PERPETUAL

TROUBLE SHOOTER'S MANUAL

by

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INTRODUCTION

The introduction to Volume 1 of the Perpetual Trouble Shooter's Manual expressed the hope that the volume would be the nucleus for a perpetual series of such books and a perpetual library of radio service information. Volume 2 is the first step in the fulfillment of this idea. With the acceptance of the work as the standard in the service branch of the radio industry, plans have been made for the period publication of this work.

Volume 2 is a continuation of Volume 1. It picks up where Volume 2 left off. Accordingly, there is no duplication of material in the two volumes, and future editions will in turn continue the series from the point where the preceding issue ended. Let it be known that Volume 2, does not supersede the first volume. It contains entirely new material. Volume 1 covered the period from 1919 to about October 1931, Volume 2 covers the period from October 1931 to the end of May 1932.

Future plans call for the publication of The Perpetual Trouble Shooter's Manual on approximately a semi-annual basis, thus covering the receivers announced during the previous six or seven months. After due consideration of the problems involved in radio service operations, it has been found that as a rule, radio receivers and kindred equipment less than six months old do not require service. Thus, if a volume covering the receivers announced during the preceding six months is available to the industry, the file of service information is kept sufficiently up-to-date to merit approval. This opinion is not personal upon the part of the author, but is the general concensus as gained in the field among the users of such information.

We wish to take this opportunity to publicly thank the many thousands of men operating in the radio service industry, who, in response to questionnaires,replied to us and advised us of the type of information they required to most satisfactorily service receivers in the field. We have tried hard to pattern this issue of the manual along the lines suggested and to furnish as much of the information requested as was obtainable.

We also wish to express our thanks publicly to the executives, engineers and service managers of the receiver manufacturers herein represented, for the kind co-operation they extended to the writer during the preparation of this manual. Were it not for them, the publication of the point to point data and other information presented in this volume, would have been well nigh impossible.

This is just as good a time as any other, to call attention to some of the contents of this volume. Every effort has been made to furnish electrical values for every resistor and fixed condenser shown upon the diagrams contained in this issue. Further progress is being made to secure similar information as related to older receivers and which are shown in schematic form in Volume 1. No doubt you appreciate that it is a difficult matter to secure values for receivers which are quite old and no longer manufactured. It is possible that the tabulation of such information will be completed by the time that Volume 3 is published.

We want to call particular attention to the fact that Volume 2 is not solely a collection of wiring diagrams. Wherever available, we have published other data supplementary to the diagram so as to make the service operation as simple as possible. In addition to wiring diagrams, voltage data and electrical values, you will invariably find chassis layouts, parts lists, alignment data, etc.

The point-to-point resistance information shown in this volume is the opening gun in what will no doubt be a revision in service analysis methods. We take pride in presenting this information to the radio service industry as being the first of the commercial manuals to contain this type of data. Similar information has been the part of some manuals produced by some of the receiver manufacturers, but since the manuals were distributed to the manufacturer's distributors and dealers, this is the first public appearance.

Resistance measurement represents the ideal method of service analysis, particularly so in modern times with special circuits and complex receivers. We feel certain that the men who have been servicing receivers by measuring resistance will certainly welcome this information and the men who have veen servicing along the conventional voltage measurement lines will find this information of value during the resistance measurement and doubly so when they are converted to resistance measurement methods of analysis and find that they can dispense with the majority of voltage measurements.

Volume 3 of the Perpetual Trouble Shooter's Manual will contain more of this data and every effort is being made to secure information of this type covering old as well as new receivers. We sincerely hope that you will find point-to-point resistance values of help in your service work, and that you will become a firm believer in this method of service analysis.

We want to call your attention to the fact that the sequence of the pages in Volume 2 is not in exact conformity with modern practice of simple arithmetical progression. Do not be alarmed if you note the absence of certain numbers. Your index will show that the correct amount of pages are contained in the manual. There is a very definite reason for the publication of these pages in this fashion. As time goes on, the volumes will increase with number. likewise the number of pages. The combined contents of Volumes 1 and 2, now numbers approximately 1850 pages. In time, you will no doubt wish to separate the receiver data according to manufacturers. You then will find that the method of page numbering in Volume 2 and in future Volumes, will enable you to file the pages in perfect order for each manufacturer and secure numerical sequence according to the model numbers as well as the page numbers. In the meantime, the pages contained in Volume 2 are in numerical order and the complete index in Volume 2 indicates whether the receiver you desire is in Volume 1 or in Volume 2. All page numbers which bear the asterisk (*) sign, are in Volume 1. All pages which do not bear the asterisk (*) sign are in Volume 2.

We have purposely omitted what may be termed a general discussion of service procedure along lines used in the past for the very simple reason that much of this data appears in text books and the space required for such data can well be devoted to other equally, if not more valuable, material.

Comments and criticism concerning the makeup of this manual and the type of information, you as a user of this manual, would like to have, are exceedingly welcome.

John F. Rider

POINT-TO-POINT RESISTANCE DATA

Point To Point Resistance Data

The application of the point-to-point data is a matter entirely within your own hands. It has been prepared along the lines which will enable a routine test upon the receiver by working through the tube sockets, thus obviating the necessity for the removal of the chassis, until the defect has been located. The condenser test is in the majority of instances likewise applicable through the sockets.

We are continually working upon the compilation of this point-to-point data, covering old as well as new receivers. A great deal more of this information will be a part of Volume 3 of the Perpetual Trouble Shooter's Manual when issued.

Tolerance Limits.

One of the precautions which must be exercised in connection with resistance measurement and this applies to the point-to-point test or to the resistance test subsequent to the voltage test is to allow sufficient tolerance.

While it is true that the values shown in circuits are exact and definite, the actual units employed in the receiver do not have the exact values marked upon the diagrams. By this we mean that a certain amount of tolerance is employed in the manufacture of the resistor and this must be recognized during the test. The tolerance limits are in a way determined by the function of the resistor and its location in the circuit. Units used in circuits which do not carry direct current have tolerance values between 10 and 15 percent. Units which carry direct current have tolerance limits which range from about 3 to 10 percent. The lower limit is to be found in filament circuit and in voltage divider resistors. An optimum range of tolerance limits for units which carry current, exclusive of the filament system is from 5 to 10 percent plus or minus.

These tolerance limits are not present in resistance measurement methods of servicing only, but are also present in voltage testing, since the variation in resistance will cause a variation in the voltage. Furthermore, the final test during voltage measurement, is the resistance test, so that the same condition applies to that test.

Tolerance limits pertaining to the resistance of r-f and i-f windings are much closer. In a-f winding, a tolerance of from 5 to 10 percent will be experienced in practice. The exact limits used by the different radio receiver manufacturers are unknown, but this does not complicate matters for the simple reason that the organization which employs a close limit, will use resistors which very closely approximate the rated value.

Voltage Co-efficient in Resistors.

Another item which must be recognized in connection with the measurement of resistors in receivers and amplifiers is the voltage co-efficient of carbon resistors. We specify the type of unit, because the same condition does not as a rule apply to wire wound and metallic coated units.

Carbon resistors should be checked at the voltages employed by the resistor manufacturer. The reason for this is that the nature of the resistor is such that its resistance (d-c) will vary according to the test voltage applied because of the current flow through the unit. This item is not the temperature co-efficient of resistance. Checking at some voltage other than that employed by the resistor manufacturer will result in the determination of some value other than the true rating when the correct voltage is applied.

However, since the correct values of voltage are not known, it is best to employ the lowest possible test voltage required to show a normal indication upon the resistance measuring device. This problem of voltage co-efficient is not native to resistance measurement method of analysis only, but is to be found when resistance is measured subsequent to a voltage test. Perhaps some time in the future, certain standards will be evolved to designate the exact test voltage to be applied to carbon resistors of various values.

By employing the lowest possible test voltage, we at least safeguard the unit against damage by overload. An approximation of the correct voltage (test) can be had by noting the position of the unit in the circuit and the voltage drop across the unit. Thus high resistors used in the plate circuits of audio frequency and detector tubes are subjected to voltages ranging from about 90 to perhaps 150 volts. Low range units used in bias circuits, varying from 10,000 to about 50,000 ohms are usually subjected to voltages ranging from 10 to perhaps 30 volts. Fortunately, the presence of a defective resistor can be detected when a low voltage is applied, despite the fact that the correct test voltage for a resistor of the type and value being checked may be much higher. In this respect, you as the operator must apply your knowledge and make your own interpretations.

Electrolytic Condensers In The Circuit.

The presence of an electrolytic condenser across a resistor will influence the resistance between two prescribed points and at the same time influences the voltage which may be applied across those two points. The variation in resistance is due to two conditions. One of these is related to the polarization of the electrolytic condenser. This type of condenser possesses one value of resistance, fairly high when the test is made with the correct polarity and a low value of resistance when checked with incorrect polarity of the testing voltage.

Therefore, it is necessary when checking resistors which may have connected across them some value of capacity, which may or may not be of the electrolytic type, to measure the resistance with the polarity of the testing voltage in both directions. This precaution is unnecessary, if the polarity of the testing voltage is maintained in conformity with the polarity of the circuit being checked. In some cases this is impossible, but it is possible in the majority of instances.

An example of the foregoing is the following. When testing grid bias resistors, the cathode or the filament centre tap are positive with respect to the chassis. The polarity of electrolytic condensers is taken into consideration when they are connected into the circuit. By arranging that the polarity of the resistance measuring system conform with the polarity of the resistor circuit when in operation, the correct polarity with respect to the electrolytic condenser is assured. In the event that the condenser connected across that resistor is not of the electrolytic type, all well and good, but if it is,correct testing circuit is applied.

A similar requirement of polarity is required when checking the resistance of units related to the rectifier filament. This terminal is positive with respect to the balance of the circuit when in operation and when making resistance tests from the rectifier filament to some other point, the polarity of the tester prod connected to the rectifier filament must be positive.

The second factor associated with electrolytic condensers is that of voltage. The usual circuit arrangement of the resistor being tested and its associated condenser is such that the voltage applied across the resistor is also applied across the condenser, since these two units are connected in parallel. Accordingly, the test voltage applied to the resistor for measurement of its ohmic value cannot exceed the operating voltage rating of the condenser. If it does,damage is the consequence.

Fortunately, low voltage electrolytic condensers are used in shunt with low values of resistance, as for example pentode bias units. Consequently, the test voltage required to check resistors of values ranging from 100 to perhaps 1000 ohms, will be sufficiently low so as not to damage the condenser or cause excessive leakage.

Electrolytic type bypass condensers in other circuits are usually within the 200 to 250 volt range, so that normal application of the tester is possible. As far as filter condensers of the electrolytic variety are concerned, the voltage rating is about twice as great as the usual testing voltage applied to the voltage divider circuits.

A third item related to electrolytic condensers and also associated with the measurement of resistance is the normal resistance of the condenser. As is well known, the insulation resistance of an electrolytic condenser is not as great as that of a solid dielectric unit. As a matter of fact, it is only a small fraction of the d-c resistance of a paper dielectric or mica dielectric unit. Accordingly, it will have some effect upon the resistance between any two prescribed points. Just what this resistance will be is not always known, but it is determined by the condition of the condenser and by the testing voltage.

If a receiver or amplifier has been inoperative for a long period of time, the ohmic value of a resistor shunted by an electrolytic condenser cannot be determined unless the condenser is disconnected. The reason for this is that the insulation resistance of an electrolytic condenser which has been inoperative for a long period of time is very low, in fact so low as to greatly influence the resistance across its terminals.

As far as perfect electrolytic condensers are concerned, the fact that leakage current flows through the condenser and that its insulation resistance is much lower than that of the solid dielectric unit must be taken into consideration. The electrolytic condenser connected across a resistor being checked is the equivalent of a shunt resistor of a certain value, determined by the leakage current through the condenser at the testing voltage.

If the voltage rating of the electrolytic condenser is high and the testing voltage applied across the circuit is low, the shunting effect of the condenser will be negligible, particularly if the ohmic value of the resistor being checked is low. It may be necessary to first determine if an electrolytic condenser is present in the circuit by comparing the readings obtained with the polarity of the test circuit, first in one manner and then reversed and then to disconnect the electrolytic unit. By maintaining the testing voltage at the lowest possible value, the effect of the shunt electrolytic condenser is minimized. Experience shows that the most frequent occasion for disconnecting the electrolytic condenser occurs when checking voltage divider circuits.

Fractional microfarad bypass condensers have low leakage. The normal rating of electrolytic condenser is somewhere around .1 to .25 milliampere per microfarad. For a .25 microfarad unit, the leakage current at say 200 volts d-c after a normal period of application would be about .000061 ampere. This means a value of resistance sufficiently high to have very little effect upon whatever units are being bypassed by the condenser.

Because of the nature of the electrolytic condenser, the resistance test voltage applied across a resistor shunted by an electrolytic condenser should be kept across the contact for a short period of time, say at least a minute for fractional microfarad units, unless the measured value of resistance indicates a normal state. In every case, the shunt effect of the condenser will lower the resistance between the test points.

In the case of filter circuits, it may be necessary to keep the resistor test prods connected across the circuit for about 5 minutes, unless the measured value immediately after application shows a normal state. In work of this type, a great deal depaneds upon the operator.

Once more we wish to mention that the facts named, are not native to resistance measurement methods of service analysis, but will be experienced if the resistance test is made subsequent to the voltage test. If you are in the habit of removing the chassis before making the tests, which is not necessary with point-to-point method of operation, you may find it advantageous to disconnect the filter condensers, if they are of the electrolytic type.

Solid and Air Dielectric Condenser Tests.

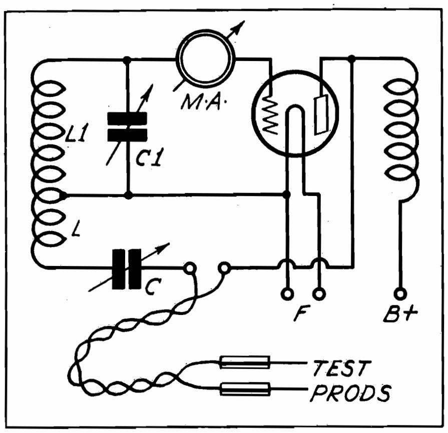
Solid and air dielectric condensers, unless shorted, have no effect upon shunt resistors, and there is no need for polarity specification. However in certain instances, as for example across bias units and across the voltage divider it is best to always connect the ohmmeter as stated in connection with electrolytic condensers. In this manner, you are certain of having the correct polarity in the event that the condenser in the circuit is of the electrolytic variety.

Open Condensers.

One of the greatest service problems encountered today is the intermittent and permanently open condenser. It is true that condensers become shorted, but when shorted, will indicate that effect by short circuiting the associated resistors. hence will be detected when the resistance test is made.

It has been customary in the past to check for open condensers by connecting a perfect condenser across the terminals of the suspected condenser and noting the effects. However, this requires that the receive be in operation and there is possibility of electrical shocks to the operator and maybe short circuiting of circuits by accidental contacts. Another method is to disconnect the suspect condenser and check it for capacity; the design of the capacity measuring unit being such as to indicate the open.

The writer has developed a condenser testing unit for the specific purpose of checking open condensers of the entire range used in radio receivers and amplifiers. While it will show a shorted condenser, its real function is to indicate whether or not a condenser is open circuited, irrespective of its location in the circuit, whether shunted by a coil or a resistor, without disconnecting the condenser from the circuit. The wiring diagram is shown below.



C1 is .0001 mfd.
C is .00035 mfd.
MA is a 0-25 d-c milliammeter
The choke in the plate circuit is a radio frequency winding of from 25 to 50 millihenrys.
L and L-1 are both parts of a single winding, with a total inductance depending upon the resonant frequency desired.

In operation, the plate circuit condenser is increased until, the circuit just stops when the test prods are shorted. The state of oscillation is indicated upon the milliameter. The circuit can be used with batteries, a-c or d-c power supply voltages. The test prods then are connected across the condenser being tested and if the condenser is intact, the circuit will oscillate and grid current will be indicated upon the milliammeter. The unit connected across the condenser being tested has no effect upon the test, unless it is shorted, in which case, the short circuit would present a direct path across the condenser. However, such a short circuit would be detected during the resistance test.

The operation of the device is based upon the introduction of the condenser under test as a series condenser in the plate circuit, thus reducing the effective capacity in the system and starting oscillations. The resonant period of the circuit is of no consequence. The writer employs 250 kc.

If the condenser is shorted, it has the same effect as if the test prods are shorted and the circuit will not oscillate. If the condenser is open and is shunted by a coil, the presence of the additional inductance in the system prevents oscillation. If the condenser is shunted by a resistor and the condenser is open, the presence of the resistor does not change the effective capacity of the ciruit and the system will not oscillate.

Point-To-Point Resistance Data.

The point-to-point resistance data presented in the subsequent pages can be employed in any one of a number of methods. It is equally effective with the chassis removed or by working through the sockets with the chassis in the cabinet.

The conditions under which these tests are made are as follows.

1. The tubes are tested separately.

2. The line voltage or battery voltage are determined independently of the receiver.

3. In a-c receivers, the a-c voltage applied to the receiver anodes is measured with an a-c meter without the rectifier or the other tubes in their sockets.

4. In a-c receivers the filament voltage is measured.

Additional conditions are named upon the pages giving the resistance details for the various receivers. The following abbreviations are used and the method of application will be described later.

TUBES

RF - rf	Radio Frequency
AF - af	Audio Frequency
IF - if	Intermediate Frequency
Det	Detector
Osc	Oscillator
Rect	Rectifier
AVC	Automatic Volume Control
AVCX	Combination automatic volume control and detector

TUBE ELEMENTS

Cg	Control grid
K	Cathode
F	Filament
H	Heater
Sg	Screen grid
Sup	Suppressor grid
P	Plate

CONDENSERS

BC	Bypass condenser
FC	Filter condenser
CC	Coupling condenser
BLC	Blocking condenser

MISCELLANEOUS

Tr	Transformer
Cplg	Coupling
wdg	Winding
Y	Chassis
chk	Choke
mfd.	Microfarad
mmfd.	Micromicrofarad

The data pages are arranged to show the test made between the chassis and the various tube elements or circuits listed in the first column. These points are reached through the tube sockets working from the top of the chassis, or from the load sockets assuming that a plug-cable method contacting the tube circuit is used.

The second column gives the correct value of resistance to be found in the circuit. These figures are the rated values and the tolerance limits must be applied. If the units used in the circuit are exactly as rated, the resistance to be expected is the quoted value. Of course electrolytic condensers must also be recognized.

The third column states probable reason for incorrect resistance between the points named, assuming that the tolerance limits have been applied. No special mention of open resistors is made unless they are in parallel circuits, on the assumption that if the resistance test indicates an open, the subsequent operation will be to locate the open resistor.

The tests have been arranged in such fashion as to enable isolation of the various units employed in the receiver, thereby enabling immediate localization of the defect in the event of a short circuit or an open circuit indication.

The third column states the probable fault and its location. An example is the following.

Tube	Correct	Incorrect
RF Plate	13,026 ohms	BC- rf P wdg- Y (1 mfd.) BC- 2 D AF Tr- 2 D K FC- 2 RF P wdg-Y (8 mfd)
RF Plate to '47 Screen	26 ohms	

Between the r-f tube plate and chassis, the resistance to be expected according to the units used in the circuit is 13,026 ohms, providing that everything is correct. Because of the nature of the circuit, that is, current flow through the system, the tolerance limit is quite low, between 5 and 10 percent. Supposing that it shows a marked difference, which means that the "incorrect" column would be referred to.

The first possible reason for the defect is the "bypass condenser connected between the rf plate winding and the chassis. It is a 1. mfd unit". The abbreviations used are not difficult to comprehend, since they are definitely associated with the names of the units.

The second possible reason for the defect is the "bypass condenser connected between the 2nd Detector tube audio frequency transformer and the 2nd detector cathode"

The third possible reason for tge defect is the "filter condenser connected between the 2nd radio frequency tube plate winding and the chassis, an 8 mfd. condenser".

Because of common circuit connections, the defect will not always be a part of the tube circuit immediately contacted. However, the defect in the circuit may be located in an associate tube.

The subsequent tabulation affords a means of isolating the radio frequency transformer primary winding, which is connected to the plate of the radio frequency tube. Naturally a defect in a resistance (r-f winding) of 26 ohms will have very little effect upon a total circuit resistance of 13,026 ohms, so that it is necessary to isolate the plate winding in order to check its resistance. This is done as stated.

Another example of the application of the abbreviations is as follows:

2 Detector Control Grid	50 ohms	TC- 2 D Cg-Y

This means that the correct resistance between the 2nd detector control grid and the chassis should be 50 ohms. If a defect is indicated, check the "tuning condenser connected between the 2nd detector control grid and the chassis"

All of the items listed under the incorrect heading are those which will influence the resistance between points. As far as open condensers are concerned, the condenser test must be applied. With respect to neutralization, incorrect alignment, etc., the routine operations are required.

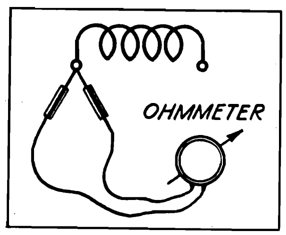
The term " TC if Tr",means the tuning condenser connected across the intermediate frequency transformer.

The wiring diagram will be found useful when working in this manner, although it is not absolutely essential. It will of course be required when the replacement is made, in order to clearly show the components of the various circuits and the exact resistor or unit in question.

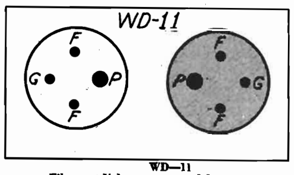
Checking Low Resistance Windings.

Special precautions must be exercised when checking low resistance windings, such as voice coils, output transformer secondaries and r-f windings. The effect of the contact resistance must be taken into consideration. The circuit shown below illustrates the method of compensating for the contact resistance with ohmmeters which have voltage compensating adjustments.

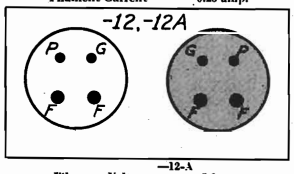
Short the two test prongs upon one of the circuit contacts which will be tested. Be sure of securing a firm connection. Then adjust the meter for zero indication. Follow this by making the resistance test. The contact resistance will then be automatically taken care of. The effect of this adjustment will be entirely negligible when measuring high resistances.



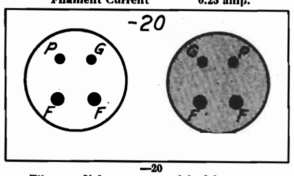
Underside of Socket and Tube Base — Top of Socket



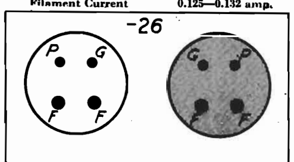
WD—11
Filament Voltage 1.1
Filament Current 0.25 amp.



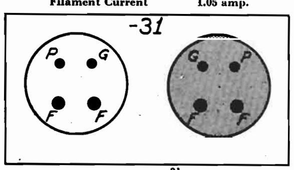
—12-A
Filament Voltage 5.0
Filament Current 0.25 amp.



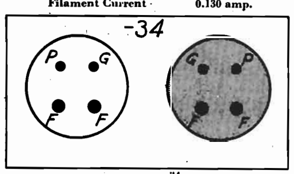
—20
Filament Voltage 3.0—3.3
Filament Current 0.125—0.132 amp.



—26
Filament Voltage 1.5
Filament Current 1.05 amp.

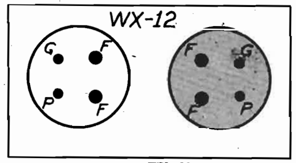


—31
Filament Voltage 2.0
Filament Current 0.130 amp.

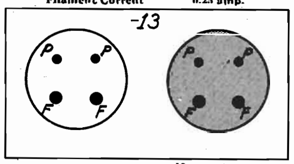


—34
Filament Voltage 2.0
Filament Current 0.060 amp.

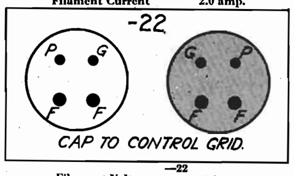
Underside of Socket and Tube Base — Top of Socket



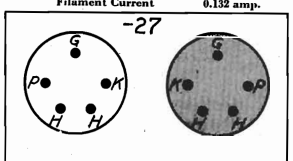
WX—12
Filament Voltage 1.1
Filament Current 0.25 amp.



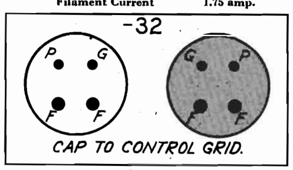
—13
Filament Voltage 5.0
Filament Current 2.0 amp.



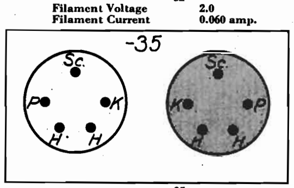
—22
Filament Voltage 3.3
Filament Current 0.132 amp.



—27
Filament Voltage 2.5
Filament Current 1.75 amp.

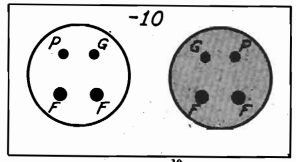


—32
Filament Voltage 2.0
Filament Current 0.060 amp.

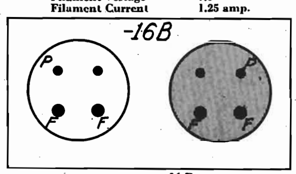


—35
Filament Voltage 2.5
Filament Current 1.75 amp.

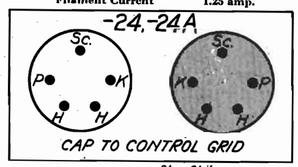
Underside of Socket and Tube Base — Top of Socket



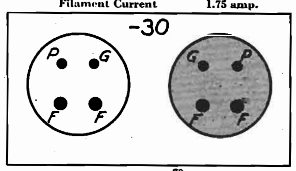
—10
Filament Voltage 7.5
Filament Current 1.25 amp.



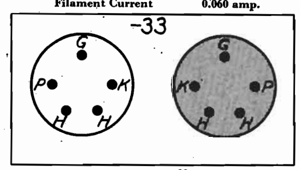
—16-B
Filament Voltage 7.5
Filament Current 1.25 amp.



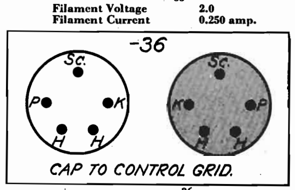
—24, —21-A
Filament Voltage 2.5
Filament Current 1.75 amp.



—30
Filament Voltage 2.0
Filament Current 0.060 amp.

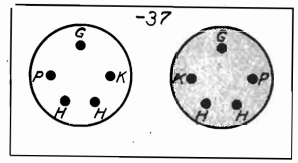


—33
Filament Voltage 2.0
Filament Current 0.250 amp.

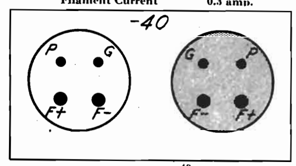


—36
Filament Current 6.3
Filament Voltage 0.3 amp.

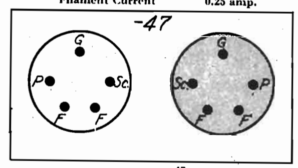
Underside of Socket and Tube Base — Top of Socket



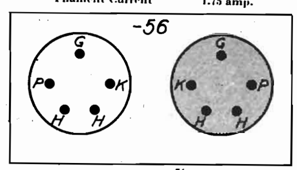
—37
Filament Voltage 6.3
Filament Current 0.3 amp.



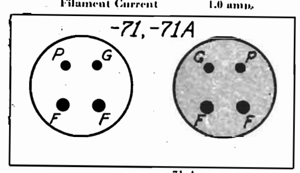
—40
Filament Voltage 5.0
Filament Current 0.25 amp.



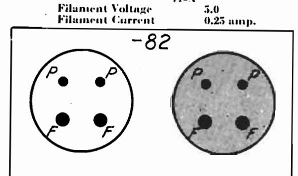
—47
Filament Voltage 2.5
Filament Current 1.75 amp.



56
Filament Voltage 2.5
Filament Current 1.0 amp.

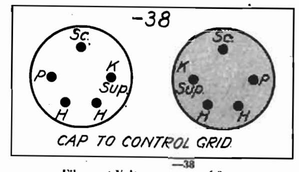


—71-A
Filament Voltage 5.0
Filament Current 0.25 amp.

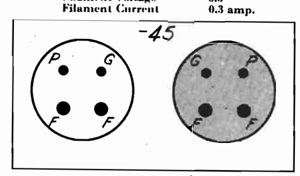


—82
Filament Voltage 2.5
Filament Current 3.0 amp.

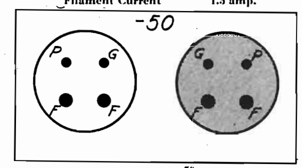
Underside of Socket and Tube Base — Top of Socket



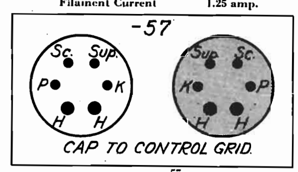
—38
Filament Voltage 6.3
Filament Current 0.3 amp.



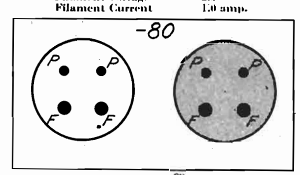
—45
Filament Voltage 2.5
Filament Current 1.5 amp.



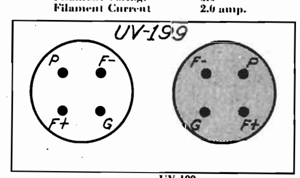
—50
Filament Voltage 7.5
Filament Current 1.25 amp.



57
Filament Voltage 2.5
Filament Current 1.0 amp.

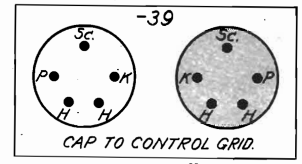


—80
Filament Voltage 5.0
Filament Current 2.0 amp.

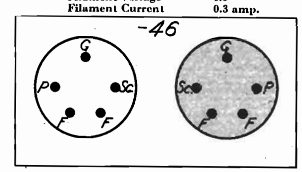


UV 199
Filament Voltage 3.0—3.3
Filament Current 0.060—0.063 amp.

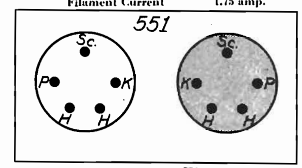
Underside of Socket and Tube Base — Top of Socket



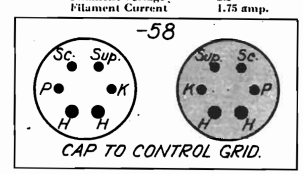
—39
Filament Voltage 6.3
Filament Current 0.3 amp.



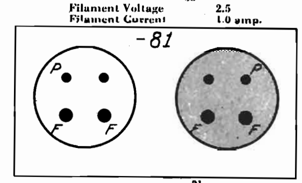
—46
Filament Voltage 2.5
Filament Current 1.75 amp.



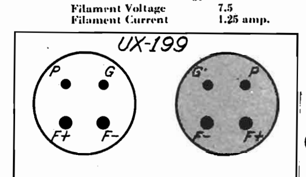
551
Filament Voltage 2.5
Filament Current 1.75 amp.



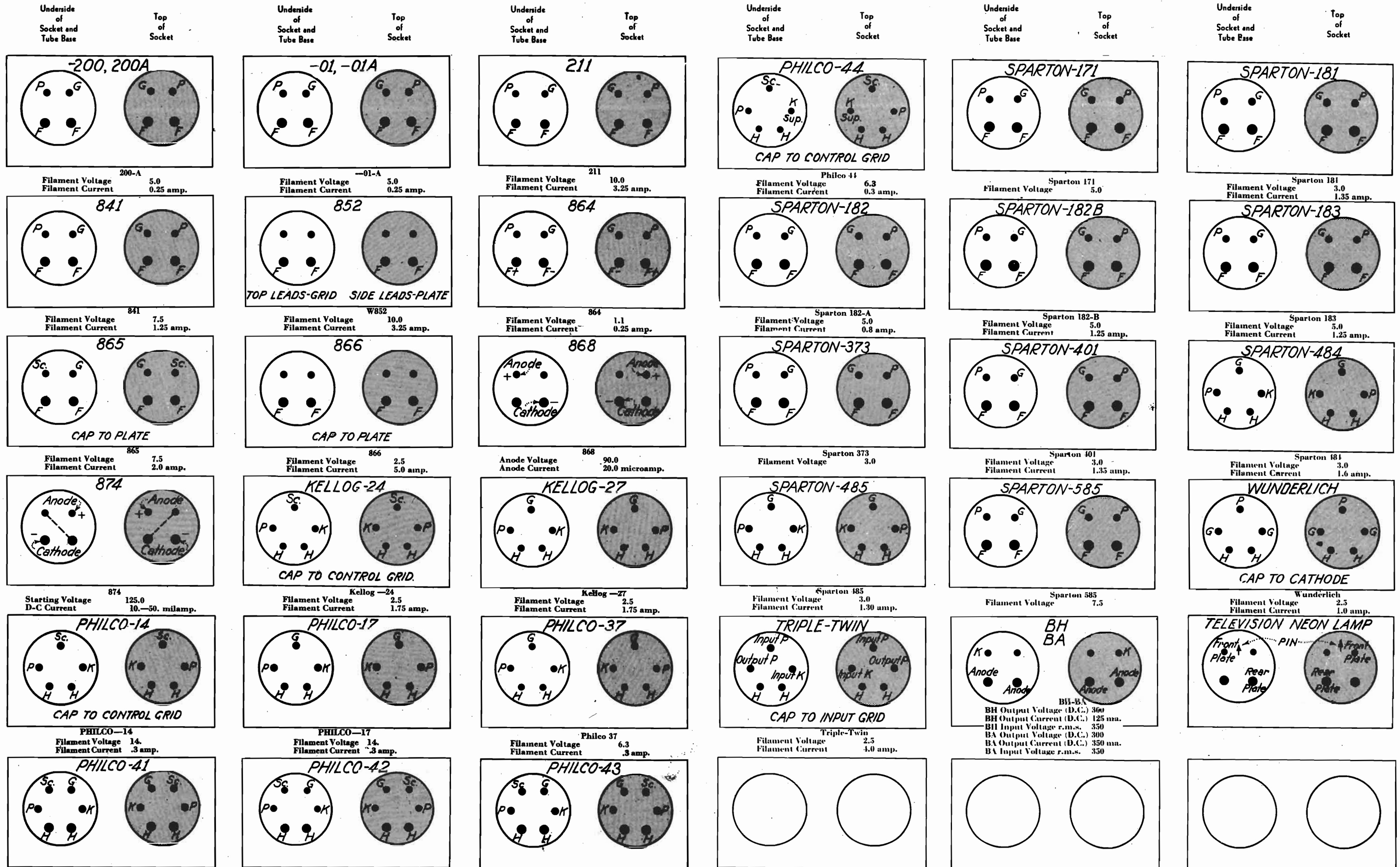
58
Filament Voltage 2.5
Filament Current 1.0 amp.



—81
Filament Voltage 7.5
Filament Current 1.25 amp.



UX 199
Filament Voltage 3.0—3.3
Filament Current 0.060—0.063 amp.



200-A
Filament Voltage 5.0
Filament Current 0.25 amp.

841
Filament Voltage 7.5
Filament Current 1.25 amp.

865
Filament Voltage 7.5
Filament Current 2.0 amp.

874
Starting Voltage 125.0
D-C Current 10.—50. milamp.

PHILCO—14
Filament Voltage 14.
Filament Current .3 amp.

PHILCO—41
Filament Voltage 6.3
Filament Current .7 amp.

—01-A
Filament Voltage 5.0
Filament Current 0.25 amp.

W852
Filament Voltage 10.0
Filament Current 3.25 amp.

866
Filament Voltage 2.5
Filament Current 5.0 amp.

Kellog —24
Filament Voltage 2.5
Filament Current 1.75 amp.

PHILCO—17
Filament Voltage 14.
Filament Current .3 amp.

Philco 42
Filament Voltage 6.3
Filament Current .7 amp.

211
Filament Voltage 10.0
Filament Current 3.25 amp.

864
Filament Voltage 1.1
Filament Current 0.25 amp.

868
Anode Voltage 90.0
Anode Current 20.0 microamp.

Kellog —27
Filament Voltage 2.5
Filament Current 1.75 amp.

Philco 37
Filament Voltage 6.3
Filament Current .3 amp.

PHILCO—43
Filament Voltage 25.
Filament Current .3 amp.

Philco 44
Filament Voltage 6.3
Filament Current 0.3 amp.

Sparton 182-A
Filament Voltage 5.0
Filament Current 0.8 amp.

Sparton 373
Filament Voltage 3.0

Sparton 485
Filament Voltage 3.0
Filament Current 1.30 amp.

Triple-Twin
Filament Voltage 2.5
Filament Current 4.0 amp.

Sparton 171
Filament Voltage 5.0

Sparton 182-B
Filament Voltage 5.0
Filament Current 1.25 amp.

Sparton 401
Filament Voltage 3.0
Filament Current 1.35 amp.

Sparton 585
Filament Voltage 7.5

BH-BA
BH Output Voltage (D.C.) 360
BH Output Current (D.C.) 125 ma.
BH Input Voltage r.m.s. 350
BA Output Voltage (D.C.) 300
BA Output Current (D.C.) 350 ma.
BA Input Voltage r.m.s. 350

Sparton 181
Filament Voltage 3.0
Filament Current 1.35 amp.

Sparton 183
Filament Voltage 5.0
Filament Current 1.25 amp.

Sparton 484
Filament Voltage 3.0
Filament Current 1.6 amp.

Wunderlich
Filament Voltage 2.5
Filament Current 1.0 amp.

KOLSTER K 60 and K 62

All tubes removed from sockets and AC plug removed from power supply. Speaker connected. Volume control maximum unless otherwise stated.

From Chassis To	Correct		Incorrect
Aerial	1.55	ohms	
RF Control Grid	1,000,000	ohms	Includes one rf wdg TC- rf Cg-Y BC- across 1 meg unit TC- across first rf wdg
RF Control Grid and first tuning condenser stator	6.4	ohms	
RF Cathode (V.C.Max)	200	ohms	BC- rf K-Y (.25 mfd)
RF Screen Grid	2,653	ohms	BC- rf Sg-Y (.25 mfd)
RF Plate	6,679	ohms	BC- rf P wdg Y(.25 mfd)
RF Plate to 80 Fil	26	ohms	
1 Detector Control Grid	26	ohms	
1 Detector Cathode	10,003.9	ohms	BC across 10,000 ohms C plg wdg 3.9 ohms
1 Detector Screen Grid	2,653	ohms	See RF Screen
1 Detector Plate	6,703	ohms	TC- IF Tr Primary .25 meg resistor across primary
IF Control Grid	50	ohms	TC- if Cg-Y
IF Cathode	200	ohms	See RF Cathode
IF Screen Grid	2,653	ohms	See RF Screen
IF Plate	6,703	ohms	See RF Plate
2 Detector Control Grid	50	ohms	TC- 2 D Cg-Y
2 Detector Cathode	25,000	ohms	BC- 2 DK-Y (1. mfd)
2 Detector Screen	252,653	ohms	BC- 2 D Sg-Y (.1 mfd)
2 Detector Plate	256,838	ohms	BC 2 DP-2DK BLC- 2 DP-'47 Cg
Oscillator Control Grid	100,000	ohms	
Oscillator Cathode	0	ohm	
Oscillator Plate	2,656	ohms	BC- rf Sg-Y
'47 Control Grid	500,200	ohms	Tone Control Condensers BC- '47 grid fil res-Y See 2 D Plate
RF Plate to '47 Screen	26	ohms	
1 Detector Plate to '47 Screen	50	ohms	
IF Plate to '47 Screen	50	ohms	
'47 Screen Grid to '80 Fil	0	ohm	
'47 Plate to Chassis	850	ohms	
'47 Plate to '80 Filament	650	ohms	
'80 Anode to Chassis	1,733	ohms	

K 60 and K 62 Cont'd

From Chassis To	Correct		Incorrect
'80 Anode to '80 Anode	166	ohms	
'80 Filament to Chassis	6,653	ohms	FC
'80 Filament to '80 Anode	8,369	ohms	FC
Output Transformer Secondary Only	0.3	ohm	
Voice Coil only	3	ohms	
Voice Coil and Secondary	0.273	ohm	
Across AC Plug (110-120 V)	1.9	ohm	
Across AC Plug (100-110 V)	1.7	ohm	
AC plug to chassis	0	ohm	BC- between power transformer primary and chassis (.1 mfd)

Notes** Oscillator coil is isolated from oscillator control grid by means of blocking condenser. Oscillator coil only has a resistance of 2.5 ohms.

KOLSTER K 60-K 62 **

Tube	Heater Voltage	Control Grid Voltage	Screen Grid Voltage	Plate Voltage	Plate Current
RF		3.*	80.	230.	6.0 ma
1 Det		6.	74.	225.	1.0
IF		4.	80.	225.	7.0
2 Det		6.	22.*	125.*	.2
Osc.		-	-	85.	6.0
Pwer		.2*	245.	225.	24.
Rect.					48. per anode

* Indicates incorrect reading due to high resistance in circuit.

** Volume control at maximum and tone control in natural position.

KOLSTER K 70 and K 72

All tubes removed from sockets and AC plug disconnected from power supply Speaker disconnected. Volume control maximum unless otherwise stated.

From Chassis To	Correct		Incorrect
Aerial	1.55	ohms	
RF Control Grid	2,250,000	ohms	TC- rf Cg-Y
RF Control Grid to Stator of first tuning condenser	6.4	ohms	
RF Cathode	200	ohms	BC- rf K-Y (.25 mfd)
RF Screen	23,000	ohms	BC-Y (1 mfd) BC Osc P-Y
RF Plate	6,026	ohms	BC- rf P wdg-Y
RF Plate to '47 Screen	26	ohms	
1 Detector Control Grid	26	ohms	
1 Detector Cathode	10,003.9	ohms	BC across 10,000 ohms Osc Cplg wdg-3.9 ohms
1 Detector Screen Grid	23,000	ohms	See RF Screen
1 Detector Plate	6,050	ohms	See RF Plate TC- if Tr wdg 250,000 ohm resistor across IF Tr primary
1 Detector Plate to '47 Screen	50	ohms	TC- if Tr
IF Control Grid	2,000,050	ohms	TC- if Cg BC- if Cg TC-Y
IF Control Grid to AVC Plate	50	ohms	TC- if Tr sec
IF Cathode	200	ohms	See RF Cathode
IF Screen Grid	23,000	ohms	See RF Screen
IF Plate	6,050	ohms	TC- IF Tr pri See RF Plate
IF Plate to '47 Screen	50	ohms	TC- IF Tr
2 Detector Control Grid	50	ohms	TC- 2 D Cg-Y
2 Detector Cathode	250,000	ohms	BC- 2 D K-Y
2 Detector Screen	253,000	ohms	BC- 2 D Sg-Y
2 Detector Plate	256,185	ohms	BC- 2 D P- 2 D K
2 Detector Plate to '47 Screen	250,000	ohms	BLC- 2 DP-'47 Cg
'47 Control Grid	502,200	ohms	BLC-'47 Cg- 2 DP BC-'47 Cg filter res-Y Tone Control condensers
'47 Filament	2,000	ohms	
'47 Screen	6,000	ohms	FC See IF Plate
'47 Screen to '80 Fil	0	ohm	
AVC Control Grid	2,032,000	ohms	CC AVC Cg- if P
AVC Control Grid to AVC Cathode	2 megohms		
AVC Cathode	32,000	ohms	
AVC Screen Grid	27,000	ohms	

K 70 and K 72 Cont'd

From Chassis To	Correct		Incorrect
AVC Plate	2,000,000	ohms	See RF Control Grid See 1 Det Control Grid
'80 Anode to '80 Anode	166	ohms	
'80 Anode to AVC Cathode*	15,483	ohms	TC
'80 Anode to 80 Filament *	53,483	ohms	FC

Across Filament contacts of speaker plug	830	ohms
Across Grid- Plate contacts of speaker plug	650	ohms
Across Voice Coil only	7.5	ohms
Across Output Transformer secondary only	0.92	ohm
Across AC Plug (110-120 V)	1.9	ohm

Note- Field coil resistance 830 ohms
Output transformer primary 650 ohms

Speaker Connected

'47 Plate to '47 Screen 650 ohms

Model 72

** Everything as in model 70, except for the following-

Speaker Disconnected

'80 Anode to AVC Cathode	20,483	ohms
'80 Anode to '80 Filament	58,483	ohms

KOLSTER K 70-K 72

Volume control at maximum. Tone contral at natural position.

Tube	Control Grid Voltage	Screen Grid Voltage	Cathode Voltage	Plate Voltage	Plate Current
RF	.5*	60.	80.	190.	.25 ma
1 Det	5.	50.	84.	180.	.6
IF	3.	75.	80.	195.	1.
AVC	.25	25.	50.	20.	-
2 Det	4.	24*	80.	100*	.25
Pwer	4. *	260.		235.	35.
Osc.	2.5		80.	80.	5.
Rect.					48. per anode

* Indicates incorrect reading due to high resistance in circuit.

KOLSTER K 80 and K 82

All tubes out of receivers and AC plug disconnected from power supply. Speaker disconnected. Volume control maximum unless otherwise stated.

From Chassis To	Correct		Incorrect
Aerial	1.55	ohms	
RF Control Grid	2,250,000	ohms	BC- rf grid filter resistor-Y BC- if Cg wdg-Y (.1 mfd)
RF Control Grid to first tuning condenser stator	6.4	ohms	
RF Cathode	200	ohms	BC- rf K-Y (.25 mfd)
RF Screen	7,000	ohms	BC- rf Sg-Y (.25 mfd)
RF Plate	13,026	ohms	BC- rf P wdg-Y (1.mfd) BC- 2 D AF Tr-2 DK FC- 2 RF P wdg-Y-(8mfd)
RF Plate to '47 Screen	26	ohms	
1 Detector Control Grid	26	ohms	
1 Detector Cathode	10,003.9	ohms	BC- across 10,000 ohms Osc. cplg wdg 3.9 ohms
1 Detector Screen Grid	7,000	ohms	BC- rf Sg-Y (.25 mfd)
1 Detector Plate	13,050	ohms	TC- if Tr See RF Plate
1 Detector Plate to '47 Screen	50	ohms	
IF Control Grid	2,000,050	ohms	BC- if wdg- if K
IF Control Grid to AVC Plate	50	ohms	TC- IF Tr
IF Cathode	200	ohms	See RF Cathode
IF Screen Grid	7,000	ohms	See RF Screen
IF Plate	13,050	ohms	See RF Plate
IF Plate to '47 Screen	50	ohms	
2 Detector Control Grid	50	ohms	TC- 2 D Cg-Y
2 Detector Cathode	25,000	ohms	BC- 2 DK-Y (1.mfd) BC- 2 DK- 2 DP(.001 mfd
2 Detector Plate	42,545	ohms	BC- AF Tr- 2 DK(1 mfd) BC- 2DP-2DK (.001 mfd) See RF Plate
2 Detector Plate to '47 Screen	29,545	ohms	
'47 Control Grid	59,250	ohms	Tone Control Condenser
'47 Control Grid to Control Grid	112,500	ohms	Tone Control Condenser Tone Switch closed
'47 Cg to Cg-Tone Switch closed	9,100	ohms	
'47 Screen Grid	13,000	ohms	
'47 Screen to '80 Fil	0	ohm	
AVC Control Grid	2,020,000	ohms	CC- AVC Cg-if P
AVC Cathode	5,000	ohms	
AVC Screen Grid	3,000	ohms	
AVC Plate	2,000,000	ohms	
AVC Filament	3,255	ohms	

K 80 and K 82 Cont'd

From Chassis To	Correct		Incorrect
'80 Anode to '80 Anode	166	ohms	
'80 Anode to AVC Cathode(K-80)	15,483	ohms	TC across filter chk FC
'80 Anode to AVC Cathode(K-82)	20,483	ohms	
'80 Anode to '80 Fil (K-80)	33,483	ohms	FC
'80 Anode to '80 Fil (K-82)	38,573	ohms	
Field coil only	830	ohms	
Output transformer primary	830	ohms	
Output transformer secondary only	0.812	ohm	
Voice coil only	8.7	ohms	
Oscillator Control Grid	100,000	ohms	
Oscillator Cathode	0	ohm	
Oscillator Plate	7,003.1	ohms	
Oscillator Plate to RF Screen	3.1	ohms	

Notice.***

In later production of the K-80, a 1000 ohm fixed resistor was added to the cathode circuit of the AVC tube. This must be added to the various values obtained by working between the AVC tube cathode and other points in the receiver.

KOLSTER K 80-K 82

Volume control at maximum. Tone control at natural position.

Tube	Control Grid Voltage	Screen Grid Voltage	Cathode Voltage	Plate Voltage	Plate Current
RF	0.4 *	80.	48.	185.	2.5 ma.
1 Det	5.5	80.	58.	185.	.6
IF	0.2 *	90.	44.	195.	1.0
AVC	0.5	44.	-60.	15.	0.0
2 Det	15.	-	75.	150.	0.6
Pwer	12. *	245.	-	225.	30.
Pwer	12. *	245.	-	225.	30.
Osc.	0. *	-	52.		6.0
Rect.					48. per anode

* Indicates incorrect reading due to high resistance in circuit.

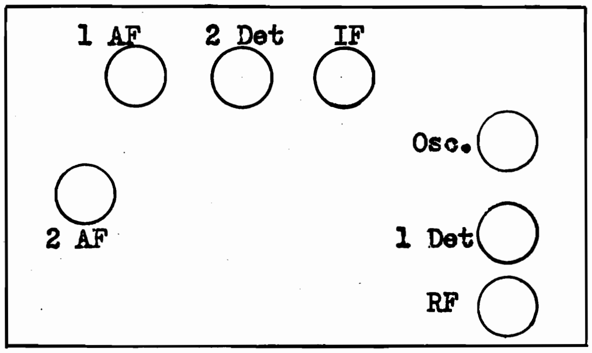
PHILCO 35

All tubes out of sockets and batteries disconnected. Volume control maximum unless otherwise stated.

From Chassis To	Correct		Incorrect
Aerial	9.3	ohms	
RF Control Grid	251,000	ohms	BC- rf Cg wdg-Y (.09 mfd) TC- rf Cg-Y
RF Control Grid to IF Control Grid	72.5	ohms	TC- IF Tr
RF Screen Grid to 67½ post	150	ohms	
RF Screen Grid to Chassis	0	ohm	BC- rf Sg-Y BC- if Sg-Y (2 mfd)
RF Plate to 135 Post	16.4	ohms	
RF Plate to Chassis	0	ohm	BLC- Osc P circuit BC- IF P wdg-Y (09 mfd) BC- D P-Y Tone Control Condenser BLC- D P - 1 AF Cg
1 Detector Control Grid	3,006.6	ohms	TC- 1 D Cg-Y BC- Osc Cplg wdg-Y BC- rf Cg wdg-Y
1 Detector Screen to 67½ post	150	ohms	
1 Detector Screen Grid to Chassis	0	ohm	See RF Screen
1 Detector Plate to 135 Post	68	ohms	TC- IF Tr
1 Detector Plate to Chassis	0	ohms	See RF Plate
IF Control Grid	251,065	ohms	TC- IF Tr See RF Control Grid
IF Screen Grid to 67½ post	150	ohms	
IF Screen Grid to Chassis	0	ohm	See RF Screen
IF Plate to 135 Post	74	ohms	TC- IF Tr
IF Plate to Chassis	0	ohm	See RF Plate
2 Detector Control Grid	25,000-100,000	ohms	Exact resistance of Cg voltage volume control not known BC- 2 D Cg wdg-Y
2 Detector Control Grid to -22½ post	40,000-47,000	ohms	approximate
2 Detector Plate to 135 post	240,013	ohms	2 Detector plate chk is 13.4 ohms
2 Detector Plate to Chassis	0	ohm	See Rf Plate
1 AF Control Grid	493,000	ohms	
1 AF Plate to 67½ Post	1,200	ohms	
'47 Control Grid to -22½ Post	6,000	ohms	
'47 Screen Grid to 135 Post	0	ohm	
'47 Plate to 135 Post	450	ohms	

35 Cont'd

Output Transformer Secondary only	.62	ohm	
Oscillator Control Grid to Chassis	54,007	ohms	BC- Osc wdg-Y TC-Osc Cg-Y
Osc Cg to Osc Plate	0	ohm	BLC- Osc P
Oscillator Plate to 135	51,000	ohms	See RF Plate



Tube Socket Readings Taken with Set Tester.

Tube	Circuit	Filament Volts	Plate Volts	Grid Volts	Plate Current Milliamperes	Screen Grid Volts
32	R. F.	1.9	133	...	3.0	60
32	1st Det.	1.9	133	...	3.0	63
30	Osc.	1.9	60	...	1.5	...
32	I. F.	1.9	133	...	3.5	60
30	2nd Det.	1.9	55	2.5	.05	...
30	1st Audio	1.9	65	...	.05	...
33	Output	1.9*	125*	7*	12.*	135*

All readings taken with volume control at maximum, antenna disconnected, and ground connected.
*These readings must be taken from the under side of the chassis using test prods and leads unless the set checker is specially equipped for testing pentode tubes.

PHILCO 50 and 50 A

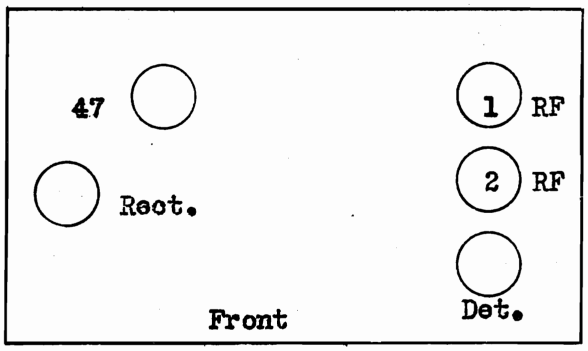
All tubes out of sockets and AC plug disconnected from power supply
Field Coil disconnected

From Chassis To	Correct	Incorrect
Aerial (V.C. Max)	24 ohms	Aerial V.C. 1800 ohms
1 RF Control Grid	6.5 ohms	TC- rf Cg-Y
1 RF Cathode (V.C.Max)	150 ohms	BC- rf K-Y (.05 mfd)
1 RF Screen Grid	20,150 ohms	V.C. in circuit 5000 ohms See RF Cathode BC- 2 rf Sg-Y FC- 80 F-Y (6 mfd EL)
1 RF Screen Grid to 80 Fil	25,000 ohms	
1 RF Plate	45,215 ohms	BC- rf P-Y See RF Screen
1 RF Plate to '80 Fil	65 ohms	
2 RF Control Grid	6.5 ohms	TC- 2 rf Cg-Y
2 RF Cathode(V.C.Max)	150 ohms	See 1 RF Cathode
2 RF Screen Grid	20,150 ohms	See 1 RF Screen
2 RF Screen Grid to '80 Fil	25,000 ohms	
2 RF Plate	45,215 ohms	See 1 RF Plate
2 RF Plate to 80 Fil	65 ohms	
Detector Control Grid	6.5 ohms	TC- D Cg-Y
Detector Cathode	32,000 ohms	BC- D K-Y
Detector Screen Grid	119,150 ohms	BC- D Sg-Y See RF Screen
Detector Screen Grid to 80 Fil	124,000 ohms	
Detector Plate	394,150 ohms	BC- 99,000 ohms-Y BLC- D P -47 Cg BC- D P-Y FC- 80 Fil-80 P wdg See RF Screen
Detector Plate to '80 Fil	349,000 ohms	
'47 Control Grid	650,000 ohms	BC- 47 Cg leak-Y
'47 Screen Grid to '80 Fil	0 ohm	
'47 Screen Grid to Chassis	45,150 ohms	See RF Screen
'47 Plate	45,516 ohms	See RF Screen
'47 Plate to '80 Fil	366 ohms	
'80 Fil to 80 Plate	695,460 ohms	FC- 80 F-(10 mfd EL)
'80 Plate to Chassis	650,310 ohms	
'80 Plate to 80 Plate	621 ohms	
Across AC plug	7.55 ohms	

50 and 50-A Cont'd

A resistor of 10,000 ohms is used in place of an r-f choke in the detector plate circuit. Two bypass condensers, with mid-junction grounded are connected across the resistor.

A fixed condenser is connected between the plate of the pentode tube and ground.



-Tube Socket Readings Taken with AC Set Tester AC Line—115 volts

Tube		Filament Volts	Plate Volts	Screen Grid Volts	Control Grid Volts	Cathode Volts	Plate Milli-amperes
Type	Circuit						
24	1st R.F.	2.4	245	90	2.5	3.0	4.5
24	2nd R.F.	2.4	250	90	2.5	3.0	5.5
24	Det.	2.4	100	42	8.0	8.0	0
47	Output	2.4	175*	190*	1.0*	...	2.7*
80	Rect.	5.0	...	...	...	...	30/

Note—Volume Control on full; Station Selector turned to Low Frequency End.

*These readings must be taken from the underside of the chassis, using test prods and leads unless the set checker is specially equipped for testing pentode tubes.

PHILCO 90 and 90 A
(1- 47)
Above serial #237,001

All tubes out of sockets and AC plug disconnected from power supply.
Speaker field and output transformer disconnected.

From Chassis To	Correct		Incorrect
Aerial	10.7	ohms	Fixed resistor across antenna coil
RF Control Grid to First Selector Condenser Stator	13.4	ohms	
RF Control Grid to Chassis	592,000	ohms	BC- rf Cg wdg-Y BC- AVCX wdg-Y BC- if Cg wdg-Y TC- rf Cg-Y
RF Cathode	60	ohms	BC- Osc K-Y
RF Screen Grid	20,280	ohms	BC- Field coil pocket-Y
RF Plate to 80 Fil	168.7	ohms	
RF Plate to '47 Screen	18.7	ohms	
1 Detector Control Grid	7.9	ohms	TC- 1 D Cg-Y
1 Detector Cathode	5,060	ohms	BC- 1 D K-Y BC- Osc K-Y
1 Detector Screen Grid	20,280	ohms	See RF Screen
1 Detector Plate to '80 Fil	218	ohms	TC- IF Tr
1 Detector Plate to '47 Screen	68	ohms	
IF Control Grid	541,068	ohms	BC- IF Cg wdg-Y TC- IF Tr
IF Cathode	60	ohms	See 1 Detector Cathode
IF Screen Grid	20,280	ohms	See RF Screen
IF Plate to '47 Screen	70	ohms	TC- IF Tr
AVCX Control Grid	110,080	ohms	BC- AVCX Cg wdg-Y
AVCX Cathode	0	ohm	
AVCX Plate	0	ohm	
AVCX Cathode to Plate	0	ohm	
Det-Amp Control Grid (V.C.Min)	0	ohm	
DET-Amp Control Grid (V.C.Max)	high resistance - exact value unknown		
Det-Amp Cathode	60	ohms	BC- Osc K-Y
Det-Amp Plate to '47 Screen	121,000	ohms	BC-70,000-Y BLC-Det Amp-P- 1 AF Cg
1 AF Control Grid	480,180	ohms	See Det-Amp Plate BC-240,000 ohms-Y
1 AF Cathode	0	ohms	
1 AF Plate to '47 Screen	50,000	ohms	BC-25,000 ohms-Y
'47 Control Grid	480,000	ohms	BC-'47 Cg resistor-Y
'47 Screen Grid to '80 Fil	0	ohm	
'47 Plate to Chassis	0	ohm	Tone control cond
Output Transformer Primary only	462	ohms	
Output Transformer Secondary only	0.106	ohm	

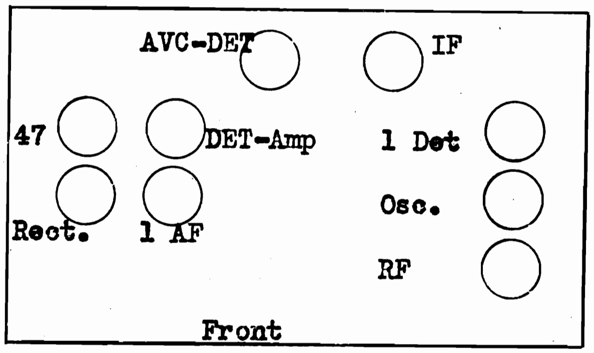
90 and 90 A Cont'd

From Chassis To	Correct	Incorrect
Speaker field only	3,200 ohms	
Oscillator Control Grid	51,006.5ohms	
Oscillator Winding only	6.5ohms	Includes section used in plate circuit
Oscillator Cathode	60 ohms	BC-Osc K-Y
Oscillator Plate to '47 Screen	51,000 ohms	
'80 Anode to '80 Anode	199 ohms	
'80 Anode to Chassis	280 ohms	
'80 Anode to '80 Fil	0 ohm	FC

Note**

Fixed condenser between Det-Amp Plate and 1 AF-Cg
Fixed condenser between 1 AF Plate and '47 Cg
Resistor of 99,000 between AVCX Cg wdg and coupling condenser to Det-Amp volume control

Across AC Plug	3.26 ohms	BC across primary
AC plug to chassis	0 ohm	BC- across primary



–Tube Socket Readings Taken with AC Set Tester, AC Line, 115 Volts

Tube Type	Tube Circuit	Filament Volts	Plate Volts	Screen Grid Volts	Control Grid Volts	Cathode Volts	Plate Milliamperes
24	R. F.	2.0	255	60	.25	20	2.4
27	Osc.	2.0	65	...	.6	20	3.6
24	1st Det.	2.0	250	64	6.0	24	.25
24	I. F.	2.0	270	76	.25	18	.4
27	Det. Rect.	2.0	0	...	0	17	0
27	Det. Amp.	2.0	140	...	.4	18	2.0
27	1st A. F.	2.0	45	...	.4	20	1.8
47	Output	2.0	220*	240*	1.0*	..	32.*
80	Rectifier	4.5					

All readings taken with antenna disconnected and ground on. Volume Control on full.
*These readings must be taken from the underside of the chassis using test prods and leads unless the set checker is specially equipped for testing pendode tubes.

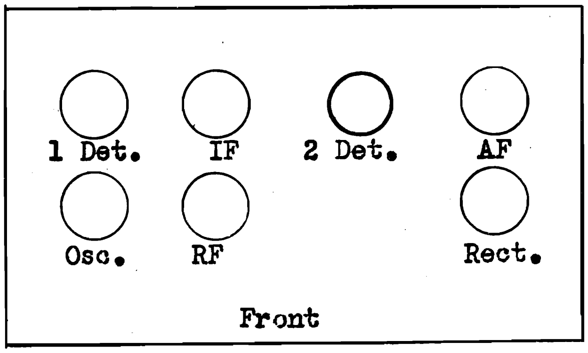
RCA	- R 4	and	R 6
G E	- J 70		J 75
Graybar	GT 7		GC 13

All tubes removed from sockets. AC plug removed from power supply line. Field coil disconnected. Volume Control maximum unless otherwise stated

From Chassis To	Correct		Incorrect
Aerial to Ground	40	ohms	
Chassis to			
RF Control Grid	1	ohm	TC- rf Cg-Y
RF Cathode (V.C.Min)	4,500	ohms	FC- rf K-Y (8 mfd)
RF Cathode (V.C.Max)	150	ohms	FC- rf K-Y (8 mfd)
RF Screen Grid	8,150	ohms	FC- rf Sg-Y(8 mfd)
RF Plate	24,208	ohms	FC-'80 F-Y (4 mfd) See RF Screen
RF Plate to '80 Fil	58	ohms	
1 Detector Control Grid	4.5 or 5	ohms	TC - 1 D Cg-Y
1 Detector Cathode	10,000	ohms	BC- 1 DK-Y (.1 mfd)
1 Detector Screen	8,150	ohms	See RF Screen
1 Detector Plate	24,243.5	ohms	FC-'80 F-Y (4.mfd) See RF Plate
1 Detector Plate to '80 Fil	93.5	ohms	TC- IF Tr
Oscillator Control Grid	40,150	ohms	Osc Grid Condenser
Oscillator Cathode	150	ohms	BC- Osc K-Y (.1 mfd)
Oscillator Plate	24,151	ohms	See RF Plate
Oscillator Plate - RF Sg	1	ohm	
IF Control Grid	41.5	ohms	TC-IF Cg-Y
IF Cathode	150	ohms	See RF Cathode
IF Plate	24,275	ohms	See RF Plate
IF Plate to '80 Fil	125	ohms	TC- IF Tr
2 Detector Control Grid	1,000,150	ohms	BC- 2 DK-Y (.5 mfd)
2 Detector Cathode	30,000	ohms	BC- 2 DK-'80F (.5 mfd) BC- 2 DK- 2 DP (.0024 mfd)
2 Detector plate	25,730	ohms	BC- 2 DP- 2 DK (.0024 mfd) FC- 80F-Y (4.mfd) FC- rf Sg-Y (8 mfd)
2 Detector Plate to '80 Fil	1,580	ohms	
'47 Control Grid	101,500	ohms	BC- AF Tr-Y (.5 mfd) Tone Control Condenser
'47 Screen Grid	24,150	ohms	See RF Plate
'47 Screen to '80 Fil	0	ohms	
'47 Plate	4,530	ohms	BC Across AF Tr in R 4 Harmonic condenser
'47 Plate to 80 Fil	380	ohms	
'80 Anode	600,240	ohms	
'80 Anode to 80 Anode	480	ohms	
'80 Fil to '80 Anode	624,390	ohms	FC- 80 Fil (10 mfd)

R 4 and 6 Cont'd

Across field coil only	**1,900**	**ohms**
Across oscillator winding only	**6**	**ohms**



RADIOTRON SOCKET VOLTAGES

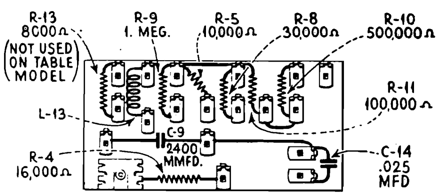
120 Volt A. C. Line

VOLUME CONTROL AT MINIMUM

Radiotron No.	Cathode to Heater Volts, D. C.	Cathode or Filament 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.	Screen Current M. A.	Heater or Filament Volts, A. C.
1. R. F.	50	50	60	235	0	0	2.66
2. Osc.	50	0	—	55	4.5	—	2.66
3. 1st Det.	10	9	100	260	1.0	0.25	2.66
4. I. F.	50	50	60	235	0	0	2.66
5. 2d Det.	25	10	—	250	1.0	—	2.66
6. Pwr.	—	10	290	280	35	—	2.66

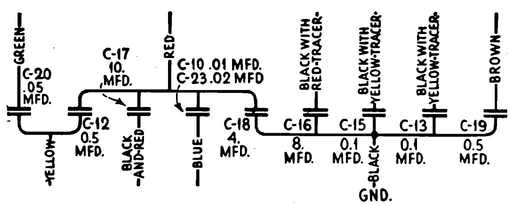
VOLUME CONTROL AT MAXIMUM

Radiotron No.	Cathode to Heater Volts, D. C.	Cathode or Filament 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.	Screen Current M. A.	Heater or Filament Volts, A. C.
1. R. F.	3.0	3.0	65	260	3.0	0.5	2.66
2. Osc.	3.0	0	—	60	5.0	—	2.66
3. 1st Det.	6.0	5.5	60	260	0.75	0.25	2.66
4. I. F.	3.0	3.0	65	260	3.0	0.5	2.66
5. 2d Det.	25	10.0	—	250	1.0	—	2.66
6. Pwr.	—	10.0	290	280	35	—	2.66



RESISTOR BOARD CONNECTIONS

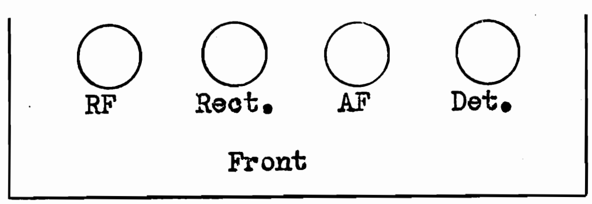
INTERNAL CONNECTIONS OF CAPACITOR PACK



RCA - R 5
G E - T 12
WESTGHSE - WR 14
Graybar - GB 4

All tubes removed from receiver and AC plug disconnected from power supply line - Red and Yellow speaker field leads disconnected

From Chassis To	Correct		Incorrect
Aerial (V.C.Max)	20,000	ohms	Antenna BLC
RF Control Grid	5.3	ohms	TC-Y
RF Cathode	600	ohms	BC-Y
RF Screen Grid	13,000	ohms	BC-Y
			BC- rf Sg - r f K
			BC-D Sg - D K
RF Plate - '80 F	91	ohms	
RF Plate	33,091	ohms	BC- rf P- rf K
			FC- Y (2. mfd)
Detector Control Grid	5.5	ohms	TC-Y
Detector Cathode	28,000	ohms	BC-Y
Detector Screen Grid	21,000	ohms	BC-D Sg - D K
Detector Plate	328,080	ohms	BC-Y (.25 mfd .45000ohms)
			FC-Y, (2. mfd)
			BLC- 47 Cg
			BC- DK (.00032 mfd)
Detector Plate - '80 Fil	295,080	ohms	See Detector Plate
'47 Control Grid	550,000	ohms	BC-Y (.5 mfd)
'47 Screen Grid	33,000	ohms	FC-Y (2. mfd)
'47 Plate	33,350	ohms	See '47 Sg
'47 Plate to '80 Fila	350	ohms	
'80 Plate	330,240	ohms	FC- (10 mfd)
'80 Plate to Plate	480	ohms	
AC Plug	0	ohms	BC-Y (.05 mfd)
Across AC Plug	9	ohms	
Across Speaker Field	2,000	ohms	
Input RF Transf Prim	41	ohms	



110-VOLT LINE

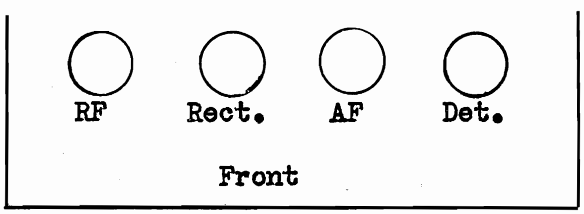
These are readings obtained with the usual Set Analyzers and are not true readings of the voltages at which the Radiotrons operate.

Radiotron No.	Heater to Cathode Volts	Cathode or Filament to Control Grid Volts	Cathode or Filament to Screen Grid Volts	Cathode or Filament to Plate Volts	Plate Current M. A	Heater Volts
1	3.0	3.0	85	225	4.0	2.2
2	7.0	7.0	65	100	0.25	2.2
3	——	2.0	225	215	30.0	2.2

RCA - R 5 X
G E - T 12 E
WESTGHSE - WR 14 CR

All tubes removed and AC plug disconnected - Speaker field red and yellow leads opened

From Chassis To	Correct	Incorrect
Aerial (V.C.Max)	20,000 ohms	Antenna BLC
RF Control Grid	5.3 ohms	TC-Y
RF Cathode	600 ohms	BC-Y
RF Screen Grid	13,000 ohms	BC-Y BC- rf Sg - rf K BC- D Sg - D K
RF Plate	33,091 ohms	BC- rf P - rf K FC - Y (2 mfd)
RF Plate - '80 F	91 ohms	
Detector Control Grid	5.5 ohms	TC-Y
Detector Cathode (Reg. Max)	12,000 ohms	BC-Y
Detector Cathode (Reg. Min)	40,000 ohms	
Detector Plate	328,080 ohms	BC-Y(.25mfd-45000 ohm) FC-Y (2. mfd) BLC- 47 Cg BC-DK 1.00032 mfd
Detector Plate - '80 Fil	295,080 ohms	See Detector Plate
'47 Control Grid	550,000 ohms	BC-Y (.5 mfd)
'47 Screen Grid	33,000 ohms	FC-Y (2. mfd)
'47 Plate	33,350 ohms	See '47 Sg
'47 Plate- '80 Fil	350 ohms	
'80 Plate	330,240 ohms	FC- (10 ,mfd)
80 Plate to Plate	480 ohms	
AC Plug	0 ohms	BC-Y (.05 mfd)
Across AC Plug	9 ohms	
Across Speaker field	2,000 ohms	
Across Input RF Transformer Primary	41 ohms	



These are readings obtained with the usual Set Analyzers and are not true readings of the voltages at which the Radiotrons operate.

110-VOLT LINE

Radiotron No.	Heater to Cathode Volts	Cathode or Filament to Control Grid Volts	Cathode or Filament to Screen Grid Volts	Cathode or Filament to Plate Volts	Plate Current M. A.	Heater Volts
1	3.0	3.0	85	225	4.0	2.2
2	7.0	7.0	65	100	0.25	2.2
3	——	2.0	225	215	30.0	2.2

RCA Superette R 7 and R9
G E S 22 and S42
WESTGHSE WR 10 and WR 12
Graybar GB 8

All tubes removed from receiver and AC plug disconnected from power supply socket. Speaker field disconnected. Volume control adjusted to maximum, unless otherwise stated

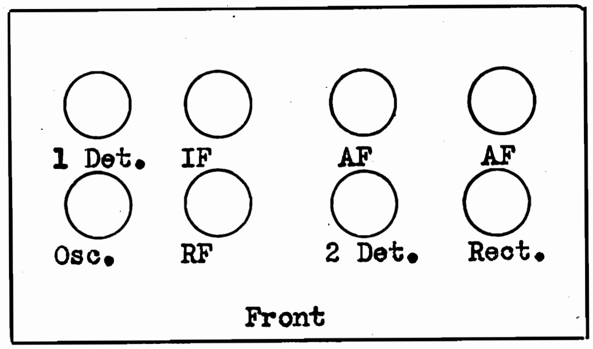
From Chassis To	Correct		Incorrect
Aerial to Ground	40	ohms	
Chassis (Y) to			
RF Control Grid	5	ohms	TC-Y
RF Cathode (V.E.Min)	3,950	ohms	BC-Y
RF Cathode (V.C.Max)	150	ohms	See Min. Adj.
RF Screen Grid	8,150	ohms	BC- rf Sg-Y
RF Plate	22,508	ohms	FC-Y (4.mfd)
			BC-'80 F-Y (.5 mfd)
1 Detector Control Grid	6	ohms	TC-Y
1 Detector Cathode	10,000	ohms	BC- 1 D K-Y
1 Detector Screen Grid	8,150	ohms	See R-F Sg
1 Detector Plate	22,601.5	ohms	See R-F Plate
			TC- 1 IF Tr
1 Detector Plate-'80 F	93.5	ohms	TC- 1 IF Tr
Oscillator Control Grid	40,150	ohms	Osc. Grid Cond.
			See R-F Cathode
Oscillator Cathode	150	ohms	See R-F Cathode
Oscillator Plate	8,151	ohms	See R-F Screen
Osc. Plate- 1 Det Screen	1	ohm	
IF Control Grid	41.5	ohms	TC-Y
IF Cathode	150	ohms	See R-F Cathode
IF Screen Grid	8,150	ohms	See R-F Screen Grid
IF Plate	22,491	ohms	See R-F Plate
			BC- if P - 2 DK
			TC- 2 IF Tr
IF Plate-'80 Fil	41.5	ohms	TC-2 IF Tr

Magnetic Pickup Terminal Board 1-2 Closed

2 Detector Control Grid	1,000,093.5	ohms	BC-#2Ter.- 2DK
2 Detector Control Grid-Ter 2	93.5	ohms	TC- #1 Terminal
2 Detector Cathode	30,000	ohms	BC- 2 D K- if P
			BC- 2 DP - 2 D K
2 Detector Plate	23,250	ohms	BC- 2 DP - 2 D K
			FC-'80 F-Y (.5 mfd)
			FC-'80 F-Y (4. mfd)
			See R-F Plate
2 Det Plate-'80 F	800	ohms	

R 7 and 9 Cont'd

Output Tube Control Grid	1,002,850	ohms	Tone Control condenser
Output Tube Grid to Grid	5,700	ohms	Tone Control condenser
			Tone Control resistance
Output Tube Plate (2 tubes)	22,630	ohms	
Output Tube Plate to Plate	360	ohms	
'80 Filament	22,450	ohms	See R-F Plate
'80 Filament to Anode	222,575	ohms	See R-F Plate
'80 Anode to Anode	250	ohms	FC-'80F -80 P (10 mfd)
'80 Anode to Chassis	200,125	ohms	
Across Speaker field	1,330	ohms	



Volume Control Maximum

Tube	Cathode-Heater	Cathode-Grid	Cathode-Screen	Cathode-Plate	Plate Current	Fil.
PF	2.5	2.5	65	225	4.0 ma	2.4
Osc.	2.5	0.		55	5.0	2.4
1Det	5.0	5.0	60	215	0.5	2.4
IF	2.5	2.5	65	225	4.0	2.4
2Det	60.	*10.		200	0.5	2.4
AF		*20.		215	20.	2.4
AF		*20.		215	20.	2.4

* Not true reading because of resistance in circuit.

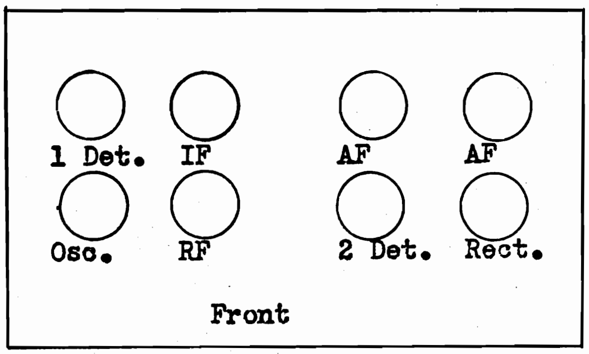
RCA - R 7A
G E - S 22A
WESTGHSE - WR 10A
Graybar - GB 8A

All tubes out of sockets and AC plug removed from power supply line. Field coil disconnected. Volume control maximum unless otherwise stated

From Chassis To	Correct		Incorrect
Aerial to Ground	40	ohms	
Chassis to			
RF Control Grid	5	ohms	TC-Y
RF Cathode (V.C.Min)	4,500	ohms	BC- rf K-Y (.5 mfd)
RF Cathode (V.C.Max)	150	ohms	BC- rf K-Y (.5 mfd)
RF Screen Grid	8,150	ohms	BC- rf Sg-Y (1. mfd)
RF Plate	24,208	ohms	BC- rf K-Y (.5 mfd) BC- rf Sg-Y (1. mfd) BC- '80 Fil-Y (5 mfd) FC- '80 Fil-Y (10 mfd)
RF Plate to '80 Fil	58	ohms	See RF Plate
1 Detector Control Grid	6	ohms	TC-Y
1 Detector Cathode	10,000	ohms	BC- 1 D K-Y (1. mfd)
1 Detector Screen Grid	8,150	ohms	See RF Screen
1 Detector Plate	24,301.5	ohms	See RF Plate
1 Detector Plate to '80 Fil	93.5	ohms	TC- IF Tr
Oscillator Control Grid	40,150	ohms	Oscillator Grid condenser
Oscillator Cathode	150	ohms	See RF Cathode
Oscillator Plate	24,151	ohms	See RF Plate
Osc. Plate to '80 Fil	1	ohm	
IF Control Grid	41.5	ohms	TC- if Cg-Y
IF Cathode	150	ohms	See Rf Cathode
IF Screen Grid	24,150	ohms	See RF Screen
IF Plate	24,191.5	ohms	BC- to 2 DK BC- 2 DP-K See RF Plate
IF Plate -'80 Fil	41.5	ohms	
2 Detector Control Grid	1,000,093.5	ohms	BC- 2 DK
2 Det Control Grid- Ter #2	93.5	ohms	TC-
2 Detector Cathode	30,000	ohms	BC- 2 DK- 2 DP
2 Detector Plate	26,530	ohms	See Rf Plate BC- 2 DP- 2 DK
2 Detector Plate to '80 Fil	2,380	ohms	
'47 Control Grid	43,800	ohms	BC- '47 Cg-Y (.004 mfd) Tone Control Condenser See RF Plate
'47 Screen Grid	24,150	ohms	See RF Plate
'47 Cg to '47 Cg	7,600	ohms	
'47 Screen to '80 Fil	0	ohm	
'47 Plate	24,455	ohms	See RF Plate

R 7A Cont'd

'47 Plate to '80 Fil	305	ohms	
'47 Plate to '47 Plate	610	ohms	Harmonic condenser
'80 Anode	200,125	ohms	
'80 Anode to '80 Anode	250	ohms	
Across Speaker field only	1,330	ohms	
Across output transformer secondary only	.325	ohm	
Across Oscillator coil	4.5	ohms	



RADIOTRON SOCKET VOLTAGES—110 VOLT A. C. LINE

Radiotron No.	Cathode to Heater Volts D. C.	Cathode or Filament to Control Grid Volts D. C.	Cathode to Screen Grid Volts D. C.	Cathode or Filament to Plate Volts D.C.	Plate Current M. A.	Heater or Filament Volts A. C.	Radiotron No.	Cathode to Heater Volts D. C.	Cathode or Filament to Control Grid Volts D. C.	Cathode to Screen Grid Volts D. C.	Cathode or Filament to Plate Volts D.C.	Plate Current M. A.	Heater or Filament Volts A. C.
VOLUME CONTROL AT MINIMUM							VOLUME CONTROL AT MAXIMUM						
1	38	35	50	200	.0	2.2	1	2.0	2.5	60	235	3.5	2.2
2	38	0	—	50	3.5	2.2	2	2.0	.0	—	50	4.5	2.2
3	7	6	80	235	0.5	2.2	3	4.0	4.0	55	230	0.5	2.2
4	38	35	50	200	.0	2.2	4	2.0	2.5	58	235	3.5	2.2
5	22	8	—	210	0.7	2.2	5	22	8	—	210	0.7	2.2
6	—	12	225	220	30	2.2	6	—	12	225	220	30	2.2
7		12	225	220	30	2.2	7	—	12	225	220	30	2.2

RCA - R 7 and R 9 DC

All tubes removed and speaker field disconnected - Interlocks closed - DC plug removed from line socket - Dial light out of socket - Volume control max unless otherwise stated - C Battery removed

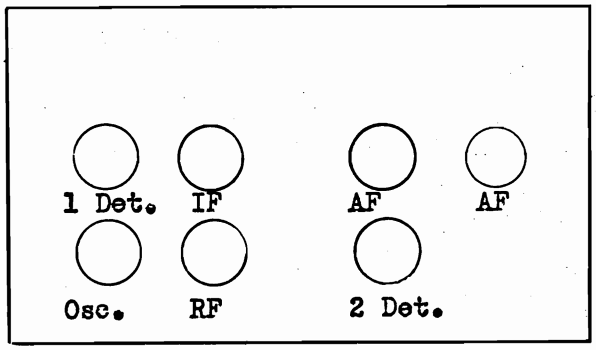
From Chassis To	Correct	Incorrect
Aerial to Ground	40 ohms	
Chassis to		
RF Control Grid	5 ohms	TC-Y
RF Cathode(V.C. Max)	150 ohms	BC-Y (.5 mfd)
RF Cathode(V.C. Min)	4,650 ohms	BC-Y (.5 mfd)
RF Screen Grid	8,150 ohms	BC-Y (1. mfd)
RF Plate	12,708 ohms	BC-Y (1. mfd) BC-2D P-2DK (0024 mfd) BC-2D P-2DK (.5 mfd)
RF Plate to 1 Detector Plate	151.5 ohms	
1 Det Control Grid	6 ohms	TC-Y
1 Detector Cathode	10,000 ohms	BC- 1DK-Y
L Detector Screen Grid	8,150 ohms	See R-F Sg
1 Detector Plate	12,743.5 ohms	TC- 1 IF Tr See R-F Plate
Oscillator Control Grid	40,150 ohms	Osc Grid Condenser
Oscillator Cathode	150 ohms	See R.F. Cathode
Oscillator Plate	8,151 ohms	See R.F. Screen
Oscillator Rlate to RF Screen	1 ohm	
IF Control Grid	41.5 ohms	TC- IF Tr-Y
IF Cathode	150 ohms	See RF Cathode
IF Screen Grid	8,150 ohms	See RF Screen
IF Screen to 1 Det Screen	0 ohms	
IF Plate	12,691.5 ohms	See RF Plate
IF Plate to RF Plate	99.5 ohms	

Pickup Terminal Broad Terminals 1 and 2 joined

2 Detector Control Grid	1,000,093.5 ohms	BC-Ter#1-2DK
2 Detector Control Grid to Ter#2	93.5 ohms	TC-IF Tr-
2 Detector Cathode	30,000 ohms	BC-2DP-2DK(0024 mfd) BC-2DP-2DK (.5 mfd)
2 Detector Plate	13,300 ohms	See RF Plate
Output Control Grid to Black Bias Lead	3,850 ohms	
Output Grid to Grid	5,700 ohms	Tone Control Condenser
Output Grid to chassis(bias leads shorted)	3,350ohms	
Output Plate to + D.C.Switch	180 ohms	
Output Plate to Plate	360 ohms	
1 Output filament terminal and chassis	20 ohms	
Across dial light socket	1.9 ohms	

R 7 and 9 D.C. Cont'd

Across Filament interlocks	60 ohms	
Across Speaker field	13.30 ohms	
RF Plate to + DC Switch	58+ ohms*	*Resistance of filter choke not known



RADIOTRON SOCKET VOLTAGES—115 or 230 Volt Line
(Separate Resistance Unit Used with 230 Volt Line)

Tube No.	Cathode to Heater Volts, D.C.	Cathode or Filament to Control Grid Volts, D.C.	Cathode to Screen Grid Volts, D.C.	Cathode or Filament to Plate Volts, D.C.	Plate Current M. A.	Screen Grid Current M. A.	Heater or Filament Volts, A.C.
VOLUME CONTROL AT MINIMUM							
1	40	30	40	75	0	0	2.3
2	20	0	—	40	2.0	—	2.3
3	6.0	3.5	65	100	.25		2.3
4	17.0	26	40	75	.0	0	2.3
5	2.0	*2.0	—	90	.23	—	2.3
6	—	25.0	—	100	4.0	—	2.3
7	—	*25.0	—	100	4.0	—	2.3
VOLUME CONTROL AT MAXIMUM							
1	10.0	2.0	50	100	3.5	**0.5	2.3
2	6.0	.0		50	3.0	—	2.3
3	8.0	5.0	50	100	0.5	.0	2.3
4	10.0	2.0	50	100	2.5	**1.0	2.3
5	2.0	*2.0	—	90	.25	0	2.3
6	—	*25.0	—	100	4.0	—	2.3
7	—	*25.0	—	100	4.0	—	2.3

* Not true reading due to Resistance in circuit

**This may be plus or minus depending on age of tubes

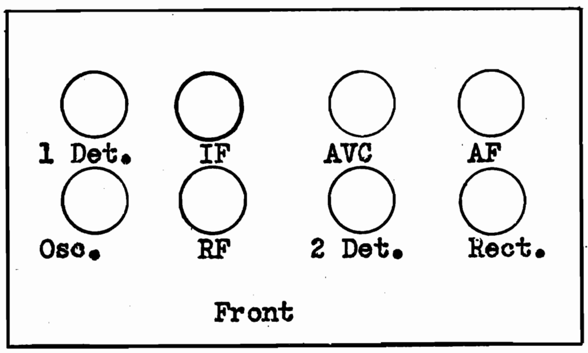
RCA - R 8 and R 12 AC
G E - J 80 and J 85
Graybar - GC 8 and GC 14

All tubes removed from sockets and AC plug removed from power supply
Field coil disconnected

From Chassis To	Correct		Incorrect
Aerial to Ground	40	ohms	
Chassis to			
RF Control Grid	1,000,005	ohms	TC- rf Cg-Y BC- rf wdg-Y (.05 mfd) BC- if Tr-Y (.1 mfd) BC-AVC P-AVC K
RF Cathode	150	ohms	BC- rf K-Y (.5 mfd)
RF Screen	8,150	ohms	FC- rf Sg-Y (4. mfd)
RF Plate	24,208	ohms	FC-80F-80A (10 mfd) FC-47 Sg-Y (4.mfd) BC-2D Tr-2DK (.5 mfd)
1 Detector Control Grid	5	ohms	TC-1D Cg-Y
1 Detector Cathode	10,000	ohms	BC-1DK-Y (.1 mfd)
1 Detector Screen Grid	8,150	ohms	See RF Screen
1 Detector Plate	24,301.5	ohms	See RF Plate
1 Det Plate to '80 Fil	93.5	ohms	TC-IF Tr Primary
Oscillator Control Grid	40,150	ohms	Oscillator Grid Condenser
Osc Control Grid to Osc Cathode	40,000	ohms	
Oscillator Cathode	150	ohms	See RF Cathode
Oscillator Plate	24,151	ohms	See RF Plate
Osc Plate to RF Screen	1	ohm	
IF Control Grid	500,041.5	ohms*	*Includes IF Transformer secondary BC- IF Tr-Y (.1 mfd)
IF Cathode	150	ohms	See RF Cathode
IF Screen Grid	8,150	ohms	See RF Screen
IF Plate to 80 Fil	41.5	ohms	TC-IF Tr. Primary
AVC Control Grid	3,240,000	ohms	See RF Control Grid See RF Plate BLC- if P-AVC Cg(9 mmfd)
AVC Control Grid-'80 Anode	3,000,175	ohms	BC-AVC Cg res-AVC H-K
AVC Cathode	250,000	ohms	BC-AVC K-AVC H (.1 mfd)
AVC Plate	1,000,000	ohms	See RF Control Grid BC AVC P-AVC K(.0024 mfd)
2 Detector Control Grid	1,000,093.5	ohms*	*Includes IF Tr Sec
2 Det Cg to Volume Control	843-93.5-10,093.5	ohms	Depends upon setting of volume control BC-2 DK (.05 mfd)
2 Detector Cathode	30,000	ohms	

R 8 and 12 Cont'd

2 Detector Plate to 80 Fil	1,730	ohms	
2 Det Plate	241,650	ohms	See RF Plate BC- 2 DP-2 DK FC-'47 Sg-Y (4 mfd)
'47 Control Grid	91,650	ohms	See RF Plate Tone Control Condenser See RF Control Grid
'47 Screen Grid to 80 Fil	0	ohm	
'47 Plate to '80 Fil	380	ohms	Harmonic condenser
'80 Filament	264,150	ohms	FC-80F-80P (10 mfd) See RF Control Grid See RF Plate
'80 Plate to '80 Plate	350	ohms	
Output Transformer Secondary only	.34	ohm	
Oscillator Coil	6.	ohms	
Oscillator Grid resistor	6,000	ohms	
Field Coil only	1,330	ohms	



120 VOLT LINE

VOLUME CONTROL DOES NOT AFFECT VOLTAGES

Radiotron No.	Cathode to Heater Volts, D. C.	Cathode or Filament 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.	Screen Current M. A.	Heater or Filament Volts, A. C.
1. R. F.	4.0	0.5	70	260	4.0	0.5	2.66
2. Osc.	4.0	0	—	65	6.0		2.66
3. 1st Det.	7.0	6.0	70	260	0.75	0.1	2.66
4. I. F.	4.0	4.0	70	260	4.0	0.5	2.66
5. 2nd Det.	28.0	10.0	—	250	1.0		2.66
6. A. V. C.	0	0	—	25	0		2.66
7. Power		10.0	290	280	35.0		2.66

RCA - R 10
G E - S 132
Graybar - GB 989

All tubes out of sockets and AC plug removed from power supply lines
Speaker field disconnected

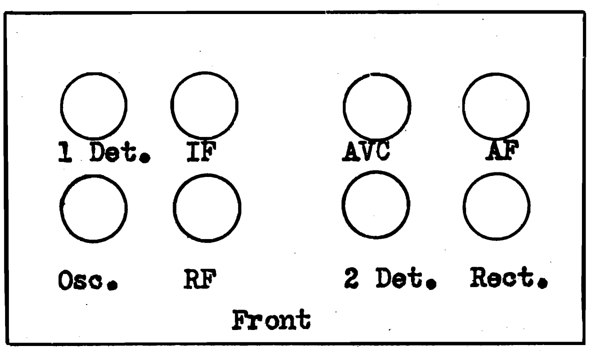
From Chassis To	Correct		Incorrect
Aerial to Ground	40	ohms	
Chassis to			
RF Control Grid	1,500,005	ohms	TC-Y BLC in tuned circuit BC-Y BC-AVC P-AVC K
RF Cathode	150	ohms	BC-Y (.5 mfd)
RF Screen Grid	18,150	ohms	BC- rf K-Y (.5 mfd)
RF Plate	34,208	ohms	BC-2 D P-Y (0024 mfd) BC- AFT. Pr - 2 D K (.5 mfd) FC-'47 Sg-Y (4. mfd)
RF Plate to '80 Fil	58	ohms	
1 Detector Control Grid	5	ohms	TC-Y
1 Detector Cathode	10,000	ohms	BC- 1 D K-Y (.1 mfd)
1 Detector Screen Grid	18,150	ohms	See RF Screen Grid
1 Detector Plate	34,301.5	ohms	See RF Plate
1 Detector Plate - '80 Fil	93.5	ohms	TC- IF Tr Pri
Oscillator Control Grid	40,150	ohms	Osc Grid Condenser
Oscillator Cathode	150	ohms	See RF Cathode
Osc Screen Grid	18,150	ohms	See RF Screen
Osc Plate	18,151	ohms	See RF Screen
Osc Plate - RF Screen	1	ohm	
IF Control Grid	500,041.5	ohms	BC-Y (.5 mfd) TC-IF Tr Sec
IF Cathode	150	ohms	See RF Cathode
IF Screen Grid	18,150	ohms	See RF Screen Grid
IF Plate	34,191.5	ohms	See RF Plate
IF Plate to '80 Fil	41.5	ohms	
AVC Control Grid	6,240,000	ohms	BLC-AVC Cg-if P BC-5 meg res. - AVC H FC-'80 F - '80 P wdg(10mfd BC- '47 Cgwdg - Y
AVC Cathode	250,000	ohms	BC-AVC K-Y BC-AVC K- AVC P
2 Detector Control Grid	1,000,093	ohms	BC- 2 D K (.5 mfd)
2 Det Cg to Vol Control	93.5-10,093	ohms	
2 Detector Cathode	30,000	ohms	BC- 2DK-2DP
2 Detector Plate	35,880	ohms	BC- 2DP-2DK
2 Detector Plate to '80 Fil	1.730	ohms	

R 10 Cont'd

'47 Control Grid	91,650	ohms	BC-Y Tone Control Condenser
'47 Screen to '80 Fil	0	ohms	
'47 Screen to Schassis	34,150	ohms	See IF Plate
'47 Plate	34,530	ohms	FC-'47 Sg-Y (4.mfd)

From Chassis To	Correct		Incorrect
'47 Plate -'47 Screen	380	ohms	Harmonic circuit
'80 Fil	34,150	ohms	
'80 Fil to '80 Anode	274,150	ohms	
'80 Anode to '80 Anode	350	ohms	

Across Field Coil only 1,330 ohms
Across Output Transformer Secondary only 0.34 ohms



110 VOLT A. C. LINE

(Volume Control Setting Does Not Affect Voltages)

Radiotron No.	Cathode to Heater Volts, D. C.	Cathode or Filament 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.	Screen Current M. A.	Heater or Filament Volts, A. C.
1	2	*0.1	75	210	5.0	0.5	2.2
2	8	0	—	60	5.0	—	2.2
3	7	7.0	70	205	0.5	0.1	2.2
4	2	*0.1	75	210	5.0	0.5	2.2
5	0	0	—	30	0	—	2.2
6	20	*8.0	—	185	0.5	—	2.2
7	—	10	210	210	25	—	2.2

*Not true reading due to resistance in circuit.

RCA - R 11
G E - K 62
WESTGHSE - WR 15
Graybar - GB 9

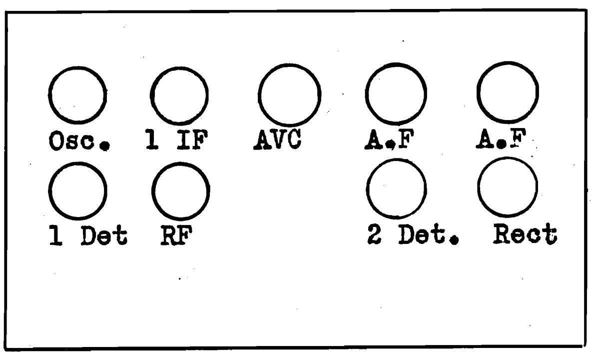
All tubes removed from sockets and AC plug removed from power supply.
Field coil disconnected

From Chassis To	Correct		Incorrect
Aerial to Ground post	40	ohms	
Chassis to			
			TC-Y
RF Control Grid(early model)	1,000,005	ohms	BLC- in tuned circuit (.1 mfd)
			BC-AVC chk-Y
RF Control Grid(late model)	1,500,005	ohms	BLC- in tuned circuit (.05 mfd)
			BC- 1 IF Tr. Sec -Y
RF Cathode	150	ohms	BC- rf K-Y (.1 mfd)
RF Screen Grid	18,150	ohms	BC- rf Sg- Y (1. mfd)
			BC-47 Sg- Y (.5 mfd)
			BC-'80 F- Spkr div. tap
RF Plate	32,508	ohms	BC- rf P-Y (1. mfd)
			See RF Screen Grid
RF Plate to '80 Fil	58	ohms	
1 Detector Control Grid	5	ohms	TC-Y
1 Detector Cathode	1,500	ohms	BC-Y (.1 mfd)
1 Detector Screen	18,150	ohms	See R-F Screen
1 Detector Plate	32,541.5	ohms	See R-F Plate
1 Detector Plate to '80 Fil	93.5	ohms	TC- 1 IF Tr.
Oscillator Control Grid	41,500	ohms	BLC-Osc.Grid Cir.(.0074)
			BC-Osc K-Y (.1 mfd)
Oscillator Cathode	1,500	ohms	BC-Osc K-Y (.1 mfd)
Oscillater Plate	18,151	ohms	See R-F Screen
Osc Plate and Det Screen	1	ohm	
IF Control Grid (all models)	500,041.5	ohms	BC-Y (.5 mfd)
IF Control Grid- AVC Plate (early)	121.5	ohms	TC-1 IF Tr Sec
IF Screen Grid	18,150	ohms	See RF Screen
IF Plate	32,491.5	ohms	See 1 Detector Plate
IF Plate -'80 Fil	41.5	ohms	TC- 2 IF Tr.Pri.
AVC Control Grid (early)	7,230,285	ohms	BLC- if P- AVC Cg(9mmfd)
			BC-5 meg - AVC H (.1mfd)
			BC-1 meg- Y (.1 mfd)
			FC-'80 Anode -80 F(2mfd)
			FC filter chk-80 F(4 mfd)
			BC-AVC K-Y (.5 mfd)
			BC-Spkr divides tap -Y
			BC-AVC K-AVC P(.0024 mfd)
AVC Control Grid (late)	4,230,285	ohms	See early model
AVC Cathode	270,000	ohms	BC-AVC K-AVC P
			BC-AVC K-Y
AVC Plate	1,000,085	ohms	BC-AVC P-AVC K
			See RF Control Grid

R 11 Cont'd

2 Det Control Grid(Pickup Board Ter#2)	93.5 ohms	
2 Det Control Grid to V.C. Arm	3,093.5-10,093.5 ohms	TC-2D Cg- VC Arm
2 Det Cathode	30,000 ohms	BC-Ter#1-Ter#3 BC- 2 DK -'80 Fil

From Chassis To	Correct		Incorrect
Pickup Board Terminal 2	1,000,000	ohms	BC-Ter#1- Ter#3
2 Detector Plate	34,830	ohms	See RF Plate
2 Detector Plate-'80 Fil	2,380	ohms	
'47 Control Grid	43,850	ohms	BC- 47 Cg-Y See AVC Cathode
'47 Control Grid to Control Grid	7,700	ohms	Tone Control Cond Tone Control Resist
'47 Screen	32,450	ohms	See 2 Detector Plate
'47 Screen - '80 Fil	0	ohms	
'47 Plate	32,755	ohms	See 2 Detector Plate
'47 Plate to Plate	610	ohms	Harmonic condenser
80 Anode to chassis	230,400	ohms	See AVC Control Grid
80 Anode to Anode	230	ohms	
80 Fil to chassis	32,450	ohms	See RF Plate See RF Screen Grid
Across Speaker field	860	ohms	



Line Voltage 110. Volume Control does not change voltages.

Tube	Cathode-Heater	Control Grid-Cathode	Screen Grid-Cathode	Plate-Cathode	Plate Current	Filament Voltage
RF	2.	0.1*	75.	205.	5.0 ma	2.2
Osc.	8.	0.	-	60.	5.0	2.2
1 Det.	7.	7.0	70.	200.	0.5	2.2
IF	2.	0.1*	75.	205.	5.0	2.2
AVC	0.	0.	-	25.	-	2.2
2 Det.	20.	8.0*	-	180.	0.5	2.2
Pwer	-	10.	210.	205.	25.	2.2
Pwer	-	10.	210.	205.	25.	2.2

* Not true reading due to resistance in the circuit.

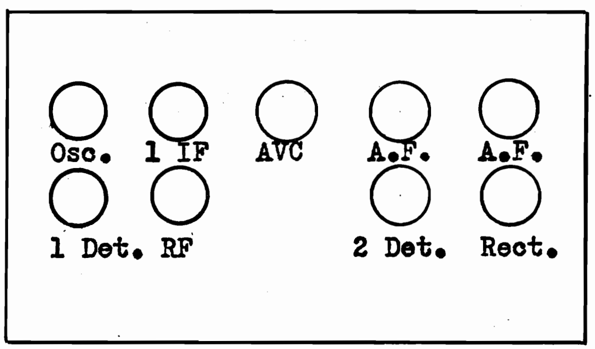
RCA - RE-18

All Tubes removed from sockets and AC plug disconnected from power supply line. All phonograph equipment disconnected from pick up terminal board and terminals 2 and 3 inter-connected. Also terminals 4 and 5 inter-connected. Field Coil disconnected

From Chassis To	Correct		Incorrect
Aerial to Ground post	40	ohms	
Chassis to			
RF Control Grid(early model)	1,000,005	ohms	TC-Y BLC- in tuned circuit (.1 mfd) BC-AVC chk-Y
RF Control Grid(late model)	1,500,005	ohms	BLC- in tuned circuit (.05 mfd) BC- 1 IF Tr. Sec -Y
RF Cathode	150	ohms	BC- rf K-Y (.1 mfd)
RF Screen Grid	18,150	ohms	BC- rf Sg-Y (1. mfd) BC- 47 Sg-Y (.5 mfd) BC-'80 F- Spkr div. tap
RF Plate	32,508	ohms	BC- rf P-Y (1. mfd) See RF Screen Grid
RF Plate to '80 Fil	58	ohms	
1 Detector Control Grid	5	ohms	TC-Y
1 Detector Cathode	1,500	ohms	BC-Y (.1 mfd)
1 Detector Screen	18,150	ohms	See R-F Screen
1 Detector Plate	32,541.5	ohms	See R-F Plate
1 Detector Plate to '80 Fil	93.5	ohms	TC- 1 IF Tr.
Oscillator Control Grid	41,500	ohms	BLC-Osc.Grid Cir.(0074) BC-Osc K-Y (.1 mfd)
Oscillator Cathode	1,500	ohms	BC-Osc K-Y (.1 mfd)
Oscillator Plate	18,151	ohms	See R-F Screen
Osc Plate and Det Screen	1	ohm	
IF Control Grid (all models)	500,041.5	ohms	BC-Y (.5 mfd)
IF Control Grid- AVC Plate (early)	121.5	ohms	TC-1 IF Tr Sec
IF Screen Grid	18,150	ohms	See RF Screen
IF Plate	32,491.5	ohms	See 1 Detector Plate
IF Plate - '80 Fil	41.5	ohms	TC-2 IF Tr.Pri
AVC Control Grid (early)	7,230,285	ohms	BLC- if P- AVC Cg(9 mmfd) BC-5 meg - AVC H (.1 mfd) BC-1 meg- Y (.1 mfd) FC-'80 Anode -80 F(2 mfd) FC Filter chk-80 F(4 mfd) BC-AVC K-Y (.5 mfd) BC-Spkr divides tap- Y BC-AVC K-AVC P(.0024 mfd)
AVC Control Grid (late)	4,230,285	ohms	See early model
AVC Cathode	270,000	ohms	BC-AVC K-AVC P BC-AVC K-Y

RE 18 Cont'd

AVC Plate	1,000,085	ohms	BC-AVC P-AVC K See Rf control grid
2 Det Control Grid(Pickup Board Ter#2)	93.5	ohms	
2 Det Control Grid to V.C. Arm	3,093.5-10,093.5	ohms	TC-2D Cg- VC Arm
2 Det Cathode	30,000	ohms	BC-Ter#1-Ter#3 BC- 2 DK-'80 Fil
Pickup Board Terminal 2	1,000,000	ohms	BC-Ter#1-Ter#3
2 Detector Plate	34,830	ohms	See RF Plate
2 Detector Plate-'80 Fil	2,380	ohms	
'47 Control Grid	43,850	ohms	BC- 47 Cg-Y See AVC Cathode
'47 Control Grid to Control Grid	7,700	ohms	Tone Control Cond Tone Control Resist
'47 Screen	32,450	ohms	See 2 Detector Plate
'47 Screen - '80 Fil	0	ohm	
'47 Plate	32,755	ohms	See 2 Detector Plate
'47 Plate to Plate	610	ohms	Harmonic condenser
80 Anode to chassis	230,400	ohms	See AVC Control Grid
80 Anode to Anode	230	ohms	
80 Fil to chassis	32,450	ohms	See RF Plate See RF Screen Grid
Across Speaker field	860	ohms	



Peak Frequency = 175 KC

110 VOLT A. C. LINE (Volume Control Setting Does Not Affect Voltages)

Radiotron No.	Cathode to Heater Volts D. C.	Cathode or Filament 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.	Screen Current M. A.	Heater or Filament Volts, A. C.
1	2	*0.1	75	205	5.0	0.5	2.2
2	8	0	—	60	5.0	—	2.2
3	7	7.0	70	200	0.5	0.1	2.2
4	2	*0.1	75	205	5.0	0.5	2.2
5	0	0	—	25	0	—	2.2
6	20	*8.0	—	180	0.5	—	2.2
7	—	10	210	205	25	—	2.2
8	—	10	210	205	25	—	2.2

* Not true reading due to resistance in circuit.

RCA - R 21

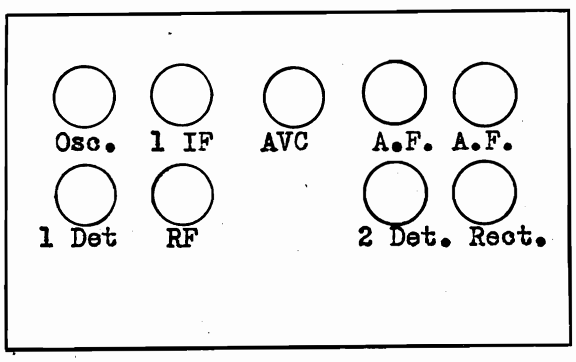
All tubes removed from sockets and AC plug removed from power supply. Pick up and field coil disconnected

From Chassis To	Correct		Incorrect
Aerial to ground post	40	ohms	
Chassis to			
			TC-Y
RF Control Grid(early model)	1,000,005	ohms	BLC- in tuned circuit (.1 mfd)
			BC-AVC chk-Y
RF Control Grid(late model)	1,500,005	ohms	BLC- in tuned circuit(.05 mfd)
			BC- 1 IF Tr. Sec -Y
RF Cathode	150	ohms	BC- rf K-Y (.1 mfd)
RF Screen Grid	18,150	ohms	BC- rf Sg- Y (1. mfd)
			BC-47 Sg-Y (.5 mfd)
			BC-'80 F- Spkr div. tap
RF Plate	32,508	ohms	BC- rf P-Y (1. mfd)
			See RF Screen Grid
RF Plate to '80 Fil	58	ohms	
1 Detector Control Grid	5	ohms	TC- Y
1 Detector Cathode	1,500	ohms	BC-Y (.1 mfd)
1 Detector Screen	18,150	ohms	See R-F Screen
1 Detector Plate	32,541.5	ohms	See R-F Plate
1 Detector Plate to '80 Fil	93.5	ohms	TC- 1 If Tr.
Oscillator Control Grid	41,500	ohms	BLC-Osc.Grid.Cir.(.0074
			BC-Osc K-Y (.1 mfd)
Oscillator Cathode	1,500	ohms	BC-Osc K-Y (.1 mfd)
Oscillator Plate	18,151	ohms	See R-F Screen
Osc Plate and Det Screen	1	ohm	
IF Control Grid (all models)	500,041.5	ohms	BC-Y (.5 mfd)
IF Control Grid- AVC Plate (early)	121.5	ohms	TC-1 IF Tr Sec
IF Screen Grid	18,150	ohms	See RF Screen
IF Plate	32,491.5	ohms	See 1 Detector Plate
IF Plate - '80 Fil	41.5	ohms	TC- 2 IF Tr. Pri.
AVC Control Grid (early)	7,230,285	ohms	BLC- if P- AVC Cg(9mmfd
			BC-5 meg - AVC H(.1 mfd)
			BC-1 meg-Y (.1 mfd)
			FC-'80 Anode-80 F(2mfd)
			FC filter chk-80 F(4mfd)
			BC-AVC K-Y (.5 mfd)
			BC-Spkr div.tap -Y
			BC-AVC K-AVC P(.0024mfd
AVC Control Grid (late)	4,230,285	ohms	See early model
AVC Cathode	270,000	ohms	BC-AVC K-AVC P
			BC-AVC K-Y
AVC Plate	1,000,085	ohms	BC-AVC P-AVC K
			See RF Control Grid

R 21 Cont'd

2 Det Control Grid(Pickup Board Ter #2)	93.5	ohms	
2 Det Control Grid to V.C. Arm	3,093.5-10,093.5	ohms	TC-2D Cg- VC Arm
2 Det Cathode	30,000	ohms	BC-Ter#1 - Ter #3 BC- 2 DK -'80 Fil
Pickup Board Terminal 2	1,000,000	ohms	BC-Ter #1- Ter#3
2 Detector Plate	34,830	ohms	See RF Plate

From Chassis To	Correct		Incorrect
2 Detector Plate-'80 Fil	2,380	ohms	
'47 Control Grid	43,850	ohms	BC- 47 Cg-Y See AVC Cathode
'47 Control Grid to Control Grid	7,700	ohms	Tone Control Cond Tone Control Resist
'47 Screen	32,450	ohms	See 2 Detector Plate
'47 Screen - '80 Fil	0	ohm	
'47 Plate	32,755	ohms	See 2 Detector Plate
'47 Plate to Plate	610	ohms	Harmonic condenser
80 Anode to chassis	230,400	ohms	See AVC Control Grid
80 Anode to Anode	230	ohms	
80 Fil to chassis	32,450	ohms	See RF Plate See RF Screen Grid
Across Speaker field	860	ohms	



Line Voltage 110. Volume Control does not change voltages.

Tube	Cathode-Heater	Control Grid-Cathode	Screen Grid-Cathode	Plate-Cathode	Plate-Current	Filament-Voltage
RF	2.	0.1*	75.	205.	5.0 ma	2.2
Osc.	8.	0.	-	60	5.0	2.2
1 Det.	7.	7.0	70	200.	0.5	2.2
IF	2.	0.1*	75	205.	5.0	2.2
AVC	0.	0.	-	25.	-	2.2
2 Det.	20.	8.0*	-	180.	0.5	2.2
Pwer	-	10.	210	205.	25.	2.2
Pwer	-	10.	210	205.	25.	2.2

* Not true reading due to resistance in the circuit

RCA - R A E 26

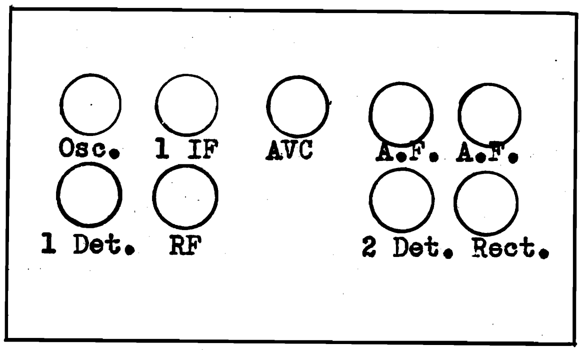
All tubes removed from socket and AC plug disconnected from power supply line. Field coil disconnected. All pickup equipment disconnected from terminal board and terminals 2 and 3 should be joined. Also terminals 4 and 5 should be interconnected.

From Chassis To	Correct	Incorrect
Aerial to Ground Post	40 ohms	
Chassis to		
		TC-Y
RF Control Grid(early model)	1,000,005 ohms	BLC- in tuned circuit (.1 mfd)
		BC-AVC chk-Y
RF Control Grid(late model)	1,500,005 ohms	BLC- in tuned circuit (.05 mfd)
		BC- 1 IF Tr. Sec -Y
RF Cathode	150 ohms	BC- rf K-Y (.1 mfd)
RF Screen Grid	18,150 ohms	BC- rf Sg-Y (1. mfd)
		BC-47 Sg- Y (.5 mfd)
		BC-'80 F- Spkr div. tap
RF Plate	32,508 ohms	BC- rf P-Y (1. mfd)
		See RF Screen Grid
RF Plate to '80 Fil	58 ohms	
1 Detector Control Grid	5 ohms	TC-Y
1 Detector Cathode	1,500 ohms	BC-Y (.1 mfd)
1 Detector Screen	18,150 ohms	See R-F Screen
1 Detector Plate	32,541.5 ohms	See R-F Plate
1 Detector Plate to '80 Fil	93.5 ohms	TC- 1 IF Tr.
Oscillator Control Grid	41,500 ohms	BLC-Osc.Grid Cir.(.0074
		BC-Osc K-Y (.1 mfd)
Oscillator Cathode	1,500 ohms	Bc-Osc K-Y (.1 mfd)
Oscillator Plate	18,151 ohms	See R-F Screen
Osc Plate and Det Screen	1 ohm	
IF Control Grid (all models)	500,041.5 ohms	BC-Y (.5 mfd)
IF Control Grid- AVC Plate (early)	121.5 ohms	TC-1 IF Tr Sec
IF Screen Grid	18,150 ohms	See RF Screen
IF Plate	32,491.5 ohms	See 1 Detector Plate
IF Plate -'80 Fil	41.5 ohms	Tc- 2 IF Tr. Pri.
AVC Control Grid (early)	7,230,285 ohms	BLC- if P- AVC Cg (9 mmfd)
		BC-5 meg - AVC H (.1 mfd)
		BC-1 meg- Y (.1 mfd)
		FC-'80 Anode - 80 F(2 mfd)
		FC filter chk-80 F(4 mfd)
		BC-AVC K-Y (.5 mfd)
		BC-Spkr divides tap - Y
		BC-AVC K-AVC P (.0024 mfd)
AVC Control Grid (late)	4,230,285 ohms	See early model
AVC Cathode	270,000 ohms	BC-AVC K-AVC P
		BC-AVC K-Y
AVC Plate	1,000,085 ohms	BC-AVC P-AVC K
		See RF Control Grid

RAE 26 Cont'd

2 Det Control Grid(Pickup Board Ter#2) 93.5 ohms
2 Det Control Grid to V.C. Arm 3,093.5-10,093.5 ohms TC-2D Cg- VC Arm
2 Det Cathode 30,000 ohms BC- Ter#1-Ter#3
BC- 2 DK-'80 Fil

From Chassis To	Correct		Incorrect
Pickup Board Terminal 2	1,000,000	ohms	BC-TER#1-TER#3
2 Detector Plate	34,830	ohms	See RF Plate
2 Detector Plate-'80 Fil	2,380	ohms	
'47 Control Grid	43,850	ohms	BC- 47 Cg-Y See AVC Cathode
'47 Control Grid to Control Grid	7,700	ohms	Tone Control Cond Tone Control Resist
'47 Screen	32,450	ohms	See 2 Detector Plate
'47 Screen - '80 Fil	0	ohm	
'47 Plate	32,755	ohms	See 2 Detector Plate
'47 Plate to Plate	610	ohms	Harmonic condenser
80 Anode to chassis	230,400	ohms	See AVC Control Grid
80 Anode to Anode	230	ohms	
80 Fil to chassis	32,450	ohms	See Rf Plate See RF Screen Grid
Across Speaker field	860	ohms	



Line Voltage 110. Volume Control does not change voltages.

Tube	Cathode-Heater	Control Grid-Cathode	Screen Grid-Cathode	Plate-Cathode	Plate Current	Filament Voltage
RF	2.	0.1*	75.	205.	5.0 ma	2.2
Osc.	8.	0.	-	60.	5.0	2.2
1 Det.	7.	7.0	70.	200.	0.5	2.2
IF	2.	0.1*	75.	205.	5.0	2.2
AVC	0.	0.	-	25.	-	2.2
2 Det.	20.	8.0*	-	180.	0.5	2.2
Pwer	-	10.	210.	205.	25.	2.2
Pwer	-	10.	210.	205.	25.	2.2

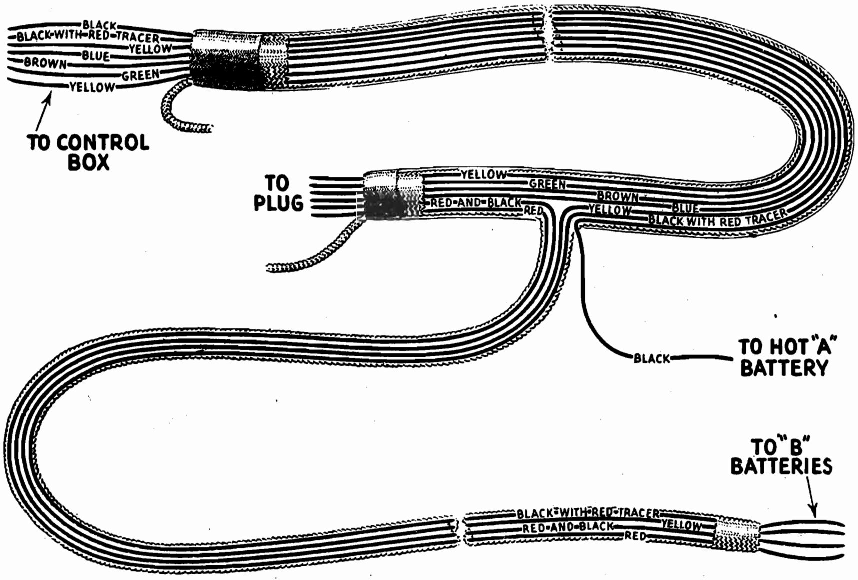
* Not true reading because of resistance in the circuit.

RCA - M 30
G E - A 90

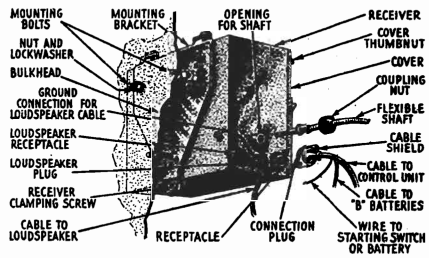
All tubes removed from sockets and all batteries disconnected. Dial lamp removed

From Chassis To	Correct		Incorrect
Aerial to Ground	28	ohms	
RF Control Grid to 45+	500,005	ohms	
RF Control Grid to Chassis	0	ohms	TC- rf Cg-Y
RF Control Grid to AVC Plate	5	ohms	BLC- in tuned circuit
RF Cathode to 45+	170	ohms	
RF Cathode to chassis	0	ohms	BC- rf K-Y
RF Screen Grid to 180+	30,000	ohms	
RF Screen Grid to chassis	0	ohms	BC- rf Sg-Y
RF Plate to 180+	58	ohms	FC-Y (4 mfd)
1 Detector Cg to chassis	5	ohms	TC- 1 D Cg-Y
1 Detector Cathode to chassis	10,000	ohms	BC- 1 DK-Y
1 Detector Screen Grid to 180+	30,000	ohms	
1 Detector Screen Grid to chassis	0	ohm	FC-Y (4 mfd) BC- 1 D Sg-Y
1 Detector Plate to 180+	89	ohms	TC- IF Tr
Oscillator Cg to chassis	40,000	ohms	Osc Grid Condenser
Oscillator Cathode to chassis	0	ohms	
Oscillator Plate to 180+	30,000	ohms	
Oscillator Plate to 1 D Screen	1	ohm	See Rf Screen
IF Control Grid to AVC Plate	40	ohms	TC- IF Tr
IF Cathode to 45+	170	ohms	
IF Screen to 180+	30,000	ohms	See RF Screen
IF Plate to 180+	40	ohms	TC- IF Tr See 1 D Plate
2 Detector Control Grid to B-	89	ohms	TC- IF Tr
2 Detector Cathode to B-	28,000	ohms	
2 Detector Plate to 180+	100,080	ohms	
2 Detector Plate to Cathode	0	ohm	BC- 2 DP- 2 DK
1 Audio Control Grid to B-	1,000,000	ohms	
1 Audio Cathode to B-	3,589	ohms	BC- 1 AF K-B-
1 Audio Plate- 180+	920	ohms	
2 AF Cg to Cg	920	ohms	
2 AF Cg to chassis (A- grounded)	1,800	ohms	BC- 2 AF Cg-F
2 AF Plate to Plate	560	ohms	
Between B- and 22+	1,715	ohms	
Across Output Transformer Secondary only	.4	ohms	
AVC Plate to 45+	500,000	ohms	
AVC Control Grid to B-	28,000	ohms	
AVC Cathode to 22+	0-29,455	ohms	

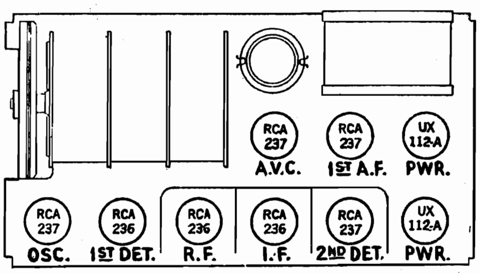
M 30 Cont'd



Internal Connections of Cables



Details of Receiver Mounting



A 4 ohm resistor is to be found between one output tube filament terminal and the "A" hot lead. This lead contains a fuse between the "A" terminal and the switch. The control grid of the AVC tube is joined directly to the cathode of the 2nd detector. The normal circuit arrangement used in the receiver assumes A- of the car battery connected to ground. If A+ is grounded, a change is required. This change is shown in the wiring diagram upon page 504-Y

RADIOTRON SOCKET VOLTAGES

VOLUME CONTROL AT MINIMUM

Tube No.	Cathode to Heater Volts	Cathode or Filament to Control Grid Volts	Cathode to Screen Grid Volts	Cathode or Filament to Plate Volts	Plate Current M. A.	Screen Grid Current M. A.	Heater or Filament Volts
1. R. F.	18	0.5	100	136	0	0	6.0
2. 1st Det.	1.0	3.0	42	150	0.25	0.1	6.0
3. Osc.	6.0	0	—	45	3.5	—	6.0
4. I. F.	18	1.0	100	136	0	0	6.0
5. 2nd Det.	12	10	—	110	0.5	—	6.0
6. 1st A. F.	15	2.0	—	165	3.5	—	6.0
7. A. V. C.	10	1.0	—	15	0	—	6.0
8. P. W. R.	—	20	—	155	1.5	—	4.5
9. P. W. R.	—	20	—	155	1.5	—	4.5

VOLUME CONTROL AT MAXIMUM
(NO SIGNAL BEING RECEIVED)

1. R. F.	18	0.5	70	135	4.0	1.0	6.0
2. 1st Det.	1.0	3.0	42	150	0.25	0.1	6.0
3. Osc.	6.0	0	—	45	3.5	—	6.0
4. I. F.	18	0.5	70	135	4.0	1.0	6.0
5. 2nd Det.	12	10	—	110	0.5	—	6.0
6. 1st A. F.	15	2.0	—	165	3.5	—	6.0
7. A. V. C.	5.0	9.0	—	15	0	—	6.0
8. P. W. R.	—	20	—	155	1.5	—	4.5
9. P. W. R.	—	20	—	155	1.5	—	4.5

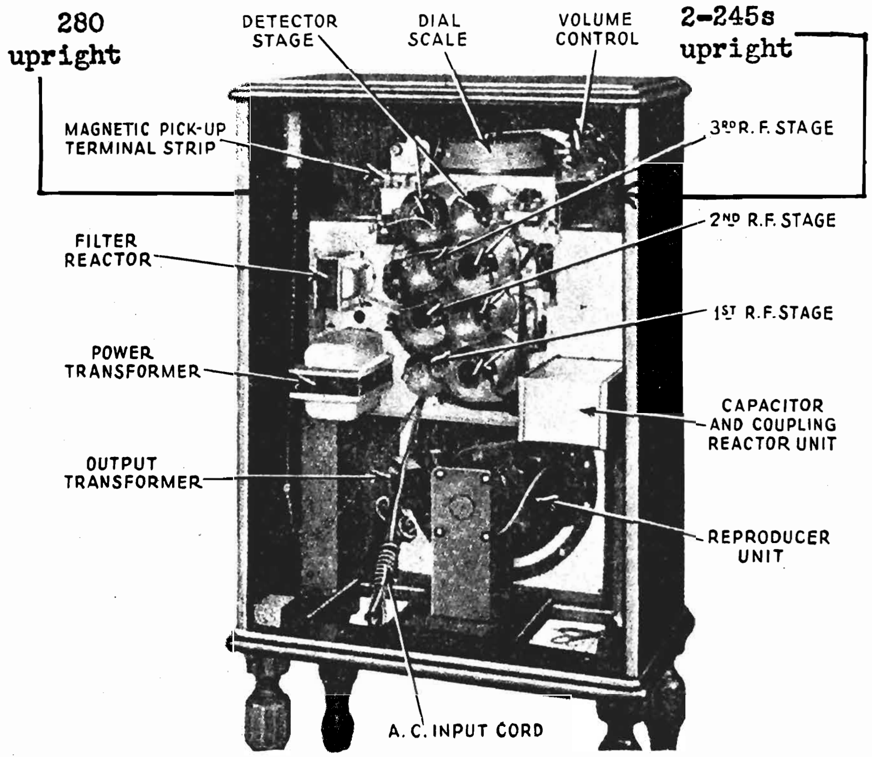
RCA - Radiola 48
WESTGHSE - WR 4
G E - T 41
Graybar - GB 678

All tubes out of sockets and AC plug removed from power supply line.
Volume Control maximum unless otherwise stated.

From Chassis To	Correct		Incorrect
Aerial (V.C. Min)	50,000	ohms	
Aerial (V.C. Max)	30	ohms	
1 R-F Control Grid	3	ohms	TC- Cg-Y
1 R-F Heater	730	ohms	BC- D H-Y
1 R-F Cathode	120	ohms	BC- 1 rf K-Y BC- 3 rf K-Y
1 R-F Screen Grid (V.C.Min)	15,950	ohms	BC- 1 rf Sg-1 rf K
1 R-F Plate	13,917	ohms	BC- 1 rf P- 1 rf K BC- 3 rf P- 3 rf K FC-Y
2 R-F Control Grid	3	ohms	TC-Cg-Y
2 R-F Cathode	120	ohms	See Ir-F Cathode
2 R-F Screen Grid	16,950	ohms	BC- 1 rf Sg- 1 rf K BC- 3 rf Sg- 3 rf K
2 R-F Plate	13,917	ohms	See 1 R-F Plate
3 R-F Control Grid	3	ohms	TC-Cg-Y
3 R-F Cathode	170	ohms	See 1 R-F Cathode Rf chk- 3 rf K
3 R-F Screen Grid	16,975	ohms	See 2 rf Sg.
3 R-F Plate	13,892	ohms	See 1 R-F Plate
Detector Control Grid	3	ohms	TC-Cg-Y
Detector Cathode	17,000	ohms	BC- D K-Y
Detector Screen Grid	210,627	ohms	BC- D Sg-Y See 2 R-F Screen Grid FC-Y (1. mfd)
Detector Plate	24,707	ohms	BC-D P- D K (See OutputP.) FC-Y (1.5 mfd)
Detector Plate to '80 Fil.	7,680	ohms	FC-Y (1.5 mfd)
Output Tube Control Grid	430,000	ohms	BLC- Af chk
Output Tube Control Grid	430,000	ohms	BLC- Af chk
Output Tube Cg to Cg	860,000	ohms	
Output Tube Plate (2 tubes)	17,492	ohms	FC-Y (2. mfd) FC-Y (.1 mfd)
Output Tube Plate to Plate	930	ohms	BC- Plate to Plate
'80 Plate	1,895	ohms	
'80 Plate to Plate	530	ohms	
Field Coil	1,330	ohms	
Output Transformer Secondary	.2	ohm	Disconnect voice coil
Voice coil only	2.5	ohms	

Radiola 48 Cont'd

Between 1 rf P- 2 rf P	**80**	**ohms**	**Rf plate windings**
2 rf P- 3 rf P	**105**	**ohms**	**Rf p wdg and chk**
D P- Output P	**645**	**ohms**	**Opt wdg and D P chk**



RADIOTRON SOCKET VOLTAGES -- 120-VOLT LINE

Tube No.	Cathode to Heater Volts D.C	Cathode or Filament to Control Grid- Volts D.C.	Cathode to Screen Grid Volts D.C.	Cathode or Filament to Plate Volts D. C.	Plate Current M. A.	Heater or Filament Volts
			VOLUME CONTROL at MAXIMUM			
RF	-40	-2.5	+85	160	3.0	2.3
RF	-36	-2,5	+85	155	3.5	2.3
RF	-36	-2.5	+75	155	3.5	2.3
DET	-28	-7.5	+55	225	0.5	2.3
AF	--	* -1.0		200	25.0	2.3
AF	--	* -1.0		200	25.0	2.3
			VOLUME CONTROL at MINIMUM			
RF	-40	-1.0	+6	200	0	2.3
RF	-40	-1.4	+6	200	0	2.3
RF	-40	-0.8	+6	200	0	2.3
DET	-28	-8.4	+75	230	.6	2.3
AF	--	* -1.0	--	205	25.0	2.3
AF	--	* -1.0	--	205	25.0	2.3

RCA - Radiola 80
G E - H 31
WESTGHSE - WR 5
G E - 700

All tubes out of sockets and AC plug disconnected from power supply.
Volume Control set for maximum signal unless otherwise specified

From Chassis To	Correct		Incorrect
Aerial to Ground	40	ohms	
Chassis to			
Link circuit condenser stator	5	ohms	TC-Y
RF Control Grid	5	ohms	TC- rf Cg-Y
RF Cathode (V.C.Min)	2,570	ohms	BC- rf K-Y (.1 mfd)
			BC- rf Sg-Y (.5 mfd)
RF Cathode (V.C. Max)	170	ohms	See V.C. Min
RF Screen Grid	16,000	ohms	BC- rf Sg- Y (.5 mfd)
			BC-2 D - Y (1. mfd)
			FC- '80 F-Y (3. mfd)
RF Plate	26,597	ohms	See RF Cathode
RF Plate to '80 Fil	42	ohms	
1 Detector Control Grid	5	ohms	TC- 1 D Cg-Y
1 Detector Cathode	2,000	ohms	BC- 1 D K-Y (.1 mfd)
1 Detector Screen Grid	16,000	ohms	See RF Screen
1 Detector Plate (distant)	26,594	ohms	See RF Screen
1 Detector Plate to '80 Fil9 distant)	39	ohms	
Oscillator Control Grid	42,000	ohms	BC- 1 D K-Y (.1 mfd)
			Oscillator Grid condenser
Oscillator Cathode	2,000	ohms	BC- 1 D K-Y (.1 mfd)
Osc control grid to cathode	40,000	ohms	
Oscillator Plate	16,000	ohms	See RF Screen
Oscillator Plate to RF Screen	1	ohm	
1 IF Control Grid	41	ohms	TC- 1 IF Cg-Y
1 IF Control Grid to distant switch	541	ohms	"Distant" Adjustment
1 IF Cathode	170	ohms	See RF Cathode
1 IF Screen Grid	16,000	ohms	See Rf Screen
1 IF Plate	26,594	ohms	See RF Screen
1 IF Plate to '80 Fil	39	ohms	
2 IF Control Grid	41	ohms	TC- 2 IF Cg-Y
2 IF Cathode	2,000	ohms	BC- 2 IF K-Y (.1 mfd)
2 IF Screen Grid	16,000	ohms	See RF Screen
2 IF Plate	26,594	ohms	See RF Screen
2 Detector Control Grid	41	ohms	TC-2D Cg-Y
2 Detector Cathode	9,346	ohms	BC-2D K-Y (1. mfd)
2 Detector Plate	28,540	ohms	FC-'80 F-Y (3 mfd)
2 Det Plate to '80 Fil	1,985	ohms	BC-2DP-2DK(.0024 mfd)
'45 Control Grid	66,500	ohms	
'45 Control Grid to Control Grid	13,000	ohms	
'45 Plate	26,730	ohms	See RF Screen

Radiola 80 Cont'd

'45 Plate to 45 Plate 350 ohms
'45 Plate to '80 Fil 175 ohms
'45 Filament 730 ohms BC-715 ohm unit-Y (.05 mfd)
'80 Filament 26,555 ohms
'80 Filament to '80 Plate 28,445 ohms FC-80F (2 mfd)
FC-80F (3 .mfd)
Harm. Condenser (3. mfd)
See RF Screen

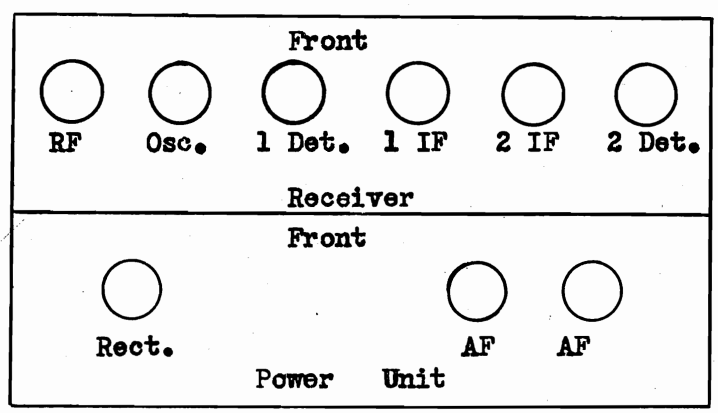
80 Anode to 80 Anode 350 ohms
Speaker field only 1,330 ohms
Output transformer secondary only .8 ohm
Voice coil only 10 ohms
Oscillator coil only 5 ohms
Across AC Plug 3.5 ohms

RADIOLA—Models 80
Volume Control at Maximum
*Not True Reading Due to Resistor in Circuit

Tube No. in Order Tested (1)	Type of Tube (2)	Position of Tube in Set (3)	Meter Readings with Jewell Test Plug in Socket of Set — Operating Voltages: Filament or Heater (4)	Plate or Anode (5)	Control Grid—Space GD+ (6)	Normal Grid—Screen GD+ (7)	Cathode to Heater (8)	Milliamperes: Screen GD L. H. '80 Plate (9)	Plate R. H. '80 Plate (10)	Tube Test (11)	Plate Current Change (12)	(13)
1	224	1 R.F.	2.2	240	2.2	80	-34	.5	3.2			
2	227	Osc.	2.2	60	-	-	-22	-	6.5			
3	224	1 Det.	2.2	230	9.5	72	-25	.1	.25			
4	224	1 I.F.	2.2	240	2.2	78	-34	.5	4.0			
5	224	2 I.F.	2.2	240	4.2	78	-31.5	.5	1.6			
6	227	2 Det.	2.2	212	-	22	-12	-	.25			
7	245	PP-AF	2.2	206	-	19*	-	-	25.0			
8	245	PP-AF	2.2	206	-	19*	-	-	25.0			
9	280	Rect.	4.6	-	-	-	-	-	-			
10												

Volume Control at Minimum

Tube No. in Order Tested (1)	Type of Tube (2)	Position of Tube in Set (3)	Meter Readings with Jewell Test Plug in Socket of Set — Operating Voltages: Filament or Heater (4)	Plate or Anode (5)	Control Grid—Space GD+ (6)	Normal Grid—Screen GD+ (7)	Cathode to Heater (8)	Milliamperes: Screen GD L. H. '80 Plate (9)	Plate R. H. '80 Plate (10)	Tube Test (11)	Plate Current Change (12)	(13)
1	224	1 R.F.	2.2	230	10	75	-25	0	0			
2	227	Osc.	2.2	65	-	-	-22	-	7.5			
3	224	1 Det.	2.2	240	10	82	-25	.1	0			
4	224	1 I.F.	2.2	230	10	75	-25	0	0			
5	224	2 I.F.	2.2	250	6	90	-32	1.0	2.2			
6	227	2 Det.	2.2	220	-	22	-12	-	.25			
7	245	PP-AF	2.2	210	-	20*	-	-	28.0			
8	245	PP-AF	2.2	210	-	20*	-	-	28.0			
9	280	Rect.	4.6	-	-	-	-	-	-			
10												



RCA - Radiola 82
G E - H 51
WESTGHSE - WR 6
Graybar - 770

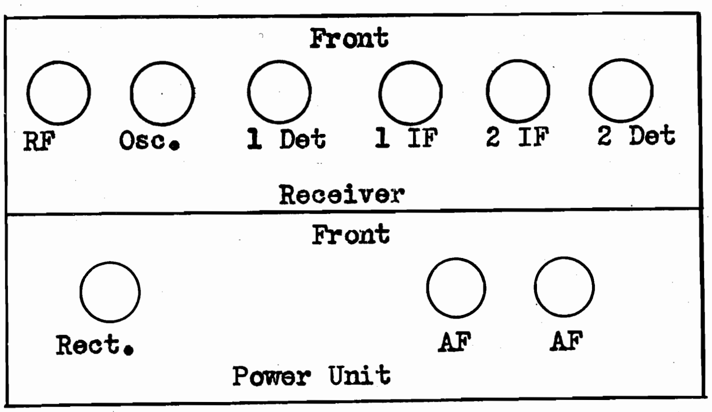
All tubes removed from sockets and AC plug disconnected from power supply. Volume Control set for maximum signal unless otherwise stated. Phonograph pickup disconnected from terminal board and terminals 1,2 and 3 joined. Terminals 4 and 5 left open.

From Chassis To	Correct		Incorrect
Aerial to Ground	40	ohms	
Chassis to			
Link Circuit condenser stator	5	ohms	TC-Y
RF Control Grid	5	ohms	TC- rf Cg-Y
RF Cathode (V.C.Min)	2,570	ohms	BC- rf K-Y (.1 mfd) BC- rf Sg-Y (.5 mfd)
RF Cathode (V.C.Max)	170	ohms	See V.C. Min
RF Screen Grid	16,000	ohms	BC- rf Sg-Y (.5 mfd) BC- 2 D K-Y (1. mfd) FC- 80 F-Y (3. mfd)
RF Plate	26,597	ohms	See RF Cathode
RF Plate to 80 Fil	42	ohms	
1 Det. Control Grid	5	ohms	TC- 1 D Cg
1 Det. Cathode	2,000	ohms	BC- 1 D K-Y (.1 mfd)
1 Det. Screen Grid	16,000	ohms	See RF Screen
1 Det. Plate (distant adj)	26,594	ohms	See Rf Screen
1 Det Plate to '80 Fil (distant)	39	ohms	
Oscillator Control Grid	42,000	ohms	BC- 1 D K-Y (.1 mfd) Oscillator grid cond
Oscillator Cathode	2,000	ohms	BC- 1 D K-Y (.1 mfd)
Osc. Cg to Cathode	40,000	ohms	
Oscillator Plate	16,000	ohms	See RF Screen
Osc Plate to RF Screen	1	ohm	
1 IF Control Grid	41	ohms	TC- 1 IF Cg-Y
1 IF Cathode	170	ohms	See RF Cathode
1 IF Screen Grid	16,000	ohms	See RF Screen
1 IF Plate to '80 Fil	39	ohms	
2 IF Control Grid	41	ohms	TC- 2 IF Cg-Y
2 IF Cathode	2,000	ohms	BC- 2 IF K-Y (.1 mfd)
2 IF Screen Grid	16,000	ohms	See RF Screen
2 IF Plate	26,594	ohms	See RF Screen
2 Detector Control Grid	41	ohms	TC-2 D Cg-Y
2 Detector Cathode	9,346	ohms	BC-2 D K-Y (1.mfd)
2 Detector Plate	28,635-29,894	ohms*	*Depending upon tone setting Tone control condenser FC-'80 F-Y (3.mfd)
2 Det Plate to '80 Fil	2,080-3,339	ohms*	*Depending upon tone setting

Radiola 82 Cont'd

'45 Control Grid	66,500	ohms	
'45 Control Grid to Control Grid	13,000	ohms	
'45 Plate	26,730	ohms	See RF Screen
'45 Plate to '45 Plate	350	ohms	
'45 Plate to '80 Fil	175	ohms	
'45 Filament	730	ohms	BC-715 Ohm Unit-Y
'80 Filament	26,555	ohms	

From Chassis To	Correct		Incorrect
'80 Fil to '80 Plate	28,445	ohms	FC- 80 F (2 mfd) FC- 80 F (3. mfd) Har. condenser (3. mfd) See RF Screen
'80 Anode to '80 Anode	350	ohms	
Speaker Field only	1,330	ohms	
Output Transformer Secondary Only	.8	ohm	
Voice Coil only	10	ohms	
Oscillator coil only	5	ohms	
Across AC Plug	3.5	ohms	



Volume Control at Maximum

*Not True Reading Due to Resistor in Circuit

Tube No. in Order Tested (1)	Type of Tube (2)	Position of Tube in Set (3)	Meter Readings with Jewell Test Plug in Socket of Set — Operating Voltages: Filament or Heater (4)	Plate or Anode (5)	Control Grid—Space (6) GD+	Normal Grid—Screen (7) GD+	Cathode to Heater (8)	Milliamperes: Screen GD L. H. '80 Plate (9)	Plate R. H. '80 Plate (10)	Tube Test (11)	Plate Current Change (12)	(13)
1	224	1 R.F.	2.2	240	2.2	80	-34	.5	3.2			
2	227	Osc.	2.2	60	-	-	-22	-	6.5			
3	224	1 Det.	2.2	230	9.5	72	-25	.1	.25			
4	224	1 I.F.	2.2	240	2.2	78	-34	.5	4.0			
5	224	2 I.F.	2.2	240	4.2	78	-31.5	.5	1.6			
6	227	2 Det.	2.2	212	-	22	-12	-	.25			
7	245	PP-AF	2.2	206	-	19*	-	-	25.0			
8	245	PP-AF	2.2	206	-	19*	-	-	25.0			
9	280	Rect.	4.6	-	-	-	-	-	-			
10												

Volume Control at Minimum

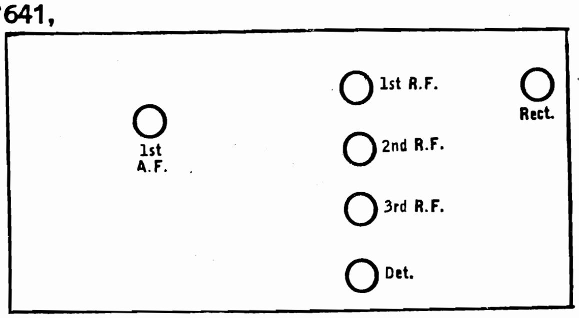
Tube No. in Order Tested (1)	Type of Tube (2)	Position of Tube in Set (3)	Meter Readings with Jewell Test Plug in Socket of Set — Operating Voltages: Filament or Heater (4)	Plate or Anode (5)	Control Grid—Space (6) GD+	Normal Grid—Screen (7) GD+	Cathode to Heater (8)	Milliamperes: Screen GD L. H. '80 Plate (9)	Plate R. H. '80 Plate (10)	Tube Test (11)	Plate Current Change (12)	(13)
1	224	1 R.F.	2.2	230	10	75	-25	0	0			
2	227	Osc.	2.2	65	-	-	-22	-	7.5			
3	224	1 Det.	2.2	240	10	82	-25	.1	0			
4	224	1 I.F.	2.2	230	10	75	-25	0	0			
5	224	2 I.F.	2.2	250	6	90	-32	1.0	2.2			
6	227	2 Det.	2.2	220	-	22	-12	-	.25			
7	245	PP-AF	2.2	210	-	20*	-	-	28.0			
8	245	PP-AF	2.2	210	-	20*	-	-	28.0			
9	280	Rect.	4.6	-	-	-	-	-	-			
10												

STROMBERG-CARLSON 641

All tubes removed from sockets and AC plug removed from power supply lead. Speaker field disconnected. Volume control maximum unless otherwise stated. Pickup disconnected

From Chassis To	Correct		Incorrect
Aerial (V.C.Max)	17	ohms	
Aerial (V.C. Varied)	0-5000	ohms*	*Antenna volume control is 20,000 ohms
1 RF Control Grid	3.8	ohms	TC- 1 rf Cg-Y
1 RF Cathode	164	ohms	BC- 1 rfK-Y (.3 mfd)
1 RF Screen	3,781	ohms	BC- 1 rf Sg-Y (.3 mfd)
1 RF Plate	8,297	ohms	BC- 1 rf P-Y (.3 mfd) BC- VD-Y (1. mfd) BC- 2 rf P-Y (.3 mfd) BC- 3 rf P-Y (.3 mfd)
1 RF Plate to 2 RF Plate	34	ohms	
2 RF Control Grid	3.5	ohms	TC- 2 rf Cg-Y
2 RF Cathode	164	ohms	See 1 RF Cathode
2 RF Screen	3,781	ohms	See 1 RF Screen
2 RF Plate	8,297	ohms	See 1 RF Plate
2 RF Plate to 1 RF Plate	34	ohms	
3 RF Control Grid	3.5	ohms	TC- 3 rf K-Y
3 RF Cathode	390	ohms	BC- 3 rf K-Y (.3 mfd)
3 RF Screen	3,781	ohms	See 1 RF Screen
3 RF Plate	8,297	ohms	See 1 RF Plate
Detector Control Grid	2,000,000	ohms	Also 3.5 ohms grid winding Grid condenser
Detector Cathode	15,000	ohms	BC- DK-Y (1.mfd)
Detector Plate	28,000	ohms	BC-DP-Y BC- AF Tr-Y (1 mfd) See RF Screen FC- Filter chk-Y
Detector Plate to '80 Fil	12,720	ohms	FC- Filter chk-Y See Detector Plate
'45 Control Grid	9,570	ohms	
'45 Fil to chassis	1,452	ohms	
'45 Plate to 80 Fil	1,403	ohms	BC- across tone filter. (2-.01 mfd) FC- Filter chk-Y
Across Speaker Terminals	1.7	ohms	
80 Fil to chassis	16,881	ohms	See Detector Plate FC- Tuned Filter chk-Y

'641,



STROMBERG-CARLSON—Model 641
Line Voltage 114—Set on High Volt Tap—Volume Control Position Max

TUBE NO IN ORDER (1)	TYPE OF TUBE (2)	POSITION OF TUBE 1ST RF DET ETC (3)	READINGS, PLUG IN SOCKET OF SET									
			TUBE OUT		TUBE IN TESTER							
			A VOLTS (4)	B VOLTS (5)	A VOLTS (6)	B VOLTS (7)	C VOLTS (CONTROL GRID) (8)	CATHODE-HEATER VOLTS (9)	NORMAL PLATE M.A. (10)	PLATE M.A GRID TEST (11)	PLATE CHANGE M.A. (12)	SCREEN GRID VOLTS (13)
1	224	1st RF	2.45	140	2.24	136	3.5	3.5	1.5	4	2.5	55
2	224	2nd RF	2.45	140	2.24	136	3.5	3.5	1.5	4	2.5	55
3	224	3rd RF	2.45	140	2.24	136	3.5	3.5	1.5	4	2.5	56
4	227	Det.	2.45	278	2.24	248	3	3	1.8	-	-	-
5	245	Amp.	2.45	355	2.24	238	35		30	32	2	-

STROMBERG-CARLSON 846

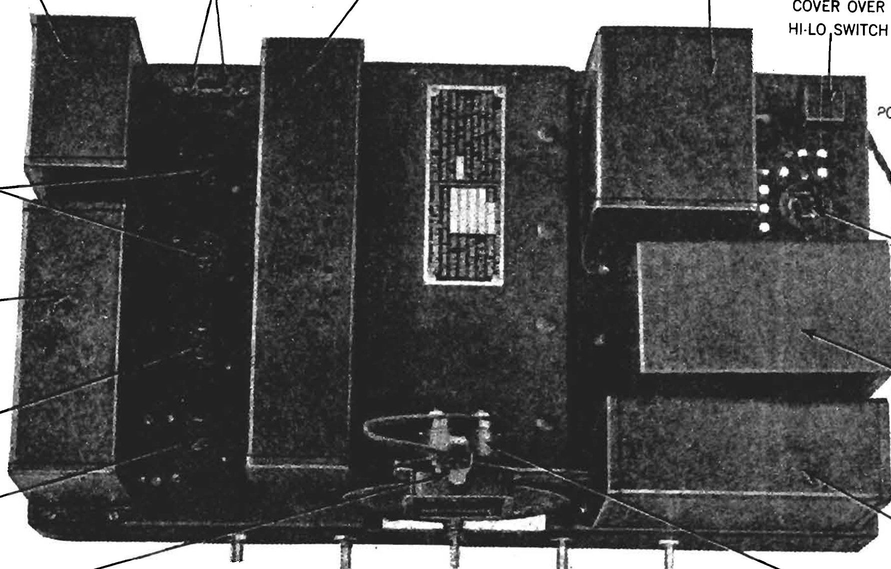
All tubes removed from receiver and AC power plug disconnected from supply circuit. Pickup switch in radio position.

From Chassis To	Correct		Incorrect
Aerial (V.C.Min)	10	ohms	
Aerial (V.C.Max)	20	ohms	
Aerial (V.C. Halfway)	5,000	ohms	approx Variable antenna V.C. has a value of 20,000 ohms
1 RF Tuning Condenser Stator	3.8	ohms	TC-Y
1 RF Control Grid	5,200,000	ohms	BLC- 1 rf Cg-grid wdg BC- 5 meg unit-Y BLC- AVC P-Y (.5 mfd)
1 RF Cathode	390	ohms	BC- 1 rf K-Y (.3 mfd)
1 RF Screen	4,350	ohms	BC- 1 rf Sg-Y(.3 mfd) BC- 2 rf Sg-Y(.3 mfd) BC- 3 rf Sg-Y(.3 mfd)
1 RF Plate	10,367	ohms	BC- 1 rf P-Y (.3 mfd) BC- 2 rf P-Y (.3 mfd) BC- 3 rf P-Y (.3 mfd) FC- V D-Y (1.mfd)
2 RF Tuning Condenser Stator	3.5	ohms	TC-Y
2 RF Control Grid	5,100,000	ohms	BLC- 2 rf Cg-grid wdg BC- 5 meg unit-Y BLC- AVC P-Y (.5 mfd) See 1 RF Screen
2 RF Cathode	390	ohms*	*DC Resistance of visual tuning meter must be added BC- 2 rf K-Y (.3 mfd)
2 RF Screen	4,380	ohms	See 1 RF Screen
2 RF Plate	10,367	ohms	See 1 RF Plate
3 RF Tuning Condenser Stator	3.5	ohms	TC-Y
3 RF Control Grid	5,000,000	ohms	BLC- 3 rf Cg-grid wdg
3 RF Cathode	600	ohms	BC- 3 rf K-Y (.3 mfd)
3 RF Screen	4,350	ohms	See 1 RF Screen
3 RF Plate	10,367	ohms	See 1 RF Plate
Detector Control Grid	2,033	ohms	TC- D Cg
Detector Cg to Det F	6	ohms	
Detector Cg to Det Cathode	15,003	ohms	BC across bias unit (1 mfd)
Detector Cathode	17,030	ohms	
Detector Plate	27,830	ohms	BC D P-Y FC- AF Tr-'80 P wdg FC- 10,000 ohm unit-80 P wdg FC- Tuned Filter chk FC- 80 F-80 P wdg
1 AF Control Grid (V.C.Max)	4,913	ohms	250,000 ohm V.C.
1 AF Cathode	1,500	ohms	
1 AF Plate	13,730	ohms	BC- AF Tr-Y (1 mfd)
2 AF Control Grid	20,840 or 11,920	ohms*	*Two windings of transformer do not have like resistance. One half has 9890 ohms and other half

846 Cont'd

From Chassis To	Correct		Incorrect
			has 14,810 ohms
2 AF Control Grid to Control Grid	24,700	ohms	
2 AF Filament	2,755	ohms	BC-across 725 ohm unit
2 AF Plate to Plate	886	ohms	
2 AF Plate to 80 Fil	825-900-	ohms	FC-Tuned Filter chk- FC-Filter chk-
Across speaker terminals only	1.77ohms		
AVC Control Grid	2,002,030	ohms	BC- 2 meg unit-Y CC- AVC Cg- 3 rf P
AVC Cathode	1,700	ohms	BC- AVC K-Y
AVC Plate	200,000	ohms	BC- AVC P-Y (.5 mfd)
'80 Filament	14,200-14,300	ohms	FC
'80 Filament to 80 Anode	16,340-16,440	ohms	FC

Note* Speaker power supply checked separately



*A very slight deflection of the meter only. Readings given are for either of the 2 tubes used in Push Pull

TUBE NO. IN ORDER ①	TYPE OF TUBE ②	POSITION OF TUBE 1ST R.F. DET., ETC. ③	READINGS, PLUG IN SOCKET OF SET									
			TUBE OUT		TUBE IN TESTER							
			④ A VOLTS	⑤ B VOLTS	⑥ A VOLTS	⑦ B VOLTS	⑧ C VOLTS (CONTROL GRID)	⑨ CATHODE-HEATER VOLTS	⑩ NORMAL PLATE M.A.	⑪ PLATE M.A. GRID TEST	⑫ PLATE CHANGE M.A.	⑬ SCREEN GRID VOLTS
1	224	1 R.F.	2.60	155	2.3	145	.5	.6	2.2	2.5	.3	60
2	224	2 R.F.	2.60	155	2.3	145	.5	.6	2.2	2.5	.3	60
3	224	3 R.F.	2.60	155	2.3	145	.5	.6	2.2	2.5	.3	54
4	227	Det.	2.60	265	2.3	225	27.0	2.9	2.0	2.1	.1	
5	227	1 A.F.	2.60	160	2.3	120	7.75	7.75	5.5	7.0	1.5	
6	227	V.C.T.	2.60	2	2.3	14	5.0	4.1	*	-	-	
7	245	P. P.	2.55	280	2.3	240	45.0	-	30	38	8.0	
8	245	P. P.	2.55	280	2.3	240	45.0	-	30	-	8.0	
9	280	Rect.	5.20	-	4.60	-	-	-	48	-		
10	280	Rect.	5.20	-	4.60	-	-	-	48	-		

STROMBERG-CARLSON 10 and 11

All tubes out of socket and AC plug removed from power supply line. Speaker plug removed from speaker socket. Phone switch in radio position

From Chassis To	Correct		Incorrect
Aerial	Condenser		
1 RF Control Grid to Input Tuning Condenser Stator	9.2	ohms	Coupling condenser
1 RF Control Grid	900-1100	ohms	Volume Control BC- 500 ohm unit-Y TC- 1 rf Cg-Y
1 RF Cathode	0	ohm	
1 RF Screen Grid	5,900	ohms	BC- 1 rf Sg-Y (.3 mfd)
1 RF Plate	11, 610	ohms	BC-1 rf Tr-Y (.3 mfd) BC- VD 80 P wdg BC- 2 rf P-Y (.3 mfd) BC- 3 rf P-Y (.3 mfd)
2 RF Control Grid	100,530	ohms	BC- 2 rf Cg wdg-Y See 1 RF Control Grid
2 RF Cathode	0	ohm	
2 RF Screen	6,500	ohms	BC- 2 rf Sg-Y (.3 mfd) BC- 1 rf Sg-Y (.3 mfd)
2 RF Screen to 3 RF Screen	0	ohm	
2 RF Plate	9,661	ohms	BC- 2 rf P wdg-P (.3 mfd) BC- 600 ohm unit-Y(.3mfd) See 1 RF Plate
2 RF Plate to 3 RF Plate	22	ohms	
Detector Control Grid	5,100,000	ohms	TC-Y Grid condenser BLC- rf grid wdg-Y(.04mfd)
Detector Cathode	20,000	ohms	BC- DK-Y (.6 mfd -1. mfd)
Detector Screen Grid	16,500	ohms	BC-D Sg-Y (.3 mfd
Detector Plate to '80 Fil	51,078	ohms	
Detector Plate	64,653	ohms	BC- DP-Y (.0001 mfd) BC- AF Tr-Y (1 mfd) FC- '80 F -'80 P wdg BC- VD-Y FC- Filter chk-80 p wdg
3 RF Control Grid	942	ohms	BC-500 ohm unit-Y (3.mfd) TC- 3 rf Cg-Y
3 RF Cathode	0	ohms	
3 RF Screen Grid	6,500	ohms	See 2 RF Screen
3 RF Plate	9,661	ohms	See 2 RF Plate See 1 RF Plate

10 and 11 Cont'd

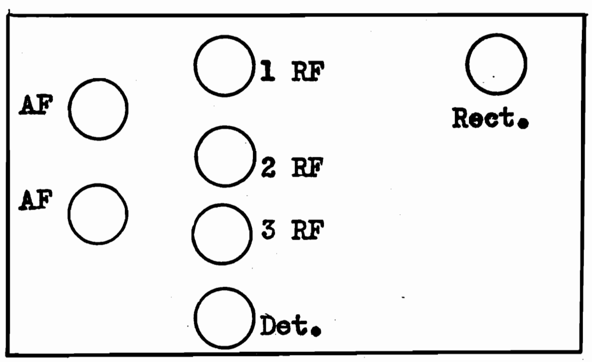
'45 Control Grid	6,400	ohms	
'45 Control Grid to Control Grid	11,400	ohms	Shunt Condenser
'45 Control Grid to '45 Fil	6,650	ohms	
'45 Plate to '45 Plate	406	ohms	Halves of windings are not equally divided
'45 Plate to '80 Fil	350-700	ohms	
'80 Fil to '80 P	15,185	ohms	See Detector Plate

Output Transformer Secondary only 1.6ohms
RF and Detector Filament to Ground 0 resistance

Input winding only 4.6ohms
Secondary winding 4.6ohms
Broad Band Transformer Primary winding 1,960 ohms
Broad Band Transformer Secondary winding 81 ohms
2nd RF Plate Winding only 11 ohms
Secondary of second bi-resonant circuit 4.6ohms
3 RF Grid Winding only 4.6ohms
Input AF Transformer primary alone 11,090 ohms
Resistance across input AF transformer primary 250,000 ohms

STROMBERG-CARLSON—Models 10 and 11
Line Voltage 120—Voltage Tap High

Tube No. in Order Tested (1)	Type of Tube (2)	Position of Tube in Set (3)	Meter Readings with Jewell Test Plug in Socket of Set — Operating Voltages: Filament or Heater (4)	Plate or Anode (5)	Control Grid—Space (6) GD+	Normal Grid—Screen (7) GD+	Cathode to Heater (8)	Milliamperes: Screen GD L. H. '80 Plate (9)	Plate R. H. '80 Plate (10)	Tube Test (11)	Plate Current Change (12)	(13)
1	224	1 R.F.	2.4	135	2.5	80						
2	224	2 R.F.	2.4	135	2.5	80						
3	224	3 R.F.	2.4	135	2.5	80						
4	224	Det.	2.4	200	-	75						
5	245	PP-AF	2.4	235	-	45						
6	245	PP-AF	2.4	235	-	45						
7	280	Rect.	4.8	-	-	-						
8												
9												
10												



STROMBERG-CARLSON 19 and 20

All tubes removed from sockets and AC plug disconnected from power supply. Speaker plug removed from speaker socket. Volume control maximum unless otherwise stated. See Notes.

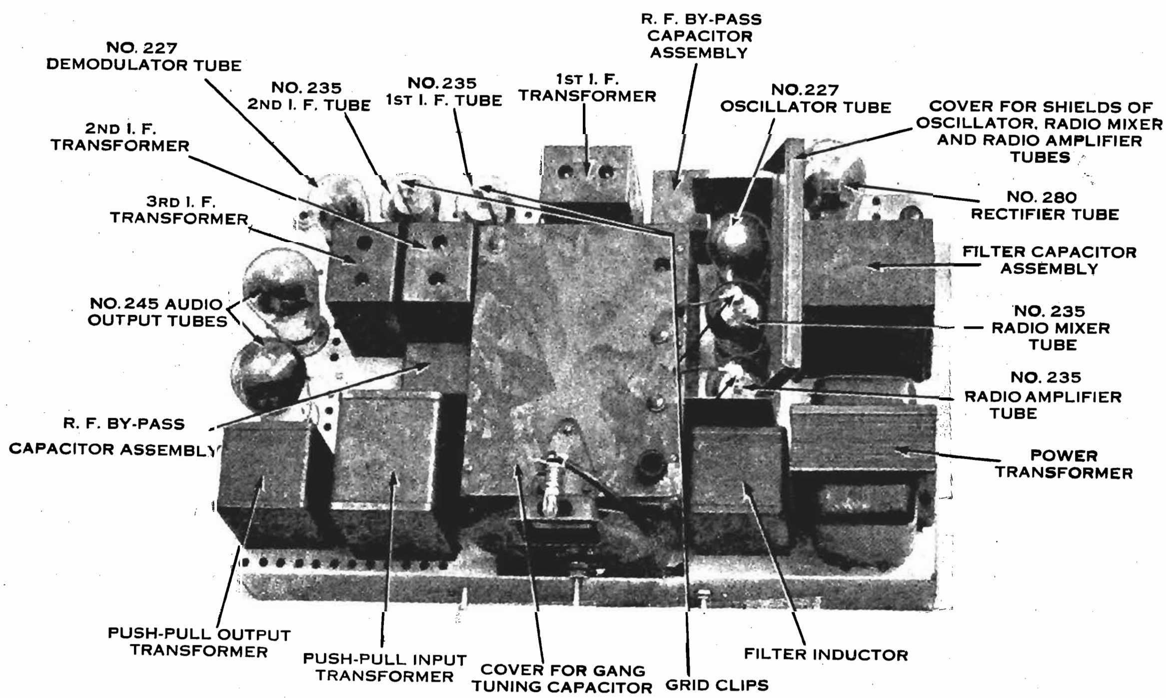
From Chassis To	Correct		Incorrect
RF Control Grid	504.9	ohms	BC- rf Cg wdg-Y
RF Cathode (V.C.Max)	60	ohms	BC- if K-Y (.3 mfd)
RF Cathode (V.C.Min)	1,060	ohms	
RF Screen Grid	2,560	ohms	BC- rf Sg-Y (.3 mfd) BC- if Sg-Y (.3 mfd)
RF Plate	4,179	ohms	BC- rf P-Y (.3 mfd) BC- if P wdg-Y (.3 mfd) FC- if P wdg-Y (1. mfd)
Mixer Tube Control Grid	4.9	ohms	TC- Mixer Cg-Y
Mixer Cathode	6,560	ohms	BC-Osc Coupling Coil-Y See RF Cathode
Mixer Screen Grid	2,560	ohms	See RF Screen
Mixer Plate	4,179	ohms	See RF Plate TC- if Tr Primary
Mixer Plate to RF Plate	88	ohms	
1 IF Control Grid	42.3	ohms	TC- 1 if Cg-Y
1 IF Cathode	60	ohms	See RF Cathode
1 IF Screen Grid	1,960	ohms	See RF Screen
1 IF Plate	3,579	ohms	BC- 1 if P wdg-Y See Mixer Plate
1 IF Plate to 2 IF Plate	90.5	ohms	
2 IF Control Grid	45.8	ohms	TC- 2 if Cg-Y
2 IF Cathode	60	ohms	BC- 2 if K-Y (.3 mfd)
2 IF Screen	1,960	ohms	See RF Screen
2 IF Plate	3,580	ohms	See 1 IF Plate
Demodulator Control Grid	10,100,000	ohms	TC- grid condenser-Y BC- grid wdg-Y (.001 mfd)
Demodulator Cathode	30,000	ohms	BC- Dem K-Y (2 mfd)
Demodulator Plate to 80 Fil	51,040	ohms	
Demodulator Plate to Chassis	0	ohm	BC- AF Tr wdg-Y (2 mfd) FC- Filter chk-Y (3 mfd) BC- AF Tr wdg- Dem K BC- Dem P- Dem K-
'45 Control Grid	4,340-5,350	ohms	Split windings do not have equal resistance
'45 Control Grid to '45 Fil	5,100-6,000	ohms	
'45 Plate to Plate	425	ohms	Tone Control condenser
'45 Plate to 80 Fil	500-525	ohms	
Output Transformer secondary only	1.4	ohms	
Oscillator Control Grid	502	ohms	Oscillator winding is tapped
Oscillator Cathode	6,500	ohms	BC- Osc K-Y (.001 mfd)
Oscillator Plate to RF Screen	1.2	ohms	
RF Mixer- IF and Demodulator Filament to chassis	0	ohm	

19 and 20 Cont'd

Across AC plug (LO)	4.1	ohms	
Across AC plug (HI)	4.5	ohms	
AC plug to chassis	0	ohm	FC- across primary

Voltage	Meter	Scale	Where Measured	Approx. Value in Volts
Heater Voltage Nos. 227 & 235 Tubes	A.C.	0–4	Across Heater Terminals of Sockets	2.4
Filament Voltage No. 245 Tubes	A.C.	0–4	Across Filament Terminals of Audio Output Sockets	2.4
Filament Voltage No. 280 Tube	A.C.	0–8	Across Filament Terminals of Rectifier Socket	4.8
Plate Voltage Radio Amplifiers	D.C.	0–250	Between Plate Terminal of R. F. Amplifier Socket (+) and Chassis Base (−)	150–170
Plate Voltage Mixer Tube	D.C.	0–250	Between Plate Terminal Mixer Tube Socket (+) and Chassis Base (−)	150–170
Plate Voltage Oscillator	D.C.	0–250	Between Plate Terminal of Oscillator Socket (+) and Chassis Base (−)	85–90
Plate Voltage I.F. Tubes	D.C.	0–250	Between Plate Terminals of I. F. Amplifier Sockets (+) and Chassis Base (−)	150–170
Plate Voltage Demodulator	D.C.	0–250	Between Plate Terminal of Demodulator Socket (+) and Chassis Base (−)	190–215
Plate Voltage Audio Output Tubes	D.C.	0–250	Between Plate Terminals Audio Output Socket (+) and 10 ohm Mid Tap Resistor R_8(−)	250
Control Grid Voltage R.F. Amplifier	D.C.	0–10	Between Control Grid Clip of R. F. Amplifier Tube (−) and Cathode (+) of R. F. Amplifier Tube	3
Control Grid Voltage Mixer Tube	D.C.	0–250	Between Control Grid Clip Mixer Tube (−) and Cathode (+) of Mixer Tube	10–12
Control Grid Voltage 1st I.F. Amplifier	D.C.	0–10	Between Control Grid Clip 1st I. F. Tube (−) to Cathode (+) of 1st I. F. Tube	3
Control Grid Voltage 2nd I.F. Tube	D.C.	0–10	Between Control Grid Clip 2nd I. F. Tube (−) to Cathode (+) of 2nd I. F. Tube	3
Grid Voltage Oscillator	D.C.	0–250	Across 6500 ohm Resistor R_{10}	10–15
Grid Voltage Demodulator	D.C.	)–250	Across 30,000 ohm Resistor R_{17}	20–25
Grid Voltage Audio Tubes	D.C.	0–250	Between Grids of Audio Tubes (−) to Mid Tap 10 ohm Resistor R_8 (+)	45–50*
Screen Voltage Radio Amplifier Mixer 1st & 2nd I.F. Tubes	D.C.	0–250	Between Screen Terminals of Tubes (+) to Chassis Base (−)	80–90*
B Voltage R.F. Amplifier and Mixer Tube	D.C.	0–250	Between Tube Side of 600 ohm Resistor R_2 and Chassis Base	150–170*
B Voltage 1st & 2nd I.F. and Mixer Tubes	D.C.	0–250	Between "High" Side of Voltage Divider and Chassis Base −	150–170*
B Voltage Audio Tubes	D.C.	0–250	Between Mid Tap of Audio Output Transformer + and Chassis Base (−	300
C Voltage Audio Output Tubes	D.C.	0–250	Across 750 ohm Biasing Resistor R_7	50
Speaker Field Voltage	D.C.	0–250	Across Small Pins of Speaker Connector Socket	150–170
Plate Voltage A.C. Pere Anode No. 280 Rectifier	A.C.	See Remarks	Between P Terminals No. 280 Rectifier Socket and Chassis Base	325–350†

*These voltage vary with dial setting and position of volume control.



Sec. 1 POINT TO POINT RESISTANCE DATA (See Special Index)

Sec. 2 SOCKET LAYOUTS From underside Top View of Sockets

Sec. 3

* DENOTES PAGE CONTAINED IN VOLUME 1.

* Denotes page contained in Volume 1.

* Denotes page contained in Volume 1.

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	PAGE

DE WALD RADIO

EARL RADIO CORP.

ECHOPHONE RADIO MFG. CO. LTD.

	PAGE

ECHOPHONE RADIO MFG. CO. LTD. (Cont'd)

EDISON, INC., THOMAS A.

ELECTRAD INC.

ELECTRICAL RESEARCH LABS. INC.

* Denotes page contained in Volume 1.

PAGE

ELECTRICAL RESEARCH LABS. INC. (Cont'd)

EMERSON RADIO & PHONOGRAPH CORP.

ENVOY - SEE INSULINE CORP. OF AMERICA

ERLA - SEE ELECTRICAL RESEARCH LAB.

EVEREADY - SEE NATIONAL CARBON CO.

FADA - SEE ANDREA, INC., F.A.D.

FANSTEEL PRODUCTS CORP. SEE BALKEIT RADIO CO.

FEDERATED PURCHASER (Acratone)

FEDERAL RADIO CORP.

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FEDERAL RADIO CORP. (Cont'd)

FIRST NATIONAL RADIO CORP. - SEE BALKEIT RADIO CO.

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R.C.A.- VICTOR CO. INC. (RADIOLA DIV.) (Cont'd)

R.C.A. VICTOR CO. INC. (Cont'd)

* DENOTES PAGE CONTAINED IN VOLUME 1.

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R.C.A. - VICTOR CO. INC. (Cont'd)

R.C.A. - VICTOR CO. INC. (VICTOR DIV.)

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R.C.A. - VICTOR CO. INC. (VICTOR DIV.) (Cont'd)

REES-MACE

RADIOTROPE - SEE U.S. RADIO & TELEVISION.

READRITE METER WORKS

SAMSON ELECTRIC CO.

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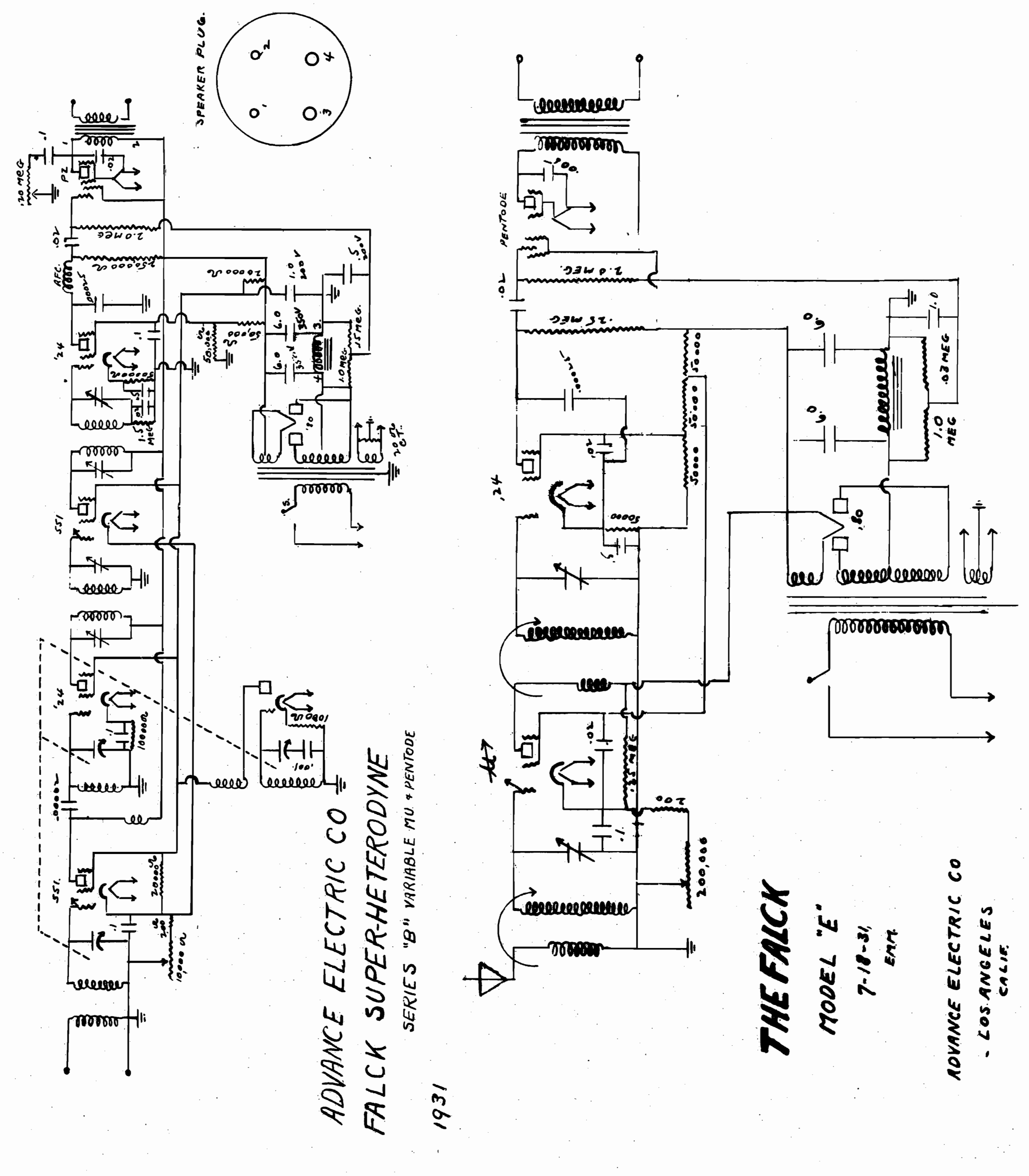
ZENITH RADIO CORP. (Cont'd)

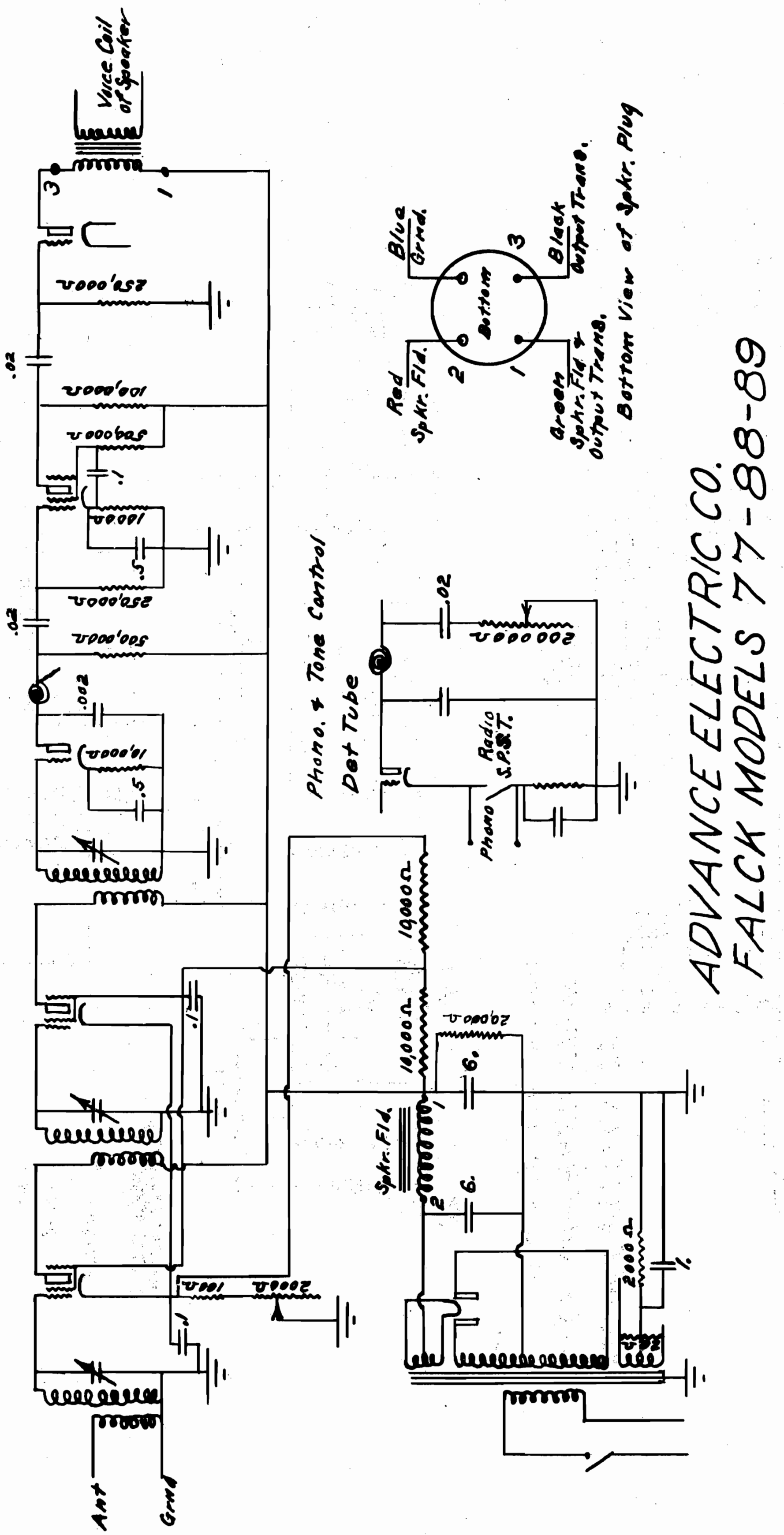
ZENITH RADIO CORP. (Cont'd)

* DENOTES PAGE CONTAINED IN VOLUME 1.

ADVANCE ELECTRIC CO.

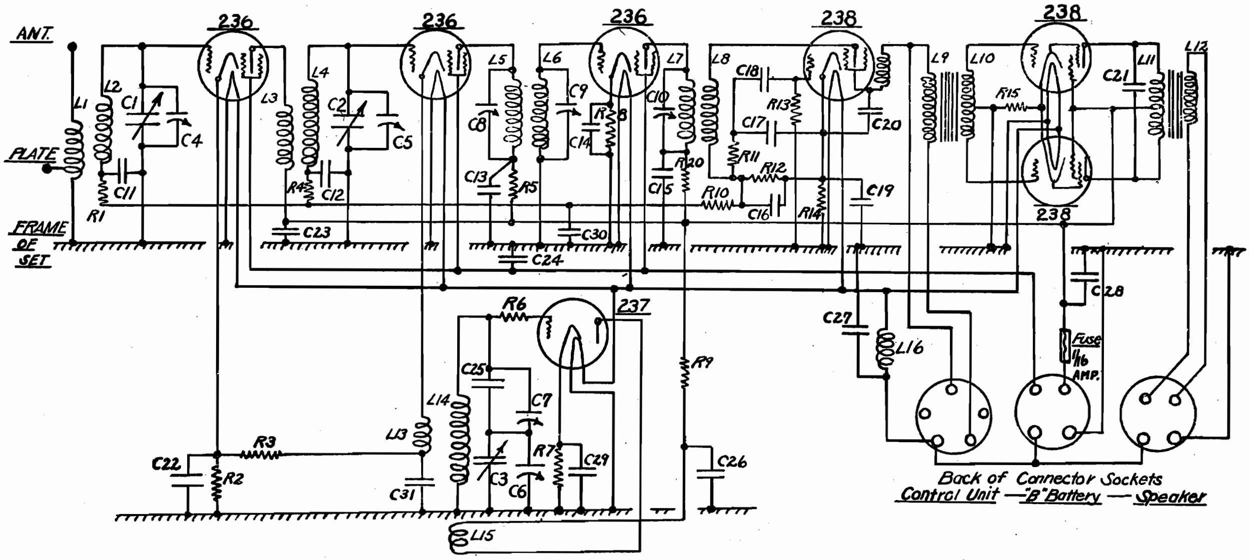


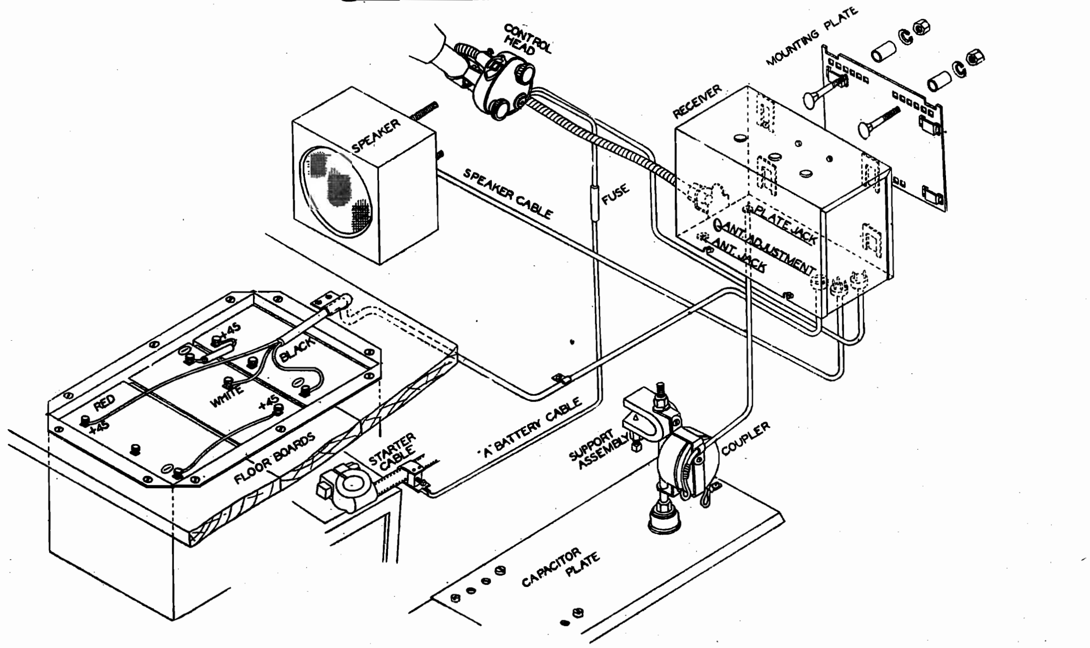
ADVANCE ELECTRIC CO.



UNITED AMERICAN BOSCH CORP

MODEL 100 SUPERHETERODYNE
MOTOR CAR RADIO
(Advertised as MODEL 9-20)





Symbols and Electrical Values

R1 —10,000 ohms
R2 — 3,000 ohms
R3 — 5,000 ohms
R4 —10,000 ohms
R5 — 1,000 ohms
R6 — 1,000 ohms
R7 — 3,000 ohms
R8 — 1,500 ohms
R9 — 5,000 ohms
R10—.5 megohm
R11—100,000 ohms
R12—.5 megohm
R13—.1 megohm
R14— 2,000 ohms
R15— 1,500 ohms
R16— 1,000 ohms
C1, C2, C3, C4, C5, C6 — Condenser Gang with Alignment Condensers
C7 —100 to 200 mmf.
C8 — 75 to 140 mmf.
C9 — 75 to 140 mmf.
C10— 75 to 140 mmf.
C11—.05 mfd.
C12—.05 mfd.
C13—.05 mfd.
C14—.05 mfd.
C15—.05 mfd.
C16—.00025 mfd.
C17—.0001 mfd.
C18—.01 mfd.
C19—.5 mfd.
C20—.0011 mfd.
C21—.004 mfd.
C22—.05 mfd.
C23—.05 mfd.
C24—.25 mfd.
C25—1100 mmf.
C26—.05 mfd.
C27—.25 mfd.
C28—.25 mfd.
C29—.05 mfd.
C30—.25 mfd.
C31—.05 mfd.
L1, L2 — Antenna Coil
L3, L4 — Radio Frequency Coil
L5, L6 — Intermediate Coil
L7, L8 — Intermediate Coil
L9, L10 — Audio Input Transformer
L11, L12 — Audio Output Transformer
L13, L14, L15 — Oscillator Coil
L16—Filter

UNITED AMERICAN BOSCH CORP.

MODEL 100 SUPERHETERODYNE
MOTOR CAR RADIO
(Advertised as MODEL 9-20)

This is a seven tube, superneterodyne receiver with full automatic volume control, push-pull pentode output and electro dynamic speaker. The Magmotor, a source of "B" current, is supplied as an accessory.

TUBES are furnished with receiver as follows:

- 1 type 236, radio frequency amplifier.
- 1 type 237, oscillator.
- 1 type 236, first detector.
- 1 type 236, intermediate frequency amplifier.
- 2 type 238, as push-pull audio amplifiers.
- 1 type 238, diode triode which functions as a second detector, and audio-amplifier, and with its related circuit, furnishes voltage for automatic volume control.

The type 238 tubes used in the last three positions named above, are pentode power output tubes. All of the tubes used in this receiver are designed especially for automobile use to withstand the vibration and heater voltage fluctuation to which they are subjected.

CHASSIS contains the tubes, tuning condensers and elements of the electrical circuit. (See circuit diagram). It is enclosed in a metal box provided with mounting hooks for easy attachment to a MOUNTING PLATE designed to be mounted either side of the bulkhead. Shielding is complete and internal filtering is so arranged that a minimum of engine interference obtains. Speaker, battery box, control head and plate antenna, find easy attachment to the chassis through cable plug connections inserted on the under side of chassis.

CONTROL UNIT fastens to the steering column and regulates the station selection and volume level. Cable is connected internally with plug for chassis connection.

FLEXIBLE SHAFT connects control unit and chassis drive. It consists of three layers of five strands of wire wound in alternate directions, enclosed in flexible tube: provides accurate tuning unaffected by excessive vibration.

LOUD SPEAKER of electro dynamic type consumes $1\frac{1}{4}$ amperes from storage battery. Cable is connected internally with plug for chassis connection.

MAGMOTOR using permanet magnet field delivers 40 M. A. of plate current at 160 volts (at the tubes) with an "A" battery drain of 2 amperes. Self-enclosed with filtering to eliminate brush interference. Cable connected internally with plug for chassis connection.

IGNITION SUPPRESSION is accomplished through use of 9 resistors in ignition circuits and grouning of cable shields.

BATTERY BOX of heavy weather proof steel, for optional use to contain 3 special Heavy Duty automobile type "B" batteries. Battery box hangs from floor boards of car, access from the top. Cable furnished with plug for chassis connection.

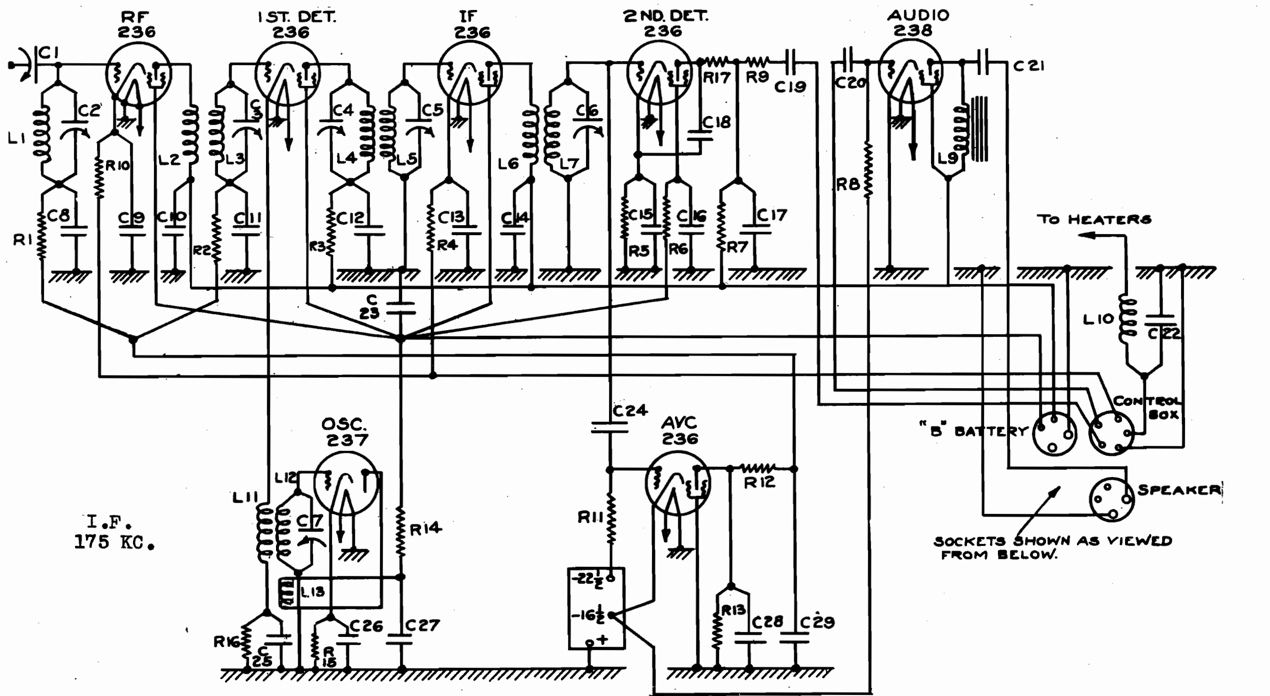
PLATE ANTENNA for optional use when there is no roof antenna in car: clamps to frame of car with hardened set screws. Step down transformer fastened to bracket; cable attached to plate with plug for chassis connection.

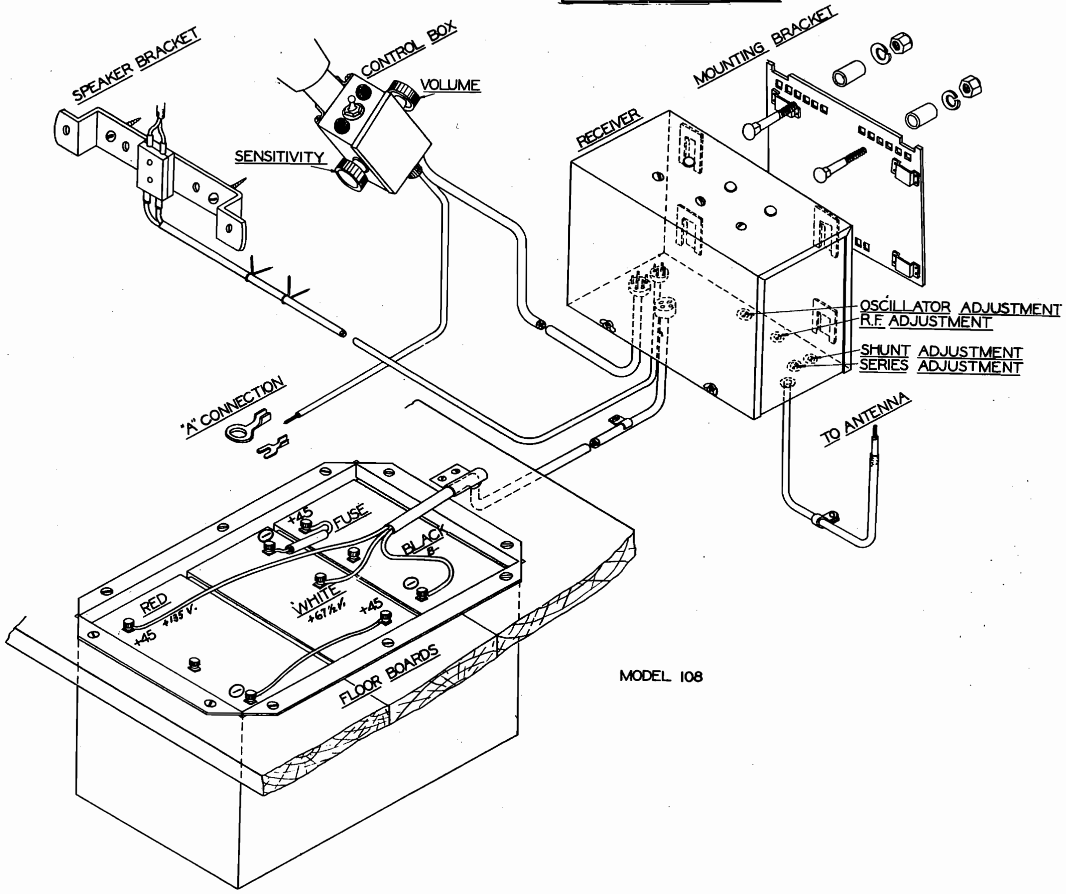
"B" Battery Cable

- B-	Black
$+67\frac{1}{2}$ B	White
+135 B	Red

UNITED AMERICAN BOSCH CORP.

"POLICE RADIO"
MODEL 108
(Automobile Set)





UNITED AMERICAN BOSCH CORP.

MODEL 108
"POLICE RADIO"

C1	75 to 140 mmf	Antenna Series Condenser
C2	7 to 70 mmf	Antenna Shunt Condenser
C3	75 to 140 mmf	Tuning Condenser (1st. Det.)
C4	75 to 140 mmf	Tuning Condenser (I.F.)
C5	75 to 140 mmf	Tuning Condenser (I.F.)
C6	75 to 140 mmf	Tuning Condenser (2nd Det.)
C7	100 to 280 mmf	Oscillator Tuning Condenser
C8	.05 mfd	By-pass Condenser (RF)
C9	.05 mfd	By-pass Condenser (RF)
C10	.05 mfd	By-pass Condenser (RF)
C11	.05 mfd	By-pass Condenser (1st. Det.)
C12	.05 mfd	By-pass condenser (1st. Det.)
C13	.05 mfd	By-pass Condenser (IF)
C14	.05 mfd	By-pass Condenser (IF)
C15	.25 mfd	By-pass Condenser (2nd. Det.)
C16	.25 mfd	By-pass Condenser (2nd Det.)
C17	.00025 mfd	By-pass Condenser (2nd Det.)
C18	.00025 mfd	By-pass Condenser (2nd Det.)
C19	.006 mfd	Audio Condenser
C20	.05 mfd	Audio Condenser
C21	.5 mfd	Audio Blocking Condenser
C22	.25 mfd	Heater By-pass Condenser
C23	.25 mfd	Screen By-pass condenser
C24	.0001 mfd	AVC Condenser
C25	.05 mfd	By-pass Condenser (1st. Det.)
C26	.05 mfd	By-pass Condenser (Osc.)
C27	.05 mfd	By-pass Condenser (Osc.)
C28	.25 mfd	By-pass Condenser (AVC)
C29	.25 mfd	By-pass Condenser (AVC)
R1	10,000 ohms	Grid Resistor (RF)
R2	10,000 ohms	Grid Resistor (1st. Det.)
R3	1,000 ohms	Plate Resistor (1st. Det.)
R4	1,000 ohms	Cathode Resistor (IF)
R5	1 megohm	Cathode Resistor (2nd. Det.)
R6	500,000 ohms	Screen Resistor (2nd. Det.)
R7	500,000 ohms	Plate Resistor (2nd. Det.)
R8	1 megohm	Audio Grid Resistor
R9	100,000 ohms	Plate Resistor (2nd Det.)
R10	1,000 ohms	Cathode Resistor (RF)
R11	2 megohm	AVC Grid Resistor
R12	100,000 ohms	AVC Resistor
R13	500,000 ohms	AVC Plate Resistor
R14	1,000 ohms	Oscillator Plate Resistor
R15	2,000 ohms	Oscillator Cathode Resistor
R16	20,000 ohms	1st. Det. Cathode Resistor
R17	10,000 ohms	2nd. Det. Plate Resistor

ADJUSTMENT OF THE RECEIVER.

After the receiver has been installed it is necessary to adjust it to the frequency of the transmitting station. Even if the set has been shipped with the proper setting, a slight readjustment will be necessary. The procedure is the same in both cases.

The positions of the four alignment condensers which take care of the adjustment are shown on the installation drawing. The car should be in the vicinity of th transmitting station when the alignment is made, in order to assure adequate signal strength. Proceed as follows:

1. Switch the receiver "on" and turn the volume and sensitivity control to maximum position.

2. Adjust OSCILLATOR condenser until the signal is picked up, using a special screw driver with an insulated tip. (Such an American Bosch Service Tool #432).

3. Reduce the sensitivity control until the station can just be heard, and re-adjust the OSCILLATOR until the signal is loudest.

4. Reduce the sensitivity conrol until the station can just be heard and adjust the RF alignment for maximum volume. As the volume increases, reduce the sensitivity as far as possible. This permits a sharper adjustment to be made, as the ear is more sensitive to changes in volume when the signal is faint.

5. Screw the SERIES antenna condenser in as far as possible. Pay no attention to the signal while doing this.

6. Attempt to find a poition of the SHUNT condenser which will give maximum volume Always reduce the sensitivity control when increased response of the set results from the various adjustments which you are making.

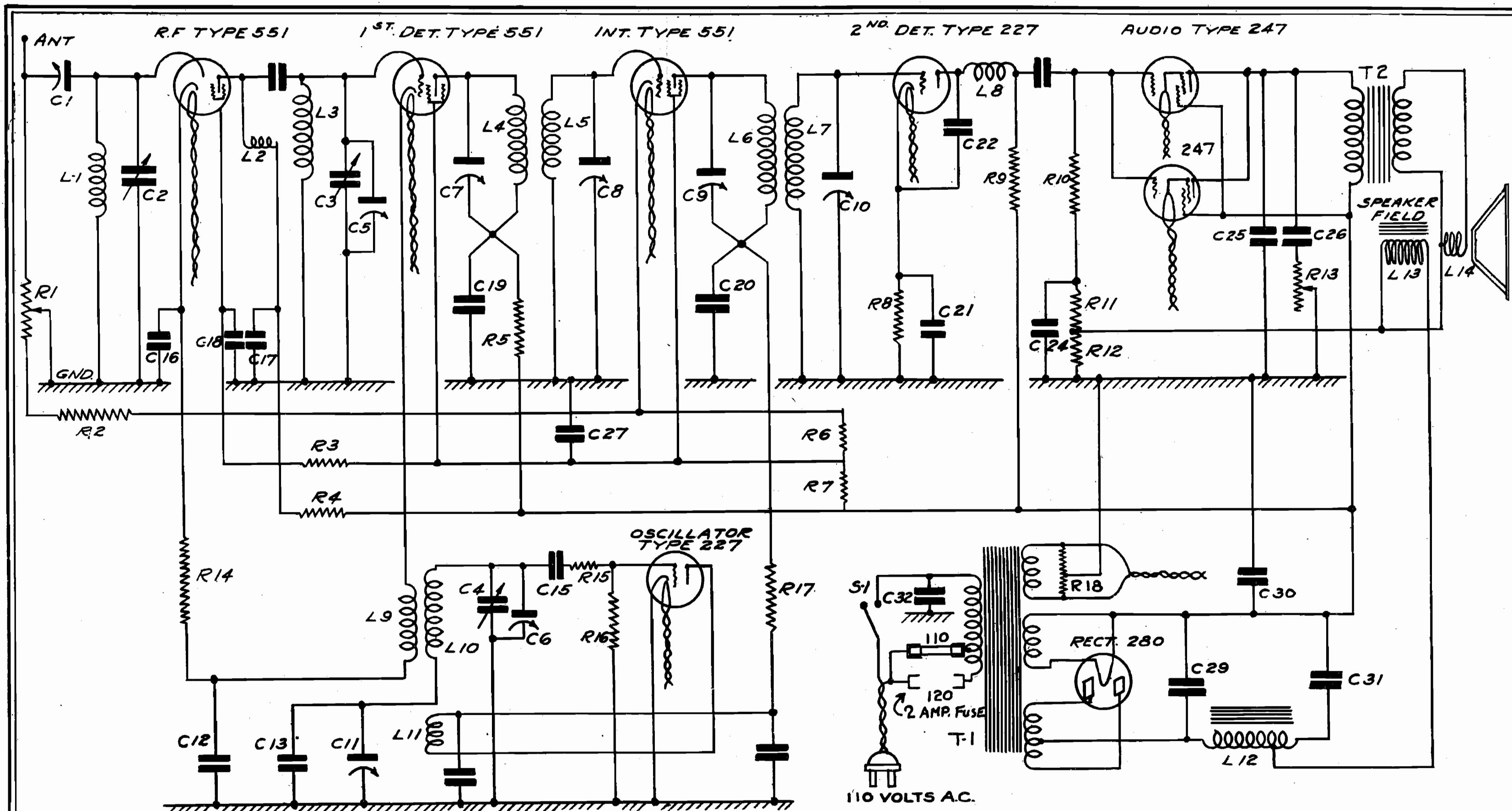
7. If no position of te SHUNT condenser will give a point of maximum volume or "peak", unscrew it as far as possible and slowly unscrew the SERIES condenser until the adjustment is obtained. Endeavor to obtain this adjustment with the SERIES condenser screwed IN as far as possible.

The relative position,of the shunt condenser is unimportant.

FUSES

A 1/16 ampere fuse is located in the B Battery jumper wire, as described under "B" Battery Cable". The "A" fuse is located in the control box and may be reached for replacement by simply removing the cover.

UNITED AMERICAN BOSCH CORP.



Stage	Tube	Plate	Screen	Cathode	Grid	Fil.	Plate	Current
RF	551	225	90	18	3	2.2	3.5	MA
Oscillator	227	60	......	0	0	2.2	5	MA
1st Det.	551	225	80	8	7	2.2	2	MA
I.F.	551	240	80	4	3	2.2	4	MA
2nd Det.	227	130	......	0	15	2.2	1	MA
Audio	247	240	240	......	16	2.2	30	MA
Audio	247	240	240	......	16	2.2	30	MA
Rectifier	280	......	......	......	......	5	38	MA

MODEL 20 SUPERHET

RECEIVER MODELS
20 J. 20 K and 20 L

UNITED AMERICAN BOSCH CORP.

MODEL 20

Alignment Instruction

1. Connect the 175 KC output of the oscillator to the grid cap of the 1st detector.

   a—Align Primary of 2nd IF Transformer (C9).
   b—Align Secondary of 2nd IF Transformer (C10).
   c—Align Primary of 1st IF Transformer (C7).
   d—Align Secondary of 1st IF Transformer (C8).

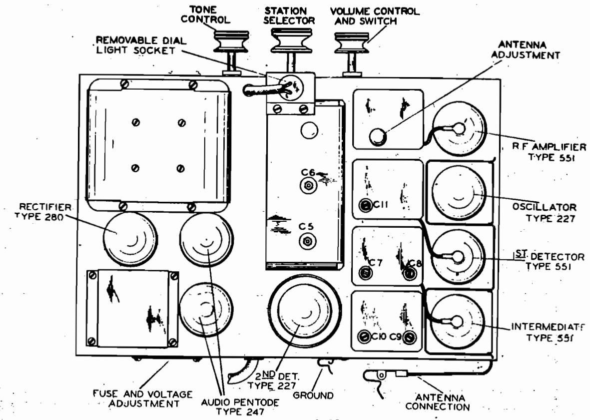
(It is advisable to go over these adjustments twice to insure accuracy).

2. Reset the Oscillator for 1400 KC, connected to the 1st detector grid as before.

   a—Align the Oscillator tuning condenser C6 by unscrewing two full turns, then turning slowly to the right until the first peak is reached.

3. Connect the 1400 KC output to the Antenna Connection of the set.
   a—Align Antenna Trimmer and 1st detector C3.

C 1—Antenna Trimmer
C 2, C 3, C 4, C 5, C 6 — Tuning Condenser Gang with trimmer condensers
C 7, C 8 — Variable Condenser Unit 75 to 140 mmf.
C 9, C 10 — Variable Condenser Unit 75 to 140 mmf.
C 11—Oscillator Series Trimming Condenser
C 12—By-pass Condenser—.05 mfd.
C 13—Oscillator Series Tuning Condenser .0011 mfd.
C 14—Oscillator Plate By-pass Condenser .05 mfd.
C 15—Oscillator Grid Condenser .0001 mfd.
C 16—RF Cathode By-pass Condenser .05 mfd.
C 17—RF Screen By-pass Condenser .05 mfd.
C 18—RF Plate By-pass Condenser .05 mfd.
C 19—1st Detector Blocking Condenser .05 mfd.
C 20—IF Blocking Condenser .05 mfd.
C 21—Detector Cathode By-pass Condenser .25 mfd.
C 22—Detector Plate By-pass Condenser .0011 mfd.
C 23—Audio Coupling Condenser .05 mfd.
C 24—Audio Grid By-pass Condenser .05 mfd.
C 25—Audio Plate By-pass Condenser .02 mfd.
C 26—Tone Selector Condenser .1 mfd.
C 27—Screen By-pass Condenser .5 mfd.
C 28—Oscillator By-pass Condenser .5 mfd.
C 29—Filter Condenser 1.8 mfd.
C 30—Filter Condenser 3.5 mfd.
C 31—Filter Condenser 1.8 mfd.
C 32—Buffer Condenser .05 mfd.



Alignment Adjustments

4. Retune the receiver to 600 KC and set oscillator to this frequency.

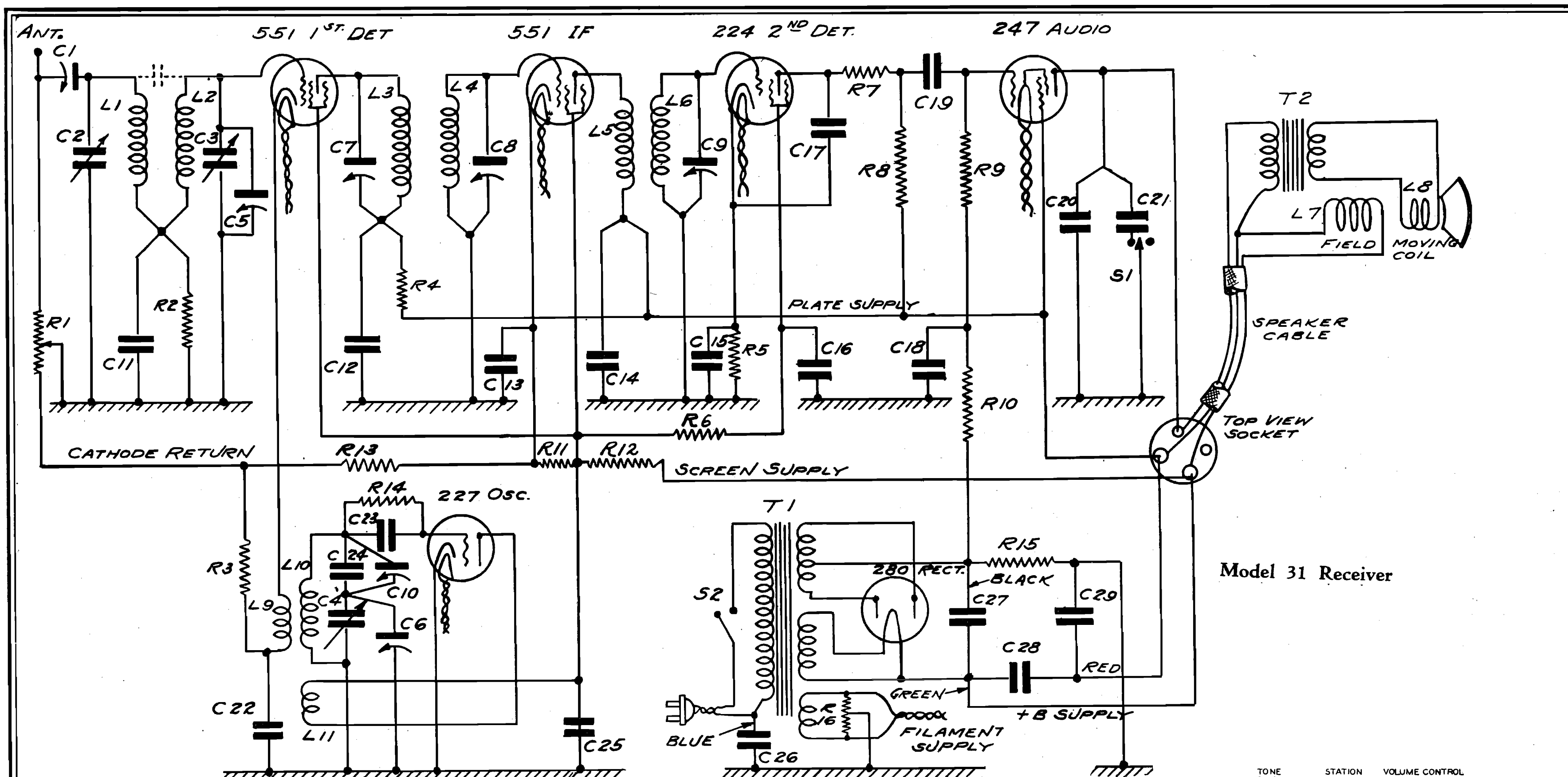
   a—Align the oscillator low frequency adjustment C11. Rotate the dial slowly back and forth over a range of perhaps ¼", at the same time rotating C11 back and forth until the maximum output is reached.

5. Return to 1400 KC (Receiver and Oscillator).
   a—Re-align C3, C6 and the Antenna Trimmer.

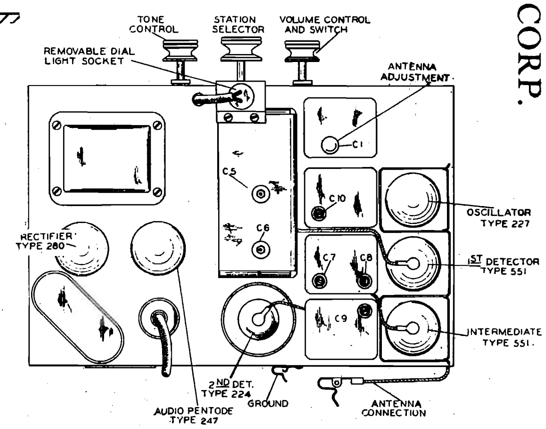
Antenna Adjustment—The antenna adjustment must be made when any change is made in the antenna.

R 1—Volume Control 10,000 ohms
R 2—Series Resistor 200 ohms
R 3—RF Screen Resistor 1000 ohms
R 4—RF Plate Resistor 1000 ohms
R 5—1st Detector Plate Resistor 1000 ohms
R 6—Divider Resistor 20,000 ohms
R 7—Screen Supply Resistor 25,000 ohms
R 8—2nd Detector Cathode Resistor 15,000 ohms
R 9—2nd Detector Plate Resistor 100,000 ohms
R 10—Audio Grid Resistor 250,000 ohms
R 11—Audio Grid Resistor 100,000 ohms
R 12—Audio Bias Resistor 200 ohms
R 13—Tone Control
R 14—Cathode Resistor 2000 ohms
R 15—Oscillator Grid Resistor 5000 ohms
R 16—Oscillator Grid Resistor 100,000 ohms
R 17—Oscillator Plate Resistor 40,000 ohms
T 1—Main Power Transformer
T 2—Output Transformer
S 1—Main Switch
L 1—Antenna Coil
L 2—Primary of RF Coil
L 3—Secondary of RF Coil
L 4—I.F. primary coil
L 5—I.F. secondary coil
L 6—I.F. primary coil
L 7—I.F. secondary coil
L 8—Detector plate choke
L 9—Oscillator coupling coil
L 10—Oscillator grid coil
L 11—Oscillator plate coil
L 12—Filter choke coil
L 13—Speaker Field Coil
L 14—Speaker Voice Coil

UNITED AMERICAN BOSCH CORP.



Model 31 Receiver



Top View of Model 31 Chassis

Antenna Adjustment—The antenna knob, located as shown on the drawing (figure 1) is for the purpose of obtaining the most efficient adjustment of the receiver to the antenna. Simply tune in a semi-distant broadcast station at reduced volume and turn the adjustment knob until the point of loudest reception is found. Select if possible a station received near 140 on the dial. The adjustment is permanent, and need not be disturbed unles the antenna is changed.

MODELS 31-32
Superheterodyne

PEAK FREQUENCY = 175 Kc.

Line Voltage—The model 31 receiver is designed for use on 50 to 60 cycle alternating current, 105 to 120 volts. The model 32 is designed for 25 to 50 cycle, 105 to 120 volt alternating current. If excessive line voltage is encountered, some type of series resistance or "voltage regulator" should be employed.

Tone Control—The tone is varied from treble to bass by means of a two-position snap switch operated by the right hand knob. The range of motion of this switch has been reduced from that found on previous models, and care should be taken not to force the switch beyond the stop position.

UNITED AMERICAN BOSCH CORP.

SOCKET VOLTAGES

T1—Power Transformer
T2—Output Transformer

L1—RF Coil
L2—RF Coil
L3—I.F. Coil (Primary)
L4—I.F. Coil (Secondary)
L5—I.F. Coil (Primary)
L6—I.F. Coil (Secondary)
L7—Speaker Field
L8—Speaker Voice Coil
L9—Oscillator Coupling Coil
L10—Oscillator Grid Coil
L11—Oscillator Plate Coil

Stage	Tube	Plate	Screen	Cathode	Grid	Fil.	Plate MA
1st Det.	551	260	80	10	7	2.2	2
Oscillator	227	75	..	*0	*0	2.2	5
I.F.	551	260	80	3	3	2.2	4
2nd Det.	224	50	*5	3	1	2.2	*.1
Audio	247	250	250	..	*3	2.2	32
Rectifier	280					4.8	22-22

Line voltage—115 volts Volume control fully "on"

* These values will vary considerably with the type of test kit employed, due to the high resistance in the circuit.

ALIGNMENT

The following instructions for the alignment of the condensers in the models 31 and 32 describe the operation as done with any type of special oscillator designed for the adjustment of superheterodyne receivers. Such an oscillator is essential for anyone who handles more than a small amount of service work. Such oscillators are designed to provide ordinary broadcast frequencies, and in addition, a 175 kilocycle for the alignment of the intermediate frequency (I. F.) stages.

Alignment Instructions:

1—With 175 KC on the grid of the 551 IF tube
Align C9

2—With 175 KC on the grid of the 551 1st detector
Align C7, C8 and re-check C9

Set the condenser gang at the maximum position and move the dial until the line of light indicator is ¼" to the right of the 55 division.

3—With 1400 KC on the grid of the 551 1st detector
Align C6

4—Set gang at 600 KC and with 600 KC input on grid of 1st detector

Align C10

Re-check as in 3 above.

5—Set gang at 1400 KC with input on antenna connection

Align C1 and C5

Main Filter Condenser

The main filter condenser unit contains buffer condenser C26, by-pass condensers C27 and C29, and condenser C28 which "tunes" the speaker field coil. The unit is connected as follows:

Red lead —Speaker plug socket (see wiring diagram)
Green lead—"F" terminal of 280 socket
Blue lead —110 volt terminal at main transformer
Black lead—to R15 (350 ohms) on resistor strip

Test C27 from Black to Green
Test C28 from Green to Red
Test C29 from Red to Ground
Test C26 from Blue to Ground

Main Power Transformer

The various transformer windings may be identified for testing purposes as follows: Four leads are brought out on the terminal strip side and five on the opposite side.

Primary Winding—two terminal strip terminals nearest rear of set.

551, 224, 227 Filaments—heavy wires, terminal strip side.

Plate Center Tap—terminal nearest front of set.

280 Plates—stranded wires, opposite side.

280 Filaments—solid wires, opposite side.

Resistors

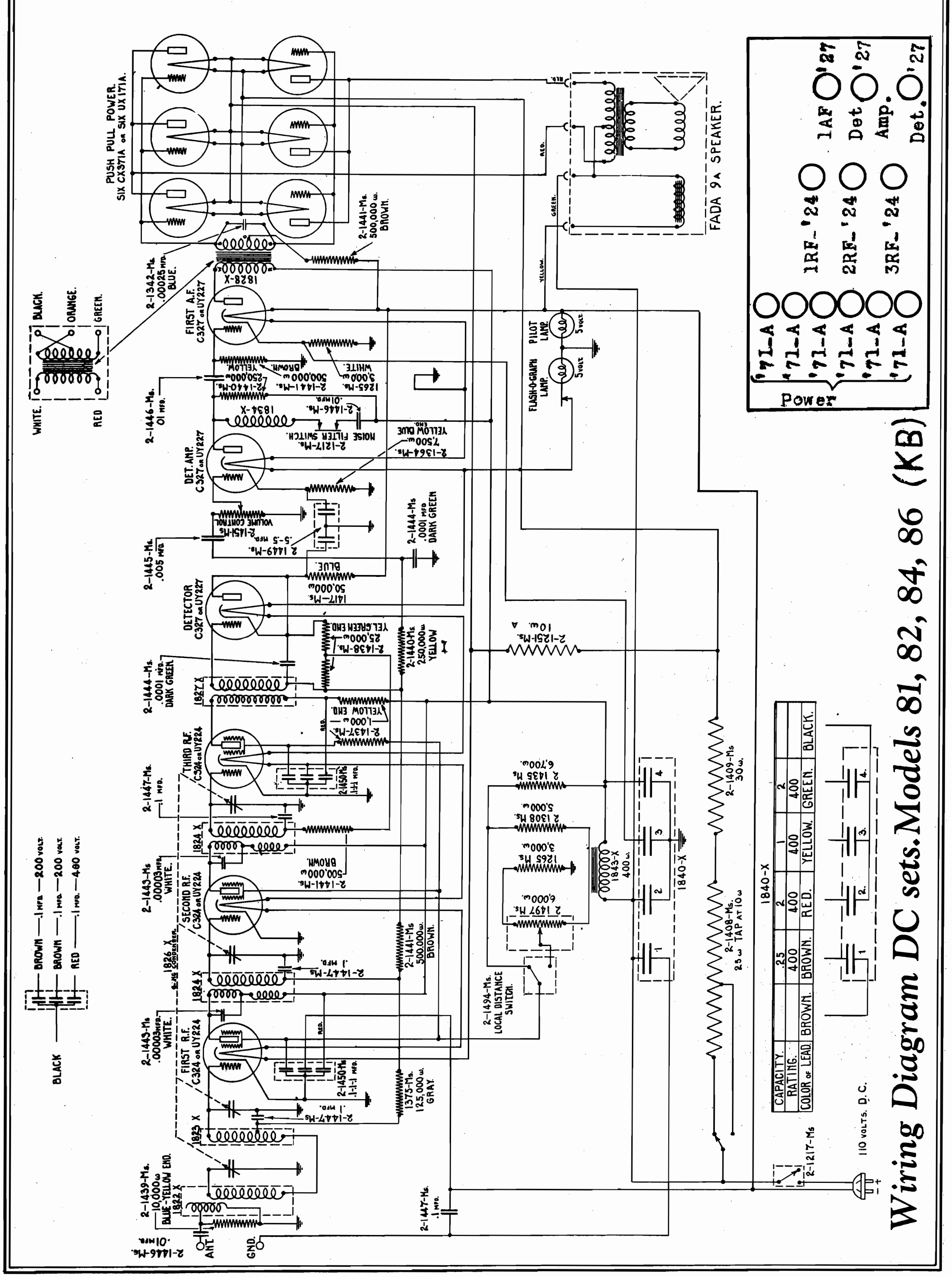
The resistors used in the models 31 and 32 receivers conform to the RMA standard of marking and may be identified by the following table of value and colors.

Value	*Body Color*	*Tip Color*	*Dot Color*
300 ohms	Orange	Black	Brown
350 "	Orange	Green	Brown
1000 "	Brown	Black	Red
5000 "	Green	Black	Red
10000 "	Brown	Black	Orange
20000 "	Red	Black	Orange
30000 "	Orange	Black	Orange
50000 "	Green	Black	Orange
100000 "	Brown	Black	Yellow
½ megohm	Green	Black	Yellow
1 megohm	Brown	Black	Green
2 megohm	Red	Black	Green

R1—Volume Control—10,000 ohms
R2—Coupling Resistor—1000 ohms
R3—1st Det. Cathode Resistor 5000 ohms
R4—1st. Det. Plate Resistor 1000 ohms
R5—2nd Det. Cathode Resistor—50,000 ohms
R6—2nd Det. Screen Resistor—2 megohms
R7—2nd Det. Plate Resistor—10,000 ohms
R8—2nd Det. Plate Desistor—1 megohm
R9—Audio Grid Resistor—½ megohm
R10—Audio Grid Resistor—100,000 ohms
R11—Divider Resistor—20,000 ohms
R12—Screen Supply Resistor—30,000 ohms
R13—Cathode Resistor—300 ohms
R14—Oscillator Grid Resistor—100,000 ohms
R15—Audio Bias Resistor—350 ohms
R16—Mid Tap Resistor
C1—Antenna Trimmer
C2—Tuning Condenser
C3—Tuning Condenser
C4—Oscillator Tuning Condenser
C5—Alignment Condenser
C6—Oscillator Tuning Alignment
C7—I. F. Alignment Condenser
C8—I. F. Alignment Condenser
C9—Alignment Condenser
C10—Oscillator Alignment
C11—RF Coupling Condenser .05 mfd.
C12—1st Det. Plate By-pass .05 mfd.
C13—I. F. Cathode By-pass .05 mfd.
C14—I. F. Plate By-pass .05 mfd.
C15—2nd Det. Cathode By-pass 1. mfd.
C16—2nd Det. Screen By-pass .25 mfd.
C17—2nd Det. Plate By-pass .0001 mfd.
C18—Audio De-coupling Condenser .02 mfd.
C19—Audio Coupling Condenser .006 mfd.
C20—Audio Plate Condenser .05 mfd.
C21—Tone Selector Condenser .05 mfd.
C22—Cathode By-pass Condenser .05 mfd.
C23—Oscillator Grid Condenser .0001 mfd.
C24—Oscillator Tuning Condenser .0011 mfd.
C25—Screen By-pass Condenser 8. mfd.
C26—Buffer Condenser .08 mfd.
C27—Filter Condenser 3.5 mfd.
C28—Field Coil Tuning Condenser .08 mfd.
C29—Filter Condenser 3.5 mfd.
S1—Tone Selector Switch
S2—Main Switch

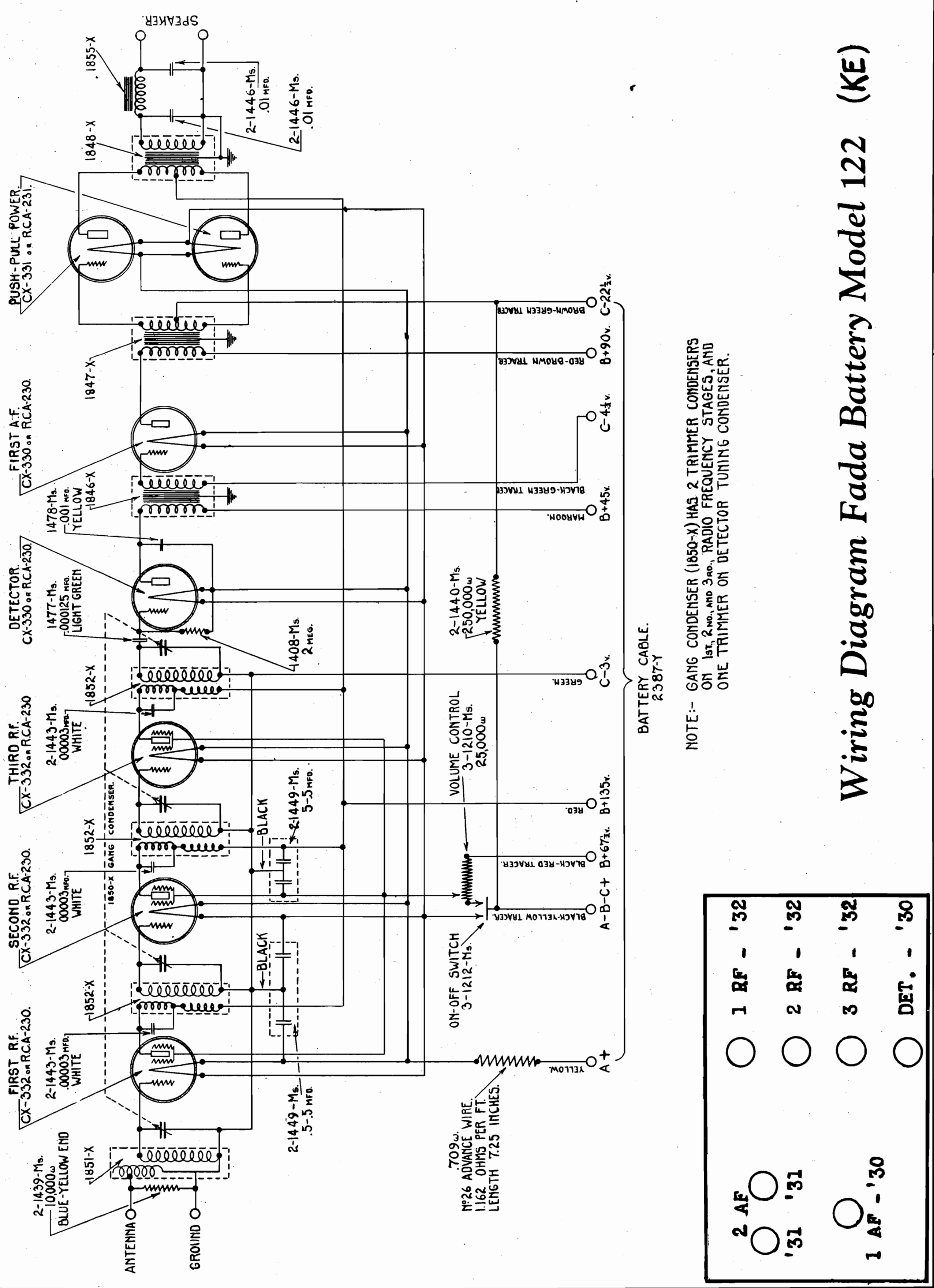
MODELS 31-32 Superheterodyne

F. A. D. ANDREA, Inc.



Wiring Diagram DC sets. Models 81, 82, 84, 86 (KB)

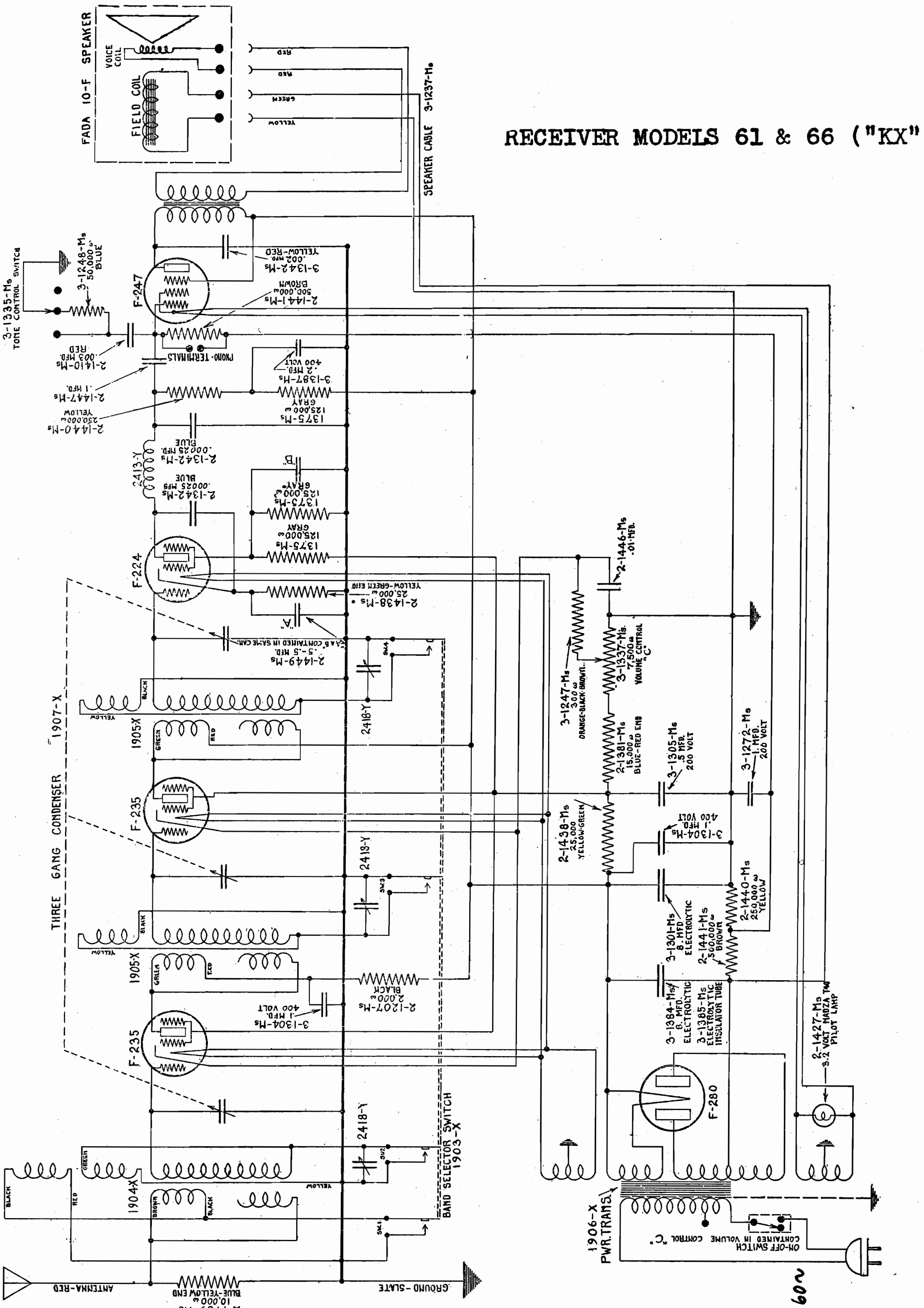
F. A. D. ANDREA, Inc.



Wiring Diagram Fada Battery Model 122 (KE)

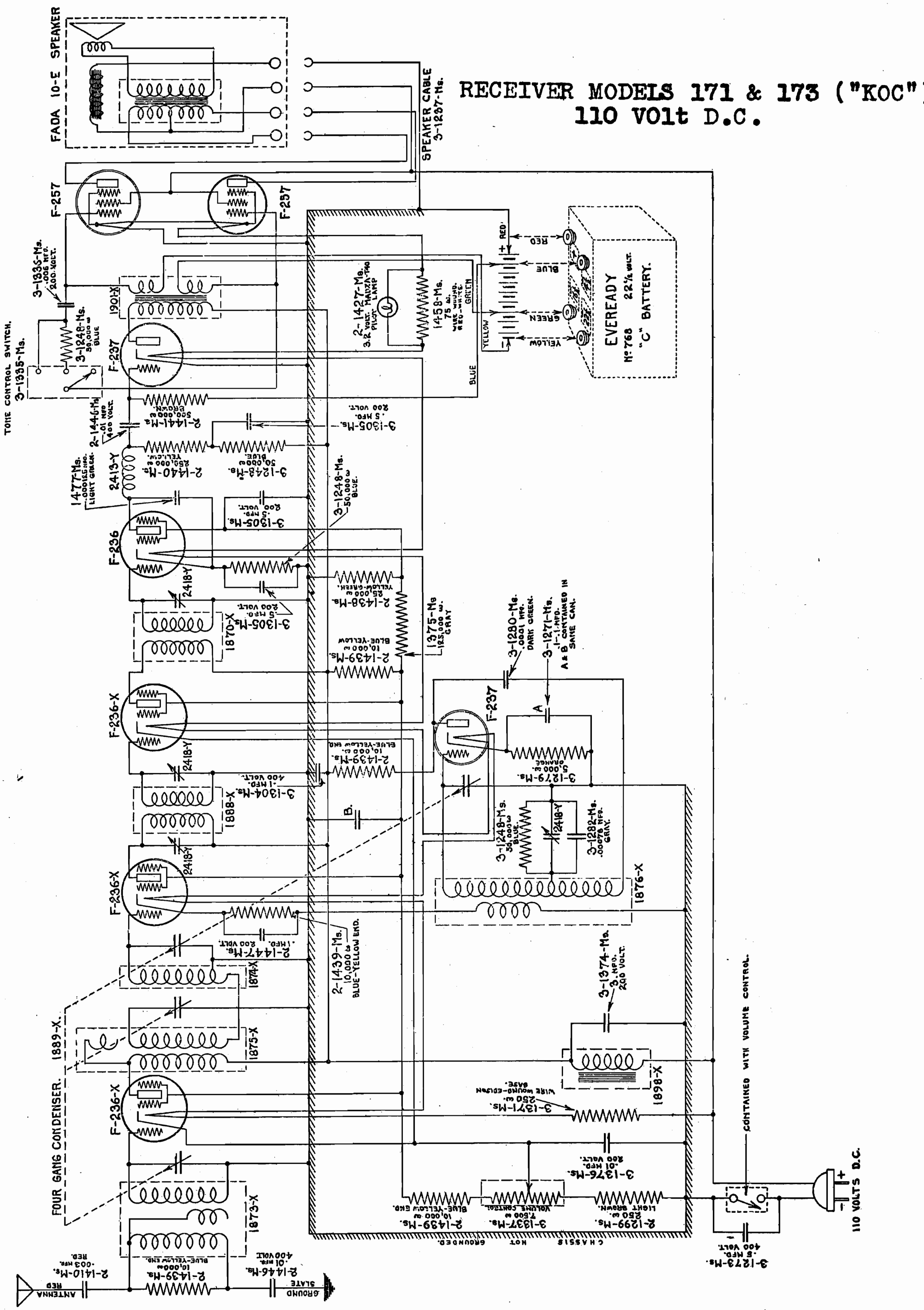
F. A. D. ANDREA, Inc.

RECEIVER MODELS 61 & 66 ("KX")



F. A. D. ANDREA, Inc.

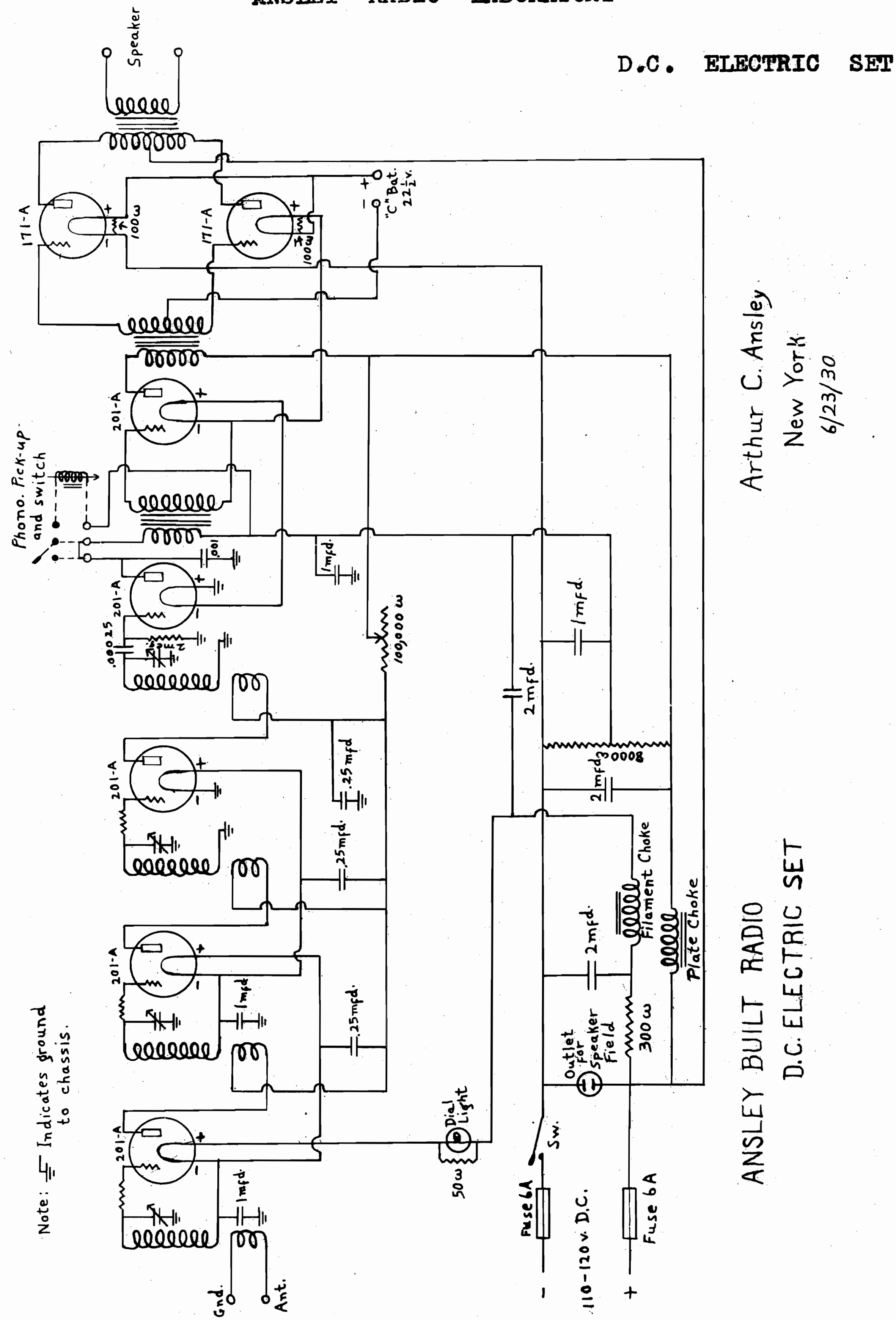
RECEIVER MODELS 171 & 173 ("KOC")
110 Volt D.C.



S-2039

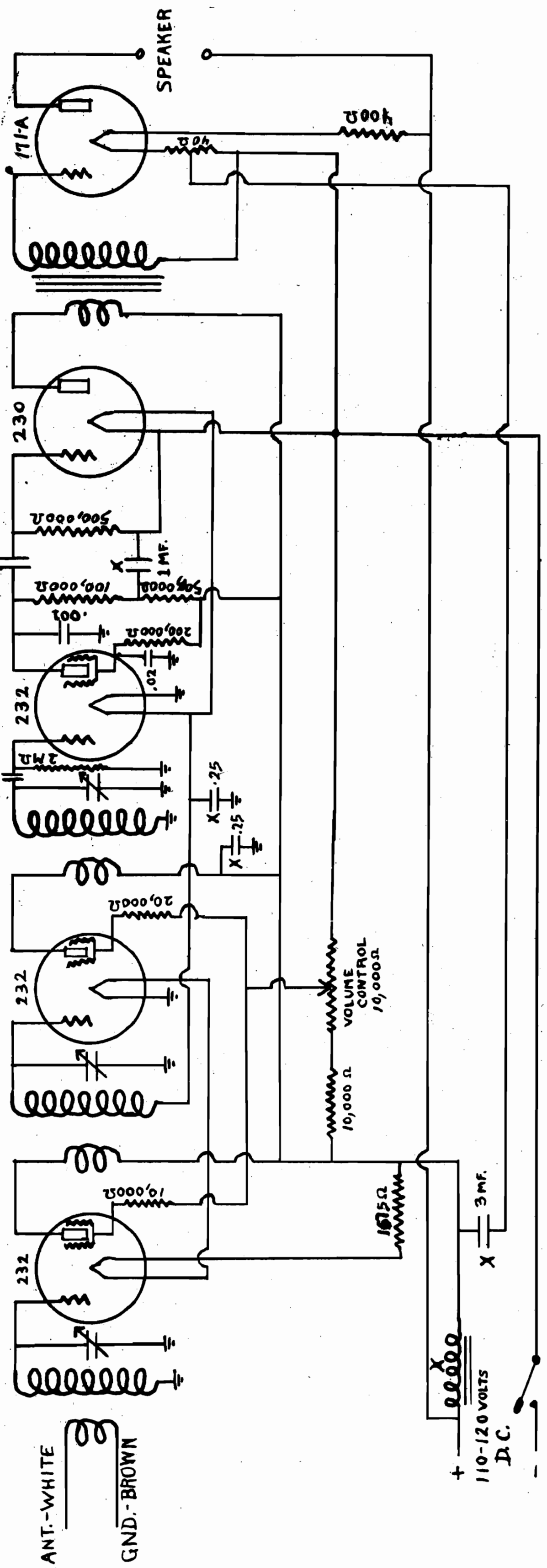
ANSLEY RADIO LABORATORY

D.C. ELECTRIC SET

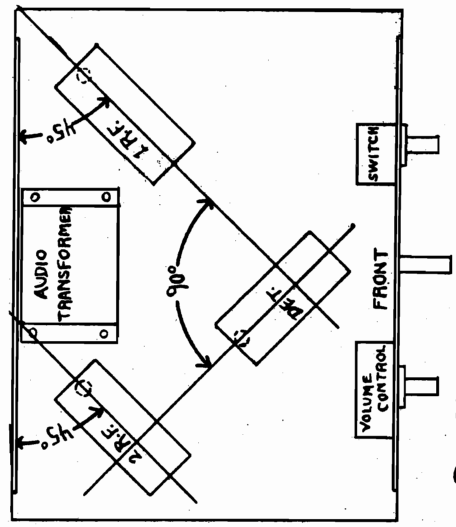


ANSLEY RADIO LABORATORY

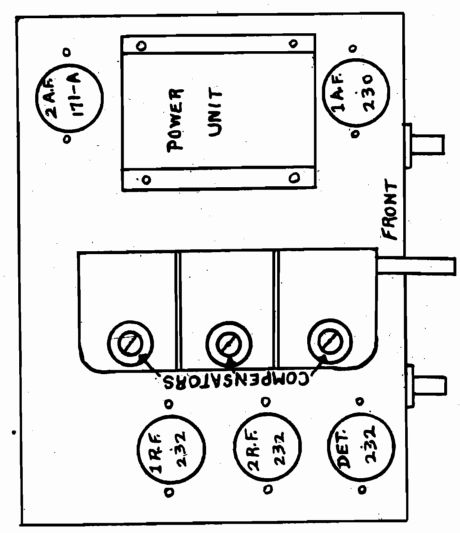
MODEL MD-1
110-120 V. D.C.



INDICATES GROUND TO CHASSIS
PARTS MARKED "X" ARE LOCATED IN POWER UNIT



BOTTOM VIEW OF CHASSIS
SHOWING CORRECT POSITION OF COILS

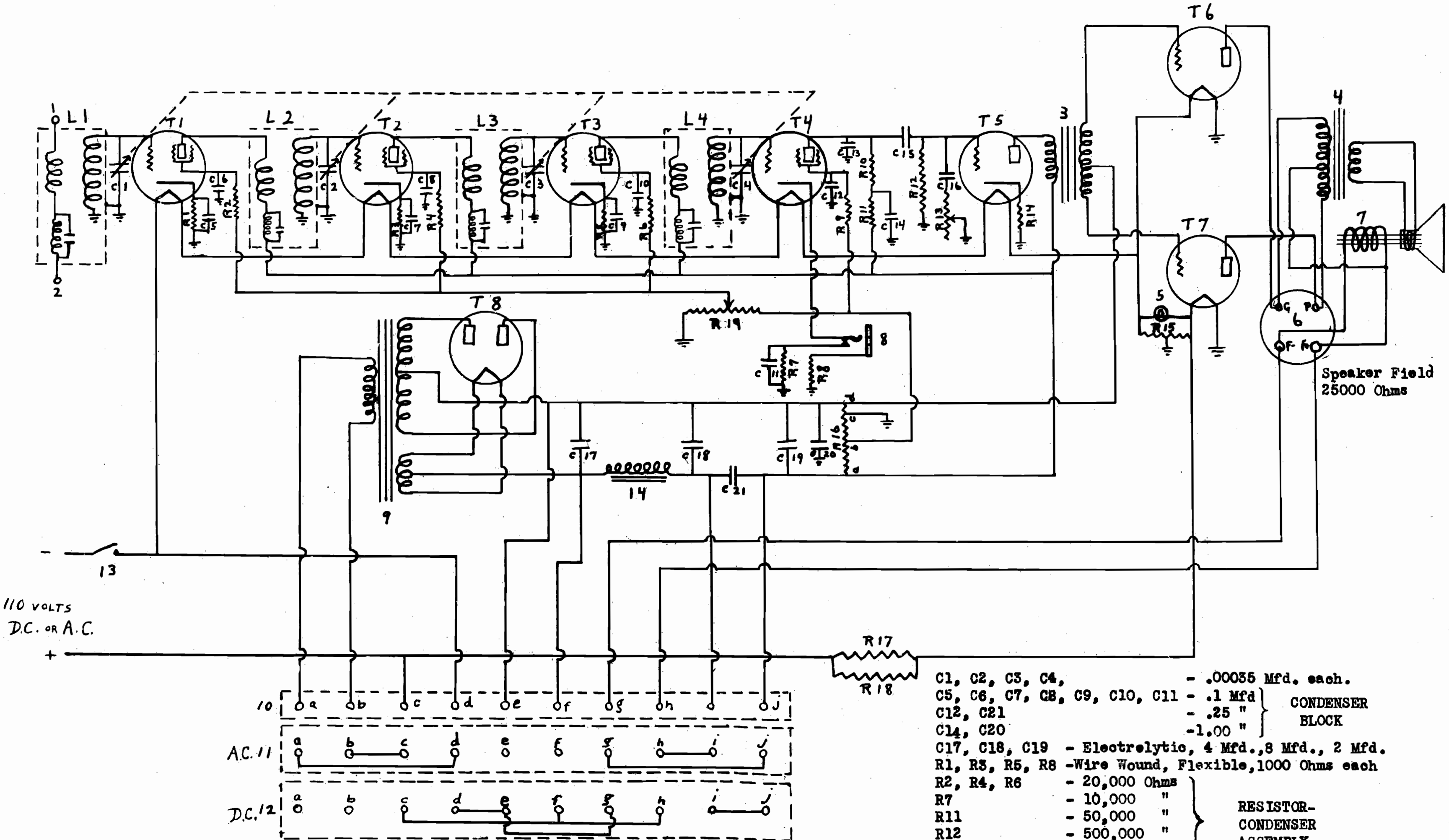


TOP VIEW OF CHASSIS

ANSLEY RADIO
SERVICE DIAGRAM MODEL MD1
ANSLEY RADIO LABORATORY
147 WEST 23^{D} STREET
NEW YORK CITY

ANSLEY RADIO LABORATORY

UNIVERSAL RADIO MODEL U-1 A.C. / D.C.



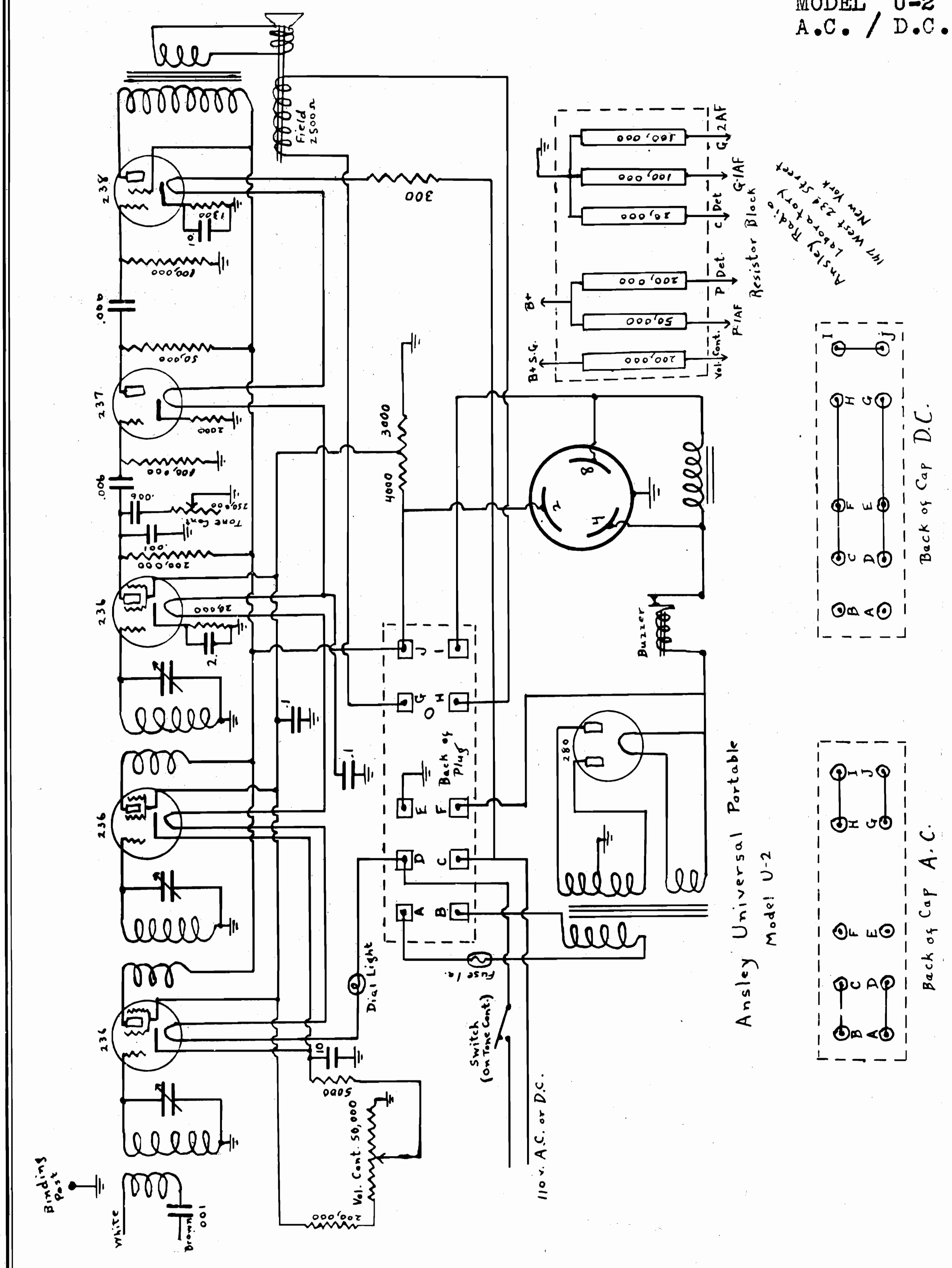
C1, C2, C3, C4,	- .00035 Mfd. each.		
C5, C6, C7, C8, C9, C10, C11	- .1 Mfd	CONDENSER BLOCK	
C12, C21	- .25 "		
C14, C20	-1.00 "		
C17, C18, C19	- Electrolytic, 4 Mfd.,8 Mfd., 2 Mfd.		
R1, R3, R5, R8	-Wire Wound, Flexible,1000 Ohms each		
R2, R4, R6	- 20,000 Ohms	RESISTOR-CONDENSER ASSEMBLY	
R7	- 10,000 "		
R11	- 50,000 "		
R12	- 500,000 "		
C13	- .001 Mfd.		
C15, C16	- .0006 "		
R13	- Tone Control, 200,000 Ohms		
R14	- Flexible, 1,500 "		
R15	-Wire Wound, Center Tapped, 20 Ohms		
R16	- Tapped, 8,000 Ohms		
R17, R18	- Enameled, 110 Ohms, 200 Watt		
R19	- Vol. Control 25,000 Ohms		

ANSLEY UNIVERSAL RADIO
MODEL U 1
ANSLEY RADIO LABORATORY
147 WEST 23RD STREET
NEW YORK CITY

T1, T2, T3, T4,	- '24
T5	- '27
T6, T7,	- '45
T8,	- '80

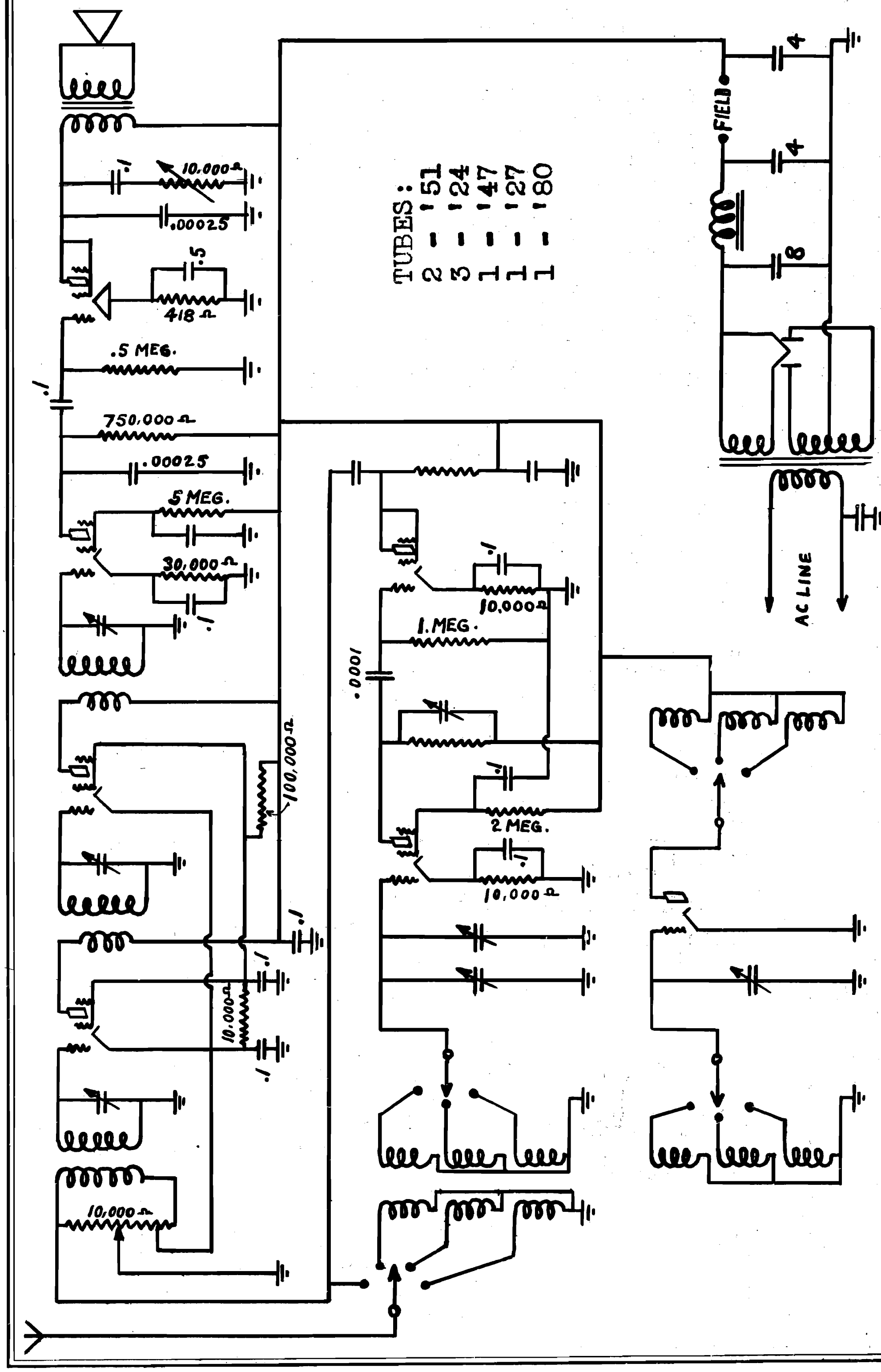
ANSLEY RADIO LABORATORY

MODEL U-2
A.C. / D.C.



APPEL & HENDERSON

SILVER KING A.C.COMBINATION
BROADCAST, SHORT WAVE and TELEVISION RECEIVER



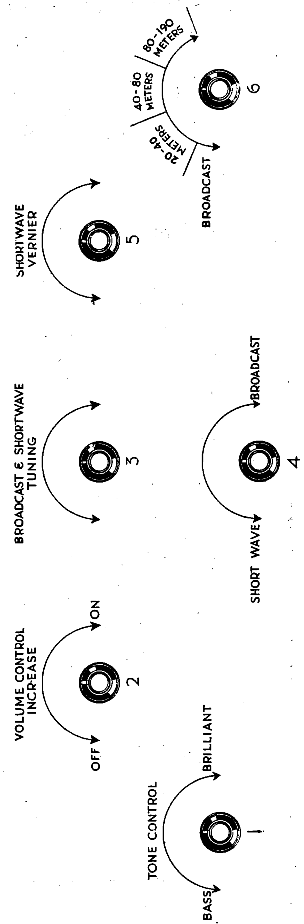
A. C. COMBINATION D. C. COMBINATION

This receiver is a combination short and broadcast and television receiver, having only one tuning dial for the entire range of wavelengths covered. It tunes from 19 to 550 meters.

On the panel there will be found six controls.

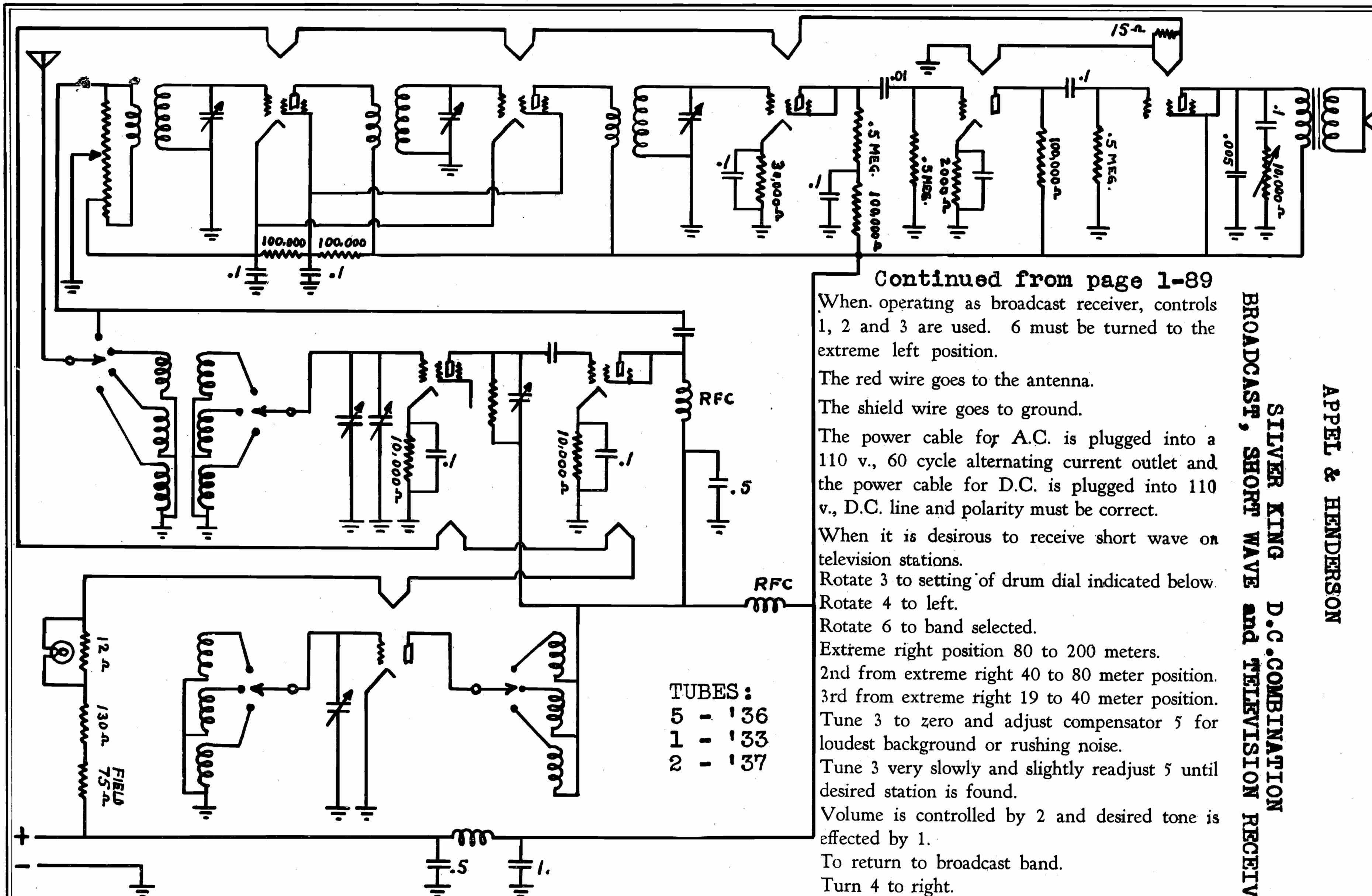
1 is a tone control.
2 is the on-off switch and volume control.
3 is tuning dial
4 is short-long wave selector
5 is short wave compensator
6 is wave band selector dial

Continued on page 1-89-A



APPEL & HENDERSON

SILVER KING D.C.COMBINATION
BROADCAST, SHORT WAVE and TELEVISION RECEIVER



Continued from page 1-89

When operating as broadcast receiver, controls 1, 2 and 3 are used. 6 must be turned to the extreme left position.

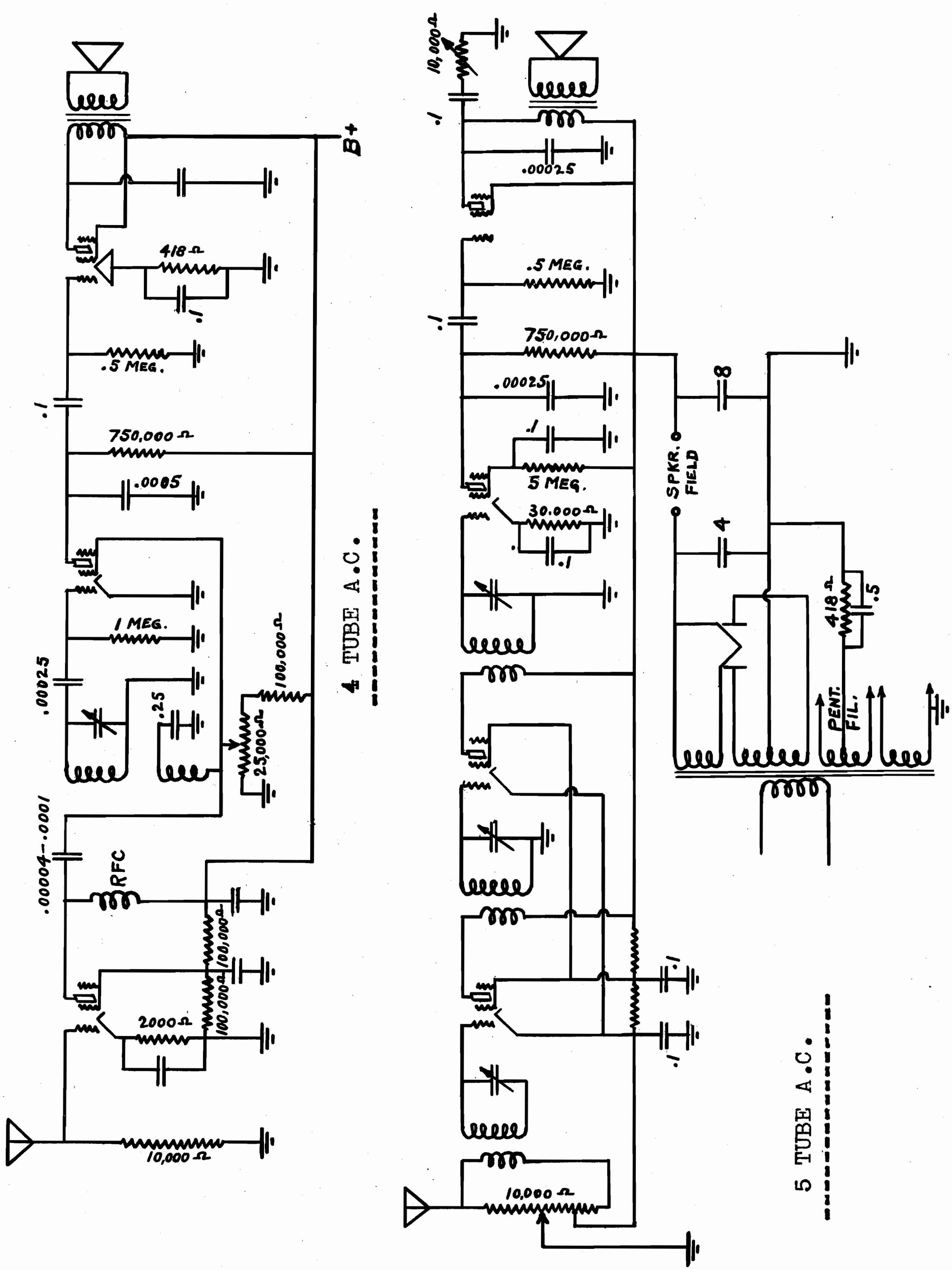
The red wire goes to the antenna.

The shield wire goes to ground.

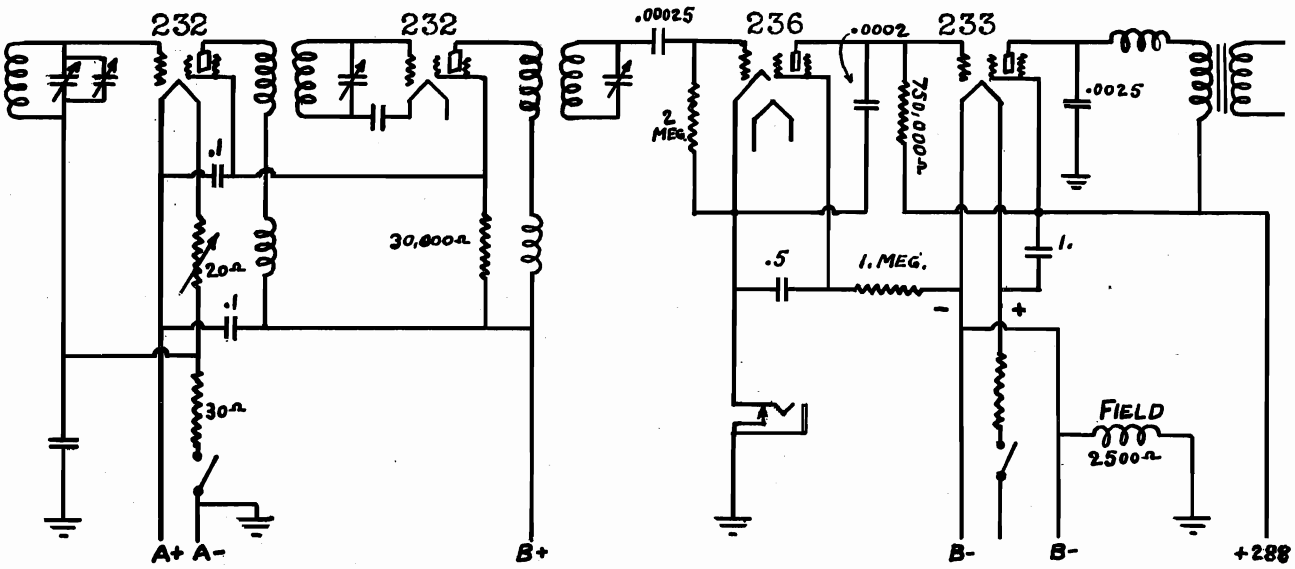
The power cable for A.C. is plugged into a 110 v., 60 cycle alternating current outlet and the power cable for D.C. is plugged into 110 v., D.C. line and polarity must be correct.

When it is desirous to receive short wave on television stations.
Rotate 3 to setting of drum dial indicated below.
Rotate 4 to left.
Rotate 6 to band selected.
Extreme right position 80 to 200 meters.
2nd from extreme right 40 to 80 meter position.
3rd from extreme right 19 to 40 meter position.
Tune 3 to zero and adjust compensator 5 for loudest background or rushing noise.
Tune 3 very slowly and slightly readjust 5 until desired station is found.
Volume is controlled by 2 and desired tone is effected by 1.
To return to broadcast band.
Turn 4 to right.
Turn 3 until click is heard
Turn 6 to extreme left.
Your receiver is now adjusted for broadcast reception.

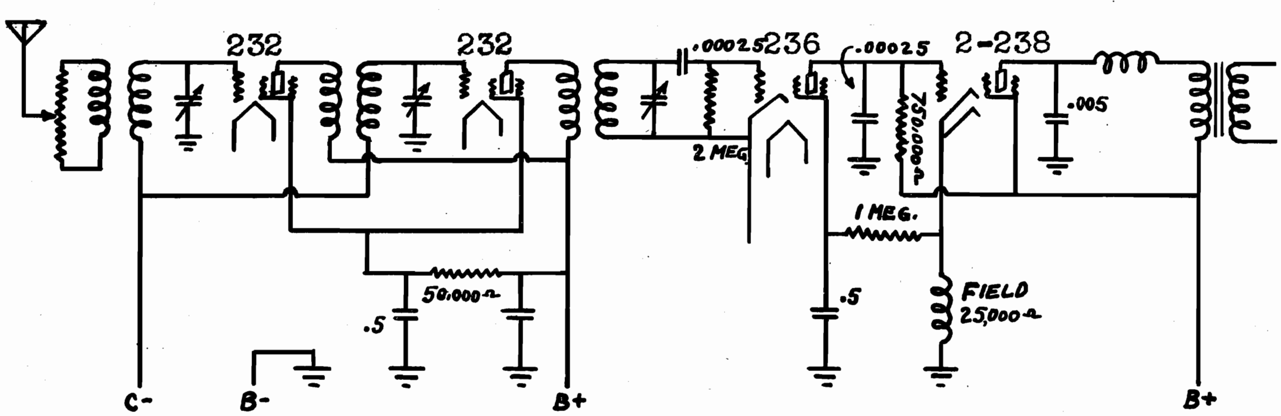
APPEL & HENDERSON

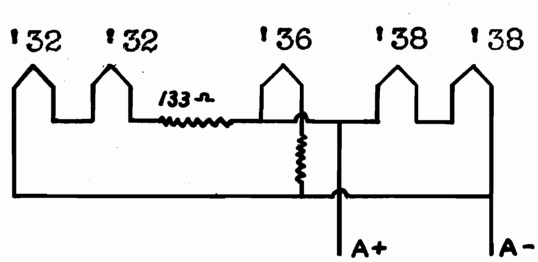


APPEL & HENDERSON



4 TUBE PORTABLE RECEIVER.





5 TUBE
BATTERY OPERATED MIDGET RECEIVER.

ATWATER KENT MFG. CO.

Model 46, 47 and 53 Receivers

General Description

Model 46 is similar to Model 43, except that the power unit is enlarged to provide adequate plate supply for the 171A-type tubes used in the 2nd A.F. stage. Also, the voltage regulator is not used, and the condensers in the power unit are contained in a separate replaceable section. Model 53 is a Model 46 with a type F-2C electro dynamic speaker mounted in a twenty-six inch high metal cabinet.

Model 47 is similar to Model 46, but has four stages of R. F. amplification, with double R.F. transformers, thus providing greater sensitivity and selectivity.

The continuity tests given on page 103 may be applied to the receiver chassis of Models 46 and 53. The same tests may be applied to Model 47, with additional tests for the 4th R.F. socket contacts, which should give the same readings as the 2nd and 3rd R.F. sockets.

Special instructions for servicing the power unit in these three models are given below.

Power Units in Models 46, 47 and 53

Apply the continuity test given in the table on page 104. If any one of the condensers is shorted or leaky, replace the condenser assembly. If the power transformer, filter-choke or output transformer is defective, replace the main sealed container, salvaging all other parts.

Replacing Condenser Assembly

Release panel assembly from power unit and remove panel-mounting strip by taking out the machine screw at each end. Unscrew two bolts holding the condenser assembly retaining-spring and take out the spring and supporting strip. Cut the three leads (white, blue, and green-yellow tracer), which connect between the condenser assembly and the transformer-choke assembly, at about the mid-point of each lead. Unsolder black lead from ground lug. Unsolder yellow lead and two black-red tracer leads from panel terminals. Unsolder leads at contacts of speaker-plug socket and socket 2Aa. Pull these leads up an inch or so through the hole in the socket-mounting angle and push the cable to one side of the unit to allow room for removal of the condenser assembly. Take out the assembly, pulling the blue M2 lead up through the cable covering.

Insert a new condenser assembly, reversing above procedure. Insulate the joints on the blue, white, and green-yellow tracer leads which connect the condenser assembly to the transformer-choke assembly.

Replacing Transformer-Choke Assembly

Unsolder leads from socket plates at both ends of container and remove these sockets. Unsolder primary winding leads at points where they connect to the toggle switch and to one side of the 110-volt cable respectively. Release panel assembly from unit. Unscrew panel-mounting strip and condenser-retaining spring. Pull the primary leads, the yellow-black tracer output leads and the brown P2Aa lead (No. 18 wire) up through the cable covering. Cut the three leads (white, blue, and green-yellow tracer) which connect the transformer-choke assembly and the condenser assembly. Cut each lead at about the mid-point. Unsolder the six filament winding leads, the brown +B, 2A lead, and the white +B, R.F. lead from terminals on panel assembly. Unsolder black lead from ground lug. Remove the condenser and panel assemblies.

Substitute a new transformer-choke assembly, mount the salvaged parts and connect exactly like the original, reversing procedure outlined above.

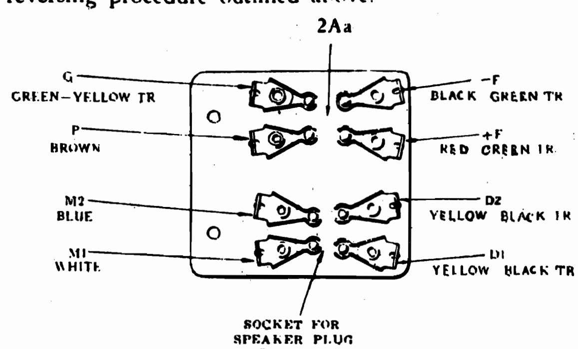
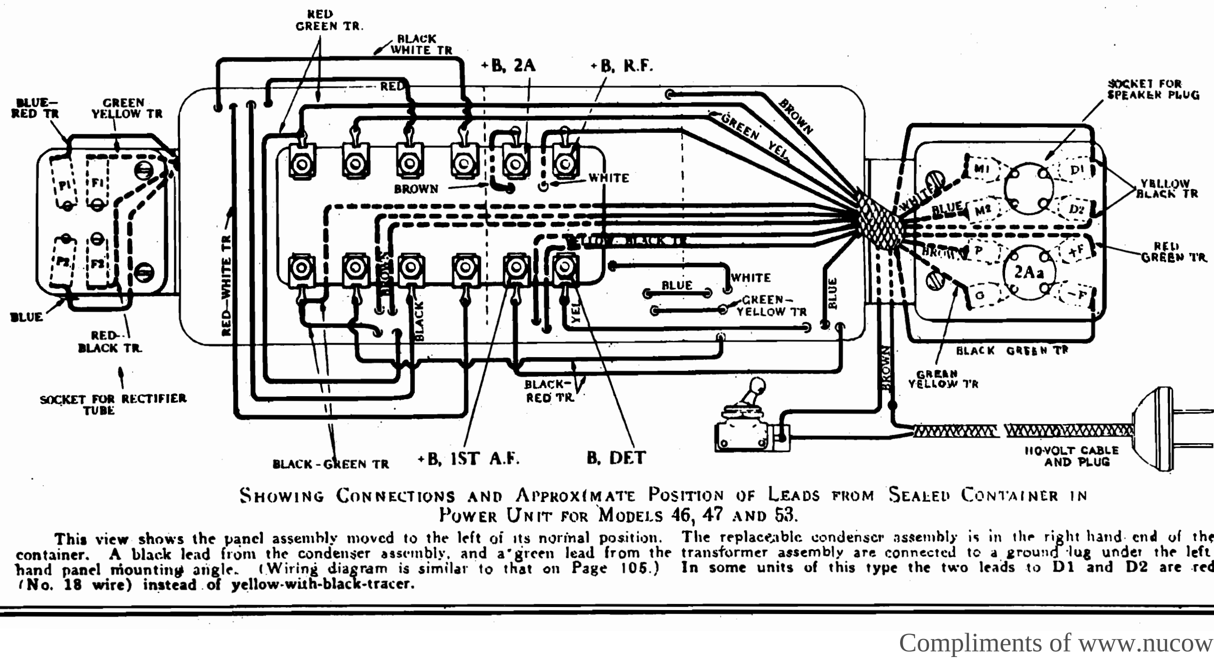


Fig. 120. View of Under-Side of Speaker-Plug Socket and Socket 2Aa on Models 13, 16, 17 and Early 53.



Showing Connections and Approximate Position of Leads from Sealed Container in Power Unit for Models 46, 47 and 53.

This view shows the panel assembly moved to the left of its normal position. The replaceable condenser assembly is in the right hand end of the container. A black lead from the condenser assembly, and a green lead from the transformer assembly are connected to a ground lug under the left hand panel mounting angle. (Wiring diagram is similar to that on Page 105.) In some units of this type the two leads to D1 and D2 are red (No. 18 wire) instead of yellow-with-black-tracer.

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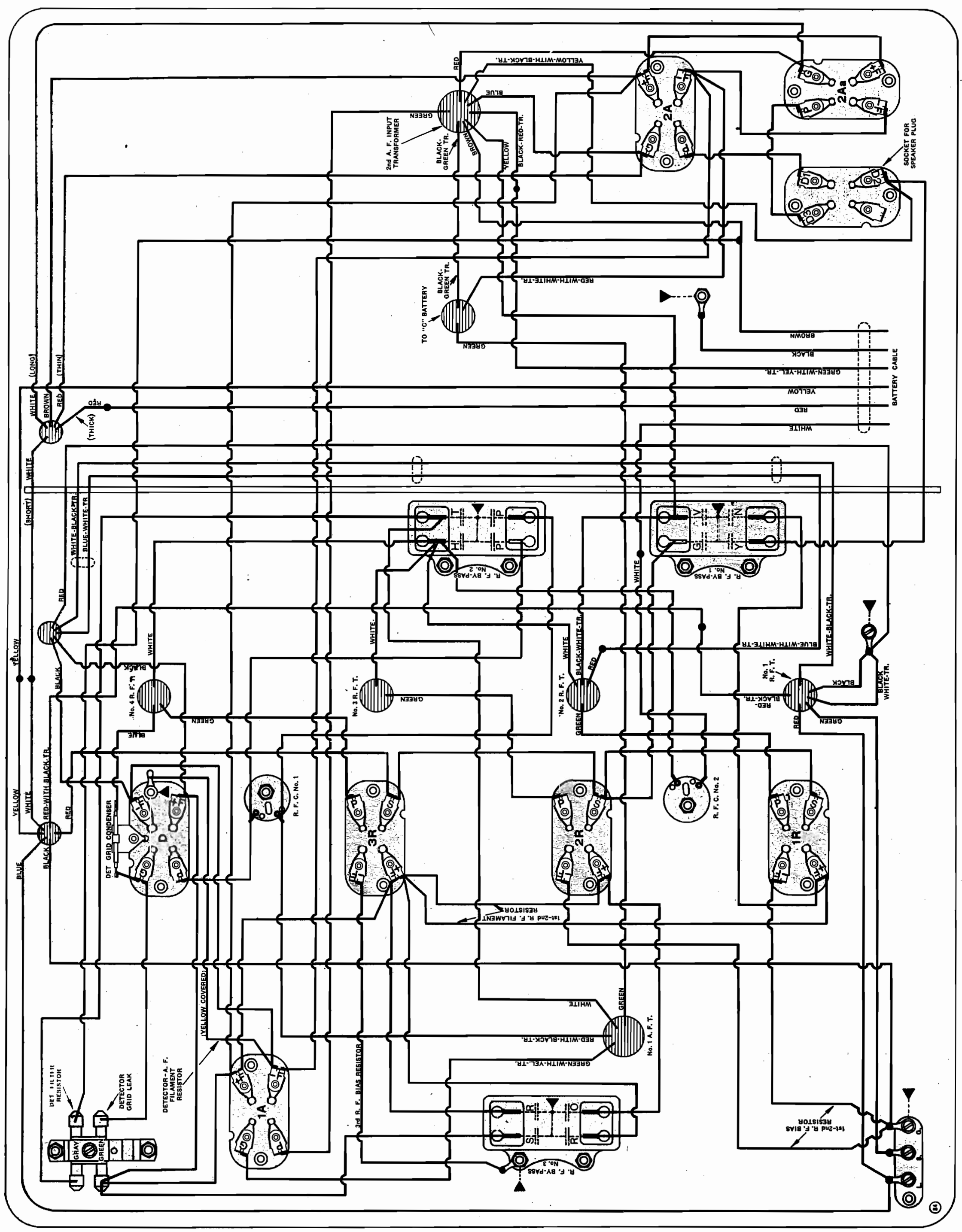
TYPE Q-2 CHASSIS (Supplement To Page 114-I)



BOTTOM WIRING OF TYPE Q-2 CHASSIS.

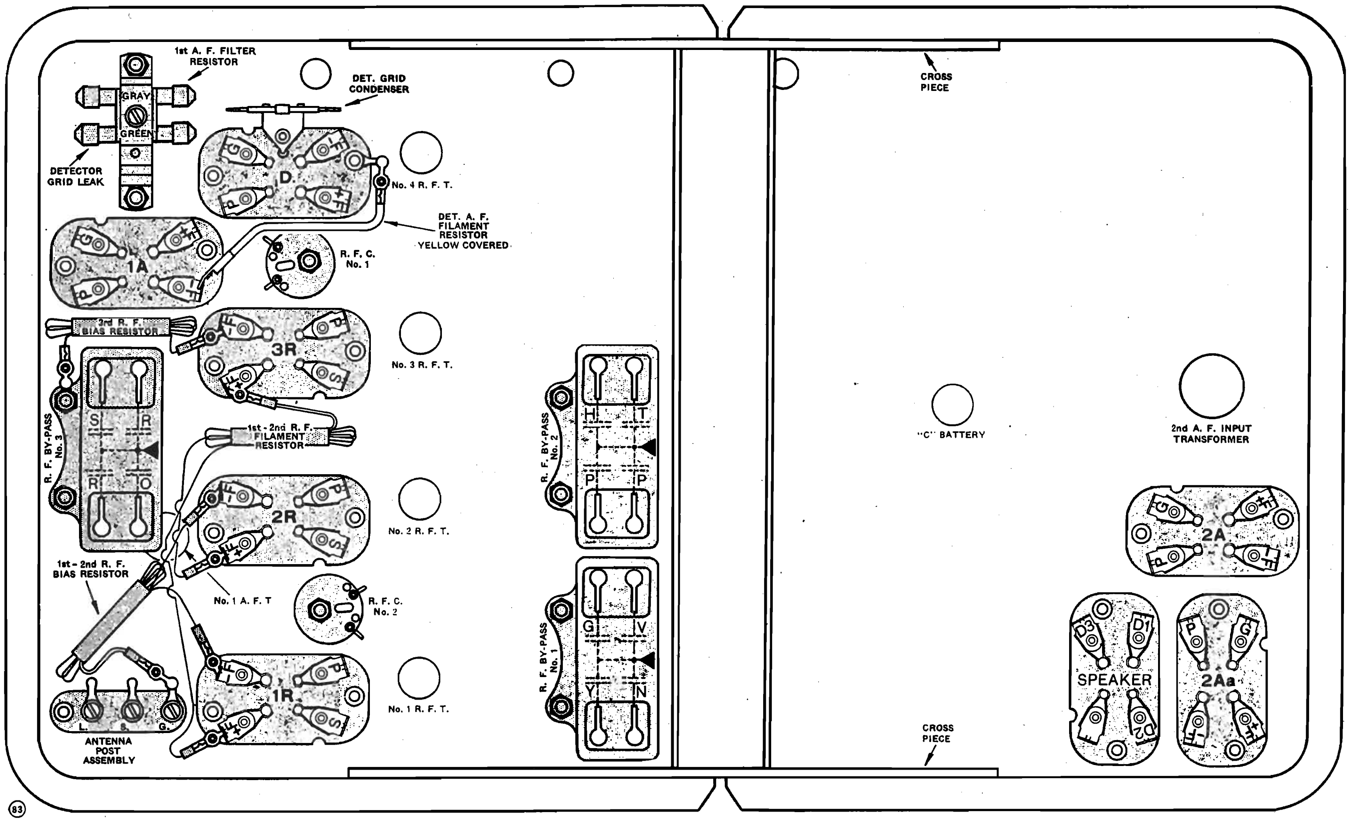
IMPORTANT. The connections of R. F. by-pass No. 2 are shown correctly when this condenser is Part No. 16060, Code H-24. If this condenser is No. 18350, Code H-28, P and P are at the top, and H and T are at the bottom, and the leads to this condenser are correspondingly changed.

(See notations on pages 2-114-I and 114-ZR)

December, 1930.

ATWATER KENT MFG. CO.

TYPE "Q" CHASSIS (No 16,800) (Supplement To Page 114-I)



Bottom View of Type Q Chassis.

R.F. By-Pass No. 1

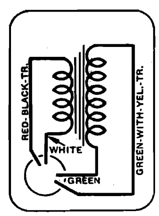
G—R.F. screen by-pass.
V—1st-R.F. grid-circuit by-pass.
Y—Output filter condenser.
N—1st-R.F. filament by-pass.

R.F. By-Pass No. 2 *

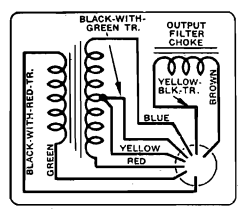
H—R.F. plate-circuit by-pass.
T—Detector filter condenser.
P—"Phone" condenser.
P—"Phone" condenser.

R.F. By-Pass No. 3

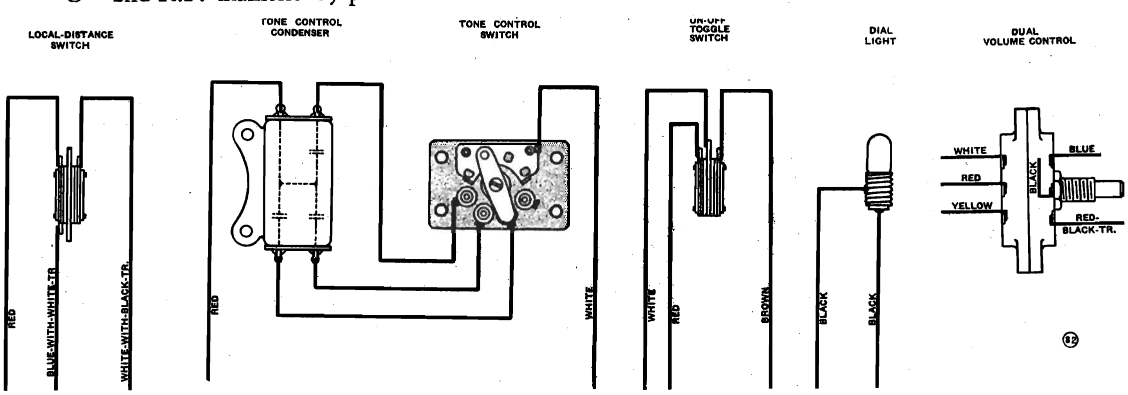
S—Detector filament by-pass.
R—3rd-R.F. filament by-pass.
R—3rd-R.F. filament by-pass.
O—2nd-R.F. filament by-pass.



No. 1 A. F. T.



2nd A. F. INPUT TRANSFORMER



The output filter choke is not used in the Q-1 chassis.

*The connections shown in Fig. 243 for R. F. by-pass No. 2 are correct when this part is No. 16060 (H-24). (See Page 1 - 114-I)
However, if a No. 18350 (H-28) is used, "P" and "P" are at top, and "H" and "T" are at bottom; therefore, the connections to this condenser are correspondingly changed.

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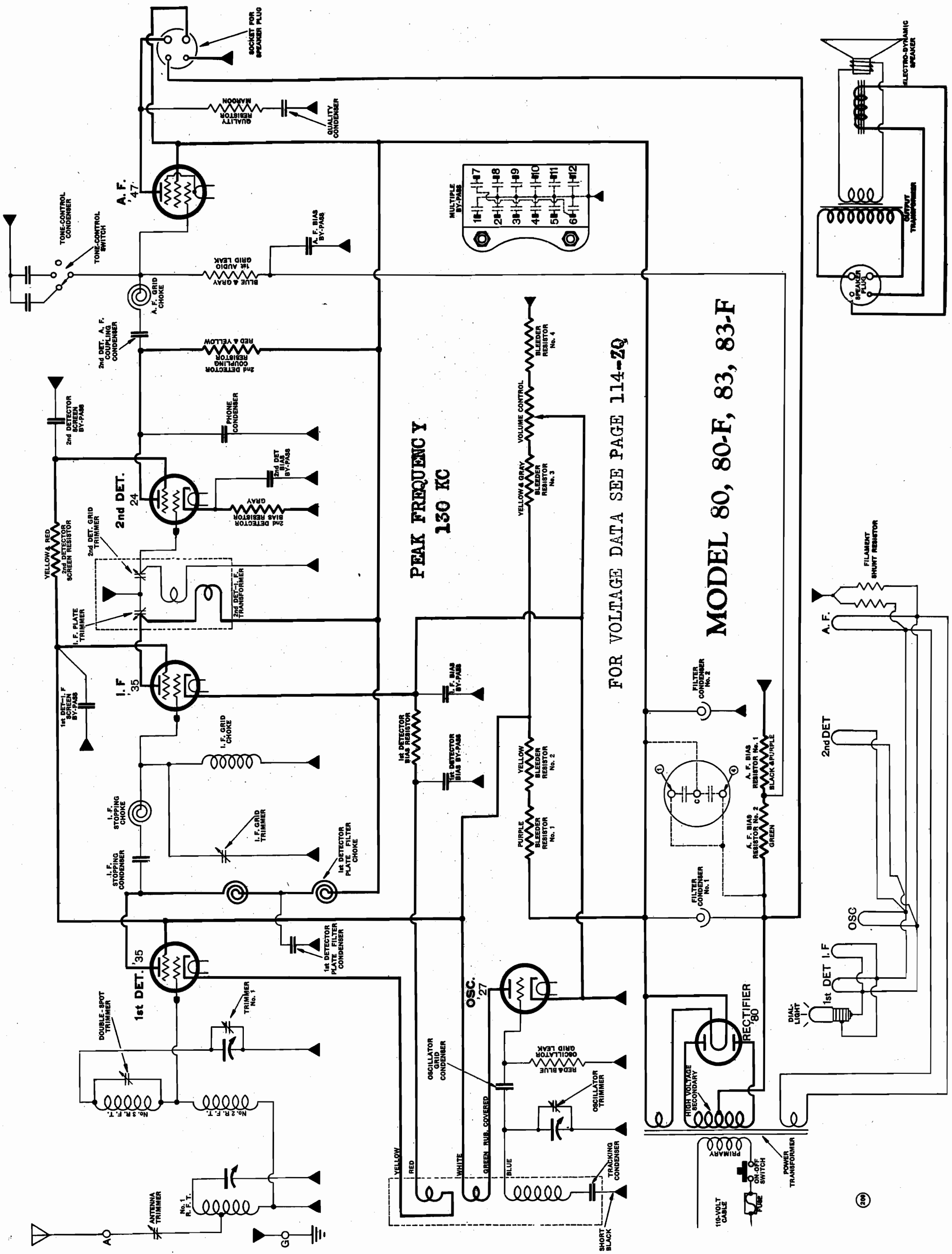

In Model 83 and 83-F, a filter-condenser unit is used and it is connected as shown in dotted lines. This unit is NOT used in Model 80 and 80-F. In Model 83, 83-F, the electrolytic filter condenser No. 1 is not used, and the filament circuit is slightly different.

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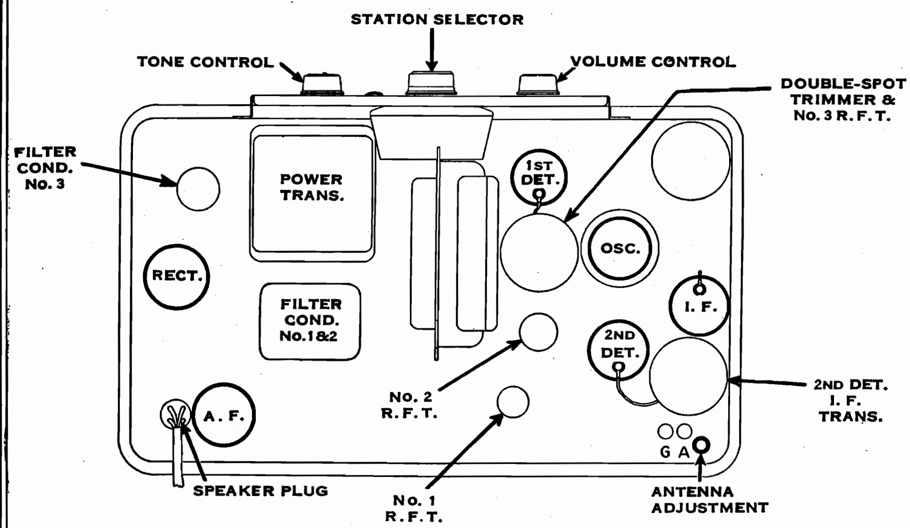


TOP VIEW OF MODEL 83, 83-F.

The circle in the upper right-hand corner is the shield that covers the coupling unit between the 1st-detector and the I. F. tubes.

Condensers in Multiple By-pass Model 80, 80-F, 83, 83-F

1—Tone-control condenser.
2—Tone-control condenser.
3—1st-detector—I. F. screen by-pass.
4—I. F. bias by-pass.
5—2nd-detector bias by-pass.
6—Phone condenser.
7—2nd-detector—A. F. coupling condenser.
8—2nd-detector screen by-pass.
9—Quality condenser.
10—1st-detector plate filter condenser.
11—A. F. bias by-pass.
12—1st-detector bias by-pass.

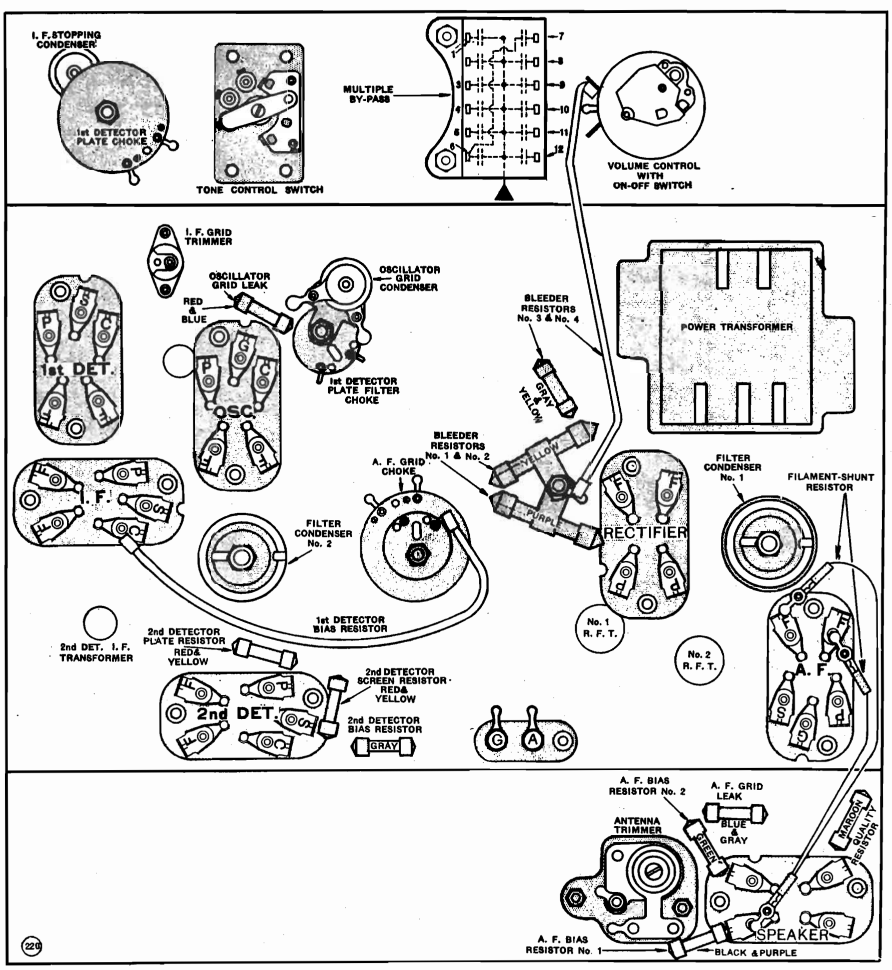
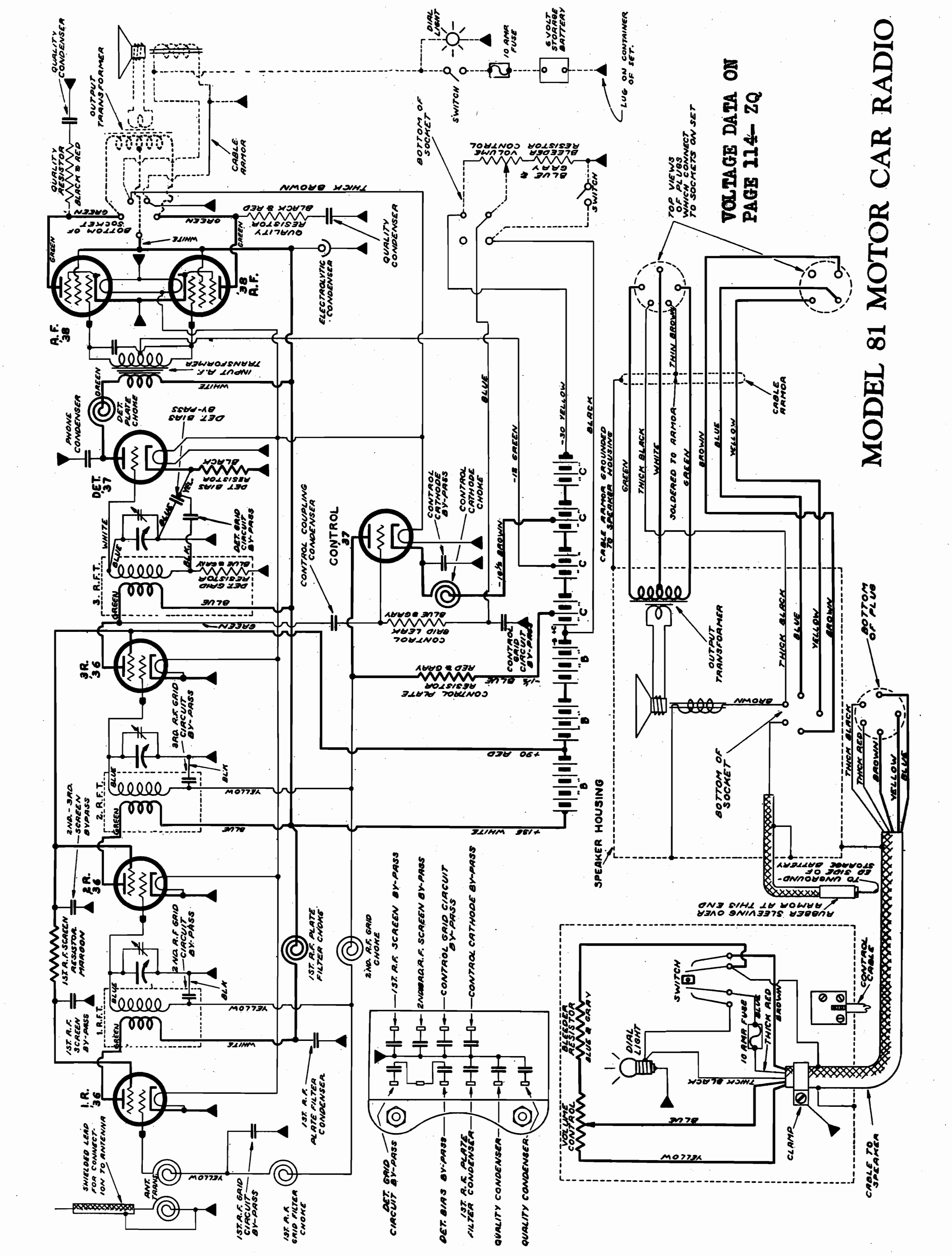


CHART OF MODEL 80, 80-F.

The parts on Model 83, 83-F are similar except that Model 83, 83-F has a filter condenser unit and only one electrolytic condenser.

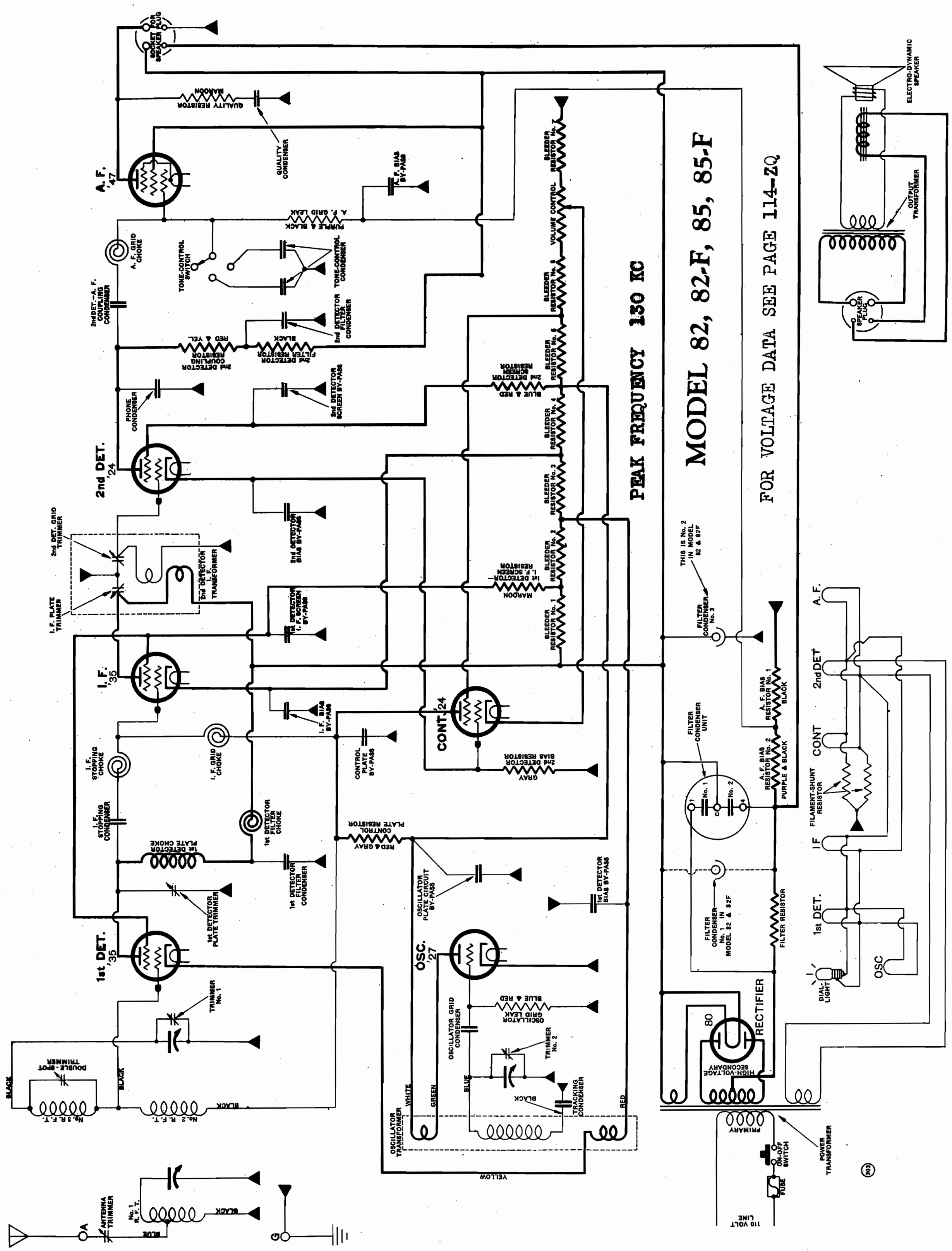
FOR VOLTAGE DATA SEE PAGE 114-ZQ

ATWATER KENT MFG. CO.



This receiver consists of three units: (1st) the chassis and battery container, (2nd) the electro-dynamic speaker, (3rd) the remote-control unit.

ATWATER KENT MFG. CO.



In Model 82 and 82-F, the filter-condenser unit is not used, but is replaced by an additional electrolytic condenser, which is shown above, connected in dotted lines. A few early-type Model 85 do not have automatic volume control; they have three electrolytic filter condensers; the circuit of these early Model 85 sets is similar to Model 80. The tracking condenser is mounted on the oscillator transformer in Model 82 and some 85 sets. The filament circuit of Model 82 is somewhat different from that shown above.

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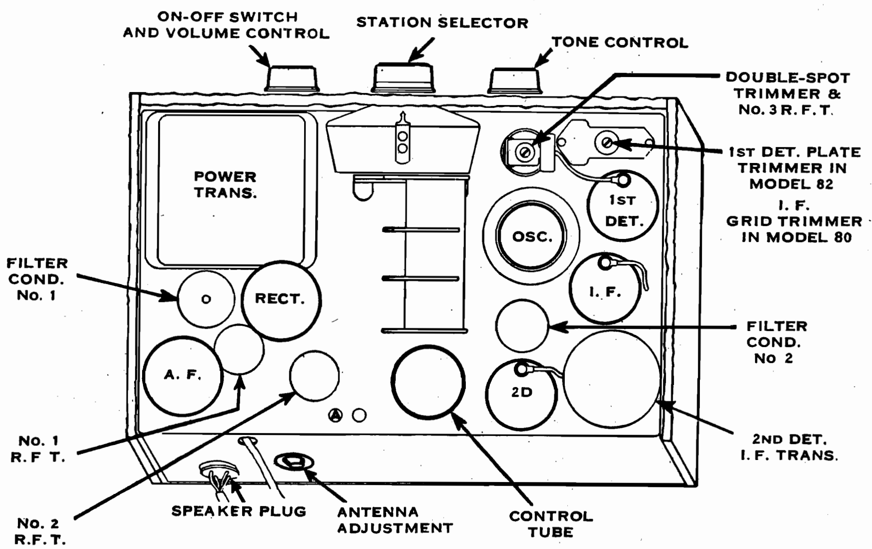


Top View of Model 82, 82-F.

The top view of Model 80, 80-F is similar except that it has no control tube and the position of No.1 and No. 2 R. F. T. is interchanged.

FOR VOLTAGE DATA SEE PAGE 114-ZQ

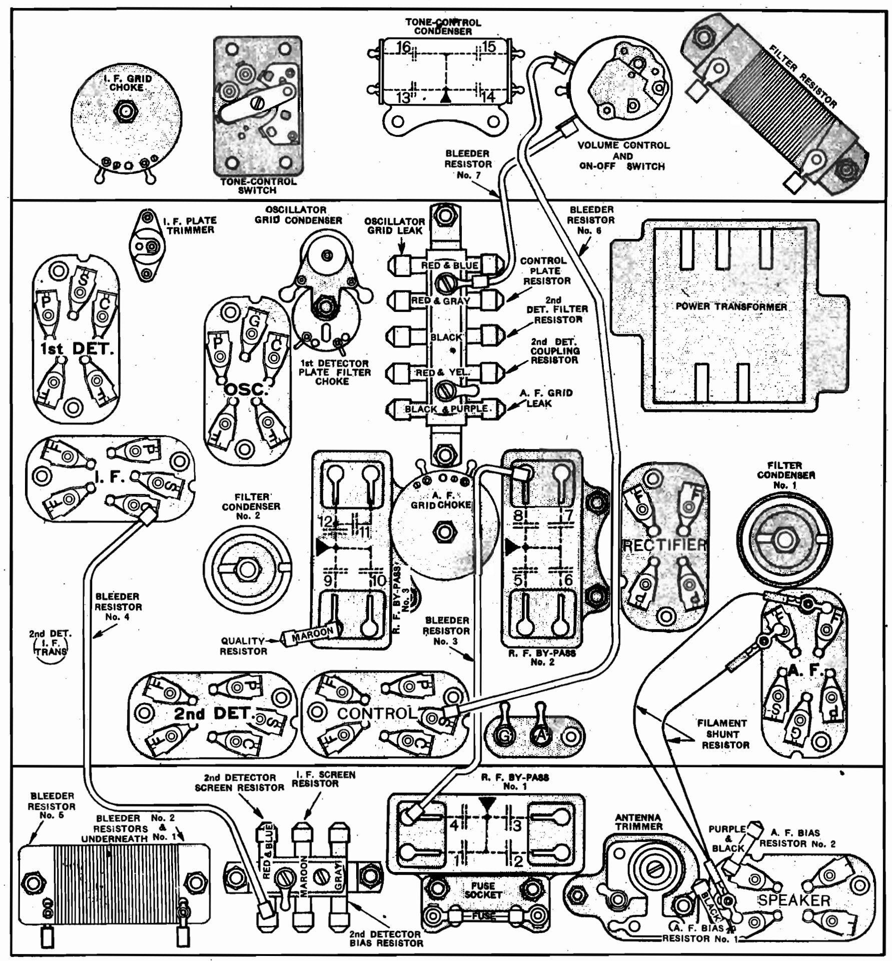


Chart of Model 82, 82-F.

The filter resistor is not used in Model 82-F.

By-pass Condensers in Model 82, 82-F

R. F. By-pass No. 1

1—2nd-detector bias by-pass.
2—Control plate by-pass.
3—Not used.
4—I. F. bias by-pass.

R. F. By-pass No. 2

5—1st-detector filter condenser.
6—1st-detector—I. F. screen by-pass.
7—2nd-detector filter condenser.
8—1st-detector bias by-pass.

R. F. By-pass No. 3

9—Quality condenser.
10—A. F. bias by-pass.
11—2nd-detector—A. F. coupling condenser.
12—Phone condenser.

Tone-control Condenser

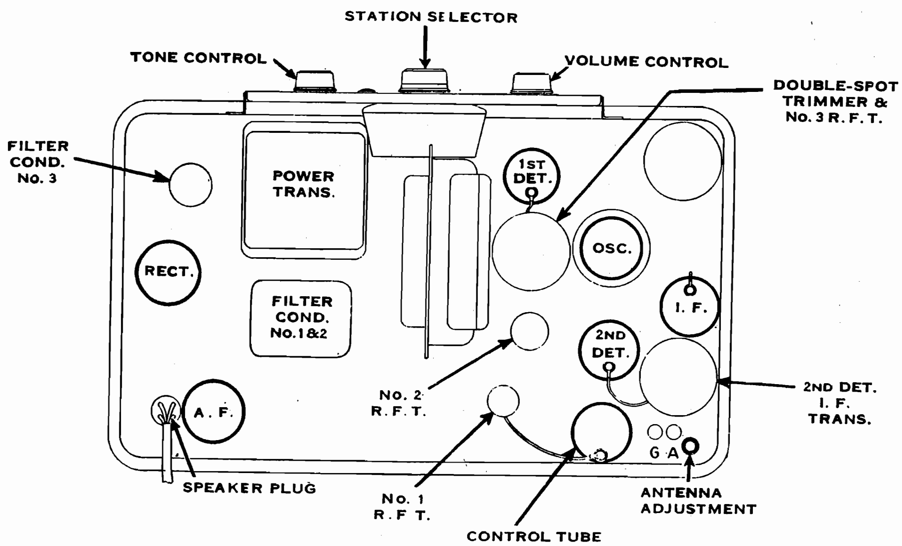
13—Tone condenser.
14—2nd-detector screen by-pass.
15—Oscillator plate-circuit by-pass.
16—Tone condenser.

ATWATER KENT MFG. CO.

MODEL 85, 85-F

FOR VOLTAGE DATA

SEE PAGE 114-ZQ



Top View of Model 85, 85-F.

The circle in the top right corner represents the shield for the coupling unit between the 1st-detector and I. F. tubes.

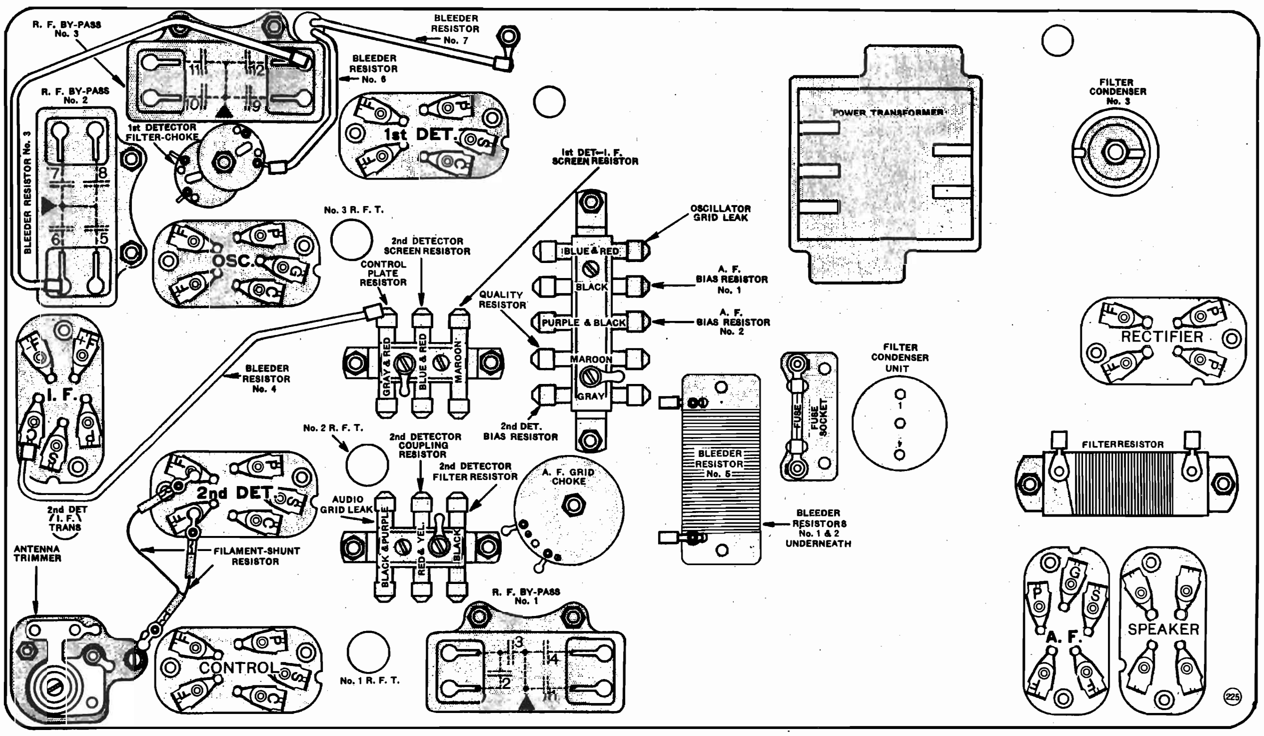


Chart of Model 85, 85-F.

The filter resistor is not used in Model 85-F.

By-pass Condensers in Model 85, 85-F

R. F. By-pass No. 1

1—Quality condenser.
2—2nd-detector—A. F. coupling condenser.
3—Phone condenser.
4—2nd-detector bias by-pass.

R. F. By-pass No. 2

5—A. F. bias by-pass.
6—I. F. bias by-pass.
7—Tracking condenser.
8—Control-plate by-pass.

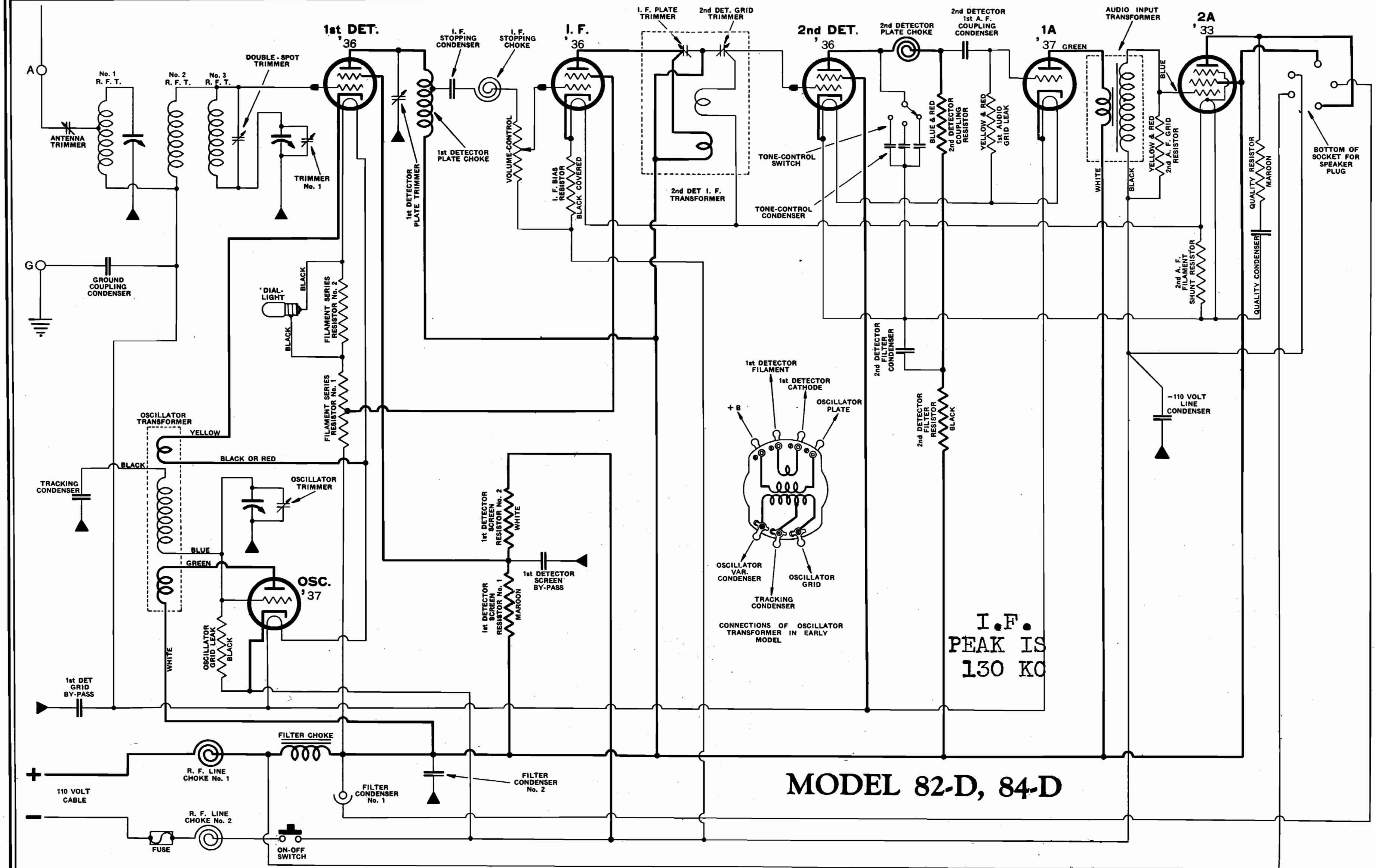
R. F. By-pass No. 3

9—1st-detector—I. F. screen by-pass.
10—2nd-detector filter condenser.
11—1st-detector filter condenser
12—1st-detector bias by-pass.

Tone-control Condenser (on front panel)

Two top contacts—2nd-detector screen by-pass and oscillator plate-circuit by-pass.
Two bottom contacts—tone-control condensers.

ATWATER KENT MFG. CO.



MODEL 82-D, 84-D

FOR VOLTAGE DATA SEE PAGE 114-ZQ

Early Model 84-D does not have tone control; it has a condenser, instead of a resistor, across the secondary of the audio input transformer; it has a small phone condenser connected to the plate of the 2nd-detector, and it has an antenna choke connected between the antenna and ground posts. In 82-D, the oscillator-tracking condenser is mounted on the oscillator transformer. Connections to the oscillator transformer in early-type 84-D are shown in the separate drawing.

In 82-D, an extra-110-volt line condenser is connected from ground to a point between R. F. line choke No. 2 and the on-off switch.

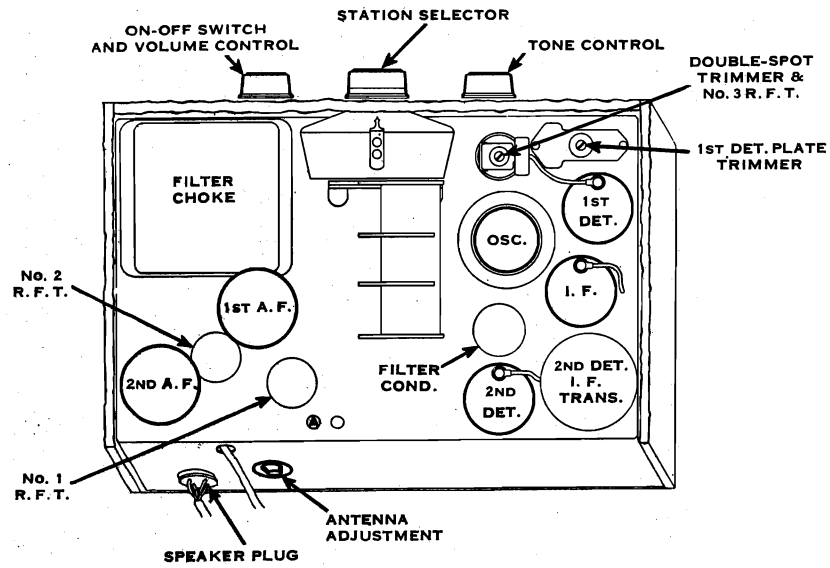
(208)

ATWATER KENT MFG. CO.

MODEL 82-D TOP VIEW AND CHART

FOR VOLTAGE DATA SEE

PAGE 114-ZQ



Top View of Model 82-D.

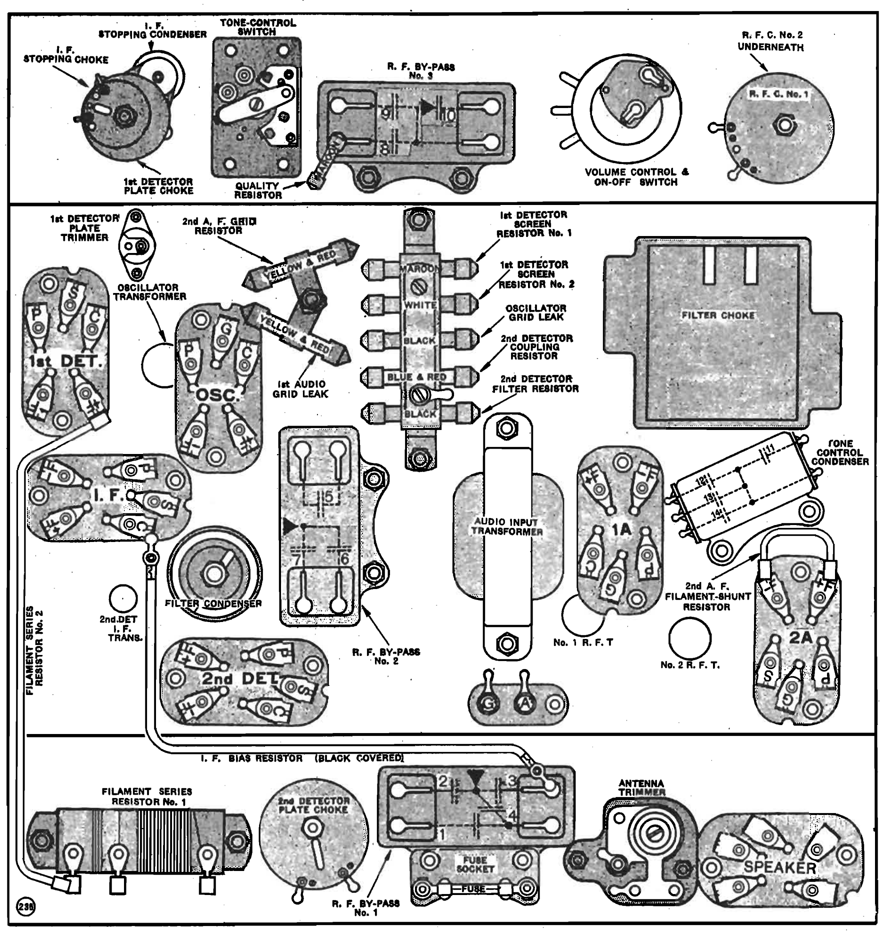
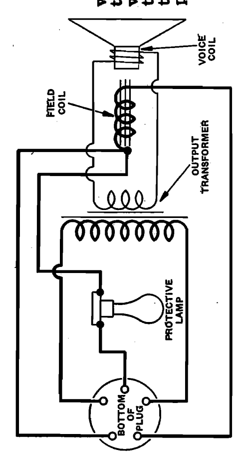


Chart of Model 82-D.

The protective lamp (75 watts) is connected in series with the electrolytic filter condenser in the chassis. If the 110-volt D. C. supply plug is reversed, the lamp will light. When the 110-volt plug is properly inserted, the lamp does not light. This action is due to the fact that the electrolytic condenser passes current if the polarity of the applied D. C. voltage is not correct.



Circuit of Speaker Used in Model 82-D, 84-D.

By-pass Condensers in Model 82-D

R. F. By-pass No. 1

1—Ground coupling condenser.
2—1st-detector screen by-pass.
3—110-volt line condenser.
4—1st-detector grid by-pass.

R. F. By-pass No. 2

5—2nd-detector—1st-A.F. coupling condenser
6—Filter condenser No. 2.
7—Not used.

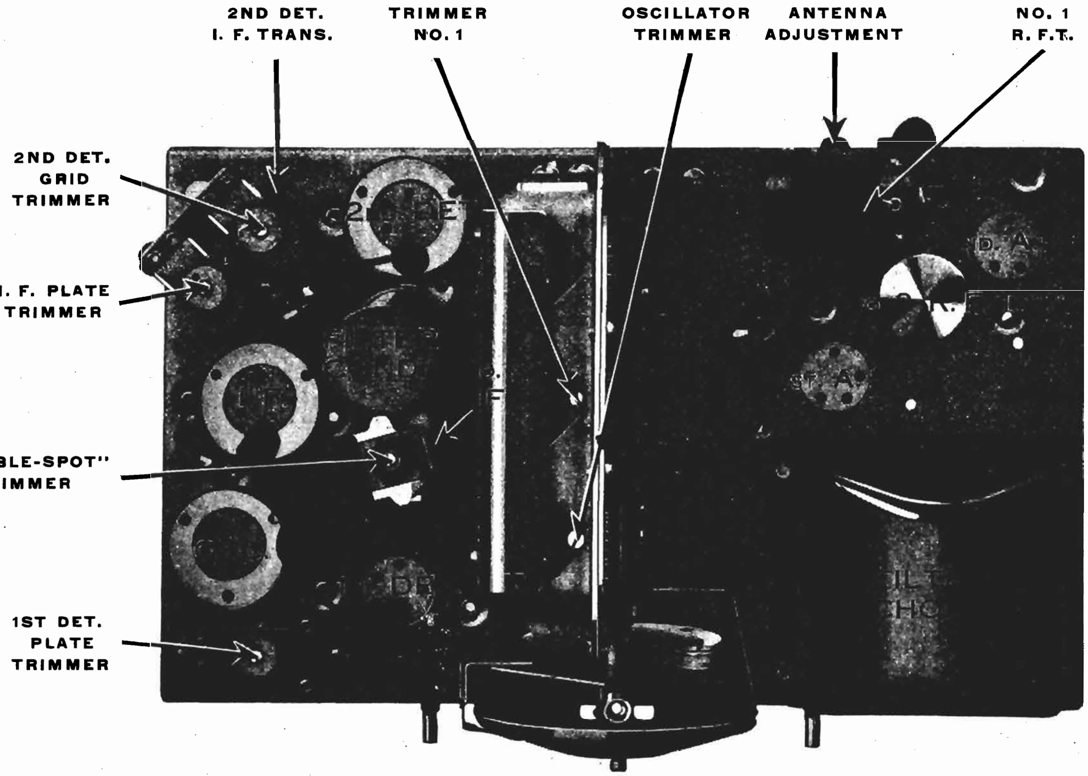
R. F. By-pass No. 3

8—Quality condenser.
9—2nd-detector filter condenser.
10—110-volt line by-pass.

Tone-control Condenser

11—Not used.
12—Tone condenser.
13—Tone condenser.
14—Tone condenser.

ATWATER KENT MFG. CO.



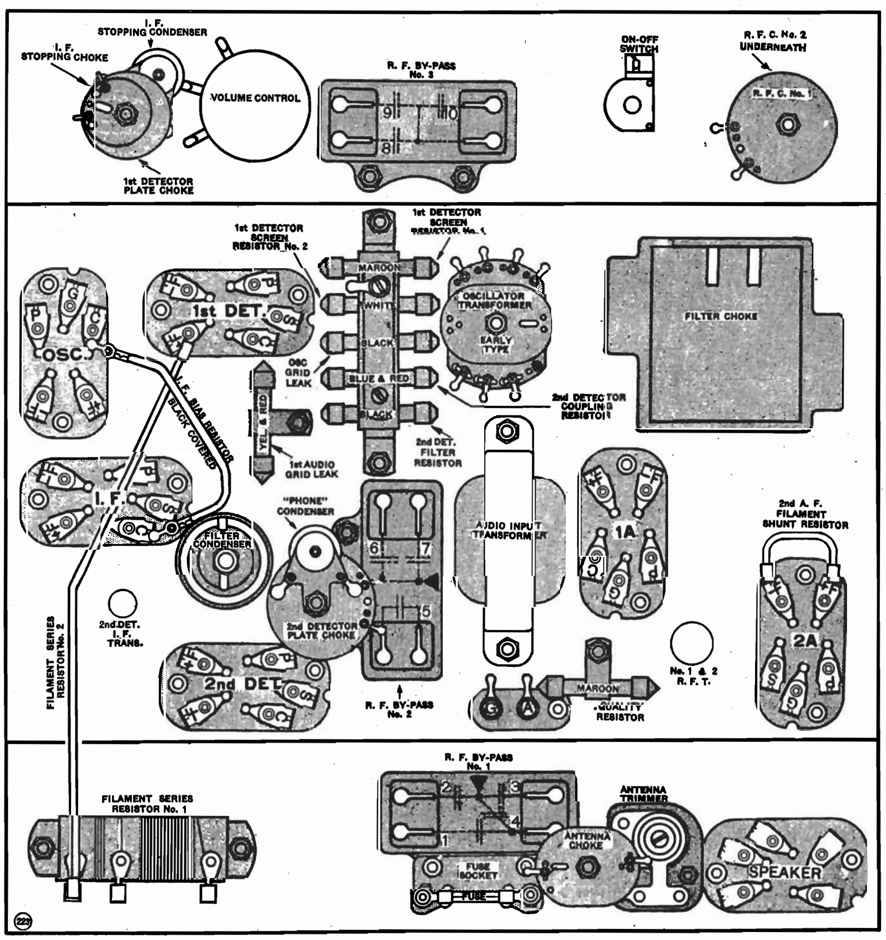


CHART OF MODEL 84-D. (EARLY TYPE WITHOUT TONE CONTROL.)

SEE NOTE ABOUT SPEAKER ON PAGE 114-Z

MODEL 84-D

By-pass Condensers in Model 84-D

Condensers in R. F. By-pass No. 1

1—Ground coupling condenser.
2—1st-detector screen by-pass.
3—110-volt line condenser.
4—1st-detector grid by-pass.

R. F. By-pass No. 2

5—2nd-detector—1st-A. F. coupling condenser.
6—Filter condenser No. 2.
7—Tracking condenser.

R. F. By-pass No. 3

8—Quality condenser.
9—2nd-detector filter condenser.
10—2nd-A. F. grid condenser in early-type sets, 2nd-detector phone condenser in later-type sets.

Tone-control Condenser (Late-type sets only)

11—Not used.
12—Tone condenser.
13—Tone condenser.
14—Tone condenser.

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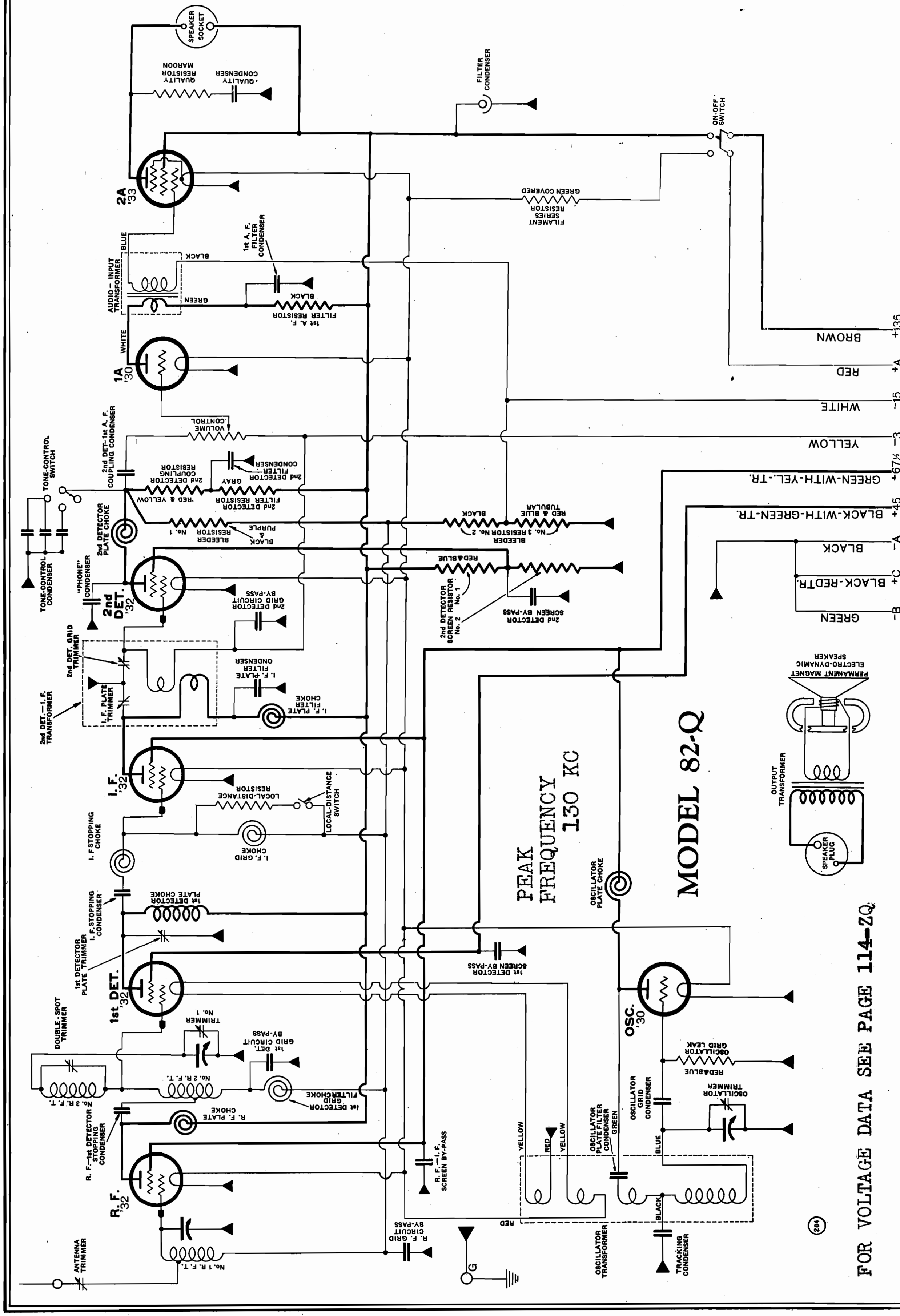


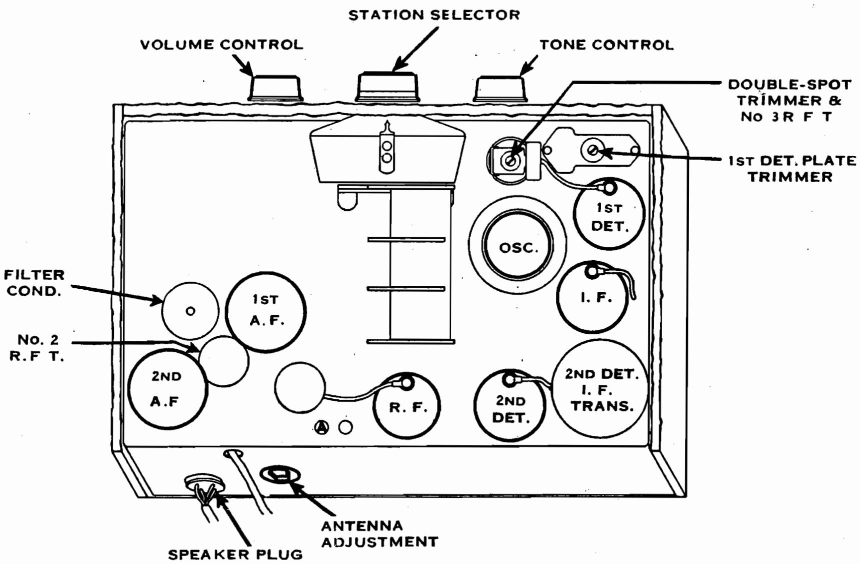
PEAK FREQUENCY 130 KC

MODEL 82-Q

FOR VOLTAGE DATA SEE PAGE 114-ZQ

In some 82-Q receivers, the primary of the audio input transformer is connected as follows: Green to the plate, and white to the 1st-A. F. filter resistor.

ATWATER KENT MFG. CO.



MODEL 82-Q

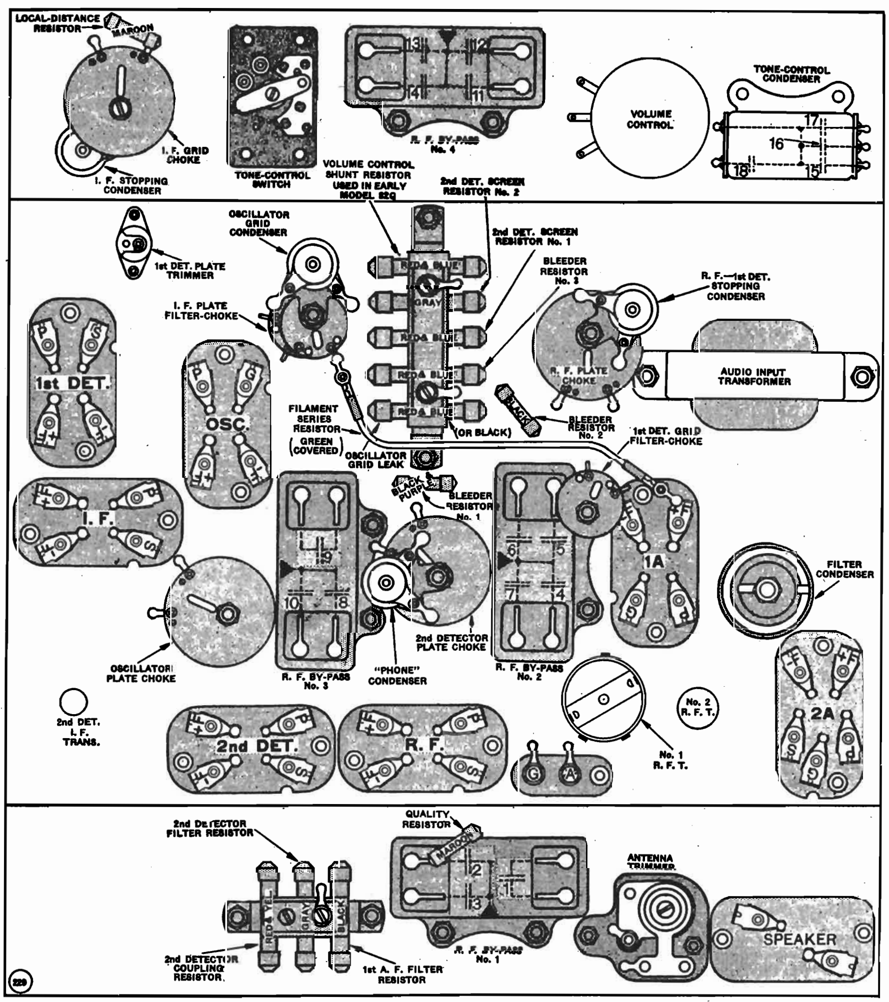


CHART OF MODEL 82-Q.

FOR VOLTAGE DATA SEE

PAGE 114-ZQ

By-pass Condensers in Model 82-Q

R. F. By-pass No. 1

1—Not used.
2—Quality condenser.
3—2nd-detector grid-circuit by-pass.

R. F. By-pass No. 2

4—+B filter condenser.
5—R. F. grid-circuit by-pass.
6—R. F.—I. F. screen by-pass.
7—1st-detector grid-circuit by-pass.

R. F. By-pass No. 3

8—2nd-detector filter condenser.
9—2nd-detector—1st-A. F. coupling condenser.
10—Tracking condenser.

R. F. By-pass No. 4

11—2nd-detector screen by-pass.
12—1st-A. F. filter condenser.
13—1st-detector screen by-pass.
14—I. F. plate filter condenser.

Tone-control Condenser

15—Tone condenser.
16—Tone condenser.
17—Tone condenser.
18—Not used.

ATWATER KENT MFG. CO.

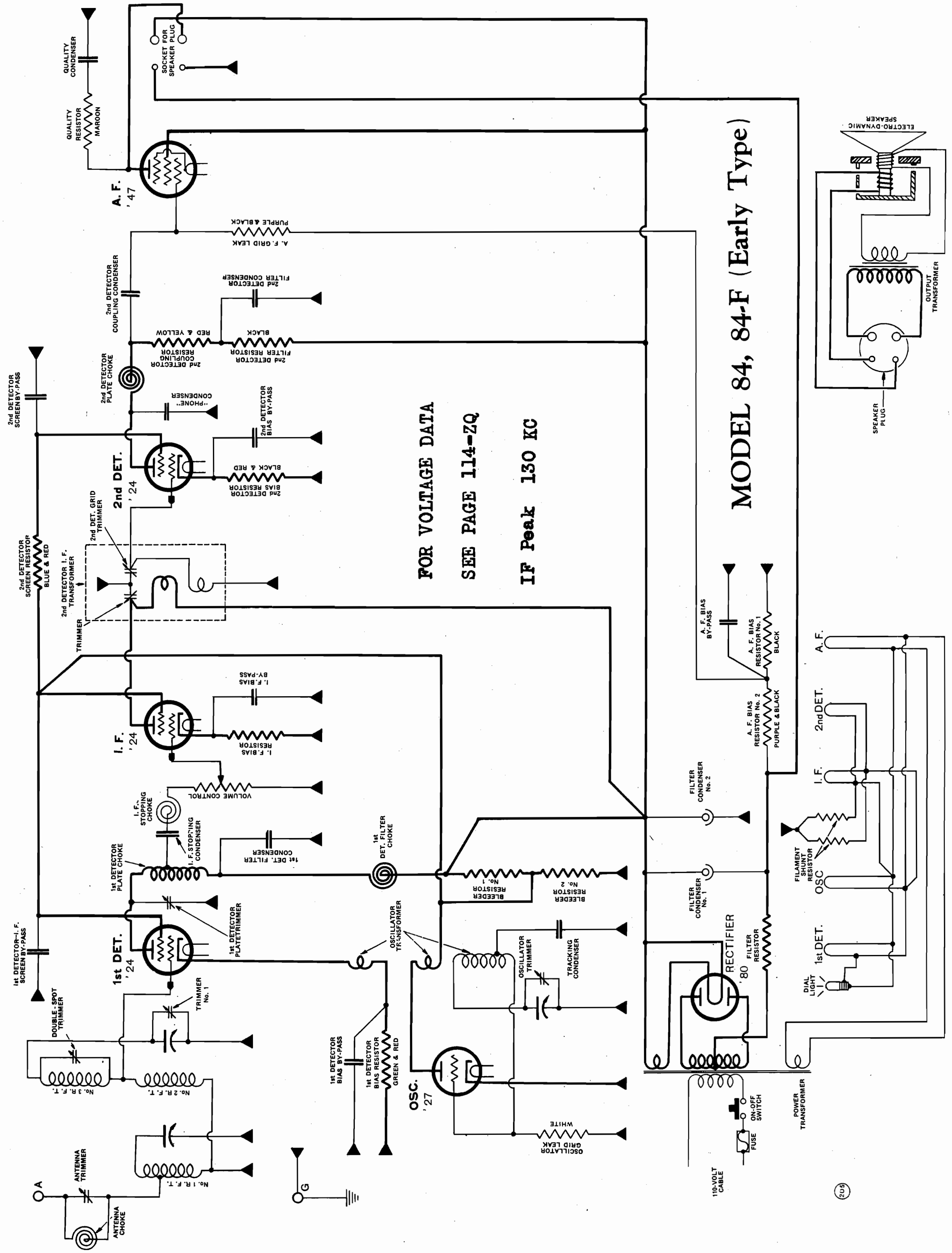


DIAGRAM OF EARLY-TYPE MODEL 84 AND 84-F (A. C.-OPERATED).

In Model 84-F, the filter resistor (connected in series with the center-tap of the high-voltage winding) is NOT used.

ATWATER KENT MFG. CO.

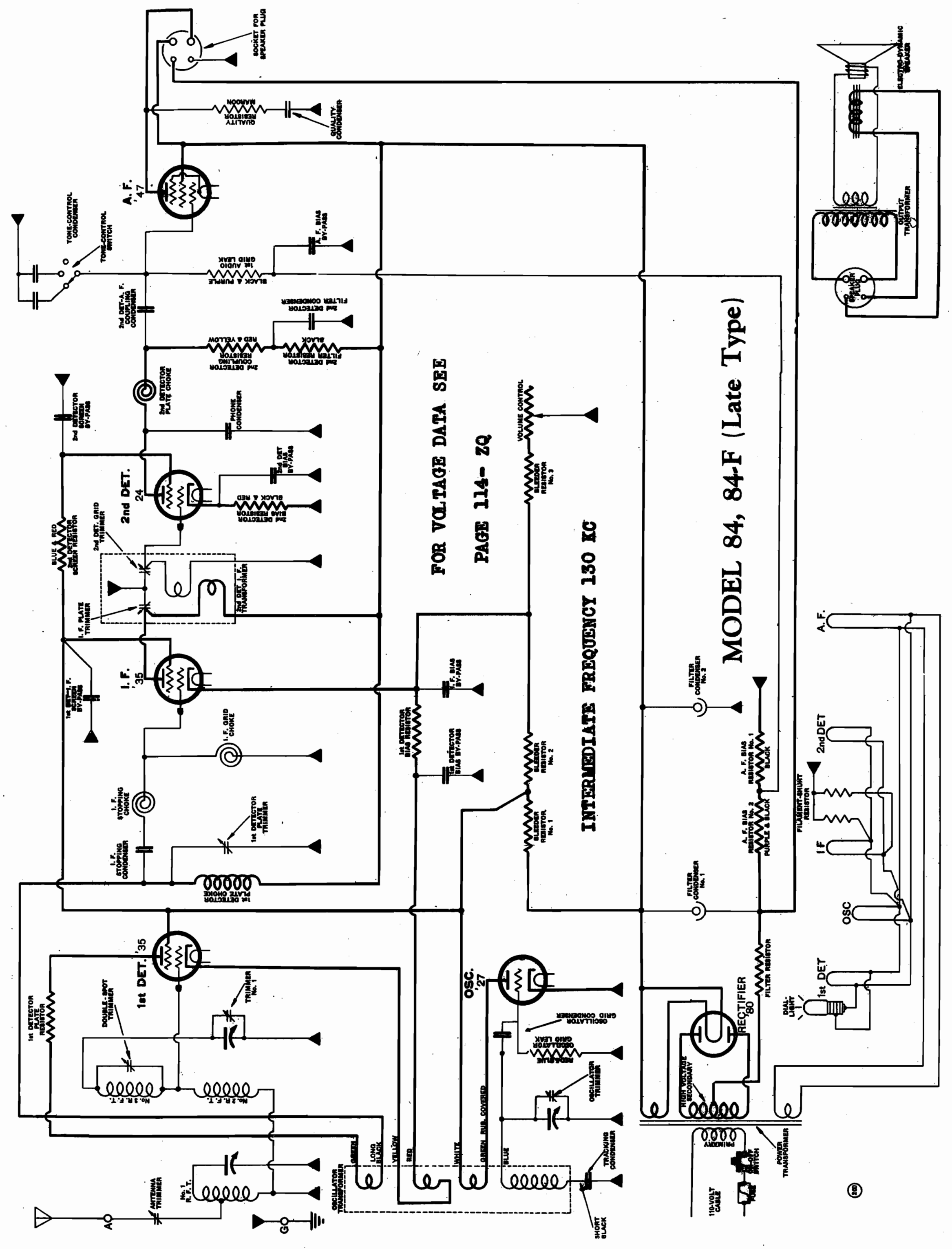


DIAGRAM OF LATE-TYPE MODEL 84 AND 84-F (A. C.-OPERATED).

A few late-type Model 84 and 84-F receivers have slightly different oscillator transformers, as explained in the notes accompanying the parts list for these sets.
The filter resistor shown in the above diagram is NOT used in Model 84-F.
This set has a 1st-detector plate filter choke and condenser not shown in the diagram.

MODEL 84, 84-F CHARTS

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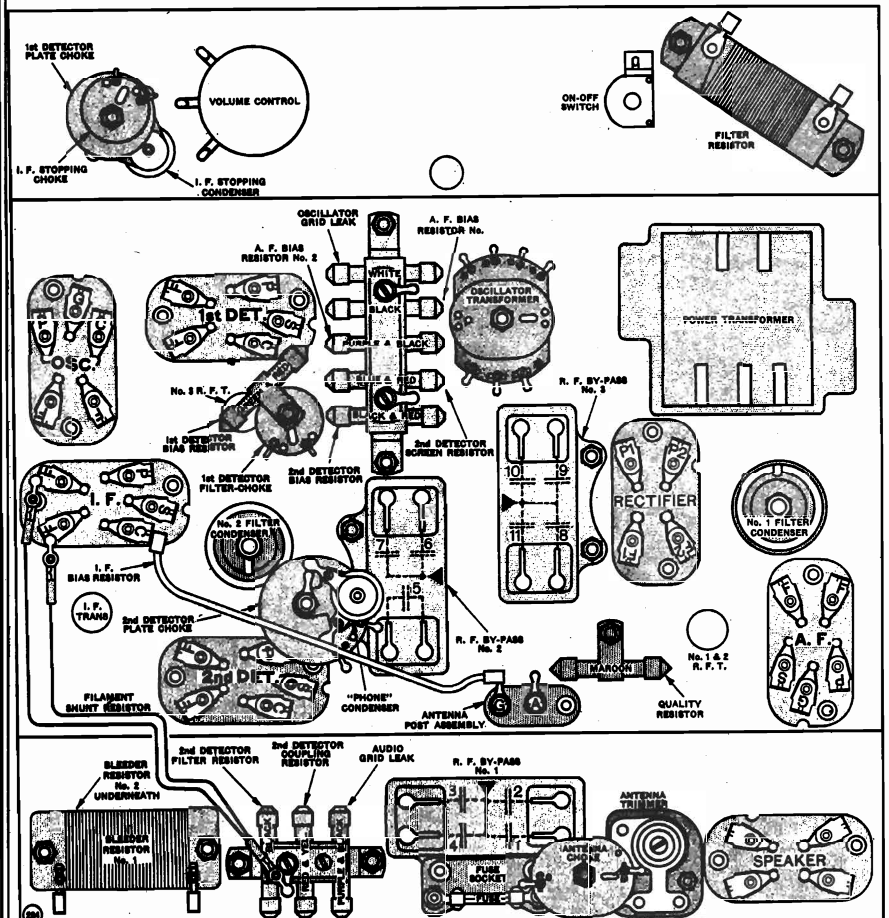

CHART OF EARLY-TYPE MODEL 84, 84-F.

In some early-type Model 84, 84-F, the 1st-detector bias resistor is a flexible type, and the quality resistor is wire-wound. These are both superseded by the tubular resistors indicated above. The filter-resistor at top-right is NOT used in any Model 84-F.

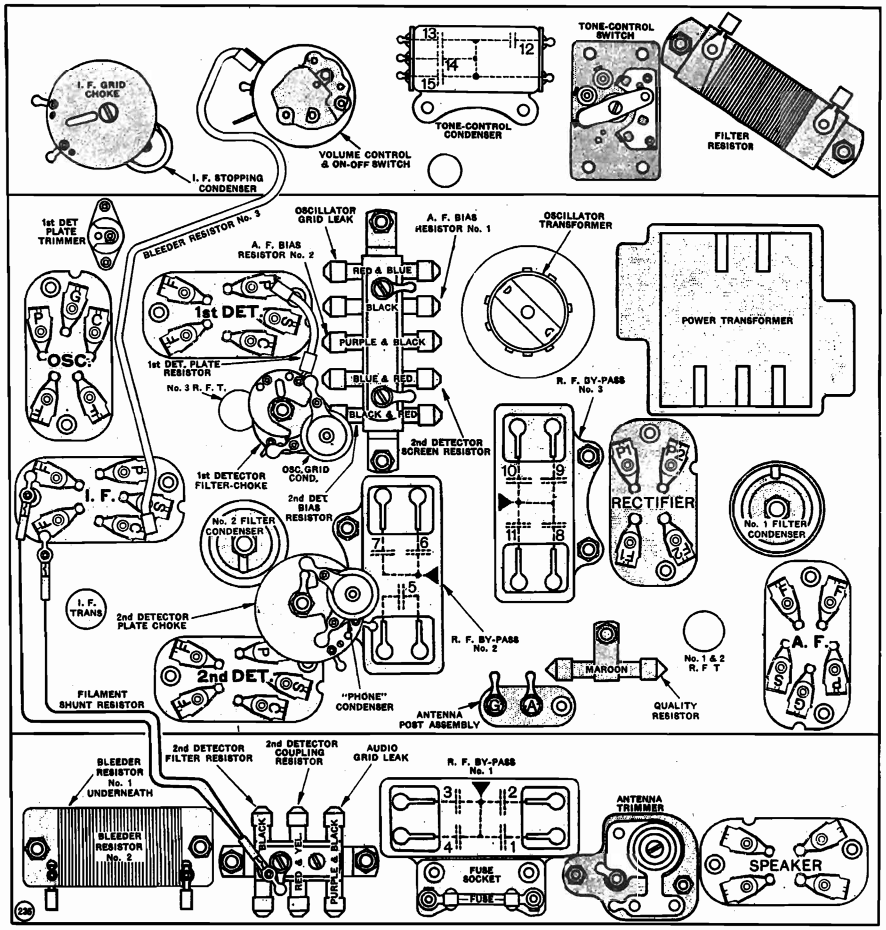

CHART OF LATE-TYPE MODEL 84, 84-F.

Some late-type Model 84, 84-F receivers have slightly different oscillator transformers and connections than indicated in the diagram Fig. 288. When servicing such sets, carefully note and adhere to the original method of wiring. A flexible type 1st-detector bias resistor (not shown above) is connected from condenser 9 to condenser 3.

By-pass Condensers in Model 84, 84-F.

R. F. By-pass No. 1

1—2nd-detector filter condenser.
2—Quality condenser.
3—I. F. bias by-pass.
4—A. F. bias by-pass.

R. F. By-pass No. 2

5—2nd-detector—A. F. coupling condenser.
6—Tracking condenser.
7—2nd-detector bias by-pass.

R. F. By-pass No. 3

8—1st-detector filter condenser.
9—1st-detector bias by-pass.
10—1st-detector—I. F. screen by-pass.
11—2nd-detector screen by-pass.

Tone-control Condenser
(used only in late type)

12—Not used.
13—Tone-control condenser.
14—Not used.
15—Tone-control condenser.

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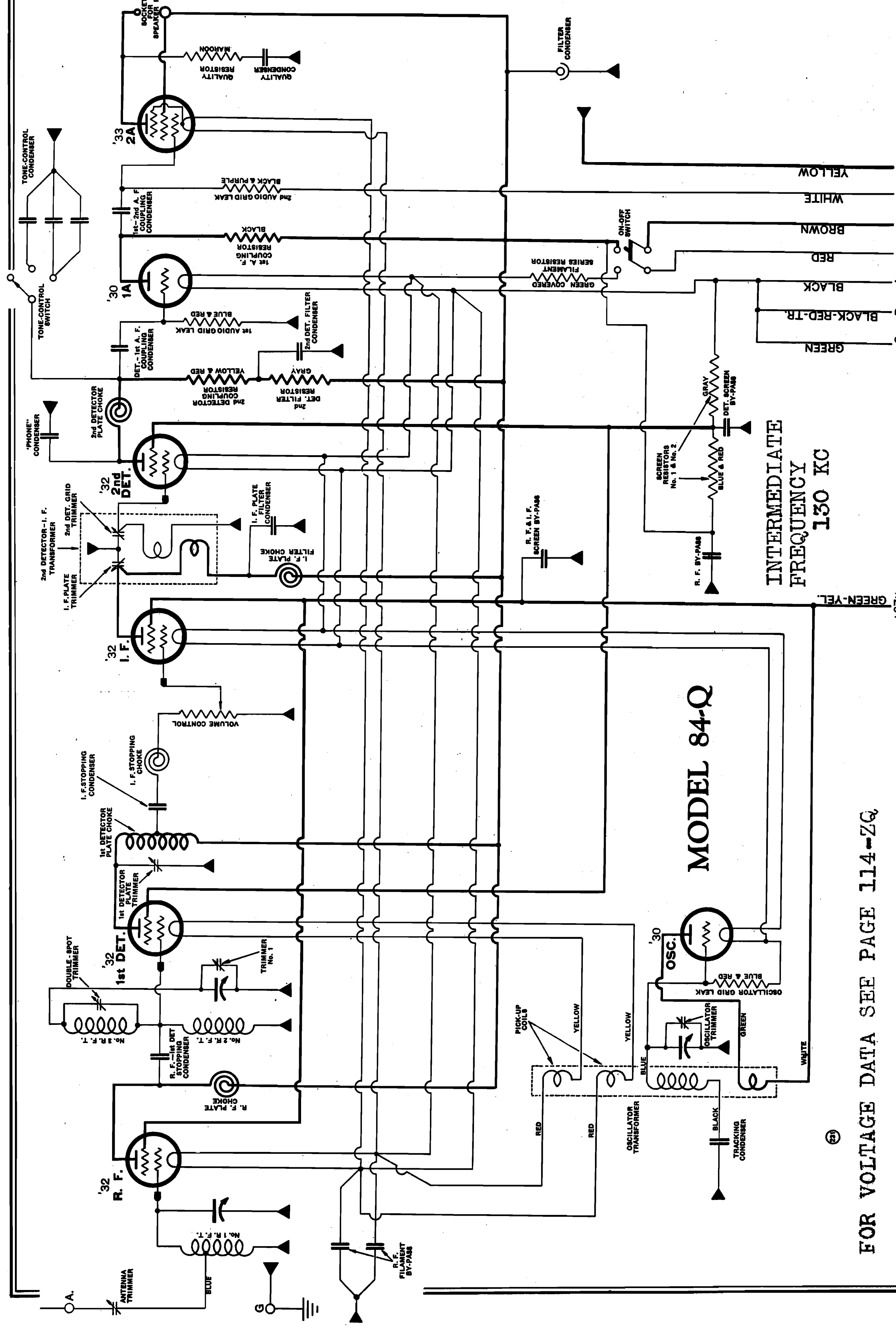

FOR VOLTAGE DATA SEE PAGE 114-ZG

A diagram of the speaker used with this set is shown in the diagram of Model 82-Q.

Early-type 84-Q does not have tone control; it has a phone condenser in the 2nd-detector plate circuit; and it has an antenna choke connected across the antenna trimmer. The oscillator transformer in early-type Model 84-Q is different in this way: It has only one pick-up coil, which is connected in series with the screen of the 1st-detector (The two filament-circuit pick-up coils are not used in the early model.)

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MODEL 84-Q

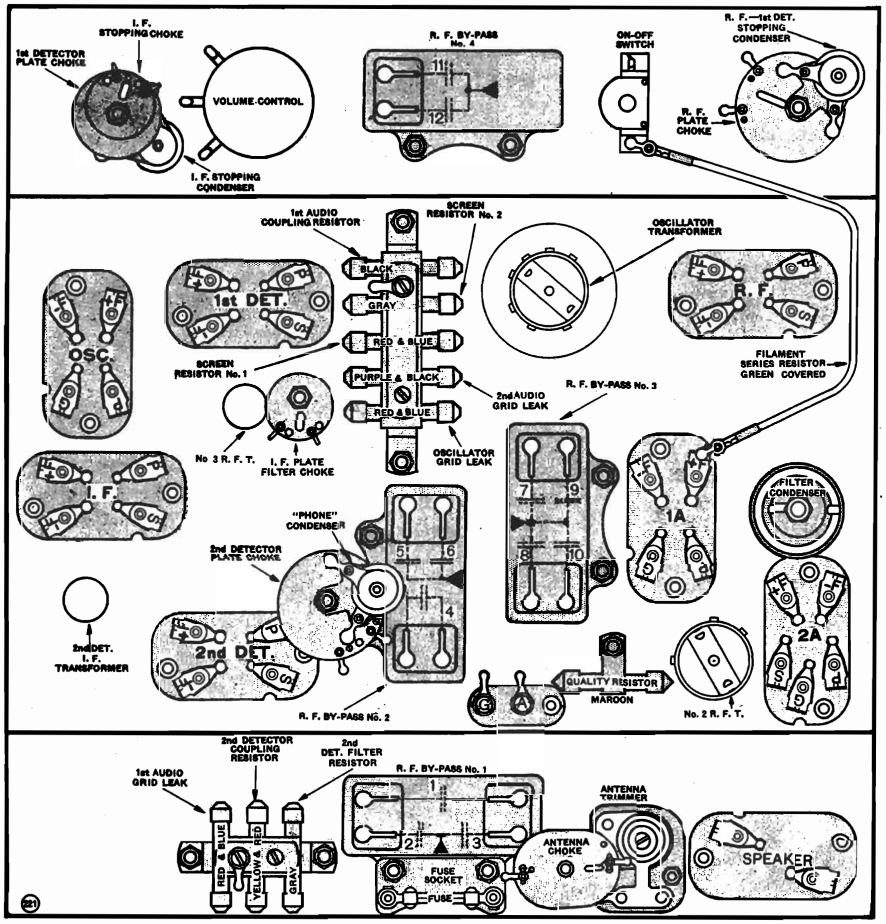


Chart of Model 84-Q. (Early Type Without Tone Control.)

By-pass Condensers in Model 84-Q

R. F. By-pass No. 1

1—1st-2nd A. F. coupling condenser.
2—Phone condenser.
3—Quality condenser.

R. F. By-pass No. 2

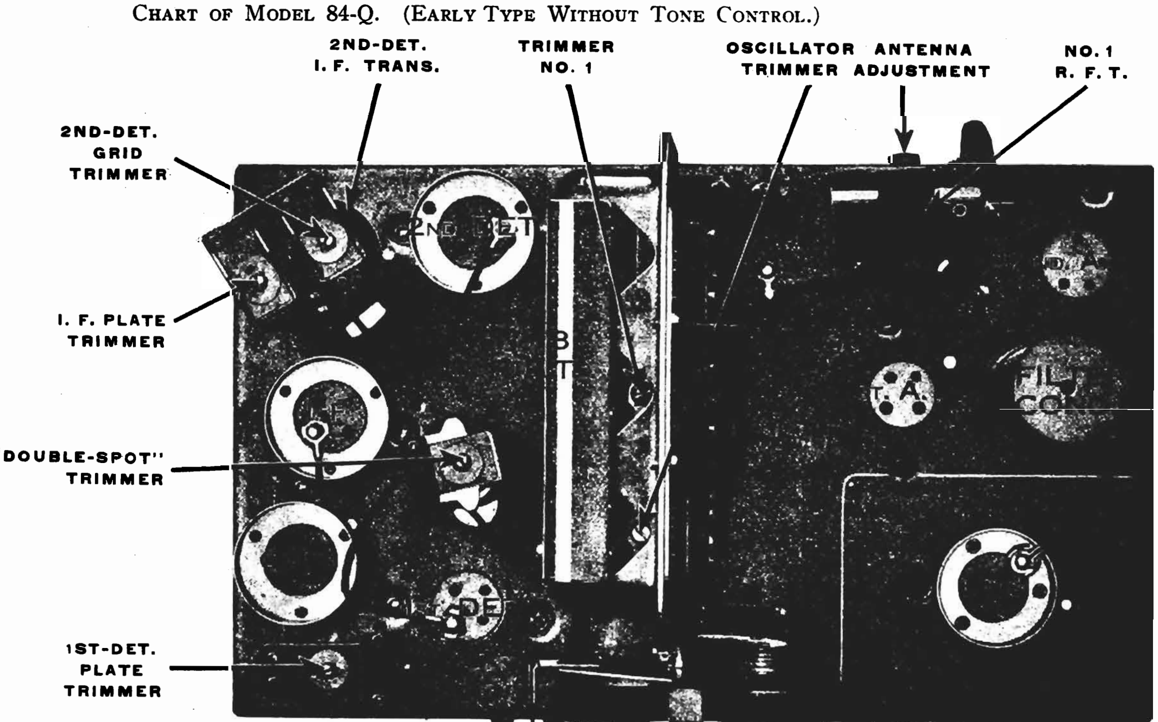
4—2nd-detector—1st-A. F. coupling condenser.
5—2nd-detector filter condenser.
6—Tracking condenser.

R. F. By-pass No. 3

7—R. F.-I. F. screen by-pass.
8—I. F. plate filter condenser.
9—1st-detector—2nd-detector screen by-pass.
10—+B filter condenser.

R. F. By-pass No. 4 (Later 84-Q only)

11—R. F. filament by-pass.
12—R. F. filament by-pass.



In a few early-model 84-Q receivers, the position of the R. F. and the 1st-A. F. socket is interchanged.

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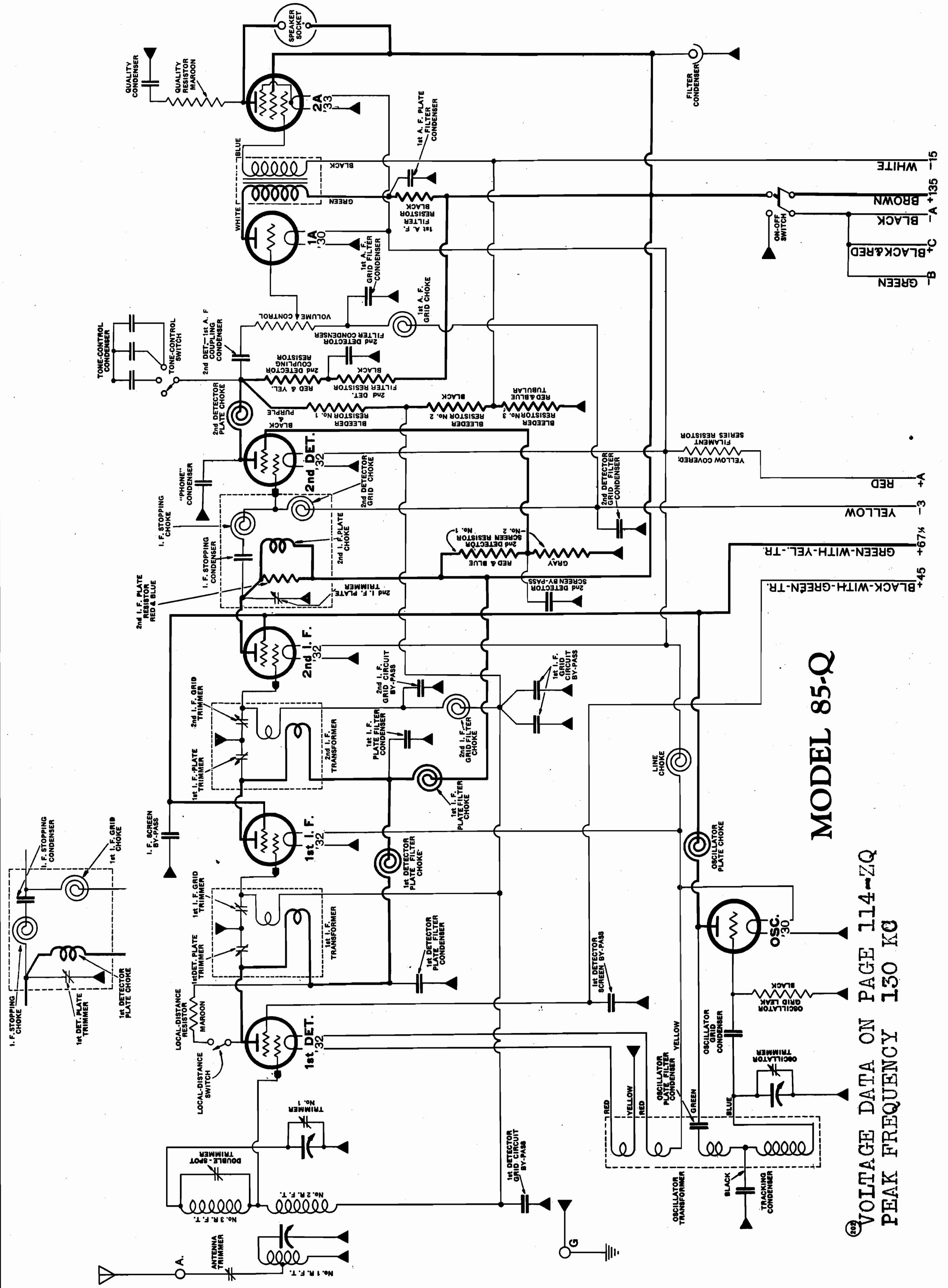

In later-type Model 85-Q, the 1st-I. F. transformer is replaced by chokes and condensers, as shown in the separate drawing above the 1st-I. F. transformer. In some 85-Q sets, the colors of the primary leads of the audio input transformer are reversed.

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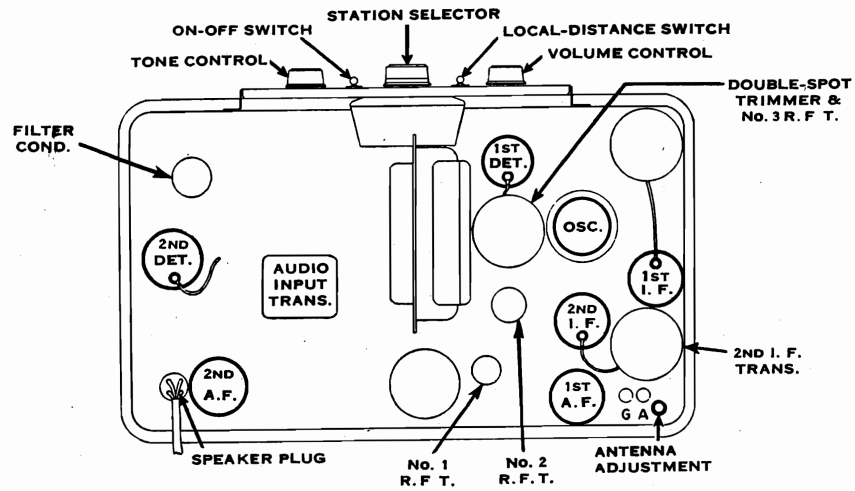
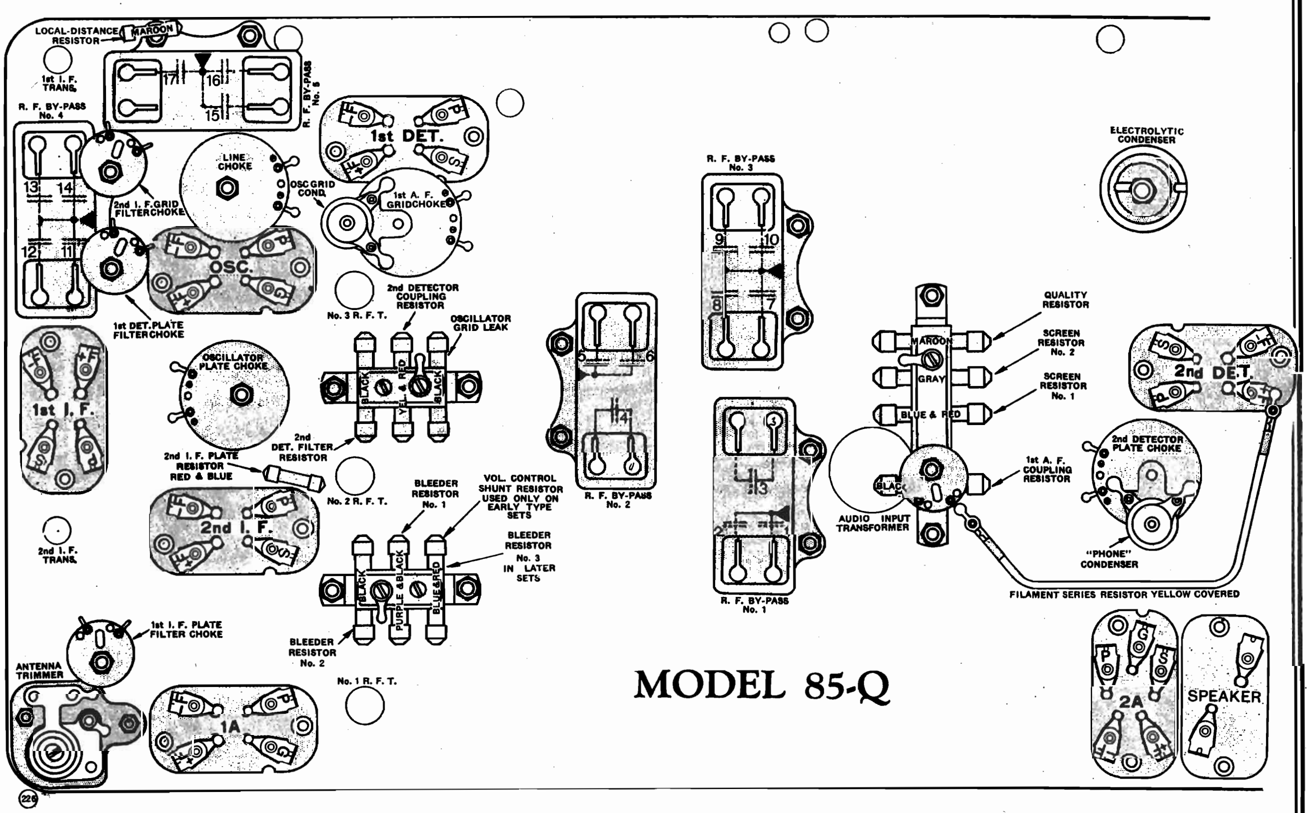


FOR VOLTAGE DATA SEE PAGE 114-ZQ

Top View of Model 85-Q.

The circle in the top right corner indicates the shield for the coupling unit between the 1st-detector and the 1st-I. F. tubes. The circle in the bottom center is the shield covering the coupling unit between the 2nd-I. F. and the 2nd-detector tubes.



By-pass Condensers in Model 85-Q.

R. F. By-pass No. 1	R. F. By-pass No. 2	R. F. By-pass No. 3	R. F. By-pass No. 4	R. F. By-pass No. 5
1—1st-detector grid-circuit by-pass.	4—2nd-detector—1st-A. F. coupling condenser.	7—2nd-detector grid filter condenser.	11—1st-I. F. plate filter condenser.	15—1st-detector screen by-pass.
2—Quality condenser.	5—1st-A. F. grid filter condenser.	8—2nd-detector screen by-pass.	12—I. F. screen by-pass.	16—1st-I. F. grid-circuit by-pass.
3—Not used.	6—Tracking condenser.	9—2nd-detector filter condenser.	13—2nd-I. F. grid-circuit by-pass.	17—1st-detector plate filter condenser.
		10—1st-A. F. plate filter condenser.	14—1st-I. F. grid-circuit by-pass.	

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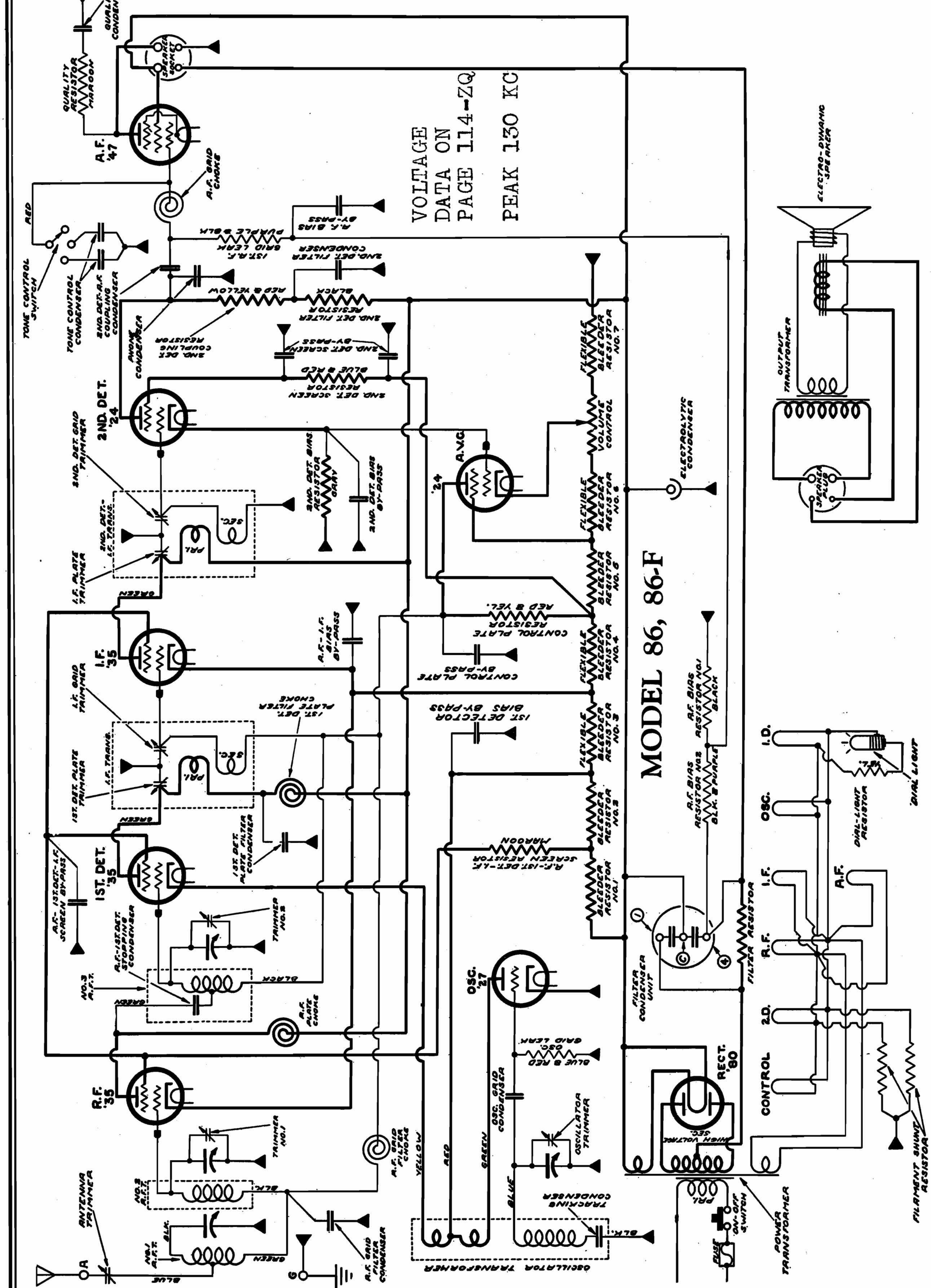

The filter resistor is not used in Model 86-F, and the control plate resistor is red and gray. The electrolytic condenser is listed in the Parts List as filter condenser No. 3.

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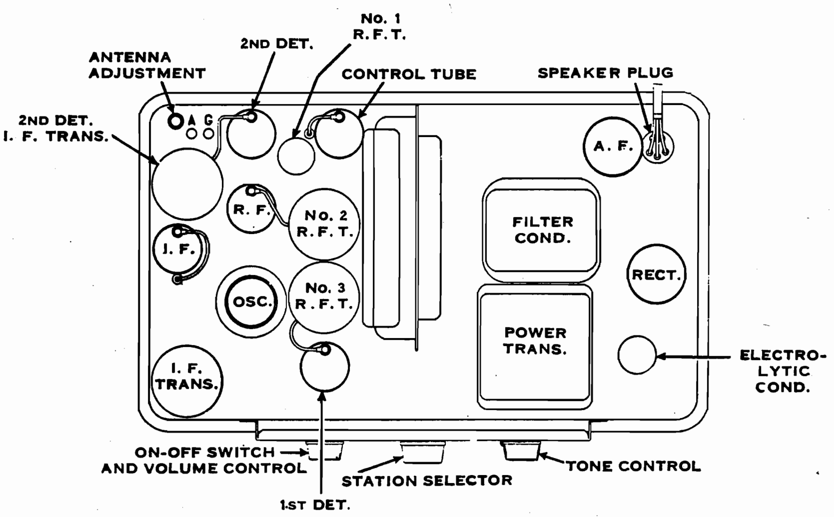
MODEL 86, 86-F

FOR VOLTAGE DATA SEE PAGE 114-ZQ



Top View of Model 86, 86-F.

The speaker plug has only four prongs instead of five, as indicated above.

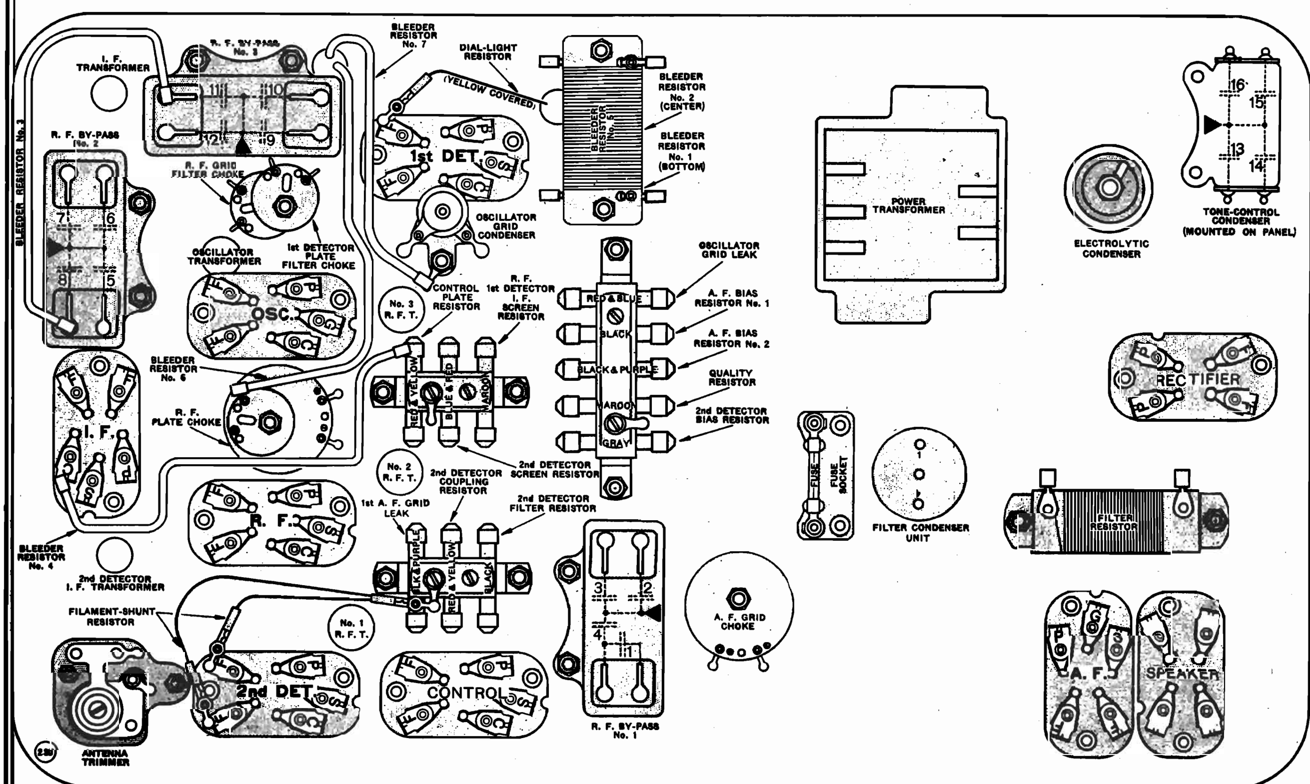


Chart of Model 86, 86-F.

The filter resistor is not used in Model 86-F.

By-pass Condensers in Model 86, 86-F

R. F. By-pass No. 1

1—2nd-detector—A. F. coupling condenser.
2—Quality condenser.
3—2nd-detector bias by-pass.
4—Phone condenser.

R. F. By-pass No. 2

5—A. F. bias by-pass.
6—R. F. grid filter condenser.
7—Control plate by-pass.
8—R. F.—I. F. bias by-pass.

R. F. By-pass No. 3

9—1st-detector plate filter condenser.
10—R. F.-1st-detector—I. F. screen by-pass.
11—1st-detector bias by-pass.
12—2nd-detector filter condenser.

Tone-control Condenser

13—Tone-control condenser.
14—Tone-control condenser.
15—2nd-detector screen by-pass.
16—2nd-detector screen by-pass.

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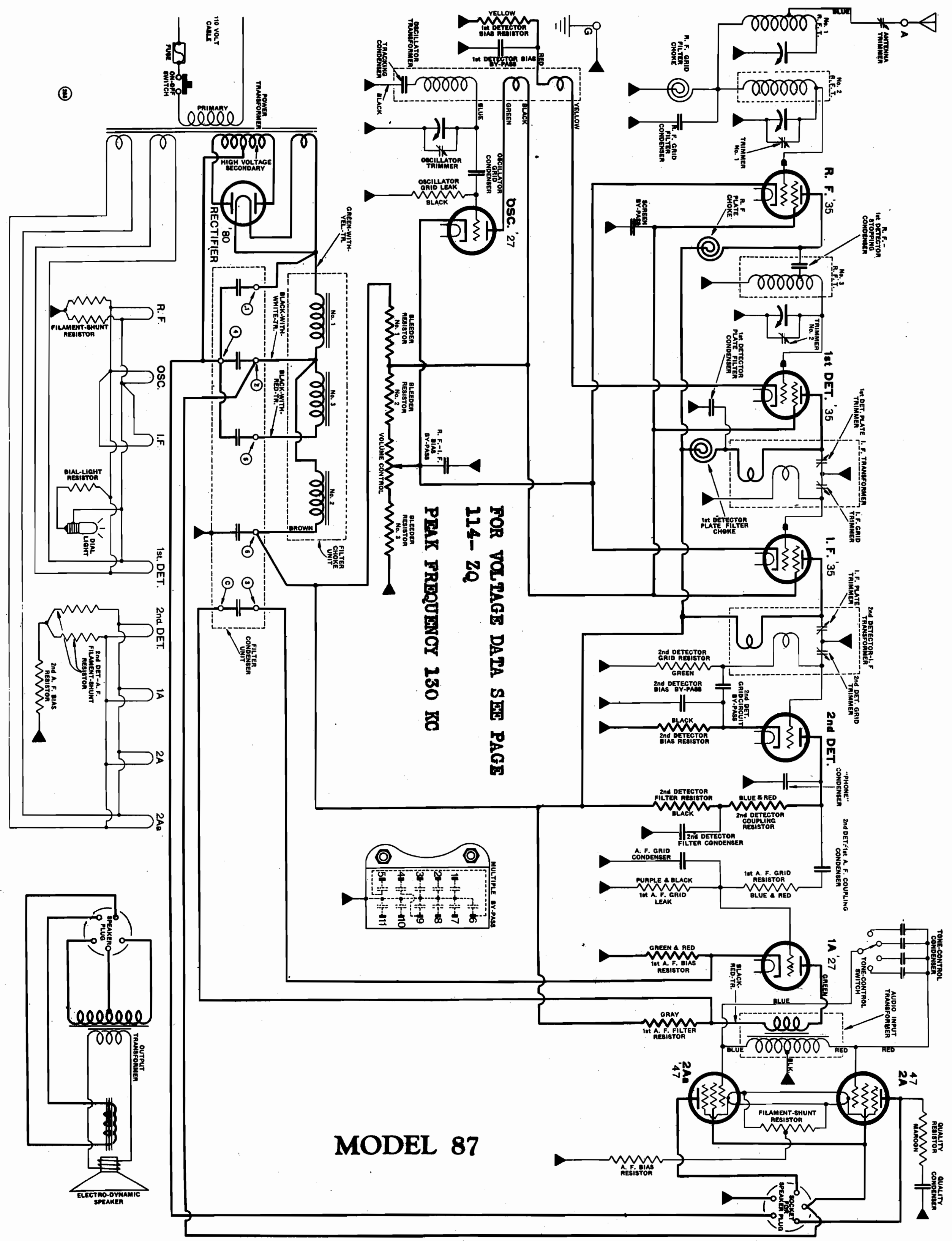

DIAGRAM OF MODEL 87 (A. C.-OPERATED).

In a few early-type Model 87 receivers, No. 2 and No. 3 R. F. transformers are connected between the R. F. tube and the 1st-detector, similar to the arrangement used in early Model 89

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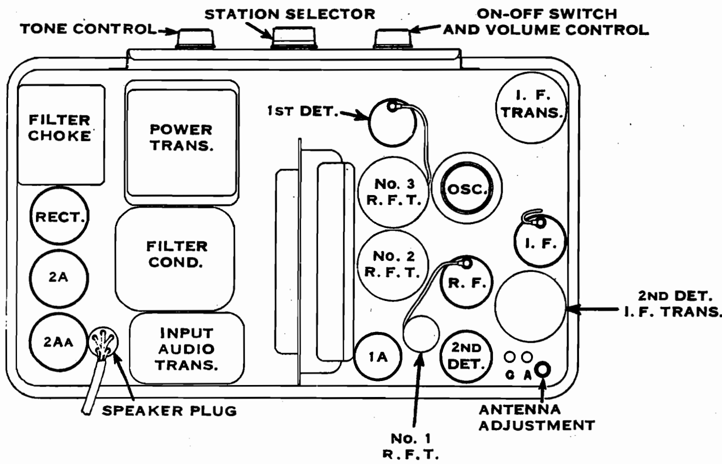
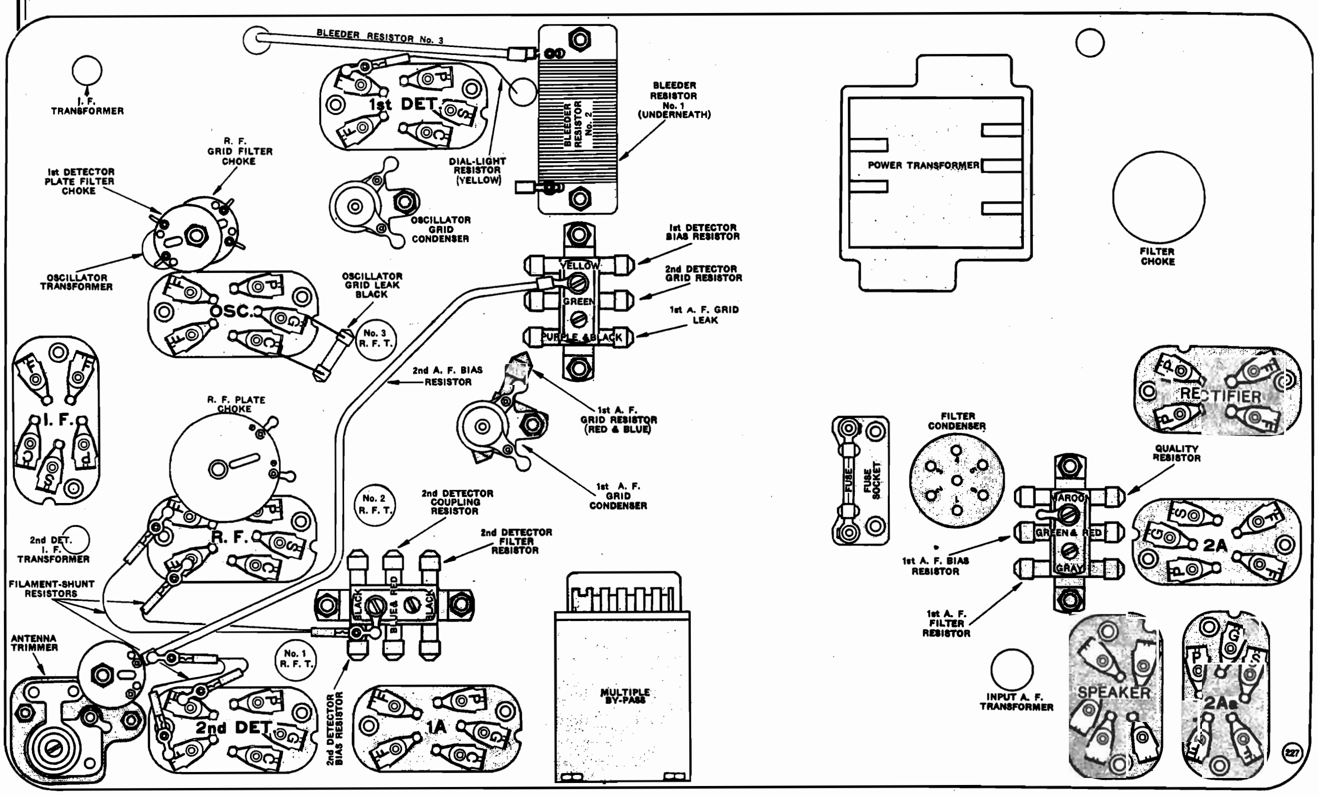
MODEL 87

FOR VOLTAGE DATA SEE PAGE

114- ZQ





Condensers in Multiple By-pass Model 87

The internal connections of the multiple by-pass are shown on page 292.

1—1st-detector plate filter condenser.
2—1st-detector bias by-pass.
3—R. F.—I. F. bias by-pass.
4—2nd-detector grid-circuit by-pass.
5—2nd-detector—1st-A. F. coupling condenser.
6—Phone condenser.
7—R. F. grid filter condenser.
8—Quality condenser.
9—2nd-detector bias by-pass.
10—2nd-detector filter condenser.
11—R. F.—1st-detector—I. F. screen by-pass.

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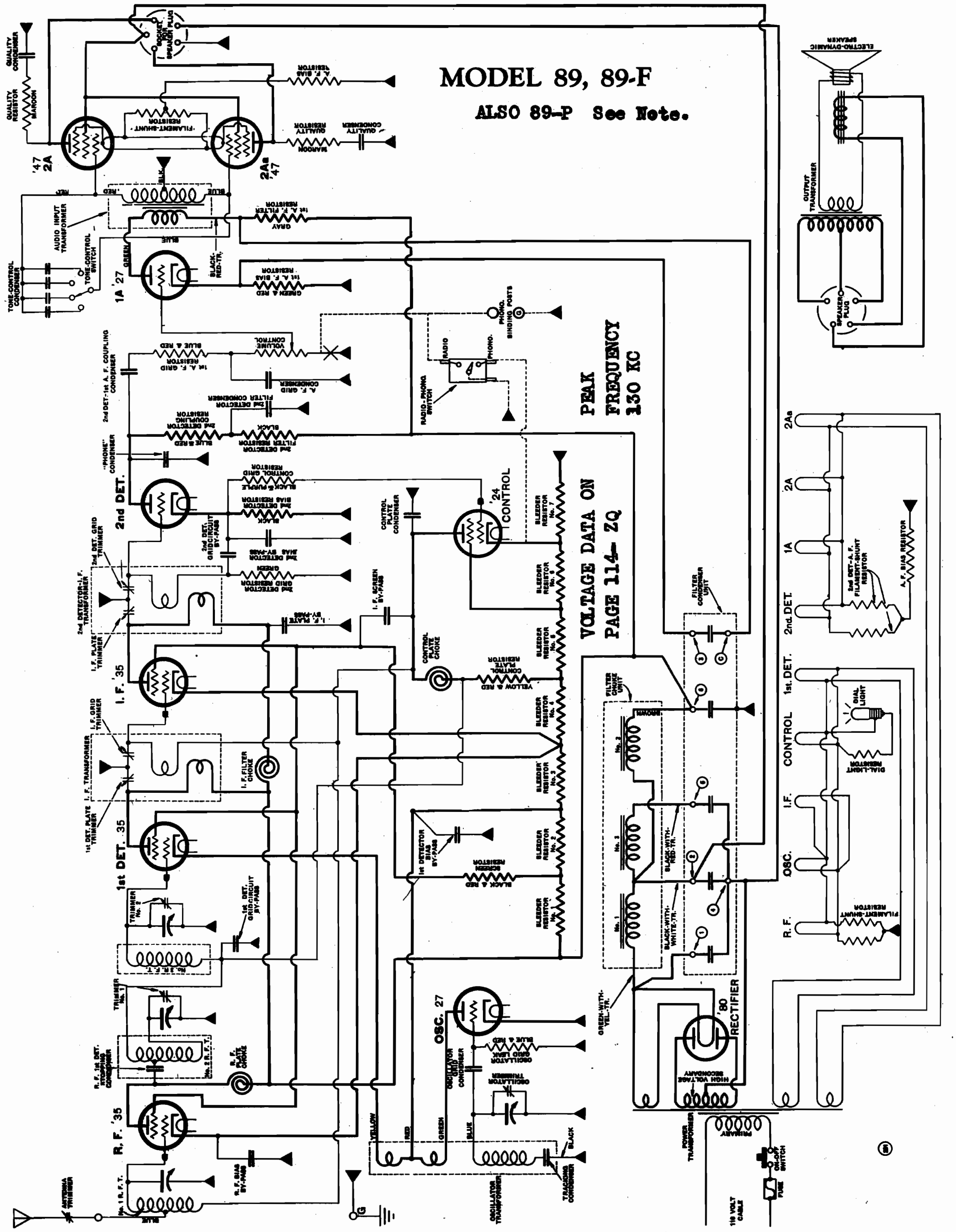

DIAGRAM OF MODEL 89, 89-F, AND 89-P (A. C.-OPERATED).

IMPORTANT: The 2nd-detector grid resistor and the 2nd-detector grid-circuit by-pass are NOT used in this set, and the grid-return of the 2nd-detector connects directly to the chassis.

Later types of this Model have No. 1 and No. 2 R. F. transformers connected ahead of the R. F. tube, as shown in the diagram of Model 87

circuit, and parts in Model 89-P are the same

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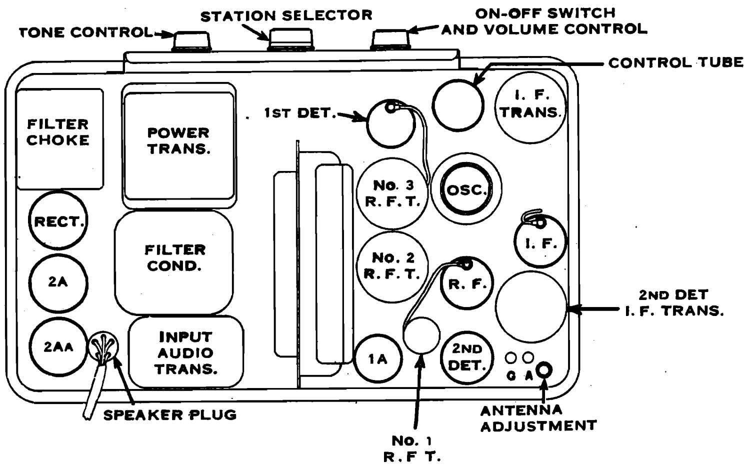
MODEL 89, 89-F

FOR VOLTAGE DATA SEE

PAGE 114- ZQ



Top View of Model 89, 89-F.

Model 89-P has two binding posts for pick-up connection at the rear of the chassis, and a radio-phono toggle switch is mounted on the front panel.

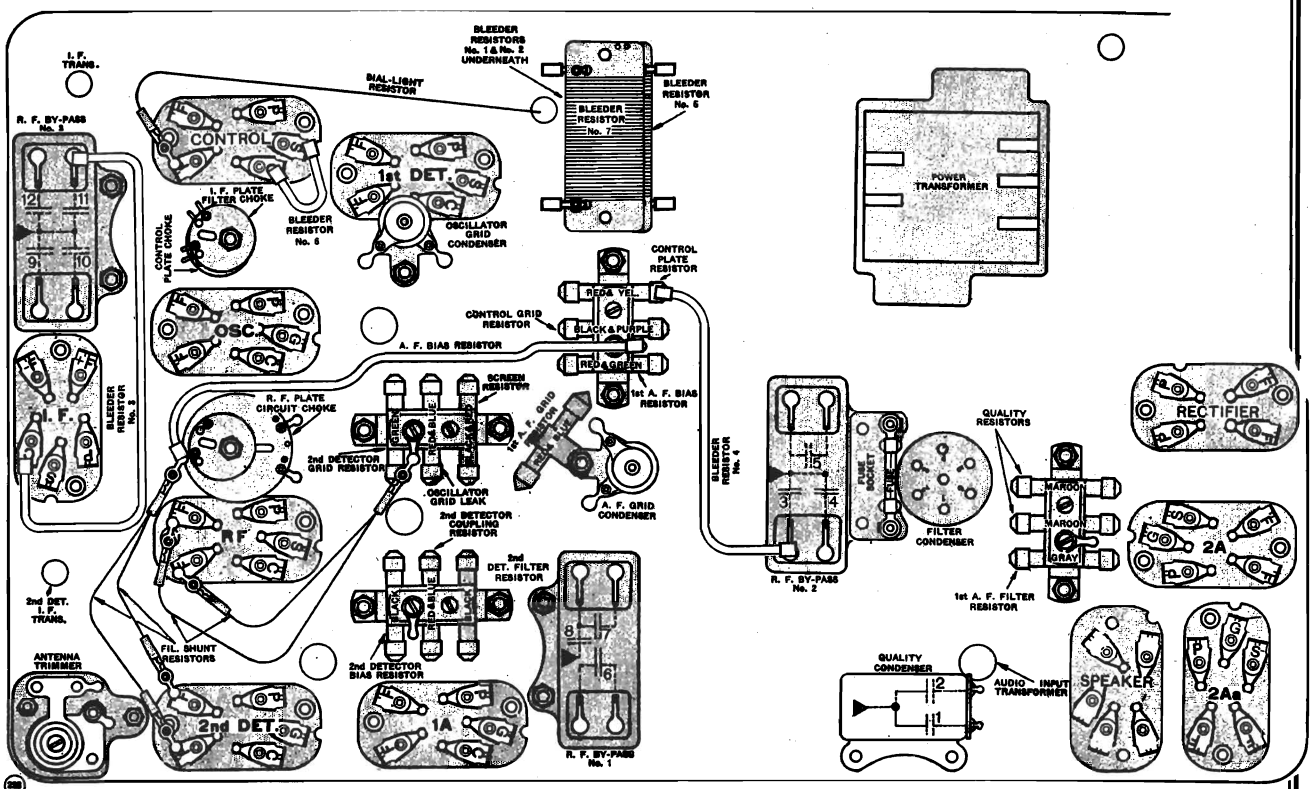


Chart of Model 89, 89-F.

The 2nd-detector grid resistor is not used in late-type Model 89, 89-F, 89-P.

By-pass Condensers in Model 89, 89-F, 89-P

Quality Condenser

1—Quality condenser.
2—Quality condenser.

R. F. By-pass No. 1

6—2nd-detector—1st-A. F. coupling condenser.
7—2nd-detector grid-circuit by-pass.
8—2nd-detector bias by-pass.
(A small "phone" condenser, not shown, is connected internally to the lower-left terminal of by-pass No. 1.)

R. F. By-pass No. 2

3—R. F. bias-by-pass.
4—2nd-detector filter condenser.
5—I. F. screen by-pass.

R. F. By-pass No. 3

9—I. F. plate by-pass.
10—1st-detector grid-circuit by-pass.
11—1st-detector bias by-pass.
12—Control-plate condenser.

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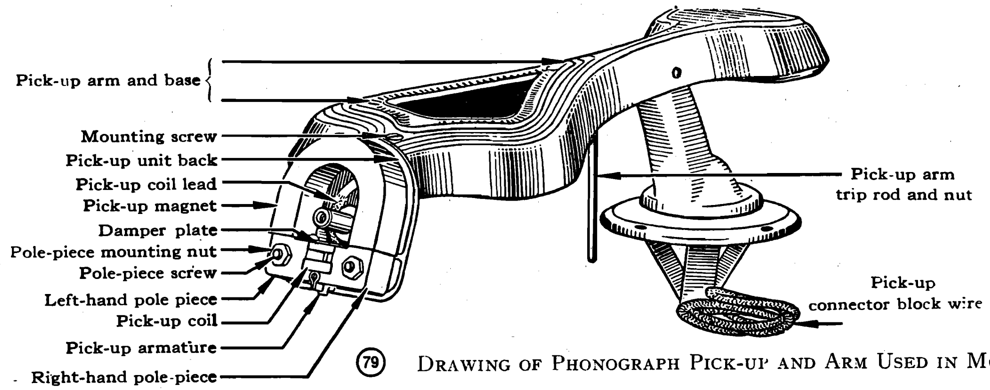
PHONOGRAPH PICKUP AND INDUCTION DISC MOTOR

(USED IN MODELS 75 AND 89-P)



(79) DRAWING OF PHONOGRAPH PICK-UP AND ARM USED IN MODEL 75.

PHONOGRAPH PICK-UP

ARMATURE ADJUSTMENT

The armature-pivot bearings consist of two small strips of rubber (armature spacing cushions) which space the armature from the bearing surfaces on each pole piece.

The top end of the armature fits in a slit in a flat rubber damper. The damper is fastened to a small brass plate that may be adjusted to the right or to the left, in order to center the armature in the magnet gap.

If the armature is off center, as indicated by erratic reproduction, loosen the two round-head screws that hold the damper plate, and move the plate slightly to the right or left to a point where the armature is centered. Tighten the two screws.

When the armature is correctly centered, it should take as much force to move the needle to the left as to the right.

If the rubber damper plate or armature spacing cushions are dried out, or lack life, replace them with new pieces of rubber, which may be secured from your distributor.

If the pick-up magnet must be removed from the pick-up *FIRST* place a steel or iron keeper (a large nail will do across the sides of the magnet poles, *THEN* remove the magnet.

Do *NOT* take off the keeper until *AFTER* the magnet is placed back on its pole pieces in the pick-up.

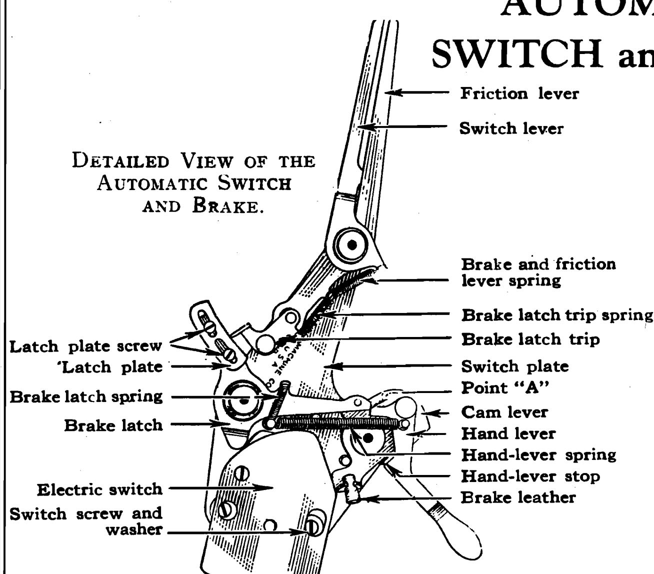
If the magnet is weak, have it re-magnetized, but be sure to place a keeper across the sides of the magnet poles before removing it from the magnetizer, and do not remove the keeper until after the magnet is placed back on its pole pieces in the pick-up.

CONTINUITY TESTS

Test across the two contacts on the neck of the molded pick-up back. The continuity reading should be nearly full. No reading indicates an open pick-up coil or leads.

Test from either contact on the pick-up to each pole piece, and to the armature. If there is any reading, it indicates that the pick-up coil or leads are grounded. This must be eliminated. Use two small pieces of thin cambric cloth to insulate the pick-up coil from the pole pieces.

AUTOMATIC ELECTRIC SWITCH and FRICTION BRAKE



DETAILED VIEW OF THE AUTOMATIC SWITCH AND BRAKE.

ADJUSTMENTS

(1) If the latch does not trip, or trips before completion of a record, bend the hand-lever stop slightly to the right or left, as necessary.

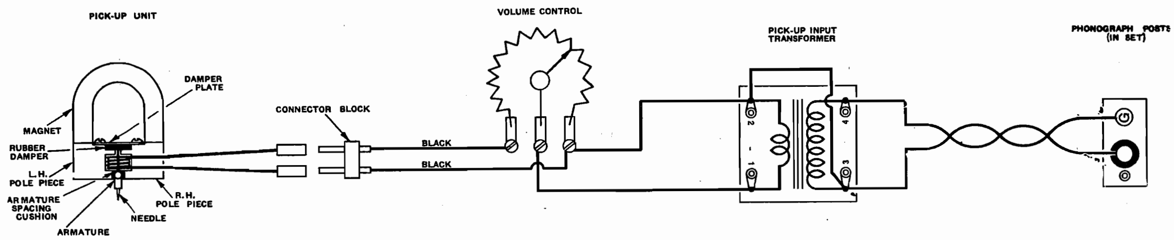
(2) If the latch trip does not engage correctly with the latch-plate, loosen the two latch-plate screws and shift the plate one way or the other, as necessary. Re-tighten the screws Remove any burrs from the teeth of the latch plate with fine emery paper.

(3) If the electric switch does not make and break contact when the hand-lever is turned on and off, it may be necessary to bend the long contact spring, or loosen the two switch screws and move the switch until the correct position is found. In the off position, there should be at least $\frac{1}{16}''$ gap between the contact points.

December, 1930.

ATWATER KENT MFG. CO.

PHONOGRAPH PICKUP AND INDUCTION DISC MOTOR (USED IN MODELS 75 AND 89-P)



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ELECTRICAL CONNECTIONS OF PICK-UP, VOLUME CONTROL AND INPUT TRANSFORMER.

INDUCTION DISC PHONOGRAPH MOTOR

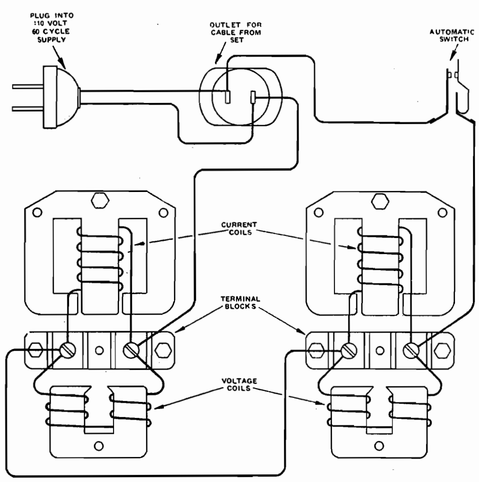

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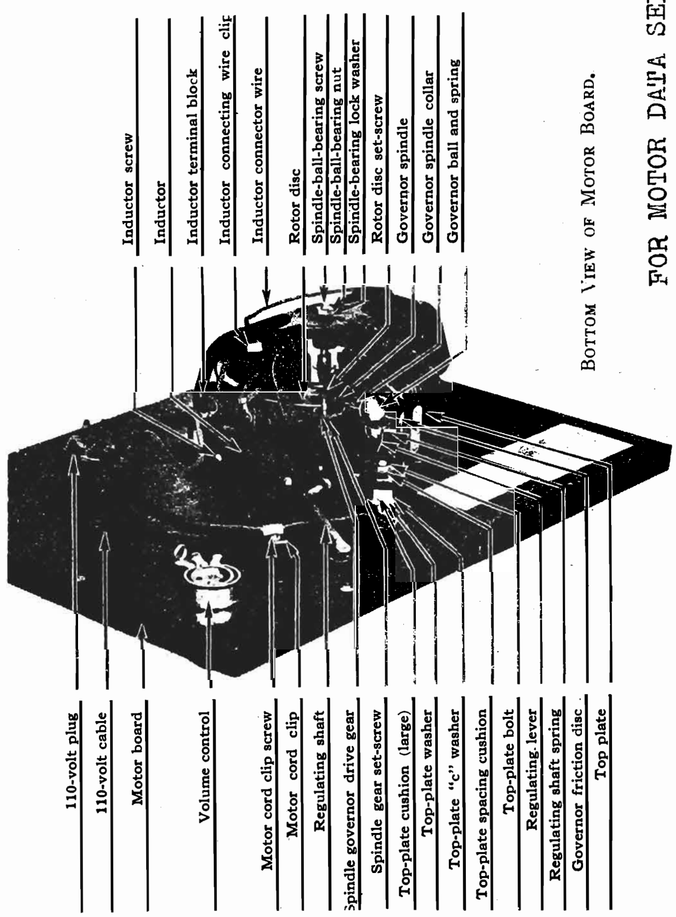
FIG. 237. ELECTRICAL CONNECTIONS OF THE INDUCTION-DISC PHONOGRAPH MOTOR.

The induction-disc phonograph motor has two sets of field coils or "inductors." Each inductor has three coils and five "poles." A magnetic field is produced between the poles by the alternating current flowing through the three coils.

The edge of a non-magnetic rotor disc fits in the narrow gap between the poles on each inductor. The magnetic field between the poles causes the disc to rotate.

The rotor disc itself has no coils, and there are no electrical connections to it.

The speed of the rotor disc is controlled by a governor and a regulating screw device. The correct speed is 78 revolutions per minute (with pick-up on record). The speed may be determined by counting the number of revolutions made by the turntable in one minute. It is preferable,



BOTTOM VIEW OF MOTOR BOARD.

however, to regulate the speed with the aid of a stroboscope disc, which may be purchased from your distributor. Simple instructions for the use of this inexpensive device are printed on the back of the stroboscope disc. The speed should be checked at least twice a year.

The motor and governor bearings and gears must be kept well greased at all times. See chart on bottom of motor board.

When an induction-disc motor requires repair, it is advisable to tear it down completely, replace the defective parts, clean and grease all parts, and reassemble correctly.

FOR MOTOR DATA SEE NEXT PAGE

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VOLTAGE TABLE

FOR MODEL 80, 81, 82, 82-D, 82-Q, 83, 84, 84-D, 84-Q, 85, 85-Q, 86, 87 and 89

The voltages listed in this table are only approximate, and are measured values, not actual operating values. Turn volume control to maximum.

Use 250-volt scale of a 1000-ohm-per-volt D. C. voltmeter.

All plate, screen and grid measurements are made from cathode in heater-type tube, and from —F in plain-filament-type tube.

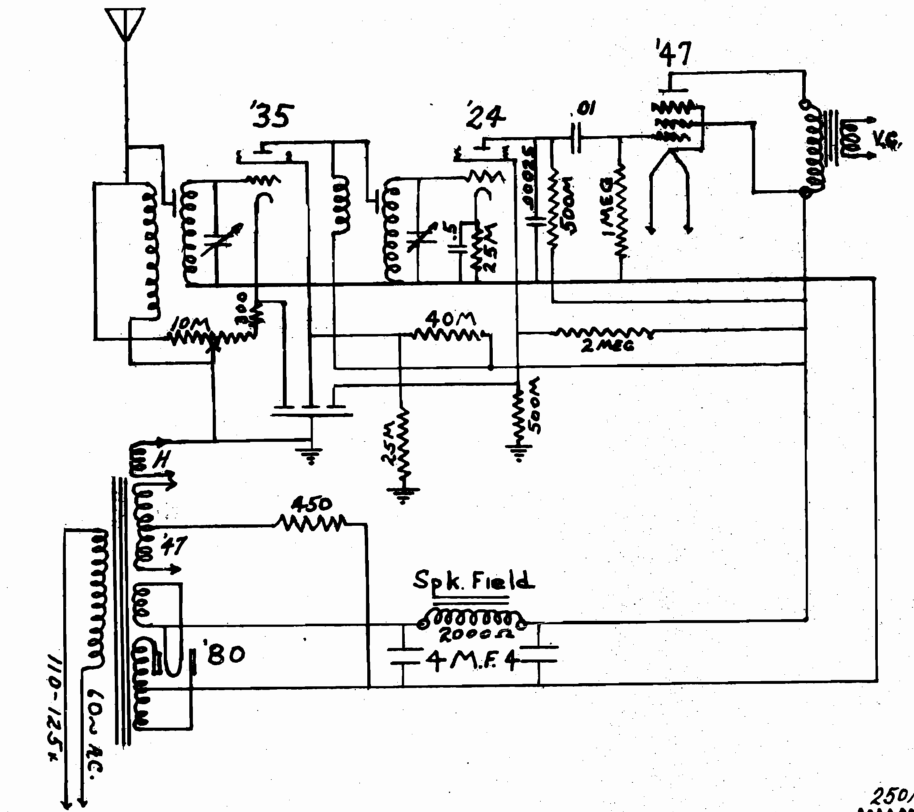
When replacing a tubular resistor, use a resistor of the same identifying color. In a few cases, owing to engineering changes, the color of a resistor in a chassis may not agree with the color specified in the diagram. In such a case, disregard the diagram and use a replacement resistor having the same color as the defective unit. However, if a resistor has been removed, or its identification destroyed, replace it with a resistor having the color that is specified in the diagram for that set.

		MODEL 80	MODEL 81	MODEL 82	MODEL 82-D	MODEL 82-Q	MODEL 83	MODEL 84	MODEL 84-D	MODEL 84-Q	MODEL 85	MODEL 85-Q	MODEL 86	MODEL 87	MODEL 89
	LINE VOLTAGE	110	—	110	112	—	110	110	120	—	110	—	115	110	110
	TOTAL "B" VOLTAGE	—	125	—	—	125	—	—	—	125	—	125	—	—	—
R. F. TUBE**	FILAMENT	—	5.5	—	—	2	—	—	—	2	—	—	2.4	2.4	2.4
	PLATE	—	125	—	—	125	—	—	—	125	—	—	125	170	125
	SCREEN	—	75	—	—	60	—	—	—	65	—	—	40	80	50
	GRID	—	SMALL	—	—	3	—	—	—	3	—	—	2	2	2
1ST DET. TUBE†	FILAMENT	2.4	5.5	2.4	5.5	2	2.4	2.4	5.7	2	2.4	2	2.4	2.4	2.4
	PLATE	225	95	135	70	125	225	205	80	125	135	125	125	160	120
	SCREEN	90	—	50	50	40	90	65	50	25	50	40	35	70	45
	GRID	5	7	4	5	3	5	6	5	3	3	3	4	11	4
I. F. TUBE	FILAMENT	2.4	—	2.4	6	2	2.4	2.4	6.5	2	2.4	2	2.4	2.4	2.4
	PLATE	230	—	140	95	125	230	215	105	125	135	125	125	170	125
	SCREEN	95	—	50	50	60	95	65	55	65	50	65	40	80	50
	GRID	2	—	SMALL	SMALL	3	2	3	SMALL	SMALL	2	3	2	2	2
2ND DET. TUBE	FILAMENT	2.4	—	2.4	5.5	2	2.4	2.4	5	2	2.4	2	2.4	2.4	2.4
	PLATE	110	—	105	55	45	110	90	55	60	100	40	95	90	120
	SCREEN	45	—	65	10	25	45	45	10	25	65	25	60	—	—
	GRID	5	—	8	2	3	5	6	1	3	7	3	8	SMALL	15
1ST A. F. TUBE	FILAMENT	2.4	5.5	2.4	5.5	2	2.4	2.4	6	2	2.4	2	2.4	2.4	2.4
	PLATE	230	120	230	75	55	230	205	80	55	215	55	210	90	120
	SCREEN	240	123	240	—	—	240	215	—	—	225	—	220	—	—
	GRID	4	11	5	3	3	4	5	2.5	3	5	3	5	3	4
2ND A. F. TUBE	FILAMENT	—	—	—	2	2	—	—	2	2	—	2	—	2.4	2.4
	PLATE	—	—	—	85	120	—	—	90	120	—	120	—	200	225
	SCREEN	—	—	—	90	125	—	—	95	125	—	125	—	210	235
	GRID	—	—	—	7	15	—	—	7	5	—	15	—	14	14
OSC. TUBE	FILAMENT	2.4	—	2.4	5	2	2.4	2.4	6	2	2.4	2	2.4	2.4	2.4
	PLATE	95	—	95	100	60	100	70	110	60	100	40	95	85	100
	GRID	*	—	*	*	*	*	*	*	*	*	*	*	*	*
CONTROL TUBE	FILAMENT	—	5.5	2.4	—	—	—	—	—	—	2.4	—	2.4	—	2.4
	PLATE	—	3	15	—	—	—	—	—	—	15	—	30	—	25
	SCREEN	—	—	8	—	—	—	—	—	—	7	—	7	—	5
	GRID	—	2	4	—	—	—	—	—	—	5	—	4	—	3

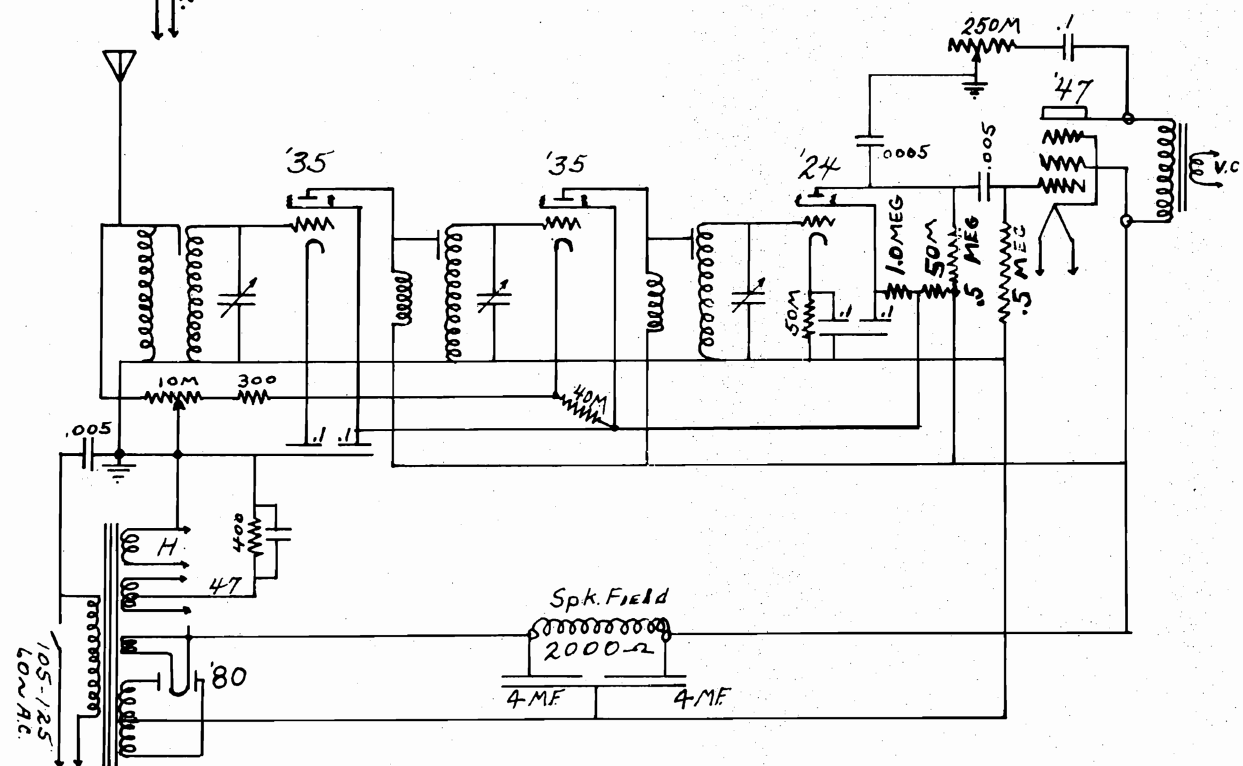
* The measured oscillator grid voltage will vary dependent on the capacity of the voltmeter leads. In some cases, the presence of the leads will stop oscillation and no reading will be secured for grid bias. In other cases, the reading will be only slight, or it may be as high as 10 volts.

**This includes the 1st, 2rd and 3rd R. F. tubes in Model 81. †This is the detector tube in Model 81.

AUDIOLA RADIO CO.



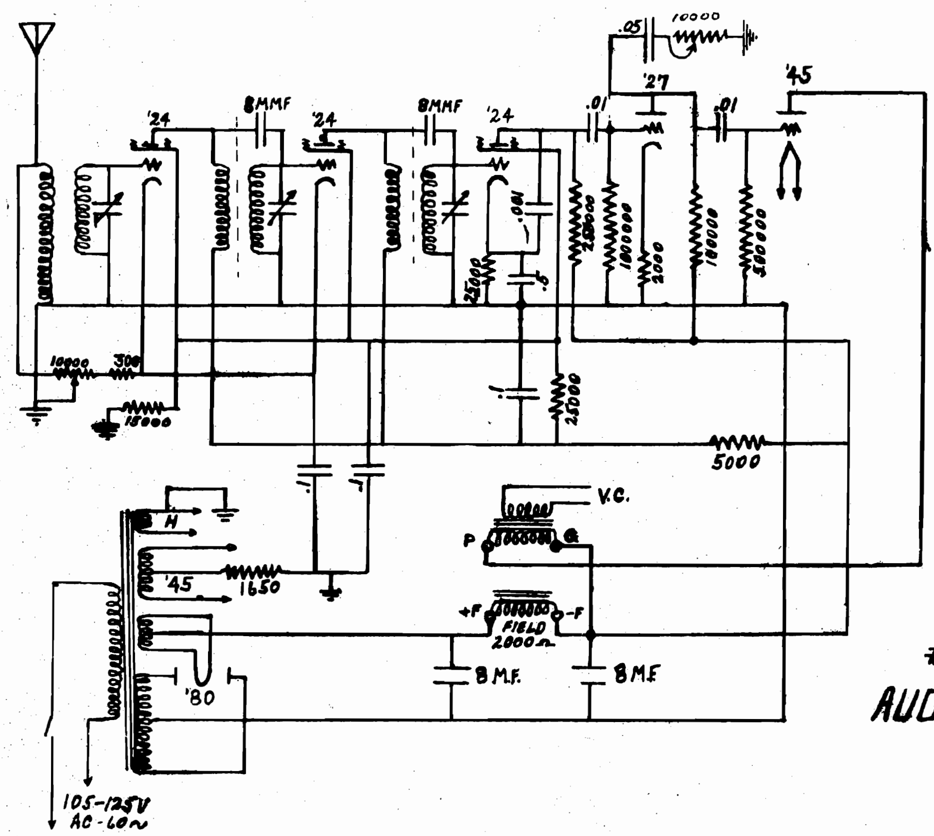
#62231
4T-31-R.F



13T5

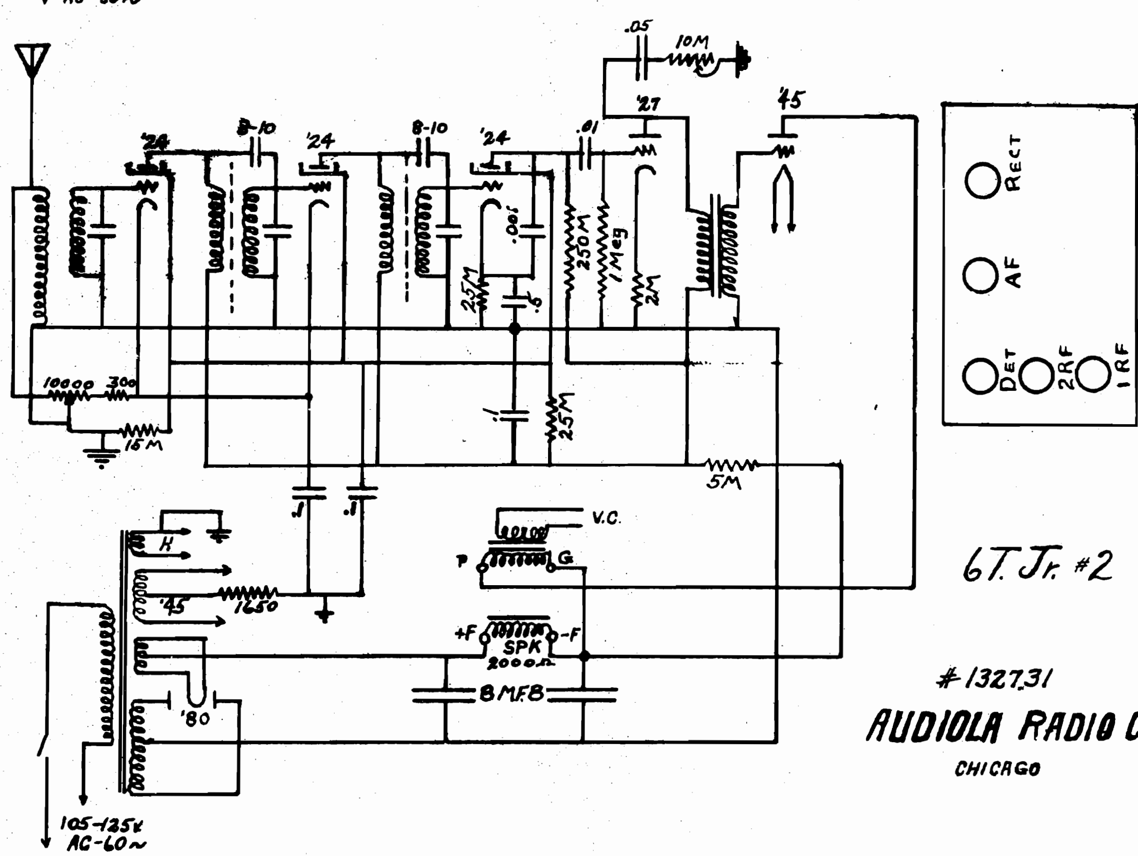
Audiola Radio Co.
Chicago
#9631

AUDIOLA RADIO CO.



6T. Jr. #1

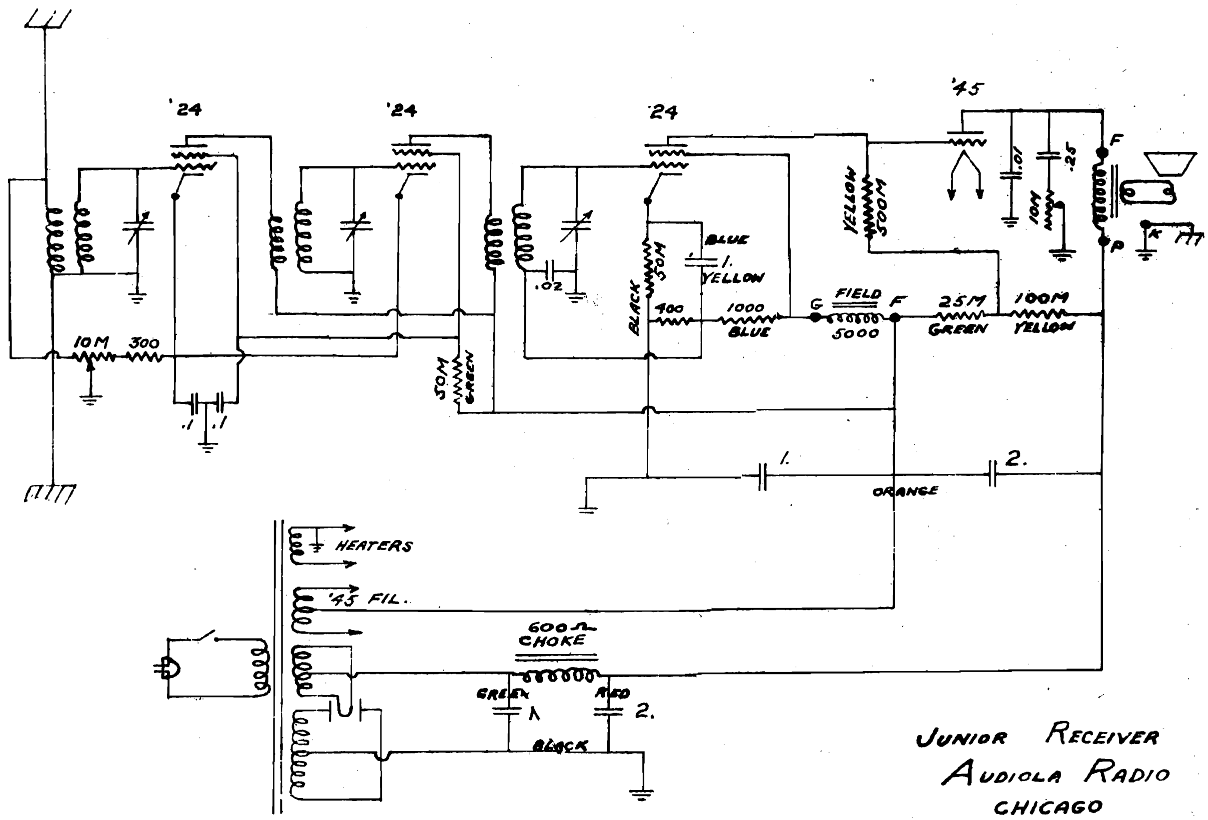
1531
AUDIOLA RADIO CO
CHICAGO



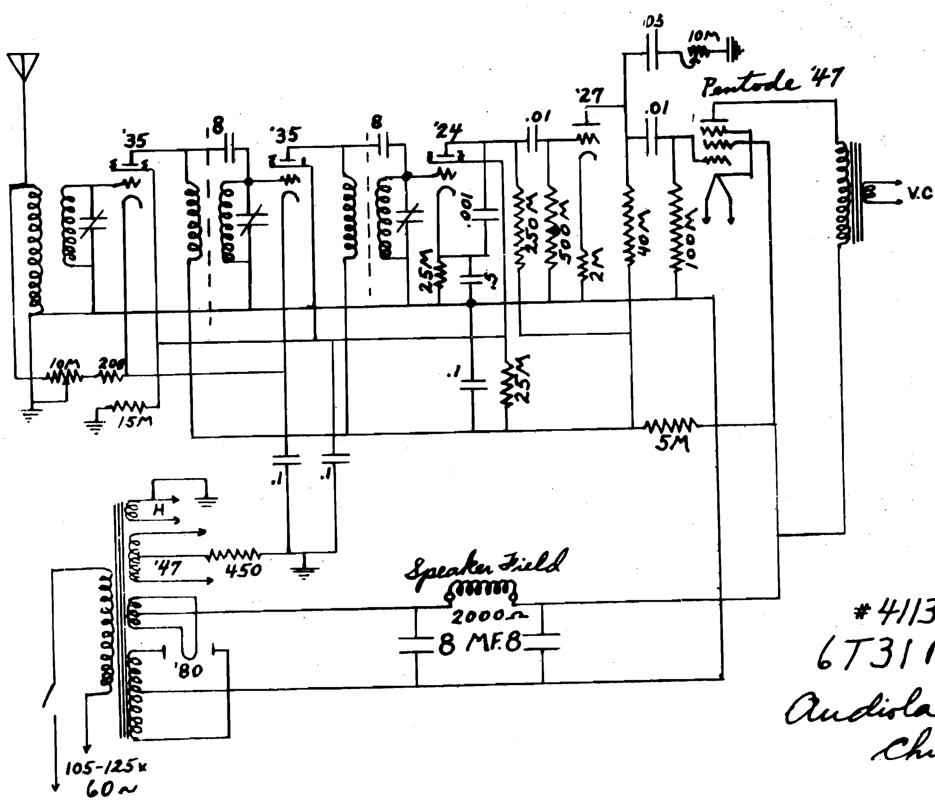
6T. Jr. #2

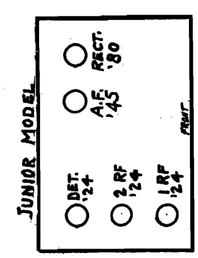
#1327.31
AUDIOLA RADIO CO
CHICAGO

AUDIOLA RADIO CO.



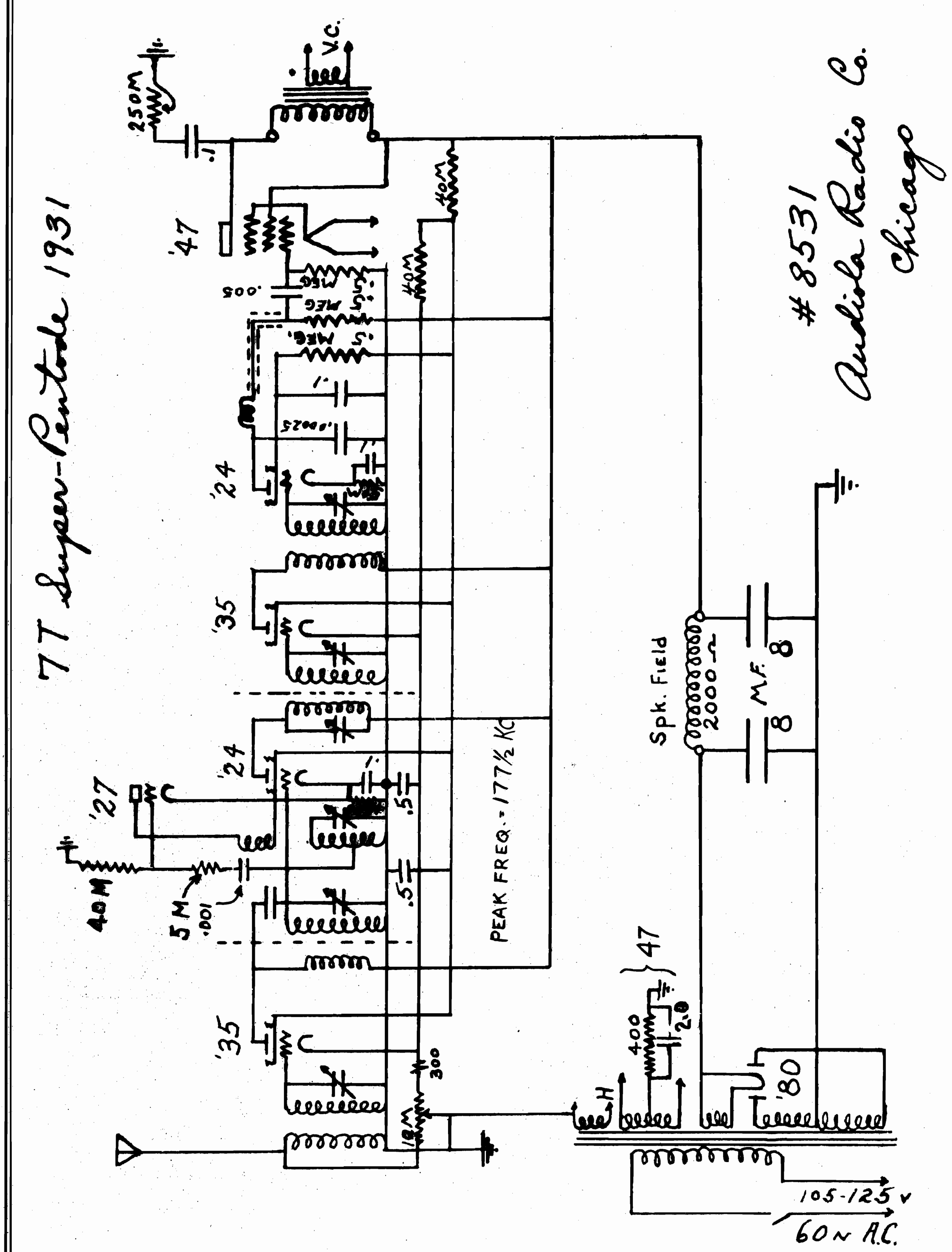
JUNIOR RECEIVER
AUDIOLA RADIO
CHICAGO
DWG #101330



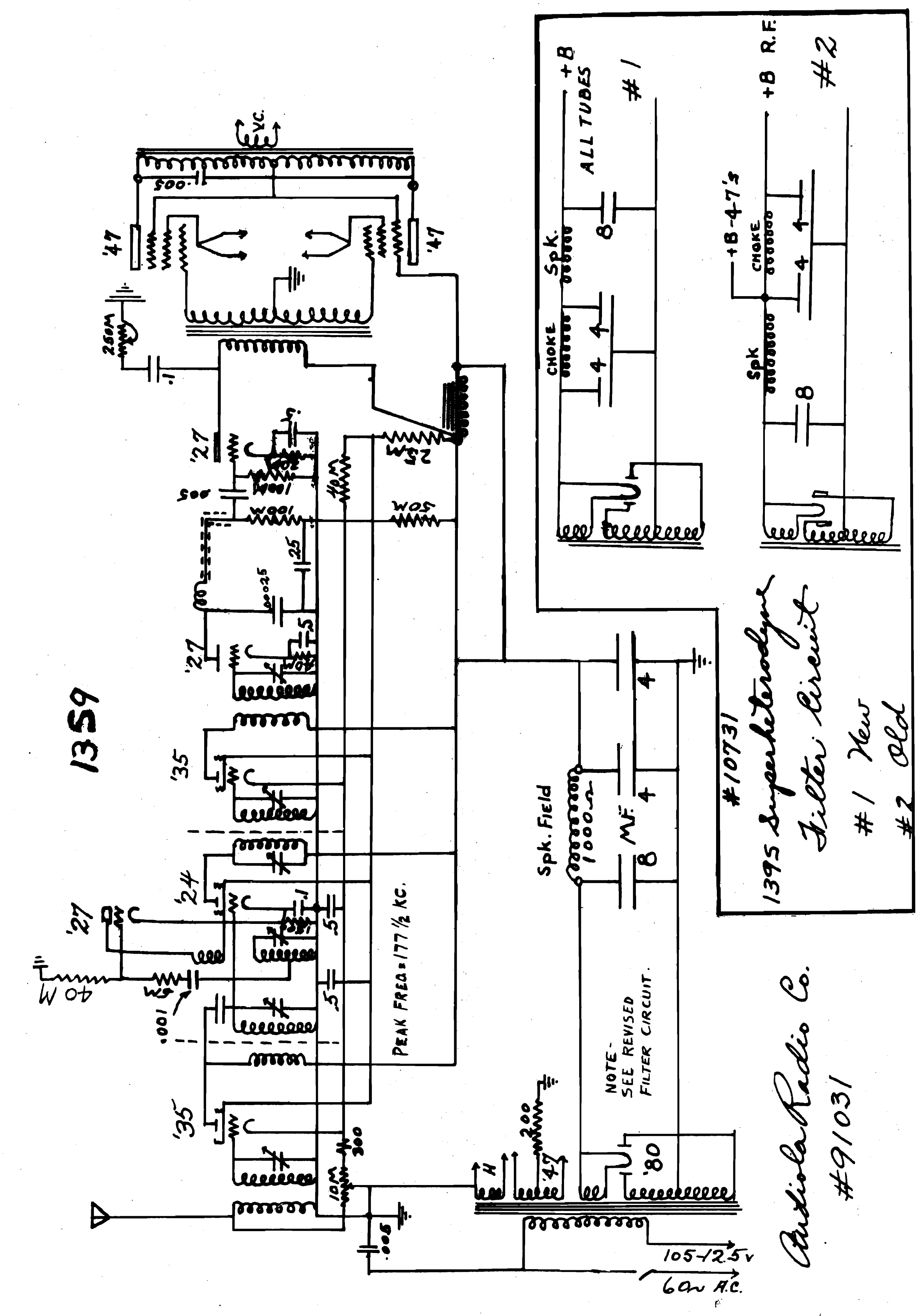


#41131
6T31 Pentode
Audiola Radio Co.
Chicago.

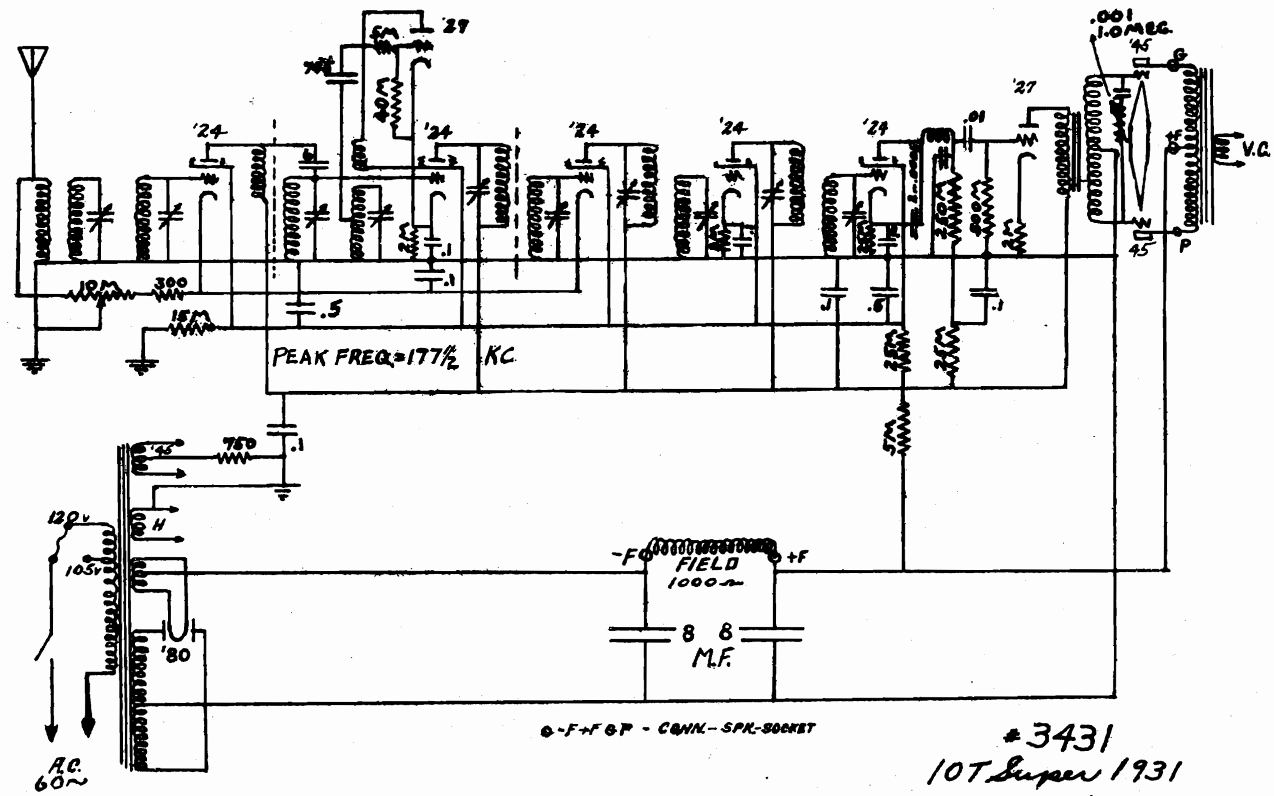
AUDIOLA RADIO CO.



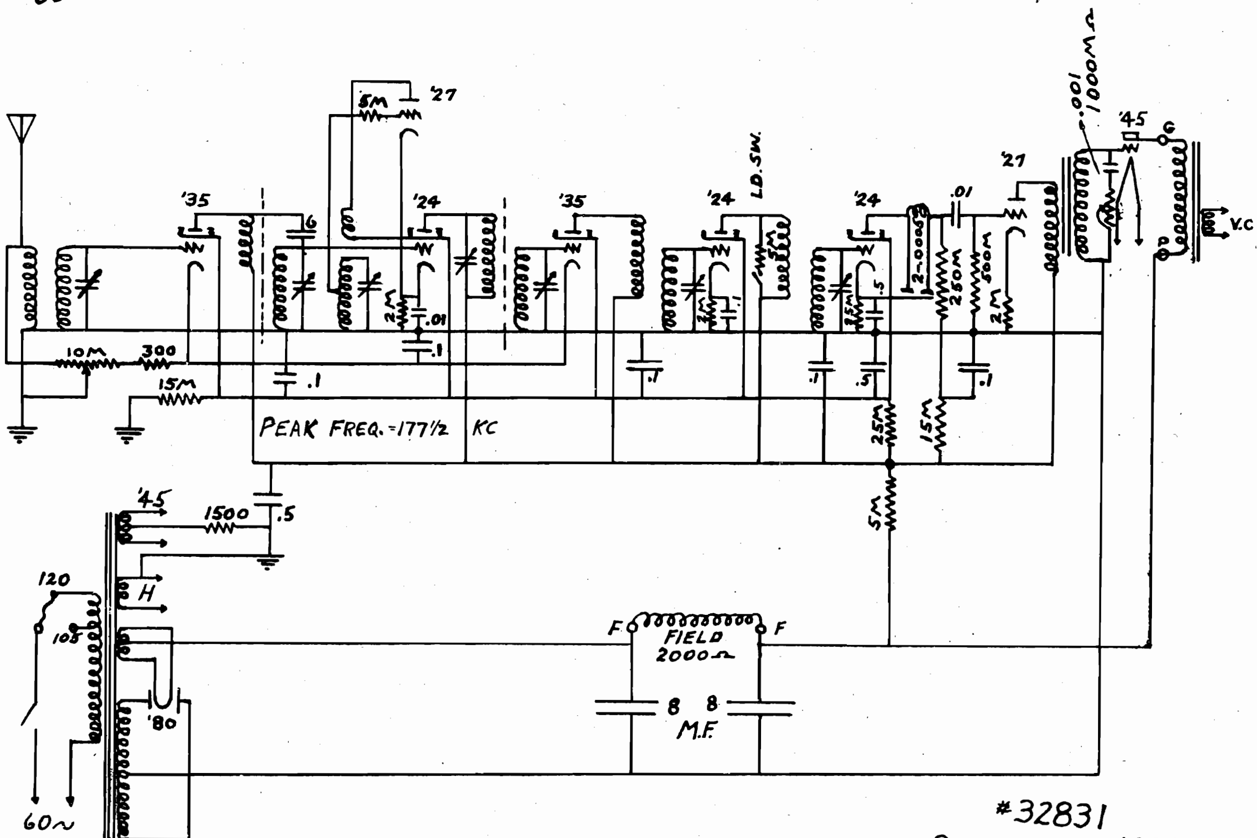
AUDIOLA RADIO CO.



AUDIOLA RADIO CO.

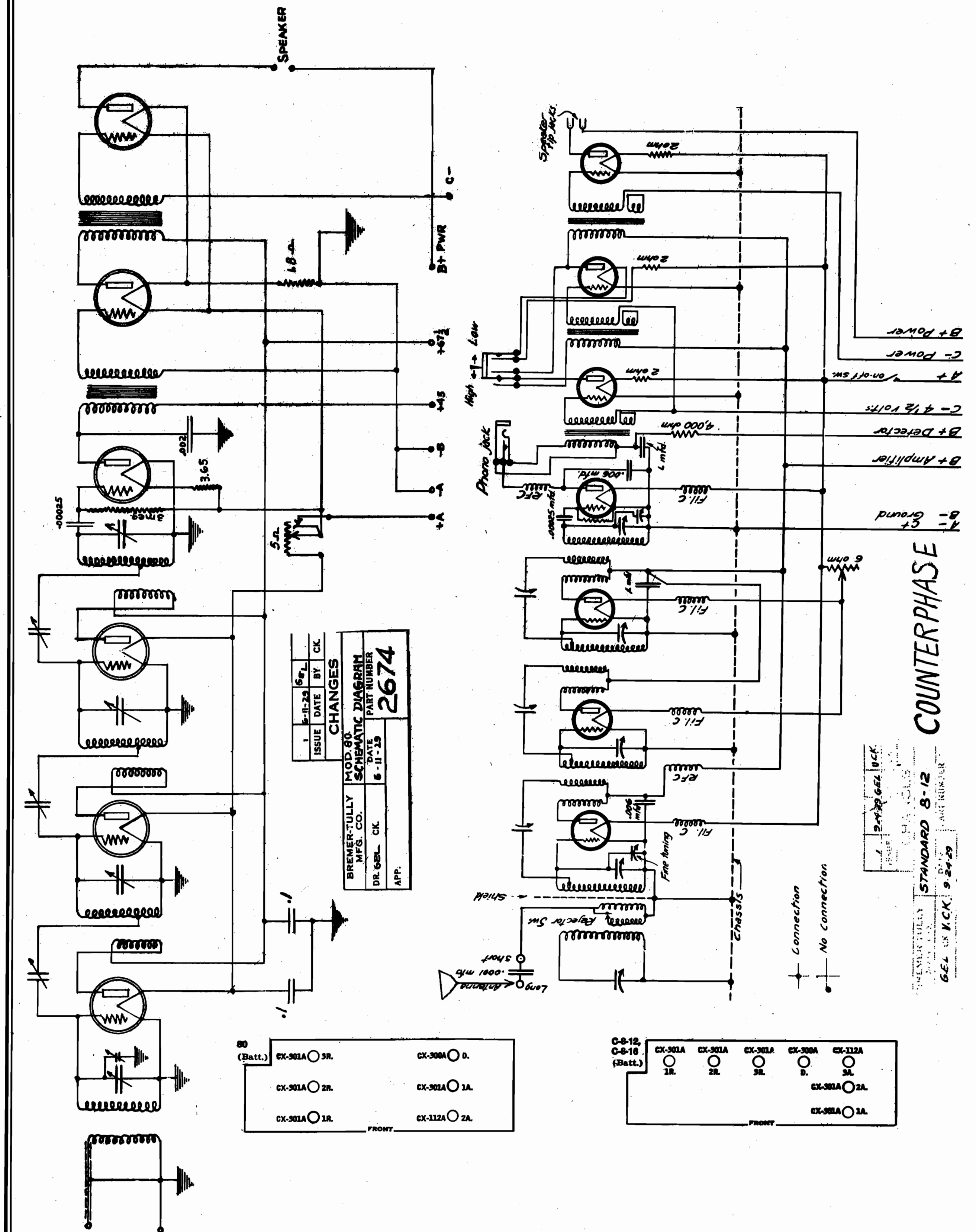


\#3431
10T Super 1931



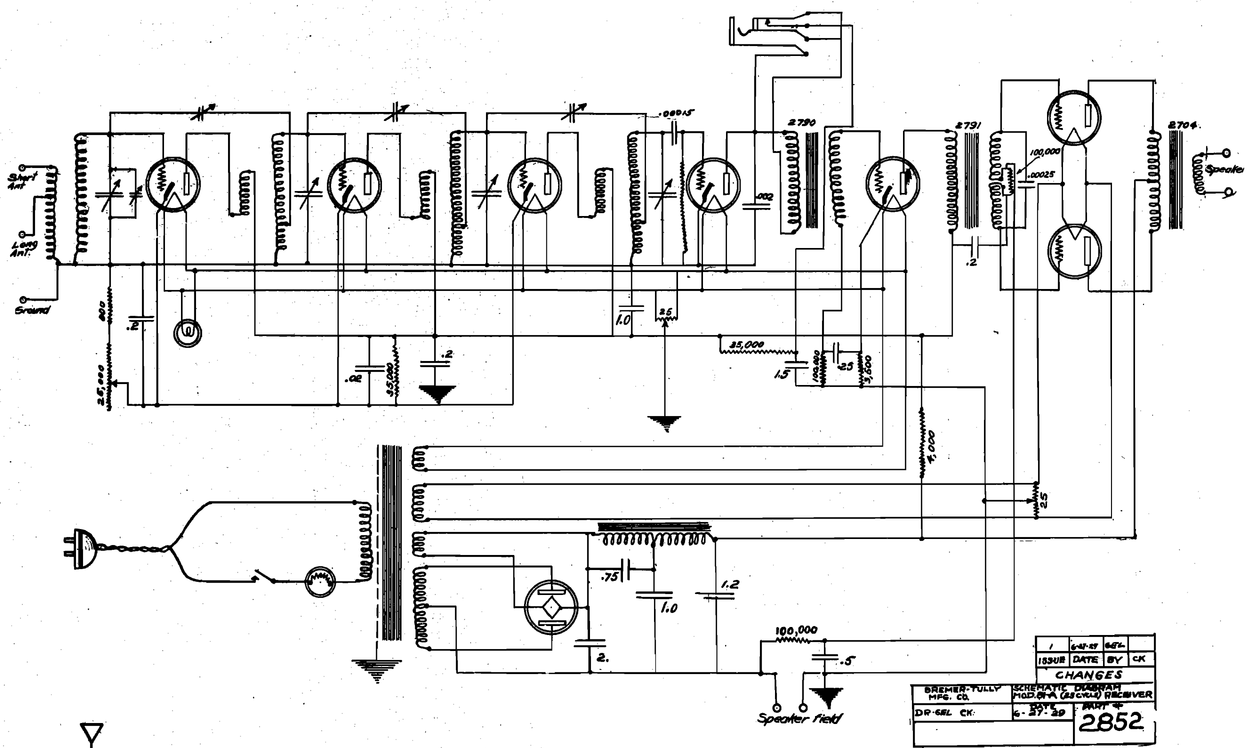
\#32831
9T45 Super 1931
Audiola Radio Co
Chicago

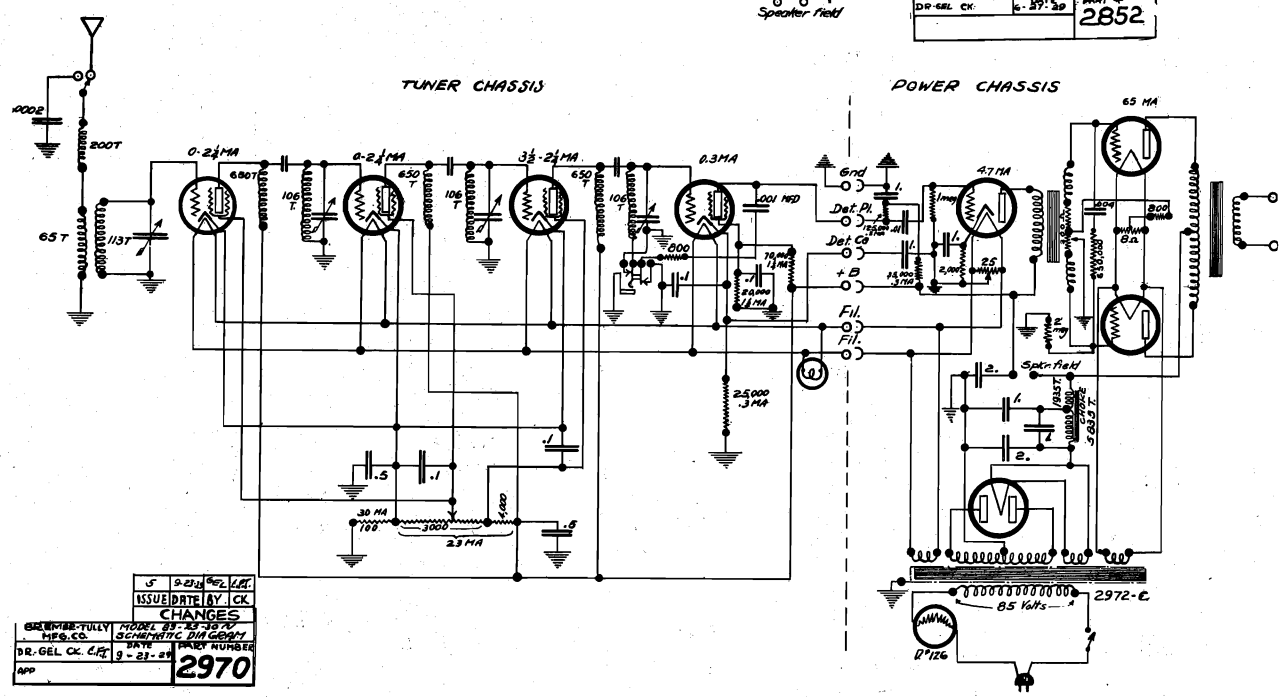
BREMER-TULLY MFG. CO



MODEL 80 MODEL 8-12 "COUNTERPHASE"

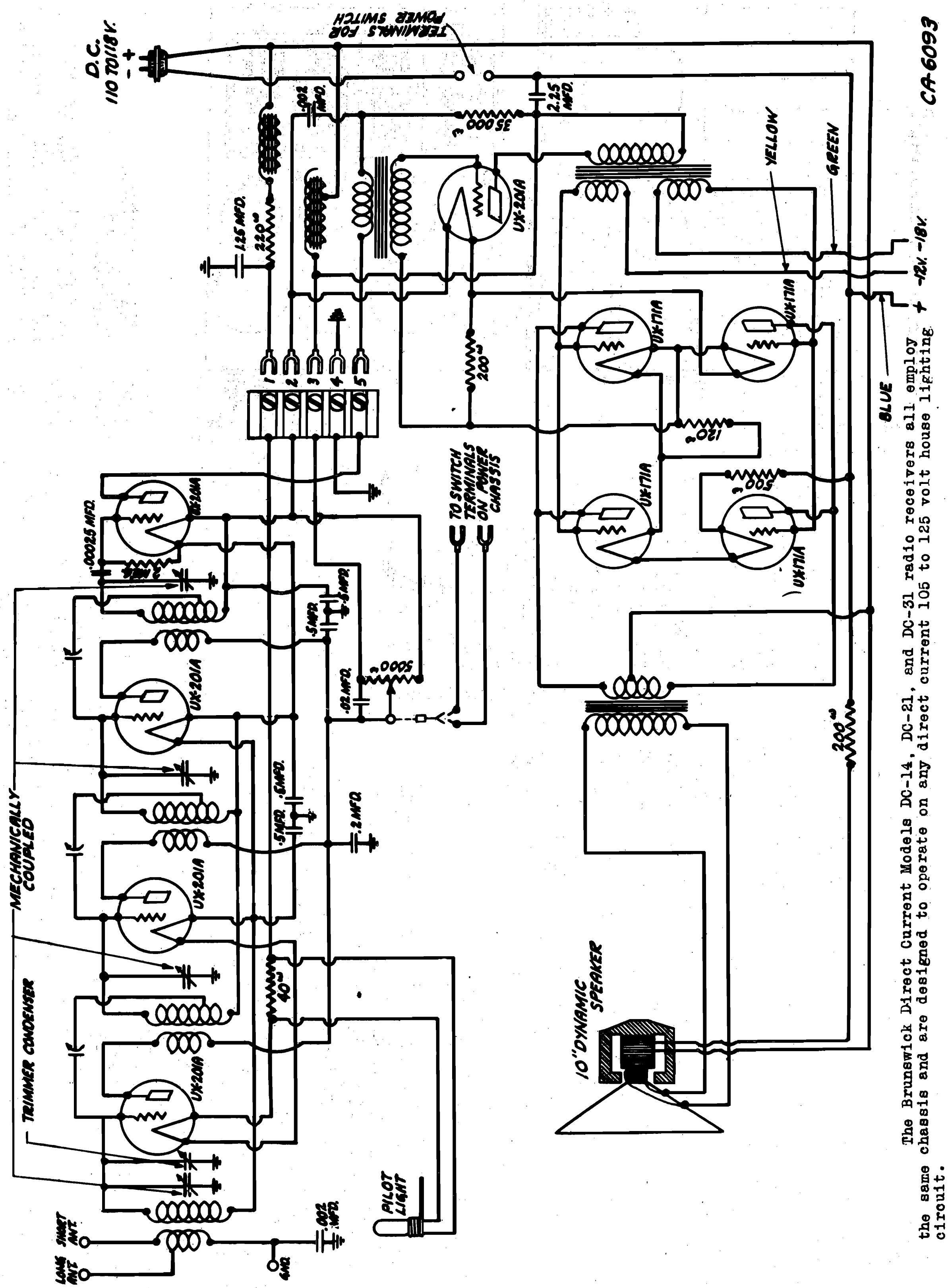
BREMER-TULLY MFG. CO





MODEL 81-A (25 CYCLE)
MODEL 83 (25-30 CYCLE)

BRUNSWICK RADIO CORP.

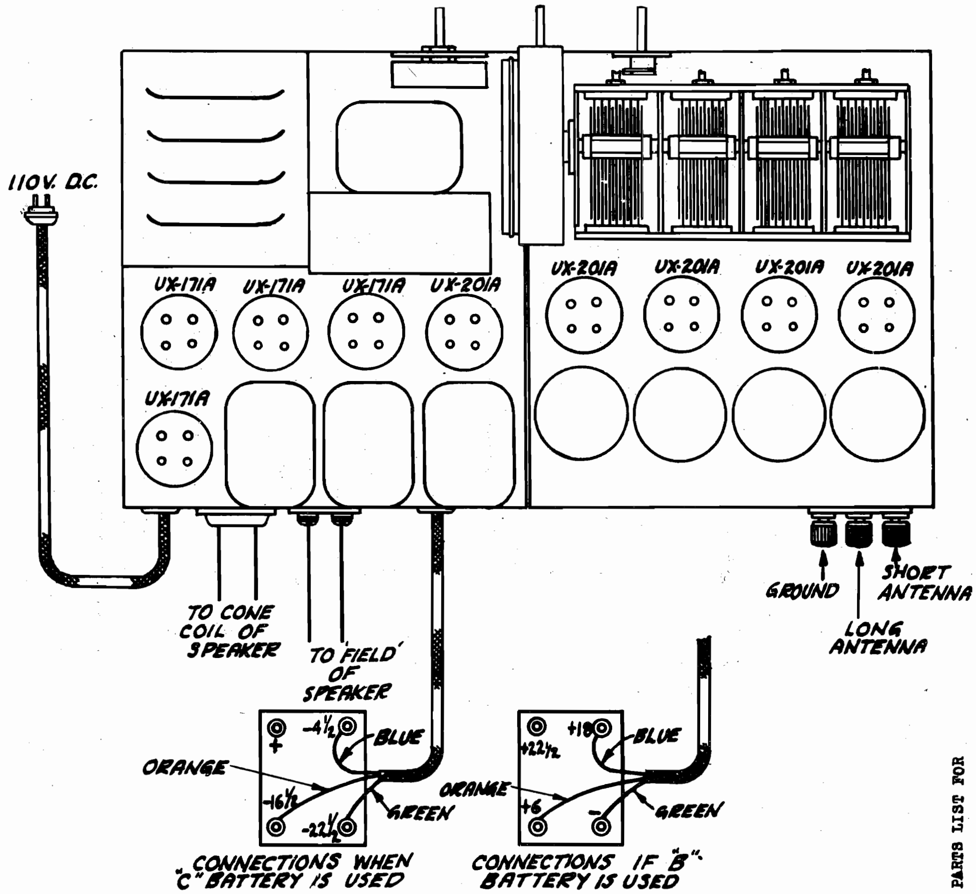


The Brunswick Direct Current Models DC-14, DC-21, and DC-31 radio receivers all employ the same chassis and are designed to operate on any direct current 105 to 125 volt house lighting circuit.

MODELS DC-14, DC-21 & COMBINATION MODEL DC-31 with PANATROPE

MODELS DC-14, DC-21 & COMBINATION MODEL DC-31 with PANATROPE

BRUNSWICK RADIO CORP.



EXTERNAL BATTERY CONNECTIONS

Part No.	
X-1314	Choke Mounting Brackets
X-1315	5" Bolt for Mtg. Resistor
X-1316	R.F. Socket Strip
X-1130	6 Volt Pilot Light
X-1300	D.C. Chassis Complete - Models 14 and 21
X-1310	D.C. Chassis Complete - Model 31
X-1317	D.C. Phono Motor (Gordon Type)
X-1318	Audio Chassis for D.C. Models 14 and 21,
X-1319	R.F. Chassis for D.C. Models 14, 21, and 31
X-1320	Audio Chassis for D.C. Model 31

REPLACEMENT PARTS LIST FOR

D.C. MODELS 14. 21. & 31

Part No.	
X-1301	Resistance Unit, 200 ohms (Large Brown)
X-1302	Resistance Unit, 220 ohms (Large Brown)
X-1303	Resistance Unit, 500 ohms (Large Brown)
X-1304	Resistance Unit, 120 ohms (Purple)
X-1305	Resistance Unit, 200 ohms (Grey)
X-673	Resistance Unit, 35,000 ohms (Yellow)
X-1307	Resistance Unit, 40 ohms (Wire Wound)
X-1308	Double Filament By-Pass Cond. - 5 mfd. (W-6428)
X-1309	Series Ground Cond. - .002 mfd.
X-1311	Insulating Bushings for Vol. Cont.
X-1312	Insulating Bushings for Gnd. Binding Post.
X-1313	Heavy Duty Filament Choke

VOLTAGE READINGS AT SOCKETS

Socket	Tube	Type	Filament	Grid	Plate
#1	1st R.F.	UX-201-A	5.5	-9	80
#2	2nd R.F.	" "	5.	-9	80
#3	3rd R.F.	" "	5.25	-5	80
#4	Detector	" "	5.25	0	32
#5	1st Audio	" "	5.75	-9	88
#6	Power Stage	UX-171-A	5.	-24	96
#7	" "	" "	5.	-15	88
#8	" "	" "	4.3	-15	92
#9	" "	" "	4.3	-22½	96

These readings will hold within 10% when taken with any reliable make of set analyzer with the tube in the socket of the set analyzer, the line voltage at 120 volts, and the volume control on maximum. Filament voltage will vary with different tubes because their filament resistance varies.

METHOD OF ADJUSTING NEUTRALIZING CONDENSERS.

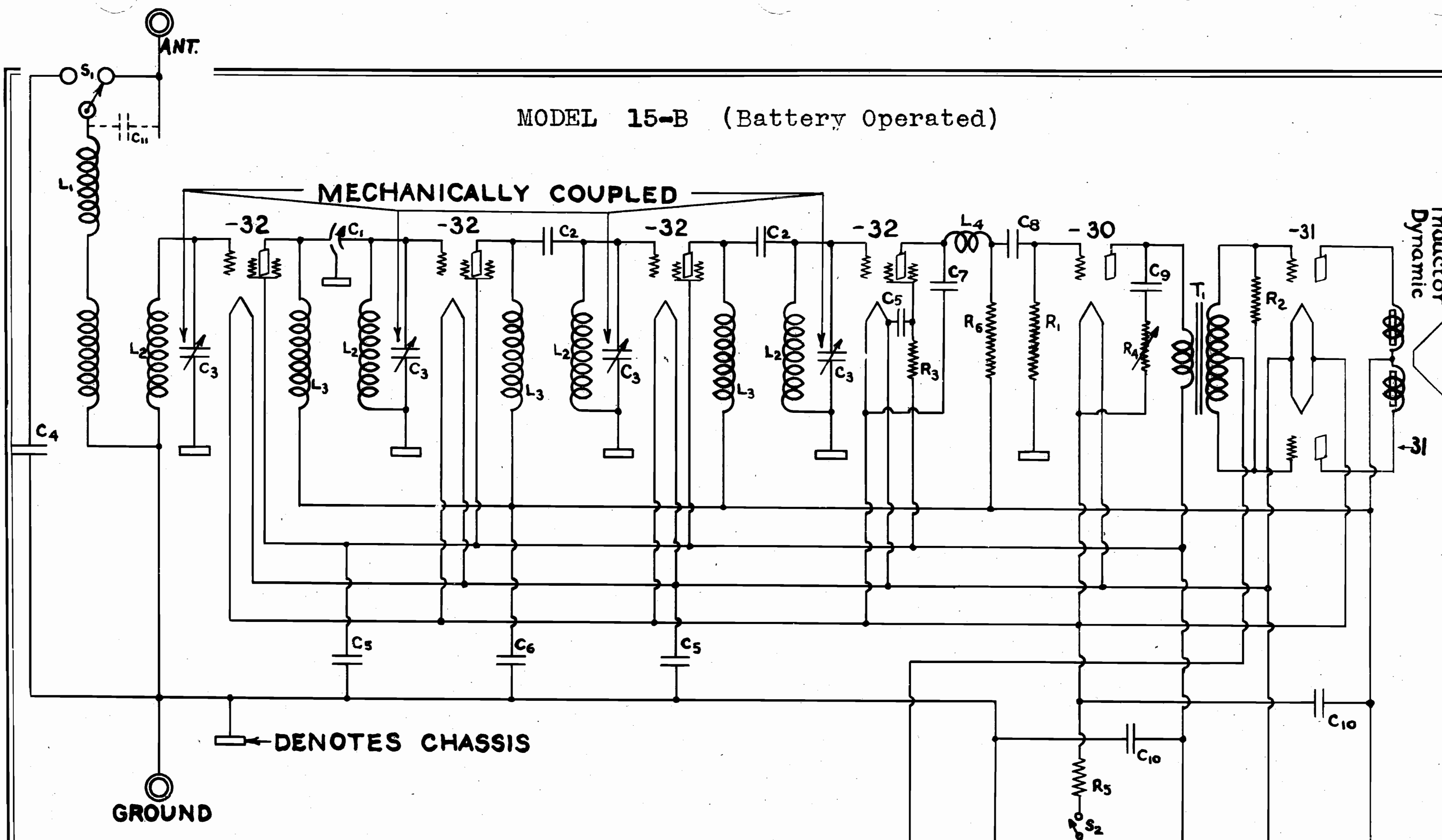
In the event the receiver oscillates at any or all parts of the tuning range, the ground and antenna should be inspected to be sure there is not a poor connection at some point. If the oscillation still persists, try changing the tubes around, and if this does not eliminate the trouble, the receiver should be neutralized by the following method:

Select a good UX-201-A tube of the same make that is to be used in the receiver and cut off one filament prong close to the base. Because the filaments of all tubes are connected in series, it will be necessary to connect a 1.25 ohm resistor across the filament contacts of the socket in which the dummy tube is to be used. (The filament of another tube may be used for this purpose.) Tune the receiver to a powerful local station broadcasting on a frequency of between 1000 and 1500 kilocycles, and adjust volume control and antenna trimmer condenser for maximum volume. Insert the dummy tube in the first socket and connect the resistor or tube filament across the filament circuit - the first neutralizing condenser should now be adjusted until no sound, or the minimum sound, is heard in the reproducer. Adjust the other two stages in the same manner and the receiver is neutralized.

In the event the receiver cannot be neutralized the R.F. by-pass condensers should be tested for open circuits and a different dummy tube should be tried.

BRUNSWICK RADIO CORP.

MODEL 15-B (Battery Operated)

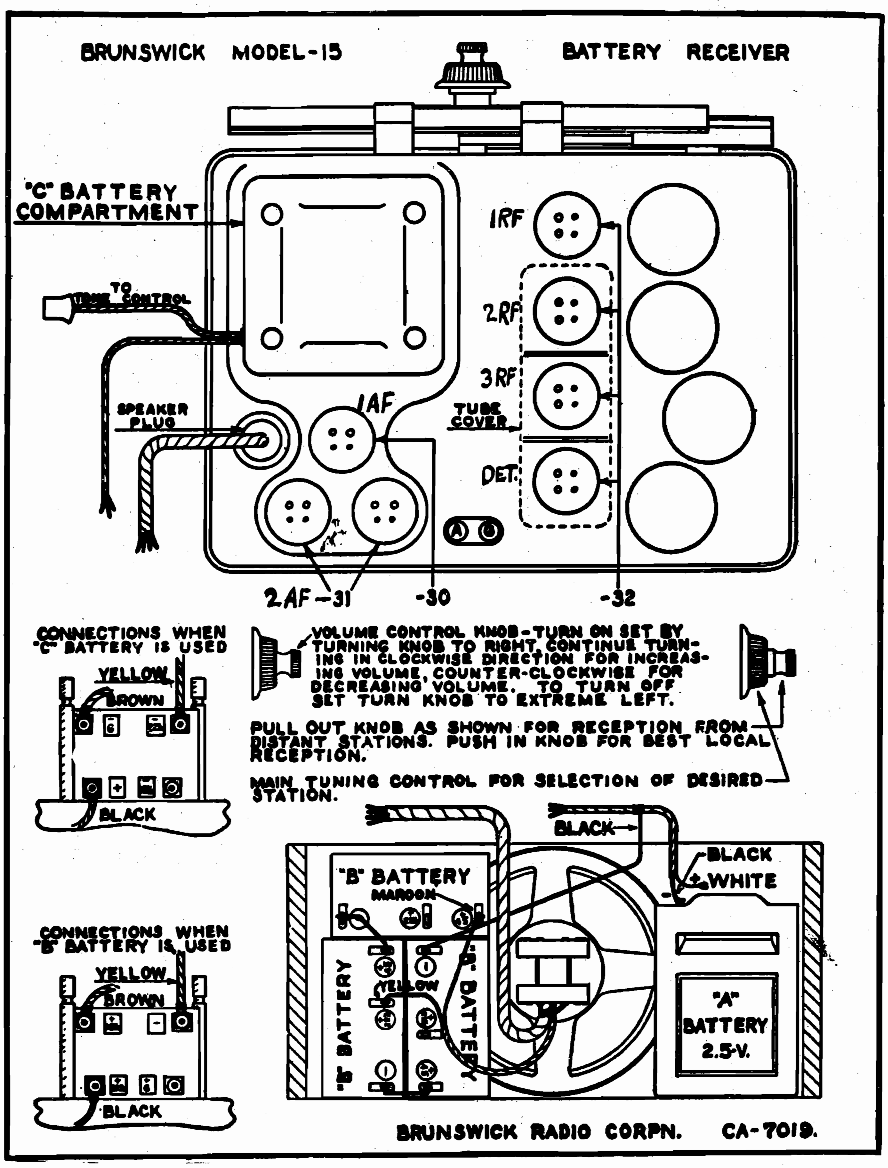


L_1 1.0 m.h.		C_5 .25 μ.f.		R_2 2 Meg. (GREEN)	
L_2 205 μ.h.		C_6 .14 μ.f.		R_3 750,000 (PURPLE)	
L_3 4.5 m.h.		C_7 .0002 μ.f.		R_4 0-50,000	
L_4 65 m.h.		C_8 .02 μ.f.		R_5 0.6	
		C_9 .03 μ.f.		R_6 250,000 (BLUE)	
C_1 0-10 μ.μ.f.		C_{10} 1.0 μ.f.			
C_2 10 μ.μ.f.		C_{11} 10 μ.μ.f.		S_1 H.&H. 3 Point Switch	
C_3 425 μ.μ.f. Max.				S_2 H.&H. 2 Point Switch	
C_4 .0002 μ.f.		R_1 500,000 (BLACK)		T_1 2:1 P.P. Transformer.	

CA-7022

BRUNSWICK RADIO CORP.

MODEL 15-B (BATTERY OPERATED)

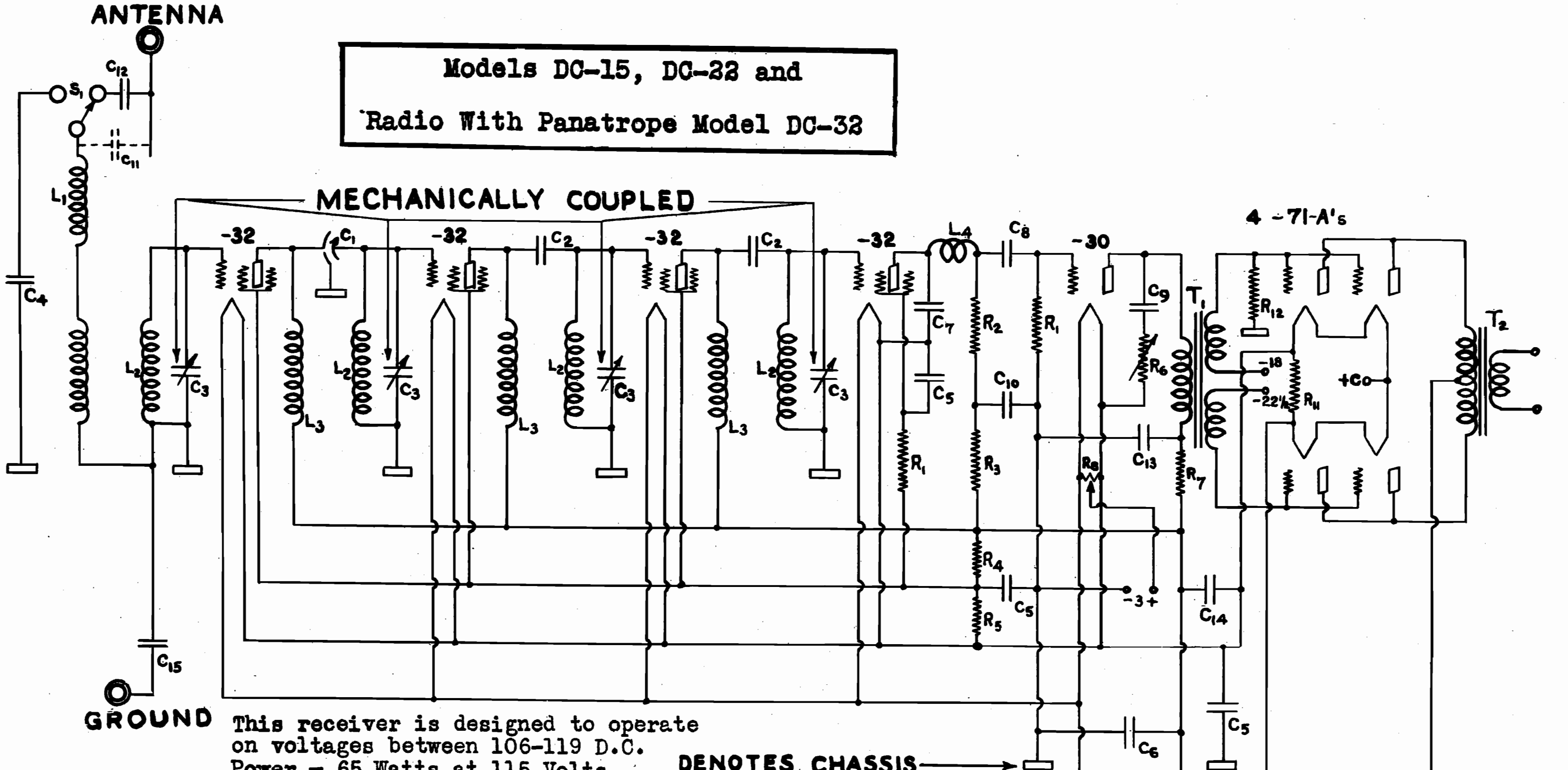


Tube Position	Filament Voltage	Plate Voltage	Plate Current	Screen Grid Voltage	Control Grid Voltage
1st R. F.	2. volts	135 volts	1.1 M. A.	69 volts	-3 volt
2nd R. F.	2. "	135 "	1.1 M. A.	69 "	-3 "
3rd R. F.	2. "	135 "	1.1 M. A.	69 "	-3 "
Detector	2. "	67.5 " *	.03 M. A.	69 "	-3 "
1st Audio	2. "	67.5 "	2.4 M. A.	--	-3 "
Power amp.	2. "	135. "	6.2 M. A.	--	-22.5"
" "	2. "	135. "	6.2 M. A.	--	-22.5"

NOTE:
(*) Because of the large resistance in the plate and screen grid circuit of this tube, the voltage reading on most analyzers will be in the neighborhood of 5. volts.

BRUNSWICK RADIO CORP.

Models DC-15, DC-22 and Radio With Panatrope Model DC-32



This receiver is designed to operate on voltages between 106-119 D.C.
Power = 65 Watts at 115 Volts.
Uses 10" Dynamic Cone-Field Res. = 60 Ohms, 0.5 Amps.

L_1 1.0 m.h.
L_2 205 μ.h.
L_3 5.2 m.h.
L_4 65 m.h.
L_5 D.C. Res. 60Ω ± 5%
L_6 12-15 hy.
C_1 0-10 μ.μ.f.
C_2 10 μ.μ.f.
C_3 425 μ.μ.f. Max.
C_4 200 μ.μ.f.
C_5 0.25 μ.f.
C_6 0.14 μ.f.

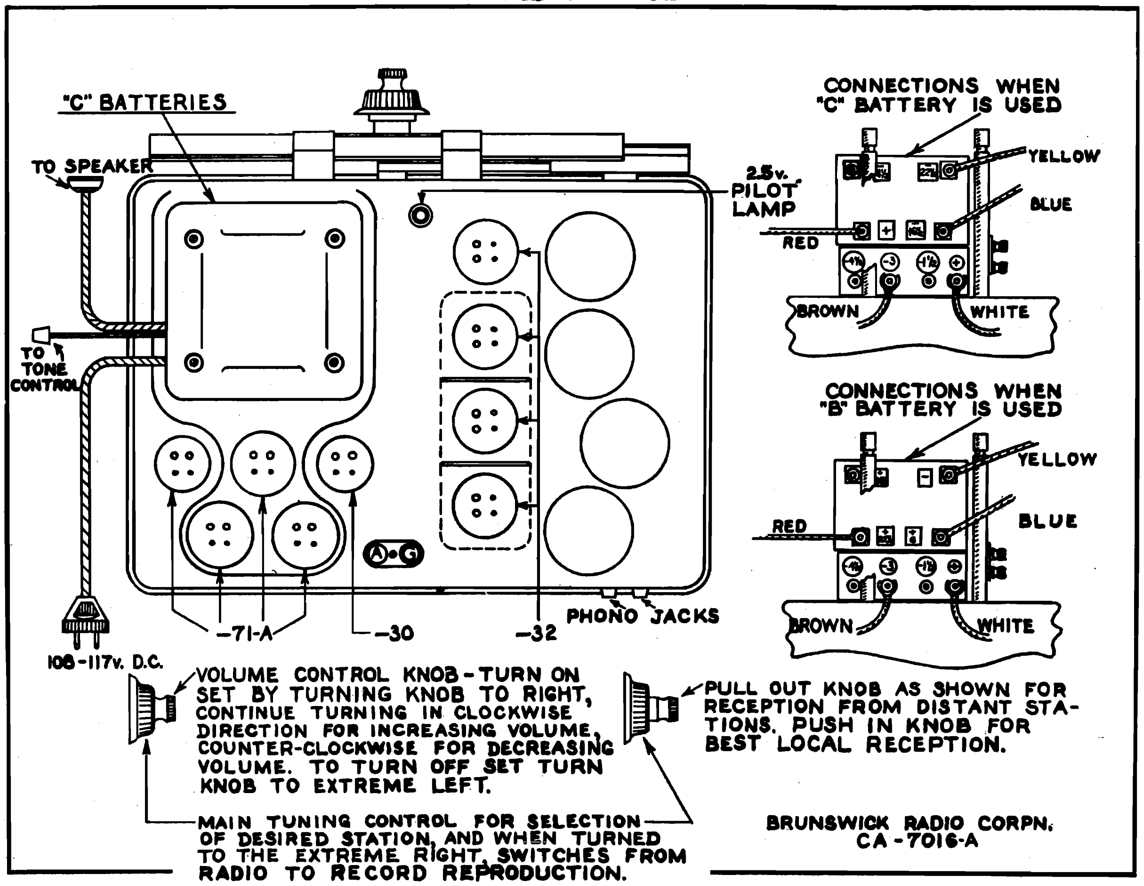
C_7 200 μ.μ.f.
C_8 0.02 μ.f.
C_9 0.03 μ.f.
C_{10} 2.0 μ.f.
C_{11} 10 μ.μ.f.
C_{12} 0.02 μ.f.
C_{13} 1.0 μ.f.
C_{14} 1.0 μ.f.
C_{15} 0.14 μ.f.
R_1 500,000 (BLACK)
R_2 250,000 (BLUE)
R_3 50,000 (RED)

R_4 15,000 (YELLOW)
R_5 30,000 (ORANGE)
R_6 0-50,000
R_7 15,000 (YELLOW)
R_8 18.0 ohms
R_9 150 ohms ± 10%
R_{10} 15.0 " ~ R_{11} - 90 ohms.
R_{12} 2 megohms (GREEN)
S_1 H.&H. 3 Point Switch
S_2 H.&H. 2 Point Switch
T_1 2:1 P.P. Transformer
T_2 60:1 Output "

BRUNSWICK RADIO CORPN.
CA - 7023.

BRUNSWICK RADIO CORP.

MODEL DC - 32



TUBE SOCKET ANALYSIS

For Models DC-15, 22 and DC-32

The values given in the following table are correct for standard analyzers on 118-volt direct current lines:

Tube Position	Filament Voltage	Plate Voltage	Plate Current	Screen Grid Voltage	Control Grid Voltage
1st R. F.	2.1 volt	100 Volt	1.4 M. A.	50	-3 volts
2nd R. F.	2.1 volt	100 Volt	1.4 M. A.	50	-3 volts
3rd R. F.	2.1 volt	100 volt	1.4 M. A.	50	-3 volts
Detector	2.1 volt	23 volt	.2 M. A.	50*	-5 volts*
1st Audio	2.1 volt	62 volt	2. M. A.	--	-3 volts**
Pwr. rear right	5.2 volt	112 volt	13. M. A.	--	17. volts
" rear left	5.2 volt	110 volt	14. M. A.	--	22. volts
" front right	5.1 volt	111 volt	11. M. A.	--	22. volts
" front left	5.1 volt	110 volt	11. M. A.	--	17.5 volts

NOTE: (*) Because of the high resistance in this circuit a much lower reading will be obtained on most analyzers.

(**) A potentiometer, located on the under side of the audio panel, varies this grid-bias and should be adjusted to give the above voltage.

BRUNSWICK AUTOMATIC PANATROPE WITH RADIO

PART I

ELECTRICAL SPECIFICATIONS

MODEL 42

Rating	105 to 130 volts—60 cycles
Also available	105 to 130 volts—50 cycles
	105 to 130 volts—25 cycles
	105 to 125 volts—direct current
Power consumption of radio set—60 cycles	85 watts
Power consumption of Panatrope and Radio	110 watts
Type of circuit	Screen-grid tuned radio frequency
Type of tubes	—80 ... 1
	—45 ... 2
	—24 ... 4
Recommended antenna length	30 to 70 feet
Average sensitivity	4.0 micro volts per meter
Number of radio frequency stages	3
Type of detection	Linear type—power detector
Number of audio stages	1
Type of audio amplification	Parallel operated—45's
Type of rectifier	125 ma. full wave type—80
Type of loudspeaker	10-inch cone—dynamic
Speaker field	Series connected—1600 ohms—100 volts—drop—62.5 ma.—6.25 watts

INTRODUCTION

The Brunswick Model 42 Automatic incorporates the same armored chassis and dynamic speaker that is used in the Models 15 and 22. In addition it has the added feature of the Automatic Panatrope which will play twenty records without attention, and then shut itself off.

It is the purpose of this bulletin to show only those features which deal with the Automatic equipment, its connections to the radio chassis, and also the information dealing with coin operation. All other data on the radio set can be obtained from Service Bulletin No. 71.

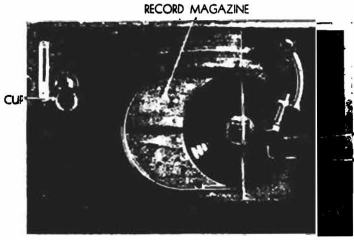


Fig. 1

The operation of the Automatic Panatrope is extremely simple, as will be readily seen by the following explanation:

Figures 1 and 2 show top and front views of the Model 42 and indicate the various components that enter into its use.

With the station selector control turned past the 1500 K. C. mark, and twenty or less records in the record magazine, turn the "off" and "on" switch to the "on" position. Then press the "start" button. This will do the following: connect the power to the radio chassis so that the audio amplifier can be used for record reproduction; starts the motor and automatic mechanism for the cycles of playing the record and ejecting the played record into the reject compartment.

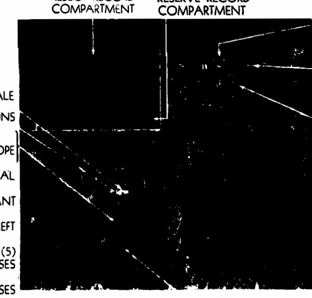


Fig. 2

PART II

THE STORY OF THE AUTOMATIC AND ITS OPERATION THROUGH A COMPLETE CYCLE

The accompanying series of sketches have been prepared in order to present a clear idea of the cycle of operations through which the Automatic mechanism goes during the playing, the rejection of a record, and the starting of a new record. In conjunction with the following explanation, these sketches should make what appears to be a complicated mechanism really a very simple piece of apparatus. An automatic record playing instrument may be made in innumerable ways, but the simplicity of its mechanism reflects the true engineering skill behind it. There should be no more apparatus necessary than that required to accomplish the purpose of the machine. In servicing such a machine, this is a factor to be appreciated.

In Sketch 1 the record is shown in the playing position. As the magnetic pickup moves toward the center of the record, beneath the top plate of the mechanism the suspension arm is pulling a special switch with it. This is shown in Sketch 2. When the end of the record is reached, this switch hits against an adjustable stop, closing the switch contacts.

From this point on, many things occur in a short space of time, ten seconds or less. Reference to the schematic circuit appearing in Figure 6 will also help to clear up a few points. In fact, it will more than pay the person who meets up with this model to sit down and follow out this circuit along with this description.

The switch just mentioned is designated as the "Suspension Arm Switch" in the schematic circuit. When this closes, the line voltage is placed directly across the solenoid coil, also shown in Sketch 3. Immediately the solenoid armature pulls the stop lever from the dotted line to the solid line position. The projection "r" on this lever (follow to Sketch 4) moves out of the way of the clutch pawl, allowing the latter under the tension of the small spring to slip in and engage with the teeth of the clutch. The only revolving parts up to now have been the motor, ejector friction disc, and the turntable. Sketch 5 shows the parts which start revolving when the clutch engages. A little further on, the reason for these gears will become evident.

As the master gear revolves, three cams on its under side function. The first is shown in Sketch 6, operating the cycle switch. This switch closes (refer to scematic circuit and note that the "reset" and "off-on" switches are closed) in order to maintain a closed power circuit to the motor when the "reset" switch opens a little later. Immediately thereafter, the second cam on the master gear, not shown, has revolved to a position where it actuates a lever raising the pickup arm, see Sketch 6.

Referring to Sketch 7—with the pickup raised off the record, the third cam raises the ejector wheel to a position where the friction cone rides on the ejector friction disc. As the ejector wheel comes up and starts to revolve, it also brings up the push rod opening the "reset" switch (see schematic). The revolving ejector wheel sends the finished record out into the reject record compartment.

In Sketch 8, note the lever arm marked "t." Functioning through its mechanical connection to the master gear, it starts moving the pickup suspension arm out of the way of the next record coming down from the magazine. The levers "x" and "y" are also working at the same time and through the connecting rod "z," as the pickup moves to the right, sends a new record down to the turntable. Sketches 8 and 9 show the respective positions of the mechanism and top of the Automatic Panatrope at the middle of the record change operation. The master gear only revolves once. The reasons for the two reduction gears, Sketch 5, should now be apparent; namely, because the turntable shaft revolves at 78 R.P.M., and this speed is entirely too high for direct application to the other moving parts, suspension arm, etc. Even if it were, the size of the motor would have to be much greater to supply all the power required during the record change. The gears serve to keep the power consumption of the Panatrope down to a minimum.

When the new record drops on the turntable, it hits the push rod closing the "reset" switch, thus keeping the power circuit to the motor and chassis closed even though the cycle switch is still closed. The position of the record, ejector wheel and push rod are now shown by Sketch 10.

Going back to Sketch 8, the suspension arm return lever, "w," now comes into play. This is during the last half of the master gear revolution. As the master gear returns to its original position, the suspension arm return lever, "w," catches the projecting pin that was pushed over by "t," carrying the suspension arm back until the other end of "w" hits the stud "s." This releases the pin, leaving the suspension arm and pickup in position over the first grooves of the new record. With the return of the suspension arm, the arm "v" in the record magazine has moved back ready to advance the next record. The pickup is lowered to the record and the master gear, completing its cycle, allows the stop lever arm to drop to the position indicated by the solid lines of Sketch 11 under the tension of the spring "u." The projection "r," Sketch 3, engages the clutch pawl, preventing the gears from revolving further. The cycle switch opens and the new record continues the program.

There is one more point to consider. Had the record magazine been empty, the mechanism would have worked in the same manner with one exception, the push rod would have remained up and the "reset" switch open. From the scematic circuit, it is evident that upon the opening of the cycle switch, the power supply circuit is broken and the whole machine shuts off.

PART III

ADJUSTMENT AND CARE

All initial adjustments are made at the factory so that the instrument is ready for immediate use when properly installed. The turntable speed should be 78 R.P.M., but if for any reason it is thought that this speed is not being maintained, by placing a paper clip at some point on the record's edge for an indicator and timing the turntable, it is possible to check this. The motor speed control is directly above the motor and is readily located when the cabinet back is removed.

The motor should be oiled about once a month; a little oftener if the machine is used steadily. The oil holes are located directly beneath the turntable. A few drops will suffice; do not flood the motor with oil as this can do more harm than good.

The Brunswick Permo-Point needle, which accompanies each instrument, will play in excess of 2.000 records. It is recommended that this needle be used in preference to all other types.

Some of the simple adjustments which may be necessary to accommodate slight differences in records, as well as some suggestions to take care of possible changes caused by shipment, are given below.

We recommend that the first time any of these adjustments are made, that the plate covering the mechanism be removed. This can be accomplished as follows:

(a) Lift off the turntable.

(b) Remove all screws around the edge of plate covering mechanism, as well as those around the suspension arm.

(c) Remove the nut which holds the suspension arm to the cast iron base.

(d) Carefully lift up the suspension arm about three-quarters of an inch and remove the plate by pulling up the front end and gently lifting out—taking care not to mar the cabinet. Removing this plate will bring the mechanism into view, permitting the adjustment of four primary points.

1. Adjustment determining the point at which the magnetic pickup is lowered to edge of record.

   Replace the turntable, re-tighten suspension arm nut, and place a record in the record magazine; press the start button. As the master gear starts through the last half revolution (see Sketch 8) it will be seen that the eccentric stop "s" controls the release of the lever "w," which is pulling the suspension arm toward the record. The adjustment of this "stop" allows the needle of the magnetic pickup to drop on the edge of the record about a sixteenth of an inch from the grooves.

2. Also in Sketch No. 8 there will be seen a spring, "q."

   After the needle has come in contact with the record, this spring pulls the suspension arm over until the needle rides in the starting grooves of the record. If the spring tension be too great, the needle may jump several grooves, or on the other hand, if it is too weak, will not pull the needle into the starting grooves at all. The earlier models with serial numbers up to 2,000 have this spring attached to a fixed stud and the tension can be varied by shortening or stretching the spring. Those with serial numbers above this have an adjustable bracket to which the spring is attached, permitting the tension to be varied without touching the spring. The remedy is obvious.

3. At the base of the suspension arm, see Sketch No. 2, is a switch which controls the rejection of a record at the finish of its playing. There are two types of these switches, the earlier type—on models with serial numbers less than 2,000 (this type is shown on the actual wiring diagram Figure 5)—and the later one that is indicated in Sketch 2.

   Removing the cover, the action of this switch can be observed. As the record plays, the switch casting is slowly carried along with the suspension arm. In the earlier type of switch the floating contact member does not touch either side contact until the magnetic pickup reaches either the inside groove of a concentric grooved record where a stop (see Sketch 2) causes the left contact to close; or on an eccentric grooved record will cause the right contact to be closed. If either of these two contacts are too close to the floating contact there is a possibility of the record rejecting before it is finished. Also, if the separation from the right

BRUNSWICK RADIO CORP.

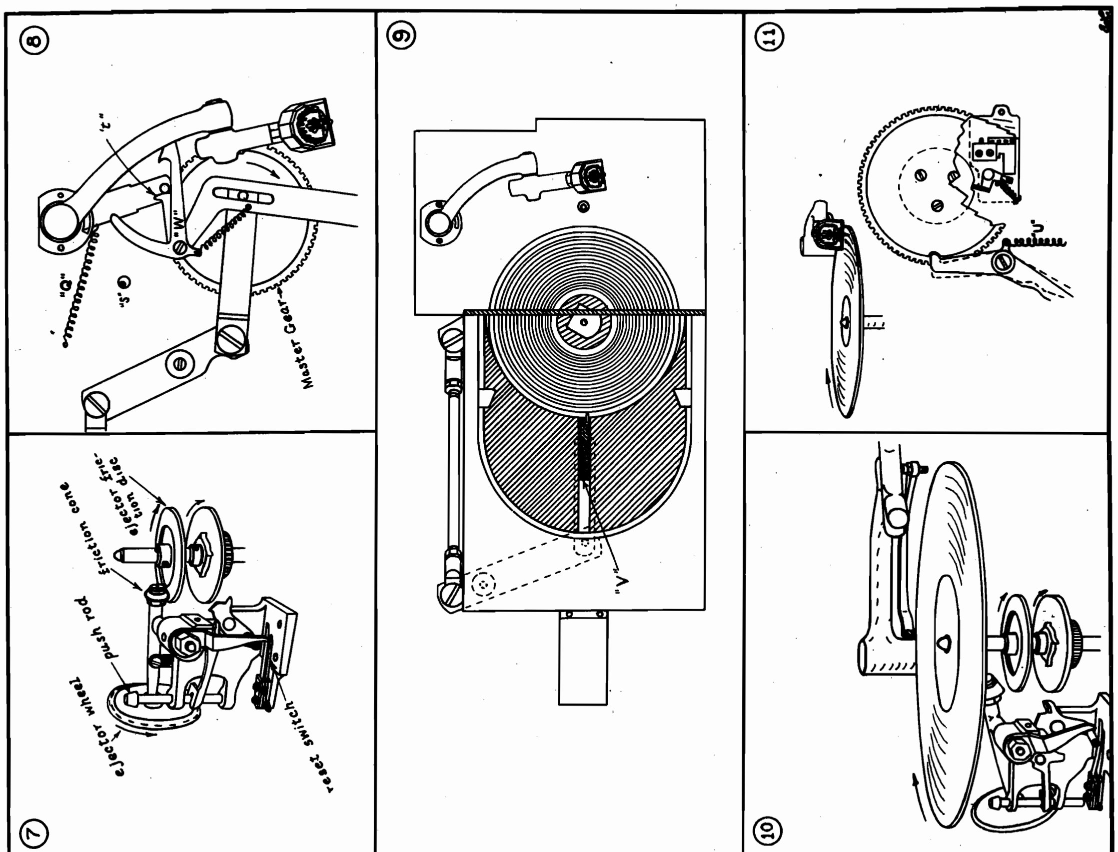


Figure 4

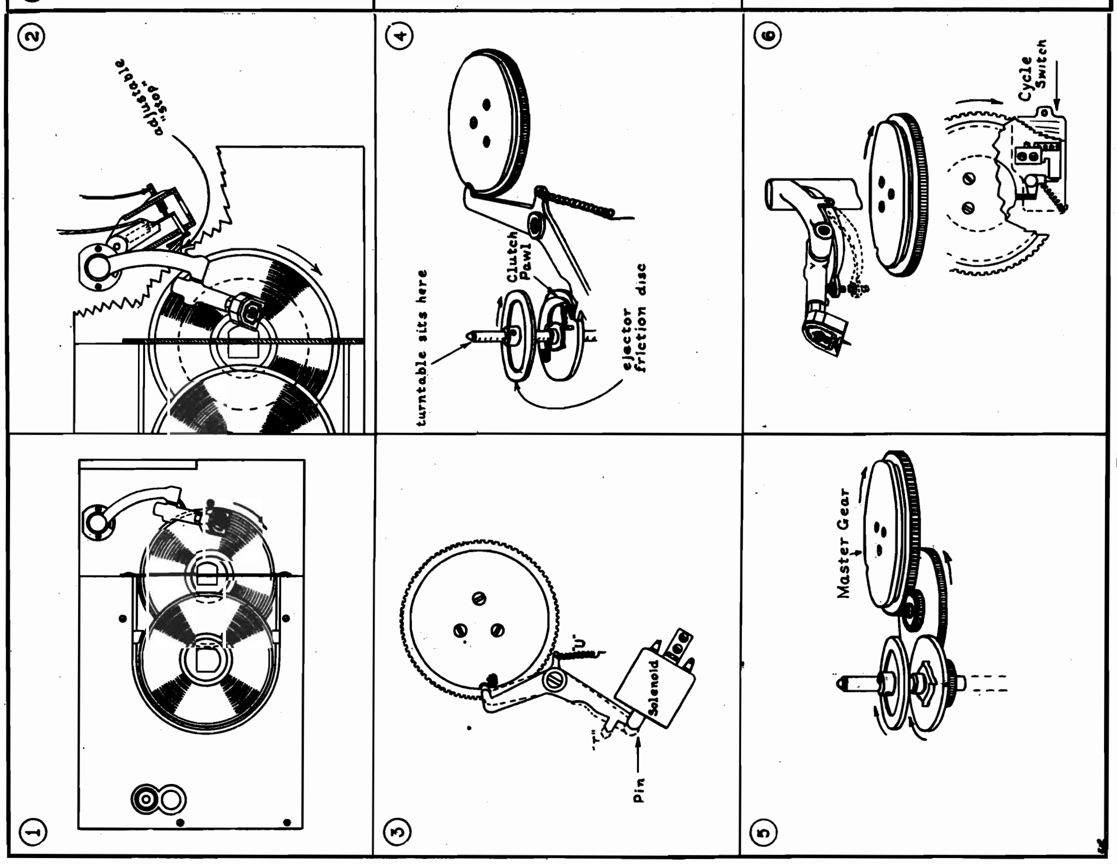
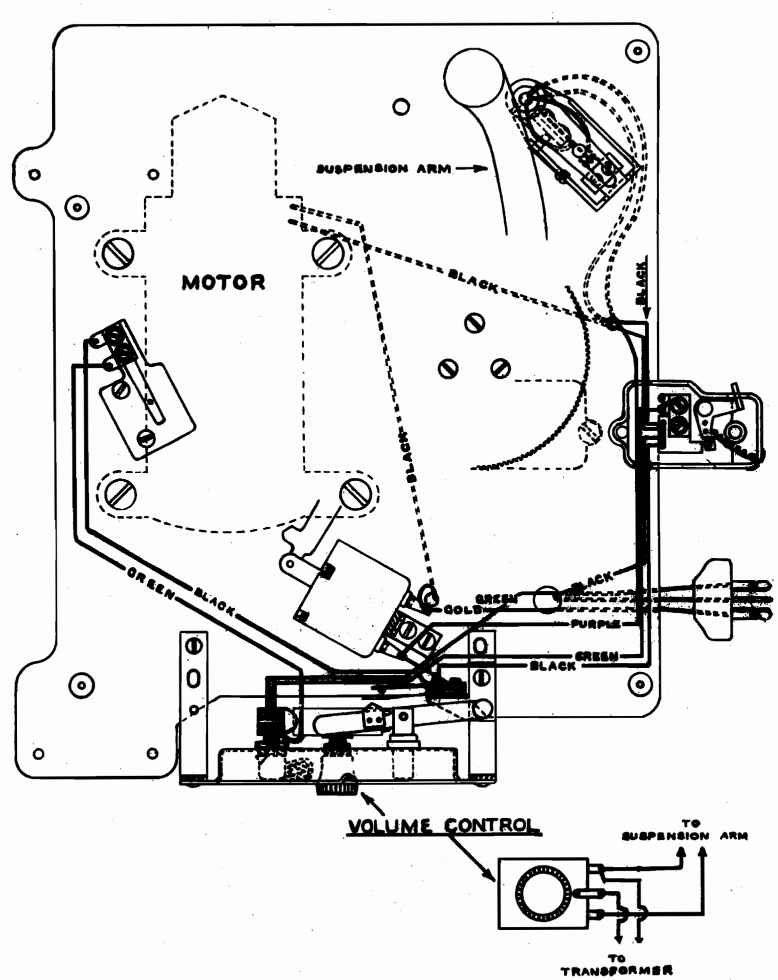


Figure 3



WIRING DIAGRAM - MODEL 42 - AUTOMATIC
CA - 7011

Figure 5

contact is too great, the switch will not close on an eccentrically grooved record. If the stop for the concentric grooved record is set too far to the left the contact will not close, and if set too far to the right, the record is rejected before the selection finishes.

The later type of switch has been simplified somewhat in construction, having only one contact, but accomplishes the same work. If the previous discussion has been carefully followed, similar reasoning applies to the adjustment and operation of this later type of switch. On the models with this later type switch the "stop" previously mentioned is adjustable through a hole in the plate covering the mechanism.

4. Solenoid operation:

Remove the turntable and press the start button. This energizes the solenoid coil which in turn operates the lever, which starts the functioning of the record-changing mechanism. After the record-changing mechanism completes its cycle, the electrical circuit of the solenoid is opened and it is de-energized. The spring, "u," Sketch 11, pulls the lever into its normal position. If the solenoid for any reason does not draw the armature in properly, or the armature vibrates against the solenoid, it can be adjusted by means of the two screws which mount the solenoid to the base. Also, if the spring "u" is too weak, the record-changing mechanism will not stop, but will continue to reject the records. If too strong, the solenoid will not have sufficient power to operate the record-changing mechanism. The solenoid armature is hollow and contains a rubber bumper which dampens out alternating current vibrations.

GENERAL POINTS TO CHECK UP IF THE AUTOMATIC PANATROPE IS INOPERATIVE

1. Be sure that the power line plug is connected to the receptacle and that this is "alive." The latter can be readily determined by plugging in a floor lamp or other similar electrical device.

2. The power plug joining the Automatic mechanism and radio chassis should be solidly connected.

3. The Panatrope input transformer tip leads should be well seated in the tip jacks at the rear of the radio chassis.

4. There should be not more than twenty records in the magazine and reject record compartment at one time to prevent the possibility of jamming and record breakage.

5. The "Off-On" switch on the Panatrope control panel should be placed at the "On" position, and the volume control turned up far enough to insure sufficient volume.

6. The station selector scale should be turned past the 1500 K. C. mark until the clicks of the Radio-Panatrope change-over switches are heard.

7. By pressing the "start" button for an instant, the radio tuning scale should be illuminated and the turntable set in motion. If the latter revolves, but the scale is not illuminated, the fuses under the power transformer cover should be tested and any defective ones replaced. Check the pilot light for continuity if the radio tubes light up.

8. If everything checks up to this point, and still no reproduction is obtained, see that the group of three tubes at the left of the radio chassis (when viewed from the rear) are lighted. Remove the cover on the three screen-grid tubes and replace the tube nearest the rear of the chassis with one known to be okay.

9. For pickup trouble see Service Bulletin No. 70, page 9.

In conjunction with the following possibilities of trouble and their remedies, it would be well for the one contemplating service on the instrument to stop for a moment before delving into the machine and try to analyze the cause of the trouble. This will save much time and unnecessary work.

Records Jamming in Mechanism

There are several conditions which may cause this; the most likely are those due to (a) warped records, (b) the record feed fingers on the record magazine bent, (c) the spring on the record gate (which supports the records while stored in the magazine) adjusted too closely, allowing only thin records to pass through; or the other extreme, too wide, allowing two records to go through, (d) the space under the record feed fingers allows two records to be caught instead of a single one.

Obviously, for (a) the record should be placed on a warm flat surface until it is once more flat. For (b) it will be necessary to remove the mechanism from the cabinet (see paragraph headed "Removal of Mechanism from Cabinet") to get at the small spring which provides tension for this finger. After once seeing how this particular part functions, the average service man can effect the repair by running the mechanism to the middle of a cycle, at which point the record feed finger will be at the edge of the magazine. If the spring is broken and enough remains to permit stretching it, too much tension will not be a serious drawback on the finger; otherwise, it is necessary to replace the spring with a similar one. For (c) refer to Figure 1. This shows the record gate in question, situated immediately over the center of the record on the turntable. This has a spring clip at its center which is adjustable either up or down. To adjust for two records coming through at once, lower the gate, and for a single thick record raise it. If records of standard make, and not warped, are used, very little trouble will be experienced from this point after it is once set. In a few cases (d) it has been found that the space under the record feed finger of the magazine lever permits two records to be caught at once. Should this be the case, the part of the lever which goes under the record first can be raised a small amount, thus lowering the height of the finger when it comes forward to select the next record for reproduction. In case the turntable does not revolve after these troubles have been remedied, turn the motor governor by hand until the mechanism reaches the start position; then it will run as usual.

Adjustment of Feeder Rod

The feeder rod is located at the back of the automatic mechanism, and is made accessible by removing the wooden top cover around the record magazine. Also refer to Sketch 9. Its length controls the distance through which the magazine lever moves. This does not often need attention but can be changed in length as follows: Loosen the lock nuts at either end of the rod. To shorten, turn the rod in a clockwise direction, or in case the rod is to be lengthened, turn in a counter-clockwise direction. Then tighten the lock nuts.

Record Ejector Wheel Not Functioning Properly

Sometimes the record ejector wheel will come up but fail to turn and throw the record out. This may be due to neglect in oiling the shaft to which it is attached. As this is only a friction drive, any opposition to its turning, in addition to the ejection of the record, may be detrimental. Other possibilities are that the friction cone is covered with oil, or is worn down. Clean it off and check before going further. If it has worn down, check the spring in the plunger which pushes this wheel up. See that this spring has some life in it by noting whether the ejector wheel rebounds readily when pushed down. If, after this the trouble is not obvious, try placing a very thin washer behind the friction cone to move it forward a little or replace the cone.

Solenoid Trouble

Vibration during record changing cycle. This may be due to the solenoid being improperly centered, or caused by the rubber bumper in the hollow solenoid armature not functioning properly. Loosen the screws which hold the solenoid to the iron base, and push it forward. Center the plunger pin and tighten the two screws. Check the smoothness of the plunger action by operating it with the finger. It is absolutely essential that the armature be properly centered. It may even be necessary to place a small piece of paper beneath the bracket near either of the two screws, or one side of the bracket to center it, but be sure it is finally centered. If the solenoid rattles after this, take the armature out and determine whether the rubber has lost its elasticity, due to excessive heat or moisture. If so, replace it and center the solenoid again. Also see "Solenoid Operation" at beginning of Part III. For an open winding in the solenoid there is no alternative but to replace the coil.

Gear and Clutch Mechanism--Cycle Switch

This is the heart of the whole mechanism. Once properly set, the likelihood of its causing trouble is small. If for any reason it becomes necessary to remove the gears, the easiest way to reset the timing is to loosen the solenoid, set the solenoid stop lever (see Sketches 3 and 4) in a position such that it has the projection "r" directly over the slot in the clutch disc. To do this it will be necessary to unfasten the solenoid lever. Raise the master gear sufficiently to clear the intermediate gear and rotate it to a position such that the end of the stop lever is in position near the slot in the master gear. Lower the master gear so that it engages the intermediate gear cogs and then drop the stop lever into position. Set the stop lever snugly in place in the slot of the clutch disc. At this point, the clutch pawl is disengaged from the clutch. If this is not possible, raise the stop lever arm and master gear again and move the latter a single cog or two in the direction which will permit the stop lever to fit properly, then set the stop lever in place and fasten down the master gear by means of the nut under the base. It may be necessary to try this procedure several times before getting perfect operation, but once it has been successfully accomplished, it will be an easy point to tackle afterwards. In case it is found that the two gear segments on the intermediate gear have become loose within each other, this part should be replaced.

The cycle switch is shown in Sketch 6, and has only one moving contact. In the event this remains open circuited, the mechanism will stop just after the rejected record has left the turntable and before the next record drops down from the magazine.

Ejector Wheel Push Rod Assembly

The case may arise where the push rod does not come up high enough to open the reset switch. First, check this rod for bends by turning it around with the finger when it is in the upper position. If it is bent, carefully straighten the push rod and apply a slight amount of oil at the guide holes. The spring tension needs very little adjusting, and if the whole assembly is oiled once every six months, it should give no trouble. Also see latter part of paragraph under heading of "Record Ejector Wheel not Functioning Properly."

Removal of Mechanism From Cabinet

Wherever it is necessary to remove the entire mechanism from the cabinet, the following procedure should be followed:

1. Disconnect the instrument from the power line, and also open the power and Panatrope plug connections between the radio chassis and the Automatic mechanism.
2. Four large nuts hold the mechanism in the cabinet, these being located at the four corners of the cast iron base. Remove these and the rubber cushions.
3. Remove the volume control knob on the control panel.
4. Remove the four screws that fasten the lid supports to the top cover of the cabinet, and gently lay the cover back.
5. Remove the wooden top piece which contains the "good" and "used" needle receptacles.

This exposes the entire mechanism and permits its removal from the cabinet.

PART IV
COIN OPERATION

A coin operation kit has been made up, designated as Part No. 1000, for use in conjunction with the Automatic Panatrope mechanism. Full instructions accompany each kit showing the connections and physical locations of each part.

This equipment will permit the Panatrope to reproduce one record for each nickel inserted up to the capacity of the magazine—twenty records. The coin control device is actuated by the feeder rod at the back of the mechanism. If the machine is used exclusively for coin operation, the "Off-On" switch should be disconnected from the circuit behind the panel to prevent the whole magazine contents from playing on a single coin.

Connection to the circuit is extremely simple, as all that need be done is to separate the power plug from the chassis to mechanism and insert the extension plug provided with the apparatus. This layout and the connections are given in the accompanying diagram.

As this equipment is of rugged construction, it will give very little trouble. The most important point to check is to be sure the actuating lever is securely fastened to the protruding arm of the lever box. This lever normally assumes a vertical position and the ratchet wheel moves one notch with each record played. An improper placing of this lever results in either too much strain on it, or else it does not move the ratchet wheel.

Complete installation instructions are supplied with each coin operation kit which may be purchased from any Brunswick Distributor or Branch.

PART V
12-INCH RECORD OPERATION

Prior to Serial No. 2500 the Model 42 Automatic Panatrope with Radio was not provided with a means for playing 12-inch records. A demand on the part of music lovers, who already had a library of 12-inch records, however, made it advisable to provide manual operation for 12-inch records. A kit of the necessary parts to make this change may be ordered from any Brunswick Distributor or Branch by specifying Part No. 4464. Directions for attaching these parts are as follows:

DIRECTIONS FOR INSTALLING PART No. 4464 KIT ON MODEL 42 AUTOMATIC PANATROPE WITH RADIO TO PERMIT MANUAL OPERATION OF TWELVE INCH RECORDS

Parts Required:
- 1 Twelve-inch Record Kit (Part No. 4464) consisting of:
  - 1 Record guide plate assembly (right).
  - 1 Record guide plate assembly (left.)
  - 2 Record guide screw-plates with screws.
  - 1 Switch cam and record locator assembly.

Tools Required:
- 1 Hack-saw with proper blades for cutting 3-16-inch steel stock.
- 1 Hand drill and the following drills, sizes:
  - 1—11-164" drill (a 3-16" drill may be used instead if available).
  - 1—3-32" drill.
- 1—12-inch flat file.
- 1—8-inch Bastard file.

The usual assortment of screwdrivers, pliers, soldering iron, etc., available in every service department.

All of the above tools should be at hand before the installation of this kit is attempted.

METHOD OF PROCEDURE

1. Removal of Record-Change Mechanism from cabinet:
   - (a) Slide "oil drip" board out of the back of the cabinet.
   - (b) Disconnect the power cable plugs between radio chassis and record-change mechanism.
   - (c) Remove the four large nuts and associated rubber cushions located at the four corners of the cast iron base of the record-change mechanism.
   - (d) Remove volume control knob on front control panel (fastened to shaft with one set screw).
   - (e) Remove the wood panel containing the needle cups located around record hopper (held in place with three wood and three machine screws).
   - (f) Remove four screws that fasten lid to lid supports and lay lid gently out of the way.
   - (g) Lift record-change mechanism from cabinet by pulling entire assembly straight up.
2. Cut Triangular-Shaped Slot in Record Hopper:
   - (a) From the dimensions given in Figure No. 9 Page 16, (see detail "b") mark in pencil the exact shape of the cut to be made on the front record hopper support (note that only the front support is to be so cut). The important dimensions are the base line (1½-inch above the turned in portion of the record hopper leg), the length of the base line (1⅞-inch long as a minimum and 2-inches long as a maximum), the width of the cut at the front (⅞-inch to 1 inch wide) and the angle at which the top of the cut intersects the base line (the easiest way to draw this is to make the cut ½-inch deep at the inside.
   - (b) Remove the two record-guide arms from the record hopper cross bar and remove the record hopper cross bar from the record hopper.
   - (c) After marking the proposed shape of the cut on the front leg of the record hopper, as directed in paragraph "a" above, saw along the two horizontal lines with a hack-saw until the inside vertical line is reached. Then bend the piece of metal to be removed back and forth until it breaks off. File the edges smooth.
   - (d) File the protruding edges of the record hopper (indicated by "e" on the drawing) back at a 30-degree angle so that these points will not scratch the 12-inch records when they are placed on and removed from the turntable.
   - (e) Fasten the record hopper cross bar and the two adjustable record guides (supplied with the kit) on the record hopper by means of the four machine screws and the two screw blocks (also supplied with the kit).
3. Fasten New Record Bumper and Switch Assembly to Top Plate:
   - (a) Remove the eight machine screws that fasten the right hand top plate to the record-change mechanism; the two machine screws that hold the suspension arm collar to the top plate and remove the top plate.
   - (b) Remove the rubber-covered record bumper from the top plate and also remove the rivet 9-16-inch above the record bumper hole.
   - (c) Remove the rubber-covered adjustable record bumper and switch throw cam from the switch assembly supplied with the kit so that the base plate may be used as a template.
   - (d) Fasten the base plate of the switch to the under side of the top plate (the switch should be mounted toward the outside edge of the top plate) using the two holes provided by the removal of the rubber-covered record bumper and the rivet (these two holes are referred to as "a" and "b" in the diagram).
   - (e) Mark the location of the third hole (referred to as "c" in Figure No. 9) with a punch, remove the switch plate and drill this hole with a 11-64-inch or 3-16-inch drill.
   - (f) The switch may now be assembled on the top plate.
   - (g) Rotate the record bumper lever through its 180-degree arc several times and a ¾-inch circle will be inscribed on the top plate. Turn the record bumper lever half way between its two end positions and mark the two places on the circle that are in line with holes "a" and "c." Use a 3-32-inch drill and drill at these two points two countersunk holes about ¼ of the way through the top plate. These two holes serve as stop positions for the adjustable record bumper.
4. Connect Switch to Solenoid Circuit:
   - (a) Remove the black and brown leads from the right hand side of the solenoid and connect them to one of the switch leads. Connect the other switch lead to the solenoid terminal thus left vacant. This permits the operator (by turning the record bumper to the right) to disconnect the solenoid from the circuit so that the record-change mechanism will not function while a 12-inch record is being played.
5. Replace the Record-Change Mechanism in the Cabinet.

To Play 12-inch Records Manually:

1. Turn station selector scale past the 1500 kilocycle mark until a click is heard and turn the "off-on" switch on the automatic panatrope control panel to the "on" position.
2. Turn the two 10-inch record guide arms, located on opposite sides of the record hopper, up, and rotate the rubber-covered record bumper (located at the right of the turntable) toward the right-hand side of the cabinet as far as it will go, so as to allow 12-inch record to fit on turntable.
3. Move the magnetic pickup toward the right-hand side of the cabinet as far as it will go and gently slide the 12-inch record on the turntable from the right side of the cabinet.
4. The magnetic pickup can now be freely moved, and by placing it in the first playing groove of the record the 12-inch records can be played.

To Change Back for 10-inch Record Automatic Operation:

Turn the record guide arms, located on the record hopper, down, and rotate the rubber-covered record bumper arm in toward the turntable. The instrument will now play 10-inch records automatically.

BRUNSWICK RADIO CORP.

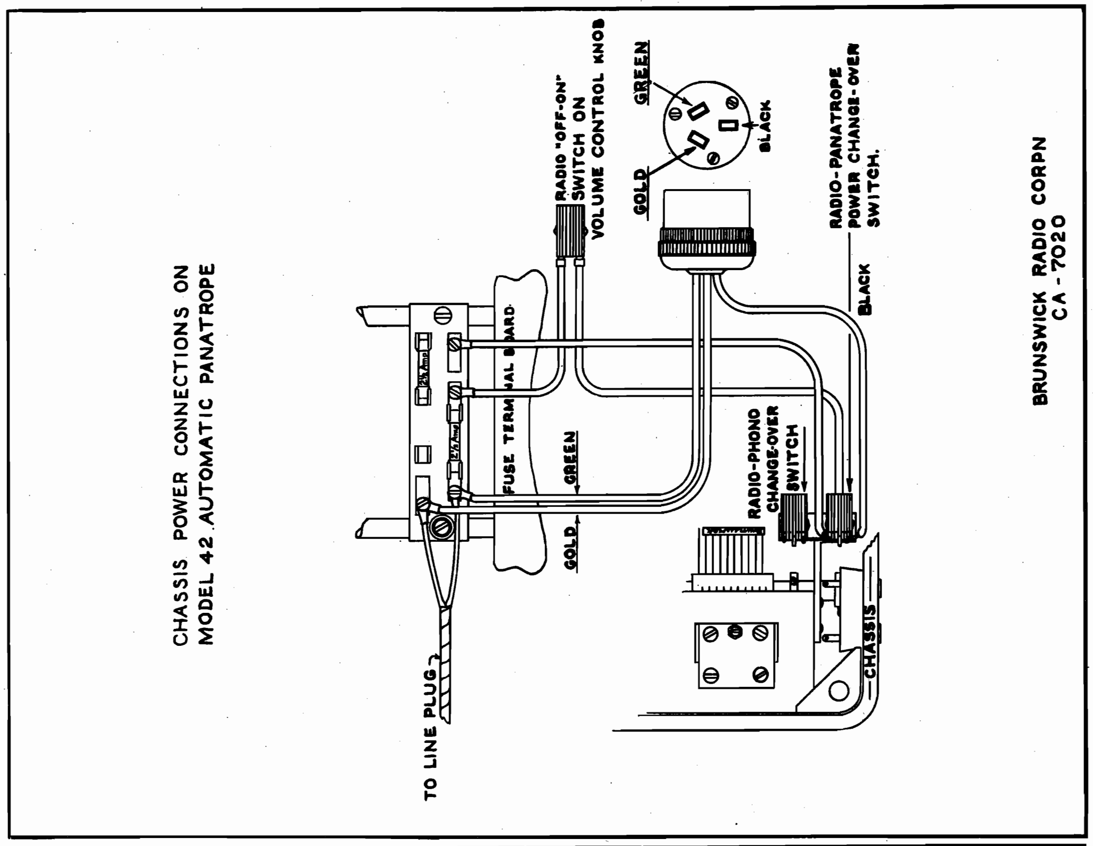


Figure 7

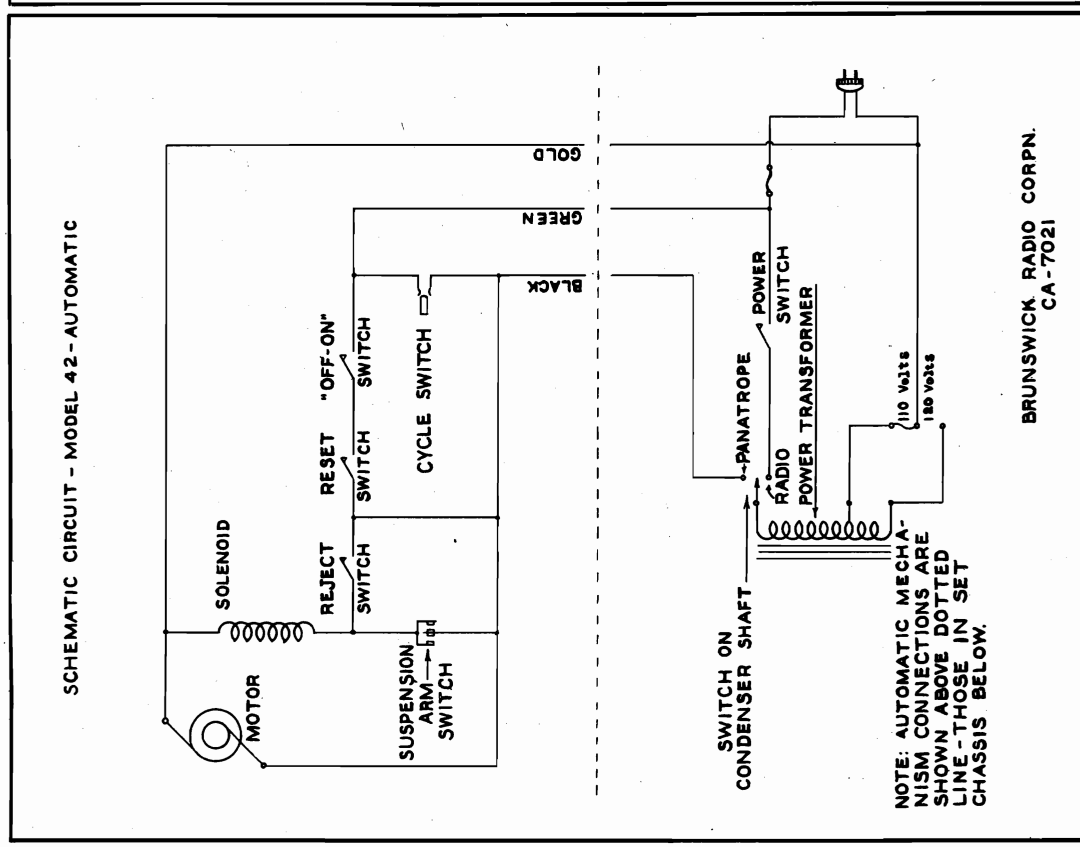
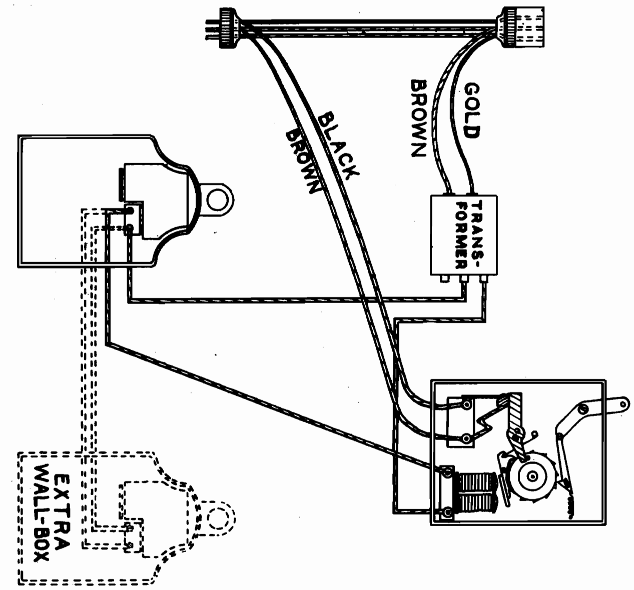


Figure 6

BRUNSWICK RADIO CORP.



ACTUAL DIAGRAM OF CONNECTIONS
OF COIN APPARATUS
CA-7018

Figure 8

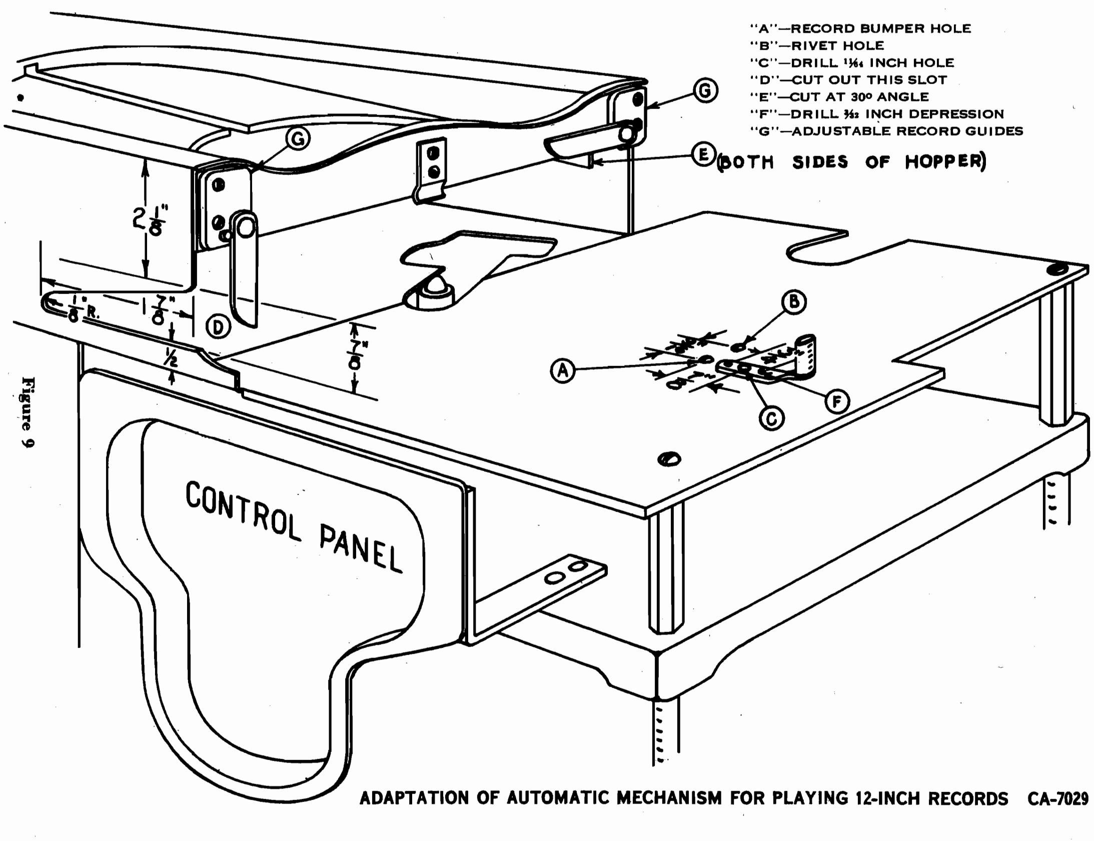
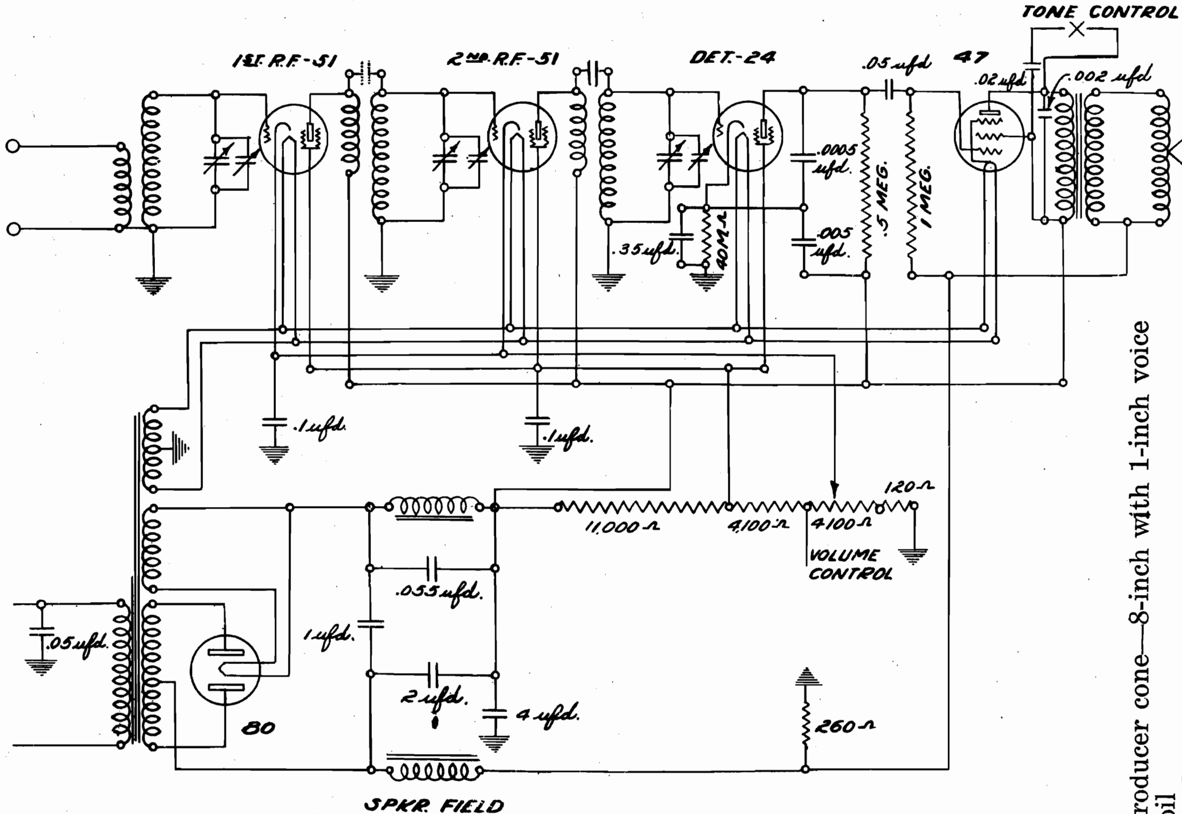


Figure 9

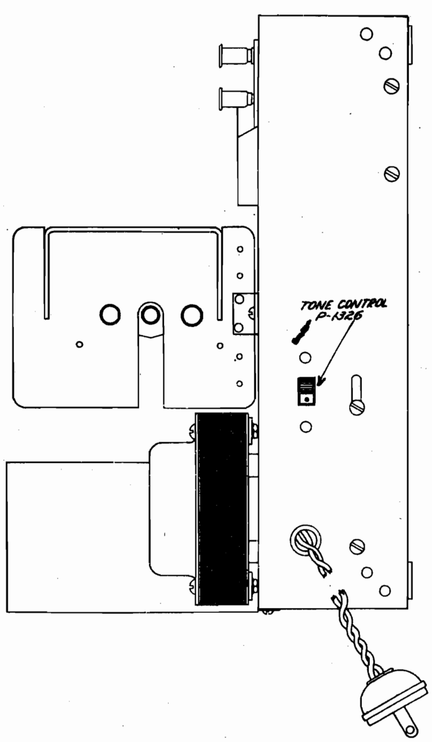
ADAPTATION OF AUTOMATIC MECHANISM FOR PLAYING 12-INCH RECORDS CA-7029

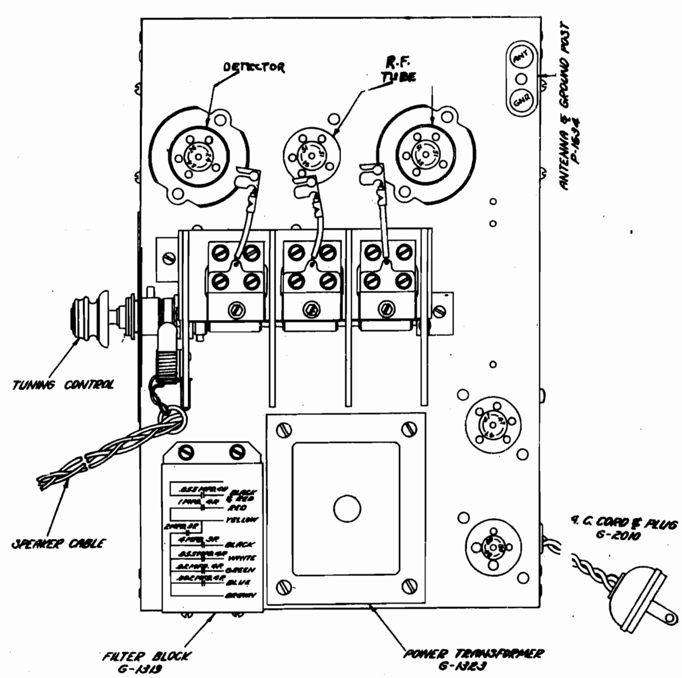
BRUNSWICK RADIO CORP.

Brunswick Radio Model No. 10



Reproducer cone—8-inch with 1-inch voice coil
Reproducer field—800 ohms, 48 volts, 60MA





BRUNSWICK RADIO CORP.

VOLTAGE ANALYSIS

READINGS TAKEN WITH WESTON MODEL 565 ANALYZER MODEL 40

No.	Stage	Type Tube	Fil. Volts	Plate Volts	Cont. Grid Volts	Cath. Volts	S. G. Volts	Ip. Normal
1	1st R. F.	C. L. 51	2.1	225	2.1	2	75	5
2	2nd R. F.	C. L. 51	2.1	230	2.2	2	75	4.5
3	Det.	C. L. 24	2.1	160*	7	7.5	75	.02
4	Output	C. L. 47	2.1	215	5*	0	225	26.5
5	Rect.	C. L. 80	4.8	280				†30

*Reading dependent upon resistance of meter.

†Reading taken for one anode only: 60 milliamperes would be about correct.

Volume control position full. Line voltage 115—60 cycle.

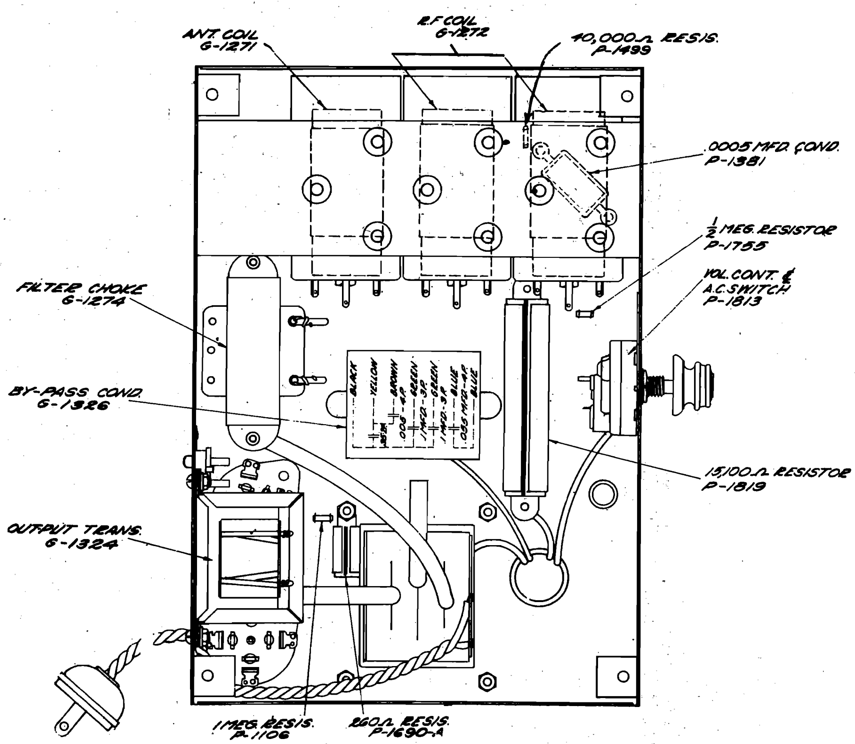
RESISTANCE TABLE

(Using 10-volt range meter 1,000 ohms per volt and 6-volt battery)

Item	Color Code*	From	To	Reading	Your Reading	Resistance in Ohms
Det. Cath. Resistor	Yel., Blk., Or.	Det. Cath.	Gnd.	1.3		40,000
Pent. Grid Resistor	Br. Blk. Green	Pent Grid	Spkr. Field	Slight Deflection		1,000,000
Wire Wound	Black	VoiceCoil,Black	Gnd.	5.9		260
Voltage Divider, Short End	Black	Volume Cont. Green Lead	S. G. Ckt.	4.2		4,100
Voltage Divider, Long End	Black	Plate	S. G. Ckt.	3.		11,000
Det. Plate Resistor	Gr., Blk., Yellow	Det. Plate	Pent. Space Chg. Grid.	.1		500,000
Vol. Control "on"		Gnd.	R. F. Cathode	4.2		4,100

Color code: read body color first, tip second and dot last.

BRUNSWICK MODEL 10 CHASSIS

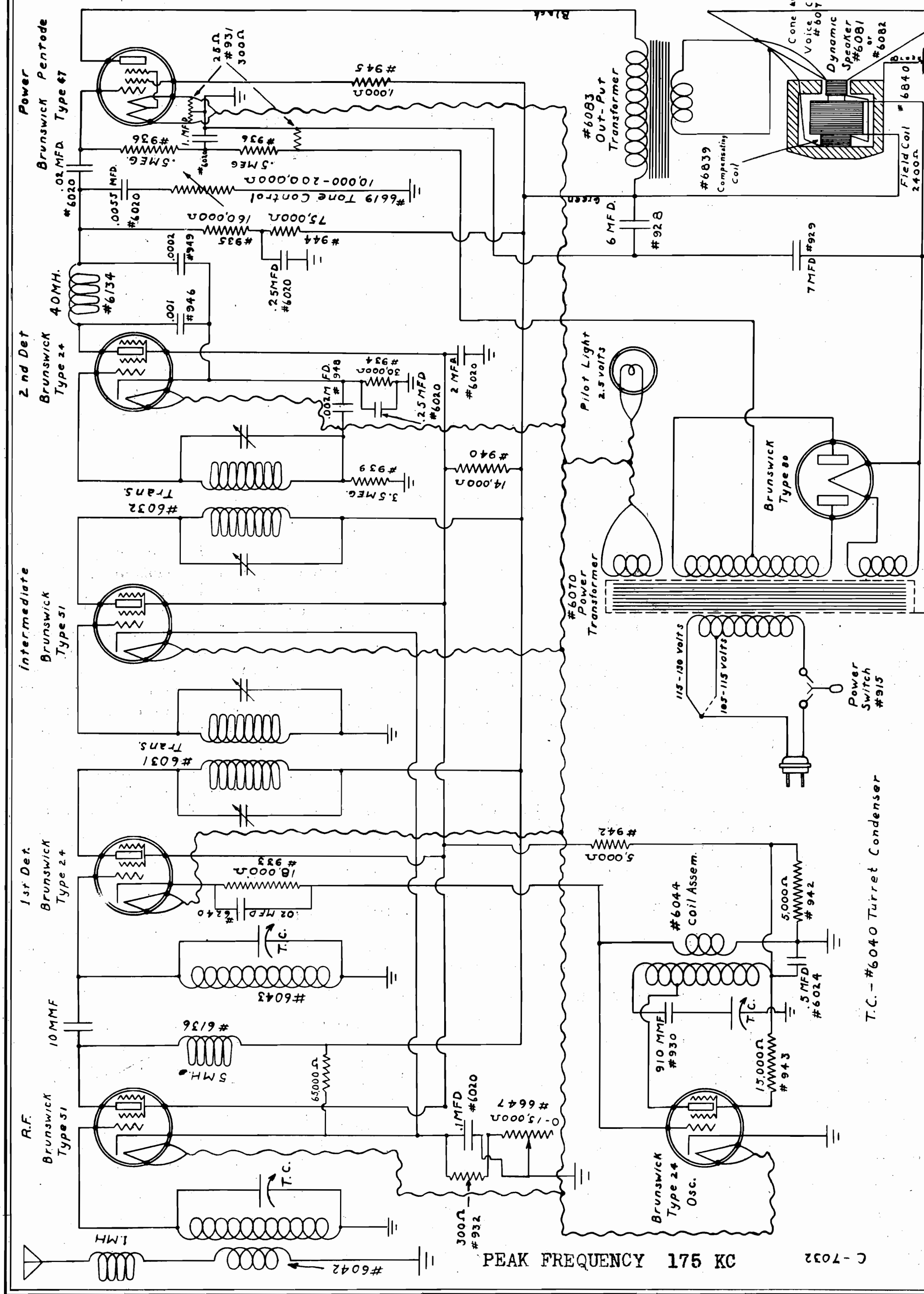


CONTINUITY TEST TABLES

(Using 10-volt scale 1,000 ohms per volt: meter on Weston 565 with 6-volt battery)

Circuit Tested	From	To	Reading	Your Reading
Ant. coil pri.	Ant. post	Ground	6.	
Ant. coil sec.	Grid 1st tube	Ground	6.	
1st R. F. Plate ckt.	Plate of tube	Brown lead of filter pack	6.	
1st R. F. Screen ckt.	Screen prong	Center lead Voltage divider	6.	
1st R. F. Cathode ckt	Cath. prong	Center tap Volume Control "ON"	6.	
2nd R. F. Grid ckt.	Grid Clip	Ground	6.	
2nd R. F. Plate ckt.	Plate prong	Brown lead of filter pack	6.	
2nd R. F. Screen ckt.	Screen prong	Center tap Voltage divider	6.	
2nd R. F. Cathode ckt.	Cathode prong	Center tap Volume Control "ON"	6.	
Det. Grid ckt.	Gird Clip	Ground	6.	
Det. Plate ckt.	Plate prong	Brown lead of filter pack	6.	
Det. Screen ckt.	Screen prong	Center Voltage divider	6.	
Det. Cathode ckt.	Cathode prong	Ground	1.4	
P. Z. cont. grid	Grid prong	Sec output trans. black lead	(slight deflection)	
P. Z. space chg. grid ckt.	S. C. Grid Prong	Brown lead of filter pack	6.	
P. Z. Plate ckt.	Plate prong	Brown lead of filter pack	5.7	
Output Sec.	One side	Other side	5.9	
Pri Power Trans.	Across A. C. Plug	Switch on	5.9	
Hi volts Sec.	Across 280 plate prongs		5.6	
Speaker field	Red wire	Green Wire	5.4	
Speaker voice coil	Green wire	Black	6.	
Filter Choke	Across red leads		6.6	
Voltage divider	Ground	Brown lead of filter pack	2.2	

BRUNSWICK RADIO CORP.



For Voltage and Trimmer alignment Data See Page 186-F

Models 11, 12, 16, (and 33)

BRUNSWICK RADIO CORP.

MODELS 11, 12, & 16.

SOCKET ANALYSIS—120 VOLT LINE

Volume Control Set at Maximum—Short Antenna to Ground

Position	*Type Tube*	*Heater Voltage*	*Control Grid Voltage*	*Plate Voltage*	*Plate Current*	*Screen Grid Voltage*
1st R.F.	—51	2.25	3.5	230	3.4 MA	70
1st Det.	—24	2.25	5.8	220	.4 MA	62
I.F.	—51	2.25	3.8	220	9 MA	60
2nd Det.	—24	2.25	.2	115*	.3 MA	60
Osc.	—24	2.25	0	35	1.2 MA	22
Power Output	—47	2.25	1	220	33 MA	220
Rec. Tube	—80	4.7		(530 (530	(26 MA (26 MA	

* Readings will vary according to resistance of meter.
Tubes used in this test are average tubes.

METHOD OF ALIGNING R.F. CIRCUITS

In the event the antenna and first detector tuned circuits are out of alignment, they may be adjusted with the aid of a weak high frequency (1300 to 1500 K. C.) signal—produced by a distant station or a local test oscillator. Tune this signal in very carefully for maximum volume, or better still, if one is available, for maximum deflection on an output meter. Adjust the antenna tuned circuit adjustment screw (located near the type 47 tube on the top plate of the turret condenser) for maximum volume or for maximum deflection on an output meter. Then, without changing the position of the tuning knob, adjust the first detector adjustment screw—located adjacent to the A. C. switch—for maximum volume or maximum deflection on an output meter. Before tightening the lock unit on each adjustment screw, go over the adjustments a second time to secure the greatest possible accuracy. A drop of ambroid glue or collodian should be placed on each adjustment screw after the lock nut has been tightened to prevent handling and speaker vibrations from changing the adjustment.

In most cases it will be unnecessary to touch the oscillator adjustment screw (located between the antenna and first detector adjustment screws.) If this adjustment is necessary it is recommended that the intermediate frequency transformer circuits be tuned first (see following paragraph). Then tune oscillator circuit, employing same method as explained above for antenna tuned circuit and first detector circuit. In the event any circuit does not tune properly, check the circuit thoroughly for open and short circuits. If the trouble cannot be located, the coil should be replaced with a new one.

METHOD OF ALIGNING I.F. TRANSFORMERS

In the event the receiver is still insensitive and lacks proper selectivity after making the foregoing adjustments, the intermediate frequency transformers should be adjusted by one of the following methods:

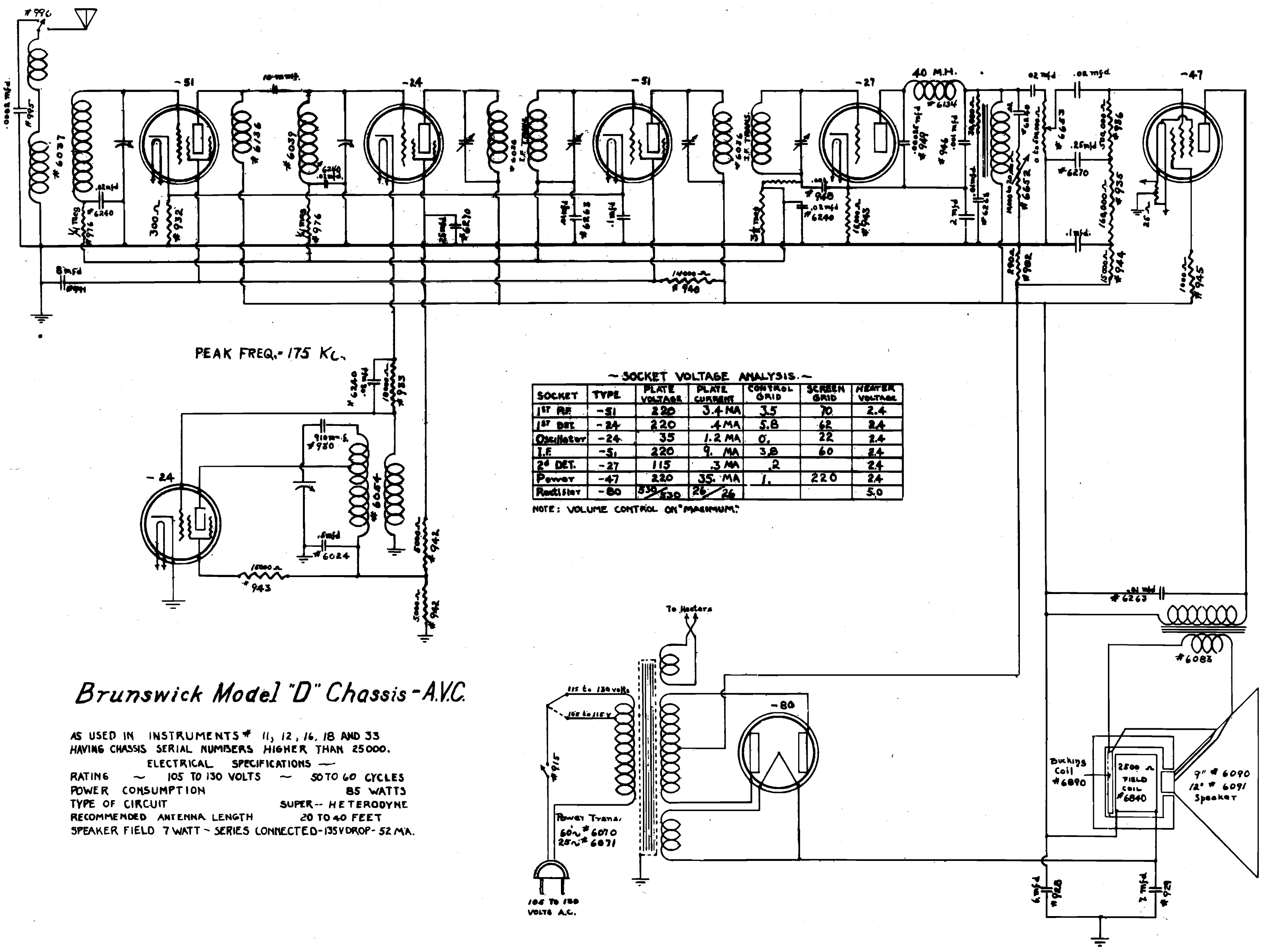
1. Tuning Intermediate Transformers with 175 K.C. Oscillator

By far the best method of aligning the tuned circuits in the intermediate frequency transformers is to employ a 175 K.C. oscillator and output meter. In making this test, remove the oscillator tube and connect the output of the oscillator to the grid cap of the first detector. Usually it will not be necessary to remove the grid cap from the tube, this depending on the strength of the oscillator and the amount the I.F. transformers are out of line. Connect the output meter across the primary of the output transformer located on the speaker (terminals 3 and 7 counting from left to right). The four I.F. adjustment screws on the I.F. transformers, located inside the chassis, should be adjusted with a non-metallic screw driver for maximum deflection on the output meter. Go over all four adjustments a second time to secure maximum accuracy.

2. Tuning Intermediate Transformers without 175 K.C. Oscillator

In the event a 175 K.C. oscillator is not available a fairly close adjustment may be made by tuning in a faint broadcast signal, and with the volume control turned on full, adjust the transformers for maximum volume with a non-metallic screw driver. After adjusting the I.F. transformers, the R.F. circuits should be realigned as explained before.

BRUNSWICK RADIO CORP.



~ SOCKET VOLTAGE ANALYSIS ~

SOCKET	TYPE	PLATE VOLTAGE	PLATE CURRENT	CONTROL GRID	SCREEN GRID	HEATER VOLTAGE
1st R.F.	-51	220	3.4 MA	3.5	70	2.4
1st DET.	-24	220	.4 MA	5.8	62	2.4
Oscillator	-24	35	1.2 MA	0.	22	2.4
I.F.	-51	220	9. MA	3.8	60	2.4
2d DET.	-27	115	.3 MA	.2		2.4
Power	-47	220	35. MA	1.	220	2.4
Rectifier	-80	330/330	26/26			5.0

NOTE: VOLUME CONTROL ON "MAXIMUM."

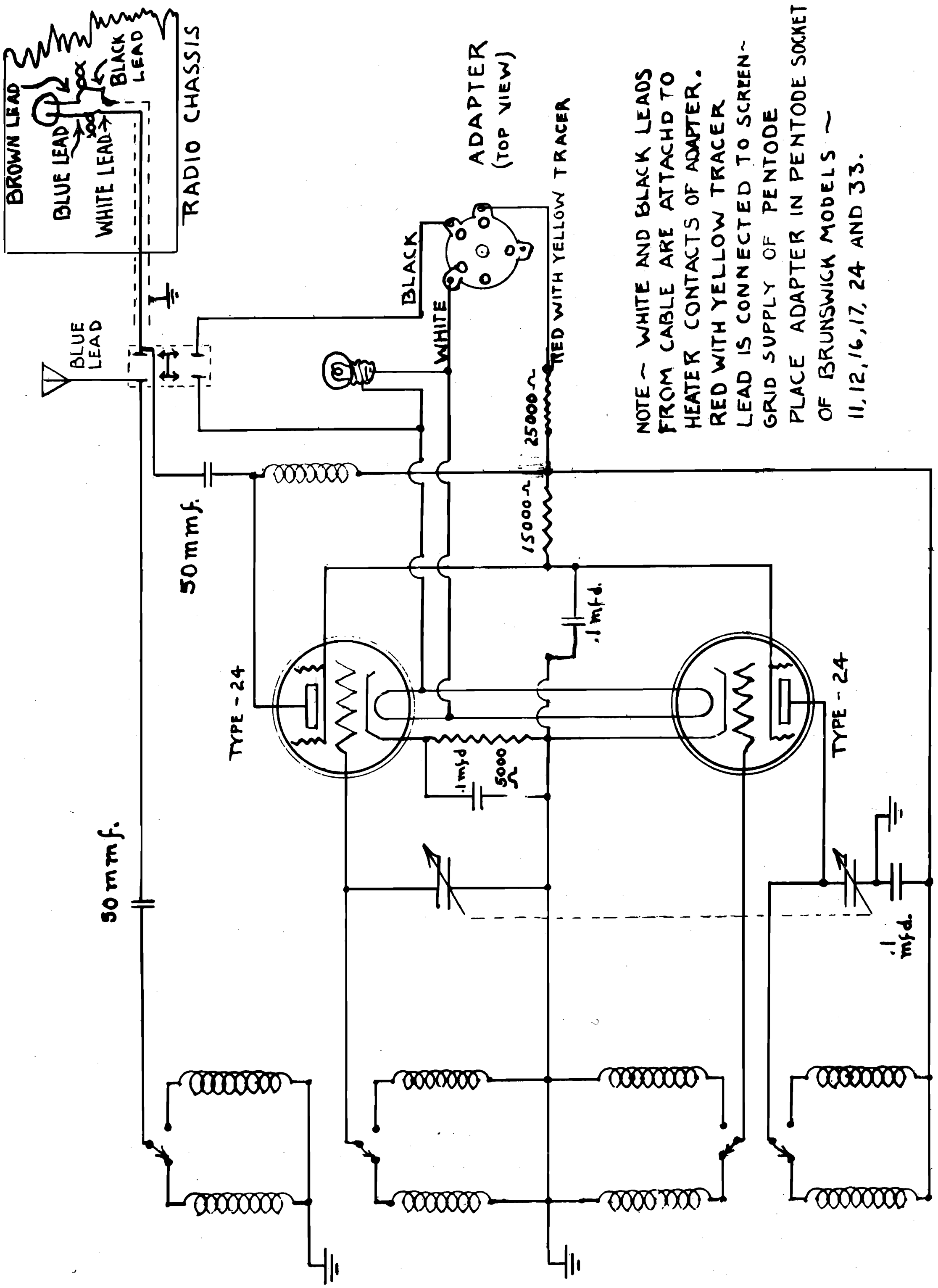
Brunswick Model "D" Chassis - A.V.C.

AS USED IN INSTRUMENTS # 11, 12, 16, 18 AND 33
HAVING CHASSIS SERIAL NUMBERS HIGHER THAN 25000.

ELECTRICAL SPECIFICATIONS —

RATING ~ 105 TO 130 VOLTS ~ 50 TO 60 CYCLES
POWER CONSUMPTION 85 WATTS
TYPE OF CIRCUIT SUPER-- HETERODYNE
RECOMMENDED ANTENNA LENGTH 20 TO 40 FEET
SPEAKER FIELD 7 WATT ~ SERIES CONNECTED - 135 V DROP - 52 MA.

BRUNSWICK RADIO CORP.

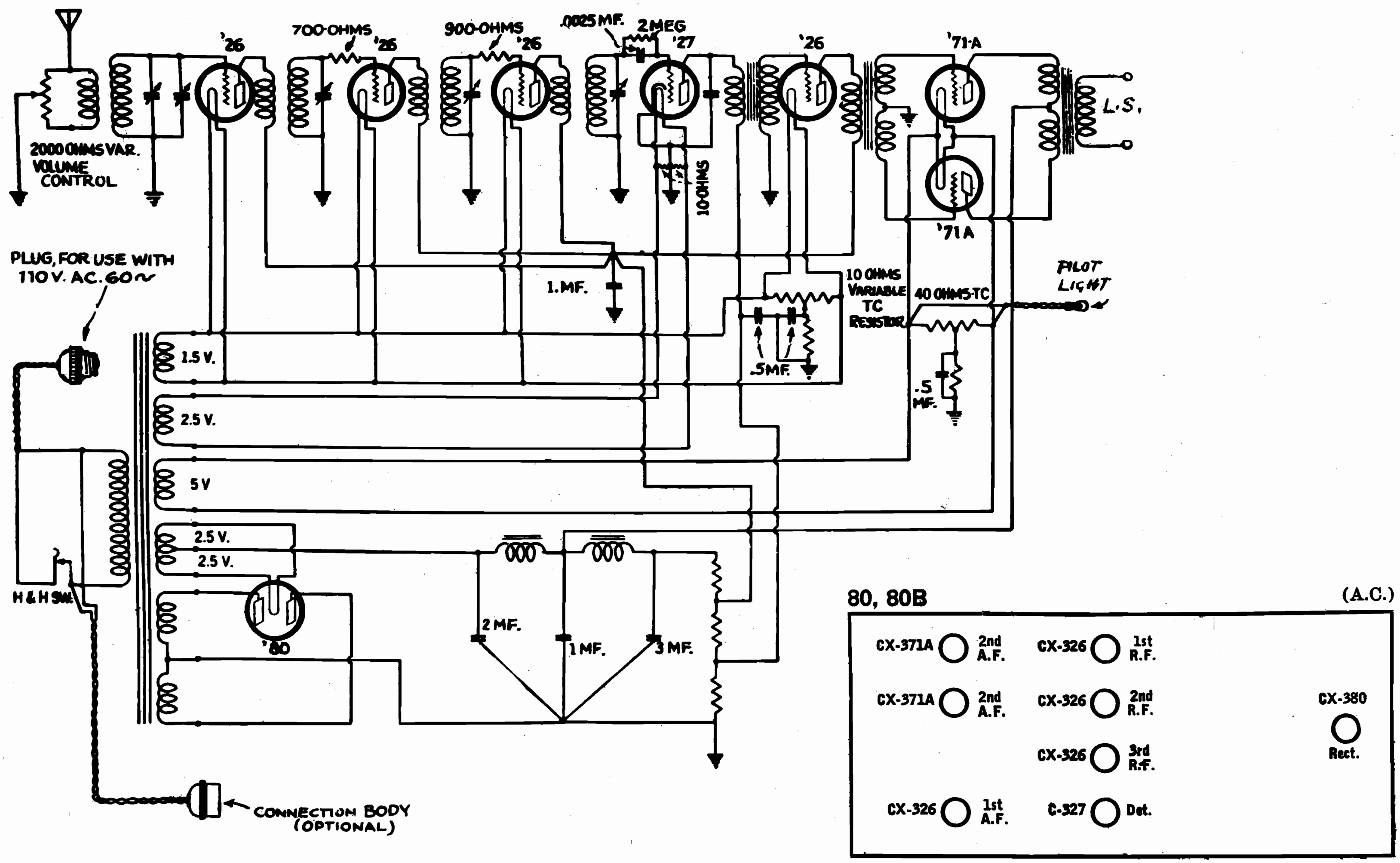


NOTE ~ WHITE AND BLACK LEADS FROM CABLE ARE ATTACHD TO HEATER CONTACTS OF ADAPTER. RED WITH YELLOW TRACER LEAD IS CONNECTED TO SCREEN-GRID SUPPLY OF PENTODE. PLACE ADAPTER IN PENTODE SOCKET OF BRUNSWICK MODELS ~ 11, 12, 16, 17, 24 AND 33.

CA-7039

BRUNSWICK MODEL-100 SHORT-WAVE CONVERTER

BUCKINGHAM RADIO CORP.



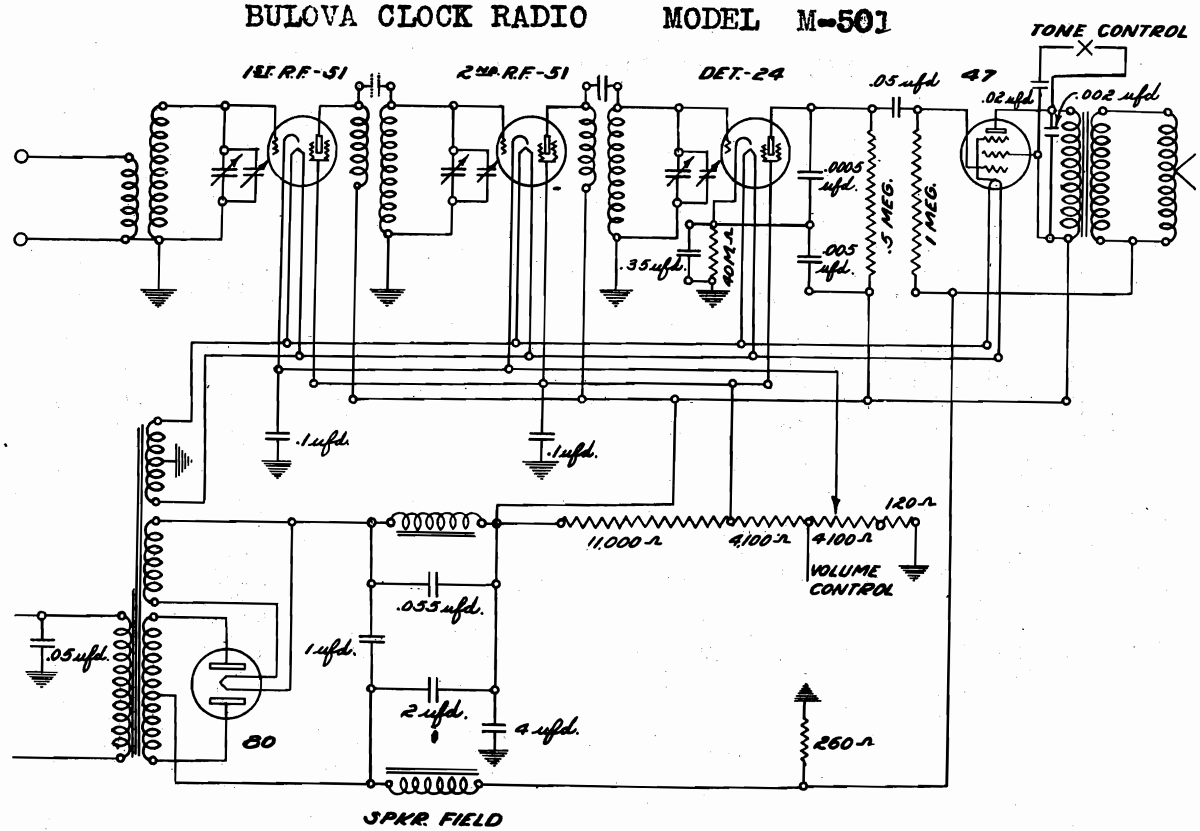
Buckingham 80 Average readings.

	1 RF	2 RF	3 RF	Det.	1 AF	2 AF
Fil. volts	1.25	1.25	1.25	2.25	1.25	5.
Bias volts	9.	9.	9.		9	45
Plate volts	125	125	125	45	125	180
Plate current (ma)	4	4	4	4	4	20

Model 80.

BULOVA WATCH COMPANY

BULOVA CLOCK RADIO MODEL M-501



CONTINUITY TEST TABLES

(Using 10-volt scale 1,000 ohms per volt: meter on Weston 565 with 6-volt battery)

Circuit Tested	From	To	Reading	Your Reading
Ant. coil pri.	Ant. post	Ground	6.	
Ant. coil sec.	Grid 1st tube	Ground	6.	
1st R. F. Plate ckt.	Plate of tube	Brown lead of filter pack	6.	
1st R. F. Screen ckt.	Screen prong	Center lead Voltage divider	6.	
1st R. F. Cathode ckt.	Cath. prong	Center tap Volume Control "ON"	6.	
2nd R. F. Grid ckt.	Grid Clip	Ground	6.	
2nd R. F. Plate ckt.	Plate prong	Brown lead of filter pack	6.	
2nd R. F. Screen ckt.	Screen prong	Center tap Voltage divider	6.	
2nd R. F. Cathode ckt.	Cathode prong	Center tap Volume Control "ON"	6.	
Det. Grid ckt.	Gird Clip	Ground	6.	
Det. Plate ckt.	Plate prong	Brown lead of filter pack	6.	
Det. Screen ckt.	Screen prong	Center Voltage divider	6.	
Det. Cathode ckt.	Cathode prong	Ground	1.4	
P. Z. cont. grid	Grid prong	Sec output trans. black lead.	(slight deflection)	
P. Z. space chg. grid ckt.	S. C. Grid Prong	Brown lead of filter pack	6.	
P. Z. Plate ckt.	Plate prong	Brown lead of filter pack	5.7	
Output Sec.	One side	Other side	5.9	
Pri Power Trans.	Across A. C. Plug	Switch on	5.9	
Hi volts Sec.	Across 280 plate prongs		5.6	
Speaker field	Red wire	Green Wire	5.4	
Speaker voice coil	Green wire	Black	6.	
Filter Choke	Across red leads		5.6	
Voltage divider	Ground	Brown lead of filter pack	2.2	

RESISTANCE TABLE

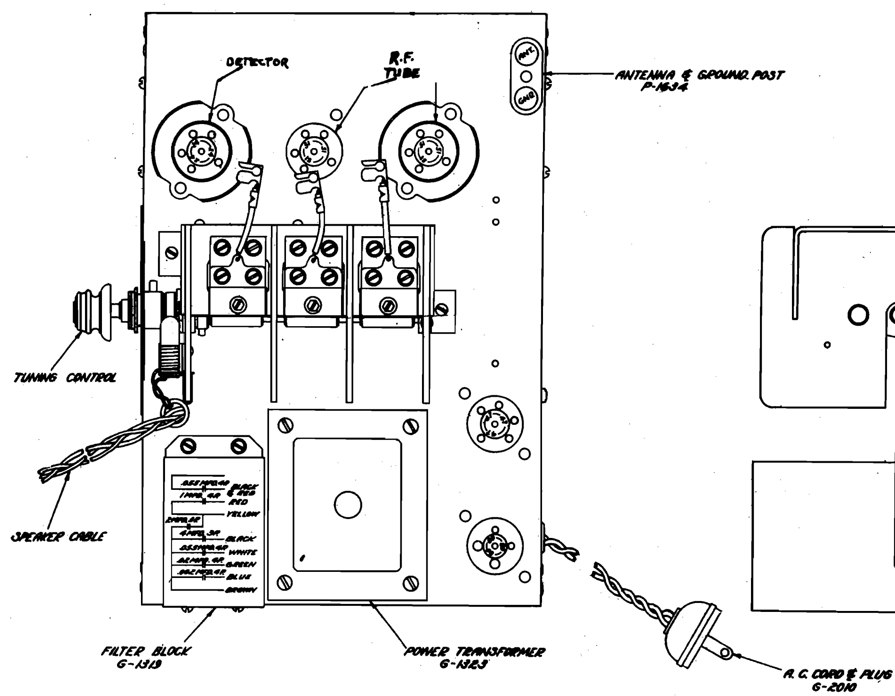
(Using 10-volt range meter 1,000 ohms per volt and 6-volt battery)

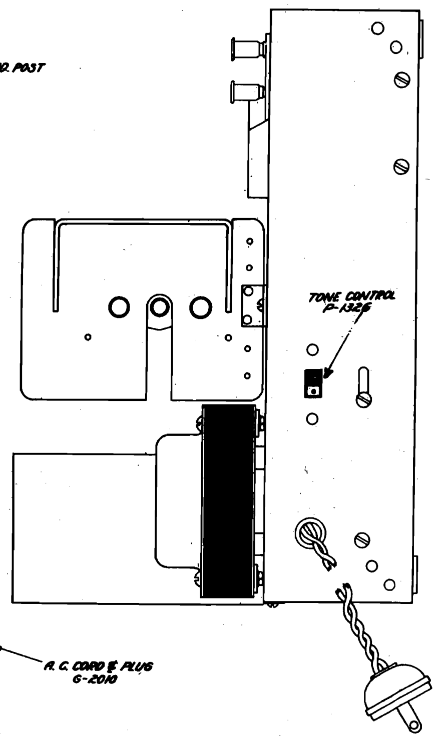
Item	Color Code*	From	To	Reading	Your Reading	Resistance in Ohms
Det. Cath. Resistor	Yel., Blk., Or.	Det. Cath.	Gnd.	1.3		40,000
Pent. Grid Resistor	Br. Blk., Green	Pent Grid	Spkr. Field	Slight Deflection		1,000,000
Wire Wound	Black	VoiceCoil.Black	Gnd.	5.9		260
Voltage Divider, Short End	Black	Volume Cont. Green Lead	S. G. Ckt.	4.2		4,100
Voltage Divider, Long End	Black	Plate	S. G. Ckt.	3.		11,000
Det. Plate Resistor	Gr., Blk., Yellow	Det. Plate	Pent. Space Chg. Grid.	.1		500,000
Vol. Control "on"		Gnd.	R. F. Cathode	4.2		4,100

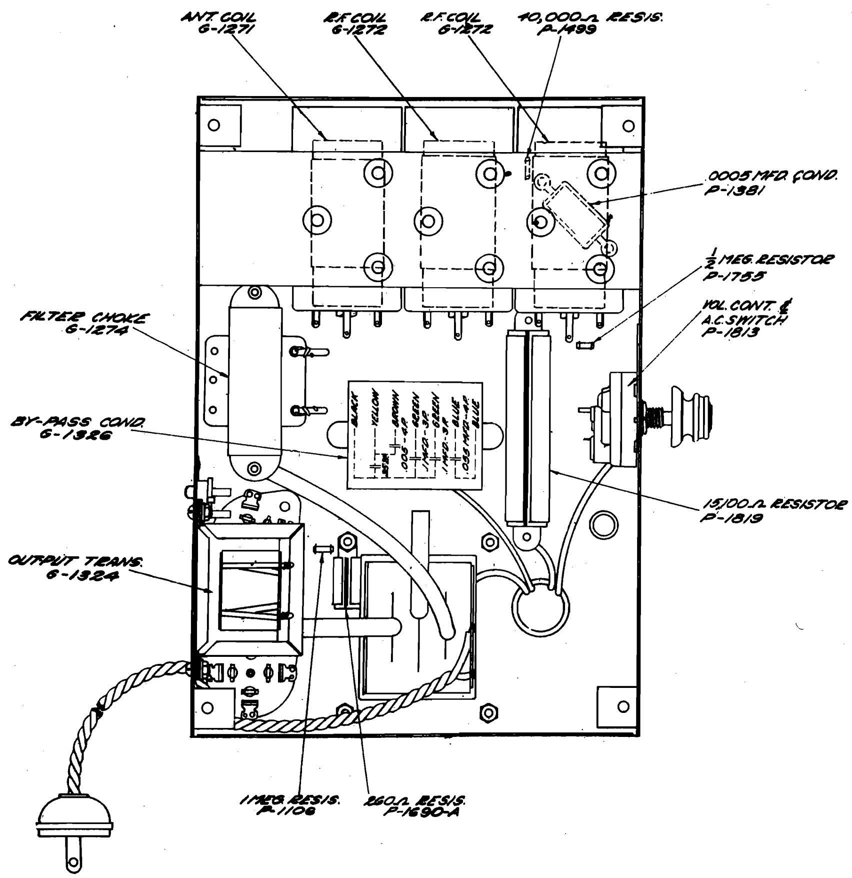
*Color code: read body color first, tip second and dot last.

BULOVA WATCH COMPANY

BULOVA CLOCK RADIO MODEL M-501







VOLTAGE ANALYSIS

READINGS TAKEN WITH WESTON MODEL 565 ANALYZER

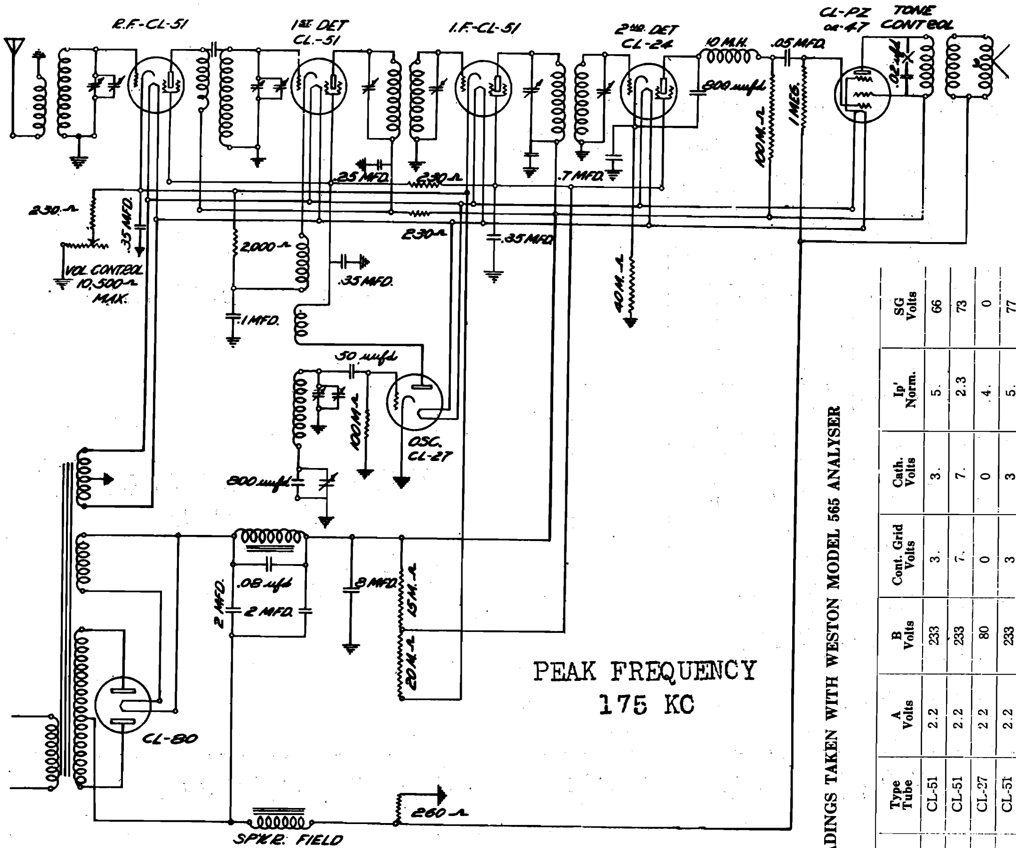
No.	Stage	Type Tube	Fil. Volts	Plate Volts	Cont. Grid Volts	Cath. Volts	S. G. Volts	Ip. Normal
1	1st R. F.	C. L. 51	2.1	225	2.1	2	75	5
2	2nd R. F.	C. L. 51	2.1	230	2.2	2	75	4.5
3	Det.	C. L. 24	2.1	160*	7	7.5	75	.02
4	Output	C. L. 47	2.1	215	5*	0	225	26.5
5	Rect.	C. L. 80	4.8	280				†30

*Reading dependent upon resistance of meter.

†Reading taken for one anode only: 60 milliamperes would be about correct.

Volume control position full. Line voltage 115—60 cycle.

BULOVA WATCH COMPANY



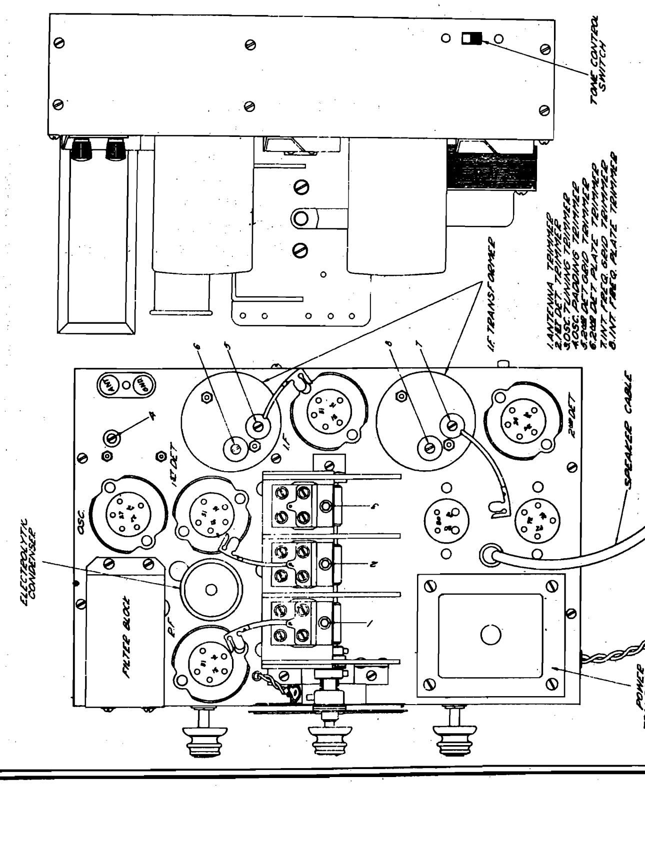
BULOVA CLOCK RADIO MODEL M-701

READINGS TAKEN WITH WESTON MODEL 565 ANALYSER

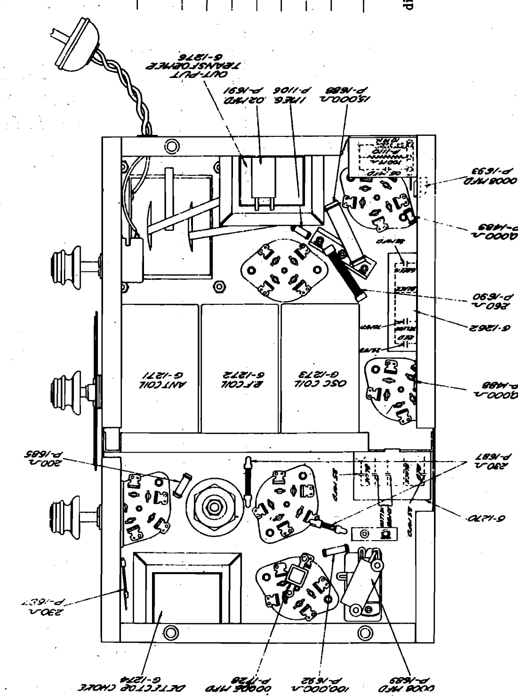
No.	Stage	Type Tube	A Volts	B Volts	Cont. Grid Volts	Cath. Volts	Ip' Norm.	SG Volts
1	r. f.	CL-51	2.2	233	3.	3.	5.	66
2	1st Det.	CL-51	2.2	233	7.	7.	2.3	73
3	Osc.	CL-27	2.2	80	0	0	4.	0
4	I.F.	CL-51	2.2	233	3	3	5.	77
5	2nd det.	CL-24	2.2	162	6.2	7.2	.5	73
6	Output	CL-PZ	2.2	228	15.	0	27	233
7	Rect	CL-80	4.8	300	0	0	50.	0

Volume control position Full   Line Voltage 115

Note: Since resistance tolerances in the sets are plus or minus 10%, and tubes may vary over 20%, your readings may disagree with the above by plus or minus 30%. CL-PZ is also known as CL-47, the latter being the final type number.



Top View



Bottom View

BULOVA WATCH COMPANY

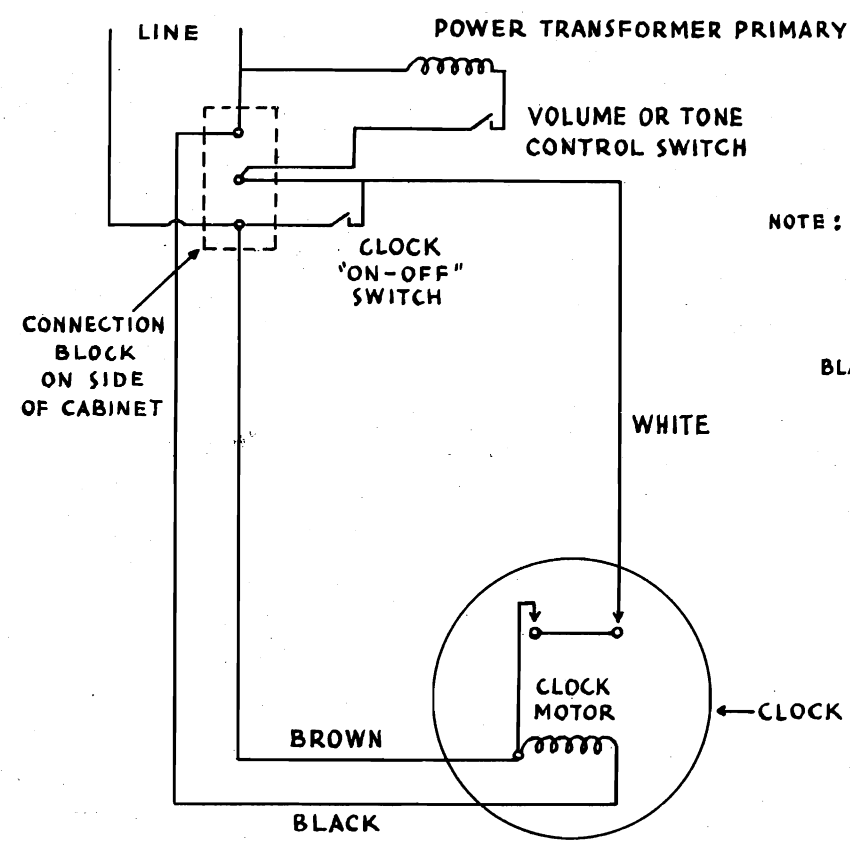
Resistance Table

BULOVA CLOCK RADIO
MODEL M-701

(Using 10 volt range meter 1000 ohms per volt and 6 volt battery)

Item Tested	Description Color—Code	From	To	Reads	Your Reading	Ohms Resistance
r. f.-grid. bias resist.	Black Strap type Wire wound	r. f. cath. prong	Vol. cont. ungrounded terminal	5.9		230
Volume control	Variable at max. resistance	Test between its two terminals (con nected)		3.2		Max. 10,500
1st det. grid bias resist.	Red Black tip	r. f. cath. prong	Other end of resist.	5.1		2,000
1st det. screen grid volts resist.	Black Strap type Wire wound	1st det. screen grid prong	Other end of resist.	5.9		230
1st det. plate resist.	Black Strap type Wire wound	Solder lug on Electrolytic cond.	B plus term. of 1st i. f. trans.	5.9		230
Oscillator grid-resist.	Brown Yellow spot Black tip	Oscillator grid prong	Ground	0.6		43,000
I. f. and r. f. cathode-bias resist.	Red Orange spot Black tip	I. f. cath. prong	I. f.-screen grid prong	2.3		20,000
I. f. and det. screen grid volts resist.	Brown Orange spot Green tip	I. f. screen grid prong	Solder lug on electrolytic cond.	2.7		15,000
2nd det. grid-bias resist.	Yellow Orange spot Black tip	2nd det. cath. prong	Ground	1.3		40,000
2nd det. plate resist.	Inside- 3rd term. det. r. f. filter assem.	Test between solder lugs on det. r. f.-filter assem. with red wires attached		0 6		100,000 in series with 10m.h. choke
Pentode grid-resist.	Brown Green spot Black tip	Pentode Grid prong	Dummy solder lug off output trans. sec.	0.5		1 Meg.
Pentode grid-bias	Wire wound Strap type	Dummy solder lug off-output trans. sec.	Ground	5.9		260

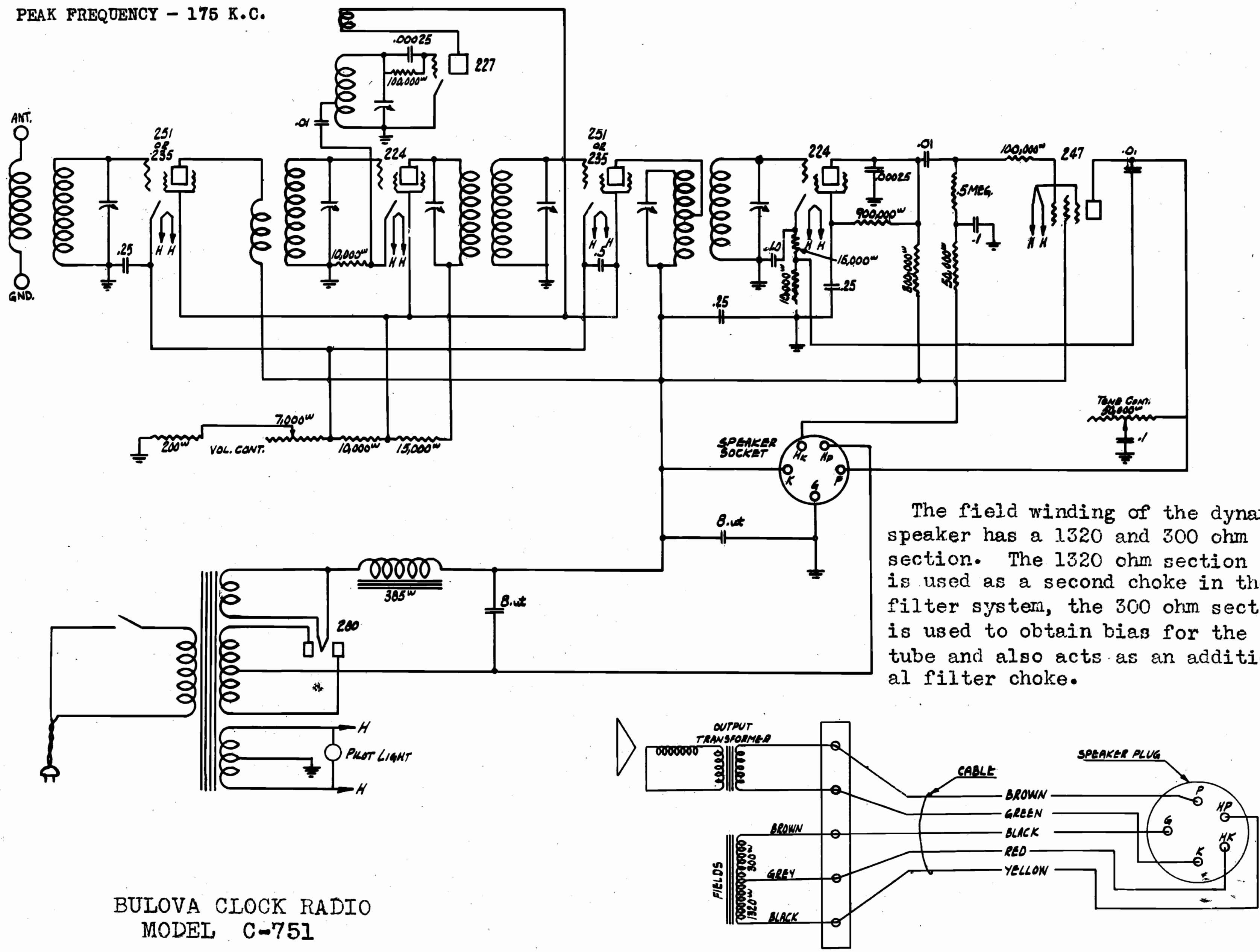
AUTOMATIC CLOCK CONTROL WIRING DIAGRAM



NOTE: ON SOME OF THE CLOCKS RED BLUE AND BLACK WIRES ARE USED INSTEAD OF BLACK WHITE AND BROWN

BULOVA WATCH COMPANY

PEAK FREQUENCY – 175 K.C.



The field winding of the dynamic speaker has a 1320 and 300 ohm section. The 1320 ohm section is used as a second choke in the filter system, the 300 ohm section is used to obtain bias for the -47 tube and also acts as an additional filter choke.

BULOVA CLOCK RADIO
MODEL C-751

BULOVA WATCH COMPANY

BULOVA CLOCK RADIO MODEL C-751.

VOLTAGE TABLE

Never check voltages until all tubes are fully warmed up to proper operating condition. The voltage table given below is taken at 115 volts line with a Model 547 Weston set checker. It must be remembered that the voltage readings taken vary directly as the line voltage and also with the accuracy of the meters used. A variation of 10% plus or minus is permissible.

115 V. Line Volume Control Full On

TUBE VOLTAGES

Type of Tube	Position of Tube	Filament Volts	B Volts	C Volts	NORMAL PLATE M.A.	Screen Volts
227	Oscillator	2.4	62.5		4.75	
235	Radio Frequency	2.4	240	2.15	2.75	27
224	1st Detector	2.4	230	4.35	.5	65
235	Intermediate	2.4	237	2.15	2.75	72
224	2nd Detector	2.4	100*	2.1*	2.5	35*
247	Pentode	2.4	250	16.5**	32.5	250
280	Rectifier	4.95			27.ea.plate	

*These readings are only comparative and are not true voltages applied. The volt meter, when the readings are taken at these points, is in series with a very high resistance.

** To read the 247 bias, read between H.K.speaker socket and ground.

INTERMEDIATE TRANSFORMERS:

The intermediate transformers are of the band pass type and of exceptionally high uniform gain. They are tuned to 175 kilocycles. The intermediate frequency trimmers are mounted on an isolantite base, preventing the transformer from becoming detuned due to the trimmer condensers absorbing moisture or warping. For this reason it should rarely, if ever, be necessary to re-track the intermediate frequency trimmers. In the event that it should be advisable to re-align the intermediate frequency coils, it is absolutely essential that a 175 kilocycle oscillator and an output measuring device be used.

ALIGNMENT OF RECEIVER:

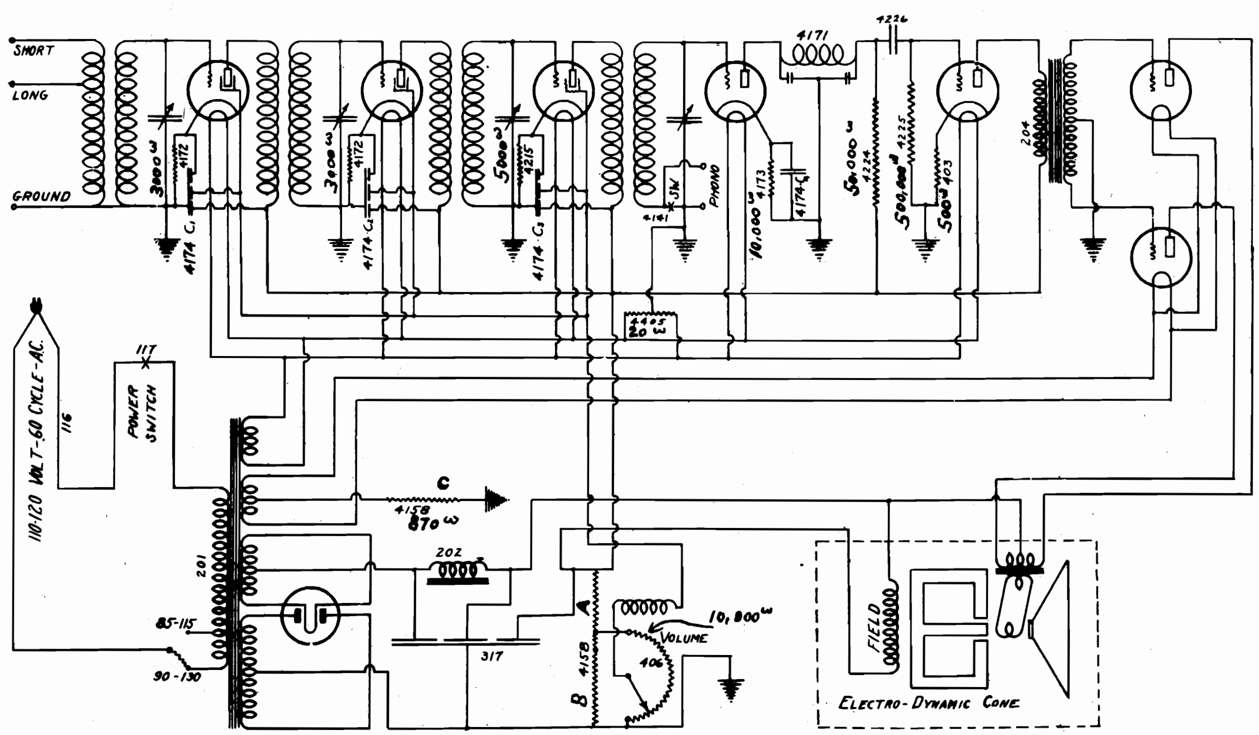
Because of the construction and thorough impregnation of the intermediate coils, the intermediate stages should rarely need re-tracking. Only when an intermediate coil has become defective due either to an open or burned out winding, should it be necessary to re-adjust the intermediate trimmers. Should this occur, it is necessary that an oscillator be used and the intermediate trimmers be adjusted at 175 kilocycles. To align the intermediate stages, connect the high side of the oscillator output to the grid circuit of the first detector, which is done by disconnecting the grid cap of the 224 first detector and connecting the high side of the test oscillator to the control grid of this tube. The ground side of the test oscillator should be connected to the ground post on the chassis. Set the oscillator at 175 kilocycles and adjust the output of the oscillator so that a convenient reading is obtained on the output meter. Be sure that the output from the oscillator is not so large that it will overload the second detector. If during the alignment the meter goes off scale, reduce the output of the test oscillator or adjust the receiver volume control.

The trimmers of the intermediate coils are accessible through the small holes in the top of the intermediate shield can. There are two trimmers to each intermediate coil. Align the grid trimmer of the first intermediate coil. After a maximum reading is obtained by adjusting the grid trimmer on the first int rmediate, adjust the primary for maximum reading and then re-check the grid side to make certain the alignment of the secondary has not been changed by the adjustment of the primary. The same procedure is followed in aligning the second intermediate coils. After both intermediate coils are properly aligned the adjustment of the intermediate stage is complete and they should not be further disturbed.

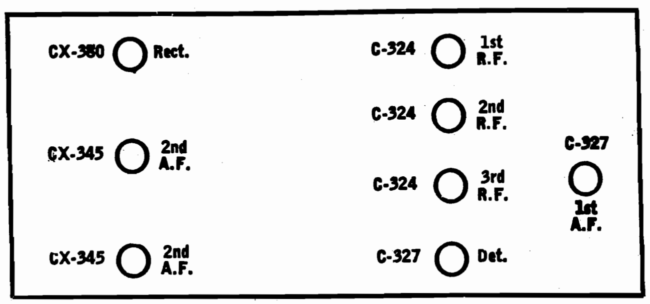
Replace the grid cap on the first detector and connect the oscillator output leads to the antenna and ground posts of the receiver and set the oscillator at 1435 kilocycles. Then tune the receiver to 1435 kilocycles on the dial. It is important that the receiver be tuned to this point. If the receiver is out of the cabinet it will be necessary to use some temporary indicator so that the position 1435 kilocycles on the dial may be accurately located. (This indicator should be set so that when the variable condensers are at the maximum capacity stop the indicator points to the last line on the dial at the low frequency end.) Then track the variable condensers by adjusting the trimmer condensers in the following order: Oscillator, antenna and radio frequency - (reading from the front of the receiver toward the back, the variable condenser sections are : Oscillator, antenna and radio frequency). After the variable condensers have been properly tracked at 1435 kilocycles, adjust the oscillator to 1295 kilocycles. Tune the receiver to this frequency. Check alignment of the condensers at this point by bending the end plate of the rotors in and out, noting the change in reading on the output meter. If when the plates are bent in the reading is increased, it is an indication that that particular section requires more capacity and the end plate should be permanently bent in at this point; or, if when the end plate is bent away, the reading is increased, the end plate should be bent away permanently, as it is an indication that that particular section requires less capacity at that particular point. The variable condensers should be checked in this manner at 1295, 880, 650 and 550 kilocycles. These points have been chosen so as to take advantage of the slots in the end plates of the variable condensers. This procedure of bending plates should rarely be necessary on the oscillator section, as the plates of the oscillator section are especially designed to properly track over the broadcast spectrum, providing the antenna and radio frequency stages are correctly aligned.

BUSH AND LANE PIANO CO.

No. 12 Screen Grid



4158—Voltage Divider Resistor 5750 Ohms, Total.



Line Voltage 112—Set on 120 Volt Tap

TUBE NO. IN ORDER ①	TYPE OF TUBE ②	POSITION OF TUBE 1ST. R.F. DET., ETC. ③	READINGS, PLUG IN SOCKET OF SET — TUBE OUT: A VOLTS ④	TUBE OUT: B VOLTS ⑤	TUBE IN TESTER: A VOLTS ⑥	B VOLTS ⑦	C VOLTS (CONTROL GRID) ⑧	CATHODE-HEATER VOLTS ⑨	NORMAL PLATE M.A. ⑩	PLATE M.A. GRID TEST ⑪	PLATE CHANGE M.A. ⑫	SCREEN GRID VOLTS ⑬
1	224	1st RF	2.45	185	2.35	170	3.5	3	1	4	3	65
2	224	2nd RF	2.45	185	2.35	170	3.0	3	1.0	4	3	65
3	224	3rd RF	2.45	185	2.35	170	3.0	3	1.6	4	3	65
4	227	Det.	2.45	150	2.35	130	18.0	18.0	1.8	3	1.2	-
5	227	1st AF	2.45	110	2.35	160	10.0	10	7.4	9	1.5	-
6	245	Pwr.	2.45	285	2.36	230	45	-	26	30	4	-
7	245	Pwr.	2.45	285	2.36	230	45	-	26	30	4	-
8	280	Rect.	5.	-	4.5	-	-	-	80	-	-	-
9												
10												

CAPEHART CORPORATION

RECORD CHANGER

Model 10-12-C

ASSEMBLY OF MOTOR TO BASE PLATE

The motor is attached to the base plate by three bolts, and mounted on rubber cushions.

The brace that is over the turntable spindle and bolted to the base plate serves as an excellent gauge for aligning the motor in the center.

When removing the two screws that hold the turntable locating plate over the turntable spindle, preparatory to operating the instrument, be sure that the locating plate lines up with the holes that the screws are just removed from.

If the motor has become shifted in transit there will be a tendency for the holes in the locating plate and base plate to not perfectly line up.

In this case it is necessary to slightly loosen the three bolts holding the motor to the base plate and shift the motor to such position that the holes in the brace and the base plate align perfectly, and while the brace is still in place, tighten the suspension bolts to hold the motor in that particular position. The brace must then be removed before the turntable is mounted on the shaft.

In placing the turntable on the shaft, be certain that the rubber driving washer is in proper place with clips over the spindle pin.

After the turntable is put on the shaft, force it down by hand to be sure that the rubber washer and turntable are making perfect contact.

To level the turntable, place a straight edge across the turntable and adjust the three suspension bolts holding the motor to the base plate until the same distance is obtained from the bottom edge of the straight edge to the base plate near the three points where the suspension bolts are located.

This measurement should be approximately 11/16″. This adjustment must be made so that there is no free movement of the motor by either of the suspension bolts being too loose.

TONE ARM ADJUSTMENT FOR TEN INCH AND TWELVE INCH RECORDS

Pickup change lever No. 5509 is for changing the instrument from 10 inch to 12 inch record operation and vice versa.

The lever changes the position of the pickup return lever in such a manner that the needle is let down for the 10 inch or the 12 inch record, as desired.

To adjust for playing 10 inch records, loosen the forward lever stop No. 5526 and hold the lever in such a position that the needle will come down on a 10 inch record exactly 4-11/16″ from the edge of the center pin. (A scale should be placed on the record with the end of the scale against the centering pin in such a position that the needle point will come down on the scale at the 4-11/16″ inch position.)

When the proper location of lever No. 5509 is ascertained, then the front stop may be set snug against this lever and the screw tightened, which will allow the lever to always be thrown over to that exact position when desiring to play 10 inch records.

To adjust for playing 12 inch records, loosen the back lever stop No. 5527 and hold the lever in such position that the needle will come down exactly 5-11/16″ from the edge of the centering pin. (A scale should be placed on the record with the end of the scale against the centering pin in such position that the needle point will come down on the scale at the 5-11/16″ position.)

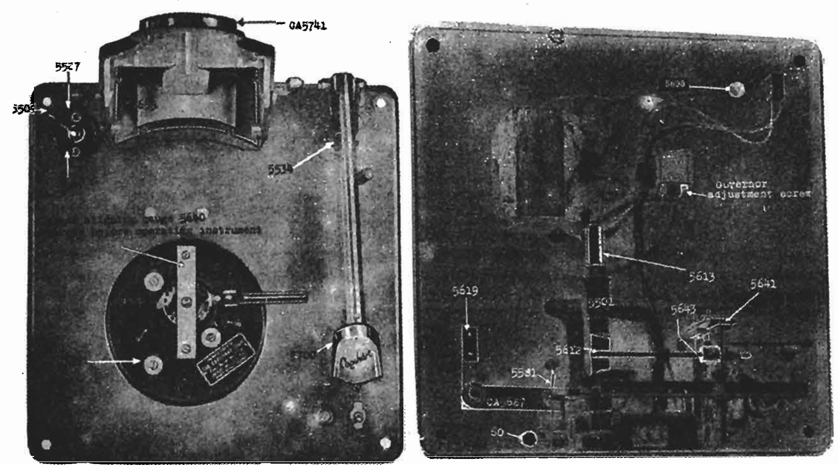
In the event you are unable to properly adjust for either 10 inch or 12 inch records by the above method, make the adjustment as nearly correct as possible then refer to instructions on Page 6 and check Tone Arm Bracket Lever adjustment making certain the adjustment is correct.

Then loosen the lock nut holding the adjustment screw on the tone arm return lever No. CA5687 and turn the adjusting screw either in or out, as the occasion requires, to bring the needle to the proper location for the size record you are unable to adjust for by the lever stop method. It will then be necessary to readjust the lever stop which was originally set in position for the other size record.

The lever stop screws must be set tight so the lever stops will not be jarred out of position as the lever is thrown from one position to ~~the other.~~

ADJUSTMENT OF PICKUP WEIGHT

Make this adjustment while music is being played, and only one record is on the turntable. With a delicate pair of scales, having a range of 0 to 12 ounces, catch the needle screw and lift the pickup from the record until the audio quality breaks, at which time a reading of 5½ to 6 ounces should be shown on the scales. Raising or lowering the spring support No. 5575 which is affixed to the tone arm lifting rod No. 5553 adjusts the weight of the pickup.



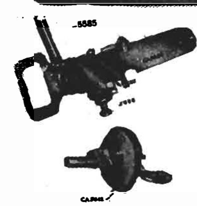


Fig. 1

5509 Eccentric Handle.
5526 Eccentric Lever Stop-Front.
5527 Eccentric Lever Stop-Rear.
5534 Tone Arm Rest.
5585 Tone Arm Lever Return Spring.
5591 Motor and Mounter Insulating Washer.
5640 Shipping Strap.
A5655 Record Shelf & Slide Assy.
5700 Pickup.
CA5741 Standard Assy.
5509 Eccentric Handle.
5554 Eccentric Pin.
CA5642 Eccentric Flange and Lever Assy.
CA5687 Tone Arm Return Lever & Fork Assy.
5696 Tone Arm Fork Spring.

5619 Eccentric Spring Assy.
5641 Short Circuit Switch Assy.
5643 Trip Lever Rod Collar Assy.
5698 Volume Control.
CA5687 Tone Arm Return Lever & Fork Assy.

60 ¼-20 Hex Head Screw.
5501 Drive Bracket.
5581 Link Spring-Lower.
5612 Trip Lever & Cam Assy.
5613 Drive Sleeve Assy.

GOVERNOR ADJUSTMENT

If the turntable speed cannot be regulated to 78 R. P. M. by the speed control lever located under the turntable, then loosen the set screw holding the governor to the governor shaft and move the governor either in or out, as the case may be, to increase or decrease the speed of the motor.

This adjustment must be made when the speed control lever under the turntable is in the center position.

To increase the speed of the turntable motor, move the governor out, and to decrease the speed of the turntable, move the governor in.

Do not, under any conditions, change the adjustment of the end thrust bearing screws.

An occasional drop of oil on the governor brake will assist in maintaining a constant speed.

CAPEHART CORPORATION

CAPEHART RECORD CHANGER MODEL 10-12-C

ASSEMBLY AND ADJUSTMENT OF OSCILLATING AND SPIRAL TRIP LEVER AND PICKUP SILENCER

To time the automatic switch so the instrument will automatically trip and change records, proceed as follows:
First: Thoroughly acquaint yourself with the different part numbers.
Second: Study the photographs carefully and note the relative location of the various parts.
Third: Complete each of the following operations before going on to the next operation.

Operation No. 1.

Turn the master cam No. 5504 until the large timing mark is exactly above the timing mark on the tone arm lifting lever No. 5761.

Operation No. 2.

Hold the switch lever and cam assembly No. 5612 against the driven clutch No. 5616, so the radius of the cam will center against the clutch.(Be sure that cam No. 5612 is directly under the driven clutch No. 5616.)

Operation No. 3.

Set the pickup silencer switch No. 5643 against the casting bearing so the shaft of cam No. 5612 cannot be moved further toward the automatic switch.

Operation No. 4.

Hold the tail of cam No. 5612 against the lug on the inside of the master cam No. 5504 and adjust the trip lever No. 5611 until it is 1/16" beyond the catch in the oscillating trip lever No. 5657. This adjustment is made while the tail of the cam No. 5612 is held against the outside of the lug inside the master cam No. 5504.)

Operation No. 5.

Care must be exercised to have the end play of the oscillating trip shaft just free. This is taken care of in adjusting the pickup silencer switch No. 5643, so a good contact is made on the pickup short circuiting switch WHEN THE NEEDLE IS ON THE RECORD AND THE AUTOMATIC SWITCH HAS BEEN TRIPPED.

After the pickup silencer switch No. 5643 has been set according to the above instructions, the resetting of the automatic trip should allow the contacts on the pickup silencing switch to open.

If the above operations are followed out in detail, and adjustments properly made, the clutch will automatically disengage when the pin on the clutch No. 5616 has travelled approximately one-half of the distance of cam No. 5612.

At the time the pin has travelled one-half of the distance of the clutch release cam, the small timing mark on cam No. 5504 should be exactly above the timing mark on the tone arm lifting lever No. 5761.

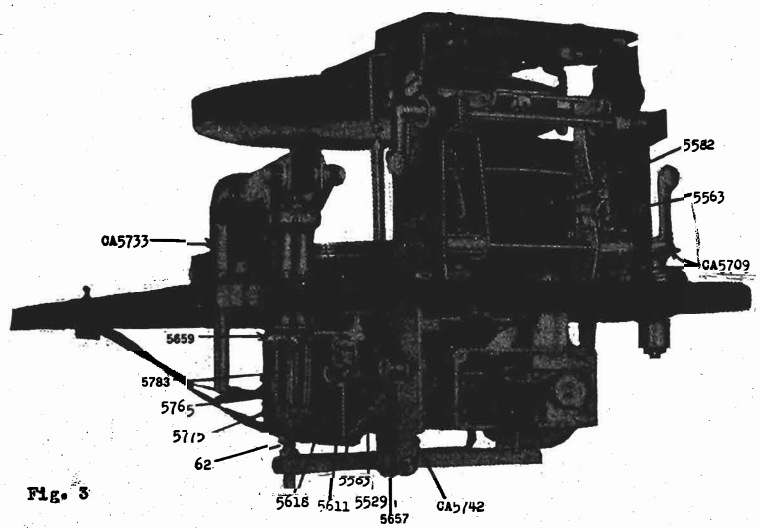


Fig. 3

62 1¼-28 Hex Head Screw.
5529 Spiral Trip Cam.
5783 Tone Arm Lift Rod.
5554 Eccentric Pin.
5563 Slide Finger Eccentric.
5582 Link Spring-Upper.
5583 Trip Lever Spring.
5611 Trip Lever & Hub Assy.
5618 Oscillating Trip Dog Assy.
5659 Tone Arm Bracket Lever & Pin Assy.
5657 Oscillating Trip Lever Assy.
CA5709 Slide Finger & Shaft Assy.
CA5733 Reject Stud Assy.
CA5742 Switch Panel Assy.
5765 Tone Arm Weight Adj. Spring
5775 Tone Arm Spring Hook.

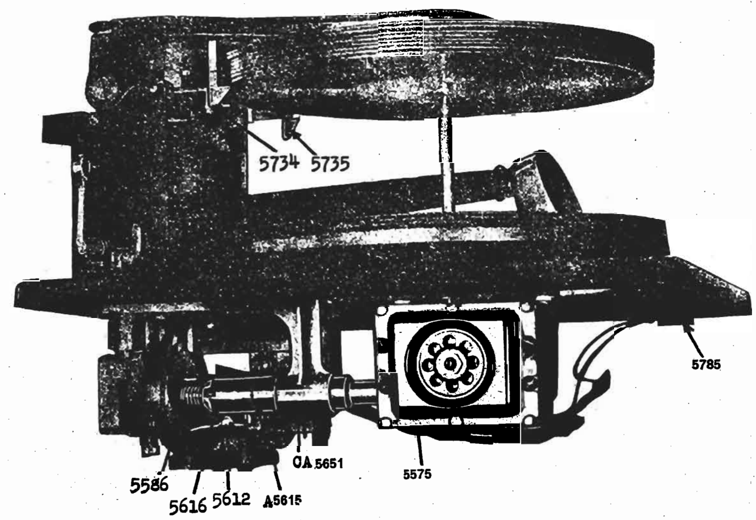


Fig. 4

5612 Trip Lever & Cam Assy.
A5615 Drive Shafe Assy.
5615 Drive Shaft Assy.
5616 Driven Rachet & Pin Assy.
CA5651 Main Drive Assy.
5785 Switch Double Circuit H & H.
5586 Clutch Spring.
5575 Motor, give voltage and cycles.
5690 Governor Assy.
5734 Record Lock Lever & Hook Assy-Left.
5735 Record Lock Lever & Hook Assy-Right.

CAPEHART CORPORATION

ADJUSTMENT OF THE SPIRAL TRIP CAM

To adjust the spiral trip cam, turn the master cam No. 5504 until the small timing mark is exactly above the timing mark on the tone arm lift lever No. 5761 at which time the automatic trip can be manually reset or tripped at will.

Lay a steel scale, graduated in 64ths, flat on the record under the pickup, with the end of the scale against the turntable spindle in such position that the needle rests on the scale. By sliding the needle toward the center of the record, the spiral cam should cause the automatic trip to operate when the point of the needle is 1-49 64" from the edge of the turntable spindle.

If the automatic trip operates before the needle has come to 1-49 64" position, then the spiral cam is set too far ahead and must be moved very slightly back, while, if the needle comes closer to the turntable spindle than 1-49 64", then the spiral cam is set too far back and must be set ahead to the proper position.

Failure to properly adjust the spiral trip cam so the automatic trip operates when the needle is 1-49 64" from the edge of the turntable spindle will cause the instrument to change records before the music is finished, or to not change records automatically.

To adjust the spiral trip cam No. 5529, slightly loosen the two screws holding the cam to automatic switch lever No. 5657 and pry the cam forward or back as required to obtain the proper setting.

To test the position of the spiral cam, it is necessary to carry the pickup back to the edge of the record each time to manually reset the automatic trip.

ASSEMBLY OF TRIP BRACKET TO BASE PLATE

The automatic trip bracket No. CA 5742 is mounted to the base plate by two nickle plated bolts and lock washers.

The end that the bakelite panel is mounted on is to be mounted toward the front of the base plate in such a manner that the bearing aligns perfectly with the bearing in the drive bracket. The final alignment can be made when the trip lever shaft No. 5612 is being installed and adjusted.

TONE ARM BRACKET LEVER ADJUSTMENT

Set lever No. 5509 to 10 inch record operating position, and slightly loosen the clamp screw holding the bracket lever No. 5704 to the bracket under the tone arm base, and turn the bracket lever to such position that the slot, where the bracket lever clamps together around the bracket, is exactly centered on each side of the aligning notch cut in the lower rim of the bracket.

Then lay a scale, graduated in 64ths, on the turntable, placing the end of the scale against the turntable spindle in such position that when the needle is automatically let down the point of the needle will come to exactly 4-11 16" from the edge of the turntable shaft.

If the needle does not automatically come down at the 4-11 16" position refer to page 2 and make final adjustment at lever stop on lever No. 5509.

Care should be exercised to lock the tone arm return bracket lever, allowing .015 inch clearance between the cork insert and the tone arm base.

After the adjustment is properly made, tighten the clamp holding the tone arm bracket lever No. 5704 in place, which should leave ample clearance between the cork insert and the tone arm housing to allow perfect freedom of the tone arm operation.

If needle fails to feed into music groove, lift tone arm bracket lever No. 5704 tightly against tone arm housing and manually move tone arm back and forth to relieve any uneveness that might occur on the face of the cork insert.

ASSEMBLY AND ADJUSTMENT OF RECORD MAGAZINE

The record magazine pin No. 5555 must be tightened in the elongated hole in the magazine top plate No. A5736 in such a manner that the offset at the bottom of the pin extends directly away from the record support shelf.

The magazine pin must also be adjusted to such a position that exactly 4⅞" clearance is obtained between the back center of the offset at the bottom of the magazine pin, and the extreme right and left corners of the record support shelf. This adjustment is to be made when the record magazine is in 10 inch playing position.

TO ADJUST THE RECORD SUPPORT HOOKS

First, throw lever No. 5509 to the 10 inch position, and place a 10 inch record on the magazine pin, bringing the magazine down to playing position.

The record suport hooks are adjusted by bending to proper position.

The record support hooks must be kept 1/16" from the edge of the record support shelf and must be adjusted far enough back to just clear the edge of a 10 inch record, as the record is released from the record support shelf.

The record support hooks must also be low enough to clear the bottom side of the record, as it is supported on the magazine shelf.

The record support hooks should operate freely in either 10 inch or 12 inch position.

ASSEMBLY OF RECORD MAGAZINE AND STANDARD TO BASE PLATE: AND ALIGNMENT OF TURNTABLE SHAFT

Mount the magazine and standard on the base plate with four bolts, tightening the bolts only tight enough to hold the complete magazine assembly in position. The magazine assembly must be so adjusted by shifting the standard on the base plate to bring the offset at the bottom end of the magazine pin exactly over the center of the point of the turntable spindle.

This adjustment cannot be made until the motor has been aligned according to the instructions on page one.

Enough clearance is allowed in the four bolt holes to take care of this adjustment.

After the adjustment is made perfect, the bolts must be securely tightened with lock washers.

ASSEMBLY AND ADJUSTMENT OF RECORD SLIDE SHELF AND FINGER

First, set the master cam No. 5504 so the lug on the cam at the side of the large timing mark comes directly under the end of the record release finger No. CA 5709.

The eccentric stud No. 5563 affixed to the main record release finger controls the adjustment of record release finger. Turn the eccentric stud No. 5563 until the record slide shelf No. 5521 is 1/64" past the front edge of record support shelf No. 5520 at which time it should be possible to obtain a slight amount of clearance between the end of the record release finger and the point of the lug on the master cam without causing the safety spring, (which is a part of this lever assembly) to give.

The two points on the record slide shelf must come to the edge of the radius on the record support shelf at the same time.

RECORD WEIGHT ADJUSTMENT

The record weight No. 5759 must be so adjusted at the bearing pivot that the lower edge of the record weight does not touch the record slide shelf while in the 10 inch position, but comes low enough to hold one record in proper position for the slide plate to unload it on the turntable.

ASSEMBLY OF DRIVE BRACKET ASSEMBLY TO BASE PLATE AND MOTOR

The drive bracket No. 5651 must be bolted to the base plate in such a manner as to align the drive shaft with motor shaft so the coupling is free. A flexible coupling No. 5613 takes care of any minor lack of alignment between the drive shaft and the motor shaft, because of the motor hanging on rubber cushions.

CAPEHART CORPORATION

CAPEHART RECORD CHANGER MODEL 10-12-C

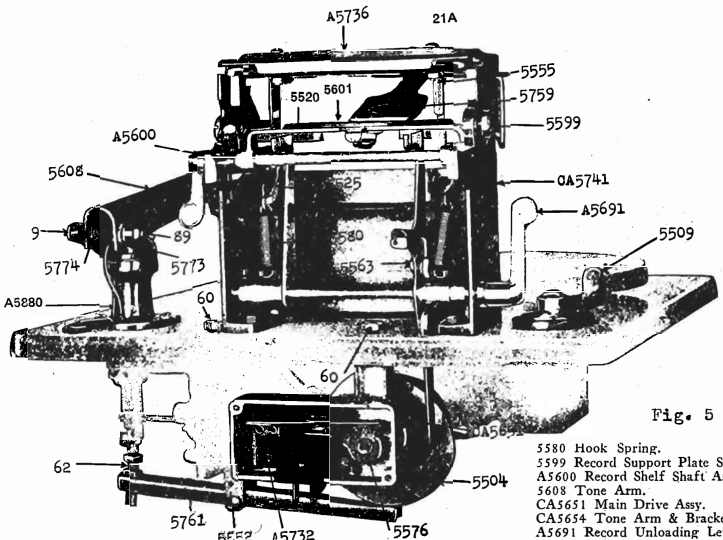


Fig. 5

9 10-32 Hex Head Screw.
21A Acorn Nut.
60 ¼-20 Hex Head Screw.
62 1¼-28 Hex Head Screw.
89 10-32 Headless Set Screw 60 Point
5504 Master Cam.
5509 Eccentric Handle.
5520 Record Shelf.
5601 Record Slide.
5525 Spring Hook.
5552 Tone Arm Lift Lever Pin.
5555 Record Support Pin.
5563 Slide Finger Eccentric.
5576 Switch Finger Cam.
5580 Hook Spring.
5599 Record Support Plate Screw.
A5600 Record Shelf Shaft Assy.
5608 Tone Arm.
CA5651 Main Drive Assy.
CA5654 Tone Arm & Bracket Assy.
A5691 Record Unloading Lever.
A5732 Switch Panel Assy.
A5736 Record Support Plate Assy.
CA5741 Standard Assy.
5759 Record Weight & Felt Assy.
5761 Tone Arm Lift Lever Assy.
5773 Tone Arm Insulating Bushing.
5774 Tone Arm Pivot Bushing.
A5880 Tone Arm Bracket Assy.

ASSEMBLY OF TONE ARM HOUSING TO BASE PLATE

The tone arm base is attached to the base plate with three screws. This can be mounted only in the proper position.

The two pivot screws holding the tone arm to tone arm bracket must be so adjusted that the pickup is free to come down on to the record by its own weight and still the points of bearing must be in good contact in such a manner that the tone arm cannot be twisted from side to side.

TO ADJUST FOR NEEDLE PLAYING POSITION

Turn the master cam until the small timing mark is exactly above the timing mark on the tone arm lifting lever No. 5761, at which time there will be no pickup weight on the tone arm lifting rod.

Then, without a record on the turntable, and the needle (of the length that is regularly going to be used with the instrument) properly inserted in the pickup, the "T" shaped tone arm rest No. 5534 should be adjusted to allow the tone arm to lower to such a position that the needle just clears the highest point of the turntable surface. THIS ADJUSTMENT PROPERLY MADE WILL ELIMINATE THE POSSIBILITY OF THE NEEDLE DAMAGING THE TURNTABLE SURFACE.

TONE ARM LIFT LEVER AND ITS ADJUSTMENT

Turn the master cam to such position that the small timing mark is directly above the timing mark on the tone arm lifting lever No. 5761.

Without a record on the turntable, and the needle in playing position, adjust the tone arm lift lever screw No. 62 until a visiting card can be slid between the top of the lever screw No. 62 and the lower end of the tone arm lifting rod No. 5553.

TIMING OF CAM No. 5576

To time cam No. 5576, turn the master cam No. 5504 by hand, bringing the lug near the large timing mark on the cam, directly under the end of the record release finger No.CA5709. At this time, hold the master cam in position and turn cam No. 5576 to the right until the corner of the cam touches but does not raise the switch contact lever on switch No. A5732.

Care must be exercised that the switch contacts on switch No. A5732 make perfect contact when cam No. 5576 is away from the switch lever, and when the cam is in the down position 1 32" clearance is maintained between the switch finger and the low side of the cam. This should insure a perfect contact at the switch points.

It is important, in the adjustment of cam No. 5576, that 1 64" clearance be allowed between the back side of this cam and the bearing through which the shaft passes.

After the above adjustment is made, check the instrument with one record on turntable, by shutting current switch off and see that instrument comes to an automatic stop position when the lug on the master cam No. 5504 has completely passed under the end of record release finger No. CA 5709. If the lug has not entirely passed under the end of the record release finger, then move cam No. 5576 to the left as little as possible to allow the lug to clear the cam when instrument stops automatically with one (1) record on turntable.

TONE ARM RETURN LEVER AND ITS ADJUSTMENT

The tone arm return lever No. CA5687 is mounted on an eccentric pin with the bushing extended downward, the tone arm change and adjusting lever No. 5509 is mounted on the same shaft and located on the top back left corner of the chassis.

The sharp point of the cam, which is a part of the eccentric pin is to be mounted toward the tension spring which is affixed to the base plate, so that when the lever is thrown to 10 inch or 12 inch position the spring will hold the cam in that particular position.

The coil spring No. 5585 is attached from the lug on the tone arm return lever to the lug on the automatic trip bracket in such a manner that the spring is held as far down as possible by the lugs.

NOTE: The adjustment screw found on the tone arm return lever is covered in the instructions on page 1, and after once being properly set, should need no further adjustment.

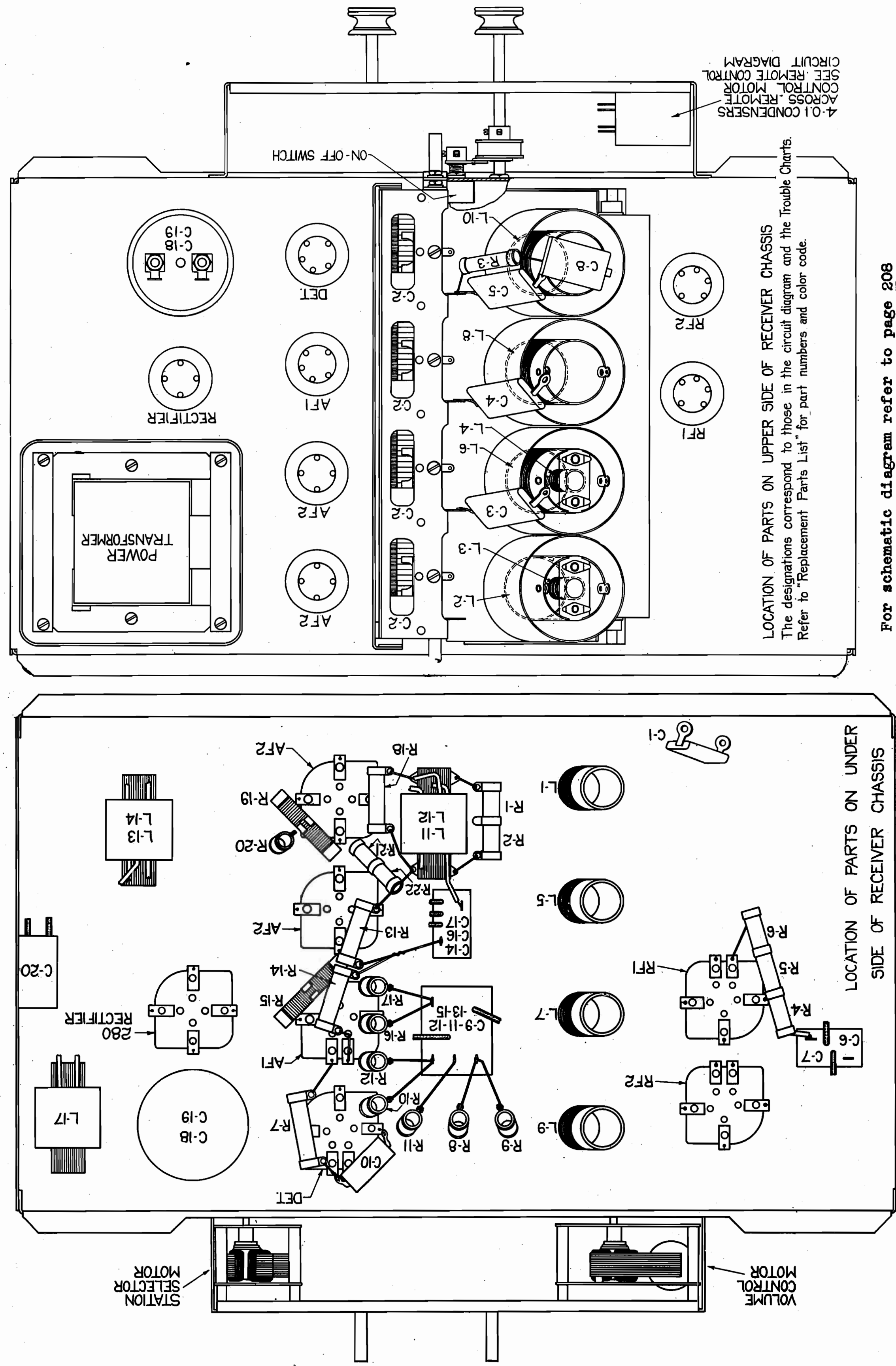
Care must be exercised to have clearance between the high point of the master cam No. 5504 and the tone arm return lever.

MOUNTING AND ADJUSTMENT OF REJECTOR

The reject button is located at the right of the tone arm and is for the purpose of discontinuing a record before it has finished playing. With the automatic trip set and the instrument playing music, there should be 1/16" clearance between the bottom of the reject pin and the lateral pin affixed to the automatic trip lever No. 5657.

If this distance is too great, one will not be able to reject a record. If this distance is too small the automatic trip will not properly reset. Adjustment can be made by CAREFULLY bending the lateral pin to its proper position with relation to the rejector pin.

COLONIAL RADIO CORP.



For schematic diagram refer to page 208
For Remote Control Automatic Tuning Unit refer to page 209

MODELS 33, 34 & 35 AC

COLONIAL RADIO CORP.

REPLACEMENT PARTS LIST

Circuit Designation	Value	Part No.	Remarks
R 1	100,000 ohms	4635—P	Center-tapped 200,000 ohm resistor
R 2	100,000	4635—P	
R 3	750,000	4595—P—6	Orange
R 4	11,000	4593—P	Tapped resistor
R 5	60,000	4593—P	
R 6	50,000	4593—P	
R 7	20,000	4595—P—5	Grey
R 8	750,000	4595—P—6	Orange
R 9	750,000	4595—P—6	Orange
R 10	200,000	4595—P—2	Brown
R 11	50,000	4595—P—4	Red
R 12	200,000	4595—P—2	Brown
R 13	400,000	4595—P—1	Yellow
R 14	1,000,000	4595—P—7	Blue
R 15	20	4529—P	Center tapped
R 16	20,000	4595—P—5	Grey
R 17	50,000	4595—P—4	Red
R 18	100,000	4595—P—3	Green
R 19	20	4529—P	Center tapped
R 20	800	4596—P	Blue vitreous enamel type resistor
R 21	210	4594—P	Center tapped 420 ohm resistor
R 22	210	4594—P	
C 1	00025 mfd.	4534—P	Ant. series condenser
C 2	.0003	1842—SA	Tuning condenser
C 3	.2	4527—P	
C 4	.2	4527—P	
C 5	.2	4527—P	
C 6	.5	4514—P	Red lead and adjacent lug
C 7	.2	4514—P	Black lead and adjacent lug
C 8	.2	4527—P	
C 9	.5	4513—P	Black lead and furthest lug in row of three
C 10	.0001	4597—P	
C 11	.005	4513—P	Red lead and middle lug in row of three
C 12	.0001	4513—P	Black lead and middle lug in row of three
C 13	1.	4513—P	Black lead and nearest lug in row of three

Circuit Designation	Value	Part No.	Remarks
L 1		1821—SA	Ant. primary
L 2		1826—SA	R.F. transformer secondary
L 3		1827—SA	Link coil
L 4		1827—SA	Link coil
L 5		1823—SA	R.F. transformer primary
L 6		1826—SA	R.F. transformer secondary
L 7		1823—SA	R.F. transformer primary
L 8		1826—SA	R.F. transformer secondary
L 9		1823—SA	R.F. transformer primary
L 10		1826—SA	R.F. transformer secondary
L 11		1843—SA	Push-pull input transformer
L 12		1843—SA	
L 13		1835—SA	Push-pull output transformer (Model 33)
L 14		1835—SA	
L 15		1866—SA	Cone and voice coil (Model 33)
L 16		1904—SA—1	Speaker field coil (Model 33)
		1959—SA	Speaker field coil (Model 34)
L 17	4.5 henries	1829—SA	Filter choke 4.5 henries
L 18		1830—SA	60 cycle power transformer (Model 33)
L 19			
L 20		1952—SA	60 cycle power transformer (Model 34)
L 21		1946—SA	25 cycle power transformer (Model 33)
L 22		1985—SA	25 cycle power transformer (Model 34)
L 23			
		1964—SA	Model 34—Push-pull output transformer (Primary)
		1960—SA	Model 34—Cone, actuating ring and secondary
		4506—P	Model 33 and 34 line switch
C 14	.2	4521—P	Black lead and adjacent lug
C 15	.25	4513—P	Black lead and solitary lug
C 16	.2	4521—P	Black lead and further lug
C 17	.0005	4521—P	Yellow leads
C 18	8.	4503—P	Mershon condenser
C 19	8.	4503—P	
C 20	.1	4598—P	Line buffer
	.1	4724—P	25 cycle R.F. screen-grid bi-pass condenser

MODELS 33, 34 & 35 AC

COLONIAL RADIO CORP.

The two models, 33AC and 34AC, are identical electrically except that Model 34 has a more sensitive loudspeaker, capable of finer reproduction. Further, the push-pull output transformer is mounted on the speaker frame instead of in the receiver chassis, as in the model 33.

The Colonial 33AC and 34AC are obtainable both with and without the remote-control automatic-tuning unit. This unit is easily installed in those receivers not having it as an integral part. It in no way interferes with the ordinary manual operation of the receiver, should that be desired. Either method of control may be used without the necessity for disconnecting, switching or changing anything. The employment of one-control system does not render the other inoperative.

Due to an automatic anti-overloading feature incorporated in the receiver, it will be found that when receiving *strong signals*, *advancing* the volume control beyond a certain point will result in a *decrease* in volume.

Sometimes it is found that volume is better *without a ground connection.* This is due to the electric light wires acting as an antenna and feeding signals to the receiver. Under such conditions reception will usually be noisy. Connection of the ground wire causes the line filter condensers to effectively drain off both unwanted noise and whatever signal there may be picked up by the line.

The spark obtained when the ground wire is touched to the ground binding post or to the chassis is a *normal* occurrence. It is due to the discharge of the condensers used in the line filter.

A poor detector tube will create an objectionable hum in the speaker.

The fuse in the double mounting on the rear of the chassis provides a means for compensating for deviation of the line voltage from normal values. Normally the fuse is in the left side of the mounting, facing the rear of the chassis. It should be put in the right side only when the line voltage is known to be consistently below 110 volts. It is important that this adjustment be made, since excessive voltage will shorten the life of the tubes, and *insufficient* voltage will make the set *insensitive.*

ACTUAL VOLTAGES APPLIED TO TUBES

	RF1	RF2	Det.	AF1	AF2	280 Rectifier
Plate Voltage	180v.	180v.	150v.	100v.	240v.	....
Control-Grid Voltage	-3	-3	-2	-6	-45	....
Screen-Grid Voltage	90	90	35	....	....	....
Plate Current	3m.a.	3m.a.	0.2m.a.	3m.a.	28m.a.	....

VOLTAGES AS READ ON A 1000 OHMS PER VOLT METER
(PLATE VOLTAGES ON THE 250v.scale; GRID VOLTAGES ON THE 50 v.scale)

	RF1	RF2	Det.	AF1	AF2	280 Rectifier
Plate Voltage	180v.	180v.	60v.	70v.	235v.	....
Control-Grid Voltage				-0.5	-22	....
Screen-Grid Voltage	80	80	12	....	....	....
Plate Current	3m.a.	3m.a.	0.2m.a.	3m.a.	....	50 ma. each plate

The discrepancies between the applied and the measured voltages result from variations in tubes and from increased voltage drops in series resistors due to the current taken by the voltmeter. Unless the measured voltages differ by more than 25 per cent from those given in the chart, it should not be taken as a definite indication of a fault. Usually any deviation greater than 25 per cent means trouble. These readings assume a 120v. line. If the line voltage differs from 120 volts, the measured voltages will differ from those given in the chart in approximately the same ratio.

The Remote-Control Automatic-Tuning Unit

Since the servicing of the remote-control automatic-tuning unit will be simple if its operation is thoroughly understood, the circuit diagram and the following explanation should be studied carefully.

*Fig. 4 shows the circuit used. As is seen, it consists essentially of two motors, one for turning the volume control and the other the tuning condensers, and means for controlling the direction and amount of rotation of the motors from a remote point. Each of the motors has two field windings, poled in such way that switching from one to the other reverses the direction of motor rotation.

When the remote-control push buttons are not pressed, the circuit is open and no current flows through the motors. When the "Vol. Inc." button is pressed, the circuit is completed through that field winding of the volume control motor which will cause rotation in the proper direction to secure an increase of volume. When the "Vol. Dec." button is pressed, the other field winding is connected, the motor runs in the opposite direction, and the volume control is turned to a lower setting. Just before its minimum position, the volume control operates the receiver line switch. Since a friction drive is used no damage will result if the button is kept pressed. After the volume control has reached the limit of its movement, the motor will merely continue running with the friction drive slipping.

* Study of fig. 4 reveals that when any one of the station buttons is pressed, the circuit is completed through the contact stud connected to it and the station-selector motor revolves, turning the tuning condensers and the split brass disk fastened to the condenser shaft. The motor continues to drive the condenser shaft (through a friction drive) until the insulating slit in the brass disk comes directly under the contact stud and breaks the circuit. When the slit is under the contact stud, the tuning condensers are in proper position for reception of the station. Should the momentum of the motor be sufficient to carry the disk past the point where the stud and slit coincide, the stud will make contact with the other half of the disk, energizing the other field winding. This reverses the motor direction, bringing the disk back until the insulating slit and the contact stud do coincide.

The button marked "Quiet", when pressed, removes the voltage applied to the screen-grids of the R.F. tubes, preventing reception of stations while the automatic-tuning mechanism is in action.

Should either or both of the drive-motors refuse to run, or run in only one direction the following procedure may be followed: Connect one end of a length of wire to contact "C" of the receptacle (fig 4.) and touch the other end alternately to each lug of the condenser mounted next to the volume control drive motor. If the motors run, and in both directions, the trouble is in either the cable, the remote-control push-button box, or the contacts on the brass disk. A continuity check will reveal the open circuit.

If the motors do not run when the wire is touched to the condenser lugs, the fault may lie in the voltage supply, the motor proper or in the 0.1 mfd filter condensers. An a.c. voltmeter connected from "C" (fig. 4) to the chassis should give a reading of approximately ten volts. If no reading is obtained, the trouble may be either a blown fuse or an open transformer. If a reading is obtained the 0.1 condensers should be tested for breakdown. If they prove perfect, the trouble is in the motors and they should be tested for shorted or open windings. In particular, the brushes should be examined for good contact with the commutator, and the commutator itself brightened with a piece of very fine sandpaper. In time the spider washers in the friction drive may lose some of their tension, resulting in slippage in the drive. These washers are easily removed and bent to increase their tension.

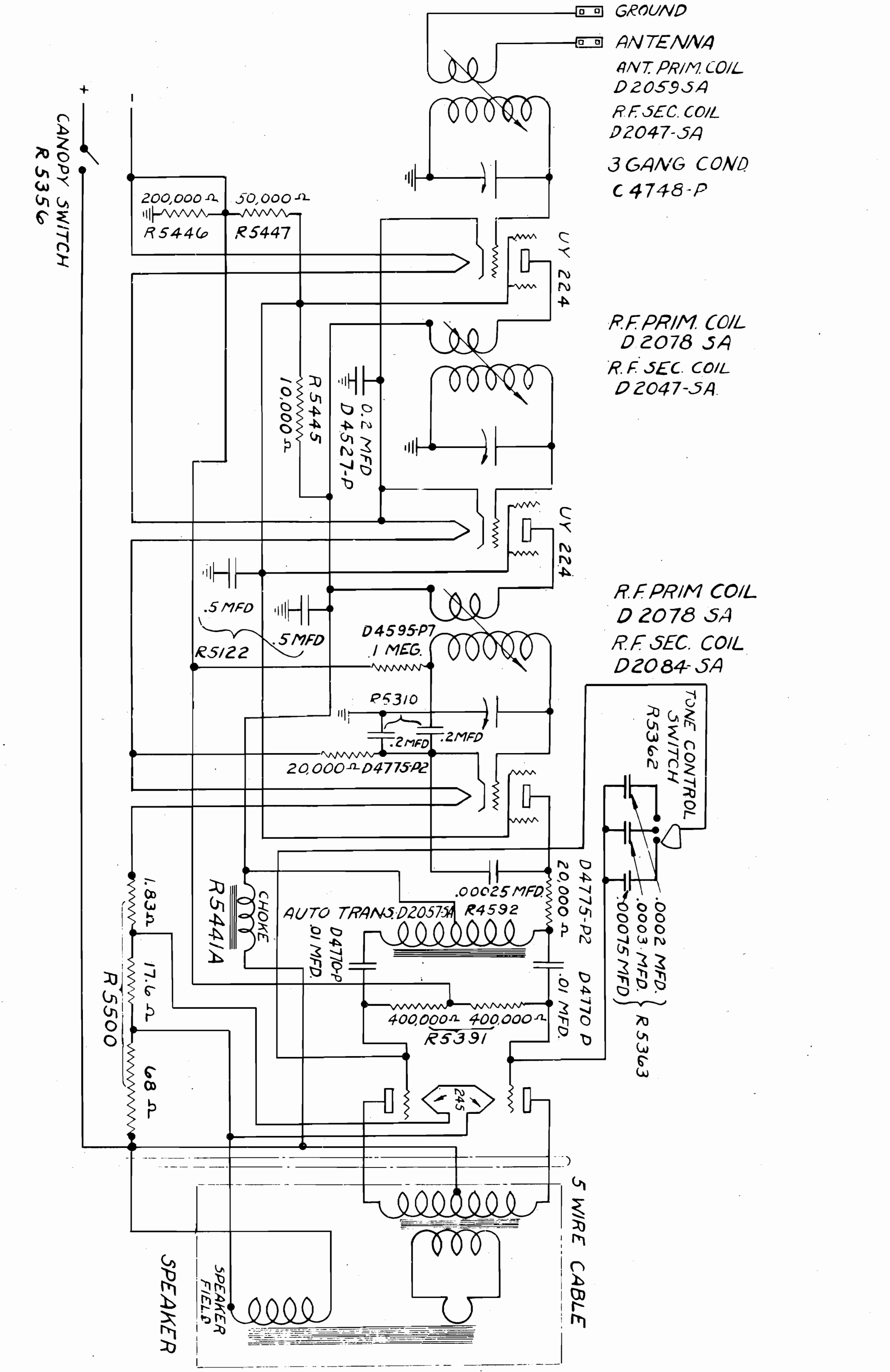
If the line voltage is above 110, the fuse should be in the right side of its mounting, facing the rear of the set. It should be put in the left side for a line voltage of less than 110.

*See diagram on lower half of page 209

MODELS 33, 34 & 35 AC

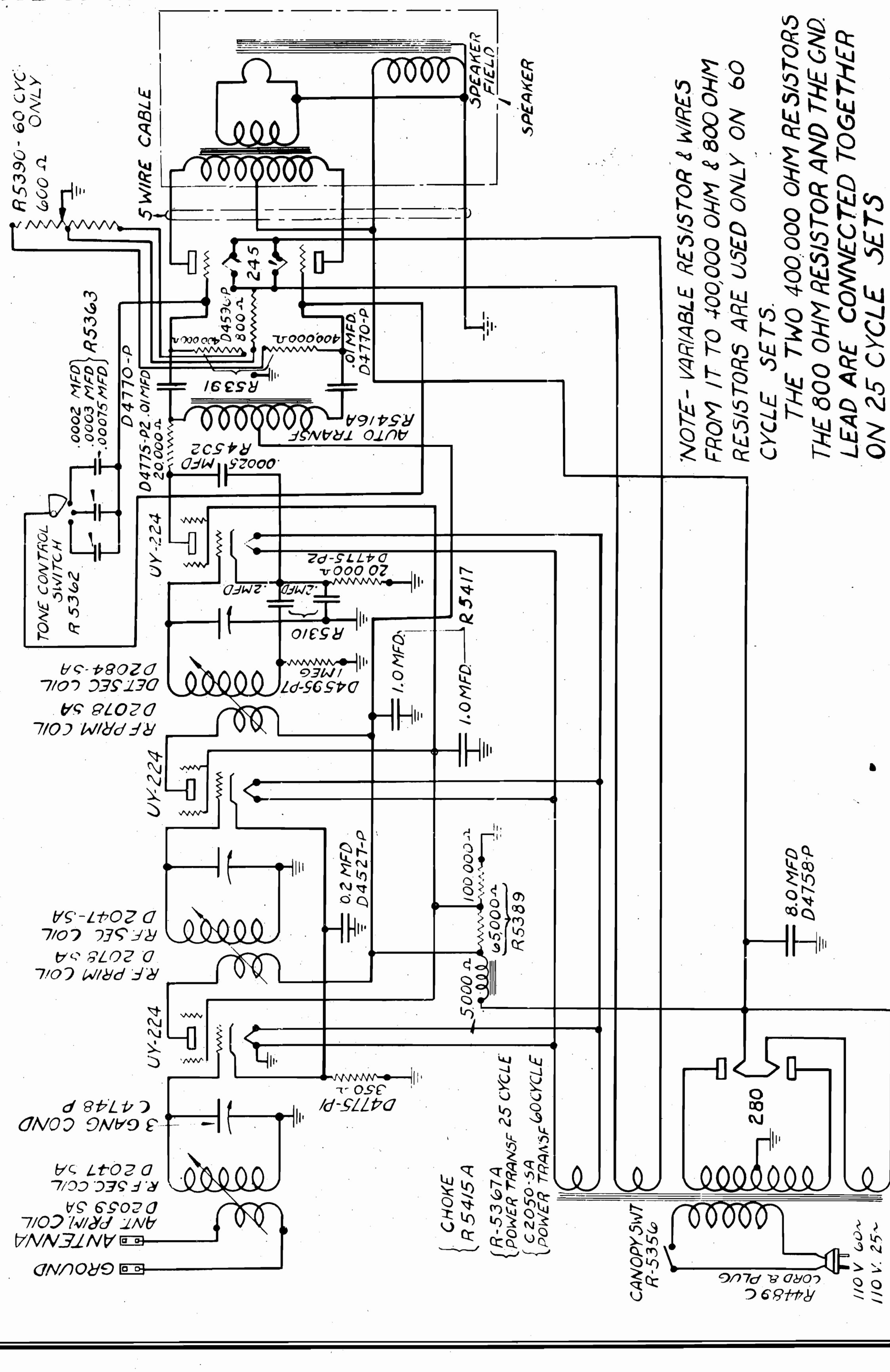
COLONIAL RADIO CORP.

MODEL 36 DC

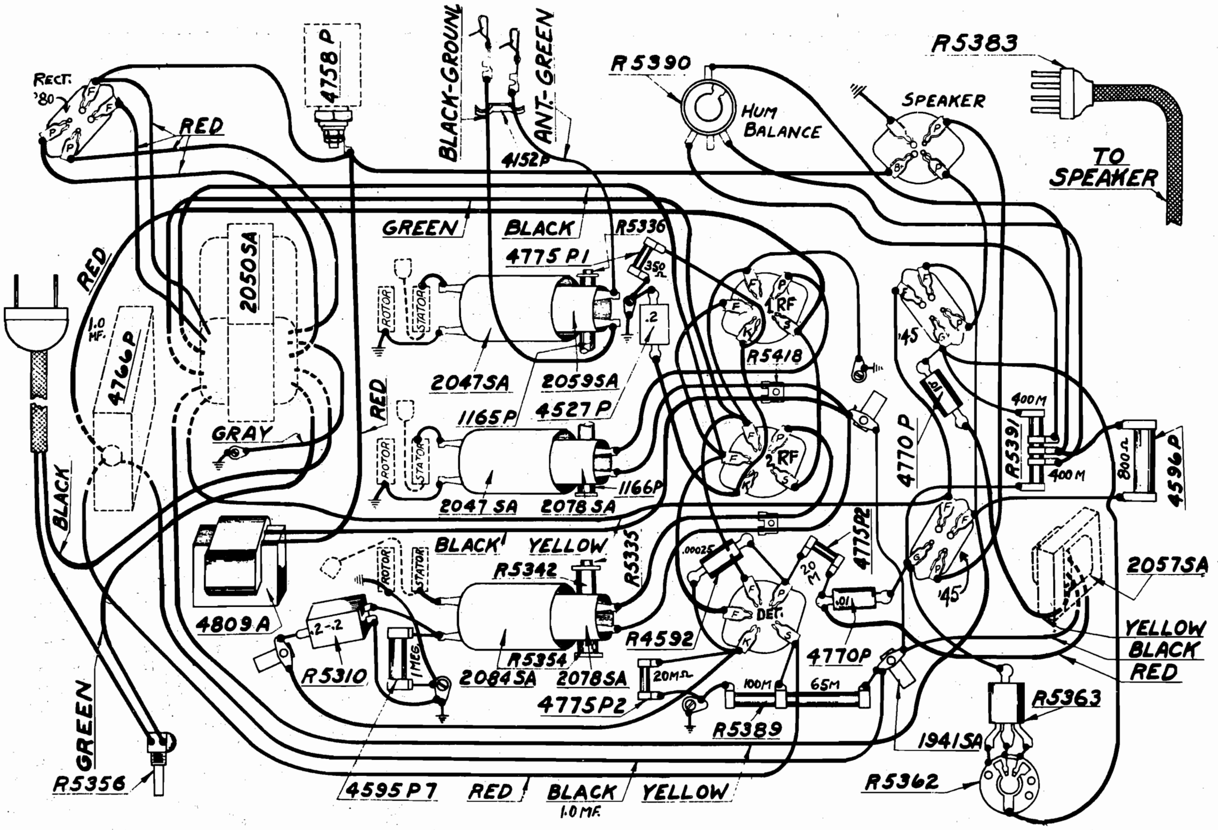


COLONIAL RADIO CORP.

MODEL 38 AC



COLONIAL RADIO CORP.



CHASSIS WIRING MODEL 36, 114.

MODELS 36, 36-P & 41-P
Parts list & color code.

R-4354	Resistor 50 M. ohm Grey (D.C.)
D-4527-P	Condenser .2 Midget
R-4592	Condenser .00025 Mfd.
D-4595-P-7	Resistor .1 Meg. Blue
D-4596-P	Resistor 300 ohm - Purple
D-4766-P	Condenser 1.5 Filter
D-4770-P	Condenser .01 Midget
D-4775-P-1	Resistor - 350 ohm Black
D-4775-P-2	" - 20 M ohm Grey
D-4782-P	Resistor 800 M ohm Yellow Tapped (D.C.)
R-5122	Condenser .5 Dual (D.C.)
R-5310	Condenser .2 Dual
	Resistor 800 M ohm Yellow
R-5366	Condenser - .5 Mfd. 25 cycle Filter
P-5369	Spacer - Dual .5 cond. (D.C.)
R-5389	Resistor - 165 M. ohm Green & Black
R-5390	Potentiometer 600 ohm
R-5431	Speaker 10"
R-5445	Resistor 10 M ohm Black (D.C.)
R-5447	Resistor 50 M ohm Red (D.C.)
R-5544	Resistor - large (D.C.)
R-5819	Resistor 100 M. ohm R.M.A.
R-5820	Resistor 65 M. ohm R.M.A.
R-5821	Resistor 20 M. ohm R.M.A.
R-5822	Resistor 400 M. ohm R.M.A.
R-5823	Resistor 1 Meg. R.M.A.
R-5824	Resistor 350 ohm R.M.A.
R-5417	Filter Condenser

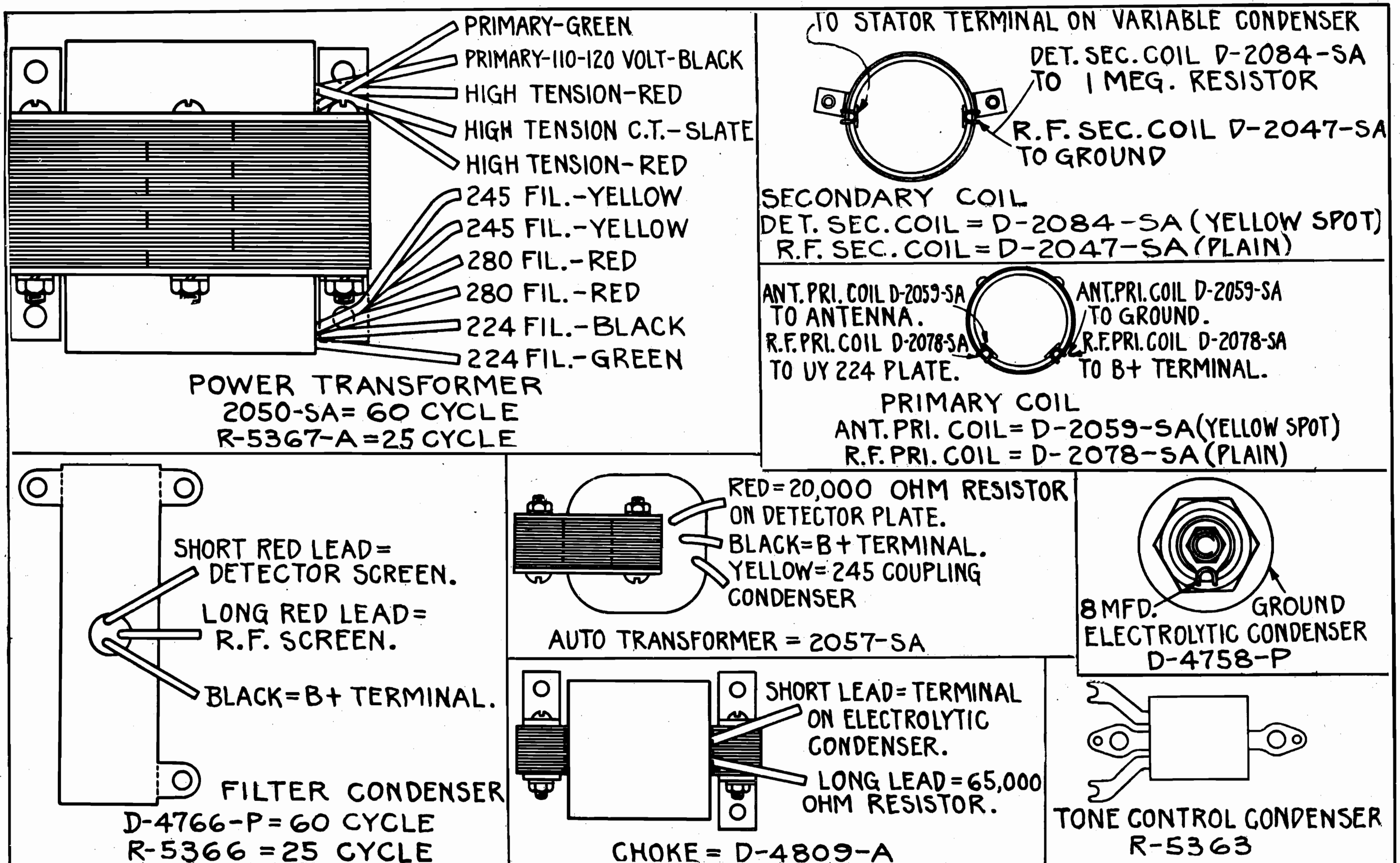
NOTE. Model 36, 114 & 36-P.

For schematic diag. refer to page 208-A
" volt. & circuit data " " " 208-B-4
" color code " " 208-B-2

Schematic diag. model 36-P, page 208-A.

COLONIAL RADIO CORP.

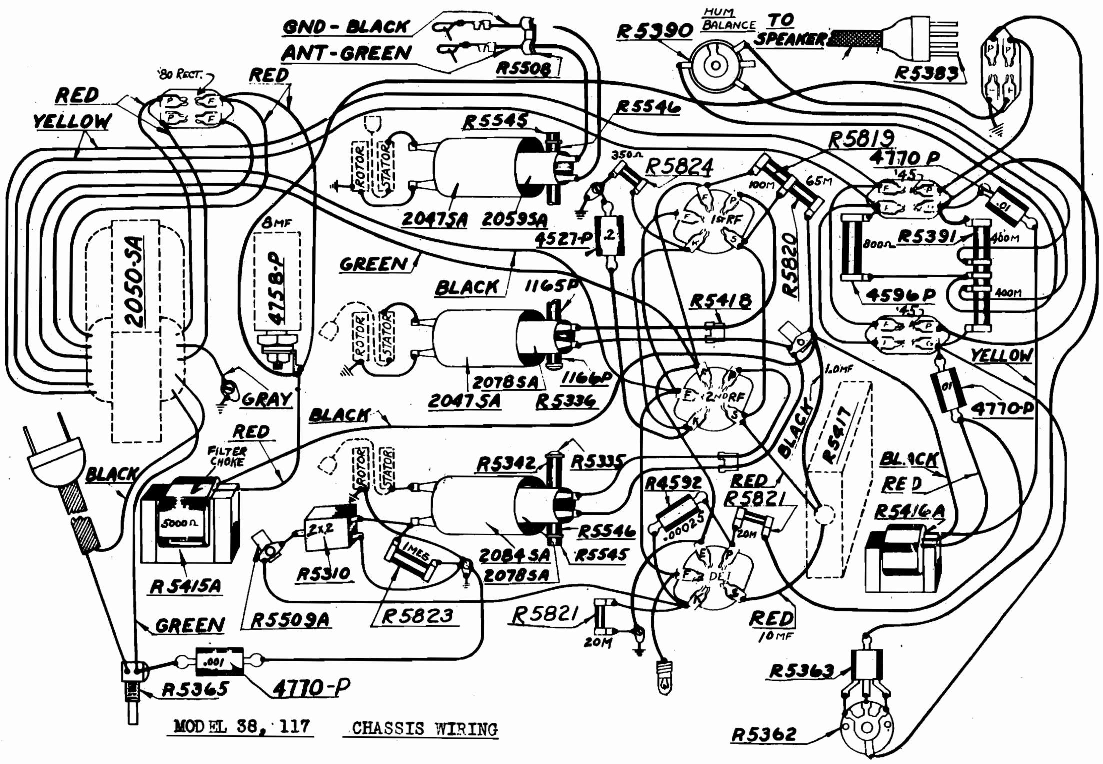
MODEL 36, 114.



LEAD DETAILS OF POWER & AUTO TRANSFORMER, CHOKE, FILTER, TONE CONTROL, & ELECTROLYTIC CONDENSERS-PRIMARY & SECONDARY R.F. COILS.

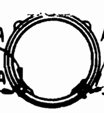
COLONIAL RADIO CORP.

MODEL 38, 117

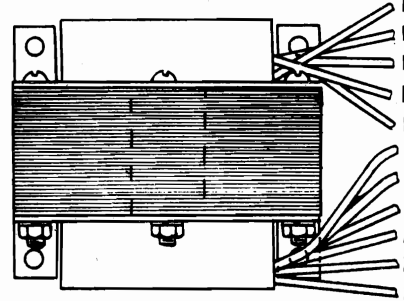


MODEL 38, 117 CHASSIS WIRING

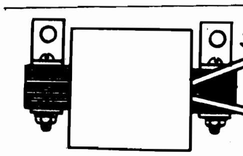
LEAD DETAILS OF POWER & AUDIO TRANSFORMER, CHOKE, FILTER, TONE CONTROL & ELECTROLYTIC CONDENSERS-PRIMARY & SECONDARY R.F. COILS.



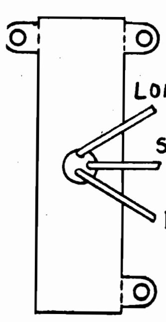
PRIMARY COIL
ANT. PRI. COIL = D-2059-SA (YELLOW SPOT
R.F. PRI. COIL = D-2078-SA (PLAIN)



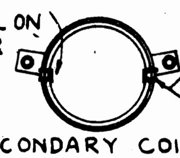
POWER TRANSFORMER
2050-SA = 60 CYCLE
R-5367-A = 25 CYCLE



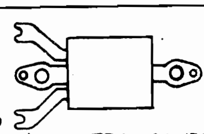
CHOKE = R-5415-A



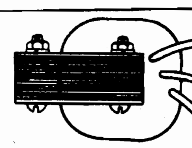
FILTER CONDENSER
R 5417 = 60 CYCLE
25 CYCLE



SECONDARY COIL
DET. SEC. COIL = D-2084-SA (YELLOW SPOT)
R.F. SEC. COIL = D-2047-SA (PLAIN)



TONE CONTROL CONDENSER
R-5363



AUTO TRANSFORMER = R5416-A

FOR FURTHER DATA, MODELS 38, 117, SEE PAGE 208-B-4.

COLONIAL RADIO CORP.

* MODELS 36, 114 & 38, 117.

* NOTE-
Schematic for models 36, 114 & 38, 117 shown on lower half of page 208-A. (Model 36) - Other data on pages 208-B-1, 2,& 3.

60 cycle Line 115 V.	RF1	RF2	Det.	245#1	2452	280AC	280DC
Plate Voltage D.C.	250	250	235	250	250	330	300
Screen Voltage D.C.	85	85	85				
Heater Voltage A.C.	2.45	2.45	2.45	2.4	2.4	4.7	
Control Grid Voltage D.C.	3	3	8	50			
Speaker Field Voltage 300							
Total Rectifier Current .090							

25 cycle Line 115 V.	RF1	RF2	Det.	245#1	245#2	280AC	280DC
Plate Voltage D.C.	230	230	215	230	230	315	270
Screen Voltage D.C.	75	75	75				
Heater Voltage A.C.	2.3	2.3	2.3	2.3	2.3	4.85	
Control Grid Voltage D.C.	2.8	2.8	7.5		45	45	
Speaker Field Voltage 270							
Total Rectifier Current .090							

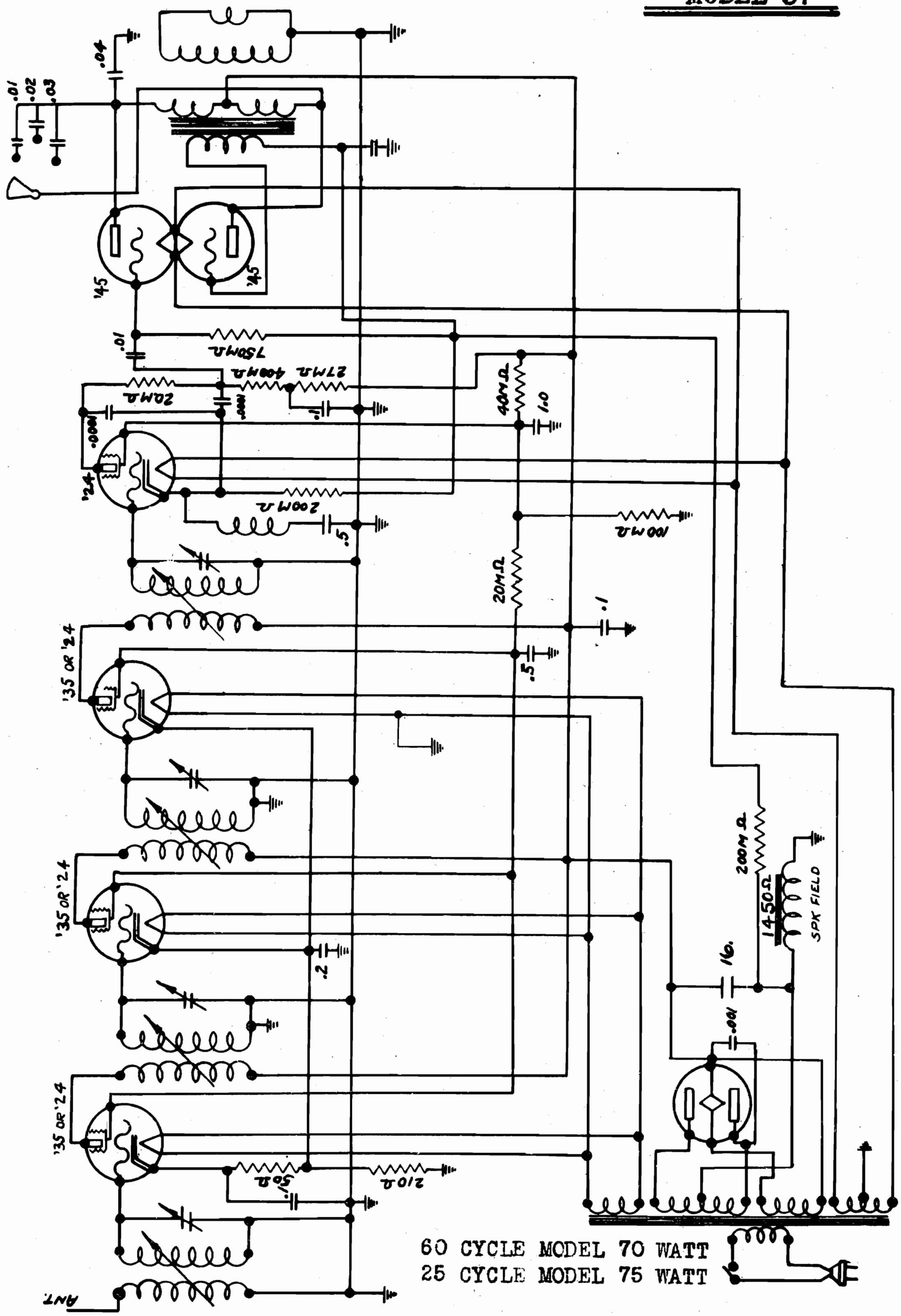
Control grid volts of the R.F. tubes and detector are measured from Cathode to Ground. 245 Grid volts Filament to Ground.

CIRCUIT DATA - The 25 cycle models are identical electrically with the 60 cycle models except for power transformer, filter condensers and omission of hum balance potentiometer. Characteristics are the same as the 60 cycle models. Voltages are slightly lower and there is a difference in the arrangement of parts. The volume control used on these receivers operates by varying the coupling between the primary and secondary on the antenna and R.F. stages. This variation in coupling is effected by moving the primary coils. The antenna and R.F. primaries are also moved by the rotation of the tuning condenser to maintain uniform sensitivity over the broadcast band. The detector primary is not moved to control volume but is moved by rotation of the tuning condenser. This system of volume control does not change the voltages or currents in the tubes. The new variable-mu, screen grid tube, -35, may be used interchangeably with the -24 in the R.F. stages only.

OSCILLATION - Oscillation in receivers employing the variable coupling volume control may be caused by (A) Leads to the movable primary coils too close together, causing interstage coupling. The pairs of leads should be spaced at least 1-1/4 inches apart throughout their length. (B) Movable primaries in wrong position. When the dial is set at 55, and the volume control set at maximum, the primaries should be at the position of maximum coupling. The U-brackets carrying the coils should have about 1/32 clearance from the plate which supports the RF coils. When the volume control is left at maximum and the dial turned to move the condenser to the higher frequency settings, the coils should remain approximately in line, the RF coils moving out slightly more than the detector primary. Adjustment may be made by moving stop collar on rear end of volume control shaft.

COLONIAL RADIO CORP.

MODEL 37

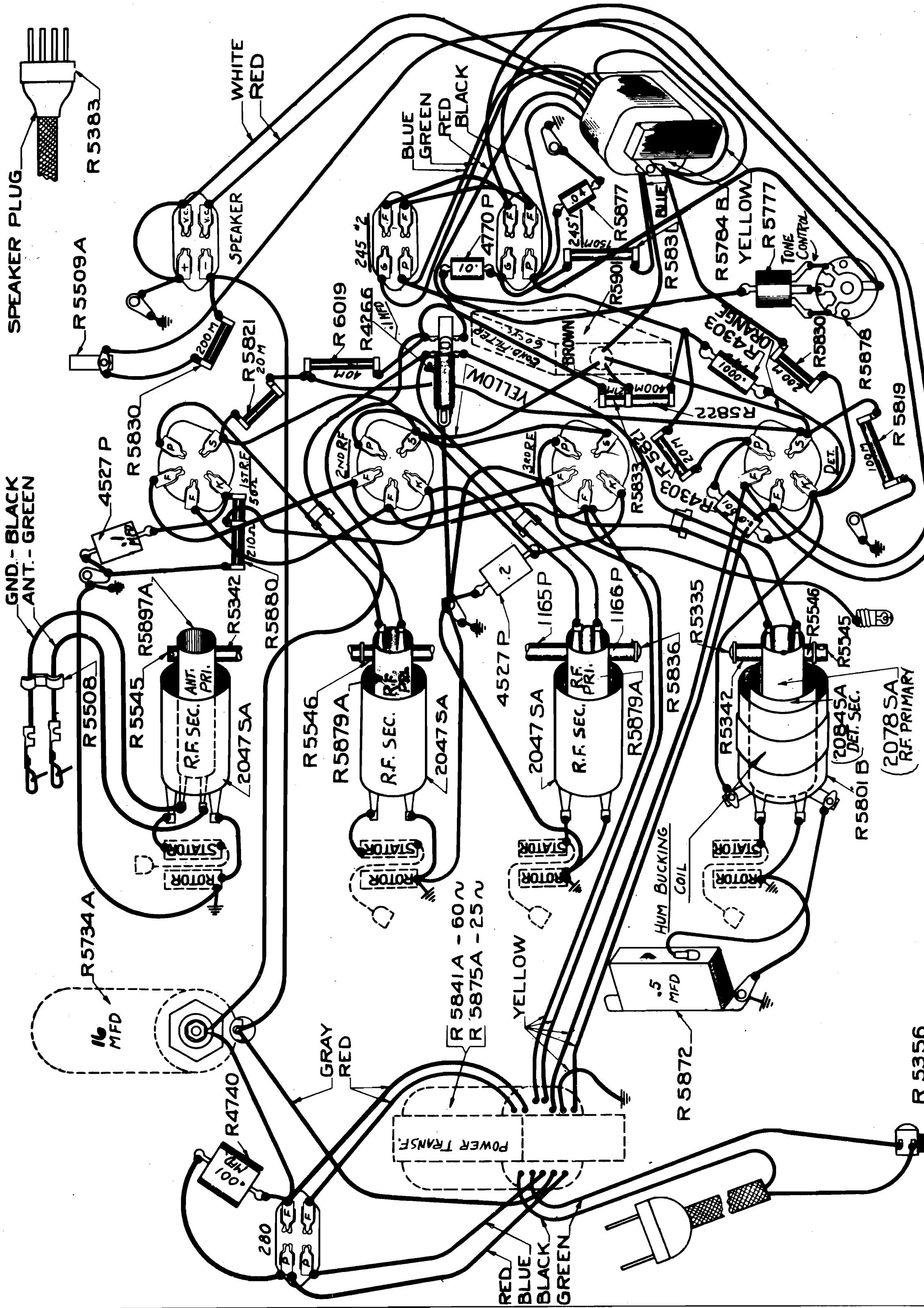


60 CYCLE MODEL 70 WATT
25 CYCLE MODEL 75 WATT

FOR VOLTAGE DATA SEE PAGE 208-B-7

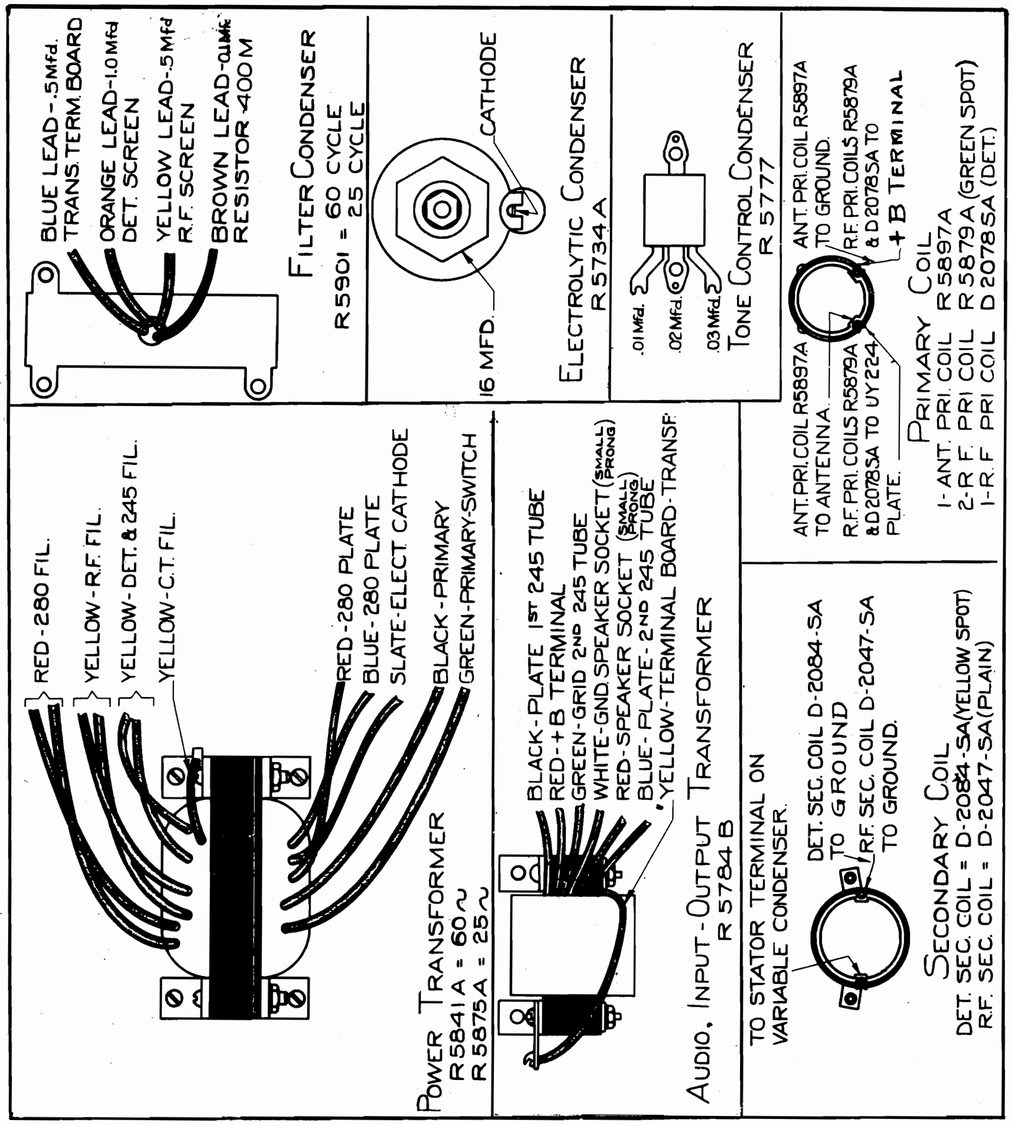
COLONIAL RADIO CORP.

MODEL 37



Hum, in this receiver, may be caused by a defective hum bucking coil. This coil is wound on the detector coil shield next to detector socket.

COLONIAL RADIO CORP.



LEAD DETAILS OF POWER & AUDIO TRANSFORMER, FILTER, TONE CONTROL, ELECTROLYTIC CONDENSERS AND R.F. COILS.

MODEL 37

VOLTAGE READINGS - MODELS 37 & 37-P

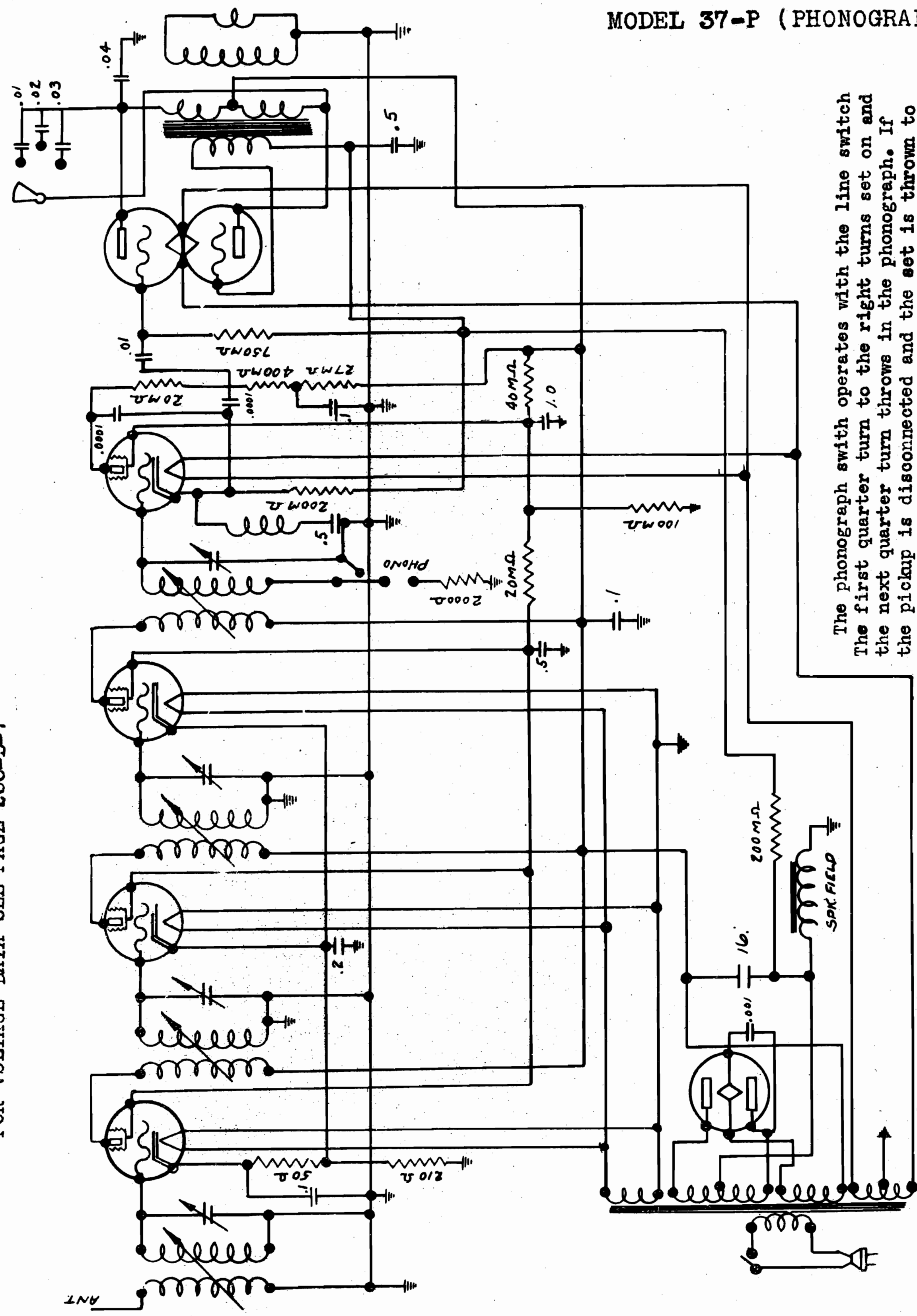
60 Cycle — Line Voltage 115	RF1	RF2	RF3	Det.	245#1	245#2	280AC	280DC
Plate Voltage D.C.	250	250	250	115	250	250	345	350
Screen Voltage D.C.	65	65	65	100				
Heater Voltage A.C.	2.4	2.4	2.4	2.4	2.4	2.4	4.8	
Control Grid Voltage D.C.	2.2	2.4	2.4	10	20	48		
Speaker Field Voltage	100							
Total Rectifier Current	.070							

25 Cycle — Line Voltage 115	RF1	RF2	RF3	Det.	245#1	245#2	280AC	280DC
Plate Voltage D.C.	240	240	240	100	240	240	340	340
Screen Voltage D.C.	65	65	65	100				
Heater Voltage A.C.	2.4	2.4	2.4	2.4	2.4	2.4	4.8	
Control Grid Voltage D.C.	2.2	2.4	2.4	10	20	45		
Speaker Field Voltage	100							
Total Rectifier Current MADC	.070							

Control grid voltage measured from cathode to ground or from cathode to filament. 245 grid voltage measured from grid to ground.

COLONIAL RADIO CORP.

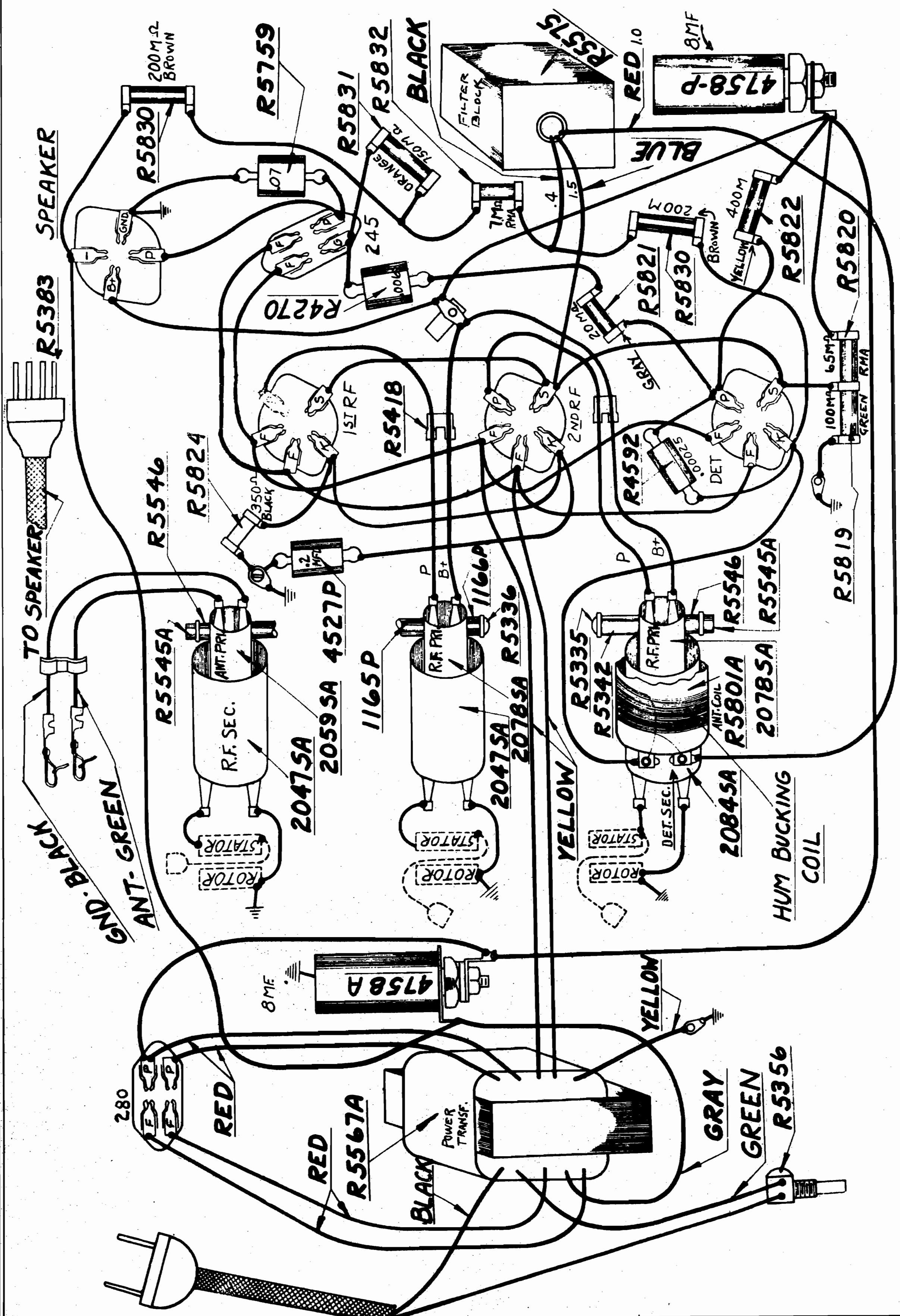
MODEL 37-P (PHONOGRAPH)



The phonograph swith operates with the line switch. The first quarter turn to the right turns set on and the next quarter turn throws in the phonograph. If the pickup is disconnected and the set is thrown to phono position, the set will not play and a loud hum will be heard in the loudspeaker. When playing records be sure to turn Radio Volume Control to the minimum position. The electrical characteristics of this receiver are identical to model 37.

FOR VOLTAGE DATA SEE PAGE 208-B-7

COLONIAL RADIO CORP.

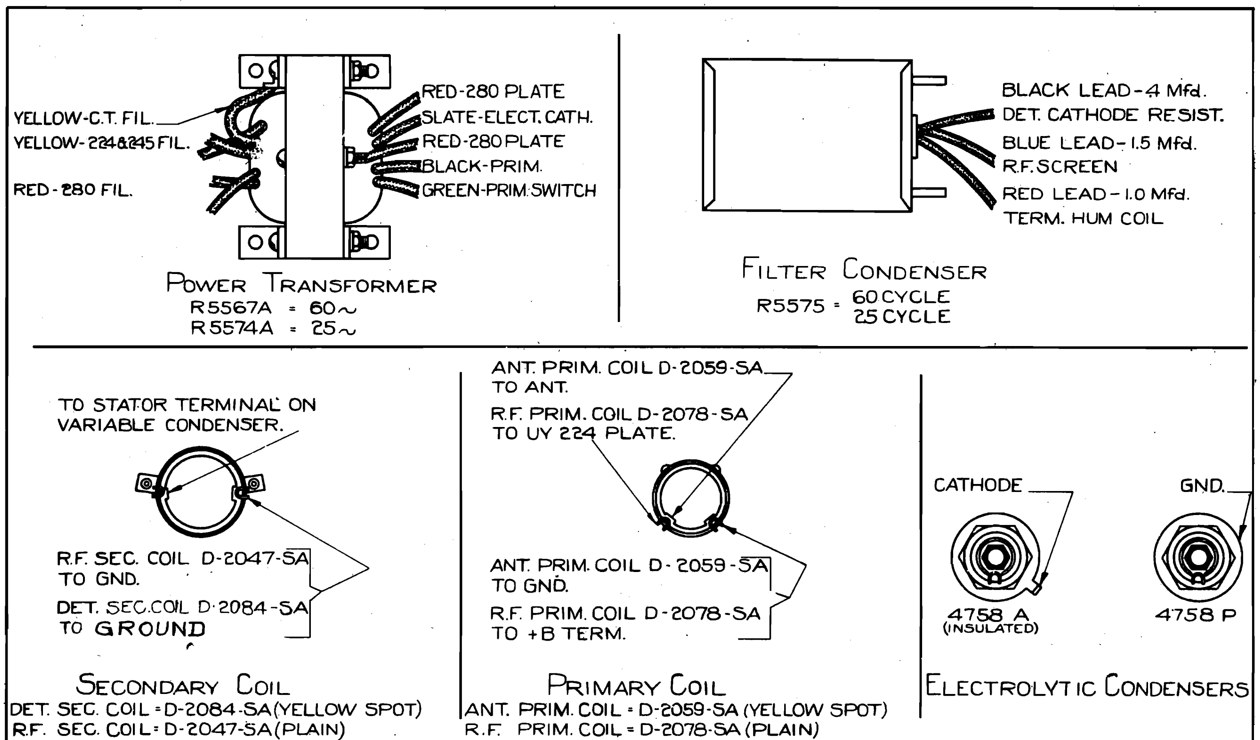


MODELS 39 & 125

Model 39 and 125 schematic diagram
shown on page 208-B
Voltage Data on page 208-B-10

COLONIAL RADIO CORP.

MODELS 39 & 125



Model 39 — LEAD DETAILS OF POWER TRANSFORMER, FILTER & ELECTROLYTIC CONDENSERS, PRIMARY & SECONDARY R.F. COILS.

60 Cycle Line Voltage 115

	RF1	RF2	Det.	245#1	245#2	280AC	280DC
Plate Voltage D.C.	245	245	120	240		320	340
Screen Voltage D.C.	75	75	75				
Heater Voltage A.C.	2.4	2.4	2.4	2.4		4.85	
Control Grid Voltage D.C.	2.6	2.6	7	30			
Speaker Field Voltage 100							
Total Rectifier Current .040							

25 Cycle Line Voltage 115

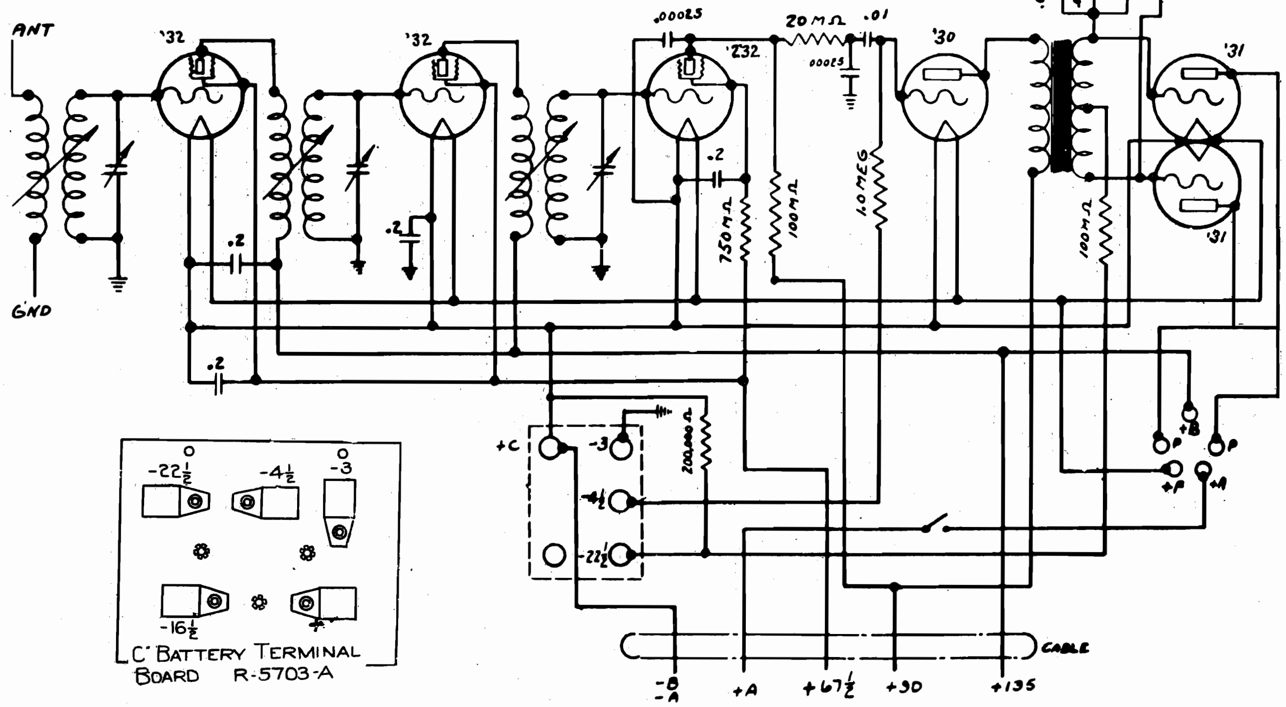
	RF1	RF2	Det.	245#1	245#2	280AC	280DC
Plate Voltage D.C.	250	250	110	245		325	350
Screen Voltage D.C.	75	75	75				
Heater Voltage A.C.	2.4	2.4	2.4	2.4		4.85	
Control Grid Voltage D.C.	2.5	2.5	7.5	30			
Speaker Field Voltage 100							
Total Rectifier Current .040							

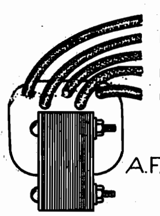
Note: Control grid volts are measured from Cathode to ground or Cathode to Heater. 245 Grid Voltage measured from Grid to Ground or Filament.

COLONIAL RADIO CORP.

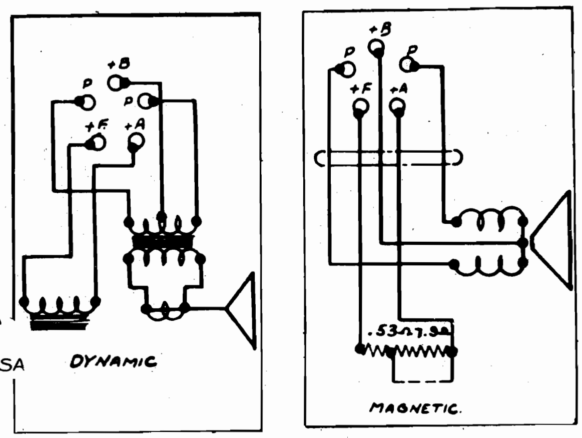
MODELS 40 & 43 (BATTERY OPERATED)

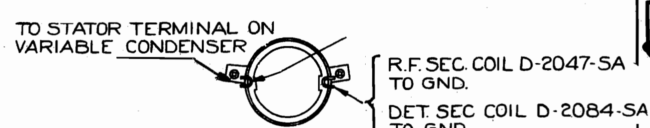
Model 40	RF1	RF2	Det.	1st Audio	231
Plate Voltage D.C.	135	135	80	90	130
Screen Voltage D.C.	67	67	25		
Filament Voltage D.C.	2.0	2.0	2.0	2.0	2.0
Control Grid Voltage D.C.	3	3		4.5	22.5



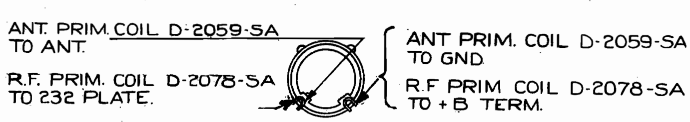


A.F. INPUT TRANSFORMER
R-5916-A · MOD. 40
R-5937-A · MOD. 43





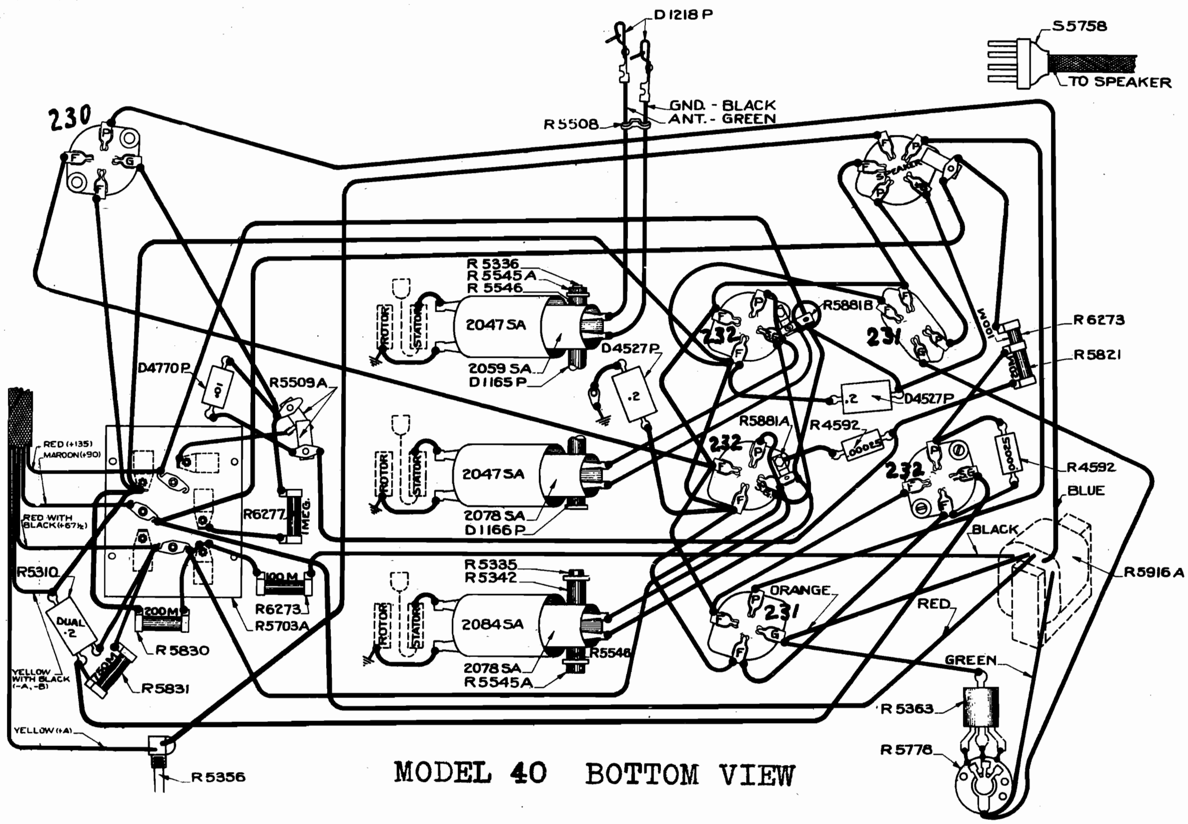
SECONDARY COIL
DET. SEC. COIL = D-2084-SA (YELLOW SPOT)
R.F. SEC. COIL = D-2047-SA (PLAIN)



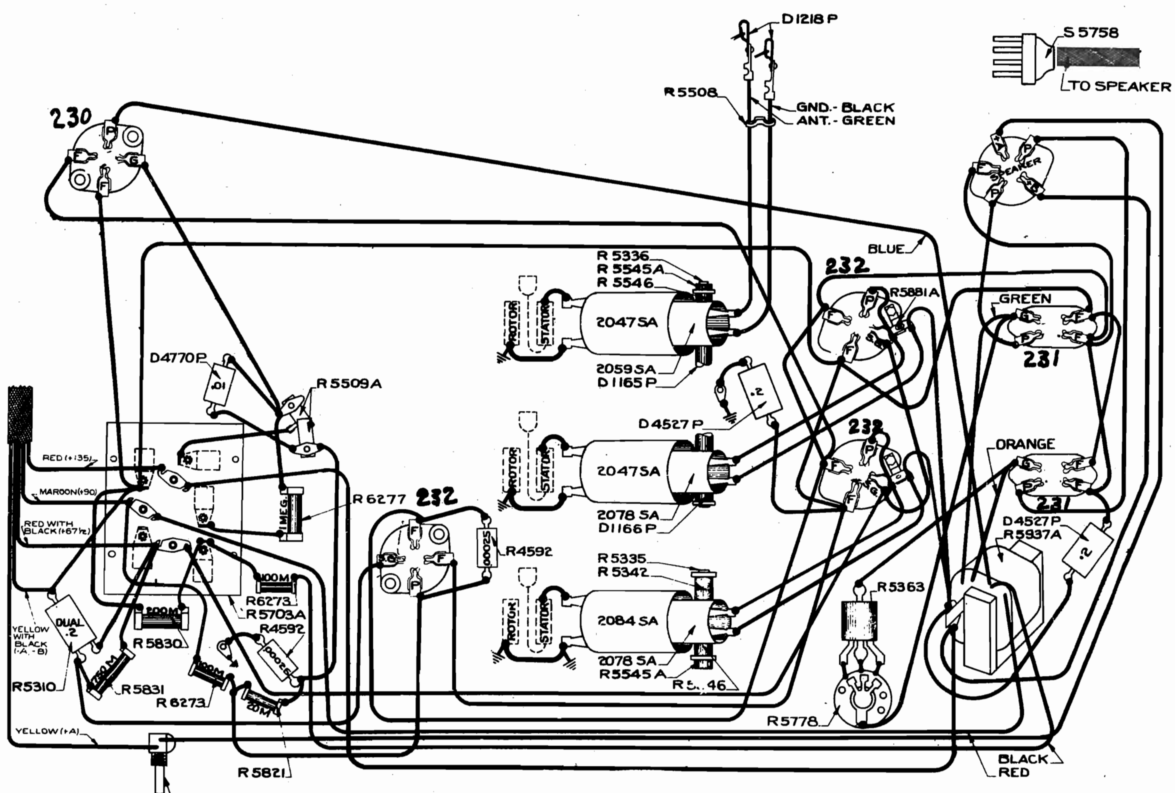
PRIMARY COIL
ANT. PRIM. COIL = D-2059-SA (YELLOW SPOT)
R.F. PRIM. COIL = D-2078-SA (PLAIN)

COLONIAL RADIO CORP.

MODELS 40 & 43 (BATTERY OPERATED)



MODEL 40 BOTTOM VIEW

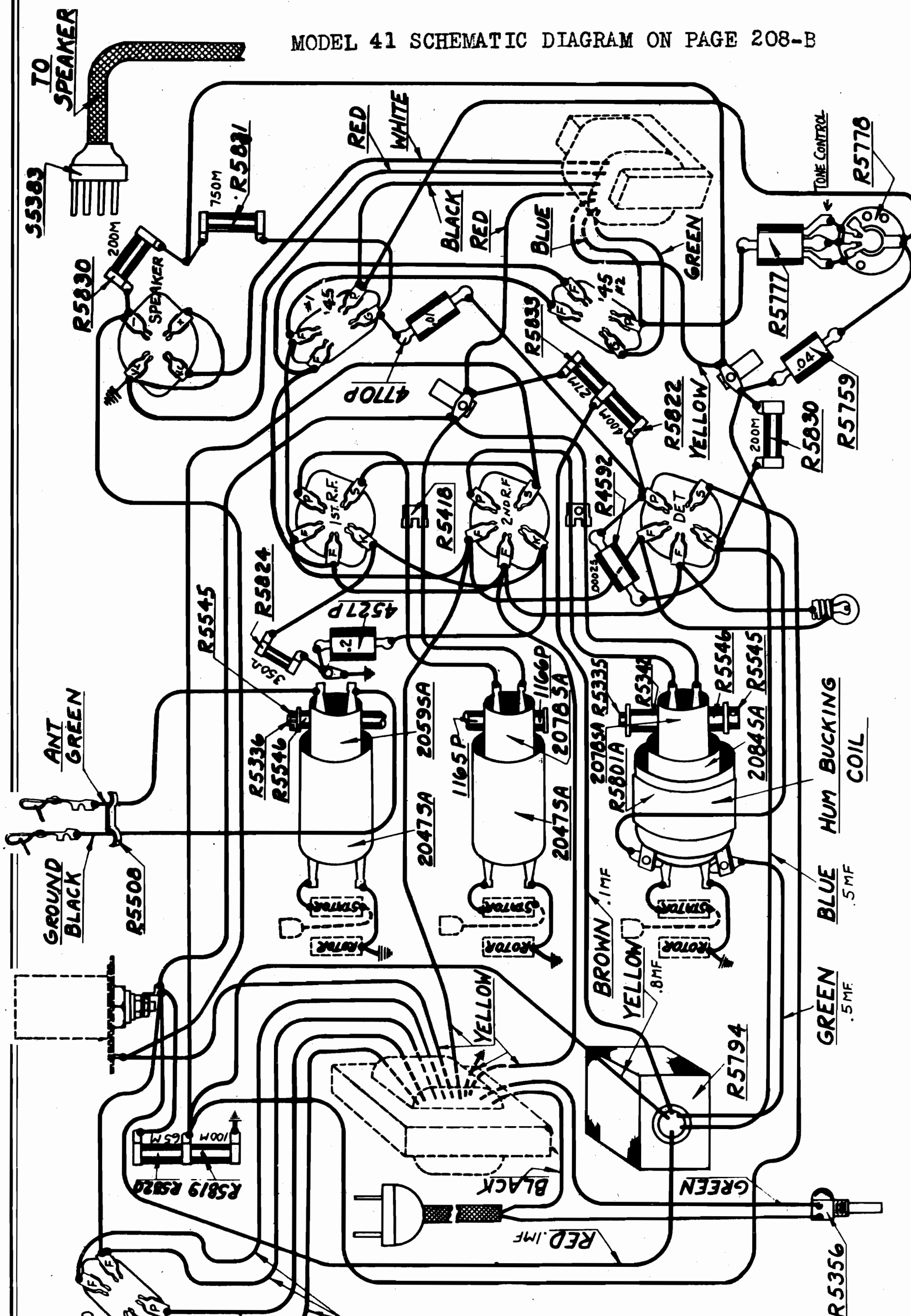


MODEL 43 BOTTOM VIEW

COLONIAL RADIO CORP.

MODEL 41

MODEL 41 SCHEMATIC DIAGRAM ON PAGE 208-B



Note: Control Grid volts are measured from Cathode to ground or Cathode to heater. -45 Grid Voltage, Grid to Ground or Grid to Filament.

MODELS 41 & 42 (25 & 60~)		RF1	RF2	Det.	245#1	245#2	280AC	280DC
Plate Voltage D.C.		240	240	95	240	240	340	340
Screen Voltage D.C.		85	85	85				
Heater Voltage A.C.		2.4	2.4	2.4	2.4	2.4	4.85	
Control Grid Voltage D.C.		3	3	8	20	45		
Speaker Field Voltage	100							
Total Rectifier Current	.065							

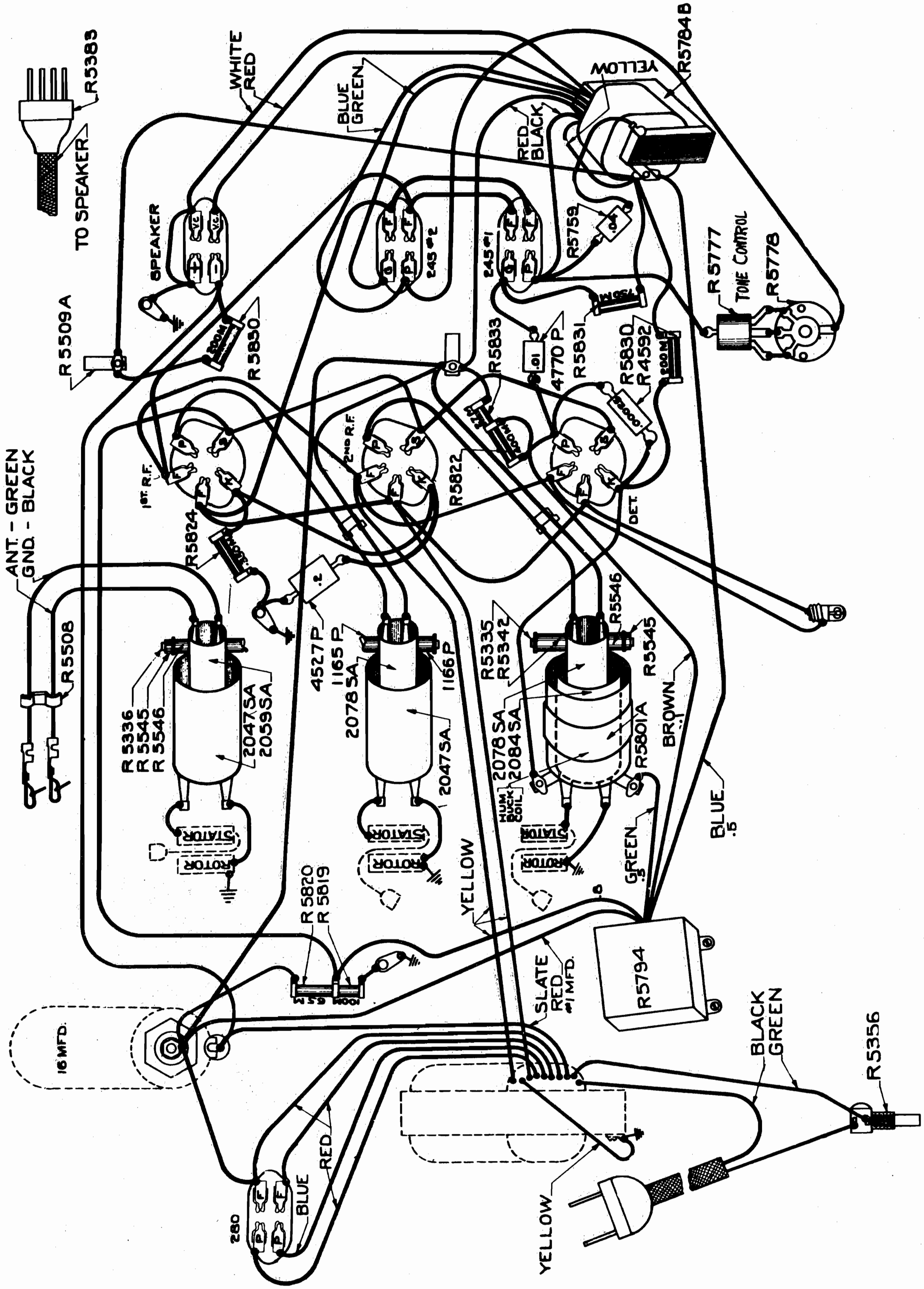
LINE VOLTS 115.

MODELS 41 & 42 - Type '35 tubes may be used in place of '24 type in R.F.stages.
Note that speaker field is in negative side of filter circuit.Voltage drop across field is used to obtain bias.

COLONIAL RADIO CORP.

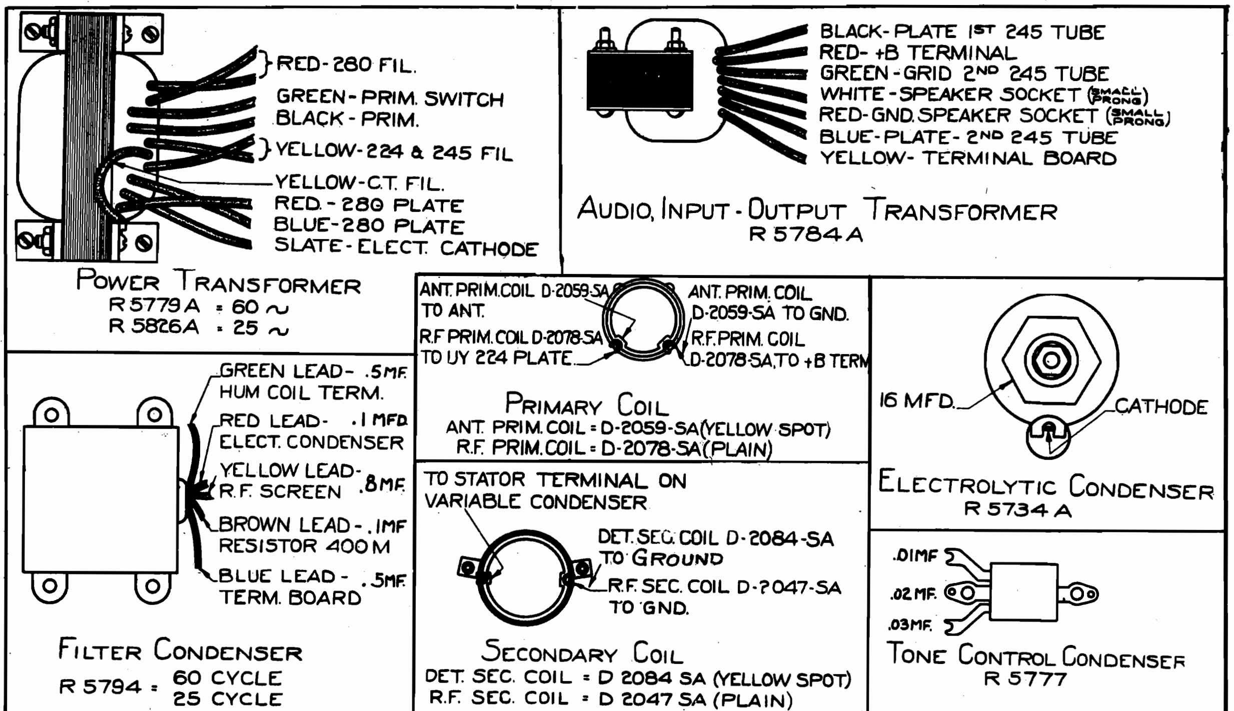
MODEL 42

MODEL 42 SHEMATIC DIAGRAM IDENTICAL WITH MODEL 41, PAGE 208-B



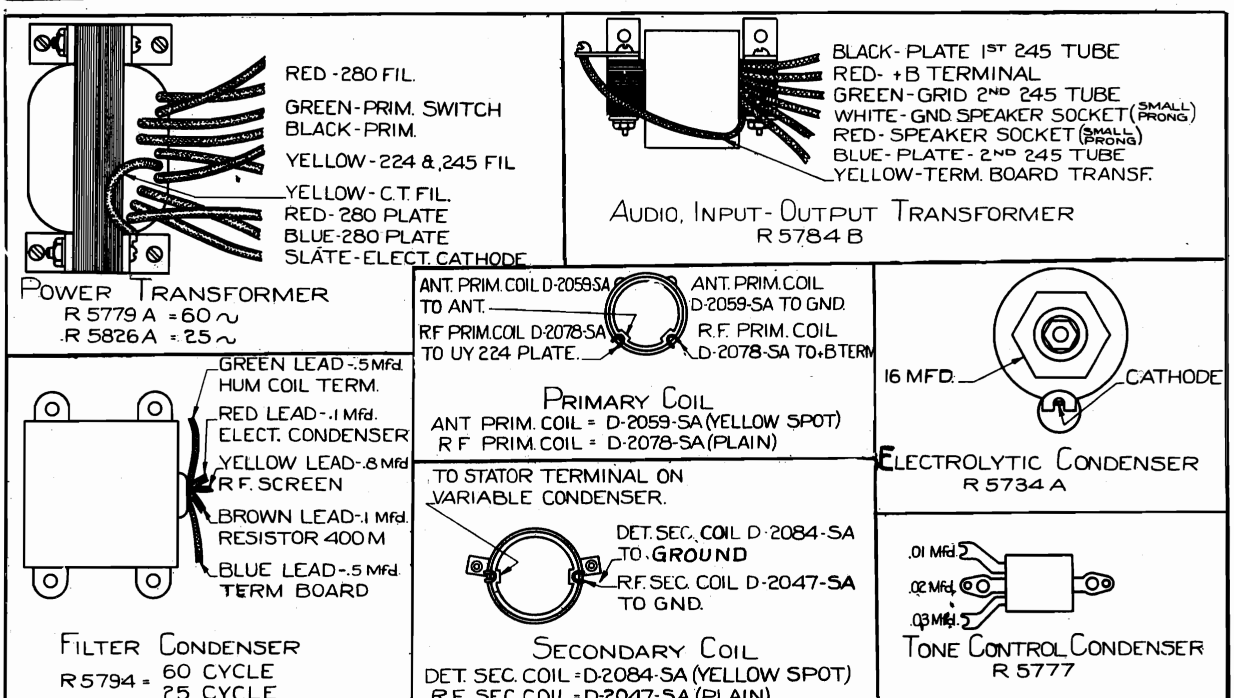
VOLTAGE TABLE AND OTHER DATA ON PAGE 208-B-11

COLONIAL RADIO CORP.



LEAD DETAILS OF POWER & AUDIO TRANSFORMER, FILTER, TONE CONTROL & ELECTROLYTIC CONDENSERS, PRIMARY & SECONDARY R.F. COILS.

MODEL 41



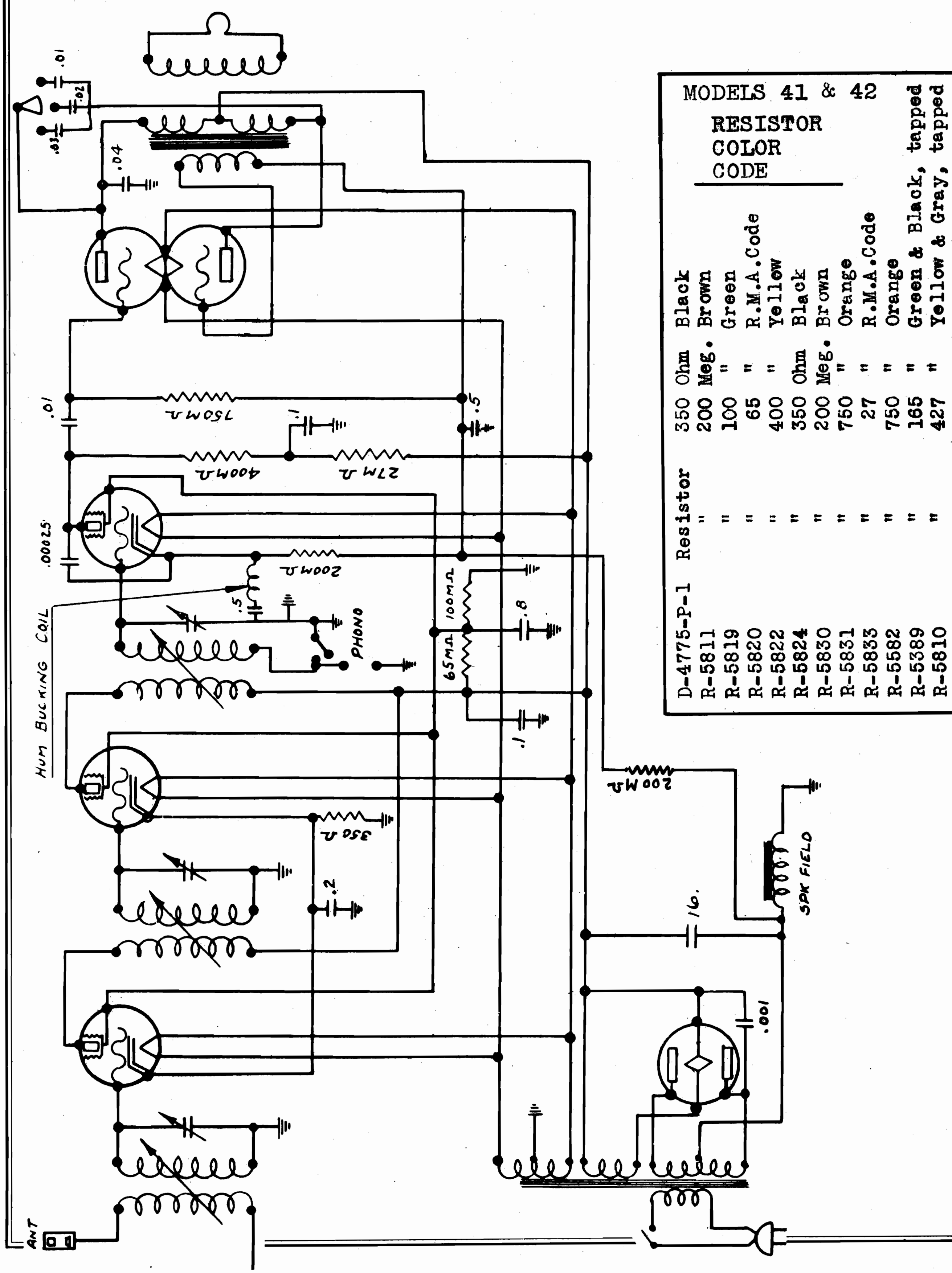
LEAD DETAILS OF POWER & AUDIO TRANSFORMER, FILTER, TONE CONTROL & ELECTROLYTIC CONDENSERS, PRIMARY & SECONDARY R F COILS.

MODEL 42

FOR ADDITIONAL DATA (RESISTOR COLOR CODE) SEE PAGE 208-B-16

MODEL 41-P

COLONIAL RADIO CORP.



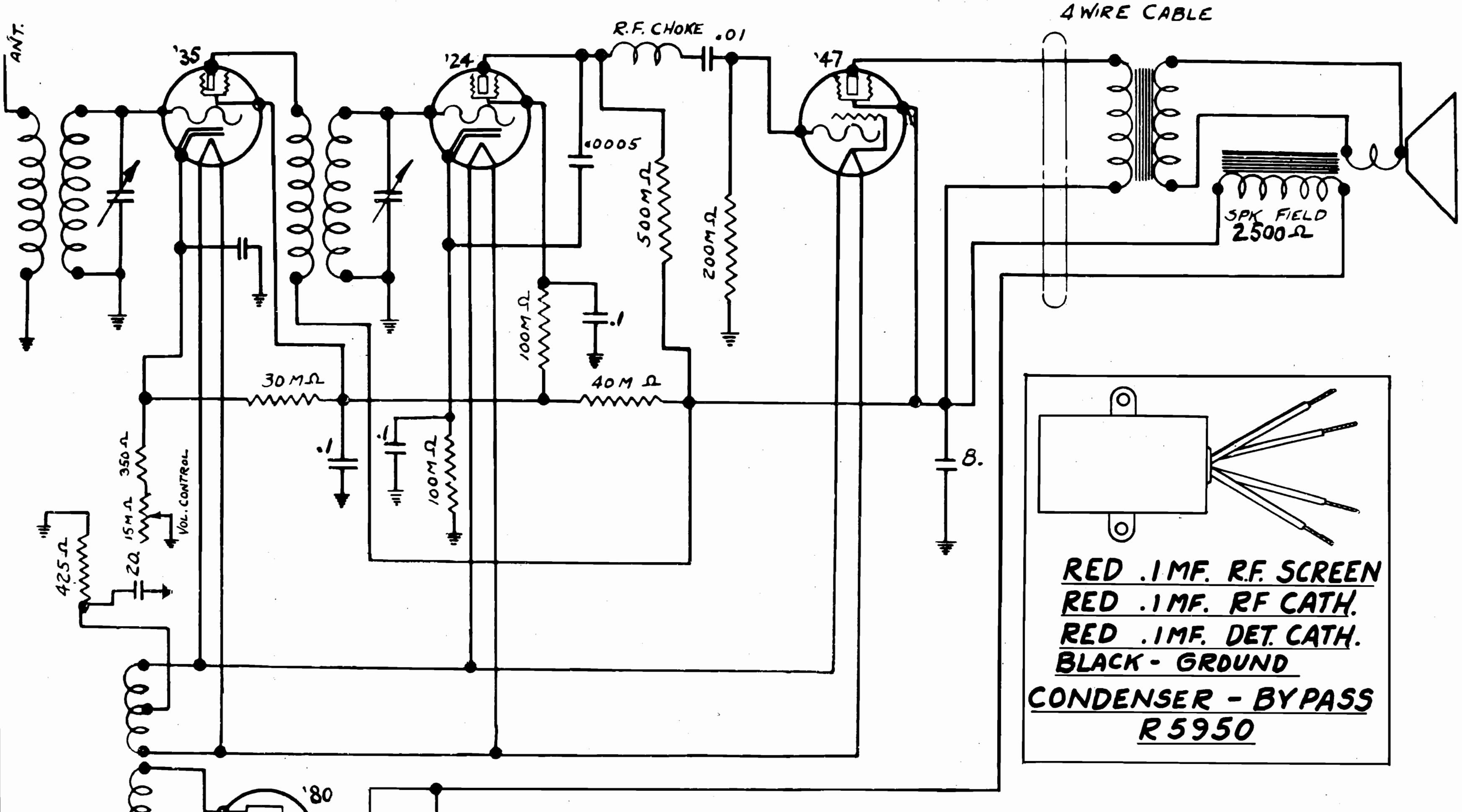
MODELS 41 & 42

RESISTOR COLOR CODE

D-4775-P-1	Resistor	350	Ohm	Black
R-5811	"	200	Meg.	Brown
R-5819	"	100	"	Green
R-5820	"	65	"	R.M.A.Code
R-5822	"	400	"	Yellow
R-5824	"	350	Ohm	Black
R-5830	"	200	Meg.	Brown
R-5831	"	750	"	Orange
R-5833	"	27	"	R.M.A.Code
R-5582	"	750	"	Orange
R-5389	"	165	"	Green & Black, tapped
R-5810	"	427	"	Yellow & Gray, tapped

MODEL 46
(Midget)

COLONIAL RADIO CORP.



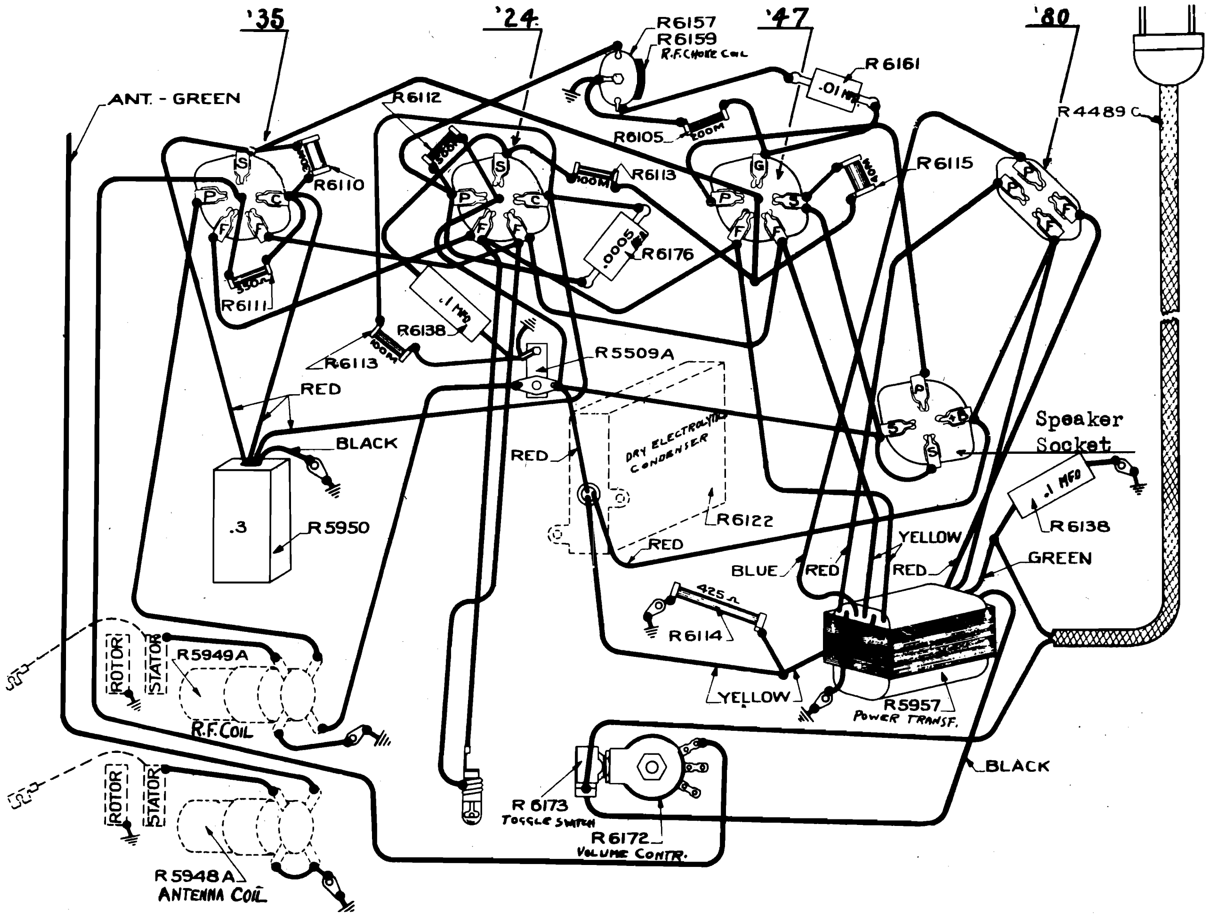
Line Voltage 115	60 Cycle	RF1	Det.	247	280AC	280DC
Plate Voltage D.C.		250	115	230	345	355
Screen Voltage D.C.		100	85	250		
Heater Voltage A.C.		2.3		2.3	4.8	
Control Grid Voltage D.C.		3.4	4.5	15		
Speaker Field Voltage	120					
Total Rectifier Current	.045					

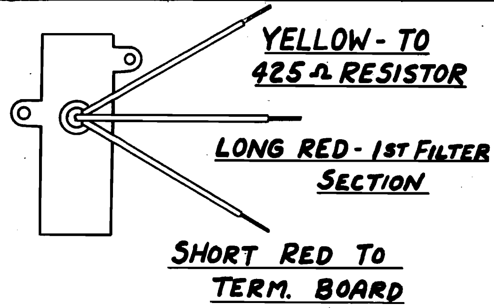
Note: Control grid volts are measured from Cathode to Ground or Cathode to Heater. 247 Grid voltage, from Filament to Ground. Volume control at minimum.

Power Consumption
60 cycle 56 Watt

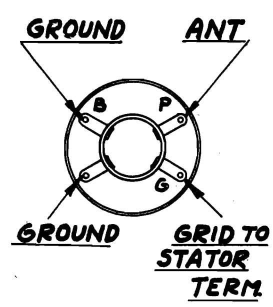
MODEL 46
(Midget)

COLONIAL RADIO CORP.

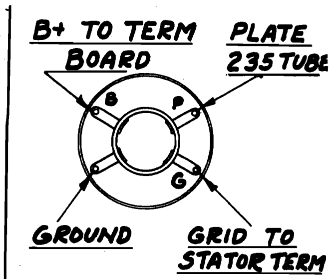




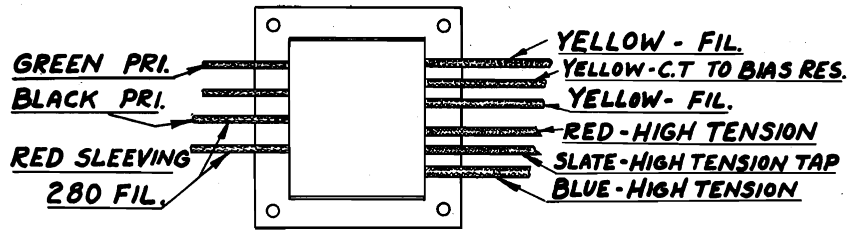
DRY ELECTROLYTIC COND.
R6122



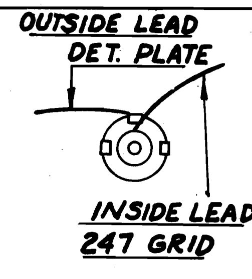
ANT COIL R5948A



R.F. COIL R 5949A



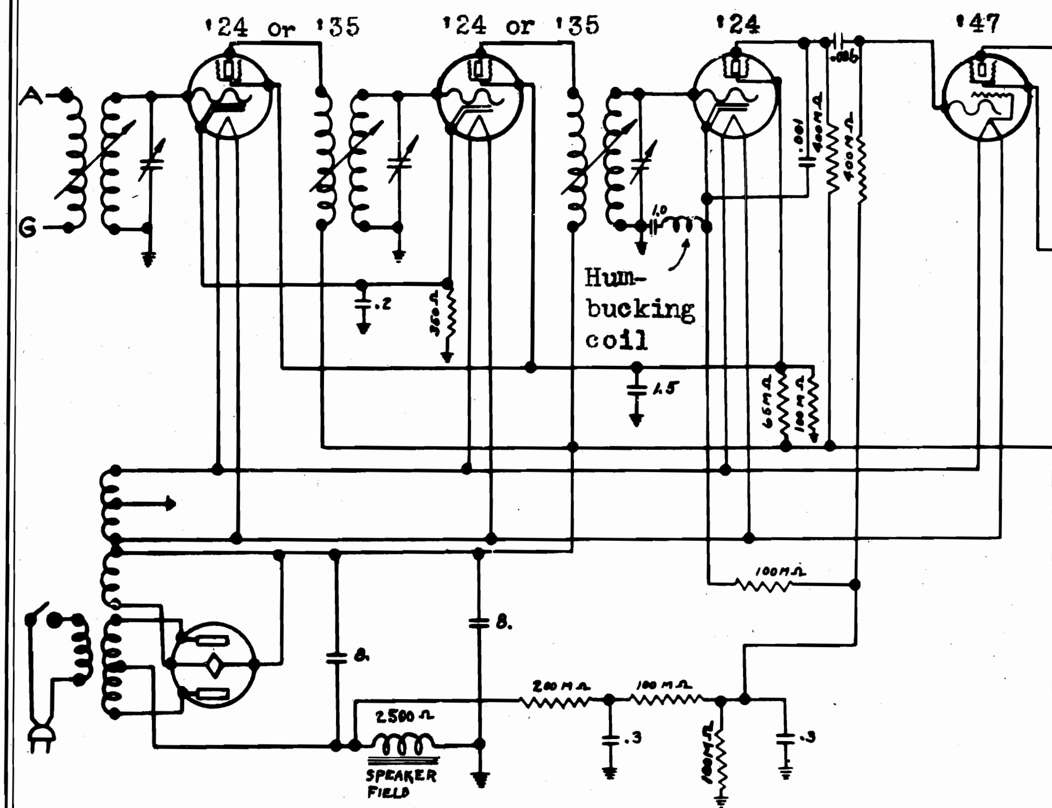
POWER TRANSFORMER
60 CYCLE R5957

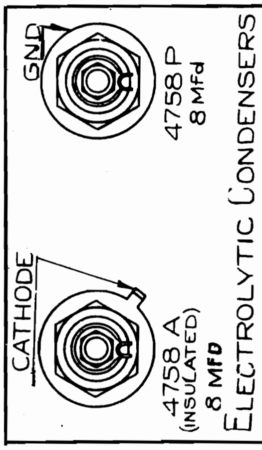


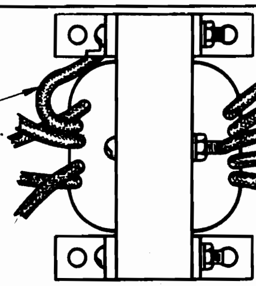
R.F. CHOKE R6159

MODEL 49
(Midget)

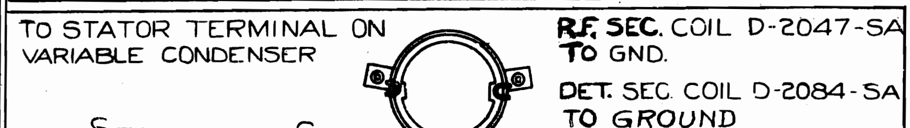
COLONIAL RADIO CORP.



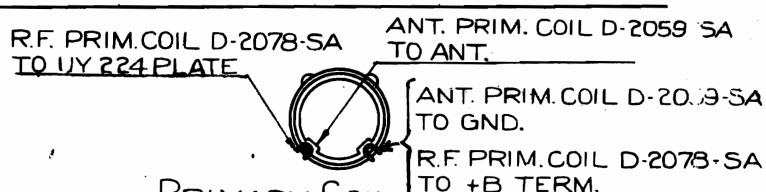




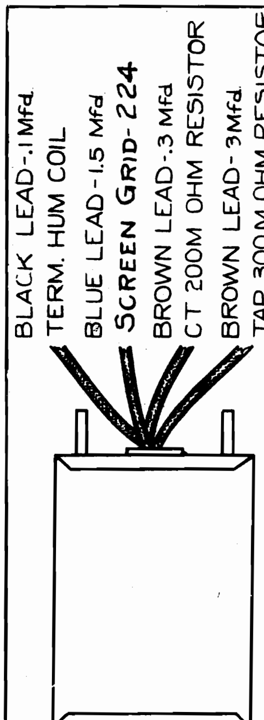
POWER TRANSFORMER
R 5567A = 60~ R 5574A = 25~



SECONDARY COIL
DET. SEC. COIL = D-2084-SA (YELLOW SPOT)
R.F. SEC. COIL = D-2047-SA (PLAIN)



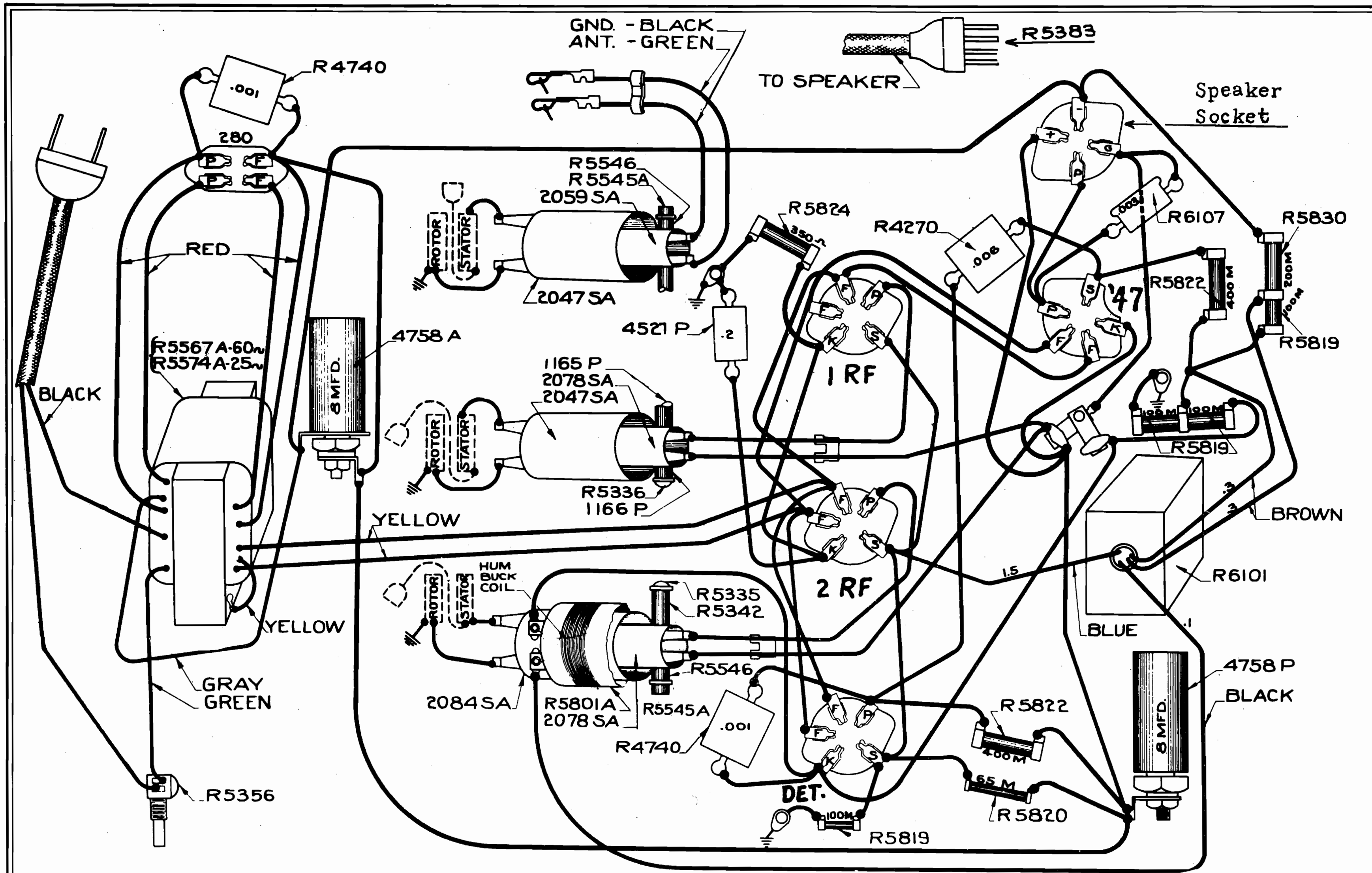
PRIMARY COIL
ANT. PRIM. COIL = D-2059-SA (YELLOW SPOT)
R.F. PRIM. COIL = D-2078-SA (PLAIN)



FILTER CONDENSER
R-6101 = 60 CYCLE
25 CYCLE

MODEL 49
(Midget)

COLONIAL RADIO CORP.



60 Cycle

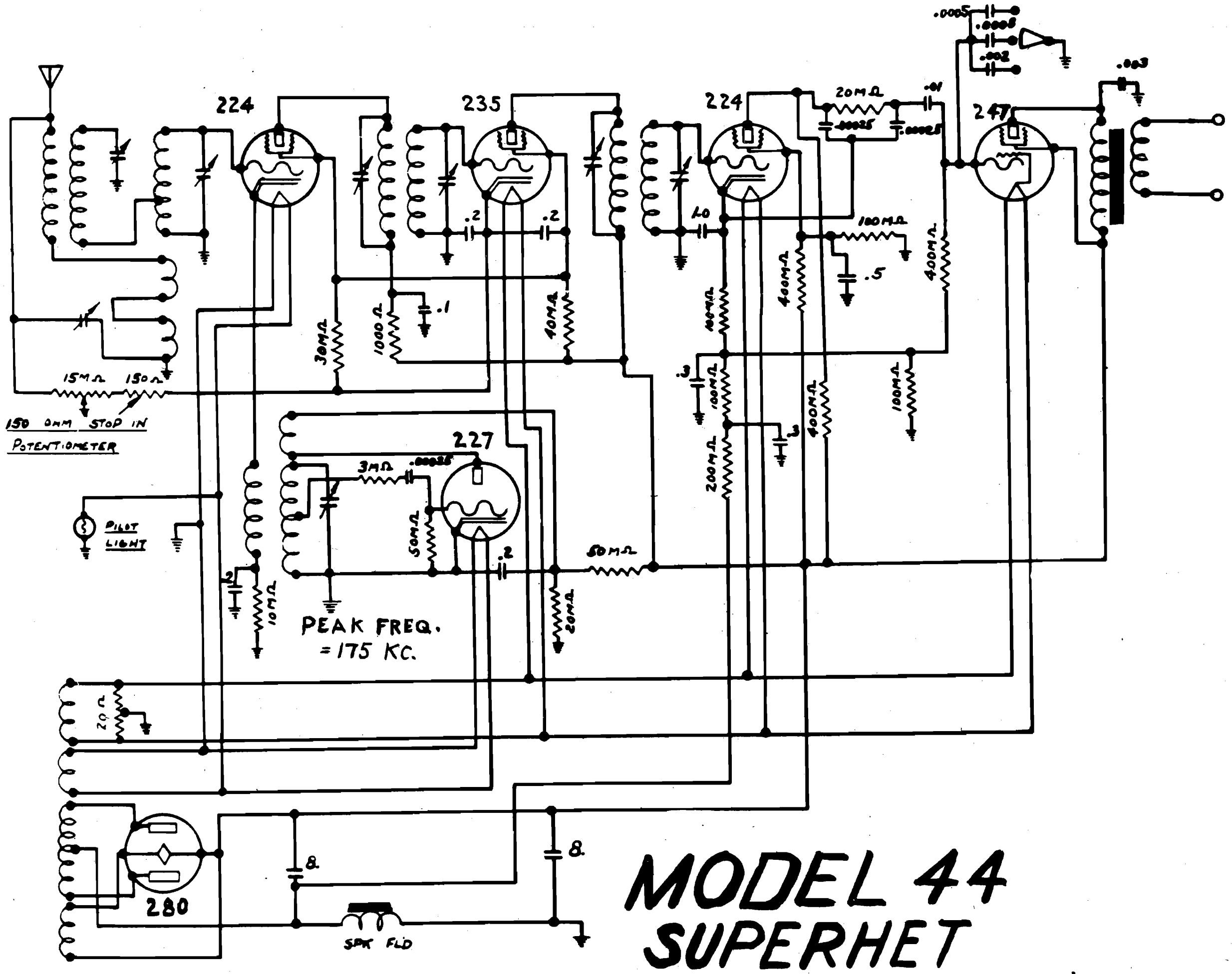
	RF1	RF2	Det.	247	280AC	280DC
Plate Voltage D.C.	220	220	100	210	340	320
Screen Voltage D.C.	70	70	70			
Heater Voltage A.C.	2.3	2.3	2.3	2.3	4.8	
Control Grid Voltage D.C.	2.4	2.4	7	15		
Speaker Field Voltage 100						
Total Rectifier Current .045				Line Voltage 115		

25 Cycle

	RF1	RF2	Det.	247	280AC	280DC
Plate Voltage D.C.	240	240	100	230	335	340
Screen Voltage D.C.	70	70	70	230		
Heater Voltage A.C.	2.4	2.4	2.4	2.4	5	
Control Grid Voltage D.C.	2.3	2.3	7	15		
Speaker Field Voltage 100						
Total Rectifier Current .045				Line Voltage 115		

Control Grid Volts are measured from Cathode to Ground or Cathode to Filament. 247 Grid Voltage. Grid to Ground or Filament.

COLONIAL RADIO CORP.



MODEL 44 SUPERHET

60 Cycle
Line Voltage - 115

Total Watts - 66

	Tran.	Osc.	I.F.	Det.	247	280AC	280DC
Plate Voltage DC	230	40	240	120	240	350	370
Screen Voltage DC	80		80	40	245		
Heater Voltage AC	2.4	2.4	2.4	2.4	2.4	4.8	
Control Grid Voltage DC	10		1.5-30	4	15		
Speaker Field Voltage	125 volts						
Total Plate Current	.050 amperes						

25 Cycle
Line Voltage- 115

Total Watts - 70

	Tran.	Osc.	I.F.	Det.	247	280AC	280DC
Plate Voltage DC	225	45	240	125	235	345	360
Screen Voltage DC	80		80	40	240		
Heater Voltage AC	2.5	2.5	2.35	2.35	2.35	4.75	
Control Grid Voltage DC	10		1.5-30	4	15		
Speaker Field Voltage	120 volts						
Total Plate Current	.050 amperes						

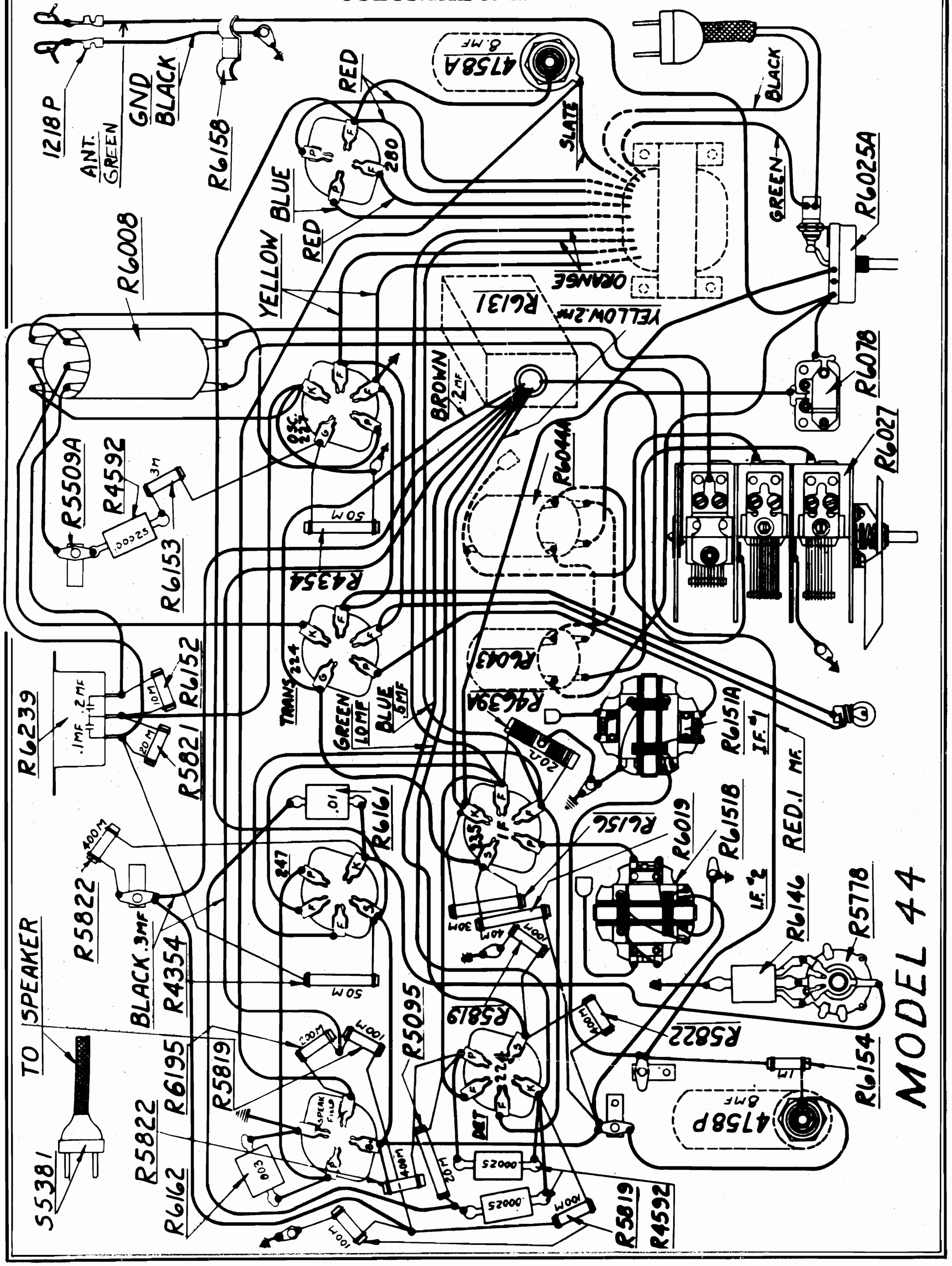
Note: Control grid volts are measured from cathode to ground or cathode to heater. 247 grid voltage from grid to ground or filament.

The 25 cycle models of this receiver are identical in electrical characteristics to the 60 cycle models.

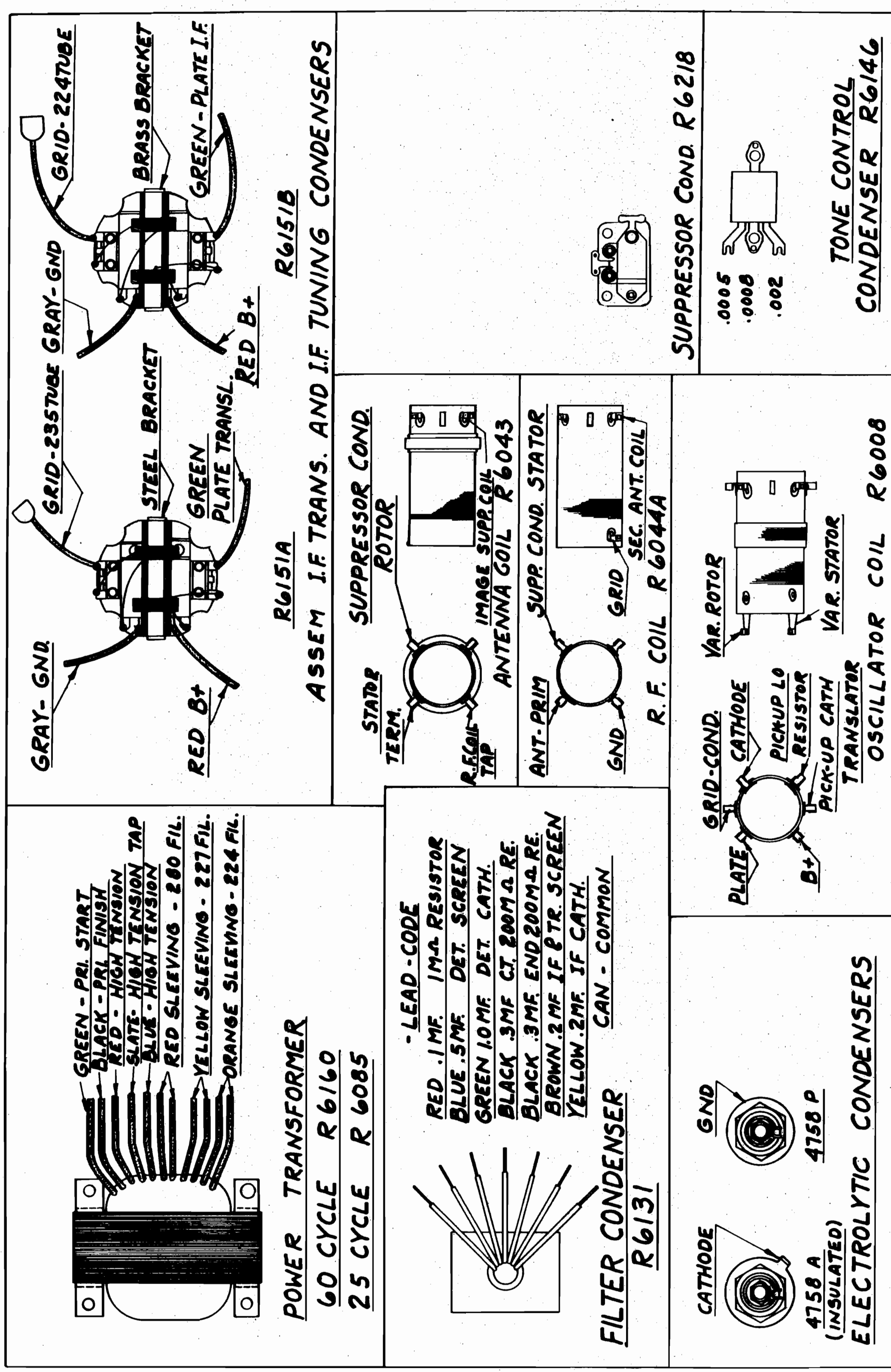
Note-The term Tran. (translator) refers to what is commonly called the first detector. IF transformer aligning screws are accessible through two holes in the base under each IF transformer. A variation voltage of about 20 percent can be allowed for in the voltage chart.

For further data see pages 208-D and 208-E

COLONIAL RADIO CORP.



COLONIAL RADIO CORP.



LEAD DETAILS OF POWER TRANSFORMER - I.F. TRANS. - I.F TUNING COND - FILTER. TONE CONTROL
ELECTROLYTIC & SUPPRESSOR CONDENSERS · R.F. - ANT & OSCILLATOR COILS

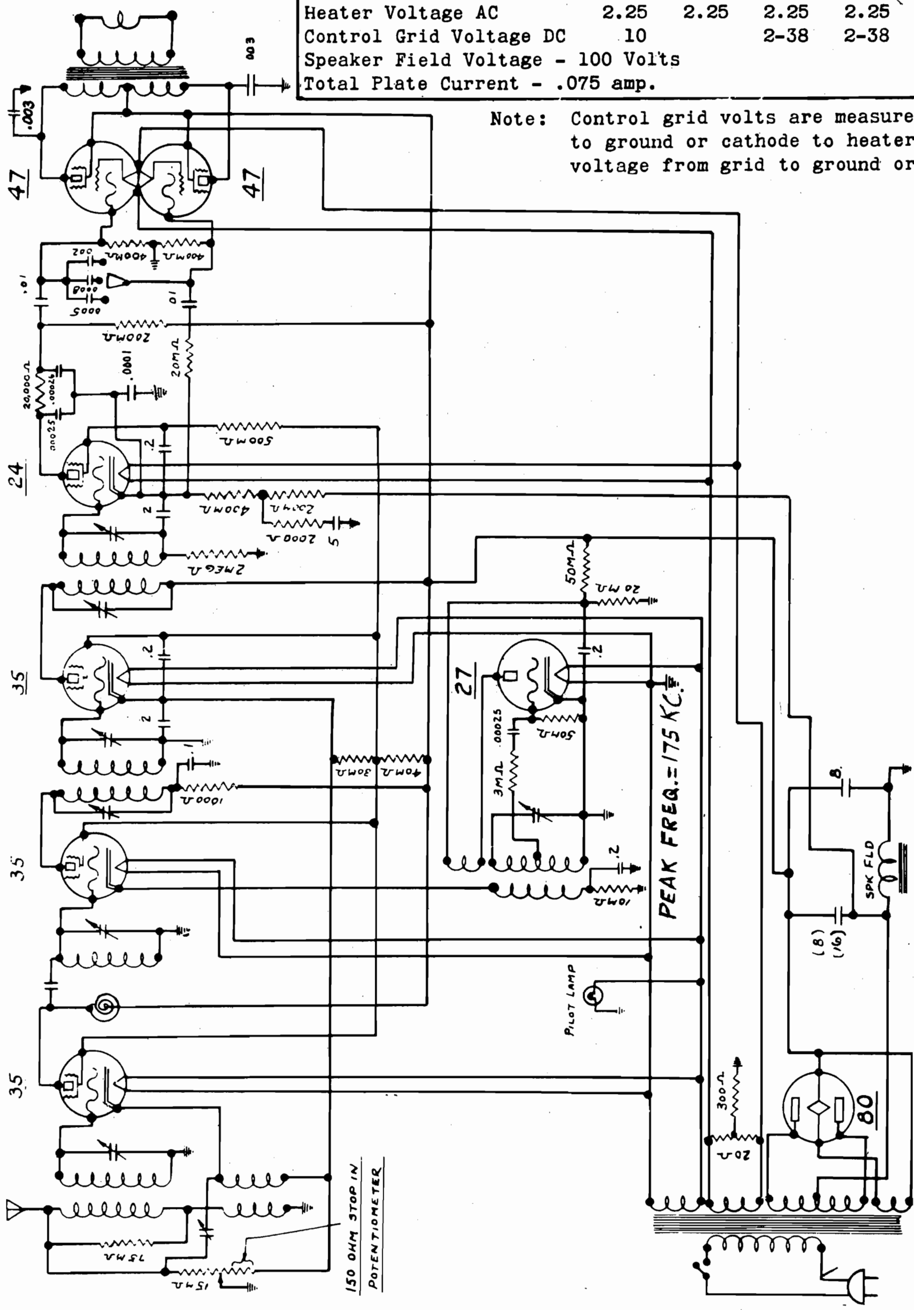
MODEL-44

COLONIAL RADIO CORP.

60 Cycle Total Watts - 80 Line Voltage - 115	Tran.	Osc.	I.F.	R.F.	Det.	2-247	280AC	280DC
Plate Voltage DC	230	40	240	240	160	235	240	350
Screen Voltage DC	65		65	65	20	240		
Heater Voltage AC	2.44	2.44	2.44	2.44	2.44	2.45	4.85	
Control Grid Voltage DC	10		1.7-40	1.7-40	20	16		
Speaker Field Voltage	110 Volts.							
Total Plate Current	1075 amp.							

25 Cycle Total Watts - 85 Line Voltage - 115	Tran.	Osc.	I.F.	R.F.	Det.	2-247	280AC	280DC
Plate Voltage DC	220	40	230	230	160	225	325	340
Screen Voltage DC	70		70	70	25	230		
Heater Voltage AC	2.25	2.25	2.25	2.25	2.45	2.45	4.7	
Control Grid Voltage DC	10		2-38	2-38	20	15		
Speaker Field Voltage - 100 Volts								
Total Plate Current - .075 amp.								

Note: Control grid volts are measured from cathode to ground or cathode to heater. 247 grid voltage from grid to ground or filament.

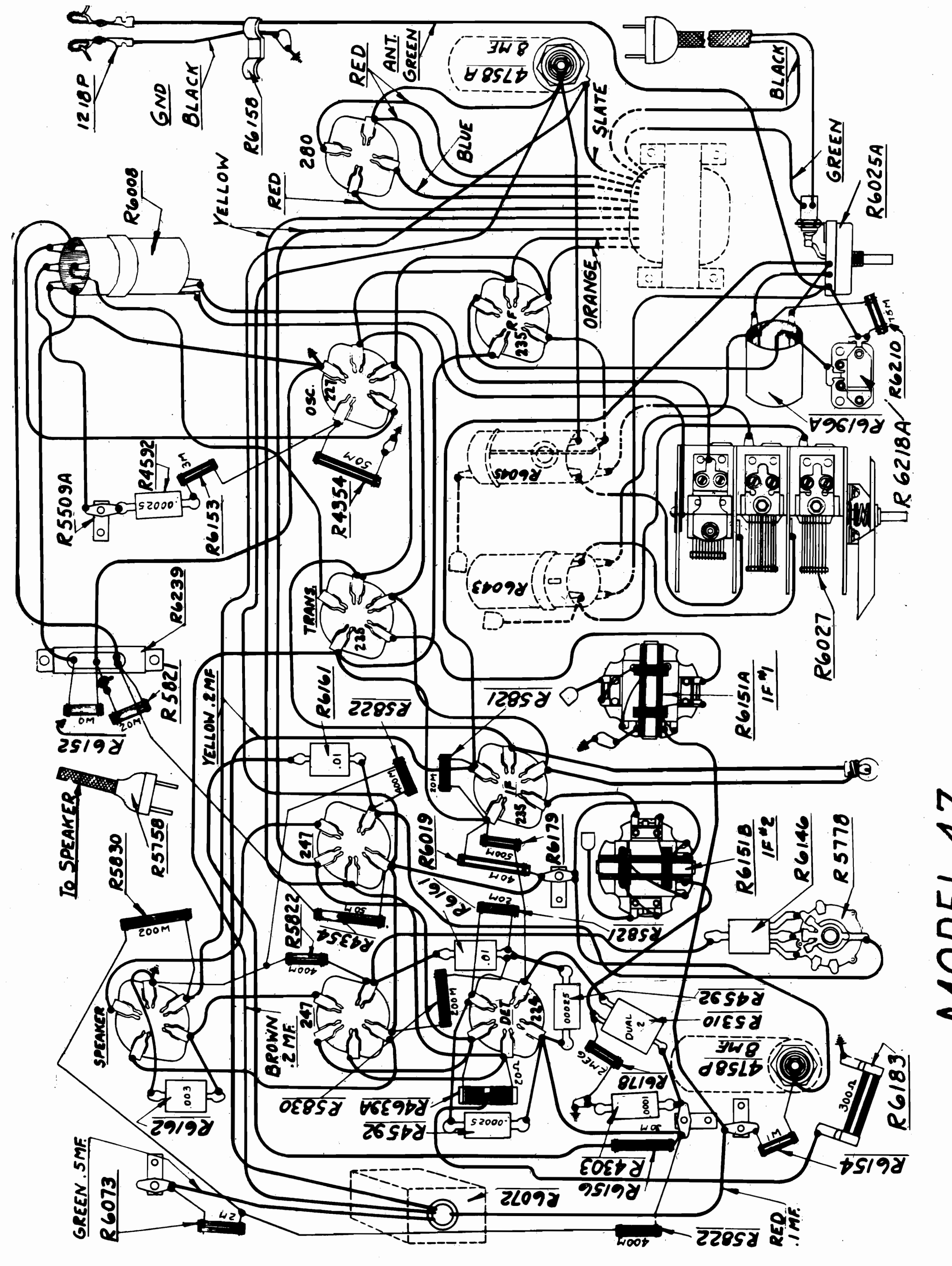


MODELS 47-48 SUPERHET.

NOTE-In this set the hum across the field coil is used to buck out hum set up in the tube circuits. Causes of hum can be traced to defective detector or output tubes. (interchange output tubes) Shorted condenser or open resistors in hum filter circuit. The hum filter circuits consists of a 2000 ohm resistor and a 0.5 condenser in the grid bias resistor circuit. This connects from the cathode of the detector to the negative side of the speaker field. Other causes of hum are Reversed speaker field, open or shorted condensers in detector circuit, open or grounded 20 ohm center tapped resistor, defective tone control, defective speaker or a defective electrolytic condenser.

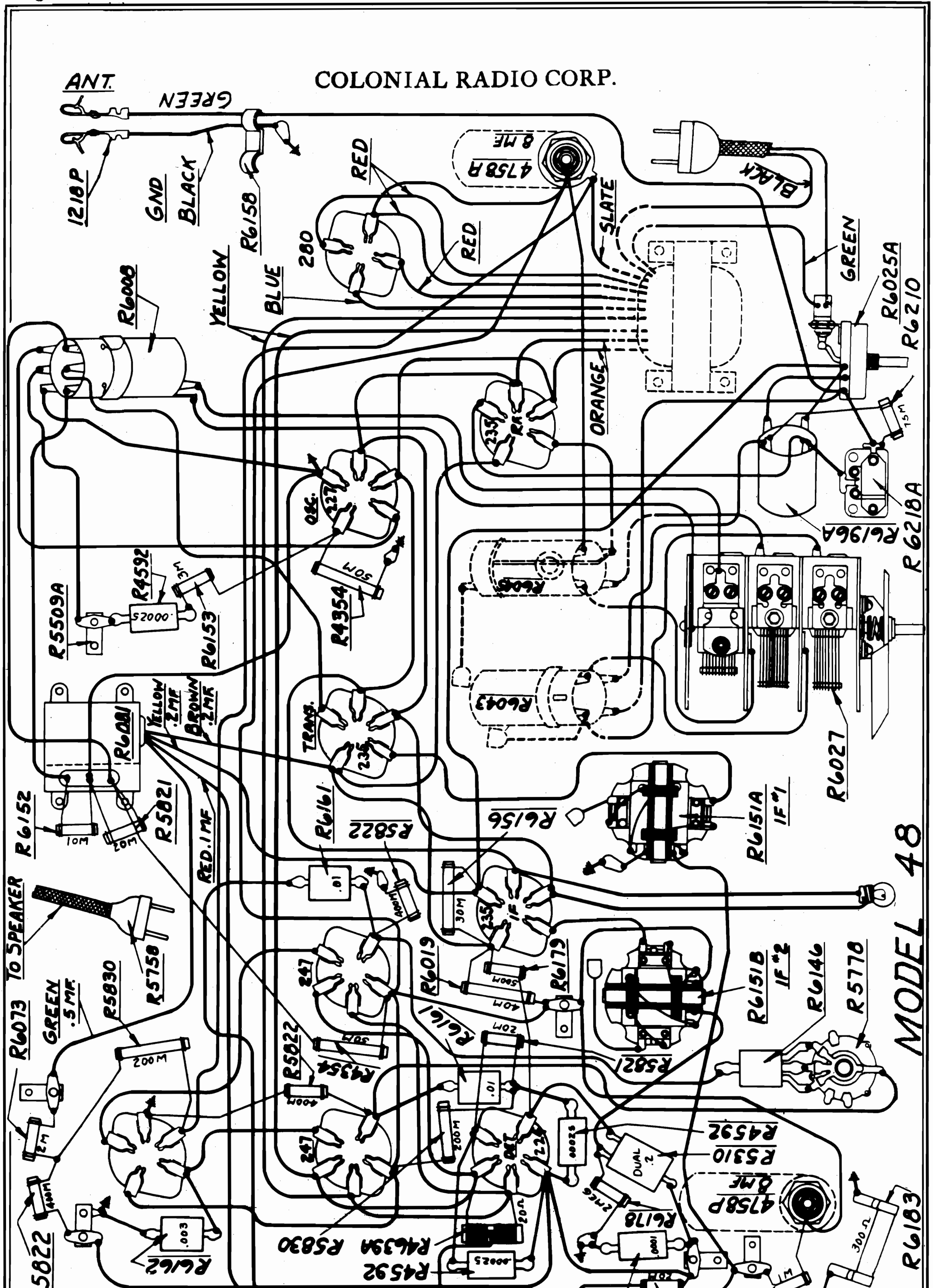
For further data see pages 208-G,208-H,208-I.

COLONIAL RADIO CORP.

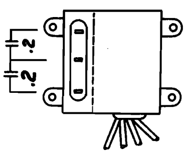


MODEL 47

COLONIAL RADIO CORP.



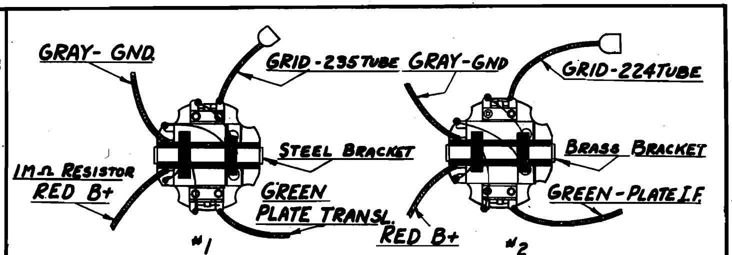
COLONIAL RADIO CORP.



-LEAD CODE-
RED .1MF. 1MΩ RESISTOR I.F
BROWN .2MF. SCREEN I.F.
YELLOW .2MF CATHODE I.F.
GREEN .5-2MΩ RESISTOR
CAN - COMMON

FILTER CONDENSER
R6081

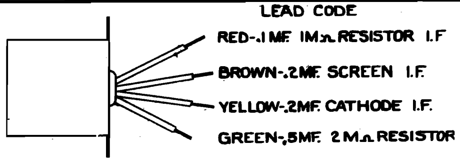
MODEL 48



ASSEM I.F. TRANS. AND I.F. TUNING CONDENSERS

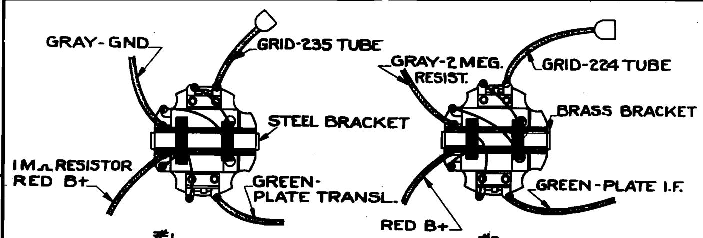
MODEL 48

LEAD CODE



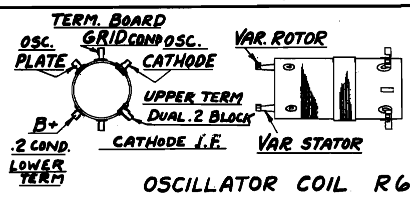
FILTER CONDENSER-R6072

MODEL 47



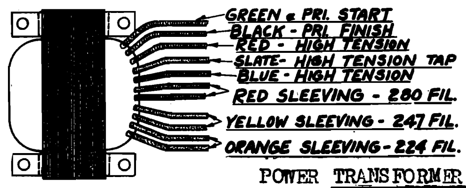
ASSEM. I.F. TRANS. & I.F. TUNING CONDENSERS

MODEL 47



OSCILLATOR COIL R6008

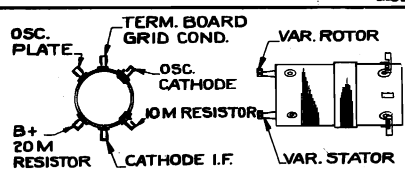
MODEL 48



POWER TRANSFORMER

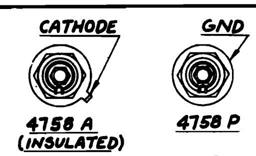
Model 48 { 60 cyc. - R6085; 25 " - R6181 }

Model 47 { 60 " - R6080A; 25 " - R6185A }

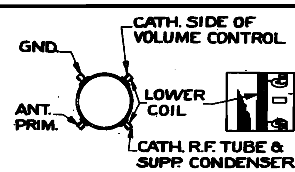


OSCILLATOR COIL R 6008

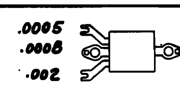
MODEL 47



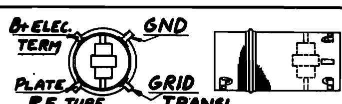
ELECTROLYTIC CONDENSERS



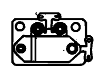
SUPPRESSOR COIL R6196A



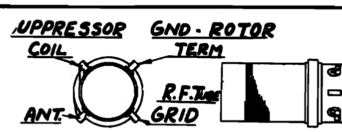
TONE CONTROL
CONDENSER R6146



R.F. COIL R6045



SUPPRESSOR COND. R6218



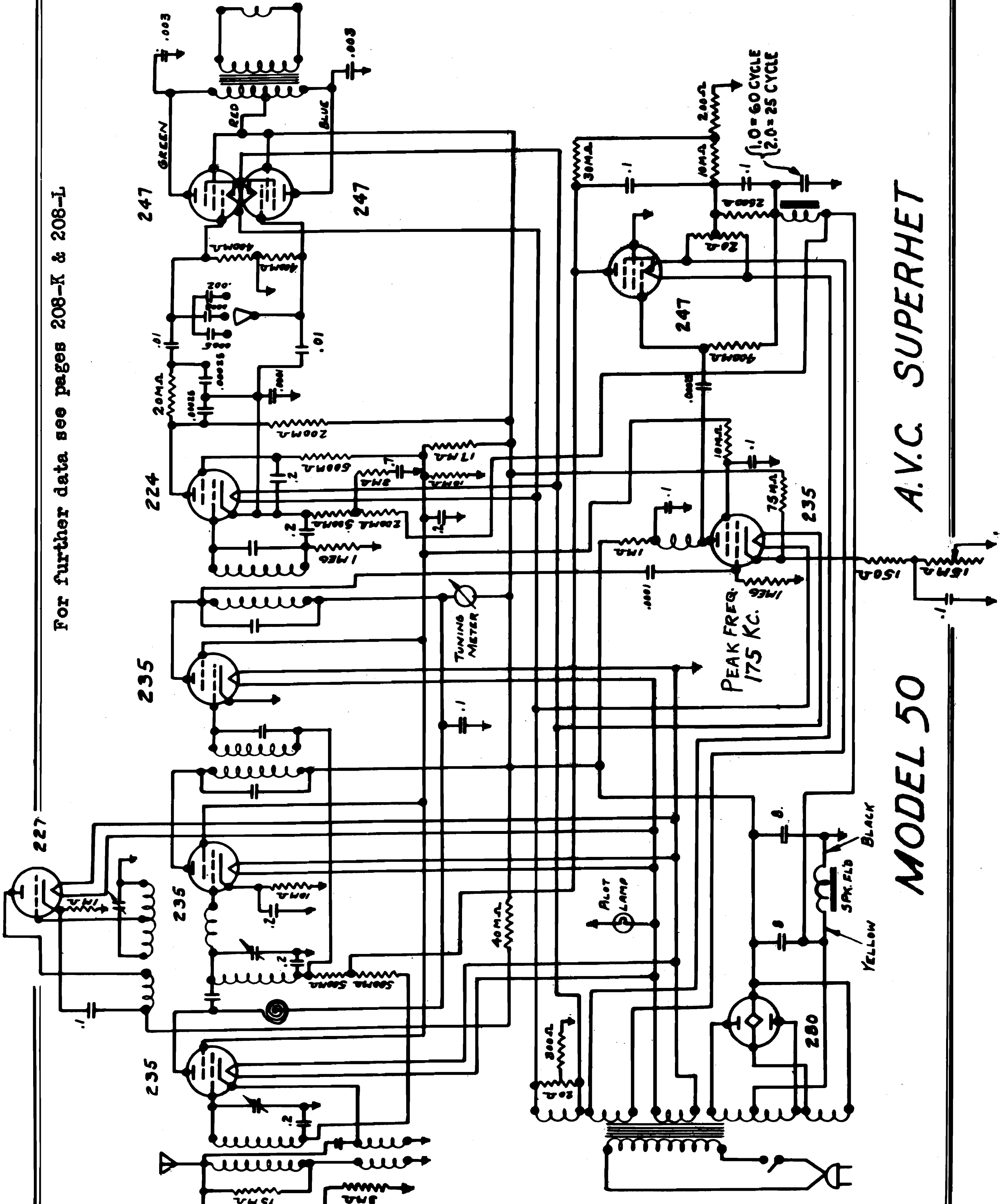
ANTENNA COIL R 6043

MODELS 47 & 48

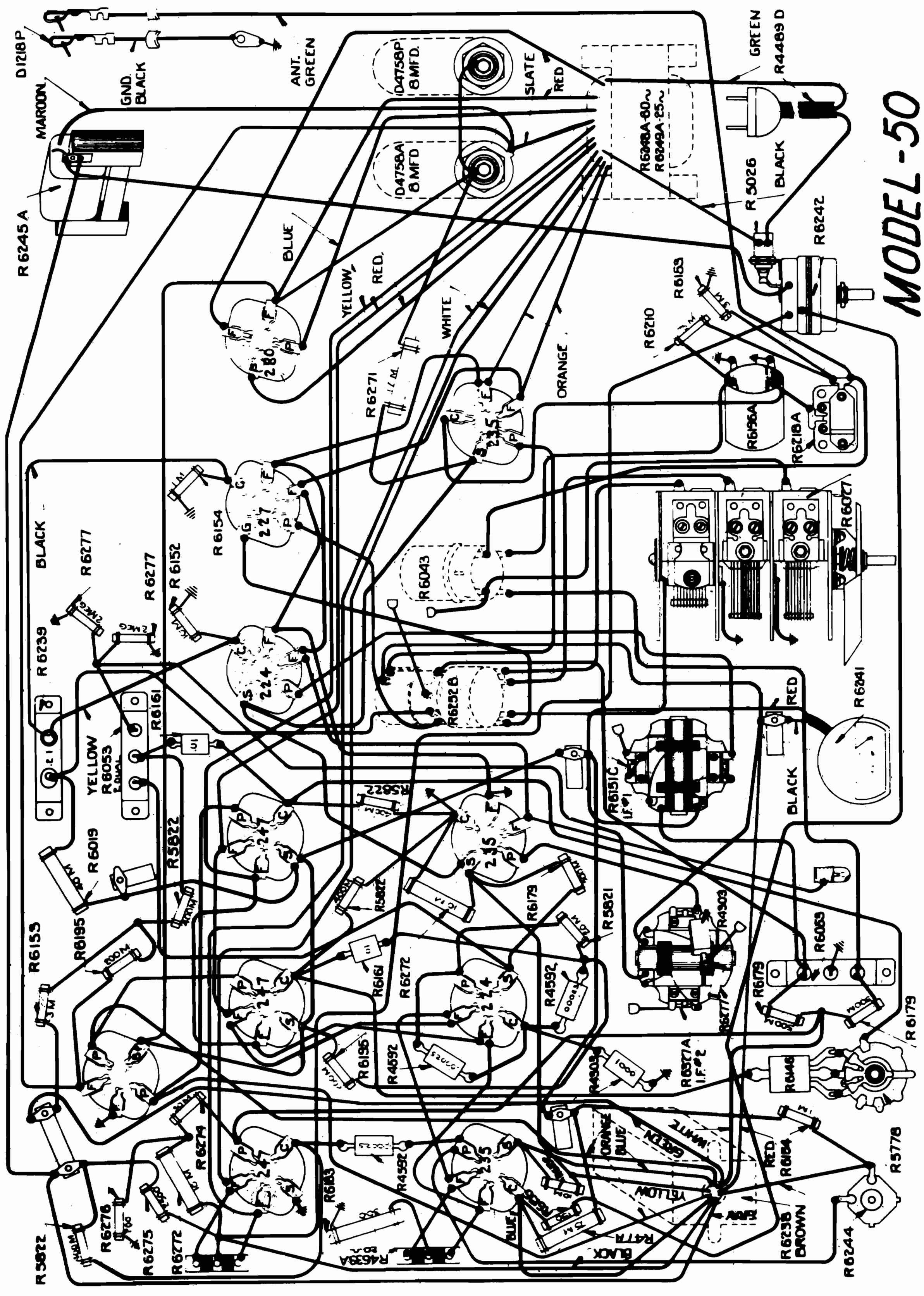
MODELS 47 AND 48

COLONIAL RADIO CORP.

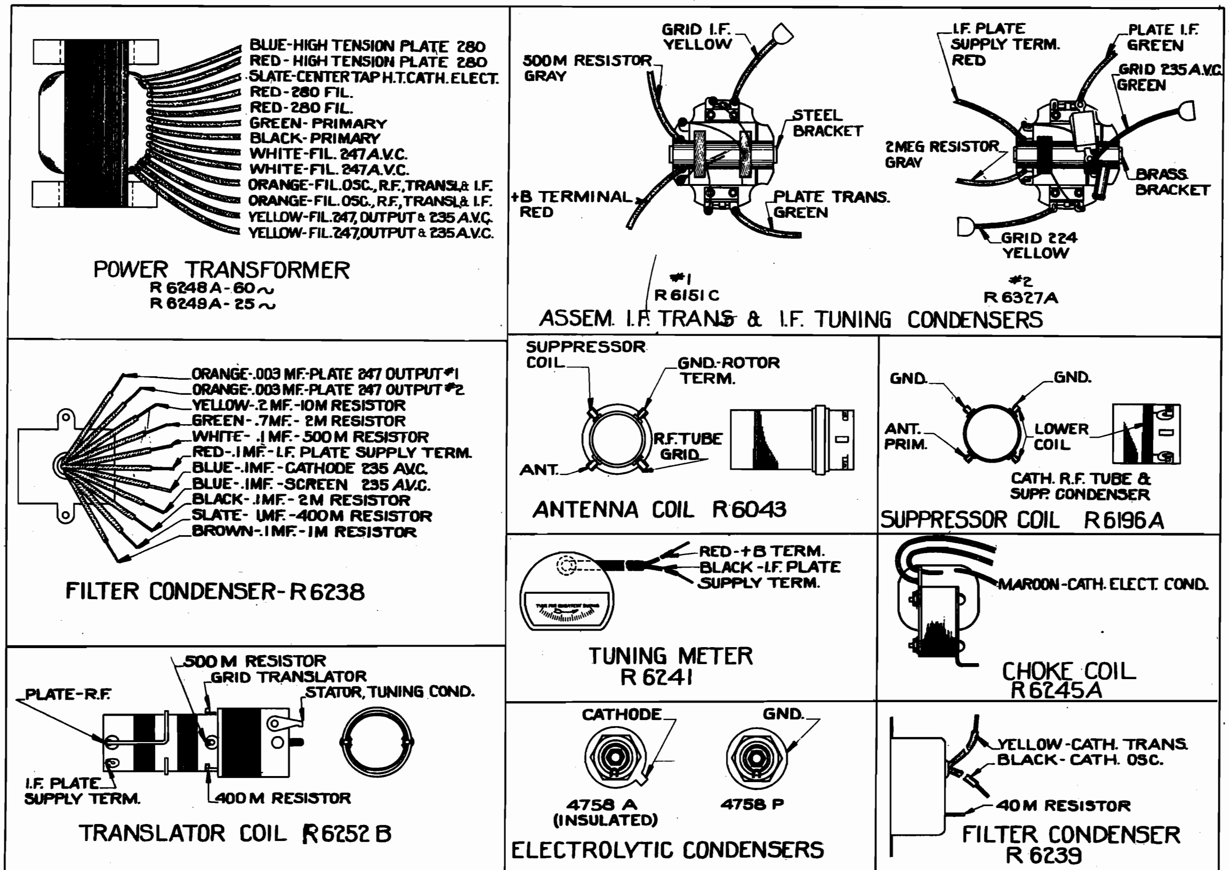
For further data see pages 208-K & 208-L



COLONIAL RADIO CORP.



COLONIAL RADIO CORP.



LEAD DETAILS OF POWER TRANSFORMER-I.F. TRANS.-I.F. TUNING COND.-FILTER COND.-ELECTROLYTIC COND.-ANTENNA, SUPPRESSOR, TRANSLATOR AND CHOKE COILS-TUNING METER.

MODEL 1430 - 60 CYCLE
Line Voltage 115
Total Watts 100

	Trans	Osc.	IF	RF	Det	#1 247 Output	#2 247 Output	AVC Amp 235	AVC 247	280 AC	280 DC
Plate Voltage	230	20	230	230	160	230	230	230		340	340
Screen Voltage	70		70	70	25	230	230	70	100		
Grid Voltage	var		var.	var.	20	15	15	var.	18		
Filament Voltage	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	4.85		

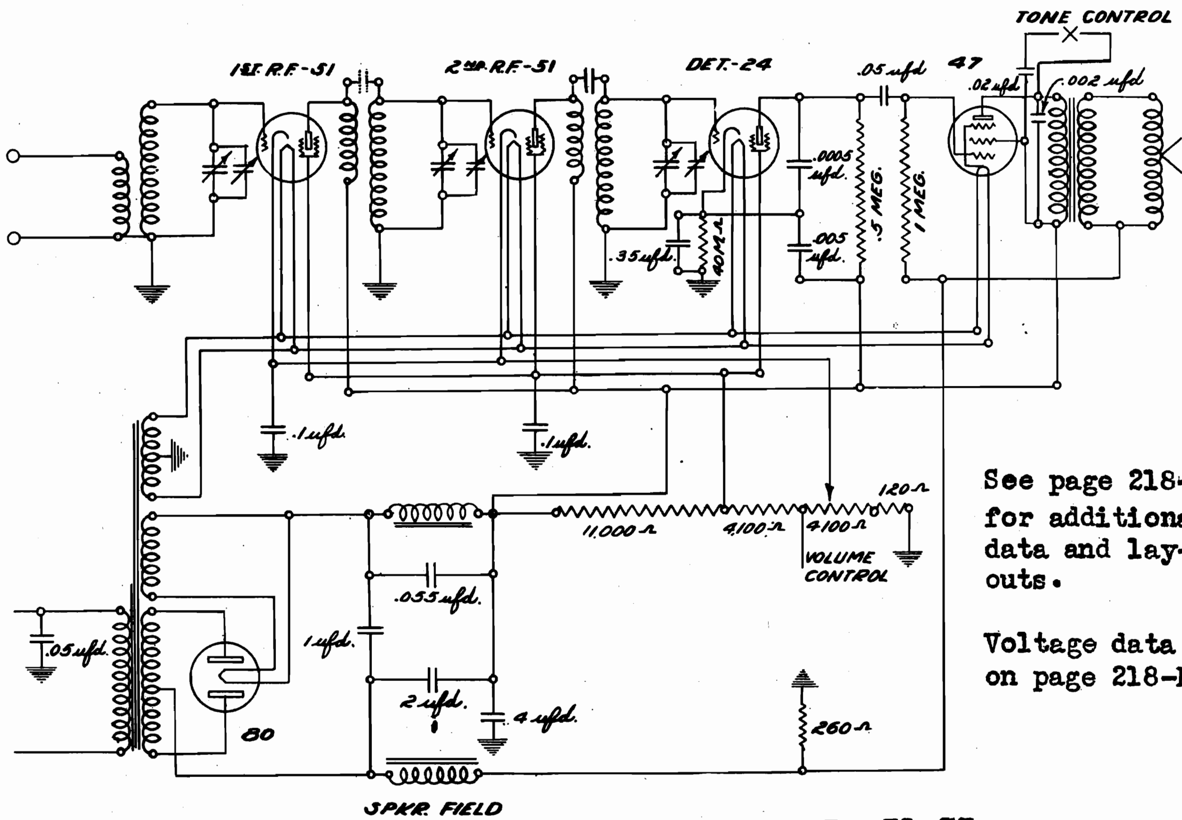
Speaker Field Voltage - 110
Total Plate Current - 80 ma.

Note: All voltages measured with a 1000 ohm per volt meter, 250 volt scale, with volume level control at maximum. 247 output grid voltages were measured from filament to ground, and translator grid from cathode to ground. Grid voltages on the RF and IF will be variable when the set is operating. AVC plate voltages will be the grid voltages on RF IF and translator tubes.

Notes-Causes of no signals can be traced to some of the following reasons. Grid clips shorted to tops of tube shields. Open or shorted condensers. Unsoldered leads. Solder under tube socket terminals. Defective tubes. Oscillator not working. Open image suppressor coil. Defective speaker or shorted tone control connection. Poor quality can be traced to defective output or detector tubes. Set not tuned properly. A poor 235 in the IF, RF or translator sockets will give poor quality and unsatisfactory volume control. Shorted or open grid coupling condenser in the audio circuit, or open resistors in the audio circuits will also contribute to poor quality. Oscillation can be traced to defective tubes, grid leads of detector and IF too close, or an open condenser in the plate circuit of the translator.

MODEL-50

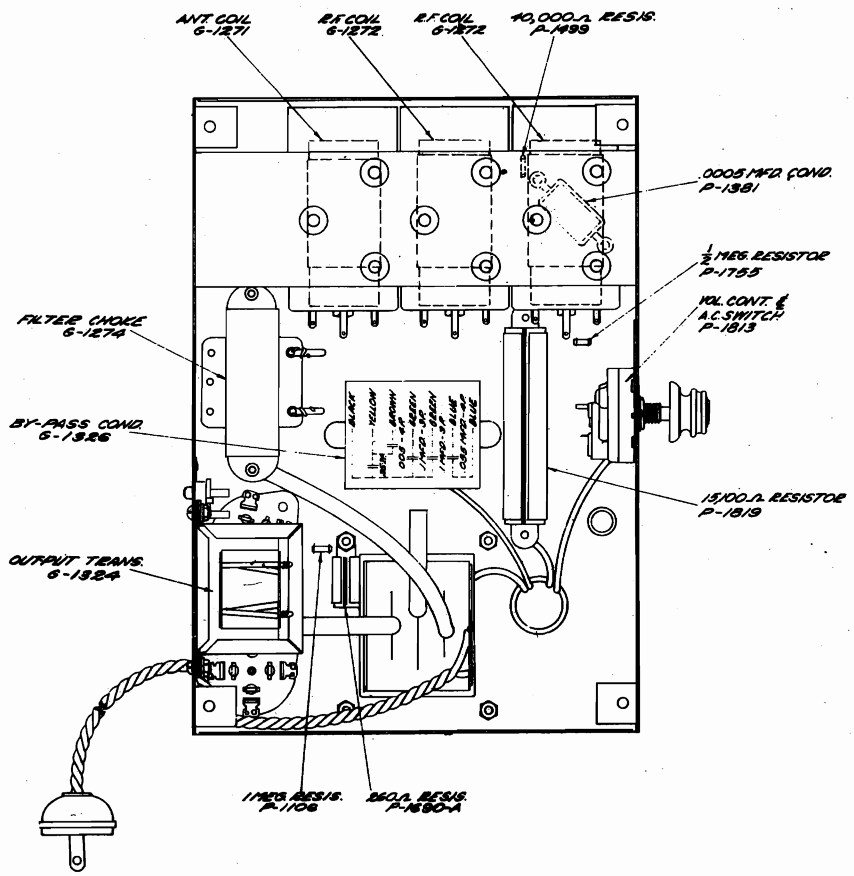
COLUMBIA PHONOGRAPH CO.



See page 218-B for additional data and lay-outs.

Voltage data on page 218-B

MODEL 31-33



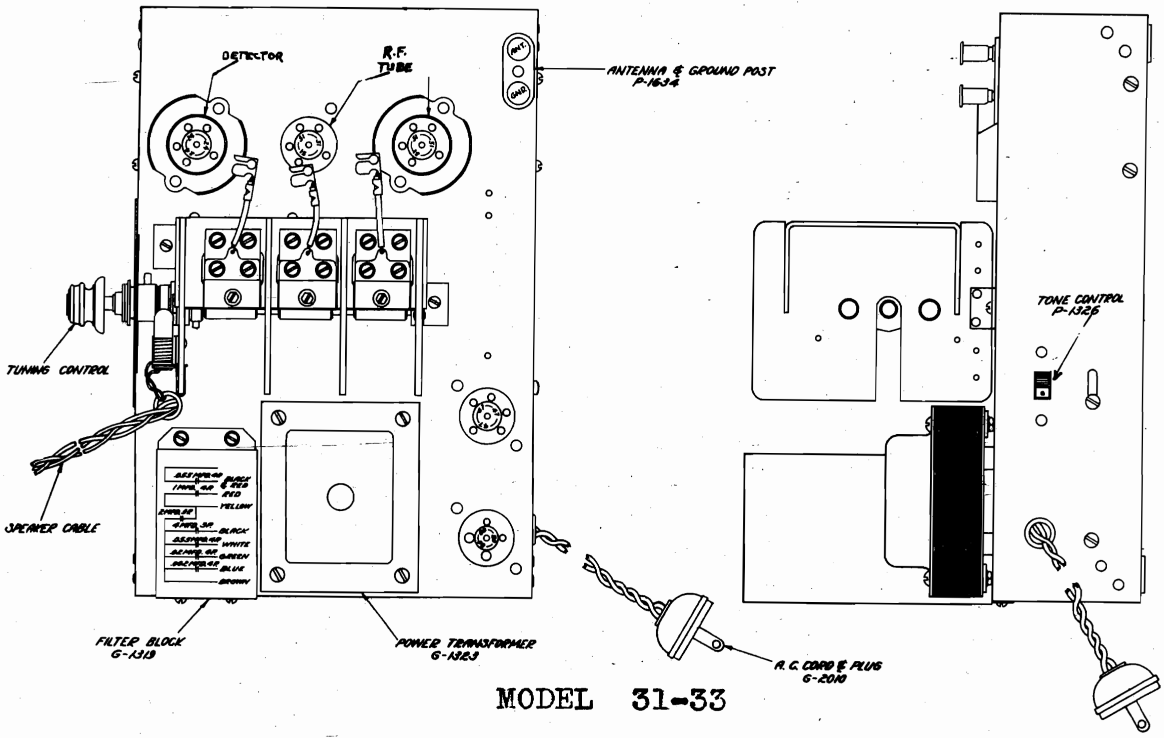
VOLTAGE ANALYSIS

READINGS TAKEN WITH WESTON MODEL 565 ANALYZER

No.	Stage	Type Tube	Fil. Volts	Plate Volts	Cont. Grid Volts	Cath. Volts	S. G. Volts	Ip. Normal
1	1st R. F.	C. L. 51	2.1	225	2.1	2	75	5
2	2nd R. F.	C. L. 51	2.1	230	2.2	2	75	4.5
3	Det.	C. L. 24	2.1	160*	7	7.5	75	.02
4	Output	C. L. 47	2.1	215	5*	0	225	26.5
5	Rect.	C. L. 80	4.8	280				†30

*Reading dependent upon resistance of meter.
†Reading taken for one anode only: 60 milliamperes would be about correct.
Volume control position full. Line voltage 115—60 cycle.

COLUMBIA PHONOGRAPH CO.



MODEL 31-33

MODEL 40 CONTINUITY TEST TABLES

(Using 10-volt scale 1,000 ohms per volt: meter on Weston 565 with 6-volt battery)

Circuit Tested	From	To	Reading	Your Reading
Ant. coil pri.	Ant. post	Ground	6.	
Ant. coil sec.	Grid 1st tube	Ground	6.	
1st R. F. Plate ckt.	Plate of tube	Brown lead of filter pack	6.	
1st R. F. Screen ckt.	Screen prong	Center lead Voltage divider	6.	
1st R. F. Cathode ckt.	Cath. prong	Center tap Volume Control "ON"	6.	
2nd R. F. Grid ckt.	Grid Clip	Ground	6.	
2nd R. F. Plate ckt.	Plate prong	Brown lead of filter pack	6.	
2nd R. F. Screen ckt.	Screen prong	Center tap Voltage divider	6.	
2nd R. F. Cathode ckt.	Cathode prong	Center tap Volume Control "ON"	6.	
Det. Grid ckt.	Gird Clip	Ground	6.	
Det. Plate ckt.	Plate prong	Brown lead of filter pack	6.	
Det. Screen ckt.	Screen prong	Center Voltage divider	6.	
Det. Cathode ckt.	Cathode prong	Ground	1.4	
P. Z. cont. grid	Grid prong	Sec output trans. black lead	(slight deflection)	
P. Z. space chg. grid ckt.	S. C. Grid Prong	Brown lead of filter pack	6.	
P. Z. Plate ckt.	Plate prong	Brown lead of filter pack	5.7	
Output Sec.	One side	Other side	5.9	
Pri Power Trans.	Across A. C. Plug	Switch on	5.9	
Hi volts Sec.	Across 280 plate prongs		5.6	
Speaker field	Red wire	Green Wire	5.4	
Speaker voice coil	Green wire	Black	6.	
Filter Choke	Across red leads.		5.6	
Voltage divider	Ground	Brown lead of filter pack	2.2	

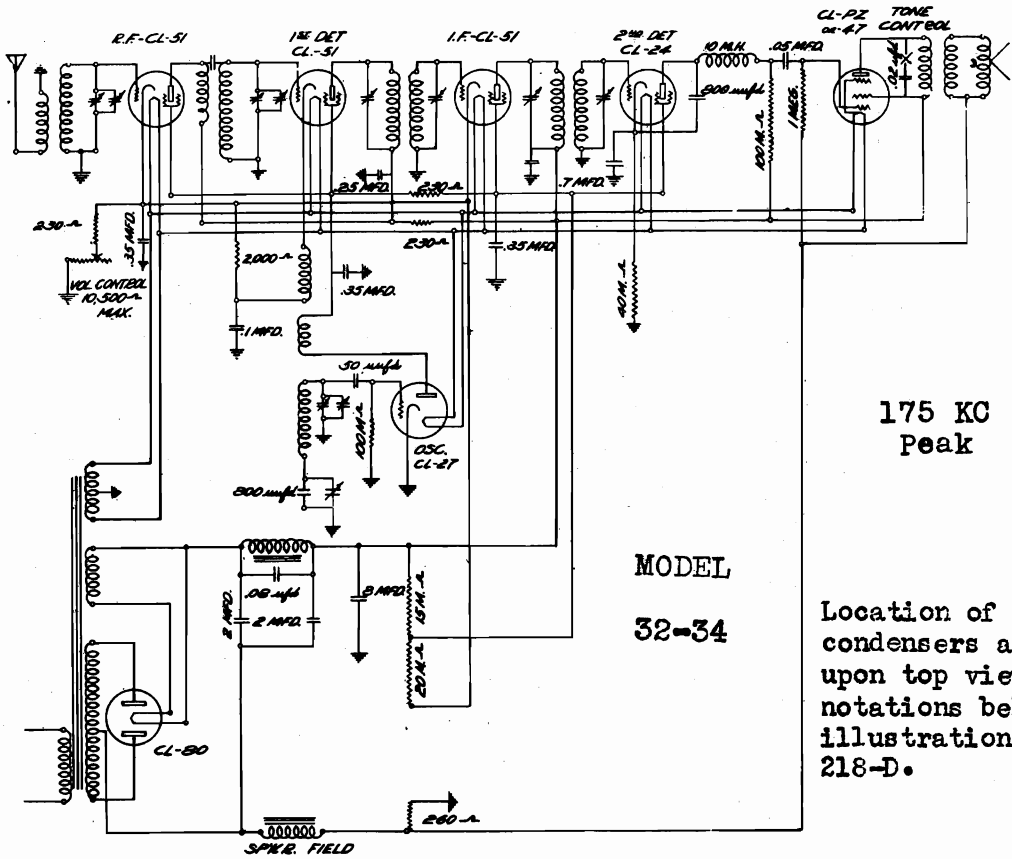
RESISTANCE TABLE MODEL 40

(Using 10-volt range meter 1,000 ohms per volt and 6-volt battery)

Item	Color Code*	From	To	Reading	Your Reading	Resistance in Ohms
Det. Cath. Resistor	Yel., Blk., Or.	Det. Cath.	Gnd.	1.3		40,000
Pent. Grid Resistor	Br. Blk, Green	Pent Grid	Spkr. Field	Slight Deflection		1,000,000
Wire Wound	Black	VoiceCoil.Black	Gnd.	5.9		260
Voltage Divider, Short End	Black	Volume Cont. Green Lead	S. G. Ckt.	4.2		4,100
Voltage Divider, Long End	Black	Plate	S. G. Ckt.	3.		11,000
Det. Plate Resistor	Gr., Blk., Yellow	Det. Plate	Pent. Space Chg. Grid.	.1		500,000
Vol. Control "on"		Gnd.	R. F. Cathode	4.2		4,100

*Color code: read body color first, tip second and dot last.

COLUMBIA PHONOGRAPH CO.



175 KC
Peak

MODEL

32-34

Location of trimmer condensers are shown upon top view with notations below this illustration. See 218-D.

For Top and Bottom views of this receiver see page 218-D.

RESISTANCE TABLE—

(Using 10 volt range meter 1000 ohms per volt and 6 volt battery)

Item Tested	Description Color—Code	From	To	Reads	Your Reading	Ohms Resistance
r. f.-grid. bias resist.	Black Strap type Wire wound	r. f. cath. prong	Vol. cont ungrounded terminal	5.9		230
Volume control	Variable at max. resistance	Test between its two terminals (con nected)		3.2		Max. 10.500
1st det. grid bias resist.	Red Black tip	r. f. cath. prong	Other end of resist.	5.1		2,000
1st det. screen grid volts resist.	Black Strap type Wire wound	1st det. screen grid prong	Other end of resist.	5.9		230
1st det. plate resist.	Black Strap type Wire wound	Solder lug on Electrolytic cond.	B plus term. of 1st i. f. trans.	5.9		230
Oscillator grid-resist.	Brown Yellow spot Black tip	Oscillator grid prong	Ground	0.6		43,000
I. f. and r. f. cathode-bias resist.	Red Orange spot Black tip	I. f. cath. prong	I. f.-screen grid prong	2.3		20,000
I. f. and det. screen grid volts resist.	Brown Orange spot Green tip	I. f. screen grid prong	Solder lug on electrolytic cond.	2.7		15,000
2nd det. grid-bias resist.	Yellow Orange spot Black tip	2nd det. cath. prong	Ground	1.3		40,000
2nd det. plate resist.	Inside- 3rd term. det. r. f. filter assem.	Test between solder lugs on det. r. f.-filter assem. with red wires attached		0.6		100,000 in series with 10m.h. choke
Pentode grid-resist.	Brown Green spot Black tip	Pentode Grid prong	Dummy solder lug off output trans. sec.	0.5		1 Meg.
Pentode grid-bias	Wire wound Strap type	Dummy solder lug off-output trans. sec.	Ground	5.9		260

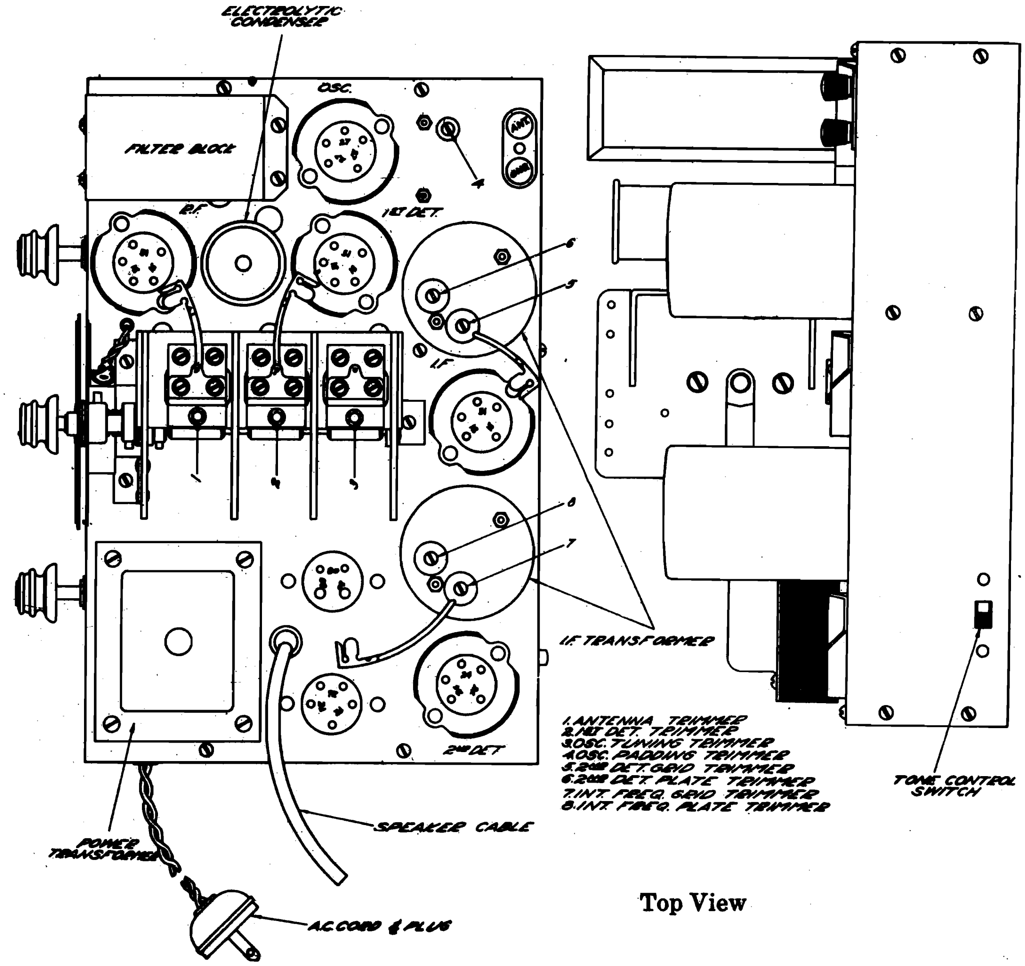
READINGS TAKEN WITH WESTON MODEL 565 ANALYSER

No.	Stage	Type Tube	A Volts	B Volts	Cont. Grid Volts	Cath. Volts	Ip' Norm.	SG Volts
1	r. f.	CL-51	2.2	233	3.	3.	5.	66
2	1st Det.	CL-51	2.2	233	7.	7.	2.3	73
3	Osc.	CL-27	2.2	80	0	0	4.	0
4	I.F.	CL-51	2.2	233	3	3	5.	77
5	2nd det.	CL-24	2.2	162	6.2	7.2	.5	73
6	Output	CL-PZ	2.2	228	15.	0	27.	233
7	Rect	CL-80	4.8	300	0	0	50.	0

Line Voltage 115
Volume control position full

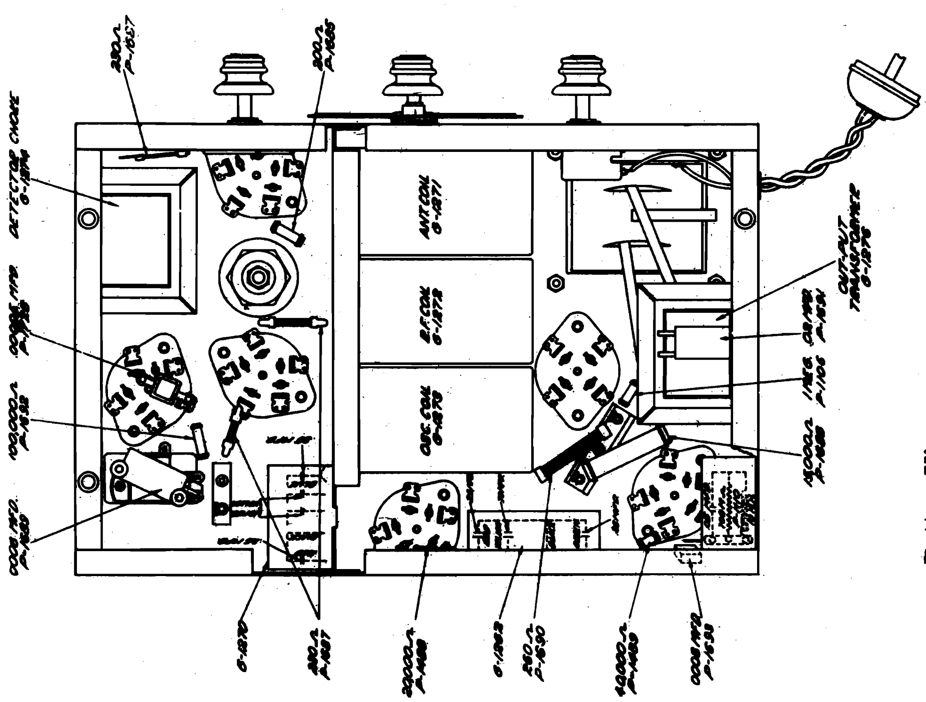
Note: Since resistance tolerances in the sets are plus or minus 10%, and tubes may vary over 20%, your readings may disagree with the above by plus or minus 30%. CL-PZ is also known as CL-47, the latter being the final type number.

COLUMBIA PHONOGRAPH CO.



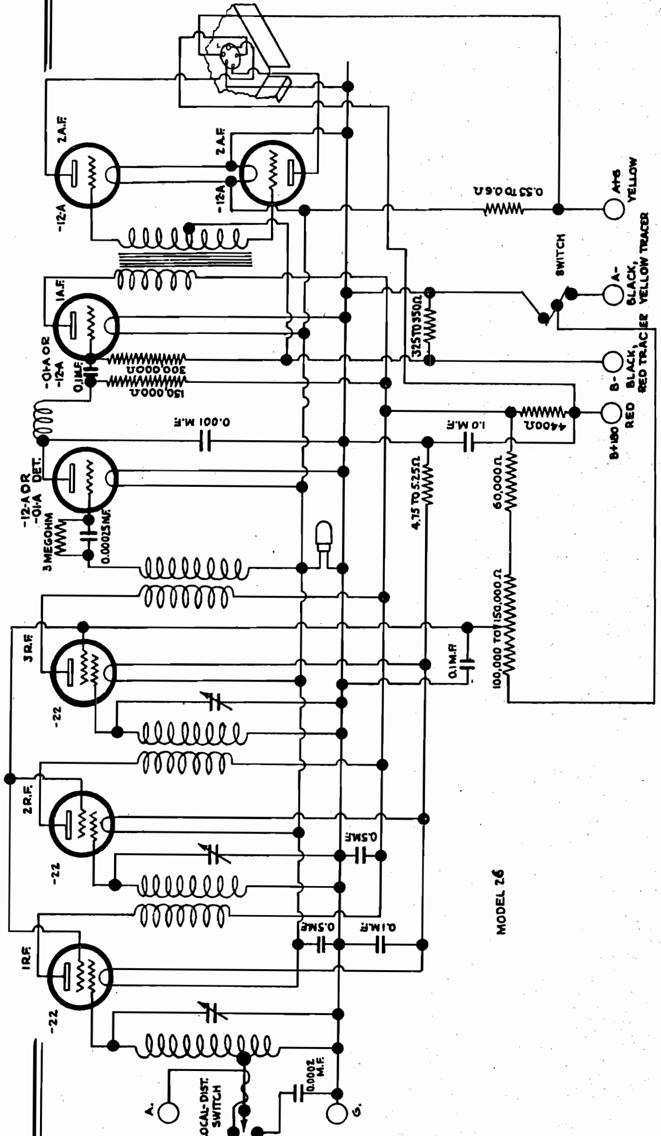
Top View

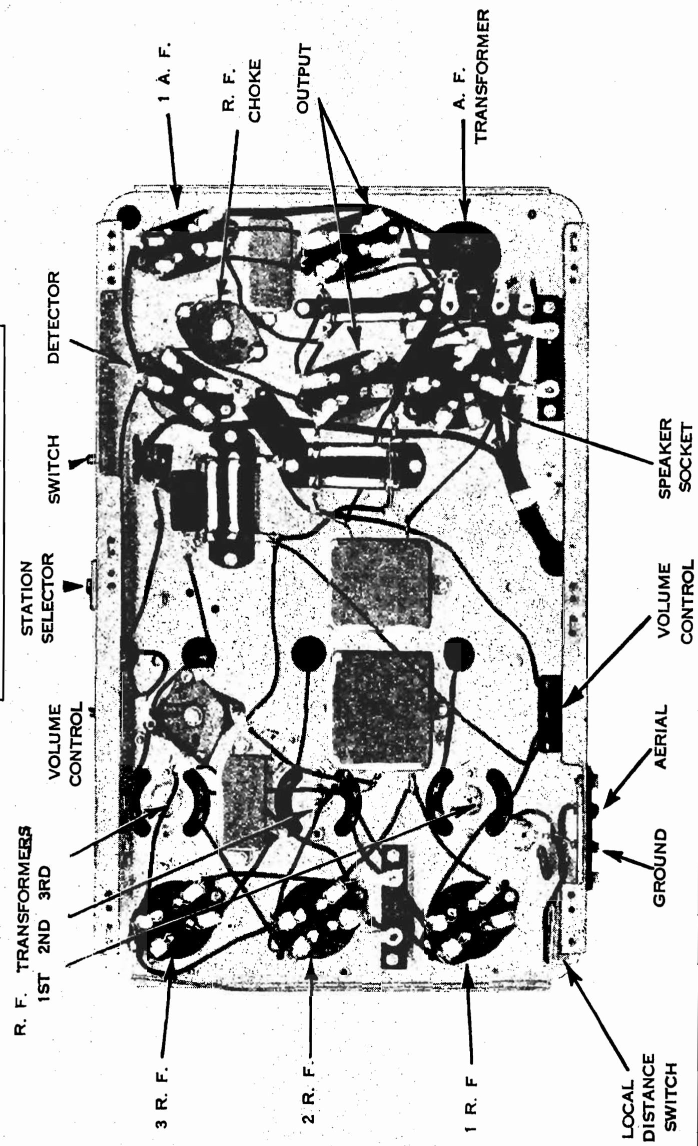
MODEL 32-34



Bottom View

CROSLEY RADIO CORP.





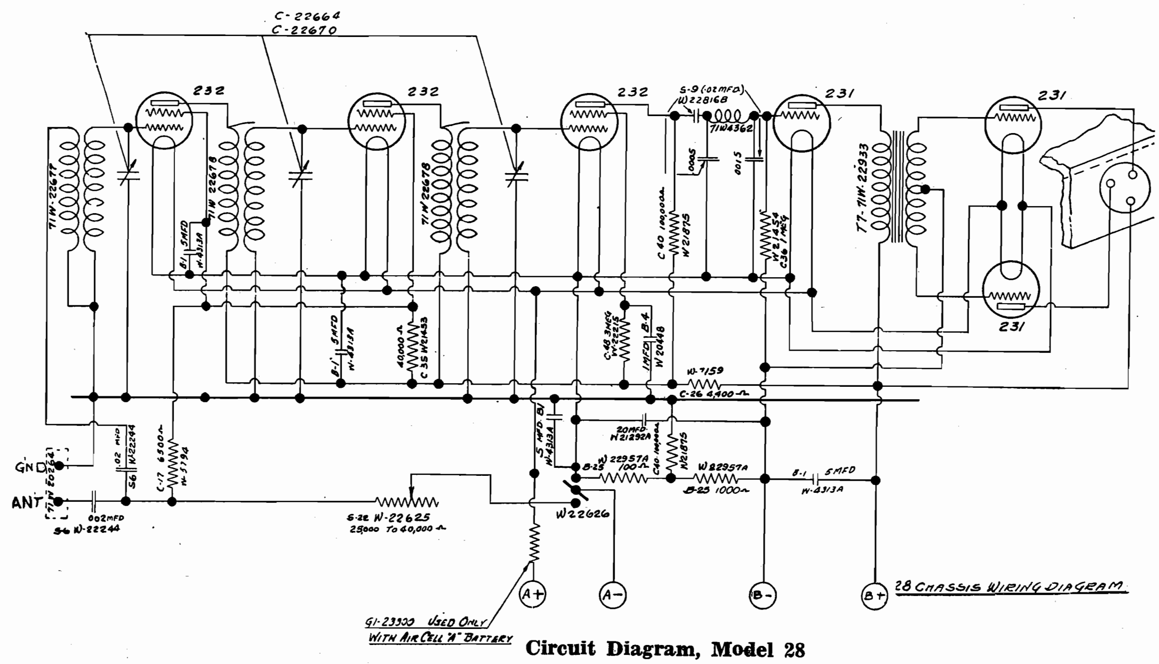
Qty.	Part No.	Description
1	W-4968	.5 Mfd. Fixed Condenser (2 paper)
1	W-6614	R. F. Choke
1	W-7753	.1 - .5 - .1 Mfd. Fixed Cond.
1	W-4013	1. Mfd. Fixed Condenser
1	W-20829	Mounting Strip
1	W-4924	.00025 Mfd. Fixed Condenser
1	W-5468	3 Meg. (Grid Leak) Resistor
1	W-4923	60000 Ohm Resistor (Blue, Orange Spot)
1	W-6754	.001 Mfd. Fixed Condenser
1	W-20829	Mounting Strip
1	W-7159	4400 Ohm Resistor (Yellow, Red Spot)
1	W-5735	150000 Ohm Resistor (Brown, Green, Yellow Spot)
1	W-4362	Plate Choke
1	W-6471	.1 Mfd. Fixed Condenser (2 paper)
1	W-5713	Mounting Strip
1	W-6704	300000 Ohm Resistor, (Brown, Blk., Yellow Spot)
1	W-20090	.55 to .6 Ohm Resistor
1	W-20100	350 Ohm Resistor

Filament Voltages	
R. F. tubes	2.4 to 2.7
Detector, 1st Audio, and Output tubes	4.3 to 4.8
Plate Voltages	
R. F. and 1st Audio tubes	120 to 130
Detector tube	110 to 120
Output tubes	150 to 160
Control Grid Voltages	
R. F. tubes	1.6 to 2.0
Detector tube	4.3 to 4.6
1st Audio and Output Tubes	4.3 to 4.6
Screen Grid Voltages	
R. F. tubes	48 to 55

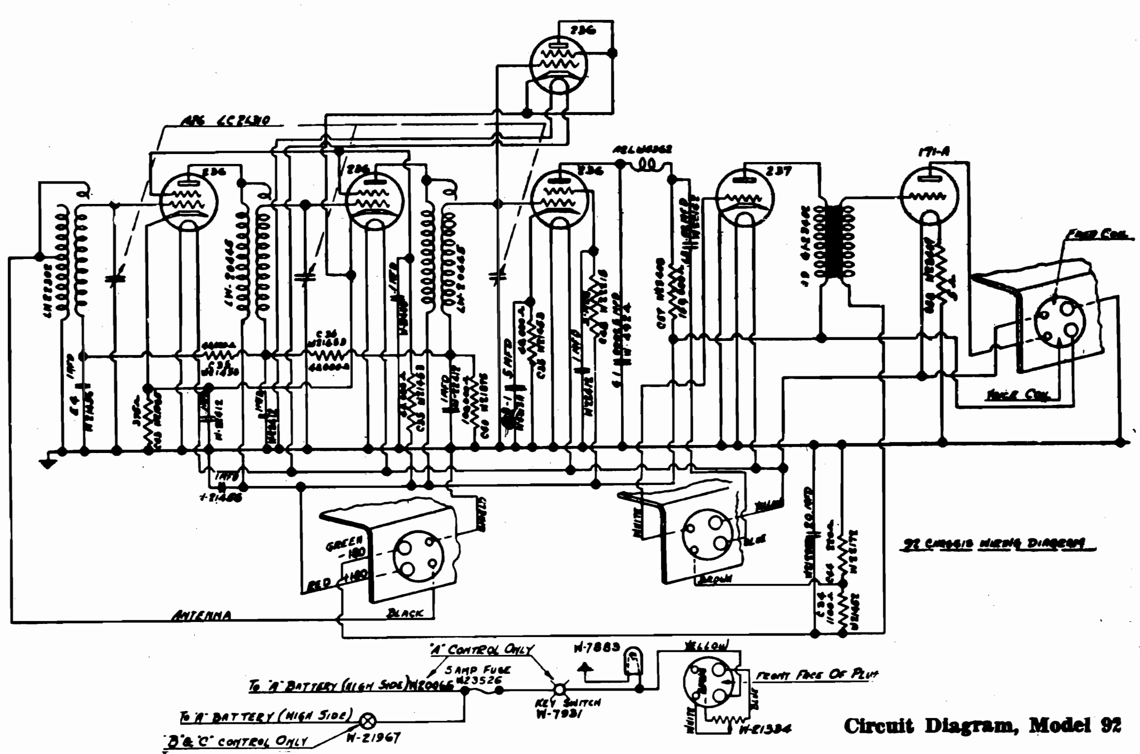
The above voltages are to be measured with the speaker connected

Model 26

CROSLEY RADIO CORP.



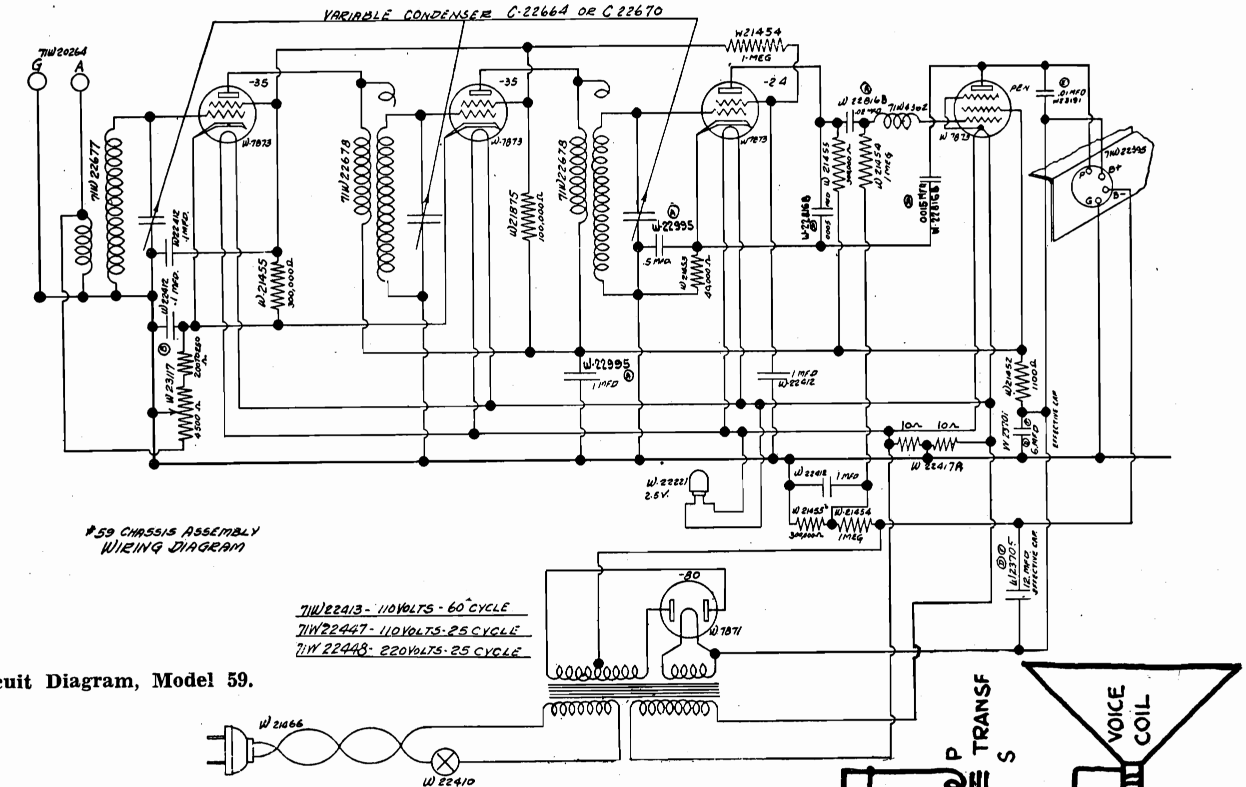
Circuit Diagram, Model 28



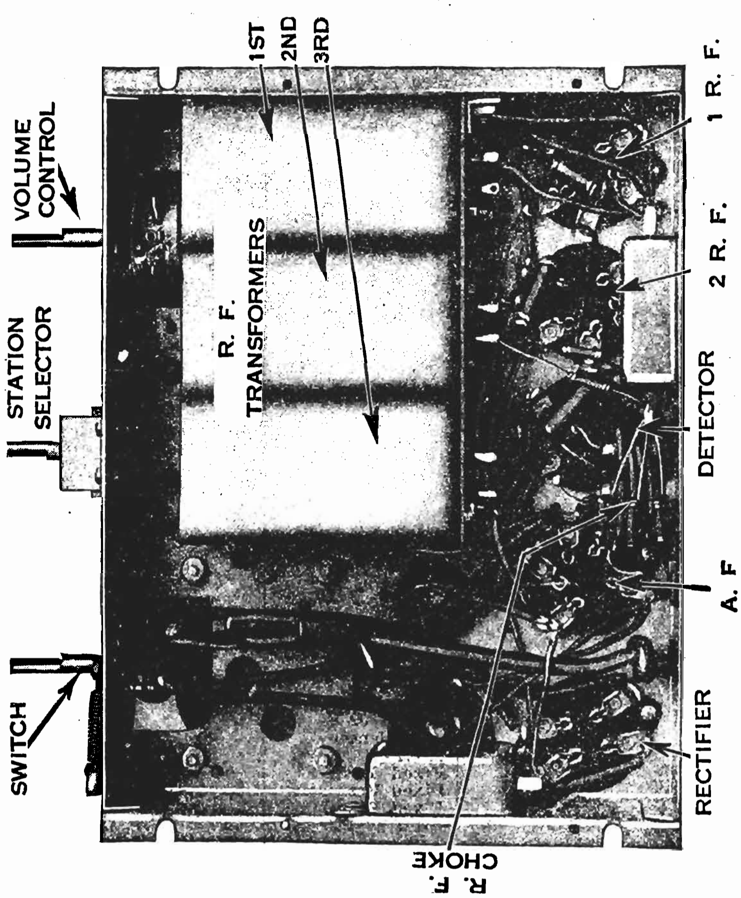
Circuit Diagram, Model 92

CROSLEY RADIO CORP.

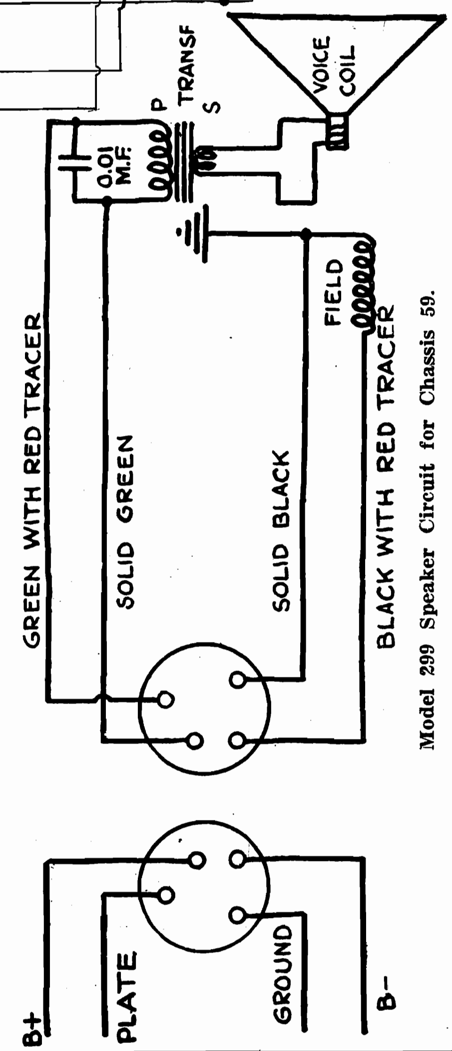
MODEL 59 AC



Circuit Diagram, Model 59.



Bottom View Model 59.



Model 299 Speaker Circuit for Chassis 59.

CROSLEY RADIO CORP.

MODEL 59 AC

Voltage Limits

Filament Voltages	
All tubes but rectifier	2.3 to 2.4
Rectifier tube	4.5 to 4.9
Plate Voltages	
R. F. Amplifiers	240 to 280
Detector	160 to 190
Output	230 to 270
Rectifier (A. C. voltage)	290 to 330 each plate
Screen Grid Voltages	
R. F. Amplifiers	55 to 65
Detector	125 to 155
Control Grid Voltages	
R. F. Amplifiers	2.5 to 3.5
Detector	11.0 to 13.0
Output tube	50 to 54

To be measured with speaker connected, volume control on full, and line voltage of 117½ (235 for 220 volt receivers). Measure plate and grid voltages with a high-resistance D. C. voltmeter (600 ohms or more per volt) from plate or grid tube contact to emitter contact. Use a low range A. C. meter for filament voltages.

Specifications

Model 59 is a compact, tuned radio-frequency receiver for operation from 110 volt and 220 volt A. C. house-lighting circuits. It is supplied in several cabinet styles in conjunction with Model 299 dynamic speaker.

The ends of the high-voltage secondary are connected to the plates of the rectifier tube, and the middle tap on it is connected to the negative side of the loudspeaker field ("B-"), and through one megohm and 300,000 ohm resistors to ground. The other side of the speaker field ("G") is connected to ground (chassis).

The positive plate supply circuit originates at the rectifier filament. One branch goes to the "B+" speaker terminal, whence it continues through the primary of the speaker output transformer to speaker terminal "P", and thence to the plate of the pentode tube.

A second branch of the B+ circuit goes through a 1100 ohm resistor to the screen grid of the pentode tube, and to the plates and screen grids of the other tubes. It is connected through a 300,000 ohm detector plate coupling resistor to the plate of the detector tube, through the primaries of the second and third radio-frequency transformers to the plates of the r. f. tubes, through a 100,000 ohm resistor to the screen grids of the r. f. tubes, a branch of the circuit returning to the r. f. cathodes through a 300,000 ohm resistor and through an additional resistor of 3 megohms to the screen grid of the detector tube.

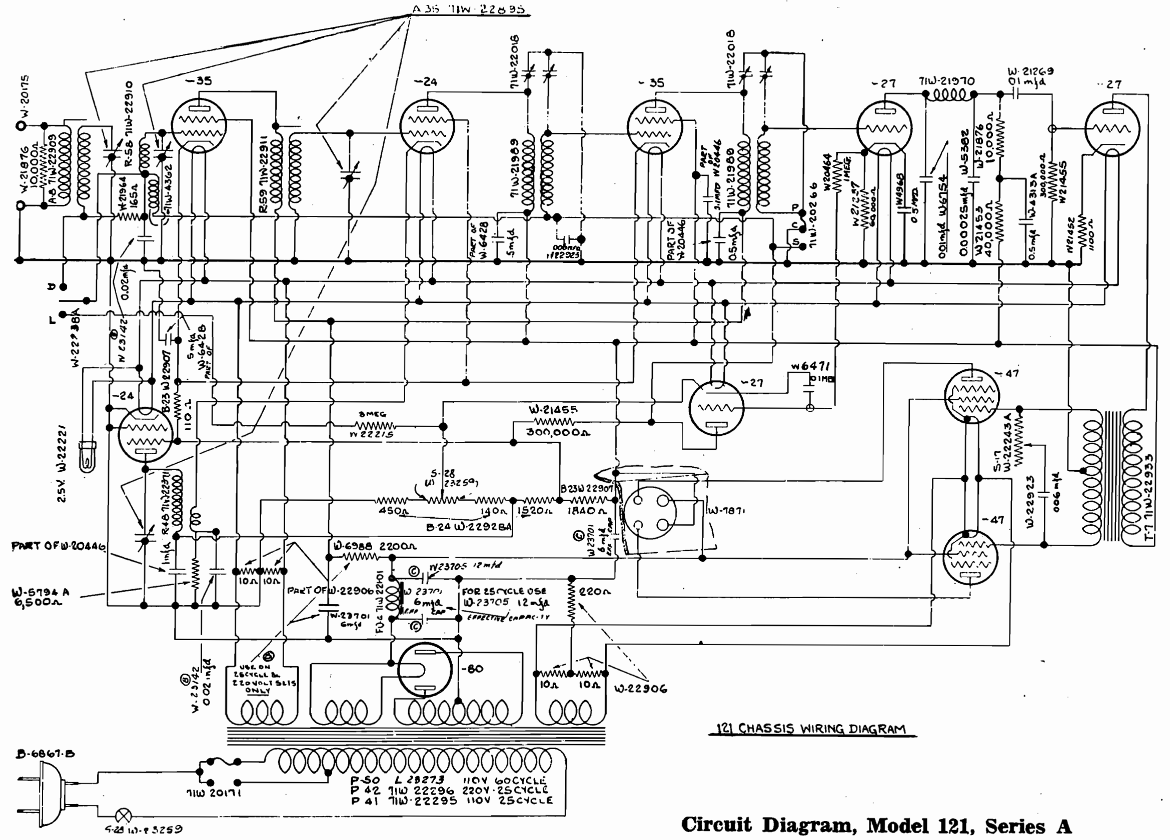
The speaker field coil, in connection with two filter condensers—one (effective capacity 6 m. f.) of which is shunted across the speaker field and the other (effective capacity 12 m. f.) of which is connected from B+ to ground—acts as a filter circuit, eliminating hum.

Biasing of the r. f. tubes is accomplished by the volume control resistor. Adjustment of the volume control simultaneously varies the bias of the r. f. tubes and the value of a resistor shunted across the primary of the antenna coil. A 40,000 ohm biasing resistor is used in the detector emitter circuit. Biasing of the audio tube is accomplished by returning the audio grid to the negative side of the 300,000 ohm resistor in the B- circuit, connected to chassis.

Qty.	Part No.	Description	List Price
1	D-22669A	Chassis	$ .75
4	W-7873	Socket (5 Prong)	.30
1	W-7871	Socket (4 Prong)	.25
1	W-21297	Socket Guide (280)	.10
1	W-22818	Socket Guide (Pen.)	.10
1	W-22819	Socket Guide (224)	.10
2	W-22820	Socket Guide (235)	.10
1	W-22413	Power Trans. 110 V. 60 Cy.	6.00
	W-22666	Power Trans. 110 V. 25 Cy.	6.25
	W-22667	Power Trans. 220 V. 25 Cy.	6.25
1	W-21459	Mershon Condenser 8 Mfd.	2.50
1	W-21485	Mershon Condenser Socket	.25
1	W-22689A	Mershon Condenser 12 Mfd.	3.50
1	W-23147	Insulating Washer	.05
1	W-22664	Tuning Condenser Gang	7.00
3	W-21973	Grid Connectors	.25
		CONDENSER DRIVE	
1	W-22685	Pulley	.25
1	W-22334	Drive Cord (39")	.25
1	W-22682	Idler Bracket Assem. (top)	.15
1	W-22683	Idler Br. Assem (lower)	.15
1	W-22460A	Drive Pulley Bracket	.10
1	W-22827	Drive Shaft	.30
1	W-22463	Stop Washer	.05
1	W-22828	Stop Washer	.05
1	W-22681	Idler Bracket Assem. (Ten.)	.15
1	W-22684	Spacer	.05
1	W-22464B	Spring	.05
1	W-22679	Dial Strip	.15

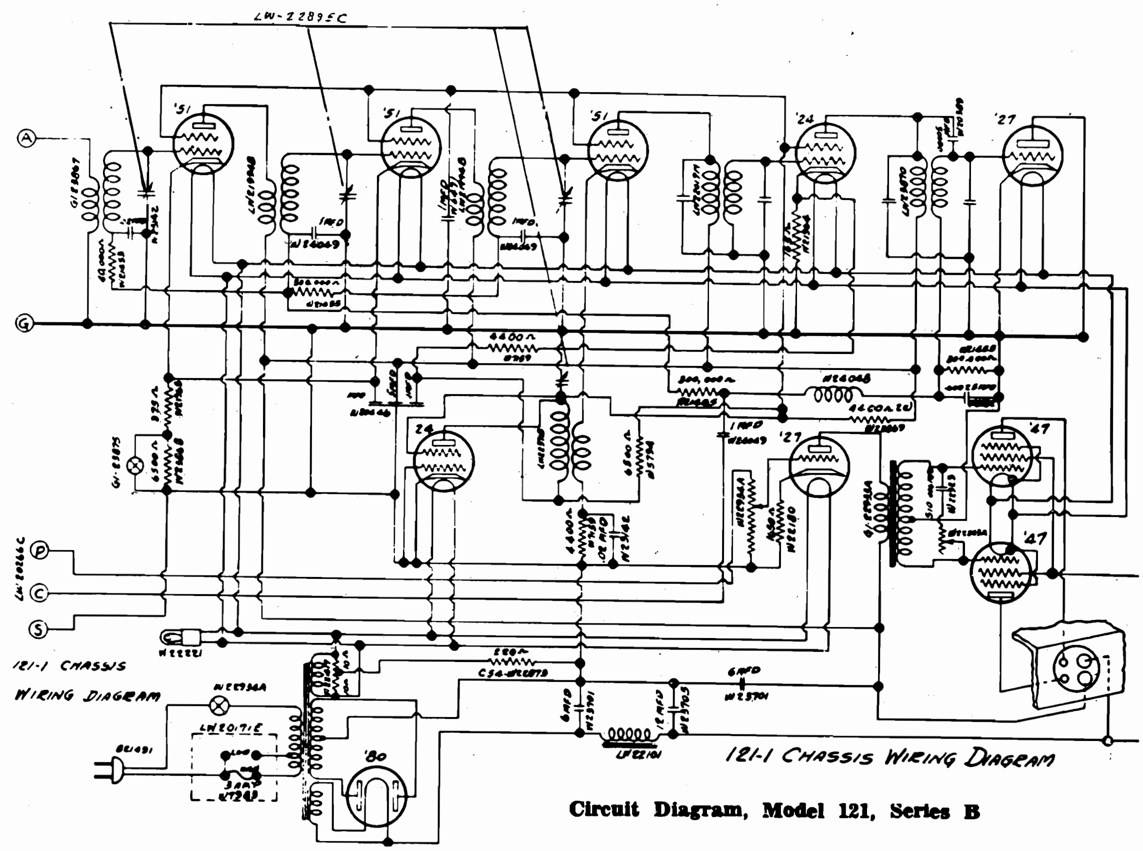
Qty.	Part No.	Description	List Price
1	W-22329	Dial Light Bracket Assembly Less Lamp	.25
1	W-22410	Switch	.75
1	W-23117	Volume Control	1.25
1	B-22929	Tube Shield Assembly	.25
		PARTS UNDER CHASSIS	
1	W-22995	.5 - .1 Mfd. Fixed Condenser	1.00
1	W-22677	R. F. Transformer (ant)	1.50
2	W-22678	R. F. Transformer (Int.)	1.50
3	W-7558A	R. F. Coil Shields	.20
1	W-22663	Mounting Plate	.30
1	W-21452	Flexible Resistor 1100 Ohms	.25
1	W-23191	.01 Mfd. Fixed Condenser	.25
1	W-21453	Fixed Resistance 40000 Ohms	.30
2	W-21454	Fixed Resistance 1 Megohm	.30
1	W-21455	Fixed Resist. 300000 Ohms	.30
1	W-4362	R. F. Plate Choke	.50
1	W-22417	Potentiometer 10-10 Ohms	.15
1	W-22816B	.0015 - .02 - .0005 Mfd. Fixed Condenser	.75
1	W-22412	.1 - .1 - .1 - .1 Mfd. Fix. Con.	.75
1	W-21454	Fixed Resistance 1 Megohm	.30
1	W-21455	Fixed Resist. 300000 Ohms	.30
1	W-21875	Fixed Resist. 100000 Ohms	.30
1	W-21455	Fixed Resist. 300000 Ohms	.30
1	W-22395	Speaker Socket	.25
1	W-22397	Insulator	.05
1	W-20264	Terminal A & G	.30
1	W-21466A	Cable & Plug	.50

CROSLEY RADIO CORP.



Circuit Diagram, Model 121, Series A

PEAK FREQUENCY = 175 K.C.

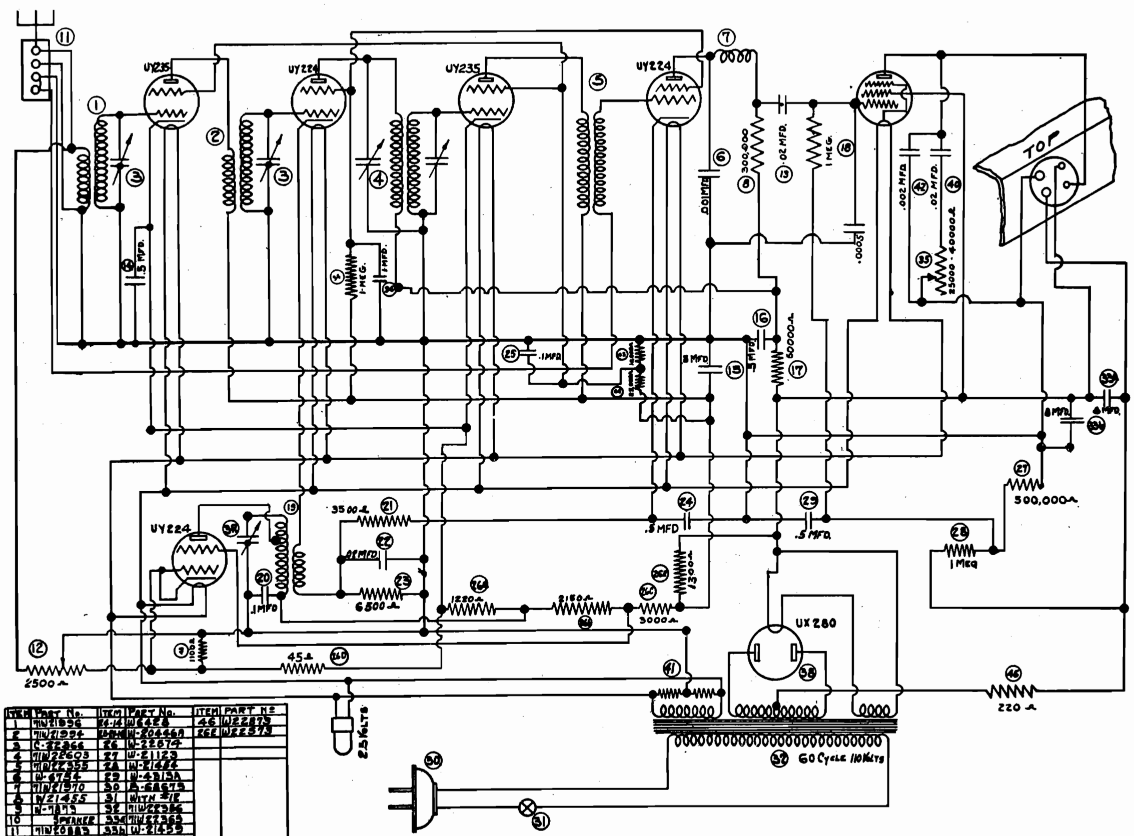


Circuit Diagram, Model 121, Series B

CROSLEY RADIO CORP.

Model 122

PEAK FREQUENCY—175 KC



ITEM	PART No.	ITEM	PART No.	ITEM	PART No.
1	71W21996	24-14	W6428	46	W22873
2	71W21994	[illegible]	W-20446A	26E	W22573
3	C-22366	26	W-22674		
4	71W22603	27	W-21123		
5	71W22355	28	W-21484		
6	W-6754	29	W-4313A		
7	71W21970	30	A-68673		
8	W21455	31	WITH #18		
9	W-7873	32	71W22366		
10	SPEAKER	33a	71W22365		
11	71W20883	33b	W-21459		
12	W-22597	34	W21454		
13	W 6434	35	W-22823		
14-24	W-6428	36	W20188		
15	W-4910	37	W7873		
[illegible]	W-20446A	38	W-7871		
17	W-21237	39			
18	W 21454	40	W-22244		
19	71W22371	41	W-22364		
[illegible]	W20446A	42	W22244		
21	W-5705	43	W22196		
22	W-6434	44	W4923		
23	W-6754	45	W21452		

Circuit Diagram Model 122

(MIDGET)

NOTE: Item 43 in above parts list should be No. W21876, item 44 should be No. W5370, and item 26 E should be W22996

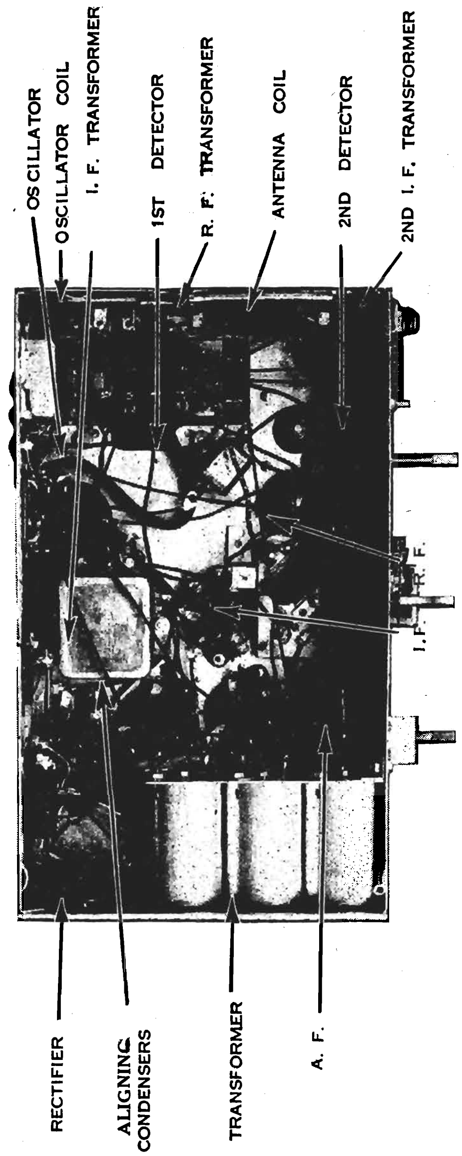
Voltage Limits

Filament Voltages	
All tubes but rectifier	2.3 to 2.5
Rectifier tube	4.6 to 5.0
Plate Voltages	
1st R. F. and Intermediate Amplifiers	170 to 200
Oscillator	28 to 38
1st Detector and 2nd Detector	185 to 215
Output	260 to 300
Rectifier (A. C. voltage)	280 to 320 each plate
Screen Grid Voltages	
1st R. F. and Intermediate Amplifiers	45 to 55
1st Detector and 2nd Detector	60 to 80
Oscillator	80 to 100
Output	260 to 300
Control Grid Voltages	
1st R. F. and Intermediate Amplifiers	1.5 to 2.5
1st Detector	6.0 to 8.0
2nd Detector	8.0 to 10.0
Output tube	18.0 to 22.0

To be measured with speaker connected, volume control on full, and line voltage of 117½ (235 for 220 volt receivers). Measure plate and grid voltages with a high-resistance D. C. voltmeter (600 ohms or more per volt) from plate or grid tube contact to emitter contact. Use a low range A. C. meter for filament voltages

For further data see Pages 238-E and 238-G.

CROSLEY RADIO CORP.



Bottom View, Model 122 Chassis

Changes In Model 122

The following changes as compared with the circuit diagram shown herein will be found in some chasses.

1. The pentode grid resistor is 300,000 ohms instead of 1 megohm as shown on the diagram.
2. The volume control resistor is 650 ohms instead of 2500 ohms, as shown.
3. The 3,000 ohm resistor shown on the diagram just to the left and above the power transformer is changed to 1790 ohms.
4. The 1100 ohm resistor shunted across a portion of the volume control is deleted.
5. The 25,000 ohm resistor in the r. f. screen grid circuit is replaced by a 20,000 ohm resistor.

MODELS 122, 123, 124

Alignment of Tuning Condensers and Intermediate-Frequency Amplifier

The procedure for aligning the tuning condensers is as follows:

1. Tune to a signal between 1300 and 1400 kilocycles.
2. Turn the volume control all of the way on. If all signals within the required range are too loud, connect a 0.00025 m. f. fixed condenser between the "A" and "G" terminals, and then couple the antenna very loosely to a wire connected to the "A" terminal.
3. If, when carefully tuned to the middle of the band, the dial reading does not correspond to the frequency of the signal, but is not more than two channels off, set the dial at the correct frequency, and adjust the padding condenser on the oscillator tuning condenser (the tuning condenser nearest the front of the chassis) until the signal is loudest. Check the tuning by re-adjusting the station selector. It may not be possible to regulate the oscillator padding condenser so that the oscillator condenser is properly aligned with the **exact** dial setting, in which case align the padding condenser with a dial setting as close to the actual frequency as practicable.
4. After aligning the oscillator padding condenser, re-tune to a frequency between 1300 and 1400 kilocycles and carefully adjust the padding condensers on the other two tuning condensers until the signal is received with greatest volume.

Aligning Intermediate Frequency Stages

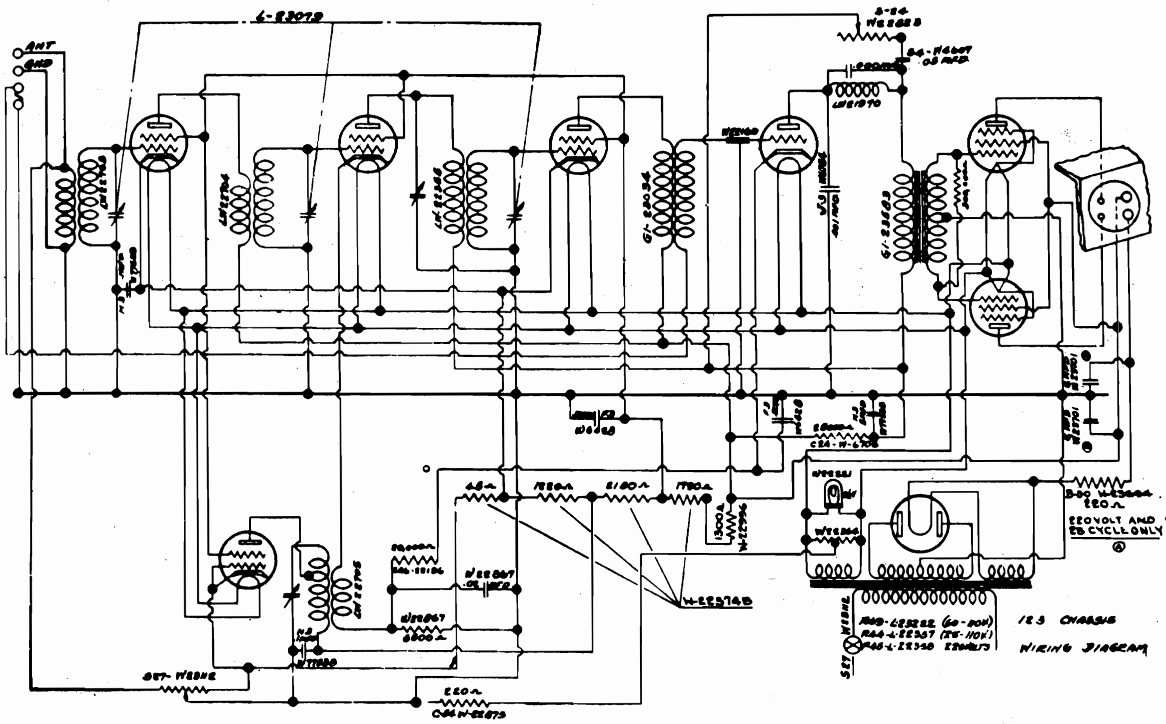
The primary and secondary circuits of the intermediate amplifier transformer must be tuned accurately to 175 kilocycles. They are aligned carefully at the factory, and no change should be necessary. In order to align them an accurately tuned local oscillator operating at 175 kilocycles is essential. The procedure is as follows:

1. A local oscillator tuned accurately to 175 kilocycles frequency is required.
2. Remove the oscillator tube from the chassis. Remove the clip wire from the first **detector tube. Connect the test oscillator output from the first detector grid to ground, and adjust the two screws at either side of the front I. F. coil for maximum reading on the output meter. Always re-align the tuning condenser after aligning the I. F. amplifier.**

CROSLEY RADIO CORP.

Model 123

PEAK FREQUENCY—175 KC



Circuit Diagram Model 123

Model 123 is the 122 chassis changed so as to have push pull output.

The important wiring changes are the introduction of a push-pull pentode output system, with push pull audio transformer instead of a single resistance-coupled output stage, and the change of the detector circuit from screen-grid to triode.

The tubes used are the same as chassis 122 with the exception of the detector, which employs a -27 instead of a -24, and the output, which utilizes two pentodes instead of one.

For further data see Pages 238-E and 238-C.

Voltage Limits

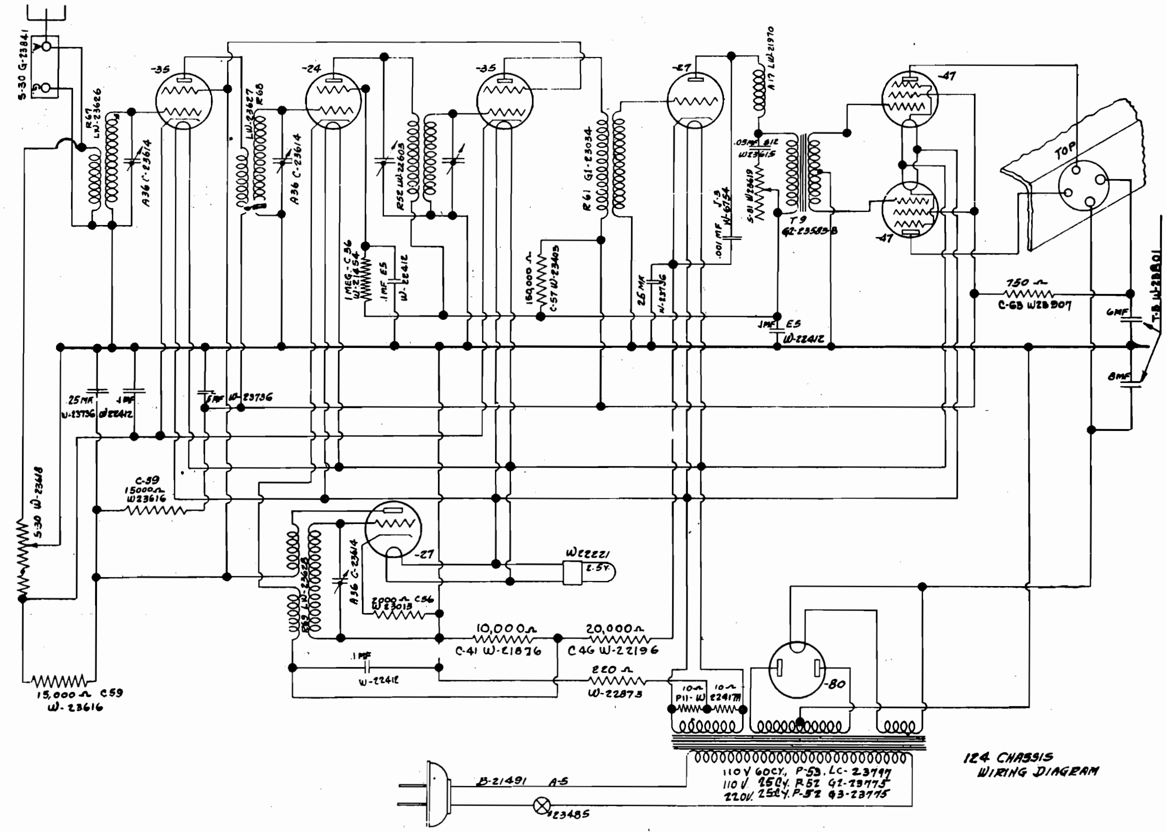
Filament Voltages	
R. F., First Detector, Oscillator and Second Detector	2.2 to 2.4
I. F. Amplifier	2.2 to 2.5
Output	2.3 to 2.6
Rectifier	4.9 to 5.3
Plate Voltages	
R. F. and I. F. Amplifiers	215 to 245
First Detector	170 to 190
Oscillator	32 to 42
Second Detector	160 to 180
Output	190 to 230
Rectifier, D. C. voltage	290 to 330
Screen Grid Voltages	
Oscillator, R. F. and I. F. Amplifiers	90 to 110
First Detector	80 to 100
Output	200 to 240
Control Grid Voltages	
R. F. and I. F. Amplifiers	1.5 to 2.5
First Detector	7 to 9
Second Detector	18 to 22
Output	13 to 16

Important: See note under "Voltage Limits," Model 122.

CROSLEY RADIO CORP.

Model 124

PEAK FREQUENCY—175 KC



Diagram, Model 124

Voltage Limits

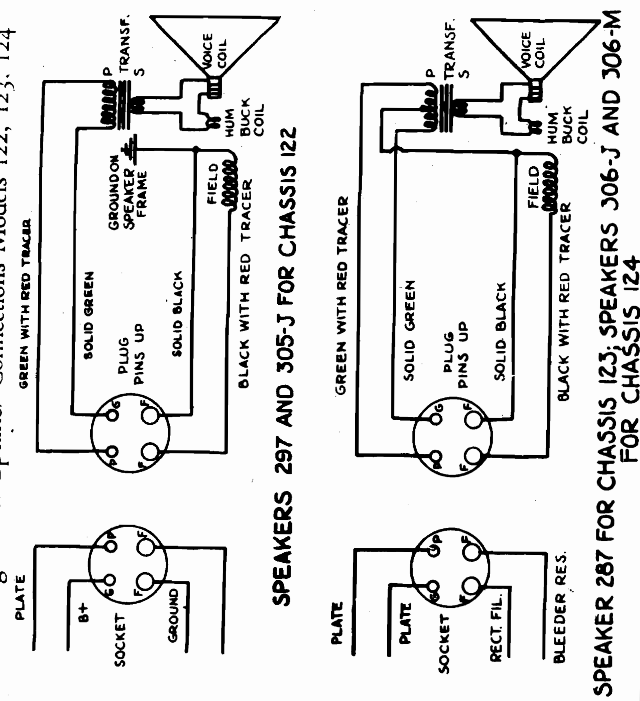
Filament Voltages	
All tubes but rectifier	2.3 to 2.5
Rectifier	4.6 to 5.0
Plate Voltages	
R. F. and I. F. Amplifiers and Output	235 to 265
put	170 to 190
First and Second Detectors	60 to 80
Rectifier, D. C. Voltage	300 to 340
Screen Grid Voltages	
R. F. and I. F. Amplifiers	80 to 100
First Detector	55 to 65
Output	230 to 270
Control Grid Voltages	
R. F. and I. F. Amplifiers	1.5 to 2.5
First Detector and Oscillator	7 to 9
Second Detector	18 to 22
Output	15 to 18

Important: See note under "Voltage Limits,"

For further data see

pages 238-E and 238-H

Diagrams of Speaker Connections Models 122, 123, 124



CROSLEY RADIO CORP.

Parts List—Model 124

Qty.	Part No.	Description
1	D-23598D	Chassis
1	G1-23800	Four prong Socket (Speaker)
1	G2-23800	Five Prong Socket (24)
2	G3-23800	Five prong Socket ('27)
2	G4-23800	Five prong Socket ('35)
2	G5-23800	Five prong Socket (47)
1	G6-23800	Four prong Socket ('80)
1	G1-23841	Terminal board (A&G)
1	LW-22603	I. F. Coil Assem. (Tuned)
1	LW-21991	Coil Shield Assembly
1	LW-21993B	Tube Connector Assembly
1	LW-22018C	Base Assembly
1	G2-23583B	A. F. Transformer Assembly
1	C-23614	Variable Tuning Condenser
1	G1-23629	Condenser Gang Bracket (Included in Price of Condenser)
2	G1-23623	Tube Connectors
1	LW-23600	Dial Light Bracket Assem.
1	G1-23686	Dial Drive Assembly
1	LC-23797	Power Trans. 110V.-60Cy.
1	G2-23775	Power Trans. 110V.-25Cy.
1	G3-23775	Power Trans. 220V-25Cy.
		Resistors
1	W-23013	2,000 Ohm Flexible (Red, red spot, black end)
1	W-21454	1-Megohm (Brown, green spot, black end)
1	W-23403	150,000-Ohm (Brown, yellow spot, green end)
1	W-21876	10,000-Ohm (Brown, orange spot, black end)
1	W-22196	20,000-Ohm (Red, orange spot, black end)
2	W-23616	15,000-Ohm (Brown, orange spot, green end)
1	W-23907	750-Ohm Flexible (Purple, brown spot, green end)
1	W-22873	220-Ohm Flexible (Red, brown spot, red end)
1	W-22417	10-10-Ohm (divided) Resistance
1	W-23618A	Volume Control & Switch
1	W-23619	Tone Control
	LB-23625	R. F. Coil Unit Assembly
1	LW-23626	Antenna Coil
1	LW-23627	Interstage Coil
1	LW-23628	Oscillator Coil
3	LW-22374	Coil Shield
1	B-23624A	Mounting Plate
1	G1-23034B	I. F. Coil (Untuned)
1	LW-21970	Plate Choke
		Fixed Condensers
1	W-23615	.05 Mfd.
1	W-22412	.1 - .1 - .1 - .1 Mfd.
1	W-6754	.001 Mfd.
1	W-22688	.1 Mfd.
1	W-22995	.5 - .1 Mfd.
1	W-23736	.25 - .5 - .25 Mfd.
1	W-23621	6 Mfd.
1	W-23622	8 Mfd.
1	W-23801	6. and 8. Mfd.
1	W-23633	Condenser Shelf
1	W-23634	Condenser Clamp
1	B-21491	Cable and Plug
1	C-23613A	Bottom
1	C-23630A	Tube and Condenser Shield
1	W-23880	Thumb Screw
3	G1-23472	Knob
1	LB-21932C	Tennaboard Assembly
1	L-23734	1-H Cabinet (Play Boy)
	L-23730	1-J Cabinet (Cheerio)
	L-23732	1-K Cabinet (Merrymaker)
	L-23802	1-L Cabinet (Announcer)
	L-23815	1-M Clock Cab. (Playtime)
1	L-23596	287 Speaker (1-H, 1-J Cab.)
1	L-23804	306 Speaker (1-K, 1-L, 1-M Cabinet)
1	LC-23813	Clock Assembly (110V 60Cy)
	L-23814	Clock Assembly (110V 50Cy)
	L-23831	Clock Assembly (110V 25Cy)
	L-23833	Clock Assembly (220V 25Cy)
	LC-24085	Clock Assembly (8 Day)

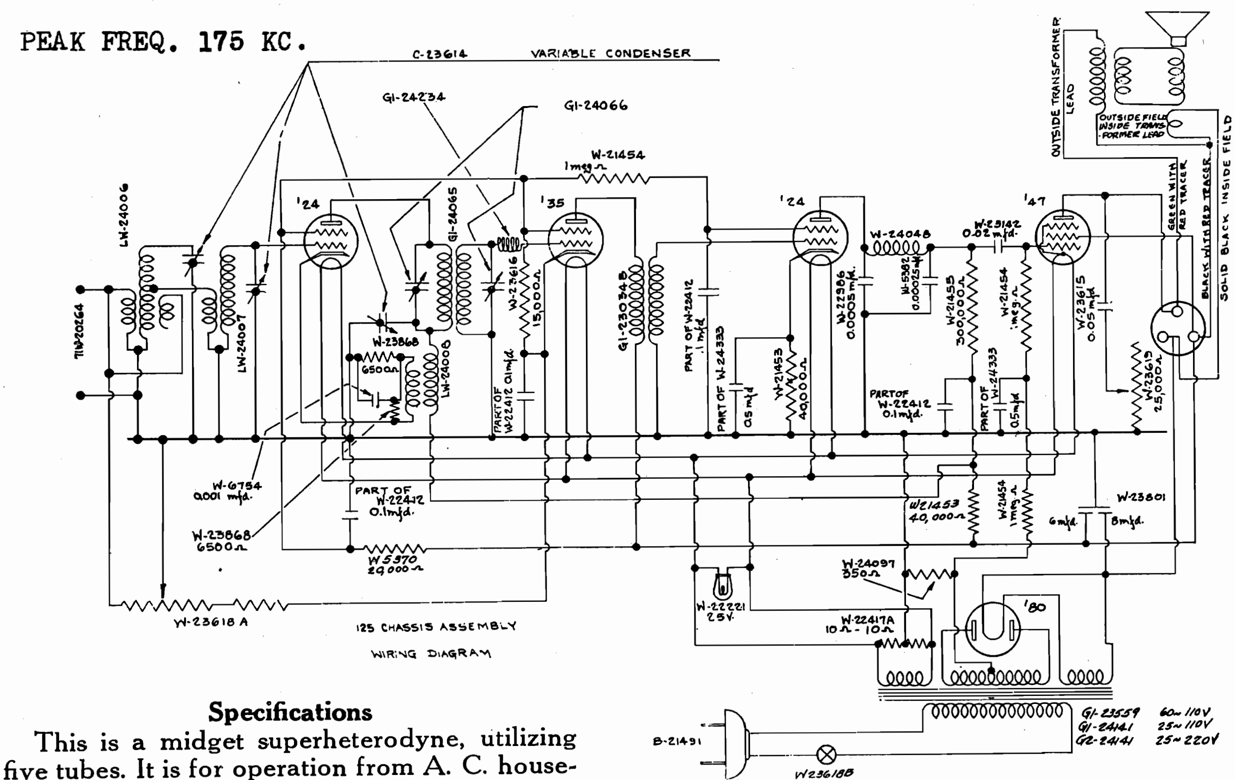
Part No	Mfd. Capacity
W-4013	1.
W-4313	.5
W-4919	.5
W-4924	.00025
W-4968	.5
W-5382	.00025
W-20499	.00025
W-5943	.1
W-6471	.1
W-6754	.001
W-7753	.1 - .5 - .1
W-7847	.0001
W-7944	.1 - .1
W-20103	.0002
W-20186	.25 - .3 - .25
W-23736	.25 - .5 .25
W-20187	.25
W-20188	.1
W-20389	.00005
W-20446	.1 - .5 - .1
W-20447	.1
W-20448	.1
W-20449	.1 - .5
W-23615	.05
W-22412	.1 - .1 - .1 - .1
W-22688	.1
W-22995	.5 - .1
W-4922	.003
W-4512	.0008
W-2096	1.
W-2629	1. - 1.
W-3207	1.
W-3326	.1 - .1
W-4233	.5
W-4232	.5 - .5
W-4381B	.1 - .1
W-4381	.06 - .06
W-4760	.1
W-4606	.1
W-5197	1.
W-5863	.5 - .5
W-5862	.1 - .1
W-6428	.5 - .5
W-5522	.1 - .1 - 005
W-6434	.02
W-23191	.01
W-22816B	.0015 - .02 - .0005
W-22244	.02 - .002
W-20156	8.
W-21456	.1 - .1 - .1
W-22986	.0005

For aligning instructions, refer to the discussions of Models 122 and 123. This receiver is very similar in circuit to chassis 123, with the following exceptions:

1. There are no phonograph pick-up terminals.
2. A -27 type oscillator is used instead of a -24.
3. The mechanical layout is quite different.

CROSLEY RADIO CORP.

MODEL 125 SUPERHETERODYNE



Circuit Diagram, Model 125.

Specifications

This is a midget superheterodyne, utilizing five tubes. It is for operation from A. C. house-lighting circuits, 110 volts 60 cycles, 110 volts 25 to 50 cycles, or 220 volts 25 to 60 cycles.

Instead of being coupled directly to the first tube, as in other Crosley models, the antenna-ground system is coupled to the detector-oscillator through a double tuned selector circuit. This increases the selectivity of the circuit.

The first tube acts both as a detector and oscillator. The oscillator circuit is tuned by a variable condenser—one of the three comprising the station selector gang—as shown on the diagram. The other two station selector condensers tune the grid circuit of the detector-oscillator and the pre-selector circuit.

The detector-oscillator is coupled to the intermediate frequency amplifier stage by an I. F. transformer, both primary and secondary of which are tuned to 175 kilocycles by small adjustable condensers shunted across them. These circuits must be tuned accurately to 175 kilocycles for efficient operation. A radio-frequency choke is in the grid circuit of the I. F. tube.

The timing condenser adjustments are made from the top of the chassis through the three holes in the condenser shield; the I. F. transformer adjustments through the holes at the left side of the chassis, near the front, as viewed from the front of the receiver.

Voltage Limits

The following data shows the average voltages which will be obtained when measurements are made on Model 125 Chassis using a voltmeter of 1000 ohms resistance per volt. Some of these voltages do not represent actual voltages present at the tube elements. A typical example of this is the grid voltage of the pentode tube, which is actually about 16 volts, but only shows about 1 volt when measured in this way.

Screen Grid Voltages

Pentode	200 to 230
I. F.	75 to 95
1st Det.	75 to 95
2nd Det.	15 to 25 (250V scale), 3-8 (50V scale)

Plate Voltages

Pentode	200 to 230
I. F.	200 to 230
1st Det.	160 to 180
2nd Det.	75 to 90 (250V scale), 20-30 (50V scale)

Control Grid Voltages

Pentode	0.5 to 1.5
I. F.	1.5 to 2.5 (20-30 vol. cont. off)
1st Det.	5.5 to 7.5
2nd Det.	4.0 to 6.0

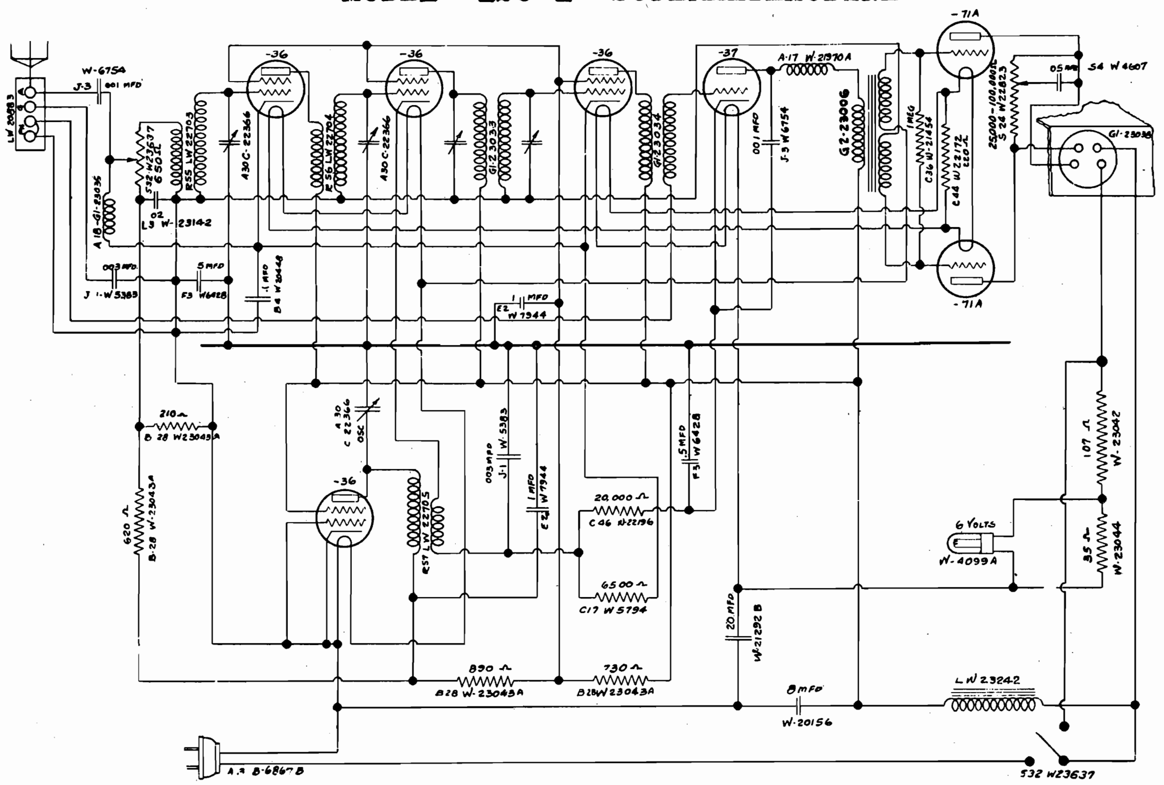
Filament Voltages

All tubes but rectifier	2.3 to 2.5
Rectifier tube	4.6 to 5.0

CROSLEY RADIO CORP.

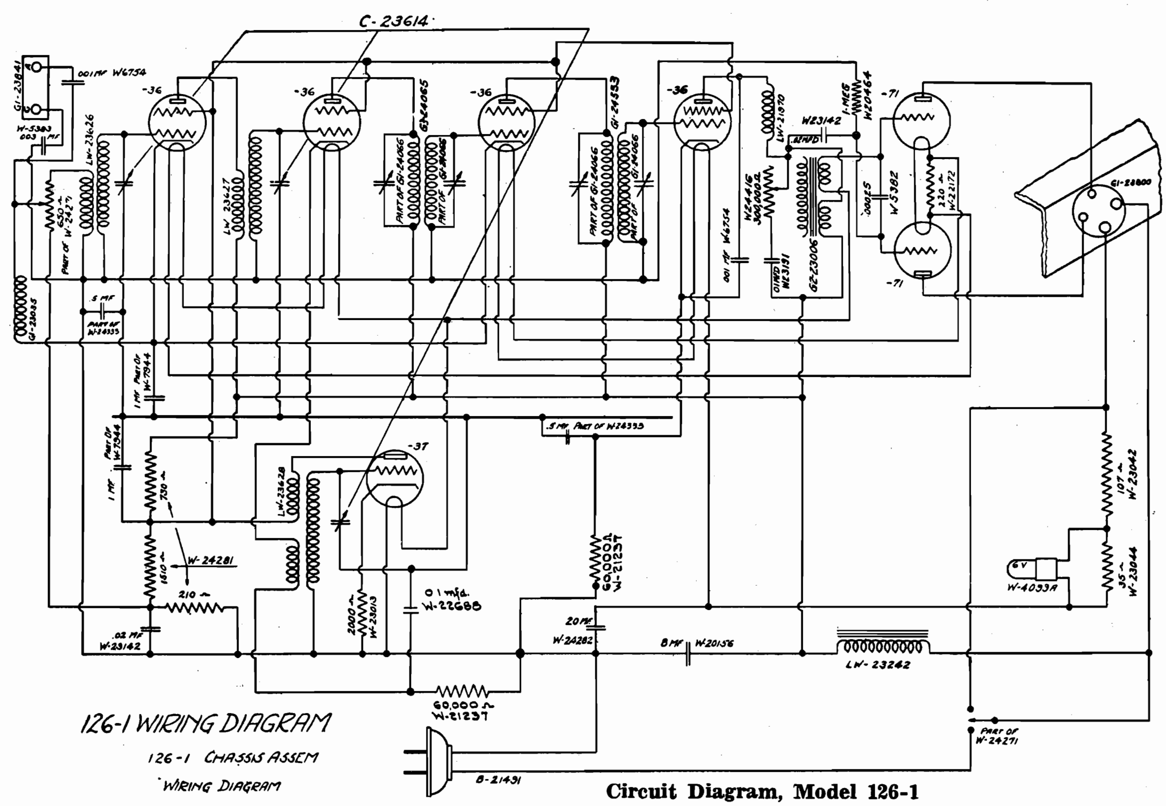
MODEL 126 SUPERHETERODYNE
MODEL 126-1 SUPERHETERODYNE

PEAK FREQ. 175 KC.



- WIRING DIAGRAM FOR 126 CHASSIS -

Circuit Diagram, Model 126



126-1 WIRING DIAGRAM

126-1 CHASSIS ASSEM WIRING DIAGRAM

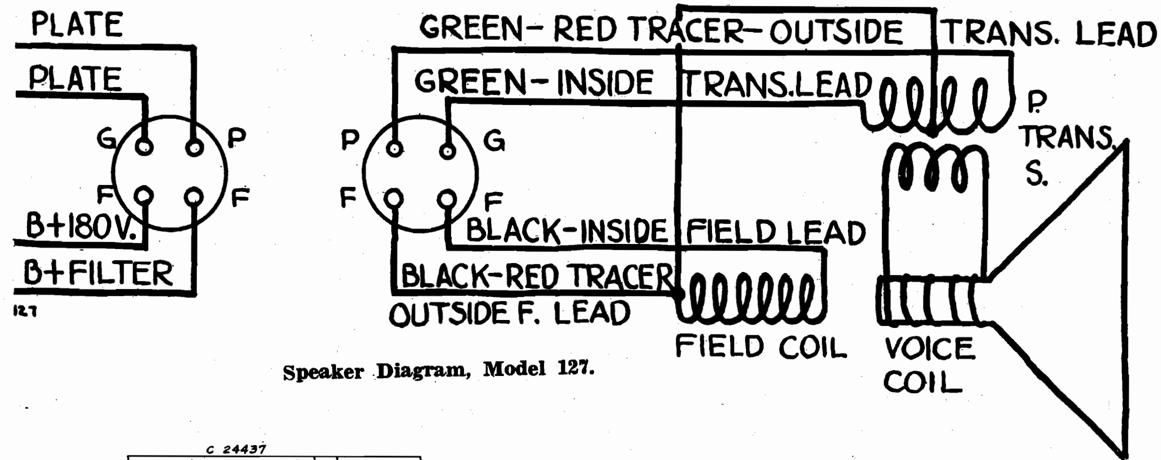
Circuit Diagram, Model 126-1

CROSLEY RADIO CORP.

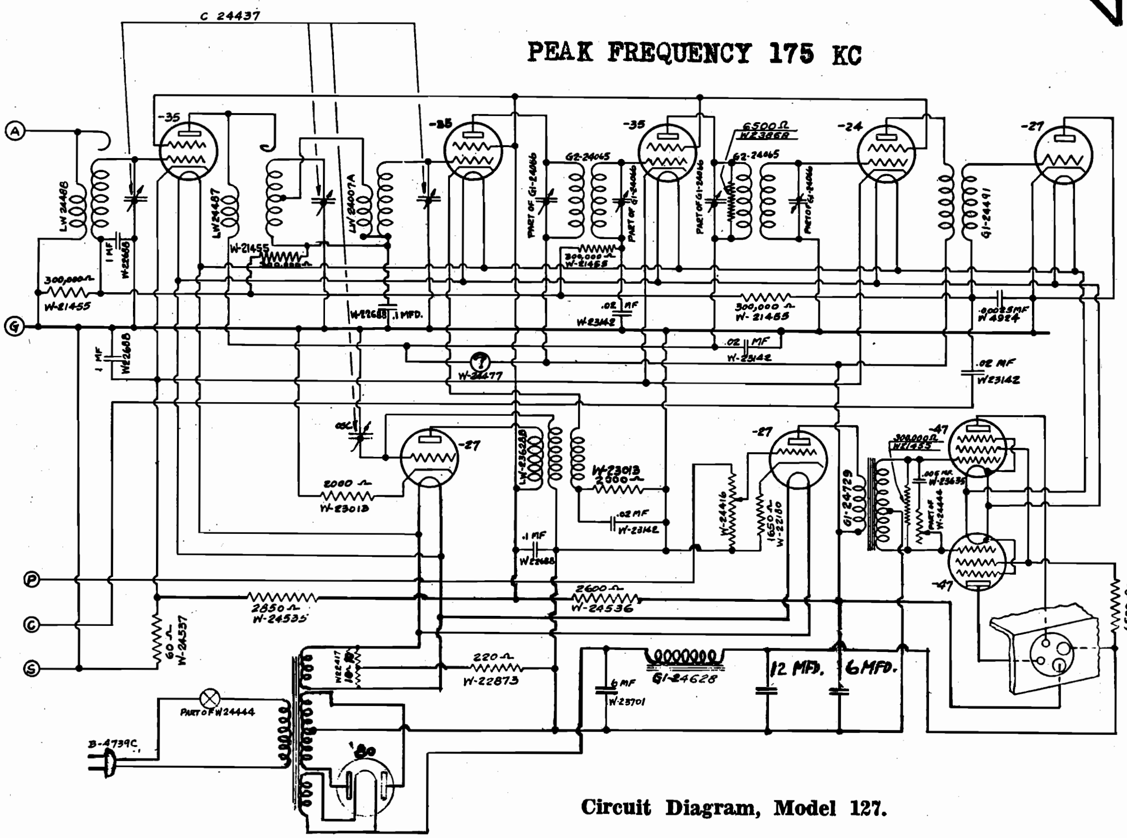
MODEL 127 10 TUBE SUPERHETERODYNE

Speaker Connections

Inside the speaker, the positive plate supply circuit branches, one branch going to a middle tap of the output transformer and thence through the transformer primary to the plate of the pentode output tubes, and the other branch going through the speaker field and thence back to the receiver. Another 6 mfd. filter condenser is connected from this point to ground.



Speaker Diagram, Model 127.



Circuit Diagram, Model 127.

Voltage Limits

To be measured with tubes in place, speaker connected, and line voltage of 117½ (235 for 220 volt receivers). Measure plate and grid voltages with a high-resistance D. C. volt-meter (600 ohms or more per volt) from plate or grid socket contact to emitter contact. Use a low-range A. C. meter to measure filament voltages.

Filament Voltages	
All tubes but rectifier	2.3 to 2.5
Rectifier tube	4.6 to 5.0
Plate Voltages	
All tubes but second detector and pentodes	170 to 200
Second detector	0
Pentode output tubes	270 to 300
Screen Grid Voltages	
All screen grid tubes but pentodes	75 to 95
Pentode output tubes	230 to 250
Control Grid Voltages	
R. F. and I. F. amplifiers	2.5 to 3.5
First detector	6 to 10
Oscillator	8 to 12
First A. F. amplifier	8 to 12
Pentode output tubes	14 to 18

MODEL 127
10 TUBE
SUPERHETERODYNE

CROSLEY RADIO CORP.

Parts List—Model 127

Qty.	Parts No.	Description	List Price Each
1	D-24442A	Chassis	.80
1	G1-23800	Four Prong Socket (Spk.)	.15
1	G2-23800	Five Prong Socket ('24)	.15
3	G3-23800	Five Prong Socket ('27)	.15
3	G4-23800	Five Prong Socket ('35)	.15
2	G5-23800	Five Prong Socket ('47)	.15
1	G6-23800	Four Prong Socket ('80)	.15
1	G1-23629	Cond. Brkt. Assy.	.05
1	LW-20266C	Terminal Board (P. C. S.)	.15
1	LW-20264D	Terminal Board (A & G)	.10
1	G1-24393	Junction Block	.05
1	LB-24446	R. F. Coil Group Assy.	3.75
1	LW-24488	Antenna Coil Assy.	.60
1	LW-24487	Interstage Coil Assy.	.80
1	LW-23628B	Oscillator Coil Assy.	.75
1	LW-24007A	Coupling Coil Assy.	.75
4	LW-22374	Shield Assy.	.15
1	W-24447	Mounting Plate	.10
1	C-24437	Variable Condenser	5.50
2	G2-23623	Tube Connection Assy.	.05
1	W-22221	Dial Lamp	.15
1	C-24440	Bottom	.15
1	LW-23600	Light Bracket Assy.	.15
1	G1-23686	Dial Drive Assy.	.50
1	G1-24436	Power Transformer (60 Cy. 110 V.)	5.00
	G2-24436	Power Transformer (25 Cy. 110 V.)	6.50
	G3-24436	Power Transformer (25 Cy. 220 V.)	6.50
2	LW-22362	Tube Shield Assy.	.15
2	G2-24065	I. F. Coil Assy.	.60
2	G1-24066	I. F. Condenser Assy.	.30
1	G1-24491	I. F. Coil	.30
1	W-24416	Volume Control	.70
1	W-24444	Tone Control & Switch	1.00
1	B-4739C	Cable	.30
1	W-24511	Shield	.05
1	W-24477A	Panel Meter	2.00
1	G1-24628	Filter Choke Assy.	1.25
1	W-24476A	Meter Bracket	.05
1	G1-24729	A. F. Transformer	2.00
1	W-22417	(10-10) Ohms	.15
1	W-22180	1650 Ohms	.25
1	W-22873	220 Ohms	.25
1	W-24537	60 Ohms	.25
1	W-24535	2850 Ohms	.25
1	W-24536	2600 Ohms	.25
1	W-5794	6500 Ohms	.25
1	W-23868	6500 Ohms	.25
2	W-23013	2000 Ohms	.25
5	W-21455	300,000 Ohms	.25
2	W-23701	6 Mfd.	1.00
1	W-23705	12 Mfd.	1.25
1	W-4924	.00025 Mfd.	.25
1	W-23635	.006 Mfd.	.25
4	W-23142	.02 Mfd.	.25
4	W-22688	.1 Mfd.	.25
1	C-24452A	Tube & Cond. Shield	.25
1	LB-21932C	Tennaboard Assy.	.15
2	W-22300	Knob	.15
1	W-24556	Knob	.15
	LC-24484	301M Speaker (Magnavox)	8.50
	LC-22982B	304J Speaker (Jensen)	10.00
	L-24461	1Q Cabinet Assembly	8.00
	L-24462	I. T. Cabinet Assembly	36.50

Type -24 Detector in Early Chasses

Earlier series of this chassis used a -24 type first detector tube. Connections were the same throughout, except in the tuned selector circuits between the R. F. and the first detector. The grid circuit of the first detector was connected directly to the chassis, instead of through the 300,000 ohm isolating resistor and 0.1 m.f. by-pass condenser shown on the diagram. The lower end of the interstage coil secondary, coupled to the R. F. plate circuit, was connected directly to the chassis, instead of to the grid circuit of the second detector as indicated here.

Alignment of Tuning Condensers and Intermediate Frequency Amplifier

To align the tuning condensers, the same procedure should be followed as outlined for Model 122,*except that there are three, instead of two, condensers in addition to the oscillator condenser to be aligned. * Page 238-E.

Follow the procedure outlined in the same bulletin for aligning the intermediate amplifier transformers, adjusting all four aligning condensers, one at a time.

Hum Adjustment

With properly matched output tubes, the hum level of this chassis is very low. The audio transformer shield may be rotated, after loosening the three hold-down screws, and so adjusted that the hum is reduced to a minimum. This adjustment is made at the factory and should not have to be made in the field unless it is necessary in servicing the receiver to loosen or remove the audio transformer shield. If the receiver hums, try other tubes in the output before attempting to adjust the transformer shield.

Specifications

Model 127 is a compact, ten tube superheterodyne chassis. It is for operation from A. C. house-lighting circuits, and may be obtained for 110 volt 25 to 50 cycle, 110 volt 60 cycle, or 220 volt 25 to 60 cycle circuits.

The tubes used are as follows: a -35 or -51 radio-frequency amplifier, a-35 or -51 first detector (-24 tubes were used for the first detectors in the earlier chasses of this series, a -27 oscillator, a -35 or -51 first intermediate-frequency amplifier, a -24 second intermediate-frequency amplifier, a -27 diode second detector and automatic volume control tube, a -27 audio-frequency amplifier, two PZ or -47 pentode push-pull output tubes, and a -80 rectifier.

When installing the receiver, make sure that the tubes are in their proper sockets as shown on the connection diagram in the instructions, being particularly careful to see that the -24, and -35 or -51 tubes are not interchanged.

Three phonograph terminals, marked "P", "C", and "S", are provided for use with Crosley phonograph pick-ups. Before connecting a phonograph pick-up, cut the wire between terminals "P" and "C". If the phonograph pick-up is later disconnected, these terminals should be wired together again.

The second detector is of the diode type, and acts also as an automatic volume control tube.

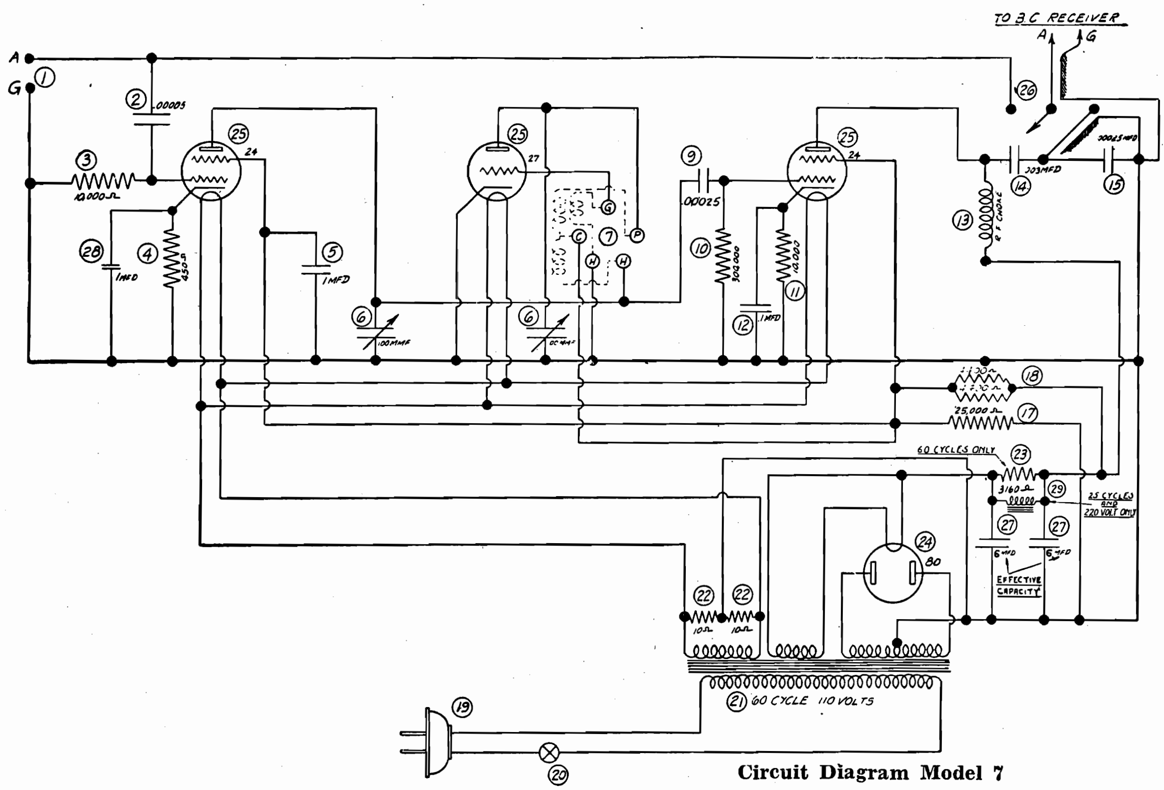
The antenna coil and the interstage coil between the R. F. stage and the tuned selector circuit are connected so as to introduce a certain amount of capacity coupling as well as inductive coupling, as in previous Crosley Models.

Audio Coupling

The diode detector is resistance coupled to the first audio tube, the coupling resistor serving as a volume control. From the detector grid, the coupling circuit continues through a 0.02 m. f. coupling condenser to phonograph terminal "C", whence it continues through a strap between terminals "C" and "P", not shown in the diagram, and from terminal "P" to one end of the volume control resistor, the other end of this resistor being grounded. Since the emitter of the second detector is also grounded, this completes the detector circuit.

CROSLEY RADIO CORP.

SHORT-WAVE CONVERTER MODEL 7
SHORT-WAVE CONVERTER MODEL 7-1



Circuit Diagram Model 7

This is a chassis for attaching to any broadcast receiver in order to adapt the latter to the reception of short-wave signals. It is of the superheterodyne type, the incoming signal being converted to a frequency within the regular broadcast range by the use of an oscillator and detector (see Service Bulletin No. A-1 for an explanation of the superheterodyne receiver). After conversion to the appropriate frequency the signal is delivered to the aerial and ground terminals of the broadcast receiver.

The chassis incorporates a -24 type, untuned buffer amplifier, a -27 tuned oscillator, a -24 tuned detector, and a -80 rectifier. Various frequency ranges are obtainable by the use of suitable coils, as explained in the instructions accompanying the chasses.

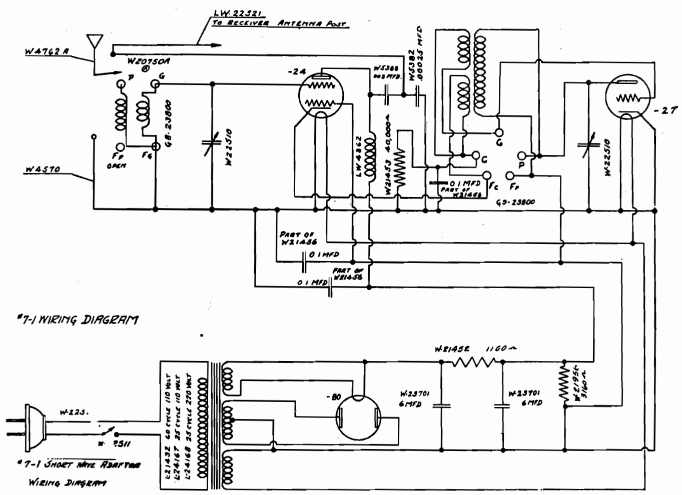
Model 7-1

Model 7-1 is a short-wave converter similar in general operation to Model 7, which has been described previously, but incorporating one less tube and having a tuned antenna circuit.

The tubes are as follows: a -24 first detector, a -27 oscillator, and a -80 rectifier.

Two sets of frequency range coils are required, one for the antenna circuit and one for the oscillator circuit. The antenna coils have four prongs and the oscillator coils five prongs. The frequency ranges obtainable with these pairs of coils are given in the instructions accompanying the receiver.

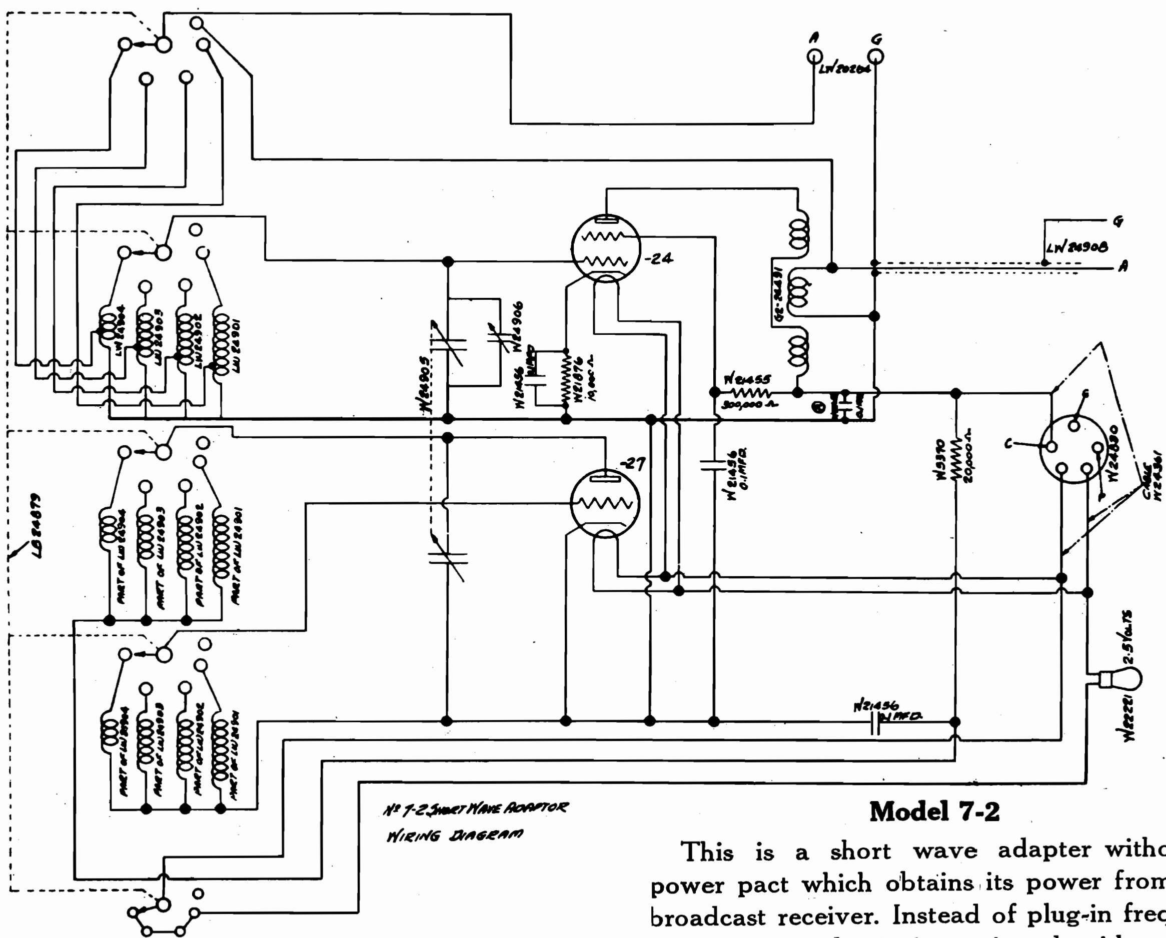
FOR MODEL 7-1 VOLTAGE DATA
SEE PAGE 2 - 239



Circuit Diagram, Model 7-1

CROSLEY RADIO CORP.

SHORT-WAVE CONVERTER MODEL 7-2



Circuit Diagram, Model 7-2

Model 7-2

This is a short wave adapter without a power pact which obtains its power from the broadcast receiver. Instead of plug-in frequency change coils, it is equipped with a coil changing switch, the desired frequency range being obtained by choosing the proper switch setting. There are five switch positions, four of which are for short-wave reception, and the fifth for operating the ordinary broadcast receiver.

Two tubes are used, a -27 oscillator and a -24 detector.

The adapter is for use only with receivers having pentode output tubes. On the end of the adapter power cable is a plug. One of the pentode output tubes is removed from the receiver, the adapter power cable plug is inserted in the pentode socket, and the pentode tube is inserted in the plug.

The tuning condensers are operated by a single dial.

The tube voltages depend to a certain extent upon the receiver with which the adapter is used. It is therefore not practicable to give them here.

Voltage Limits, Model 7-1

The following tube voltages are the approximate values which should be obtained with tubes in place and receiver connected to a 117½ volt line, using a voltmeter of 1000 ohms resistance per volt.

Filament Voltages	
Detector and oscillator tubes	2.3 to 2.7
Rectifier tube	4.5 to 5.5
Plate Voltages	
Detector tube	150 to 190
Oscillator tube	90 to 110
Grid Voltages	
Detector tube	3 to 5
Screen-Grid Voltage	
Detector tube	85 to 105

FOR MODEL 7-1 DIAGRAM
SEE PAGE 1 - 239

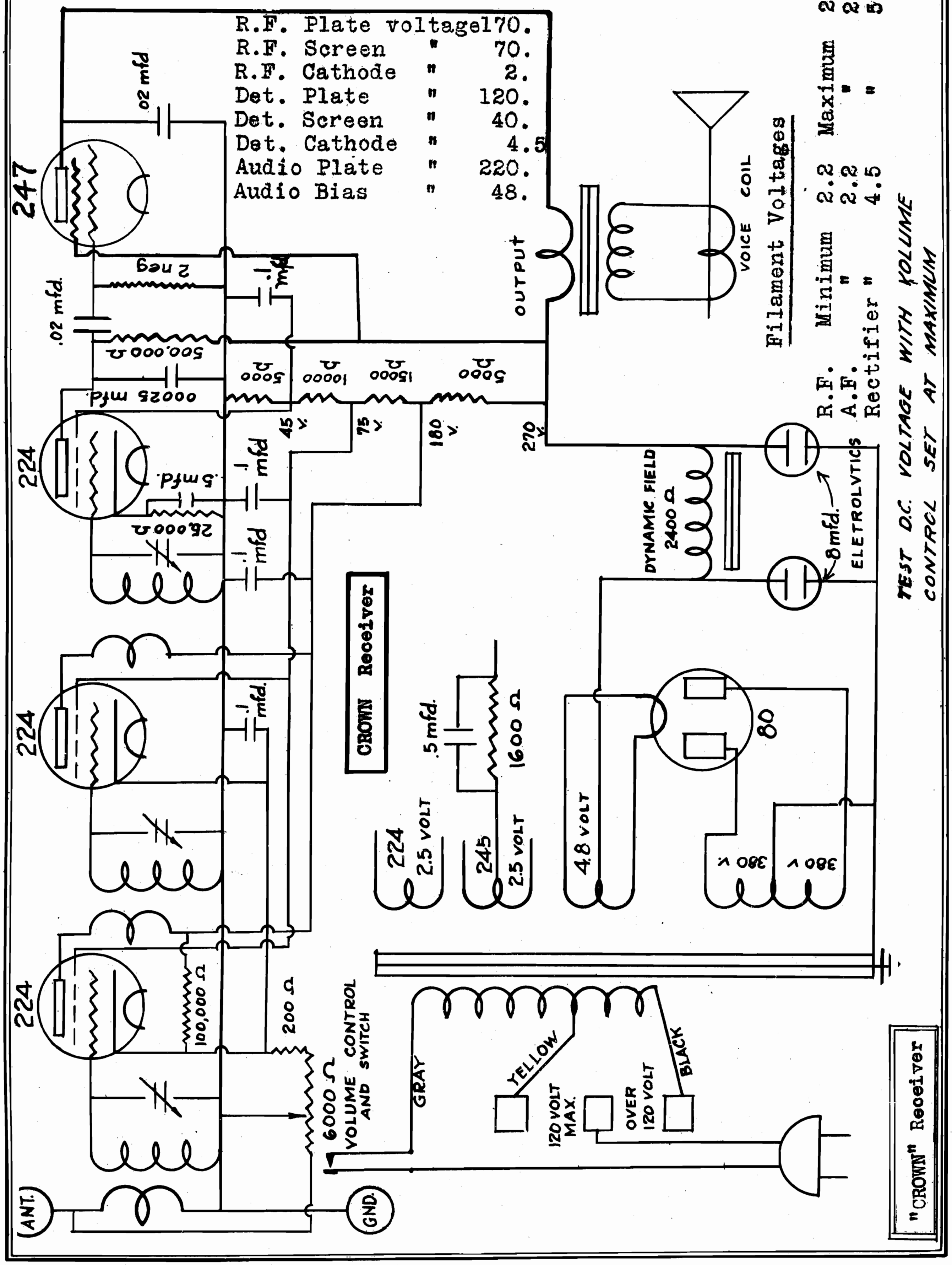
CUSTOM BUILT RADIO CO.

R.F. Plate	voltage	170.
R.F. Screen	"	70.
R.F. Cathode	"	2.
Det. Plate	"	120.
Det. Screen	"	40.
Det. Cathode	"	4.5
Audio Plate	"	220.
Audio Bias	"	48.

Filament Voltages

	Minimum	Maximum
R.F.	2.2	2.5
A.F.	2.2	2.6
Rectifier	4.5	5.0

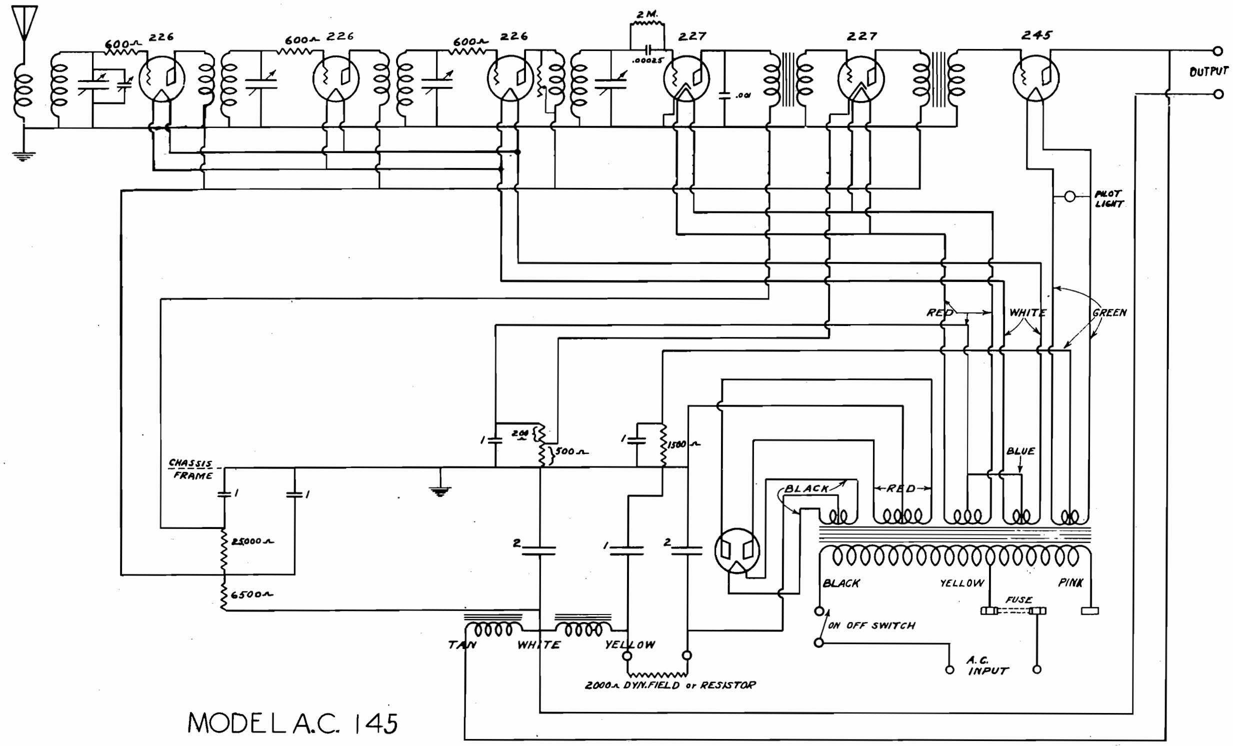
TEST D.C. VOLTAGE WITH VOLUME CONTROL SET AT MAXIMUM



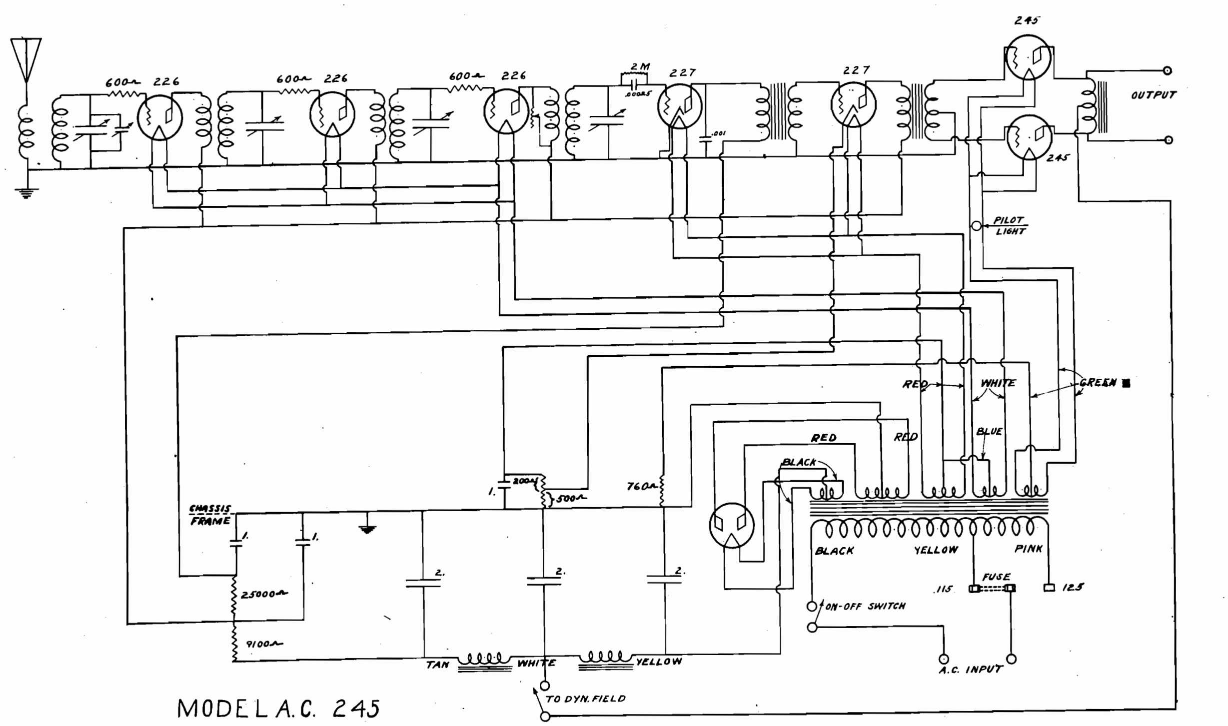
"CROWN" Receiver

MODEL AC 145
MODEL AC 245

DE WALD RADIO



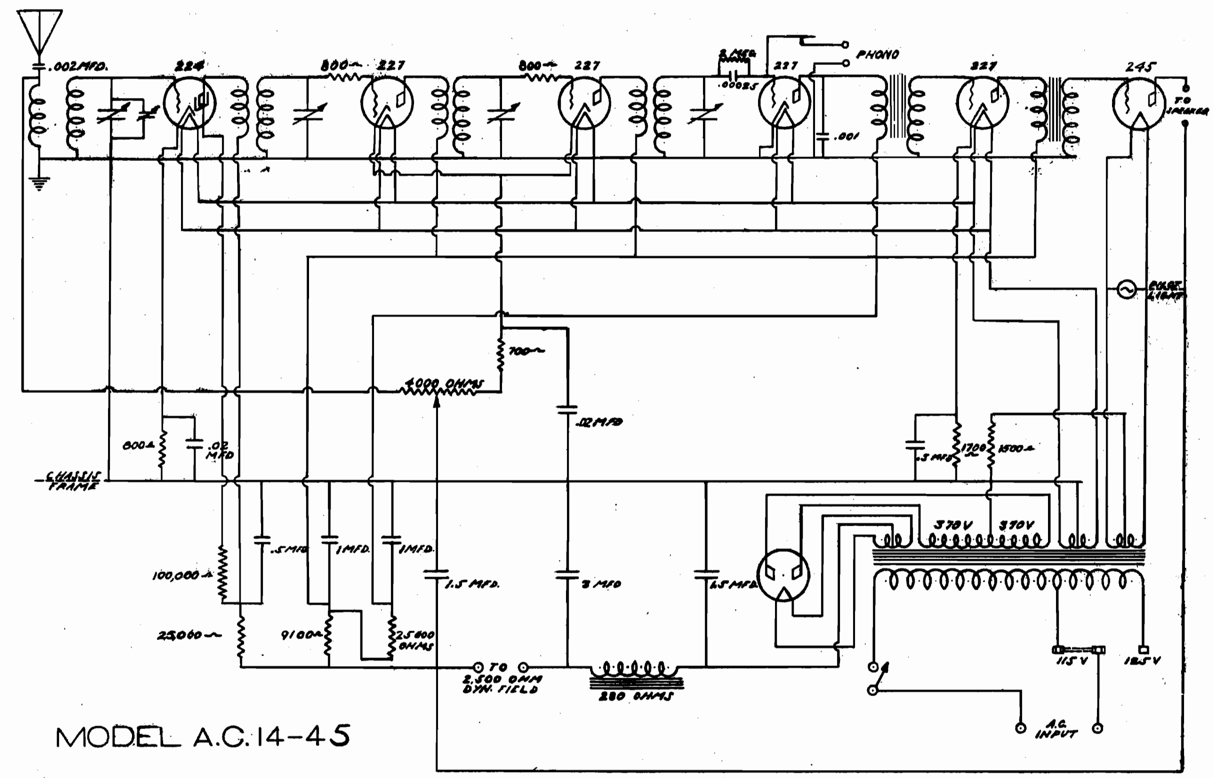
MODEL A.C. 145



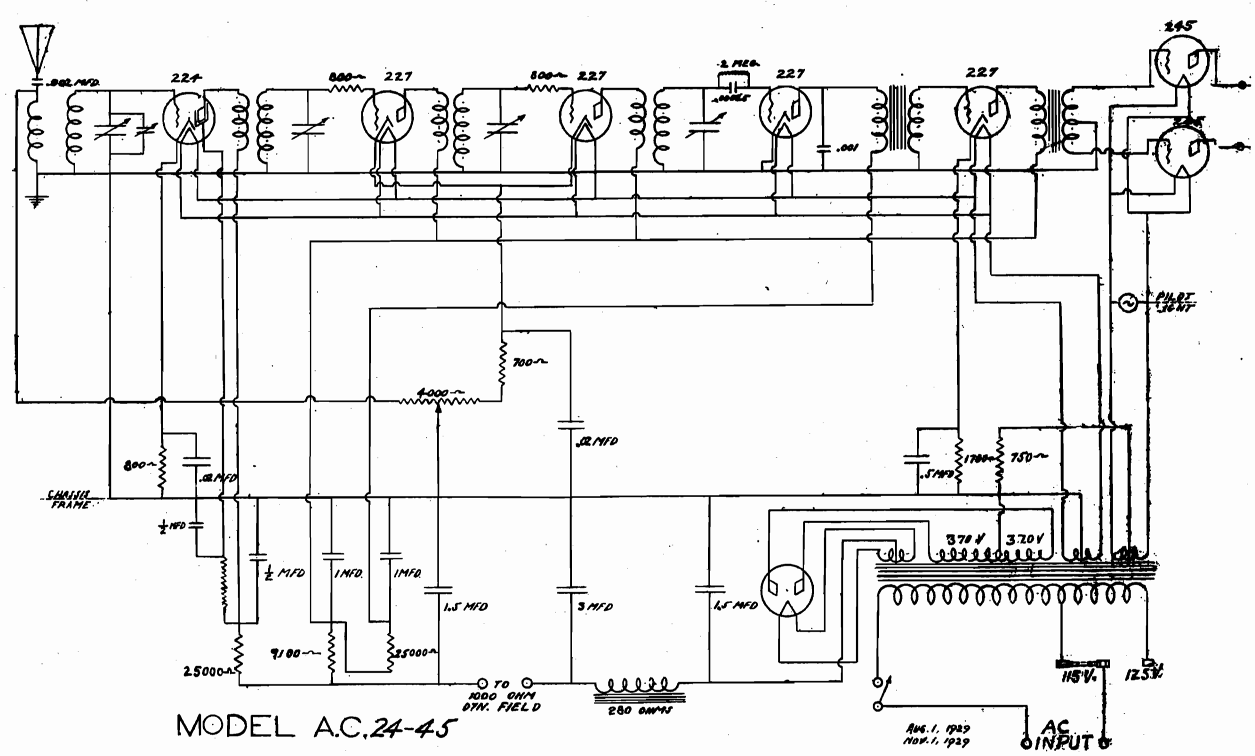
MODEL A.C. 245

MODEL AC 14-45
MODEL AC 24-45

DE WALD RADIO



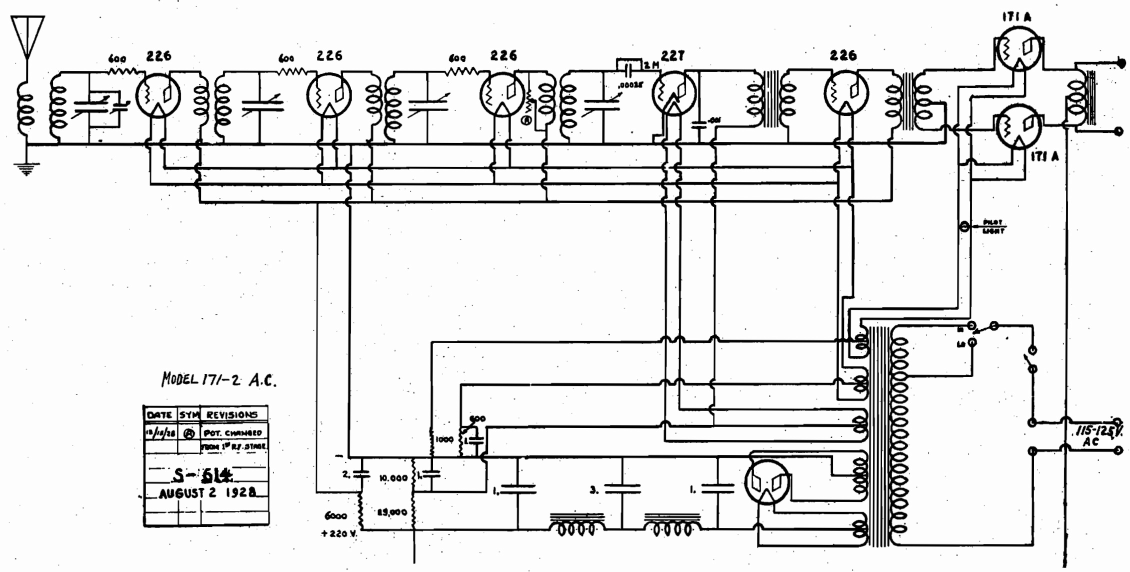
MODEL A.C.14-45

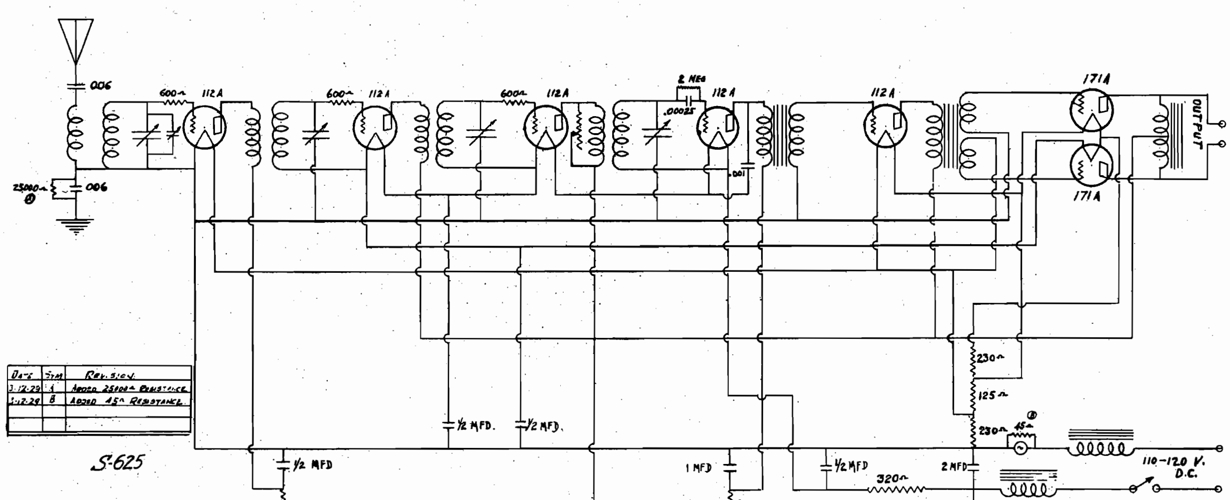


MODEL A.C.24-45

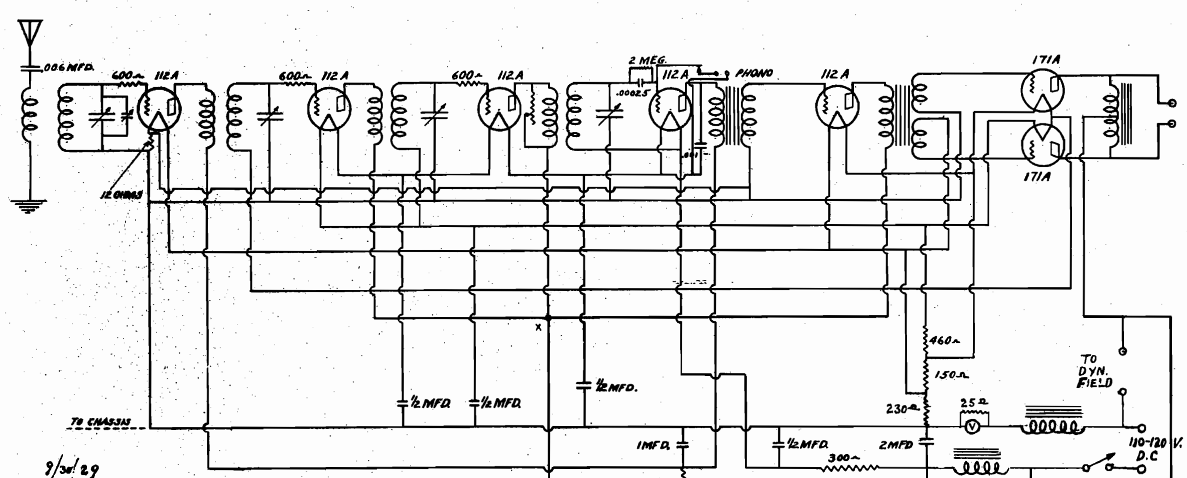
DE WALD RADIO

MODEL AC 171-2
MODEL DC 173-4
MODEL DC 273





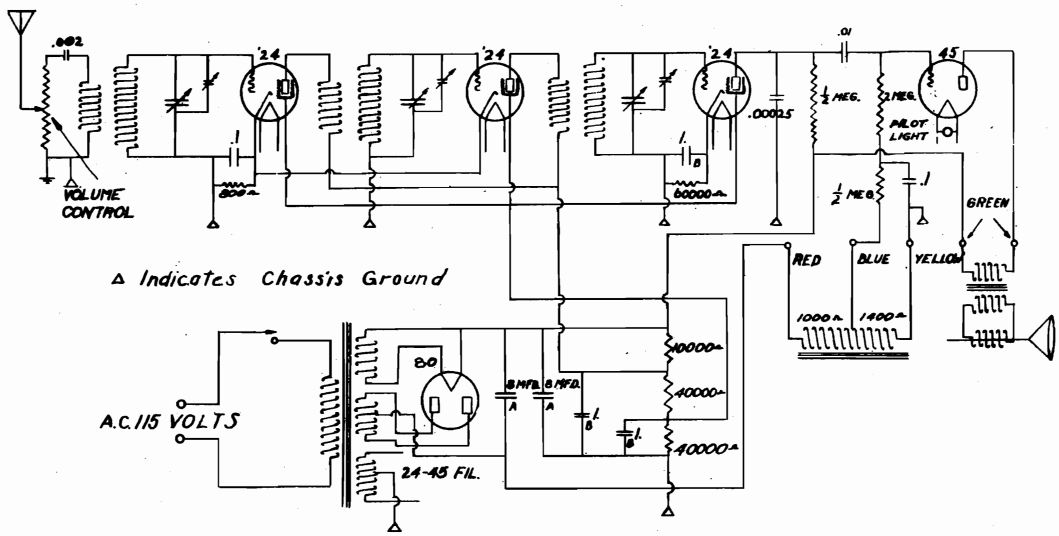
, MODEL DC173-4



MODEL D.C.273

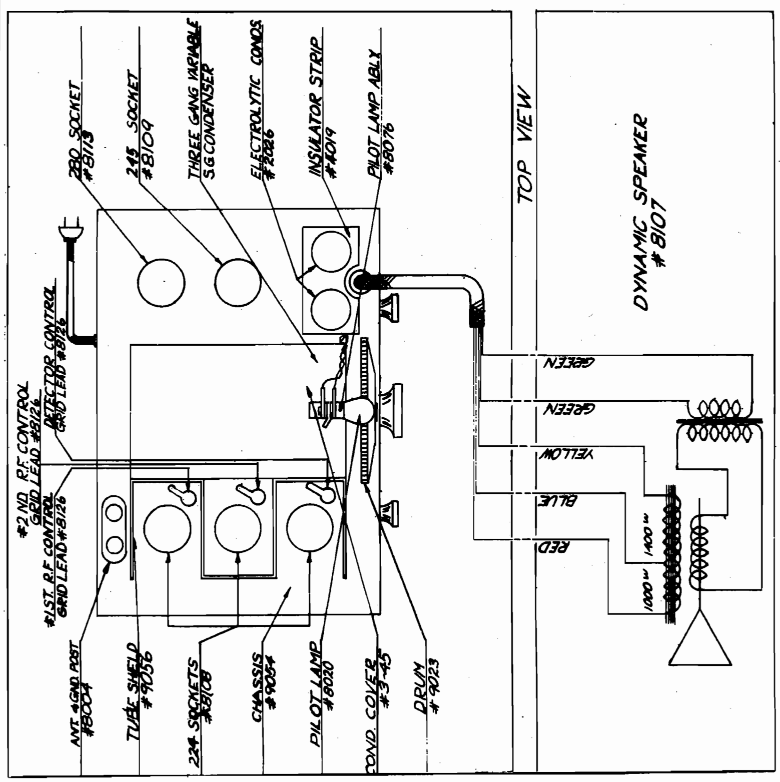
DE WALD RADIO

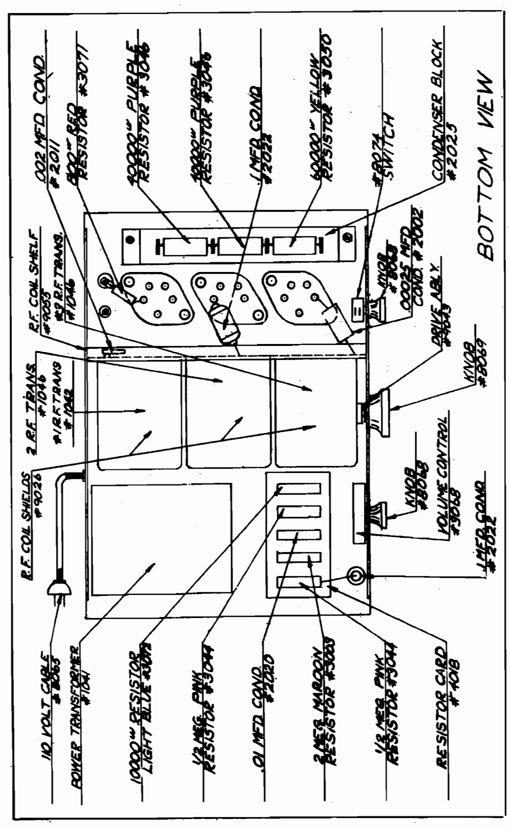
MODEL AC 524



-NOTE-

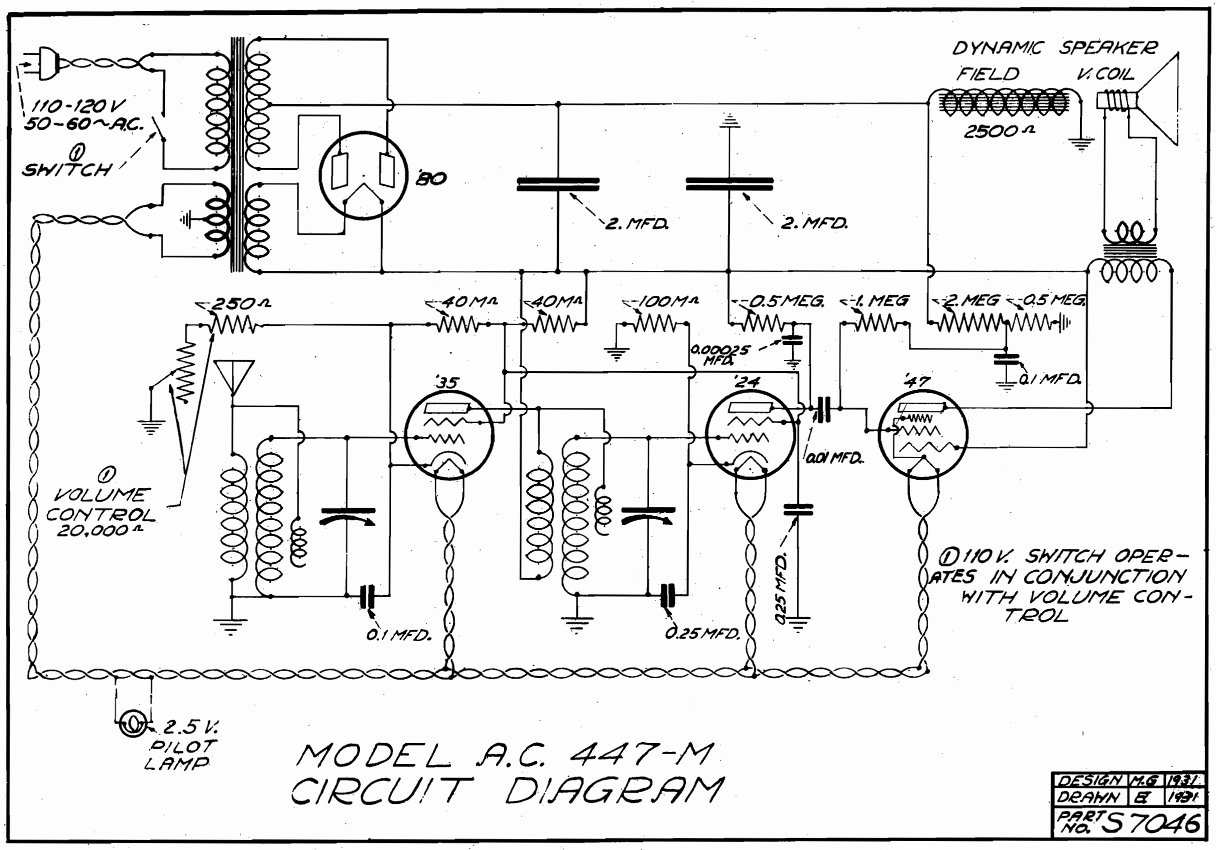
CONDENSORS MARKED A, 8 MFD ARE ELECTROLYTIC
CONDENSORS MARKED B ARE IN FILTER BLOCK

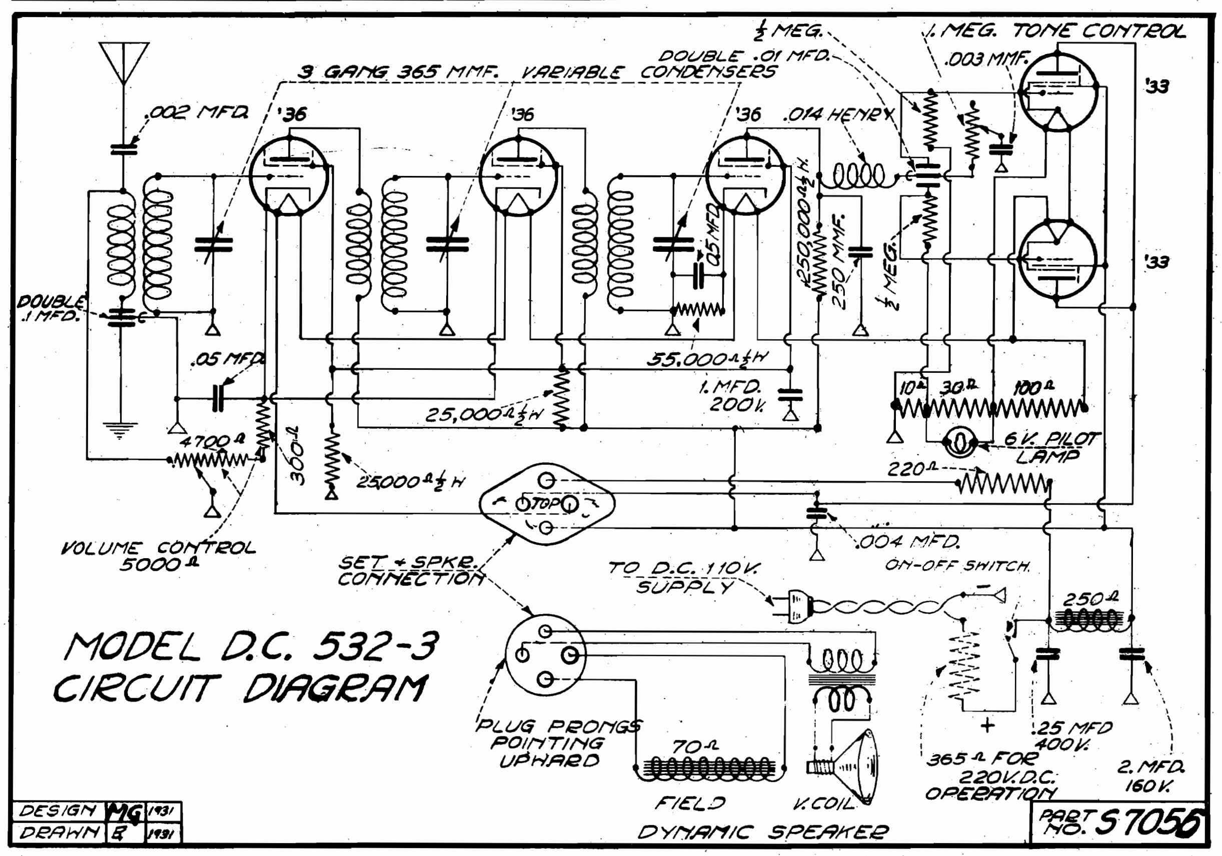




MODEL AC 447-M
MODEL DC 532-3

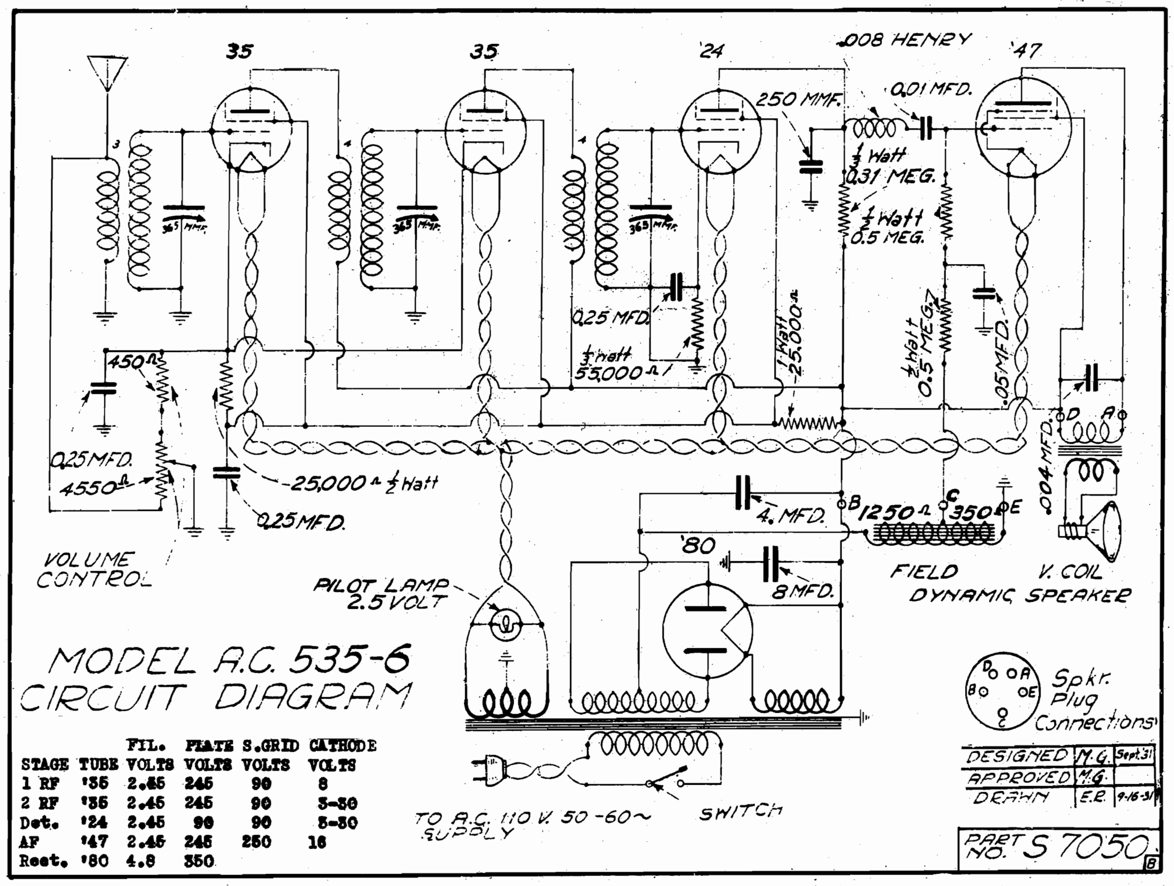
DE WALD RADIO



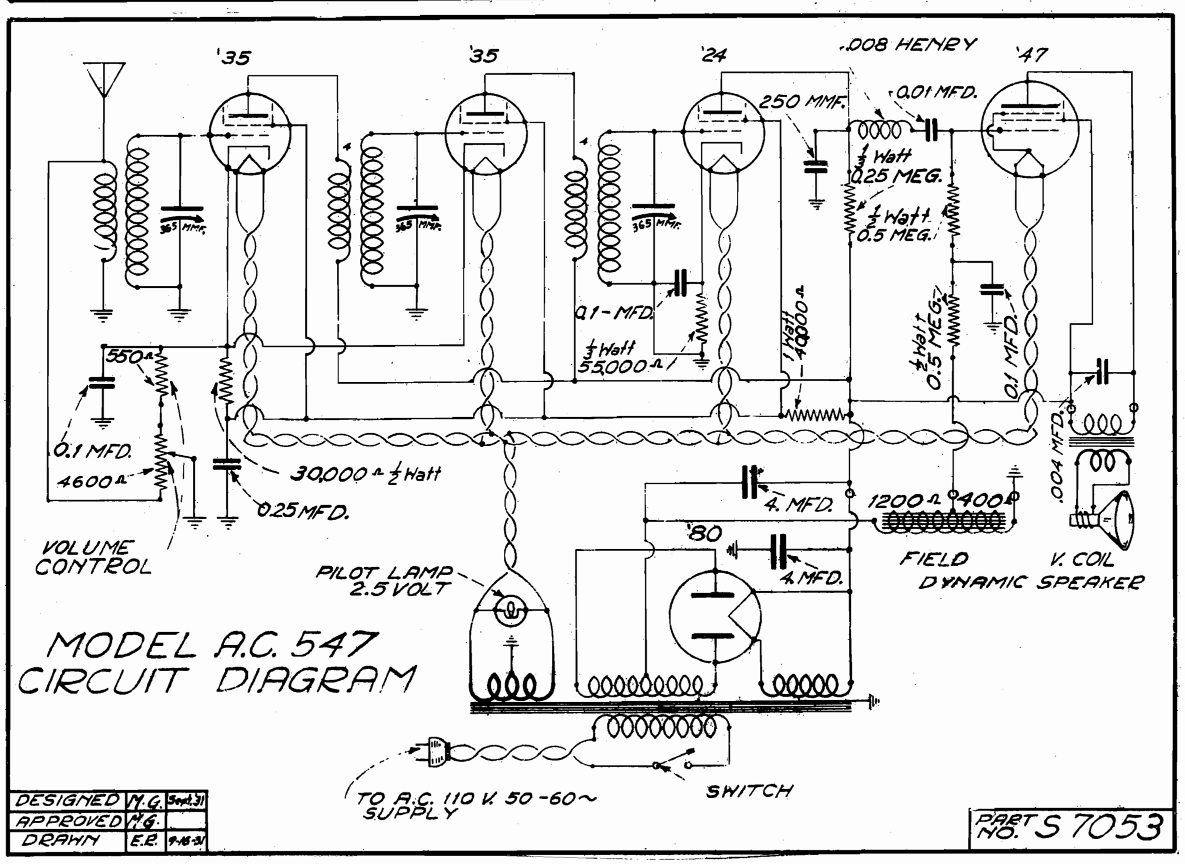


MODEL AC 535-6
MODEL AC 547

DE WALD RADIO

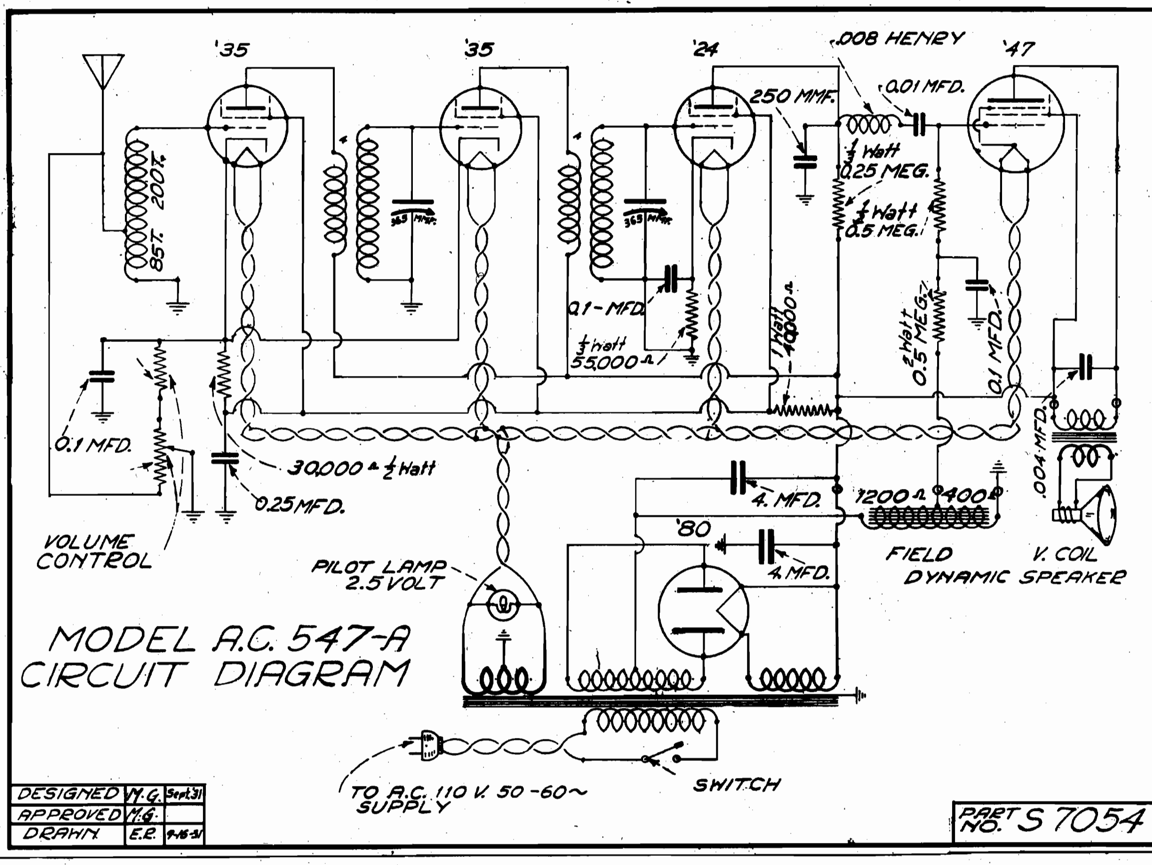


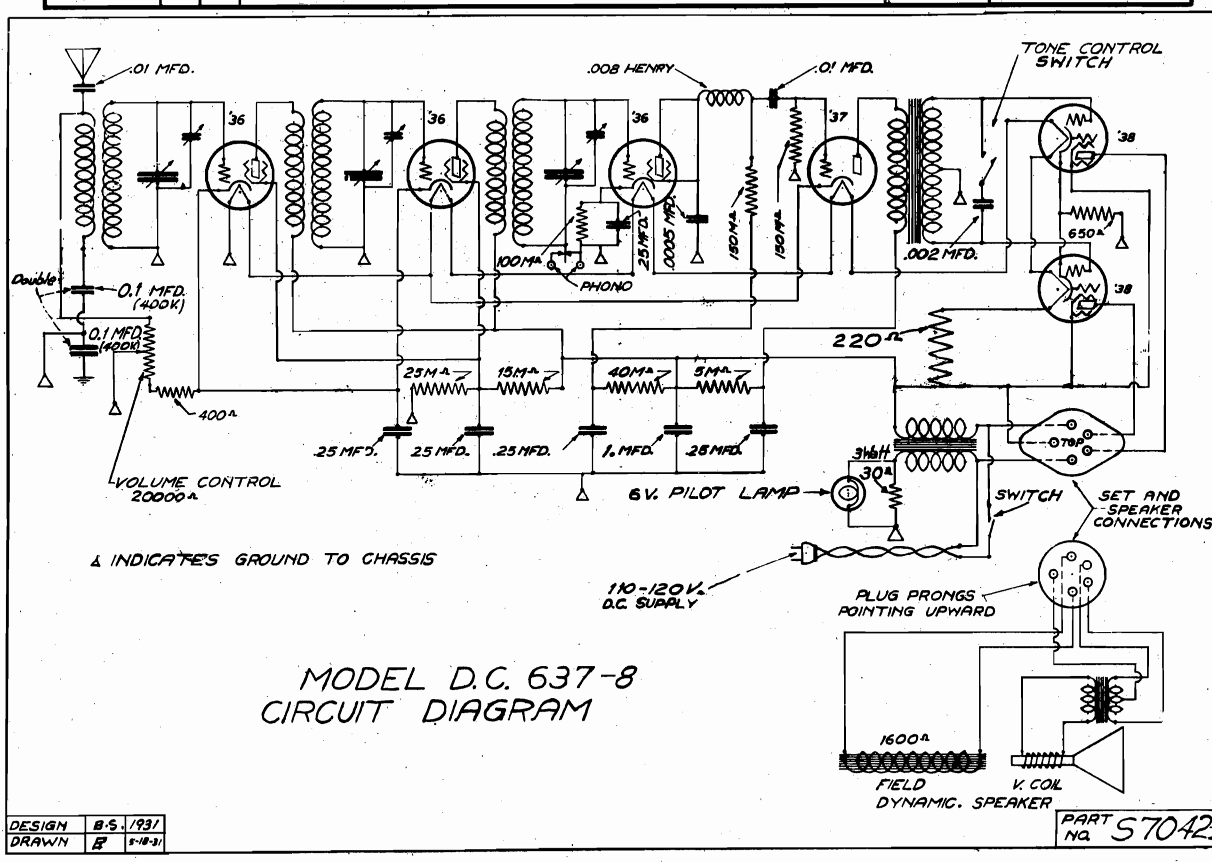
STAGE	TUBE	FIL. VOLTS	PLATE VOLTS	S.GRID VOLTS	CATHODE VOLTS
1 RF	'35	2.45	245	90	8
2 RF	'35	2.45	245	90	3-30
Det.	'24	2.45	90	90	3-30
AF	'47	2.45	245	250	16
Rect.	'80	4.8	350		



MODEL AC 547-A
MODEL DC 637-8

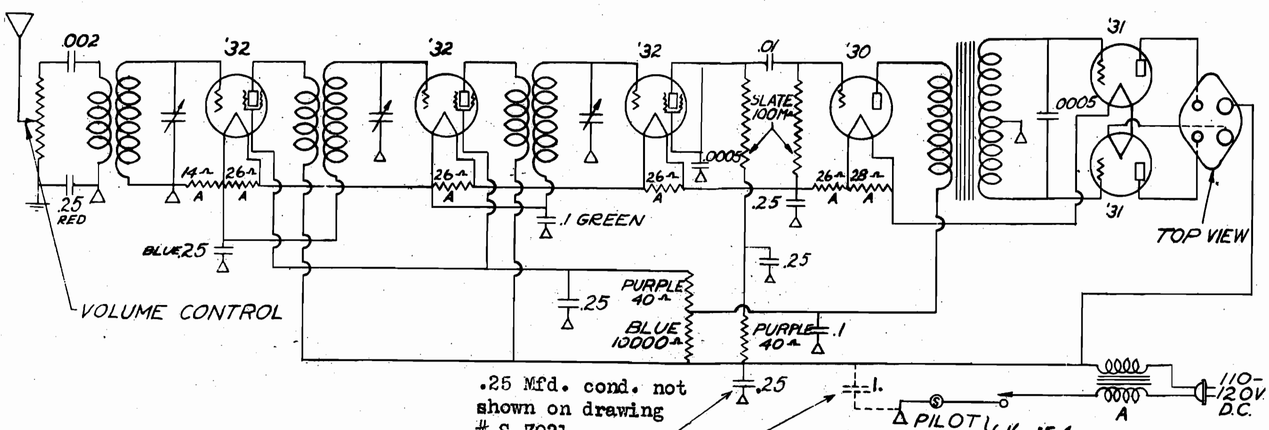
DE WALD RADIO





MODEL DC 632

DE WALD RADIO

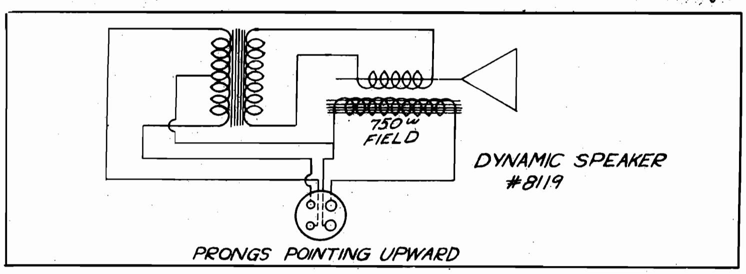


.25 Mfd. cond. not shown on drawing # S 7021.

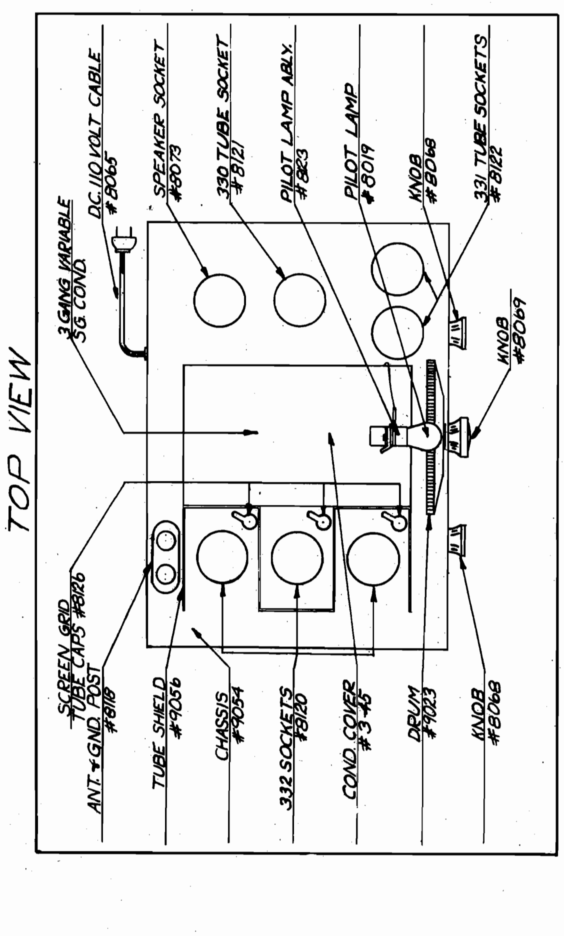
1. mfd. cond. shown on drawing # S 7021 only.

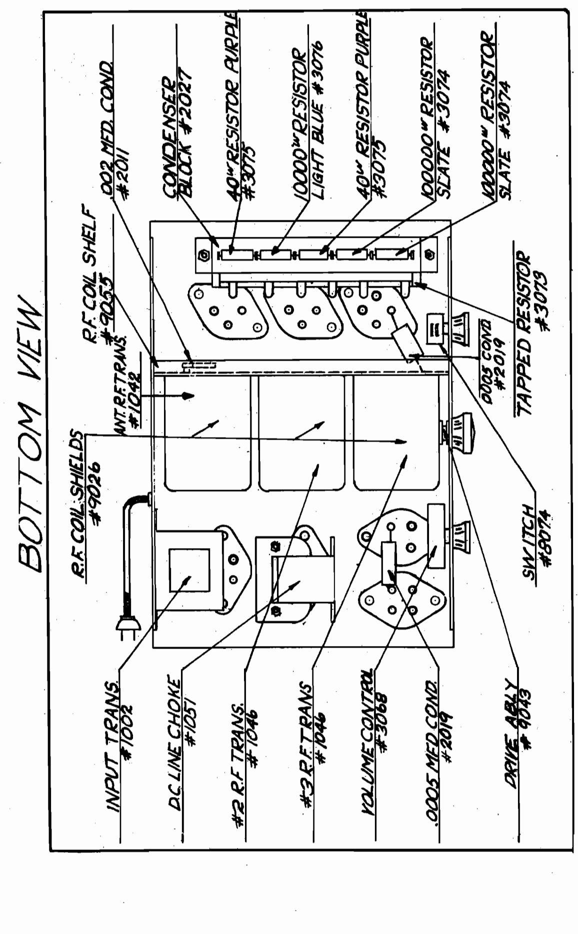
MODEL DC 632
Revised drawing # S 7021-A

ADDED CHOKE	(A)	11-4-30	B.S.
ALTERATIONS	SYM	DATE	APPR'D



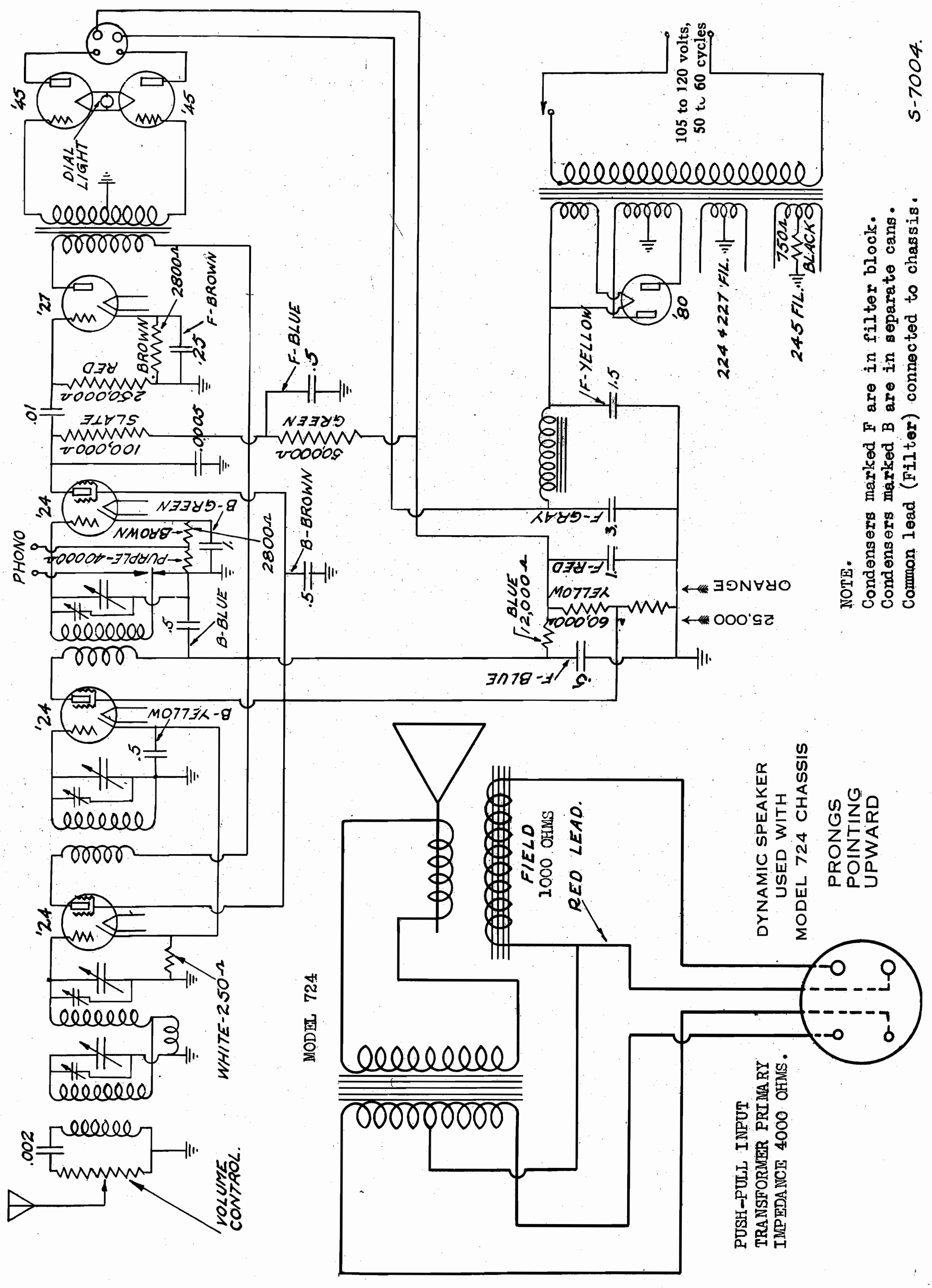
NOTE.
Resistors marked "A" are one unit.





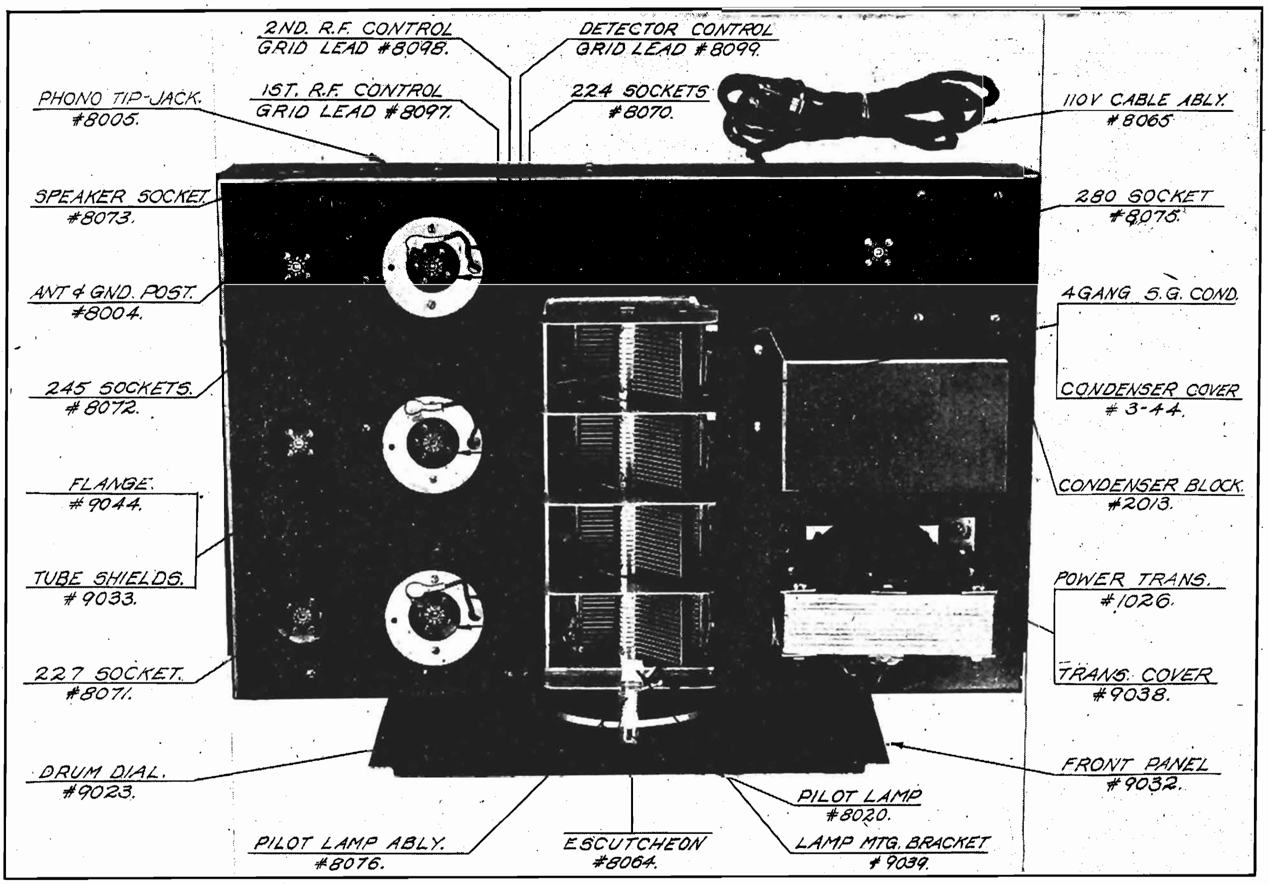
MODEL AC 724

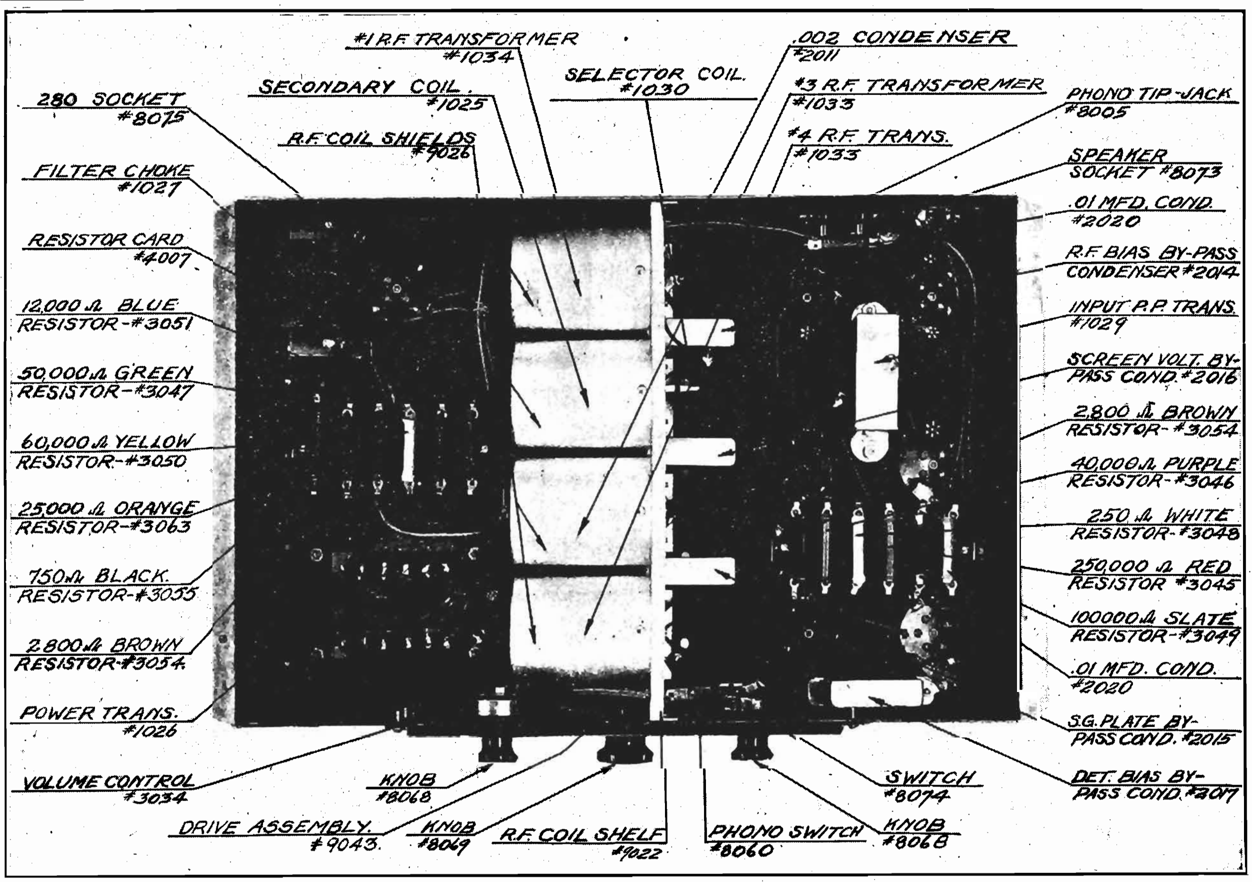
DE WALD RADIO



MODEL AC 724

DE WALD RADIO

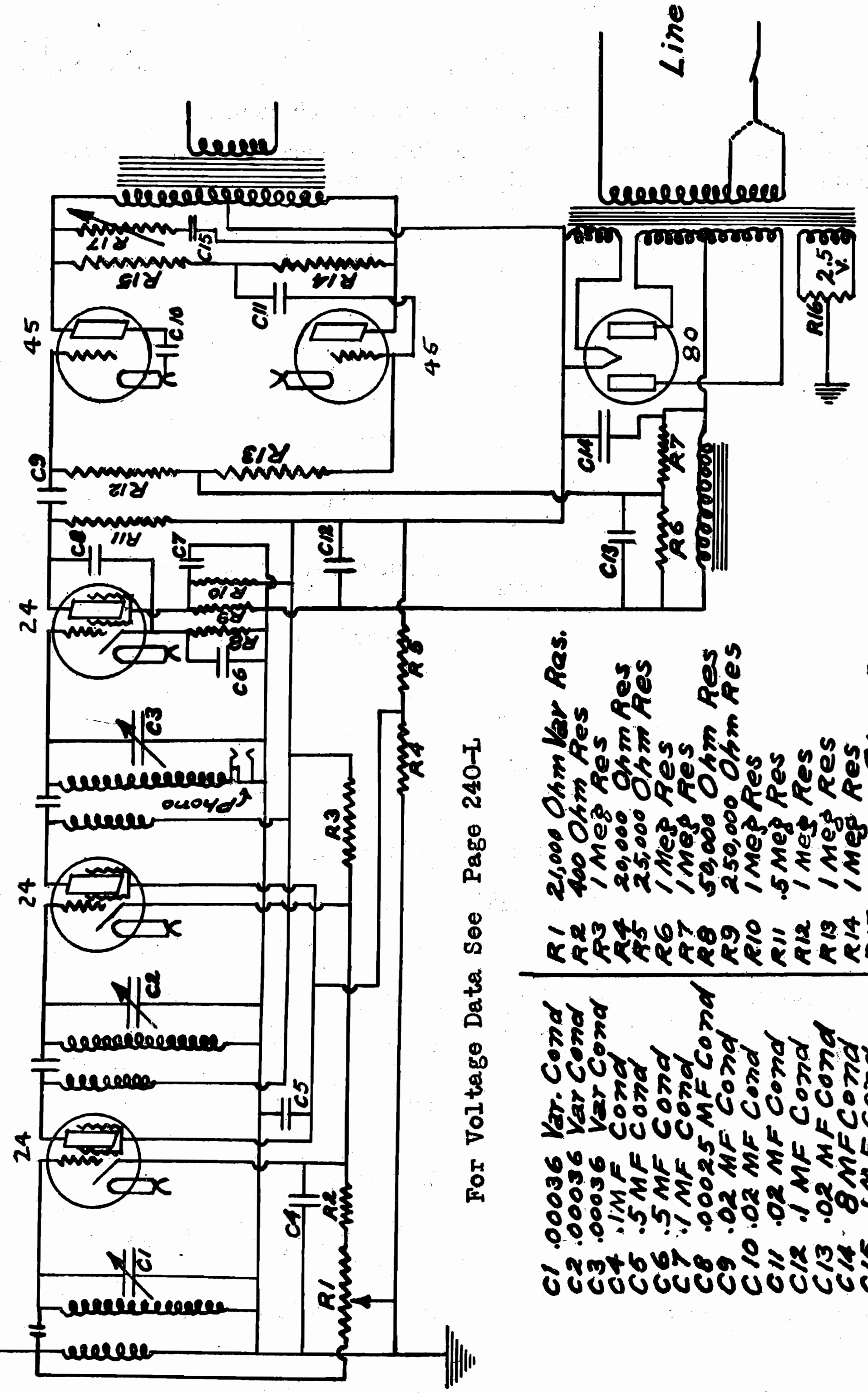




ECHOPHONE RADIO MFG. CO. LTD.

ECHOPHONE - Model F

The bias for the 45 tubes is obtained through a one megohm resistor connected to the midpoint of the two resistors across the dynamic speaker field which is in the negative lead.



For Voltage Data See Page 240-L

C1 .00036 Var. Cond	R1 21,000 Ohm Var Res.
C2 .00036 Var Cond	R2 400 Ohm Res
C3 .00036 Var Cond	R3 1 Meg Res
C4 .1 MF Cond	R4 20,000 Ohm Res
C5 .5 MF Cond	R5 25,000 Ohm Res
C6 .5 MF Cond	R6 1 Meg Res
C7 .1 MF Cond	R7 1 Meg Res
C8 .00025 MF Cond	R8 50,000 Ohm Res
C9 .02 MF Cond	R9 250,000 Ohm Res
C10 .02 MF Cond	R10 1 Meg Res
C11 .02 MF Cond	R11 .5 Meg Res
C12 .1 MF Cond	R12 1 Meg Res
C13 .02 MF Cond	R13 1 Meg Res
C14 8 MF Cond	R14 1 Meg Res
C15 .1 M.F. Cond.	R15 250,000 Ohm Res
	R-16 20 Ohm C.T. Res
	R17 15,000 Ohm Var Res

The filter circuit consists of an 8 M. F. electrolytic condenser and the 1500 ohm field of the dynamic speaker. The hum balance is used in connection with the bias resistors of the 45 tubes, a condenser of proper capacity being connected from the midpoint of these resistors to ground.

ECHOPHONE RADIO MFG. CO. LTD.

Model "F"

VOLTAGE TESTS

Voltages given are tested on 250 volt scale of 1000 ohms per volt meter.

All voltage tests were made with volume control on full and tone control in off position, no signal in receiver, line voltage 115 volts. Speaker must be connected to receiver.

R. F. Plate	
Low	210 volts
Normal	220 "
High	230 "
R. F. Screen	
Low	75 volts
Normal	80 "
High	90 "
R. F. Cathode	1.5 to 2.5 volts
Detector Plate	
Low	55 volts
Normal	65 "
High	75 "
Detector Screen	
Low	25 volts
Normal	30 "
High	35 "
Detector Cathode	3 to 6 volts
245 Plate	
Low	210 volts
Normal	220 "
High	230 "
245 Bias	20 to 40 volts
280 Filament	4.5 to 5.2 volts
Filaments for all 2.5 Volt Tubes	2.2 to 2.5 volts
Speaker Field Voltage Drop	90 to 110 volts

Model 40 Echoette

VOLTAGE TESTS

All voltages given were tested on 250 volt scale of 1000 ohms per volt meter.

All voltage tests were made with volume on full and no signal in receiver, line voltage 115 volts with A. C. line connected to tap of transformer as shipped from factory.

247 Plate to ground
230 to 250 volts

247 Screen to ground
240 to 260 volts

247 Grid to ground
6 to 8 volts

Det. Plate to ground
25 to 35 volts

Det. Screen to ground
30 to 40 volts

Det. Bias cathode to ground
7 to 9 volts

R. F. Plate to ground
240 to 260 volts

R. F. Screen to ground
70 to 85 volts

R. F. Bias—Cathode to ground
2.5 to 3.5 volts

Filament All 2.5 volt tubes
2.4 to 2.6

Filament 280 tube
4.8 to 5 volts

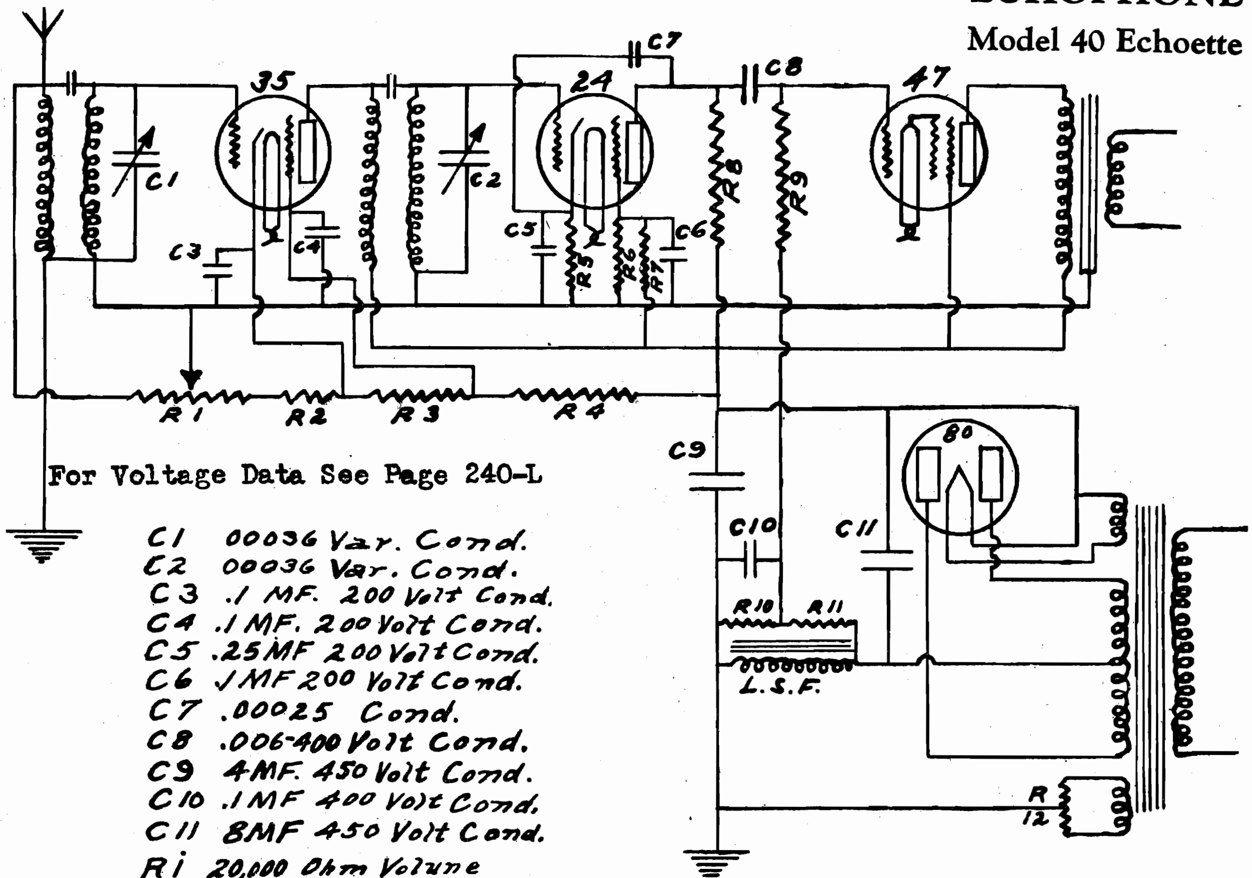
R. F. Cathode volume control in off position
40 to 50 volts

Voltage across speaker field
90 to 110 volts.

ECHOPHONE RADIO MFG. CO. LTD.

ECHOPHONE

Model 40 Echoette



For Voltage Data See Page 240-L

C1 00036 Var. Cond.
C2 00036 Var. Cond.
C3 .1 MF. 200 Volt Cond.
C4 .1 MF. 200 Volt Cond.
C5 .25 MF 200 Volt Cond.
C6 .1 MF 200 Volt Cond.
C7 .00025 Cond.
C8 .006-400 Volt Cond.
C9 4 MF. 450 Volt Cond.
C10 .1 MF 400 Volt Cond.
C11 8 MF 450 Volt Cond.
R1 20,000 Ohm Volume Control With R2 300 Ohm Fixed Bias
R3 35000 Ohm .5 Watt
R4 50000 Ohm 1 Watt
R5 50000 Ohm 1 Watt
R6 .5 Meg 1 Watt
R7 1 Meg .5 Watt
R8 1.5 Meg .5 Watt
R9 .5 Meg 1 Watt
R10 .2 Meg .5 Watt
R11 1 Meg .5 Watt
R12 20 Ohm C.T. Resistor

All Resistors +- 10% Unless Otherwise Specified

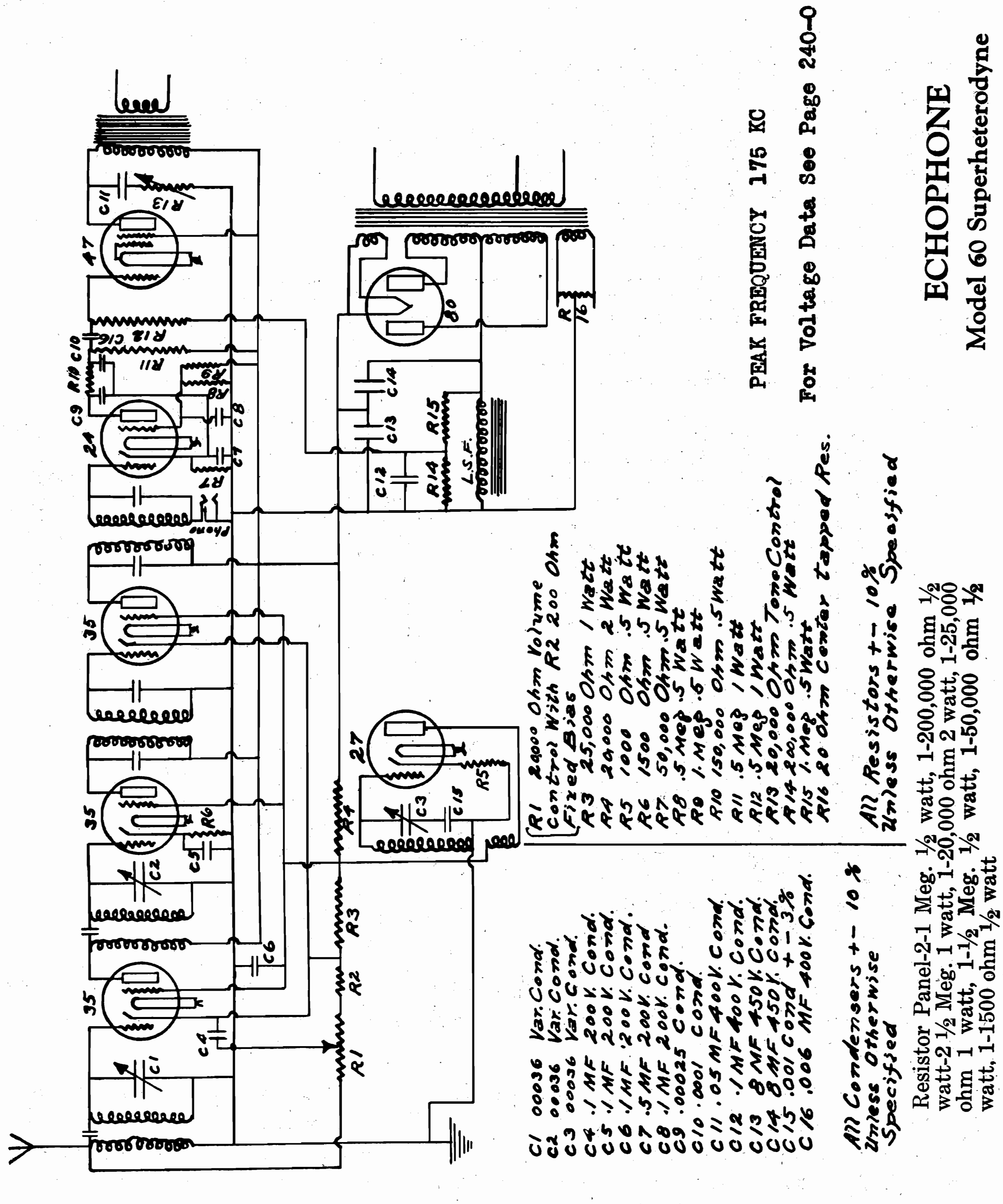
All Cond. +- 10% Unless Otherwise Specified

In the later models the speaker field is in the negative lead and part of the drop across it is used to bias the grid of the power tube. A bucking coil is used in the speaker to keep the field ripple out of the voice coil.

The R. F. stage is impedence coupled and there is a small coupling condenser fastened on the lower end of the R. F. coil. If the set is weak or oscillates at the high frequency end of the band a slight adjustment of this condenser will remedy the trouble. After adjusting this condenser the gang condenser should be checked for alignment with the rotor plates nearly open.

The filter circuit consists of an 8 M. F. and 4 M. F. electrolytic condenser and the 2000 ohm speaker field. The speaker field is in the positive lead and the power tube is self biased by a resistor from the filament circuit to ground. This resistor is by-passed by an 8 M. F. condenser.

ECHOPHONE RADIO MFG. CO. LTD



The filter circuit consists of two 8 MF electrolytic condensers and the 1500 ohm speaker field. The hum balance circuit is used in connection with the power tube bias resistors. The speaker field is in the negative lead and part of the voltage drop across it is used for biasing the power tube. A bucking coil is used in the speaker to keep the field ripple out of the voice coil.

ECHOPHONE RADIO MFG. CO. LTD.

VOLTAGE TESTS

All voltages given were tested on a 250 volt scale of 1000 ohms per volt meter.

All voltage tests were made with volume on full, and tone control in off position, no signal in receiver, line voltage 115 volts with A. C. line connected to tap of transformer as shipped from factory.

Model 60 Superheterodyne

First Det. Plate to ground
230 to 250 volts

First Det. Screen to ground
70 to 80 volts

First Det. Bias—Cathode to ground
4 to 6 volts

Oscillator Plate to ground
70 to 80 volts

Oscillator Bias—Cathode to ground
4 to 6 volts

R.F. & I.F. Bias with volume control in off position
40 to 50 volts

Filament for all 2.5 volt tubes
2.4 to 2.6 volts

Filament of 280 tube
4.8 to 5 volts

Voltage across speaker field
80 to 90 volts

247 Plate to ground
230 to 245 volts

247 Screen to ground
230 to 250 volts

247 Bias grid to ground
6 to 8 volts

Second Det. Plate to ground
35 to 45 volts

Second Det. screen to ground
30 to 40 volts

Second Det. Bias—Cathode to ground
7 to 9 volts

R.F. & I.F. Plate to ground
230 to 250 volts

R.F. & I.F. Screen to ground
70 to 80 volts

R.F. & I.F. Bias—Cathode to ground
2.5 to 3.5 volts

Model 80 Superheterodyne

First Det. Plate to ground
230 to 245 volts

First Det. Screen to ground
70 to 80 volts

First Det. Bias—Cathode to ground
4 to 6 volts

Oscillator plate to ground
70 to 80 volts

Oscillator Bias Cathode to ground
4 to 6 volts

R.F. & I.F. Bias with volume control in off position
40 to 50 volts

Filament for all 2.5 volt tubes
2.4 to 2.6 volts

Filament of 280 tube
4.8 to 5 volts

Voltage across speaker field
90 to 110 volts

247 Plate to ground
225 to 235 volts

247 Screen to ground
230 to 245 volts

247 Bias—Center Tapped resistor to ground
16 to 18 volts

Second Det. Plate to ground
30 to 40 volts

Second Det. Screen to ground
25 to 35 volts

Second Det. Bias—Cathode to ground
7 to 9 volts

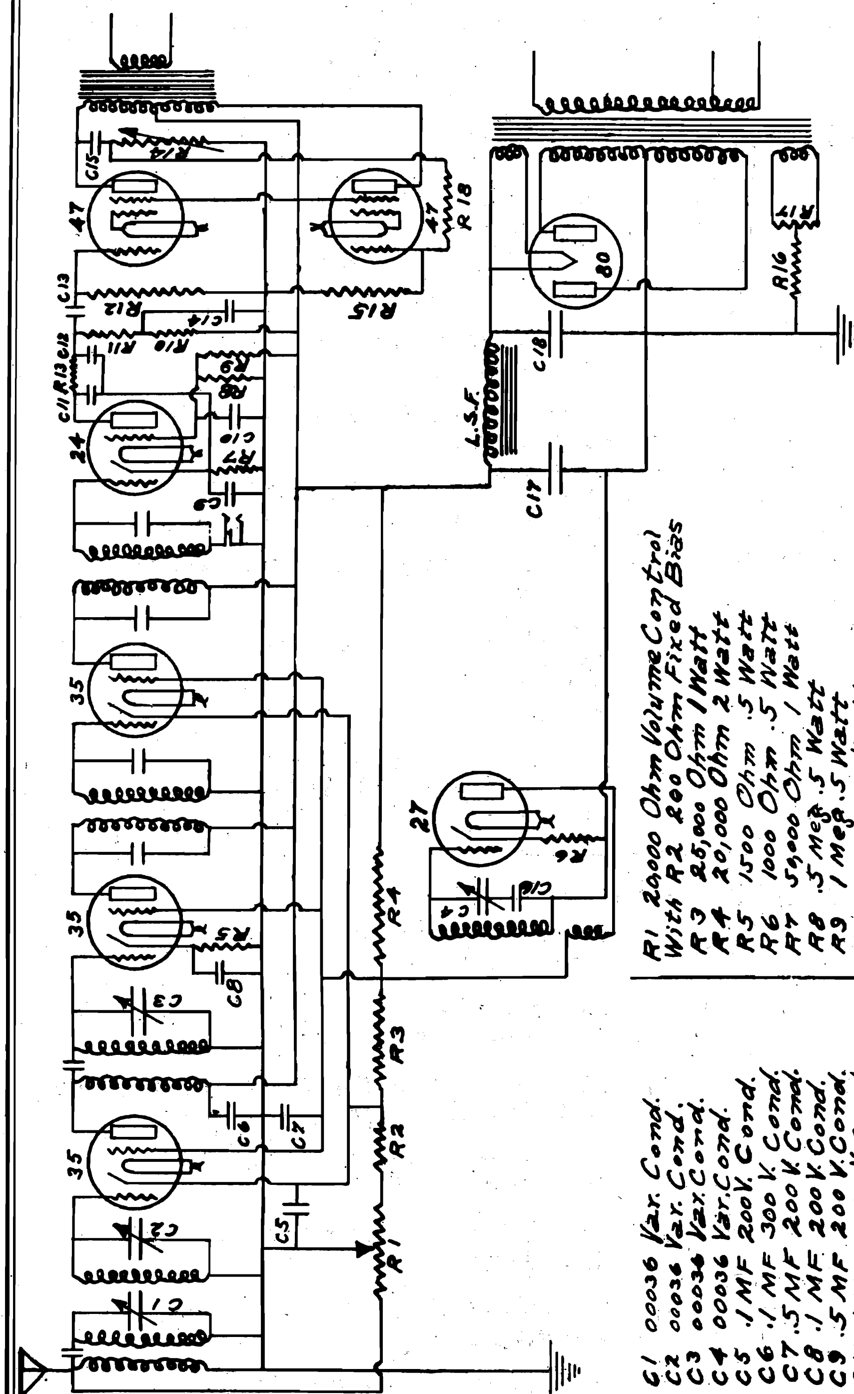
R.F. & I.F. Plate to ground
230 to 245 volts

R.F. & I.F. Screen to ground
70 to 80 volts

R.F & I.F. Bias—Cathode to ground
2.5 to 3.5 volts

ECHOPHONE RADIO MFG. CO. LTD.

The volume control acts as a dual control by varying the bias on the RF and IF tubes and by varying the antenna input to the antenna stage.



C1 .00036 Var. Cond.
C2 .00036 Var. Cond.
C3 .00036 Var. Cond.
C4 .00036 Var. Cond.
C5 .1 MF 200 V. Cond.
C6 .1 MF 300 V. Cond.
C7 .5 MF 200 V. Cond.
C8 .1 MF 200 V. Cond.
C9 .5 MF 200 V. Cond.
C10 .1 MF 200 V. Cond.
C11 .00025 Cond.
C12 .0001 Cond.
C13 .006 MF 400 V. Cond.
C14 .1 MF 200 V. Cond.
C15 .05 MF 400 V. Cond.
C16 .001 Cond. +- 3%
C17 4 MF 450 V. Cond.
C18 8 MF 450 V. Cond.

All Cond. +- 10%
Unless Otherwise Specified.

R1 20000 Ohm Volume Control
With R2 200 Ohm Fixed Bias
R3 25,000 Ohm 1 Watt
R4 20,000 Ohm 2 Watt
R5 1500 Ohm .5 Watt
R6 1000 Ohm .5 Watt
R7 50,000 Ohm 1 Watt
R8 .5 Meg .5 Watt
R9 1 Meg .5 Watt
R10 .5 Meg .5 Watt.
R11 .5 Meg. .5 Watt
R12 .5 Meg. .5 Watt
R13 150,000 Ohm .5 Watt
R14 20,000 Ohm Tone Control
R15 10,000 Ohm .5 Watt
R16 250 Ohm 2 Watt
R17 20 Ohm Center Tapped Res
R18 .25 Meg 1 Watt

All Resistors +- 10%
Unless Otherwise Specified.

Resistor Panel-4-½ Meg. ½ Watt
1-10,000 Ohm ½ Watt, 1-250,000 Ohm 1 Watt
1-1 Meg. ½ Watt, 1-20,000 Ohm 2 Watt
1-25,000 Ohm 1 Watt, 1-250 Ohm 2 Watt
1-50,000 Ohm 1 Watt

PEAK FREQUENCY 175 KC

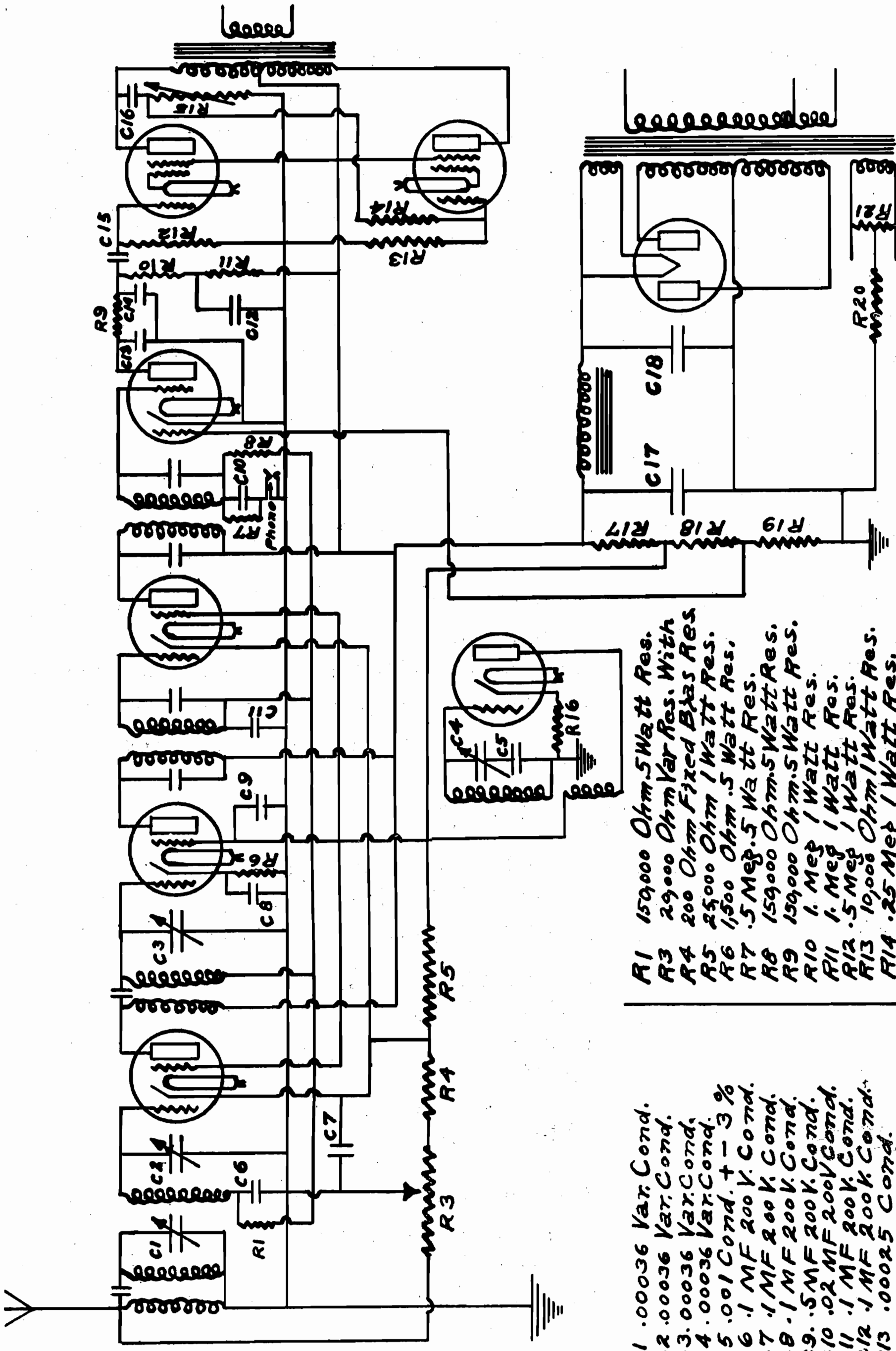
For Voltage Data See Page 240-O

ECHOPHONE

Model 80 Superheterodyne

The filter circuit consists of an 8 MF and a 4 MF electrolytic condenser and the 1200 ohm speaker field. The field is in the positive lead and the output tubes are self-biased by a resistor between the filament circuit and ground. A bucking coil is used in the speaker to keep the field ripple out of the voice coil.

ECHOPHONE RADIO MFG. CO. LTD.



C1 .00036 Var. Cond.
C2 .00036 Var. Cond.
C3. .00036 Var. Cond.
C4 .00036 Var. Cond.
C5 .001 Cond. +− 3%
C6 .1 MF 200 V. Cond.
C7 .1 MF 200 V. Cond.
C8 .1 MF 200 V. Cond.
C9. .5 MF 200 V. Cond.
C10 .02 MF 200 V Cond.
C11 .1 MF 200 V. Cond.
C12 .1 MF 200 V. Cond.
C13 .00025 Cond.
C14 .0001 Cond.
C15 .02 MF 400 V. Cond.
C16 .05 MF 400 V. Cond.
C17 8 MF 450 V. Cond.
C18 12 MF 450 V. Cond.

All Condensers +− 10% Unless Otherwise Specified

R1 150,000 Ohm .5 Watt Res.
R3 29,000 Ohm Var. Res. With
R4 200 Ohm Fixed Bias Res.
R5 25,000 Ohm 1 Watt Res.
R6 1,500 Ohm .5 Watt Res.
R7 .5 Meg. .5 Watt Res.
R8 150,000 Ohm .5 Watt Res.
R9 150,000 Ohm .5 Watt Res.
R10 1. Meg 1 Watt Res.
R11 1. Meg 1 Watt Res.
R12 .5 Meg 1 Watt Res.
R13 10,000 Ohm 1 Watt Res.
R14 .25 Meg 1 Watt Res.
R15 20,000 Ohm Tone Control
R16 1,000 Ohm .5 Watt Res.
R17 15,000 Ohm 1 Watt Res.
R18 50,000 Ohm 1 Watt Res.
R19 2,000 Ohm 1 Watt Res.
R20 250 Ohm 2 Watt Res.
R21 20 Ohm Center Tapped Res.

All Resistors +− 10% Unless Otherwise Specified

Resistor Panel .5 Meg 1 Watt, 1; 10,000 Ohm 1 Watt, 1; .25 Meg 1 Watt, 1; 250 Ohm 2 Watt, 1; 1 Meg 1 Watt, 2; 15,000 Ohm 1 Watt, 1; 2,000 Ohm 1 Watt, 1

PEAK FREQUENCY=175 KC

ECHOPHONE
Model 90 Superheterodyne

The Echophone, Model 90, is an 8-tube Superheterodyne, employing variable MU and Pentode Tubes.

The circuit consists of a pre-selector; one stage of high gain R.F. amplification using a type 235 tube; a first detector using a type 235 tube; one stage of intermediate frequency amplification using a type 235 tube; a second detector using a type 235 tube; a single audio stage using two type 247 Pentode tubes in a resistance coupled push-pull circuit; an oscillator using a type 227 tube, and a power supply system using a type 280 tube.

The antenna and pre-selector coils are mounted on top of the chassis, and are tuned by the first and second sections of the gang condenser.

ECHOPHONE RADIO MFG. CO: LTD

Model 90—Superheterodyne

The first detector is of the grid biased type. The second detector is a type 235 tube used as a space charge detector. In this system, the screen grid is used as a control grid and a small positive voltage is applied to the top grid which is normally used as the control grid. A grid leak and condenser are used in the control grid circuit, and the negative voltage developed across the grid leak when strong signals are received is fed back to the R.F., first detector and I.F. grids which gives the semi-automatic volume control, and prevents overloading of the second detector. A phonograph pickup jack is incorporated in the grid return of this tube.

The R.F. Circuit is a high gain impedence coupled type with capacity coupling condenser mounted on coil. This condenser should require no adjustment after leaving factory. The fourth section of variable condenser tunes the R.F. circuit.

The oscillator circuit is of the conventional tuned grid type with plate feed back, and is inductively coupled to the grid circuit of the R.F. stage.

The intermediate frequency amplifier has a total of four tuned circuits, and is adjusted to 175 K.C.

The volume control acts as a dual control by varying the bias on the R.F. and I.F. tubes, and by varying the antenna input to the antenna coil.

The filter circuit consists of an 8 MF and a 12 MF electrolytic condenser, and the 1200 ohm speaker field. The field is in the positive lead, and the power tubes are self-biased by a resistor from the filament circuit to ground. A bucking coil is used in the speaker to keep the field ripple out of the voice coil.

VOLTAGE TESTS

All voltages given were tested on 250-volt scale of 1000 ohms per volt meter. All voltage tests made with volume on full and tone control in off position, no signal in receiver, line voltage 115 volts with A.C. line connected to tap of transformer as shipped from factory.

247 Plate to ground
230 to 240 volts

247 Screen to ground
235 to 250 volts

247 Bias-Center tap resistor to ground
13 to 18 volts

Second Det. Plate to ground
20 to 30 volts

Second Det. Screen Grid to ground
Less than 1 volt negative

Second Det. Control Grid to ground
1 to 2 volts

I.F. Plate to ground
235 to 250 volts

I.F. Screen to ground
70 to 90 volts

I.F. Cathode to ground
2 to 4 volts

R.F. Plate to ground.
235 to 250 volts

R.F. Screen to ground
70 to 90 volts

R.F. Cathode to ground
2 to 4 volts

First Det. Plate to ground
235 to 250 volts

First Det. Screen to ground
70 to 90 volts

First Det. Cathode to ground
4 to 7 volts

Oscillator Plate to ground
70 to 90 volts

Oscillator Cathode to ground
4 to 7 volts

Voltage drop across field
95 to 110 volts

Filament Voltage for all 2.5 volt tubes
2.4 to 2.6 volts

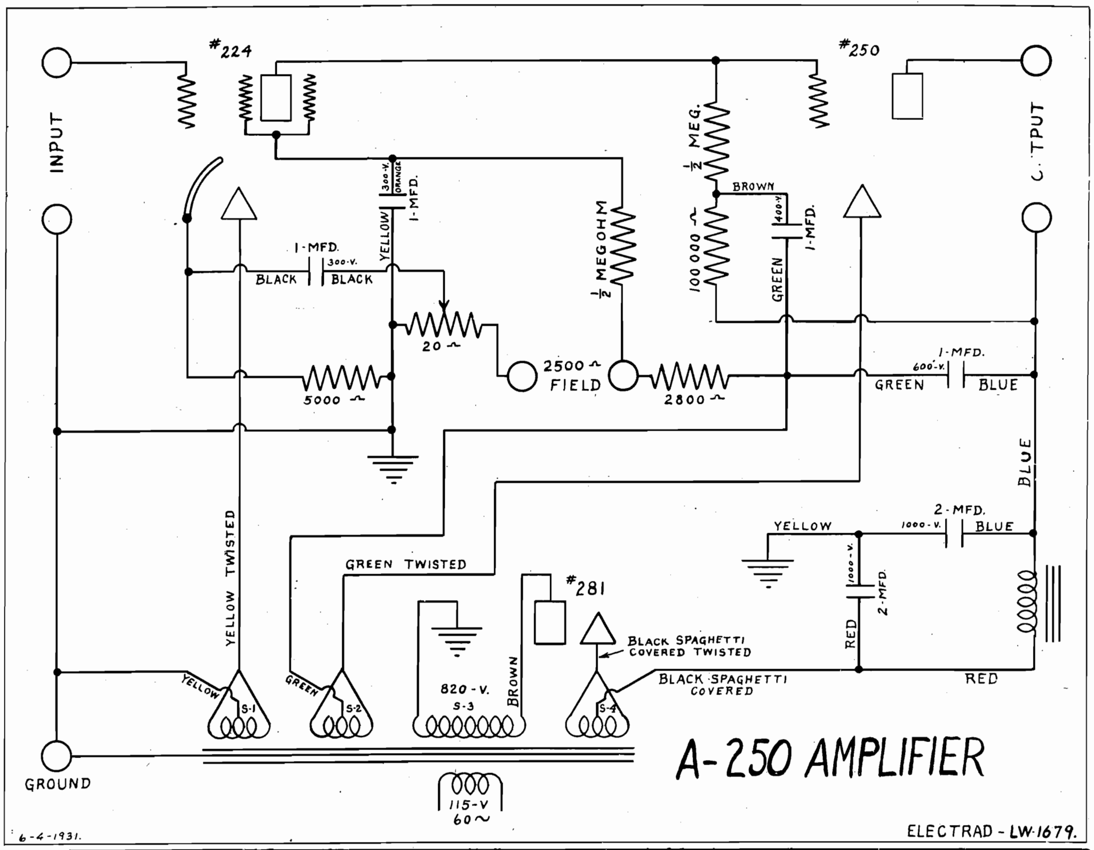
Filament Voltage for 280 tube
4.8 to 5 volts

R.F. and I.F. Cathode with volume control in off position
40 to 50 volts

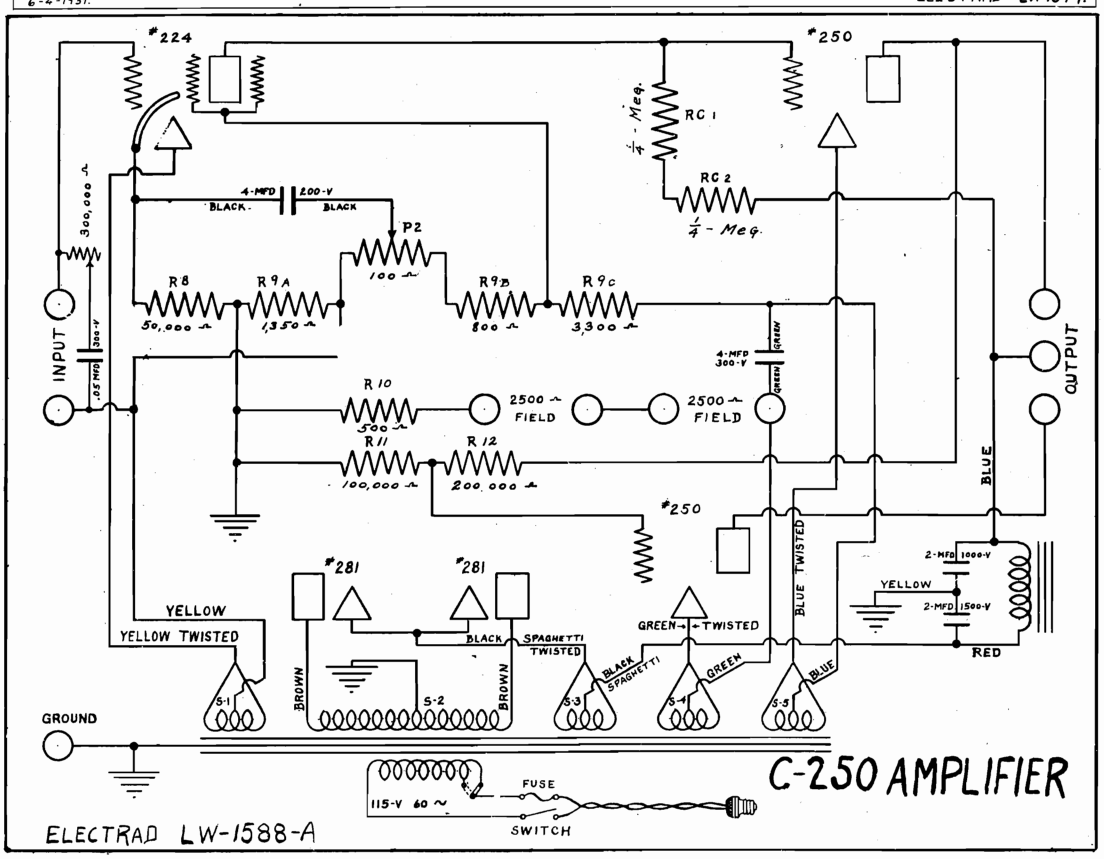
On very strong signals a small negative voltage can be measured between the R.F., I.F., and first detector grid returns and ground, due to the action of automatic volume control.

ELECTRAD INC.

MODEL A-250
MODEL C-250



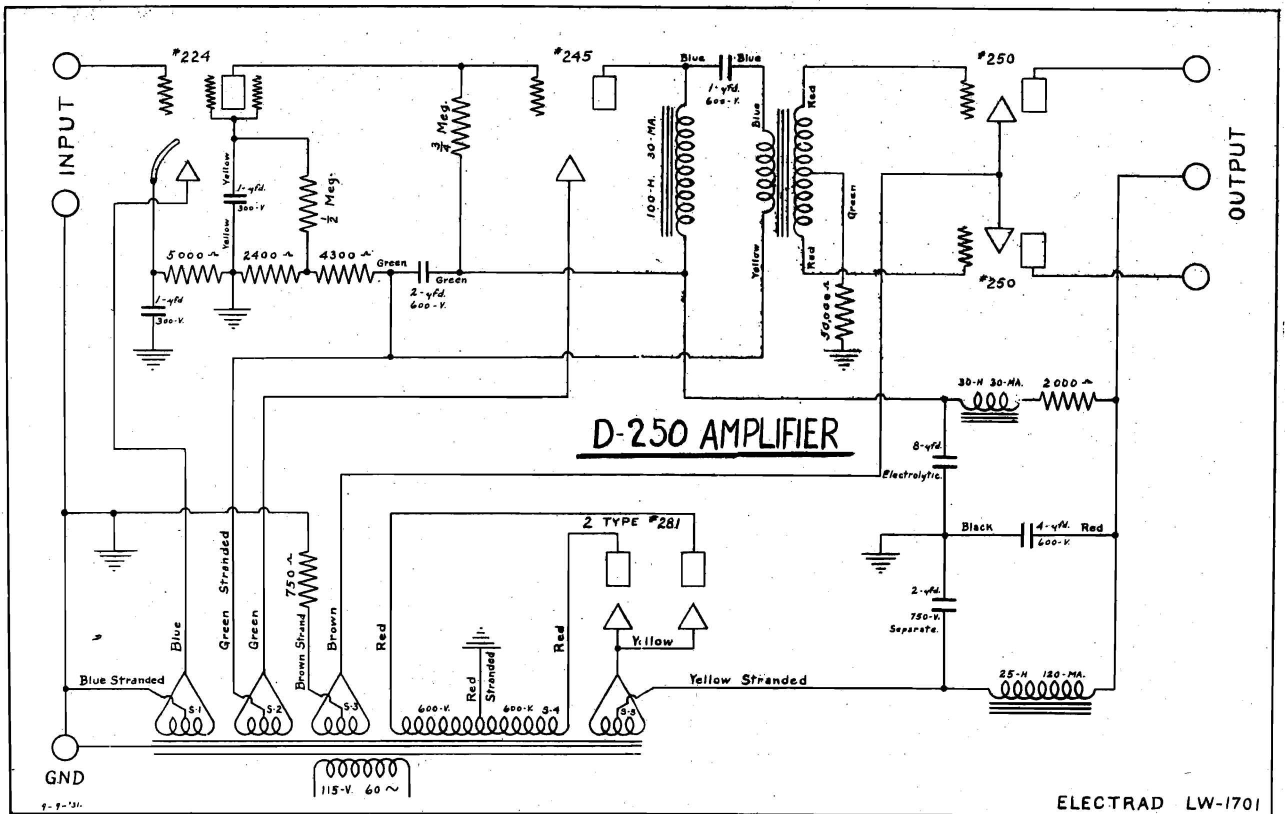
A-250 AMPLIFIER

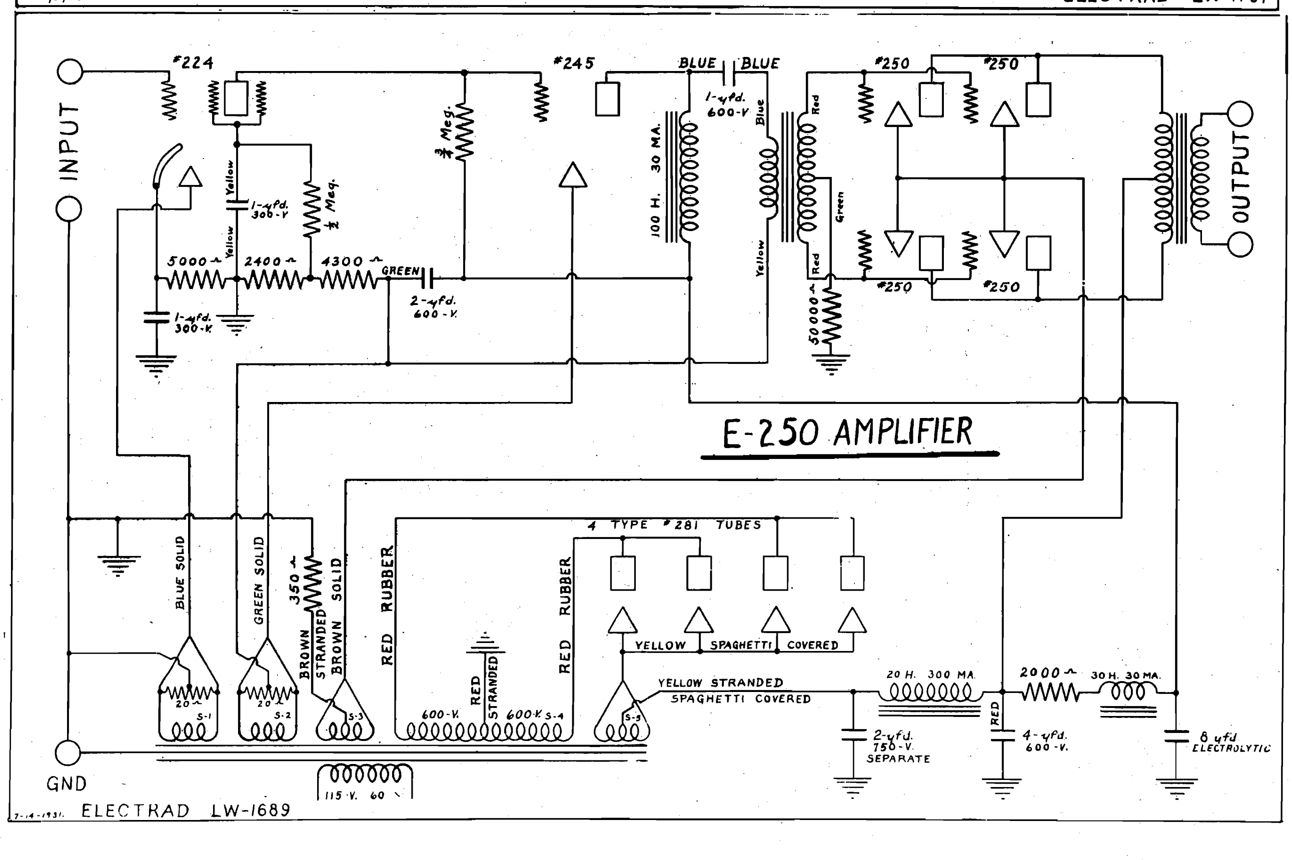


C-250 AMPLIFIER

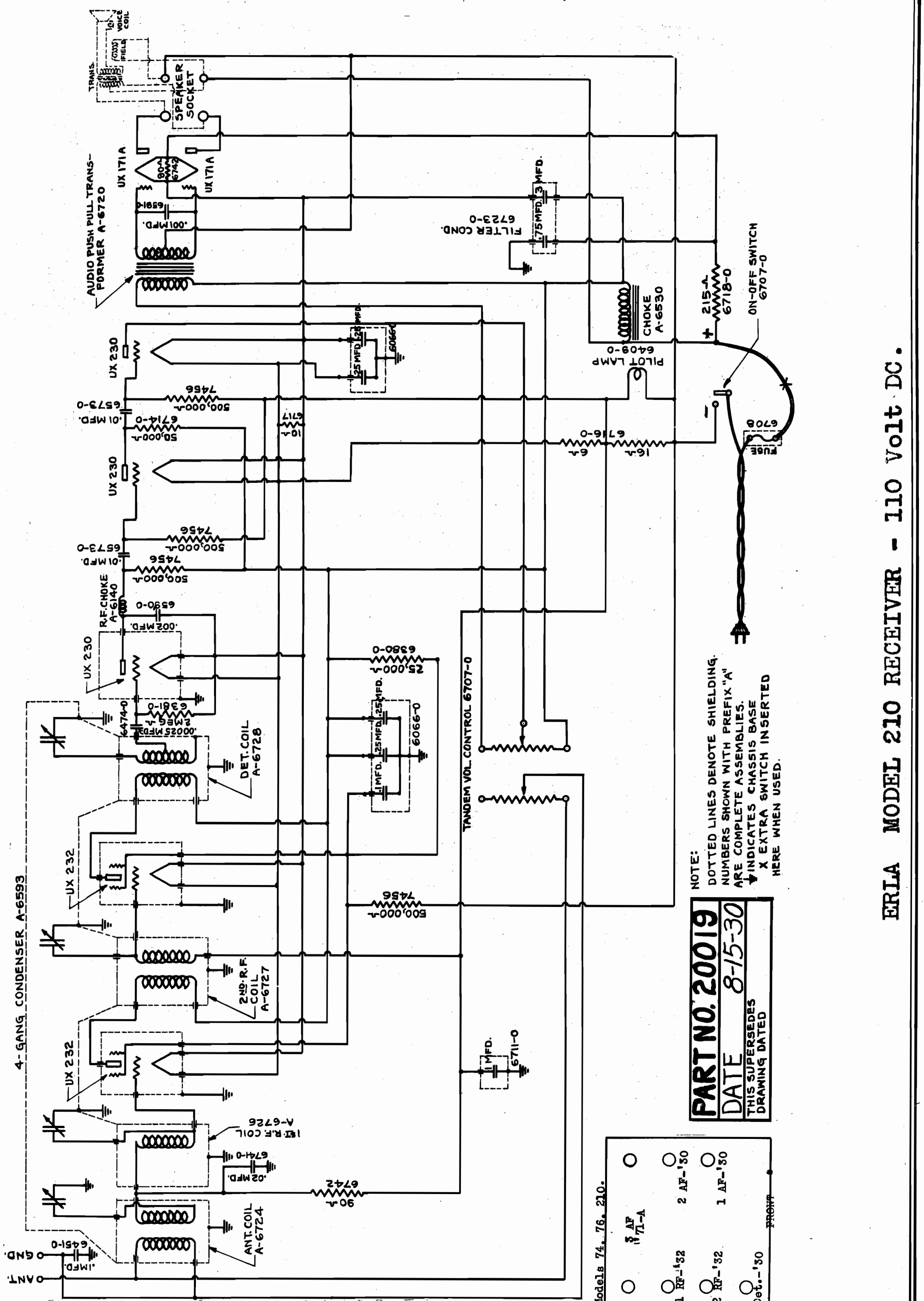
MODEL D-250
MODEL E-250

ELECTRAD INC.



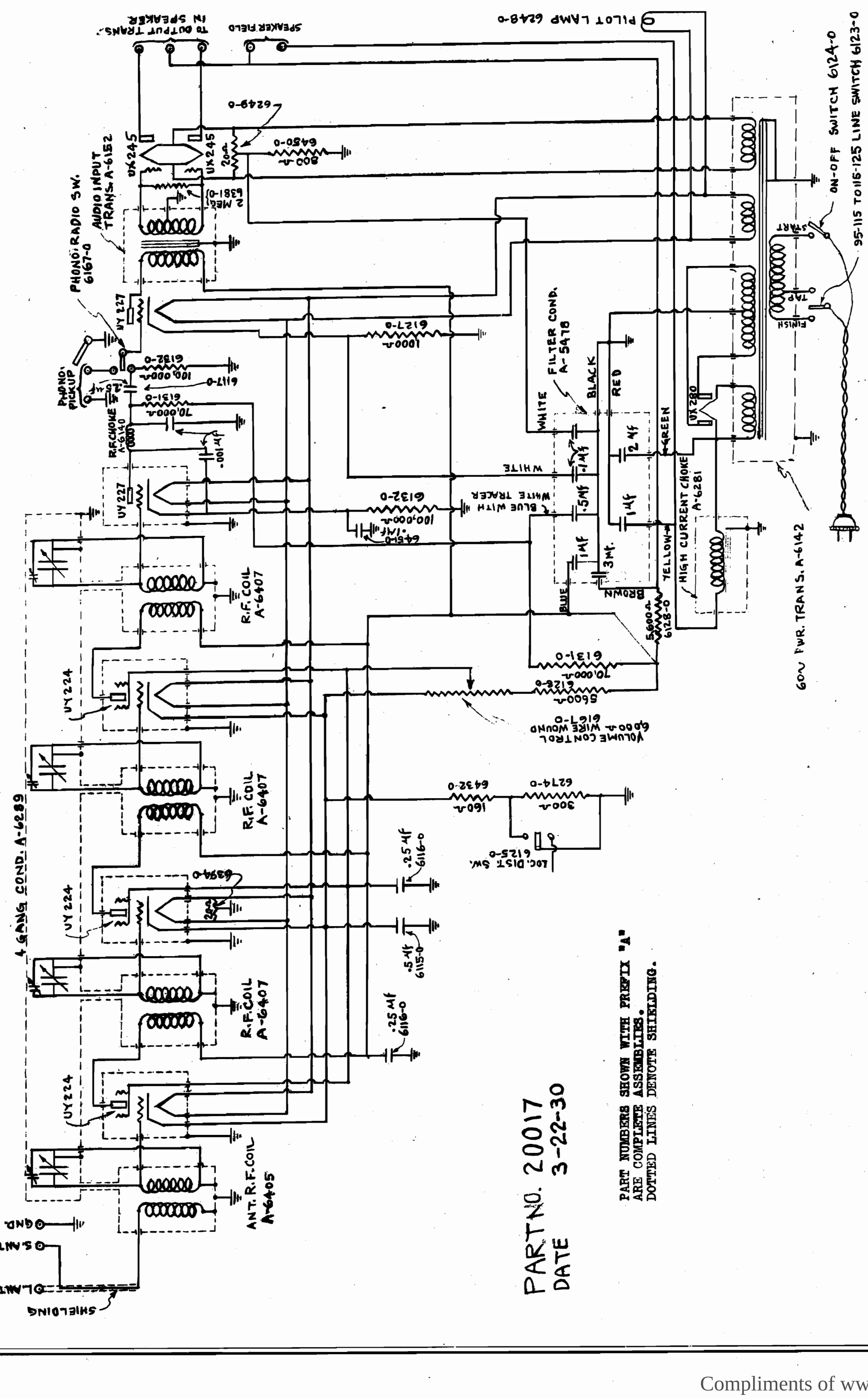


ELECTRICAL
RESEARCH LABORATORIES, Inc.



ELECTRICAL
RESEARCH LABORATORIES, Inc.

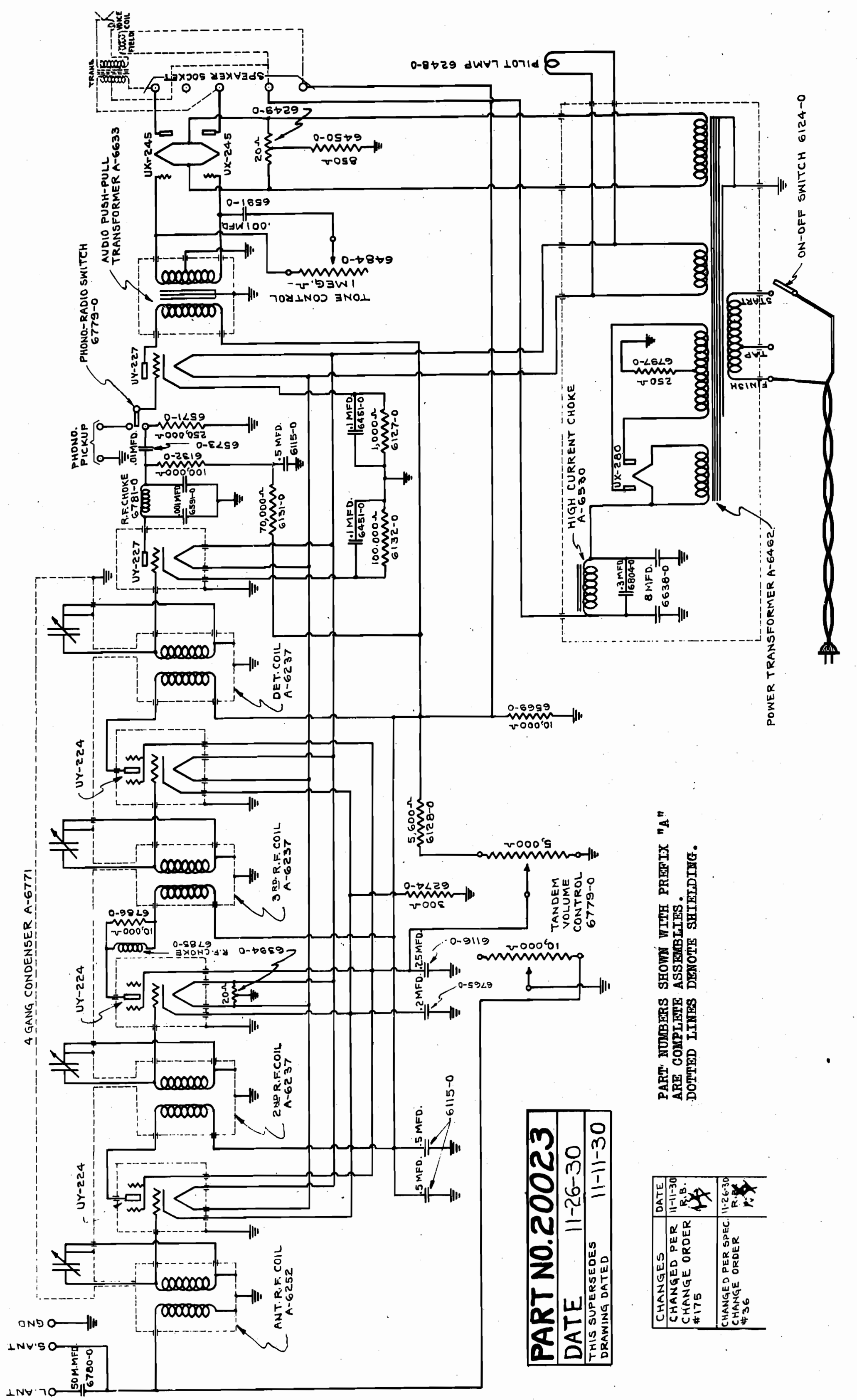
ERLA MODEL 224-B RECEIVER



PART NO. 20017
DATE 3-22-30

PART NUMBERS SHOWN WITH PREFIX "A" ARE COMPLETE ASSEMBLIES.
DOTTED LINES DENOTE SHIELDING.

ELECTRICAL RESEARCH LABORATORIES, Inc.



PART NUMBERS SHOWN WITH PREFIX "A" ARE COMPLETE ASSEMBLIES.
DOTTED LINES DENOTE SHIELDING.

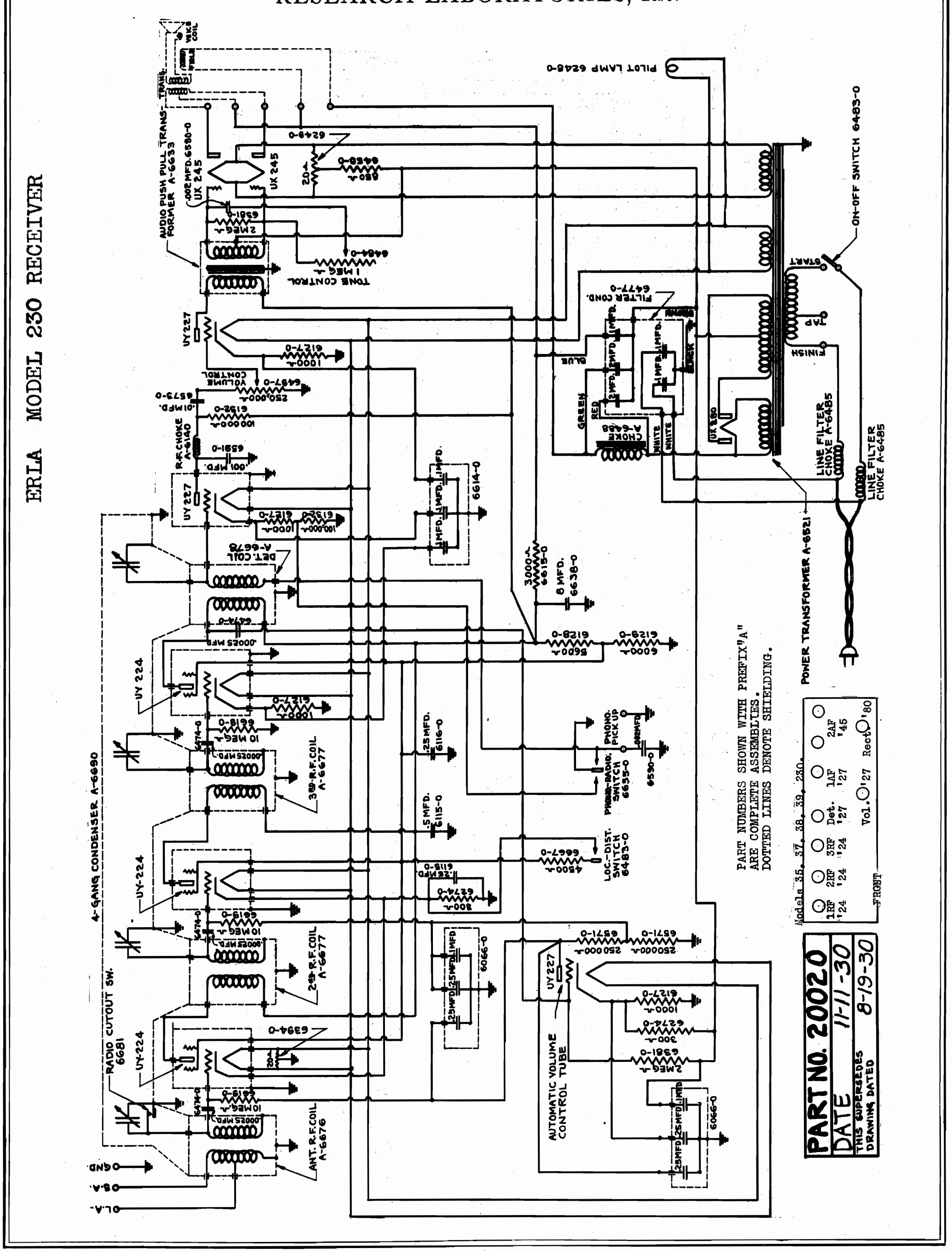
ERLA MODEL 225 RECEIVER

PART NO. 20023
DATE 11-26-30
THIS SUPERSEDES DRAWING DATED 11-11-30

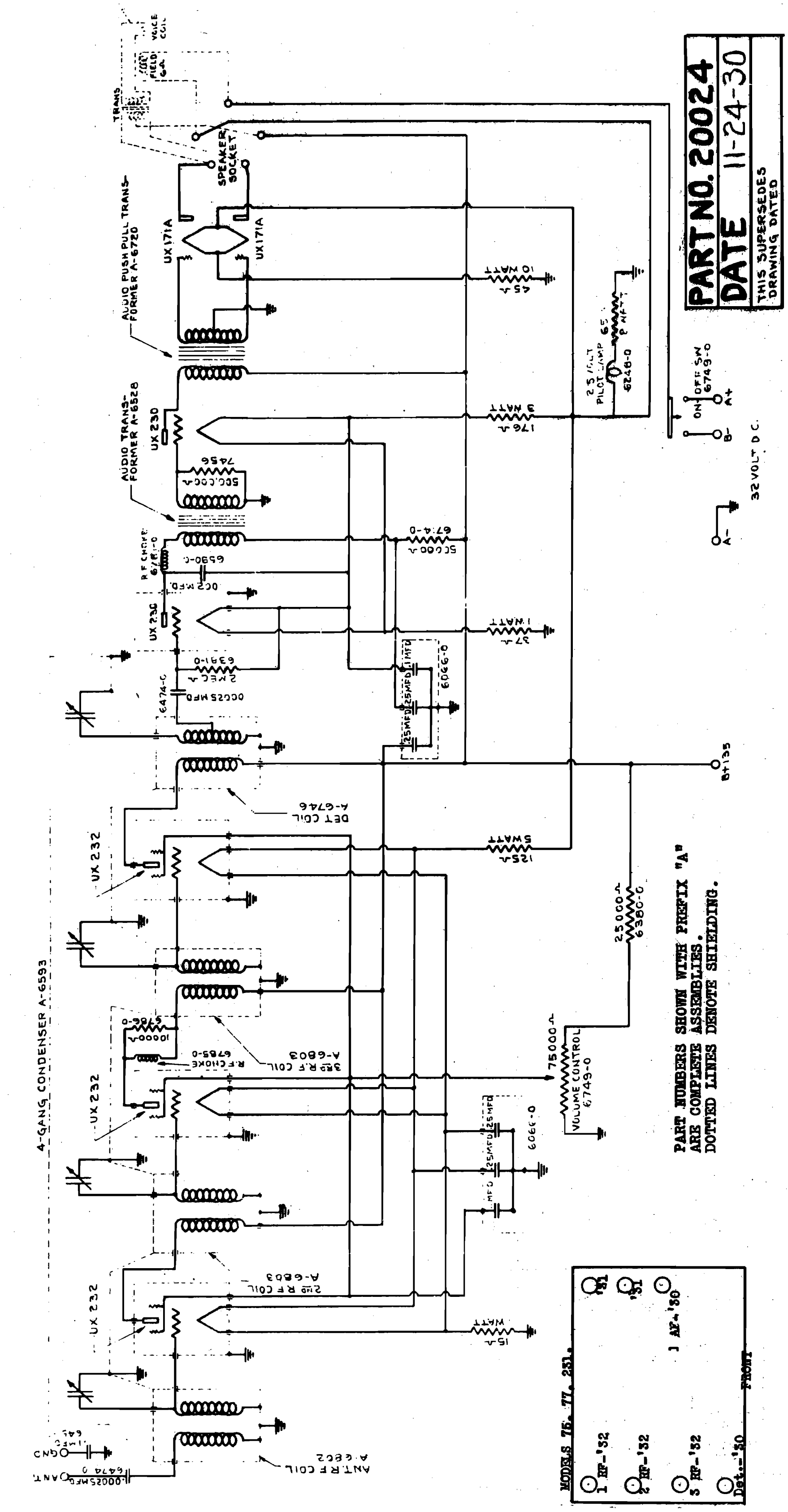
CHANGES	DATE
CHANGED PER CHANGE ORDER #175	11-11-30 R.B.
CHANGED PER SPEC. CHANGE ORDER #36	11-26-30 R.B.

ERLA MODEL 230 RECEIVER

ELECTRICAL
RESEARCH LABORATORIES, Inc.

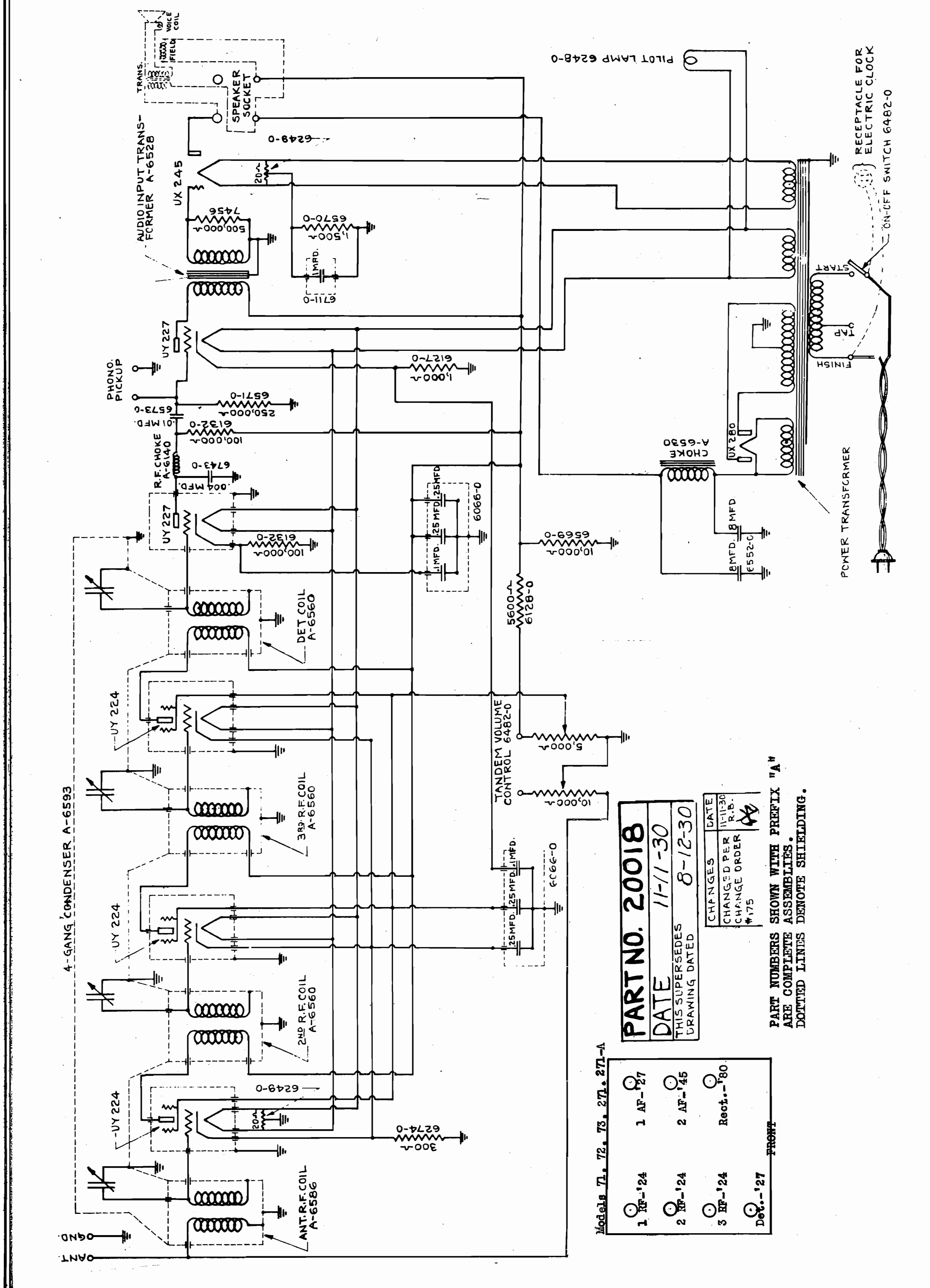


ELECTRICAL RESEARCH LABORATORIES, Inc.



ERLA MODEL 231 DC
For 32 volt operation.

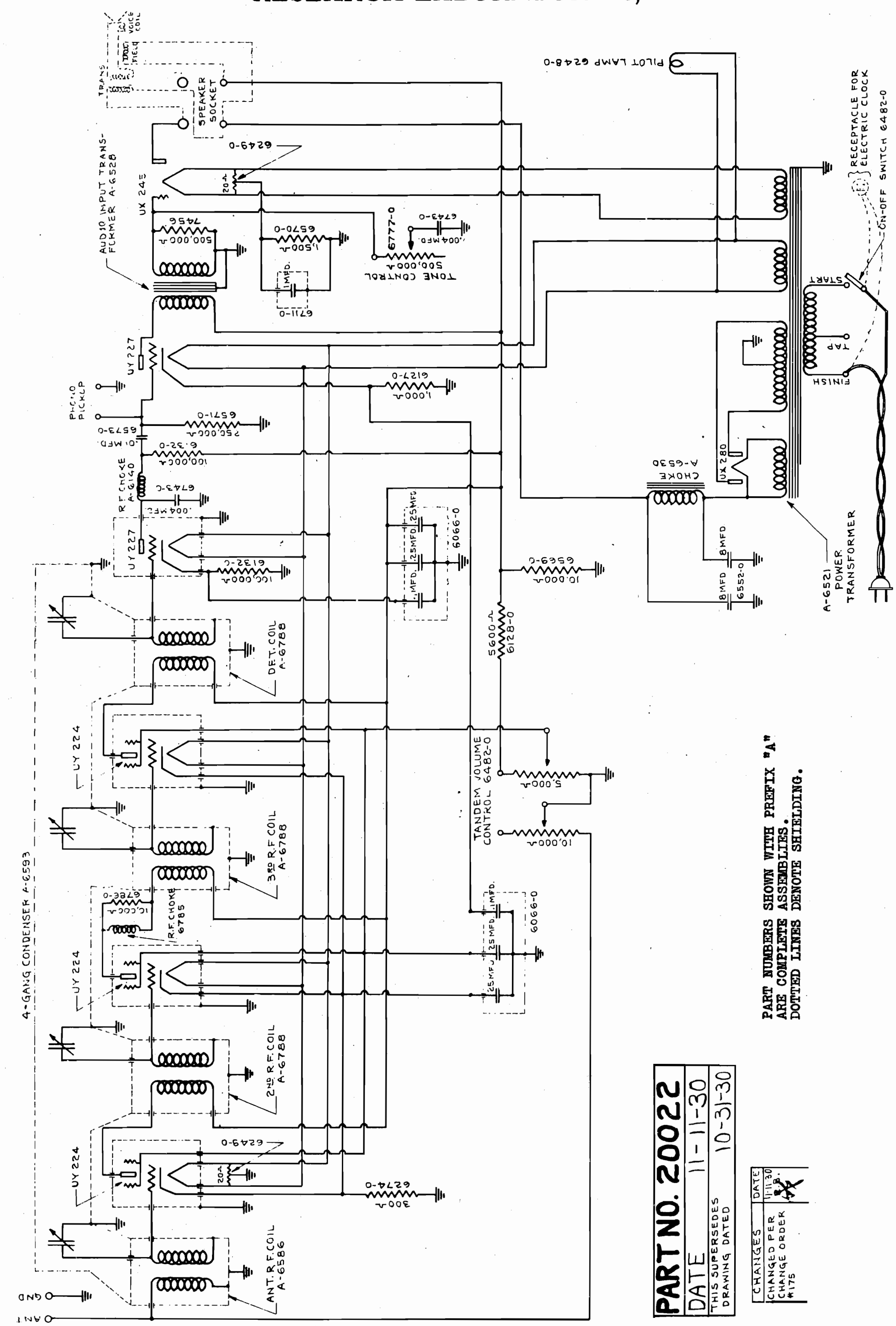
ELECTRICAL RESEARCH LABORATORIES, Inc.



ERLA MODEL 271 RECEIVER

ELECTRICAL RESEARCH LABORATORIES, Inc.

ERLA MODEL 271-A RECEIVER



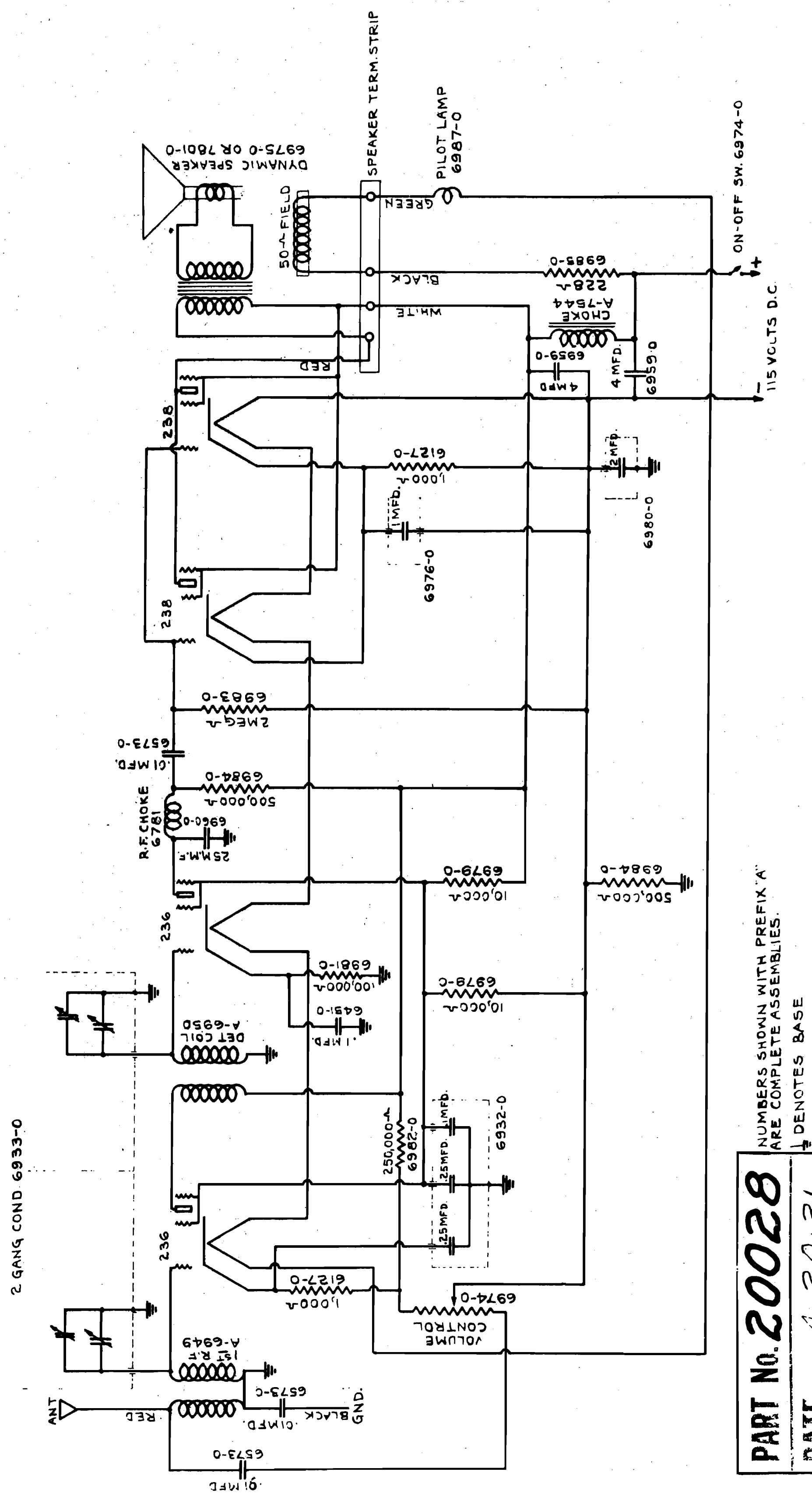
PART NUMBERS SHOWN WITH PREFIX "A" ARE COMPLETE ASSEMBLIES.
DOTTED LINES DENOTE SHIELDING.

PART NO. 20022	
DATE	11-11-30
THIS SUPERSEDES DRAWING DATED	10-31-30

CHANGES	DATE
CHANGED PER CHANGE ORDER #175	11-11-30

For socket layout refer to page 252-J.

ELECTRICAL RESEARCH LABORATORIES, Inc.



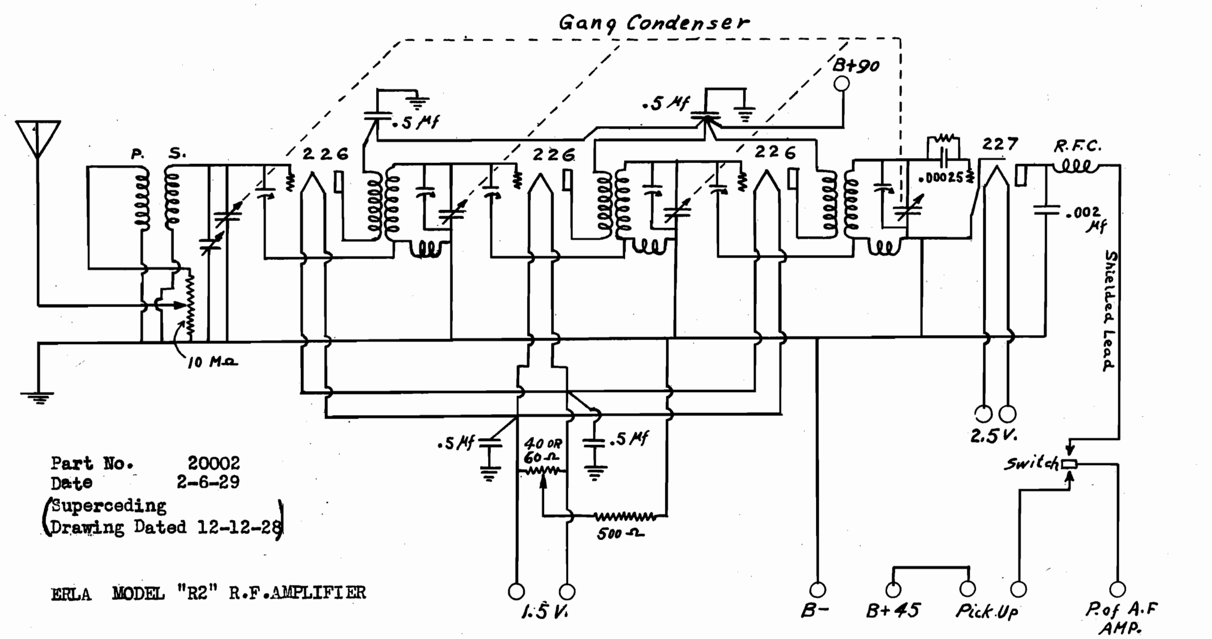
PART No. 20028

DATE 4-20-31

THIS SUPERSEDES DRAWING DATED

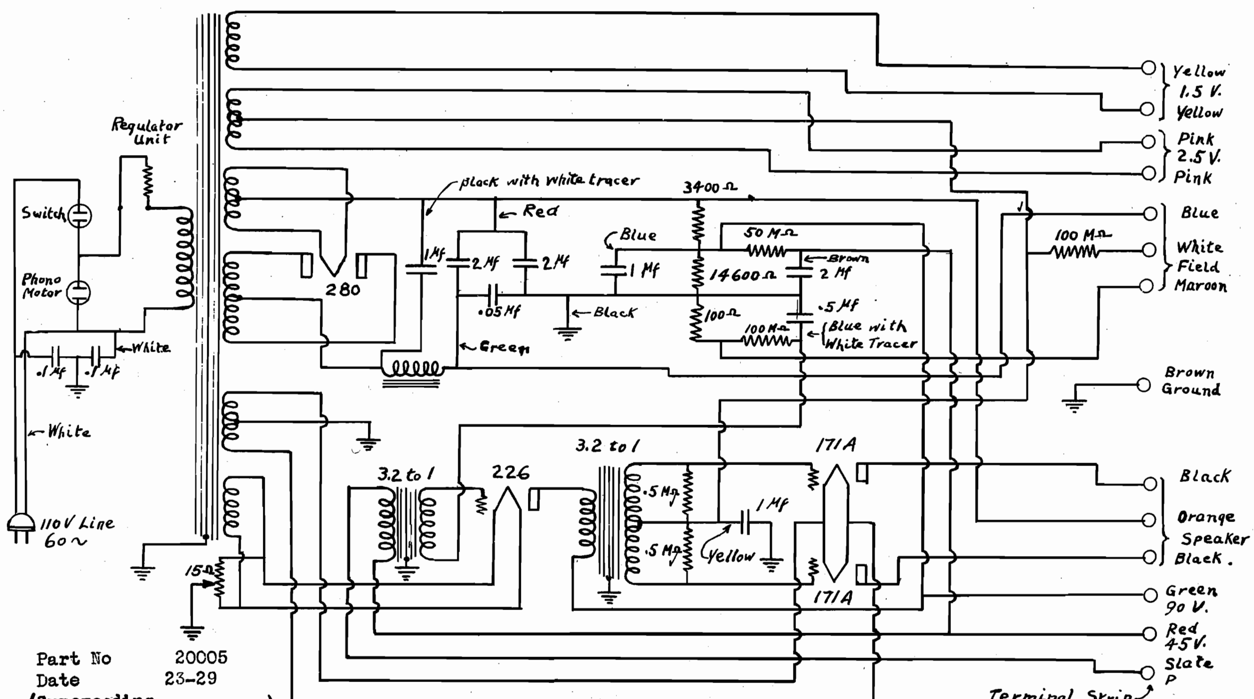
ERLA MODEL 336 RECEIVER

ELECTRICAL RESEARCH LABORATORIES, Inc.



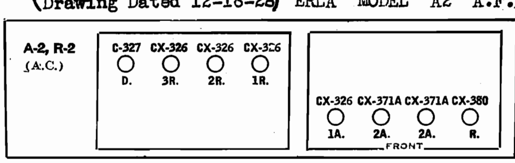
Part No. 20002
Date 2-6-29
(Superceding Drawing Dated 12-12-28)

ERLA MODEL "R2" R.F.AMPLIFIER



Part No 20005
Date 23-29
(Superceding Drawing Dated 12-18-28)

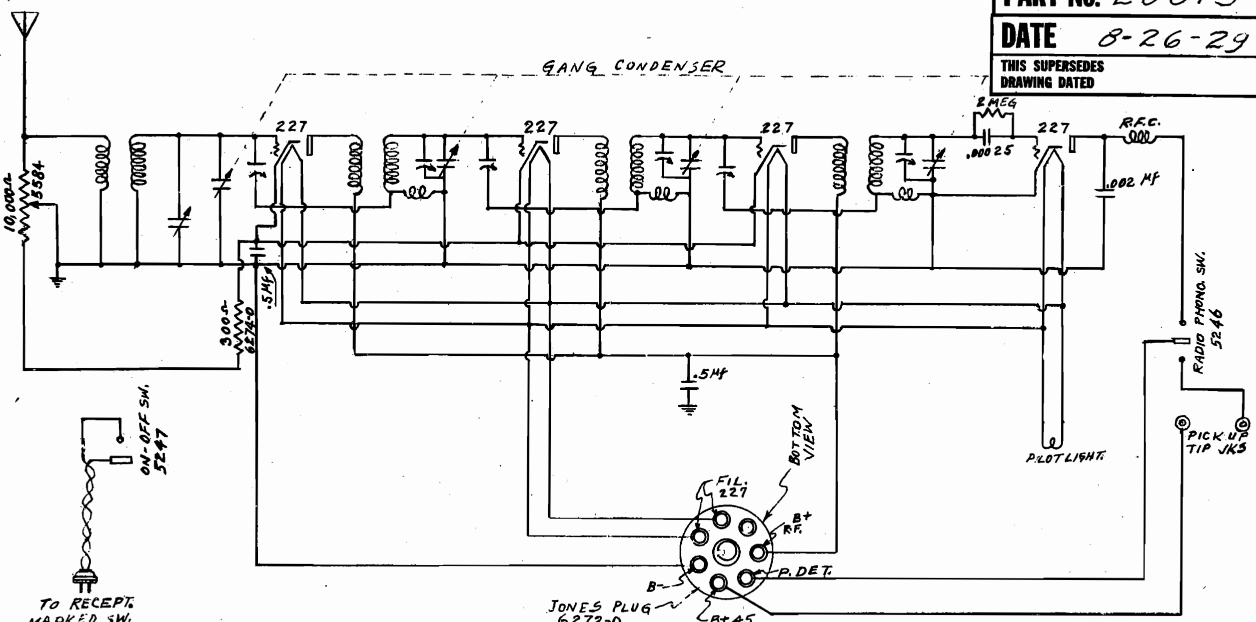
ERLA MODEL "A2" A.F.AMPLIFIER



ERLA MODEL "R2" R.F.AMPLIFIER
ERLA MODEL "A2" A.F.AMPLIFIER

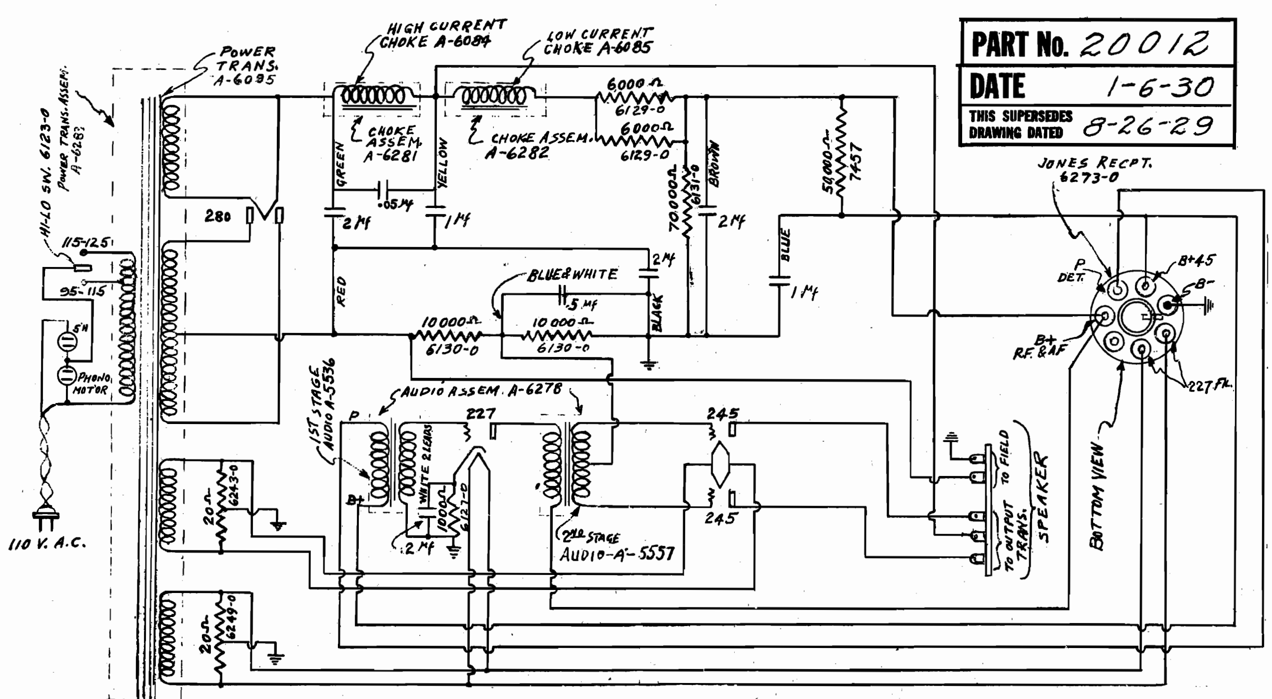
ELECTRICAL
RESEARCH LABORATORIES, Inc.

PART No.	20013
DATE	8-26-29
THIS SUPERSEDES DRAWING DATED	

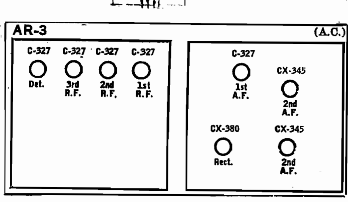


ERLA MODEL "R3" R.F.AMPLIFIER

PART No.	20012
DATE	1-6-30
THIS SUPERSEDES DRAWING DATED	8-26-29



ERLA MODEL "A3" A.F.AMPLIFIER



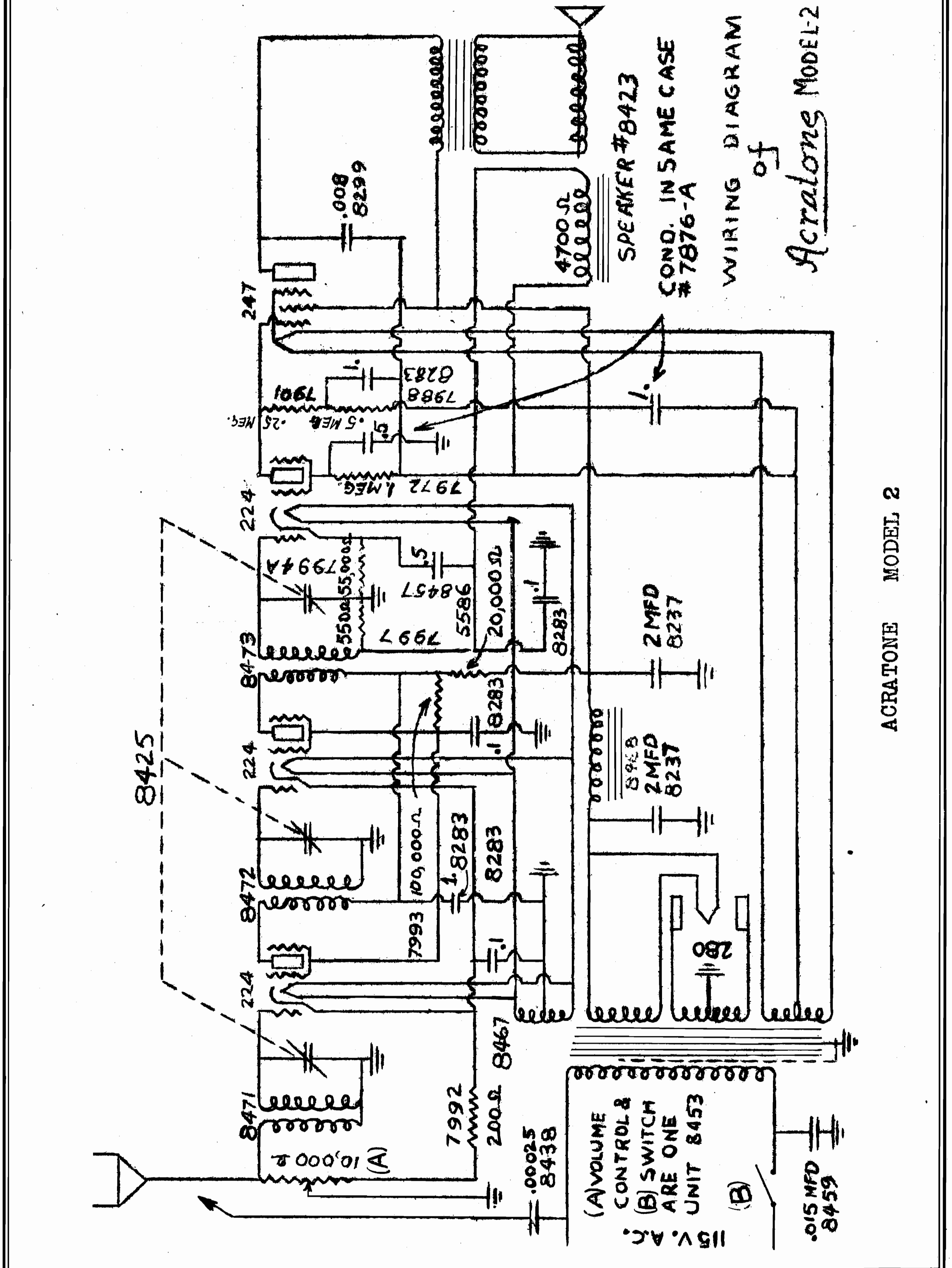
ERLA MODELS 30, 31, 32, AR-3
CABLE AND SKY ROVER—MODEL 224

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 R.F.	2.25	170	1.75	85	.2	2	3.0	4.4
'24	2 R.F.	2.25	170	1.75	85	.2	2	3.0	4.5
'24	3 R.F.	2.25	170	1.75	85	.2	2	3.0	4.5
'27	Det.	2.25	90	12.0	....	....	+12	0.5	0.5
'27	1 A.F.	2.25	105	2.0	....	....	+5.5	5.0	6.5
'45	{2 A.F.	2.4	250	22.5	....	....	....	30.0	35.0
'45	P.P.}	2.4	250	22.5	....	....	....	30.0	35.0
'80	Rect.	4.8	......	....	....	....	....	37.0 per anode	

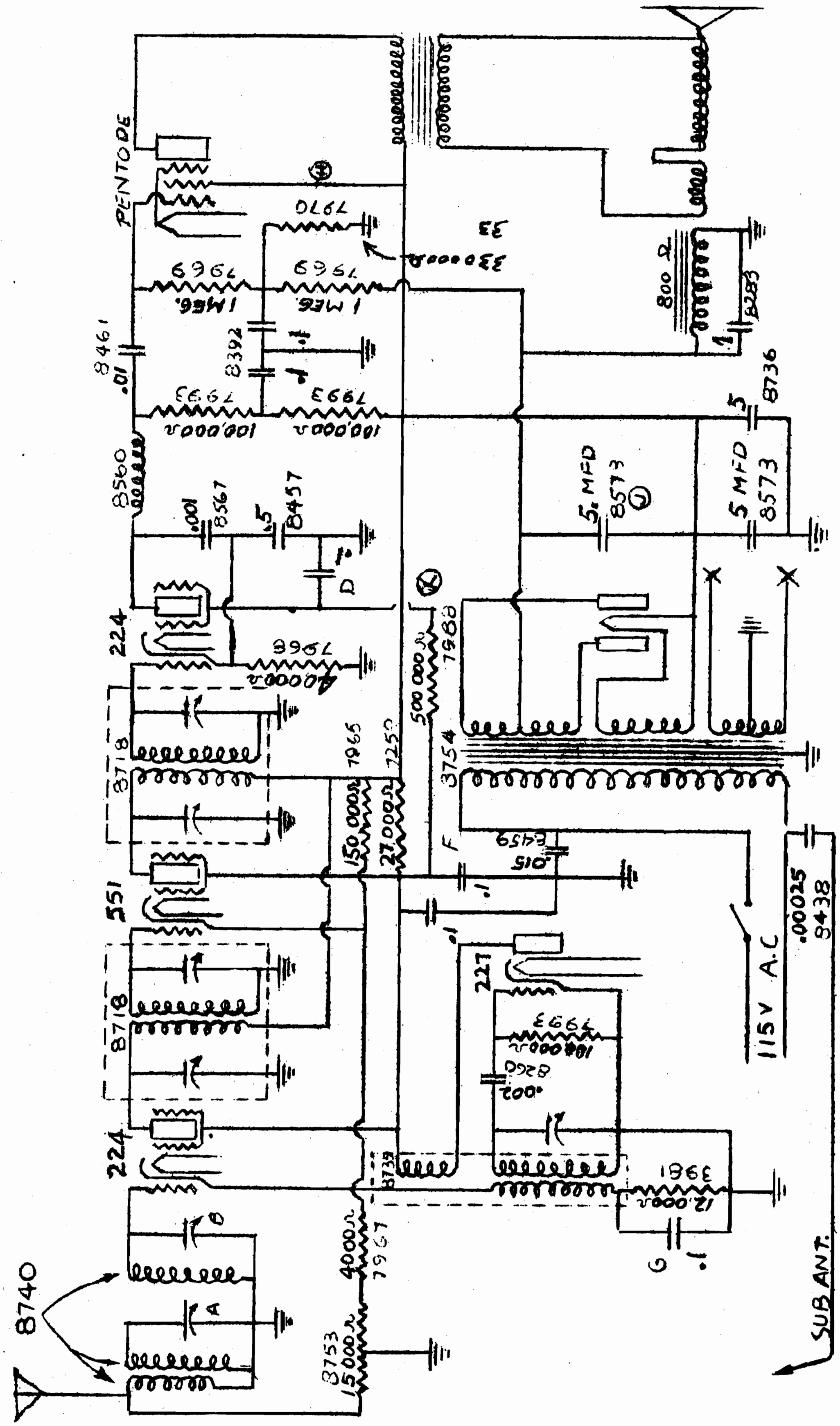
LV—110. LVS—95-115. Vol. Con. Max.

ERLA MODEL "R3" R.F.AMPLIFIER
ERLA MODEL "A3" A.F.AMPLIFIER

FEDERATED PURCHASER



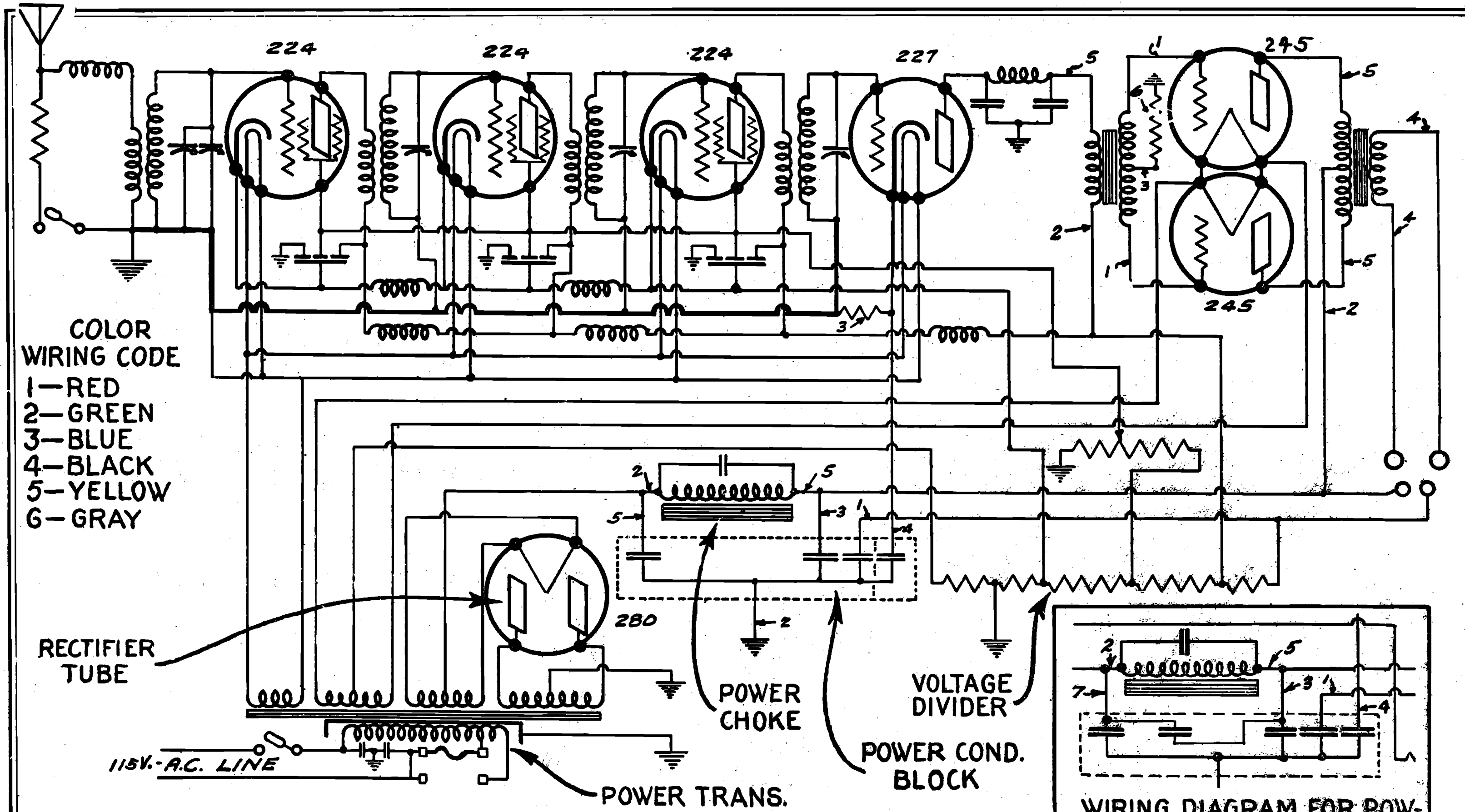
FEDERATED PURCHASER



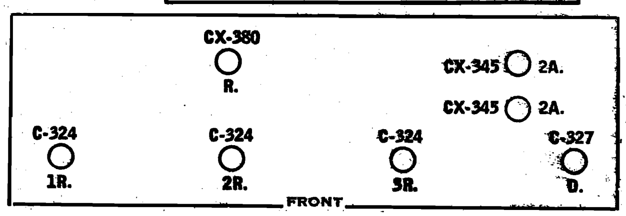
ACRATONE MODEL 5

GENERAL MOTORS RADIO CORP.

DAY-FAN
MODEL A-5005 (60)
MODEL A-5020 (25)



Type of Tube	Position of Tube	TUBE IN SET ANALYZER "A" Volts	"B" Volts	Con. Grid "C" Volts	Screen Volts	Cathode Volts	Normal Plate Ma.	Gd. Test Ma.
224	1-R. F.	2.2	145	— 3	+66	+ 3	2.0	4.0
224	2-R. F.	2.2	145	— 3	+66	+ 3	2.0	4.0
224	3-R. F.	2.2	145	— 3	+66	+ 3	2.0	4.0
227	Det.	2.2	130	—13	....	+13	....	....
245	A. F.	2.2	220	— 8	....	....	32.0	37.0
245	A. F.	2.2	220	— 8	....	....	32.0	37.0
280	Rect.	4.4	....	....	....	....	105.0	....

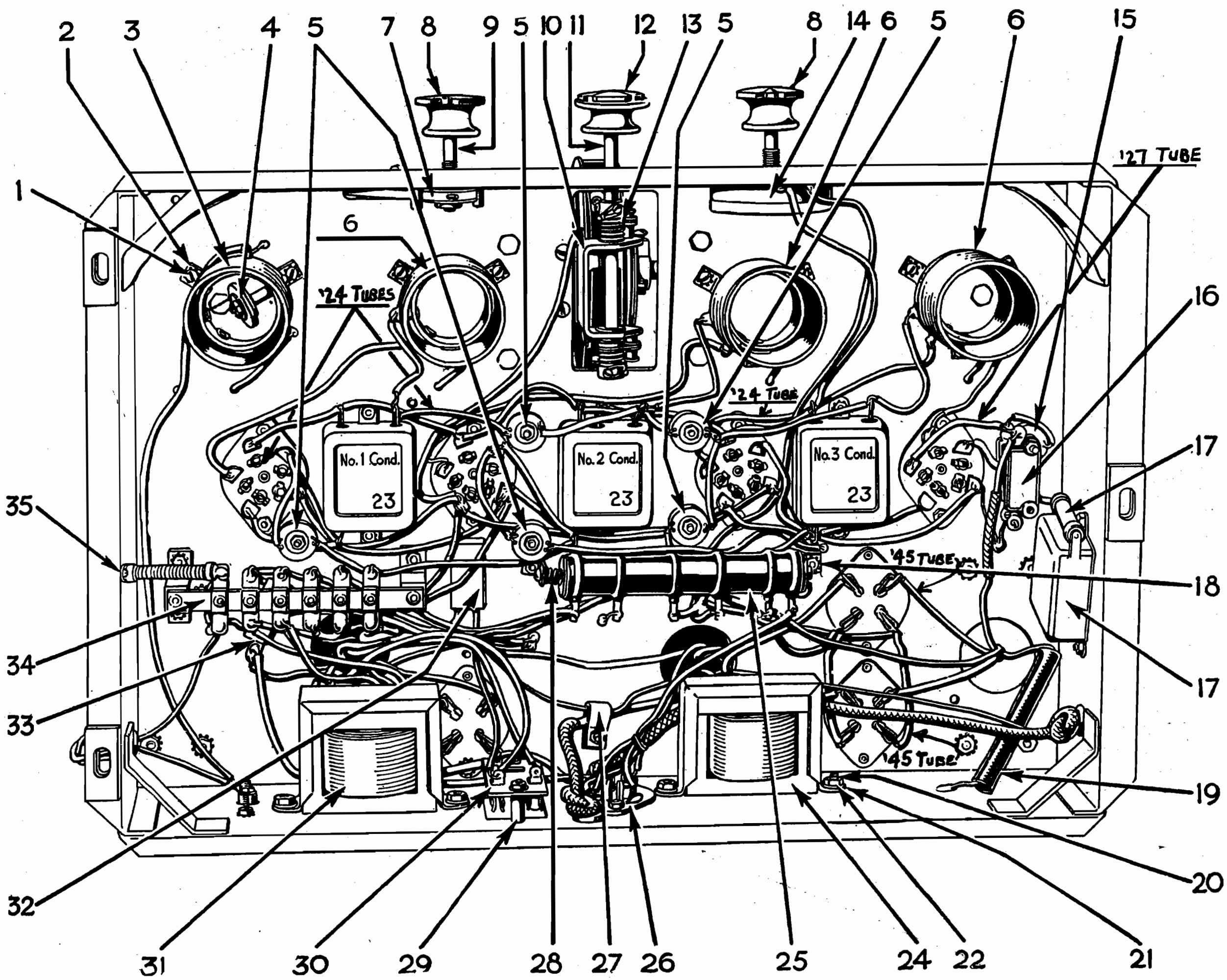


A5005
93, 94
(A.C.)

Line Voltage During Test —110 Volts
Volume Control —On Full
Position of Fuse —115 Volt Clips

GENERAL MOTORS RADIO CORP.

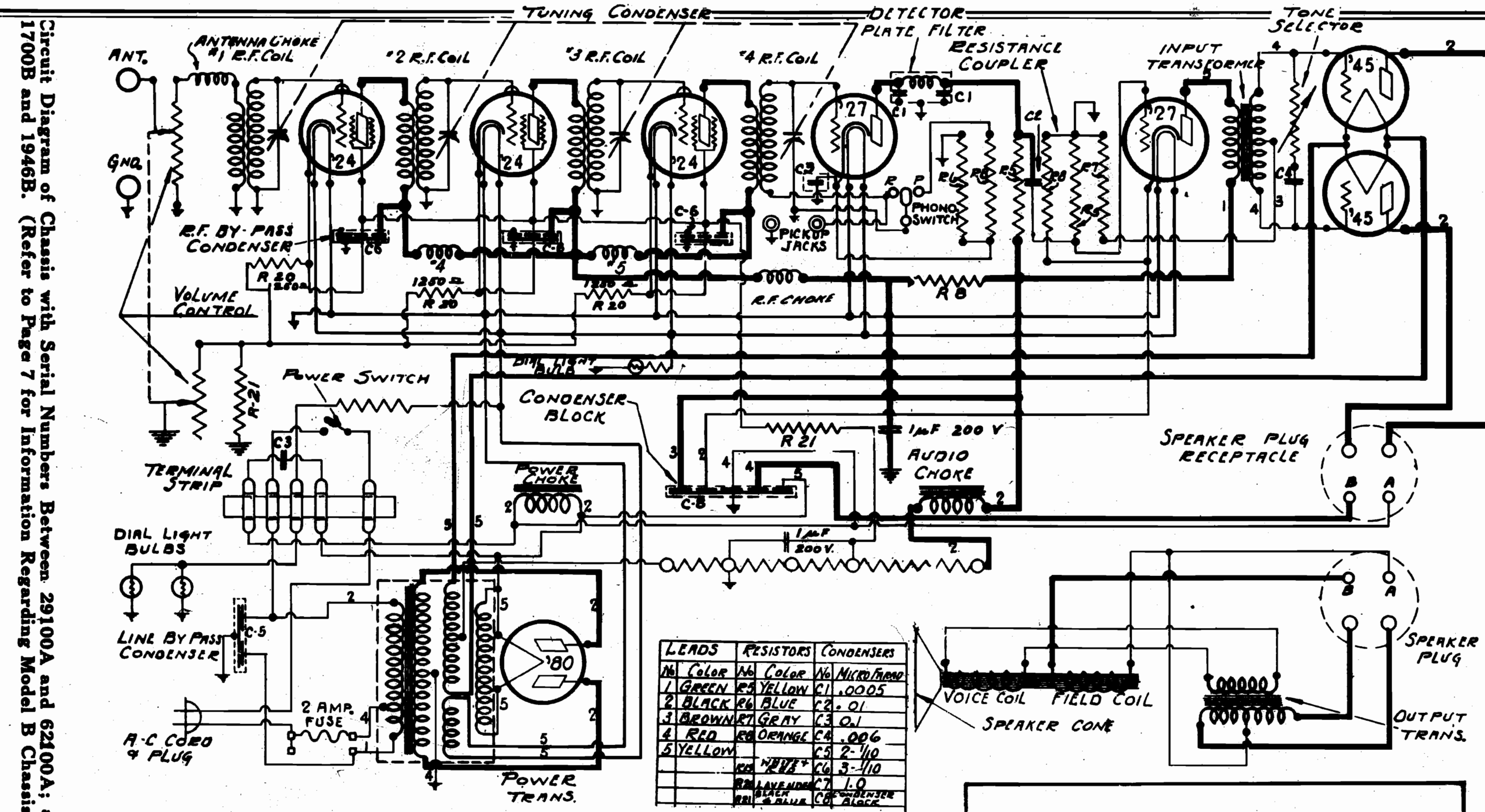
DAY-FAN
MODEL A-5005
MODEL A-5020



Bottom of Chassis

Illus. No.	Part Number	Description	Illus. No.	Part Number	Description
1	26758	Screw	18	26568	Mounting Bracket
2	138164	Lock Washer	19	1201604	Resistor, 500,000 Ohms
3	14609	No. 1 R. F. Coil	20	21678	Screw
4	14650	Antenna Coil	21	138475	Shake-proof Washer
5	14556	Choke Coils	22	25591	Nut
6	14603	No. 2, 3, 4 R. F. Coils	23	1200473	Condenser, .1-.1-.1 Mfd.
7	14766	Trimmer Drive Pulley & Pin	24	14597	Output Transformer
7	26682	Belt	25	1200167	Voltage Divider
8	14351	Knob	26	14594	Speaker Plug Receptacle
9	26679	Trimmer Shaft	27	24981	Strap
10	14591	Selector Bracket Assem.	28	26562	Spring
11	26175	Selector Shaft	29	24901	Spacer
12	14664	Knob-Tuning Condenser	30	1200195	Fuse Block Assem.
13	14662	Windlass	31	1200135	Power Choke
14	14588	Volume Control	32	14738	Line By-Pass Condenser
15	14556	Det. Plate Choke	33	13075	Condenser
16	1200413	Condenser	34	14566	Terminal Strip Assem.
17	1201610	Resistor, 25,000 Ohms	35	14624	Local and Distance Resistor.
17	14686	No. 4 Condenser			

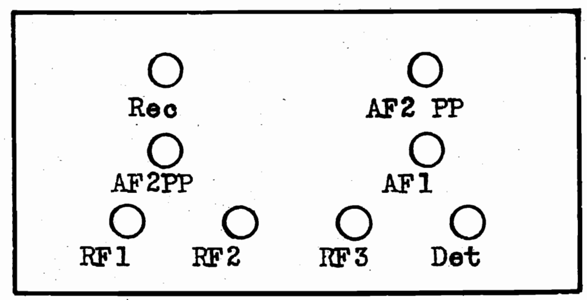
GENERAL MOTORS RADIO CORP.



LEADS No	LEADS Color	RESISTORS No	RESISTORS Color	CONDENSERS No	CONDENSERS Micro Farad
1	GREEN	R5	YELLOW	C1	.0005
2	BLACK	R6	BLUE	C2	.01
3	BROWN	R7	GRAY	C3	0.1
4	RED	R8	ORANGE	C4	.006
5	YELLOW			C5	2-1/10
		[illegible]	[illegible]	C6	3-1/10
		R20	LAVENDER	C7	1.0
		R21	BLACK & BLUE	C8	CONDENSER BLOCK

Tube	Fil. V.	Pl. V.	C.G.Volts	S.G.Volts	Cath.Volts	Pl. Cur. (MA)
RF-1	2.3	150	- 3	55	3	2.
RF-2	2.3	150	- 3	55	3	2.
RF-3	2.3	150	- 3	55	3	2.
Det.	2.3	100	- 8	..	10	.2
AF-1	2.3	140	- 3	..	10	4.
AF-2	2.3	220	-12	..	..	30.
AF-2	2.3	220	-12	..	..	30.
Rect	4.5	...	...	..	..	100.

Line Voltage - 110 Volume Control on Full

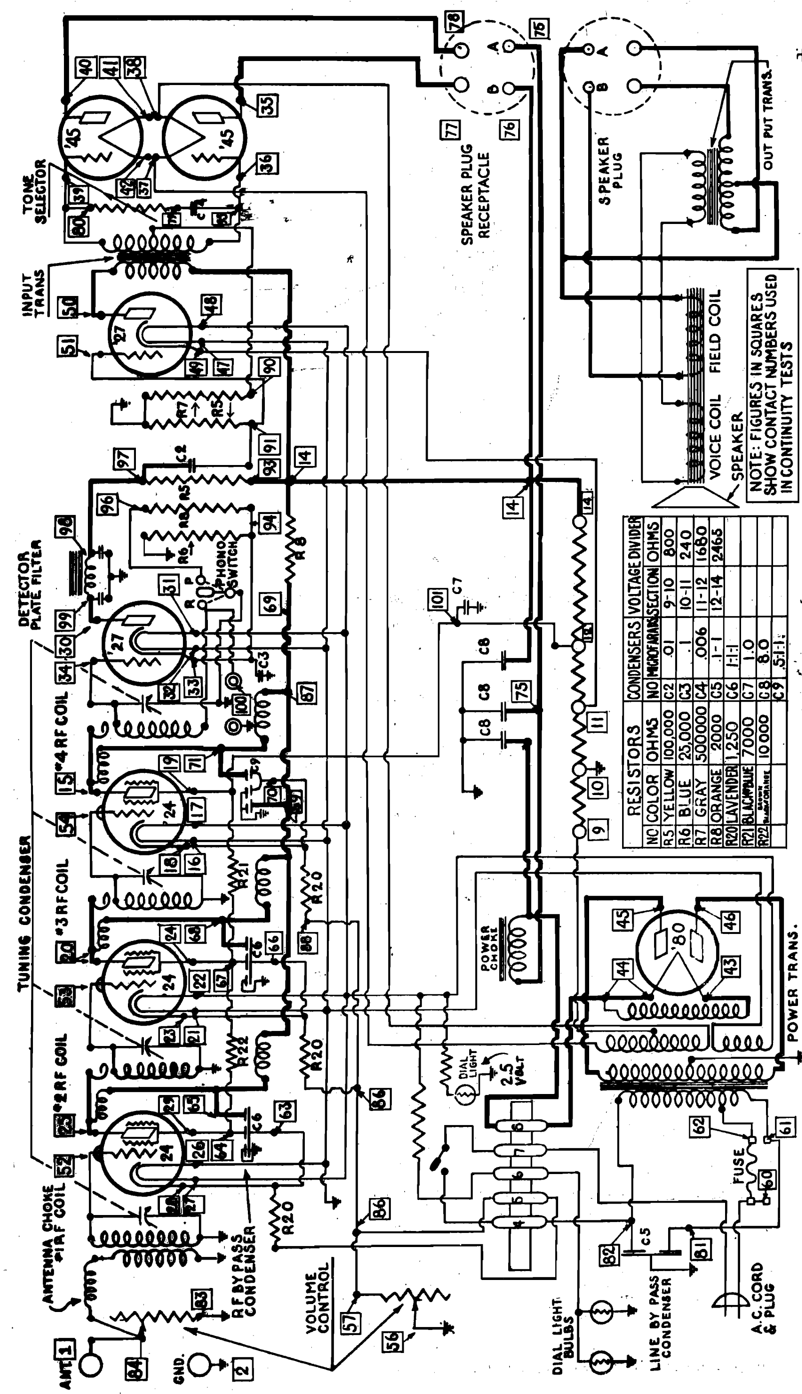


Circuit Diagram of Chassis with Serial Numbers Between 29100A and 62100A; and 1700B and 1946B. (Refer to Page 7 for Information Regarding Model B Chassis.)

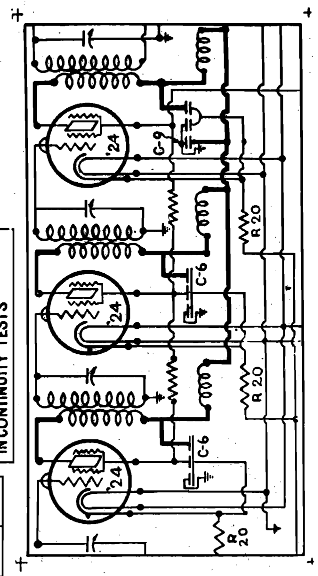
Models 120, 130 & 140
(Chassis Models "A" and "B")

This page replaces original page 346

GENERAL MOTORS RADIO CORP.



Circuit Diagram of Chassis with Serial Numbers Above 62100-A and 1964-B



The above diagram shows the circuits of sets using the R. F. Coils with the single turn primaries. The insert shows the part of the circuit which is different from the above, in sets using the original type R. F. Coils.

Sets with Serial Numbers Above 62100A

TUBE IN SET ANALYSER

Type of Tube	Position of Tube	"A" Volts	"B" Volts	"C" Volts Control Grid	Screen Volts	Cathode Volts	Normal Plate MA	Grid Change
'24	1st R. F.	2.3	170	— 3	60	3	2.	4.
'24	2nd R. F.	2.3	170	— 3	68	3	2.	4.
'24	3rd R. F.	2.3	170	— 3	75	3	2.	4.
'27	Detector	2.3	100	—12	....	12	.2	.2
'27	1st A. F.	2.3	165	— 3	....	12	4.	7.
'45	2nd A. F.	2.3	235	—12	....	....	30.	35.
'45	2nd A. F.	2.3	235	—12	....	....	30.	35.
'80	Rectifier	4.5	....	....	....	....	100.	....

Line Voltage 110 Volume Control on Full

Models 120, 130 & 140

(Chassis Models "A" and "B")

For further data refer to page 346-1 and 346-2
For socket layout refer to page 345

GENERAL MOTORS RADIO CORP.

Models 120, 130, 140.
(Chassis Models "A" & "B"

The Models "A" and "B" chassis are divided into three groups having slightly different circuits.

Serial Numbers below 29100A and 1700B:

In the original models, with serial numbers below approximately 29100A and 1700B, one side of the Dual Volume Control is in the Antenna circuit between the antenna and the first R. F. coil, with a .0005 mfd. condenser between the antenna and the antenna choke.

The other side of the volume control, together with a 5000 Ohm resistor is in the screen grid circuit of the R. F. stages. In these sets there are two R. F. chokes in the cathode circuit of the R. F. tubes.

Sets with this circuit can be distinguished by the presence of five similar R. F. chokes, one being located near the first 224 tube socket, and four between the second and third 224 tube sockets. (Page 343)

Serial Numbers between 29100A and 62100A, and 1700B and 1964B:

In sets with serial numbers between approximately 29100A and 62100A, and 1700B and 1964B, the .0005 mfd. condenser is not used with the volume control in the antenna circuit.

The other side of the volume control in these sets is in the cathode circuit of the three R. F. Stages. The two R. F. chokes in the 224 cathode circuits are not used, but three 1250 Ohm resistors are used, one in series between the cathode of each 224 tube and the volume control.

Serial Numbers Above 62100A and 1964B:

The circuits of sets with serial numbers above approximately 62100A and 1964B, are practically the same as those in sets with serial numbers between 29100A and 62100A, except that the Audio choke is not used and the Power Condenser Block is replaced by three 8 mfd. Electrolytic Condensers.

Above serial numbers approximately 64372A and 1964B, new R. F. coils are used. These coils have single turn primaries, and are "capacity coupled."

Sets above 62100A and 1964B can be distinguished by the presence of the Electrolytic Condensers.

Sets having the "capacity coupled" R. F. coils can be distinguished by the presence of three R. F. Chokes mounted on brackets at the bases of the R. F. Coil Shields.

Model "B" Chassis:

The circuits of the Model "B" (25 cycle) chassis are the same as those of Model "A" (60 cycle), except that one 1.0 mfd. condenser, Part No. 1200160, is added in parallel with the power choke.

Sets with this circuit can be distinguished by the presence of three resistors between the cathodes of the 224 tubes and the R. F. terminal strip, located between the second and third 224 tube sockets. (Page 345)

Electrolytic Condensers:

To test the Electrolytic condensers used in chassis above 62100A and 1964B use an "Open Test" or "Continuity Test" meter with a 22½ volt battery. The test being made similar to other continuity tests.

It should be noted that by reversing the test leads, different readings will be obtained.

The condenser to be tested should be removed from the chassis and tested as follows:

Pos. Test Point	Neg. Test Point	Correct Reading
Center Terminal	Condenser Can	Hand Should Jump and Return
Condenser Can	Center Terminal	Hand Should Rise Slowly, Almost to Full Scale

If both readings are the same, the condenser is defective and should be replaced. When in doubt try replacing the condenser.

GENERAL MOTORS RADIO CORP

Models 120, 130, 140.
(Chassis Models "A" & "B")

Trimmer Adjustment on Tuning Condensers:

A small Trimmer Condenser is located on each of the four variable condenser units which comprise the Gang Tuning Condenser. The trimmer screws may be adjusted by means of screw-driver, through the holes in the top of condenser shield.

The No. 1 Trimmer (Left side when viewed from the front), should be adjusted when the set is installed as it balances the antenna stage to meet the requirements of the antenna used. This Trimmer should be adjusted by tuning a station whose frequency is at the high end of the scale, near 1400 Kilocycles. No. 2, 3, and 4 Trimmers should be adjusted only when the complaint is very definitely lack of volume or broad tuning.

If the sensitivity or selectivity is not normal, the Trimmers should be adjusted before attempting to calibrate the Tuning Condenser. To adjust the Trimmers, tune in a station around 1400 Kilocycles and turn the volume down by means of the volume control until the station is just audible.

Start with the Trimmer which is on the left side of the chassis, when viewed from the front, and adjust the screw either to the right or left until the loudest signal is obtained. This adjustment should bring the receiver back to normal operation. If not, the Trimmer on the right should be adjusted in the same manner. The two center trimmers should not be adjusted except in rare cases, and extreme care should be taken when adjusting these Trimmers so that the selector Pointer will not be thrown off adjustment and read incorrectly.

Condenser Adjustments:

If the selector pointer will cover only 1500 to 600 Kilocycles on the selector strip, the two-fingered washer has become bent so that the stop washer will slide over it. To correct this, remove the selector shaft assembly and invert the flat, two-fingered washer.

If the Phono-switch will not trip, set the selector pointer at 1460 Kilocycles, loosen the set screws holding the switch lever and turn the switch lever until it just engages the switch. Tighten the set screws in this position.

Selector Strip Adjustment—Mechanical:

If the selector pointer appears to be off mechanically, i. e., if a station close to 700 Kilocycles is off 1/8 inch and a station close to 1400 Kilocycles is also off the same amount, the adjustment of the selector strip to log one station would bring them all into line.

To make such an adjustment, tighten all set screws, then tune in a station of known frequency. Reduce the volume by means of the volume control so that the selector can be set on the exact peak of the incoming wave. Loosen the screws holding the selector strip and shift the strip until it indicates properly the frequency of incoming signal.

If the selector strip cannot be shifted far enough, loosen the set screws by which the selector windlass is attached to the selector shaft and shift the pointer to its approximate position before shifting the selector strip.

Selector Adjustment—Electrical:

The adjustment of the selector electrically, is known as "logging". If it becomes necessary to re-log the set, tune in a station between 550 and 700 Kilocycles, preferably as close to 550 as possible, which is known to be broadcasting exactly on its assigned wave length. Set the selector pointer to log this station accurately as described in the preceeding paragraph.

Then set the pointer on the exact frequency of a station known to be operating at that time between 1350 and 1500 kilocycles. Adjust the volume control until the station is just audible, without moving the pointer, adjust the left trimmer condenser (viewed from the front of the chassis) until maximum volume is obtained. Repeat the operation on the remaining three trimmers, one at a time, going from left to right until the station is peaked exactly on the correct reading.

Now try the station which was used to set the low frequency point and if it logs properly, all other stations will be in line. If the station does not log properly, repeat the above operation.

Hum:

If the No. 245 Tubes are unmatched, or if one or the other is defective, a hum will result which is very similar to what is known as 60 cycle hum. This can be eliminated by replacing one or both of the No. 245 Tubes.

It is to be understood that the No. 245 Tubes may not necessarily be defective. They may operate satisfactorily in another set, but may be merely unmatched with respect to each other.

The No. 227 Detector Tube will sometimes cause a similar trouble, except that the No. 227 Tube causes more of a buzz than a hum. If this buzz or hum cannot be eliminated by switching the 227 Tubes, the defective Tube should be replaced.

Volume Control:

Many complaints of unsatisfactory volume control action are not caused by defective volume controls, but in reality the faulty action is due to variation in the cut-off point of the No. 224 screen grid tubes. It is necessary to have, in the first R. F. stage at least, one tube which has a low cut-off point.

If the complaint is not due to a volume control which is actually defective, it usually can be eliminated by switching the No. 224 tubes from one socket to another until the proper arrangement is obtained.

In chassis with serial numbers between 29100A and 62100A (also 1700B and 1964B) a 7000 Ohm Resistor (Black and Blue) is connected between the cathodes of the screen grid tubes and ground, in parallel with one side of the volume control. When near a powerful local broadcasting station, the volume control, because of this resistor, may not cut the volume down low enough. This can be improved by removing the resistor mentioned. This is resistor No. R-21 shown in the wiring diagram

COMBINATION MODELS No. 150 & 160.

PART 1. THE ELECTRIC PICK-UP & TRANSFORMER

Description:

The electric pick-up provides an electrical means for sound reproduction. The pick-up is composed of three major parts:

1. A permanent magnet.
2. A small generating coil.
3. A vibrating armature which is caused to vibrate by the phonograph needle.

The generating coil is located in the center of the field of the permanent magnet which causes a constant flow of magnetic lines of force through the coil. In order to generate current in the coil, it is necessary to vary the strength of the magnetic field. This is accomplished by placing a vibrating armature in the center of the coil with a needle inserted in the needle holder.

The needle rides in the grooves on the record and as it vibrates back and forth it also causes the armature to vibrate. By the vibration of the armature in the magnetic field, the field strength is varied accordingly and a pulsating current of electricity is generated in the coil. The pulsations of this current correspond to the sound waves of the music, but they are too weak to be audible in the speaker.

The generating coil is connected, through a volume control, to the radio wiring and the electrical pulsations are amplified many times by means of the radio amplifying tubes.

When the pulsations of current generated in the generating coil have passed through the amplifying tubes, they are carried to the speaker unit where they set the diaphragm in motion which generates audible sound waves in the air.

The advantages of this method of reproduction are the ease with which the volume of sound may be varied by the volume control which varies the strength of the electrical pulsations before delivery to the amplifying tubes, and the truer reproduction through the radio speaker.

Servicing:

Adjusting Vibrating Arm:

Place a good needle in the needle holder and a record on the turntable. Turn the power switch on and the selector pointer to the right until the Phono-switch trips. After the tubes have had sufficient time to heat properly, tap the needle lightly with your finger, first on one side and then on the other. Each time the needle is tapped, a click should be heard in the speaker. If the click is louder when striking the needle on one side than it is on the other, the pick-up is out of adjustment. Remove the metal cover from the pick-up and note whether the vibrating arm, which is operated by the needle, is directly in the center of the space between the two pole pieces.

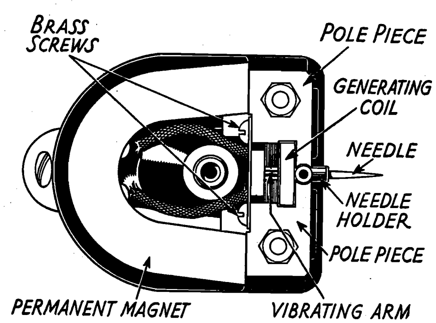


Figure 1

Pick up Transformer - Part No. 1,200,877
Cord Assembly - Part No. 1,200,866
Choke Coil - Part No. 1,200,869
Condenser - Part No. 1,200,418

(Cord Assembly Part No. 12,001,184 used on Models 150-A and B -)

PART 1. THE ELECTRIC PICK-UP & TRANSFORMER (Continued)

If the vibrating armature is off center, loosen the two brass round head screws which hold the small brass plate in position on the pole pieces. Center the armature between the pole pieces and tighten the brass screws securely.

Testing for Open Coil or Wiring:

If there is no click at all, when tapping the needle, put the pick-up in place on the record and allow the record to rotate. Place the terminals of a set of ear phones on the two connections of the volume control to which leads from the pick-up connect. Reproduction of the record should be heard faintly.

Provided no sound is heard, remove the pick-up leads from the volume control and check for open circuit in those leads and the pick-up. (Note: Inspect the contacts on the pick-up end of the leads, to insure good contact in the socket on the pick-up.)

Repair Instruction:

Pick-ups that cannot be adjusted properly or that have open coils, should be replaced with new ones and the old ones returned to the nearest service station for repair.

Next Step if Pick-Up is O. K.:

If reproduction of the record can be heard faintly through the ear phones, check the volume control or the connections between the pick-up and the radio unit for the trouble.

Testing Pick-Up Transformer:

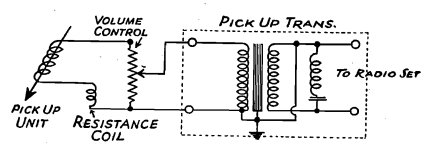


Figure No. 2—Pick-Up Wiring Diagram

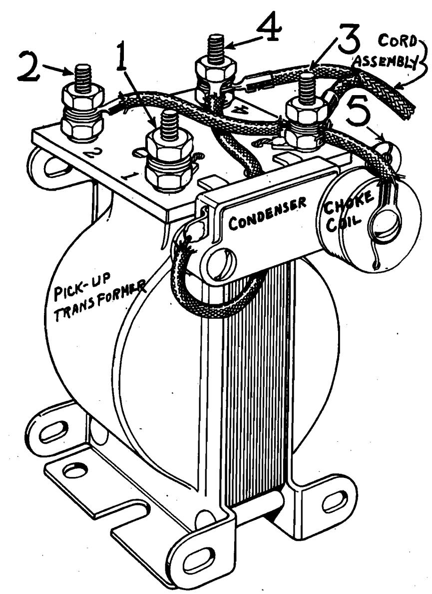


Figure 3

Make the following tests with an open test meter. (See Figure 3 for contact numbers.)

From Contact Number	To Contact Number	Proper Reading	Incorrect Reading Caused by
1	2	Full Scale	Open Winding
3	4	¾ Scale	Open Winding
3	5	Full Scale	Open Choke
Cond. Lead from No. 4	5	*Hand should Jump and Return to Zero	Shorted or Open Condenser

*Blue Condenser Lead must be disconnected from No. 4.

COMBINATION MODELS No.150 & 160

GENERAL MOTORS RADIO CORP.

PART 2. INDUCTION DISC MOTOR

Description:

The motor consists of an induction disc of aluminum arranged to revolve between the poles of two sets of field magnets. The coils of the field magnets, commonly called field coils, receive current from the house lighting circuit and are the only parts electrically connected to that circuit.

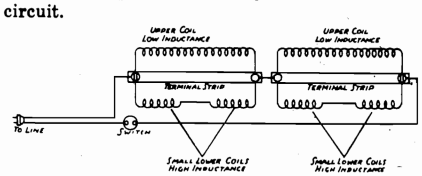


Figure 4—Wiring Diagram of Induction Disc Motor

The main shaft of the motor operates in a vertical position, is supported at the bottom by a single ball bearing, carries the induction disc and turntable, and drives the governor shaft through a set of gears. The speed of the shaft is controlled by a mechanical fly ball governor.

The induction disc motor has no commutator, slip rings, or other moving electrical contacts, and this, with the natural slow speed, makes it very well suited for the service for which it is used.

Servicing:

Any servicing which the motor may require is in general, of a minor nature, and in most cases, adjustments will be mechanical rather than electrical. Two of the most common causes of motor failure are incorrect power voltage and lack of lubrication.

Power Voltage Variation:

High voltage will cause the motor coils to heat excessively and thus destroy the insulation and dry the lubrication.

Low voltage will cause a lack of power and unstable operation. When servicing the induction disc motor, always check the power line voltage at the socket to which the motor is connected and, if possible, while the motor is running. This voltage should be between 105 and 120 volts A. C.

Lubrication:

It is important that the motor be lubricated at least once every six months with the proper lubricants. A motor lubricating chart is shown on the under side of the motor board.

A light grease should be used on the teeth of the drive gear and spiral. The governor bearings, governor friction sleeve and the upper and lower turntable spindle bearings should be lubricated with oil. For lubricating the governor friction leather use Neat's Foot Oil.

Motor Does Not Operate:

If the motor fails to start, first be sure that it is not binding any place and that the turntable turns freely.

If it turns freely, check the wiring for open circuits with an open test meter.

With the switch closed, test across the contacts of the power plug. A full scale reading should be obtained. If not, this will indicate that the switch is defective or some part of the wiring is broken.

A visual inspection of the switch will show whether or not the trouble is in the switch. For information regarding the adjustments of the switch, see page 7.

If the switch is making good contact, check all wiring carefully for broken wires or loose connections.

If a full scale reading of the meter is obtained when testing across the light socket plug points, check the field coils. To determine which coil is defective, if any, it is necessary to test each coil separately.

Continuity Tests:

To do this, remove all connections from the two terminal strips, one located at each end of the motor. Refer to Figure 5 and take a reading across each coil with an open test meter as follows:

No. to No.	Correct Reading	Incorrect Reading Caused by
1A—1B	Full Scale	Open Upper Coil
2A—2B	Full Scale	Open Lower Coil
1C—1D	Full Scale	Open Upper Coil
2C—2D	Full Scale	Open Lower Coil
B— C	Full Scale	Open Wiring

When replacing coils it is necessary to replace both the upper and lower coils as a unit. The core and coil assembly may be taken off by removing the three screws holding the coils to the frame and top plate.

When the coils are replaced, be sure that the wire terminals marked with the same letter are placed together. That is, 1A, 2A and 3A must be attached to the terminal strip at the point "A", etc. See Figure 5.

PART 2. INDUCTION DISC MOTOR (Continued)

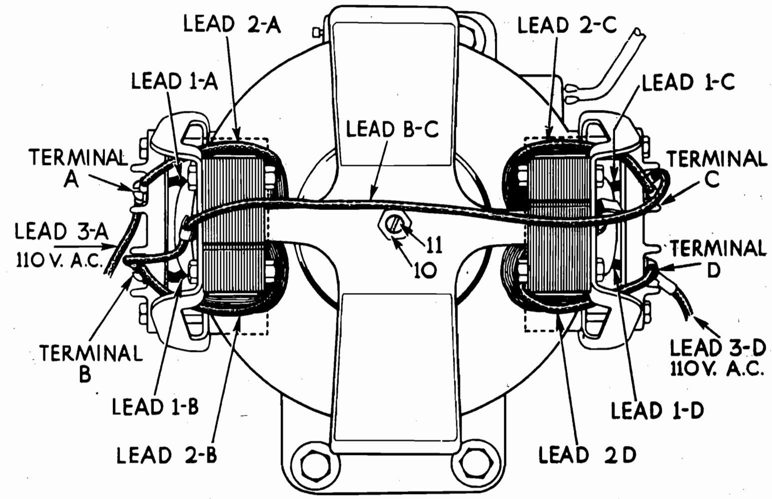


Figure 5

Failure to Maintain Constant Speed:

There are four points to be checked if the motor fails to maintain constant speed.

Hardened or Gummed Lubrication. Examine the moving parts. If necessary, remove them and wash with kerosene. Replace the parts and lubricate them.

Shifting of Motor on Motor Board. In some cases a slight shifting of the motor on the motor board during shipment will cause binding. Loosen the three motor screws, and retighten, alternately, while the motor is running until the binding has been eliminated and the motor runs steadily.

Weak Coils. If the lubrication and mounting of the motor have been examined as described above, and the condition still exists, replace one or both of the motor coils as described under subject "Motor Does Not Operate."

Mechanical Causes. All the points mentioned in subject entitled "Reducing Mechanical Noise" will have a certain effect upon the regulation of speed and should be taken into account even though there is no actual mechanical noise present.

Reducing Hum:

There are a number of causes for hum in the induction disc motor, but in most cases any existing hum can be eliminated by proper adjustment.

Loose Coil Winding on Iron Core. The condition can be corrected by forcing a small wooden wedge between the outside of the coil and the core. It may be necessary to wedge both the upper and lower sections of each coil.

Coil Loose on Top Plate. The three screws holding the coil on the top plate should be tightened securely.

Loose Laminations of Iron Core. The bolts clamping the iron laminations together should be tightened securely. In some cases, however, it may be found that the hum can be minimized by adjusting the tension of these bolts.

COMBINATION MODELS No. 150 & 160

PART 2. INDUCTION DISC MOTOR (Continued)

Motor Not Fastened Securely to Motor Board. Make certain that the nuts holding the motor to the motor board are fastened securely and with equal tension and that the felt washers between the motor and the motor board are not injured.

Motor Not Properly Secured to Cabinet. In many cases motor hum can be eliminated or minimized by adjusting the four screws which hold the motor board to the cabinet. Placing a piece of felt between the motor board and the motor board rail will often help to eliminate hum.

Reducing Mechanical Noise:

There are several features which may cause motor noise other than a hum.

Governor Springs. A noise or rattle may sometimes be caused by loose or broken governor springs. Tighten all the governor spring screws. If this does not stop the noise, loosen the screws on the disc end of the governor springs and allow the motor to run for a minute or so to allow the springs to assume their correct position. Stop the motor and retighten the screws. If any of the springs are broken or badly out of balance, they should be replaced. Removal of the governor can be accomplished by loosening the two governor bearing screws, one at each end of the shaft, and lifting the governor from the frame.

Governor Thrust Bearing. The thrust bearing at the disc end of the governor may sometimes cause noise while the motor is running. Hold one finger over the end of the bearing and loosen the set screw which holds the bearing in position. Adjust the bearing to the most quiet running position, and retighten the set screw.

Governor Spindle. A bent governor spindle will cause binding in the gears and bearings as well as a noise. The bent spindle should be replaced with a new one.

Governor Driving Gear. Remove the turntable spindle as described above and examine the gear for wear. If the wear on the teeth is greater on one side than on the other, the turntable spindle is bent and should be replaced. The gear should also be replaced.

Turntable Spindles and Disc. A bent turntable spindle or a bent or improperly adjusted disc will cause noise. The bent spindle may cause the disc to rub against the iron core of one of the coils as described above. A bent spindle can be detected by placing a pencil flat on the motor board with the point against the spindle. If the pencil point touches the spindle on one side only while the motor is running, the spindle is bent and should be replaced.

Speed Regulation:

The governor will maintain a constant speed of the motor within a range of sudden voltage changes of 15 volts, provided all parts are correctly adjusted.

The speed regulator is adjusted before leaving the factory to that speed which is proper for perfect reproduction, namely 78 revolutions per minute.

However, if this adjustment is altered for any reason it is possible to reset the speed regulator by placing a small piece of white paper on the outer edge of the turntable. By counting the number of times the paper passes a given point per minute, it can be determined whether the speed should be increased or decreased. The motor may be adjusted to the proper speed by turning the speed regulator screw in the direction indicated on the regulator plate.

Removal of Disc:

The motor disc and the governor drive gear are each fastened to the turntable spindle with set screws. When removing the disc loosen the two set screws, and pull the spindle away from the top plate. Care should be observed that the ball bearing on which the lower end of the spindle rests is not lost. When replacing the disc, it will be noted that the spindle is spotted for the governor drive gear and disc set screws, and that these spots are in line with the pin on the turntable spindle.

Adjusting Position of Disc:

The disc should be properly aligned between the upper and lower section of each coil so that it does not touch the iron core of either and does not cause binding of the governor gears. In case the disc rubs against the iron, it should be adjusted by means of the spindle adjusting screw 11. See Figure 5, page 5. Loosen the lock nut and turn the screw until the disc is evenly spaced between the upper and lower coils.

PART 3. THE AUTOMATIC SWITCH & BRAKE

Description:

The automatic switch and brake consists of a system of cams and levers operating in such a manner that the movements caused by the eccentric groove at the end of the record trips the switch, forcing a friction leather against the turntable and, at the same time, cutting off the power to the motor.

Servicing:

The switch will ordinarily require no adjustment. In some cases, however, the upper spring shown in Figure 6 may become bent upward far enough to prevent the contacts from coming together when the hand lever is turned.

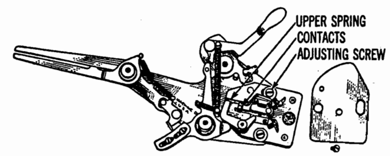


Figure 6

When such a condition is found, bend the upper spring down until the contact points make a firm contact when the hand lever is turned on. When replacing the switch on the brake plate, care should be observed in properly locating the switch on the plate, so that the switch will make and break contact when the hand lever is turned on and off. The two adjusting screws can be loosened and the switch moved in the slot until the correct position is located. When the hand lever is in the off position, the contact points should be at least 1/16 inch apart to prevent excessive sparking when the switch is turned off.

Adjustments:

The following adjustments will eliminate a majority of the troubles encountered:

1. Switch Fails to Trip. Bend the lug B (Figure 7) so that there will be less contact at point A.

Failure to trip may sometimes be caused by a loose trip arm. Make certain that all screws of this assembly are tight.

2. Switch Trips Before the Completion of a Record. Bend the lug back, so that there will be more contact at point A. (Figure 7.)

Warning: Do not bend the lug too far, as bending too often in opposite directions will snap off the lug.

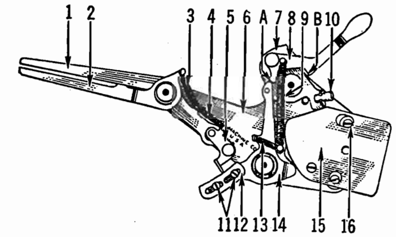


Figure 7

3. The two surfaces at the point A must be square. If they have become worn round, they should be squared with a fine file.

4. If the switch lever 1 swings with the eccentric groove, but the friction lever 2 fails to swing, or swings but slightly, the latch trip 5 is probably caught in a burr on one of the teeth of the latch plate 12. Rub the teeth of the latch plate with a piece of emery cloth, taking off any burrs that may be present.

5. If the latch trip does not engage with the latch plate properly when the tone arm is swung to the starting position, loosen the screw 11, adjust the plate 12 the required amount, and tighten the screws.

Note: The adjusting of the latch plate has nothing to do with the tripping of the latch.

6. If the brake does not stop the turntable soon enough the condition can be remedied by one of the following:

a. Examine the friction leather, making certain it is not worn down too far to make proper contact with the inside rim of the turntable.

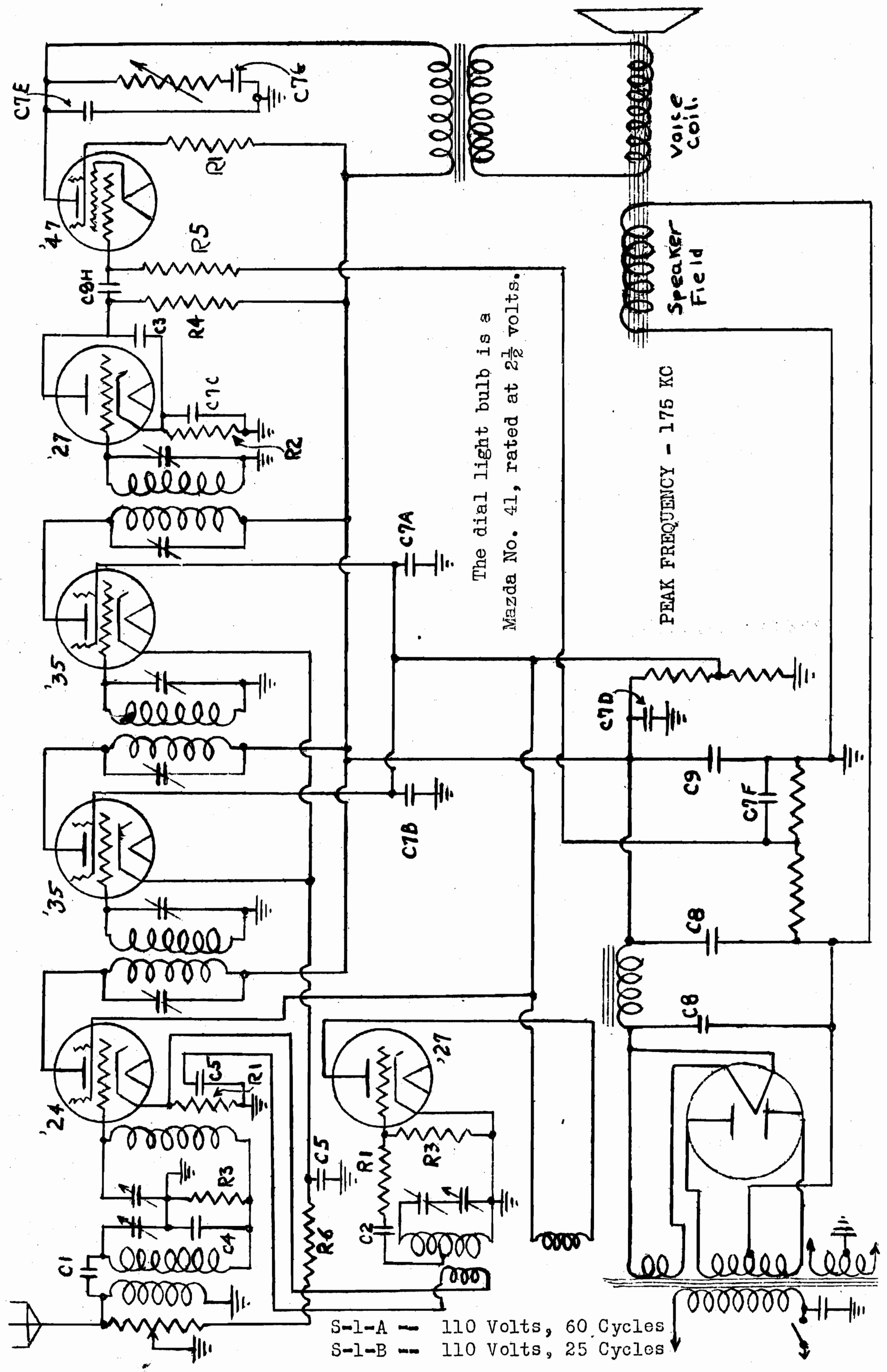
b. Increase the tension of the spring 9 (Figure 7) by cutting off one or more of the coils and then replacing the end of the spring over the lug.

7. If the latch 14 does not strike the lug A when the hand lever is pulled to the ON position:

a. Increase the tension of the spring 13 in the same manner as described above in "B" of 6.

b. Decrease the tension of the spring 4 by stretching the coils if necessary.

GENERAL MOTORS RADIO CORP.



MODEL 216, 217, 219, 250 SUPERHETERODYNE RECEIVERS. (CHASSIS MODELS S1A & S1B)

GENERAL MOTORS RADIO CORP.

MODEL 216, 217, 219, 250 SUPERHETERODYNE RECEIVERS.

ANTENNA AND GROUND CONNECTIONS

On Models 216, 217 and 219 a special antenna is installed in the cabinet and an antenna and ground terminal strip with three clips is located, on the bottom of the speaker baffle board.

If an outside antenna and ground are used, connect the antenna lead-in wire to the clip marked "A" and the ground wire to the clip marked "G". The jumper wire provided should connect clips marked "G" and "X".

If the local reception special antenna in the cabinet is used, connect the special antenna lead to the clip marked "A". The jumper should connect clips marked "G" and "X".

If the power line is to be used as an antenna, simply connect clips "A" and "X" by means of the jumper. If possible connect a ground wire to clip marked "G".

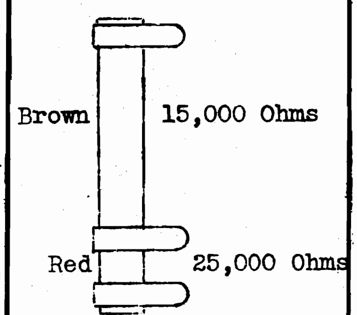
CONDENSERS

NO.	CAPACITY	NO.	CAPACITY	LEAD COLOR
C1	.00001 Mfd.	C7A	.25	Green
C2	.0005 Mfd.	C7B	.25	Green
C3	.002 Mfd.	C7C	.1	Brown
C4	.01 Mfd.	C7D	.25	Terminal
C5	.1-.1 Mfd.	C7E	.006	Red
C6	.1 Mfd.	C7F	.25	Green
		C7G	.03	Blue
		C7H	.03	White-White

C8 4-4 Mfd. (Electrolytic)
C9 8 Mfd. (Electrolytic)

Condensers C7A to C7H, inclusive, are included in the By-Pass Condenser Pack.

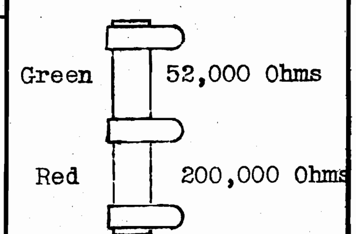
Voltage Divider



RESISTORS

NO.	BODY	END	SPOT	RESISTANCE	WATTS
R1	Yellow	Green	Red	4,500	½
R2	Red	Green	Orange	25,000	½
R3	Yellow	Black	Orange	40,000	½
R4	Brown	Black	Yellow	100,000	½
R5	Green	Black	Yellow	500,000	½
R6	In Metal Cover			400	

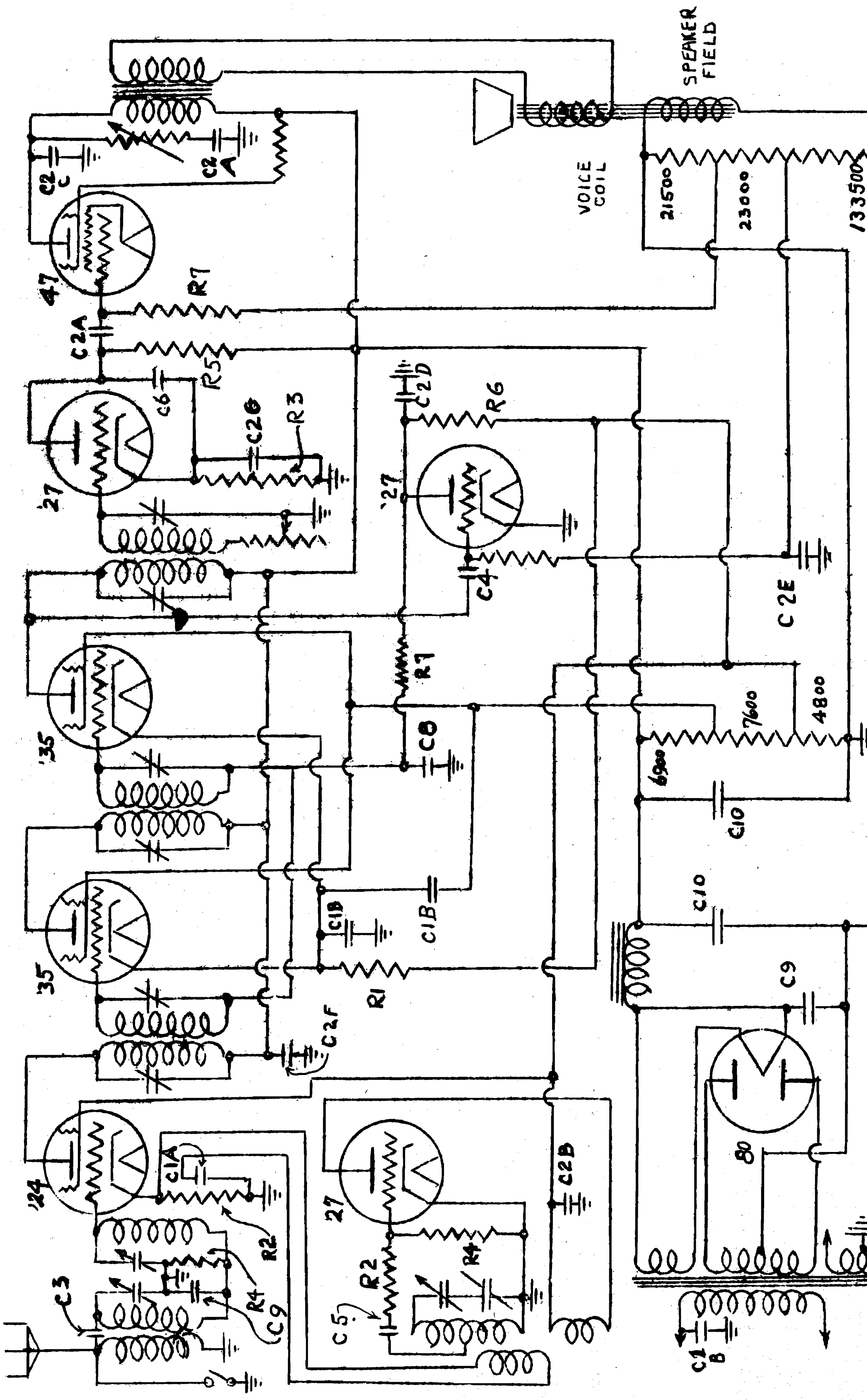
Pentode Bias



Type of Tube	Position of Tube	Fil. Volts	Plate Volts	Control Grid Volts	Screen Grid Volts	Cathode Volts	Pentode Screen Volts	Normal Plate M.A.
224	1st Det.	2.1	225	2.0	85	7	--	1
235	1st I.F.	2.1	225	3.3	79	5	--	14
235	2nd I.F.	2.1	225	3.3	75	5	--	13
227	Oscillator	2.15	75	0	--	0	--	5
227	2nd Det.	2.15	125	15.0	--	15	--	1
247	A. F.	2.15	210	1.0	--	--	200	3.5
280	Rect.	4.5	300	--	--	--	--	25-25

Line Volts 110. Volume Control on Full.

GENERAL MOTORS RADIO CORP.



S2A - 110 Volts, 60 Cycles
S2B - 110 Volts, 25 Cycles

PEAK FREQUENCY - 175 KC

MODEL 251 SUPERHETERODYNE (CHASSIS MODELS S2A & S2B)

GENERAL MOTORS RADIO CORP.

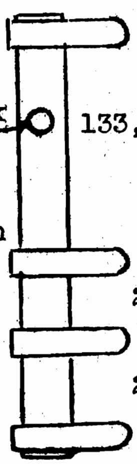
MODEL 251 SUPERHETERODYNE (CHASSIS MODELS S2A & S2B)

Type of Tube	Position of Tube	Fil. Volts	Plate Volts*	Control Grid Volts	Screen Grid Volts	Cathode Volts#	Pentode Screen Volts	Normal Plate MA	Rated Fil. Volts
224	1st Det.	2.1	255	1.9	77	6.0	--	1.0	2.20
235	1st I.F.	2.1	200	.3	100	95.0	--	1.6	2.20
235	2nd I.F.	2.1	200	.3	100	95.0	--	1.6	2.20
227	2nd Det.	2.15	145	.0	--	15.0	--	.5	2.25
227	Osc.	2.15	75	.0	--	0	--	7.0	2.25
227	A.V.C.	2.15	60	.0	--	0	--	.0	2.30
247	A.F.	2.15	235	1.0	--	--	215	30.0	2.30
280	Rect.	4.5	200	--	--	--	--	30-30	4.70

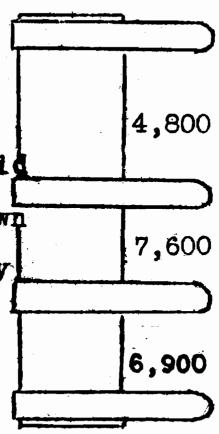
Line Volts 110 Volume on Full

* Use 600 Volt Scale. # Measured from Cathode to Heater.

Pentode Bias



Voltage Divider



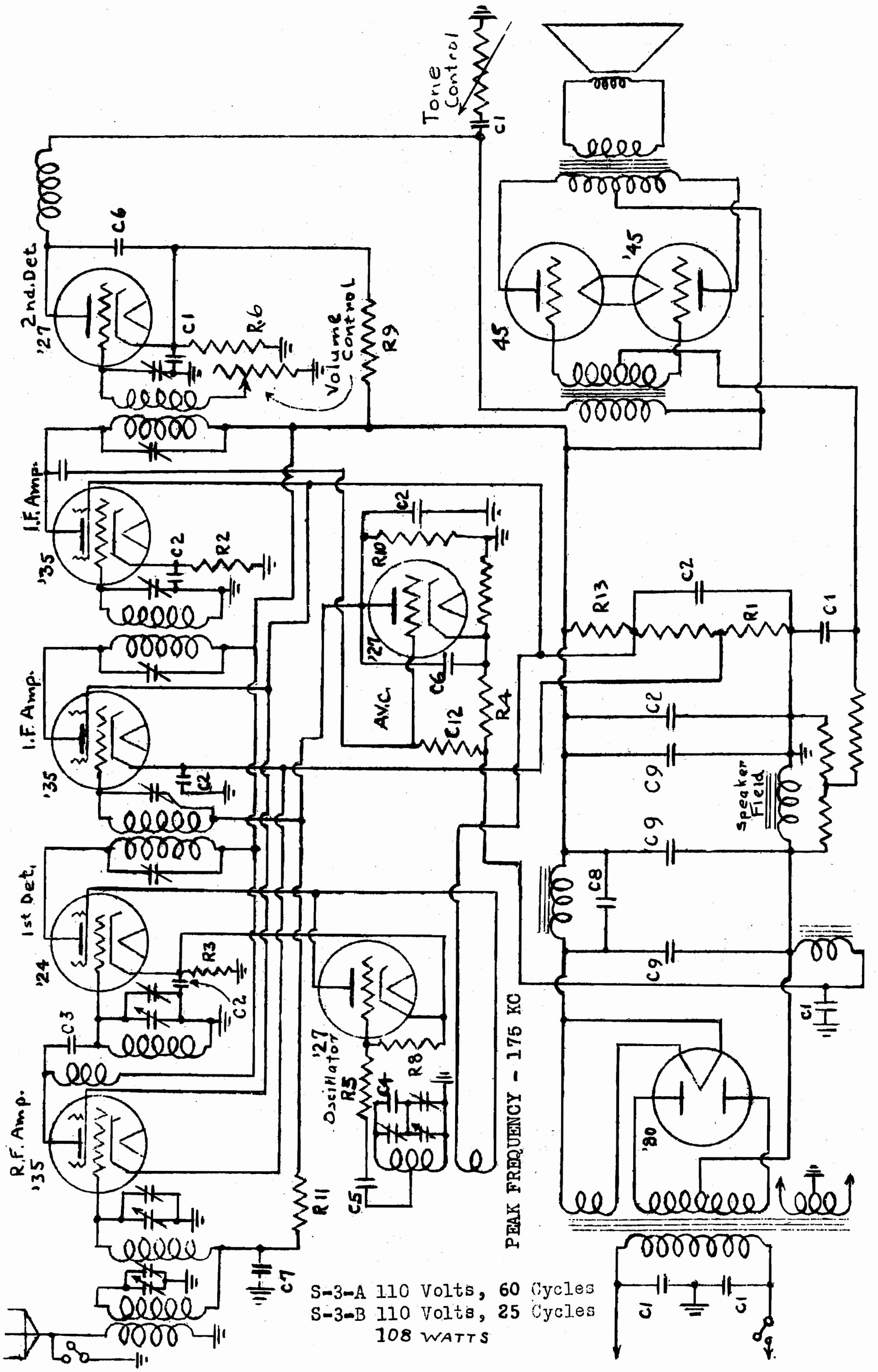
No.	Capacity	
C1A	.1 Mfd.	By-Pass Cond. Pack No. 1
C1B	1.0 Mfd.	
C2A	.03 Mfd.	By-Pass Cond. Pack No. 2
C2B	.1 Mfd.	
C2C	.006 Mfd.	
C2D	.25 Mfd.	
C2E	1.0 Mfd.	
C2F	.25 Mfd.	
C2G	.1 Mfd.	
C3	.00001 Mfd.	
C4	.00025 Mfd.	
C5	.00075 Mfd.	
C6	.002 Mfd.	
C7	.01 Mfd.	
C8	1.0 Mfd.	
C9	4.0 Mfd.	(Electrolyt.
C10	8.0 Mfd.	(Electrolyt.

Resistors

No.	Body	End	Spot	Resistance	Watts
R1	Orange	Black	Brown	300	½
R2	Yellow	Green	Red	4,500	½
R3	Red	Green	Orange	25,000	½
R4	Yellow	Black	Orange	40,000	½
R5	Brown	Black	Yellow	100,000	½
R6	Red	Green	Yellow	250,000	½
R7	Green	Black	Yellow	500,000	½
R8	Red	Black	Green	2 Megohms	½

The dial light bulb is a Mazda No. 41, rated at 2½ volts.

GENERAL MOTORS RADIO CORP.



MODEL 252, 253, 254, 255, 256, 257, 258 SUPERHETERODYNE RECEIVERS.
(CHASSIS MODELS S3A & S3B)

S-3-A 110 Volts, 60 Cycles
S-3-B 110 Volts, 25 Cycles
108 WATTS

GENERAL MOTORS RADIO CORP.

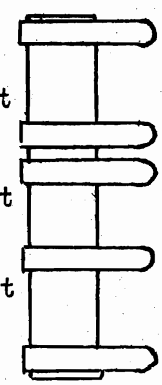
MODELS 252, 253, 254, 255, 256, 257, 258 SUPERHET. RECEIVERS. (CHASSIS MODELS S3A & S3B)

Type of Tube	Position of Tube	Fil. Volts	Plate Volts	Control Grid Volts	Screen Grid Volts	Cathode Volts	Normal Plate M.A.	Grid Change
227	Oscillator	2.1	65	.3	—	7	5	0
235	R. F.	2.1	230	.5	77	2.5	6	3.5
224	1st Det.	2.1	230	5.0	65	5	1	.3
235	1st I.F.	2.1	230	.5	77	3	5	3.5
235	2nd I.F.	2.1	230	5.0	60	10	8	3.5
237	2nd Det.	2.2	205	23.0	—	23	1	4.0
227	A.V.C.	2.2	25	2.5	—	30	0	0
245	A.F.	2.2	230	20.0	—	—	30	35
245	A.F.	2.2	230	20.0		—	30	35
280	Rectifier	4.5	330	—		—	30-30	—

Line Volts, 110 Volume Control on Full

CONDENSERS

No.	CAPACITY
C1	1.0 - 1.0 - .1 - .1 - .1 Mfd.
C2	.5 - .5 - .5 - .1 - .1 - .1 Mfd.
C3	5 Mmfd.
C4	.0007 Mfd.
C5	.00075 Mfd.
C6	.002 Mfd.
C7	.02 Mfd.
C8	.5 Mfd.
C9	8.0 Mfd. (Electrolytic)

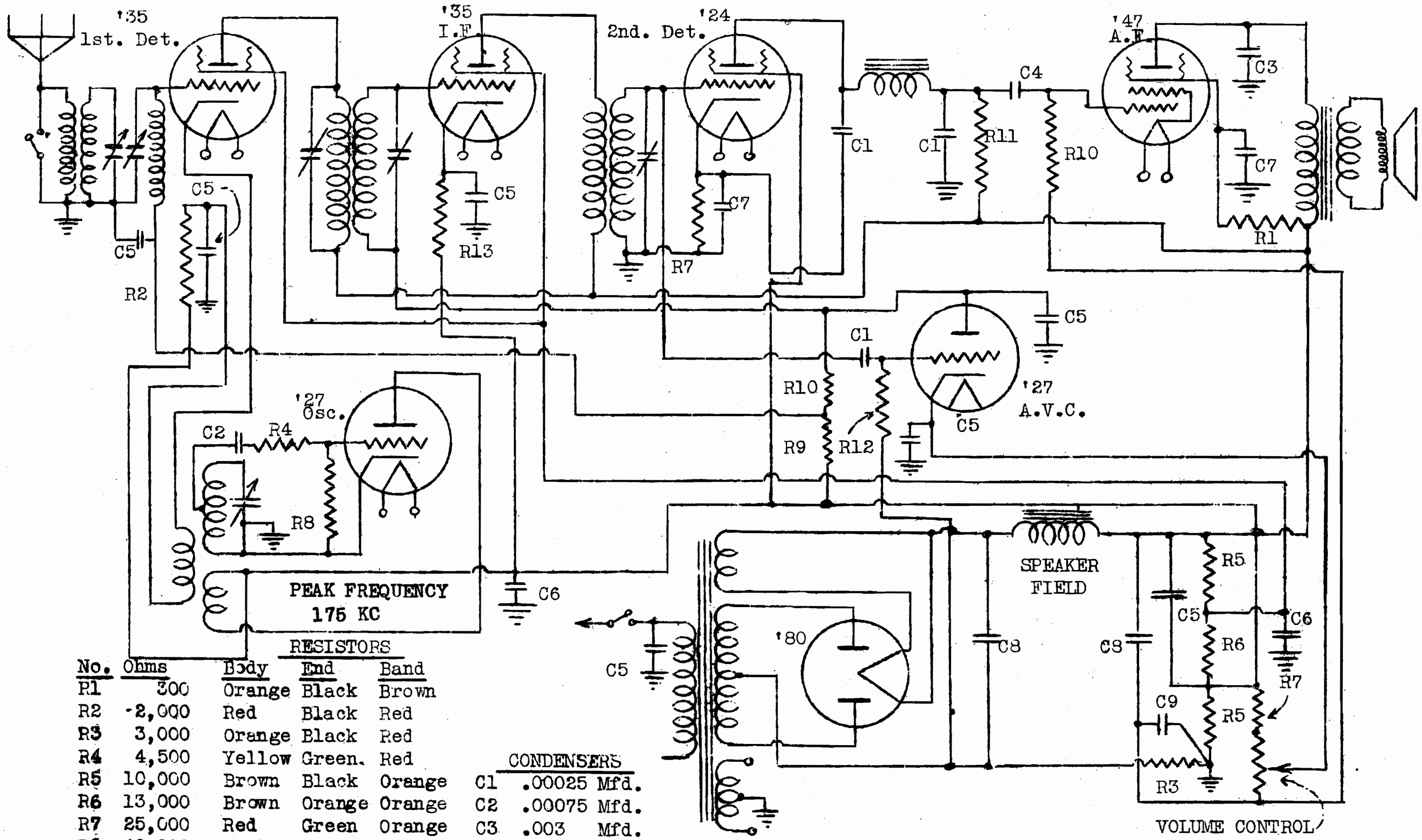


RESISTORS

NO.	BODY	END	SPOT	RESISTANCE	WATTS
R1	Brown	Green	Brown	150	½
R2	Lavender	Green	Brown	750	½
R3	Solid Lavender			1250	½
R4	Green	Black	Orange	50,000	½
R5	Blue	Black	Red	6,000	½
R6	Brown	Black	Orange	10,000	1
R7	Brown	Gray	Orange	18,000	1
R8	Yellow	Black	Orange	40,000	½
R9	Brown	Brown	Yellow	110,000	1
R10	Orange	Black	Yellow	300,000	½
R11	Green	Black	Yellow	500,000	½
R12	Red	Black	Green	2 Megohms	½
R13	Solid Orange			14,550	3

The dial light bulb is a Mazda No. 41, rated at $2\frac{1}{2}$ volts.

GENERAL MOTORS RADIO CORP.



No.	Ohms	Body	End	Band
RESISTORS				
R1	300	Orange	Black	Brown
R2	-2,000	Red	Black	Red
R3	3,000	Orange	Black	Red
R4	4,500	Yellow	Green.	Red
R5	10,000	Brown	Black	Orange
R6	13,000	Brown	Orange	Orange
R7	25,000	Red	Green	Orange
R8	40,000	Yellow	Black	Orange
R9	100,000	Brown	Black	Yellow
R10	150,000	Brown	Green	Yellow
R11	250,000	Red	Green	Yellow
R12	4 meg.	Yellow	Black	Green
R13	400	Yellow	covered wire	

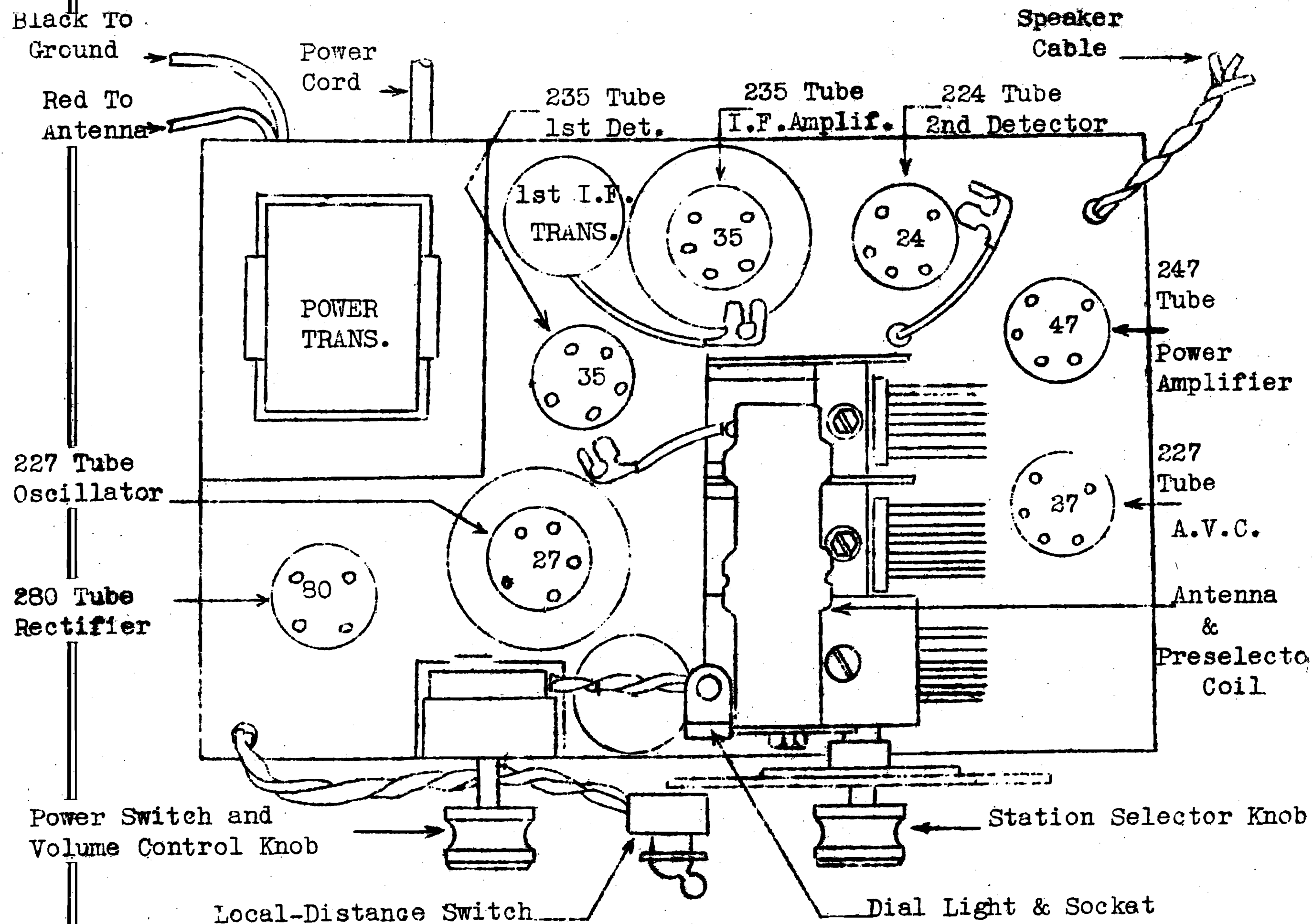
CONDENSERS

C1	.00025	Mfd.
C2	.00075	Mfd.
C3	.003	Mfd.
C4	.02.	Mfd.
C5	.1	Mfd.
C6	.25	Mfd.
C7	.5	Mfd.
C8	8.0	Mfd.
C9	15.0	Mfd.

MODEL 220 SUPERHET. RECEIVER
CHASSIS MODELS S-10-A (50-60~) and
and S-10-B (25~)

GENERAL MOTORS RADIO CORP.

MODEL 220 SUPERHET. RECEIVER
CHASSIS MODELS S-10-A (50-60~) and S-10-B (25~)



TUBE IN SET ANALYZER

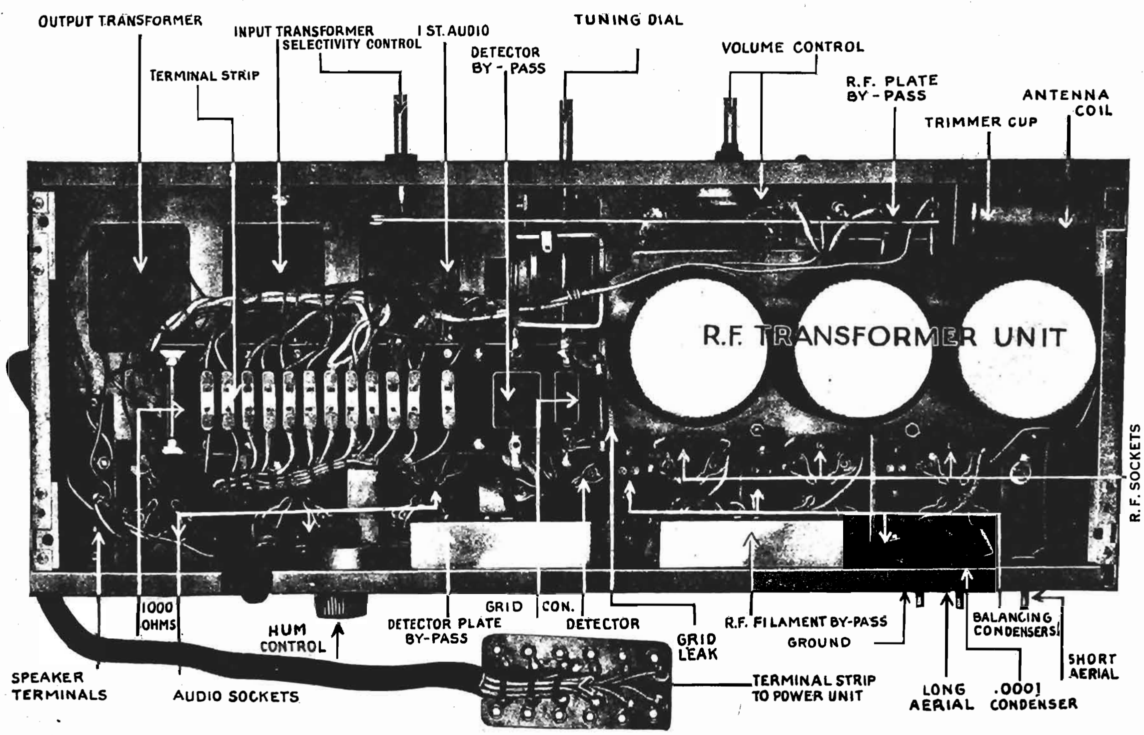
Type of Tube	Position of Tube	Fil. Volts	Plate Volts	Control Grid Volts	Screen Grid Volts	Cathode Volts	Pentode Screen Volts	Normal Plate M.A.
*235	1st Det.	2.25	170	5.0	87	100	---	4.0
*235	I.F. Amp.	2.25	200	1.0	95	100	---	8.0
*224	2nd Det.	2.25	120	6.0	77	7.0	---	.5
247	A.F. Amp.	2.25	270	7.0	--	---	255	35.0
227	Osc.	2.25	90	0.0	--	0	---	8.0
227	A.V.C.	2.25	30	2.0	--	15	---	0.0
280	Rectifier	4.1	360	---	--	---	---	30-30

Line Voltage 112. Volume Control on maximum

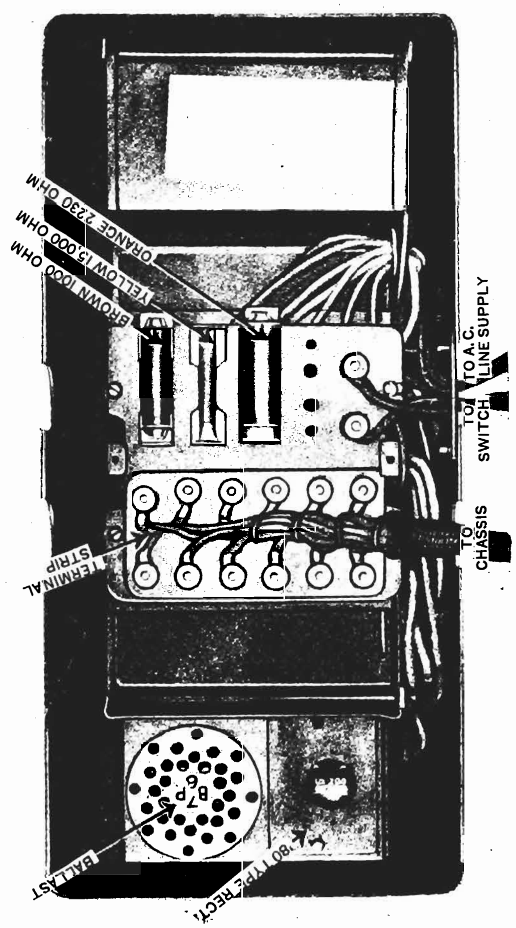
*When testing 224 and 235 tubes, connect a .1 mfd condenser between the control grid of the tube being tested and the frame of the chassis, to prevent oscillation, and to insure correct reading of the screen grid volts.

GRIGSBY GRUNOW CO.

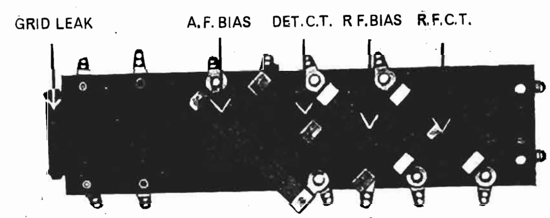
MAJESTIC - MODEL 70-B CHASSIS



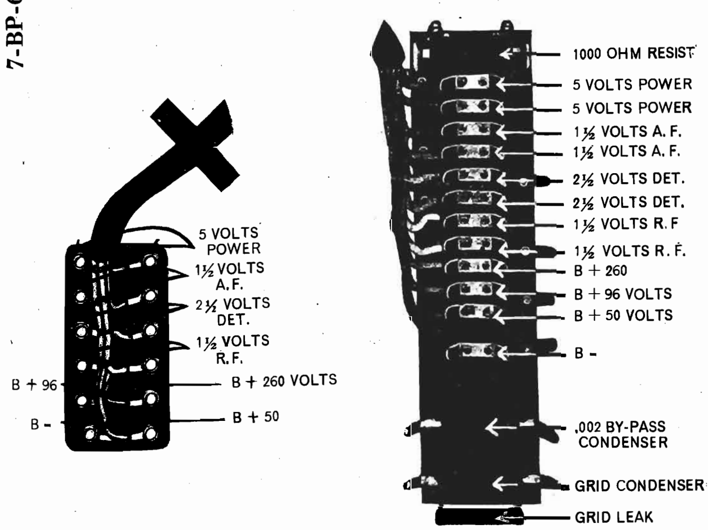
Model 70-B Chassis



7-BP-6—7-BP-3 Power Unit



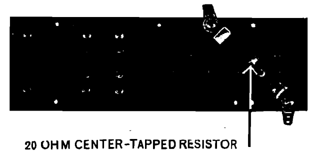
Bottom View of Terminal Board in 70-B Chassis, Showing Resistors Employed



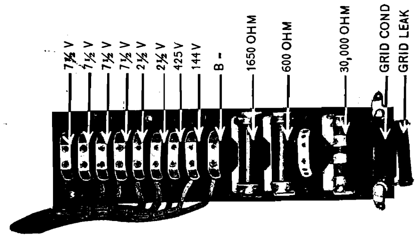
Cable for 70-B Chassis, Showing Resistors, Grid Condenser and Leak, and Voltages at Terminals.

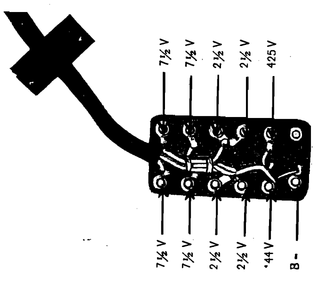
GRIGSBY - GRUNOW CO.

MAJESTIC - MODEL 180 CHASSIS

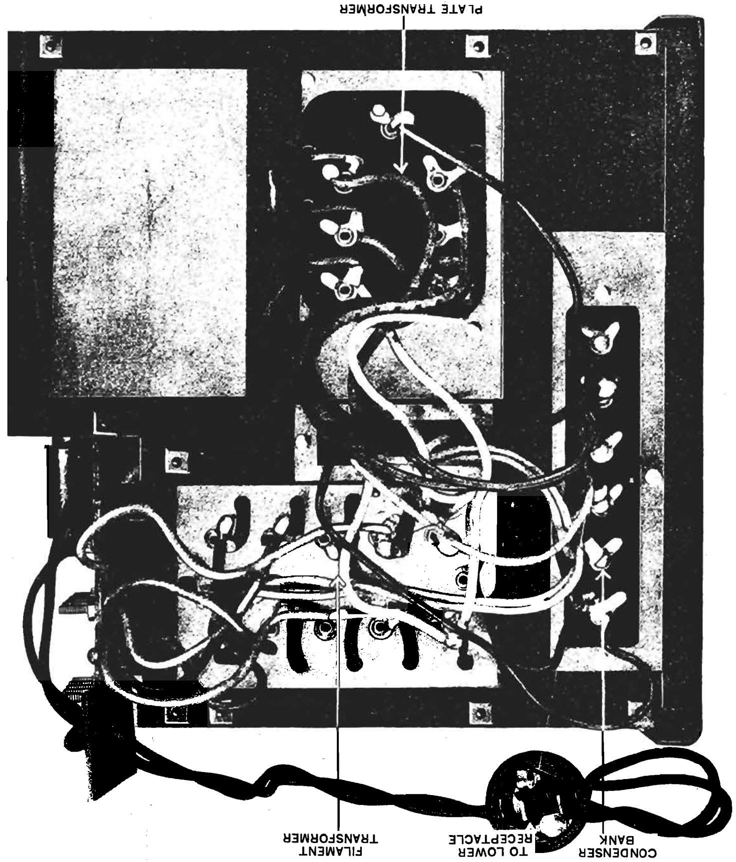


Bottom View of Terminal Board of Model 180 Chassis, Showing C. T. Resistor

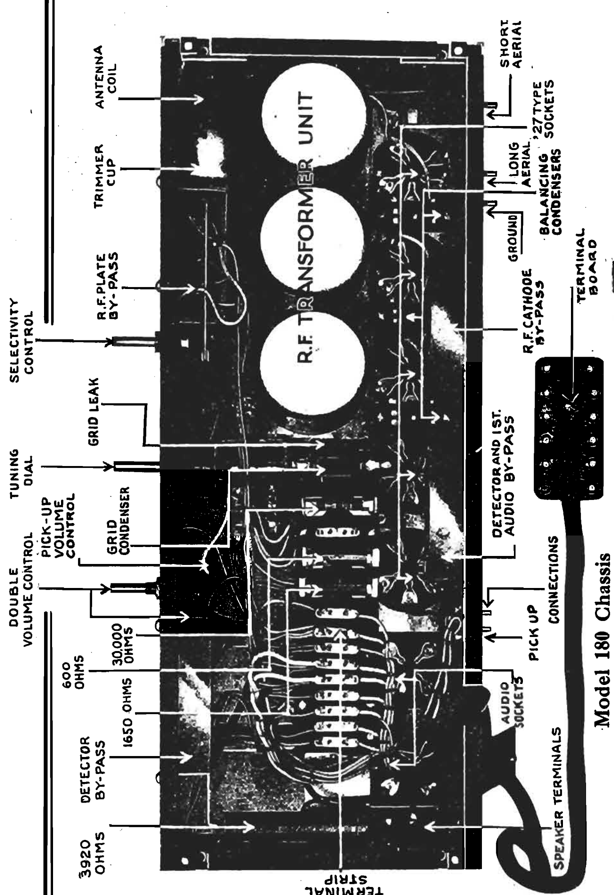




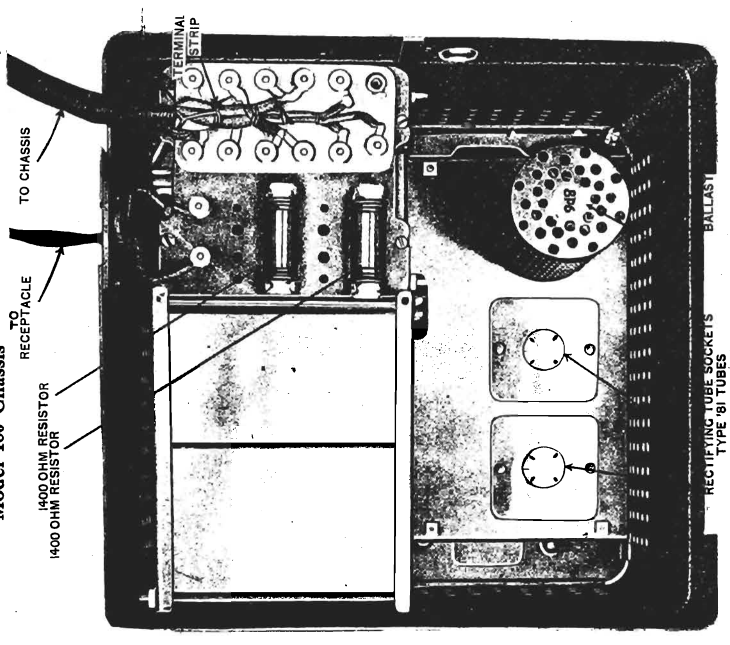
Power Cable and Terminal Board of Model 180 Chassis, Showing Resistors, Grid Leak and Condenser, and Voltages Supplied.



Side View of 8-P-6—8-P-3 Power Unit, Showing Internal Wiring



Model 180 Chassis

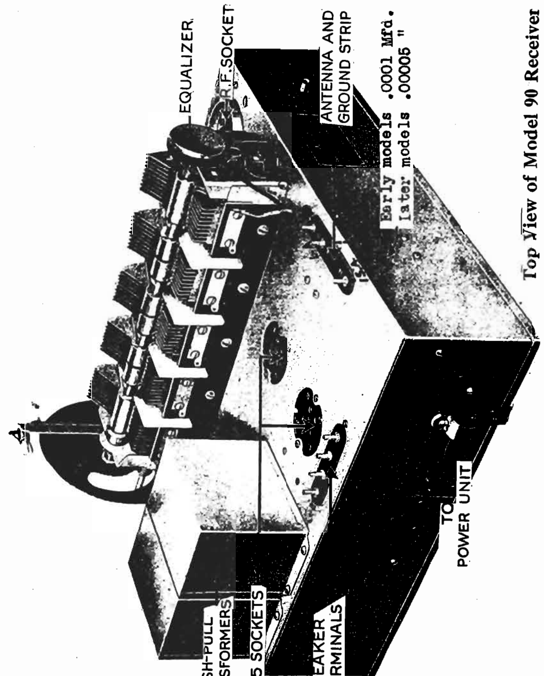


Top View of Model 8-P-6—8-P-3 Power Unit

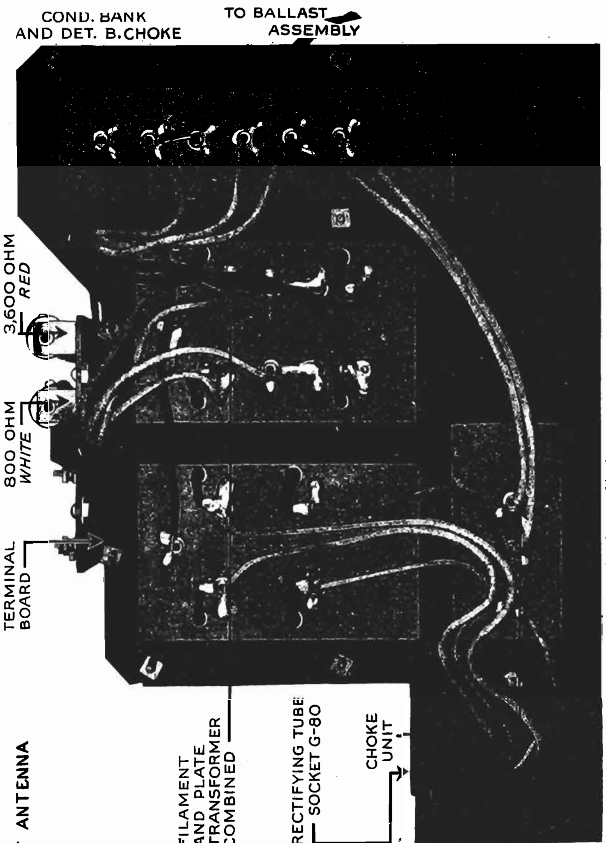
GRIGSBY - GRUNOW CO.

MAJESTIC

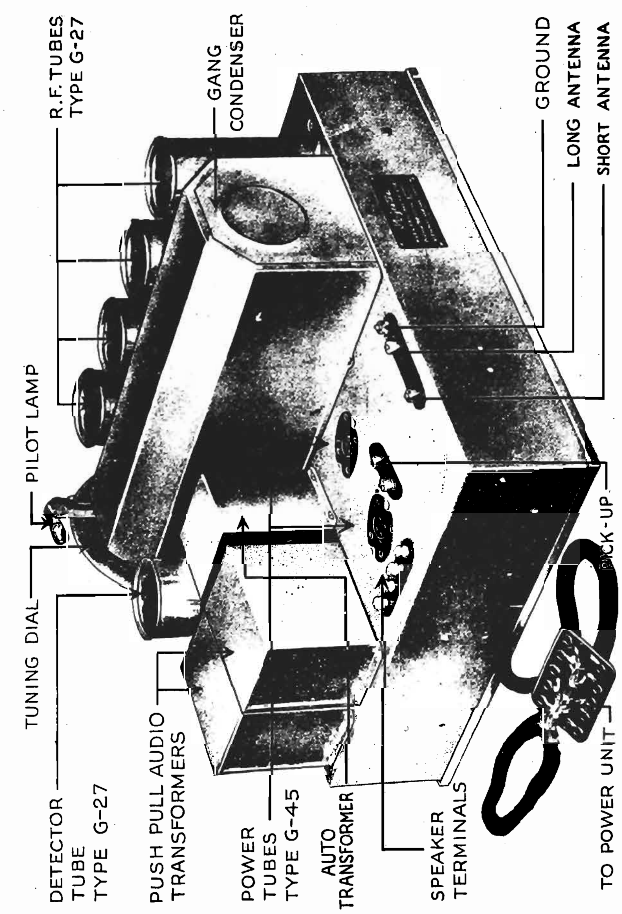
CHASSIS MODEL 90 - RECEIVER MODELS 91 & 92
CHASSIS MODEL 100 - RECEIVER MODEL 101
POWER UNIT 9-P-6 & 9-P-3

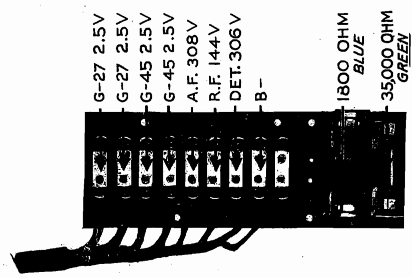


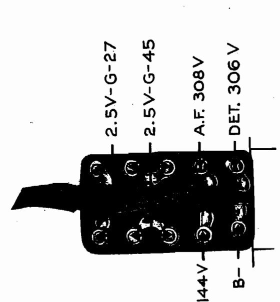
Top View of Model 90 Receiver



Side View of Models 9P6-9P3 Power Units



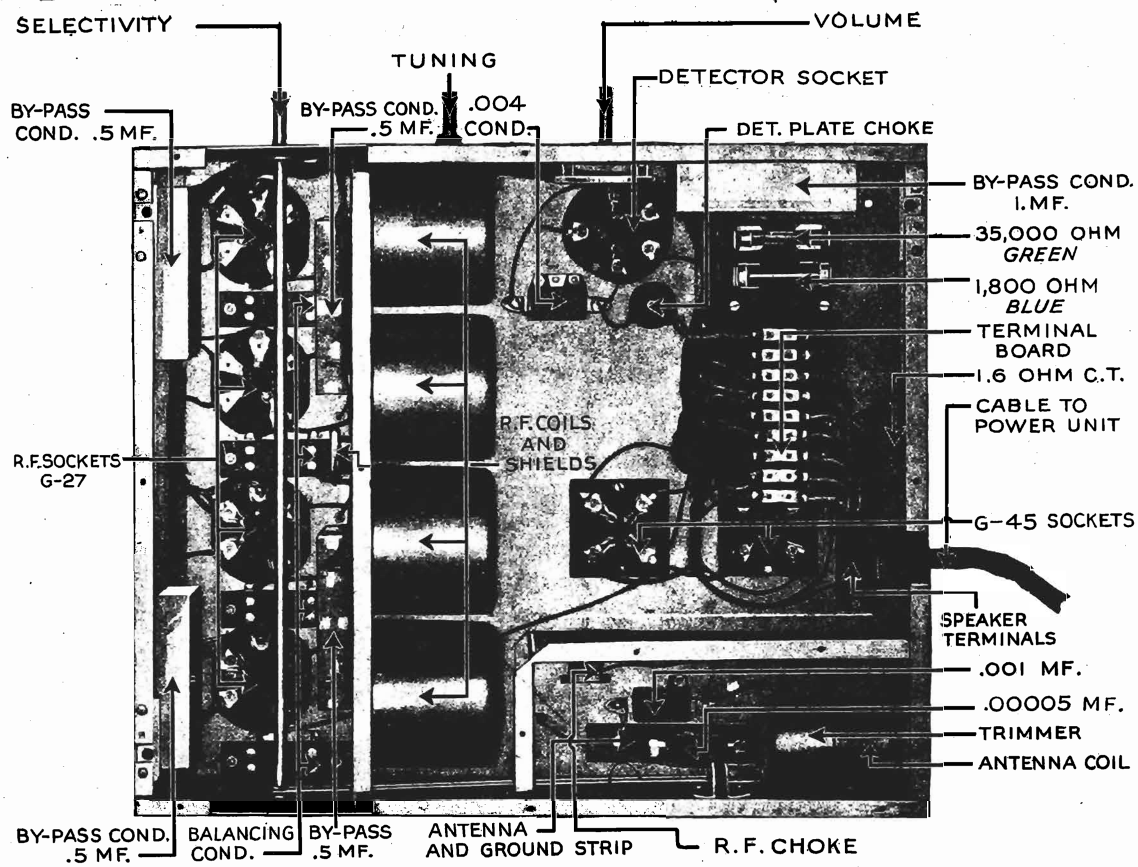




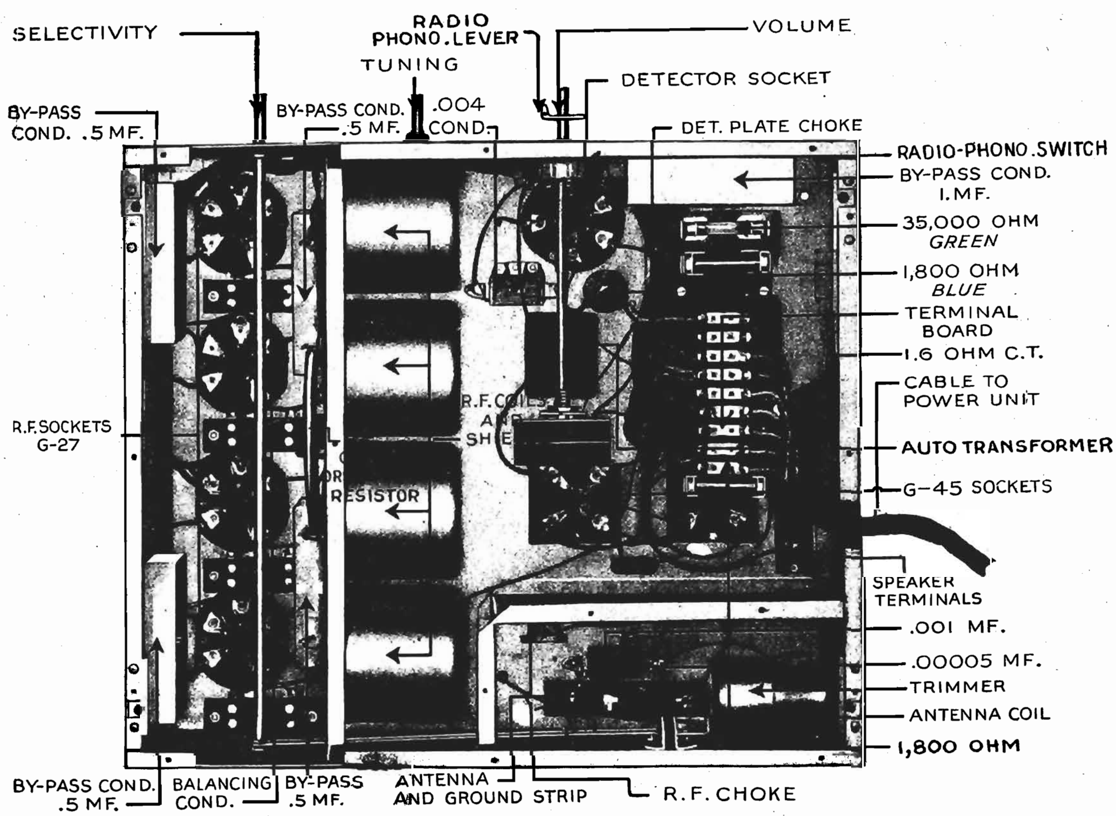
Power Cable, with Voltages Model 90 Receiver

MAJESTIC
MODEL 90 CHASSIS
MODEL 100 CHASSIS

GRIGSBY - GRUNOW CO.

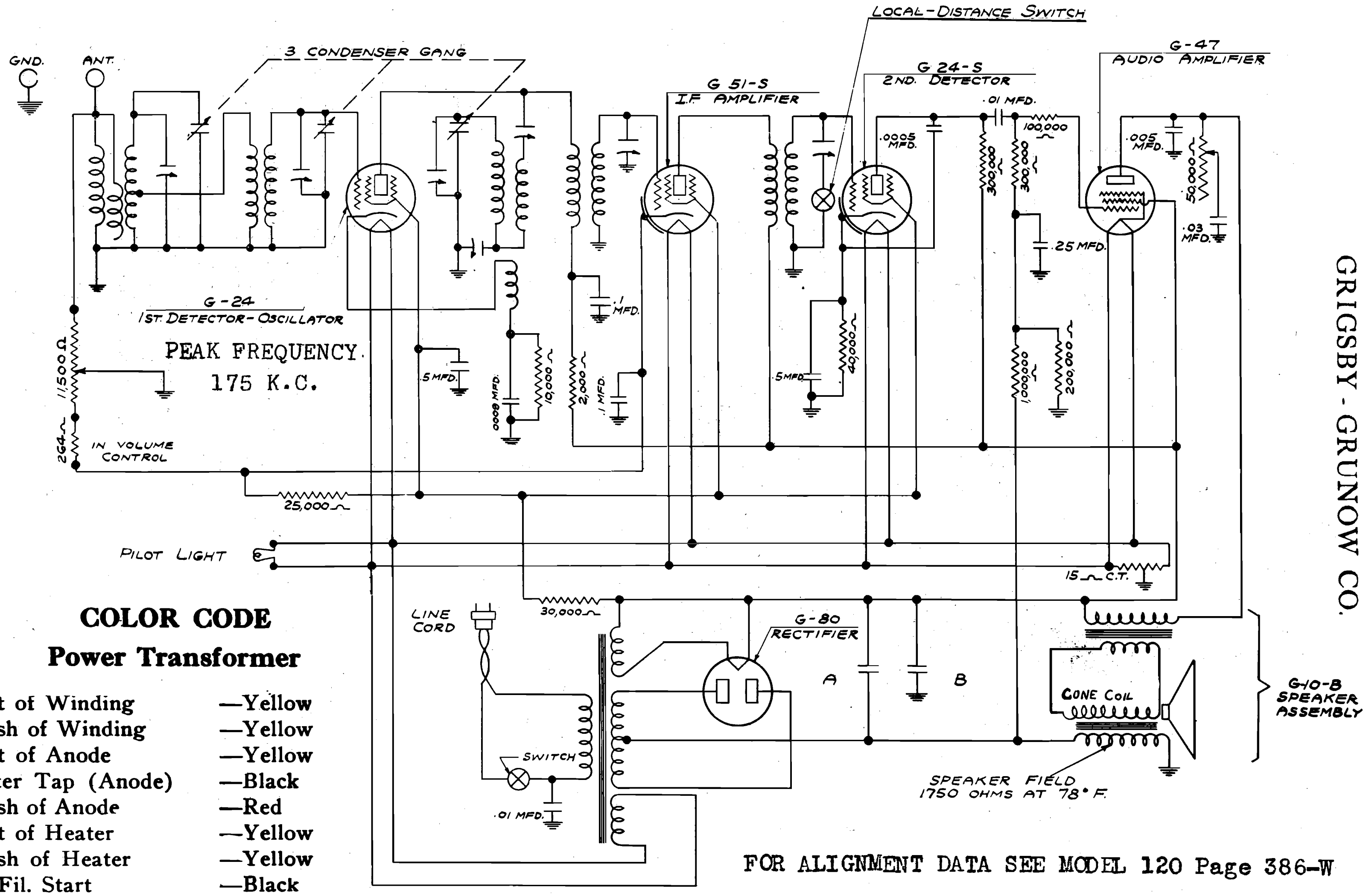


Position of Parts, and Wiring of Model 90 Receiver



GRIGSBY - GRUNOW CO.

SCHEMATIC DIAGRAM OF MAJESTIC SCREEN GRID SUPERHETERODYNE RECEIVER
MODEL 15 (65,149 UP TO INCLUSIVE) CHASSIS 115 AND 230 VOLTS, 25-50 AND 50-60 CYCLES
POWER REQD.—60 WATTS



PEAK FREQUENCY
175 K.C.

FOR ALIGNMENT DATA SEE MODEL 120 Page 386-W

COLOR CODE

Power Transformer

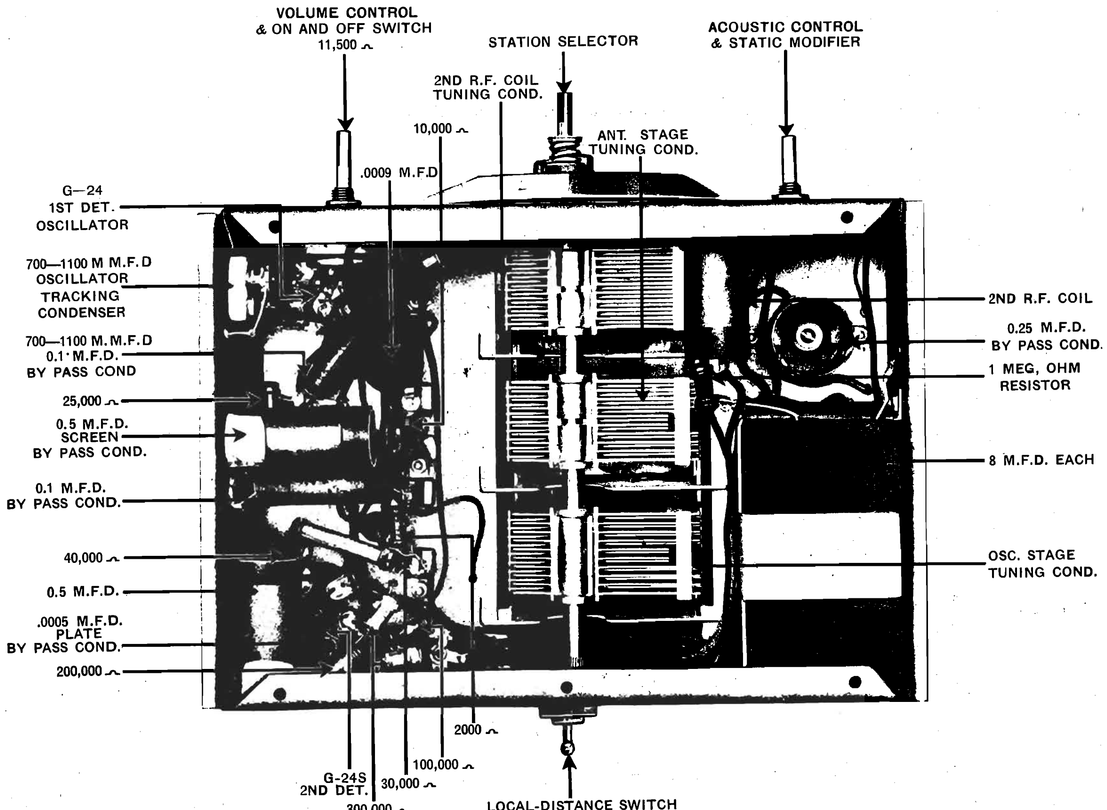
PRI.	Start of Winding	—Yellow
PRI.	Finish of Winding	—Yellow
	Start of Anode	—Yellow
	Center Tap (Anode)	—Black
	Finish of Anode	—Red
	Start of Heater	—Yellow
	Finish of Heater	—Yellow
	280 Fil. Start	—Black
	280 Fil. Finish	—Black

MODEL 15 Chassis (up to 65, 149 Incl.) 115-230 V. 25-50 & 50-60 Cycles - 60 Watts.

Model 15 Chassis
Employed in Havenwood, Ellswood and Sherwood Models

GRIGSBY - GRUNOW CO.

Model 15 Chassis



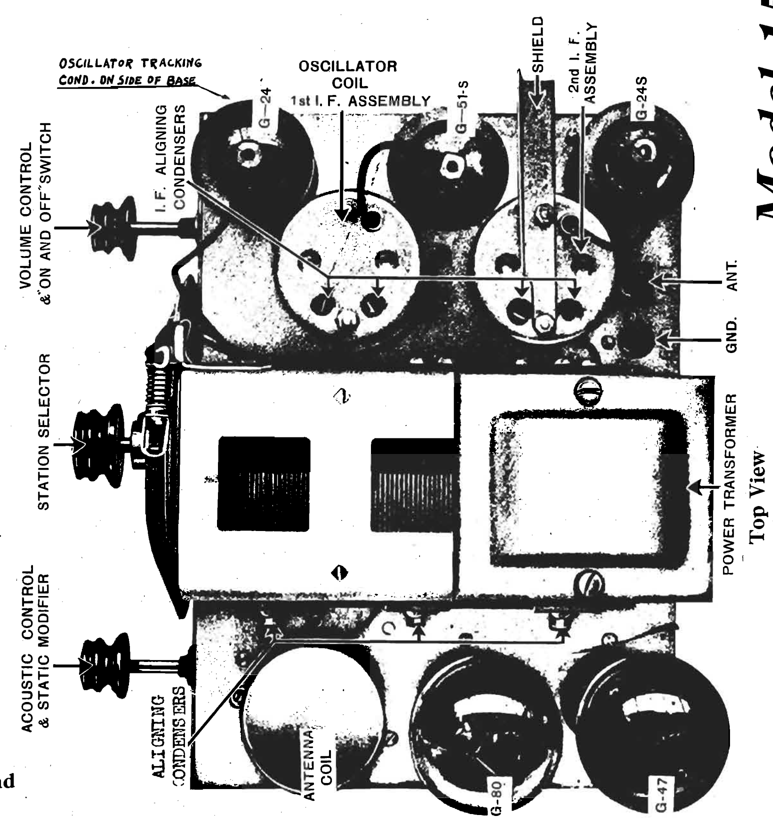
Bottom View Model 15 Chassis

Tube Purpose	Type	Fil. Volts A. C.	Plate Volts D. C.	Grid Volts D. C.	Cathode Volts D. C.	Plate Current M. A.—D. C.	Screen Volts D. C.
1st Det.—Osc.	G-24	2.5	250	.....	9	0.9	90
I. F. Amplifier	G-51-S	2.5	250	.....	3.0**	7.0	90
2nd Detector	G-24-S	2.5	250	-16.5*	9	0.17	90
Power Amplifier	G-47	2.5	250	.....	...	32	250
Rectifier	G-80	5.0	...	.....	...	54	...

Table of Voltages to Ground

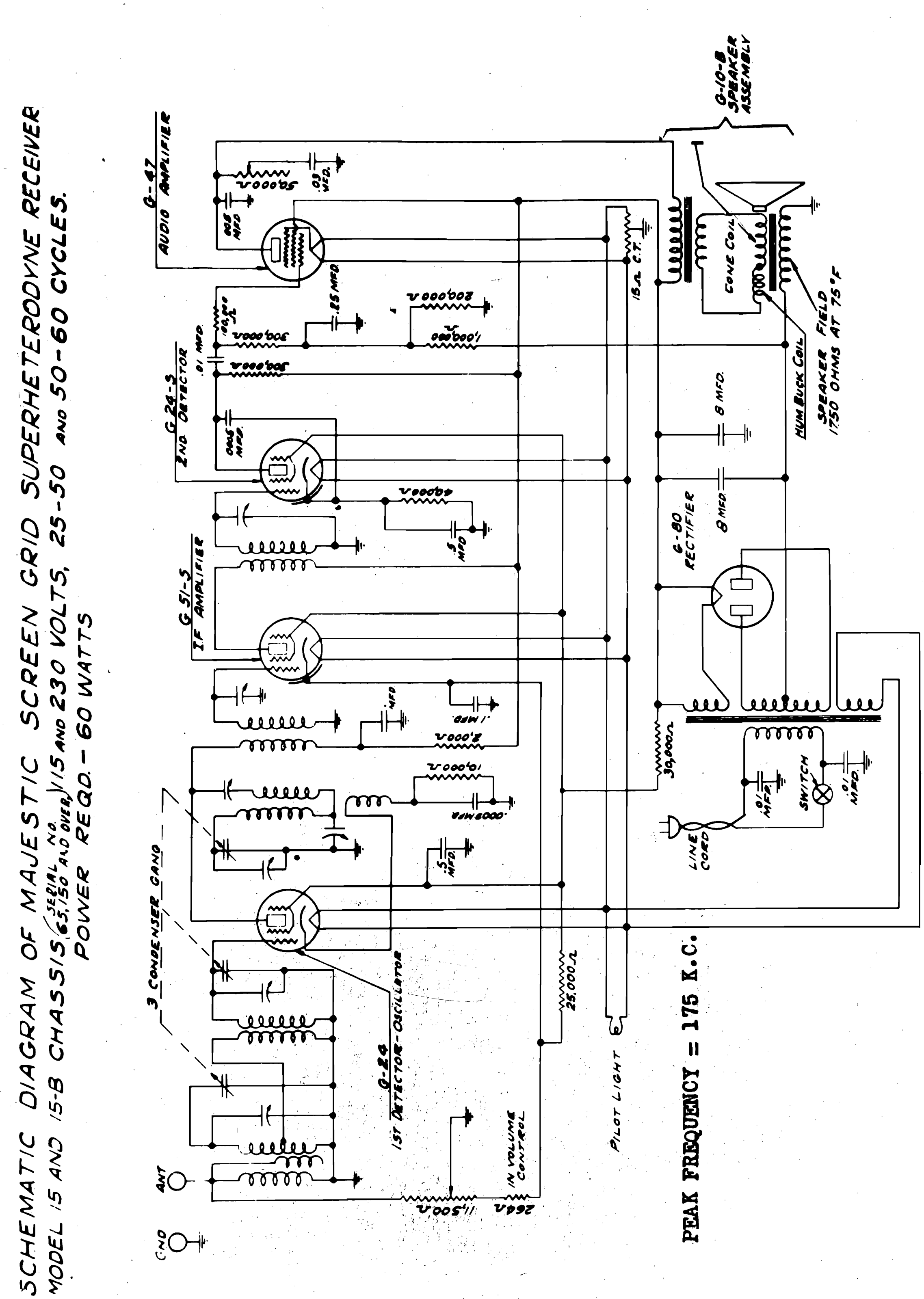
*This cannot be measured with the customary 1000 ohm per volt meter because of the high resistance between the grid and ground. If there is any doubt about the pentode bias, check the 100,000 ohm, 1 megohm, 200,000 and 300,000 ohm resistors and .25 M.F.D. Condenser in this circuit and be sure the speaker field voltage is correct, 112 volts. Also measure the pentode plate and screen voltages and if they are 250 volts, the plate current should be 32 M.A.

**This should rise to 42 when the volume control is turned to minimum.



Top View

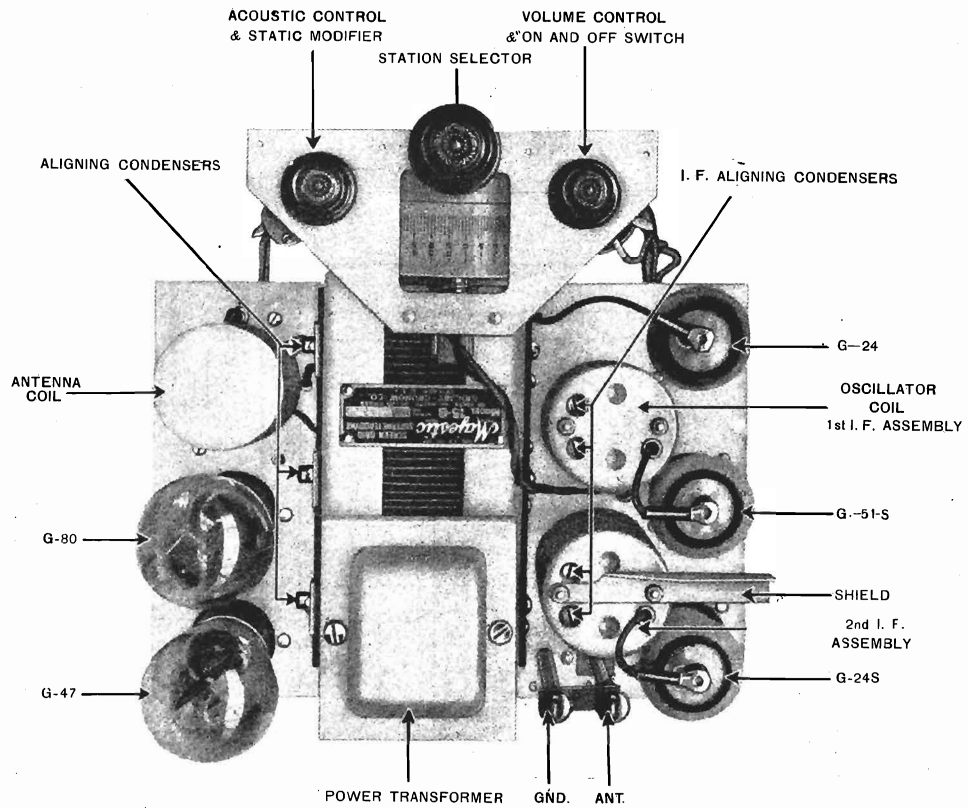
GRIGSBY - GRUNOW CO.



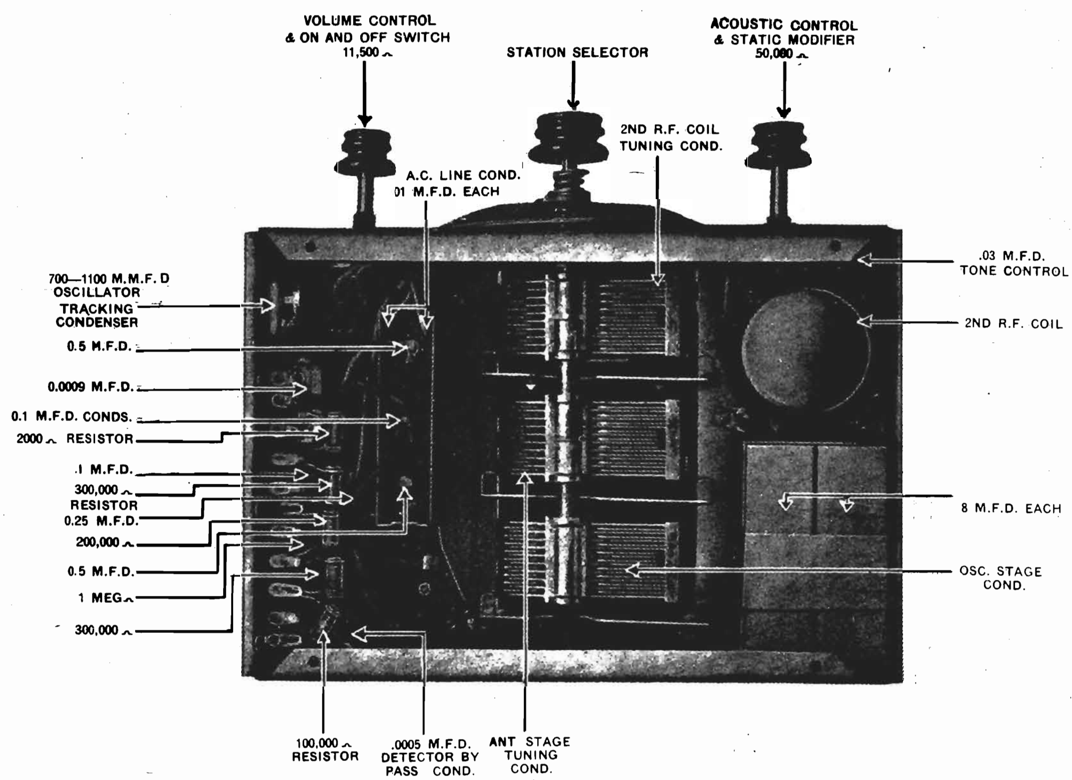
FOR ALIGNMENT DATA SEE MODEL 120 Page 386-W

Model 15B Chassis Employed in Fyfewood Model

GRIGSBY - GRUNOW CO.

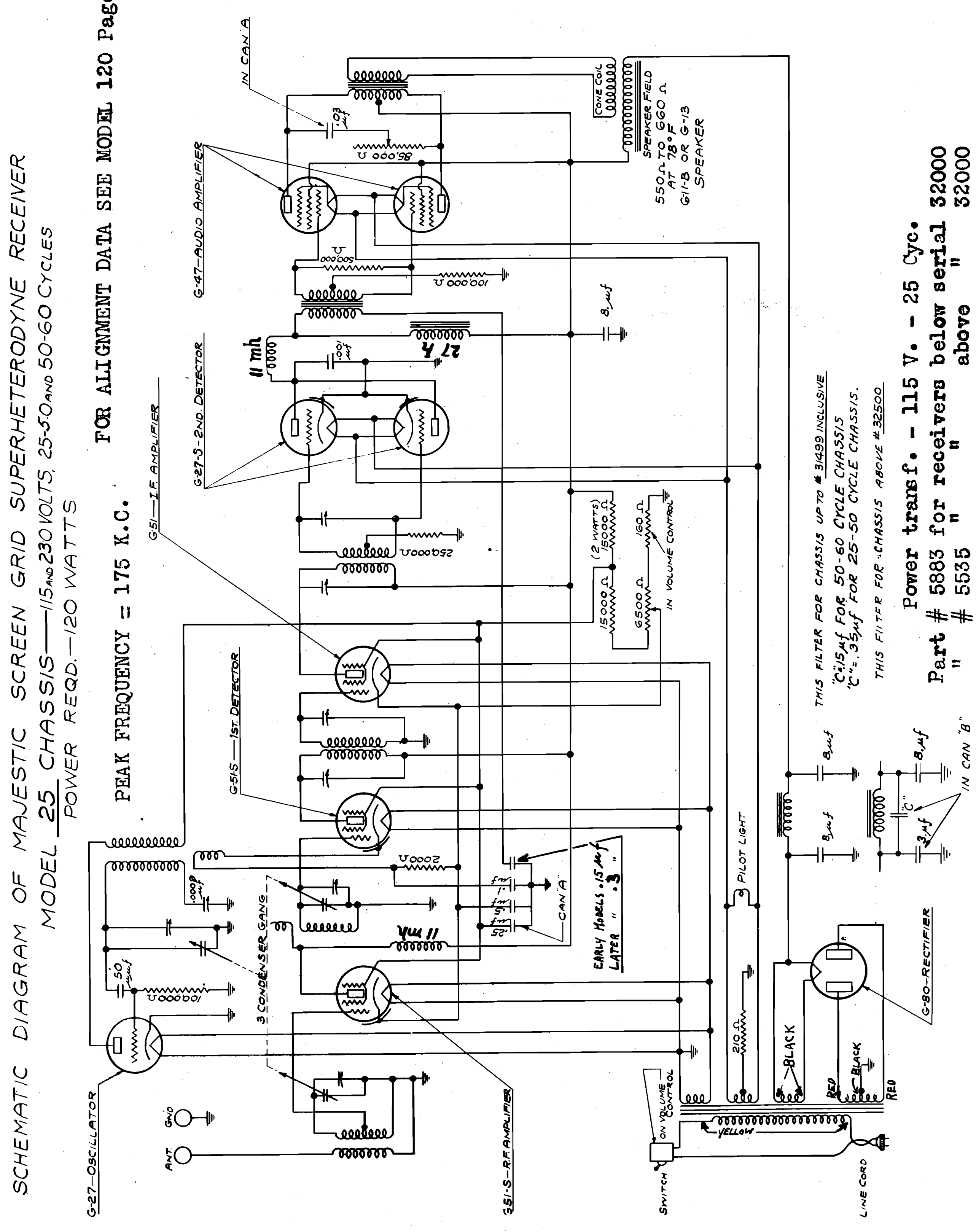


Top View Model 15B Chassis



Bottom View Model 15B Chassis

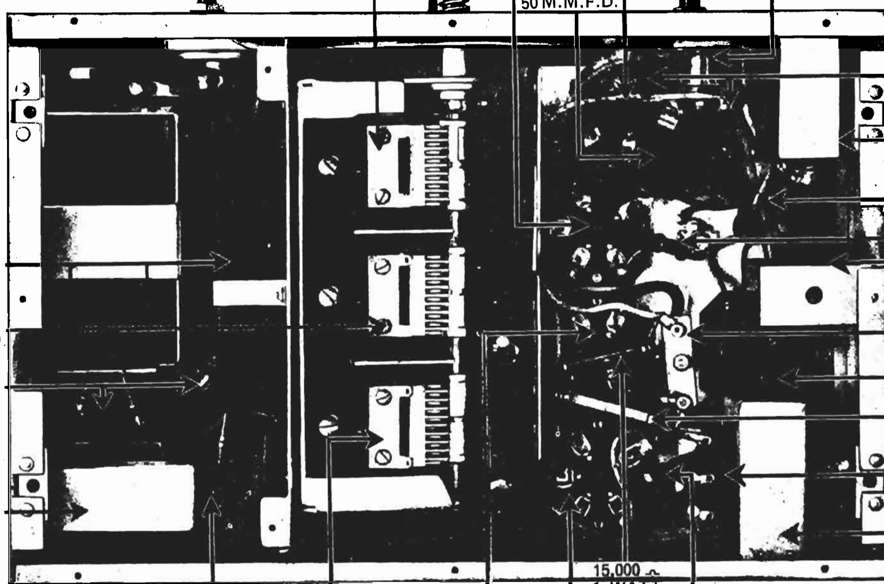
GRIGSBY - GRUNOW CO.



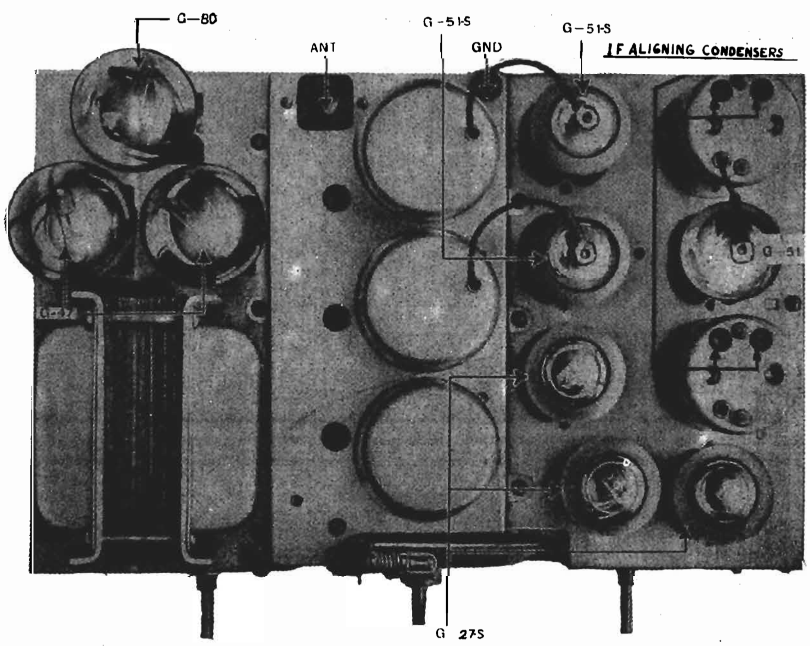
Model 25 Chassis

Employed in Brentwood, Cheltenwood and Brucewood Models

GRIGSBY - GRUNOW CO.



Bottom View Model 25 Chassis



Top View Model 25 Chassis

Tube Purpose	Type	Fil. Volts A.C.	Plate Volts D.C.	Fil. to Ground D.C.	Cathode Volts	Plate Current M.A.—D.C.	Screen Volts
R. F. Amp	G-51's	2.5	260	—	3.5	5.0	90
1st Det.	G-51's	2.5	260	—	8.0	1.0	90
Osc.	G-27	2.5	90	—	—	3.5	—
I. F.	G-51's	2.5	260	—	3.5	5.5	90
2nd Det.	G-27's	2.5	115	—	—	14	—
2nd Det.	G-27's	2.5	115	—	—	14	—
Power Amp.	G-47	2.5	245	-16.5	—	32	260
Power Amp.	G-47	2.5	245	16.5	—	32	260
Rectifier	G-80	5.	400	—	—	120 (Total)	—

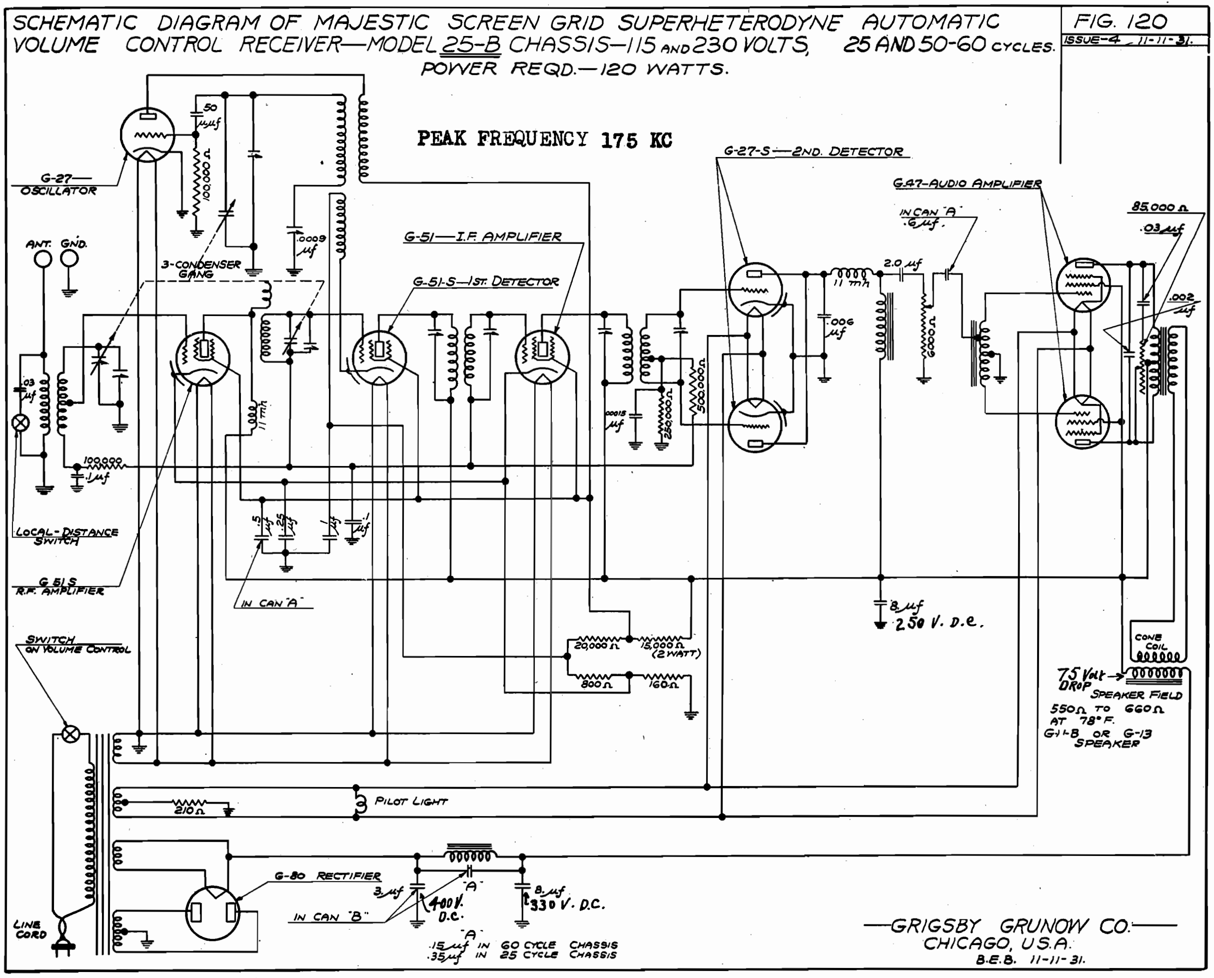
D. C. First Condenser 385 Volts
D. C. Second Condenser 330 Volts
Line Voltage 115 Volts
Speaker Field 70 Volts
Volume Control—Maximum

Table of Voltages to Ground
Model 25

GRIGSBY - GRUNOW CO.

MAJESTIC MODEL 25-B CHASSIS

RECEIVER MODELS CHELTENWOOD (251)- BRENTWOOD (253)- BRUCEWOOD (254)



The audio system is tuned to give full bass response as low as forty cycles, also an image rejector circuit is used in the pre-selector to reduce image response.

Power Supply System

The power supply system on the Model 25B Chassis consists of a power transformer, G80 rectifier, filter choke (tuned), speaker field, 3 mfd. paper condenser, and two 8 mfd. electrolytic condensers.

Color Code for Model 25-B Power Transformer

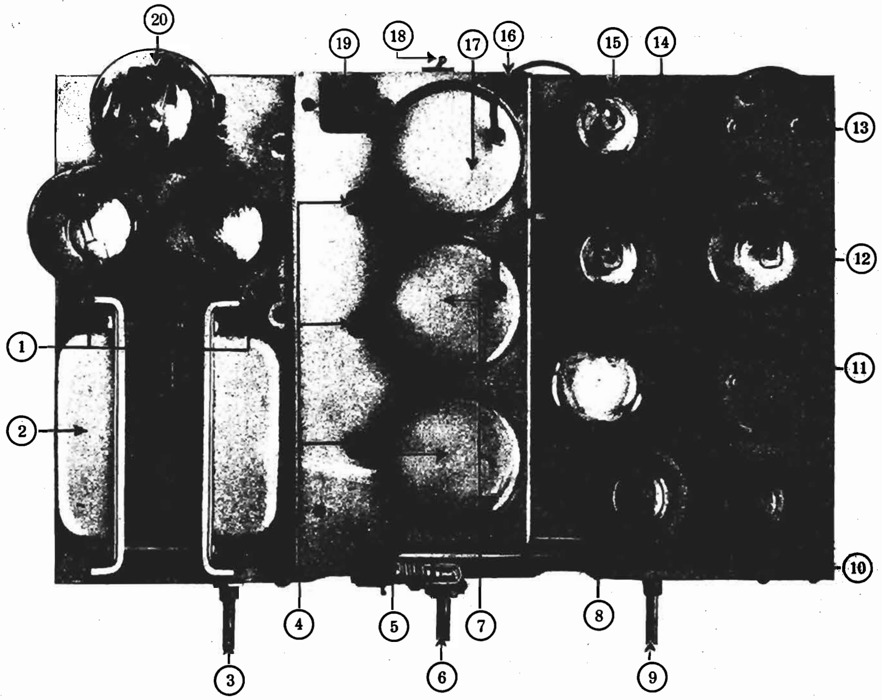
Start of Primary	Yellow	Center Tap No. 1 Heater	Red
Finish of Primary	Yellow	Finish of No. 1 Heater	Black
Start of Anode	Red	Start of No. 2 Heater	Yellow
Center Tap (Anode)	Black	Finish of No. 2 Heater	Yellow
Finish of Anode	Red	Start 5 v. Fil.	Black
Start of No. 1 Heater	Black	Finish 5 v. Fil.	Black

MODEL 25-B			Line 115 Volts - Vol. Contr. Max.					
TUBE	CIRCUIT	FIL.	PLATE	F.to GRND.	CATH.	CURRENT	S.G.VOLTS	S.G.CURRENT
G-51-S	R.F.Amp.	2.5	260	....	3	4.2	90	1.2
G-51-S	1st Det.	2.5	260	....	7	1.3	90	.4
G-27	Osc.	2.5	90	....	....	3.5	....	....
G-51-S	I.F.	2.5	260	....	3	5.	90	1.6
G-27-S	2nd Det.	2.5	135	16	....	14.	....	....
G-27-S	2nd Det.	2.5	135	16	....	14.	....	....
G-47	Power	2.5	250	16	....	30.	250	7.2
G-47	Power	2.5	250	16	....	30.	250	7.2
G-80	Rect.	5.	....	400	....	120 Total	....	....

FOR TECH. DATA REFER TO PAGE 386-Q-5
" SPEAKER " " " 386-Q-6

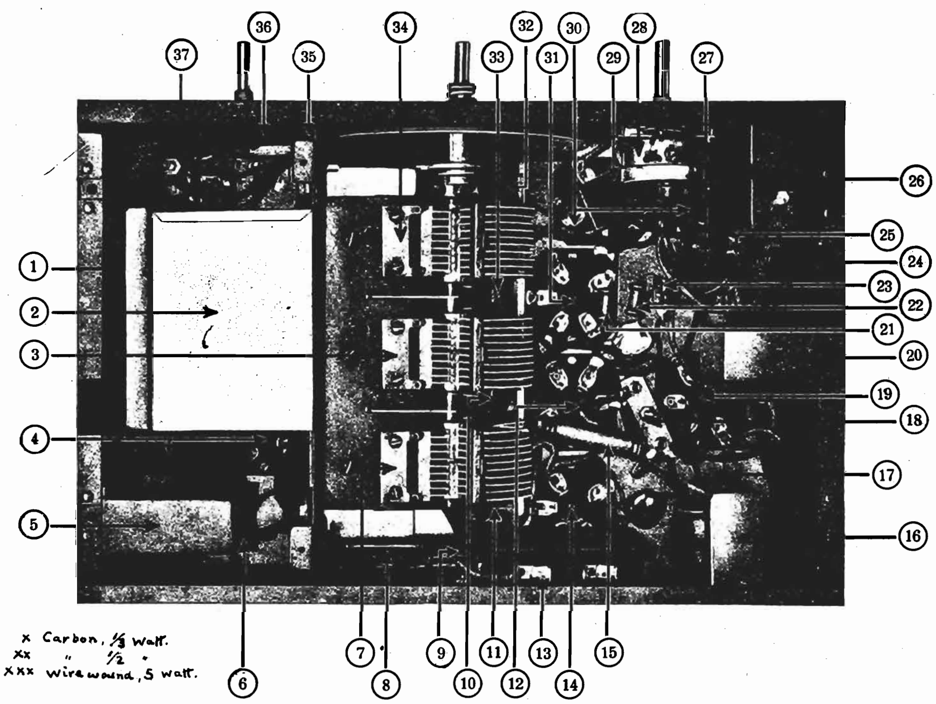
MAJESTIC
MODEL 25-B CHASSIS

GRIGSBY - GRUNOW CO.



Top View of Model 25B Chassis

1. G47 Pentode Audio Amplifier Tubes
2. Power Transformer
3. Tone Control
4. Aligning Condensers
5. Oscillator Coil
6. Tuning Control
7. R. F. Coil
8. G27 Oscillator Tube
9. Volume Control and Line On-Off Switch
10. G-27-S Second Detector Tubes
11. 2nd I. F. Transformer
12. G-51 I. F. Amplifier Tube
13. First I. F. Transformer
14. G-51-S 1st Detector Tube
15. G-51-S R. F. Amplifier Tube
16. Ground Post
17. Antenna Coil
18. Local-Distance Switch
19. Antenna Post
20. G-80 Rectifier Tube



x Carbon, 1/3 watt.
xx " 1/2 "
xxx wirewound, 5 watt.

Bottom View of Model 25B Chassis

1. 8 mfd. Cond. (2)
2. 3 mfd. and .15 mfd. Cond.
3. R. F. Stage Tuning Cond.
4. G-47 P.P. Audio Sockets
5. Filter Choke
6. G-80 Rectifier Socket
7. Ant. Stage Tuning Cond.
8. .03 mfd. Local-Distance Cond. (Cartridge)
9. Local-Distance Switch
10. 100,000 Ohm Resistor x
11. .1 mfd. Cond. (Cartridge)
12. G-51-S First Det. Socket
13. "Can C" Cond. Assembly
14. G-51-S R. F. Amplifier Socket
15. 15,000 Ohm Resistor xxx
16. Push-Pull Input Choke
17. 160 Ohm Resistor x
18. R. F. Choke
19. G-51-S I. F. Amplifier
20. Det. Plate A. F. Choke
21. 100,000 Ohm Resistor x
22. 250,000 Ohm Resistor x
23. 500,000 Ohm Resistor x
24. 800 Ohm Resistor x
25. 20,000 Ohm Resistor xx
26. "Can A" Cond. Assembly
27. .00015 mfd. Mica Cond.
28. Volume Control and Line Switch
29. .006 Mfd. Mica Cond.
30. G-27-S 2nd Det. Sockets
31. G27 Oscillator Socket
32. .00005 mfd. Mica Cond.
33. .1 mfd. Cond.
34. Oscillator Stage Tuning Cond.
35. Oscillator Tracking Cond.
36. Tone Control
37. .03 mfd. Tone Control Cond.

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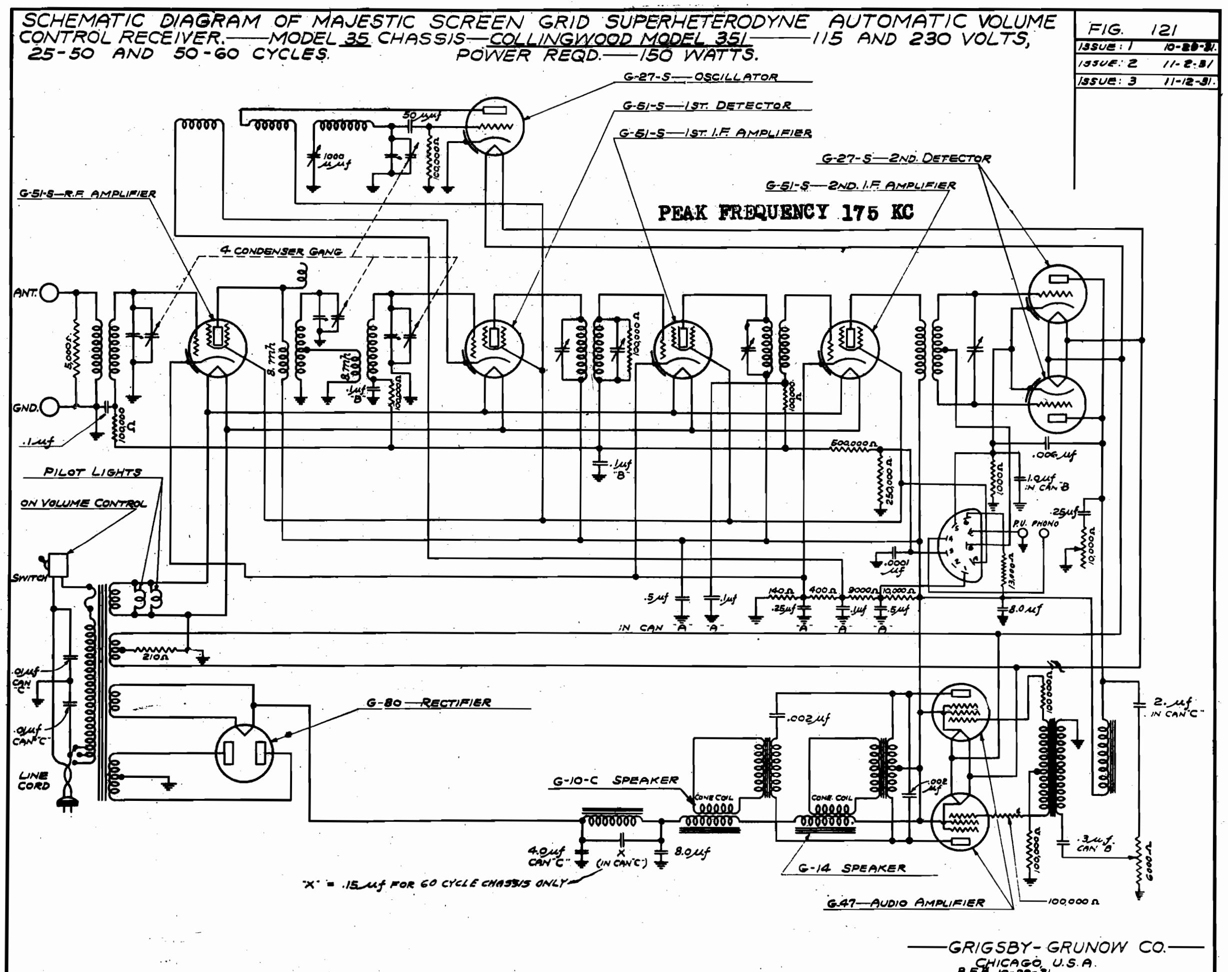
MAJESTIC MODEL 35 CHASSIS
RECEIVER MODELS ABBEYWOOD (353) and COLLINGWOOD (351)



Radio-Phonograph Switch

Both the COLLINGWOOD and ABBEYWOOD Models have a radio-phonograph switch which is located below the central control or station selector. This switch is turned to the right for radio operation and to the left for phonograph operation. There are pick-up terminals on the Model 35 chassis employed in both these sets, although the COLLINGWOOD Model is not a combination receiver. There should always be a jumper across the pickup terminals when the pickup is not attached.

Power Supply System

The power supply system of the Model 35 chassis consists of a power transformer, G-80 rectifier, a filter choke which is tuned to hum frequency, a 4 mfd. paper condenser, and two 8 mfd. electrolytic condensers. The condenser employed across the filter choke is a .15 mfd. for sixty cycle operation, and a .35 mfd. for twenty-five cycle operation. The output from this filter section passes through the fields of both dynamic speakers which act as additional chokes to the filter circuit.

MODEL 35				Line 115 Volts				
TUBE	CIRCUIT	FIL.	PLATE	F.to GRND.	CATH.	CURRENT	S.G.VOLTS	S.G.CURRENT
G-51-S	R.F.Amp.	2.5	265	....	4	5	90	0.5
G-51-S	1st Det.	2.5	265	....	8	1	90	0.5
G-27	Osc.	2.5	90	....	...	4	....	....
H-51-S	1st I.F.	2.5	265	....	4	5	90	0.5
G-51-S	2nd I.F.	2.5	265	....	4	5	90	0.5
G-27-S	2nd Det.	2.5	115	....	...	12	....	....
G-27-S	2nd Det.	2.5	115	....	...	12	....	....
G-47	Power	2.5	250	16.5	...	32	260	7
G-47	Power	2.5	250	16.5	...	32	260	7
G-80	Rect.	5.0	...	....	...	130 Total	....	....

Color Code for Model 35 Power Transformer

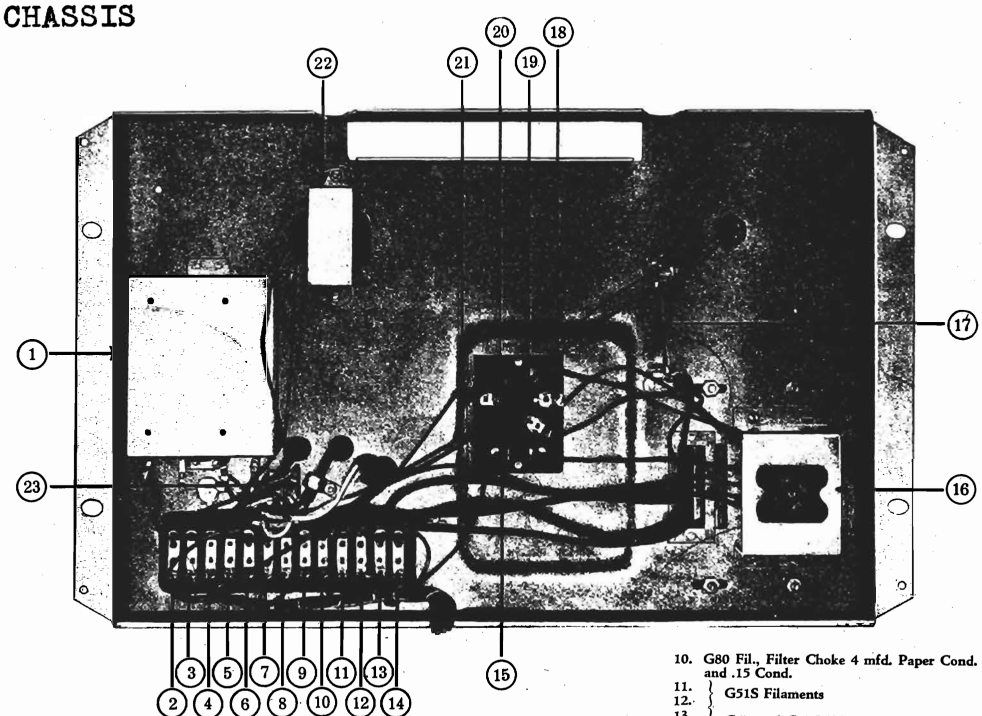
Start of Primary........Black
1st Tap of Primary........Green
2nd Tap of Primary........Yellow
Finish of Primary........Blue
Start of Anode........Red
Center Tap (Anode)........Black
Finish of Anode........Red

Start of No. 1 Heater........Black
Center Tap No. 1 Heater....Red
Finish of No. 1 Heater....Black
Start of No. 2 Heater....Yellow
Finish of No. 2 Heater....Yellow
Start G-80 Filament........Black
Finish G-80 Filament........Black

FOR TECH. DATA REFER TO PAGE 386-Q-5
" SPEAKER " " " 386-Q-6

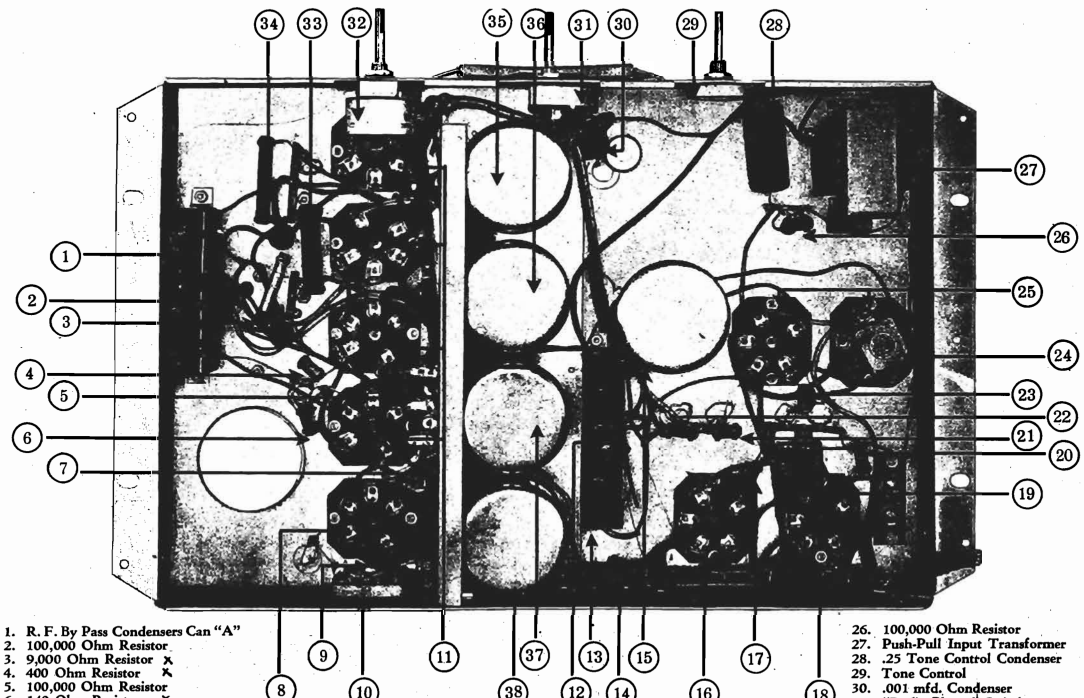
MAJESTIC
MODEL 35 CHASSIS

GRIGSBY - GRUNOW CO.



View Showing Power Supply Circuit of Model 35 Chassis

1. 2—8 mfd. Electrolytic Condensers
2. 265 V. to G47 Screens, 8 mfd. Electrolytic Cond. Det. Audio Choke and G14 Speaker Field
3. 2 mfd. Cond. Det. Audio Choke and Second Det. Plates
4. 2 mfd. Cond. and Volume Control
5. 110 V. Line Cord—On and Off Switch and .01 Cond.
6. 110 V. Line Cord—Primary Switch and .01 Cond.
7. G47 Plate and Input to Speakers
8. G47 Plate and Input to Speakers
9. Power Filter Choke G-10C Speaker Field, .15 Cond. and 8 mfd. Electrolytic Cond.
10. G80 Fil., Filter Choke 4 mfd. Paper Cond. and .15 Cond.
11. } G51S Filaments
12. }
13. } G47 and G27S Filaments
14. }
15. Fuse
16. G80 Rectifier Socket
17. 210 Ohm Resistor
18. 125 V. Primary Tap
19. 115 V. Primary Tap
20. 105 V. Primary Tap
21. Line
22. Audio Frequency Choke
23. Junction G10C—G14 Speaker Fields



Interior View of Model 35 Chassis

1. R. F. By Pass Condensers Can "A"
2. 100,000 Ohm Resistor
3. 9,000 Ohm Resistor x
4. 400 Ohm Resistor x
5. 100,000 Ohm Resistor
6. 140 Ohm Resistor x
7. .1 mfd. Condenser
8. G27S Oscillator Tube Socket
9. 100,000 Ohm Resistor
10. Oscillator Tracking Condenser
11. G51S Tube Sockets
12. 100,000 Ohm Resistor
13. R. F. By Pass Condenser Can "B"
14. 5000 Ohm Resistor x
15. 3rd I. F. Transformer
16. } G47S Tube Sockets
18. }
17. 100,000 Ohm Resistor
19. .002 mfd. Condenser (Mica)
20. 100,000 Ohm Resistor
21. 250,000 Ohm Resistor x (x Carbon)
22. 500,000 Ohm Resistor x
23. 1000 Ohm Resistor x
24. .006 mfd. Condenser (Mica)
25. G27S Push-Pull Detector Sockets
26. 100,000 Ohm Resistor
27. Push-Pull Input Transformer
28. .25 Tone Control Condenser
29. Tone Control
30. .001 mfd. Condenser
31. "Radio Phono" Switch
32. Manual Volume Control and (Off and On) Line Switch
33. 10,000 Ohm Resistor } wire wound
34. 13,000 Ohm Resistor }
35. Link R. F. Coil
36. R. F. Coil
37. Antenna Coil
38. Oscillator Coil

GRIGSBY - GRUNOW CO.

MAJESTIC CHASSIS MODELS 25-B and 35 (Continued)

Technical Data
Models 25B and 35 Chassis

Procedure for Alignment

WARNING: The Power Line shall never be connected to the receiver until the speaker and tubes are connected in the receiver.

The receiver shall be aligned with the volume control set at maximum and input reduced to keep output below 1 watt.

1. Supply 175 K.C. on 1st detector grid and adjust all I.F. tuning condensers to give maximum sensitivity.

2. Set dial at 1500 K.C. and line up all radio frequency circuits on 1500 K.C. signal for maximum output.

3. Set dial at 550 K.C. and adjust oscillator tracking condenser for maximum sensitivity with 550 K.C. feeding into the set. For each adjustment of the oscillator tracking condenser, there will be a different dial setting for maximum sensitivity. The combination of tracking condenser adjustment and dial setting which gives maximum sensitivity, disregarding calibration is the correct adjustment. If this adjustment falls within 5 K.C. of the 550 K.C. calibration point, readjust trimmers at 1500 K.C. and check dial calibration at 1000 K.C.

Each Receiver Must Be Aligned for Maximum Sensitivity. Check volume control throughout its range for noise, open or short circuit and irregularity of control operation. Check acoustic control over entire range for noise, open, short circuit and operation.

Automatic Volume Control System

The manual control is a 6,000 ohm potentiometer between second detectors and output tubes, operating entirely independent of the automatic control.

Automatic control is accomplished by applying the second detector grid bias on the R.F., Detector and I. F Stages to control their amplification, and by the inherent control of audio amplification in the second detector stage, due to the same bias.

Sensitivity

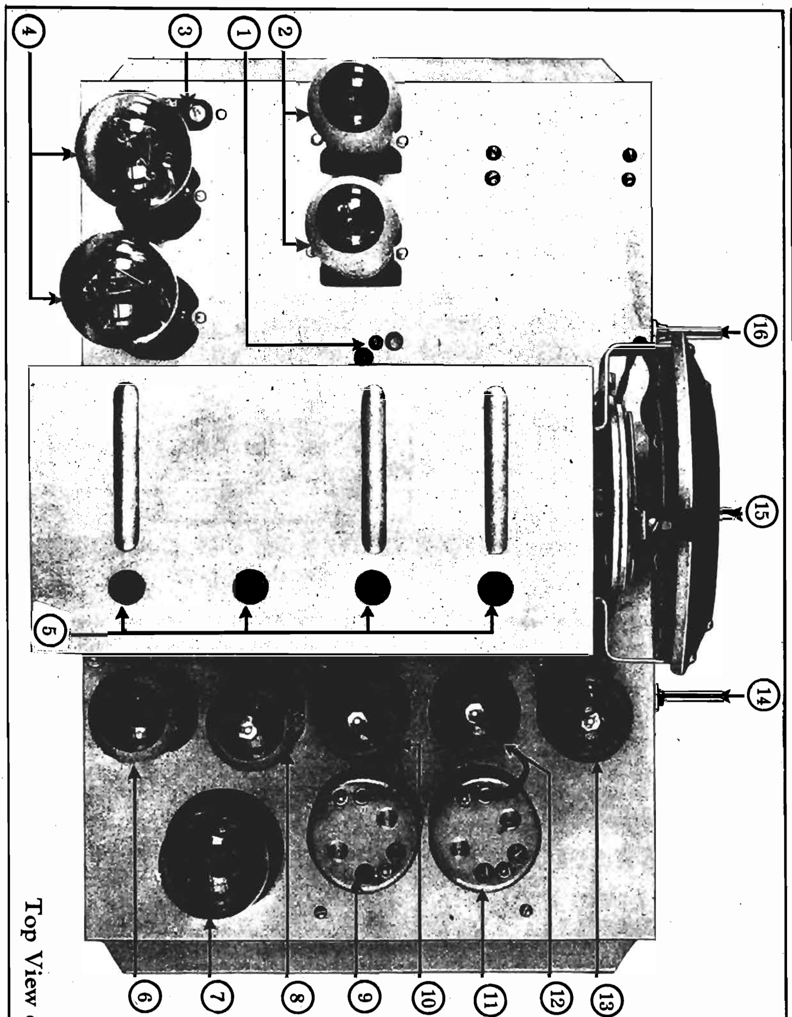
In cases where low sensitivity is encountered, the first step taken to remedy the condition, should be to check the G51S Tubes, which may be drawing abnormal grid current. This procedure should always be taken prior to any attempt to remedy by aligning the condenser gang.

Method of Biasing

The necessary bias obtained on the R. F., First Detector and I. F. is obtained from a bleeder circuit. The Oscillator is self-biasing with grid current drop across the 100,000 ohm grid resistor. The second detectors are self-biasing from a grid current drop across the 250,000 ohm grid resistor. The pentodes are also self-biasing by the 210 ohm wire-wound resistor in the filament circuit.

"Off" and "On" Line Switch

The "Off" and "On" Line Switch is attached to the volume control shaft. Turning the volume control completely to the left shuts the receiver off. The first fifteen degrees rotation of the control to the right will turn the receiver on. The balance of rotation to the right controls the volume of the receiver.



1. 3rd I. F. Transformer Alignment
2. G27S Push-Pull Detector Tubes
3. Phonograph Pickup Connections
4. G47 Pentode Tubes
5. Gang Aligning Condensers
6. G27S Oscillator Tube
7. G80 Rectifier Tube
8. G51S R. F. Tube
9. 2nd I. F. Transformer
10. G51S 2nd I. F. Tube
11. 1st I. F. Transformer
12. G51S 1st I. F. Tube
13. G51S 1st Detector Tube
14. Volume Control On-Off Line Switch
15. Station Selector
16. Acoustic Control

Top View of Model 35 Chassis

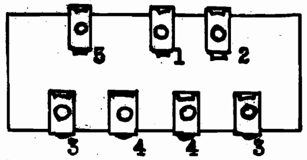
GRIGSBY - GRUNOW CO.

MAJESTIC CHASSIS MODELS 25-B and 35

CHASSIS 25-B
DYNAMIC SPEAKER
MODEL G-10-C
" G-13-B
" " G-14
" G-14-B

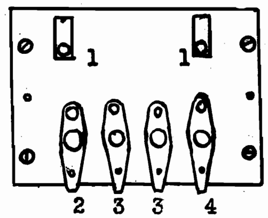
CHASSIS 35
DYNAMIC SPEAKER
MODEL G-11-B
" G-13

G-10-C Speaker
COLLINGWOOD Model



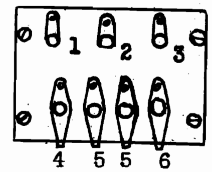
1 Primary Plate Lead Terminal
2 .002 Cond. Plate Terminal
3 Speaker Field Terminals
4 Voice Coil & Secondary Junct.
5 Primary & .002 Cond. Junction

G-14 Speaker
COLLINGWOOD Model



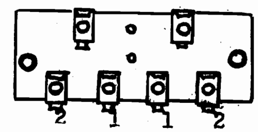
1 Voice Coil & Output Sec. Junct.
2 Field Coil & Primary Tap Junct.
3 Primary Plate Lead Terminals
Field Coil Terminal

G-14-B Speaker
ABBEYWOOD Model



1 Output Sec. & Voice Coil of G-14-B & G-13-B Junction
2 Voice Coil of G-13-B & Output Secondary Junction
3 Voice Coil of G-14-B & Output Secondary Junction
4 Field Coil & Primary Tap Junct.
5 Primary Plate Lead Terminals
6 Field Coil Terminals

G-13-B Speaker
ABBEYWOOD Model

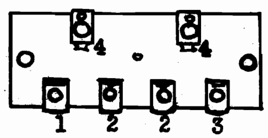


1 Voice Coil & Output Sec. Junct.
2 Field Coil Terminals

Models G-10-C, G-13-B, G-14 and G-14-B Dynamic Speakers Employed in Models Collingwood and Abbeywood

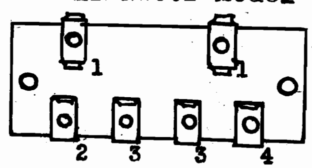
Both the COLLINGWOOD and ABBEYWOOD Models are equipped with twin speakers. The COLLINGWOOD Model employs the G-10-C, a small dynamic speaker (field resistance 200 ohms) for the high notes and the G-14, a large dynamic speaker (field resistance 750 ohms) for the low notes. The ABBEYWOOD Model employs the G-13-B dynamic speaker (field resistance 300 ohms) for the high notes and the G-14-B dynamic speaker (field resistance 550 ohms) for the low notes. The voice coil of the G-14-B is excited by one-half of the secondary of the output transformer which is located in the base of the speaker, and the voice coil of the G-13-B is excited by the other one-half of the same secondary. These speakers operating simulataneously produce an almost flat audio frequency response curve that gives these receivers a truly faithful reproduction.

G-13 Speaker
BRENTWOOD and BRUCEWOOD Models



1 Field Coil Terminal
2 Voice Coil & Output Sec. Junct.
3 Field Coil & Primary Tap Junct.
4 Primary Plate Lead Terminals

G-11-B Speaker
CHELTENWOOD Model



1 Primary Plate Lead Terminals
2 Field Coil Terminal
3 Voice Coil & Output Secondary Junct.
4 Field Coil & Primary Tap Junction

Models G-11-B and G-13 Dynamic Speakers Employed in Models Cheltenwood, Brentwood and Brucewood

The Models G-11-B and G-13 Dynamic Speakers have a field resistance of 570 ohms at 78° F. The G-11-B Speaker which is employed in the Cheltenwood Model, has a field structure of heavy "U" construction, and a 9.5" paper weight cone which responds readily to the slightest excitation. The output transformer with its terminal board is rigidly fastened to the cone housing. The G-13 speaker, which is employed in the Brentwood and Brucewood Models, has a field structure of heavy "U" construction mounted on a 6" base which is also used as a case for the output transformer. The 12" cone is a special made paper weight cone which responds readily to the slightest excitation.

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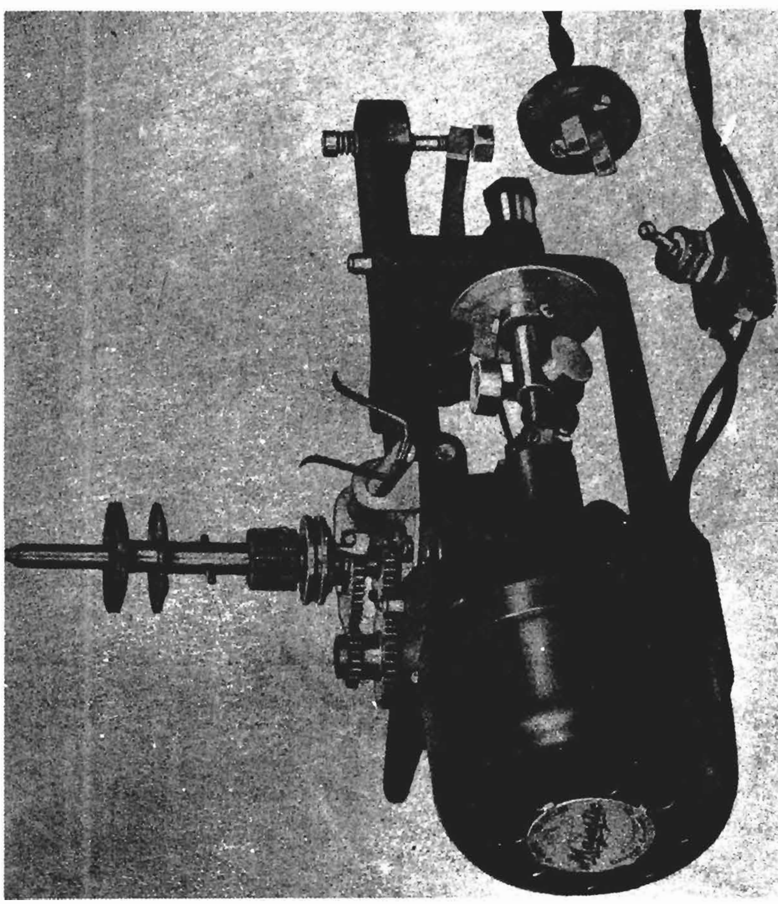
RECEIVER MODEL 353
(CHASSIS MODEL 35)
AUTOMATIC RECORD CHANGER

Bottom View of Record Changer



View of Phonograph Motor Assembly

ELECTROMATIC RECORD CHANGER

6070	Turn-table
6072	Pick-up Head
6080	Needle Clamp Screw
6073	Majestic Phonograph Motor, 115 Volt, 60 Cycle
6074	Majestic Phonograph Motor, 115 Volt, 50 Cycle
6075	Majestic Phonograph Motor, 220 Volt, 50 Cycle
D-1008	Record Ejector With Shaft
D-1011	Magazine Ring
D-1012	Automatic Trip Assembly
D-1013	Magazine Rest With Shaft
D-1015	Magazine Operating Link
D-1021	Pickup Left Spring
D-1022	Automatic Trip Driver Assembly
D-1023	Pickup Lift Lever Bracket
D-1024	Magazine Cam Assembly
C-1030	Record Ejector Cam
C-1034	Motor Pinion
D-1035	Reject Lever Assembly
D-1036	Speed Change Cam Assembly
C-1037	Universal Lever
C-1039	Record Ejector Cam Spring
C-1046	Pickup Arm Hinge Screw
C-1049	Main Gear Stud
C-1050	Record Ejector Cam Spring Nut
C-1051	Universal Lever and Pickup Control Adjuster Screw
D-1053	Pickup Control Lever Assembly
D-1061	Pickup Operating Cam Assembly
D-1062	Pickup Arm Assembly
D-1063	Pickup Lift Lever and Roller Assembly
C-1066	Pickup Lift Lever Hinge Pin
C-1067	Pickup Control Lever Spring
D-1068	Pickup Arm Shaft Nut
D-1069	Magazine Cam Screw
D-1075	Main Gear Assembly
C-1079	Magazine Operating Link Spring Clip
C-1085	Spring Washer for Magazine Operating Link and Record Ejector Cam.
D-1086	Diehl Motor Sub-base Assembly
C-1087	Record Ejector Instruction Plate
D-1088	Clutch Gear and Sector Assembly
C-1092	Magazine Cam Screw Washer
C-1093	Automatic Trip and Clutch Gear Shaft Washer
D-1104	Pickup Lift Rod Spec. Nut
D-1105	Pickup Lift Rod and Ball Assembly
D-1109	Speed Changer Spring
D-1110	Speed Changer Lever
D-1121	Magazine Record Rest
D-1122	Magazine Record Safety Spring
D-1123	On and Off Switch S.P.S.T.
D-1124	On and Off Switch Escutcheon Plate
D-1126	On and Off Switch Knurled Nut
D-1127	On and Off Switch Hex. Nut Stat. Bronze Fin.
D-1128	On and Off Switch Hex. Nut Plain Brass
1800	Motor Pinion Set Screw

RECEIVER MODEL 353
(CHASSIS MODEL 35)
AUTOMATIC RECORD CHANGER

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Instructions for Care and Operation of Automatic Record Changer Employed in the Majestic Model 353 Receiver

IMPORTANT.—The following instruction should be used in operating the MAJESTIC Automatic Record Changer employed in the Model 353 Abbeywood Receiver.

WARNING.—Before attempting to operate the automatic record changer, three screws which pass through the base plate of the record changer and the wood shelf, should be loosened so that the chassis is resting freely on the rubber cushions.

WARNING.—At no time for any reason should the turntable be stopped by hand. If this warning is not adhered to, serious damage may result.

RECORDS.—It is possible to play the two types of records available for home entertainment, that is, the ordinary records and the new long playing records. Each of these two types can be obtained in both twelve and ten inch diameter. The approximate playing time of these records is as follows:

Ordinary Records.	*New Long Playing Records.*
10 inch—2½ minutes.	10 inch—10 minutes.
12 inch—3½ minutes.	12 inch—15 minutes.

SPEED.—The standard record turns at a speed of 78 revolutions per minute, whereas the long playing record turns at the rate of 33 1/3 revolutions per minute. The mechanism is provided with a speed control lever to give either of these speeds, as required.

SWITCHES.—The line switch for the phonograph motor is located near the front of the turn table.

Directly under the main tuning dial is the "Radio-Phonograph" switch, which should be thrown to phonograph position for record playing. The line switch for the radio receiver is incorporated in the volume control assembly, which is located to the left of the phonograph switch.

NEEDLES.—The long playing records should be played using only the special needles designed for this type of record. After the special needle has once been removed from the pick-up head, do not use it again. Replace with a new one.

Do not play ordinary records with the special needle designed for long playing records.

Instructions for Setting Selector Device

It will be noted that to the right of the turn table there is a selector lever for the purpose of playing ten inch records automatic, ten inch records repeat, twelve inch records repeat, and universal or manual operation.

10" AUTOMATIC.—This is the only position in which the ten inch records are changed automatically.

10" REPEAT.—In this position, the mechanism will repeat the playing of the same record as many times as desired.

12" REPEAT.—The mechanism in this position will keep repeating a 12" standard record. Do not, however, attempt to repeat a 12" long playing record as it should be played manually with the lever in the universal position.

"UNIVERSAL."—In this position, the automatic changing and the repeat mechanism are not in operation, and the playing is controlled manually as with the ordinary phonograph. This position should always be used for playing the 12" long playing record and may be used for playing standard records.

Instructions for Operating Automatic Record Changer

Select the desired records and place them carefully in the record holder or magazine. The record at the bottom of the magazine will be the first one to be played.

The automatic changing magazine handles from one to ten of the 10" records. Do not mix standard records with long playing records in the magazine for automatic playing, as each type requires a different speed and a different type of needle.

It is best to place the first record on the table by hand and start the needle very carefully in the first groove with the selector lever in the "Universal" position; then the lever may be turned to the automatic position if desired, after which the changer will operate as outlined in paragraph II under "Instructions for Setting Selector Device." This procedure protects the needle and the record, and assures longer life for both.

REJECT LEVER.—While playing in the automatic position, if it is desired to interrupt the record and to play the following one, pull forward the reject lever which is located to the right of the turn table. This will cause the mechanism to go through a complete cycle of changing the record.

RELOADING.—When all of the records have been played through, and the magazine is empty, the mechanism will repeat the last record over and over. In reloading the magazine, switch off the motor at the time the magazine has travelled to the extreme left position, and carefully remove the stack of records from the turn table. Then replace them in the magazine in any desired sequence, with the side facing up which you desire to play. ***The magazine may be swung up and down, but do not try to force it sideways manually.***

ARM REST.—When changing records, the pick-up should be placed on the rest, to the right. If it cannot be placed there without straining, this is a sign that the automatic mechanism has not completed its cycle. In this case, hold the pick-up loosely, turn on the motor switch and wait until the record magazine has moved to the extreme left, which will allow the pick-up to be placed on its rest.

Instructions for Operating Manually

By placing the lever in the "UNIVERSAL" position, the records will be played manually. The 12 inch long playing records should always be played in this position.

Oiling

Every two or three months, the turn table should be removed and three or four drops of oil placed in each of the six holes provided.

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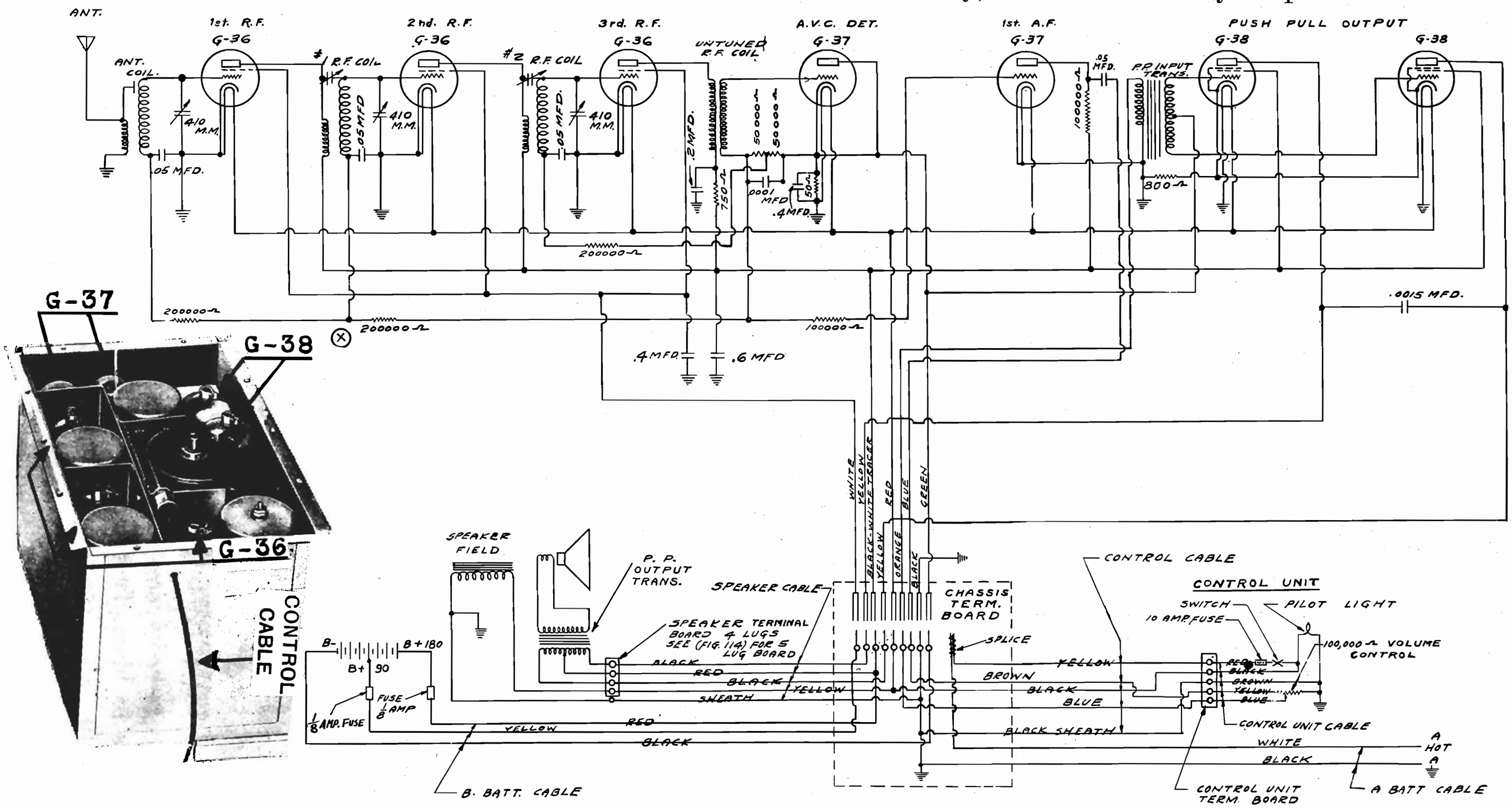
Majestic Model 110 Auto Radio

All leads marked "A" plus signify the ungrounded side of the car battery, and not necessarily the positive side.



Note on Alignment of Gang Condenser: Should a receiver need realignment in the field, a station should be tuned in at approximately 1300 kilocycles and the alignment made in the usual manner. In case one alignment condenser will not indicate a peak of sensitivity, slightly advance or retard the tuning control and proceed to readjust the alignment condenser as before.

Note on Automatic Volume Control System: The Model 110 chassis utilizes an automatic volume control system in combination with a diode detector, the G-37 detector serving both functions.

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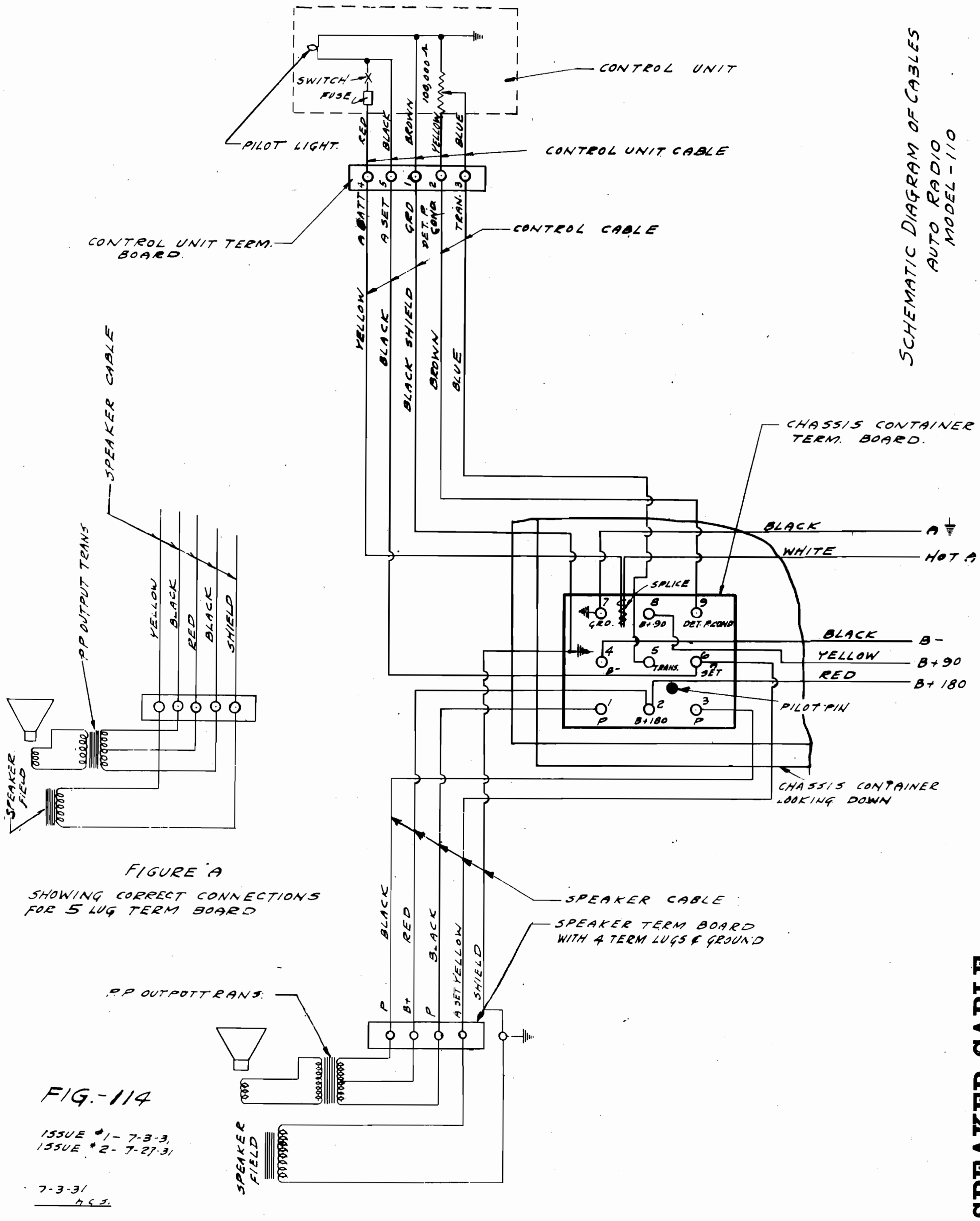

"B" BATTERY CABLE

180 volt "B" plus—red
180 volt "B" minus—black
90 volt "B" plus—yellow

"A" BATTERY CABLE

"A" plus—white
"A" minus—black

SPEAKER CABLE

Field Supply "A" plus—yellow
Field Supply "A" minus—ground cable shield
Pentode Plates—black
Positive "B" center tap—red

CONTROL CABLE

Switch—yellow from chassis to red from control cable.
Switch—black from chassis to black from control cable.
Volume control—Center Arm—blue from chassis to blue from control cable.
Right stop (high side)—brown from chassis to yellow from control cable.
Left Stop (low side)—Control cable shield ground.

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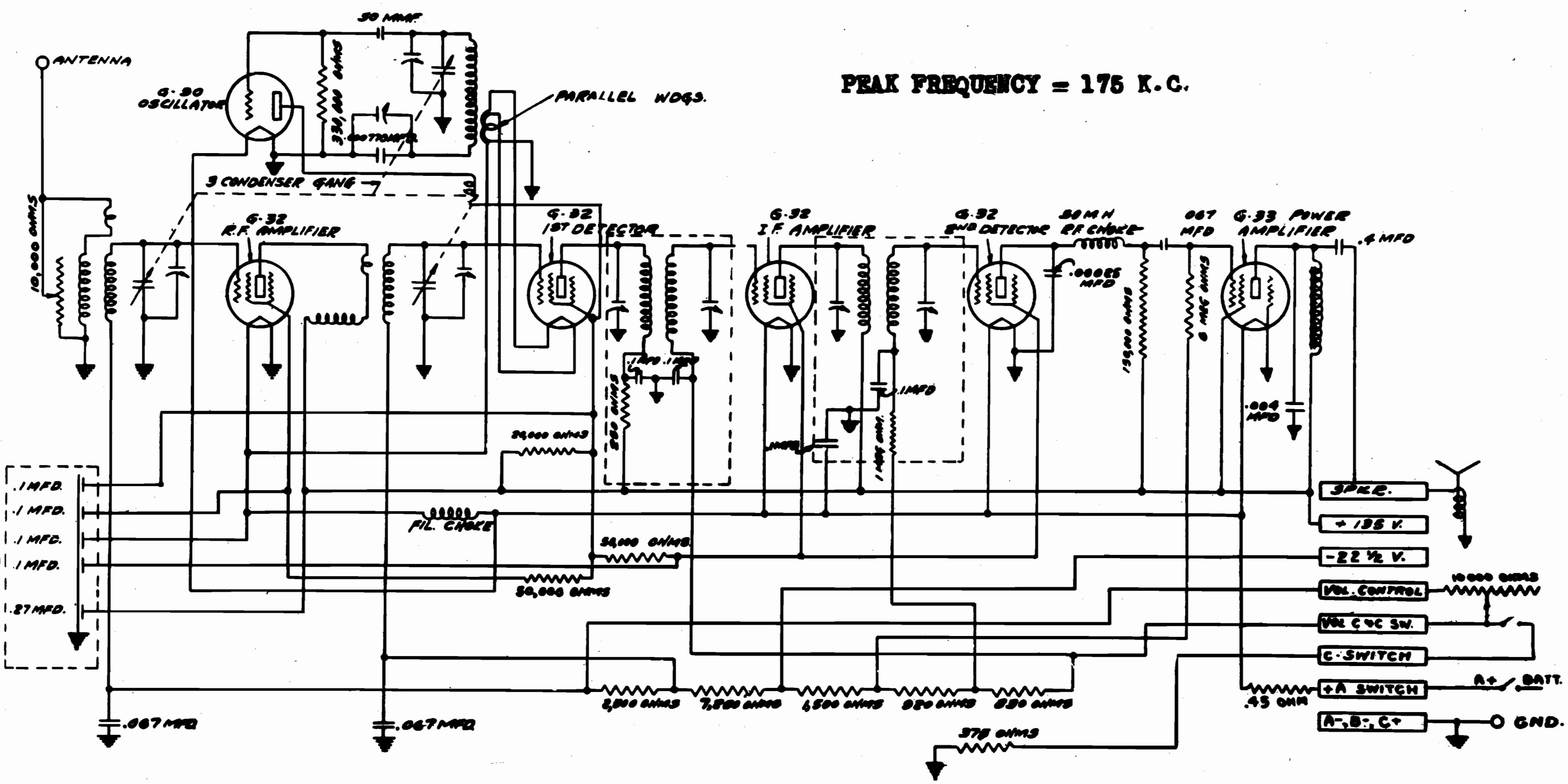
SCHEMATIC DIAGRAM OF MAJESTIC SCREEN GRID SUPERHETRODYNE
HOME BATTERY RECEIVER MODEL -120



BIAS VOLTAGES

Volume Control at Maximum		Volume Control at Minimum	
R. F.	3 volts	R. F.	11 volts
Osc.	0 volts	Osc.	0 volts
1st Det.	8 volts	1st Det.	14 volts
I. F.	3 volts	I. F.	3 volts
2nd Det.	8 volts	2nd Det.	8 volts
Pentode	13.5 volts	Pentode	13.5 volts

FOR ALIGNMENT DATA SEE MODEL 120 Page 386-W

MODEL 120 CHASSIS

The Model 120 chassis is employed in the Model 121 receiver.

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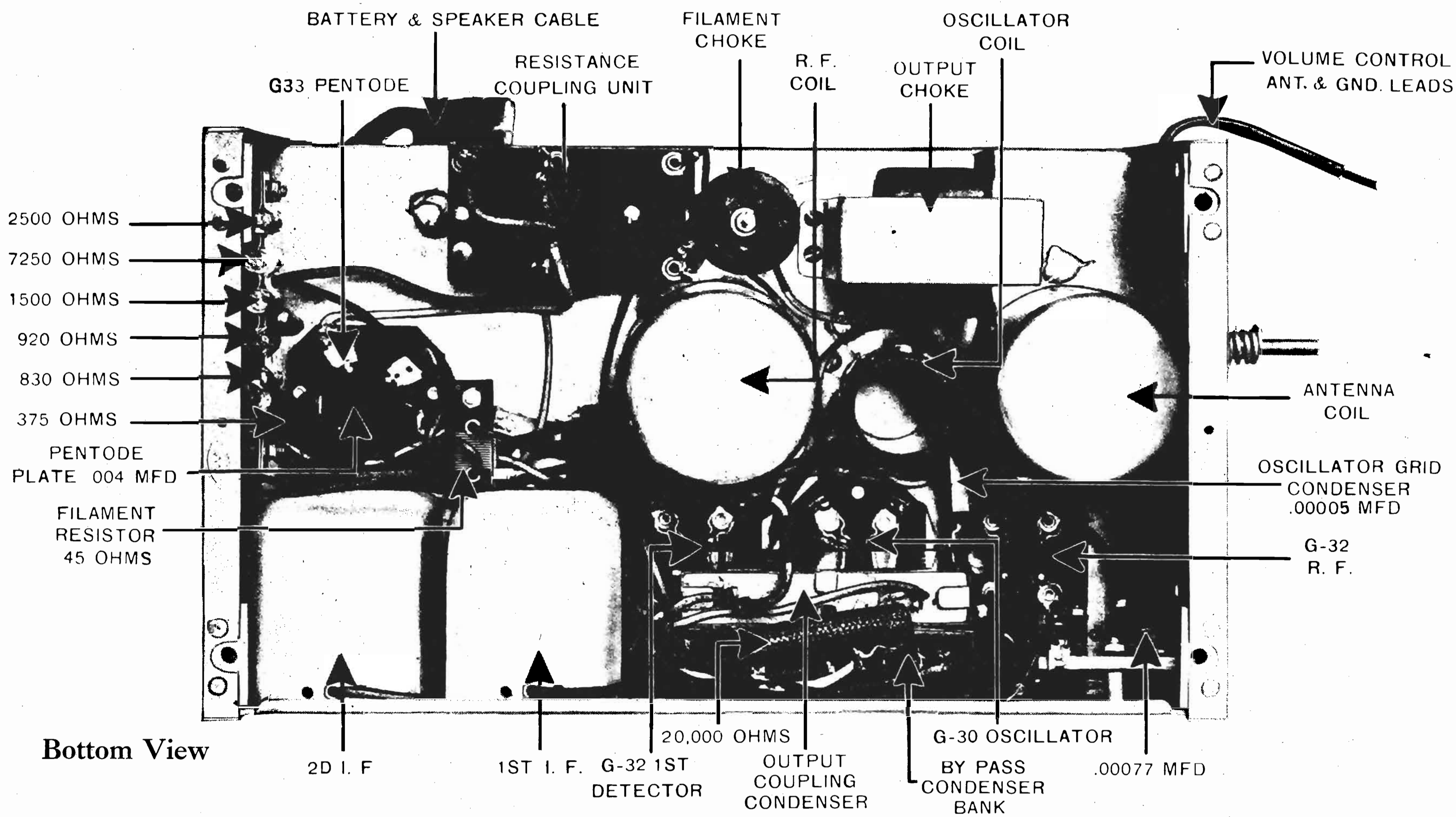

Bottom View

Volume-Control and Switch Connections

Antenna section of volume control—Red and Black.
"C" bias section of volume control—Blue and Yellow.
"A" battery side of switch—Red.
Jumper switch to volume control—Blue.
Switch to "C" bias—White.

Battery Connections

3 wire cable plus 135 volts—Red.
minus 22½ volts—Green.
plus "C" minus "B"—Black.

2 wire cable to speaker—Red and Black and Red.
minus "A" Black.

Model 120 Chassis

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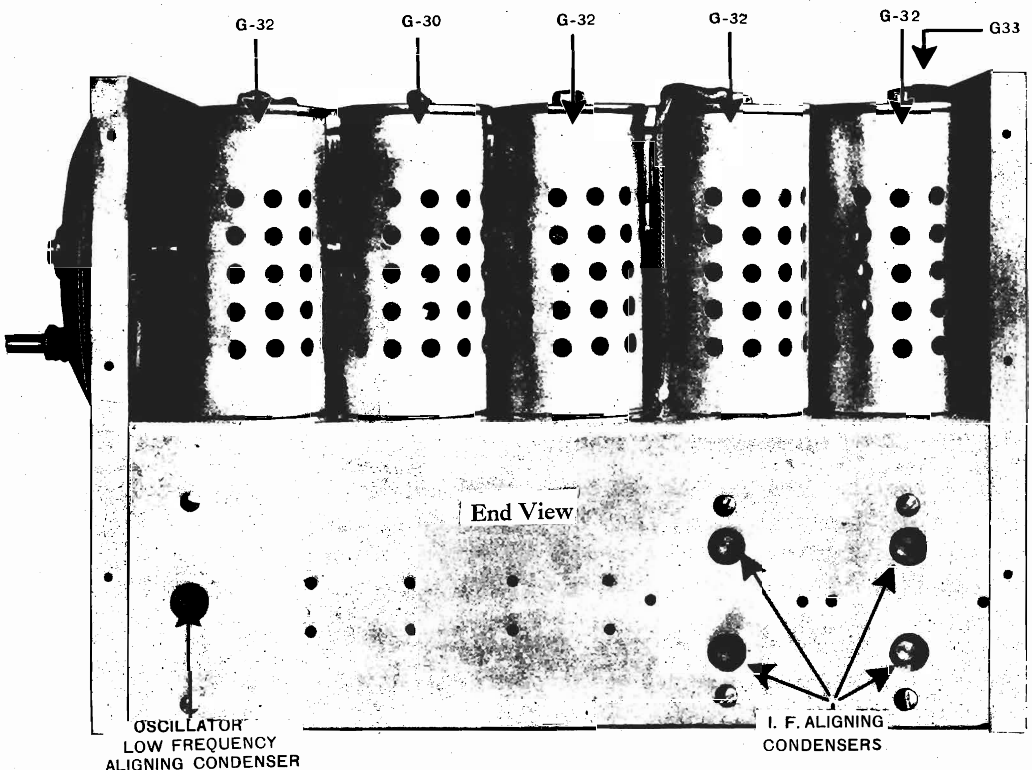

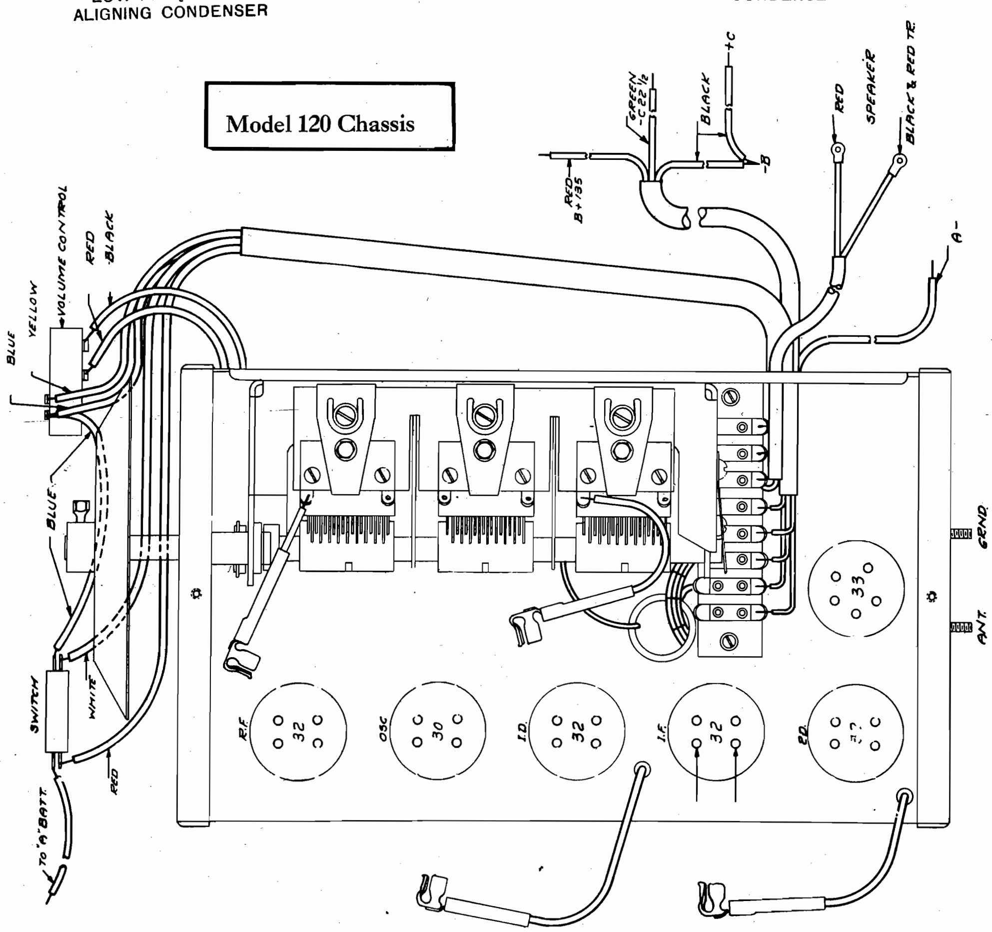

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TECHNICAL DATA PERTAINING TO MODEL 120 CHASSIS

Battery Supply. The "A" voltage supply of the Model 120 chassis comes from an Eveready air cell, two volt size, which is placed on the upper shelf of the cabinet to the right of the receiver chassis. Due to the special design of the G-32 type tube which operates on an "A" supply of two volts, this battery is specified for this use. This combination of "A" supply and G-32 type tubes provides a continuous operating period of 800 hours or better.

The Eveready Air Cell in the Model 121 receiver can be replaced by a two volt storage cell providing the .450 ohm wire wound filament resistor in the chassis is short circuited by a wire jumper. This resistor is easily accessible when the chassis is removed from the cabinet. The storage cell is then connected to the regular "A" leads in the battery cable.

The following provisions should be observed when some other source of "A" voltage is used with the Model 121 receiver:

1. It is recommended that the cell be mounted outside of the cabinet because of the creepage of electrolyte which may spoil the cabinet and chassis. However, if the battery is mounted in the cabinet, the maximum overall dimensions should not exceed the following: Height, 11 inches; length, 12 inches; width, 6 inches.

Model G-3575 Speaker

The G-3575 speaker is employed in the Model 121 receiver. The Model G-3575 speaker is a special magnetic speaker adapted for use with the Model 120 chassis.

Procedure of Aligning Model 120 Chassis

In all alignment procedure an output meter must be used.

I. F. Transformers Alignment

1. Connect oscillator for intermediate frequency alignment and set it in operation.

2. Align each aligning condenser on the intermediate frequency transformers to give maximum signal output.

3. After all four condensers have been aligned at 175 kilocycles, this stage should not be again adjusted.

R. F. and Oscillator Alignment

1. Tune in station in the vicinity of 1,500 kilocycles, or put output of local oscillator (if available) into receiver.

2. Align R. F. stages and oscillator tuning condenser. The position of these condensers is shown on illustrated photograph in this manual.

Oscillator Tracking Condenser Alignment

1. Tune in local oscillator to 600 kilocycles.

2. Adjust both tuning control and tracking condenser simultaneously to give maximum signal as noted on output meter. This will be obtained by rocking tuning control across resonance point while adjusting tracking condenser to give maximum output at the point of resonance. This operation cannot be performed without local oscillator and output meter.

Check

Check the alignment previously made of R. F. and oscillator aligning condensers in the vicinity of 1,500 kilocycles.

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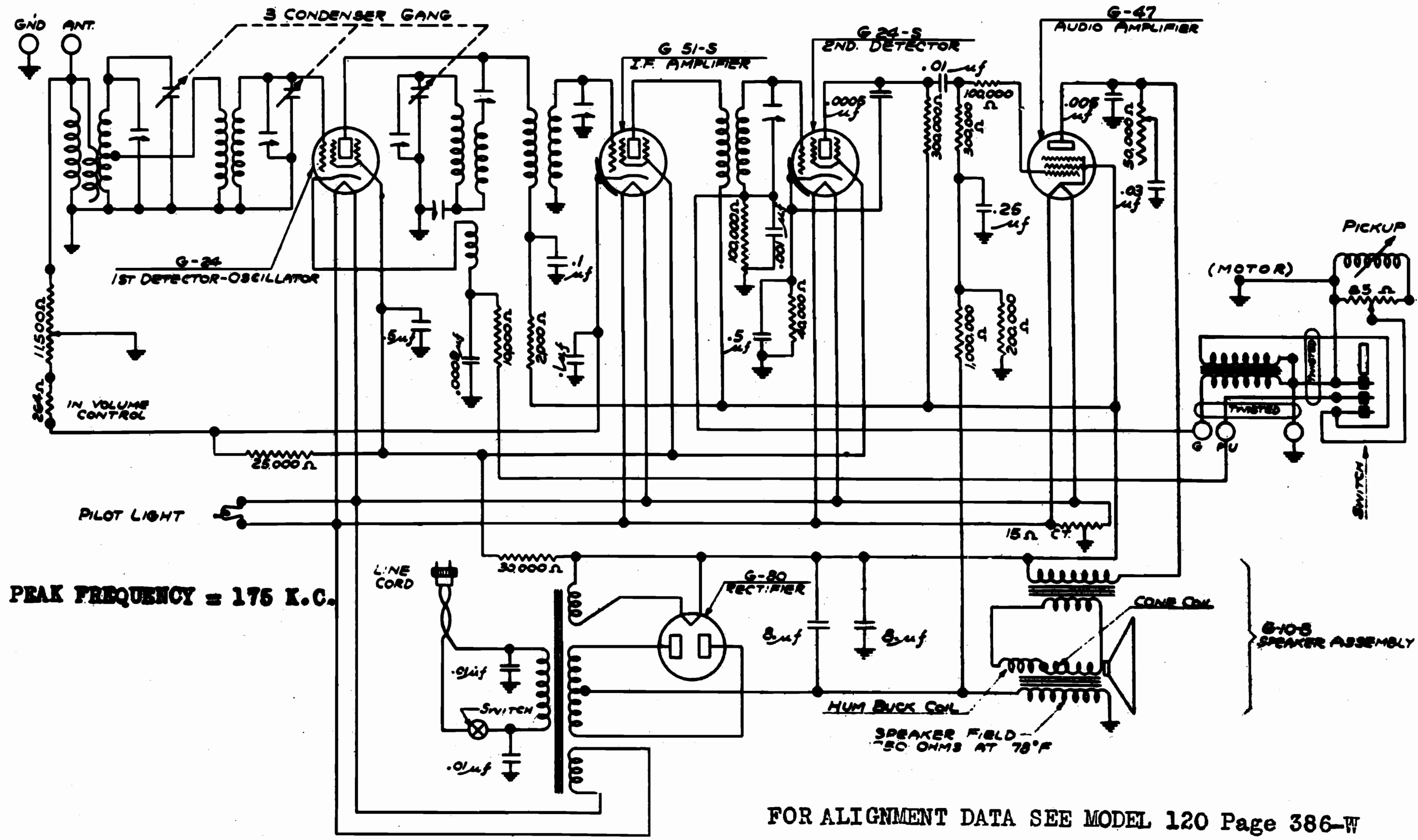
SCHEMATIC DIAGRAM OF MAJESTIC SCREEN GRID SUPERHETERODYNE RECEIVER AND ELECTRIC PHONOGRAPH COMBINATION. MODEL 150 CHASSIS——
115 AND 230 VOLTS, 25-50 AND 50-60 CYCLES.
POWER REQD — 90 WATTS WITH MOTOR.



PEAK FREQUENCY = 175 K.C.

FOR ALIGNMENT DATA SEE MODEL 120 Page 386-W

Model 150 Chassis Employed in Castlewood Phonograph Combination Model

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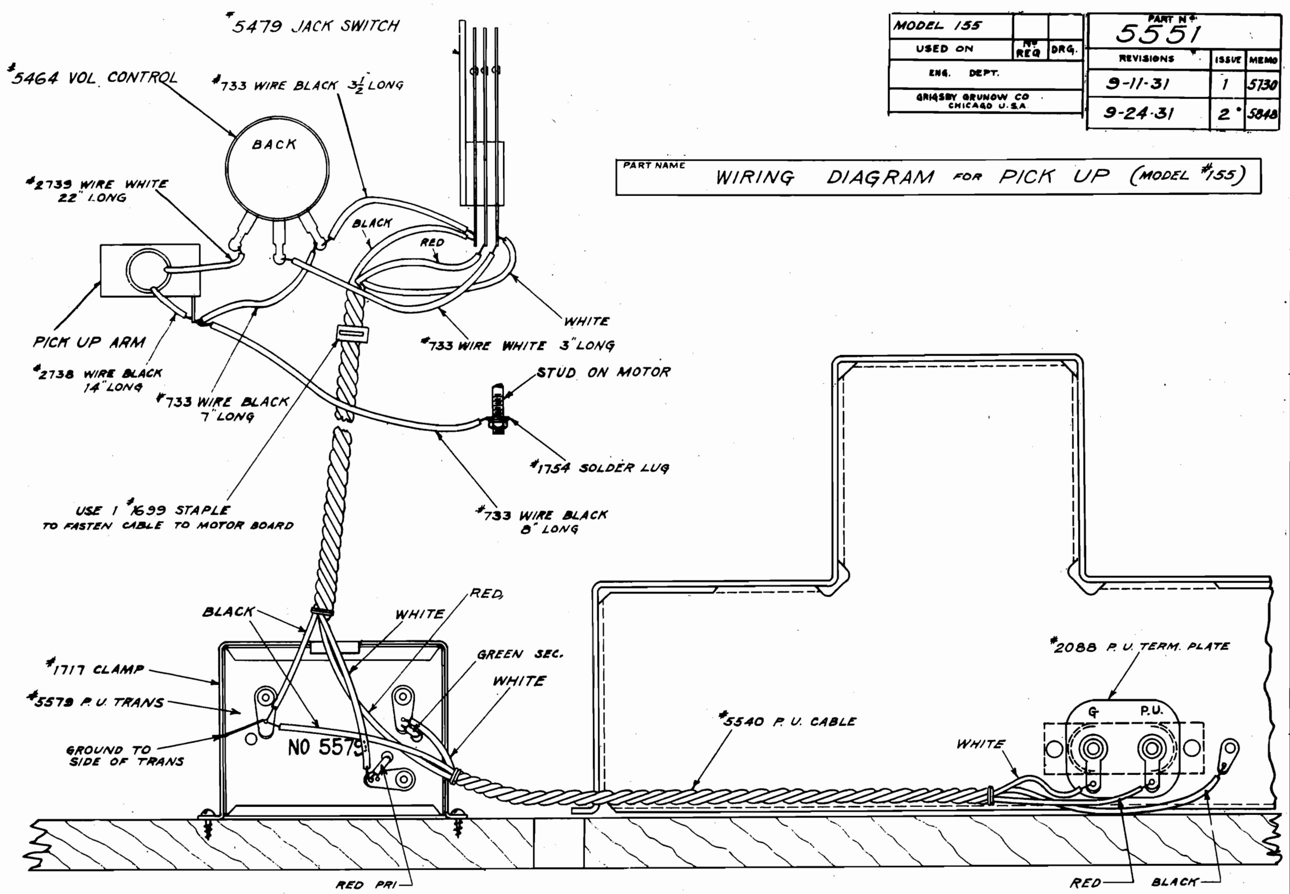


VIEW OF REAR MODEL 155

5211	Resistor (15 Ohms.) (Wire wound C. T.).
5214	Filter Condenser.
5218	Output Transformer with Coil No. 5217.
5219	Carbon Resistor, 10,000 Ohms.
5220	Carbon Resistor, 2,000 Ohms.
5221	Carbon Resistor, 40,000 Ohms.
5222	Carbon Resistor, 300,000 Ohms.
5223	Carbon Resistor, 100,000 Ohms.
5224	Carbon Resistor, 1,000,000 Ohms.
5225	Carbon Resistor, 200,000 Ohms.
5226	Carbon Resistor, 25,000 Ohms.
5227	Carbon Resistor, 30,000 Ohms.
5228	Mica Condenser, .0009 mfd.
5230	Cartridge Condenser, .01 mfd.
5231	.005 mfd. Cartridge Condenser.
5236	.03 mfd. Cartridge Condenser.
5309	Carbon Resistor, 100,000 Ohms—⅓ Watt.
5311	Resistor, 210 Ohms, Wire Wound.
5312	Carbon Resistor, 15,000 Ohms, 2 Watt.
5313	Carbon Resistor, 15,000 Ohms, 1 Watt.
5450	Carbon Resistor, 500,000 Ohms, ⅓ Watt.

5631	R. F. Condenser Assembly 2-.5, 1-.25, 2-.1, and 2-.01 M. F. D. Condensers	
4162	Sleeving 1¼" for 300,000 Ohm Resistor	
5211	Wire Wound Resistor 15 Ohm C. T	
5226	Carbon Resistor 25,000 Ohms	
5227	Carbon Resistor 30,000 Ohms	
5222	Carbon Resistor 300,000 Ohms	MODELS
5220	Carbon Resistor 2,000 Ohms	15
5225	Carbon Resistor 200,000 Ohms	15-B
5223	Carbon Resistor 100,000 Ohms	150
5219	Carbon Resistor 10,000 Ohms	
5224	Carbon Resistor 1,000,000 Ohms	
5221	Carbon Resistor 40,000 Ohms	
4260	Mica Condenser .0005 M. F. D	15-B, 150
4264	Mica Condenser .001 M. F. D.	15-B, 150
4228	Mica Condenser .0009 M. F. D	15-B
5409	By-Pass Condenser .5 M. F. D	15
5410	By-Pass Condenser .25 M. F. D	15
5236	Cartridge Condenser .03 M. F. D	15, 15-B, 150
5231	Cartridge Condenser .005 M. F. D	15, 15-B, 150
5230	Cartridge Condenser .01 M. F. D	15, 15-B, 150
5233	Cartridge Condenser .1 M. F. D	15
5234	Cartridge Condenser .1 M. F. D	15

Technical Data for Model 150 Majestic Phonograph Chassis

The radio circuit and performance of the Model 150 Radio Phonograph Combination chassis, which is employed in the Castlewood Model, is identical with that of the Model 15 Chassis.

The front panel controls of the Castlewood Model are radio controls only, and are the same as that of the Model 15 Receiver as employed in the Havenwood, Ellswood and Sherwood Models.

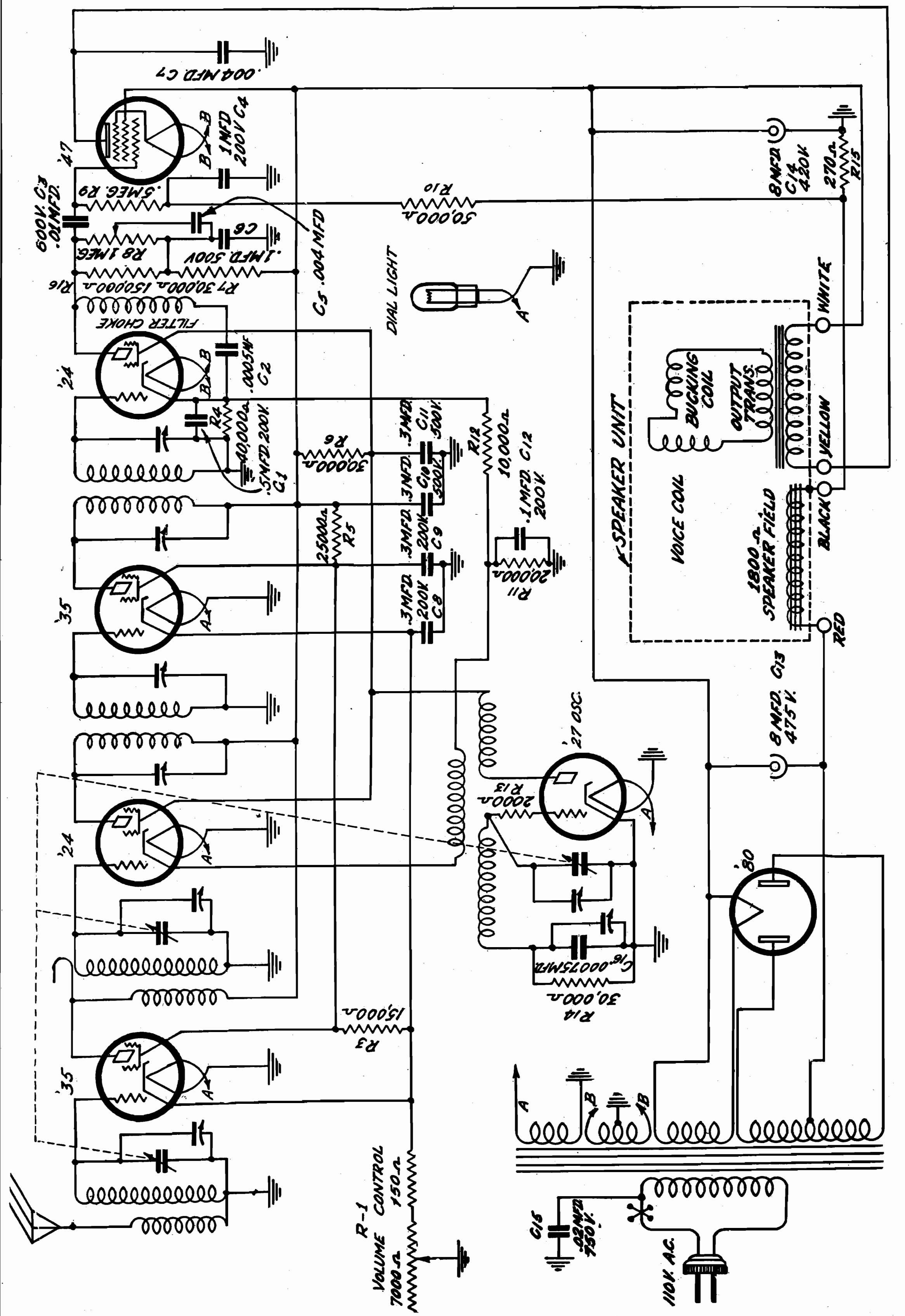
The phonograph side of the Castlewood Model 150 Combination consists of a pick-up, pick-up transformer, phonograph volume control, phono-radio switch and motor board assembly.

The phonograph volume control is separate from the radio volume control and is located alongside the turntable on the motor board as is the phono-radio switch. This arrangement has been used not only for the purpose of insuring against any interaction between the radio and phonograph circuits, but, also, as a means for providing more convenience and ease in operation. Separate controls for radio and phonograph will lessen the complexity of control arrangements ordinarily found on most combinations.

The phono-radio switch is located in the pedestal which supports the phonograph pick-up arm. Lifting of the pick-up off the pedestal automatically switches the Receiver for phonograph operation. Replacing the pick-up on the pedestal automatically switches the Receiver for radio operation.

Model 150 Chassis

GULBRANSEN CO.

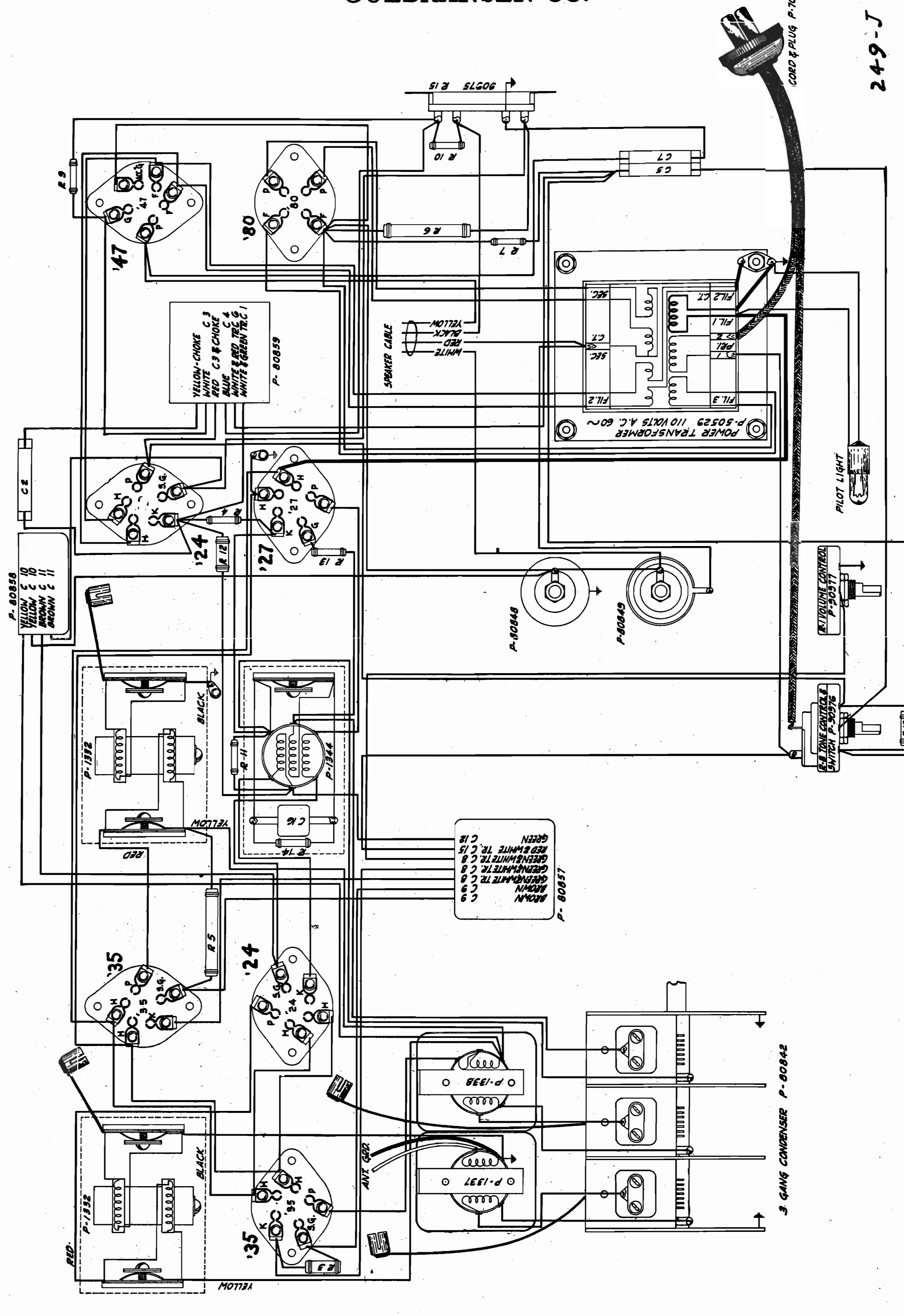


PEAK FREQUENCY = 175 Kc.

For Alignment Data see Page 392-O

Series 13, Seven Tube Superheterodyne,
25 to 60 Cycle, 110 and 220 Volt A. C. Chassis

GULBRANSEN CO.



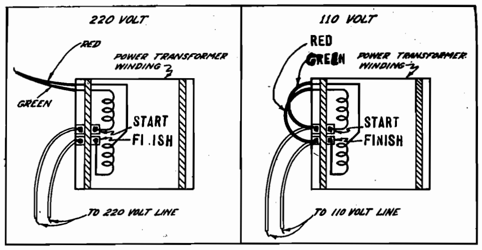
SERIES 13 SUPERHETERODYNE

GULBRANSEN CO.

POWER TRANSFORMER

One side of the 110 volt line is connected to the terminal marked "Pri. 2" and the other side to one switch terminal on the receiver. The switch completes the circuit to the "Pri. 1" terminal.

The 25 cycle transformer is especially designed for operation on 110 volt, 25 cycle current but may also be used on any 110 volt, A.C. supply having a higher frequency.



Receivers having a 220 volt, 40 to 60 cycle power transformer may also be operated on 110 volt, 40 to 60 cycle current when connections on the primary of the transformer have been changed.

The red and green wires shown in the sketch, (220 volt) must be disconnected and then connected as shown in the 110 volt sketch. No other changes are necessary.

CONDENSERS AND RESISTORS

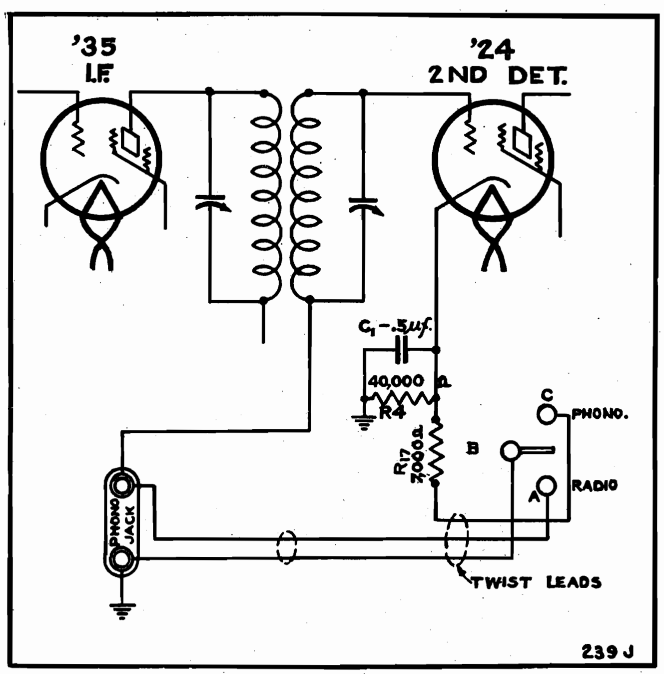
Three blocks contain the majority of condensers. The choke in the plate circuit of the second detector tube is also contained in one of these blocks. The common leads of condenser blocks No. 1 and No. 2 are grounded. C1, C4, and C6 in block No. 3 have a common lead which is grounded, and the choke and C3 in this block have a common lead connected to the plate of the 2nd detector.

ANALYZER CHART

All voltages taken with a 1,000 ohm per volt voltmeter on the scale indicated in the column headed "Meter Scale." Turn the volume all the way on and connect the antenna and ground leads together. The grid, plate, and screen grid voltages are measured to cathode of the '24 and '35 tubes and to filament of the '47 tube.

The grid voltage on the '27 oscillator cannot be taken except with a very sensitive, low scale voltmeter. The voltage is approximately .05 volts when the A.C. line voltage is 110 volts.

Tube	Circuit	Meter Scale	110 V.
R.F. (Ant.) '35	Grid	0—10	1.9
	Screen Grid	0—100	63.
	Plate	0—250	225.
1st Det. '24	Grid	0—25	14.5
	Screen Grid	0—100	65.
	Plate	0—250	220.
Int. '35	Grid	0—10	1.9
	Screen Grid	0—100	63.
	Plate	0—250	225.
2nd Det. '24	Grid	0—25	14.5
	Screen Grid	0—100	65.
	Plate	0—250	135.
Osc. '27	Grid		
	Plate	0—100	80.
Aud. '47 (See Caution Above)	Grid	0—10	2.7
	Accelerating Grid	0—250	225.
	Plate	0—250	205.
'80 Rect.	Filament, to Ground	0—1000	233.



Phonograph Hook-up

PHONO RADIO INSTALLATION

When phonograph equipment is to be connected to a receiver, the installation should be of a permanent nature. The circuit shown in Fig. 2 is the best possible method of permanently connecting phonograph equipment to this chassis. The circuit consists of a pickup with self-contained volume control, connected in the grid circuit of the second detector tube.

PICKUP AND PHONO TRANSFORMER

To obtain good tone and volume, a pickup with medium or low impedance and a transformer are recommended for use with this receiver. A pickup with high impedance should be used when a transformer is not available.

INSTALLATION

The following parts must be supplied from the factory to make the installation:

1 Volume control, Stock No. P-90978
1 7,000 ohm Resistor, Stock No. P-90979
1 Tip Jack Assembly, Stock No. P-1193

The volume control must be mounted in the same position as the original. The switch is operated by turning the volume control knob to the left as far as possible. The connections on the volume control are the same as on the original.

Removal of the license plate on the rear of the chassis will disclose a slot with small holes at each end. The tip jack assembly should be bolted to the chassis (inside), through the small holes. Bolt the license plate through the small holes, directly above its original position.

Locate the black wire under the chassis, leading from the secondary of the second intermediate transformer. This transformer is directly behind the gang condenser. Disconnect this wire where it is grounded on the chassis and solder the end to the tip jack nearest the center of the back of the chassis. If it does not reach to the tip jack, splice an extra length of wire to it but make the lead as short as possible. Solder and tape the splice so it is firm and well insulated.

Ground the **OPPOSITE** tip jack on the chassis by soldering one end of a short length of wire on the jack and the opposite end on a lug placed under the nut on the bolt holding the nearest end of the tip jack assembly.

Solder one end of the 7,000 ohm resistor (R17, Fig. 2) to the cathode connection on the second detector tube socket.

Three wires, twisted together and long enough to reach from the switch on the volume control (around the closed ends of the R.F. transformer shields), to the tip jacks are connected as shown in Fig. 2.

Wire No. 1 connects the grounded tip jack and the switch terminal farthest from the center of the volume control.

Wire No. 2 connects the jack on which the black lead from the I.F. transformer is connected, and the raised switch terminal near the center.

Wire No. 3 connects one end of the 7,000 ohm resistor and the remaining open lug on the switch.

When the receiver volume control is turned to the left as far as possible, the S.P.D.T. switch is thrown and opens the circuit from "A" (Fig. 2) to "B" and closes the circuit from "B" to "C."

This action places the pickup in the circuit and connects the 7,000 ohm resistor so that a proper grid bias is obtained for phonograph reproduction.

If a transformer is used, a ratio of 4 to 1 will prove satisfactory. The secondary is connected to the tip jacks and the primary to the pickup cords.

Reversing the pickup leads will determine the correct position in which they should be left. Some pickups have one side grounded and that side should be connected to the grounded pickup jack in the receiver.

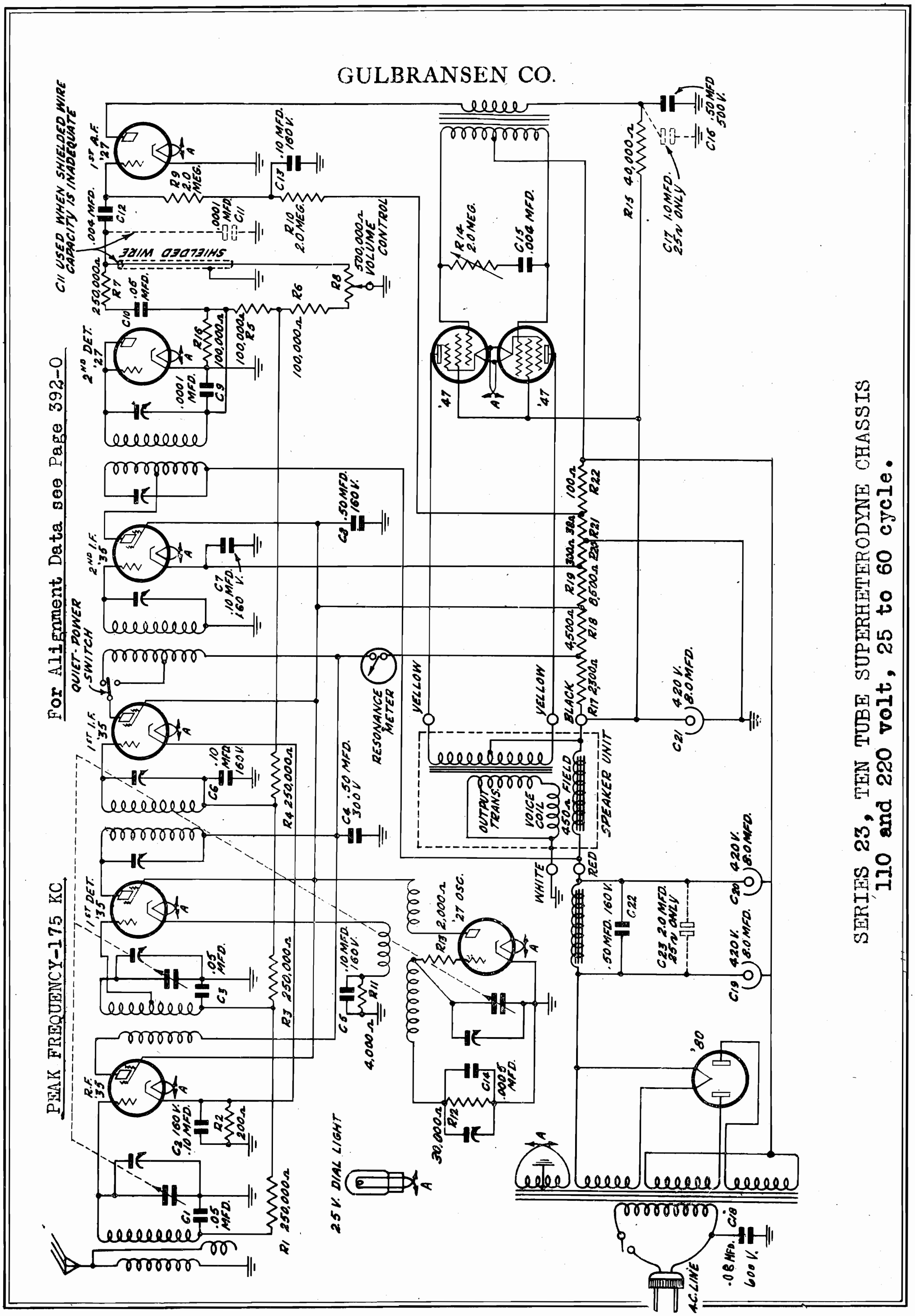
If the pickup is disconnected, a wire "jumper" MUST be placed across the tip jacks before broadcast signals may be received. *The receiver must never be turned on for even a moment without the jumper in place.* A jumper will close the circuit between "A" and "B." This grounds the circuit, thereby placing the proper grid bias on the detector tube, even though the volume control may be thrown to the phonograph position. This jumper may be a piece of solid wire, the ends of which are bent at right angles and plugged into the tip jacks.

RESISTORS

Diagram Key	Part No.	Resistance in ohms	Type	IDENTIFICATION Base	End	Dot
R1	P-90976		Vol. Cont.			
R1	P-90978		Vol. Cont.	With Phonograph Switch		
R3	P-90905-B	15,000	Carbon	Brown	Green	Orange
R4	P-90916-B	40,000	Carbon	Yellow	Black	Orange
R5	P-90927-A	25,000	Carbon	Red	Green	Orange
R6	P-90926-A	30,000	Carbon	Orange	Black	Orange
R7	P-90956	30,000	Carbon	Orange	Black	Orange
R8	P-90977	1 Meg.	Tone Cont.			
R9	P-90938-A	500,000	Carbon	Green	Black	Yellow
R10	P-90941-A	50,000	Carbon	Green	Black	Orange
R11	P-90959-A	20,000	Carbon	Red	Black	Orange
R12	P-90930-C	10,000	Carbon	Brown	Black	Orange
R13	P-90906-B	2,000	Carbon	Red	Black	Red
R14	P-90956-A	30,000	Carbon	Orange	Black	Orange
R15	P-90975-A	270	Candohm			
R16	P-90963-A	150,000	Carbon	Brown	Green	Yellow
R17	P-90979	7,000	Carbon	Lavender	Black	Red
				For phonograph installation		

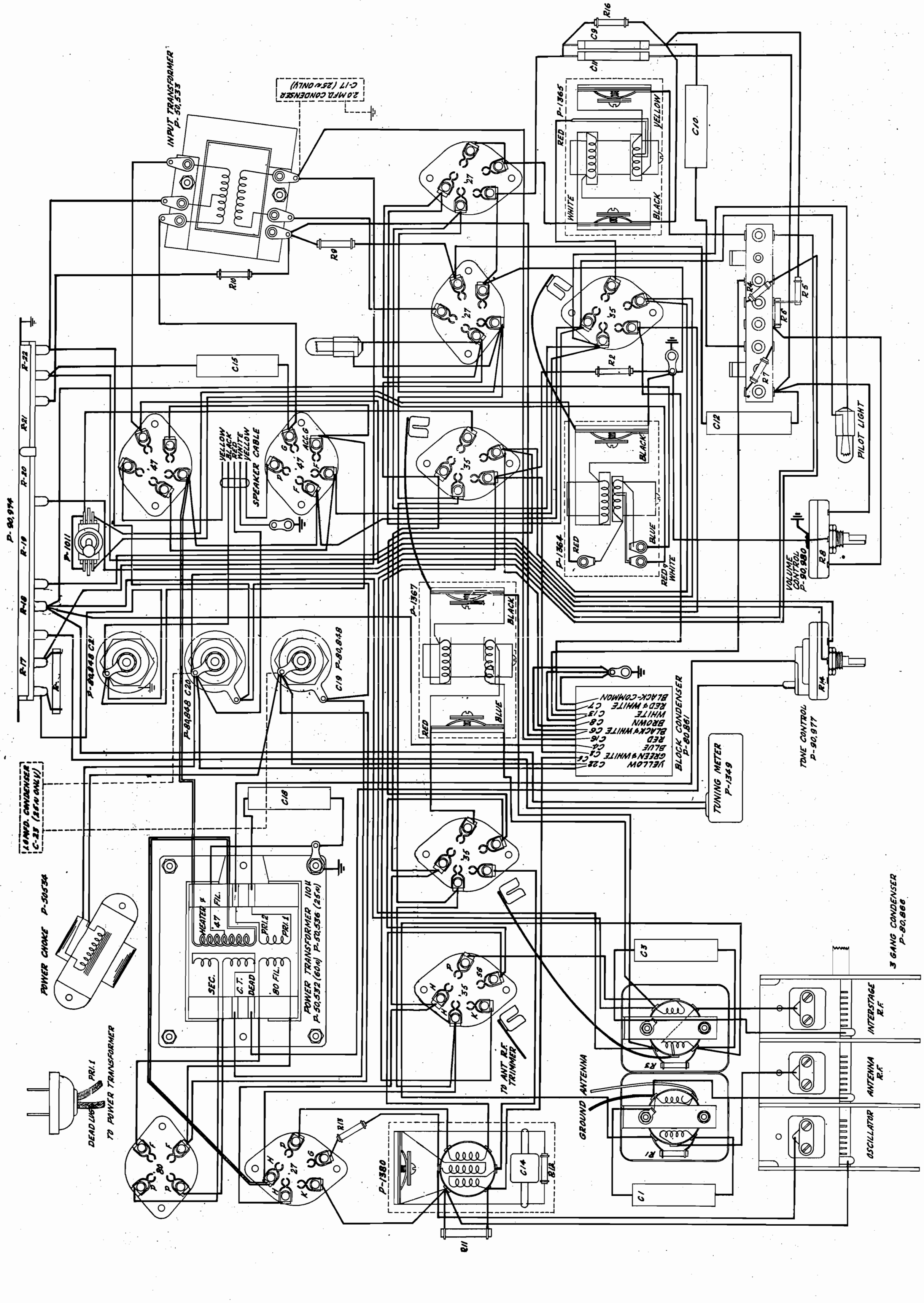
CONDENSERS

Key No.	Part No.	Capacity	Type	Voltage Rating	Indentification Mark
C12	P-80857-A	.1 mfd.	Block	200 V.	White, Green Tr.
C8	Block	.3 mfd.	Block	200 V.	Brown
C9	No. 1	.3 mfd.	Block	200 V.	White, Red Tr.
C15		.02 mfd.	Block	750 V.	Green
C10	P-80858	.3 mfd.	Block	500 V.	Brown
C11	Block No. 2	.3 mfd.	Block	500 V.	Yellow
C1	P-80859-C	.5 mfd.	Block	200 V.	White and Red
C3	Block	.01 mfd.	Block	600 V.	White, Red Tr.
C6	No. 3	.1 mfd.	Block	500 V.	Blue
C4		.1 mfd.	Block	200 V.	Yellow and Red
Choke					White, Green Tr.
C2	P-80855	.0005 mfd.	Moulded		Red
C5	P-80860	.004 mfd.	Moulded		Tan
C7	P-80860	.004 mfd.	Moulded		Tan
C13	P-80848-Hi.	8.0 mfd.	Electrolytic		Red
C14	P-80849-Lo.	8.0 mfd.	Electrolytic		Green
C16	P-80856	.00075 mfd.	Moulded		Violet
	P-80842-D	Complete Gang Assembly with Shield (No Dial Assembly)			



SERIES 23, TEN TUBE SUPERHETERODYNE CHASSIS
110 and 220 volt, 25 to 60 cycle.

GULBRANSEN CO.



SERIES 23 SUPERHETERODYNE

GULBRANSEN CO.

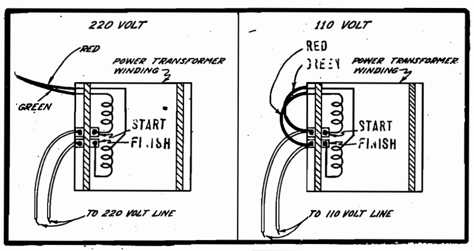
SERIES 23 SUPERHETERODYNE

POWER TRANSFORMER

Fig. 4 shows the 110 volt power transformer connections. One side of the 110 volt A. C. line is connected to the terminal marked "Pri. 1" and the other side to the open terminal, on the opposite side of the winding, which is in turn connected to one terminal of the switch on the receiver. The switch completes the circuit to the "Pri. 2" terminal.

The 25 cycle transformer is especially designed to operate on 110 volt, 25 cycle current, but may also be operated on any 110 v. A. C. supply having a higher frequency, **after the condensers C17 and C23 have been disconnected.**

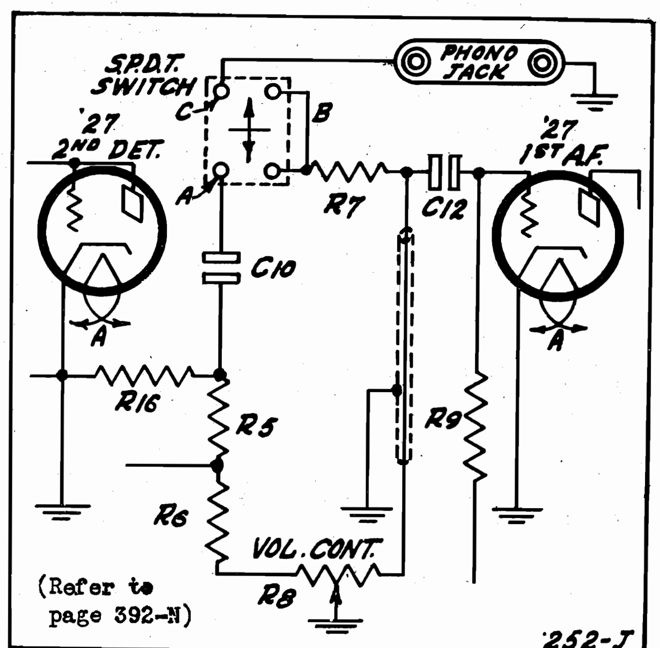
The filaments and heaters as shown in the pictorial diagram, Fig. 4, are connected in a loop circuit.



Receivers having a 220 volt, 40 to 60 cycle power transformer may also be operated on 110 volt, 40 to 60 cycle current when connections on the primary of the transformer have been changed.

The red and green wires shown in the 220 volt sketch, must be disconnected and then connected as shown in the 110 volt sketch. No other changes are necessary.

Tube	Circuit	Meter Scale	110 V.
R.F.	Screen		
'35	Grid	0—100	82.
	Plate	0—250	166.
1st	Screen		
Det.	Grid	0—100	77.
'35	Plate	0—250	163.
Oscillator			
'27	Plate	0—100	85.
1st I.F.	Screen		
'35	Grid	0—100	82.
	Plate	0—250	166.
	Screen		
2nd I.F.	Grid	0—100	79.
'35	Plate	0—1000	277.
1st A.F.			
'27	Plate	0-100	104.
	Grid	0-25	15.4
2nd A.F.	Accelerating		
'47	Grid	0-1000	235.
	Plate	0-1000	220.
'80	Current	0-100	108. M.A.
Rect.	(Both		
	Plates)		
(See	Plate to	0-1000	690.
below)	Plate voltage		



Phonograph Hook-up

The '80 rectifier plate voltages shown are the totals of both plates, measured from each plate to center tap of high voltage secondary

All voltages taken with a 1,000 ohm per volt voltmeter on the scale in the column headed "Meter Scale." Turn the volume all the way on, connect the antenna and ground leads together and turn the gang condenser plates all the way out. CHECK THE LINE VOLTAGE.

The measurement of grid bias voltages (except on the 47 pentodes) is not recommended, as this causes an abnormal rise in plate current which is injurious to the tube. Further, the measurement of actual grid bias voltages is impossible due to the high resistance in the grid circuits. When the receiver does not function properly and the trouble is apparently due to improper grid bias on any tube or tubes, the cause of the trouble may be determined by applying the proper continuity tests.

CAUTION: IN ORDER THAT THE EFFICIENCY OF EACH TUBE MAY BE COMPARED WITH THAT OF OTHER TUBES OF THE SAME TYPE, THEY MUST NOT BE TESTED IN THE SOCKET IN WHICH THEY ARE USED. TEST ALL '35 TUBES IN THE SECOND I. F. SOCKET AND TEST THE '27 TUBES IN THE FIRST A. F. SOCKET. TAKE THE VOLTAGE READINGS AT THE SOCKET IN WHICH THE TUBE IS USED.

GULBRANSEN CO.

SERIES 23 SUPERHETERODYNE

PHONO PICKUP INSTALLATION

The following parts must be supplied from the factory to make the installation:

1 S. P. D. T. Switch, Stock No. P-1011

1 Tip Jack Assembly, Stock No. P-1193.

Removal of the license plate on the rear of the chassis will disclose a slot with small holes at each end. The tip jack assembly should be bolted, inside, through the small holes.

Drill a 31/64" hole one inch from the tip jack nearest the center of the rear of the chassis and place the barrel of the switch through the hole with the body of the switch in a horizontal position.

The terminal strip mounted in the left front corner of the base has the resistor, R7, (Red body, green end, yellow dot), connected to the first and second terminals on the end of the strip nearest the center of the chassis. One end of the .05 mfd. condenser, C10, is also connected to the second terminal. See Fig. 4.

Disconnect the resistor, R7, at the second terminal of the strip. Splice a piece of wire to the disconnected end of the resistor and connect the other end of the wire to two terminals, one on each end and on the same side of the switch.

Connect another wire to the terminal where the resistor was disconnected and connect the other end to one of the two open terminals on the switch.

The remaining open terminal on the switch is then connected to the tip jack nearest the corner of the chassis base.

Ground the **opposite** tip jack on the grounded terminal of the candohm resistor.

Make all wires and connections short, firm, and well insulated.

When the switch is thrown so that the circuit from "A" to "B," is open and the circuit from "B" to "C" is closed, the pickup is then properly connected for phonograph reproduction. The switch is thrown in the opposite direction for the reception of broadcast signals.

Reversing the pickup leads will determine the correct position in which they should be left. Some pickups have one side grounded and that side should be connected to the grounded pickup jack in the receiver.

For phonograph hookup diagram refer to page 392-M

C6 and C13 contained in the block have one side grounded and the balance of the condensers in the block, with the exception of C22, have a common lead which is also grounded. C22 tunes the choke in the power supply.

C17 and C23 are used in the 25 cycle chassis only, as shown in the schematic diagram.

RESISTORS

Part No.	Key No.	Resistance	Type	Base	End	Dot
P-90954-B	R1	250,000	Carbon	Red	Green	Yellow
P-90935-A	R2	200	Carbon	Red	Black	Brown
P-90954-B	R3	250,000	Carbon	Red	Green	Yellow
P-90954-B	R4	250,000	Carbon	Red	Green	Yellow
P-90912-A	R5	100,000	Carbon	Brown	Black	Yellow
P-90912-A	R6	100,000	Carbon	Brown	Black	Yellow
P-90954-B	R7	250,000	Carbon	Red	Green	Yellow
P-90980	R8	500,000	Volume Control			
P-90923-A	R9	2 meg.	Carbon	Red	Black	Green
P-90923-A	R10	2 meg.	Carbon	Red	Black	Green
P-90947	R11	4,000	Carbon	Yellow	Black	Red
P-90956-A	R12	30,000	Carbon	Orange	Black	Orange
P-90906-C	R13	2,000	Carbon	Red	Black	Red
P-90977-B	R14	2 meg.	Tone Control			
P-90945	R15	40,000	Carbon	Yellow	Black	Orange
P-90912-A	R16	100,000	Carbon	Brown	Black	Yellow
P-90974-C	R17	2,300	Candohm			
	R18	4,500				
	R19	8,500				
	R20	300				
	R21	38				
	R22	100				

CONDENSERS

Part No.	Key No.	Capacity	Type	Voltage Rating	Identification
P-80862	C1	.05	Tubular		Red - Orange
P-80862	C3	.05	Tubular		Red - Orange
P-80865	C9	.0001	Moulded		Red - Orange
P-80862	C10	.05	Tubular		Red - Orange
P-80865	C11	.0001	Moulded		Red - Orange
P-80863	C12	.004	Tubular		Tan - Orange
P-80867	C14	.0005	Moulded		Red - Orange - Blue
P-80863	C15	.004	Tubular		Tan - Orange
P-80869	C17	1.0			
P-80868	C18	.02	Tubular		Green - Orange
P-80848-A	C19	8.0	Electrolytic	420 V.	Orange
P-80848-A	C20	8.0	Electrolytic	420 V.	Orange
P-80848-A	C21	8.0	Electrolytic	420 V.	Orange
P-80870	C23	2.0			
P-80861-B (Block)	C2	.1	Block	160 V.	White, Green Tr.
	C4	.5	Block	300 V.	Blue
	C5	.1	Block	160 V.	White, Green Tr.
	C6	.1	Block	160 V.	Black, White Tr.
	C7	.1	Block	600 V.	White, Red Tr.
	C8	.5	Block	160 V.	Brown
	C13	.1	Block	160 V.	White
	C16	.5	Block	500 V.	Red
	C22	.5	Block	160 V.	Yellow (2)
P-80866	Complete Gang Assembly with Shield (no dial assembly)				

GULBRANSEN CO.
ALIGNMENT

A thorough check of the receiver should be made before any attempt is made to re-align any circuits. Examine the antenna and ground connections. Test all the tubes and check all voltages to determine if the failure of the receiver to operate properly is not due to some fault other than mis-alignment. A superheterodyne receiver must be accurately aligned to be selective and sensitive. This receiver has been accurately aligned at the factory and, due to the mechanical design of the gang and adjustable condensers, will not lose its alignment unless damaged by abuse or accident.

A modulated test oscillator and an output meter MUST be used when aligning this receiver to insure accurate alignment. It is important that the oscillator deliver a signal at exactly 175 K.C. in addition to frequencies in the broadcast band.

The adjustable condensers which tune the secondaries of the intermediate transformers are located under the hole in top of the shield where the grid lead to the tube is brought out. The condensers which tune the primaries are located under the small hole opposite. The capacity of each condenser is varied by rotating the small adjustment screw under the hole.

Make each adjustment in the order given below or the receiver may be thrown further out of alignment and it will then be a difficult task to align it properly.

The receiver and test oscillator must be well grounded and the output kept within the range of the output meter at all times.

All shields must be in place when making the adjustments.

INTERMEDIATE CIRCUITS

Tune the test oscillator to exactly 175 K.C. and connect its output to the grid of the first detector tube after removing the clip on the lead from the gang condenser.

Adjust the primary and secondary of the first intermediate transformer for greatest volume.

Follow the same procedure on the second intermediate transformer and then turn the receiver off.

Disconnect one end of the speaker voice coil and connect the output meter across the secondary of the speaker coupling transformer. Short the oscillator tuning condenser (in the gang) by grounding the stator plates with a screw driver.

Turn the receiver on and adjust the output until the output meter shows a small or medium scale deflection.

Adjust the primary of the first intermediate transformer for the greatest deflection on the output meter.

Adjust the secondary in the same manner.

Follow the same procedure on the second intermediate transformer and then check the settings of all condensers to make certain the maximum output has been obtained.

When the above instructions have been followed, remove the test oscillator coupling and replace the grid lead on the first detector, and also remove the screw driver shorting the oscillator tuning condenser.

GANG CONDENSERS

Couple the test oscillator output to the antenna, (white wire), on the receiver.

Tune the oscillator to 1400 K.C. and carefully tune the receiver to the signal.

A trimmer condenser is mounted over each condenser in the gang and is adjusted by turning the screw located under the hole in top of the gang shield. The shield should not be removed. Adjust each trimmer condenser for maximum deflection on the output meter.

OSCILLATOR

Tune the test oscillator to 600 K.C. and tune the receiver to the signal. Then after turning the receiver off, disconnect the output meter and replace the voice coil lead which was disconnected.

Turn the receiver on and rotate the adjusting screw on the 600 K.C. tracking condenser under the hole in top of the oscillator transformer shield. **Rock the gang condenser back and forth across the signal at the same time** and listen closely until the maximum volume is obtained. The tracking condenser is then properly adjusted and remains fixed thereafter.

The receiver should be accurately aligned if the above instructions have been followed and no further adjustments need be made.

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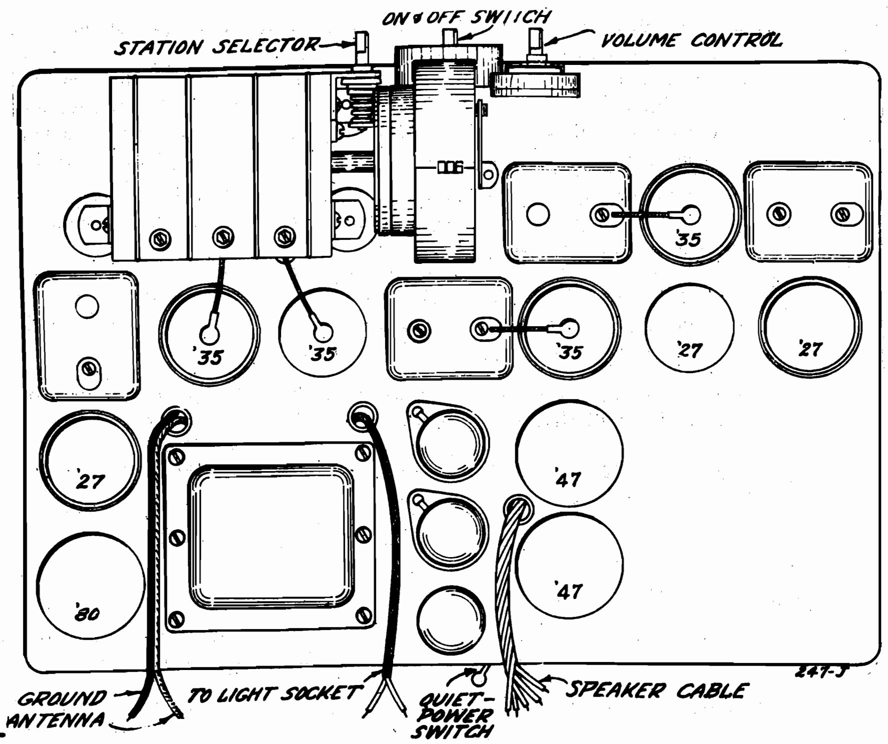
SERIES 23
SUPERHETERODYNE



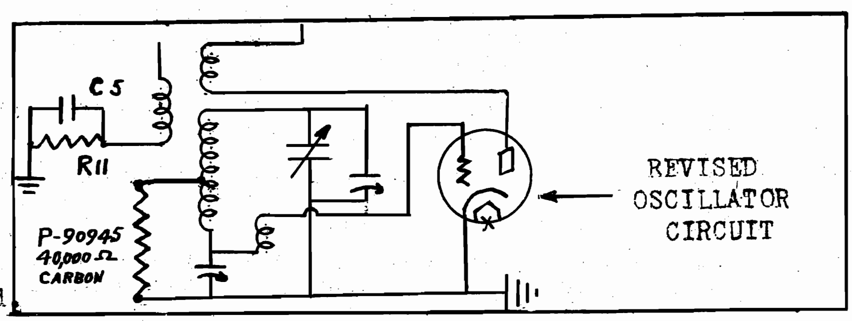
TOP VIEW OF EARLY MODEL RECEIVER

REVISED MODEL

A green paint mark on the left rear corner of a chassis indicates the following changes:

(1) Combination tone control and "On-Off" switch replaced by two separate units. The tone control is mounted and connected as previously but "On-Off switch is on side of cabinet.

(2) Intermediate transformers assembled together with their adjustable tuning condensers in a round shield. Condensers are adjusted by inserting screwdriver trough the holes provided underneath base, directly below transformer assembly. Early models are adjusted through hole in top of (rectangular) shield.



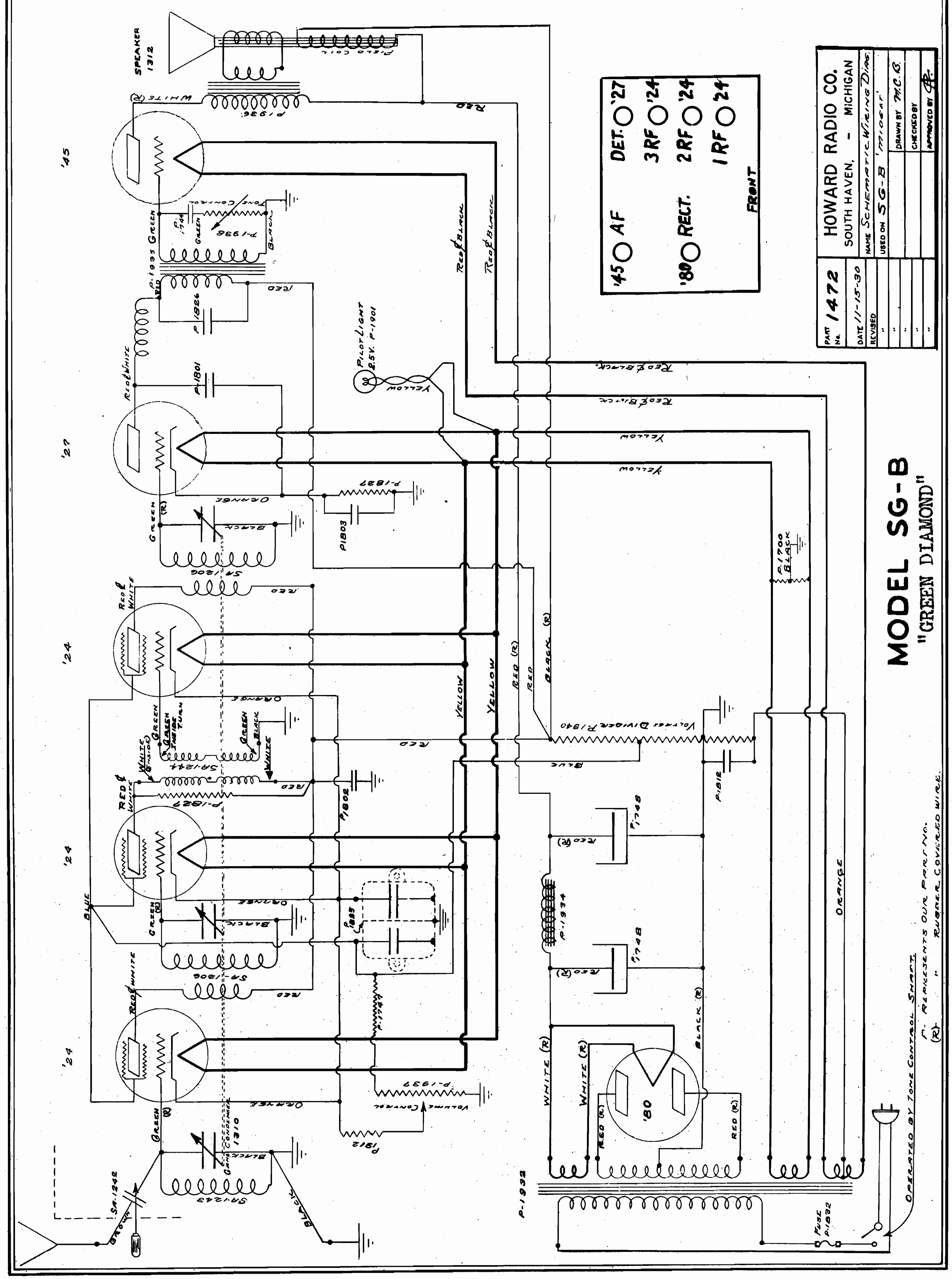
REVISED OSCILLATOR CIRCUIT

(3) The oscillator coil, its shield, and the 600 K.C. tracking condensor are all mounted separately on the base. The tracking condensor adjustment screw will be found near the left rear corner of the oscillator coil shield. The .0005 mfd. condensor (C14) is not used and the 30,000 ohm resistor (R12) is replaced by a 40,000 ohm resistor mounted between a coil lug and the tracking condensor. The revised oscillator circuit is shown herewith:

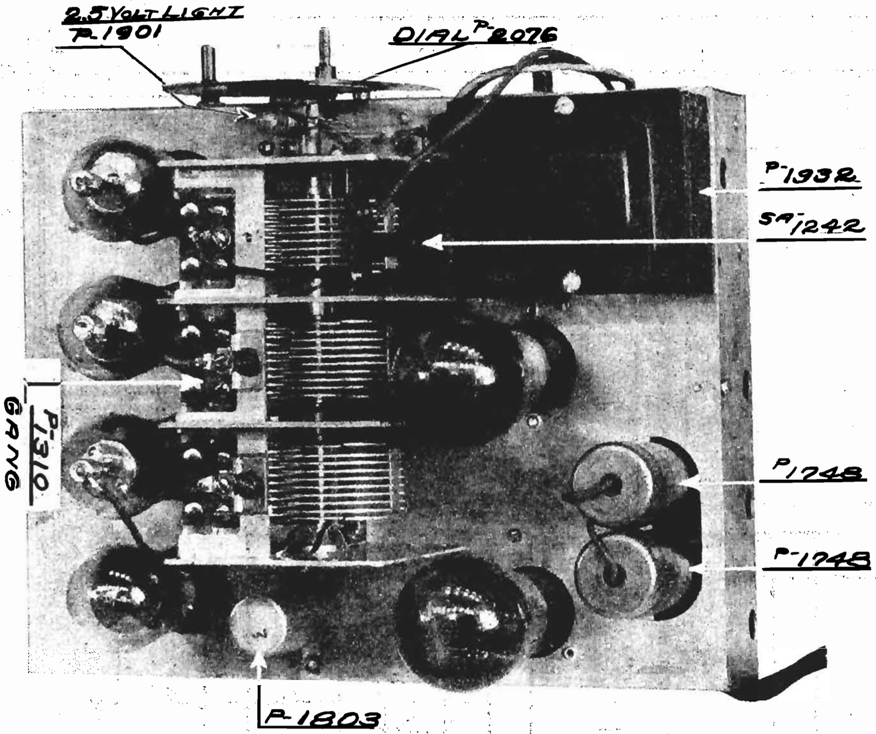
The parts affected by the change, are listed below with corresponding parts numbers:

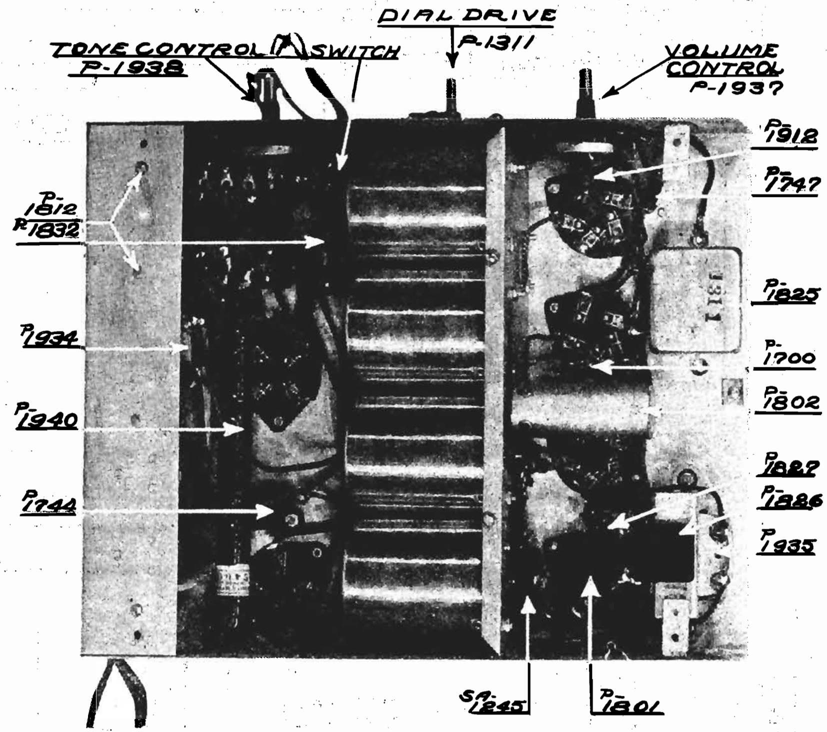
OLD NUMBER		NEW NUMBER	
Tone Control & "On-Off" Switch	P-90977	"On-Off" Switch	P-1054
		Tone Control	P-90986-A
1st I.F. Transformer Assembly	P-1367	1st I.F. Assembly	P-1424
		2nd I.F. Assembly	P-1425
2nd I.F. Transformer Assembly	P-1364	3rd I.F. Assembly	P-1426
		Oscillator Coil	P-1400
3rd I.F. Transformer Assembly	P-1365	Coil Shield	P-40412
		600 K.C. Tracking Conden.	P-1385-A
Oscillator Unit Assembly	P-1366	40,000 Ohm Carbon Resistor	P-90945

HOWARD RADIO CO.



HOWARD RADIO CO.

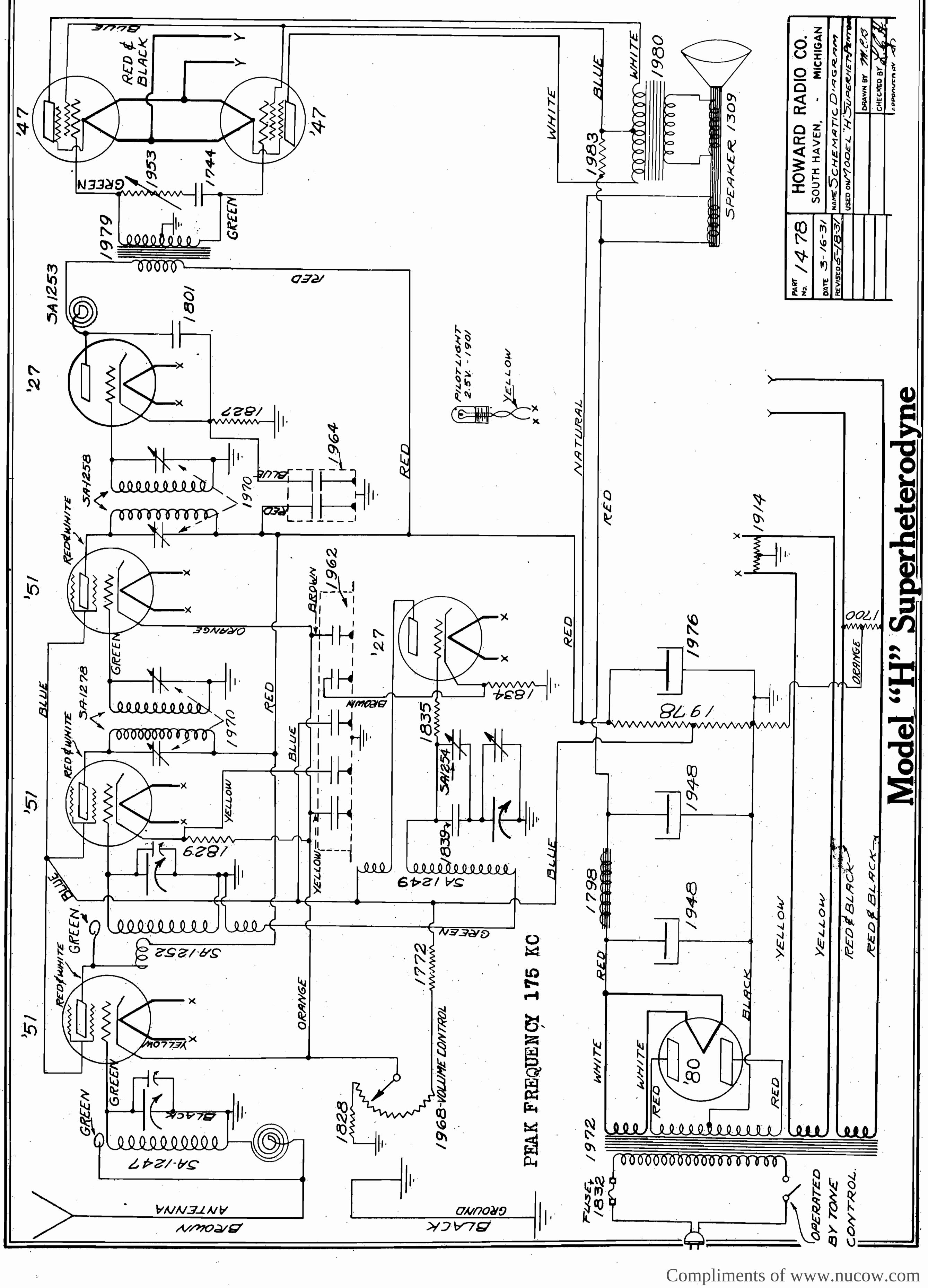




Part Numbers	Description	Remarks
1310	Gang tuning condenser	
1827	Resistor	(Used only on sets numbering 150,000 to 151,000)
1801	Condenser	.001 mfd. (fixed)
1826	Condenser	.005 mfd. (fixed)
1744	Condenser	.004 mfd. (fixed)
1802	Condenser	.5 mfd. (fixed)
1803	Condenser	1.0 mfd. (fixed)
1912	Resistor	300 Ohm, ½ Watt
1937	Potentiometer	10,000 Ohm, (tapered)
1747	Resistor	50,000 Ohm, ½ Watt
1827	Resistor	30,000 Ohm, ½ Watt
1938	Variable Resistor	2.5 megohms (tapered)
1935	Audio Transformer	Ratio 3:1
1825	Condenser	¼ mfd. and ½ mfd.
1832	Fuse	2 amp.
1932	Power Transformer	
1748	Electrolytic-condenser	8 mfd. ea. unit
1934	Choke	10 henry
1940	Resistor	Voltage divider 7400 ohms.
1812	Condenser	½ mfd. (fixed)
1700	Resistor (Center tap)	10 ohms.
1312	Speaker	2400 ohm. Field
1936	Output Transformer	
1242	Antenna compensating, cond.	
1243	Antenna coil	
1206	Radio frequency transformers	
1244	Broad band transformer	
1245	Radio frequency choke coil	

Model SG-B

HOWARD RADIO CO.



HOWARD RADIO CO.

MODEL "H"

ADJUSTMENTS The 175 kc. oscillator must be accurately tuned to 175 kc. and only 175 kc. If this precaution is not observed it will be impossible to align the oscillator to the rest of the set and the set will not operate correctly as the oscillator is designed for exact 175 kc. operation.

The second intermediate frequency amplifier transformer shield can is removed and one side of the small variator condenser is disconnected from the primary coil. This coil is connected so that it still is in the plate circuit of the tube but the tuning condenser is not connected in the circuit. Now remove the grid cap from the intermediate amplifier tube and connect a 3 megohm resistor from the control grid to ground. Now connect the output from the 175 kc. oscillator to the grid of the intermediate frequency amplifier tube and tune the secondary for maximum deflection of the output meter. (Low voltage alternating current meter, 0 to 3 volts, connected across the voice coil of speaker). Now remove the shield can and connect the small tuning condenser that was previously removed back across the primary coil. With the 175 kc. oscillator connected the same as before, tune the primary for a maximum deflection of the output meter. (Caution: Do not under any circumstances try to retune the secondary after having tuned the primary. **This is important.**) After having tuned this stage proceed to the next intermediate frequency:

(b) Replace the grid cap on the intermediate frequency amplifier and proceed to the first detector tube. Remove this tube cap and connect the 175 kc. oscillator as before, being sure to connect the 3 megohm resistor from control grid to ground. Now proceed to tune the intermediate frequency transformer by tuning the secondary first for maximum deflection of the output meter and then tuning the primary for maximum deflection. Tuning this transformer must be done very carefully as the selectivity of the whole receiver depends entirely on the tuning of this transformer.

(c) To line up the radio frequency amplifier and detector stages, remove the oscillator tube and the second detector tube. Unsolder the connection on the plate terminal of first detector tube socket and solder a wire from this terminal to the plate terminal of the second detector tube socket. Now set the Test Oscillator (R. F. Generator) which tunes over the broadcast frequency range to 1400 kcs. Connect the output of this oscillator to the aerial and ground wires of the receiver. Now make sure that when the tuning condensers are all in maximum capacity that the pointer on the escutcheon lines up with the line just beyond the 550 kc. dial mark and then turn the dial until the escutcheon pointer lines up with the 1400 kc. line on the dial. The tuning condenser trimmers should now be adjusted until a maximum deflection is shown by the output meter. Now set the oscillator to 1000 kcs. Turn the dial to 1000 kcs. and then secure maximum deflection on the output meter by moving the serated plates of the variable condenser in or out as the case may be. Repeat the same procedure at 600 kcs. as was used at 1000 kcs. (Do not touch the trimmer condensers after having once set them at 1400 kcs.). Unsolder the wire connecting the first detector plate terminal to the second detector plate terminal. Resolder the wire that was originally unsoldered from the first detector plate terminal. Now replace the oscillator and second detector tubes.

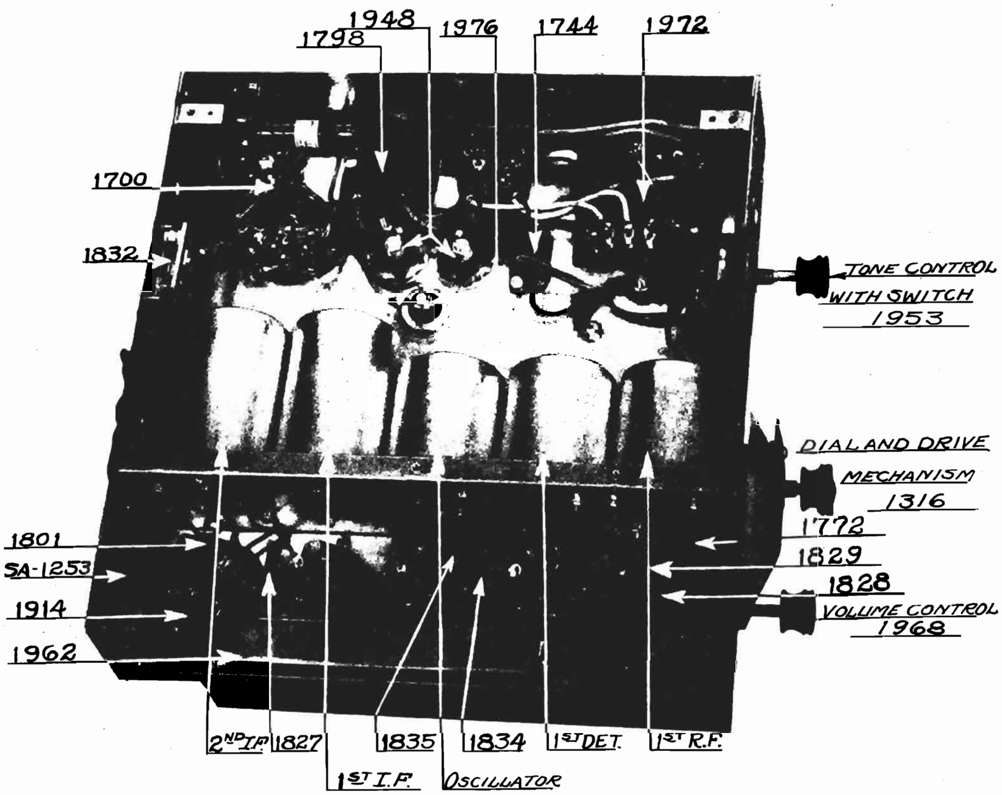
(d) To line up the oscillator tune the set to 1400 kcs. and adjust the oscillator tuning condenser trimmer (the last hole of the three holes in a line on the top of the tuning condenser housing) as viewed from the front of the set, (see Fig. 1) until a maximum reading is secured on the output meter. Adjust the Test Oscillator to 600 kcs. and tune the receiver to 600 kcs. Now adjust the oscillator series condenser trimmer (the hex. nut in the hole to the left of the oscillator tuning condenser trimmer hole) until a maximum deflection is secured on the output meter. Now reset the Test Oscillator to 1400 kcs. and retune the set to 1400 kcs. and make adjustments if any are necessary on the oscillator tuning condenser trimmer. It is very seldon necessary to make any readjustments at 1400 kcs. after they have once been made.

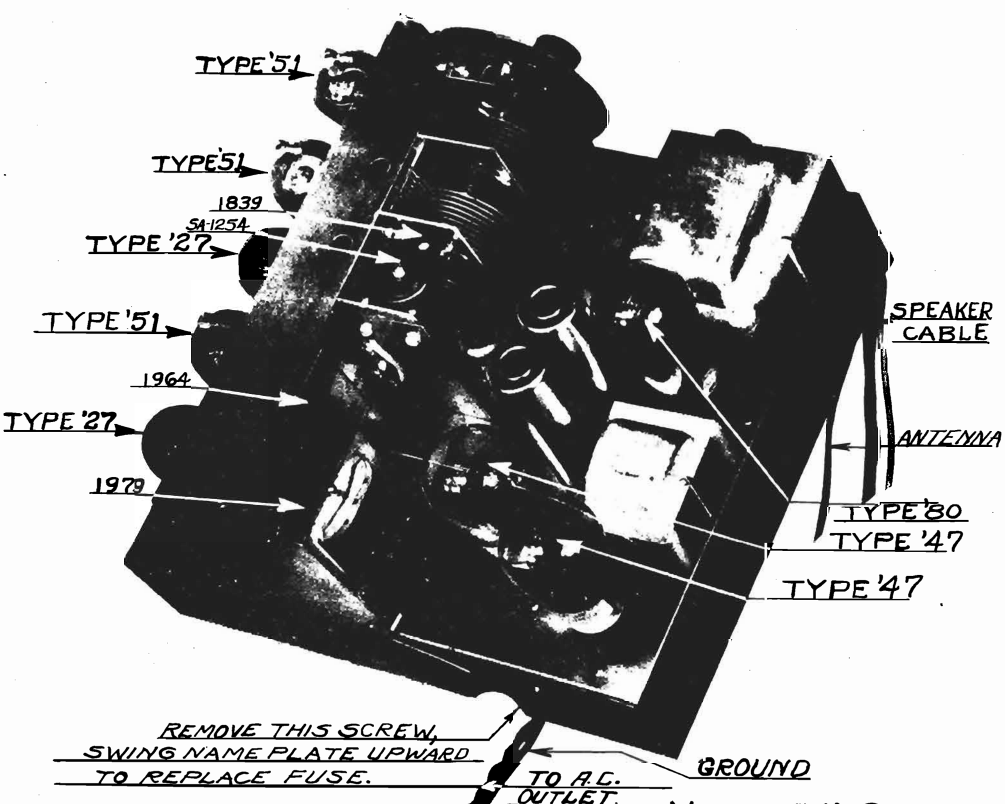
Now tune the Test Oscillator to 1000 kcs. and tune the set to 1000 kcs. Try adjusting the antenna trimmer condenser to determine whether the oscillator aligns at this frequency. If the antenna trimmer must increase capacity to give maximum deflection of output meter the oscillator tuning condenser serated plates should be moved out. If the antenna trimmer condenser is decreased in capacity the oscillator tuning condenser serated plates should be bent in towards the stator plates.

The Test Oscillator must again be set to 1400 kcs. and the set retuned to 1400 kcs. to make sure that the antenna trimmer condenser has been correctly reset after the oscillator adjustment has been made at 1000 kcs.

In making tests after having made adjustments according to the foregoing paragraphs, it is necessary to replace the tube and coil can shields before making the tests.

HOWARD RADIO CO.

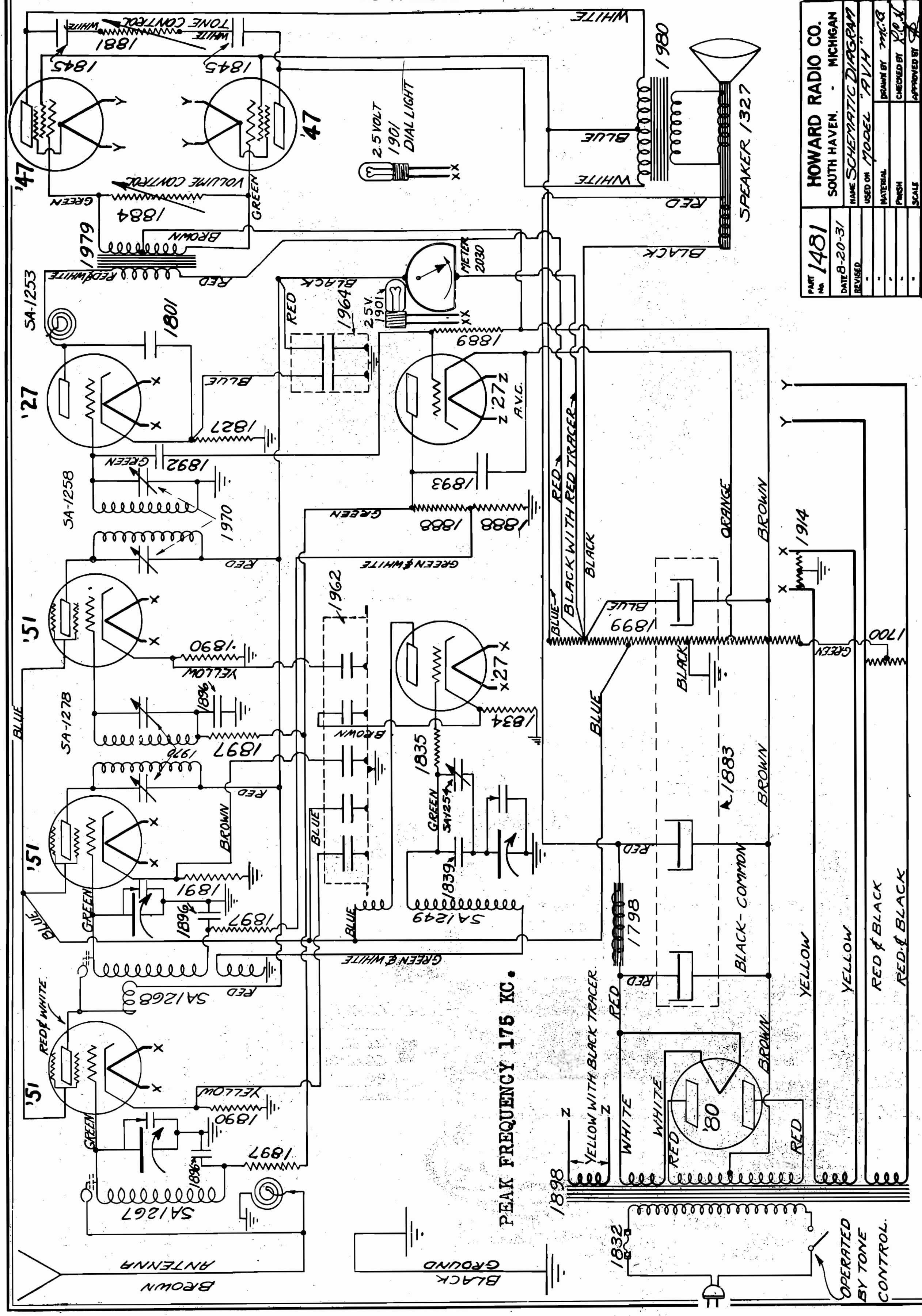




MODEL "H" SUPERHET.

Part No.	Description
1309	Loudspeaker and output transformer
1700	Center tapped resistor LTE-10
1846	Condenser .1 mfd.
1772	Resistor, 20,000 ohms ½ watt
1798	Choke coil No. 0221 Filter
1801	Condenser .001 mfd. (fixed mica)
1827	Resistor 30,000 ohms ½ watt
1828	Resistor 200 ohms ½ watt
1829	Resistor 1800 ohms ½ watt
1832	Fuse 2 amp (auto type)
1834	Resistor 2000 ohms ½ watt
1835	Resistor 3000 ohms 1/3 watt
1839	Condenser .0009 mfd. (fixed mica)
1841	Condenser 1 mfd. 300 volt—narrow chassis only—omit on "H" chassis
1901	Pilot Light 2.5 volt tubular
1914	Center tapped resistor TE-10
1948	Condenser 8 mfd. electrolytic (filter)
1881	Resistor and on-off switch (tone control)
1962	Condenser, by-pass block 2 sections ¼ mfd. 2 sections 1/10 mfd. 1 section ½ mfd.
1964	Condenser, by-pass block 1 section ½ mfd. 1 section 9/10 mfd.
1968	Potentiometer (volume control)
1970	Intermediate frequency transformer tuning condensers (2 condensers per unit)
1972	Power Transformer No. 1429
1976	Condenser 4 mfd. (electrolytic filter)
1978	Resistor, voltage divider
1979	Audio input transformer HR-41
1983	300 ohm resistor 5 watt
SA-1247	Antenna transformer (r.f.)
SA-1249	Oscillator coil
SA-1252	Radio frequency transformer
SA-1253	Detector radio frequency choke coil
SA-1254	Oscillator series padding trimmer Condenser (Includes P-1839)
SA-1258	Intermediate frequency transformer
SA-1278	Intermediate frequency transformer

HOWARD RADIO CO.

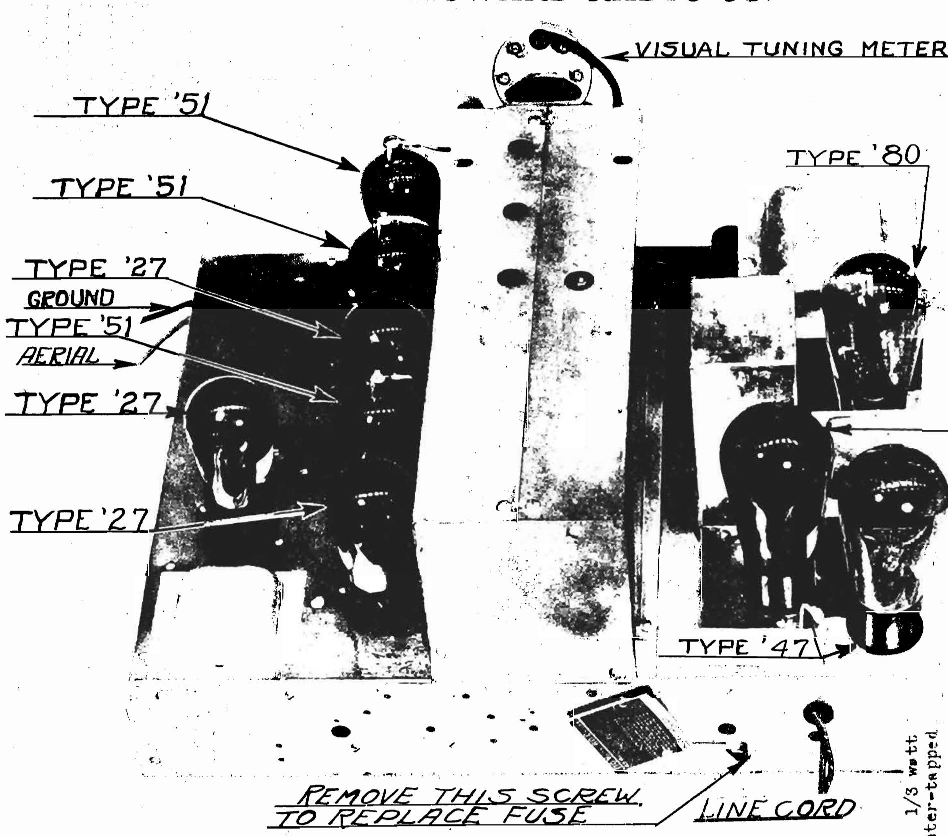


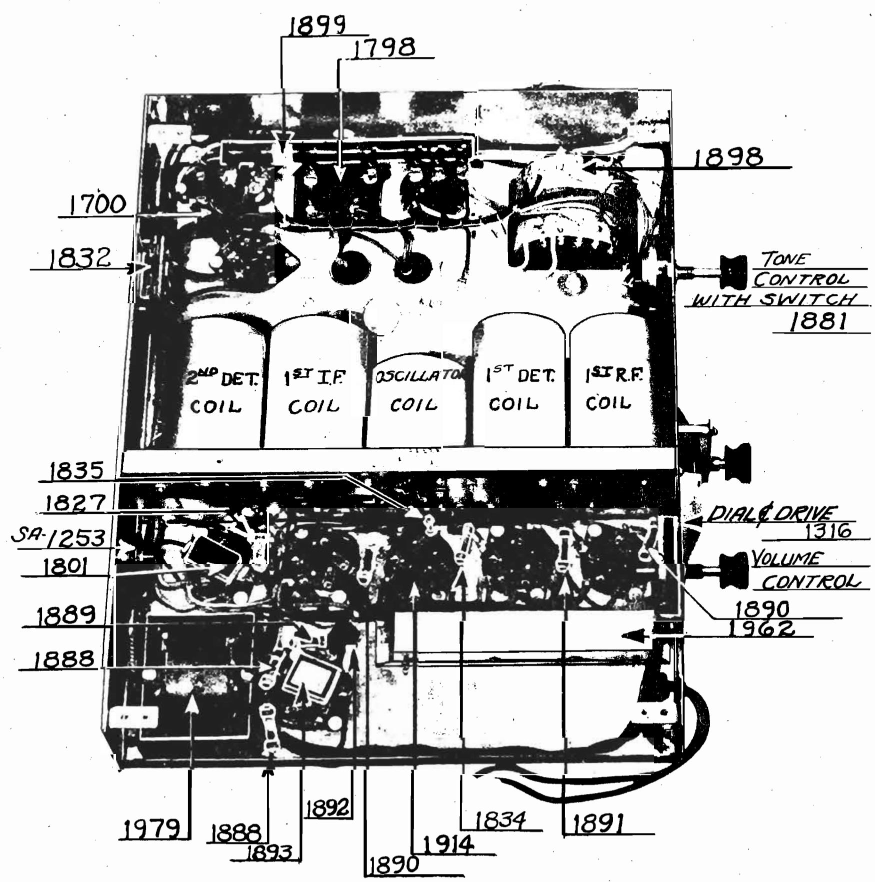
For further data refer to pages 404-H-1 and 404-I-3

PEAK FREQUENCY 175 KC.

MODEL AVH SUPERHETERODYNE
(AUTOMATIC VOLUME CONTROL)

HOWARD RADIO CO.



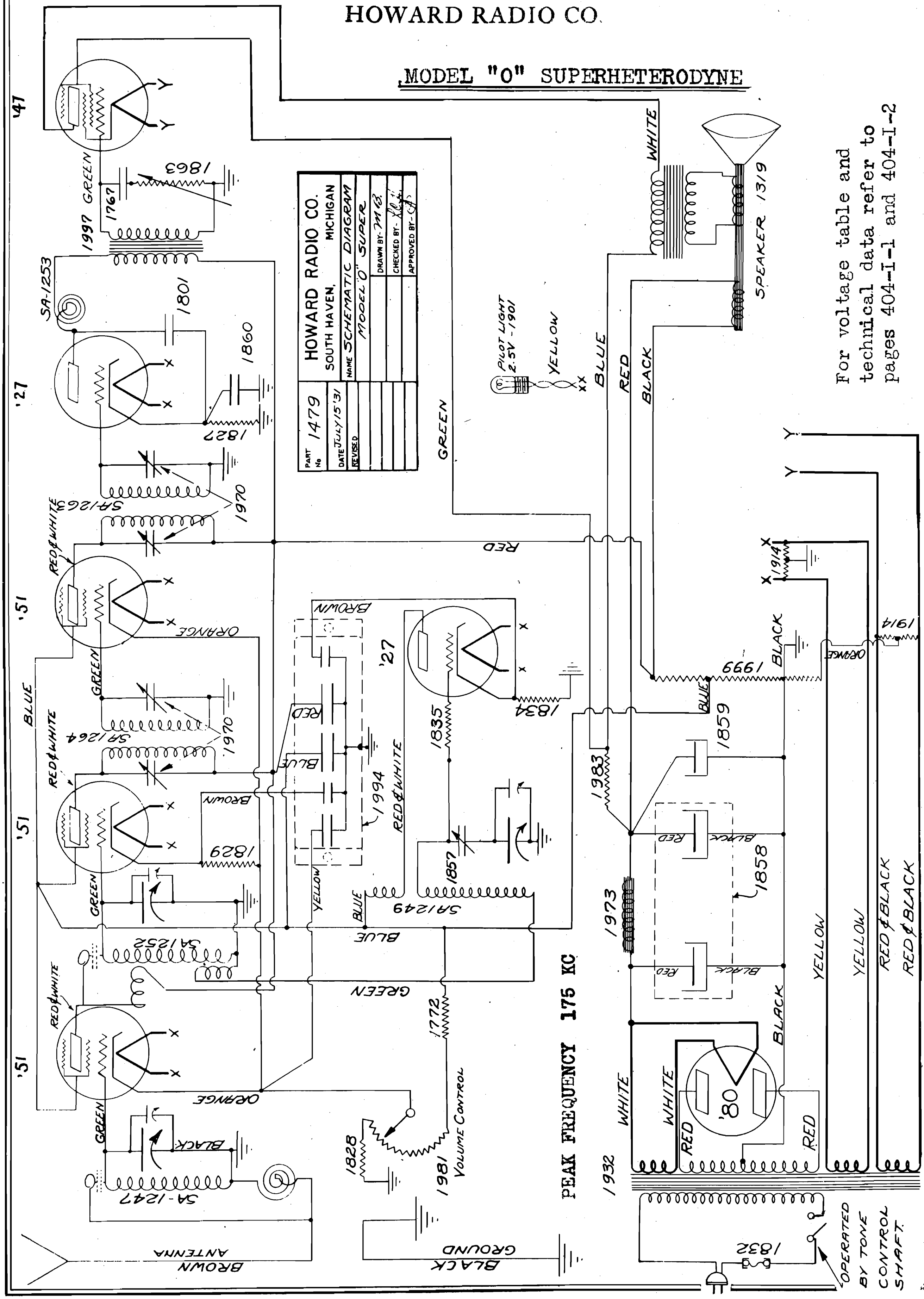


MODEL AVH SUPERHETERODYNE

1801	Condenser .001 Mfd.	
1827	Resistor 30,000 ohms 1/2 watt	
1832	Fuse 2 Amp. A. G.	
1834	Resistor 2,000 ohms 1/2 watt	
133	Spacer, 5 16 diam. x 3/8" long	
P-664	AVC Coil Mtg. disc	
SA-1249	Oscillator Coil for AVH	
SA-1253	R.F. Choke	
SA-1254	Oscillator Trimmer	
SA-1267	Antenna Coil for AVH	
SA-1268	1st Detector Coil for AVH	
SA-1271	Complete 1st IF for AVH	
SA-1272	Complete 2nd IF for AVH	
1835	Resistor 3,000 ohms 1/3 watt	
1914	Resistor 10 ohms center-tapped	
P-1327	Speaker, Jensen D-9 with 350 ohm field	
P-1704	Socket, Type 227	
1846	Condenser, .1 mfd. 200 vlots	
1881	Tone Control, 500,000 ohms and power switch	
P-1883	Filter condenser, No. 688, 450 volts 22 mfd.	
P-1884	Volume Control, 1/2 megohm	
P-1888	Resistor, 150,000 ohms, 1/2 watt	
P-1889	Resistor, 2 megohms, 1/2 watt	
P-1890	Resistor, 500 ohms, 1/2 watt	
P-1891	Resistor, 6000 ohms, 1/2 watt	
P-1892	Condenser, .00025 mfd. fixed mica	
P-1893	Condenser, .05 mfd. Sprague	
P-1896	Condenser, Sprague .1 mfd.	
P-1897	Resistor, 200,000 ohms, 1/3 watt	
P-1898	Power Transformer, special	
P-1899	B stick, 10110 ohms	
P-1979	Audio Transformer (with cover)	
P-2030	Tuning Meter	
P-2098	License Plate	

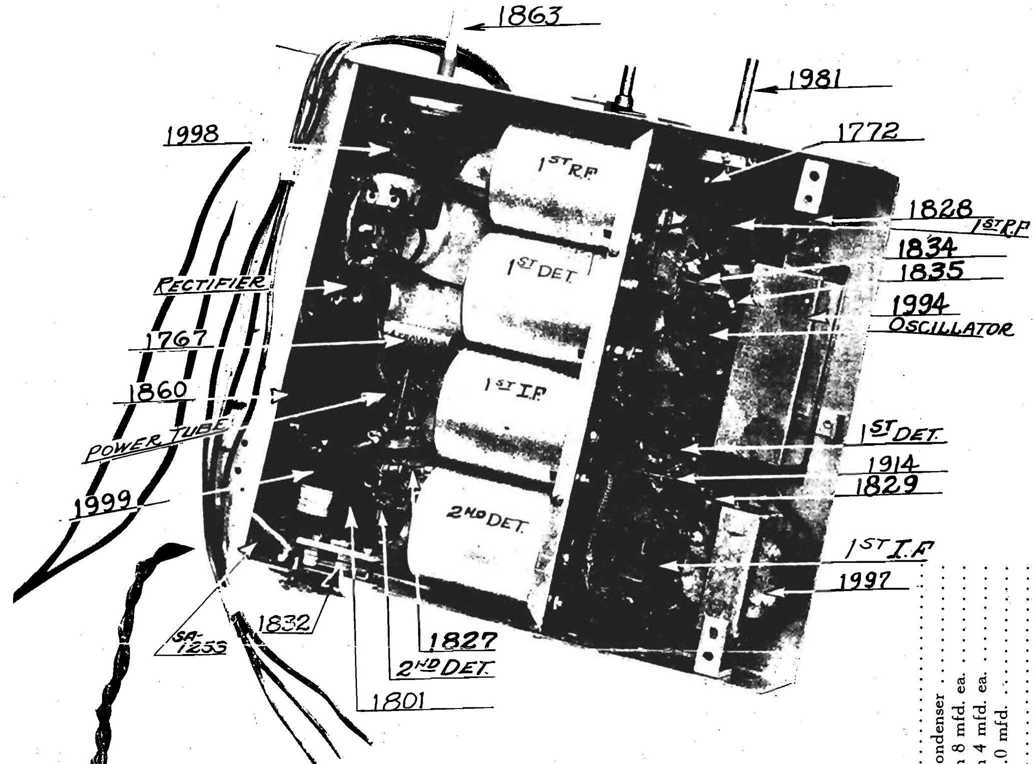
HOWARD RADIO CO.

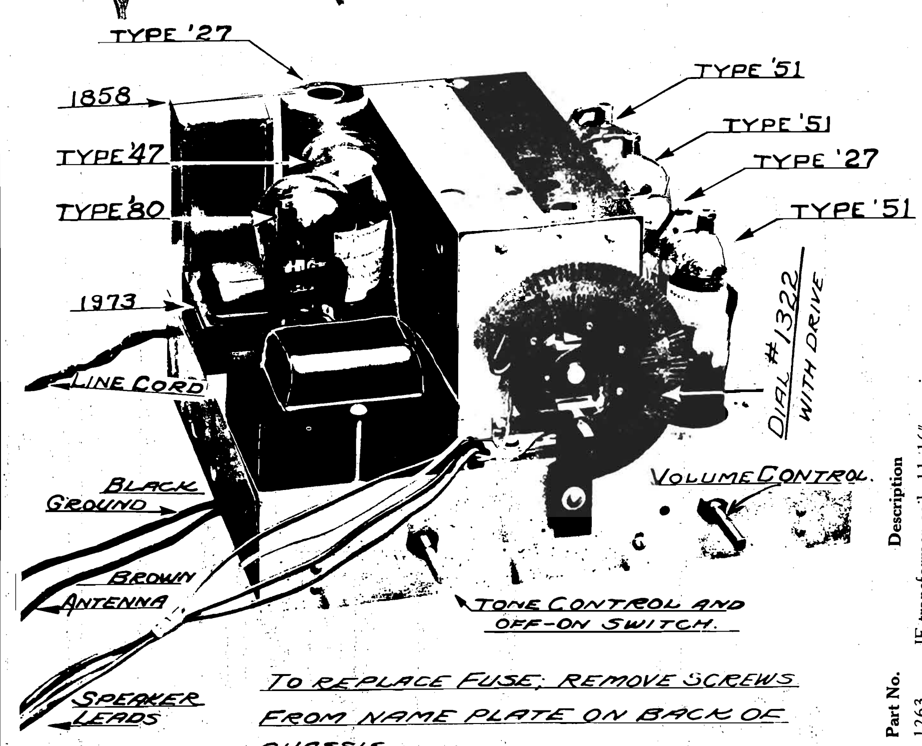
MODEL "O" SUPERHETERODYNE



For voltage table and technical data refer to pages 404-I-1 and 404-I-2

HOWARD RADIO CO.





Part No.	Description
1263	IF transformer coils 11/16" spacing
1264	IF transformer coils 1" spacing
1318	Variable tuning condenser
1322	Dial drive mechanism and scale No. 2042
562	AC line cord and plugs
1702	Socket No. 280
1704	Socket No. 227
1705	Socket No. 551
1767	Condenser .01 mfd.
1772	Resistor, 20,000 ohms, ½ watt
1801	Condenser .001 mfd.
1827	Resistor 30,000 ohms ½ watt
1828	Resistor 200 ohms ½ watt
1829	Resistor 1800 ohms ½ watt
1832	Fuse 2 amp. A.G.
1834	Resistor 2,000 ohms ½ watt
1835	Resistor 3,000 ohms 1/3 watt
1847	Socket No. 247
1857	Oscillator padding condenser
1858	Filter cond. 2 section 8 mfd. ea.
1859	Filter cond. 1 section 4 mfd. ea.
1860	By-pass condenser 1.0 mfd.
1901	Pilot light 2.5 volt
1914	Resistor 10 ohm center-tapped
1932	Power transformer
1863	Tone control and power switch
1970	IF transformer tuning condenser (variators)
1973	Choke coil, power pack
1981	Volume control
1983	Resistor 300 ohm, 5 watt
1994	By-pass condenser block
1997	Audio transformer
1999	Resistor (voltage divider)

Sub-Assemblies

SA-1247	Antenna radio frequency transformer
SA-1249	Oscillator tuning coil
SA-1252	Radio frequency transformer
SA-1253	Detector radio frequency choke coil

MODEL "O" SUPERHETERODYNE

HOWARD RADIO CO.

MODEL "O" SUPERHETERODYNE

Schematic Circuit

The schematic circuit of this receiver is shown in Dwg. No. 1479. The antenna connects to the set by means of the brown flexible lead shown in Fig. 1. The ground also connects to the set by means of a black flexible lead also shown in Fig. 1. (In later models binding posts are provided for antenna and ground.)

Inside the set, the antenna lead goes to a high inductance primary. The other end of this inductance grounds to the metal chassis. From the antenna end of this inductance a single turn of wire is coupled capacitively to the secondary of the radio frequency transformer. This coil is made in this manner so that the amplification will be equal throughout the frequency band. The secondary is tuned by means of a section of a three gang condenser. One end of this secondary connects to the control grid of the radio frequency amplifier tube while the other end is grounded.

The plate circuit of the radio frequency amplifier tube connects to +B voltage through a high impedance choke coil. The plate circuit of the r.f. amplifier is coupled to the secondary circuit by means of a single turn of wire in close physical relation to the grid end of the secondary coil which connects to the grid of the first detector or mixer tube. This single turn gives the necessary capacity coupling to produce uniform amplification over the broadcast frequency spectrum. The secondary coil of this transformer is tuned by a second section of the three gang variable tuning condenser. As with the secondary of the radio frequency amplifier transformer, one end of this coil is connected to the control grid of the first detector tube. The other end of this secondary coil is grounded to the chassis.

In order to introduce the oscillator voltage into the grid circuit of the mixer or first detector tube a small coil is wound in inductive relation to the secondary coil at the grounded end of the secondary. This small coupling coil is insulated from the secondary by means of a pyralin strip.

This small coil is a part of the oscillator inductance. Tuning of the oscillator is accomplished by means of the third section of the three gang variable tuning condenser, which has in series with it a fixed padding capacitor. This padding condenser has across it a small trimmer condenser. This condenser tunes the oscillator to an exact frequency at the low frequency end of the spectrum. One end of the oscillator coil is grounded through the 1st detector coupling coil while the other end connects to the control grid of the oscillator tube by means of a resistor P-1835 (Dwg. 1479). This resistor is used to stabilize the oscillator voltage over the frequency range. The plate circuit of the oscillator contains the conventional tickler coil, and is connected to the screen grid voltage tap for its plate voltage. The oscillator is of the biased type having a bias resistor connected from the cathode to ground. This resistor is by-passed by a section of the by-pass condenser block.

Voltage and Current Readings Howard Model "O"

Tube No.	Type	Position	A Volts	B Volts	Screen Volts	C Volts	Plate Current M.A.	Screen Current
1	551	1st R.F.	2.20	180	92	— 3.5	5.4	
2	227	Osc.	2.20	88		—10.0	2.8	
3	551	1st Det.	2.25	175	90	— 8.0	2.5	
4	551	I.F.	2.25	180	92	— 3.5	6.2	
5	227	2nd Det.	2.30	160		—17.0	0.6	
6	247	Audio	2.35	260	270	—21.0	25.0	4.2
7	280	Recitfier	4.60	350–350				

Line voltage, 115 volts. Volume Control, Full On.

(I) Alignment

IMPORTANT. The 175 kcs. oscillator **must be accurately tuned to 175 kcs. If this precaution is not observed it will be impossible to align the oscillator to the rest of the set and the set will not operate correctly as the oscillator is designed for exact 175 kcs. operation.**

This set is designed slightly different from **the Model H superheterodyne in that the** second intermediate frequency transformer **is not overcoupled.**

The following alignment procedure **should be followed:**

A. Intermediate Transformer Alignment.

1. Remove grid cap from **intermediate frequency amplifier tube and connect the con**trol grid of this tube to a 2 or 3 megohm resistor. **Connect other end of this resistor to** ground.

2. Connect output of 175 kc. oscillator to control grid circuit of this tube.

3. Tune secondary of intermediate transformer for maximum deflection of output meter. (Low voltage alternating current meter, 0-3 volts connected across voice coil of speaker.)

4. Tune primary of intermediate transformer for maximum deflection of output meter. Retune secondary to make sure tuning of primary has not affected the resonant point of secondary.

5. Replace grid cap as originally. Remove grid cap of the 1st detector and connect the 3 megohm resistor from control grid to ground. Connect the output of 175 kc. oscillator to control grid of 1st detector.

6. Tune secondary of 1st intermediate frequency transformer to 175 as shown by maximum deflection of output meter.

7. Now tune primary of this transformer to 175 as indicated by maximum deflection of output meter. Retune secondary to see it has not been affected by primary tuning.

8. Retune second intermediate frequency transformer to make sure it is exactly tuned at 175 kc. as there may be some change in tuning when the 1st detector is connected in the circuit.

No. 1 Radio Frequency Amplifier Alignment.

1. After aligning IF transformers, replace 1st detector grid cap. Unsolder the wire connecting the plate of the 1st detector tube to the IF transformer. Remove oscillator tube and 2nd detector tubes. Connect the plate terminal of 1st detector tube to the plate terminal of the second detector socket.

2. Rotate the condenser in clockwise direction as far as they will go. Make sure that when the rotors of the condenser are all in that the starting mark on the dial aligns with the pointers on the escutcheon. This starting mark is the line just beyond the 550 kc. line on the dial (See Fig. 1.)

3. Set test oscillator (RF Generator) which tunes over broadcast band to 1400 kc. Connect antenna and ground wires to oscillator. Tune set to 1400, as shown on dial. Adjust trimmer on first and third variable condensers for maximum deflection of output meter.

4. Now tune oscillator 1000 kcs. and tune set to 1000 kcs. as shown on the dial. Adjust for maximum deflection on output meter by moving serated plates on rotor of tuning condensers in or out as the case may be. **Do not adjust** trimmer condensers at this frequency.

5. Repeat process in paragraph 4 at 600 kcs.

6. Remove wire soldered from 1st detector plate terminal to second detector plate terminal and resolder wire from intermediate frequency transformer to plate terminal of 1st detector as originally connected.

Oscillator Alignment.

1. Set test oscillator to 1400 kcs. Tune set to 1400 kcs. and adjust oscillator or second (middle) tuning condenser trimmer for maximum output as shown on the output meter. (Oscillator trimmer condenser second hole of the three in line.)

2. Set test oscillator to 600 kcs. Tune set to 600 kcs. Adjust oscillator padding condenser (single hole to left of three holes in line) for maximum deflection of output meter.

3. Reset test oscillator again to 1400 kcs. and retune set to 1400 kcs. Readjust oscillator trimmer if necessary. This adjustment is very seldom necessary if the other adjustments are made correctly.

4. Now tune test oscillator to 1000 kcs. and tune set to 1000 kcs. Try adjusting antenna trimmer condenser to determine whether the oscillator aligns at this frequency. If the antenna trimmer must increase in capacity to give maximum deflection of output meter the oscillator tuning condenser serated plates should be moved out. If the antenna trimmer condenser is decreased in capacity the oscillator tuning condenser serated plates should be bent in towards the stator plates. It must be remembered that a small capacity change in the oscillator circuit means a tremendous frequency change, and this adjustment must be made very carefully.

5. Now adjust test oscillator to 1400 kcs. and retune set at 1400 kcs. to make sure that the antenna trimmer condenser has been reset to its original position after Test 4 has been made.

In making the above tests it is necessary before making each test, to replace all shielding.

The foregoing tests are of a delicate nature, and it is essential that each one be made carefully before going to the next test.

HOWARD RADIO CO.

MODEL AVH SUPERHETERODYNE

1. Specifications.

The Howard Model AVH receiver is a superheterodyne receiver similar to the Model H receiver with the addition of an Automatic Volume Control.

2. Schematic Circuit.

Draw. # 1481 shows a schematic diagram of the Model AVH. Since the Model "H" and Model "AVH" are nearly identical, it will only be necessary to show wherein the two differ.

In the radio chassis the following differencies are noted.

The first radio frequency transformer SA-1267 is not grounded as in the Model "H". A non-inductive .1 mfd. condenser is connected between the end of this coil and ground. This condenser provides an insulation as far as direct current is concerned for the grid of the radio frequency amplifier tube. From a radio frequency standpoint, this condenser offers a low impedance path to ground for the radio frequency voltage. Since this condenser and the tuning condenser are in series across the tuning coil it is necessary that this condenser be large in order to have small effect on the tuning capacity.

The second radio frequency transformer SA-1268 is constructed in the same manner as the first radio frequency transformer as far as grounding is concerned and needs no further explanation. For actual physical construction refer to section 2 of Model "H" Service Manual).

The first intermediate frequency transformer SA-1278 also has an isolating condenser in the grid circuit. This condenser serves the same purpose as those in the radio frequency transformers.

The initial operating bias for the various tubes is secured by means of individual resistors in each cathode circuit. The plate current flowing through this resistor causes a voltage drop across it which places the cathode positive with respect to ground. Since the grid is effectively at ground potential this is the same as placing a negative voltage on the grid. It is necessary to bias these tubes individually so that there is no common impedance which might give rise to reaction between the tubes. Each resistor is by-passed to form a low impedance path for radio frequency around the resistor.

3. Automatic Volume Control.

The Automatic Volume Control is actuated by means of a type 227 tube and in order to explain its operation it is necessary to explain its action under condition of no signal being received and then its action when a signal is being received.

The tube is connected so that the grid is at absolute -B potential by means of a 2 megohm resistor (P-1889). The cathode of the tube is connected to a point on the voltage divider which is at +24 volts with respect to -B or thegrid. There exists then between the cathode and the grid a potential difference of 24 volts with the grid negative by this amount. The plate of this tube connects to ground by means of two 150,000 ohm resistors (P-1888). Since ground is connected to +124 volts with respect to -B there exists between the cathode and the plate a potential difference of 100 volts. In order to by-pass any radio frequency energy which may appear on the plate a non-inductive condenser (P-1893) is connected from the plate of the Automatic Volume Control tube to the cathode.

With the condition of no signal there exists a bias of 24 volts and a plate voltage of 100 volts. Under these conditions there is no plate current flowing and the tube is said to be cut-off. Since no plate current is flowing there exists no voltage drop across the plate circuit resistors and, therefore, there is no bias voltage on the grids of the controlled tubes. The only bias on the r.f., 1st det. and i.f. is caused by the respective voltage drops across their cathode resistors. These resistors are designed to give the most sensitive operating point.

Now let us consider the case of a received signal. The signal passes through the receiver to the second detector grid. Here the AVC (automatic volume control) tube grid and the second detector grid are in parallel. The signal voltage is fed to the grid of the AVC tube by means of a small fixed condenser P-1892. This signal voltage swings back and forth with its center coinciding with the initial bias on the AVC tube. It will be seen that during the positive half at the cycle, the peak voltage of the signal swing substracts from the original bias voltage. This means that the instantaneous bias on the tube is less than the original bias and the tube begins to draw current in the plate circuit. Since this current flows in the resistors in the plate circuit of the AVC tube, there exists a voltage drop across these resistors. Also the flow of the electrons is from plate to ground so that the plate becomes negative with respect to ground. Now since the original potential of the cathodes of the r.f., 1st. det. and i.f. tube is positive with respect to ground, it follows that if the grids of the respective tubes are connected to resistor in the plate circuit of the AVC tube, that any potential existing across this resistor is added to the original bias and makes the grids more negative than the original bias by the amount of the voltage drop across the resistor in the AVC tube plate.

It is at once apparent that the greater the signal voltage appearing at the grid of the AVC tube, the more plate current will flow in plate circuit. An increase in plate current means an increase in bias on the r.f., 1st det. and i.f. tubes. An increased bias on these tubes means less amplification and therefore, less grid swing on the second detector and AVC tube. This cycle goes on until a constant voltage is obtained across the second detector input or in other words until a condition of equilibrium is reached.

The action of the AVC is to maintain a constant voltage across the grid of the second detector regardless of the voltage of the incoming signal. Since this voltage remains constant this means that the audio output also remains constant.

In order to connect the grids of the various tubes to the AVC resistor, it is necessary to insert decoupling resistors P-1897 in each grid lead. These resistors are of such value so that in conjunction with the isolating condenser, they form a resistance capacity filter section so that any modulation from the AVC tube does not reach the grids of the other tubes.

Due to certain detector characteristics it is not advisable to control the 1st detector tube as much as is necessary with the r.f. and i.f. tubes. The grid return of the 1st detector, therefore, goes to the center tap of the two resistors in the plate circuit of the AVC tube while the grid return of the r.f. and i.f. tubes go directly to the plate of the AVC tube.

4. Volume Level Control.

In the automatic volume control set the receiver is designed so that the maximum audio output is just below the point of overload of the audio power tube. Since this value of output is far more than necessary for normal room volume, it is necessary to introduce some type of volume level control in order that the customer may adjust the output to any desired value. In order to accomplish this a variable resistor is shunted across the secondary of the input transformer to the pentode tubes. By adjusting this control, the volume may be set at any desired level and once adjusted need not be adjusted until it is desired to receive an extremely distant station which has a field strength too weak to operate the automatic volume control.

5. Tone Control.

Since the volume level control on the Model AVH is connected where the tone control is normally connected, it was necessary to re-design the tone control for a new location. The tone control consists of two condensers P-1845 and a variable resistor P-1881. This combination is connected in series across the plates of the two pentodes. The action of this control is the same as that on the Model H in that as less resistance is included between the two condensers, they become more effective in by-passing the higher audio frequencies and at the same time they tune the primary of the output transformer to a lower audio frequency

6. Visual Tuning Meter.

Since the Automatic Volume Control tends to hold the audio output of the set to a certain definite volume level, it will be at once apparent that the main tuning dial may be rotated quite a distance without any appreciable change in audio volume. This means that the point of resonance is hard to distinguish. In order to tune the receiver to absolute resonance, a visual tuning meter is used. This meter is connected in series with the plate supply voltage of the three controlled tubes. As the bias increases on these tubes as the receiver is tuned to resonance, the plate current decreases. This decrease in plate current is recorded by the meter. A station is in exact resonance when the tubes are drawing their minimum plate current for a given signal strength. At this condition the best tonal qualities are realized from the set. It is important that the service man and dealer both understand this tuning so that the customer may be instructed in the correct manner of tuning his radio set. This broadness of tuning is only apparent and does not effect the selectivity of the receiver. This action is explained fully in the instruction pamphlet with each receiver and should be thoroughly understood so that an explanation can be given the customer.

7. Power Pack.

The power pack is of the conventional type and is similar to the Model H with a few exceptions.

The power transformer has a separate winding for the heater of the AVC tube. This is necessary because if the heater were grounded as the other heaters, it would place 100 volts potential difference between cathode and heater and it is possible that rectification might take place between these two elements which would hinder the action of the AVC tube.

The HV. secondary of this power transformer is also changed to give an increased high voltage. This increase is necessary because the AVC tube requires an additional 124 volts for operation.

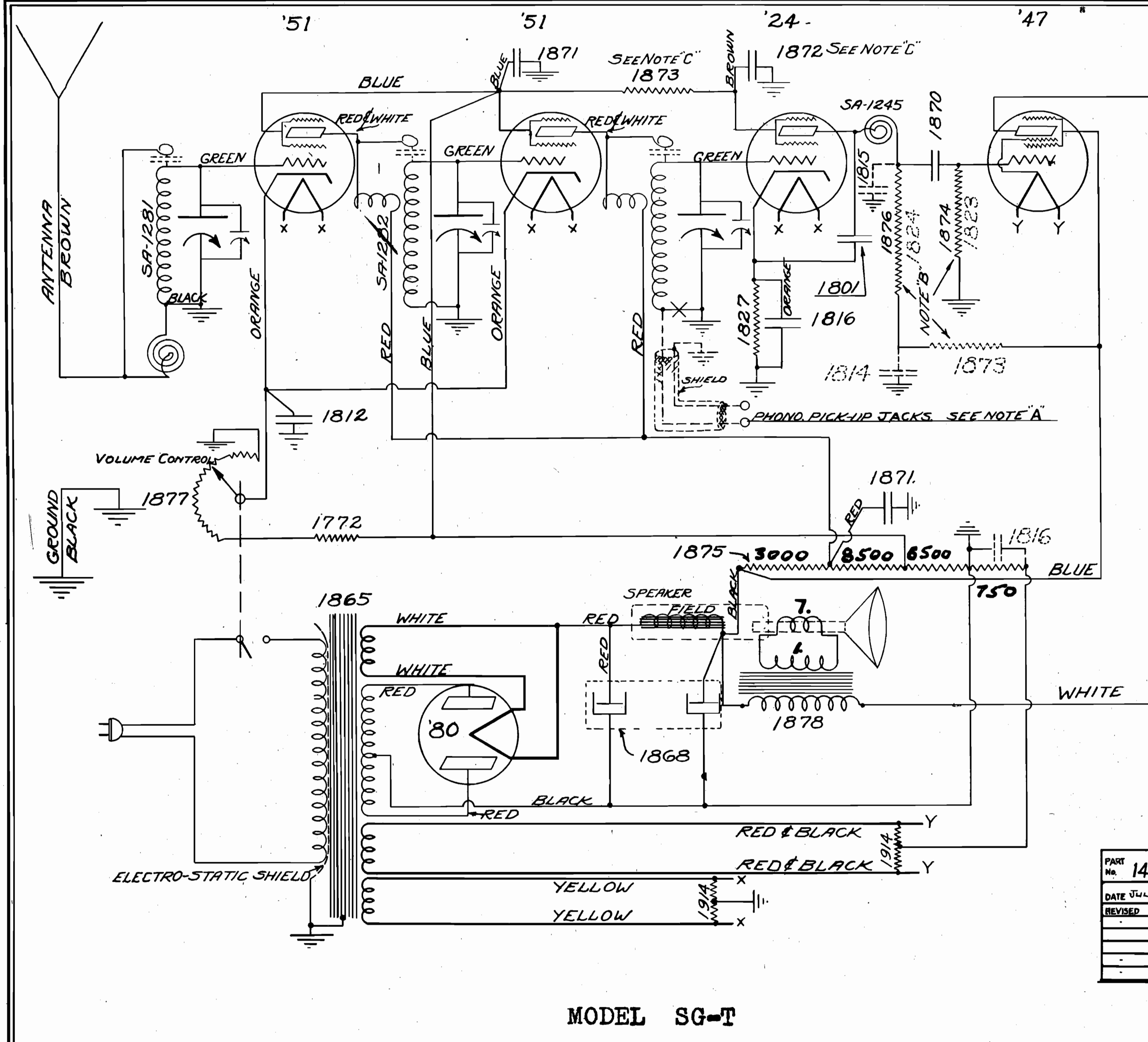
Since an additional 124 volts is required above the usual 180 volts for plate operation this means that from +B to -B on the voltage divider resistor there is a total of 304 volts. As our power tubes require only 250 volts plate and 16.5 volts bias it is at once apparent that they may be connected betwen +B and -B with suitable resistors to drop the voltages to the correct operating voltages.

The speaker field is connected the same as in the Model "H" but since the total current of the set now flows through the speaker field the resistance of the field is only 350 ohms instead of 2400 ohms as in the standard Model H.

The filter condensers on the Model AVH are of the dry electrolytic type since there would exist a potential difference between the case and the chassis if the wet electrolytic were used which might shock the user if he happened to touch the can of the condenser and the chassis. These dry electrolytic condensers are housed in a container which is at ground or chassis potential so that this danger is eliminated.

Two pilot lights are used on the Model AVH, one for illuminating the dial and the other for illuminating the meter.

HOWARD RADIO CO.



NOTE-A:-
PHONOGRAPH JACKS ON EXPORT MODELS ONLY. DETECTOR COIL GROUND OPENED AT X.

NOTE-B:-
WITH A LATER SERIES OF SETS, THE FOLLOWING REVISIONS WILL BE NOTED:-
1876 = 750,000Ω NOW 1824 = 250,000Ω
1874 = 400,000Ω " 1823 = 1 MEG.

ADD:- 1873 RESISTOR
1814 CONDENSER
1815 "
1816 "

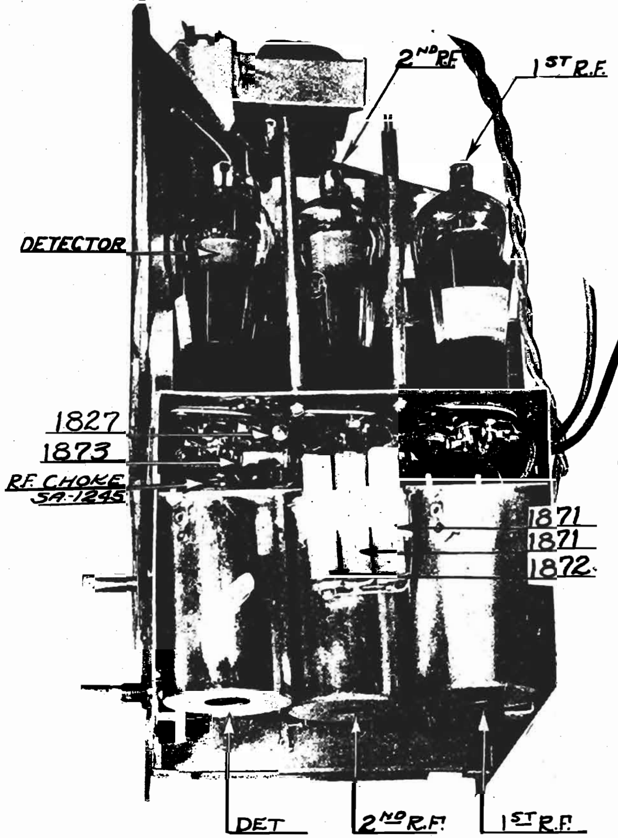
NOTE-C:-
OMITTED:- 1872 CONDENSER
1873 RESISTOR

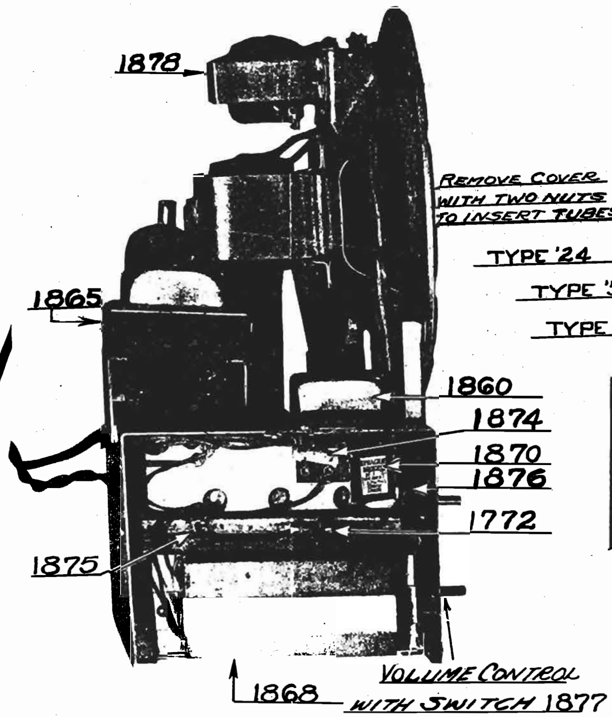
PART No. 1480	HOWARD RADIO CO. SOUTH HAVEN. - MICHIGAN		
DATE July 20 '31			
REVISED	NAME Schematic Diagram		
	USED ON Model SG-T		
	MATERIAL ~	DRAWN BY - M.B.	
	FINISH ~	CHECKED BY -	
	SCALE ~	APPROVED BY -	

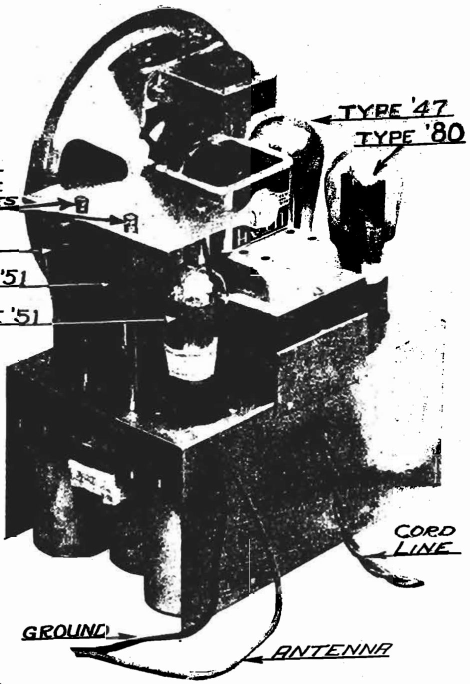
MODEL SG-T

HOWARD RADIO CO.

MODEL SG-T







1323	Condenser, variable tuning condenser, 3 gang.	1870	Condenser .1 mfd. Sprague Type G.......
1325	Tuning mechanism (complete with scale).....	1871	Condenser 1.0 mfd. Elkon 200 volt rating..
1562	Line cord, 8½ ft., with H. & H. Bakelite plug.	1872	Condenser .5 mfd. Elkon 200 volt rating...
1702	Socket type, No. 280..................	1873	Resistance 100,000 ohms, ½ watt........
1703	Socket type, No. 224..................	1874	Resistance 400,000 ohms, ½ watt........
1705	Socket type, No. 551..................	1875	Resistor "B" stick ....
1772	Resistor 20,000 ohms ½ watt...........	1876	Resistor 750,000 ohms, ½ watt.........
1801	Condenser .001 mfd. Fixed mica........	1877	Volume Control (on-off switch included)..
1812	Condenser .5 mfd.	1914	Resistor 10 ohms center tapped type 7E-10.
1827	Resistance 30,000 ohms, ½ watt.........		
1847	Socket type, No. 247..................		
1816	Consender 1.0 mfd.		
1865	Power Transformer, No. H.R. 55.........		
1868	Condenser 16 mfd. (2-8 mfd. sections)....		

Sub-Assembly Parts List

SA-1245	R.F. Choke coil ....
SA-1281	Radio Frequency Transformer (Antenna)..
SA-1282	Radio Frequency Transformer (Interstage).

R.F. Amplifiers:

The secondary of the first radio frequency transformer is connected between the grid of the 1st r.f. amplifier tube and ground. This secondary is tuned by means of one section of a three-gang variable condenser.

The cathode of this tube connects directly to the volume control. The volume control will be discussed under a separate section.

The screen grids of the radio frequency amplifier tubes connect together and then to a point on the voltage divider resistor which applies the correct operating potential on the screens. In order to prevent common coupling impedance these screens are by-passed to ground by means of a condenser. This eliminates a possibility of oscillation from this source.

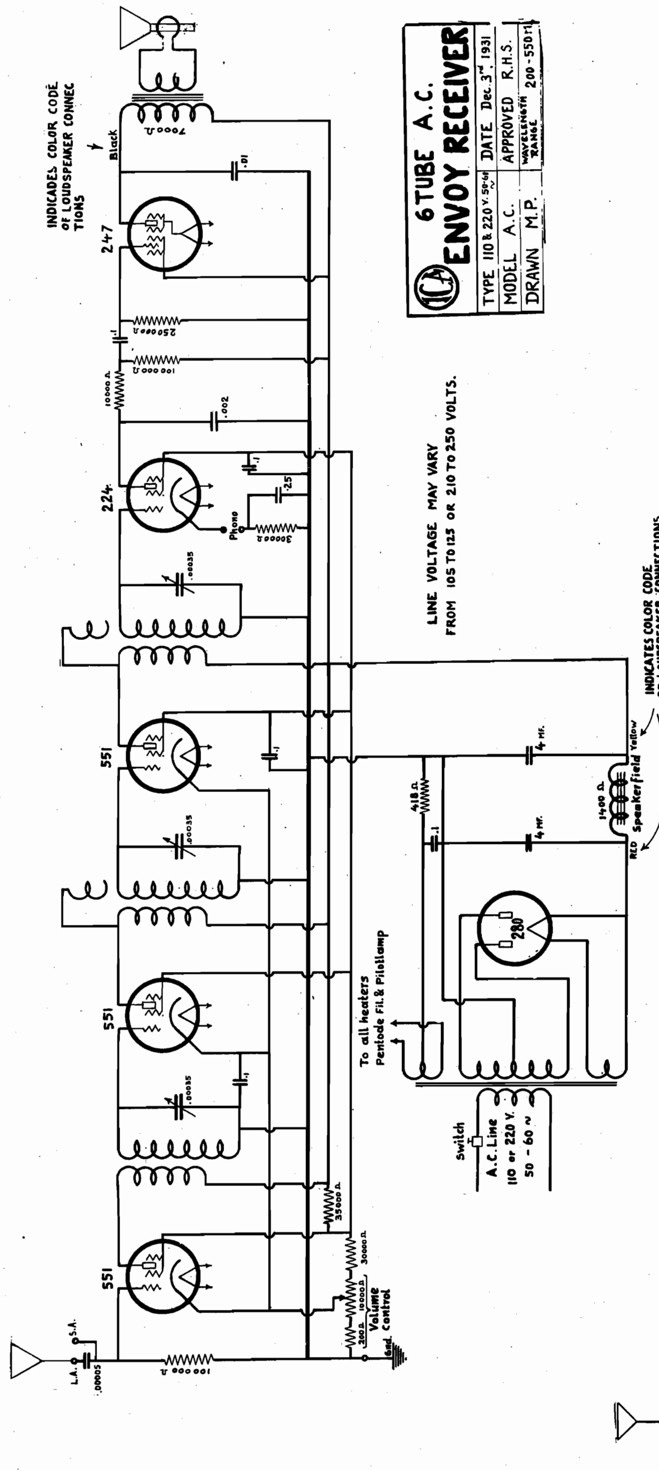
Connected between the source of B voltage and the plate of the first radio frequency amplifier tube is a high inductance choke coil. This coil is located in the top of the second radio frequency transformer but in physical relation to the secondary of this transformer so that there is no electromagnetic coupling. Connected to the plate end of this choke is a wire which is in close physical relation to the grid end of the secondary of this transformer. As in the case of the 1st r.f. transformer, this turn gives a small capacity coupling. The combination of the choke and small capacity formed by the single turn of wire gives a frequency characteristic which is substantially flat over the frequency range.

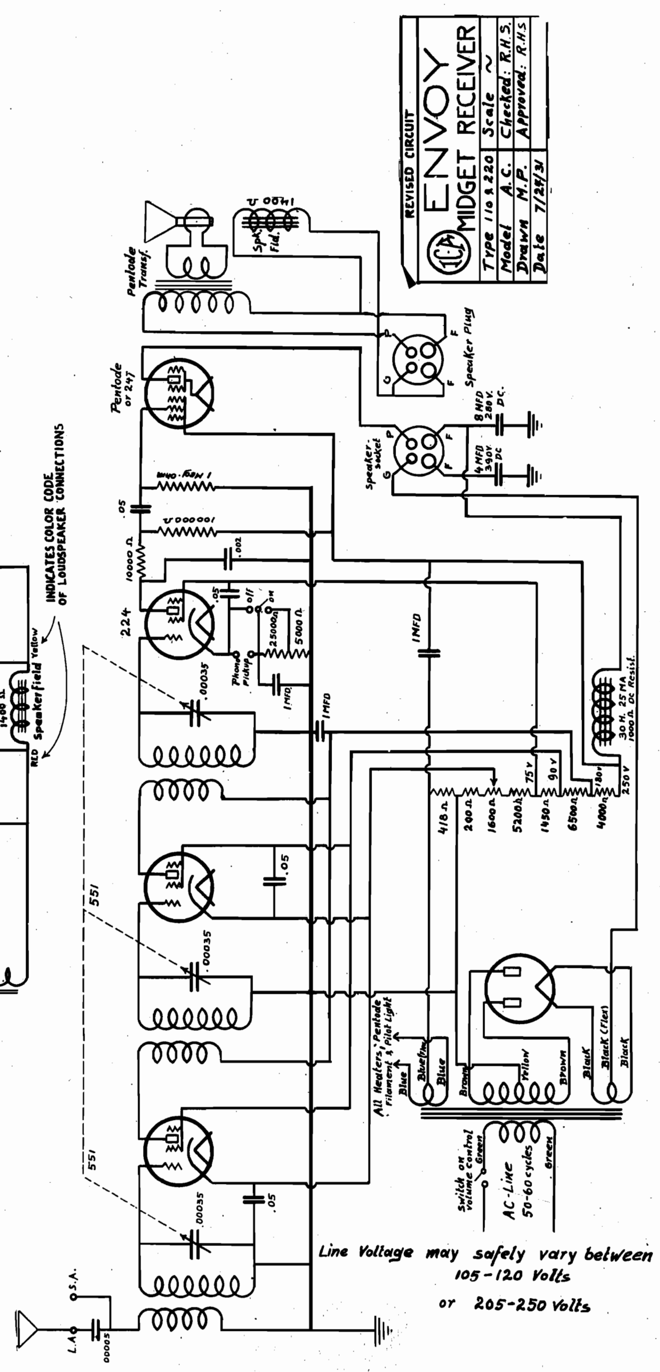
The secondary of the second transformer is similar to the one used in the 1st r.f. transformer and is tuned by means of the second section of the variable tuning condenser. It is connected between grid and ground of the second radio frequency amplifier tube.

The cathode and screen of this tube are connected the same as the first radio frequency amplifier and need no further description.

The third radio frequency transformer is a duplicate of the second radio frequency transformer and therefore, needs no description. On export models, the ground lead of this transformer is connected to a phonograph jack, and the other terminal of the phonograph jack is connected to ground. In the radio position these jacks are shorted by means of a switch. In the phono. position, this switch is opened and the pick-up is plugged into the jacks. It is necessary to tune the radio set to some point on the dial where there is no signals from a broadcast station coming in, otherwise the radio signals will feed through and interfere with the phono. music.

INSULINE CORPORATION OF AMERICA

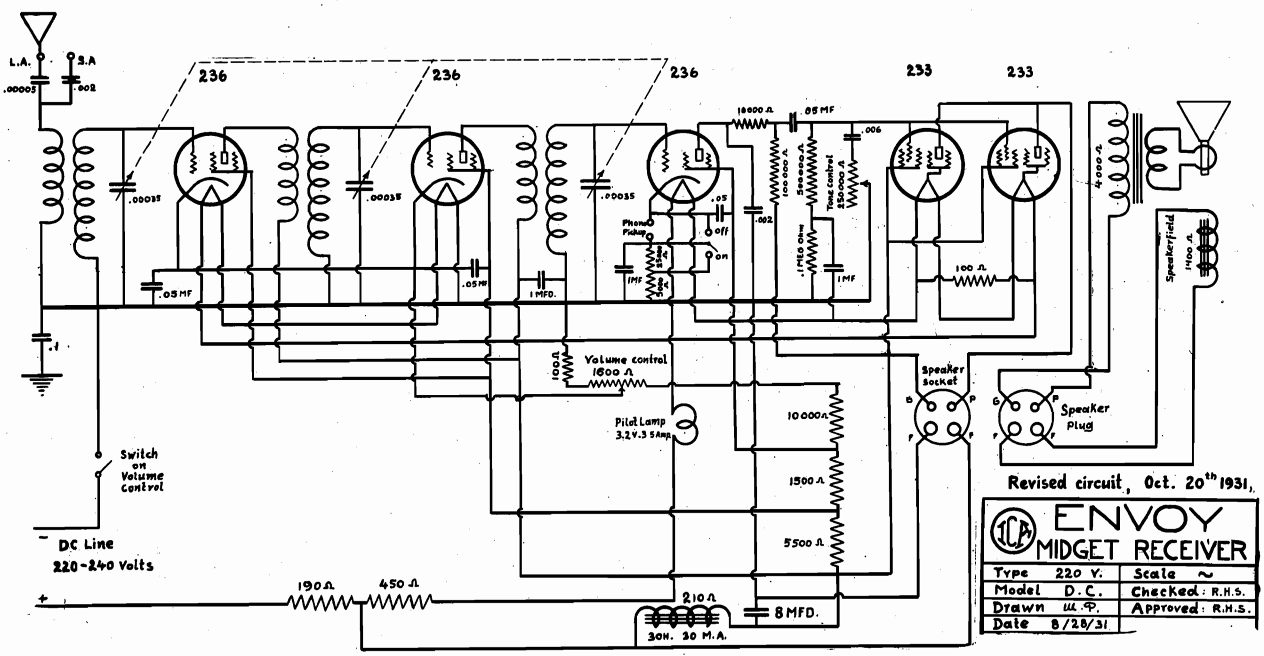


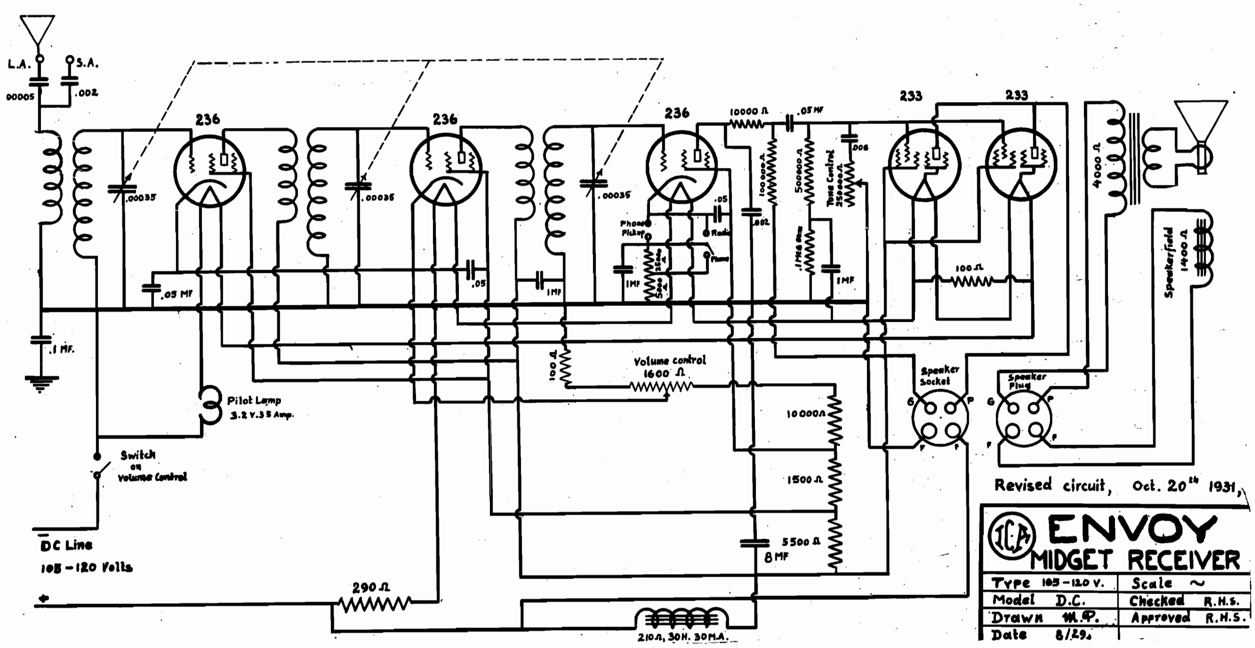


"ENVOY" 6 TUBE AC RECEIVER

"ENVOY" AC MIDGET RECEIVER

INSULINE CORPORATION OF AMERICA

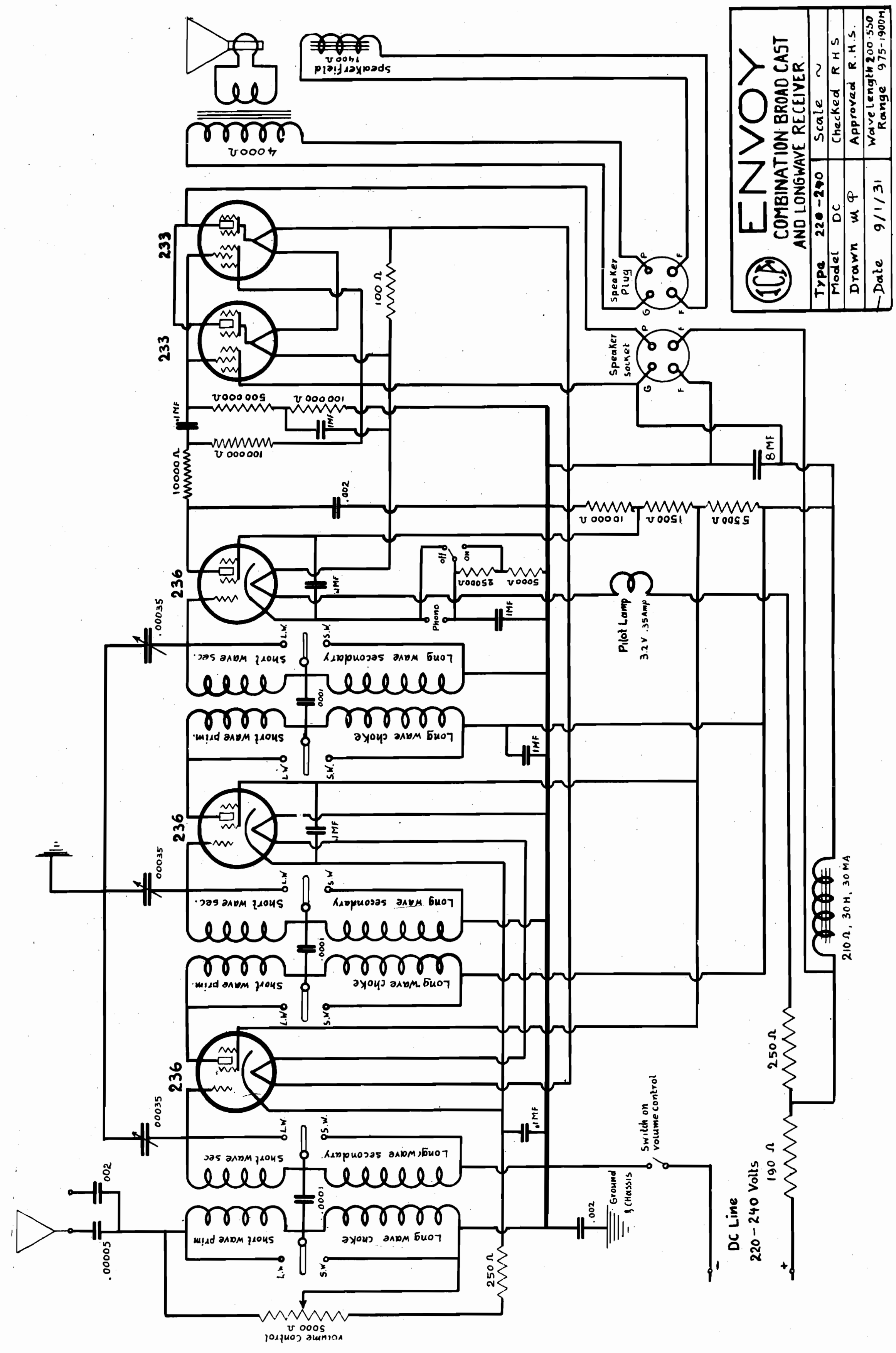




"ENVOY" DC MIDGET RECEIVER (220 V)

"ENVOY" DC MIDGET RECEIVER (105-120 V)

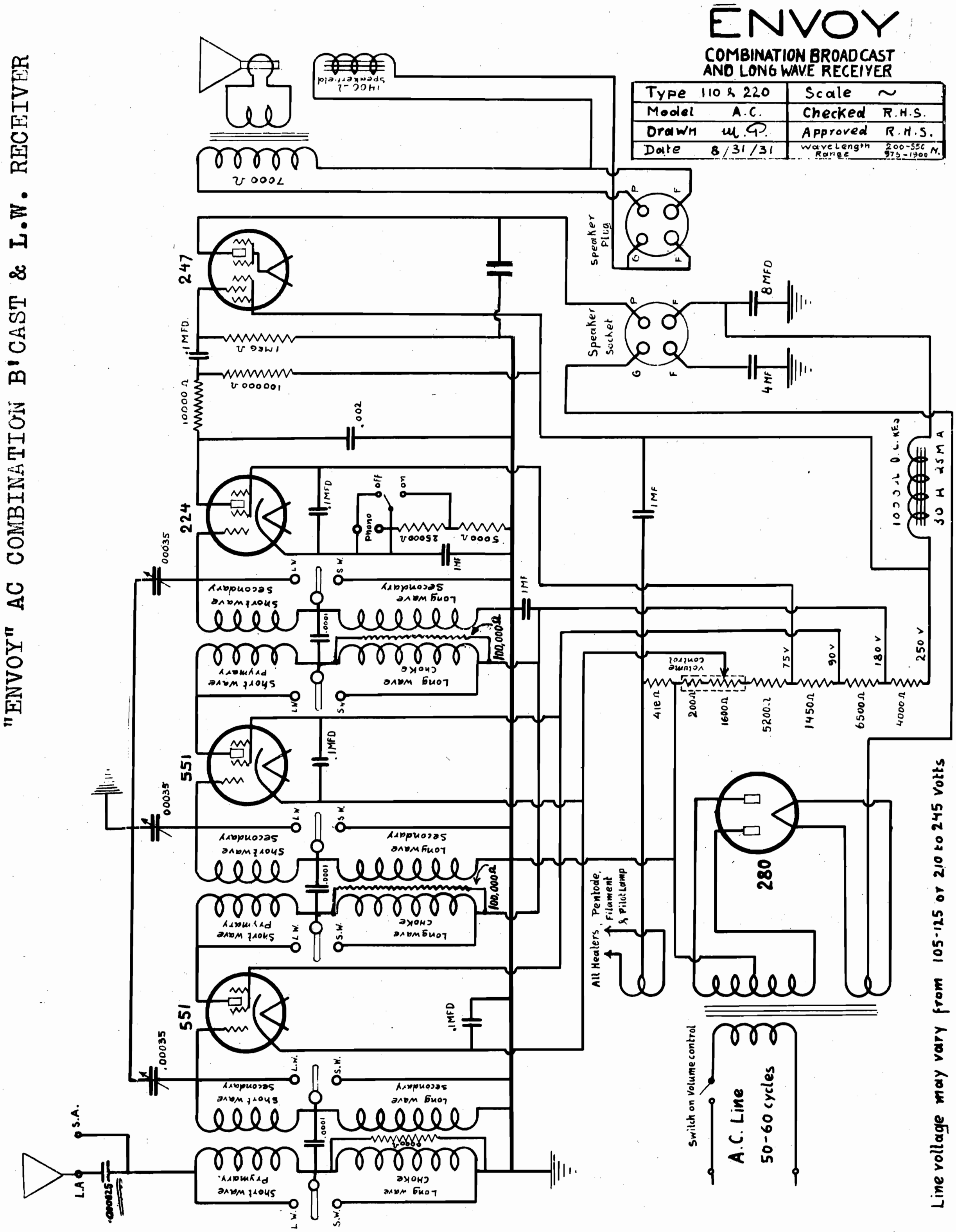
INSULINE CORPORATION OF AMERICA



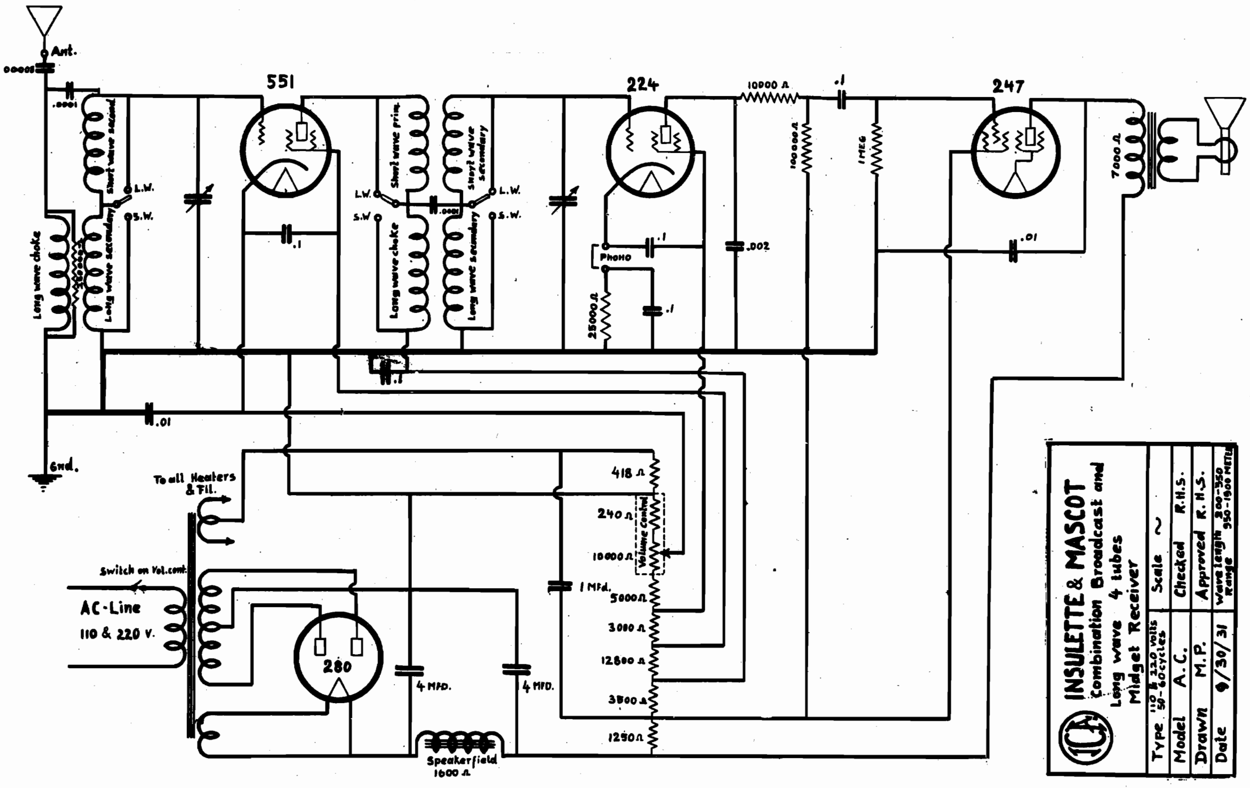
"ENVOY" DC COMBINATION B'CAST & L.W. RECEIVER

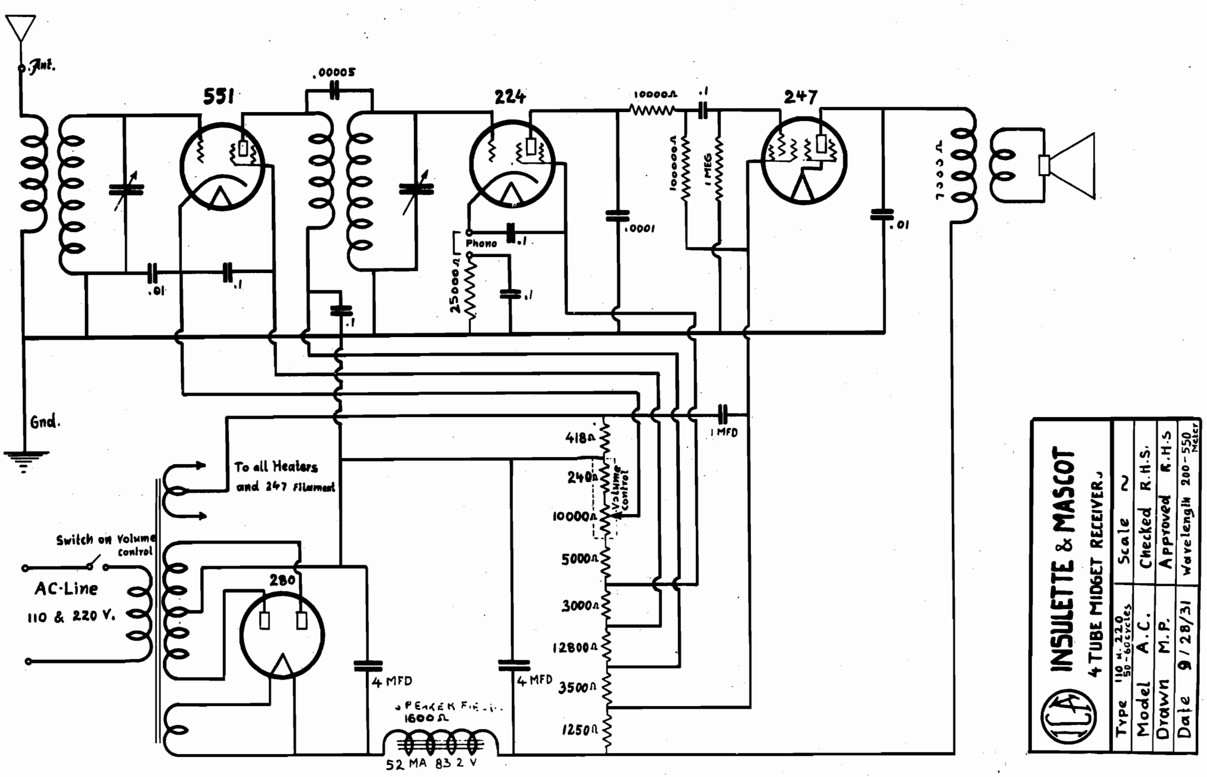
INSULINE CORPORATION OF AMERICA

"ENVOY" AC COMBINATION B'CAST & L.W. RECEIVER



INSULINE CORPORATION OF AMERICA

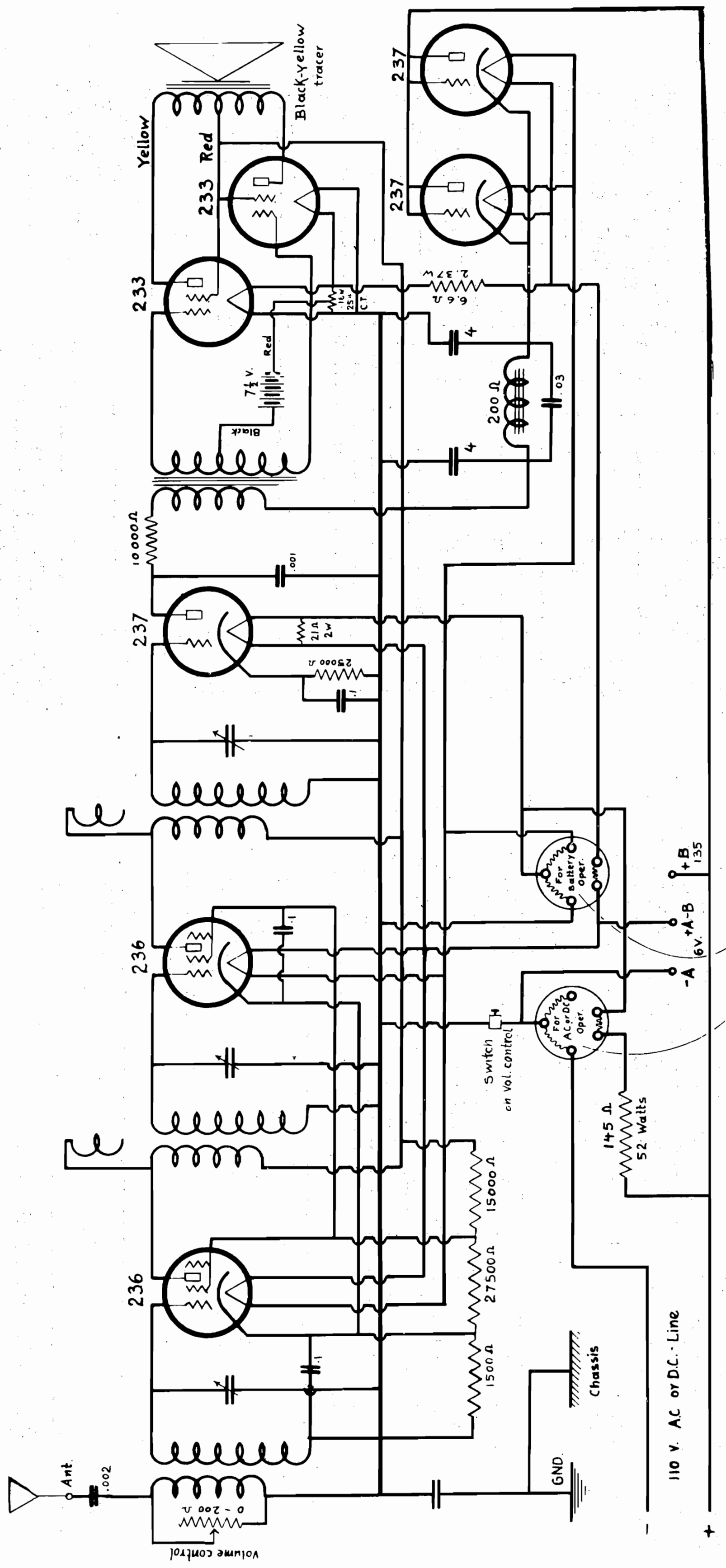




"INSULETTE" & "MASCOT"
4 TUBE MIDGET RECEIVER

"INSULETTE" & "MASCOT"
4 TUBE COMBINATION B'CAST & L.W.
MIDGET RECEIVER

INSULINE CORPORATION OF AMERICA

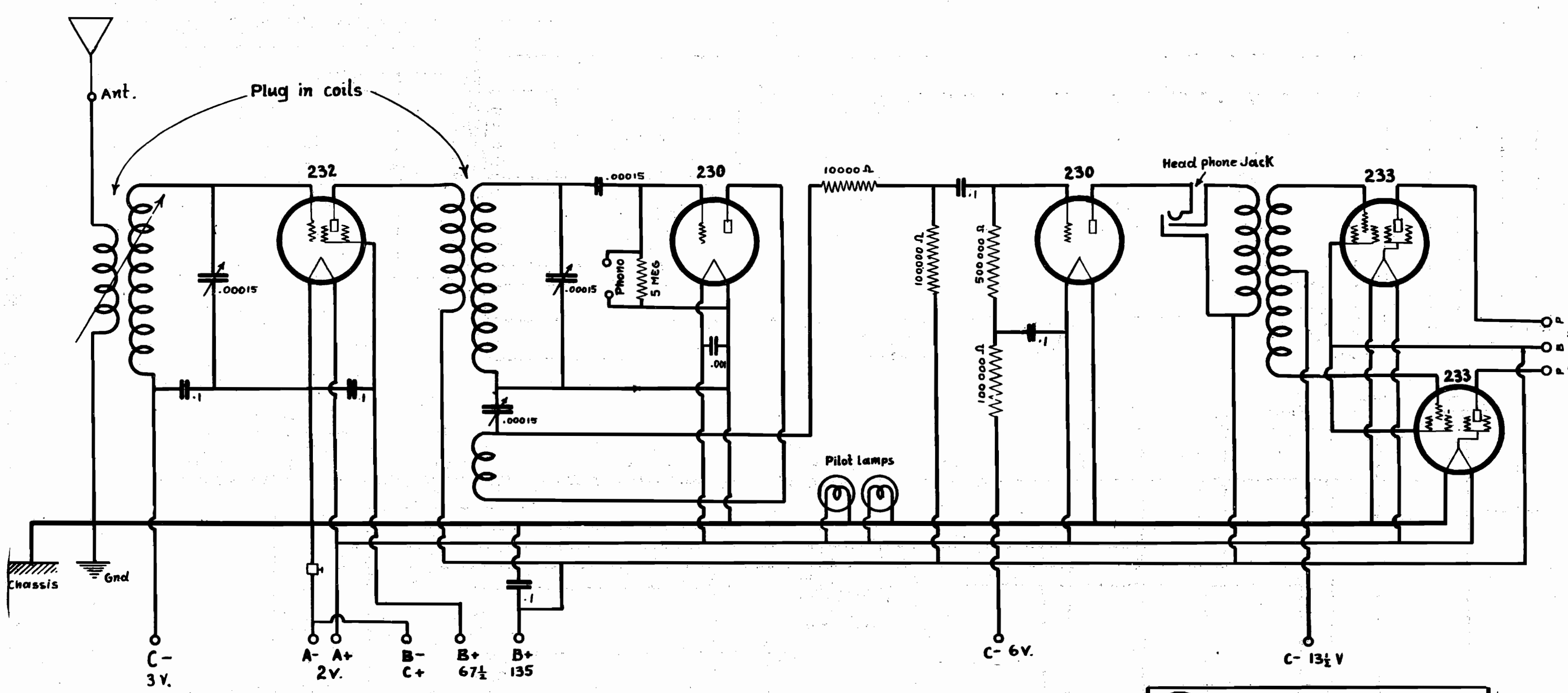


NEW 7 TUBE UNIVERSAL
COMPANION
PORTABLE RECEIVER

Type	A.C.-D.C.-Batt.	Scale
Model	Portable	Checked R.H.S.
Drawn	M.P.	Approved R.H.S.
Date	11/24/31	

"COMPANION" 7 TUBE UNIVERSAL PORTABLE RECEIVER

INSULINE CORPORATION OF AMERICA



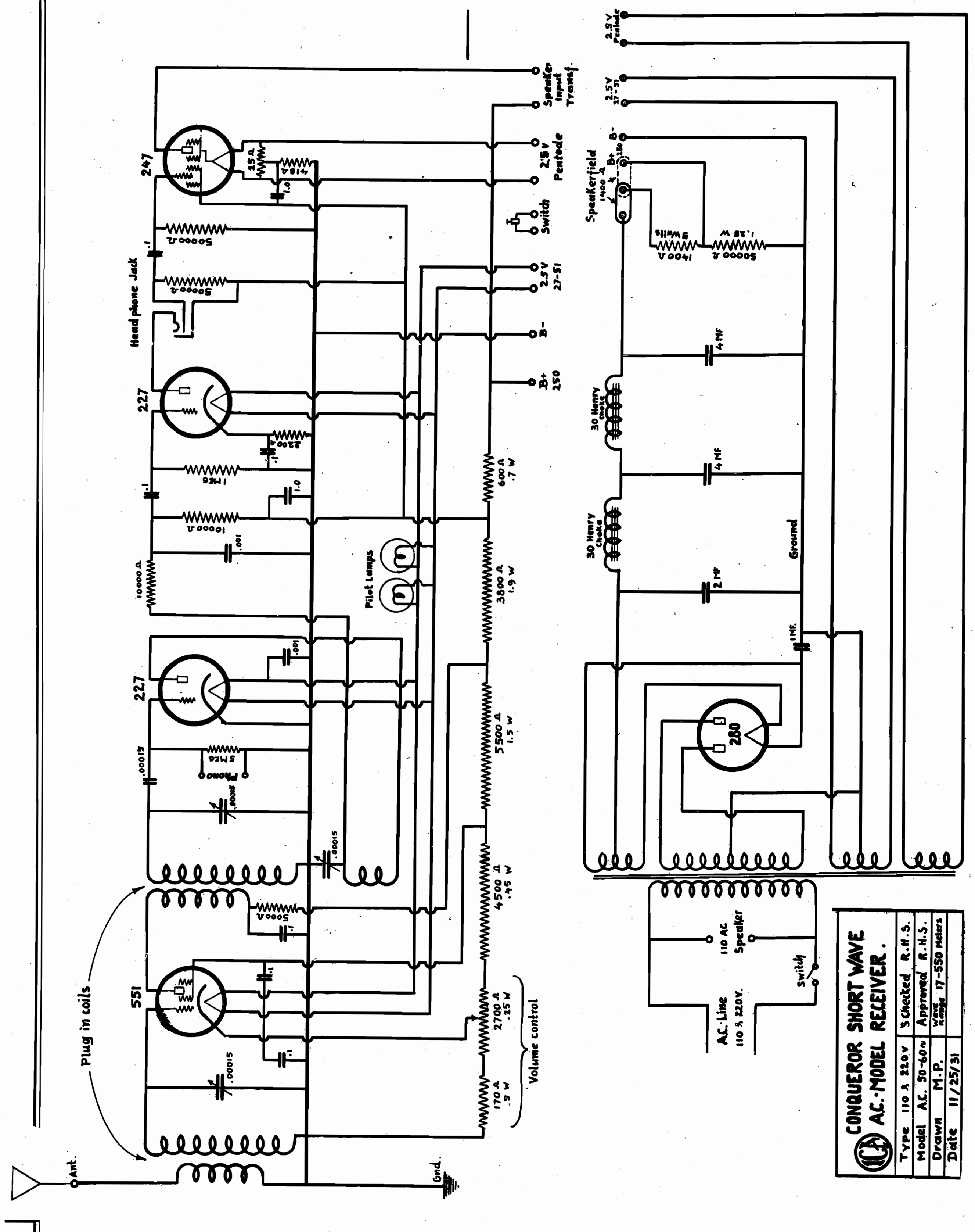
NOTE: LOUD SPEAKER OR SPEAKER COUPLNG TRANSFORMER SHOULD HAVE AN IMPEDANCE OF 7500 OHMS EACH SIDE OF CENTER TAP FOR MAXIMUM UNDISTORTED OUTPUT.

ICA CONQUEROR SHORT WAVE BATTERY MODEL RECEIVER

Type	BATTERY	Scale	/
Drawn	M.P.	Checked	R.H.S.
Date	11.27.31.	Approved	R.H.S.
		Wave Range	17 – 550 METERS

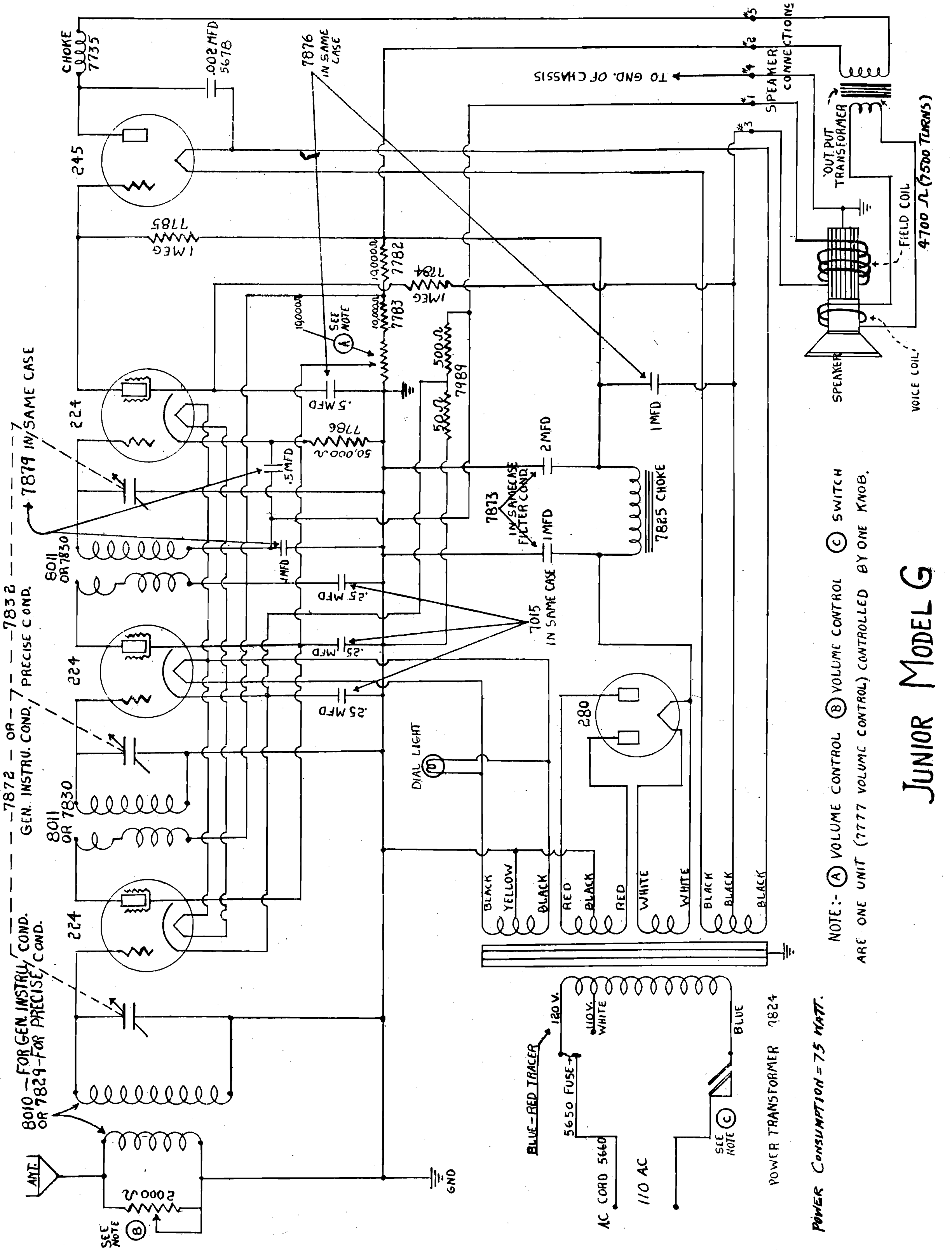
"CONQUEROR" S.W. BATTERY MODEL RECEIVER

INSULINE CORPORATION OF AMERICA



CONQUEROR" SHORT WAVE A.C. MODEL RECEIVER

JESSE FRENCH MFG. CO.



NOTE:- Ⓐ VOLUME CONTROL Ⓑ VOLUME CONTROL Ⓒ SWITCH
ARE ONE UNIT (7777 VOLUME CONTROL) CONTROLLED BY ONE KNOB.

POWER CONSUMPTION = 75 WATT.

JUNIOR MODEL G

JESSE FRENCH MFG. CO.

JUNIOR MODEL G

Radio Frequency Coils:

The R. F. Coils are of the high reactance type, accurately matched with the condensers.

There are two types of coil sets as well as two types of condenser gangs, and are designated by the markings as follows:

A. The coils used first with precise type condensers, are wound with 116 turns, space wound, and have no color designations on tubing.

B. No. 7829—7830. These coils used with precise condensers, are wound with 122 turns, space wound and have a red mark of paint on base of tubing.

C. No. 8010—8011. These coils used with General instrument condensers, have 126 turns, space wound, have a marking of white paint on base of tubing.

Positions:

Coils No. 8010—7829. The first R. F. coil is located at the front of chassis and is not interchangeable with the second and third R. F. coils.

Coils No. 8011—7830. The second and third R. F. coils are interchangeable and are located in their respective places.

The first R. F. coil differs from the others, as it does not have a choke bucking coil inside of the tubing as the others.

Coil cans are very essential to aid selectivity and reduce interference.

The Condenser Gang:

The tuning condensers are graded in three types.

The condensers can be defined as follows:

The first precise type, have no extended shields between the condensers.

No. 7832. The second precise type have two shields extending between the center and outside condensers.

No. 7872. The general instrument type have four shields and can be easily distinguished from the others.

VOLTAGES

Referring to the Circuit Diagram, the following voltages are given throughout the circuit using straight A. C. or D. C. meters.

CHECK FROM GROUND OF CHASSIS TO POINT DESIGNATED.
GROUND IS NEGATIVE. POINT DESIGNATED IS POSITIVE.
SET VOLUME CONTROL AT MINIMUM.
SET CHASSIS ON ONE END WITH BOTTOM IN VIEW.

Use 600 volt D. C. meter—1000 ohms per volt.

Rectifier filiment or choke No. 7825 (beginning) .... 440 volts
Choke No. 7825 (ending) .... 390 volts
245 power tube plate or choke No. 7735 .... 368 volts

Use 300 volt D. C. meter—1000 ohms per volt.

Detector plate or resistor No. 7785 (ending) .... 48 volts
R. F. Plate or red wire of condenser No. 7015 .... 242 volts
245 grid or resistor No. 7785 (ending) .... 48 volts
Detector grid or green wire of condenser No. 7879 .... 22 volts
Detector cathode or resistor No. 7786 .... 12 volts
R. F. cathode or black wire condenser No. 7015 .... 2 volts
R. F. Screen Grid at red wire volume control or at Resistor No. 7783 (end) .... 120 volts

USING A WESTON SET TESTER MODEL 537

Volume control set at maxim.

SETTINGS	*R. F. TUBES*	*DETECTOR*	*AMPLIFIER*
PLATE (300)	190 d. c.	55 d. c.	210 d. c.
CATHODE POS.	2 d. c.	65 d. c.	*none*
FIL. (4)	2.8 a. c.	2.7 a. c.	2.7 a. c.
PL. MA. (30)	*none*	*none*	25 d. c.
BIAS (c60)	2 d. c.	2 d. c.	12 d. c.

Rectifier pl. ma. (30) 19 D. C.—Fil. volts 4.5 a. c.
Det. grid on 50 volt d. c. meter 12 volts.
R. F. grid on 250 volt d. c. meter 89 volts.
Det. cathode on 50 volt d. c. meter 21 volts.
Line voltage 114 volts a. c.

SPEAKER SERVICING

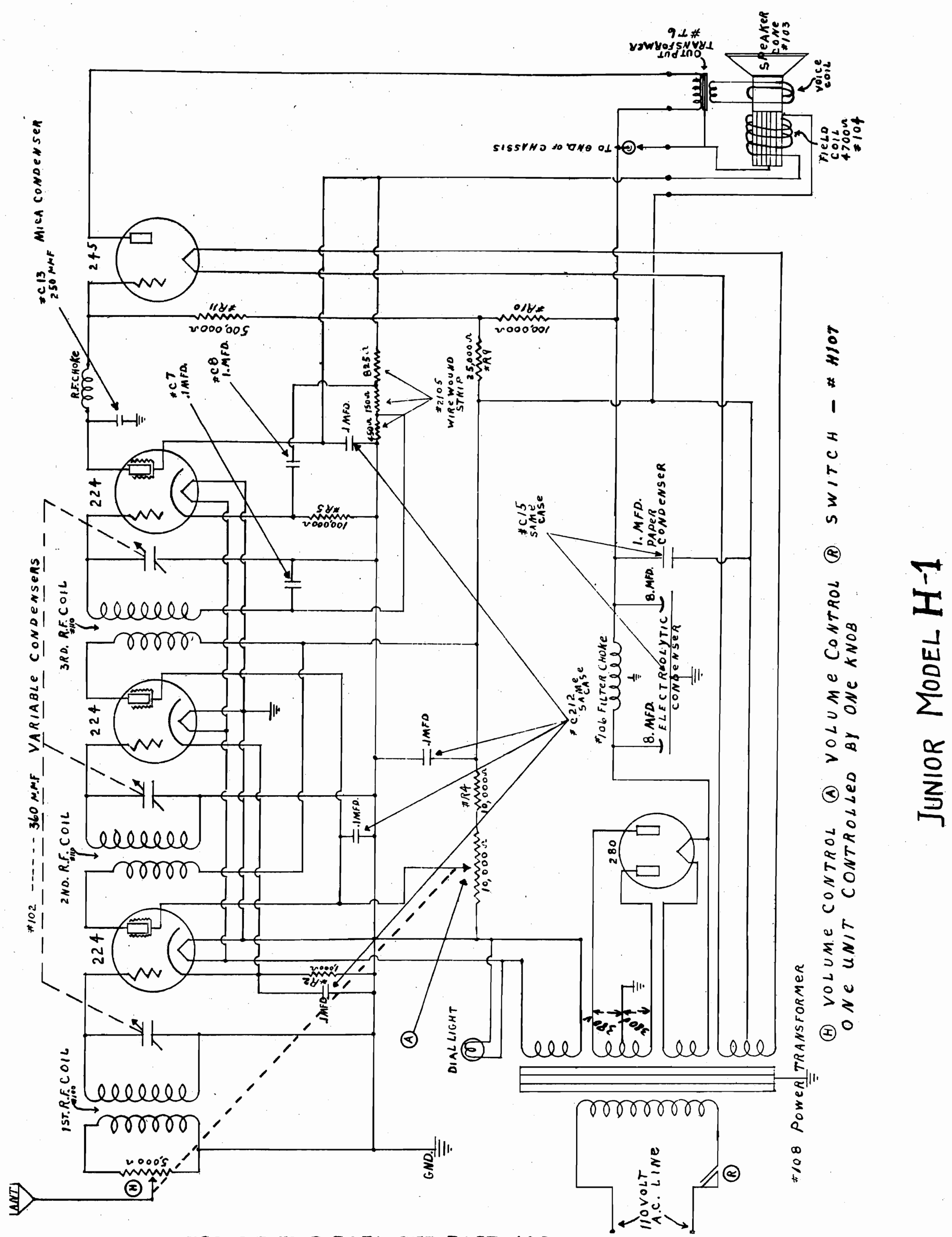
The speaker color chart and the respective wiring connections. As follows: Chassis connections:

A. Yellow No. 4 goes to ground of set.
B. Black No. 3 goes to center tap of 245 tube filament, and resistor No. 7784.
C. Black No. 1 goes to No. 7989, 500 ohm resistor and grid return of detector, at R. F. coil.
D. Red No. 2 goes to No. 7782, 10,000 and 7785 resistors.
E. Red No. 5 goes to plate of 245 or No. 7735 choke coil.

SPEAKER CONNECTIONS:

A. Yellow No. 4 goes to speaker ground.
B. Black No. 3 goes to speaker field.
C. Black No. 1 goes to speaker field.
D. Red No. 2 goes to output transformer.
E. Red No. 5 goes to output transformer.

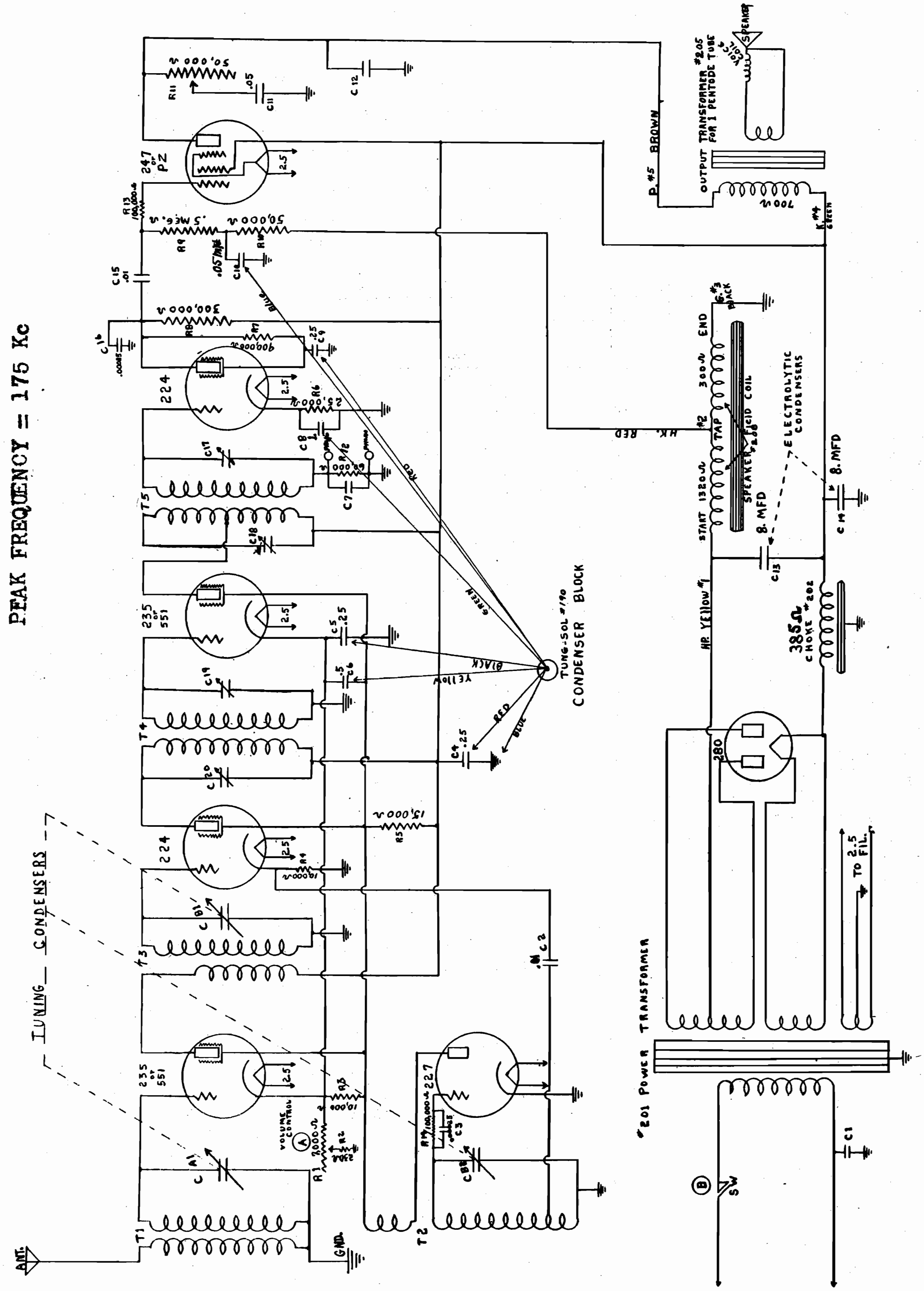
JESSE FRENCH MFG. CO.



FOR FURTHER DATA SEE PAGE 406-E

JESSE FRENCH MFG. CO.

PEAK FREQUENCY = 175 Kc



3/31

Jesse French U-1 Superheterodyne
Schematic Wiring Diagram and Parts Designations

J.O.1

FOR FURTHER DATA SEE PAGE 406-E

JESSE FRENCH MFG. CO.

THE U-1 SUPERHETERODYNE CIRCUIT

The U-1 Chassis uses seven tubes as follows: one 551 variable Mu tube for the first tuned R. F. stage, one 224 screen grid tube for first tuned detector, with a 227 oscillator tube signal beating into the first detector stage. One 551 Variable Mu tube for the intermediate R. F. stage and a 224 for power detector. This second detector or Power Detector is resistance coupled to the power tube which is a PZ Pentode type tube. One 280 tube is used as a rectifier.

The grid bias of the Pentode is obtained by the center tap of the Rectifier Plate passing through the 1620 ohm field coil to ground instead of leading direct to ground for negative potential. The power grid is tapped into the field coil at 1320 ohms or 300 ohms from ground, making a positive flow to ground. The resistances are so arranged in the grid circuit of this power tube, that it gives excellent tone quality because it presents a constant positive flow to ground of circuit.

A 385 ohm filter choke connects the source of the plate or 280 filament with the plate filter by passes which are of the 8 mfd wet electrolytic type condensers and the remainder of the circuit being by-passed by paper and mica condensers.

The first electrolytic condenser by-passes the plate positive source to the center tap of the rectifier plate winding or negative potential which will have a negative voltage of approximately 83 volts before it passes through the field coil to ground. The body or negative of the electrolytic case being insulated from the chassis permits this by-passing arrangement.

LINE VOLTAGE 110 VOLTS A.C. - VOL. CONTROL AT MIN.

Tubes	227	551	224	551	224	PZPentode	280
Plate	95	246	246	246	98	226	278
Screen Grid	none	95	95	95	30	246	
Cathode	none	37	7.5	37	4.75	0	
Grid	-5.75	0	0	0	0	-1.5	

VOL. CONTROL AT MAX.

Plate	68	240	240	240	94	220	275
Screen Grid	0	68	68	68	28	240	
Cathode	0	3.5	5	3.5	4.5	0	
Grid	3.4	0	0	0	0	1.5	

The following are the given voltages at the speaker terminals: Brown lead 220 volts - Green lead 240 volts - Black lead 0 - Red lead 14 volts - Yellow lead 83 volts.

Resistors are marked according to the standard R.M.A. color code.

JUNIOR MODEL H-1

DETECTOR

It is quite a question in the Loftin-White direct coupled amplifier where detection actually takes place, but for the time being, we will call the type 224 tube the detector, and the type 245 tube the audio frequency amplifier. The detector can be considered of the high bias type. A 100,000 ohm resistor in the cathode circuit of the 224 tube connects the cathode approximately 15 volts positive with respect to ground. This is too high a bias for the 224 to operate as a detector. Therefore the grid return is brought back to a position on the network about 12 volts position with respect to ground. This leaves a three volt bias on the grid of the detector which is the proper value for detecting weak signals. When a strong signal is delivered to the grid of the detector, the detector plate current increases. This changes the cathode voltage from 15 volts approximately 20. At the same time, the plate current in the network decreases making the grid returns approximately 8 volts positive with respect to ground. The effective bias on the grid of the detector tube is therefore about 12 volts which is the proper value for detecting the strong signals. In measuring the bias on the detector, the readings will be affected a great deal by the type of volt meter used. It is best for the service man to take these readings on a set which is known to be good with his own volt meter. In the future these readings can be taken as standard and questionable sets compared to them.

AUDIO

The peculiar part of measurements on this audio system is the high voltage from the 245 tube plates to ground, the high voltage from the filament to ground and the impossibility to read the grid voltage with a meter. The best indication of the Loftin-White detector amplifier condition is the plate current of the type 245 tube. This should be approximately 38 milliamperes. This reading will vary quite a bit with different tubes and with the line voltage.

Tube	Filament V	Plate V	Cathode V	Grid V	Plate Current
1st R. F.	2.5	160	3	0	3
2nd R. F.	2.5	160	3	0	3
Detector	2.5	varies	14	12	.25
Audio	2.5	380	160	varies	40
Rectifier	5				20 ma. per Plate

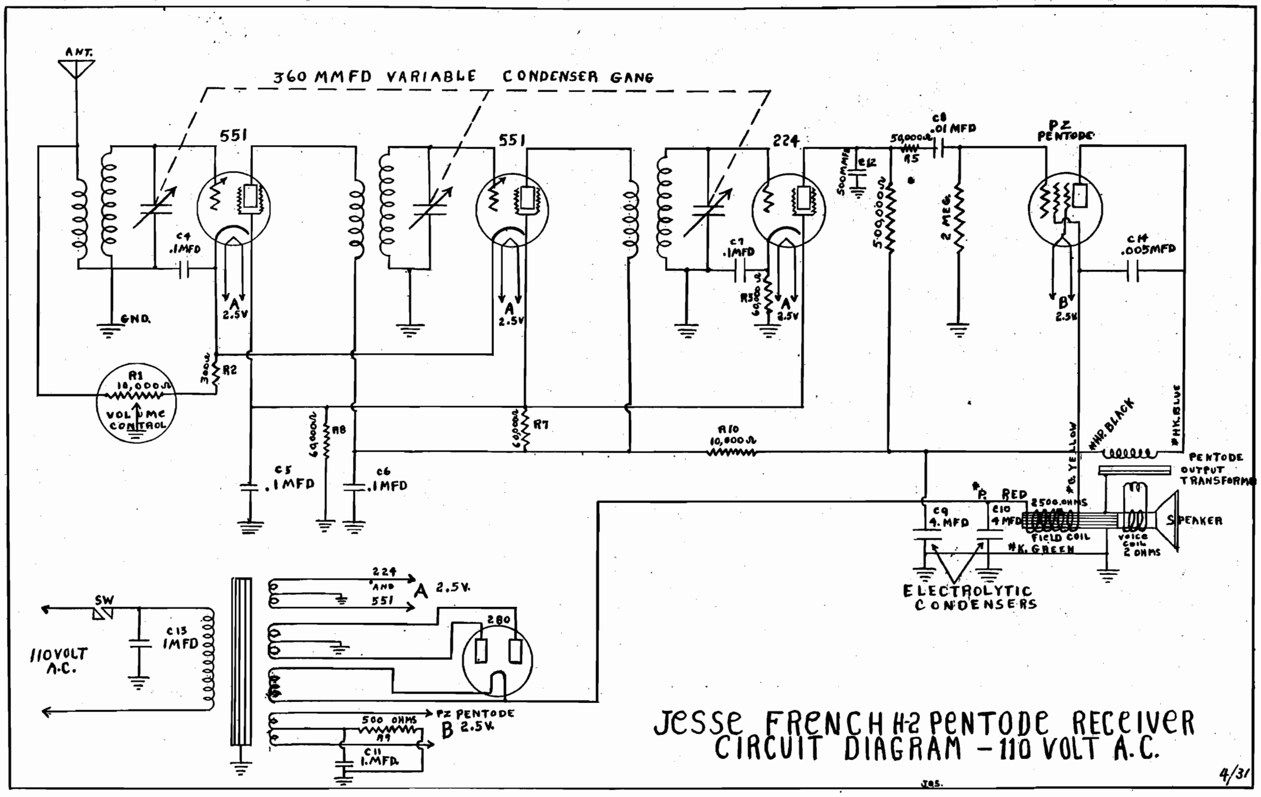
Line Voltage 120—

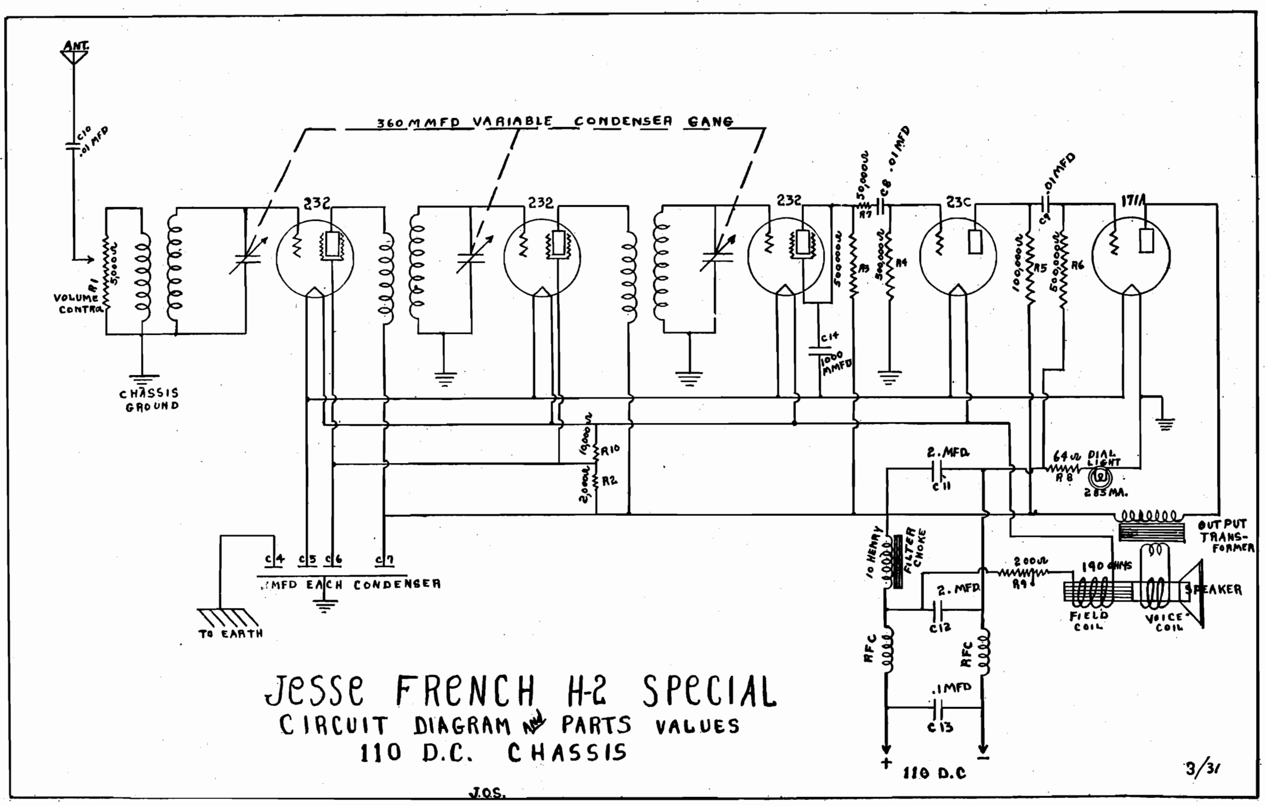
All plate voltages are read from plate of the tube to ground.
All cathode voltages are read from the cathode to ground.
All grid voltages are read from the grid of the tube to ground.

A special dynamic speaker with a 4700 ohm field coil is used as part of the Loftin-White resistance network.

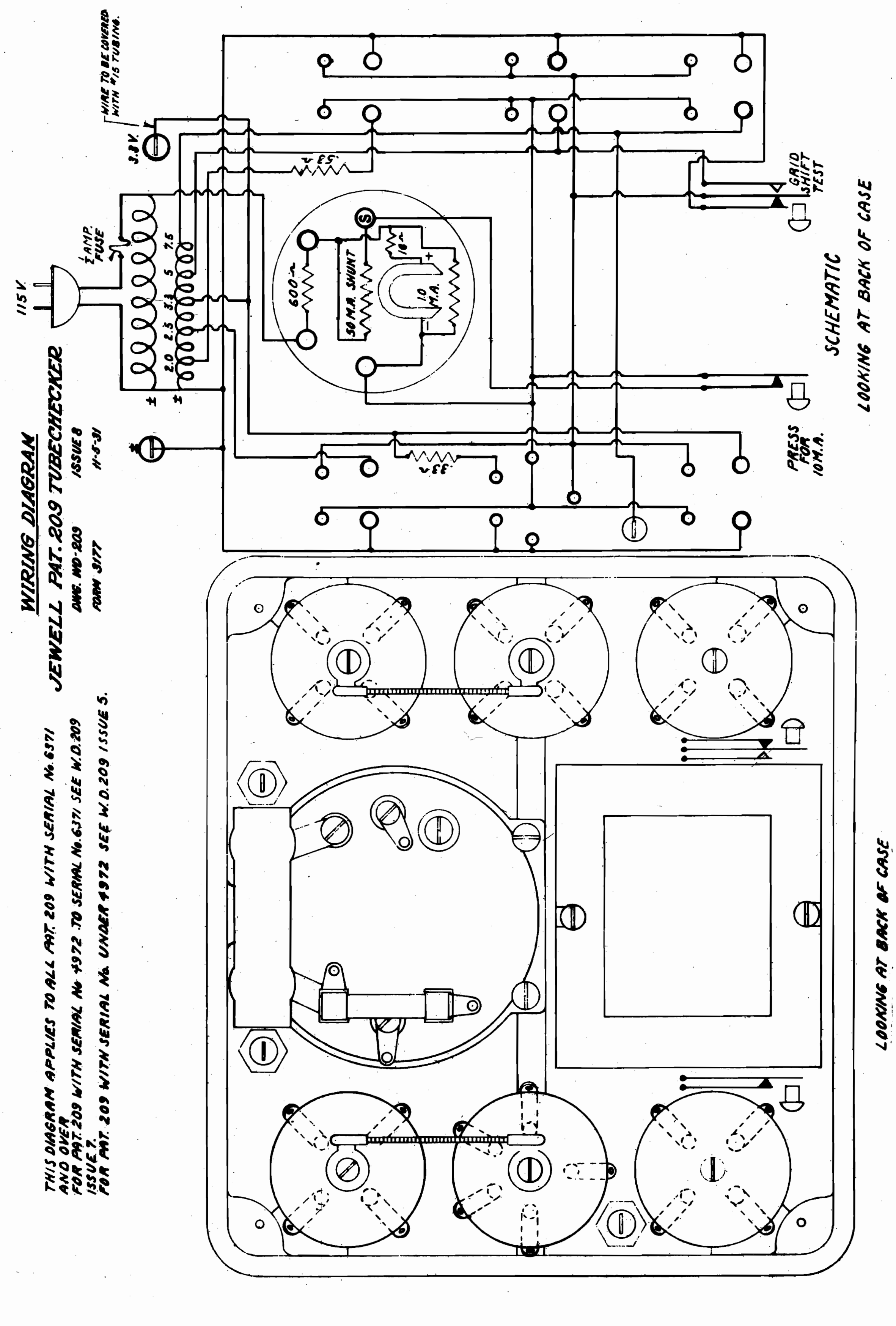
The rectifier tube is used as a full wave rectifier and supplies the total plate current of the set which is approximately 38 milliamperes at 400 volts.

JESSE FRENCH MFG. CO.





JEWELL ELECTRICAL INSTRUMENT CO.



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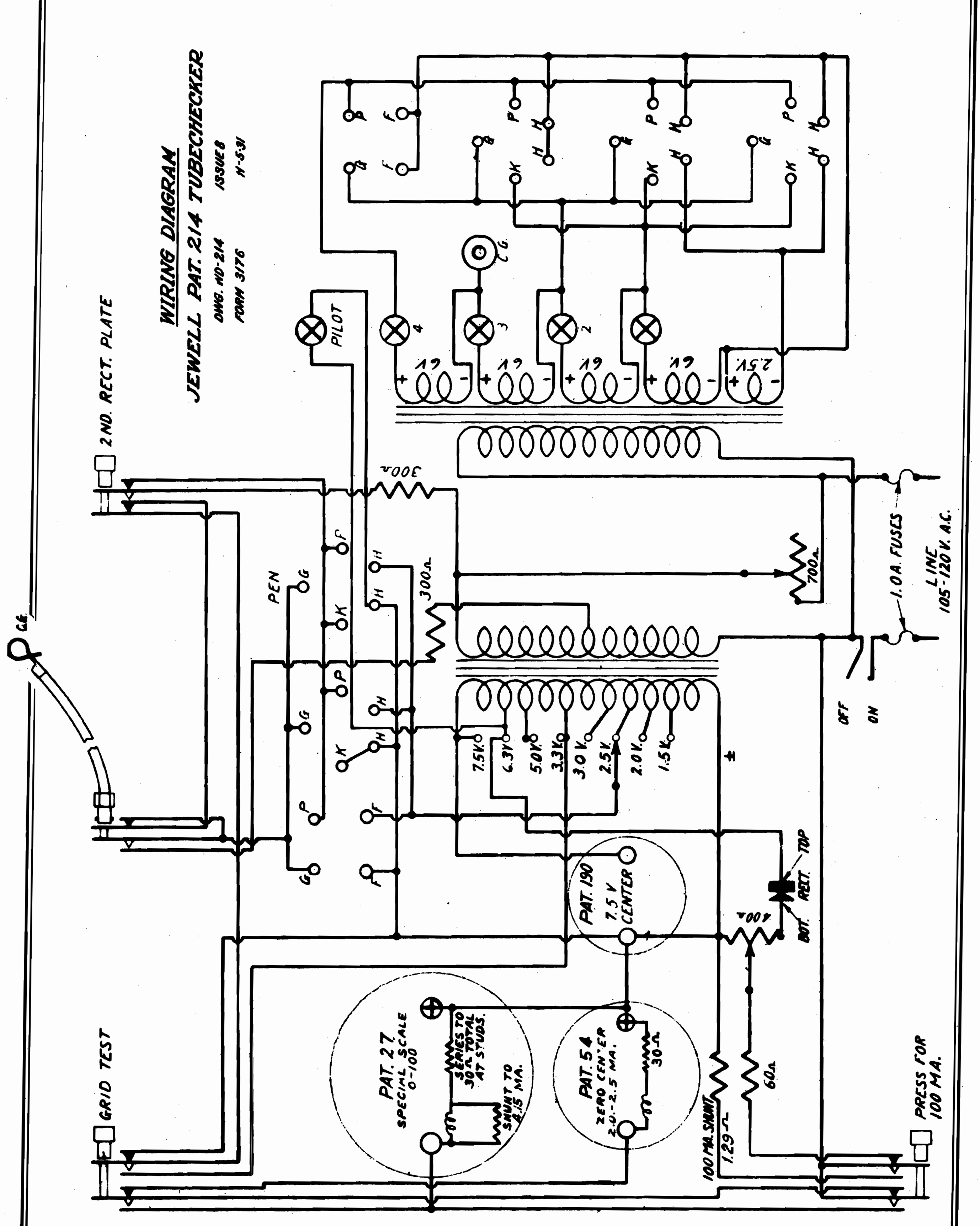

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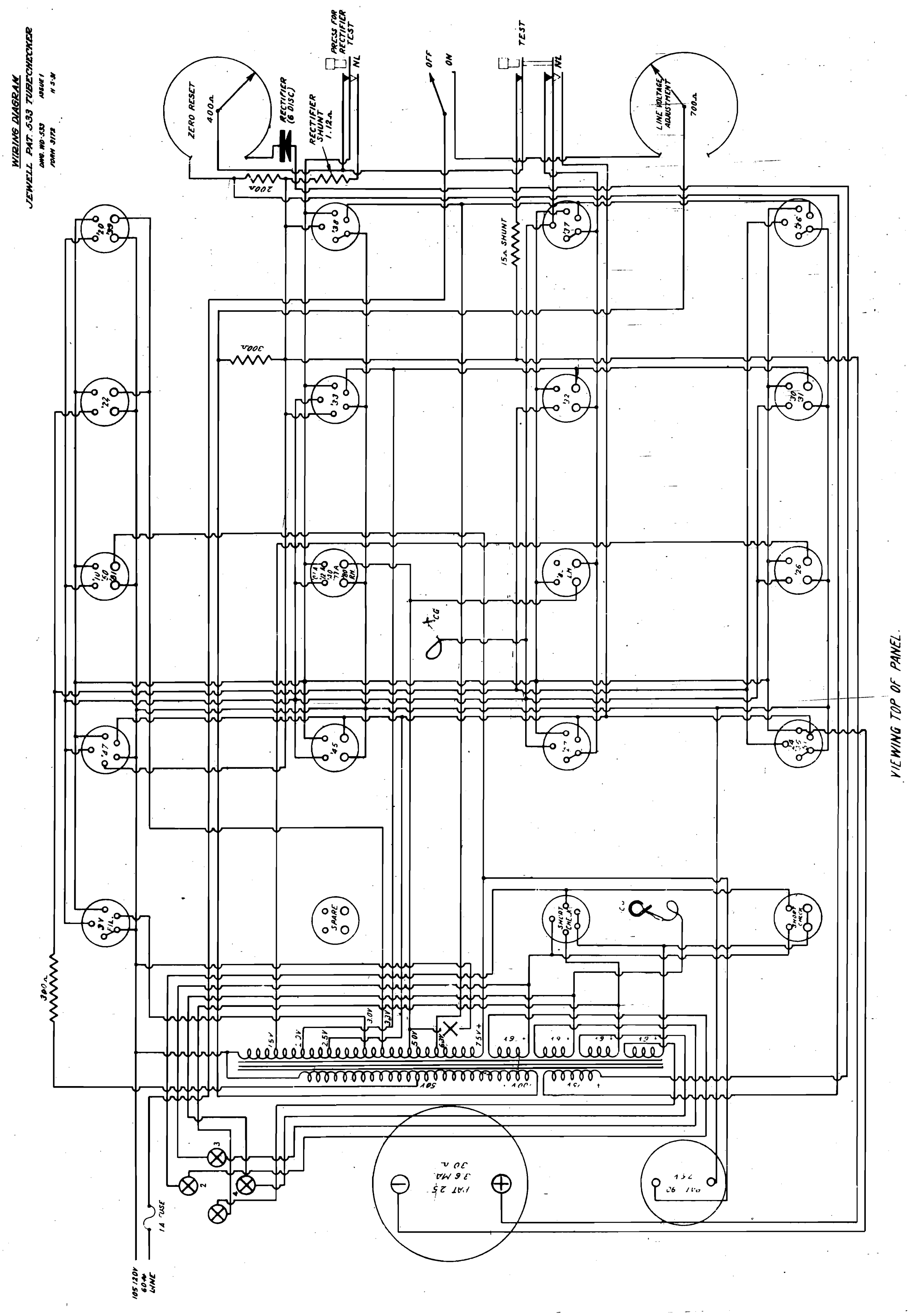

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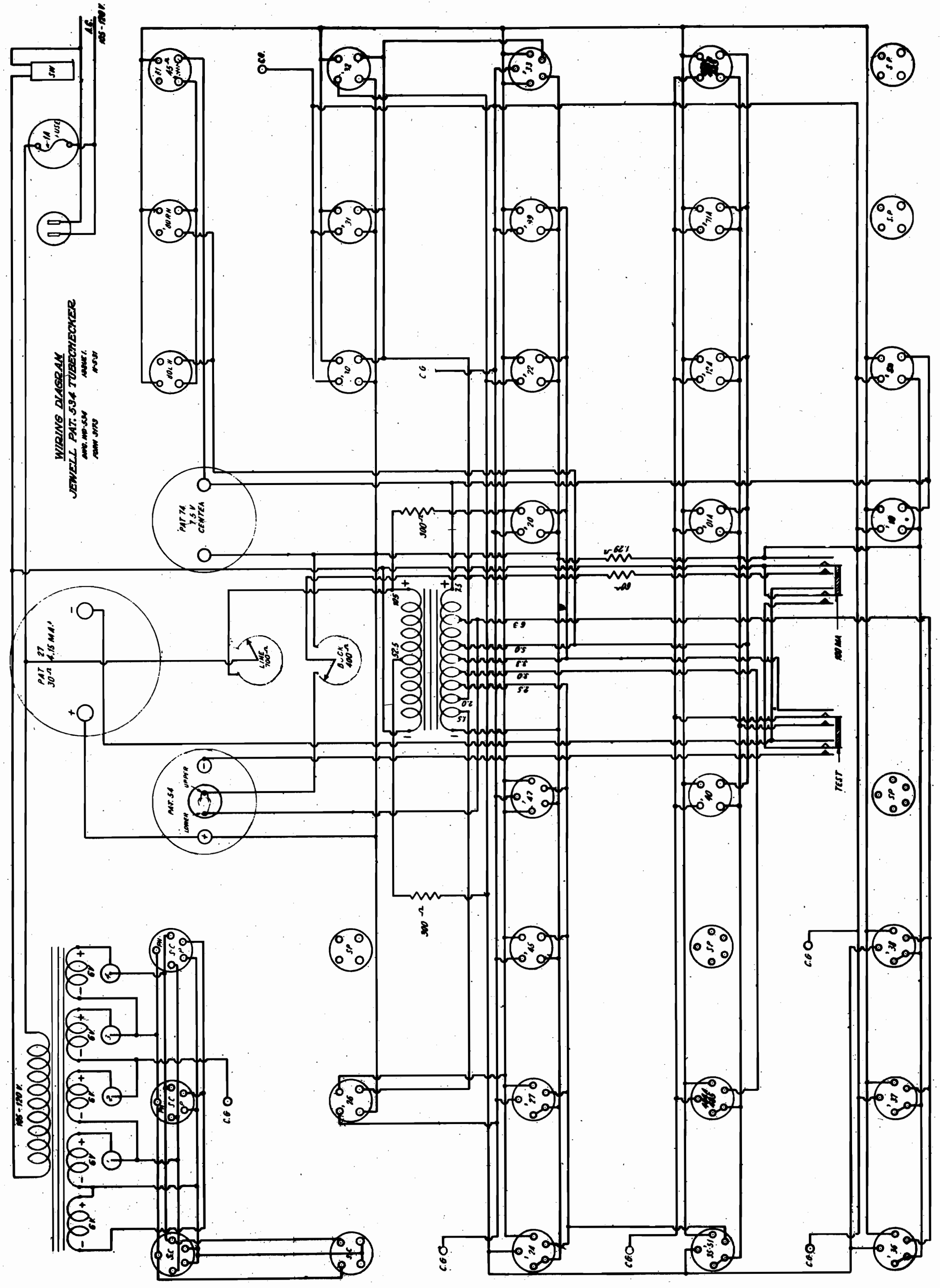

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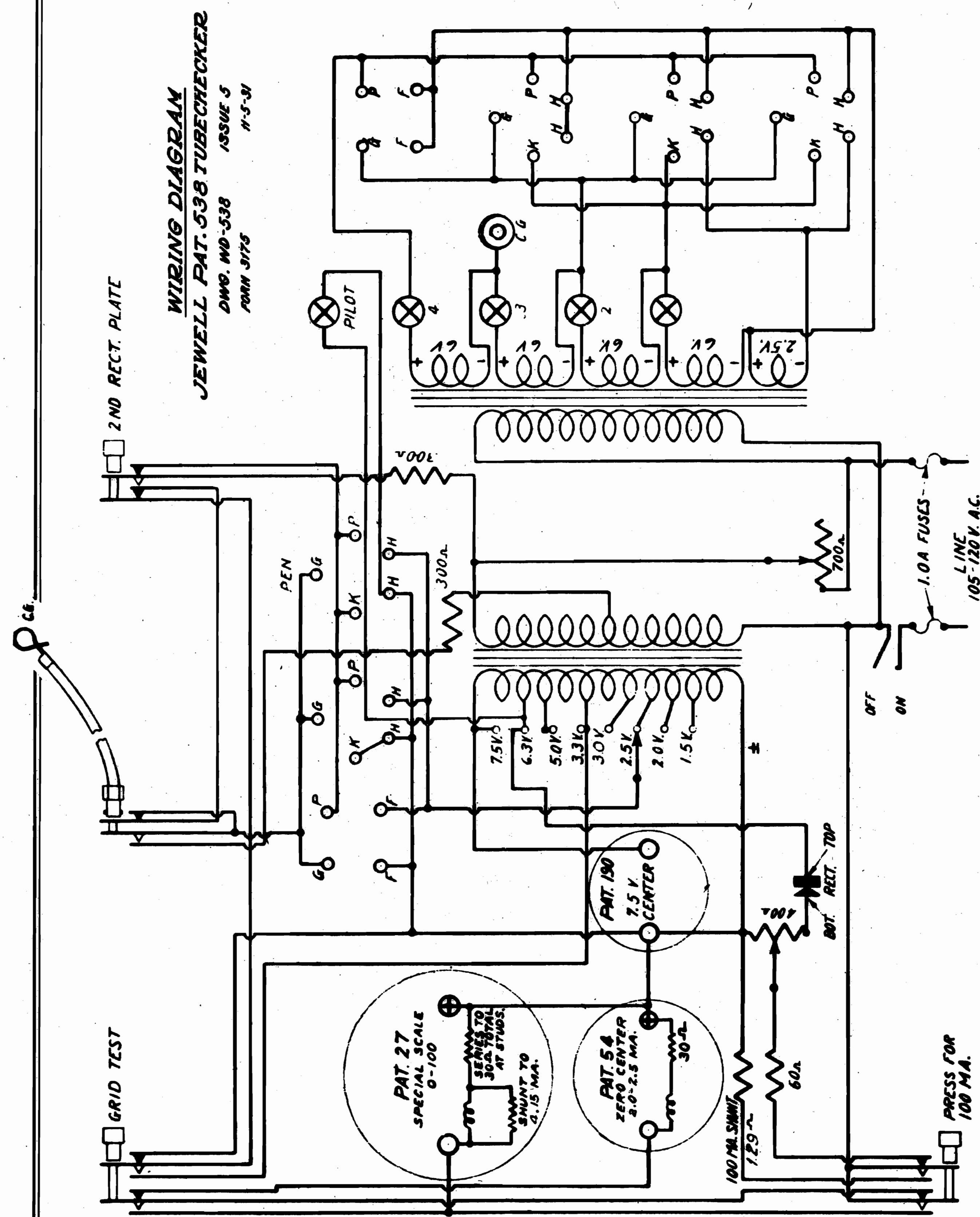

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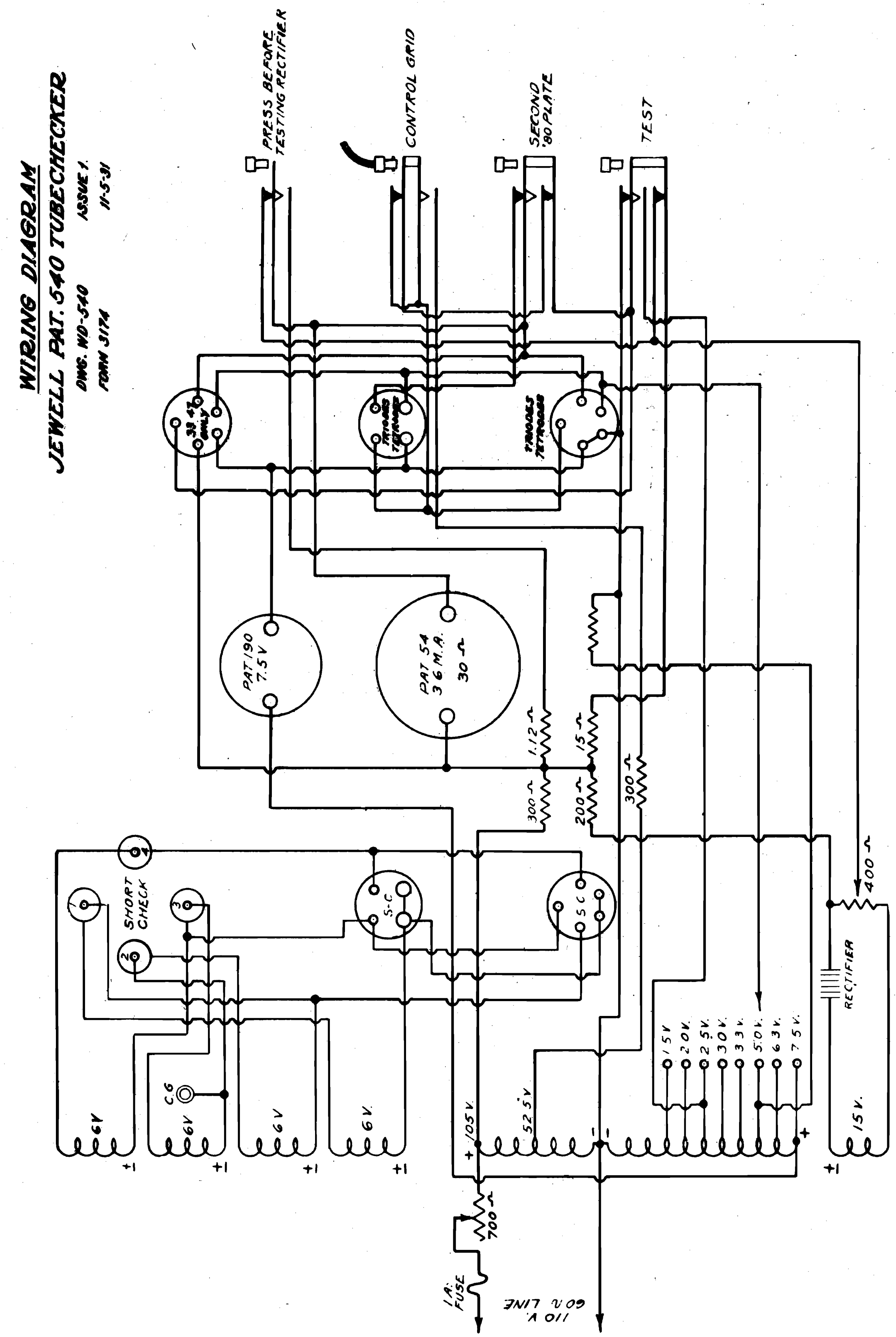

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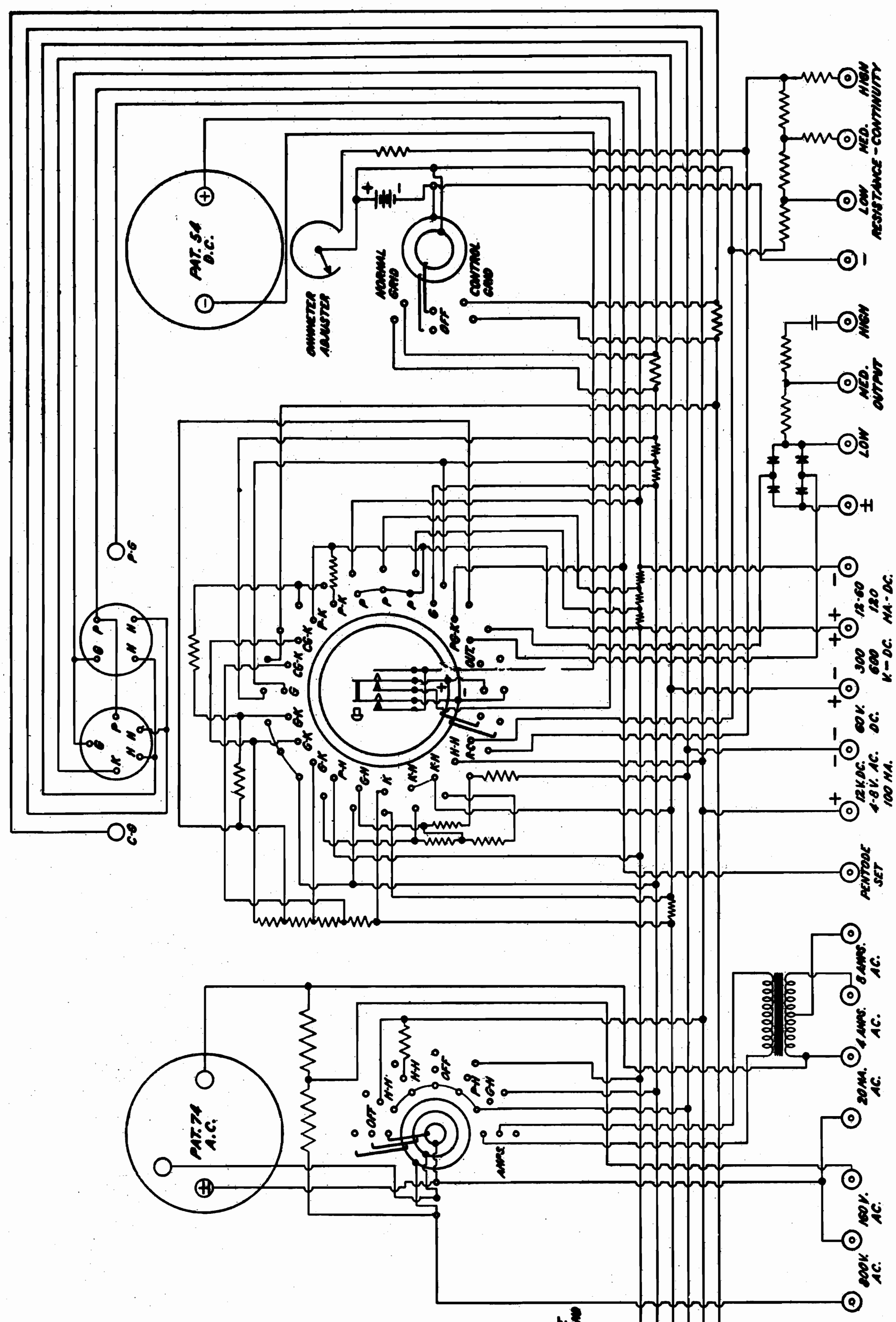
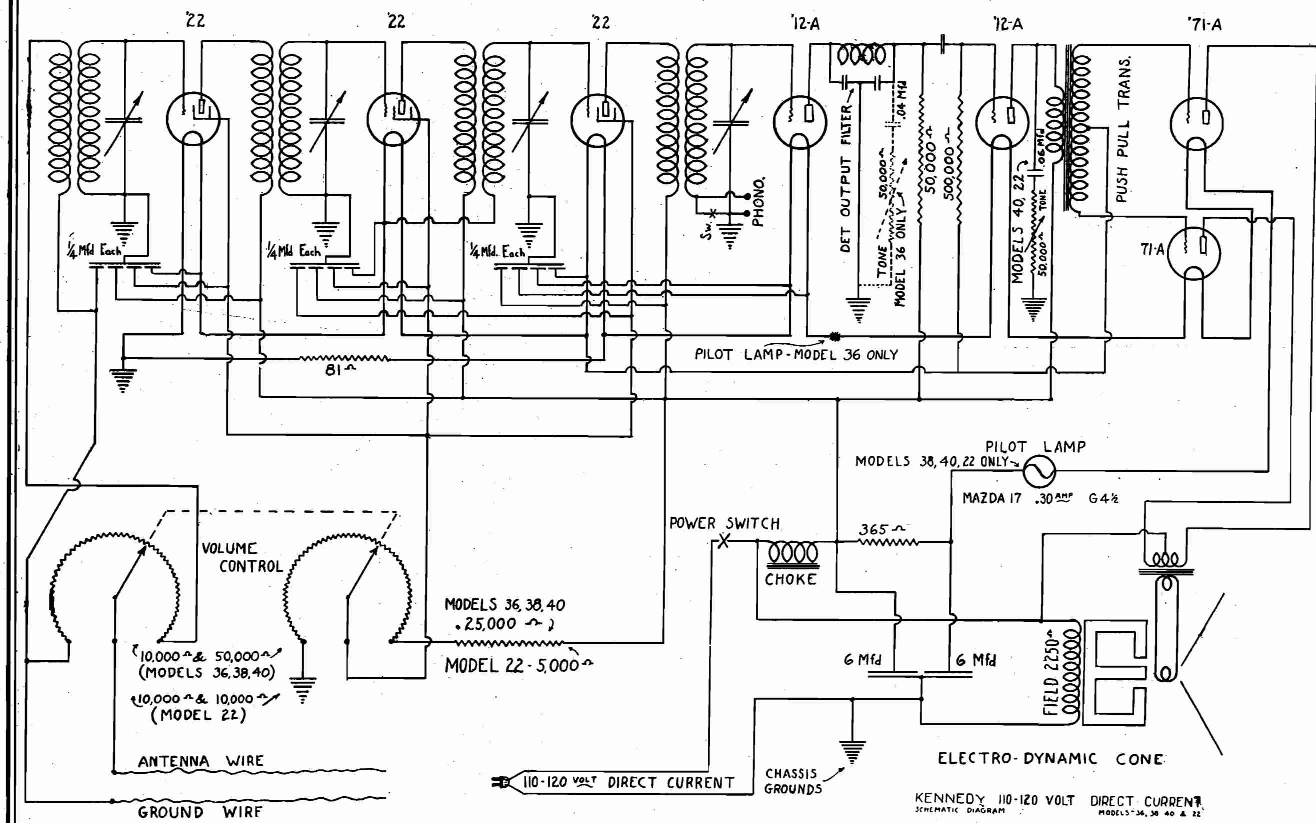


Jewell Pattern No. 444 Set Analyzer

COLIN B. KENNEDY CORP.



MODELS 22, 36, 38, 40, DIRECT CURRENT S.G. CHASSIS.

The majority of the parts are interchangeable with those in the corresponding A. C. model.

The standard filter choke is omitted, the power transformer being replaced by the heavy D. C. choke.

It will be noted that the position of the pilot lamp differs, in the model 36, from its position in the models, 38, 40 and 22.

The position of the tone control also is different in the model 36 from the models 40 and 22.

All variations in parts are indicated on the accompanying circuit diagram.

The coils for the D. C. models differ slightly from those used in A. C. models, and are obtainable in matched sets of four.

The same dynamic speaker as used on the A. C. models is employed.

The filaments of all tubes, a heavy 365 ohm vitreous resistor and the pilot lamp are are all in series across the line, following the choke. An 81 ohm resistor "by passes" a portion of the current across the three audio frequency tubes as the type 222 tubes do not draw the full quarter ampere as do the 171-A and 112-A type tubes. As the pilot lamp is also in series with the tubes a bulb of the proper voltage and current draw must be used.

The mechanical layout of the D. C. models corresponds to the equivalent A. C. model in each case except for the few variations noted below.

D. C. Model	*Corresponding A. C. Model*
36	26
38	30
40	32
22	20B

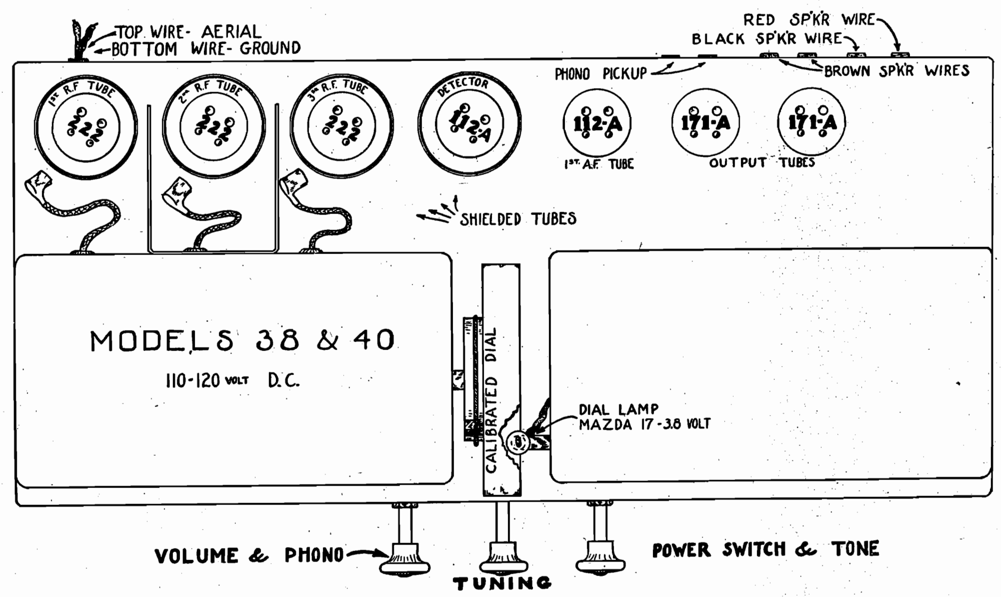
PARTS LIST

116202	Heavy D. C. Filter Choke
116302	Filter Condenser (Paper, 6 mfd. and 6 mfd.)
116158	365 ohm Vitreous Resistor
116405	81 ohm Wire Wound Resistor
116600	Set of 4 Matched D. C. Model Coils
116513	4-prong Single Socket marked 222
116515	4-prong Single Socket marked 112-A
116507	4-prong Single Socket marked 171-A
116154	Pilot Lamp 3.8 volt Mazda—17 0.30 amp. G-4½
123406	Dual 10,000 ohm volume control (Model 22)
117406	Dual 10,000 - 50,000 ohm volume control (Models 36, 38, 40)

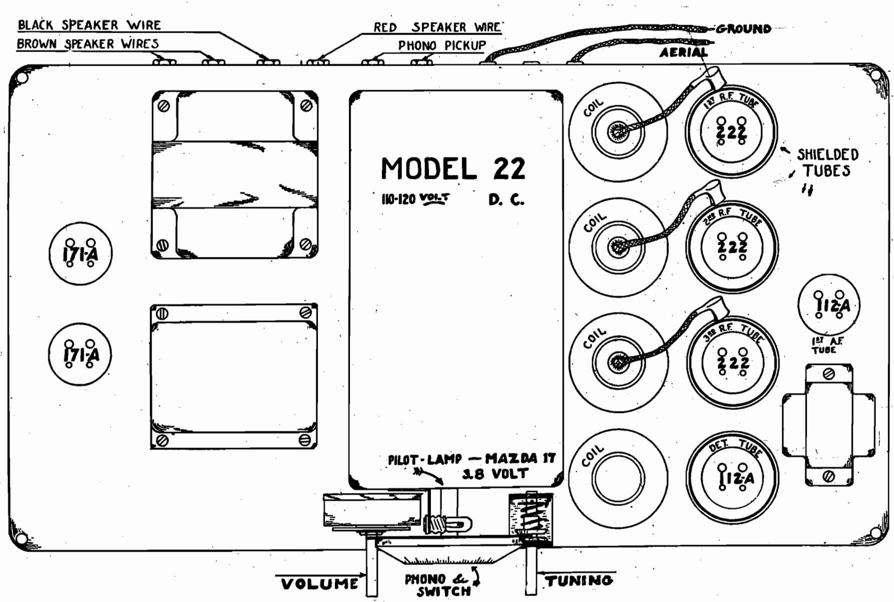
Parts identical with those used in the corresponding models are not listed here.

COLIN B. KENNEDY CORP.

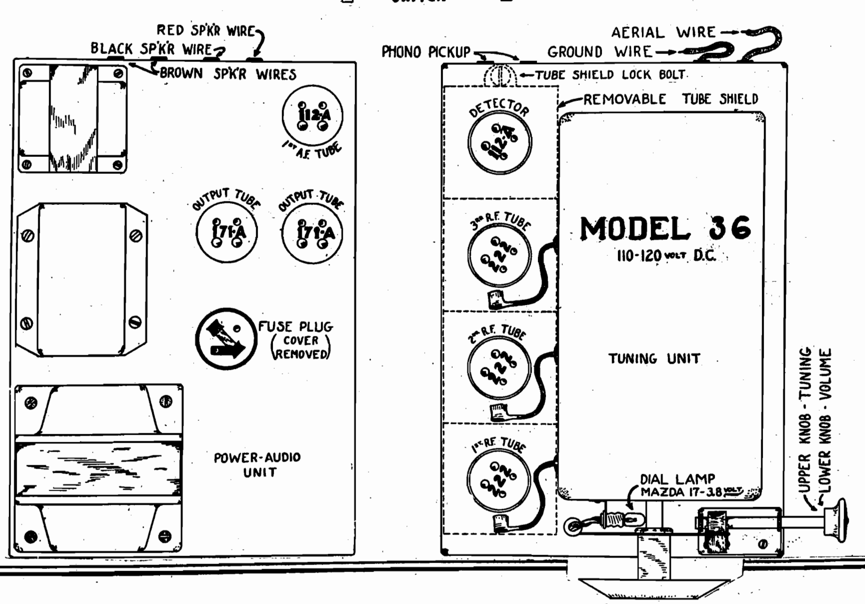
Tube Socket Diagram for Chassis Models Nos. 38 and 40



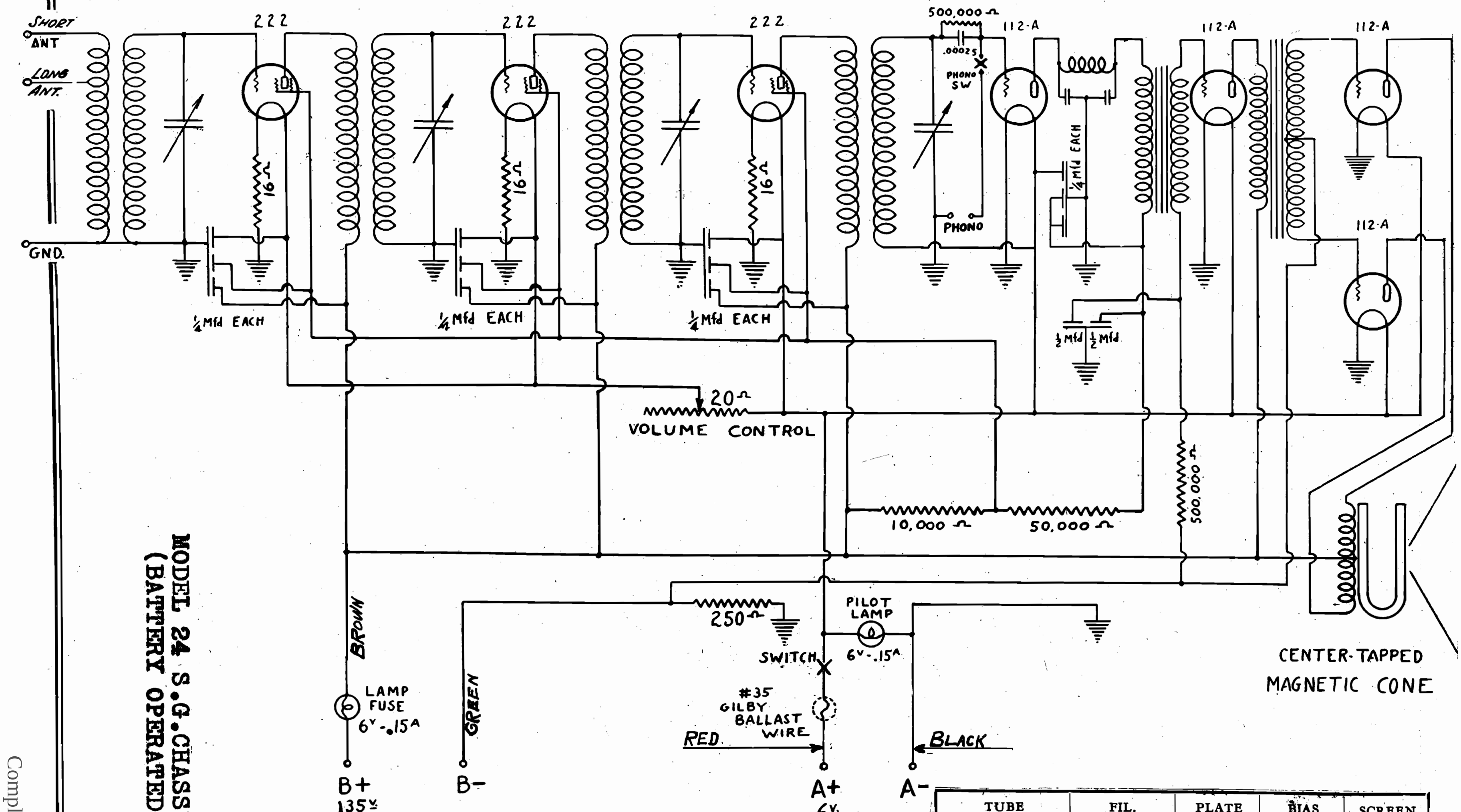
Tube Socket Diagram for Chassis Model No. 22



Tube Socket Diagram for Chassis Model No. 36



COLIN B. KENNEDY CORP.



MODEL 24 S.G.CHASSIS
(BATTERY OPERATED)

Tubes

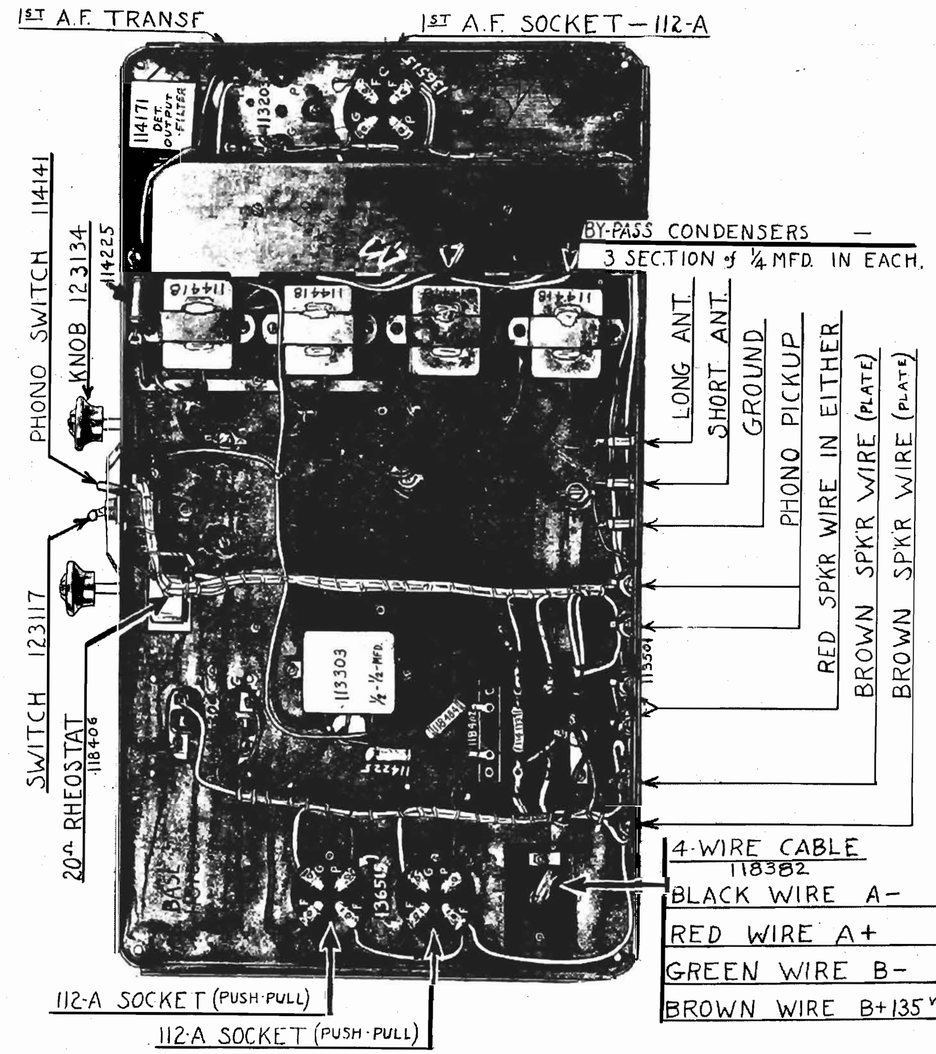
The tubes employed are:

1st radio frequency............type 222 or 322
2nd radio frequency............type 222 or 322
3rd radio frequency............type 222 or 322
Detector tube............type 112-A or 312-A
1st audio frequency............type 112-A or 312-A
Push-Pull power tubes............type 112-A or 312-A

TUBE	FIL.	PLATE	BIAS	SCREEN
1st R.F.	3	135	2.0*	75
2nd R. F.	3	135	2.0*	75
3rd R. F.	3	135	2.0*	75
Detector	5	25*	0	....
1st A. F.	5	130	8.0*	....
Pwr. Tubes	5	130	8.0	....

volume control full "ON"
* Voltages not easily measured with customary test kit.

COLIN B. KENNEDY CORP.



Resistors

The resistance values of the various colored resistors employed are:

10,000 ohms..Grey
50,000 ohms..Yellow
500,000 ohms......................................Brown

Fuses and Ballast

Under a cover-plate near the battery cable will be found a pilot lamp bulb and a piece of small wire held by two posts. This bulb is used as a fuse in the "B" battery circuit and is identical with the pilot lamp — both being Mazda No. 40 (6 volt, 0.15 amp.) The fuse lamp does not light up when set is operating, and, if it should do so it is an indication of trouble elsewhere in the receiver.

The small wire held by the two posts is a fuse and ballast in the storage battery circuit. In addition to its function as a fuse it serves to compensate for variations in the voltage of the storage battery. Extra pieces of this wire are provided with the set, and it is IMPORTANT that no other wire be used. This wire is No. 34 B. & S. gauge Gilby ballast wire. If other wire is used there is danger of injury to the tubes.

General Information

The Kennedy Battery Operated Chassis Model 24 is constructed on a base similar to the Kennedy Models 20 and 22 (A. C. and D. C. line models). A great many of the component parts of the battery operated chassis are interchangeable with those of the corresponding A. C. and D. C. line models, 20 and 22.

If set oscillates over entire dial range, it is possible that the detector output filter is defective, and a new one may be tried.

The wires at the tops of the coil shield (to control grids) may have been pulled sufficiently to bend coil lugs and permit more than 3¼ inches of wire (from shield to start of clip) to be exposed. Extra length here tends to cause an unstable receiver.

If receiver oscillates at just a small spot or two of dial range, it may frequently be corrected by pushing a piece of solid, bare copper wire between the rubber grommet and coil shield (barely through) of the second R. F. coil shield, and twisting a few times around the wire leading to the control grid of the 2nd R. F. tube.

In the event it becomes necessary to change a coil it is extremely desirable to change all four coils for a new set of four matched and impregnated coils that are designed to work together.

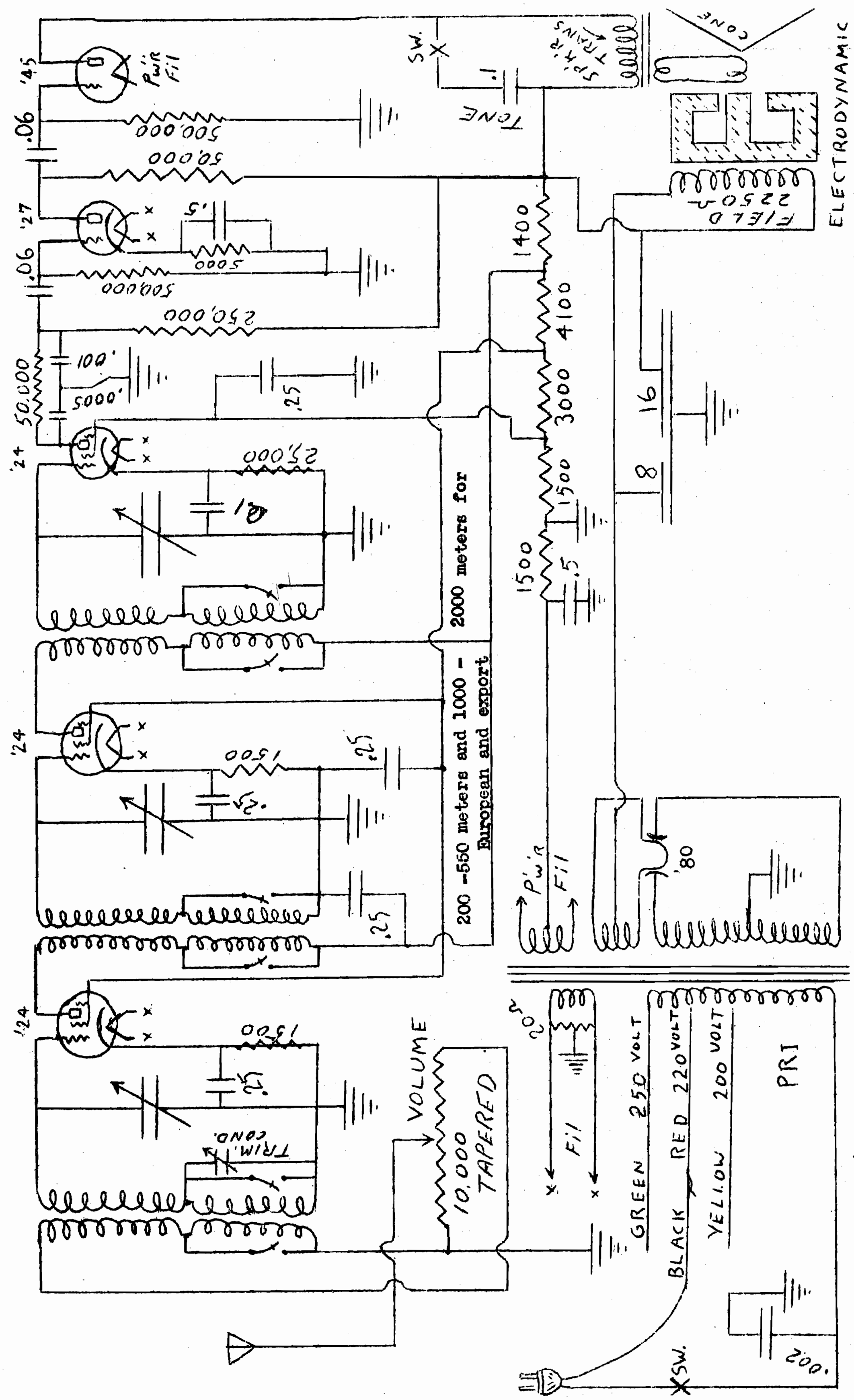
Tests for resonance, or matching of the tuned circuits, are accomplished with an oscillator—connections to the resonant circuits being made from ground to grid terminals of the R. F. sockets for the R. F. coils and from A+ terminal of detector socket to end of grid leak or grid condenser furthest from detector socket grid terminal for the detector coil.

Batteries

The model 24 receiver requires one six volt storage "A" battery and one 135 volt "B" battery (or three 45 volt "B" batteries). No "C" batteries are required as all bias voltages are obtained automatically within the receiver.

The storage battery drain is exceptionally low for this type of receiver, being approximately 1.37 amperes.

COLIN B. KENNEDY CORP.

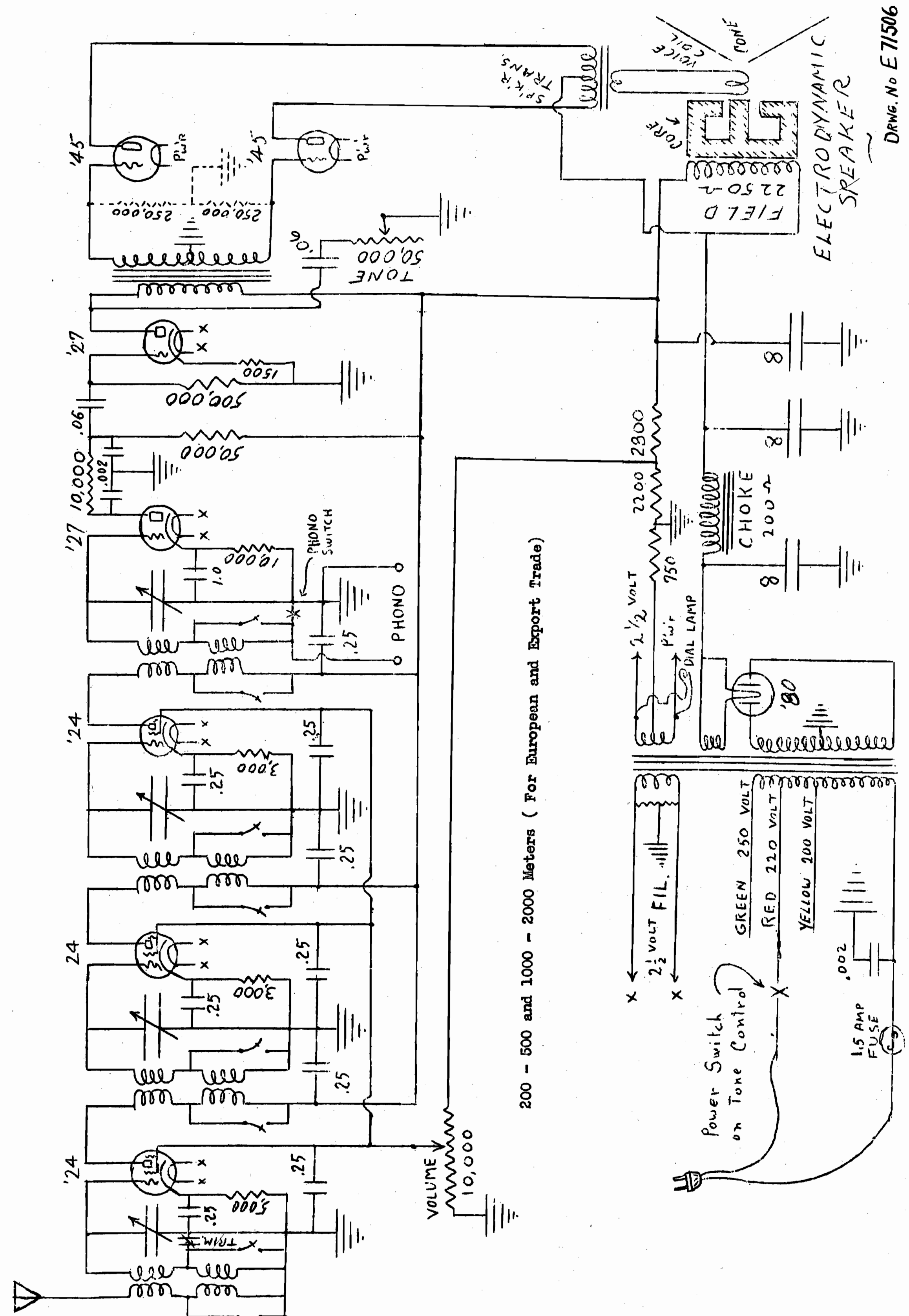


DRWG. No E 7/505

KENNEDY - MODEL 44

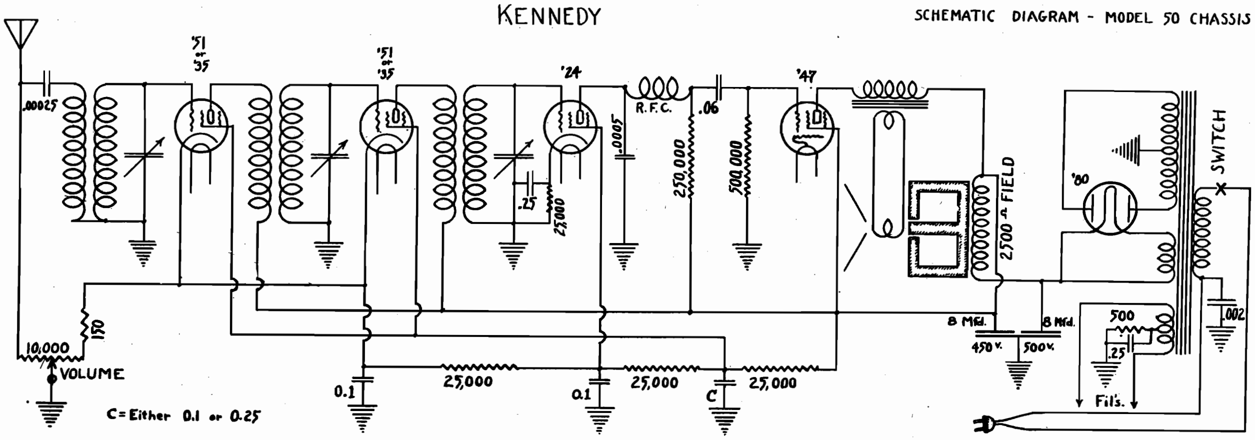
200 - 550 Meters and 1000 - 2000 Meters (For European and Export Trade)

COLIN B. KENNEDY CORP.



KENNEDY - MODEL 48

COLIN B. KENNEDY CORP.



Coils

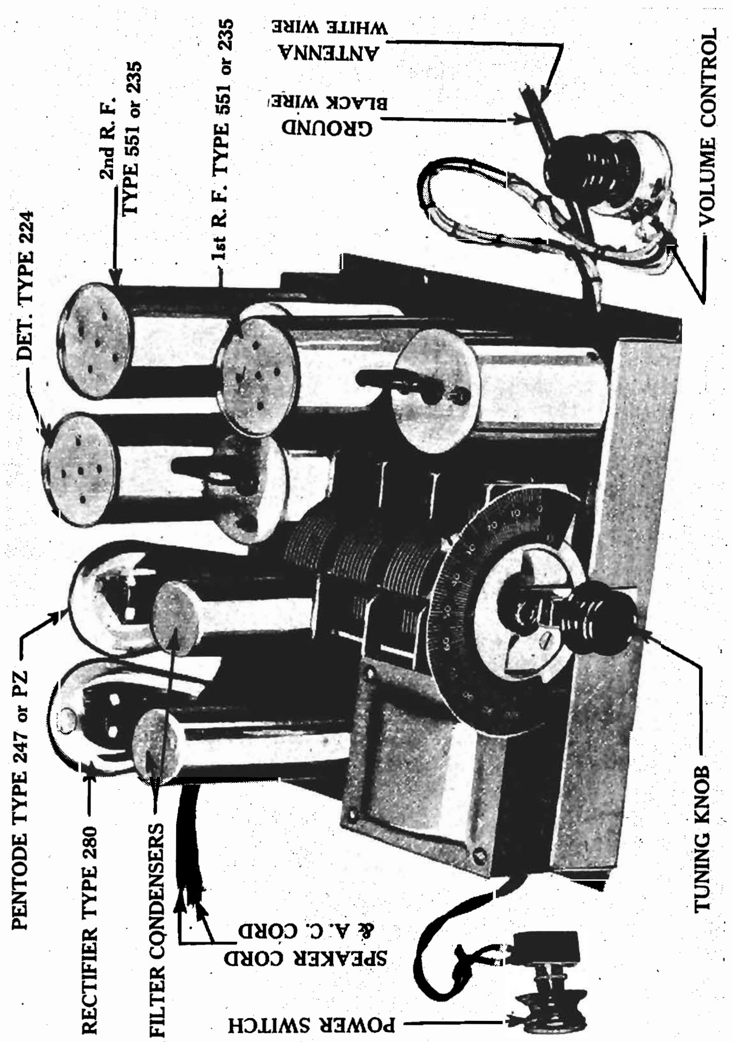
11759 Coils, set of 3 matched, shielded..............

Condensers

13417 Condenser, ¼, ¼ and ¼ mfd., 300-volt..
15417 Condenser, ¼ and ¼ mfd., 200-volt........
13306 Condenser, 0.1 mfd. tubular 200-volt......
13226 Condenser, 0.06 mfd. tubular 200-volt....
11A473 Condenser, .0005 Mica ....
113306 Condenser, .002 Mica ....
113305 Condenser, .00025 Mica ....
15302 Condenser, 8.0 mfd. filter, 500-volt..........
16302 Condenser, 8.0 mfd. filter, 450-volt..........
13301 Condenser, three-gang, tuning ....

Resistors

114225 Resistor, 500,000-ohm graphite..................
114224 Resistor, 50,000-ohm graphite..................
117366 Resistor, 25,000-ohm graphite..................
114173 Resistor, 10,000-ohm graphite..................
114215 Resistor, 5,000-ohm graphite..................
12158 Resistor, 500-ohm vitreous..................
16406 Resistor, 10,000-ohm variable with 150-ohm fixed ....



Alignment

Alignment of the tuned circuits is made in the conventional manner. An oscillator covering the broadcast band and an output meter or indicator will be found helpful and will speed up the procedure.

The three circuits are first aligned at, or near, the 1,500 K. C. end of the dial. The first condenser section has a "trimmer" condenser which may be adjusted. The other two sections may be adjusted by bending the proper segments of the slotted rotor end plates. A check at four or five positions across the dial range is usually ample.

Tube	*Type*	*Fil. A.C.*	*Plate*	*Screen*	*Bias*
1st R.F.	551	2.3	250	175	2.5 to 39
2nd R.F.	551	2.3	250	175	2.5 to 39
Detector	224	2.3	155	.....	4
Power Tube	247	2.3	235	235	16
Rectifier	280	4.8	340-340	.....	...

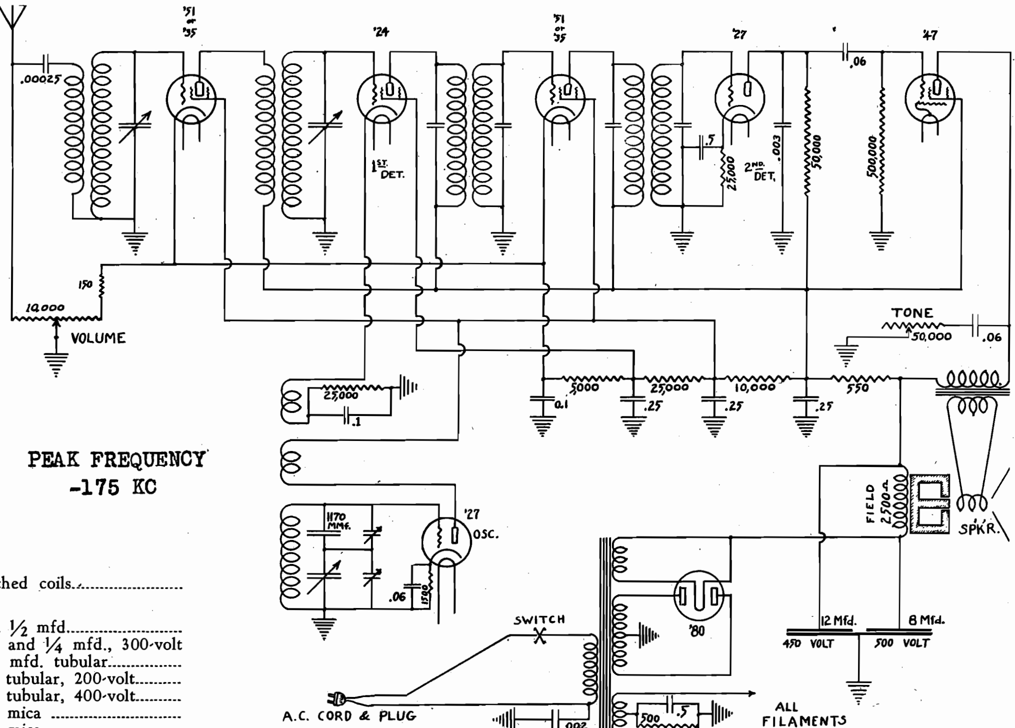
Line voltage = 115 Volume full on.

MODEL 50 CHASSIS

COLIN B. KENNEDY CORP.

Purpose	Type	Fil.A.C.	Plate	Screen	Bias
Radio Frequency	551	2.3	225	95	2.6 to 33
1st Detector	224	2.3	225	30	2
Oscillator	227	2.3	100	...	8.5
Intermediate Freq.	551	2.3	225	95	2.6 to 33
2nd Detector	227	2.3	160	...	21
Power Tube	247	2.3	225	225	14
Rectifier	280	4.8	335-335 A.C.		

Volume control full on. Line voltage = 115.
Plate, screen and bias voltages measured from ground or chassis to respective terminals.



PEAK FREQUENCY -175 KC

Coils

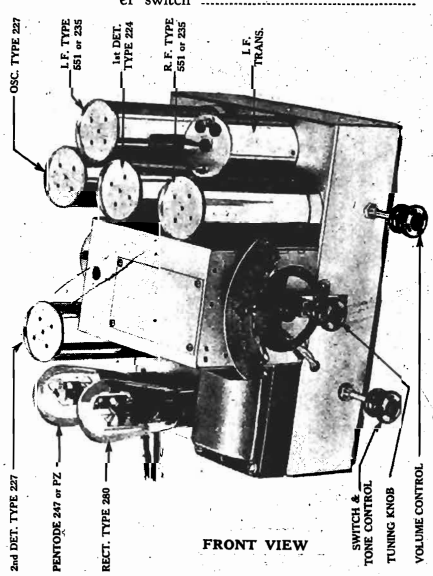
11600 Set of three matched coils

Condensers

113303	Condenser	½ and ½ mfd
13417	Condenser	¼, ¼ and ¼ mfd., 300-volt
13306	Condenser	.1 mfd. tubular
13226	Condenser	.06 tubular, 200-volt
23226	Condenser	.06 tubular, 400-volt
14306	Condenser	.003 mica
113305	Condenser	.00025 mica
16302	Condenser	8 mfd., 500-volt
17302	Condenser	12 mfd., 430-volt

Resistors

114225	Resistor	500,000-ohm graphite
11F225	Resistor	250,000-ohm graphite
114224	Resistor	50,000-ohm graphite
117366	Resistor	25,000-ohm graphite
114173	Resistor	10,000-ohm graphite
114215	Resistor	5,000-ohm graphite
114175	Resistor	1,500-ohm graphite
112158	Resistor	500-ohm vitreous
16406	Resistor	10,000-ohm variable and 150-ohm fixed, volume
15369	Resistor	50,000-ohm variable with power switch



FRONT VIEW

TECHNICAL DATA - MODELS 52 AND 56

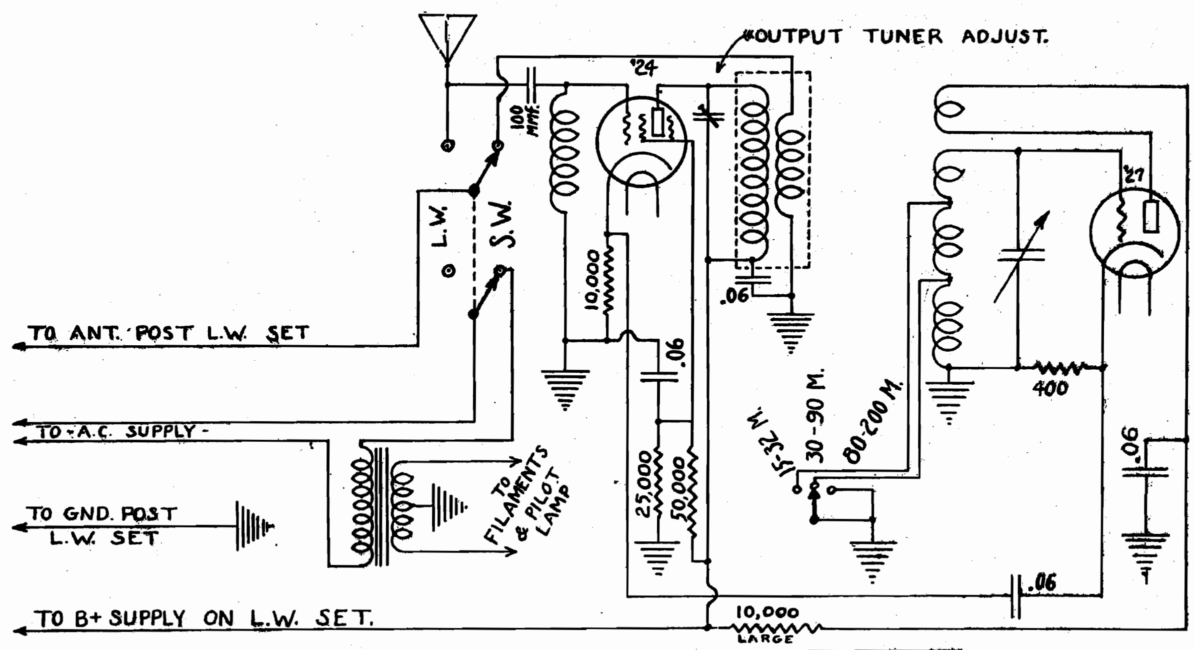
ALIGNMENT:-Use an output meter and 175 KC oscillator for aligning the IF transformers. Remove grid clip of first detector tube and fasten a short length of wire to the grid terminal of the tube. Place the oscillator in the vicinity of this wire. Adjust trimmers in tops of IF transformer shields for maximum output meter reading. For adjusting the tuning condenser, an oscillator covering the broadcast band should be used. In this case place the oscillator near the antenna of the receiver. The receiver and oscillator are first tuned to 1500 KC and the condenser trimmers adjusted for maximum output. Do the same thing at 550 KC. It is desirable to move the dial back and forth in making the above adjustments, particularly so when altering any capacities connected with the oscillator circuit.

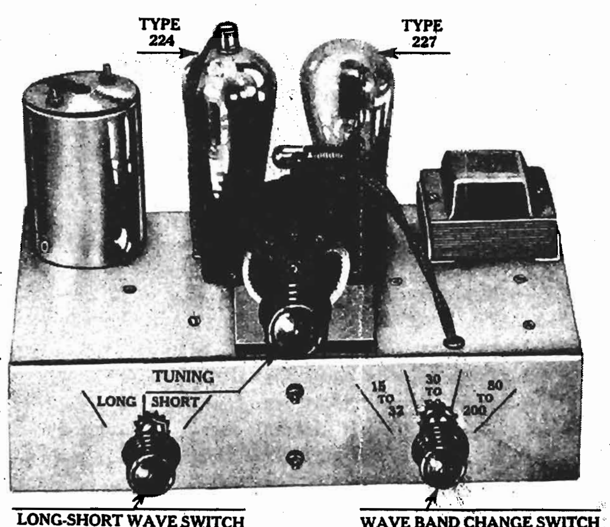
MICROPHONICS:-This is occasioned by mechanical vibration of the oscillator tuning condenser plates. A particularly microphonic tube may also cause it. See that the tuning condenser is floating on the rubber and that the cabinet is not binding on the dial drive shaft. Oscillation is not paramount in this receiver but an effect similar to this may be encountered at spots on the dial if the IF transformers are not set at their proper setting of 175 KC. Too much RF energy reaching the speaker leads produces a similar effect, overcome by twisting the ground and plate wires together in the speaker cable. This is done before the other two speaker leads are tied along with them.

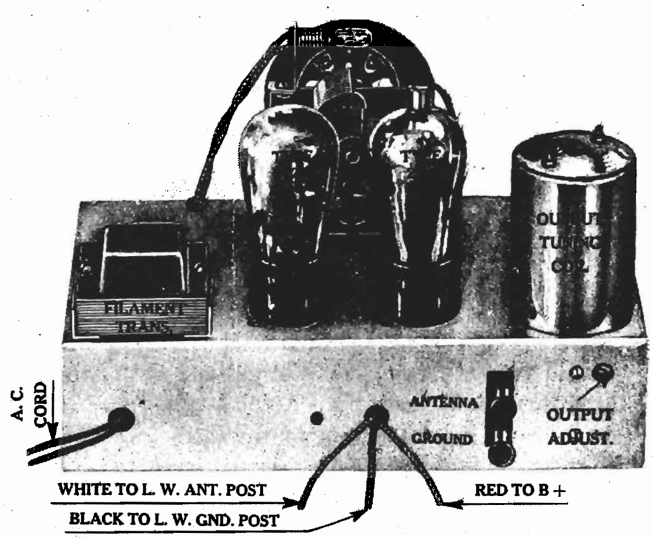
MODEL 52 CHASSIS
7 TUBE SUPERHETERODYNE

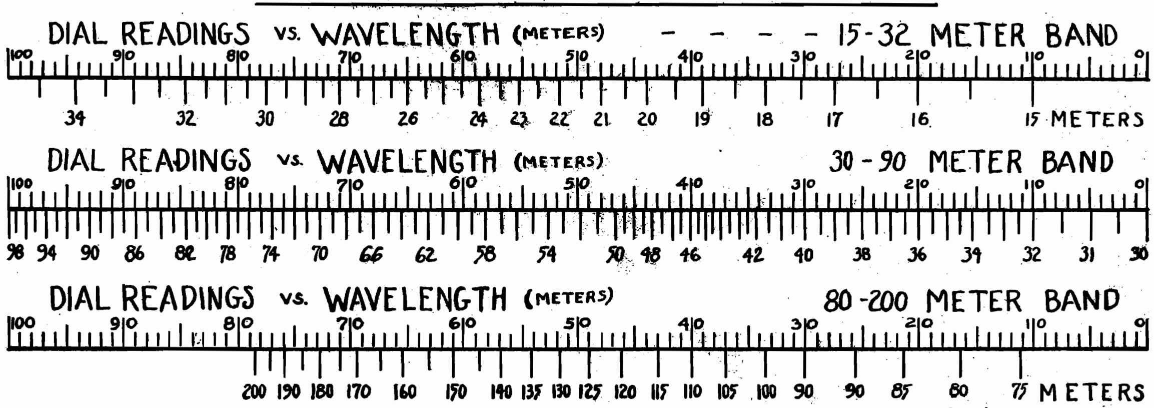
COLIN B. KENNEDY CORP.

MODEL 53 SHORT WAVE CONVERTER









CALIBRATION SCALE - MODELS 53 & 54-A

COLIN B. KENNEDY CORP.

MODEL 53 SHORT WAVE CONVERTER

THE KENNEDY Model 53 short wave unit operates on the superheterodyne principle, and is commonly called a converter or adapter.

When switched to long wave position the power is shut off from the short wave unit. When switched to the short wave position the power is turned on, and after the tubes warm up the unit is ready to operate.

In factory assembled combinations the short wave unit is already properly connected to the broadcast receiver. It is always advisable to check over this wiring, however, and see that all connections are properly and securely made.

The three wires from the rear-center of the unit are to be connected as follows:

BLACK: The black wire is to be connected to the ground post of the long wave receiver. The actual ground wire is attached to the GND post of the short wave unit and left there permanently.

WHITE: The white wire is to be connected to the antenna post of the long wave receiver. The actual antenna, or aerial, is attached to the ANT post of the short wave unit and left there permanently.

RED: The red wire is to be attached to a source of "B" voltage—either at the long wave chassis or speaker. Any voltage of from 150 to 250 volts is suitable. It should be obtained from some point in the long wave receiver chassis, speaker or filter system, where it will receive fairly good filtering and be relatively free from A. C. hum.

IMPORTANT. As the output of the short wave unit is tuned to a definite frequency it is necessary to set the dial of the long wave receiver at this frequency, and leave it there while tuning for short wave stations. It is important that the long wave dial be set exactly at the output frequency of the short wave unit.

This point is approximately 1,000 kilocycles.

If for any reason the output frequency of the short wave unit has shifted it may be retuned as follows. Set long wave dial at 1,000 kilocycles or at mark. Tune in short wave signals. Tune output by means of adjustment screw, until signal is loudest. Use a bakelite screw driver. The output adjusting screw is at right hand end of short wave chassis, facing the rear.

In the event a strong local station at or near 1,000 kilocycles interferes with short wave reception, the long wave dial may be moved slightly to right or left of 1,000 kilocycle mark, and the output retuned, as above, to obtain greatest short wave output at this newly selected frequency. Move long wave dial off 1,000 K. C. only a few kilocycles at a time, returning the short wave output each time, until the interference is eliminated.

Should the short wave output adjustment be far out of tune, a simple method of resetting is to feed the output of a laboratory or service man's oscillator (tuned to 1,000 K. C.) into the grid of the 224 tube of the short wave unit (while operating) and with long wave receiver also set at 1,000 K. C. (previously set by means of same oscillator, for accuracy). The short wave output adjustment screw may now be turned until maximum oscillator signal is heard, or an output meter, on long wave set, indicates maximum.

PARTS LIST
MODELS 53 & 54-A

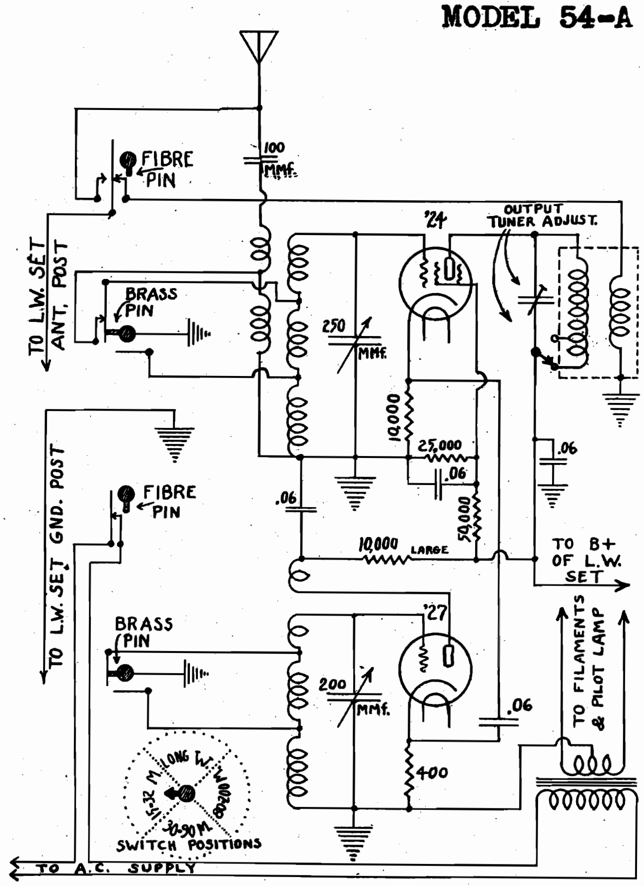
1-4-450	Coil, oscillator, with leads	$ .75
1-6-301	Condenser, oscillator tuning, 200 Mmf	3.25
1-3-226	Condenser, tubular, 0.06 mfd	.30
1-4-462	Condenser, output adjust, 10-70 Mmf	.50
1-1-A474	Condenser, mica, 100 Mmf	.30
1-1-3154	Dial lamp, 2½ volt	.30
1-2-7134	Knob, large, wood	.20
2-2-7134	Knob, small, wood	.18
1-1-F531	Post, ant	.10
1-1-F530	Post, gnd	.10
1-2-F529	Post, bakelite insulating strip	05
1-1-F550	Post, insulating washer	.01
2-1-4173	Resistor, 1 watt, 10,000 ohm	.25
1-1-4173	Resistor, graphite, 10,000 ohm	.25
1-1-7366	Resistor, graphite, 25,000 ohm	.25
1-1-4224	Resistor, grapihte, 50,000 ohm	.25
1-2-172	Resistor, 400 ohm	.25
1-7-103	Shield, output coil, with bolts	.15
2-3-514	Socket, 224	.18
2-4-515	Socket, 227	.18
1-8-201	Transformer, 60 cycle	2.00
2-8-201	Transformer, 25 cycle	3.30

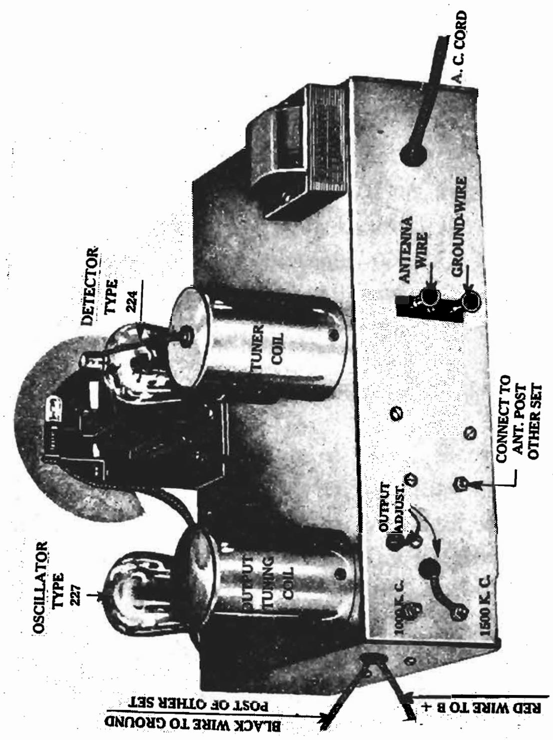
ADDITIONAL PARTS
MODEL 53

1-2-253	Coil, output	1.00
1-6-122	Dial, complete, with scale	1.00
1-3-468	Switch, 3 point, tap	.50
1-3-471	Switch, A. C. and LW-SW	.65

COLIN B. KENNEDY CORP.

MODEL 54-A SHORT WAVE CONVERTER





THE KENNEDY Model 54-A short wave unit operates on the superheterodyne principle, and is commonly called a converter or adapter.

A four-position rotary cam switch changes all connections to any one of three short wave band circuits or to long wave position. This switch makes the proper power and antenna connections, turning off the short wave unit and connecting the antenna directly to the broadcast receiver when in the long wave position. When switched to any one of the short wave bands, the tubes of the short wave unit are supplied with power, and antenna and output connections are made. The short wave unit is, naturally, not used for long wave broadcast reception.

In factory assembled combinations the short wave unit is already properly connected to the broadcast receiver. It is always advisable to check over this wiring, however, and see that all connections are properly and securely made.

The two wires from the left side (facing rear) are to be connected as follows:

BLACK: The black wire is to be connected to the ground post of the long wave receiver. The actual ground wire attached to the GND post of the short wave unit and left there permanently.

RED: The red wire is to be attached to a source of "B" voltage—either at the long wave chassis or speaker. Any voltage of from 150 to 250 volts is suitable. It should be obtained from some point in the long wave receiver chassis, speaker or filter system, where it will receive fairly good filtering and be relatively free from A. C. hum.

A wire, as short as practical, must be connected from the binding post at left-center (facing rear) of unit to the antenna post of the broadcast chassis. The actual antenna, or aerial, is attached to the ANT post of the short wave unit and left there permanently.

FOR CALIBRATION SCALE REFER TO PAGE 416-L-1

COLIN B. KENNEDY CORP.

MODEL 54-A SHORT WAVE CONVERTER

The short wave range (15 to 200 meters) is divided into three bands. Switch to left, 15 to 32 meters. Switch down, 30 to 90 meters. Switch to right, 80 to 200 meters. Switch up, short wave unit off and connections made for long wave broadcast reception. A rotary cam switch performs these operations. Its action will be apparent from inspecting the accompanying diagram. The contacts may be tested with a continuity meter.

The output of the unit has been tuned, for greatest efficiency. It is tuned at the factory to an intermediate frequency of 1,000 kilocycles, as this has been found to be an almost universally accepted spot on the long wave dial for pre-setting the broadcast receiver for short wave reception.

—o—

IMPORTANT: As the output of the short wave unit is tuned to a definite frequency, it is necessary to set the dial of the long wave receiver at this frequency, and leave it there while tuning for short wave stations. It is important that the long wave dial be set exactly at the output frequency of the short wave unit.

The dial of the long wave receiver, in factory assembled combinations, is marked at the frequency of the short wave unit output. This point is approximately 1,000 kilocycles. The upper of the two binding posts at the left side, facing rear, of unit should be hooked to the short wire near them. The lower post is to be used only for a 1,500 kilocycle output frequency, as explained later.

If for any reason the output frequency has shifted, or it is found desirable to shift it slightly away from 1,000 K. C. to avoid interference from a strong or local station at or near that frequency, it may be done as follows:

Set long wave dial at 1,000, or at mark. Tune in a short wave signal. Tune output by means of adjustment screw (near binding posts at left) until signal is loudest. Use a bakelite screw driver. If desired to shift the output frequency, move long wave dial slightly in desired direction and retune output. Move long wave dial only a few kilocycles at a time, retuning the short wave output each time, until the interference is avoided.

A simple means of tuning the output to a desired setting on the long wave dial is by means of a service man's oscillator. For example, to set at 1,000 K.C.: Tune oscillator to 1,000 kilocycles and feed it into the grid of the 224 tube of the short wave unit (while operating) and with the long wave dial set at 1,000 K. C. (previously set by means of same oscillator coupled into antenna wire, for accuracy). The short wave output adjustment screw may now be turned until maximum oscillator signal is heard, or an output meter, on long wave set, indicates maximum.

In rare instances it will be found difficult to use the 1,000 K. C. setting and short wave output due to local broadcast interference.

In this case the short wire on the rear may be moved to the lower binding post, and the output retuned, as above, for a long wave dial setting of 1,500 K. C. This 1,500 K. C. point may be shifted, as explained above, a short ways above or below this point to suit the needs of the particular location.

The marks on the long wave dial may be erased and redrawn with pencil at the desired point.

—o—

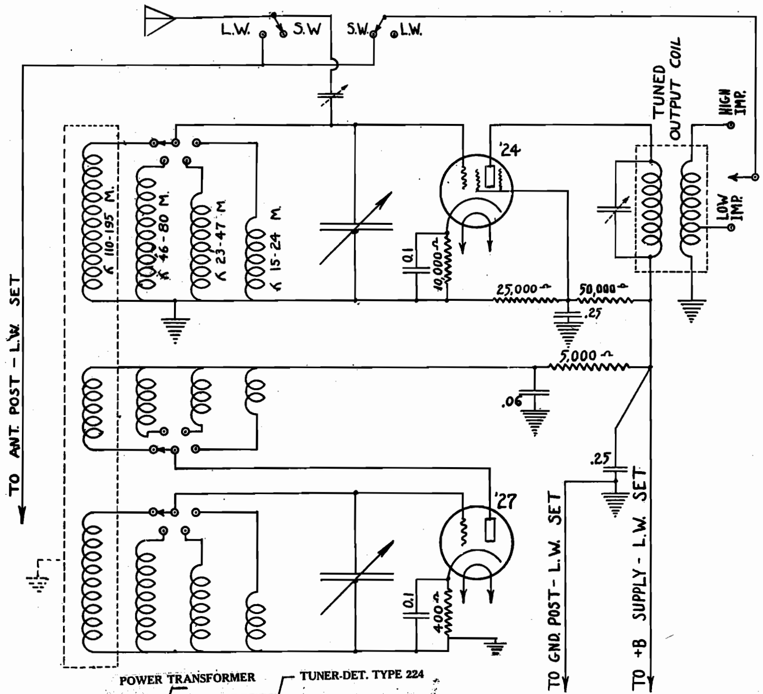
The tuning condenser is supported on "live" rubber to prevent microphonic noises. It should "float" freely at all times, and not bind at shaft or knob.

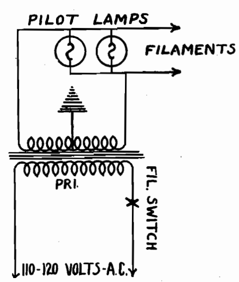
PARTS LIST - MODEL 54-A

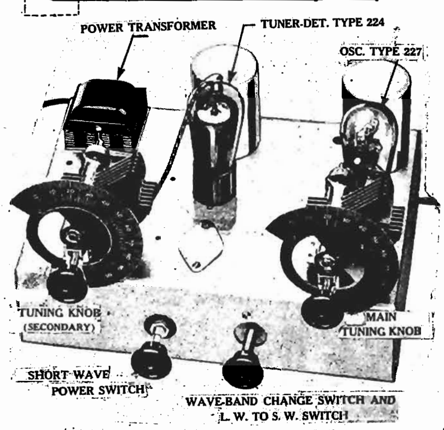
1-6-103	Shield antenna coil, with bolts	.15
1-5-601	Coil, antenna, with leads	.75
1-3-253	Coil, output	1.25
1-5-301	Condenser, antenna tuning, 250 Mmf	3.50
2-3-122	Dial, drive and scale	
2-5-567	Switch, panel assembly, with springs, etc.	1.00
1-4-736	Switch, shaft assembly, with pins	.75
2-4-181	Switch, panel brkt. assembly (with cam springs)	1.00
1-4-345	Switch cam	15.00 C
1-1-691	Screw 6-32 x 3-16" C. P. set screw	4.50 C
1-5-148	Switch shaft bearings	7.50 C
1-3-3503	Switch short contact spring	.05
1-2-126	Switch long contact spring	.05
1-1-126	Switch contact spring (Rt. angle bend)	.05

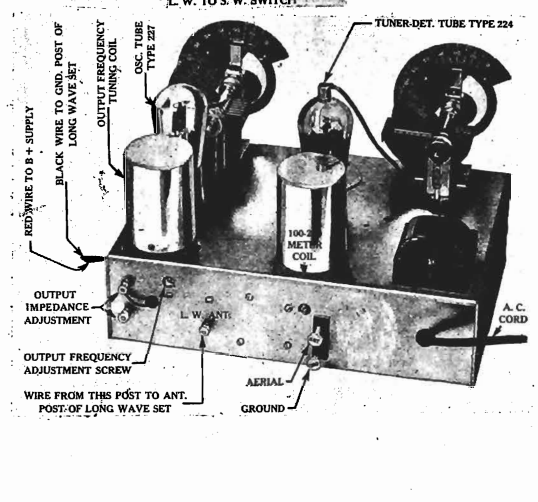
FOR ADDITIONAL PARTS DATA REFER TO PAGE 416-L-2

COLIN B. KENNEDY CORP.









When testing the short wave unit at the factory, it is adjusted for use with an average antenna. Improved results may sometimes be obtained by re-adjusting to the antenna actually used. The procedure for this adjustment is as follows:

Almost exactly in the center of the back of the short wave unit is an adjustment screw which can be operated through a hole provided for it. This screw should be turned with a bakelite screw driver, which most service men carry. A metal screw driver will disturb the adjustment.

Set the switch on the position marked "15-25 meters"—tune in a station (music or code) at about 50 on the right-hand dial. Then adjust the screw described above until the left-hand dial also reads approximately 50 when properly tuned in. This adjustment then holds for all wave bands.

The BLACK wire is connected to the "ground" binding post of the long wave set. The RED wire is connected to the negative side of the speaker field coil (dynamic speaker), to the speaker wire or connection carrying a filtered "B" voltage supply, or, inside the chassis, to the positive end of the voltage divider resistor.

If difficulty is had in getting the unit to operate when initially hooked up, and the "B" source is suspected, 90 to 135 volts of "B" batteries may temporarily be tried. The red wire goes to the "B" +, the black wire to the long wave receiver ground post as before, and the "B" — to the same ground post.

Any source of "B" voltage from 150 to 250-volts is suitable. It should be obtained from some point in the long wave receiver speaker or filter system, where it will receive fairly good filtering and be relatively free from hum. A lower voltage, well filtered, is more to be desired than a higher voltage with a large proportion of A.C. modulation.

Obtaining this plate supply is very simple on many receivers, such as the Kennedy models 210, 310, 220, 320, 1030, 632, 426, 526, 726, and 826. In these cases the B supply may be taken from the tip-jack terminating the black speaker wire. In Kennedy models 42, 50 and 52 it may be obtained at the speaker terminal panel from the side of the field winding which is common with the speaker transformer primary

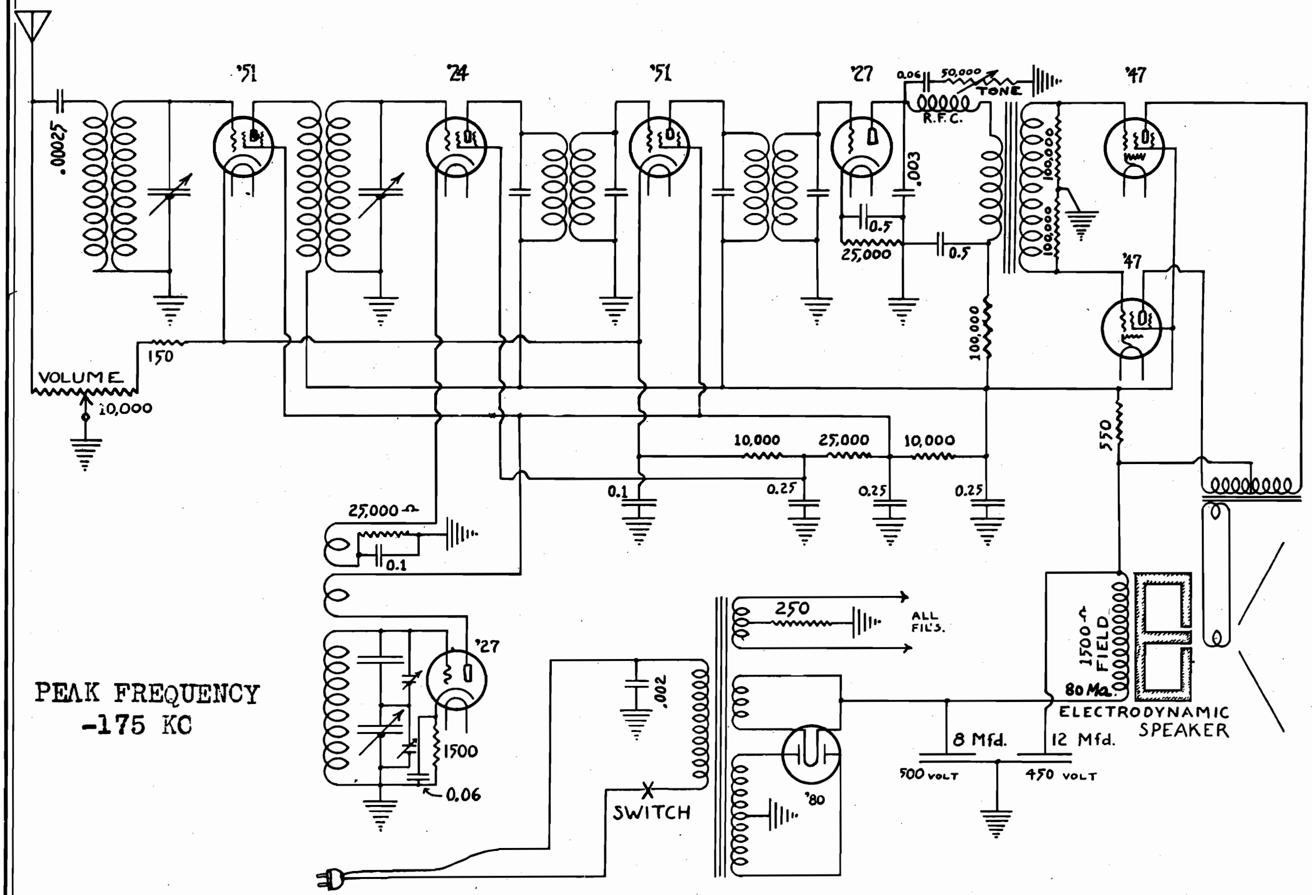
The output of the short wave unit is tuned. It is set, at the factory, to tune to approximately 1525 kilocycles. Naturally, the long wave receiver dial must be set at this point for short wave reception, and left there.

In the event the long wave receiver will not tune past 1500 kilocyles, or a strong local broadcast station interferes at that point, the output frequency tuning may be altered slightly to avoid the difficulty. An adjusting screw for this tuning may be reached through a hole in the rear of the chassis. It is located near the impedance adjusting wire and binding posts, and is to be adjusted with a bakelite screw driver, as a metal tool will upset the adjustment.

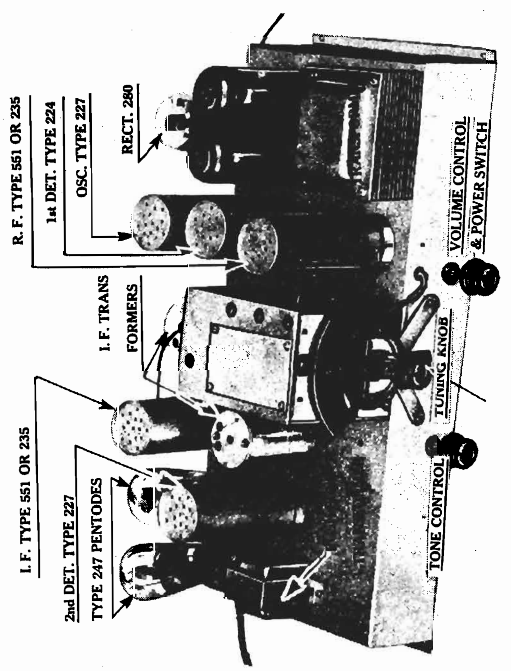
It will be noted, facing the rear of the chassis, that on the left hand side a wire has been brought out which may be connected to either one of two small binding posts near the end of the base. The purpose of this is to adjust the output impedance of the unit to that of the antenna input circuit of the receiver it is to be used with. The Kennedy models named above have high impedance antenna circuits and therefore require this wire to be on the upper binding post. In doubtful cases this wire may be tried first on one and then on the other, with unit operating, and permanently left where best results are obtained. These connections are indicated on the accompanying illustration.

MODEL 54 " GLOBE TROTTER"
SUPERHET. S.W. CONVERTER

COLIN B. KENNEDY CORP.



PEAK FREQUENCY -175 KC



Purpose	Type	Fil.A.C.	Plate	Screen	Bias
Radio Frequency	551	2.35	208	98	3 to 30
1st Detector	224	2.35	208	30	5
Oscillator	227	2.35	90	...	10
Intermediate Freq.	551	2.35	208	98	3 to 30
2nd Detector	227	2.35	120	...	16
Power Tubes	247	2.35	220	208	14
Rectifier	280	4.90	....	...	...

Volume control full on except for R. F. and I. F. bias extremes. Line voltage 115.

Plate, screen and bias voltages measured from ground or chassis to respective terminals.

Resistors

117366	Resistor	25,000-ohm graphite
114173	Resistor	10,000-ohm graphite
114175	Resistor	1,500-ohm graphite
12158	Resistor	500-ohm vitreous
26406	Resistor	10,000-ohm variable and 150 ohm fixed, volume, with switch
25369	Resistor	50,000-ohm variable

Coils

11600 Set of three matched coils

Condensers

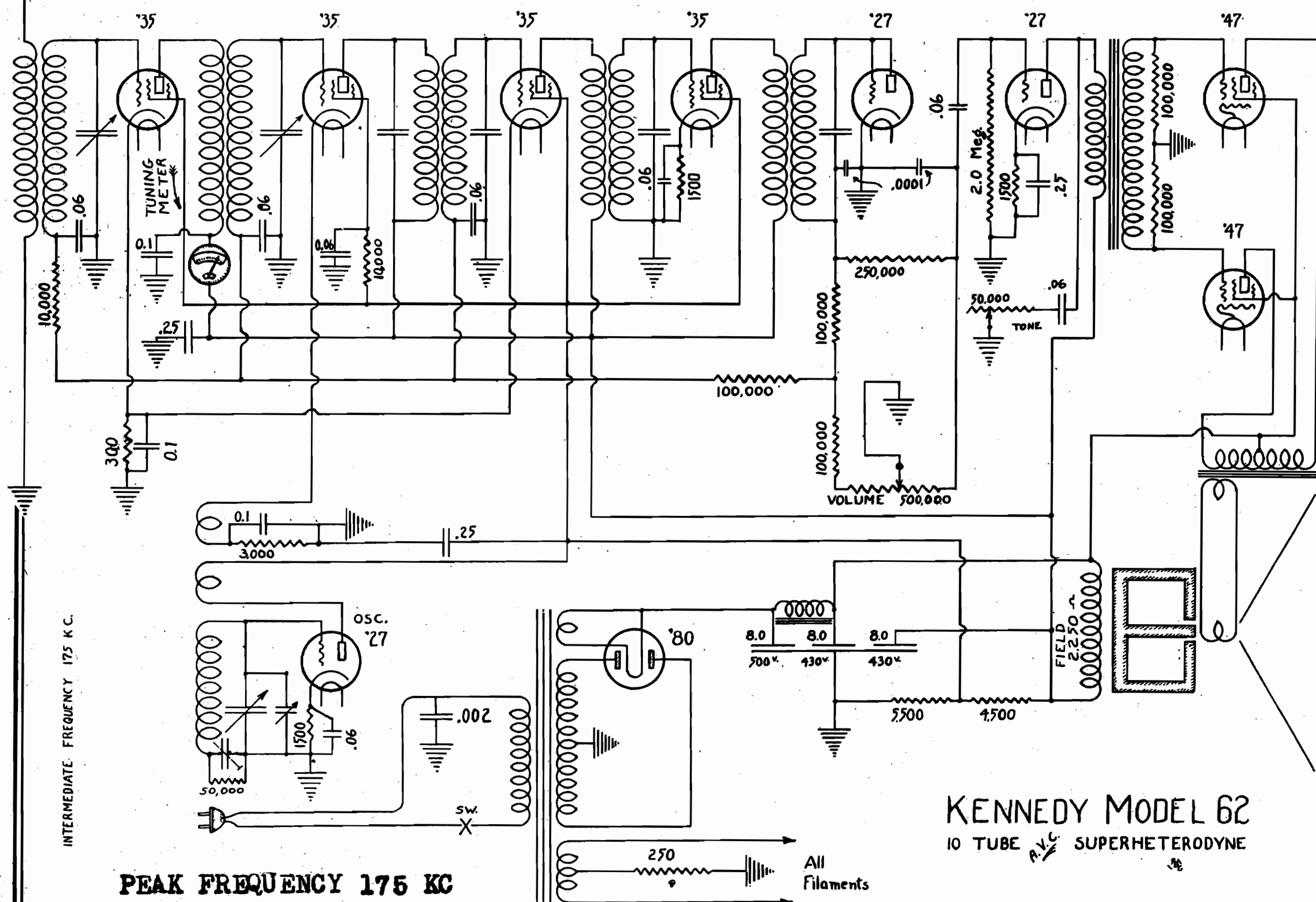
113303	Condenser	1/2 and 1/2 mfd.
13417	Condenser	1/4, 1/4 and 1/4 mfd., 300-volt
13306	Condenser	.1 mfd. tubular
13226	Condenser	.06 tubular, 200-volt
14306	Condenser	.003 mica
113305	Condenser	.00025 mica
16302	Condenser	8 mfd., 500-volt
17302	Condenser	12 mfd., 430-volt

MODEL 56
8 TUBE SUPERHETERODYNE

For technical data refer to page 416-L

COLIN B. KENNEDY CORP.

MODEL 62 SUPERHETERODYNE (A.V.C.)



PEAK FREQUENCY 175 KC

Coils		
1-5-600	Set three matched coils	3.00
Condensers		
1-3-417	Condenser 1/4, 1/4 & 1/4 mfd., 300 volt	1.25
1-3-306	Condenser 0.1 mfd. tubular, 200 volt	.35
1-3-226	Condenser 0.06 mfd. tubular, 200 volt	.30
1-1-A474	Condenser .0001 mfd. mica	.30
1-6-302	Condenser 8 mfd. wet elect'lytic 500 v.	2.50
2-7-302	Condenser 8 mfd. wet elect'lytic 430 v.	2.25
4-8-302	Condenser 8 mfd. dry elect'lytic 430 v.	1.75
1-4-301	Condenser three-gang, tuning	4.25
Resistors		
1-1-3404	Graphite, 2 megohm	.25
1-1-F225	Graphite, 250,000 ohm	.25
1-1-8484	Graphite, 100,000 ohm	.25
1-1-4224	Graphite, 50,000 ohm	.25
1-1-4173	Graphite, 10,000 ohm	.25
1-1-4172	Graphite, 3,000 ohm	.25
1-1-4175	Graphite, 1,500 ohm	.25
1-2-172	Graphite, 400 ohm	.25
1-4-172	Graphite, 1,000 ohm	.25
1-6-369	Tone control with Sw. 50,000 ohm	1.35
1-7-406	Volume control, 500,000 ohm	1.00
1-1-F158	Voltage divider, 4,500 and 5,500 ohm	1.25
Transformers		
1-11-201	Power, 60-cycle	6.00
1-11-200	Power, 25-cycle	8.50
1-1-3203	Audio, push-pull	3.50
1-3-963	I. F. first stage	2.50
2-3-963	I. F. second stage	2.50
3-3-963	I. F. third stage	2.75
Speaker		
D-9XP	Speaker, 2,250 ohm P-P pentode, 12"	12.00

The electrodynamic speaker used with this receiver has a field resistence of 2,250 ohms. It acts as a filter choke, preceded by an 8 henry, 200 ohm choke incorporated in the chassis.

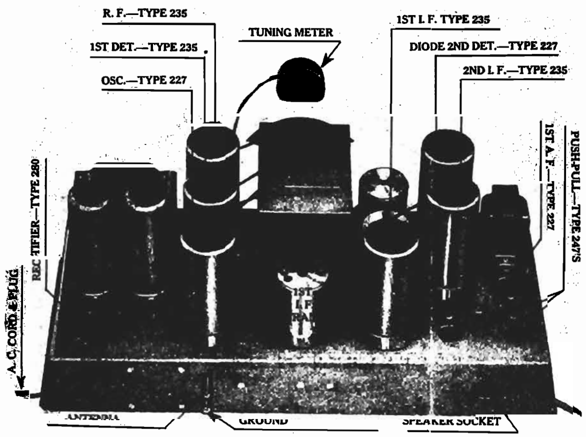
Purpose	*Type*	*Fil., A. C.*	*Plate*	*Screen*	*Bias*
R. F.	235	2.45	212	80	4
1 Det.	235	2.45	214	70	6
Osc.	227	2.45	80		6
1 I. F.	235	2.45	215	80	4
2 I. F.	235	2.45	214	80	7
2 Det.	227	2.45	(DIODE)		
1 A. F.	227	2.45	200		10
Power Tubes	247	2.44	300	285	19
Rect.	280	4.95			

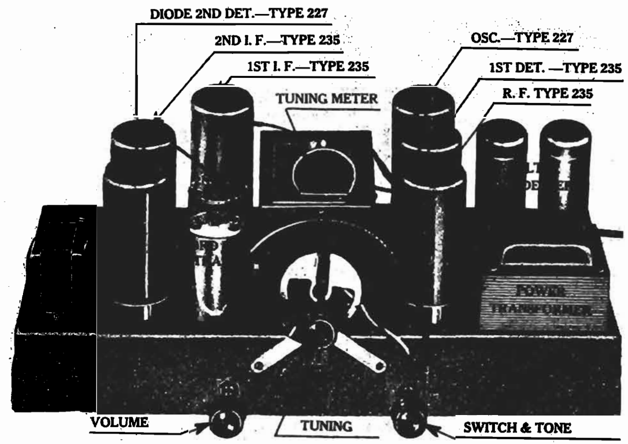
Volume control full on. Line voltage 120. Plate and screen voltages measured from cathodes to socket terminals. Bias measured from cathodes to ground.

Small deviations above or below the values given may be expected due to variations in parts, tubes and meters used.

MODEL 62 SUPERHETERODYNE

COLIN B. KENNEDY CORP.





Alignment

Before aligning or testing alignment of tuned circuits, it is desirable to "short out" the automatic volume control action. This is done by grounding the grid return wire of the first three tubes at some point between the 10,000 ohm and 100,000 ohm grid return filter resistors. It will be noted that the low ends of the detector coil and 1st I. F. coil secondaries are connected to this wire. The antenna coil is also connected, but through a 10,000 ohm filtering resistor.

In aligning, it is first desirable to see that the intermediate frequency transformers are properly set. This is most readily accomplished by using an output meter and an accurate source of 175 kilocycle radio frequency, such as an oscillator. The accuracy of this oscillator may be checked by tuning a radio set to a station on 700 kilocycles and placing the oscillator near the antenna. A harmonic of the 175 kilocycle oscillator will "zero beat" with the station if the oscillator is correct. Other "harmonic" points may also be tried.

Remove the grid clip from the top of the first detector tube and fasten a short length of wire to the grid terminal of this tube. Lay this wire sufficiently near the 175 K. C. oscillator to note the energy from it in the output meter. With the oscillator set on exactly 175 K. C., adjust the trimmers in the tops of the I. F. transformer shields for maximum reading of the output meter. If the meter tends to read "off scale," move oscillator farther from set and wire, thereby reducing input energy. If these I. F. transformers are badly out of alignment, it may be necessary to place the "pick up" wire on the grid of the 1st I. F. tube and adjust the second transformer alone, at first, then moving wire to detector grid and proceed as above. It will be noted that the 2nd and 3rd I. F. transformers have but one adjustment, while the first has two.

The tuning condenser may be adjusted for alignment or "tracking" of the tuned circuits by a similar method except that an oscillator covering the broadcast band should be used. The output meter is used as before. The energy from the oscillator, in this case, is coupled weakly into the antenna circuit—a simple means being to place the oscillator near the antenna wire.

The receiver and oscillator are first tuned to approximately 1,500 kilocycles, and by watching the output indicator, the three condenser trimmers (reached through three holes in top-right of condenser shield, or, in some cases, through removable plate) are adjusted for maximum output. These three trimmers must then be left *untouched* for all further aligning.

The next step is to tune both receiver and oscillator to some point near 550 kilocycles. Here, the alignment is made by adjusting the "padding" condenser (through hole in rear of condenser shield) for maximum response. If necessary to adjust the two R. F. condenser sections, it may be accomplished by bending the condenser end plates. If found necessary to align at other than the ends of the "band," it may be done by bending the slotted end plate of the condenser rotors. Alignment of the two ends of the scale is usually quite sufficient.

IMPORTANT: It is desirable to move the dial back and forth across the signal while making the above alignments. This is particularly necessary when altering any capacities connected with the oscillator circuit. An insulated or bakelite screw driver (containing little, if any, metal) is advised for use in adjusting "trimmer" or "padding condensers."

Circuit correction: The bias for the oscillator tube, on later models, will be found to be obtained from the 1st detector cathode resistor instead of the 1,500 ohm self bias resistor as indicated. In this case, the 1st detector bias resistor has been changed from 3,000 ohms, as shown, to 1,000 ohms. The self bias resistor of the 2nd I. F. tube will be found changed to 3,000 ohms.

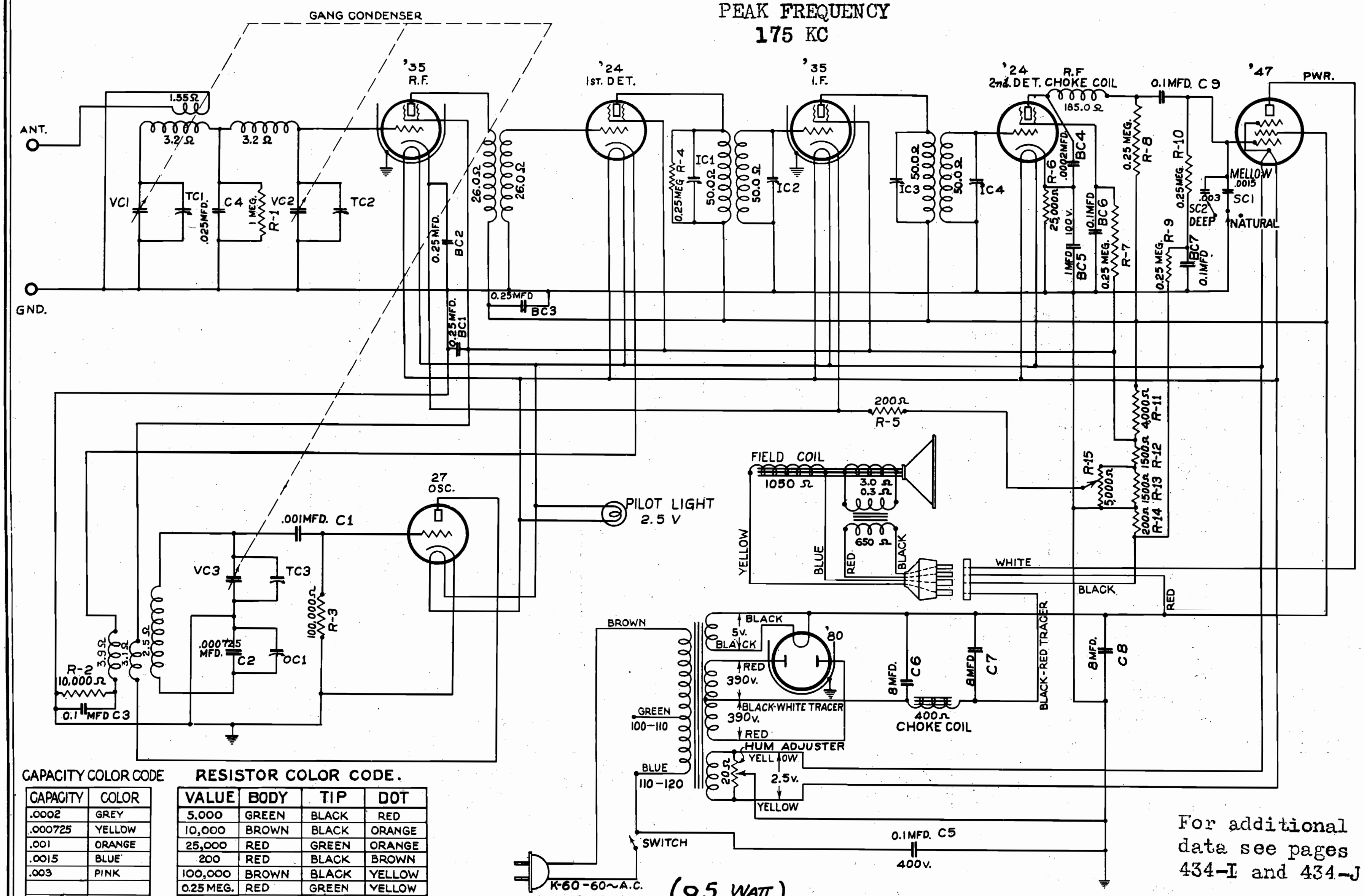
The automatic volume control functions with the diode second detector. The rectified radio frequency flows from the grid and plate (which are joined) to cathode and ground. It returns through the manual volume control and the two 100,000 ohm resistors to the secondary of the last I. F. transformer, and back to the plate and grid, completing the rectifying circuit. No current flows in this circuit until a carrier wave is tuned in. With no current flowing, the bias for the R. F. and 1st I. F. tubes is obtained in the 300 ohm resistor in series with their two cathodes. The biases of the 1st detector and 2nd I. F. tubes are obtained by individual cathode resistors. When current flows in the diode circuit, points along the resistence path from volume control ground to secondary coil are successively more and more negative with respect to ground due to the drop in these resistors. They are naturally more negative when more current flows in this circuit. Advantage is taken of this to provide almost perfect automatic bias control for the first three tubes by returning the grid circuits of these tubes to a determined point on these resistors. Thus, the negative voltage developed by the diode circuit is added to the fixed bias already provided for these tubes. Stronger signals increase this added bias; weaker signals reduce the added bias; and the result in the over-all response is uniformity of volume level. As the volume control is rotated toward minimum or "OFF," more resistance is added to the automatic circuit, increasing its action, and at the same time operates in the audio system by tending to short out the signal to the first audio tube grid.

In all other respects, the circuit is entirely conventional, and may be tested in the regular ways with standard equipment.

Continuity of circuit and coils may be tested with a battery, meter and pair of test leads. If necessary to replace a coil, it is advisable to replace the entire set of three with a new correctly matched set.

KOLSTER RADIO, INC.

PEAK FREQUENCY
175 KC



CAPACITY COLOR CODE

CAPACITY	COLOR
.0002	GREY
.000725	YELLOW
.001	ORANGE
.0015	BLUE
.003	PINK

RESISTOR COLOR CODE.

VALUE	BODY	TIP	DOT
5,000	GREEN	BLACK	RED
10,000	BROWN	BLACK	ORANGE
25,000	RED	GREEN	ORANGE
200	RED	BLACK	BROWN
100,000	BROWN	BLACK	YELLOW
0.25 MEG.	RED	GREEN	YELLOW
1.0 MEG.	BROWN	BLACK	GREEN

For additional data see pages 434-I and 434-J

Power Consumption 95 Watt

KOLSTER — INTERNATIONAL RADIO MODELS K-60—K-62 -1931-

KOLSTER RADIO, INC.

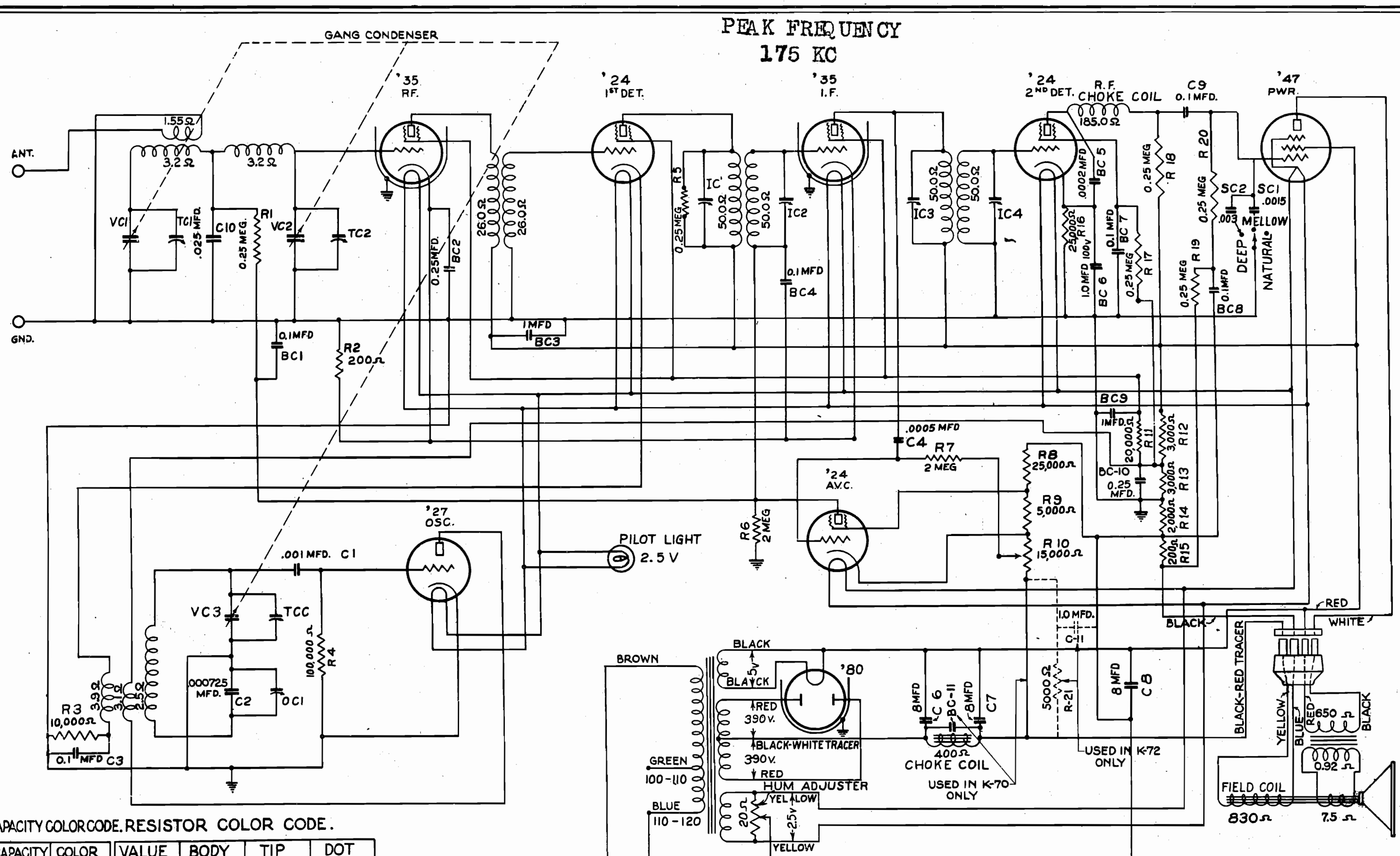
Volume control at maximum.
Tone control natural position.

KOLSTER K-60—K-62 VOLTAGE READING CHART

*Indicates incorrect reading due to high resistance in circuit.
All voltages will vary with different tubes.

	TUBE—80 Rectifier		TUBE—27 Oscillator				TUBE—35 1st R. F.					TUBE—24 1st Detector					TUBE—35 1st I. F.					TUBE—24 2nd Detector					TUBE—47 Power A. F.				Cause of Incorrect Reading
	Plate M.A.	Plate M.A.	Grid	K Volts	Plate Volts	Plate M.A.	Grid	S.G. Volts	K Volts	Plate Volts	Plate M.A.	Grid	S.G. Vots	K Volts	Plate Volts	Plate M.A.	Grid	S.G. Volts	K Volts	Plate Volts	Plate M.A.	Grid	S.G. Volts	K Volts	Plate Volts	Pate M.A.	Grid	S.G. Volts	Plate Volts	Plate M.A.	
NORMAL READINGS	48	48	0	0	85	6.0	*.25	80	3.0	230	6.0	6.4	74	6	225	1	3.5	80	4.0	225	7	4.2	*22	6	*125	.2	*2.	245	225	24	
High cathode and low plate volt. on 1st R.F., 1st I.F.							1.0	0	75	10	0						.30	5	30	10	0										Open 200 ohm resistor in volume control centre tap lead (R-5)
No C.G. voltage 1st R.F.							0	80	4	240	8.5																				Open 1 megohm 1st R.F. bias resistor (R-1)
No plate or S.G. voltage 2nd detector																						4.5	0	6.5	0	0					Open 25,000 ohm 2nd detector cathode resistor (R-6)
No cathode voltage 2nd detector																						.25	0	0	*125	0					Open 250,000 ohm 2nd detector S.G. vol. resistor (R-7)
No plate voltage nor plate current 2nd detector																						2.0	*22	3	0	0					Open 250,000 ohm 2nd detector plate res., open R.F. choke (R-8)
Low plate voltage high plate current pentode																											*1.0	200	160	40	Open 250,000 ohm power pentode grid bias resistors (R-10)
No voltages osc. 1st R.F., 1st & 2nd det., 1st I.F.	15	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	83.	0	0	0	Open 200 ohm section of vitreous or open field coil (R-14)
High plate voltage, 1st R.F., 1st & 2nd det., 1st I.F.	40	40	0	0	0	0	*.25	0	0	300	0	0	0	0	280	0	0	0	0	280	0	.25	0	0	*160	0	*2.	260	240	50	Open 4,000 ohm section of vitreous (R-11)
High S.G. voltage, 1st R.F., 1st & 2nd det., 1st I.F.			4.5	0	175	12	0	175	7	240	16	20	170	18	220	2	7.5	175	7.5	240	13	7.5	*56	10	*135	0	*1.	245	225	22	Open 1,500 ohm section of vitreous (R-12)
High S.G. volt. high plate current 1st R.F., 1st I.F.							0	120	5	225	15						4.5	125	5	225	10										Open 1,500 ohm section of vitreous across volume control (R-13)
Low S.G. and low plate 1st detector												7.5	5	7	10	0															Open 10,000 ohm 1st detector, K. resistor (R-2)
No C.G. nor cathode voltage 1st detector												0	80	0	225	6															Shorted 0.1 mfd. 1st detector by-pass (C-3)
High C.G. voltage 1st R.F.							2.4	80	3.0	235	6																				Shorted .025 mfd. 1st R.F. grid bias by-pass condenser (C-4)
High C.G., no plate voltages 2nd detector																						9.0	*18	15	0	0					Shorted .0002 mfd. 2nd detector plate to K. condenser (BC-4)
No C.G. and low plate 2nd detector																						0	*20	0	*45	2					Shorted 1.0 mfd. 2nd detector K. by-pass condenser (BC-5)
No C.G., S.G. nor cathode voltages 2nd detector																						0	0	0	125	0					Shorted 1.0 mfd. 2nd detector S.G. to ground, by-pass (BC-6)
No C.G. or no cathode voltage 1st R.F., 1st I.F.							0	80	0	235	8						0	80	0	225	8.5										Shorted 0.25 mfd. 1st R.F. and 1st I.F. K. to grd. by-pass (BC-2)
High rectifier and no voltages on tubes	90	90	0	0	0	0	*.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*2.5	0	0	0	Shorted 0.25 mfd. plate supply to grd. (BC-3)
No S.G., no cathode volt. on 1st R.F., 1stI.F.,1st and 2nd detector	50	50	0	0	0	0	*.5	0	0	225	0	0	0	0	215	0	0	0	0	225	0	0	0	0	*115	0	*2.	225	205	20	Shorted 0.25 mfd. S.G. to grd. (BC-1)
Low plate voltages 2nd detector and pentode																						3.6	*20	4	*100	.2	*1.0	200	160	44	Shorted 0.1 mfd. 2nd detector R.F. choke to pentode grid (C-9)
Low plate voltages high plate current pentode																											*.5	200	155	44	Shorted 0.1 mfd. pentode grid to grd. or shorted tone cont. condensers (BC-7, SC-1, SC-2)
No plate volt. or M.A. on 1st R.F.							*.25	80	2.5	0	0																				Open primary of untuned R.F. transformer
No plate volt. or M.A. on 1st detector												5	74	5.5	0	0															Open primary of 1st I.F. transformer
No plate volt. or M.A. on 1st I.F.																	6	78	2.5	0	0										Open primary of 2nd I.F. transformer
No plate volt. or M.A. on 2nd detector																						2.	*22	2.5	0	0					Open R.F. choke
No plate volt. or M.A. on oscillator			0	0	0	0																									Open oscillator plate coil
No plate volt. or M.A. on pentode																											*2	245	0	0	Open primary of output transformer
No C.G. voltage on 1st R.F.							0	80	3	225	7																				Open 2nd R.F. pre-selector coil
No C.G. voltage on 1st detector												0	130	23	200	3															Open secondary of untuned R.F. transformer
No C.G. voltage on 1st I.F.																	0	80	3	225	7.5										Open secondary of 1st I.F. transformer
No C.G. voltage on 2nd detector																						0	*16	12.5	*55	1.7					Open secondary of 2nd I.F. transformer

KOLSTER RADIO, INC.



For additional data see pages 434-I and 434-J

CAPACITY COLOR CODE.

CAPACITY	COLOR
.0002	GREY
.0005	RED
.000725	YELLOW
.001	ORANGE
.0015	BLUE
.003	PINK

RESISTOR COLOR CODE.

VALUE	BODY	TIP	DOT
200	RED	BLACK	BROWN
5,000	GREEN	BLACK	RED
10,000	BROWN	BLACK	ORANGE
15,000	BROWN	GREEN	ORANGE
20,000	RED	BLACK	ORANGE
25,000	RED	GREEN	ORANGE
100,000	BROWN	BLACK	YELLOW
0.25 MEG.	RED	GREEN	YELLOW
2 MEG.	RED	BLACK	GREEN

POwer Consumption 95 Watt

KOLSTER — INTERNATIONAL RADIO MODELS K-70—K-72

-1931-

KOLSTER RADIO, INC.

Volume control at maximum.
Tone control natural position.

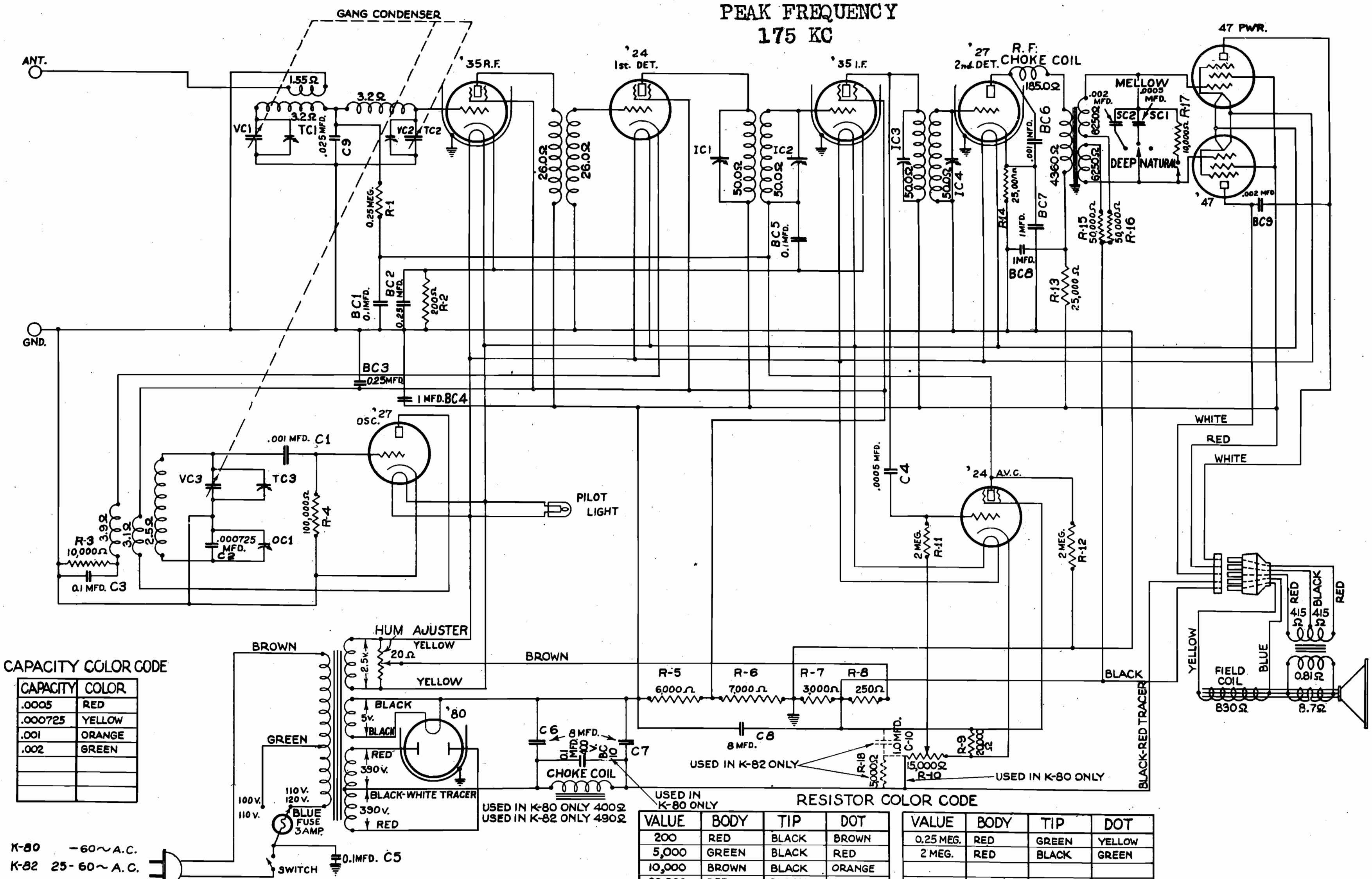
KOLSTER K-70—K-72 VOLTAGE READING CHART

*Indicates incorrect reading due to high resistance in circuit.
All voltages will vary with different tubes.

	TUBE—80 Rectifier		TUBE—27 Oscillator				TUBE—35 1st R. F.					TUBE—24 1st Detector					TUBE—35 1st I. F.					TUBE—24 A. V. Cont.					TUBE—24 2nd Detector					TUBE—47 Power A. F.				Causes of Incorrect Reading
	M.A.	M.A.	Grid Volts	K Volts	Plate Volts	Plate M.A.	C.G. Volts	S.G. Volts	K Volts	Plate Volts	Plate M.A.	C.G. Volts	S.G. Volts	K Volts	Plate Volts	Plate M.A.	C.G. Volts	S.G. Volts	K Volts	Plate Volts	Plate M.A.	C.G. Volts	S.G. Volts	K Volts	Plate Volts	Plate M.A.	Grid Volts	S.G. Volts	K Volts	Plate Volts	Plate M.A.	Grid Volts	S.G. Volts	Plate Volts	Plate M.A	
NORMAL READING	46	46	2.5	80	80	5.0	*.5	60	80	190	.25	5.	50	84	180	.6	3.0	75	80	195	1.0	.25	25	50	20	0	4.0	*24	80	*100	.25	*4.0	260	235	35	
High cathode and low plate volt. on 1st R.F., 1st I.F.							*0.8	0	85	0	0						0.8	0	85	0	0															Open 200 ohms resistor, cathode 1st R.F. and 1st I.F. (R-2)
Low plate, low S.G. volt. on 1st R.F.							*0.2	54	80	175	5.0																									Open 250,000 ohms in 1st R.F. bias resistor (R-1)
No S.G. or plate volt. on 2nd det.																											3.8	0	76	0	0					Open 25,000 ohms 2nd det. K resistor (R-16)
No C.G. or S.G. volt. on 2nd det.																											0	0	72	*94	0					Open 250,000 ohms 2nd det. S.G. voltage resistor (R-17)
No plate volt. or M.A. on 2nd det.																											1.4	*24	70	0	0					Open 250,000 ohms 2nd det. plate resistor (R-18)
Low volt. and high M.A. on pentode																																*1.0	215	165	46	Open 250,000 pentode grid bias resistor (R-19-20)
Low volt. on all tubes & high grid on pentode	10	10	0	20	25	1.8	*0.4	20	20	55	0.1	0.8	20	20	55	0	0.4	20	20	55	.1	0.8	45	270	45	0	0.4	*.5	18	*25	0	*7.8	70	65	0	Open 200 ohms section of vitreous resistor (R-15)
No S.G. or plate volt., high cathode volts	36	36	0	300	0	0	*0.5	0	300	0	0	0	0	300	0	0	0.5	0	300	0	0	0	10	–49	50	0	0	0	300	0	0	*1.0	260	215	56	Open2,000 ohms section of vitreous resistor (R-14)
High S.G. & high pl. volt., low cathode volts	42	42	8	60	160	9	*2.0	170	50	245	8	15	95	76	180	1	3.2	185	33	230	3.5	1	9	–46	10	0	5.9	*49	66	*105	.2	*2	260	225	35	Open 3,000ohms section ofvitreous resistor (R-13)
No S.G. or cathode volt., high plate volts	35	35	0	0	0	0	*0.6	0	0	300	0	0	0	0	240	0	0.5	0	0	300	0	0	9	–50	5	0	0	0	13	*20	20	*1.0	260	210	60	Open 3,000 ohms section of vitreous resistor (R-12)
No S.G. volt. or M.A. on 1st R.F., 1st I.F.							*0.5	1.0	66	192	0	2	2.0	66	85	0	0.5	1.0	66	185	0															Open 20,000 ohms S.G. voltage resistor (R-11)
No C.G. or S.G. volt. on A.V.C.																						0	0	–72	24	0										Open 25,000 vitreous resistor to S.G. of A.V.C. (R-8)
High S.G. and low plate volt. on A.V.C.																						0	59	–72	5	0										Open 5,000 ohms resistor S.G. to cathode of A.V.C. (R-9)
No C.G. or plate volt. on A.V.C.																						0	8	–48	0	0										2megohm resistor plate of A.V.C. to ground (R-6)
No S.G. or plate volt. on 1st det.												5.4	0	80	0	0																				Open 10,000 ohms 1st det. cathode (R-3)
High grid volt. on oscillator			4	74	83	2.5																														Open 100,000 ohms grid of osc. to ground (R-4)
No C.G. and high M.A. on 1st det.												0	50	84	180	1.7																				Shorted 0.1 mfd. 1st det. K by-pass cond. (C-3)
High C.G. volt. on 1st R.F.							*1.9	60	80	190	4.0																									Shorted 0.25 mfd. 1st R.F. grid bias cond. (C-10)
High plate volt. on A.V.C.							*0.5	50	80	185	3.5						2.0	50	84	180	5.	0	25	+50	135	0										Shorted 0.1 mfd. A.V.C. plate to ground (BC1)
High C.G. and no plate volt. on 2nd det.																											7.5	*40	86	0	0					Shorted 0.0002 mfd. 2nd det. plate to cath. (BC5)
No C.G. and low plate volt. on 2nd det.																											0	8	80	*50	.5					Shorted 1.0 mfd. 2nd det. cath. to ground (BC6)
Reverse polarity reading on 2nd det. pl., pent. grid																											1.5	*18	55	*–50	0	**5.	200	140	58	Shorted 0.1 mfd. R.F. choke to grid of pentode (C-9)
Low C.G. and no S.G. volt. on 2nd det.																											0.5	0	80	*100	0					Shorted 0.1 mfd. S.G. to ground 2nd det. (BC-7)
Slight change in 1st R.F. and 1st I.F. C.G. volts							*.3	60	80	190	.25						2.8	75	80	195	1.0															Shorted 0.25 mfd. 1st R.F. and 1st I.F. K's to ground (BC-2)
High cathode volt.	56	56	0	190	0	0	*0.5	0	190	0	0	0	0	190	0	0	0.5	0	190	0	0	.25	30	–65	40	0	0	0	190	0	0	*4.0	190	185	5	Shorted 1 mfd. plate supply to ground (BC-3)
No plate volt. or M.A. on 1st R.F.							*0.5	40	75	0	0																									Open primary of untuned R.F. transformer
No plate volt. or M.A. on 1st det.												4.0	50	80	0	0																				Open primary of 1st I.F. transformer
No plate volt. or M.A. on 1st I.F.																	0.4	40	75	0	0															Open primary of 2nd I.F. transformer
No plate volt. or M.A. on 2nd det.																											1.5	*24	75	0	0					Open R.F. choke
No plate volt. or M.A. on oscillator			0	80	0	0																														Open oscillator plate coil
No plate volt. or M.A. on pentode																																*4.0	260	0	0	Open primary of output transformer
No C.G. volts and high M.A. on 1st R.F.							0	50	80	180	4.0																									Open 2nd pre-selector coil
No C.G. volts and high M.A. on 1st det.												0	45	84	175	1.0																				Open secondary of untuned R.F. transformer
No C.G. volts and high M.A. on 1st I.F.																	0	50	80	185	5.															Open secondary of 1st I.F. transformer
No C.G. volts and high M.A. on 2nd det.																											0	*15	80	45	.5					Open secondary of 2nd I.F. transformer

KOLSTER RADIO, INC.

PEAK FREQUENCY
175 KC



CAPACITY COLOR CODE

CAPACITY	COLOR
.0005	RED
.000725	YELLOW
.001	ORANGE
.002	GREEN

RESISTOR COLOR CODE

VALUE	BODY	TIP	DOT
200	RED	BLACK	BROWN
5,000	GREEN	BLACK	RED
10,000	BROWN	BLACK	ORANGE
20,000	RED	BLACK	ORANGE
25,000	RED	GREEN	ORANGE
50,000	GREEN	BLACK	ORANGE
100,000	BROWN	BLACK	YELLOW

VALUE	BODY	TIP	DOT
0.25 MEG.	RED	GREEN	YELLOW
2 MEG.	RED	BLACK	GREEN

Power Consumption 95 Watt

For additional data see pages 434-I and 434-J

KOLSTER — INTERNATIONAL RADIO MODELS K-80—K-82

- 1931 -

KOLSTER RADIO, INC.

KOLSTER K-80-82 VOLTAGE READING CHART

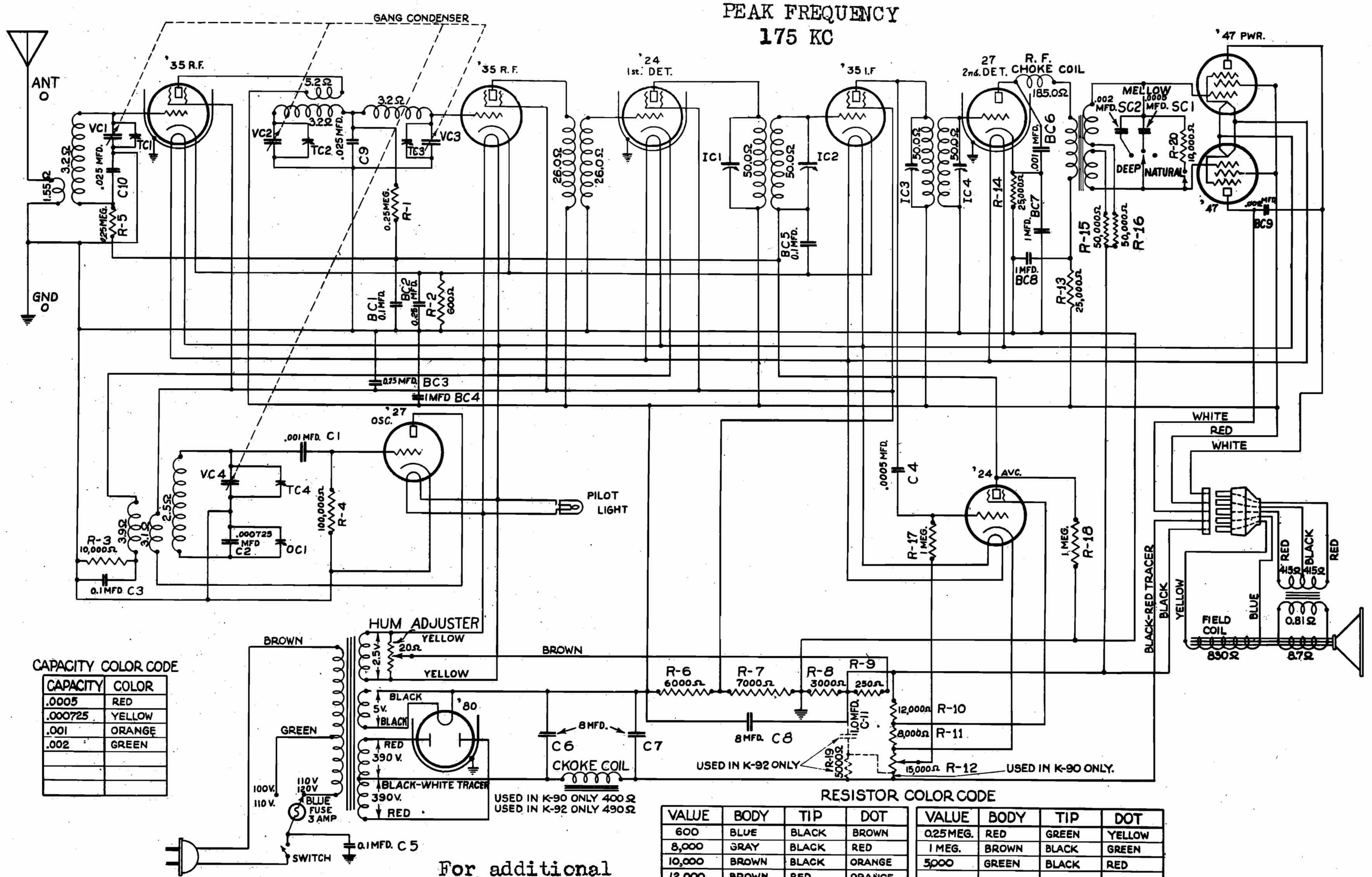
Volume Control Maximum
Tone Control Natural Position

*Indicates incorrect reading due to high resistance in circuit. All voltages will vary with change in tubes.

	TUBE—80 Rectifier		TUBE—27 Oscillator				TUBE—35 1st R. F.					TUBE—24 1st Det.					TUBE—35 1st I. F.					TUBE—24 A. V. Cont.					TUBE—27 2nd Det.				TUBE—47 Pentode A. F.				TUBE—47 Pentode A. F.				Causes of Incorrect Readings
	M A	M A	Grid V.	K. V.	Pl. V.	Pl. M A	C. G.	S G V.	K. V.	Pl. V.	Pl. M A	CG V.	SG V.	K. V.	Pl. V.	Pl. M A	C. G V.	SG V.	K. V.	Pl. V.	Pl. M A	C. G V.	S.G V.	K. V.	Pl. V.	Pl. M A	Grid V.	K. V.	Pl. V.	Pl. M A	Spa. Chg.	Grid V.	Pl. V.	Pl. M A	Spa. Chg.	Grid V.	Pl. V.	Pl. M A	
NORMAL READINGS	48	48	*0	52	80	6.0	*0.4	80	48	185	2.5	5.5	80	58	185	.6	*0.2	90	44	195	1.0	0.5	44	-60	15	0	15	75	150	0.6	245	*12	225	30	245	*12	225	30	
No plate v., high grid v. on 1st R.F. & 1st I.F.							*0.6	0	60	0	0						*0.6	0	60	0	0																		Open 200 ohm res., 1st I.F. & 1st R.F. K to gnd. (R-2)
High M.A. on 1st R.F. & 1st I.F.							*0.2	75	60	165	7.0						*0.2	70	66	160	5.0																		Open 250M ohm res., 1st R.F. & 1st I.F. grid bias (R-1)
No plate v. or M.A. on 2nd det.																											16	75	0	0									Open 25M ohm 2nd det. Cath. res. (R-14)
No plate v. or grid v. on 2nd det.																											0	60	0	0									Open 25M ohm 2nd det. plate v. res. (R-13)
No grid v. on Pent.																															165	0	135	40	165	0	135	40	Open 50M ohm pwr. Pent. bias res. (R-15-16)
High plate and high S.G. v.	25	25	*5.0	0	110	6.0	*2.0	145	-40	300	.5	12	115	0	265	1	*8.0	145	0	300	1.5	0	20	-80	15	0	20	0	205	0.8	85	*50	80	0	85	*50	80	0	Open 250 ohm sect. of vit. res. (R-8)
No plate and high Cath. v.	46	46	0	250	0	0	*0.5	0	250	0	0	0	0	250	0	0	*0.5	0	250	0	0	0.5	38	-54	50	0	0	250	0	0	260	*12	235	35	260	*12	235	35	Open 3M ohm sect. of vit. res. (R-7)
High plate and no S.G. v.	45	45	0	-15	0	0	*0.5	0	-15	300	0	0	0	15	300	0	*0.5	0	-15	300	0	0.2	35	-54	25	0	20	5	235	1.0	242	*13	260	30	245	*13	260	30	Open 6M ohm sect. of vit. res. (R-5)
High S.G. and low Cath. v.	50	50	*4.0	66	100	6.5	*1.0	150	24	200	2.0	10	100	75	155	1.0	*0.5	165	24	210	2.5	0.1	40	-58	10	0	12	78	130	0.5	240	*10	220	30	240	*10	220	30	Open 7M ohm sect. of vit. res. (R-6)
No plate v. and low Cath. v. on A.V.C.																						0	30	-48	0	0													Open 2 meg. res. grid of A.V.C. to vol. cont. (R-11)
No plate v. or C.G. v. on A.V.C.																						0.5	42	-58	0	0													Open 2 meg. res. plate of A.V.C. to gnd. (R-12)
No plate v. and high S.G. v. on A.V.C.																						0.4	72	-88	0	0													Open 20M ohm A.V.C. S.G. to K res. (R-9)
No plate v. or S.G. v. on A.V.C.																						0	0	-12	0	0													Open 15M ohm vol. cont. (R-10)
No M.A. on osc.			0	50	80	0																																	Open 100M ohm osc. grid to gnd. res. (R-4)
High grid v. on osc. & 1st det.			*2.0	50	85	4.0						7.0	0	58	0	0																							Open 10M ohm 1st det. Cath. res. (R-3)
High C.G. v. & high M.A. on 1st R.F.							*1.5	70	50	165	5.0						*5.0	75	58	175	1.0																		Shorted .025 mfd. pre-selec. coup. cond. (C-9)
No plate v. & high grid v. on 2nd det.																											75	135	0	0									Shorted 2nd det. bridg. cond. (BC-6)
No grid v. & high M.A. on 2nd det.																											0	55	50	5.0									Shorted 2nd det. Cath. by-pass cond. (BC-7)
No grid & no plate v. on 2nd det.																											0	60	0	0									Shorted 1.0 mfd. pl. to gnd. by-pass cond. (BC-8)
Slight drop of M.A. on 1st R.F.							*0.4	80	48	185	1.5						*0.4	90	44	195	1.0																		Shorted .25 mfd.1 R.F.& 1 I.F. K by-pass cond. (BC-2)
No osc. pl.v.or S.G.v.on 1st R.F., 1 det. 1st I.F.			0	63	0	0	*0.5	0	68	165	0	0	0	65	160	0	*0.5	0	68	165	0	0.4	45	-60	20	0													Shorted .25 mfd. S.G. to gnd. by-pass cond. (BC-3)
No plate & high Cath. v.	60	60	0	180	0	0	0	0	180	0	0	0	0	180	0	0	0	0	180	0	0	0.5	54	-65	35	0	0	180	0	0	180	*8	165	20	180	*8	165	20	Shorted 1.0 mfd. by-pass cond. (BC-4)
No C.G. v. & high M.A. on 1st I.F.																	0	68	70	155	6.0																		Shorted 0.1 mfd. by-pass cond. (BC-5)
High plate v. & no M.A. on A.V.C.																						0.4	44	-60	125	0													Shorted 0.1 mfd.pl. of A.V.C.to gnd. by-pass cond.(BC-1)
No C.G. v. & high M.A. on 1st det.												0	78	60	175	3.0																							Shorted 0.1 mfd. 1st det. Cath. by-pass cond. (C-3)
No C.G. on 1st R.F.							0	75	54	165	6.5																												Open 2nd pre-selec. coil.
No plate v. or M.A. on 1st R.F.							*0.4	80	50	0	0																												Open pri. of untuned transf.
No C.G. on 1st det.												0	60	72	170	2.0																							Open sec. of untuned transf.
No plate v. or M.A. on 1st det.												5.5	80	58	0	0																							Open pri. of 1st I.F. transf.
No C.G. on 1st I.F.																	0	80	65	180	7.5																		Open sec. of 1st I.F. transf.
No plate v. or M.A. on 1st I.F.																	*0.2	80	50	0	0																		Open pri. of 2nd I.F. transf.
No grid v. on 2nd det.																											0	50	125	1.0									Open sec. of 2nd I.F. transf.
No plate v. or M.A. on 2nd det.																											0	45	0	0									Open R.F. choke or pri. of audio transf.
No grid v. & high M.A. on one Pent.																															150	0	170	56	205	*14	200	8	Open sect. of sec. of audio transf.
No grid v. & high M.A. on one Pent.																															205	*14	200	8	150	0	170	56	Open sect. of sec. of audio transf.
No plate v. or M.A. on one Pent.																															250	*12	0	0	250	*12	225	35	Open sect. of output transf.
No plate v. or M.A. on one Pent.																															250	*12	225	35	250	*12	0	0	Open sect. of output transf.
No plate v. or M.A. on both Pent.																															250	*10	0	0	250	*10	0	0	Open center tap of output transf.

KOLSTER RADIO, INC.

PEAK FREQUENCY
175 KC



CAPACITY COLOR CODE

CAPACITY	COLOR
.0005	RED
.000725	YELLOW
.001	ORANGE
.002	GREEN

RESISTOR COLOR CODE

VALUE	BODY	TIP	DOT
600	BLUE	BLACK	BROWN
8,000	GRAY	BLACK	RED
10,000	BROWN	BLACK	ORANGE
12,000	BROWN	RED	ORANGE
25,000	RED	GREEN	ORANGE
50,000	GREEN	BLACK	ORANGE
100,000	BROWN	BLACK	YELLOW

VALUE	BODY	TIP	DOT
0.25 MEG.	RED	GREEN	YELLOW
1 MEG.	BROWN	BLACK	GREEN
5,000	GREEN	BLACK	RED

For additional data see pages 434-I and 434-J

Power Consumption 95 Watt

KOLSTER—INTERNATIONAL RADIO MODELS K-90—K-92

-1931-

KOLSTER RADIO, INC.

Volume Control Maximum
Tone Control Natural Position

KOLSTER K-90-92 VOLTAGE READING CHART

*Indicates incorrect reading due to high resistance in circuit. All voltages will vary with different tubes.

	TUBE—80 Rectifier		TUBE—27 Oscillator				TUBE—35 1st R. F.					TUBE—35 2nd R. F.				
	M A	M A	* Grid V.	K. V.	Pl. V.	Pl. M A	* C.G. V.	S.G. V.	K. V.	Pl. V.	Pl. M A	* C.G. V.	S.G. V.	K. V.	Pl. V.	Pl. M A
NORMAL READINGS	**47.**	**47.**	**0**	**62**	**73**	**5.5**	**-0.2**	**75.**	**68**	**176**	**3.0**	**-0.2**	**75**	**68**	**177**	**3.0**
No plate v. on R.F. & I.F.							-0.8	0	71	4.0	0	-0.8	0	70	4.0	0
High pl. current on 2nd R.F. & I.F.												-0.2	70	72	170	6.0
High pl. current on 1st R.F.							-0.2	74	72	175	7.0					
No plate v. or M.A. on 2nd det.																
No plate v. or grid v. on 2nd det.																
No grid v. on Pent.																
High plate & S.G. v.	24	24	-5.0	0	115	7.0	-0.2	110	5.0	260	5.0	-2.3	130	0	310	0.7
No plate & high Cath. v.	43	43	0	250+	0	0	-0.4	0	250+	0	0	-0.5	0	250+	0	0
High S.G. & low Cath. v.	50	50	-5.0	60	120	8.0	-0.2	125	70	180	5.5	0.2	125	70	180	5.5
High plate & no S.G. v.	44	44	0	-16	0	0	-0.4	0	-16	300	0	-0.4	0	-16	300	0
Low plate & Cath. on A.V.C.																
No plate v. or M.A. on A.V.C.																
No S.G. v. on A.V.C.																
High Cath. v. on A.V.C.																
No S.G. & low Cath. v on A.V.C.																
High grid v. on osc. & 1st det.			-5.0	40	100	5.0										
No grid on osc.			0	40	100	4.0										
High grid v. on 2nd R.F. & I.F.							-0.2	75	68	180	3.0	6.0	75	68	180	3.0
No grid v. & high M.A. on 1st det.																
High grid & no plate v. on 2nd det.																
No grid v. & high M.A. on 2nd det.																
No grid v. & no plate v. on 2nd det.																
Slight drop of M.A. on 2nd R.F.							0	75	80	160	4.5	-4.0	85	100	180	1.5
No osc. pl. v. or S.G. v. on R.F. & I.F.			0	70	0	0	0	0	70	175	0	0	0	70	175	0
No plate & high Cath. v.	64	64	0	100+	0	0	0	0	100+	0	0	0	0	100+	0	0
High M.A. on 1st I.F.																
High plate v. & no M.A. on A.V.C.																
High grid v. on 1st R.F. & I.F.							-6.0	75	68	180	3.0	-0.2	75	68	180	3.0
High M.A. on 1st R.F							0	73	72	175	6 0					
No plate v. or M.A. on 1st R.F							-0.2	73	63	0	0					
High M.A. on 2nd R.F.												0	72	72	175	5 6
No plate v. or M.A. on 2nd R.F.•												-0.3	75	64	0	0
High M.A. on 1st det.																
No plate v. or M.A. on 1st det.																
High M.A. on I.F.																
No plate v. or M.A. on I.F																
High M.A. on 2nd det.																
No plate v. or M.A. on 2nd det.																
No plate v. or M.A. on osc.			0	60	0	0										
No grid v & high M.A. on one Pent.																
No grid v. & high M.A. on one Pent.																
No plate v or M.A. on one Pent.																
No plate v. or M.A. on one Pent.																
No plate v or M.A. on both Pent.																

	TUBE—24 1st Det.					TUBE—35 1st I. F.					TUBE—27 2nd Det.				TUBE—24 A. V. C.				
	C. G. V.	S.G. V.	K. V.	Pl. V.	Pl. M A	* C. G V.	S.G V.	K. V.	Pl. V.	Pl. M A	Grid V.	K. V.	* Pl. V.	Pl. M·A	C.G. V.	S.G. V.	K. V.	Pl. V.	Pl. M A
NORMAL READINGS	**-5.6**	**72.**	**68**	**175**	**0.52**	**-0.4**	**75**	**68**	**177**	**2.6**	**-15.0**	**76.**	**145**	**0.65**	**-0.5**	**44**	**-58**	**67.**	**0**
No plate v. on R.F. & I.F.						-1.2	0	70	4.0	0									
High pl. current on 2nd R.F. & I.F.						-3.5	75	66	175	1.5									
High pl. current on 1st R.F.																			
No plate v. or M.A. on 2nd det.											-20.0	78	4.0	0					
No plate v. or grid v. on 2nd det.											0	60	0	0					
No grid v. on Pent.																			
High plate & S.G. v.	-12.0	105	5.0	260	0.86	-76	135	0	300	1.6	-23	5 0	215	0 9	-0.4	8.0	-66	25.	0
No plate & high Cath. v.	0	0	250+	0	0	0	0	250+	0	0	0	250+	0	0	-0.4	15.	-50	190	0
High S.G. & low Cath. v.	-12	120	72	180	1.0	-33	155	39	200	2.5	-15.0	72	150	0.65	-0.4	15.	-54	40	0
High plate & no S.G. v.	-0.3	0	-14	300	0	-0.4	0	-16	300	0	-24.0	8 0	240	1.0	-0.4	14.	-51	20	0
Low plate & Cath. on A.V.C.															0	15	-54	12.	0.1
No plate v. or M.A. on A.V.C.															-0.4	16	-54	0	0
No S.G. v. on A.V.C.															-0.4	0	-84	80	0
High Cath. v. on A.V.C.															-0.4	66	-84	60	0.1
No S.G. & low Cath. v on A.V.C.															-8.0	0	-14	30	0
High grid v. on osc. & 1st det.	-14.	0	52	0	0														
No grid on osc.																			
High grid v. on 2nd R.F. & I.F.						-2.0	75	68	180	2.5									
No grid v. & high M.A. on 1st det.	0	72	68	175	4.0														
High grid & no plate v. on 2nd det.											-77	100+	0	0					
No grid v. & high M.A. on 2nd det.											0	68	50	4.3					
No grid v. & no plate v. on 2nd det.											0	72	0	0					
Slight drop of M.A. on 2nd R.F.						0	90	50	200	1.5									
No osc. pl. v. or S.G. v. on R.F. & I.F.	0	0	70	175	0	0	0	70	175	0					-4.0	20	-56	70	0
No plate & high Cath. v.	0	0	100+	0	0	0	0	100+	0	0	0	100+	0	0	-4.0	25	-65	150	0
High M.A. on 1st I.F.						0	60	88	150	5.5									
High plate v. & no M.A. on A.V.C.															-4.0	20	-56	120	0
High grid v. on 1st R.F. & I.F.						-2.0	75	68	180	2.5									
High M.A. on 1st R.F																			
No plate v. or M.A. on 1st R.F																			
High M.A. on 2nd R.F.																			
No plate v. or M.A. on 2nd R.F.•																			
High M.A. on 1st det.	0	60	80	160	1.4														
No plate v. or M.A. on 1st det.	-6.0	75	66	0	0														
High M.A. on I.F.						0	73	72	175	5.5									
No plate v. or M.A. on I.F						-0.4	75	64	0	0									
High M.A. on 2nd det.											0	68	80	1.75					
No plate v. or M.A. on 2nd det.											0	58	0	0					
No plate v. or M.A. on osc.																			
No grid v & high M.A. on one Pent.																			
No grid v. & high M.A. on one Pent.																			
No plate v or M.A. on one Pent.																			
No plate v. or M.A. on one Pent.																			
No plate v or M.A. on both Pent.																			

	TUBE—47 Pentode A. F.				TUBE—47 Pentode A. F.				Causes of Incorrect Readings
	Spa. Chg.	* Grid	Pl. V.	Pl. M A	Spa. Chg.	* Grid	Pl. V.	Pl. M A	
NORMAL READINGS	**250**	**-12**	**228**	**28.**	**250**	**-12.0**	**228**	**28.0**	
No plate v. on R.F. & I.F.									Open 600 ohm res., Cath. to gnd. (R-2)
High pl. current on 2nd R.F. & I.F.									Open 250M ohm res., grid to gnd. in-band stage (R-1)
High pl. current on 1st R.F.									Open 250M ohm res., 1st R.F. stage (R-5)
No plate v. or M.A. on 2nd det.									Open 25M ohm 2nd det. Cath. res. (R-14)
No plate v. or grid v. on 2nd det.									Open 25M ohm 2nd det. plate res. (R-13)
No grid v. on Pent.	180	0	150	38	180	0	150	38	Open 50M ohm pwr. Pent. bias res. (R15-16)
High plate & S.G. v.	85	-50	170	0	85	-50	170	0	Open 250 ohm sect. of vit. res. (R-9)
No plate & high Cath. v.	260	-16	240	30	260	-16	240	30	Open 3M ohm sect. of vit. res. (R-8)
High S.G. & low Cath. v.	235	-15	210	28	235	-15	210	28	Open 7000 ohm sect. of vit. res. (R-7)
High plate & no S.G. v.	260	-13	240	32	260	-13	240	32	Open 6M ohm sect. of vit. res. (R-6)
Low plate & Cath. on A.V.C.									Open 1 meg. res. grid of A.V.C (R-17)
No plate v. or M.A. on A.V.C.									Open 1 meg. res. plate of A.V.C. (R-18)
No S.G. v. on A.V.C.									Open 12M ohm S.G. to res. sect. of A.V.C. (R-10)
High Cath. v. on A.V.C.									Open 8M ohm S.G. to Cath. res. of A.V.C. (R-14)
No S.G. & low Cath. v on A.V.C.									Open 15M ohm vol. cont. (R-12)
High grid v. on osc. & 1st det.									Open 10M ohm 1st det. bias res., osc. coup. coil (R-3)
No grid on osc.									Open 100M ohm osc. grid to gnd. res. (R-4)
High grid v. on 2nd R.F. & I.F.									Shorted pre-selec. coup. cond. (C-9)
No grid v. & high M.A. on 1st det.									Shorted 1st det. Cath. by-pass cond. (G-3)
High grid & no plate v. on 2nd det.									Shorted 2nd det. bridg. cond. (BC-6)
No grid v. & high M.A. on 2nd det.									Shorted 2nd det. Cath. by-pass cond. (BC-7)
No grid v. & no plate v. on 2nd det.									Shorted 1.0 mfd. pl. to gnd. by-pass cond. (BC-8)
Slight drop of M.A. on 2nd R.F.									Shorted 0.25 mfd. R.F.&I.F. Cath.by-pass cond. (BC-2)
No osc. pl. v. or S.G. v. on R.F. & I.F.									Shorted 0.25 mfd. S.G. to gnd. by-pass cond. (BC-3)
No plate & high Cath. v.	190	-11	180	20.5	190	-11	180	20.5	Shorted 1.0 mfd. by-pass cond. (BC-4)
High M.A. on 1st I.F.									Shorted 0.1 mfd. I.F. by-pass cond. (BC-5)
High plate v. & no M.A. on A.V.C.									Shorted 0.1 mfd. pl.of A V.C.to gnd.by-pass cond. (BC-1)
High grid v. on 1st R.F. & I.F.									Shorted 1st R.F. 0.025 mfd. coup. cond. (C-10)
High M.A. on 1st R.F									Open sec. of ant. coup. coil
No plate v. or M.A. on 1st R.F									Open pri. of pre-selec. coil
High M.A. on 2nd R.F.									Open 2nd pre-selec. coil
No plate v. or M.A. on 2nd R.F.•									Open pri. of untuned trans.
High M.A. on 1st det.									Open sec. of untuned transf.
No plate v. or M.A. on 1st det.									Open pri. of 1st I.F. transf.
High M.A. on I.F.									Open sec. of 1st I.F. transf.
No plate v. or M.A. on I.F									Open pri. of 2nd I.F. transf
High M.A. on 2nd det.									Open sec. of 2nd I.F. transf.
No plate v. or M.A. on 2nd det.									Open R.F. choke or pri. of audio transf.
No plate v. or M.A. on osc.									Open osc. plate coil
No grid v & high M.A. on one Pent.	220	0	180	52	235	-18	220	18	Open sect. of sec. of audio transf.
No grid v. & high M.A. on one Pent.	235	-18	220	18	220	0	180	52	Open sect. of sec. of audio transf.
No plate v or M.A. on one Pent.	250+	-14	0	0	250+	-14	235	30	Open sect. of pri of output transf.
No plate v. or M.A. on one Pent.	250+	-14	235	30	250+	-14	0	0	Open sect. of pri. of output transf.
No plate v or M.A. on both Pent.	250+	-12	0	0	250+	-12	0	0	Open center tap of pri. of output transf.

KOLSTER RADIO, INC.

Models K-60—K-62 — K-70—K-72 — K-80—K-82— K-90—K-92

R.F. TUNING AND OSCILLATOR TRIMMING CONDENSER ADJUSTMENTS

Located on the front of the gang condenser are three trimmer condensers (TC-1-2-3) which are provided for aligning the R.F. circuits. The 600 K.C. trimmer condenser (OC-1) for the OSCILLATOR will be found on the right hand top of the chassis base directly in front of the '80 socket and opposite the coil shield. Poor tone, lack of sensitivity and selectivity, or complete inoperation of the receiver may be caused by these condensers being out of adjustment.

(a) Place the oscillator in operation at exactly 1400 K.C. and couple it to the antenna. Connect the output device in accordance with the type used. Tune in the oscillator signal and adjust the coupling between the oscillator and the antenna lead of the set, or increase the volume control setting until a deflection is obtained in the output meter.

(b) With an insulated screw driver adjust each of the trimmer condensers mounted on the gang condenser frame until a maximum deflection is obtained in the output meter. If the pointer goes off scale reduce the coupling or the volume control.

(c) Set the oscillator now at 600 K.C. Tune in this signal with the receiver and adjust coupling or volume control for a deflection in the output meter. Now adjust the oscillator 600 K.C. trimmer condenser (OC-1) until a maximum deflection is obtained. In making this adjustment it is advisable to rock the tuning condenser back and forth a few degrees each side of the normal position.

(d) Change the setting of the oscillator back to 1400 K.C. and readjust the three trimmer condensers.

If attention is given to the adjustments the R.F. and oscillator circuits will be properly aligned and satisfactory results should be obtained. If not the next step is to adjust the I.F. circuits.

I.F. CIRCUIT ADJUSTMENTS

A single intermediate frequency stage with two transformers is used in band-pass arrangement. Each transformer has both the primary and secondary windings tuned accurately for 175 K.C.

To adjust these circuits proceed as follows:

(a) Set the previously mentioned oscillator at 175 K.C.

(b) Connect the output device.

(c) Remove the oscillator tube, which is the type '27 adjacent to the type '80, and make a good ground connection to the chassis.

(d) Connect the output of the oscillator to the Control Grid cap of the first detector, which is the type '24 tube.

(e) Adjust the oscillator output or the receivers volume control until a deflection is obtained in the output device.

(f) Place the chassis on end and the adjusting screws for the I.F. transformer condensers (IC-1-2-3-4) will be found through holes in the under side of the base after the bottom shield has been removed.

(g) Adjust the secondary and primary of the second and first I.F. transformers in the order just mentioned until a maximum deflection is obtained in the output meter. Make these adjustments the second time to insure proper aligning. It is now advisable to recheck the R.F. and oscillator condensers again.

LINE VOLTAGE VARIATIONS Models K-60—K-62 and Models K-70, K-72

These models were tested on 115 volts, and are therefore suitable for operation on line voltages ranging from 110 to 120 volts. Should lower line voltages be encountered it will be necessary to remove the chassis from the cabinet and unsolder the BLUE lead, which comes from the under side of the power transformer and is connected to one side of the line switch mounted on the rear of the volume control. In its place solder the GREEN lead, taping the end of the Blue lead just removed so that it will not short against other leads in the chassis. In locations where the line voltages exceed 120 volts, a suitable resistor will be necessary to reduce the voltage applied to the correct value.

CAUTION

NEVER TURN ON THE POWER TO THE SET WHEN THE SPEAKER IS DISCONNECTED

KOLSTER RADIO INC.

MODELS K-60—K-62

- Condenser, Electrolytic, 475 volts, 8 mfd. (C6-C7)
- Condenser, Electrolytic, 430 volts, 8 mfd. (C8)
- Condenser, fixed, Mica, .000725 mfd. (Yellow) (C2)
- Condenser, fixed, Mica, .0002 mfd. (Gray) (BC-4)
- Condenser, fixed, Mica, .001 mfd. (Orange) (C1)
- Condenser, fixed, Mica, .0015 mfd. (Blue) (SC-1)
- Condenser, fixed, Mica, .003 mfd. (Pink) (SC-2)
- Condenser, fixed, paper, .025 mfd. (200 volts) (C4)
- Condenser, fixed, paper, .1 mfd. (200 volts) (BC-6)
- Condenser, fixed, paper, .1 mfd. (400 volts) (C-5)
- Condenser, variable, 3 gang, comp. (VC-1, VC-2, VC-3)
- Condenser block (4 sections) (BC-1, BC-2, BC-3, C3)
- Resistor, fixed, carbon, 200 ohms (Body red, tip black, dot brown) (R5)
- Resistor, fixed, carbon, 10000 ohms (Body brown, tip black, dot orange) (R2)
- Resistor, fixed, carbon, 25000 ohms (Body red, tip green, dot orange) (R6)
- Resistor, fixed, carbon, 100000 ohms (Body brown, tip black, dot yellow) (R3)
- Resistor, fixed, carbon, .25 megohms (Body red, tip green, dot yellow) (R4, R7, R8, R9, R10)
- Resistor, fixed, carbon, 1 megohm (Body brown, tip black, dot green) (R1)
- Resistor, vitreous, tapped (R11, R12, R13, R14)

MODELS K-70—K-72

- Condenser, Electrolytic, 475 volts, 8 mfd. (C6-C7)
- Condenser, Electrolytic, 430 volts, 8 mfd. (C8)
- Condenser, fixed, Mica, .000725 mfd. (Yellow) (C2)
- Condenser, fixed, Mica, .0002 mfd. (Gray) (BC-5)
- Condenser, fixed, Mica, .0005 mfd. (Red) (C4)
- Condenser, fixed, Mica, .001 mfd. (Orange) (C1)
- Condenser, fixed, Mica, .0015 mfd. (Blue) (SC-1)
- Condenser, fixed, Mica, .003 mfd. (Pink) (SC-2)
- Condenser, fixed, paper, .025 mfd. (200 volts) (C-10)
- Condenser, fixed, paper, 0.1 mfd. (200 volts) (C3, C-9, BC-1, BC-4, BC-7, BC-8)
- Condenser, fixed, paper, 0.1 mfd. (400 volts) (C5), BC-11
- Condenser, fixed, paper, 1.0 mfd. (K-72) (C11)
- Condenser, variable, 3 gang, comp. (VC-1, VC-2, VC-3)
- Condenser block (5 sections) (BC-2, BC-3, BC-6, BC-9, BC-10)
- Resistor, fixed, carbon, 200 ohms (Body red, tip black, dot brown) (R2)
- Resistor, fixed, carbon, 5000 ohms (Body green, tip black, dot red) (R9, R21)
- Resistor, fixed, carbon, 10000 ohms (Body brown, tip black, dot orange) (R3)
- Resistor, fixed, carbon, 20000 ohms (Body red, tip black, dot orange) (R11)
- Resistor, fixed, carbon, 25000 ohms (Body red, tip green, dot orange) (R8, R16)
- Resistor, fixed, carbon, 100000 ohms (Body brown, tip black, dot yellow) (R4)
- Resistor, fixed, carbon, .25 megohms (Body red, tip green, dot yellow) (R1, R5, R17, R18, R19, R20)
- Resistor, fixed, carbon, 2 megohms (Body red, tip black, dot green) (R6, R7)
- Resistor, vitreous, tapped (R12, R13, R14, R15)

MODELS K-80—K-82

- Condenser, Electrolytic, 475 V. (C6-C7)
- Condenser, Electrolytic, 430 V. (C8)
- Condenser, fixed, Mica, .000725 Mfd. (Yellow) (C2)
- Condenser, fixed, Mica, .0005 Mfd. (Red) (SC-1, C4)
- Condenser, fixed, Mica, .001 Mfd. (Orange) (C1, BC-6)
- Condenser, fixed, Mica, .002 Mfd. (Green) (SC-2, BC-9)
- Condenser, fixed, paper, .025 Mfd. (200 volts) (C9)
- Condenser, fixed, paper, .1 Mfd. (200 volts) (BC-1, BC-5, C3)
- Condenser, fixed, paper, .1 Mfd. (400 volts) (C5) (BC-10)
- Condenser, fixed, paper, 1 Mfd. (200 volts) (K-82) (C10)
- Condenser, variable, 3 gang comp. (VC-1, VC-2, VC3)
- Condenser block (5 sections) (BC-2, BC-3, BC-4, BC-7, BC-8)
- Resistor, fixed, carbon, 200 ohms (Body red, tip black, dot brown) (R2)
- Resistor, fixed, carbon, 5000 ohms (Body green, tip black, dot red) (R18) (K-82)
- Resistor, fixed, carbon, 10000 ohms (Body brown, tip black, dot orange) (R3, R17)
- Resistor, fixed, carbon, 20000 ohms (Body red, tip black, dot orange) (R9)
- Resistor, fixed, carbon, 25000 ohms (Body red, tip green, dot orange) (R13, R14)
- Resistor, fixed, carbon, 50000 ohms (Body green, tip black, dot orange) (R15, R16)
- Resistor, fixed, carbon, 100000 ohms (Body brown, tip black, dot yellow) (R4)
- Resistor, fixed, carbon, .25 megohms (Body red, tip green, dot yellow) (R1)
- Resistor, fixed, carbon, 2 megohms (Body red, tip black, dot green) (R11, R12)
- Resistor, vitreous, tapped (R5, R6, R7, R8)

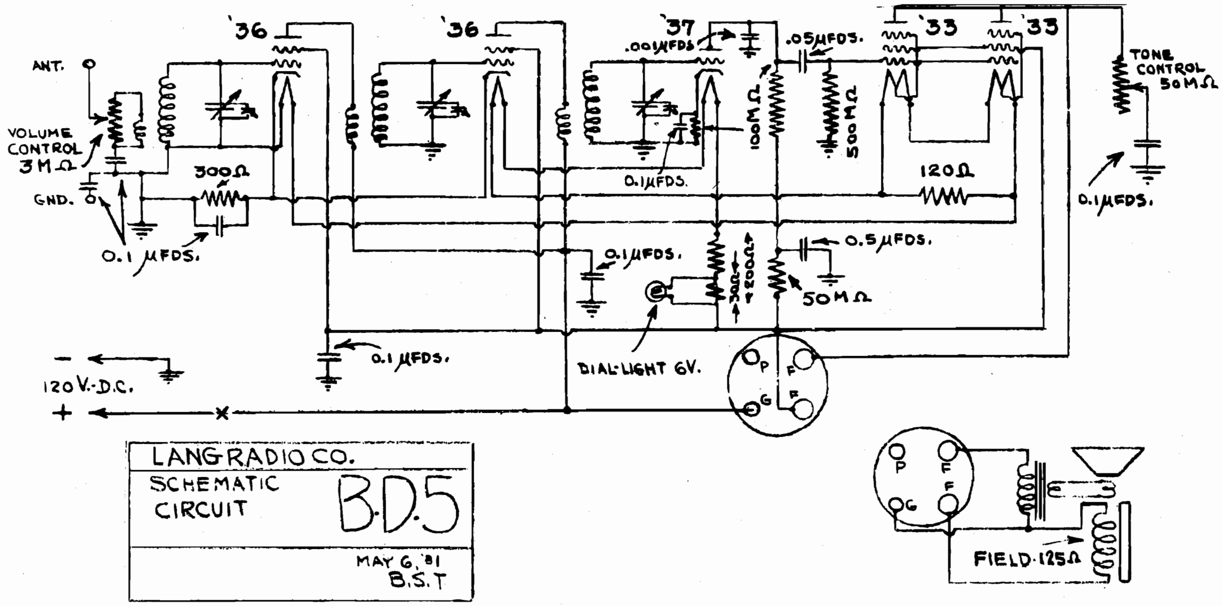
MODELS K-90—K-92

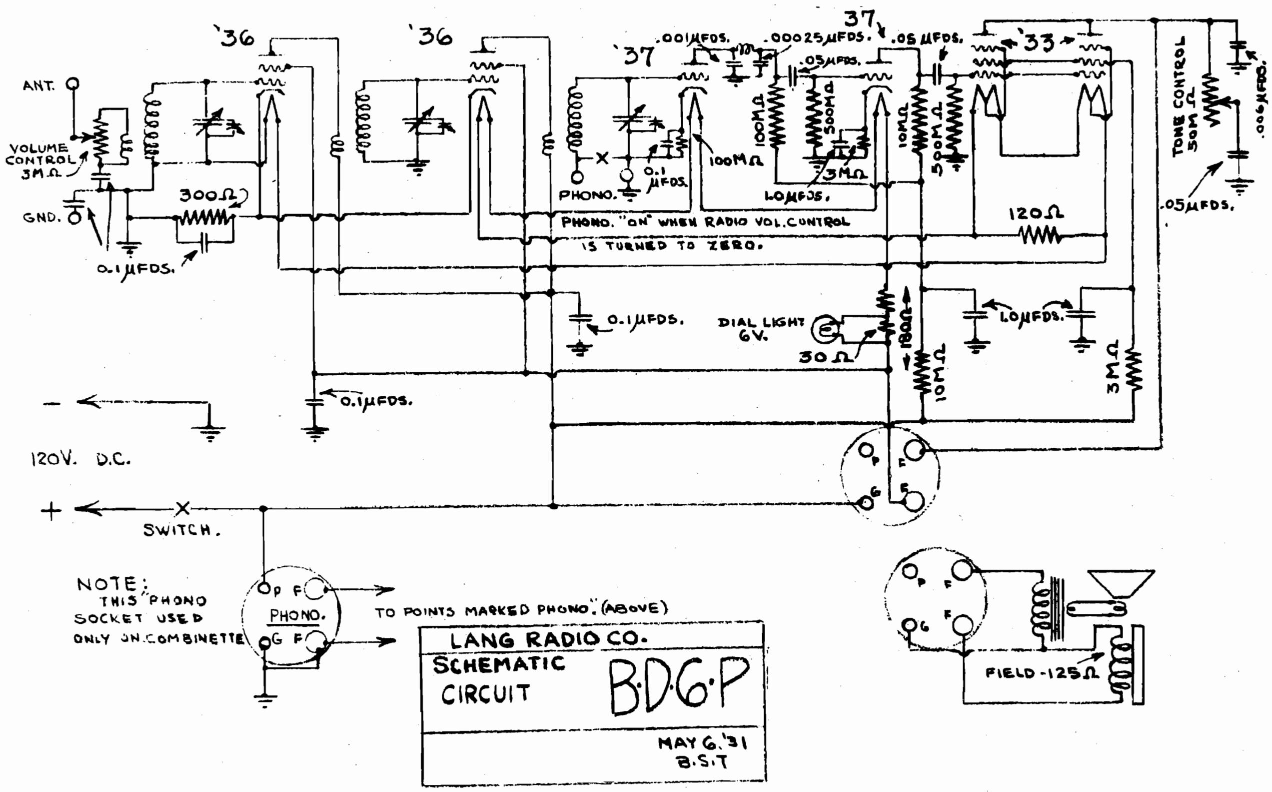
- Condenser, Electrolytic, 475 V. (C6-C7)
- Condenser, Electrolytic, 430 V. (C8)
- Condenser, fixed, Mica, .000725 Mfd. (Yellow) (C2)
- Condenser, fixed, Mica, .0005 Mfd. (Red) (SC-1, C4)
- Condenser, fixed, Mica, .001 Mfd. (Orange) (BC-6, C1)
- Condenser, fixed, Mica, .002 Mfd. (Green) (SC-2, BC-9)
- Condenser, fixed, paper, .025 Mfd. (200 volts) (C9-C10)
- Condenser, fixed, paper, .1 Mfd. (200 volts) (BC-1, BC-5, C3)
- Condenser, fixed, paper, .1 Mfd. (400 volts) (C5)
- Condenser, fixed, paper, 1 Mfd. (200 volts) K-92 (C11)
- Condenser, variable, 4 gang, comp. (VC-1, VC-2, VC-3, VC-4
- Condenser block (5 sections) (BC-2 BC-3, BC-4, BC-7, BC-8)
- Resistor fixed, carbon, 200 ohms (Body red, tip black, dot brown) (R2)
- Resistor, fixed, carbon, 5000 ohms (Body green, tip black, dot red) (R19)
- Resistor, fixed, carbon, 8000 ohms (Body gray, tip black, dot red) (R11)
- Resistor, fixed, carbon, 10000 ohms (Body brown, tip black, dot orange) (R3-R20)
- Resistor, fixed, carbon, 12000 ohms (Body brown, tip red, dot orange) (R-10)
- Resistor, fixed, carbon, 25000 ohms (Body red, tip green, dot orange) (R13-R14)
- Resistor, fixed, carbon, 50000 ohms (Body green, tip black, dot orange) (R15-R16-R19)
- Resistor, fixed, carbon, 100000 ohms (Body brown, tip black, dot yellow) (R4)
- Resistor, fixed, carbon, .25 megohms (Body red, tip green, dot yellow) (R1-R5)
- Resistor, fixed, carbon, 1 megohm (Body brown, tip black, dot green) (R17-R18)
- Resistor, vitreous, tapped (R6-R7-R8-R9)

Model K 80-82 sets as originally manufactured employed 15,000 ohm volume control unit, (Stamped No. 62018). To improve volume control action, this unit has been replaced with 15,000 ohm potentiometer, (Stamped No. 62025).

In addition to replacing the volume control unit as just described, a 1,000 ohm fixed resistor, Part No. 6569-15, is installed in the Cathode circuit of the automatic volume control tube. This should be connected between the end of the volume control unit (R-10) and the 20,000 ohm resistor (R-9).

LANG RADIO CO.

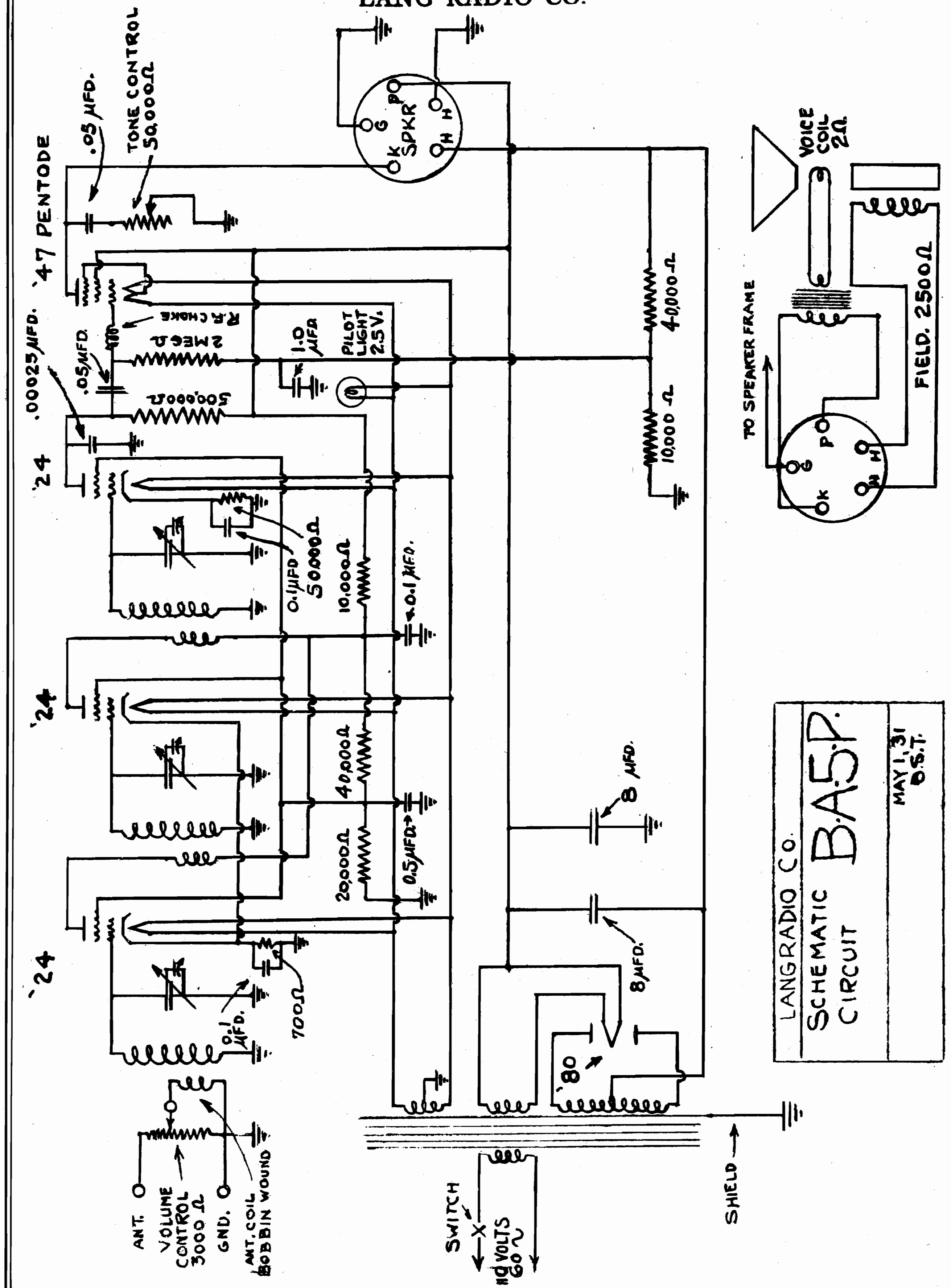




MODEL BD-5 (DC)
MODEL BD-6-P (DC)

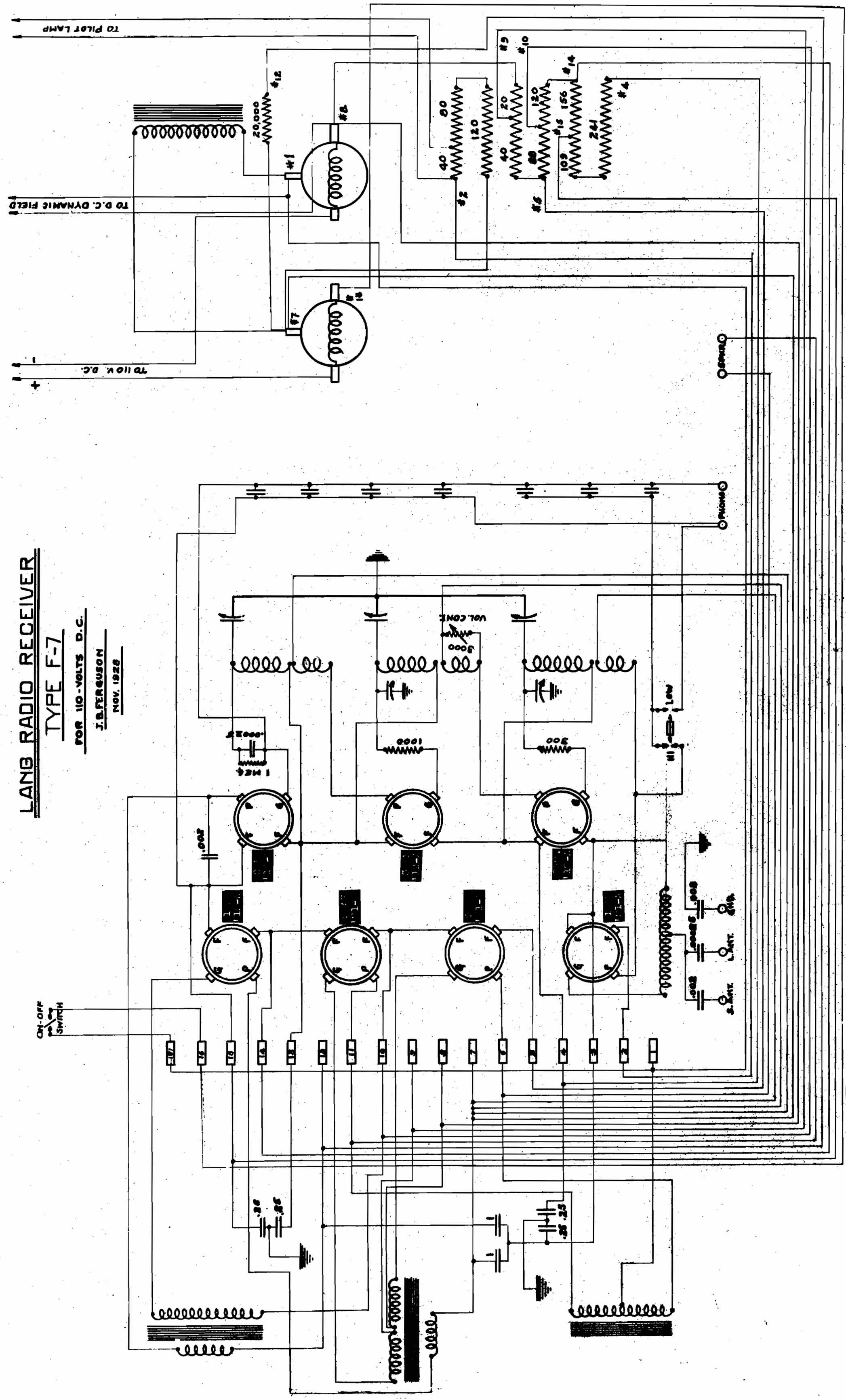
BA-5-P A.C.
PENTODE

LANG RADIO CO.

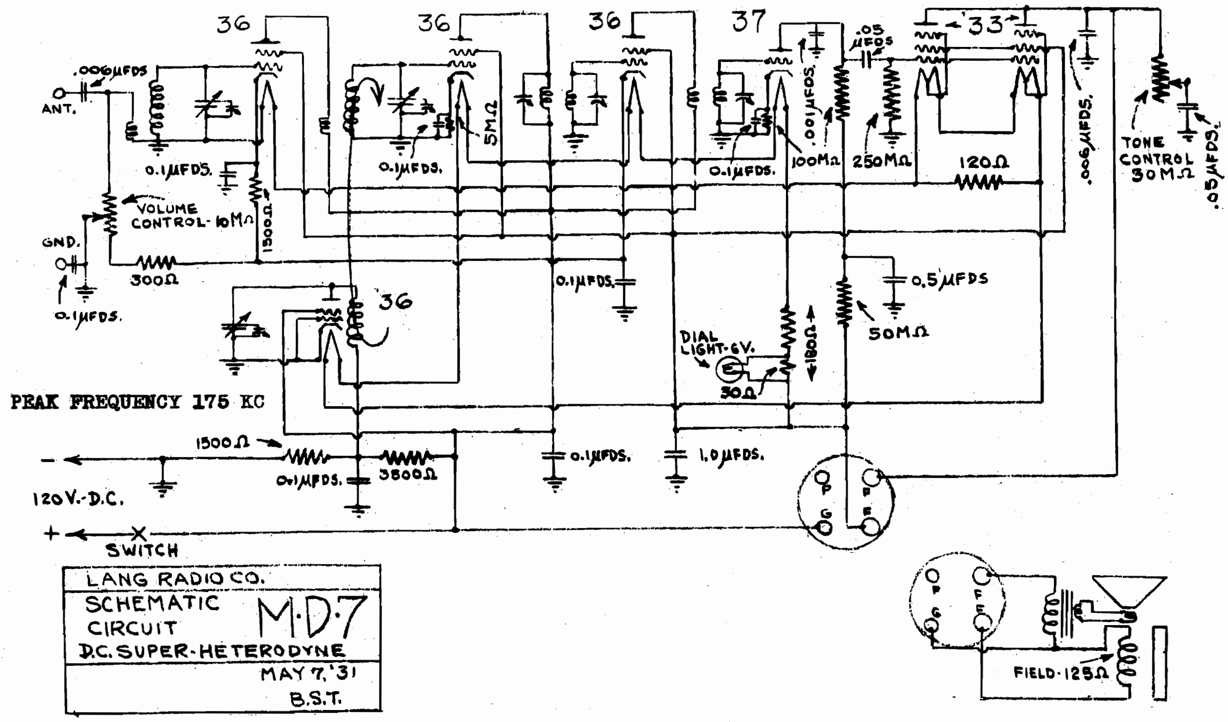


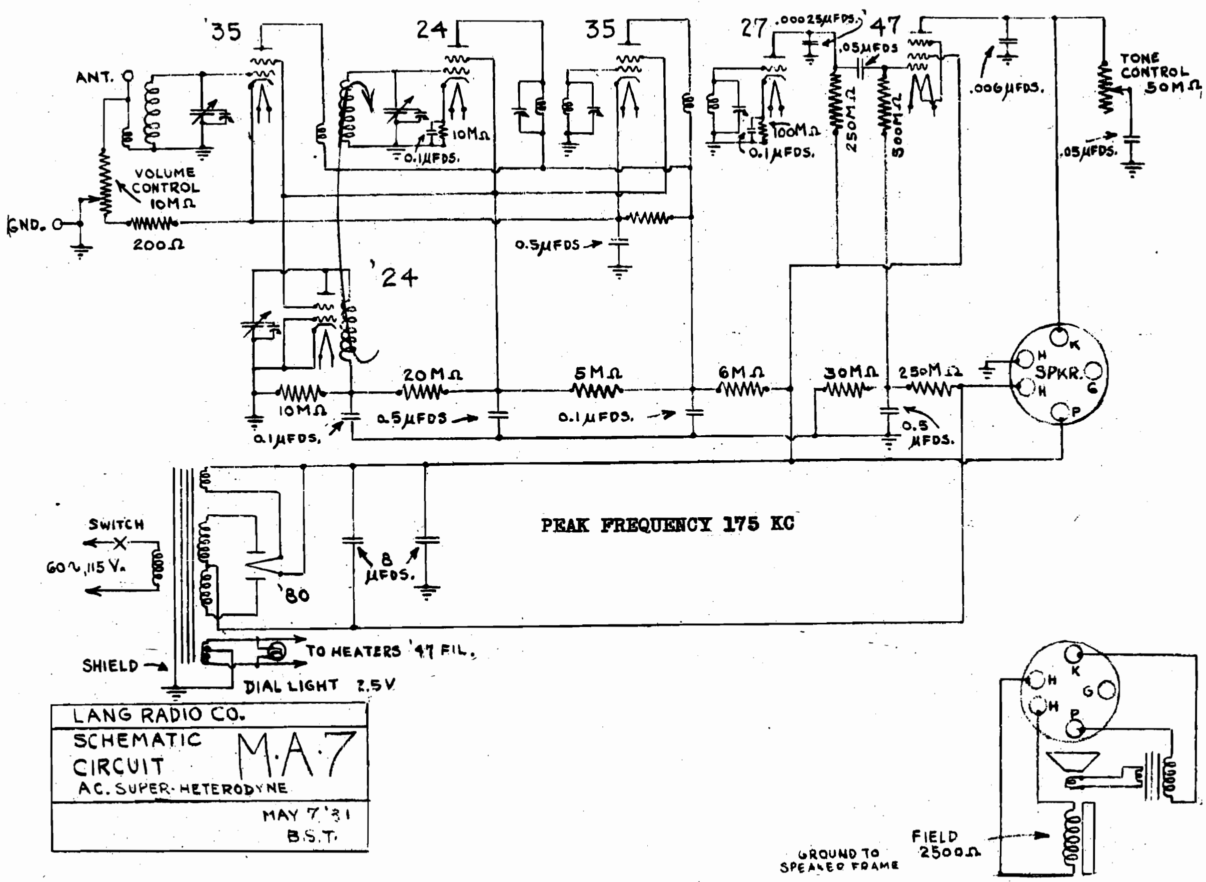
TYPE F-7
110 V D.C.

LANG RADIO CO.



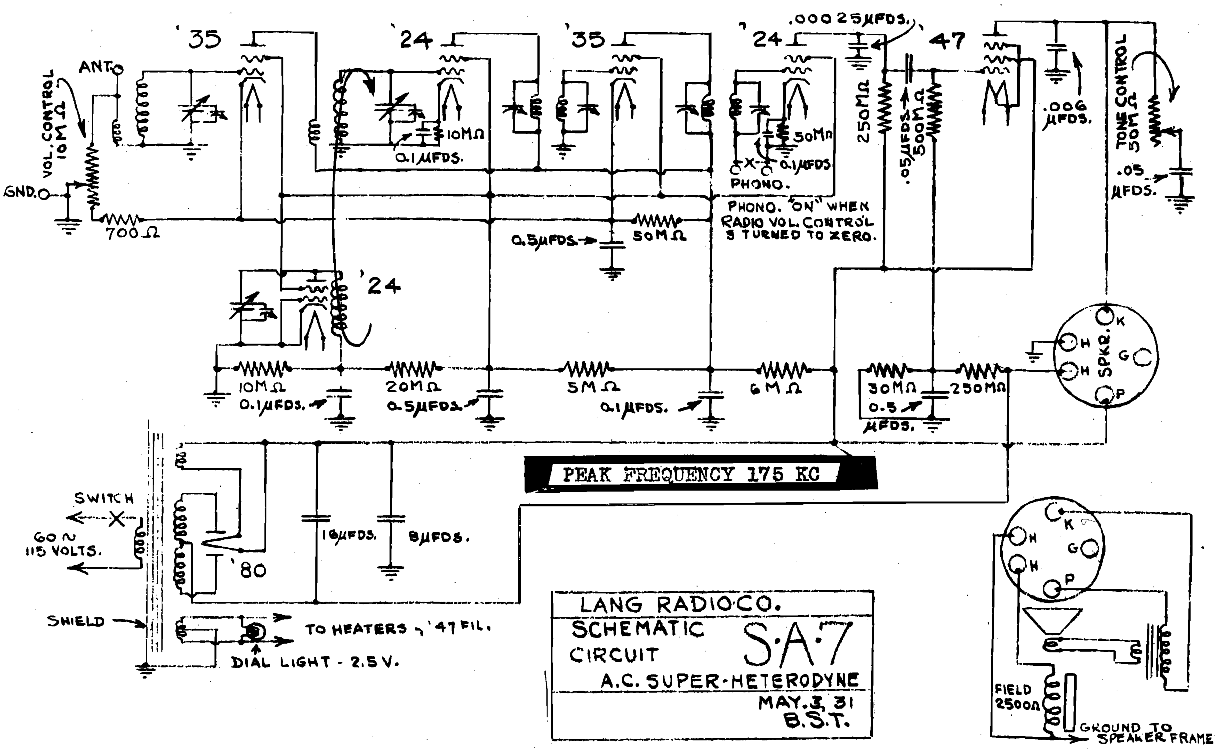
LANG RADIO CO.

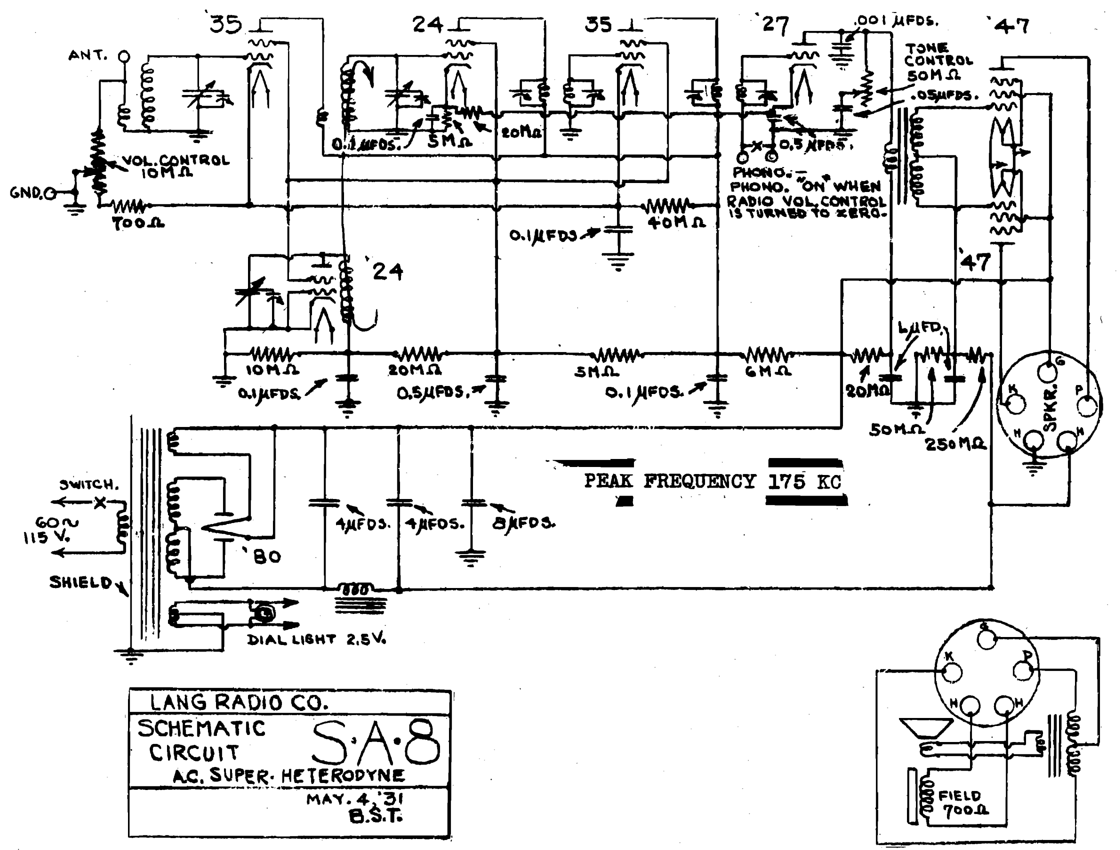




MODEL MD-7 SUPERHETERODYNE (DC)
MODEL MA-7 SUPERHETERODYNE (AC)

LANG RADIO CO.

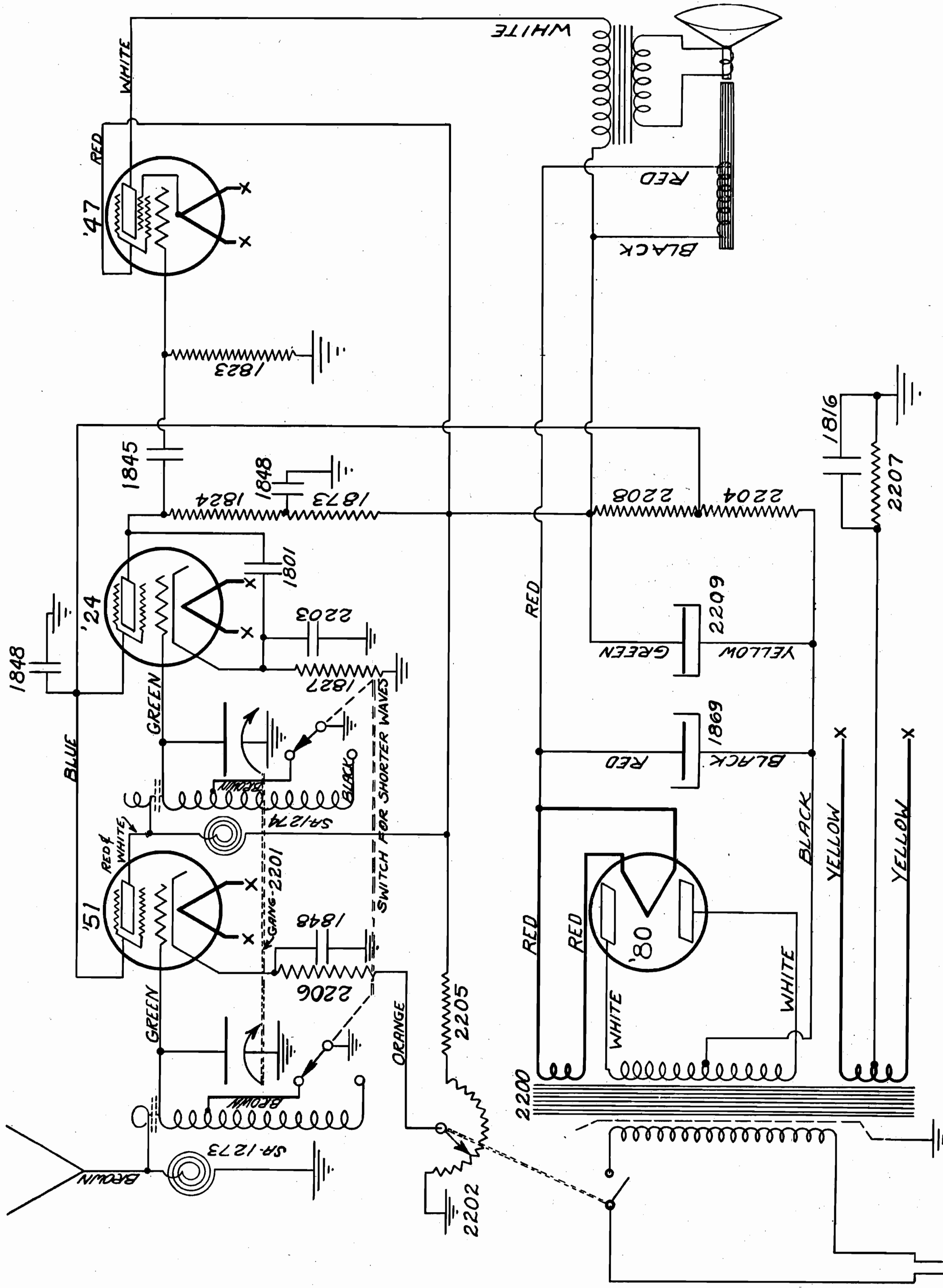




MODEL SA-7 SUPERHETERODYNE (AC)
MODEL SA-8 SUPERHETERODYNE (AC)

CABLE - NELSON

MODEL D-4 CHASSIS (CABINET MODEL 5)



Schematic Diagram for Cable-Nelson Radio Receiver. Model D-4

CABLE - NELSON

MODEL D-4 CHASSIS (CABINET MODEL 5)

Voltage and Current Readings

Tube No.	Type	Position	A Volts	B Volts	Screen Volts	C Volts	Plate Current M.A.	Screen Current
1	'51	1st R. F.	2.3	200	80	-2	7	
2	'80	Rectifier	4.8	320 per plate			21.5 per plate	
3	'24	Detector	2.3	28				
4	'47	Audio	2.25	185	200	-13	24	4

Line voltage, 115 volts. Volume Control, Full On.

Parts List - Model D-4

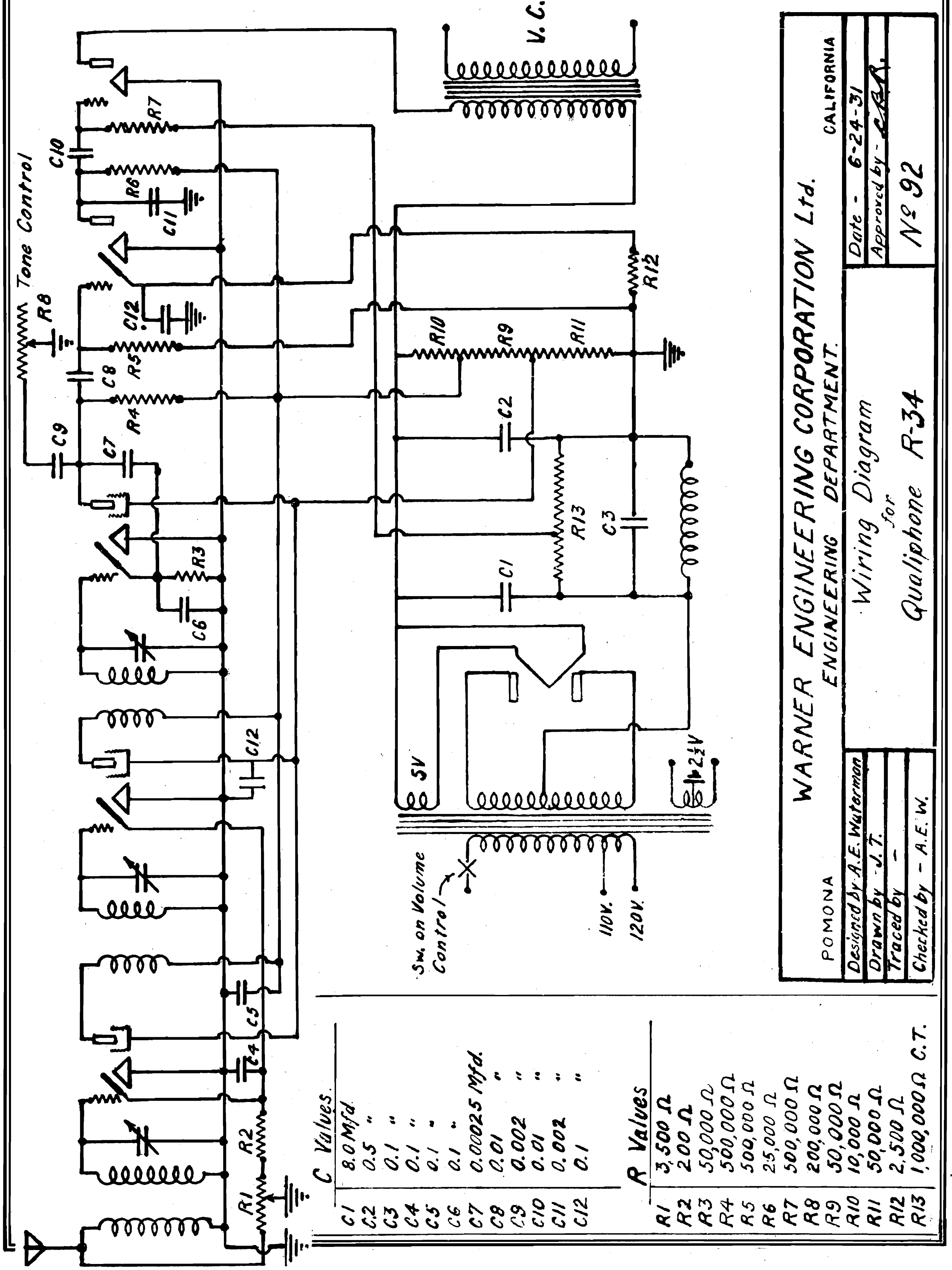
Part No.	Description	Amount per Unit	List Price
1332	Dial with Disc	1	$ .55 ea.
1702	Socket, type '80	1	.30 ea.
1703	Socket, type '24	1	.33 ea.
1705	Socket, type '51	1	.33 ea.
1801	Condenser .001 mfd.	1	.41 ea.
1816	Condenser 1 mfd. 200 V.	1	.85 ea.
1823	Resistor 1 meg. $\frac{1}{2}$ watt	1	.35 ea.
1827	Resistor 30000 ohms $\frac{1}{2}$ watt	1	.35 ea.
1845	Condenser 1 mfd. 200 V.	1	.25 ea.
1847	Socket, type '47	1	.33 ea.
1848	Condenser 1 mfd. 200 V.	3	.70 ea.
1869	Condenser 8 mfd. 450 V.	2	1.90 ea.
1873	Resistor 100000 ohms $\frac{1}{2}$ watt	1	.35 ea.
1901	2.5 Volt Pilot Light	1	.33 ea.
2200	Power Transformer	1	4.75 ea.
2201	Two Gang Condenser	1	4.00 ea.
2202	Volume Control with Switch	1	1.75 ea.
2203	Condenser $\frac{1}{2}$ mfd. 200 V.	1	.55 ea.
2204	Resistor 23500 Ohms $\frac{1}{2}$ Watt	1	.35 ea.
2205	Resistor 35000 Ohms 1 Watt	1	.35 ea.
2206	Resistor 500 Ohms $\frac{1}{2}$ Watt	1	.35 ea.
2207	Resistor 500 Ohms 1 Watt	1	.35 ea.
2208	Resistor 20000 Ohms 1 Watt	1	.35 ea.
2209	Condenser 6 mfd. 400 Volt	1	1.50 ea.

Sub-Assemblies

Part No.	Description	Amount per Unit	List Price
SA-1273	Antenna R. F. Coil	1	2.76 ea.
SA-1274	2nd R. F. Coil	1	2.00 ea.

QUALIPHONE
R-34

WARNER ENGINEERING CORP. LTD.

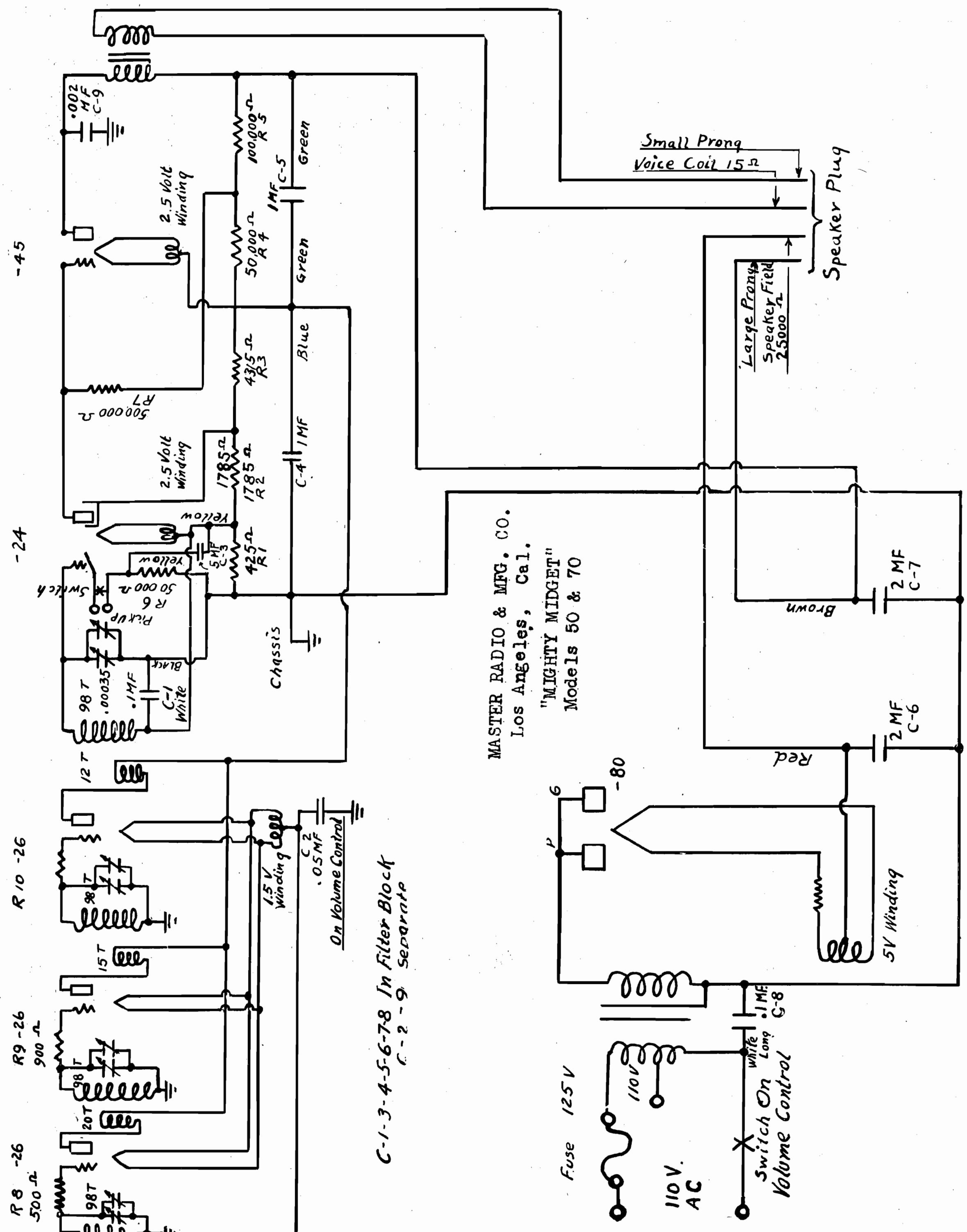


C Values	
C1	8.0 Mfd
C2	0.5 "
C3	0.1 "
C4	0.1 "
C5	0.1 "
C6	0.1 "
C7	0.00025 Mfd.
C8	0.01 "
C9	0.002 "
C10	0.01 "
C11	0.002 "
C12	0.1 "

R Values	
R1	3,500 Ω
R2	200 Ω
R3	50,000 Ω
R4	500,000 Ω
R5	500,000 Ω
R6	25,000 Ω
R7	500,000 Ω
R8	200,000 Ω
R9	50,000 Ω
R10	10,000 Ω
R11	50,000 Ω
R12	2,500 Ω
R13	1,000,000 Ω C.T.

"MIGHTY MIDGET"
MODELS 50 & 70

MASTER RADIO AND MFG. CO.



Normal Voltages. (Readings on Supreme 400-B N4 Diagnometer)

	Plate V.	Grid V.	Plate Ma.	S.G.V.
1st R.F.	150	- 6.0	4.0	
2nd " "	do	do	do	
3rd " "	do	do	do	
Det.	13.	- 2.0	.5	plus 45.0
Output	250	-47.0	35.0	

MONTGOMERY WARD & CO.

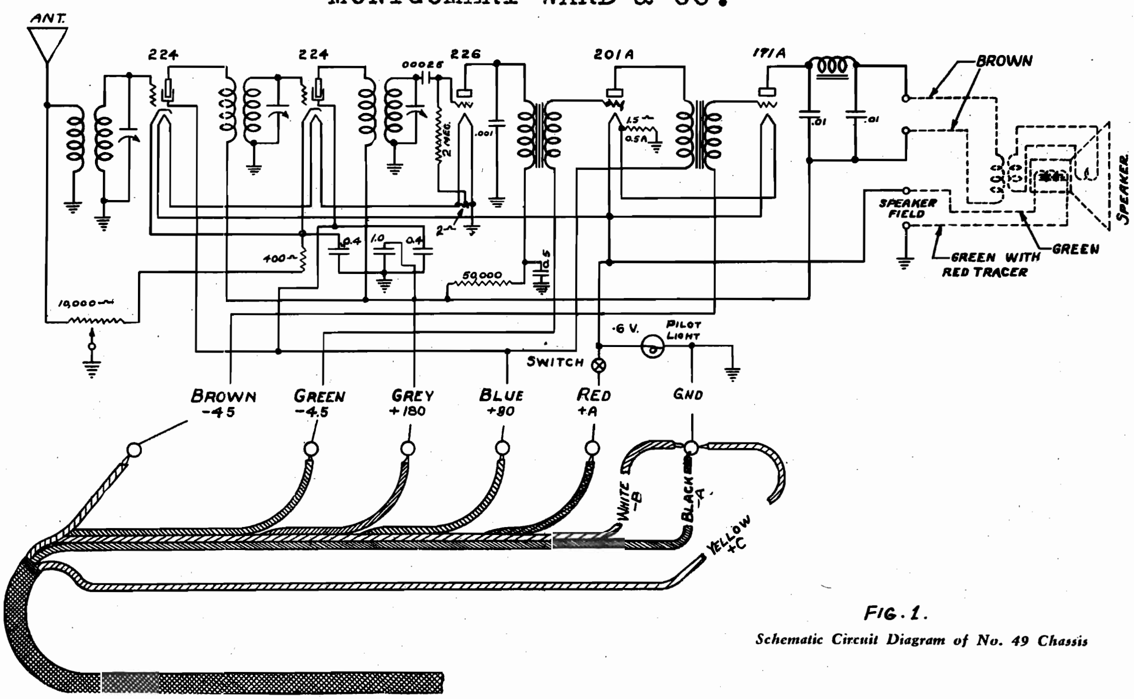


FIG. 1.
Schematic Circuit Diagram of No. 49 Chassis

General Description

Not many of these chassis were put out. Because of the high "A" battery consumption, certain changes were suggested that could be made to reduce "A" battery consumption.

Diagram No. 1 gives the original circuit and it will be seen that the tube circuit consists of—

2—224's; 1—226; 1—201A; and 1—171A.

Diagram No. 2 shows the changes to be made so the set will consume less "A" battery current. The tubes are now:

2—NY 64's, or 236's; 2—201A; and 1—112A.

The NY 64 tubes are screen-grid battery operated tubes which were designed for use in automobile radio sets. Their current consumption is small; their amplification factor quite high and they are rugged and very long lived.

The "A" and "B" batteries are not changed to convert the receiver for lower "A" battery consumption.

Make the changes shown on the diagram. Connect the storage battery to black (neg.) and red (pos.) leads. Insert two NY 64 tubes in sockets marked 224. Place a 201A in socket marked 226, and one 201A in socket marked 201A. Use a 112A in socket marked 171A. Turn on filament switch and see if tubes light—if so connect "B" batteries as tagged, except "B + 180" lead—connect this to "B + 135" terminal.

Connect two 4½ Volt "C" batteries in series. The "C — 4½" Volt lead goes to the connection between the 4½ Volt "C" batteries. The "C — 45" goes to the 4½ Volt part of the second battery.

It is recommended that these changes not be made on sets where the customer is entirely satisfied with the operation and the life of the "A" battery. The operation with the 224 tubes is very highly satisfactory. The sensitivity is extremely high, and the tone quality very good.

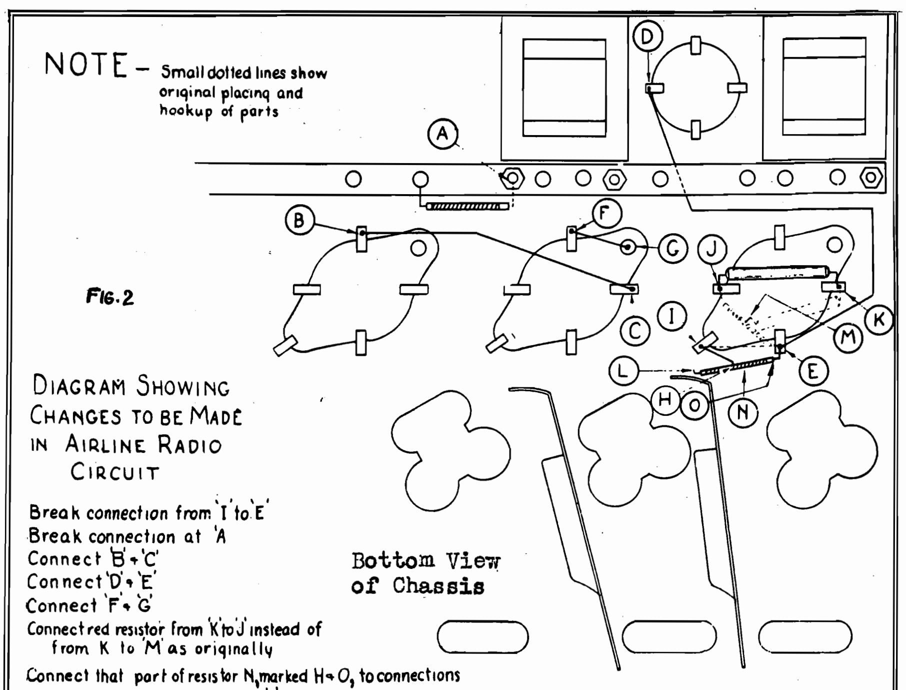


FIG. 2

DIAGRAM SHOWING CHANGES TO BE MADE IN AIRLINE RADIO CIRCUIT

Break connection from 'I' to 'E'
Break connection at 'A'
Connect 'B' + 'C'
Connect 'D' + 'E'
Connect 'F' + 'G'
Connect red resistor from 'K' to 'J' instead of from K to 'M' as originally
Connect that part of resistor N, marked H + O, to connections I + E, leaving end connection 'L', open

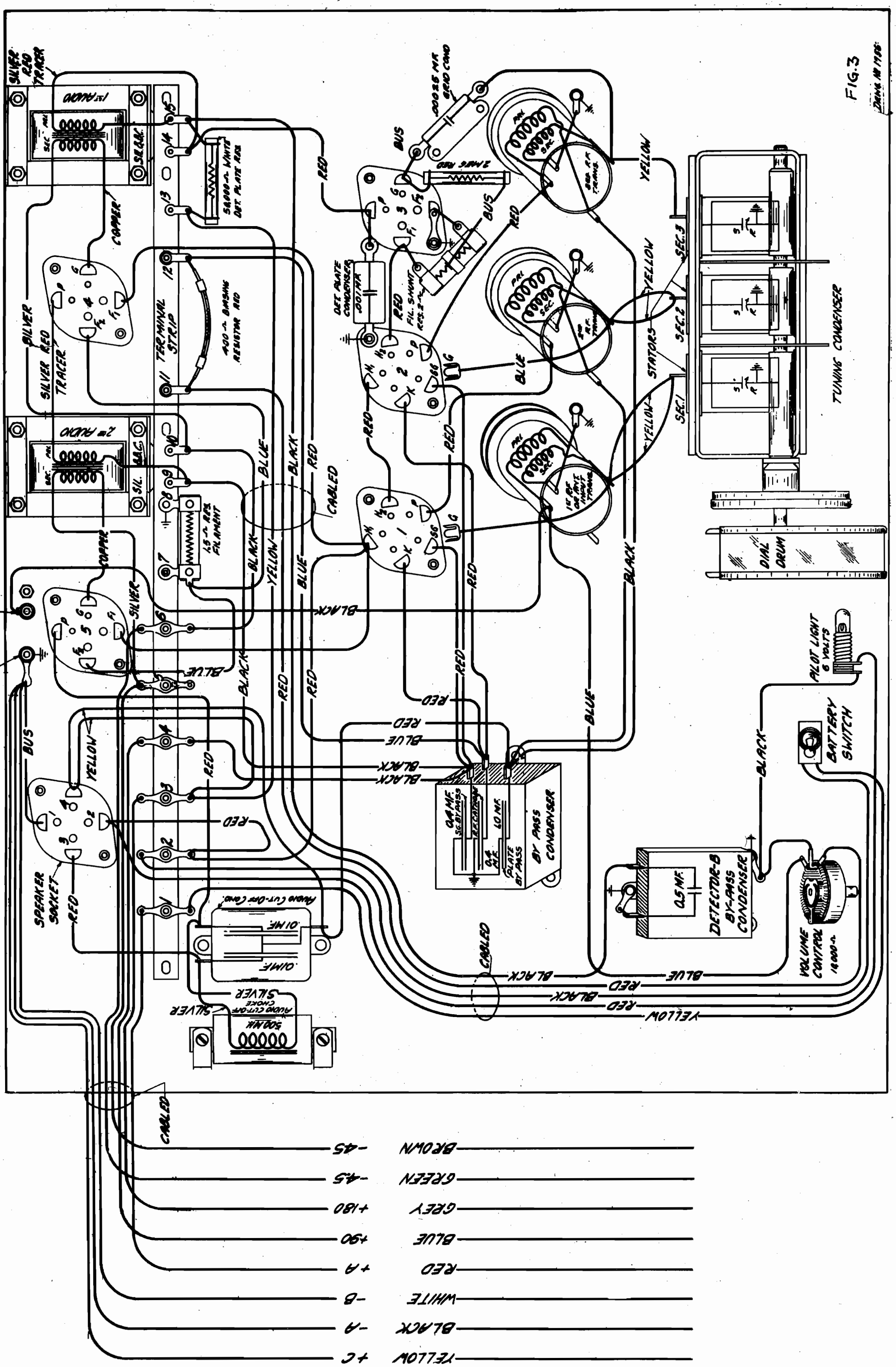
Bottom View of Chassis

5 TUBE S.G. BATTERY CHASSIS No 49
"AIRLINE" No 62-055
CAT. No 1922 (Also No 1522)

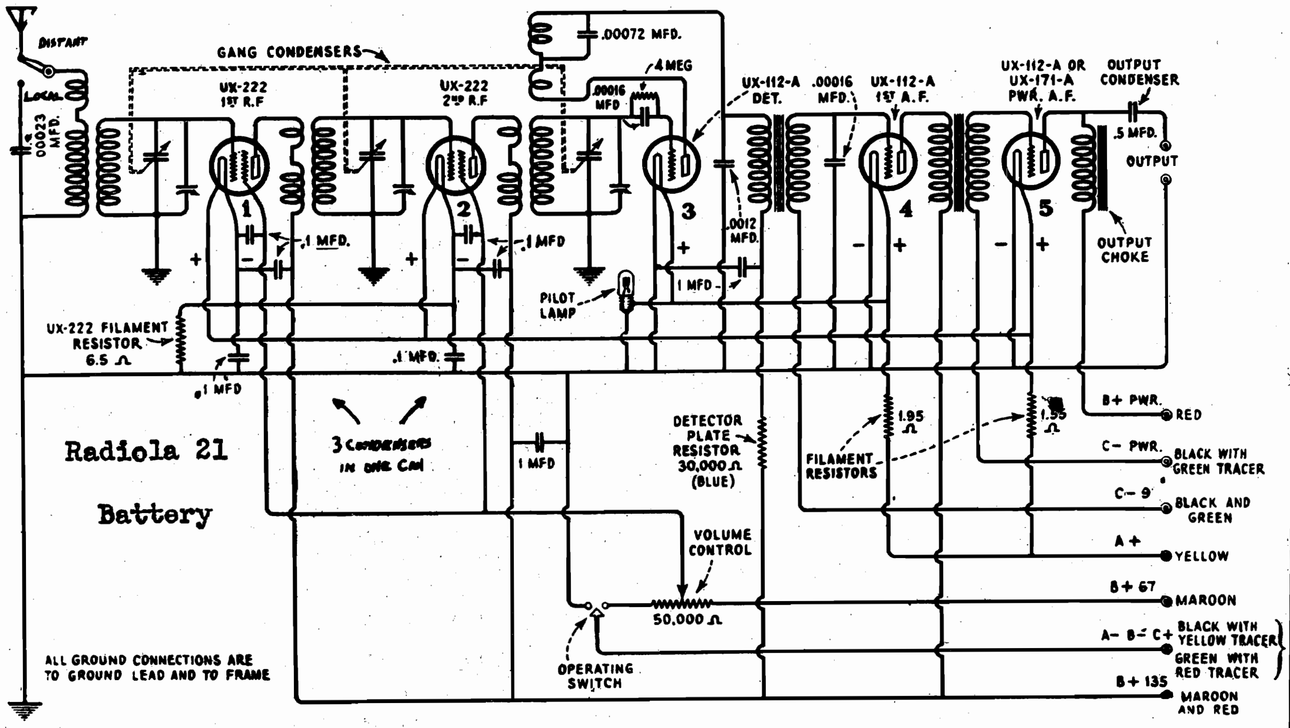
MONTGOMERY WARD & CO.

5 TUBE BATTERY CHASSIS No 49 "AIRLINE" No 62-055

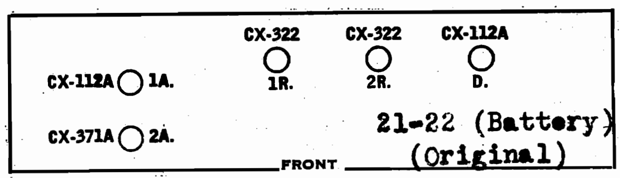
Diagram of original Circuit



MONTGOMERY WARD & CO.



RADIOLA 21 & 22 (Battery)
Original Circuit



General Description

Radiolas 21 and 22 are the tuned RF type, using two stages of radio frequency and one tuned antenna stage. The antenna coil has a high impedance primary and for this reason will give most satisfactory performance on an outside aerial of from forty to seventy-five feet long, including Lead-in. A forty foot aerial should be used in congested localities where there is serious interference. In the event it is impossible to install an aerial and lead-in of from forty to seventy-five feet, a longer aerial may be used and a .0005 or .0001 MFD fixed condenser connected in series with the antenna connection to the set.

Volume Control

The volume control consists of a 50,000 Ohm Potentiometer connected in the B+67 Volt lead and controls the screen voltage to the two RF tubes. The on and off switch is of a special type which automatically breaks the A & B connections when snapped in the off position.

Six Volt Storage Battery Operation

Figure No. 1 gives the completed circuit for operation on 6 Volt A supply. Two type 222 tubes are used as radio frequency amplifiers. A 112A detector, a 112A tube in the first audio stage and a 112A or 171A tube in the second audio stage. The two 222's used in the RF stages receive their filament supply of 3.2 Volts through the 6½ Ohm resistor connected in the A negative lead. The detector and first audio are operated at 5 Volts through the 1.95 Ohm filament resistor in the positive A lead. The filament of the power stage is supplied through the 1.55 Ohm filament resistor. A 171A power tube may be used in the power stage with the proper B supply of 180 Volts and 40½ Volts C. A 112A tube using 135 Volts of B and 9 Volts of C is recommended however, for most economical operation.

CHANGING RADIOLA #22 for 2-VOLT TUBES

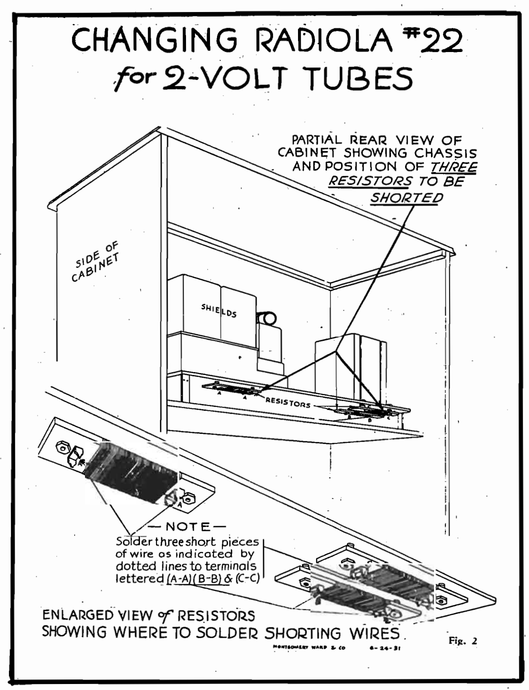


Fig. 2

5 TUBE S.G. BATTERY RECEIVER
MODELS 921, 923, 924, 839.
(RADIOLA MODELS 21 & 22)

MONTGOMERY WARD & CO.

5 TUBE S.G. BATTERY RECEIVER
MODELS 921, 923, 924, 839. (RADIOLA MODELS 21 & 22)

Method of Converting a 6 Volt Receiver for Using the 2 Volt Tubes

ALL of the original Radiola Models 21 (Table Model) and 22 (Console Model) were designed for 6 Volt storage battery operation. It is possible, however, to change the wiring of these sets slightly so that the new 2 Volt dry cell tubes may be used in conjunction with either the Aircell battery or our 2 Volt long life A battery.

Description of the original receiver for storage battery operation is given first. Following this, the method of changing over the set for 2 Volt tubes will be shown. The original color code is shown on the schematic diagram, Figure No. 1. For storage battery operation the cable should be connected to the batteries according to this code.

The following parts are necessary:

One No. 6000 long life A battery designed to last one year at three hours a day. One kit of tubes consisting of 2—No. 232 screen grids; 2—No. 230's; 1—No. 231. One new instruction book. One No. 5512-75 Milliampere pilot light. One pair of green and red resistors. One socket chart label to stick over old RCA labels. The last four items can be ordered on stock order by specifying "one conversion kit for Radiola Set." The A battery and tubes should be ordered on stock order in the usual way. When you receive all of the necessary parts to make the conversion, you will use them in the following manner:

Operation No. 1
First examine Figure No. 2. There are three resistors at the back of the chassis mounted directly underneath the sub-panel. The wires attached to these three resistors must not be removed but the three resistors should be shorted out by soldering short pieces of wire across as shown on the dotted lines in Figure No. 2. On the console models it is not necessary to remove the chassis to do this. Remove the chassis when changing the table model.

Operation No. 2
Insert new low drain pilot light and adjust the position by sliding the pilot light clamp up and down until the figures on the dial can be seen prominently.

NOTE: The insertion of this new pilot light is extremely important—the life of the A battery depends upon it.

Operation No. 3
Remove the Radiola instruction book, red service card and pilot light. Discard them.

Operation No. 4
Remove the battery tag from the cable and destroy it.

Operation No. 5
Connect one end of the green (2.2 Ohms) resistor to the end of the yellow positive A battery lead. This is important.

Operation No. 6
Insert new instruction books and paste new tube chart label over RCA tube position chart, and advertising sticker. This label is designed to cover the tube replacement label and the socket chart. Don't cover up the license notice.

The tube chart indicates the position of the new tubes. 232's—R.F. stages—230's—1st Audio and Detector—231—last audio.

The red resistor is given to the customer in an envelope. It contains a small red label tied at one end and instructing the customer how to use it, which is as follows:

Over a period of time the A battery voltage will drop. Its initial voltage is slightly over 3 Volts. The green resistor drops this 3 Volts down to 2 Volts for the tubes. After the set has been used for a few months the battery voltage will drop to about 2½ Volts, so it is necessary to use a smaller resistor on the battery to give the tubes 2 Volts. When the set begins to lose volume and the tubes go dim, the green resistor should be replaced with the red resistor. After the receiver has been in use a few months more, the battery voltage will drop to about 2 Volts, then the resistor should be removed entirely and the battery used alone until dead.

Note: The new color code and method of connecting the battery cable is shown in Figure No. 3. Use this color code for connecting the batteries after the conversion is made.

Caution: Be sure all battery connections are correct.

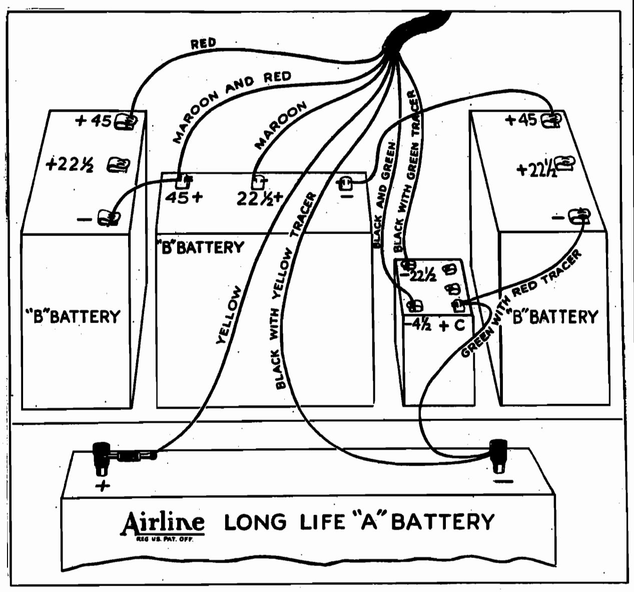
Alignment:
In order to align the condensers, it is necessary both in the console and table model, to first remove the chassis from the cabinet. Connect up all batteries and tune in a station at about 1400 Kilocycles. The trimmer condensers will be found mounted on the frame of the variable condenser nearest the front panel. These should be adjusted in turn for maximum volume on a station that does not fade.

Long Distance Switch:
In many localities the local distance switch will not operate satisfactorily on the local side.

In the country it is seldom necessary to use the local switch on the local side, for it is only put on as a safeguard to enable proper control of volume when under the shadow of powerful broadcast stations.

IMPORTANT NOTICE

If the pilot light should burn out and you are unable to obtain another one immediately, remove the celluloid strip from the escutcheon plate by sliding it out of its slot from the rear. This will enable the user to see the figures on the dial until such time as you are able to put the correct pilot light in place. **Never use any pilot light but the No. 5512 we recommend.**



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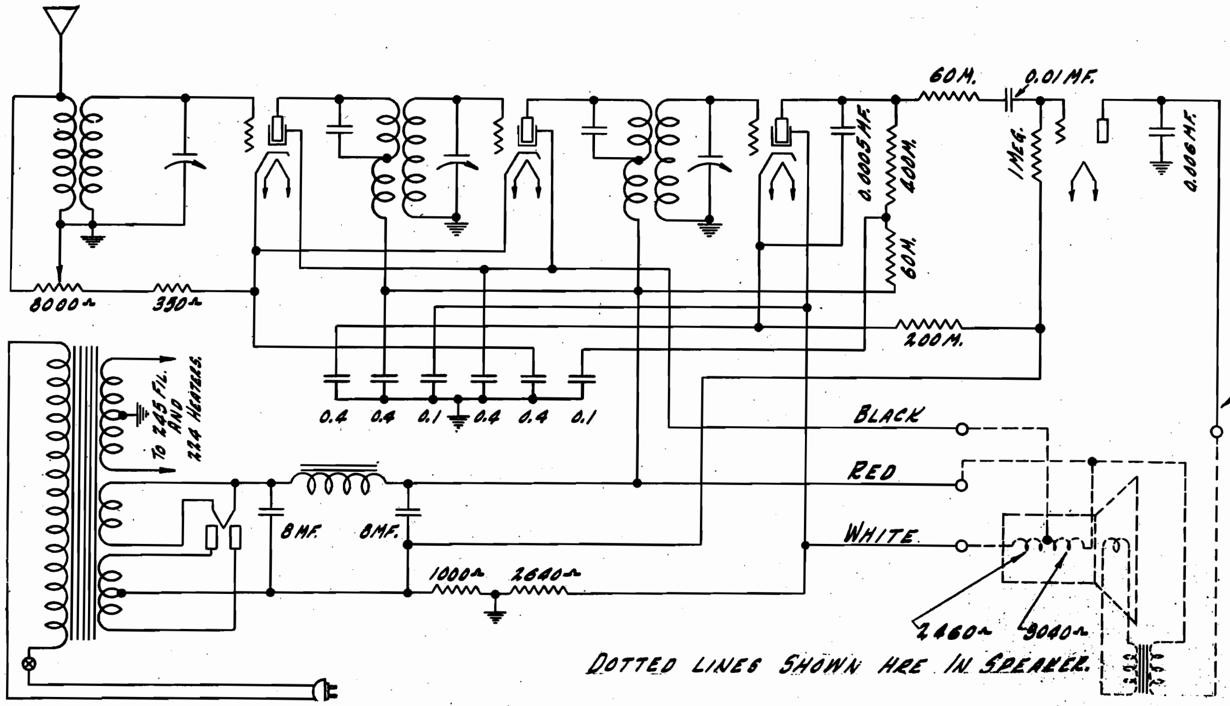
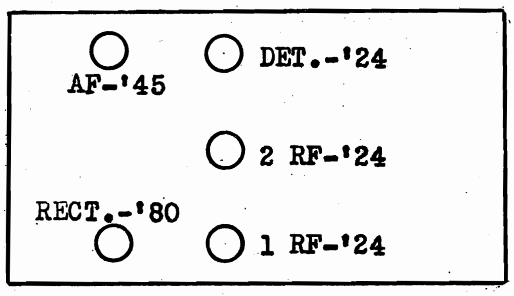




NO. 26 W CHASSIS—VOLTAGES AT SOCKETS—VOLUME CONTROL AT MAXIMUM—LINE VOLTAGE, 115—PLUG IN SOCKET OF RECEIVER—TUBE IN TEST SET

Type of Tube	Position Tube	Function	"A" Volts	"B" Volts	Control Grid "C" Volts	Screen Volts	Screen Current MA	Cathode Volts	Plate MA	Grid Test MA
224	1	1st Radio	2.2	245	2.5	80	.6	2.5	2.9	5.1
224	2	2nd Radio	2.2	245	2.5	80	.6	2.5	2.9	5.1
224	3	Detector	2.2	130	3.	40	.1	3.	.25	.4
245	4	Audio	2.35	245	50.				28.	31.
280	5	Rectifier	4.6						25. Per Plate	

General Description

The Model 26W chassis used in both the Princess and Challenger, Jr., is similar in many respects to the 32W chassis used in the Troubadour. The operating voltages, however, will be found to be different, and also this chassis does not use the band pass filter input circuit, as used in the 32W. Only one 245 tube is used in this chassis, and only one stage of resistance coupled audio.

The speaker is of a new type using a center tap field. The entire field winding being used as a shunt resistor. The center tap supplies the screen grid voltage to the radio frequency tubes. Only two electrolytic filter condensers are used, and a number of the small bypass condensers are eliminated, as shown in the schematic diagram, Figure I.

The general service procedure as described for the Model 32 W chassis can be used in servicing the 26W chassis.

AIRLINE 5 TUBE S.G.

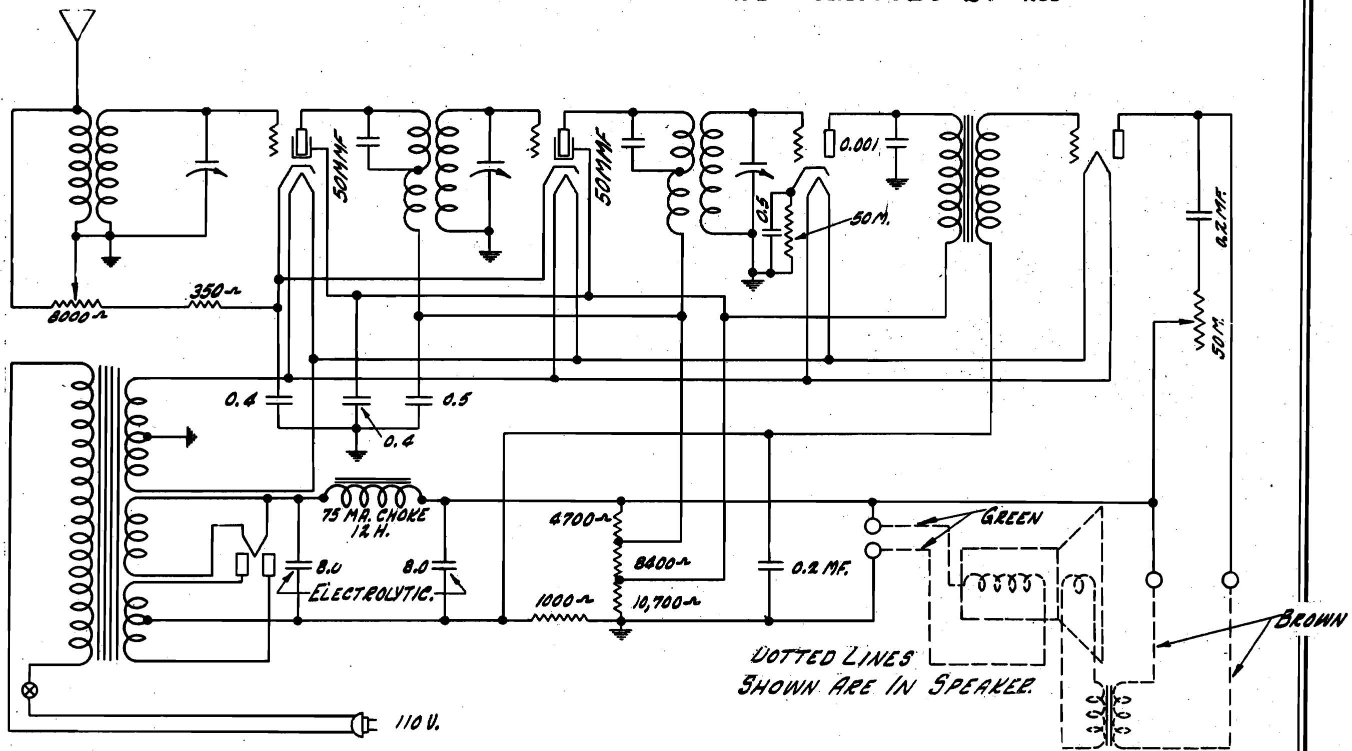
"Princess" No 62-070
and
"Challenger Jr." No 62-060
(Cat. No 1800)

60 ∿ CHASSIS No 26-W
25 ∿ " No 26-WX

NOTE: For 25 Cycle Sets use No. 2281 Power Transformer instead of No. 2251.

MONTGOMERY WARD & CO.

AIRLINE 5 TUBE S.G. (MANTEL TYPE)
"Collegian No 15,000 (Cat.No 1500)
60∿ CHASSIS 27-W 25∿ CHASSIS 27-WX



The 27W Chassis uses the following tubes:
2—224's as R.F. Amplifiers,
1—227 as Detector,
1—245 as Audio Amplifier,
1—280 as Rectifier.

The two stages of screen grid R.F. amplification in conjunction with the tuned antenna stage of this chassis give a sensitivity averaging 10 Microvolts per meter while the 227 power detector used with the single stage high gain audio provides good power output, with excellent tone quality.

Volume Control

The 8000 ohm volume control is connected across the antenna and ground of the input stage. The movable arm of the volume control is connected to ground in series with the cathodes of the two 224 R.F. amplifier tubes. This method of connection gives us a dual volume control action, which varies the signal input to the antenna stage as well as the grid bias on the first two R.F. tubes. The volume control may be easily tested by taking the voltage readings from the cathode of the 224's to the ground connection and at the same time, varying the volume control. This will give an indication if the volume control is controlling the grid bias properly.

The R.F. transformers in the R.F. stages are the same as those used in the 32W and 26W chassis. The cathode, screen grid, and plates of the R.F. tubes are bypassed by the 964A bypass condenser.

The Power Detector

The power detector receives its grid bias from the voltage drop across the 50M cathode resistor (Part No. 1892). The plate of the detector is bypassed to ground through the .001 M.F. R.F. plate bypass condenser.

The audio stage consists of a high ratio audio transformer of special design. The secondary of this transformer connects directly to the 245 power tube. The audio transformer may be tested with the continuity meter of your set checker. Disconnect the primary and secondary leads from the chassis before taking continuity measurements. Test the primary and secondary for opens or shorts, and also take continuity readings between the primary and secondary terminals, and ground. There should be no readings between these terminals and the core of the transformer or chassis ground.

The tone control is connected across the primary of the output push pull transformer, and consists of 50M variable resistance in series with a .2 M.F. fixed condenser. A short in this condenser will short circuit the primary of the speaker transformer and no signals will reach the loud speaker.

The power supply of the 27W chassis is similar to that used in some of our other chassis previously described.

Two electrolytic condensers are used in the filter circuit and care must be taken that these chassis are always kept in an upright position to prevent any small amount of electrolytic leakage in the filter condensers. It is a good idea to inspect the electrolytic condensers, upon delivery of any sets, and to wipe the top perfectly dry.

25 Cycle Chassis No. 27WX

This chassis uses a 25 cycle power transformer. Otherwise the constants of the circuit are the same.

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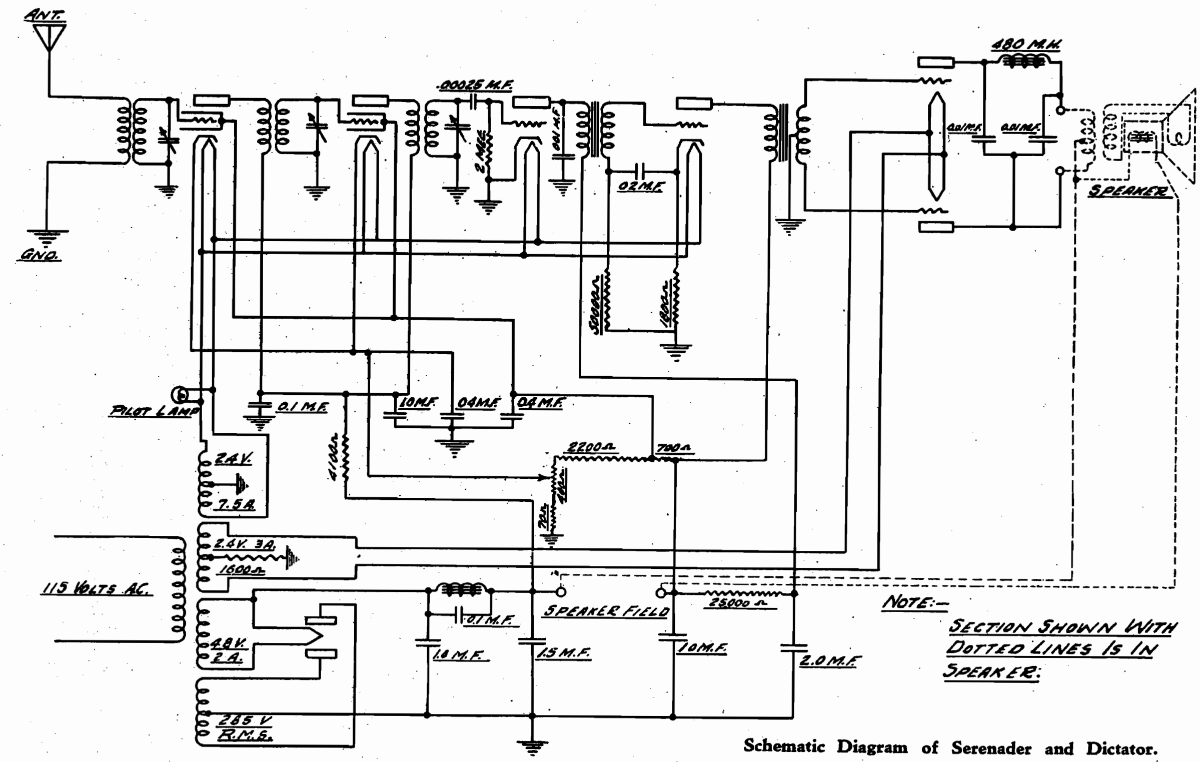
AIRLINE 7 TUBE S.G.

"Serenader" No 10,000
and
"Dictator" No 500



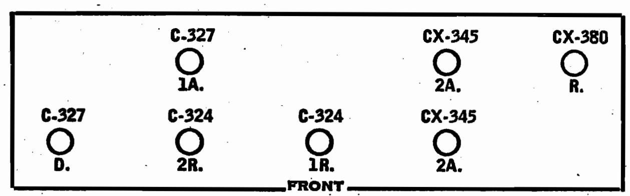
Schematic Diagram of Serenader and Dictator.

The Serenader and Dictator models use identically the same chassis. The schematic diagram is given in Picture 1. Comparing this diagram with the schematic diagram of the 2800 chassis (Balboa and De Sota) you will note generally the two chassis are the same. Therefore, the service instructions given for the 2800 chassis can be used in servicing the Dictator and Serenader models, with the following changes.

The Serenader and Dictator chassis use a high frequency cut-off filter which is shown in the schematic diagram as the 480 M.H. choke and the two .01 mfd. fixed condensers while the 2800 chassis uses a regulation tone control. In case of a short in either of the two .01 mfd. condensers, no signals will reach the loud speaker. If the .01 mfd. condensers are open the filter will fail to function properly and the tone of the chassis will be of a high pitch.

Another change from the 2800 chassis will be noted in the cathode connections of the first audio stage. A .02 mfd. condenser, a 50,000 ohm resistor and an 1800 ohm resistor are connected in the cathode circuit of this stage. Any defects in the resistor or bypass condenser will give abnormal grid voltage on the first audio tube.

The Serenader and Dictator chassis use an antenna and ground lead wire while the antenna and ground binding posts are provided on the 2800 chassis.



TUBE NO. IN ORDER TESTED (1)	TYPE OF TUBE (2)	POSITION OF TUBE IN SET (3)	METER READINGS WITH JEWELL TEST PLUG IN SOCKET OF SET: OPERATING VOLTAGES — FILAMENT OR HEATER (4)	PLATE OR ANODE (5)	CONTROL GRID—SPACE CG+ (6)	NORMAL GRID—SCREEN SG+ (7)	CATHODE TO HEATER (8)	MILLIAMPERES — SCREEN OR L. H. '80 PLATE (9)	PLATE R. H. '80 PLATE (10)	TUBE TEST (11)	PLATE CURRENT CHANGE (12)	(13)
1	224	1 R.F.	2.36	173	2.72	86	2.72	.87	3.0			
2	224	2. R.F	2.31	173	2.72	86	2.72	.81	3.0			
3	227	Det.	2.28	38	-	0	-	-	2.8			
4	227	1 A.F.	2.28	100	-	6.1	-	-	3.25			
5	245	2 A.F.	2.29	169	-	38	-	-	11.3			
6	245	2 A.F.	2.29	169	-	38	-	-	11.3			
7	280	Rect.	4.61	-	-	-	-	34.5	34.5			

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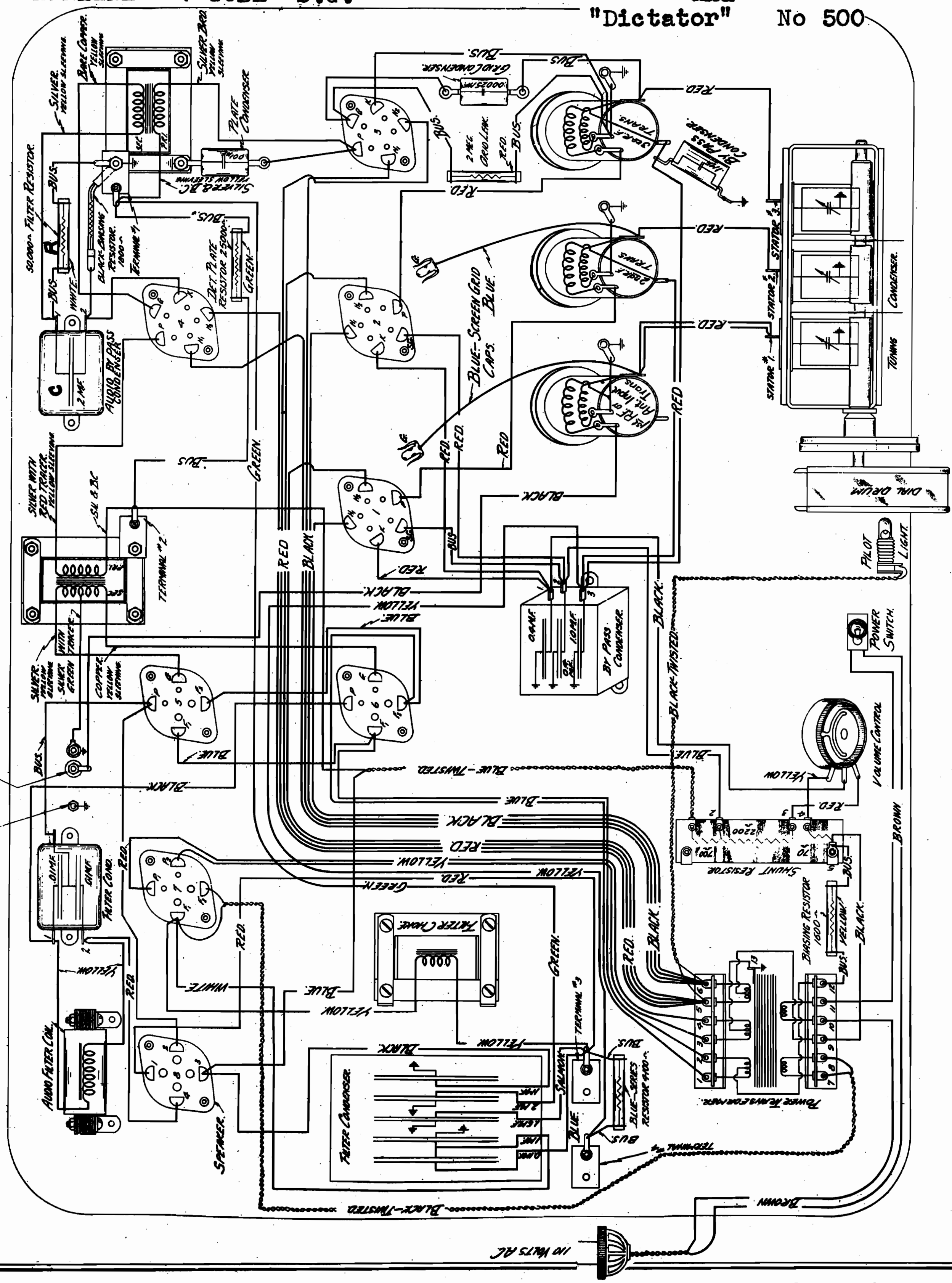
AIRLINE 7 TUBE S.G.

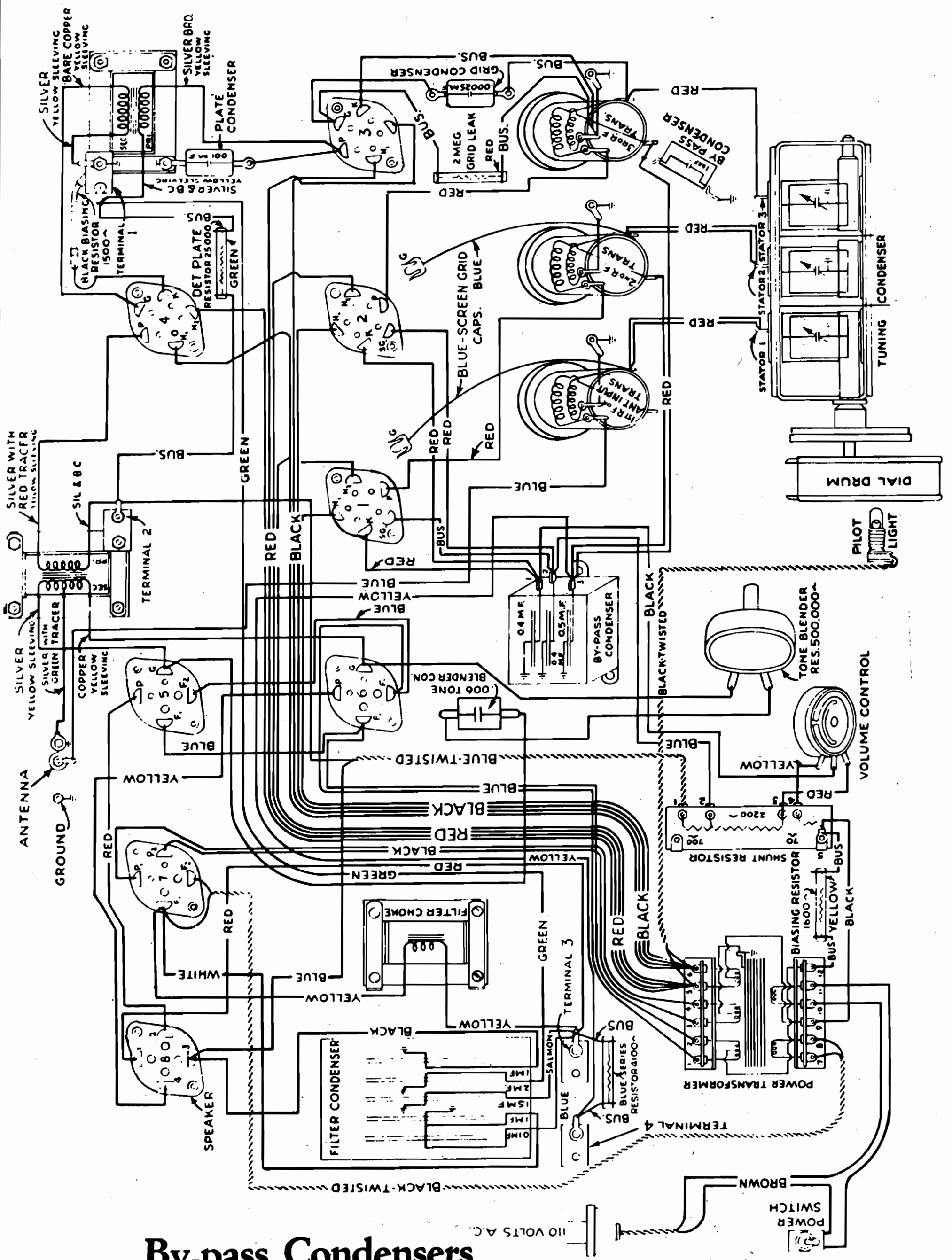
"Serenader" No 10,000
and
"Dictator" No 500



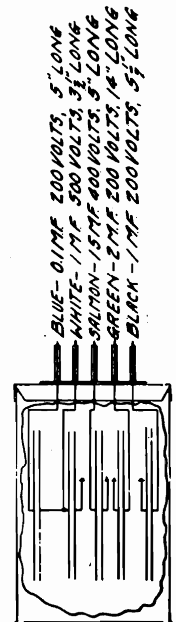
MONTGOMERY WARD & CO.

AIRLINE 7 TUBE S.G.

"Balboa" No 2822 And "De Soto" No 2895
"Balboa" No 2827 (25~) "De Soto" No 2897 (25~)



Filter System



Filter Condensers

25 Cycle Chassis No. 2897 and 2827

This chassis is the same as the 60 cycle chassis just described with the exception of the power transformer, the filter choke and an additional .4 M.F. condenser which is connected across the .1 M.F. condenser of the filter choke. The 25 cycle chassis will operate satisfactorily on 60 cycles if the .4 M.F. choke condenser is removed, however, the 60 cycle chassis cannot be used on 25 cycles.

By-pass Condensers

The plate circuits of the two screen grid tubes are by-passed by the .5 M.F.D. section of the 964A and the .1 M.F.D. condenser No. 675. If these condensers are open the screen grid tubes will oscillate, while a short will connect the 4100-ohm blue resistor across the power supply and cause this to be defective. No plate voltage on the 224s is an indication that these condensers are shorted. A short in either of the 4 sections of the 964A will result in no C bias on the 224 tubes and faulty operation of the volume control. An open will cause oscillation and the volume control will effect the tuning.

RESISTOR COLOR CODE.

2 Meg. grid leak	-	Red
25,000 ohm resist.	-	Green
4100 " "	-	Blue
1600 " "	-	Yellow

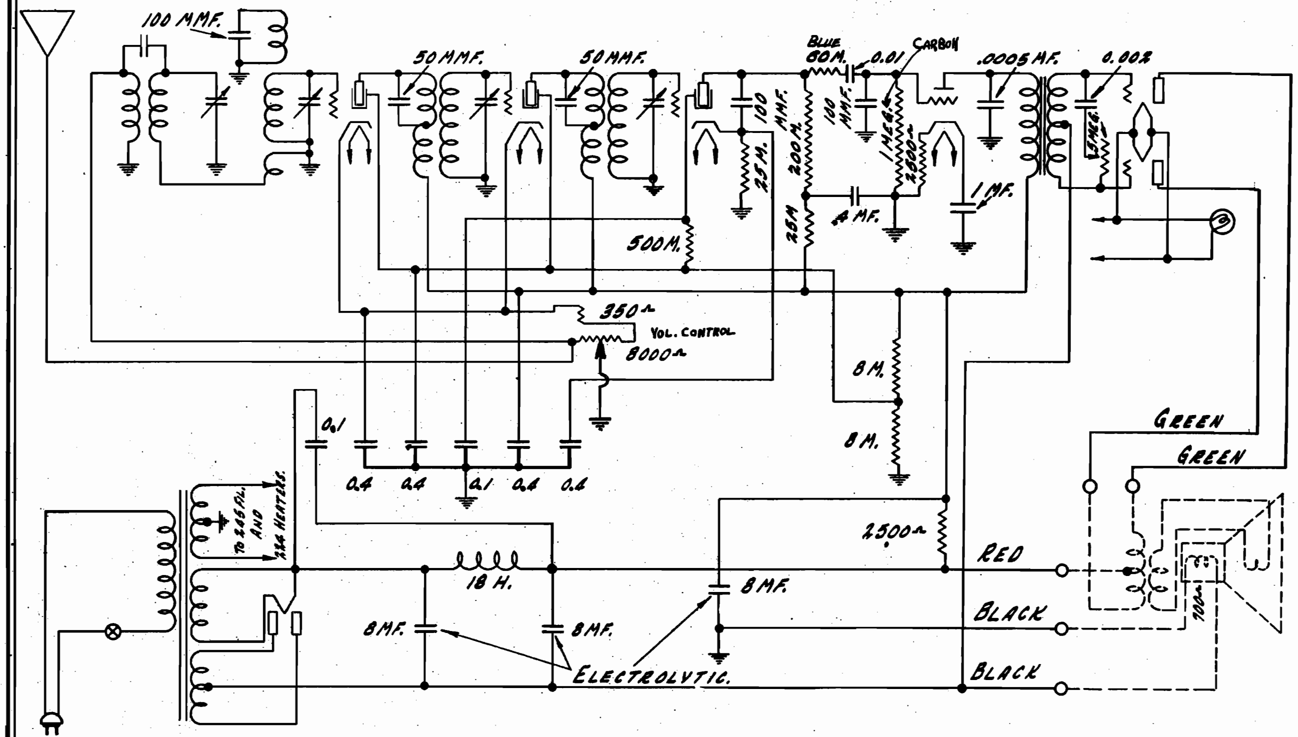
FOR SCHEMATIC DIAGRAM AND VOLTAGE DATA REFER TO PAGE 452-A.

MONTGOMERY WARD & CO.

AIRLINE 7 TUBE S.G.

"Troubadour" No 62-030 And "Lafayette" No 62-232 (Catalogue No 62-3235)

60 ∿ Chassis No 32-W 25 ∿ Chassis No 32-WX



DOTTED LINES SHOWN ARE IN SPEAKER.

The model 32 W chassis used in the Troubadour and Lafayette is similar in many respects to the Commander, Cavalier, Coronado and Cortez. The special differential features of this chassis are the band pass filter and the radio frequency transformers.

A band pass filter is used in the antenna input stage, and consists of two separate tuned circuits which are inductively coupled. The advantages of this filter are an increase in selectivity; elimination of cross talk and improved tone. Incorporated in the filter is a special coil and condenser, which is inductively coupled to the grid coil of the first tube, tending to give this stage a constant gain over the entire frequency band.

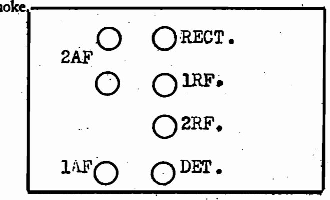
Another feature of this set is the tuned radio frequency coils which have two separate primary windings, so connected as to give equal gain throughout the broadcast band. A screen grid power detector is used, giving the advantages of sensitivity with very good overload characteristics. The over-all fidelity response characteristics are especially good, due to the resistance coupling used in the first stage of audio, and the 245 tubes in push pull in the last stage. Sensitivity in this chassis averages 4 Microvolts per meter.

R.F. Coils

The antenna input transformer is of the high impedance type, and is both inductively and capacitively coupled. The primary winding is on a small bobbin inside the coil form wound concentric with the secondary, allowing inductive coupling. The capacity coupling is obtained by an extra turn of wire connected to the primary and wound on the coil alongside one end of the secondary winding. This antenna coil is coupled to the grid coil of the first tube through three turns of wire wound on the low potential end of the grid coil. Inside of the grid coil is a small bobbin coil shunted by a 100 mmfd. condenser, and being in inductive relation to the grid coil. This small coil with condenser in shunt is tuned to the lower frequency. The 100 mmfd. condenser is a small condenser without any color marking to distinguish it from the 50 M.M.F. condensers with the yellow dot which are used in the other stages of the radio frequency. The primaries of the radio frequency coils proper, are made up of two parts; the inside primary is wound on a bobbin which is inside the coil form, and is shunted with a 50 M.M.F. condenser. The outside primary is wound on the coil form over the secondary winding and is separated by an insulated strip, the two primaries being connected in series. The energy transfer of the inside tuned primary decreases with increase in frequency—the energy transfer of the outside primary increases with increase in frequency: resulting in a net gain that is practically uniform over the broadcast band. Any trouble in the R.F. coils of this receiver will be noted by the lack of sensitivity at either the high or low wave part of the dial.

Twenty-Five Cycle Chassis

A twenty-five cycle power transformer and an additional .45 M.F.D. condenser are used in this chassis. In converting a sixty cycle chassis to twenty-five cycle, first remove the .1 M.F.D. condenser across the filter choke and connect it across the .1 M.F.D. screen condenser. This provides additional filtering. Connect the .45 M.F.D. condenser across the filter choke.



NO. 32 W CHASSIS — VOLTAGES AT SOCKETS — VOLUME CONTROL AT MAXIMUM—LINE VOLTAGE, 115—PLUG IN SOCKET OF RECEIVER—TUBE IN TEST SET

Type of Tube	Position of Tube	Function	"A" Volts	"B" Volts	Control Grid "C" Volts	Screen Volts	Screen Current MA	Cathode Volts	Plate MA	Grid Test MA
224	1	1st Radio	2.3	198	3.	88	.9	3.	3.5	6.
224	2	2nd Radio	2.3	198	3.	88	.9	3.	3.5	6.
224	3	Detector	2.3	150	6.	40°	.1	6.	.25	.4
227	4	1st Audio	2.3	180	12.5			12.5	5.	6.1
245	5	2nd Audio	2.4	255	55.				26.	31.
245	6	2nd Audio	2.4	255	55.				26.	31.
280	7	Rectifier	5.						36. Per Plate	

°Calculated value—cannot be read on ordinary Voltmeter.

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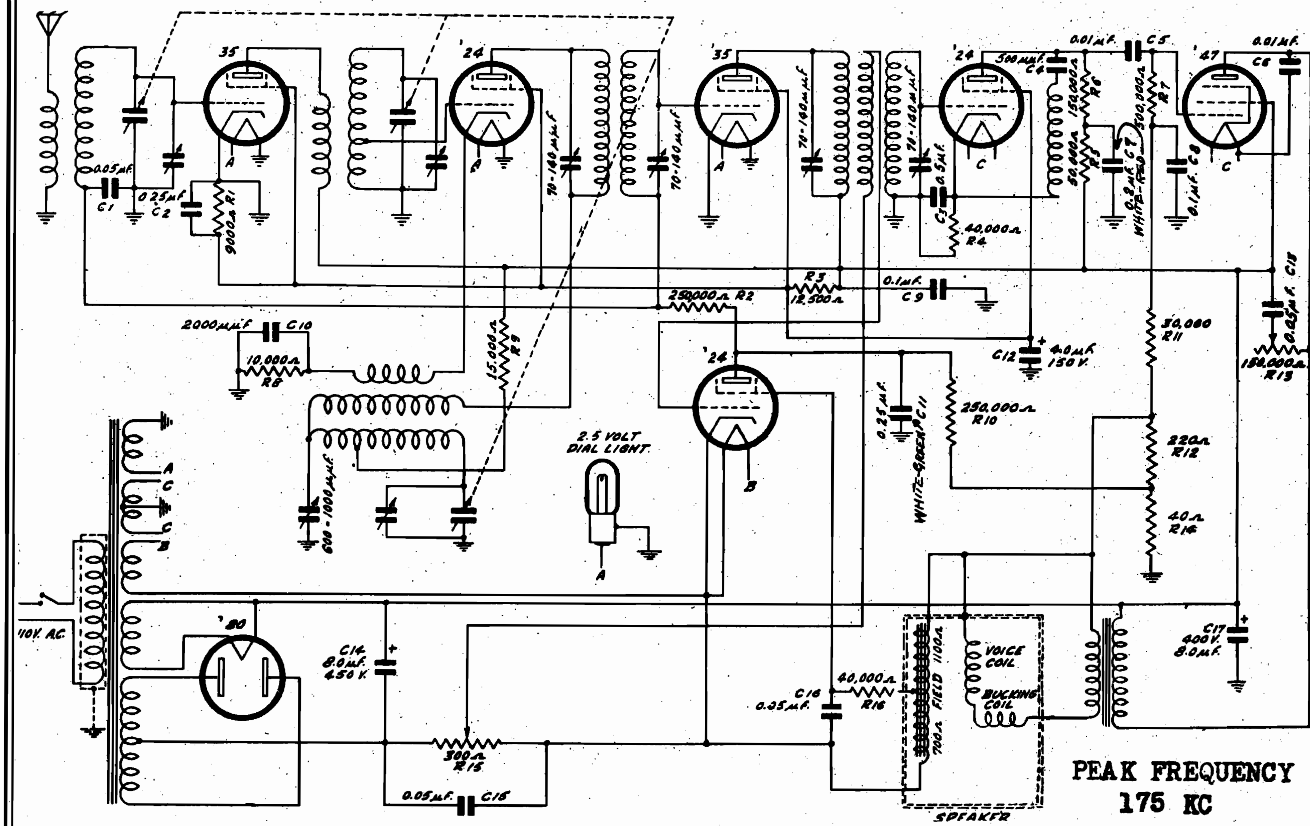
AIRLINE 7 TUBE S.G. SUPERHETERODYNE (A.V.C.)

No 62-20 (60~) And No 62-20-X (25~)
(Catalogue No 62-25)



PEAK FREQUENCY
175 KC

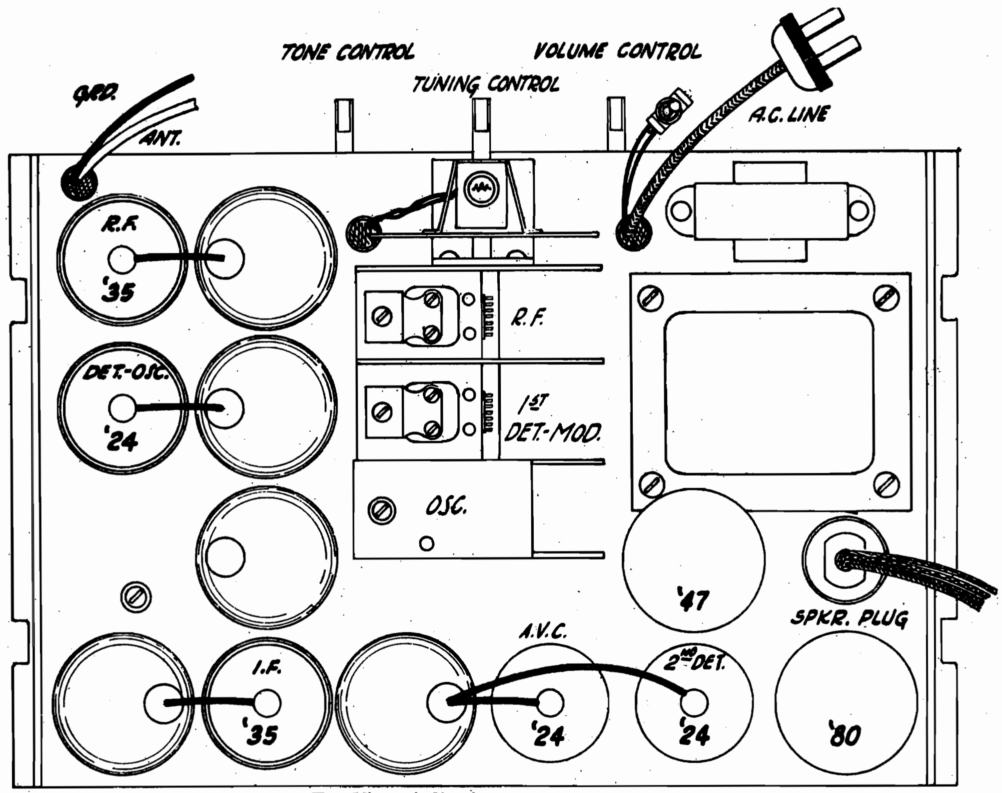
TUBE	CIRCUIT	LINE VOLTAGE 90 V.	100 V.	110 V.	120 V.	130 V.
R. F. '35	Screen-Grid / Plate	70 / 192	78 / 213	85 / 234	92 / 256	100 / 277
Det.-Modulator '24	Screen-Grid / Plate	70 / 192	78 / 213	85 / 234	92 / 256	100 / 277
I. F. '35	Screen-Grid / Plate	70 / 192	78 / 213	85 / 234	92 / 256	100 / 277
2nd Detector '24	Screen-Grid / Plate	70 / 154	78 / 171	85 / 187	92 / 204	100 / 221
Audio '47	Accelerating Grid / Plate	199 / 181	221 / 200	244 / 220	267 / 240	289 / 260
A. V. C. '24	Grid / Screen-Grid	12.3 / 34.5	13.7 / 38.5	15.1 / 42	16.5 / 46	17.8 / 50
Rectifier '80	Plate to Plate / Current (both plates)	308 / 52.3 MA	342 / 58.1 MA	376 / 64 MA	410 / 69.7 MA	445 / 75.5 MA

TURN THE VOLUME CONTROL ALL THE WAY ON, CONNECT THE ANTENNA AND GROUND LEADS TOGETHER AND TURN THE GANG CONDENSER PLATES ALL THE WAY OUT. CHECK THE LINE VOLTAGE.

The voltages shown are measured to the cathode of the heater type tubes and to filament of the '47 Pentode.

MONTGOMERY WARD & CO.

AIRLINE 7 TUBE S.G. SUPERHETERODYNE (A.V.C.)
No 62-20 (60~) And No 62-20-X (25~)
(Catalogue No 62-25)



Top View of Chassis.

273-J

I. F. and Oscillator Units

The primary and secondary of both intermediate transformers are tuned with adjustable condensers which remain fixed after the transformers have been tuned to exactly 175 kilocycles.

The oscillator 600 K.C. tracking condenser is mounted directly in front of the oscillator coil shield on the right rear corner of the chassis base.

Holes in the chassis base allow the tuning condensers for the intermediate transformers to be adjusted with a screwdriver from the under side of the chassis.

Power-Supply,

The 25 and 60 cycle power transformers are designed for operation on any 95 to 130 volt A.C. supply without adjustment and without overloading.

The 25 cycle chassis has a special power transformer and has two 8 mfd. 450 volt dry electrolytic condensers, in parallel, instead of the one condenser, C14, shown in the schematic diagram. An 8 mfd. 450 volt wet electrolytic condenser is mounted on top of the chassis base and this condenser replaces the condenser, C17, shown in the diagram. The 25 cycle chassis differs in no other way from the 60 cycle chassis.

Replacing Rubber Drive

You will note that the Vernier tuning drive on this chassis uses a rubber pinion. Under normal operating conditions this rubber will last for a number of years. Should it become worn it can be readily replaced by loosening the set screw of the brass bushing located next to the rubber pinion and pulling out the station selector shaft. Place a new bushing in position, slip the station selector shaft in place and tighten the set screw.

Automatic Volume Control (A.V.C.)

The action of the automatic volume control tube controls the grid bias on the R.F. and I.F. tubes and consequently the amplification of those tubes. The primary of the 2nd I.F. transformer has a tertiary winding which is connected in series in the A.V.C. tube grid circuit.

A signal of sufficient strength reaching the second detector, applies a voltage on the grid of the A.V.C. tube and the voltage thus applied depends upon the signal strength.

The plate of the A.V.C. tube will draw current when the grid voltage of the tube rises in potential and the drop in plate current is applied to the grids of the R.F. and I.F. tubes through their grid returns to the A.V.C. tube plate. This results in a control of the amplification of these tubes and a practically constant receiver output.

The manual volume control adjusts the negative biasing on the control grid of the A.V.C. tube, regulating in this manner the level of the input to the second detector at which the A.V.C. action commences. Thus the manual volume control behaves virtually as an output level control.

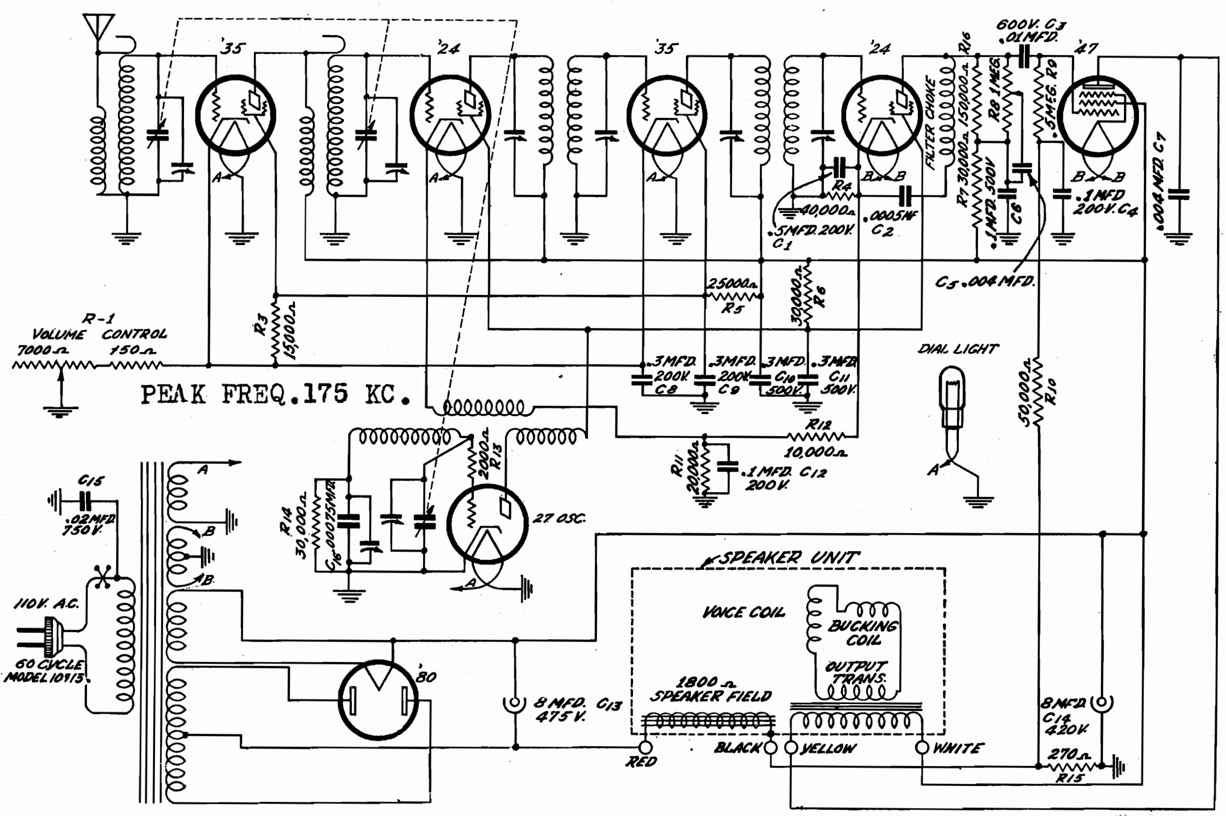
If the A.V.C. tube is defective or removed from its socket, there will be no control of the volume. Similarly, if the A.V.C. tube grid circuit is open, the plate of the tube applies a high grid bias on the R.F. and I.F. tube grids and practically no amplification is obtained from these tubes and consequently no receiver output.

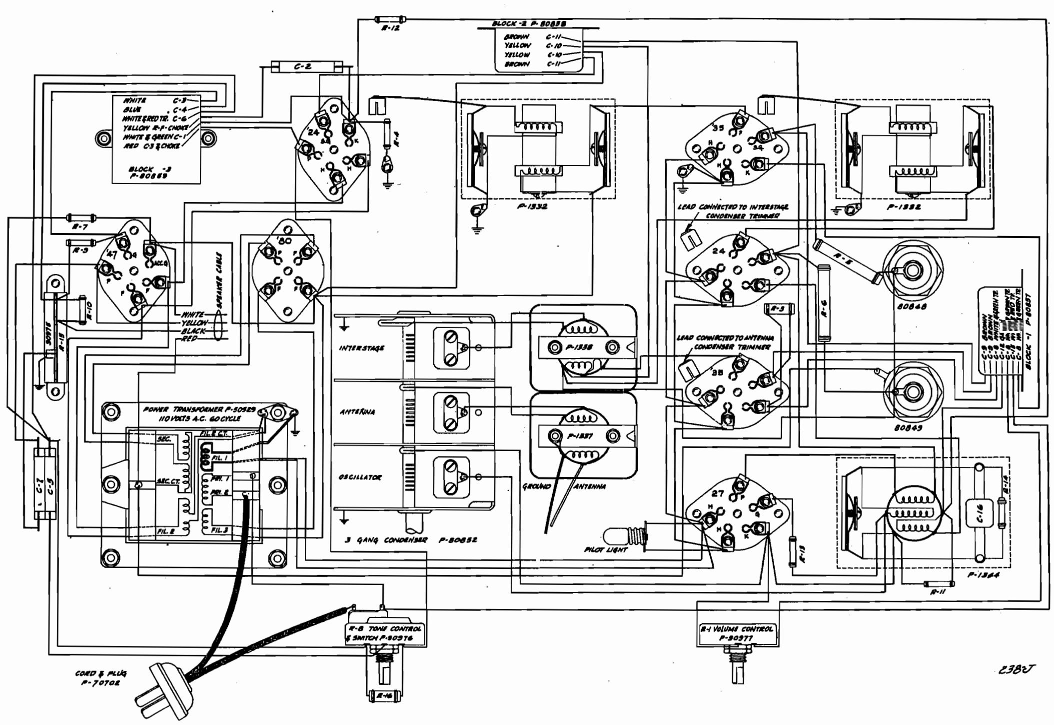
A signal which is too weak to affect the A.V.C. tube grid voltage will not, of course, produce any change in plate current and the maximum amplification of the R.F. and I.F. tubes will be obtained, depending upon their grid bias as set by the A.V.C. tube plate.

MONTGOMERY WARD & CO.

AIRLINE 7 TUBE SUPERHETERODYNE

"FANTASY" CONSOLE No 1111 (Cat. No 62-1611)
"SOLO" MANTEL No 811 (Cat. No 62-1711)
60 ∿ Chassis No 1111 & 811 - 25 ∿ Chassis No 1111X & 811X





MONTGOMERY WARD & CO.

AIRLINE 7 TUBE SUPERHETERODYNE
"FANTASY" CONSOLE No 1111 (Cat. No 62-1611)
"SOLO" MANTEL No 811 (Cat. No 62-1711)

R.F. and Oscillator Transformers

The antenna and R.F. coupling transformers are properly shielded and the oscillator unit is assembled in a shield together with the 600 K.C. tracking condenser, the .00075 condenser (C16) and the resistor (R14) to ground. This method of assembly has eliminated radiation which is a common fault in superheterodyne receivers.

These three units are matched within one microhenry. Each coil has a paint mark inside the coil form near the terminal lugs and the color of this mark indicates the inductance of the coils. The antenna, R.F., and oscillator units in each receiver have the same color and it is necessary that the color be mentioned when ordering a transformer for replacement.

RESISTORS

Diagram Key	Part No.	Resistance in ohms	Type
R1	P-90976		Vol. Cont.
R1	P-90978	Vol. Cont.	With Switch
R3	P-90905-B	15,000	Carbon
R4	P-90916-B	40,000	Carbon
R5	P-90927-A	25,000	Carbon
R6	P-90926-A	30,000	Carbon
R7	P-90956	30,000	Carbon
R8	P-90977	1 Meg.	Tone Cont.
R9	P-90938-A	500,000	Carbon
R10	P-90941-A	50,000	Carbon
R11	P-90959-A	20,000	Carbon
R12	P-90930-C	10,000	Carbon
R13	P-90906-B	2,000	Carbon
R14	P-90956-A	30,000	Carbon
R15	P-90975-A	270	Candohm
R16	P-90963-A	150,000	Carbon
R17	P-90979	7,000	Carbon

STANDARD COLOR CODE

Tube	Circuit	Meter Scale	110 V.
R.F. (Ant.) '35	Grid Screen Grid Plate	0—10 0—100 0—250	1.9 63. 225.
1st Det. '24	Grid Screen Grid Plate	0—25 0—100 0—250	14.5 65. 220.
Int. '35	Grid Screen Grid Plate	0—10 0—100 0—250	1.9 63. 225.
2nd Det. '24	Grid Screen Grid Plate	0—25 0—100 0—250	14.5 65. 135.
Osc. '27	Grid Plate	 0—100	 80.
Aud. '47 (See Caution Above)	Grid Accelerating Grid Plate	0—10 0—250 0—250	2.7 225. 205.
'80 Rect.	Filament, to Ground	0—1000	233.

Tuning

The primary and secondary of both intermediate transformers are tuned with adjustable condensers which remain fixed after the transformers have been tuned to exactly 175 kilocycles.

The oscillator has an adjustable tracking condenser which is adjusted at 600 kilocycles and remains fixed thereafter.

Condensers and Resistors

Three blocks contain the majority of condensers. The choke in the plate circuit of the second detector tube is also contained in one of these blocks. The common leads of condenser blocks No. 1 and No. 2 are grounded. C1, C4, and C6 in block No. 3 have a common lead which is grounded, and the choke and C3 in this block have a common lead connected to the plate of the 2nd detector.

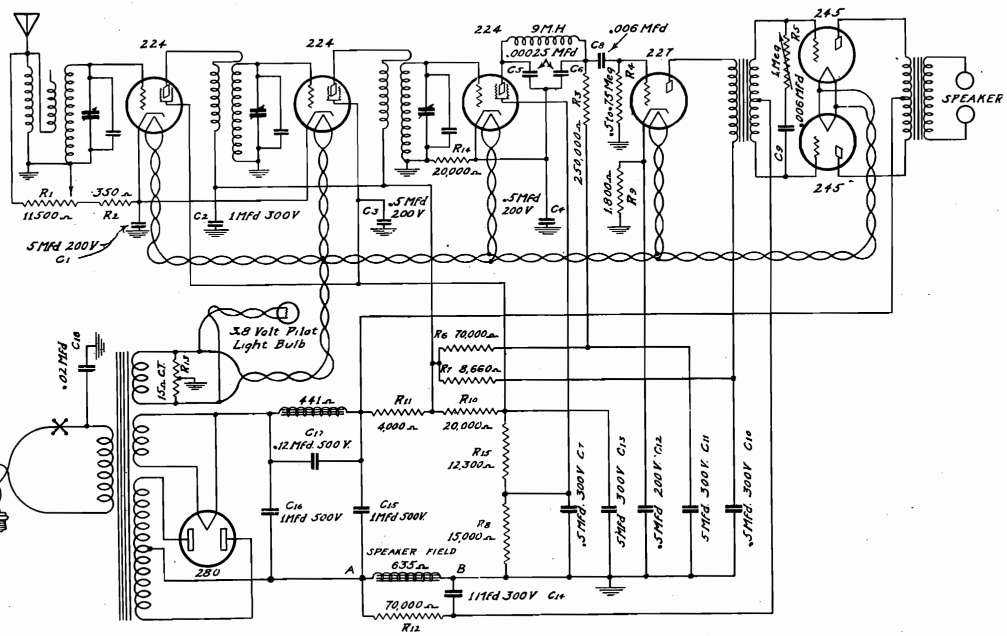
ANALYZER CHART

All voltages taken with a 1,000 ohm per volt voltmeter on the scale indicated in the column headed "Meter Scale." Turn the volume all the way on and connect the antenna and ground leads together. The grid, plate, and screen grid voltages are measured to cathode of the '24 and '35 tubes and to filament of the '47 tube.

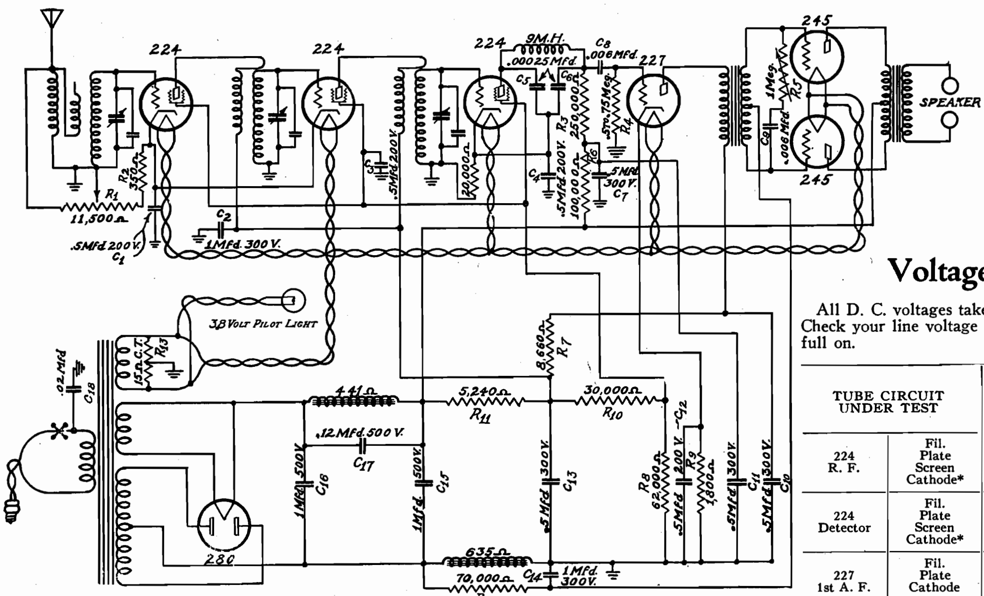
The grid voltage on the '27 oscillator cannot be taken except with a very sensitive, low scale voltmeter. The voltage is approximately .05 volts when the A.C. line voltage is 110 volts.

MONTGOMERY WARD & CO.

"AIRLINE" 7 TUBE S.G. "CHALLENGER" No 11,000



Schematic Diagram of Challengers with Serial Number Above A94313.



Schematic Diagram of Challengers with Serial Number Below A94313.

Voltage Characteristics

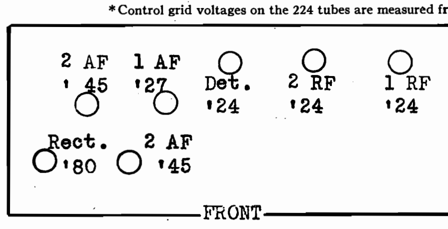
All D. C. voltages taken with a 1,000 ohm per volt voltmeter. Check your line voltage before taking readings. Volume control full on.

TUBE CIRCUIT UNDER TEST		LINE VOLTAGE				
		90 V.	100 V.	110 V.	120 V.	130 V.
224 R. F.	Fil.	1.75	1.95	2.17	2.3	2.57
	Plate	130	150	169	183	193
	Screen	68	78	86	94	100
	Cathode*	2.0	2.43	2.83	3.2	3.6
224 Detector	Fil.	1.77	1.97	2.19	2.33	2.6
	Plate	35	40.8	45.5	50.5	55
	Screen	37.5	43	48	52	56.8
	Cathode*	2.55	3.1	3.65	4.2	4.8
227 1st A. F.	Fil.	1.79	1.99	2.22	2.34	2.62
	Plate	95	108	118	122	138
	Cathode	5.7	6.7	7.5	8.4	9.3
245 2nd A. F.	Fil.	1.8	2.0	2.23	2.35	2.62
	Plate	180	210	233	255	280
	Grid	—35	—42.3	—49	—55	—62
280 Rect.	Fil.	3.66	4.1	4.55	4.8	5.35
	Plate Current	54 ma	64 ma	73 ma	82 ma	90 ma

*Control grid voltages on the 224 tubes are measured from cathode to ground.

R.F. Coils

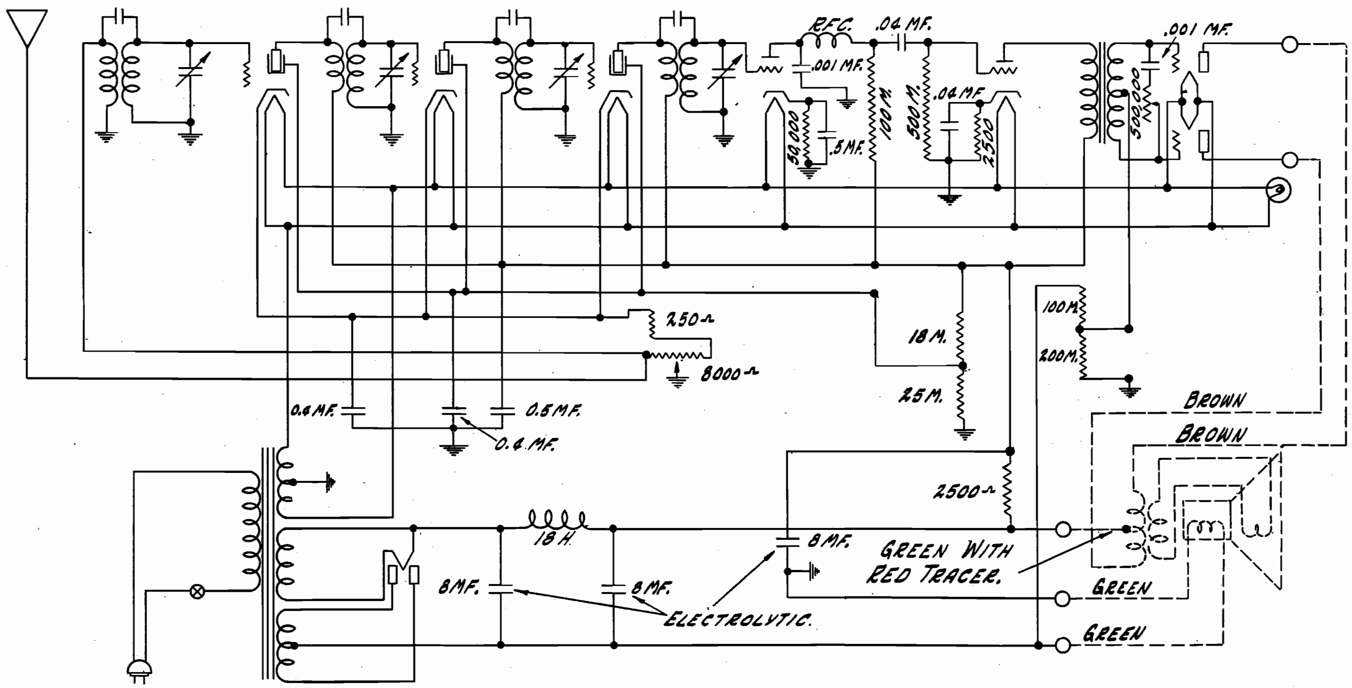
The antenna coil in particular is a departure from the usual performance of antenna stages in other receivers. With the usual commercial type of antenna circuit, a short antenna will detune the antenna stage and reduce the sensitivity of the set accordingly. The antenna stage in this set is so constructed that it will not be affected by short or long antennas to any appreciable extent. The R.F. coils in each stage are marked with a color, according to the group in which they fall, and three coils of the same color are placed in the chassis. This color marking is a streak of paint inside the secondary coil inside the lugs. In ordering coils for replacement, be sure to mention the color of the paint on the coil so that the replacements will be of the same characteristics. If in doubt, return the coils.



MONTGOMERY WARD & CO.

AIRLINE 8 TUBE S.G.

"COMMANDER" No 14,000
and
"CAVALIER" No 62,000



Schematic Diagram of Commander and Cavalier Sets

DOTTED LINES SHOWN ARE IN SPEAKER.

Model 29 W chassis used in both the Commander and Cavalier sets is similar in all essential respects to the Airline Cortez and Coronado.

Certain changes have been made, however, which have to do chiefly with the operating voltages. The schematic diagram as compared with the diagram of the Cortez will show clearly where these changes have been made, and the operating voltages chart will show the effect that the changes have had in the voltages at the various tube sockets. In performance this chassis is quite similar to the Cortez, with the exception of slightly less power out-put when operated with the volume control full on.

Servicing instructions which apply to the Cortez also apply in the 29 W chassis. Do not forget, however, that in making any measurements with the set analyzer on the 29 W chassis, that the voltages are widely different from those used in the Cortez.

For "CORONADO" NO 3035 (60~) & 3037 (25~)
and "CORTEZ" No 3065 (60~) & 3067 (25~)
refer to page 452-A

Operating Voltages

VOLTAGES AT SOCKETS—VOLUME CONTROL AT MAXIMUM—LINE VOLTAGE, 115 PLUG IN SOCKET OF RECEIVER—TUBE IN TEST SET

Type of Tube	Position of Tube	Function	A Volts	B Volts	Control Grid Volts	Screen Volts	Screen Current MA	Cathode Volts	Plate M.A.	Grid Test M.A.
224	1	1st Radio	2.3	247	4.0	103	.75	4.0	4.6	9.3
224	2	2nd Radio	2.3	247	4.0	103	.75	4.0	4.6	9.3
224	3	3rd Radio	2.3	247	4.0	103	.75	4.0	4.6	9.3
227	4	Detector	2.3	160	17	.....	.....	17	.35	.4
227	5	1st Audio	2.3	223	15	.....	.....	15	5.9	6.9
245	6	2nd Audio	2.25	243	29.2	.....	.....	.....	27.5	32
245	7	2nd Audio	2.25	243	29.2	.....	.....	.....	27.5	32
280	8	Rectifier	4.9	.....	.....	Per	Plate	.....	.....	42.5

MONTGOMERY WARD & CO.

AIRLINE MODEL 181 CHASSIS

"COMMODORE" No 62-040 (Cat. No 62-3335)

"SOVEREIGN" No 62-181 (No Cat. No.)

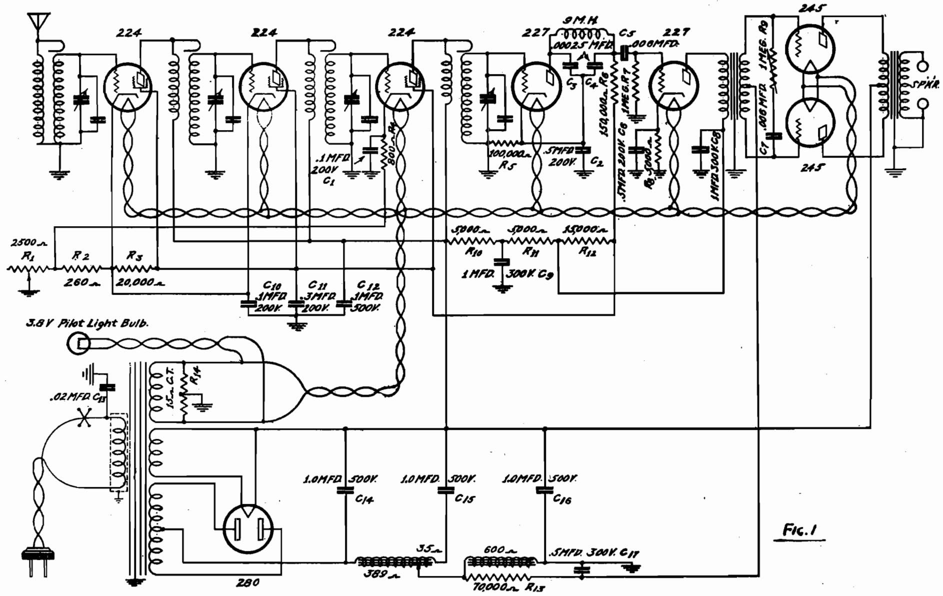


Fig. 1

IMPORTANT

All chassis below serial number 139149 use volume control P-90966 shown in Figure 1. Chassis above 139149 use volume control P90969 shown in Figure 3. When replacing volume controls use P90969 and volume control connections shown in Fig. 3.

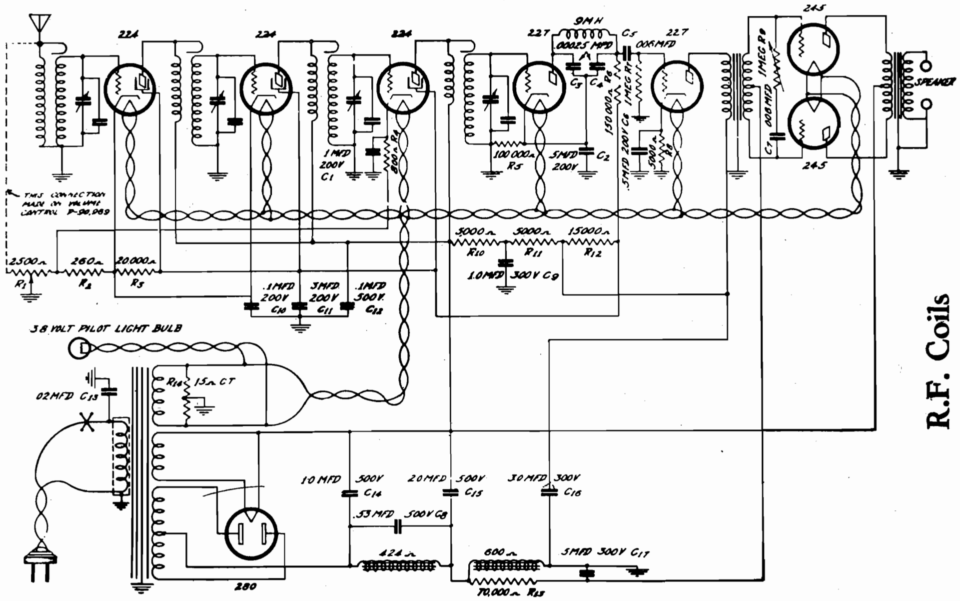


Fig. 3 25-Cycle Chassis

R.F. Coils

The R.F. Coils on this receiver are both inductively and capacitively coupled in such a way that the R.F. gain is constant throughout the entire broadcast band. Each coil is marked with a streak of paint inside the secondary coil near the lugs, according to the group into which it falls. Four coils of the same color are used in each chassis. When ordering a coil for replacement, therefore, be sure to mention the color of the paint on that coil so that it will be replaced with one of identically the same characteristics. If there is any doubt, return the coil. It is seldom that one of these radio frequency coils needs replacement, but should it be necessary to do so, first unsolder the wires on the coil lugs, then loosen the nuts holding the metal coil can. After the coil can is removed, loosen the two nuts holding the coil form and remove the coil.

The dynamic loud speaker has a field resistance of 600 ohms. The field is used as one of the filter chokes in the power pack.

Tube Voltages

All D.C. voltages taken with a 1000 ohm per volt meter on the scale indicated in column headed "Meter Scale." Turn the volume control all the way on and connect the antenna and ground leads together.

The grid, plate, and screen grid voltages are measured to cathode of the heater tubes and to filament of three-element tubes.

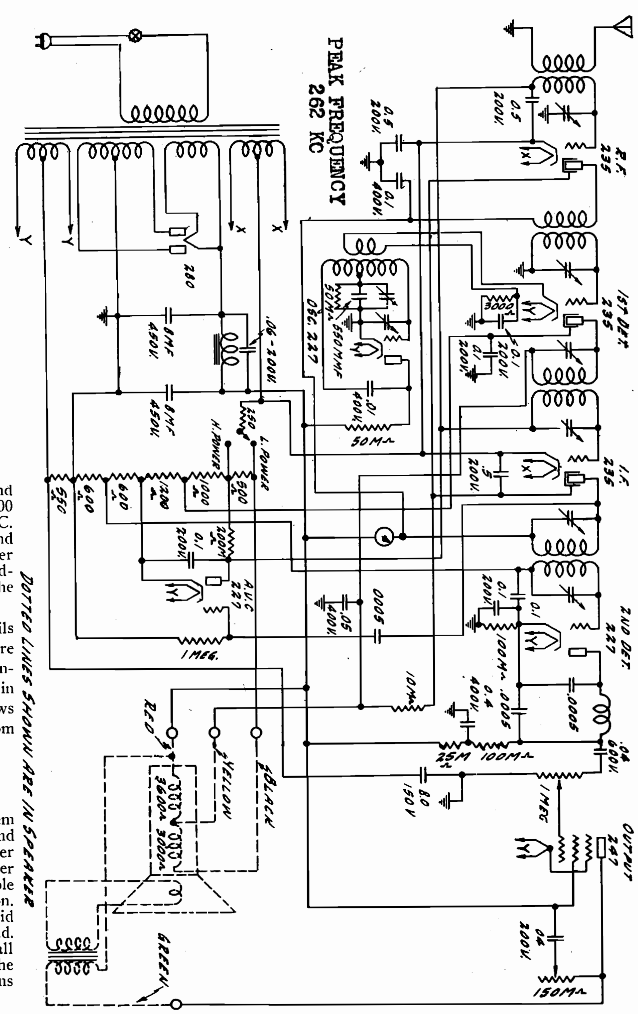
Tube	Circuit	Meter Scale	90 V.	100 V.	110 V.	120 V.	130 V.
1st two 224 R.F. Amplifier Tubes	Grid Screen Grid Plate	0-5 0-100 0-750	-2.5 62 220	-2.9 70 240	-3.3 76 270	-3.7 84 295	-4.1 90 310
2nd 224 R.F. Amplifier Tube	Grid	0-5	-1.9	-2.3	-2.6	-3.	-3.4
Detector 227 Tube	Grid Plate	0-10 0-100	2.4 21.0	2.7 24.0	-3. 26.0	-3.3 29.0	-3.6 32.0
227 Audio Amplifier Tube	Grid Plate	0-10 0-250	.3 90	.4 145	.5 158	.55 170	.6 183
245 Power Tubes	Grid Plate	0-100 0-750	30 220	34 240	39 275	43 300	47 320
280 Rectifier Tube	Plate	0-750	300	330	360	400	415

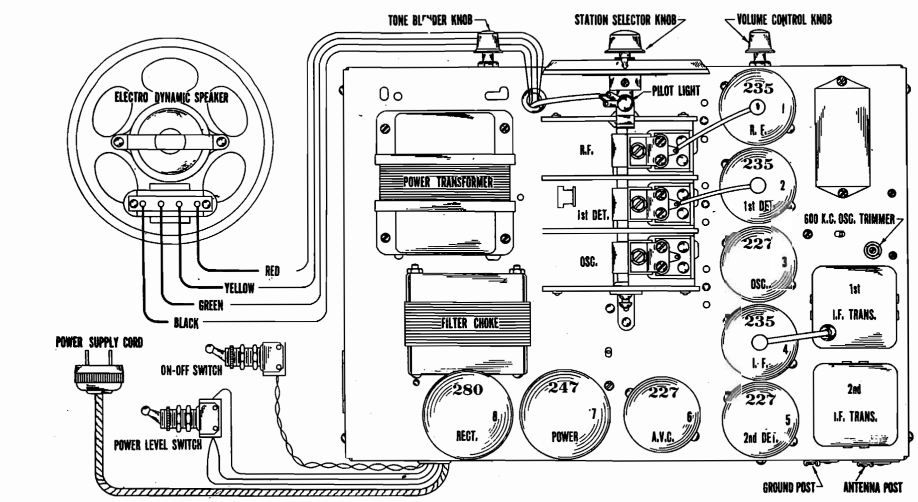
MONTGOMERY WARD & CO.

"AIRLINE" 8 TUBE S.G.SUPERHETERODYNE

"RECITAL" No 1238 (Cat.No 62-1838)

60 ∿ Chassis No 1238 & 1838 - 25 ∿ Chassis No 1238-X





Top View of Chassis Showing Tube Location and Speaker Connections

8 TUBE CHASSIS—VOLTAGES AT SOCKETS—VOLUME CONTROL AT MAXIMUM LINE VOLTAGE 115—POWER LEVEL SWITCH HIGH POWER

Type of Tube	Function	"A" Volts	"B" Vo ts	Control Grid "C" Volts	Screen Volts	Screen Current MA	Cathode Volts	Plate MA	Grid Test MA
235	R.F.	2.3	190	2.3(1)	68	1.0	0	3.8	6.5
235	1st Det.	2.3	190	6.5	70	.35	14.	2.0	4.9
227	Osc.	2.3	80	15—50(2)			20.	4.7	4.8
235	I.F.	2.3	190	2.3(1)	68	.6	0	3.6	6.0
227	2nd Det.	2.3	150	20.			20.	.4	.4
227	A.V.C.	2.3	65(3)	40.(4)			20.	0.	0.
247	Power	2.35	260	20.(5)	280	7.		32.	36.
280	Rectifier	5						41. Per plate	

(1) Measured across 250 ohm series resistor.
(2) Bias voltage varies from 15 to 50 between 1500 and 550 K.C. settings of tuning condenser.
(3) Measured across 1000 and 1200 ohm sections of shunt resistor.
(4) Measured across two 600 ohm sections of shunt resistor.
(5) Measured across 550 ohm series resistor.

25 Cycle Chassis No. 1238X

For 25 cycle sets remove the .06 Mfd. condenser across the filter choke and use No. U-3084 power transformer instead of U-2783.

In order to provide satisfactory tracking with the R. F. and 1st detector tuned circuits the oscillator is provided with a 600 K. C. and a 1400 K. C. trimmer condenser. The 1400 K. C. trimmer condenser is located on top of the tuning condenser and is connected across the tuning condenser. The 600 K. C. trimmer condenser is across the 550 Mmf. fixed condenser and the adjusting screw is in front of the first I. F. can on top of the chassis.

The I. F. transformers are small universal wound coils mounted on a piece of tubing. The I. F. tuning condensers are small mica condensers. The coil tubing standards and condensers are mounted on porcelain bases and are enclosed in metal cans located on top of the chassis. The adjusting screws of the four I. F. tuning condensers are reached from the bottom of the chassis.

Voltages

Check the voltages at the sockets to see if the power system is delivering the correct voltages. The antenna and ground should be disconnected. The shield should be on. The tester plug can be inserted in the sockets and the shield placed over it. When the plug is inserted in the oscillator socket the cable must be doubled back over it in order to get the shield back on. When reading the voltages of the 1st detector bring the grid cap and wire through the trimmer condenser hole in the shield. The voltage chart shows the voltages and currents with all tubes in, speaker connected and set in operating condition. The voltages will vary with individual receivers and with variations in tubes. The voltages as shown are with a line voltage of 115.

Several of the voltages as indicated in the chart cannot be satisfactorily read at the socket but should be read across the resistors at which they are developed.

(SEE ; NOTE - "GRENADIER" No 62-12 - PAGE 452-B-19)

MONTGOMERY WARD & CO.

AIRLINE 8 TUBE S.G.SUPERHETERODYNE
"GRENADIER" No 62-14 (Cat. No 62-11, 62-27)
60 ∿ Chassis No 62-14, 62-11 - 25 ∿ Chassis No 62-14X
("GRENADIER" No 62-12 - See Note)

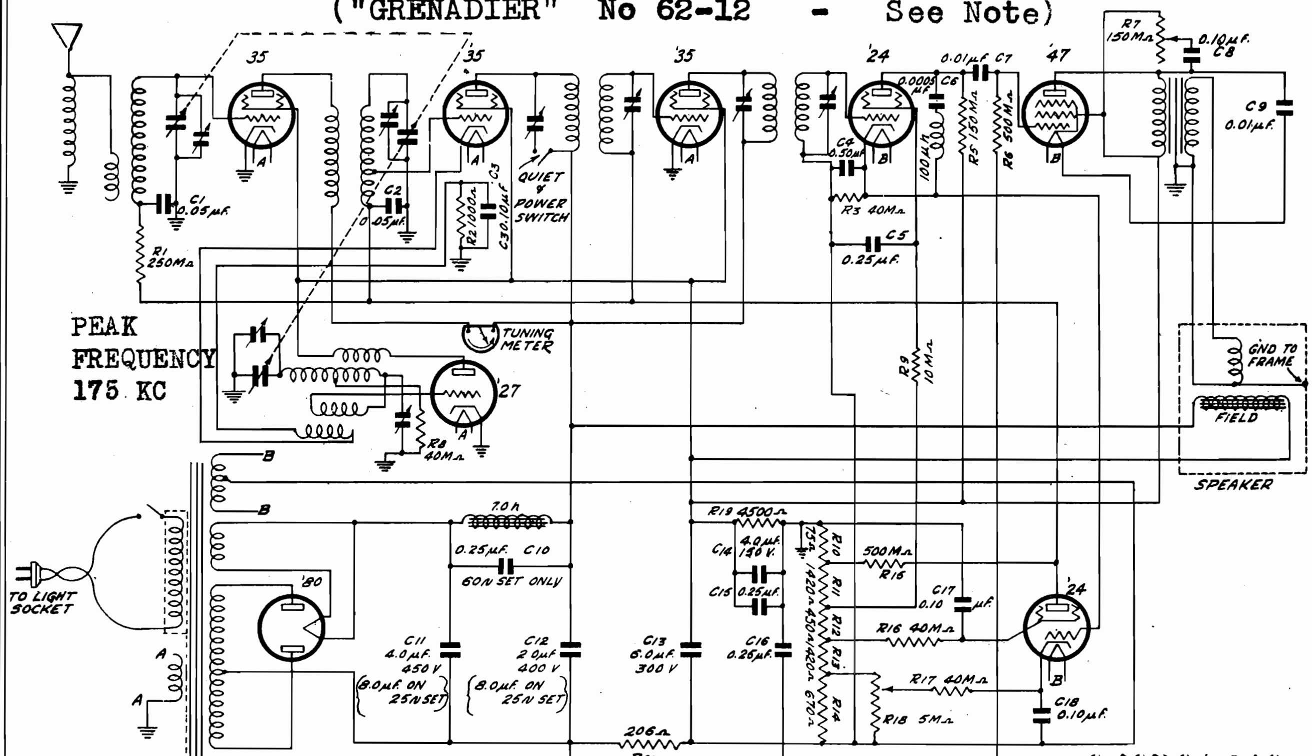


Figure 1—Schematic Diagram

TUBE	CIRCUIT	LINE VOLTAGE 90 V.	100 V.	110 V.	120 V.	130 V.
R.F.	Screen grid	70	78	85	92	100
'35	Plate	143	159	175	191	207
1st Det.	Screen grid	70	78	85	92	100
'35	Plate	143	159	175	191	207
I. F.	Screen grid	70	78	85	92	100
'35	Plate	143	149	175	191	207
Oscillator						
'27	Plate	70	78	85	92	100
2nd Det.	Screen grid	66	73	80	87	94
'24	Plate	127	134	141	148	155
A. V. C.	—	14	15.5	17	18.5	20
'24	—Grid grid Screne	24	26	28	30	32
Audio	Accel. Grid	199	221	244	267	289
'47	Plate	171	190	210	230	250
Rectifier	Current (both plates)	67 MA	75 MA	82 MA	89 MA	96 MA
'80	Plate to Plate Voltage	512	569	625	682	739

NOTE - "GRENADIER" No 62-12

Two entirely different chassis were supplied to the Retail Stores under the name "Grenadier." Each chassis, however, has a different Catalogue number and should be distinguished from this number. The Grenadier No. 62-12 uses the U. S. Radio 8 tube chassis and is exactly the same as our Nos. 1238 and 1838. Therefore, when servicing or ordering repair parts for the Grenadier No. 62-12, use the No. 1238 and 1838 service manual. Grenadier No. 62-14 (Catalogue No. 62-11) is the Wells-Gardner 8 tube chassis which will be described in this service manual.

The voltage readings on this chassis cannot be taken in the conventional way, namely between the tube elements and ground. You will note from diagram Figure No. 1, that the ground connection is taken off the shunt resistor near to the positive end, and the chassis is therefore, approximately 150 Volts positive, with respect to the tube elements. The correct voltage readings may be obtained by taking readings to the cathode of the heater type tubes, and filament of the 247.

TURN THE VOLUME CONTROL ALL THE WAY ON, CONNECT THE ANTENNA AND GROUND LEADS TOGETHER AND TURN THE GANG CONDENSER PLATES ALL THE WAY OUT. CHECK THE LINE VOLTAGE.

The voltages shown are measured to the cathode of the heater type tubes and to filament of the '47 Pentode.

MONTGOMERY WARD & CO.

AIRLINE 8 TUBE SUPERHETERODYNE
"GRENADIER" No 62-14 (Cat. No 62-11, 62-27)

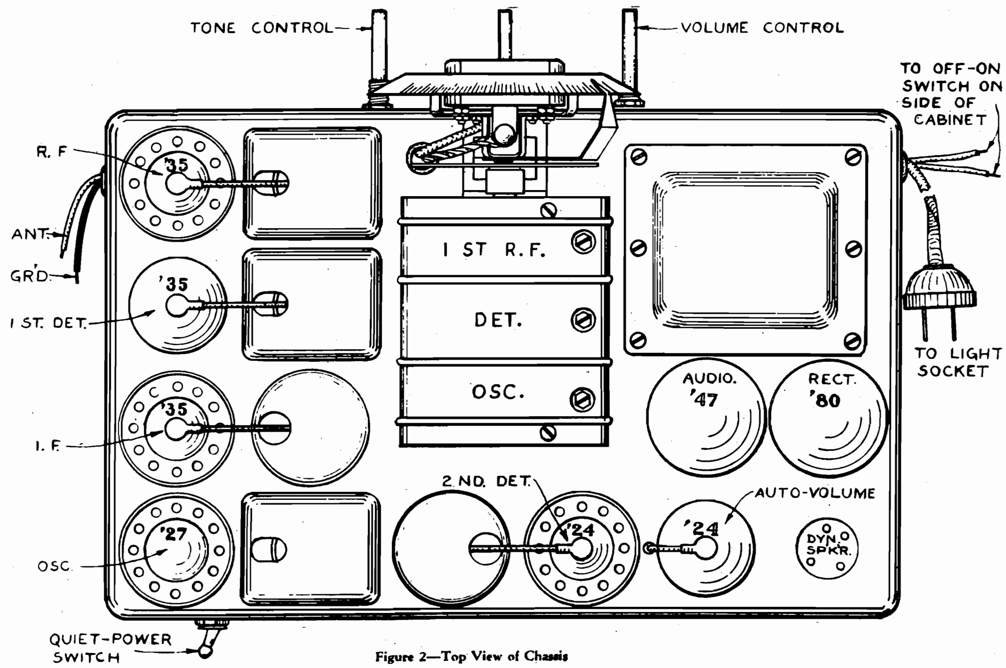


Figure 2—Top View of Chassis

Oscillator

A 227 tube used in this socket that does not oscillate will completely stop any signals from reaching the intermediate frequency amplifier and the chassis will not operate. There is also a slight variation in the characteristics of tubes, and for this reason it is advisable to try a number of tubes in the oscillator position and to use the one which gives the most satisfactory performance.

The oscillator has an adjustable tracking condenser which is adjusted at 600 kilocycles and remains fixed thereafter.

Automatic Volume Control Tube

The automatic volume control tube is equally as important as the oscillator tube. In this chassis a 224 is used. If the A.V.C. tube's characteristics are not exact, it will cause the chassis to lack sensitivity or spoil the tone quality. The tuning meter will not function properly with a poor A.V.C. tube. If the grid circuit of this tube is open the chassis will lose its sensitivity and in some cases will not pass signals. In each installation, therefore, it is advisable to try a number of 224's in the automatic volume control position and use the tube which gives the most satisfactory performance as to control of volume, operation of tuning meter, and tone quality.

Replacing Rubber Drive

You will note that the Vernier tuning drive on this chassis uses a rubber pinion. Under normal operating conditions this rubber will last for a number of years. Should it become worn it can be readily replaced by loosening the set screw of the brass bushing located next to the rubber pinion and pulling out the station selector shaft. Place a new bushing in position, slip the station selector shaft in place and tighten the set screw.

25 Cycle Chassis No. 62-14X

The 25 cycle receivers use power transformer No. P50540 instead of P50539. Two 8.0 mfd. electrolytic condensers No. P80880 are used instead of No. P80873 and No. P80874. The .25 mfd choke condenser C10 is not used in the 25 cycle chassis.

Resonance Meter

This meter is a small milliameter in the plate return of the R. F. tube. When the receiver is turned on, and no signal is tuned in, the meter will indicate the total plate current drawn by the R. F. tube. When a signal is tuned in, the meter will indicate less current, and when tuned to resonance, the greatest swing (or least deflection), of the meter hand will be obtained.

The deflection of the meter hand will vary according to the setting of the manual volume control on this chassis.

Method of Aligning

These chassis will only lose their alignment when they have been subject to extremely rough handling or have been used under abnormal conditions, as for instance, a very hot or very humid location. Under any one of these conditions, the alignment may shift slightly and the chassis should be realigned according to the following procedure.

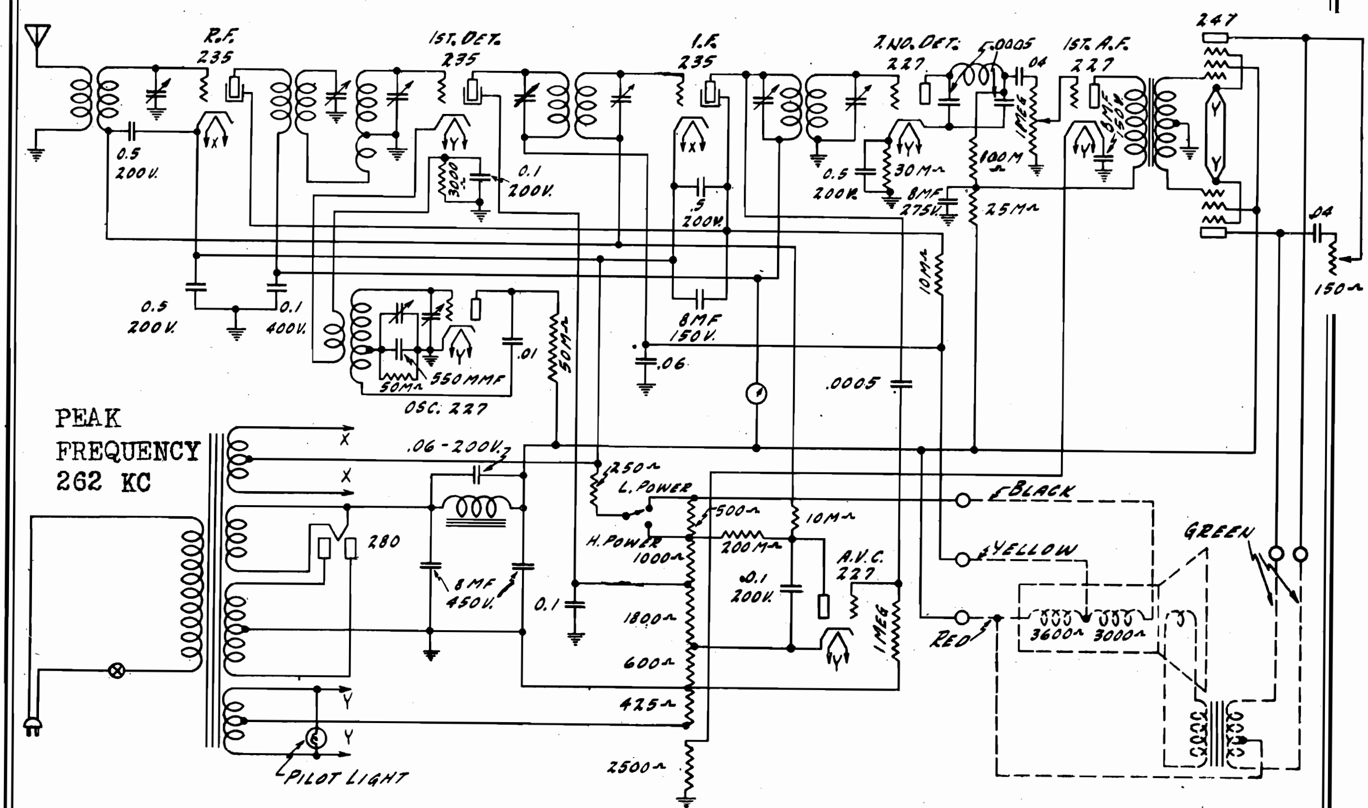
Tune in a local station of approximately 1400 Kilocycles, being very careful to tune this station in at the exact reasonance point. This may be easily done by carefully adjusting for maximum deflection of the tuning meter. Then reduce the volume to the desired level. Turn to Figure 2 and note the position of the first radio frequency trimmer adjustment. Slowly turn the trimmer to the right or left until the signal is at maximum intensity. Proceed to adjust the detector trimmer in the same manner. In most instances these two adjustments will align the chassis perfectly. If the receiver still lacks sensitivity after the first RF and detector trimmers have been adjusted, then the oscillator trimmer may be checked by turning the adjusting screw not more than a quarter of a turn to the right or left of its present adjustment. When aligning any of these receivers be sure that the condenser shield is firmly in place and that you are using good tubes in the chassis. This is particularly true in case of the oscillator and automatic volume control tube.

The R. F., 1st detector, oscillator and 1st I. F. tubes have one side of their heater circuit grounded.

The voice coil and speaker frame are grounded to prevent any "feedback" of a 175 K. C. frequency which might enter the speaker.

MONTGOMERY WARD & CO.

AIRLINE 10 TUBE S.G.SUPERHETERODYNE
"MINSTREL" No 1355 (Cat.No 62-1955)
60 ∿ Chassis No 1355 & 1955 - 25 ∿ Chassis No 1355X



DOTTED LINES SHOWN ARE IN SPEAKER

1955 AND 1355 CHASSIS—VOLTAGES AT SOCKETS —LINE VOLTAGE 115 VOLUME CONTROL AT MAXIMUM—POWER LEVEL SWITCH HIGH POWER

Type of Tube	Position of Tube	Function	"A" Volts	"B" Volts	Contro Grid "C" Volts	Screen Volts	Screen Current MA	Cathode Volts	Plate MA	Grid Test MA
235	1	R.F.	2.3	175	2.3(1)	65	.7	0.	4.	6.
235	2	1st Det.	2.3	185	7.0	69	.4	14.	2.0	2.6
235	3	I.F.	2.3	175	2.3(1)	65	.7	0.	4.0	6.0
227	4	2nd Det.	2.3	115	12.			7.5	.4	.5
227	5	1st Audic	2.3	145	11.(1)			10.	4.6	5.4
227	6	Osc.	2.3	83	15—35(3)			21.	4.2	4.4
227	7	A.V.C.	2.3	89(4)	20.(5)			1.5	0.	0.
247	8	Power	2.35	255	18.5	265	4.5			
247	9	Power	2.35	255	18.5	265	4.5		21.	28.
280	10	Rect.	4.9						45.	

(1) Measured across 250 ohm series resistor.
(2) Measured across 2500 ohm series resistor.
(3) Bias voltage varies from 15 to 35 between 1500 and 550 K.C. settings of tuning condenser.
(4) Measured across 1000 and 1800 ohm section of shunt resistor.
(5) Measured across 600 ohm section of shunt resistor.

Voltages

Check the voltages at the sockets to see if the power system is delivering the correct voltages. The antenna and ground should be disconnected. The tube shield should be on. The tester plug can be inserted in the sockets and the shield placed over it. When the plug is inserted in the 235 tube sockets care must be taken that the grid connection is not shorted to the tube shield. The chart shows the voltages and currents with all tubes in, speaker connected and set in operating condition.

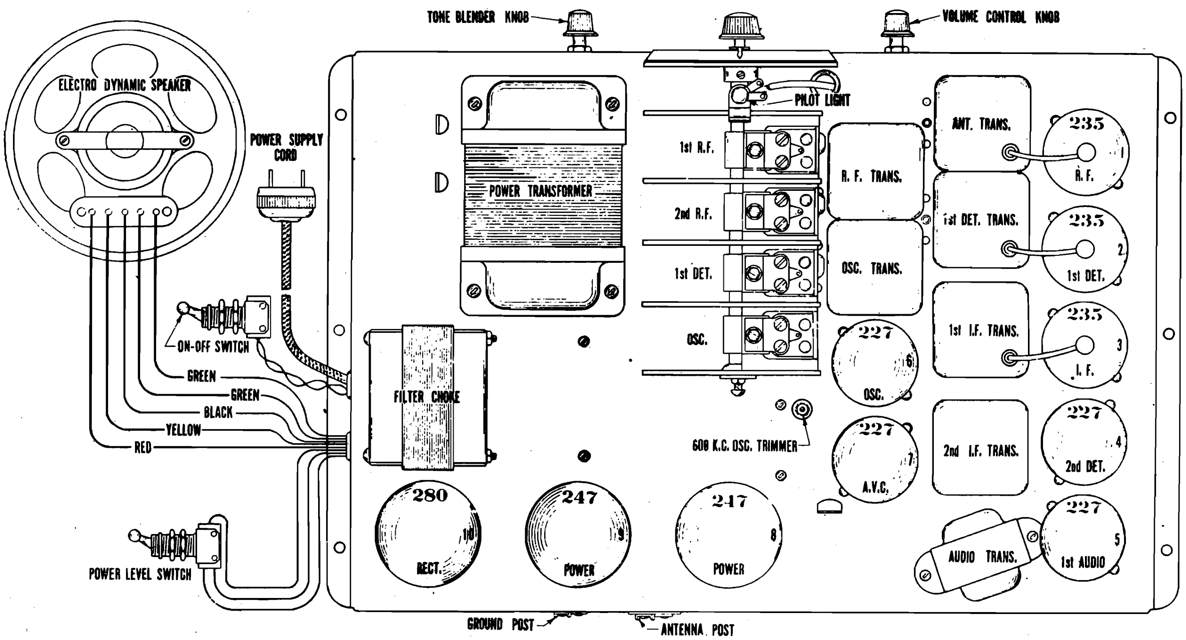
In reading the I. F. voltages at the socket with a set analyzer some difficulty may be encountered if the control grid lead is in the same cable as the rest of the leads to the socket plug. If this is the case the grid plate capacity caused by the grid and plate leads being in the same cable results in a feed back which causes an I. F. oscillation. This manifests itself as a blocking or motorboating.

25 Cycle Chassis No. 1355X

For 25 cycle sets remove the .06 Mfd. condenser across the filter choke and use No. U-3169 power transformer instead of No. U-2912.

MONTGOMERY WARD & CO.

"AIRLINE" 10 TUBE SUPERHETERODYNE
"MINSTREL" No 1355 (Cat. No 62-1955)



Automatic Volume Control

The automatic volume control as used in this receiver varies the signal strength by changing the bias voltage of the R. F. and I. F. 235 tubes. A 227 tube is used as the A. V. C. tube. Plate, cathode and grid circuits of this tube are connected to the voltage divider resistor as shown in Fig. 1 to secure the required plate and grid voltage. In the plate circuit of this tube is a 200,000 ohm resistor. The grid circuits of the R. F. and I. F. tubes are connected to the plate of the A. V. C. tube through a 10,000 ohm resistor. The cathodes of these two tubes are connected through the 250 ohm biasing resistor to the other end of this 200,000 ohm resistor in the plate circuit (power level switch on "H" power). The grid of the A. V. C. tube is connected to the plate of the I. F. 235 tube through a .0005 condenser. The A. V. C. tube has an initial bias of 20 volts and under conditions of no signal, no plate current flows in this tube. However, when an A. C. voltage of 15 or greater is applied to the grid circuit of the A. V. C. through the .0005 coupling condenser, plate current flows and a drop is established across the 200,000 ohm resistor. This lowers the voltage of the R. F. and I. F. grids, increasing the bias and decreasing the sensitivity in proportion to the strength of the signal being received. The higher the A. C. voltage applied to the A. V. C. grid the greater the drop across the 200,000 ohm resistor and the higher the bias voltage. For weak signals, therefore, the A. V. C. does not affect the bias and maximum sensitivity is obtained, while for strong signals the bias is increased and a corresponding reduction in sensitivity effected.

Servicing

The usual checking of wiring and soldered connections and checking of resistors and condensers for opens, shorts, grounds and wrong value also apply, of course, to the Super-heterodyne. In working on the receiver care should be taken that the I. F. plate and grid leads are not bent too close to the chassis as the capacity to the ground will be excessively high. Note that the R. F. and I. F. control grids are not at ground potential and a slight shock can be obtained between the grid caps of these tubes and the chassis. Do not get the antenna lead near the 2nd detector as a harmonic of the signal in the 2nd detector plate circuit may feed into the antenna system and beat with the R. F. signal causing an audible whistle.

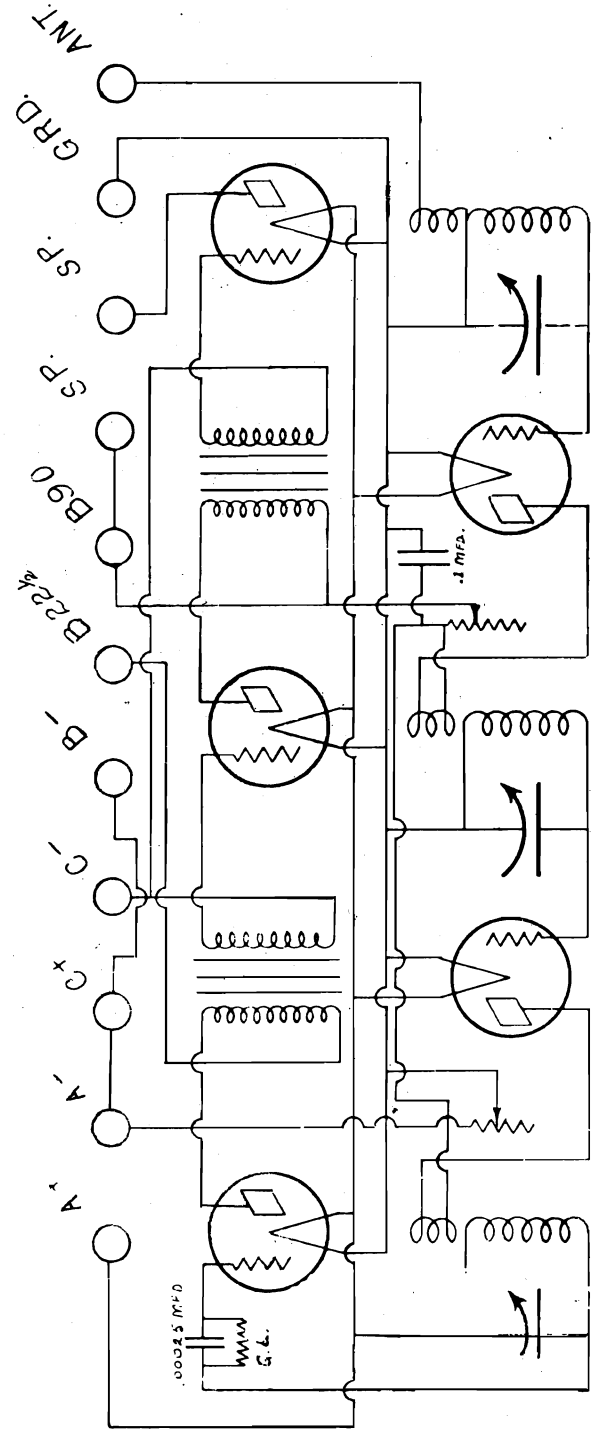
A good check to determine if the oscillator is working is to read the voltage across the 50,000 ohm resistor. This will vary between the limits as shown in the voltage chart for the oscillator bias, depending on the frequency to which the receiver is tuned.

In order to provide satisfactory tracking with the R. F. and first detector tuned circuits the oscillator is provided with a 600 K. C. and a 1400 K. C. trimmer condenser. The 1400 K. C. trimmer condenser is located on top of the tuning condenser and is connected across the oscillator tuning condenser. The 600 K. C. trimmer condenser is across the 550 Mmf. fixed condenser and the adjusting screw is in back of the tuning condenser on top of the chassis.

The I. F. transformers are small universal wound coils mounted on tubing. The I. F. tubing condensers are small mica condensers. The coil tubing and condensers are mounted on porceain bases and are enclosed in metal cans located on top of the chassis. The adjusting screws of the four I. F. tuning condensers are reached from the bottom of the chassis.

OZARKA INC.

SCHEMATIC MODEL VIKING 5-A



OPERATING VOLTAGES MODEL 90 AND MODEL VIKING 91

MODEL 90

Tube	Type	Plate	Grid
R.F.	'24	160	160
R.F.	'26	160	
R.F.	'26	160	
R.F.	'26	160	
Det.	'27	40	
A.F.	'27	150	
Pwr.	'45	300	
Pwr.	'45	300	

Volume Max.
All Volts to Ground.
Grid Volts Fil.To Grd.
(Diagram on page 458-B)

MODEL VIKING 91

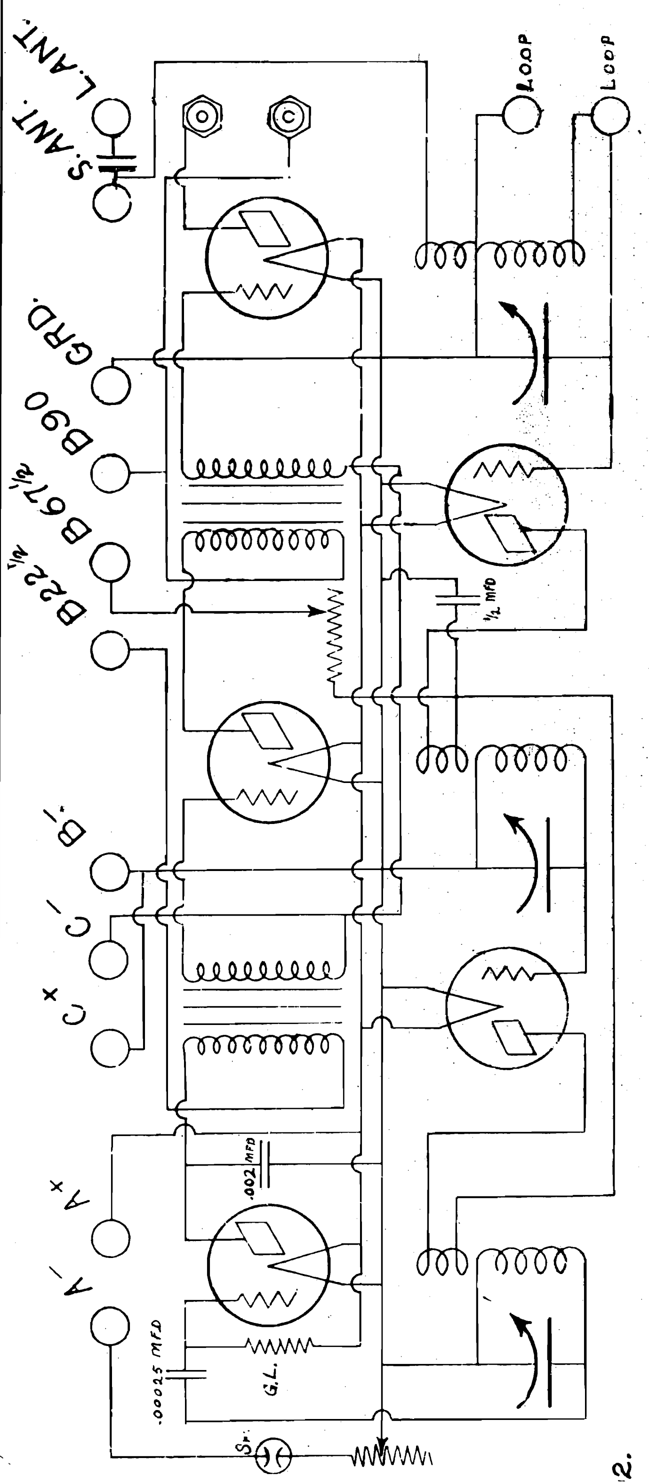
Tube	Type	Plate	Grid	Cath.
R.F.	'24	150	65	2
R.F.	'24	150	65	2
Det.	'24	50	30	3
A.F.	'27	145		47(Grid)
Pwr.	'45	295		
Rect.	'80			

Volume Max.
Voltages To Ground.
(Diagram on page 458-A)

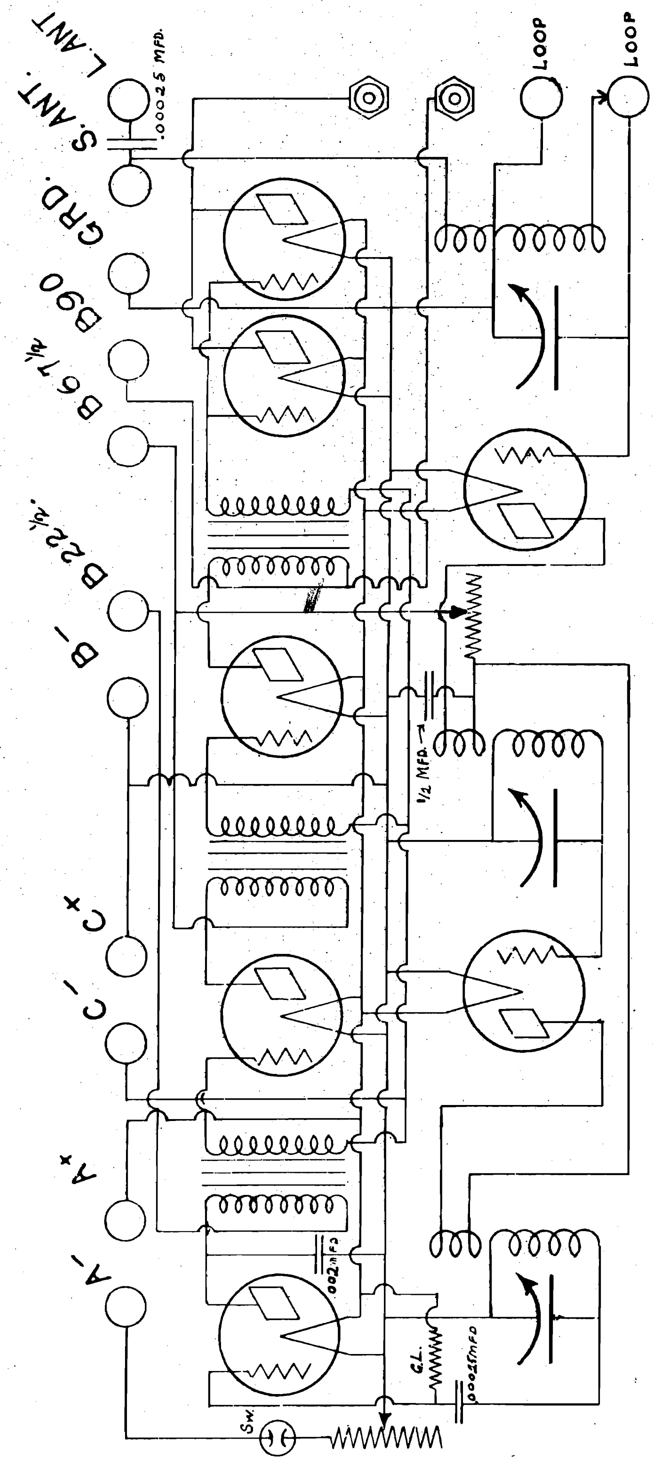
3.

OZARKA INC.

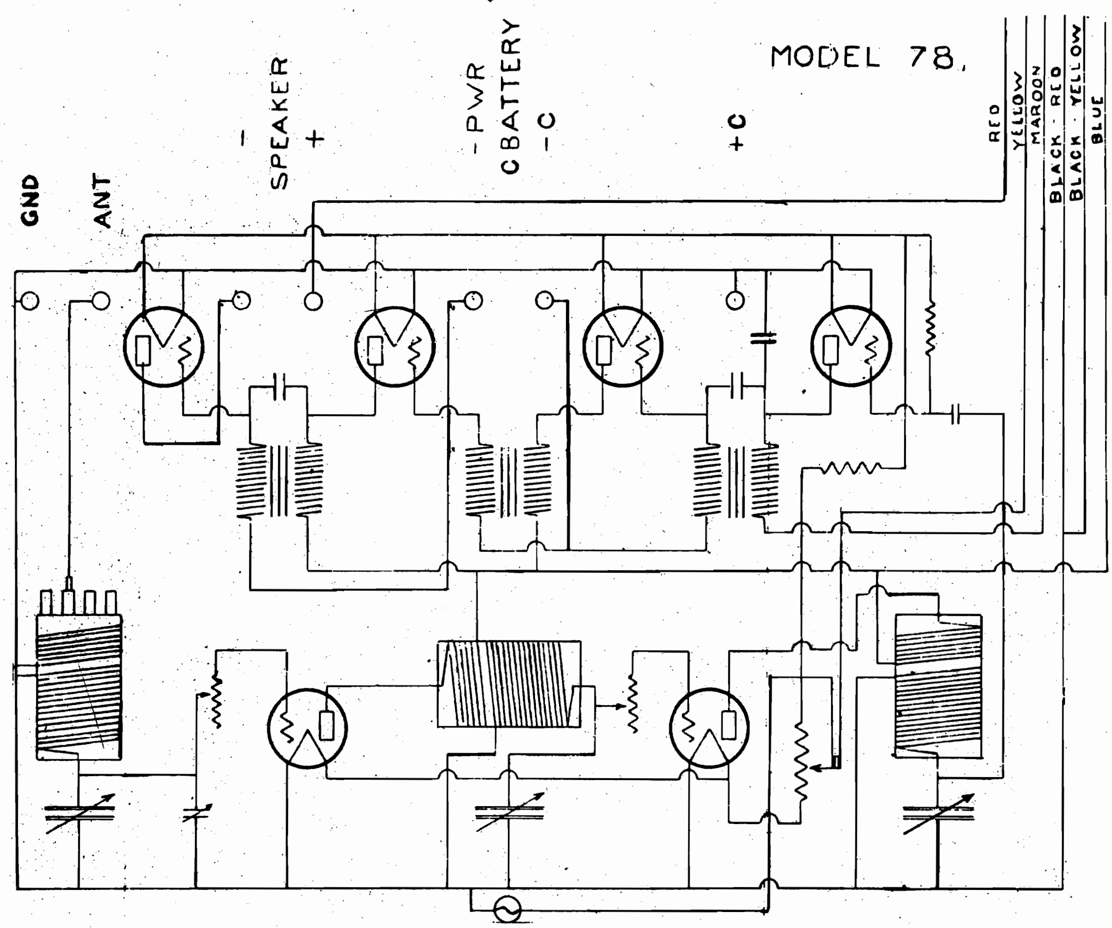
OZARKA S-5



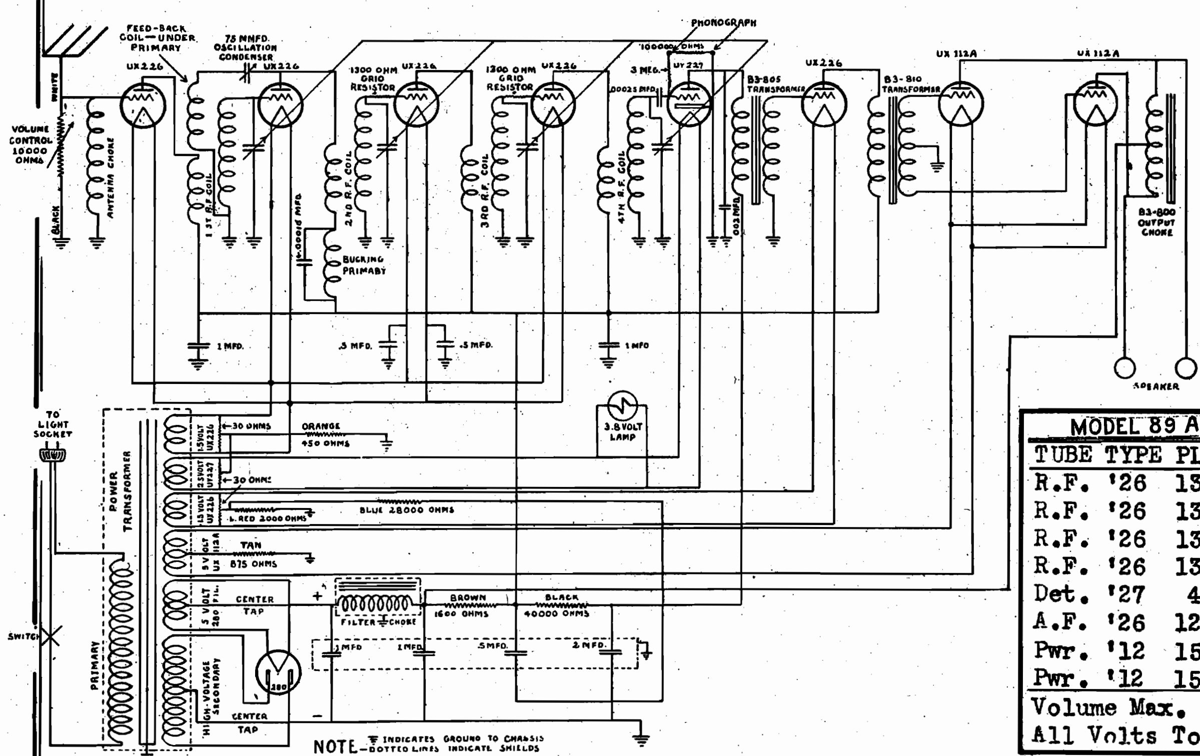
OZARKA S-7



OZARKA INC.



MODEL 78



MODEL 89 AC

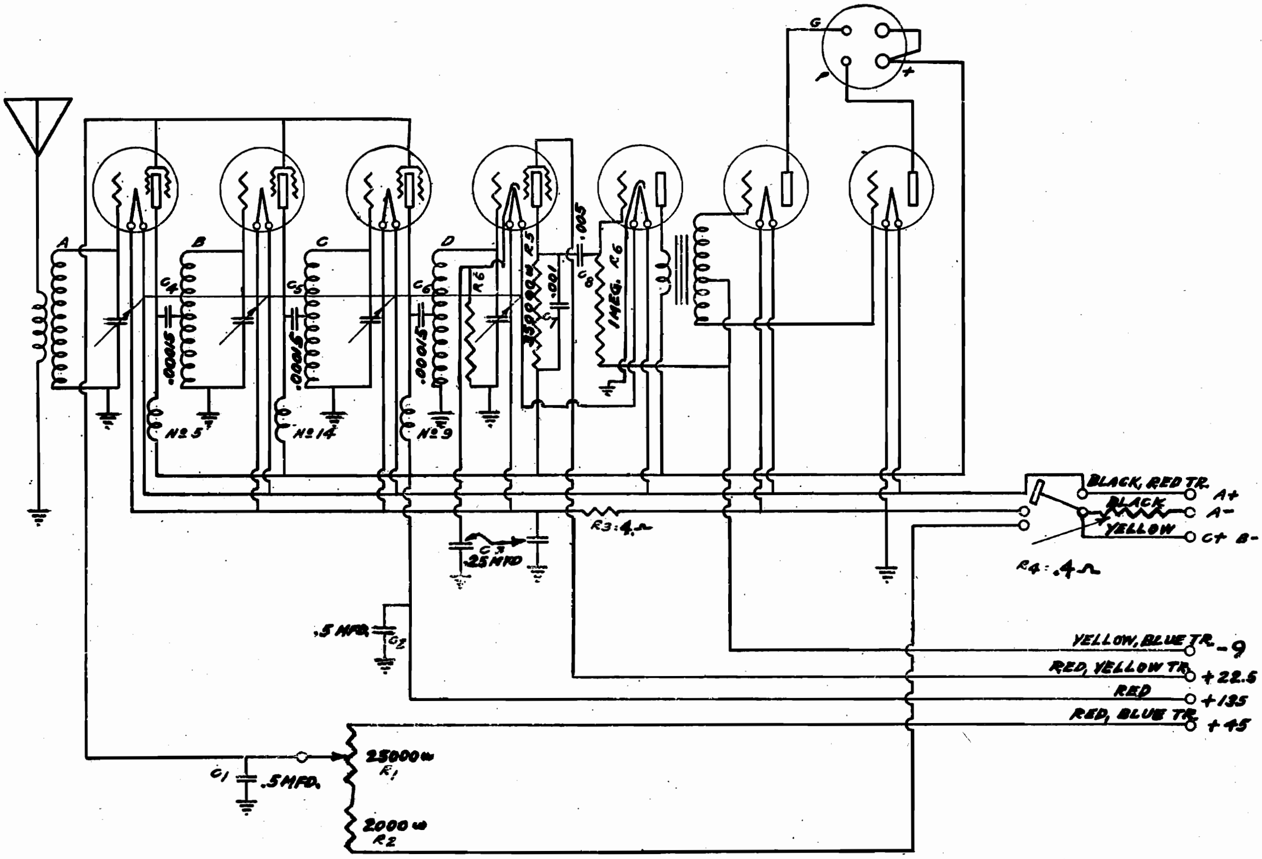
MODEL 89 A C.

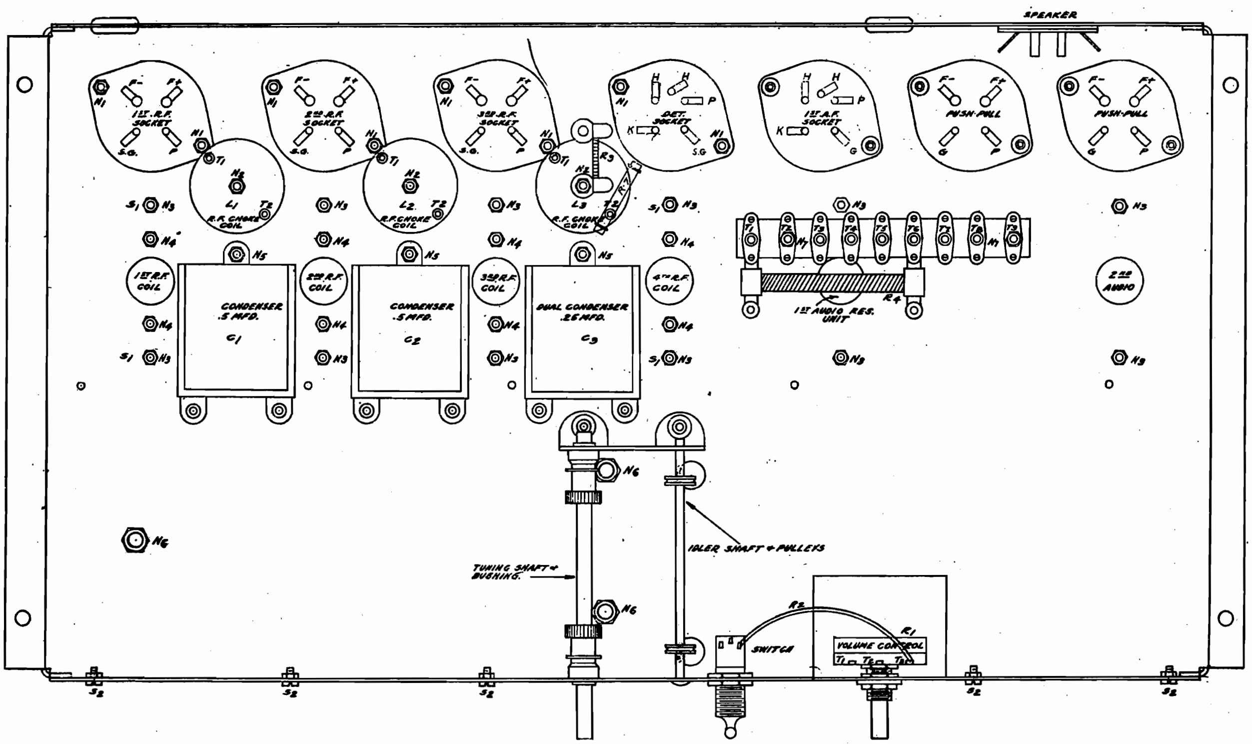
TUBE	TYPE	PLATE	GRI
R.F.	'26	130	10
R.F.	'26	130	10
R.F.	'26	130	10
R.F.	'26	130	10
Det.	'27	40	10
A.F.	'26	125	10
Pwr.	'12	150	20
Pwr.	'12	150	20

Volume Max.
All Volts To Ground.

OZARKA INC.

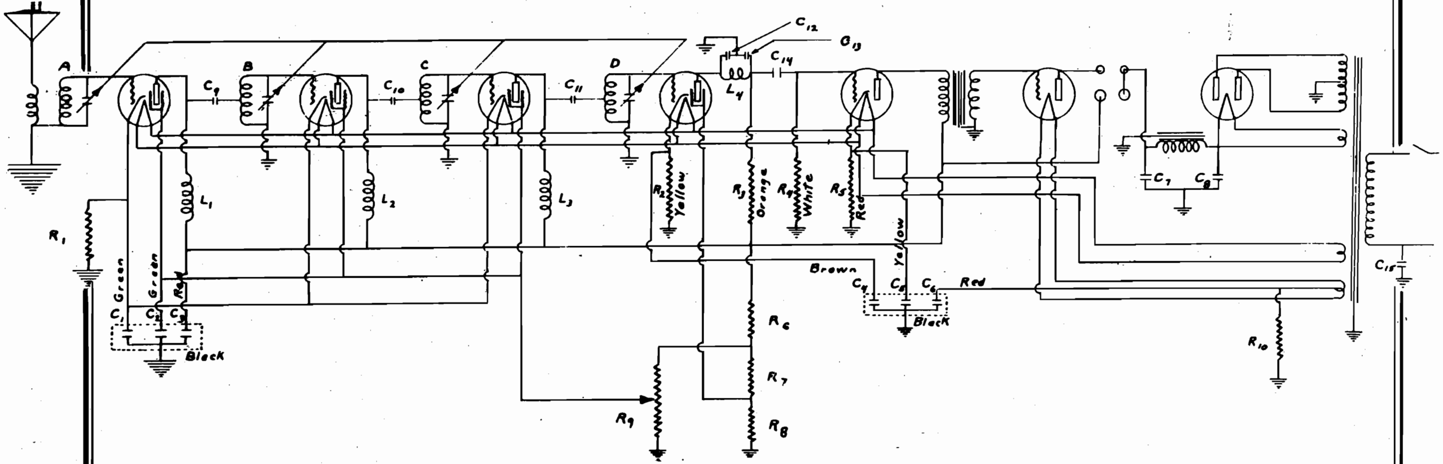
MODEL 91 - (BATTERY OPERATED)





OZARKA INC.

VIKING 92 AC

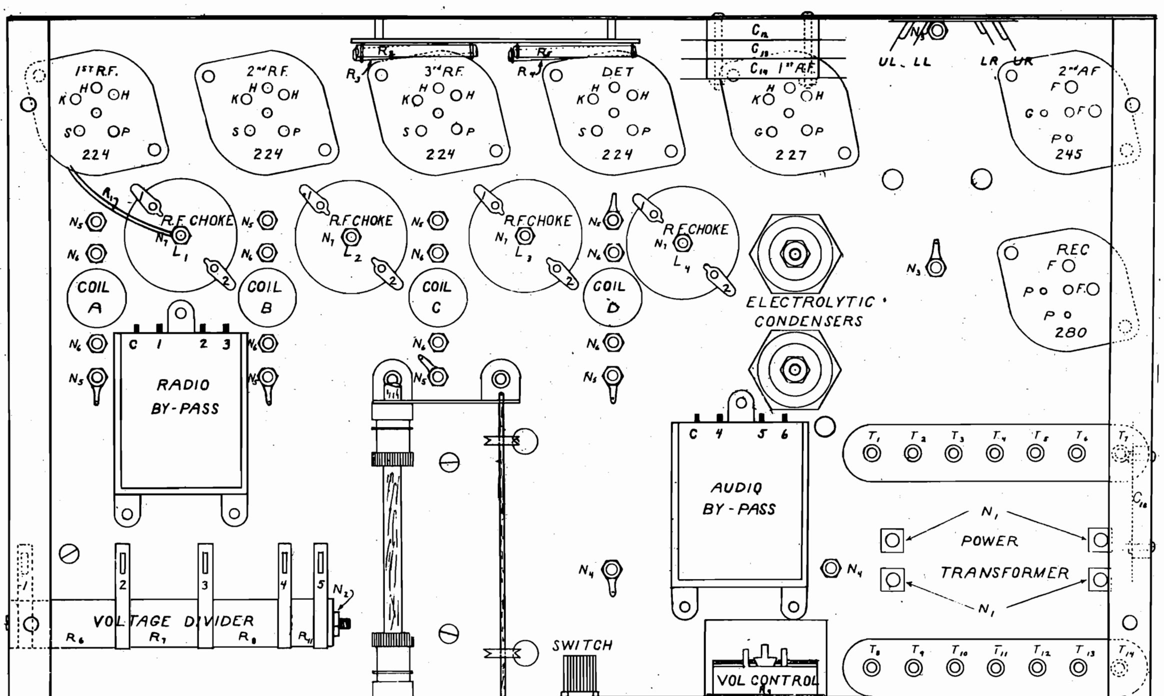


Tube	Type	Plate	S.Grid	Cath.
R.F.	'24	150	70	2
R.F.	'24	150	70	2
R.F.	'24	150	70	2.5
Det.	'24	50	35	8
A.F.	'27	140	--	50(Grid)
Pwr..	'45	270	--	
Rect.	'80			

Volume MAX. Voltages to ground.

C1- .25, C2- .25, C3- 1.0 } RF By Pass
C4- .25, C5- .1, C6- .5 } AF By Pass
C7- 8.0
C8- 8 0
C9- .0001
C10- .0001
C11- .0001
C12- .001
C13- .001
C14- .005
C15- .005

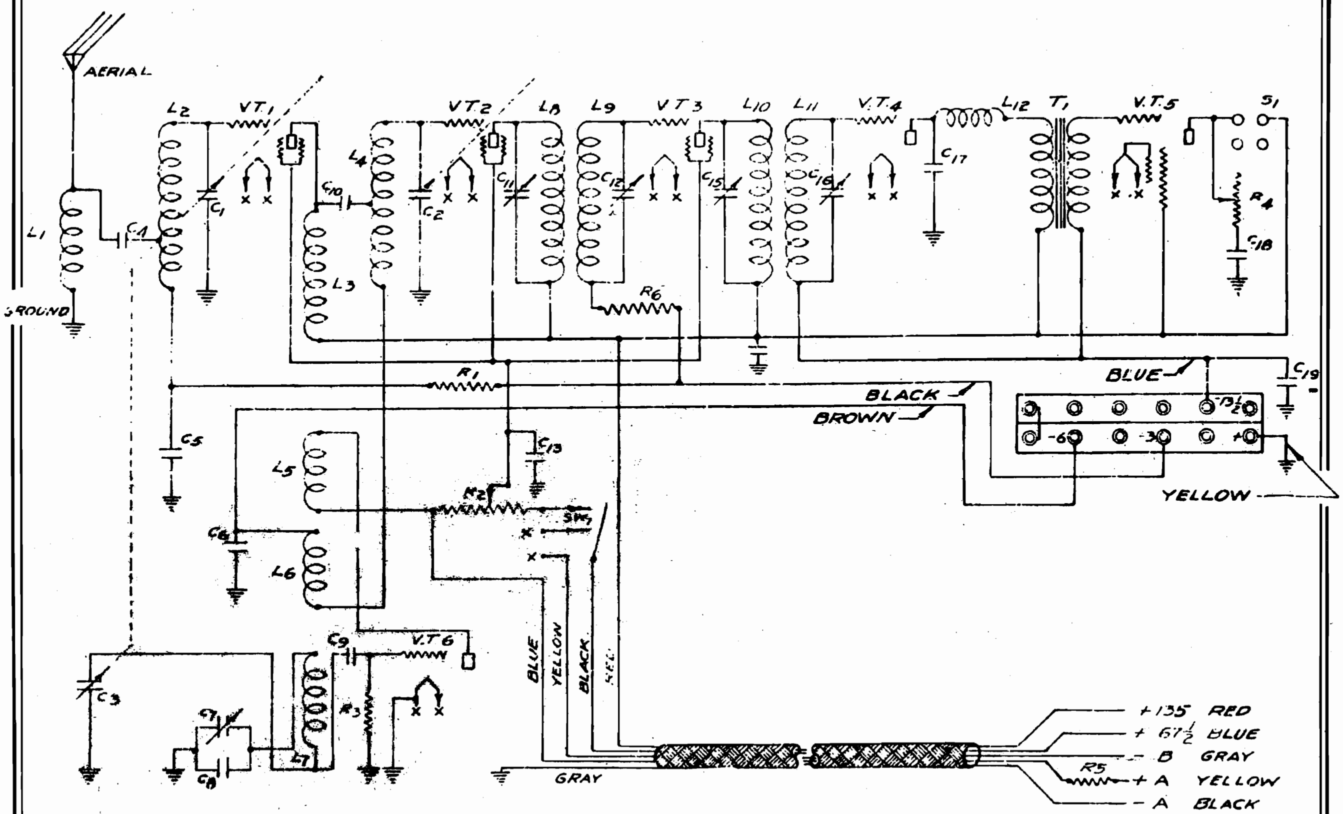
R1- .225 ~
R2- 40,000 ~
R3- 350,000 ~
R4- 1 Meg ~
R5- 2000 ~
R6- 5000 ~
R7- 5000 ~
R8- 5000 ~
R9- 10,000 ~
R10- 1600 ~

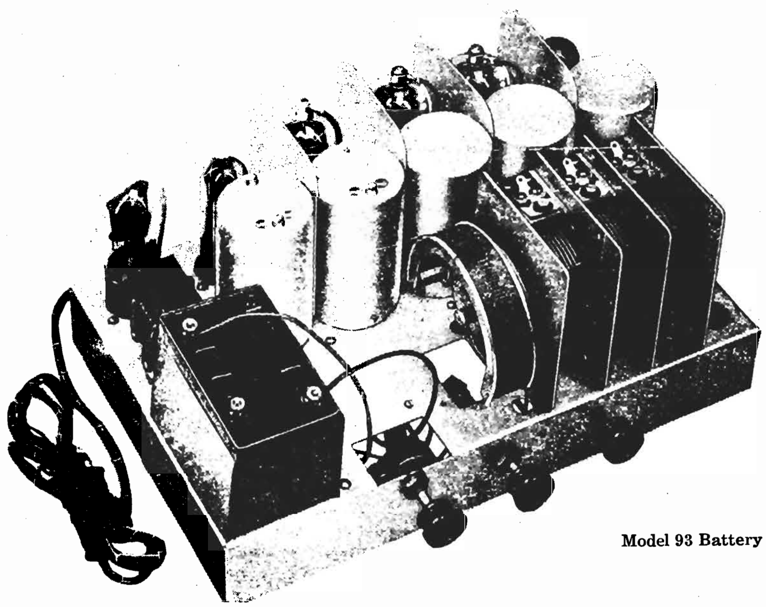


THE VIKING
MODEL 92-AC

OZARKA INC.

MODEL 93 SUPERHETERODYNE (Battery)





Model 93 Battery

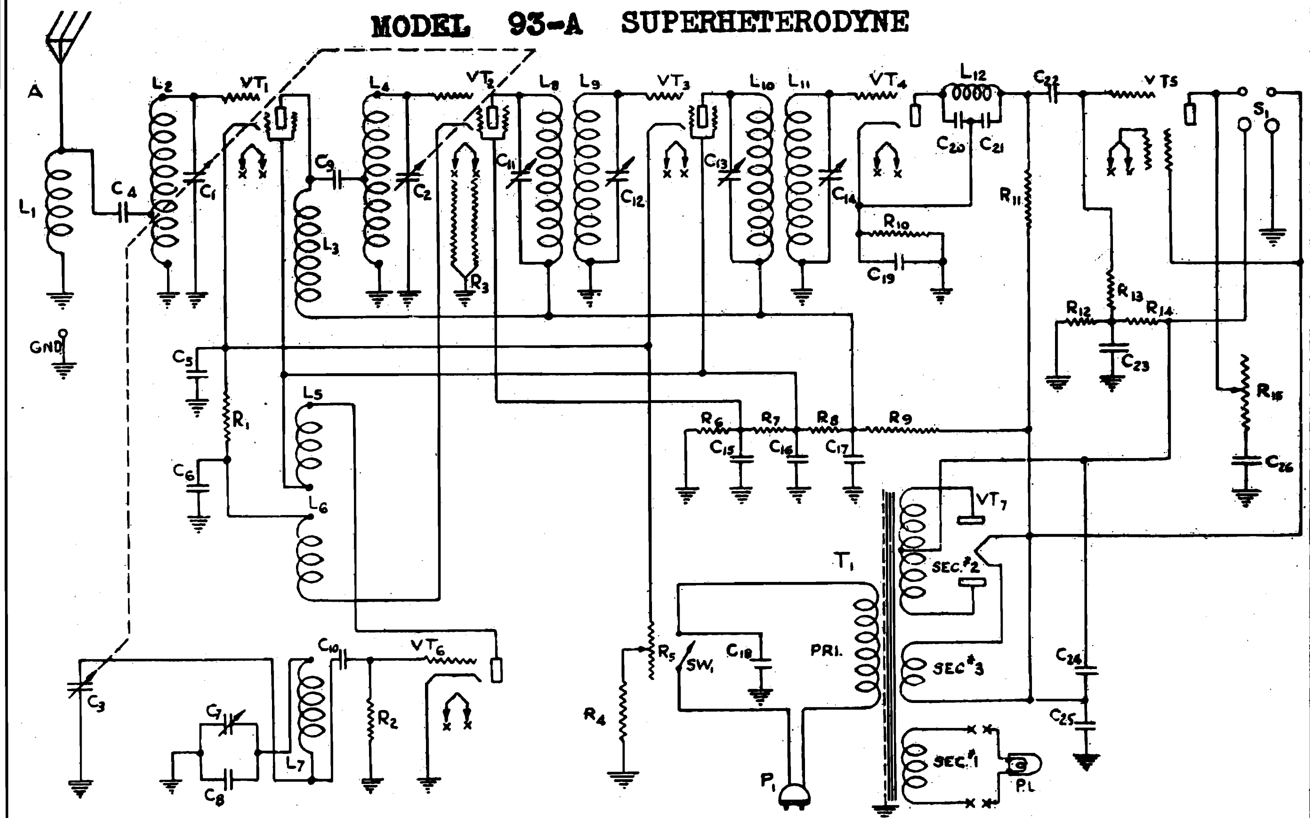
MODEL 93-A				
Tube	Type	Plate	S.Grid	Cath.
Osc.	'27	80	--	--
R.F.	'35	155	80	1.5
Det.	'35	155	40	2.
I.F.	'35	155	80	1.5
Det.	'27	125	--	13.
Pwr.	'47	182	200	
Rect.	'80			

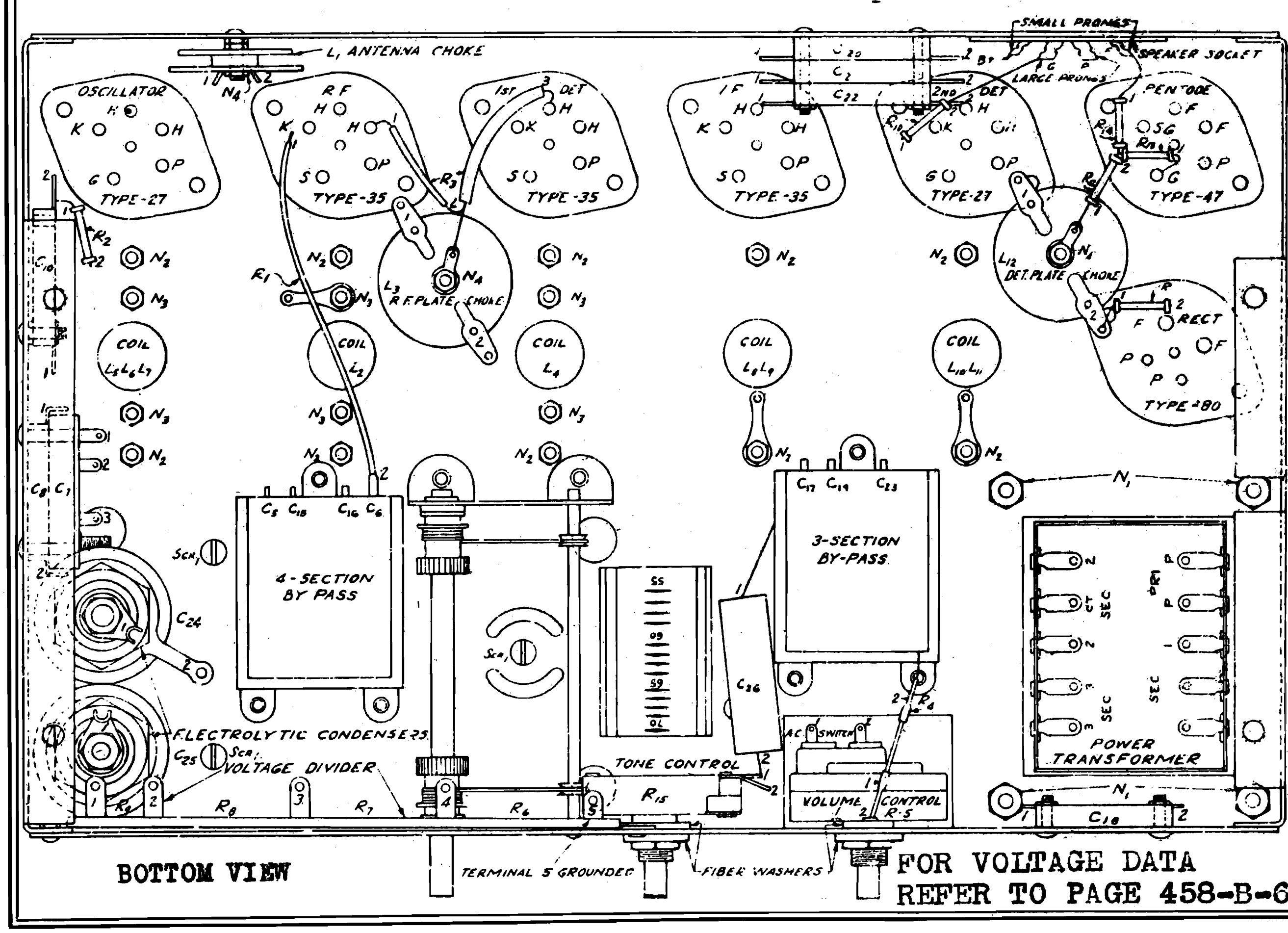
Volume Max. Volts To Ground.

Diagram on page 458-B-7

OZARKA INC.

MODEL 93-A SUPERHETERODYNE



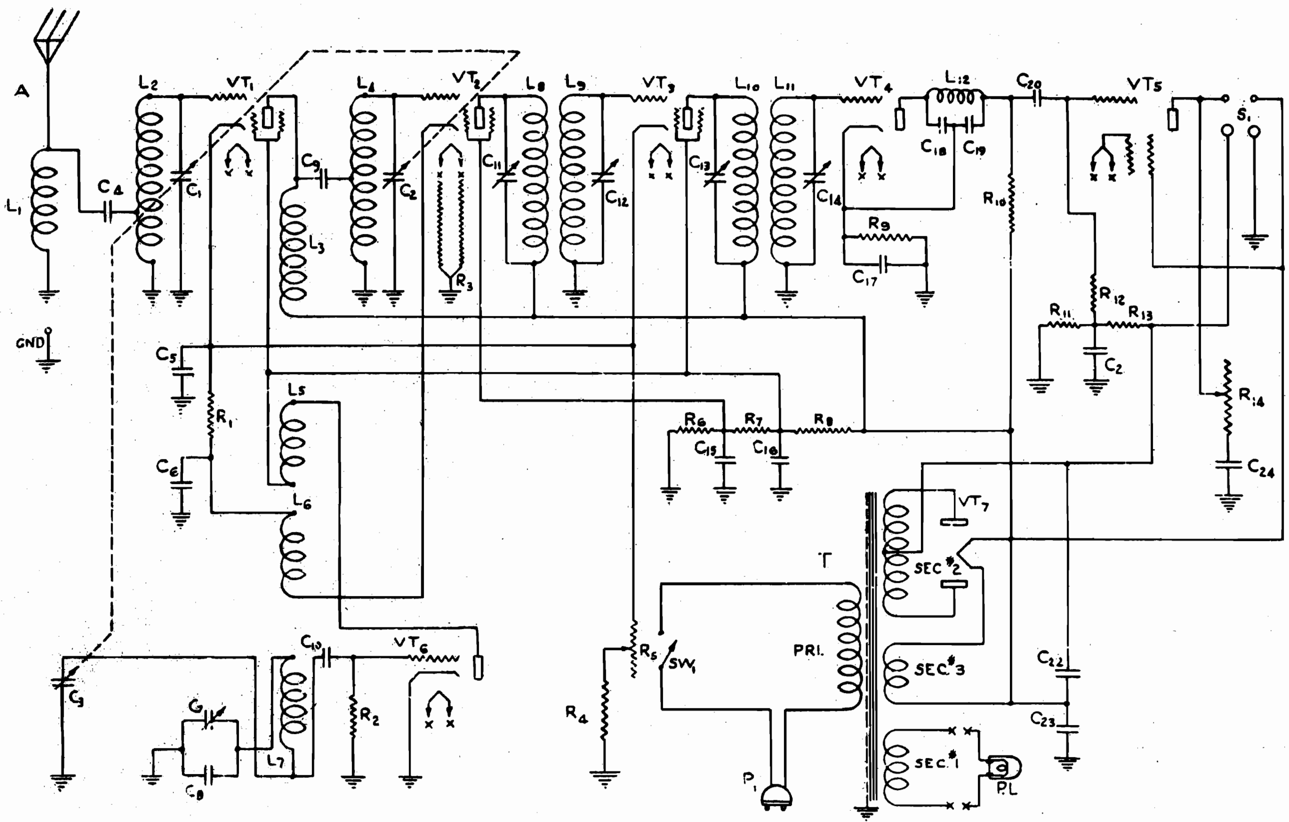


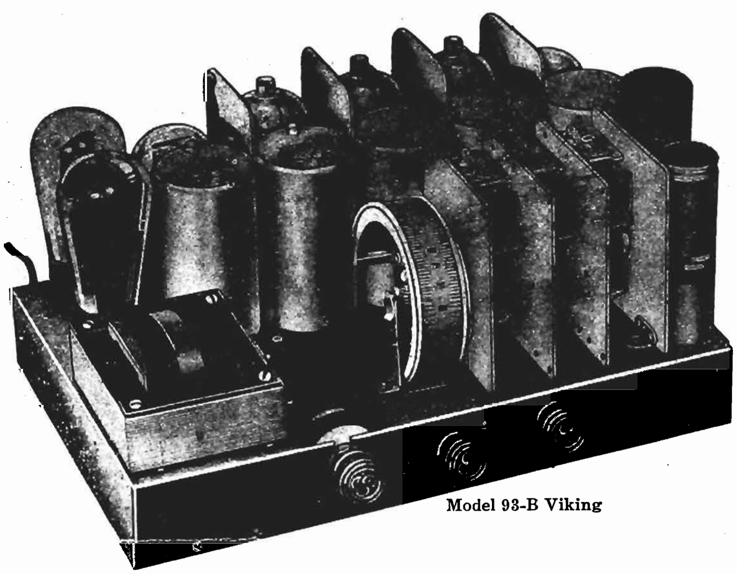
BOTTOM VIEW

FOR VOLTAGE DATA REFER TO PAGE 458-B-6

OZARKA INC.

VIKING 93-B SUPERHETERODYNE





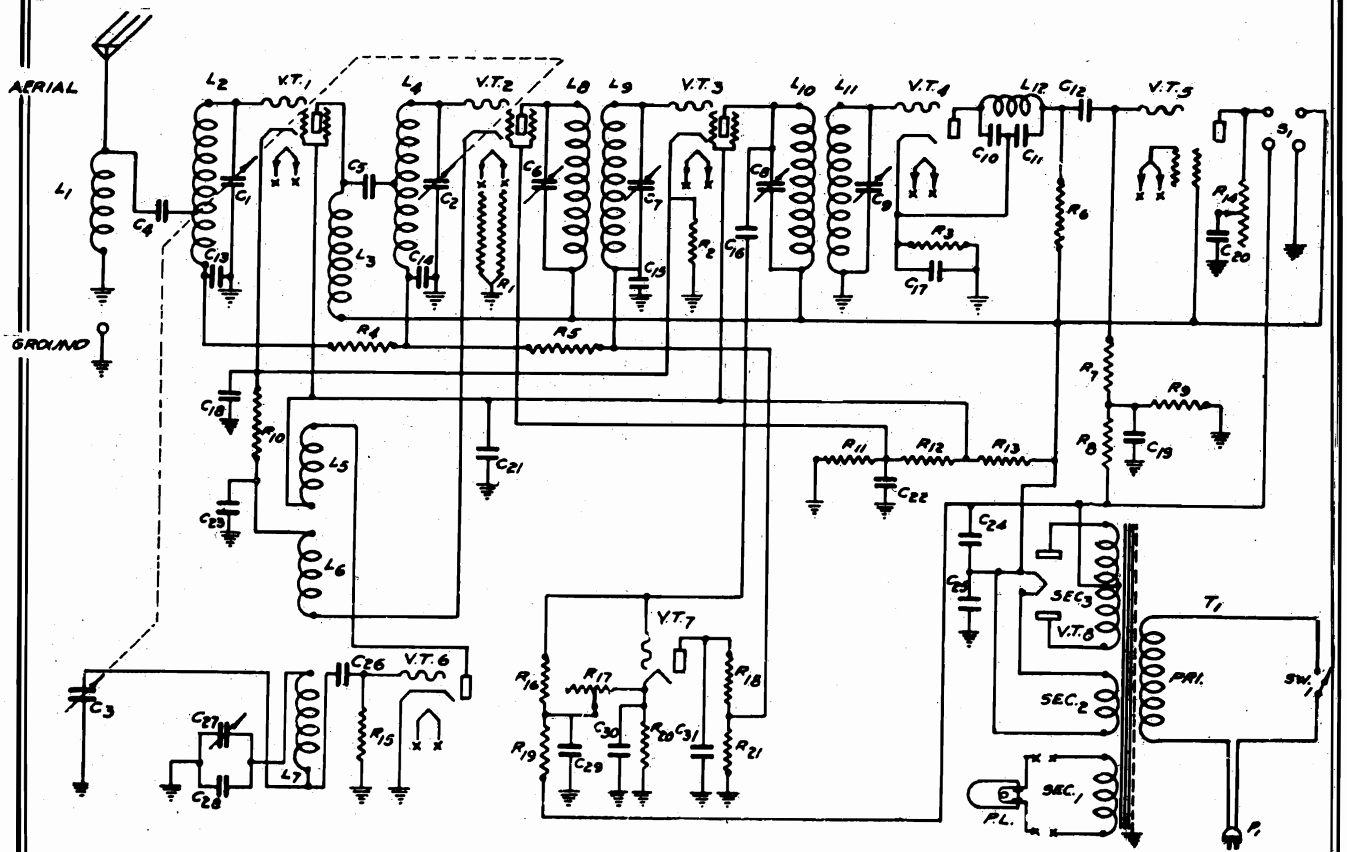
Model 93-B Viking

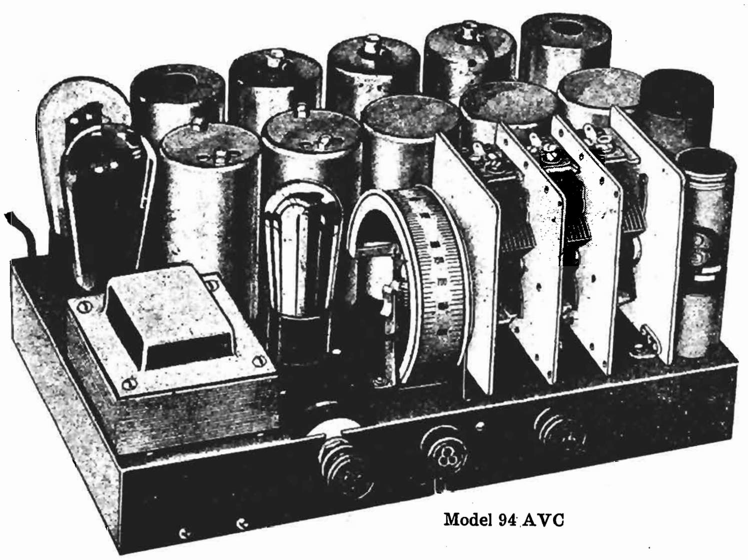
MODEL 93-B

Tube	Type	Plate	S.Grid	Cath.
Osc.	'27	80	--	--
R.F.	'35	190	85	1.5
Det.	'35	190	45	2.
I.F.	'35	190	85	1.5
Det.	'27	125	--	12.
Pwr.	'47	175	190	
Rect.	'80			
Vol.-Max.		Volts To Ground.		

OZARKA INC.

MODEL 94-AVC SUPERHETERODYNE

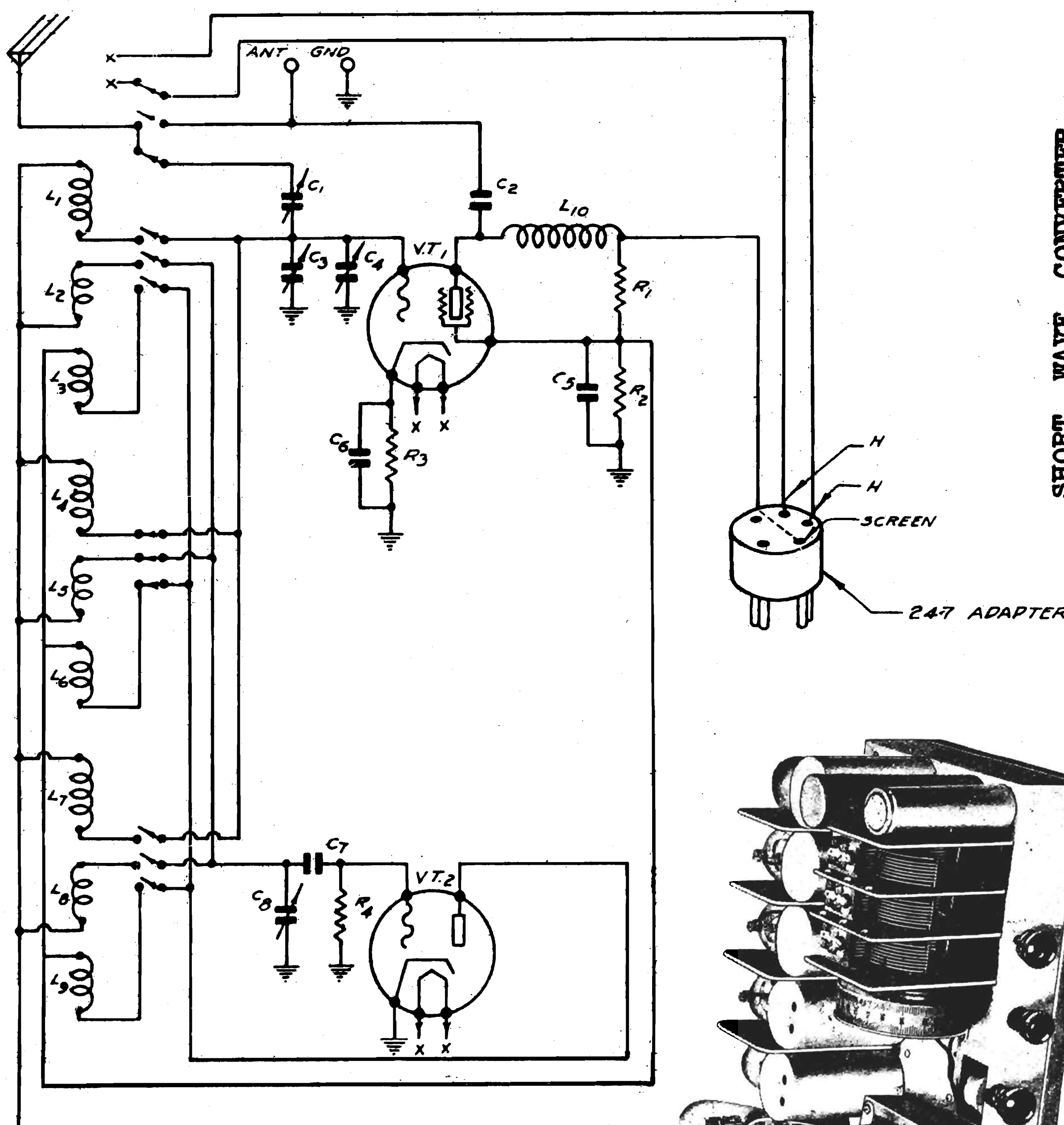




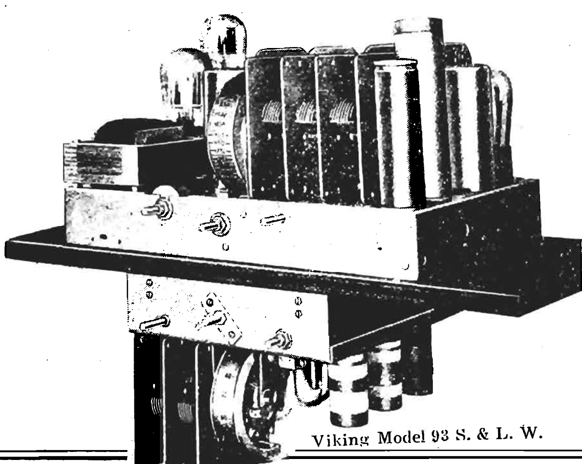
Model 94 AVC

MODEL 94				
Tube	Type	Plate	S.Grid	Cath.
Osc.	'27	80	--	
R.F.	'35	190	85	1.5
Det.	'35	190	45	2.
I.F.	'35	190	85	1.5
Det.	'27	125	--	12.
Pwr.	'47	175	190	--
A.V.C.	'27			10.
Rect.	'80			
Volume Max.		Volts To Ground.		

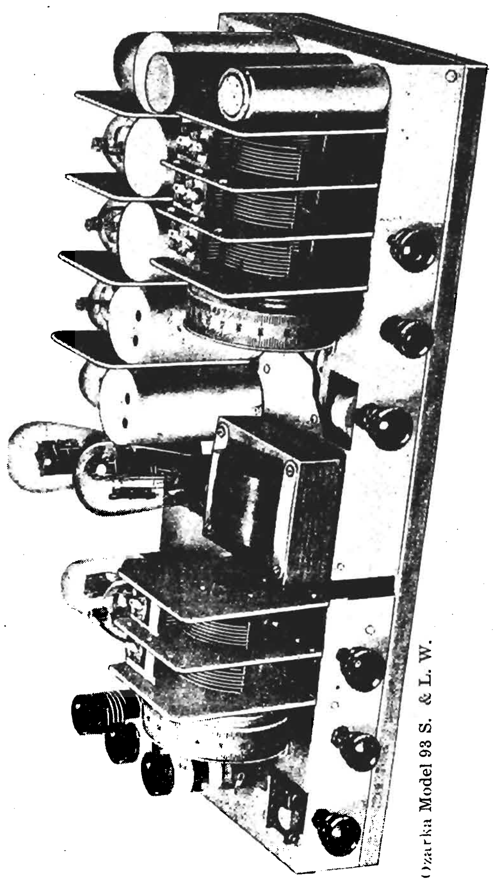
OZARKA INC.



SHORT WAVE CONVERTER



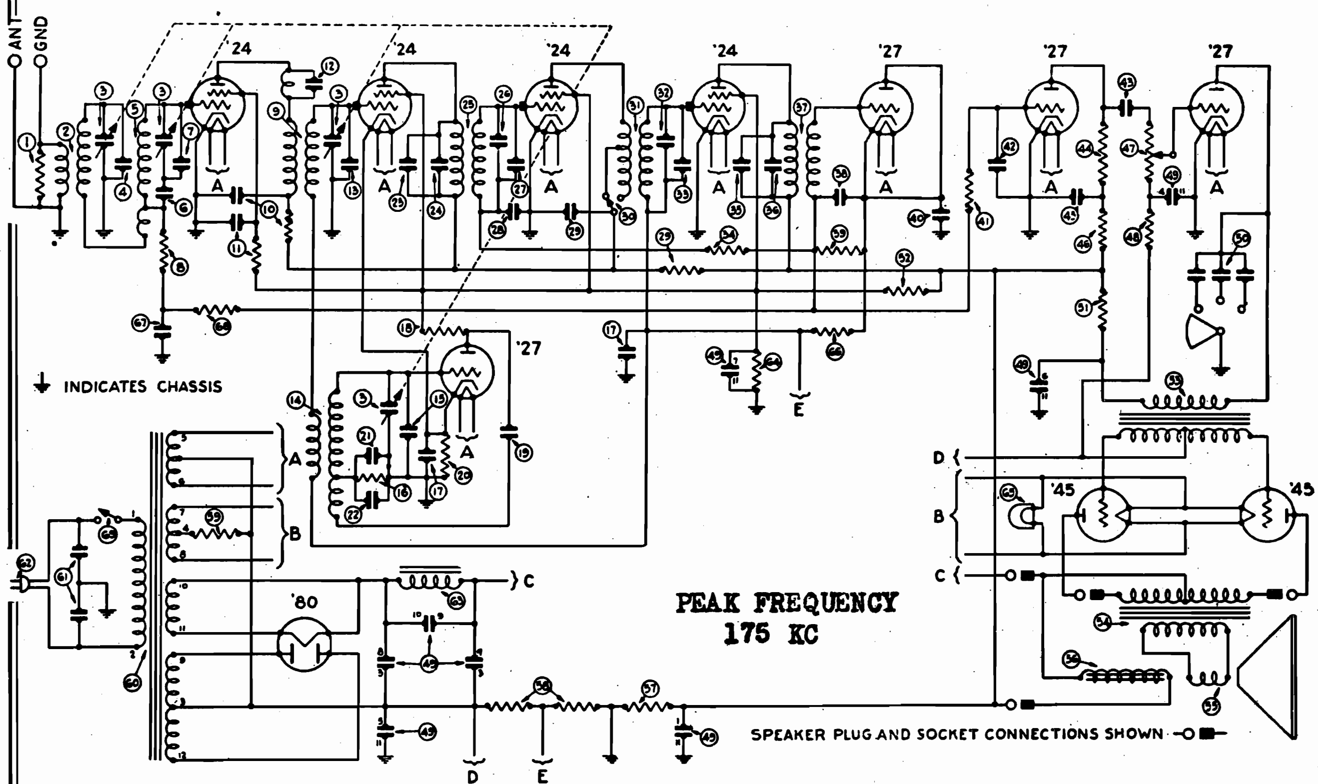
Viking Model 93 S. & L. W.



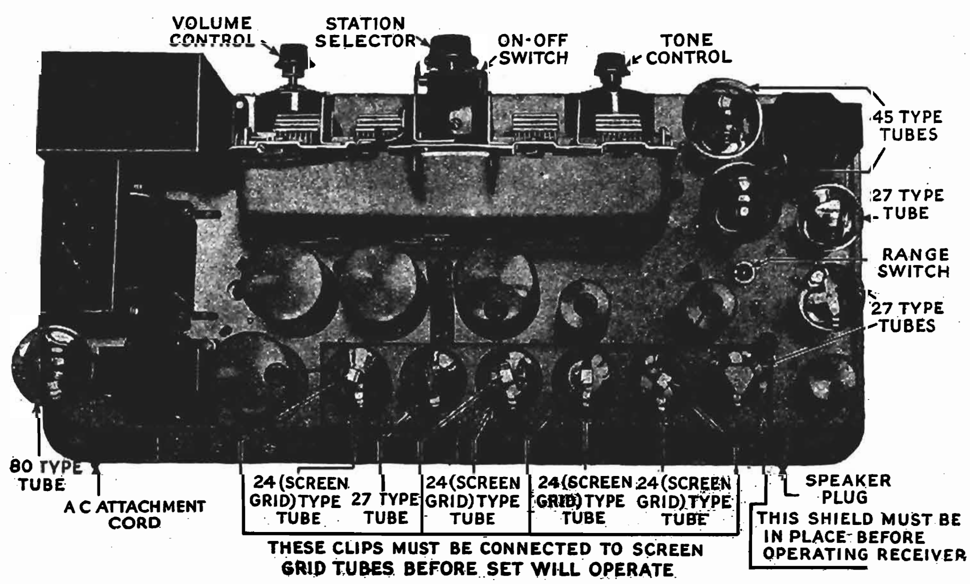
Ozarka Model 93 S. & L. W.

PHILADELPHIA STORAGE BATTERY CO.

PHILCO MODEL 111 SUPERHETERODYNE (50-60 Cycle)
PHILCO MODEL 111-A SUPERHETERODYNE (25-60 Cycle)



NOTE: The connection shown between Condenser No. 7 and Condenser No. 6 should also be connected to ground.



TOP VIEW OF
MODELS 111, 111-A and MODELS 211, 211-A

PHILADELPHIA STORAGE BATTERY CO.

MODELS 111, 111-A, 211 & 211-A SUPERHETERODYNE

Table 1—Tube Socket Readings Taken with AC Set Tester AC Line—115 volts

Tube Type	Tube Circuit	Filament Volts	Plate Volts	Screen Grid Volts*	Control Grid Volts	Cathode Volts	Plate Milli-Amperes	Screen-Grid Milli-Amperes ‡
24	1st R. F.	2.1	190	60	.2	5	1.7	1.75
27	Osc.	2.1	45	..	.7	7	1.6	....
24	1st Det.	2.1	180	62	4.6	8	.5†	.15
24	1st I. F.	2.1	185	65	...	5	1.5	1.7
24	2nd I. F.	2.1	190	82	2.2	5	3	1.85
27	Det. Rect.	2.2	...	..	.4	.5	.....	....
27	Det. Amp.	2.2	35	..	.4	5	.20‡	....
27	1st A. F.	2.1	95	..	1.2	5	4.	....
45	2nd A. F.	2.2	255	..	50	...	32.5	....
45	2nd A. F.	2.2	255	..	50	...	32.5	....
80	Rect.	4.9	...	..	...	...	50/Plate	....

*Read with C 100 Scale.
†Read with 20 Mil. Scale.
‡Read with 2 Mil. Scale.

Note—Volume Control Off; Station Selector turned to Low Frequency End; Range Switch set in "Normal" Position.

Table 2—Power Transformer Voltages

Terminals	A.C. Volts	
1—2		Primary
3		Center Tap 80 Tube
4		Center Tap 45 Tubes
5—6	2.67	Heaters for 24 and 27 Tubes
7—8	2.68	Filaments for 45 Tubes
9—12	750.	Plates 80 Tube
10—11	5.0	Filament 80 Tube
Rubber Covered Lead		Center Tap for 24 and 27 Tubes

Parts List - Models 111, 111-A, 211 & 211-A

No. on Figs. 3 and 4	Description	Part No.
1	Resistor—10,000 Ohms	4412
2	1st R. F. Coil	3884-J
3	Tuning Condenser	4000-D
4	Compensating Condenser	3772-A
5	2nd R. F. Coil	3884-T
6	Condenser—.05	3615-L
7	Compensating Condenser	3968-A
8	Resistor—100,000 Ohms	4411
9	1st Detector Coil	3884-V
10	Condenser—.05 and 250 Ohms	3615-C
11	Condenser—.05 and 250 Ohms	3615-C
12	Coupling Condenser	3892-A
13	Compensating Condenser	3968-A
14	Oscillator Coil	3884-U
15	Compensating Condenser	3968-A
16	Resistor—50,000 Ohms	4518
17	Condenser—.25 double	3557
18	Resistor—13,000 Ohms	3766
19	Condenser—.00011	4519
20	Resistor—1,000 Ohms	4590
21	Condenser—.0007	4520
22	Compensating Condenser	3772-B
23	Condenser—.00011	4519
24	Compensating Condenser	3772-C
25	1st I. F. Coil	4501-B
26	Compensating Condenser	3772-C
27	Condenser—.0001	4519
28	Condenser—.05	3615-J
29	Condenser—.05 and 250 Ohms	3615-B
30	Range Switch	3116
31	2nd I. F. Coil	4501-C
32	Compensating Condenser	3772-C
33	Condenser—.00011	4519
34	Resistor—500,000 Ohms	4517
35	Condenser—.00005	4587
36	Compensating Condenser	3772-D
37	3rd I. F. Coil	4501-D
38	Condenser—.00011	4519
39	Resistor—100,000 Ohms	4411
40	Condenser—.5	3583
41	Resistor—100,000 Ohms	4411
42	Condenser—.00025	3082
43	Condenser—.015	3793-B
44	Resistor—500,000 Ohms	3769
45	Condenser—.05	3615-S
46	Resistor—250,000 Ohms	3768
47	Volume Control	4093
48	Resistor—70,000 Ohms	3542
49	B Filter Condenser Block—60 cycles	3754
	B Filter Condenser Block—25 cycles	3755
50	Tone Control	4037-A
51	Resistor—25,000 Ohms	3656
52	Resistor—25,000 Ohms	3656
53	Push-pull Input Transformer	3537
54	Push-pull Output Transformer	2848
55	Voice Coil and Cone Assembly	2794-B
56	Field Coil	2850
57	B Resistor—10,000 Ohms	4532
58	C Resistor	3764
59	C Resistor—800 Ohms	3763
60	Power Transformer—60 cycles	4446
	Power Transformer—25 cycles	4447
61	Condenser—.015 double	3793-E
62	A C Cord and Plug	L-943-A
63	Filter Choke	3422
64	Resistor—70,000 Ohms	3542
65	Pilot Lamp	3463
66	Resistor—100,000 Ohms	4411
67	Condenser—.05	3615-D
68	Resistor—100,000 Ohms	4411
69	On-Off Switch	4095
	Insulator for Part Nos. 3557-3583	4105
	Pilot Bracket Assembly	4027-A
	Bolt for Pilot Bracket Assembly	W-439
	Tone Control Nut	W-434
	By-pass Condenser Mounting Bolt	W-443
	Bottom Shield Bolt	W-453
	Chassis Mounting Bolt	W-468

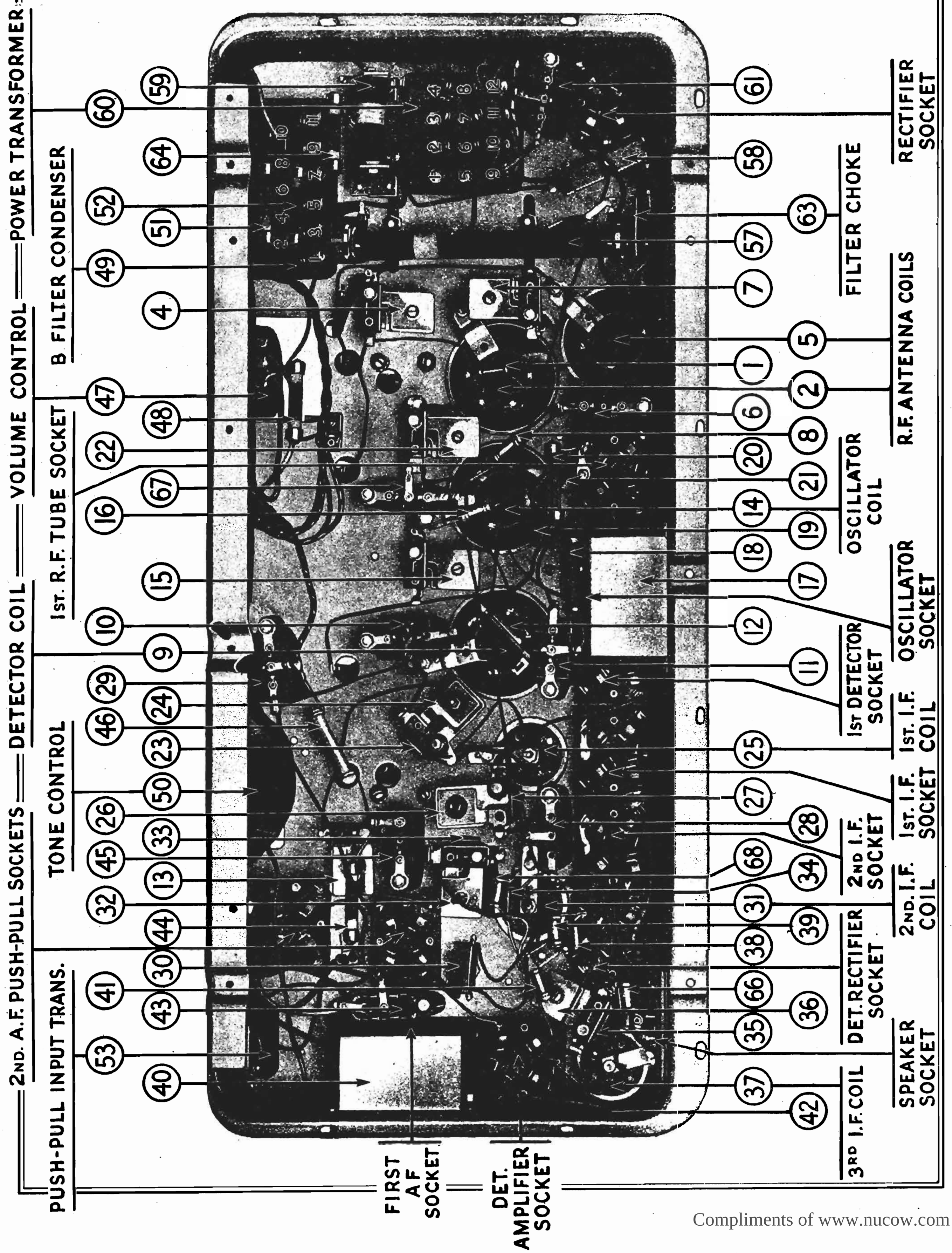
The following changes have been made in Models 111, 111-A, 211 & 211-A to prevent overloading when the receivers are used in the immediate vicinity of powerful local broadcasting stations.

The 100,000 ohm resistor # 39 (Part # 4411) has been replaced with two 50,000 ohm resistors (Part # 4518) connected in series. The lead coming from resistor # 34, after being removed from resistor # 39, is connected to the center tap between the two 50,000 ohm resistors.

NOTE - The Chasses of the 211 and 211-A (Page 466) are the same as the chasses of the 111 and 111-A except for the additional of the Radio-Phono switch and pickup. The tube socket readings and power transformer voltages shown on this page, as well as condenser and resistor data shown on page 466, apply to all of the above models. The condenser blocks # 3754 and 3755, shown on page 466, are also used in models 211 and 211-A, resp.

PHILADELPHIA STORAGE BATTERY CO.

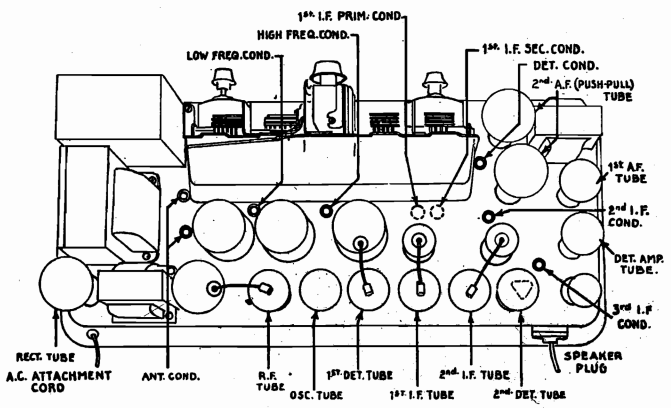
PHILCO MODELS 111 & 111-A SUPERHETERODYNE



PHILADELPHIA STORAGE BATTERY CO.

PHILCO MODEL 112 SUPERHETERODYNE

ADJUSTING THE MODEL 112 SUPERHETERODYNE PLUS USING A JEWEL 560 OSCILLATOR



Set up the Receiver for operation using standard tubes, which you know are in good condition. Set the Normal - Maximum switch in the Normal position for the intermediate frequency adjustment. Connect the Jewell pattern 560 oscillator to the Receiver.

INTERMEDIATE FREQUENCY OR I. F. STAGES – Remove the tube shield, replace the control grid clip of the detector tube with the lead from the "A" terminal of the oscillator. The "G" terminal of the oscillator must be connected to the Receiver Chassis. Replace the tube shield on the chassis.

Turn on the filament control of the oscillator about one-half the total movement. The "A" Battery of the oscillator must be replaced when it is necessary to turn this control all the way on in order to obtain a signal. Turn the center switch to the intermediate position. The tuning control of the oscillator must be set so that the oscillator signal is exactly 175 K. C. This setting can be determined from calibration data furnished with the instrument.

Turn the volume control of the receiver on full. Set the atenuator control so that an audible signal is received in the speaker. Connect the ± and low terminals of the output meter to the voice coils of the speaker. Adjust the atenuator control so that not more than one-half full scale reading is obtained on the meter.

Using a Philco fibre wrench, part No. 3164, adjust the third I. F. condenser until the maximum reading is obtained in the output meter. Next, adjust the second I. F. condenser and then the secondary and primary condensers of the first I. F. stage for maximum reading on the meter. During these adjustments it may be necessary to reduce the signal strength by turning down the volume control of the receiver so that the needle will not be deflected beyond the end of the scale.

HIGH FREQUENCY CONDENSER – Remove the "A" terminal lead from the control grid of the first detector tube and replace the grid clip. Replace the tube shield. Connect the "A" terminal of the oscillator to the antenna post of the Receiver and the "G" terminal of the oscillator to the ground terminal of the chassis. Do not change the oscillator setting. Turn up the attenuator of the oscillator until it is all the way on. Set the Philco scale to approximately 140 (1400 K. C.); set the NORMAL - MAXIMUM switch in the Maximum Position provided the Receiver is not too far out of adjustment the eighth harmonic of the 175 note will be heard at or near the 140 position of the scale. Set the station selector knob at exactly 140 and tune the high frequency condenser until the oscillator note is peaked at exactly 140 on the Receiver scale. Next adjust the detector condenser for maximum reading on the output meter.

If the Receiver is so far out of adjustment that the eighth harmonic of 175 K. C. is not audible, it will be necessary to set the oscillator for broadcast frequencies. Set the tuning control of the oscillator at approximately 1400 K. C. (as indicated in the data furnished with the instrument), then adjust the high frequency condenser for maximum signal in the output meter. Set the first and second antenna condensers for maximum signal in the output meter reducing the atenuator setting as the signal increases to prevent damage to the meter mechanism. Turn the center control of the oscillator to intermediate frequency and reset the tuning control of the oscillator to the 175 K. C. position and proceed as outlined above. Final adjustment must be made when the oscillator is set at exactly 175 K. C. in the intermediate position.

ANTENNA CONDENSERS – With the oscillator set at the original 175 K. C. position adjust the first and then the second antenna condenser for maximum reading in the output meter.

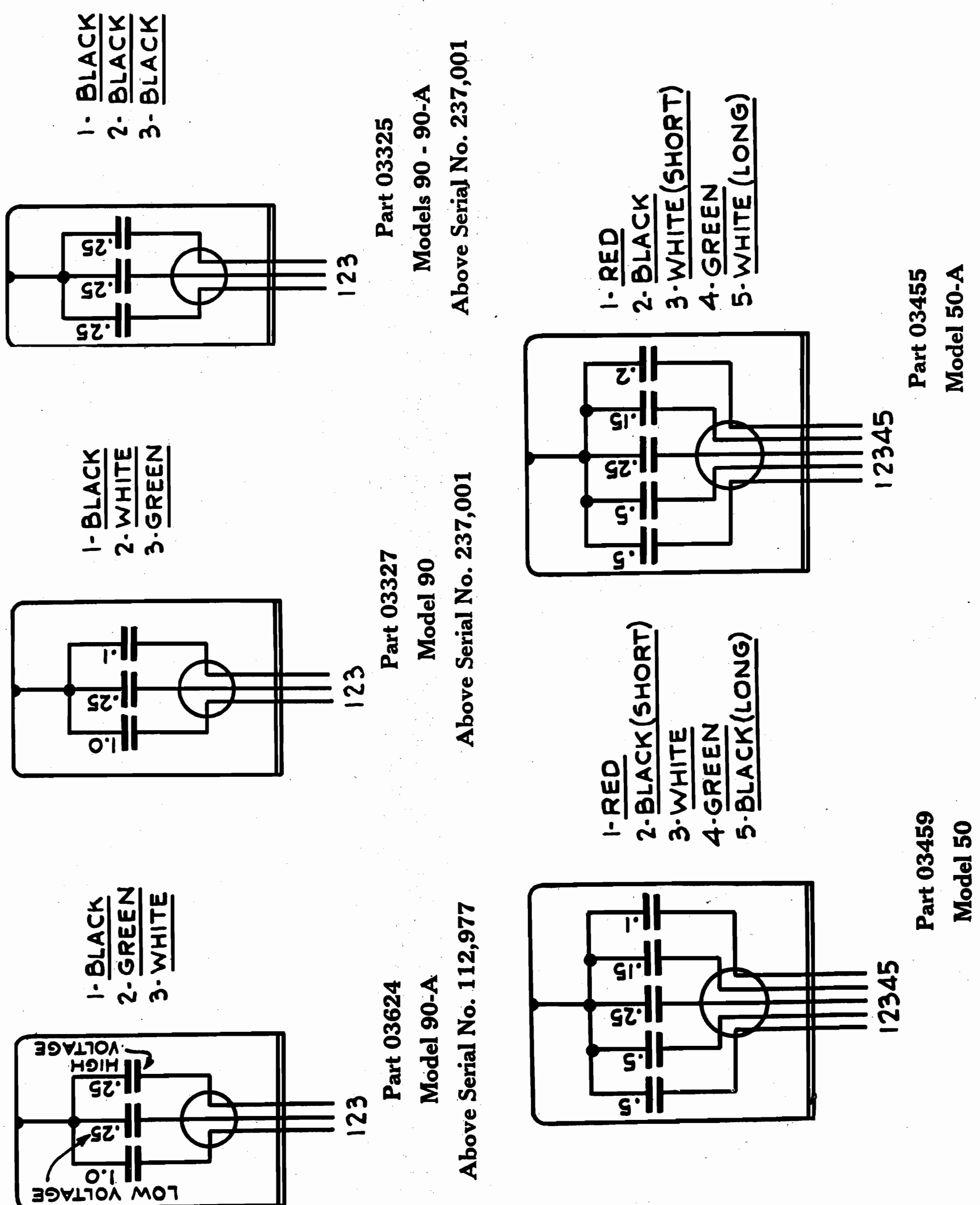
LOW FREQUENCY CONDENSER – Set the oscillator on broadcast position and tune to exactly 600 K. C. The oscillator signal should be received at 60 on the Receiver scale. Adjust the low frequency condenser until the maximum reading is obtained in the output meter with the Receiver set at 60.

Where it is necessary to replace the tuning scale on the Model 112 Superheterodyne, put a mark opposite 55 on the tuning condenser drum. Remove the old scale and place the new one in position so that 55 is exactly opposite the above mark.

FOR FURTHER DATA ON MODELS 112 & 112-A REFER TO PAGES 466-E, 466-F, ETC.

PHILADELPHIA STORAGE BATTERY CO.

Internal Connections of Condenser Banks



CONDENSER DATA — COLOR CODING USED ON ALL PHILCO RECEIVERS

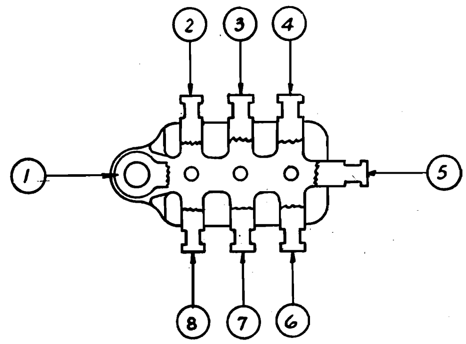
PART NO.	CAPACITY MF.	COLOR	PART NO.	CAPACITY MF.	COLOR
3082	.00025	Yellow	4519	.00011	Blue and Golden Yellow
3774	.00005	White	4520	.0007	White and Golden Yellow
3910	.0005	Green	4587*	.00005	Light Blue and White
4059	.002	Light Blue	5120	.00041	Yellow & Orange

*Note: Part No. 4587 is held to closer tolerance limits than Part No. 3774. Do not substitute either of these condensers, use the part numbers given.

PHILADELPHIA STORAGE BATTERY CO.

Standard By-Pass Condenser Data

The tables below list the various Philco standard by-pass condensers in black bakelite containers. The drawing shows all possible lug connections and the tables list the lug numbers.



Condenser 3615 .05 Mfd.

Part No.	Cond. Cap. Mfd.	Lugs Used	Wire Resis. Ohms	Resis. Wiring Lugs	Cond. Wiring Lugs
3615-B	.05	1-3-5	250	3-5	1-5
3615-C	.05	1-5-7	250	5-7	1-5
3615-D	.05	1-3-5	...	...	1-5
3615-E	.05	2-5	...	...	...
3615-F	.05	2-3-5	...	...	3-5
3615-G	.05	5-8	...	...	...
3615-H	.05	3-5-8	...	...	5-8
3615-J	.05	1-5-7	...	...	1-5
3615-K	.05	3-5-8	250	3-5	5-8
3615-L	.05	1-5	...	...	...
3615-M	.05	2-5-7	...	...	2-5
3615-N	.05	1-4-7	...	...	1-4
3615-P	.05	1-4-7	250	4-7	1-4
3615-R	.05	1-5-7	250	5-7	1-5
3615-S	.05	1-4	...	...	...
3615-T	.05	1-5-7	150	1-7	1-5
3615-U	.05	1-5-7	...	...	1-7
3615-W	.05	1-2-5	...	...	1-5
3615-X	.05	1-2-5-7	150	1-7	1-5
3615-Y	.05	1-2-5-7	150	1-5	1-7

Condenser 3793 .015 Mfd.

Part No.	Cond. Cap. Mfd.	Lugs Used	Wire Resis. Ohms	Resis. Wiring Lugs	Cond. Wiring Lugs
3793-B	.015	5-7	...	...	...
3793-C	.015	2-4	...	...	...
3793-D	.015	2-6	...	...	...
3793-E	Twin .015	1-5-7	...	...	1-5 & 1-7
3793-F	.015	5-7-8	...	...	7-8
3793-G	.015	2-3-6	...	...	2-6
3793-H	Twin .015	1-3-5	...	...	1-3 & 1-5

Condenser 3903 .01 Mfd.

Part No.	Cond. Cap. Mfd.	Lugs Used	Wire Resis. Ohms	Resis. Wiring Lugs	Cond. Wiring Lugs
3903-F	.01	3-5	...	...	...
3903-G	.01	2-4-7	...	...	2-4
3903-H	.01	5-8	...	...	...
3903-J	.01	2-5-7	...	...	2-5
3903-K	.01	1-2-4-7	...	...	1-7
3903-L	.01	3-5-8	...	...	3-5
3903-M	.01	4-7-8	...	...	4-8
3903-N	.01	3-5-8	...	...	5-8
3903-P	.01	2-5-7	...	...	2-7

Condenser 4989 .09 Mfd.

Part No.	Cond. Cap. Mfd.	Lugs Used	Wire Resis. Ohms	Resis. Wiring Lugs	Cond. Wiring Lugs
4989-B	Twin .09	1-3-5	...	...	1-3 & 1-5
4989-C	Twin .09	1-5-7	...	...	1-5 & 1-7
4989-D	.09	1-5	...	...	...
4989-E	.09	1-5-7	250	7-5	1-5
4989-F	.09	1-5-7	...	...	1-5
4989-G	Twin .09	1-4-7	...	...	1-4 & 1-7
4989-H	Twin .09	1-5	...	...	1-5 & 1-5

PHILADELPHIA STORAGE BATTERY CO.

PHILCO RESISTOR AND CONDENSER SPECIFICATIONS

Resistor Data

Starting with the Model 46 and continuing in all future models, standard R. M. A. colors are being used to indicate the value of the various resistors in Philco Receivers. The code is as follows:

0 — Black	2 — Red	4 — Yellow	6 — Blue	8 — Gray
1 — Brown	3 — Orange	5 — Green	7 — Violet	9 — White

The body color represents the first digit in the resistance. The tip color represents the second digit. The dot color represents the number of zeros after the second digit: If the dot color is not present consider it to have the same color as the body. For instance, Resistor No. 3524 in the table below has a brown body—this means that the first digit is one, it has a black tip meaning that the second digit is zero, it has an orange dot meaning that there are three ciphers after the second digit or a resistance value of 10,000 Ohms.

Philco Resistors are made in three sizes—one to carry .5 watt—a larger resistor to carry 1 watt, and a third size to carry 2 watts. Below is a table giving the part number and color code used in present Philco Resistors.

PART NO.	POWER (Watts)	RESISTANCE (Ohms)	— COLOR — BODY	TIP	DOT
3524	1	10,000	Brown	Black	Orange
3525	1	32,000	Orange	Red	Orange
3526	1	5,000	Green	Black	Red
3542	1	70,000	Violet	Black	Orange
3656	1	25,000	Red	Green	Orange
3766	1	13,000	Brown	Orange	Orange
3767	1	99,000	White	White	Orange
3768	1	240,000	Red	Yellow	Yellow
3769	1	490,000	Yellow	White	Yellow
4237	1	51,000	Green	Brown	Orange
4409	.5	1,000,000	Brown	Black	Green
4410	.5	240,000	Red	Yellow	Yellow
4411	.5	99,000	White	White	Orange
4412	.5	10,000	Brown	Black	Orange
4414	1	1,000,000	Brown	Black	Green
4517	.5	490,000	Yellow	White	Yellow
4518	.5	51,000	Green	Brown	Orange
4590	1	1,000	Brown	Black	Red
5023	1	190,000	Brown	White	Yellow
5256	.5	45,000	Yellow	Green	Orange
5278	1	15,000	Brown	Green	Orange
5279	.5	32,000	Orange	Red	Orange
5309	.5	2,900	Red	White	Red
5310	.5	5,000	Green	Black	Red
5331	.5	160,000	Brown	Blue	Yellow
5385	.5	70,000	Violet	Black	Orange
5649	2	20,000	Red	Black	Orange
5718	2	15,000	Brown	Green	Orange
5837	.5	1,000	Brown	Black	Red
5838	.5	8,000	Gray	Black	Red
5868	2	51,000	Green	Brown	Orange
5872	.5	2,000,000	Red	Black	Green
6010	.5	4,000,000	Yellow	Black	Green

Condenser Data

Standard By-Pass Condenser Data

Condenser 3615 .05 Mfd.

Part No.	Cond. Cap. Mfd.	Lugs Used	Wire Resis. Ohms	Resis. Wiring Lugs	Cond. Wiring Lugs
3615-AA	.05	1-3-5-8	...	...	1-5
3615-AB	.05	1-4-7-8	...	...	1-4
3615-AC	.05	1-5-7-8	...	...	1-7
3615-AD	.05	3-5-8	...	...	3-5
3615-AE	.05	1-7-8	...	...	7-8
3615-AF	Twin .05	4-7-8	...	...	4-8 & 7-8
3615-AG	.05	1-3-5	...	...	1-5
3615-AH	.05	1-5	...	...	1-5
3615-AJ	Twin .05	1-3-6-8	...	...	1-3 & 1-6
3615-AK	.05	1-5-7-8	...	...	1-7

Condenser 3793 .015 Mfd.

Part No.	Cond. Cap. Mfd.	Lugs Used	Wire Resis. Ohms	Resis. Wiring Lugs	Cond. Wiring Lugs
3793-J	.015	2-5-7	...	...	2-5
3793-K	Twin .015	1-3-5-8	...	...	1-3 & 1-5
3793-L	Twin .015	5-7-8	...	...	7-8
3793-M	Twin .015	5-7-8	...	...	5-8 & 7-8

Condenser 3903 .01 Mfd.

Part No.	Cond. Cap. Mfd.	Lugs Used	Wire Resis. Ohms	Resis. Wiring Lugs	Cond. Wiring Lugs
3903-R	.01	4-7-8	...	...	4-7
3903-S	Twin .01	1-5-7	...	...	1-5 & 1-7
3903-T	.01	5-7-8	...	...	7-8
3903-U	.01	1-2-5-7	...	...	1-7
3903-W	.01	2-4-7	...	...	2-7
3903-X	.01	3-5-8	...	...	3-8
3903-Y	.01	3-5	...	...	3-5

Condenser 4989 .09 Mfd.

Part No.	Cond. Cap. Mfd.	Lugs Used	Wire Resis. Ohms	Resis. Wiring Lugs	Cond. Wiring Lugs
4989-J	.09	3-5	...	...	3-5
4989-K	Twin .09	3-5	...	...	3-5
4989-L	.09	3-4-8	200	3-8	4-8
4989-M	Twin .09	4-7-8	...	...	4-8 & 7-8

The above is additional to Standard Bypass Condenser Data shown on PAGE 466-B-4

The following color code will be used to determine the capacity of the small fixed condensers used in all models of Philco Receivers.

4990	.000035	Green and Yellow
5215	.001	Green and White
5877	.00165	Green and Blue
5878	.0008	Green and Orange
5886	.00125	Blue and Orange
5858	.00025	Yellow
5863	.0007	White Yellow
5981	.006	Orange
6009	.003	Orange and White
6018	.0018	White and White

The above is additional to Condenser Data shown on PAGE 466-B-3

PHILCO
COIL
AND
COMPENSATING
CONDENSER
SPECIFICATIONS

PHILADELPHIA STORAGE BATTERY CO.

Code Numbering of Philco Coils

For the purposes of identification, the various coils which are used in Philco receivers are now being code markes before being shipped from the Philco National Service Station. The following is a complete list of all of these coils with the new code number which is marked on the mounting bracket.

(#118 - Dated Jan. 1932)

CODE NO.	PART NO.	USED IN MODELS	KEY NO. IN SERVICE BULLETIN DIAGRAM
1	3075A	511, 86, 87	3 5 6
2	3075B	511, 86, 87	2 2 3
3	3506B	65	2
4	3506A	65	7
5	3744A	95, 96	3 2
6	3744B	95, 96	5 7
7	3744C	95, 96	13 12
8	03345	90 (Pentode Output)	13
9	3884A	76, 77, 40, 41	4 2 5 2
10	3884B	76, 77, 40, 41	13 5 8 5
11	3884C	76, 77, 40, 41	10 9 14 11
12	3884N	20, 21	2
13	3884P	20, 21	10
14	3884S	111, 112	3
15	3884T	111, 112	5
16	3884U	111, 112	14
17	3884V	111, 112	9
18	3884X	46, 46E	2
19	3884Y	46, 46E	8
20	4182A	30	2
21	4182B	30	8
22	03014	90 (all Models)	5 5
23	03015	90 (all Models)	7 7
24	03016	90 (all Models)	44 37
25	03082	70	2
26	03083	70, 35	6 7
27	03084	70	8
28	03283	50	2
29	03284	50	5
30	03320	35	2
31	03321	35	9
32	03360	90 (Pentode Output)	2
33	03013	90 (45's Output)	2
34	03009	90 (all Models), 35	13 10 17
35	03038	111, 112	25
36	03039	111, 112	31
37	03040	111, 112	37
38	03091	70	19
39	03092	70, 35	22 20
40	03143	90 (45's Output)	18
41, 42	03734	4, 470, 490	1 16
43	03880	51	2
44	03881	51	5
45	03882	51	8
46	03887	51	12
47	03886	51	16

Standard Compensating Condensers

The various compensating condensers used in the models 35, 70, 270, 370, 90, 112, and 212 have been changed so as to include a bakelite mounting board on which the code letter of the condenser appears. In the case of the I. F. compensating condensers, which have been used in conjunction with a parallel fixed condenser, the new compensating condensers have been increased in capacity so that the fixed condensers are no longer required. For replacement purposes, if desired, the new compensating condensers can be substituted on earlier sets for the earlier combination of a fixed and an adjustable condenser.

The low frequency compensating condensers have been changed with respect to the bakelite mounting, but their capacity remains unchanged, thereby requiring the parallel fixed condenser as in the past.

All of these new condensers can be identified by the letter which is stamped on the bakelite mounting board. For example part 04000-E has the letter E stamped over the surface of the mounting board; part 04000-F has the letter F stamped on the board.

The following table lists the part numbers of the various new condensers, their identification code letter, capacity range, where used, the superseded part number, and the part number of the parallel fixed condenser when one is still used.

(#98 - Dated Sept.1931)

Part Number	Identification Code Letter	Capacity Range Mmf.	Used on Models	Supersedes	Used with Fixed Condenser
04000-B	B	40-250	90 (Early and Late)	03050	4520 (700 mmf.)
04000-D	D	6-50	112, 212	3772-A	———
04000-E	E	5-30	112, 212	3968-A	———
04000-F	F	40-250	112, 212	3772-B	4520 (700 mmf.)
			370. 70, 270	03120	5120 (410 mmf.)
			35	03249	5120 (410 mmf.)
04000-H	H	40-180	70*, 270*, 370* 90* early	03051	———
04000-J	J	40-180	70* 270*, 370*, 212* 112*, 90* early	3772-C	———
04000-K	K	30-140	70*, 370*	03061	———
04000-L	L	30-140	270*	03262	———
			112*	3772-D	———
04000-M	M	15-130	35*	03411	———

*FIXED PARALLEL CONDENSER NOT REQUIRED

FOR RESISTOR DATA AND FOR ADDITIONAL CONDENSER DATA REFER TO PAGES 466-B-3, 466-B-4, 466-B-5

PHILADELPHIA STORAGE BATTERY CO.

ADJUSTMENT OF MODELS 50 AND 50-A

Adjustment of the compensating condensers in the model 50 should be done with the aid of a good oscillator for the R.F. signal. The oscillator lead should be connected to the "ANT" terminal of the receiver. A good ground connection must be made from the receiver to the grounded side of the oscillator and to a water or radiator pipe.

Either the ear method or an output meter, connected across the speaker voice coil terminals can be used while adjusting.

When the Receiver is set up for operation, adjust the oscillator signal to a frequency which is approximately 1400 kilocycles.

With the volume control advanced to maximum, and using a weak oscillator signal, tune the receiver sharply to the oscillator note.

Adjust the third R. F. compensating condenser by means of the Philco fibre wrench, part 3164, for maximum output signal. If an output meter is being used, adjust for maximum reading.

Next adjust the second R. F. compensating condenser and finally the first. In each case, always adjust for maximum signal or reading.

REPLACEMENT PARTS MODELS 50 AND 50-A

No. on Figs. 3 and 4	Description	Part No.
1	Volume Control	5232
2	First R. F. Transformer	03283
3	Gang Condenser	03293
4	Compensating Condenser (Part of Gang Condenser Assembly)	
5	Second R. F. Transformer	03284
6	Compensating Condenser (Part of Gang Condenser Assembly)	
7	Third R. F. Transformer	03284
8	Compensating Condenser (Part of Gang Condenser Assembly)	
9	Condenser—250 Mmf.	3082
10	Condenser—250 Mmf.	3082
11	Resistor—10,000 Ohms	4412
12	Condenser—.01 Mfd.	3903-L
13	Resistor—240,000 Ohms	4410
14	Resistor—490,000 Ohms	4517
15	Bypass Condenser (.15 Mfd., .25 Mfd., 2-.5 Mfd., .1 Mfd.) 50-60 cycles	03459
	(.15 Mfd., .25 Mfd., 2-.5 Mfd., .05 Mfd.) 25-40 Cycles	03455
16	Bypass Condenser—.01 Mfd.	3903-N
17	Output Transformer	2660
18	Voice Coil and Cone Assembly	02970
19	Speaker Field (Assembled with Pot and Frame)	02942
20	Resistor—490,000 Ohms.	4517
21	Resistor—160,000 Ohms.	5331
22	Resistor—150 Ohms and Condenser—.05 Mfd.	3615-X
23	Resistor—15,000 Ohms	5278
24	Bypass Condenser—.05 Mfd.	3615-L
25	Bypass Condenser—(.05 Mfd.) (combined with 15)	
26	Resistor—25,000 Ohms	3656
27	Resistor—99,000 Ohms	4411
28	Resistor—32,000 Ohms	5279
29	Resistor—99,000 Ohms	4411
30	On-Off Switch	5382
31	Power Transformer—50-60 cycles	5266
	Power Transformer—25-40 cycles	5267
	Power Transformer—50-60 cycles 210-240 volts	5268
32	Electrolytic Condenser—6 Mfd.—50-60 cycles	4916
	Electrolytic Condenser—10 Mfd. 25-40 cycles	5142
33	Electrolytic Condenser—6 Mfd.—25-40 cycles and 50-60 cycles	4916
	Tube Shield	03390
	Knob (Large)	03064
	Knob (Small)	03427
	Spring (For Dial Knobs) Small	4147
	Spring (For Dial Knobs) Large	5262
	Grid Clip	4897
	Five Prong Socket Assembly	4956
	Four Prong Socket Assembly	5026
	Dial Complete	03322
	Bezel	5383

For Further Data On Models 50 & 50-A
Refer To Pages 466-B-1 & 466-B-2.

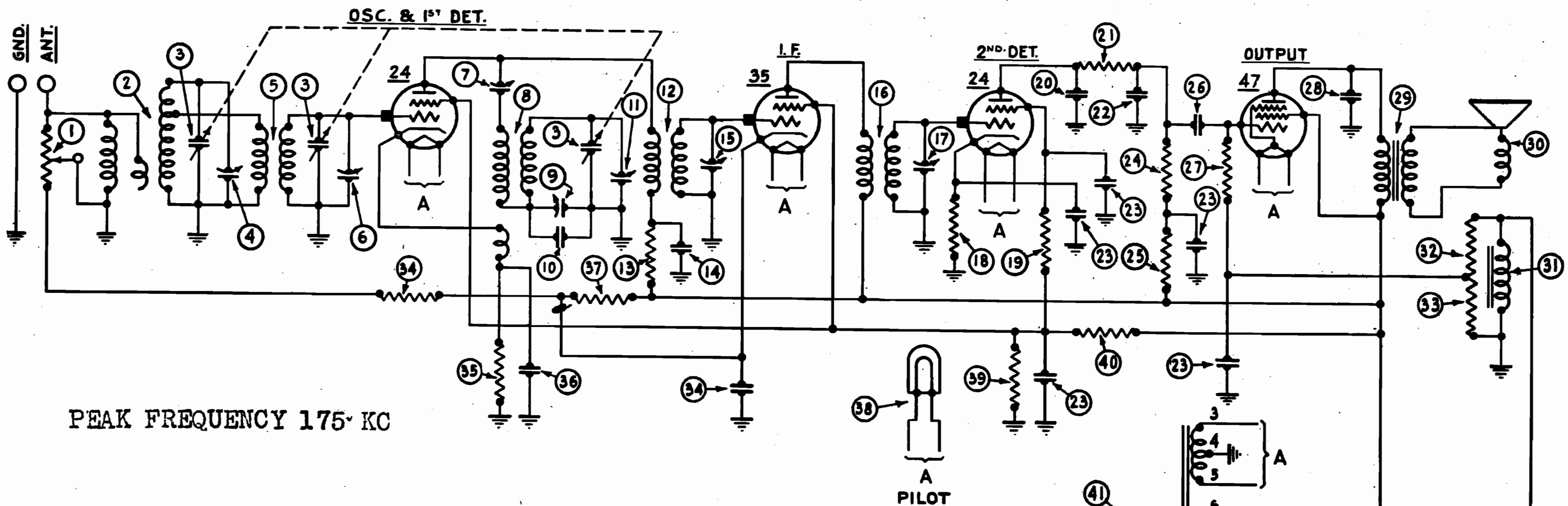
MODEL 51
MODEL 51-A

PHILADELPHIA STORAGE BATTERY CO.

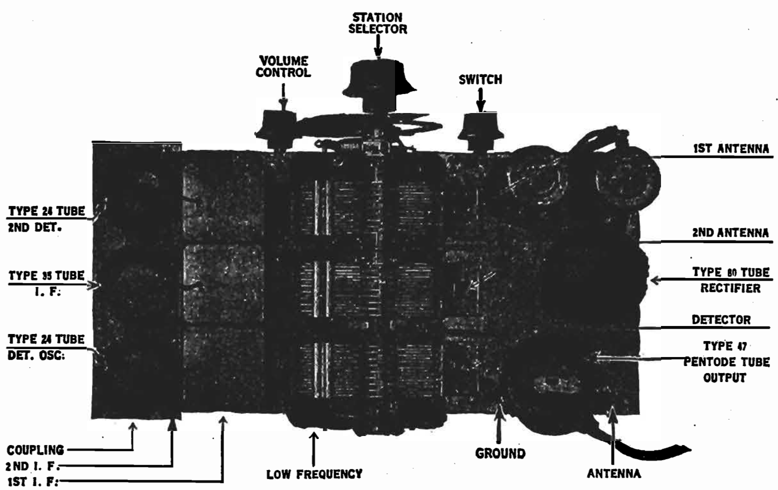
ARRANGEMENT OF WIRES

The placing of certain wires in the receiver will effect the operation to a marked extent. The red wire from the primary of the first I. F. transformer (12), Figs. 1 and 2, to the .05 mfd. condenser (14), Figs. 1 and 2, must come straight down to the corner of the I. F. tube socket, then straight up to the condenser lug.

The wire from the plate of the detector-oscillator tube to the coupling compensating condenser (7), Figs. 1 and 2, must be away from the chassis at the side.



PEAK FREQUENCY 175 KC



Voltage table on page 466-B-9
For further data see pages 466-B-9 & 466-B-10

PHILCO MODELS 51 and 51-A SUPERHETERODYNE

PHILADELPHIA STORAGE BATTERY CO.

Model 51 Receivers are for operation on 100-130 volt, 50-60 cycle AC line
Model 51-A Receivers are for operation on 100-130 volt, 25-40 cycle AC line

Table 1—Tube Socket Readings Taken with AC Set Tester AC Line—115 volts

Tube Type	Tube Circuit	Filament Volts	Plate Volts	Screen Grid Volts	Control Grid Volts	Cathode Volts	Plate Milli-amperes
24	Osc. & 1st Det.	2.2	220*	85*	9.0*	9.0*	...
35	I.F.	2.2	210	85	3.0	3.0	6.2
24	2nd Det.	2.2	75	54	5.2	5.2	0
47	Output	2.2	210**	240**	0.2**	...	28.**
80	Rect.	5.0	240/Plate	...	...	...	30/ Plate

Note—Volume Control on full; Station Selector turned to Low Frequency End.
*These readings must be taken from the underside of the chassis, using a suitable high resistance D.C. voltmeter equipped with test prods and leads.
**These readings must likewise be taken from the underside of the chassis unless the set tester is especially equipped for testing pentode tubes.

Table 2—Power Transformer Voltages

Terminals	A.C. Volts	Connection	Color
1-2	105 to 125	Primary	Black (Small Gauge)
3-5	2.5	Filament of 24, 35 and 47	Black
6-7	5.	Filament of 80	Light Blue
8-10	700.	Plates of 80	Yellow
4	.....	Center Tap of 3-5	Black, Yellow Tracer
9	.....	Center Tap of 8-10	Yellow, Green Tracer

Table 3—Condenser Data

Nos. on Figs. 1 and 2	Capacity Mfd.	Container
(20) (22)	.00025	Yellow
(10) (38)	.00011	Blue and Golden Yellow
(26) (28)	.01	Black Bakelite Container
(14)	.05	Black Bakelite Container
(23)	.1, .15, .25, 2-.5 (50-60 cy.)	Metal Container
	.2, .15, .25, 2-.5 (25-40 cy.)	Metal Container
(43)	6 (50-60 cycles)	Electrolytic
	10 (25-40 cycles)	Electrolytic
(44)	6	Electrolytic

Table 4—Resistor Data

Nos. on Figs. 1 and 2	Power (Watts)	Resistance (Ohms)	Color Body	Color Tip	Color Dot
(34)	...	250 and .05 Mfd.	Black Bakelite Container		
(13)	.5	1,000	Brown	Black	Red
(35)	.5	8,000	Grey	Black	Red
(21)	.5	10,000	Brown	Black	Orange
(30)	1.	25,000	Red	Green	Orange
(18)	.5	32,000	Orange	Red	Orange
(40)	1.	32,000	Orange	Red	Orange
(37)	2.	51,000	Green	Brown	Orange
(19) (25)	.5	99,000	White	White	Orange
(33)	.5	160,000	Brown	Blue	Yellow
(24) (27) (32)	.5	490,000	Yellow	White	Yellow

Adjustments

The adjustment of the Model 51 Receiver requires the use of a 175 K.C. oscillator and a broadcast oscillator such as the Jewell 560.

Set up the receiver for operation with the ground wire attached, but the aerial disconnected. Connect the ground wire of the oscillator to the receiver ground terminal. Connect the output meter (low terminals) across the speaker voice coil terminals.

Intermediate Frequency or I.F. Adjustment—Place the oscillator in operation at 175 K.C. Remove the tube shield and attach the oscillator output lead to the control grid terminal on top of the detector oscillator tube (see illustration above).

With the receiver volume control on full, adjust the oscillator output until the output meter reads about ½ scale deflection.

Using a Philco-fibre wrench, part 3164, adjust the 2nd I.F. compensating condenser for maximum reading in the output meter. The illustration above shows the positions of the various compensating condensers. Next adjust the first I.F. compensating condenser, and finally adjust the coupling condenser. Remove the oscillator connection from the grid terminal of the detector oscillator tube, and replace the clip on the tube.

Detector Condenser—Connect the oscillator to the "Ant." terminal of the receiver chassis. Place the oscillator in operation at 175 K.C. Turn the station selector of the receiver to exactly 1400 K.C. Adjust the detector compensating condenser for maximum reading in the output meter.

If the receiver is so far out of adjustment that the signal is not audible, it may be necessary to set the oscillator for 1400 K.C. on the broadcast frequency setting. After making this adjustment, again set the oscillator at 175 K.C. The adjustment of the detector condenser will determine the position on the Philco scale where the eighth harmonic of 175 K.C. (1400 K.C.) will be tuned in. It must be tuned in at exactly 140 on the Philco scale.

Antenna Condensers—With the oscillator still set at 175 K.C. and the tuning dial at 1400 K.C., adjust the second antenna compensating condenser for maximum reading in the output meter, and then adjust the first antenna condenser.

Low Frequency Condenser—Set the broadcast oscillator to exactly 600 K.C. and turn the receiver dial to exactly 60 on the scale. Adjust the low frequency condenser for maximum reading in the output meter.

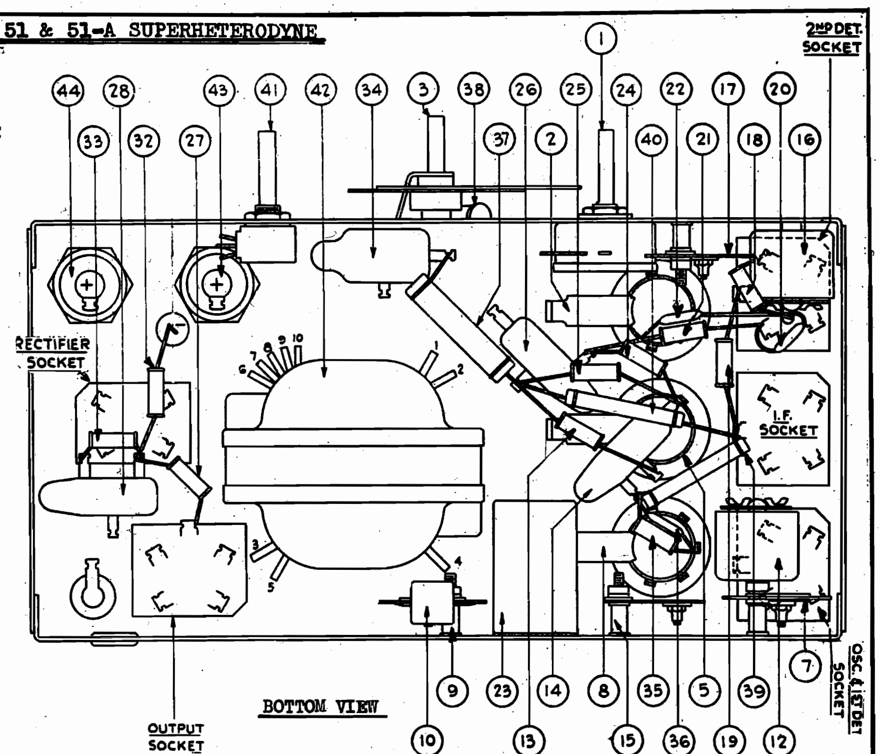
After making this adjustment, it will be desirable to check the detector compensating condenser adjustment again. Set the oscillator at 175 K.C. and receiver at 140 on the scale. Adjust again for maximum reading in the output meter.

PENTODE SUPERHET.
MODEL 51
MODEL 51-A
MODEL 551

PHILADELPHIA STORAGE BATTERY CO.

No. on Figs. 1 and 2	Description	Part No.
1	Volume Control	5839
2	Antenna Coil	03880
3	Gang Condenser	03809
4	Compensating Condenser (Part of gang condenser assembly)	
5	First R.F. Transformer	03881
6	Compensating Condenser (part of gang condenser assembly)	
7	Compensating Condenser	04000-A
8	Oscillator Coil	03882
9	Compensating Condenser	04000-F
10	Condenser (710 mmf.)	5863
11	Compensating Condenser (part of gang condenser assembly)	
12	First I. F. Transformer	03887
13	Resistor (1,000 ohms)	5837
14	By-pass Condenser (.05 mfd.)	3615-AC
15	Compensating Condenser	04000-D
16	Second I.F. Transformer	03886
17	Compensating Condenser	04000-D
18	Resistor (33,000 ohms)	5279
19	Resistor (99,000 ohms)	4411
20	Condenser (250 mmf.)	5858
21	Resistor (10,000 ohms)	4412
22	Condenser (250 mmf.)	5858
23	Condenser (.1, .15, .25, 2-.5) 50-60 cycles	03915
	Condenser (.2, .15, .25, 2-.5) 25-40 cycles	03945
24	Resistor (490,000 ohms)	4517
25	Resistor (99,000 ohms)	4411
26	Condenser (.01 mfd.)	3903-N
27	Resistor (490,000 ohms)	4517
28	Condenser (.01 mfd.)	3903-K
29	Output Transformer	2660
30	Voice Coil and Cone Assembly	
	TYPE "S" (Large)	02887
	TYPE "P" (Small)	02861
31	Field Coil and Pot Assembly	02942
32	Resistor (490,000 ohms)	4517
33	Resistor (160,000 ohms)	5331
34	Resistor (250 ohms and .05 mfd.)	3615-C
35	Resistor (8,000 ohms)	5838
36	Condenser (710 mmf.)	5863
37	Resistor (51,000 ohms)	5868
38	Pilot Light	3463
39	Resistor (25,000 ohms)	3656
40	Resistor (32,000 ohms)	3525
41	On-off Switch	5382
42	Power Transformer, 50-60 cycles	5266
	Power Transformer, 25-40 cycles	5267
	Power Transformer, 50-60 cycles, 230 volts	5268
43	Electrolytic Condenser (6 mfd.) 50-60 cycles	4916
	Electrolytic Condenser (10 mfd.) 25-40 cycles	5142
44	Electrolytic Condenser (6 mfd.)	4916
	By-pass Condenser (across power line) .01 mfd. double, Colonial Clock only	3903-S
	Clock Unit (60 cycles) Model 551	5950
	Clock Glass Model 551	5942
	Tube Shield	04011
	Knob (Large)	03064
	Knob (Small)	03437
	Grid Clip	4897
	Five Prong Socket Assembly	4956
	Four Prong Socket Assembly	5026
	Pilot Light Bracket Complete	03814
	Dial Complete	04031
	Bezel	5879
	Spring (Large)	5262
	Spring (Small)	4147
	Scroll (Model 551)	44613
	Turnings (3 used) Model 551	44607

MODEL 51 & 51-A SUPERHETERODYNE



New Replacement Parts Models 51 and 551

Part No.	Name	List Price
3615-AC	Condenser (.05 Mfd.)	$0.20
3903-K	Condenser (.01 Mfd.)	.16
3903-S	Condenser (.01 Mfd. Double)	.20
5837	Resistor (1,000 Ohms)	.20
5838	Resistor (8,000 Ohms)	.20
5839	Volume Control	.75
5858	Condenser (250 Mmf.)	.16
5863	Condenser (710 Mmf.)	.18
5868	Resistor (51,000 Ohms)	.35
5879	Bezel	.20
5942	Clock Glass	.30
5950	Clock Unit (60 Cycles)	5.50
02861	Voice Coil and Cone Assembly (Type P) Small	.60
02887	Voice Coil and Cone Assembly (Type S) Large	.75
02942	Field Coil and Pot Assembly	1.75
03809	Gang Condenser	4.75
03814	Pilot Light Bracket Complete	.08
03880	Antenna Coil	.75
03881	First R. F. Transformer	.75
03882	Oscillator Coil	.75
03886	Second I. F. Transformer	1.00
03887	First I. F. Transformer	1.25
03915	Condenser (.1, .15, .25, 2-.5) 50-60 Cycles	1.25
03945	Condenser (.2, .15, .25, 2-.5) 25-40 Cycles	1.25
04011	Tube Shield	.25
04031	Dial Complete	.40
44607	Turnings (3 used)	.18
44613	Scroll	

PHILADELPHIA STORAGE BATTERY CO.

Models 90 and 90-A Receivers

Model 90 Receivers are for Operation on 105-125 volt, 50-60 cycle AC Lines.
Model 90-A Receivers are for Operation on 105-125 volt, 25-60 cycle AC Lines.

Models 90 and 90-A

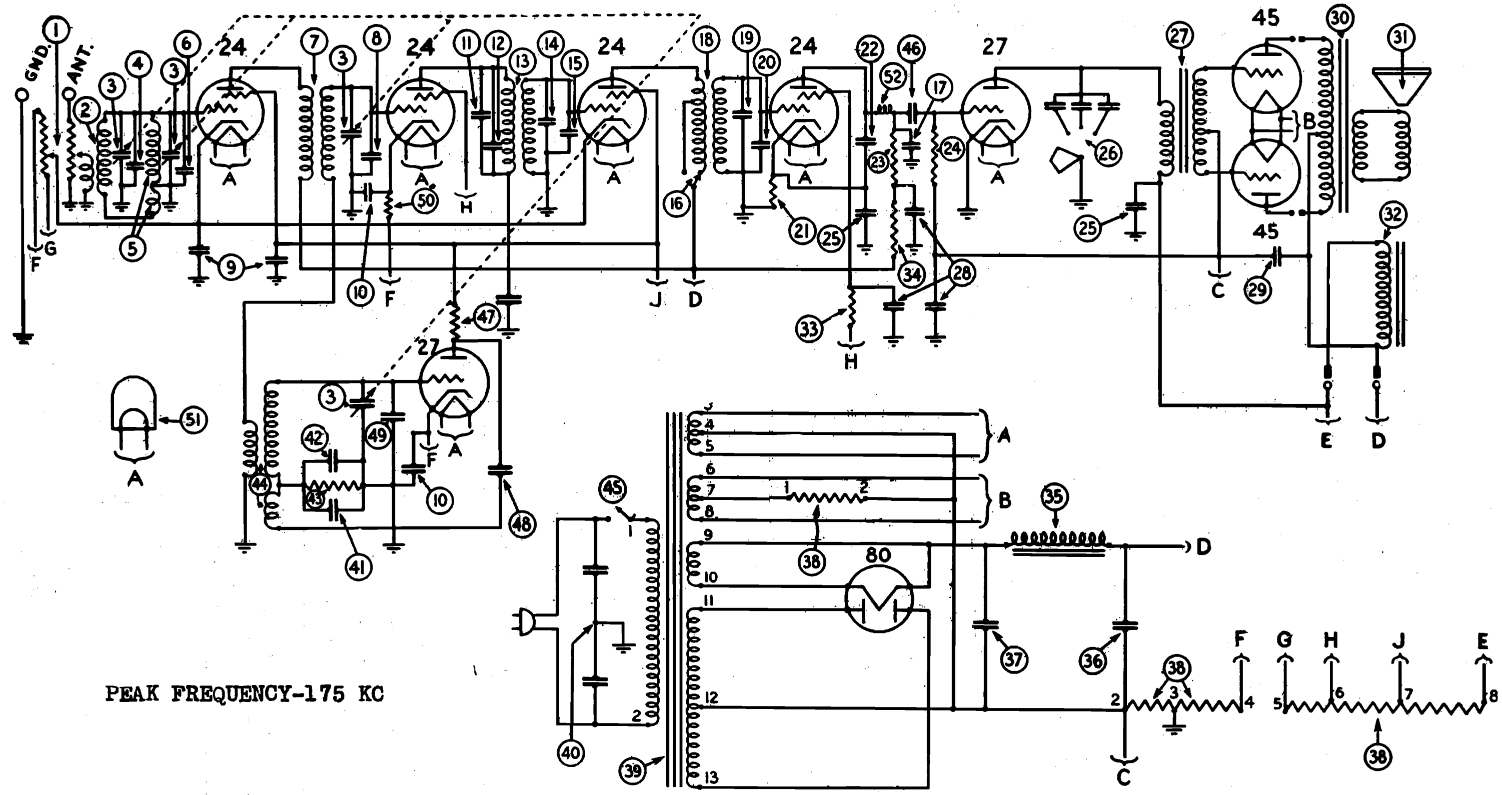


Table 1—Tube Socket Readings Taken with AC Set Tester, AC Line, 115 Volts

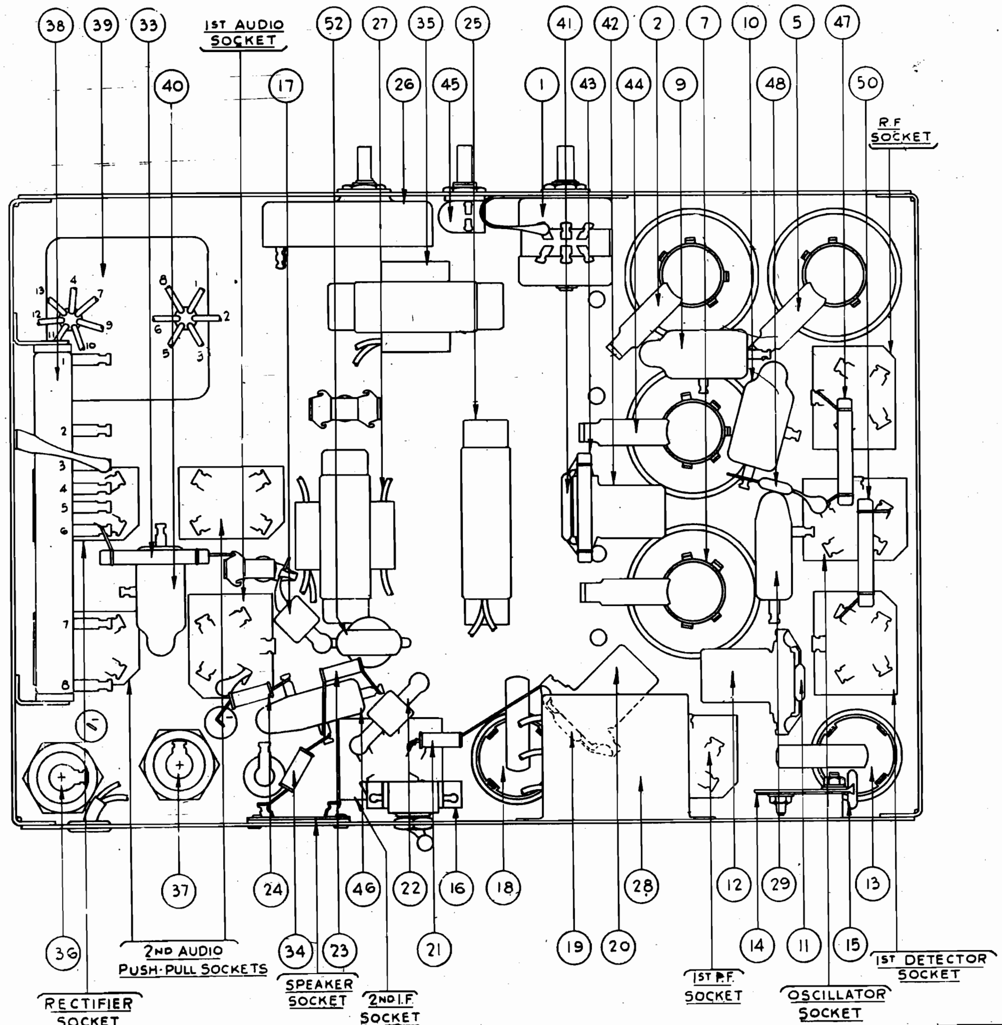
Tube Type	Tube Circuit	Filament Voltage	Plate Voltage	Grid Voltage	Screen Grid Voltage	Cathode Voltage	Plate Milliamperes
24	1st R. F.	2.1	250	3.3	83	15	3
27	Osc.	2.1	60	1	...	15	2
24	1st Det.	2.1	250	5.5	23	15	.5
24	1st I. F.	2.1	250	3.8	80	15	4.5
24	2nd Det.	2.1	48	3.7	42	15	3
27	1st Audio	2.1	140	.25	...	10	....
45	Audio	2.2	243	46	...	...	30
45	Audio	2.2	243	46	...	...	30
80	Rect.	4.5	...	...	...	...	...

All readings taken with antenna disconnected and ground on. Volume Control on full.

Alignment Data will be found on Page 466-D-5. Condenser Data will be found on pages 466-B-3 and 466-B-4. For Serial Numbers above 237,001 see pages 466-D-3 and 466-D-4.

PHILADELPHIA STORAGE BATTERY CO.

Models 90 and 90-A



For additional Fixed Condenser Data See Pages
466-B-3 and 466-B-4

Table 2—Power Transformer Voltages

Terminals	A.C. Volts		Color
1—2	105 to 125	Primary	Black (Small Gauge)
3—5	2.5	Heaters of 24 and 27 Tubes	Black (Heavy Gauge)
4	2.5	Center Tap of 3—5	Black with Yellow
6—8	2.5	Filament of 45 Tubes	Dark Green
7	2.5	Center Tap of 6—8	Black with Green
9—10	5.0	Filament of 80 Tube	Light Blue
11—13	650.	Plates of 80 Tube	Yellow
12	...	Center Tap of 11—13	Yellow with Green

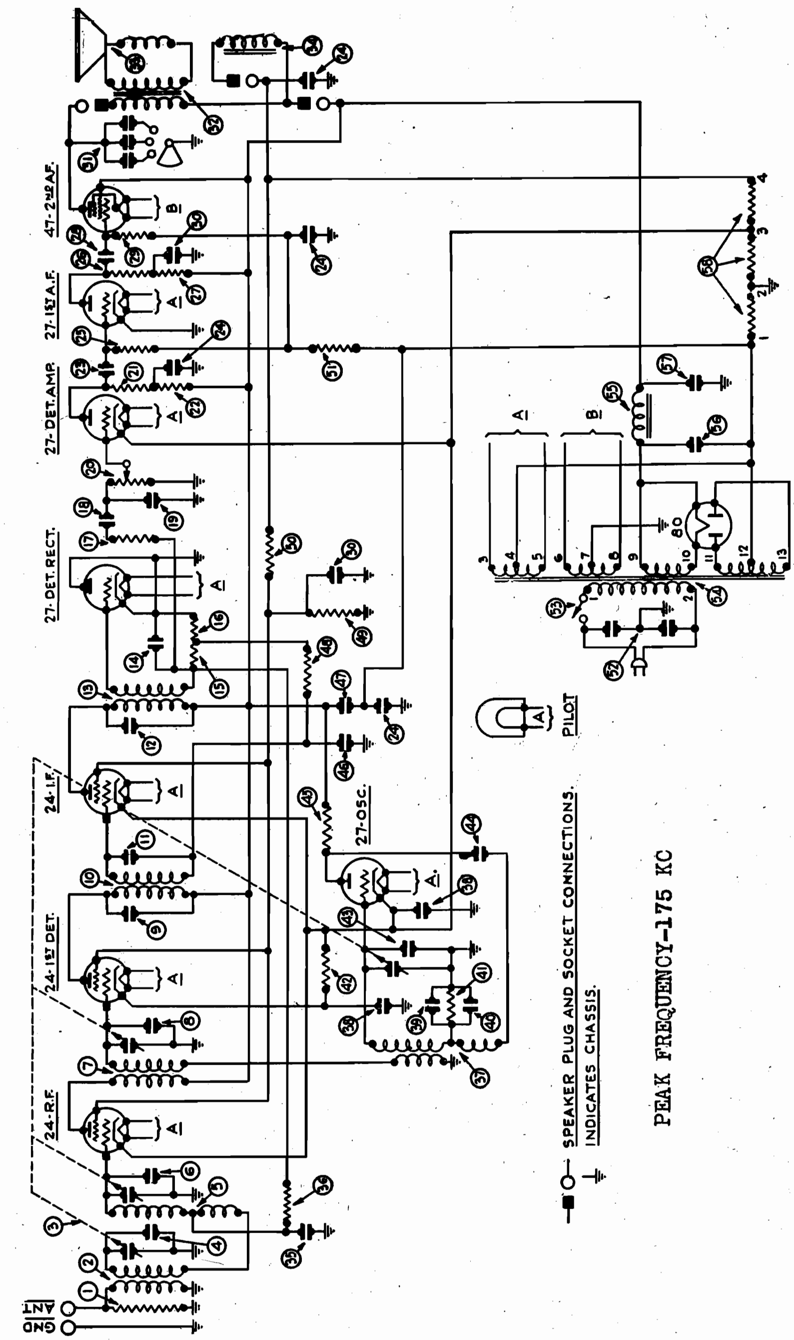
Table 3—Resistor Data

No. on Fig.	Terminal	Power (Watts)	Resistance	Color Body—Tip—Dot
38	1—2	...	800	(Long Tubular)
	2—3	...	263	
	3—4	...	75	
	5—6	...	370	
	6—7	...	1,800	
	7—8	...	1,430	
47	....	1.	13,000	Brown—Orange—Orange
21	....	.5	50,000	Green—Brown—Orange
43	....	1.	50,000	Green—Brown—Orange
33	....	1.	250,000	Red—Yellow—Yellow
34, 23	....	.5	250,000	Red—Yellow—Yellow
24	....	.5	1,000,000	Brown—Black—Green

Table 4—Condenser Data

No. on Figs.	Capacity	Color
9	.09 Double	Black Bakelite Container
10	.09 Double	Black Bakelite Container
11, 15, 16, 20, 48	.00011	Blue, Golden Yellow
17, 22	.000035	Yellow and Green
25	.5	Metal Container
28	.25 Double (Black wires to Ground) .5 (White wire to Ground)	Metal Container
29	.05	Black Bakelite Container
36, 37	6.	Electrolytic Type
35 (25 to 40 cycles)	10.	Electrolytic Type
40	.015 Double	Black Bakelite Container
41	.0007	White, Golden Yellow
46	.001	Green and White

PHILADELPHIA STORAGE BATTERY CO.



Models 90 and 90-A Receivers

(Above Serial No. 237,001)

This Bulletin Does Not Supersede Service Bulletin No. 56

Model 90 Receivers are for Operation on 100-130 volt, 50-60 cycle AC Lines.
Model 90-A Receivers are for Operation on 100-130 volt, 25-60 cycle AC Lines.

For Alignment Data See Page 466-D-5.
For Earlier Serial Numbers see Pages 466-D-1 & 466-D-2
Additional Fixed Condenser Data will be found on Pages 466-B-3 and 466-B-4.

Table 1—Tube Socket Readings Taken with AC Set Tester, AC Line, 115 Volts

Tube Type	Tube Circuit	Filament Volts	Plate Volts	Screen Grid Volts	Control Grid Volts	Cathode Volts	Plate Milliamperes
24	R. F.	2.0	255	60	.25	20	2.4
27	Osc.	2.0	65	...	.6	20	3.6
24	1st Det.	2.0	250	64	6.0	24	.25
24	I. F.	2.0	270	76	.25	18	.4
27	Det. Rect.	2.0	0	...	0	17	0
27	Det. Amp.	2.0	140	...	.4	18	2.0
27	1st A. F.	2.0	45	...	.4	20	1.8
47	Output	2.0	220*	240*	1.0*	..	32.*
80	Rectifier	4.5					

All readings taken with antenna disconnected and ground on. Volume Control on full.
*These readings must be taken from the underside of the chassis using test prods and leads unless the set checker is specially equipped for testing pendode tubes.

PHILADELPHIA STORAGE BATTERY CO.

Philco Models 90 and 90-A

For Additional Fixed Condenser Data
See Pages 466-B-3 and 466-B-4.

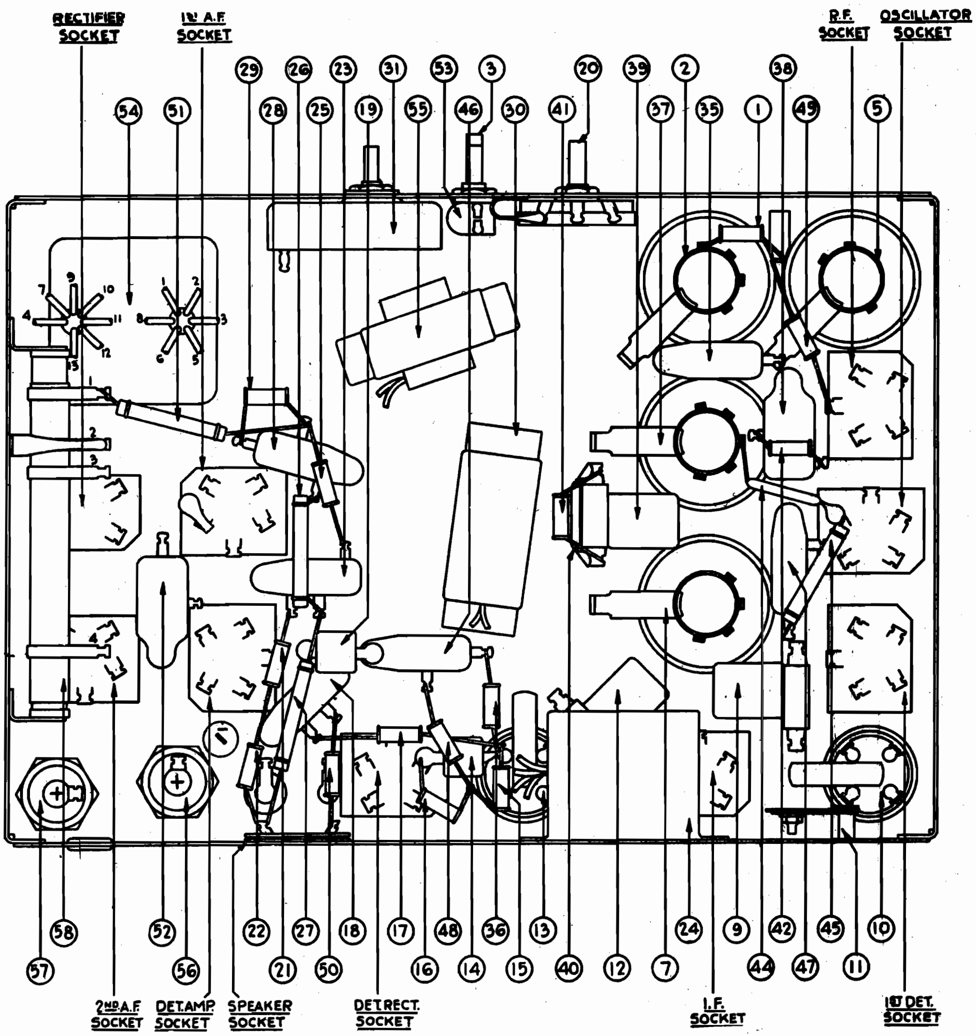


Table 2—Power Transformer Voltages

Terminals	A.C. Volts		Color
1—2	105 to 125	Primary	White
3—5	2.5	Heaters of 24 and 27 Tubes	Black
4	2.5	Center Tap of 3—5	Black with Yellow
6—8	2.5	Filament of 47 Tube	Dark Green
7	2.5	Center Tap of 6—8	Black with Green
9—10	5.0	Filament of 80 Tube	Light Blue
11—13	650.	Plates of 80 Tube	Yellow
12	...	Center Tap of 11—13	Yellow with Green

Table 3—Resistor Data

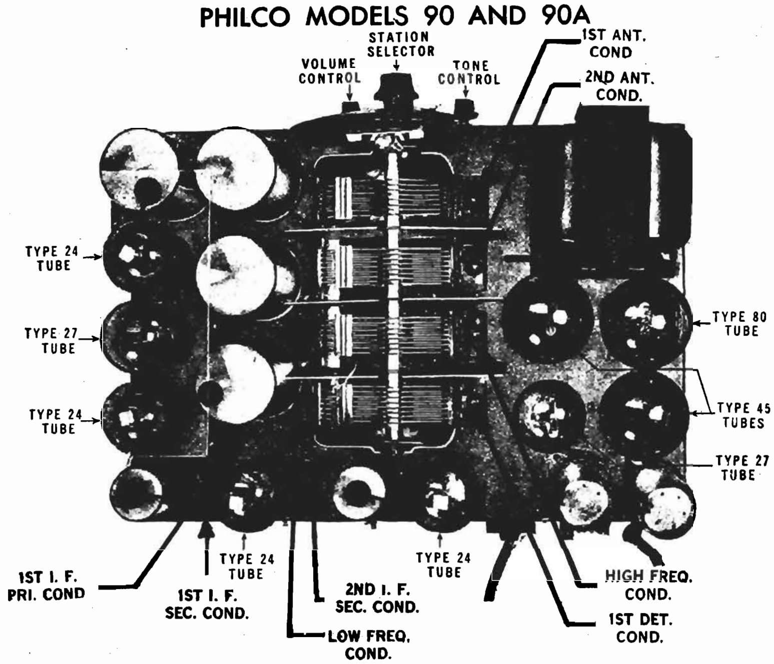
No. on Figs. 1 and 2	Terminal	Power (Watts)	Resistance (Ohms)	Color: Body	Color: Tip	Color: Dot
59	1—2 2—3 3—4		180 60 3,500	(Long Tubular)		
42		1.	5,000	Green	Black	Red
1		.5	10,000	Brown	Black	Orange
26 27		1.0	25,000	Red	Green	Orange
50		.5	25,000	Red	Green	Orange
15 16 21 41		.5	51,000	Green	Brown	Orange
45		1.	51,000	Green	Brown	Orange
53 49		.5	70,000	Violet	Black	Orange
17		.5	99,000	White	White	Orange
25 29		.5	240,000	Red	Yellow	Yellow
51		1.	240,000	Red	Yellow	Yellow
38 48		.5	490,000	Yellow	White	Yellow

Table 4—Condenser Data

No. on Figs. 1 and 2	Capacity	Color
14 44	.00011	Blue, Golden Yellow
19	.00025	Yellow
18 23 28	.01	Black Bakelite Container
52	.015	Black Bakelite Container
35 48 47	.05	Black Bakelite Container
38	.09	Black Bakelite Container
24	.1-.13-.25-1.	Metal Container
30	.25-1.	Metal Container
54 57	(50-60 Cycles) 6.	Electrolytic Type
	(25-40 Cycles) 10.	Electrolytic Type

PHILADELPHIA STORAGE BATTERY CO.

PHILCO MODELS 90 AND 90A



Adjusting the Model 90 Using a Jewell 560 Oscillator

Set up the Receiver for operation using standard tubes. Set the Normal-Maximum switch in the Normal position.

Intermediate Frequency Adjustment—Remove the tube shield. Remove the control grid clip of the first detector tube (Type 24 tube nearest back of the Receiver Chassis under the tube shield). Connect the "A" terminal of the oscillator to the control grid of the first detector tube. The "G" terminal must be connected to the Receiver Chassis. Turn the filament control of the oscillator on about ½ the total movement. The middle switch much be turned to the intermediate position. The tuning control of the oscillator must be set for exactly 175 K.C., as indicated in the calibration data sent with the instrument.

Turn the volume control of the Receiver on full. Set the atenuator control so that an audible signal is received in the speaker. Connect the ± and the low terminals of the output meter to the voice coil terminals of the speaker. Adjust the atenuator control for not more than ½ full scale reading of the meter.

Using a Philco part No. 3164 fibre wrench, adjust the second I. F. secondary condenser for maximum reading in the output meter. Adjust the first I. F. secondary and then the first I. F. primary condensers for maximum reading in the output meter. Reduce the oscillator signal to prevent any damage to the meter mechanism. Replace the grid clip on the first detector tube and replace the tube shield.

High Frequency Compensator — Connect the "A" and "G" terminals of the oscillator to the ANT and GND terminals of the Receiver. Do not change the oscillator setting. Tune the Receiver to exactly 140 and adjust the high frequency compensator for maximum reading in the output meter.

Antenna and Detector Condensers — With the Receiver and oscillator in the same setting, set the detector and antenna condensers for maximum reading in the output meter. If the Receiver is so far out of adjustment that the signal is extremely weak when adjusting the high frequency condenser it is advisable to temporarily check the adjustment of the detector and antenna condensers. Final adjustment of these condensers must be made as described.

Low Frequency Condenser—With the oscillator turned to broadcast frequency set the Philco scale at 60 and adjust the low frequency compensating condenser for maximum signal in the output meter. If the signal comes in off the 60 position on the Philco scale, set the Receiver slightly off the signal towards 60 and adjust the signal for maximum strength in this position. By repeating this, you will be able to bring the signal up to the 60 setting on the Philco scale.

PHILADELPHIA STORAGE BATTERY CO.

PHILCO MODELS 470 & 470-A
SUPERHETERODYNE
BROADCAST AND SHORT WAVE COMBINATION

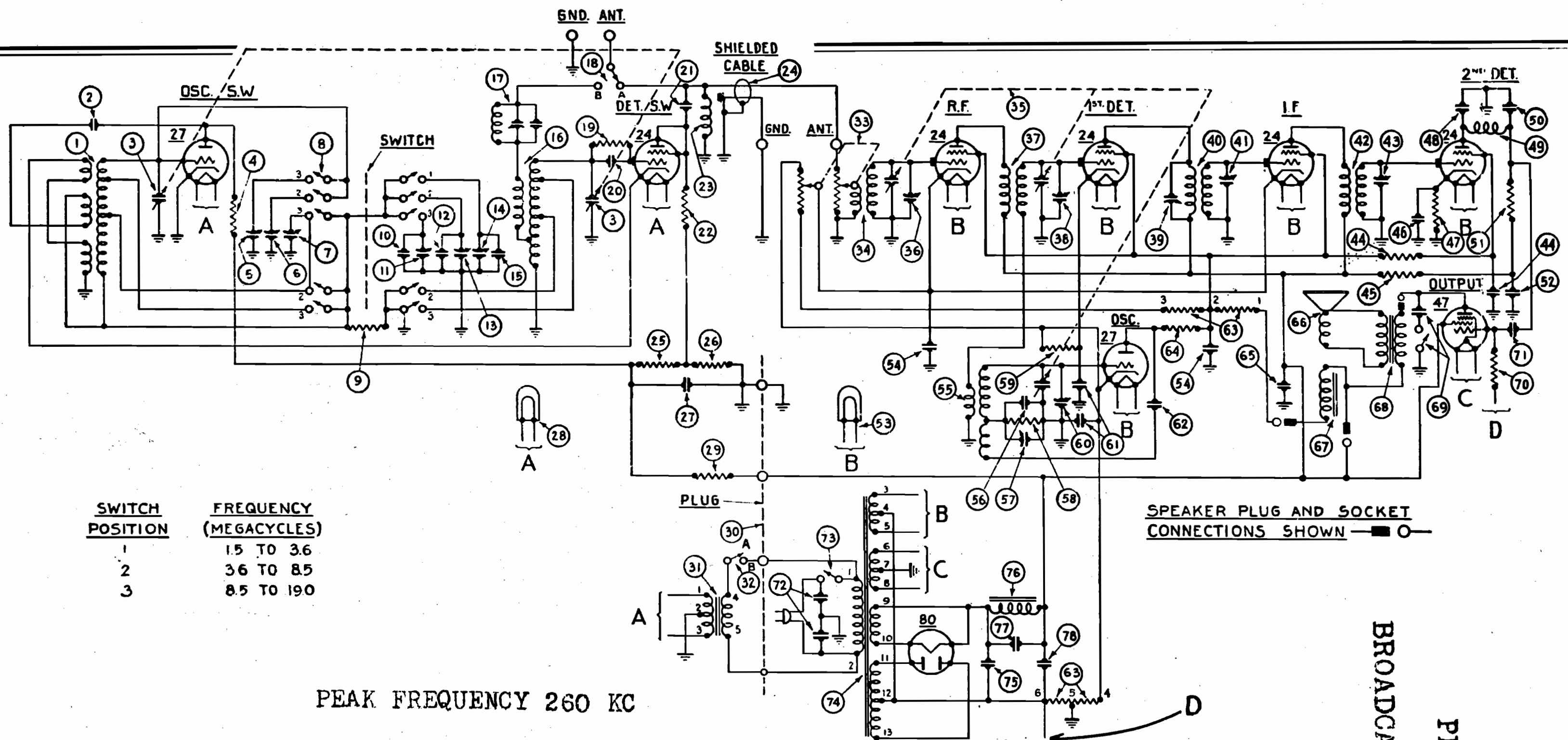


Table 1—Tube Socket Data taken with AC Set Tester—AC Line 115 Volts

Tube Type	Tube Circuit	Filament Volts	Plate Volts	Screen Grid Volts	Control Grid Volts	Cathode Volts	Plate Milli-amperes
			SHORT WAVE UNIT*				
27	Osc.	2.2	110	...	3.3	0	...
24	Det.	2.2	24	24	5.	0	...
			BROADCAST UNIT				
24	R. F.	2.4	255	50	3.5	25	7.5
24	1st. Det.	2.4	260	60	9	38	...
27	Osc.	2.4	60	...	3.5	25	2.
24	I. F.	2.4	265	50	3	22	3.5
24	2nd Det.	2.4	116	40	7	25	...
47	Output	2.5**	205**	220**	.7**	..	28**
80	Rectifier	4.5	260/Plate				

*The voltage readings of the short wave unit were taken from the under side of the chassis, using a Weston multi-range voltmeter, 1000 Ohms per volt. The radio set tester cannot be used, either for voltage or plate current readings because of the effect of the long leads through the set tester cord.

**These readings must likewise be taken from the socket terminals on the under side of the chassis unless the set tester is especially equipped with an adapter for testing pentode tubes.

All the above readings were taken with volume control at maximum.

PHILADELPHIA STORAGE BATTERY CO.

Table 3—Resistor Data

No. on Figs. 1, 2 and 3	Terminal	Power (Watts)	Resistance (Ohms)	Color: Body	Color: Tip	Color: Dot
44	....	....	250	....	Black Bakelite	....
63	1–2	....	1060	....	Long Tubular	....
	2–3	....	2300			
	4–5	....	70			
	5–6	....	240			
59	....	1	5,000	Green	Black	Red
29	....	.5	5,000	Green	Black	Red
4 64	....	1	13,000	Brown	Orange	Orange
25 26	....	1	32,000	Orange	Red	Orange
45	(50-60 cycles)	.5	45,000	Yellow	Green	Orange
47 58	....	.5	51,000	Green	Brown	Orange
22	....	1	99,000	White	White	Orange
45	....	.5	99,000	White	White	Orange
9	....	1	240,000	Red	Yellow	Yellow
51 70	....	.5	240,000	Red	Yellow	Yellow
19	....	.5	2,000,000	Red	Black	Green

Table 4—Condenser Data

Nos. on Fig. 1, 2 and 3	Capacity (Mfd.)	Container
20 62	.00011	Blue and Golden Yellow
14 21 50	.00025	Yellow
56	.00041	Yellow and Orange
48	.0005	Green
12	.0008	Green and Orange
10	.00125	Blue and Orange
71	.01	Black Bakelite
72	.015 (Double)	Black Bakelite
2 65	.05	Black Bakelite
54 61	.09 (Double)	Black Bakelite
77	.09 (50–60 cycles)	Black Bakelite
77	.18 (25–40 cycles)	Black Bakelite
52	.25	Metal
46	.5	Metal
75	6 (50–60 cycles)	Electrolytic
75	10 (25–40 cycles)	Electrolytic
78	6 (50-60 cycles)	Electrolytic
78	10 (25–40 cycles)	Electrolytic

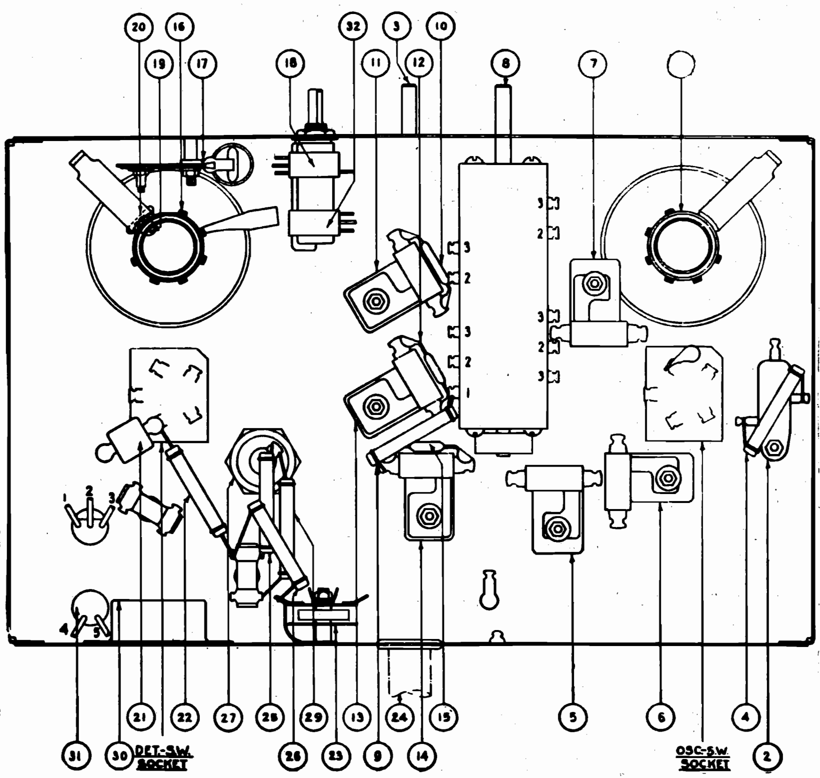
No. on Figs. 1 and 2	Description	Part No.
1	Oscillator Coil*	03734
2	By-pass Condenser (.05 mfd.)	3615-M
3	Gang Condenser Assembly	03692
4	Resistor (13,000 ohms)	3766
5	Compensating Condenser (19 MC End of Top Scale)	04000-E
6	Compensating Condenser (8.5 MC End of Center Scale)	04000-E
7	Compensating Condenser (3.6 MC End of Bottom Scale)	04000-E
8	Frequency Control Switch	03751
9	Resistor (240,000 ohms)	3768
10	Condenser (1,250 mmf.)**	5886
11	Compensating Condenser (8.5 MC End of Top Scale**	04000-F
12	Condenser (800 mmf.)	5878
13	Compensating Condenser (3.6 MC End of Center Scale)	04000-F
14	Condenser (250 mmf.)	3082
15	Compensating Condenser (1.5 MC End of Bottom Scale)	04000-F
16	Detector Transformer*	03734
17	Frequency Filter	03662
18	Antenna Switch Assembled with 32	5796
19	Resistor (2 megohms) Assembled with 20	03879
20	Condenser (110 mmf.) Assembled with 19	03879
21	Condenser (250 mmf.)	3082
22	Resistor (99,000 ohms)	3767
23	R. F. Choke	03893
24	Shielded Cable	L-1278
25	Resistor (32,000 ohms)	3525
26	Resistor (32,000 ohms)	3525
27	Electrolytic Condenser (6 mfd.)	4916
28	Pilot Light (Short Wave Unit)	3463
29	Resistor (5,000 ohms)	3526
30	Plug	03913
31	Filament Transformer (50-60 cycles)	5906
	Filament Transformer (25-40 cycles)	5923
	Filament Transformer (50-60 cycles, 230 volts)	5924
32	On-off Switch (Assembled with 18)	5796
33	Volume Control	5039
34	First R. F. Transformer	03082
35	Tuning Condenser (50-60 cycles)	03076
	Tuning Condenser (25-40 cycles)	03077
36	Compensating Condenser — Antenna — Part of Gang Condenser Assembly	
37	First Detector Transformer	03083
38	Compensating Condenser — Detector — Part of Gang Condenser Assembly	
39	Compensating Condenser — First I. F. Primary	04000-J
40	First I. F. Transformer	03091
41	Compensating Condenser — First I. F. Secondary	04000-H
42	Second I. F. Transformer	03092
43	Compensating Condenser—Second I. F.	04000-K
44	Resistor (250 ohms Combined with .09 mfd. Condenser)	4989-E
45	Resistor (45,000 ohms) 50-60 cycles	5256
	Resistor (99,000 ohms) 25-40 cycles	4411
46	Condenser (.5 mfd.)	3583
47	Resistor (51,000 ohms)	4518
48	Condenser (500 mmf.)	3910
49	R. F. Choke	03086
50	Condenser (250 mmf.)	3082
51	Resistor (240,000 ohms)	4410
52	Condenser (.25 mfd.)	4264
53	Pilot Light (Broadcast Unit)	3463
54	Condenser (.09 mfd. double)	4989-C
55	Oscillator Coil	03084
56	Condenser (410 mmf.)	5120
57	Compensating Condenser—Low Frequency	04000-F
58	Resistor (51,000 ohms)	4518
59	Resistor (5,000 ohms)	5310
60	Compensating Condenser—High Frequency —Part of Gang Condenser Assembly	
61	Condenser (.09 mfd. double)	4989-C
62	Condenser (110 mmf.)	4519
63	B. C. Resistor	03079
64	Resistor (13,000 ohms)	3766
65	Condenser (.05 mfd.)	3615-L
66	Voice Coil and Cone Assembly	02996
67	Field Coil Assembled with Pot.	02966
68	Output Transformer	2673
69	Tone Control	03140
70	Resistor (240,000 ohms)	4410
71	Condenser (.01 mfd.)	3903-L
72	Condenser (.015 mfd. double)	3793-K
73	"On-off" Switch	4095
74	Power Transformer (50-60 cycles)	5117
	Power Transformer (25-40 cycles)	5118
	Power Transformer (50-60, 230 volts)	5119
75	Electrolytic Condenser (6 mfd.) 50-60 cycles	4916
	Electrolytic Condenser (10 mfd.) 25-40 cycles	5142
76	Choke	4819
77	Condenser (.09 mfd.) 50-60 cycles	4989-J
	Condenser (.18 mfd.) 25-40 cycles	4989-K
78	Electrolytic Condenser (6 mfd.) 50-60 cycles	4916
	Electrolytic Condenser (10 mfd.) 25-40 cycles	5142
	Line Cord and Plug	L-943
	Tube Shield	03987
	Bezel (Broadcast)	5008
	Bezel (Short Wave)	5178
	Knob (Large)	03063
	Knob (Small)	03064
	Knob (On-Off Switch—Broadcast)	03437
	Knob (Control Switch—Short Wave)	5811
	Spring (For Small Knobs)	4147
	Spring (For Large Knobs)	5262
	Grid Clip	4897
	Five Prong Socket Assembly	4956
	Four Prong Socket Assembly	4955
	Dial Complete (Broadcast)	03031
	Dial Complete (Short Wave)	03890

*Includes matched oscillator coil and detector transformer.

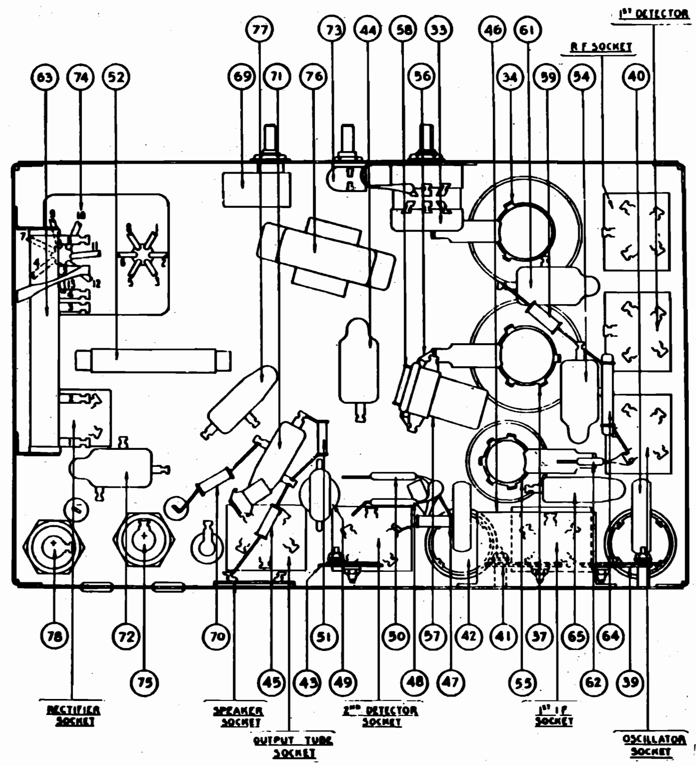
**These parts replaced on later production by .0018 mfd. condenser, part 6018.

PHILCO MODELS 470 & 470-A SUPERHETERODYNE

PHILADELPHIA STORAGE BATTERY CO.



SHORT WAVE CHASSIS



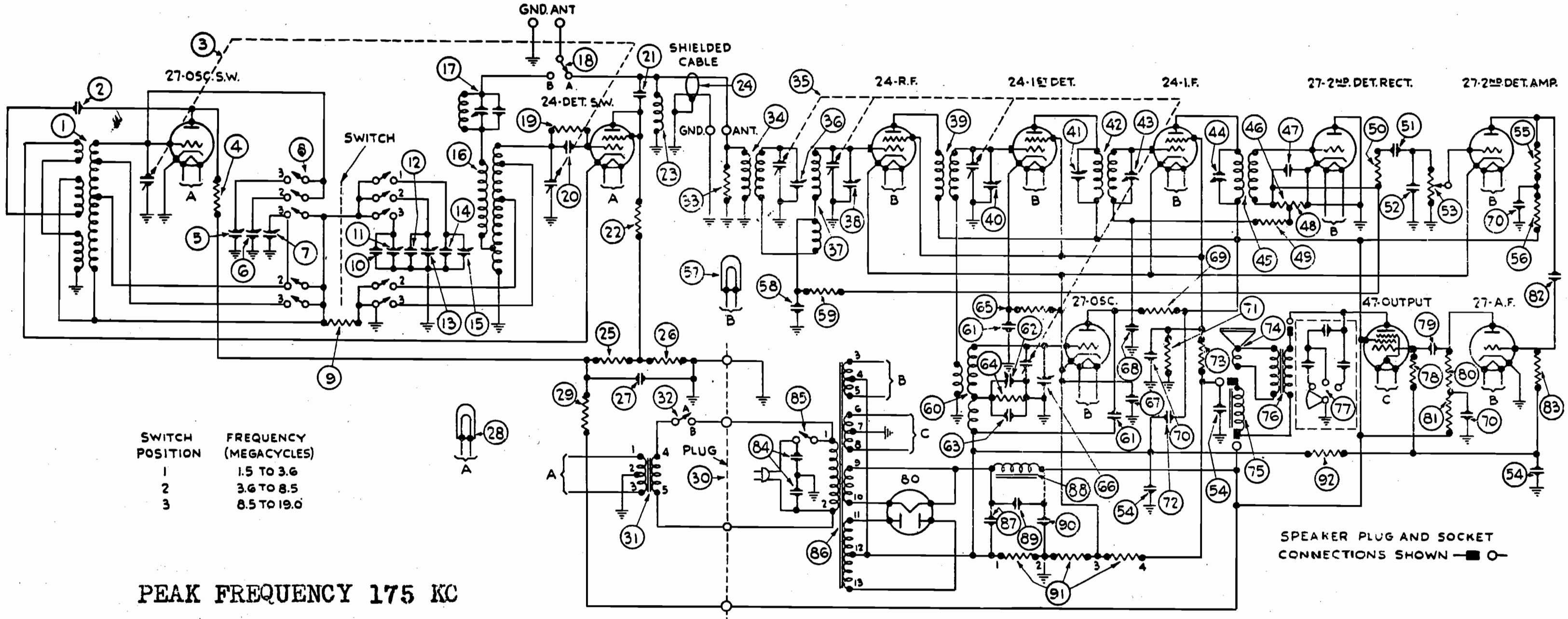
BROADCAST CHASSIS

Table 2—Power Transformer Voltage

Terminals	A. C. Volts	Circuit	Color
		SHORT WAVE UNIT	
4–5	105 to 125	Primary	Black
1–3	2.5	Secondary	Yellow
2	...	Center Tap 1–3	Green
		BROADCAST UNIT	
1–2	105 to 125	Primary	White (Small Gauge)
3–5	2.5	Filament of 47	Dark Green
6–8	2.5	Filament of 24	Black (Heavy Gauge)
9–10	5.	Filament of 80	Light Blue
11–13	700	Plate of 80	Yellow
4	...	Center Tap of 3–5	Black, Green Tracer
7	...	Center Tap of 6–8	Black, Yellow Tracer
12	...	Center Tap of 11–13	Yellow, Green Tracer

PHILCO MODELS 470 & 470-A
SUPERHETERODYNE

PHILADELPHIA STORAGE BATTERY CO.



SWITCH POSITION	FREQUENCY (MEGACYCLES)
1	1.5 TO 3.6
2	3.6 TO 8.5
3	8.5 TO 19.0

PEAK FREQUENCY 175 KC

Table 1—Tube Socket Readings—Line Voltage 115 volts

Tube Type	Tube Circuit	Filament Volts	Plate Volts	Screen Grid Volts	Control Grid Volts	Cathode Volts	Plate Milli-amperes
			SHORT WAVE UNIT*				
27	Osc.	2.2	110	...	3.3	0	...
24	1st Det.	2.2	24	24	5.	0	...
			BROADCAST UNIT*				
24	R. F.	2.1	220	50	6.	15	2.
27	Osc.	2.1	80	...	6	15	2.3
24	1st Det.	2.1	210	55	5	15	.5
24	I. F.	2.1	220	60	8	15	0
27	Rect. Det.	2.1	...	...	...	14	...
27	Ampl. Det.	2.1	150	..	0	15	1.3
27	1st Audio	2.1	150	...	2	15	1.5
47	Output	2.4**	205**	220**	7**	...	28.**
80	Rectifier	4.5	220/Plate	...	...	...	...

*The voltage readings of the short wave unit were taken from the under side of the chassis, using a Weston Multi-range voltmeter, 1000 ohms per volt. The radio set tester cannot be used, either for voltage or plate current readings because of the effect of the long leads through the set tester cord.
**These readings must likewise be taken from the socket terminals on the under side of the chassis unless the set tester is especially equipped with an adapter for testing pentode tubes.

PHILCO MODEL 490 SUPERHETERODYNE BROADCAST AND SHORT WAVE COMBINATION.

PHILADELPHIA STORAGE BATTERY CO.

PHILCO MODEL 490
SUPERHETERODYNE

Table 3—Resistor Data

Nos on Figs 1, 2 and 3	Terminal	Power (Watts)	Resistance (Ohms)	COLOR Body	COLOR Tip	COLOR Dot
91	1–2 / 2–3 / 3–4		180 / 60 / 3500		Long Tubular	
29	......	1	5,000	Green	Black	Red
65	......	½	5,000	Green	Black	Red
33	......	½	10,000	Brown	Black	Orange
4	......	1	13,000	Brown	Orange	Orange
73	......	½	25,000	Red	Green	Orange
80 81	......	1	25,000	Red	Green	Orange
25 26	......	1	32,000	Orange	Red	Orange
46 48 55 64	......	½	51,000	Green	Brown	Orange
69 61	......	1	51,000	Green	Brown	Orange
56 71	......	½	70,000	Violet	Black	Orange
22	......	1	99,000	White	White	Orange
50 78	......	½	99,000	White	White	Orange
9 83	......	1	240,000	Red	Yellow	Yellow
78 53	......	½	240,000	Red	Yellow	Yellow
49 59	......	½	490,000	Yellow	White	Yellow
92	......	1	490,000	Yellow	White	Yellow
19	......	½	2,000,000	Red	Black	Green

Table 4—Condenser Data

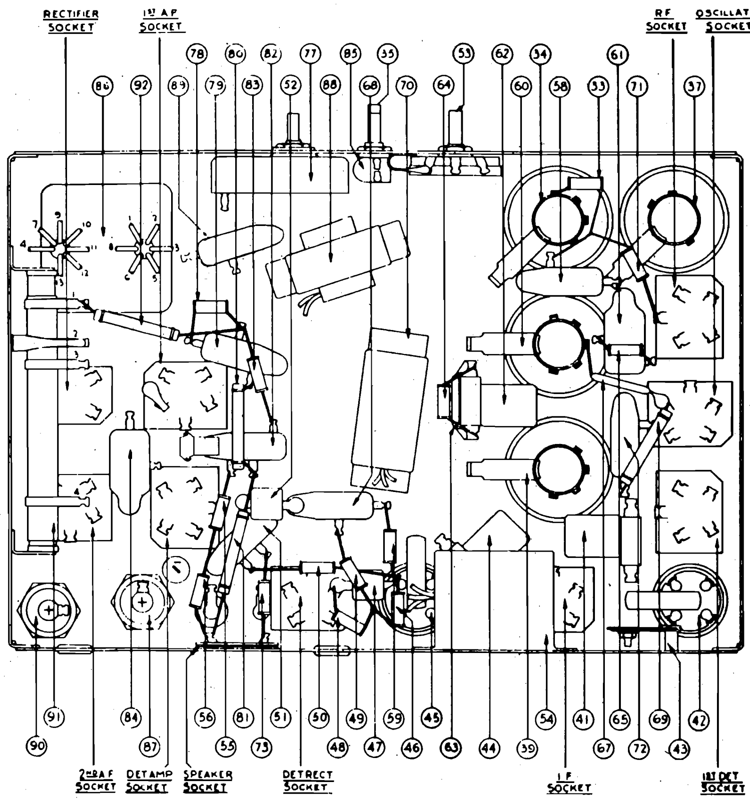
Nos. on Figs. 1, 2 and 3	Capacity Mfd.	Container
20 47 67	.00011	Blue and Golden Yellow
14 21 52	.00025	Yellow
63	.0007	White and Golden Yellow
12	.0008	Green and Orange
10	.00125	Blue and Orange
51 79 82	.01	Black Bakelite
84	.015 Double	Black Bakelite
2 58 68 72	.05	Black Bakelite
61	.09 (50-60 cycles)	Black Bakelite
89	.18 (25-40 cycles)	Black Bakelite
54	3–.25 each	Metal
70	1, .25, .1 (50-60 cycles)	Metal
	1, .25, .25 (25-40 cycles)	Metal
87	6 (50-60 cycles)	Electrolytic
90	6 (50-60 cycles)	Electrolytic
87	10 (25-40 cycles)	Electrolytic
90	14 (25-40 cycles)	Electrolytic

No. on Figs. 1 and 2	Description	Part No.
1	Oscillator Coil*	03734
2	By-pass Condenser (.05 mfd.)	3615-M
3	Gang Condenser Assembly	03692
4	Resistor (13,000 ohms)	3766
5	Compensating Condenser (19 MC end of Top Scale)	04000-E
6	Compensating Condenser (8.5 MC End of Center Scale)	04000-E
7	Compensating Condenser (3.6 MC End of Bottom Scale)	04000-E
8	Frequency Control Switch	03751
9	Resistor (240,000 ohms)	3768
10	Condenser (1,250 mmf.)**	5886
11	Compensating Condenser (8.5 MC End of Top Scale)**	04000-F
12	Condenser (800 mmf.)	5878
13	Compensating Condenser (3.6 MC End of Center Scale)	04000-F
14	Condenser (250 mmf.)	3082
15	Compensating Condenser (1.5 MC End of Bottom Scale)	04000-F
16	Detector Transformer*	03734
17	Frequency Filter	03662
18	Antenna Switch Assembled with 32	5796
19	Resistor (2 megohms) Assembled with 20	03879
20	Condenser (110 mmf.) Assembled with 19	03879
21	Condenser (250 mmf.)	3082
22	Resistor (99,000 ohms)	3767
23	R. F. Choke	03893
24	Shielded Cable	L-1278
25	Resistor (32,000 ohms)	3525
26	Resistor (32,000 ohms)	3525
27	Electrolytic Condenser (6 mfd.)	4916
28	Pilot Light (Short Wave Unit)	3463
29	Resistor (5,000 ohms)	3526
30	Plug	03913
31	Filament Transformer (50-60 cycles)	5906
	Filament Transformer (25-40 cycles)	5923
	Filament Transformer (50-60 cycles, 230 volts)	5924
32	On-off Switch (Assembled with 18)	5796
33	Resistor (10,000 ohms)	4412
34	First R. F. Transformer	03360
35	Gang Condenser Assembly (50-60 cycles)	03001
	Gang Condenser Assembly (25-40 cycles)	03078
36	Compensating Condenser—First R. F.—Part of Gang Condenser Assembly	
37	Second R. F. Transformer	03014
38	Compensating Condenser—Second R. F.—Part of Gang Condenser Assembly	
39	First Detector Transformer	03015
40	Compensating Condenser—First Detector—Part of Gang Condenser Assembly	
41	Compensating Condenser—First I. F. Primary	04000-J
42	First I. F. Transformer	03009
43	Compensating Condenser—First I. F. Secondary	04000-J
44	Compensating Condenser—Second I. F. Primary	04000-L
45	Second I. F. Transformer	03345
46	Resistor (51,000 ohms)	4518
47	Condenser (110 mmf.)	4519
48	Resistor (51,000 ohms)	4518
49	Resistor (490,000 ohms)	4517
50	Resistor (99,000 ohms)	4411
51	Condenser (.01 mfd.)	3903-R
52	Condenser (250 mmf.)	3082
53	Volume Control	5366
54	By-pass Condenser (3—.25 mfd.)	03325

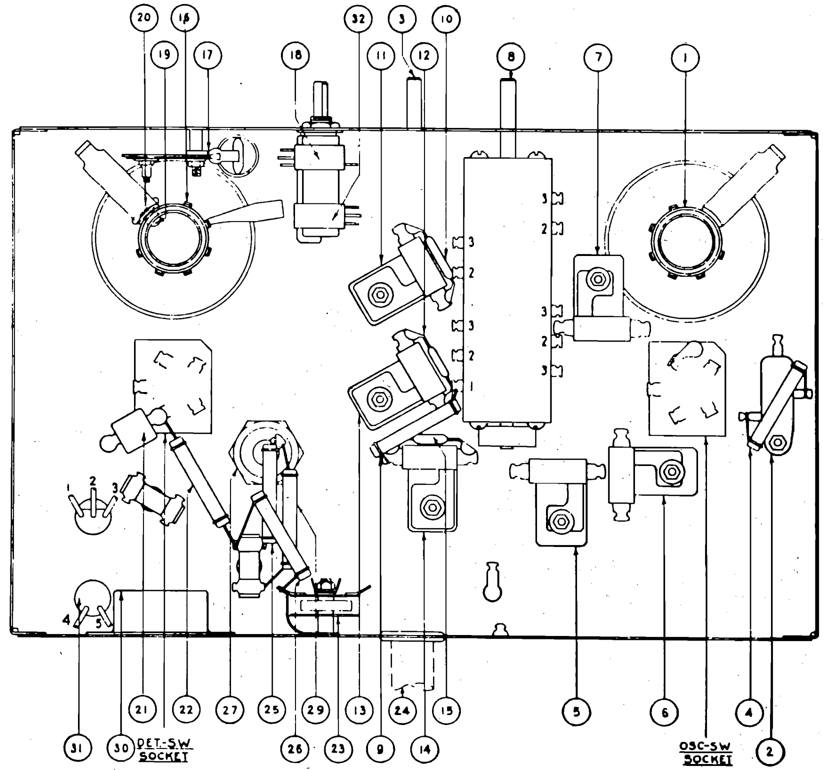
No. on Figs. 1 and 2	Description	Part No.
55	Resistor (51,000 ohms)	4518
56	Resistor (70,000 ohms)	5385
57	Pilot Light (Broadcast Unit)	3463
58	Condenser (.05 mfd.)	3615-W
59	Resistor (490,000 ohms)	4517
60	Oscillator Coil	03916
61	Condenser (.09 mfd.)	4989-G
62	Compensating Condenser—Low Frequency	04000-B
63	Condenser (700 mmf.)	4520
64	Resistor (51,000 ohms)	4518
65	Resistor (5,000 ohms)	5310
66	Compensating Condenser — High Frequency—Part of Gang Condenser Assembly	
67	Condenser (110 mmf.)	4519
68	Condenser (.05 mfd.)	3615-U
69	Resistor (51,000 ohms)	4237
70	By-pass Condenser (1., .25, .1) 50-60 cycles	03327
	By-pass Condenser (1., .25, .25) 25-40 cycles	03624
71	Resistor (70,000 ohms)	5385
72	Condenser (.05 mfd.)	3615-E
73	Resistor (25,000 ohms)	4516
74	Voice Coil and Cone Assembly	02996
75	Speaker Field (Assembly with Pot)	02966
76	Output Transformer	2673
77	Tone Control	03137
78	Resistor (240,000 ohms) 50-60 cycles	4410
	Resistor (99,000 ohms) 25-40 cycles	4411
79	Condenser (.01 mfd.)	3903-P
80	Resistor (25,000 ohms)	3656
81	Resistor (25,000 ohms) 50-60 cycles	3656
	Resistor (50,000 ohms) 25-40 cycles	4237
82	Condenser (.01 mfd.)	3903-M
83	Resistor (240,000 ohms)	4410
84	Condenser (.015 mfd. Double)	3793-E
85	On-off Switch	4095
86	Power Transformer (50-60 cycles)	5362
	Power Transformer (25-40 cycles)	5363
	Power Transformer (50-60 cycles, 230 volts)	5364
87	Electrolytic Condenser (6 mfd.) 50-60 cycles	4916
	Electrolytic Condenser (10 mfd.) 25-40 cycles	5142
88	Choke	4819
89	By-pass Condenser (.09 mfd.) 50-60 cycles	4989-J
	By-pass Condenser (.18 mfd.) 25-40 cycles	4989-K
90	Electrolytic Condenser (6 mfd.) 50-60 cycles	4916
	Electrolytic Condenser (14 mfd.) 25-40 cycles	5725
91	B. C. Resistor	03457
92	Resistor (240,000 ohms) 50-60 cycles	3768
	Resistor (490,000 ohms) 25-40 cycles	3769
	Line Cord and Plug	L-943
	Tube Shield (Large)	03982
	Tube Shield (27 Type)	5387
	Bezel (Broadcast)	5009
	Bezel (Short Wave)	5175
	Knob (Large)	03063
	Knob (Small)	03064
	Knob (On-Off Switch—Broadcast)	03437
	Knob (Control Switch—Short Wave)	5811
	Spring (For Small Knobs)	4147
	Spring (For Large Knobs)	5262
	Grid Clip	4897
	Five Prong Socket Assembly	4956
	Four Prong Socket Assembly	4955
	Dial Complete (Broadcast)	03031
	Dial Complete (Short Wave)	03890

*Includes matched oscillator coil and detector transformer.
**These parts replaced on later production by .0018 mfd. condenser, part 6018.

PHILADELPHIA STORAGE BATTERY CO.



BROADCAST CHASSIS



SHORT WAVE CHASSIS

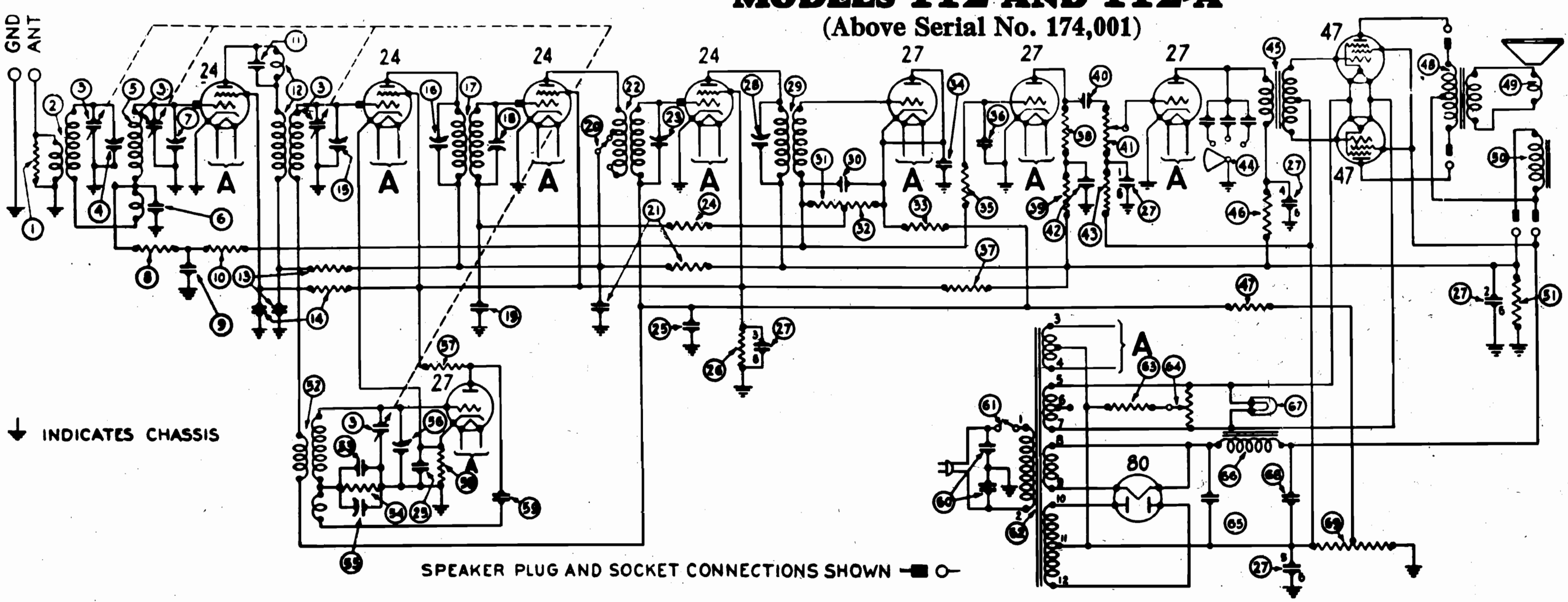
Table 2—Power Transformer Voltages

Terminals	A.C. Volts	Circuit	Color
		SHORT WAVE UNIT	
4–5	105 to 125	Primary	Black
1–3	2.5	Secondary	Yellow
2	...	Center Tap 1–3	Green
		BROADCAST UNIT	
1–2	105 to 125	Primary	White
3–5	2.5	Heaters of 24 and 27 Tubes	Black
4	...	Center Tap of 3–5	Black with Yellow
6–8	2.5	Filament of 47 Tube	Dark Green
7	...	Center Tap of 6–8	Black with Green
9–10	5.0	Filament of 80 Tube	Light Blue
11–13	650.	Plates of 80 Tube	Yellow
12	...	Center Tap of 11–13	Yellow with Green

PHILCO MODEL 490
SUPERHETERODYNE

MODELS 112 AND 112-A

(Above Serial No. 174,001)



REPLACEMENT PARTS—MODELS 112, 112-A AND 112-E

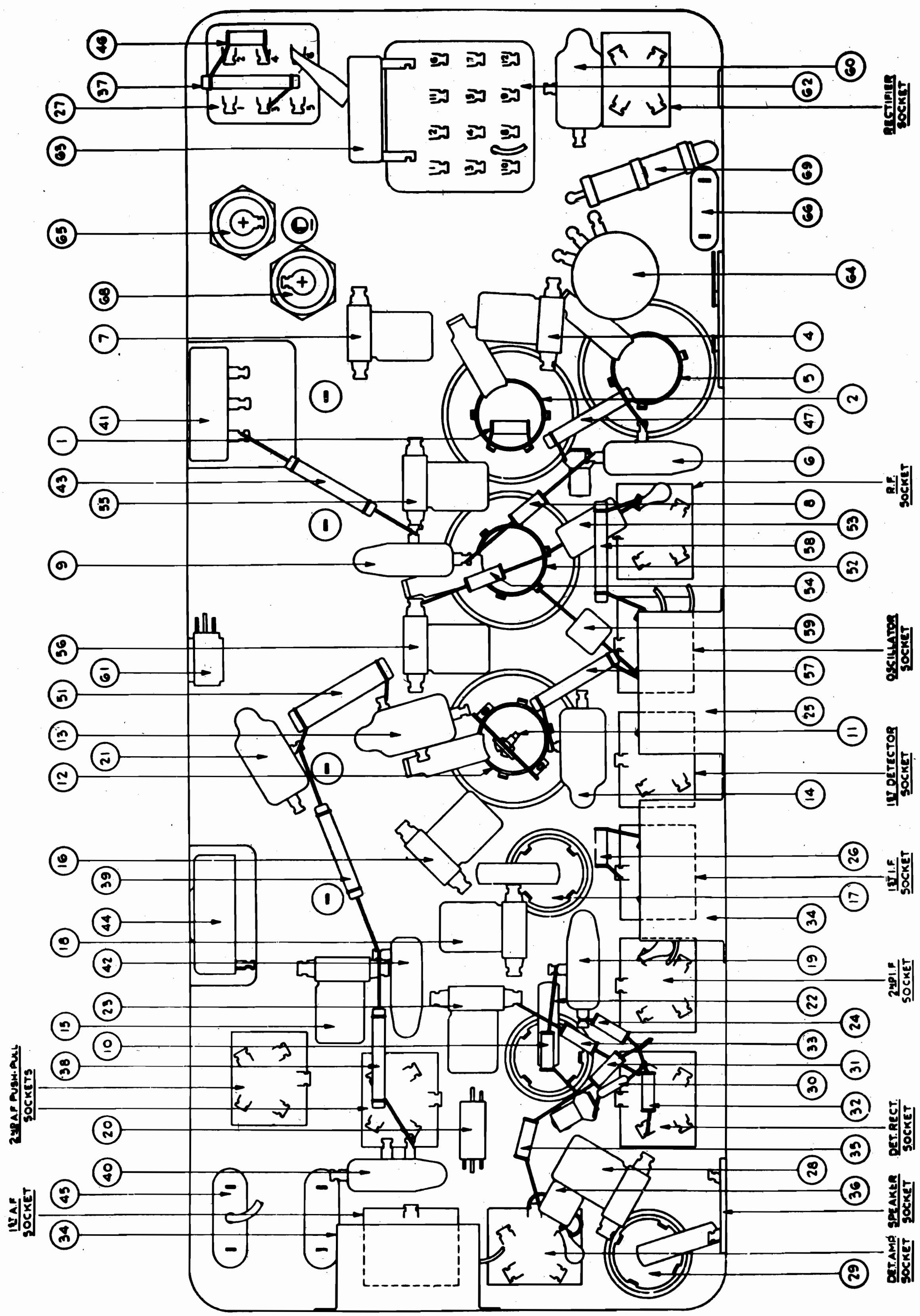
(Above Serial No. 174,001)

No.	Part	Part No.
1	Resistor (10,000 ohms)	4412
2	First R. F. Coil	3884-S
3	Tuning Condenser	4000-D
4	Compensating Condenser	04000-E
5	Second R. F. Coil	3884-T
6	By-pass Condenser (.05 mfd.)	3615-J
7	Compensating Condenser	04000-D
8	Resistor (99,000 ohms)	4411
9	By-pass Condenser (.05 mfd.)	3615-D
10	Resistor (99,000 ohms)	4411
11	Condenser	3892-A
12	First Detector Coil	3884-V
13	By-pass Condenser & Resistor (.05 mfd. and 250 ohms)	3615-Z
14	By-pass Condenser & Resistor (.05 mfd. and 250 ohms)	3615-B
15	Compensating Condenser	04000-E
16	Compensating Condenser	04000-J
17	First I. F. Transformer	03038
18	Compensating Condenser	04000-J
19	By-pass Condenser (.05 mfd.)	3615-J
20	Range Switch	3116
21	By-pass Condenser & Resistor (.05 mfd. and 250 ohms)	3615-B
22	Second I. F. Transformer	03039
23	Compensating Condenser	04000-J
24	Resistor (490,000 ohms)	4517
25	By-pass Condenser (1/4 mfd.)	3557
26	Resistor (70,000 ohms)	5385
27	Filter Condenser Block (50-60 cycles)	03489
	Filter Condenser Block (25-40 cycles)	03589
28	Compensating Condenser	04000-L
29	Third I. F. Transformer	03040
30	Condenser (110 mmf.)	4519
31	Resistor (51,000 ohms)	4518
32	Resistor (51,000 ohms)	4518
33	Resistor (99,000 ohms)	4411
34	By-pass Condenser (.5 mfd.) 2 used	3583
35	Resistor (99,000 ohms)	4411
36	Condenser (250 mmf.)	3082
37	Resistor (25,000 ohms)	3656
38	Resistor (99,000 ohms)	3769
39	Resistor (490,000 ohms)	3768
40	Condenser (.015 mfd.)	3793-F
41	Volume Control	4093
42	By-pass Condenser (.05 mfd.)	3615-S
43	Resistor (70,000 ohms)	3542
44	Tone Control	03137
45	Push-pull Input Transformer	5662
46	Resistor (25,000 ohms)	4516
47	Resistor (13,000 ohms)	3766
48	Push-pull Output Transformer	2635
49	Voice Coil and Cone Assembly	02997
50	Speaker Field (assembled with pot and frame)	02892
51	Resistor (15,000 ohms)	5718
52	Oscillator Coil	3884-U
53	Condenser (700 mmf.)	4520
54	Resistor (50,000 ohms)	4518
55	Compensating Condenser	04000-F
56	Compensating Condenser	04000-E
57	Resistor (13,000 ohms)	3766
58	Resistor (1,000 ohms)	4590
59	Condenser (110 mmf.)	4519
60	By-pass Condenser (.015 mfd. double)	3793-E
61	On-Off Switch	4095
62	Power Transformer (115 volts 50-60 cycles)	5594
	Power Transformer (115 volts 25-40 cycles)	5595
	Power Transformer (230 volts 50-60 cycles)	5596
63	Resistor (205 ohms)	03513
64	Hum Control Potentiometer	5650
65	Electrolytic Condenser (6 mfd.)	4916
66	Filter Choke	5643
67	Pilot Light	3463
68	Electrolytic Condenser (6 mfd.)	4916
69	Resistor (2 sections 70 ohms each)	3764

PHILADELPHIA STORAGE BATTERY CO.

MODELS 112 AND 112-A

(Above Serial No. 174,001)



PHILADELPHIA STORAGE BATTERY CO.

Models 112 and 112-A Receivers

(Above Serial No. 174,001)

Model 112 Receivers are for operation on 115 volt, 50-60 cycle AC lines

Model 112-A Receivers are for operation on 115 volt, 25-60 cycle AC lines

Table 1—Tube Socket Readings taken with A.C. Set Tester A.C. Line—115 volts

Tube		Filament Volts	Plate Volts	Screen Grid Volts	Control Grid Volts	Cathode Volts	Plate Milli-amperes	Screen-Grid Milli-amperes
Type	Circuit							
24	1st R. F.	2.25	160	75	.2	5.0	4.0	1.
27	Osc.	2.25	55	...	.6	7.5	1.8	..
24	1st Det.	2.25	160	75	2.5	8.0	.8	1.
24	1st I. F.	2.25	160	75	.2	5.0	4.0	1.
24	2nd I. F.	2.25	160	75	6.*	4.0	4.0	1.
27	Det. Rect.	2.25	...	...	...	...	...	..
27	Det. Amp.	2.25	20	...	...	4.0	...	..
27	1st A. F.	2.30	150	...	...	4.0	3.0	..
47	2nd A. F.	2.30	245	255	16.5	...	31**	9.
47	2nd A. F.	2.30	245	255	16.5	...	31**	9.
80	Rect.	5.0	...	...	...	...	54/54	..

*60 Volt scale.

**Special adapter must be used for this test.

Note—Volume control off; station selector turned to low frequency end; range switch set in "Normal" position.

Table 2—Power Transformer Voltages

Terminals	A.C. Volts	
1—2	115.	Primary
3—4	2.67	Heater for 24 and 27 Tubes
6		Not used
5—7	2.68	Filaments for 47 Tubes
10—12	750.	Plates 80 Tube
11		Center Tap 80 Tube
8—9	5.0	Filament 80 Tube
Rubber Covered Lead		Center Tap for 24 and 27 Tubes

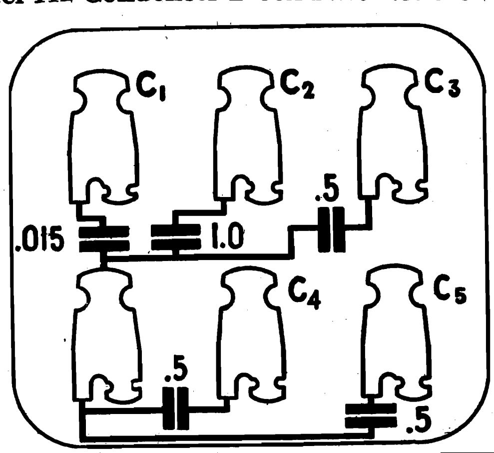
Table 3—Condenser Data

No. on Figs.	CAPACITY	COLOR
6 9 19 42	.05	Bakelite Container
13 14 21	.05 and 250 Ohms	Bakelite Container
25	.25	Metal Container
30 59	.00011	Blue, Golden Yellow
36	.00025	Yellow
40	.015	Bakelite Container
53	.0007	White, Golden Yellow
60	.015 Double	Bakelite Container
65 68	6 Mfd.	Electrolytic

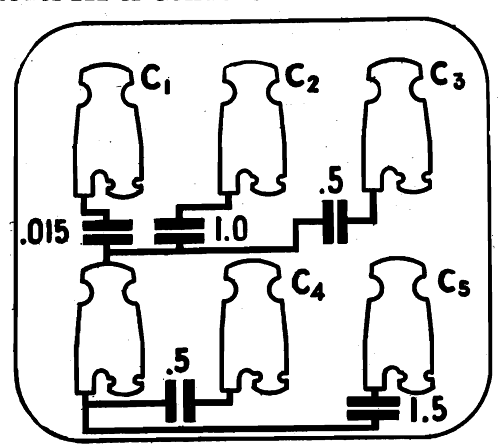
Table 4—Resistor Data

No. on Figs.	Resistance (Ohms)	Power (Watts)	COLOR		
			Body	Tip	Dot
69	2 Sections 70 ohms ea.		Flat	Wire Wound Tubular	
63	205				
58	1,000	1	Brown	Black	Red
1	10,000	½	Brown	Black	Orange
47 57	13,000	1	Brown	Orange	Orange
51	15,000	2	Red	Orange	Black
37	25,000	1	Red	Green	Orange
46	25,000	½	Red	Green	Orange
31 32 54	51,000	½	Green	Brown	Orange
26	70,000	½	Violet	Black	Orange
43	70,000	1	Violet	Black	Orange
8 10 33 35	99,000	½	White	White	Orange
38	99,000	1	White	White	Orange
24	490,000	½	Yellow	White	Yellow
39	490,000	1	Yellow	White	Yellow

Model 112 Condenser Block Part No. 3754



Model 112-A Condenser Block Part No. 3755



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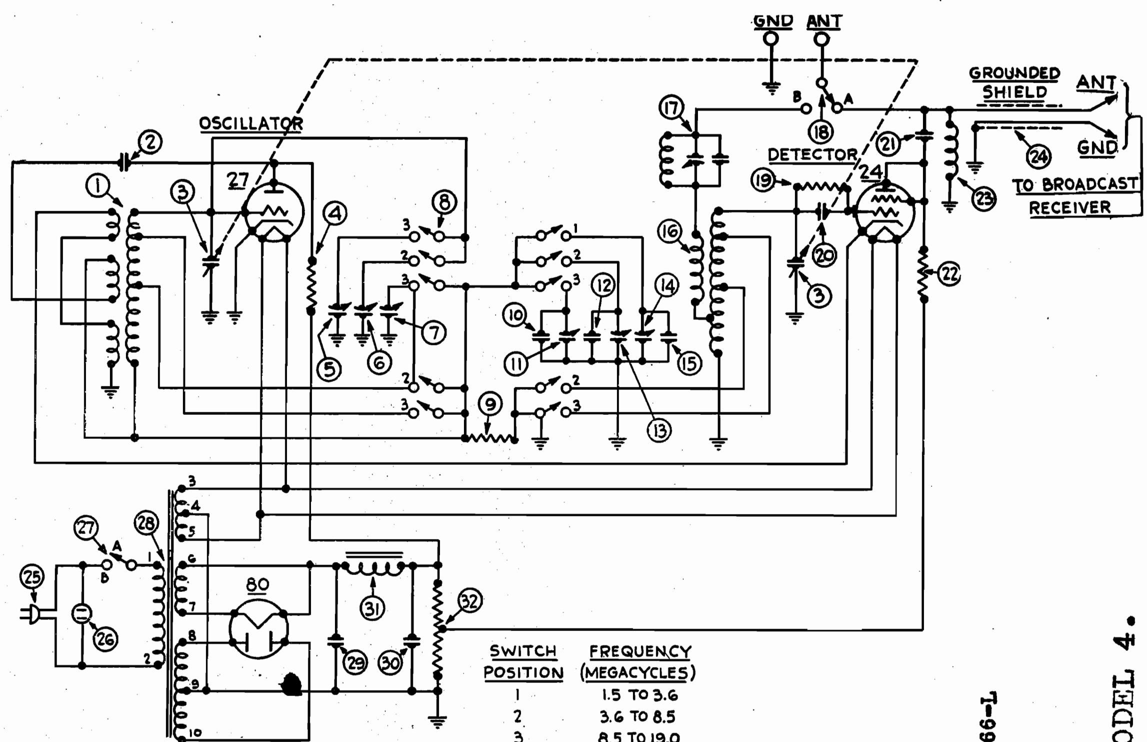


FOR FURTHER DATA SEE PAGE 466-L

PHILCO SHORT WAVE CONVERTER - MODEL 4.

(For operation on 115 volt, 50-60 cycle AC lines.)

Table 1—Tube Socket Readings—Line Voltage—115 volts

Tube Type	Tube Circuit	Filament Volts	Plate Volts	Screen Grid Volts	Control Grid Volts	Cathode Volts
27	Oscillator	2.4	110	..	.1	0
24	Detector	2.4	25	25	.3	0
80	Rectifier	5.0	170/170	..	..	..

NOTE: The above voltage readings were taken from the socket terminals on the underside of the chassis, using a Weston multi-range voltmeter, 1000 ohms per volt. The radio set tester cannot be used either for voltage or plate current readings because of the effect of the long leads through the set tester cord.

Table 2—Power Transformer Voltages

Terminals	A. C. Volts		Color
1—2	105—125	Primary	White
3—5	2.5	Filament of 24 and 27	Black
6—7	5.0	Filament of 80	Light Blue
8—10	340	Plates of 80	Yellow
4	...	Center Tap of 3—5	Black with Yellow Tracer
9	...	Center Tap of 8—10	Yellow with Green Tracer

Table 3—Condenser Data

Nos. on Figs. 1 and 2	Capacity Mfd.	Container
20	.00011	Blue and Golden Yellow
12	.0008	Green and Orange
10	.00125	Blue and Orange
2	.05	Black Bakelite Container
29 30	6.	Electrolytic

Table 4—Resistor Data

Nos. on Figs. 1 and 2	Power (Watts)	Resistance (Ohms)	COLOR Body	COLOR Tip	COLOR Dot
32		4750 / 4750	Long Tubular		
4	1.	13000	Brown	Orange	Orange
22	1.	99000	White	White	Orange
9	.5	240,000	Red	Yellow	Yellow
19	.5	2 Megohms	Red	Black	Green

(FOR CONDENSER DATA REFER TO PAGE 466-B-3 & 466-B-4)

PHILADELPHIA STORAGE BATTERY CO.

PHILCO SHORT WAVE CONVERTER - MODEL 4.

The adjustment of the compensating condensers in the Model 4 is **done with the aid of a** modulated oscillator, accurately calibrated at 3600KC. **A** high grade crystal controlled oscillator, of this type, Philco Model No. 091, can be obtained on order from the Philco National Service Station. The various harmonics and image frequencies of this signal are used to adjust the compensating condensers at the different short wave dial settings. If the oscillator is off frequency, the harmonics and image frequencies will be off correspondingly.

Remove the converter from its cabinet. Connect the Model 4 to the broadcast receiver in the usual manner, with the ground wire connected and the aerial disconnected. A Model 112 is preferable as this offers greatest sensitivity. *It is important that the broadcast receiver be accurately calibrated at 1000KC and that the dial be set exactly at this point.*

1. **Adjusting at 3.6 megacycles on lower scale**—Place the oscillator in operation and couple it with a wire to the antenna connection of the converter. Be sure that the oscillator is grounded. Set the dial at 3.6 megacycles on the lower scale and set the frequency control switch of the converter in its proper position. Carefully adjust the "3.6L" compensator, shown in the illustration above, by means of a fibre wrench, Philco part 3164, until maximum signal is heard in the loudspeaker. It may be necessary to reduce the oscillator output by removing the oscillator from the coupling wire in order to obtain a faint input signal, the maximum strength of which can be readily determined by ear.

2. **Adjusting at 1.6 megacycles**—Set the dial at 1.6 megacycles and adjust the "1.5" compensating condenser in the same manner as described above.

3. **Adjusting at 7.2 megacycles**—Set the dial at 7.2 megacycles and set the frequency control switch in its proper position for the middle dial scale. Connect the oscillator output direct to the antenna terminal of the converter. Adjust the "8.5M" compensating condenser for maximum output in the loudspeaker as described above.

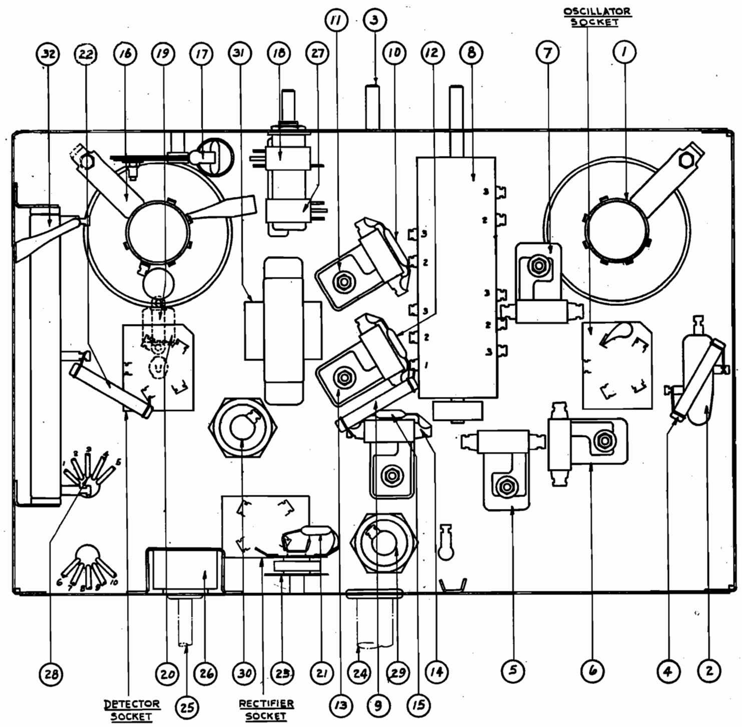
4. **Adjusting at 3.6 on middle scale**—Turn the dial to 3.6 on the middle scale and adjust the "3.6M" compensator as described above.

5. **Adjusting at 18. megacycles**—Set the dial at 18 and the frequency control switch in its corresponding position. Adjust the "19" compensator as described above. More than one signal will be heard as the adjustment is being made. Be sure to adjust for the one which is heard second as the compensating condenser capacity is reduced from its maximum (adjusting nut all the way in). When this adjustment has been made correctly, the oscillator signal can be heard at 18, 16, 14.4 and 12.4 megacycles. This adjustment is the most critical of any, and will require more care in getting the correct point.

6. **Adjusting at 8.8 megacycles**—Turn the dial to 8.8. Adjust the "8.5H" compensator in the manner described above.

RE-SETTING 1000KC WAVETRAP

A wavetrap tuned to 1000 kilocycles is connected in the antenna circuit of the converter for the purpose of suppressing any possible interference from nearby stations which might be broadcasting at or near 1000 kilocycles. If it is impossible to find a point between 950 and 1050 KC at which interference is not heard, the wavetrap should be re-adjusted by means of the fibre wrench until the interfering station is tuned out.



No. on Figs. 1 and 2	Description	Part No.
1	Oscillator Coil	03733*
2	By-pass condenser (.05 mfd.)	3615-M
3	Gang condenser	03692
4	Resistor (13,000 ohms)	3766
5	Compensating condenser (19 MC end of top scale)	04000-E
6	Compensating condenser (8.5 MC end of center scale)	04000-E
7	Compensating condenser (3.6 MC end of bottom scale)	04000-E
8	Frequency control switch	03751
9	Resistor (240,000 ohms)	3768
10	Condenser (1250 mmf.)	5886
11	Compensating condenser (8.5 MC end of top scale)	04000-F
12	Condenser (800 mmf.)	5878
13	Compensating condenser (3.6 MC end of center scale)	04000-F
14	Compensating condenser (1.5 MC end of bottom scale)	04000-F
15	Condenser (250 mmf.)	3082
16	Detector transformer	03731
17	Frequency filter	03662
18	Antenna switch (assembled with 27)	5796
19	Resistor (2 Megohms) assembled with (20)	03879
20	Condenser (110 mmf.) assembled with (19)	03879
21	Condenser (250 mmf.)	3082
22	Resistor (99,000 ohms)	3767
23	R. F. choke	03103
24	Shielded cable	L-1278
25	Power cord and plug	L-943-A
26	Outlet receptacle	5439
27	"On-Off" switch (assembled with 18)	5796
28	Power transformer—50-60 cycles	5785
	25-40 cycles	5786
29	Electrolytic condenser (6 mfd.)	4916
30	Electrolytic condenser (6 mfd.)	4916
31	Filter choke (50-60 cycles)	4951
	Filter choke (25-40 cycles)	5930
	50-60 cycles)	
	Resistor (two 32,000 ohms, 25-40 cycles)	3525
	Bezel	5175
	Cabinet	40600

*Includes matched oscillator coil and detector transformer.

PHILCO recommends that under no circumstances should any attempt be made to adjust the compensating condensers in the field, unless proper equipment is available, and that where such is not the case the unit should be turned over to a Philco Distributors Service Department. The adjustment is extremely critical and requires more time and patience than the ordinary broadcast receiver. All of the compensating condensers are accessible only from the bottom of the chassis. The short wave converter is accurately adjusted at the factory prior to shipment.

PHILADELPHIA STORAGE BATTERY CO.

Adjusting Philco Superheterodynes

The compensating condensers in every Philco Receiver are carefully adjusted before the set leaves the factory. Under ordinary circumstances they should never have to be re-adjusted in the field. Extremely rough handling during shipment, or a slight change in some of the electrical characteristics of the radio circuit may in some cases make re-adjustment necessary.

The indications that the set may require re-adjustment are poor sensitivity, poor selectivity and dial readings in kilocycles off more than 20 K.C. In some cases, an unstable condition of the set with a tendency to squeal or howl on certain sections of the dial may also be an indication of improper adjustment.

Under no circumstances should a re-adjustment be attempted unless the necessary equipment is available and unless the proper instruction has been received. Your distributor will gladly assist you in both of these matters.

The general method of adjusting the compensating condensers in all Philco superheterodyne receivers is the same. Once this procedure is understood for one model, it can be applied with but little change to the various other Philco models. By means of the instructions below and by reference to the different illustrations, the complete adjustments can be made on all Philco superheterodynes.

EQUIPMENT. The following equipment is needed:

1. Intermediate frequency oscillator accurately calibrated at 175 K. C. and 260 K. C. The Philco Oscillator Model 095 is recommended.
2. Output meter. The oscillator mentioned above is equipped with an output meter.
3. Philco fibre wrench, part 3164.

INTERMEDIATE FREQUENCY OR I. F. ADJUSTMENTS. The adjustment of the I. F. compensating condensers should be done in the following manner:

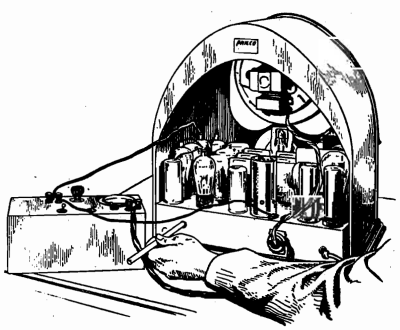


Fig. 1

1. Make the necessary connections between the oscillator and the receiver as shown in the illustration, Fig. 1. The connections consist of (a) the ground wire to the GND. terminal of the radio set and to the G terminal of the oscillator; (b) the A terminal of the oscillator to the grid of the first detector tube (tube shield in place and first detector grid clip removed), (c) output meter terminals to the primary of the output transformer (this connection is obtained at the speaker plug and socket through the Philco plug-in adapter, part 6095), (d) power cord of receiver to the electric power outlet after all other connections have been completed.
2. Turn on the radio set and the oscillator. For Philco models of the 70 and 35 series, the oscillator switch should be placed in the 260 K. C. position. For models of the 111, 112, 90 and 51 series, the switch should be placed in the 175 K. C. position. When adjusting sets with a NORMAL-MAXIMUM switch, the switch should be placed in the NORMAL position. Turn the radio volume control to Maximum. Set the dial between 60 and 65 on the Philco scale. Adjust the oscillator control (attenuator) until a reading is obtained on the output meter of approximately ½ the scale deflection.
3. By means of the Philco fibre wrench, part 3164, adjust the various intermediate frequency condensers, one at a time, to obtain maximum reading in the output meter. Locations of all compensating condensers are shown in the illustrations on pages 3 and 4. It is desirable to start with the last I. F. compensating condenser in the circuit (2nd I. F. secondary in the case of the 112) and progress in the adjustments toward the first. It may be necessary while the adjustments are being made, to lower the setting of the oscillator control from time to time so as to keep the output meter reading within the scale range.
4. After these adjustments have been completed, remove the oscillator connection from the grid terminal of the first detector tube and restore the grid clip connection to this terminal.

COUPLING CONDENSER. Adjust the coupling condenser in the Model 51 at 175 K. C. in the same manner as the I. F. condenser.

HIGH FREQUENCY ADJUSTMENTS. Improper adjustment of the high frequency compensating condenser is characterized by weak reception and poor selectivity at the high frequency end of the dial and by dial readings being off by more than 20 K. C. at this end of the dial. Proceed in the following manner:

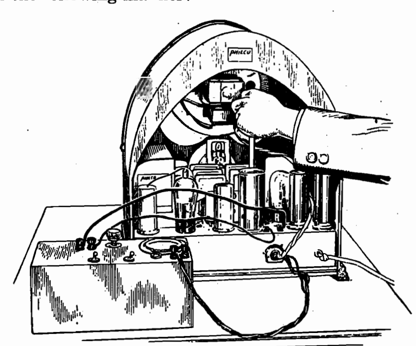


Fig. 2

1. Connect from the A terminal of the oscillator to the ANT terminal of the broadcast receiver. All other connections remain the same as for adjustment of the I. F. compensating condensers. See Fig. 2 for complete connections.
2. Set the switch on the oscillator to 175 K. C. Set the dial of the receiver to exactly 140 (1400 K. C.). The eighth harmonic of 175 K. C. will be received at this point. Turn the volume control to maximum. Turn on the oscillator and adjust the control until a ½ scale reading is obtained on the output meter. If the receiver is badly out of adjustment, it may not be possible to obtain such a reading, in which case the meter reading must be disregarded temporarily and the adjustments made by ear.
3. Carefully adjust the high frequency compensating condenser for maximum reading in the output meter or for maximum volume if the output is not great enough to be read on the meter.
4. When making this adjustment, it may be found that a given position of the adjusting nut can be obtained at which maximum reading is noted, but that the meter reading decreases when the fibre wrench is lifted from the nut. Allow for this condition by turning slightly beyond the point of maximum reading, then when the wrench is removed the reading will go up instead of down.
5. After making the adjustment, turn the station selector slightly to note if any increase in volume is obtained as the set is being re-tuned. If such an increase is obtained, then the antenna, detector and r. f. condensers should be adjusted as described below. After this adjustment, the high frequency condenser can again be re-adjusted at 1400 K. C.
6. In some cases, when first starting to make the 1400 K. C. adjustment, it may be found that the signal from the oscillator cannot be heard at 140 because the set is so far out of adjustment. In this case, tune the set to the signal, and then adjust the Antenna Detector and R. F. condenser first. Re-adjust the high frequency condenser at 140 on the dial.

ANTENNA, DETECTOR, AND R. F. ADJUSTMENTS:

The adjustment of the antenna, detector, and R. F. compensating condensers is done at 140 on the dial in the same manner and with the same connections as for the high frequency adjustments.

LOW FREQUENCY ADJUSTMENT. The characteristics of improper adjustment of the low frequency condensers are weak reception, poor selectivity and dial calibrations off more than 20 K. C. at the low end of the dial. The low frequency adjustment is made with the same connections as for the high frequency and Antenna condenser adjustments. Proceed in the following manner:

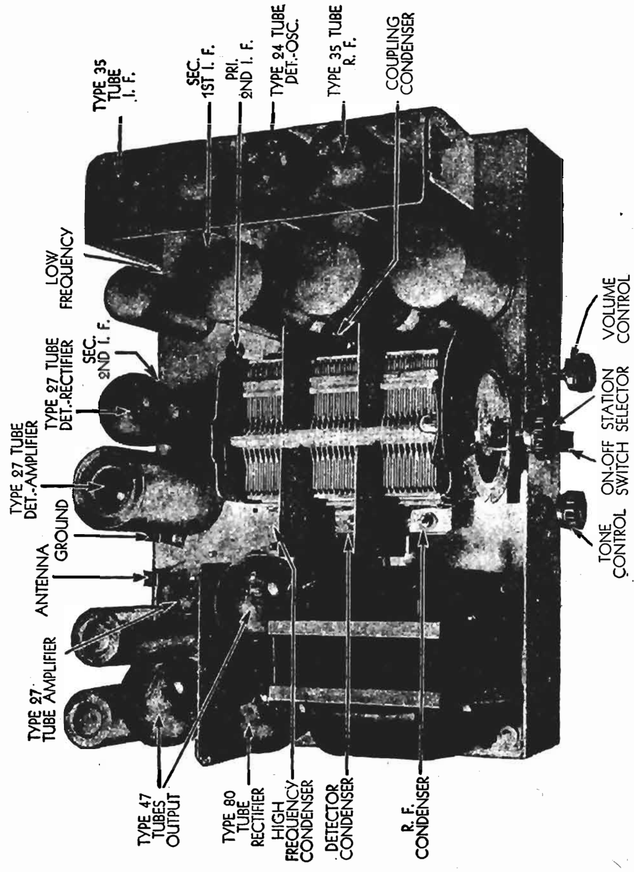
1. With the receiver and the oscillator in operation, the latter at 175 K. C., set the Philco dial at exactly 70 on the scale.
2. With the volume control at maximum, adjust the oscillator output until the output meter reads approximately ½ scale deflection. Adjust the low frequency compensating condenser for maximum reading in the output meter.
3. If the signal comes in stronger at a position off 70 on the Philco scale, adjust for maximum output on the meter at this "Off K. C." position of the dial. Now re-tune the set slightly to obtain any further possible increase, adjusting the compensating condenser and re-tuning the dial each time so as to bring the point of maximum output as near 70 as possible.
4. Re-set the dial to exactly 140, and re-adjust the high frequency condenser. It is possible that the adjustment of the low frequency condenser has affected the high setting of the dial slightly.

PHILADELPHIA STORAGE BATTERY CO.

MODEL 35

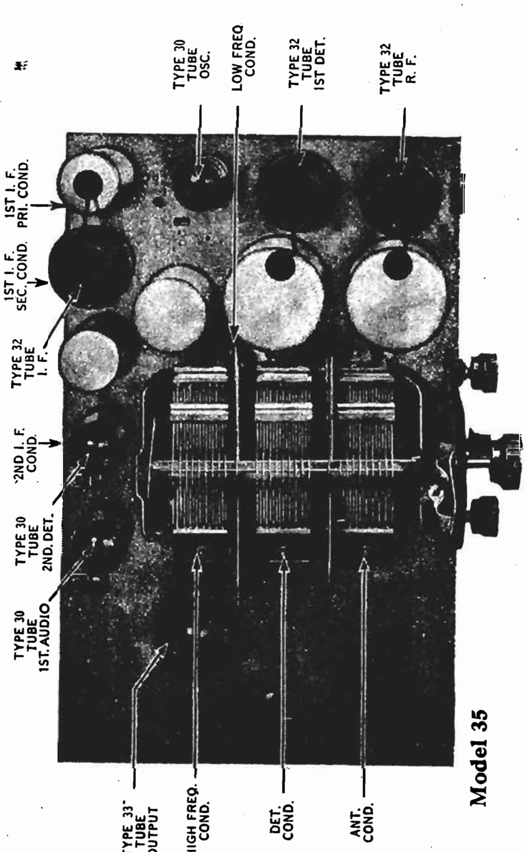
MODEL 70
(Above Serial 22,000)

MODEL 90
(Serial B-32,001 to B-35,000 and above 53,100)

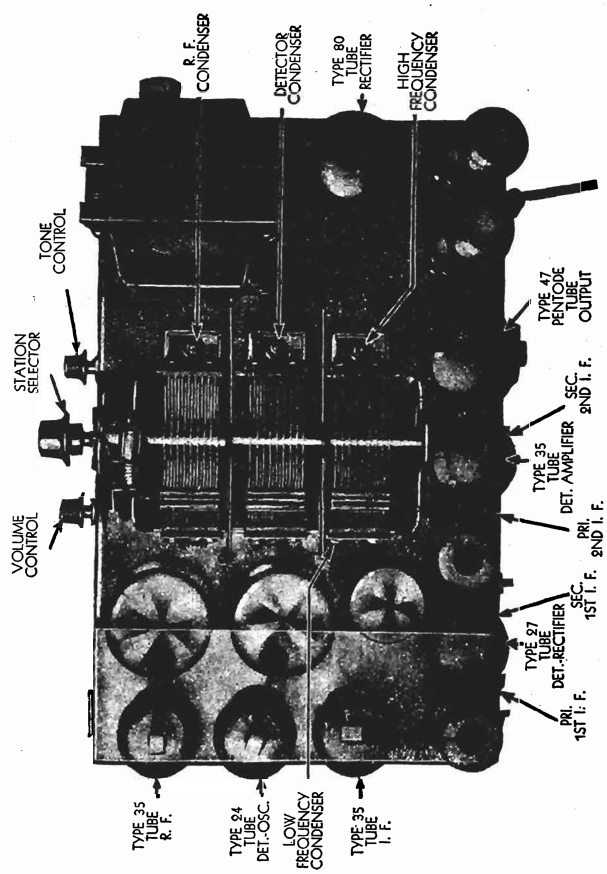


Model 90
(Serial Nos. B-32,001 to B-35,000 and above B-53,100)
Adjust I.F. compensating condensers and coupling condenser at 260 K.C.

NOTE.
For illustration showing location of trimmer condensers on MODEL 111 and adjustment data refer to page 466-4.



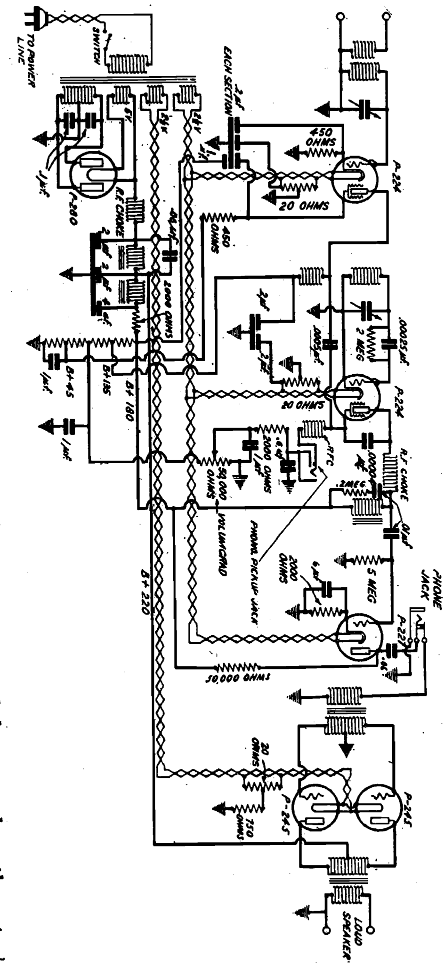
Model 35



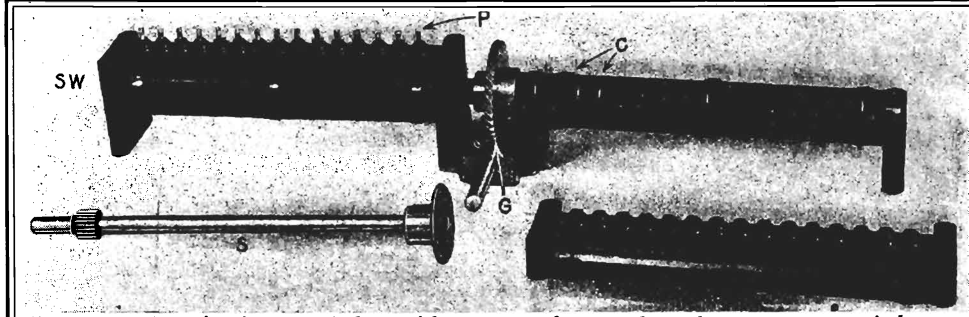
Model 70
(Above Serial No. B-22,000)
Adjust I.F. compensating condensers at 260 K.C.

PILOT RADIO AND TUBE CORP.

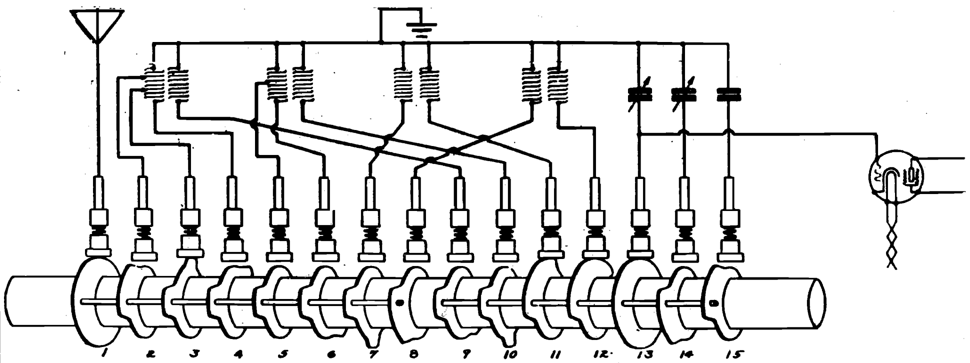
A.C.UNIVERSAL SUPER-WASP (K-136)



This schematic diagram of the Universal is a functional hook-up, and does not show the actual connections to the cam switches.



Close-up of the pair of cam switches, with one opened up to show the arrangement of the cams and the split construction of the housing.



A break-down view of one of the cam switches showing the relative positions of the cams on the shaft.

The R. F. or antenna coils contain two windings apiece, a primary and a secondary. One end of each is left grounded, and the other ends terminate at the plunger contacts on the antenna switch. The detector or interstage coils also have two windings apiece: a combination primary and tickler and a grid coil or secondary, arranged the same way. The tuning condensers for each stage are split units, each consisting of a small section of 130 mmf. maximum and a larger section of 415 mmf. maximum. They have a common rotor but separate stator connections, the latter brought out to contacts on the switches. In addition, there is a fixed loading condenser of .0004 mf. mounted inside the stage shields. If the small sections are designated as A and the large as B, and the loading condenser as C; and the four coils, in the upward value of their inductance, as 1, 2, 3 and 4, the seven combinations are as follows:

WAVE RANGES

Range 1, 15 to 22 meters: coils 1 and condensers A.

Range 2, 21 to 40 meters: coils 2 and condensers A.

Range 3, 39 to 75 meters: coils 3 and condensers A.

Range 4, 70 to 144 meters: coils 3 and condensers A and B.

Range 5, 140 to 270 meters: coils 4 and condensers A.

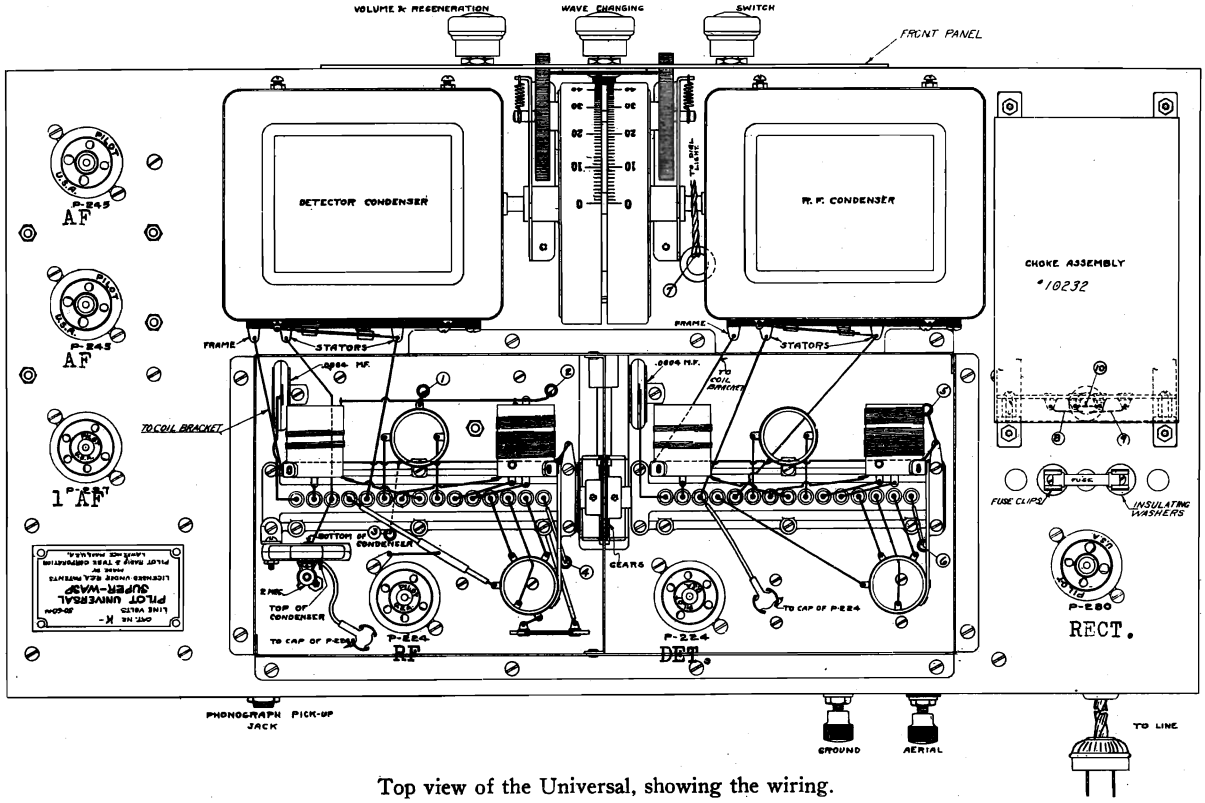
Range 6, 250 to 500 meters: coils 4 and condensers A and B.

Range 7, 470 to 650 meters: coils 4 and condensers A, B and C.

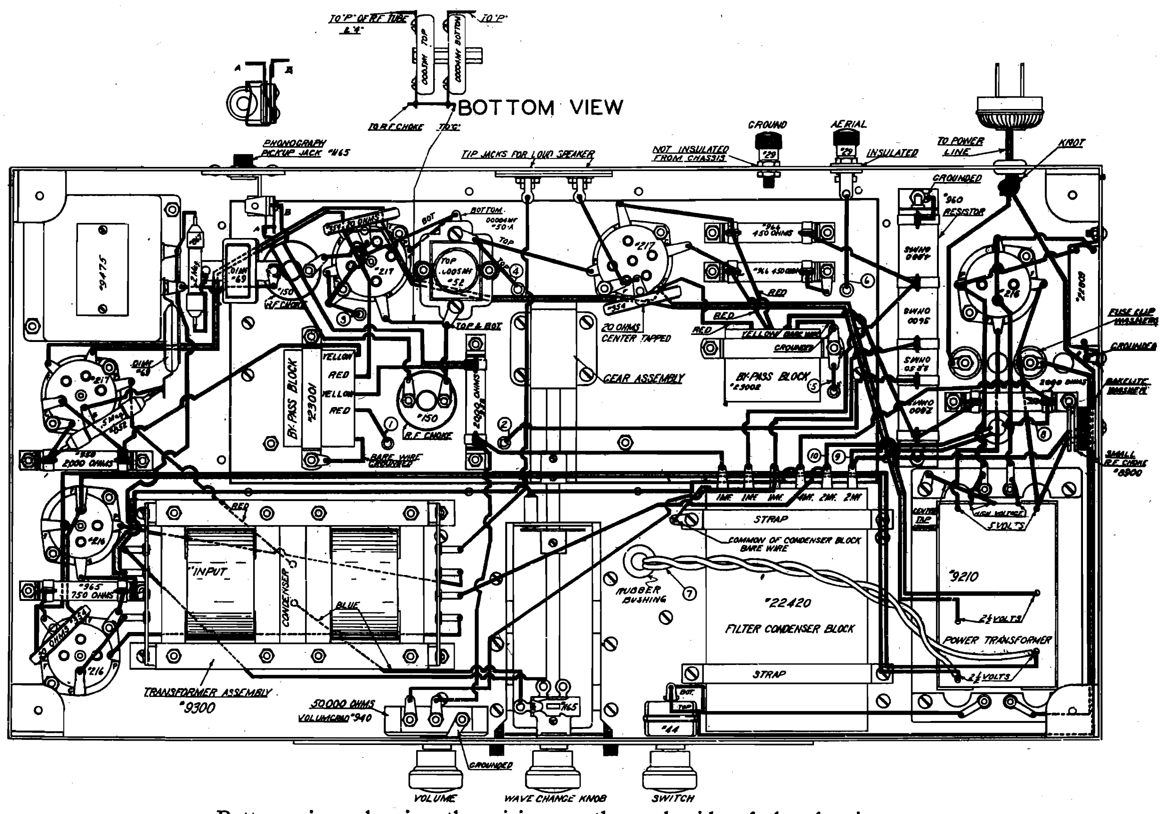
The primary and tickler windings of both coils 3 are each tapped in one place, part of the winding being used for wave range 3 and all for wave range 4. The primaries and ticklers of both coils 4 are tapped in two places, for use on ranges 5, 6 and 7.

PILOT RADIO AND TUBE CORP.

A.C.UNIVERSAL SUPER-WASP (K-136)



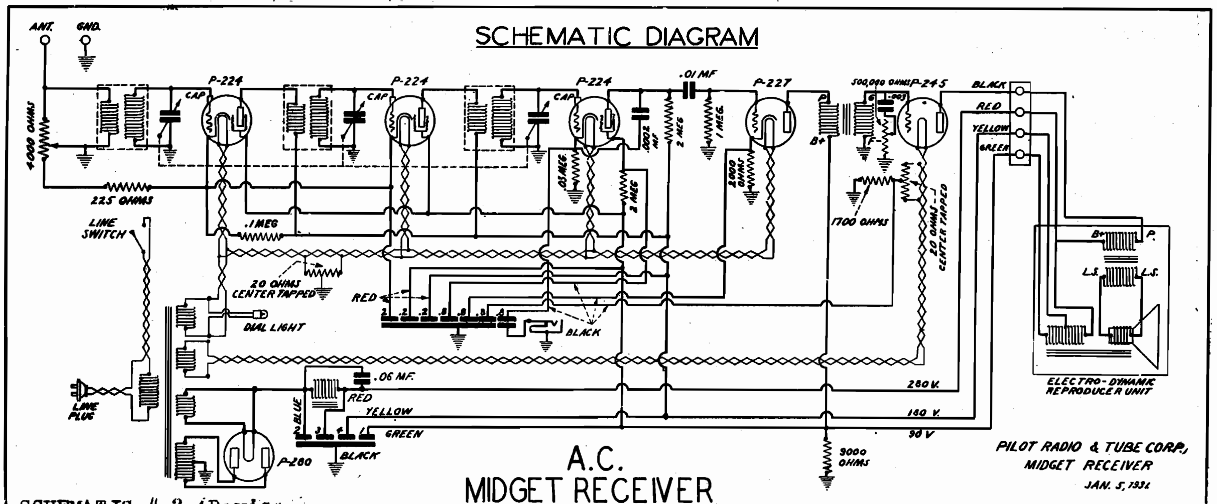
Top view of the Universal, showing the wiring.



Bottom view, showing the wiring on the underside of the chassis.

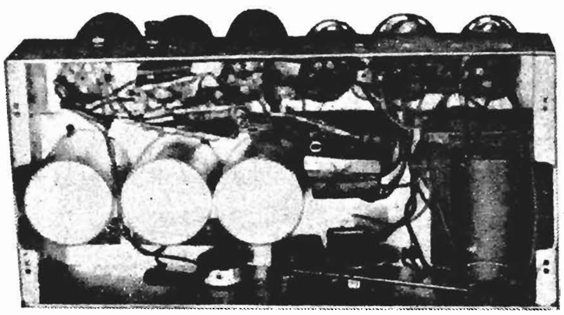
PILOT RADIO AND TUBE CORP.

A.C.CHASSIS - CONSOLETTE MODELS C-157, C-157A, C-157B, C-157F
MIDGET " S-157, S-157A, S-157B, S-157F

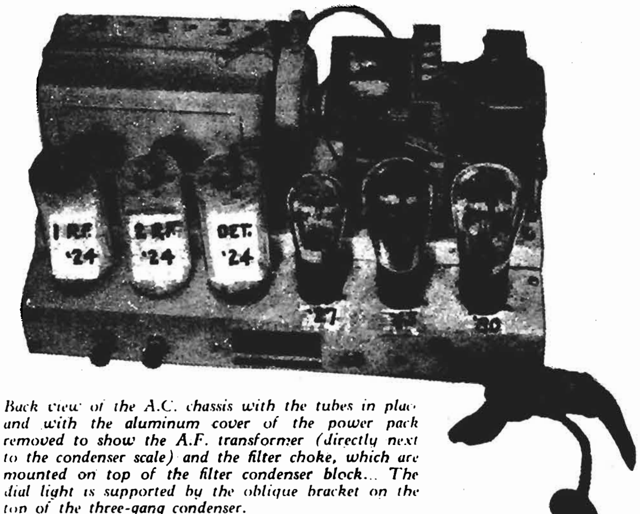


SCHEMATIC # 2 (Revised)

The tapped field winding of the dynamic speaker, which acts as a filter choke in the rectifier circuit, also acts as a voltage divider resistor, the 180-volt connection coming off the tap, through the yellow wire. Also note that the right end .8 mf. section of the seven-section by-pass condenser block is not grounded directly, as the other sections are, but runs instead to the phonograph pick-up jack.



Under view of the A.C. chassis... On the front of the set (the bottom edge in this view) are the biasing resistance and the volume control at left, the power switch in the center, and the tone control resistance and condenser at the right. At the extreme right is the power transformer. The three round objects are the R.F. shield cans, which are held by spring catches and pull out very easily.



Back view of the A.C. chassis with the tubes in place and with the aluminum cover of the power pack removed to show the A.F. transformer (directly next to the condenser scale) and the filter choke, which are mounted on top of the filter condenser block... The dial light is supported by the oblique bracket on the top of the three-gang condenser.

From left to right the tubes are: 224, 224, 224, 227, 245, 280. The aerial and ground binding posts are under the 224's. The phonograph pick-up jack is on the back edge below and between the 227 and the 245

The various portions of the R.F. and the A.F. circuits are by-passed by a seven section condenser block mounted on the under side of the chassis between the detector shield can and the power transformer. This condenser is held in place by a simple strap and may be removed and replaced very easily.

A.C.RECEIVER PARTS LIST PAGE 470-A-1

The filter condenser block is mounted on the top side of the chassis and on top of it in turn are mounted the choke coil (to the right) and the audio amplifying transformer (next to the indicating scale). The 9,000 ohm bleeder resistance is mounted between the transformer and choke directly under the bakelite connection strip for the loud speaker wires.

The 225 ohm fixed grid biasing resistance is mounted directly on one post of the volume control.

Schematic diagram of the AC MIDGET receiver, as originally designed, is shown on page 471.

THE Pilot Midget receiver is made in four models for alternating current and one model for direct current. The Consolette uses the same chassis and loud speaker but simply in a larger cabinet. The catalog numbers, voltage ratings, and code words of the various sets are listed herewith:

MIDGET RECEIVERS

S-155 —for 115 volts (110-120) 50 to 60 cycle alternating current—Code ZOCEF
S-155A—for 220 volts (210-230) 50 to 60 cycle alternating current—Code ZUVUH
S-155B—for 240 volts 50 to 60 cycle alternating current—Code ZOILP
S-155F—for 125 volts 50 to 60 cycle alternating current—Code ZOTAV
S-156—for 110 volts direct current only—Code ZUSBE

These five sets have exactly the same cabinet and are identical in external appearance.

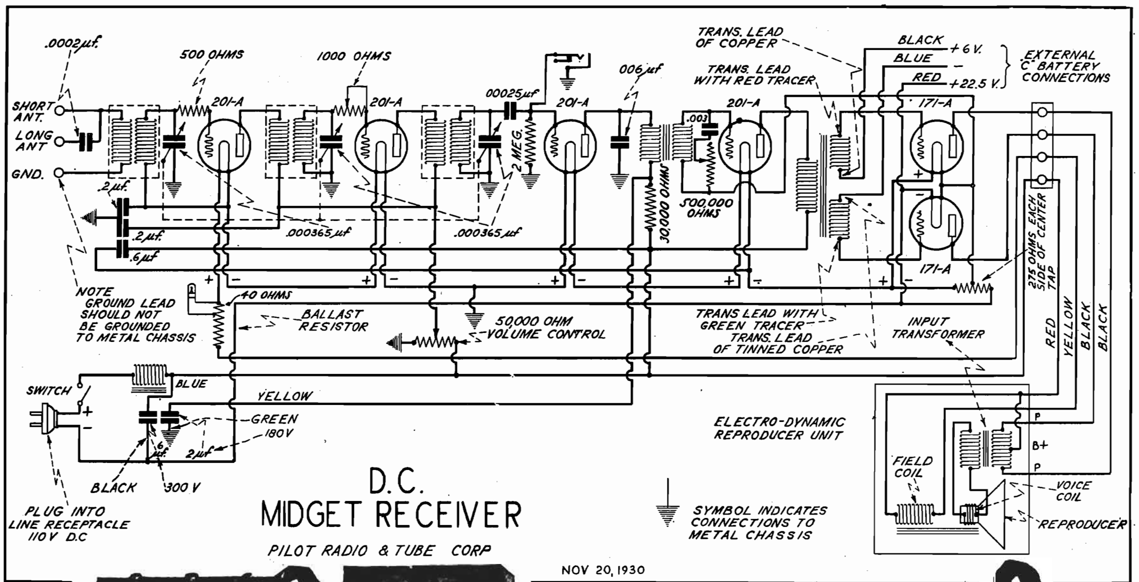
CONSOLETTE RECEIVERS

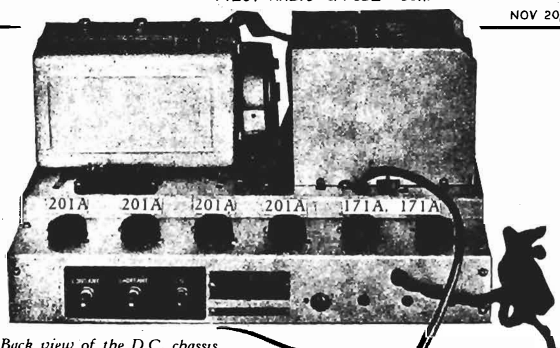
C-157 for 115 volts (110-120) 50 to 60 cycle alternating current—Code ZAYNO
C-157A for 220 volts (210-230) 50 to 60 cycle alternating current—Code YAWTY
C-157B—for 240 volts 50 to 60 cycle alternating current—Code YATPO
C-157F—for 125 volts 50 to 60 cycle alternating current—Code YEZAV
C-158—for 110 volts direct current only—Code YEYEV

These five models are also identical in external appearance. The same chassis is used in all the A.C. models, the only difference between them being in the primary voltage rating of the power transformer. The D.C. chassis is similar in general appearance to the A.C. model, but uses different tubes and has a different arrangement of parts on the under side.

PILOT RADIO AND TUBE CORP.

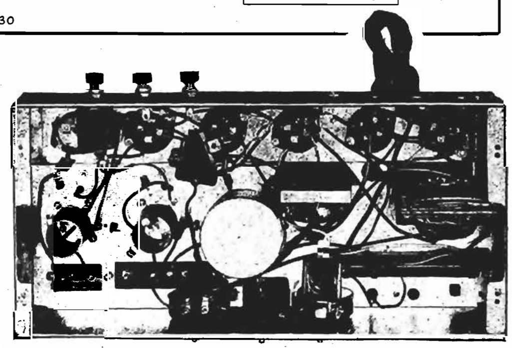
D.C.CHASSIS - CONSOLETTE MODEL C-158 & MIDGET MODEL S-156





Back view of the D.C. chassis.

The black object in front of the tuning condenser is the oscillation control. The three wires in the flexible cable are the "C" battery connections, the 22½-volt battery itself fitting inside the cabinet. The large bakelite plate surrounding the aerial and ground binding posts is protection against short-circuits to the chassis, which must not be grounded.



Under view of the D.C. chassis, with the first two shield cans removed to show the method of mounting the R.F. transformers. The same arrangement is used in the A.C. set. The long black object in the lower right corner is the 355 ohm ballast resistor; above it is the filter choke.

SPECIAL NOTE

A slight change was made in the D.C. set. The ground binding post has been replaced by a red flexible wire 3½ feet long, to which the ground wire should be spliced. This arrangement will prevent accidental contact of the ground wire with the chassis, which always results in one or more blown out tubes. The receiver otherwise is exactly the same as before.

PARTS LIST - A.C. and D.C. MIDGET RECEIVERS

Catalog No.		Used For A.C.	Used For D.C.
3063 Sp.	Variable Condenser, three gang	1	1
MS 11	Drum Dial	1	1
DC 13	Grid Suppressor		1
MS 23	R.F. Coils	3	
DC 23	R.F. Coils		3
MS 26	A.C. Filter Block	1	
DC 26	Filter Block		1
MS 32	A.C. By-pass Block	1	
DC 32	D.C. By-pass Block		1
MS 52	Power Transformer—110 Volts	1	
MS 52 A	Power Transformer—220 Volts	1	
MS 52 B	Power Transformer—240 Volts	1	
MS 52 F	Power Transformer—125 Volts	1	
MS 53	.06 Condenser	1	
MSD 16-A	Pilot Light Assembly	1	1
MS-1	Midget Cabinet	1	1
CS-1	Consolette Cabinet	1	1
MS-3	R.F. Coil Shields	3	3
MS-4	Coil Shield Springs	9	9
MS-8	Bronze Dial Plate	1	1
MS-164	Grid Wire Springs	3	
MS-34	Name Plate	1	1
MS-40	Control Grid Cap	3	
MS-55	Dynamic Speaker	1	

Catalog No.		Used For A.C.	Used For D.C.
DC-55	Dynamic Speaker		1
MS-64	Tube Shield Base	3	
MS-65	Tube Shields	3	
29	Binding Post	2	3
44 Sp	Switch	1	1
50 D	Fixed Condenser, .0002 mf.	1	1
51	Fixed Condenser, .00025 mf.		1
68	Fixed Condenser, .006 mf.		1
69	Fixed Condenser, .01 mf.	1	
75	Fixed Condenser, .0002 mf.	1	
216	Socket	2	6
217	Socket	4	
354	Center Tapped Resistance, 20 ohms	2	
377/381	Choke Assembly	1	1
408 Sp.	Push Pull Unit		1
854	Grid Leak—1. Megohm	1	
856	Grid Leak—2. Megohm	2	1
868	Grid Leak—.03 Megohm	1	1
940 Sp.	Volumgrad, 50,000 ohms		1
958	Resistance, 2,000 ohms	1	
967	Resistance, 225 ohms	1	
155 Ohm.	Resistance		1
275 Ohm.	Resistance		
1700 Ohm.	Resistance	1	
9000 Ohm.	Resistance	1	
1001	Adjustograd		1
1165	Jack	1	
1260W	Knob	2	2

THE D.C. CHASSIS

As the tubes in this set are connected in series, the failure of any one of the 201-A's will cause the circuit to open and cause all the others to stop burning. This does not apply to the 171-A's as there is a special center tapped resistance connected across them for the purpose of equalizing the flow of plate current through the filaments.

OSCILLATION CONTROL

Oscillation adjustment is provided by means of the variable grid suppresser mounted in back of the main tuning condenser. The set will tend to oscillate more easily as the adjustment screw is turned in. It should be adjusted for best results with the tuning dial set at about 1000 kilocycles. In some cases greater sensitivity can be obtained by the use of 112-A tubes instead of 201-A tubes in the R.F. and detector circuits. If these are used, the grid suppressor must again be adjusted.

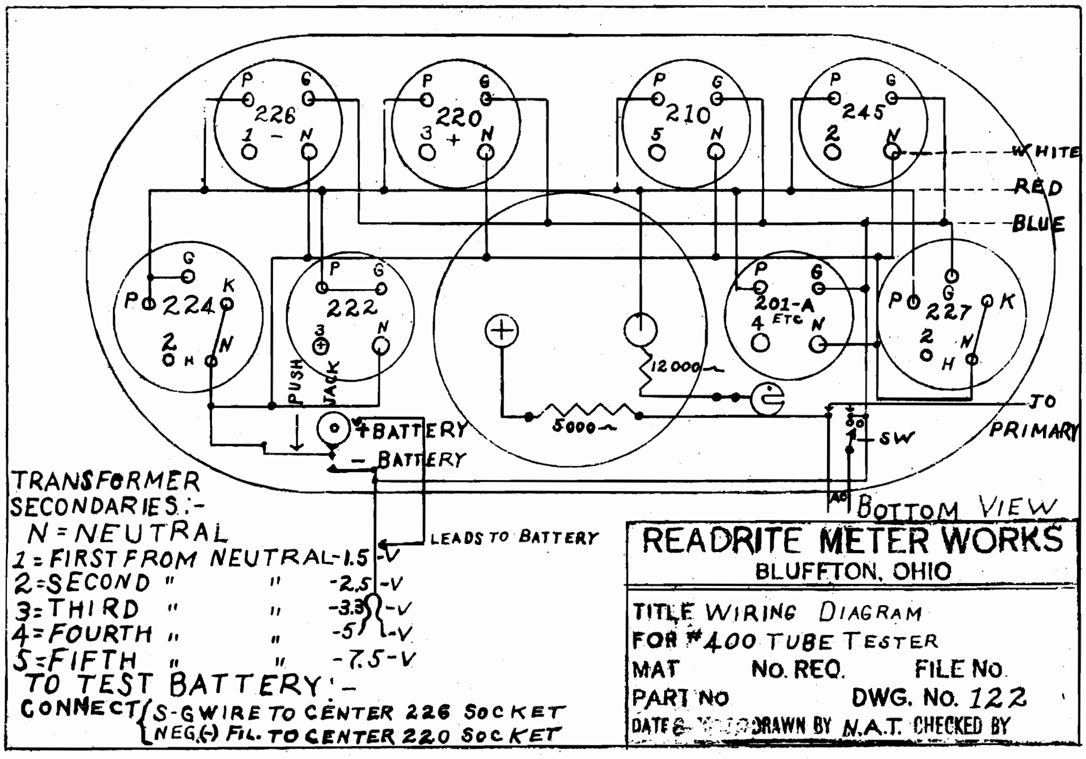
The dial light is a six volt flashlight bulb. It is connected across part of the ballast resistor, which is the long unit mounted on the under side of the chassis in front of the tone control.

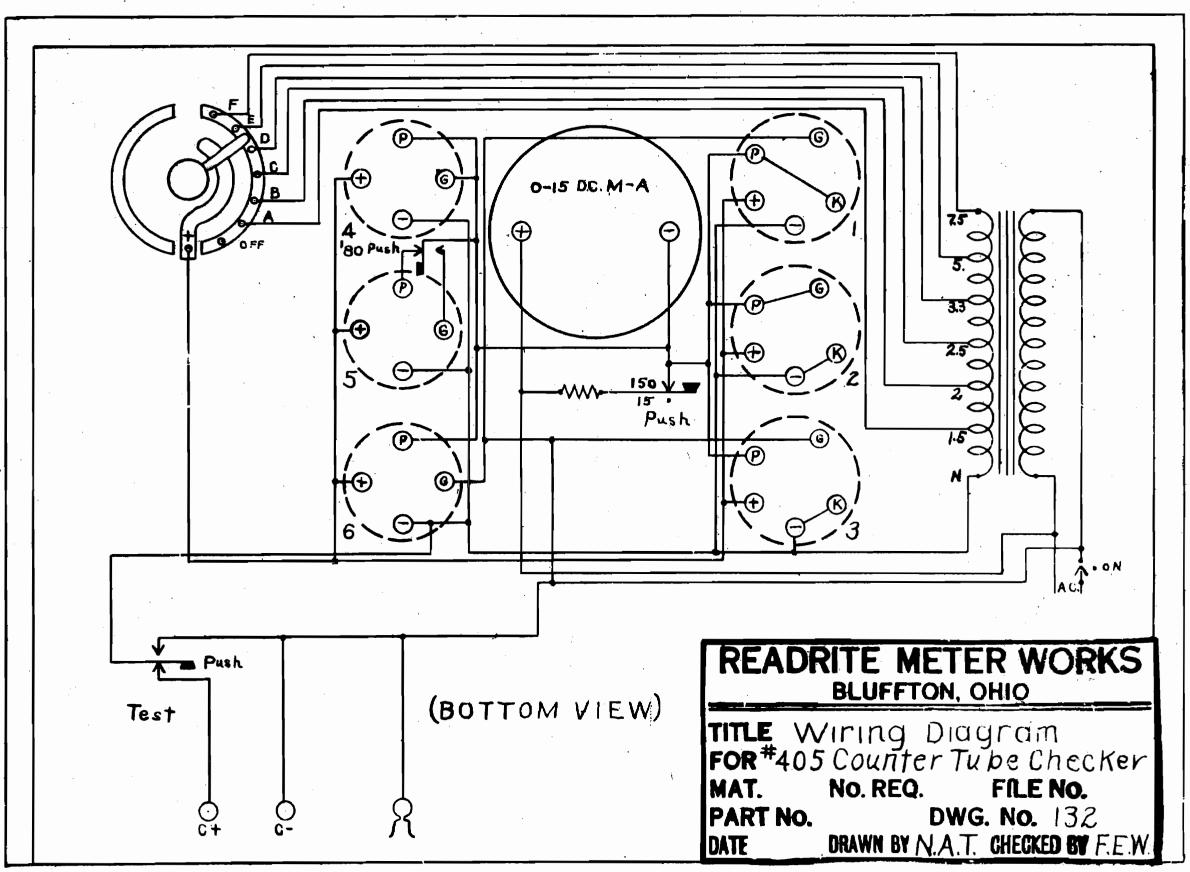
The phonograph pick-up is connected directly across the grid leak of the detector tube.

Every direct current receiver shipped from the factory is supplied with a heavy lead cap which should be placed over the detector tube to prevent microphonic howling. Some tubes are more susceptible to howling than others, so it is a good idea to switch the 201-A's around until the quietest one is found.

READRITE METER WORKS

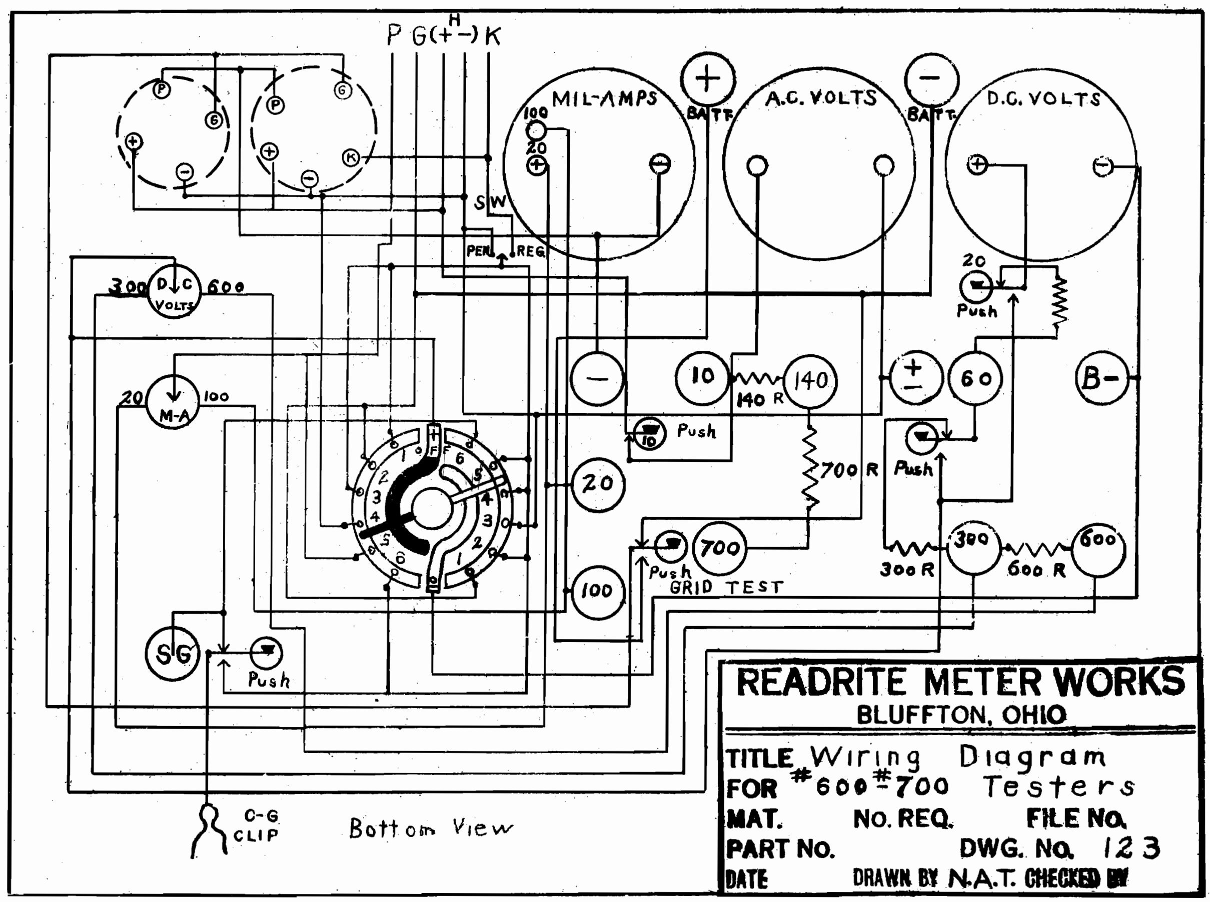
MODEL 400 TUBE TESTER
MODEL 405 COUNTER TUBE CHECKER

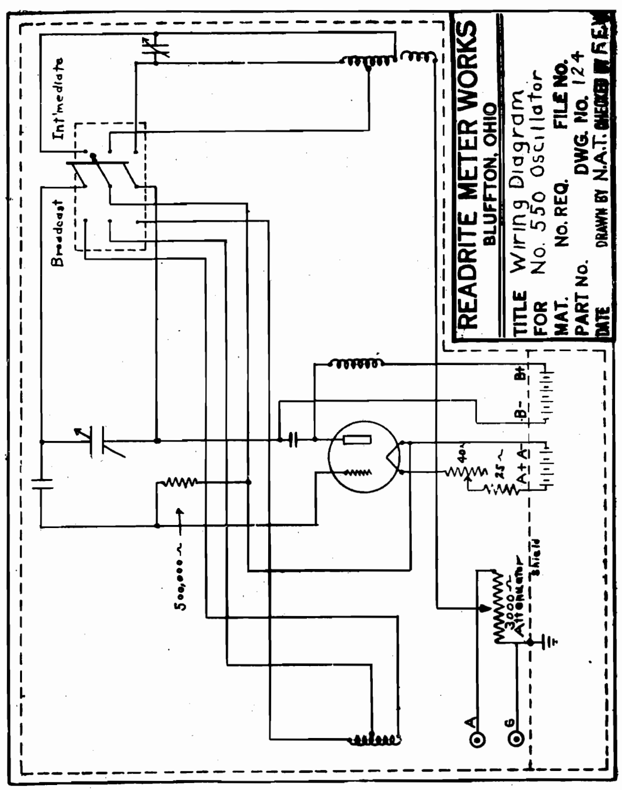


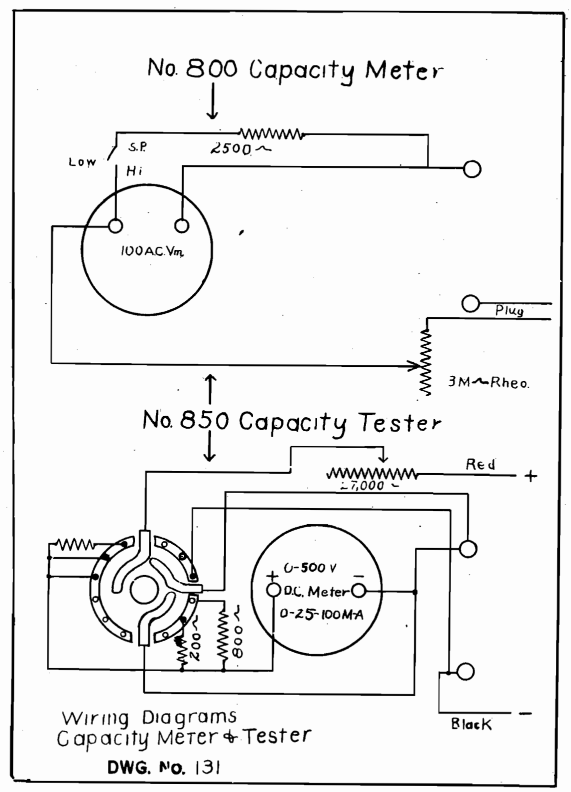


READRITE METER WORKS

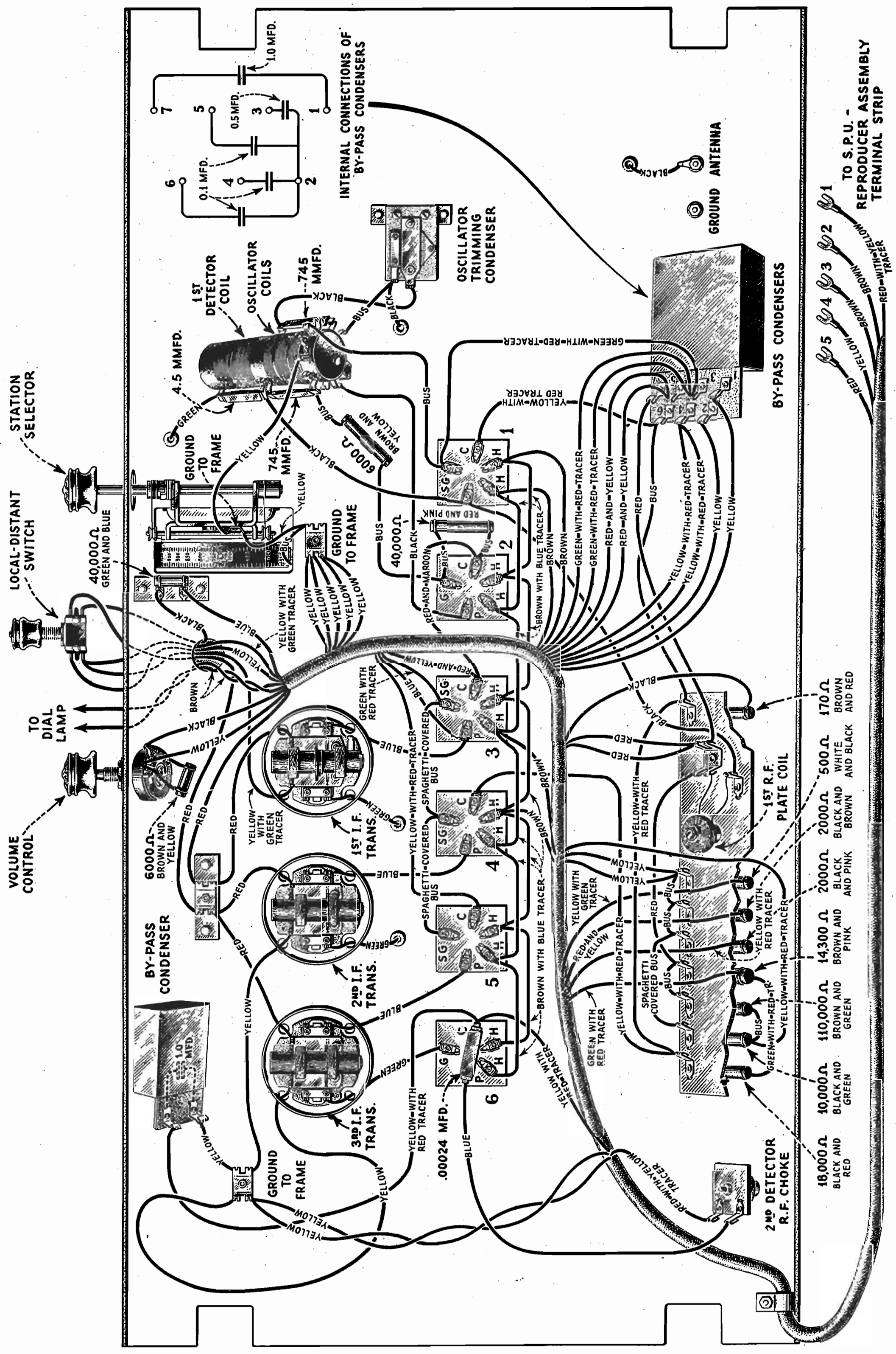
MODEL 600 & 700 TESTERS
MODEL 550 OSCILLATOR
MODEL 800 CAPACITY METER
MODEL 850 CAPACITY TESTER







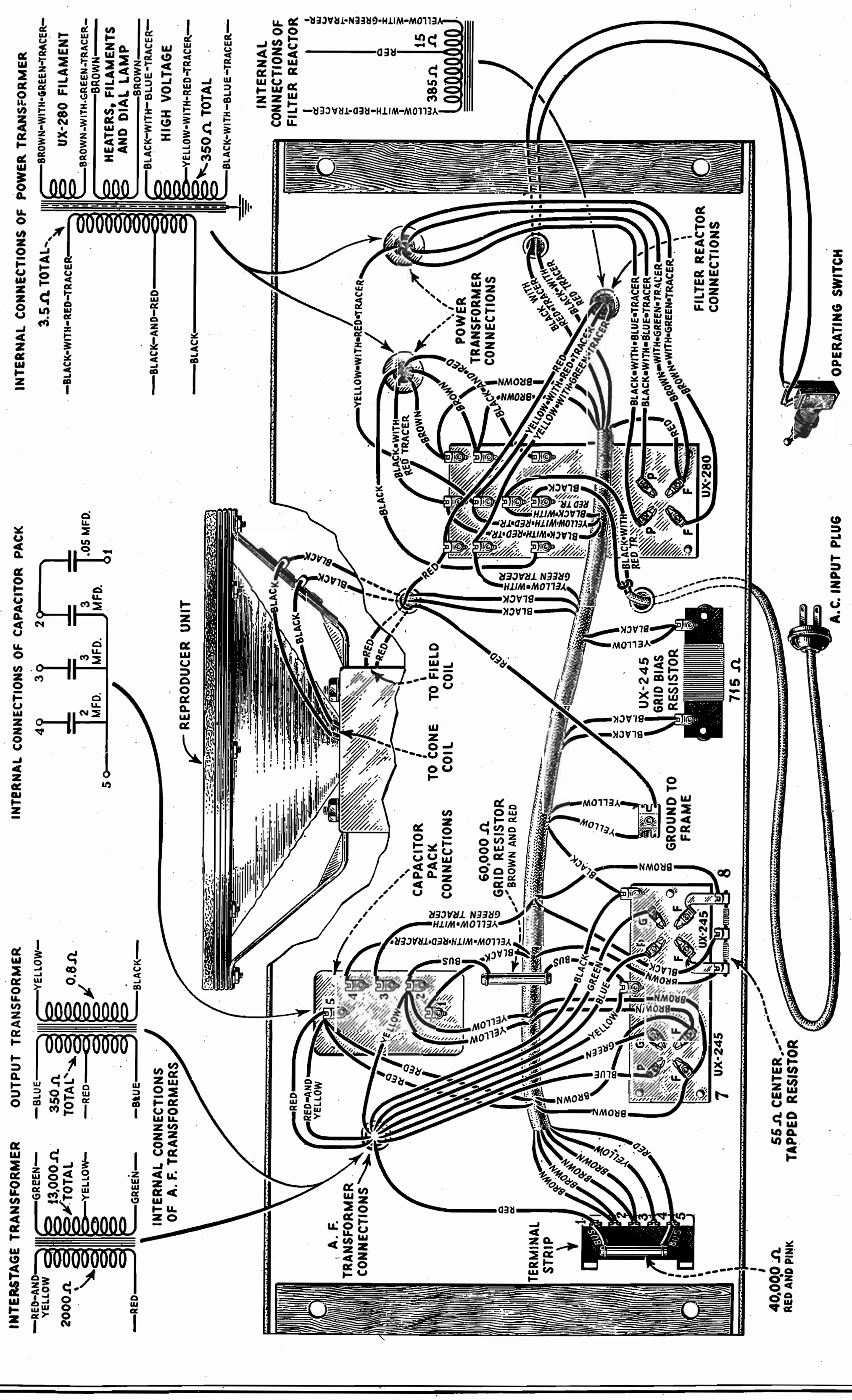
R. C. A. - VICTOR CO., Inc.
Radiola Division



Wiring diagram of receiver assembly

RADIOLA 80

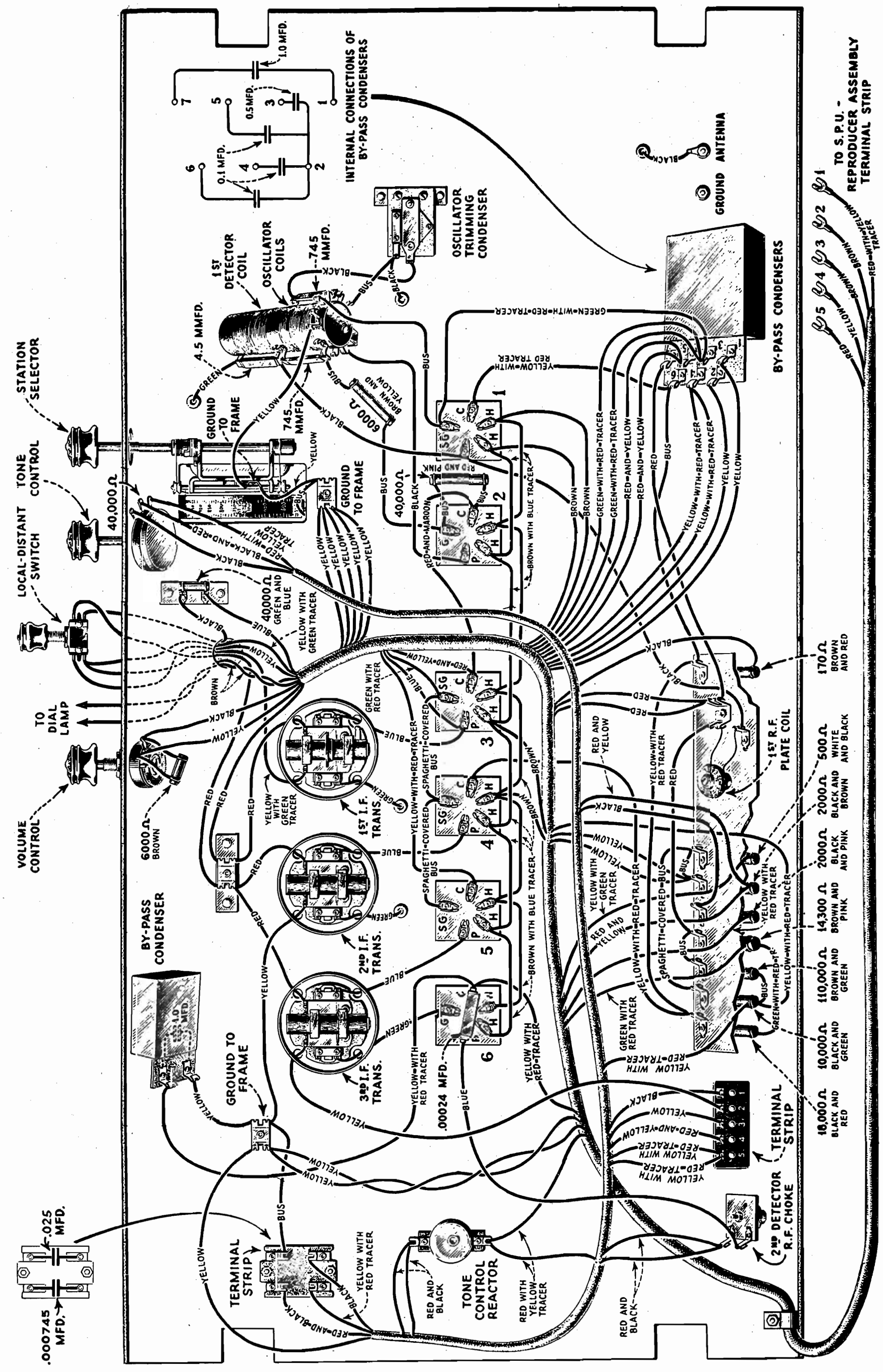
R. C. A. - VICTOR CO., Inc.
Radiola Division



Wiring diagram of S.P.U.-Reproducer assembly

RADIOLA 80

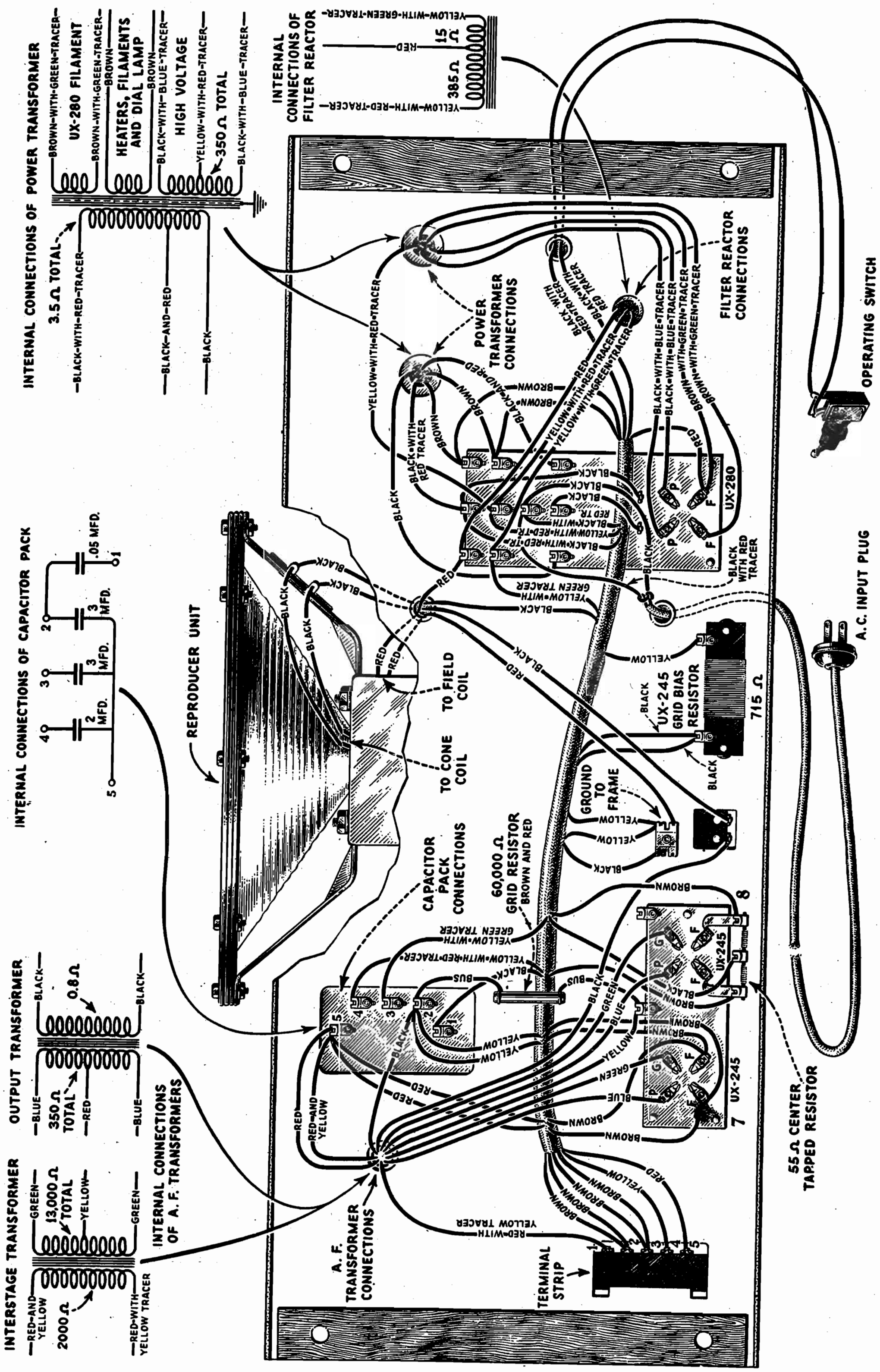
R. C. A. - VICTOR CO., Inc.
Radiola Division



Wiring diagram of the receiver assembly.

RADIOLA 82

R. C. A. - VICTOR CO., Inc.
Radiola Division



Wiring diagram of the socket power unit.

RADIOLA 82

R. C. A. VICTOR CO., Inc.
Radiola Division

VOLTAGE READING SERVICE DATA CHART

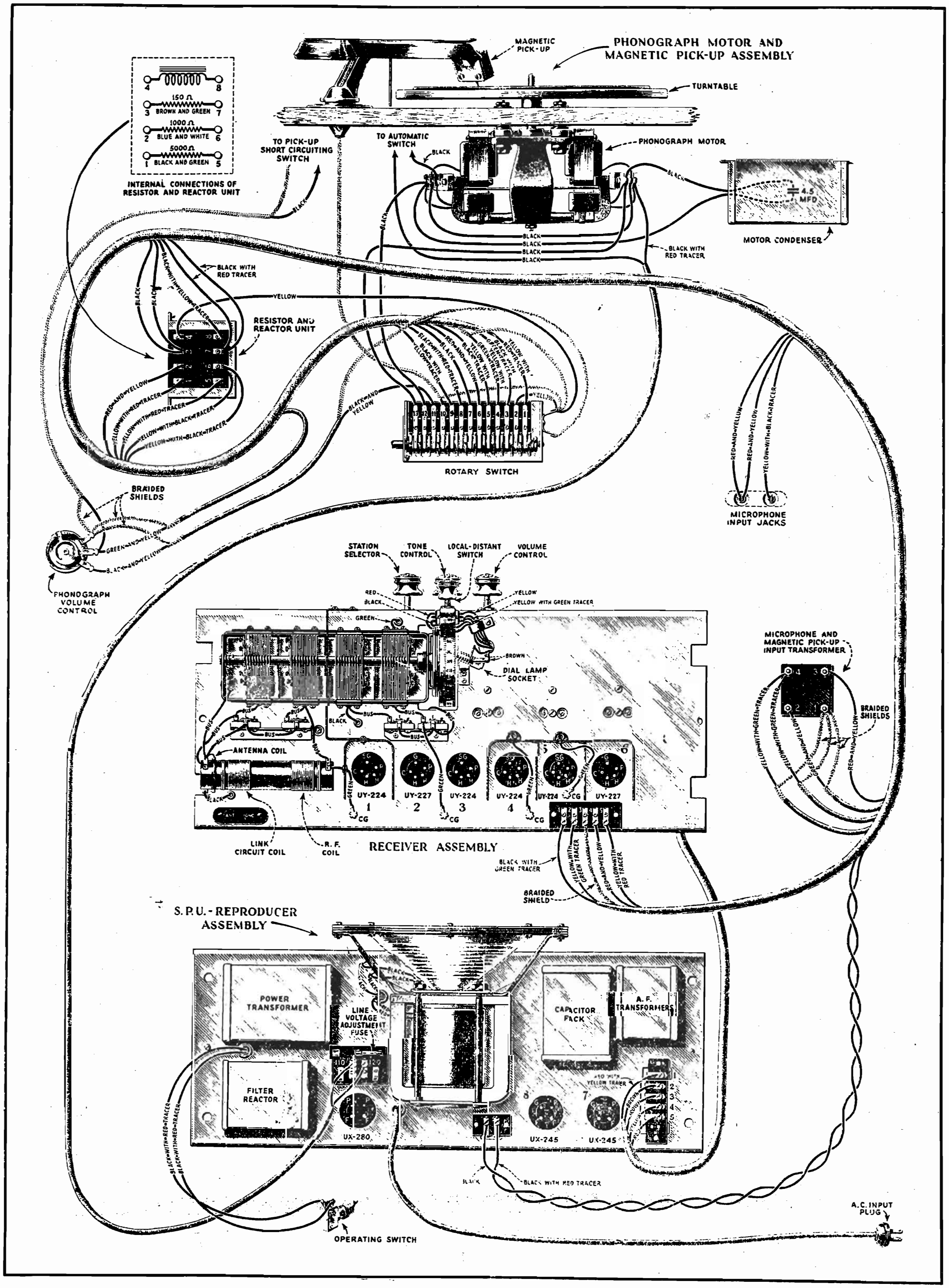
Volume Control at Maximum

Local-Distant Switch at Distant

VOLTAGE CHARACTERISTIC	TUBE 1 (R.F.)				TUBE 2 (osc)		TUBE 3 (1st DET.)				TUBE 4 (I.F.)				TUBE 5 (I.F.)				TUBE 6 (2nd DET.)			TUBE 7 (A.F.)			TUBE 8 (A.F.)			Cause of Incorrect Readings
	C. G. Volts	S. G. Volts	Plate Volts	Plate M.A.	Plate Volts	Plate M.A.	C. G. Volts	S. G. Volts	Plate Volts	Plate M.A.	C. G. Volts	S. G. Volts	Plate Volts	Plate M.A.	C. G. Volts	S. G. Volts	Plate Volts	Plate M.A.	Grid Volts	Plate Volts	Plate M.A.	Grid Volts	Plate Volts	Plate M.A.	Grid Volts	Plate Volts	Plate M.A.	
Normal	2.2	90	240	4.0	80	6.0	8.0	80	235	.25	2.2	85	240	5.5	5.0	85	240	2.0	23	210	.5	20	200	30	20	200	30	
High grid bias on tubes 1 and 3	138	0	110	0	100	10	32	130	250	0	137	0	105	0	13	130	255	3.0	26	235	1.0							Open volume control and 6000-ohm resistor, or open 170-ohm resistor
No. C.G. voltage on R.F. tube	0	85	245	5.0																								Open grid coil of R.F. transformer
Low plate voltage on R.F. tube	2.0	80	60	0																								Open plate winding of R.F. tube
High S.G. voltage	2.4	120	245	6.0	85	8.0	26	110	230	.25	22	110	240	6.5	65	105	240	3.0										Open 18,000-ohm resistor
No. C.G. voltage on tube 3							0	70	225	3.5																		Open grid coil of 1st detector
No. C.G. voltage on tube 4											0	85	240	6.0														Open secondary of 1st I.F. transformer
No. C.G. voltage on tube 5															0	80	230	5.0										Open secondary of 2nd I.F. transformer
No grid voltage on tube 6																			0	100	8.0							Open secondary of 3rd I.F. transformer
High S.G. voltage and no Osc. volts or M.A.	3.2	115	240	5.0	0	0	6	115	235	2.5	3.5	110	240	6.0	7.0	110	235	3.0										Open Osc. plate coil
No plate volts or M.A. on tube 3							8.0	80	0	0																		Open primary of 1st I.F. transformer
No plate volts or M.A. on tube 4											2.0	80	0	0														Open primary of 2nd I.F. transformer
No plate volts or M.A. on tube 5															3.2	80	0	0										Open primary of 3rd I.F. transformer
No plate volts or M.A. on tube 6																			18	0	0							Open 2nd Det. R.F. choke
No Osc. or 1st Det. plate volts or M.A.	3.1	110	250	5.5	0	0	87	0	0	0	3.0	95	250	5.0	7.0	105	240	3.5										Open 200-ohm Osc. and 1st Det. bias resistor
No voltages on tube 5															*7.5	0	0	0										Open 2000-ohm 2nd I.F. bias resistor
No plate volts and high grid volts on tube 6																			185	0	0							Open 10,000-ohm 2nd Det. bias resistor
High 2nd Det. plate M.A.																			22	225	2.0							Open 110,000-ohm resistor
No C.G. or S.G. volts on tubes 1, 2, 3, 4 and 5; high 2nd Det. volts	0	0	300	0	0	0	0	0	300	0	0	0	300	0	0	0	300	0	29	260	0							Open 14,300-ohm resistor
No C.G. volts on tubes 1 and 4	0	85	230	1.5							0	75	230	6.5														Shorted .1 Mfd. condensor across volume control and 170-ohm resistor
No C.G. or S.G. volts on tubes 1, 2, 3, 4 and 5	0	0	285	0	0	0	0	0	270	0	0	0	270	0	0	0	70	0										Shorted .5 Mfd. condensor from S.G. supply to ground
No C.G. volts on tube 3					85	6.5	0	90	235	5.5																		Shorted .1 Mfd. condensor from cathodes 2 and 3 to ground
No C.G. volts on tube 5															0	90	235	5.5										Shorted .1 Mfd. condensor from cathode 5 to ground
All voltages low; no grid volts on tube 5	2.0	70	210	2.5	60	4.5	6.5	70	205	.25	1.5	70	210	3.0	4.0	75	205	2.0	0	180	20							Shorted 1.0 Mfd. condensor from cathode 6 to ground
High grid and no plate volts on tube 6															4.0	80	225	2.0	195	0	0							Shorted .0024 Mfd. condensor from plate to cathode tube 6
Low voltages; no grid volts on tubes 7 and 8	1.0	40	120	1.5	40	2.5	3.5	40	120	.5	1.0	40	120	1.5	1.8	45	120	1.0	10	110	.5	0	125	50	0	125	50	Shorted .05 Mfd. condensor across 715-ohm bias resistor
High voltages on tubes 1, 2, 3, 4, 5 and 6	4.5	145	375	6.0	110	11.0	32	130	365	.5	4.5	135	370	8.5	8.0	105	370	4.5	38	340	1.0	80	275	1.0	80	275	1.0	Open 715-ohm or 60,000-ohm grid resistor in S. P. U.
High grid volts on tubes 7 and 8																						37	210	30	37	210	30	Shorted 60,000-ohm resistor
No plate M.A. on tube 6																			23	200	0	23	210	37	23	210	37	Open primary of inter-stage transformer
High plate current on tube 8	1.5	70	205	2.5	60	5.0	6.0	70	200	.25	2.0	70	205	3.5	4.0	75	200	2.0	20	180	.25	26	155	0	0	135	75	Open one-half secondary of inter-stage transformer
High plate current on tube 7	1.5	70	205	2.5	60	5.0	6.0	70	200	.25	2.0	70	205	3.5	4.0	75	200	2.0	20	180	.25	0	135	75	26	155	0	Open one-half secondary of inter-stage transformer
No voltages on tube 8	3.0	100	270	5.0	75	6.5	9.0	90	260	.25	3.0	95	260	6.5	6.0	95	260	3.0	26	230	.25	24	250	35	0	0	0	Open one-half primary of output transformer
No voltages on tube 7	3.0	100	270	5.0	75	6.5	9.0	90	260	.25	3.0	95	260	6.5	6.0	95	260	3.0	26	230	.25	0	0	0	24	250	35	Open one-half primary of output transformer

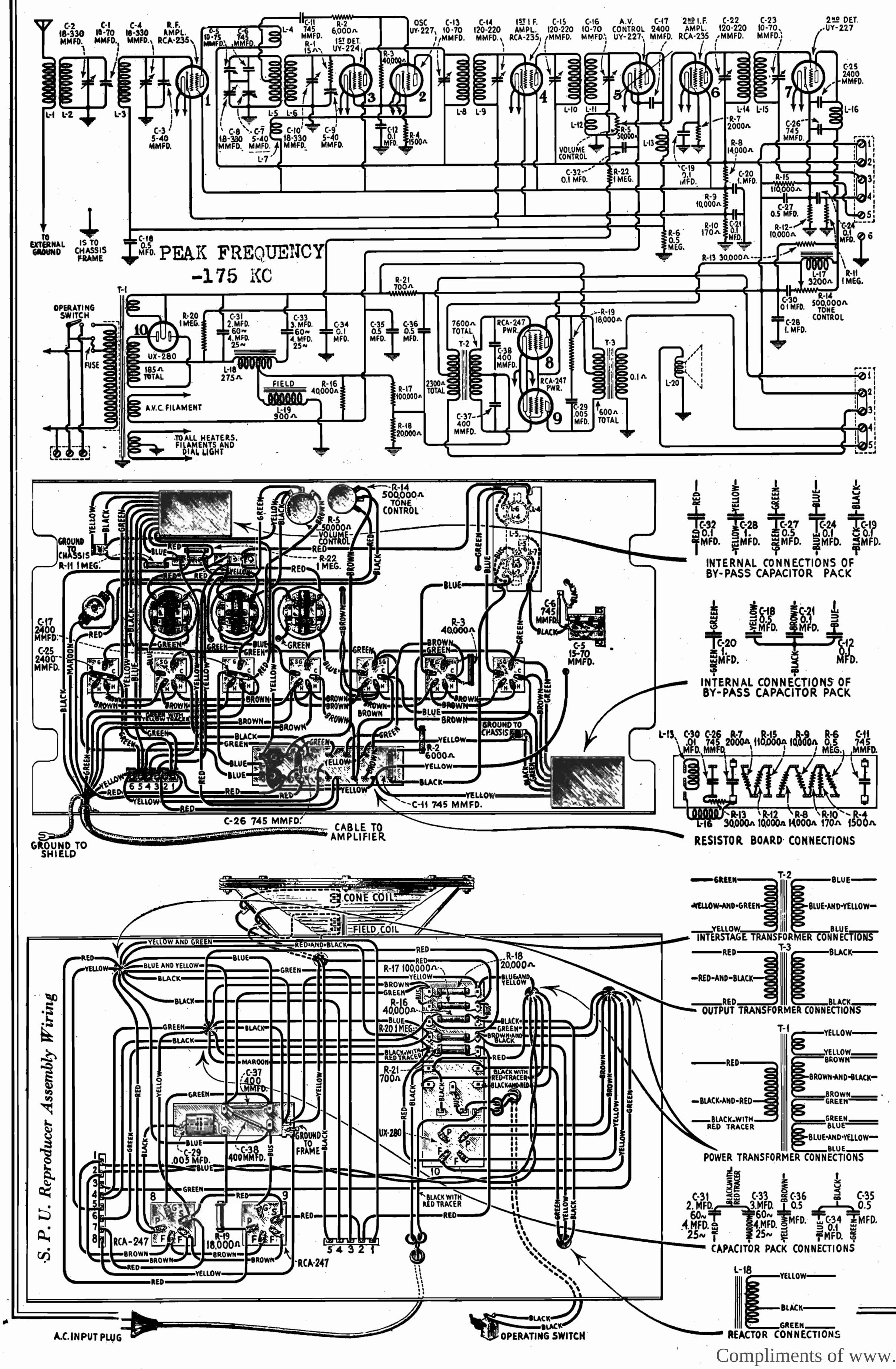
RADIOLA MODELS 80, 82.

R. C. A. - VICTOR CO., Inc.
Radiola Division



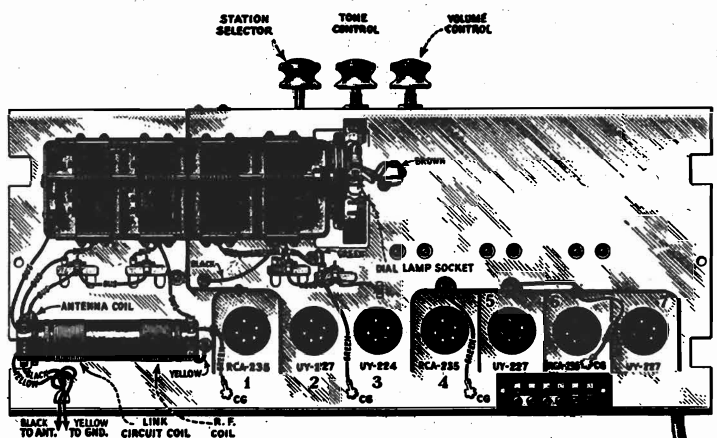
Assembly wiring diagram of the radio-phonograph combination instrument

R. C. A. - VICTOR CO., Inc.

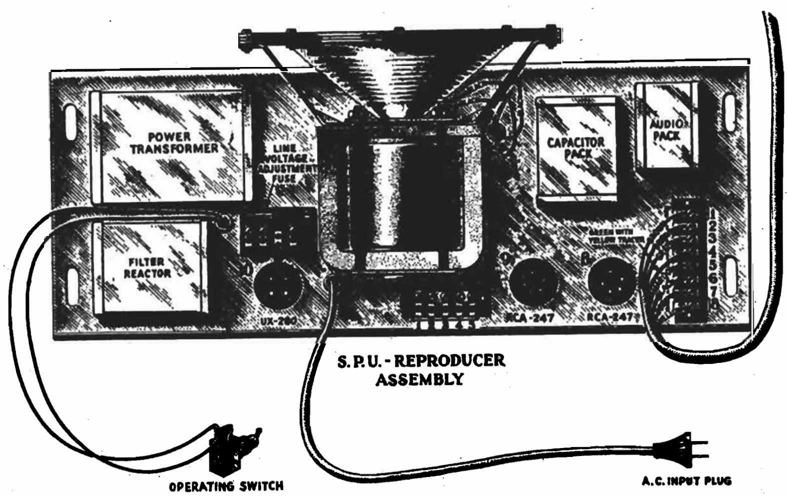


R-50 and R-55

R. C. A. - VICTOR CO., Inc.



RECEIVER ASSEMBLY



S.P.U. - REPRODUCER ASSEMBLY

SERVICE DATA

Information pertaining to R. F., Oscillator and I. F. adjustments together with general service data for this type receiver may be obtained from the Service Notes already issued on the RCA Radiola 80.

The beat frequency—175 K. C.—appears in the plate circuit of the first detector which is accurately tuned to 175 K. C. The tube used as a first detector is Radiotron UY-224.

R. F. OSCILLATOR AND I. F. ADJUSTMENTS

A reference to the RCA Radiola 80 Notes will give the details for making correct R. F., I. F. and Oscillator adjustments. However, due to the use of an automatic volume control tube, its action will defeat the use of an output meter. To overcome this, a "dummy" Radiotron UY-227 (one that has one heater prong removed but is otherwise O. K.) should be substituted for the tube in the automatic volume control socket. Do not make any adjustments with this tube removed from the socket. While apparently everything functions in the normal manner, the lack of tube capacity in the circuits will cause an incorrect alignment to be made.

In the RCA Victor Radiola R-50 and R-55 the I. F. transformers are adjusted for maximum output and no attempt at band pass tuning should be made when these adjustments are made.

It will be noted on the early Models of R-50 and R-55 that a small 9 mmfd. capacitor is inserted in series with the oscillator trimming capacitor. This capacitor is not used on later models that have a slightly different dial scale. When replacing a dial scale it may therefore be necessary to short this capacitor. A failure in the capacitor may be remedied either by replacing the capacitor or the dial scale.

VOLTAGES ARE THE SAME AT EITHER POSITION OF THE VOLUME CONTROL

110 VOLT LINE

Radiotron No.	Heater to Cathode Volts	Cathode or Filament or Control Grid Volts	Cathode or Filament to Screen Grid Volts	Cathode or Filament to Plate Volts	Plate Current M. A.	Heater Volts
1. R.F.	2.0	*0.2	60	230	3.5	2.5
2. Osc.	5.0	0	—	50	4.0	2.5
3. 1st Det.	4.0	3.5	60	230	0.5	2.5
4. 1st I.F.	2.0	*0.2	60	230	3.5	2.5
5. A.V.C.	0	0	—	30	0.1	2.5
6. 2nd I.F.	2.0	3.5	60	230	2.5	2.5
7. 2nd Det.	20.0	*8.0	—	210	0.5	2.5
8. Pwr.	—	*10.0	250	235	25.0	2.5
9. Pwr.	—	*10.0	250	235	25.0	2.5

*These readings are not correct due to the resistance in the circuits

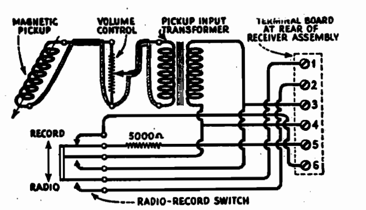


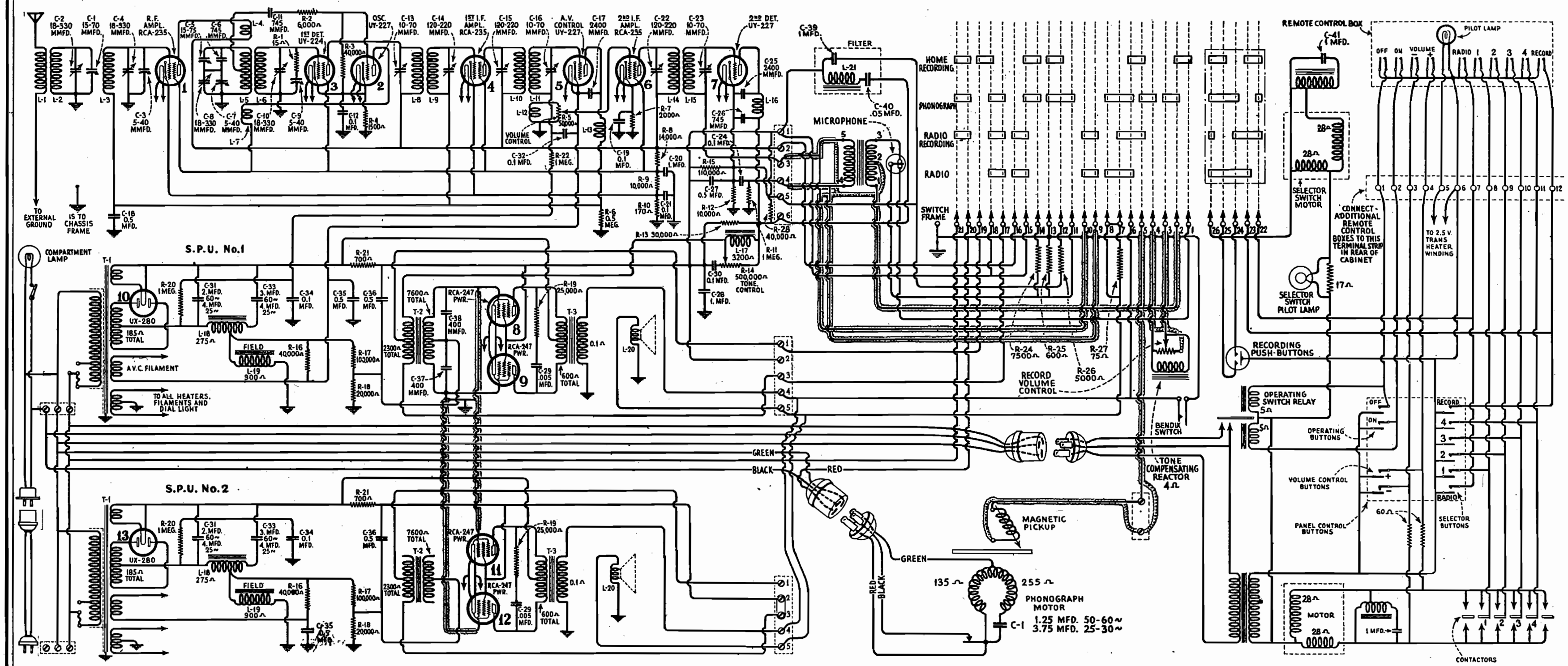
Figure 3—Magnetic Pickup connections.

Note: Place the Radio-Record switch and input transformer in the receiver cabinet. Try connecting a wire from receiver terminal No. 6 to input transformer frame or braided shield to pickup and use connection that gives minimum hum.

R-50 and R-55

R. C. A. VICTOR CO., Inc.

MODEL RAE-79
SUPERHETERODYNE



PEAK FREQUENCY 175 KC

Schematic diagram of Model RAE-79

The RCA Victor Model RAE-79 is a thirteen tube, super-heterodyne radio receiver incorporated in the same cabinet with the perfected RCA Victor automatic record changing mechanism.

Features of this instrument are:

RCA Victor DeLuxe Radio Chassis incorporating Super Control Radiotrons, automatic volume control giving a new degree of quiet operation, remote control of tuning and volume, double push-pull amplifiers employing Pentode Output Radiotrons, and twin loudspeakers. The automatic record changing mechanism has provision for playing continuously, one side of ten 10-inch records of either the "standard" or Program Transcription variety and either type twelve inch records manually. Home recording on the RAE-79 reaches a new degree of perfection through the use of a studio type two button microphone and Pentode Output Radiotrons. Such records may be made either 78 or 33⅓ R.P.M. thus giving a maximum of eight minutes of home recording on a ten inch record.

A reference to the R-50 and R-55 Service Notes covers the general service data on this type of instrument. (See page 504-9)

R. C. A. - VICTOR CO., Inc.

MODEL RAE-79
(Part 2)

SERVICE DATA ON REMOTE CONTROL UNIT

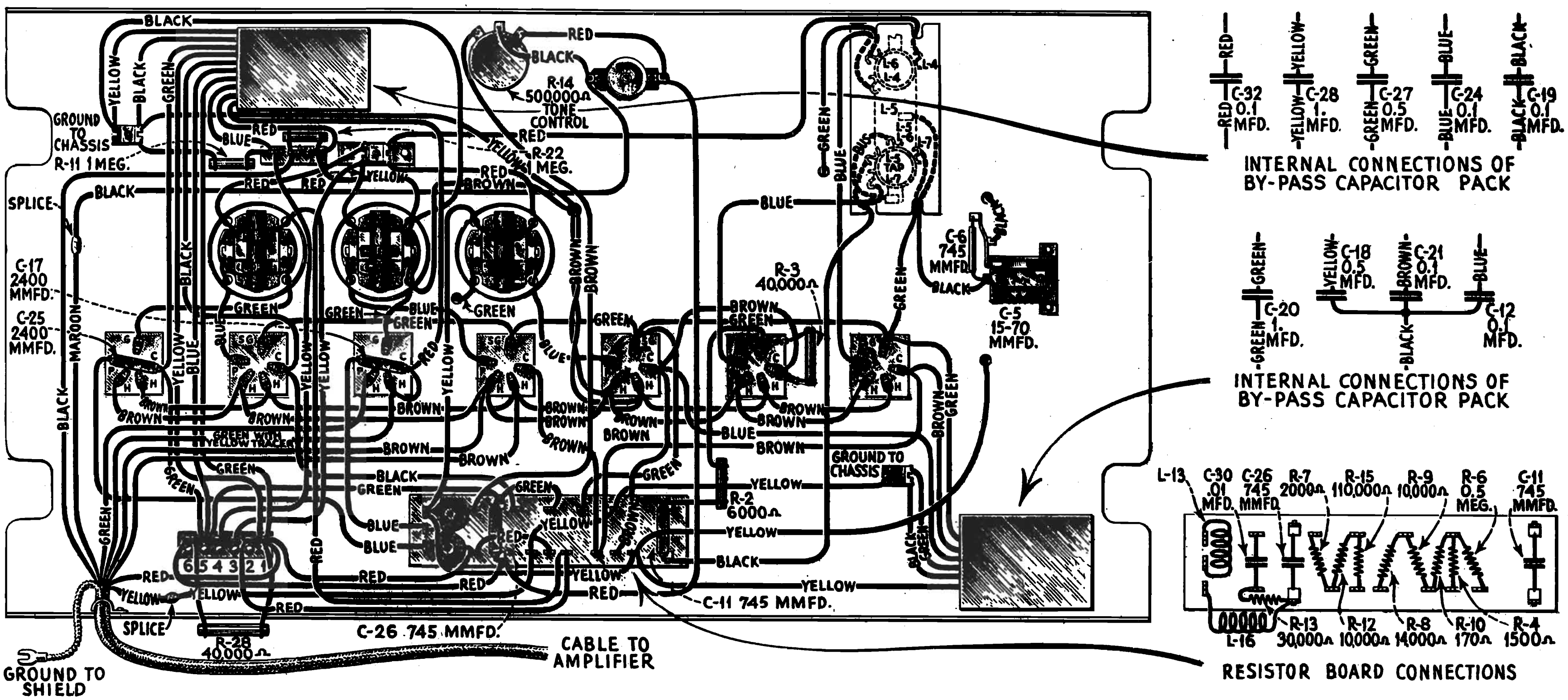
The Remote Control Contactors of Model RAE-79 are adjusted at the Factory with a 115 volt A. C. input being applied to the receiver. Due to the extreme selectivity of the receiver used, it may be necessary to readjust the motor contactors when the instrument is used on extremely high or low line voltages. The following test covers these adjustments thoroughly.

This is also true on Models used at frequencies other than that specified. For example, when a 60 cycle model is used on 50 cycles, the phonograph motor must be changed and the remote control contactors completely readjusted.

The remote control feature is unique in that it not only allows control of the receiver from a distant point but also pre-selects the desired station accurately. Manual tuning, other than necessary for the original setting of the selector buttons, is therefore eliminated. Selection of any one of four stations, adjustment of the volume control, turning the receiver "on" or "off" or changing from Radio to Record may be accomplished at one or more remote points from the receiver. Operation of the tone control or home recording must be done at the receiver.

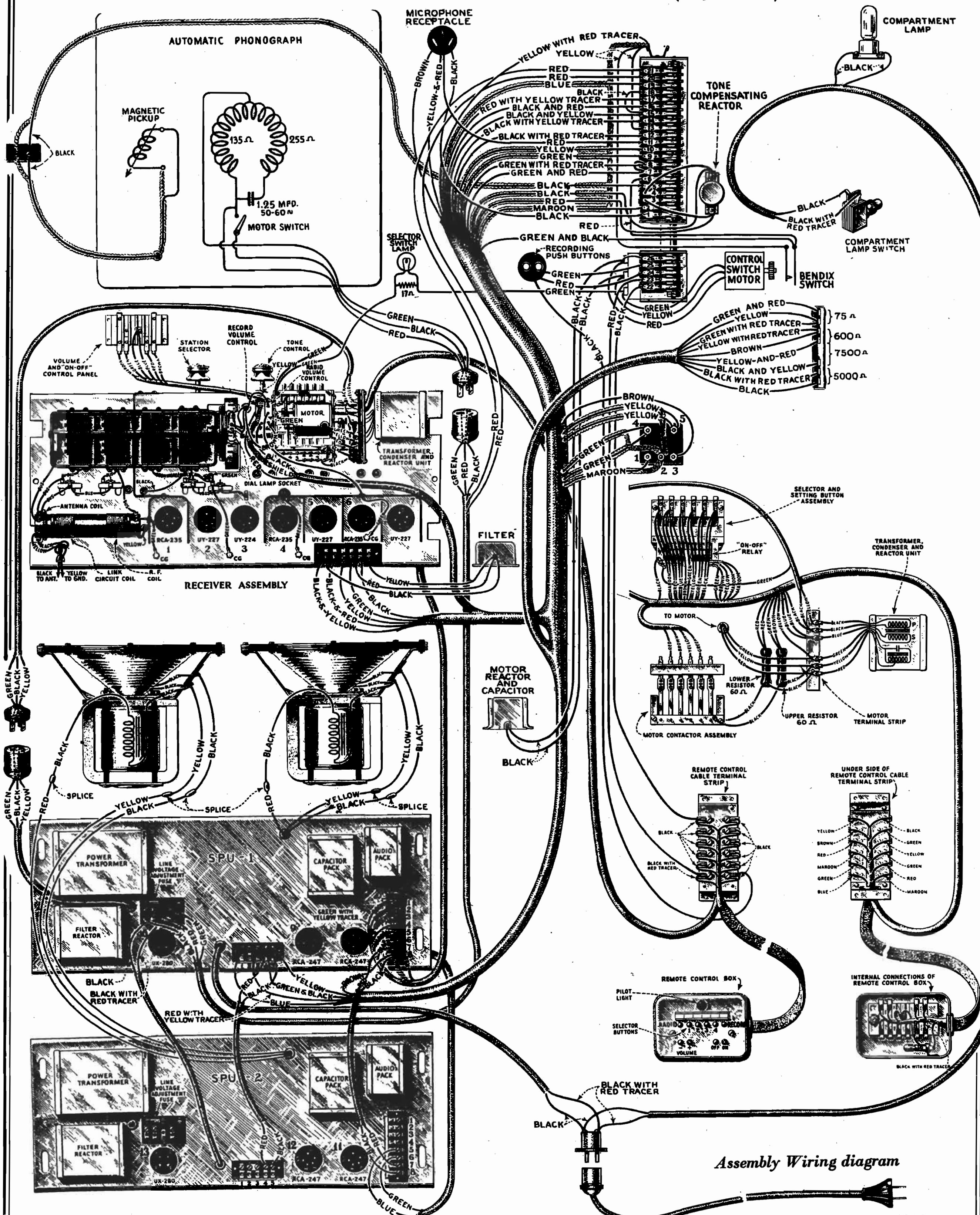
One control box and twenty-five feet of flat cable are supplied. If desired, any number of additional units may be installed or the cable lengthened to seventy-five feet.

RECEIVER ASSEMBLY WIRING



R. C. A. VICTOR CO., Inc.

MODEL RAE-79 SUPERHETERODYNE
(Part 3)

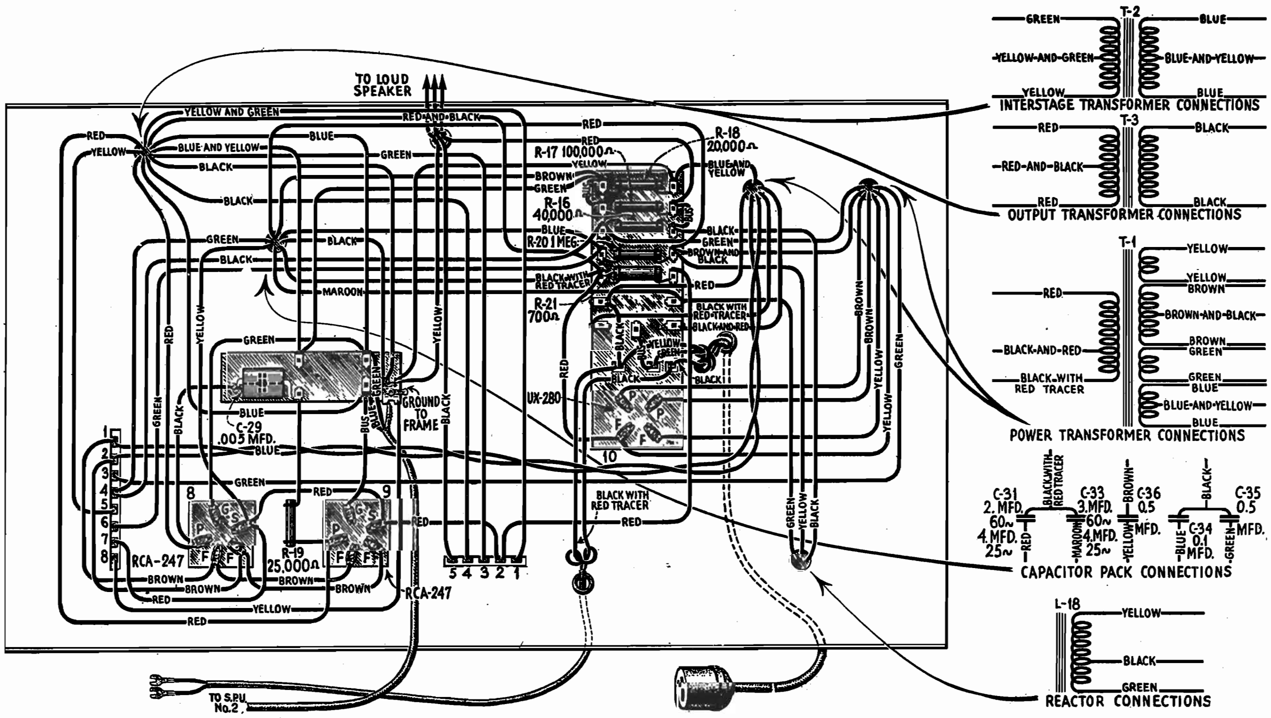


Assembly Wiring diagram

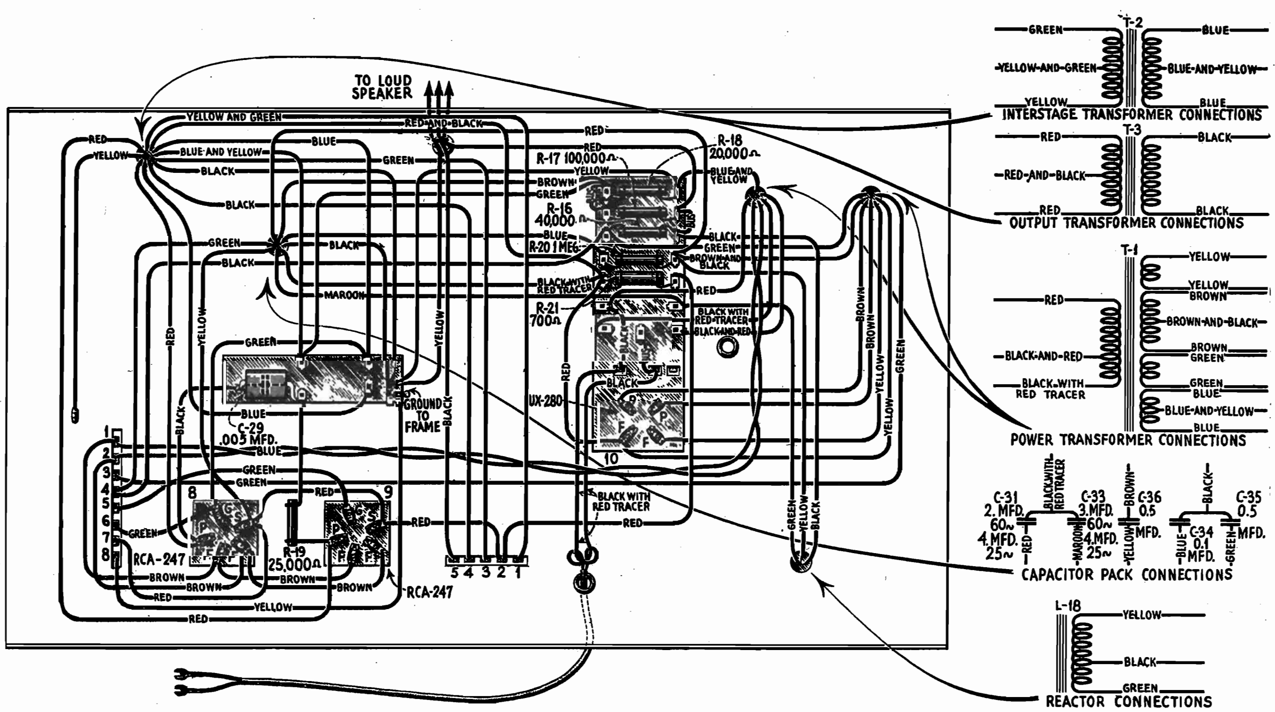
MODEL RAE-79
(Part 4)

R. C. A. VICTOR CO., Inc.

S.P.U. No 1 & S.P.U. No 2
WIRING DIAGRAMS



S. P. U. No. 1 wiring



S. P. U. No. 2 wiring

R. C. A. - VICTOR CO., Inc.

Electrical Description of Unit

The remote control feature consists of a standard R-50 chassis with a special gang condenser; a capacitor motor coupled to the gang condenser through a series of gears; a series of drums and contactors by which the motor is started in the right direction for a given station and stopped at the right point; a special volume control geared to the motor; a relay to turn the set "on" or "off" and a remote control box by which these operations are controlled.

The motor is provided with a tapped reactor and condenser for changing the phase angle of the applied current so that operation in either direction may be secured. The motor operates at 23 volts for the station selector and 18 volts for the volume control.

Referring to Figure 1 we see the normal position of the motor armature. It will be noted that a spring holds the armature so that the gear at one end is meshed with the volume control gears. At 18 volts, the voltage used for volume control operation, the gears remain in this position and operation of the volume control is secured. When the speed of the motor is increased by operating it at 23 volts, this voltage being used when the selector buttons are pressed, the end thrust of the armature causes it to move laterally, thereby disengaging the gear at the volume control end and engaging the gear at the station selector end. See Figure 2. The spring at the end of the armature causes it to always return to the volume control position when the current is "off" at the motor. As this action takes place with the motor operating in either direction, controlling the voltage at which the motor is operated determines its function. A sixty ohm resistor is placed in each motor circuit controlling the volume to reduce the voltage from 23 to 18 volts.

The proper direction of operation and stopping of the motor for selection of a desired station is controlled by a series of drums and contactors. Figure 3 shows a schematic circuit of the motor and its adjacent circuits. The drums hold the contactors in the proper position so that when a particular selector button is depressed, the motor will turn in the right direction. When the contactor is at the point on the drum where it is half way between each contact, the motor stops. This is 180° from the hole that is used to set the drum for a particular station.

The setting of the drums is made by the pins on the front panel. These are known as the "setting buttons." The selector button is pressed and the drum is moved by the motor until the corresponding contactor is midway between the contacts. The pin will now fall in the hole in the drum if pushed in by the finger. See Figure 4. Holding the pin firmly in the hole, the desired station is then accurately tuned in by means of the manual station selector knob. After tuning the pin is then released. As the point on the opposite side of the drum is where the diameter of the drum changes, the contactor is half way between the contacts. Pressing the selector buttons will therefore cause no movement of the motor. If another button is pressed and the drum moved, pressing the original button will always bring the drum back to the position for which it was set.

Referring to Figure 10, the schematic diagram, it will be noted that a common lead is used for the pilot lamp and the selector buttons in the remote control box. By doing this, when a selector button on the box is pressed, the current through the common lead is increased, likewise the voltage drop in the lead is increased. The result is that while the motor is running the pilot lamp becomes very dim. As soon as the motor stops, the lamp flashes bright, thus indicating that the motor has stopped and the station is tuned in. If the station is not then heard, it is necessary to press the + volume control button a little at a time until the desired output level is obtained.

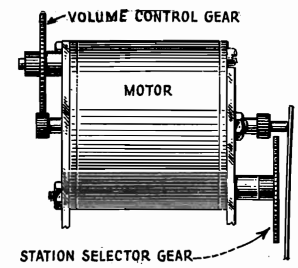


Figure 1—Motor with armature in volume control position

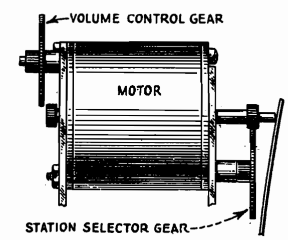


Figure 2—Motor with armature in station selector position

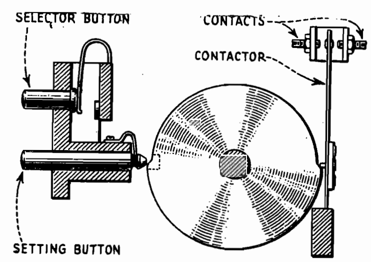


Figure 4—End view of drum and contactor

Special Installations

(1) INCREASING LENGTH OF REMOTE CONTROL BOX CABLE

The cable to the remote control box supplied with the remote control models is twenty-five (25) feet in length. This is ample for most rooms as it is very rare that a person wishes to listen to a program at a greater distance from the loudspeaker.

If, however, it is desired to place the remote control box at a greater distance from the set, any twelve conductor cable, the wires of which are No. 14 or larger in size, may be used to splice onto the regular cable and increase the total length up to seventy-five (75) feet. Figure 5 shows the method recommended for adding this additional cable.

(2) INCREASING NUMBER OF REMOTE CONTROL BOXES

One remote control box is supplied as standard equipment. Any number of additional boxes may be installed if desired although only one box can be used at a time for controlling the receiver. The boxes should be connected in parallel at the terminal strip on the rear of the Radiola. Figure 11 shows such a connection.

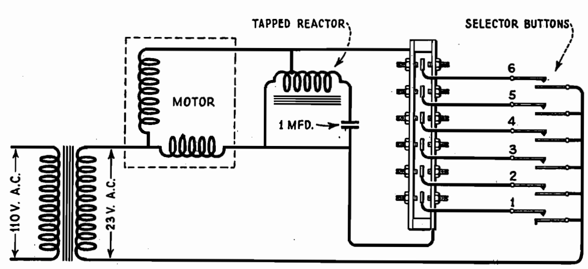


Figure 3—Schematic diagram of motor circuits

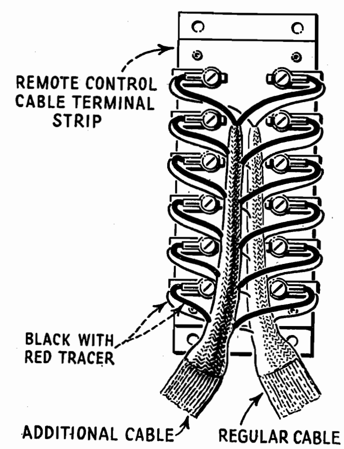


Figure 6—Connections for adding additional boxes

MODEL RAE-79
(Part 6)

R. C. A. VICTOR CO., Inc.

Adjustments

(1) ADJUSTMENT OF MOTOR CONTACTORS

The four station selector motor contactors located at the rear of the motor may require adjustment due to changes in the amount of friction in the entire drive assembly. Need for adjustment is evidenced by the motor failing to stop at the exact point for a particular station.

In order to make these adjustments two tools are necessary. They may be constructed, see Figure 7, or obtained as a spare part, the replacement parts section listing them. The chart on page * gives the procedure to be followed for making adjustments. This procedure must be repeated on each contactor that is out of adjustment. * See Motor Cont.Adjust.Chart, Page 504-5

If all contactors are out of adjustment in a similar manner, then the friction screw, see Figure 8, requires adjustment. This should be either tightened or loosened, the exact adjustment to be determined by trial. The adjustment that is correct for one contactor will be correct for all, assuming the friction screw to be at fault.

(2) REPLACING OR ADJUSTING CONTACTORS

Six contactors are used for connecting the motor so that it rotates in the proper direction. To make this adjustment or replacement, a special offset screw driver will be required unless the unit is to be removed from the base. This is shown in Figure 12

Referring to Figure 4 we see that when the setting button is in the hole in the drum, the contactor for that particular drum is exactly half way between the contacts. The holes that hold the contactors are elongated so that they may be raised or lowered until they rest exactly half way between the contacts when the setting button is inserted in the drum hole. This is the only adjustment required of these contactors, and with the special screw driver is quite easy to make.

(3) MAKING REPLACEMENTS

The operating relay, the resistors, the motor, the gears and other small parts may be replaced. All power transformers when replaced must have the primaries so connected that the pilot light on the remote control box lights properly. If the transformers are improperly phased, the lamp will brighten instead of dim when a selector button is pressed. The drum assembly is specially fitted and assembled and any individual replacements can not be made. If trouble is experienced in this assembly, a complete replacement of the unit will be required.

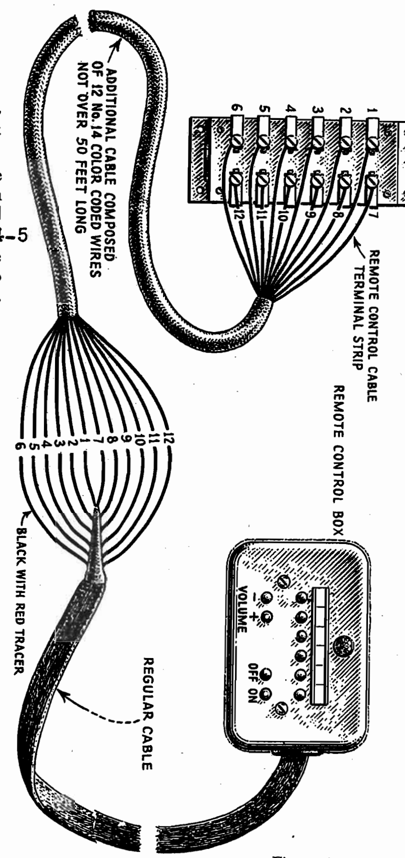


Figure 5
Wiring diagram of method for connecting additional cable

SELECTOR SWITCH AND MISCELLANEOUS INFORMATION

(1) BENDIX LOUDSPEAKER SWITCH

At the end of the selector switch motor a switch is located that shorts the cone coil when the instrument is changing from one function to another.

The switch is operated by the lateral thrust of the motor wherever it goes into operation. If for any reason, noise should be heard when changing from Radio to Record or Home Recording, it may be due to this switch not functioning. Bending the lever so that it makes proper contact will remedy this condition.

(2) PRECAUTIONS WHEN MAKING RADIO RECORDING RECORDS

When making radio recording records, it is necessary that the radio volume be adjusted for its greatest undistorted output if good quality records are to be obtained. While using the maximum undistorted output it is also important that the volume control should not be advanced beyond this point, as it is possible that the maximum *distorted* output, if fed into the pickup long enough, will cause the pickup coil to heat and its wax to run out.

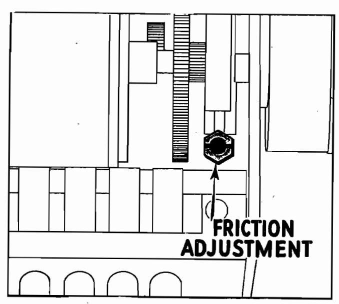


Figure 8—Location of Friction Adjustment

(3) SERVICE DATA ON MICROPHONE

The Microphone used on Model RAE-79 is a two-button studio type that has excellent frequency characteristics and is simple and rugged in construction. Generally, any failure in the microphone can be remedied only by replacing the unit. However, an unbalance in the buttons may be corrected by means of a small adjustment. The following procedure details the correct manner in making this adjustment. Refer to Figure 9.

(a) Remove the microphone from its shell. Be careful not to lose its supporting springs. Measure the D. C. resistance of each button. This may vary from 200 to 1000 ohms, but each button should be measured within 50% of the other.

(b) Loosen the set screw shown in Figure 9, and adjust the pressure of the cup by either increasing or decreasing its pressure against the diaphragm. Increasing the pressure reduces the resistance and decreasing it, increases the resistance of the button. Usually it is best practice to match the buttons by increasing the resistance rather than by decreasing it. Be very careful however to avoid spilling any carbon granules.

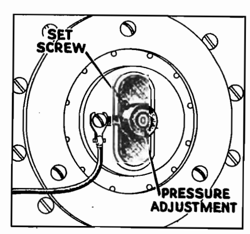


Figure 9—Details of Microphone Adjustment

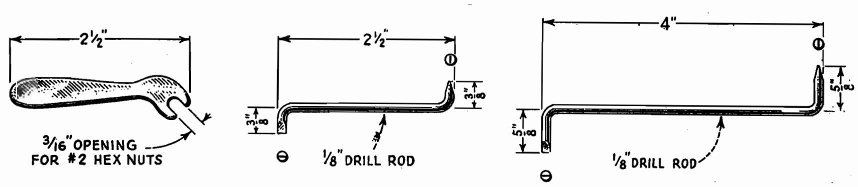
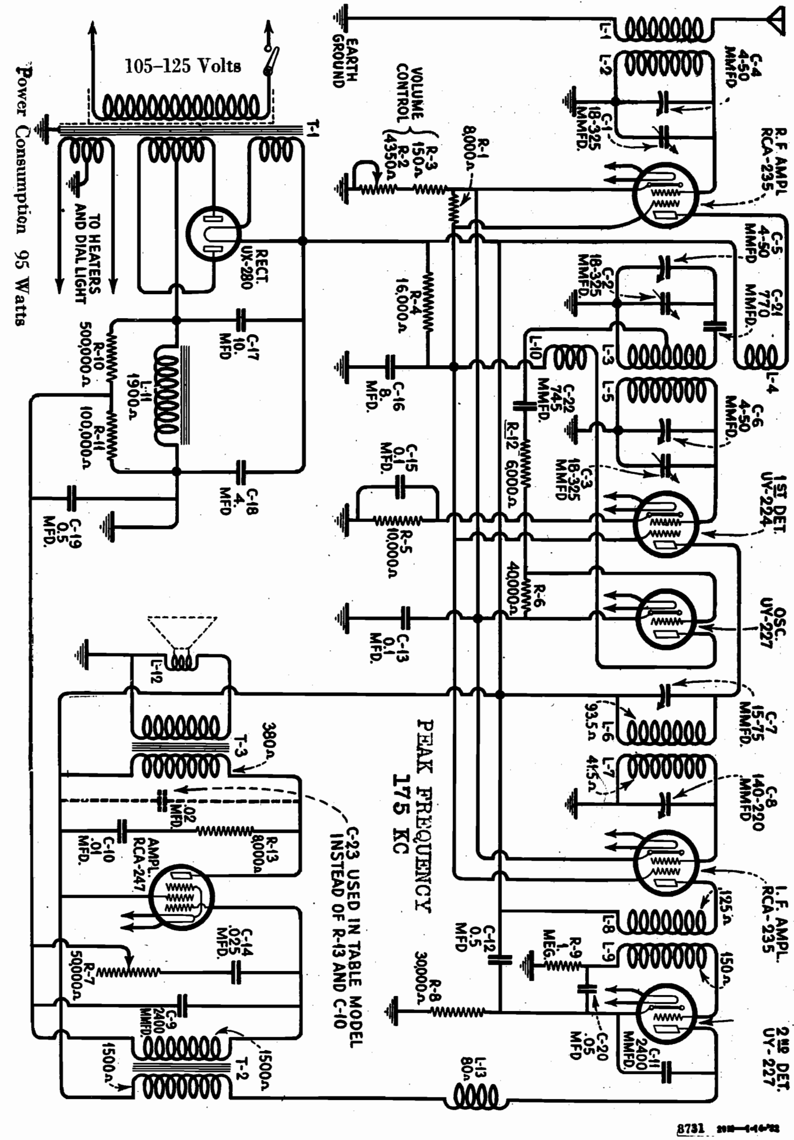


Figure 7—Constructional details of special tools used with remote control models

MODELS R-4 & R-6 AC

R. C. A. - VICTOR CO., Inc.



L-1 40 ohms L-2 5 ohms L-3 6 ohms L-4 58 ohms L-10 1 ohm

REPLACEMENT PARTS

Stock No.	Description	List Price
	PARTS COMMON TO R-4 AND R-6	
2563	Resistor—6000 ohms—Carbon type—1 watt—Package of 5	$3.00
2746	Socket—Dial lamp socket	.50
2747	Cap—Grid contactor cap—Package of 5	.50
2749	Capacitor—2400 mmfd.	1.50
2875	Knob—Tuning control, volume control or tone control knob—Package of 5	1.50
2881	Bracket—Dial lamp bracket—Package of 5	.50
2882	Socket—Five contact Radiotron socket—Complete with insulator—6 used	.50
2963	Resistor—8000 ohms—Carbon type—1 watt—Package of 5	2.50
2968	Socket—Four contact Radiotron socket—Complete with insulator—1 used	.50
2991	Transformer—1st intermediate transformer	3.00
2994	Coil—R.F. choke coil	.60
2995	Volume control—Volume control complete with mounting nut—Package of 5	6.00
2997	Coil—R.F. coil	1.90
2999	Shaft—Tuning condenser drive shaft complete	.50
3000	Scale—Dial drum and scale with set screws	.60
3003	Cushion—Receiver chassis sponge rubber cushion—Package of 4	.50
3048	Resistor—500,000 ohms—Carbon type—½ watt—Package of 5	2.50
3056	Shield—Radiotron shield—3 used—Package of 2	.50
3060	Resistor—40,000 ohms—Carbon type—1 watt—Package of 5	2.50
3076	Resistor—1 megohm—Carbon type—½ watt—Package of 5	2.50
3077	Resistor—30,000 ohms—Carbon type—½ watt—Package of 5	2.50
3078	Resistor—10,000 ohms—Carbon type—½ watt—Package of 5	2.50
3081	Resistor—16,000 ohms—Carbon type—3-watt	.06
3082	Board—Resistor board complete—Less resistors, capacitors and coil	1.00
3234	Tone control—Tone control complete with mounting nut	1.90
3252	Resistor—100,000 ohms—Carbon type—½ watt—Package of 5	2.75
6179	Terminal—Single ground terminal—Complete with mounting rivet—Package of 5	.50
6180	Capacitor—0.025 mfd.—Package of 5	.75
6181	Capacitor—770 mmfd.—Package of 5	1.30
6193	Rubber strip—Rubber clamping strip located inside of chassis shield—Package of 4	.50
7054	Cord—Power cord	1.00
7241	Capacitor—3 gang tuning capacitor	8.00
7299	Capacitor—745 mfd.	.70
7436	Coil—1st detector and oscillator coil	3.20
8837	Support—Receiver chassis metal mounting support—Package of 4	.70
8841	Transformer—2d intermediate transformer	2.50
8842	Transformer—Power transformer—105-125 volts, 50-60 cycles	6.25
8843	Transformer—Power transformer—105-125 volts, 25-40 cycles	9.55
8844	Transformer—Power transformer—220 volts, 60 cycles	6.45
	RECEIVER PARTS SPECIAL FOR R-4	
8839	Capacitor—Comprising one 0.05 mfd., two 0.5 mfd., one 10.0 mfd., one 8.0 mfd., one 0.02 mfd., one 4.0 mfd., and two 0.1 mfd. capacitors in metal container	$8.95
8840	Transformer—Audio transformer assembly—Comprising interstage and output transformer	4.50
	RECEIVER PARTS SPECIAL FOR R-6	
6183	Resistor—8,000 ohms—Carbon type—½ watt—Package of 5	2.00
7343	Transformer—Audio transformer assembly—Comprising interstage and output transformer	3.85
8846	Capacitor—Comprising one 0.05 mfd., two 0.5 mfd., one 10.0 mfd., one 8.0 mfd., one 0.01 mfd., one 4.0 mfd. and two 0.1 mfd. capacitors in metal container	8.95
	R-4 LOUDSPEAKER PARTS	
2975	Rivet—Cone retaining ring mounting rivet—Package of 100	.50
3005	Screw assembly—Speaker mounting screw assembly—Comprising 4 screws, 4 eyelets, 4 washers and 4 nuts—Package of 1 set	.50
6182	Board—Terminal board complete with 3 terminals Package of 5	.50
7442	Cone—Speaker paper cone—Package of 5	7.50
8702	Ring—Cone retaining ring	.80
8845	Coil assembly—Speaker field coil assembly—Comprising field coil, cone bracket and magnet	4.50
	R-6 LOUDSPEAKER PARTS	
3237	Screw assembly—Speaker mounting screw assembly—Comprising 4 screws, 4 washers, 4 eyelets and 4 nuts—Package of 1 set	.50
6184	Board—Terminal board complete with 3 terminals and mounting rivets—Package of 5	.50
7345	Coil—Speaker field coil assembly—Comprising coil, cone housing and magnet	5.00
8559	Ring—Cone retaining ring	.80
8601	Cone—Speaker paper cone—Package of 5	15.00
	R-4 CABINET PARTS	
X-33	Baffle board and grille cloth	.85
6113	Foot—Felt foot—Package of 15	.50
7437	Escutcheon—Tuning dial escutcheon—Complete with mounting screws	.90
9403	Cabinet—Cabinet complete less equipment	13.00
	R-6 CABINET PARTS	
X-34	Post—Front post—R.H.	2.85
X-35	Post—Back post—R.H.	2.55
X-36	Post—Front post—L.H.	2.85
X-37	Post—Back post—L.H.	2.55
X-38	Control panel	4.60
X-39	Moulding—Control panel top moulding	1.60
X-40	Top	4.85
X-41	Stretcher	3.55
X-42	Foot	1.10
X-43	Baffle board with grille cloth	.90
7437	Escutcheon—Tuning dial escutcheon—Complete with mounting screws	.90
9404	Cabinet—Cabinet complete less equipment	42.35

R. C. A. VICTOR CO., Inc.

MODELS R-4 & R-6 AC

The RCA Victor Models R-4 and R-6 are seven tube Super-Heterodyne radio receivers incorporating such features as Super Control Screen Grid Radiotrons in the R.F. and I.F. stages, single Pentode output stage and the inherent sensitivity, selectivity and tone quality of the RCA Victor Super-Heterodyne. Model R-4 is a table model and R-6 is a small console. Except for the cabinet, speakers and output circuit, both models are identical.

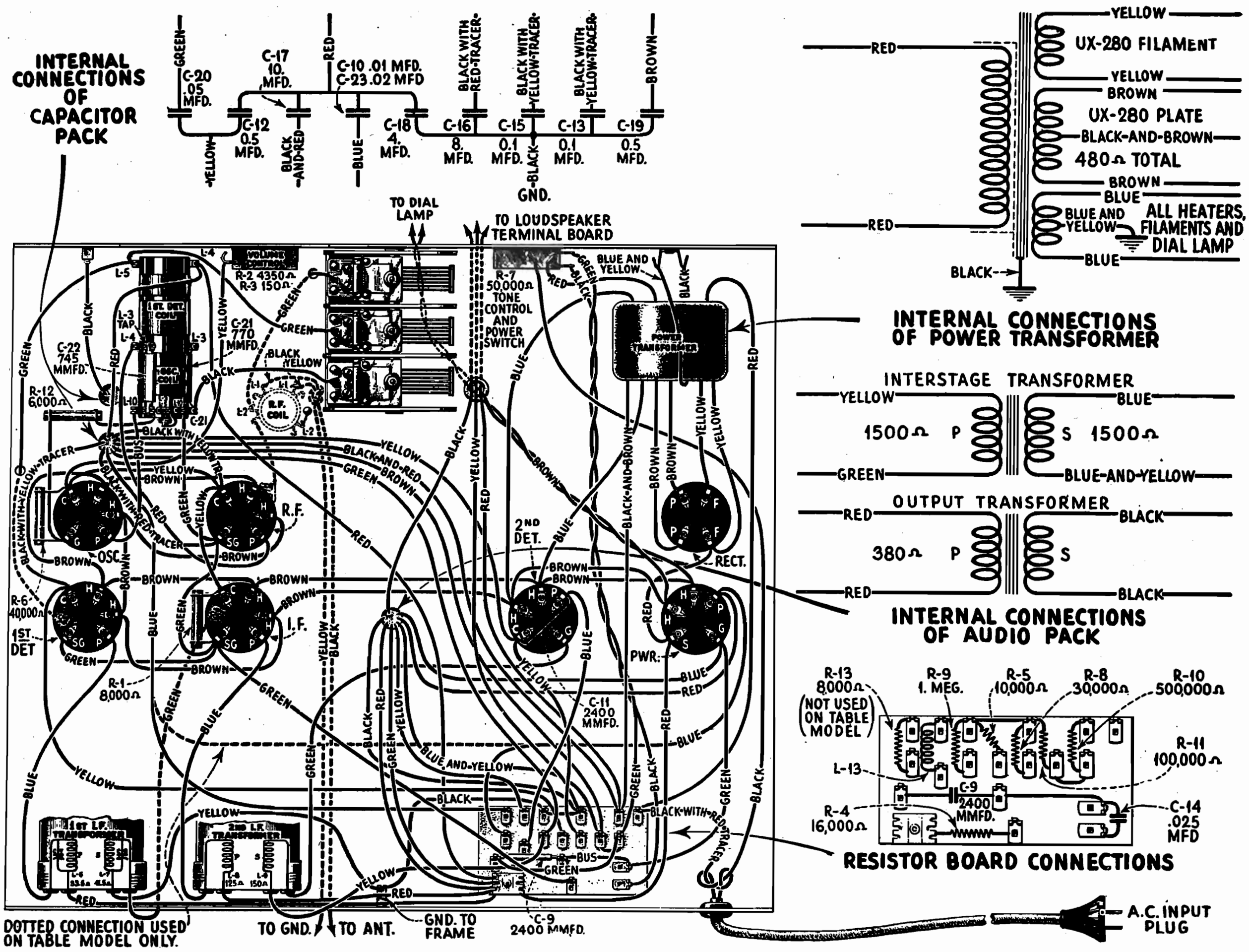
Service work in conjunction with this receiver will be very similar to that of other table type receivers. However, there are several new features of this model which require some consideration.

The second I.F. transformer in this receiver is of the untuned variety, making the set slightly less sensitive and selective than the R-7. This decreased selectivity permits the omission of the 600 K.C. adjustable capacitor used on the R-7, R-10 and other Super-Heterodyne receivers. When aligning adjustments are necessary, it is therefore only necessary to tune one I.F. transformer and the three tuning capacitors. The I.F. transformer is adjusted at 175 K.C. and the tuning capacitors at 1400 K.C. In the case of the latter, the dial should be set at 1400 as well as the oscillator and the three screws adjusted for maximum output. This will permit the dial to read very accurately.

RADIOTRON SOCKET VOLTAGES

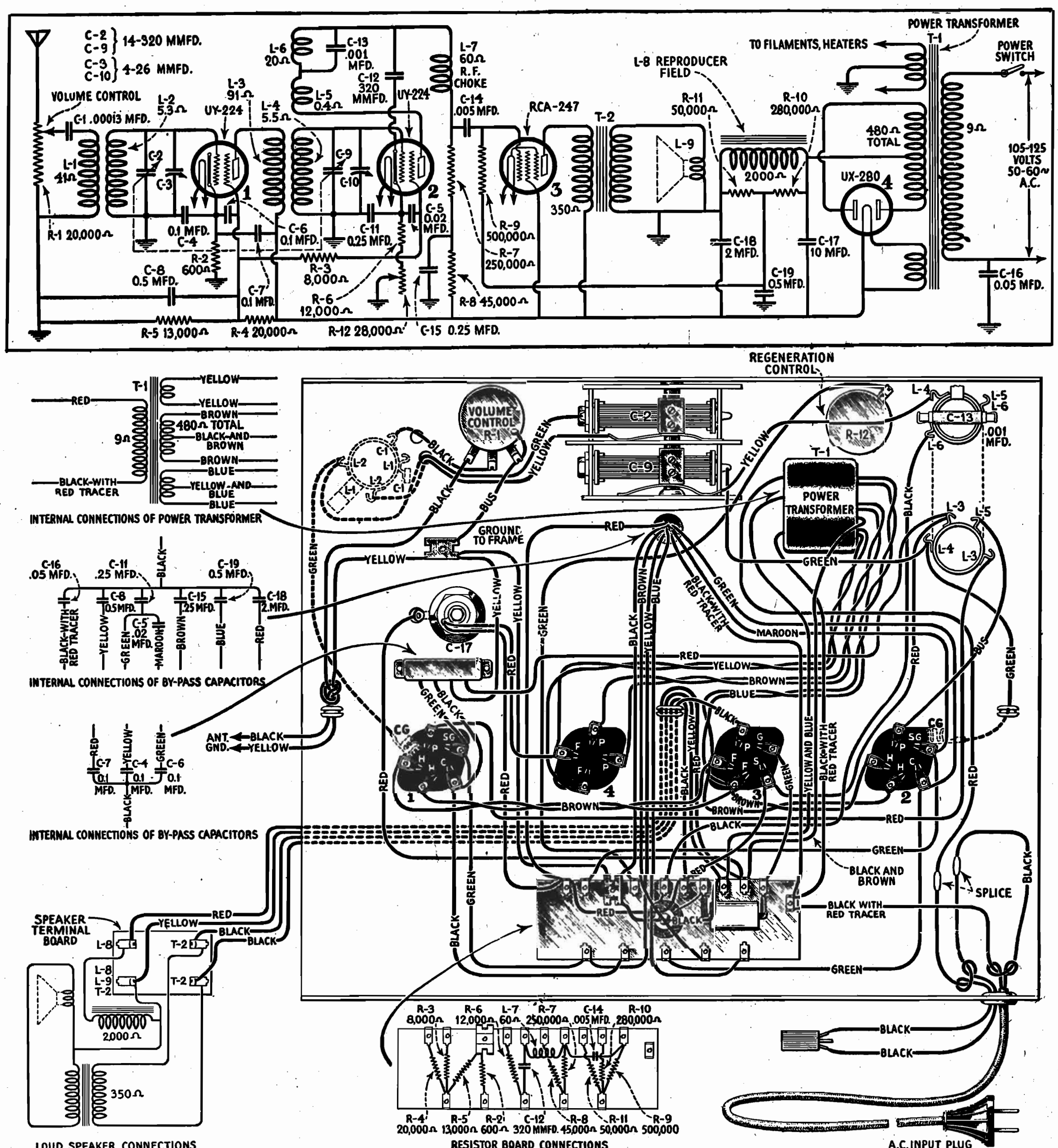
120 Volt A. C. Line

VOLUME CONTROL AT MINIMUM								VOLUME CONTROL AT MAXIMUM							
Radiotron No.	Cathode to Heater Volts, D. C.	Cathode or Filament 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.	Screen Current M. A.	Heater or Filament Volts, A. C.	Radiotron No.	Cathode to Heater Volts, D. C.	Cathode or Filament 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.	Screen Current M. A.	Heater or Filament Volts, A. C.
1. R. F.	50	50	60	235	0	0	2.66	1. R. F.	3.0	3.0	65	260	3.0	0.5	2.66
2. Osc.	50	0	—	55	4.5	—	2.66	2. Osc.	3.0	0	—	60	5.0	—	2.66
3. 1st Det.	10	9	100	260	1.0	0.25	2.66	3. 1st Det.	6.0	5.5	60	260	0.75	0.25	2.66
4. I. F.	50	50	60	235	0	0	2.66	4. I. F.	3.0	3.0	65	260	3.0	0.5	2.66
5. 2d Det.	25	10	—	250	1.0	—	2.66	5. 2d Det.	25	10.0	—	250	1.0	—	2.66
6. Pwr.	—	10	290	280	35	—	2.66	6. Pwr.	—	10.0	290	280	35	—	2.66



R. C. A. - VICTOR CO., Inc.
Radiola Division

Model R-5-X



These are readings obtained with the usual Set Analyzers and are not true readings of the voltages at which the Radiotrons operate.

110-VOLT LINE

Radiotron No.	Heater to Cathode Volts	Cathode or Filament to Control Grid Volts	Cathode or Filament to Screen Grid Volts	Cathode or Filament to Plate Volts	Plate Current M. A.	Heater Volts
1	3.0	3.0	85	225	4.0	2.2
2	7.0	7.0	65	100	0.25	2.2
3	—	2.0	225	215	30.0	2.2

R. C. A. - VICTOR CO., Inc.
Radiola Division

Model R-5-X

RCA Victor Radiolette R-5-X is a two tuned circuit R. F. type radio receiver. Compact construction together with good sensitivity, selectivity and high output are features of this receiver.

The receiver uses four Radiotrons, two UY-224, one UX-280, and one RCA-247 Power Output Pentode. Referring to Figure 1 and tracing a signal through the various stages we find the following action taking place.

The antenna and ground are connected to each side of a 20,000 Ohm potentiometer. The moving contact of the potentiometer is connected to the primary of the first R.F. transformer through a .00013 MFD. condenser, the other side of the transformer being connected to ground. The action of the potentiometer, reducing the voltage applied to the grid of the first R.F. tube, constitutes that of a volume control. The secondary of the R.F. transformer is connected to the grid circuit of the R.F. Radiotron UY-224, which is tuned by one unit of the gang condenser. The plate circuit of this tube works into the primary coil of the 2nd R.F. transformer.

The detector is of the regenerative, grid bias type and its output is coupled by means of resistance coupling to the output Radiotron RCA-247. The regenerative feature of the detector is unusual in that it uses two regeneration coils. One of these resonates at a low frequency and improves the sensitivity at that end, while the other has but few turns and brings up the sensitivity at the high frequency end.

The output stage uses the RCA-247 Output Pentode which gives a high undistorted output—2.5 watts—together with a high gain in the stage.

The grid bias for this tube is obtained by using a portion of the drop across the reproducer field. Due to the fact that the plate current of the RCA-247 represents the greatest portion of the total plate current, using the drop across the field acts as a semi-self biasing arrangement.

Plate and grid supply to all tubes is supplied through the use of Radiotron UX-280. The filter is of the "brute force" type. The reproducer unit field coil functions as the reactor. One electrolytic 10 MFD. capacitor and one paper 2 MFD. capacitor act as filter capacitors.

LINE-UP CAPACITOR ADJUSTMENTS

Two adjustable capacitors are provided for aligning the two tuned circuits at the high frequency end of the scale. The following procedure may be used for making any readjustments that may be necessary.

A. Procure an Oscillator giving a modulated signal at exactly 1400 K.C. Also procure a special socket wrench such as RCA Victor Stock No. 3007.

B. An output indicator is necessary. This may be a current squared thermo-galvanometer connected to the secondary of the output transformer in place of the cone coil or other types of output indicators.

C. Turn the station selector until the knob reads exactly 0. Then remove the chassis from the cabinet being careful not to disturb the setting of the dial. The gang condenser rotor plates should be fully meshed with the stator plates. If not, then the dial drum must be adjusted until such a condition exists. Replace the chassis in the cabinet.

D. Place the oscillator in operation at exactly 1400 K.C. and couple its output to the antenna lead. Set the dial scale at 85 and place the Radiolette in operation. Place a soft pad on the bench and turn the instrument on its side. Now with the special wrench, adjust each line-up capacitor until maximum output is obtained in the output meter. Be careful to adjust the volume control or oscillator output so that an excessive reading is not obtained. Go over each adjustment a second time to compensate for any interlocking of adjustments.

REPLACEMENT PARTS

Part No.	DESCRIPTION	List Price
2549	Resistor—250,000 Ohms—Carbon type—Package of 5	$3.00
2747	Cap—Control grid contactor cap—Package of 5	.50
2954	Capacitor—By-pass capacitor pack containing three 0.1 Mfd. capacitors	.75
2955	Transformer—First R.F. transformer complete with mounting washer and nut	1.50
2956	Transformer—Second R.F. transformer complete with mounting washer and nut	2.00
2957	Capacitor—10 Mfd. electrolytic type Complete with terminal, insulating washer, mounting nut and lock washer	3.00
3069	Switch—Operating switch complete	.60
2959	Volume control—20,000 Ohm Volume control complete with mounting washers and nut	1.50
2960	Dial—Dial scale complete with set screws—Package of 2	.50
2961	Coil—Detector plate R.F. choke coil	.50
2962	Capacitor—0.005 Mfd. audio coupling capacitor	.75
2963	Resistor—8000 Ohms - Carbon type—Package of 5	2.50
2964	Resistor—13000 Ohms - Carbon type—Package of 5	2.50
2965	Resistor—600 Ohms—Carbon type—Package of 5	2.50
2967	Resistor—45,000 Ohms—Carbon type Package of 5	2.50
2969	Resistor—50,000 Ohms—Carbon type—Package of 5	2.50
2970	Resistor—500,000 Ohms—Carbon type—Package of 5	2.50
2971	Resistor 280,000 Ohms—Carbon type—Package of 5	2.50
2972	Shield Radiotron shield complete with mounting screw, washer and nut	.50
2975	Rivet Eyelet rivet for mounting cone—Package of 100	.50
2976	Knob—Volume control or Regeneration control knob Package of 5	1.50
2977	Knob Station selector knob—Package of 5	2.50
2978	Screw assembly—Loudspeaker mounting screw assembly comprising four screws, four washers, four lock washers, eight nuts and four eyelets	.60
2981	Capacitor—320 Mmfd. detector plate R.F. by-pass capacitor	.50
3006	Capacitor .001 Mfd.—Used across low frequency tickler coil	.50
3007	Wrench—Special wrench for R.F. line-up condenser adjustments	1.00

Part No.	DESCRIPTION	List Price
3066	Resistor—12,000 Ohms—Carbon type—Package of 5	$2.50
3067	Variable Resistor — Regeneration Control Variable Resistor complete with mounting washer and nut	1.50
5817	Resistor—20,000 Ohms—Carbon type	.90
7054	Cord—Power cord complete with male connector plug	1.00
7229	Socket—Five prong Radiotron socket complete with insulating shield 3 used—Package of 2	.50
7230	Socket—Four prong Radiotron socket complete with insulating shield—1 used—Package of 2	.50
7231	Capacitor—Filter and by-pass capacitor pack—Comprising one 0.05 mfd., two 0.5 mfd., two 0.25 mfd. and one 2.0 mfd. condensers	2.50
7232	Capacitor—2 gang variable tuning capacitor	5.00
7234	Transformer—Output transformer—With fibre terminal board	1.50
7236	Cone—Reproducer cone complete with voice coil and paper ring	1.50
8669	Transformer—Power transformer—105–125 volt, 50–60 cycle—Complete with mounting washers and nuts	6.00
8670	Transformer—Power transformer—105–125 volt, 25–40 cycle—Complete with mounting washers and nuts	9.00
8671	Transformer—Power transformer—220 volts, 50–60 cycles—Complete with mounting washers and nuts	8.00
10434	Resistor—Mid-tapped filament resistor—Used on early models only	.50
	SPECIAL PARTS SUPPLIED ON ORDER ONLY (Not to be stocked)	
2979	Board—Baffle board complete with grille cloth	.75
2980	Escutcheon—Station selector escutcheon complete with mounting screws	.75
3068	Board—Resistor mounting board—Less all resistors, capacitors and coils	1.00
7235	Coil—Field coil complete with bracket and cone ring	2.00
9321	Cabinet—Cabinet complete—Less all equipment	7.25
9339	Chassis—Receiver chassis complete—Less reproducer unit, knobs and Radiotrons	27.50
9340	Reproducer unit—Reproducer unit complete	4.75

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SUPERETTE MODEL R-7A (AC)

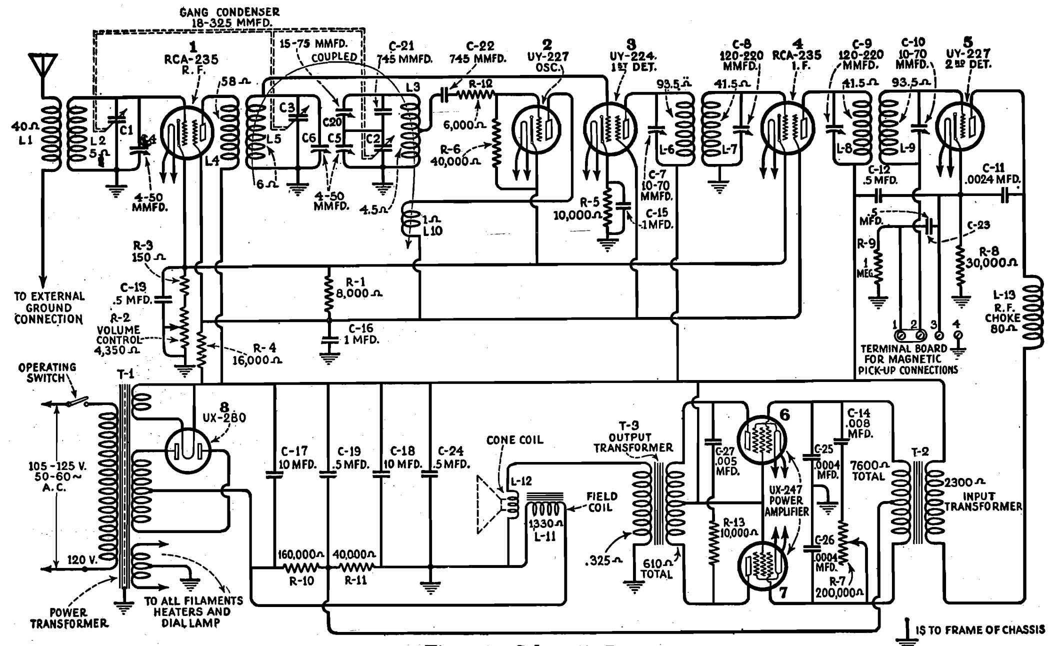

Figure 1—Schematic Diagram

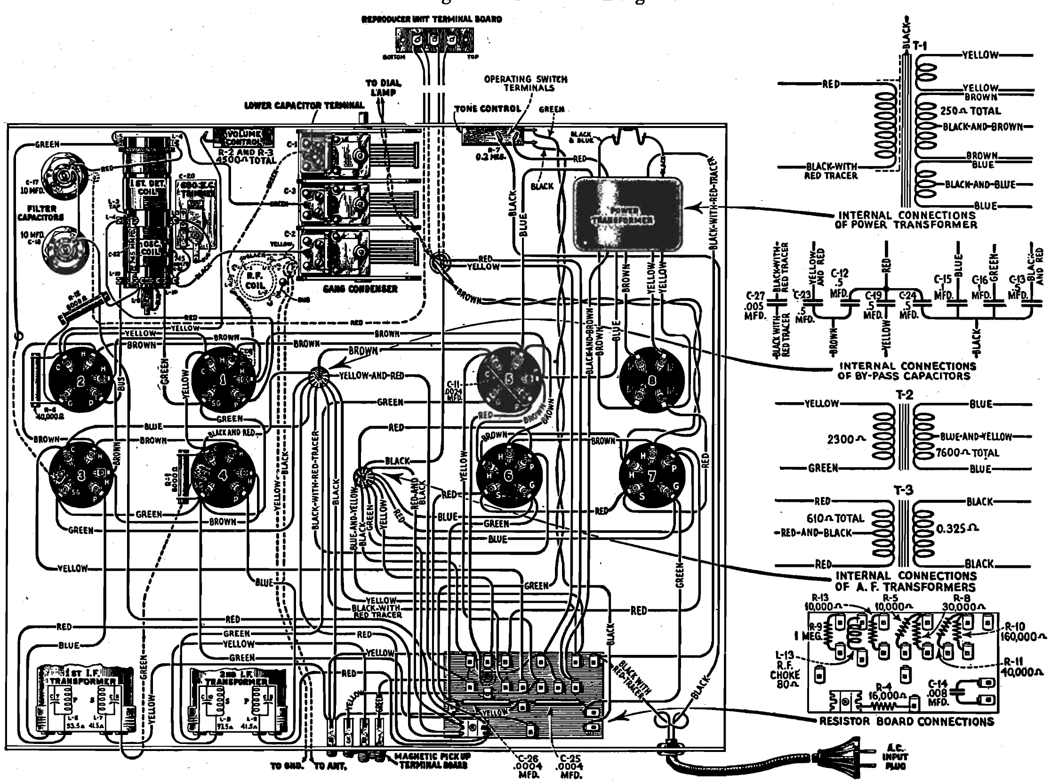

Figure 2—Wiring Diagram

RADIOTRON SOCKET VOLTAGES—110 VOLT A. C. LINE

Radiotron No.	Cathode to Heater Volts D. C.	Cathode or Filament to Control Grid Volts D. C.	Cathode to Screen Grid Volts D. C.	Cathode or Filament to Plate Volts D.C.	Plate Current M. A.	Heater or Filament Volts A. C.	Radiotron No.	Cathode to Heater Volts D. C.	Cathode or Filament to Control Grid Volts D. C.	Cathode to Screen Grid Volts D. C.	Cathode or Filament to Plate Volts D.C.	Plate Current M. A.	Heater or Filament Volts A. C.
VOLUME CONTROL AT MINIMUM							VOLUME CONTROL AT MAXIMUM						
1	38	35	50	200	.0	2.2	1	2.0	2.5	60	235	3.5	2.2
2	38	0	—	50	3.5	2.2	2	2.0	.0	—	50	4.5	2.2
3	7	6	80	235	0.5	2.2	3	4.0	4.0	55	230	0.5	2.2
4	38	35	50	200	.0	2.2	4	2.0	2.5	58	235	3.5	2.2
5	22	8	—	210	0.7	2.2	5	22	8	—	210	0.7	2.2
6	—	12	225	220	30	2.2	6	—	12	225	220	30	2.2
7	—	12	225	220	30	2.2	7	—	12	225	220	30	2.2

R. C. A. VICTOR CO., Inc.

SUPERETTE MODEL R-7A (AC)

The RCA Victor Superette R-7A is an eight tube screen grid Super-Heterodyne similar to the R-7 with the exception that the new Pentode Radiotrons, RCA-247 are used in the push-pull output stage instead of Radiotrons UX-245. Use of these tubes, with their associated circuits, results in greater sensitivity, greater power and better tone quality.

Referring to Figure 1, the schematic circuit diagram, the audio circuit functions in the following manner:

The output of the detector is coupled to the grids of the Radiotrons RCA-247 through an audio transformer. Shunted across the secondary of this transformer are two 0.0004 mfd. condensers, connected in series with the center connection grounded. The purpose of these two condensers is to prevent any audio oscillation and to provide a high frequency cut-off for the stage. Also across the secondary of the input transformer is shunted the resistor and capacitor that constitutes the tone control. This is a 200,000 ohm variable resistor and a 0.008 mfd. condenser connected in series. The tone control functions to reduce the high frequency output as the resistance is decreased. At the extreme low position, the condenser and secondary of the A. F. transformer resonates at a low frequency and thereby accentuates the bass response. A 0.005 mfd. condenser connected in series with a 10,000 ohm resistor is placed across the primary of the output transformer. This functions to reduce the third harmonic distortion, an inherent characteristic of the Pentode tube. The bias voltage for Radiotrons RCA-247 is obtained by using a portion of the drop across the reproducer field. One 160,000 ohm and one 40,000 ohm resistor act as voltage dividers.

SERVICE DATA

Figure 1 shows the schematic diagram and Figure 2 the wiring diagram. The voltage readings are shown on the reverse side and the replacement parts below.

Reference to the RCA Victor Radiola Superette Service Notes should be used for service data applying to the R. F., oscillator and I. F. stages as well as general service data on this type of receiver.

REPLACEMENT PARTS

Part No.	DESCRIPTION	List Price
2563	Resistor—6,000 ohms—Carbon type—Package of 5	$3.00
2734	Capacitor—745 mmfd.—Package of 5	2.20
2745	Screw—Adjusting condenser screw—Package of 10	.50
2746	Socket—Dial lamp socket	.50
2747	Cap—Grid connector cap—Package of 5	.50
2749	Capacitor—2400 mmfd.	1.50
2875	Knob—Tuning, volume control or tone control knob —Package of 5	1.50
28 1	Bracket—Dial lamp bracket—Package of 5	.50
2882	Socket—UY Radiotron socket—7 used	.50
2957	Capacitor—10 mfd. electrolytic capacitor	3.00
2963	Resistor—8,000 ohm carbon type—Package of 5	2.50
2968	Socket—UX Radiotron socket—1 used	.50
2973	Board—Magnetic pickup terminal board	.50
2991	Transformer—First intermediate transformer	3.00
2992	Transformer—Second intermediate transformer	3.00
2994	Coil—Second detector plate coil complete with mounting rivet	.60
2995	Volume control—Complete less knob—Package of 5	6.00
2997	Coil—R. F. coil—Complete with mounting washers and nuts	1.90
2998	Coil—Detector and oscillator coil—Complete with mounting washers and nuts	2.40
2999	Drive shaft—Dial drive shaft with mounting screws and washers	.50
3000	Scale—Dial scale and drum with set screws	.60
3003	Cushion—Sponge rubber chassis support cushions—One set of 4	.50
3005	Screw assembly—Speaker mounting screw assembly—Comprising one set of 4 screws, 4 eyelets, 4 nuts and 4 washers	.50
3020	Escutcheon—Station selector escutcheon complete with 4 mounting screws	.60
3036	Shield—Radiotron shield—3 used—Package of 2	.50
3060	Resistor—40,000 ohm—Carbon type—Package of 5	2.50
3062	Board—Loudspeaker terminal board—Package of 3	$0.50
3076	Resistor—1 megohm—Carbon type—Package of 5	2.50
3077	Resistor—30,000 ohm—Carbon type—Package of 5	2.50
3078	Resistor—10,000 ohm—Carbon type—Package of 5	2.50
3079	Resistor—40,000 ohm—Carbon type—Package of 5	2.50
3080	Resistor—160,000 ohm—Carbon type—Package of 5	2.50
3081	Resistor—16,000 ohm—Carbon type	.60
3082	Board—Resistor board—Less resistors, coil and capacitor	1.00
3083	Tone control and switch—Tone control and operating switch—Complete less knob	1.60
3084	Capacitor—0.008 mfd.—For tone control	.70
3085	Capacitor—400 mmfd.	.60
7054	Cord—Power cord	1.00
7062	Capacitor-Adjustable oscillator trimming capacitor	1.00
7241	Capacitor—3 gang tuning capacitor	8.00
7242	Board—Baffle board and grille cloth	1.00
7255	Transformer—Interstage audio transformer	4.50
7256	Capacitor pack—By-pass capacitor pack	3.50
8559	Ring—Cone retaining ring	.80
8570	Shield—Intermediate transformer shield	.60
8601	Cone—Cone with voice coil—Package of 5	15.00
8653	Coil—Speaker field coil, core and cone support	5.00
8654	Transformer—Power transformer—220 volt, 50-60 cycle	11.00
8679	Transformer—Power transformer—105-125 volt, 50-60 cycle	9.00
8680	Transformer—Power transformer—105-125 volt, 25-40 cycle	12.00
9323	Speaker—Loudspeaker complete	8.70
9351	Receiver—Receiver assembly- 105-125 volt, 50-60 cycle	40.00
9353	Cabinet—Completewith grille cloth and baffle board	15.00

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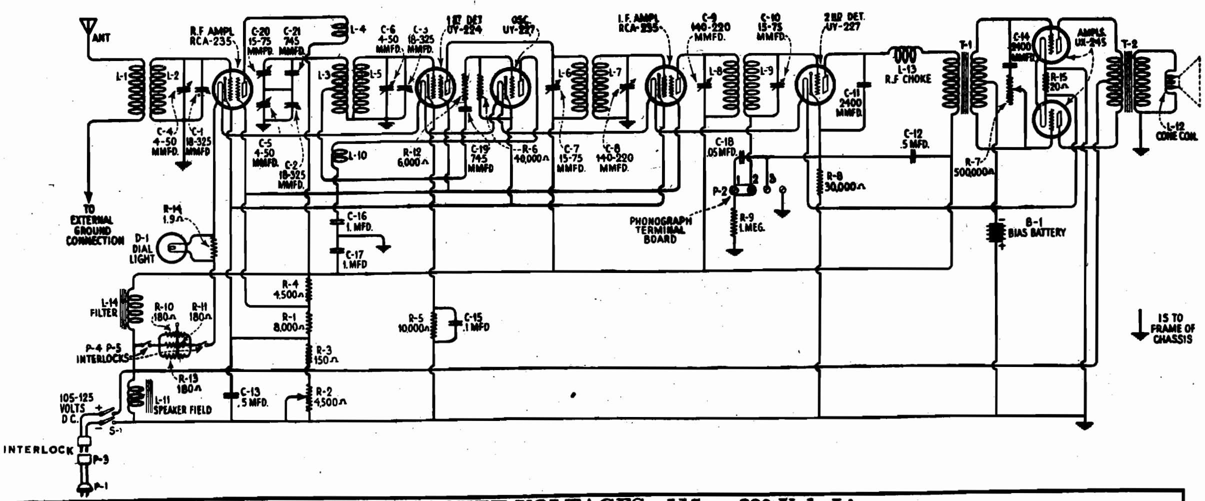
Radiola Division



RADIOTRON SOCKET VOLTAGES—115 or 230 Volt Line
(Separate Resistance Unit Used with 230 Volt Line)

Tube No.	Cathode to Heater Volts, D.C.	Cathode or Filament to Control Grid Volts, D.C.	Cathode to Screen Grid Volts, D.C.	Cathode or Filament to Plate Volts, D.C.	Plate Current M. A.	Screen Grid Current M. A.	Heater or Filament Volts, A.C.
VOLUME CONTROL AT MINIMUM							
1	40	30	40	75	0	0	2.3
2	20	0	—	40	2.0	—	2.3
3	6.0	3.5	65	100	.25		2.3
4	17.0	26	40	75	.0	0	2.3
5	2.0	*2.0	—	90	.23	—	2.3
6	—	25.0	—	100	4.0	—	2.3
7	—	*25.0	—	100	4.0	—	2.3
VOLUME CONTROL AT MAXIMUM							
1	10.0	2.0	50	100	3.5	**0.5	2.3
2	6.0	.0		50	3.0	—	2.3
3	8.0	5.0	50	100	0.5	.0	2.3
4	10.0	2.0	50	100	2.5	**1.0	2.3
5	2.0	*2.0	—	90	.25	0	2.3
6	—	*25.0	—	100	4.0	—	2.3
7	—	*25.0	—	100	4.0	—	2.3

* Not true reading due to Resistance in circuit

** This may be plus or minus depending on age of tubes

The RCA Victor Superette, R-7 D.C. and the Console, R-9 D.C. are similar to the A.C. Models with the exception that the necessary changes for D.C. operation have been made. The Service Notes on the A.C. Models, therefore, apply to the D.C. Models with the exception of voltage readings and circuit diagrams.

Provision for operation at 220 volts is made by the use of a separate resistance unit which drops the voltage to 110. This unit should be located in a place that is well ventilated and it should not come in contact with any wood or cloth material other than that upon which it is resting.

An interlock is provided on the cabinet back so that access to the parts cannot be made without opening the power supply. However, when service work is being performed, it may be necessary to run jumpers from the back to the connection block so that operation of the receiver may be secured. *Never make these interlocks inoperative except under these conditions.* They are designed for protection of the customer.

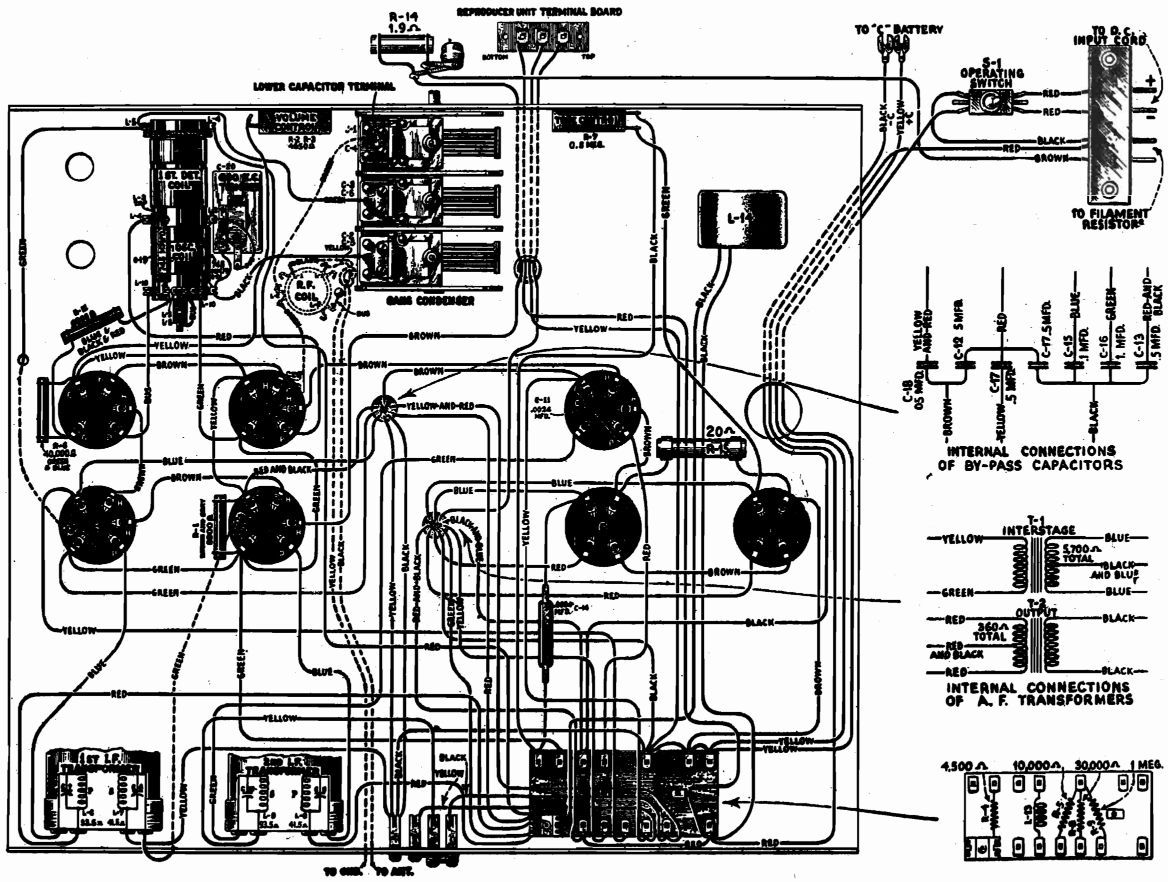
SPECIAL PARTS FOR R-9 D.C.		
3070	Bolts—Speaker mounting bolts, nuts and washers—Package of 2	.50
7222	Foot	.50
8664	Control panel	7.50
8665	Board—Baffle board complete with grille cloth	1.00
9329	Stretcher	4.50
9331	Top	3.25
9332	Post—Front post R. H.	2.50
9333	Post—Back post R. H.	2.50
9334	Post—Front post L. H.	2.50
9335	Post—Back post L. H.	2.50
9350	Cabinet—R-9 D.C. cabinet complete—Less all equipment	55.00
9357	Door—Rear cabinet door	5.00

SPECIAL PARTS FOR R-7 D.C.		
7242	Cloth—Grille cloth complete with baffle board	1.00
9322	Panel—R-7 D.C. back panel—Less resistors and power cord	2.00
9325	Cabinet—R-7 cabinet—Walnut—Less back panel	15.00

RCA Victor R-7 D.C. and R-9 D.C.

R. C. A. - VICTOR CO., Inc.
Radiola Division

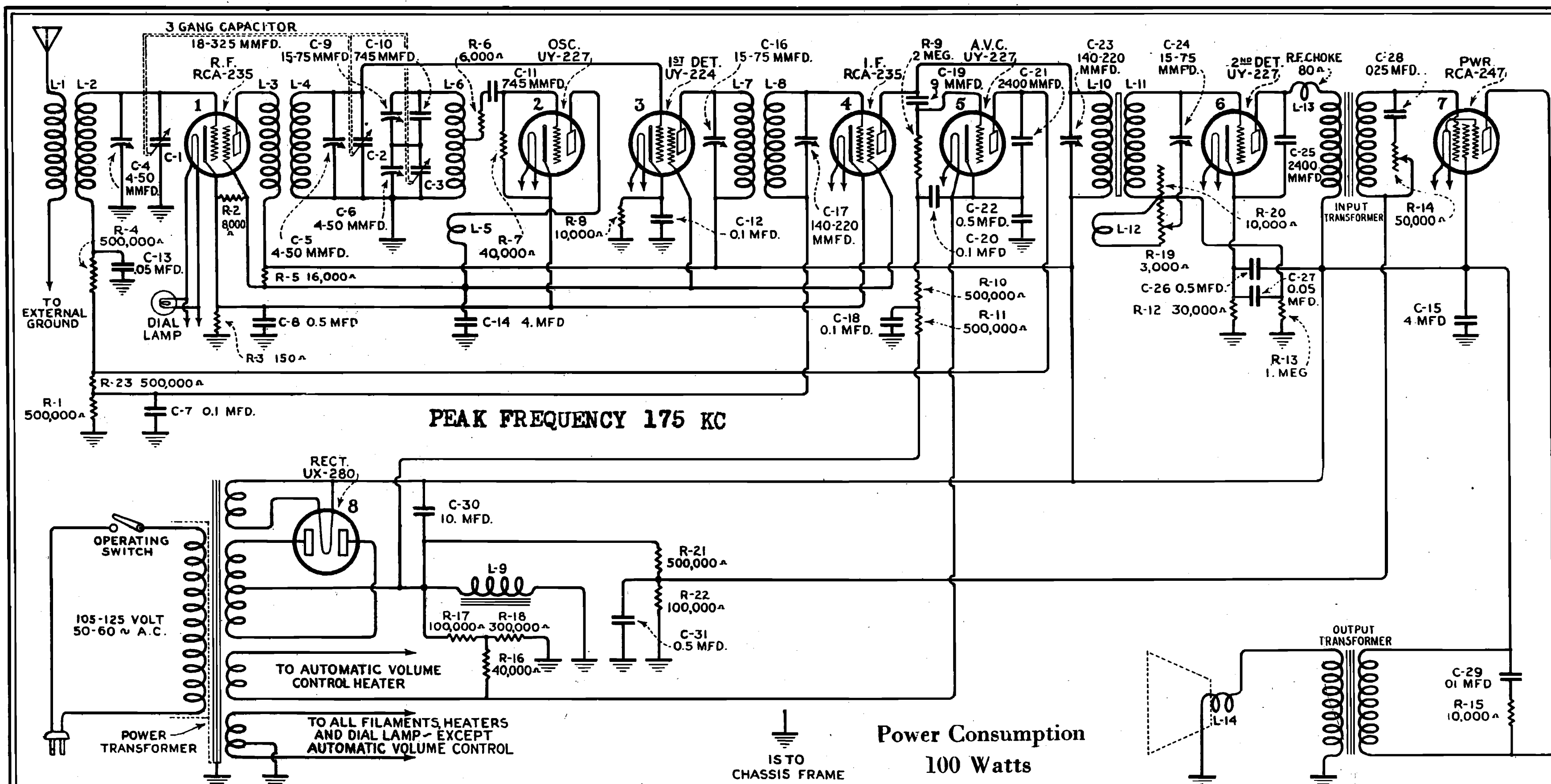
RCA Victor R-7 D.C. or R-9 D.C.



Part No.	DESCRIPTION	List Price
	PARTS COMMON TO R-7 D.C. AND R-9 D.C.	
2240	Resistor—30,000 Ohms—Carbon type	$0.70
2546	Resistor—1 Megohm—Carbon type—Package of 5	3.00
2731	Resistor—10,000 Ohms—Carbon type—Package of 5	2.00
2746	Socket—Dial lamp socket	.50
2749	Capacitor—2,400 Mmfd.—Used as 2nd Detector R.F. by-pass capacitor	1.50
2875	Knob—Station Selector, Tone Control or Volume Control Knob—Package of 5	1.50
2881	Bracket—Dial lamp bracket—Package of 5	.50
2882	Socket—Five prong Radiotron Socket complete with insulating shield—Five used	.50
2946	Escutcheon—Station Selector Escutcheon	.60
2968	Socket—Four prong Radiotron Socket complete with insulating shield—Two used	.50
2973	Board—Magnetic Pickup terminal board complete with terminals and screws—Package of 2	.50
2990	Resistor—4,500 ohms—Carbon type—Package of 5	2.50
2991	Transformer—1st I. F. Transformer complete with shield and mounting screws	3.00
2992	Transformer—2nd I. F. Transformer complete with shield and mounting screws	3.00
2993	Board—Resistor mounting board complete with terminals and mounting brackets—less resistors	1.00
2994	Coil—2nd Detector R.F. Choke Coil complete with rivet	.60
2995	Volume Control—complete less knob—Package of 5	6.00
2996	Tone Control—Complete less knob—Package of 5	6.00
2997	Coil—R.F. coil complete with mounting washer and nut	1.90
2998	Coil—1st Detector and Oscillator Coil assembly complete with mounting washers and nuts	2.40
2999	Shaft—Dial Scale drive shaft complete with mounting screws and lock washers	.50
3000	Scale—Dial drum and scale complete with set screws	.60
3001	Resistor—1.9 Ohms—Porcelain resistor used in parallel with dial lamp	.60
3002	Resistor—20 Ohms—Porcelain resistor used across UX-245 filaments	.60
3003	Cushion—Sponge Rubber Cushions—Package of 4	.50
3004	Resistor—Porcelain type—180 Ohms—used as heater supply resistor—Three used	1.80
3005	Screw Assembly—Loudspeaker Screws, Nuts, Eyelets and Washers—Package of 1 set of four each (for R-7)	$ .50
3045	Resistor—40,000 ohms—Carbon type—Package of 5	2.50
3071	Plug—Male and Female power plug—used as interlock—Set of 2 Complete plugs	1.60
3072	Resistor Unit—Resistor Unit complete for use on 220 volt D.C. lines	19.00
3073	Switch—Operating switch	.80
7054	Cord—Power Cord and Plug	1.00
7062	Condenser—Adjustable Oscillator trimming condenser	1.00
7238	Capacitor Pack—R.F. by-pass capacitor pack in metal container	3.50
7239	Transformer—A.F. transformer assembly in metal container	6.00
7240	Reactor—Filter reactor	5.50
7241	Condenser—3-gang tuning condenser complete with mounting washers and screws	8.00
8559	Ring—Cone retaining ring	.80
8601	Cone—Cone complete—Package of 5	15.00
8639	Coil—Loudspeaker field coil complete with cone support	5.00
9323	Loudspeaker—Loudspeaker unit complete	8.70
9338	Receiver Assembly—Receiver Assembly complete—less loudspeaker and Radiotrons	40.00

R. C. A. VICTOR CO., Inc.

MODELS R-8 & R-12 AC



Power Consumption
100 Watts

S. O. 8733 20M—1 14-'32

120 VOLT LINE — VOLUME CONTROL DOES NOT AFFECT VOLTAGES

Radiotron No.	Cathode to Heater Volts, D. C.	Cathode or Filament 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.	Screen Current M. A.	Heater or Filament Volts, A. C.
1. R. F.	4.0	0.5	70	260	4.0	0.5	2.66
2. Osc.	4.0	0	—	65	6.0	—	2.66
3. 1st Det.	7.0	6.0	70	260	0.75	0.1	2.66
4. I. F.	4.0	4.0	70	260	4.0	0.5	2.66
5. 2nd Det.	28.0	10.0	—	250	1.0	-	2.66
6. A. V. C.	0	0	—	25	0	—	2.66
7. Power	—	10.0	290	280	35.0	—	2.66

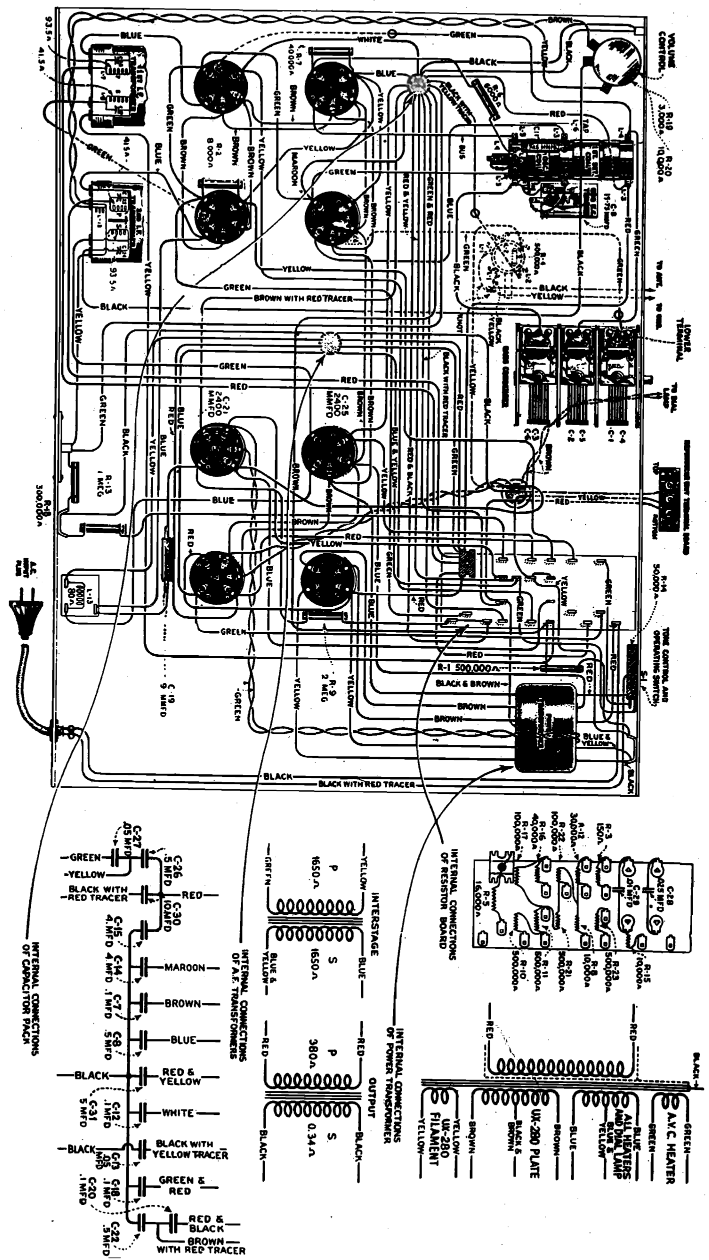
RCA Victor Models R-8 and R-12 are eight tube Super-heterodyne radio receivers incorporating such features as Super-Control, Screen Grid Radiotrons, Automatic Volume Control, Pentode output tube and the inherent sensitivity, selectivity and tone quality of the RCA Victor Super-Heterodyne.

Model R-8 is a table type receiver and the R-12 is of the Console type. Except for the Dial Scale, both models use the same chassis, which is also identical with that of the R-10.

A reference to the Service Notes already published on the R-11 and R-7 will give details of any service information required on these receivers.

MODELS R-8 & R-12 AC

R. C. A. - VICTOR CO., Inc.



Stock No.	DESCRIPTION	List Price
	RECEIVER PARTS COMMON TO R-8 AND R-12	
2563	Resistor—6,000 ohms—Carbon type—1 watt—Package of 5	$3.00
2734	Capacitor—745 mmfd.—Package of 5	2.20
2746	Socket—Dial lamp socket	.50
2747	Cap—Grid contactor cap—Package of 5	.50
2749	Capacitor—2400 mmfd.	1.50
2882	Socket—UY Radiotron socket complete with insulation strip—7 used	.50
2963	Resistor—8,000 ohms—Carbon type—1 watt—Package of 5	2.50
2968	Socket—UX Radiotron socket complete with insulation strip—1 used	.50
2970	Resistor—500,000 ohms—Carbon type—1 watt—Package of 5	2.50
3003	Cushion—Sponge rubber cushion—Package of 4	.50
3024	Capacitor—9 mmfd.—Package of 2	.50
3045	Resistor—40,000 ohms—Carbon type—1 watt—Package of 5	2.50
3048	Resistor—500,000 ohms—Carbon type—½ watt—Package of 5	2.50
3049	Resistor—150 ohms—Carbon type—½ watt—Package of 5	2.50
3056	Shield—Radiotron shield—4 used—Package of 2	.50
3076	Resistor—1 megohm—Carbon type—½ watt—Package of 5	2.50
3077	Resistor—30,000 ohms—Carbon type—½ watt—Package of 5	2.50
3078	Resistor—10,000 ohms—Carbon type—½ watt—Package of 5	2.50
3079	Resistor—40,000 ohms—Carbon type—½ watt—Package of 5	2.50
3081	Resistor—16,000 ohms—Carbon type—3 watt	.60
3092	Volume control—Volume control complete with mounting nut	1.50
3095	Coil—R. F. coil—Complete with mounting bracket	1.90
3137	Knob—Tuning control, volume control and tone control knob—Package of 5	3.25
3234	Tone control—Tone control complete with mounting nut	1.90
3235	Coil—First detector and oscillator coil	2.85
3251	Coil—R. F. choke coil	.90
6185	Resistor—100,000 ohms—Carbon type—½ watt—Package of 5	2.00
6186	Resistor—500,000 ohms—Carbon type—¼ watt—Package of 5	2.00
6187	Resistor—300,000 ohms—Carbon type—½ watt—Package of 5	2.00
6188	Resistor—2 megohm—Carbon type—½ watt—Package of 5	2.00
7054	Cord—Power cord	1.00
7062	Capacitor—Adjustable capacitor—15–70 mmfd.	1.00
7298	Capacitor—0.01 mfd.	.80
7340	Transformer—First intermediate transformer	3.00
7341	Transformer—Second intermediate transformer	3.00
7342	Capacitor—Comprising two 0.05 mfd., four 0.5 mfd., one 10.0 mfd., two 4.0 mfd. and four 0.1 mfd. capacitor in metal container	7.85
7343	Transformer—Audio transformer	$3.85
7344	Transformer—Power transformer	8.00
7348	Board—Resistor board complete less resistors and capacitors	2.30
7362	Capacitor—0.025 mfd.	1.00
8770	Transformer—Power transformer—105–125 volts, 25–40 cycles	12.00
8771	Transformer—Power transformer—220 volts, 60 cycles	9.00
8837	Support—Receiver chassis metal mounting bracket—Package of 4	.70
	RECEIVER PARTS SPECIAL TO R-8	
2999	Shaft—Tuning condenser drive shaft complete	.50
3029	Bracket—Dial lamp bracket and indicator	.50
3097	Scale—Dial drum and scale with set screws—Package of 2	.50
7241	Capacitor—3 gang tuning capacitor	8.00
	RECEIVER PARTS SPECIAL TO R-12	
6189	Bracket—Dial lamp bracket and indicator—Pkg. of 2	.65
6190	Shaft—Tuning condenser drive shaft complete with 3 washers—Package of 5	.85
6191	Cord—Tuning condenser drive cord—Package of 5	.55
6192	Spring—Tuning condenser drive cord tension spring—Package of 10	.50
7438	Capacitor—Variable tuning capacitor	5.20
7439	Drum—Dial drum with set screw	.50
7440	Scale—Dial and dial scale	.75
	LOUDSPEAKER	
6174	Screw assembly—Speaker mounting screw assembly—Comprising 4 screws, 8 nuts, 4 washers and 4 eyelets—Package of 1 set—For R-8	.50
3237	Screw assembly—Speaker mounting screw assembly—comprising 4 screws, 8 nuts, 4 washers and 4 eyelets—Package of 1 set—For R-12	.50
6184	Board—Terminal board complete with 3 terminals and mounting rivets—Package of 5	.50
7345	Coil—Speaker field coil assembly—Comprising coil, cone housing and magnet	5.00
8559	Ring—Cone retaining ring	.80
8601	Cone—Speaker paper cone—Package of 5	15.00
	R-8 CABINET PARTS	
X-32	Baffle board and grille cloth	.90
6113	Foot—Cabinet felt foot—Package of 15	.50
7435	Escutcheon—Tuning dial escutcheon complete with mounting screws	.90
9402	Cabinet—Cabinet complete less equipment	16.00
	R-12 CABINET PARTS	
X-44	Top	4.65
X-45	Leg	2.00
X-46	Foot	1.10
X-47	Stretcher	4.50
X-48	Baffle board and grille cloth	.95
X-49	Mouldings—Control panel mouldings—Comprising 1 bottom moulding, 4 vertical mouldings, 1 top moulding and 2 center ornaments—Package of 1 set	3.95
7441	Escutcheon—Tuning dial escutcheon complete with mounting screws	1.05
9405	Cabinet—Cabinet complete less equipment	47.50

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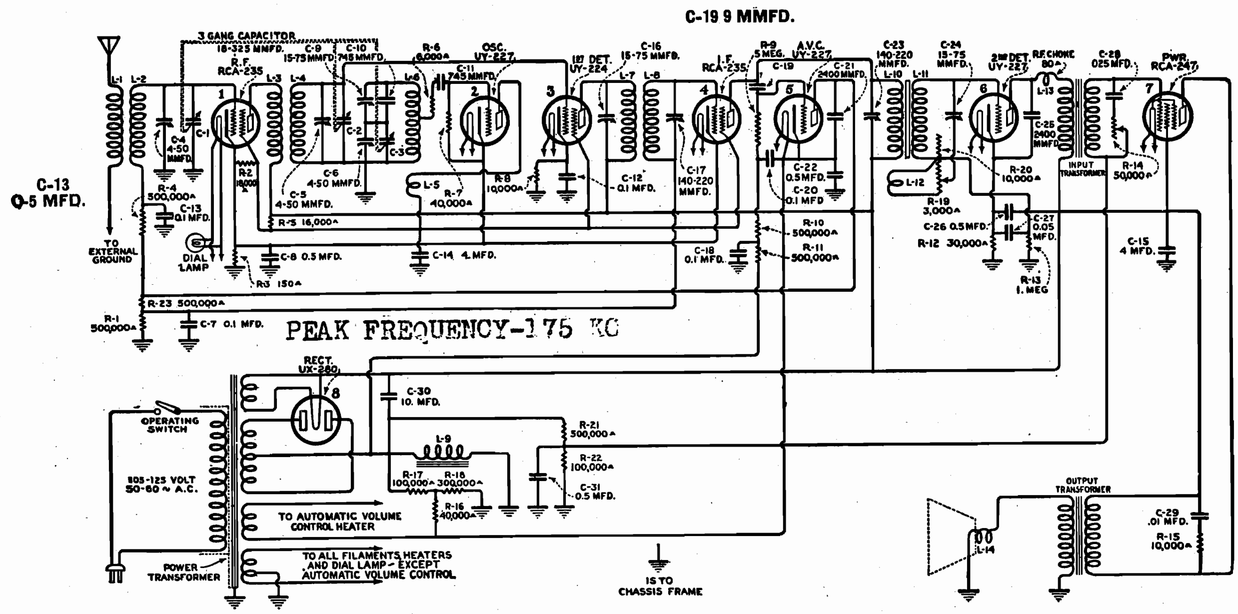
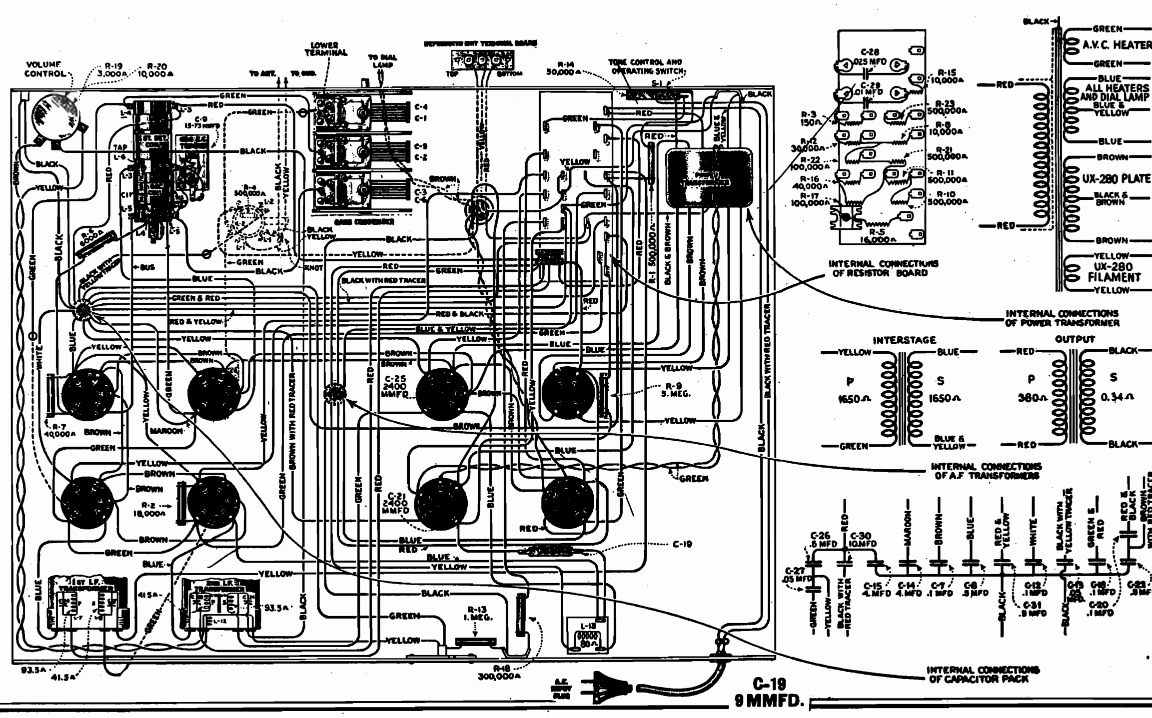


RCA Victor Console R-10 is an eight tube, automatic volume control, Pentode output Super-Heterodyne radio receiver. Features of this instrument are, screen grid super-heterodyne, quiet automatic volume control, single Pentode output tube, and the inherent sensitivity, selectivity and tone quality of the Super-Heterodyne circuit

A reference to the Service Notes on the R-11 will give the details of making R. F. oscillator and I. F. adjustments. Other Service information on this type of receiver is contained in the Service Notes on the RCA Victor Superette R-7.



Console, R-10

R. C. A. VICTOR CO., Inc.

Console, R-10

RADIOTRON SOCKET VOLTAGES

110 VOLT A. C. LINE

(Volume Control Setting Does Not Affect Voltages)

Radiotron No.	Cathode to Heater Volts, D. C.	Cathode or Filament 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.	Screen Current M. A.	Heater or Filament Volts, A. C.
1	2	*0.1	75	210	5.0	0.5	2.2
2	8	0	—	60	5.0	—	2.2
3	7	7.0	70	205	0.5	0.1	2.2
4	2	*0.1	75	210	5.0	0.5	2.2
5	0	0	—	30	0	—	2.2
6	20	*8.0	—	185	0.5	—	2.2
7	—	10	210	210	25	—	2.2

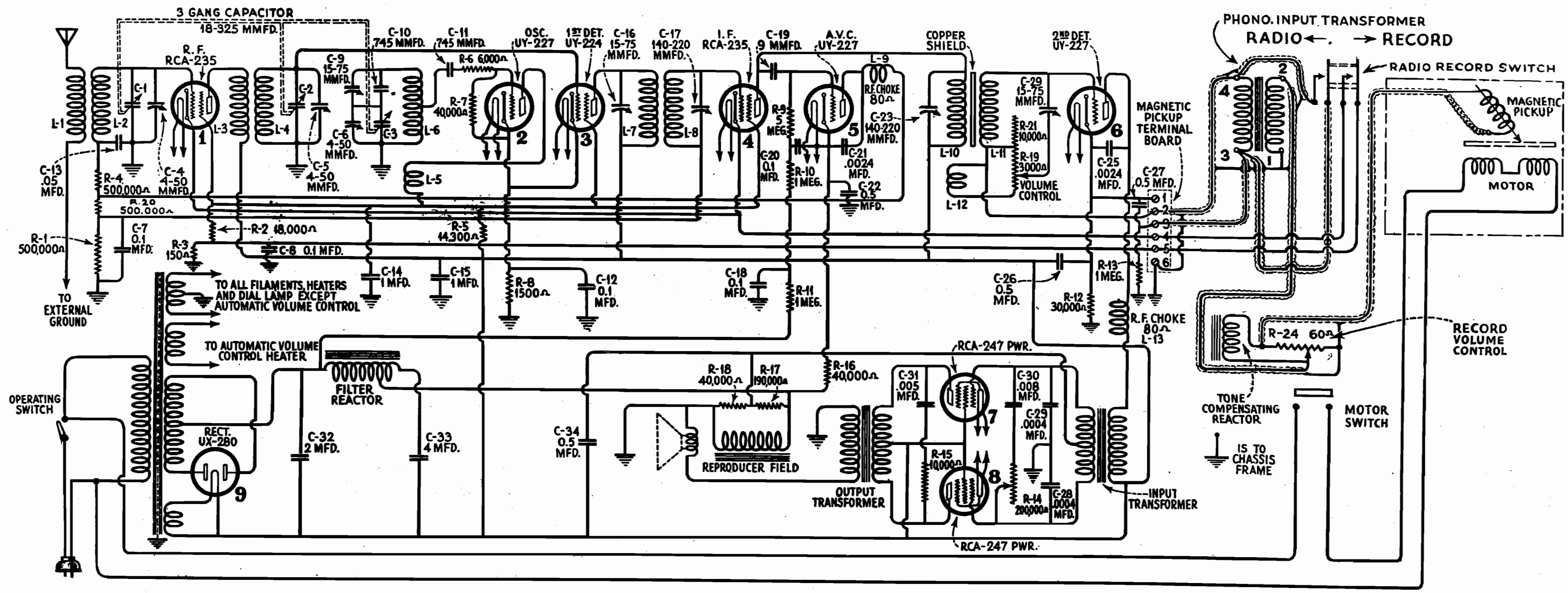
*Not true reading due to resistance in circuit.

REPLACEMENT PARTS

Stock No.	DESCRIPTION	List Price
	RECEIVER	
2563	Resistor—6,000 Ohms—Carbon type—Package of 5	$3.00
2730	Resistor—18,000 Ohms—Carbon type—Package of 5	2.00
2734	Capacitor—745 Mmfd.—Package of 5	2.20
2746	Socket—Tuning dial lamp socket	.50
2747	Caps—Grid connector caps—Package of 5	.50
2749	Capacitor—2400 Mmfd.	1.50
2875	Knobs—Volume control, tone control and tuning dial control knob—Package of 5	1.50
2882	Socket—Radiotron socket with insulator—7 used	.50
2968	Socket—Radiotron socket with insulator—1 used	.50
2999	Shaft—Tuning dial drive shaft	.50
3003	Cushions—Receiver chassis rubber cushions—Package of 4	.50
3024	Capacitor—9 Mmfd.—Package of 2	.50
3029	Bracket—Dial lamp bracket and indicator	.50
3045	Resistor—40,000 Ohms—1 Watt—Carbon type—Package of 5	2.50
3048	Resistor—500,000 Ohms—Carbon type—Package of 5	2.50
3049	Resistor—150 Ohms—Carbon type—Package of 5	2.50
3051	Resistor—5 Megohms—Carbon type—Package of 5	2.00
3056	Shield—Radiotron tube shield—Package of 2	.50
3076	Resistor—1 Megohm—Carbon type—Package of 5	2.50
3077	Resistor—30,000 Ohms—Carbon type—Package of 5	2.50
3078	Resistor—10,000 Ohms—Carbon type—Package of 5	2.50
3079	Resistor—40,000 Ohms—½ Watt—Carbon type—Package of 5	2.50
3081	Resistor—16,000 Ohms—Carbon type	.60
3092	Control—Volume control complete with mounting nut	1.50
3095	Coil—R. F. Coil—Complete with mounting bracket	1.90
3097	Scale—Dial scale and drum with set screw—Package of 2	.50
3234	Tone Control—Tone control and operating switch complete with mounting nut	1.90
3235	Coil—Detector and oscillator coil	2.85
3236	Escutcheon—Tuning dial escutcheon with mounting screws	.75
3241	Resistor—300,000 Ohms—Carbon type—Package of 5	2.50
3251	Coil—Choke coil	.90
3252	Resistor—100,000 Ohms—Carbon type—Package of 5	$2.75
7054	Cord—Power cord	1.00
7062	Capacitor—Adjustable oscillator trimmer capacitor	1.00
7241	Capacitor—3 gang tuning capacitor	8.00
7298	Capacitor—0.01 Mfd	.80
7340	Transformer—1st intermediate transformer	3.00
7341	Transformer—2d intermediate transformer	3.00
7342	Capacitor—Comprising two 0.05 Mfd., four 0.5 Mfd., one 10.0 Mfd., two 4.0 Mfd. and four 0.1 Mfd. capacitors in metal container	7.85
7343	Transformer—Audio transformer	3.85
7344	Transformer—Power transformer—110 volts—60 cycles	8.00
7348	Board—Resistor board less resistors and capacitors	2.30
7362	Capacitor—0.025 Mfd	1.00
8770	Transformer—Power transformer—110 volts—25 cycles	12.00
8771	Transformer—Power transformer—220 volts—60 cycles	9.00
	REPRODUCER	
3237	Screw assembly—Speaker mounting screw assembly—Comprising four screws, four washers, four eyelets, four nuts—Package of 1 set	.50
7345	Coil assembly—Comprising field coil, cone bracket and magnet	5.00
8559	Ring—Cone retaining ring	.80
8601	Cone—Reproducer paper cone—Package of 5	15.00
	CABINET	
7346	Foot	.90
7347	Moulding—Front top rail end moulding R. H. or L. H.—Package of 2	1.30
8772	Leg	3.75
8773	Moulding—Front top moulding	1.95
8774	Board—Baffle board and grille cloth	1.05
8775	Stretcher	4.40
9392	Cabinet—Cabinet complete less equipment	44.65
9393	Top	7.00
9394	Panel—Control panel	5.65

R. C. A. - VICTOR CO., Inc.

PEAK FREQUENCY - 175 KC



RADIOLA ELECTROLA, RE-18 SUPERHETERODYNE

This is a combination radio and electrola incorporating a new type automatic volume control that is quiet between stations. The new motor - board equipment has a synchronous motor using the R. C. A. - Victor Inertia tone arm. The motor is fitted with a speed reducing gear that allows for the playing of both standard and Program Transcription Records.

In many respects this receiver is similar to the R. C. A. - Victor Model R-11 and methods similar to those used in servicing the R-11 can be applied to this Model, noting, of course, that there are some differences.

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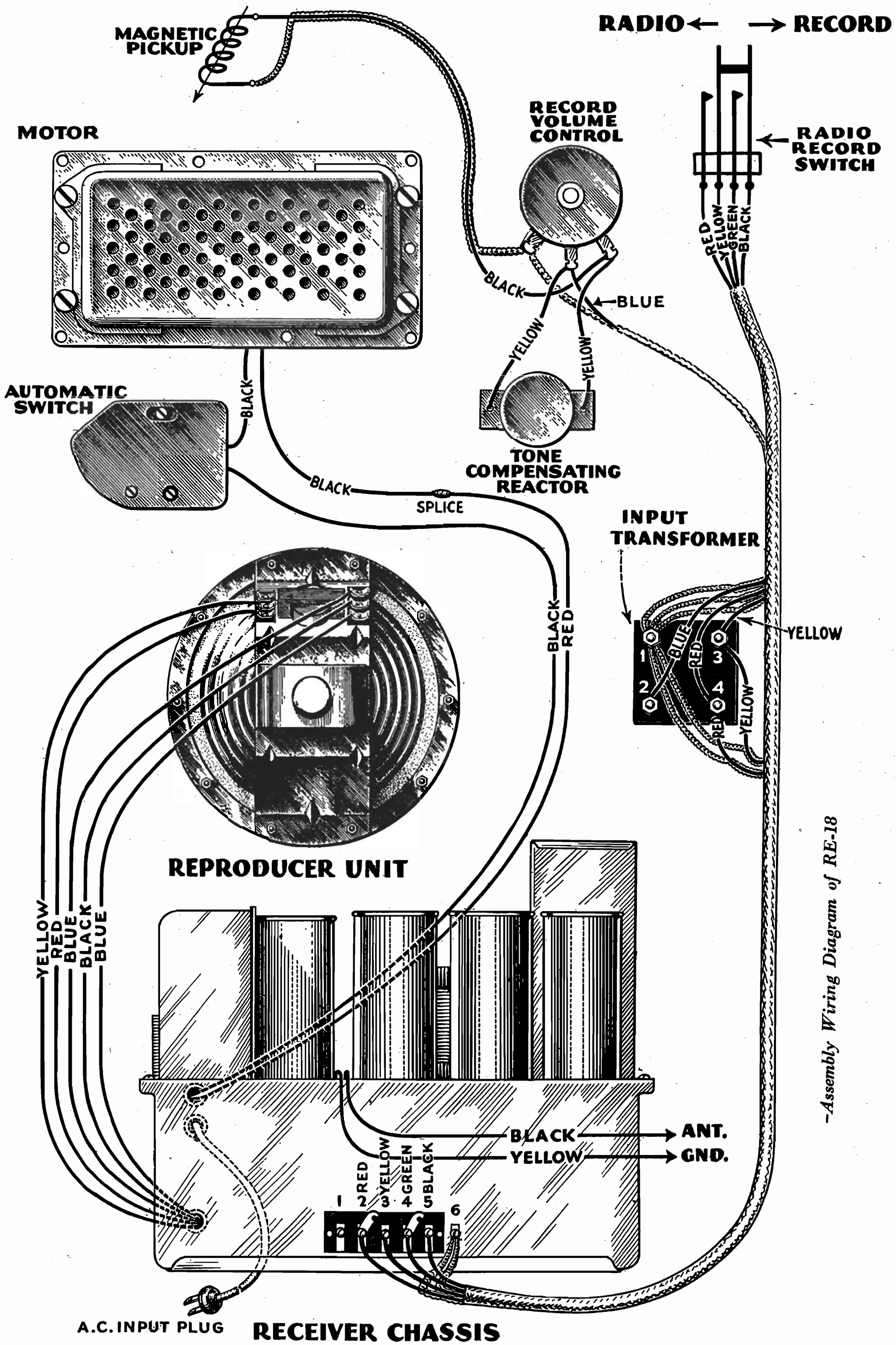

—Assembly Wiring Diagram of RE-18

RADIOLA ELECTROLA, RE-18 SUPERHETERODYNE

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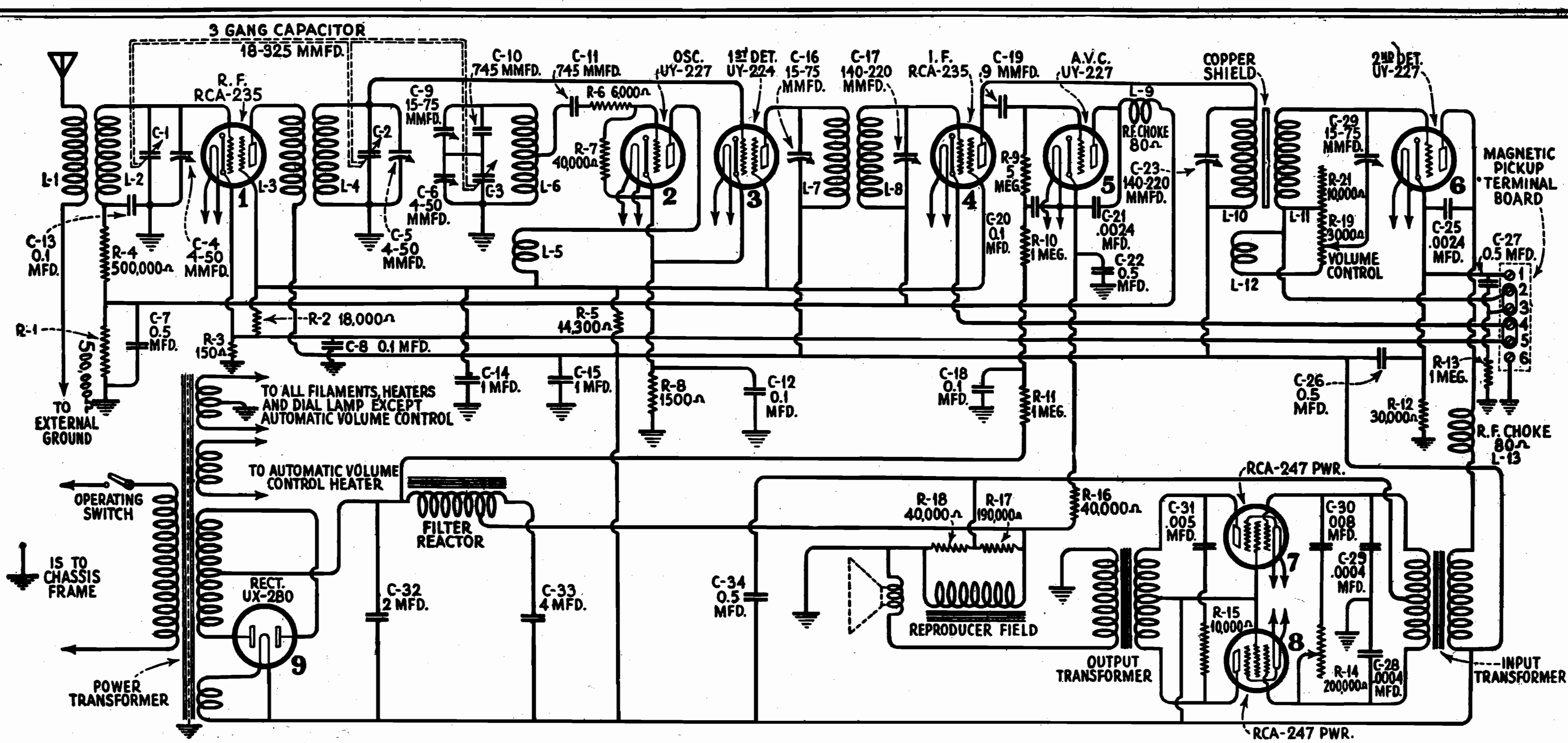
Radiola Division

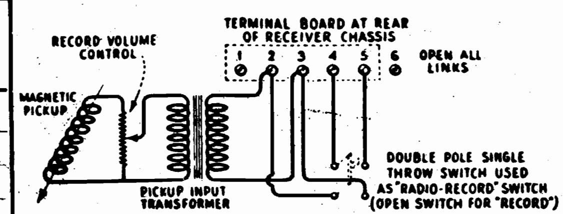


Peak Frequency = 175 KC

110 VOLT A. C. LINE (Volume Control Setting Does Not Affect Voltages)

Radiotron No.	Cathode to Heater Volts D. C.	Cathode or Filament 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.	Screen Current M. A.	Heater or Filament Volts, A. C.
1	2	*0.1	75	205	5.0	0.5	2.2
2	8	0	—	60	5.0	—	2.2
3	7	7.0	70	200	0.5	0.1	2.2
4	2	*0.1	75	205	5.0	0.5	2.2
5	0	0	—	25	0	—	2.2
6	20	*8.0	—	180	0.5	—	2.2
7	—	10	210	205	25	—	2.2
8	—	10	210	205	25	—	2.2

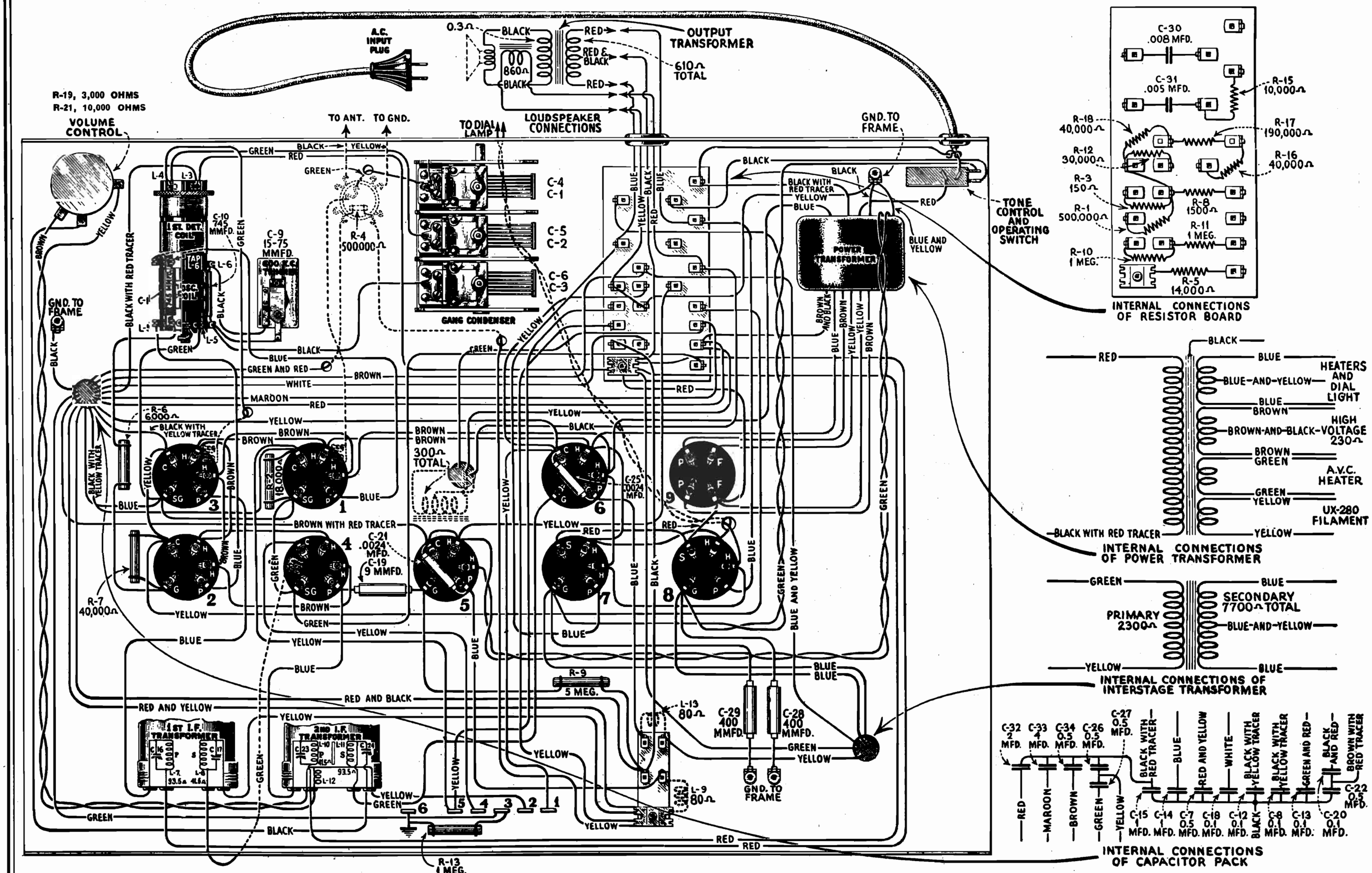
* Not true reading due to resistance in circuit.



Magnetic Pickup Connections

RCA Victor Console, R-11

R. C. A. - VICTOR CO., Inc.
Radiola Division

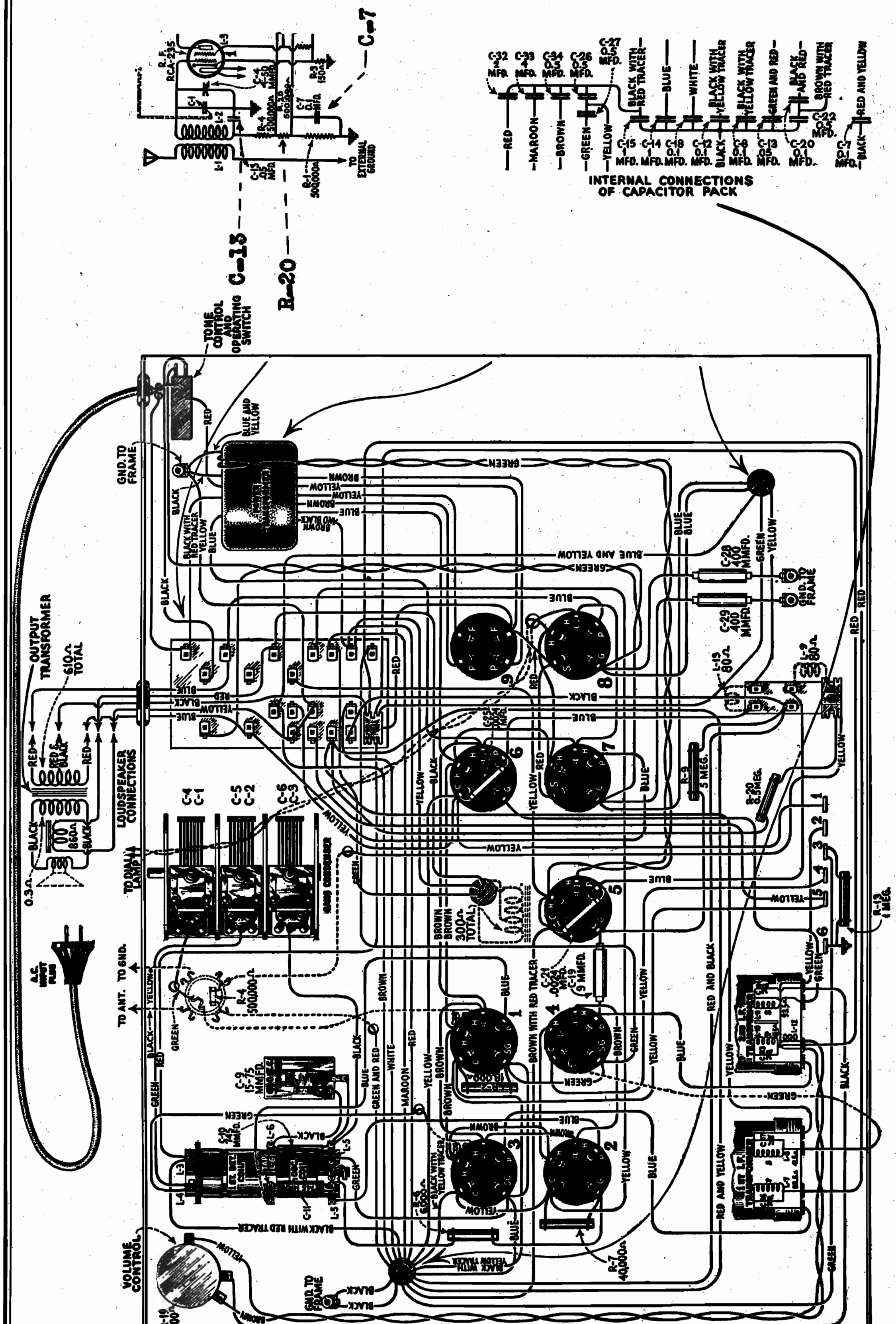


R. F. OSCILLATOR AND I. F. ADJUSTMENTS

A reference to the RCA Victor Radiola Superette Service Notes will give the details for making correct R. F., I. F. and Oscillator adjustments. However, due to the use of an automatic volume control tube, its action will defeat the use of an output meter. To overcome this, a "dummy" Radiotron UY-227 (one that has one heater prong removed but is otherwise O.K.) should be substituted for the tube in the automatic volume control socket. *Do not make any adjustments with this tube removed from the socket.* While apparently everything functions in the normal manner, the lack of tube capacity in the circuits will cause an incorrect alignment to be made.

Model R-11

R. C. A. - VICTOR CO., Inc.
Radiola Division



Wiring diagram of late production R-11

Late production of the RCA Victor Radiola R-11 has a slight change in the wiring, two changes in capacitor values and the addition of a 0.5 megohm resistor (R-20). Capacitor C-7 has been changed from 0.5 mfd. to 0.1 mfd. and C-13 from 0.1 mfd. to 0.05 mfd. Resistor R-20 has been added.

R. C. A. - VICTOR CO., Inc.
Radiola Division

RCA Victor Console, R-11

REPLACEMENT PARTS

Stock No.	DESCRIPTION	List Price
2563	Resistor—6,000 ohms—Carbon type—Package of 5	$3.00
2730	Resistor—18,000 ohms—Carbon type—Package of 5	2.00
2734	Capacitor—745 mmfd.—Package of 5	2.20
2746	Socket—Dial lamp socket	.50
2747	Contact cap—Package of 5	.50
2749	Capacitor—2400 mmfd.	1.50
2875	Knobs—Package of 5	1.50
2882	Socket—UY Radiotron socket—Complete with insulating shield—8 used	.50
2968	Socket—UX Radiotron socket—Complete with insulating shield—1 used	.50
2999	Shaft—Dial drum drive shaft	.50
3029	Indicator—Tuning dial indicator—Complete with bracket	.50
3046	Resistor—190,000 ohms—Carbon type—Package of 5	2.50
3047	Resistor—1500 ohms—Carbon type—Package of 5	2.50
3048	Resistor—500,000 ohms—Carbon type—Package of 5	2.50
3049	Resistor—150 ohms—Carbon type—Package of 5	2.50
3050	Resistor—14,000 ohms—Carbon type—Package of 1	.60
3051	Resistor—5 megohm—Carbon type—Package of 5	2.00
3053	Capacitor—9 mmfd.—Package of 2	.50
3054	Escutcheon—Station selector escutcheon—With 4 mounting screws	.60
3055	Cushion—Chassis support cushion—Package of 4	.50
3056	Shield—Radiotron shield—6 used—Package of 2	.50
3076	Resistor—1 megohm—Carbon type—Package of 5	2.50
3077	Resistor—30,000 ohms—Carbon type—Package of 5	2.50
3078	Resistor—10,000 ohms—Carbon type—Package of 5	2.50
3079	Resistor—40,000 ohms—Carbon type—Package of 5	2.50
3085	Capacitor—400 mmfd.	.60
3089	Terminal board—Magnetic pickup terminal board	.50
3090	Board—A. V. C. and 2nd detector R. F. choke mounting board—Less choke coils	.50
3091	Board—Resistor board—Less resistor and capacitors	1.00
3092	Volume control—Complete with mounting nut	1.50
3093	Tone control—Complete with mounting nut	1.90
3094	Shield—Radiotron shield—1 used—Package of 2	.50
3095	Coil—R.F. coil—Complete with mounting bracket	1.90
3096	Coil—1st detector and oscillator coil—Complete with mounting bracket	3.55
3097	Scale—Dial drum scale with set screws—Pkg. of 2	$0.50
3098	Capacitor—0.008 mfd.	.50
3099	Capacitor—0.005 mfd.	.75
7054	Cord—Power cord	1.00
7062	Capacitor—Adjustable oscillator trimmer capacitor	1.00
7241	Capacitor—3 gang tuning capacitor with mounting screws and washers	8.00
7266	Transformer—1st intermediate transformer	3.00
7267	Transformer—2d intermediate transformer	3.00
7268	Coil—Detector or A.V.C. R.F. choke coil—Complete with mounting rivet	.60
7269	Capacitor pack—In metal container—60 cycle	7.25
7270	Reactor—Filter reactor	4.00
7271	Transformer—Interstage transformer	4.25
7272	Transformer—Power transformer—105–125 volt, 50–60 cycles	12.00
7273	Capacitor pack—By-pass capacitor pack—25–40 cy.	10.00
7274	Transformer—Power transformer—105–125 volts, 25–40 cycles	15.00
7275	Transformer—Power transformer—220 volts, 50–60 cycles	10.00
	LOUDSPEAKER ASSEMBLY	
7257	Coil—Cone support with retaining ring, magnet and field coil	6.00
7258	Transformer—Output transformer	1.70
8559	Ring—Cone retaining ring	.80
8601	Cone—Cone with voice coil—Package of 5	15.00
	CABINET ASSEMBLY	
8691	Panel—Control panel	8.50
8692	Grille cloth and baffle board	.90
8693	Leg—Front—Right or left	1.25
8694	Leg—Back—Right hand	1.00
8695	Leg—Back—Left hand	1.00
8696	Stretcher	2.50
8697	Foot	.75
8698	Top	5.50
8699	Ornament—Control panel ornament	2.25
9358	Cabinet—Complete less all equipment	62.50

In previous automatic volume control receivers, the volume control was placed in the grid circuit of the automatic volume control tube, its action being to vary the control grid voltage of this tube. When operating sets of this character, the receiver jumped to full sensitivity when not tuned to a signal and if in a noisy location, this noise was very objectionable.

In this instrument, however, the volume control is not in the automatic volume control tube circuit, but in the grid circuit of the second detector. By means of it the signal voltage applied to the second detector is controlled and under no conditions can noise or other signals exceed the level for which it has been set. Electrically, the primary and secondary of the second I. F. transformer are shielded from each other so that there is no transference of energy except by means of a small pickup coil. The volume control is a potentiometer shunted across this coil which determines the amount of pickup that will be used. As a further means of controlling a strong signal, a second section is provided which places up to 10,000 ohms (R-21) in series with the tuned circuit of second detector grid. This effectively reduces even the most powerful signals received.

A 0.005 mfd. condenser connected in series with a 10,000 ohm resistor is placed across the primary of the output transformer. This functions to reduce the third harmonic distortion, an inherent characteristic of the Pentode output tube. The direct plate and grid voltages are supplied from high voltage alternating current which is rectified by means of Radiotron UX-280. The filter is of the tapped reactor type which gives an output of well filtered D. C. The bias voltage for the Radiotrons RCA-247 is obtained by using a portion of the drop across the reproducer field. One 190,000 ohm and one 40,000 ohm resistors act as the voltage dividing resistors.

A tone control, consisting of a 0.008 mfd. condenser in series with a 200,000 ohm variable resistor connected across the two grids of Radiotrons RCA-247 is incorporated in this stage. The tone control functions to reduce the high frequency output as the resistance is reduced. At the extreme low position, the condenser and secondary of the A. F. transformer resonate at a low frequency and thereby further accentuate the bass response. The two 0.0004 mfd. condensers, connected in series with their mid-point grounded are connected across the secondary of the input transformer. The purpose of these condensers is to prevent audio oscillations and provide a high frequency audio cut-off.

The next circuit to examine is the first detector. The circuit is tuned by means of one of the gang condensers to the frequency of the incoming signal. Radiotron UY-224 is used in this stage. In the grid circuit there is present the incoming signal and the oscillator signal, the latter being at a 175 K. C. difference from the former. The first detector is biased so as to operate as a plate rectification detector and its purpose is to extract the difference or beat frequency, produced by combining the signal and oscillator frequencies. The beat frequency—175 K. C.—appears in the plate circuit of the first detector which is accurately tuned to 175 K. C.

The next stage is that of the I. F. amplifier. A single stage is used, requiring two I. F. transformers, consisting of four tuned circuits. The plate circuit of the first detector, the grid and plate circuit of the I. F. amplifier and the grid circuit of the second detector are all tuned to 175 K. C. Radiotron RCA-235 is used in this stage and its control grid voltage is also varied by means of the automatic volume control tube.

SERVICE DATA

Information pertaining to general service data for this type receiver may be obtained from the Service Notes already issued on the RCA Victor Radiola Superette.

R. C. A. - VICTOR CO., Inc.

RADIOLA ELECTROLA RE-18A SUPERHETERODYNE

RCA Victor Radiola Electrola RE-18A is a nine-tube combination super-heterodyne radio receiver and electric phonograph. Except for the cabinet and tuning dial, the RE-18A is similar to the RE-18.* A reference to the RE-18 service notes should be made for information relative the circuits and similar data. The replacement parts are listed below. (* See page 504-F-3)

ELECTRICAL SPECIFICATIONS

Voltage Rating.................105–125 Volts

Frequency Rating.....25, 30, 50 and 60 Cycles

Power Consumption......25, 30 and 50 Cycles 170 Watts, 60 Cycles 160 Watts

Type of Circuit.......Super-Heterodyne using Super-Control Radiotrons and Push-pull Pentode output stage.

Type and Number of Radiotrons...2 RCA-235, 3 UY-227, 1 UY-224, 1 UX-280, 2 RCA-247—Total, 9

Number of Radio Frequency Stages..........1

Type of First Detector..Tuned Input Grid Bias

Number of Intermediate Stages.............1

Type of Second Detector......Power Grid Bias

Type of Automatic Volume Control....UY-227 Controlled by signal voltage in turn controlling bias on R. F. and I. F. tubes

Type of Manual Volume Control......Potentiometer used to regulate input to second detector

Type of Tone Control....Variable resistance in series with capacitor connected across grids of output stage. Capacitor tunes transformer at "low" position

Number of Audio Stages (Radio)............1

Number of Audio Stages (Phonograph).......2

Type of Magnetic Pick-up.....Low Impedance

Type of Tone Arm....................Inertia

Diameter of Turntable..............12 inches

Type of Rectifier..................Full Wave

Type of Loudspeaker......8" Electro-Dynamic

Undistorted Output...............4.0 Watts

REPLACEMENT PARTS

Stock No.	DESCRIPTION	List Price
	RECEIVER ASSEMBLY	
2563	Resistor—6,000 ohms—Carbon type—1 watt—Package of 5	$3.00
2730	Resistor—18,000 ohms—Carbon type—1 watt—Package of 5	2.00
2734	Capacitor—745 mmfd.—Package of 5	2.20
2746	Socket—Dial lamp socket	.50
2747	Cap—Grid contactor cap—Package of 5	.50
2749	Capacitor—2400 mmfd	1.50
2875	Knob—Tuning control, volume control or tone control knob—Package of 5	1.50
2882	Socket—Five contact Radiotron socket complete with insulator—8 used	.50
2963	Resistor—8,000 ohms—Carbon type—1 watt—Package of 5	2.50
2968	Socket—Four contact Radiotron socket complete with insulator—1 used	.50
3024	Capacitor—9 mmfd.—Package of 2	.50
3046	Resistor—190,000 ohms—Carbon type—½ watt—Package of 5	2.50
3047	Resistor—1,500 ohms—Carbon type—½ watt—Package of 5	2.50
3048	Resistor—500,000 ohms—Carbon type—½ watt—Package of 5	2.50
3049	Resistor—150 ohms—Carbon type—½ watt—Package of 5	2.50
3050	Resistor—14,000 ohms—Carbon type—3 watt	.60
3055	Cushion—Receiver chassis sponge rubber cushion—Package of 4	.50
3056	Shield—Radiotron shield—6 used—Package of 2	$0.50
3076	Resistor—1 megohm—Carbon type—½ watt—Package of 5	2.50
3077	Resistor—30,000 ohms—Carbon type—½ watt—Package of 5	2.50
3078	Resistor—10,000 ohms—Carbon type—½ watt—Package of 5	2.50
3079	Resistor—40,000 ohms—Carbon type—½ watt—Package of 5	2.50
3085	Capacitor—400 mmfd	.60
3089	Board—Terminal board complete with 5 terminals	.50
3091	Board—Resistor board complete less resistors and capacitors	1.00
3092	Volume control—Volume control complete with mounting nut	1.50
3093	Tone control—Tone control complete with mounting nut	1.90
3095	Coil—R. F. coil	1.90
3096	Coil—1st detector and oscillator coil complete with mounting bracket	3.55
3098	Capacitor—0.008 mfd	.50
3099	Capacitor—0.005 mfd	.75
6179	Terminal—Single ground terminal with screw complete with mounting rivet—Package of 5	.50
6188	Resistor—2 megohm—Carbon type—½ watt—Package of 5	2.00
6189	Bracket—Dial lamp bracket and indicator—Package of 2	.65
6190	Shaft—Tuning dial shaft complete with 3 washers—Package of 5	.85

R. C. A. VICTOR CO., Inc.

RADIOLA ELECTROLA RE-18A SUPERHETERODYNE

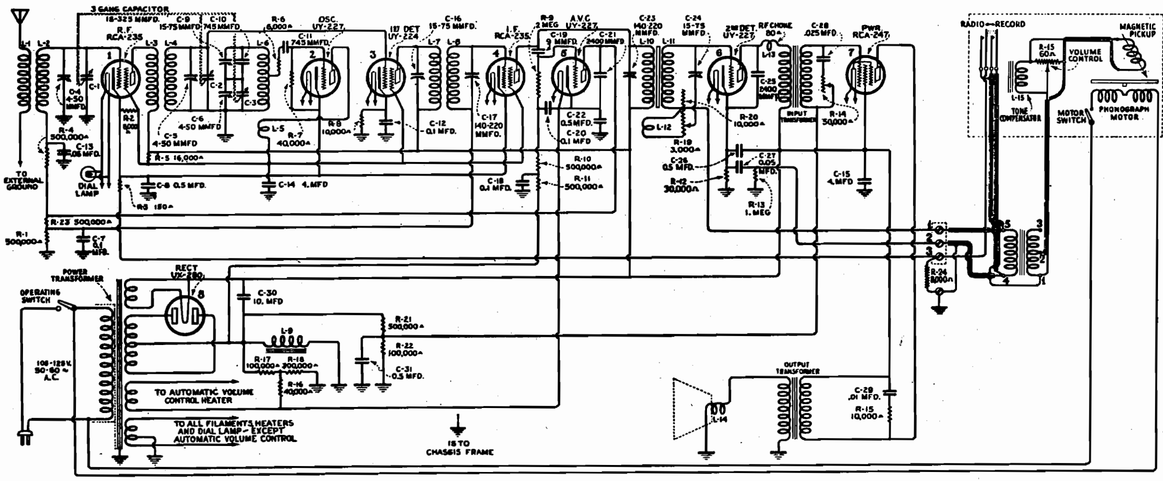
REPLACEMENT PARTS—Continued

Stock No.	DESCRIPTION	List Price
	RECEIVER ASSEMBLY—Continued	
6191	Cord—Condenser drum drive cord—Package of 5	$0.55
6192	Spring—Condenser drum drive cord tension spring—Package of 10	.50
7054	Cord—Power cord	1.00
7062	Capacitor—Adjustable capacitor—15–70 mmfd.	1.00
7266	Transformer—1st intermediate transformer	3.00
7267	Transformer—2nd intermediate transformer	3.00
7268	Coil—Detector choke coil complete with mounting rivet	.60
7269	Capacitor—Comprising one 2.0 mfd., one 4.0 mfd., four 0.5 mfd., two 1.0 mfd., five 0.1 mfd. and one 0.05 mfd. capacitor in metal container	7.25
7270	Reactor—Filter reactor	4.00
7271	Transformer—Interstage transformer	4.25
7272	Transformer—Power transformer—105–125 volts, 50–60 cycles	12.00
7273	Capacitor—Comprising one 4.0 mfd., one 6.0 mfd., four 0.5 mfd., two 1.0 mfd., five 0.1 mfd., and one 0.05 mfd. capacitors in metal container	10.00
7274	Transformer—Power transformer—105–125 volts—25–40 cycles	15.00
7275	Transformer—Power transformer—220 volts—50–60 cycles	10.00
7438	Capacitor—Variable tuning capacitor	5.20
7439	Drum—Tuning condenser drive drum with set screw—Complete with 3 dial scale mounting nuts	.50
7440	Scale—Dial and dial scale	.75
8871	Support—Receiver chassis metal mounting support—Package of 4	.75
	LOUDSPEAKER ASSEMBLY	
3237	Speaker mounting screw assembly—Comprising 4 screws, 8 washers, 8 nuts and 4 eyelets—Package of 1 set	.50
7257	Coil assembly—Comprising field coil, cone bracket and magnet	6.00
8559	Ring—Cone retaining ring	.80
8601	Cone—Speaker paper cone—Package of 5	15.00
	MOTOR BOARD ASSEMBLY	
X-13	Board—Motor board less equipment	5.85
2614	Switch—Automatic brake switch	1.40
2620	Cushion—Pickup rubber cushions—Comprising 1 damper and two pivot cushions—Package of 5 sets.	1.25
2767	Spring—Pickup magnet retaining spring—Package of 10	.50
2768	Armature—Pickup armature	.50
2770	Plate—Pickup damper plate—Package of 5	.50
2771	Screw—Pickup damper plate mounting screw—Package of 10	.50
2875	Knob—Volume control and record-radio switch knob—Package of 5	1.50
2908	Spring—Pawl carrier spring—Package of 10	.50
3052	Screw assembly—Pickup pole shoe mounting screw assembly—Comprising screw, nut and washer—Package of 10 sets	.50
3157	Gear—Driving gear—Located on turntable spindle above top plate	1.00
3159	Friction brake—Gear reducing friction brake spring with pad—Complete with mounting rivet—Package of 4	2.00
3161	Spring—Shift lever spring—Package of 5	1.20
3167	Magnet—Pickup magnet	2.60
3169	Pole shoe—Pickup pole shoe—R. H.	1.45
3170	Pole shoe—Pickup pole shoe—L. H.	1.45
3205	Screw—Pickup needle holding screw—Package of 10.	.80
3207	Screw—Pickup cover mounting screw—Package of 10.	.50
3208	Screw assembly—Pickup mounting screw assembly—Comprising screw, nut and washer—Package of 10	.60
3211	Washer—Turntable spindle leather washer—Package of 10	.50
3224	Switch—Record-Radio switch complete with mounting nut and washer	1.35
3278	Bearing—Rotor shaft fibre thrust bearing and cork button—Package of 10	.50
3279	Screw and nut—Rotor shaft thrust bearing adjusting screw and nut—Package of 10	.50
3280	Washer—Metal washer—Located on turntable spindle underneath gear reducing unit—Package of 20	.50
3281	Pawl—Gear reducing pawl with mounting stud	.50

Stock No.	DESCRIPTION	List Price
6119	Stud—Motor hanging stud—Package of 6	$0.50
6120	Screw—For holding turntable spindle bearing and grease cap—Package of 10	.50
6121	Bearing—Turntable spindle bearing and grease cap	1.10
6215	Escutcheon—Shift lever speed escutcheon plate with mounting screws—Package of 2	.70
6216	Rod—Automatic brake trip rod with nut—Package of 5	.50
6221	Cover—Pickup cover	.75
6222	Pickup—Pickup unit complete	12.50
6224	Receptacle—Tungstone needle box holder	.75
6232	Box—Needle box with lid—Package of 2	.90
6237	Holder—Twin needle holder with mounting screws	.75
6238	Transformer—Input transformer	3.10
7084	Cover—Turntable cover	.50
7151	Back—Pickup housing back	.50
7305	Gear—Gear reducing unit complete	4.50
7332	Cable—Main cable from receiver to input transformer, volume control and radio record switch	2.30
7387	Reactor—Tone compensating reactor with bracket	.85
7388	Spindle—Turntable spindle with fibre gear—110 volts or 220 volts—60 cycles	6.00
7389	Rotor and shaft—110 volts or 220 volts—60 cycles	9.00
7390	Motor mounting washer and springs—Comprising 3 "C" washers, 9 cup washers and 6 springs—Package of 1 set	.75
7391	Volume control—Record volume control complete with mounting nut and washer	1.35
7393	Block—Pickup connector block and wire	.90
7400	Spindle—Turntable spindle with fibre gear—25 cycles	8.00
7401	Rotor and shaft—25 cycles	10.00
7402	Spindle—Turntable spindle with fibre gear—30 cycles	8.00
7403	Rotor and shaft—30 cycles	10.00
7443	Rotor and shaft—110 volts or 220 volts—50 cycles	9.00
7444	Spindle—Turntable spindle with fibre gear—110 volts or 220 volts—50 cycles	6.00
8795	Motor—Motor complete—110 volts—60 cycles	19.85
8800	Motor—Motor complete—110 volts—25 cycles	24.65
8801	Motor—Motor complete—110 volts—30 cycles	24.65
8856	Motor—Motor complete—110 volts—50 cycles	19.85
8872	Lever—Shift lever complete with mounting screws	1.60
8873	Brake—Automatic brake complete with mounting screws and washers	3.50
8876	Support—Lid support	2.00
8877	Turntable—Turntable with cover	4.60
8880	Arm—Pickup arm complete less pickup unit	6.00
8887	Motor—Motor complete—220 volts—60 cycles	19.85
8888	Motor—Motor complete—220 volts—50 cycles	19.85
10174	Springs—Automatic brake springs—Set of 4 springs—Package of 2 sets	.50
10184	Plate—Automatic brake trip plate complete with screws—Package of 5	.60
	CABINET ASSEMBLY	
X-14	Board—Baffle board and grille cloth	1.30
X-16	Stretcher	4.70
X-17	Foot	1.00
X-18	Leg	3.55
X-19	Lid	12.00
X-21	Overlay—Front top rail end overlay—R. H. or L. H.	1.25
X-22	Overlay—Front top rail center overlay	2.65
X-23	Mouldings—Control panel mouldings—Package of 1 set	1.60
X-85	Escutcheon—Tuning dial escutcheon	1.15
X-86	Panel—Control panel	6.90
X-87	Doors—R. H. and L. H. doors complete less door pulls and hinges—Package of 1 set	8.00
X-88	Mouldings—Door mouldings for R. H. and L. H. doors—Package of 1 set	3.00
2776	Catch—Door catch and strike with nail—Package of 2 sets	.50
3156	Label—Metal trade mark label—Package of 5	2.50
6210	Hinge assembly—Door hinge assembly—Comprising 4 hinges and 16 mounting screws—Package of 1 set.	.90
6211	Pull—Door pull with mounting screw—Package of 4.	1.20
6219	Hinge—Cabinet lid hinge complete with mounting screws—Package of 2	.50
6236	Support—Metal screen support	.50
9410	Cabinet—Cabinet complete less equipment	83.00
10901	Spring—Lid support spring—Package of 2	.50

R. C. A. VICTOR CO., Inc.

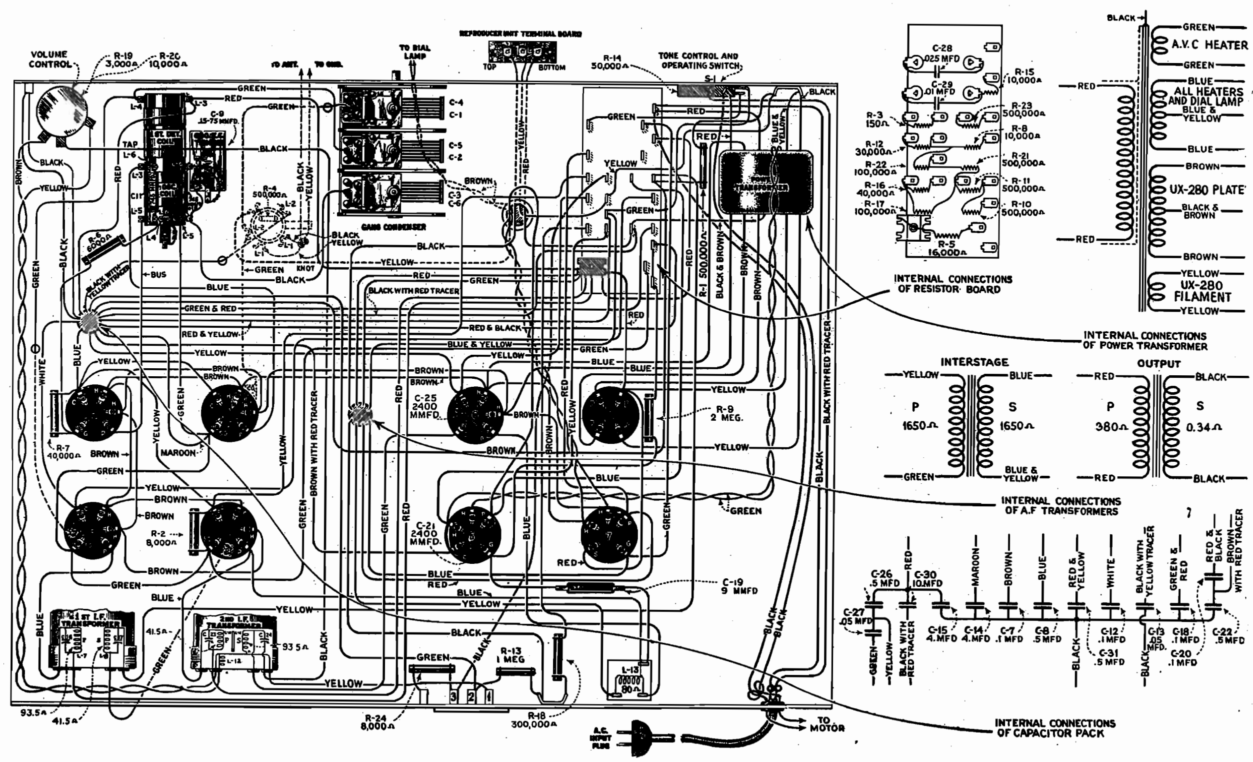
MODEL RE-19 SUPERHETERODYNE (A.V.C.)



Schematic Circuit

Voltage Rating.................105–125 Volts
Frequency Rating......25, 30, 50 or 60 Cycles
Power Consumption......25 ~ 135 Watts, 30 ~ 140 Watts, 50 ~ 135 Watts, 60 ~ 130 Watts

RCA Victor RE-19 is an eight tube Super-Heterodyne combination radio receiver and electric phonograph. The chassis used is similar to the R-12 with the exception that terminals for attaching a magnetic pickup are provided. The motor board assembly is similar to the RE-18. Reference to previous RCA Victor Service Notes should be made for service information relative to these assemblies. The replacement parts are given below and the diagrams on the following pages.



Wiring Diagram

S. O. 8734 10M—1-14-32

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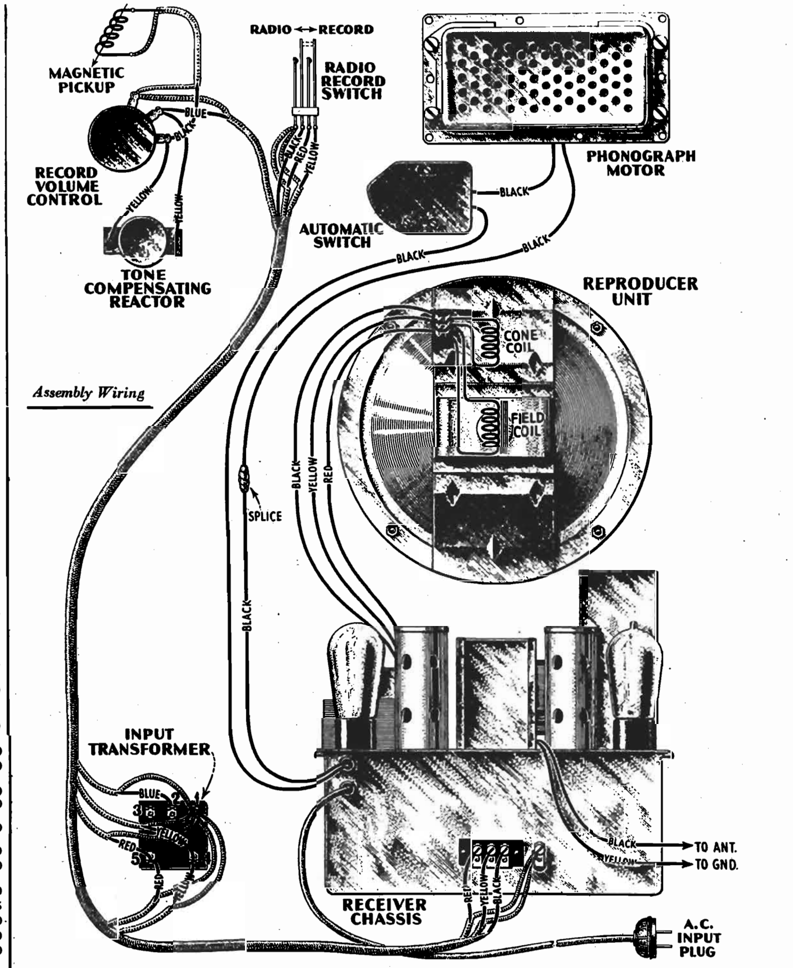
MODEL RE-19 SUPERHETERODYNE



Assembly Wiring

RECEIVER ASSEMBLY

2563	Resistor—6,000 ohms—Carbon type—1 watt—Package of 5	$3.00
2734	Capacitor—745 mmfd.—Package of 5	2.20
2746	Socket—Dial lamp socket	.50
2747	Cap—Grid contactor cap—Package of 5	.50
2749	Capacitor—2400 mmfd.	1.50
2875	Knob—Tuning control, volume control or tone control knob—Package of 5	1.50
2882	Socket—Five contact Radiotron socket—Complete with insulator—7 used	.50
2963	Resistor—8,000 ohms—Carbon type—1 watt—Package of 5	2.50
2968	Socket—Four contact Radiotron socket complete with insulator	.50
2970	Resistor—500,000 ohms—Carbon type—1 watt—Package of 5	2.50
3003	Cushion—Receiver sponge rubber cushion—Package of 4	.50
3024	Capacitor—9 mmfd.—Package of 2	.50
3045	Resistor—40,000 ohms—Carbon type—1 watt—Package of 5	2.50
3048	Resistor—500,000 ohms—Carbon type—½ watt—Package of 5	2.50
3049	Resistor—150 ohms—Carbon type—½ watt—Package of 5	2.50
3056	Shield—Radiotron shield—4 used—Package of 2	.50
3076	Resistor—1 megohm—Carbon type—½ watt—Package of 5	2.50
3077	Resistor—30,000 ohms—Carbon type—½ watt—Package of 5	2.50
3078	Resistor—10,000 ohms—Carbon type—½ watt—Package of 5	2.50
3079	Resistor—40,000 ohms—Carbon type—½ watt—Package of 5	2.50
3081	Resistor—16,000 ohms—Carbon type—3 watts	.60
3092	Volume control—Volume control complete with mounting nut	1.50
3095	Coil—R.F. coil complete with mounting bracket	1.90
3234	Tone control—Tone control complete with mounting nut	1.90
3235	Coil—First detector and oscillator coil	2.85
3251	Coil—R.F. choke coil	$0.90
6179	Terminal—Single ground terminal—Complete with mounting rivet—Package of 5	.50
6185	Resistor—100,000 ohms—Carbon type—½ watt—Package of 5	2.00
6186	Resistor—500,000 ohms—Carbon type—¼ watt—Package of 5	2.00
6187	Resistor—300,000 ohms—Carbon type—½ watt—Package of 5	2.00
6188	Resistor—2 megohm—Carbon type—½ watt—Package of 5	2.00
6189	Bracket—Dial lamp bracket and indicator—Package of 2	.65
6191	Cord—Tuning condenser drive cord—Package of 5	.55
6192	Spring—Dial drum drive cord tension spring—Package of 10	.50
6214	Board—Magnetic pickup terminal board—Package of 2	.70
7054	Cord—Power cord	1.00
7062	Capacitor—Adjustable capacitor—15–70 mmfd.	1.00
7298	Capacitor—0.01 mfd.	.80
7340	Transformer—First intermediate transformer	3.00
7341	Transformer—Second intermediate transformer	3.00
7342	Capacitor—Comprising two 0.05 mfd., four 0.5 mfd., one 10.0 mfd., two 4.0 mfd., and four 0.1 mfd. capacitors in metal container	7.85
7343	Transformer—Audio transformer	3.85
7344	Transformer—Power transformer—105–125 volts, 50–60 cycles	8.00
7348	Board—Resistor board complete less resistors and capacitors	2.30
7362	Capacitor—0.025 mfd.	1.00
7438	Capacitor—Variable tuning capacitor	5.20
7439	Drum—Dial drive drum with set screws complete with 3 dial scale mounting nuts	.50
7440	Scale—Dial and dial scale	.75
8770	Transformer—Power transformer—105–125 volts, 25–40 cycles	12.00
8771	Transformer—Power transformer—220 volts, 60 cycles	9.00
8837	Support—Receiver metal mounting support—Package of 4	.70

LOUDSPEAKER ASSEMBLY

3005	Screw assembly—Speaker mounting screw assembly—Comprising 4 screws, 4 eyelets, 8 washers and 8 nuts—Package of 1 set	$0.50
7345	Coil assembly—Speaker field coil assembly—Comprising field coil, magnet and cone bracket	5.00
8601	Cone—Speaker paper cone—Package of 5	15.00
8559	Ring—Speaker cone retaining ring	.80

MOTOR BOARD ASSEMBLY

X68	Board—Motor board	4.00
2614	Switch—Automatic brake switch	1.40
2620	Cushions—Pickup rubber cushions—Comprising one damper and two pivot cushions—Package of 5 sets	1.25
2767	Spring—Pickup magnet retaining spring—Package of 10	.50
2768	Armature—Pickup armature	.50
2770	Plate—Pickup damper plate—Package of 5	.50
2771	Screw—Pickup damper plate mounting screw—Package of 10	.50
2875	Knob—Record switch knob—Package of 5	1.50
2908	Spring—Gear reducing pawl spring—Package of 10	.50
3052	Screw assembly—Pickup pole shoe mounting screw assembly—Comprising nut, washer and screw—Package of 10 sets	.50
3157	Gear—Driving gear with set screw—Located on turntable spindle above top plate	1.00
3159	Friction brake—Gear reducing brake spring and pad—Complete with mounting rivets—Package of 4	2.00
3161	Spring—Shift lever spring—Package of 5	1.20
3167	Magnet—Pickup magnet	2.60
3168	Coil—Pickup coil	.85
3169	Pole shoe—Pickup pole shoe—R.H.	1.45
3170	Pole shoe—Pickup pole shoe—L.H.	1.45
3175	Receptacle—Tungstone needle box receptacle	.75
3189	Box—Needle box with lid—Package of 2	.70
3205	Screw—Pickup needle holding screw—Package of 10	.80
3207	Screw—Pickup cover mounting screw—Package of 10	.50
3208	Screw assembly—Pickup mounting screw assembly Comprising one screw, one nut, and one washer—Package of 10	.60
3211	Washer—Turntable spindle leather washer—Package of 10	.50
3224	Switch—Record switch complete with mounting washer and nut	1.35
3278	Bearing—Rotor shaft fibre thrust bearing and cork button—Package of 10	.50
3279	Screw and nut—Rotor shaft thrust bearing adjusting screw and lock nut—Package of 10	.50
3280	Washer—Metal washer—Located on turntable spindle underneath gear reducing unit—Package of 20	.50
3281	Pawl—Gear reducing pawl complete with mounting stud	.50
6119	Stud—Motor hanging stud—Package of 6	.50
6120	Screw—For holding turntable spindle bearing and grease cap—Package of 10	.50
6121	Bearing—Turntable spindle bearing and grease cap	1.10
6215	Escutcheon—Shift lever speed escutcheon plate—Complete with mounting screws—Package of 2	.70
6216	Rod—Automatic brake trip rod with lock nut—Package of 5	$0.50
6217	Pickup—Pickup unit complete	12.50
6218	Screw and washer—Motor board mounting screw and washer—Package of 10	.50
6221	Cover—Pickup cover	.75
7084	Cover—Turntable cover	.50
7151	Back—Pickup housing back	.50
7305	Gear reducing unit complete	4.50
7387	Reactor—Compensating reactor with mounting bracket	.85
7388	Spindle—Turntable spindle with fibre gear—110 or 220 volts—60 cycles	6.00
7389	Rotor and shaft—110 or 220 volts—60 cycles	9.00
7390	Spring and washer—Motor mounting springs and washers—Comprising 9 cup washers, 3 "C" washers and 6 springs—Package of 1 set	.75
7393	Block—Pickup connector block and wire	.90
7400	Spindle—Turntable spindle with fibre gear—25 cycles	8.00
7401	Rotor and shaft—25 cycles	10.00
7402	Spindle—Turntable spindle with fibre gear—30 cycles	8.00
7403	Rotor and shaft—30 cycles	10.00
7443	Rotor and shaft—110 or 220 volts—50 cycles	9.00
7444	Spindle—Turntable spindle with fibre gear—110 or 220 volts—50 cycles	6.00
7445	Transformer—Input transformer	4.55
8795	Motor—Motor complete, 110 volts, 60 cycles	19.85
8800	Motor—Motor complete—25 cycles	24.65
8801	Motor—Motor complete—30 cycles	24.65
8856	Motor—Motor complete—110 volts—50 cycles	19.85
8872	Shift lever—Speed shift lever complete with mounting screws	1.60
8873	Brake—Automatic brake complete with mounting screws and washers	3.50
8874	Arm—Pickup arm complete less pickup unit	6.00
8875	Cable—Main cable from input transformer to volume control, record switch and receiver	2.20
8876	Support—Lid support	2.00
8877	Turntable—Turntable with cover	4.60
8887	Motor—Motor complete—220 volts—60 cycles	19.85
8888	Motor—Motor complete—220 volts—50 cycles	19.85
10174	Spring—Automatic brake springs—Set of 4 springs—Package of 2 sets	.50
10184	Plate—Automatic brake latch trip plate complete with mounting screws—Package of 5	.60

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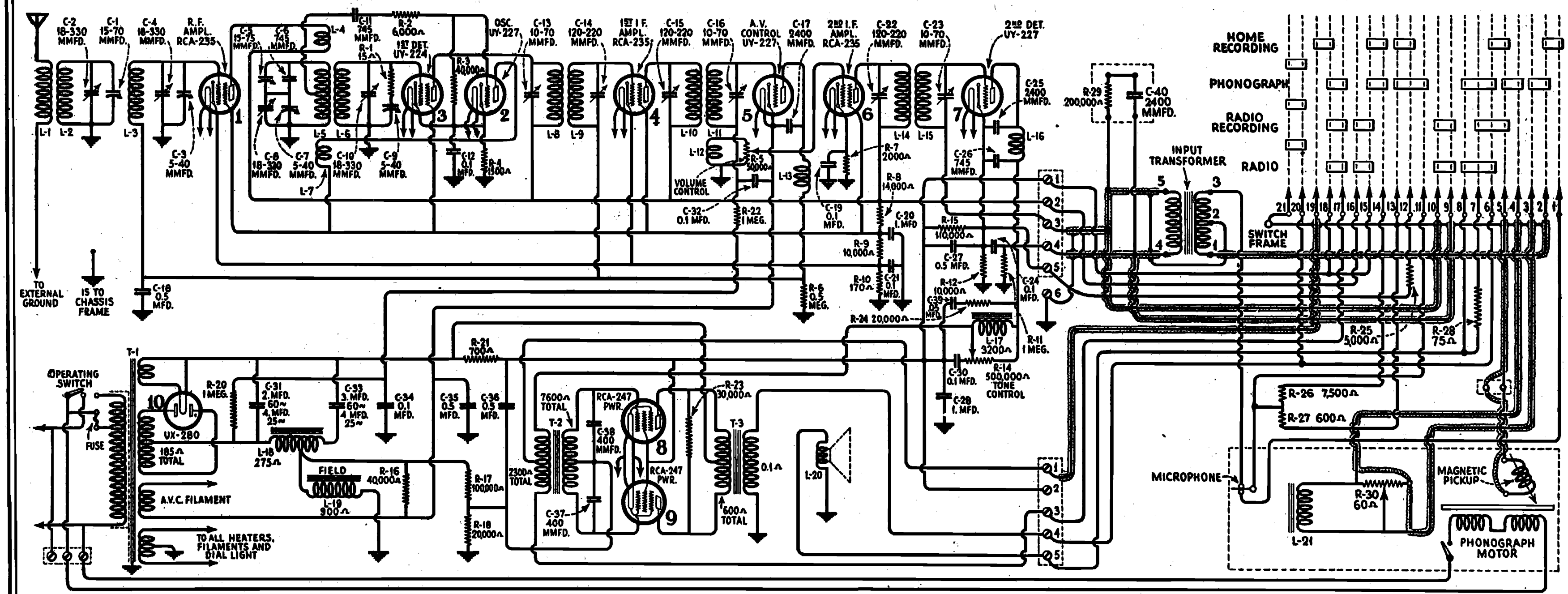
RADIOLA ELECTROLA
MODEL RE-20



Schematic Circuit

RCA Victor RE-20 is a ten tube De Luxe Super-Heterodyne combination radio receiver and electric phonograph. Except for the differences in cabinet and omission of the automatic record changing mechanism, the RE-20 is similar to the RAE-59.

Service work in conjunction with this model is similar to that of the R-50, R-55 and RAE-59. Reference to these Service Notes should therefore be made when such information is necessary. The replacement parts and the diagrams are given on the following pages.

Voltage Rating....................105–125 Volts
Frequency Rating....................25, 30, 50 and 60 Cycles
Power Consumption (Radio only)....................145 Watts
Power Consumption (Phonograph)....................160 Watts (Approximately)
Type of Circuit..........A. V. C. Super-Heterodyne with Push-pull Pentode Output Stage
Type and Number of Radiotrons..3 RCA-235, 1 UY-224, 3 UY-227, 2 RCA-247, 1 UX-280—Total 10
Wattage Dissipation in Loudspeaker Field....................10 Watts
Undistorted Output....................4.0 Watts

Phonograph Specifications Page 504-J-8

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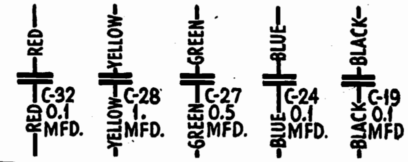
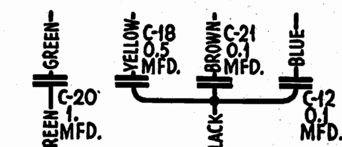
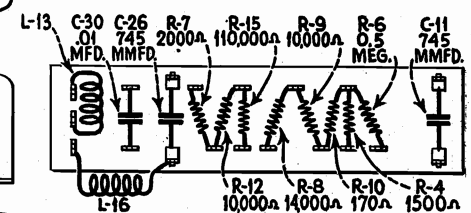
RADIOLA ELECTROLA MODEL RE-20



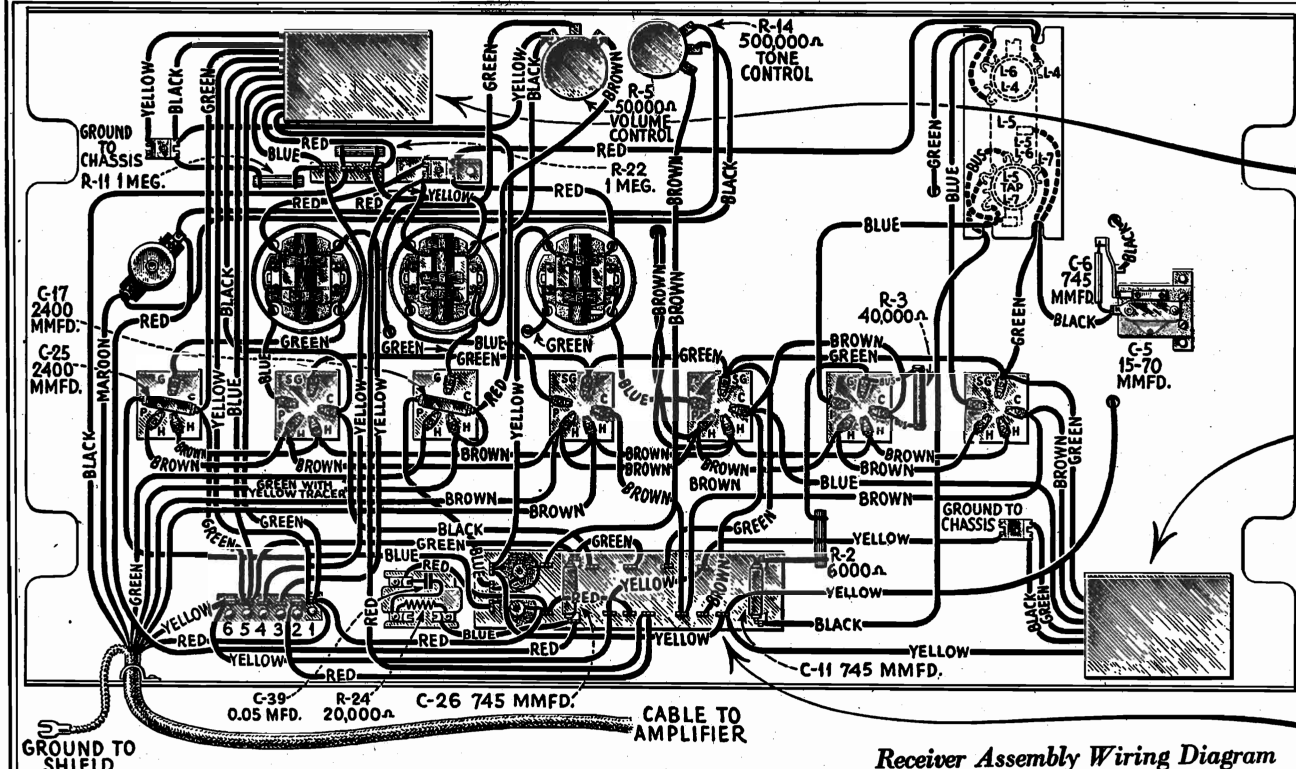
INTERNAL CONNECTIONS OF BY-PASS CAPACITOR PACK



INTERNAL CONNECTIONS OF BY-PASS CAPACITOR PACK



RESISTOR BOARD CONNECTIONS



Receiver Assembly Wiring Diagram

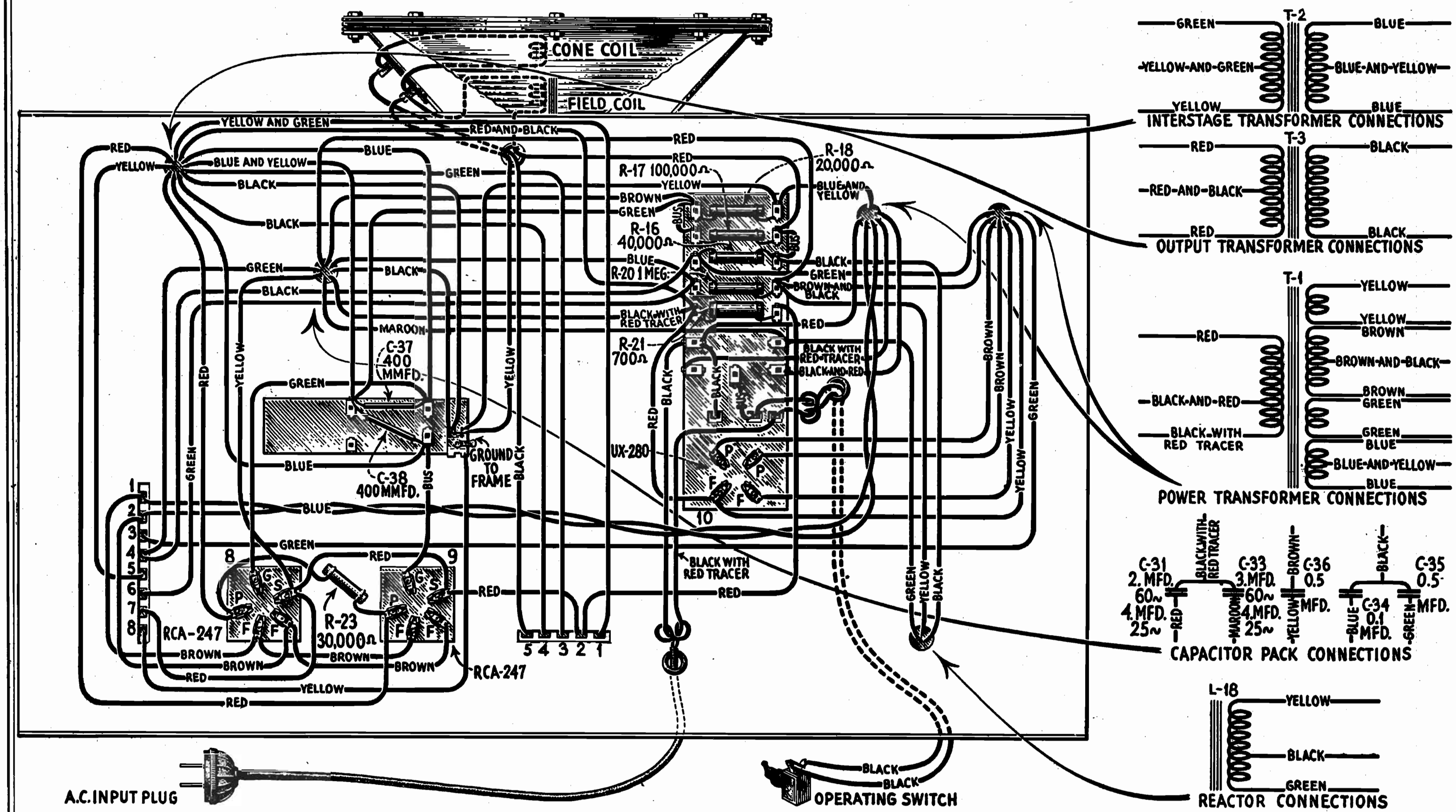
Stock No.	DESCRIPTION	List Price
	RECEIVER ASSEMBLY	
2563	Resistor—6,000 ohms—Carbon type—1 watt—Package of 5	$3.00
2726	Socket—Five contact Radiotron socket—Complete with insulator—7 used	.70
2731	Resistor—10,000 ohms—Carbon type—1 watt—Package of 5	2.00
2732	Resistor—110,000 ohms—Carbon type—1 watt—Package of 5	2.00
2736	Resistor—170 ohms—Carbon type—1 watt—Package of 5	2.00
2749	Capacitor—2400 mmfd.	1.50
2970	Resistor—500,000 ohms—Carbon type—1 watt—Package of 5	2.50
3031	Board—Terminal board complete with insulator—Three terminals	.50
3033	Resistor—1 megohm—Carbon type—¼ watt—Package of 5	2.00
3045	Resistor—40,000 ohms—Carbon type—1 watt—Package of 5	2.50
3050	Resistor—14,000 ohms—Carbon type—3 watt	.60
3153	Resistor—1500 ohms—Carbon type—1 watt—Package of 5	2.75
3154	Resistor—2,000 ohms—Carbon type—1 watt—Package of 5	2.75
3220	Resistor—15 ohms—Flexible wire type—Package of 5	2.75
6114	Resistor—20,000 ohms—Carbon type—1 watt—Package of 5	2.00
6220	Capacitor—0.05 mfd.—Package of 5	1.10
7062	Capacitor—Adjustable capacitor—15–70 mmfd.—2 used	1.00
7063	Capacitor—Adjustable capacitor 5–40 mmfd.—3 used	1.00
7278	Coil—R. F. and link circuit coil	2.50
7285	Capacitor pack—Comprising one 1.0 mfd., one 0.5 mfd., and two 0.1 mfd. capacitors in metal container—6 leads	3.50
7286	Capacitor pack—Comprising one 1.0 mfd., one 0.5 mfd., and three 0.1 mfd. capacitors in metal container—10 leads	4.50
7298	Capacitor—0.01 mfd.	.80
7299	Capacitor—745 mfd.	.70

RADIOLA ELECTROLA
MODEL RE-20

R. C. A. - VICTOR CO., Inc.

S. P. U. REPRODUCER ASSEMBLY

2240	Resistor—30,000 ohms—Carbon type—1 watt	.70
2546	Fuse—Glass type—1.5 amperes—Package of 5	.50
3045	Resistor—40,000 ohms—Carbon type—1 watt—Package of 5	2.50
3058	Resistor—100,000 ohms—Carbon type—1 watt—Package of 5	2.50
3085	Capacitor—400 mmfd.	.60
3099	Capacitor—0.005 mfd.	.75
3145	Resistor—700 ohms—Carbon type—3 watt	.85
6114	Resistor—20,000 ohms—Carbon type—1 watt—Package of 5	2.00
7290	Reactor—Filter reactor	4.75
8710	Transformer—Power transformer—105–125 volts, 50–60 cycles	12.50
8711	Transformer—Audio transformer	6.60
8712	Capacitor pack—Comprising one 2.0 mfd., one 3.0 mfd., one 0.1 mfd., and two 0.5 mfd. capacitors in metal container—50–60 cycles	7.80
8749	Transformer—Power transformer—105–125 volts, 25–40 cycles	20.50
8750	Transformer—Power transformer—220 volts, 50–60 cycles	13.00
8751	Capacitor pack—Comprising two 4.0 mfd., two 0.5 mfd. and one 0.1 mfd. capacitors in metal container	9.50
10907	Fuse—Glass type—3 amperes—Package of 5	.50



S. P. U. Reproducer Wiring Diagram

RADIOLA ELECTROLA
MODEL RE-20

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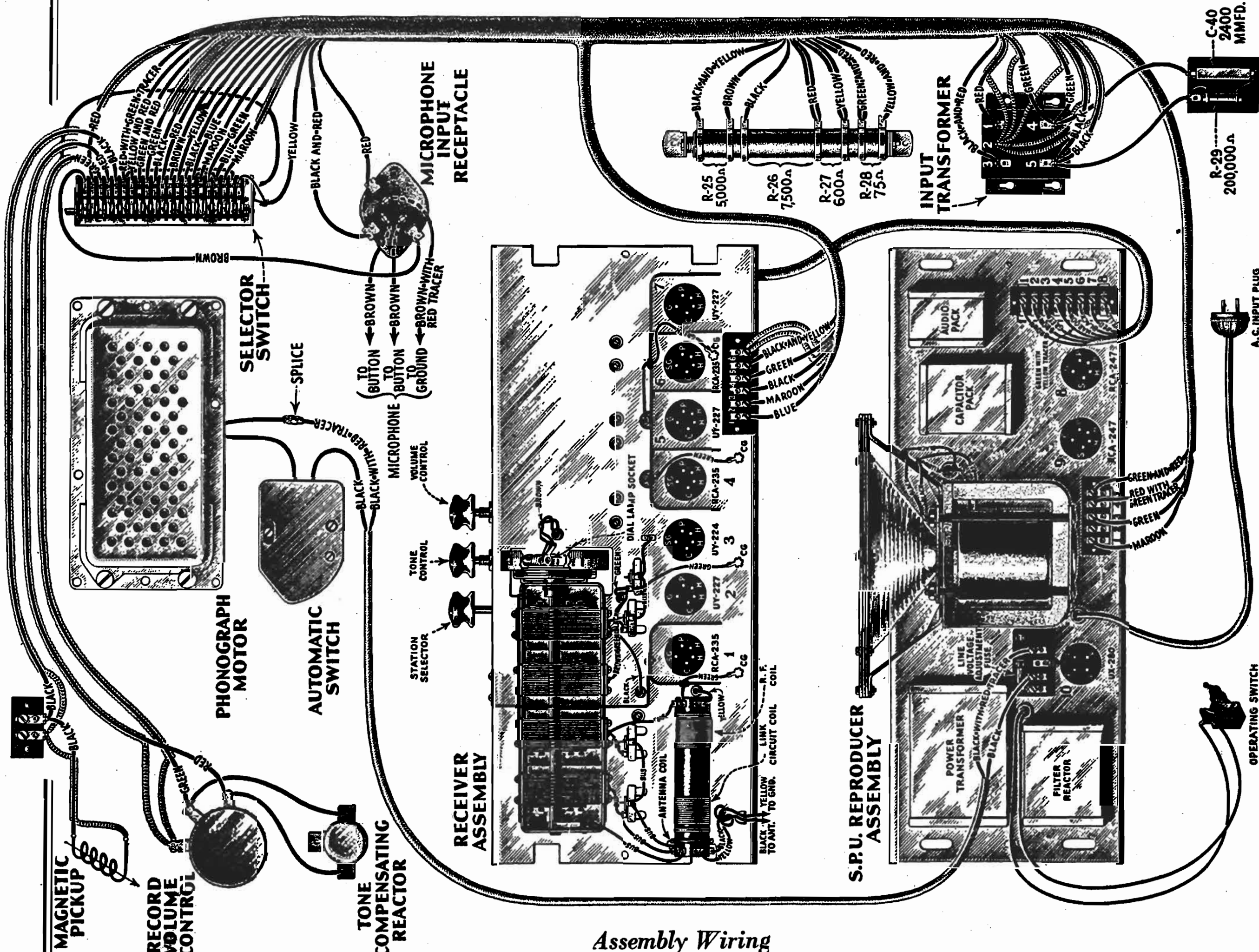


Assembly Wiring

Type of Magnetic Pickup. . . . . Low Impedance
Type of Tone Arm. . . . . Inertia
Diameter of Turntable. . . . . 12 inches
Type of Phonograph Motor. . . . . Induction, running at synchronous speed
Turntable Speed. . . . . 78 and 33⅓ R. P. M.

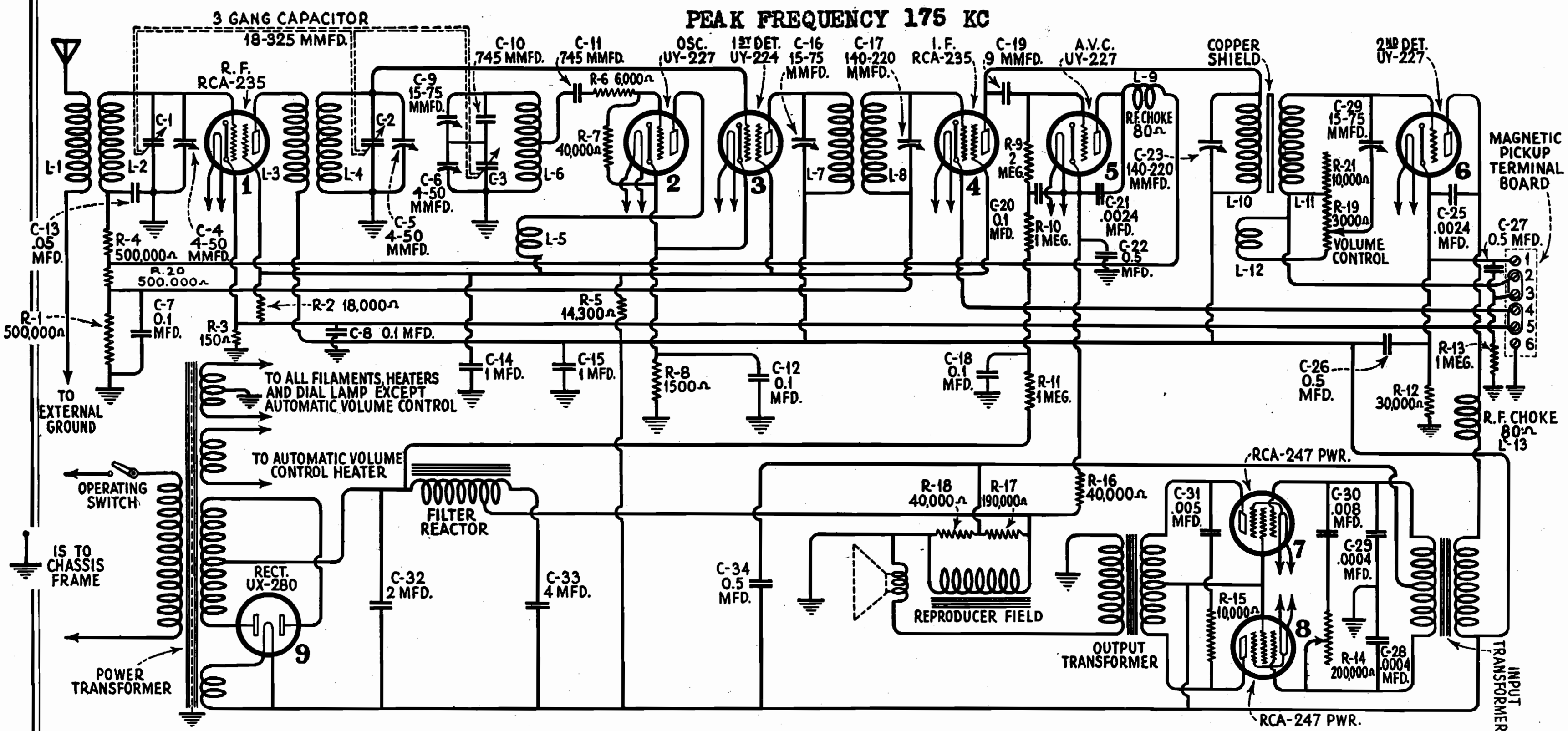
	LOUDSPEAKER ASSEMBLY	
7292	Screw assembly—Speaker mounting screw assembly—Comprising two screws, two nuts, two washers and one plate—Package of 1 set	.95
8558	Cone—Speaker paper cone	4.00
8559	Ring—Cone retaining ring	.80
8713	Coil—Speaker field coil	5.00
	MOTOR BOARD AND MISCELLANEOUS ASSEMBLIES	
2749	Capacitor—2400 mmfd.	1.50
7327	Mechanism—Microphone mechanism complete with cord	14.95
7375	Resistor—13175 ohms tapped porcelain resistor	2.10
7387	Reactor—Tone compensating reactor complete with mounting bracket	.85
7388	Spindle—Turntable spindle with fibre gear—110 volts or 220 volts—60 cycles	6.00
7389	Rotor and shaft—110 volts or 220 volts—60 cycles	9.00
6226	Transformer—Phono input transformer	3.75
6228	Resistor—200,000 ohms—Carbon type—½ watt—Package of 5	2.50
6227	Resistor board assembly—Comprising one 200,000 ohms—Carbon type—¼ watt resistor and one 2400 mmfd. tooth pick capacitor on board	1.35
6229	Cable—30″ shielded red cable from selector switch to volume control—Package of 2	.70
6230	Cable—30″ shielded green cable from selector switch to volume control—Package of 2	.70
6231	Cable—18″ shielded black cable from selector switch to pickup terminal board—Package of 2	.60
7400	Spindle—Turntable spindle with fibre gear—25 cycles	8.00
7401	Rotor and shaft—25 cycles	10.00
7443	Rotor and shaft—110 volts or 220 volts—50 cycles	9.00
7444	Spindle—Turntable spindle with fibre gear—110 volts or 220 volts—50 cycles	6.00
8795	Motor—Motor complete—110 volts—60 cycles	19.85
8800	Motor—Motor complete—110 volts—25 cycles	24.65
8856	Motor—Motor complete—110 volts—50 cycles	19.85
8887	Motor—Motor complete—220 volts—60 cycles	19.85
8888	Motor—Motor complete—220 volts—50 cycles	19.85

R. C. A. VICTOR CO., Inc.

REPLACEMENT PARTS (Continued)

3099	Capacitor—0.005 mfd.	.75
3137	Knob—Tuning control, volume control and tone control knob—Package of 5.	3.25
6179	Terminal—Single ground terminal with set screw—Complete with mounting rivet—Package of 5	.50
6186	Resistor—500,000 Ohms—Carbon type —¼ Watt—Package of 5	2.00
6188	Resistor—2 Megohm—Carbon type—½ Watt—Package of 5	2.00
6189	Bracket—Dial lamp bracket and indicator—Package of 2	.65
6190	Shaft—Tuning condenser drive shaft complete with 3 washers—Package of 5	.85
6191	Cord—Tuning condenser drive cord—Package of 5	.55
6192	Spring—Tuning condenser drive cord tension spring—Package of 10	.50
7054	Cord—Power cord	1.00
7062	Capacitor—Adjustable capacitor—15–70 mmfd.	1.00
7266	Transformer—2nd intermediate transformer	3.00
7267	Transformer—1st intermediate transformer	3.00
7268	Coil—Choke coil	.60
7269	Capacitor—Comprising one 2.0 mfd., one 4.0 mfd., four 0.5 mfd., two 1.0 mfd., five 0.1 mfd., and one 0.05 mfd. capacitors in metal container	7.25
7270	Reactor—Filter reactor	4.00
7271	Transformer—Interstage transformer	4.25
7272	Transformer — Power transformer — 105–125 volts, 50–60 cycles	$12.00
7273	Capacitor—Comprising one 4.0 mfd., one 6.0 mfd., four 0.5 mfd., two 1.0 mfd., five 0.1 mfd. and one 0.05 mfd. capacitors in metal container—105–125 volts, 25–40 cycles	10.00
7274	Transformer—Power transformer—105–125 volts, 25–40 cycles	15.00
7275	Transformer—Power transformer—220 volts, 60 cycles	10.00
7438	Capacitor—Variable tuning capacitor	5.20

Voltage Rating....................105–125 Volts
Frequency Rating............50–60 Cycles and 25–40 Cycles
Power Consumption...25–40 Cycles 140 Watts, 50–60 Cycles 135 Watts

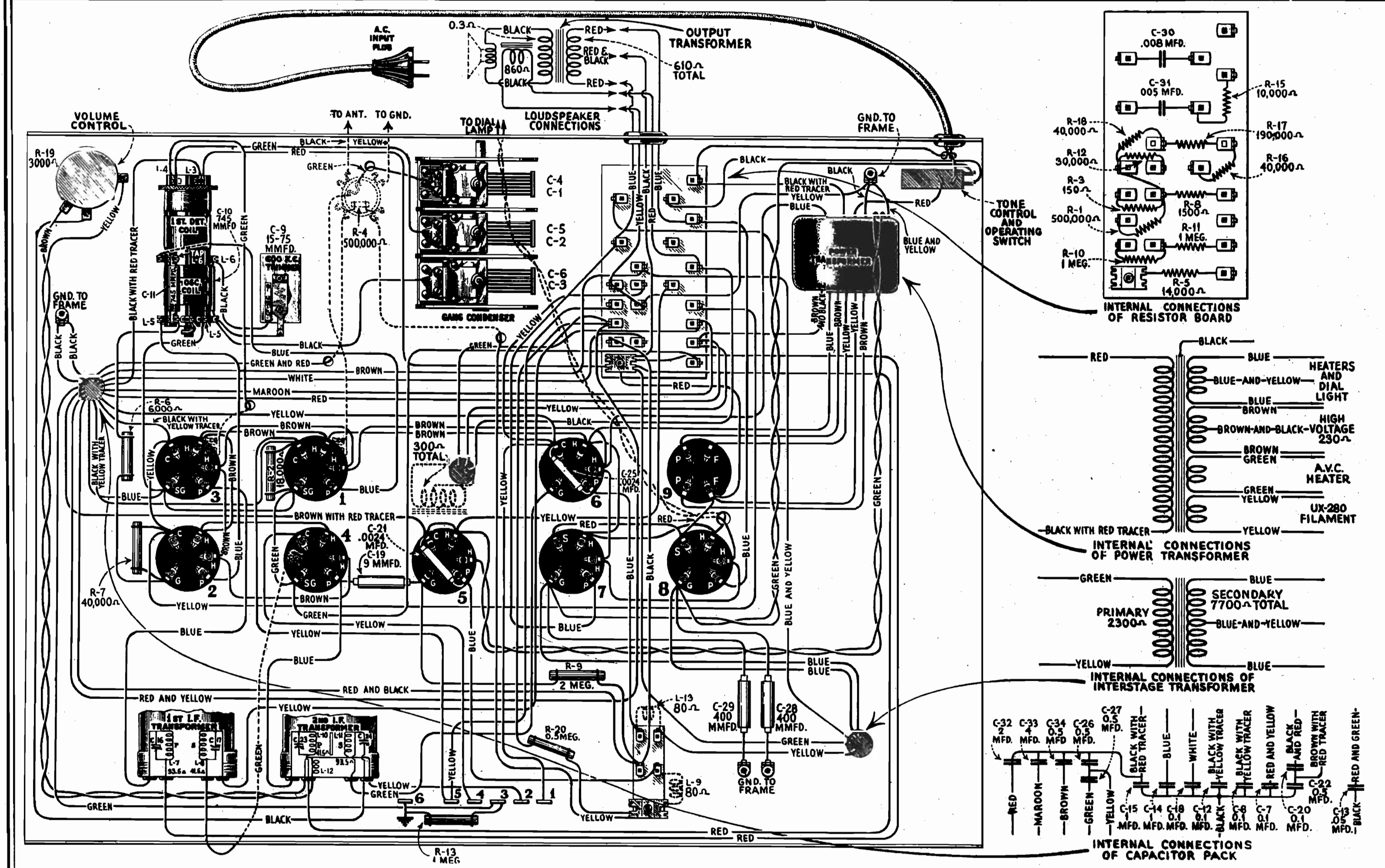


The chassis and loudspeaker used in Model R-21 is identical with that used in the R-11 except for the dial and scale. A reference to the R-11 Service Notes will therefore give any information necessary in reference to circuit diagram, voltage reading and other service information. One change should be noted in later production of R-11s and all R-21s and that is the change in value of Resistor R-9 from 5 Megohms to 2 Megohms.

MODEL R-21 SUPERHETERODYNE

R. C. A. VICTOR CO., Inc.

MODEL R-21 SUPERHETERODYNE



REPLACEMENT PARTS

2563	Resistor—6,000 ohms—Carbon type—1 Watt—Package of 5	$3.00
2730	Resistor—18,000 ohms—Carbon type—1 Watt—Package of 5	2.00
2734	Capacitor—745 mmfd.—Package of 5	2.20
2746	Socket—Dial lamp socket	.50
2747	Cap—Grid contactor cap—Package of 5	.50
2749	Capacitor—2400 mmfd.	1.50
2882	Socket—5 contact Radiotron socket—Complete with insulator—8 used	.50
2968	Socket—4 contact Radiotron socket—Complete with insulator—1 used	.50
3046	Resistor—190,000 ohms—Carbon type—½ Watt—Package of 5	$2.50
3047	Resistor—1,500 ohms—Carbon type—½ Watt—Package of 5	2.50
3048	Resistor—500,000 Ohms—Carbon type—½ Watt—Package of 5	2.50
3049	Resistor—150 Ohms—Carbon type—½ Watt—Package of 5	2.50
3050	Resistor—14,000 Ohms—Carbon type—3 Watt	.60
3053	Capacitor—9 mmfd.—Package of 2	.50
3055	Cushion—Receiver chassis sponge rubber cushion—Package of 4	.50
3056	Shield—Radiotron shield—6 used—Package of 2	$0.50
3076	Resistor—1 Megohm—Carbon type—½ Watt—Package of 5	2.50
3077	Resistor—30,000 Ohms—Carbon type—½ Watt—Package of 5	2.50
3078	Resistor—10,000 Ohms—Carbon type—½ Watt—Package of 5	2.50
3079	Resistor—40,000 Ohms—Carbon type—½ Watt—Package of 5	2.50
3085	Capacitor—400 mmfd.	.60
3089	Board — Magnetic pickup terminal board — Complete with mounting rivets	.50
3090	Board—A.V.C. and 2nd detector R.F. choke board—Less choke coils	.50
3091	Board—Resistor board complete less resistors and capacitors	1.00
3092	Volume Control—Volume control complete with mounting nut	1.50
3093	Tone Control—Tone control complete with mounting nut	1.90
3095	Coil—R.F. coil	1.90
3096	Coil—1st detector and oscillator coil	3.55
3098	Capacitor—0.008 mfd.	.50

R. C. A. VICTOR CO., Inc.

UNIVERSAL RADIOLA RO-23

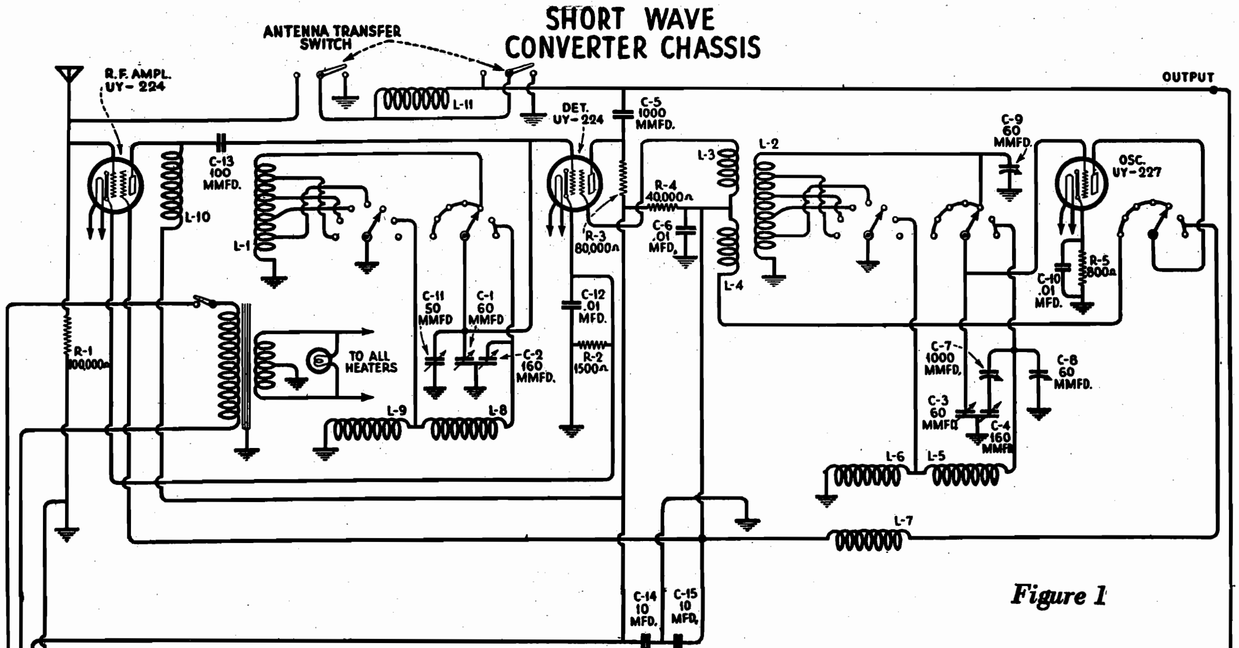
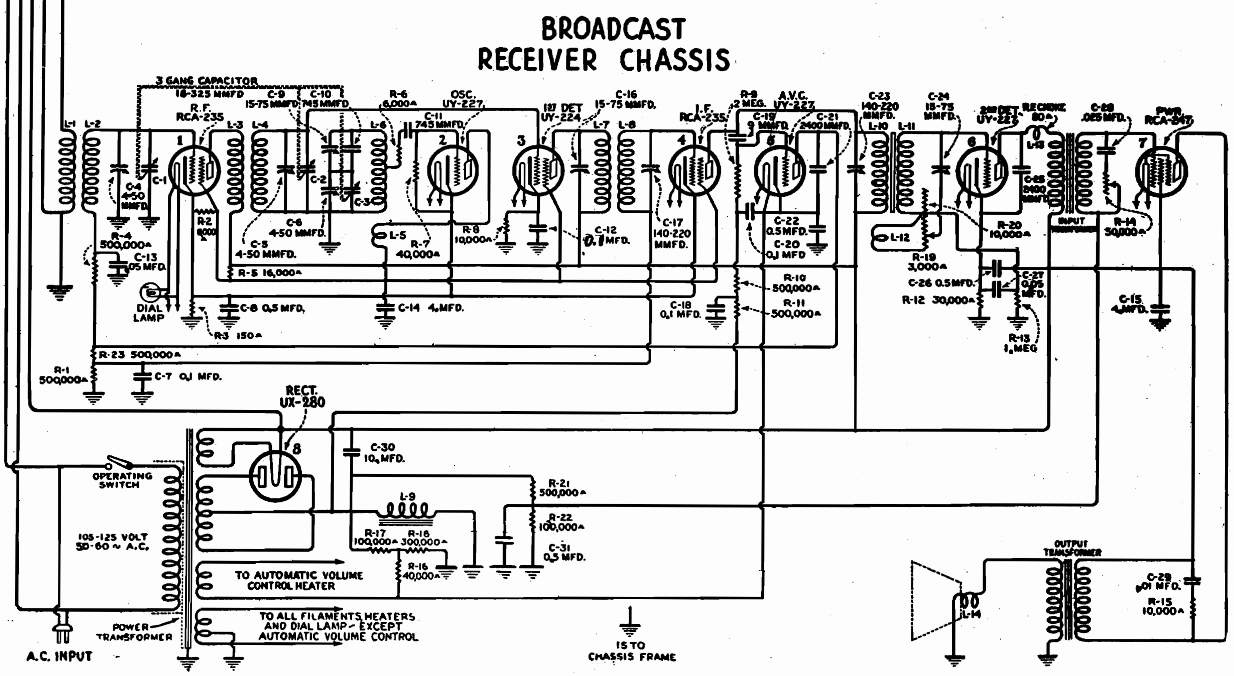


Figure 1

BROADCAST RECEIVER INTERMEDIATE FREQUENCY 175 KC
CONVERTER INTERMEDIATE FREQUENCY 1075 KC

Note—On some models operating switch for broadcast receiver is in circuit to Converter.



Voltage Rating......105–125 Volts and 200–250 Volts
Frequency Rating......50–60 cycles and 25–40 cycles
Power Consumption.................120 Watts

UNIVERSAL RADIOLA
MODEL RO-23
(Part 2)

R. C. A. VICTOR CO., Inc.

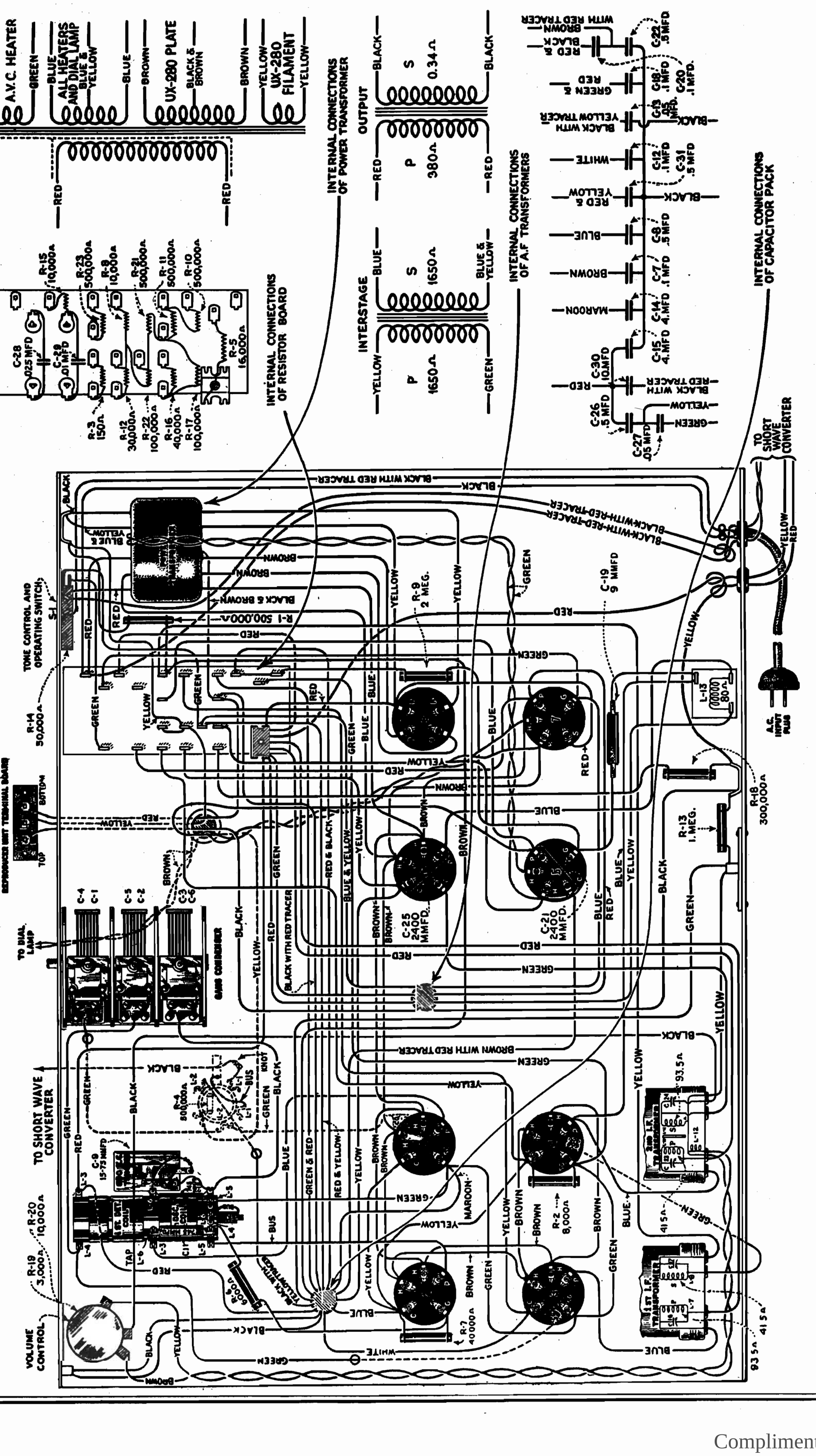


Figure 4—Wiring Diagram of Broadcast Band Receiver

B'CAST RECEIVER-	Volt.Data	Page	504-D-5
	Service	"	504-C
S.W.CONVERTER -	Volt.	"	504-J-15
	Cal. Chart	"	504-J-17

UNIVERSAL RADIOLA
MODEL RO-23
(Part 3)

R. C. A. - VICTOR CO., Inc.

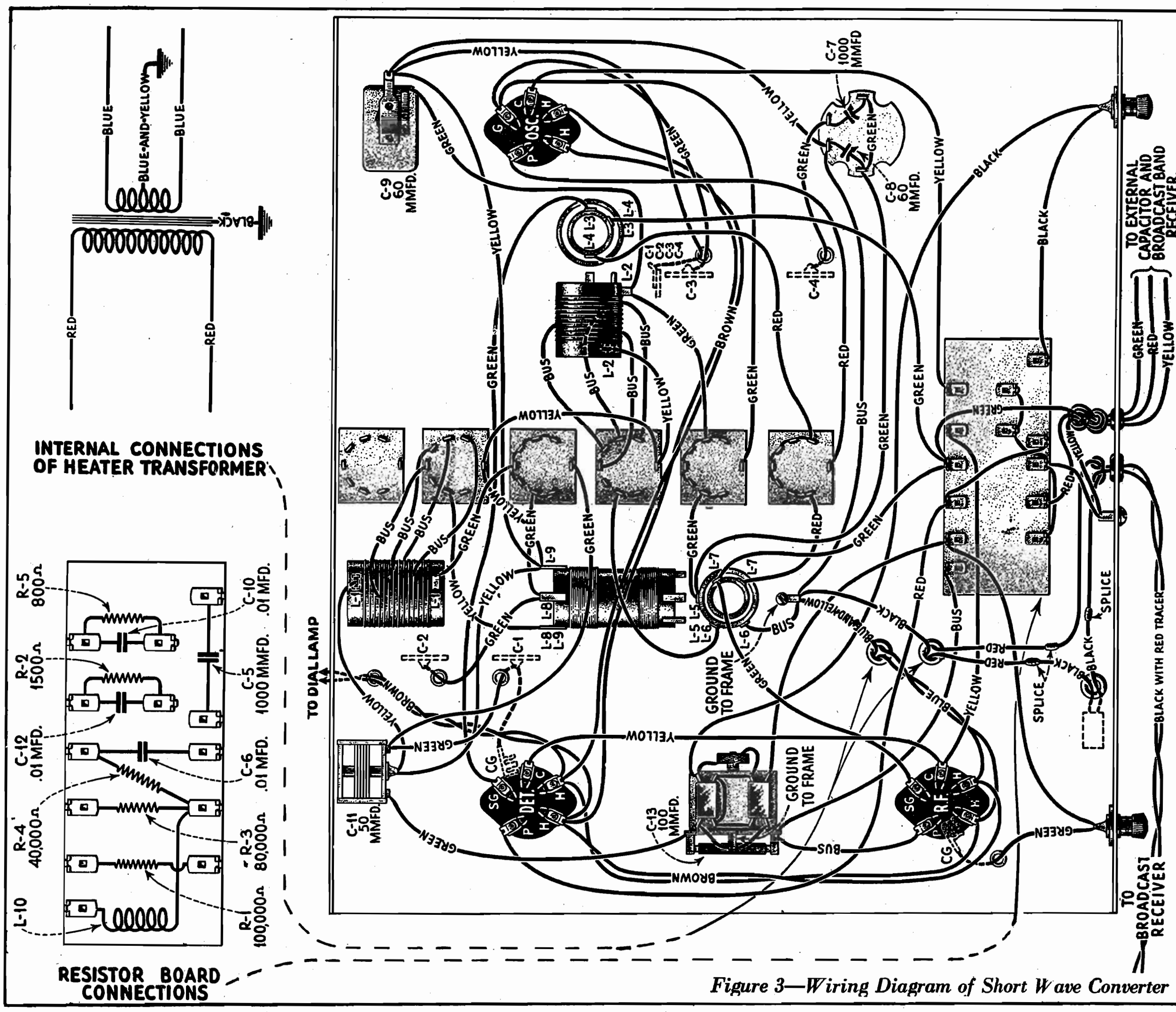


Figure 3—Wiring Diagram of Short Wave Converter

SERVICE DATA

Service information in conjunction with the broadcast receiver is covered in the Service Notes already issued on RCA-Victor Models R-8, R-10 or R-12. The Short Wave Converter is however somewhat different from the usual broadcast receiver and a discussion of its service problems will help the service man in the performance of his work.

ELECTRICAL DESCRIPTION OF CONVERTER CIRCUIT

The RCA Victor Short Wave Converter uses three Radiotrons, one UY-224 as an R. F. Amplifier, one UY-224 as a Detector and one UY-227 as an Oscillator. The purpose of the Converter is to amplify the incoming high frequency signal by means of the R. F. stage, beat it with a local Oscillator signal and produce a modulated beat frequency by means of the Detector, extract the beat frequency so that it may be amplified by means of the broadcast receiver. A special tuning Capacitor, for tuning the Oscillator and Detector stages simultaneously, is incorporated in this unit. A series of tapped coils in conjunction with a range switch provides for the shifting to various bands without interchanging coils as with the older style Converters. Also this switch changes the capacity used by the tuning capacitor so that the frequency range of each band is approximately the same. A small trimmer capacitor, known as the Resonator, is used to re-align the detector circuit with the Oscillator whenever the band is changed or the I. F. frequency is shifted. The shaft that controls the Resonator capacitor is also mechanically connected to the operating switch and the antenna switch. It is so made that when the power is turned "off," the antenna is shifted to the broadcast receiver so that broadcast reception may be obtained.

UNIVERSAL RADIOLA
MODEL RO-23
(Part 4)

R. C. A. - VICTOR CO., Inc.

(1) ALIGNMENT OF CONVERTER CIRCUITS

If the Converter does not cover the bands indicated on the range switch, refer to Figure 2 and make the following adjustments. A calibrated oscillator or frequency meter is desirable although if the service man is familiar with the stations in the high frequency spectrum, the location of these stations on the scale can be used as a guide for making the adjustments. Also a calibrated short-wave receiver that has an oscillating detector may be used to check the Converter oscillator frequency.

Adjust the broadcast receiver so that it is accurately set at 1075 K. C.—the short wave I. F. frequency. Set the "Range" switch at the 51.3–98.5 meter position.

Set the tuning capacitor at its minimum position. (Plates fully out of mesh.)

Place the external oscillator in operation at 5960 K. C.

Adjust the oscillator shunt capacitor C-8 so that the external oscillator will be heard in the loudspeaker or noted on an output meter.

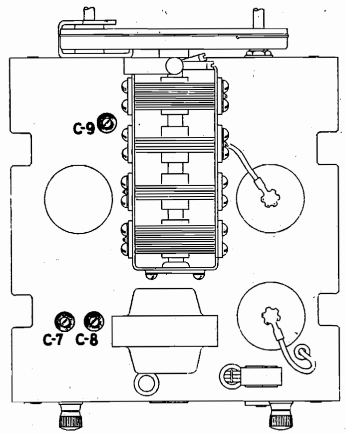


Figure 2—Location of Adjusting Capacitors

If the calibrated oscillator is not available then a calibrated receiver may be used to receive and check the frequency of the converter oscillator. The capacitor C-8 should be adjusted until the oscillator frequency is 7035 K. C.

If a wave meter is the only standard available, then a second receiver should be calibrated from it by means of one of the several methods for doing this accurately.

If no standards are available a satisfactory adjustment can be made by increasing capacitor C-8 slightly more than the point at which the 49 meter broadcasting stations are heard when the tuning capacitor is at its minimum position on the 51.3–98.5 meter band. (With C-8 set at minimum the 49 meter band should be received.)

Now shift the tuning capacitor to its maximum position. The Converter oscillator frequency, as picked up on a calibrated receiver, should be adjusted for 4130 K. C. by the oscillator series capacitor C-7. So adjusted, the receiver will receive a 3055 K. C. signal with an intermediate frequency of 1075.

Again, if no standards are available, an adjustment of C-7 that will give a definite point of resonance near the center range of the Resonator control with the tuning dial at 50 will be satisfactory.

After checking each end of the 51.3 to 98.5 meter band, shift the range switch to the 38–51.3 meter position. Set the tuning capacitor at its minimum position (plates fully out of mesh) and the I. F. frequency at 1075. Adjust the oscillator shunt capacitor C-9 until the oscillator frequency is 9100 K. C. or the receiver will respond to a signal of 8025 K. C. If no standards are available, adjust C-9 until the 49 meter stations all fall within and near the center of the 49 meter markings on the dial. Unless this adjustment is properly made the short wave broadcasting will not fall within the bands marked on the dial.

Alignment at each end of the 51.3–98.5 meter band are also for the 98.5–200 meter band. The other alignment is for the five high frequency ranges. When these alignments are properly made, and an intermediate frequency between 1050 and 1100 K. C. is used, the Resonator control will function properly and the various short wave broadcasting services will fall within the bands indicated on the dial.

Special Notes on Effects of Aligning and I. F. Frequency Changes

Unless the line-up adjustments are carefully and properly made, the dial markings will be found to be incorrect. If it is necessary to replace the oscillator coil, the leads on the new coil should be made as short as possible and the alignment of the set checked. Also during operation it is preferable that the I. F. frequency of 1075 be used although any frequency between 1050 and 1100 will be satisfactory.

In unusual cases where local conditions preclude the use of a frequency between 1050 and 1100 K. C., considerably more variation in I. F. frequency without the loss of sensitivity will be permissible. However, the calibration will be shifted considerably, especially at the lower frequencies.

(2) DIAL INDICATOR

The indicator on the dial lamp should be so adjusted that the dial will read 100 when the tuning capacitor is at its maximum capacity position. It is important that this be checked before any alignment adjustments are made.

(3) BROADCASTING STATION HARMONICS

When tuning on the 98.5–200 meter band, the second and third harmonics of broadcasting stations will be heard and as there is no regular short wave broadcasting service on this band such signals may be discounted as better results will be obtained by listening to such programs on their regular wave band.

On the lower length bands, the short wave broadcasting stations will be received in the bands indicated for each position of the range switch with but few exceptions. Broadcasting received at other positions of the dial should therefore be viewed with skepticism unless it is definitely proved to be a short wave station and not a higher harmonic of a broadcast station.

(4) LOCAL STATION INTERFERENCE

When the receiver is located very close to a powerful transmitter, either broadcasting or code it is recommended that an antenna not exceeding 30 feet in length be used. However, if a longer antenna is necessary in order to obtain satisfactory reception, cross modulation from the local station may occur. Such a condition is evidenced by the local station coming in on unmodulated carriers on top of some short wave stations.

Under such conditions, it is advisable to use a tuned input circuit to the short Wave Converter. Such an input circuit can readily be made by winding 3 turns of No. 20 wire on a 1¼ inch tube, spacing the turns ⅛ inch apart. The coil is tuned by means of a .0005 mfd. variable capacitor and should be connected from the antenna input to ground. Such a combination will tune broadly from 13.8 to 51 meters.

(5) ACOUSTIC FEEDBACK

If Acoustic feedback is experienced, it is an indication that the two chassis are not entirely supported on rubber. While with the usual broadcast receiver, such a condition is not so vitally necessary, with high frequency reception, unless each chassis is entirely floating in its rubber mounting and its shafts and knobs not touching the cabinet, howling will result.

(6) BROADCAST RECEIVER HARMONICS

When tuning through the various bands, at various points a slight breathing tone can be heard that is not a C. W. signal, but a harmonic of the broadcast receiver oscillator, being received. If an intermediate frequency of between 1050 and 1100 is used, these will not fall on any of the short wave broadcasting services. However, if they should and thereby cause a whistle, a slight shift —5 kilocycles of the intermediate frequency—will eliminate the interference. Retuning the Short Wave Converter will be necessary to restore the signal to its normal intensity. Identification of these harmonics can be made by this means, a slight shift in the intermediate frequency causing them to disappear while an incoming signal will slowly diminish in volume.

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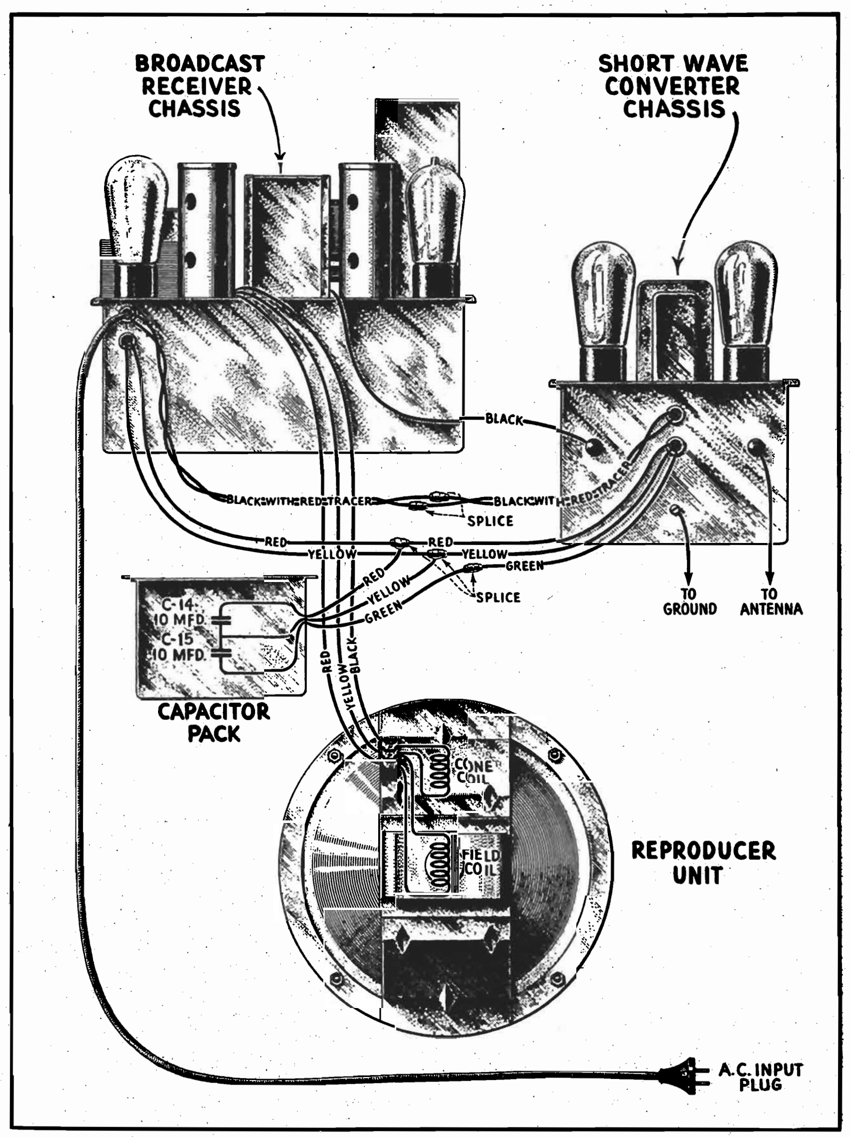


Figure 5—Assembly Wiring

S. O. 8737 5M 1-14-'32

(7) C. W. RECEPTION

Normally C. W. transmitters will not be heard unless they are modulated. However, such reception can be obtained by coupling an external oscillator loosely to the second detector of the broadcast receiver. This oscillator should be at about 174 or 176 K. C. so that a pleasing beat note will be obtained. Also a beat note may be obtained by means of an oscillator, the frequency of which is at the 1st I. F. frequency—1150 to 1100 K. C.—and loosely coupled to the input of the Broadcast receiver chassis.

(8) HUM

In addition to the usual causes of hum in the broadcast receiver, the following points should be checked in relation to hum in the Short Wave Converter.

(a) A. C. input cord near antenna wire. Keep these two leads separate as much as possible.
(b) Slack in A. C. cord has been placed close to Converter chassis. Take up the slack near the outlet, not near the Converter.
(c) Filament transformer center tap not connected.
(d) One side of filament transformer grounded, thereby shorting one section of the secondary.

(9) RANGE SWITCH

A defective "Range" switch may cause any of the following conditions:

(a) Noise. A corroded or loose wire or contact may cause excessive noise even when the switch is not being shifted. Check by removing the antenna to see if the noise decreases.
(b) Resonator control not effective. Check the detector sections—1 and 3 from the front—for faulty contacts.
(c) Oscillator not functioning. Check the oscillator sections—2, 4 and 5 from the front.
(d) Shift of dial readings. Check for corroded or loose connections.

(10) ANTENNA RESONANCE COIL

An open antenna resonance coil will lower the sensitivity of short wave reception. Its purpose is to match the output of the Converter to the input of the broadcast receiver.

(11) ANTENNA TRANSFER SWITCH

The Resonator Control shaft also is used to shift the antenna from the Short Wave Converter to the broadcast receiver. Also the power switch to the converter is operated simultaneously. A failure of these switches will usually be due to the failure of the engaging lever to throw the switch. If such a condition develops, the switch may be raised so that it properly engages with the operating arm on the shaft. See that no oil or grease prevents proper connection to the shaft at the friction bearing or noise will result when the Resonator is adjusted.

(12) FLUTTER

Fluttering may be caused by either of the following:

(a) Open capacitor C-14 or C-15. The purpose of these capacitors is to prevent flutter that may be encountered in a single Pentode receiver.
(b) Antenna lead close to detector Radiotron. See that this lead is in its proper position and removed from the detector Radiotron in the Converter.

(13) VOLTAGE READINGS

The following voltages are obtained at the Converter Radiotron sockets when measured with the usual set analyzers.

RADIOTRON SOCKET VOLTAGES

120 Volt A. C. Line

Radiotron No.	Control Grid to Cathode Volts D. C.	Screen Grid to Cathode Volts D. C.	Plate to Cathode Volts D. C.	Plate M. A.	Heater Volts A. C.
R. F.	—3	50	260	1.0	2.66
Detector	—3	50	180	1.0	2.66
Oscillator	—5	—	50	5.0	2.66

UNIVERSAL RADIOLA
MODEL RO-23
(Part 6)

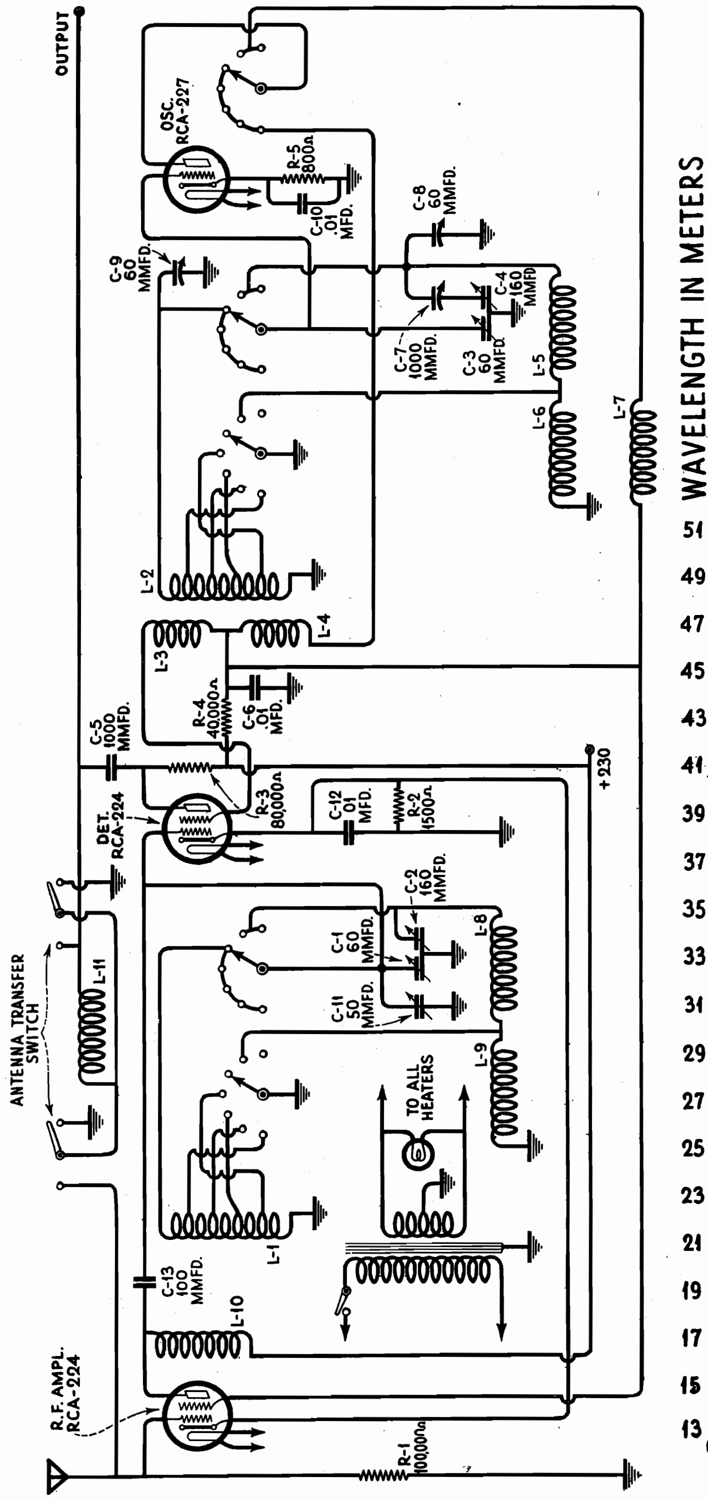
R. C. A. VICTOR CO., Inc.

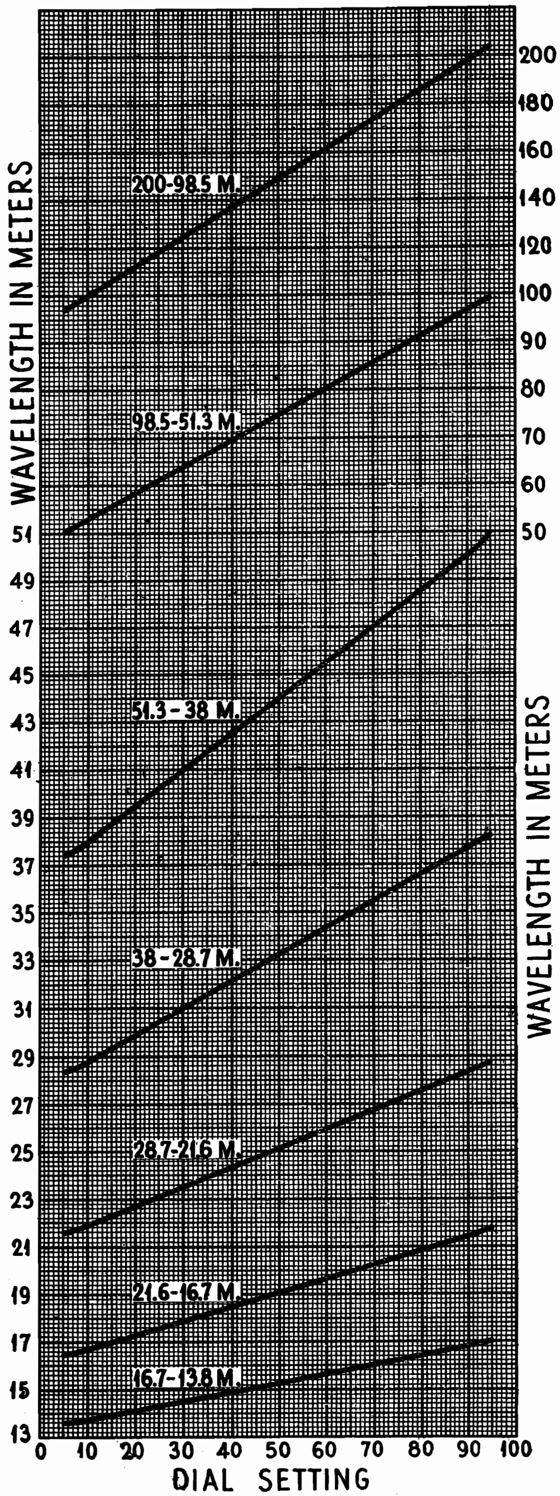
REPLACEMENT PARTS

Stock No.	Description	List Price
	LONG WAVE RECEIVER	
2563	Resistor—6,000 ohms—Carbon type—1 watt—Package of 5	$3.00
2730	Resistor—18,000 ohms—Carbon type—1 watt—Package of 5	2.00
2746	Socket—Dial lamp socket	.50
2747	Cap—Grid contactor caps—Package of 5	.50
2749	Capacitor—2400 mmfd.	1.50
2882	Socket—UY Radiotron socket complete with insulation strip	.50
2968	Socket—UX Radiotron socket—Complete with insulation strip	.50
2970	Resistor — 500,000 ohms — Carbon type—1 watt—Package of 5	2.50
2977	Knob—Tuning control, volume control or tone control knob—Package of 5	2.50
3003	Cushion — Receiver chassis rubber cushion—Package of 4	.50
3024	Capacitor—9 mmfd.—Package of 2	.50
3029	Bracket—Dial lamp bracket and indicator	.50
3045	Resistor—40,000 ohms—Carbon type—1 watt—Package of 5	2.50
3048	Resistor — 500,000 ohms — Carbon type—½ watt—Package of 5	2.50
3049	Resistor—150 ohms—Carbon type—½ watt—Package of 5	2.50
3056	Shield — Radiotron shield — Package of 2	.50
3076	Resistor—1 megohm—Carbon type—½ watt—Package of 5	2.50
3077	Resistor—30,000 ohms—Carbon type—½ watt—Package of 5	2.50
3078	Resistor—10,000 ohms—Carbon type—½ watt—Package of 5	2.50
3079	Resistor—40,000 ohms—Carbon type—½ watt—Package of 5	2.50
3081	Resistor—16,000 ohms—Carbon type 3 watt	.60
3092	Volume control—Volume control complete with mounting nut	1.50
3093	Tone control—Tone control complete with mounting nut	1.90
3095	Coil—R.F. coil	1.90
3235	Coil—1st detector and oscillator coil	2.85
3251	Coil—Choke coil	.90
3284	Board—Terminal board with 1 soldering terminal—Package of 5	.90
3285	Cord—Drive cord—Package of 5	1.00
3286	Spring—Drive cord tension spring—Package of 5	1.40
6185	Resistor — 100,000 ohms — Carbon—½ watt—Package of 5	2.00
6186	Resistor — 500,000 ohms — Carbon type—¼ watt—Package of 5	2.00
6187	Resistor — 300,000 ohms — Carbon type—½ watt—Package of 5	$2.00
6188	Resistor—2 megohm—Carbon type—½ watt—Package of 5	2.00
7054	Cord—Power cord	1.00
7062	Capacitor—Adjustable capacitor 15–70 mmfd.	1.00
7298	Capacitor—0.01 mfd.	.80
7299	Capacitor—745 mmfd.	.70
7340	Transformer—1st Intermediate transformer	3.00
7341	Transformer—2nd Intermediate transformer	3.00
7342	Capacitor—Comprising two 0.05 mfd., four 0.5 mfd., one 10.0 mfd., two 4.0 mfd. and four 0.1 mfd. capacitors in metal container	7.85
7343	Transformer—Audio transformer	3.85
7344	Transformer — Power transformer — 110 volts—60 cycles	8.00
7348	Board—Resistor board complete less resistors and capacitor	2.30
7362	Capacitor—0.025 mfd.	1.00
7404	Drum—Dial drum and scale	1.20
7405	Capacitor—20 mfd. electrolytic capacitor—In metal container	5.00
8770	Transformer — Power transformer — 25 cycles	12.00
8771	Transformer — Power transformer — 220 volts—60 cycles	9.00
8805	Capacitor—Variable tuning capacitor	6.00
8837	Support — Receiver chassis metal mounting support—Package of 4	.70
	LOUDSPEAKER ASSEMBLY	
3237	Loudspeaker mounting screw assembly—Comprising 4 screws, 8 nuts, 8 washers and 4 eyelets—Package of 1 set	.50
7345	Coil assembly—Comprising field coil, cone bracket and magnet	5.00
8559	Ring—Cone retaining ring	.80
8601	Cone—Speaker cone—Package of 5	15.00
	SHORT WAVE RECEIVER	
2747	Cap—Grid contactor cap—Package of 5	.50
2977	Knob—Station selector or Resonator knob—Package of 5	2.50
3058	Resistor — 100,000 ohms — Carbon type—1 watt—Package of 5	2.50
3153	Resistor—1500 ohms—Carbon type—1 watt—Package of 5	2.75
3285	Cord—Drive cord—Package of 5	1.00
3286	Spring—Drive cord tension spring—Package of 5	1
	SHORT WAVE RECEIVER—Continued	
3288	Socket—UY Radiotron socket—Complete with insulation strip	$ .50
3289	Contact lug—Complete with mounting rivet—Package of 10	.50
3290	Switch—"Off and On"—Toggle switch complete with mounting nut	1.00
3291	Board—Terminal board with two soldering terminals complete with mounting rivets—For switch and bracket assembly—Package of 5	.50
3292	Drive shaft and pulley—Package of 5	2.35
3293	Coil—For resistor board assembly	.65
6100	Coil—Coil assembly complete with mounting eyelet—For switch and bracket assembly	.75
6101	Socket—Dial lamp socket and bracket with mounting rivets	.50
6102	Capacitor—1000 mmfd.—Package of 5	2.50
6103	Resistor—800 ohms—Carbon type—1 watt—Package of 5	2.00
6104	Resistor—80,000 ohms—Carbon type 1 watt—Package of 5	2.00
6105	Resistor—40,000 ohms—Carbon type 3 watt—Package of 5	2.00
6106	Coupling—Switch lever shaft coupling bushing with 2 groove pins—Package of 5	.50
6107	Switch — Antenna transfer toggle switch	1.00
6108	Binding post—Complete with terminal lug, mounting washer and nut—Package of 5	1.75
6109	Knob—Knob with pointer—Package of 5	1.75
6110	Dial lamp shield and indicator	.50
6111	Escutcheon—Band selector switch knob escutcheon—Package of 5	1.80
6112	Cushion — Receiver chassis rubber cushion—Package of 4	.50
7062	Capacitor — Adjustable capacitor — 15–70 mmfd.	1.00
7298	Capacitor—0.01 mfd.	.80
7406	Capacitor—Double adjustable capacitor—One section 10–70 mmfd., one section 800–1000 mmfd.	1.10
7407	Coil—High frequency detector coil	$1.05
7408	Coil—Low frequency detector and oscillator coil	1.45
7409	Coil—High frequency oscillator coil	1.85
7410	Capacitor—Variable capacitor 7 plate—Complete with mounting nut and washer	1.75
8806	Transformer—Filament power transformer	3.25
8807	Transformer—Filament power transformer—105–120 volts, 25-cycles	5.75
8808	Transformer—Filament power transformer—220 volts, 60 cycles	3.40
8809	Board—Resistor board less resistors, capacitors and coil	1.00
8810	Lever—Switch lever assembly—Comprising shaft, 3 switch levers and coupling bushing	.70
8811	Switch—Band selector switch complete with mounting washer and nut	6.60
8812	Capacitor—Tuning capacitor assembly	5.10
8813	Dial drum and scale	1.20
8837	Support — Chassis metal mounting support—Package of 4	.70
10820	Capacitor—100 mmfd.	.50
	CABINET ASSEMBLY	
X-24	Top	7.00
X-25	Stretcher rails—Comprising R.H. and L.H. end rails and center rail	4.10
X-26	Leg	4.15
X-27	Foot assembly — Comprising foot, hanger bolt, packing nut and ferrule—Assembled	1.45
X-28	Baffle board and grille cloth	1.35
X-29	Escutcheon—Tuning dial escutcheon for long wave	1.60
X-30	Escutcheon—Tuning dial escutcheon for short wave	1.60
3223	Escutcheon—Metal bezel for dial	.50
3287	Label—Metal trade mark label—Package of 5	.75
9398	Cabinet—Cabinet complete less equipment	77.25

R. C. A. VICTOR CO., Inc.

MODEL SWA-2 SHORT WAVE CONVERTER





Approximate Calibration of Short Wave Tuning Dial of RO-23 (with 1075 K.C. Intermediate Frequency).

Voltage Rating.................105–125 Volts and 200–250 Volts
Frequency Rating.................50–60 cycles and 25–40 cycles
Power Consumption..20 Watts
Recommended Antenna Length.......................25–75 feet

Service Data Page 504-J-13

Voltage Data Page 504-J-15

R. C. A. - VICTOR CO., Inc.

MODEL SWA-2 SHORT WAVE CONVERTER

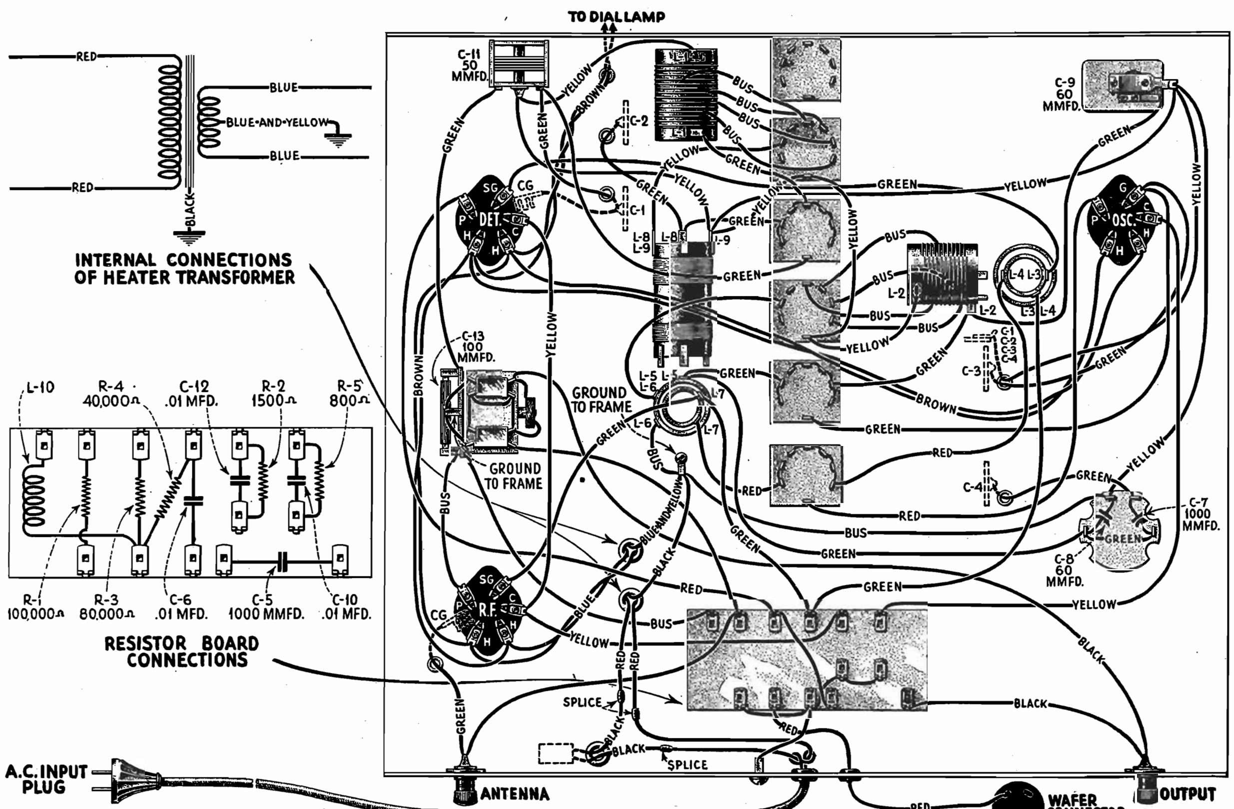
RCA Victor Short Wave Converter SWA-2 is a three tube, single control short wave unit designed to convert all short wave signals from 13.8–200 meters to a single frequency so that they may then be amplified by means of the usual broadcast receiver.

One Radiotron UY-224 is used as an R. F. Amplifying stage, one UY-224 as the detector and one UY-227 as the oscillator. Heater current for these Radiotrons is obtained from a small transformer incorporated in the unit. Plate supply is obtained from the broadcasting receiver.

A wafer connector is supplied that may be inserted under the tube socket when a receiver using a UX-280 rectifier and a filter in the negative side of the line is used. Under these conditions—most modern receivers are so designed that this is true—the plate supply to the converter is obtained through the contact on the wafer connector to the UX-280 filament. On receivers where this condition does not exist, but where Pentode output tubes are used, the wafer connector can be used to make connection to the screen grid of the Pentode. On receivers where neither condition exist any connection that gives a filtered D. C. output of from 180 to 260 volts between the contact and ground will be suitable.

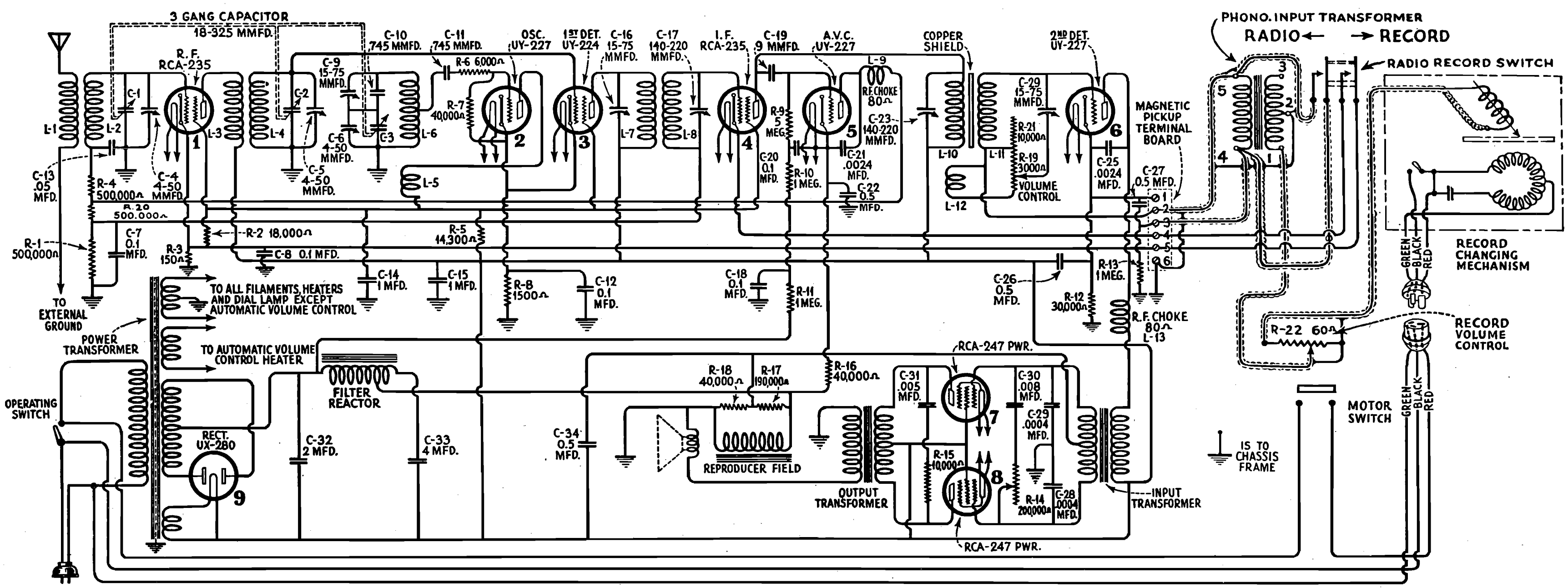
Due to the SWA-2 being identical with the converter chassis used in the RO-23, reference to the RO-23 Service Notes should be made for data pertaining to Service work. (Page 504-J-13.)

Stock No.	DESCRIPTION	List Price
2747	Cap—Grid contactor cap—Package of 5	$0.50
2977	Knob—Station selector, or Resonator knob—Package of 5	2.50
3058	Resistor—100,000 ohms—Carbon type—1 watt—Package of 5	2.50
3153	Resistor—1500 ohms—Carbon type—1 watt—Package of 5	2.75
3285	Cord—Drive cord—Package of 5	1.00
3286	Spring—Drive cord tension spring—Package of 5	1.40
3288	Socket—UY Radiotron socket—Complete with insulation strip	.50
3289	Contact lug—Complete with mounting rivets—Package of 10	.50
3290	Switch—Antenna—"Off and On"—Toggle type—2 used—Complete with mounting nut	1.00
3291	Board—Terminal board with two soldering terminals complete with mounting rivets—Located on switch bracket—Package of 5	.50
3292	Drive shaft with pulley—Package of 5	2.35
3293	Coil—For resistor board assembly	.65
6100	Coil—Coil assembly with mounting eyelet—For switch and bracket assembly	.75
6101	Socket—Dial lamp socket and bracket with mounting rivets	.50
6102	Capacitor—1000 mmfd.—Package of 5	2.50
6103	Resistor—800 ohms—Carbon type—1 watt—Package of 5	2.00
6104	Resistor—80,000 ohms—Carbon type—1 watt—Package of 5	2.00
6105	Resistor—40,000 ohms—Carbon type—3 watt—Package of 5	2.00
6106	Coupling—Switch lever shaft coupling with 2 taper pins—Package of 5	.50
6107	Switch—Toggle type—Power switch	1.00
6108	Binding post—Conplete with terminal lug, mounting washer and mounting nut—Package of 5	1.75
6109	Knob—Knob with pointer—Package of 5	$1.75
6110	Dial lamp shield and indicator	.50
6111	Escutcheon—Range switch knob escutcheon—Package of 5	1.80
6112	Cushion—Receiver chassis rubber cushions—Package of 4	.50
7062	Capacitor—Adjustable capacitor—15–70 mmfd.	1.00
7298	Capacitor—0.01 mfd.	.80
7406	Capacitor—Double adjustable capacitor—One section 10–70 mmfd.—One section 800–1000 mmfd.	1.10
7407	Coil—High frequency detector coil	1.05
7408	Coil—Low frequency detector and oscillator coil	1.45
7409	Coil—High frequency oscillator coil	1.85
7410	Capacitor—Variable capacitor—7 plate—Complete with mounting nut and washers	1.75
8806	Transformer—Filament power transformer	3.25
8807	Transformer—Filament power transformer—110 volts–25 cycle	5.75
8808	Transformer—Filament power transformer—220 volts—60 cycle	3.40
8809	Board—Resistor board less resistors, capacitors and coil	1.00
8810	Lever—Switch lever assembly—Comprising shaft, 3 switch levers and coupling bushing	.70
8811	Switch—Range switch complete with mounting washer and nut	6.60
8812	Capacitor—Variable tuning capacitor assembly	5.10
8813	Dial drum and scale	1.20
10820	Capacitor—100 mmfd.	.50
	CABINET	
3229	Escutcheon—Tuning dial escutcheon with mounting screws	.70
6113	Foot—Cabinet felt foot—Package of 15	.50
9399	Cabinet—Complete less equipment	12.00



Wiring Diagram

R. C. A. - VICTOR CO., Inc.



PEAK FREQUENCY--175 KC

RCA Victor Radiola Automatic Electrola RAE-26 is a nine tube radio receiver combined with the perfected RCA Victor Automatic Record Changing Mechanism.

The Automatic Record Changing Mechanism provides for the continuous playing of ten 10-inch records. Provision is also made for a turntable speed of 33⅓ R.P.M. as well as 78 R.P.M. This makes the mechanism adaptable for the playing of the Program Transcription Records as well as standard records, either manually or automatically.

Data pertaining to adjustments and service on the Automatic Record Mechanism will be found on pages 504-Q R, S, T and U.

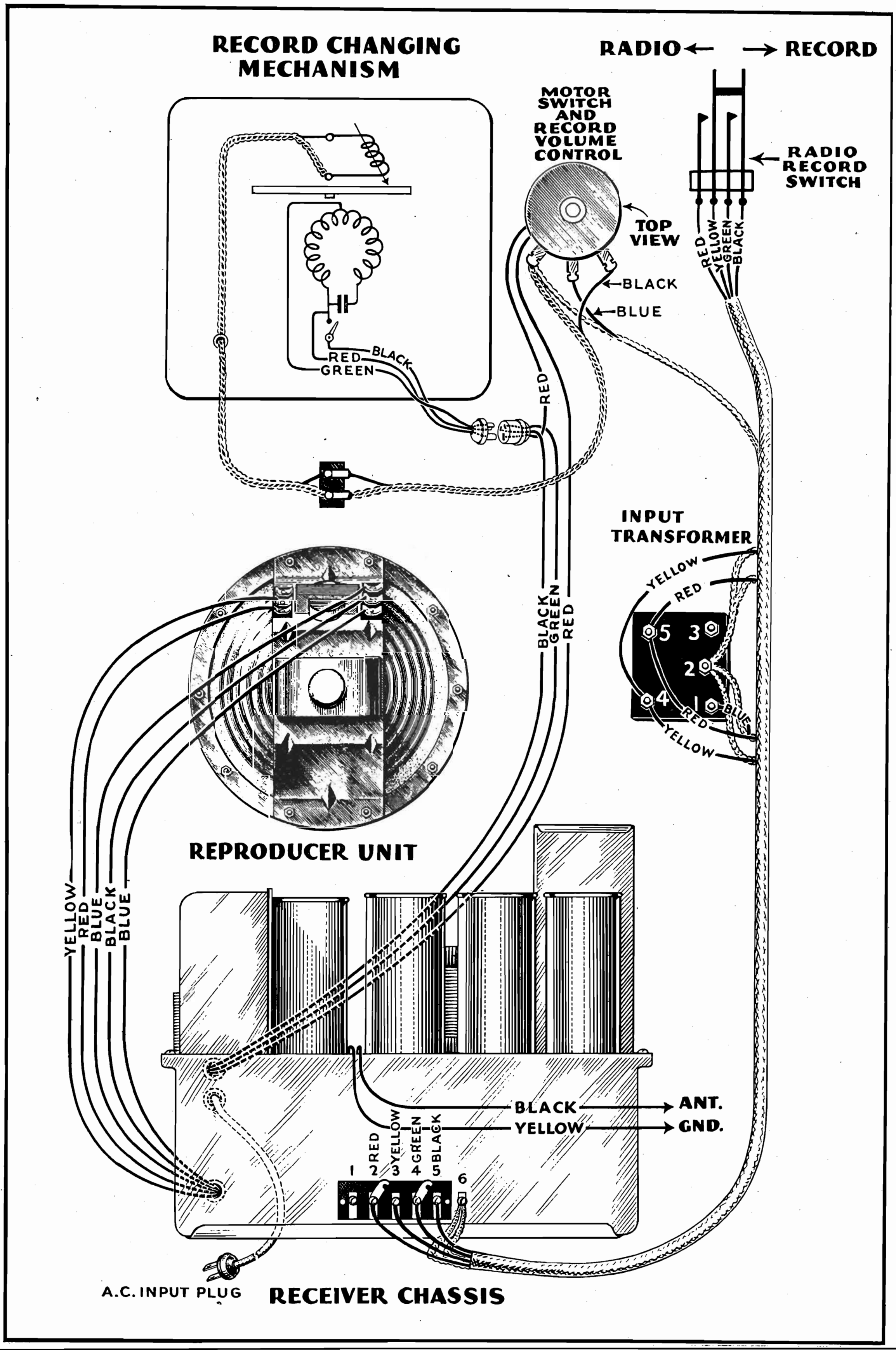
RAE-26

SERVICE DATA

The Receiver assembly and Loudspeaker used in Model RAE-26 is exactly the same as that used in the R-11. A reference to the Service Notes for the R-11 will therefore give the details of any Service information required on these units.

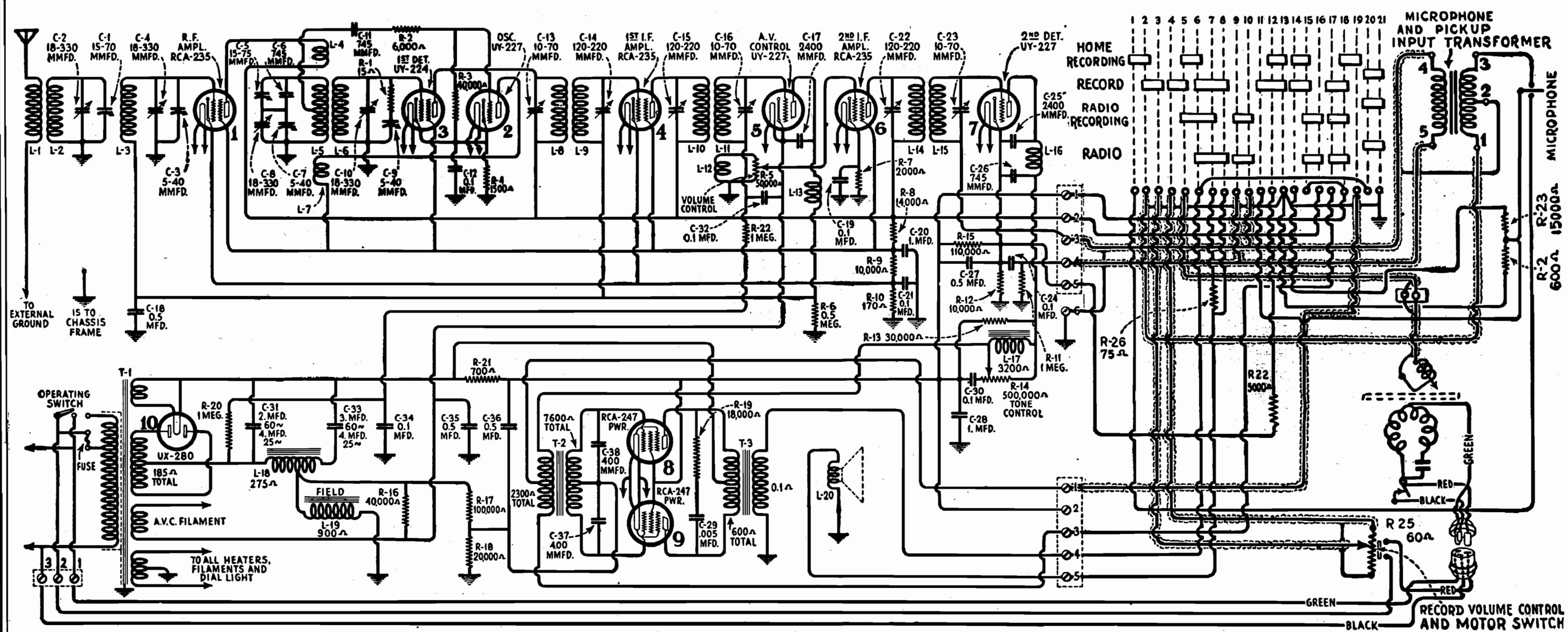
A reference to the Service Notes on the RCA Victor Automatic Record Changing Mechanism gives details of any service work that may be required on this unit. It will also be found useful in identifying the replacement parts listed below. Figure 1 shows the schematic circuit diagram and Figure 2 the assembly wiring diagram.

R. C. A. VICTOR CO., Inc.



Assembly Wiring Diagram of RAE-26

R. C. A. VICTOR CO., Inc.



PEAK FREQUENCY-175 KC

Radiola Automatic Electrola, Model RAE-59

The RCA Victor RAE-59 is a Combination DeLuxe Radio and Automatic Phonograph instrument that provides a large variety of home entertainment features. The radio receiver, amplifier and loudspeaker are identical with those used in Models R-50 and 55. The automatic record changing mechanism is of simple, sturdy design and may be operated at 33⅓ R.P.M. as well as 78 R.P.M.

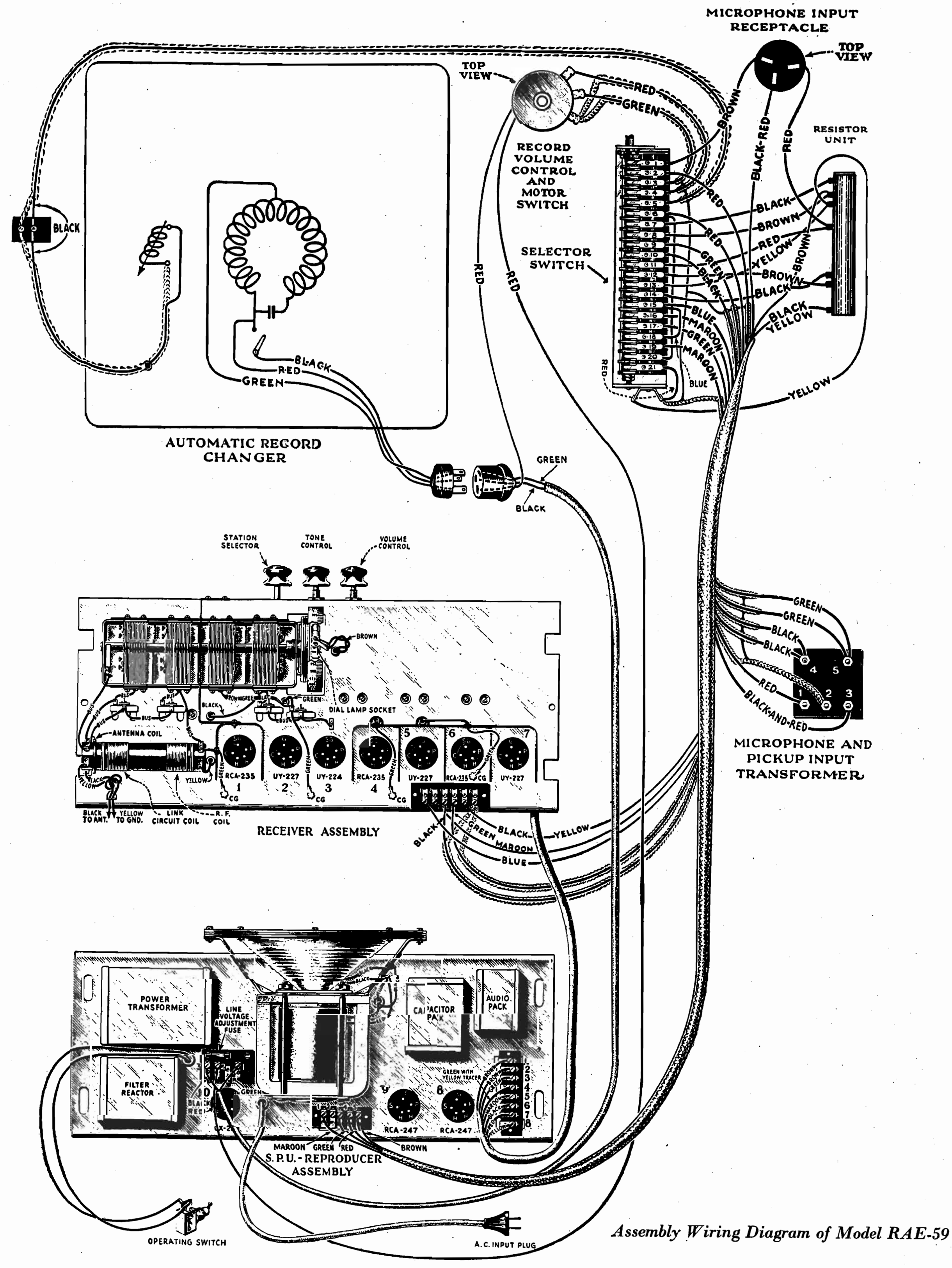
Excellent home recording is a feature of this instrument, its high quality being due to the use of a two button studio microphone and a high gain amplifier. Also a much greater power output is available, due to the use of Radiotrons RCA-247 in the output stage.

SERVICE DATA

A reference to the R-50 and R-55 Service Notes will give the details of any service work necessary in conjunction with the receiver and amplifier assemblies. Figure 1 shows the schematic wiring diagram and Figure 2 the assembly wiring. A reference to the Service Notes on the RCA Victor Record changing mechanism will give any details of service work in conjunction with this unit.

See Pages 504-Q, R, S, T and U.

R. C. A. - VICTOR CO., Inc.



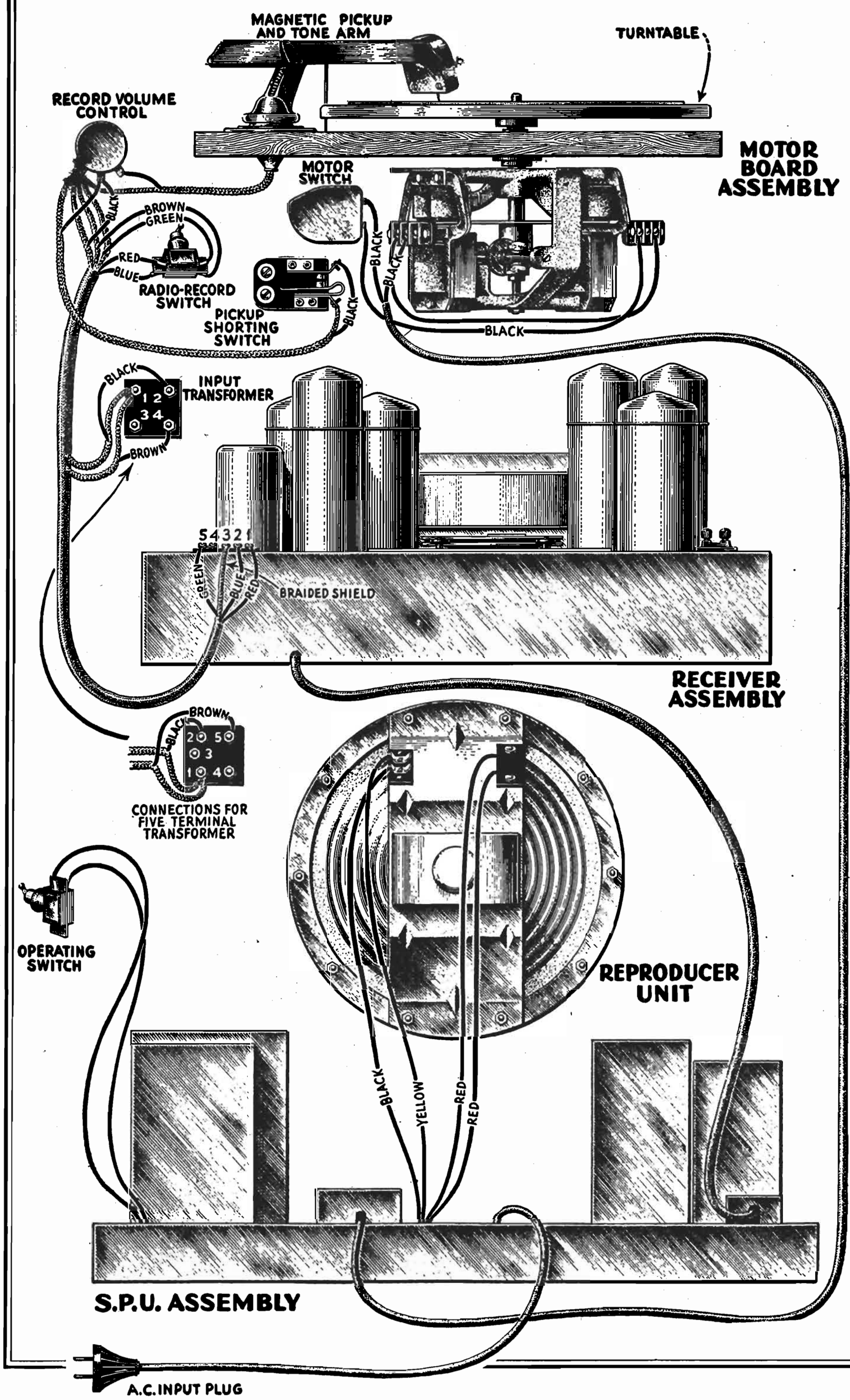
Assembly Wiring Diagram of Model RAE-59

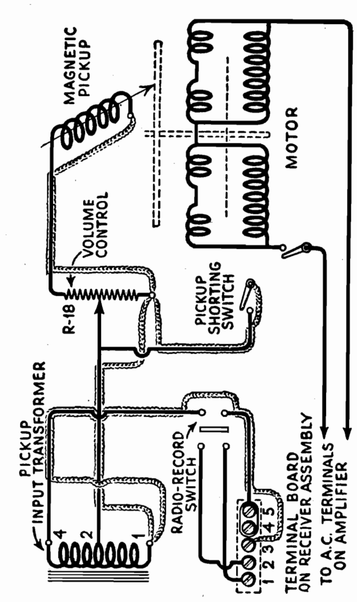
R. C. A. VICTOR CO., Inc.

RCA Victor Radiola Electrola RE–73 is an eight tube screen grid tuned R. F. type radio receiver combined with a standard Electrola mechanism. The receiver assembly and amplifier of this model is similar to that used in the 1930 Victor Receivers, Models R–35, R–39, and RE–57. The loudspeaker used is similar to that employed in the RCA Victor Superette R–7.

A reference to the RCA Radiola 86 Service Notes will give the details of any service work necessary in conjunction with the motor board assembly.

Radiola Electrola, RE-73





Schematic Diagram of Motor Board

R. C. A. VICTOR CO., Inc.

REPLACEMENT PARTS— RE-73.

Stock No.	DESCRIPTION	List Price
	RECEIVER ASSEMBLY—Continued	
10838	Resistor—9000 ohms—Carbon type—Package of 5	$2.50
10839	Resistor—130 ohms—Carbon type—Package of 5	2.50
10840	Resistor—2800 ohms—Carbon type—Package of 5	2.50
10841	Resistor—1½ megohm—Carbon type—Package of 5	2.50
10842	Capacitor—10 mfd. condenser—Package of 2	.60
10843	Shield—Radiotron shield body with cap—Package of 1 set	.90
10844	Shield—Coil shield body with cap—Package of 1 set	.90
10851	Panel—Radio chassis escutcheon panel—Less dial	3.00
10920	Cable—Wiring cable—Used to connect receiver to amplifier	2.75
10948	Spring—Tuning condenser spring—Package of 5	.50
10949	Link—Tuning condenser link—Bakelite—Package of 5	.60
10969	Roller—Tuning condenser roller and shaft with eyelet screw and nut—Package of 5	.50
	S. P. U.	
2721	Socket—UX-245 Radiotron double socket with insulator and rivets	1.00
2722	Resistor—55 ohm—Mid-tapped—Wire wound—Filament resistor	1.00
2723	Switch—Operating switch—Toggle—With mounting nuts and washer—Package of 5	3.00
2757	Strip—Terminal strip—Two contact	.50
2880	Resistor—70,000 ohms—Carbon type—Package of 5	3.00
2963	Resistor—8,000 ohms—Carbon type—Package of 5	2.50
7053	Resistor—715 ohms—Wire wound	.70
7054	Cord—Amplifier power cord with male connector plug	1.00
7075	Socket—UX-280 Radiotron socket	1.80
7224	Cover—Fuse cover with bushing and insulator	.50
10845	Transformer—A. F. transformer	14.00
10907	Fuse—3 amperes—Package of 5	1.00
10908	Cover—Terminal strip cover—Package of 2	.50
10909	Condenser—Condenser bank—60 cycles	16.00
10910	Capacitor—Extra filter capacitor for 25 cycles	5.00
10911	Reactor—Filter reactor	4.50
10912	Strip—Terminal strip—8 contacts	.70
10913	Cable—Amplifier wiring cable	2.00
10915	Transformer—Power transformer—105-125 volts—25-40 cycles	16.00
10917	Transformer—Power transformer—105-125 volts—50-60 cycles	12.00
	PHONOGRAPH PARTS	
2614	Switch—Automatic brake contact switch	1.40
2615	Springs—Brake springs—Set of 4 springs—Package of 2 sets	.50
2620	Cushions—Pickup rubber cushion—Comprising 1 damper and 2 pivot cushions—Package of 5 sets	1.25
2622	Coil assembly—Located nearest governor—105-125 volts, 25 cycles—Comprising 2 current coils, 1 voltage coil, laminated core, end bracket, terminal board, nuts, bolts, screws and washers—Completely assembled ready for mounting	9.00
2623	Coil assembly—Located farthest from governor—105-125 volts, 25 cycles—Comprising 2 current coils, 1 voltage coil, laminated core and bracket, terminal board nuts, bolts, screws and washers—Completely assembled ready for mounting	9.00
2691	Governor—Comprising shaft with worm, brake disc, weights, springs and screws—Assembled	5.25
2692	Bearings—Governor shaft bearings—One set of 2	1.35
2693	Gear—Governor drive worm gear with set screw	1.35
2695	Bearings—Threaded thrust bearing with lock nut for end of turntable spindle	.50
2759	Box—Needle box with lid—Package of 2	.60
2765	Screw—Pickup needle holding screw—Package of 10	.80
2766	Screw—Pickup cover mounting screw—Package of 10	.50
2767	Spring—Pickup magnet spring—Package of 10	.50
2768	Armature—Pickup armature	.50
2770	Plate—Pickup damper plate—Package of 5	.50
2771	Screw—Pickup damper plate mounting screw—Package of 10	.50
2787	Switch—Pickup shorting switch	1.00
2789	Cord—Motor cord—Connects motor coil and starting switch	.60
2826	Cable—Shielded cable from shorting switch to record volume control	.50
2829	Knob—Motor board lifting knob and screw—Package of 2	$0.50
2858	Rest—Pickup rubber rest with mounting brad—Package of 5	.50
3052	Screw assembly—Pickup pole piece mounting screw, nut, washer—Package of 10 sets	.50
3101	Switch—Record-radio toggle switch with mounting nuts and escutcheon plate—Located on top of motor board	1.25
3102	Receptacle—Needle receptacle	.75
3158	Screw assembly—Motor mounting screw assembly—Comprising 3 screws, 3 bushings, 3 metal washers and 12 cushion washers	.80
3162	Regulator—Speed regulator with mounting screws—Comprising cam and shaft, bushing and bracket	.80
3163	Escutcheon—Speed regulator escutcheon with mounting screw—Package of 5	2.00
3164	Control—Record volume control with mounting washer and nut—Less knob	1.70
3167	Magnet—Pickup magnet	2.60
3168	Coil—Pickup coil	.85
3169	Shoe—Pickup pole shoe R. H.	1.45
3170	Shoe—Pickup pole shoe L. H.	1.45
3249	Sleeve—Spindle sleeve complete with set screw	.50
6067	Lever—Speed control regulator lever for motor—Comprising lever, spring, mounting bolt, nut and washer	1.60
6069	Coil assembly—Located nearest governor—105-125 volts, 60 cycles—Comprising 2 current coils, 1 voltage coil, laminated core end bracket, terminal board, nuts, bolts, screws and washers—Completely assembled ready for mounting	8.40
6070	Coil assembly—Located farthest from governor—105-125 volts, 60 cycles—Comprising 2 current coils, 1 voltage coil, laminated core, end bracket, terminal board, nut, bolts, screws and washers—Completely assembled ready for mounting	8.40
	RECEIVER ASSEMBLY	
2012	Condenser—1200 MMFD. condenser	$0.55
2546	Resistor—1 megohm—Carbon type resistor—Package of 5	3.00
2746	Socket—Dial lamp socket	.50
2747	Cap—Contact cap—Package of 5	.50
2748	Posts—Twin binding posts with lock washers and nut—Antenna and ground	.50
2804	Knob—Volume or station selector knob—Package of 5	2.50
2966	Resistor—28,000 ohm—Carbon type—Package of 5	2.50
2970	Resistor—½ megohm—Carbon type—Package of 5	2.50
7124	Socket—UY Radiotron socket	.80
7303	Dial—Station selector dial scale—Package of 5	3.00
10426	Screw—Cam wheel adjusting screw—Package of 20	.50
10805	Shield—Round condenser shield	.75
10806	Shield—Variable condenser shield	1.50
10807	Shield—White enamel lamp shield	.60
10808	Indicator—Dial indicator—Package of 5	.50
10809	Plate—Cover plate with screw—Package of 5	.50
10810	Roller—Cam roller—Package of 5	.50
10811	Condenser—Variable condenser	3.50
10812	Shaft—Cam roller shaft with washer and nuts—Package of 2	.50
10813	Control—Tone control with plate washers and nut	1.60
10814	Shield—Filter coil and capacitor shield with washers and nuts—Package of 2	.60
10815	Coil—Filter coil and capacitor with mounting screws, lock washers and nuts	$1.50
10816	Coil—3rd R. F. coil	1.60
10817	Coil—Link coil	1.50
10818	Condenser—Bank of two condensers—0.25 and 0.75 mfd.	1.80
10819	Condenser—Bank of three condensers—Three 0.1 mfd.	1.80
10820	Condenser—100 mmfd. condenser	.50
10821	Coil—Resistor board coil	.80
10822	Wheel—Cam wheel with spring washers, cup washer and pin	2.60
10824	Strip—Terminal strip with insulation and rivet—Two contact	.50
10825	Inductor—Stabilizing inductor with screw, lock washer and nut	2.20
10826	Control—Volume control with nut, washer and locking plate	2.50
10828	Coil—Antenna coupling coil	1.50
10829	Coil—1st R. F. coil	1.60
10830	Coil—2nd R. F. coil	1.60
10831	Strip—Terminal strip with link	.70
10832	Socket—UX Radiotron single socket with insulator	.60
10833	Strip—Terminal strip with insulation and rivets—Six contacts	.70
10834	Clip—Tube socket clips—Package of 10	.50
10835	Capacitor—0.01 mfd.	.50
10837	Capacitor—Bank of three 0.1 mfd. capacitors	.75

SERVICE NOTES

for

RCA Victor Automatic Record Changing Mechanism

The RCA Victor Automatic Record Changing Mechanism is used in RCA Victor Models RAE-26, RAE-59 and RAE-79. Except for the finish of exposed parts, these units are identical. This mechanism is of simple, fool-proof design and will perform efficiently with a minimum of service requirements. Features of this mechanism are; continuous playing of one side of ten 10-inch records, operation at either 33⅓ or 78 R.P.M. for playing standard or Program Transcription records manually or automatically, a special clutch to prevent jamming in case of failure of a part and a heavy duty motor operating at synchronous speed thereby eliminating any need for regulating devices. A general view of the mechanism is shown on the cover page. Figure 1 shows the schematic wiring diagram.

The Replacement Parts for this mechanism are listed in the Service Notes on each individual instrument. The identification nomenclature given on pages 10 and 11, will be found useful in identifying parts. Where parts are identical in all models the Stock Number of each part is given in addition to its name.

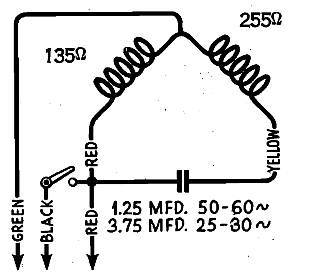


Figure 1—Schematic Diagram

INSTALLATION

After unpacking the instruments in which this mechanism is used, it is imperative that certain preliminary checks be made before they are placed in operation. These checks should be performed in the order given and any adjustments found necessary must be made.

1. When installing the instrument it is advisable to see that all parts are properly lubricated without excessive grease or oil on any parts. This is especially important in the speed reducing unit. A lack of oil in the spindle bearings or between the sprocket and the surface upon which it rests, may be the cause of a "wow" at slow speed. Also excessive grease on the gears or on the damper pads may cause this same condition. The motor should be lubricated with light oil once every six months. Oil holes are provided at each end of the motor. Once a year the turntable and speed reducing unit should be removed and all exposed gears thoroughly cleaned and lubricated with light grease. All bearings should be lubricated with oil. Be careful not to lose the spiral spring in the end of the spindle or the washers under the turntable and speed reducing unit.

2. The motor board must be level. This should be checked both ways by means of a small spirit level. Placing the cabinet legs on the same surface will usually insure the motor board being level.

3. A small spring is located in the center of the turntable spindle. Be sure that this is in position before placing the turntable on the spindle. After placing the turntable on the spindle make sure that the spindle nose may be easily depressed. If it is not, then remove the turntable and turn the spring upside down or replace it with a new spring.

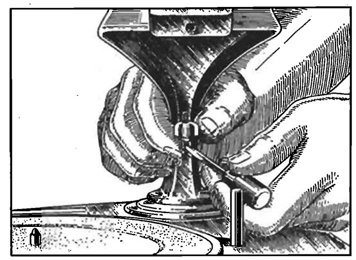


Figure 2—Adjusting height of tone arm

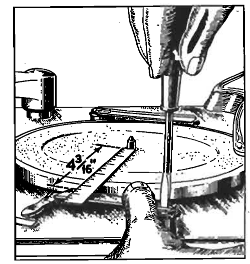


Figure 3—Adjusting elevator pad

4. Examine the wire cable that is attached to the back of the tone arm. It should be seated on the small pulleys over which it passes.

5. Place a Home Recording needle into the pickup as far as it will go. Then lower the pickup on the side of the turntable. The needle should extend from 1/32" to 1/16" below the top of the metal edge of the turntable. If it does not, an adjustment can be made by means of a screw located under the tone arm. Lifting the arm provides accessibility to the screw. See Figure 2.

6. If when starting the automatic mechanism, the needle lowers onto the smooth outer rim of the record but fails to swing into the first groove, it may be caused by the following:

   (a) Cabinet not level. Check as indicated in Paragraph 1.

   (b) Weak tension in spring. A flat spring presses against the tone arm lever on the under side of the motor board. See Figure 17 Page 11. Bending it so as to increase its tension against the tone arm lever will cause the needle to swing into the first record groove. Be careful not to bend it too much as excessive tension will cause the needle to skip several grooves.

7. After the instrument has completed one record changing operation, a ten inch record should extend about three-quarters way over each elevator pad. If this condition does not exist, an adjustment can be made by means of the screws that hold the pads in position. A pair of pliers heavily padded with cloth or other soft material should be used to hold the elevator shafts while loosening and tightening the screws. The distance from the closest part of either pad to the edge of the spindle is approximately 4 3/16". Figure 3 shows the method of making this adjustment.

If any adjustments are necessary other than the foregoing, a reference to the Service Date section of this booklet should be made.

Remember That the Control Lever Can Be Changed from Automatic to Manual Only When the Mechanism is Not Changing Records

SERVICE DATA

The following Service information will be found useful in making any adjustments or correction of any irregular operation that may be necessary. All the major adjustments are accessible from the rear of the cabinet. For the sake of clearness the illustrations in this text do not show the cabinet background.

No special tools are required other than a small offset screw driver. (Stock No. 2930) A stand consisting of three Stock No. 7203 will be found useful in supporting the mechanism should removal from the cabinet be required.

(1) SPEED VARIATIONS (WOW)

A variation in the speed of the turntable evidenced by distortion on long sustained notes when playing Program Transcription records may be caused by any of the following:

(a) Improper operation. It is very important when changing the speed shift lever from 78 R.P.M. operation to 33⅓ R.P.M. operation, to place the hand on the turntable and hold it until it is positively engaged by the driving mechanism.

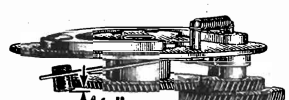


Figure 4—Adjustment of damper pads

(b) Lack of proper lubrication. It is important that excessive grease on the gear reducing mechanism be avoided and that sufficient oil is present between the ratchet and the surface upon which it rests. Also clean and oil the spindle bearing and wipe off any excess lubricant that may be on the damper pads or the drive gear upon which it rests.

(c) Improper Adjustment of the Damper Pads. The damping pads with the necessary springs are provided to place a load on the 33⅓ R.P.M. driving gear at all times while it is in operation. Placing such a load on the gear takes up any possible play and reduces the possibility of a "wow" during operation at the slower speed.
Adjust these pads by slipping each spring to one side and bend them until they are 1/16" beyond the opposite surface upon which they rest. (See Figure 4).

(d) Washers Not in Place. A metal washer is placed directly under the speed reducing mechanism and a leather washer directly over it, both washers being over the spindle. These washers must be in their proper position. Also if the leather washer has become hard it must be replaced.

(e) In some cases, removing the speed reducing mechanism and turning it approximately 90° and then replacing it, may eliminate a "wow" caused by improper meshing of the gears.

(2) ADJUSTMENT OF MAGAZINE ROLLER

The magazine roller should be set in such a position that the plane of the roller is 90° to a line drawn from the center of the magazine bearing to the center of the roller. The height should be adjusted so that it will just touch the magazine when it is empty.

(3) FAILURE OF NEEDLE TO LOWER PROPERLY

Failure of the needle to lower onto the smooth outer rim of the 10-inch records when the instrument is playing automatically may be caused by:

(a) Improper Tone Arm Setting. Loosen the set screws as shown in Figure 5. With the mechanism out of its cycle, press the locating lever at a point near the flat spring until the lever strikes the stop screw. Holding the locating lever, Figure 17, in this position, move the front portion of the trip lever, Figure 15, until the pin against which the flat spring presses, is making contact with the locating lever. Holding the two levers in this position, move the pickup arm until the needle is 1/16" from the first groove of a standard 10-inch record. Now retighten the two set screws shown in Figure 5.

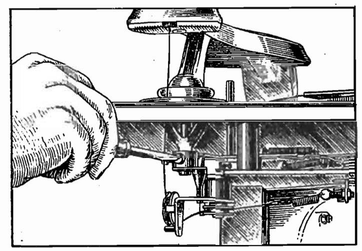


Figure 5—Adjusting position of tone arm

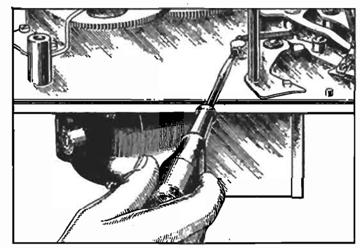


Figure 6—Adjusting tone arm locating screw

(b) Improper adjustment of tone arm locating screw. This adjustment, shown in Figure 6, can be used to make a substitute adjustment for that described in (a), when the mechanism is out of the cabinet. Make the adjustment so that the needle will lower exactly 1/16" from the first groove on a standard 10-inch record. Loosen the lock nut on the adjusting screw by means of a No. 4 Spintite wrench on which the shoulder has been ground sufficiently thin for clearance. *Do not attempt to make this adjustment without first loosening the lock nut.* Tighten the lock nut when the proper adjustment has been made.

(4) FAILURE OF NEEDLE TO LOWER ONTO RECORD SURFACE

Failure of the needle to lower onto the record surface may be caused by:

(a) Cable out of pulley. Examine the tone arm cable and ascertain that it is seated in the pulley.

(b) Shielded pickup wire improperly placed. Examine the shielded lead coming out of the tone arm base and make sure that it is free from the moving parts of the mechanism.

(c) Incorrect setting of tone arm lowering screw. Check the position of the tone arm as described in Paragraph 5, Page 4.

(d) Turntable washer not in place. A leather washer is supplied to fit under the turntable. If this part is not in place, the turntable will be too low, and may cause the needle not to lower onto the record.

(e) Incorrect adjustment of cable tension screw. The cable tension screw shown in Figure 7 should be so adjusted that the needle will lower smoothly onto the record without dropping. When this adjustment is obtained, the cable will be slightly loose when the needle is lowered onto a record. Loosen the lock nuts, turn the screw to the right or left as required and retighten the lock nut. Check the adjustment to make sure that the needle clears the record on the return of the tone arm. The needle should rise 1/16" from the record before any horizontal motion takes place.

(5) NEEDLE FAILS TO CLEAR RECORD AFTER PLAYING

Failure of the needle to clear the record surface on the return of the tone arm is caused by too loose adjustment of the cable tension. Adjust this tension as described in Section 4, Paragraph (e).

(6) FAILURE OF RECORD TO DEPOSIT ON TURNTABLE

Incorrect lowering of the record onto the turntable may be caused by:

(a) Improper turntable spindle height. The height of the turntable spindle nose should be approximately $\frac{1}{32}''$ above the inside bottom surface of the record magazine. Adjustment of this height made by means of the screw at the bottom of the motor. (See Figure 8).

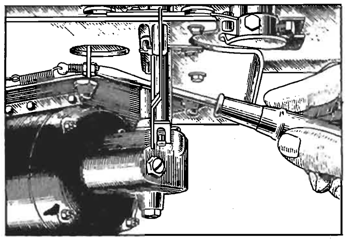


Figure 7—Adjusting tone arm cable tension screw

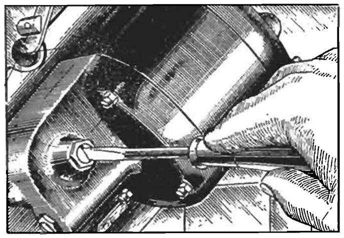


Figure 8—Adjusting spindle height

(b) Improper setting of magazine. The horizontal swing of the magazine should be so adjusted when the mechanism is out of cycle that the outer surface at its nearest point to the nearest side of the turntable spindle is $5\frac{1}{32}''$. This can be done by loosening the two screws as shown in Figure 9, moving the magazine to its correct position and retightening the screws.

(c) Improper height of record transfer lever. The small plate on top of the motor board at the left side of the turntable should be so adjusted that it will depress approximately $\frac{1}{32}''$ when the magazine swings over the turntable. When this adjustment is made correctly, the transfer lever will engage the bottom record in the magazine as the latter is swinging back into the playing position. A small adjusting screw and lock nut are provided for this adjustment. See Figure 10.

(d) Improper Position of Record Transfer Lever. When a ten-inch record is placed so that its edge touches both pins on the record transfer lever, a line drawn from the center of the hole of the lever to the center of the record hole should pass directly over the center of the spindle. See Figure 11. The two record transfer lever mounting screws can be loosened and the lever shifted until this condition exists. Also when a record is on the turntable it should just clear this lever. Unless this adjustment is properly made the record may not center properly over the spindle.

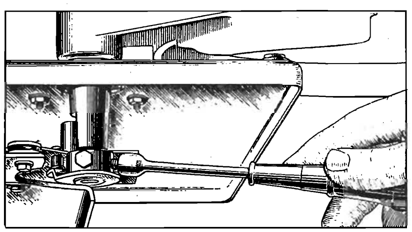


Figure 9—Magazine adjustments

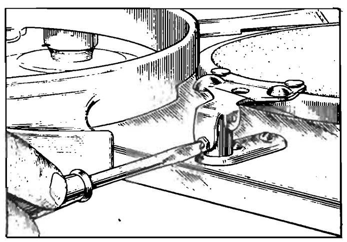


Figure 10—Record transfer lever adjustment

(e) Weak spring in turntable spindle. The spring inside the turntable spindle which holds up the spindle nose will cause the records to align improperly with the turntable spindle if the spring tension is too weak or if the spindle nose is sticking inside the spindle. Access to the spring for stretching the coils or for replacement can be obtained by removing the turntable.

(7) RECORDS DISCHARGED IMPROPERLY FROM TURNTABLE

Failure of the Record on the turntable to be removed and placed in the magazine can be caused by:

(a) Improper horizontal adjustment of elevator pads. The elevator pads Figure 16, should be so adjusted that the inside of the pad flange is $4\frac{3}{16}''$ from the nearest side of the turntable spindle. See Figure 3. Loosen the screw on top of the elevator shaft, move the pad to its correct position, holding both the pad and the elevator shaft in position and tighten the screw. Care should be observed that the ridge in the elevator shaft is not turned against the slot in the elevator shaft actuating lever so as to cut the latter. Grip the shaft with padded pliers while this adjustment is being made in order to prevent the shaft from turning. If for any reason the elevator pads have been removed, always place the one with the rubber surface toward the front of the mechanism when replacements are being made.

(b) Improper adjustment of elevator shaft. The elevator shafts should rise to such a height as to give $\frac{1}{16}''$ clearance between the lowest surface of the elevator pad bottom and the top of the empty magazine. This adjustment can be made by means of the screw and lock nut as shown in Figure 12.

(8) FAILURE TO TRIP ON ECCENTRIC GROOVE

Failure of the mechanism to change records when the eccentric groove is reached may be caused by:

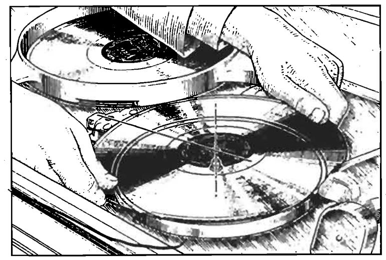


Figure 11—Method of checking transfer lever lateral adjustment

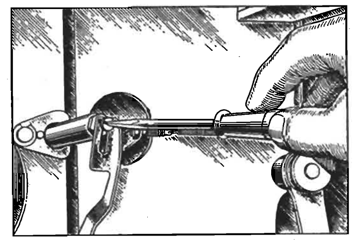


Figure 12—Adjusting height of elevator shaft

(a) Improper setting of the latch plate. Adjust the latch plate, Figure 17, by means of a small offset screw driver such as Stock No. 2930, until it makes proper contact with the latch trip when the eccentric groove is reached.

(b) Weak spring on trip lever. A weak spring on the latch trip lever will be a cause of failure to trip.

(9) INABILITY TO SET FOR MANUAL OPERATION

The manual operation lever should set in its back position so as to free the tone arm and prevent the mechanism from tripping. *This change from automatic to manual operation should be made only when the mechanism is out of its cycle, otherwise the mechanism will reject continuously.* The back position of the lever should be such that the end of the lever causes the latch trip to clear the latch plate by $\frac{1}{32}''$. An incorrect setting of the latch plate may cause the trip lever to clear the plate at one position of the tone arm, but to make contact with the plate at some other position of the tone arm. Check this point when adjusting the latch plate.

(10) FAILURE TO STOP

Failure of the mechanism to stop after the "off" button has been pressed, and the mechanism has completed its cycle is caused by improper setting of the secondary stop switch. See Figure 17. The switch body should be so mounted that the contacts will open $\frac{1}{32}''$ when the cycle is completed, but will close as soon as the mechanism has tripped.

(11) CONTINUED TRIPPING OF MECHANISM

This condition may be caused by:

(a) Manual operation lever set for non-automatic operation during cycle.

(b) Improper setting of latch plate.

(c) Improper timing of gears and associated parts. See Section 13 for the correct method of retiming.

(12) CLUTCH SLIPPING

Slipping of the clutch when the mechanism is passing through the cycle causing a loud clicking noise, may be caused by:

(a) Weak spring on pawl carrier. Remove the pawl spring Figure 17, and increase its tension by removing two or three coils.

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(b) Turntable spindle shaft too low. This condition will cause binding between the pawl carrier and the clutch wheel. Raise the spindle as shown in Figure 8.
(c) Binding in any of the moving parts. Such binding may be in the slide, the magazine, the elevator shaft or the gears. The slide rollers at the left are mounted on eccentric shafts for adjustment of play. These may be so regulated as to cause excessive binding of the slide. Examine all of these parts carefully, and take any necessary steps to relieve the binding.

(13) RETIMING THE MECHANISM

Should it be necessary to retime the mechanism after replacing parts, or because of continued tripping proceed in the following manner:

(a) Allow the mechanism to operate until the slide Figure 17 is in its extreme forwarding position. When this setting is reached the straight side of the cam, Figure 17, will be parallel with the side of the slide.
Check the position of the trip lever and roller at this time to see that they are approximately as shown in Figure 13. If the various parts are not in their proper relation, the mechanism should be retimed.

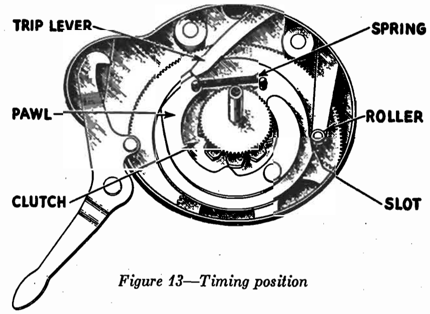

Figure 13—Timing position

(b) Loosen the set screw in the clutch wheel and lift the wheel from the turntable spindle.
(c) Lift the pawl carrier until it disengages from the gear.
(d) Lower the pawl carrier into mesh with the gears so that the trip lever is touching the end of the pawl as shown in Figure 13, when the cable lever roller is engaged in the slot on the side of the pawl carrier as shown.
(e) Recheck to see that the straight side of the cam is parallel with the slide.
(f) Replace the clutch wheel and retighten the set screw, making sure that the set screw fits into the spot on the turntable spindle.

(14) REMOVING MOTOR BOARD

Should it be necessary to remove the motor board from the mechanism for replacement of any of the parts, the following procedure should be used:

(a) Remove nuts and washers from the bolts which hold the motor board to the cabinet, and disconnect the pickup leads and power wiring to the mechanism. Then lift the mechanism from the cabinet.
(b) Loosen the two set screws and remove the magazine lever Figure 9.
(c) Lift out magazine.
(d) Unhook tone arm cable from spring.
(e) Loosen the two set screws in the tone arm lever.
(f) Remove the three small screws in the tone arm base, taking care not to lose the lock nuts.
(g) Disengage the tone arm lever from the tone arm shaft and carefully lift the tone arm from the motor board, bringing the tone arm lever and the shielded cable up through the tone arm base hole in the motor board.
(h) Remove the screw and lock nuts in the bottom of the elevator shaft.
(i) Lift elevator shaft from mechanism.
(j) Unfasten wires from motor board.
(k) Remove the four motor board screws which support the bottom plate.
(l) Carefully lift the motor board from the mechanism.

Access can now be had to all the parts on the bottom plate. The parts can be assembled in the reverse order from that given above. It will then be necessary to make various adjustments after the parts have been reassembled.

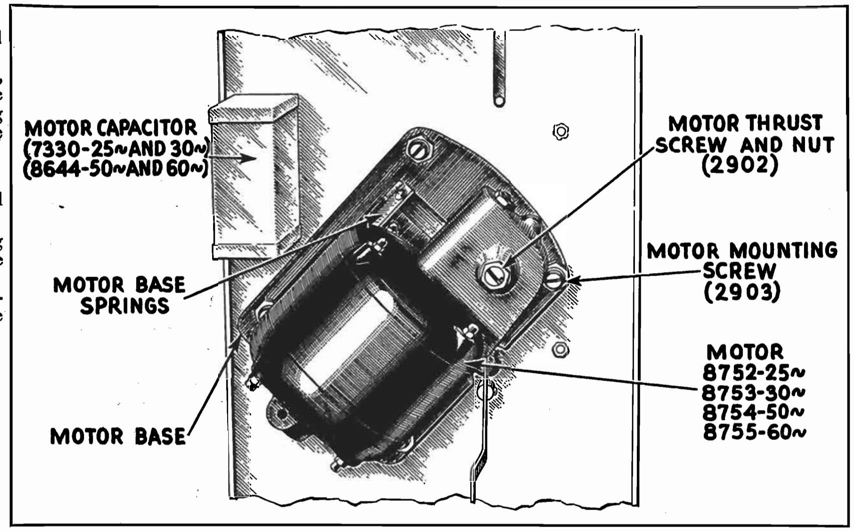

Figure 14—Motor parts

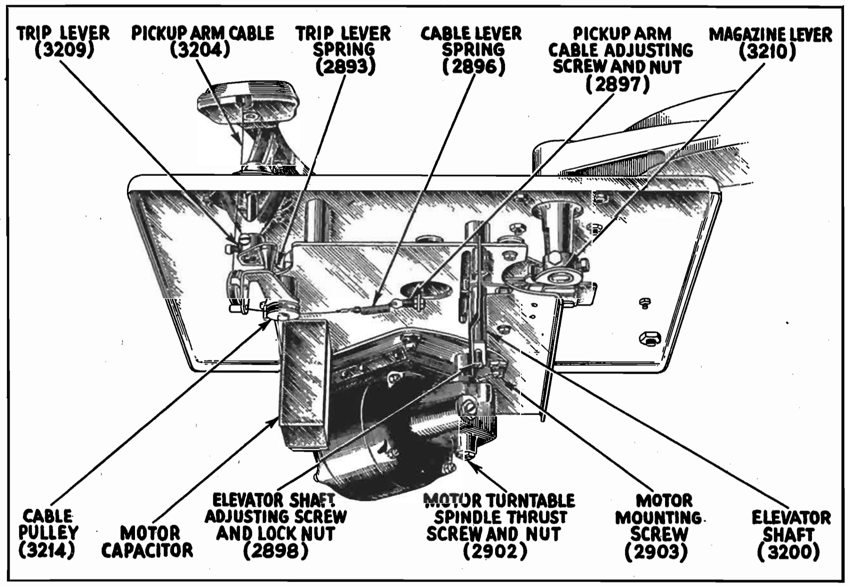

Figure 15—Bottom view of mechanism showing parts

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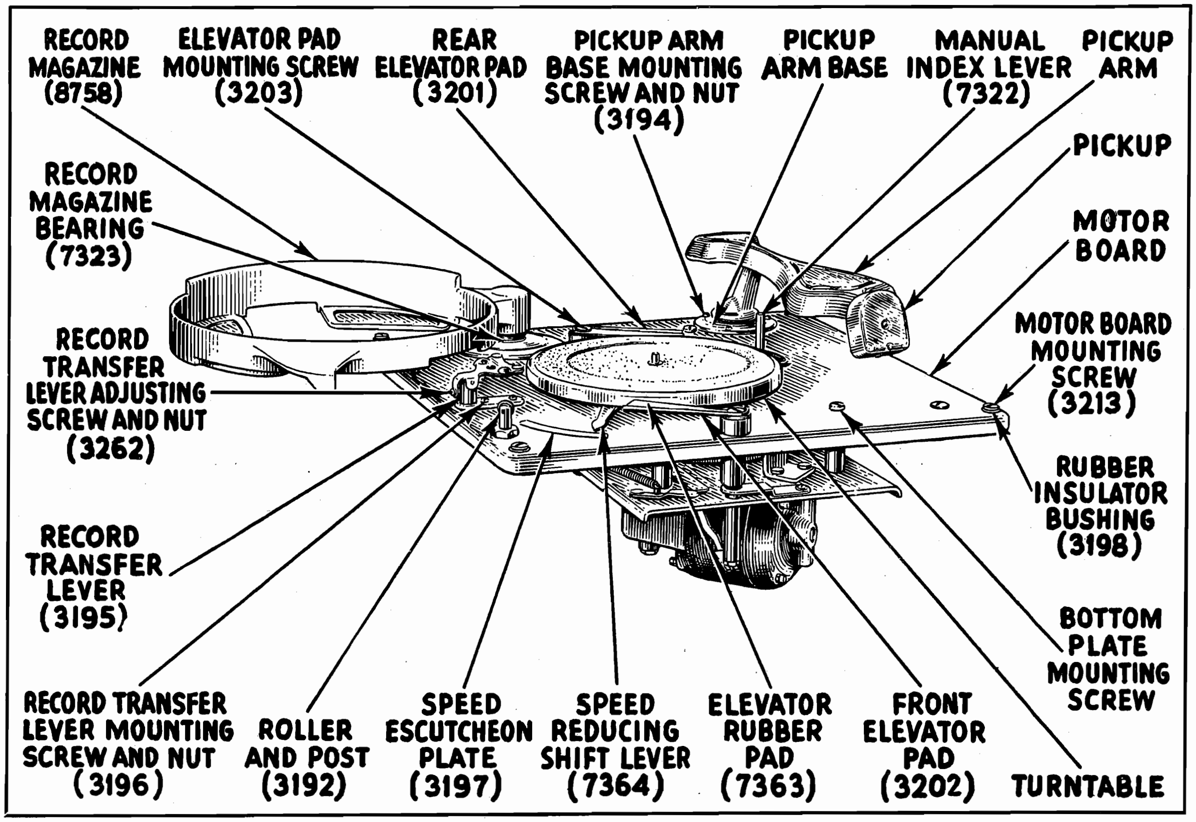
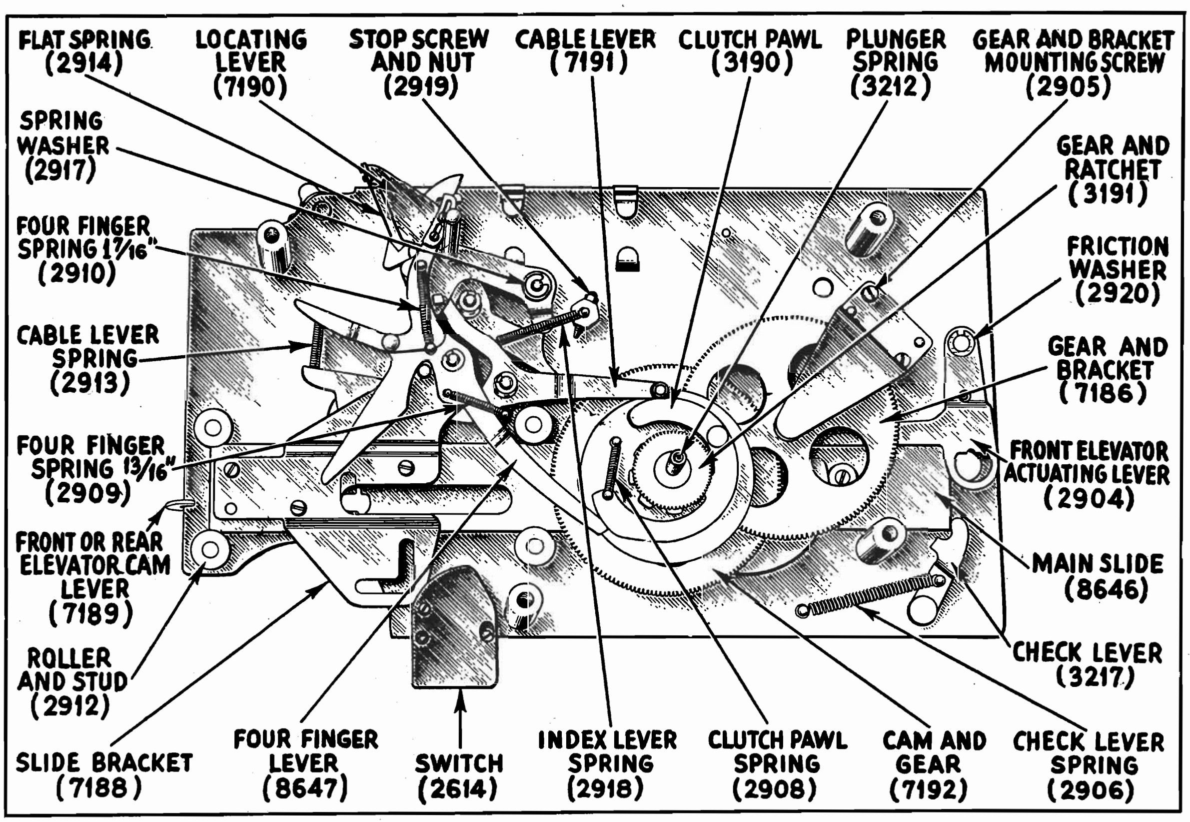


Top view of mechanism showing parts



Top view of mechanism with plate removed

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The RCA Victor Portable Victrola Model 2-65 is a small portable type instrument built into a cabinet resembling a small suitcase. Excellent quality, high output and good mechanical construction are features of this instrument.

LUBRICATION

Premature wear, noisy operation and failure of parts are direct results of failure to clean and lubricate the motor at necessary intervals. The various bearings and gears of the motor should be cleaned and lubricated at least once every six months. In addition to the regular lubrication, all parts should be covered with a light film of oil to prevent rusting. Use only RCA Victor Motor Oil and Motor Grease when lubricating this instrument.

Initial Operation. When the instrument is first played, wind the motor and allow it to run down *completely* several times. This insures a complete distribution of lubricant within the spring barrel. Maximum run is dependent on this point.

The speed of the motor should be adjusted so that the turntable revolves at 78 R.P.M. This can be checked by means of a Stroboscope Disc in conjunction with a source of A.C. illumination of proper frequency for the disc used or by counting the revolutions. In both cases a Record must be playing in the normal manner when the check is made.

Motor. Figure 1 shows a view of the motor with the top plate removed. Before lubricating the parts shown in this illustration, a thorough cleaning with carbon tetra-chloride (Carbona) or gasoline is necessary. If necessary disassemble the entire motor for such cleaning.

Tone Arm. The joint between the goose neck and tone arm and that between the tone arm and sound chamber must be free to swing easily without play and be sealed with grease. The goose neck is detached or adjusted by means of two collars that hold it in place. The bearing between the tone arm and sound box is accessible when the swivel and three mounting screws are removed. Failure to seal these joints will result in poor quality. Unnecessary friction at either of these points will cause undue record wear.

AUTOMATIC STOP MECHANISM

The Automatic Stop Mechanism is simple of design and effective in operation. Figure 2 shows its principal parts.

Failure to Start. Should pulling the tone arm to the right and then placing the sound box on the record fail to start the motor, it may be due to:

(a) Improper location of base plate. Loosen the screws A, B, and C and shift position of mechanism counter-clockwise until proper operation is secured.

(b) Worn or rounded surfaces at point D. Square these points with a small file.

(c) Insufficient tension at spring E. Remove a few turns or replace spring.

Failure to Trip. Should the mechanism fail to stop the motor at the end of a Victor record having the eccentric groove, check the following:

(a) Improperly adjusted base plate. Loosen screws A, B, and C and shift the mechanism clockwise until proper operation is obtained.

(b) Loose or improperly adjusted latch plate.

(c) Insufficient tension at spring F. Remove several turns or replace spring.

Tripping during Operation. Premature tripping during the operation of a record may be caused by:

(a) Binding at bearing G. Clean and lubricate this bearing.

(b) Insufficient bite at point D. Loosen the screws A, B, and C and adjust the base plate so that a larger bite is obtained at point D.

MOTOR

The motor used in Model 2-65 is of simple design and will give excellent performance. If kept clean and properly lubricated, little service attention will be required. The following points may prove useful when it is necessary to effect repairs.

Removing Motor from Cabinet. To remove the motor from the cabinet proceed as follows:

(a) Unscrew the spindle cap and remove the turntable.

(b) Remove the eight machine screws that hold the motor board in place. The sound deflector is also removed.

(c) Remove the three motor mounting screws, together with the one holding the speed regulator lever. Remove this lever. The motor board may now be turned over and the motor pulled clear and placed in a position convenient for work. The various parts are easy of access and adjustments or replacements are simple to make.

Changing Motor Springs. Should a spring break and require replacement the best method to make a repair is to replace the entire spring barrel. While the cost of the spring barrel is greater than that of the spring alone, the saving in labor will usually justify such replacement. Unless the serviceman is experienced in handling springs of this type, the following directions should be followed carefully:

(a) Disassemble the motor and remove the spring barrel. Remove the winding gear.

(b) Place the gear flat on a piece of metal and file off the ends of the six rivets. Remove the rivets and gear.

(c) Place the palm of the right hand over the closed end of the barrel, making sure that the fingers do not protrude beyond the open side. Firmly hold the barrel, open side downward over a large can or barrel. With the left hand pull the center turns of the spring out. As soon as the spring starts, pull the left hand clear of the can holding the spring barrel firmly until the spring is entirely clear.

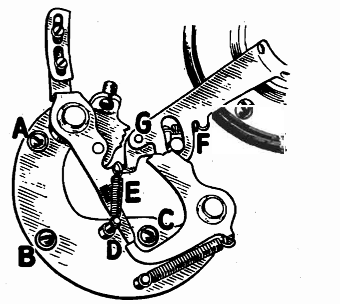

Figure 2—Automatic Stop Mechanism

(d) The new spring is furnished coiled and with a heavy wire clamp. Hit the spring flat on a table thereby driving the clamp to one edge of the spring. Grasp the exposed part of the spring firmly with the right hand and pull the clamp off with the left hand. Allow the spring to gradually release its tension in the right hand and then unwind it completely.

(e) Place the hooked end of the spring over the barrel hook and wind the spring into the barrel toward the center. Be careful to push each turn completely inside the barrel before winding on the next turn.

(f) Place a tablespoonful of spring lubricant between the spring leaves and in the center of the spring.

(g) Place the gear in position and rivet it with six rivets to the spring barrel. Use a small punch for flattening the ends of the rivets. Place the gear on a flat surface while re-riveting the barrel to it.

(h) Reassemble the motor in the reverse manner of that used to dismantle it.

Winding Shaft Binding. A heavy jar may cause the motor to shift slightly on the motor board and produce binding of the winding shaft against the motor board. Loosening the motor mounting screws and shifting the motor to its proper position will correct this condition.

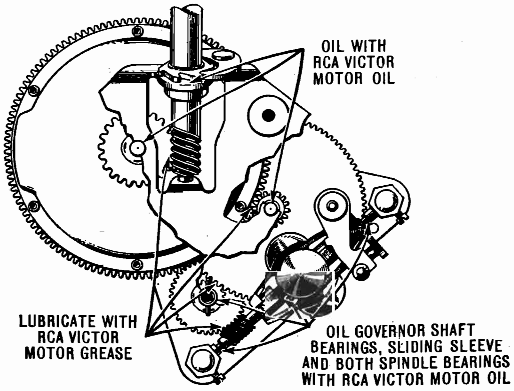

Figure 1—Lubrication Diagram of Model 2-65

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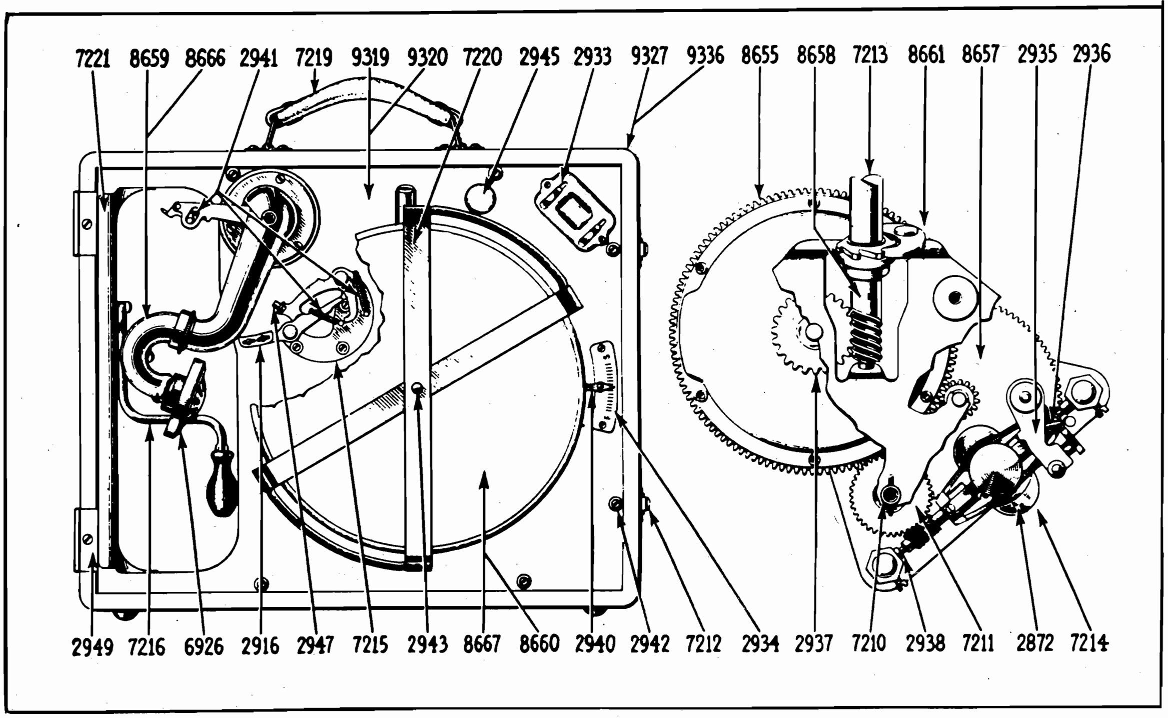

Figure 3—Cabinet, Motor Board and Motor Parts

PORTABLE VICTROLA MODEL 2-65

STOCK NO.	DESCRIPTION	LIST PRICE
2872	Governor Ball and Spring—Governor ball and spring assembly comprising ball, spring, mounting screws and washers—Package of 5	$0.75
2916	Plate—Latch Plate complete with mounting screws —Package of 5	.60
2933	Holder—Needle Holder complete with mounting screw—Package of 2	.80
2935	Lever—Speed Regulator Lever complete with stud and spring—Package of 2	.50
2936	Spring—Speed Regulator Lever Spring—Package of 10	.50
2937	Gear—Winding Gear and sleeve	.90
2938	Governor Bearing Assembly—Governor bearing, comprising 2 bearings, 2 set screws and 2 balls—Package of 3 sets	.50
2939	Screw—Motor Mounting Screw complete with washer—Package of 2 sets—Not illustrated	.50
2940	Lever—Speed Regulator Lever complete with springs, washers and nut—Package of 2	.60
2941	Spring—Automatic Brake Springs—one set of 3 springs	.50
2942	Screws—Motor Board Mounting Screws complete with finishing washers—Package of 10	.60
2943	Cap—Turntable spindle cap screw—Package of 5	1.50
2944	Screw—Sound Box Needle Screw—Package of 20—Not illustrated	1.00
2945	Rest—Rubber Needle Rest—Package of 5	.50
2947	Leather—Friction Leather for Brake—Package of 20	.50
2948	Rivet—Driving Gear Rivet—Package of 100	.50
7210	Spindle—Turntable Spindle complete with Pin and Ball Bearing—less gear	.80
7211	Gear—Turntable Spindle Gear complete with set screw	.50
7212	Catch—Cabinet Catch, two pieces, complete with mounting rivets—Package of 2	1.00
7213	Extension—Winding Shaft Extension	.60
7214	Governor Assembly—Governor Assembly, comprising governor spindle, disc, collar, governor balls and springs	2.50
7215	Brake—Automatic Brake complete with mounting screws	1.25
7216	Key—Winding Key	$1.00
7219	Handle—Carrying Handle complete with bracket and mounting rivets	1.00
7226	RCA Victor Motor Oil—1 pint can	.50
7227	RCA Victor Motor Grease—1 pint can	.60
7228	RCA Victor Spring Lubricant—1 pint can	.65
8655	Barrel—Spring Barrel complete with mainspring and driving gear—less winding gear	3.00
8656	Spring—Mainspring—Not illustrated	1.15
8657	Gear—Intermediate Gear complete with pinion and shaft	.70
8658	Shaft—Winding Shaft, comprising shaft, collar, pin, ratchet and washer—less winding extension	1.25
	SPECIAL PARTS SUPPLIED ON ORDER ONLY (NOT TO BE STOCKED)	
2934	Scale—Speed Regulator Scale complete with mounting screw—Package of 5	.50
2949	Hinge—One set of 2 hinges complete with mounting screws and rivets	.50
6926	Sound Box—Sound Box complete with needle screw	4.50
7218	Support—Lid Support with mounting screws, package of 2—Not illustrated	.50
7220	Tray—Record Carrying Tray	.75
7221	Deflector—Sound Deflector	1.50
8659	Tube—Taper tube complete with goose neck and mounting screw—less sound box—Blue	7.00
8660	Turntable—Turntable complete with covering—Blue	2.50
8661	Motor—Spring motor complete with spindle cap screw—less mounting screws	12.00
8666	Tube—Taper Tube complete with goose neck and mounting screw—less sound box—Red	7.00
8667	Turntable—Turntable complete with covering—Red	2.50
9319	Board—Motor Board—Blue	5.50
9320	Board—Motor Board—Red	5.50
9327	Cabinet—Cabinet complete with handle and catches —less motor board—Blue	12.50
9336	Cabinet—Cabinet complete with handle and catches —less motor board—Red	12.50

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Radiola Division

SPECIFICATIONS

Voltage Rating	105/125 Volts
Frequency Rating	50/60 Cycles
Power Consumption	60 Watts
Type of Magnetic Pickup	Low Impedance
Type of Tone Arm	Inertia

MODEL T-5
END TABLE ELECTROLA

RCA Victor End Table Electrola Model T–5 is a small compact phonograph unit consists of a magnetic pickup, a motor and turntable assembly, record volume control, Radio–Record switch and input transformer assembly and a connecting cable.

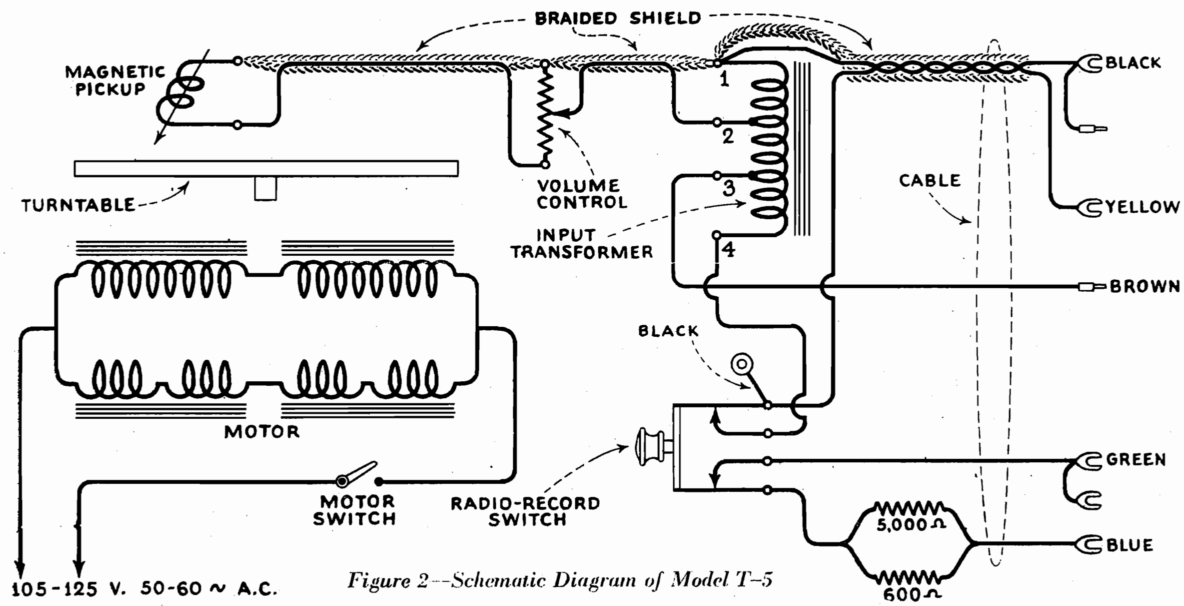
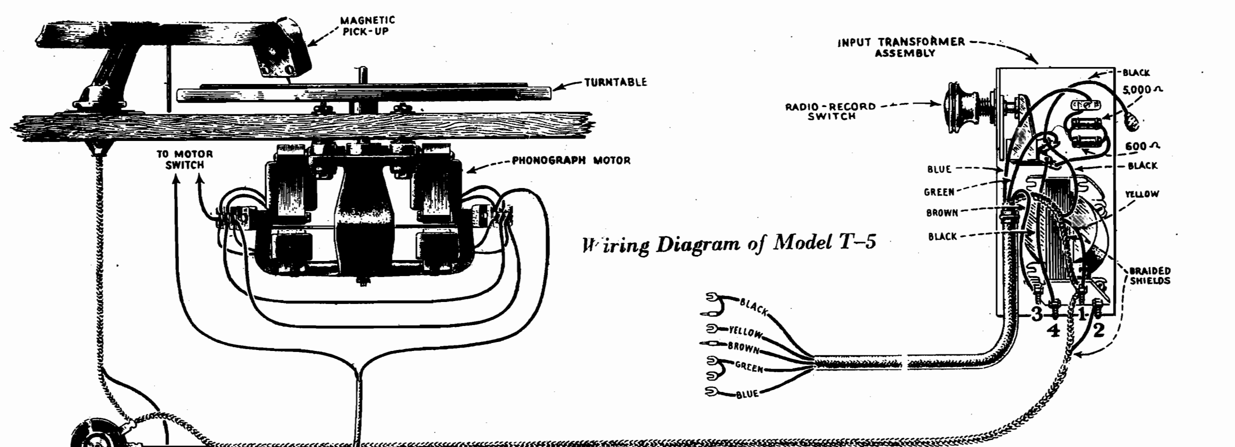


Figure 2—Schematic Diagram of Model T–5

Service Data pertaining to the magnetic pickup assembly and the motor assembly is included in the Service Notes on RCA Radiola 86 and Victor Radio Electrola RE–57.



Wiring Diagram of Model T–5

The speed of the motor should be checked occasionally by placing the stroboscope disc, furnished with the instrument, on the turntable, and adjusting the speed regulator screw, Figure 1, in accordance with the instructions on the disc.

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Radiola Division

MODEL T-5 END TABLE ELECTROLA

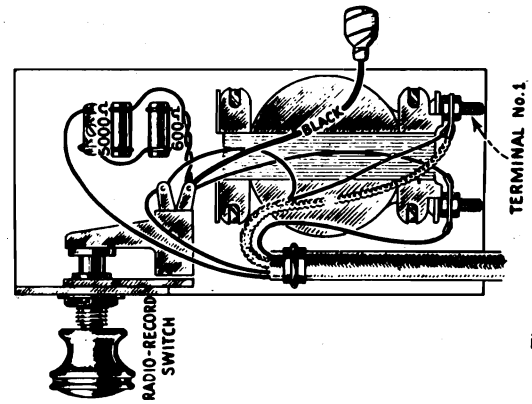


Figure 2—Terminal Board Connections

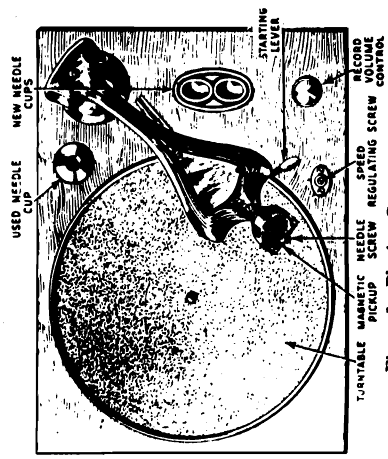
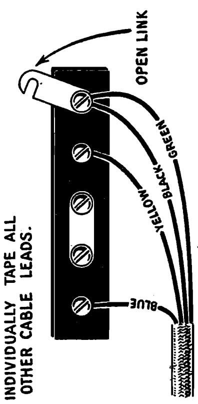


Figure 1—Playing Compartment



CONNECT BLACK LEAD TO TERMINAL No.1 OF INPUT TRANSFORMER AND USE BOTH RESISTORS.
SHIFT LEAD OF PICKUP CABLE FROM TERMINAL No. 2 TO TERMINAL No. 3
SHIFT YELLOW TRANSFORMER LEAD FROM TERMINAL No. 1 TO TERMINAL No. 4

Figure 5—Victor R-14, R-15, Radiola 48 and Radiola 42 Connections

SHIFT YELLOW TRANSFORMER LEAD FROM TERMINAL No.1 TO TERMINAL No. 4
CONNECT BLACK LEAD ON TERMINAL No.1 OF INPUT TRANSFORMER AND DISCONNECT 600 Ω RESISTOR

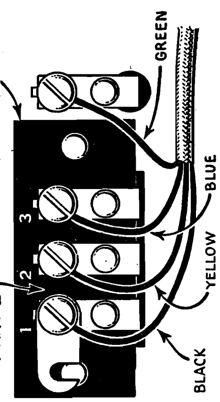
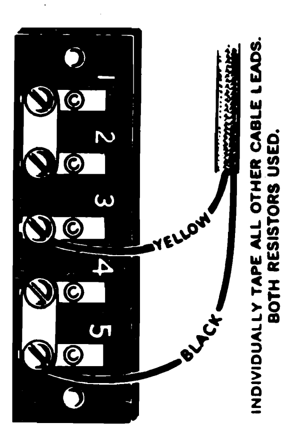


Figure 4—RCA Victor Superette Connections



INDIVIDUALLY TAPE ALL OTHER CABLE LEADS. BOTH RESISTORS USED.

Figure 3—Victor Radio R-35 and R-39 Connections

BOTH RESISTORS USED

SHIFT YELLOW TRANSFORMER LEAD FROM TERMINAL No. 1 TO TERMINAL No. 4

PLACE BROWN LEAD FORMERLY ON TERMINAL No.3 ON TERMINAL No.1. PLACE THE ADAPTOR UNDER DETECTOR OR FIRST A. F. TUBE. IF THE SET USES A POWER DETECTOR INTERNAL WIRING CHANGES MAY BE NECESSARY.

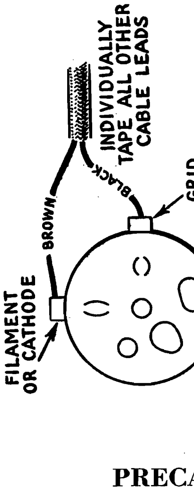
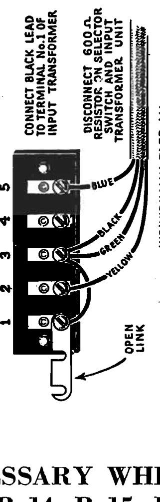


Figure 8—Adaptor for use with other receivers

SHIFT YELLOW TRANSFORMER LEAD FROM TERMINAL No.1 TO TERMINAL No. 4

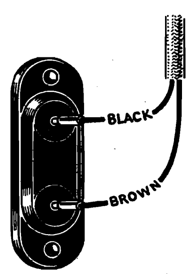


CONNECT BLACK LEAD TO TERMINAL No.1 OF INPUT TRANSFORMER

DISCONNECT 600 Ω RESISTOR ON SELECTOR SWITCH AND INPUT TRANSFORMER UNIT

INDIVIDUALLY TAPE ALL OTHER CABLE LEADS

Figure 7—RCA Radiola 82 Connections



INDIVIDUALLY TAPE ALL OTHER CABLE LEADS. USE BOTH RESISTORS. SET SWITCH IN "PHONO" POSITION AND USE "RADIO-RECORD" SWITCH ON PANEL. CONNECT BLACK LEAD ON TERMINAL No.1 OF INPUT TRANSFORMER.
SHIFT YELLOW TRANSFORMER LEAD FROM TERMINAL No. 1 TO TERMINAL No. 4

Figure 6—Victor Radio R-32 and 52 Connections

PRECAUTIONS NECESSARY WHEN CONNECTING MODEL T-5 TO VICTOR RADIO R-14, R-15, RADIOLA 42, OR RADIOLA 48

If the set has a tendency to oscillate due to a poor ground, remove the phone tip from the brown cable lead and solder it to the spade terminal of green cable lead. Also place the other end of the brown lead on terminal No. 1 of input transformer.

MODEL M-30
AUTO RADIOLA
Part 1

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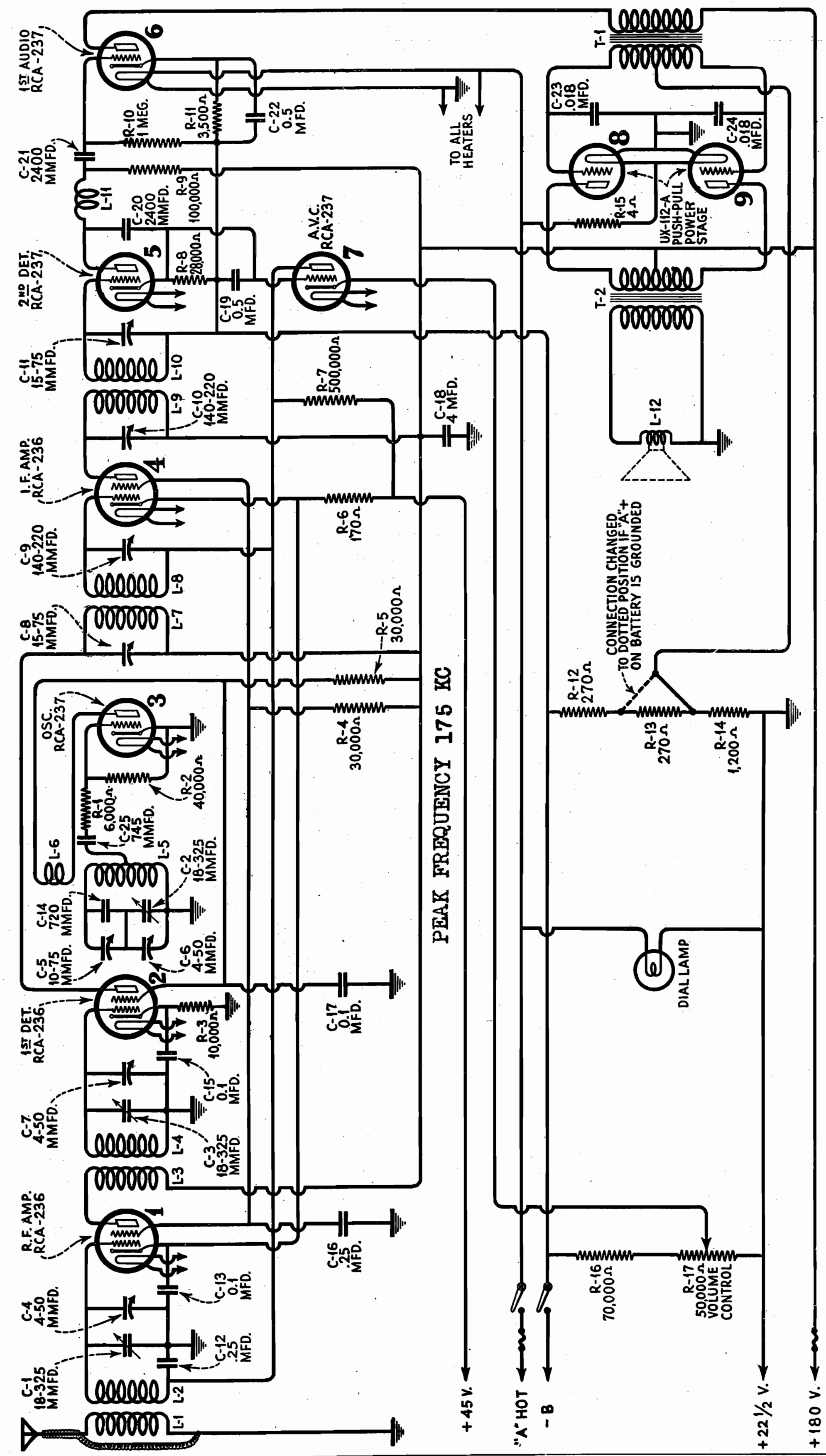

Figure 22—Schematic Wiring Diagram of Receiver Assembly

Chassis wiring diagram-Page 504-Y-1
Socket layout " 504-Y-4
Tuning adjustments " 504-Y-8
Voltage data " 504-Y-9

MODEL M-30
R.C.A.VICTOR AUTOMOBILE RADIOLA

MODEL M-30
AUTO RADIOLA
Part 2 (Cont.)

R. C. A. VICTOR CO., Inc.

MODEL M-30
R.C.A.VICTOR AUTOMOBILE RADIOLA

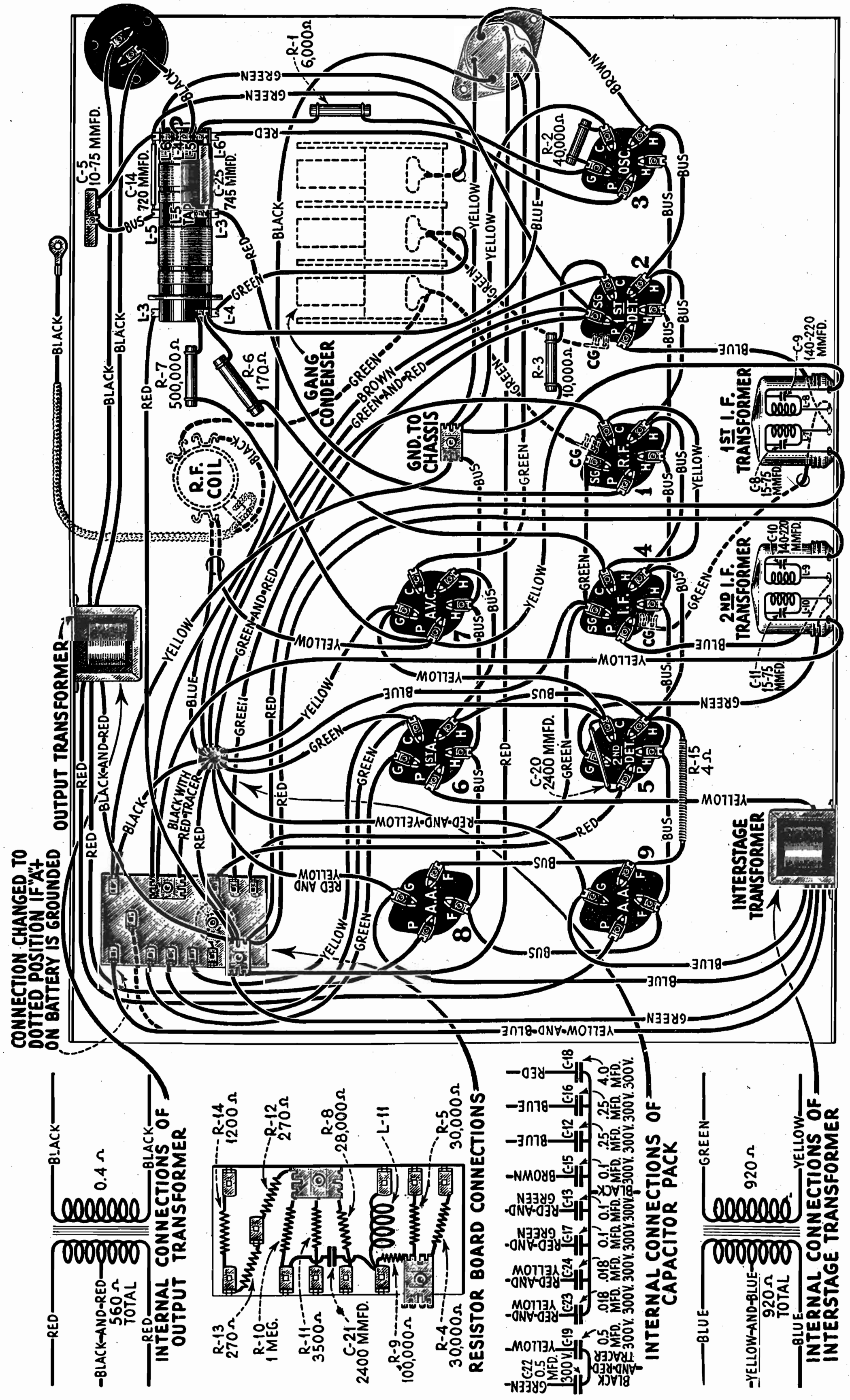

Figure 26—Wiring Diagram of Receiver Unit

SERVICE AND INSTALLATION NOTES

for

RCA Victor Automobile Radiola Model M-30

INTRODUCTION

The RCA Victor Automobile Radiola, Model M-30, is a nine tube Super-Heterodyne radio receiver designed for automobile or motor boat use. Features of this receiver are; sensitivity and selectivity equal to that of high quality home receivers, high output Class B amplifier giving a large undistorted output with a small plate battery drain, permanent magnet dynamic loudspeaker requiring no external field supply, automatic volume control using entirely new principles of operation and extremely low battery consumption for both heater and plate supply. This feature allows the use of the automobile battery as "A" supply without imposing an additional load upon it that cannot be readily compensated for by a slight generator charging readjustment. The low plate current drain allows excellent "B" battery life. Use of the new automobile type Radiotrons eliminates the possibility of Radiotron failure due to vibration or varying heater voltage such as is encountered in automobile driving.

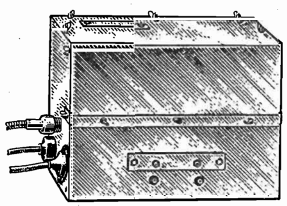

Figure 1—Receiver Assembly

In the design of this receiver, special attention has been given to the ease with which the installation may be made, and the elimination of interference originating in the ignition system. Thorough shielding of all parts together with proper design of the receiver makes it possible to reduce ignition interference to a negligible degree. This is done without any sacrifice in the sensitivity of the receiver.

A description of the various units follows.

RECEIVER ASSEMBLY

The receiver assembly, Figure 1, is housed in a metal case that acts as an effective mechanical and electrical shield. A bracket is provided for mounting so that dismounting is a comparatively simple operation, requiring the removal of but one screw.

The top section of this container is fastened by means of wing nuts. This provides for easy removal for checking or replacing Radiotrons. The battery and control box cable, the loudspeaker cable and the flexible tuning cable are all held in place by means of fittings which allow their easy removal in case the box is to be removed from its mounting. The case is finished in a dull smooth black that is not easily scratched and harmonizes with the usual car finishes.

CONTROL BOX

The control box, Figure 2, contains the station selector knob, the dial scale, the volume control and the key switch. It is provided with a felt strip and mounting clamp for attaching to the steering column of the car. The dial scale is marked in channels (multiply by 10 for kilocycles) and is of the non-glare type. The switch is provided with a key, which when removed, locks the radio at the "off" position.

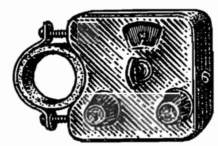

Figure 2—Control Box

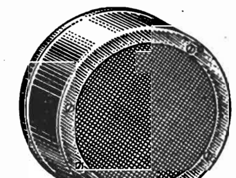

Figure 3—Loudspeaker

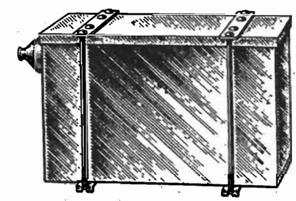

Figure 4—Battery Box

LOUDSPEAKER

The loudspeaker, Figure 3, used in the automobile equipment is of the permanent magnet, dynamic type. It is housed in a smooth black finished metal container which also acts as an effective baffle. Due to the presence of the strong magnetic field, even when the set is turned off, special provision has been made to prevent metallic substances from being drawn into the air gap of the speaker and thereby cause rattles. The speaker edge and center is entirely closed, thus preventing such entry from the front. A fine gauze covering is placed over the back, thus eliminating any such matter from entering from that side. The cord outlet is provided with a rubber bushing that closes up its opening. The speaker has excellent frequency characteristics and is of extremely rugged construction.

BATTERY BOX

A special heavy steel battery box, Figure 4, is furnished as optional equipment when it is either undesirable or impossible to install the batteries behind or under the seats or in the rear compartment of the car. This box is so constructed that the batteries may be mounted and connected therein and then lifted into position beneath the car. Four carriage bolts, each provided with two lock nuts, hold it in place.

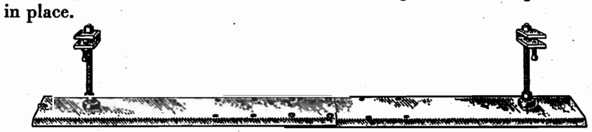

Figure 5—Antenna Plate

ANTENNA PLATE

The antenna plate, Figure 5, is provided for use when a roof antenna is not already installed in the car. It is provided with special bolts and clamps that allow easy mounting to the frame of the car. Due to the high sensitivity of this receiver, satisfactory results may be obtained with the undercar antenna except in districts where the signal intensity of all stations is extremely low. In such cases a roof antenna must be erected in accordance with the instructions given in Part I, Section 3.

MODEL M-30
AUTO RADIOLA
Part 4 (Cont.)

R. C. A. VICTOR CO., Inc.

IGNITION EQUIPMENT

Six spark plug type suppressors, one distributor type suppressor and two 0.75 mfd. capacitors, Figure 6, are provided for the suppression of ignition interference so that it does not materially affect radio reception. The details of installing this equipment are covered in Part I and varies somewhat in different cars.

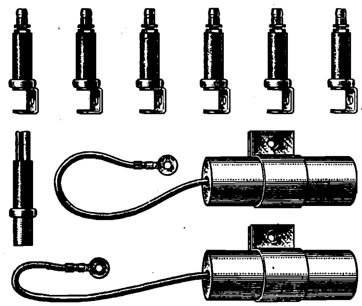

Figure 6—Ignition Equipment

PART I—INSTALLATION

Due to the nature of the installation it is advisable that the RCA Victor Automobile Radiola be installed by a competent radio service man in conjunction with an automobile mechanic. The usual automobile repair shop has the necessary tools and lifts that are desirable in making the installation. If it is necessary to erect a roof antenna, this work must be done by a competent "trim" shop working under direction of the service man. However, after making several installations the service man may feel confident enough to attempt all the installation work himself, with the exception of the roof antenna. For such work the following list of equipment is provided which will be found useful when performing such work.

1 Pair Gas Pliers	1 Heavy Duty Soldering Iron
1 Pair Diagonal Pliers	1 Medium Soldering Iron
1 Pair Long Nose Pliers	Supply of Rosin Core Solder
1 Small Crescent Wrench	Supply of Acid Core Solder
1 No. 4 Spintite Wrench	Supply of ½" Belden Braid
1 Thin Shank 6" Screw Driver	Supply of Sheet Copper
1 Small Screw Driver	1 Electric Drill with Set of Drills Up to ½"
1 Large Screw Driver	1 Set Seat and Door Protectors
1 Pair Tin Shears	1 Reamer—¾" maximum

1 Set Analyzer or Miscellaneous Voltmeters

(1) LOCATION AND MOUNTING OF UNITS

The proper method of installing the equipment of the RCA Victor Automobile Radiola is covered in the Installation Instructions packed with each equipment. However, as there are many different types of installations, this information will be repeated together with a discussion of its numerous variations.

RECEIVER UNIT

Location The usual location for the receiver unit is on the right side of the engine compartment bulkhead directly under the dash. Figure 7 shows a typical installation. In some cars this will have to be on the opposite side directly over the steering column, Figure 8. It is important that the space selected have at least four inches clearance directly over the receiver, otherwise it cannot be removed from the mounting bracket. Interference with other equipment under the dash, and interference of the mounting bolts with equipment on the engine side of the bulkhead must be avoided. Figure 8A shows an installation where the receiver is in the usual location, but the loudspeaker is in the center.

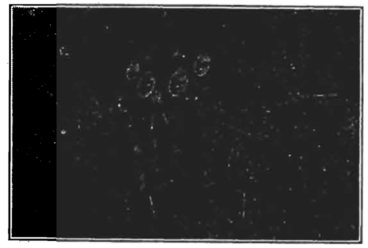

Figure 7— Usual Location of Receiver

Figure 8—Receiver Over Steering Column

In some cars, the ignition coil is on the compartment side of the bulkhead or under the dash. If there is a choice of places available, the one at the greatest distance from the coil should be chosen. This is important as it reduces the ignition noise considerably.

Mounting Using the card inside of the Receiver Carton as a template, determine the proper location on the bulkhead and mark the location of the three holes with a center punch. A space at least four inches high must be left above the receiver. Extra holes are provided in the bracket to be used in case the regular holes are not satisfactory. If the bulkhead is curved, the template must be used flat and not follow the contour of the curved surface. In some cases, the receiver unit bracket must be mounted away from the bulkhead to clear obstructions. The center punch must be held perpendicular to the template when marking the holes to insure proper alignment. Next drill three 5/16 inch holes as marked. Then attach the bracket to the bulkhead by means of nuts and lockwashers furnished as shown in Figure 9.

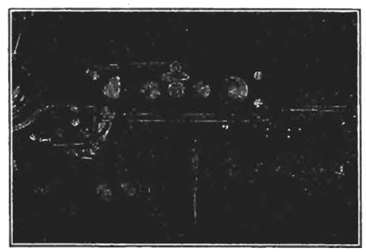

Figure 8A—Receiver on Right with Loudspeaker in Center

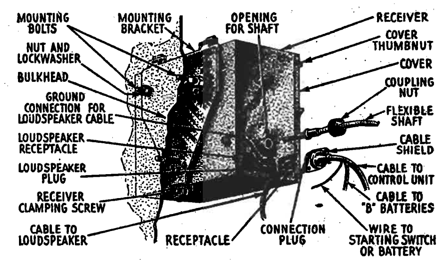

Figure 9—Details of Receiver Mounting

Remove the thumb-nuts from the top, front and sides of the receiver. Remove the packing material from around the Radiotrons and make certain that they are in the proper sockets. (See Figure 10).

Press the grid contact caps firmly over the contacts on top of all RCA-236 Radiotrons. Also make sure that the tuning capacitor rotor plates are fully meshed with the stator plates so that the flexible shaft may be easily mounted. If the positive terminal of the storage battery is grounded to the frame of the car, it will be necessary to remove the bottom of the receiver and change the yellow and blue wire from its normal position on the resistor board to that indicated by the dotted line in Figure 11. Replace the bottom, the cover and thumb-nuts making sure the nuts are tight. Hang the receiver on the bracket hooks, insert the clamp screw and washer at the bottom and tighten with a screw driver.

MODEL M-30
AUTO RADIOLA
Part 5 (Cont.)

R. C. A. - VICTOR CO., Inc.

LOUDSPEAKER

Location The Loudspeaker may be mounted at several locations, in most automobiles. However, the preferable location is on the bulkhead facing the rear of the car and on the opposite side from that of the receiver. If several locations are available, choose the one that gives the best acoustical results. This can easily be determined by experiment by not mounting the speaker until the rest of the equipment is in place and the receiver operating.

Mounting The instructions for mounting the receiver assembly apply equally well to the loud speaker, with the exception that the loudspeaker is mounted direct, there being no bracket provided. A template is also provided for this unit. No clearance space above the loudspeaker is required.

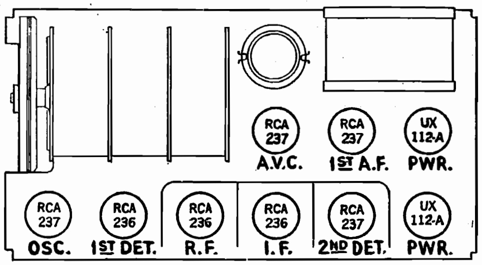

Figure 10—Radiotron Socket Location

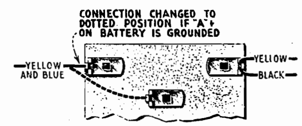

Figure 11—Wiring Change for Cars Having Positive Side of "A" Battery Grounded

CONTROL UNIT

Location The control unit is mounted on the steering column at a convenient height for the driver. Due to the large size of the steering wheel hub on some cars, this distance must be adjusted for best visibility.

Mounting Place the felt around the steering column and hold it in place by means of string or a piece of tape. Remove one screw from the clamp and place the box and clamp around the felt. Replace the screw that was removed and tighten both screws equally.

FLEXIBLE SHAFT

Location The flexible shaft is used to mechanically connect the tuning capacitor in the receiver assembly to the drive and dial in the control box. It should be placed and fastened to the car so that it connects these two points together and is clear of any foot room or instruments. On some cars a special length shaft will be required. Such flexible shafts are listed in Part IV, page 24.

Mounting Turn the Station Selector until the flat side of the shaft may be seen through the hole in the side of the unit. Insert the end of the shaft into the opening at the rear of the Control Unit making certain that it engages the end of the shaft inside of the latter. Turn the shaft until the set screw is visible and tighten the set screw against the flat side of the shaft. Thread the coupling nut of the shaft onto the Control unit.

Turn the Station Selector knob clockwise so that the dial is at the extreme counter-clockwise position. Then insert the free end of the shaft into the opening provided on the receiver, turning the Station Selector knob back and forth until the shaft meshes. Tighten the collar that holds the shaft to the receiver unit.

After completing these two operations, slowly turn the Station Selector knob to the extreme clockwise and then to the extreme counter-clockwise position. Normally, this will insure the use of the complete range of the dial. If, however, it is noticed that a slight amount of tension is present at either end of the dial, then the control unit must be turned on the steering column in the direction of the tension, while making this adjustment. Then returning it to its normal position will relieve this additional tension. Figure 12 gives the details of this latter adjustment.

ANTENNA PLATE

Location The antenna plate, if used, should be mounted under the car and as far to the rear as possible. Also it must be as low (close to the road) as possible and still maintain the clearance of the lowest point of the car from the road.

Usually, it is mounted on the opposite side from the Muffler and exhaust pipe to prevent crowding. See Figure 13. In some cases, it is desirable to mount the plate crosswise to the car chassis. Avoid any location that will place the plate in a position that will impede the free motion of the chassis parts such as springs, drive shaft, or axles, as damage to the antenna will result.

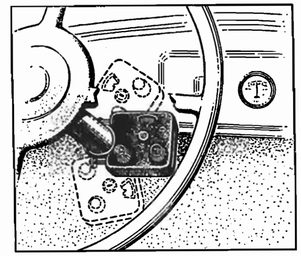

Figure 12—Position for Control Box in Order to Make Adjustments

Mounting After determining the proper location, fasten the plates together with the screws provided. Adjust the length so that the plate is as long as possible and still fulfill the foregoing conditions. Assemble the mounting bolts onto the plate as shown in Figure 5 and fasten the clamps to the car frame. Then tighten the bolt that holds the antenna plate to the bracket and the screw and lock nut that holds the bracket to the car frame. *Too much attention to the proper tightening of these screws is impossible, as any loosening of this plate that results in one end dropping while the car is driven at high speed may result in an accident.*

Figure 13—Typical Location of Antenna Plate and Battery Box

"B" BATTERIES

Location If possible, the "B" batteries should be mounted under one of the seats or behind the back of the rear seat. In cars having a rear compartment or trunk, the batteries may be located therein.

However, if such a place is not possible, then a battery box must be used. This box can usually be mounted under the car by fastening to the floor boards. Its location should be as far from the muffler and exhaust pipe as possible, as the heat from these parts will have a detrimental effect on the life of the batteries.

Mounting Using the cover of the battery box as a template, locate the cover on the floor boards under the car and mark the boards for the center of the four mounting bolts. Drill four 3/8" holes in the floor boards. Insert the four carriage bolts in the holes from the top. Make sure the hanger bolts are in place in the cover and fasten the cover to the four bolts in the floor board. In the case of cars having metal floor boards, machine screws with spacers must be used instead of carriage bolts. Make sure that the mounting bolts do not project too far down into the box so that they will fail to clear the batteries.

After fastening the top securely in place, place the "B" batteries in the box and connect them to the receptacle as shown in Figure 14. Slip the cambric cover over the fuse and place the paper strips and plate over the terminals. Then lift the box into place, swing the hanger bolts into place and tighten both nuts securely. Care should be taken to draw up on all four nuts gradually.

For mounting both the antenna plate and the battery box, it is desirable to place the car on a "lift."

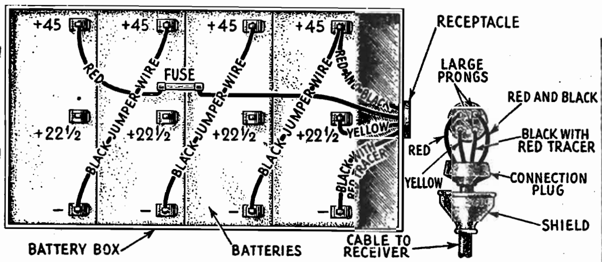

Figure 14—Battery Box Connections

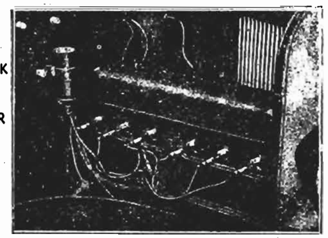

Figure 14A—Typical Installation of Suppressors

IGNITION EQUIPMENT

Two .75 mfd. capacitors, six spark plug type suppressors and one distributor type suppressor are furnished to be installed in the car's ignition system so that its R.F. radiation may be reduced to a point so as not to interfere with radio reception.

One .75 mfd. capacitor is connected across the output of the generator. Remove a screw from the generator frame, usually the one holding the cut-out, insert the screw through the hole in the capacitor clamp and replace the screw. Connect the lead from the end of the capacitor to the terminal on the generator side of the cut-out switch.

The other capacitor is connected from the battery side of the ammeter to the car frame. Usually, one of the screws on the underside of the dash can be used to hold the capacitor, thereby making the ground connection. Then connect the lead to the ammeter terminal.

The spark plug type suppressors are inserted in series with each high tension lead at its point of connection to the plug. The distributor suppressor is inserted in series with the high tension lead from the coil at its point of connection to the distributor.

There are a number of variations in the installation of this ignition suppression equipment that are covered in Part II.

(2) CONNECTIONS

Loudspeaker to Receiver Insert the plug on the end of the loudspeaker cable into the two-contact receptacle on the end of the receiver. Fasten the pigtail under the self-tapping screw as shown in Figure 9.

Main Cable to Receiver A long cable, from the control unit and battery box, is attached to the receiver by means of a six point female plug. Insert the plug into the receptacle on the receiver. A metal cap is fitted over two studs at the same time. Fasten the nuts over these studs securely.

Main Cables to Batteries Drill ½" hole in the toe boards directly below the end of the receiver unit to which connections are made. (If any holes that may be used for this purpose are already available, drilling additional holes is unnecessary). Pass the free end of the cable through the hole and thence to the "B" Battery location. Possibly other holes must also be drilled. Connect the "B" batteries to the cable as shown in Figure 15. The metal braid must be pushed back from the free end and taped so that sufficient length leads are obtained for connecting the batteries. If the battery box is used, solder the four prong plug onto the end of the cable as shown in Figure 14.

The cable should be fastened to the chassis of the car by means of the clamps or staples provided. Take up any slack by making a loop and tape securely.

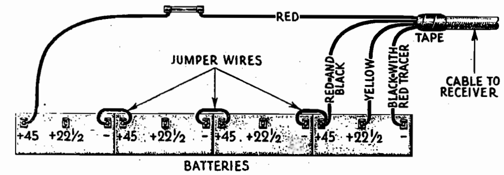

Figure 15—Cable Connections to "B" Batteries

Receiver to Antenna The antenna lead should follow the shortest practical path between the receiver and the antenna. It is very desirable to avoid passing it through the engine compartment or close to the ignition coil, if mounted on the dash or compartment side of bulkhead.

If a roof antenna is used, cut the lead from the antenna as short as possible and still allow length for connection. Then cut the antenna lead and shield from the receiver to a proper length, allowing about two inches extra on the shield so that it may be slit and braided into a pigtail. Solder and tape the connections securely. Then solder the frayed part of the pigtail and either fasten or solder it securely to the car frame. The pigtail should be as short as possible and a good electrical joint made to the car frame.

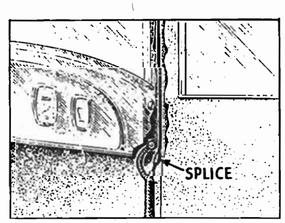

Figure 16—Proper Method of Grounding Shield When Using Roof Antenna

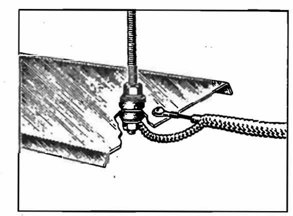

Figure 17—Proper Method of Grounding Shield When Using Plate Antenna

If the antenna plate is used, the antenna lead and shield should be cut in the same manner as for the top antenna, except that the pigtail must be slightly longer. An eyelet terminal is provided for soldering to the end of the antenna lead so that it may be held by the screw and nut at the end of the antenna plate. The pigtail should be fastened under one of the nuts that hold the plate to its mounting bolts. Figures 16 and 17 illustrate the correct manner in making both types of connections.

Receiver to "A" Battery One side of the "A" Battery connection is made through the frame of the car. The "hot" side is made by means of a single lead that is brought out from the main cable. This lead is provided with a lug that should be fastened under the nut that holds the battery connection to the starting motor switch.

This completes the installation. All cables should be fastened securely to the car so that interference with its operation is avoided. This is especially true of those under the dash which may interfere with the driver's foot room. The switch may then be turned "on" and the receiver operated in the usual manner. Normally, starting the car engine will not introduce any objectionable noise. However, if ignition interference is present that is objectionable, then a reference to Part II will give the details for clearing up this trouble.

(3) INSTALLATION OF ROOF ANTENNA

In cars not already equipped with roof antennae, the usual installation is that of the antenna plate. Due to the high sensitivity of this receiver, entirely satisfactory results are obtained from the plate antenna in most installations. However, if the car is to be operated in a locality remote from any stations and having a general low degree of signal strength, the erection of a roof antenna is advisable. The following details cover the procedure to be used in a majority of closed cars. This work should be done by a competent "trim" man as a degree of skill, only acquired by experience, is necessary in removing and replacing the fabric top of a car.

The antenna should be composed of copper screen having a total area of at least 10 square feet. It should be located as far to the rear as possible and insulated from any metal part of the car which may ground it. In some cars having a metal rib in the center, it will be advisable to make the antenna in two pieces and use insulated wire as straps for bonding it together. All joints together with the lead-in connections should be well soldered.

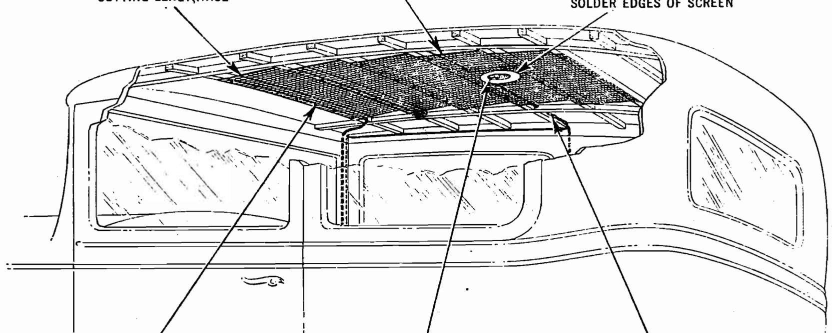

Figure 18—Details of Roof Antenna

1. First determine if there is a grounded metal screen in the roof of the car, as some cars use such a screen for the top material support. A sharp pointed instrument, connected on one side of a continuity tester, the other side being grounded, should be used. Push the point through the top lining and fish around until it comes in contact with the wire screen. If any reading is obtained, even though very small, the screen is grounded and it cannot be used for an antenna. If not, however, one corner of the head lining may be removed and a connection soldered to the screen which will make an excellent antenna.
2. If the screen is grounded or if no screen is present, it will be necessary to remove the head lining and a strip clipped from the screen several inches from all edges and from the dome light or insert a copper screen approximately of these same dimensions. If there is a possibility of the screen shifting, tack it to one of the ribs and lace the sides with cord.
3. Solder a length of shielded wire to the right front corner of the screen. Then solder or bond the shield securely to the car frame. The lead-in is then run down the right front roof support. Usually, this can follow the path of the dome light lines. It should be noted however, that if the ignition coil is mounted on either side of the dash, it is preferable to run the lead-in down the column further from the coil.
4. Again test the antenna from the set end of the lead-in to ground for any possible shorts. If none exist then replace the head lining. Figure 18 shows a typical roof antenna installation.

(4) INSTALLATIONS ON MODEL A FORDS

The Model A Ford presents a somewhat involved problem for the installation of the RCA Victor Automobile Radiola. The reason for this is that due to the gasoline tank being part of the cowl, the usual location for the set and speaker cannot be used. Two positions for the receiver and three for the speaker are possible, each having several disadvantages.

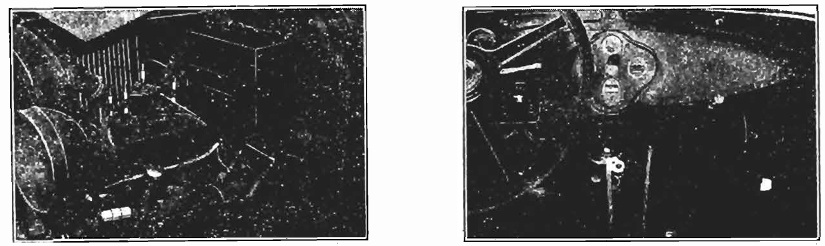

Figure 19—Location of Units in Model A Ford

The receiver unit may be mounted in the engine compartment as shown in Figure 19, more easily than at any other location. The disadvantage of this position is that due to the high noise level present even when suppressors are used, a satisfactory installation cannot always be made. The receiver is also subject to motor fumes, water and steam used in engine cleaning and the usual atmospheric conditions.

The other alternative position for the receiver is on the right side of the driving compartment as shown in Figure 20. The dimensions for a template to be mounted to the body to hold the receiver or loudspeaker are shown in Figure 21. The interference may be successfully eliminated at this location but the position of the receiver interferes with the leg room of the person riding beside the driver.

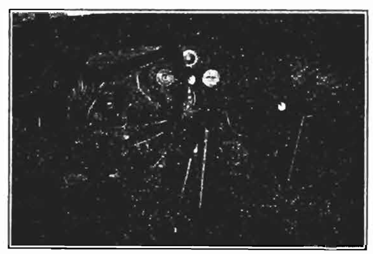

Figure 20—Alternative Position for Receiver and Loudspeaker

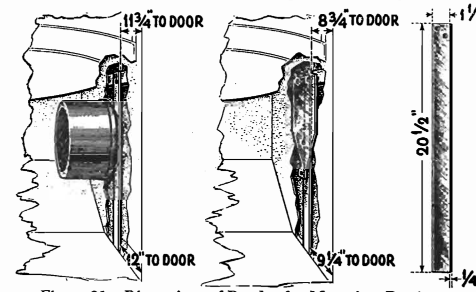

Figure 21—Dimensions of Bracket for Mounting Receiver or Loudspeaker to Side of Driver's Compartment

The loudspeaker may be mounted at either side of the car, using the same template for a bracket as that shown in Figure 21, on models not having pockets at either of these locations. On such models, such as the roadster, the loudspeaker can be mounted directly behind the gear shift lever and bolted to the seat base. This location is not seriously in the way and gives good acoustical results.

The batteries may be mounted behind the rear seat in the sedan models, in the rear compartment of coupes and roadsters or in a battery box on any model.

PART II—SUPPRESSION OF IGNITION INTERFERENCE

In general, the use of the ignition suppressors and capacitors as described in Part I of this booklet will reduce the ignition interference to a negligible amount. However, on some installations it will be found that the noise is still present to a degree that is undesirable. In such cases, the following hints will aid the installation man in clearing up this trouble.

(1) IGNITION ADJUSTMENTS ON MOTOR

The first step in clearing up a noisy installation is to thoroughly check and remedy any defects in the ignition system of the car. By this we mean the spark plugs should be cleaned and adjusted or replaced, the breaker points replaced or adjusted and synchronized if necessary, the distributor arm filled out with solder until it makes a full even contact, and the generator commutator cleaned and its brushes adjusted or replaced. Also all wiring should be cleaned and loose connections or poor joints remedied. This work is the first step in the clean-up job and it should be done by a competent ignition expert, who has been acquainted with the need of accurately making all adjustments.

Usually, such adjustments though made on a motor that is performing efficiently, will materially reduce the ignition noise in the radio receiver.

(2) BY-PASS CAPACITORS

In some installations a re-arrangement of the connections of the by-pass capacitors will be found beneficial. For example, the by-pass capacitor connected to the battery side of the ammeter, if connected to the battery side of the ignition coil may be more effective.

In other cases using an additional capacitor at the coil, a total of three for the installation, will remedy the trouble. In all cases the generator capacitor is used, although if a clicking is heard when the cut-out makes and breaks its circuit, the pigtail should be connected to the load side rather than the generator side of the cut-out relay.

On some cars, two capacitors—one on each terminal—at the ammeter will greatly reduce the noise. This is especially true of 1932 Studebakers.

(3) IGNITION COIL

The car ignition coil, due to the high electromagnetic field surrounding it, should be at as great a distance as possible from the receiver, preferably on the opposite side of the metal bulkhead. On cars that have the ignition coil mounted on the instrument board directly over the receiver unit, it may be necessary to place it in the engine compartment. Where the switch is mounted into one end of the coil, the switch assembly must be removed from the coil and a bracket provided for mounting it. The leads from the coil should be shielded and the shield grounded. (Use Packard High Tension Cable for the high tension lead to the distributor).

Another important point is that of the primary connections. While not affecting the ignition system in its relation to the car, due to the use of auto-transformers as coils, interchanging the primary leads to a coil will sometimes materially reduce the ignition noise.

(4) ANTENNA PLATE

If grounding the antenna at its point of exit from the shield reduces or eliminates the noise, then it is feeding in through the antenna. The remedy in such a case is to place the antenna further toward the rear of the car. Also lowering it, slightly will greatly increase its signal pickup. Care must be exercised when doing this, to ascertain that the road clearance of the car is not reduced. Another important point to check is the grounding of the outer end of the antenna shield. Grounding this end of the shield to the chassis in practically all cases, materially reduces ignition noise. However, in certain cases, grounding this shield may increase the noise. In such cases the shield should be insulated with tape and left ungrounded.

(5) CABLES

Proper placing of the various shielded cables may have a bearing on the ignition noise picked up as well as contact noise caused by a variable contact between the cable shields and the car frame.

The antenna lead should follow the shortest path between the receiver unit and the antenna. If there is any possibility of the shield rubbing against any of the car frame, the cable should be taped or clamped in place. The "B" battery cable should be taut and any slack taken up by means of a loop. It should also be fastened or taped securely.

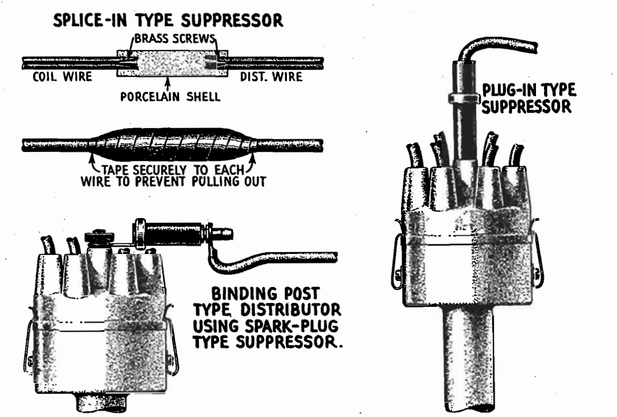

Figure 23—Installation of Various Types of Distributor Suppressors

(6) DISTRIBUTOR SUPPRESSORS

Three different styles of distributor suppressors are used, due to the variations in the distributor head connections. These are illustrated in Figure 23. The plug-in type is supplied with this equipment and is used in the majority of cars. The spark plug type with the end flattened is used in Packard and other cars having the binding post connection. The splice-in type is used on cars that do not have a readily removable connection to the distributor head. It is spliced into the high tension head, as close to the distributor as possible. This type may also be used on cars not having much room at the spark plugs, such as the Buick. While not furnished with regular equipment, the splice-in type suppressor is listed in Part IV.

PART III—SERVICE DATA

Service work in connection with the RCA Victor Automobile Radiola is very similar to that of the usual broadcast receiver. However, the following description of the circuit and method of making adjustments will be found helpful in locating and remedying any failure that may occur.

ELECTRICAL DESCRIPTION OF CIRCUIT

The following description of the circuit will give the service man a better understanding of the functioning of the receiver and thereby help him in his work. Figure 22 shows the schematic circuit diagram. (See Page 504-Y)

The first tube is the tuned R.F. stage. This is the screen Grid Radiotron, RCA-236. The control grid bias for this Radiotron is varied by means of the automatic volume control tube.

The output of the R. F. stage is coupled inductively to the grid coil of the first detector. At this point the oscillator output is also coupled inductively to the grid coil of the first detector.

This is a tuned grid circuit oscillator using a Radiotron RCA-237 and having a closely coupled plate coil that gives sufficient feed-back to provide stable operation. The grid circuit is so designed that by means of a correct combination of capacity and inductance a constant frequency difference between the oscillator and the tuned R. F. circuits throughout the tuning range of the receiver is obtained.

The next circuit to examine is the first detector. The circuit is tuned by means of one of the gang condensers to the frequency of the incoming signal. Radiotron RCA-236 is used in this stage. In the grid circuit is present the incoming signal and oscillator frequencies. The beat frequency —175 K.C.—appears in the plate circuit of the first detector which is accurately tuned to 175 K.C.

The next stage is that of the I.F. amplifier. A single stage is used, requiring two I.F. transformers, consisting of four tuned circuits. The plate circuit of the first detector, the grid and plate circuit of the I.F. amplifier and the grid circuit of the second detector are all tuned to 175 K.C. Radiotron RCA-236 is used in this stage and its control grid voltage is also varied by means of the automatic volume control tube.

At this point it is well to consider the action of the automatic volume control tube as it controls the R.F. and I.F. amplifiers of the receiver. The grid of the automatic volume control tube, RCA-237, is connected direct to the cathode of the second detector.

The change in the bias voltage of the second detector, due to fluctuation of the signal, is applied to the grid of the A. V. C. tube. This produces a voltage drop across a resistor in the plate circuit which constitutes the control grid bias for the R. F. and I. F. amplifier. As the value of the plate current is a direct result of the voltage applied to the grid, a greater plate current gives a greater voltage drop across the resistor in its plate circuit and therefore a higher bias on the I. F. and R. F. stage. This results in less sensitivity and vice versa. The volume control varies the bias on the grid of the volume control tube.

The second detector is of the grid-biased type, using Radiotron RCA-237. The purpose of the second detector is to extract the audio frequency component of the R.F. signal which represents the voice or musical modulations produced in the studio of the broadcasting station. The audio component is extracted and used to drive the first A.F. tubes while the R.F. current is by-passed and not further used.

The output of the second detector is coupled by means of resistance coupling to the grid of the first A. F. Radiotron RCA-237. This audio stage is used as a driver for the Class B amplifier.

The output of the first audio stage is coupled by means of transformer coupling to the grids of the Radiotrons UX-112-A used as a push-pull Class "B" power stage. This stage is so biased that normally no plate current flows. However, as the grid swings positive due to the signal voltage being applied, plate current flows which is entirely of an audio character. As there is little residual current when no signal is present, this is a very economical amplifier as well as providing a high undistorted output—2 Watts.

The entire "A" battery current drain is 2.85 Amperes and the "B" current 12 M.A. minimum and 25 M.A. average maximum.

Filament and heater current is supplied from the storage battery in the car. Plate current is supplied by means of four medium size "B" batteries. A fuse is provided in both filament and plate circuits to protect the batteries and tubes.

(1) R. F. AND OSCILLATOR ADJUSTMENTS

Four adjustable capacitors are provided for aligning the R. F. circuits and adjusting the oscillator frequency so that it will be at a 175 K. C. difference from the incoming R. F. signal throughout the tuning range of the set. Poor quality, insensitivity, 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 tuning capacitors—the following procedure may be used for adjusting these capacitors.

1. Loosen the receiver unit clamping screw and dismount the receiver from its mounting bracket. Do not remove any of the connections or the flexible cable.
2. Procure an R. F. oscillator giving a modulated signal at exactly 1400 K. C. and 600 K. C. Also procure a non-metallic screw driver—Stock No. 7065 — and a No. 5 Spintite socket wrench.
3. An output indicator is necessary. This should be a current-squared thermo-galvanometer substituted or connected in parallel to the loudspeaker leads.

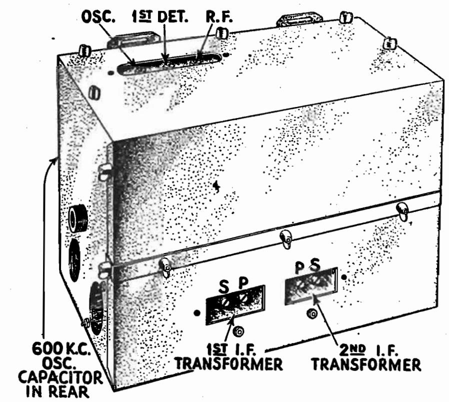

Figure 24—Location of Radio Frequency, Oscillator and Intermediate Frequency Adjustments

4. Remove the top cover of the receiver and remove the automatic volume control tube. Also ascertain that the tuning capacitor is fully meshed when the dial reads 150.
5. Place the oscillator in operation at exactly 1400 K. C. and couple it to the antenna. Set the dial at exactly 140 and adjust the coupling between the antenna and oscillator so that the output indicator does not give an excessive reading.
6. With the socket wrench, adjust the oscillator (see Figure 24), the first detector and the R. F. line-up capacitors until a maximum deflection is obtained in the output meter.
7. Set the oscillator at 600 K. C. Tune in this signal with the receiver and adjust for a deflection in the output meter. Now adjust the 600 K. C. series capacitor, Figure 24, until maximum output is obtained. Rock the tuning capacitor back and forth while making this adjustment.
8. Change the oscillator frequency to 1400 K. C. and set the dial at 140. Again make the adjustments given under 2, 3, 4, 5 and 6.

(2) I. F. TUNING CAPACITOR ADJUSTMENTS

A single intermediate frequency amplifier stage is used in this receiver. Two transformers are used and all circuits are tuned to 175 K. C. The circuits are peaked and when alignment adjustments are made, the capacitors are adjusted for maximum output. It will be necessary to remove the chassis from its mounting bracket as is the case of the R. F. adjustments.

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AUTO RADIOLA
Part 10 (Cont.)

R. C. A. - VICTOR CO., Inc.

A detailed procedure for making these adjustments follows:

a. Procure a modulated R. F. oscillator giving a signal at 175 K. C. The General Radio Type 360 is suitable. A non-metallic screw driver such as Stock No. 7065 is also necessary.

b. Connect an output meter in the circuit. A current-squared galvanometer connected either in place of or across the loudspeaker leads is suitable.

c. Remove the metal cover over the top of the receiver and then remove the oscillator and automatic volume control tube, Figure 10. Make a good ground connection between the receiver chassis and the car frame.

d. Place the oscillator in operation and connect its output between the control grid connection of the first detector and ground, see Figure 10.

e. Now adjust the secondary and primary of the second and first I. F. transformers until a maximum output is obtained in the output meter. Go through these adjustments a second time as a slight readjustment may be necessary. Be sure the output from the oscillator is not great enough to overload the first detector and I. F. tubes.

f. When the adjustments are made, the set should perform at maximum efficiency. However, due to the interlocking of adjustments, it is a good plan to always follow the I. F. adjustments with the R. F. and oscillator lineup capacitor adjustments as described in Part III, Section I.

(3) VOLTAGE READINGS AT RADIOTRON SOCKETS

The following voltages taken at each Radiotron socket with the receiver in operating condition should prove of value when checking with test sets such as the Weston Model 547, Type 3, or others giving similar readings. The plate currents shown are not necessarily accurate for each tube, as the cable in the test set will cause some circuits to oscillate, due to its added capacity. Small variations of voltages will be caused by different tubes. Therefore, the following values must be taken as approximately those that will be found under varying conditions. The numbers in column 1 indicate the tube socket numbers shown in Figure 26.

RADIOTRON SOCKET VOLTAGES

VOLUME CONTROL AT MINIMUM

Tube No.	Cathode to Heater Volts	Cathode or Filament to Control Grid Volts	Cathode to Screen Grid Volts	Cathode or Filament to Plate Volts	Plate Current M. A.	Screen Grid Current M. A.	Heater or Filament Volts
1. R. F.	18	0.5	100	136	0	0	6.0
2. 1st Det.	1.0	3.0	42	150	0.25	0.1	6.0
3. Osc.	6.0	0	—	45	3.5	—	6.0
4. I. F.	18	1.0	100	136	0	0	6.0
5. 2nd Det.	12	10	—	110	0.5	—	6.0
6. 1st A. F.	15	2.0	—	165	3.5	—	6.0
7. A. V. C.	10	1.0	—	15	0	—	6.0
8. P. W. R.	—	20	—	155	1.5	—	4.5
9. P. W. R.	—	20	—	155	1.5	—	4.5

VOLUME CONTROL AT MAXIMUM
(NO SIGNAL BEING RECEIVED)

Tube No.	Cathode to Heater Volts	Cathode or Filament to Control Grid Volts	Cathode to Screen Grid Volts	Cathode or Filament to Plate Volts	Plate Current M. A.	Screen Grid Current M. A.	Heater or Filament Volts
1. R. F.	18	0.5	70	135	4.0	1.0	6.0
2. 1st Det.	1.0	3.0	42	150	0.25	0.1	6.0
3. Osc.	6.0	0	—	45	3.5	—	6.0
4. I. F.	18	0.5	70	135	4.0	1.0	6.0
5. 2nd Det.	12	10	—	110	0.5	—	6.0
6. 1st A. F.	15	2.0	—	165	3.5	—	6.0
7. A. V. C.	5.0	9.0	—	15	0	—	6.0
8. P. W. R.	—	20	—	155	1.5	—	4.5
9. P. W. R.	—	20	—	155	1.5	—	4.5

(4) TESTING CAPACITORS

The by-pass capacitors are in a metal container. The internal wiring diagram is shown in Figure 26.

The capacitors can best be tested by freeing their connections and charging them with approximately 180 volts D. C. (use the four "B" batteries) and then noting their ability to hold the charge. After charging, short circuiting the capacitor terminals with a screw driver should produce a flash the size of the flash depending on the capacity of the capacitor and the voltage used for charging. A capacitor that will not hold its charge is defective and requires replacement of the entire unit.

(5) CHECKING RESISTANCE VALUES

The values of the various resistance units in this receiver are shown in the schematic diagram, Figure 22. When testing a receiver for defects, the various values of resistance should be checked. This may be done by a resistance bridge; the voltmeter-ammeter method, or by the following method.

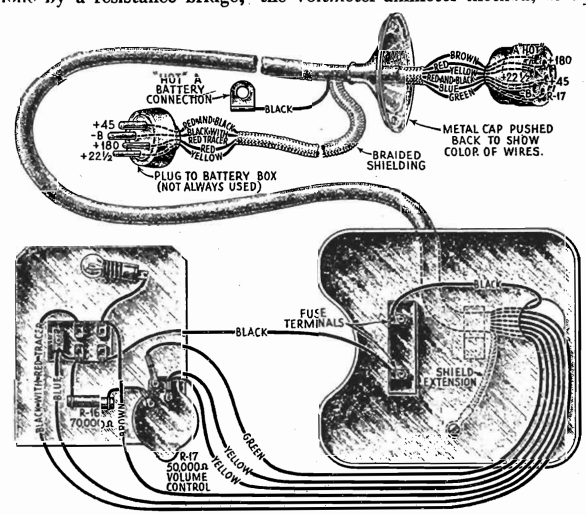


Figure 25—Control Box Wiring

For resistance of low value, 5000 ohms or less, use a voltmeter having a resistance not greater than 100 ohms per volt. For high values of resistance use a meter of 1000 ohms or more per volt. The Weston meters, Type 301 or 280, each have a resistance of 62 ohms per volt and are satisfactory for the low values. Use sufficient battery to give a good deflection on the meter, for example, a 45 volt "B" battery for a 0-50 voltmeter. Take two readings, one of the battery alone, and one of the battery with the unknown resistance in series. Then apply the following formula:

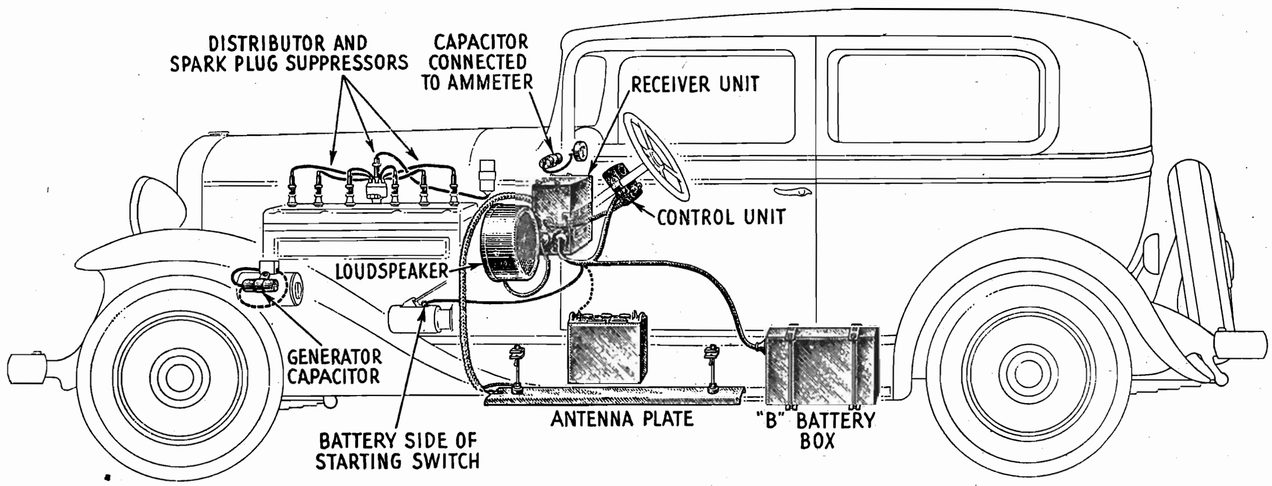
$$\left(\frac{\text{Reading obtained of battery alone}}{\text{Reading obtained with resistance in series}} - 1 \right) \text{Resistance of meter} = \text{Unknown Resistance}$$

(6) WIRING DIAGRAMS

The schematic wiring diagram is shown in Figure 22. The Control Unit wiring is shown in Figure 25 and the general wiring in Figure 26. A reference to these diagrams when locating trouble or replacing a unit will usually prove helpful. The internal connections of the cables are shown in Figure 27.

MODEL M-30
AUTO RADIOLA
Part 11 (Cont.)

R. C. A. VICTOR CO., Inc.



General View of Typical Installation of Automobile Radio

(7) VOLUME CONTROL

Normally, turning the volume control to the extreme counter-clockwise position will reduce the output volume of the receiver to zero. However, in event a powerful local station does not reduce to a satisfactory level, then check the following points.

a. Automatic volume control tube. Try interchanging it with others of a similar type or replacing it with a new one.

b. Volume control. Normally the volume control is of 50,000 ohms resistance. If for any reason it should be less, then the fixed resistor R-16 must also be reduced in value so that the proportion of 50,000 ohms to 70,000 ohms is maintained. For example—if the volume control measures 30,000 ohms, the fixed resistor should be replaced with one of 42,000 ohms. Such a replacement is much easier than a replacement of the complete volume control.

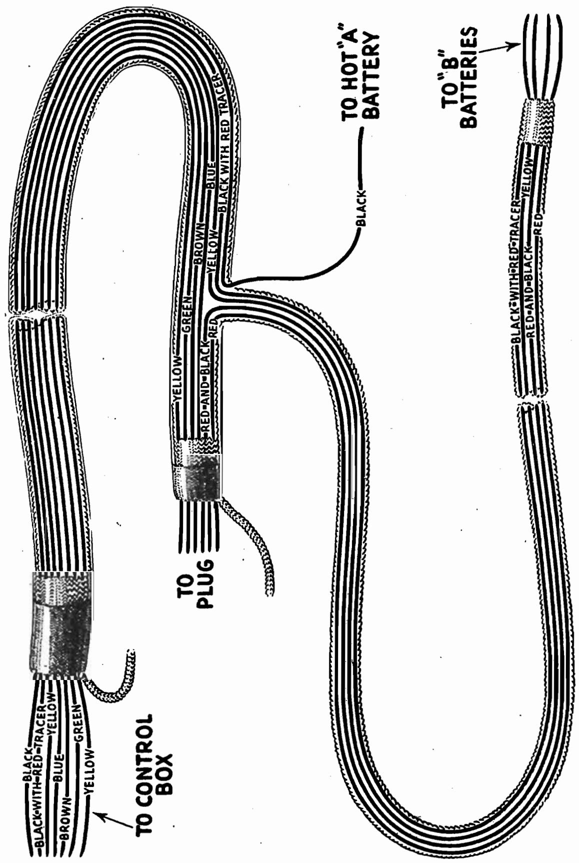


Figure 27—Internal Connections of Cables

PART IV—REPLACEMENT PARTS

On the following pages the parts that are required for replacement use are listed. It will be noted that several parts not included in the standard equipment are also listed. There are respectively, several types of ignition suppressors and special length flexible shafts. Reference to these parts has been made in the text and on some special installations they will be required.

MODEL M-30
AUTO RADIOLA
Part 12

R. C. A. - VICTOR CO., Inc.

REPLACEMENT PARTS

Stock No.	DESCRIPTION	List Price
	RECEIVER ASSEMBLY	
2240	Resistor—30,000 ohms—Carbon type —1 watt	$0.70
2546	Resistor—1 megohm—Carbon type—1 watt—Package of 5	3.00
2736	Resistor—170 ohms—Carbon type—1 watt—Package of 5	2.00
2741	Idler—Tuning capacitor drive idler—Package of 5	.80
2742	Spring—Tuning capacitor drive tension spring—Package of 5	.50
2747	Cap—Grid contactor cap—Package of 5	.50
2749	Capacitor—2400 mmfd	1.50
2966	Resistor—28,000 ohms—Carbon type —1 watt—Package of 5	2.50
2994	Coil—2nd detector R.F. choke coil	.60
3048	Resistor—500,000 ohms—Carbon type —½ watt—Package of 5	2.50
3078	Resistor—10,000 ohms—Carbon type —— watt—Package of 5	2.50
3118	Resistor—100,000 ohms—Carbon type —¼ watt—Package of 5	2.00
3288	Socket—UY Radiotron socket—Complete with insulation strip	.50
6133	Socket—UX Radiotron socket—Complete with insulation strip	.50
6134	Resistor—1200 ohms—Carbon type—1 watt—Package of 5	2.00
6135	Resistor—270 ohms—Carbon type—¼ watt—Package of 5	2.00
6136	Resistor—3500 ohms—Carbon type—1 watt—Package of 5	2.00
6137	Coil—R.F. coil	1.90
6138	Coil—1st detector and oscillator coil	3.30
6139	Cord—Tuning condenser drive cord—Package of 5	.65
6140	Plug—6 prong male plug and plug receptacle	.50
6141	Receptacle—Two prong receptacle for speaker cord plug—Package of 2	.70
6142	Resistor—6,000 ohms—Carbon type—½ watt—Package of 5	2.00
6143	Resistor—40,000 ohms—Carbon type —¼ watt—Package of 5	2.00
6144	Resistor—4 ohms—Flexible wire type —Package of 5	1.00
6145	Cover Plate—Adjustable capacitor adjustment cover plate—Located on back receiver shield—Package of 5	.50
6146	Screw—Self tapping hex head screw—For mounting cover plates to shield —Package of 40	.60
6147	Nut—Wing nut for receiver shield—Package of 20	.60
6148	Fuse—10 amperes—Package of 5	.50
6149	Bumper—Rubber bumpers—Located on receiver mounting bracket—Package of 10	.50
6150	Plug—Six prong female plug Located on main cable	.50

Stock No.	DESCRIPTION	List Price
	RECEIVER ASSEMBLY—Continued	
6151	Suppressor—Spark plug type suppressor	$0.65
6152	Suppressor—Distributor type suppressor	.65
6175	Suppressor—Distributor splice-in suppressor	.65
7062	Capacitor — Adjustable capacitor — 15–70 mmfd	1.00
7065	Micarta Screw Driver—Used for I. F. and R. F. adjustment	1.10
7299	Capacitor—745 mmfd	.70
7421	Capacitor pack—Comprising two 0.5 mfd., two 0.018 mfd., three 0.1 mfd., two 0.25 mfd. and one 4.0 mfd. capacitors in metal container	5.25
7422	Transformer—1st intermediate transformer	2.50
7423	Transformer—2nd intermediate transformer	2.50
7424	Transformer—Output transformer	1.85
7425	Transformer—Interstage transformer	2.20
7426	Board—Resistor board complete, less resistors, coil and capacitor	.75
7427	Cover plate—Intermediate adjustment cover plate—Located on front receiver shield—Package of 5	.50
7428	Cover plate—Tuning capacitor trimmer adjustment cover plate—Located on top receiver shield—Package of 5	.50
7429	Capacitor—0.625 mfd.—In metal casing with mounting bracket	2.20
8821	Capacitor assembly—Tuning capacitor assembly—Comprising 3 variable capacitors, drive bracket, drive cord, drive shaft and drum—Assembled	8.60
8822	Flexible drive shaft—Length 30″—From control box to receiver	4.90
8823	Shield—Back cover shield for receiver chassis	2.05
8824	Shield—Front cover shield for receiver chassis	1.10
8825	Shield—Top cover shield for receiver chassis	1.15
8826	Bracket—Receiver chassis mounting bracket complete with two rubber bumpers	1.20
8827	Cable—Main cable less plug—From control box to receiver chassis and battery box	2.20
8833	Flexible drive shaft—Length 42″—From control box to receiver	8.65
8834	Flexible drive shaft—Length 54″—From control box to receiver	9.35
8835	Flexible drive shaft—Length 66″—From control box to receiver	9.65
8836	Flexible drive shaft—Length 78″—From control box to receiver	10.40

Order By Stock Number Only

REPLACEMENT PARTS—(Continued)

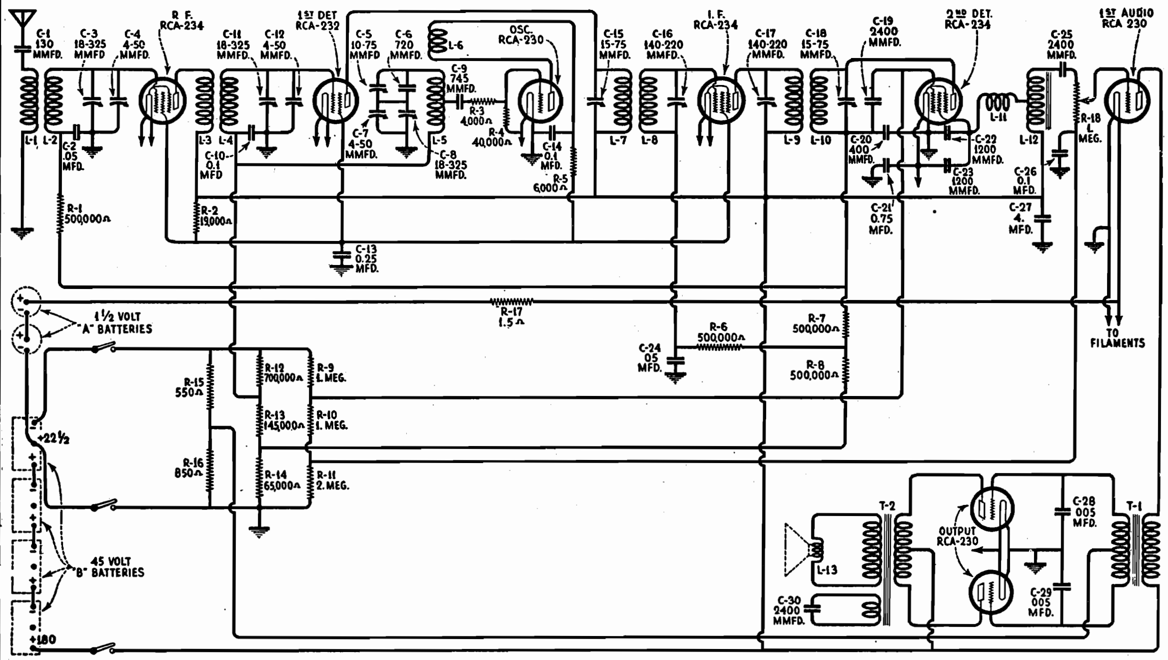
Stock No.	DESCRIPTION	List Price
	CONTROL BOX ASSEMBLY	
3287	Label—Metal trade mark label—Package of 5	$0.75
6153	Clamp—For clamping control box to steering wheel shaft—Package of 5	.50
6154	Screw — Clamp mounting screw — Package of 50	.50
6155	Shaft—Tuning dial shaft with gear and drive washer—Package of 5	1.25
6156	Switch—Lock switch—Complete with mounting nut and washer	.80
6157	Volume control—Volume control complete with mounting nut	1.50
6158	Nut—Knurled nut for lock switch—Package of 10	.50
6159	Resistor—70,000 ohms—Carbon type —½ watt—Package of 5	2.00
6160	Dial scale—Package of 5	.50
6161	Knob—Tuning control knob—Package of 5	1.50
6162	Spring—Knob tension spring—Package of 25	.50
6163	Knob—Volume control knob—Package of 5	1.50
6164	Key—Lock switch key—Package of 10	.50
6165	Lamp—Dial scale lamp—Package of 5	1.75
6169	Felt—Felt strip for steering column—Package of 10	.50
7430	Control box complete—Less flexible shaft and cable	5.25
7431	Cover assembly—Comprising top and bottom covers	1.20
7432	Bracket assembly—Comprising brackets, studs, stop washer and lamp socket—Located inside of control box	3.45
	LOUDSPEAKER ASSEMBLY	
2975	Rivet—Cone retaining ring mounting rivet—Package of 100	.50
6166	Board—Terminal board with two terminals—Located on cone bracket —Package of 5	1.00
6167	Plug—Two prong male plug—For cable No. 8832—Package of 5	.75
6170	Rivet—For mounting speaker and front grille into housing—Package of 100	.50
6171	Rivet—For mounting No. 8831 bracket to housing—Package of 100	.50
7433	Screen-Speaker housing case wire screen —Package of 5	1.50
7434	Screen—Dust screen for back of speaker housing case—Package of 5	1.75
8702	Ring—Cone retaining ring	.80
8828	Magnet assembly—Comprising cone bracket, core and magnet	4.60

Stock No.	DESCRIPTION	List Price
	LOUDSPEAKER ASSEMBLY —Continued	
8829	Cone—Speaker paper cone. Package of 5	$8.00
8830	Housing—Speaker housing complete—Comprising front screen, back dust screen, case and mounting bracket	3.00
8831	Bracket assembly—Speaker housing bracket — Comprising bracket, 2 mounting bolts, 4 washers and 4 nuts	.95
8832	Cable—Speaker shielded cable less plug	.55
8838	Speaker complete—Comprising Speaker, housing case and cord—Assembled	13.50
	ANTENNA ASSEMBLY	
6129	Staple—Insulated staple—Package of 100	.75
6130	Screw and Nut—U bracket set screw —⅜—16 x 1¼—Complete with lock nut—Package of 10	.50
6131	Insulator—Insulator bushing for No. 7420—Package of 10	.70
7419	Bracket—U bracket for mounting antenna plates—Package of 2	1.00
7420	Stud—Antenna plate stud—⅜—16 x 8″—Complete with 5 mounting nuts—Package of 5	1.90
8819	Plate—Single antenna plate	1.75
	BATTERY BOX ASSEMBLY	
2968	Receptacle—Four prong receptacle complete	.50
6122	Clamp—Cable clamp—Package of 15	.50
6123	Plug—Four prong male plug	.50
6124	Cap—Plug cover rubber cap for No. 6123—Package of 5	1.50
6125	Fuse—¼ amperes—Package of 5	.50
6126	Clip—Fuse clip—Package of 12	.50
6127	Bolt—Carriage bolt for mounting top of box to car—5/16—18 x 1¼″—Complete with lock nut—Package of 5	.50
7418	Bolt—Hanger bolt 5/16—18 x 9¼″—Complete with two lock nuts—Package of 5	.50
8817	Box body assembly—Comprising bottom plate, 2 side plates, 2 bottom strips and receptacle—Assembled	3.45
8818	Box cover assembly—Comprising cover plate, 2 strips and 2 rubber strips —Assembled	1.70
8820	Plate and strip assembly—Cardboard plate and strip assembly comprising six strips and one plate — Package of 5	.75

Order By Stock Number Only

R. C. A. VICTOR CO., Inc.

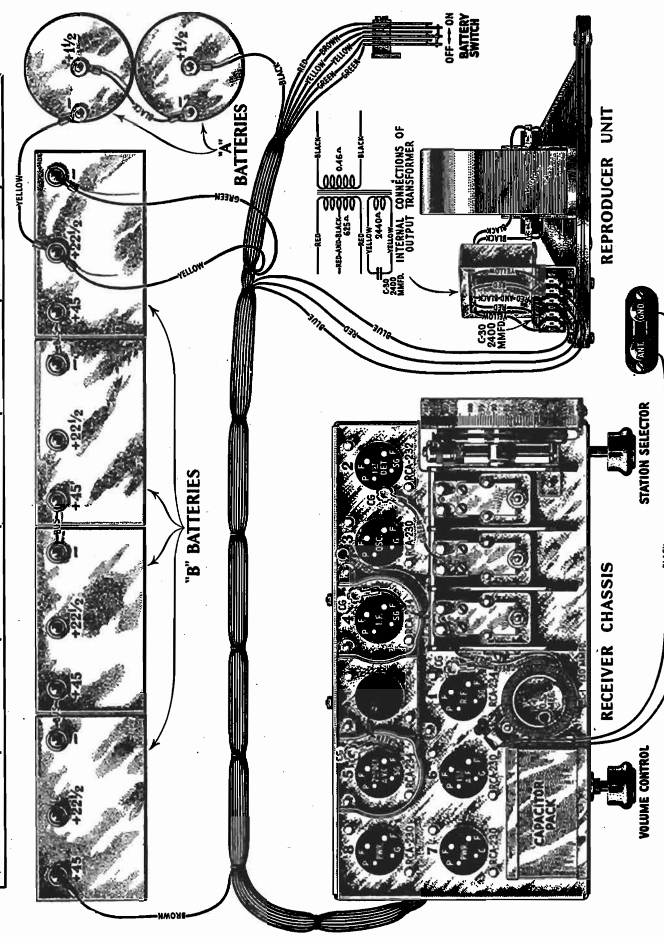
PORTABLE RADIOLA P-31



"A" Battery Current.........0.48 Amps.
Average "B" Battery Current...18 M. A.
Type of Audio Output Amplifier...Class "B"
Undistorted Output............0.75 Watts

RADIOTRON SOCKET VOLTAGES
(No Signal Being Received)

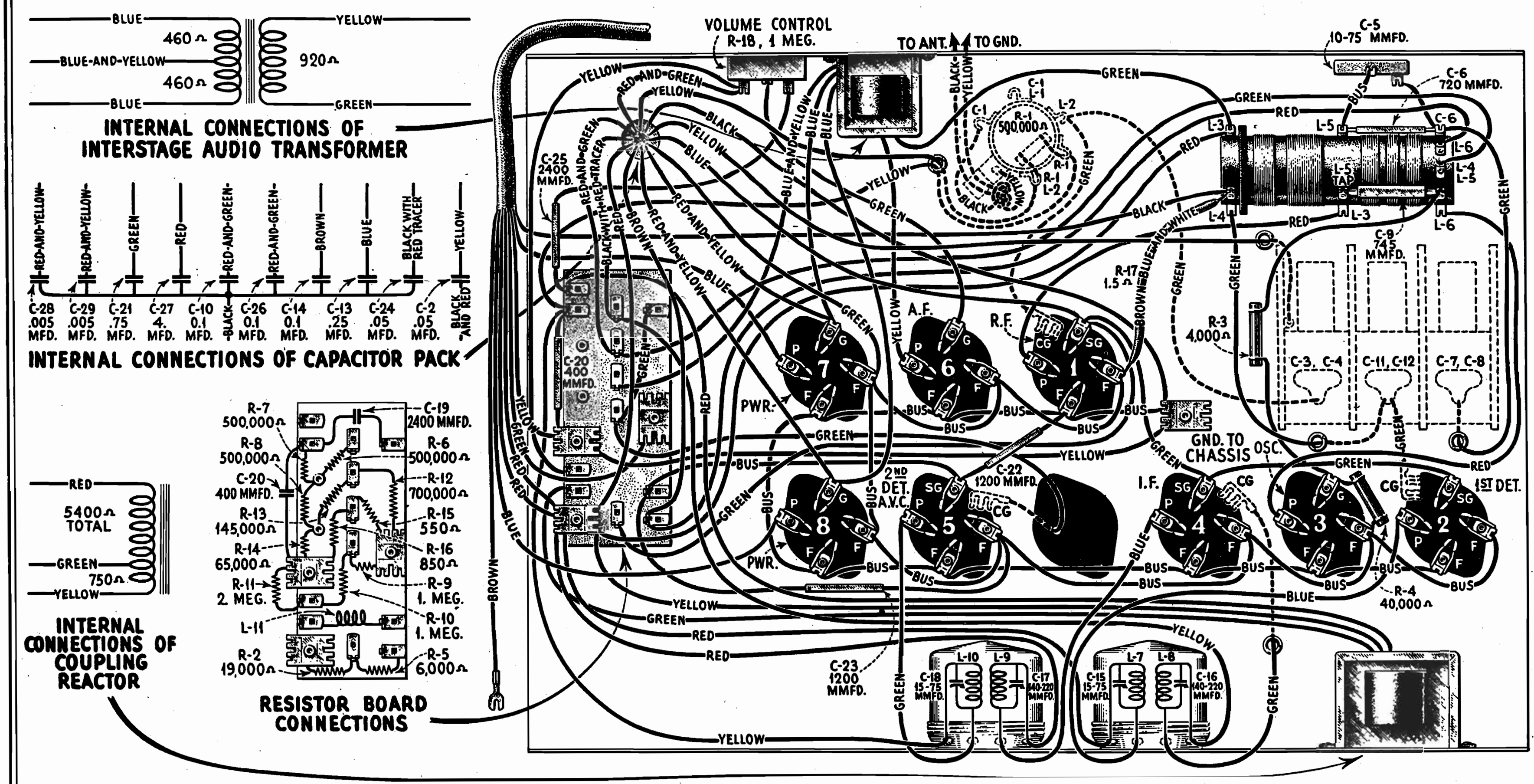
Radiotron No.	Control Grid to Filament Volts	Screen Grid to Filament Volts	Plate to Filament Volts	Screen Current M. A.	Plate Current M. A.	Filament Volts
1. R. F.	0.2	65	150	1.0	3.0	2.0
2. 1st Det.	0.5	65	150	0.1	0.2	2.0
3. Osc.	1.0	—	45	—	3.0	2.0
4. I. F.	0.5	65	150	1.0	3.0	2.0
5. 2nd Det.	2.0	150	—1.5	4.0	0	2.0
6. 1st A. F.	1.0	—	145	—	2.5	2.0
7. Power	14.0	—	150	—	1.5	2.0
8. Power	14.0	—	150	—	1.5	2.0

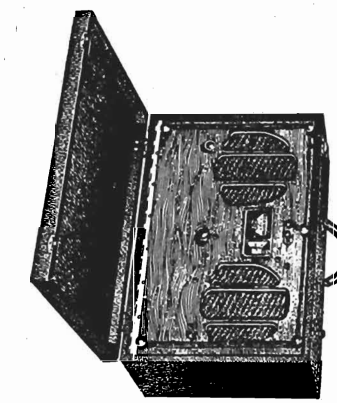


Assembly Wiring Diagram

R. C. A. VICTOR CO., Inc.

PORTABLE RADIOLA P-31





SERVICE DATA

The plate circuit of the first detector, the grid circuit of the I. F. amplifier, the plate circuit of the I. F. amplifier and the grid circuit of the second detector are all tuned to 175 K. C.

The Radiotron RCA-234 used as the second detector is also the automatic volume control. It is a diode detector, being a straight rectifier, a triode audio amplifier and a bias control automatic volume control, the signal current across a resistor giving the necessary voltage drop.

The signal voltage is applied to the filament and plate of the second detector, being rectified by straight diode action. The audio output is then applied to the control grid and filament by means of capacitor C-19. The tube then operates as an Audio Amplifier, the screen grid acting as the plate. Now examining the input circuit it will be noted that the signal current flows through resistors R-7 and R-8. The drop across resistor R-8 constitutes the control grid bias for the I. F. amplifier and the drop across R-7 and R-8 constitutes the control grid bias for the R. F. stage. A small initial bias—1.5 volts— is present on these tubes being the drop across the 65,000 ohm resistor of the voltage dividing system. Also the control grid bias for the second detector is obtained from the drop across the resistors R-10 and R-11, while R-9 and R-10 in parallel constitute a grid leak for its operation as an audio amplifier, C-19 being the coupling capacitor.

The output of the detector is then coupled by means of impedance coupling to the grid of the first A. F. amplifying tube. The grid leak is in the form of a potentiometer which is the volume control, its action controlling the audio voltage applied to the grid of the first A. F. tube. The output of this tube is then applied to the grids of the two Radiotrons RCA-230 which are connected in Push-Pull as a Class "B" amplifier. The output of this stage is then transformer coupled to the cone coil of the permanent magnet dynamic type loudspeaker. An extra winding, shunted by a capacitor, acts as a high frequency cut-off.

Service Data on the RCA Victor Portable Radiola P-31 is similar to that of other RCA Victor Super-Heterodyne receivers. Alignments of the R. F., Oscillator and I. F. stages should be made in a manner similar to that described in the Service Notes on the Automobile Radiola M-30. The location of the various line-up capacitors is the same as that of the M-30.

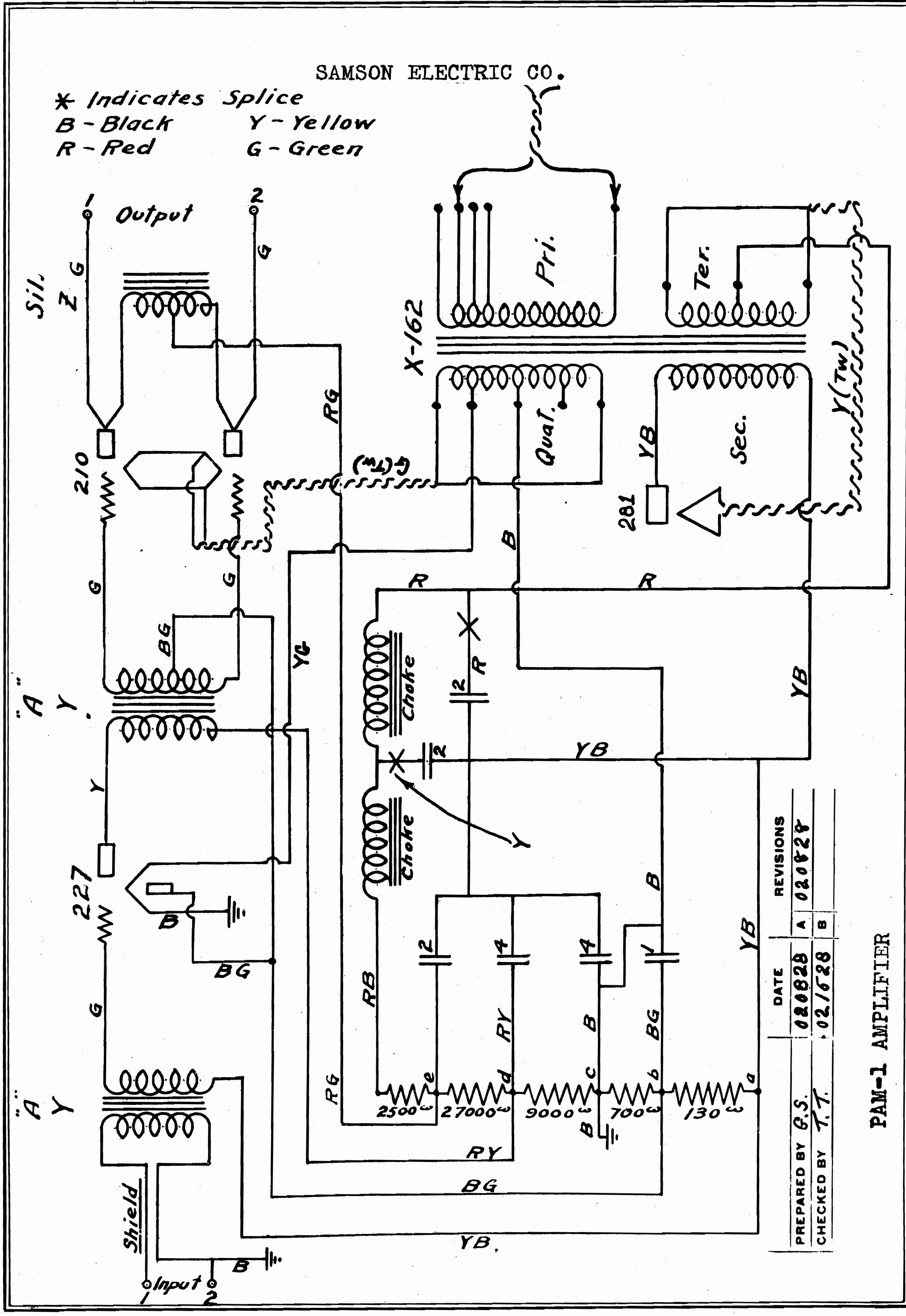
In making line-up adjustments on the P-31, there is one important feature that affects this operation, that should be remembered. That feature is the automatic volume control. Due to it being a combined A. V. C. and second detector, it cannot be removed from its socket or replaced with a dummy Radiotron.

R. F., OSCILLATOR AND I. F. ADJUSTMENTS

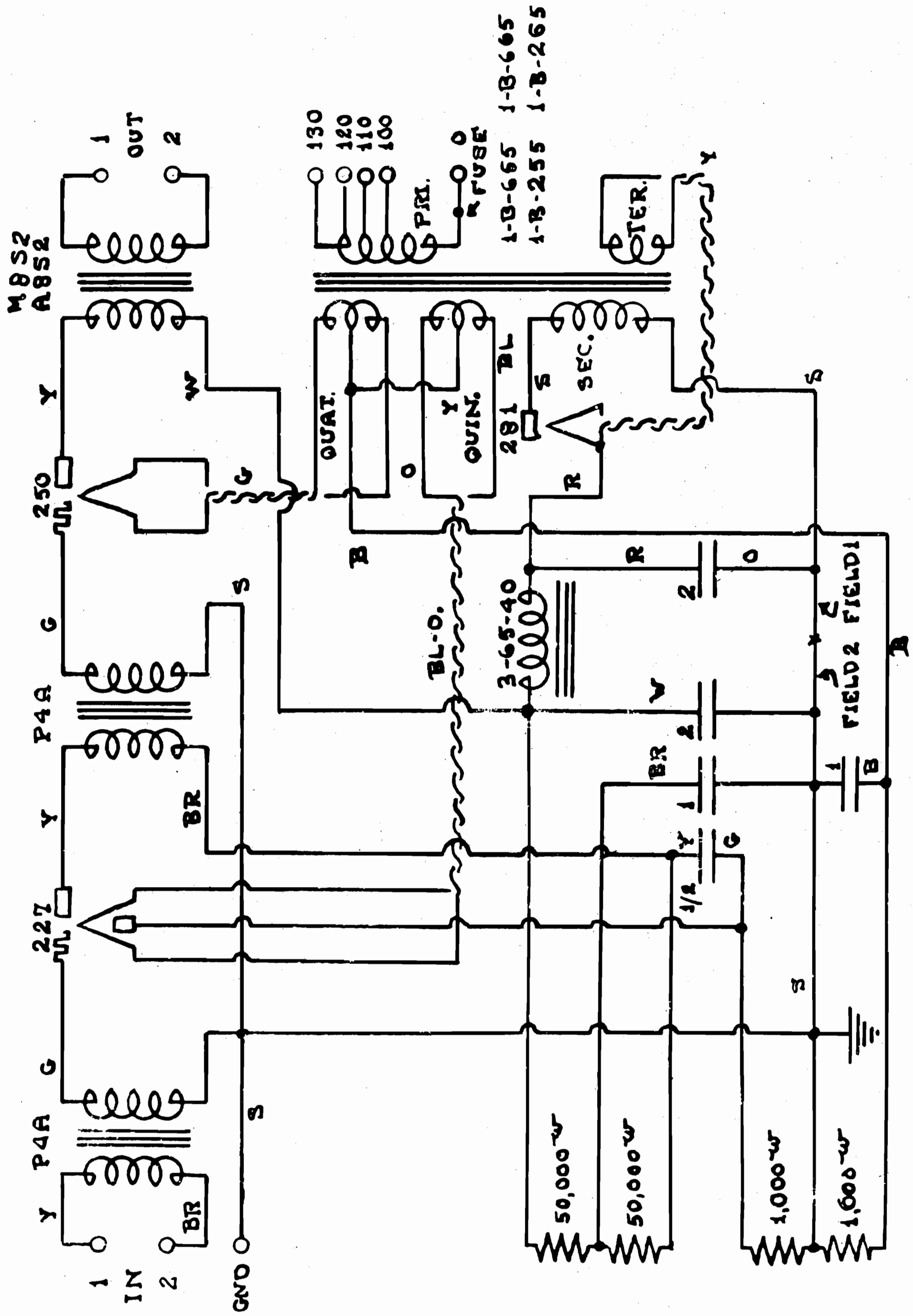
The R.F., Oscillator and I.F. Adjustments in Model P-31 are similar to those of the Automobile Radiola M-30. However, due to the A.V.C. tube also being the second detector, it cannot be removed while line-up adjustments are made. The proper manner in making this adjustment is as follows:

(a) Set the volume control of the receiver at maximum.

(b) Reduce the output of the external oscillator or its coupling to the receiver until a definite reduction in output meter reading is obtained. The oscillator output should again be reduced until but a slight indication in the output meter is obtained. At this low input the A.V.C. action is not sufficiently flat to interfere with the proper alignment of the various circuits.


SAMSON ELECTRIC CO.
✱ Indicates Splice
B - Black
Y - Yellow
R - Red
G - Green
Output
1
2
Sil.
Z
G
210
X-162
Pri.
Ter.
Quat.
Sec.
Y(Tw)
YB
281
RG
G(Tw)
B
R
YG
BG
"A"
Y
Choke
2
227
RB
RY
4
1
130
700
9000
27000
2500
a
b
c
d
e
Shield
Input
REVISIONS
DATE
A 020828
B 02/628
PREPARED BY G.S.
CHECKED BY T.T.
PAM-1 AMPLIFIER

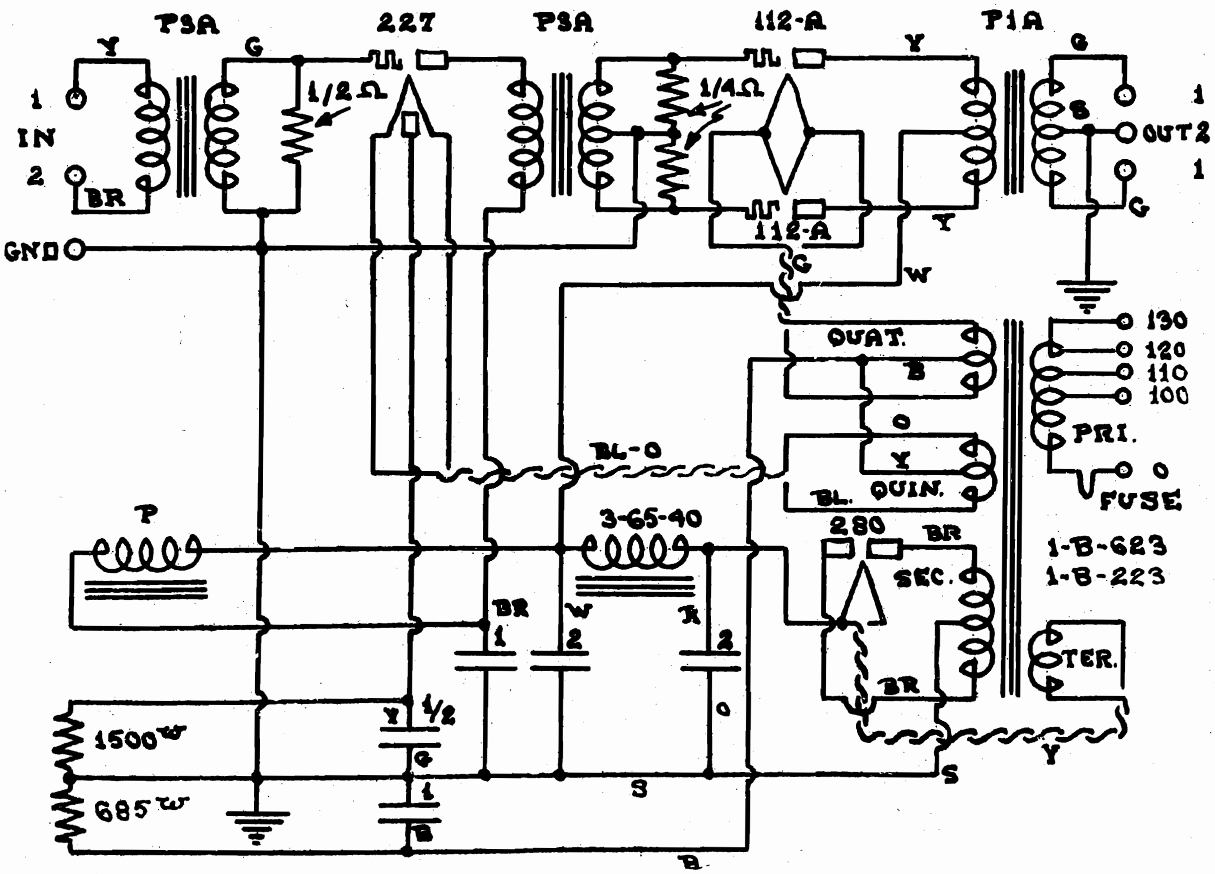
SAMSON ELECTRIC CO.



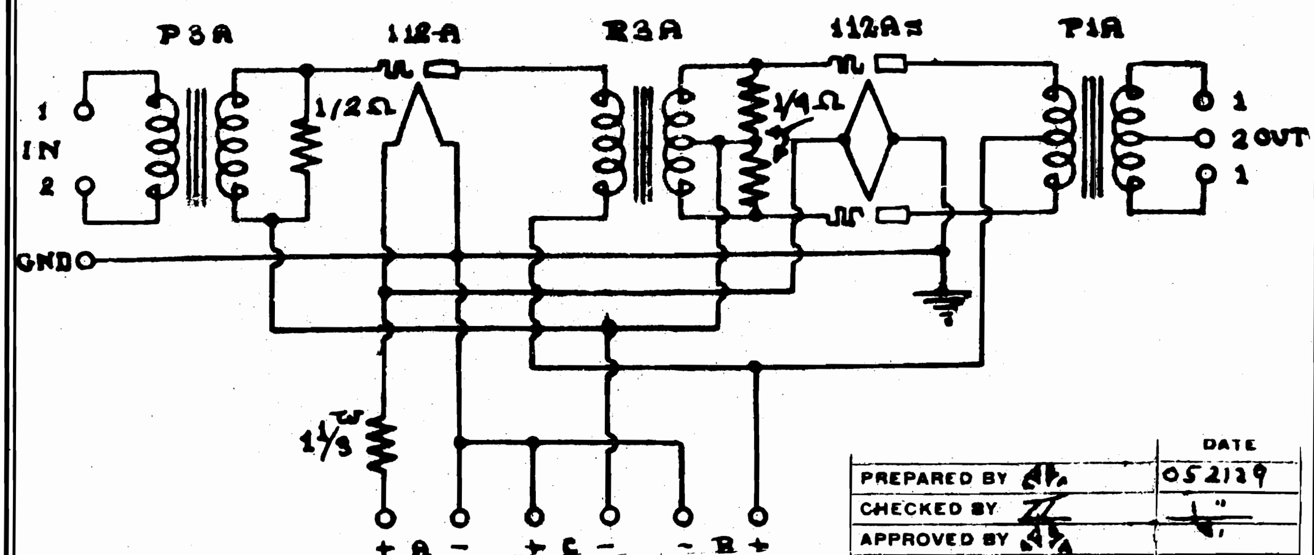
	DATE	REVISIONS
PREPARED BY	060929	A
CHECKED BY	"	B
APPROVED BY	"	C
FORM BY 6 W.B.	120529	D

PAM-3 AMPLIFIER

SAMSON ELECTRIC CO.



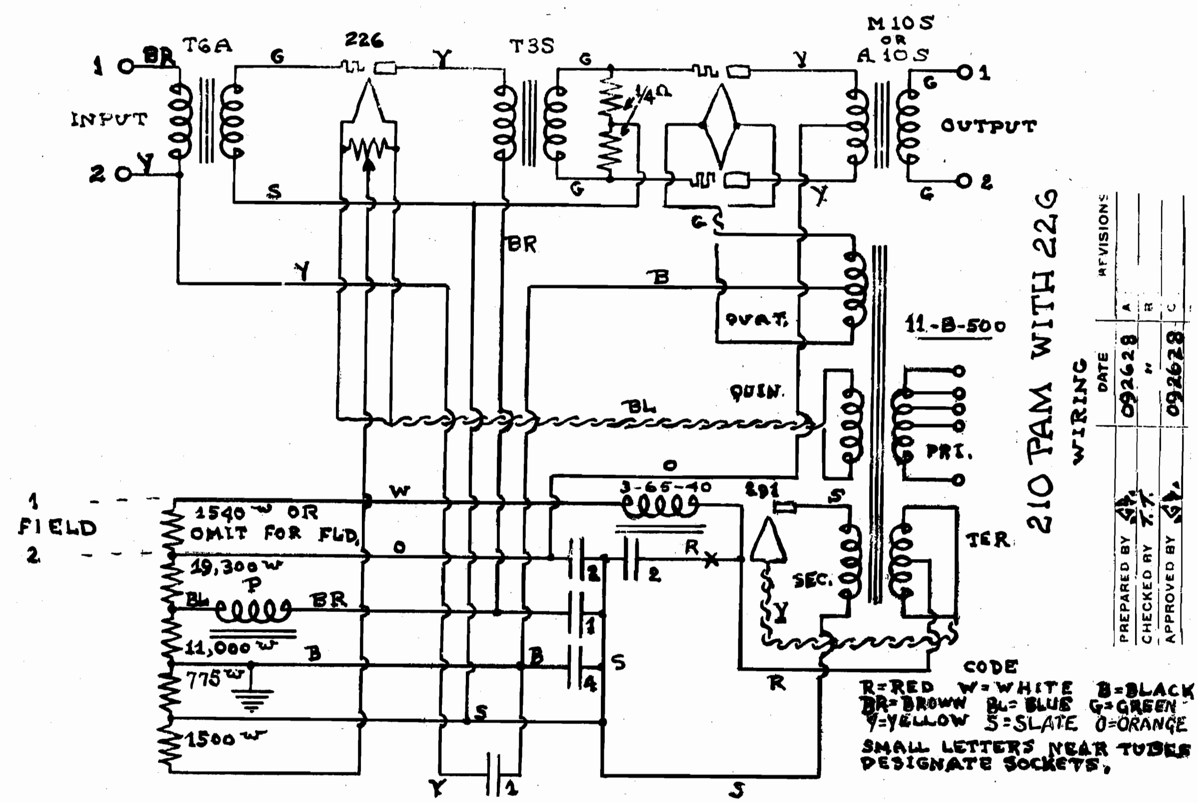
PAM-5 AMPLIFIER



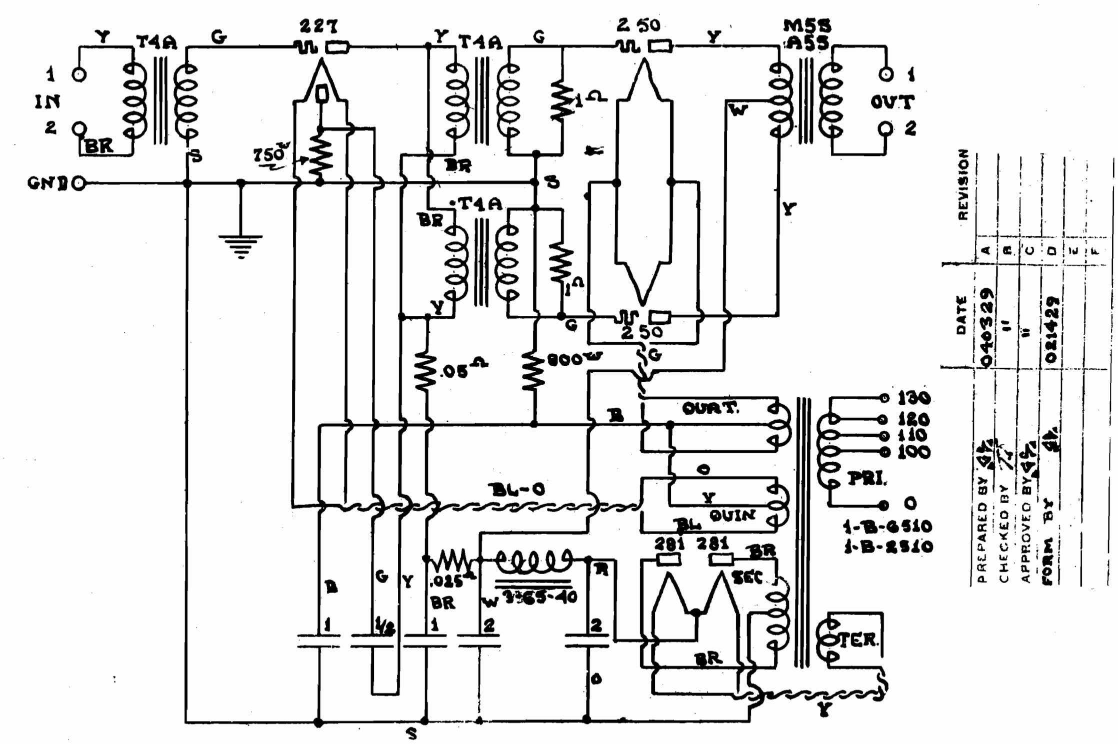
	DATE
PREPARED BY	052129
CHECKED BY	"
APPROVED BY	
FORM BY G.W.B.	120529

PAM-5-D AMPLIFIER

SAMSON ELECTRIC CO.



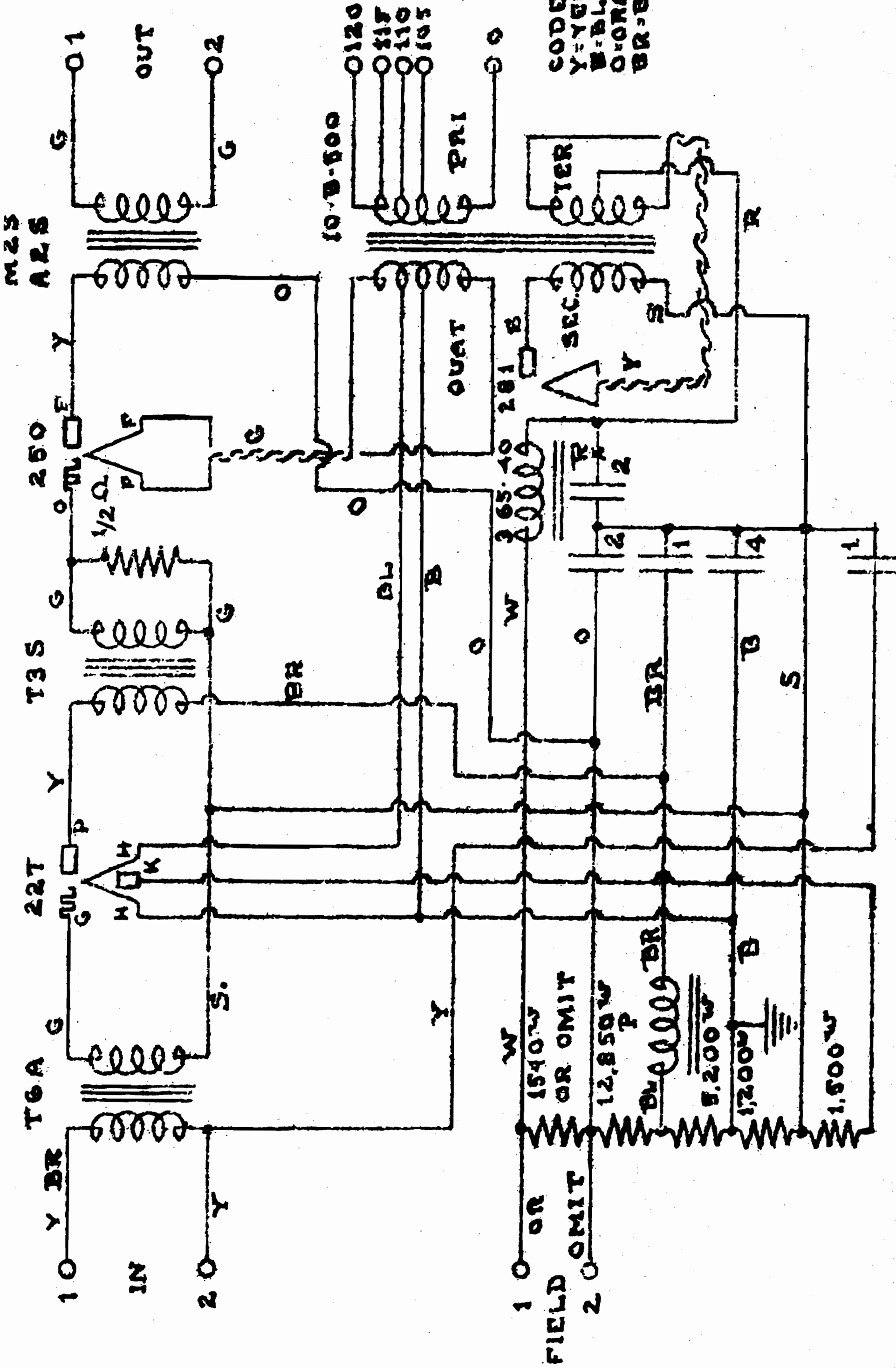
PAM-8 & PAM-18 AMPLIFIER



PAM-9 AMPLIFIER

SAMSON ELECTRIC CO.

CODE R = RED
Y = YELLOW W = WHITE
B = BLACK G = GREEN
O = ORANGE BL = BLUE
BR = BROWN S = SLATE

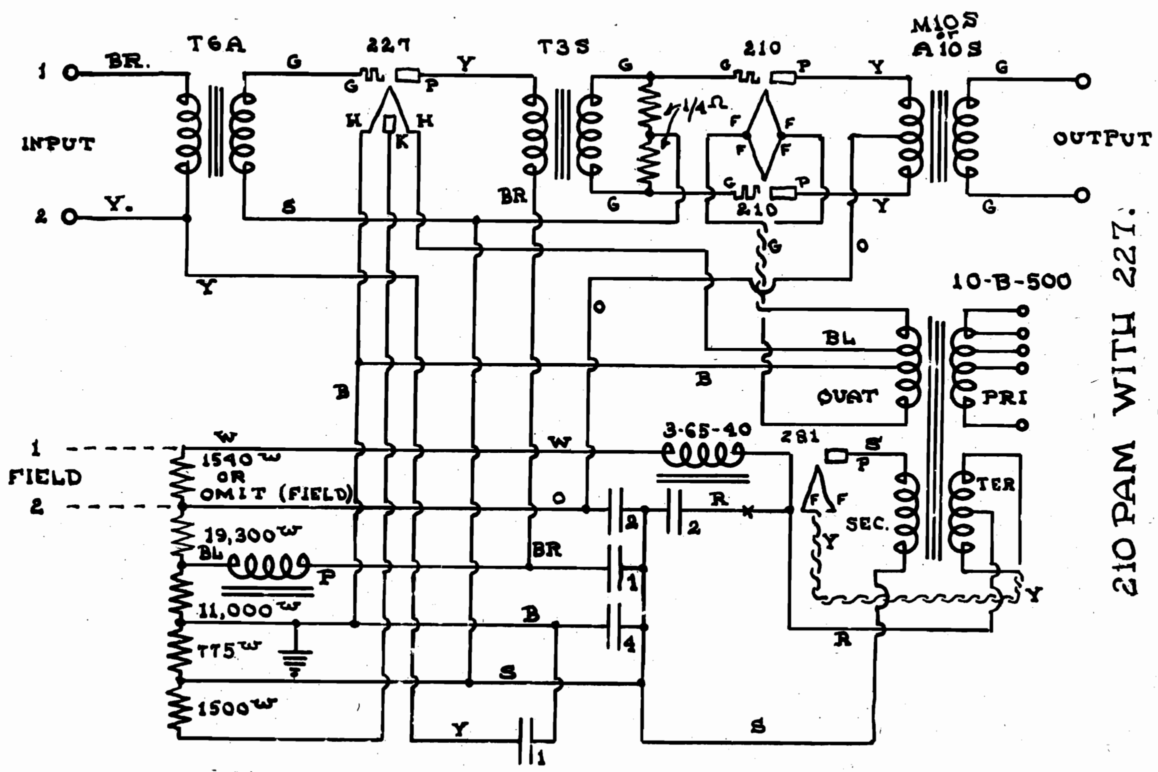


PREPARED BY	ŚĒ.	120728	A	REVISION
CHECKED BY	T.T.	"	B	
APPROVED BY	ŚĒ.		C	

NOTE: SIMILAR JOB WITH 226 REQUIRES UX SOCKET, HUM CONTROL, AND 11-B-500 TRANSFORMER. SEE DIAGRAM OF 210 PAM WITH 226

PAM-11, 12, 13, 14 AMPLIFIERS

SAMSON ELECTRIC CO.



210 PAM WITH 227.

WIRING

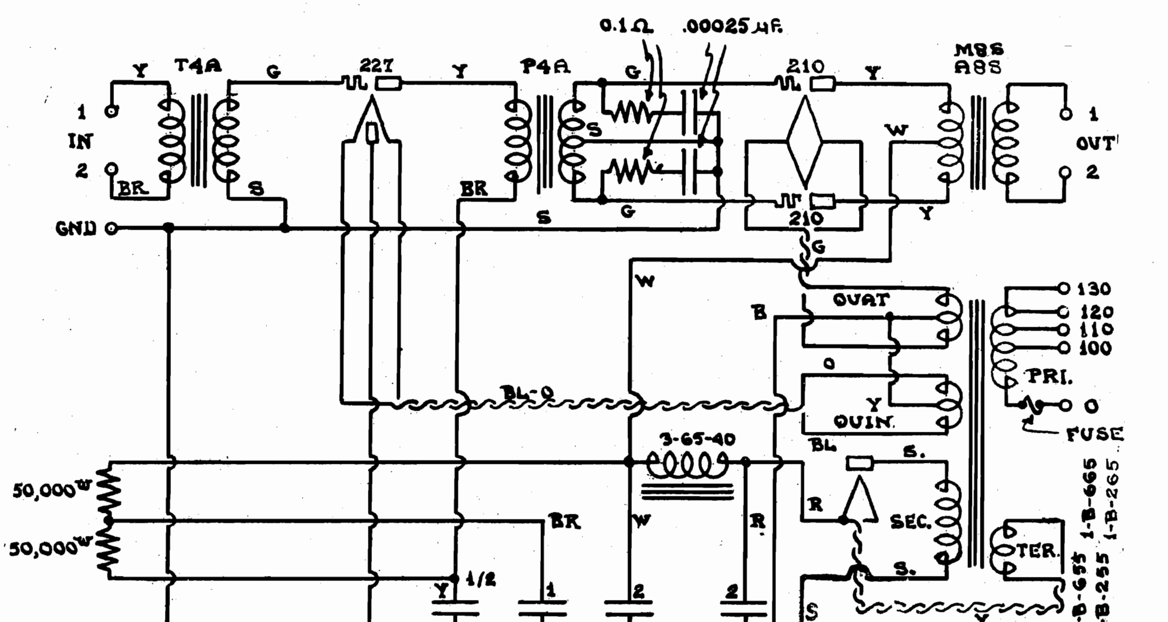
PAM-16 (No Field)

PAM-17 (Field)

CODE
S = SLATE R = RED
Y = YELLOW G = GREEN
B = BLACK BR = BROWN
BL = BLUE O = ORANGE
W = WHITE.

THE SMALL LETTERS NEAR THE TUBES DESIGNATE SOCKET TERMINALS

		DATE
PREPARED BY	G.S.	092628
CHECKED BY	T.T.	"
APPROVED BY	G.S.	092628

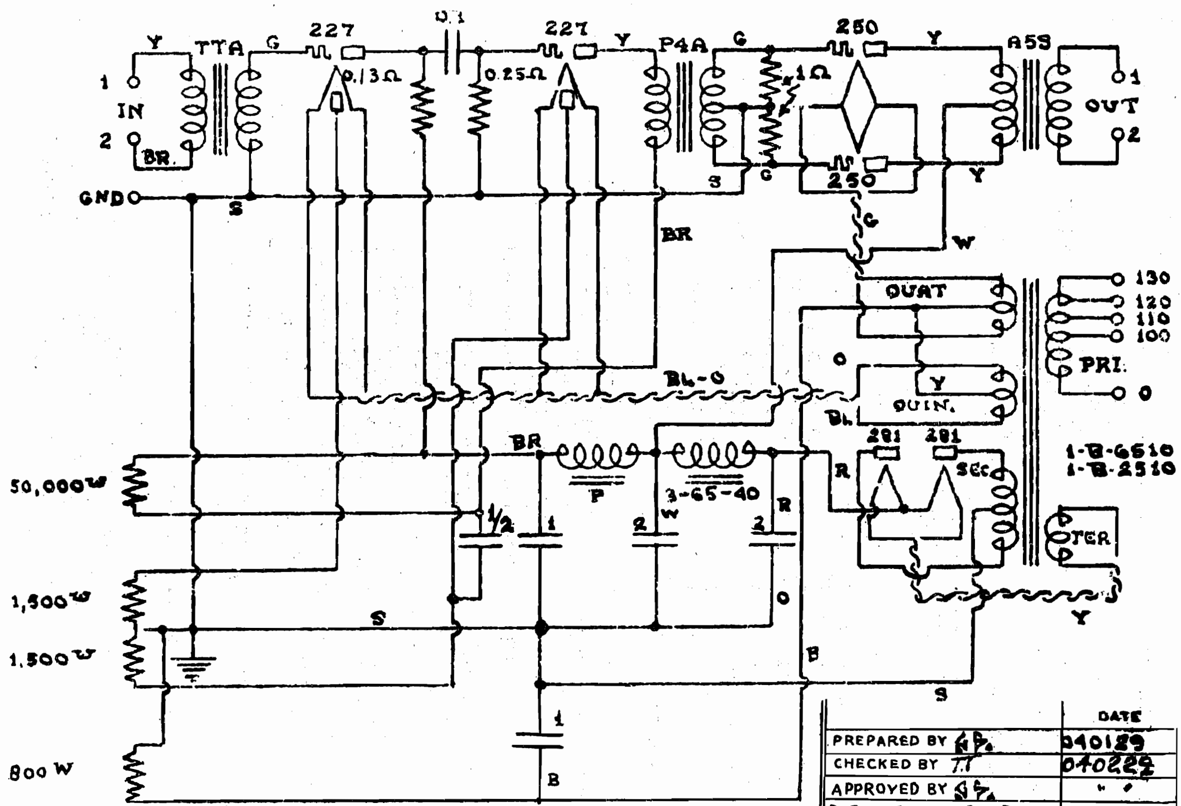


PAM-16-N (No Field)

PAM-17-N (Field)

		DATE
PREPARED BY	G.S.	050429
CHECKED BY	T.T.	"
APPROVED BY	G.S.	"
FORM BY	G.S.	021429

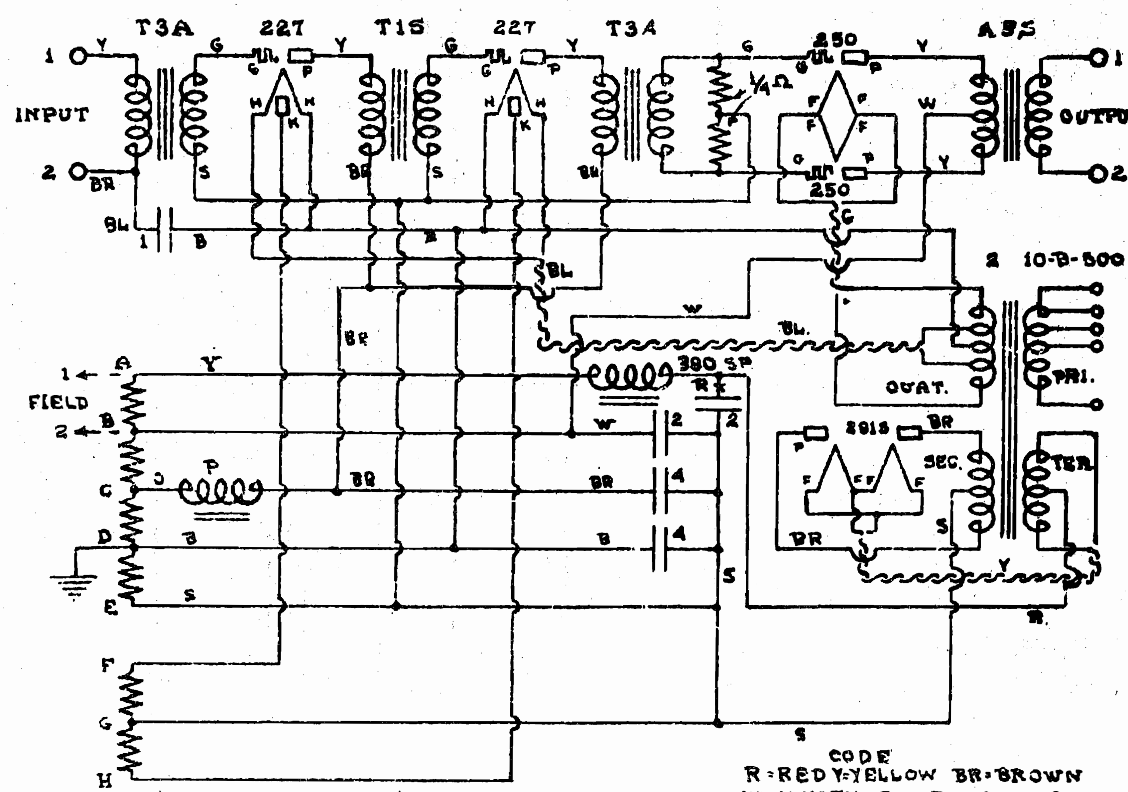
SAMSON ELECTRIC CO.



	DATE
PREPARED BY [illegible]	040129
CHECKED BY T.T.	040229
APPROVED BY [illegible]	" "
FORM BY G.W.B	120529

PAM-19-N AMPLIFIER.

(For PAM-19 schematic diagram refer to page 713.)



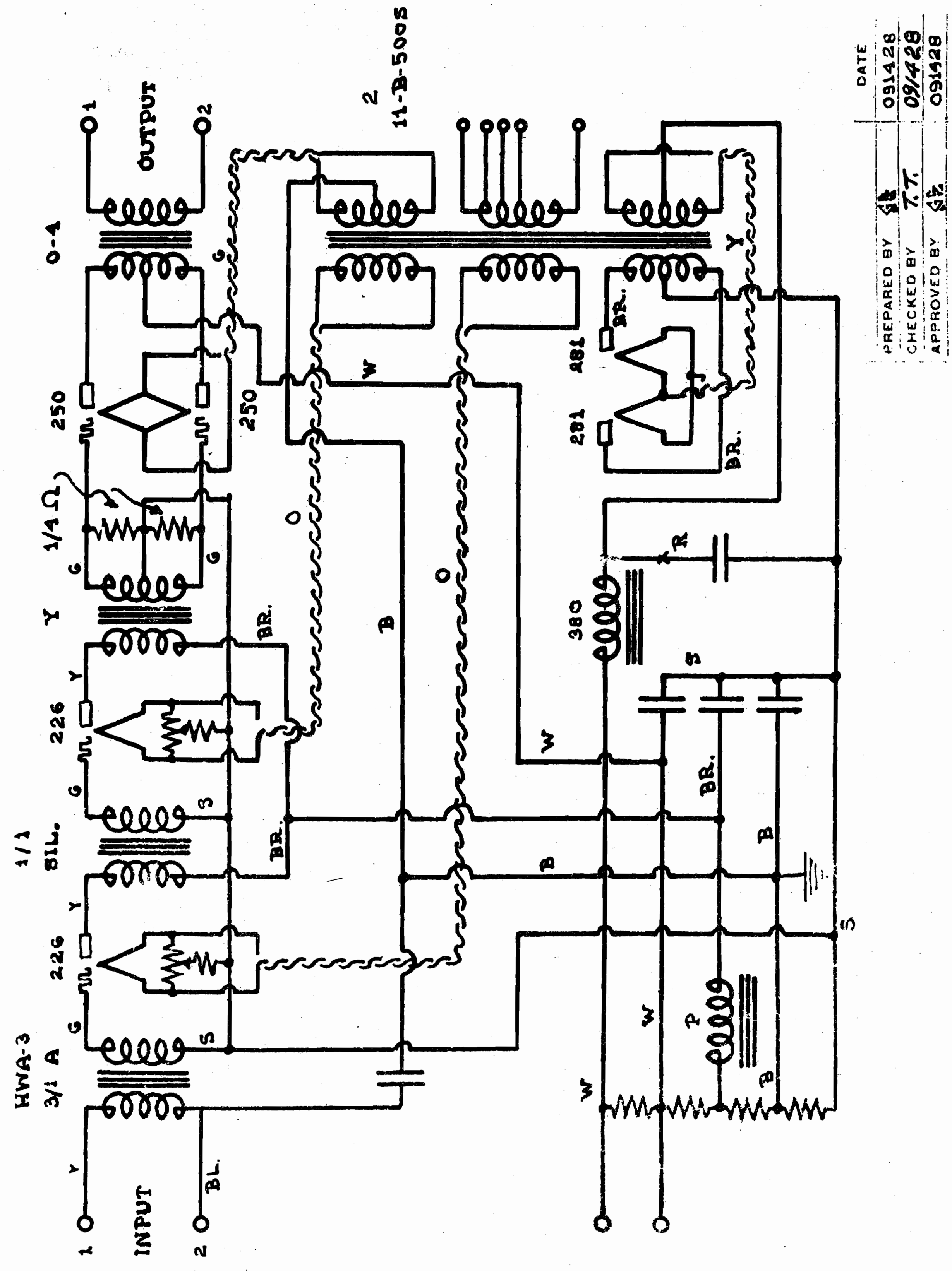
	DATE
PREPARED BY [illegible]	093028
CHECKED BY T.T.	"
APPROVED BY [illegible]	093028

CODE
R=RED Y=YELLOW BR=BROWN
W=WHITE BL=BLUE G=GREEN
O=ORANGE B=BLACK S=SLATE
THE SMALL LETTERS NEAR TUBES DESIGNATE SOCKET TERMINALS.
SEE OTHER PRINTS FOR DETAILS

PAM-250 WITH 227S

PAM-19-Q AMPLIFIER

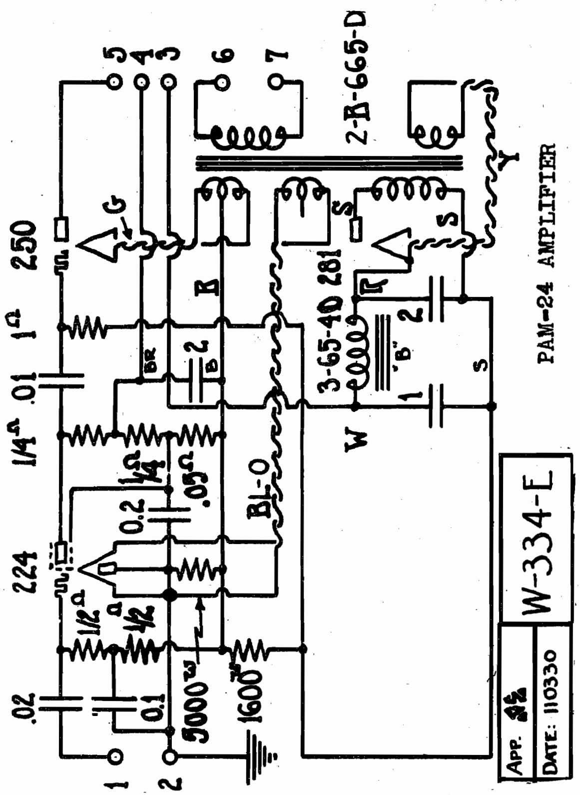
SAMSON ELECTRIC CO.



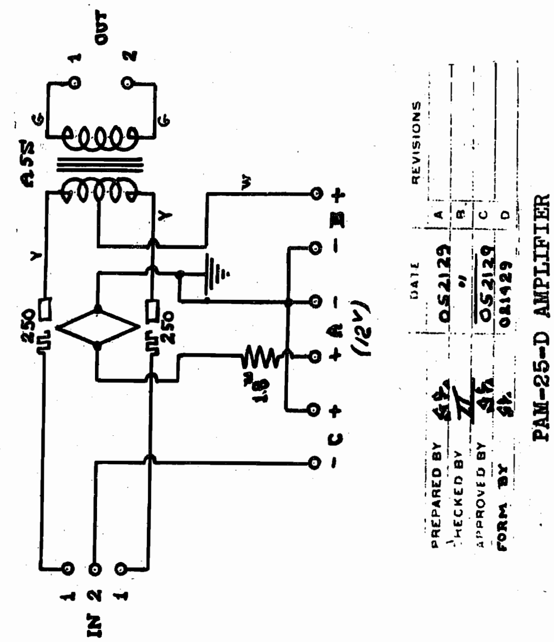
PAM-22 AMPLIFIER

SAMSON ELECTRIC CO.

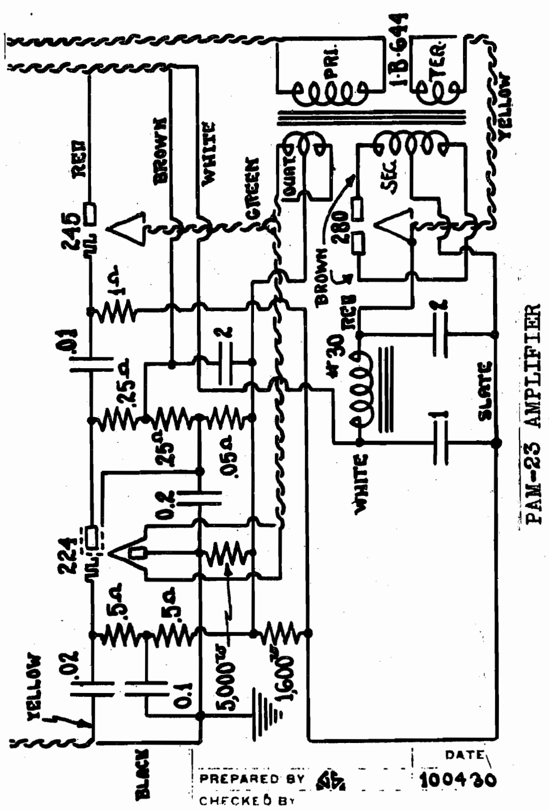
PAM-23, 24, 25 & 25-D AMPLIFIERS



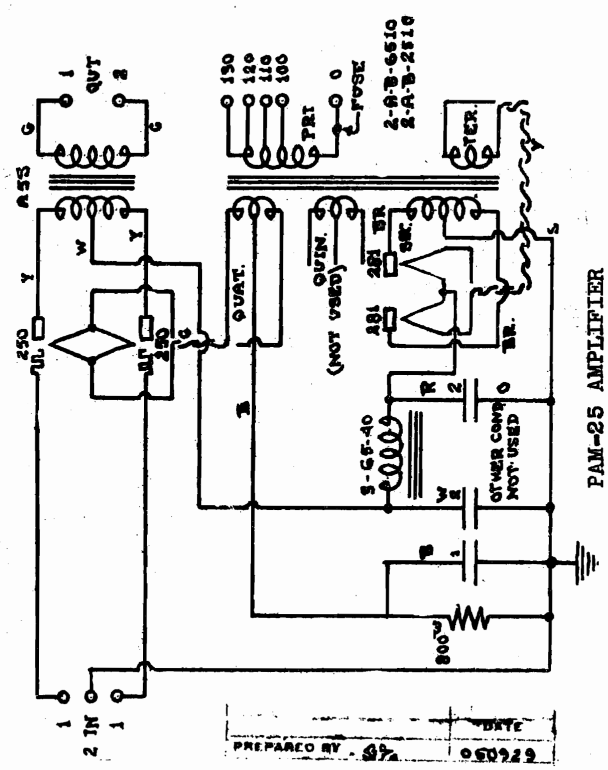
PAM-24 AMPLIFIER



PAM-25-D AMPLIFIER

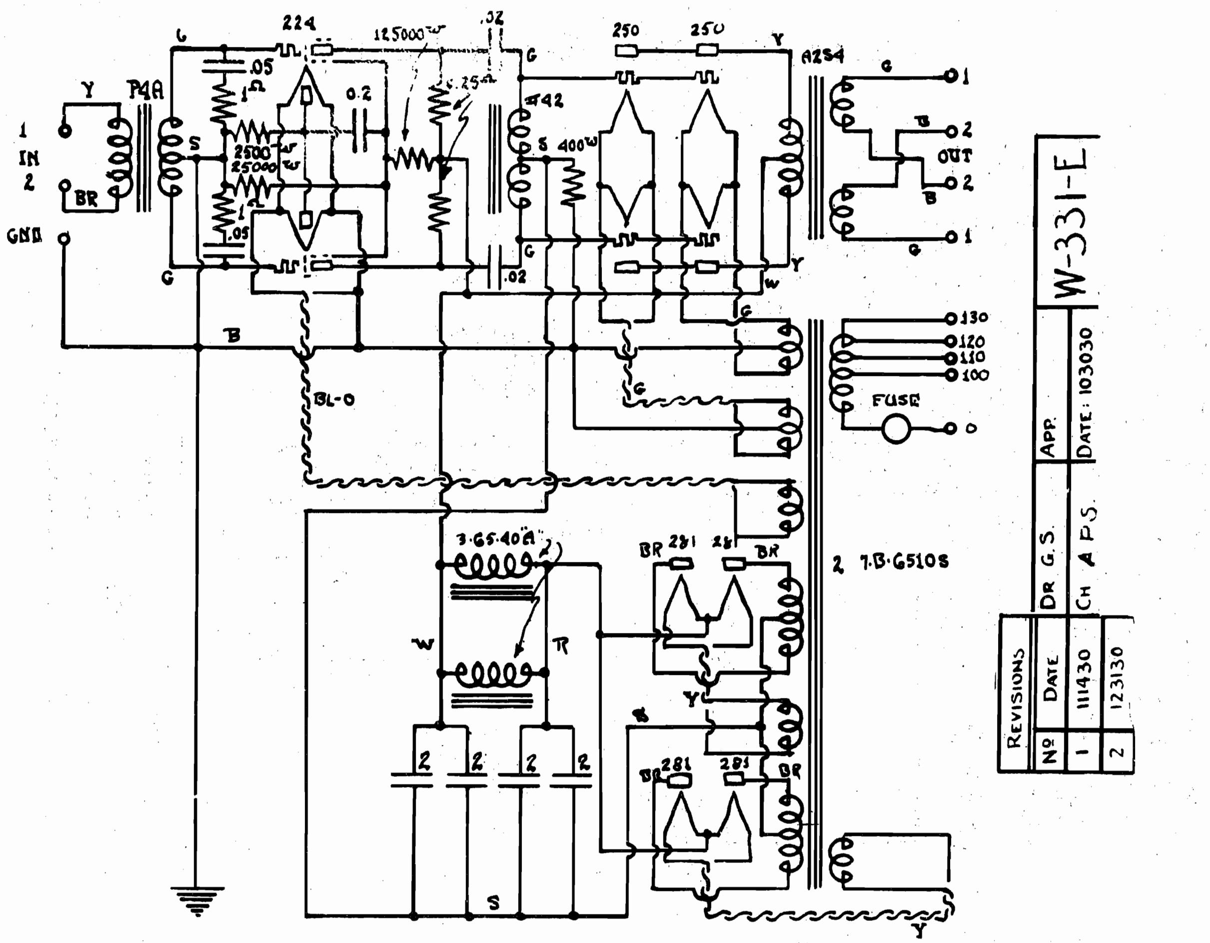


PAM-23 AMPLIFIER

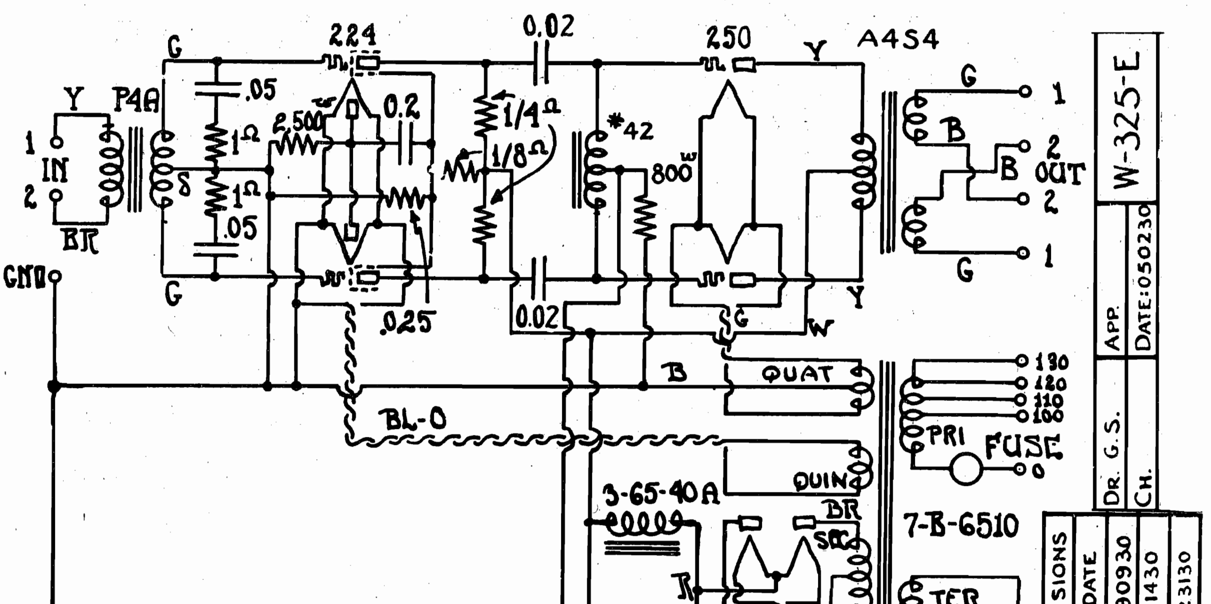


PAM-25 AMPLIFIER

SAMSON ELECTRIC CO.

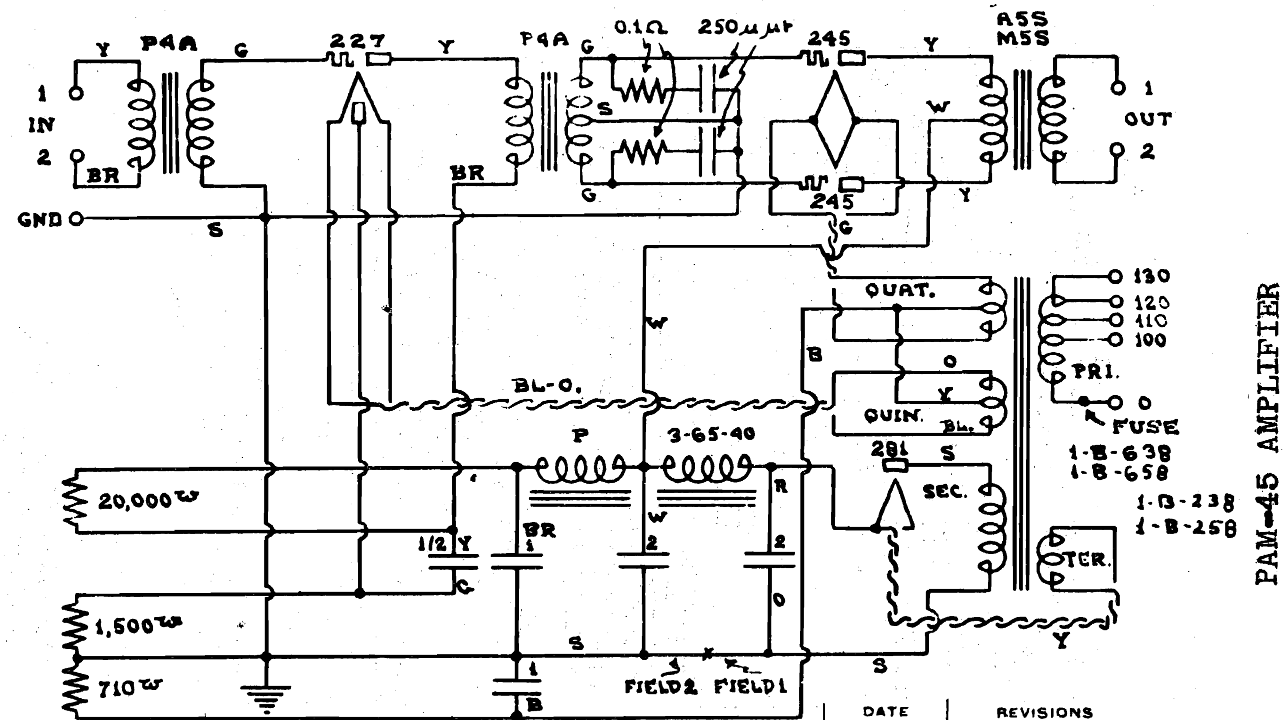


PAM-29 AMPLIFIER



PAM-39 AMPLIFIER

SAMSON ELECTRIC CO.



PAM-45 AMPLIFIER

		DATE		REVISIONS
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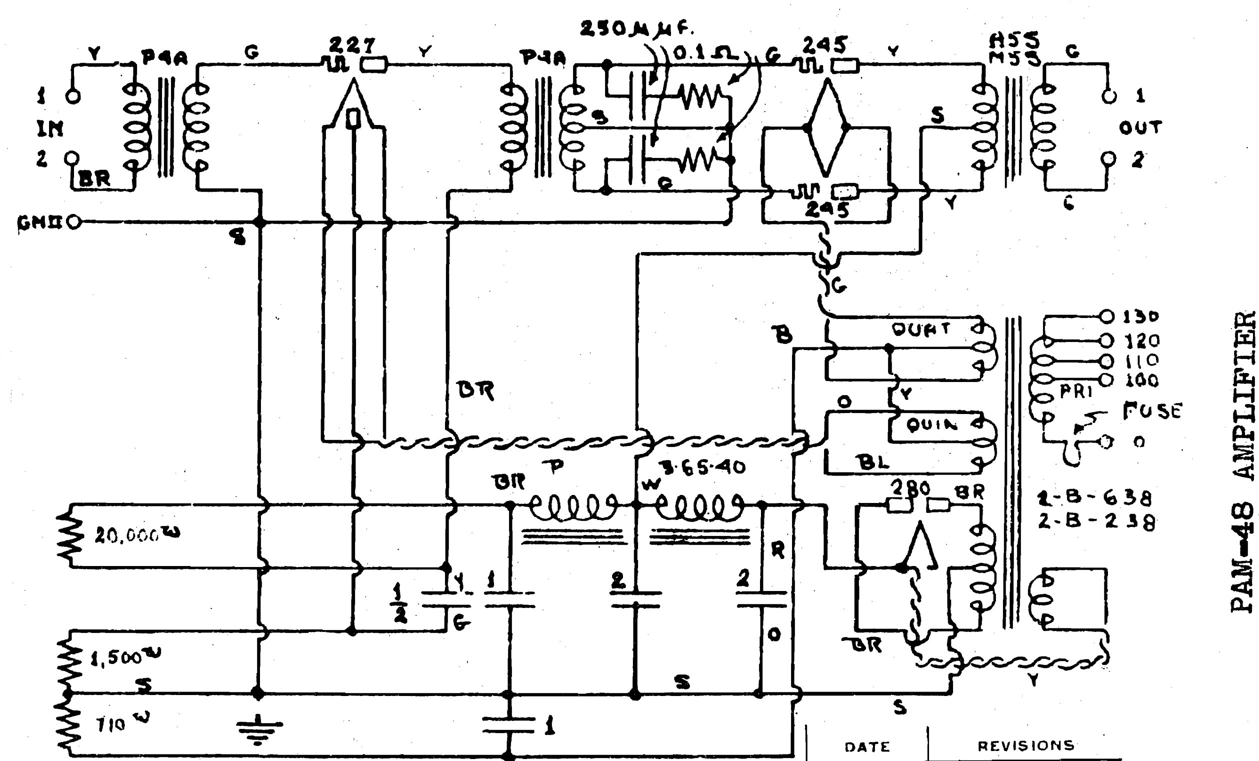
CHECKED BY	T.T.	"	B	
APPROVED BY	GS	"	C	
FORM BY	G.W.B.	120529	D	



PAM-48 AMPLIFIER

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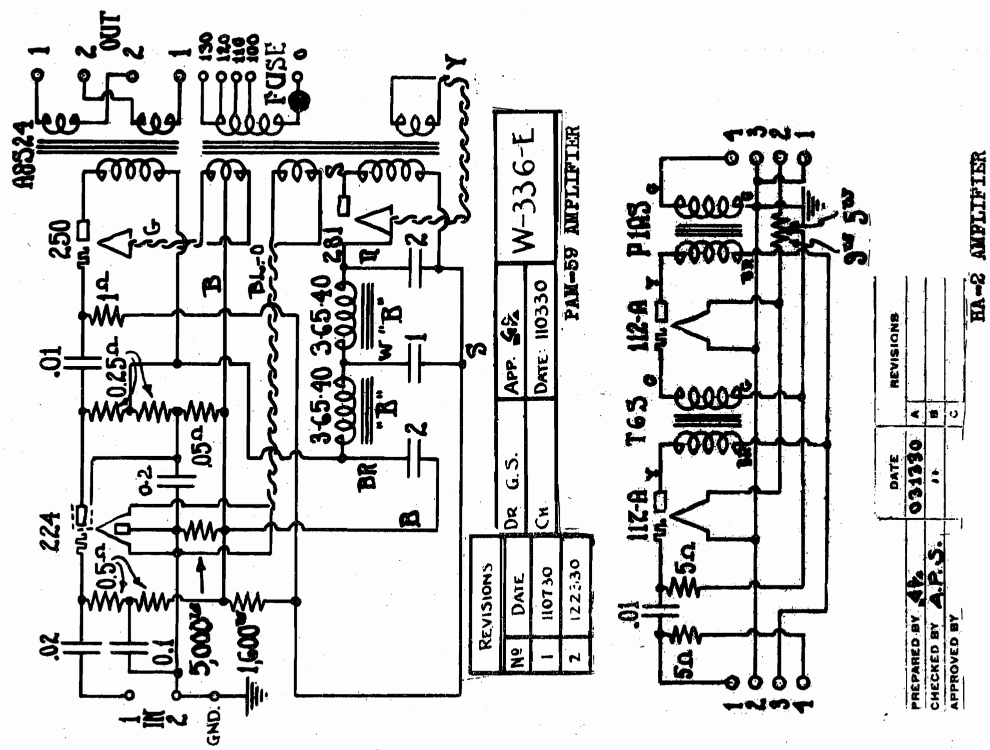
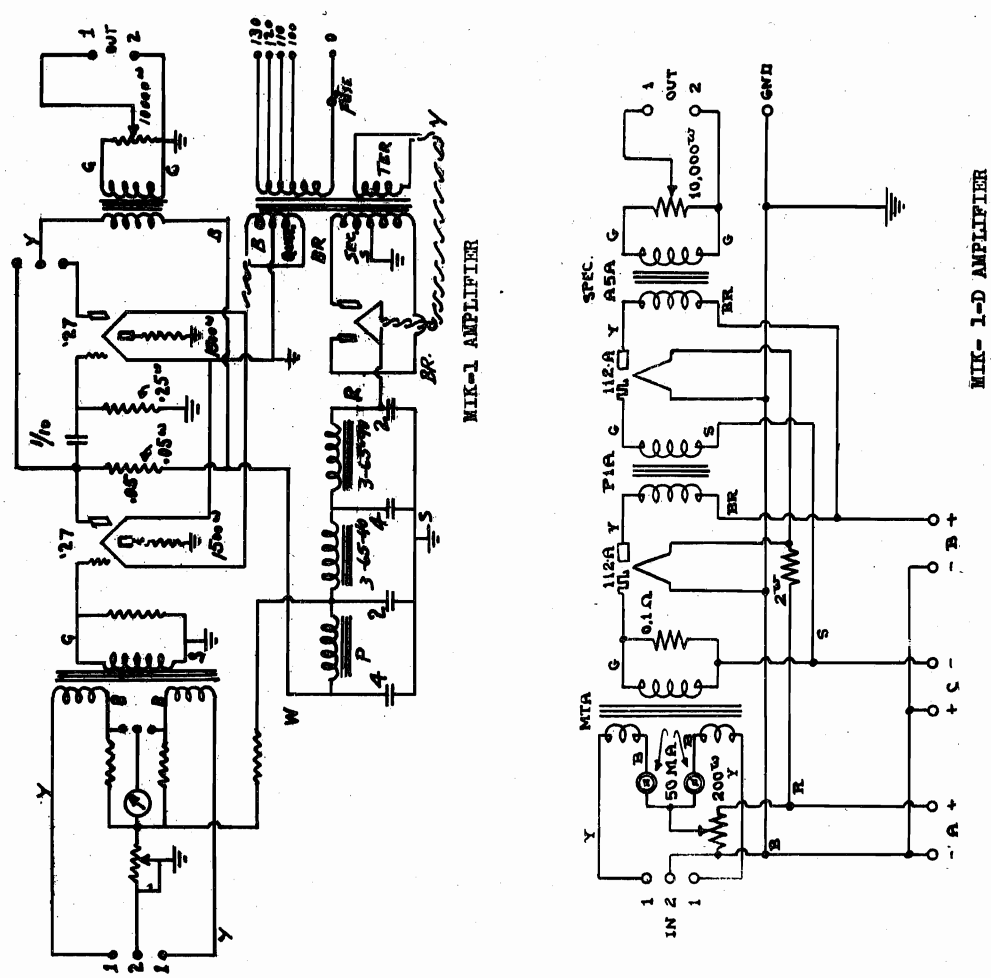
FORM BY	GS	021429	D	

SAMSON ELECTRIC CO.



PAM-59 AMPLIFIER
HA-2 AMPLIFIER

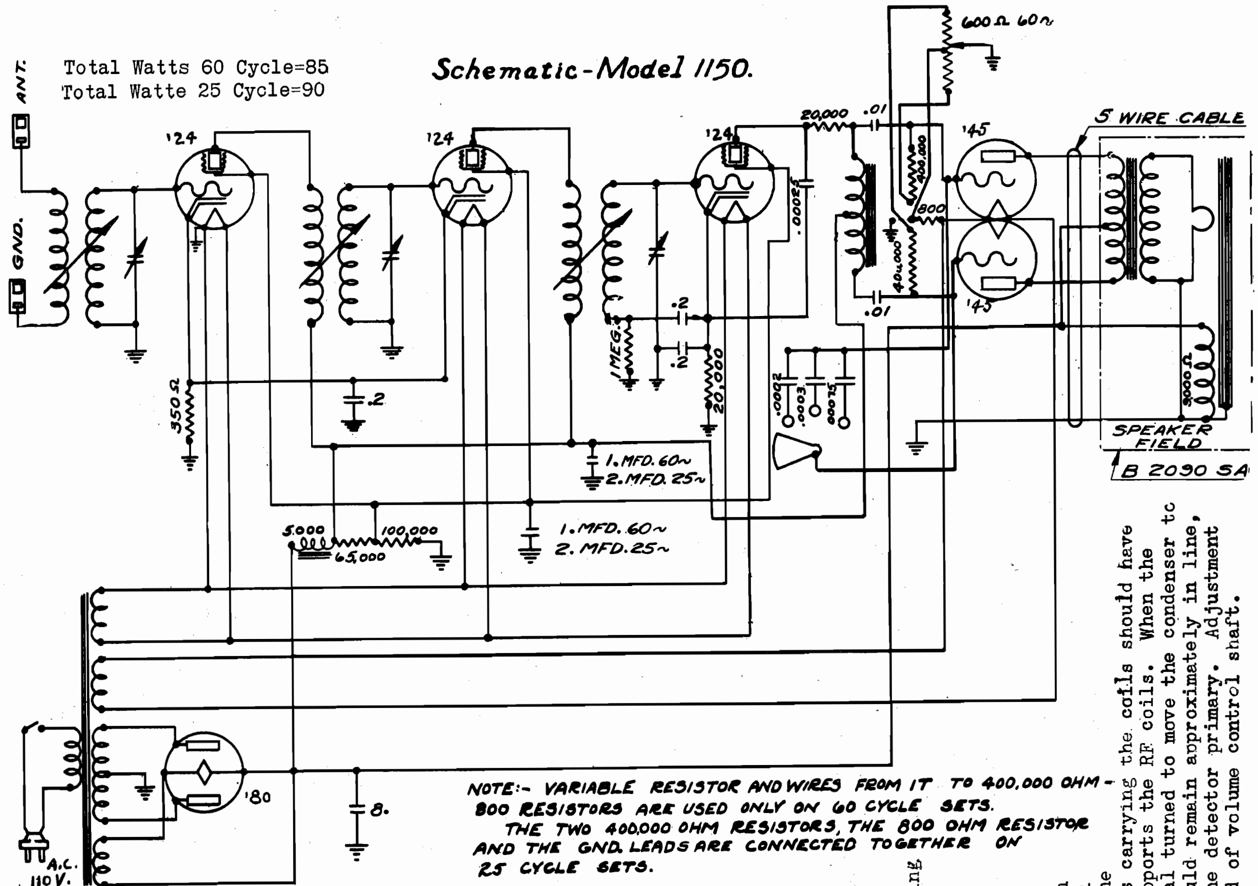


MIK-1 AMPLIFIER
MIK-1-D AMPLIFIER

SEARS, ROEBUCK and COMPANY

Schematic-Model 1150.

Total Watts 60 Cycle=85
Total Watte 25 Cycle=90



NOTE:- VARIABLE RESISTOR AND WIRES FROM IT TO 400,000 OHM - 800 RESISTORS ARE USED ONLY ON 60 CYCLE SETS.
THE TWO 400,000 OHM RESISTORS, THE 800 OHM RESISTOR AND THE GND. LEADS ARE CONNECTED TOGETHER ON 25 CYCLE SETS.

Line Voltage 115 60 Cycle	RF1	RF2	Det.	245#1	2452	280AC	280DC
Plate Voltage D.C.	250	250	235	250	250	330	300
Screen Voltage D.C.	85	85	85				
Heater Voltage A.C.	2.45	2.45	2.45	2.4	2.4	4.7	
Control Grid Voltage D.C.	3	3	8	50			
Speaker Field Voltage 300							
Total Rectifier Current .090							

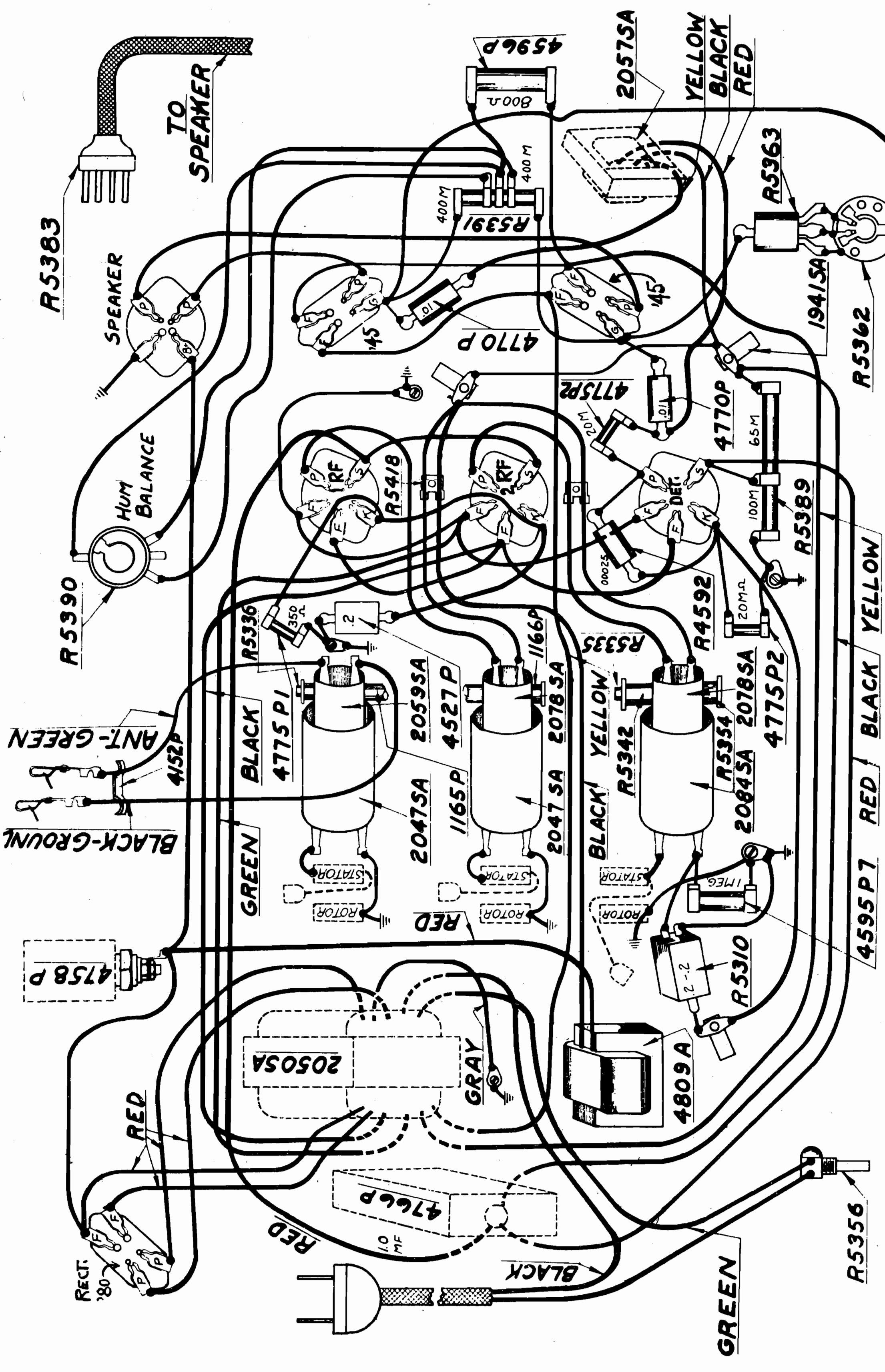
Line Voltage 115 25 Cycle	RF1	RF2	Det.	245#1	245#2	280AC	280DC
Plate Voltage D.C.	230	230	215	230	230	315	270
Screen Voltage D.C.	75	75	75				
Heater Voltage A.C.	2.3	2.3	2.3	2.3	2.3	4.85	
Control Grid Voltage D.C.	2.8	2.8	7.5		45	45	
Speaker Field Voltage 270							
Total Rectifier Current .090							

Note: Control grid volts of R.F. tubes and detector are measured from Cathode to Ground. 245 Grid volts Filament to Ground.
The 25 cycle models are identical electrically with the 60 cycle models except for power transformer, filter condensers and omission of hum balance potentiometer. Arrangement of parts differ somewhat. Voltages are slightly lower. All characteristics are the same as the 60 cycle models. The volume control used on these receivers operates by varying the coupling between the primary and secondary on the antenna and R.F. stages. This variation in coupling is effected by moving the primary coils. The antenna and R.F. primaries are also moved by the rotation of the tuning condenser to maintain uniform sensitivity over the broadcast band. The detector primary is not moved to control volume but is moved by rotation of the tuning condenser. This system of volume control does not change the voltages or currents in the tubes. The new variable-mu, screen grid tube, -35, may be used interchangeably with the -24 in the R.F. stages only of these receivers.

OSCILLATION- Oscillation in receivers employing the variable coupling volume control may be caused by-
1. Leads to the movable primary coils too close together, causing interstage coupling. The pairs of leads should be spaced at least 1-1/4 inches apart throughout their length.
2. Movable primaries in wrong position. When the dial is set at 55, and the volume control set at maximum, the primaries should be at the position of maximum coupling. The U-brackets carrying the coils should have about 1/32 clearance from the plate which supports the RF coils. When the volume control is left at maximum and the dial turned to move the condenser to the higher frequency settings, the coils should remain approximately in line, the RF coils moving out slightly more than the detector primary. Adjustment may be made by moving stop collar on rear end of volume control shaft.

Silvertone-Models-1150, 1170.

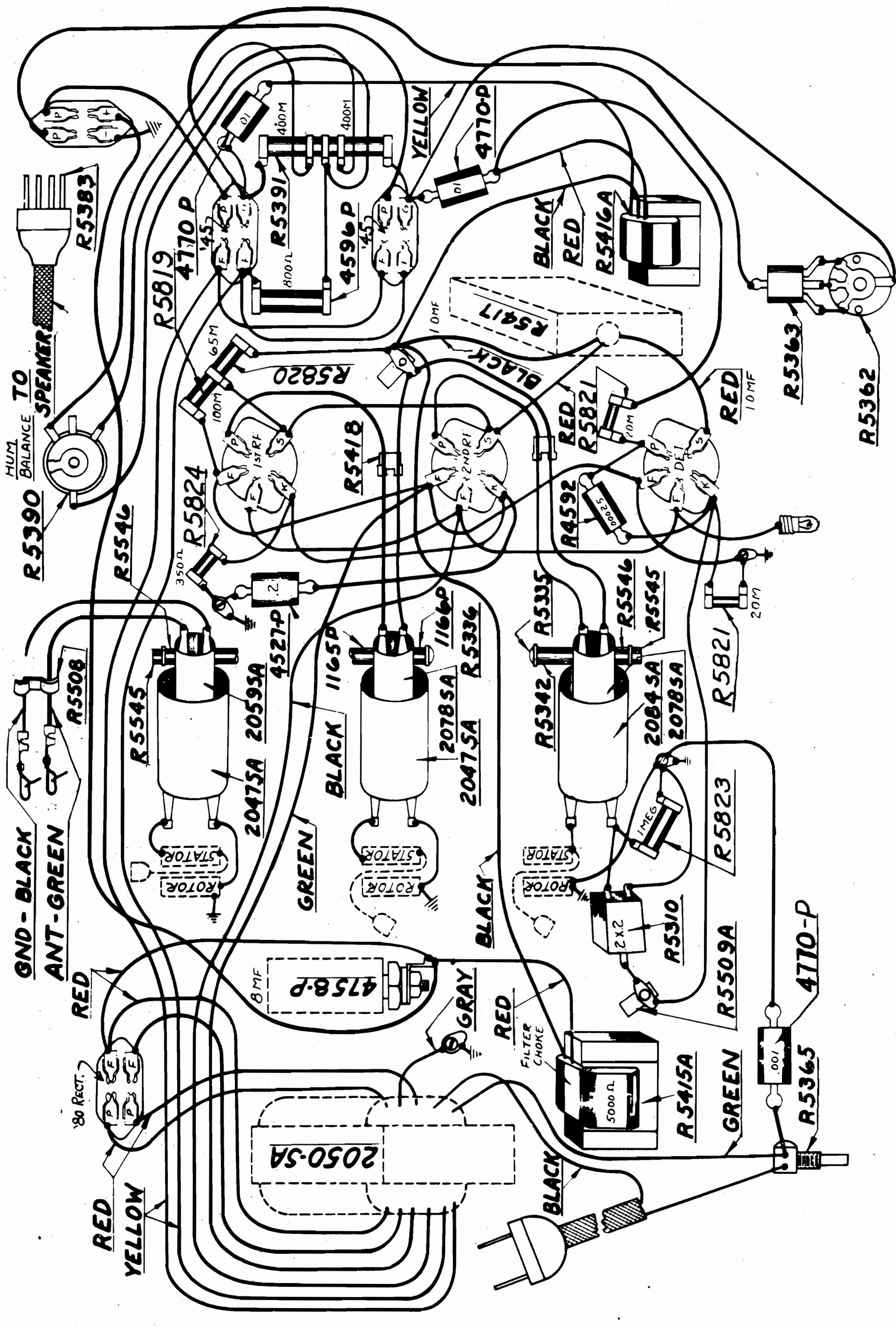
SEARS, ROEBUCK and COMPANY



ACTUAL WIRING DIAGRAM

Silvertone - Model 1150.

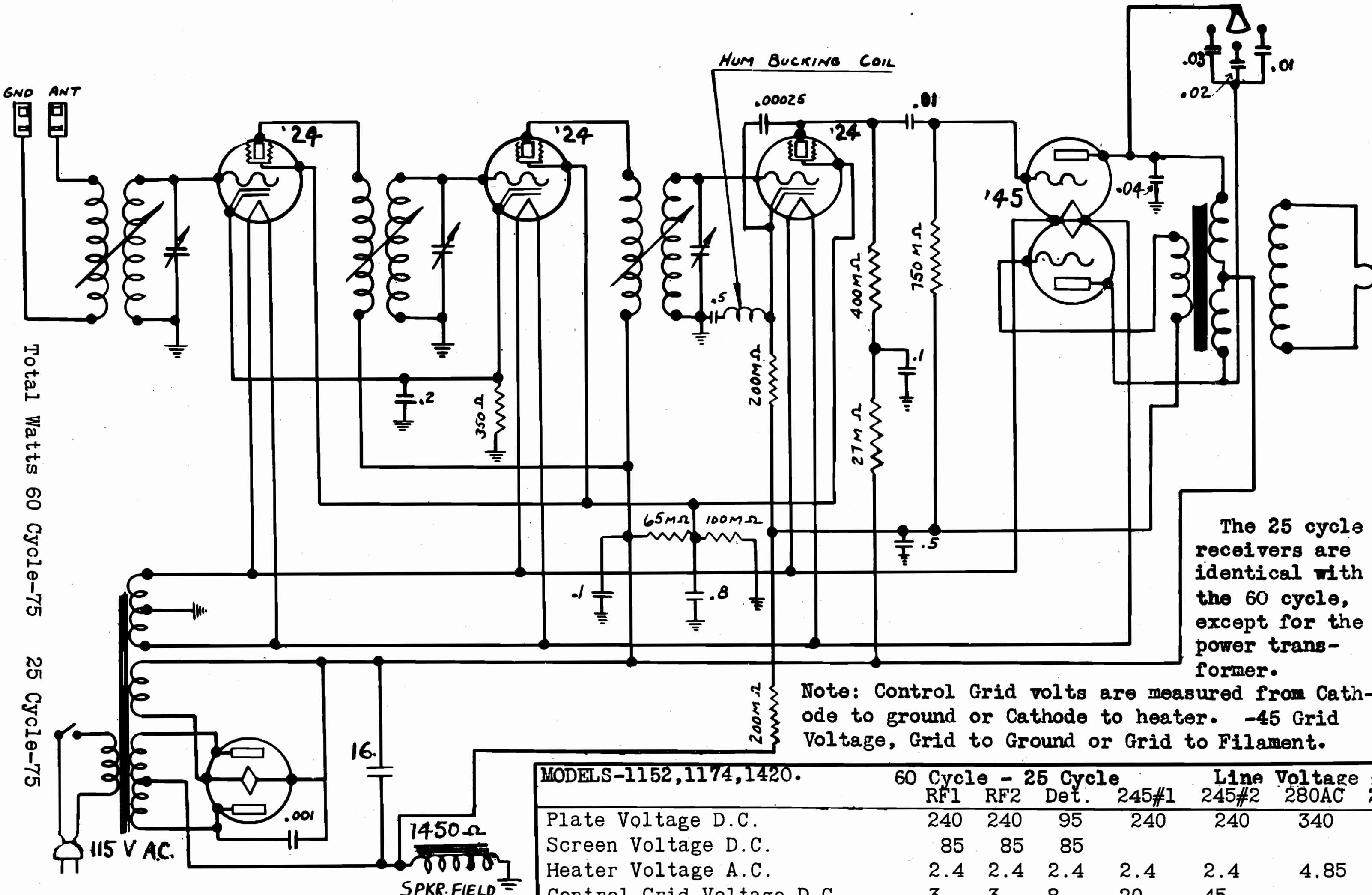
SEARS, ROEBUCK and COMPANY



ACTUAL WIRING DIAGRAM

Silvertone-Model 1170.

SEARS, ROEBUCK and COMPANY



Total Watts 60 Cycle-75 25 Cycle-75

The 25 cycle receivers are identical with the 60 cycle, except for the power transformer.

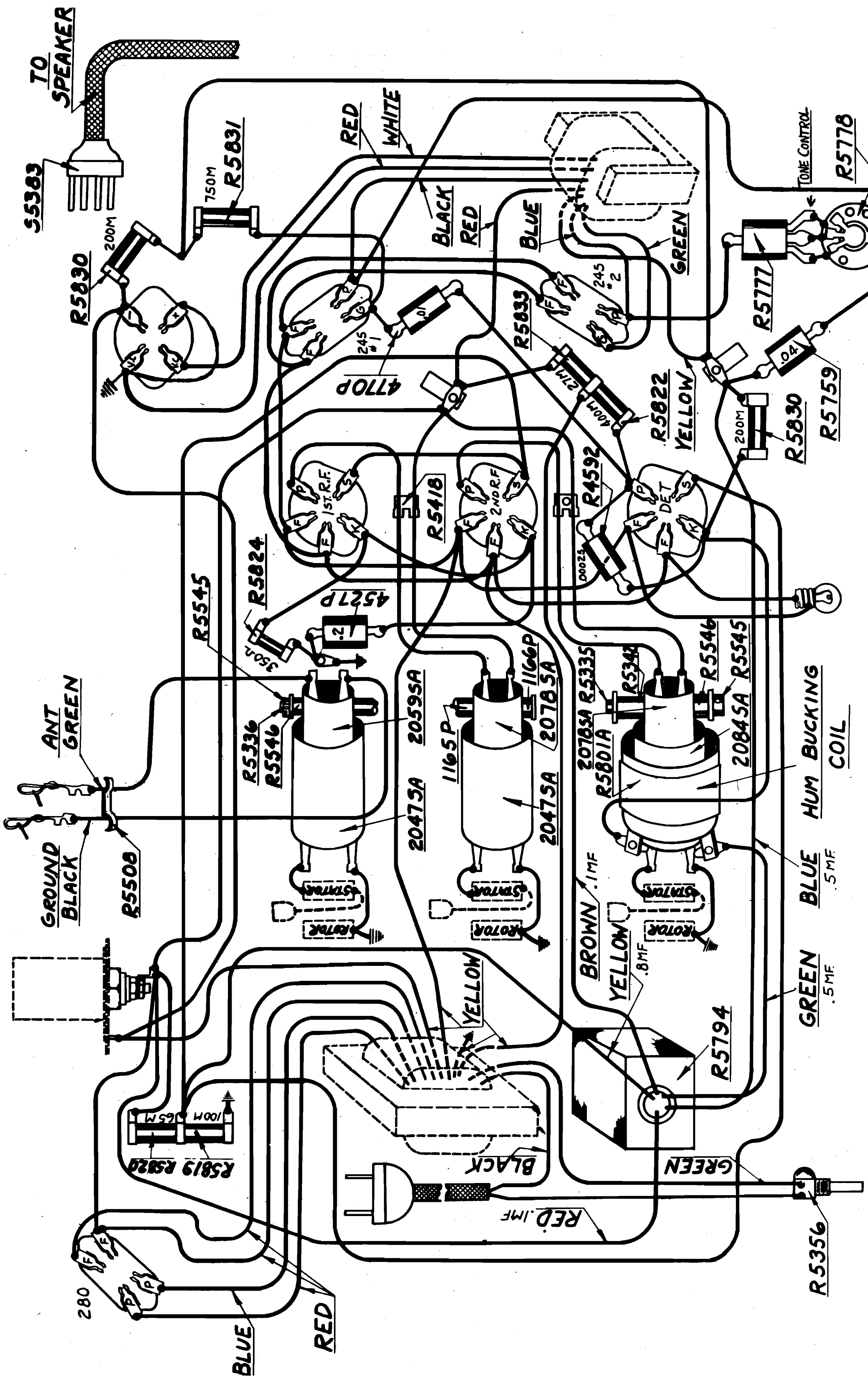
Note: Control Grid volts are measured from Cathode to ground or Cathode to heater. -45 Grid Voltage, Grid to Ground or Grid to Filament.

MODELS-1152,1174,1420.		60 Cycle - 25 Cycle				Line Voltage = 115		
		RF1	RF2	Det.	245#1	245#2	280AC	280DC
Plate Voltage D.C.		240	240	95	240	240	340	340
Screen Voltage D.C.		85	85	85				
Heater Voltage A.C.		2.4	2.4	2.4	2.4	2.4	4.85	
Control Grid Voltage D.C.		3	3	8	20	45		
Speaker Field Voltage	100							
Total Rectifier Current	.065							

In these receivers the new type -35 tubes can be used interchangeably with the type -24 tubes, but only in the R.F. stages. A hum bucking coil is wound on the detector coil shield. If this coil is open or shorted, a hum will result. It is also well to note that the speaker field is used in the negative side of the filter circuit and that the voltage drop across this field is used to obtain various bias voltages.

Silvertone - Models 1152,1174.

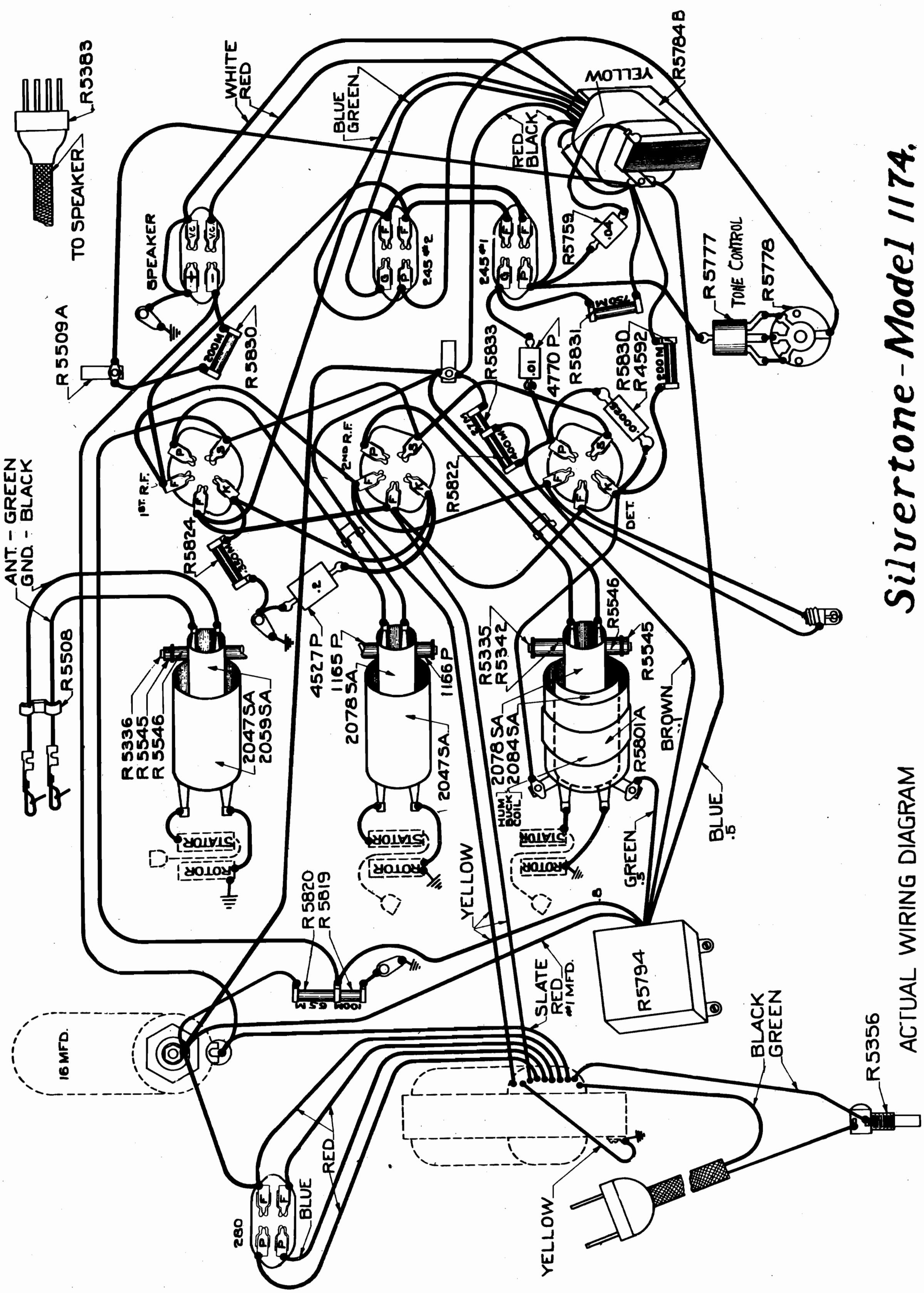
SEARS, ROEBUCK and COMPANY



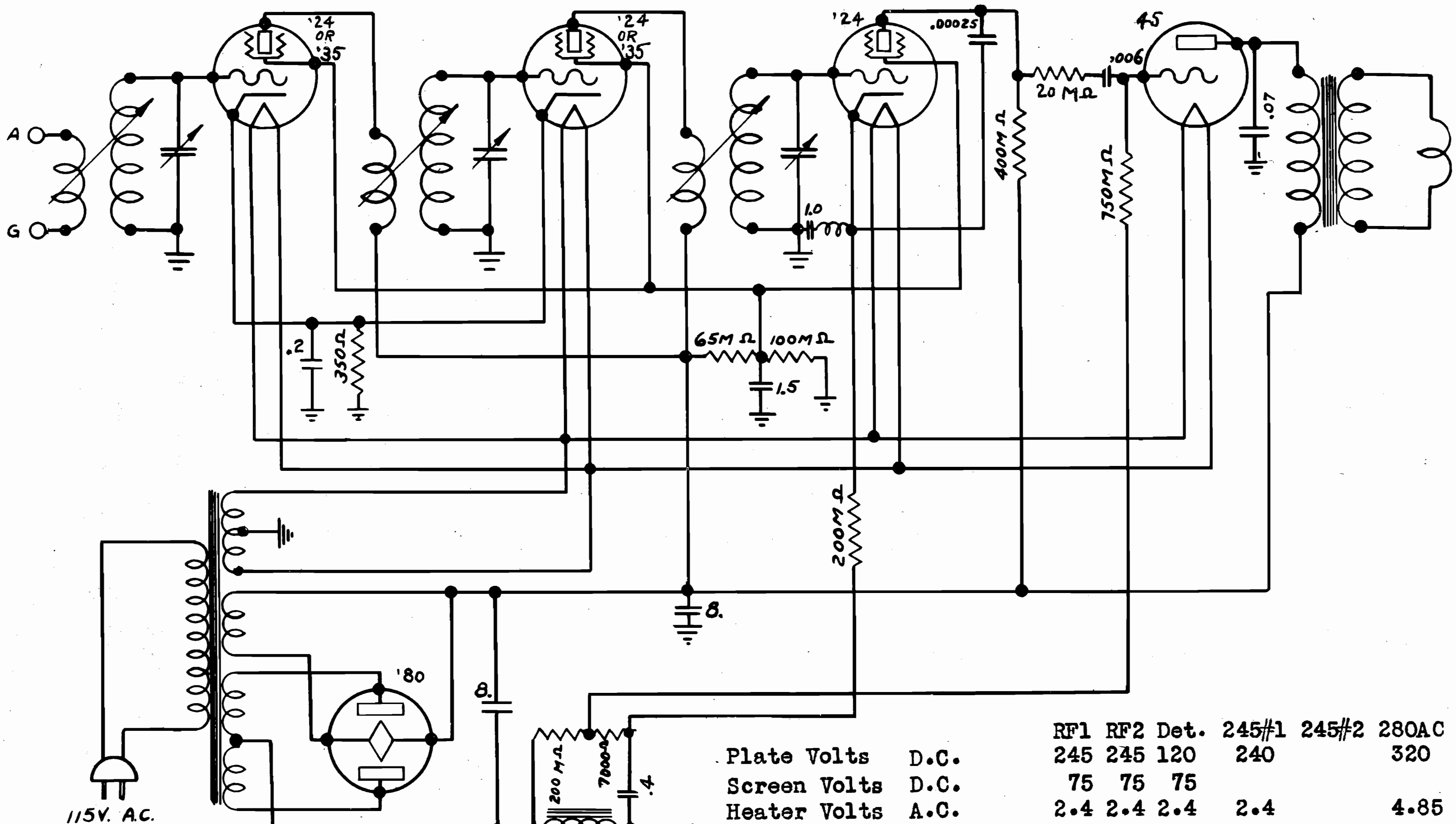
Silvertone - Model 1152.

- ACTUAL WIRING DIAGRAM

SEARS, ROEBUCK and COMPANY



SEARS, ROEBUCK and COMPANY



Total Watts 60 Cycle=50
25 Cycle=55

Note: Control grid volts are measured from Cathode to Ground or Cathode to Heater. 245 Grid Voltage measured from Grid to Ground or Filament.

	RF1	RF2	Det.	245#1	245#2	280AC	280DC
Plate Volts D.C.	245	245	120	240		320	340
Screen Volts D.C.	75	75	75				
Heater Volts A.C.	2.4	2.4	2.4	2.4		4.85	
Control Gr. V.D.C.	2.6	2.6	7	30			
Spkr. Fld. Voltage 100							
Total Rect. Current .040							

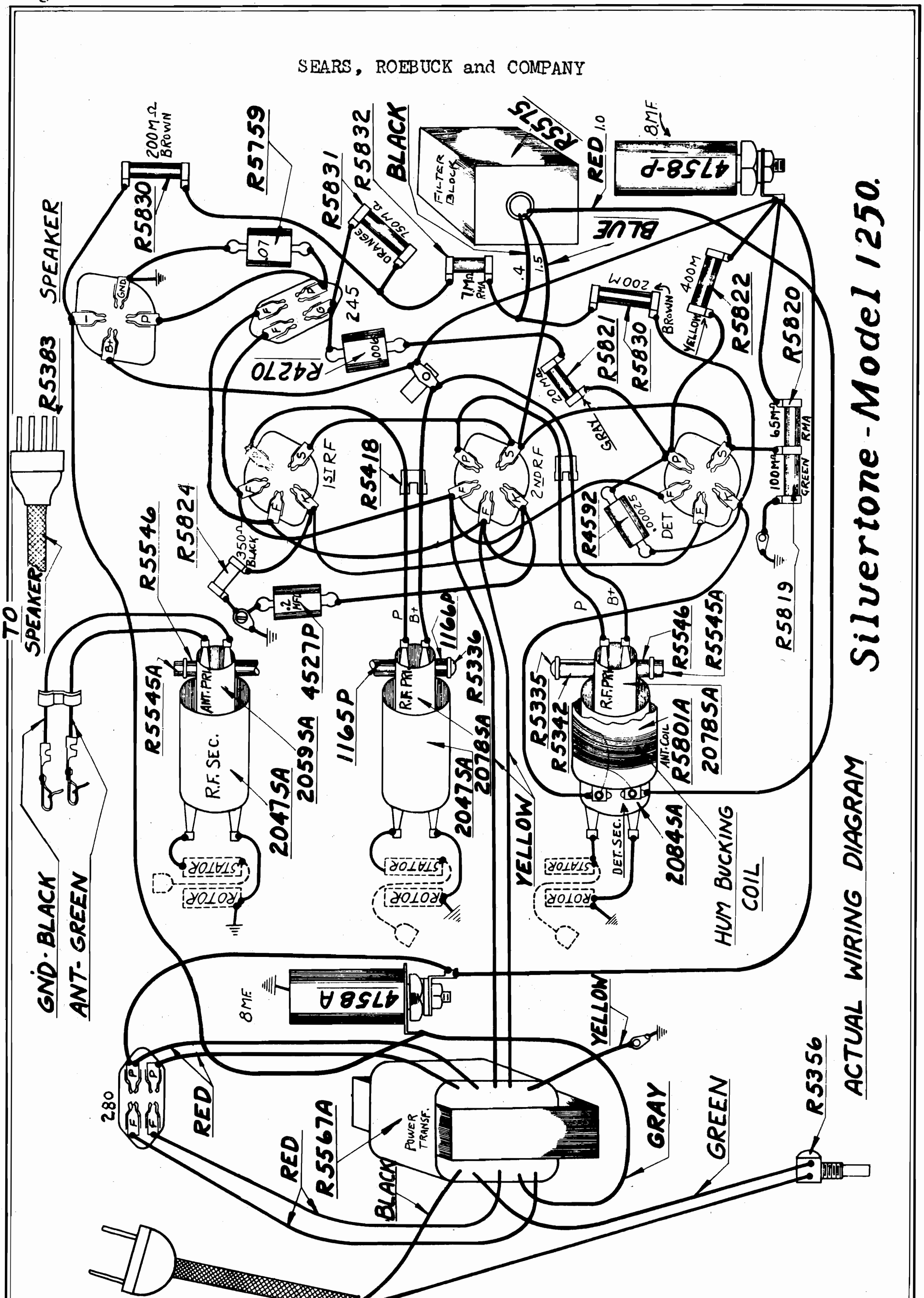
(60 cycle - line V.= 115.)

	RF1	RF2	Det.	245#1	245#2	280AC	280DC
Plate Volts D.C.	250	250	110	245		325	350
Screen Volts D.C.	75	75	75				
Heater Volts A.C.	2.4	2.4	2.4	2.4		4.85	
Control Gr.V. D.C.	2.5	2.5	7.5	30			
Spkr. Fld. Voltage 100							
Total Rect. Current .040							

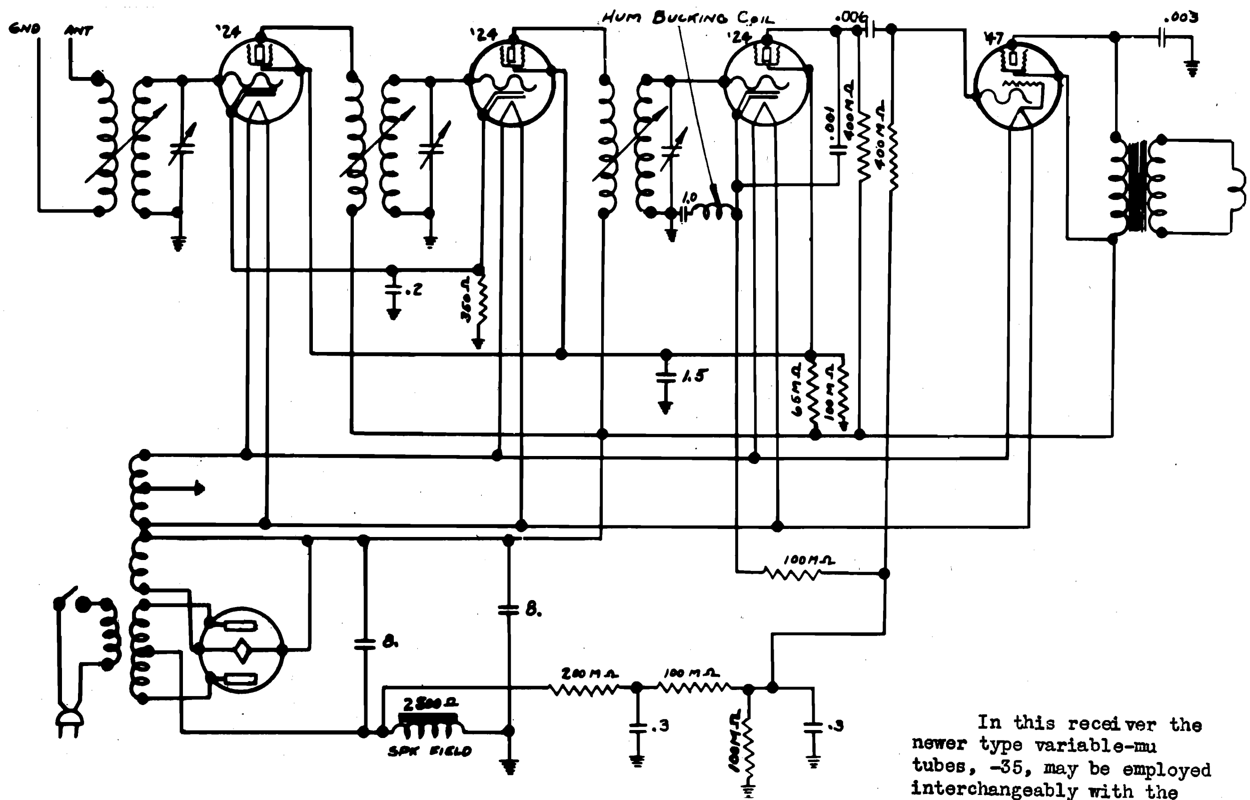
(25 cycle - line V = 115)

Silvertone-Model 1250.

SEARS, ROEBUCK and COMPANY



SEARS, ROEBUCK and COMPANY



In this receiver the newer type variable-mu tubes, -35, may be employed interchangeably with the type -24 tubes, but only in the R.F. stages.

The speaker field is used as a choke in the negative side of the filter circuit. The field resistance is 2500 ohms. The bias voltages for the detector cathode and the -47 grid are taken through a voltage divider from the negative side of the speaker field. This voltage divider also serves as a hum filter circuit.

	RF1	RF2	Det.	247	280AC	280DC
Plate Voltage D.C.	220	220	100	210	340	320
Screen Voltage D.C.	70	70	70			
Heater Voltage A.C.	2.3	2.3	2.3	2.3	4.8	
Control Grid Voltage D.C.	2.4	2.4	7	15		
Speaker Field Voltage 100						
Total Rectifier Current .045		60 Cycle	Line	Voltage	115	

	RF1	RF2	Det.	247	280AC	280DC
Plate Voltage D.C.	240	240	100	230	335	340
Screen Voltage D.C.	70	70	70	230		
Heater Voltage A.C.	2.4	2.4	2.4	2.4	5	
Control Grid Voltage D.C.	2.3	2.3	7	15		
Speaker Field Voltage 100						
Total Rectifier Current .045		25 Cycle	Line	Voltage	115	

Note: Control Grid Volts are measured from Cathode to Ground or Cathode to Filament. 247 Grid Voltage. Grid to Ground or Filament.

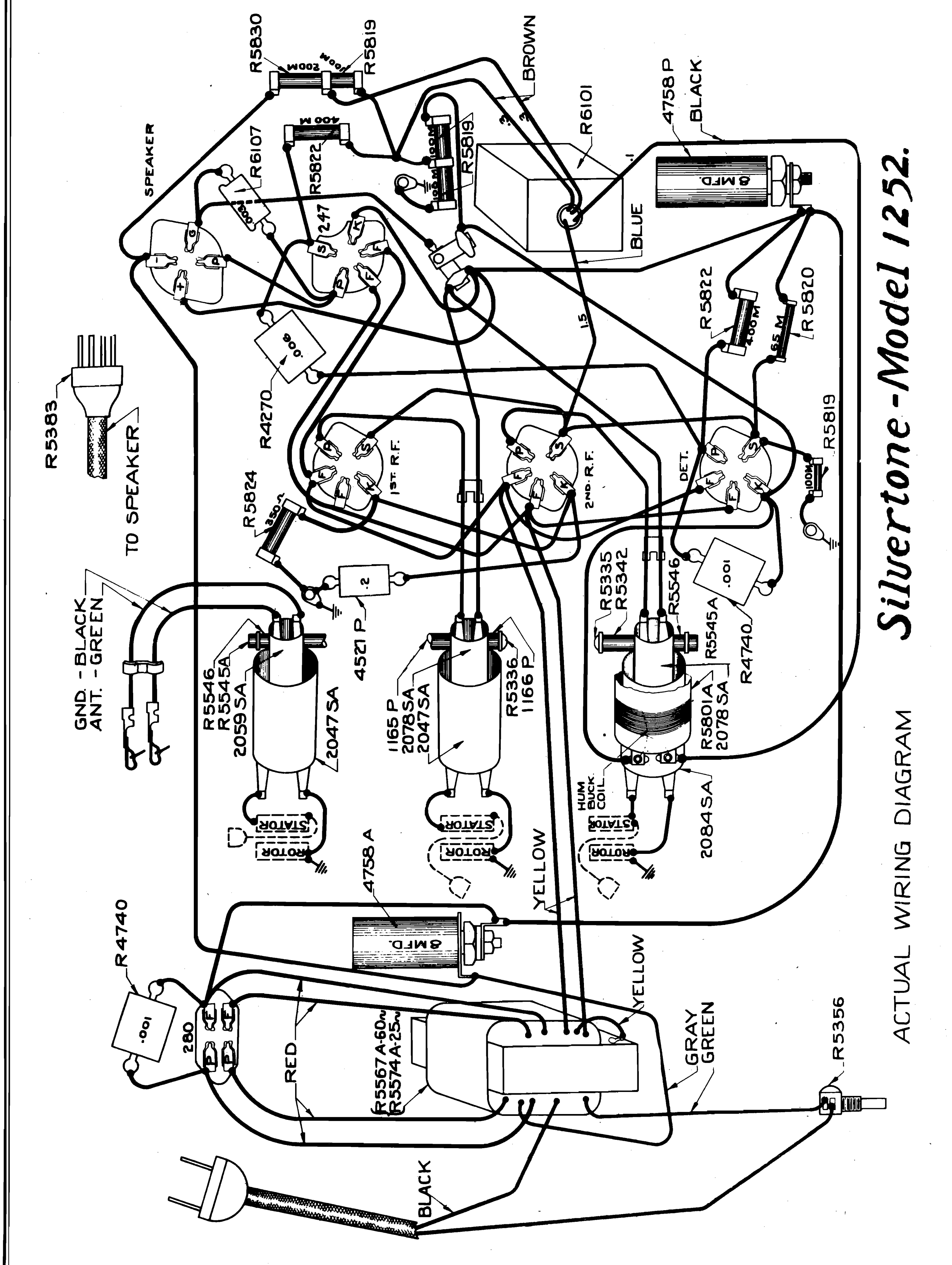
The 25 cycle receiver is identical with the 60 cycle receiver except for the power transformer.

Silvertone Model 1252

If the 0.003 Mfd. condenser connected between the plate of the pentode and ground becomes open or disconnected it is very likely that the set will oscillate.

A hum bucking coil is wound on the detector coil shield and is connected from the cathode through a condenser to ground. If this coil is open or shorted a hum will result.

SEARS, ROEBUCK and COMPANY



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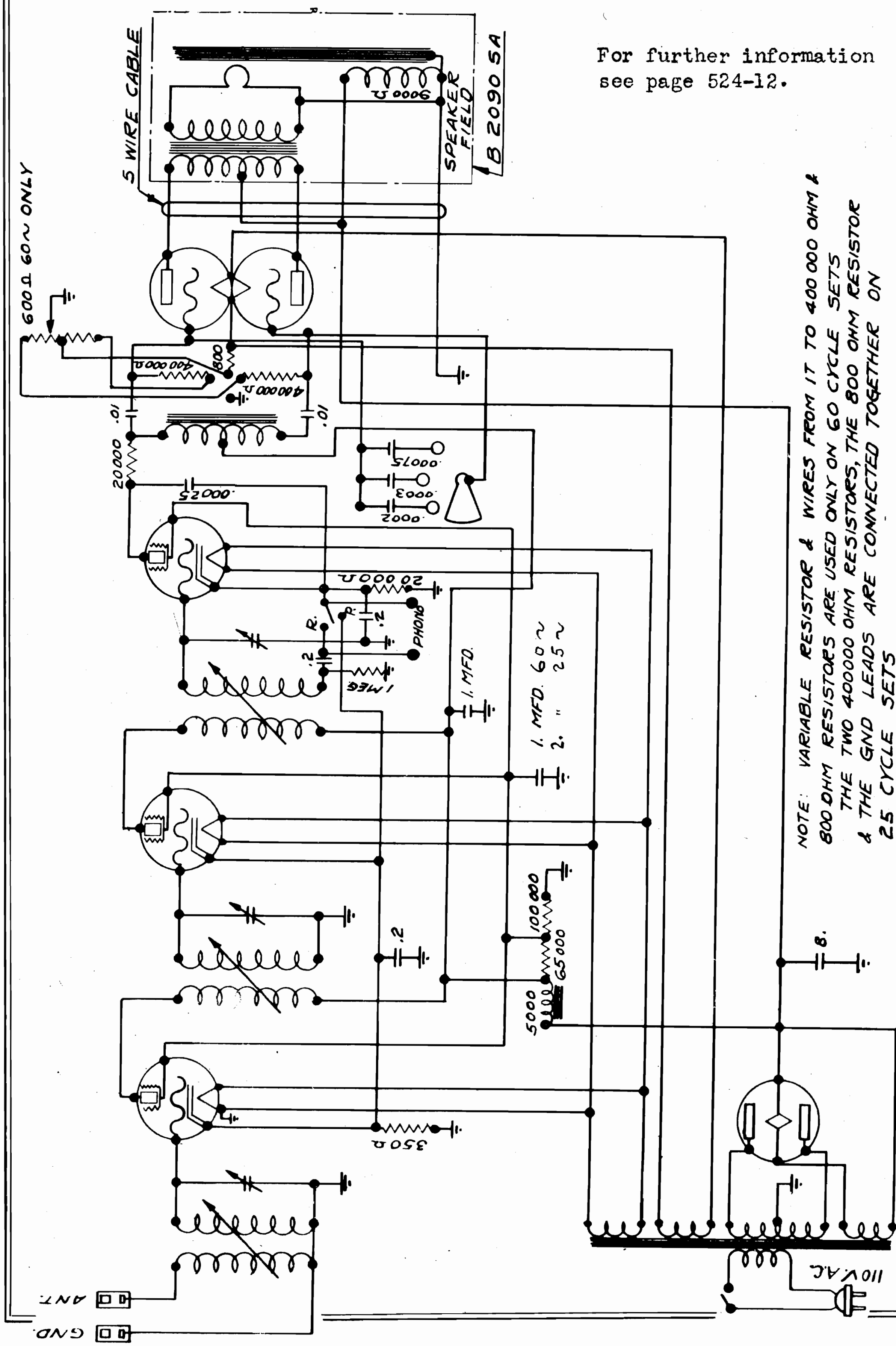
SEARS, ROEBUCK and COMPANY

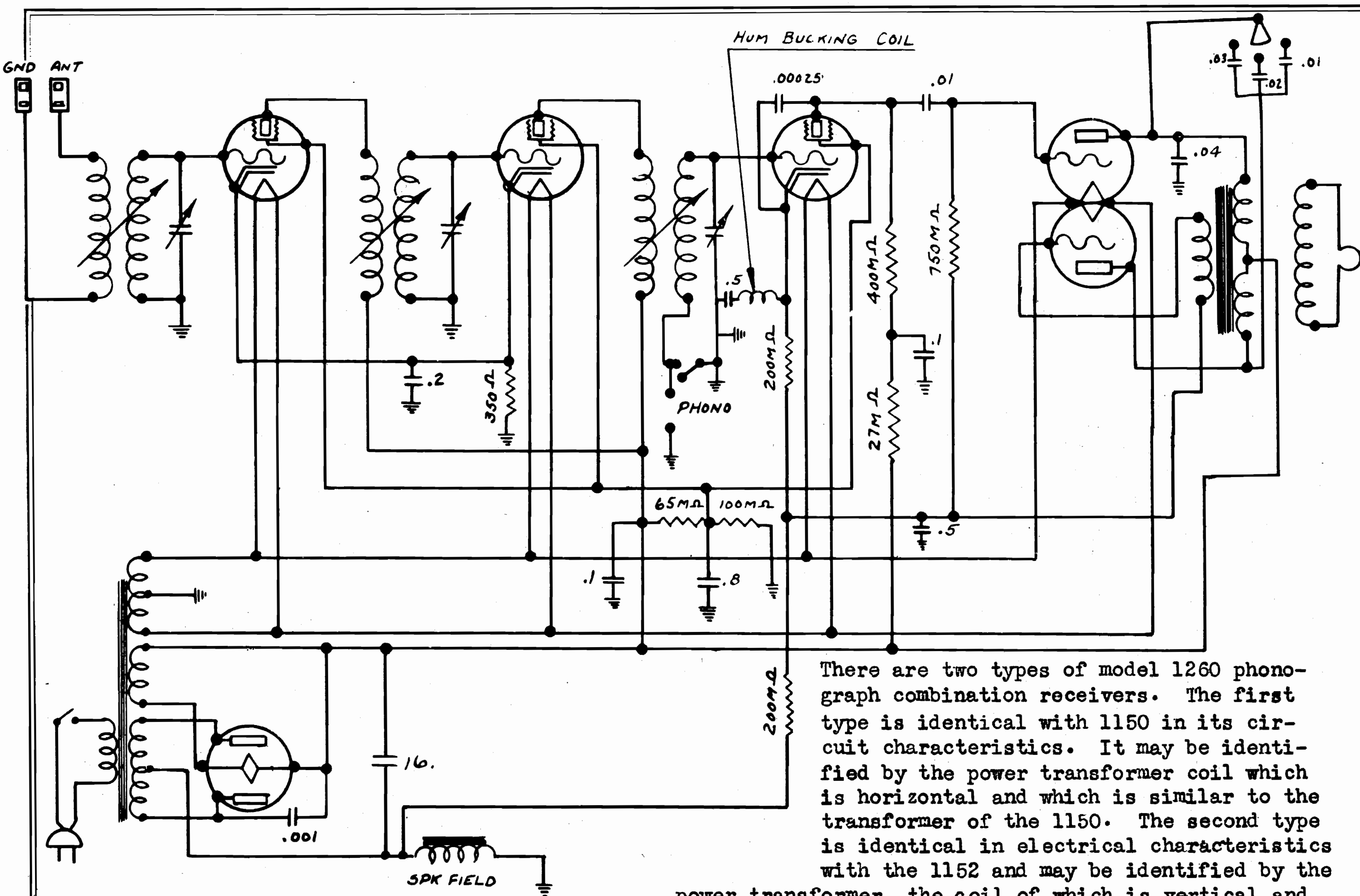
For further information
see page 524-12.



NOTE: VARIABLE RESISTOR & WIRES FROM IT TO 400 000 OHM & 800 OHM RESISTORS ARE USED ONLY ON 60 CYCLE SETS THE TWO 400000 OHM RESISTORS, THE 800 OHM RESISTOR & THE GND LEADS ARE CONNECTED TOGETHER ON 25 CYCLE SETS

Silvertone-Model 1260.
(ORIGINAL)

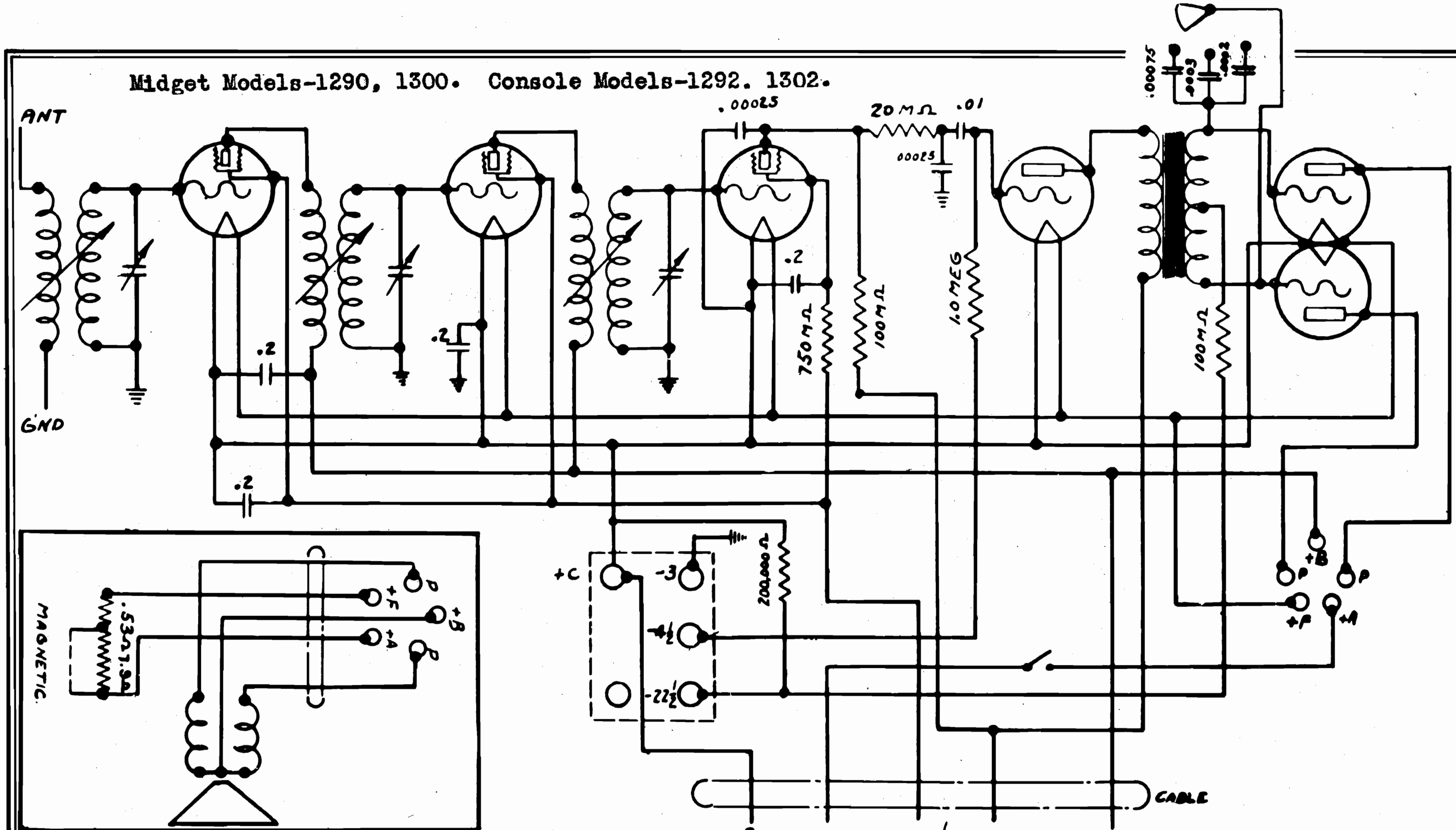
SEARS, ROEBUCK and COMPANY

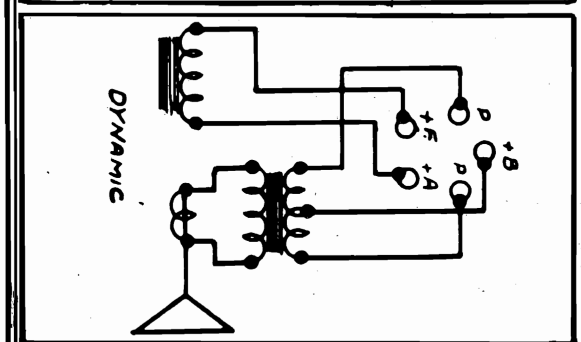


There are two types of model 1260 phonograph combination receivers. The first type is identical with 1150 in its circuit characteristics. It may be identified by the power transformer coil which is horizontal and which is similar to the transformer of the 1150. The second type is identical in electrical characteristics with the 1152 and may be identified by the power transformer, the coil of which is vertical and which is similar to the power transformer of the 1152. The Radio-Phono switch operates with the line switch knob. The first quarter turn to the right turns the set on; the next quarter turn connects the pick-up.

Silvertone-Model 1260
(LATER MODEL)

Midget Models-1290, 1300. Console Models-1292. 1302.



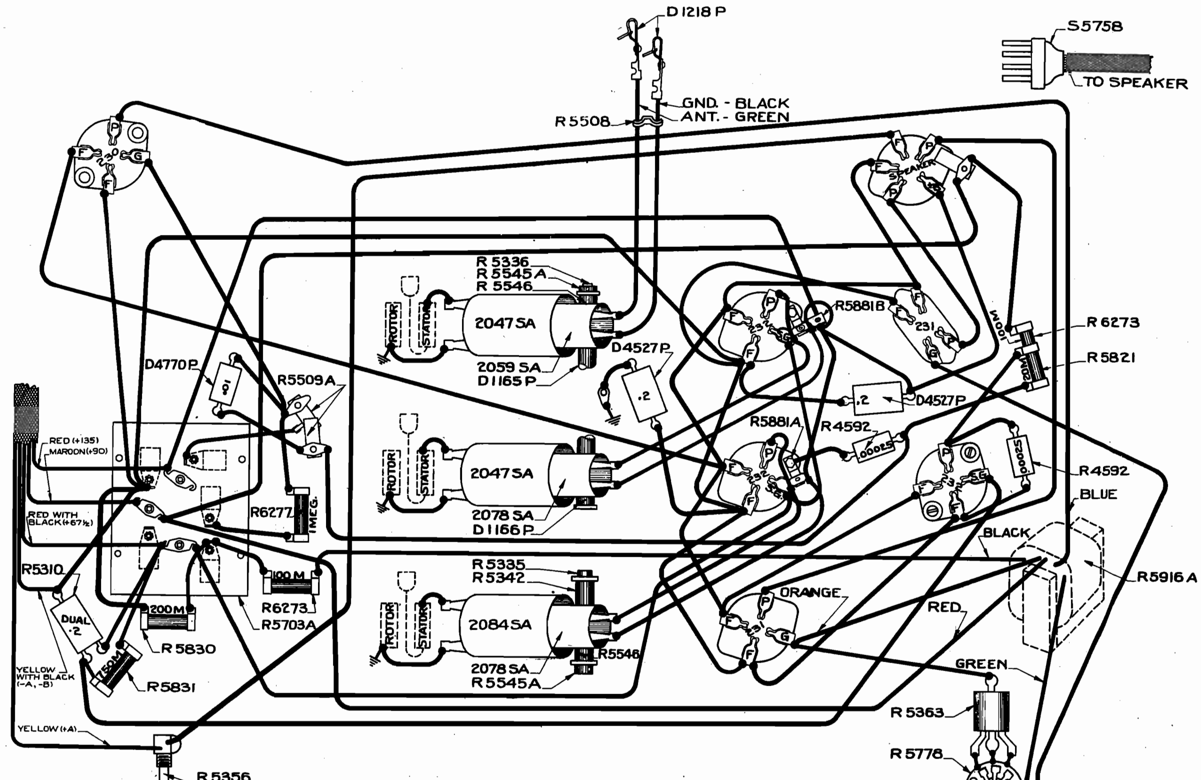


Model 1290	RF1	RF2	Det.	1st Audio	231
Plate Voltage D.C.	135	135	80	90	130
Screen Voltage D.C.	67	67	25		
Filament Voltage D.C.	2.0	2.0	2.0	2.0	2.0
Control Grid Voltage D.C.	3	3		4.5	22.5

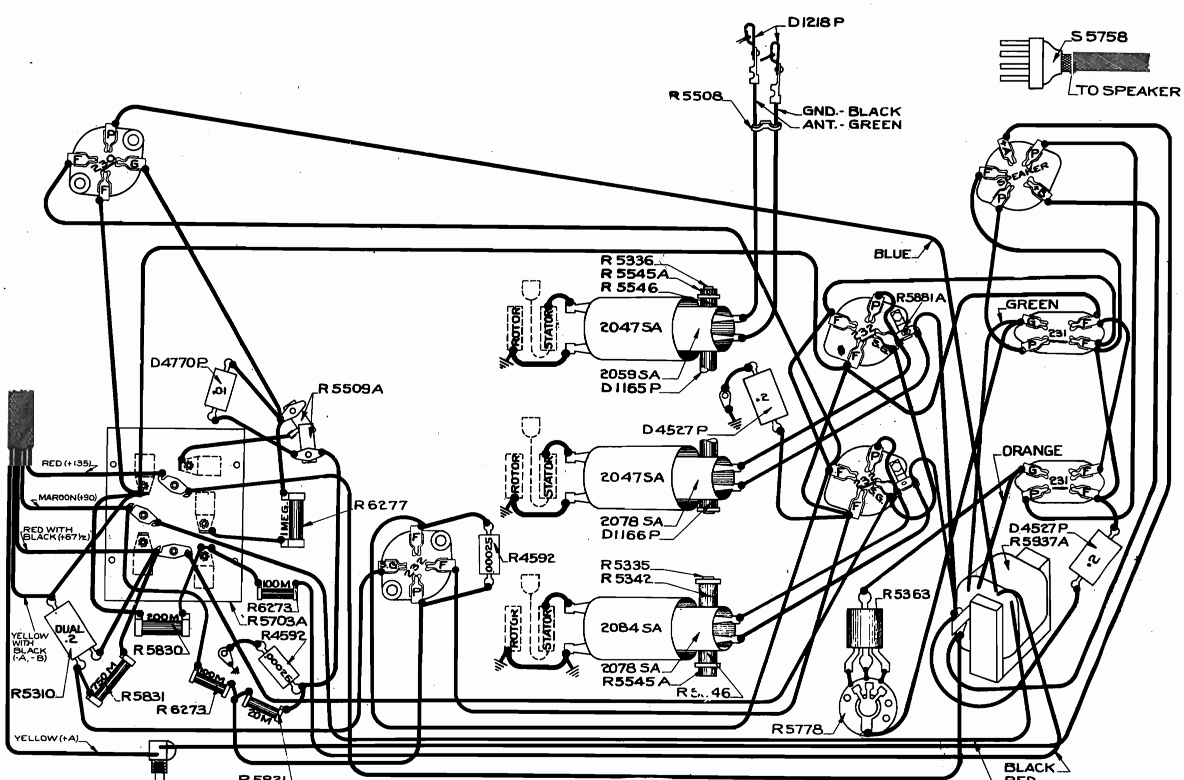
Model 1292-1302 are electrically identical to 1290 and 1300. 1292 uses a 9" magnetic speaker, and 1302 a 10" dynamic. Model 1290 uses a magnetic speaker, model 1300 uses a dynamic speaker.

Silvertone - Models 1290, 1292, 1300, 1302.

SEARS, ROEBUCK and COMPANY

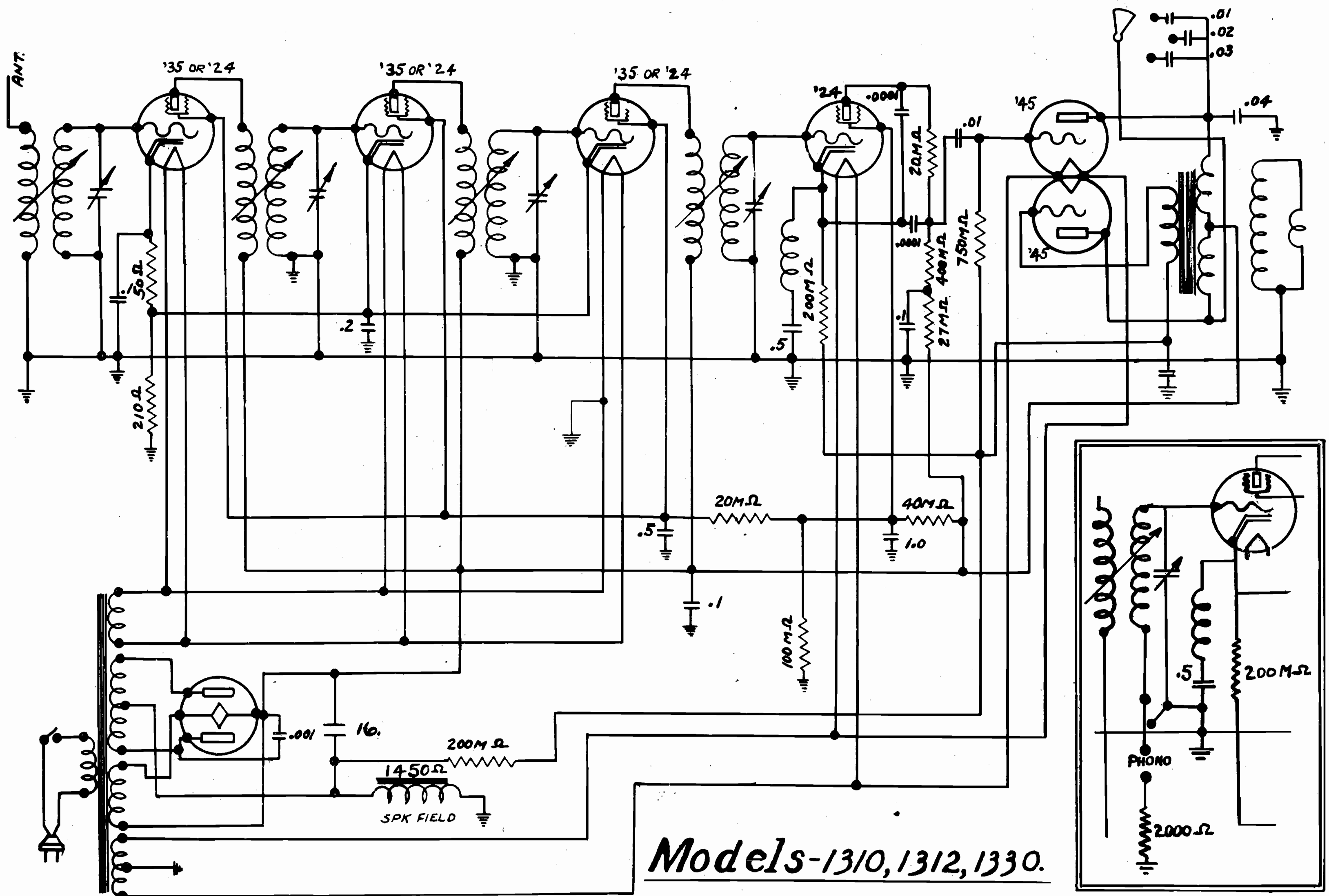


ACTUAL WIRING DIAGRAM *Silvertone-Model 1300*



ACTUAL WIRING DIAGRAM *Silvertone-Model 1302.*

SEARS, ROEBUCK and COMPANY



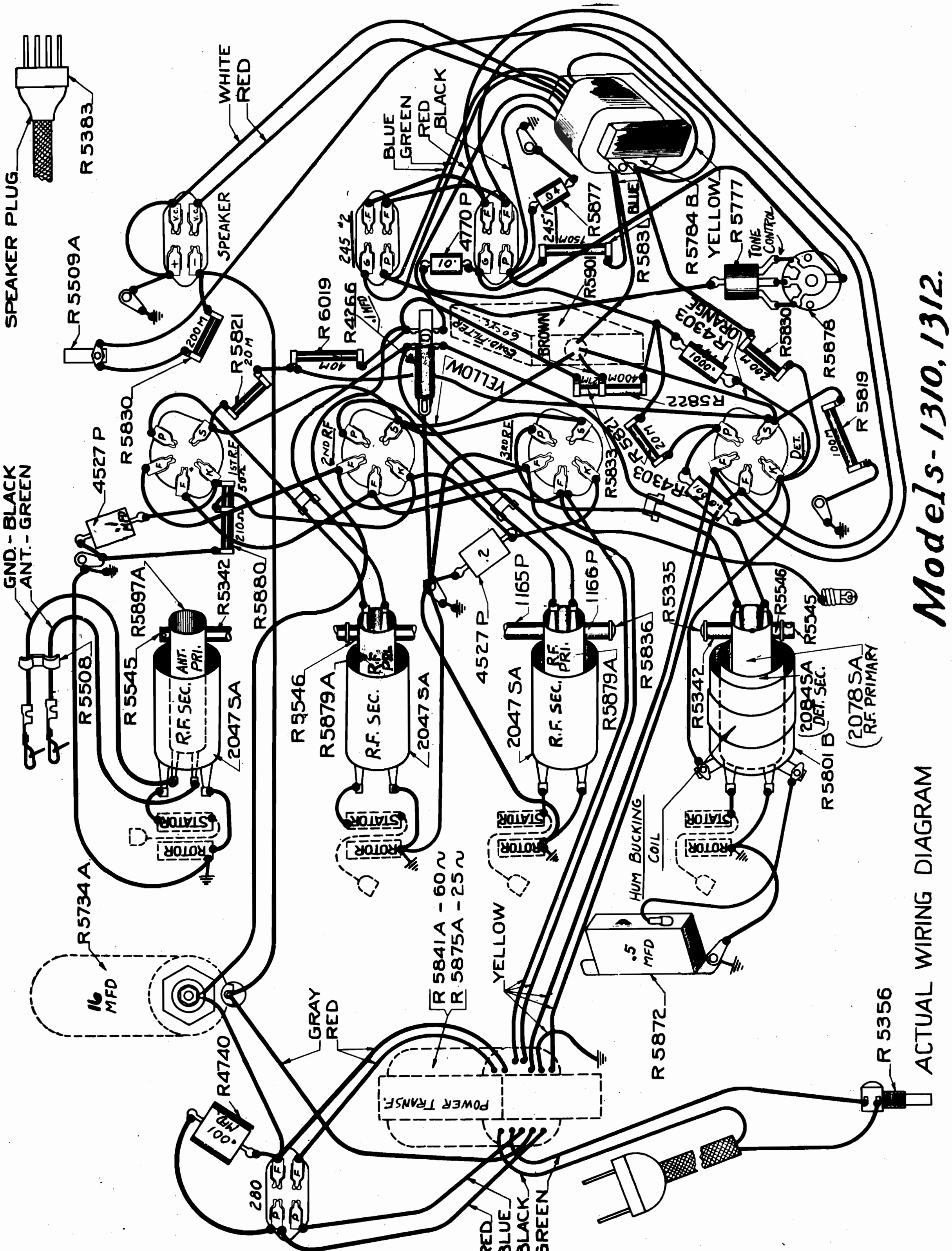
Models-1310, 1312, 1330.

Model 1310, 25 Cycle receiver is identical with the 60 Cycle model except for the power transformer.

Phonograph Model 1330 is equipped to use electrical pick-up, and the electrical characteristics of this receiver are identical to the Model 1310, with the exception of a switch which throws the radio set from radio position to phonograph position.

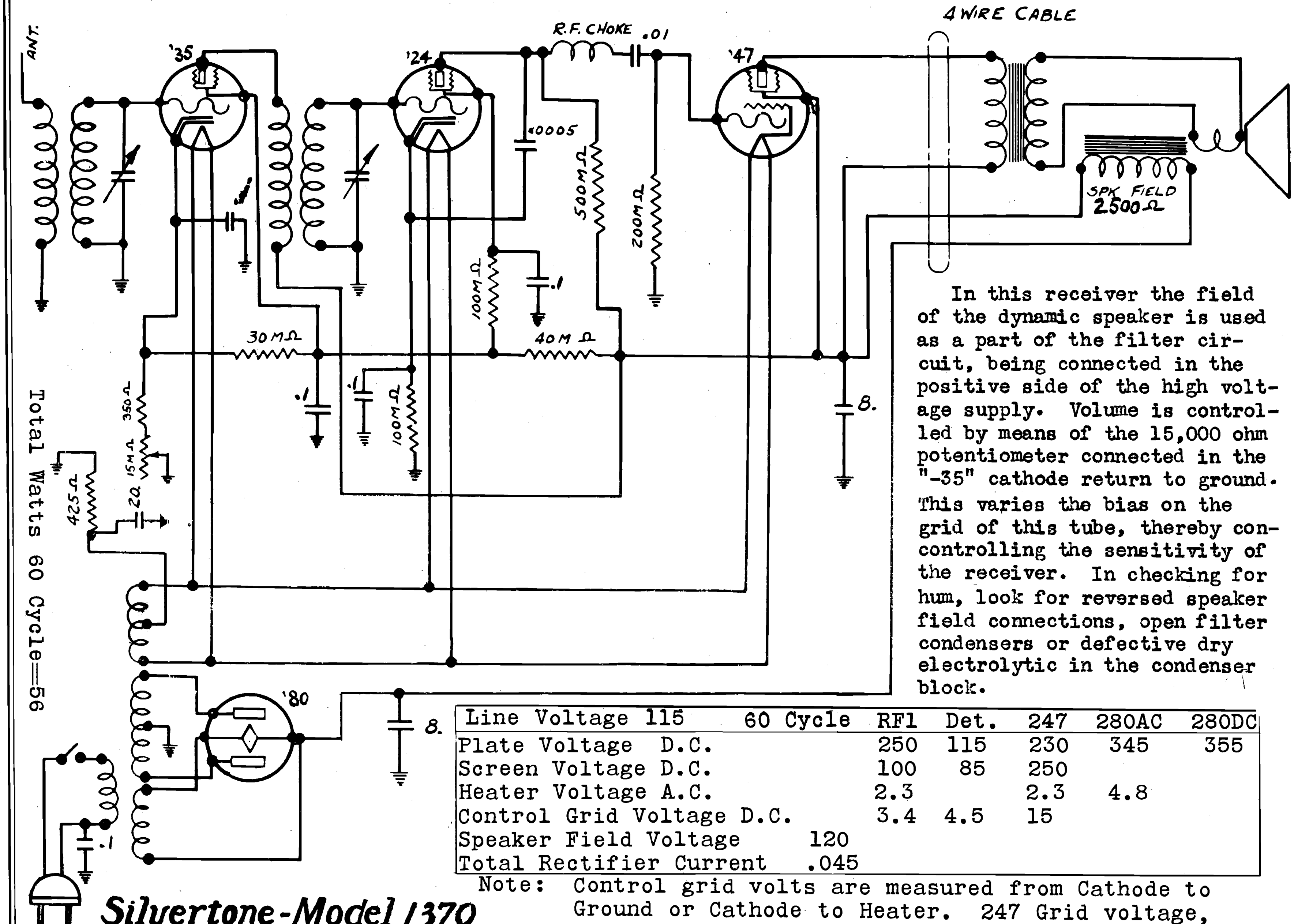
(Model 1330)
Detector circuit arrangement for use of phonograph pick-up.

SEARS, ROEBUCK and COMPANY



A hum bucking coil is wound on the detector coil shield adjacent to the detector socket. If this coil is open or shorted hum will result.

SEARS, ROEBUCK and COMPANY



In this receiver the field of the dynamic speaker is used as a part of the filter circuit, being connected in the positive side of the high voltage supply. Volume is controlled by means of the 15,000 ohm potentiometer connected in the "-35" cathode return to ground. This varies the bias on the grid of this tube, thereby concontrolling the sensitivity of the receiver. In checking for hum, look for reversed speaker field connections, open filter condensers or defective dry electrolytic in the condenser block.

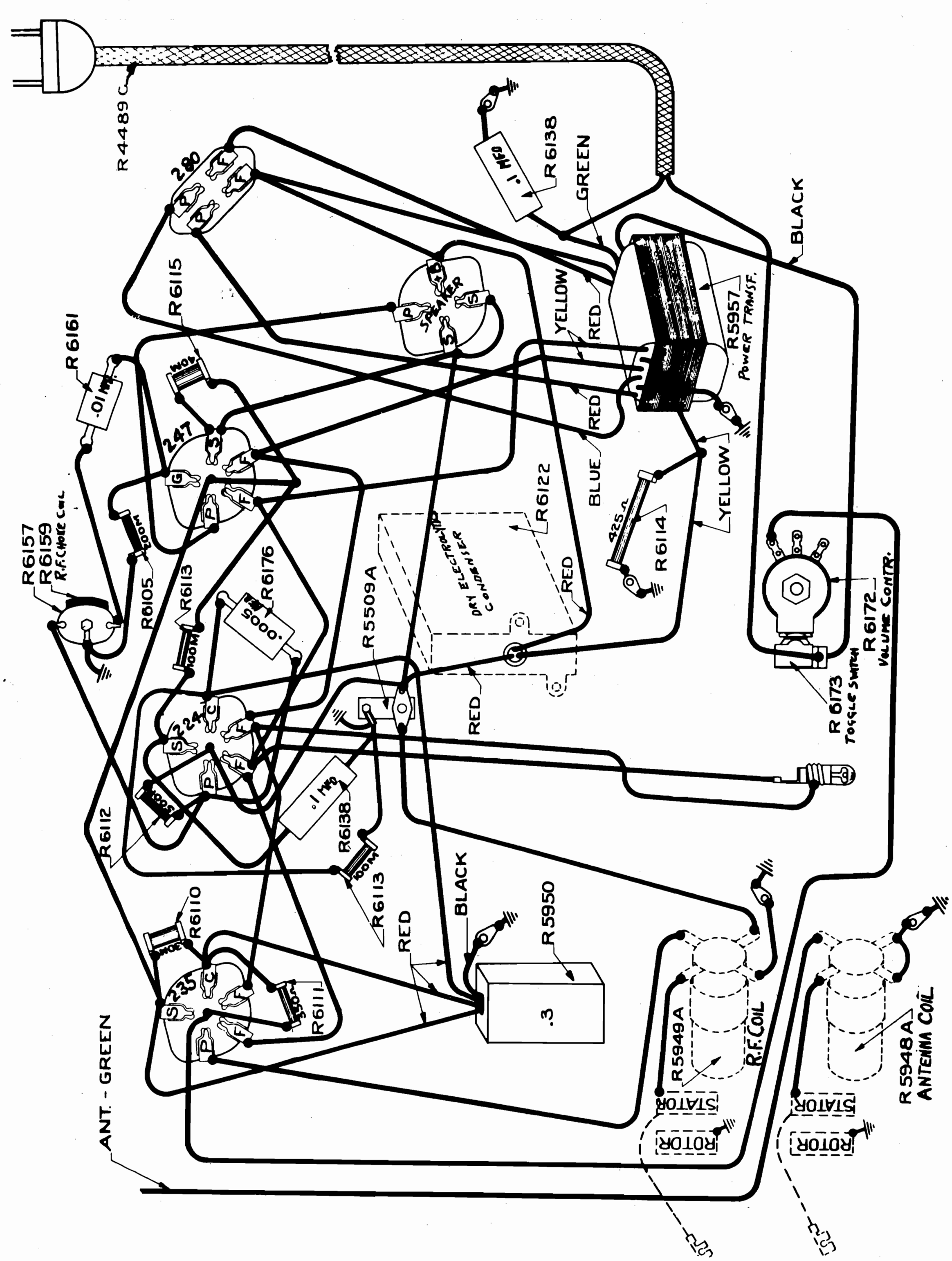
Line Voltage 115	60 Cycle	RF1	Det.	247	280AC	280DC
Plate Voltage D.C.		250	115	230	345	355
Screen Voltage D.C.		100	85	250		
Heater Voltage A.C.		2.3		2.3	4.8	
Control Grid Voltage D.C.		3.4	4.5	15		
Speaker Field Voltage	120					
Total Rectifier Current	.045					

Note: Control grid volts are measured from Cathode to Ground or Cathode to Heater. 247 Grid voltage, from Filament to Ground. Volume control at minimum.

Total Watts 60 Cycle=56

Silvertone-Model 1370

SEARS, ROEBUCK and COMPANY

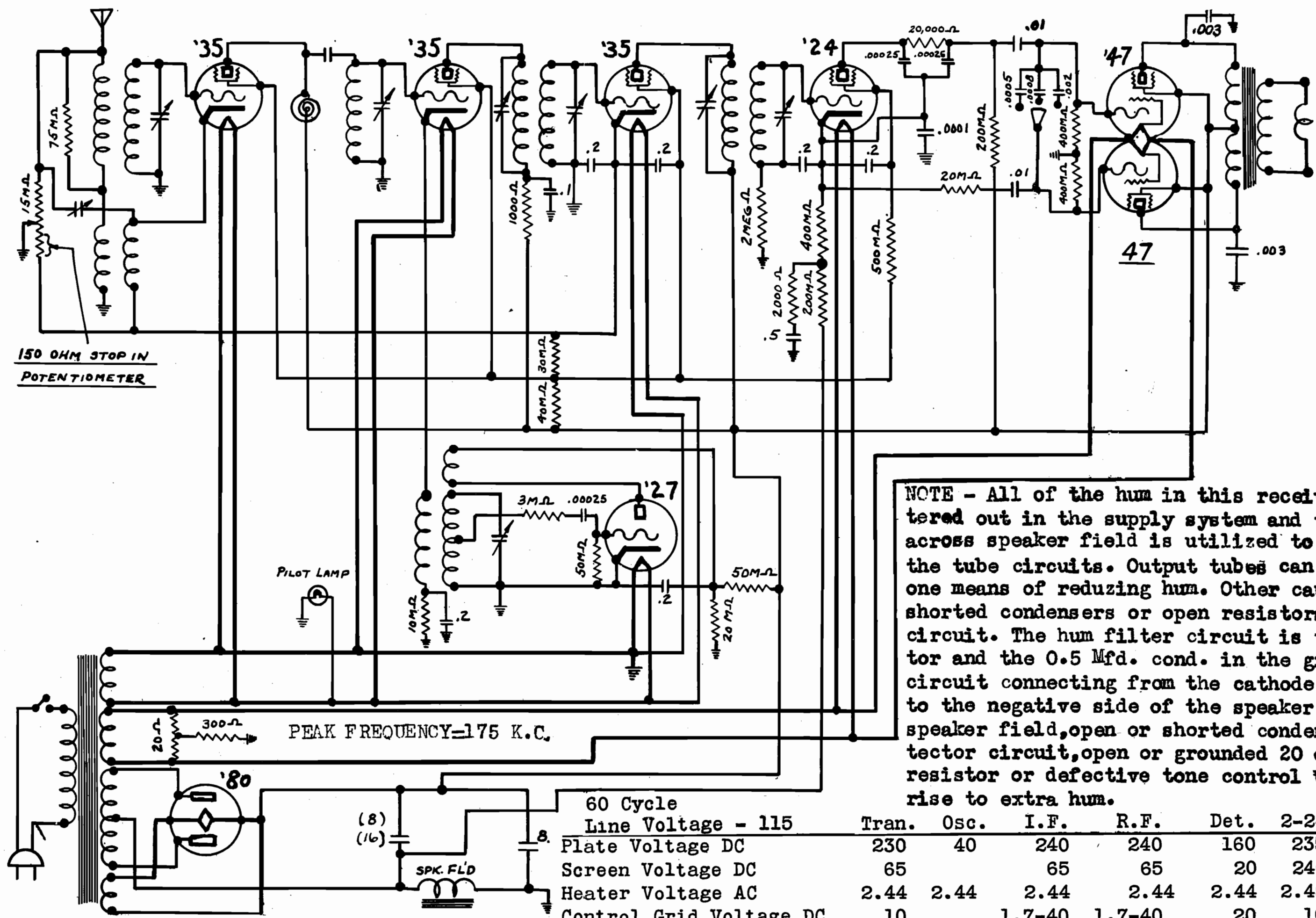


Silvertone - Model 1370.

ACTUAL WIRING DIAGRAM

In this receiver the dry electrolytic condenser is located directly behind the variable condensers on the top of the chassis. The antenna and first RF tuning coils are located at the front of the chassis with the second RF coil located immediately behind.

SEARS, ROEBUCK and COMPANY



NOTE - All of the hum in this receiver is not filtered out in the supply system and the hum voltage across speaker field is utilized to buck out hum in the tube circuits. Output tubes can be intrchanged as one means of reduzing hum. Other causes of hum are-shorted condensers or open resistors in hum filter circuit. The hum filter circuit is the 2000 ohm resistor and the 0.5 Mfd. cond. in the grid bias resistor circuit connecting from the cathode of the detector to the negative side of the speaker field. Reversed speaker field,open or shorted condensers in the detector circuit,open or grounded 20 ohm center-tapped resistor or defective tone control will also give rise to extra hum.

60 Cycle

Line Voltage - 115	Tran.	Osc.	I.F.	R.F.	Det.	2-247	280AC	280DC
Plate Voltage DC	230	40	240	240	160	235	240	350
Screen Voltage DC	65		65	65	20	240		
Heater Voltage AC	2.44	2.44	2.44	2.44	2.44	2.45	4.85	
Control Grid Voltage DC	10		1.7-40	1.7-40	20	16		

Speaker Field Voltage 110 Volts.
Total Plate Current 1075 amp.

Control grid volts are measured from cathode to ground or cathode to heater. 247 grid voltage from grid to ground or filament.

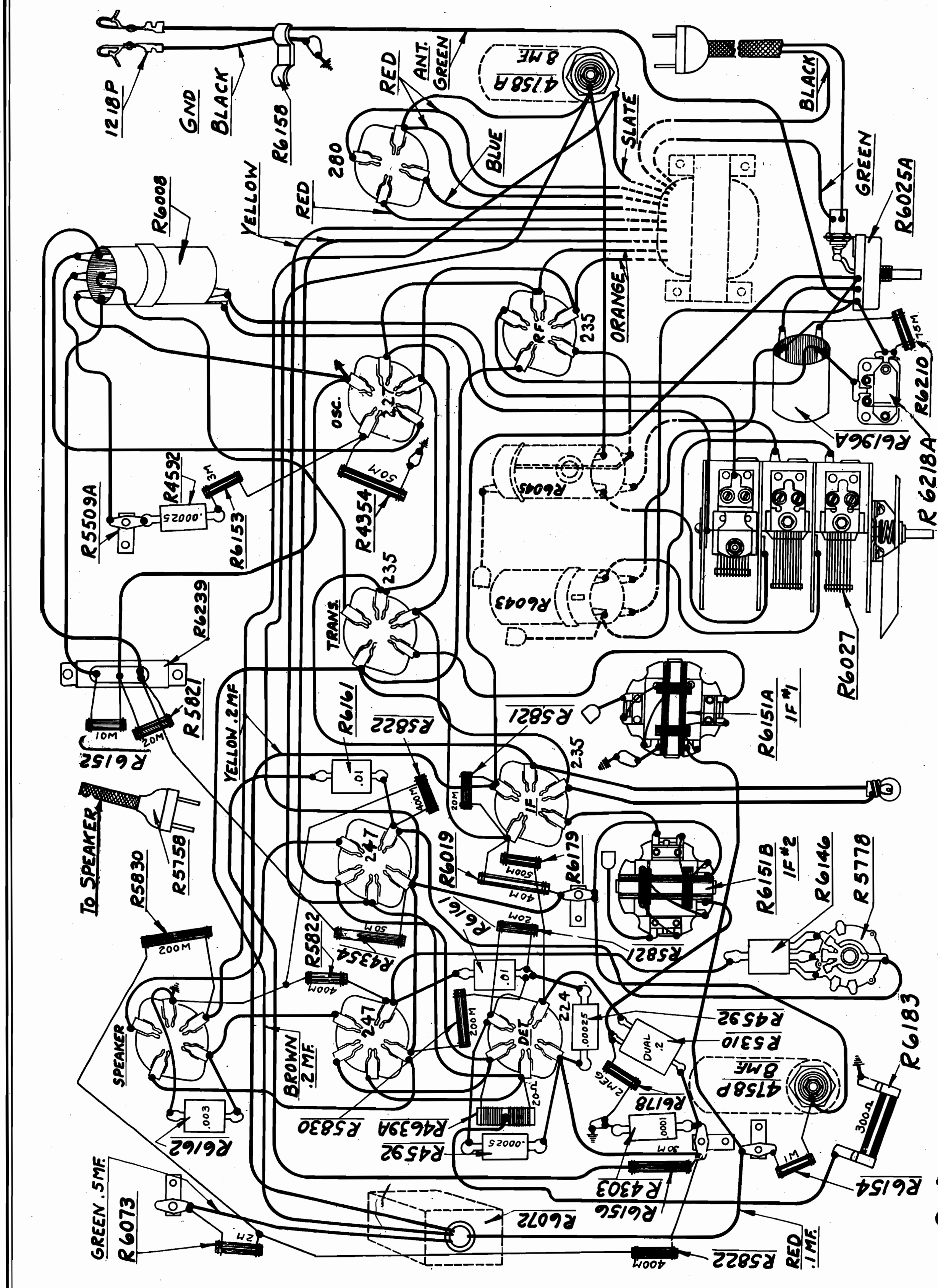
25 Cycle

Line Voltage - 115	Tran.	Osc.	I.F.	R.F.	Det.	2-247	280AC	280DC
Plate Voltage DC	220	40	230	230	160	225	325	340
Screen Voltage DC	70		70	70	25	230		
Heater Voltage AC	2.25	2.25	2.25	2.25	2.45	2.45	4.7	
Control Grid Voltage DC	10		2-38	2-38	20	15		

Speaker Field Voltage - 100 Volts
Total Plate Current - .075 amp.

Silvertone
Models 1320, 1322, 1324

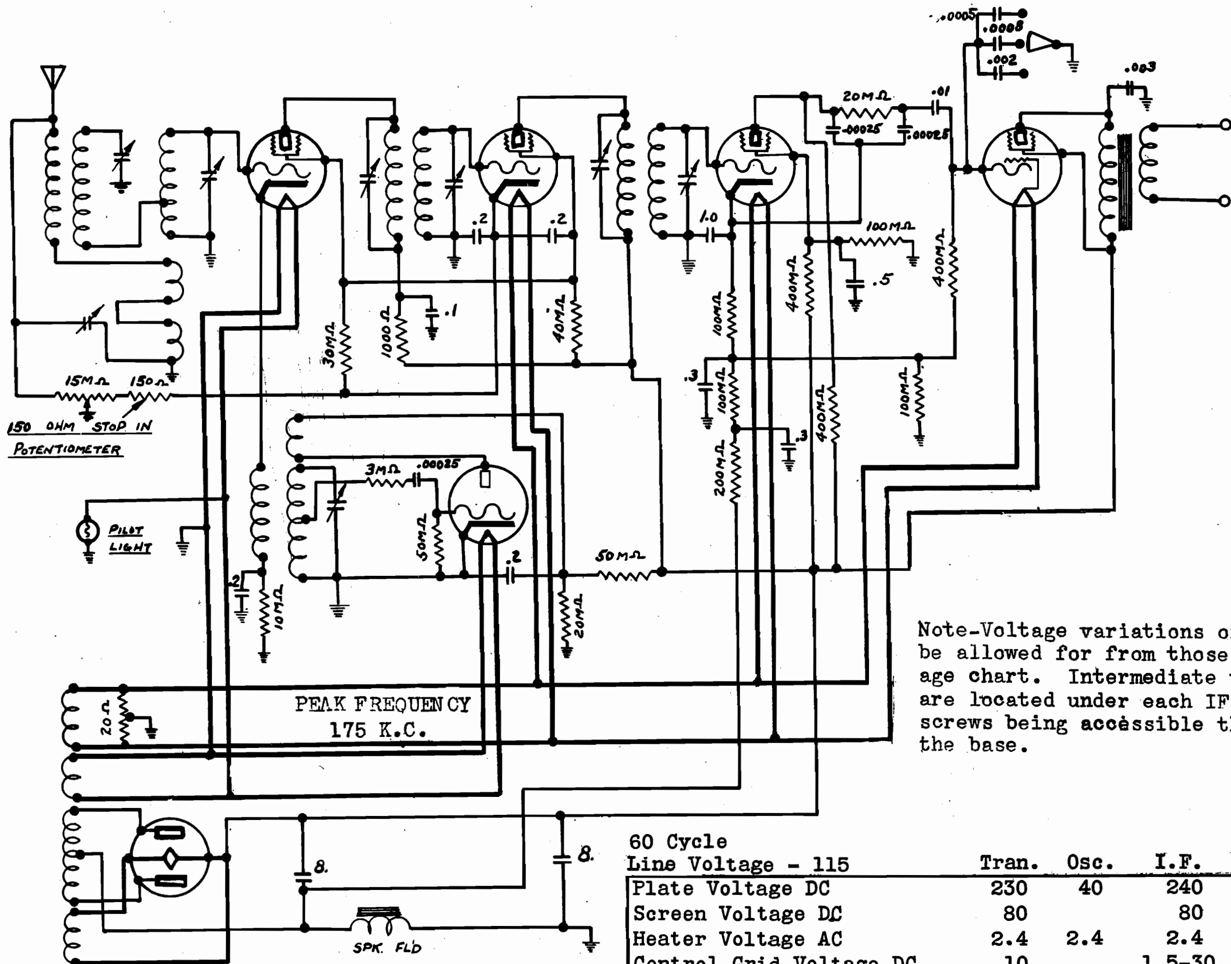
SEARS, ROEBUCK and COMPANY



Silvertone-Models 1320, 1322, 1324.

SEARS, ROEBUCK and COMPANY

Note-In the voltage chart, the term Tran. refers to the first detector (translator) The small variable condenser shown in the antenna circuit controls the suppression of image response frequencies and should not be adjusted except in the event that RF coils or suppressor coils are changed.



Note-Voltage variations of about 20 percent can be allowed for from those indicated in the voltage chart. Intermediate transformer condensers are located under each IF transformer, aligning screws being accessible through two holes in the base.

60 Cycle

Line Voltage - 115	Tran.	Osc.	I.F.	Det.	247	280AC	280DC
Plate Voltage DC	230	40	240	120	240	350	370
Screen Voltage DC	80		80	40	245		
Heater Voltage AC	2.4	2.4	2.4	2.4	2.4	4.8	
Control Grid Voltage DC	10		1.5-30	4	15		
Speaker Field Voltage	125 volts						
Total Plate Current	.050 amperes						

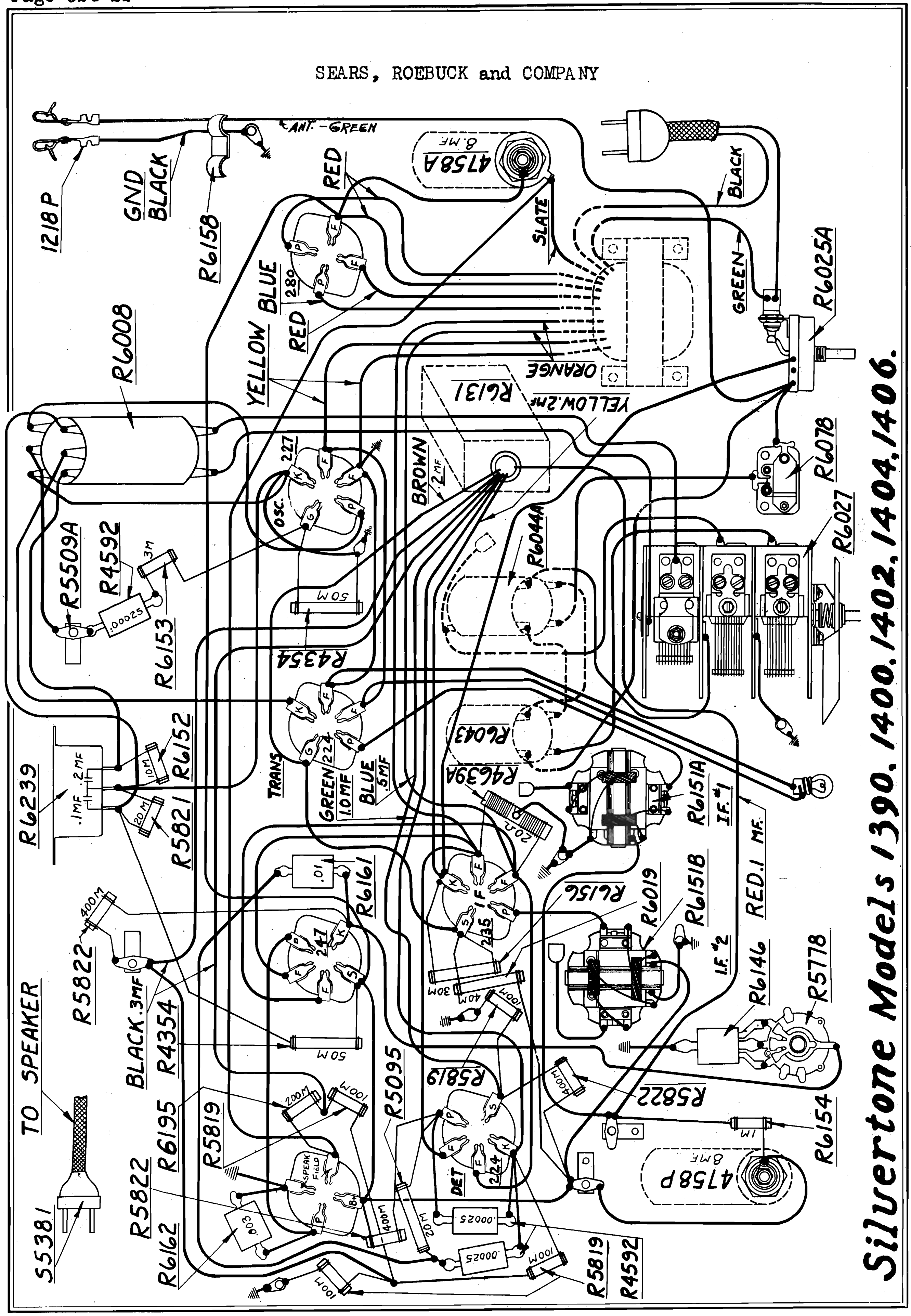
25 Cycle

Line Voltage- 115	Tran.	Osc.	I.F.	Det.	247	280AC	280DC
Plate Voltage DC	225	45	240	125	235	345	360
Screen Voltage DC	80		80	40	240		
Heater Voltage AC	2.5	2.5	2.35	2.35	2.35	4.75	
Control Grid Voltage DC	10		1.5-30	4	15		
Speaker Field Voltage	120 volts						
Total Plate Current	.050 amperes						

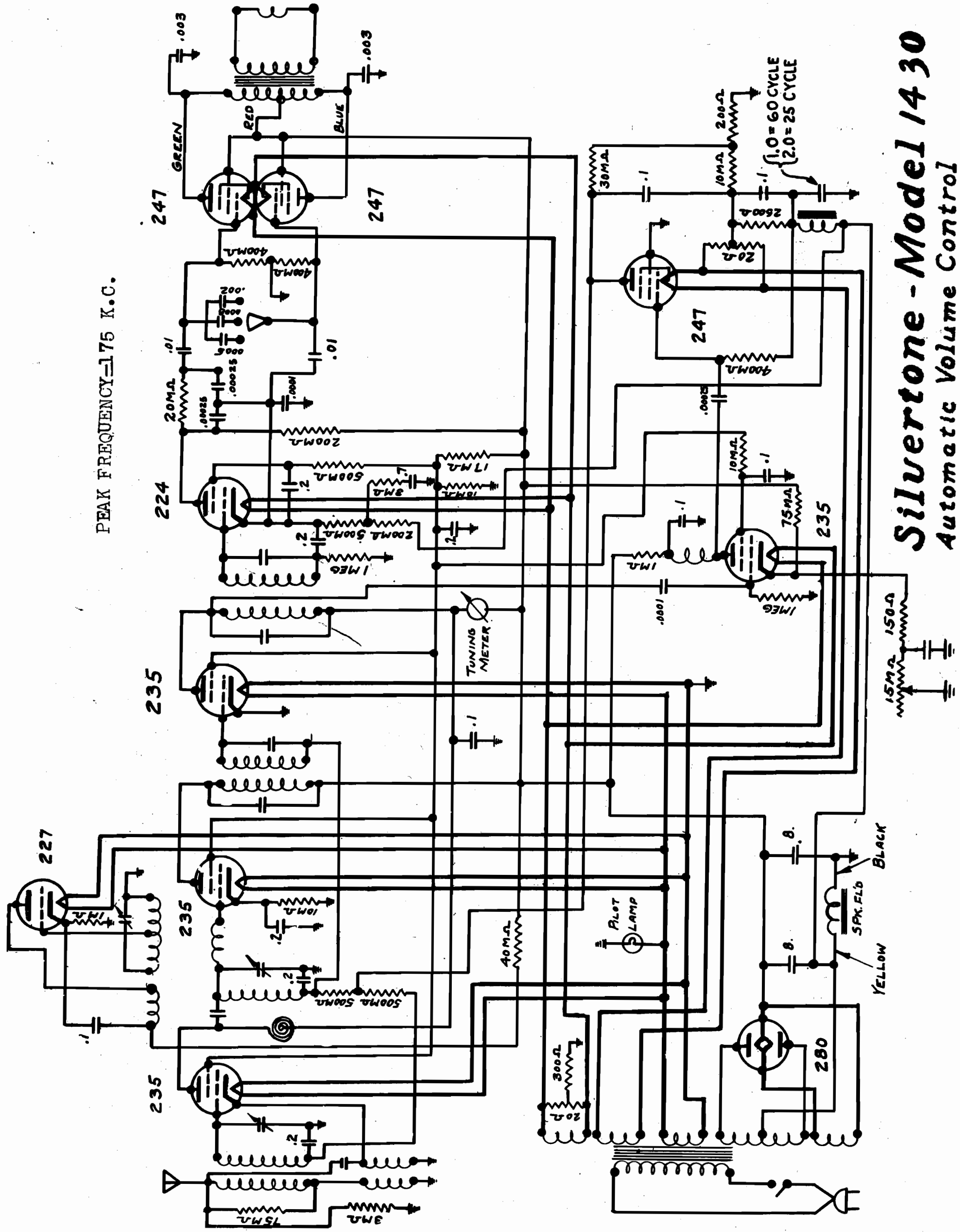
Control grid volts are measured from cathode to ground or cathode to heater. 247 grid voltage from grid to ground or filament.

Silvertone
Models 1390, 1400, 1402, 1404 and 1406.

SEARS, ROEBUCK and COMPANY



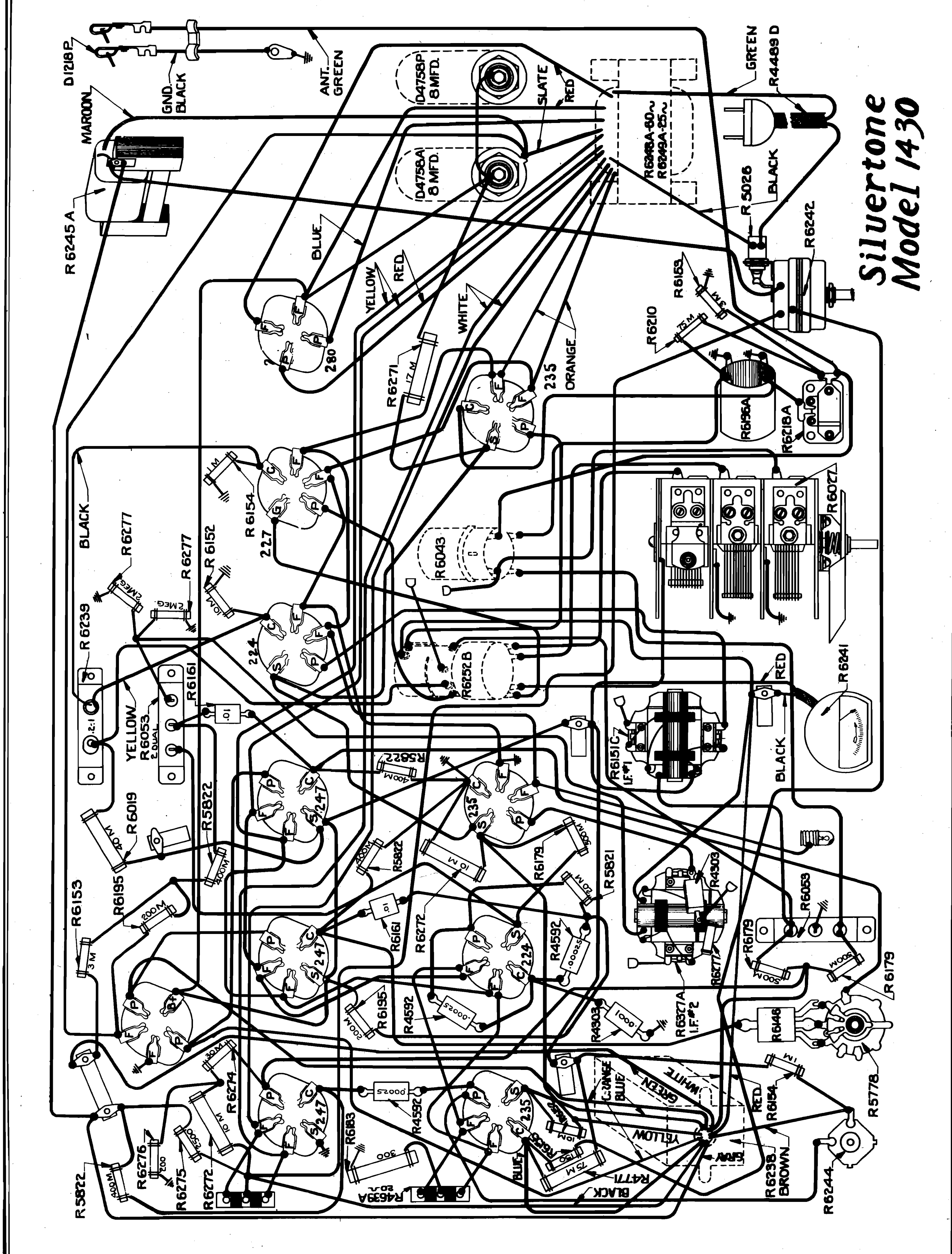
SEARS, ROEBUCK and COMPANY



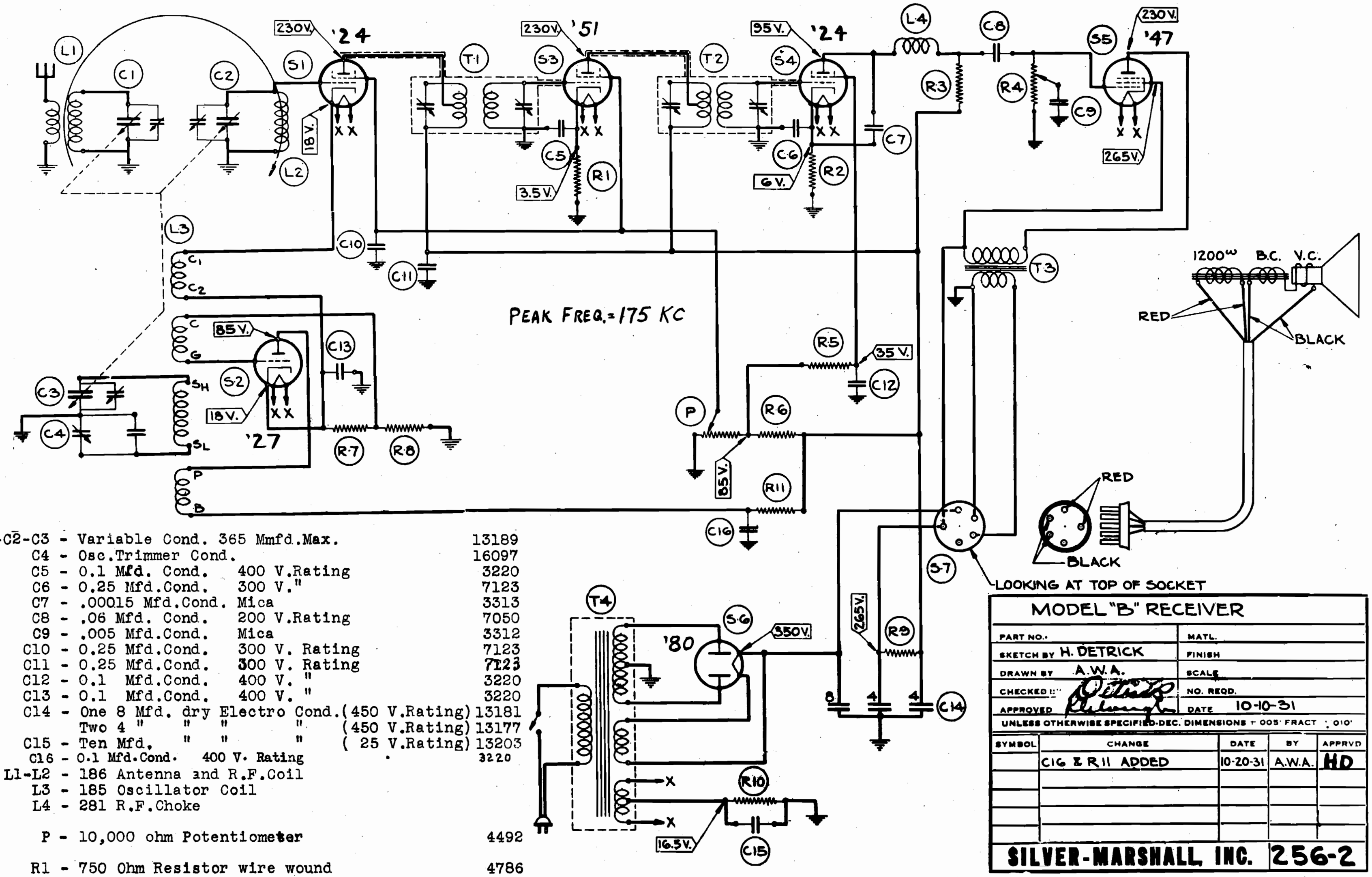
Uncontrollable volume can be traced to the following points-Open volume control; open choke from negative speaker field to automatic volume control filament; open resistors or condensers in automatic volume control circuit; open choke, resistors or shorted condensers in automatic volume control amplifier.

In cases of hum, look for defective output or detector tubes, reversed speaker field, open screen or cathode resistors, open center tap resistor, shorted condenser or open resistors in the hum filter circuits or an open 1.0 Mfd. condenser in the automatic volume control circuit.

SEARS, ROEBUCK and COMPANY



SILVER-MARSHALL, Inc.



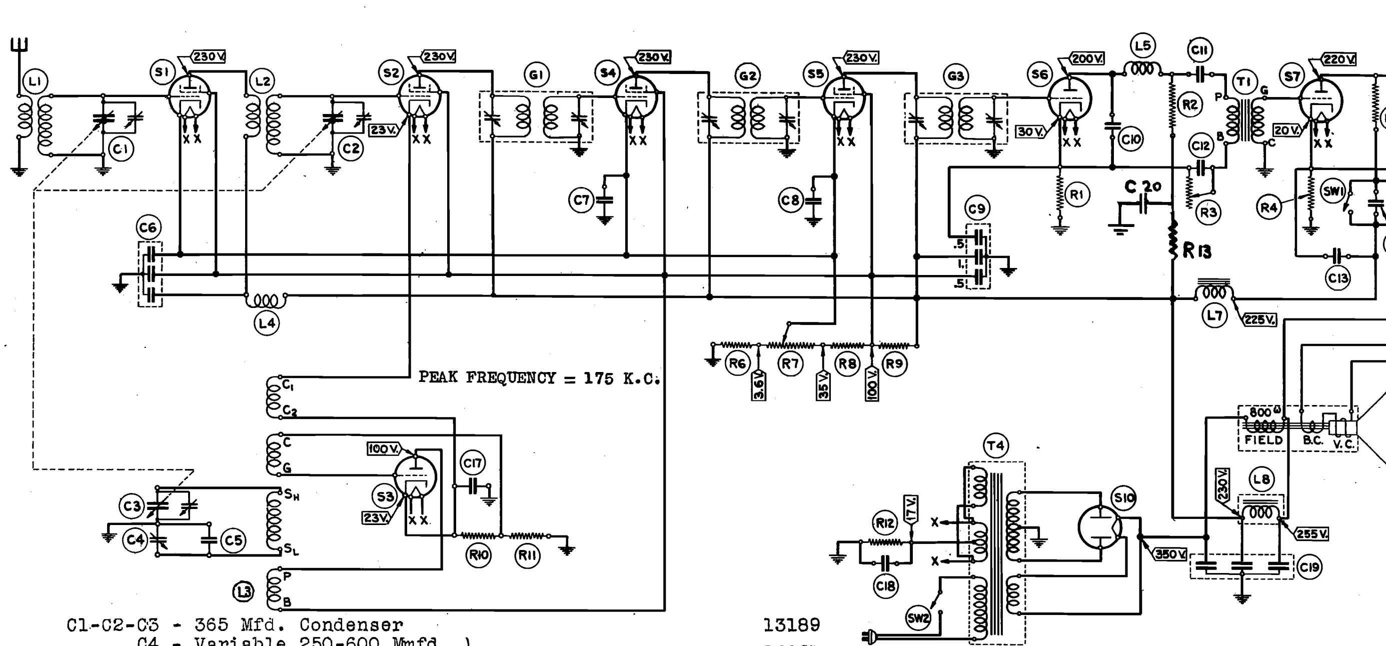
C1-C2-C3 -	Variable Cond. 365 Mmfd.Max.		13189
C4 -	Osc.Trimmer Cond.		16097
C5 -	0.1 Mfd. Cond.	400 V.Rating	3220
C6 -	0.25 Mfd.Cond.	300 V."	7123
C7 -	.00015 Mfd.Cond.	Mica	3313
C8 -	.06 Mfd. Cond.	200 V.Rating	7050
C9 -	.005 Mfd.Cond.	Mica	3312
C10 -	0.25 Mfd.Cond.	300 V. Rating	7123
C11 -	0.25 Mfd.Cond.	300 V. Rating	7123
C12 -	0.1 Mfd.Cond.	400 V. "	3220
C13 -	0.1 Mfd.Cond.	400 V. "	3220
C14 -	One 8 Mfd. dry Electro Cond.	(450 V.Rating)	13181
	Two 4 " " " "	(450 V.Rating)	13177
C15 -	Ten Mfd. " " "	(25 V.Rating)	13203
C16 -	0.1 Mfd.Cond.	400 V. Rating	3220
L1-L2 -	186 Antenna and R.F.Coil		
L3 -	185 Oscillator Coil		
L4 -	281 R.F.Choke		
P -	10,000 ohm Potentiometer		4492
R1 -	750 Ohm Resistor wire wound		4786
R2 -	30,000 ohm Resistor 1 Watt Carbon		14693
R3 -	300,000 ohm Resistor 1 Watt Carbon		4685
R4 -	½ Megohm Potentiometer		14403
R5 -	300,000 ohm Resistor 1 Watt Carbon		4685
R6 -	10,000 ohm Resistor 3 Watt Carbon		4789
R7 - 100 ohm) R8 - 1700 ohm)	1800 ohm wire wound, tapped unit		14723

R9 -	1750 ohm Resistor	1 Watt Carbon	14747
R10-	425 ohm Resistor	1 Watt Carbon	14699
R11-	20,000 ohm Resistor		4718
T1 -	E-1 I.F.Trans.		
T2 -	E-2 I.F.Trans.		
T3 -	10179 Output Trans.		
T4 -	10178 Power Trans.		

Model-B.

SILVER - MARSHALL, Inc.

Model - G Receiver.



C1-C2-C3	- 365 Mfd. Condenser			13189
C4	- Variable 250-600 Mmfd.)			16097
C5	- 500 Mmfd. Cond. (Mica))			
C6	- Triple .1 Mfd. Cond.			3316
C7-C8	- .1 Mfd. Cond. 200 V Rating			3220
C9	- .5 - .5 - 1. Mfd. Cond.	(.5 - 200V rating		13140
		(1.0- 300V rating		
C10	- .001 Mfd. Cond. Mica			7039
C11	- .02 Mfd. Cond.			13195
C12	- .001 Mfd. Cond. Mica			7039
C13	- 4 Mfd. Cond. - 450V Rating			13177
C14	- .01 Mfd. Cond.			7047
C15	- .06 Mfd. Cond.			7050
C16	- .00075 Mfd. Cond. Mica			7144
C17-C18	- .1 Mfd. Cond. - 200V Rating			3220
C19	- Three 4 Mfd. Units 450V Rating			13120
C20	- 4 Mfd. Cond.			13177
G1	- 1st I.F. Transformer			
G2	- 2nd I.F. Transformer			
G3	- 3rd I.F. Transformer			
C20-				
L1	- 182 Ant. Coil			
L2	- 178 R.F. Coil			
L3	- 179 Osc. Coil			
L4	- 281 Choke Coil			
L5	- 281 Choke Coil			
L6	- 10164 Choke Coil			
L7	- 10145 Choke			
L8	- 10145 Choke			

R1	- 60,000 ohm resistor	1 watt	4698
R2	- 30,000 ohm "	1 watt	14693
R3	- 1 Megohm variable resistor		14371
R4	- 2600 ohm resistor	1 watt	4770
R5	- 1000 ohm resistor	1 watt	14722
R6	- 300 ohm resistor	wire wound	14692
R7	- 4500 ohm potentiometer with on-off switch		14323
R8	- 13,500 ohm resistor	1 watt	14694
R9	- 10,000 ohm resistor	2 watt	4726
R10	- 100 ohm resistor) wire wound		14723
R11	- 1700 ohm resistor)		
R12	- 210 ohm resistor	2 watt - carbon	4774
R13	- 10,000 Ohm		14696
S1	- '51 Tube		
S2	- '24 "		
S3	- '27 "		
S4-S5	- '51 "		
S6-S7	- '27 "		
S8-S9	- '47 "		
S10	- '80 "		
T1	- 10149 Transformer (Specification 8-7-31)		
T2	- 10159 Transformer (" 8-7-31)		
T3	- 10143 Transformer		
T4	- 10177 Transformer 60 Cycle		
SW1	- Tone Control Switch		5485
SW2	- On-Off Switch (Combined with volume control)		

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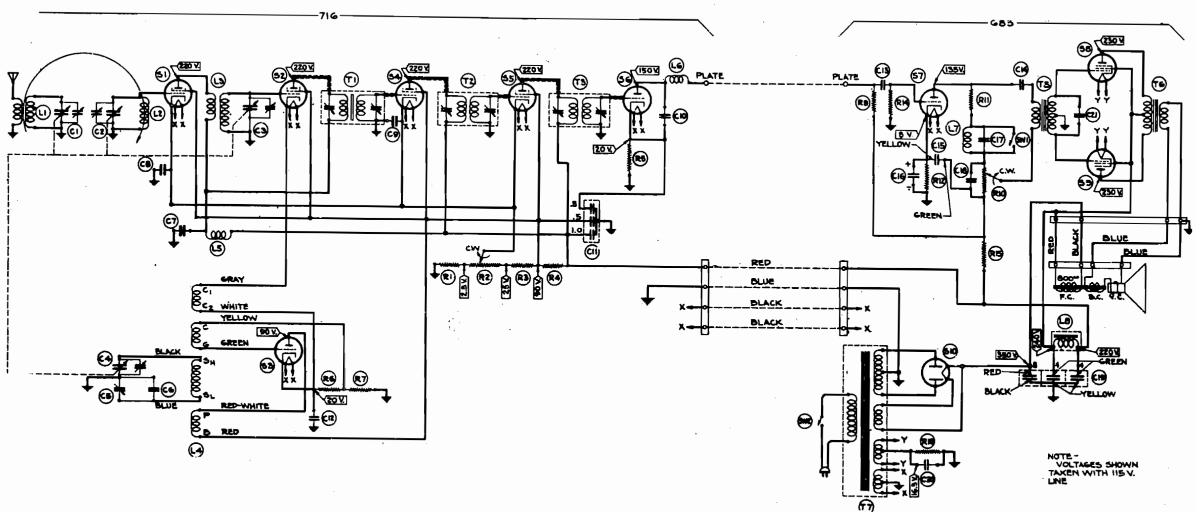


MODEL 716 Tuner & 683 Amplifier and Power Supply

C1-C2-C3-C4 - Vairable Condenser 365 Mmfd. Max - 5 Mmfd. 13217
C5 - Osc. Trimmer Cond. - 120 to 325 Mmf. 16035
C6 - 500 Mmfd. Cond.Mica - 10% 450-500 (Blue)500-550 (Red) "
C7 - .1 Mfd. Cond. 200 V.Sprague 3220
C8 - .1 Mfd. Cond. 200 V. " 3220
C9 - .1 Mfd. Cond. 200 V. " 3220
C10 - .001 Mfd. Cond. Mica 7039
C11 - .5,.5,1.0 Mfd. Cond.(.5-200V.)(1.0-300V.) 13140
C12 - .1 Mfd. Cond. 200V. 3220
C13 - .02 Mfd. Cond. 500V. 13195
C14 - .04 Mfd. Cond. 7046
C15 - 4 Mfd.Cond.Dry Electro 450V. 13177
C16 - 10 Mfd. Cond. Dry Electrolytic (25V.) 13023
C17 - .01 Mfd. Cond. Mica 7047
C18 - 0.25 Mfd. Cond. 500V.Sprague 3322
C19 - 2 4Mfd. Cond. Dry Electrolytic (450V.) 13177
1 8Mfd. Cond. " " '450V.) 13181
C20 - .1 Mfd. Cond. 200V. 3220
C21 - .00025 Mfd. Cond. Mica 3330

L1-L2 - 170 A Coil
L3 - 178 Coil
L4 - 179 Coil
L5 - 281 R.F.Choke
L6 - 281 R.F.Choke
L7 - 10164 Air Cone Choke
L8 - 10145 Choke

R1 - 100 Ohm Resistor - wire wound 4743
R2 - 4500 Ohm Volume Control 14342
R3 - 13,000 Ohm Resistor - 1 Watt.Carbon, Brown,Orange,Orange. 14694
R4 - 10,000 Ohm Resistor - 2 Watt. Carbon,Brown,Black, Orange. 4726
R5 - 60,000 Ohm Resisto - 1 Watt. Carbon,Blue, Black, Orange. 4698
R6 - 100 Ohms
R7 - 1700 Ohms } Wire wound tapped resistor No color 14723
R9 - 30,000 Ohm Resistor - 1 Watt.Carbon, Orange, Black,Orange 14693
R10 - 10,000 Potentiometer 4492
R11 - 720 Ohm Resistor - wire wound No color 4786
R12 - 2,600 Ohm Resistor - 1 watt Carbon Red,Blue,Red. 4770
R13 - 220 Ohm Resistor - 2 Watt.Ohmite (Red Devil) 14692
R14 - 300,000 Ohm Resistor 1 Watt.Carbon, Orange,Black,Yellow 4685
R15 - 10,000 Ohm Resistor 1 Watt.Carbon, Brown,Black,Orange 14696

S1-S4-S5 - '51 Tubes
S2 - '24 "
S3-S6-S7 - '27 "
S8-S9 - '47 "
S10 - '80 "

SW1 - Tone Control Switch 5485
SW2 - On-Off Switch (Combines with R2)

T1 - 1st I.F.Transformer (G-1)
T2 - 2nd I.F.Transformer (G-4) } Same spacing as G-3
T3 - 3rd I.F.Transformer (G-3)
T5 - 10159 Input Transformer
T6 - 10143 Output Transformer
T7 - 3470 Power Transformer.

List of Parts Used in 716 and 683.

There are two mounting holes left open on the tuner chassis for mounting the variable bass, and the high tone controls that are connected to flexible leads on the 683 amplifier.

Looking at the rear of the tuner, the antenna and ground posts are mounted on the top left of the chassis. On the right rear of the chassis is the output post marked "plate" This is connected to the input post on the 683 amplifier.

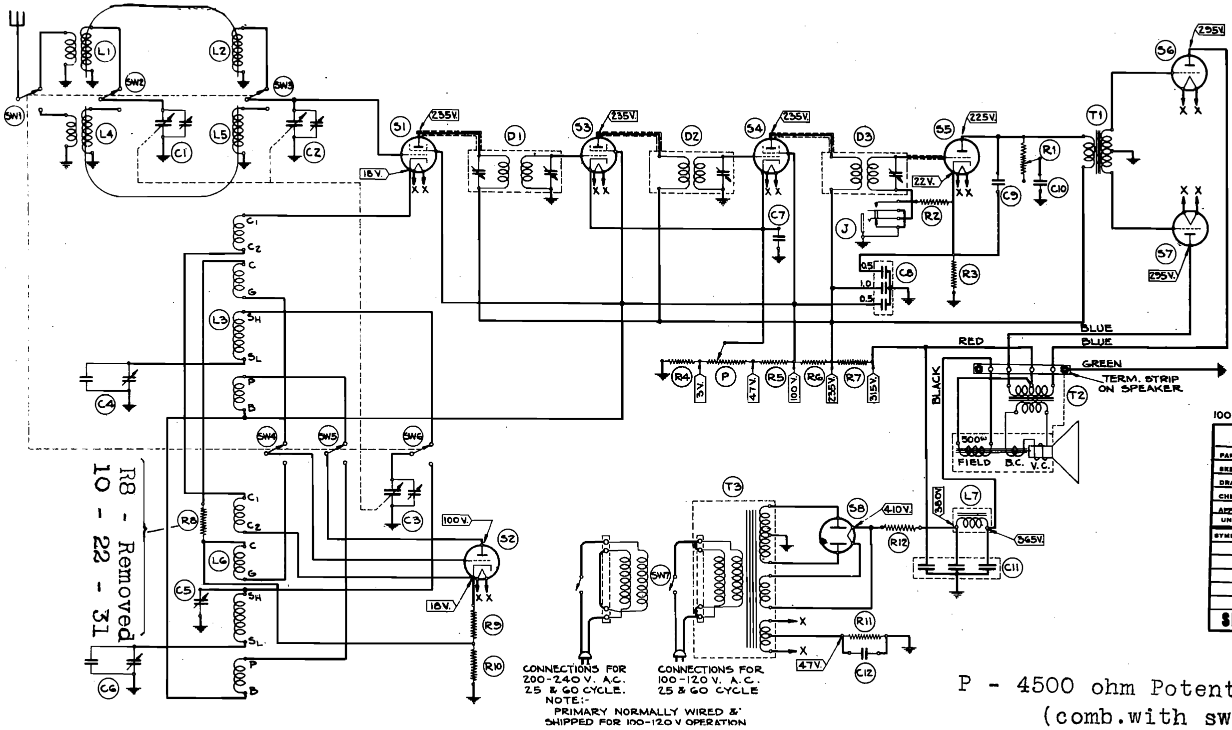
In the rear center of the chassis is a four terminal strip, color coded as follows: Red, Blue, Black, Black. A coded cable is furnished with the tuner for connecting this terminal strip to the 683 or similar amplifier.

The color code reads as follows: Red-B positive 240 volts, Blue-B negative or ground, Black, Black - 2½ volt heater or filament supply. The cable supplied with the tuner contains two heavy duty filament lead wires colored Green-Black and connect to the two Black terminals on this strip.

There are two sets of four terminal lugs on the back of the amplifier. Looking at the rear of the amplifier the set on the right are connections for the SM 855B speaker or similar type of speaker. Cable is furnished with the amplifier. This terminal strip is color coded as follows: red, black, blue, blue. The two blue leads connect to the speaker voice coil, the red and black to the field coil. The SM 855B speaker also has a four terminal strip similarly color coded. The four terminal strip to the left, looking at the rear of the amplifier, is filament and plate supply for the 716 tuner.

The 716-683 combination should be operated only on 100-120 volt A.C. 50 to 60 cycles current and should be operated with a D.C. type electro dynamic speaker such as the SM-855B having a field resistance of 800 Ohms, and a bucking coil and voice coil in series having an impedance of 15 Ohms.

SILVER - MARSHALL, Inc.



100-120 V. & 200-240 V. A.C. - 25 & 60 CYCLE

MODEL 773 RECEIVER	
PART NO.	MATL.
SKETCH BY F. S.	FINISH
DRAWN BY A.W.A.	SCALE
CHECKED BY	NO. REQD.
APPROVED	DATE 5-1-31

UNLESS OTHERWISE SPECIFIED-DEC. DIMENSIONS ±.005" FRACT. ±0"

SYMBOL	CHANGE	DATE	BY	APPRVD.

SILVER-MARSHALL, INC. 151

Model-773 Broadcast and Long Wave Receiver.

S1	224 Tube	
S3-S4	551 "	
S2-S5	227 "	
S6-S7	245 "	
S8	280 "	

C1-C2-C3	Variable Cond. 407 Mmfd. Max.	3253
C4	Broadcast Osc. Trimmer Cond.	16058
C5	400 kc. Trimmer Cond.	16035
C6	Long Wave Osc. Trimmer Cond.	16059
C7	.25 Mfd. Cond. 200 V. Rating	3322
C8	1.0 Mfd. 300 V., 0.5 Mfd. 200 V.	13140
C9	.001 Mfd. Cond. (Mica)	7039
C10	.025 Mfd. Cond. 400 V. Rating	3333
C11	Electrolytic Filter Cond. - Three 4 mfd.units 450 V.	13120
C12	0.1 Mfd. Cond. 200 V. Rating	3220

D1	1st I.F. Transformer
D2	2nd I.F. Transformer
D3	3rd I.F. Transformer

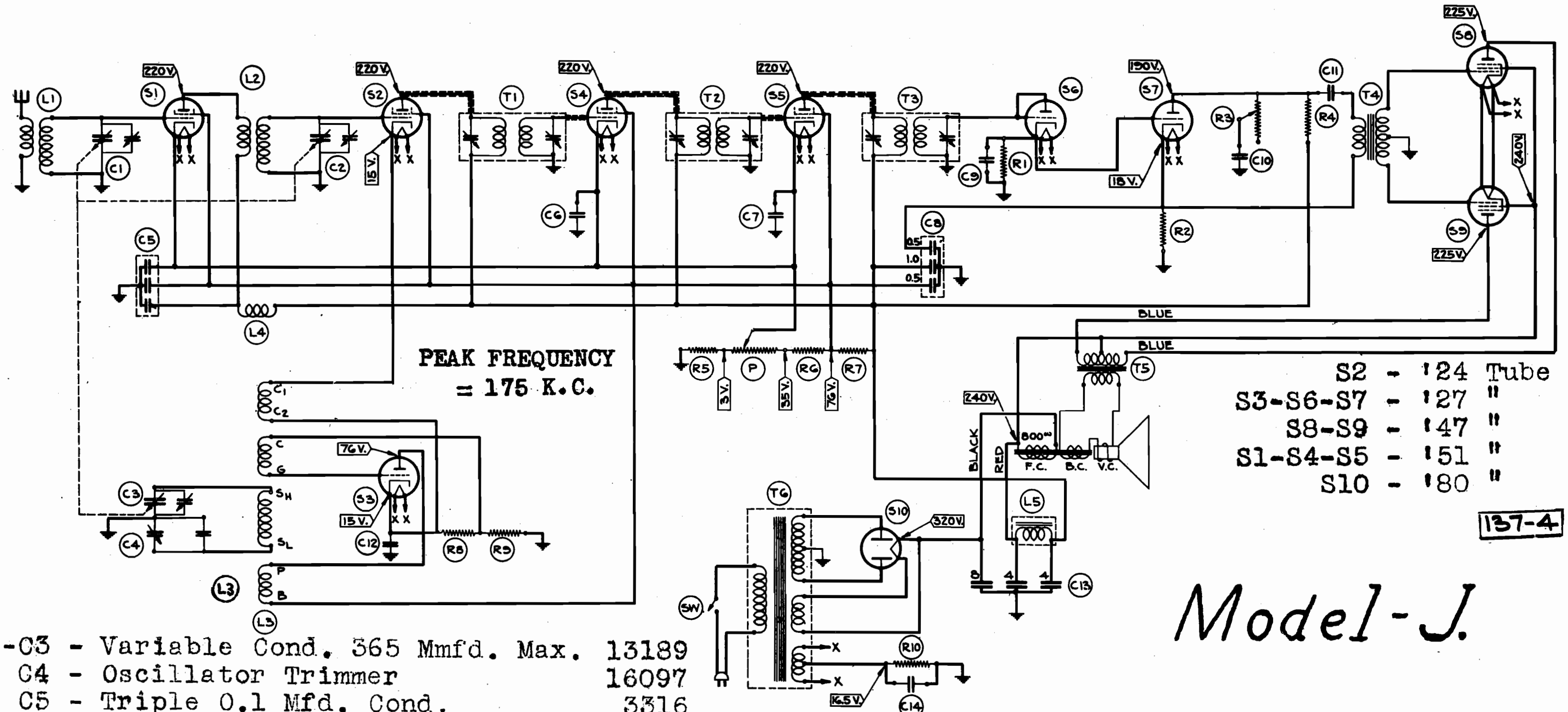
L1-L2	170 R.F. Coil (Broadcast)
L3	173 Oscillator Coil (Broadcast)
L4-L5	171 R.F. Coil (Long Wave)
L6	172 Oscillator Coil (Long Wave)
L7	339U Choke

P	4500 ohm Potentiometer (comb.with switch)		14342
R1	1/2 Megohm Variable Resistor		4507
R2	3500 ohm Resistor	1 watt Carbon	4804
R3	60,000 " "	1 watt Carbon	14695
R4	100 " "	wire wound	4743
R5	6500 " "	1 watt Carbon	
R6	5000 " "	3 watt Carbon	
R7	2000 " "	3 watt Carbon	
R8	400 " "	wire wound	4701
R9	100 ohm } 1800 ohm	{ wire wound tapped unit }	14723
R10	1700 ohm } 1800 ohm	{ wire wound tapped unit }	14723
R11	800 ohm Resistor	3 watt Carbon	4686
R12	300 ohm "	3 watt Carbon	14745

SW1-SW2-SW3	Change-over switch (R.F. coil)	15100
SW4-SW5-SW6	" " " (Osc. coil)	15100
SW7	On-off Switch (comb. with pot.)	

T1	270-S Input Trans.
T2	271-A Output "
T3	10175 Power "

P-4500 Ohm Potentiometer (Combination)
SW-On-Off A.C.Switch (Combined with Pot)



C1-C2-C3	-	Variable Cond. 365 Mmfd. Max.	13189
C4	-	Oscillator Trimmer	16097
C5	-	Triple 0.1 Mfd. Cond.	3316
C6	-	0.1 Mfd. Cond. 200 V.Rating	3220
C7	-	0.1 Mfd. Cond. 200 V.Rating	3220
C8	-	.5,.5,1.0 Mfd. Cond. (10. 300 V.0.5,0.5-200 V.)	13140
C9	-	.00015 Mfd. Cond. Mica	
C10	-	.06 Mfd. Cond.	
C11	-	0.15 Mfd. Cond.	
C12	-	0.1 Mfd. Cond. 200 V.Rating	
C13	-	Two 4 Mfd. (Dry Electro.) 450 V.Rating	
	-	One 8 Mfd. (" ") " " "	
C14	-	0.1 Mfd. Cond. 200 V.Rating	

L1 - 182 Antenna Coil
L2 - 178 R.F.Coil
L3 - 179 Osc.Coil
L4 - 281 R.F.Choke
L5 - 10145 Choke

R1	-	500,000 Ohm Resistor	1 Watt Carbon
R2	-	30,000 Ohm Resistor	1 Watt Carbon
R3	-	½ Megohm Tapered variable resistor	
R4	-	30,000 Ohm Resistor	1 Watt Carbon
R5	-	120 Ohm Resistor	Wire Wound
R6	-	10,000 Ohm Resistor	1 Watt Carbon
R7	-	10,000 Ohm Resistor	3 Watt Carbon
R8	-	100 Ohm) 1800 Ohm tapped resistor	
R9	-	1700 Ohm)	
R10	-	220 Ohm Resistor	2 Watt Carbon

T1 - C-1 I.F.Transformer
T2 - C-2 " " "
T3 - C-3 " " "
T4 - A-270 Input Transformer
T5 - 10143 Output Transformer
T6 - 10178 Power Transformer

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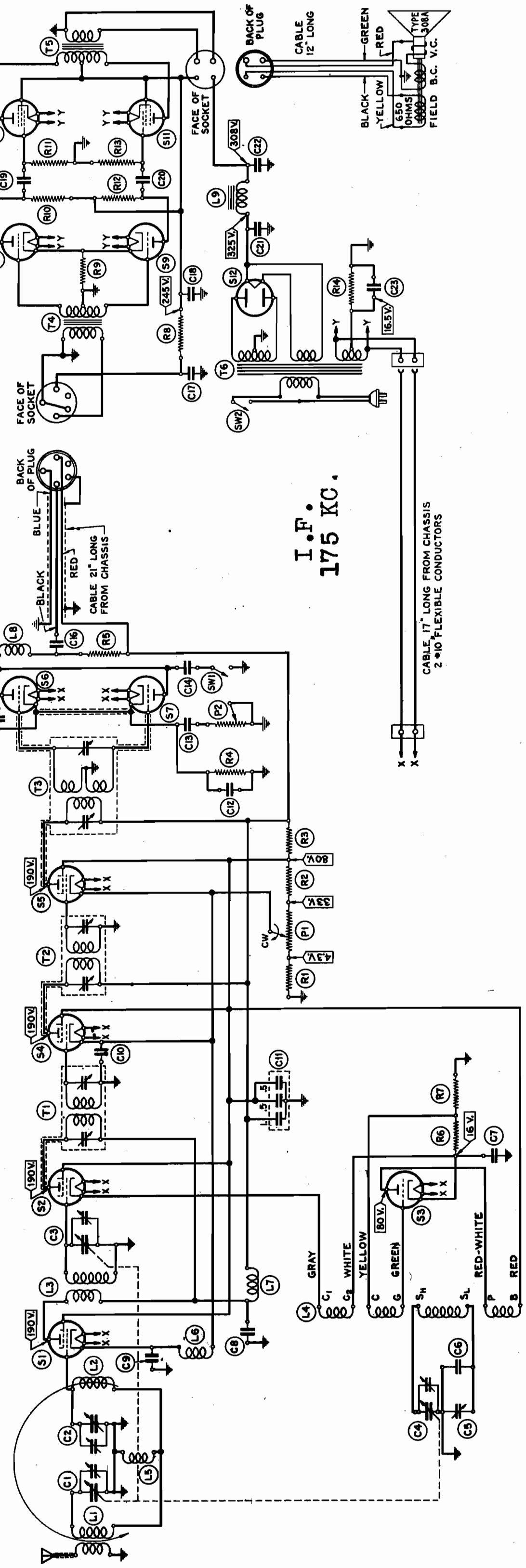
MODEL "C" SUPERHETERODYNE



S1-S4-S5 - '51 Tubes
S2 - '24 Tubes
S3 - '27 Tubes
S6-S7-S8-S9 - '27 Tubes
S10-S11- '47 Tubes
S12- '80 Tubes

T1 - 1st I.F.Trans. G-2
T2 - 2nd I.F.Trans. G-4
T3 - 3rd I.F.Trans. G-5
T4 - 10159 C.Transformer
T5 - 10143 G Transformer
T6 - 10193 Power Transformer

MODEL C RECEIVER
SKETCH BY K.C.
DRAWN BY M.K.
DATE 12-8-31
SILVER-MARSHALL, INC. 153-1

SILVER - MARSHALL, Inc.

MODEL "C" SUPERHETERODYNE (60 ∿)

C1-C2-C3-C4	- 365 Mmfd. Condenser ± 5 Mmfd. Max.	13217
C5	- Trimmer Cond. 120-325 Mmfd.)	16035
C6	- 750 Mmfd. Cond.(mica)±10%(675-750Blue)(750-825Red))	
C7-C8-C9	- .1 Mfd. Cond.	3220
C10	- .25 Mfd. Cond.	7114
	(1.Mfd. Cond.-300 V.)	
C11	-(.5 Mfd. Cond-200V.)	13140
	(.5 Mfd.Cond - 200 V)	
C12	- .04 Mfd. Cond.	7046
C13	- 1.Mfd. Cond. 150 V.Rating	3254
C14	- .025 Mfd. Cond.	3333
C15	- .001 Mfd. Cond.	7039
C16	- .08 Mfd. Cond.	13288
C17	- 8 Mfd. Cond.-450 V.Rating (Dry Electrolytic)	13181
C18	- 4 Mfd. Cond.-450 V.Rating (Dry Electrolytic)	13177
C19-C20	- .15 Mfd. Cond.	13145
C21	- 2 Mfd. Cond. - 600 V.Rating (Paper)	3328
C22	- 8 Mfd. Cond. - 450 V.Rating (Dry Electrolytic)	13181
C23	- .1 Mfd. Cond.	3220
L1	- 194s ANTENNA Coil	
L2	- 193s R.F.Coil	
L3	- 195s R.F.Coil	
L4	- 196s OSC.Coil	
L5	- 30 C Coupling Coil	
L6-L7-L8	- 281 Choke Coil	
L9	- 339U Filter Choke	
P1	- 4500 Ohm Potentiometer	14419
P2	- 20,000 Ohm Potentiometer	14427
R1	- 400 Ohm Resistor, Wire wound Blue	4701
R2	- 10,000 Ohm Resistor, 1 watt, Brown,Black,Orange	14696
R3	- 10,000 Ohm Resistor, 2 watt, Brown,Black,Orange	4726
R4-R5	- 25,000 Ohm Resistor, 1 watt, Brown,Black,Orange	4697
R6	- 100 Ohm Resistor) wire wound	14723
R7	- 1700 Ohm Resistor)	
R8	- 2600 Ohm Resistor 1 watt, Red,Blue,Red	4770
R9	- 1350 Ohm Resistor 1 watt,	14767
R10-R12	- 10,000 Ohm Resistor 1 watt, Brown,Black,Orange	14696
R11-R13	- 300,000 Ohm Resistor 1 watt, Orange,Black,Yellow	4685
R14	- 220 Ohm Resistor, 2 watt, Ohmite Red Devil	14766
SW1	- Tone Control Switch	5485
SW2	- On-Off Switch	5199

SILVER - MARSHALL, Inc.

MODEL 727-SW ALL WAVE SUPERHETERODYNE
16.5 TO 550 Meter

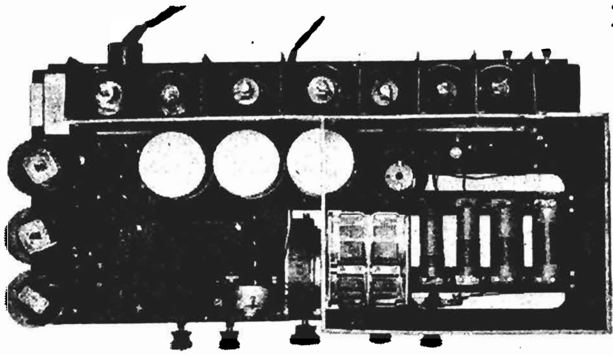


Fig. 2. Top inside view of the 727SW Tuning meter and dial are from laboratory, not final, model in this photograph.

Examining Fig. 2, the chassis is seen with the top of the large shield housing the gang condenser and all coils but the oscillator removed The four short wave coils are clearly visible, as is the gang condenser, 600 kc. oscillator trimmer screw adjustment; and the quite large broadcast antenna coil, with its small oversize primary visible in its center. The tubes are, right to left, '27 harmonic generator, '27 oscillator, '24 r.f. or first detector, two '51 i.f. tubes, '27 audio detector, '27 A.V.C. tube, two '47 pentodes and '80 rectifier. The tuning meter is seen above the dial, actually centered over the dial, and the i.f. transformers in the three round aluminum cans, their trimmers accessible from below. The power transformer is to the left of the dial, and the audio transformer at the left rear.

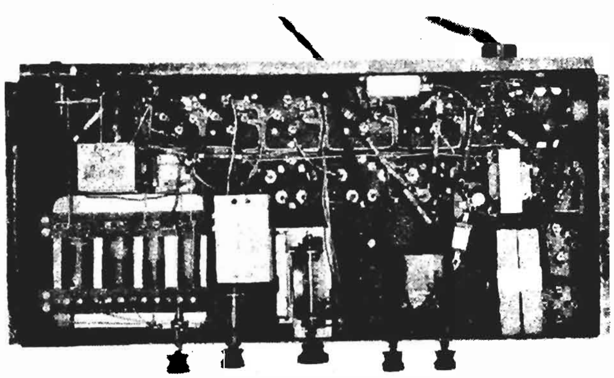
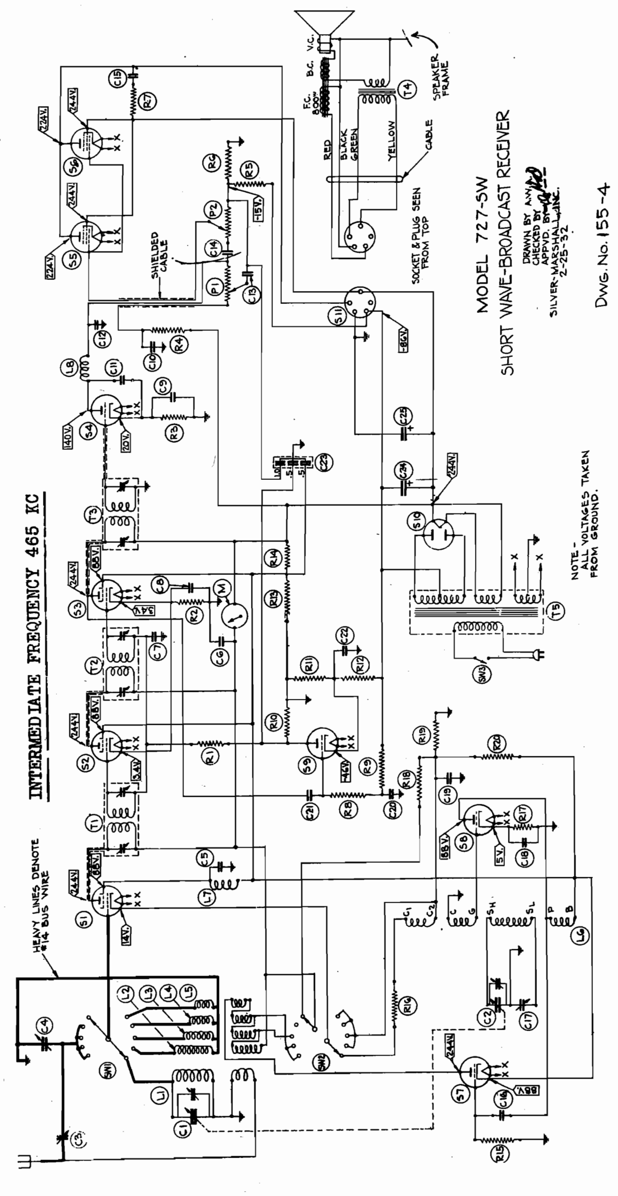


Fig. 3. Bottom view of the 727SW with shielding pan removed.

Looking at the bottom of the chassis, Fig. 3, the placement of parts is reasonably self-explanatory, the wave change switch seen next to the short-wave antenna tuning condenser, and behind it the shielded oscillator coil. The antenna compensating (series) condenser is seen at the left rear corner of the chassis, near the antenna and ground binding posts. The control arrangement seen from the front is, left to right, on-off switch and volume control, tone control, tuning, short wave antenna tuning, and five point range selector switch.



SILVER - MARSHALL, Inc.

MODEL 727-SW ALL WAVE SUPERHETERODYNE

C1-C2	2 Gang Variable Condenser-365 mmfd.Max. $\pm$5 mmfd. 0°-90° $\pm$1 mmfd. 90°-180° $\pm\frac{1}{2}$ of 1%	13372
C3	25 Mmfd. Trimmer Cond.	16249
C4	200 Mmfd. Variable trimmer condenser	13302
C5	0.1 Mfd. Condenser - Sprague 200 V.	3220
C6	0.1 Mfd. Condenser - Sprague 200 V.	3220
C7	0.1 Mfd. Condenser - Sprague 200 V.	3220
C8	0.1 Mfd. Condenser - Sprague 200V.	3220
C9	0.1 Mfd. Condenser - Sprague 200 V.	3220
C10	½ Mfd. Condenser - Polymet Waxtite 200 V.	13329
C11	.001 Mfd.Condenser - Mica	7039
C12	.001 Mfd.Condenser - Mica	7039
C13	.025 Mfd.Condenser - Sprague 200 V.	3333
C14	.025 Mfd.Condenser - Sprague 200 V.	3333
C15	.03 Mfd.Condenser - Sprague 700 V.	13331
C16	.00015 Mfd. Condenser - Mica	3313
C17	Oscillator Trimmer Condenser	16179
C18	0.1 Mfd. Condenser - Sprague 200 V.	3220
C19	0.1 Mfd. Condenser - Sprague 200 V.	3220
C20	0.15Mfd. Condenser - Sprague	13145
C21	.0005 Mfd. Condenser - Mica	7052
C22	0.1 Mfd. Condenser - Sprague 200 V.	3220
C23	1.0,.5,.5 Mfd. Condenser	13140
C24	8 Mfd. Dry Electrolytic Cond. 450 V.	13181
C25	12 Mfd. Dry Electrolytic Cond. 450 V.	3162
M	Tuning Meter - 15 M.A.	13923
P1	100,000 Ohm Pot. (Tone control)	14438
P2	250,000 Ohm Pot. (Volume control-Comb.with A.C.Switch)	4360
R1	100,000 Ohm Resistor - 1 watt carbon	14691
R2	250 Ohm Resistor - wire wound	4725
R3	60,000 Ohm Resistor - 1 watt carbon	4695
R4	25,000 ohm Resistor - 1 watt carbon	4697
R5	500,000 Ohm Resistor - 1 watt carbon	4772
R6	100,000 Ohm Resistor - 1 watt carbon	14691
R7	5,000 Ohm Resistor - 1 watt carbon	14765
R8	1 Megohn Resistor - 1 watt carbon	4759
R9	1 Megohn Resistor - 1 watt carbon	4759
R10	1 Megohn Resistor - 1 watt carbon	4759
R11	12,000 Ohm Resistor - 1 watt carbon	4746
R12	9,000 Ohm Resistor - 1 watt carbon	14746
R13 - R14	8,250 Ohm / 6,500 Ohm — 14,750 Ohm R.D.Ohmite - 3 watt	14781
R15	300,000 Ohm Resistor - 1 watt carbon	4685
R16	400 Ohm Resistor - wire wound	4701
R17	400 Ohm Resistor - wire wound	4701
R18	300,000 Ohm Resistor - 1 watt carbon	4685
R19	3,500 Ohm Resistor - 1 watt carbon	4804
R20	60,000 Ohm Resistor - 1 watt carbon	4695
SW1-SW2	Tandem change-over switch	15298
SW3	A.C.switch (Combination with volume control)	

L1 - 197 Broadcast Antenna Coil (550-1500 K.C.)
L2 - 302 Short Wave Antenna Coil (1.56-3.46 megacycles)
L3 - 201 Short Wave Antenna Coil (3.51-5.36 megacycles)
L4 - 200 Short Wave AntennaCoil (5.54-10.29 megacycles)
L5 - 199 Short Wave Antenna Coil (9.6-18.15)megacycles)
L6 - 198 Oscillator Coil
L7 - 281 R.F.Choke
L8 - 283 R.F.Choke

T1 - Q-1 I.F.Transformer
T2 - Q-2 I.F.Transformer
T3 - Q-4 I.F.Transformer
T4 - 10208 Output Transformer
T5 - 10202 Power Transformer

S1 - '24 Tube
S4-S7-S8-S9 - '27 Tubes
S5-S6 - '47 Tubes
S2-S3 - '51 Tubes
S10 - '80 Tubes
S11 - Speaker Socket

SILVER - MARSHALL, Inc.

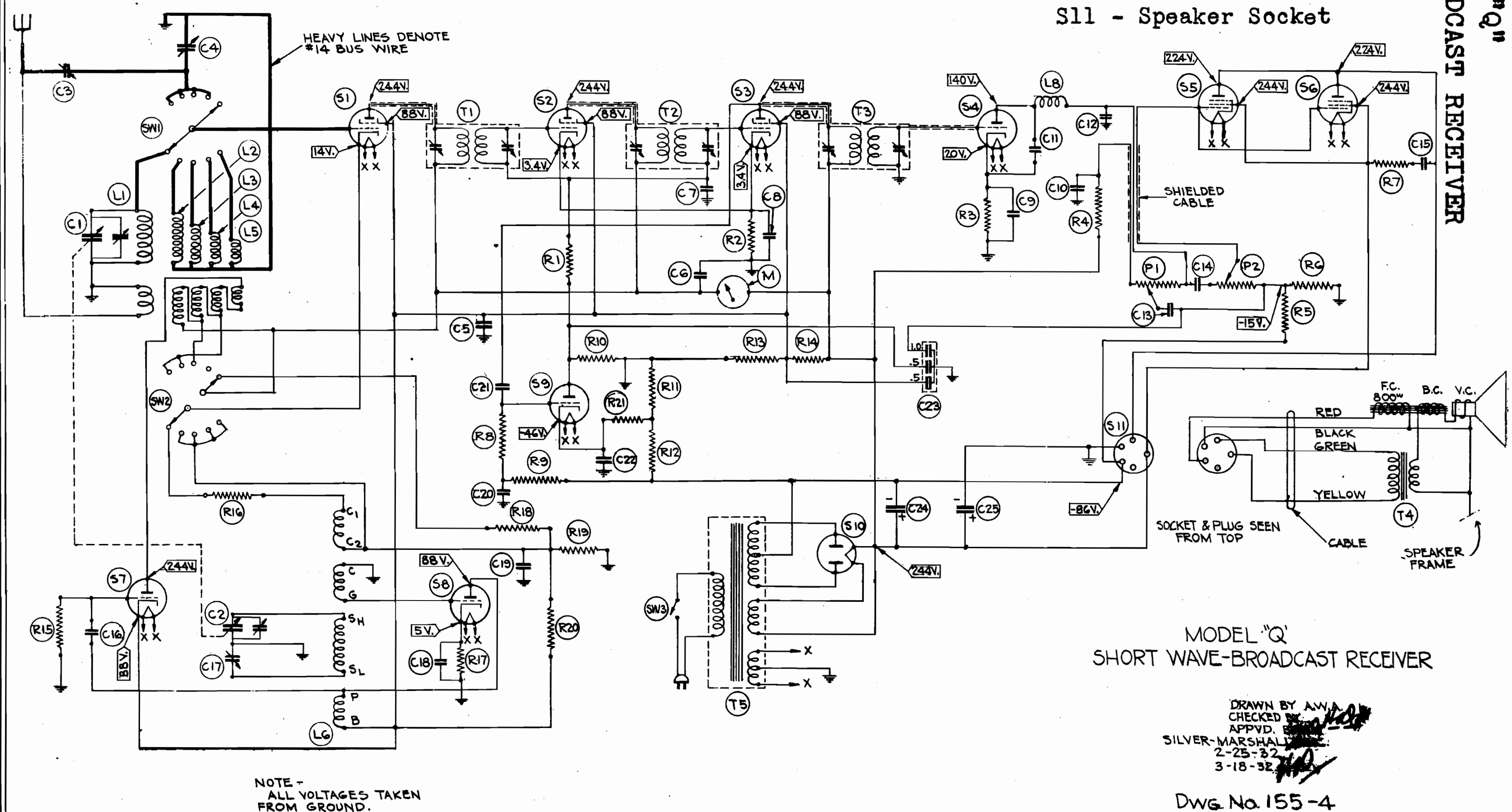
MODEL "Q"
SHORT WAVE - BROADCAST RECEIVER

L1 - 197 Broadcast Antenna Coil (550-1500 K.C.)
L2 - 202 Short Wave Antenna Coil (1.56-3.46 megacycles)
L3 - 201 Short Wave Antenna Coil (3.51-5.36 megacycles)
L4 - 200 Short Wave Antenna Coil (5.54-10.29 megacycles)
L5 - 199 Short Wave Antenna Coil (9.6-18.15 megacycles)
L6 - 198 Oscillator Coil
L8 - 283 R.F.Choke

M - Tuning Meter - 15 M.A.

T1 - Q-1 I.F.Transformer
T2 - Q-2 I.F.Transformer
T3 - Q-4 I.F.Transformer
T4 - 10208 Output Transformer
T5 - 10202 Power Transformer

S1 - '24 Tube
S4-S7-S8-S9- '27 Tubes
S5-S6 - '47 Tubes
S2 S3 - '51 Tubes
S10 - '80 Tube
S11 - Speaker Socket



MODEL "Q"
SHORT WAVE-BROADCAST RECEIVER

DRAWN BY A.W.A.
CHECKED
APPVD.
SILVER-MARSHALL
2-25-32
3-18-32

Dwg. No. 155-4

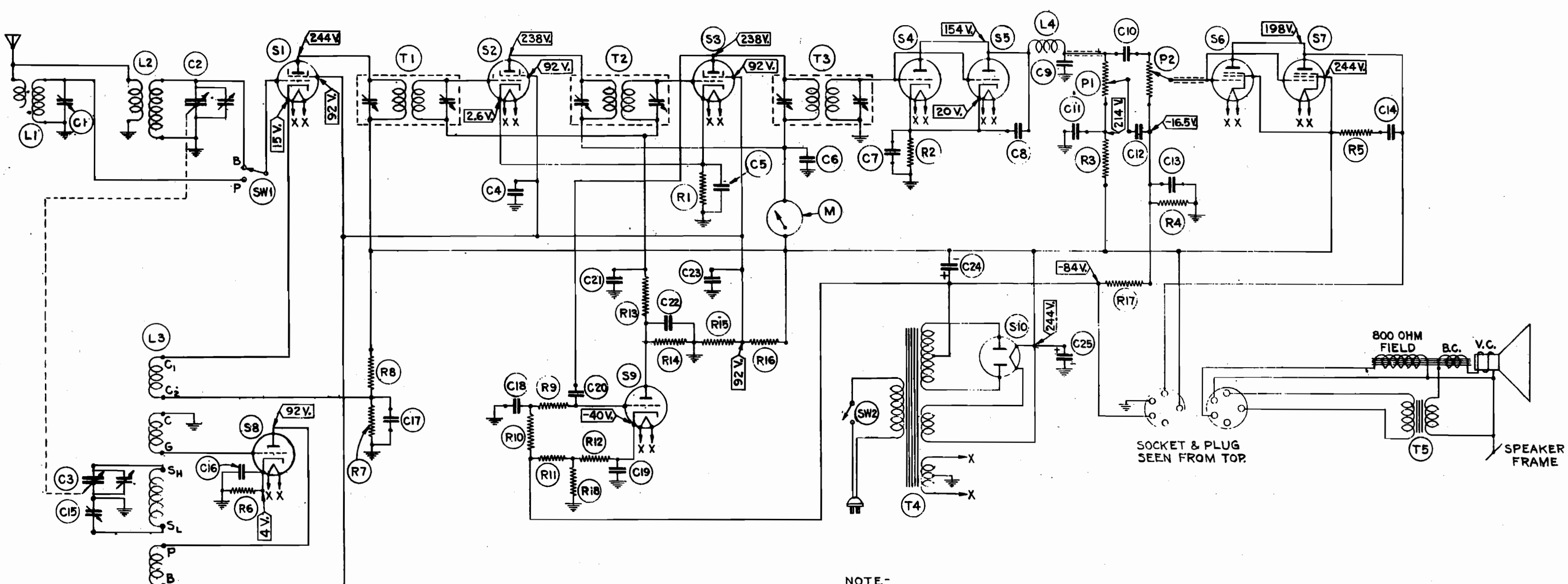
SILVER - MARSHALL, Inc.

MODEL "Q" SHORT WAVE - BROADCAST RECEIVER (Revised)

C1-C2	2 Gang Variable Condenser - 365 mmfd. Max.-5 mmfd. 0°-$90^\circ \pm 1$ mmfd. 90°-$180^\circ \pm \frac{1}{2}$ of 1%	13372
C3	25 mmfd. Trimmer Cond.	16249
C4	200 mmfd. Variable Trimmer Condenser	13302
C5	4 mfd. Dry Electrolytic Cond. 450 V.	13177
C6	0.1 mfd. Condenser - Sprague 400 V.	3173
C7	0.1 mfd. Condenser - Sprague 200 V.	3220
C8	0.1 mfd. Condenser - Sprague 200 V.	3220
C9	0.1 mfd. Condenser - Sprague 200 V.	3220
C10	$\frac{1}{2}$ mfd. Condenser - Polymet Waxtite 200 V.	13329
C11	.001 mfd. Condenser - Mica	7039
C12	.001 mfd. Condenser - Mica	7039
C13	.025 mfd. Condenser - Sprague 200 V.	3333
C14	.025 mfd. Condenser - Sprague 200 V.	3333
C15	.03 mfd. Condenser - Sprague 700 V.	13331
C16	.00015 mfd. Condenser - Mica	3313
C17	Oscillator Trimmer Condenser	16179
C18	0.1 mfd. Condenser - Sprague 200 V.	3220
C19	0.1 mfd. Condenser - Sprague 200 V.	3220
C20	0.15 mfd. Condenser - Sprague	13145
C21	.0005 mfd. Condenser - Mica	7052
C22	$\frac{1}{2}$ mfd. Condenser - Polymet Waxtite 200 V.	13329
C23	1.0, .5, .5 mfd. Condenser	13140
C24	8 mfd. Dry Electrolytic Cond. 450 V.	13181
C25	12 mfd. Dry Electrolytic Cond. 450 V.	3162
R1	100,000 ohm Resistor - 1 watt carbon	14691
R2	250 ohm Resistor - wire wound	4725
R3	60,000 ohm Resistor - 1 watt carbon	44695
R4	25,000 ohm Resistor - 1 watt carbon	4697
R5	500,000 ohm Resistor - 1 watt carbon	4772
R6	100,000 ohm Resistor - 1 watt carbon	14691
R7	5,000 ohm Resistor - 1 watt carbon	14765
R8	1 megohm Resistor - 1 watt carbon	4759
R9	1 megohm Resistor - 1 watt carbon	4759
R10	1 megohm Resistor - 1 watt carbon	4759
R11	12,000 ohm Resistor - 1 watt carbon	4746
R12	9,000 ohm Resistor - 1 watt carbon	14746
R13 - R14	8,250 ohm) 6,500 ohm) 14,750 ohm R.D. Ohmite - 3 watt	14781
R15	300,000 ohm Resistor - 1 watt carbon	4685
R16	400 ohm Resistor - wire wound	4701
R17	400 ohm Resistor - wire wound	4701
R18	300,000 ohm Resistor - 1 watt carbon	4685
R19	3,500 ohm Resistor - 1 watt carbon	4804
R20	60,000 ohm Resistor - 1 watt carbon	4695
R21	60.000 ohm Resistor - 1 watt carbon	4695
P1	100,000 ohm Pot. (Tone control)	14438
P2	250,000 ohm Pot. (Volume control-Comb.with A.C.Switch)	4360
SW1-SW2	Tandem Change-over switch	15298
SW3	A.C.switch (Combination with volume contrel)	

SILVER - MARSHALL, Inc.

T1 - Q-1 I.F. Transformer	L1 - 203 Police Call Coil	S1 - '24 Tube
T2 - Q-2 I.F. Transformer	L2 - 204 Antenna Coil	S2-S3 - '51 Tubes
T3 - Q-4 I.F. Transformer	L3 - 205 Oscillator Coil	S4-S5-S8-S9 - '27 Tubes
T4 - 10202 Power Transformer	L4 - 283 R.F Choke	S6-S7 - '47 Tubes
T5 - 10208 Output Transformer.		S10 - '80 Tube



NOTE-
ALL VOLTAGES MEASURED
FROM GROUND.

DRAWN BY M.K.
CHECKED BY
APPVD. BY
SILVER-MARSHALL, INC.
MARCH 3, 1932.

Dwg. No. 156

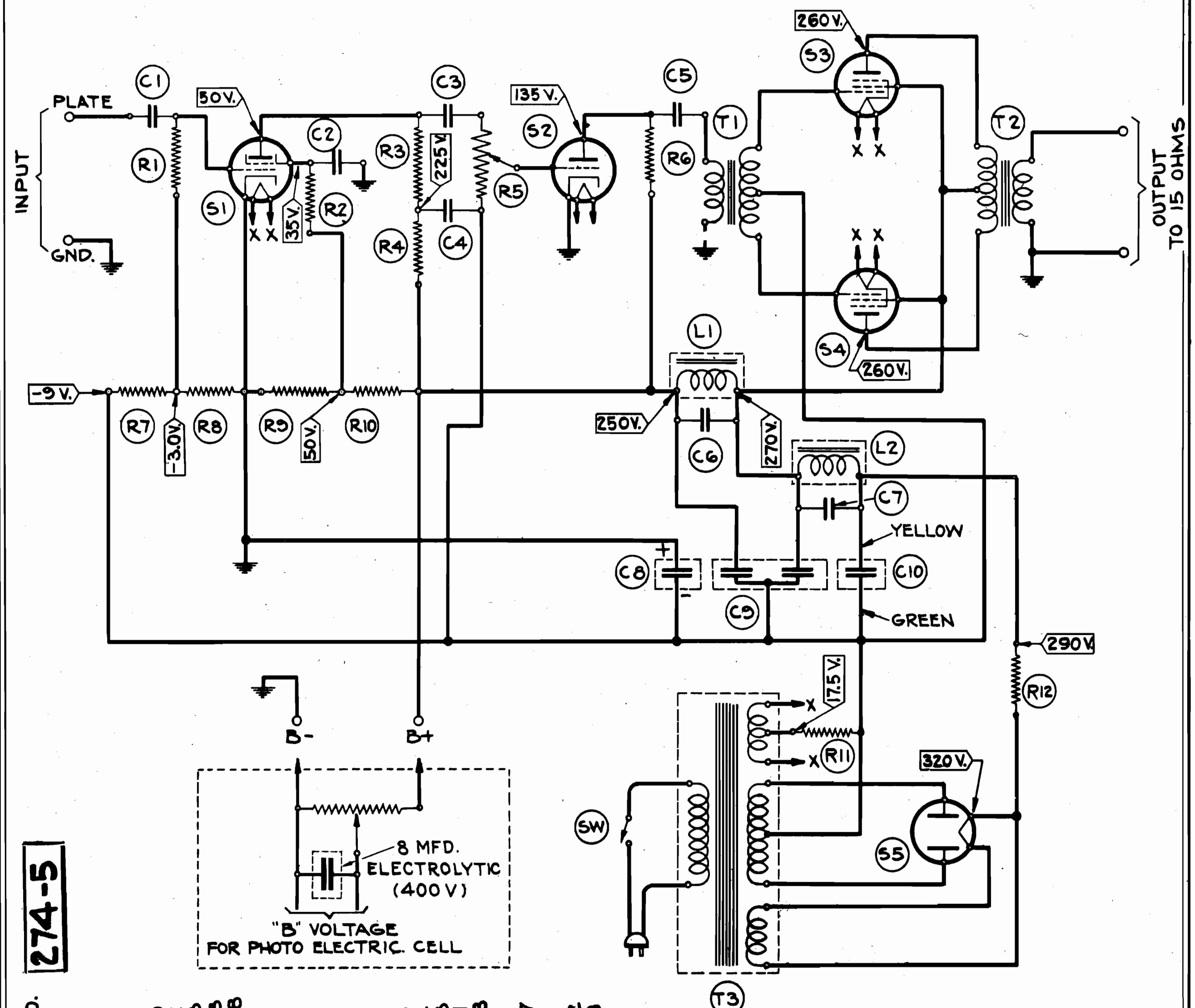
MODEL "R" SUPERHETERODYNE

SILVER - MARSHALL, Inc.

MODEL "R" SUPERHETERODYNE

C1	- 48-112 mmfd. Trimmer Condenser	16275
C2-C3	- 2 gang variable Condenser - 365 mmfd. max.	13372
C4	- 4 mfd. Dry Electrolytic Condenser 450 V.	13177
C5	- .1 Mfd. Condenser 200 V.	3220
C6	- .1 Mfd. Condenser 400 V.	3173
C7	- .1 mfd. Condenser 200 V.	3220
C8	- .001 Mfd. Condenser - mica	7039
C9	- .001 Mfd. Condenser - Mica	7039
C10	- .025 Mfd. Condenser - Sprague 200 V.	3333
C11	- ½ Mfd. ,Condenser - Polymet Waxtite- 200 V.	13329
C12	- .025 Mfd. Condenser - Sprague 200 V.	3333
C13	- 1 Mfd. Cond. (1,½,½, mfd. Unit)	13140
C14	- .03 Mfd. Condenser - Sprague 700 V.	13331
C15	- 75-500 Mfd. Osc.Trimmer Condenser	16179
C16	- .1 Mfd. Condenser - Sprague 200 V.	3220
C17	- .1 Mfd. Condenser - Sprague 200 V.	3220
C18	- .15 Mfd. Condenser - Sprague 200 V.	13145
C19	- ½ Mfd. Condenser - Polymet Waxtite 200 V.	13329
C20	- .0005 Mfd. Condenser - Mica	7052
C21	- .1 Mfd. Condenser - Sprague 200 V.	3220
C22	- ½ Mfd. Condenser (See C13)	
C23	- ½ Mfd. Condenser (See C13)	
C24	- 8 Mfd. Dry Electrolytic Condenser 450 V.	13181
C25	- 12 Mfd. Dry Electrolytic Condenser 450 V.	3162
M	- Tuning Meter - 15 ma.	13923
P1	- 100,000 Ohm Pot. (Tone Control)	14438
P2	- 250,000 Ohm Pot. (Vol Control combined with A,C.Switch)	4360
R1	- 250 Ohm Resistor - wire wound	4725
R2	- 60,000 Ohm Resistor - 1 watt carbon	4695
R3	- 25,000 Ohm Resistor - 1 watt carbon	4697
R4	- 100,000 Ohm Resistor - 1 watt carbon	14691
R5	- 5,000 Ohm Resistor - 1 watt carbon	14765
R6	- 400 Ohm Resistor - wire wound	4701
R7	- 3,500 Ohm Resistor - 1 watt carbon	4804
R8	- 80,000 Ohm Resistor - 1 watt carbon	14778
R9	- 1 Megohn Resistor - 1 watt carbon	4759
R10	- 1 Megohn Resistor - 1 watt carbon	4759
R11	- 9,000 Ohm Resistor - 1 watt carbon	14746
R12	- 60,000 Ohm Resistor - 1 watt carbon	4695
R13	- 100,000 Ohm Resistor - 1 watt carbon	14691
R14	- 1 megohm Resister - 1 watt carbon	4759
R15	- 8,250 Ohms) 14,750 Ohm R,D,Ohmite - 3 watt	14781
R16	- 6,500 ohms)	
R17	- ½ Megohm Resistor - 1 watt	4772
R18	- 12,000 Ohm Resistor - 1 watt	4746
SW1	- Change-over Switch	15327
SW2	- A.C.Switch (Combined with Vol.Control)	

SILVER - MARSHALL, Inc.



274-5

LEGEND		P.P. NO.
C1 - .05 MFD. SPRAGUE (400 V.)		13127
C2 - 1.0 MFD. (150V.)		3325
C3 - .01 MFD. (MICA)		7047
C4 - 1.0 MFD. (200V.)		7116
C5 - .25 MFD. SPRAGUE (750V.)		3322
C6 - .1 MFD. " "		3220
C7 - .25 MFD. " "		3322
C8 - 10 MFD. ELECTROLYTIC (25 V.) DRY		13203
C9 - 2 MFD.(PAPER) (400 V.)		3328
2 MFD.(PAPER) (400 V.)		3328
C10 - 8 MFD. ELECTROLYTIC (450 V.) DRY		13181
L1 - 10145 CHOKE		
L2 - 339-U CHOKE		
R1 - 2 MEGOHMS	1 WATT	4700
R2 - 60,000 OHMS	1 WATT	4698
R3 - ½ MEGOHM	1 WATT	4772
R4 - 30,000 OHMS	1 WATT	14693
R5 - 1 MEGOHM TAPERED VARIABLE RESISTOR		14371
R6 - 30,000 OHMS	1 WATT	14693
R7 - 250 OHMS		
R8 - 125 OHMS	5 WATT	14727
R9 - 2300 OHMS		
R10 - 11,300 OHMS		
R11 - 220 OHMS	2 WATT	14692
R12 - 300 OHMS	5 WATT	14728
S1 - '24		
S2 - '27		
S3 - '47		
S4 - '47		
S5 - '80		
SW - ON-OFF SWITCH		5485
T1 - 10159 INPUT TRANS.		
T2 - 10143 OUTPUT TRANS.		
T3 - 360-U POWER TRANS.		

S - M 684
AMPLIFIER

SILVER - MARSHALL, Inc.

Instructions for S-M 684 Amplifier

NOTE: Before using the S-M 684 amplifier, be sure to read these instructions carefully.

DESCRIPTION:

The S-M 684 Power Amplifier is a three stage 90 DB gain amplifier developing an undistorted output of six to eight watts when operating directly into the voice coil of an a.c. operated electro-dynamic speaker such as the S-M 852 having a voice coil impedance of 15 ohms. The amplifier requires a speaker without an input transformer.

The amplifier is suitable for working directly out of a P.E. cell, (furnishing its necessary polarizing voltage), or out of a microphone when using the S-M 10147 or S-M 10154 transformers described on Page 6 of the S-M Parts Catalog.

Tubes required:

2 - '47 Pentode Power Tubes
1 - '24 Tube
1 - '27 Tube
1 - '80 Rectifier Tube

Note: Many '47 pentode power tubes will show a decided blue glow. This is not an indication of a gassy or defective power tube but is an efflorescence on the surface of the glass which causes no harm whatever.

CONNECTIONS:

Speaker

With the speaker amplifier tubes facing toward you, the two binding posts at the right hand side of the amplifier connect to the voice coil of the speaker.

Microphone Input

The grid terminal of the microphone transformer secondary will connect to the binding post on the extreme left hand end of the amplifier that is insulated from the chassis. The grid return or "F" post of the microphone transformer will connect to the other binding post at the left end of the chassis. Volume will be regulated by the left hand knob located on the front of the amplifier. The right hand knob is the on-off switch.

P.E. Cell Input

The anode terminal of the P.E. cell will connect to the ungrounded input binding post at the left hand side of the chassis, the cathode to the grounded terminal opposite. Polarizing voltage is applied by connecting a 100,000 ohm potentiometer across the two binding posts at the center of the amplifier. The moving arm of the potentiometer connects to one side of a 2 megohm resistor (or proper size recommended by P.E. cell manufacturer) the other side of this resistor connecting to the anode of the P.E. cell.

CAUTION: The input, output and power supply leads should be well separated to prevent coupling.

SPARKS WITHINGTON CO.
SPARTON OF CANADA LTD.

Standard Resistor Color Code and Resistors Used In Sparton Radio Receiving Sets and Sparton Ensembles

STANDARD RESISTOR COLOR CODE

0—Black	5—Green
1—Brown	6—Blue
2—Red	7—Violet
3—Orange	8—Gray
4—Yellow	9—White

To determine the value of a resistor, the first significant figure of resistance value is represented by the color of the body of the resistor, and the second figure of resistance value by the color of the tip of the resistor. The number of ciphers following the second figure is determined by the color of the dot or stripe in the center of the body of the resistor. For example, a 20,000 ohm resistor has a red body, black tip, with orange dot or orange stripe. A 2,200 ohm resistor would be red body, with red tip and red dot, or red stripe, and as all colors are the same, it would be a single color resistor.

SPARTON PART NO.	RESISTANCE, OHMS	SIZE, WATTS	OLD COLOR	STANDARD RESISTOR COLOR CODE BODY	TIP	DOT OR STRIPE
A-2934	20,000	2	Green	Red	Black	Orange
A-3397	1,000	2	Tan	Brown	Black	Red
A-3397-X	1,000	0.5	Tan	Brown	Black	Red
A-3423	50,000	2	Red	Green	Black	Orange
*A-3750	1,250	3	Black, Silver Ends	Brown	Orange	Red
A-4107	15,000	5	Black, Silver Ends	Brown	Green	Orange
A-4234	250,000	5	Brown, Blue Ends	Red	Green	Yellow
A-4261	20,000	1	Green	Red	Black	Orange
A-4353	2,800	0.5	Gray	Red	Gray	Red
A-4613	1,700	1	Brown	Brown	Violet	Red
A-4614	10,000	1	Blue	Brown	Black	Orange
A-5139	30,000	1	Red	Orange	Black	Orange
A-5180	5,000	15	Green	Green	Black	Red
A-5269	500,000	1	Green	Black	Black	Yellow
A-5270	250,000	1		Red	Green	Yellow
A-5354	100,000	1		Brown	Black	Yellow

*1250 ohm resistors same color scheme as 1300 ohm resistors.

Standard Resistor Color Code Is Not Applied to Vitreous Enamel Resistors

SPARTON PART NO.	RESISTANCE OHMS	SIZE WATTS	COLOR	SPARTON PART NO.	RESISTANCE OHMS	SIZE WATTS	COLOR
A-4363	7	20	Blue	A-4365	15	50	Blue
A-4364	12	30	Blue	A-5177	160	1	Blue
A-4365	63	10	Blue	A-5426	2,400-1,800	8	Blue
A-5889	54	175	Blue	A-5990	14	6	Blue

Standard Color Code Is Not Applied to Wire Wound Resistors

SPARTON PART NO.	RESISTANCE OHMS	SIZE, WATTS	COLOR	SPARTON PART NO.	RESISTANCE OHMS	SIZE, WATTS	COLOR
A-3383	3,000	10	Black	A-4915	110	1	Black
A-3535	7,000	10	Black	A-4974	1,250	5	Gray
A-3536	900	10	Black	A-5137	330	1	Gray
A-3811	30,000	0.5	Black	A-5502	200	1	Red
A-4260	7,000-2,000	20	Black	A-5861	57	175	Blue
A-4363	7	20	Black	A-5862	12	10	Blue
A-4583	7,000	10	Black	A-5863	2	5	Blue
A-4670	110	1	Black				

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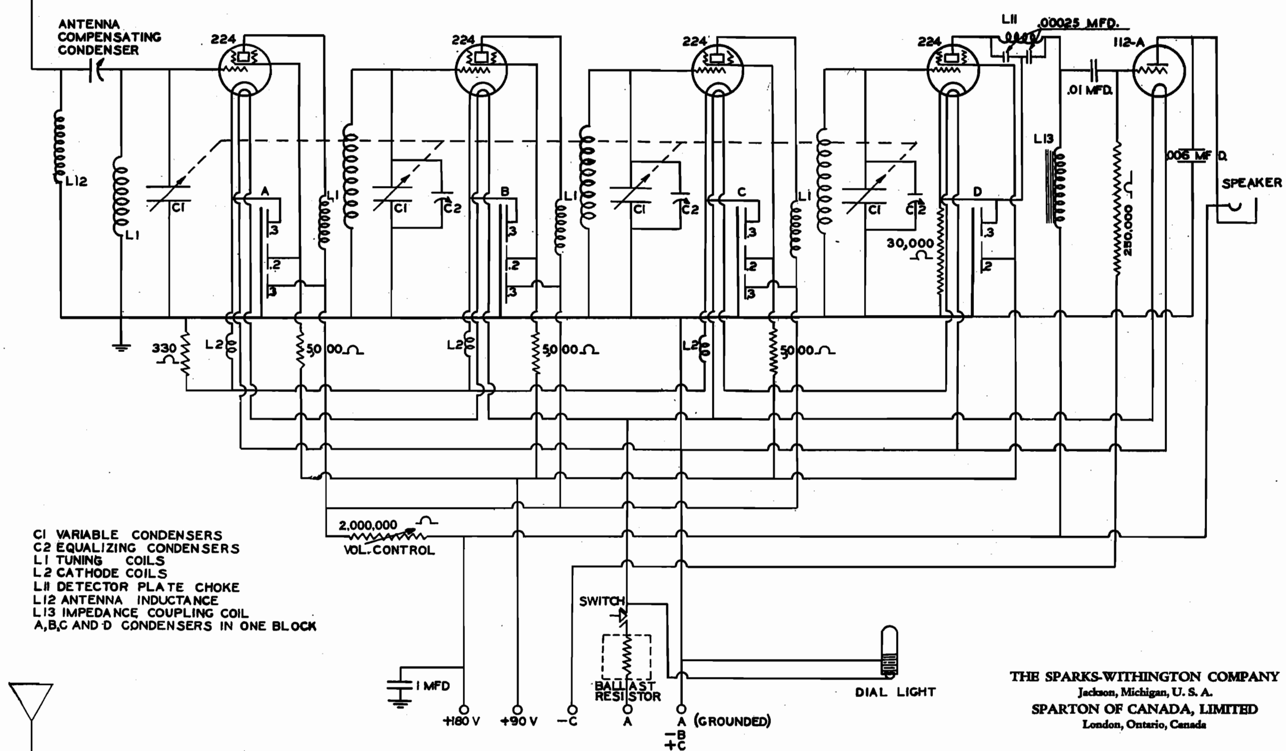
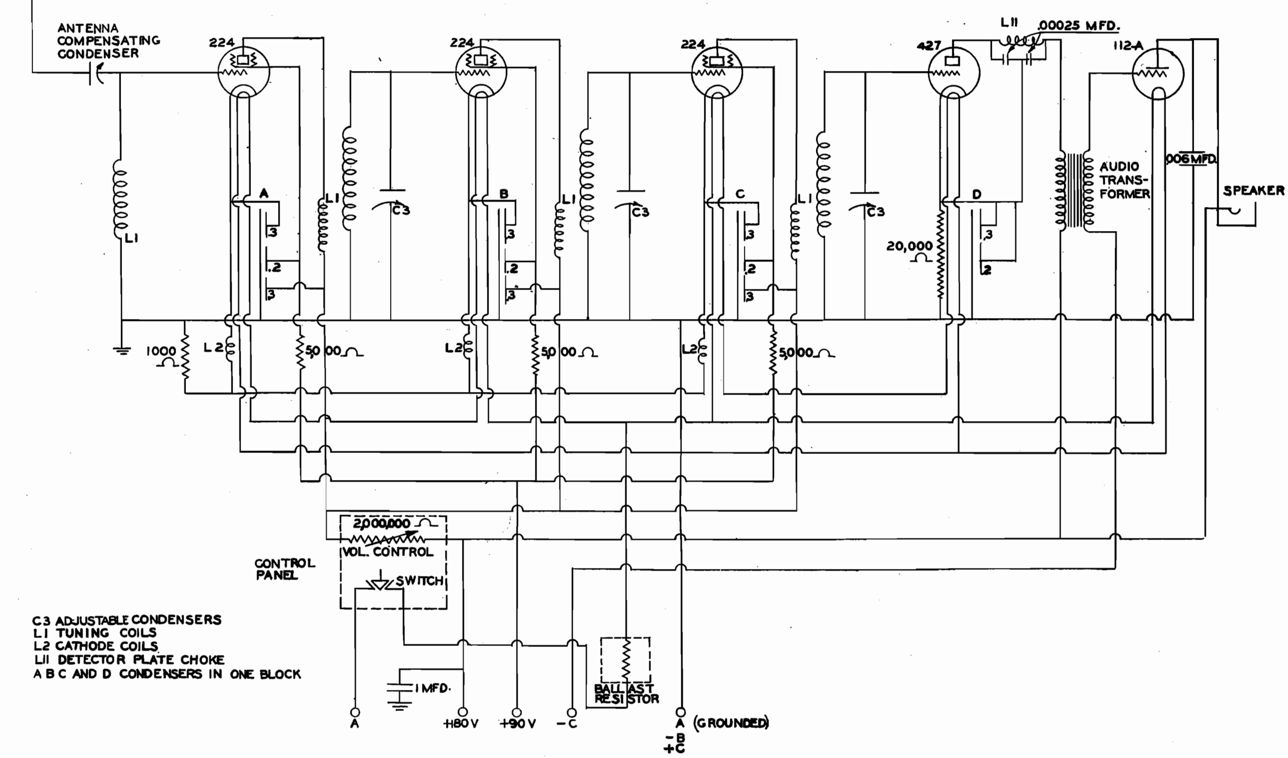
SPARTON MODEL A.R.-19



C1 VARIABLE CONDENSERS
C2 EQUALIZING CONDENSERS
L1 TUNING COILS
L2 CATHODE COILS
L11 DETECTOR PLATE CHOKE
L12 ANTENNA INDUCTANCE
L13 IMPEDANCE COUPLING COIL
A,B,C AND D CONDENSERS IN ONE BLOCK

THE SPARKS-WITHINGTON COMPANY
Jackson, Michigan, U. S. A.
SPARTON OF CANADA, LIMITED
London, Ontario, Canada

SPARTON MODEL AR-50
POLICE AUTOMOBILE RADIO



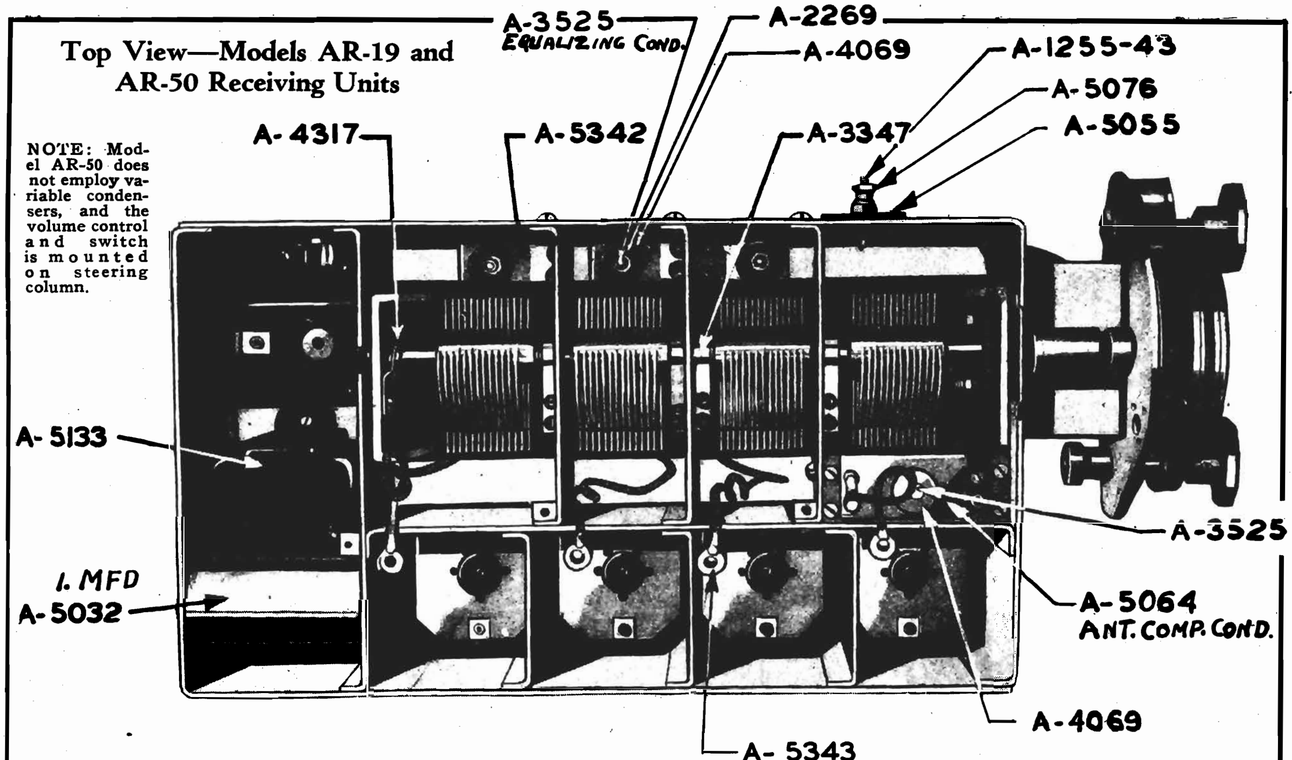
C3 ADJUSTABLE CONDENSERS
L1 TUNING COILS
L2 CATHODE COILS
L11 DETECTOR PLATE CHOKE
A B C AND D CONDENSERS IN ONE BLOCK

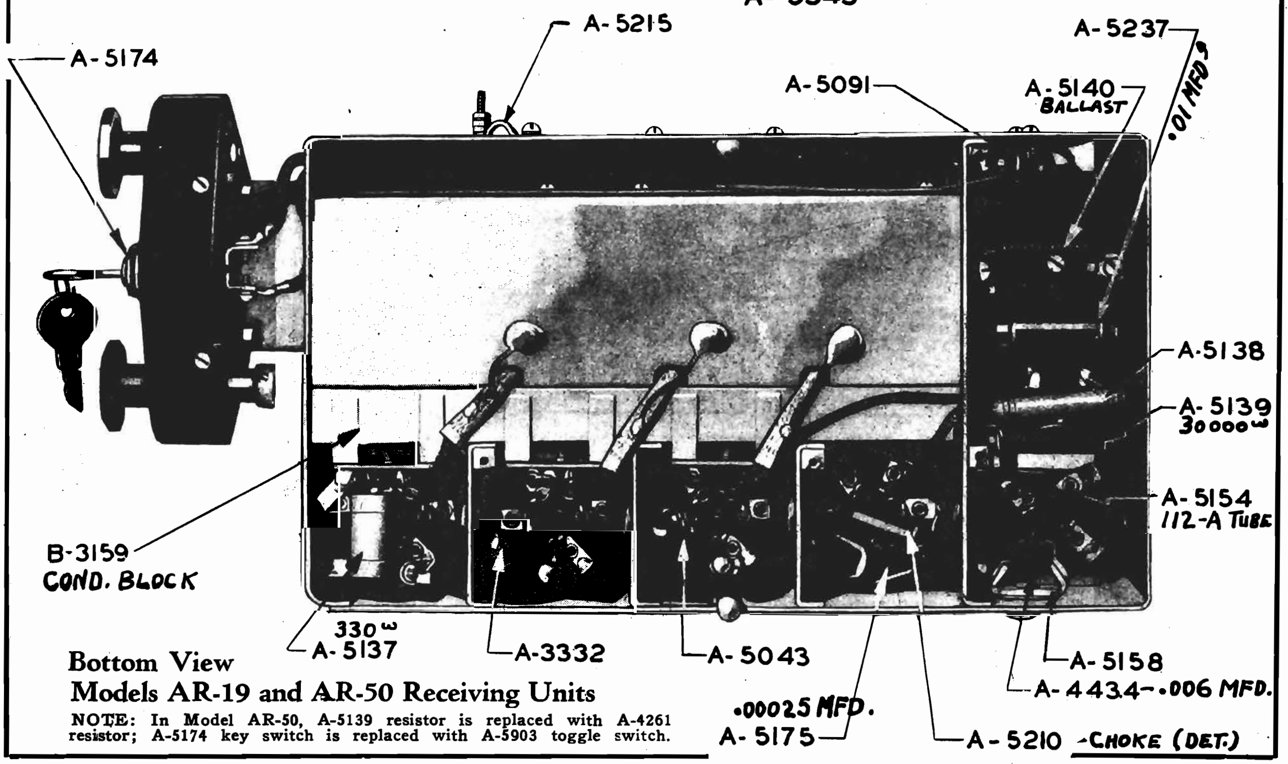
For Alignment Data see Page 568-X
For chassis layout see Page 568-C

SPARKS WITHINGTON CO.
SPARTON OF CANADA LTD.

Top View—Models AR-19 and AR-50 Receiving Units

NOTE: Model AR-50 does not employ variable condensers, and the volume control and switch is mounted on steering column.





Bottom View
Models AR-19 and AR-50 Receiving Units

NOTE: In Model AR-50, A-5139 resistor is replaced with A-4261 resistor; A-5174 key switch is replaced with A-5903 toggle switch.

PART #A5217 FOR SPARK PLUG=.01 MFD
PART #A5238 FOR GENERATOR=.01 MFD

For chassis layout see Page 568-C

SPARKS WITHINGTON CO.
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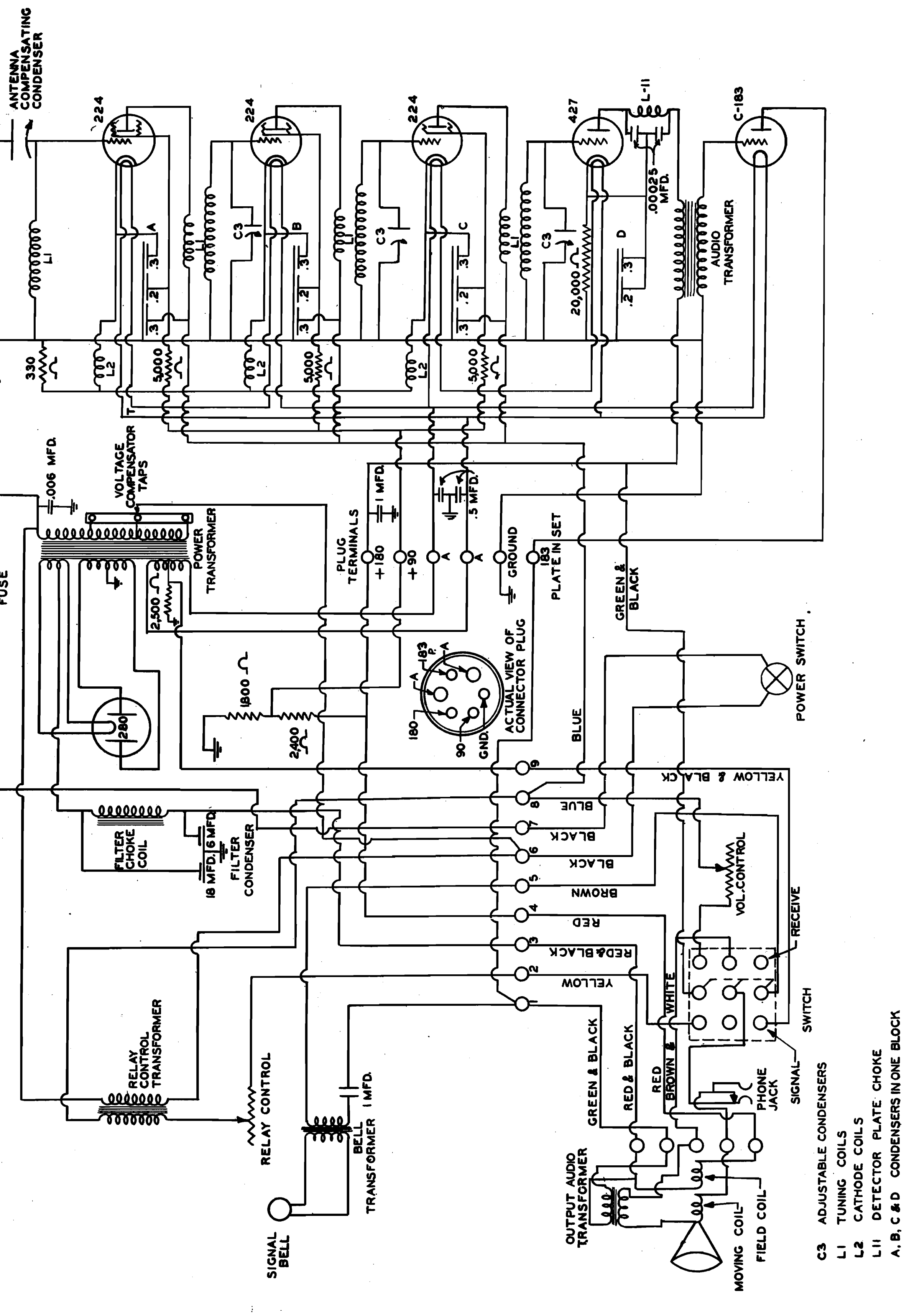
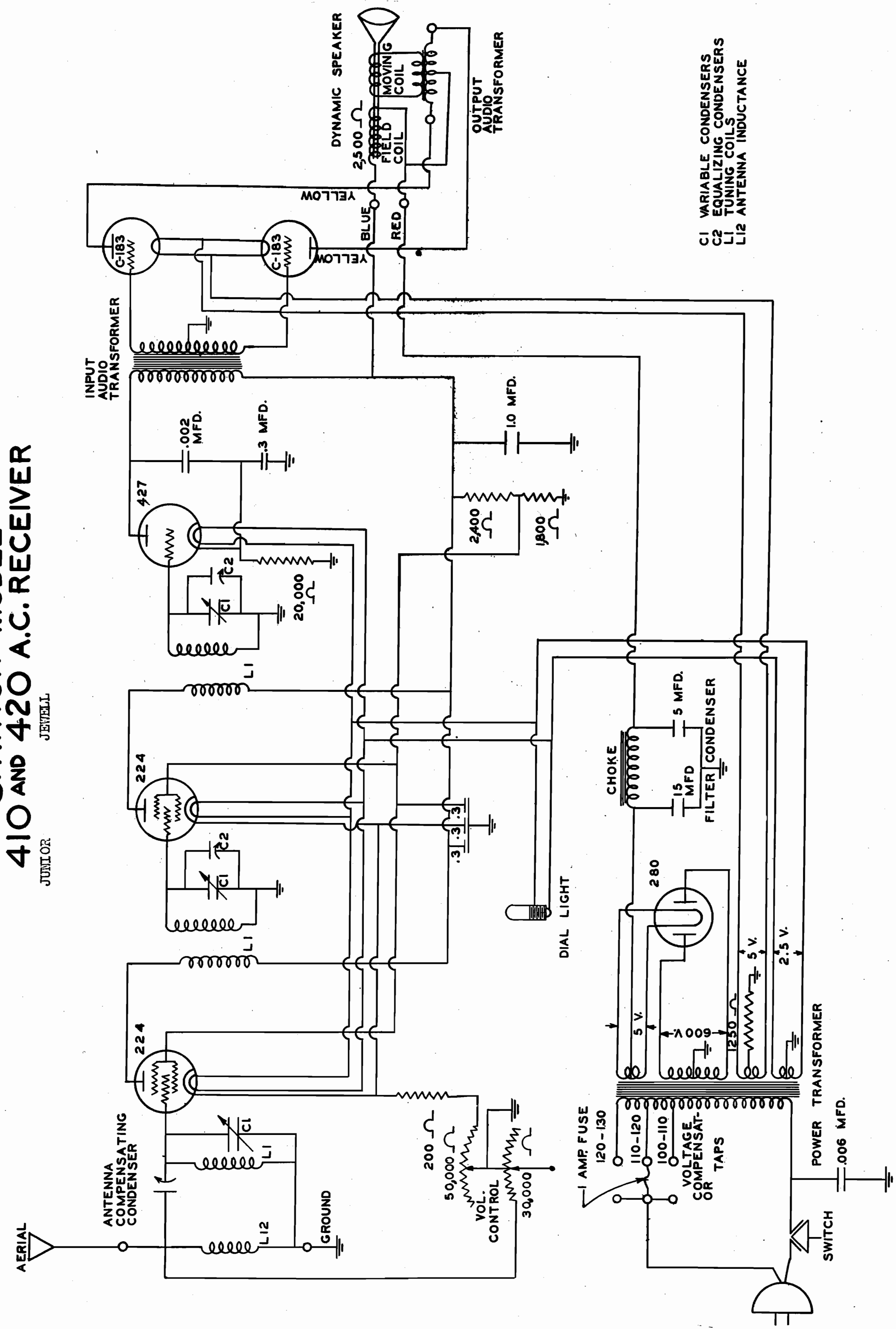
SPARTON MODEL 55 A.C. POLICE BARRACKS RADIO



SPARKS WITHINGTON CO.
SPARTON OF CANADA LTD.

SPARTON MODEL 410 AND 420 A.C. RECEIVER

JUNIOR JEWELL



For Chassis Layout see Page 568-F. For Alignment Data see Page 568-X

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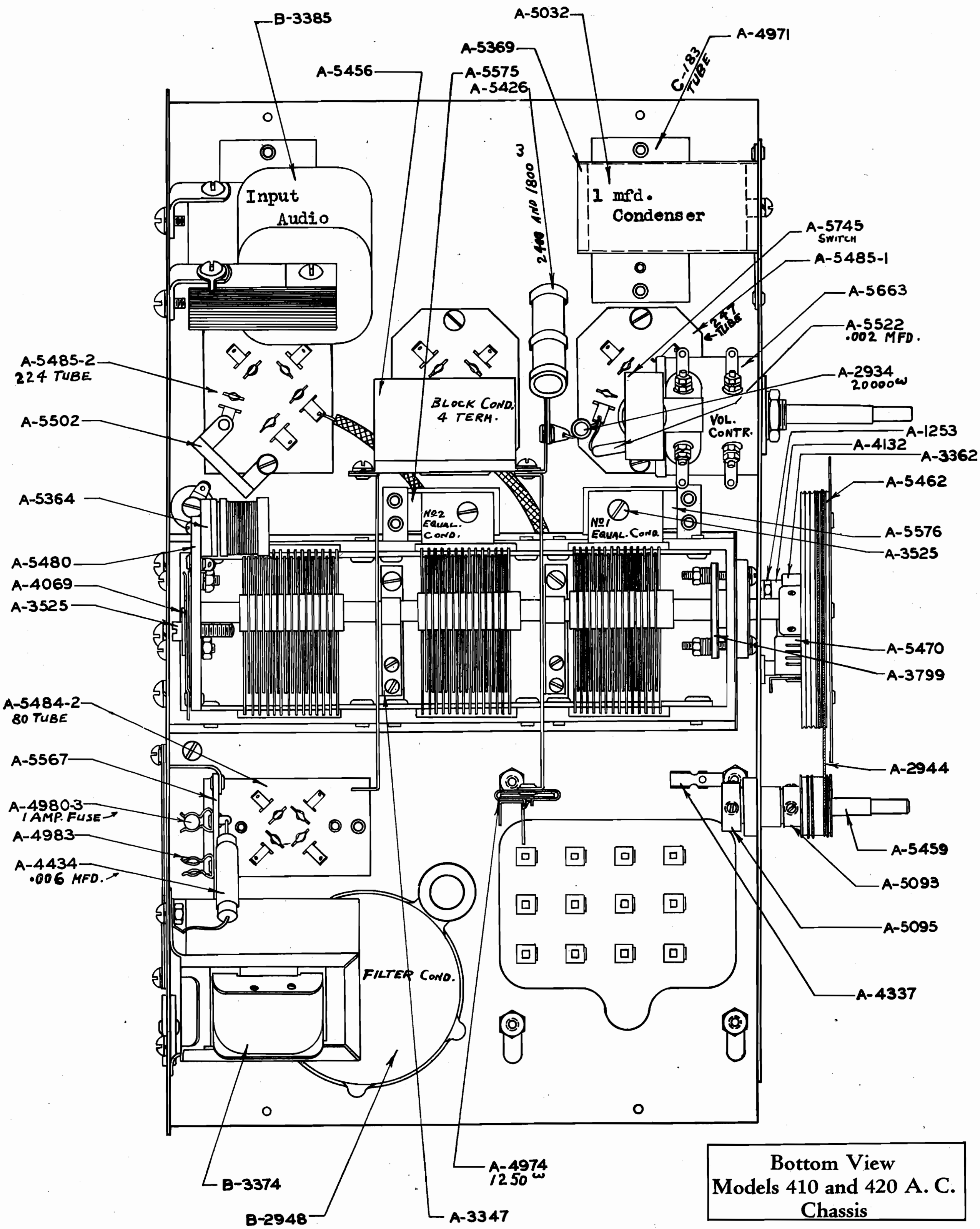
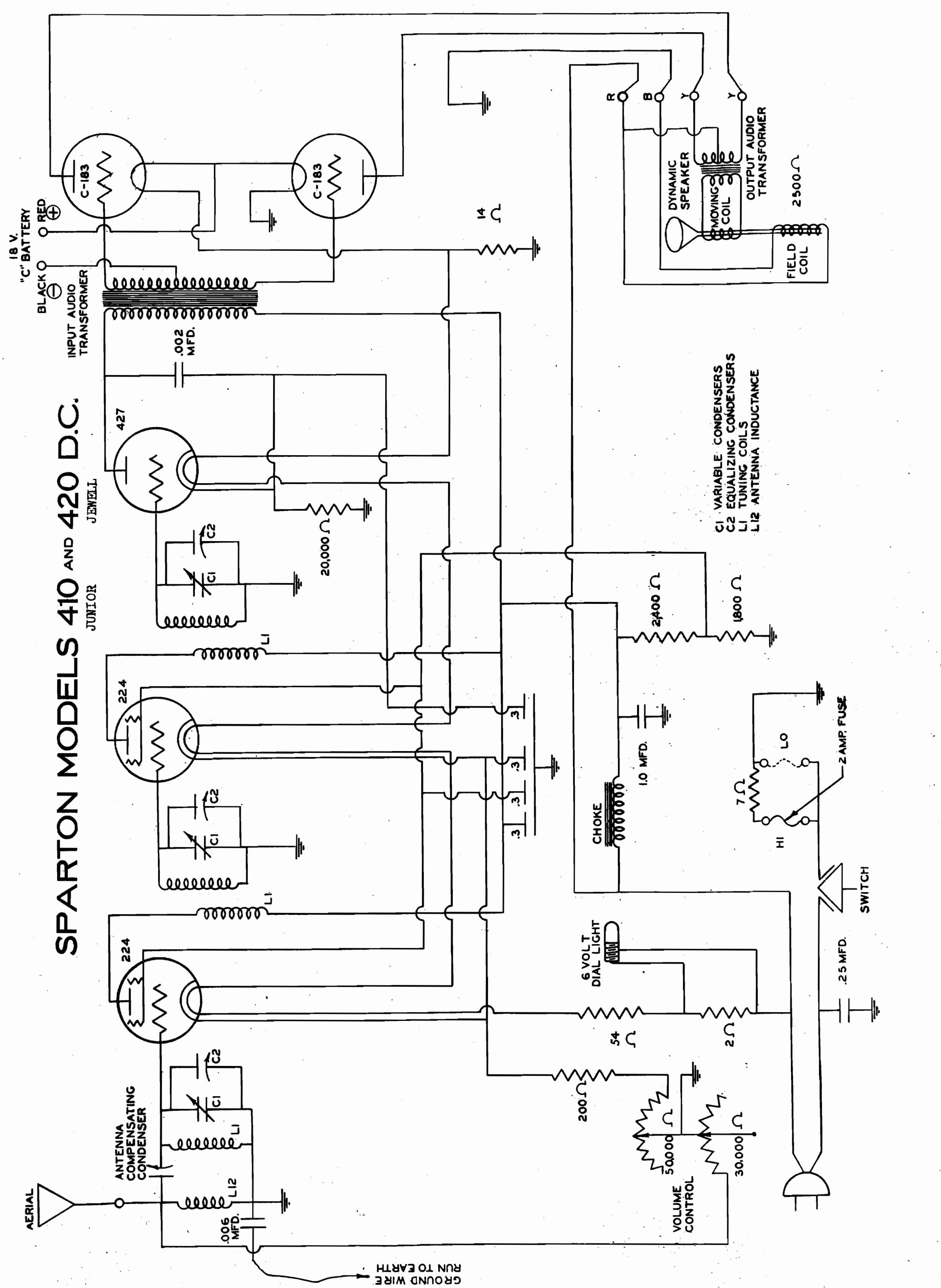


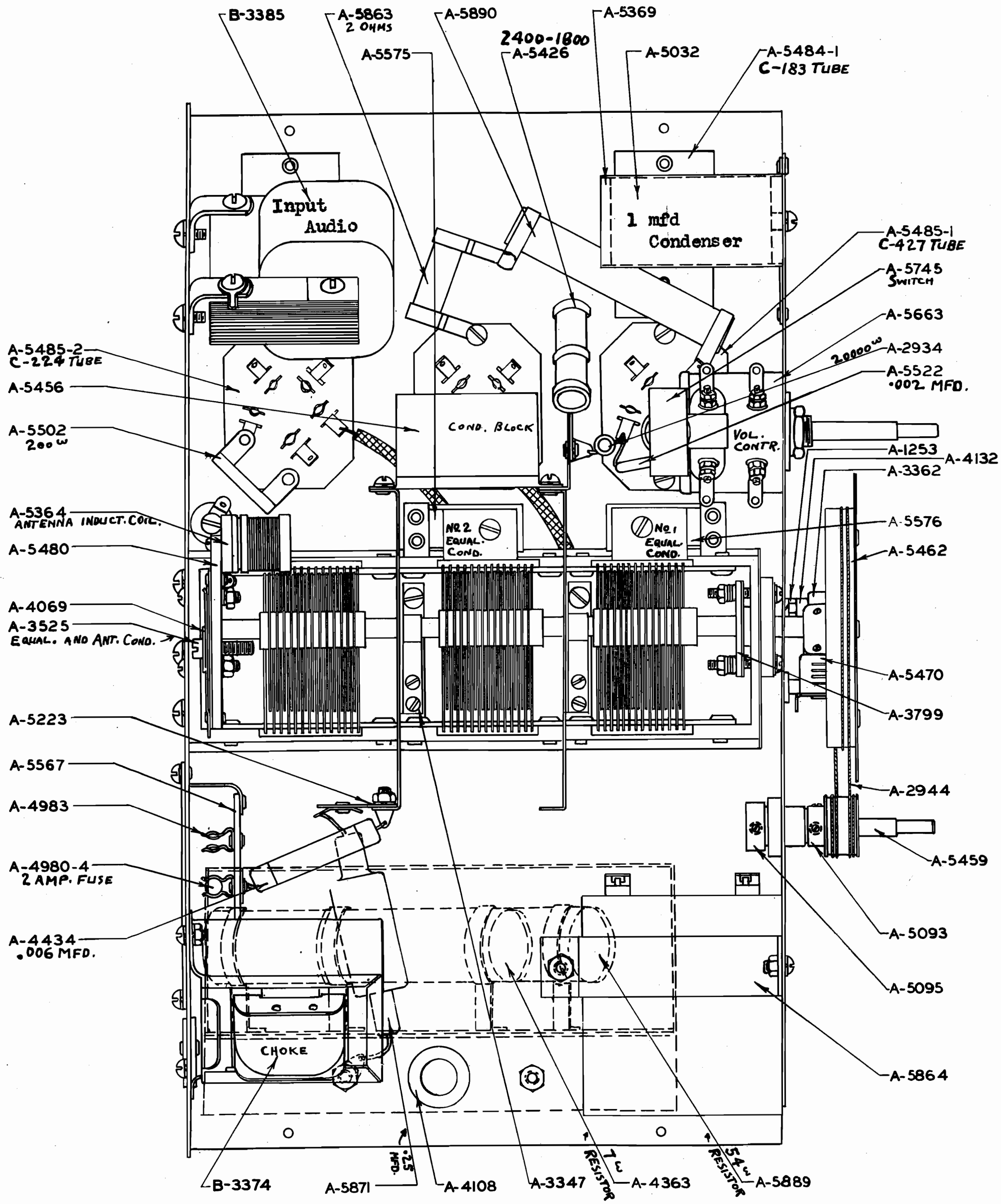
Bottom View
Models 410 and 420 A. C.
Chassis

SPARKS WITHINGTON CO.
SPARTON OF CANADA LTD.



See Page 568-H for Chassis Layout and Page 568-X for Alignment Data

SPARKS WITHINGTON CO.
SPARTON OF CANADA LTD.



Bottom View—Model 410 and 420 D. C. Chassis

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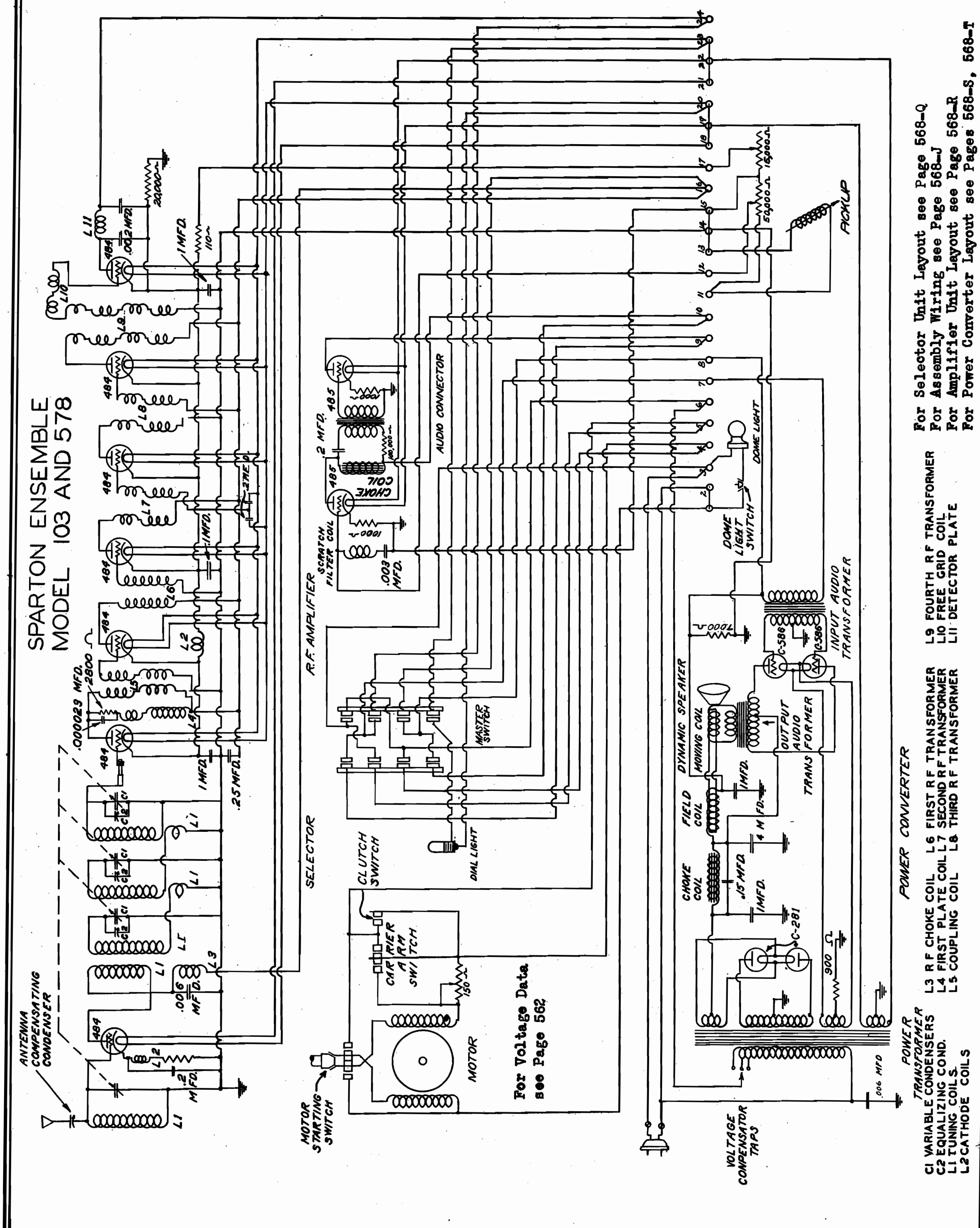
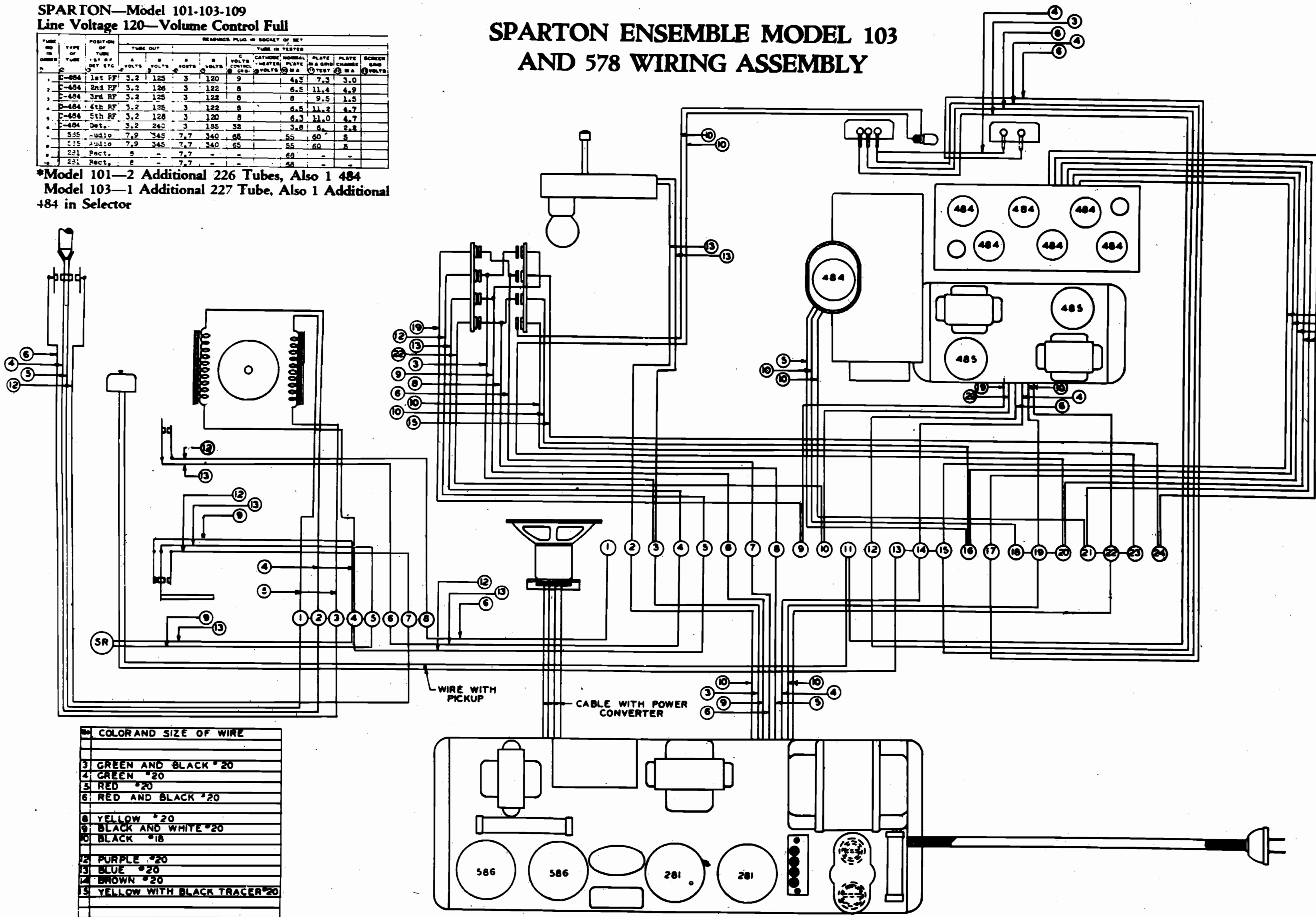
SPARTON OF CANADA LTD.



For Alignment Data see Page 568-X

SPARKS WITHINGTON CO.
SPARTON OF CANADA LTD.

SPARTON ENSEMBLE MODEL 103 AND 578 WIRING ASSEMBLY



SPARTON—Model 101-103-109
Line Voltage 120—Volume Control Full

Tube No. in Order	Type of Tube	Position of Tube 1st RF Det etc.	Tube Out: A Volts	Tube Out: B Volts	Tube in Tester: A Volts	Tube in Tester: B Volts	C Volts Control Grid	Cathode-Heater Volts	Normal Plate MA	Plate MA Grid Test	Plate Change MA	Screen Grid Volts
1	C-484	1st RF	3.2	125	3	120	9		4.3	7.3	3.0	
2	C-484	2nd RF	3.2	126	3	122	8		6.5	11.4	4.9	
3	C-484	3rd RF	3.2	125	3	122	8		8	9.5	1.5	
4	D-484	4th RF	3.2	125	3	122	8		6.5	11.2	4.7	
5	C-484	5th RF	3.2	128	3	120	8		6.3	11.0	4.7	
6	C-484	Det.	3.2	240	3	185	32		3.8	6.	2.2	
7	585	Audio	7.9	345	7.7	340	66		55	60	5	
8	585	Audio	7.9	345	7.7	340	65		55	60	5	
9	281	Rect.	8	-	7.7	-	-		68	-	-	
10	281	Rect.	8	-	7.7	-	-		68	-	-	

*Model 101—2 Additional 226 Tubes, Also 1 484
Model 103—1 Additional 227 Tube, Also 1 Additional 484 in Selector

No.	COLOR AND SIZE OF WIRE
3	GREEN AND BLACK #20
4	GREEN #20
5	RED #20
6	RED AND BLACK #20
8	YELLOW #20
9	BLACK AND WHITE #20
10	BLACK #18
12	PURPLE #20
13	BLUE #20
14	BROWN #20
15	YELLOW WITH BLACK TRACER #20
19	TAN WITH BLUE PIN TRACER #20
20	BLACK TWISTED PAIR #14
22	BLUE WITH RED TRACER #20

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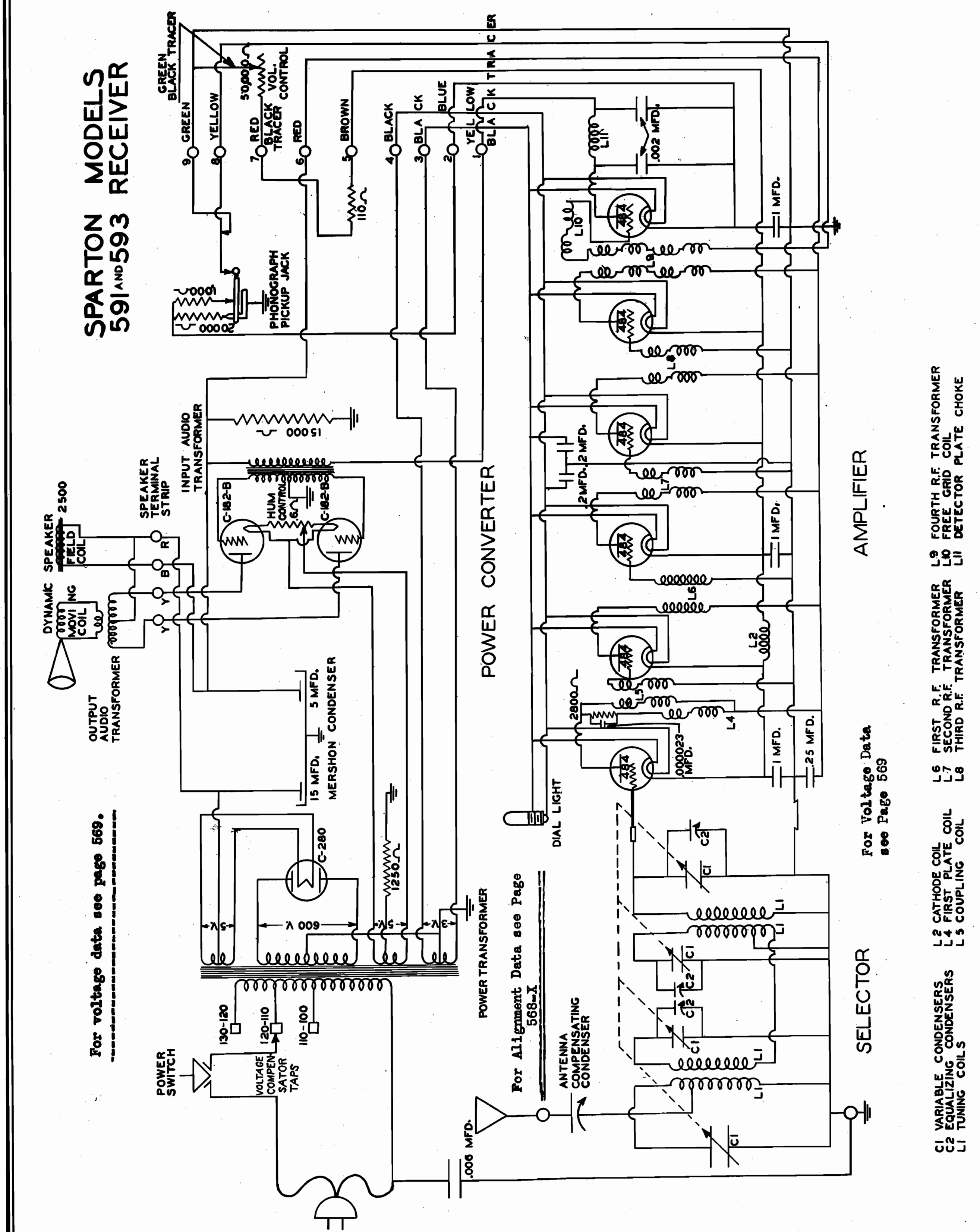

For Selecter Unit Layout see Page 568-Q
For Amplifier Unit Layout see Page 568-R
For Power Converter Layout see Page 568-S

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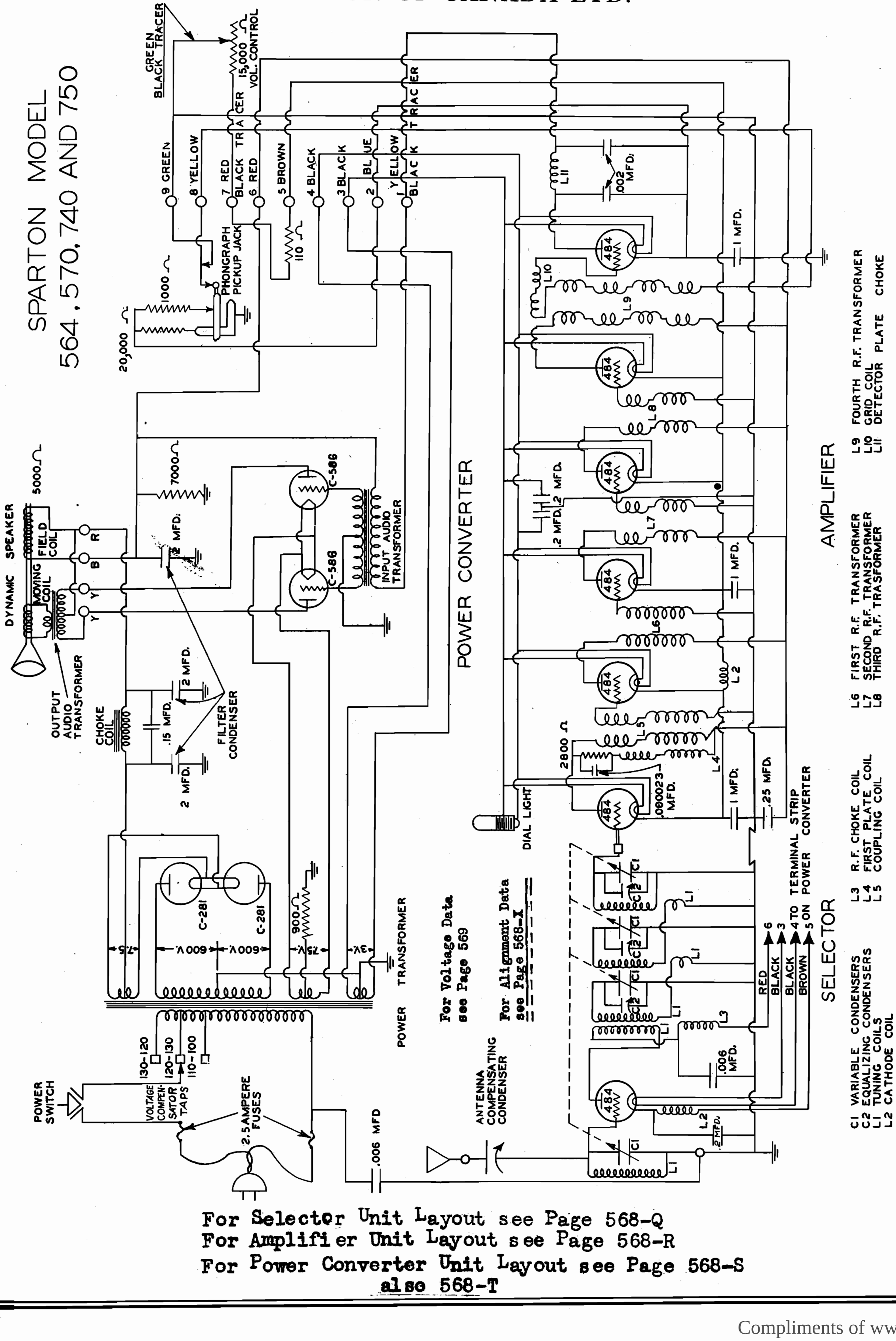

For Selector Unit Layout see Page 568-Q
For Amplifier Unit Layout see Page 568-R
For Power Converter Unit Layout see Page 568-S
also 568-T

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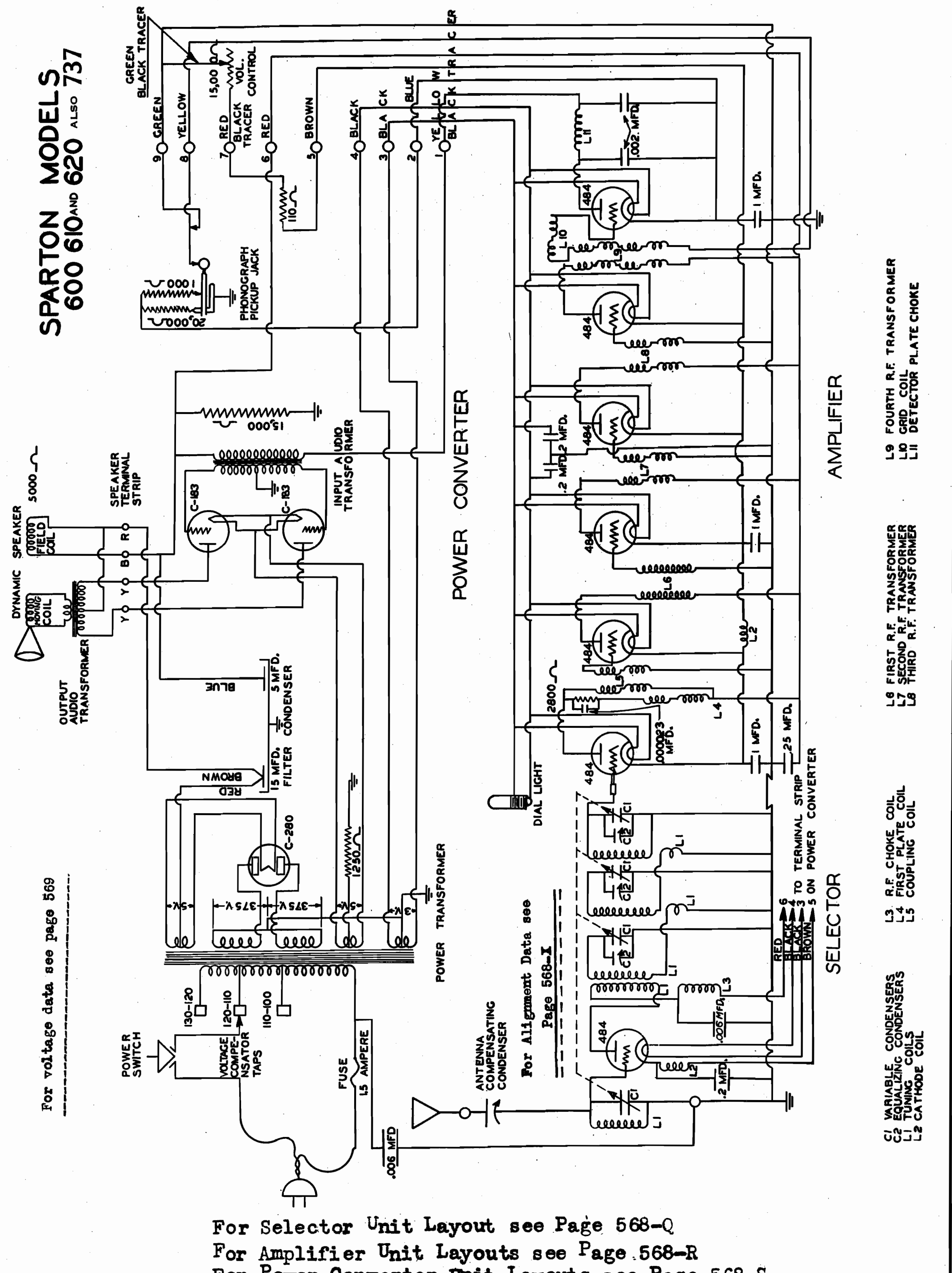

For Selector Unit Layout see Page 568-Q
For Amplifier Unit Layouts see Page 568-R
For Power Converter Unit Layouts see Page 568-S

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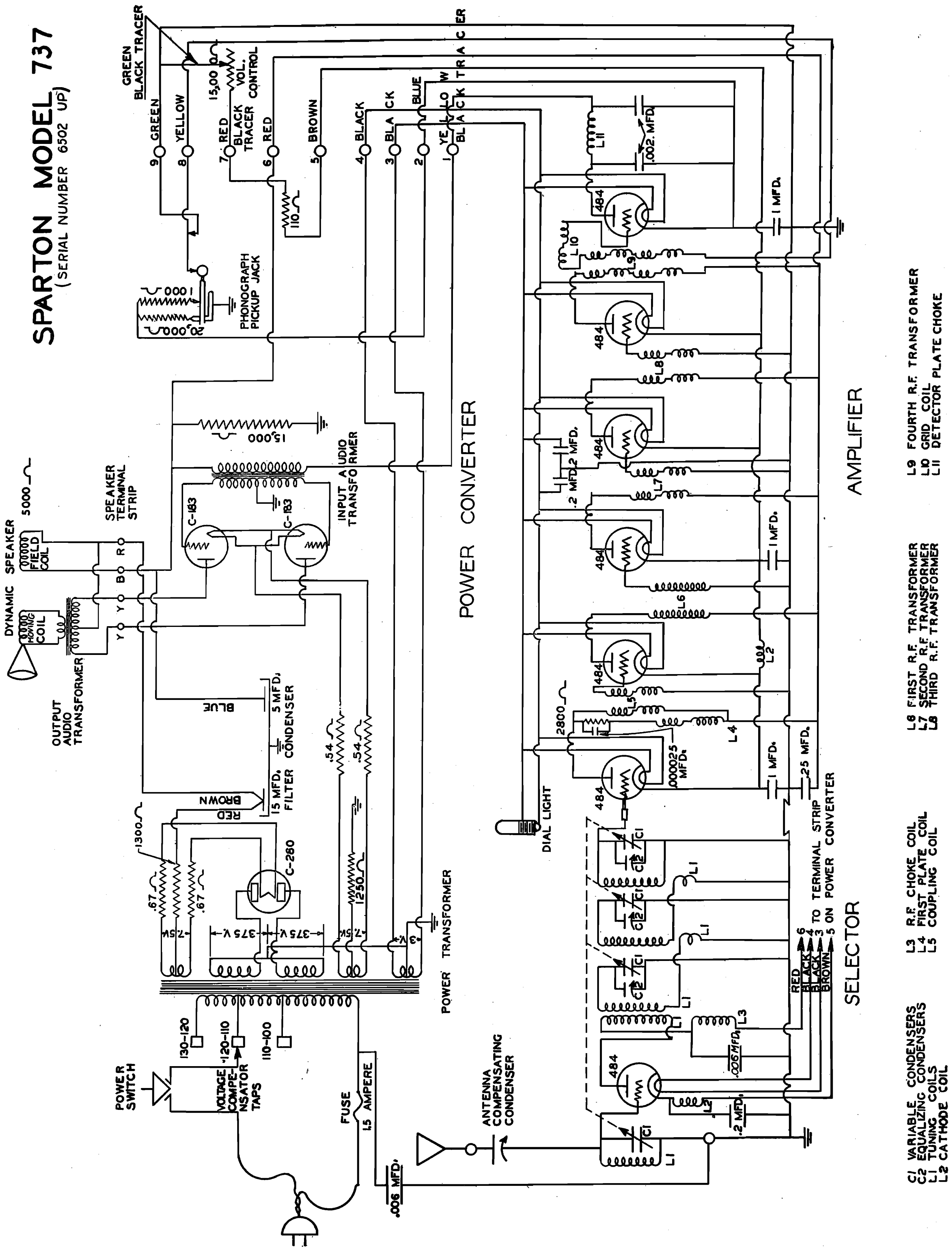

For Selector Unit Layout see Page 568-Q
For Amplifier Unit Layouts see Page 568-R
For Power Converter Unit Layouts see Page 568-S

SPARKS WITHINGTON CO.
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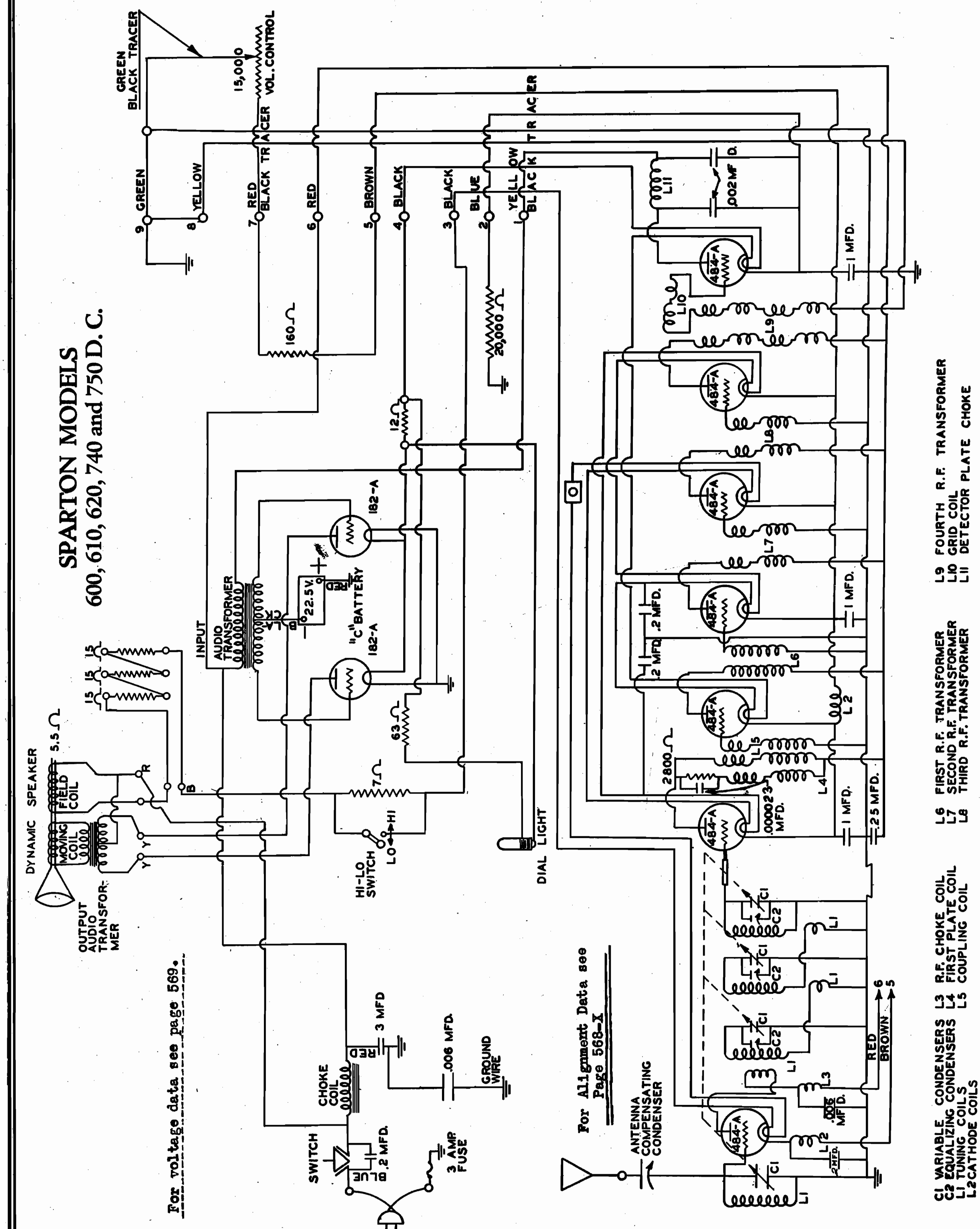

For Selector Unit Layouts see Page 568-Q
For Amplifier Unit Layouts see Page 568-R
For Power Converter Unit Layouts see Page 568-S

SPARKS WITHINGTON CO.
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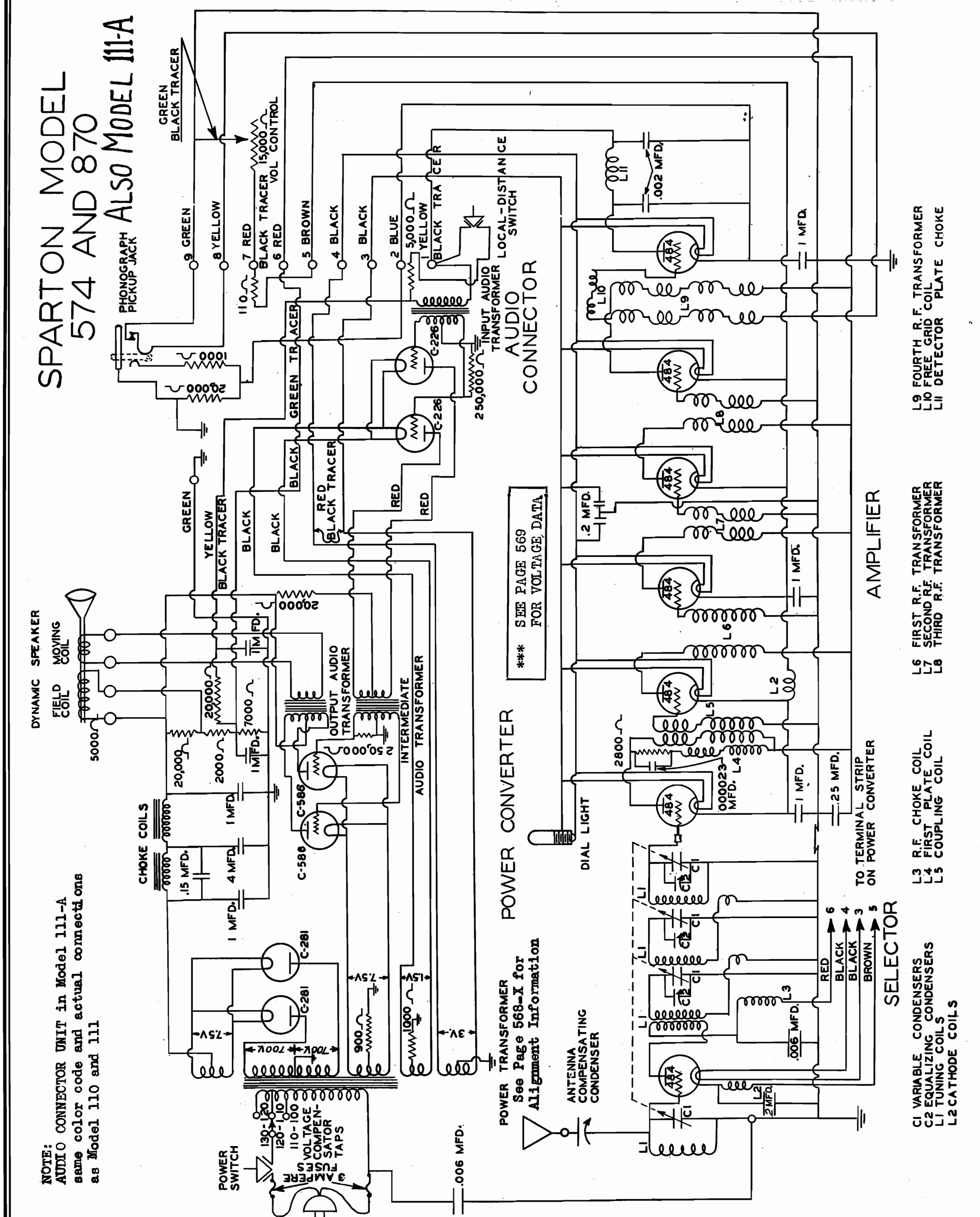

For Selector Unit Layouts see Page 568-Q
For Amplifier Unit Layouts see Page 568-R
For Connector Unit Layouts see Page 568-R
For Power Converter Unit Layouts see Page 568-S

SPARKS WITHINGTON CO.
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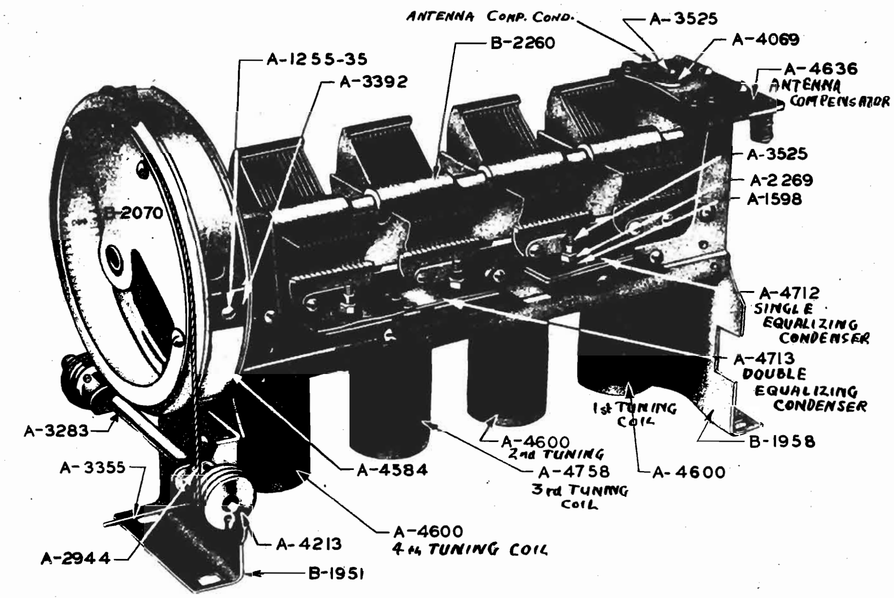
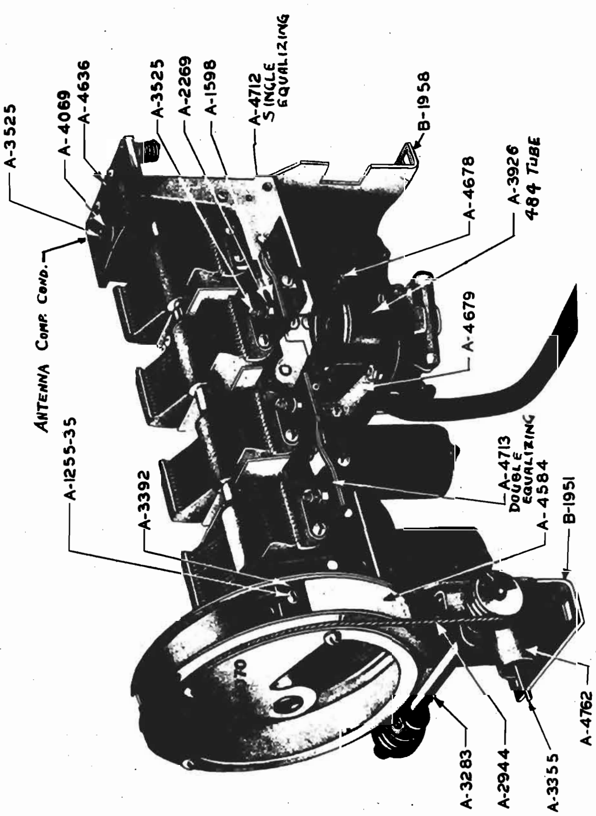


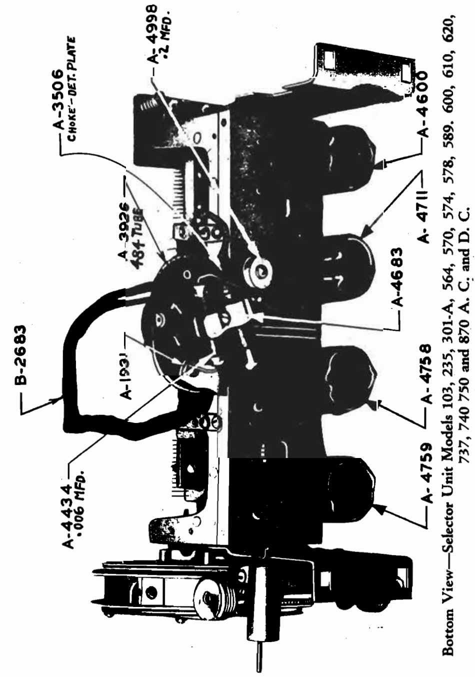
Inside View—Selector Unit Models 301, 591, 593 and 931 A. C. and D. C.

Note: D. C. Models use A-4388 Antenna Compensating Condenser.



Top View—Selector Unit, Models 103, 111-A, 235, 301-A, 564, 570, 574, 578, 589, 600, 610, 620, 737, 740, 750 and 870 A. C. and D. C.

Note: D. C. Models use A-5276 Antenna Compensating Condenser.



Bottom View—Selector Unit Models 103, 235, 301-A, 564, 570, 574, 578, 589. 600, 610, 620, 737, 740 750 and 870 A. C. and D. C.

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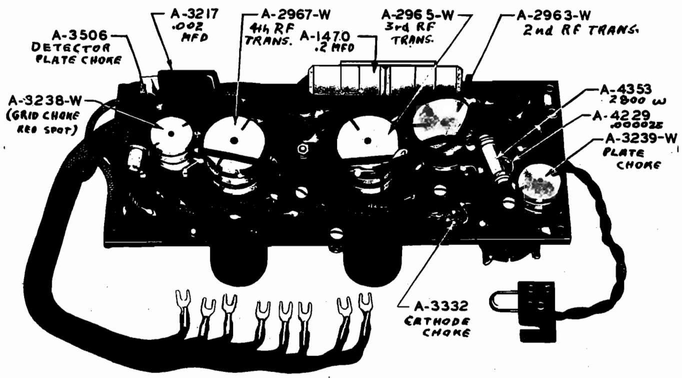
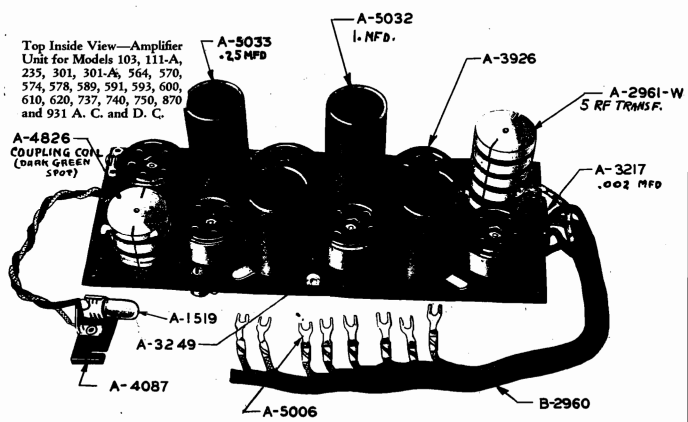
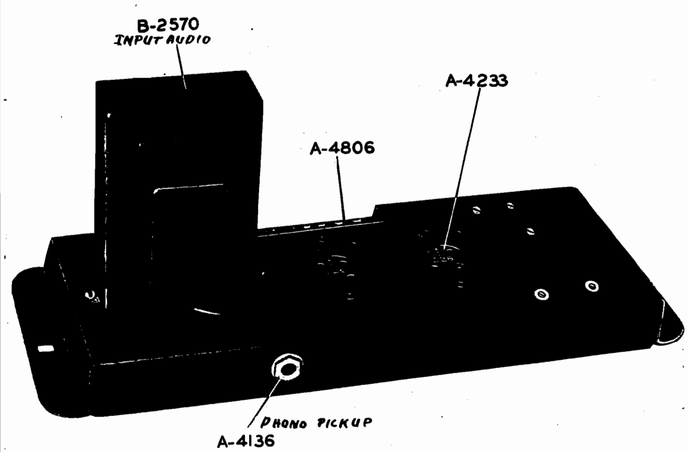


(Left) Bottom Inside View of Amplifier Unit - Models 103 - 111A- 235- 301- 301A- 564- 570- 578- 589- 600- 610- 620- 737- 740- 750- 870- and 931 AC and DC.

(Right) Top Inside View of Amplifier Unit- Models 103- 111A- 235- 301- 301A- 564- 570- 574- 578- 589- 591- 593- 600- 610- 620- 737- 740- 750- 870- 931 AC and DC.



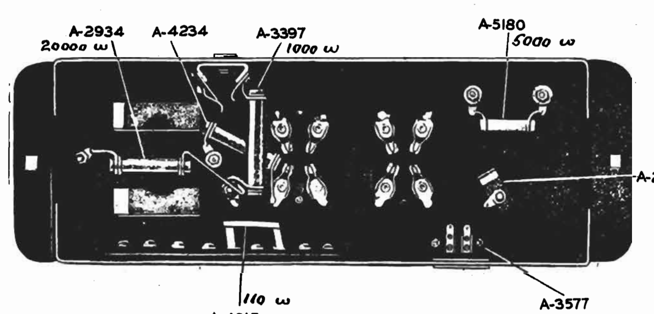
Top Inside View—Amplifier Unit for Models 103, 111-A, 235, 301, 301-A, 564, 570, 574, 578, 589, 591, 593, 600, 610, 620, 737, 740, 750, 870 and 931 A. C. and D. C.



Top View—Connector Unit, Models 111-A and 870 A. C.

(Left) Top View of Connector Unit for Models 111A and 870 AC

(Right) Bottom View of Connector Unit for Models 111A- 574- 870 AC



Bottom View—Connector Unit, Models 111-A and 870 A. C.
ALSO 574

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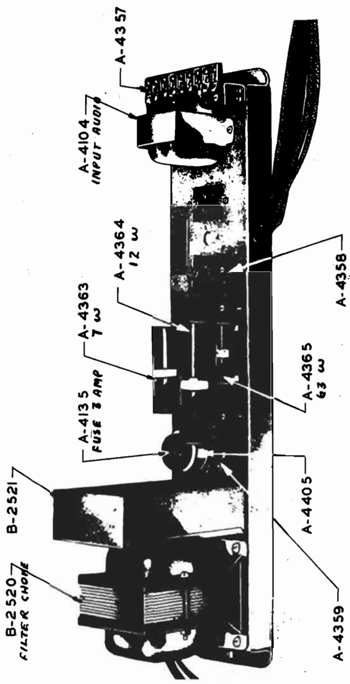
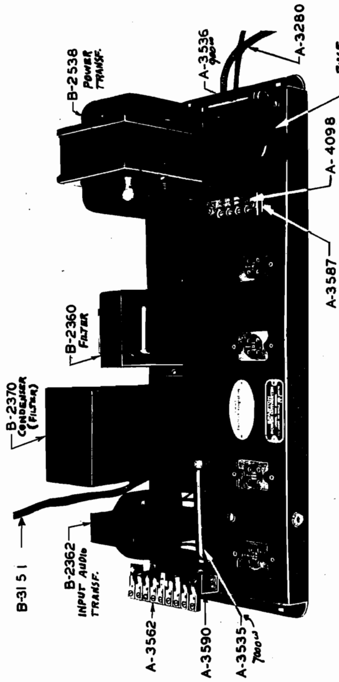
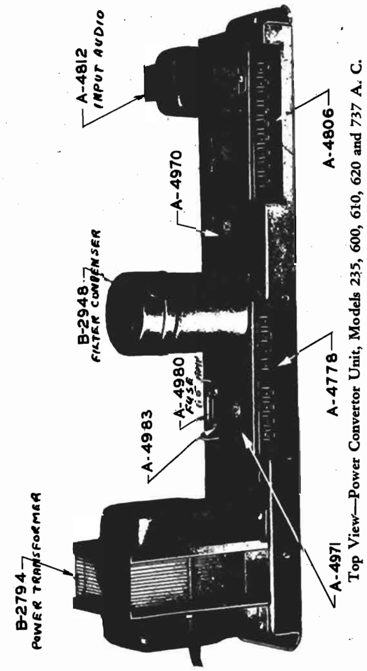


Top View—Power Convertor, Models 235, 600, 610, 620, 737, 740, 750 D. C.

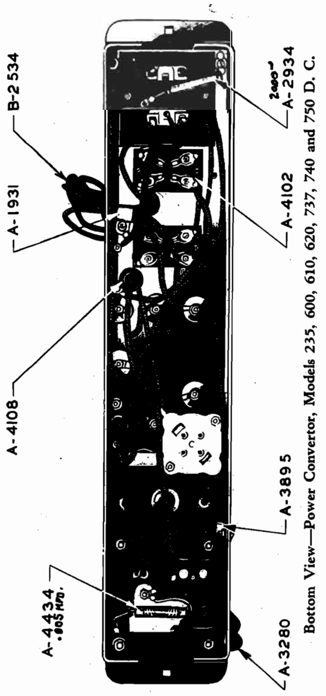


Top View—Power Convertor—Models 103, 301-A, 578, 740 and 750 A. C.

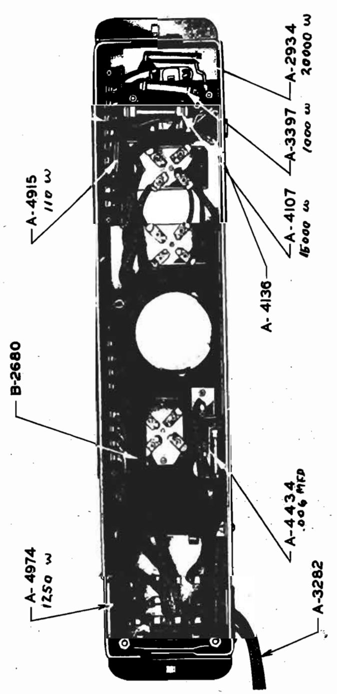
Note: Models 103 and 578 use 302-121B cable instead of B-3151, and B-2320 Filter Condenser instead of B-2370. A-3562 Terminal Block, and A-3590 Terminal Block Brackets are not used



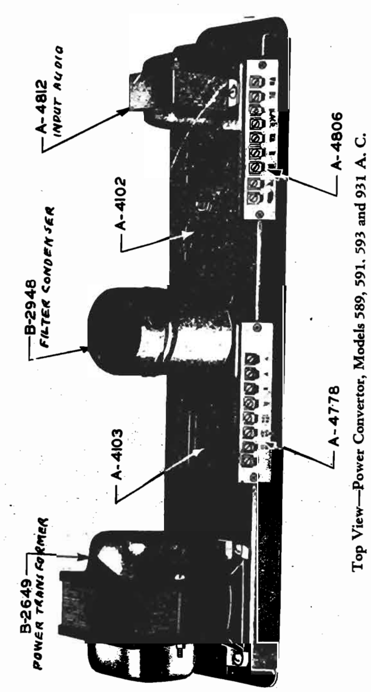
Top View—Power Convertor Unit, Models 235, 600, 610, 620 and 737 A. C.



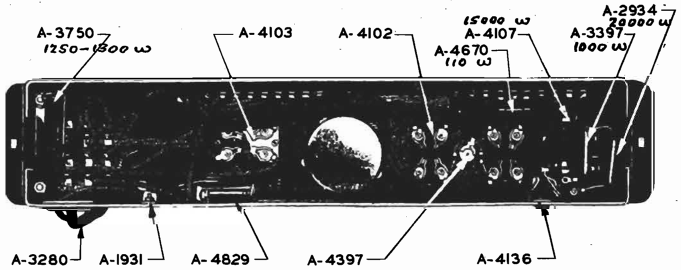
Bottom View—Power Convertor, Models 235, 600, 610, 620, 737, 740 and 750 D. C.



Bottom View—Power Convertor, Models 235, 600, 610 and 620 A. C.



Top View—Power Convertor, Models 589, 591, 593 and 931 A. C.



Bottom View—Power Convertor, Models 589, 591, 593 and 931 A. C.

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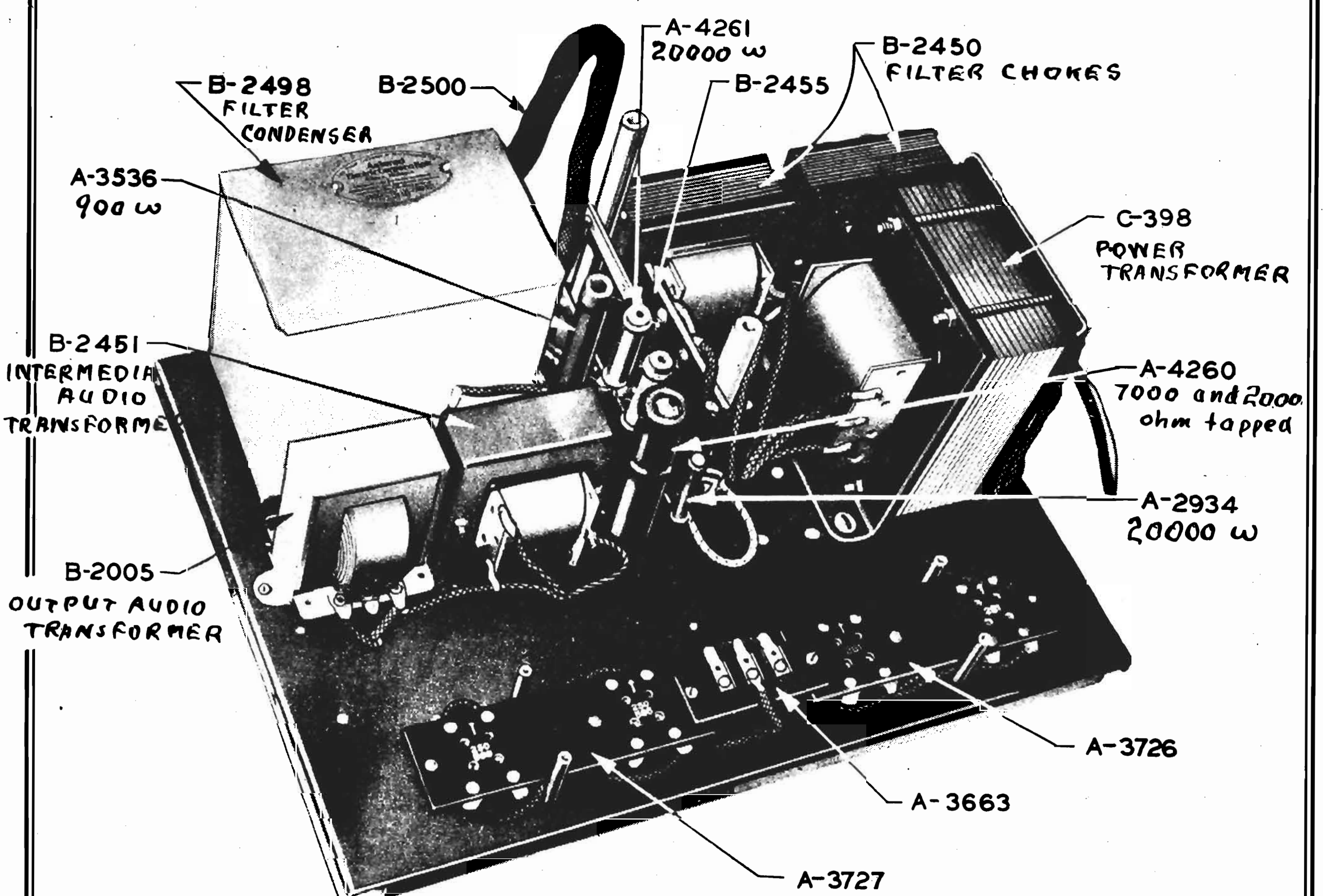
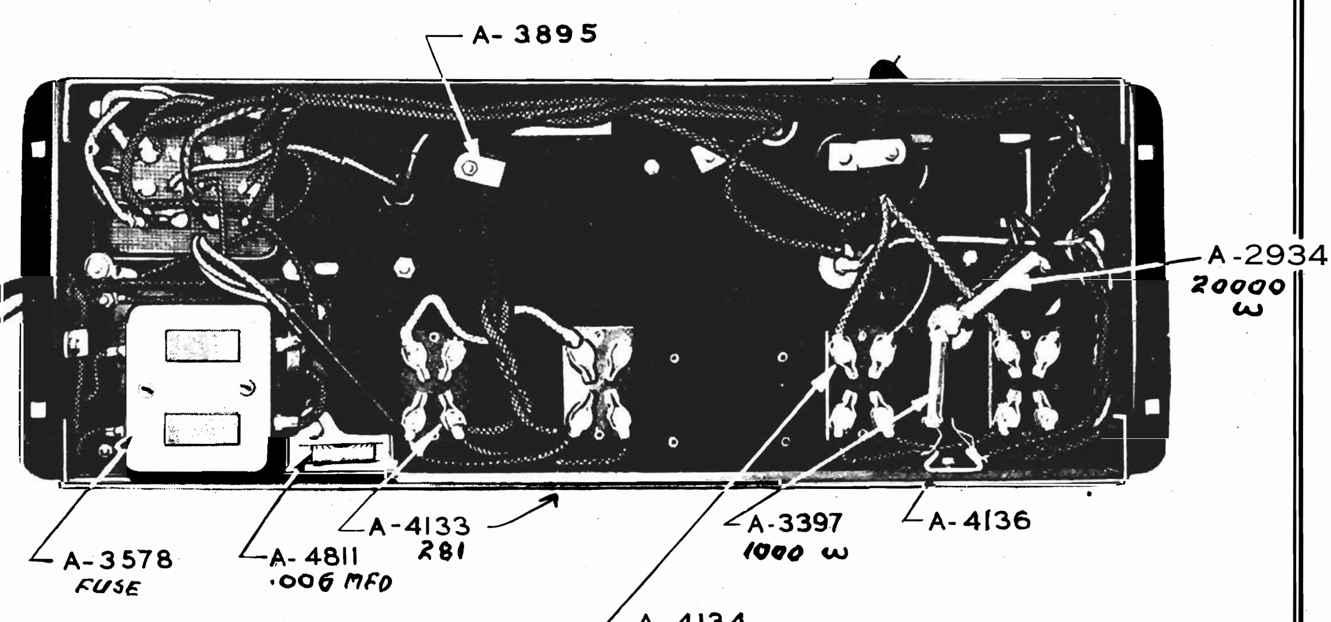


Inside View—Power Convertor, Models 111-A and 870 A. C.
ALSO 574



Bottom View—Power Convertor, Models 103, 301-A, 578, 740 and 750 A. C.

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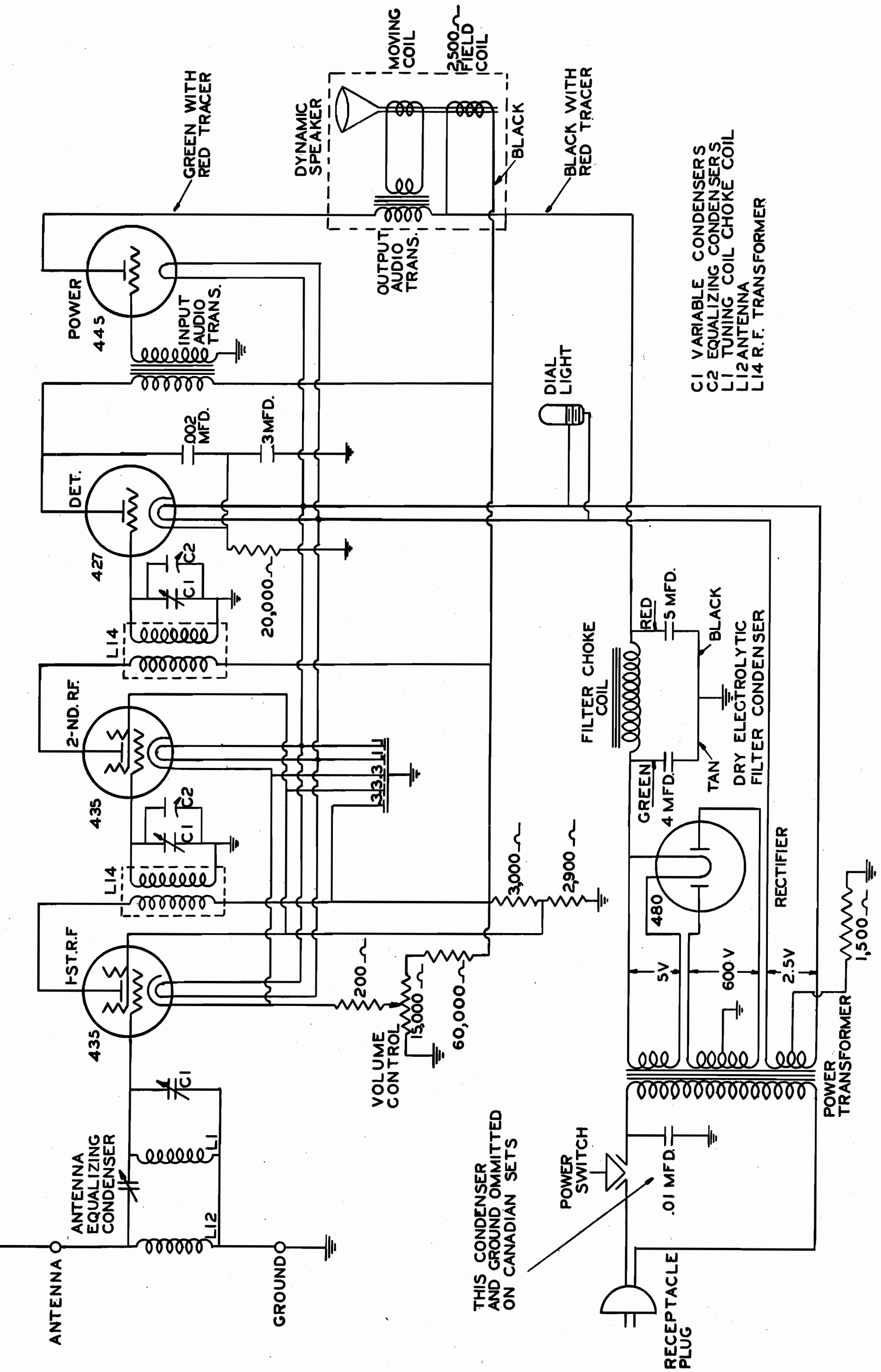
Sparton Radio Service Manual

SPARTON MODEL 5 AND 9 SCHEMATIC DIAGRAM



For Socket Layout and Voltage Data see Page 568-W

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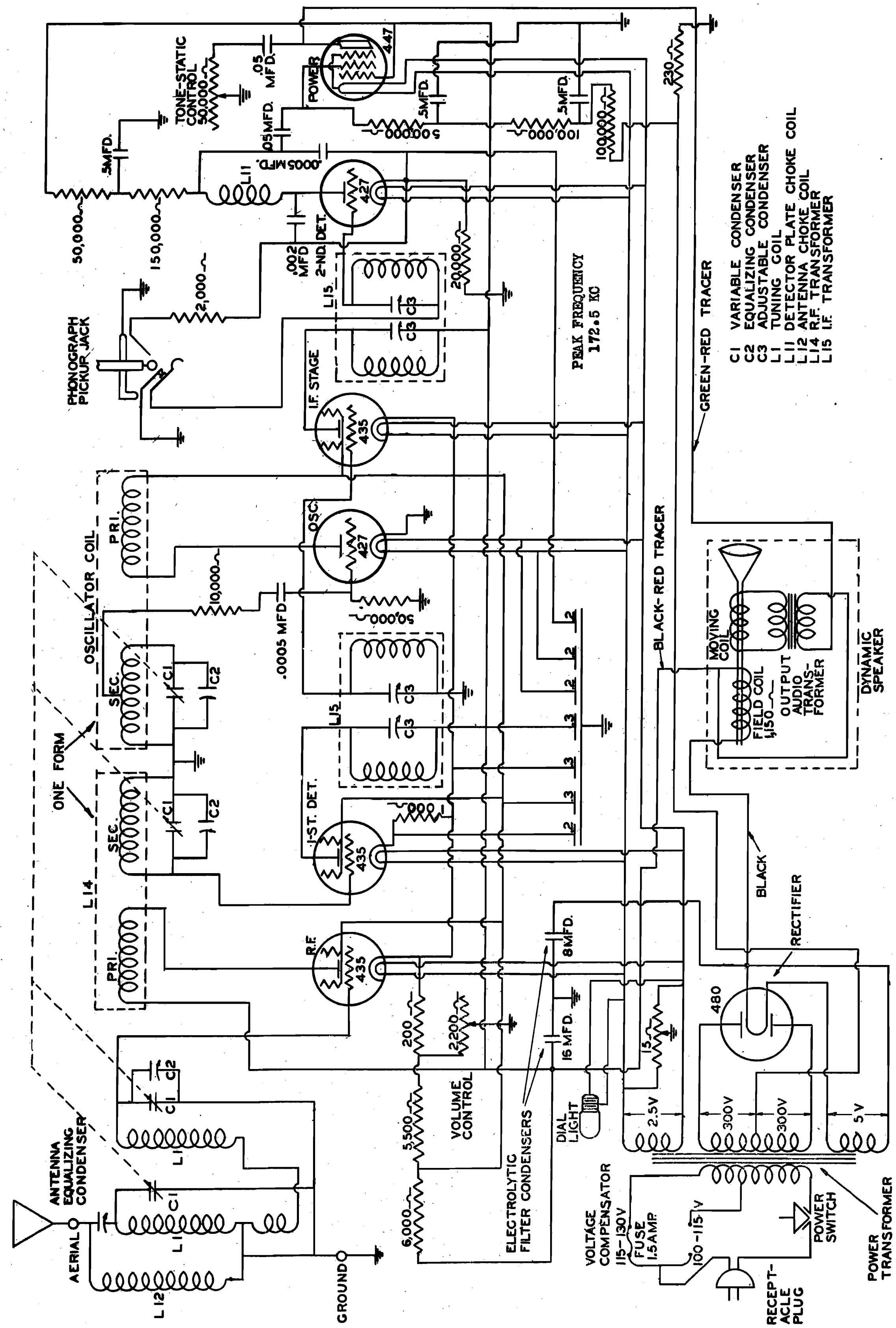
Sparton Model 10—Schematic Diagram



For Socket Layout and Voltage Data see Page 568-W

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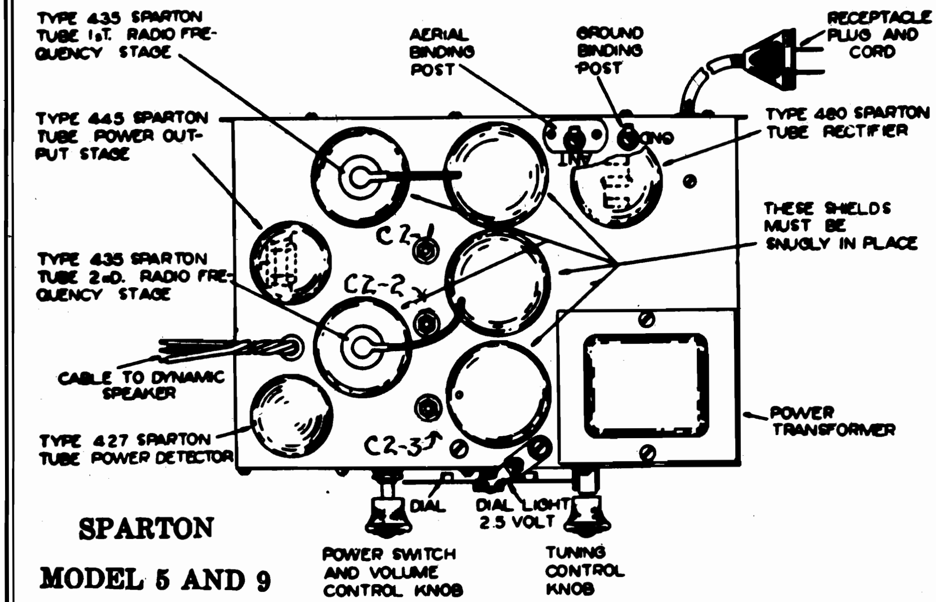
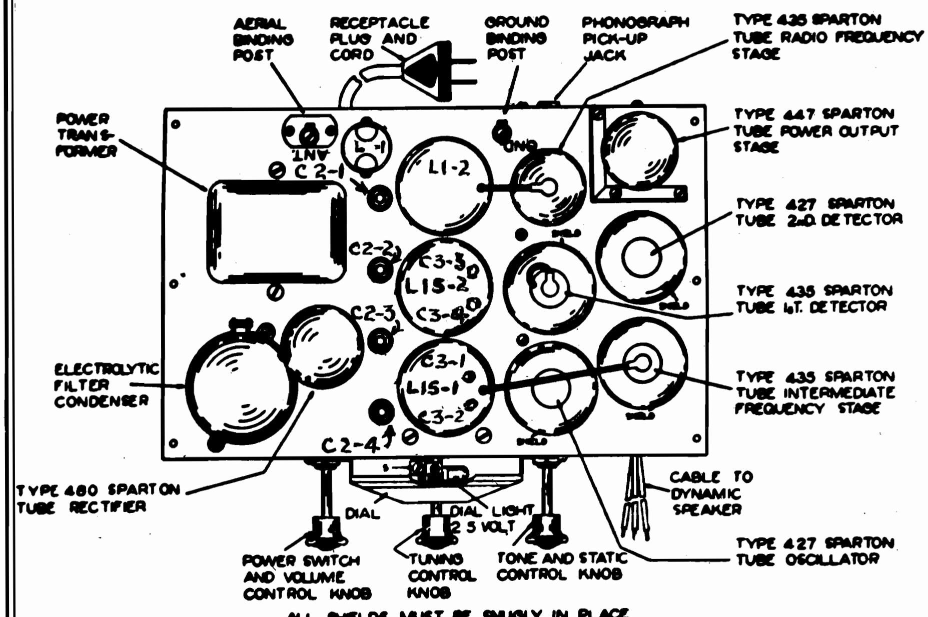
C2-1 ANTENNA EQUALIZING CONDENSER
C2-2 1st. RADIO FREQUENCY STAGE EQUALIZING CONDENSER
C2-3 2nd. RADIO FREQUENCY STAGE EQUALIZING CONDENSER



SPARTON

MODEL 5 AND 9



SPARTON MODEL 10 SUPERHETERODYNE CHASSIS

C2-1 ANTENNA EQUALIZING CONDENSER
C2-2 RADIO FREQUENCY STAGE EQUALIZING CONDENSER
C2-3 1st. DETECTOR EQUALIZING CONDENSER
C2-4 OSCILLATOR EQUALIZING CONDENSER

L1-1 First R. F. Tuning Coil
L1-2 Second R. F. Tuning Coil
L15-1 First I. F. Transformer
L15-2 Second I.F. Transformer
C3-1 I. F. Stage First Adjustable Condenser
C3-2 I. F. Stage Second Adjustable Condenser
C3-3 I. F. Stage Third Adjustable Condenser
C3-4 I. F. Stage Fourth Adjustable Condenser

MODEL 5 and 9

Line Voltage 105-125 Volume Control FULL

Location	Heater	Plate	Control Grd	Sc.Grd.	Plt.Crnt.
1st RF	2.2-2.5	140-180	2-3	70-90	6. - 8.
2nd RF	2.2-2.5	140-180	2-3	70-90	6. - 8.
Det.	2.2-2.5	130-170	10-15		.5 - .7
Audio	2.2-2.5	210-240	40-50		27. - 33.
Rectifier	5.2-5.	260-320			29. - 35.

MODEL 10

Line Voltage 115 Volume Control FULL

Location	Heater	Plate	Control Grd	Sc.Grd	Plt.Crnt.
1st RF	2.2-2.5	230-270	2.5-4.	85-110	5. - 8.
1st Det.	2.2-2.5	230-270	4.5-7.5*	85-110	**1.8- 3.5
1st IF	2.2-2.5	230-270	2.5-4.	85-110	5. - 8.
Osc.	2.2-2.5	85-110	8. -14		
2nd Det.	2.2-2.5	100-135	15. -18		4. - .7
Power	2.2-2.5	220-260			30. -36.
Rect.	4.2-5.	360-420			40. -55.

** Remove Oscillator Tube

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How to Adjust the Antenna Compensating and Equalizing Condensers

SPARTON MODELS 103, 235, 564, 570, 574, 578, 589, 591, 593, 600, 610, 620, 740, 750 AND 870, ALSO MODELS EQUIPPED WITH PHONOGRAPH PICKUP JACK MANUFACTURED PRIOR TO JUNE 1, 1930.

After the aerial and ground have been inspected and found to be in good order, and all tubes have been tested and placed in their proper sockets, the final operation in the installation of a SPARTON Radio Receiving Set is adjustment of the antenna compensating and equalizing condensers. This adjustment should ALWAYS be made with the use of a High Resistance Voltmeter as a resonance indicator. Using the ear as a resonance indicator should be resorted to only when it is impossible to employ a Voltmeter.

Any 1,000 ohm per volt 0-60, 75 or 100 scale D. C. Voltmeter will serve the purpose.

Connect two leads to the binding posts of the Voltmeter to be used, and terminate them in a phone plug which is then inserted in the Phonograph Pick-up Jack just far enough to touch the first inside contact. (See figure 2.) (DO NOT PLUG ALL THE WAY INTO THE JACK, as this will short out the Detector tube biasing resistor, and cause inaccurate readings.) Be sure that no Analyzer Adapters are connected to the end of the Analyzer Cord, or plugged into the Analyzer Socket, as this will short-circuit the Voltmeter.

NOTE: (When aligning Models 235 and 103, two small battery clips instead of a phone plug are fastened to the Voltmeter leads. On the Model 235 the leads are connected to terminals No. 11 and No. 13 of the terminal block located on the left-hand side of the cabinet. On the Model 103 the leads are connected to terminals No. 14 and No. 17 on the terminal strip.)

1. With aerial and ground wires connected to the set as they are to be permanently used, tune in a DISTANT STATION at 1200 kilocycles or at a higher frequency.

2. Turn Volume Control on FULL for this entire adjustment.

3. Adjust Antenna Compensating condenser screw with insulated handle Screw Driver until indicator reaches highest point on Voltmeter scale. NOTE: The numerical value that the indicator reaches is of no consequence. The object is to have the indicator deflect from zero upward as high as possible.

4. The equalizing condensers are numbered 1, 2, and 3. Number 3 is next to the dial drum. With the adjusting wrench, adjust No. 3 until the indicator reaches highest point on the Voltmeter scale.

5. Next adjust No. 1 and No. 2 in the same manner.

TO CHECK ADJUSTMENT

6. Tune in a station between 550 and 650 kilocycles.

7. Readjust the Antenna compensating condenser and the Equalizing condensers No. 3, No. 1, and No. 2 in exactly the same manner as they were adjusted at the 1200 or higher kilocycle setting of the dial. The purpose of this adjustment is to check the "tracking" of the four variable condensers. The voltmeter reading should decrease if any of the four original adjustments are changed. That is, the four tuned circuits must show alignment between 550 and 650 kilocycles on the ADJUSTMENT made at 1200 or higher kilocycle setting.

TO READJUST

8. After the check at 550 kilocycles it will be necessary to again readjust the condensers as explained in No. 1 to No. 5 inclusive. This is necessary, due to the adjustments being slightly thrown off in the checking process.

CALIBRATION OF DIAL STRIP ON SPARTON MODELS 103, 235, 410, 420, 564, 570, 574, 578, 589, 591, 593, 600, 610, 620, 740, 750 AND 870.

9. Note carefully whether or not a station around 600 kilocycles indicates correctly on the dial when tuned to the loudest volume.

10. If station reads off its proper setting, loosen the screws which hold the celluloid strip in place and slide the strip so the reading is correct for the station being received.

NOTE: (On Models 410, 420—If station reads off its proper setting, loosen the screws which hold the dial drum to the condenser shaft and move the drum one way or the other, until the reading is correct for the station being received. When doing this be sure that the condenser shaft does not turn when the dial is moved.)

11. Next, tune in a station between 1100 and 1300 kilocycles and see if it reads correctly on the dial.

12. If stations tune in to maximum volume at a setting different from station's correct kilocycle reading, turn dial to the reading the station should come in on according to its log-book reading. Then readjust the Condensers as explained in No. 1 to No. 5.

13. This final adjustment will scarcely affect the calibration of the stations around 600 kilocycles and will properly align the Selector Unit to its highest efficiency, and will cause the dial to read correctly over the entire broadcast spectrum.

MODELS AR-19 AND 31

Due to the construction of these Models, it is not convenient to connect a Voltmeter at the proper place in the circuit so it can be used as a resonance indicator, therefore, a pair of ear phones are substituted for the speaker and are used as the means of determining when the antenna compensating and equalizing condensers have been properly adjusted.

1. With aerial and ground wires connected to the set as they are to be permanently used, tune in a DISTANT STATION between 80 and 90 or higher on the dial.

2. Turn Volume control down until station is barely audible.

3. Adjust Antenna Compensating Condenser with insulated handle screw driver to a point where the station sounds the loudest.

4. The Equalizing Condensers are numbered 1, 2, and 3, from front to back of receiver. Reduce the volume control until the station is barely audible and with the adjusting wrench, adjust No. 3 to a point where the station sounds the loudest.

5. Next adjust No. 1 and No. 2 in the same manner.

TO CHECK ADJUSTMENT

6. Tune in a station between 15 and 25 on the dial.

7. Readjust the Antenna Compensating and the Equalizing Condensers No. 3, No. 1, and No. 2 in exactly the same manner as they were adjusted between the 80 to 90 setting of the dial. The purpose of this adjustment is to check the "tracking" of the four condensers. The volume of the station should decrease if any of the four original adjustments are changed. That is, the four tuned circuits must show alignment between 15 and 25 on the dial on the adjustment made between 80 and 90.

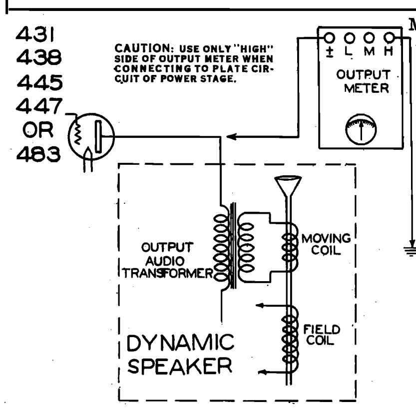
TO READJUST

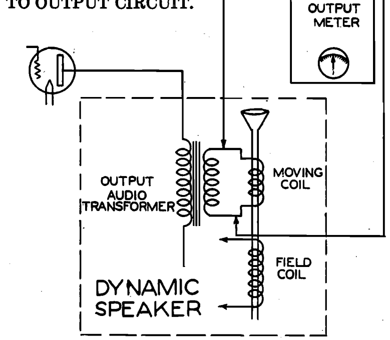
8. After the check between 15 and 25 on the dial, it will be necessary to again readjust the condensers as explained in No. 1 to No. 5 inclusive. This is necessary due to the adjustments being slightly thrown off during the checking process.

SPARTON MODELS 410 AND 420

Follow the same procedure outlined for adjusting the antenna compensating and equalizing condensers for the SPARTON Models AR-19 and 31, except in this case ear phones are not substituted for the speaker as a means of determining when the condensers are properly adjusted. The speaker serves this purpose as it is, and as the dial is calibrated in kilocycles a station is tuned in at 1200 kilocycles or higher frequency instead of between 80 and 90 as specified in paragraph No. 1, and the re-check is made between 500 and 600 kilocycles instead of between 15 and 25.

METHODS OF CONNECTING
AN OUTPUT METER
TO OUTPUT CIRCUIT.





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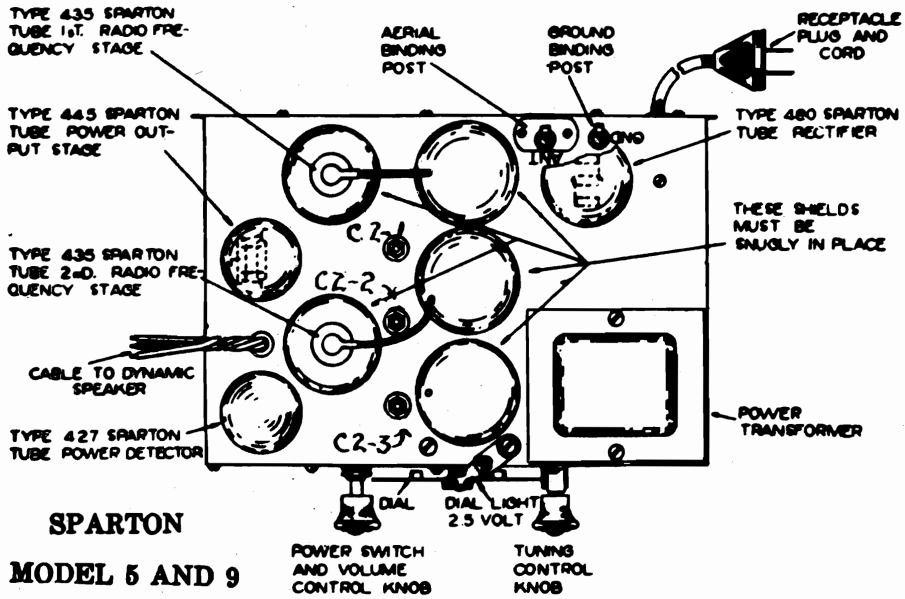
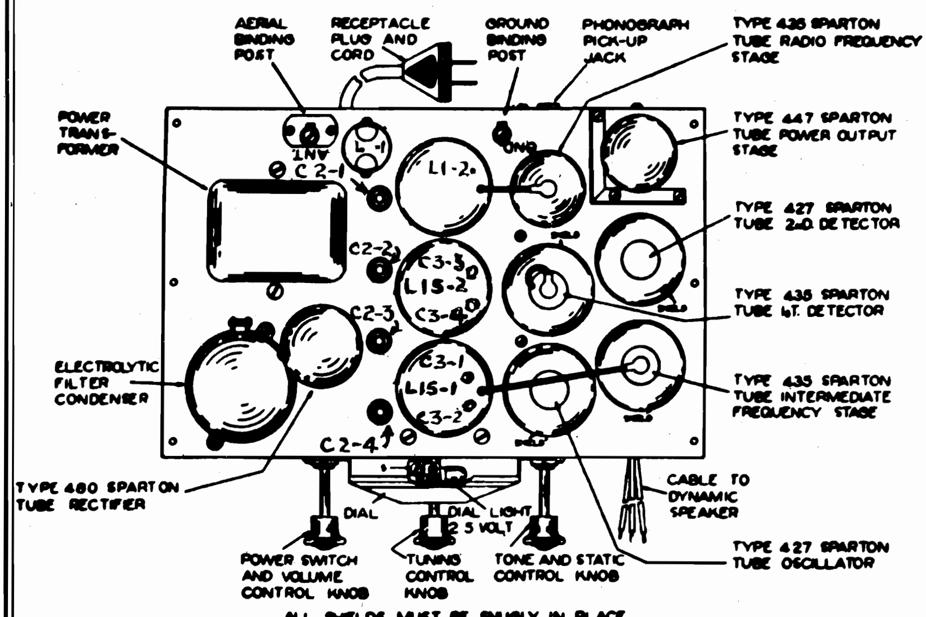
C2-1 ANTENNA EQUALIZING CONDENSER
C2-2 1st. RADIO FREQUENCY STAGE EQUALIZING CONDENSER
C2-3 2nd. RADIO FREQUENCY STAGE EQUALIZING CONDENSER



SPARTON

MODEL 5 AND 9



ALL SHIELDS MUST BE SNUGLY IN PLACE

SPARTON MODEL 10 SUPERHETERODYNE CHASSIS

C2-1 ANTENNA EQUALIZING CONDENSER
C2-2 RADIO FREQUENCY STAGE EQUALIZING CONDENSER
C2-3 1st. DETECTOR EQUALIZING CONDENSER
C2-4 OSCILLATOR EQUALIZING CONDENSER

L1-1 First R. F. Tuning Coil
L1-2 Second R. F. Tuning Coil
L15-1 First I. F. Transformer
L15-2 Second I.F. Transformer
C3-1 I. F. Stage First Adjustable Condenser
C3-2 I. F. Stage Second Adjustable Condenser
C3-3 I. F. Stage Third Adjustable Condenser
C3-4 I. F. Stage Fourth Adjustable Condenser

MODEL 5 and 9

Line Voltage 105-125 Volume Control FULL

Location	Heater	Plate	Control Grd	Sc.Grd.	Plt.Crnt.
1st RF	2.2-2.5	140-180	2-3	70-90	6. - 8.
2nd RF	2.2-2.5	140-180	2-3	70-90	6. - 8.
Det.	2.2-2.5	130-170	10-15		.5 - .7
Audio	2.2-2.5	210-240	40-50		27. - 33.
Rectifier	5.2-5.	260-320			29. - 35.

MODEL 10

Line Voltage 115 Volume Control FULL

Location	Heater	Plate	Control Grd	Sc.Grd	Plt.Crnt.
1st RF	2.2-2.5	230-270	2.5-4.	85-110	5. - 8.
1st Det.	2.2-2.5	230-270	4.5-7.5*	85-110	**1.8- 3.5
1st IF	2.2-2.5	230-270	2.5-4.	85-110	5. - 8.
Osc.	2.2-2.5	85-110	8. -14		
2nd Det.	2.2-2.5	100-135	15. -18		4. - .7
Power	2.2-2.5	220-260			30. -36.
Rect.	4.2-5.	360-420			40. -55.

** Remove Oscillator Tube

SPARKS WITHINGTON CO.
SPARTON OF CANADA LTD.

How to Adjust the Antenna Compensating and Equalizing Condensers

SPARTON MODELS 103, 235, 564, 570, 574, 578, 589, 591, 593, 600, 610, 620, 740, 750 AND 870, ALSO MODELS EQUIPPED WITH PHONOGRAPH PICKUP JACK MANUFACTURED PRIOR TO JUNE 1, 1930.

After the aerial and ground have been inspected and found to be in good order, and all tubes have been tested and placed in their proper sockets, the final operation in the installation of a SPARTON Radio Receiving Set is adjustment of the antenna compensating and equalizing condensers. This adjustment should ALWAYS be made with the use of a High Resistance Voltmeter as a resonance indicator. Using the ear as a resonance indicator should be resorted to only when it is impossible to employ a Voltmeter.

Any 1,000 ohm per volt 0-60, 75 or 100 scale D. C. Voltmeter will serve the purpose.

Connect two leads to the binding posts of the Voltmeter to be used, and terminate them in a phone plug which is then inserted in the Phonograph Pick-up Jack just far enough to touch the first inside contact. (See figure 2.) (DO NOT PLUG ALL THE WAY INTO THE JACK, as this will short out the Detector tube biasing resistor, and cause inaccurate readings.) Be sure that no Analyzer Adapters are connected to the end of the Analyzer Cord, or plugged into the Analyzer Socket, as this will short-circuit the Voltmeter.

NOTE: (When aligning Models 235 and 103, two small battery clips instead of a phone plug are fastened to the Voltmeter leads. On the Model 235 the leads are connected to terminals No. 11 and No. 13 of the terminal block located on the left-hand side of the cabinet. On the Model 103 the leads are connected to terminals No. 14 and No. 17 on the terminal strip.)

1. With aerial and ground wires connected to the set as they are to be permanently used, tune in a DISTANT STATION at 1200 kilocycles or at a higher frequency.

2. Turn Volume Control on FULL for this entire adjustment.

3. Adjust Antenna Compensating condenser screw with insulated handle Screw Driver until indicator reaches highest point on Voltmeter scale. NOTE: The numerical value that the indicator reaches is of no consequence. The object is to have the indicator deflect from zero upward as high as possible.

4. The equalizing condensers are numbered 1, 2, and 3. Number 3 is next to the dial drum. With the adjusting wrench, adjust No. 3 until the indicator reaches highest point on the Voltmeter scale.

5. Next adjust No. 1 and No. 2 in the same manner.

TO CHECK ADJUSTMENT

6. Tune in a station between 550 and 650 kilocycles.

7. Readjust the Antenna compensating condenser and the Equalizing condensers No. 3, No. 1, and No. 2 in exactly the same manner as they were adjusted at the 1200 or higher kilocycle setting of the dial. The purpose of this adjustment is to check the "tracking" of the four variable condensers. The voltmeter reading should decrease if any of the four original adjustments are changed. That is, the four tuned circuits must show alignment between 550 and 650 kilocycles on the ADJUSTMENT made at 1200 or higher kilocycle setting.

TO READJUST

8. After the check at 550 kilocycles it will be necessary to again readjust the condensers as explained in No. 1 to No. 5 inclusive. This is necessary, due to the adjustments being slightly thrown off in the checking process.

CALIBRATION OF DIAL STRIP ON SPARTON MODELS 103, 235, 410, 420, 564, 570, 574, 578, 589, 591, 593, 600, 610, 620, 740, 750 AND 870.

9. Note carefully whether or not a station around 600 kilocycles indicates correctly on the dial when tuned to the loudest volume.

10. If station reads off its proper setting, loosen the screws which hold the celluloid strip in place and slide the strip so the reading is correct for the station being received.

NOTE: (On Models 410, 420—If station reads off its proper setting, loosen the screws which hold the dial drum to the condenser shaft and move the drum one way or the other, until the reading is correct for the station being received. When doing this be sure that the condenser shaft does not turn when the dial is moved.)

11. Next, tune in a station between 1100 and 1300 kilocycles and see if it reads correctly on the dial.

12. If stations tune in to maximum volume at a setting different from station's correct kilocycle reading, turn dial to the reading the station should come in on according to its log-book reading. Then readjust the Condensers as explained in No. 1 to No. 5.

13. This final adjustment will scarcely affect the calibration of the stations around 600 kilocycles and will properly align the Selector Unit to its highest efficiency, and will cause the dial to read correctly over the entire broadcast spectrum.

MODELS AR-19 AND 31

Due to the construction of these Models, it is not convenient to connect a Voltmeter at the proper place in the circuit so it can be used as a resonance indicator, therefore, a pair of ear phones are substituted for the speaker and are used as the means of determining when the antenna compensating and equalizing condensers have been properly adjusted.

1. With aerial and ground wires connected to the set as they are to be permanently used, tune in a DISTANT STATION between 80 and 90 or higher on the dial.

2. Turn Volume control down until station is barely audible.

3. Adjust Antenna Compensating Condenser with insulated handle screw driver to a point where the station sounds the loudest.

4. The Equalizing Condensers are numbered 1, 2, and 3, from front to back of receiver. Reduce the volume control until the station is barely audible and with the adjusting wrench, adjust No. 3 to a point where the station sounds the loudest.

5. Next adjust No. 1 and No. 2 in the same manner.

TO CHECK ADJUSTMENT

6. Tune in a station between 15 and 25 on the dial.

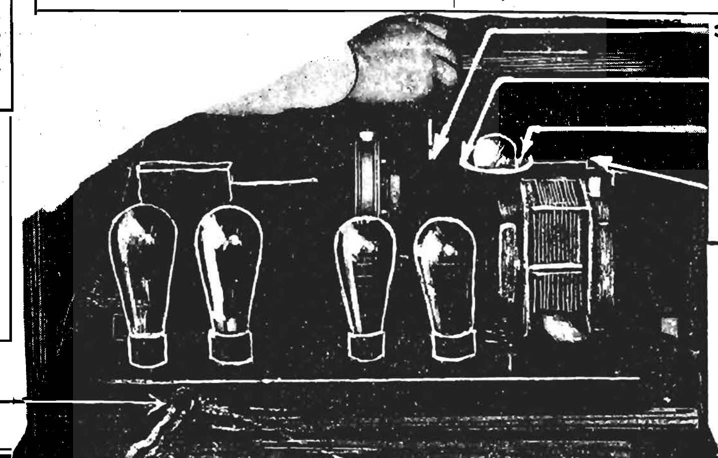
7. Readjust the Antenna Compensating and the Equalizing Condensers No. 3, No. 1, and No. 2 in exactly the same manner as they were adjusted between the 80 to 90 setting of the dial. The purpose of this adjustment is to check the "tracking" of the four condensers. The volume of the station should decrease if any of the four original adjustments are changed. That is, the four tuned circuits must show alignment between 15 and 25 on the dial on the adjustment made between 80 and 90.

TO READJUST

8. After the check between 15 and 25 on the dial, it will be necessary to again readjust the condensers as explained in No. 1 to No. 5 inclusive. This is necessary due to the adjustments being slightly thrown off during the checking process.

SPARTON MODELS 410 AND 420

Follow the same procedure outlined for adjusting the antenna compensating and equalizing condensers for the SPARTON Models AR-19 and 31, except in this case ear phones are not substituted for the speaker as a means of determining when the condensers are properly adjusted. The speaker serves this purpose as it is, and as the dial is calibrated in kilocycles a station is tuned in at 1200 kilocycles or higher frequency instead of between 80 and 90 as specified in paragraph No. 1, and the re-check is made between 500 and 600 kilocycles instead of between 15 and 25.



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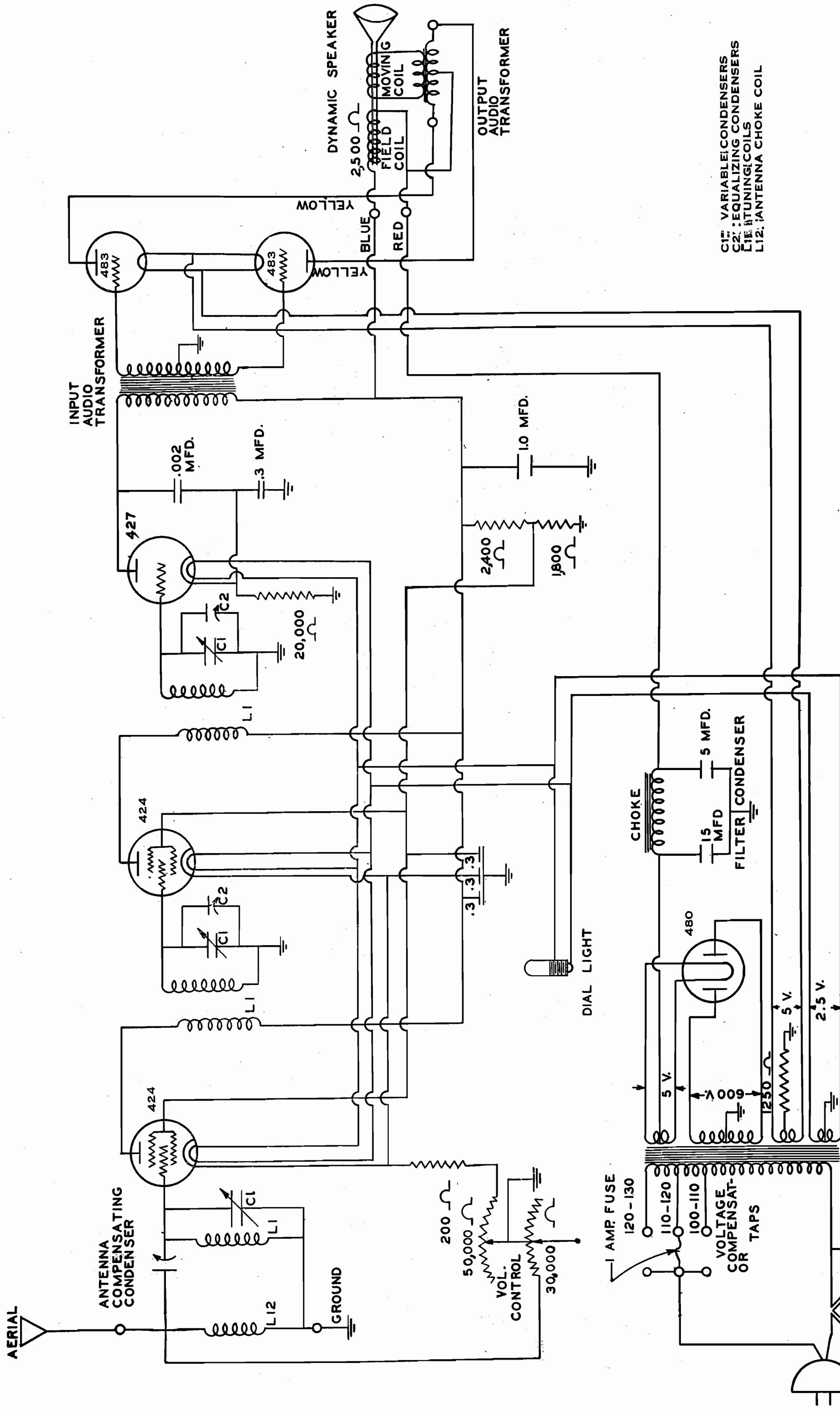

THE SPARKS-WITHINGTON COMPANY
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SPARTON OF CANADA, LIMITED
London, Ontario, Canada

SPARTON MODEL 9-A
410, 420, 600-A, 610-A, 620-A.

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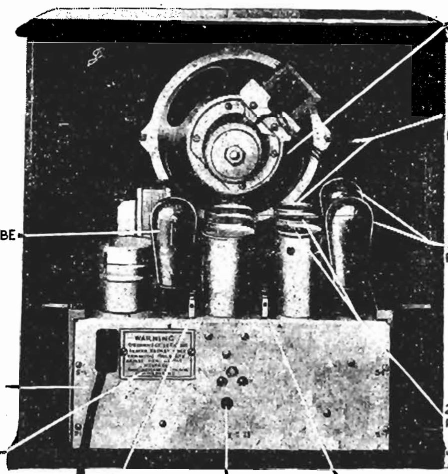
SPARTON OF CANADA LTD.

SPARTON MODEL 9-A
410, 420, 600-A, 610-A, 620-A.



REAR VIEW OF
MODEL 9A, 410 AND 420

Voltage - Current Characteristics

Line Voltage 115—Position of Voltage Compensator 110-120—Position of Volume Control Full

		OPERATING VOLTAGES				
Tube	Location	Heater or Filament	Plate	Control Grid —	Screen Grid +	Plate Current Mils.
424	1st R. F.	2.2 - 2.5	160 - 180	2 - 3	60 - 80	2.5 - 4
424	2nd R. F.	2.2 - 2.5	160 - 180	2 - 3	60 - 80	2.5 - 4
427	Detector	2.2 - 2.5	145 - 165	12 - 18		.4 - 1
483	Power	4.7 - 5	220 - 240	45 - 55		24 - 28
483	Power	4.7 - 5	220 - 240	45 - 55		24 - 28
480	Rectifier	4.7 - 5	320 - 340			40 - 55

IMPORTANT

The voltage current characteristics of the Model 9-A SPARTON Radio were obtained with a Radio Set Analyzer equipped with 1,000 ohm per volt Voltmeters. Only Voltmeters of this grade should be used when comparing voltage and current values obtained in a test with the values in the chart.

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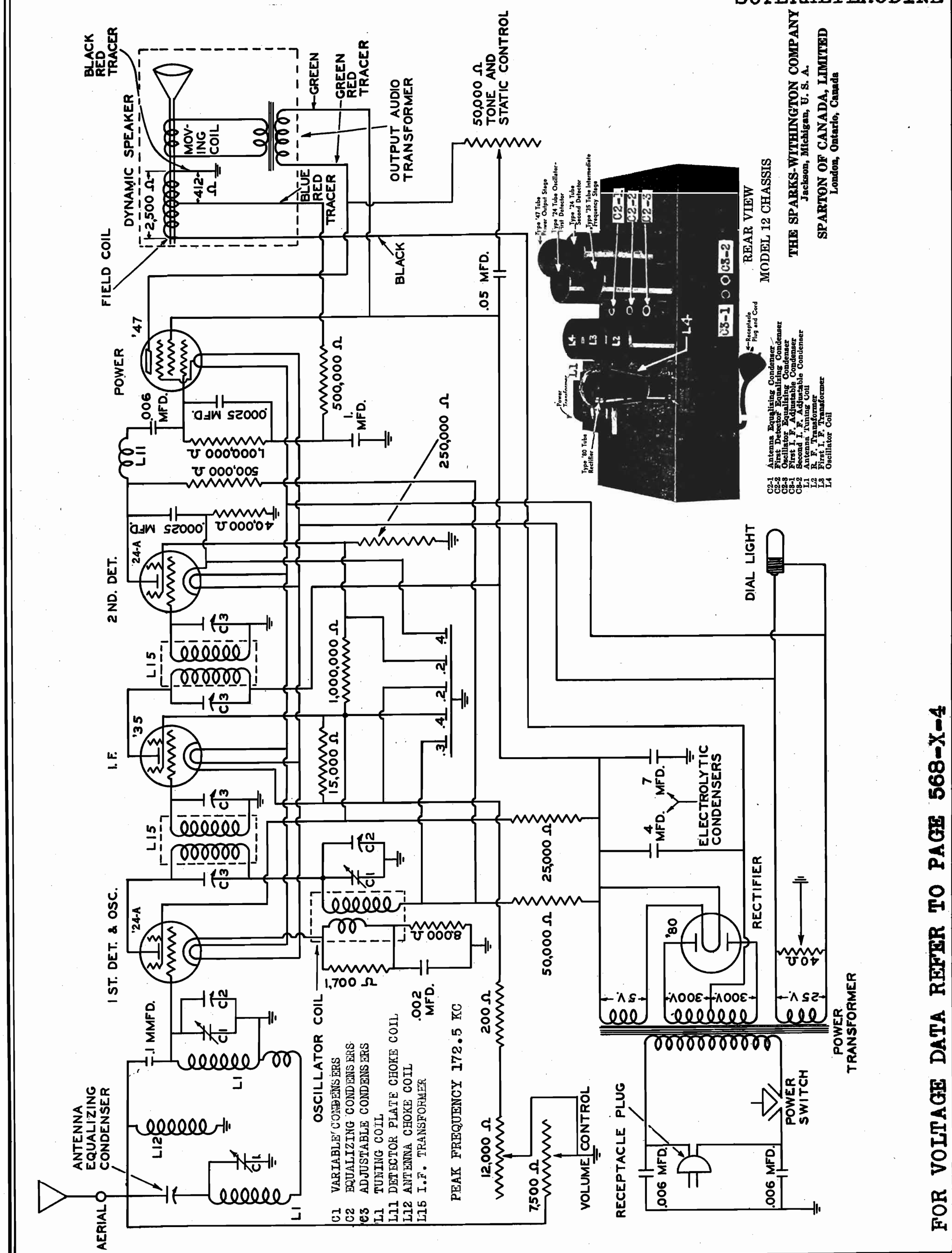
MODEL 12 SUPERHETERODYNE



FOR VOLTAGE DATA REFER TO PAGE 568-X-4

VOLTAGE DATA
MODEL 12
" 16 & 16-AW
" 26 & 26-AW
" 60 SW CONVERTER

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MODEL 12 (Page 568-X-3)

Tube	Location	Heater or Filament	Plate	Control Grid —	Screen Grid +	Plate Current M. A.
'24-A	1st Det.-Osc.	2.2 - 2.5	149 - 171	9.2 - 10.8	58 - 70	.9 - 1.1
'24-A	2nd Det.	2.2 - 2.5	62 - 74	1.6 - 2.0	5.4 - 6.6	.17 - .20
'35	I. F.	2.2 - 2.5	227 - 253	3.2 - 3.8	58 - 70	6.9 - 8.1
'47	Power	2.2 - 2.5	221 - 247	11.0 - 13.0	237 - 263	21.5 - 25.3
'80	Rectifier	4.4 - 5.0	339 - 375	--------	--------	19 - 23

LINE VOLTAGE 115 POSITION OF VOLUME CONTROL FULL

MODEL 60 SHORT-WAVE CONVERTER (Page 568-X-8)

Tube	Location	Filament Heater or	Plate	Control Grid —	Screen Grid +	Plate Current M. A.
'24-A	R. F.	2.2 - 2.5	180 - 230	2 - 3	70 - 100	3 - 6
'24-A	Detector	2.2 - 2.5	180 - 230	*5 - 6	70 - 100	.2 - 1
427	Oscillator	2.2 - 2.5	180 - 230	†	--------	§
'80	Rectifier	4.4 - 5.0	230 - 260	--------	--------	7 - 10

LINE VOLTAGE 115 POSITION OF VOLUME CONTROL FULL
† Tube generates own bias when oscillating.
* Presence of voltage can only be determined by testing circuit continuity and measuring the plate and screen grid current of this tube. Voltage is five thousand times current in amperes.
§ Measure with plug in the second detector socket and tube in test kit.

MODEL 16 (Page 568-X-5)

Line Voltage 115—Position of Voltage Compensator 115-130—Position of Volume Control Full

Tube	Location	Heater or Filament	Plate	Control Grid —	Screen Grid +	Plate Current M. A.
'35	R. F.	2.2 - 2.5	255 - 285	2 - 3	80 - 100	3.5 - 6.0
'35	1st Det.	2.2 - 2.5	245 - 275	*4 - 6	80 - 100	2.7 - 3.1
'35	I. F.	2.2 - 2.5	255 - 285	2 - 3	80 - 100	3.5 - 6.0
427	Oscillator	2.2 - 2.5	70 - 100	†	--------	¶3.0 - 5.0
427	2nd Det.	2.2 - 2.5	235 - 265	18 - 23	--------	0.8 - 1.2
427	A. V. C.	2.2 - 2.5	25 - 35	27 - 35	--------	Zero
'47	Power	2.2 - 2.5	245 - 275	17 - 20	255 - 285	20 - 28
'47	Power	2.2 - 2.5	245 - 275	17 - 20	255 - 285	20 - 28
'80	Rectifier	4.4 - 5.0	360 - 410	--------	--------	35 - 45

MODEL 16-AW (Page 568-X-5)

Line Voltage 115—Position of Voltage Compensator 115-130—Position of Volume Control Full

Tube	Location	Heater or Filament	Plate	Control Grid —	Screen Grid +	Plate Current M. A.
'35	R. F.	2.2 - 2.5	250 - 280	2 - 3	80 - 100	3.5 - 6.0
'35	1st Det.	2.2 - 2.5	245 - 275	*4 - 6	80 - 100	2.7 - 3.1
'35	I. F.	2.2 - 2.5	250 - 280	2 - 3	80 - 100	3.5 - 6.0
427	Oscillator	2.2 - 2.5	70 - 100	†	--------	¶3.0 - 5.0
427	2nd Det.	2.2 - 2.5	230 - 260	18 - 23	--------	0.8 - 1.2
427	A. V. C.	2.2 - 2.5	25 - 35	27 - 35	--------	Zero
'47	Power	2.2 - 2.5	240 - 275	17 - 20	250 - 280	20 - 28
'47	Power	2.2 - 2.5	240 - 275	17 - 20	250 - 280	20 - 28
'80	Rectifier	4.4 - 5.0	360 - 410	--------	--------	38 - 48

MODEL 16-AW SHORT-WAVE UNIT (Pages 568-X-7 & 568-X-5)

Tube	Location	Heater or Filament	Plate	Control Grid —	Screen Grid +	Plate Current M. A.
'24-A	R. F.	2.2 - 2.5	230 - 280	2 - 3	70 - 100	3.0 - 6.0
'24-A	Detector	2.2 - 2.5	230 - 280	‡5 - 6	70 - 100	0.2 - 1.0
427	Oscillator	2.2 - 2.5	230 - 280	†	--------	x

* True value. Amount is less if measured on test kit.
† Tube generates own bias when oscillating.
¶ True value. Amount is more if measured on test kit.
x Measure with plug in second detector socket and tube in test kit.
‡ Presence of voltage can only be determined by testing circuit continuity and measuring the plate and screen grid current of this tube. Voltage is five thousand times current in amperes.

FOR MODELS 25 & 26
REFER TO PAGES 568-Z-1 & 568-Z-2

MODEL 26-AW (25, 26, 26-AW) (Page 568-X-6)

Line Voltage 115—Position of Voltage Compensator 115-130—Position of Volume Control Full

Tube	Location	Heater or Filament	Plate	Control Grid —	Screen Grid +	Plate Current M. A.
'35	R. F.	2.2 - 2.5	170 - 205	2.5 - 4	80 - 100	4 - 6
'35	1st Det.	2.2 - 2.5	170 - 205	*6.4 - 14	80 - 100	*0.8 - 1.8
'35	1st I. F.	2.2 - 2.5	175 - 210	2.5 - 4	80 - 100	4 - 6
'35	2nd I. F.	2.2 - 2.5	175 - 210	2.5 - 4	80 - 100	4 - 6
427	Oscillator	2.2 - 2.5	80 - 100	†	--------	x
427	2nd Det.	2.2 - 2.5	165 - 205	14 - 20	--------	0.7 - 1.0
427	A. V. C.	2.2 - 2.5	‡	30 - 45	--------	Zero
'45	Power	2.2 - 2.5	225 - 270	§28 - 45	--------	20 - 30
'45	Power	2.2 - 2.5	225 - 270	§28 - 45	--------	20 - 30
'80	Rectifier	4.4 - 5	380 - 440	--------	--------	48 - 58

MODEL 26-AW SHORT-WAVE UNIT (Pages 568-X-7 & 568-X-6)

Tube	Location	Heater or Filament	Plate	Control Grid —	Screen Grid +	Plate Current M. A.
'24-A	R. F.	2.2 - 2.4	170 - 200	2 - 3	70 - 100	3 - 6
'24-A	Detector	2.2 - 2.4	170 - 200	¶5 - 6	70 - 100	0.2 - 1
427	Oscillator	2.2 - 2.4	170 - 200	†	--------	x

* Remove oscillator Tube
† Tube generates own bias when oscillating.
¶ Presence of voltage can only be determined by testing circuit continuicy and measuring the plate and screen grid current of this tube. Voltage is five thousand times current in amperes.
x Measure with plug in second detector socket and tube in test kit.
‡ Test kit reading. True voltage is 125 volts.
§ Meter reading on 150 volt scale. True voltage 50-75. If lower scale voltmeter is used, expect lower voltage.

The voltage current characteristics were obtained with a Radio Set Analyzer equipped with 1,000 ohm per volt Voltmeters. Only Voltmeters of this grade should be used when comparing voltage and current values obtained in a test with the values of the chart.

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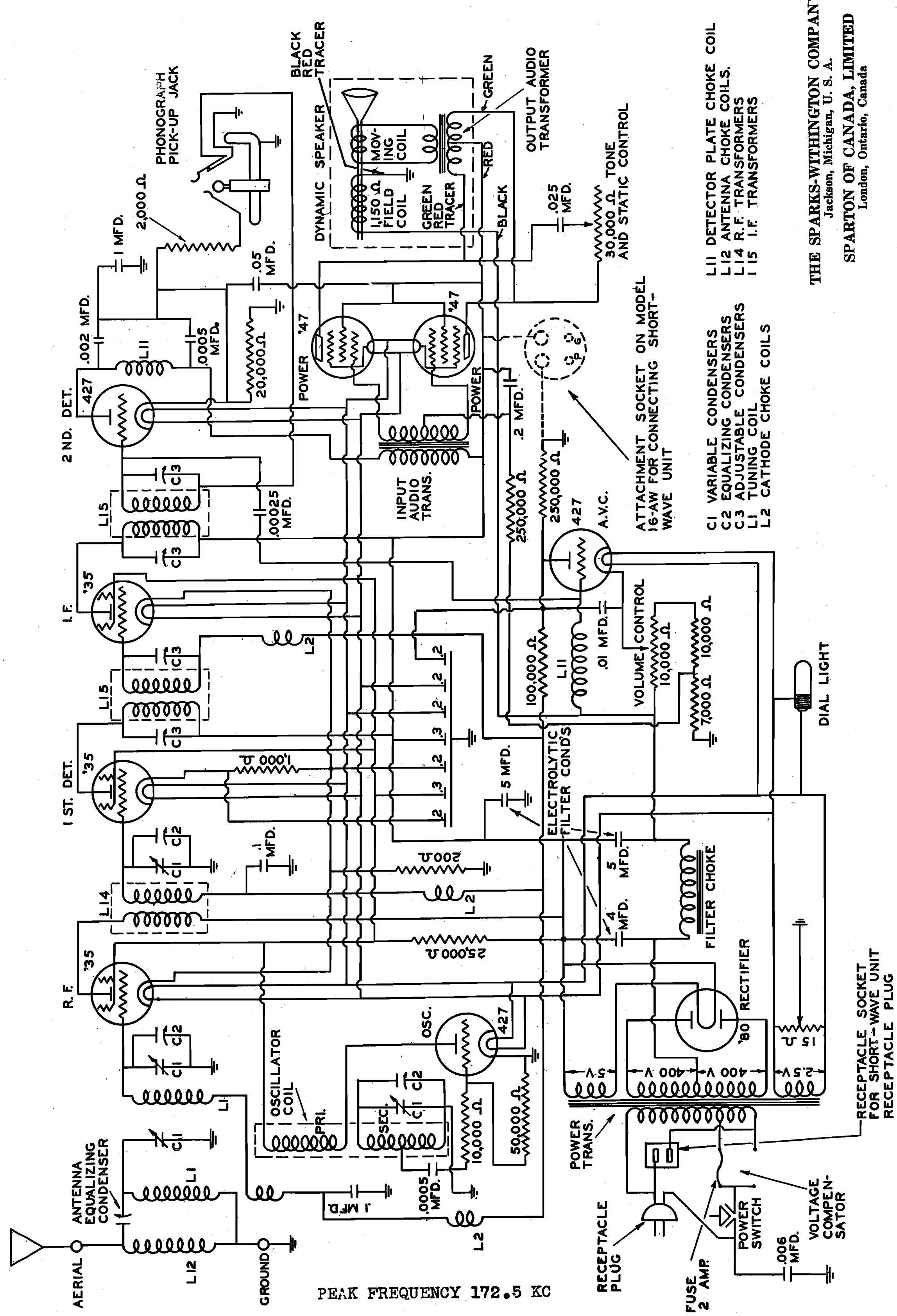
MODEL 16 & 16-AW SUPERHETERODYNE



FOR VOLTAGE DATA REFER TO PAGE 568-X-4

FOR SHORT WAVE UNIT REFER TO PAGE 568-X-7

MODEL 26-AW
SUPERHETERODYNE

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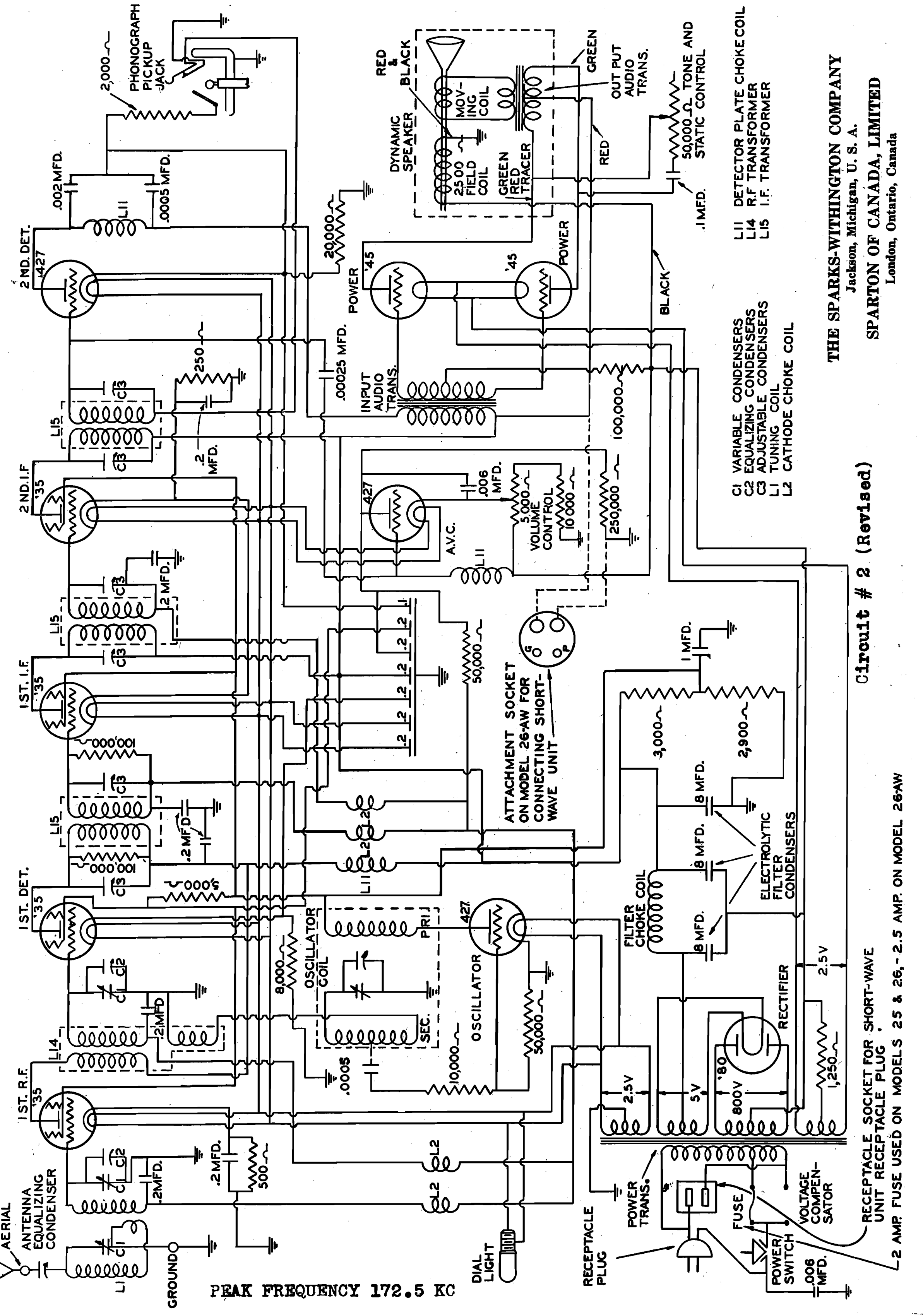
FOR ADDITIONAL DATA ON MODELS 25 & 26 REFER TO PAGES 568-Z-1, 568-Z-2
FOR SHORT WAVE UNIT REFER TO PAGE 568-X-7



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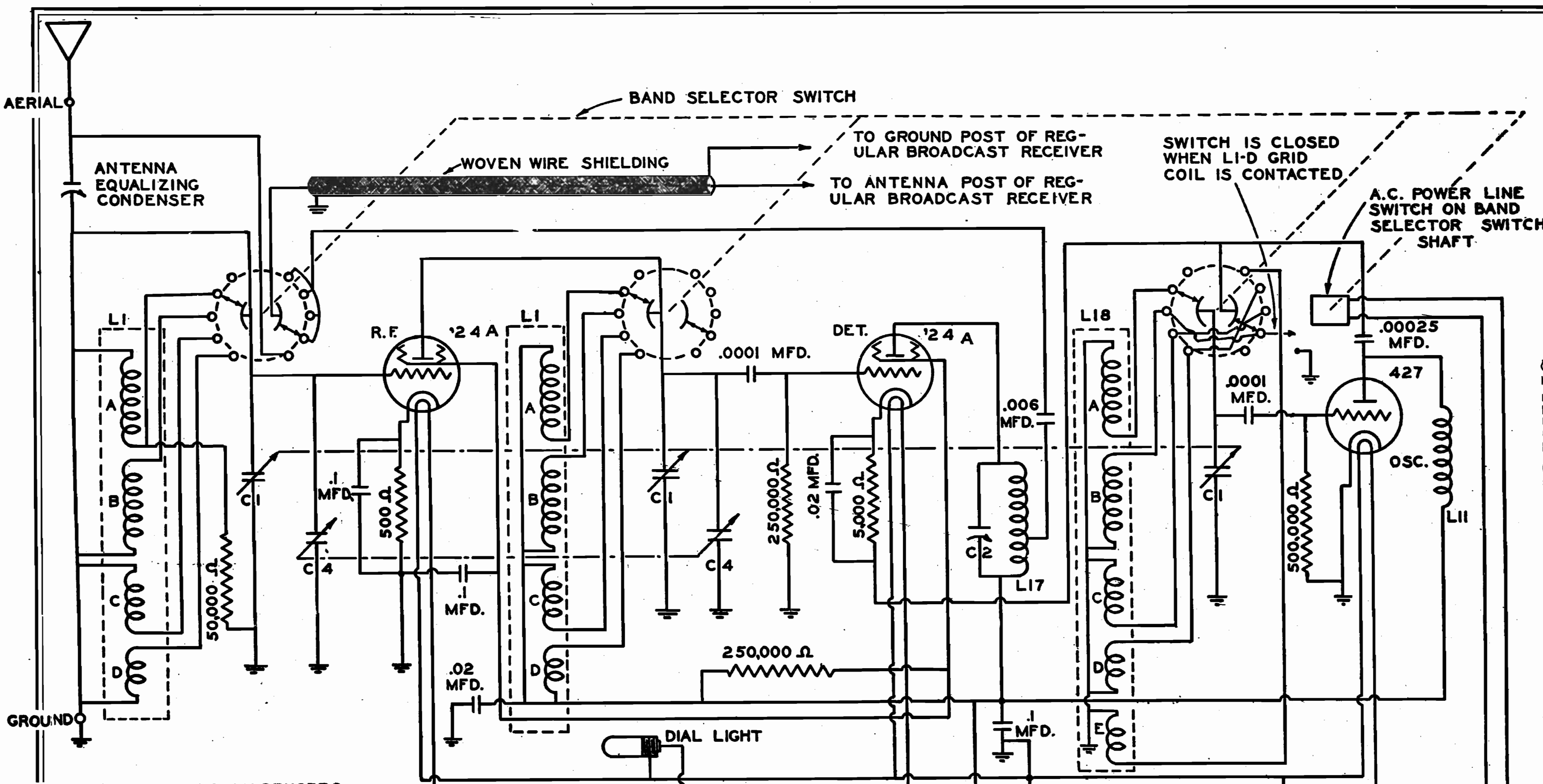
MODEL 16-AW AND 26-AW SHORT WAVE UNIT



C1 VARIABLE TUNING CONDENSERS
C2 EQUALIZING CONDENSER
C4 VARIABLE TRIMMING CONDENSERS
L1 TUNING COILS
L11 DETECTOR PLATE CHOKE COIL
L17 DETECTOR PLATE OUTPUT TRANS.
L18 OSCILLATOR COIL

FREQUENCY BANDS COVERED BY COILS.

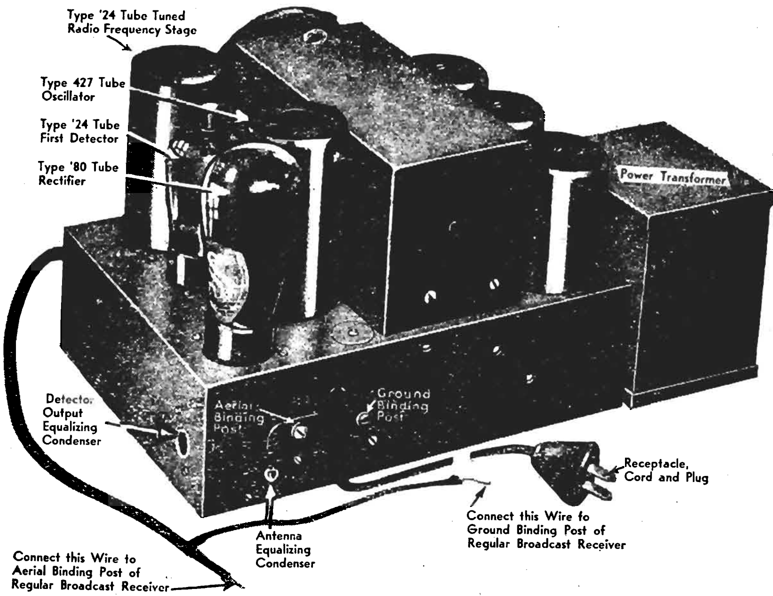
COILS L1	COIL L18	
A	A & B	1.5-3.7 MEGACYCLES
B	B & C	3.2-7.55 MEGACYCLES
C	C & D	7.2-15.5 MEGACYCLES
D	D & E	15.2-25.5 MEGACYCLES

SHORT WAVE UNIT
USED WITH
SUPERHETERODYNE MODELS 16-AW AND 26-AW

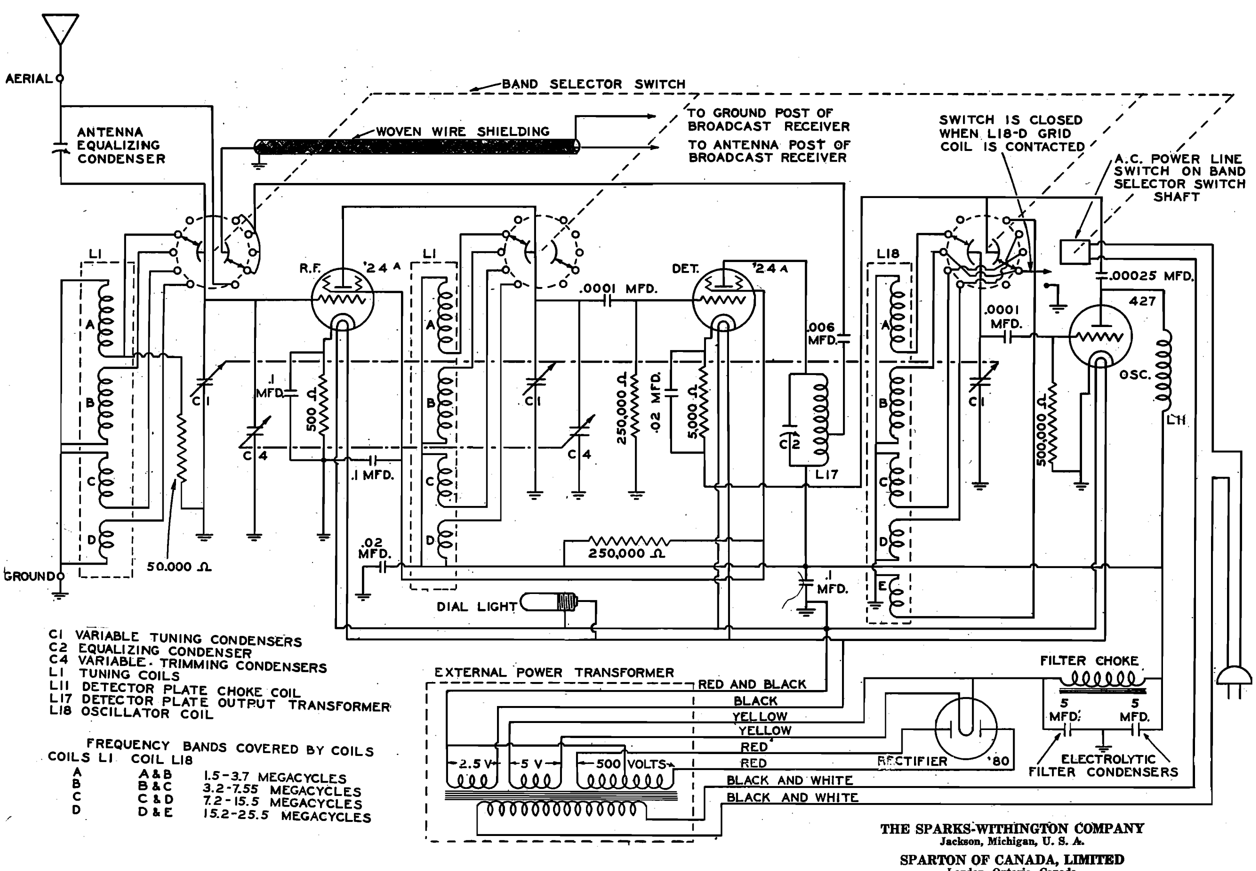
FOR VOLTAGE DATA REFER TO PAGE 568-X-4

SPARKS WITHINGTON CO.
SPARTON OF CANADA LTD.

MODEL 60 SUPERHET. SHORT WAVE CONVERTER



REAR VIEW MODEL 60 CHASSIS



C1 VARIABLE TUNING CONDENSERS
C2 EQUALIZING CONDENSER
C4 VARIABLE TRIMMING CONDENSERS
L1 TUNING COILS
L11 DETECTOR PLATE CHOKE COIL
L17 DETECTOR PLATE OUTPUT TRANSFORMER
L18 OSCILLATOR COIL

FREQUENCY BANDS COVERED BY COILS

COILS L1	COIL L18	
A	A & B	1.5-3.7 MEGACYCLES
B	B & C	3.2-7.55 MEGACYCLES
C	C & D	7.2-15.5 MEGACYCLES
D	D & E	15.2-25.5 MEGACYCLES

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Jackson, Michigan, U. S. A.
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London, Ontario, Canada

FOR VOLTAGE DATA REFER TO PAGE 568-X-4

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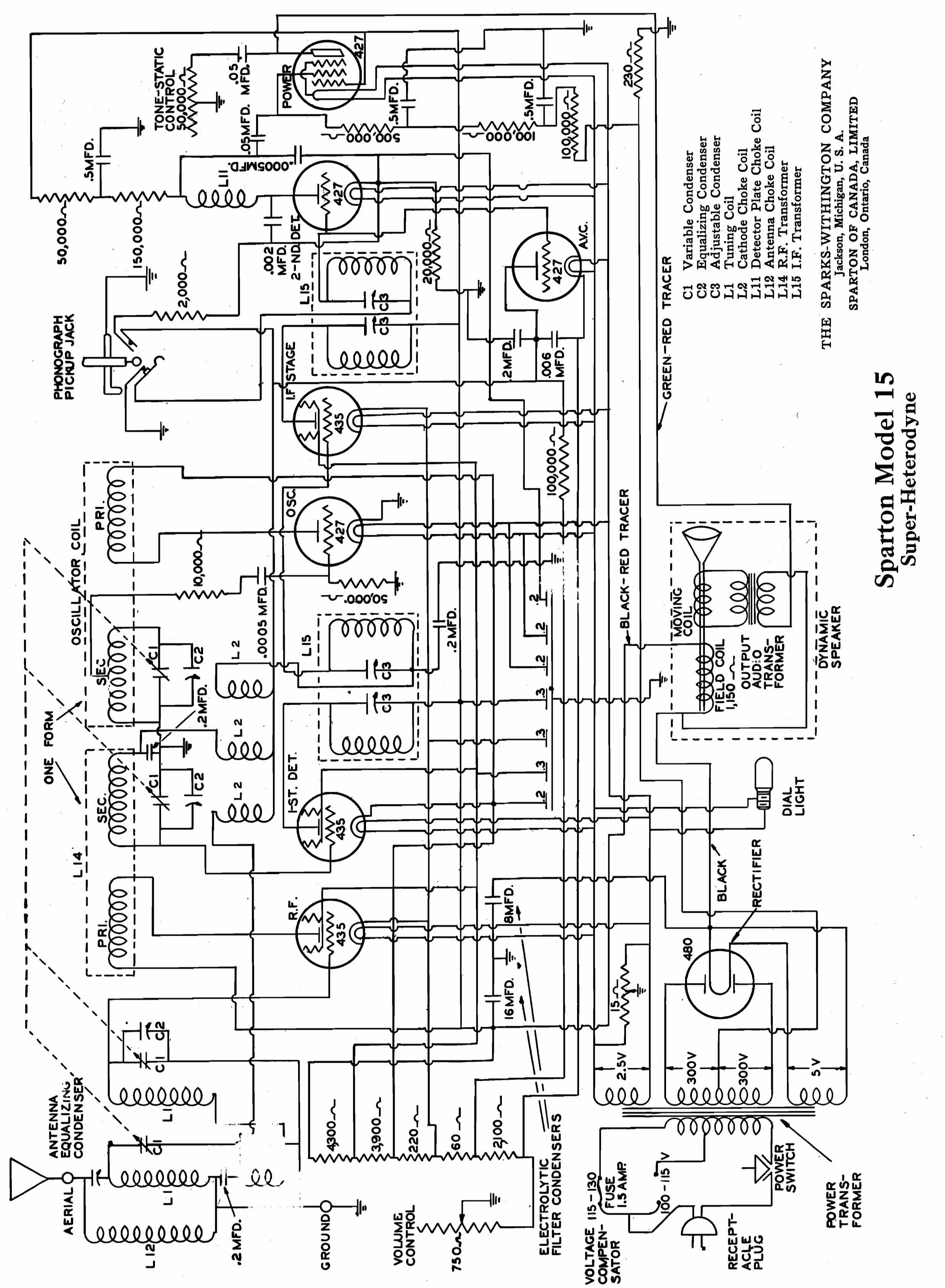

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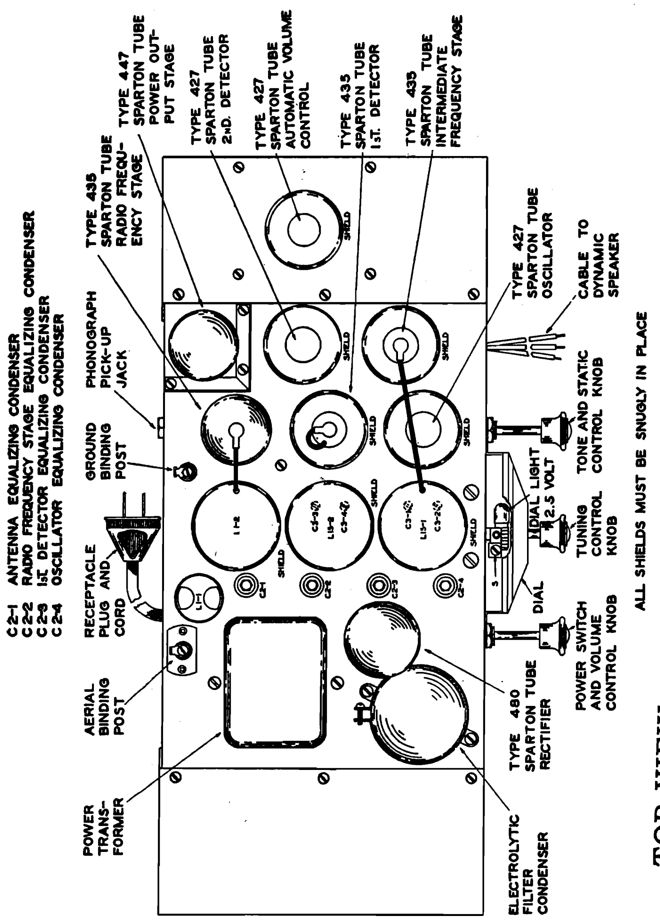
Sparton Model 15



TOP VIEW

L1-1 First R. F. Tuning Coil
L1-2 Second R. F. Tuning Coil
L15-1 First I. F. Transformer (1st. Det. to I. F. Stage)
L15-2 Second I. F. Transformer (I. F. to 2nd. Det. Stage)
C3-1 I. F. Stage First Adjustable Condenser
C3-2 I. F. Stage Second Adjustable Condenser
C3-3 I. F. Stage Third Adjustable Condenser
C3-4 I. F. Stage Fourth Adjustable Condenser

Voltage-Current Characteristics

Line Voltage 115—Position of Voltage Compensator 115-130—Position of Volume Control Full

		OPERATING VOLTAGES				
Tube	Location	Heater or Filament	Plate	Control Grid—	Screen Grid+	Plate Current Mills.
435	1st R. F.	2.2 - 2.5	155 - 185	2 - 3	70 - 100	3 - 6
435	1st Det.	2.2 - 2.5	150 - 180	§ 7 - 11	70 - 100	§ 1.8 - 3
435	1st I. F.	2.2 - 2.5	155 - 185	2 - 3	70 - 100	3 - 6
427	Oscillator	2.2 - 2.5	70 - 95	†	....	‡
427	2nd Det.	2.2 - 2.5	*100 - 135	8 - 14	....	4.0 - .7
427	A. V. C.	2.2 - 2.5	30 - 40	24	....	Zero
427	Power	2.2 - 2.5	220 - 260	15 - 18	230 - 270	30 - 36
480	Rectifier	4.2 - 5	320 - 370	....	....	40 - 55

* Use 300 volt scale.
§ Remove Oscillator tube.
† Tube generates own bias when oscillating.
‡ Test with plug in 2nd. Detector socket and tube in analyzer.

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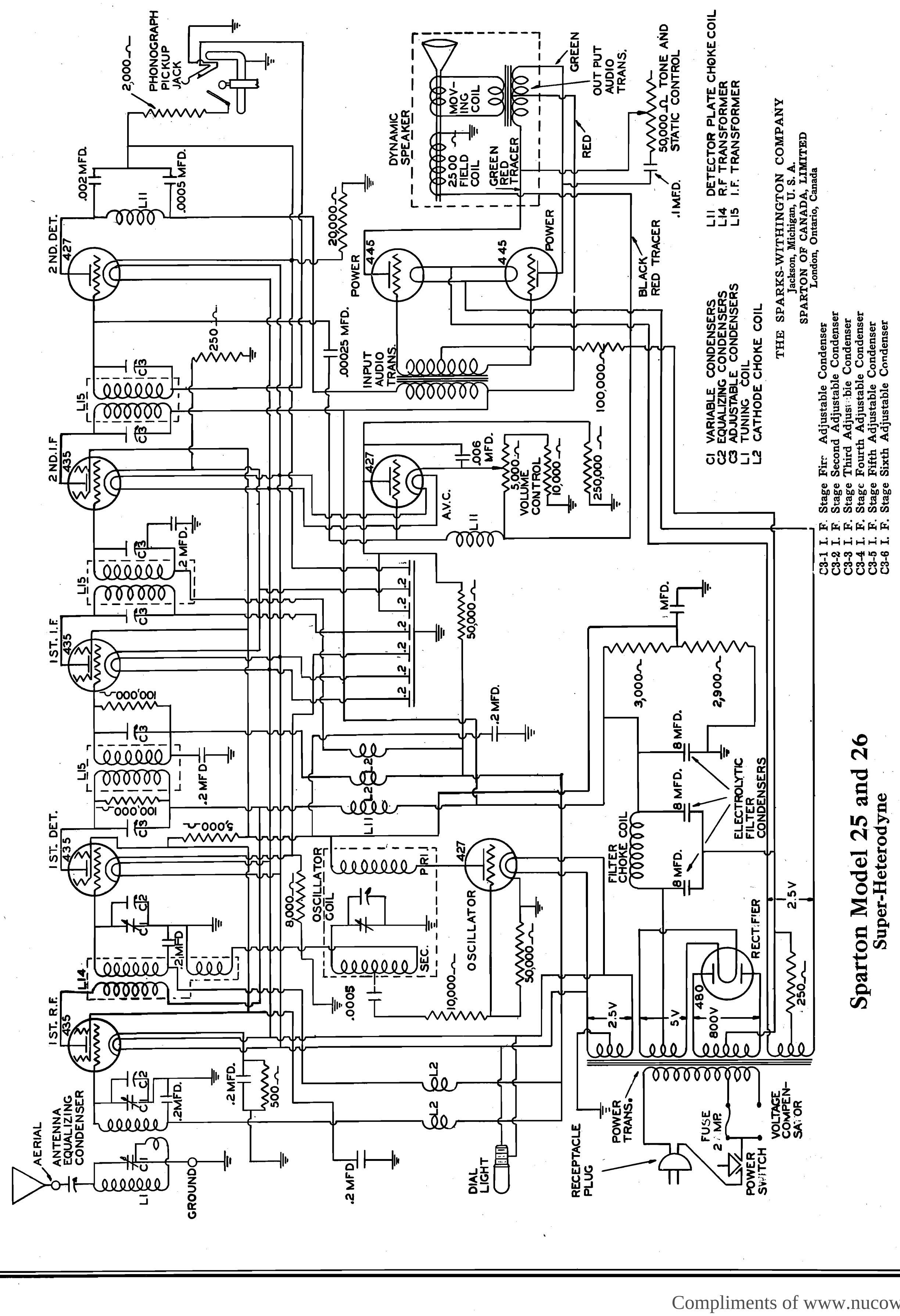

Sparton Model 25 and 26
Super-Heterodyne

SPARKS WITHINGTON CO.
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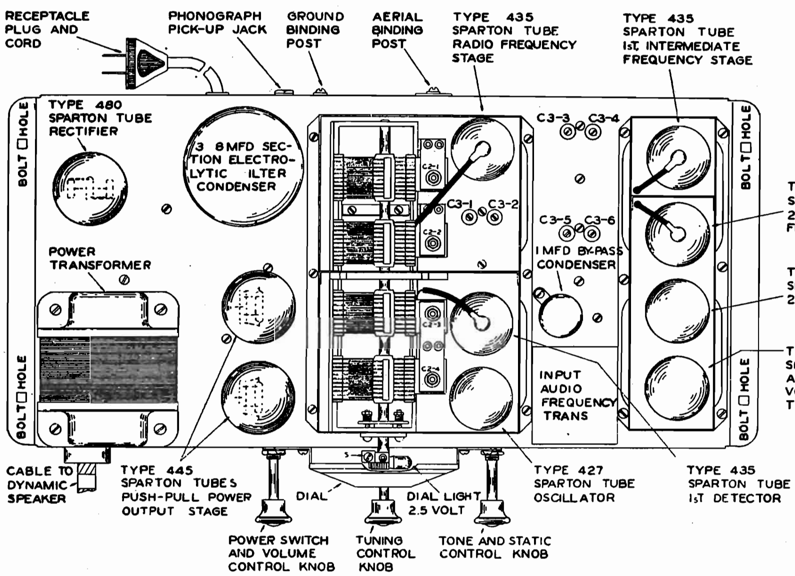
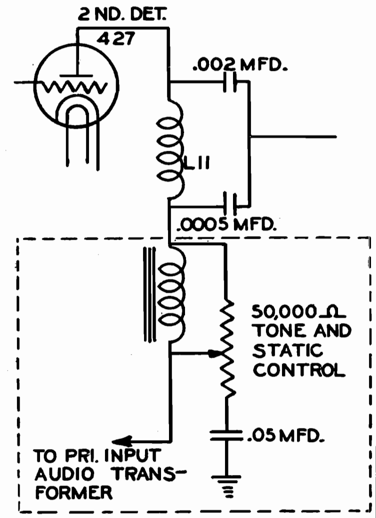
SPARTON MODEL 25 AND 26



C2-1 ANTENNA EQUALIZING CONDENSER
C2-2 RADIO FREQUENCY STAGE EQUALIZING CONDENSER
C2-3 1ST. DETECTOR EQUALIZING CONDENSER
C2-4 OSCILLATOR EQUALIZING CONDENSER

TOP VIEW OF MODEL 25 AND 26 CHASSIS



Schematic Diagram of Tone Control System used on a few of the first SPARTON Model 25 and 26.

Voltage-Current Characteristics

Line Voltage 115—Position of Voltage Compensator 100-115—Position of Volume Control Full

Tube	Location	OPERATING VOLTAGES Heater or Filament	Plate	Control Grid—	Screen Grid+	Plate Current Mills.
435	1st R. F.	2.2 - 2.5	180 - 220	2.5 - 4	80 - 100	5 - 8
435	1st Det.	2.2 - 2.5	180 - 220	*6.4 - 14	80 - 100	*.8 - 1.8
435	1st I. F.	2.2 - 2.5	180 - 220	2.5 - 4	80 - 100	5 - 8
435	2nd I. F.	2.2 - 2.5	180 - 220	2.5 - 4	80 - 100	5 - 8
427	Oscillator	2.2 - 2.5	80 - 100	†	....	‡
427	2nd Det.	2.2 - 2.5	170 - 205	14 - 20	....	.7 - 1.0
427	A. V. C.	2.2 - 2.5	§	30 - 50	....	Zero
445	Power	2.2 - 2.5	225 - 270	‖30 - 45	....	20 - 30
445	Power	2.2 - 2.5	225 - 270	‖30 - 45	....	20 - 30
480	Rectifier	4.2 - 5	360 - 440	....	....	48 - 58

* Remove oscillator tube.
† Tube generates own bias when oscillating.
‖ Meter reading use 150 volt scale—true voltage 50-75—if lower scale voltmeter is used expect lower voltages.
§ Test from grid prong to ground approx. 125 volts.
‡ Test with plug in 2nd. Detector socket and tube in Analyzer.

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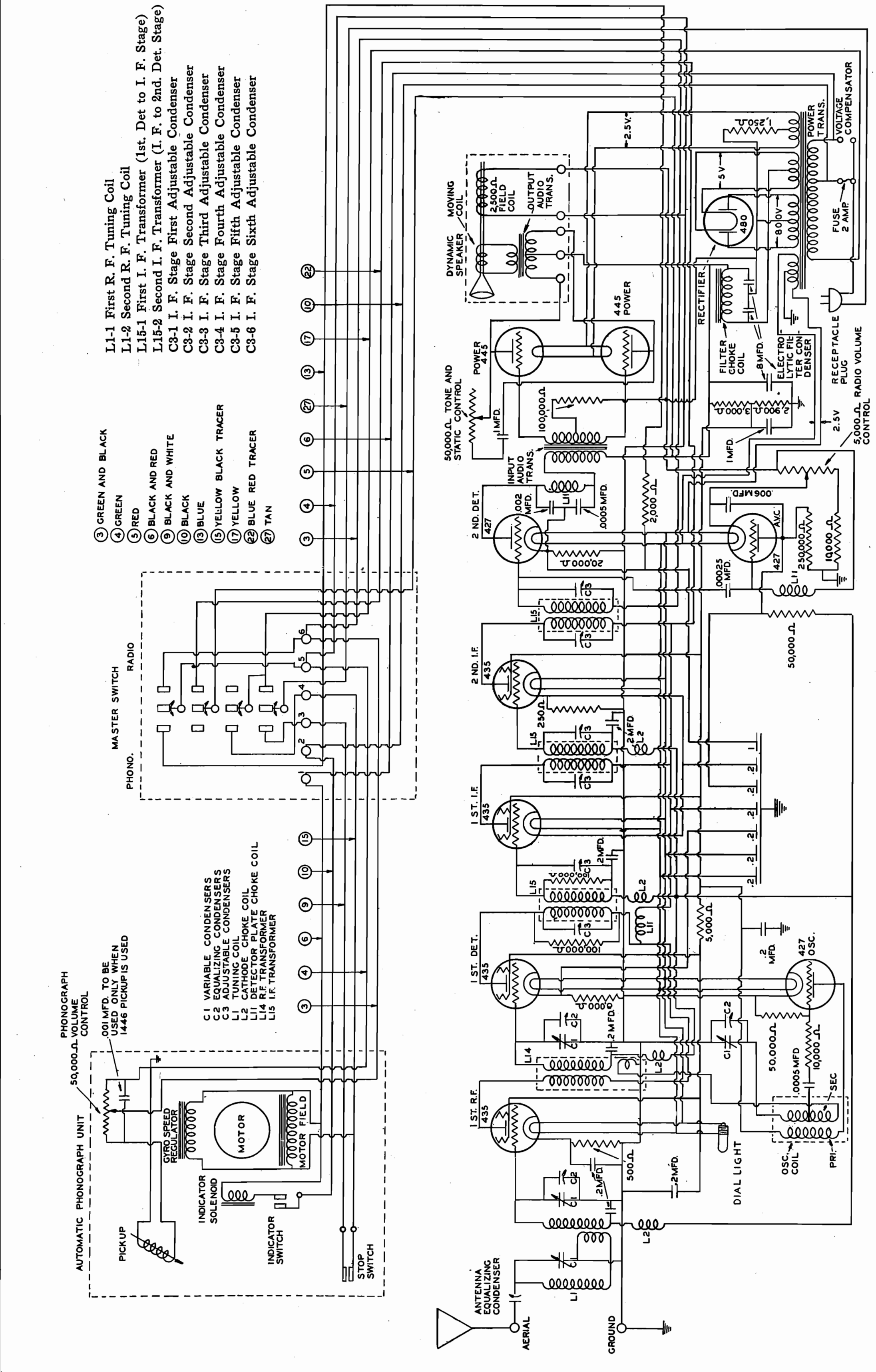
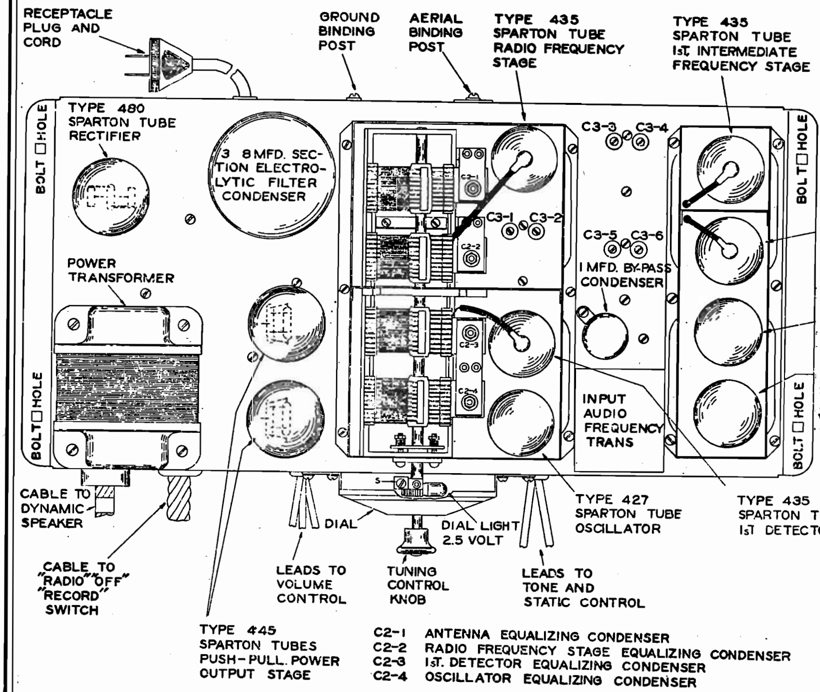


THE SPARKS-WITHINGTON COMPANY
Jackson, Michigan, U. S. A.
SPARTON OF CANADA, LIMITED
London, Ontario, Canada

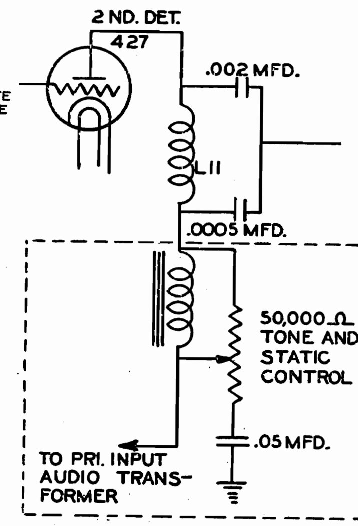
Sparton Model 30
Radio Phonograph Combination

SPARKS WITHINGTON CO.
SPARTON OF CANADA LTD.

SPARTON MODEL 30
ENSEMBLE



TOP VIEW



Schematic Diagram of Tone Control System used on a few of the first SPARTON Model 30.

Voltage-Current Characteristics

Line Voltage 115—Position of Voltage Compensator 100-115—Position of Volume Control Full

		OPERATING VOLTAGES				
Tube	Location	Heater or Filament	Plate	Control Grid—	Screen Grid+	Plate Current Mills.
435	1st R. F.	2.2 - 2.5	180 - 220	2.5 4	80 - 100	5 - 8
435	1st Det.	2.2 - 2.5	180 - 220	*6.4 - 14	80 - 100	*.8 - 1.8
435	1st I. F.	2.2 - 2.5	180 - 220	2.5 - 4	80 - 100	5 - 8
435	2nd I. F.	2.2 - 2.5	180 - 220	2.5 - 4	80 - 100	5 - 8
427	Oscillator	2.2 - 2.5	80 - 100	†	....	‡
427	2nd Det	2.2 - 2.5	170 - 205	14 - 20	....	.7 - 1.0
427	A. V. C.	2.2 - 2.5	§	30 - 50	....	Zero
445	Power	2.2 - 2.5	225 - 270	‖30 - 45	....	20 - 30
445	Power	2.2 - 2.5	225 - 270	‖30 - 45	....	20 - 30
480	Rectifier	4.2 - 5	360 - 440	....	....	48 - 58

* Remove oscillator tube.
† Tube generates own bias when oscillating.
‖ Meter reading use 150 volt scale—true voltage 50-75—If lower scale is used expect lower voltages.
§ Test from grid prong to ground approx. 125 volts.
‡ Test with plug in 2nd. Detector socket and tube in Analyzer.

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SPARTON ENSEMBLE MODEL 30

RECEIVING UNIT PARTS

Description	Part No.
Antenna Terminal and Insulation Assembly	A-6898
Body Complete—Amplifier	B-3627
Body Complete—Selector Assembly Top	B-3623
Bracket—Base Mounting	A-6718
Bracket—Dial Drive Support	B-4109
Bracket—2 Mfd. Condenser	A-7499
Bulb—Dial Light	A-5058
Chassis Less Tubes 25 Cycle	D-327
Chassis—Less Tubes 60 Cycle	D-326
Clamp—Cable 1/32" Radius	A-5215
Clamp—Cable 3/16" Radius	A-2251
Clip—Fuse	A-4983
Choke Coil—Cathode	A-7209
Choke Coil—Detector Plate	A-7297
Choke Coil—Filter	B-3429
Choke Coil—Tone Control	A-6862
Coil—Oscillator	A-6873
Coil—Tuning No. 1	A-6791
Coil—Tuning No. 2	A-6794
Condenser Frame and Anchor Plate Insulation	B-4021
Condenser—Double Equalizing	A-7054
Condenser—I. F. Adjustable and Bracket	A-7097
Condenser—Rotor Assembly	B-3648
Condenser—Single Equalizing	A-2053
Condenser Stator Assembly No. 1, 2, and 4	A-6582
Condenser Stator Assembly No. 3	A-6581
Condenser—.1 Mfd.	A-7475
Condenser—.2 Mfd. Cub	A-7005
Condenser—.2 Mfd. with Cap	A-4998
Condenser—.2 Mfd. Less Cap	A-7094
Condenser—.05 Mfd.	A-6927
Condenser—.002 Mfd.	A-7038-3
Condenser—.006 Mfd.	A-4434
Condenser—.0005 Mfd.	A-7038-1
Condenser—.00025 Mfd.	A-5175
Condenser—1 Mfd.	A-5032
Condenser—8 Mfd. Electrolytic	A-6884
Condenser—Block 7 Lead	B-4107
Contact—Rotor Shaft Center	A-5814
Contact—Rotor Shaft Front	A-5308
Contact—Rotor Shaft Rear	A-4317
Cotter Key—Drive Shaft	A-7130
Cover—Amplifier Body	B-3625
Cover—Bottom	B-4084
Cover—Electrolytic Condenser Assembly	A-6715
Cover—Selector Body	B-3621
Cushion—Rubber Mounting	A-6967
Dial Control Assembly	A-7070
Drive Disc and Light Shield Assembly	A-7166
Fuse—1½ Ampere	A-4980-4

RECEIVING UNIT PARTS (Continued)

Description	Part No.
Grommet—Rubber	A-5183
Insulation—Filter Condenser	A-7264-A
Insulation—Phonograph Volume Control	A-6970
Insulation—1st I. F. Transformer Shield	A-7445
Kilocycle Scale and Support	B-4120
Lug—I. F. Transformer Soldering	A-3737
Lug—Rivet Soldering	A-1866
Lug—Screw Soldering	A-1865
Nut—Equalizing Condenser	A-2269
Plate—Condenser Bearing	A-4226
Plate—Clamping	A-3799-A
Plate and Double Terminal	A-7051
Plate—Filter Condenser Mounting	A-6705
Plate—6 Point Resistor and Condenser	A-7055
Plate—Rotor Shaft Thrust	A-4310-A
Plate—Stator Clamping	A-5751
Pointer—Dial	A-7113
Receptacle Cord and Plug	A-6743
Resistor and Condenser Assembly	B-4259
Resistor—200 Ohm	B-4114-11
Resistor—250 Ohm	B-4114-3
Resistor—1250 Ohm	A-7018
Resistor—500 Ohm	B-4114-1
Resistor—2,000 Ohm	B-4114-6
Resistor—5,000 Ohm	B-4114-20
Resistor—8,000 Ohm	B-4114-2
Resistor—10,000 Ohm .5 Watt	B-4114-7
Resistor—10,000 Ohm 3 Watt	B-4114-5
Resistor—20,000 Ohm	B-4114-14
Resistor—50,000 Ohm	B-4114-12
Resistor—100,000 Ohm	B-4114-10
Resistor—2,900-3,000 Ohm	A-6619
Resistor—250,000 Ohm	B-4114-4
Screw—Aerial and Ground Binding Post	A-6575
Screw—Equalizing Condenser	A-3525
Screw—I. F. Adjustable Condenser	A-7692
Selector Assembly	C-687
Shaft—Drive and Spring	A-7165
Shaft—Drive and Washer	A-7058
Shield—Input Transformer	A-7680
Shield—Condenser Rear Stator	A-6767
Shield—Coil Copper Selector Assembly	B-3602
Shield—I. F. Adjustable Condensers	A-7211
Shield—I. F. Transformer Bottom	A-6600
Spacer Bushing—6 x 1⅞	A-6731
Spacer Bushing—¼ x 7/32	A-7040
Spacer Bushing—¼ x ⅝	A-3725
Spring—Drive	A-7112

MODEL 30 AUTOMATIC PHONOGRAPH

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Service Data for Sparton Ensemble Model 30 Automatic Phonograph Mechanism

The automatic phonograph mechanism of the Model 30 SPARTON Ensemble consists of three principal divisions: The Power Source, the Tripping mechanism, and the Discard-Indicating mechanism. A description of the construction and function of each division is outlined in the following paragraphs.

POWER SOURCE

The Power Source consists of (Fig. 1) Motor 1321 mounted between Top Plate C-623 and Bottom Plate C-619, which are held parallel by (Fig. 2) Spreader 1261 and together by (Fig. 1) eight screws 1365. A worm in the Motor Shaft meshes with the Worm Gear, on the Turntable Shaft and causes the Turntable Shaft to revolve. A portion of this shaft protrudes below the Worm Gear Chamber. On this portion of the shaft (Fig. 2) Pinion 1207 turns freely. It is held in position by Thrust Washers bearing on the end of (Fig. 1) Sleeve 1255, on which Clutch Spool 1206 is mounted and held by Pin 1351. This pin holds the Sleeve integral with the shaft, but allows the Clutch Spool to travel up and down. The pin works in the Slot on the Clutch Spool. The Clutch Spool always revolves with the Turntable Shaft. Raising the Clutch Spool causes one of its three teeth to mesh with one of the two teeth in (Fig. 2) Pinion 1207, causing Pinion to turn with the Turntable Shaft. The teeth of this pinion mesh with the teeth in the (Fig. 1) Compound Intermediate Gear A-6138 causing it to revolve, then the teeth in the Compound Intermediate Gear mesh with the teeth of (Fig. 2) Cam B-3715 and causes the cam to revolve in a clockwise direction. The Compound Intermediate Gear and Cam are held in position by Pivot Studs in The Top Plate, and (Fig. 2) Pivot Bearings, 1262 which are adjustable, and locked into The Bottom Plate by means of Nut 733. These Pivot Bearings should be adjusted so the shafts turn freely, but do not move up and down. Cam B-3715 is the "heart" of the mechanism. All motions and power are derived from it, except the Power for (Fig 3) Turntable C-617-A which is revolved by (Fig. 1) Rubber Washer 1321-1 acting against Metal Washer 1321-2 which is driven by a pin through the top of the Turntable Shaft. The thrust from the Turntable Shaft is taken by (Fig. 1) Thrust Screw 1256-A, which is locked in position by Nut 773.

TRIPPING MECHANISM

When a record has been reproduced the needle in (Fig. 1) Pickup Unit A-6126 travels into the center of the record by means of the eccentric groove or the spiral groove depending upon the type of record. This motion is transmitted through Pickup Arm C-621 which is pivoted to (Fig. 3) Bracket 1269 by (Fig. 2) pivot screws 1270. (Fig. 3) Bracket 1269 is pivoted between the Top and Bottom Plates, at the top by (Fig. 2) Pivot Stud 1263 which is held in position by Top Support 1342-A and at the bottom by Pivot Bearing 1262. The motion of (Fig. 1) Pickup Unit A-6126 causes (Fig. 3) Bracket 1269 to move on a vertical axis. In case of Spiral Groove records (Fig. 2) Pawl Arm 1234 attached to Bracket 1269 moves in and out, causing Spiral Pawl 1245 to raise Trip Lever 1233. In case of Eccentric Groove records Eccentric Pawl 1246 raises Trip Lever 1233. This causes Throw-Out Lever 1275 to be released, allowing it to travel downward and act on (Fig. 1) Clutch Lever 1277-A which pivots on Stud 1467. This allows the forked end to travel upward, which causes Clutch Spool 1206 to also travel upward, and its lugs engage with the lugs on (Fig. 2) Driving Pinion 1207, causing Pinion 1207 to turn which turns Cam B-3715 through (Fig. 1) Compound Intermediate Gear A-6138. When the cam (Fig. 2) B-3715 has nearly completed its cycle the Lug on it passes under the cam surface of Throw-out Lever 1275, causing it to rise and be held in position by allowing the notch in Trip Lever 1233 to engage under the projection step in Throw-out Lever 1275. The Lug also prevents (Fig. 1) Clutch Lever 1277-A from rising. This holds Clutch Spool 1206 in mesh with (Fig. 2) Drive Pinion 1207 placing a strain on Spring 1366. When the Lug passes over the end of (Fig. 1) Clutch Lever 1277-A, the end snaps up, the forked end snaps down, and causes Clutch Spool 1206 to dis-engage from (Fig. 2) Pinion 1207. This stops the cycle operation.

MOVEMENT OF PICKUP

The (Fig. 1) Pick-up Unit A-6126 is moved by means of (Fig. 3) Follow Arm 1271 attached to (Fig. 1) Pick-up Unit Arm C-621 by (Fig. 3) Screws 13830-7 and 13830-9. The Follow Arm is moved by a Pin on the end of it which travels in a groove on the top of (Fig. 2) Cam B-3715. One quarter of the way around the top of the Cam there are two grooves. When the Pin is in the inner groove, the needle in (Fig. 1) Pick-up Unit A-6126 will lower at the starting position for 10" records. When the Pin is in the outer groove the Pick-up Unit will lower at the starting position for 12" records. Cam Track Switch 1266 (not shown) changes this pin into groove required. This is done by (Fig. 3) Switch Cam 1297 being raised up by Shift Lever 1303-A, which is pulled forward by Piston A-6136 in Solenoid A-6135-A which is energized by the Indicator Switch described in a subsequent discussion. When Switch Cam 1297 which is pivoted on Bracket 1357-A, is in contact with Finger 1303-A it causes the inner side of (Fig. 2) Cam B-3715 to rise, making it engage on lower lug of Cam Track Switch 1266 (not shown). This changes the position of the Cam Track Switch, causing the necessary movement for the Pick-up Unit to lower to the starting position for 12" records.

DISCARD-INDICATING MECHANISM

(Fig. 3) Lift Lever 1302-A attached to Shift Lever 1303-A; is caused to rise at each revolution of the (Fig. 2) Cam B-3715 by a roller acting on a perpendicular surface inside of the cam. If (Fig 3) Shift Lever 1303-A is in the proper position to raise Cam 1297 it also will cause end of Lift Lever 1302-A to rise under the low part of (Fig. 2) Roller Arm 1471, causing Roller 1243 to rise on largest perpendicular cam surface on Cam B-3715. This causes (Fig. 1) Discarder B-3711-AA to be pulled back into the proper position to discard 12" records. If (Fig. 3) Shift Lever 1303-A is not in the forward position, Lift Lever 1302-A does not come up under the low part of (Fig. 2) Roller Arm 1471 and the Roller travels around on the smaller perpendicular surface of Cam B-3715 and the (Fig 1) Discarder B-3711-AA stays at the proper position to discard 10" records. These two discarder motions are accomplished by the fork in (Fig. 2) Roller Arm 1471 engaging in the fork of (Fig. 1) Yoke 1238 which is attached to the top and bottom plate by (Fig. 2) Links 1217 and (Fig 1) 1440 so the entire Discard Mechanism B-3711-AA can travel back and forth being controlled by (Fig. 2) Roller Arm 1471, which acts on either of the two perpendicular cam surfaces on Cam B-3715. To (Fig. 1) Link Yoke 1238, Links 1225 are attached. These Links are also attached to Discard Arm B-3711 and Shoe 1226. This gives a parallel motion to the Discard Arm up and down. This movement is accomplished by (Fig. 2) Lift Lever 1224 acting on (Fig. 1) Shoe 1226, when (Fig. 2) Lever 1224 is raised and lowered. Lever 1234 is raised and lowered by Lever 1279-A which is acted upon by the stud in it being in contact with the bottom surface of Cam B-3715. The inward motion of the Discarder is caused by the tension of Spring 1370 and is stopped by Stop Stud 1379. This relieves the pressure of Roller 1243 and allows Roller Arm 1471 to drop from the 12" record position to the 10" record position when the Roller is at the neutral part of cam surface. To prevent this roller from dropping down at any other time, (Fig. 1) Roller Arm Holdup 1452 is made use of, because (Fig. 2) Roller Arm 1471 is always over the vertical leg of (Fig. 1) Hold-up Arm 1452 when it is acting on the 12" cam surface. Repeat Lever 1377 is used when the continuous playing of one record is desired. This Lever when moved in, comes under Link 1225, making it impossible for Discard Arm B-3711 to Lower to the position to discard a record. (Fig. 3) Rest Hook 1349 is made use of when loading records. When Follow-Arm 1271 is placed on this hook, (Fig. 3) Discard Hold-up B-3712 is brought over (Fig. 2) Lever 1279-A, preventing it from acting to lower (Fig. 1) Discard Mechanism and remains in this position until it is pushed out by the Lug on (Fig. 2) Cam B-3715. This is why the Pick-up Unit can be brought to the center of the record and tripped without discarding the record, thus enabling the needle to start in the proper position, according to the record that is to be reproduced.

When (Fig. 1) pick-up Unit A-6126 causes mechanism to trip and begin a cycle of operation due to motion transmitted through it via the spiral or eccentric groove of the record, it is immediately swung away from the center of the record and poised above the edge of the turntable.

At the same instant the pick-up Unit has

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MODEL 30 AUTOMATIC PHONOGRAPH

SERVICE DATA FOR SPARTON ENSEMBLE MODEL 30 PHONOGRAPH MECHANISM

stopped in its travel away from the center of the record the Finger on (Fig. 2) Cam 1290 attached to the top of Cam B-3715 engages with indicator finger A-7639 attached to indicator unit shaft A-6002.

Cam B-3715 revolves further, exerts additional influence on the indicator finger causing the (Fig. 3) indicator C-620 and kick-off arm A-6117 attached to it to describe a half circle. Kick-off Arm A-6117-A pushes record to be discarded into the receiving compartment.

When the Kick-off Arm A-6117-A has swung through its arc of travel outward, Indicator Switch B-3710-AA rests on the top record of the group on the turn table. This switch reaches this position only when the arm has completed its arc of travel, and is not visible when the arm has reversed its direction of movement.

This is due to a sloping edge cut on the (Fig. 1) indicator shaft bushing A-6121 onto which the lower parallel arm of the indicator switch rides when the shaft turns as described.

When the roller of the indicator switch rides on a 10" record, the other roller attached to the other parallel arm, to which is also fastened another switch contact, does not rest on any surface and thus the switch remains unclosed.

When the switch sets on a 12" record both rollers rest on the record thus closing the switch. When this occurs, the closing of the switch energizes solenoid A-6135-A, which causes plunger A-6136 to be moved, which in turn actuates switch Cam 1297 attached to it.

The movement of switch Cam 1297 causes switch 1266 (not shown) to move the pin on the end of Follow Arm 1271 from the inner to the outer groove on (Fig. 2) Cam B-3715.

When this is done (Fig 1) Pick-up Unit A-6126 lowers at the position to start a 12" record.

Adjustments on the Model 30 Automatic Phonograph Mechanism

CAUTION—Be sure that you understand exactly what the trouble is with the mechanism before starting to repair it. Do not attempt to "doctor" or "experiment". Remember, the mechanism operated perfectly at the factory.

TO ADJUST MECHANISM SO (Fig. 1) PICK-UP UNIT A-6126 COMES DOWN IN THE PROPER PLACE, adjust (Fig. 3) Screws 13830-7 and 13830-8 in and out as required. Keep the front surface of Follow-Arm 1271 parallel.

TO MAKE (Fig. 3) STOP SWITCH 1412-AA CUT OFF AT THE PROPER PLACE which occurs when (Fig. 1) Pick-up Unit A-6126 drops to its lowest position with no record on the Turntable, adjust screws which hold (Fig. 3) Stop Switch 1412-AA by loosening or tightening the front screw and the holdout screw where the Stop Switch fastens to the top plate.

TO ADJUST MECHANISM SO NEEDLE TRIPS ON INNER CIRCLE OF COLUMBIA RECORDS adjust (Fig. 2) Pawl Arm 1234 by means of screws which attach it to Bracket 1269 so that Pawl Spiral 1245 trips on vertical part of Trip Lever 1233. Spiral Pawl 1245 should clear serrated surface on Trip Lever 1234 by about 1/32".

TO ADJUST (Fig. 1) CLUTCH LEVER 1277-A, loosen Stud 1467 which is in a slot on Bracket 1244, until upper end of Clutch Lever clears the Lug on Cam B-3715 by about 1/32" when Clutch Spool is up as far as it will go. If Clutch rattles or fails to operate properly, it is due to this adjustment. It is possible to change this adjustment by bending the lever, in cases where (Fig. 3) Stud 1467 is not in a slot.

TO ADJUST (Fig. 1) DISCARD ARM B-3711 FOR HEIGHT use set screw in (Fig. 2) Lever 1279-A. The discard arm should be adjusted so that 12" records just clear the top of (Fig. 1) Spindle A-6137-A when the Arm is in its highest upward position.

TO ADJUST (Fig. 3) DISCARD TONGUE A-6099-A, adjust screw A-1255-9. The proper distance for this adjustment is when Roller A-6082 rests on record, (Fig. 1) Discard Arm B-3711 is in the down position, and there is just room for the tongue to pass under a normal size record.

TO ADJUST (Fig. 1) DISCARD ARM B-3711 IN AND OUT adjust (Fig. 3) Discard Tongue A-6099-A so that it will just come down behind a record in its lowest position, using screws which hold Roller Bracket (Fig. 2) 1472-A to Roller Arm 1471.

IF MECHANISM TRIPS HARD, it is probably due to the fact that the notch in (Fig. 2) Trip Lever 1233 is not smooth or not machined at the correct angle. Also, it may be due to the fact that Spring 1366 has too much tension. Throw-out Lever 1275 should rise high enough when the Lug in Cam B-3715 is passing under it to allow the notch in Trip Lever 1233 to enter under the Lug on Lever 1275.

IF NEEDLE FAILS TO SLIDE FROM THE SMOOTH PART OF RECORD into the grooves it is probably due to the (Fig. 1) Pick-up Arm C-621 being tight or not properly adjusted. (Fig. 3) Bracket 1269 should be tilted toward the discard compartment at top, which gives a natural tendency for the (Fig. 1) Pick-up Unit A-6126 to swing toward the center of record. This can be effected by loosening screws which hold (Fig. 2) Top Bearing Plate 1342-A and moving the Plate to the proper position. If Pick-up Arm is then out of center with the hole, it can be readjusted by Pivot Screws 1270.

ADJUST POSITION OF (FIG. 1) KICK-OFF ARM A-6117-A.

When the Kick-off Arm is in a stationary position the finger on the end should clear a 12" record by about 1/8", when the record is being raised from the turntable as shown in Fig. 1.

The position of the Kick-off Arm is regulated by (Fig. 2) finger A-7639 bearing araginst Cam A-6122. This finger is adjusted by the adjusting screws in adjujsting block A-7637. The adjusting block is fastened to spindle A-6022 by set screw 1371.

HEIGHT OF (FIG. 1) GUIDE RAIL B-3709-A. The height is regulated by the position of nuts A-47-N.

ALWAYS BE SURE THAT THE TURNTABLE IS OPERATING AT 78 R.P.M. Often apparent trouble is due to improper speed that the turntable is set to run. If a speed indicator is not available, the speed of the turntable can be ascertained by placing a strip of paper underneath a record in playing position, so it will project just beyond the edge of the turntable. By placing the finger where the paper will strike it the number of revolutions per minute can be counted. Be sure to have the record playing, so the retarding action of the needle on the record will be taken into account while you are counting the revolutions. To regulate the speed of the motor, adjust the speed control lever which extends from beneath the record turntable. The movement of this control lever to the front will decrease the speed of the motor. Vary the setting of this lever until the paper touches the finger seventy-eight (78) times; while the second hand of a watch makes one complete revolution. The speed of the turntable has been properly adjusted at the factory for normal record reproduction, and under normal conditions should require no further adjustment.

BE SURE THAT ALL JOINTS OPERATE FREELY AND SMOOTHLY. A little oil in all joints and wearing surfaces will insure this condition.

BE SURE THAT ENSEMBLE IS STANDING REASONABLY LEVEL.

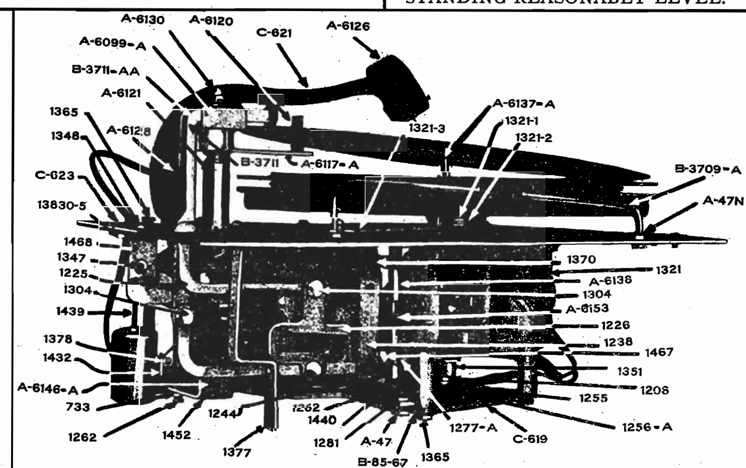

Fig. 1

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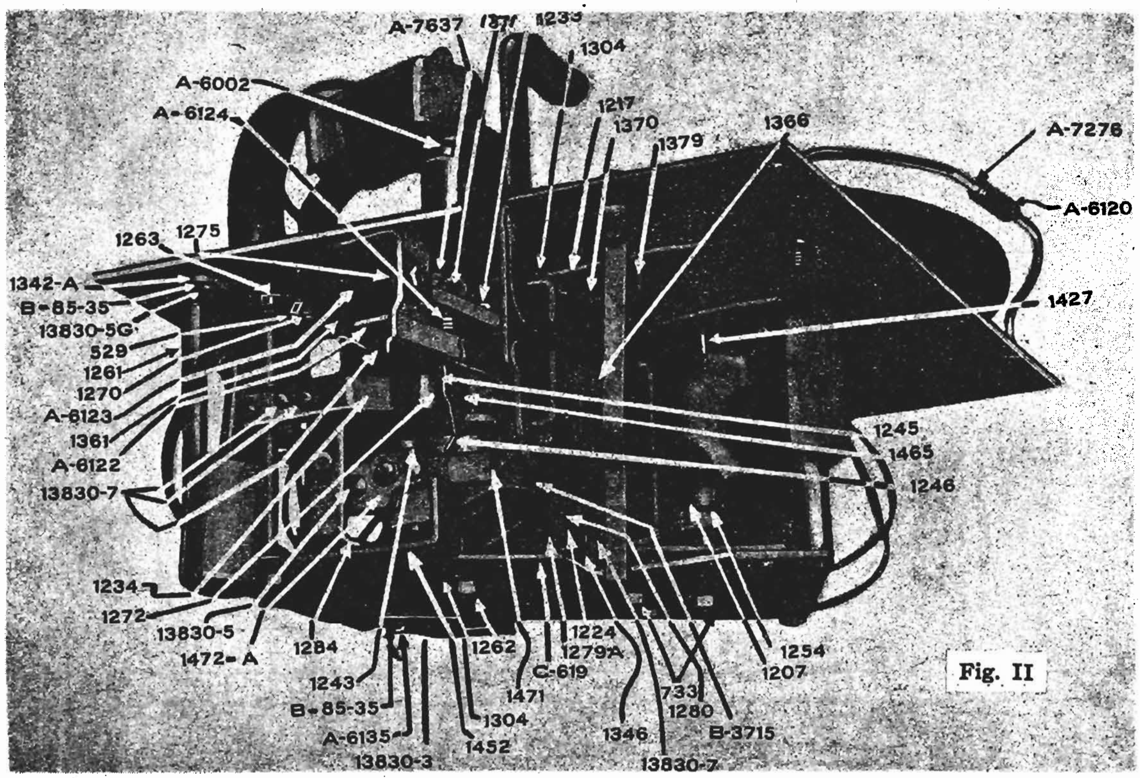

Fig. II

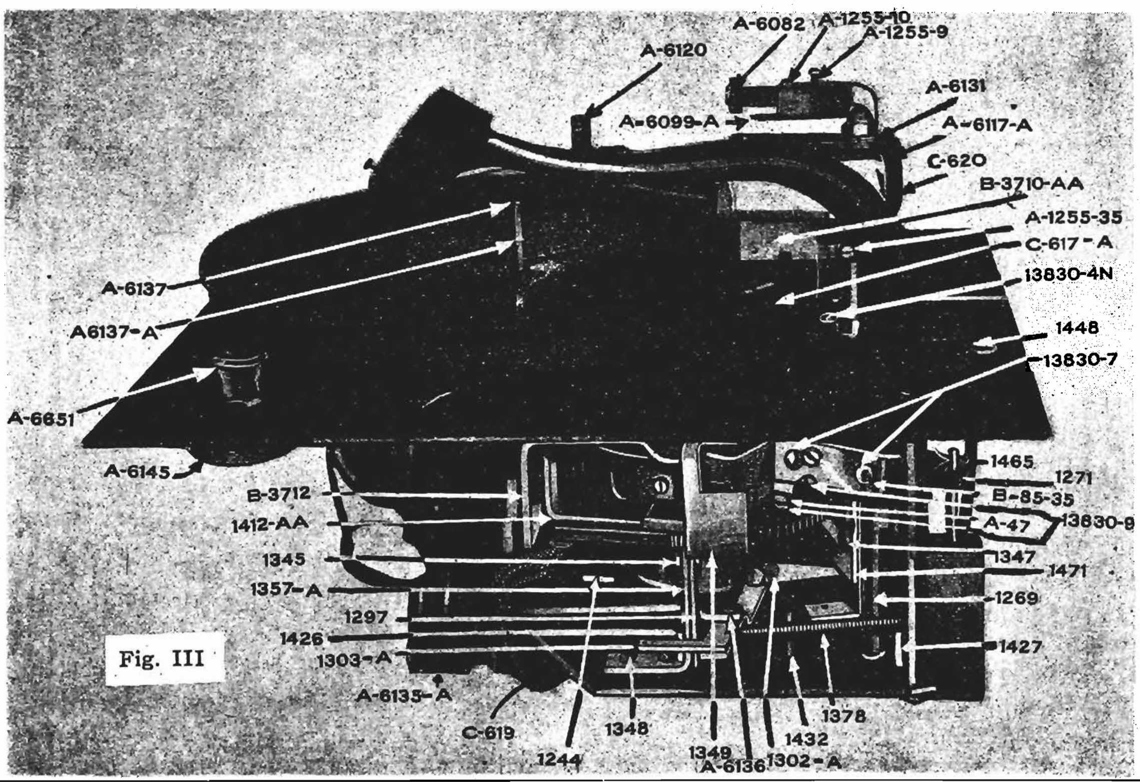

Fig. III

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Service Data for Sparton Ensemble Model 35 Automatic Phonograph Mechanism

GENERAL OPERATION

At the completion of the reproduction portion of a record, the needle moves into the groove in the center of the record. The first oscillatory movement of the needle on an eccentric groove record, or the feed-in movement on a spiral groove record trips Trip Lever 814, *figure 1*.

Dog 813 *figure 2* for eccentric groove records and Spiral Trip Dog 533 for spiral groove records is attached to Pick-up Arm Lever 811 by means of Adjusting Stud 860 and Adjustment for Pick-up Lever 812. Pick-up Arm Lever 811 is attached to Pick-up Unit 904 *figure 3* by means of Yoke 867 and Pick-up Arm 866 which is connected to Bracket 810 *figure 4*, onto which Pick-up Arm Lever 811 *figure 2* is attached by means of two screws 155 *figure 4*. This whole device is allowed to swing from right to left due to its attachment to Standard 788 by the Dog Point Set Screws 823 which fit into the Bearing in Bracket 810.

When Trip Lever 814 *figure 1* is tripped, it allows Throwout Lever 822 to drop, and this causes Clutch Lever 816-C to push Clutch 526 into the Pins of Clutch Collar 527-C which is revolving; acting through Worm Gear 514-C which is driven by the Worm in Drive Shaft 793 connected to Motor by means of Drive Spring 877. The connecting of this Clutch causes worm shaft 524-C[1] which is meshed with Cam Worm Gear 528[2] to cause Cam 789 to revolve and lower the Turntable to the "swing back" elevation. This is accomplished by Lift Lever 817 *figure 2* which is operated by Cam 789 *figure 1* acting on the bottom of Turntable Shaft 507-C, through Turntable Lift 516 *figure 2* and Adjustment 818 to which the Turntable Shaft is attached.

Turntable 510-C[3] *figure 1* is driven in a clockwise motion by means of Worm Gear 553-C (not shown), which is meshed with Drive Shaft 793. This Worm Gear is provided with inside lugs which fit into the grooves in Turntable Shaft 507-C[4] and allows the Shaft to raise up and down without interfering with its turning motion.

DISCARD POSITION OF TURNTABLE

Returning to the action of Cam 789 *figure 1* as it rotates further, Turntable 510-C[3] drops to the discard position, allowing the record to come in contact with Discard Rubber 650 *figure 4*. This raises the record above Receiving Stud 508 *figure 3* and the rotation of Turntable 510-C[3] then causes the record to be discarded into the Receiving Compartment.

"SWING BACK" OF PICKUP UNIT

Before the Cam 789 *figure 1* allows the Turntable to be moved into the discard elevation, and while the Turntable is still in the "swing back" elevation, the Pick-up Unit is swung away from the record by means of Index Lever 815 *figure 2* which is connected to the Pick-up Arm through Pick-up Arm Lever 811. The inner end of the slot in Index Lever 815 acts on Pin 763 *figure 1* that revolves with the Cam in a clockwise motion. It is through this means that the Pick-up is swung away from the record.

SLIDE MOVEMENT FOR 10" RECORDS

When Cam 789 *figure 1* starts to revolve, Eject Arm 790 *figure 2* also starts to revolve as it is driven by Dog 522. Roller 552 attached to Eject Arm 790, travels in the slot in Drive Lever 550 and causes it to move from the left to right, which moves Eject Slide 835-C and brings the center of the record over Receiving Pin 508 *figure 3* in Turntable 510-C[3]. This motion is caused by Drive Lever 550 *figure 2* acting through Link 852 attached to Lever 865 which is pinned to Shaft 558 connected to Top Lever 853-C which acts on Transverse Lever 854-C through Link 856. The Transverse Lever is connected to the twelve inch record Regulating Lever 859 which is fastened to Eject Slide 835-C by means of the Stud in the "L" shaped slot. This Stud remains in the "L" end of Lever 859 and allows Slide 835-C to place a ten inch record in the proper position over Receiving Stud 508 *figure 3*.

SLIDE MOVEMENT FOR 12" RECORDS

In case a twelve inch record is on the Slide, Centering Lever 850-C *figure 4* is pushed out by the record to a position where its tail end trips the twelve inch Regulating Lever 859 *figure 2*. Eject Slide 835-C moves forward, causing the Stud to leave the "L" end of the slot in Lever 859 allowing Eject Slide 835-C to travel just far enough to place a twelve inch record over Receiving Stud 508 *figure 3*.

Ten or twelve inch records can be used without discrimination. The engagement of the needle on ten or twelve inch records is controlled by Engaging Regulator Weight 872 *figure 4* acting on Cable 900 which is attached to Index Lever 815 *figure 2*. When the Weight is allowed to act, Index Lever 815 is pulled over and the long slot engages on Pin 763 *figure 1* causing the Pick-up Unit to swing into the proper place to engage on a 12" record. If Regulator Weight 872 *figure 4* is not allowed to act, Index Lever 815 *figure 2* is carried over by means of Drag Link 530 *figure 1* so that the short notch engages on Pin 763 and the needle engages at the proper place to start a 10" record. Whether or not the Weight 872 *figure 4* is allowed to act depends on Shaft 824 which, when underWeight 872, keeps the Weight from acting. Shaft 824 is controlled by Engaging Regulator Arm 787.

When a 12" record is fed out, Centering Lever 850-C *figure 4* is pushed out. The Finger on it carries Arm 787 out with it, swinging end of Shaft 824 from under Weight 872, allowing 872 to act. Shaft 824 will remain in this position until a 10" record is fed out of the Hopper. Thus, a 12" record may be repeated on the Turntable as many times as desired. When a 10" record is fed out of the Hopper, Eject Slide 835-C *figure 2* goes out farther over the Turntable, allowing Pin 887 to come in contact with Arm 787 causing it to move so that Shaft 824 takes a position under Weight 872 and prevents it from acting. This position will be held until a 12" record is fed out of the Hopper, thus, a 10" Record will continue to repeat until the position of Shaft 824 is changed.

RECEIVING POSITION OF TURNTABLE

Again returning to the motion of Cam 789 *figure 1* further rotation of this Cam causes the Turntable to rise to receiving elevation in time to receive the record which has been moved to the positions just described. The Turntable remains in this position while the Cam rotates further, allowing Roller 552 *figure 2* which is attached to Eject Arm 790, to travel in the slot in Drive Lever 550 and return Eject Slide 835-C to its original position. As soon as Eject Slide 835-C has returned to this position, Cam 789 *figure 1* has revolved to a position where it allows the Turntable to drop to the "swing in" elevation.

"SWING IN" MOVEMENT OF PICK-UP UNIT

At this time Pin 763 *figure 1* has revolved far enough to connect with either the ten or twelve inch notch in Index Lever 815 *figure 2*. Its further revolution causes the Pick-up to swing in over the record so the Needle rests on the smooth part of the record as the Turntable is raised to reproducing elevation by means of Cam 789 *figure 1*. Regulating Weight Lever 872 *figure 4* on Standard 788 now causes the Pick-up to move over from the smooth part of the record to the first reproducing groove. Reproduction of the record begins at once.

COCKING MECHANISM AND STOPPING CYCLE OF CAM

When the Pick-up Unit first swings away from the record, Pick-up Arm Lever 811 *figure 2* passes under the tail of Throwout Lever 822 *figure 1*, causing it to rise to a position where the notch in Trip Lever 814 is allowed to enter its proper place under the lug in Throw-out Lever 822, holding Throwout Lever 822 in this

Parts Lists Numbers: [1]524, [2]1026, [3]B-3700, [4]A-6000

(Continued)

SPARTON ENSEMBLE 35 PHONOGRAPH MECHANISM

position after the Pick-up Arm Lever 811 *figure 2* no longer supports it. When the Throwout Lever is raised to this position, a spring tension is created which pulls on Clutch Lever 816-C *figure 1* attempting to pull back and open Clutch 526 but Clutch Lever 816-C is held in the engaging position by means of Control Disc 864-C until the Cam has completed its entire revolution when a notch in the Control Disc allows the Clutch Lever to follow the urge of the spring and disengage the Clutch.

REPEATING

In case it is desired to play the same record over, the repeat Button *figure 5* is moved to the left. This moves Repeat Lever 809 *figure 2* causing it to press against Drive Dog 522 causing the Dog to recede and not catch on Eject Drive Arm 790. Eject Drive Arm 790 remains stationary and the Eject Slide does not move. The Cam revolves and the Turntable goes through all of the elevating positions except the discard elevation. Eject Arm 790 does not allow Roller 845 to drop to the discard elevation in Cam 789 *figure 1*, thus the record will be repeated until the Repeat Lever is moved to the right.

CONTROL OF RECORDS

When Eject Slide 835-C *figure 4* comes forward, the bottom record is caught between the "V" shaped plates 836 and 837 *figure 3* which brings the bottom record forward with the Slide. The other records slide over the top of these "V" shaped plates and remain in the Hopper. Only the bottom record is allowed to come out of the Hopper onto the Turntable. Other records are prevented from coming out by means of the two Admitters 819-C which are devised so they gauge themselves according to the thickness of the record. Thick, thin or warped records are fed out through the action of the admitters without injury to the records or mechanism. The admitters are held down against the record by means of springs and are adjusted by Screws 902. Back Stops 871 prevent records from sliding too far back in Hopper.

If a ten inch record is on the bottom and is not in the center, it is forced into the center by the two Centering Levers 850-C *figure 4* and 848-C *figure 3* which are held in position under tension by Springs 569 *figure 4* and 565 *figure 3*. These Springs are right and left hand and are attached to bushings in Studs, which have right and left hand threads and have a tendency to keep the spring from unscrewing the studs and nuts which hold them.

These Springs hold the Centering Lever against the Stop Pins which are set so that they hold the Centering Levers just the right distance to allow a 10" record to pass through with a slight amount of tension. In case a 12" record is on the bottom, these Springs are allowed to open up and the Centering Lever 850-C *figure 4* acts to trip the mechanism as described under the paragraph about Slide Movement for 12" records.

THE STARTING BUTTON

In starting or rejecting records, the Starting Button *figure 5* is pressed. When this Button is pressed slightly, it causes the contacts in switch 897-A *figure 2* to be spread apart which changes the fields in the motor from a series connection to a parallel connection for a greater starting torque. Pressing down further causes Lever 662 *figure 2* to act against Throwout Lever Trip 814 and trip mechanism which discards the record. This is the same action as though it were tripped with the Dogs 813 or 814.

THE CLUTCH SWITCH

Clutch Switch 896-A on Bracket 876 *figure 1* is operated by Clutch Lever 816-C by means of a fibre switch Opener, the purpose of this switch is to allow switch 898-A *figure 4* to be opened when the Clutch is engaged and the Cam is in motion. This carries the current whenever Clutch is in motion and the Pick-up Unit is not resting on a Record.

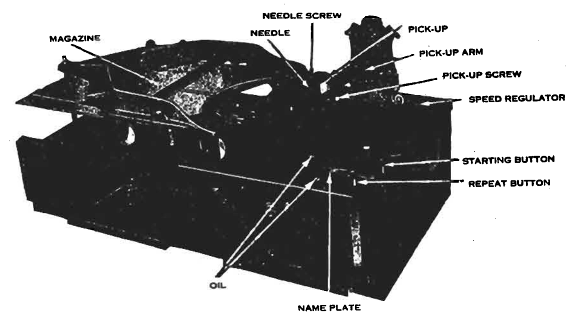

FIGURE 5

THE PICK-UP UNIT SWITCH

Pick-up Switch 898-A *figure 4* is attached to the back of Standard 788. When the Pick-up is not resting on a record, the Pick-up Arm drops down, swiveling at Trunnion Pin 641, *figure 3*. This allows the Brake Shoe on Pick-up Arm 866 to rise and press against Cork Insert 623 *figure 4* which is in the Brake Adjustment 585. This retards the Swinging action of the Pick-up and allows it to move only when forced by Index Lever 815 *figure 2*. This Brake Adjustment 585 can be regulated to bring the Pick-up to the height desired and is locked in place by a nut.

Through the center of Brake Adjustment 585 is a Fibre Rod 590 *figure 4* which also rests on Brake Shoe 974 and is raised whenever the Brake is closed. The upper end of this acts on the Contact Spring in Switch 898-A and causes it to open the Switch and break the entire circuit, acting the same as the Clutch Switch in parallel with it. With both of these switches open, the power supply is entirely cut off. Also, when this switch is open a contact is formed with the upper part of the Switch which cuts out Speed Regulating Rheostat No. 544 *figure 2* and allows the full power to be used while the Cam is in the operating cycle.

Lubrication on the Sparton Ensemble Model 35 Automatic Phonograph Mechanism

The Model 35 automatic phonograph mechanism is thoroughly lubricated at the factory when assembled and requires no oiling or greasing except as noted in this section.

THE ELECTRIC MOTOR ARMATURE SHAFT BEARINGS. Oil once every six months. Use nothing but light fine oil. Located on the upper side of the motor board *figure 5* are two (2) pipe plugs marked "OIL." Remove these plugs and inject a quantity of oil in the tubes under them. This lubricates both armature shaft bearings. The wick type oil wells used on the bearings keep the bearings well lubricated for a six (6) months period of normal operation.

KNUCKLES, JOINTS AND BEARINGS. Oil once every six (6) months. Use nothing but light fine oil.

AUTOMATIC MECHANISM GEARS AND BEARINGS. Grease once every year. Use nothing but a good grade of grease of about the consistency of vaseline, mixed with graphite if possible. In the main body casting, housing the turntable shaft and worm gears two (2) pipe (2) pipe plugs 687 *figure 4* marked "Grease." Remove these Plugs and inject a small quantity of grease in the openings.

Adjustments on the Sparton Ensemble Model 35 Automatic Phonograph Mechanism

ADMITTERS 819-C FIGURE 3. Use Adjusting Screw 902. Turning this screw in a clockwise direction raises the end of the admitter higher. The height of the admitter should be just enough to touch a record on the Eject Slide 835-C *figure 2* when the slide is out.

ALIGNMENT OF MOTOR DRIVE SPRING 877, FIGURE 1 WITH DRIVE SHAFT 793. Two adjustments are provided for this purpose, one for aligning the spring if it is horizontally off center with the drive shaft and the other for alignment if the spring is vertically off center.

To align the spring if horizontally off center loosen the four collars (see 574-C, *figure 1*) on Screw Studs 797. This will then allow either side of Motor 895-C to be moved back or forth on the studs as the case demands. To align the spring if off center vertically, the Hex. nut on Stud 799 should be loosened or tightened depending upon whether the motor is to be tipped up or down.

PICKUP UNIT TO STRIKE AT PROPER PLACE ON RECORD. Use adjusting Screw 535 *figure 2*. The needle in the Pickup Unit should strike about ⅛ inch in from the outside edge of the record.

PICKUP UNIT TO TRIP MECHANISM ON SPIRAL GROOVE RECORD. Use adjusting Screw 812, *figure 2*. The mechanism should trip on a Columbia record with a 3⅝ inch diameter inner circle when the needle has followed the spiral groove to within 1/16 inch of the groove's maximum inward travel.

PICKUP UNIT TO TRIP MECHANISM ON ECCENTRIC GROOVE RECORD. Use Adjusting Screw 860, *figure 2*. The tip of eccentric trip Dog 813 should be 1/32 inch above trip lever 814 before it starts to travel in under this lever.

THE NEEDLE ENGAGING REGULATOR SHAFT 824. Loosen Set Screw in Arm 787, *figure 4*, and move Shaft 824 to the required position. When a 10″ record is on the turn-table being reproduced, Shaft 824 should be under Weight 872.

THE HEIGHT OF NEEDLE ABOVE RECORD. Use Adjusting Screw 585, *figure 4*. This adjustment should be made immediately after the pickup unit has swung in and just before the turn-table rises. When the turn-table is in this position the needle should be ⅛ inch above the record.

THE HEIGHT OF THE TURN-TABLE. Use Adjusting Screws 818, *figure 2*. The height of the turn-table should be 2⅛ inches from top of motor board to top of turn-table when the turn-table is in the record receiving, or highest, position.

FORWARD STOP OF EJECT SLIDE. Use the screw in Top Lever 853-C, *figure 4*. The Eject Slide should carry out a 10 inch Victor record to a distance where the tip of Receiving Stud 508, *figure 3*, enters the hole in the record at the front side of the hole. If a 10″ Columbia record is used to make this adjustment, the stud should enter the hole in the record at the rear side.

END PLAY IN CAM WORM SHAFT 524-C, FIGURE 1. Use Adjusting Screw 525-C. The end play in this shaft should be just enough to be detected when shaft is moved back and forth by hand. If end play is too great, the clutch will remain engaged and the mechanism will not automatically stop when the last record has been reproduced.

PICKUP SWITCH 898-A, FIGURE 4. This switch is adjusted by loosening the two screws turntable shaft and worm gears are located two by which it is fastened to standard 788, and moving it up or down so the contacts will close when the pickup unit is on a record in reproducing position.

CLUTCH SWITCH 896-A, FIGURE 1. This switch is adjusted by loosening the two screws which hold Bracket 876 to the body casting and moving the bracket one way or the other so the contacts will close when clutch 526 is in gear. Clutch 526 is placed in gear immediately after a record has been discarded automatically or manually.

END PLAY IN DRIVE SHAFT 793, FIGURE 1. Use Adjusting Screw 706-C, *figure 4*. The end play in this shaft should be just enough to be detected when shaft is moved back and forth by hand. If end play is too great, the reproduction of a record will have a wavering effect.

SPRING TENSION ON CENTERING LEVER 848-C and 850-C, FIGURE 4 and 3, RESPECTIVELY. Use Adjusting Screws 847 and 849, *figure 4*. The spring tension on these levers must be equal and sufficient to hold the center of a record in a line with Receiving Stud 508, *figure 3*. If the tension is insufficient or unequal, Eject Slide 835-C, *figure 2*, will not center the record over turn-table 510-C. Loosen these screws and turn them to the right or left to increase or decrease tension as the case demands.

(Continued)

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(Continued)

SPARTON ENSEMBLE 35 PHONOGRAPH MECHANISM

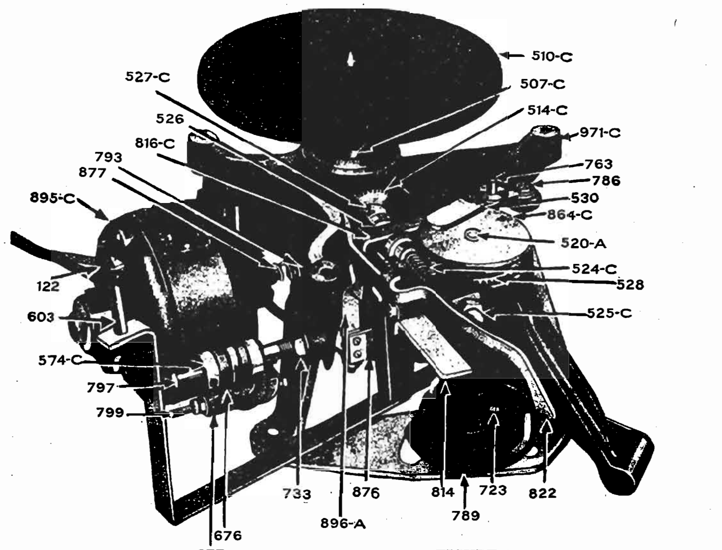

FIGURE 1

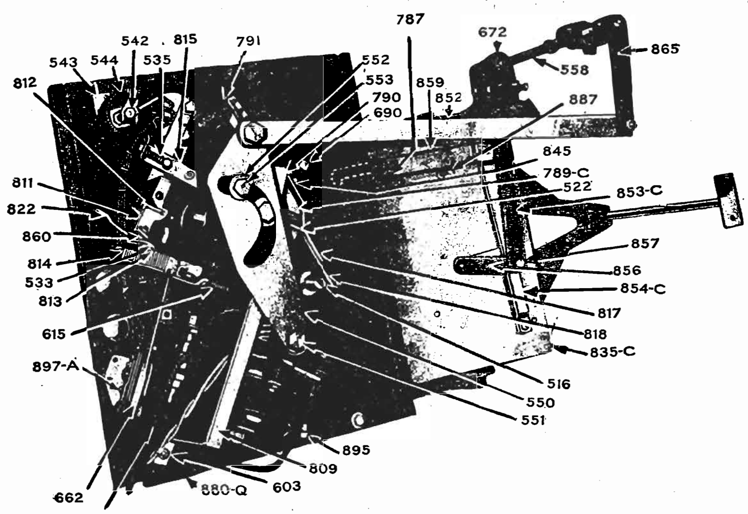

FIGURE 2

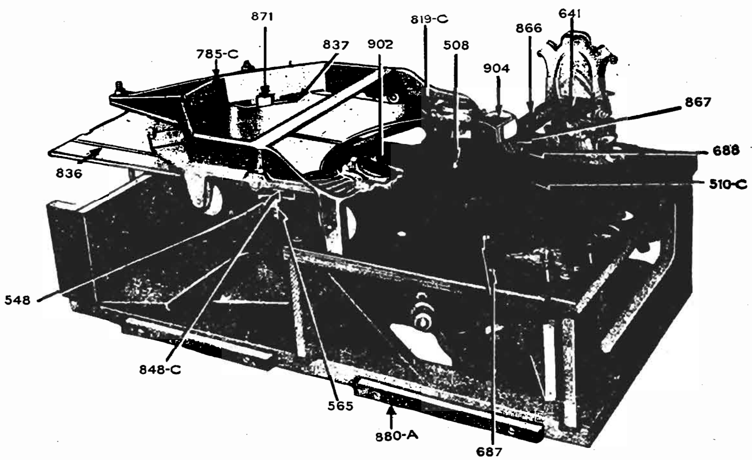

FIGURE 3

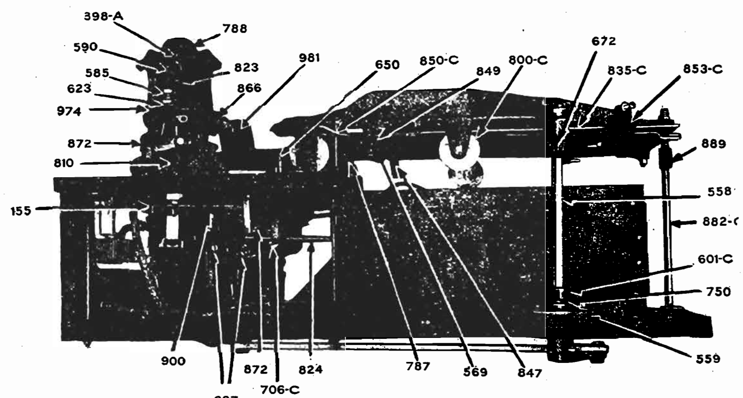

FIGURE 4

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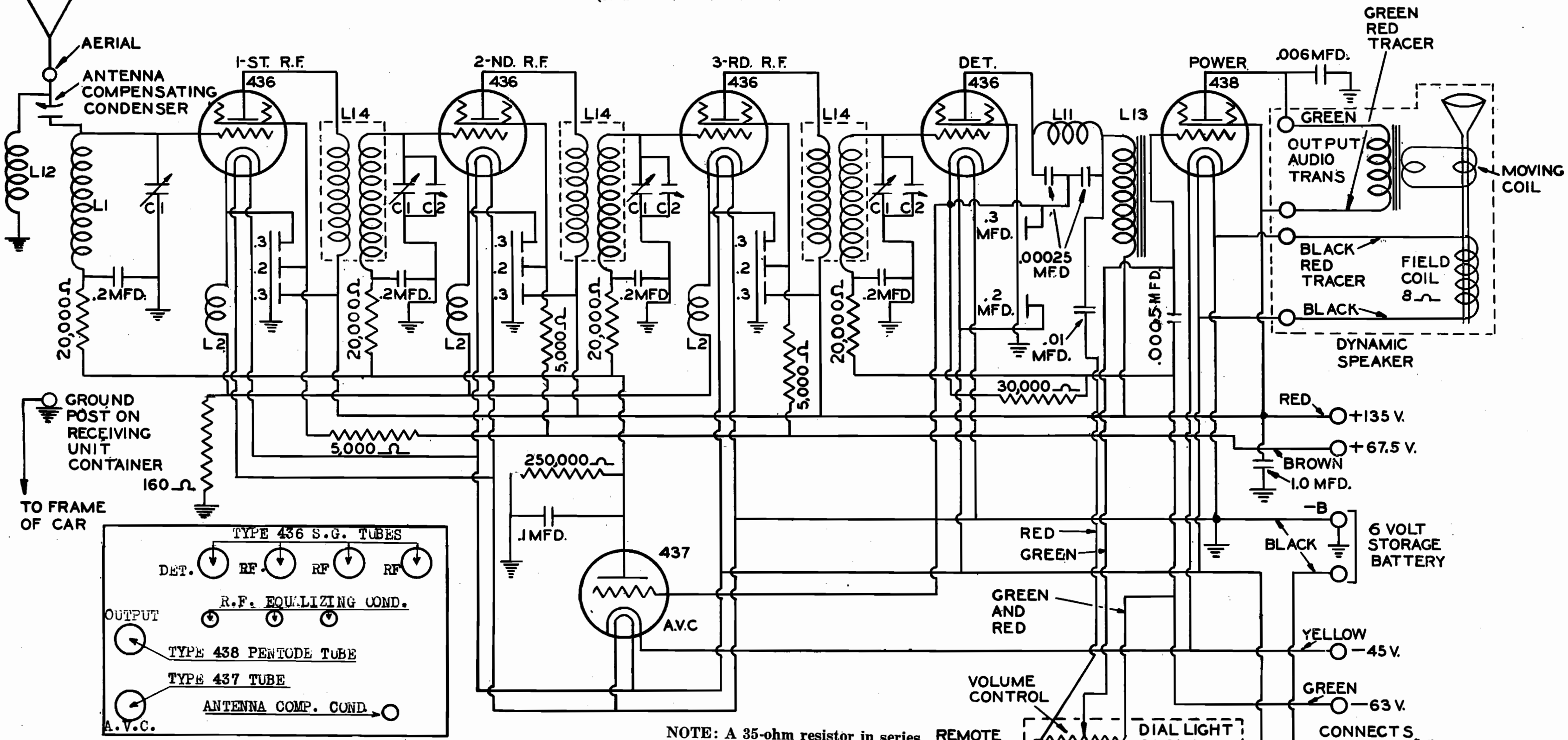
SPARTON MODEL 40 SCHEMATIC DIAGRAM

(AUTOMOBILE RECEIVER)



NOTE: A 35-ohm resistor in series with dial light and switch to reduce brilliance is not shown in this diagram.

C1 VARIABLE CONDENSER
C2 EQUALIZING CONDENSER
L1 TUNING COILS
L2 CATHODE CHOKES
L11 DETECTOR PLATE CHOKE
L12 ANTENNA CHOKE COIL
L13 IMPEDANCE COUPLING COIL
L14 R.F. TRANSFORMER

LINE VOLTAGE 115 - POSITION OF VOLTAGE COMPENSATOR 110-120 - POSITION OF VOLUME CONTROL FULL WITH NO SIGNAL

TUBE	LOCATION	FILAMENT OR HEATER	PLATE	CONTROL GRID−	SCREEN GRID +	PLATE CURRENT MILLS
436	1st R.F.	6	135	1.5	67.5	3.
436	2nd R.F.	6	135	1.5	67.5	3.
436	3rd R.F.	6	135	1.5	67.5	3.
436	Detector	6	132	10.	67.5	.1
437	A. V. C.	6	---	18.	----	0.
438	Power	6	135	18.	135.	8.

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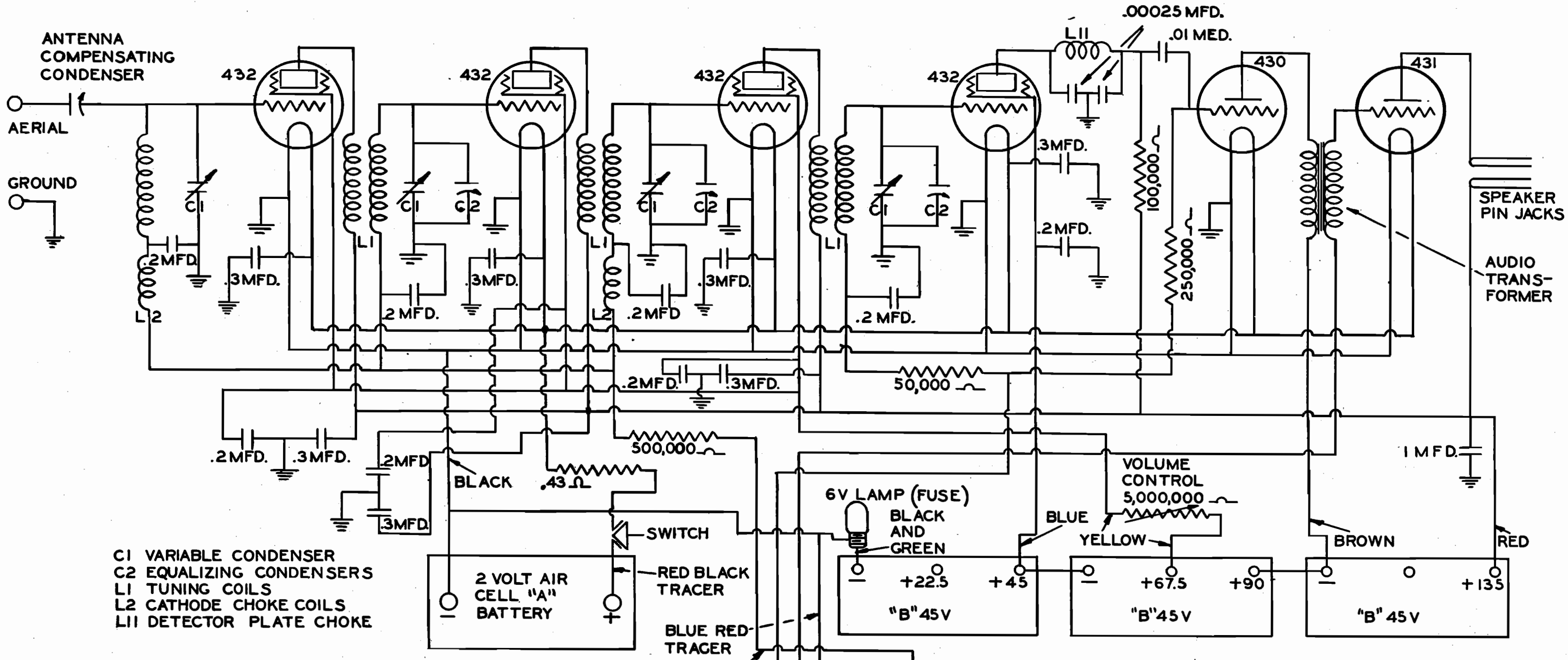
Sparton Model 51 and 52 Schematic Diagram



C1 VARIABLE CONDENSER
C2 EQUALIZING CONDENSERS
L1 TUNING COILS
L2 CATHODE CHOKE COILS
L11 DETECTOR PLATE CHOKE

POSITION OF VOLUME CONTROL--FULL

TUBE	LOCATION	FILAMENT OR HEATER	PLATE	CONTROL GRID--	SCREEN GRID+	PLATE CURRENT
432	1st R.F.	2	135	3.0	67.5	2.0
432	2nd R.F.	2	135	3.0	67.5	2.0
432	3rd R.F.	2	135	3.0	67.5	2.0
432	Detector	2	135	4.5	45.	0.5
430	1st A.F.	2	90	4.5		2.5
431	2nd A.F.	2	130	22.5		8.0

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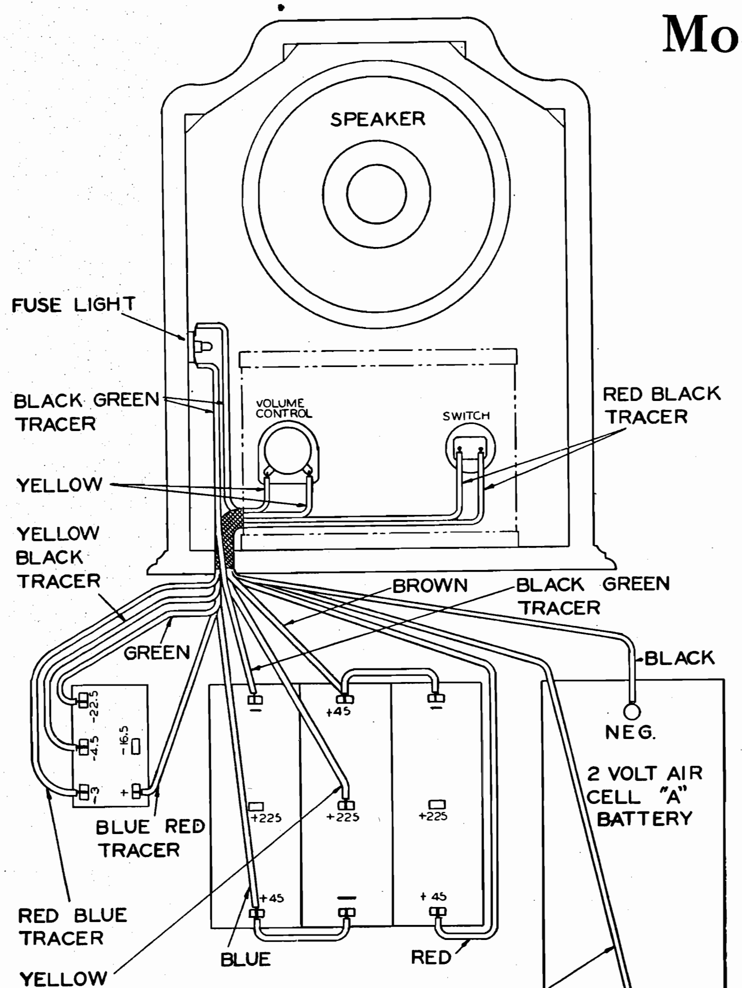
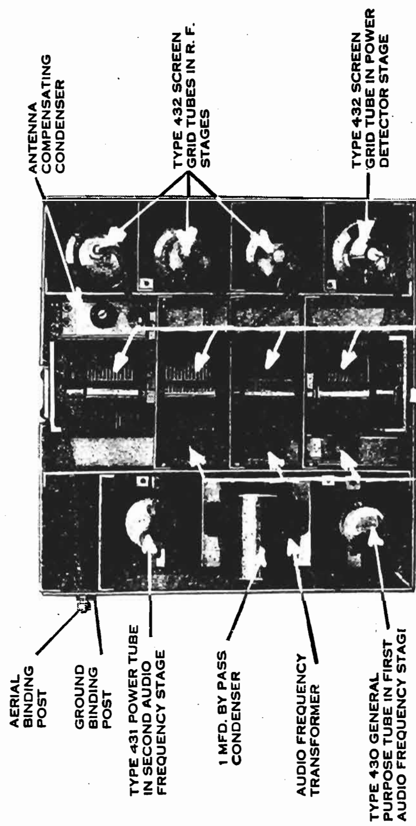
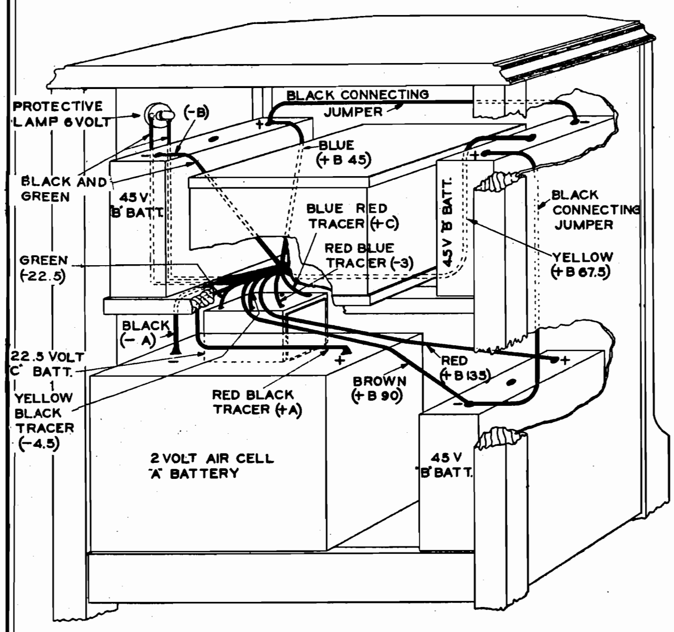
Model 51 and 52



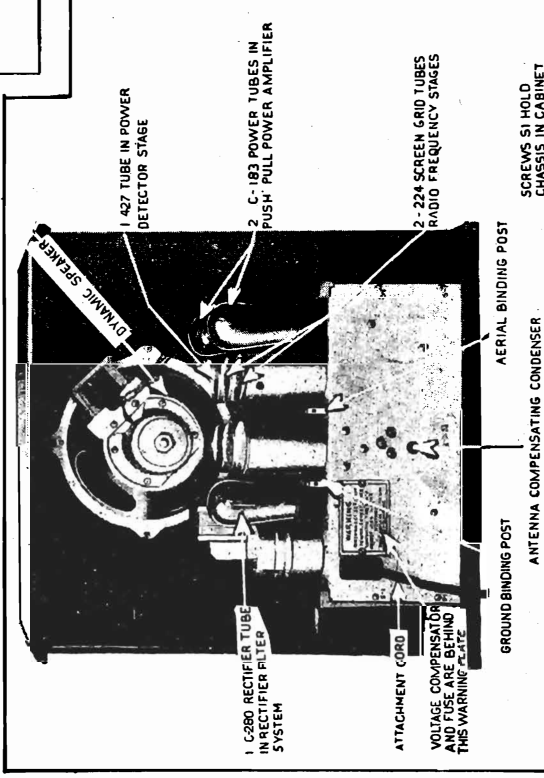
SPARTON Model 51
Wiring Diagram



SPARTON Model 51 and 52 Chassis



SPARTON MODEL 52 WIRING DIAGRAM



SPARTON MODEL 9A, 410 AND 420

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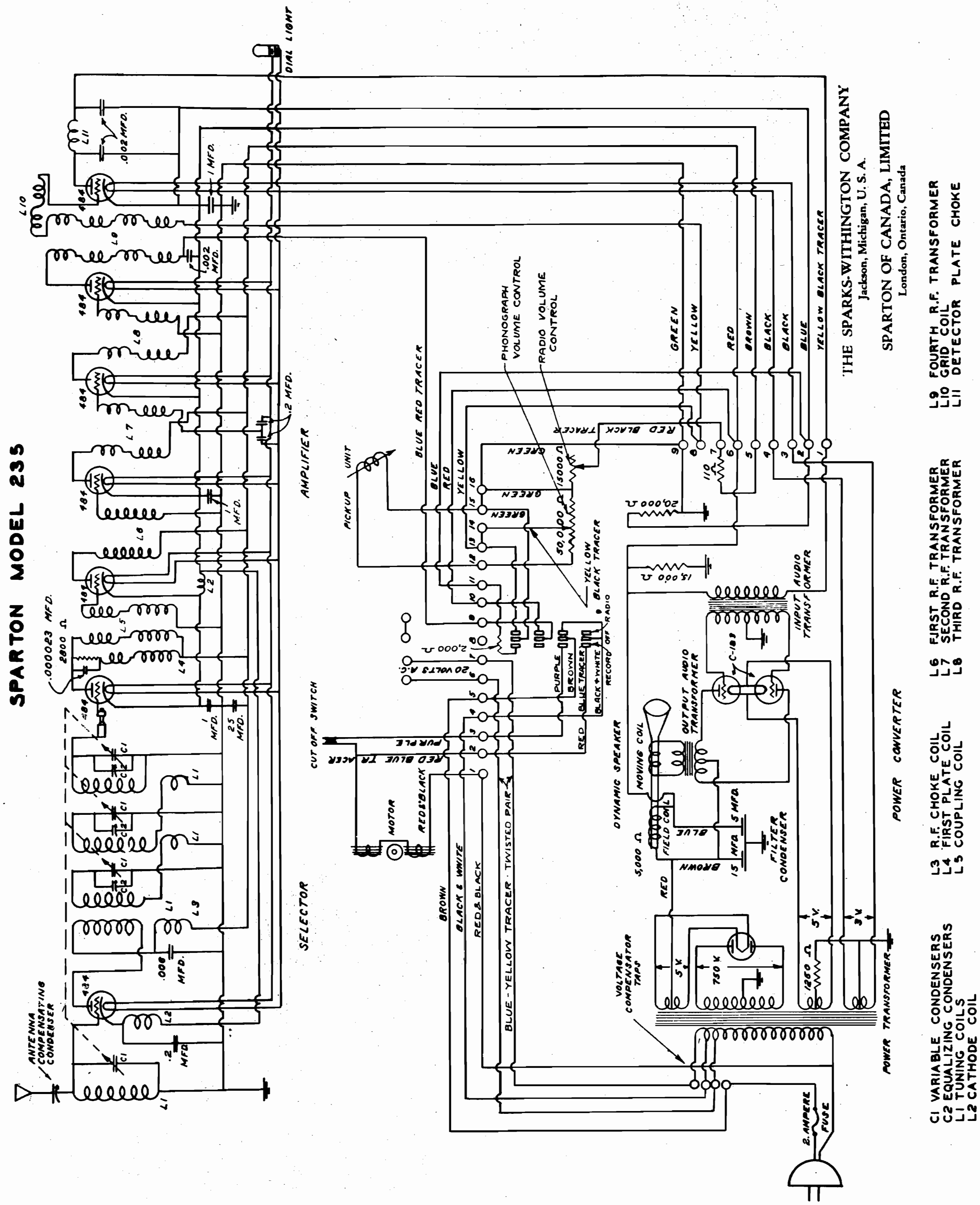

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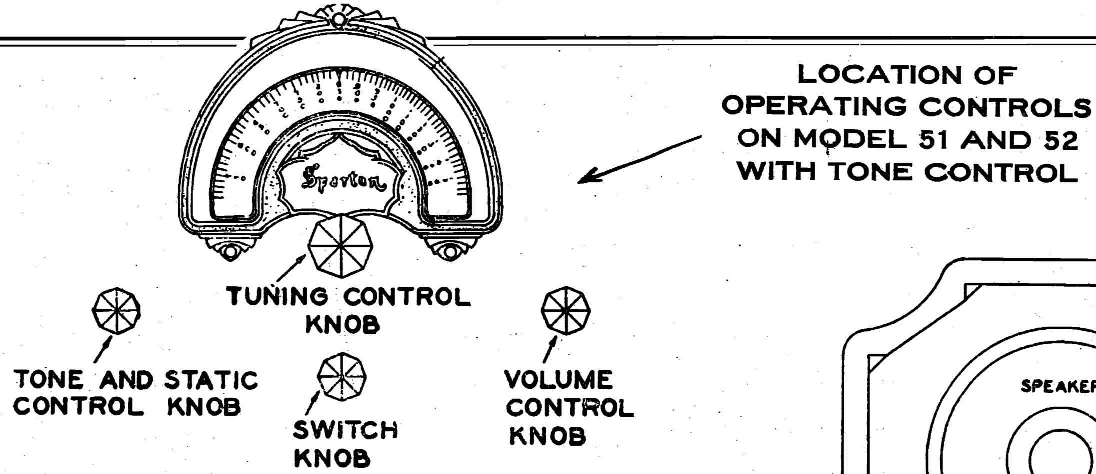
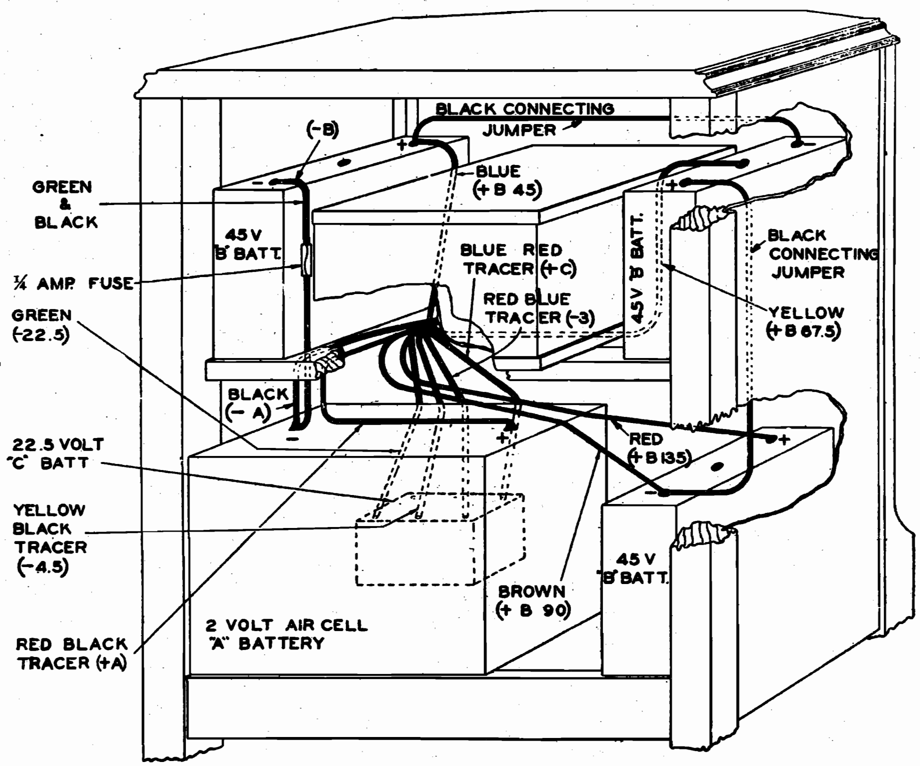
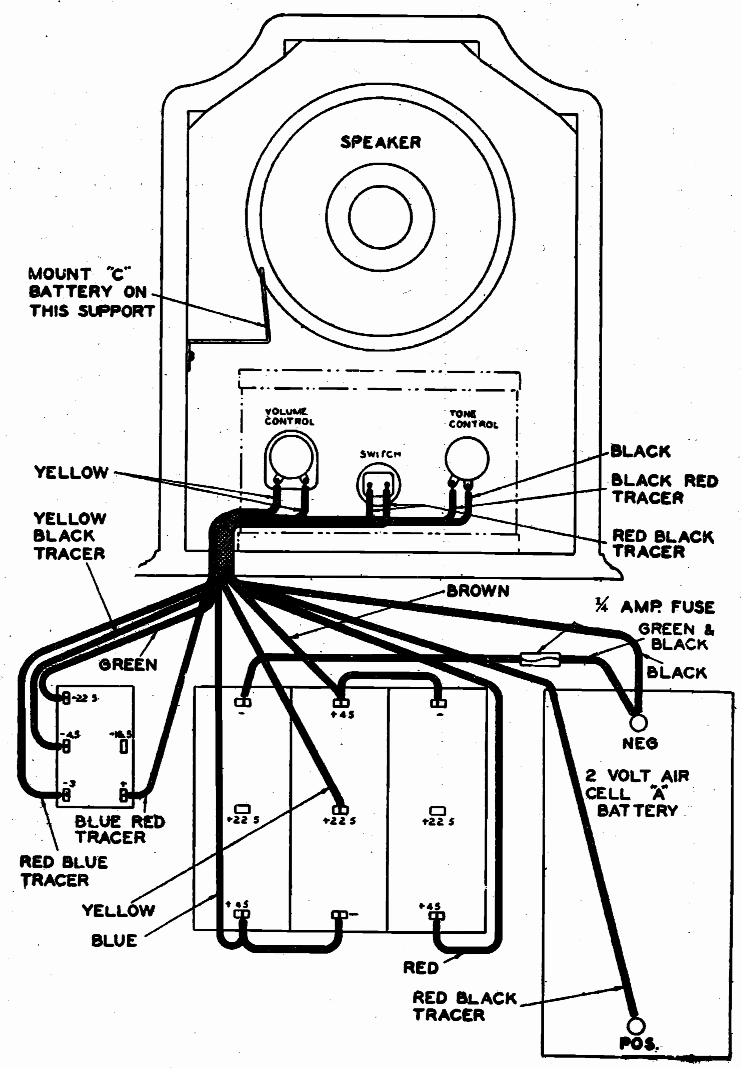
FOR FURTHER DATA ON
MODELS 51 & 52
SEE PAGE 568-Z-7





MODEL 52 WIRING (WITH TONE CONTROL)



MODEL 51 WIRING (WITH TONE CONTROL)

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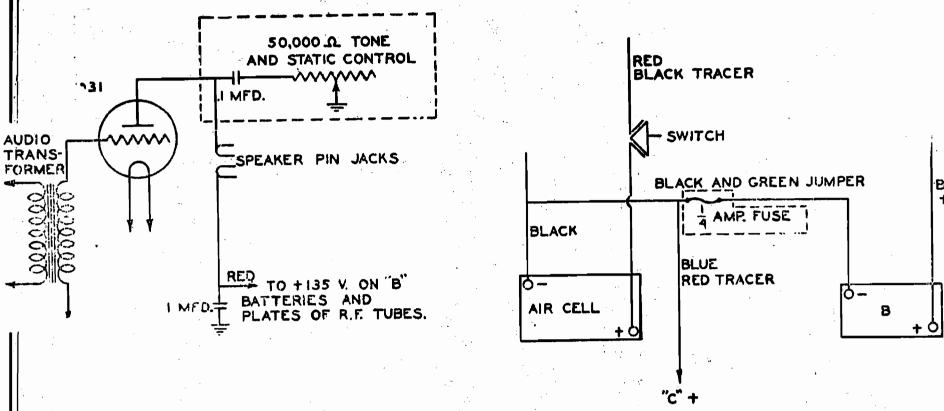
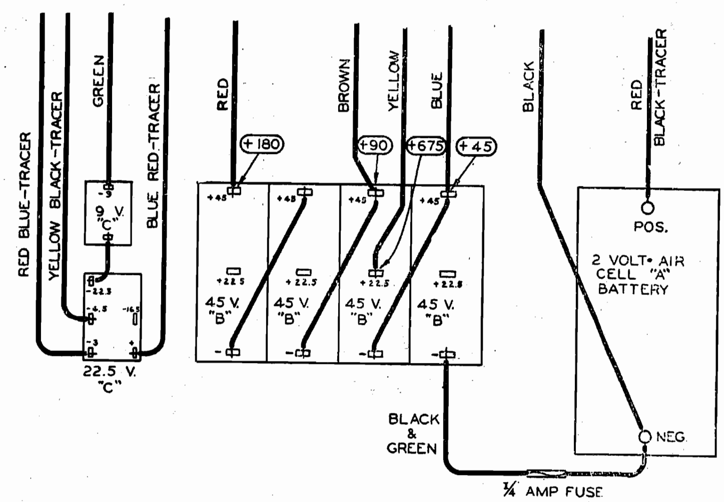
MODEL 51 & 52

TONE CONTROL AND 180 VOLT "B" BATTERY WIRING DIAGRAM



SCHEMATIC DRAWING OF TONE AND STATIC CONTROL AND ¼ AMPERE "B" BATTERY FUSE USED ON MODLES 51 AND 52 SERIAL NOS. 345 AND 195 UP RESPECTIVELY

WIRING DIAGRAM FOR 180 VOLTS OF "B" BATTERY SPARTON MODEL 51 AND 52



How to Replace Cone Head in Magnetic Speaker in Model 51 and 52

First:

Remove the motor or speaker driving element by removing the four mounting screws, unsoldering the lead wires from the outside terminal lugs, and unsoldering the driving link from the diaphragm apex pin.

Second:

Remove the cone head and all paper rings from the speaker housing.

Third:

Coat the rim of the speaker housing where the paper ring on the diaphragm rests with an ample coating of cellulose cement (such as Du Pont's Household Cement or Ambroid).

Fourth:

Place the cone head (part No. B-3528) into position, set the speaker housing onto a flat surface with the opening of diaphragm down, place a weight on housing and leave until cement is dry.

Fifth:

Fasten the driving motor back into position with four mounting screws, making sure that the movable armature of the motor is in exact center between the pole pieces before mounting, and solder the lead wires to the terminal lugs.

Sixth:

Solder the diaphragm apex pin to the apex driving link, making sure not to exert any strain on the drive link which might put the motor armature out of center while soldering. The apex pin should be cut off before soldering, so that it will extend about ¼" along the drive link. Use ordinary soft solder.

Seventh:

Next cement the paper ring (part No. A-5847) and finally the paper ring (part No. A-5846) into position, using cellulose cement.

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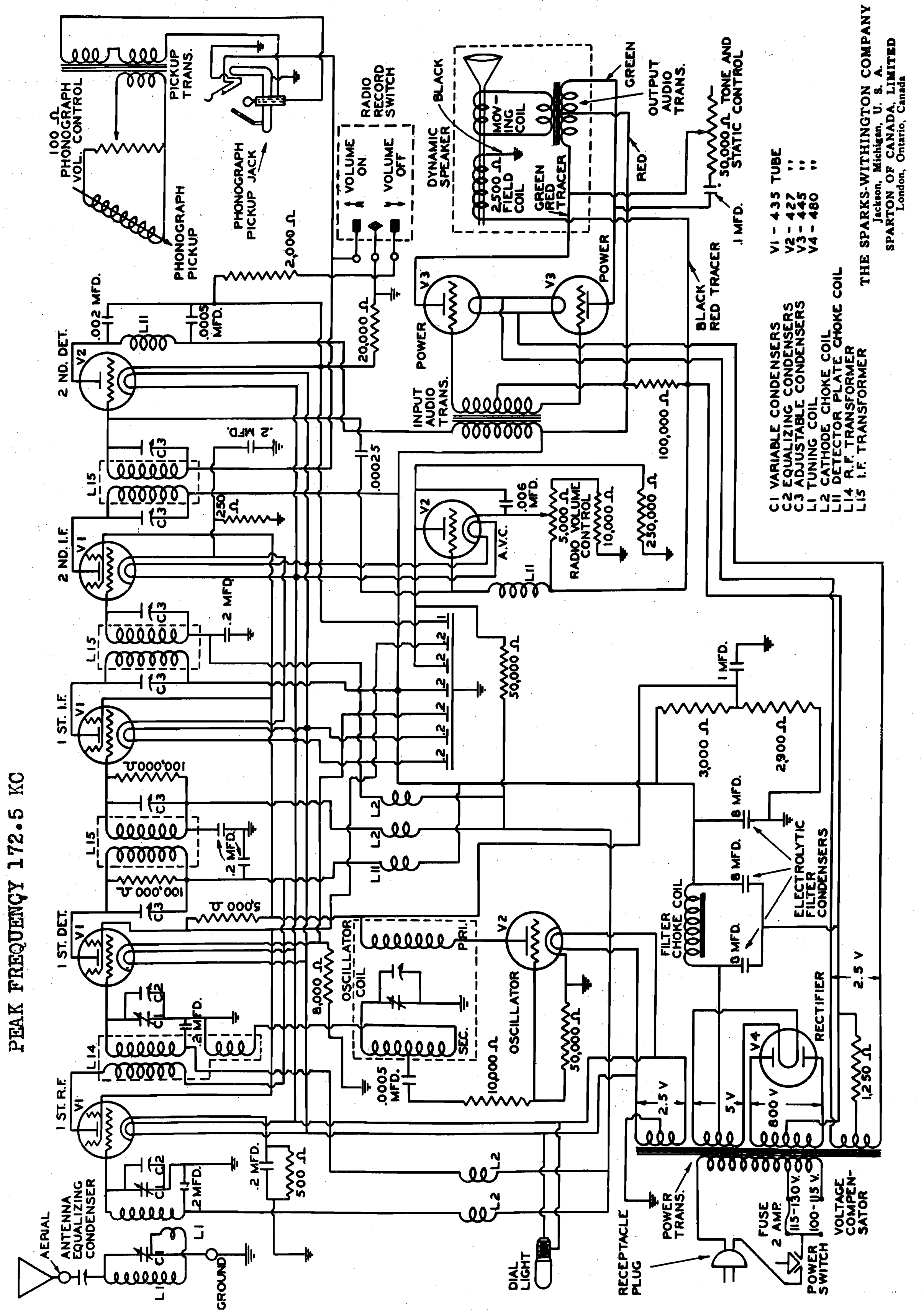

SPARTON MODEL 45 (VISIONOLA) SUPERHETERODYNE

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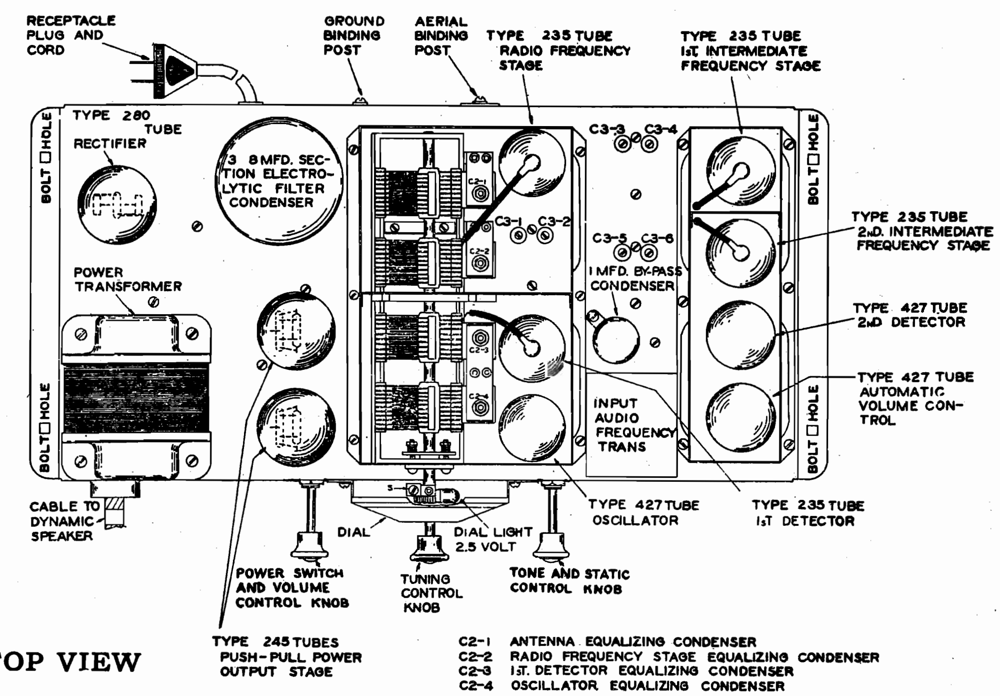
SPARTON MODEL 45 (VISIONOLA) SUPERHETERODYNE

Line Voltage 115—Position of Voltage Compensator 100-115—Position of Volume Control Full

		OPERATING VOLTAGES				
Tube	Location	Heater or Filament	Plate	Control Grid—	Screen Grid+	Plate Current Mills.
435	1st R. F.	2.2 - 2.5	180 - 220	2.5 - 4	80 - 100	5 - 8
435	1st Det.	2.2 - 2.5	180 - 220	*6.4 - 14	80 - 100	*.8 - 1.8
435	1st I. F.	2.2 - 2.5	180 - 220	2.5 - 4	80 - 100	5 - 8
435	2nd I. F.	2.2 - 2.5	180 - 220	2.5 - 4	80 - 100	5 - 8
427	Oscillator	2.2 - 2.5	80 - 100	†	....	‡
427	2nd Det.	2.2 - 2.5	170 - 205	14 - 20	....	.7 - 1.0
427	A. V. C.	2.2 - 2.5	§	30 - 50	....	Zero
445	Power	2.2 - 2.5	225 - 270	‖30 - 45	....	20 - 30
445	Power	2.2 - 2.5	225 - 270	‖30 - 45	....	20 - 30
480	Rectifier	4.2 - 5	360 - 440	....	....	48 - 58

(Measured with 1000 ohm per volt voltmeter)

* Remove oscillator tube.
† Tube generates own bias when oscillating.
‖ Meter reading use 150 volt scale—true voltage 50-75—if lower scale voltmeter is used expect lower voltages.
§ Test from grid prong to ground approx. 125 volts.
‡ Test with plug in 2nd. Detector socket and tube in Analyzer.



TOP VIEW

C3-1 I. F. Stage First Adjustable Condenser
C3-2 I. F. Stage Second Adjustable Condenser
C3-3 I. F. Stage Third Adjustable Condenser
C3-4 I. F. Stage Fourth Adjustable Condenser
C3-5 I. F. Stage Fifth Adjustable Condenser
C3-6 I. F. Stage Sixth Adjustable Condenser

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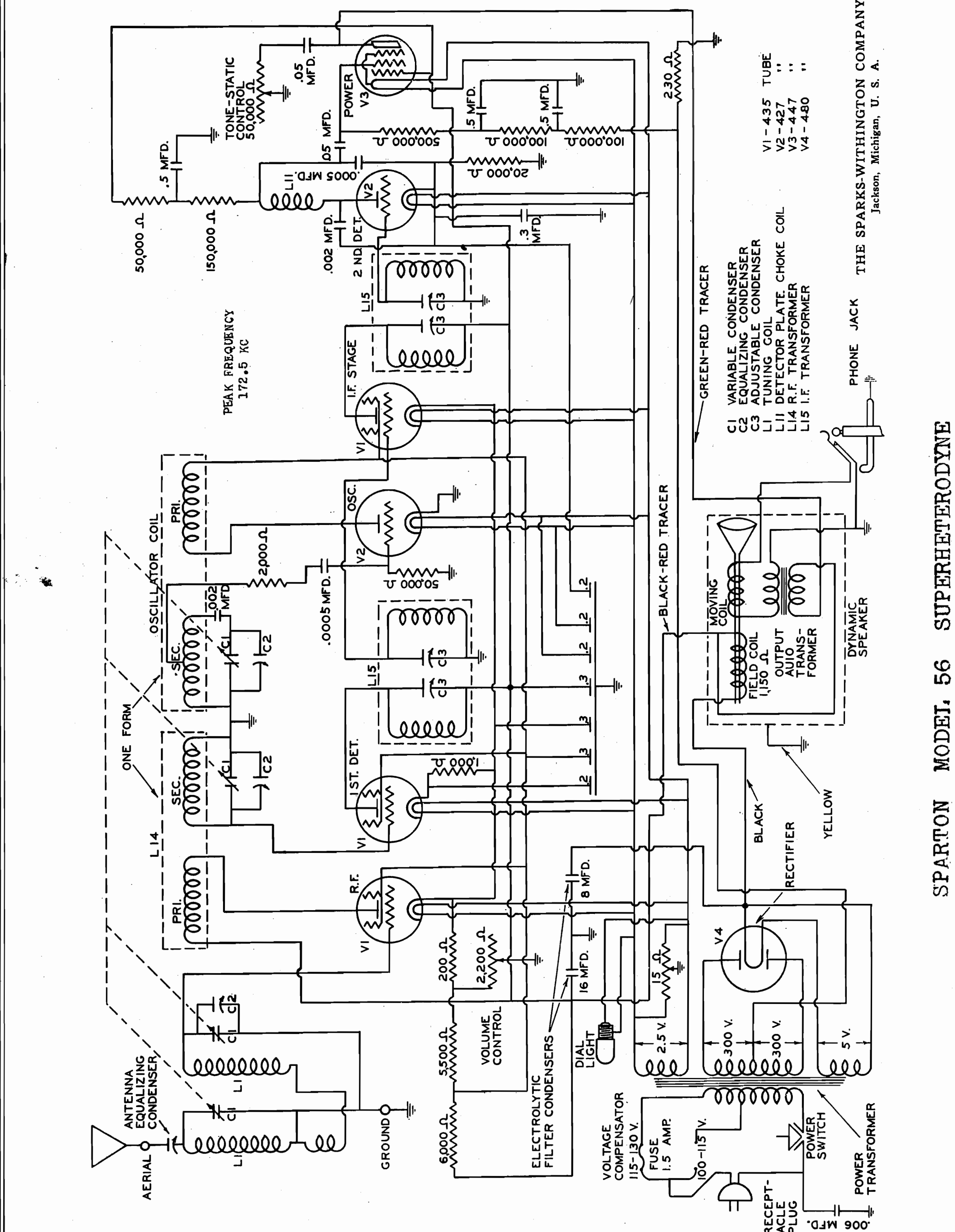

PEAK FREQUENCY 172.5 KC

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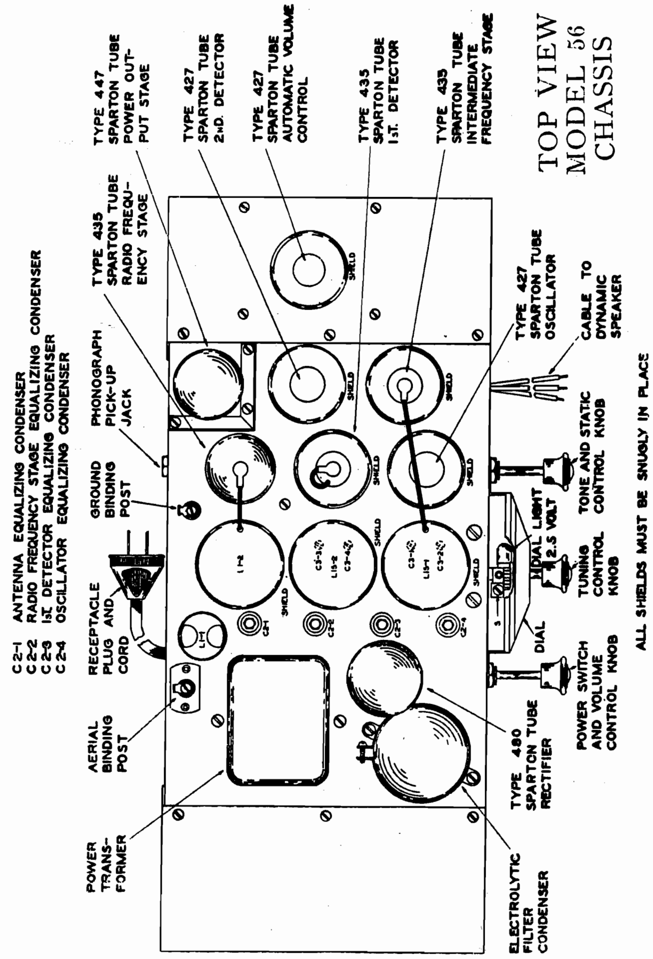
SPARTON MODEL 56 SUPERHETERODYNE

TOP VIEW
MODEL 56
CHASSIS



L1-1 First R. F. Tuning Coil
L1-2 Second R. F. Tuning Coil
L15-1 First I. F. Transformer (1st. Det. to I.F. Stage)
L15-2 Second I. F. Transformer (I.F. to 2nd. Det. Stage)
C3-1 I. F. Stage First Adjustable Condenser
C3-2 I. F. Stage Second Adjustable Condenser
C3-3 I. F. Stage Third Adjustable Condenser
C3-4 I. F. Stage Fourth Adjustable Condenser

Voltage Current Characteristics

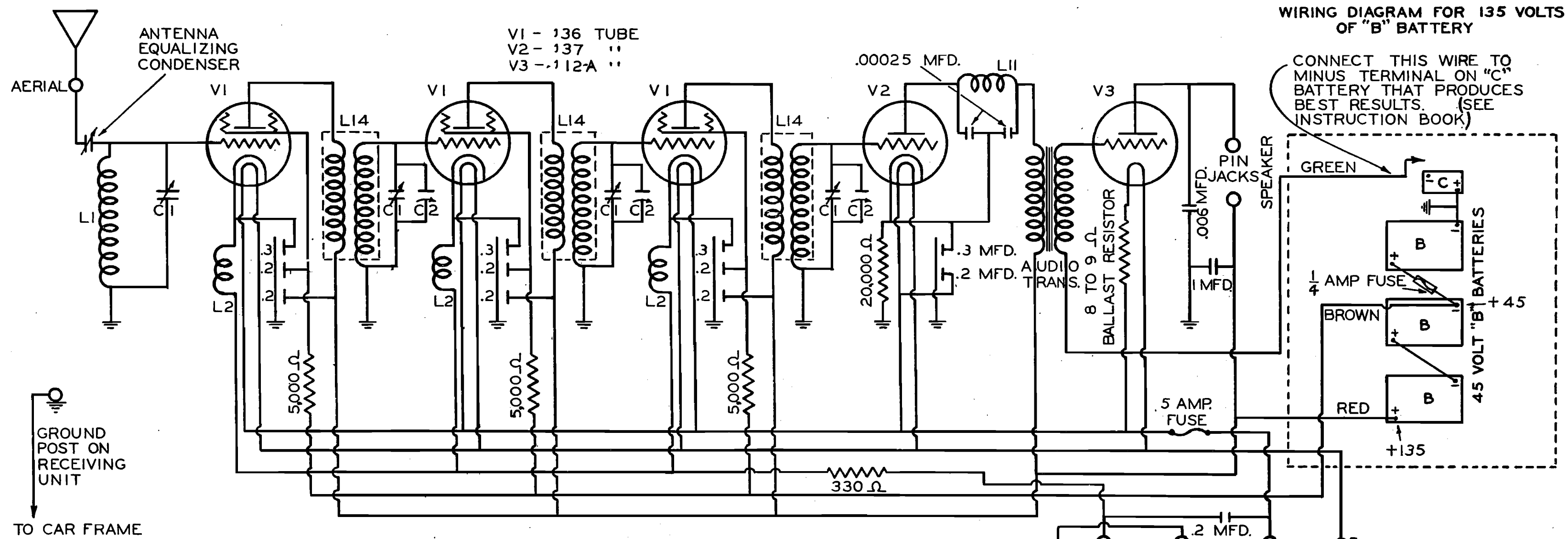
Line Voltage 115—Position of Voltage Compensator 100-115—Position of Volume Control Full

		OPERATING VOLTAGES				
Tube	Location	Heater or Filament	Plate	Control Grid —	Screen Grid +	Plate Current Mills.
435	1st R. F.	2.2 - 2.5	230 - 270	2.5 - 4.0	85 - 100	5 - 8
435	1st Det.	2.2 - 2.5	230 - 270	**4.5 - 7.5	85 - 100	**1.8 - 3.5
435	1st I. F.	2.2 - 2.5	230 - 270	2.5 - 4.0	85 - 100	5 - 8
427	Oscillator	2.2 - 2.5	85 - 110	†	....	‡
427	2nd Det.	2.2 - 2.5	*100 - 135	8 - 14	....	4.0 - .7
447	Power	2.2 - 2.5	220 - 260	15 - 18	230 - 270	30 - 36
480	Rectifier	4.2 - 5	360 - 420	....	....	40 - 55

***Use 300 volt scale.** **†Tube generates own bias when oscillating.**
****Remove Oscillator tube.** **‡Test with plug in 2nd. Detector socket and tube in analyzer**

SPARKS WITHINGTON CO.
SPARTON OF CANADA LTD.

SPARTON MODEL 41
POLICE AUTO RECEIVER



C1 TUNING CONDENSER
C2 EQUALIZING CONDENSER
L1 TUNING COILS

L2 CATHODE CHOKES
L11 DETECTOR PLATE CHOKE
L14 R.F. TRANSFORMER

VOLTAGE-CURRENT CHARACTERISTICS (FOR 135 VOLTS OF "B" BATTERY)

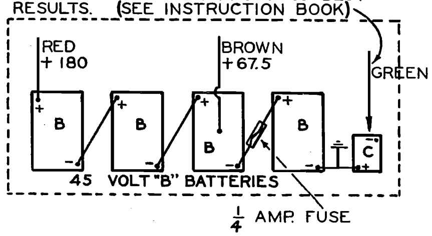
Condition of "A" Battery Good
Condition of "B" Battery Good
(Meter 1000 ohms per volt)

Condition of "C" Battery Good
Position of Volume Control Full
With No Signal

Operation Voltages

Tube Type	Location	Filament or Heater	Plate	Control Grid--	Screen Grid	Plate Current
'36	1st R.F.	6	135	1.5	67.5	1.5
'36	2nd R.F.	6	135	1.5	67.5	1.5
'36	3rd R.F.	6	135	1.5	67.5	1.5
'37	Detector	6	125	10	67.5	.5
'38	Power	4-5	135	18	135	6-8

WIRING DIAGRAM FOR 180 VOLTS OF "B" BATTERY

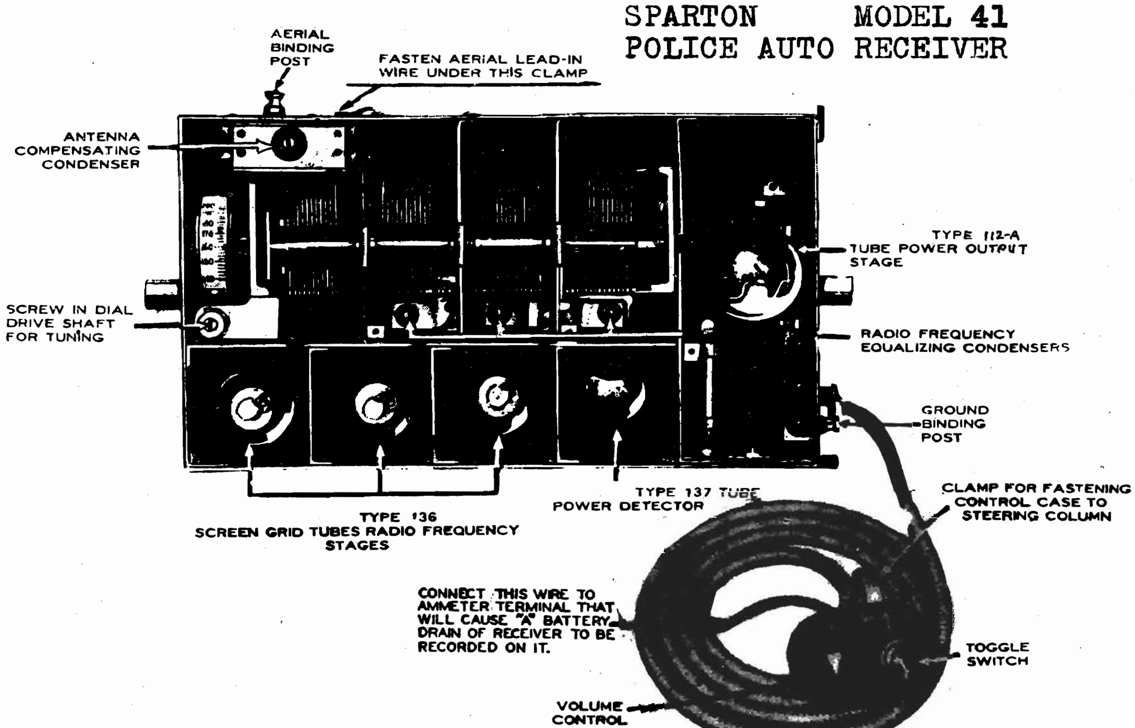


THE SPARKS-WITHINGTON COMPANY
Jackson, Michigan, U. S. A.

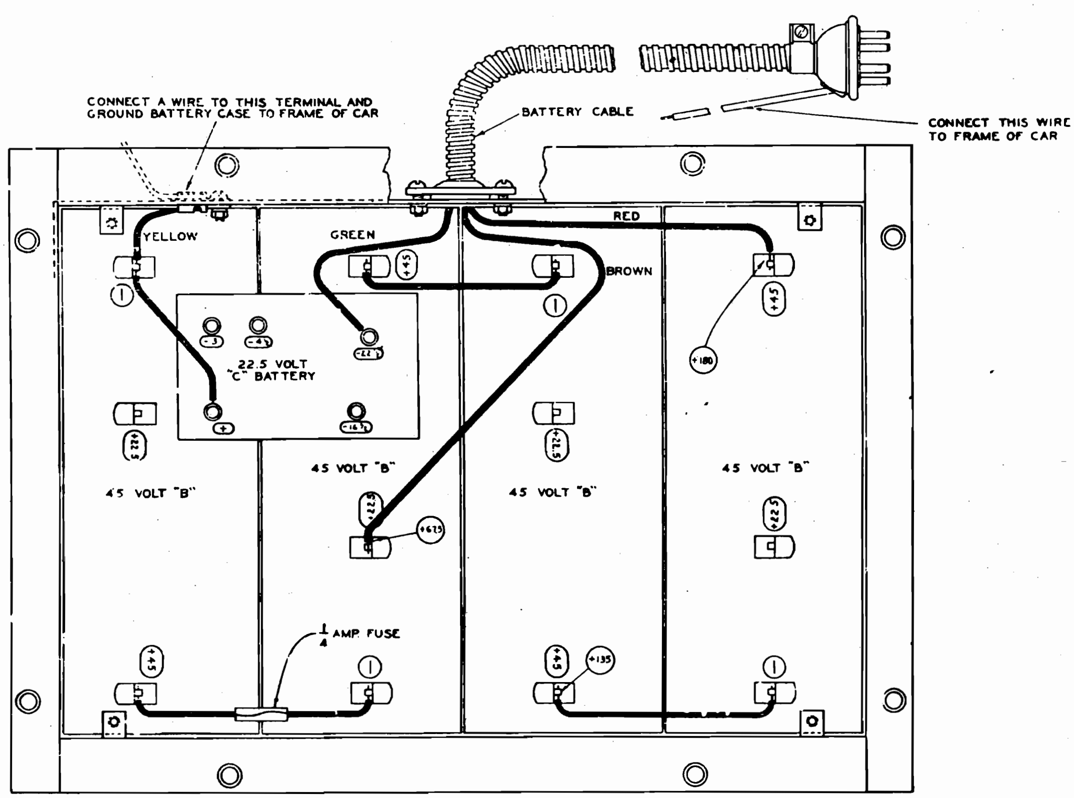
U. S. A. BULLETIN NO. 24-C
Effective June 1, 1931

SPARKS WITHINGTON CO.
SPARTON OF CANADA LTD.

SPARTON MODEL 41
POLICE AUTO RECEIVER

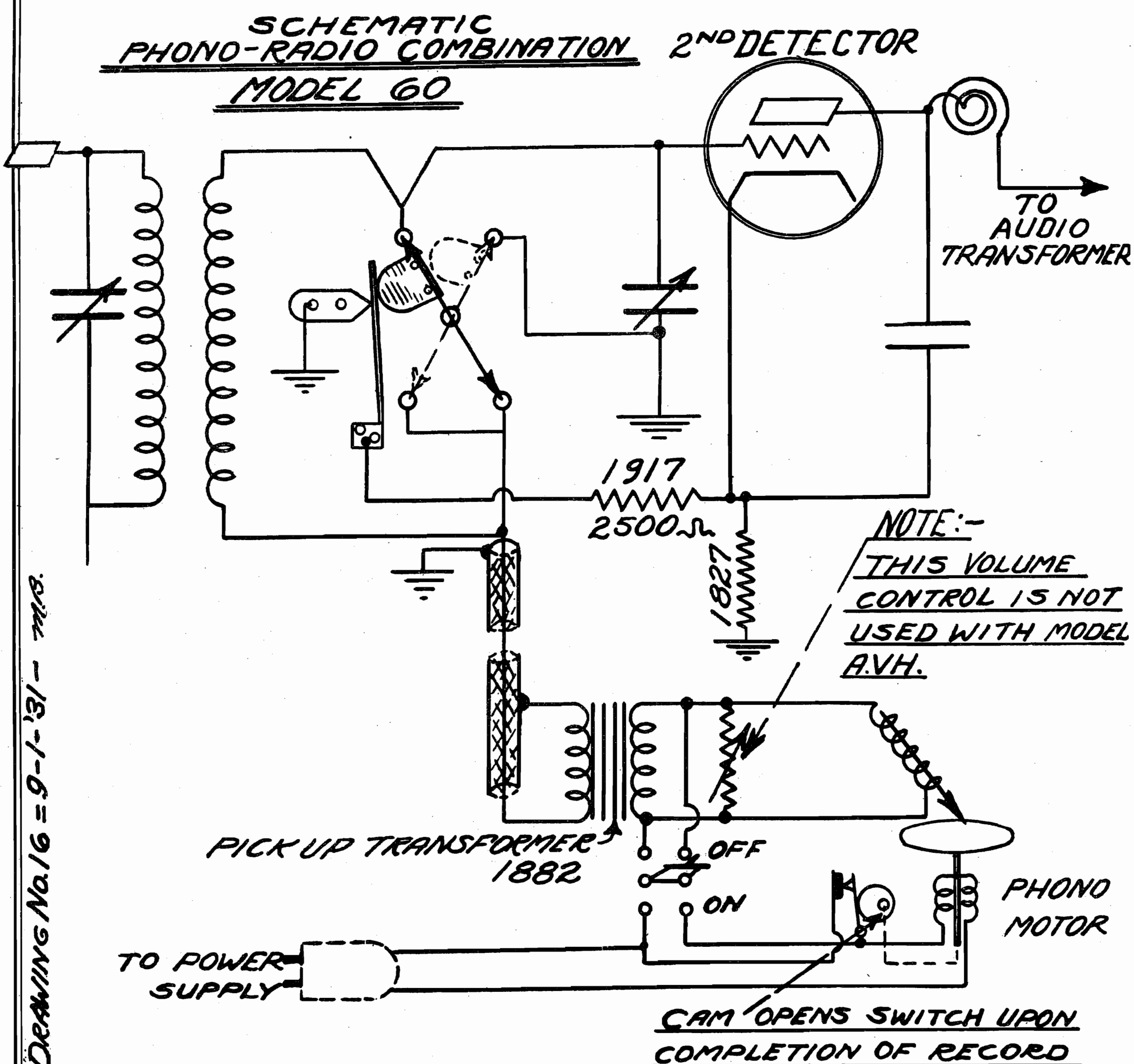


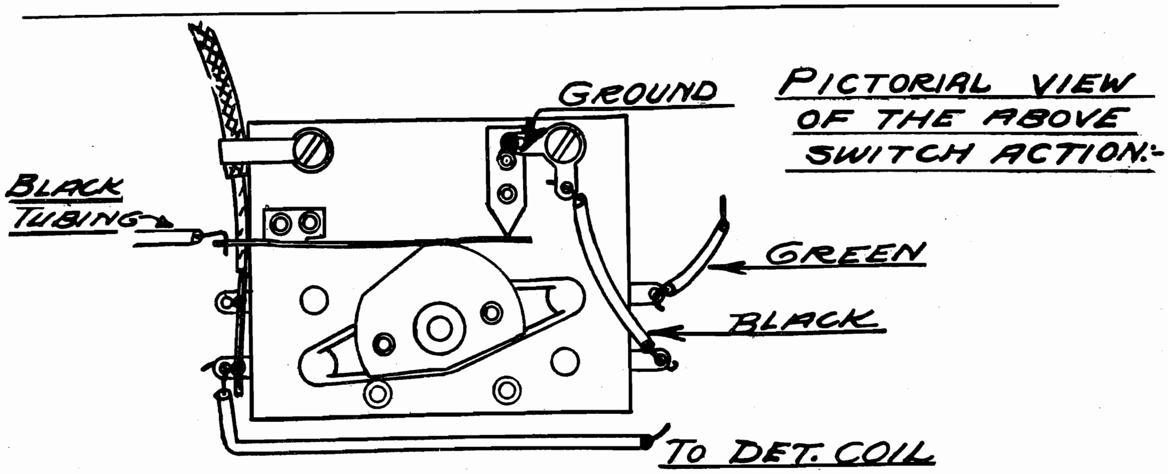
OPEN VIEW OF SPARTON MODEL 41 POLICE AUTOMOBILE RADIO RECEIVER



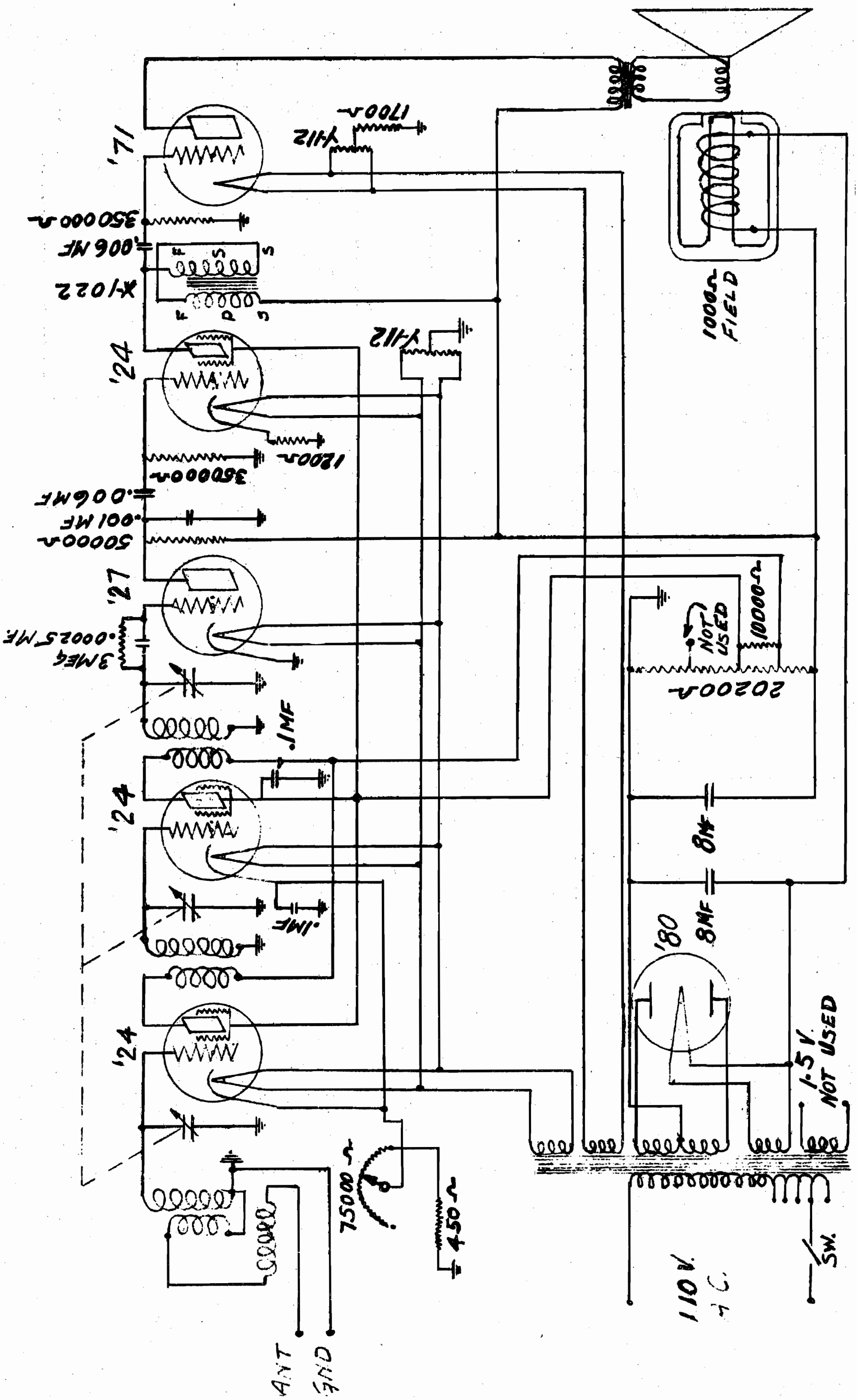
"B" AND "C" BATTERY WIRING DIAGRAM FOR 180 VOLTS OF "B" BATTERY
(To use 135 volts of "B" battery connect brown wire to +45 and red to +135 and adjust "C" battery voltage for about 6 milliamperes through speaker)

STEINITE RADIO CO.





STEINITE RADIO CO.

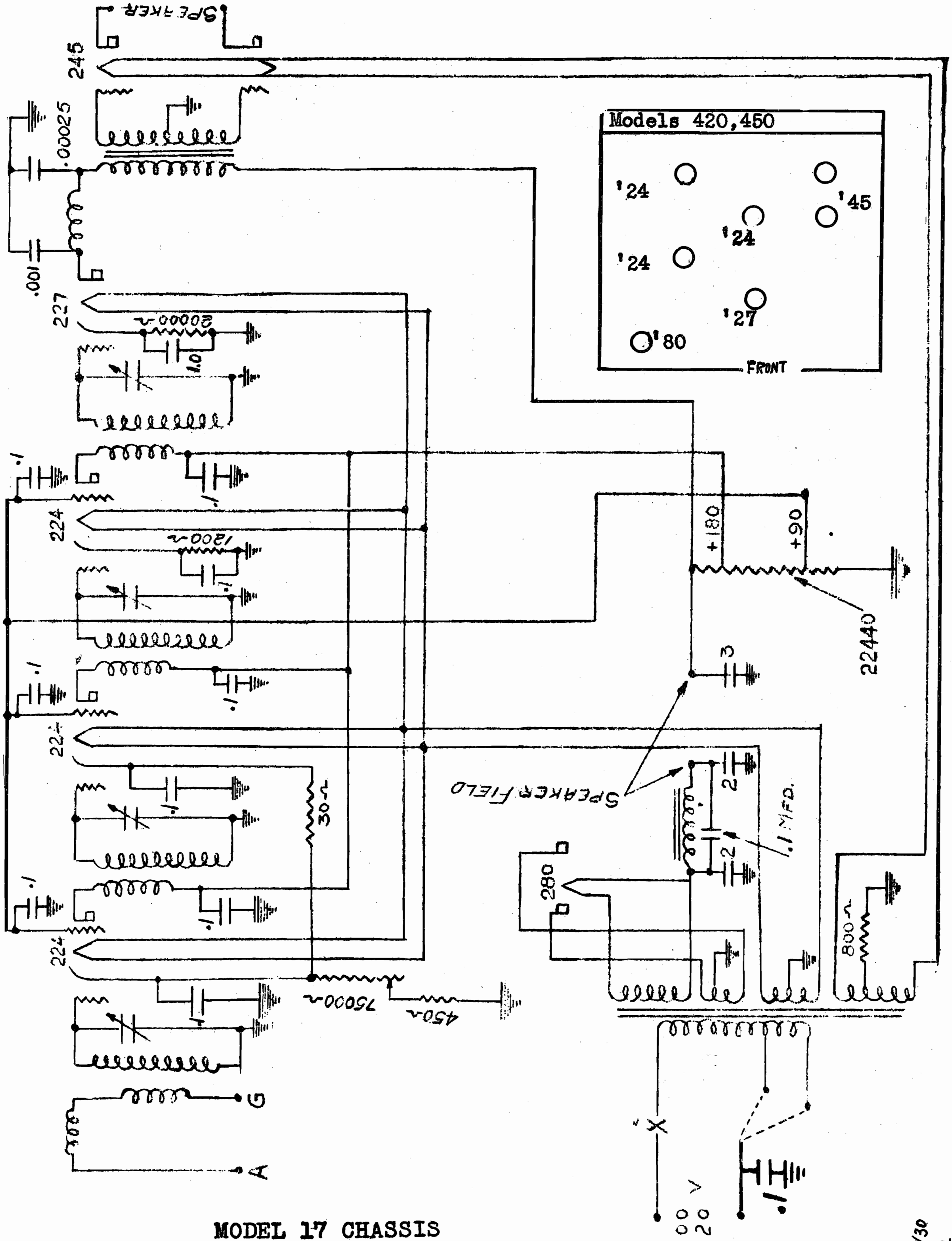


MODEL 15 CHASSIS
Used with
RECEIVER MODELS 412 & 420.

(For socket layout model 420 see page 576-B)

7/30/30
1183

STEINITE RADIO CO.

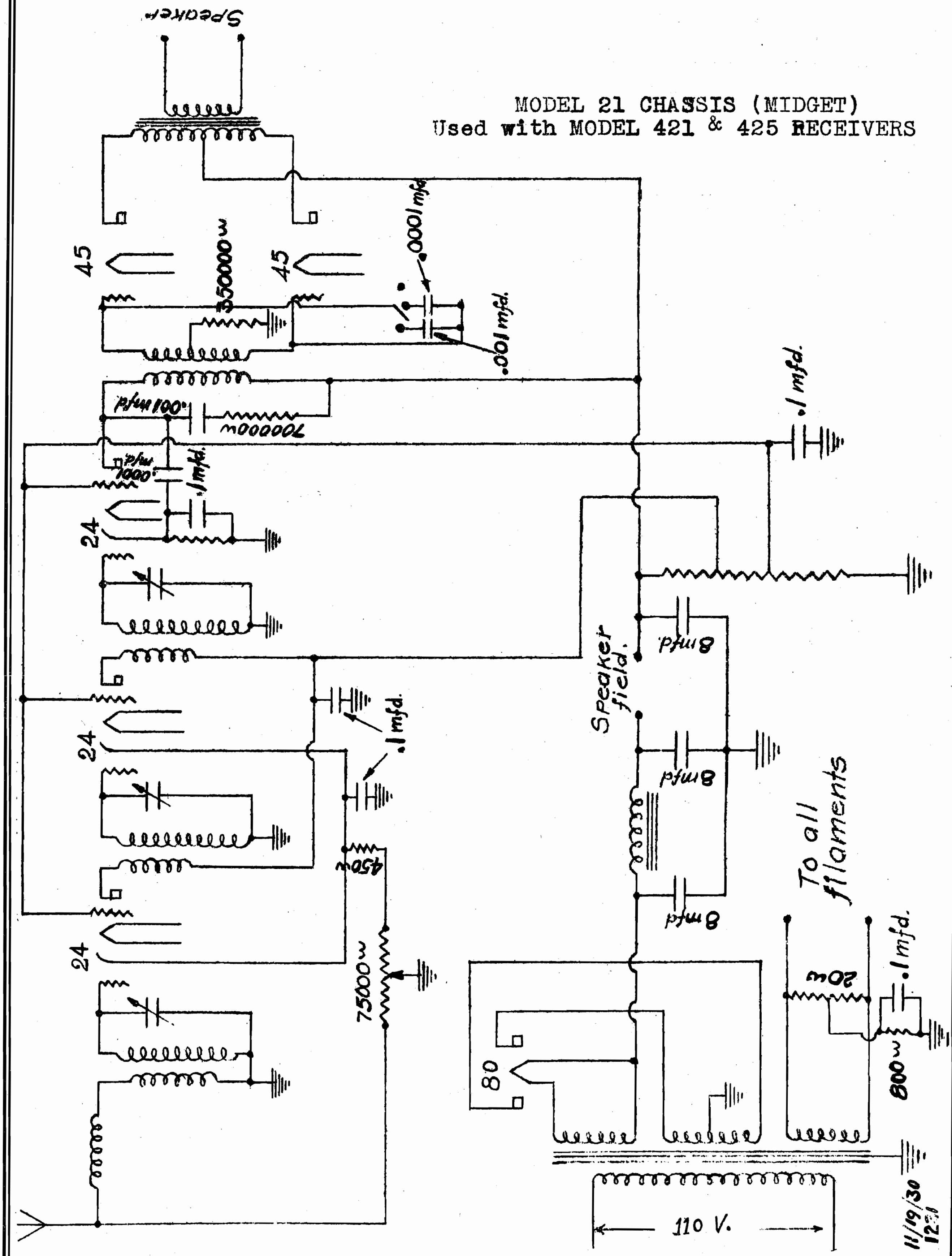


MODEL 17 CHASSIS
Used with
RECEIVER MODELS 210, 230, 420, 450.

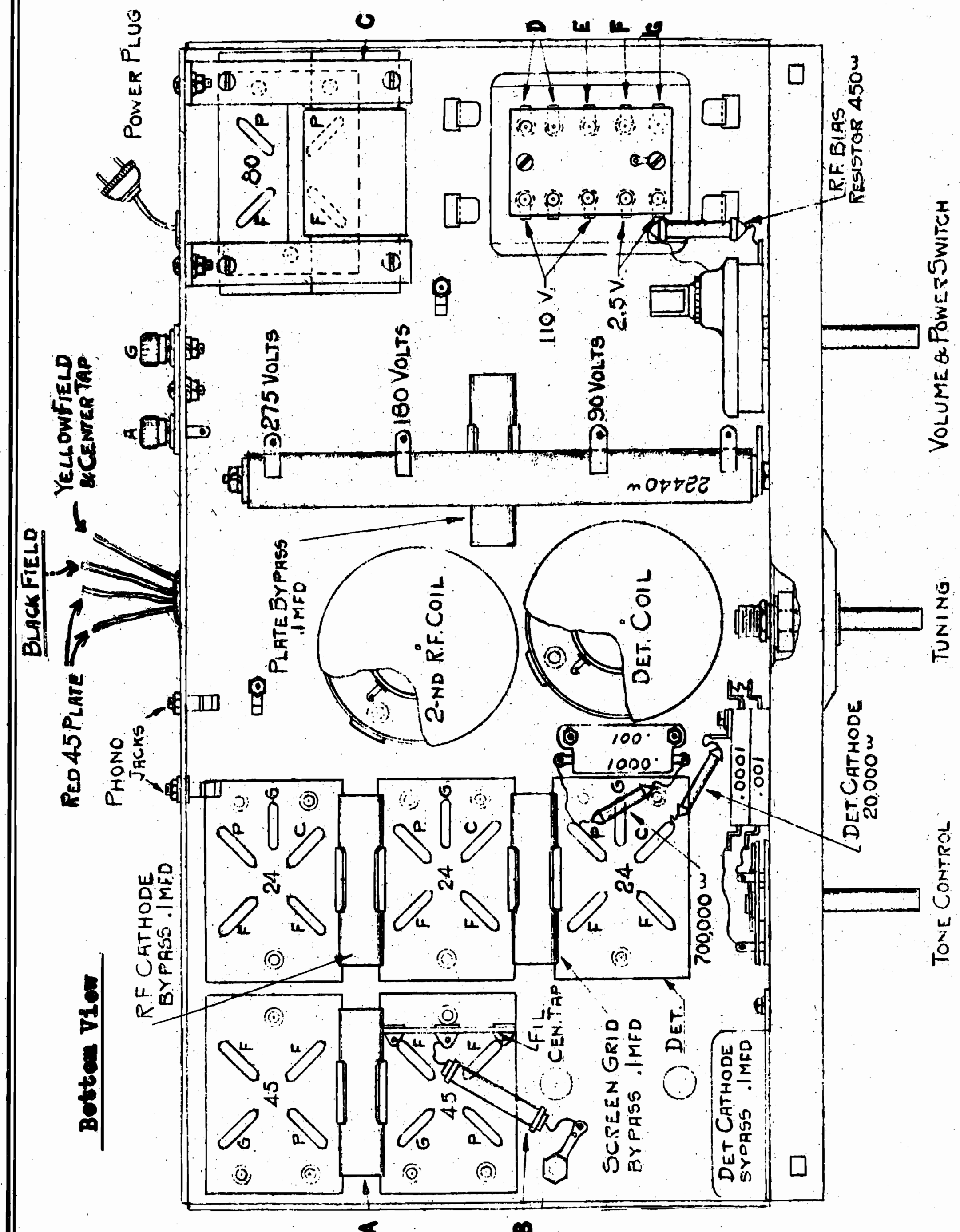
10/20/30
1192

STEINITE RADIO CO.

MODEL 21 CHASSIS (MIDGET)
Used with MODEL 421 & 425 RECEIVERS



STEINITE RADIO CO.



A - 245 bias bypass - .1 Mfd.
B - 245 bias Res. - 800 Ohms.
C - Filter Choke

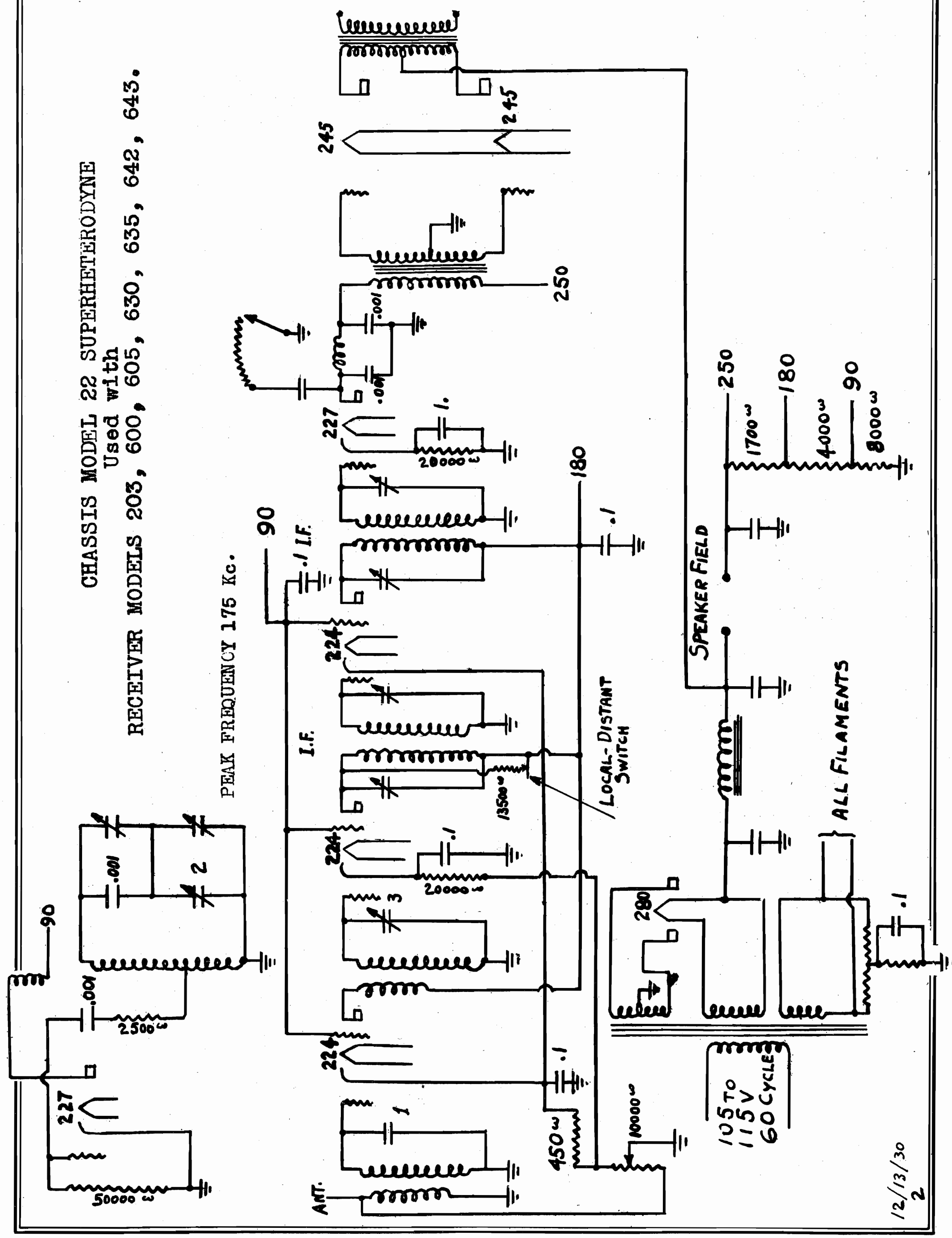
D - Rectifier Filament
E - Rectifier Plate
F - Ground
G - Rectifier Plate

MODEL 21 CHASSIS (MIDGET)
Used with MODEL 421 & 425 RECEIVERS

Readings obtained with
Line Volt. = 110
Vol. Cont. Max.

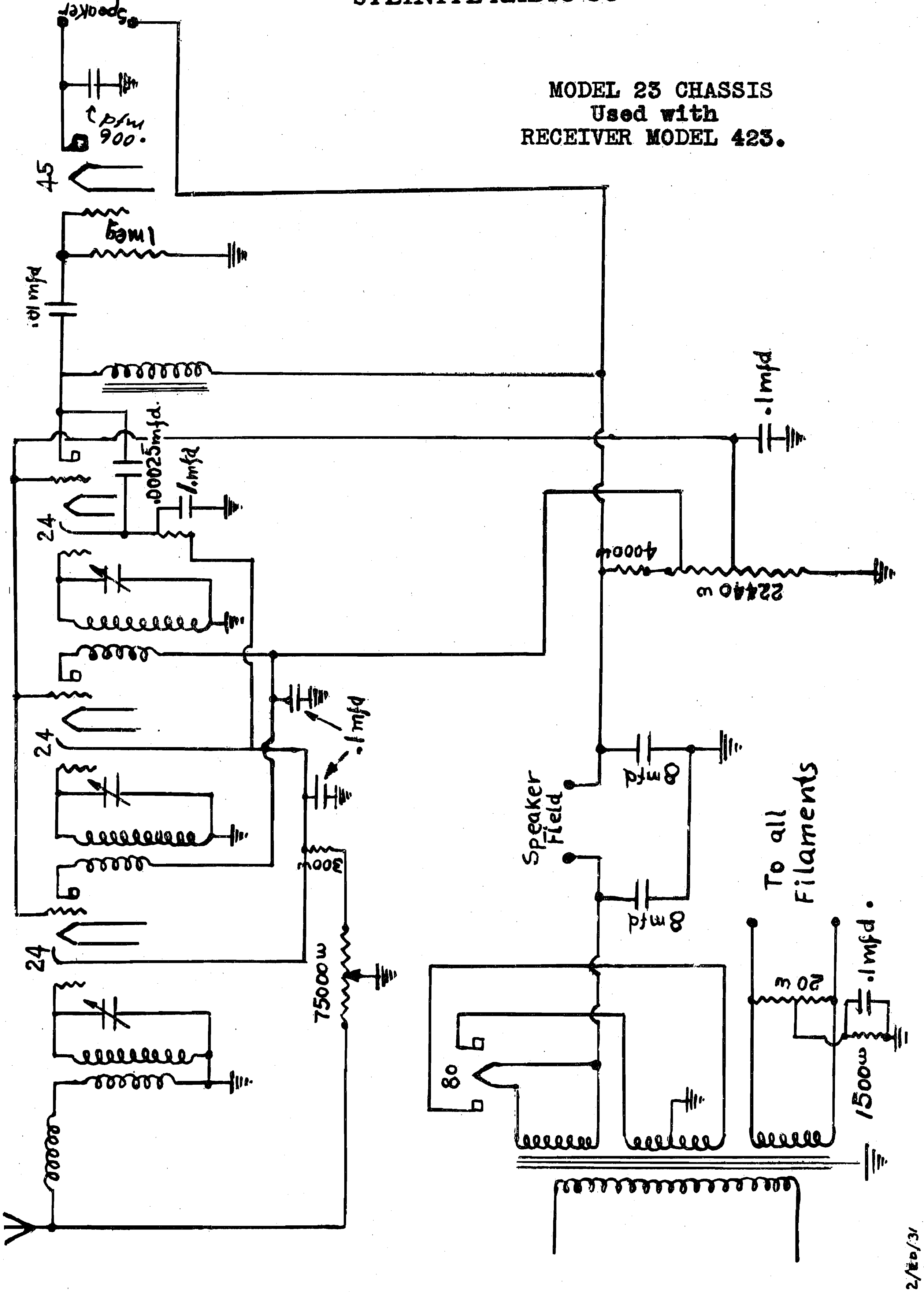
'24 and '45 filaments ---------------------2.2 v
'80 filament ---------------------------------4.5 v
R.F. screen grids (to ground)-------------- 90 v
R.F. plates (to ground)---------------------180 v
Detector Plate (to ground)------------------250 v
Detector screen grid (to ground)----------- 90 v
R.F. Cathode to ground
Volume Control Maximum---------- 3 v
Volume Control minimum---------- 10 v
Detector Cathode (to ground)--------------- 10 v
'45 plate (to ground)------------------------275 v
All filaments to ground-------------------- 40 v

STEINITE RADIO CO.



STEINITE RADIO CO

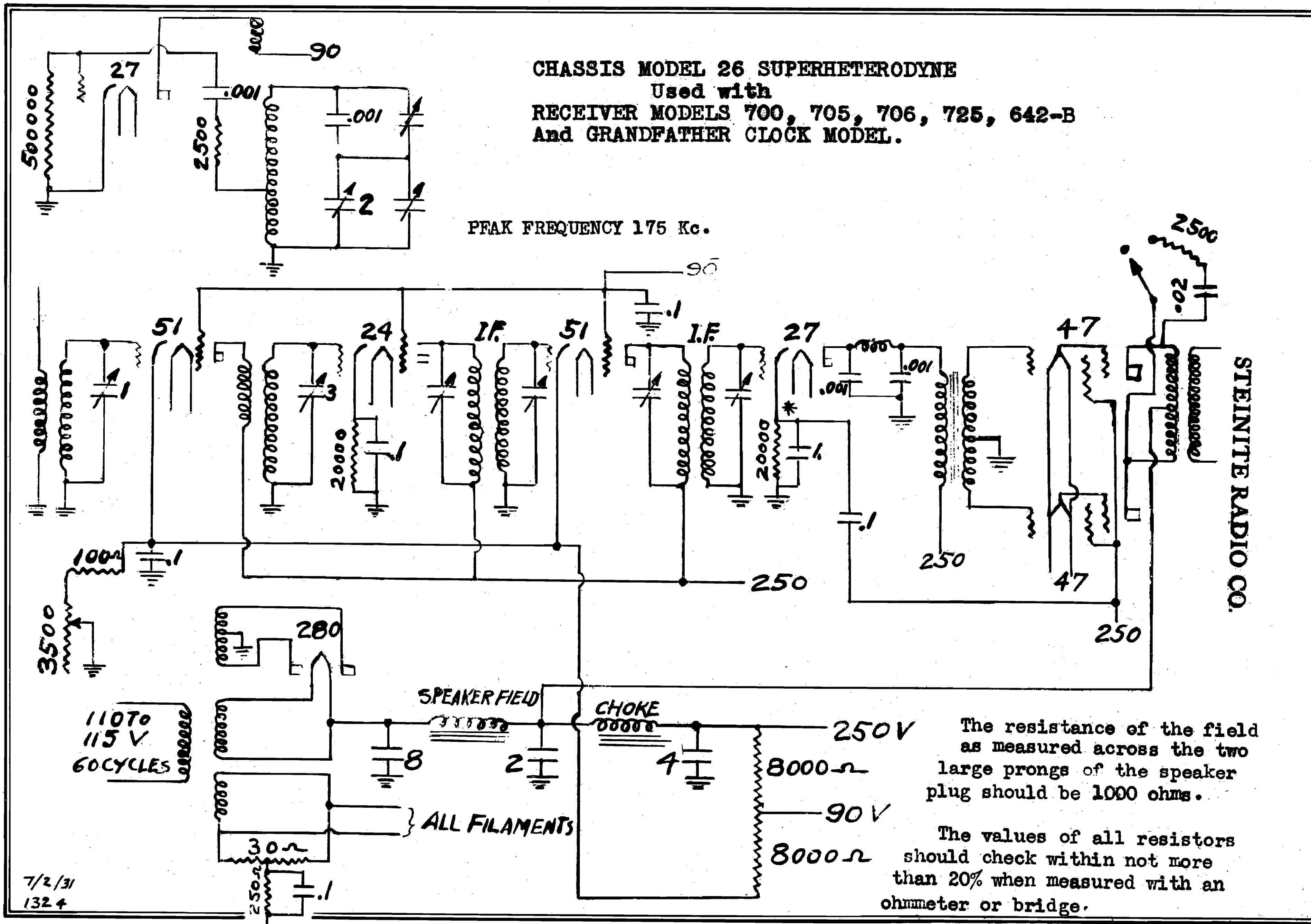
MODEL 23 CHASSIS
Used with
RECEIVER MODEL 423.



STEINITE RADIO CO.

CHASSIS MODEL 26 SUPERHETERODYNE
Used with
RECEIVER MODELS 700, 705, 706, 725, 642-B
And GRANDFATHER CLOCK MODEL.

PEAK FREQUENCY 175 Kc.



The resistance of the field as measured across the two large prongs of the speaker plug should be 1000 ohms.

The values of all resistors should check within not more than 20% when measured with an ohmmeter or bridge.

STEINITE RADIO CO.

If a 175 kilocycle oscillator is available, the receiver may be aligned as follows: (all aligning operations should be made with bottom plate under act)

The output of the 175 K.C. oscillator is connected to the grid of the 1st detector tube and 125 m.a. thermo couple output meter is connected to the voice coil of the loud speaker. The two aligning condensers of each I.F. transformer should then be carefully adjusted for maximum output. These four condensers should be adjusted several times to be certain that all four circuits are tuned to exactly 175 K.C. (Use an insulated screw driver.)

After this has been done a station operating on about 1400 K.C. or preferably a modulated oscillator should be tuned in with the antenna or lead from the oscillator connected to the grid of the R.F. amplifier tube. The tuning dial should be set to correspond to the signal being used. That is, if a 1400 K.C. signal is being used, turn the tuning dial to read 1400 K.C. Then adjust the aligning condenser of the middle section of the gang condenser until maximum output is obtained. The next step is to remove the lead from the grid of the R.F. tube and connect it to the antenna binding post. DO NOT CHANGE THE TUNING DIAL WHILE DOING THIS. Then adjust the aligning condenser on the R.F. section of the condenser (the section at the rear of the chassis) until maximum output is obtained. After this has been completed the receiver is properly aligned at high frequencies.

Next set the oscillator at 600 K.C. or tune in a station near this frequency with the lead from oscillator or the antenna connected to the grid of the R.F. tube. Then adjust the oscillator aligning condenser (mounted in lower center front of chassis) for maximum output. This should be carefully done and at the same time the tuning dial should be changed slightly to see if maximum output is obtained. If it is found necessary to change the oscillator trinning condenser greatly it is well to repeat the aligning operation at the high freqnency mentioned above.

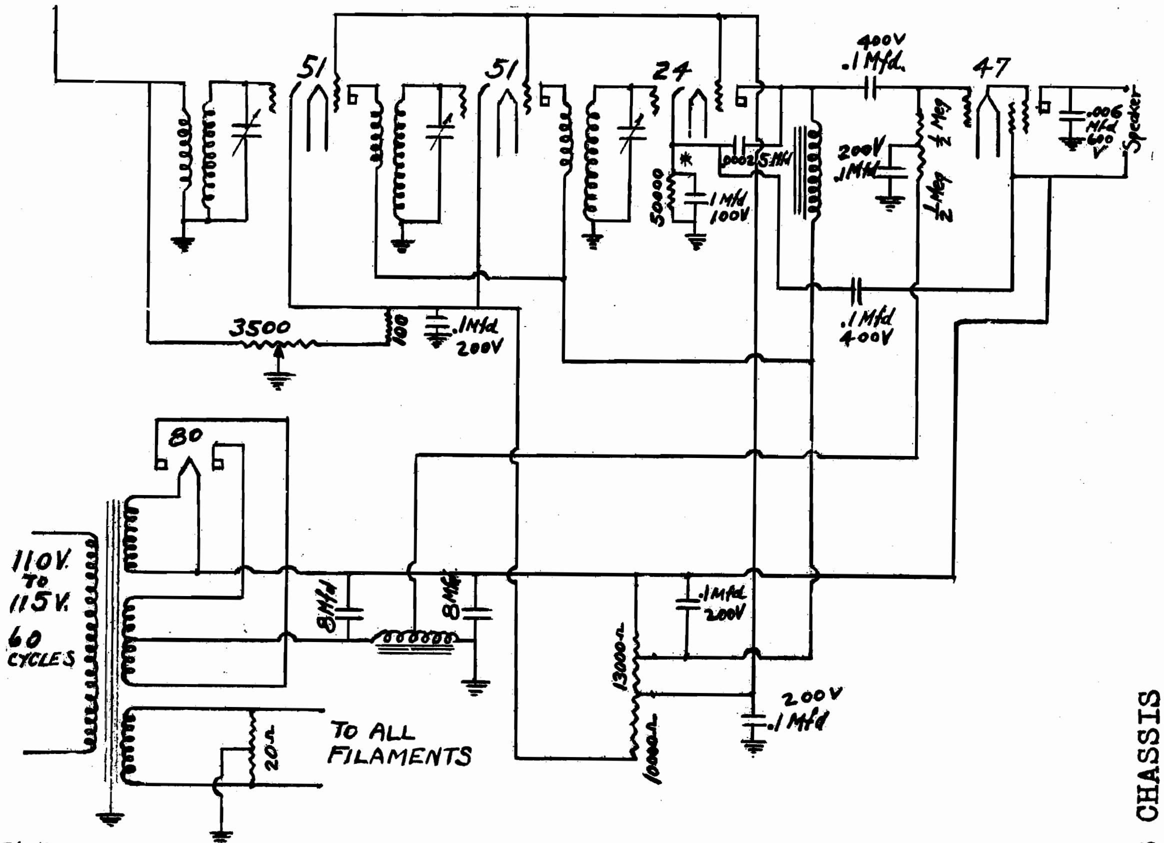
Readings obtained with Line Volt.= 110 Vol.Cont. at Max.	R.F. 1st detector, and I.F.plate to ground	250 volts
	R.F. 1st detector, and L.F. screen to ground	90 volts
	R.F. and I.F. cathode to ground	3 volts
	1st detector, cathode to ground	12 volts
	Oscillator, plate to ground	90 volts
	2nd, detector, plate to ground	250 volts
	2nd, detector, cathode to ground	22 volts
	'47 plate to filament	250 volts
	'47 screen to filament	250 volts
	All filaments to ground	16.5 volts
	'51, '47, '27, and '24 filaments	2.4 volts
	'80 filament	4.7 volts

The following points should be checked if no signald are heard when a good set of tubes are used.

The oscillator may be checked for oscillation by reading the cathode voltage of the 1st detector. This is normally about 12 volts. Then touch the grid of the oscillator tube and if it is working properly the reading obtained on the cathode of the 1st detector will drop to about half the normal reading. If it is not oscillating various '27 tubes should be tried in the oscillator position and if still no oscillation is obtained connections in the oscillator circuit should be checked for continuity.

CHASSIS MODEL 26 SUPERHETERODYNE
RECEIVER MODELS 700, 705, 706, 725, 642-B
And GRANDFATHER CLOCK MODEL.

STEINITE RADIO CO.



7/2/31
1323

MODEL 28 CHASSIS
Used with
RECEIVER MODELS 700 & 701

It will be seen from the wiring diagram that a special impendence coupling is used from the power detector to the power pentode. If the set "motor boats", check opens in this circuit or short circuit in the coupling condenser.

All filaments except that of the type 80 tube are taken from one winding of the power transformer. Bias voltage for '47's is obtained from the drop across a portion of the speaker field. This maintains the grid at a 16.5 potential relative to ground. The grid is connected through two 1/2 meg. resistors, by-passed at center by a .1 mfd. condenser. Should this condenser become open, a very pronounced hum will result. In case of excessive hum or poor quality, check these connections.

Readings obtained with Line Volt.= 110 Vol. Cont. at Max.

'24 and '45 filaments	2.3
'80 filament	4.7
R.F. screen grids (to ground)	90
R.F. plates (to ground)	250
Detector plate (to ground)	250
Detector screen grid (to ground)	90
R.F. Cathode (to ground)	
Volume Control Maximum	3v
Volume Control Minimum	35
Detector Cathode (to ground)	10
'47 plate (to ground)	250v
'47 Screen (to ground)	250v
All filaments (to ground)	0v
Pentode Bias (at speaker field tap) ( )	16.5v

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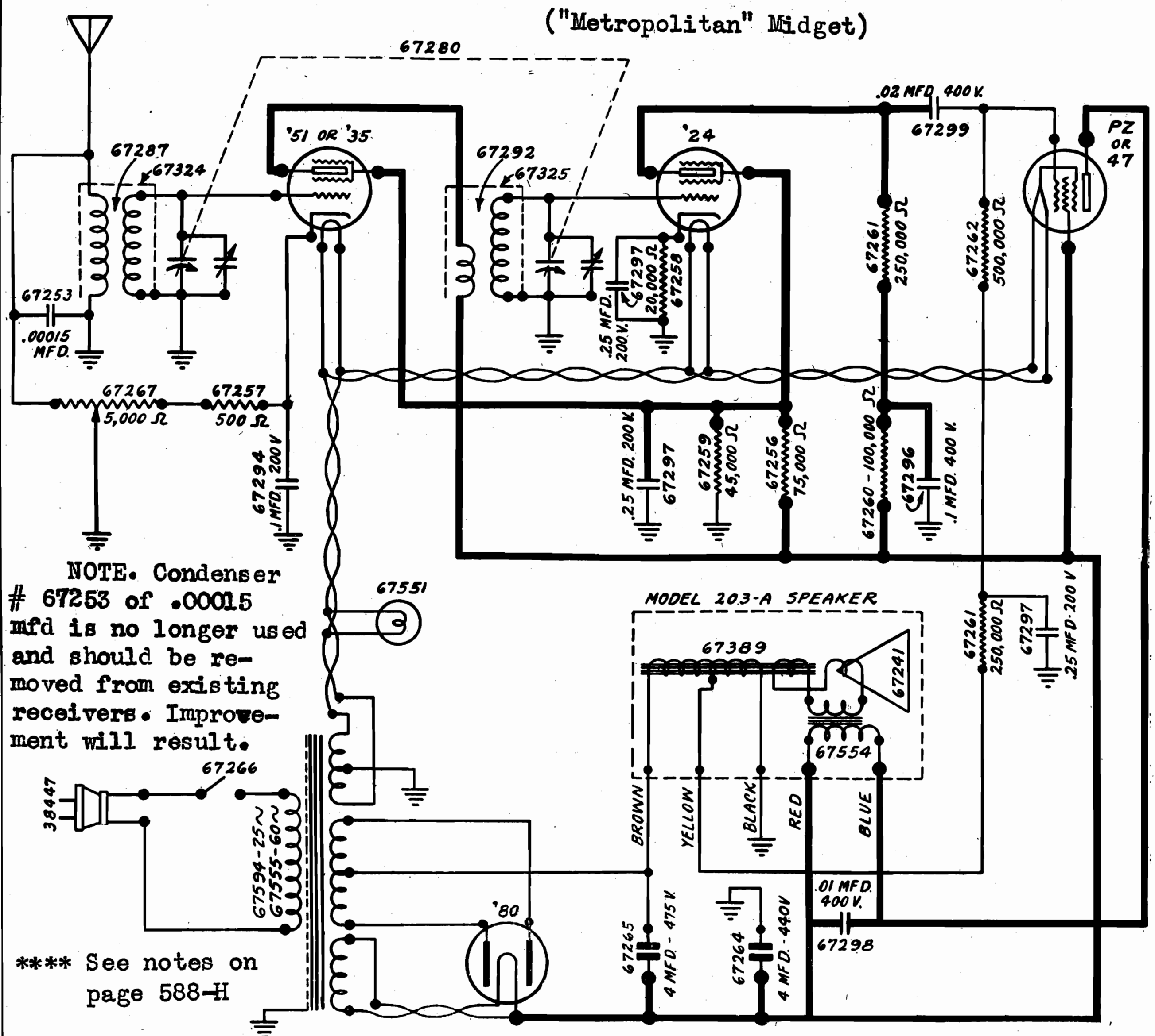
Model R-101-A and R-101-B Radio Receiver

("Metropolitan" Midget)



NOTE. Condenser # 67253 of .00015 mfd is no longer used and should be removed from existing receivers. Improvement will result.

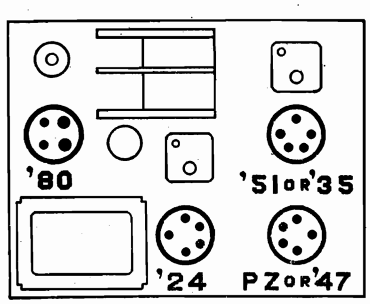
**** See notes on page 588-H

Type of Tube	Tube Circuit	Filament Voltage	Plate Voltage	Screen Grid Voltage	Bias Voltage
'51	R.F.	2.4	243	68	2.75
'24	Det.	2.4	80	68	6
PZ or '47	Output	2.4	228	243	16 *
'80	Rect.	4.8			

* This reading obtained between ground and yellow speaker lead. Direct reading from grid to ground or reading taken with a set tester will show low voltage because of high resistance in grid circuit.

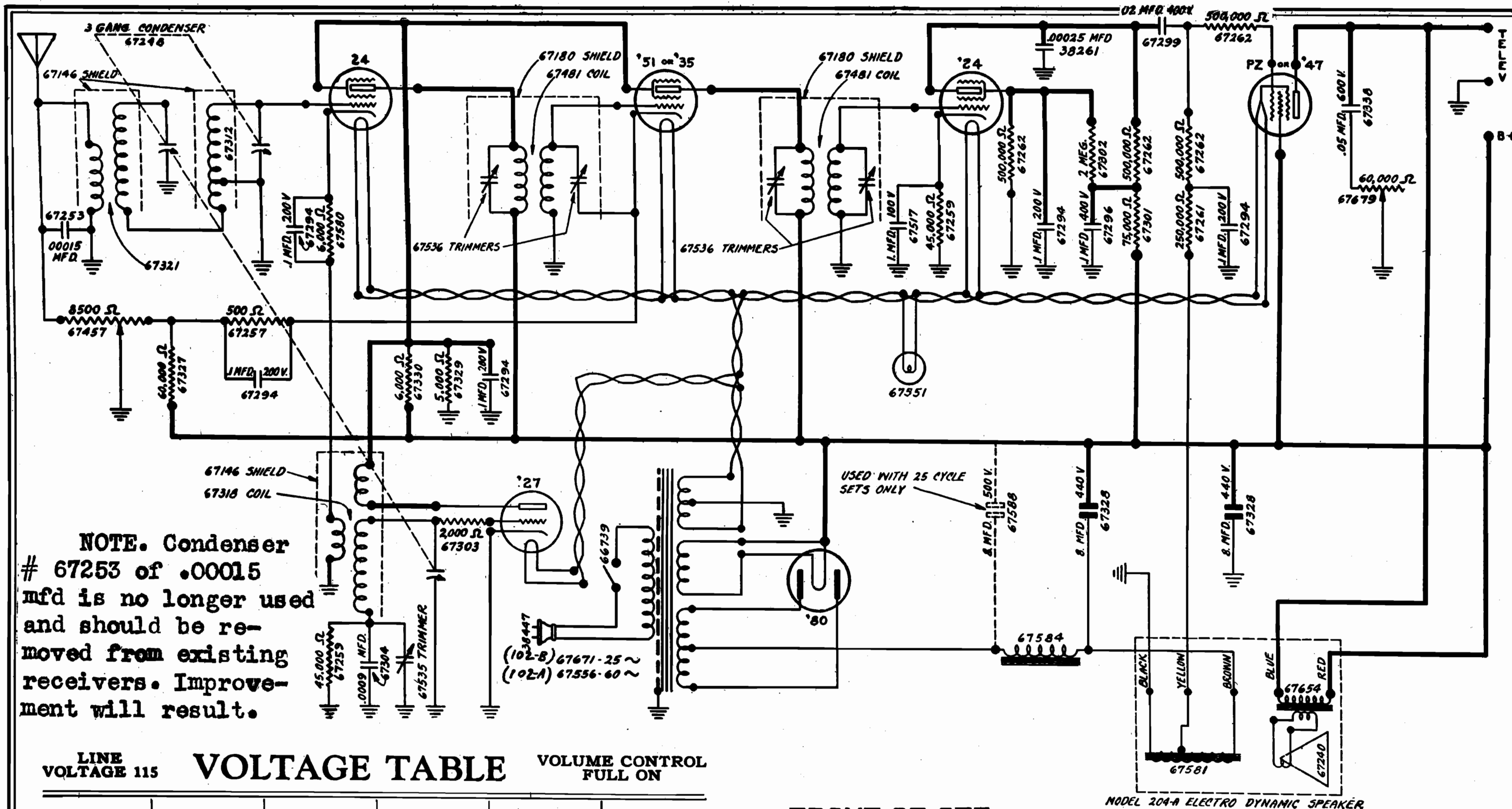
All D.C. voltages are taken between socket terminals and ground with high resistance voltmeters having resistances of 1000 ohms per volt.
Line Voltage—115.
Volume Control full on.

FRONT OF SET



TUBE LOCATIONS

STEWART-WARNER CORP.



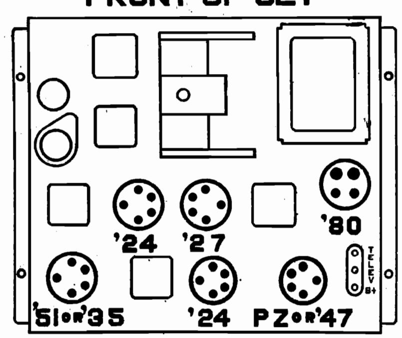
NOTE. Condenser # 67253 of .00015 mfd is no longer used and should be removed from existing receivers. Improvement will result.

LINE VOLTAGE 115 — **VOLTAGE TABLE** — VOLUME CONTROL FULL ON

Type of Tube	Tube Circuit	Filament Voltage	Plate Voltage	Screen Grid Voltage	Bias Voltage
'24	1st Det.	2.4	245	90	6.7
'27	Osc.	2.4	90		0
'51	I. F.	2.4	245	90	3
'24	2nd Det.	2.4	100	20	3
P. Z. or '47	Output	2.4	220	245	15*
'80	Rect.	4.8			

* This reading obtained between ground and yellow speaker lead. Direct reading from grid to ground or reading taken with a set tester will show low voltage because of high resistance in grid circuit.

FRONT OF SET



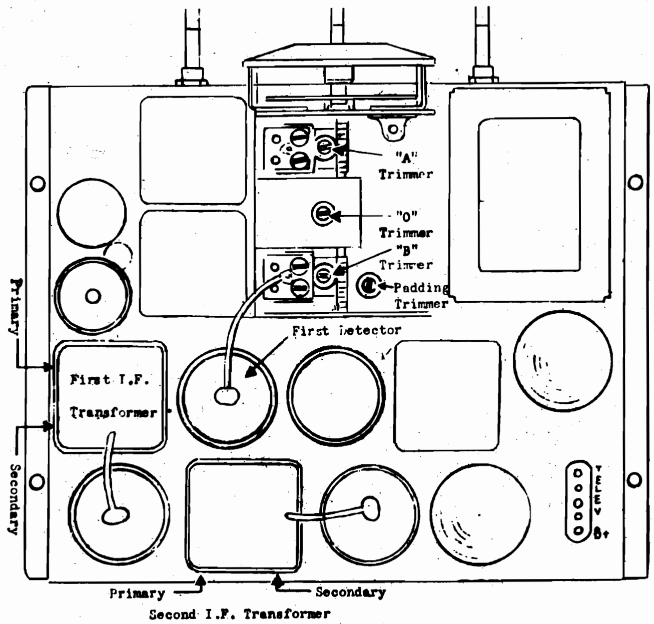
TUBE LOCATIONS

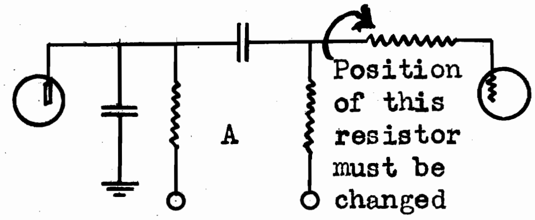
INTERMEDIATE FREQUENCY TRANSFORMERS TUNED TO 177.5 K. C.

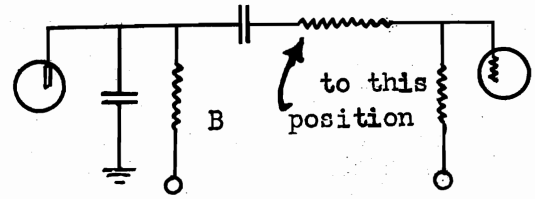
See notes on page 588-H and 588-I
Voltage data accurate at sockets

Models 102A, B & E.

STEWART-WARNER CORP.





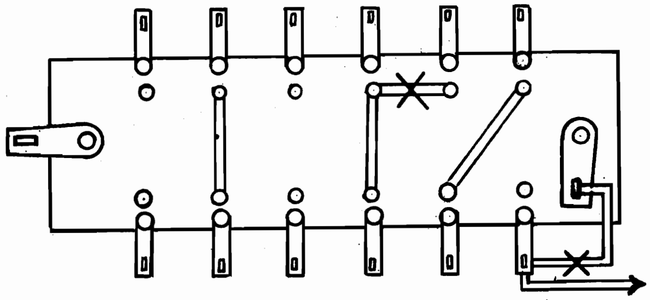


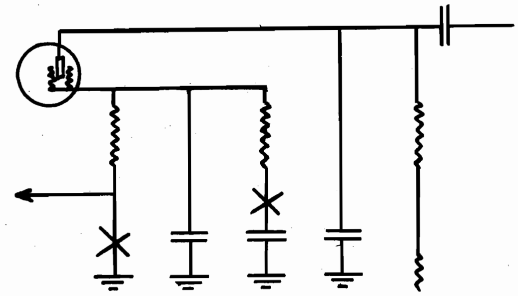
PENTODE SERVICE NOTES FOR MODELS R101-R102 series.

Pentode tubes in which the steady grid current is somewhat higher than average overload readily in the type of circuit used in the R101 and R102 series. Overloading of this type is evidenced in several ways;- by a distinct buzz in the speaker, by a peculiar fluttering reception that develops after the tube warms up and by short tube life. Troubles of this sort can be permanently eliminated by reducing the value of the resistance inserted in the pentode control grid circuit. Figure A shows the normal connection of the pentode control grid circuit in the above receivers. Shift the 500,000 ohm resistor from the normal position shown in figure A to that shown in figure B, namely between the blocking condenser and the junction of the grid leak and the control grid terminal of the pentode tube.

VOLUME DIFFICULTY IN R 102A.

If the output volume is below normal and the alignment is perfect, check the 2nd detector screen grid voltage and circuit. If it is appreciably below 20 volts when measured with a high resistance voltmeter, the 2 meg detector screen grid resistor is probably open circuited. Instead of replacing with a new unit, make the following changes, which as a matter of fact are now incorporated in the production models. The change consists of cutting out the 2 meg resistor and feeding the screen grid through the 500,000 ohm resistor that was previously used as the bleeder unit in this circuit. This change requires nothing more than the cutting of two wires and the soldering of two connections. This change will raise the screen grid voltage to about 30 volts. The diagrams below show the resistor terminal strip and the screen and plate circuits of the 2nd detector indicating the points at which the wires are cut and the new lead inserted. Cut wires at point marked "X" and make changes shown.





STEWART - WARNER CORP.

ADDITIONAL SERVICE NOTES FOR MODELS R101 and R102 Series

The following applies to oscillation troubles in the R102 series of receivers when the volume control is in an intermediate position. Tighten down all coil shields, then carefully realign the tuned circuits. This applies if the regeneration although excessive is not violently so. If the trouble is very pronounced, the aforementioned operations may not be of complete aid. In such cases the 2000 ohm suppressor resistor in the grid circuit of the oscillator tube should be cut out and shifted to the cathode circuit where it acts both as a suppressor and as a bias resistor. This resistor is the small red unit with the black end, that connects direct from the grid of the '27 oscillator tube to the oscillator coil..After disconnecting the resistor, resolder the open leads. Then remove the short bare wire from the cathode of the oscillator to the grounded lug on the padding trimmer condenser and connect the resistor between these two points.

Parasitic oscillation of the oscillator tube, evidenced by a continuous whistle, particularly upon the high frequency end of the dial is eliminated by the aforementioned change.

The phasing tool required to adjust the trimmers is part # T 70583 and is available at a cost of $.25. To align the tuned circuits it is necessary to remove the chassis. Remove the control knobs and the four hex head screws which hold the chassis in place. The speaker can be left in the cabinet since the leads are of sufficient length. The various trimmers are shown upon the chassis layout illustrated upon page 588-H. The IF transformers are of the tuned primary and tuned secondary type, each tuned by a separate trimmer. The IF trimmer adjusting screws can be reached thru small holes at the base of each shield, the primary in each case being at the left and the secondary at the right. If a commercial output meter is used it can be plugged into the television terminals, but a series condenser must be in one of the output meter leads. The test signal is fed into the 1st detector tube, the "A" lead of the oscillator being connected to the control grid, after the regular control lead has been removed. The IF peak frequency is 177.5 KC.

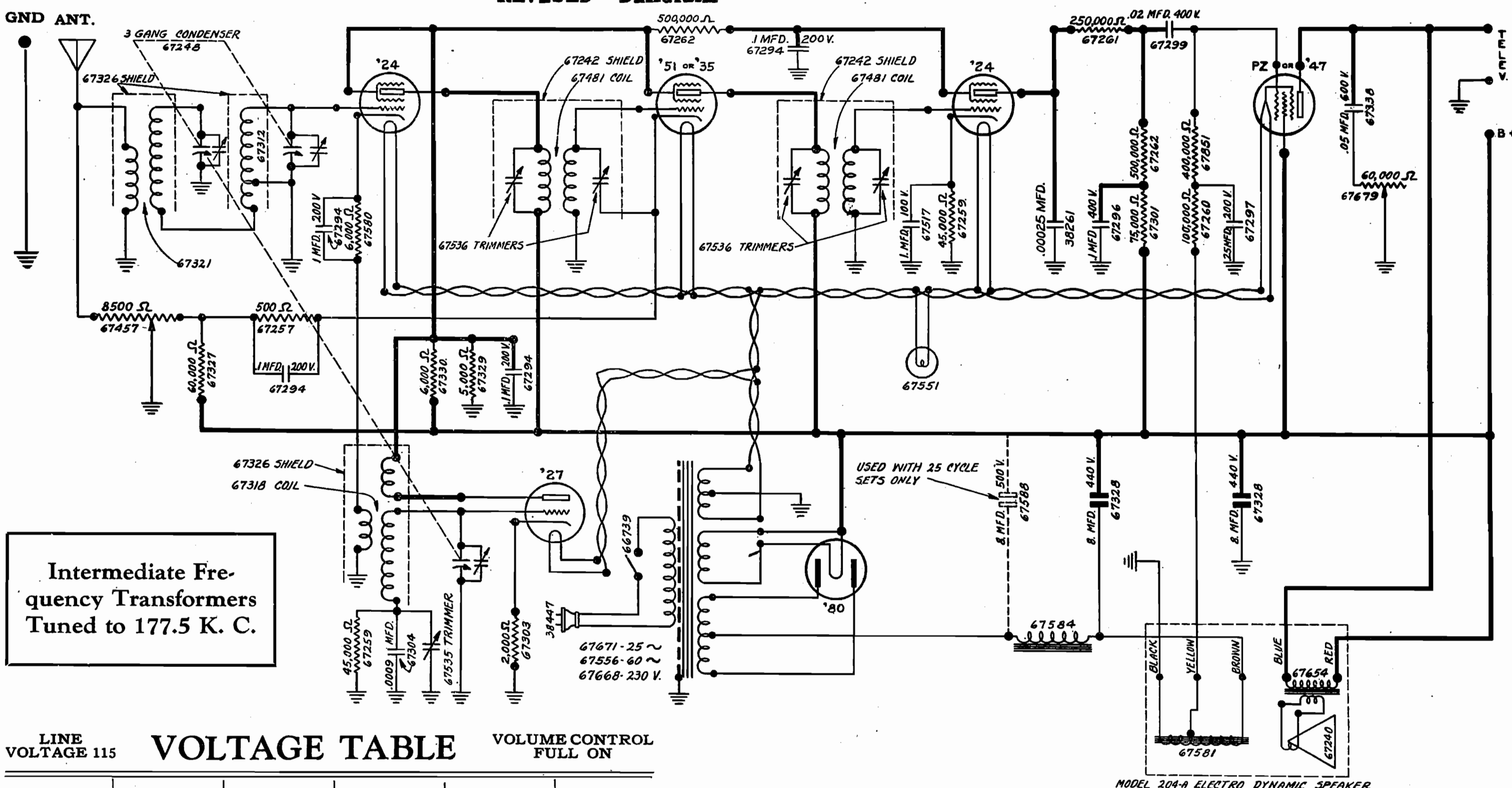
The RF and oscillator circuits require that the signal be fed to the receiver through the regular aerial and ground posts. Replace the control grid lead to the 1st detector. Ground the set and oscillator. Adjust the oscillator to 1400 KC. Tune the receiver to maximum output. Then reduce oscillator output until output meter reads half scale. Then tune "A" trimmer for maximum meter indication. If the output eter goes beyond full scale, REDUCE THE OSCILLATOR OUTPUT AND DO NOT CHANGE THE RECEIVER VOLUME CONTROL. Then adjust "B" and "O" trimmers for maximum output. The "O" trimmer adjustment is very critical. Then shift test oscillator frequency to 600 KC and tune receiver for maximum output. Then adjust receiver oscillator padding condenser for maximum output, RETUNING the set after each change in adjustment. Then increase test oscillator frequency to 1400 KC and carefully tune the set to this frequency. Then carefully adjust the "A", "B" and "O" trimmers for maximum output.

The following should be of interest in connection with the Models 203 and 204 speakers used in the present line of receivers. A high temperature developed by the field coil is not a sign of a defect. This is true even if the housing becomes too hot to touch, providing of course that the speaker is functioning in normal manner. This design is deliberate and proper porvision has been made to safeguard against injury of the windings.

STEWART - WARNER CORP.

Circuit Data of Stewart-Warner Models R-102-A, B & E.*

REVISED DIAGRAM



Intermediate Frequency Transformers Tuned to 177.5 K. C.

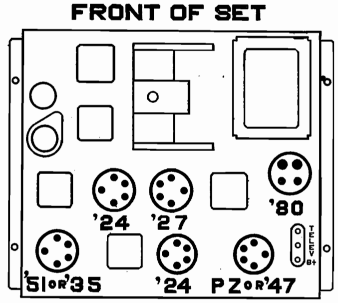
LINE VOLTAGE 115 — **VOLTAGE TABLE** — VOLUME CONTROL FULL ON

Type of Tube	Tube Circuit	Filament Voltage	Plate Voltage	Screen Grid Voltage	Bias Voltage
'24	1st Det.	2.45	250	95	6.5
'27	Osc.	2.45	95		9
'51	I. F.	2.40	250	95	3
'24	2nd Det.	2.45	70	30	7
P. Z. or '47	Output	2.45	230	250	15 ‡
'80	Rect.	4.8	170		

All D. C. voltages measured with respect to ground, using high resistance voltmeter of 1000 ohms per volt. Readings will vary, depending upon voltage range of meter, being higher for higher range instruments. This variation is most marked for second detector screen grid and plate voltages.

‡ This reading obtained between ground and yellow speaker lead. Direct reading from grid to ground or reading taken with a set tester will show about 3 volts because of high resistance in grid circuit.

FRONT OF SET



TUBE LOCATIONS

*This data sheet applies to the following serial numbers only:

Model 102-A, 34,000 upwards
Model 102-B, 10,500 upwards
Model 102-E, 10,200 upwards

See Form 5535 for lower serial numbers

Form 5551—Printed in U. S. A.

STEWART - WARNER CORP.

RADIO SERVICE NOTES (R-101 & 102)

REPLACING POWER TRANSFORMERS

When replacing power transformers in Model 101 or 102 Radio Receivers, the following precautions must be observed, or the transformer is almost certain to hum badly.

After mounting the transformer but prior to clamping it tightly in place, paint the edges of the steel core of the transformer with a liberal quantity of shellac or medium thick clear lacquer to act as a binder and prevent the individual laminations from rattling. Allow the shellac to dry for several minutes and then using a heavy screw driver, tighten down the bolts with as much force as you can exert. A light screw driver will not enable you to tighten the bolts sufficiently. Do not omit the lock-washers under the screw-heads. Do not turn on the set until the binder has had a chance to dry, otherwise hum may not be eliminated.

When servicing a radio receiver in which the transformer hums, remove the two bolts holding it in position, thus loosening the transformer. It is not necessary to unsolder the leads. Drive in the fibre wedge which you will find on one side of the center leg of the core between the core and coil. This tightens the center portion of the core and prevents it from vibrating. Now paint the transformer core liberally with shellac, insulating varnish, or medium thick clear lacquer, and replace as directed above.

For humming filament transformers in Model 301 receivers, remove the two screws holding the transformer to the set and pry off the U shaped metal clamp from about the steel core, taking care that you do not bend it out of shape. Paint the edges, with particular attention to the top I section, with a liberal quantity of shellac or lacquer as in the case of power transformers and replace the U shaped clamp. If necessary, bend in the side flaps of the clamp so that they press the individual laminations together more firmly.

REPAIRING SHORT WAVE CONVERTERS HAVING POOR VOLUME

Occasionally a short wave converter may be found which is very insensitive even though all circuits check perfectly and the tubes are in good condition.

Converters of this type may frequently be made to operate satisfactorily by RESOLDERING EVERY SOLDERED CONNECTION IN THE CONVERTER, even though these connections may appear to be entirely satisfactory.

A poorly soldered connection may have sufficiently high resistance to materially affect performance on short waves, yet not high enough to show up on a simple continuity test.

STEWART - WARNER CORP.

Stewart-Warner Short Wave Converter R301-A, B, and E

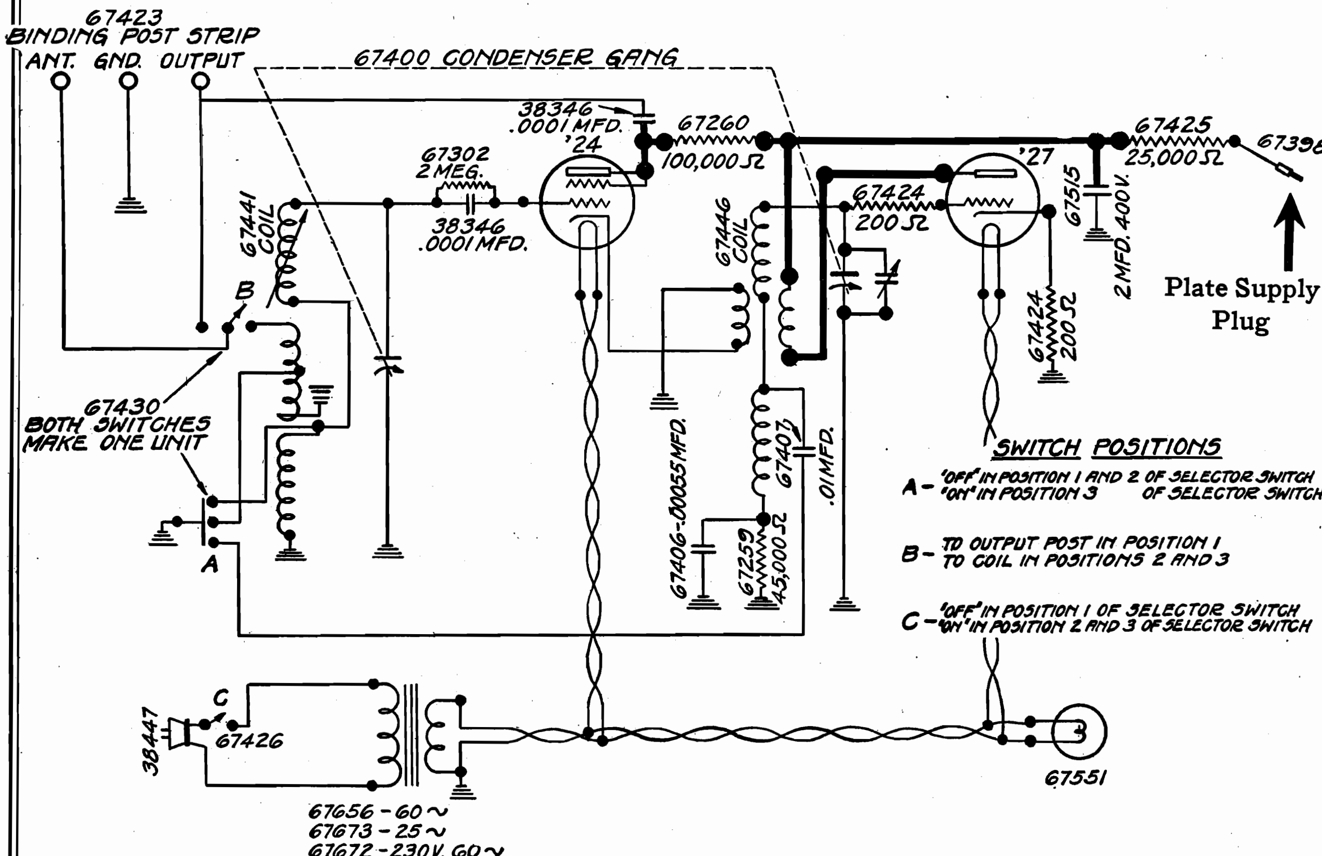


Plate supply plug (#67398) must be connected to some source of filtered D.C. at a potential of 180 to 280 volts. **Recommended voltage is 250.** The Ground Post of the converter is the negative return and must be connected to the negative side of the external plate supply. The table below gives plate voltages at both tubes for three different plate supply voltages.

Plate Supply Voltage	'24 Plate	'27 Plate
180	26	70
250	34	93
280	37	102

NOTES ON SHORT WAVE CONVERTER

When connecting the Stewart Warner 301 A short wave converter to any receiver other than the 102-A, the following points must be borne in mind.

The plate supply plug must connect to a source of filtered DC inside the radio receiver that will deliver approximately 6 milliamperes at 180 to 280 volts although the recommended plate voltage is 250 volts. If it drops below 180 volts the '27 oscillator tube may not oscillate at the higher frequencies. If it rises above 280 volts parasitic oscillations may be produced.

In this broadcast receivers in which the speaker field is in the positive side of the plate supply, a connection to the high voltage side of the speaker

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field will usually prpvide a satisfactory source of plate potential.

Where the speaker field and filter choke are in the negative side of the plate power supply, the correct positive potential for the short wave converter can frequently be taken off conveniently at the filament terminal of the 280 rectifier tube socket.

When tapping into the plate supply of any broadcast set, make certain that no resistors are being overloaded by the added drain of the converter. It is always safest to tap as close to the output of the filter as possible. Should this give excessively high voltage, it may be cut down to the correct value by means of a separate series resistor, capable of carrying 6 milliamperes safely. The value of this external resistor will be roughly 175 ohms for every volt in excess of 250. For example, if the B supply voltage is 350, a resistor of 17,500 ohms will be required to reduce it to 250 volts, which is the recommended value.

As a check on the correct voltage, the plate voltages at the tube sockets of the converter may be measured. The '27 tube plate should be kept about 90 volts when in normal operating condition. It should never drop below 70 volts or rise about 105 volts. The attached circuit data sheet gives plate voltage as measured with a high resistance voltmeter, of both tubes at input voltages of 180, 250 and 280.

The negative return of the Converter B supply is made thru its ground binding post to the broadcast receiver ground which, in a great majority of A.C. receivers, is at B negative potential. However, there are some sets on the market in which the negative B supply does not connect to the chassis. When the Model 301-A converter is to be used with sets of this type, the ground binding post of the converter must not be connected to ground but to the negative of the B supply system at a point inside the broadcast set. The broadcast set should be grounded in the usual way.

The plate supply lead of the converter should never go direct to a plate terminal of the broadcast set, since this may result in detuning and objectionable regeneration in the broadcast receiver.

The following advice should also be of interest:

"Don't tune above 33 meters for distant stations in daylight.

"Don't tune below 25 meters for distant stations after dark.

"Don't expect to hear many distant stations above 50 meters.

"Don't skim over the dials. Tune slowly.

"Don't expect to find stations on all parts of the dials. Short wave stations are widely separated except in a very few places.

"Don't expect stations to tune broadly. Most distant stations tune very sharply.

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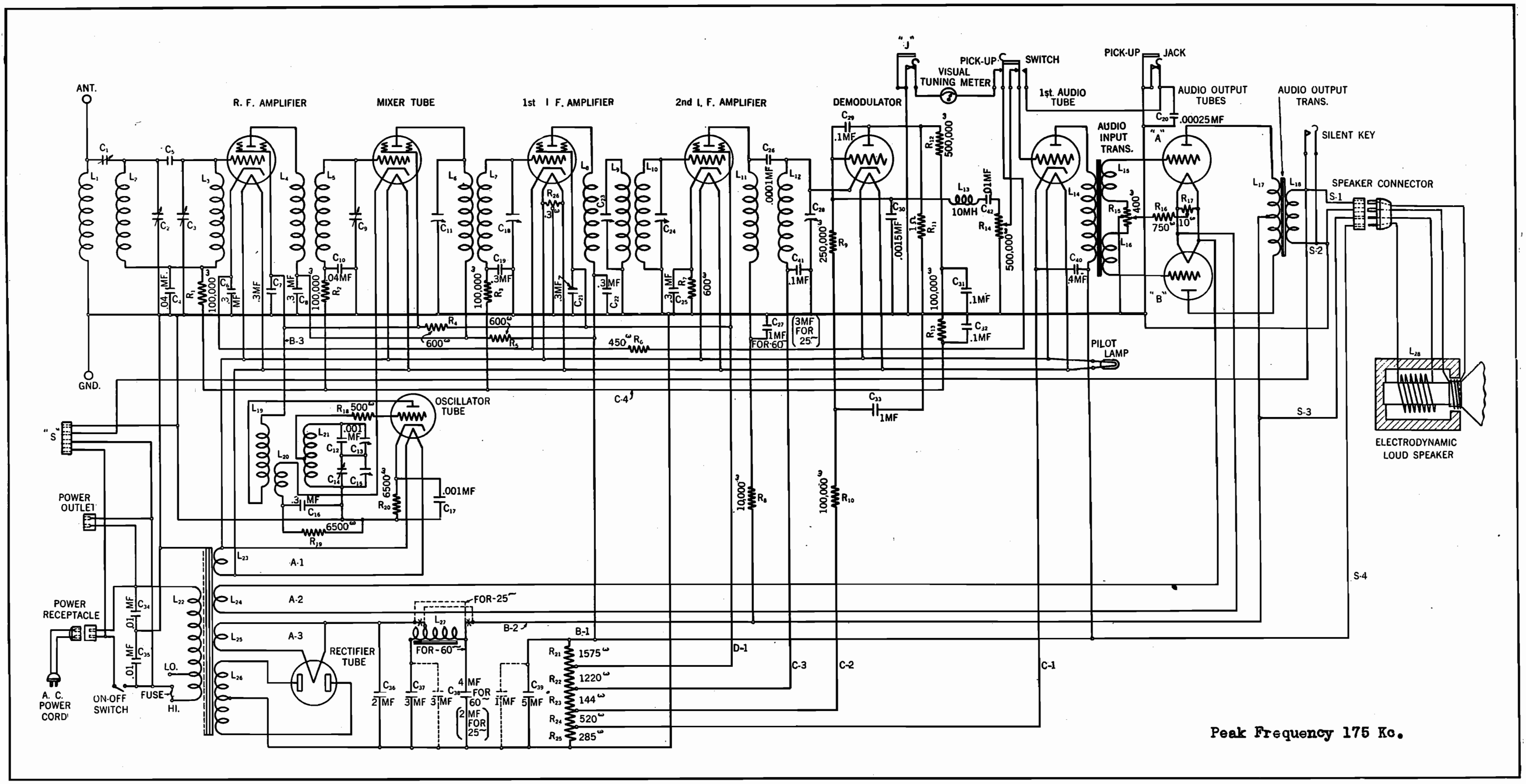
Schematic Circuit of No. 22 Superheterodyne

(MODEL 22-A RECEIVER)



Chassis wiring diagram upon Page 614-F. Parts list and voltage table upon Page 614-H. Chassis layout upon Page 614-G. The 1st and 2nd IF transformers have two tuning adjustments. The 3rd, has but one tuning adjustment. Three windings are used in the 2nd IF transformer. The tuning condensers are accessible through holes through the top of the IF transformer containers.

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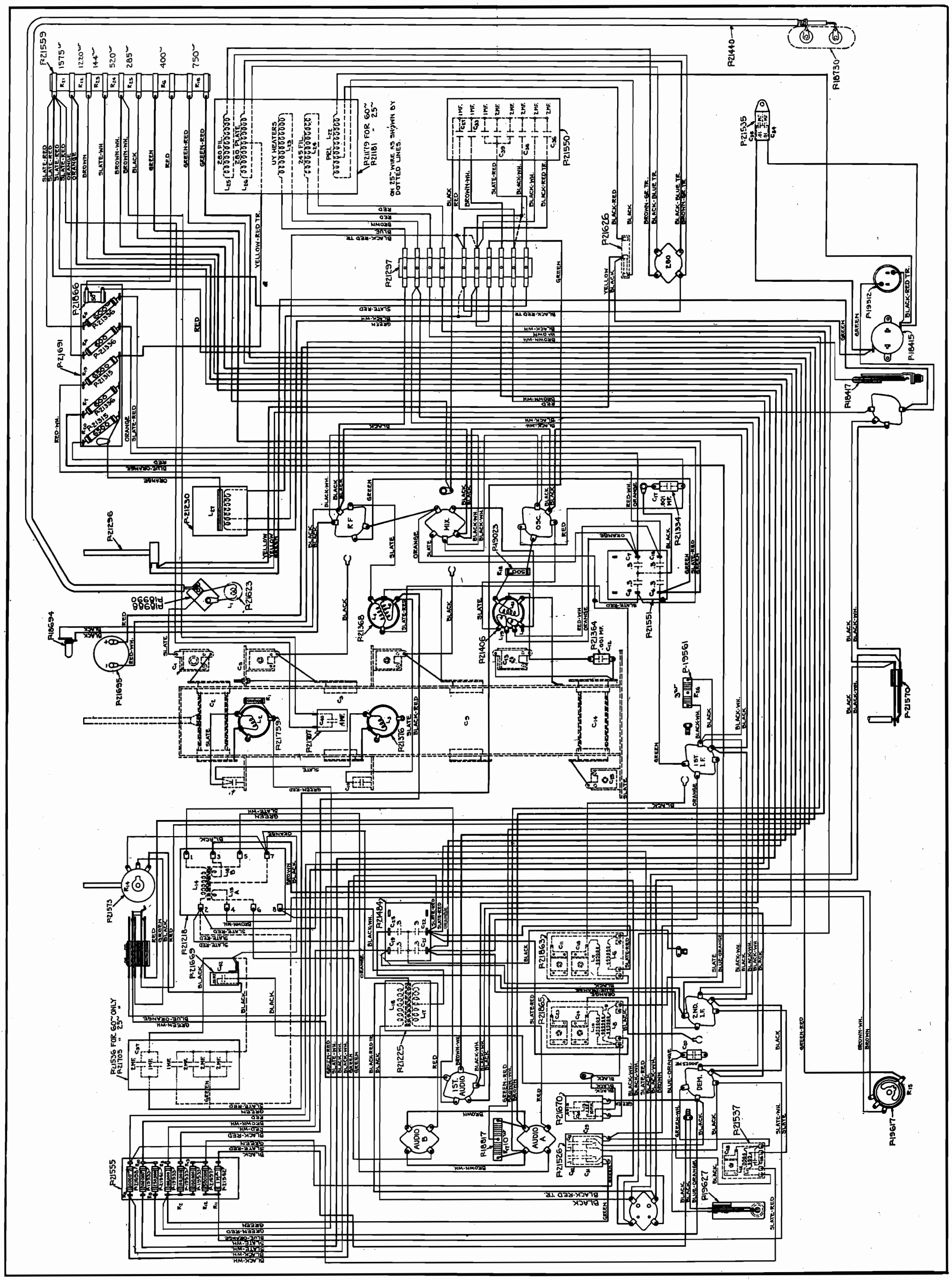

Wiring Diagram of Chassis for No. 22 Superheterodyne Receiver

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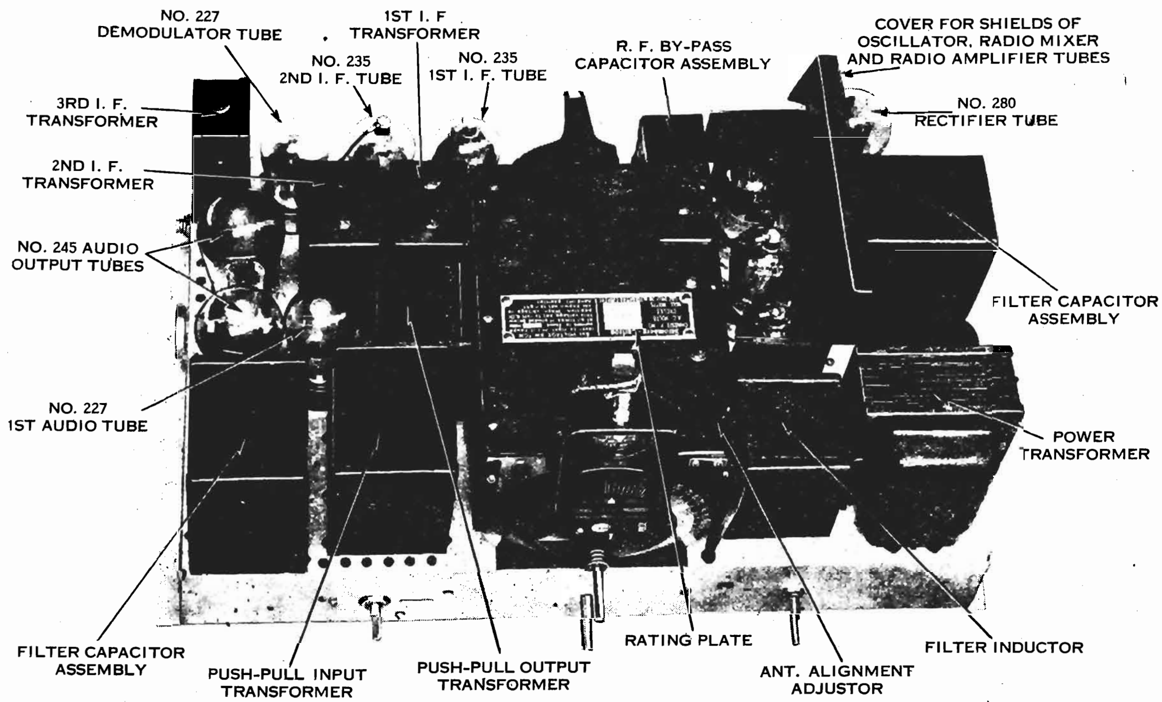
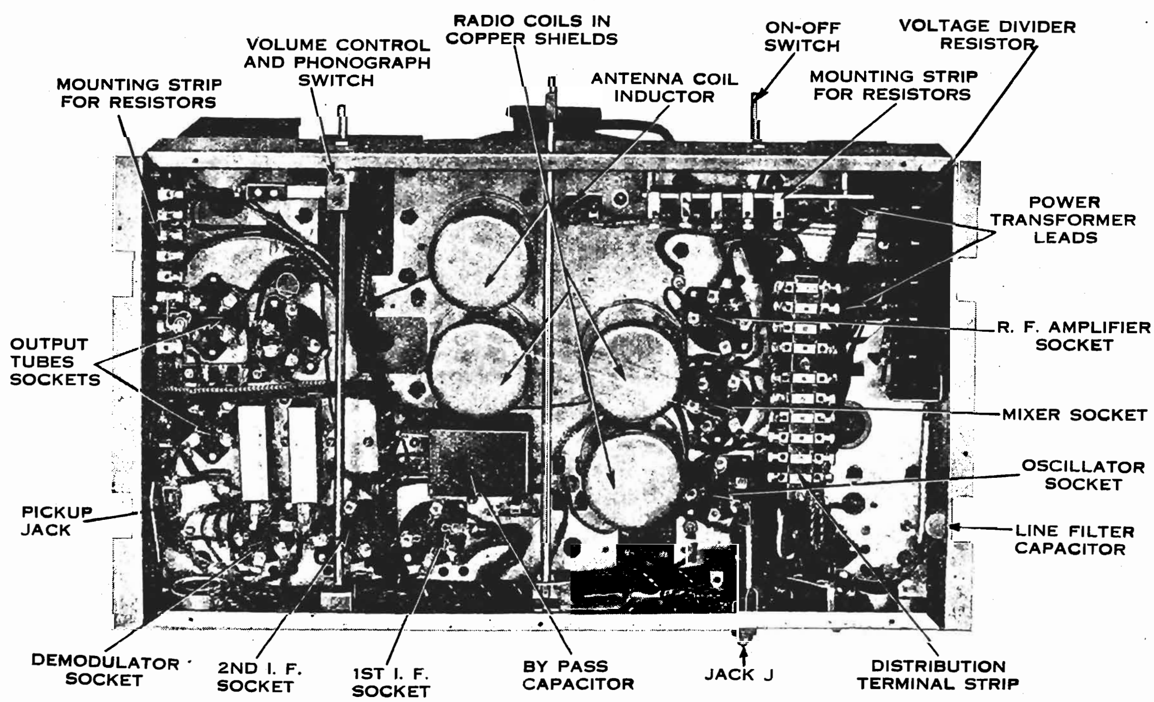


Top View of Chassis with Tube Shields Removed.



Bottom View of Chassis (Bottom Shield Removed).

The hum adjuster is located at the rear of the chassis under the third IF transformer. The fuse box is to the front of the rectifier tube socket looking at the chassis from the front. The two outlets near the rectifier tube socket are the power input and power output. The pickup jack is to the rear of the audio output tubes, next to the speaker connector recepticle.

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No. 22 Radio Receiver.

TUBE	APPROX. VOLTS
Plate Voltage RF	135-155
Plate Voltage 1st Det.	135-155
Plate Voltage Osc.	75-90
Plate Voltage 1st I.F.	135-155
Plate Voltage 2nd I.F.	220-245
Plate Voltage 2nd Det.	Note A
Plate Voltage 1st AF	135-155
Plate Voltage AF Output	230-260
"C" Voltage RF	4.0
"C" Voltage 1st Det.	9.4
"C" Voltage 1st IF	4.1
"C" Voltage 2nd IF	2.8
Grid Voltage Osc.	18.5-21.0
Grid Voltage 2nd Osc.	35-40
Grid Voltage 1st AF	11.6
Grid Voltages AF	45-55*
Screen Voltage RF	75-90*
Screen Voltage 1st Det	75-90*
Screen Voltage IF Tubes	75-90*
B Voltage RF 1st Det	135-155*
B Voltage 1st IF	135-155*
B Voltage 2nd IF	225-250*
B Voltage 1st AF	135-155
B Voltage Output (AF)	285-330
C Voltage 1st AF	11.5
C Voltage AF Output	45-55
Speaker Field Voltage	135-155
AC Plate Voltage per Anode	325-355
Heater Voltage '27-35	2.4
Filament Voltage '45	2.4
Filament Voltage '80	4.8

*These voltages vary with Dial setting and position of Volume Control.

NOTE "A" No voltage can be obtained across these terminals. The plate is grounded to the Chassis through 1 Megohm R 11.

CONDENSERS	
C2	400. mmf max
C3	400. mmf max
C4	.04 mf
C5	Approx. 1 mmf
C6	.3 mf
C7	.3 mf
C8	.3 mf
C9	400. mmf max.
C10	.04 mf
C12	.001 mf
C14	400. mmf max.
C16	.3 mf
C17	.001 mf
C19	.3 mf
C20	250. mmf
C21	.3 mf
C22	.3 mf
C25	.3 mf
C25	.3 mf
C26	100. mmf
C27	1. mf (3 mf for 25 cyc)
C29	.1 mf
C30	.0015 mf
C31	.1 mf
C32	.1 mf
C33	1. mf
C34	.01 mf
C35	.01 mf
C36	2. mf
C37	3. mf (6 mf for 25 cyc)
C38	4. mf (2 mf for 25 cyc)
C39	5. mf (6 mf for 25 cyc)
C40	.4 mf
C41	.1 mf
C42	.01 mf

RESISTANCES

No.	Value	Body
R1	100,000	Brown Black Yellow
R2	100,000	Brown Black Yellow
R3	100,000	Brown Black Yellow
R4	600	Blue Black Brown
R5	600	Blue Black Brown
R6	450	(Wire Wound)
R7	600	Blue Black Brown
R8	10,000	Brown Black Orange
R9	250,000	Red Green Yellow
R10	100,000	Brown Black Yellow
R11	1 meg	Brown Black Green
R12	500,000	Green Black Yellow
R13	100,000	Brown Black Yellow
R14	500,000	
R15	400	(Wire Wound)
R16	750	(Wire Wound)
R17	10	(Wire Wound)
R18	500	Green Black Brown
R19	6,500	Blue Green Red
R20	6,500	Blue Green Red
R21	1,575	(Wire Wound)
R22	1,220	(Wire Wound)
R23	144	(Wire Wound)
R24	520	(Wire Wound)
R25	285	(Wire Wound)
R26	3	(Wire Wound)

INDUCTANCES

L1	.9	millihenry
L2	215.	microhenry
L3	215.	microhenry
L4	5.5	millihenry
L5	215.	microhenry
L6	5.5	millihenry
L7	5.5	millihenry
L8	5.5	millihenry
L9	5.5	millihenry
L10	5.5	millihenry
L11	40.	millihenry
L12	5.5	millihenry
L13	10.	millihenry
L19	15.	microhenry
L20	5.5	microhenry
L21	172.	microhenry

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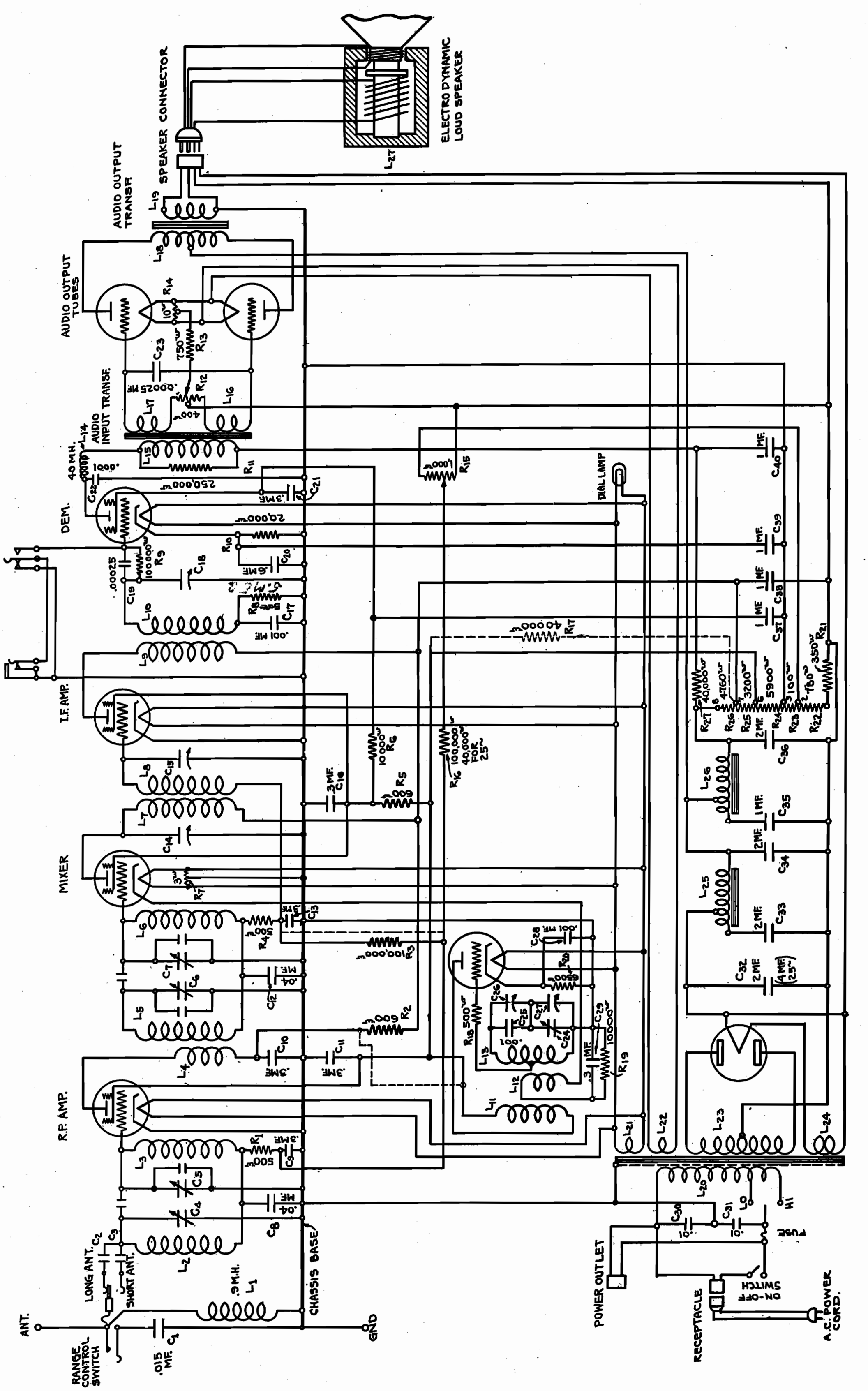
Schematic Circuit of Nos. 25 and 26 Superheterodyne Receivers

PEAK FREQUENCY 175 KC



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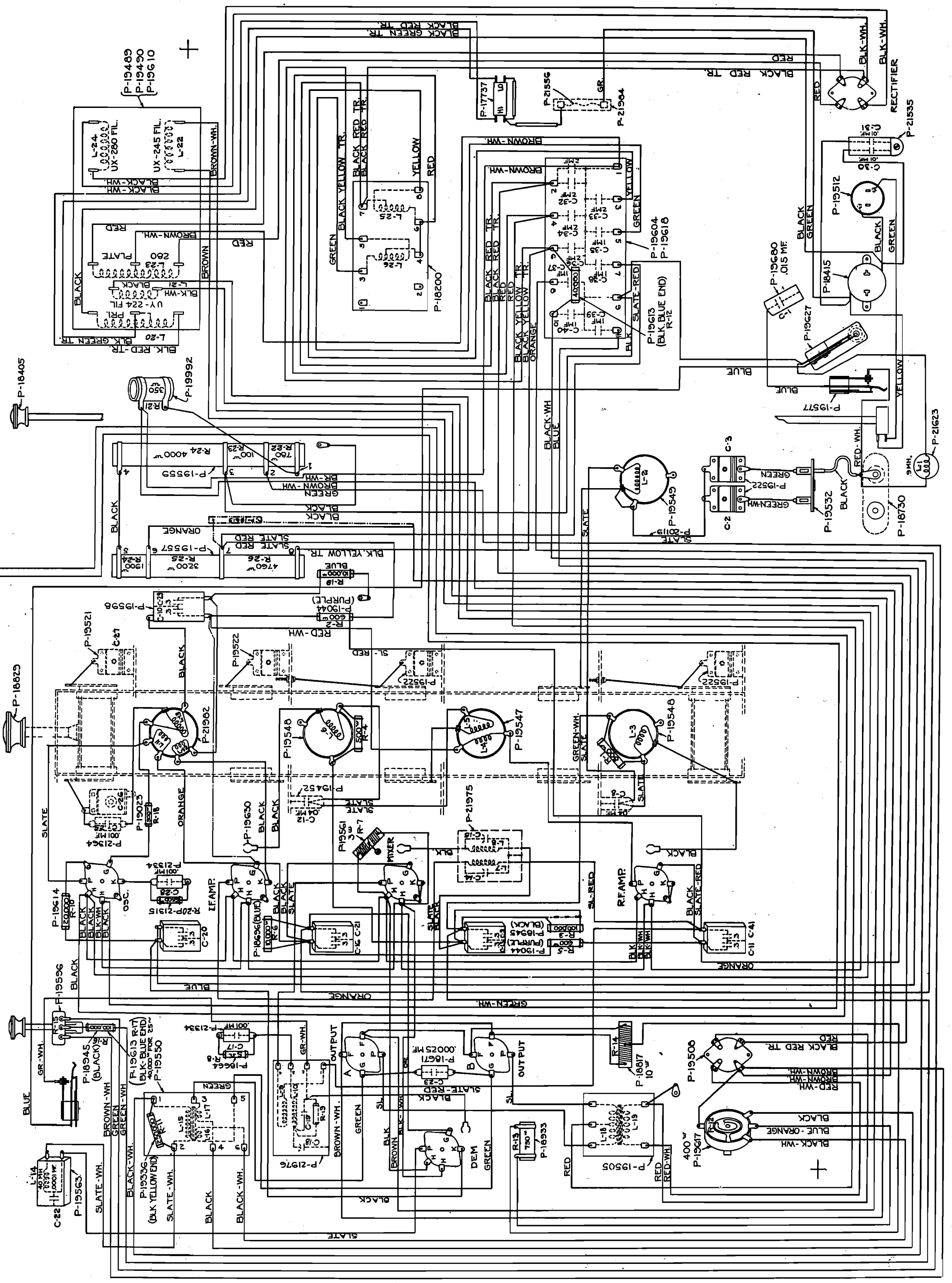

NOTE-A (REVISE PER——— LINES AND CHANGE RESISTOR VALUES FOR 25-40~ REC.)

Wiring Diagram of Chassis for Nos. 25 and 26 Superheterodyne Receivers

II. COMPONENT IDENTIFICATION TABLES

TABLE 1. INDUCTOR IDENTIFICATION

Designation	Function	Value
L_1	Antenna Inductor	.9 Millihenry
L_2	First Coil Preselector Bi-resonator	195 Microhenrys
L_3	Second Coil Preselector Bi-resonator	195 Microhenrys
L_4	Primary of Radio Transformer	
L_5	First Coil of Second Bi-resonator	195 Microhenrys
L_6	Second Coil of Second Bi-resonator	195 Microhenrys
L_7	Primary of First I. F. Transformer	10 Millihenrys
L_8	Secondary of First I. F. Transformer	10 Millihenrys
L_9	Primary of Second I. F. Transformer	10 Millihenrys
L_{10}	Secondary of Second I. F. Transformer	10 Millihenrys
L_{11}	Plate Inductor of Oscillator	15 Microhenrys
L_{12}	Cathode Coupling Inductor of Mixer Tube	5.5 Microhenrys
L_{13}	Grid Inductor of Oscillator	158 Microhenrys
L_{14}	Demodulator Plate Radio Frequency Choke	40 Millihenrys
L_{15}	Primary of Push-Pull Input Transformer	
L_{16}	Secondary of Push-Pull Input Transformer	
L_{17}	Secondary of Push-Pull Input Transformer	
L_{18}	Primary of Push-Pull Output Transformer	
L_{19}	Secondary of Push-Pull Output Transformer	
L_{20}	Primary of Power Transformer	
L_{21}	Secondary of Power Transformer for Heaters	
L_{22}	Secondary of Power Transformer for Output Tube Filaments	
L_{23}	Secondary of Power Transformer for Plates of Rectifier Tube	
L_{24}	Secondary of Power Transformer for Rectifier Filament	
L_{25}	First Ripple Filter Inductor	
L_{26}	Second Ripple Filter Inductor	
L_{27}	Speaker Field Winding	

TABLE II. RESISTOR IDENTIFICATION

Designation	Function	Value
R_1	Grid Bias Feeder of Radio Amplifier	500 Ohms
R_2	Filter Resistor Plate Circuit of Radio Amplifier	600 Ohms
R_3	Grid Bias Feeder for Mixer of I. F. Amplifier	100,000 Ohms
R_4	Grid Bias Feeder for Mixer Tube	500 Ohms
R_5	Filter Resistor for Screen Circuits of Mixer and I. F. Amplifier	600 Ohms
R_6	Filter Resistor for Demodulator Screen Circuit	10,000 Ohms
R_7	Mid-tap Resistor Heater Circuit (at Mixer Tube)	3 Ohms
R_8	Grid Bias Feeder for Demodulator	5 Megohms
R_9	Grid Bias Feeder for Demodulator	100,000 Ohms
R_{10}	Cathode Resistor of Demodulator Tube	20,000 Ohms

TABLE II. RESISTOR IDENTIFICATION—Continued

Designation	Function	Value
R_{11}	Shunt Resistor for Primary of Push-Pull Input Transformer	250,000 Ohms
R_{12}	Hum Balancer Potentiometer	400 Ohms
R_{13}	Grid Biasing Resistor at Power Output Tube	750 Ohms
R_{14}	Mid-Tap Resistor of Filament Circuit of Output Tube	10 Ohms
R_{15}	Volume Control Potentiometer	1,000 Ohms
R_{16}	Filter Resistor for Grid Bias Circuits	100,000 Ohms (40,000 Ohms 25 Cycles)
R_{17}	Filter Resistor of Screen Circuits, 25 Cycles Only	40,000 Ohms
R_{18}	Series Grid Resistor of Oscillator	500 Ohms
R_{19}	Cathode Resistor of Mixer Tube	10,000 Ohms
R_{20}	Cathode Resistor of Oscillator Tube	6,500 Ohms
R_{21}	Auxiliary Voltage Divider Resistor	350 Ohms
R_{22}	Section of Voltage Divider Resistor	780 Ohms
R_{23}	Section of Voltage Divider Resistor	100 Ohms
R_{24}	Section of Voltage Divider Resistor	5,900 Ohms
R_{25}	Section of Voltage Divider Resistor	3,200 Ohms
R_{26}	Section of Voltage Divider Resistor	4,760 Ohms
R_{27}	Filter Resistor of Demodulator Plate Circuit	40,000 Ohms

TABLE III. CAPACITOR IDENTIFICATION

Designation	Function	Value
C_1	Range Control Capacitor	.015 Mf.
C_2	"Long Antenna" Aligning Capacitor	
C_3	"Short Antenna" Aligning Capacitor	
C_4	Unit of Variable Gang Capacitor	400 Mmf. Max.
C_5	Unit of Variable Gang Capacitor	400 Mmf. Max.
C_6	Unit of Variable Gang Capacitor	400 Mmf. Max.
C_7	Unit of Variable Gang Capacitor	400 Mmf. Max.
C_8	First Bi-resonator Main Coupling Capacitor	.04 Mf.
C_9	Grid Circuit By-pass of Radio Amplifier	.3 Mf.
C_{10}	Plate Circuit By-pass of Radio Amplifier	.3 Mf.
C_{11}	Screen Circuit By-pass of Radio Amplifier	.3 Mf.
C_{12}	Second Bi-resonator Main Coupling Capacitor	.04 Mf.
C_{13}	Grid Circuit By-pass of Mixer and I. F. Amplifier	.3 Mf.
C_{14}	Aligning Capacitor for Primary of First I. F. Transformer	
C_{15}	Aligning Capacitor for Secondary of First I. F. Transformer	
C_{16}	Screen Circuits By-pass for Mixer and I. F. Amplifier	.3 Mf.
C_{17}	Grid Circuit By-pass of Demodulator	.001 Mf.
C_{18}	Aligning Capacitor for Secondary of Second I. F. Transformer	
C_{19}	"Grid Capacitor" of Demodulator	250 Mmf.
C_{20}	Cathode By-pass of Demodulator	.6 Mf.
C_{21}	Screen Circuit By-pass of Demodulator	.3 Mf.
C_{22}	Demodulator Plate Filter Capacitor	100 Mmf.

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NOS. 25 AND 26 RECEIVERS

TABLE III. CAPACITOR IDENTIFICATION—Continued

Designation	*Function*	*Value*
C_{23}	Capacitor across Grids of Push-Pull Output Tubes	250 Mmf.
C_{24}	Unit of Variable Gang Capacitor	400 Mmf. Max.
C_{25}	Series Capacitor for Oscillator Tuning Circuit	.001 Mf.
C_{26}	Aligning Capacitor for C_{23}	
C_{27}	Aligning Capacitor for C_{24}	
C_{28}	Cathode By-pass of Oscillator	.001 Mf.
C_{29}	Cathode By-pass of Mixer Tube	.3 Mf.
C_{30}	Power Line Filter Capacitor	.01 Mf.
C_{31}	Power Line Filter Capacitor	.01 Mf.
C_{32}	Ripple Filter Capacitor	2 Mf. (4 Mf. 25 Cycles)
C_{33}	Ripple Filter Capacitor	2 Mf.
C_{34}	Ripple Filter Capacitor	2 Mf.
C_{35}	Ripple Filter Capacitor	1 Mf.
C_{36}	Ripple Filter Capacitor	2 Mf.
C_{37}	Demodulator Screen Circuit Filter Capacitor	1 Mf.
C_{38}	R. F. Amplifier and Mixer Plate Circuit Filter Capacitor	1 Mf.
C_{39}	Cathode By-pass of Demodulator	1 Mf.
C_{40}	Demodulator Plate Circuit Filter Capacitor	1 Mf.

III. NORMAL VOLTAGE READINGS

Voltage	*Meter*	*Scale*	*Where Measured*	*Approx. Value in Volts*
Heater Voltages No. 224 and 227 Tubes	A. C.	0–4	Across Heater Terminals of Sockets	2.4
Heater Voltages No. 245 Tubes	A. C.	0–4	Across Heater Terminals of Audio Output Sockets	2.4
Heater Voltage No. 280 Tube	A. C.	0–8	Across Heater Terminals of Rectifier Socket	4.8
Plate Voltage R. F. Amplifier Tube	D. C.	0–250	Between Plate Terminal of R. F. Amplifier Socket (+) and Chassis Base (−)	135–150
Plate Voltage Mixer Tube	D. C.	0–250	Between Plate Terminal of Mixer Socket (+) and Chassis Base (−)	135–150
Plate Voltage I. F. Tube	D. C.	0–250	Between Plate Terminal of I. F. Socket (+) and Chassis Base (−)	135–150
Plate Voltage Oscillator Tube	D. C.	0–250	Between Plate Terminal of Oscillator Socket (+) and Chassis Base (−)	80–90
Plate Voltage Demodulator Tube	D. C.	0–250	Between Plate Terminal of Demodulator Socket (+) and Chassis Base (−)	190–215

NORMAL VOLTAGE READINGS—Continued

Voltage	*Meter*	*Scale*	*Where Measured*	*Approx. Value in Volts*
Plate Voltages Audio Output Tubes	D. C.	0–250	Between Plate Terminals of Audio Output Sockets (+) and Mid Tap 10 ohm Resistor (−)	225–255
Control Grid Voltage, R. F., Mixer and I. F. Tubes	D. C.	0–10	Between Center Terminal of 1000 ohm Volume Control Potentiometer (−) and Chassis Base (+)	2.5
Grid Voltage Oscillator Tube	D. C.	0–250	Between Cathode Terminal of Oscillator Socket (+) and Chassis Base (−)	13
Control Grid Voltage Demodulator Tube	D. C.	0–250 (See Note)	Between Cathode Terminal of Demodulator Socket (+) and Chassis Base (−)	7
Grid Voltage Audio Output Tubes	D. C.	0–250	Between Grid Terminals of Audio Output Sockets (−) and Mid Tap 10 ohm Resistor (+)	40–50
Screen Voltages R. F., Mixer, I. F. and Demodulator Tubes	D. C.	0–250	Between Screen Terminals of Tubes (+) and Chassis Base (−)	130–150
B Voltage R. F. Amplifier Tube	D. C.	0–250	Between Tube Side of 600 ohm Resistor (+) and Chassis Base (−)	135–150
B Voltages Mixer and I. F. Tubes	D. C.	0–250	Between Terminal No. 6 on Voltage Divider (+) and Chassis Base (−)	135–150
B Voltage Demodulator Tube	D. C.	0–250	Between Terminal No. 1 on Input Transformer (+) and Chassis Base (−)	200–230
B Voltage Audio Output Tubes	D. C.	0–250	Between Mid Tap on Audio Output Transformer (+) and Chassis Base (−)	250–290
C Voltage R. F., Mixer and I. F. Tubes	D. C.	0–10	Across 100 ohm Resistance on Voltage Divider	2.5
C Voltage Oscillator Tube	D. C.	0–250	Across 6,500 ohm Biasing Resistor	12
C Voltage Demodulator Tube	D. C.	0–250	Across 20,000 ohm Biasing Resistor	7
C Voltage Audio Output Tube	D. C.	0–250	Across 750 ohm Biasing Resistor	40–50
Total B Voltage	D. C.	0–500	Between Terminals No. 1 and No. 8 on Voltage Divider	260–300
Speaker Field Voltage	D. C.	0–500	Across Small Pins of Speaker Connector Socket	300–335
Plate Voltage A. C. Per Anode No. 280 Tube	A. C.		Between P Terminals of No. 280 Rectifier Socket and Negative Side of 350 ohm Resistor	320–350*

NOTE: Measurements to be taken on 0–250 Volt Scale to give accurate readings as this voltage is across only 20,000 ohms.

* Cannot be measured on Weston Model 528 Meter unless multiplier is used.

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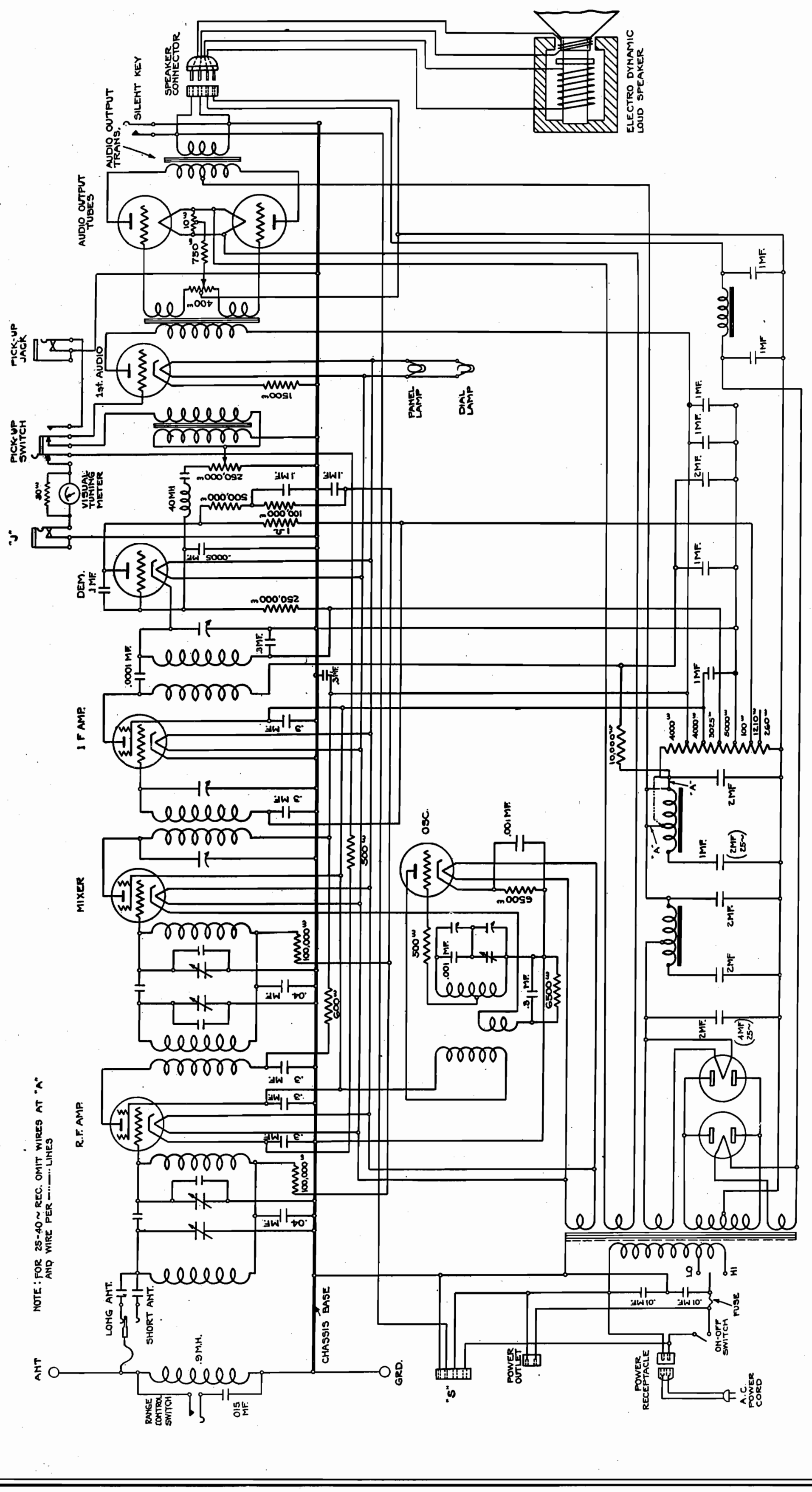
Schematic Circuit of No. 27 Superheterodyne Receiver

PEAK FREQUENCY 175 KC



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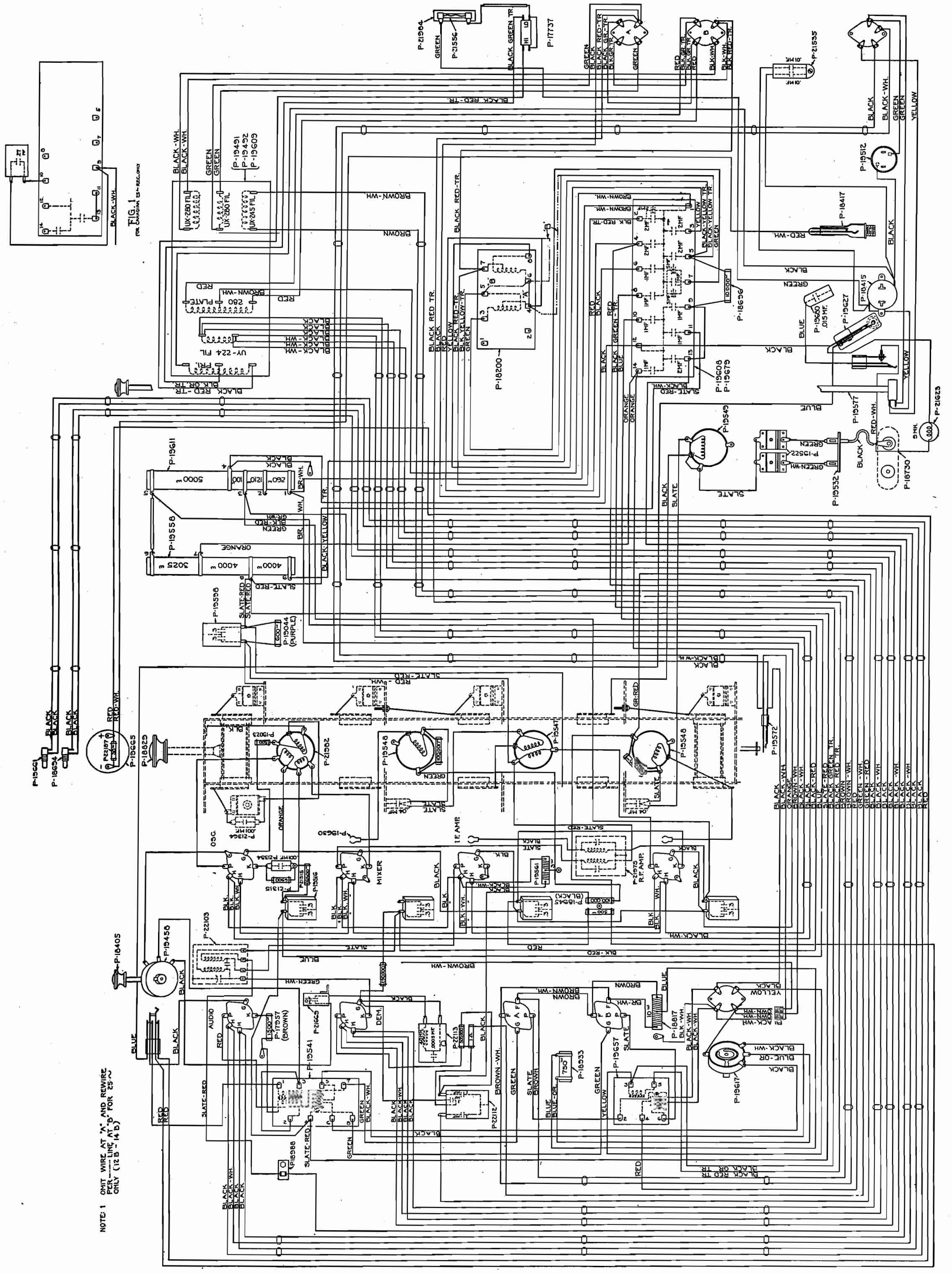

Wiring Diagram of Chassis for No. 27 Superheterodyne Receiver

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REPLACEMENT PARTS
NO. 27 RECEIVER

Piece Number	Name of Part	Description of Part	Required per Receiver	Price Each
P-18429	Knob, Station Selector	Large Moulded Knob	1	.50
P-18405	Knob, Volume Control, On-Off and Silent Key	Small Moulded Knob	3	.40
P-19665	Meter	Visual Tuning Meter	1	16.25
P-19735	Pick-up Head	Low Impedance Magnetic Pick-up	1	15.00
P-19656	Pin Plug Assembly	Antenna Pin Tip	1	.10
P-19532	Pin Jack	Antenna Pin Jacks	1	.25
List 3027	Plug	Pick-up Cord Plug	1	.60
P-19673	Potentiometer	Phonograph Volume Control	1	2.50
P-19617	Potentiometer	Hum Balancer	1	1.00
P-18415	Receptacle, Convenience Outlet	Power Supply Outlet — Rear of Chassis	1	.50
P-19512	Receptacle, Supply Cord	Input Power Supply Receptacle	1	.65
P-21562	Resistor, 1 Megohm	Carbon Type, Brown-Black-Green	1	.35
P-21697	Resistor, 500,000 ohms	Carbon Type, Green-Black-Yellow	1	.35
P-21561	Resistor, 250,000 ohms	Carbon Type, Red-Green-Yellow	1	.35
P-19533	Resistor, 100,000 ohms	Carbon Type, Brown-Black-Yellow	2	.35
P-18945	Resistor, 100,000 ohms	Carbon Type, Black	1	.35
P-18696	Resistor, 10,000 ohms	Carbon Type, Blue	1	.35
P-21315	Resistor, 6,500 ohms	Carbon Type, Blue-Green-Red	2	.35
P-17957	Resistor, 1,500 ohms	Carbon Type, Brown	1	.35
P-19044	Resistor, 600 ohms	Carbon Type, Purple	1	.35
P-19023	Resistor, 500 ohms	Carbon Type, Pink	2	.35
P-18817	Resistor, 10 ohms	Wire Wound (mid-tap)	1	.50
P-19561	Resistor, 3 ohms	Wire Wound (mid-tap)	1	.50
P-19558	Resistor, 11,025 ohms	Voltage Divider (Vitreous Enameled)	1	2.50
P-19611	Resistor, 6,570 ohms	Voltage Divider (Vitreous Enameled)	1	2.50
P-18933	Resistor, 750 ohms	Vitreous Enameled Type	1	1.00
P-19572	Silent Tuning Key	Silent Tuning Key Assembly	1	1.00
P-19508	Socket	UX Type (4 Prong)	5	.45
P-19507	Socket	UY Type (5 Prong)	7	.45
P-19410	Speaker	Complete Assembly—10″ Cone	1	Price on Request
P-17737	Switch	Hi-Lo Switch	1	1.00
P-19577	Switch	On-Off Switch on Local-Distance Switch Assembly	1	2.50
P-19491	Transformer, Power	60 Cycle, 110 Volt	1	20.00
P-19492	Transformer, Power	25-60 Cycle, 110 Volt	1	26.00
P-19609	Transformer, Power	25-60 Cycle, 220 Volt	1	28.00
P-18957	Transformer, Pick-up	Pick-up Input Transformer	1	15.00
P-19458	Volume Control Assembly	Volume Control and Phonograph Switch Assembly	1	3.00

Piece Number	Name of Part	Description of Part	Required per Receiver	Price Each
P-19541	Audio Transformer Assembly	First Audio and Push-Pull Input Transformer	1	$17.50
P-19657	Audio Output Transformer	Push-Pull Output Transformer	1	9.50
P-18730	Binding Post Assembly	Antenna and Ground Binding Post	1	.60
P-19504	Bracket Assembly	Carbon Resistor Mounting	4	.05
P-18964	Bracket Assembly	Pilot Lamp Socket Mounting	1	.50
P-18691	Bracket Assembly	Voltage Divider Mounting	2	.20
P-18937	Cap	Aligning Capacitor Covers	8	.03
P-19522	Capacitor, Aligning	Aligning Capacitor for Bi-Resonator Circuits	3	.50
P-19521	Capacitor, Aligning	Detector Stage Aligning Capacitor	1	.50
P-19520	Capacitor, Aligning	Antenna Aligning Capacitor	2	.50
P-21964	Capacitor, Aligning	Oscillator Series Tuning Capacitor	1	.50
P-19516	Capacitor Assembly	Radio Bi-Pass Capacitors—Two .3 MF Units	4	1.25
P-19598	Capacitor Assembly	Radio Bi-Pass Capacitors—Two .3 MF Units	1	1.25
P-22112	Capacitor Assembly	Radio Bi-Pass Capacitors—Three .1 MF Units	1	1.00
P-19608	Capacitor Assembly	Filter Capacitor Block—60 Cycle	1	19.25
P-19679	Capacitor Assembly	Filter Capacitor Block—25 Cycle	1	22.50
P-19452	Capacitor	Bi-Resonator Coupling Capacitor —.04 MF	1	1.50
P-19680	Capacitor	Range Control Capacitor—.015 MF	1	1.50
P-21334	Capacitor	Fixed Capacitor—.001 MF	1	55
P-21535	Capacitor	Line Filter Across A. C. Input	1	.75
P-21364	Capacitor	Series Tuning Oscillator Tuning	1	.55
P-19549	Coil Assembly R. F.	First Coil of First Bi-Resonator	1	1.25
P-19548	Coil Assembly R. F.	Second Coil of First and Second Bi-Resonators	2	.75
P-19547	Coil Assembly R. F.	First Coil of Second Bi-Resonator	1	1.50
P-21982	Coil Assembly, Oscillator	Oscillator Tuning Inductor	1	4.00
P-21975	Coil and Capacitor Assembly	First I. F. Transformer	1	3.50
P-22103	Coil and Capacitor Assembly	Second I. F. Transformer	1	3.00
P-18746	Cone and Moving Coil Assembly	Moving Element of P-19410 Dynamic Speaker	1	4.00
P-19502	Cord	Power Supply Cord to Chassis	1	1.50
P-19415	Cord	Speaker Connector Cord	1	1.25
P-19629	Dial	Station Selector Dial	1	2.00
P-19486	Drive Assembly	Driving Unit for Gang Tuning Capacitor Assembly	1	1.00
P-18701	Escutcheon Assembly	Selector Dial Escutcheon	1	.65
P-22113	Filter Assembly	Demodulator Plate Filter	1	1.75
P-19627	Frame and Spring Assembly	Pick-up Jack	1	.75
P-19630	Grid Clip	Control Grid Clips for Tetrodes	3	.10
P-18200	Inductor Assembly	Filter Inductor Assembly—Double "B" Choke	1	10.00
P-18417	Jack	Remote Control Jack	1	1.00

MODEL 27

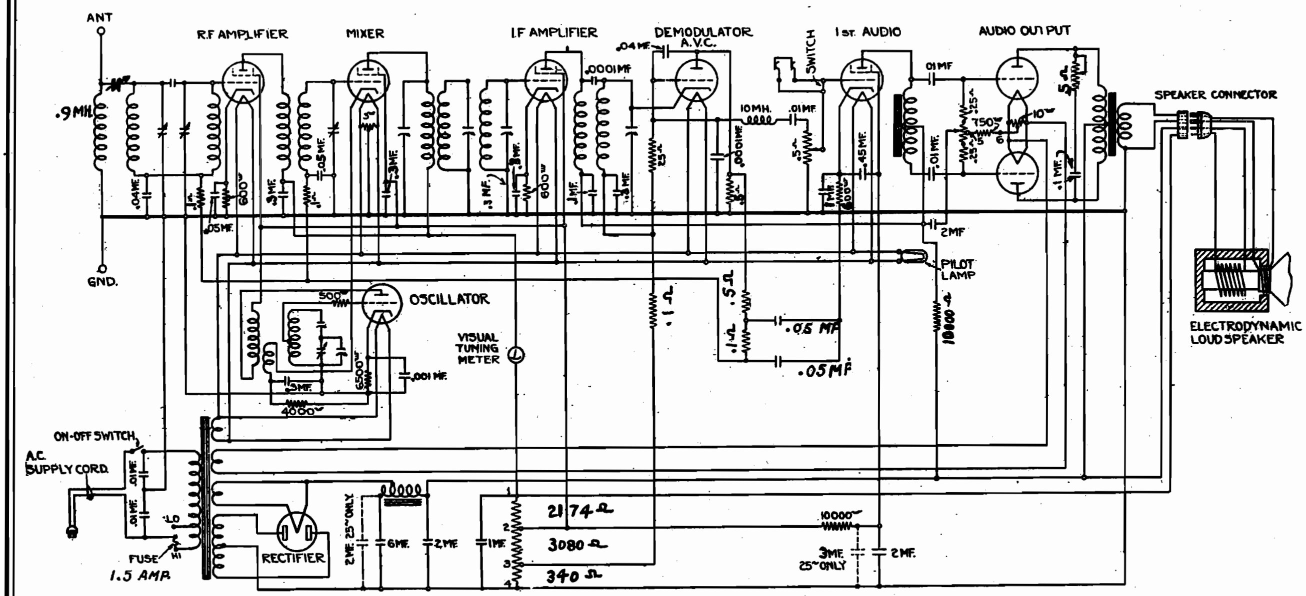
NORMAL VOLTAGE READINGS

Voltage	Meter	Scale	Where Measured	Approx. Value in Volts
Heater Voltages No. 224 and 227 Tubes	A. C.	0–4	Across Heater Terminals of 224 and 227 Tube Sockets	2.4
Filament Voltages No. 245 Tubes	A. C.	0–4	Across Filament Terminals of Audio Output Sockets	2.4
Filament Voltages No. 280 Tubes	A. C.	0–8	Across Filament Terminals of Rectifier Tube Sockets	4.8
Plate Voltage R. F. Tube	D. C.	0–250	Between Plate Terminal of R. F. Amplifier Socket (+) and Chassis Base (—)	140–165
Plate Voltage Mixer Tube	D. C.	0–250	Between Plate Terminal of Mixer Socket (+) and Chassis Base (—)	140–165
Plate Voltage Oscillator Tube	D. C.	0–250	Between Plate Terminal of Oscillator Socket (+) and Chassis Base (—)	75–90
Plate Voltage I. F. Tube	D. C.	0–250	Between Plate Terminal of I. F. Socket (+) and Chassis Base (—)	210–230
Plate Voltage Demodulator Tube	D. C.	0–250	Between Plate Terminal of Demodulator Socket (+) and Chassis Base (—)	See Note A
Plate Voltage 1st A. F. Tube	D. C.	0–250	Between Plate Terminal of 1st A. F. Socket (+) and Chassis Base (—)	110–125
Plate Voltages Audio Output Tubes	D. C.	6–750	Between Plate Terminals of Audio Output Sockets (+) and Mid Tap of 10 ohm Resistor (—)	250–270
"C" Voltage R. F. Tube	D. C.	6–110	Between Cathode Terminal of R. F. Socket (+) and Chassis Base (—)	2.4
"C" Voltage Mixer Tube	D. C.	0–10	Between Cathode Terminal of Mixer Socket (+) and Chassis Base (—)	6.5
Grid Voltage Oscillator Tube	D. C.	0–250	Between Cathode Terminal of Oscillator Socket (+) and Chassis Base (—)	27–35
Control Grid Voltage I. F. Tube	D. C.	0–10	Between Control Grid Clip of I. F. Tube (—) and Cathode Terminal of I. F. Socket (+)	2.8
Grid Voltage Demodulator Tube	D. C.	0–250	Between Cathode Terminal of Demodulator Socket (+) and Chassis Base (—)	45–55
Grid Voltage 1st A. F. Tube	D. C.	0–10	Between Cathode Terminal of 1st A. F. Socket (+) and Chassis Base (—)	6.5
Grid Voltage Audio Output Tube	D. C.	0–250	Between Grid Terminals of Audio Output Sockets (—) and Mid Tap of 10 ohm Resistor (+)	40–50
Screen Voltages R. F. Mixer and I. F. Tubes	D. C.	0–250	Between Screen Terminals of R. F., Mixer and I. F. Sockets (+) and Chassis Base (—)	75–90
"B" Voltages R. F. Mixer and 1st A. F. Tubes	D. C.	0–250	Between Terminal 8 on Voltage Divider (+) and Chassis Base (—)	140-165
"B" Voltage Oscillator Tube	D. C.	0–250	Between Screen Terminal of Mixer Tube Socket (+) and Chassis Base (—)	75–90
"B" Voltage I. F. Tube	D. C.	0–250	Between Terminal 9 on Capacitor Assembly (+) and Chassis Base (—)	210–230
"B" Voltage Audio Output Tubes	D. C.	0–750	Between Terminal 4 on Output Transformer (+) and Chassis Base (—)	248–268
"C" Voltage I. F. Tube	D. C.	0–10	Between Terminals 3 (—) and 4 (+) on Voltage Divider	2.9
"C" Voltage Audio Output Tubes	D. C.	0–250	Across 750 ohm Biasing Resistor	45–55
Speaker Field Voltage	D. C.		Across Small Pins on Speaker Connector Socket	335–365
Plate Voltage A. C. Per Anode No. 280 Rectifier Tubes	A. C.	0–150	Between Plate Terminals of Rectifier Tube Sockets and Terminal 1 on Voltage Divider	330–360

NOTE "A"—No voltage can be obtained across these terminals as the Demodulator Plate is connected to the Chassis Base through 1 megohm and 100 ohm resistances.

STROMBERG - CARLSON TEL. MFG. CO.

MODEL 29 SUPERHETERODYNE



The Stromberg-Carlson No. 29 Radio Receiver is a Superheterodyne employing nine tubes. An improved Automatic Volume Control circuit with Visual Tuning Meter is incorporated.

Four No. 235 tubes are used as R. F. Amplifier, Mixer, I. F. Amplifier, and First Audio Amplifier. Two No. 227 tubes are used as Oscillator and Demodulator-AVC. Two No. 245 tubes are used in the push-pull output stage. A No. 280 Rectifier is used in the power supply.

A Bi-resonator is used to couple the antenna to the R. F. amplifier to prevent any cross modulation. The R. F. amplifier is coupled to the mixer by an ordinary tuned R. F. transformer. This gives three tuning circuits (four gang tuning capacitor) for R. F. selectivity ahead of the mixer, thus the image response ratio is exceedingly high. The oscillator is coupled to the cathode circuit of the mixer tube in the regular manner. The I. F. output of the mixer tube is fed into a Tri-resonator (three tuned circuit transformer) and thence to the I. F. amplifier tube. This tube is coupled to the duo-diode demodulator-AVC tube by a choke-tuned circuit arrangement. The audio output of the duo-diode is fed through a radio frequency filter to the resistor unit of the Manual Volume Control which acts as a coupling resistor to the audio amplifier. The A. V. C. voltages from the other diode circuit are led back to the control grids of the first two tubes. A No. 235 screen grid tube is used in the first audio stage to obtain high amplification without distortion.

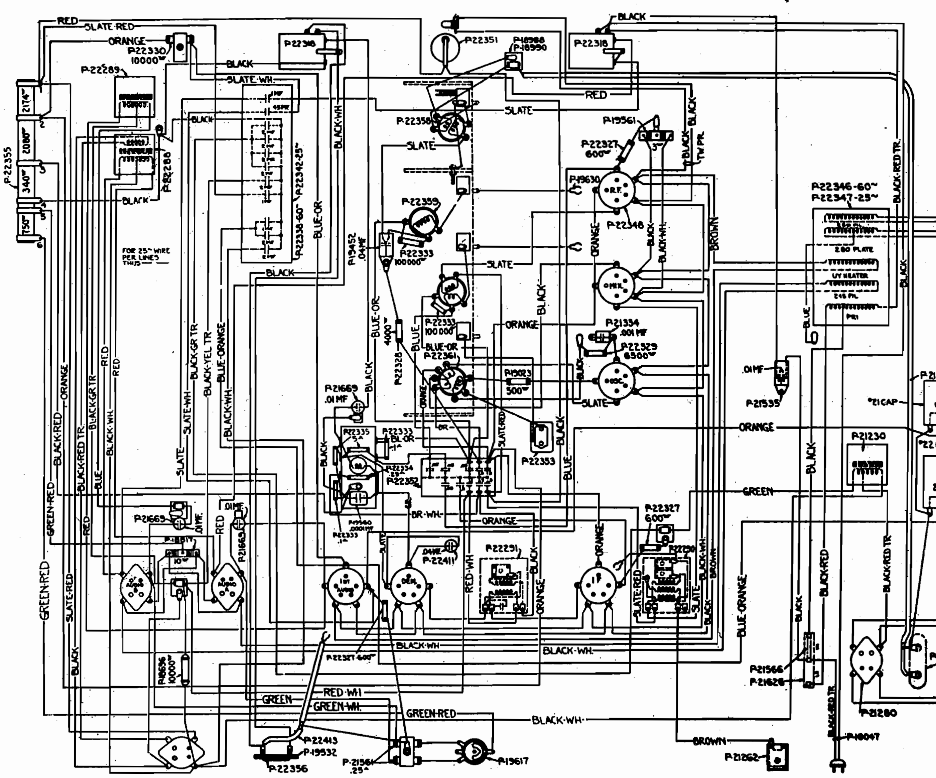
NORMAL VOLTAGE READINGS

These voltage readings correspond to a line voltage at 120 volts with the fuse in the "HI" position or 110 volts in the "LO" position. The fuse should be set in the proper position for the line voltage obtained before making measurements. **When voltages are measured proper allowance should be made for a difference in line voltage above or below 110 or 120 volts.** Be sure to make these readings with the Meter and Scale indicated, otherwise the results will not agree with those tabulated. Alternating voltages are indicated by italics.

Voltage	Meter	Scale	Where Measured	Approx. Value in Volts
Heater Voltages No. 227 and No. 235 Tubes	A. C.	0–4	Across Heater Terminals of Sockets	*2.48*
Filament Voltage No. 245 Tubes	A. C.	0–4	Across Filament of Audio Output Socket	*2.48*
Plate Voltage Radio Amplifiers	D. C.	0–250	Between Plate Terminal of R. F. Amplifier Socket (+) and Chassis Base	170
Plate Voltage Mixer Tube	D. C.	0–250	Between Plate Terminal of Mixer Socket (+) and Chassis Base (—)	170
Plate Voltage Oscillator Tube	D. C.	0–250	Between Plate Terminal of Oscillator Tube Socket (+) and Chassis Base (—)	87
Plate Voltage I. F. Tube	D. C.	0–250	Between Plate Terminal of First I. F. Socket (+) and Chassis Base (—)	220
Plate Voltage First Audio Tube	D. C.	0–250	Between Plate Terminal of First Audio Socket (+) and Chassis Base (—)	192
Plate Voltage Audio Output Tubes	D. C.	0–750	Between Plate Terminals of Audio Output Sockets (+) and Midtap 10-Ohm Resistor Midtap (—)	250
"C" Voltage R. F. Amplifier	D. C.	0–10	Between Cathode Terminal of R. F. Amplifier Socket (+) and Chassis Base (—)	3
"C" Voltage Mixer Tube	D. C.	0–10	Between Cathode Terminal of Mixer Socket (+) and Chassis Base (—)	8
"C" Voltage I. F. Amplifier	D. C.	0–10	Between Cathode Terminal I. F. Socket (+) and Chassis Base (—)	3
Grid Voltage Oscillator Tube	D. C.	0–250	Between Cathode Terminal of Oscillator Socket (+) and Chassis Base (—)	14–18
Plate Voltage Demodulator Tube	D. C.	0–250	Between Voltage Divider Terminal No. 3 (+) and Chassis Base (—)	12.5
Screen Voltages of R. F. Amplifier, Mixer, and I. F. Amplifier	D. C.	0–250	Between Screen Terminals on Sockets (+) and Chassis Base (—)	87
"B" Voltage R. F. Amplifier	D. C.	0–250	Between High Side Voltage Divider (+) and Chassis Base (—)	175
"B" Voltage I. F. Amplifier and First Audio Tube	D. C.	0–250	Between Midtap First Audio Transformer (+) and Chassis Base (—)	225
"B" Voltage Output Tubes	D. C.	0–750	Between Midtap on Output Transformer (+) and Chassis Base (—)	305
"C" Voltage First A. F. Tube	D. C.	0–10	Between Cathode of First A. F. Tube (+) and Chassis Base (—)	3
"C" Voltages Output Tubes	D. C.	0–250	Across 750-Ohm Biasing Resistor	50
Speaker Field Voltage	D. C.	0–250	Across Small Pins on Speaker Connector Socket	127.5
Plate Voltage A. C. Per Anode No. 280 Rectifier Tube	A. C.		Between Plate Terminals of No. 280 Rectifier Socket and Chassis Base	*340*
Filament Voltage No. 230 Rectifier Tube	A. C.	0–8	Between Filament Terminals of No. 280 Rectifier Socket	*4.9*

STROMBERG - CARLSON TEL. MFG. CO

MODEL 29 SUPERHETERODYNE

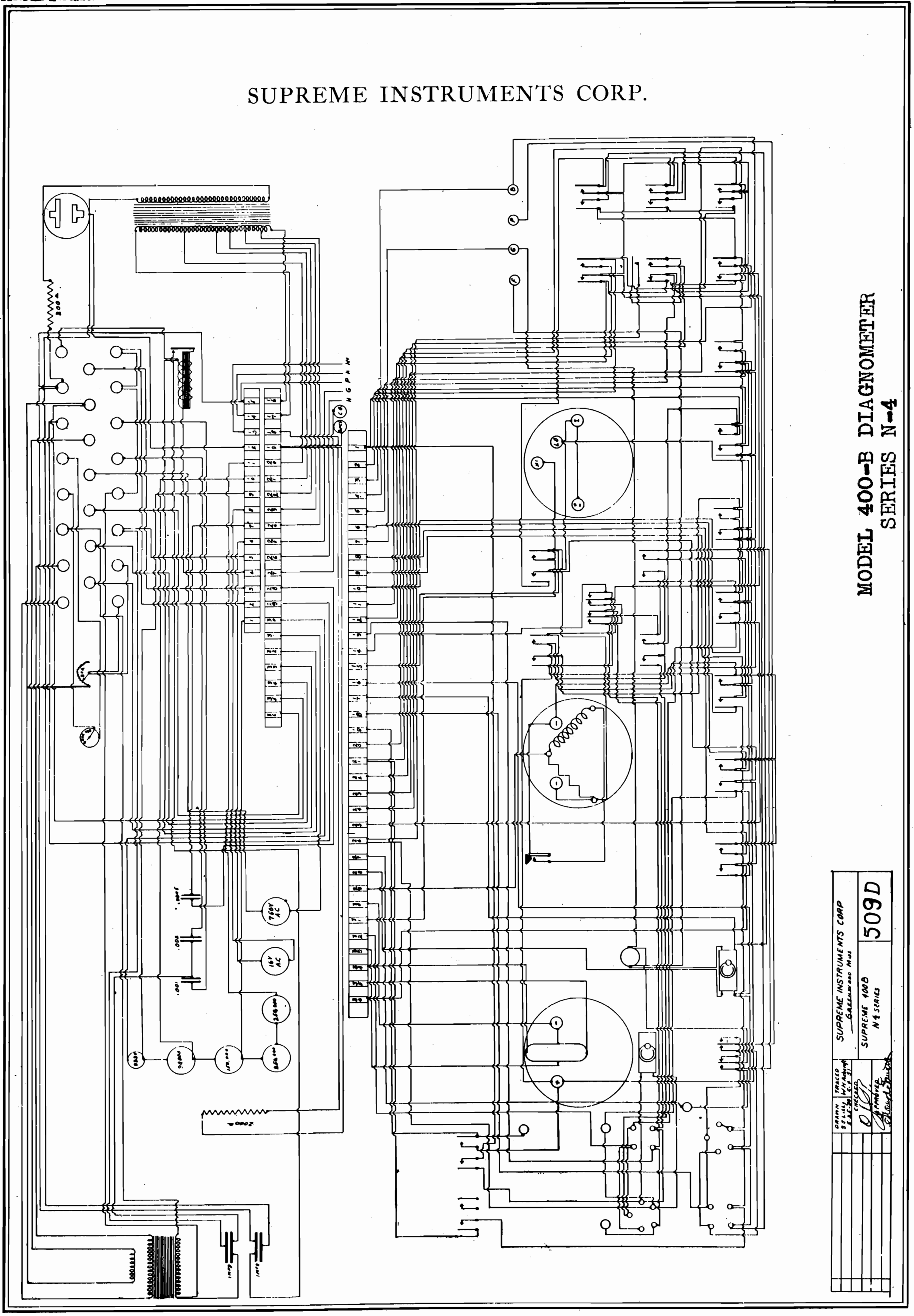


Wiring Diagram of Chassis for No. 29 Superheterodyne Receiver

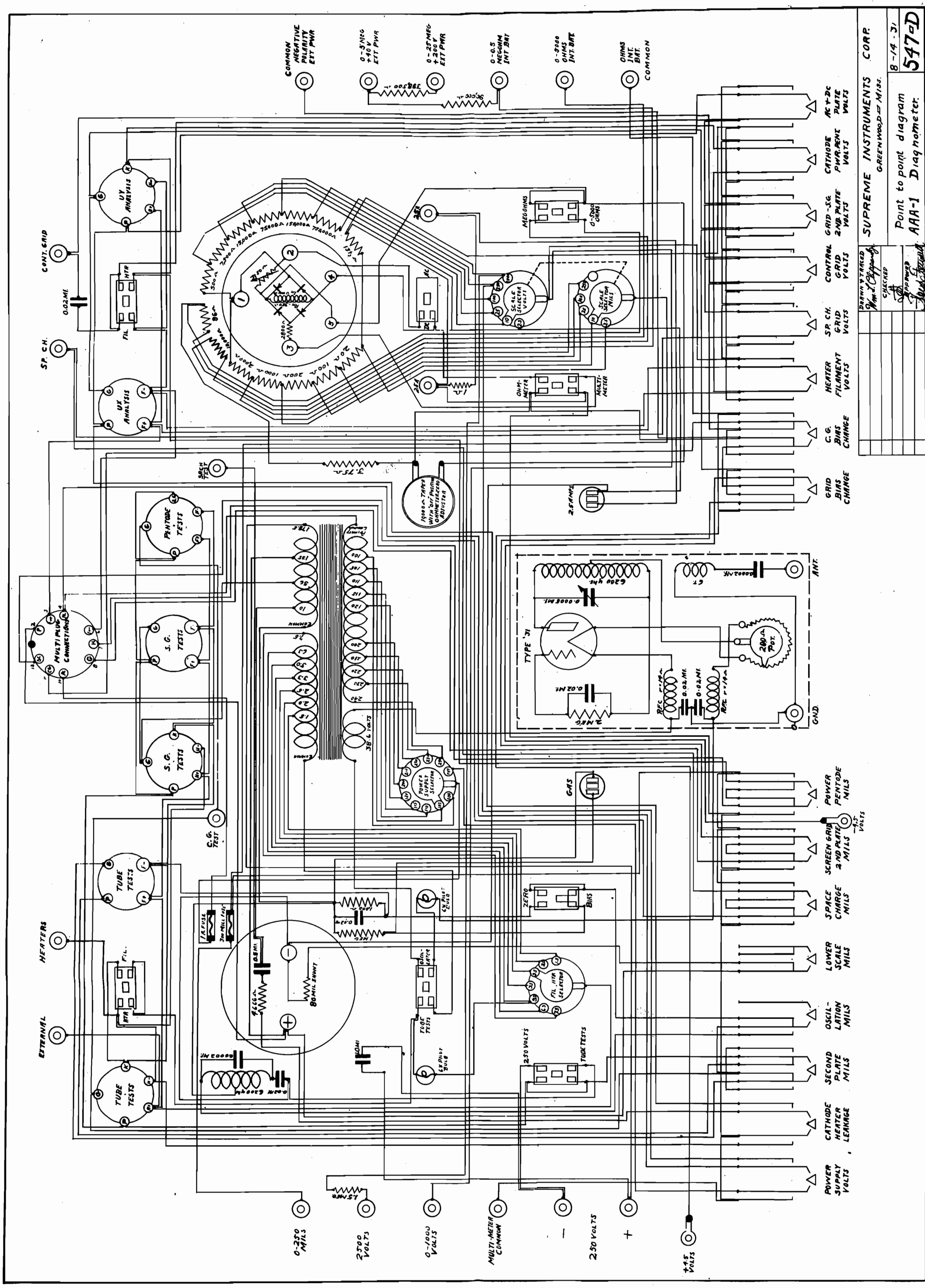
REPLACEMENT PARTS

(See Chassis Assembly on Page 4 and Wiring Diagram on Page 2)

Piece Number	Part	Description of Part	Required per Receiver	Price Each
P-22288	Audio Transformer	Audio Output Transformer	1	$ 3.25
P-22289	Audio Transformer	Push-Pull Transformer	1	4.00
P-21663	Bracket Assembly	Voltage Divider Mounting	1	.10
P-22352	Capacitor	By-Pass Capacitor	1	3.25
P-22353	Capacitor, Aligning	Oscillator "Series Aligner"	1	.75
P-21334	Capacitor	.001 Mfd.	1	.55
P-21535	Capacitor	.01 Mfd.	1	.75
P-21669	Capacitor	.01 Mfd.	3	.50
Code No. 21	Capacitor	1 Mfd. Filter Capacitor	1	1.50
Code No. 22	Capacitor	2 Mfd. Filter Capacitor	1	1.75
P-19452	Capacitor	Bi-Resonator Coupling Capacitor .04 Mfd.	1	.75
P-22411	Capacitor	.04 Mfd.	1	.75
P-21262	Capacitor, Aligning	Aligner for First I. F. Transformer	1	.45
P-22338	Capacitor Assembly	Filter Capacitor (60 Cycle)	1	8.25
P-22342	Capacitor Assembly	Filter Capacitor (25 Cycle)	1	8.50
P-22290	Coil and Capacitor Assembly	First I. F. Transformer	1	4.10
P-22291	Coil and Capacitor Assembly	Second I. F. Transformer	1	3.75
P-22358	Coil Assembly	First Coil of Bi-Resonator	1	1.50
P-22359	Coil Assembly	Second Coil of Bi-Resonator	1	1.75
P-22360	Coil Assembly	R. F. Transformer	1	2.50
P-22361	Coil Assembly	Oscillator Coil	1	2.50
P-21623	Coil Assembly	Antenna Inductor	1	.35
P-21566	Fuse	1½ Amperes	1	.10
P-19630	Grid Clip	. . . .	4	.10
P-21704	Grid Clip Assembly		2	.20
P-21230	Inductor Assembly	Filter Inductor—"B" Choke	1	4.25
P-21277	Knob	Antenna Aligner	1	.15
P-22390	Knob	Selector Knob	1	.25
P-22391	Knob	Volume Control and Clarifier-Switch	2	.20
P-22351	Meter	Visual Tuning Meter	1	2.75
P-19617	Potentiometer	Hum Adjuster	1	.85
P-22318	Potentiometer and Switch	Volume Control and Phonograph Switch and Clarifier and "On-Off" Switch	2	1.95
P-19561	Resistor, 3-Ohms	Resistor across Heater of Mixer Tube	1	.35
P-18817	Resistor, 10-Ohms	Resistor across Filament of Output Tubes	1	.35
P-19023	Resistor, 500-Ohms, "C" Type	Carbon Resistor, Green, Black, and Brown	1	.35
P-22327	Resistor, 600-Ohms, "C" Type	Carbon Resistor, Blue, Black, and Brown	3	.35
P-22328	Resistor, 4,000-Ohms. "C" Type	Carbon Resistor, Yellow, Black, and Red	1	.35
P-22329	Resistor, 6,500-Ohms, "C" Type	Carbon Resistor, Blue, Green, and Red	1	.35
P-22355	Resistor, 7,344-Ohms,	Voltage Divider	1	2.00
P-18696	Resistor, 10,000-Ohms, "B" Type	Carbon Resistor, Brown, Black, and Orange	1	.35
P-22330	Resistor, 10,000-Ohms, "C" Type	Carbon Resistor, Brown, Black, and Orange	1	.35
P-22333	Resistor, 100,000-Ohms, "D" Type	Carbon Resistor, Brown, Black and Yellow	4	.35
P-21561	Resistor, 250,000-Ohms, "C" Type	Carbon Resistor, Red, Green, and Yellow	2	.35
P-22334	Resistor, 250,000-Ohms, "D" Type	Carbon Resistor, Red, Green, and Yellow	1	.35
P-22335	Resistor, 500,000-Ohms, "D" Type	Carbon Resistor, Green, Black, and Yellow	2	.35
P-22344	Resistor and Coil Assembly	Demodulator Plate Filter	1	2.75
P-22346	Transformer	Power, 60 Cycle, 110 Volts	1	8.75
P-22347	Transformer	Power, 25-60 Cycle, 110 Volts	1	12.25


SUPREME INSTRUMENTS CORP.
MODEL 400-B DIAGNOMETER
SERIES N-4
SUPREME INSTRUMENTS CORP
GREENWOOD MISS
SUPREME 400B
N4 SERIES
509D

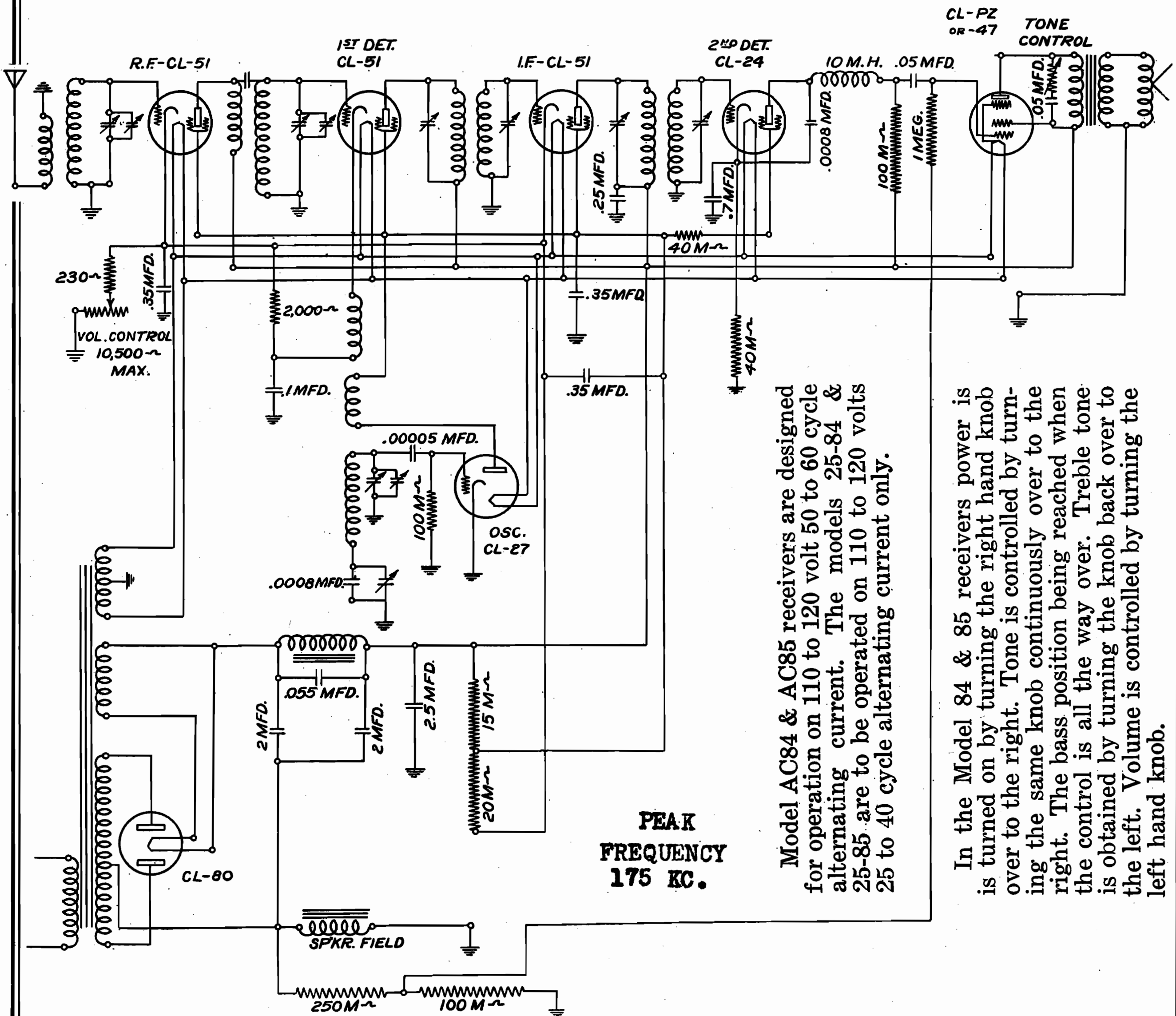
SUPREME INSTRUMENTS CORP.



MODEL AAA-1 DIAGNOMETER

TRANSFORMER CORP. OF AMERICA

CLARION MODELS 84 & 85



PEAK FREQUENCY 175 KC.

Model AC84 & AC85 receivers are designed for operation on 110 to 120 volt 50 to 60 cycle alternating current. The models 25-84 & 25-85 are to be operated on 110 to 120 volts 25 to 40 cycle alternating current only.

In the Model 84 & 85 receivers power is is turned on by turning the right hand knob over to the right. Tone is controlled by turning the same knob continuously over to the right. The bass position being reached when the control is all the way over. Treble tone is obtained by turning the knob back over to the left. Volume is controlled by turning the left hand knob.

READINGS TAKEN WITH WESTON MODEL 565 ANALYSER

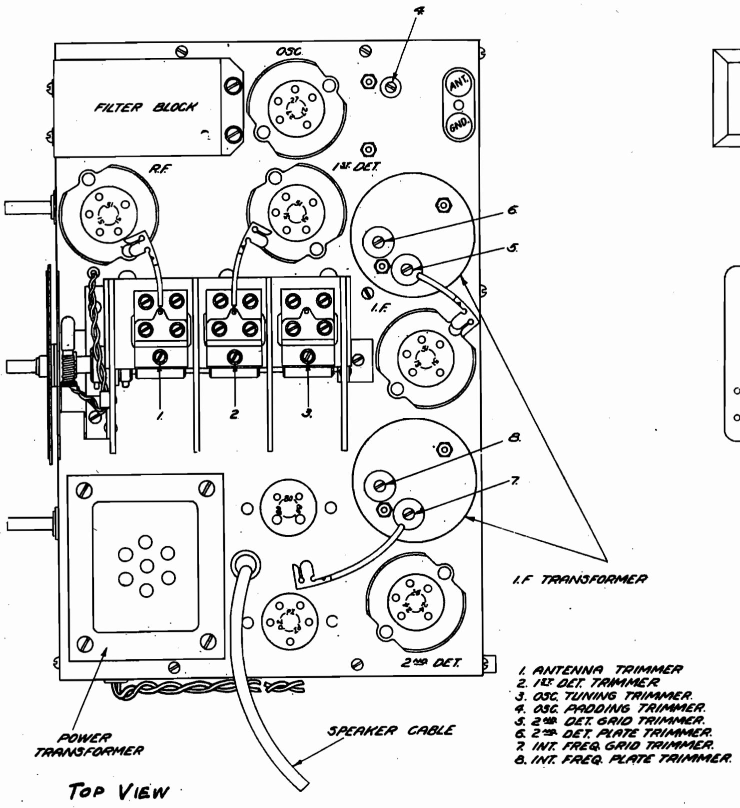
No.	Stage	Type Tube	A Volts	B Volts	Cont. Grid Volts	Cath. Volts	Ip' Norm.	SG Volts
1	r. f.	51	2.1	255	3.5	3.5	3.5	78
2	1st Det.	51	2.1	240	10.	10.	2.	108
3	Osc.	27	2.1	135	0	0	6.	0
4	I. F.	51	2.1	250	3.5	3.5	3.5	77
5	2nd det.	24	2.2	190	6.0	6.0	.2	68
6	Output	47	2.2	228	14.	0	25.	255
7	Rect.	80	4.4	....	0	0	....	0

Volume control position **Full** Line Voltage **115**

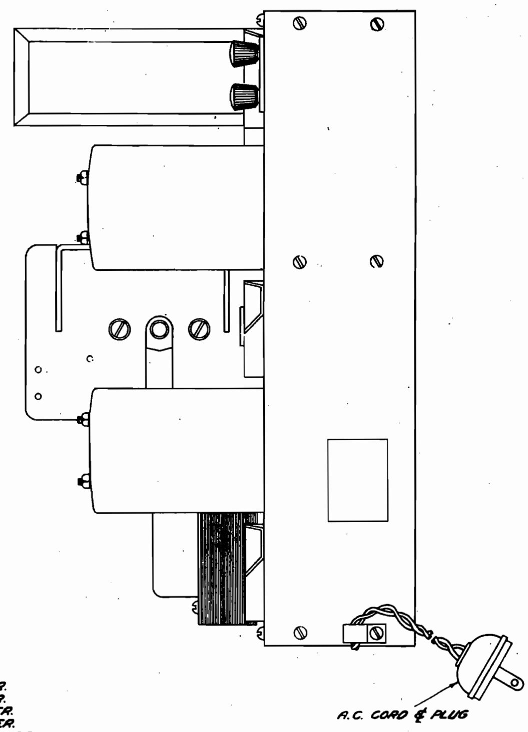
Note: Since resistance tolerances in the sets are plus or minus 10%, and tubes may vary over 20%, your readings may disagree with the above by plus or minus 30%.

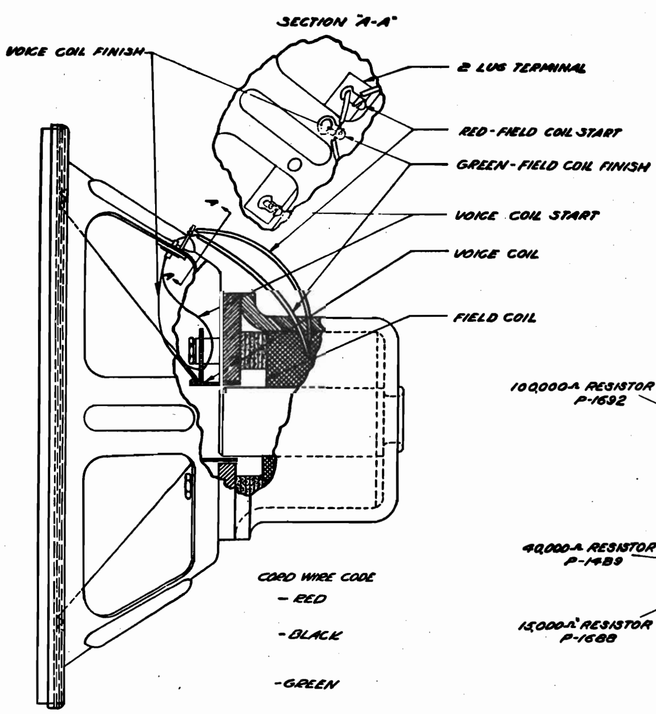
TRANSFORMER CORP. OF AMERICA

CLARION MODELS 84 & 85

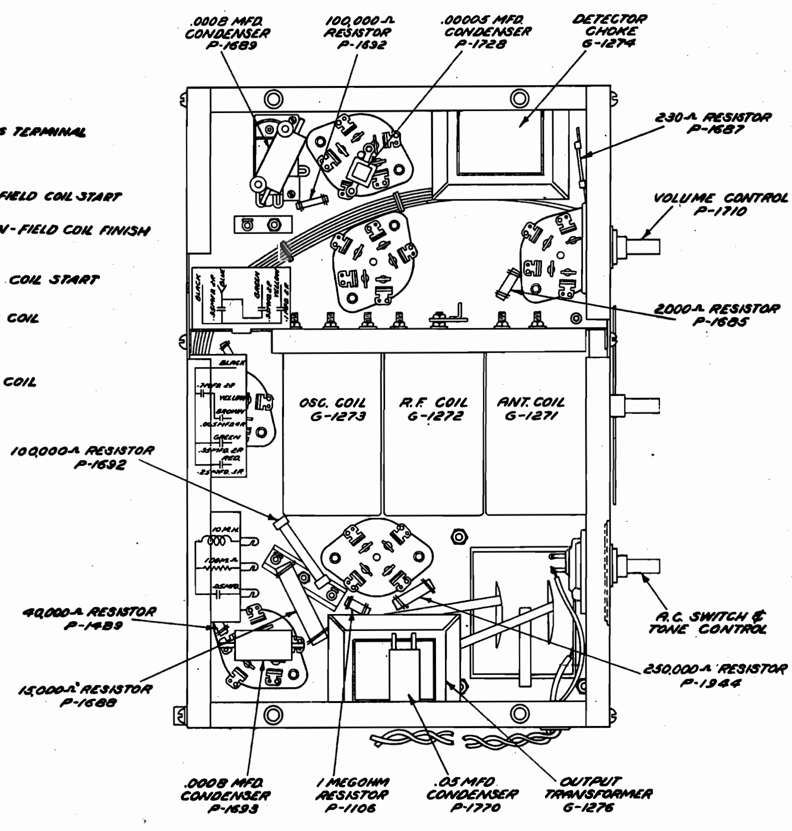


TOP VIEW





DYNAMIC SPEAKER
MODELS 84 & 85 AND 94 & 25-94



G-83 CHASSIS
BOTTOM VIEW

TRANSFORMER CORP. OF AMERICA

CONTINUITY TEST TABLES
(Using 10 volt range meter 1000 ohms per volt and 6 volt battery)

Circuit Tested	From	To	Readings
Antenna Pri.	Antenna post	Ground	6.
R. F. Grid	Grid clip	Ground	6.
R. F. Cathode	Rect. fil. prong	R, F. Cath. prong	1.4
R. F. Screen	Rect. fil. prong	R. F. Screen prong	2.5
R. F. Plate	Rect. fil. prong	R. F. Plate prong	5.6
1st Det. grid	Grid cap clip, 1st det.	Ground	6.0
1st Det. Cath.	Rect. fil. prong	1st Det. Cath. prong	1.4
1st Det. screen	Rect. fil. prong	1st Det. screen prong	2.5
1st Det. plate	Rect. fil. prong	1st. Det. plate prong	5.6
I. F. Grid	I. F. Grid clip	Ground	6.0
I. F. Cath.	Rect. fil. prong	I. F. Cath. prong	1.4
I. F. Screen	Rect. fil. prong	I. F. Screen prong	2.5
I. F. Plate	Rect. fil. prong	I. F. Plate prong	5.6
2nd Det. grid	2nd Det. grid clip	Ground	6.0
2nd Det. cath.	Rect. fil. prong	2nd Det. cath. prong	1.4
2nd Det. screen	Rect. fil. prong	2nd Det. screen prong	.7
2nd Det. plate	Rect. fil. prong	2nd Det. plate prong	.5
Pent. cont. grid	Rect. fil. prong	Pent. cont. grid prong	.1
Pent. S. C. Grid	Rect. fil. prong	Pent. S. C. grid prong	5.7
Pent. plate	Rect. fil. prong	Pent. plate prong	5.6
Osc. grid	Osc. grid prong	Ground	.5
Osc. pick up coil	Green lead on .00005 cond.	Black lead on padding cond.	6.0
Osc. Plate	Rect. fil. prong	Osc. Plate prong	2.5
Osc. cath.	Rect. fil. prong	Osc. cathode prong	1.4
Power trans. pri.	ACROSS	A. C. Plug	6.
Power trans. sec.	Plate to plate	Rect. socket	5.7
Output trans. sec.	Black and green leads in cable	Spkr. disconnected	6.
Voice coil disconnected	V. C. green lead	V. C. Yellow lead	6.
Speaker field	Field, red lead	Field, green lead	5.6
Osc. tuning Ckt.	Green lead on .00005 cond.	Black lead on padding cond.	6.

RESISTANCE TABLE
(Using 6 volt scale, 1,000 ohms per volt; meter and 6 volt battery)

Item Tested	Description Color—Code	From	To	Reads	Ohms Resistance
r. f.-grid. bias resist.	Black Strap type Wire wound	r. f. cath. prong	Vol. cont. ungrounded terminal	5.9	230
Volume control	Variable at max. resistance	Test between its two terminals (connected)		3.2	Max. 10,500
1st det. grid bias resist.	Red Black tip	r. f. cath. prong	Other end of resist.	5.1	2,000
Tone control resistance in.	On front panel	Across tone control		2.8	100,000
2nd Det. Screen	Yellow Orange spot Black tip	Across resistor		1.1	40,000
Oscillator grid-resist.	Brown Yellow spot Black tip	Oscillator grid prong	Ground	0.6	100,000
I. f. and r. f. cathode-bias resist.	Red Orange spot Black tip	I. f. cath. prong	I. f.-screen grid prong	2.3	20,000
I. f. and det. screen grid volts resist.	Brown Orange spot Green tip	I. f. screen grid prong	Pentode space charge grid prong	2.7	15,000
2nd det. grid-bias resist.	Yellow Orange spot Black tip	2nd det. cath. prong	Ground	1.1	40,000
2nd det. plate resist.	Inside—3 term. det. plate filter assem.	Test between solder lugs on det. plate-filter assem. where red wires attach.		0.6	100,000 in series with 10 m.h. choke
Pentode grid-resist.	Brown Green spot Black tip	Pentode Grid prong	Across resistor	0.5	1 Meg.
Pentode grid-bias	Brown Yellow tip Black spot	Across resistor		.6	100,000
Bias dividing resistor	Red Green tip Yellow spot	Across resistor		.5	250,000

CLARION
MODELS 84 & 85

TRANSFORMER CORP. OF AMERICA

CLARION
MODELS 84 & 85
MODELS 94 & 25-94

READJUSTING TRIMMERS

To readjust the trimmers on these superheterodyne receivers it will be necessary that a good design of 175 k.c. oscillator be employed and that a dependable broadcast test oscillator be on hand so that stages handling intermediate frequency and those handling radio frequency can be thoroughly checked. It is advisable to use a bakelite screw driver when making any of these adjustments.

First, connect the 175 k.c. oscillator output leads from the control grid cap of the first detector tube to ground. Do not remove any of the tubes from the sockets, and it is not necessary to disconnect the grid cap clip from the first detector tube. Reset trimmers No. 5, No. 6, No. 7 and No. 8 for maximum output. While this test oscillator is working into the intermediate frequency stages, no adjustment of the tuning condenser on the receiver will have any effect, inasmuch as the intermediate frequency stage is fixed tuned.

If your test oscillator is properly designed, it will supply exactly 175 k.c., and when trimmers No. 5, No. 6, No. 7 and No. 8 are set and turned for maximum output, they will be correctly adjusted.

Next, disconnect the 175 k.c. test oscillator and connect to the antenna binding post of the receiver, the output lead from your broadcast test oscillator or tune in a broadcast signal around 1400 k.c., then reset trimmer No. 2 and No. 1, respectively, for maximum output. This adjustment will track the first detector and r. f. stages.

To check calibration of the receiver, whether it be high or low, trimmer No. 3 (oscillator) should be reset until a station of known high frequency is brought in at the correct dial marking with peak volume. If your broadcast test oscillator is accurately calibrated, it might be used in place of the broadcasting station signal. In this adjustment, a broadcast station or test oscillator signal at about 1400 k.c. should be chosen. The setting of the trimmer at 1400 k.c. is more critical than it would be at 600 k.c.

The next adjustment is important and not easily explained in writing, so pay close attention to the following instructions. We will now balance the oscillator to the r. f. and first detector stages.

Tune the external broadcast test oscillator and the receiver both to 600 k.c., then slowly increase or decrease the capacity of No. 4 (oscillator padding trimmer), at the same time and continuously tuning back and forth across the signal with the receiver tuning condenser gang. The output meter needle will now be swinging up and down in step with the variation in tuning. Watch the peak of this swinging closely and readjust No. 4 trimmer until the swinging needle reaches its highest peak.

Retune the receiver and broadcast test oscillator to 1400 k.c. and re-check trimmer No. 3 to make sure that the adjustment of No. 4 has not thrown the receiver out of calibration. If it has, then readjust No. 3 until the calibration is correct, (as previously explained), and check on trimmers No. 2 and No. 1, to make sure that the adjustment of No. 4 has not reduced the sensitivity.

CONTINUITY TESTS

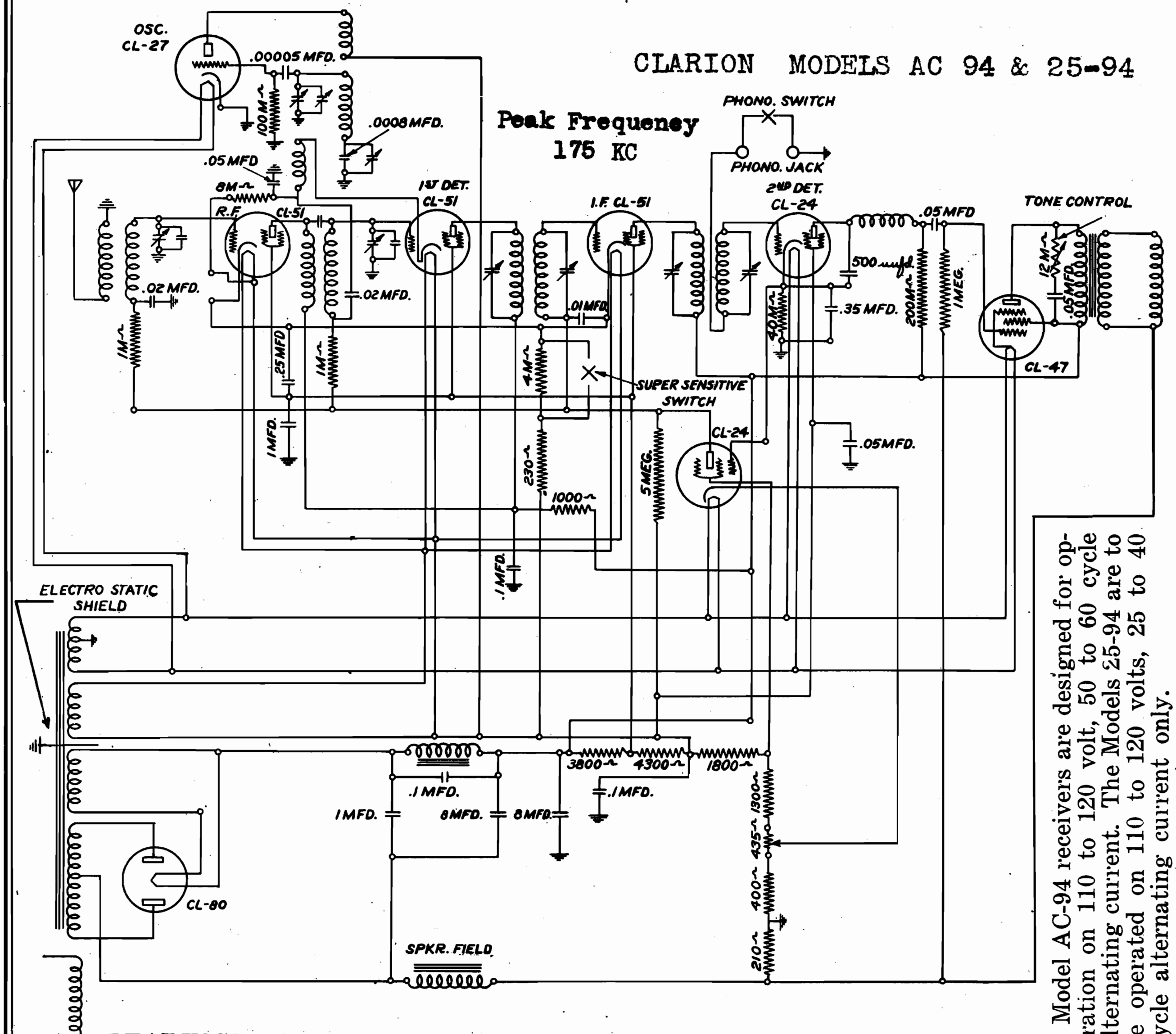
(Applicable to completely and partially inoperative sets and circuits)

A 175 k.c. test oscillator should be connected to the grid cap of the first detector tube so that the modulated signal can be reproduced in the loud speaker. This indicates that the first detector and intermediate frequency stages are operating. To determine if the oscillator is working, **a broadcast test oscillator** should be connected to the grid cap of the first detector tube. No signal will come through unless the oscillator tube and stage are functioning correctly. The r. f. tube, of course, can be checked lastly by connecting the broadcast test oscillator to the antenna and ground binding posts of the receiver.

TRANSFORMER CORP. OF AMERICA

CLARION MODELS AC 94 & 25-94

Peak Frequency 175 KC



Model AC-94 receivers are designed for operation on 110 to 120 volt, 50 to 60 cycle alternating current. The Models 25-94 are to be operated on 110 to 120 volts, 25 to 40 cycle alternating current only.

READINGS TAKEN WITH WESTON MODEL 565 ANALYSER

No.	Stage	Type Tube	A Volts	B Volts	Cont. Grid Volts	Cath. Volts	Ip' Norm.	SG Volts
1	r. f	51	2.1	178	1.5	2.5	4.5	82
2	1st det.	51	2.1	160	9.5	10.	1.2	75.
3	Osc.	27	2.05	120	0	0	10	0
4	I. F.	51	2.05	180	.6	3.	3	82.
5	2nd det.	24	2.05	220	8.	8.	.25	85.
6	A.V.C.	24	2.05	50	12.	20	0	37
7	A.F.	47	2.1	260	16.5		40	275.
8	Rect.	80	4.6	160			40	

Volume control position Full. Line Voltage 115-60 cycle.

NOTE: Filaments and cathodes of R.F., I.F., and first detector are 95 volts positive with respect to ground.
NOTE: Since resistance tolerances in the sets are plus or minus 10%, and tubes may vary over 20%, your readings may disagree with the above by plus or minus 30%.

FOR SPEAKER DATA REFER TO PAGE 622-K-1
FOR TRIMMER ADJUSTMENT DATA REFER TO PAGE 622-K-3

CLARION
AC MODELS
94 & 25-94

TRANSFORMER CORP. OF AMERICA

CONTINUITY TEST TABLES

Circuit	From	To	Reading
Antenna Coil Pri.	Antenna post	Ground	6.0
R. F. Grid	Rect. fil. prong	R. F. grid cap clip	0.2
R. F. Cathode	Rect. fil. prong	R. F. cathode prong	2.7*
R. F. Screen	Rect. fil. prong	R. F. screen prong	4.2
R. F. Plate	Rect. fil. prong	R. F. plate prong	5.3
1st Det. Grid	Rect. fil. prong	1st det. grid cap clip	0.2
1st Det. Cathode	Rect. fil. prong	1st det. cathode prong	2.3
1st Det. Screen	Rect. fil. prong	1st screen prong	4.2
1st Det. Plate	Rect. fil. prong	1st det. plate prong	5.3
I. F. Grid	Rect. fil. prong	I. F. grid cap clip	0.2
I. F. Cathode	Rect. fil. prong	I. F. cathode prong	2.7*
I. F. Screen	Rect. fil. prong	I. F. screen prong	4.2
I. F. Plate	Rect. fil. prong	I. F. plate prong	5.8
A. V. C. Grid	Rect. fil. prong	A. V. C. grid clip	1.0
A. V. C. Cathode	Rect. fil. prong	A. V. C. cathode prong	2.9
A. V. C. Screen	Rect. fil. prong	A. V. C. screen prong	3.0
A. V. C. Plate	Rect. fil. prong	A. V. C. plate prong	0.2
2nd Det. Grid	Rect. fil. prong	2nd det. grid prong	3.8
2nd Det. Cathode	Rect. fil. prong	2nd det. cathode prong	1.0
2nd Det. Screen	Rect. fil. prong	2nd det. screen prong	3.3
2nd Det. Plate	Rect. fil. prong	2nd det. plate prong	0.3
Pent. Cont. Grid	Rect. fil. prong	Pent cont. grid prong	0.1
Pent. S. C. Grid	Rect. fil. prong	Pent S. C. grid prong	5.8
Pent. Plate	Rect. fil. prong	Pent plate prong	5.6
Osc. Grid	Rect. fil. prong	Osc. grid prong	0.5
Osc. Cathode	Rect. fil. prong	Osc. cathode prong	2.8
Osc. Plate	Rect. fil. prong	Osc. plate prong	3.2
Power Trans. Pri.	ACROSS	A. C. plug	6.0
Power Trans. Sec.	ACROSS	280 plates	5.8
Osc. pick up coil	Black lead on Osc. trimmer	Green lead on .00005 cond.	6.0
Speaker V.C. disconnected	V.C. ground lead	V. C. black lead	6.0
Speaker field	Field red lead	Field green lead	5.6

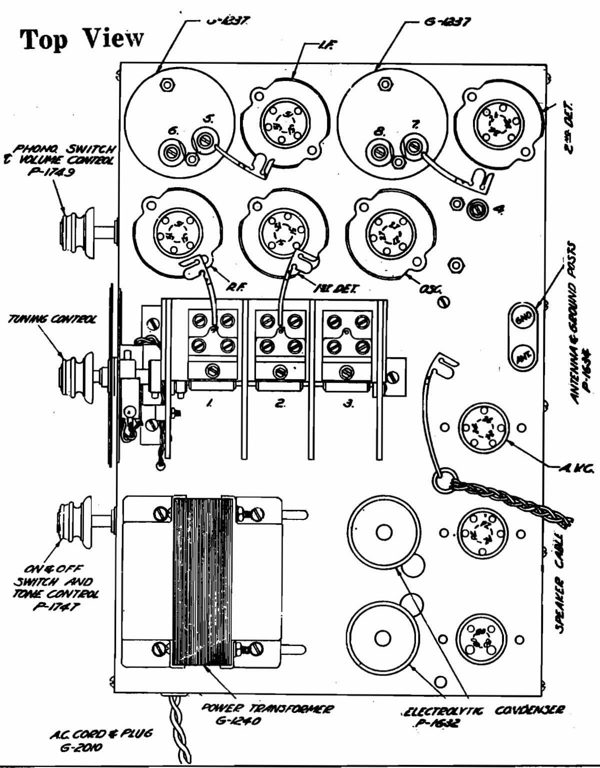
*Supersensitive Switch in "Normal" Position.

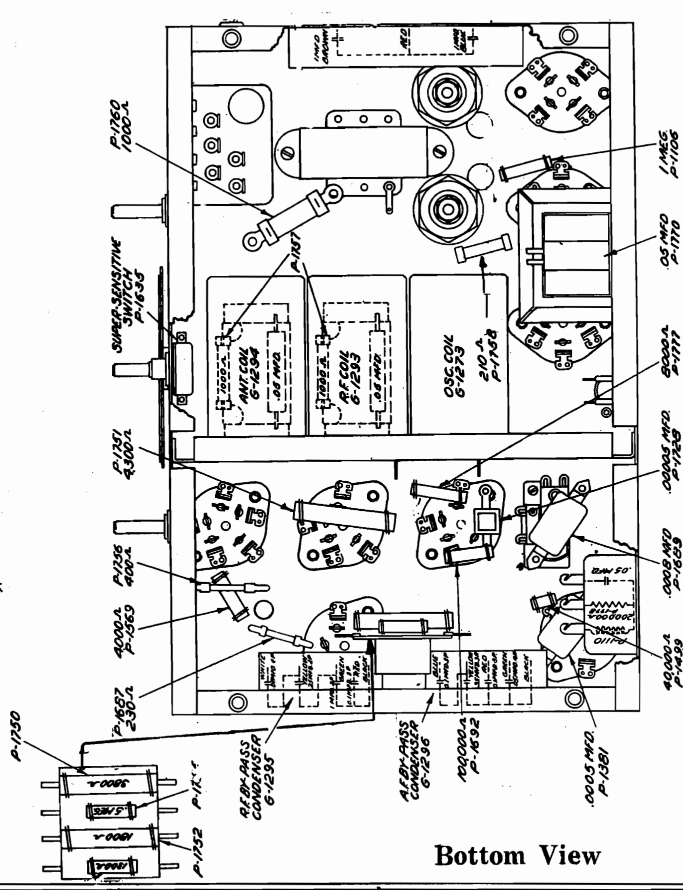
RESISTANCE TABLE

(Using 6 volt scale, 1,000 ohms per volt; meter and 6 volt battery

Item Tested	Description Color—Code	From To	Reads	Ohms Resistance
Osc. Grid Resistor	Brown body, black tip, yellow dot	Across Resistor	.6	100,000
1st Det. Grid Bias Resistor	Gray body, black tip, red dot	Across Resistor	3.4	8,000
Super-Sensitive Grid Bias Rest.	Yellow body, black tip, red dot	Across Resistor	4.4	4,000
R.F. and I.F. Grid Bias Resistor	Black, wire wound	Across Resistor	5.9	230
Volume Cont.	Red, wire wound	Across Resistor	5.8	400
Screen Voltage Resistor	Orange body, gray tip, red dot	Across Resistor	4.4	3,800
A.V.C. Plate Resistor	Green body, black tip, yellow dot	Across Resistor	.1	500,000
A.V.C. Screen Voltage Resist.	Brown body, gray tip, red dot	Across Resistor	5.2	1,800
A.V.C. Grid Bias Resistor	Brown body, orange tip, red dot	Across Resistor	5.3	1,300
2nd Det. Screen Voltage Resistor	Yellow body, orange tip, red dot	Across Resistor	4.2	4,300
Vol. Cont.	Front panel	Across Control	5.8	435
Tone Cont.	Front panel	Across Control	2.6	12,000
1st Det. and I.F. Plate Volt. Rest.	Wire wound on filter choke	Across Resistor	5.5	1,000
Pentode Grid Bias Resistor	Wire wound green	Across Resistor	5.9	210
Pentode Grid Coupling Resistor	Brown body, black tip, green dot	Across Resistor	.1	1,000,000
2nd Det. Plate Coupling Resistor	In det. plate choke	Across red leads on det. choke	.3	200,000
2nd Det. Grid Bias Resistor	Yellow body, black tip, orange dot	Across Resistor	1.3	40,000

Top View

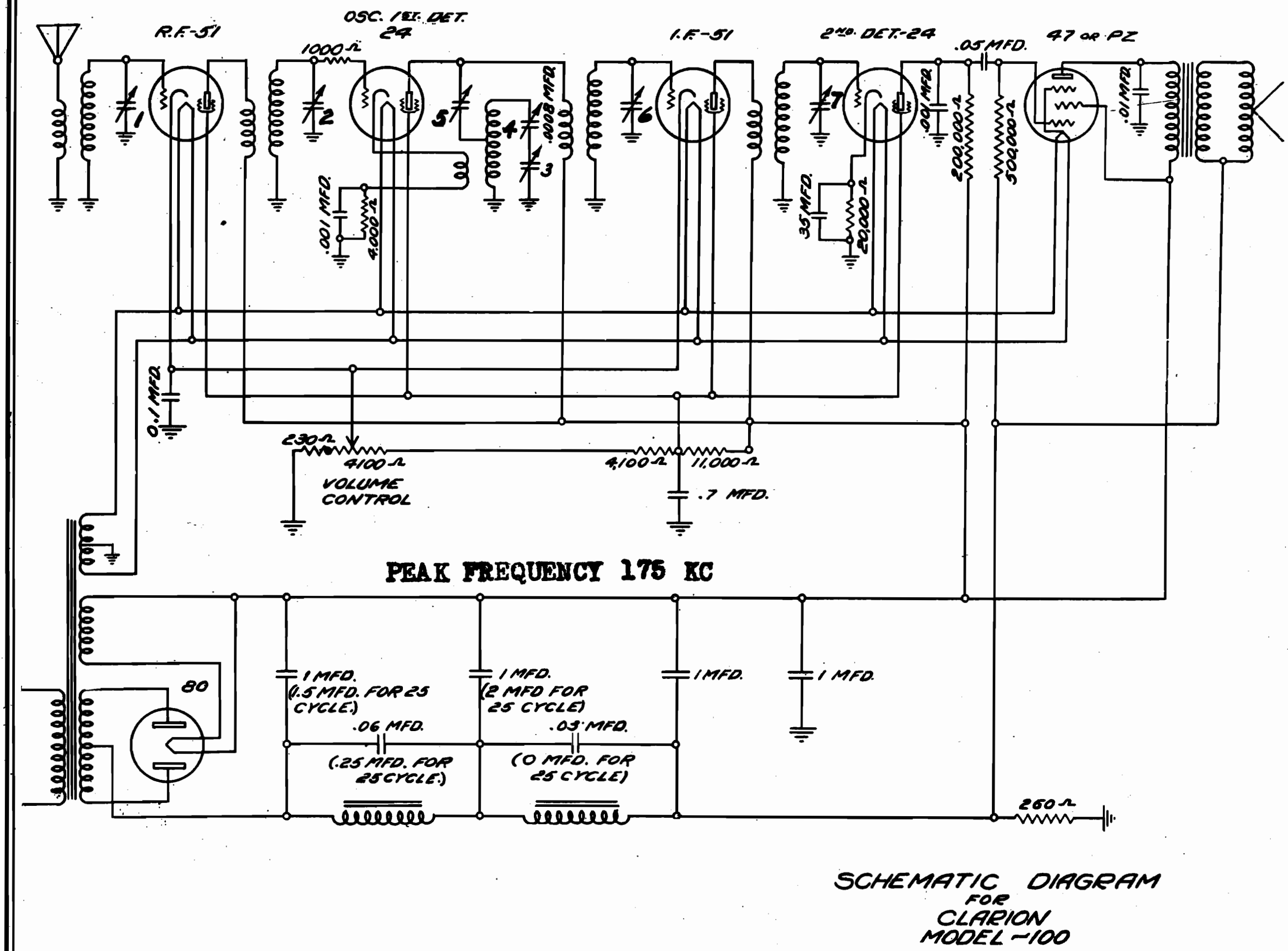




Bottom View

TRANSFORMER CORP. OF AMERICA

CLARION SERIES 100 SUPERHETERODYNE



READING TAKEN WITH WESTON MODEL 565 ANALYZER

MODEL No. CUSTOMER BY

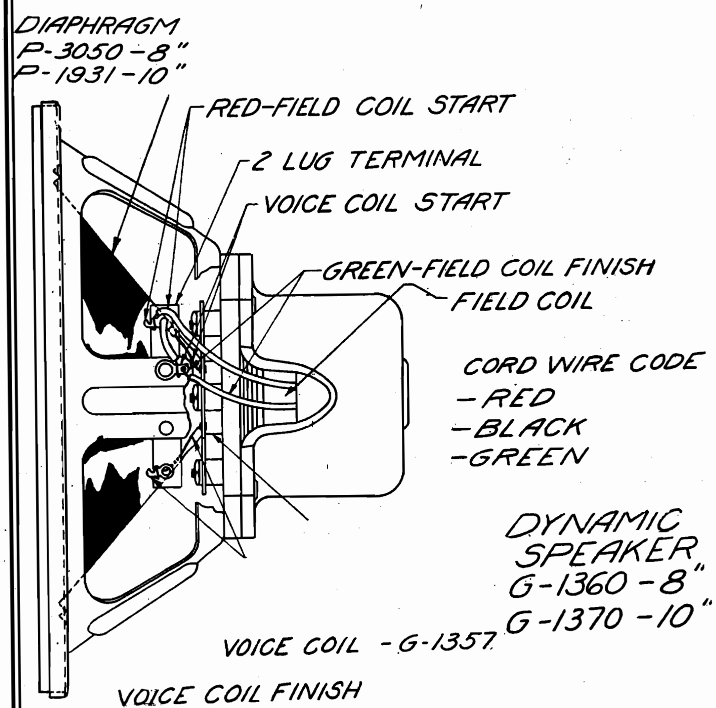
No.	Stage	Type Tube	"A" Volts	"B" Volts	Cont. Grid Volt	Cath. Volts	S. G. Volts	Ip Norm.
1	R. F.	51	2.15	235	2.4	2.5	80.	5.0
2	Autodyne	24	2.15	225	5.0	6.0	75.	3.0
3	I. F.	51	2.15	230	2.4	2.5	75.	4.0
4	2nd Det.	24	2.15	104	10.	15.	65.	0.6
5	Audio	47	2.25	250	16	0	260	30.
6	Rect.	80	4.4					57.5

Line Voltage 115. Order of Test: 1 Rect., 2 Power, 3 Det., Etc.
Volume Control Position, Full On.

NOTE: Since resistance tolerances in the sets are plus or minus 10% and tubes may vary over 20%, your readings may disagree with the above by plus or minus 30%.

TRANSFORMER CORP. OF AMERICA

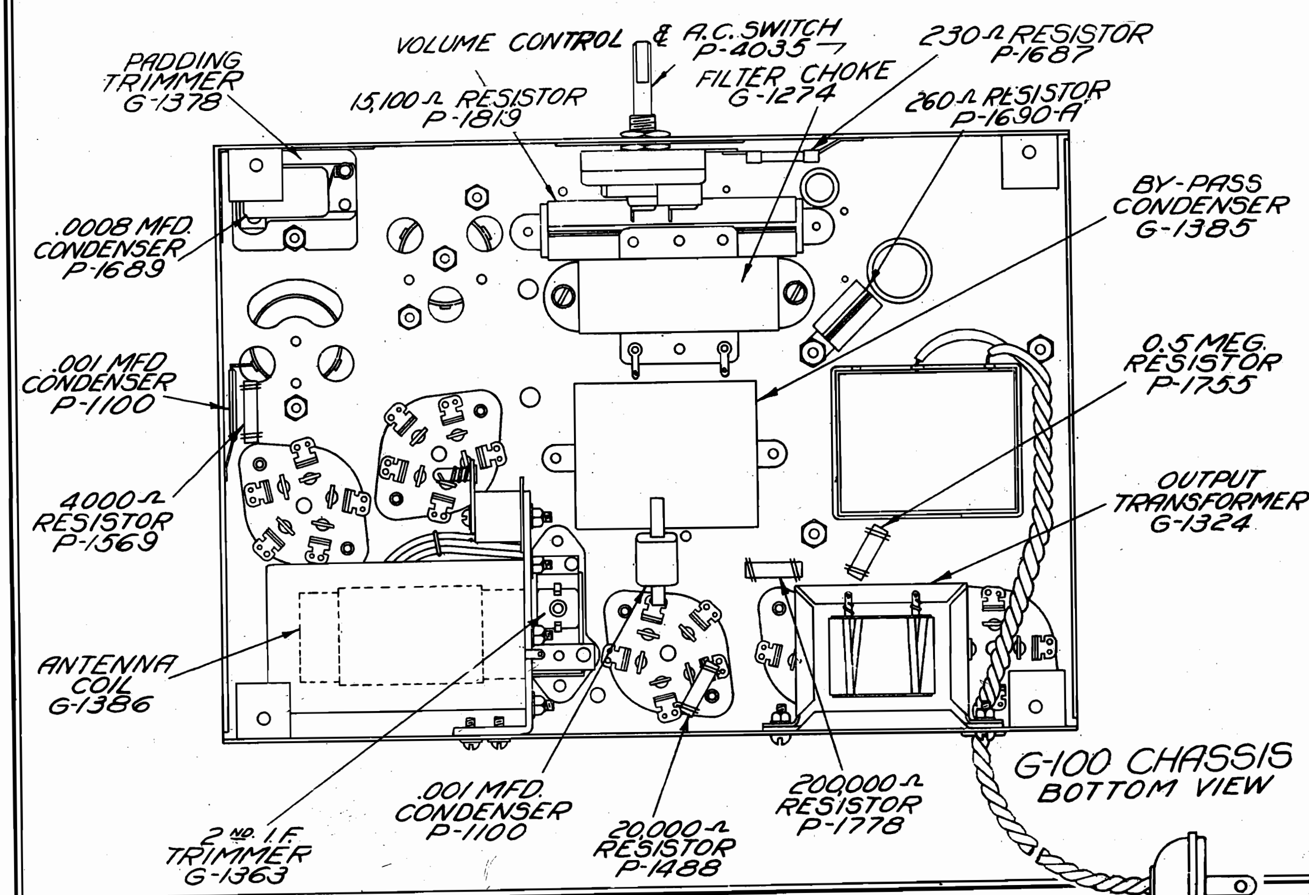
CLARION SERIES 100 SUPERHETERODYNE



CONTINUITY TESTS

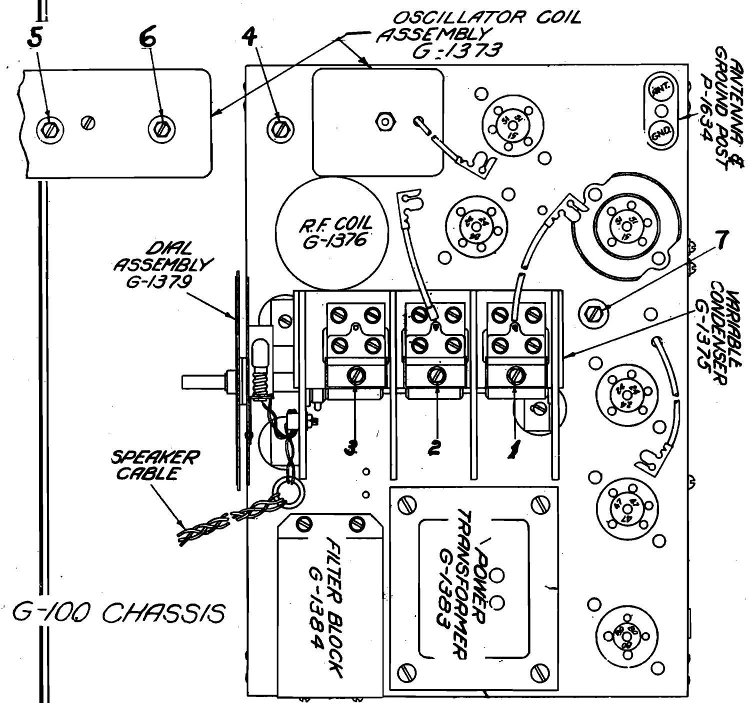
Applicable to Completely and Partially In-Operative Sets and Circuits)

To determine which section of the receiver is defective, the second detector tube might be tapped with the finger, listening for a ringing noise in the speaker—this indicates that the audio end is O. K. *A 175 K. C. test oscillator* should be connected to the grid cap of the Super-autodyne tube so that the modulated signal can be reproduced in the loud speaker. This indicates that the Super-autodyne and intermediate frequency stages are operating. To determine if the super-autodyne is oscillating as it should be, a broadcast test oscillator should be connected to the grid cap of the super-autodyne tube. No signal will come through unless the tube is oscillating, and the stage functioning correctly. The R. F. tube, of course, can be checked, lastly by connecting the broadcast test oscillator to the antenna and ground binding posts of the receiver.



TRANSFORMER CORP. OF AMERICA

CLARION SERIES 100 SUPERHETERODYNE



READJUSTING TRIMMERS

Number 1 is the antenna trimmer.

Number 2 is the gang condenser trimmer tuning the grid of the Super-autodyne.

Number 3 is the gang condenser trimmer tuning the plate (or oscillator of the super-autodyne).

Number 4 is the oscillator padding trimmer.

Number 5 is the Super-autodyne plate trimmer.

Number 6 is the I. F. grid trimmer.

Number 7 is the second detector grid trimmer.

To readjust the trimmer, it will be necessary that a good design of 175 k. c. oscillator be employed, and that a dependable broadcast test oscillator be on hand so that stages handling intermediate frequency, and those handling radio frequency can be thoroughly checked. It is advisable to use a bakelite screwdriver when making any of these adjustments.

First, connect the 175 k. c. oscillator output leads from the control grid cap of the super-autodyne tube to ground. Do not remove any of the tubes from the sockets, and it is not necessary to disconnect the grid cap clip from the tube. Reset trimmers numbers 5, 6 and 7 for maximum output. While this test oscillator is working into the intermediate frequency stages, no adjustment of the tuning condenser on the receiver will have any effect, inasmuch as the intermediate frequency stage is fixed tuned.

If your test oscillator is properly designed, it will supply exactly 175 k. c., and when trimmers number 5, 6 and 7 are set for maximum output, they will be correctly adjusted and should be sealed.

Next, disconnect the 175 k. c. test oscillator and connect to the antenna binding post of the receiver, the output lead from your broadcast test oscillator, or tune in a broadcast signal around 1400 k. c., then reset trimmers numbers 2 and 1 respectively for maximum output. This adjustment will track the super-autodyne grid circuit of the R. F. stage.

To check the calibration of the receiver, whether it be high or low, trimmer number 3 should be reset until a station of known high frequency is brought in on the correct dial marking with peak volume. If your broadcast test oscillator is accurately calibrated, it might be used in place of the broadcasting station signal. In this adjustment, a broadcast station or test oscillator signal at about 1400 k. c. should be chosen. The setting of the trimmer at 1400 k. c. is more critical than it would be at 600 k. c.; calibration, therefore more accurate.

The next adjustment is important and not easily explained in writing, so pay close attention to the following instruction. We will now balance the oscillator to the r. f, and first detector stages.

Tune the external broadcast test oscillator and the receiver both to 600 k.c., then slowly increase or decrease the capacity of No. 4 (oscillator padding trimmer), at the same time and continuously tuning back and forth across the signal with the receiver tuning condenser gang. The output meter needle will now be swinging up and down in step with the variation in tuning. Watch the peak of this swinging closely and readjust No. 4 trimmer until the swinging needle reaches its highest peak.

Retune the receiver and broadcast test oscillator to 1400 k.c. and re-check trimmer No. 3 to make sure that the adjustment of No. 4 has not thrown the receiver out of calibration. If it has, then readjust No. 3 until the calibration is correct, (as previously explained), and check on trimmers No. 2 and No. 1, to make sure that the adjustment of No. 4 has not reduced the sensitivity.

CLARION SERIES 100 SUPERHETERODYNE

P-1038	Dial light	$ 0.35
P-1049	Grid cap clip	.05
P-1100	Autodyne Cath. cond. .008	.25
P-1459	Tube shield base	.10
P-1472	Tube shield	.10
P-1569	Autodyne Cath. resistor 4000 ohms	.55
P-1593	Type 24 socket	.20
P-1595	Type 80 socket	.20
P-1634	Ant. ground binding post	.25
P-1682	Type 51 socket	.20
P-1683	Type 47 socket	.20
P-1689	Autodyne trimmer cond. .008	.30
P-1690A	260 ohm wire wound resistor	.25
P-1755	Pentode cont. grid resistor, 500,000 ohms	.35
P-1778	2nd det. plate resistor, 200,000 ohms	.30
P-1819	Voltage dividing resistor	.75
P-3050	Speaker diaphragm	.55
P-4033	Escutcheon plate	.55
P-4035	Vol. cont. and on-off switch	2.00
P-4037	Large knobs	.30
P-4045	I. F. coil (unshielded)	.60
P-4047	Small knobs	.25
P-4088	2nd det. cathode Resistor 20,000 ohms	25
G-1274	Filter choke	1.75
G-1324	Output transformer	1.50
G-1357	Voice coil and spider assembly	.75
G-1360	Speaker complete	12.50
G-1363	Trimmer condenser	.45
G-1372	Antenna and R. F. coil shield	.25
G-1373	Autodyne coil	2.00
G-1376	R. F. coil, less shield	.75
G-1378	Autodyne trimmer cond. (insulated)	.50
G-1379	Dial and scale assembly	1.50
G-1383	Power transformer 110 v. 60 cycle	3.50
G-1383A	Power transformer 110 v. 25 cycle	7.20
G-1383B	Power transformer 220 v. 60 cycle	7.20
G-1384	Filter pack, 60 cycle	3.50
G-1384A	Filter pack, 25 cycle	4.50
G-1385	By-pass condenser pack	1.50
G-1386	Antenna coil	.75

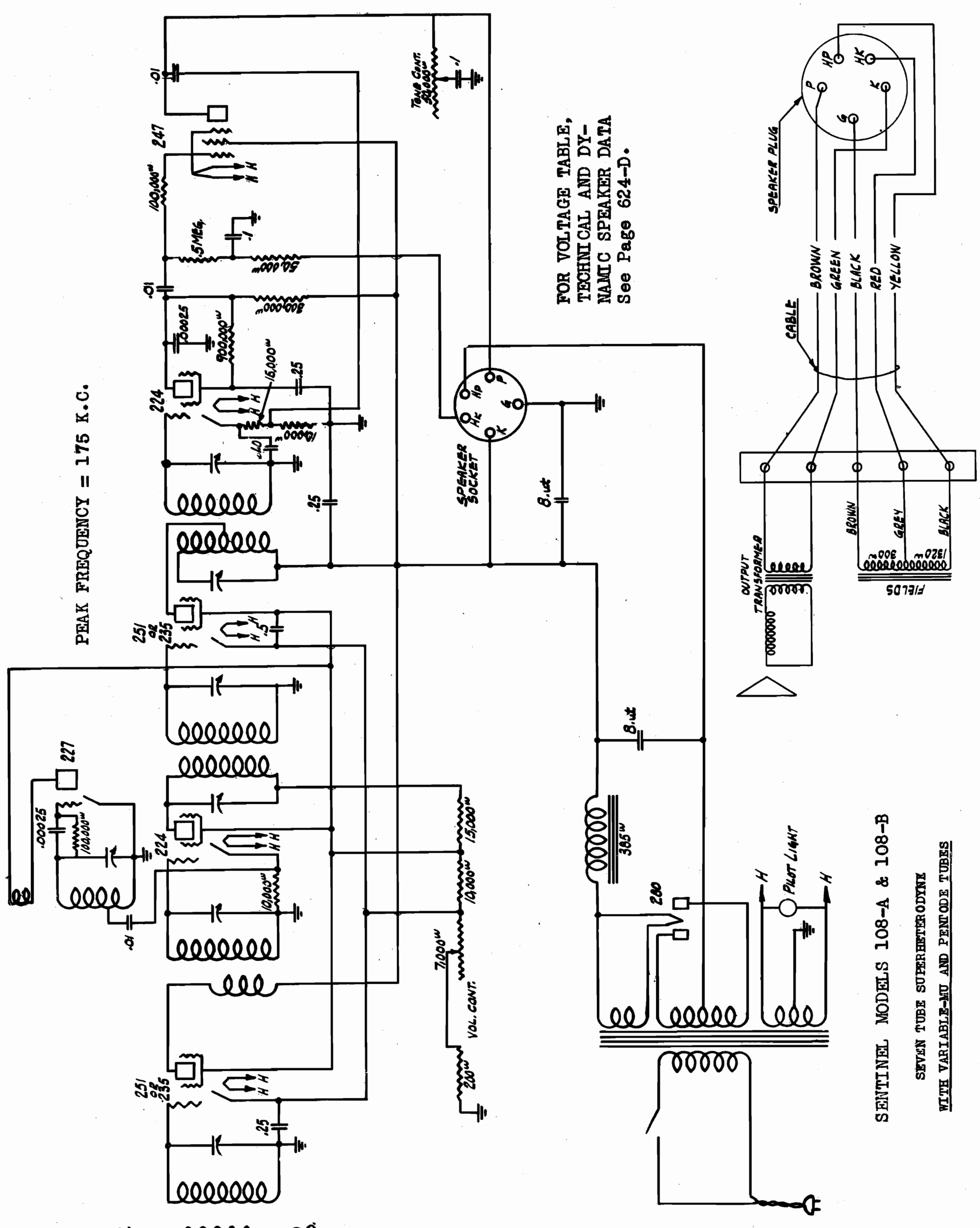
CONTINUITY TEST TABLES

Using 10 Volt Scale 1000 Ohm Per Volt Meter and 4½ Volt Battery

Circuit Tested	From	To	Readings
R. F. Grid	Rect. Fil. Prong	R. F. Grid Clip	1.5
R. F. Screen	Rect. Fil. Prong	R. F. Screen Prong	2.2
R. F. Plate	Rect. Fil. Prong	R. F. Plate Prong	4.4
R. F. Cathode	Rect. Fil. Prong	R. F. Cathode Prong	1.5
Autodyne Grid	Rect. Fil. Prong	Autodyne Grid Clip	1.5
Autodyne Screen	Rect. Fil. Prong	Autodyne Screen Prg.	2.2
Autodyne Plate	Rect. Fil. Prong	Autodyne Plate Prg.	4.5
Autodyne Cathode	Rect. Fil. Prong	Autodyne Cath. Prg.	1.3
I. F. Grid	Rect. Fil. Prong	I. F. Grid Clip	1.5
I. F. Screen	Rect. Fil. Prong	I. F. Screen Prong	2.2
I. F. Plate	Rect. Fil. Prong	I. F. Plate Prong	4.4
I. F. Cathode	Rect. Fil. Prong	I. F. Cathode Prong	1.5
2nd Det. Grid	Rect. Fil. Prong	2nd Det. Grid Clip	1.5
2nd Det. Screen	Rect. Fil. Prong	2nd Det. Screen Prg.	2.2
2nd Det. Plate	Rect. Fil. Prong	2nd Det. Plate Prong	.2
2nd Det. Cathode	Rect. Fil. Prong	2nd Det. Cath. Prong	.8
Pent. Cont. Grid	Rect. Fil. Prong	Pent. C. G. Prong	.1
Pent. Plate	Rect. Fil. Prong	Pent. Plate Prong	4.4
Pent. S. C. Grid	Rect. Fil. Prong	Pent. S. C. Grid Prg.	4.5
Ant. Pri.	Antenna Post	Gnd. Post	4.5
Pwr. Trans. Pri.	Across	A. C. Plug	4.5
Pwr. Trans. Sec.	Across	Rect. Plates	4.3
Spkr. Field	Red Lead Cable	Black Lead Cable	4.2
Spkr. V. C.	Green Lead Cable	Black Lead Cable	4.5

TRANSFORMER CORP. OF AMERICA

UNITED AIR CLEANER CORP.



UNITED AIR CLEANER CORP.

MODELS 108-A, 108-B and MODEL 109.

INTERMEDIATE TRANSFORMERS:
The intermediate transformers are of the band pass type and of exceptionally high uniform gain. They are tuned to 175 kilocycles. The intermediate frequency trimmers are mounted on an isolantite base, preventing the transformer from becoming detuned due to the trimmer condensers absorbing moisture or warping. For this reason it should rarely, if ever, be necessary to re-track the intermediate frequency trimmers. In the event that it should be advisable to re-align the intermediate frequency coils, it is absolutely essential that a 175 kilocycle oscillator and an output measuring device be used.

ALIGNMENT OF RECEIVER:
Because of the construction and thorough impregnation of the intermediate coils, the intermediate stages should rarely need re-tracking. Only when an intermediate coil has become defective due either to an open or burned out winding, should it be necessary to re-adjust the intermediate trimmers. Should this occur, it is necessary that an oscillator be used and the intermediate trimmers be adjusted at 175 kilocycles. To align the intermediate stages, connect the high side of the oscillator output to the grid circuit of the first detector, which is done by disconnecting the grid cap of the 224 first detector and connecting the high side of the test oscillator to the control grid of this tube. The ground side of the test oscillator should be connected to the ground post on the chassis. Set the oscillator at 175 kilocycles and adjust the output of the oscillator so that a convenient reading is obtained on the output meter. Be sure that the output from the oscillator is not so large that it will overload the second detector. If during the alignment the meter goes off scale, reduce the output of the test oscillator or adjust the receiver volume control.

The trimmers of the intermediate coils are accessible through the small holes in the top of the intermediate shield can. There are two trimmers to each intermediate coil. Align the grid trimmer of the first intermediate coil. After a maximum reading is obtained by adjusting the grid trimmer on the first intermediate, adjust the primary for maximum reading and then re-check the grid side to make certain the alignment of the secondary has not been changed by the adjustment of the primary. The same procedure is followed in aligning the second intermediate coils. After both intermediate coils are properly aligned the adjustment of the intermediate stage is complete and they should not be further disturbed.

Replace the grid cap on the first detector and connect the oscillator output leads to the antenna and ground posts of the receiver and set the oscillator at 1435 kilocycles. Then tune the receiver to 1435 kilocycles on the dial. It is important that the receiver be tuned to this point. If the receiver is out of the cabinet it will be necessary to use some temporary indicator so that the position 1435 kilocycles on the dial may be accurately located. (This indicator should be set so that when the variable condensers are at the maximum capacity stop the indicator points to the last line on the dial at the low frequency end.) Then track the variable condensers by adjusting the trimmer condensers in the following order: Oscillator, antenna and radio frequency - (reading from the front of the receiver toward the back, the variable condenser sections are : Oscillator, antenna and radio frequency). After the variable condensers have been properly tracked at 1435 kilocycles, adjust the oscillator to 1295 kilocycles. Tune the receiver to this frequency. Check alignment of the condensers at this point by bending the end plate of the rotors in and out, noting the change in reading on the output meter. If when the plates are bent in the reading is increased, it is an indication that that particular section requires more capacity and the end plate should be permanently bent in at this point; or, if when the end plate is bent away, the reading is increased, the end plate should be bent away permanently, as it is an indication that that particular section requires less capacity at that particular point. The variable condensers should be checked in this manner at 1295, 880, 650 and 550 kilocycles. These points have been chosen so as to take advantage of the slots in the end plates of the variable condensers. This procedure of bending plates should rarely be necessary on the oscillator section, as the plates of the oscillator section are especially designed to properly track over the broadcast spectrum, providing the antenna and radio frequency stages are correctly aligned.

VOLTAGE TABLE

Never check voltages until all tubes are fully warmed up to proper operating condition. The voltage table given below is taken at 115 volts line with a Model 547 Weston set checker. It must be remembered that the voltage readings taken vary directly as the line voltage and also with the accuracy of the meters used. A variation of 10% plus or minus is permissible.

115 V. Line   Volume Control Full On

TUBE VOLTAGES

Type of Tube	Position of Tube	Filament Volts	B Volts	C Volts	NORMAL PLATE M.A.	Screen Volts
227	Oscillator	2.4	62.5		4.75	
235	Radio Frequency	2.4	240	2.15	2.75	27
224	1st Detector	2.4	230	4.35	.5	65
235	Intermediate	2.4	237	2.15	2.75	72
224	2nd Detector	2.4	100*	2.1*	2.5	35*
247	Pentode	2.4	250	16.5**	32.5	250
280	Rectifier	4.95			27.ea.plate	

SENTINEL
MODEL 108-A
MODEL 108-B

*These readings are only comparative and are not true voltages applied. The volt meter, when the readings are taken at these points, is in series with a very high resistance.

** To read the 247 bias, read between H.K.speaker socket and ground.

ELECTRO DYNAMIC SPEAKER:
The electro dynamic speaker has a tapped field winding - one section of which is 1320 ohms and is utilized as the second choke in the filter circuit. The other section, which is 300 ohms, is used to obtain the proper bias for the 247 tube, as well as acting as an additional filter choke.

UNITED AIR CLEANER CORP.

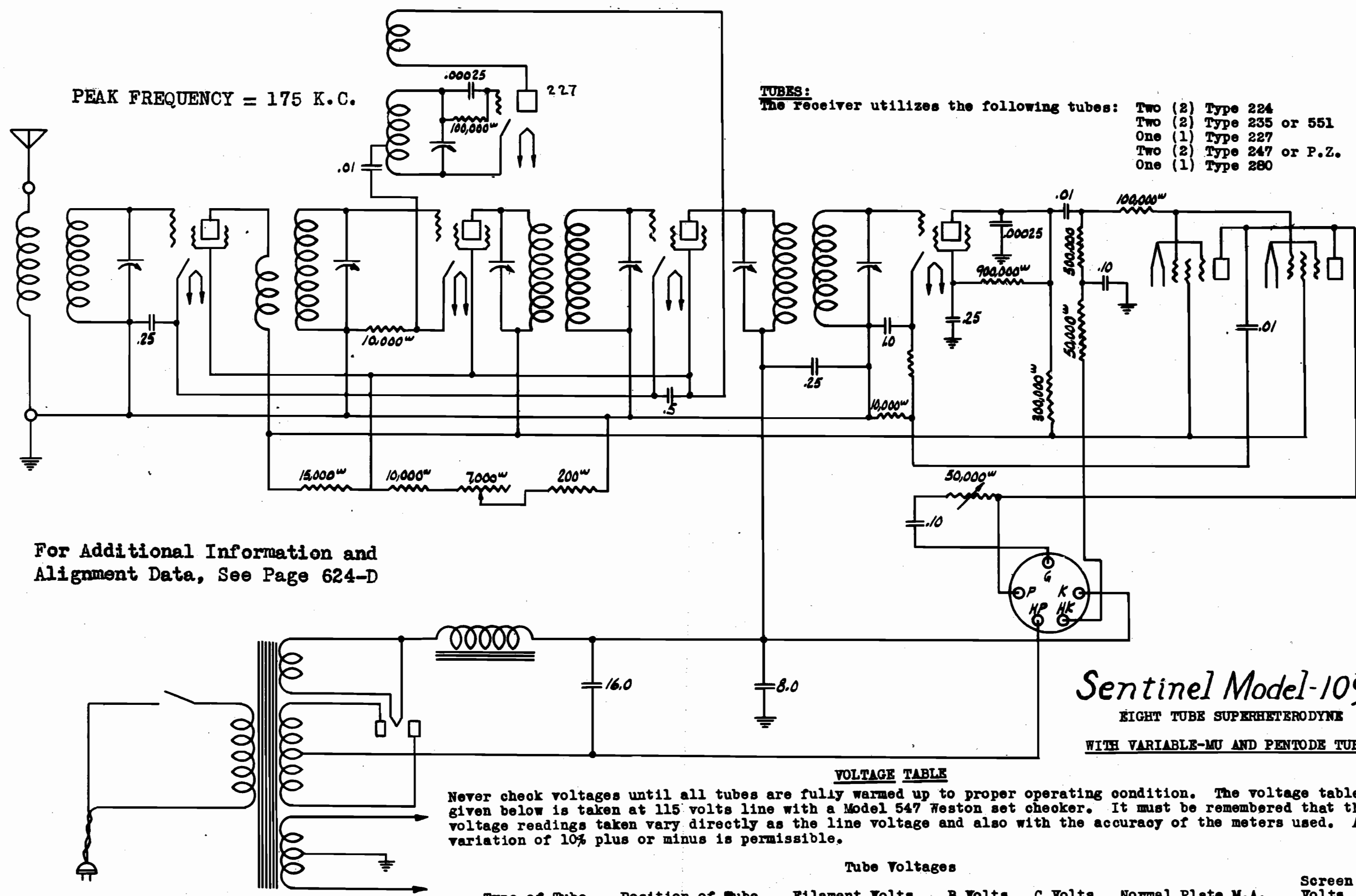
Sentinel Model-109.

EIGHT TUBE SUPERHETERODYNE

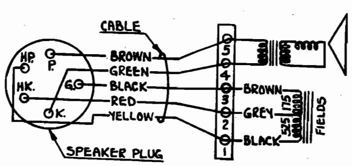
WITH VARIABLE-MU AND PENTODE TUBES

TUBES:
The receiver utilizes the following tubes:
Two (2) Type 224
Two (2) Type 235 or 551
One (1) Type 227
Two (2) Type 247 or P.Z.
One (1) Type 280

PEAK FREQUENCY = 175 K.C.



For Additional Information and Alignment Data, See Page 624-D



VOLTAGE TABLE

Never check voltages until all tubes are fully warmed up to proper operating condition. The voltage table given below is taken at 115 volts line with a Model 547 Weston set checker. It must be remembered that the voltage readings taken vary directly as the line voltage and also with the accuracy of the meters used. A variation of 10% plus or minus is permissible.

Tube Voltages

Type of Tube	Position of Tube	Filament Volts	B Volts	C Volts	Normal Plate M.A.	Screen Volts
227	Oscillator	2.4	62.5		4.75	
235	Radio Frequency	2.4	240	2.15	2.75	27
224	1st Detector	2.4	230	4.35	.5	65
235	Intermediate	2.4	237	2.15	2.75	72
224	2nd Detector	2.4	100*	2.1*	2.5	35*
247	Pentode	2.4	220	16.5**	32.5	250
247	Pentode	2.4	220	16.5**	32.5	250
280	Rectifier	4.95			47.5 ea.plate	

115 V. Line   Volume Control Full On

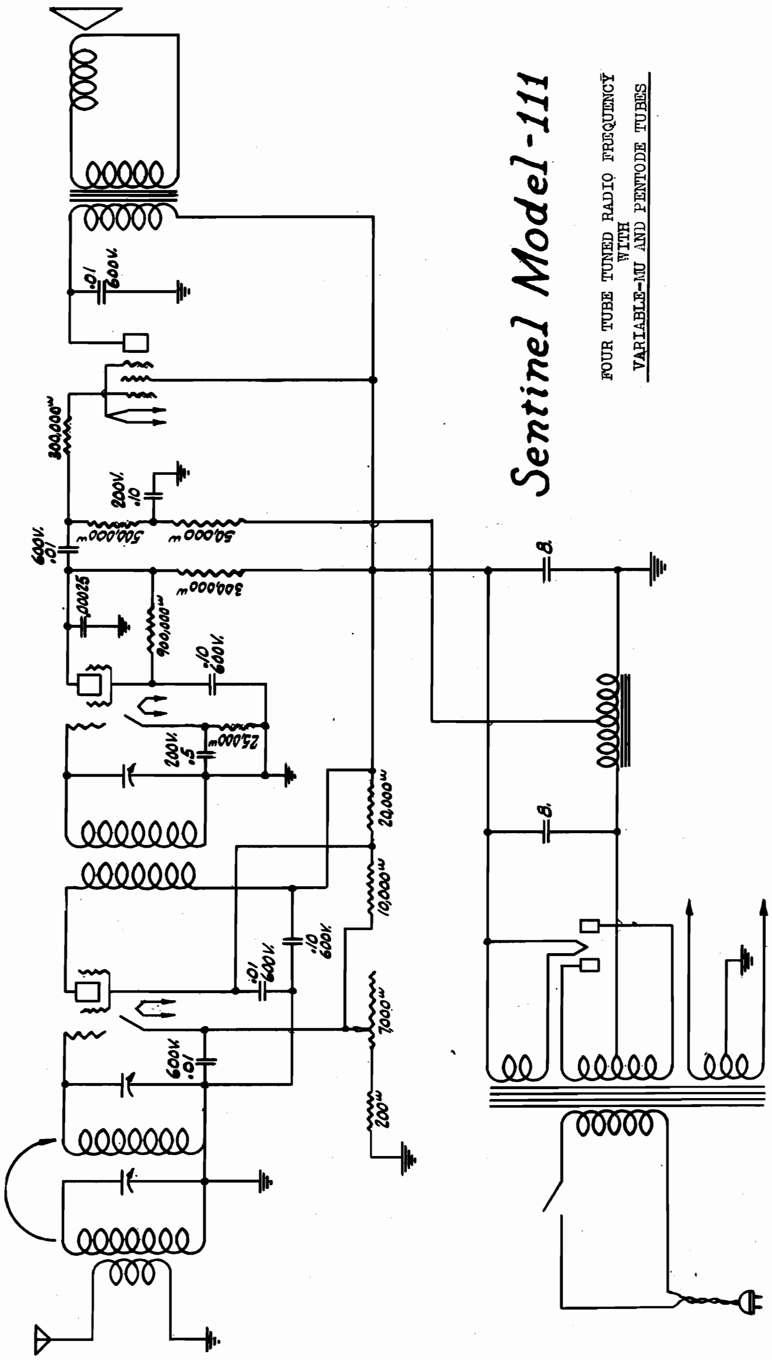
*These readings are only comparative and are not true voltages applied. The volt meter, when the readings are taken at these points, is in series with a very high resistance.

**To read the 247 bias, read between H.K.speaker socket and ground.

ELECTRO DYNAMIC SPEAKER:
The electro dynamic speaker has a tapped field winding - one section of which is 525 ohms and is utilized as the second choke in the filter circuit. The other section, which is 175 ohms, is used to obtain the proper bias for the 247 tubes. as well as acting as an additional filter choke.

VOLTAGE REGULATOR TUBE:
Shipped with each receiver is a fuse plug containing a 4 ampere fuse and one spare 4 ampere fuse. Frequent and continued burning out of the fuse is an indication that either there is a defective tube, or some part of the receiver is defective, and these possible sources of trouble should be carefully checked if this condition exists. In districts where the line voltage is excessively high or low or fluctuating, the fuse plug may be substituted by a line voltage regulator tube which will maintain the voltage applied to the primary more constant. Either an Amperite #10-10 or Duresite #101 may be used.

UNITED AIR CLEANER CORP



Sentinel Model-111

FOUR TUBE TUNED RADIO FREQUENCY
WITH
VARIABLE-MU AND PENTODE TUBES

ALIGNMENT OF RECEIVER:
To aligh receiver it is recommended that an oscillator and output meter be used, as much better results can be obtained than by aligning on a broadcast signal. However, in either case the procedure is the same. To align the variable condensers connect the high side of the test oscillator to the antenna lead and the low side of the oscillator to the ground lead and tune the oscillator to 1500 kilocycles, adjusting the output of the oscillator so that a convenient reading is obtained on the output meter. If during the alignment the meter goes off scale, adjust the output of the test oscillator or reduce the output by adjusting the receiver volume control. It is important that the receiver be tuned to minimum capacity stop. Then track the variable condensers at this point by adjusting the trimmer condensers, which are mounted on top of the variable condensers, to maximum reading on the output meter in the following order: Antenna, Coupling Stage and Radio Frequency Stage. The variable condenser sections are: (Antenna, Coupling Stage, and Radio Frequency Stage looking at the receiver from the front, reading toward the back.)

After the variable condensers are properly aligned at 1500 kilocycles by adjusting the trimmer condensers, adjust the oscillator to 1295 kilocycles. Tune the receiver to this frequency, making sure that the receiver is tuned exactly in resonance with the incoming signal, and check alignment of the condensers at this point by bending the end plate of the rotors on the antenna coupling stage and radio frequency stage in the order named, noting the change in reading on the output meter. If when the plates are bent in the reading is increased, it is an indication that that particular section requires more capacity at that point of the variable condenser and the end plate should be permanently bent; or if when the end plate is bent away the reading is increased, that section requires less capacity at that particular point, and the end plate should be permanently bent away from the stator. Each section of the variable condenser should be checked in this manner at 1295, 800, 750 and 550 kilocycles. These frequencies have been chosen so as to take advantage of the slots in the end plates of the variable condenser.

TUBES:

1 Type 224 Detector
1 Type 235 or 551 Radio Frequency
1 Type 247 Output
1 Type 280 Rectifier

ELECTRO DYNAMIC SPEAKER:
The electro dynamic speaker has a tapped winding, one section of which is 1320 ohms and the other section 300 ohms is used to obtain the proper bias for the 247 tube. The field winding is used as the filter choke.

Tube Voltage

Type of Tube	Position of Tube	Filament Volts	Plate Volts	C Volts	Normal Plate M.A.	Space Charge Grid	Screen Volts
235	Radio Frequency	2.4	250	2.5	4		90
224	Detector	2.4	65*	2.5*	.4		37.5*
247	Output	2.4	230	16.5*	35	250	
280	Rectifier	5.			30 M.A.		

115 V. Line   Volume Control Full On

*These readings are only comparative and are not true voltages applied. The volt meter, when the readings are taken at these points, is in series with a very high resistance.

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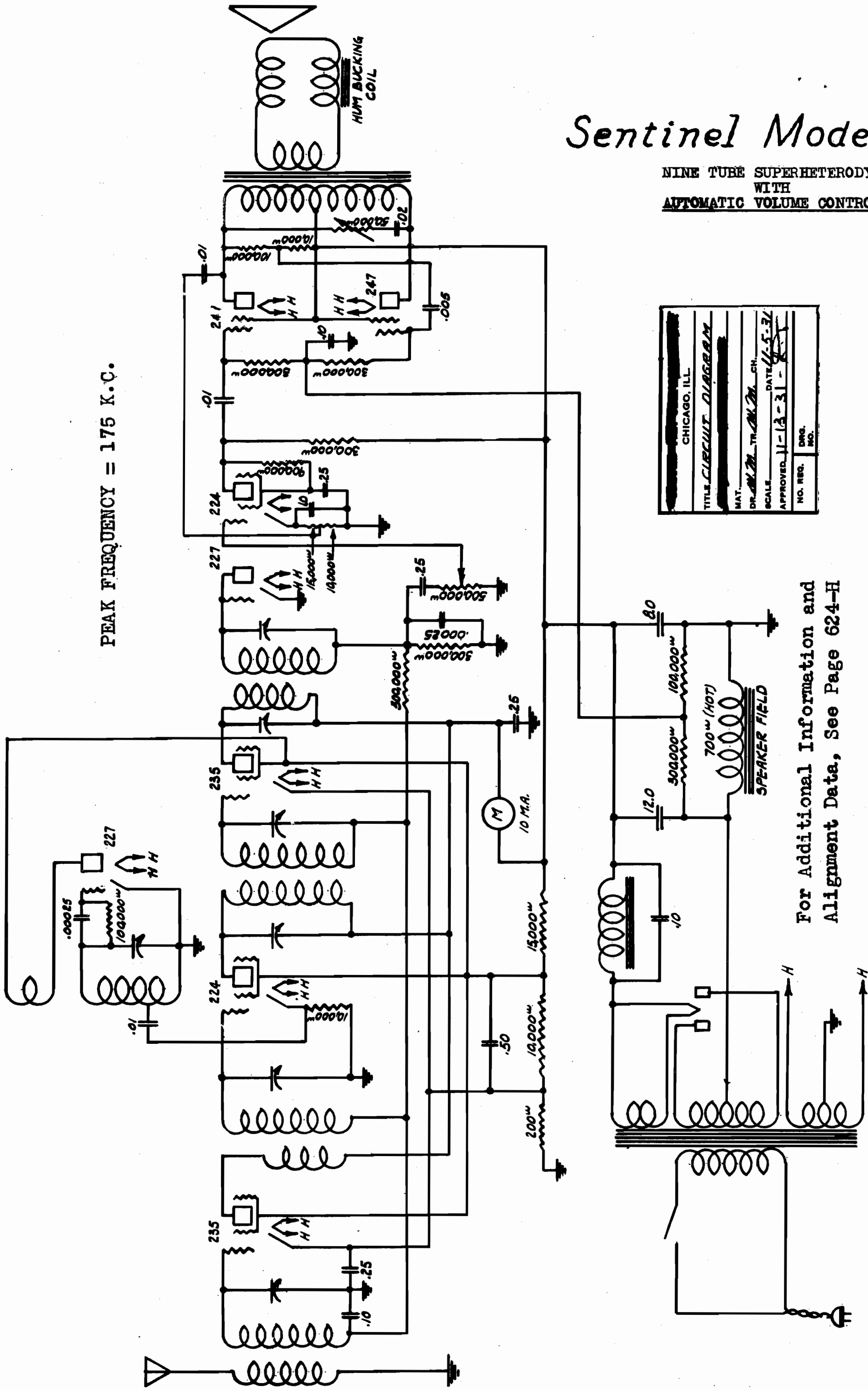
Sentinel Model-114

**NINE TUBE SUPERHETERODYNE
WITH
AUTOMATIC VOLUME CONTROL**



ELECTRO DYNAMIC SPEAKER:
The electro dynamic speaker field winding, which is 700 ohms, is utilized as an additional choke in the filter circuit. The correct bias for the two 247 output tubes is obtained from the voltage drop across the speaker field shunt resistors.

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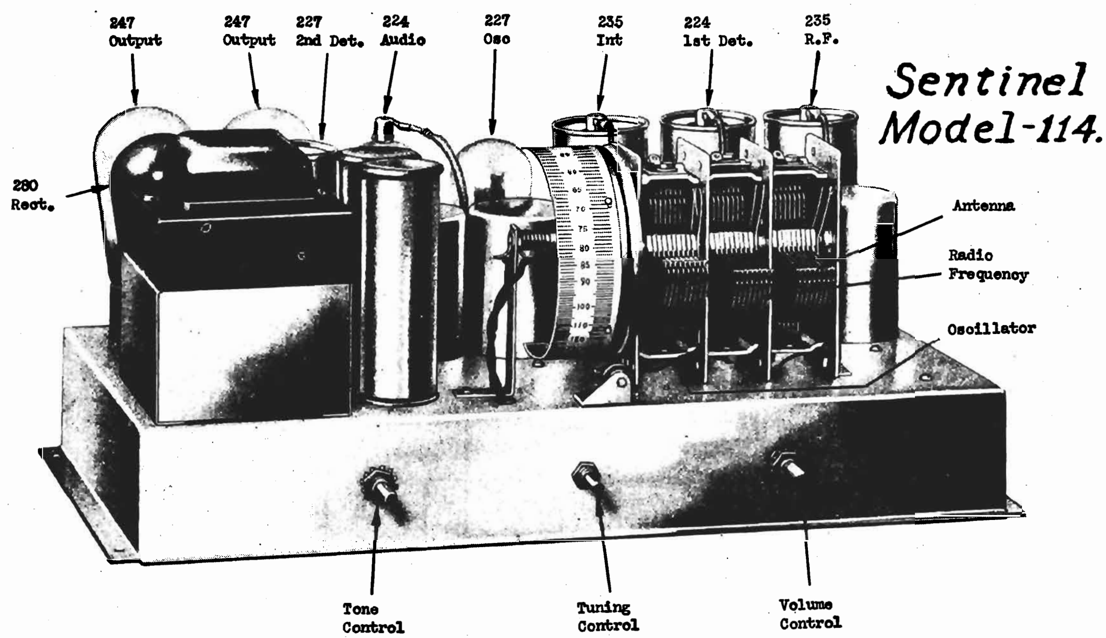

ALIGNMENT OF RECEIVER:

Because of the construction and thorough impregnation of the intermediate coils, the intermediate stages should rarely need retracking. Only when an intermediate coil has become defective due to an open or burned out winding, should it be necessary to readjust the intermediate trimmers. Should this occur, it is necessary that an oscillator be used and the intermediate trimmers be adjusted at 175 kilocycles. To align the intermediate stages, connect the high side of the oscillator output to the grid circuit of the first detector, which is done by disconnecting the grid cap of the 224 first detector and connecting the high side of the test oscillator to the control grid of this tube. The ground side of the test oscillator should be connected to the ground post on the chassis. Set the oscillator at 175 kilocycles and adjust the output of the oscillator so that a convenient reading is obtained on the output meter. Be sure that the output from the oscillator is not so large that it will overload the second detector. If during the alignment the meter goes off scale, reduce the output of the test oscillator or adjust the receiver volume control.

The trimmers of the intermediate coils are accessible through the small holes in the bottom of the chassis. There are two trimmers to each intermediate coil. Align the grid trimmer of the first intermediate coil. After a maximum reading is obtained by adjusting the grid trimmer on the first intermediate, adjust the primary for maximum reading and then recheck the grid side to make certain the alignment of the secondary has not been changed by the adjustment of the primary. The same procedure is followed in aligning the second intermediate coils. After both intermediate coils are properly aligned the adjustment of the intermediate stage is complete and they should not be further disturbed.

Replace the grid cap on the first detector and connect the oscillator output leads to the antenna and ground posts of the receiver and set the oscillator at 1435 kilocycles. Then tune the receiver to 1435 kilocycles on the dial. It is important that the receiver be tuned to this point. If the receiver is out of the cabinet it will be necessary to use some temporary indicator so that the position 1435 kilocyles on the the dial may be accurately located. (This indicator should be set so that when the variable condensers are at the maximum capacity stop the indicator points to the last line on the dial at the low frequency end.) Then track the variable condensers by adjusting the trimmer condensers in the following order: Oscillator, antenna and radio frequency - (reading from the front of the receiver toward the back, the variable condenser sections are: Oscillator, antenna and radio frequency). After the variable condensers have been properly tracked at 1435 kilocycles, adjust the oscillator to 1295 kilocycles. Tune the receiver to this frequency. Check alignment of the condensers at this point by bending the end plate of the rotors in and out, noting the change in reading on the output meter. If when the plates are bent in the reading is increased, it is an indication that that particular section requires more capacity and the end plate should be permanently bent in at this point; or, if when the end plate is bent away the reading is increased, the end plate should be bent away permanently, as it is an indication that that particular section requires less capacity at that particular point. The variable condensers should be checked in this manner at 1295, 880, 650 and 550 kilocycles. These points have been chosen so as to take advantage of the slots in the end plates of the variable condensers. This procedure of bending plates should rarely be necessary on the oscillator section, as the plates of the oscillator section are especially designed to properly track over the broadcast spectrum, providing the antenna and radio frequency stages are correctly aligned.

Tube Voltages

Type of tube	Position of Tube	Filament Volts	B Volts	C Volts	Normal Plate M.A.	Screen Volts
227	Oscillator	2.4	62.5		4.75	
235	Radio Frequency	2.4	240	2.15	2.75	27
224	1st Detector	2.4	230	4.35	.5	65
235	Intermediate	2.4	237	2.15	2.75	72
227	2nd Detector	2.4				
247	Pentode	2.4	220	8.**	32.5	250
247	Pentode	2.4	220	8.**	32.5	250
280	Rectifier	4.9			47.5 ea.plate	
224	1st Audio	2.4	100	2.1*	.5	35*

115 V. line Volume Control Full On

**To read the 247 bias, read between 247 grid and ground.

*These readings are only comparative and are not true voltages applied. The volt meter, when the readings are taken at these points, is in series with a very high resistance.

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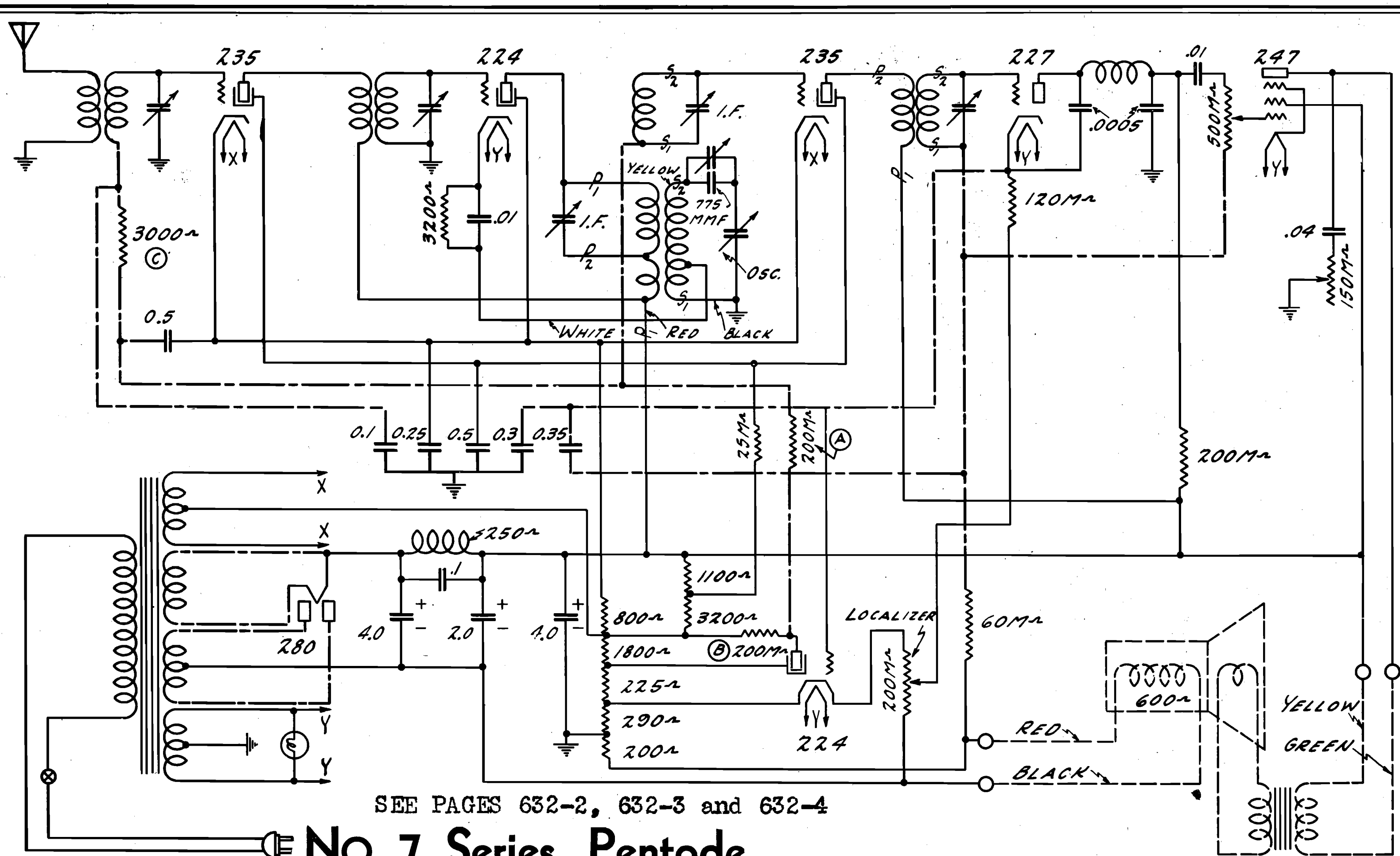

SEE PAGES 632-2, 632-3 and 632-4

NO. 7 Series, Pentode

— RUBBER COVERED WIRE

PEAK FREQUENCY 262 KC
VOLTAGE DATA ON PAGE 632-2
SOCKET LAYOUT ON PAGE 632-2

Ⓐ AFTER SERIAL Nº 1,062,700 RESISTOR WILL BE OMITED.
Ⓑ AFTER SERIAL Nº 1,062,700 RESISTOR WILL BE 300MΩ
Ⓒ AFTER SERIAL Nº 1,070,000 RESISTOR CHANGED TO 5 μh. CHOKE.

There are certain features to be noted in this receiver. The mixer tube is of the autodyne type, wherein it functions as the mixer (1st detector) and at the same time function as the oscillator. The structure of the oscillator-IF transformer is shown upon page 623-3. The structure of the 2nd IF transformer is also shown upon the same page. Take not of the changes recorded upon the wiring diagram. See the footnotes concerning the significance of the numbers contained within the circles. A "Localizer" unit adjustment associated with the automatic volume control tube is discussed on page 632-2. Special alignment data required because of the autodyne circuit is shown upon page 632-5.

FOR 25 CYCLE RECEIVER MODEL 7 X, SEE DATA ON PAGE 632-3

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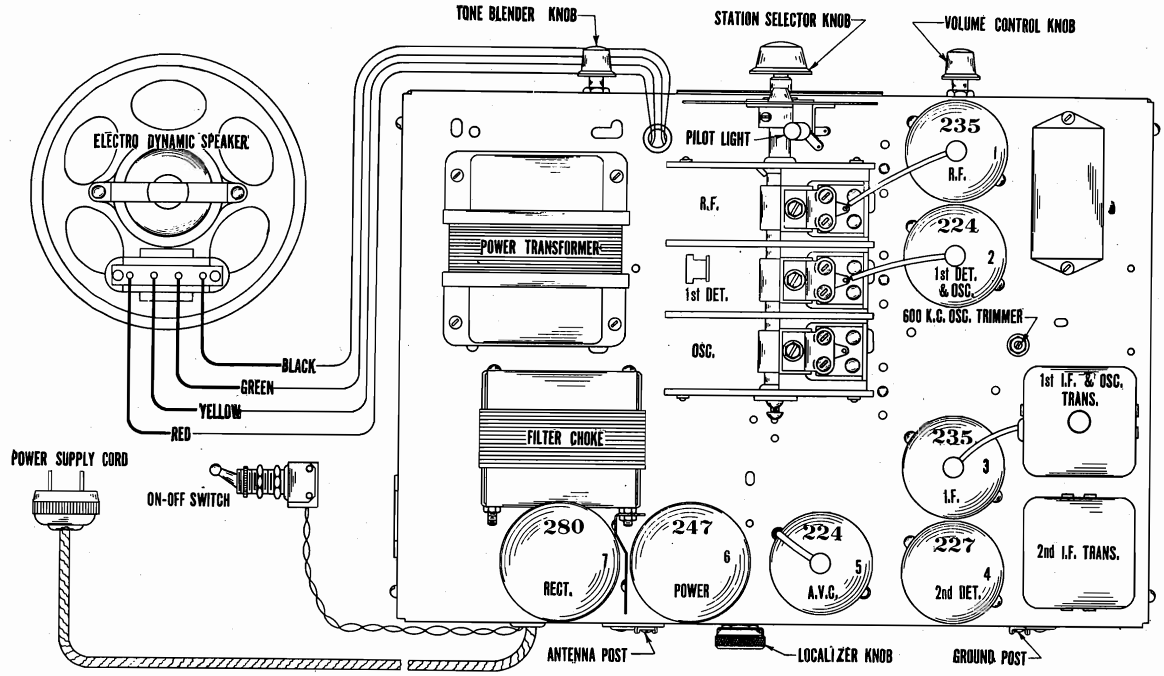

—Top View of No. 7 Chassis showing Tube Sequence and Speaker Connections

No. 7 CHASSIS—VOLTAGES AT SOCKETS—LINE VOLTAGE 115
VOLUME CONTROL AT MAXIMUM—LOCALIZER AT NORMAL SETTING

Type of Tube	Position of Tube	Function	Across Filament or Heater	Plate to Cathode	Grid to Cathode	Screen to Cathode	Screen MA	Cathode to Heater	Plate MA	Grid Test MA
235	1	R.F.	2.35	150	4.5 (1)	70 (2)	.9	4.5	2.7	4.2
224	2	1st Det. & Osc.	2.35	240	6.4	93	.3	6.4	1.8	2.6
235	3	I.F.	2.35	150	4.5 (1)	70 (2)	.9	4.5	2.7	4.2
227	4	2nd Det.	2.35	150	12–24 (3)			0–10 (3)	.2–.5 (3)	.21–.51 (3)
224	5	A.V.C.	2.35	60	0–15 (3)	9	0 (4)	12	0 (4)	0 (4)
247	6	Power	2.35	220	16 (5)	240	6.4		34	40
280	7	Rect.	4.9						39 Per Plate	

(1) This voltage read across 800 ohm resistor.
(2) Voltage as read with 600,000 ohm meter.
(3) Varies with setting of localizer. Voltages read with high resistance meter.
(4) Current zero with no signal and localizer at normal position.
(5) The voltage read across 200 ohm section of voltage divider.

SETTING THE LOCALIZER.

Turn the localizer knob cpunterclockwise as far as it will go. Then turn the knob one quarter turn clockwise. Next tune in a fairly strong signal and reduce the volume by means of the volume control knob on the front panel. Then turn the localizer knob to the extreme clockwise position. This will cause plate current cutoff in the RF and IF tubes. Then turn the knob slowly in a counter-clockwise direction until the signal is again heard. With a slight additional turn in the same direction the signal builds up sharply to full strength and this is the correct position of the localizer setting. This adjustment should not be changed unless the set is reinstalled or the tubes are changed. Incorrect adjustment of this knob will control the action of the AVC tube in such fashion that the automatic action will commence too soon or too late.

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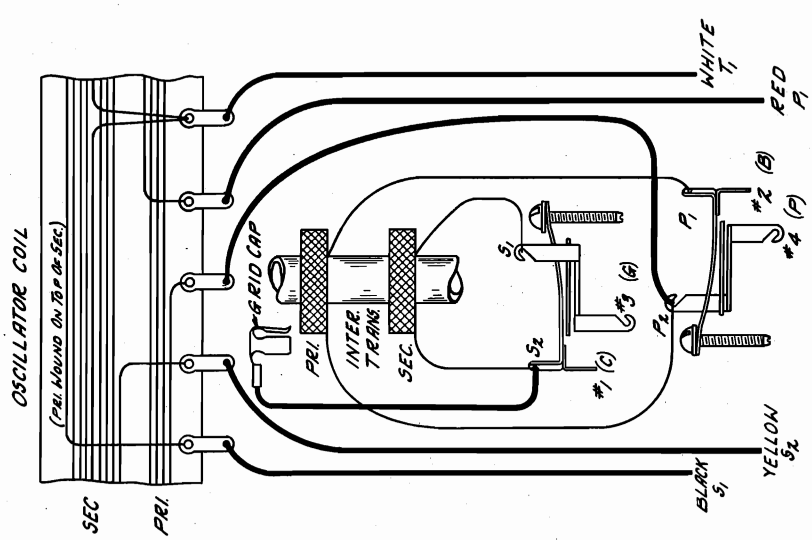
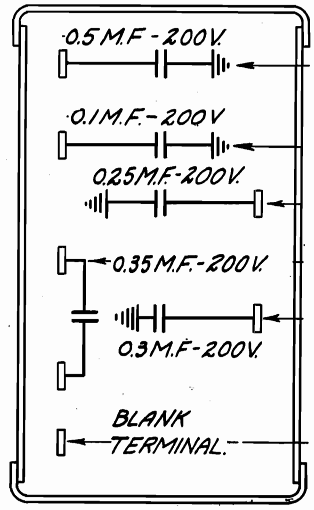
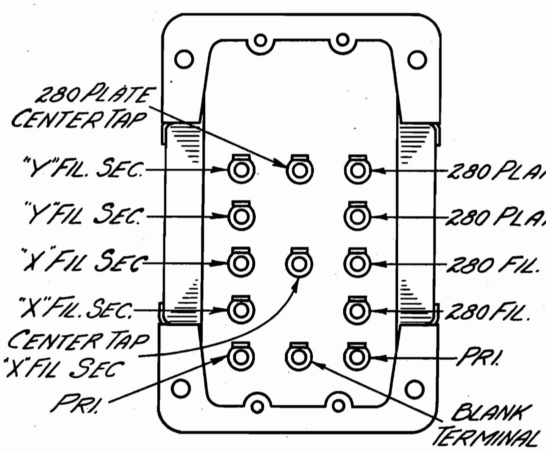


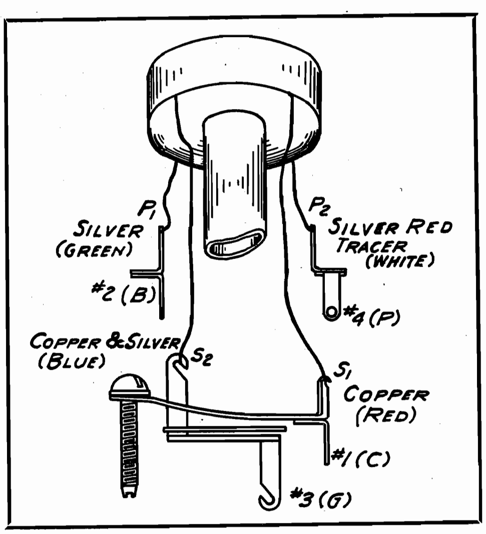
–Wiring Diagram, Osc. and I.F. Assembly



5 Section Condenser Internal Wiring



–Power Transformer Terminals



–Wiring Diagram, 2nd I.F. Assembly

No. 7X Chassis—25 Cycle, 115 Volt

Chassis No. 7X is almost identical in construction with chassis No. 7, except that it is designed for 25 cycle, 115 volt operation. All parts as used in the No. 7 chassis are used in the No. 7X chassis with the exception of the power transformer, .1 Mfd. choke tuning condenser and 2 Mfd. electrolytic filter condenser. These items are replaced by a 25 cycle power transformer, .35 Mfd. choke tuning condenser and a 4 Mfd. electrolytic filter condenser. All of these items for the 25 cycle receiver are shown in the parts list.

The description and testing as covered in the No. 7 Service Notes also applies to the No. 7X.

Referring to Fig. 1 it will be noted that in the 60 cycle, No. 7 chassis the filter choke is tuned with a .1 Mfd. condenser. The purpose of this condenser is to tune the choke so as to offer maximum opposition to the 120 cycle ripple component. In the No. 7X chassis a .35 Mfd. condenser is used to tune the choke so as to offer maximum opposition to the 50 cycle ripple component which is present when 25 cycle power is used. Also in the No. 7X chassis there are three 4 Mfd. filter condensers used, while the No. 7, 60 cycle chassis uses two 4 Mfd. units and one 2 Mfd. unit.

The No. 7X, 25 cycle chassis can be operated satisfactorily from a 60 cycle power supply. If there is excessive hum it will be necessary to remove the .35 choke condenser and replace it with a .1 Mfd. choke condenser, Part No. 2927. The reverse is not true, that is, the No. 7, 60 cycle receiver cannot be operated satisfactorily from a 25 cycle power supply.

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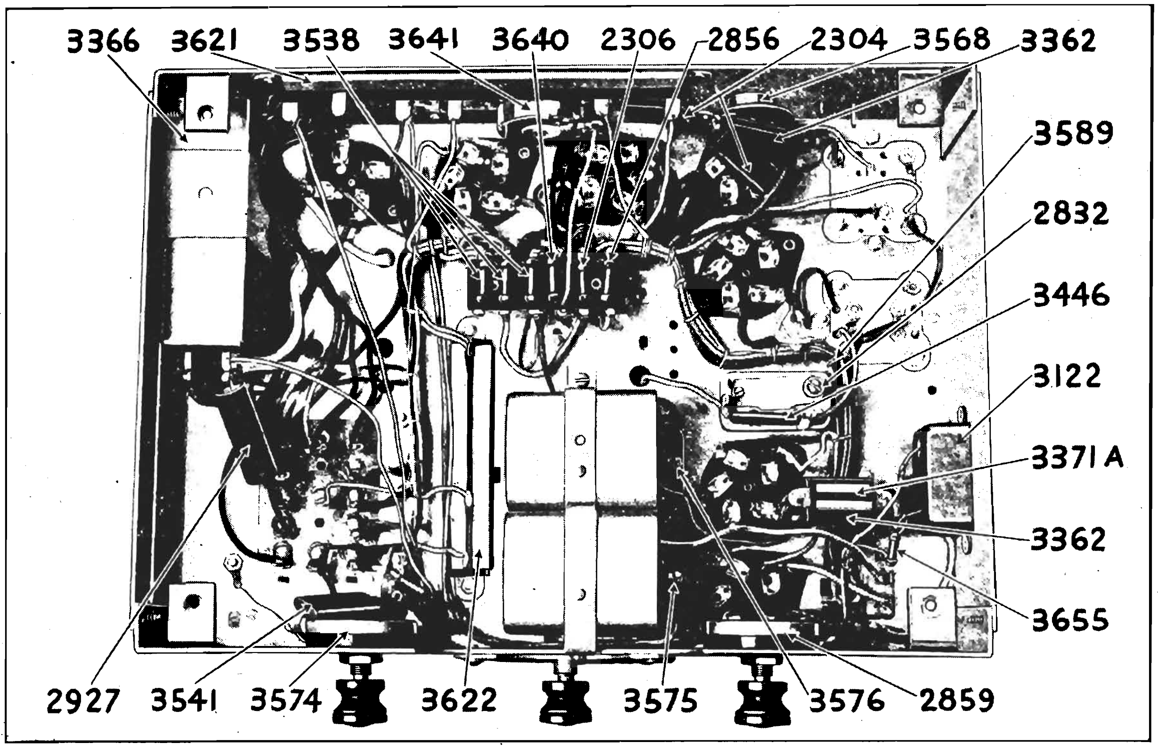

—*No. 7 Chassis, Bottom View*

No. 7 CHASSIS REPLACEMENT PARTS

Parts orders must be accompanied by serial number and model number of chassis. Order through your distributor.

Part No.	*Description*	*No. Used in Set*	*List Price Each*
2304	.0005 Mfd. By-pass Condensers	2	$ .40
2832	Oscillator 600 K.C. Trimmer Condenser	1	.40
2927	.1 Mfd. Choke Condenser for 60 Cycle	1	.40
3683	.35 Mfd. Choke Condenser for 25 Cycle	1	.55
3122	.5 Mfd. By-pass Condenser	1	.70
3362	.01 Mfd. Coupling and By-pass Condensers	2	.30
3366	4 Mfd. Electrolytic Condenser Unit, 450 Volt	2	1.40
3529	2 Mfd. Electrolytic Condenser Unit, 450 Volt	1	1.10
3559	Clamp for Electrolytic Condenser Unit	1	.10
3446	775 Mmf. Oscillator Condenser	1	.45
3541	.04 Mfd. Tone Blender Condenser	1	.30
2306	60,000 Ohm Series Resistor, Carbon	1	.45
2856	25,000 Ohm Series Resistor, Carbon	1	.45
2859	Volume Control 0—500,000 Ohm	1	1.40
3574	Tone Blender 0—150,000 Ohm	1	1.40
3641	Localizer Resistor 0—200,000 Ohm	1	1.20
3371A	3,200 Ohm Biasing Resistor, Wire Wound	1	.40
3537	300,000 Ohm Plate Resistor, Carbon	1	.40
3538	200,000 Ohm Plate and Series Resistors, Carbon	3	.40
3621	3315 Ohm Voltage Divider Resistor, Wire Wound	1	1.10
3622	4300 Ohm Voltage Divider Resistor, Wire Wound	1	.70
3640	120,000 Ohm Bias Resistor, Carbon	1	.40
3655	3,000 Ohm R.F. Resistor, Carbon	1	.40
3575	Antenna Transformer } Sold in matched	1	1.00
3576	1st Detector Transformer } sets of two	1	.60
3562	Can for Antenna and 1st Detector Transformer	1	.65
E.P.	Escutcheon Plate (Specify Model No. of Receiver)	1	.75
3568	Detector Plate Choke Assembly complete	1	.60
3680	R.F. Choke Coil, 5 uh	1	.10
3589	Harness Cable	1	1.00

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No. 7 CHASSIS

Condenser Alignment

Aligning Intermediate Condensers—First align the intermediate condensers. A non-metallic screw driver is preferable for this. Adjust the signal generator for a signal of 262 K.C. The Localizer knob should be at the normal position as explained in the section on this control or else it may be turned to the extreme counter-clockwise position. One of the best ways of reading the output is by means of a rectifier type meter. This meter, if of low range, is connected across the secondary of the output transformer in the speaker. If it is of a high range, it may be connected across the primary of the transformer in series with a large condenser to prevent the flow of D.C. plate current through the meter. In either method of connection, opening the voice coil of the speaker will give a better deflection on the output meter.

Remove the grid cap from the grid connection of the 224 1st detector tube and connect the lead from the signal generator to the grid of the 224 1st detector. The tube shield should be on and the chassis grounded. One way to make this connection is to bring the antenna lead from the signal generator through the place in the shield through which the grid wire passes. A grid cap on the end of the antenna lead of the signal generator will facilitate making this connection. This lead, of course, should be insulated. Another way of making this connection is to cut a hole of about 1″ diameter in a No. 7 chassis tube shield over the 1st detector tube. The signal generator lead can then be passed through this hole to the grid connection of the 224 tube. Connect the ground lead of the signal generator to the ground post of the chassis.

The oscillator coil must be shorted out by grounding the lead from the tap on the secondary. This can be done conveniently by connecting a jumper from ground to the lug on the 3,200 ohm resistor at the end which connects to the oscillator.

The intermediate condenser adjusting screws are reached from the bottom of the chassis. There are two on the porcelain base of the oscillator and 1st I.F. transformer assembly, Part No. 3571 and one on the porcelain base of the 2nd I.F. transformer assembly, Part No. 3644. The volume control should be at maximum setting. Attenuate the signal from the signal generator until the output is 75 volts or less in order to prevent any action of the A.V.C. Then adjust the three intermediate condenser screws until maximum output is obtained on the output meter, keeping the output at 75 volts or less. After all three have been adjusted the first time, go over them again and check the setting for maximum output.

Aligning R.F. and Oscillator Condensers—For adjusting the R.F. and oscillator condensers the signal input from the signal generator should be made to the antenna post. Adjust the signal generator for a signal of exactly 1400 K.C. Then turn the tuning condenser rotor until the pointer is at exactly 1400 on the dial scale. Then adjust the three trimmers on the tuning condenser for maximum output adjusting the oscillator trimmer first (trimmer nearest back of chassis). Turn the screws up or down until greatest deflection on output indicating meter is obtained. Keep the output below 75 volts as explained above.

The next step is to adjust the oscillator 600 K.C. trimmer condenser. The adjusting screw for this condenser is reached from the top of the chassis and is located just in front and to the side of the 1st I.F. and oscillator assembly. Adjust the signal generator for a signal of 600 K.C. and turn the tuning condenser rotor until the output is at maximum. To correctly adjust this oscillator 600 K.C. trimmer it will be necessary to turn the screw to several different positions, using a nonmetallic screw driver preferably. At every position of this adjusting screw turn the tuning condenser rotor until maximum output is obtained. For each position of the adjusting screw there will be a maximum output and the correct position of the adjusting screw is the setting at which the deflection on output indicating meter is the greatest.

Next set the signal generator again for a 1400 K.C. signal and check the adjustment of the tuning condenser trimmers at this frequency for maximum output. Then set the signal generator for a signal of 1000 K.C. and turn the tuning condenser rotor until the output indicating meter shows maximum deflection. Then bend the slotted rotor plate sections of the R.F. tuning condenser sections which are last in mesh, in or out until maximum output is obtained. In some instances it may be necessary to bend the oscillator condenser rotor plate sections also in order to get maximum output but this should be done only as the last resort as it tends to throw the dial calibration off. Tune in a signal at 750 K.C. and then at 600 K.C. and follow the same procedure bending the rotor plate sections last in mesh until maximum output is obtained. Do not change the setting of the oscillator 600 K.C. trimmer in any way after it has once been set as indicated above.

NOTE—In the No. 7 Receivers, starting approximately with Serial No. 1,074,054 the oscillator 600 K.C. trimmer is replaced by a condenser of fixed value and a different dial chart is used. The procedure for aligning the R.F. and oscillator condensers of these receivers is as follows:

Loosen the drive plate set screws and turn the tuning condenser rotor counterclockwise as far as it will go so that the rotor is completely in mesh. Turn the drive plate until the lowest frequency mark is directly under the dial pointer. Then lightly tighten one set screw.

Set the signal generator for a signal of 1400 K.C. and turn the drive plate until the 1400 K.C. mark is under the pointer. Adjust the three trimmer condensers at this frequency until maximum output is obtained, adjusting the oscillator trimmer first (trimmer nearest back of chassis).

Set the signal generator for a signal of 600 K.C. and tune the receiver exactly to this signal. Loosen the drive plate set screw and adjust dial pointer until it is at the 600 K.C. mark on the drive scale. Then tighten the drive plate set screw lightly.

Set the signal generator again for a signal of 1400 K.C. and tune the receiver to this frequency. Readjust the trimmer condensers if necessary until the signal is received with maximum volume when the pointer is at 1400 on the dial chart.

Recheck the calibration at 600 K.C. for maximum output and if it is correct tighten both drive plate set screws firmly, care being taken that the rotor shaft does not slip.

Then set the signal generator for signals of 1,000, 750 and 600 K.C. and check the two R.F. condensers for resonance. Bend the slotted rotor plate sections last in mesh of these two banks until maximum output is obtained.

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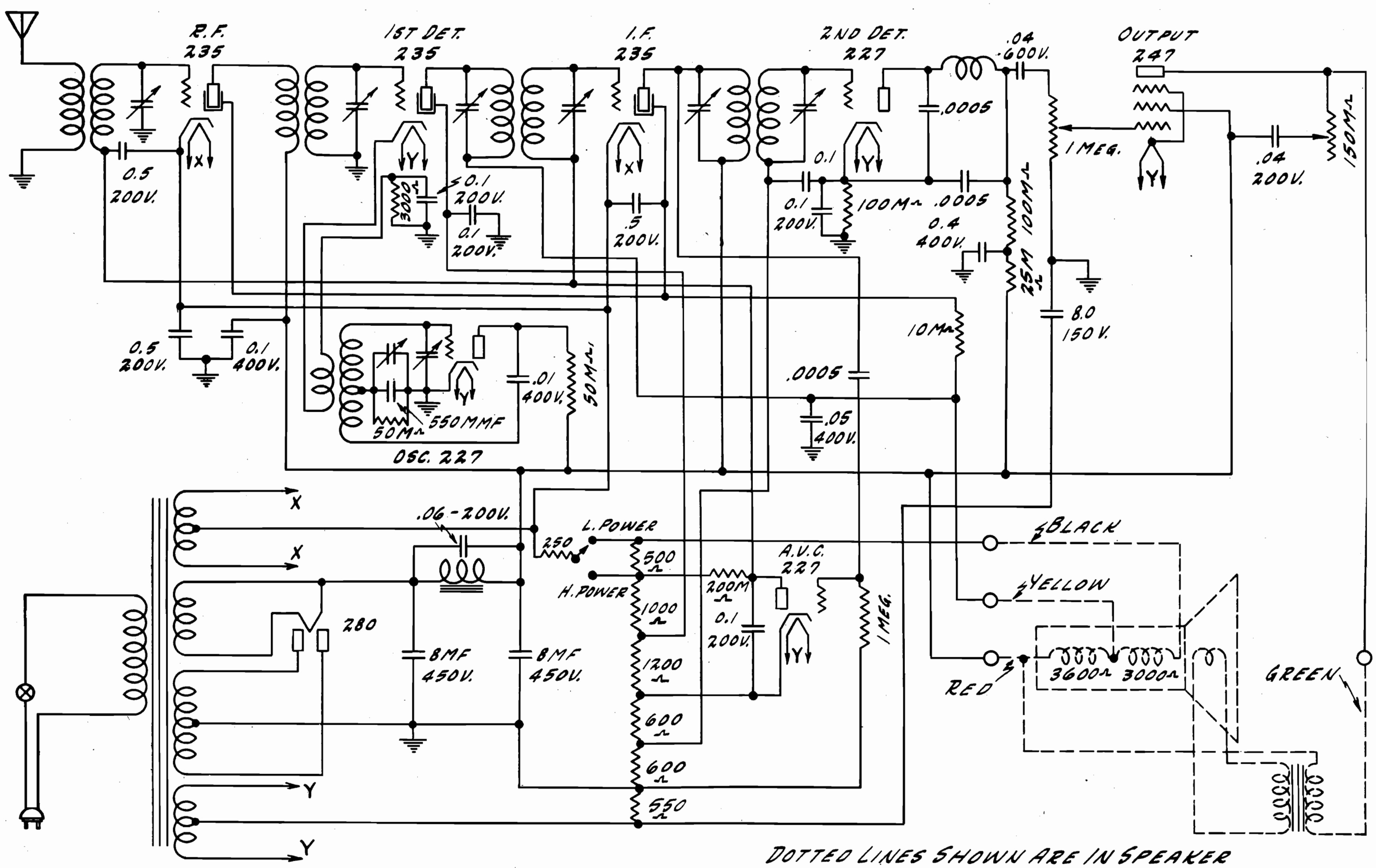
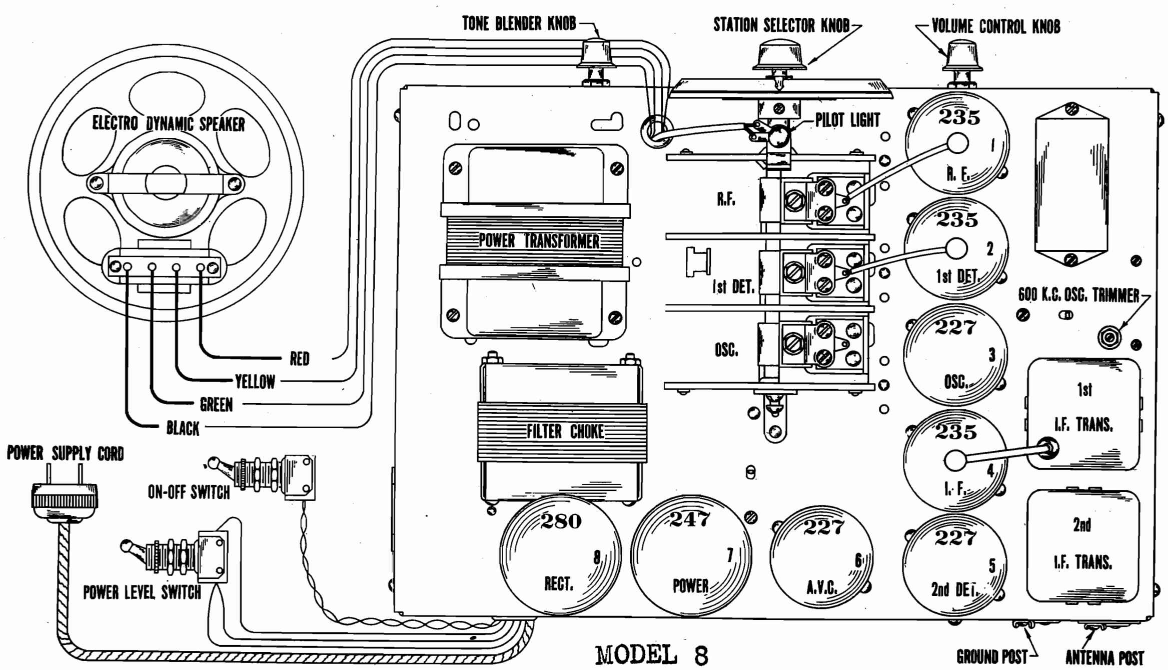


No. 8 Series Super-Heterodyne

Page 632 B for Voltage Data
Page 632 B for Socket Layout
Page 632 C for Chassis Layout
Page 632 G for Service Notes.

PEAK FREQUENCY 262 KC

U. S. RADIO & TELEVISION CORP.

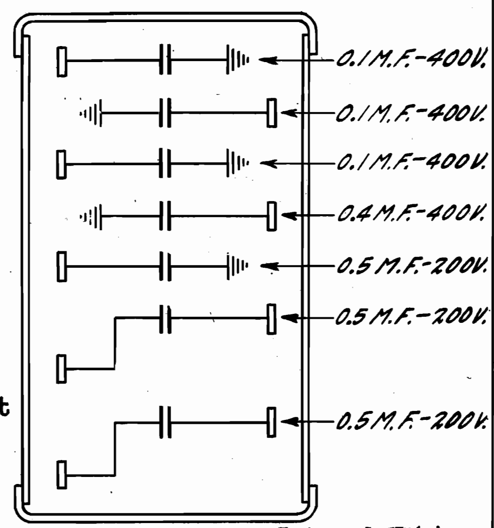


Top View of Chassis Showing Tube Location and Speaker Connections

MODEL 8

Tube	A Volts	B Volts	V Volts	Scr. Volts	Plt. Crnt.
RF	2.3	190	2.3[1]	68.	3.8
1st Det	2.3	190	6.5	70.	2.0
Osc.	2.3	80	15-50[2]		4.7
IF	2.3	190	2.3[1]	68.	3.6
2nd Det	2.3	150	20.		.4
AVC	2.3	65[3]	40. [1]		0.
Power	2.35	260	20 [5]	280.	32.
Rect.	5.				41. [6]

1 Across 250 ohm series resistor
2 Governed by setting of tuning condenser
3 Across 1000 and 1200 ohm sections of shunt resist
4 Across two 600 ohm sections of shunt resistor
5 Across 550 ohm series resistor
6 Per Anode.



Section Condenser Internal Wiring

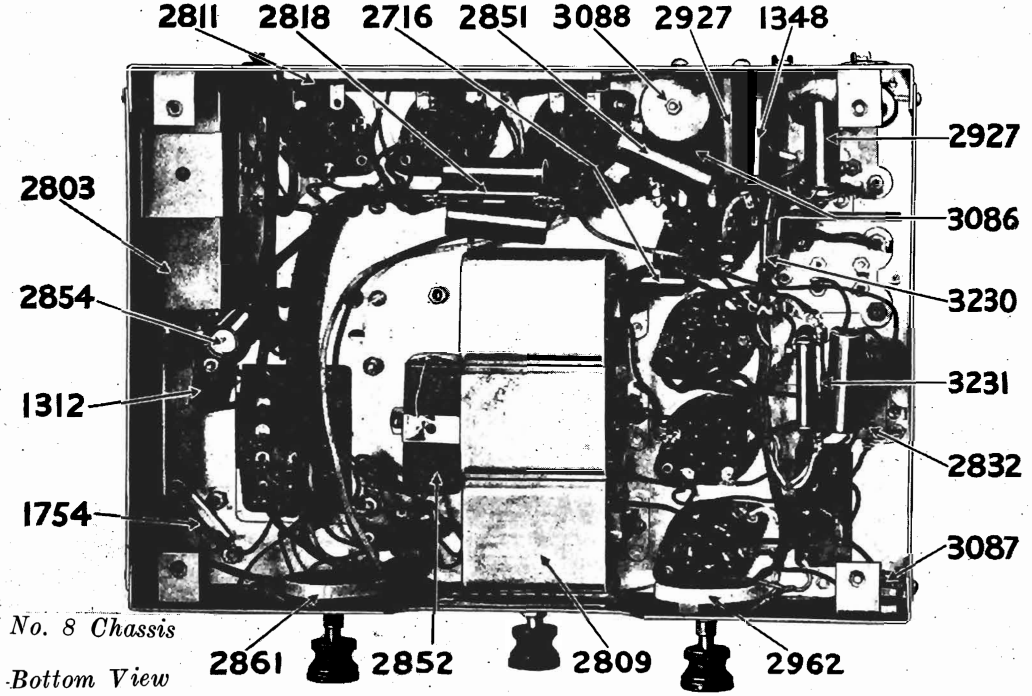
The No. 8X chassis is the same as the No. 8 except that it is intended for use on 25 cycle lines. The major difference is found in the power transformer and in the use of an untuned filter system. The .06 mfd condenser shown in the model 8 schematic connected across the filter choke is not employed in 8X. The 8X chassis may be used on a 60 cycle line. If the hum is bad, add the .06 mfd condenser.

For special service data see Heterodyne and Motorboating notes upon page 632E and RF, Oscillator and IF trimmer condenser data upon page 632 G.

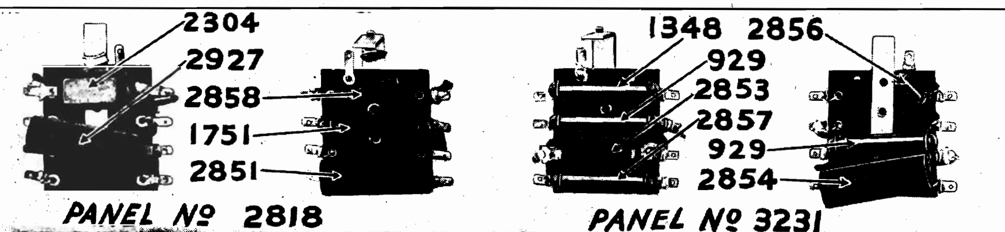
U. S. RADIO & TELEVISION CORP.

NO. 8 CHASSIS, REPLACEMENT PARTS

Part No.	*Description*
929	50,000 Ohm Bias and Series Resistors, Carbon
1348	100,000 Ohm Bias and Series Resistors, Carbon
1751	200,000 Ohm Series Resistor, Carbon
1754	250 Ohm Bias Resistor, Wire Wound
2811	4450 Ohm Voltage Divider Resistor
2856	25,000 Ohm Series Resistor, Carbon
2857	10,000 Ohm Series Resistor, Carbon
2858	1 Megohm Grid Resistor, Carbon
2861	Tone Blender 0—150,000 Ohm
2962	Volume Control 0—1 Megohm
3087	3,000 Ohm Bias Resistor, Wire Wound
2304	.0005 Mfd. Coupling and By-Pass Condensers
2716	.01 Mfd. Oscillator Condenser
2803	8 Mfd. Electrolytic Condenser Unit, 450 Volts
2810	Clamp for 2803 Electrolytic Condenser Units
2852	8 Mfd. Electrolytic Condenser Unit, 150 Volts
2849	Clamp for 2852 Electrolytic Condenser Unit
2808	7-Section Condenser Block
2832	Oscillator 600 K.C. Trimmer Condenser
2851	.04 Mfd. Coupling and By-pass Condensers
2853	550 Mfd. Oscillator Condenser
2854	.06 Mfd. Choke and By-Pass Condensers
2923	3-Gang Variable Condenser Assembly Complete Less Drive
2927	.1 Mfd. By-pass Condensers
115	Pilot Light Lamp, 2.5 Volts
2946	Pilot Light Bracket with Leads
861	Attachment Cord and Plug
678	Ground Binding Post
2333	Antenna Binding Post Assembly
701	Tube Socket—280
703	Tube Socket—227
2757	Tube Socket—247
2805	Tube Socket—235
1312	Terminal Insulator
1436	On-Off Escutcheon Plate
2948	Power Level Escutcheon Plate
2881	Escutcheon Plate
2813	Antenna Transformer (Sold In Matched Sets of Three)
2814	1st Detector Transformer (Sold In Matched Sets of Three)
2815	Oscillator Transformer (Sold In Matched Sets of Three)
2809	R.F. Transformer Shield Can
2824	Tube Shield
2879	Tube Shield Wing Nuts
2783	Power Transformer, 60 Cycle, 115 Volt
3084	Power Transformer, 25 Cycle, 115 Volt
2830	1st Intermediate Assembly Complete with Can
2831	2nd Intermediate Assembly Complete with Can
2842	Adjusting Screw for Intermediate Condenser
2850	Special Hex Nut for Intermediate Condenser
2392	On-Off Switch and Leads
2936	Power Level Switch and Leads
2883	Drive Assembly Complete with Dial Chart
2902	Dial Chart Assembly
2895	Pointer Tension Spring for Drive
2847	Chassis End Plates



No. 8 Chassis
Bottom View



-*Resistor and Condenser Panels No. 8 Chassis*

2932	Filter Choke Assembly
2818	Resistor and Condenser Panel Assembly Complete
3231	Resistor and Condenser Panel Assembly Complete
3086	2nd Detector Panel Assembly Complete with Socket
1766	Detector Plate Choke Coil
3088	Shield Can for Detector Plate Choke Coil
2801	8" D.C. Electrodynamic Speaker for No. 8 Chassis
3294	Field Coil for Speaker
3298	Transformer for Speaker
2608	Terminal Strip for Speaker
3295	Terminal Strip Cover for Speaker
3296	Head Assembly Complete including Cone, Housing, Voice Coil, Spider and Pot Magnet Front Piece for Speaker
3297	Pot Magnet Back Piece for Speaker

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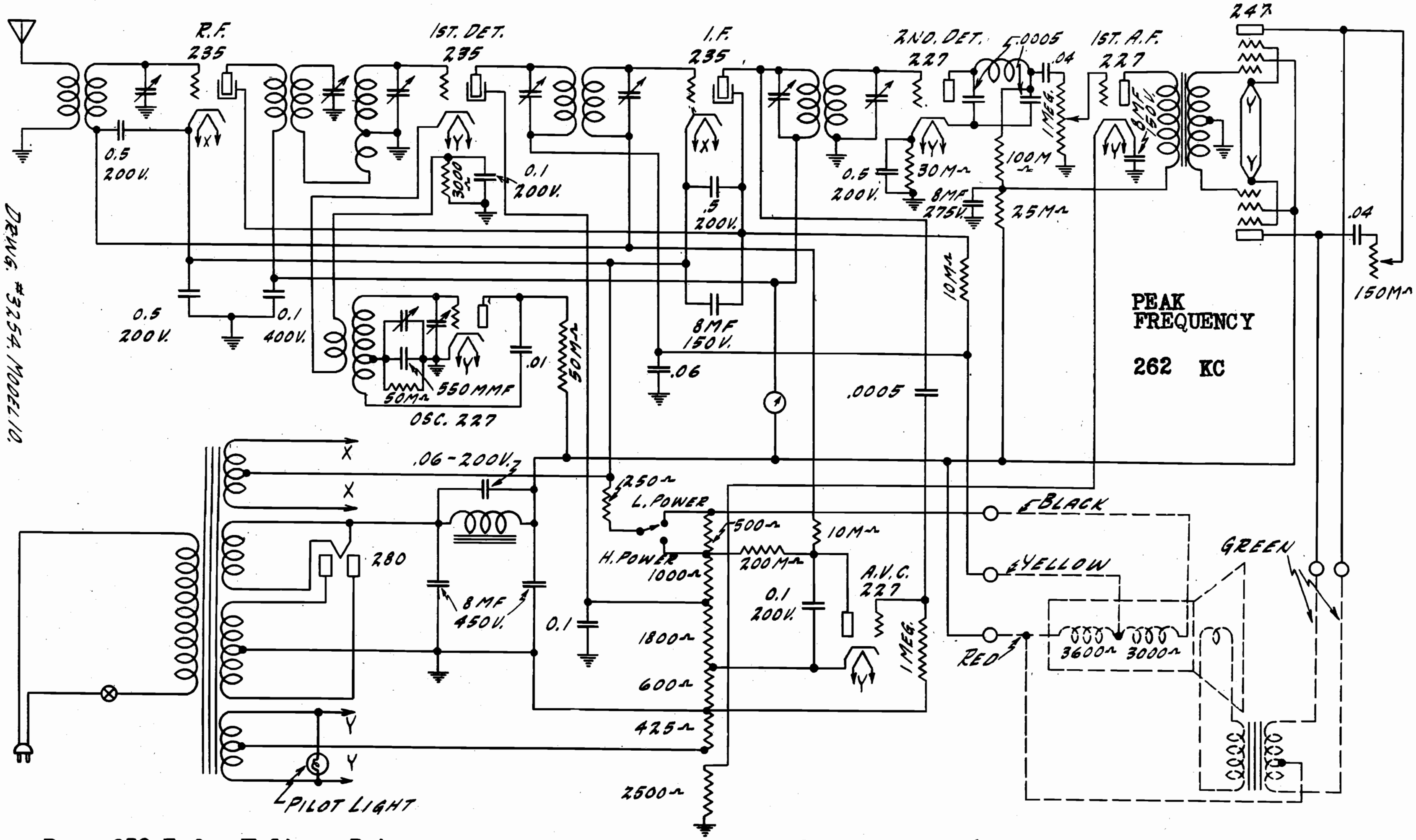

Page 632 E for Voltage Data
Page 632 E for Socket Layout

Chassis No. 10X is almost identical in construction with chassis No. 10, except that it is designed for 25 cycle, 115 volt operation. All parts as used in the No. 10 chassis are used in the No. 10X with the exception of the power transformer and .06 Mfd. choke tuning condenser. The correct power transformer for the No. 10X chassis is shown in the parts price list.

The No. 10X, 25 cycle chassis can be operated satisfactorily from a 60 cycle power supply. If there is excessive hum it will be necessary to secure a .06 Mfd. condenser, Part No. 2854, and connect it in the circuit across the filter choke. The reverse is not true, that is, the No. 10, 60 cycle receiver cannot be operated satisfactorily from a 25 cycle power supply.

Page 632 E for ServiceNotes
Page 632 G for Trimmer Notes

No. 10 Series Super-Heterodyne

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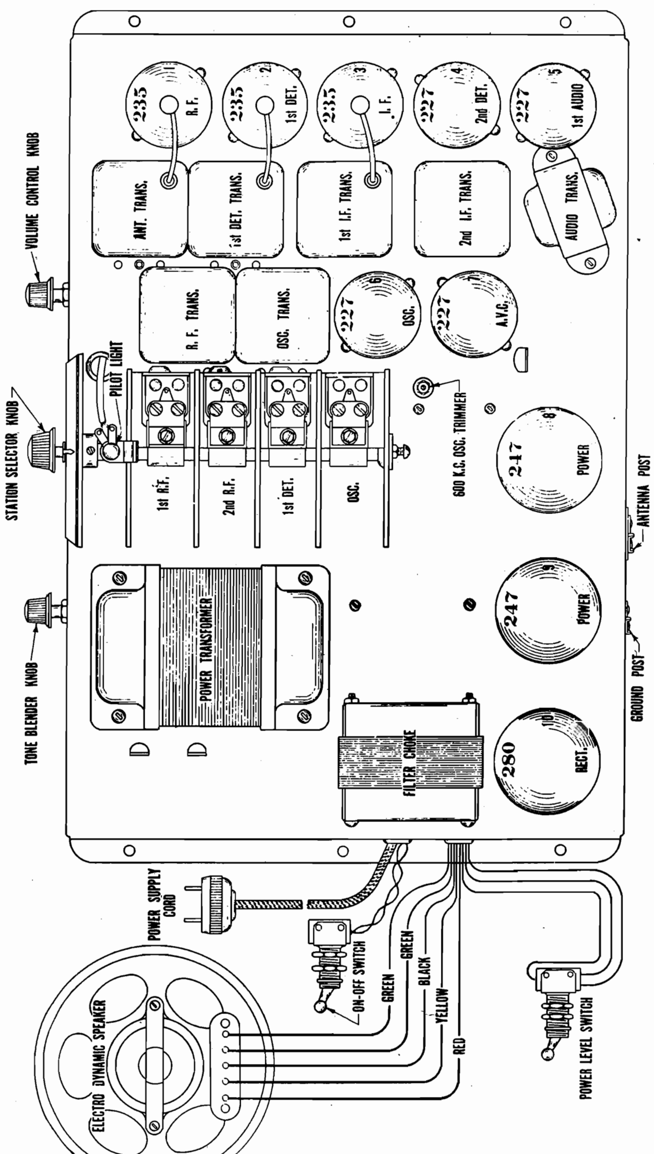

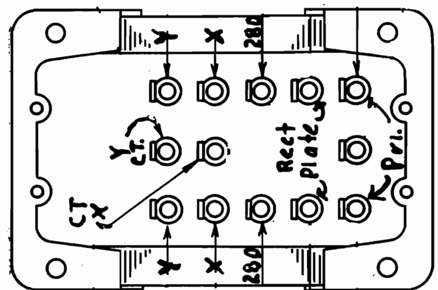

Power Transformer Terminals

MODEL 10 PENTODE SUPERHETERODYNE

Tube	A Volts	B Volts	C Volts	Scr. Volts	Plt. Crnt.
RF	2.3	175.	2.3[1]	65	4.0
1st Det	2.3	185.	7.0	69	2.0
IF	2.3	175	2.3[1]	65	4.0
2nd Det	2.3	115	12.		.4
1st AF	2.3	145	11.[2]		4.6
Osc.	2.3	83	15-35[3]		4.2
AVC	2.3	89[4]	20.[5]		0.
Power	2.35	255	18.5	265	21.
Power	2.35	255	18.5	265	21.
Rect.	4.9				45.[6]

1 Across 250 ohm series resistor
2 Across 2500 ohm series resistor
3 Governed by setting of tuning condenser
4 Across 1000 and 1800 ohm sections of shunt resistor.
5 Across 600 ohm section of shunt resistor
6 Per Anode.

Heterodyne Whistle

A heterodyne whistle in the Super-heterodyne Receiver may be caused by a beat between a harmonic of the I.F. signal and an R.F. signal.

A whistle can be brought about at 786 K.C., 1048 K.C. or 1310 K.C. if the 2nd detector filter choke is shorted or if the antenna lead is under this choke. The above mentioned frequencies are harmonics of the intermediate frequency of 262 K.C. and as they fall within the broadcast band can cause an audible beat with an R.F. signal.

A whistle can also be brought about between 540 and 600 K.C. if the I.F. tuning condensers are adjusted at too high a frequency rather than at 262 K.C. If they are adjusted, for example, at 280 K.C. the second harmonic is 560 K.C. which falls within the broadcast band and can beat with an R.F. signal.

Blocking or Motorboating

Blocking or motorboating in the No. 10 chassis may be due to an open grid in the 1st detector or I.F. stage. Check these circuits if motorboating is experienced. Motorboating may also be caused if the 10,000 ohm series resistor in the I.F. and R.F. screen line is shorted.

If the A.V.C. tube is not operating properly motorboating may result. Try out a new tube and check the A.V.C. circuit. Blocking or motorboating may also be due to open R.F. and I.F. screen by-pass condenser and to various other defective filter and by-pass condensers.

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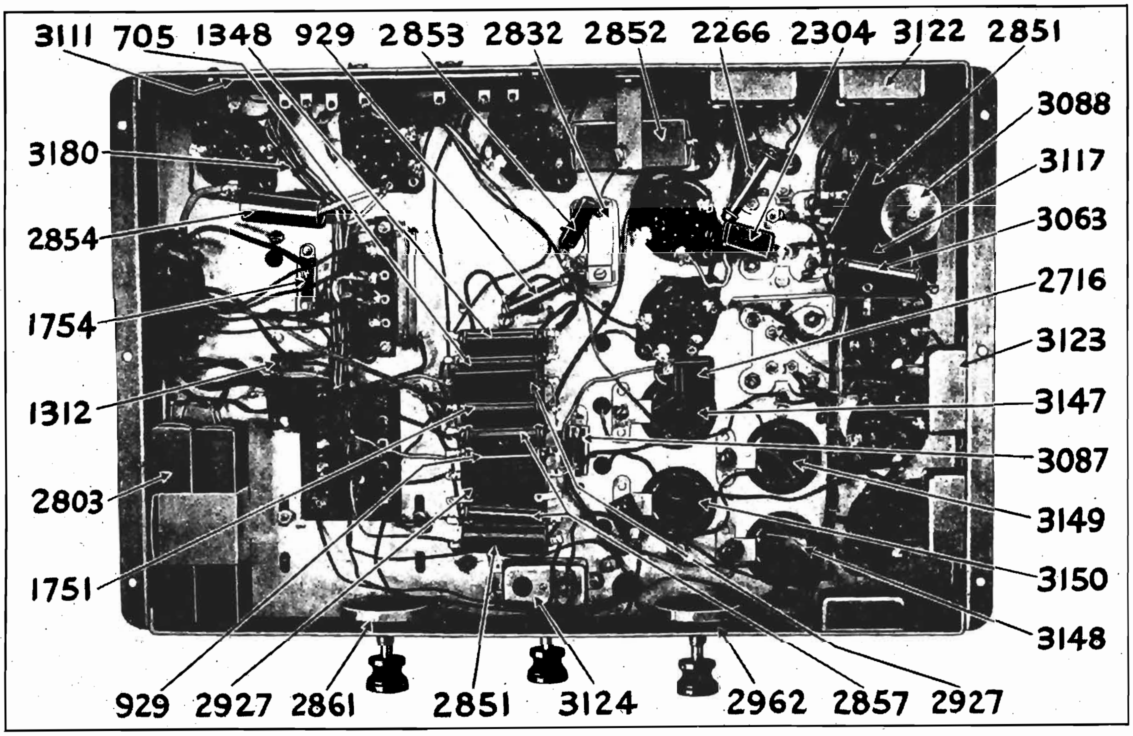
NO. 10 CHASSIS



Bottom View No. 10 Chassis

No. 10 Chassis

Part No.	Description	
705	25,000 Ohm Series Resistor, Carbon	
929	50,000 Ohm Bias and Series Resistors, Carbon	
1348	100,000 Ohm Series Resistor, Carbon	
1751	200,000 Ohm Series Resistor, Carbon	
1754	250 Ohm Bias Resistor, Wire Wound	
2266	1 Megohm Resistor	
2857	10,000 Ohm Series Resistors, Carbon	
2861	Tone Blender 0—150,000 Ohm	
2962	Volume Control 0—1 Megohm	
3063	30,000 Ohm Bias Resistor, Carbon	
3087	3,000 Ohm Bias Resistor, Wire Wound	
3111	6825 Ohm Voltage Divider Resistor	
2304	.0005 Mfd. Coupling and By-Pass Condensers	
2716	.01 Mfd. Oscillator Condenser	
2719	8 Mfd. Electrolytic Condenser Unit, 275 Volt	
2803	8 Mfd. Electrolytic Condenser Unit, 450 Volt	
3112	Clamp for 2803 Electrolytic Condenser Units	
2852	8 Mfd. Electrolytic Condenser Unit, 150 Volt	
3113	Clamp for 2852 Electrolytic Condenser Unit	
3190	Auxiliary Bracket for 2852 Electrolytic Condenser Unit	
2832	Oscillator 600 K.C. Trimmer Condenser	
2851	.04 Mfd. Coupling and Filter Condensers	
2853	550 Mmfd. Oscillator Condenser	
2854	.06 Mfd. Choke Condenser	
2927	.1 Mfd. By-Pass Condensers, 200 Volts	
3122	.5 Mfd. By-Pass Condensers, 200 Volts	
3123	Dual .1—.05 Mfd. Condenser, 200 Volt	
3124	.1 Mfd. By-Pass Condenser, 400 Volt	
3114	Resistor and Condenser Panel Assembly, Complete	
1766	Detector Plate Choke Coil	
3088	Shield Can for Detector Plate Choke Coil	
3117	2nd Detector Panel Assembly, Complete with Socket	
678	Ground Binding Post	
2333	Antenna Binding Post Assembly	
1312	Terminal Insulators	
3148	Antenna Transformer	Sold in Matched Sets of Four
3150	R.F. Transformer	Sold in Matched Sets of Four
3149	1st Detector Transformer	Sold in Matched Sets of Four
3147	Oscillator Transformer	Sold in Matched Sets of Four
3180	Chassis Harness	
701	Tube Socket—280	
703	Tube Socket—227	
2757	Tube Socket—247	
2805	Tube Socket—235	
861	Attachment Cord and Plug	
1436	On-Off Escutcheon Plate	
2948	Power Level Escutcheon Plate	
2882	Escutcheon Plate	
2876	Walnut Knobs	
2392	On-Off Switch and Leads	
2936	Power Level Switch and Leads	
3175	4-Gang Variable Condenser Assembly Complete less Drive and Meter	
3121	Variable Condenser Shield	
2883	Drive Assembly Complete with Dial Chart	
2902	Dial Chart Assembly	
2895	Pointer Tension Spring for Drive	
2911	Tuning Meter	
3081	Bracket for Tuning Meter	
3181	Grid Cap Assembly	
2830	1st Intermediate Assembly Complete with Can	
2831	2nd Intermediate Assembly Complete with Can	
2842	Adjusting Screw for Intermediate Condensers	
2850	Special Hex Nuts for Intermediate Condensers	
2912	Power Transformer, 60 Cycles, 115 Volt	
3169	Power Transformer, 25 Cycles, 115 Volt	
2932	Filter Choke Assembly	
3100	Audio Transformer	

U. S. RADIO & TELEVISION CORP.

No 8 and 8X CHASSIS
No 10 and 10X CHASSIS

Condenser Alignment

This information applies equally to the models 8 and 10 series super-heterodyne receivers. The major difference between the two receivers is not one which will influence the alignment operations.

The Super-heterodyne is a receiver of exceptional selectivity and sensitivity and accurate alignment of the I.F., R.F. and oscillator condensers is of the greatest importance. A local and accurately calibrated signal generator as well as an output indicating meter is absolutely essential for correct alignment. This signal generator must provide a signal at the broadcast frequencies of from 550 to 1500 K.C. and in addition a signal of 262 K.C. for the intermediate frequency. The broadcast band signals of the signal generator must be accurately known as the dial scale of the receiver is calibrated in kilocycles and alignment of the gang tuning condenser must be made at definite frequencies in order to have the pointer at the correct location on the scale for the various frequencies. The intermediate frequency signal of the signal generator must likewise be accurate in order to align the I.F. stages at 262 K.C.

Several companies manufacturing test equipment including Jewell Electrical Instrument Company, Weston Electrical Instrument Company, and Supreme Instrument Company have complete R.F. and I.F. signal generators on the market which have incorporated with them copper oxide meters for reading the output. The output meter is connected across the voice coil of the speaker or across the primary if it is of sufficient range. At a later date further information on suitable signal generators will be issued from this office.

Aligning Intermediate Condensers — A nonmetallic screw driver is necessary for aligning the intermediate condensers. The extreme limits of the signal generator signal are from 256 to 264 K.C. Remove the grid cap from the grid connection of the 235 1st detector tube and connect the lead from the signal generator to the grid of the 235 1st detector. As the shield should be left on for this test it will be necessary to bring the signal lead through the hole in the shield over this tube. To facilitate making this connection at the factory a hole of about 1" diameter is cut in the shield over the 1st detector tube. If many of these chassis are to be aligned it is suggested that an extra tube shield for this chassis be purchased and such a hole made in it. Connect the ground lead of the signal generator to the ground post of the chassis.

The intermediate condenser adjusting screws are reached from the bottom of the chassis. There are two on each of the two porcelain bases of the I.F. transformer assemblies. The volume control must be at maximum setting and the power level switch at "H" power for all adjustments. Attenuate the signal generator signal until the output is 100 volts or less in order to prevent any action of the automatic volume control. Then adjust the four intermediate condenser screws until maximum output is obtained on the output meter. After all four have been adjusted the first time, go over them again and check the setting for maximum output.

Aligning R.F. and Oscillator Condensers—For adjusting the R.F. and oscillator condensers the signal input from the signal generator should be made to the antenna post. Adjust the signal generator for a signal of exactly 1400 K.C. Then turn the tuning condenser rotor until the pointer is at exactly 1400 on the dial scale. Then adjust the four trimmers on the tuning condenser for maximum output adjusting the oscillator trimmer first (trimmer nearest back of chassis). Turn the screws up or down until greatest deflection on output indicating meter is obtained.

Then set the signal generator for a signal of 600 K.C. and turn the tuning condenser rotor until the output is at maximum. The next step is to adjust the oscillator 600 K.C. trimmer condenser. The adjusting screw for this condenser is in back of the tuning condenser and is reached from the top of the chassis. To correctly adjust this oscillator 600 K.C. trimmer it will be necessary to turn the screw to several different positions using a nonmetallic screw driver. At every position of this adjusting screw turn the tuning condenser rotor until maximum output is obtained. For each position of the adjusting screw there will be a maximum output and the correct position of the adjusting screw is the setting at which the deflection on output indicating meter is the greatest.

Next set the signal generator again for a 1400 K.C. signal and check the adjustment of the tuning condenser trimmers at this frequency for maximum output. Then set the signal generator for a signal of 1000 K.C. and turn the tuning condenser rotor until the output indicating meter shows maximum deflection. Then bend the slotted rotor plate sections of each tuning condenser bank which are last in mesh, in or out until maximum output is obtained. Tune in a signal at 750 K.C. and then at 600 K.C. and follow the same procedure bending the rotor plate sections last in mesh until maximum output is obtained. Do not change the setting of the oscillator 600 K.C. trimmer in any way after it has once been set as indicated above.

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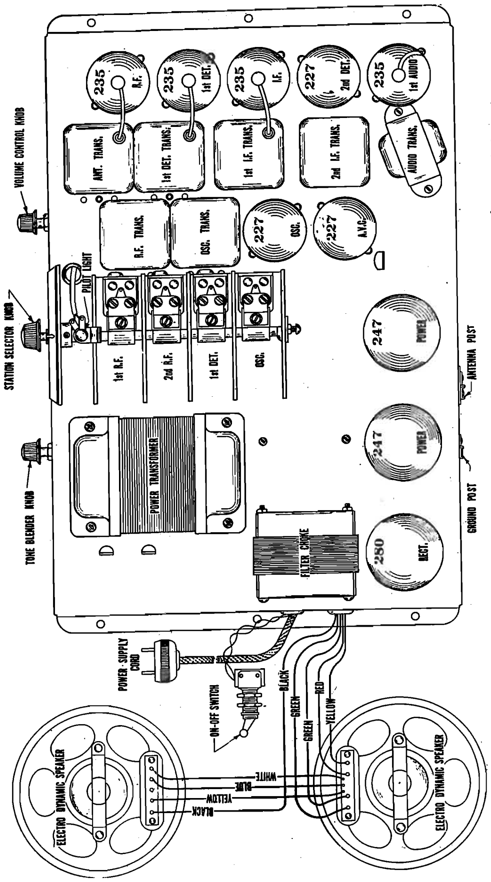
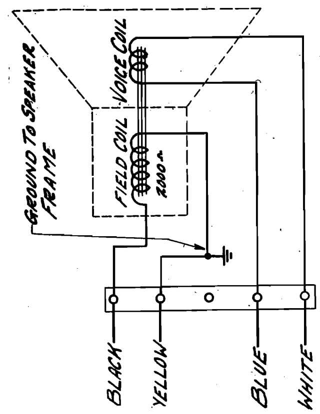
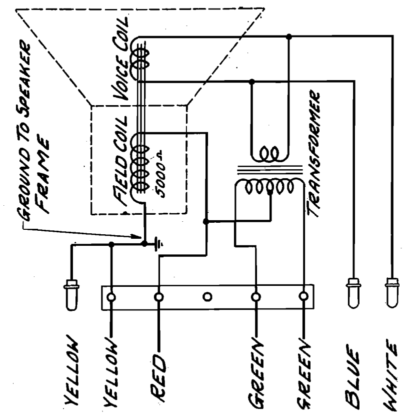
No 10 SERIES (10-C)
No 1000 & 1001 CHASSIS



Top View of Chassis Showing Tube Location and Connections of Speakers

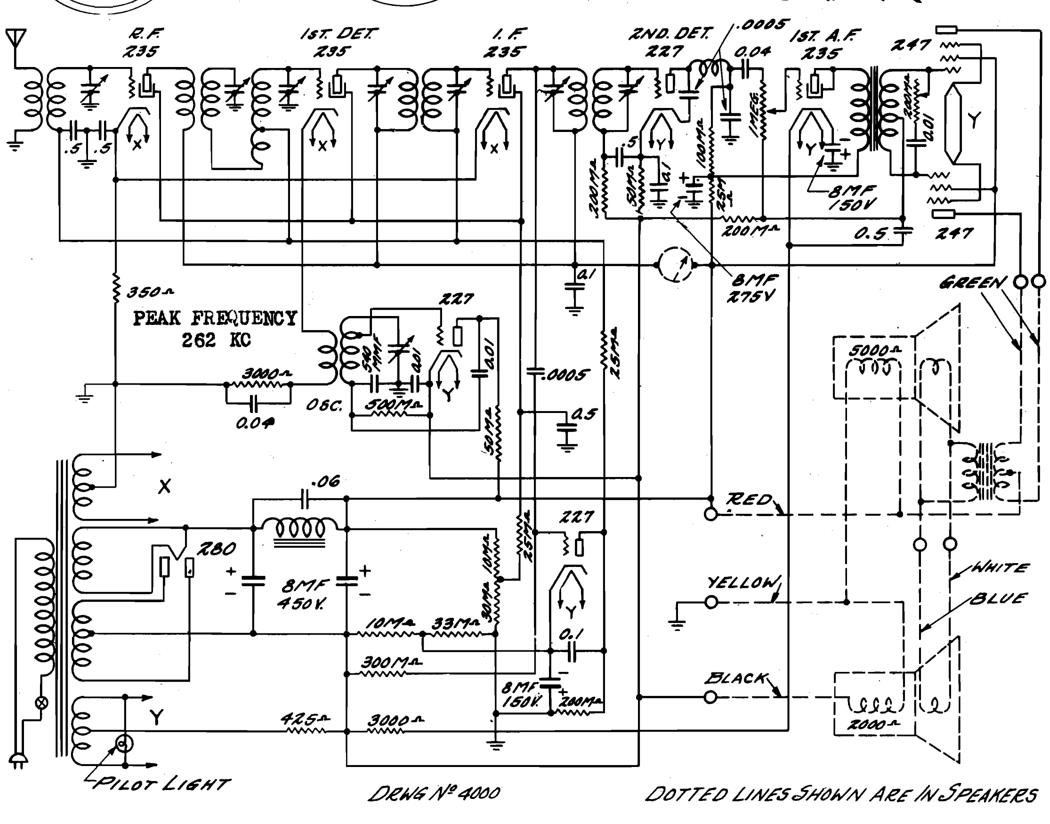


No. 3847 Electrodynamic Speaker and Connections



No. 3846 Electrodynamic Speaker and Connections

For condenser alignment and other data refer to pages 632-E, 632-G, 632-G-2.



No. 1001 Super-Heterodyne Chassis

(4002)

U. S. RADIO & TELEVISION CORP.

No 10 SERIES (10-C)
No 1000 & 1001 CHASSIS

SPEAKERS

The output of the receiver is fed into the primary of the transformer for the speakers. In the chassis No. 1001 matched speakers are used. Both are D.C. baffle mounting electrodynamic speakers—one having a cone diameter of 10 inches and the other an 8 inch cone.

The fields of both speakers are energized by the power system and are a part of the total resistance shunted across the power system from which the required voltages are obtained. The 5000 ohm field coil is a component part of the 10 inch speaker—Part No. 3846—as is the output transformer. The 5000 ohm field coil is above ground potential whereas the 2000 ohm field coil is below ground potential, as can be seen by referring to Fig. 1. The ground potential side of each field coil winding is grounded to the speaker frame. The voice coil of each speaker is connected in parallel across the secondary winding of the output transformer.

CAUTION—Do not use any other type of speakers with the No. 1001 chassis than the two supplied with it. It can readily be appreciated from the above that the speakers are especially designed for this chassis.

An open or shorted voice coil in either of the speakers will cause poor audio quality. Check voice coil tips (blue and white) at speaker terminal strip for good electrical contact. A shorted 2000 ohm speaker coil will cause distortion as will also an open 5000 ohm speaker coil, and in both cases, the needle of the tuning meter will swing to the extreme left.

The polarity of the leads connecting the voice coils of the two speakers in parallel should be checked. If the blue and white wires making these connections are reversed, distortion and motorboating will result, because one cone is moving out while the other is moving in, and vice versa.

ual. If one of the pilot light terminals is grounded, the second audio bias will be shorted out and there will be distortion present.

If the 2000 ohm field coil of the No. 3847 electrodynamic speaker is open lack of volume will be experienced and will be evidenced by the needle of the visual tuning meter, swinging almost to the extreme right. The same will be true if the 5000 ohm field of the No. 3846 electrodynamic speaker is open. However, in this case the needle of the tuning meter will swing to the extreme left. The yellow wire connecting the speakers to the chassis ground should be checked for good electrical connection. If this lead is making poor contact loss of volume will result. The tuning meter will register approximately a 50% reduction in swing at no signal.

MICROPHONIC HOWL

The No. 1001 Chassis is mounted in the console cabinet on sponge rubber washers to prevent any microphonic action that might otherwise arise due to vibrations set up between the speaker and tube elements.

At the time of installation of the receiver the two bolts, one at the center of the flange at each end of the chassis should be removed. These bolts are used to securely anchor the chassis to the cabinet shelf and are intended only for shipping purposes. If they are not removed vibrations of the speaker will be transmitted to the tube elements and a microphonic howl may result.

This howl may also manifest itself when the chassis and speaker are being tested on a service bench thus making it very difficult to service the unit. The chassis or speaker should be cushioned as a preventive.

No. 1001 CHASSIS—VOLTAGES AT SOCKETS—LINE VOLTAGE 115 VOLUME CONTROL AT MAXIMUM

Type of Tube	Position of Tube	Function	"A" Volts	"B" Volts	Control Grid "C" Volts	Screen Volts	Screen Current MA	Cathode Volts	Plate MA	Grid Test MA
235	1	R.F.	2.2	160	2.8 (1)	60	.4	0.	2.7	6.1
235	2	1st Det.	2.25	160	6.5	55	.3	7.	1.8	2.4
235	3	I.F.	2.2	160	2.8 (1)	60	.4	0.	2.7	6.1
227	4	2nd Det.	2.3	105	6.			5.5	.2	.3
235	5	1st Audio	2.3	125	13. (2)			7.	2.8	3.0
227	6	Osc.	2.35	110	11-28 (3)			21.	3.4	3.5
227	7	A.V.C.	2.3	55 (4)	21. (5)			1.5	0.	0.
247	8	Power	2.3	250	20. (6)	258	4.6		20.	26.
247	9	Power	2.35	250	20. (6)	258	4.6		20.	26.
280	10	Rect.	5.0						50. Per Plate	

(1) Measured across 350 ohm bias resistor.
(2) Measured across 3000 ohm bias resistor. B- to Cathode.
(3) Measured across 500 M ohm osc. bias resistor. Bias voltage varies from 11 to 28 between 1500 and 550 K.C. settings of tuning condenser.
(4) Measured from B- to A.V.C. plate.
(5) Measured from B- to A.V.C. Cathode.
(6) Measured across 425 ohm bias resistor. B- to "Y" filament.

U. S. RADIO & TELEVISION CORP.

No 10 SERIES (10-C)

No. 1000X AND No. 1001X CHASSIS

Chassis No. 1000X and No. 1001X are almost identical in construction with chassis No. 1000 and No. 1001 except that they are designed for 25 cycle, 115 volt A.C. operation. The parts used in the 60 cycle chassis are also used in those chassis designed for 25 cycle operation with the exception of the power transformer and .06 Mfd. filter choke tuning condenser. The correct power transformer for the 25 cycle chassis as well as the correct filter choke tuning condenser are shown in the Parts Price List.

The description and testing as covered in the service notes for the 60 cycle chassis also applies to the 25 cycle chassis.

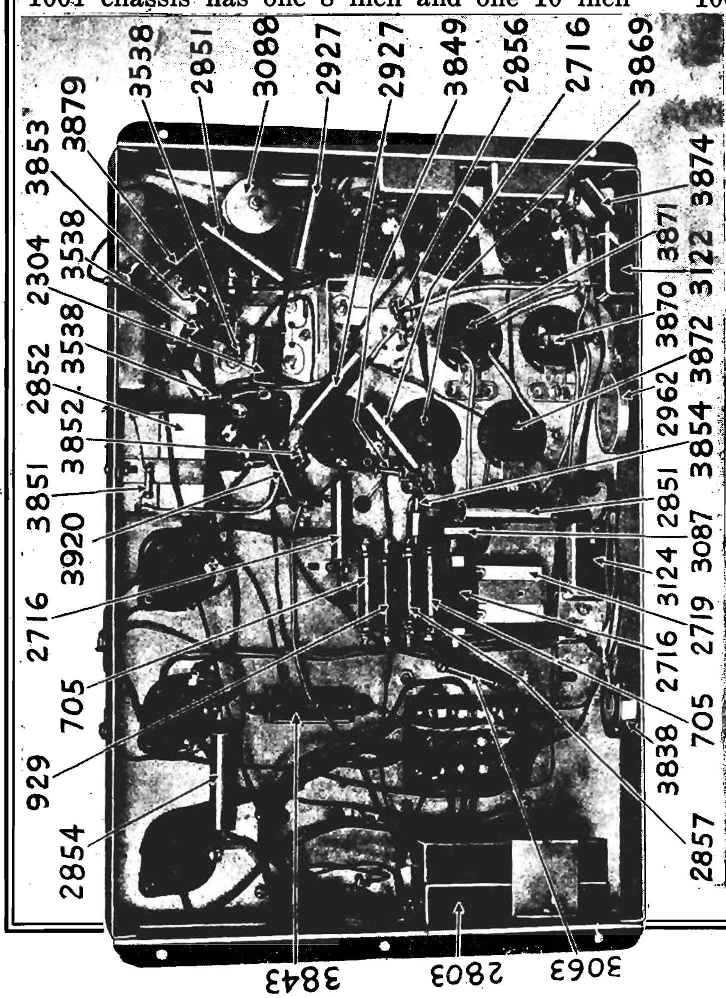
The 25 cycle chassis can be operated satisfactorily from a 60 cycle power supply. However, there may be excessive hum in which case it will be necessary to change the No. 1375 .45 Mfd. choke condenser to a No. 2854 .06 Mfd. condenser. The reverse is not true, that is, the 60 cycle chassis cannot be operated satisfactorily from a 25 cycle power supply.

SUPPLEMENTARY NOTES FOR No. 1000 CHASSIS

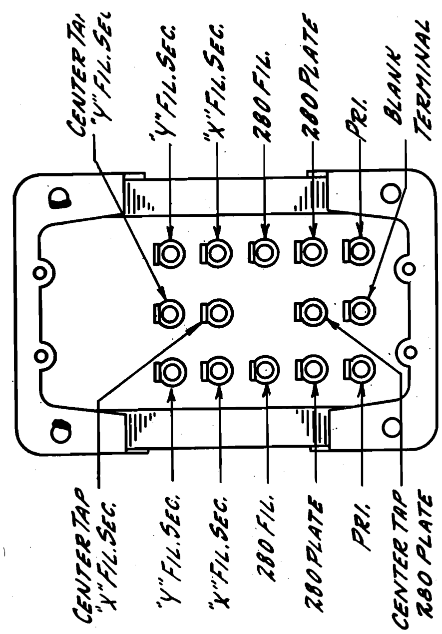
The No. 1000 and No. 1001 Chassis are identically alike as regards the schematic circuit and the electrical constants. Referring to the schematic wiring diagram it will be noted the visual tuning meter is not drawn in solid lines but instead dotted lines are used. The significance of the dotted lines is to illustrate that the tuning meter is a component part of chassis No. 1001 whereas in chassis No. 1000 the meter is omitted the electrical circuit being completed by the joining of the two leads ordinarily connected to the meter leads on the 1001 chassis.

The electrical constants of the dual speakers used with each chassis are alike, however, the 1001 chassis has one 8 inch and one 10 inch electrodynamic speaker whereas the No. 1000 chassis utilizes two 8 inch speakers. The speakers for their respective chassis carry entirely different part numbers and these dissimilarities including other changes in a few of the parts for each chassis are enumerated in the parts list to follow.

It will be noted a number of the speaker parts for the No. 1001 chassis are interchangeable with the component parts of the speakers for the No. 1000 chassis and therefore it has not been thought necessary to make a repetition of these parts numbers in the accompanying list of the changes in parts for the No. 1000 chassis.



Bottom View No. 1001 Chassis



Power Transformer Terminals

For CONDENSER ALIGNMENT DATA refer to page 632-E.

Other SERVICE DATA pages 632 -G and 632-G-2.

U. S. RADIO & TELEVISION CORP.

No 10 SERIES (10-C)
No 1000 & 1001 CHASSIS

No. 1001 CHASSIS REPLACEMENT PARTS

Part No.	Description	No. Used in Set	List Price Each
678	Ground Binding Post	1	.15
705	Resistor, 25,000 Ohm, Carbon, 1 Watt	2	.50
929	Resistor, 50,000 Ohm, Carbon, 1 Watt	1	.45
1375	Choke Condenser .45 Mfd, for 25 Cycle	1	1.00
1766	Detector Plate Choke Coil	1	.60
2304	Condenser, .0005 Mfd Coupling and Bypass	3	.40
2333	Antenna Binding Post	1	.20
2716	Condenser, .01 Mfd, 400 Volt	2	.45
2719	Dry Electrolytic Condenser, 8 Mfd. 275 Volt	1	2.00
2803	Dry Electrolytic Condenser, 8 Mfd. 450 Volt	2	2.00
2851	Condenser, .04 Mfd. 400 Volt	2	.40
2852	Dry Electrolytic Condenser, 8 Mfd. 150 Volt	2	1.00
2854	Condenser, .06 Mfd, 400 Volt	1	.40
2856	Resistor, 25,000 Ohm, .1 Watt	1	.45
2857	Resistor, 10,000 Ohm, Carbon, 1 Watt	1	.45
2927	Condenser, .1 Mfd, 200 Volt	2	.40
2962	Volume Control, 0—1 Megohm	1	1.40
3063	Resistor, 30,000 Ohm, Carbon, 1 Watt	1	.45
3080	Bracket for 3854 Condenser	1	.05
3087	Resistor, 3000 Ohm, Candohm	1	.35
3088	Shield Can for Detector Plate Choke Coil	1	.15
3112	Clamp for 2803 Electrolytic Condenser	1	.05
3113	Clamp for 2852 Electrolytic Condensers	1	.05
3119	Intermediate Frequency Shield	1	.05
3122	Condenser, .5 Mfd, 200 Volts	5	.70
3124	Condenser, .1 Mfd, 400 Volts	1	.65
3358	Bakelite Terminal Insulator	3	.05
3538	Resistor, 200,000 Ohm, Carbon, .1 Watt	3	.40
3838	Tone Control, 0—200,000 Ohm	1	1.40
3843	Resistor, 425-3000 Ohm, Candohm	1	.50
3849	Resistor, 500,000 Ohm, Carbon, .1 Watt	1	.40
3851	Resistor, 33,000 Ohm, Carbon, .1 Watt	1	.40
3852	Resistor, 10,000 Ohm, Carbon, .1 Watt	1	.40
3853	Resistor, 50,000 Ohm, Carbon, .1 Watt	1	.40
3854	Condenser, 540 Mmfd	1	.50
3866A	Resistor and Condenser Panel Assembly	1	2.50
3865	2nd Detector Panel Assembly Complete with Socket	1	2.50
3869	Oscillator Transformer } SOLD IN MATCHED SETS OF FOUR	1	.60
3870	Antenna Transformer	1	1.00
3871	1st. Detector Transformer	1	.60
3872	R.F. Transformer	1	.60
3874	Resistor, 350 Ohm, Candohm	1	.30
3879	Resistor, 100,000 Ohm, .1 Watt	1	.40
3920	Resistor, 300,000 Ohm, .1 Watt	1	.40
115	Pilot Light Lamp	1	.25
701	Tube Socket—280	1	.35
703	Tube Socket—227	3	.35
861	Attachment Cord and Plug	1	1.00
1436	On-Off Escutcheon Plate	1	.10
2392	On-Off Switch with Leads	1	1.00
2757	Tube Socket—247	2	.35
2805	Tube Socket—235	4	.35
2830	1st Intermediate Transformer Assembly Complete with Can	1	1.80
2831	2nd Intermediate Transformer Assembly Complete with Can	1	1.80
2842	Adjusting Screw for Intermediate Condensers	4	.01
2850	Special Hex Nuts for Intermediate Condensers	4	.03
2876	Walnut Knobs	3	.30
2882	Escutcheon Plate, U.S. APEX	1	.75
2883	Drive Assembly Complete with Dial Chart	1	1.20
2895	Pointer Tension Spring for Drive	1	.15
2902	Dial Chart Assembly	1	.20
2932	Filter Choke Assembly	1	2.70
3081	Bracket for Tuning Meter	1	.10
3100	Audio Transformer	1	3.00
3108	Tube Shield	1	.80
3121	Variable Condenser Shield	1	.40
3151	Pilot Light Bracket with Leads	1	.30
3178	Shield Can for R.F. and 1st Detector Transformer	1	.75
3179	Shield Can for Oscillator and R.F. Transformer	1	.75
3181	Grid Cap with Lead	2	.05
3834	Power Transformer, 60 Cycle, 115 Volt	1	9.00
3846	10 inch D.C. Electrodynamic Speaker with Input Transformer	1	10.00
3847	8 inch D.C. Electrodynamic Speaker less Input Transformer	1	6.00
3860	Tuning Meter	1	3.50
3862	Speaker Cable	1	.65
3873	Grid Cap with Lead for 1st Audio 235	1	.05
3881	Power Transformer, 25 Cycle, 115 Volt	1	11.00
3884	4 Gang Variable Condenser Complete less Drive and Meter	1	10.00
4010	Transformer for 3846 and 3844 Speakers	1	3.00
4011	Field Coil for 3846 and 3844 Speakers—5000 Ohm	1	3.00
4012	Terminal Strip for 3846 and 3844 Speakers	1	.50
4013	Head Assembly for 3847, 3844 and 3845 Speakers	1	3.50
4015	Terminal Strip for 3847 and 3845 Speakers	1	.50
4016	Terminal Strip Cover for 3846 Speaker	1	.50
4017	Terminal Strip Cover for 3847, 3844 and 3845 Speakers	1	.50
4020	Head Assembly for 3846 Speaker	1	3.75
4021	Field Coil for 3847 Speaker, 2000 Ohm	1	2.75

No. 1000 CHASSIS REPLACEMENT PARTS (SUPPLEMENTING No. 1001 PARTS LIST)

The following parts are used in addition to the parts listed for the No. 1001 Chassis:

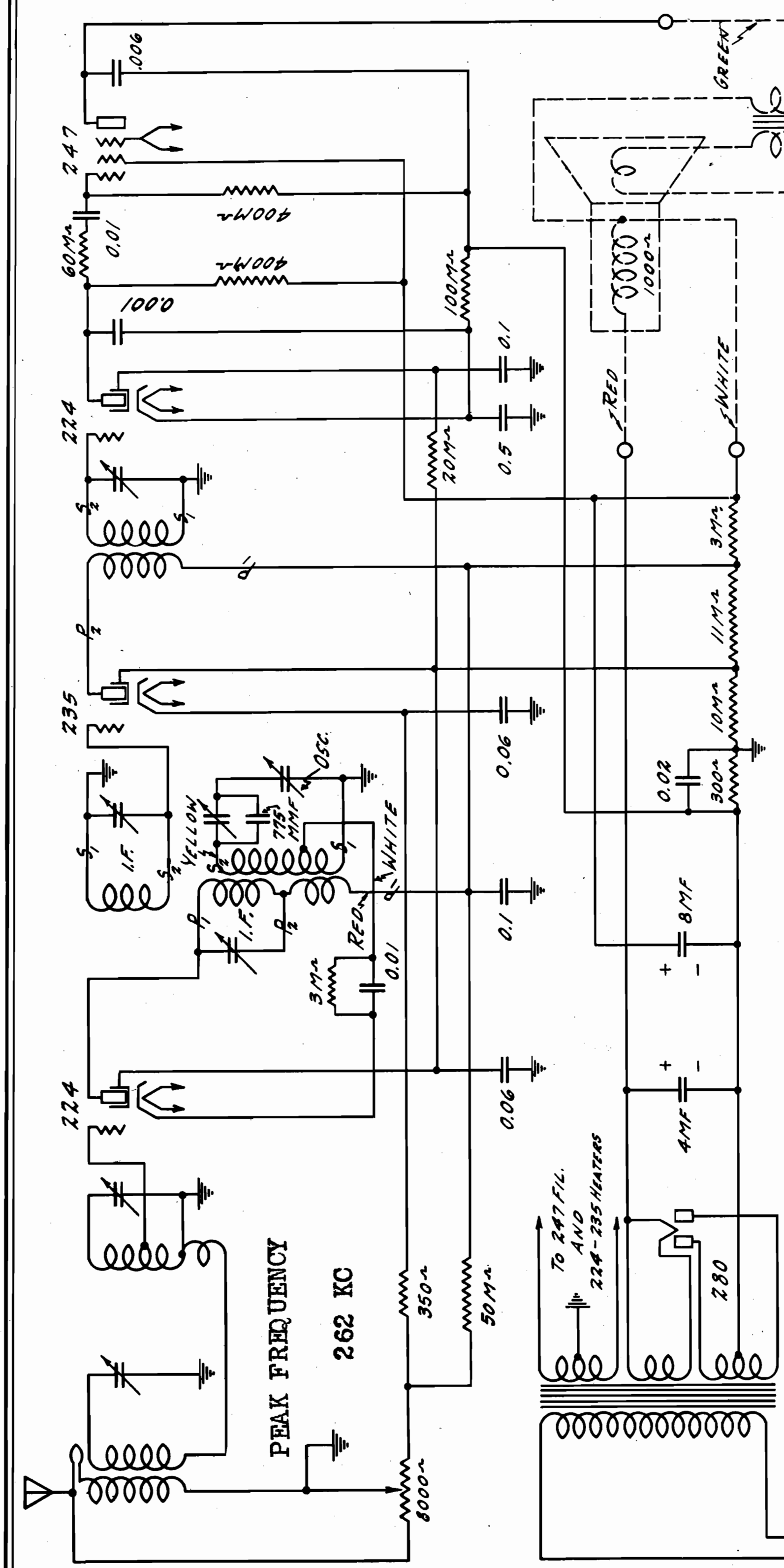
Part No.	Description	No. Used in Set	List Price Each
3408	Escutcheon Plate, U. S. APEX	1	.75
3789	Volume Control, 0—1 Megohm	1	1.40
3837	Tone Blender Rheostat, 0—200,000 Ohm	1	1.40
3844	8" D.C. Electrodynamic Speaker with Input Transformer	1	8.50
3845	8" D.C. Electrodynamic Speaker less Input Transformer	1	6.00
3867	Drive Assembly Complete with Dial Chart less Pilot Light	1	1.20
3873	4 Gang Variable Condenser Assembly	1	10.00
4014	Field Coil for 3845 Speaker—2,000 Ohm	1	3.00

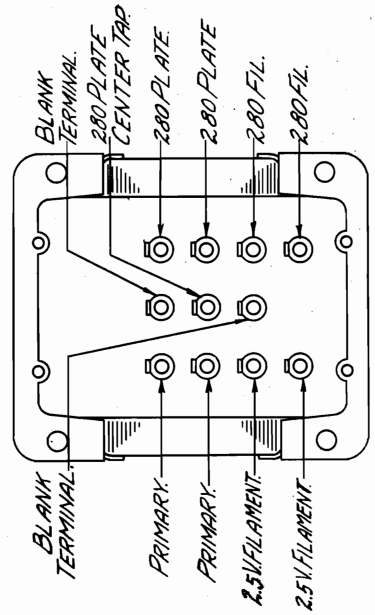
The following parts listed for the No. 1001 Chassis are not used in the No. 1000 Chassis:

Part No.	Description	No. Used in Set	List Price Each
2882	Escutcheon Plate, U. S. APEX	1	.75
2883	Drive Assembly Complete with Dial Chart	1	1.20
2895	Pointer Tension Spring for Drive	1	.15
2902	Dial Chart Assembly	1	.20
2962	Volume Control, 0—1 Megohm	1	1.40
3081	Bracket for Tuning Meter	1	.10
3151	Pilot Light Bracket with Leads	1	.30
3838	Tone Blender Rheostat, 0—200,000 Ohm	1	1.40
3846	10" D.C. Electrodynamic Speaker with Input Transformer	1	10.00
3847	8" D.C. Electrodynamic Speaker less Input Transformer	1	6.00
3860	Tuning Meter	1	3.50
3884	4 Gang Variable Condenser Assembly Complete less Drive and Meter	1	10.00
4016	Terminal Strip Cover for 3846 Speaker	1	.50
4020	Head Assembly Complete for 3846 Speaker	1	3.75
4021	Field Coil for 3847 Speaker—2,000 Ohm	1	2.75

U. S. RADIO & TELEVISION CORP.

No. 99 Series



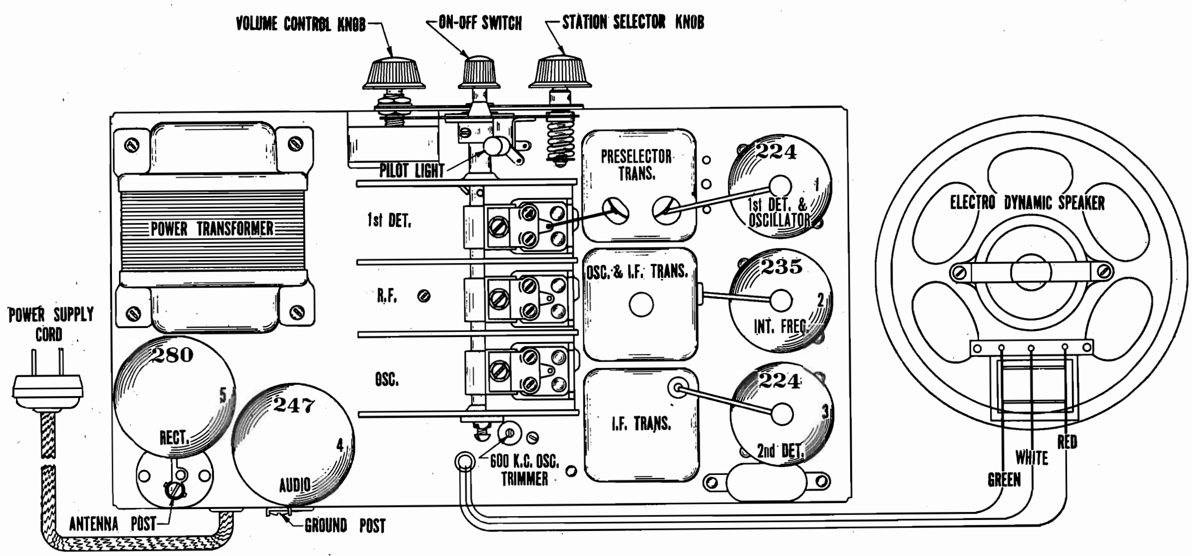


—Power Transformer Terminals

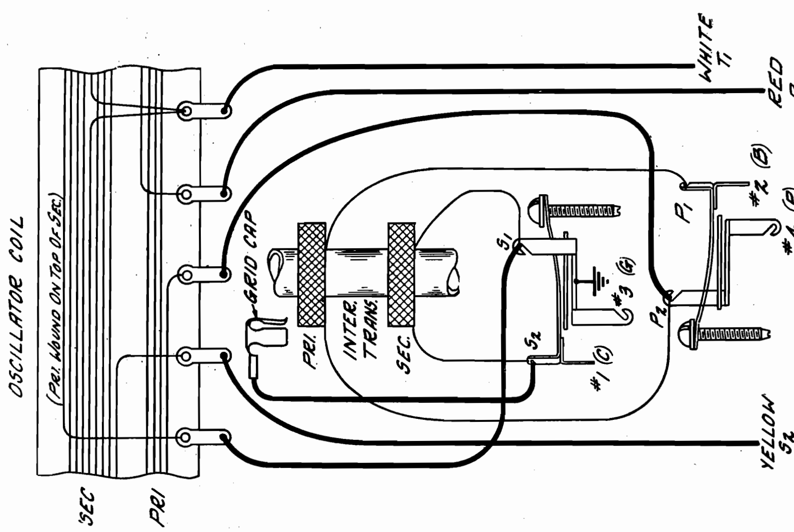
There are certain features to be noted in this receiver. The mixer is of the autodyne type, wherein it functions as a mixer (1st detector) and also as an oscillator. Also that the grid lead from the mixer tube joins the grid coil at a tap upon this winding. This tap is so apportioned that the circuit acts to suppress the tranmission of image frequency signals, in this case 524 KC higher than the frequency setting of the tuned circuit. The IF transformer is also of special structure combining the coupling transformer and also the oscillator system. The structure of this transformer-oscillator is illustrated upon the next page.

PEAK FREQUENCY 262 KC. FOR VOLTAGE DATA SEE PAGE 632-I
Socket layout is shown upon page 632-I. Chassis layout upon page 632-J. Data covering 25 cycle receiver 99-X will be found upon page 632-J. Structure of the combination IF transformer and oscillator coil is shown upon page 632-I.

U. S. RADIO & TELEVISION CORP.



Top View of No. 99 Chassis showing Tube Sequence and Speaker Connections.



—Wiring Diagram, Osc. and I.F. Assembly

No. 99X CHASSIS—25 CYCLE, 115 VOLT

Chassis No. 99X is almost identical in construction with chassis No. 99, except that it is designed for 25 cycle, 115 volt operation. All parts as used in the No. 99 chassis are used in the No. 99X with the exception of the power transformer. The correct power transformer for the No. 99X chassis is shown in the parts price list.

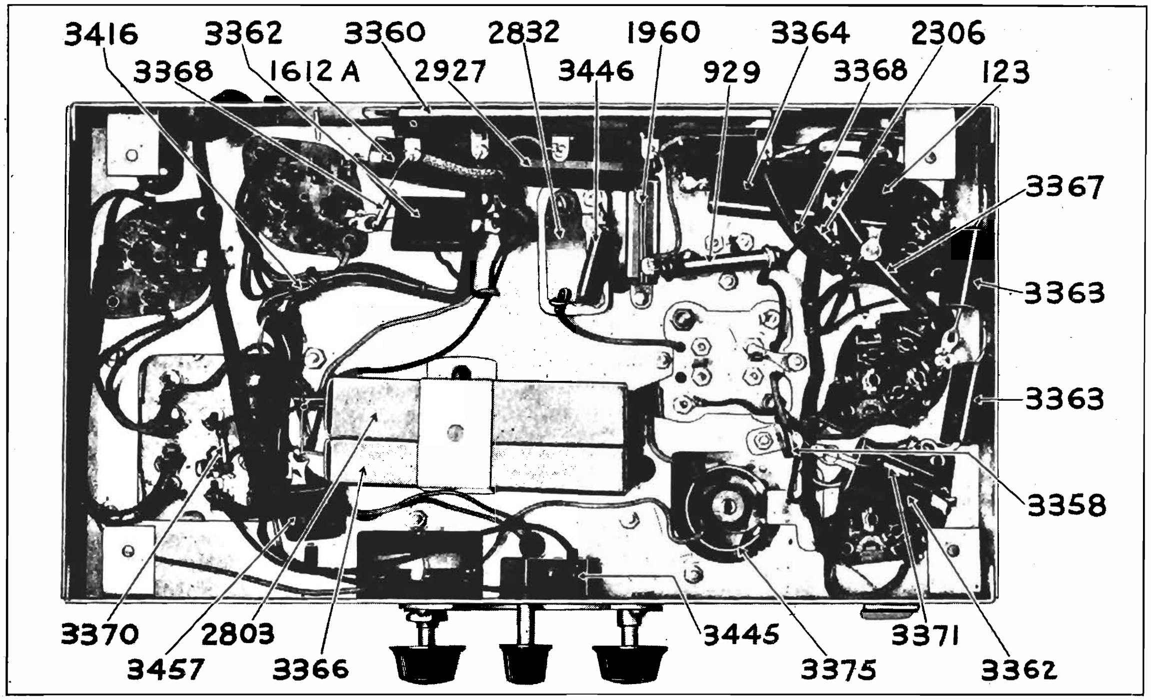
The description and testing as covered in the No. 99 Service Notes also applies to the No. 99X chassis.

No. 99 CHASSIS—VOLTAGES AT SOCKETS
LINE VOLTAGE 115—VOLUME CONTROL AT MAXIMUM

Type of Tube	Position of Tube	Function	"A" Volts	"B" Volts	Control Grid "C" Volts	Screen Volts	Screen Current MA	Cathode Volts	Plate MA	Grid Test MA
224	1	1st Det. & Osc.	2.25	165	4.5-5.25 (1)	65	.4	4.5-5.25 (1)	1.3	2.0
235	2	I.F.	2.25	165	2.5	65	1.5	2.5	6.4	7.4
224	3	2nd Det.	2.25	128	6.5	60 (2)	.05	6.5	.22	.23
247	4	Audio	2.25	205	16. (3)	225	8.0		29.	33.
280	5	Rect.	4.9						27. Per Plate	

(1) Varies with frequency setting of dial approximately as shown.
(2) Voltage as measured with 600,000 ohm meter.
(3) Measured across 300 ohm section of voltage divider resistor.

U. S. RADIO & TELEVISION CORP.



—*No. 99 Chassis, Bottom View*

No. 99 CHASSIS

Parts orders must be accompanied by serial number and model number of chassis. Order through your distributor.

Part No.	*Description*	*No. Used in Set*	*List Price Each*
123	.001 Mfd. By-pass Condenser	1	.45
1612A	.006 Mfd. By-pass Condenser	1	.50
2803	8 Mfd. Electrolytic Condenser unit, 450 Volt	1	2.00
3366	4 Mfd. Electrolytic Condenser unit, 450 Volt	1	1.40
3357	Clamp for Electrolytic Condensers	1	.04
2832	Oscillator 600 K.C. Trimmer Condenser	1	.40
2927	.1 Mfd. By-pass Condenser, Tubular type	1	.40
3364	.1 Mfd. By-pass Condenser, Flat type	1	.35
3362	.01 Mfd. Coupling and By-pass Condensers	2	.30
3363	.06 Mfd. By-pass Condensers	2	.30
3365	.5 Mfd. By-pass Condenser	1	.70
3446	775 Mmf. Oscillator Condenser	1	.45
3457	.02 Mfd. By-pass Condenser	1	.30
929	50,000 Ohm Biasing Resistor, Carbon	1	.45
1960	350 Ohm Biasing Resistor, Wire Wound	1	.30
2306	60,000 Ohm Series Resistor	1	.45
3360	24,300 Ohm Voltage Divider Resistor, Wire Wound	1	1.30
3367	20,000 Ohm Series Resistor, Carbon	1	.40
3368	400,000 Ohm Coupling Resistors	2	.40
3370	100,000 Ohm Series Resistor, Carbon	1	.40
3371	3,000 Ohm Biasing Resistor, Carbon	1	.45
3406	Volume Control 0—8,000 Ohm	1	1.50
2333	Antenna Binding Post Assembly	1	.20
678	Ground Binding Post	1	.15
E.P.	Escutcheon Plate (Specify Model Number of Receiver)	1	.75
3358	Insulated Terminal Assemblies	2	.04
3416	Chassis Harness	1	.60
3445	Power Switch	1	.70

U. S. RADIO & TELEVISION CORP.

CONDENSER ALIGNMENT

No. 99 CHASSIS

Aligning Intermediate Condensers—A nonmetallic screw driver is necessary for aligning the intermediate condensers. A signal of 262 K.C. is required. Remove the grid cap from the grid connection of the 224 1st detector tube and connect the lead from the signal generator to the grid of the 224 1st detector. The tube shield should be left on. One way to make this connection is to bring the antenna lead from the signal generator through the slot in the shield for the grid wire. A grid cap on the end of the antenna lead of the signal generator will facilitate making this connection. This lead, of course, should be insulated.

The oscillator coil must be shorted out by grounding the lead from the tap on the secondary. This is the white lead which comes through the porcelain base of the oscillator and I.F. assembly. This lead terminates at a lug on a vertically mounted bakelite terminal strip. Connect the jumper from this lug to the ground Connect the ground lead from the signal generator to the ground post of the chassis.

The intermediate condenser adjusting screws are reached from the bottom of the chassis. There are two on the porcelain base of the oscillator and 1st I.F. transformer assembly, Part No. 3382 and one on the porcelain base of the 2nd I.F. transformer assembly, Part No. 3388. The volume control should be at maximum setting. Then adjust the three intermediate condenser screws until maximum output is obtained on the output meter. After all three have been adjusted the first time, go over them again and check the setting for maximum output.

Aligning R.F. and Oscillator Condensers—For adjusting the R.F. and oscillator condensers the signal input from the signal generator should be made to the antenna post. Adjust the signal generator for a signal of exactly 1400 K.C. Then turn the tuning condenser rotor until the pointer is at exactly 1400 on the dial scale. Then adjust the three trimmers on the tuning condenser for maximum output adjusting the oscillator trimmer first (trimmer nearest back of chassis). Turn the screws up or down until greatest deflection on output indicating meter is obtained.

Then set the signal generator for a signal of 600 K.C. and turn the tuning condenser rotor until the output is at maximum. The next step is to adjust the oscillator 600 K.C. trimmer condenser. The adjusting screw for this condenser is in back of the tuning condenser and is reached from the top of the chassis. To correctly adjust this oscillator 600 K.C. trimmer it will be necessary to turn the screw to several different positions using a nonmetallic screw driver. At every position of this adjusting screw turn the tuning condenser rotor until maximum output is obtained. For each position of the adjusting screw there will be a maximum output and the correct position of the adjusting screw is the setting at which the deflection on output indicating meter is the greatest.

Next set the signal generator again for a 1400 K.C. signal and check the adjustment of the tuning condenser trimmers at this frequency for maximum output. Then set the signal generator for a signal of 1000 K.C. and turn the tuning condenser rotor until the output indicating meter shows maximum deflection. Then bend the slotted rotor plate sections of each tuning condenser bank which are last in mesh, in or out until maximum output is obtained. Tune in a signal at 750 K.C. and then at 600 K.C. and follow the same procedure bending the rotor plate sections last in mesh until maximum output is obtained. Do not change the setting of the oscillator 600 K.C. trimmer in any way after it has once been set as indicated above.

FLUTTERING OR MOTORBOATING

Fluttering or motorboating may be due to an open 8 Mfd. electrolytic filter condenser or to low capacity in this condenser. It may also be due to an open or low capacity .06 Mfd. screen by-pass condenser. If the 4 and 8 Mfd. electrolytic condenser units are reversed in position fluttering may result. The correct position of these two units is shown in Fig. 1.

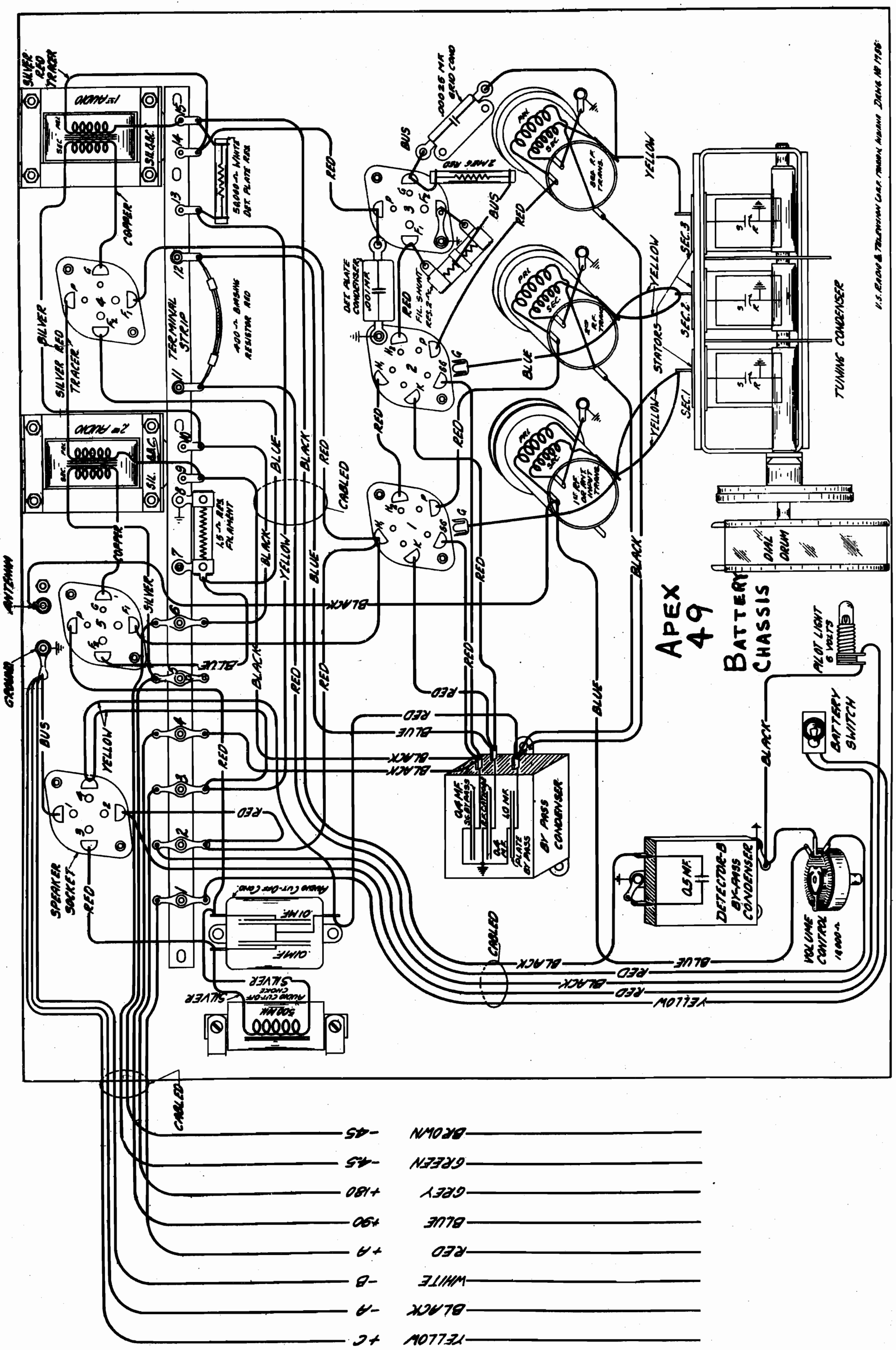
A 224 1st detector with characteristics varying considerably from the standard may cause fluttering. Try out some new 224 tubes in this socket. A defective oscillator and. 1st I.F transformer assembly may also be responsible for this type of disturbance. If, after the tubes have been changed and the other possibilities suggested in this article have been investigated, fluttering persists, it may be advisable to secure a new oscillator and 1st I.F. transformer assembly and try it out in the receiver. Motorboating may be due to a poor grid connection to the 235 I.F. tube and to the 224 2nd detector.

ELECTROLYTIC FILTER CONDENSERS

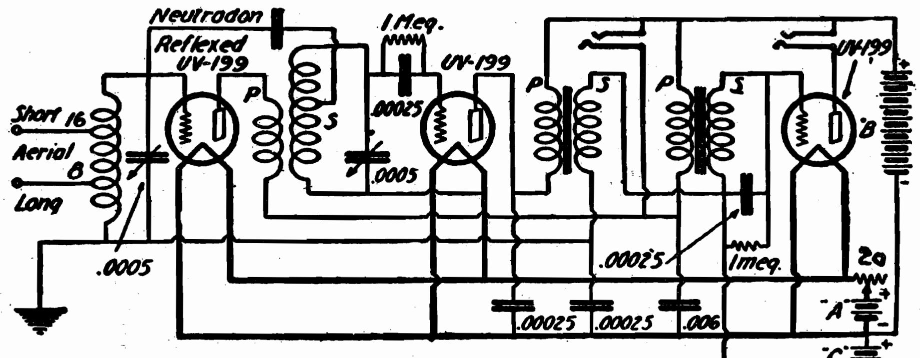
There are two dry electrolytic condenser units in the No. 99 chassis. One of these units is an 8 Mfd., 450 volt condenser, Part No. 2803. The other unit is a 4 Mfd., 450 volt condenser, Part No. 3366.

In replacing the electrolytic condenser units great care should be taken to wire them in with the correct polarity. Tag the leads when they are taken off the old condensers. The positive terminal of the condenser is identified by a + symbol on the box. The positive lead in the chassis can be determined by referring to the schematic circuit diagram.

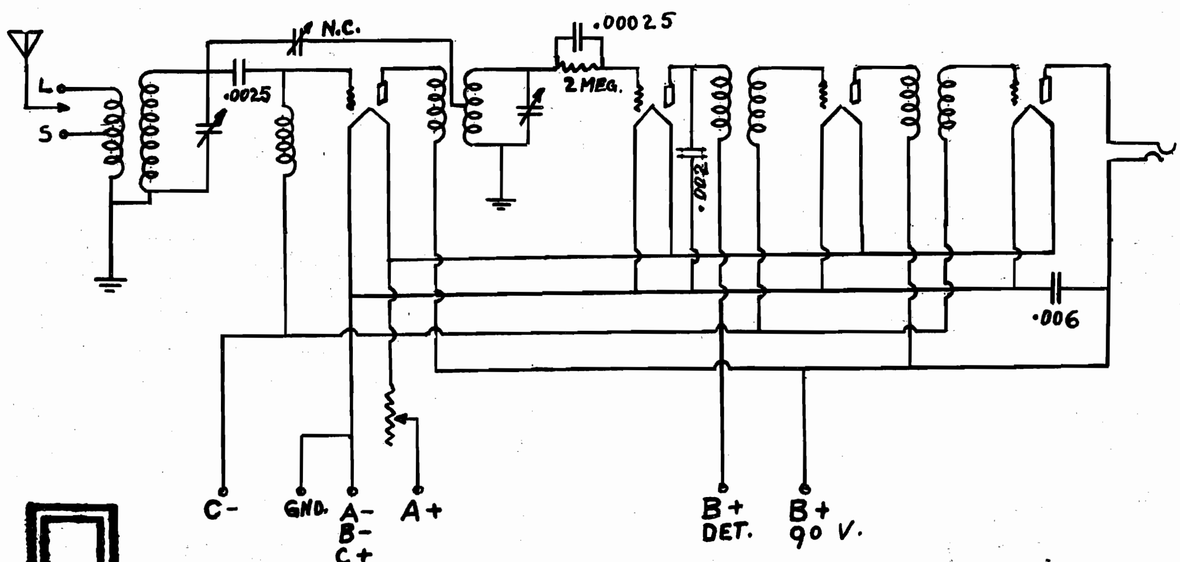
U. S. RADIO & TELEVISION CORP.



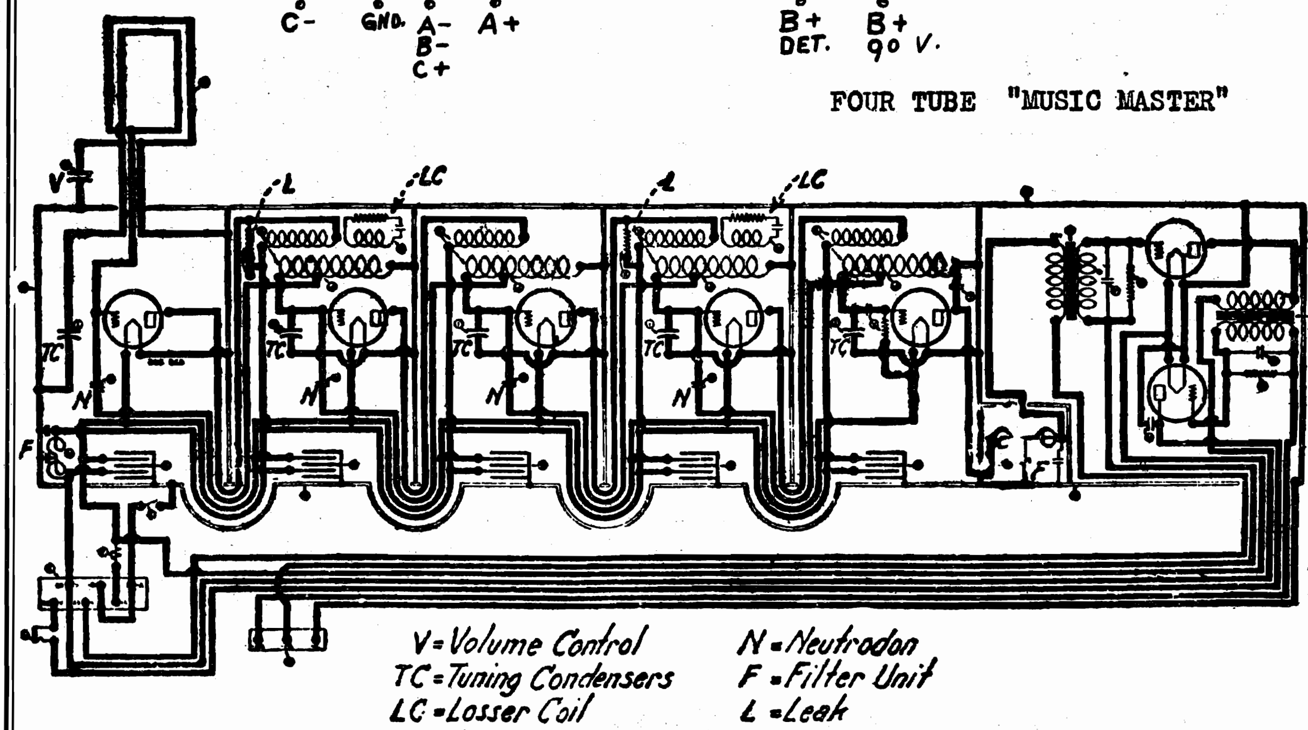
WARE MANUFACTURING CORP.



TYPE T, TWO-CONTROL NEUTRODYNE

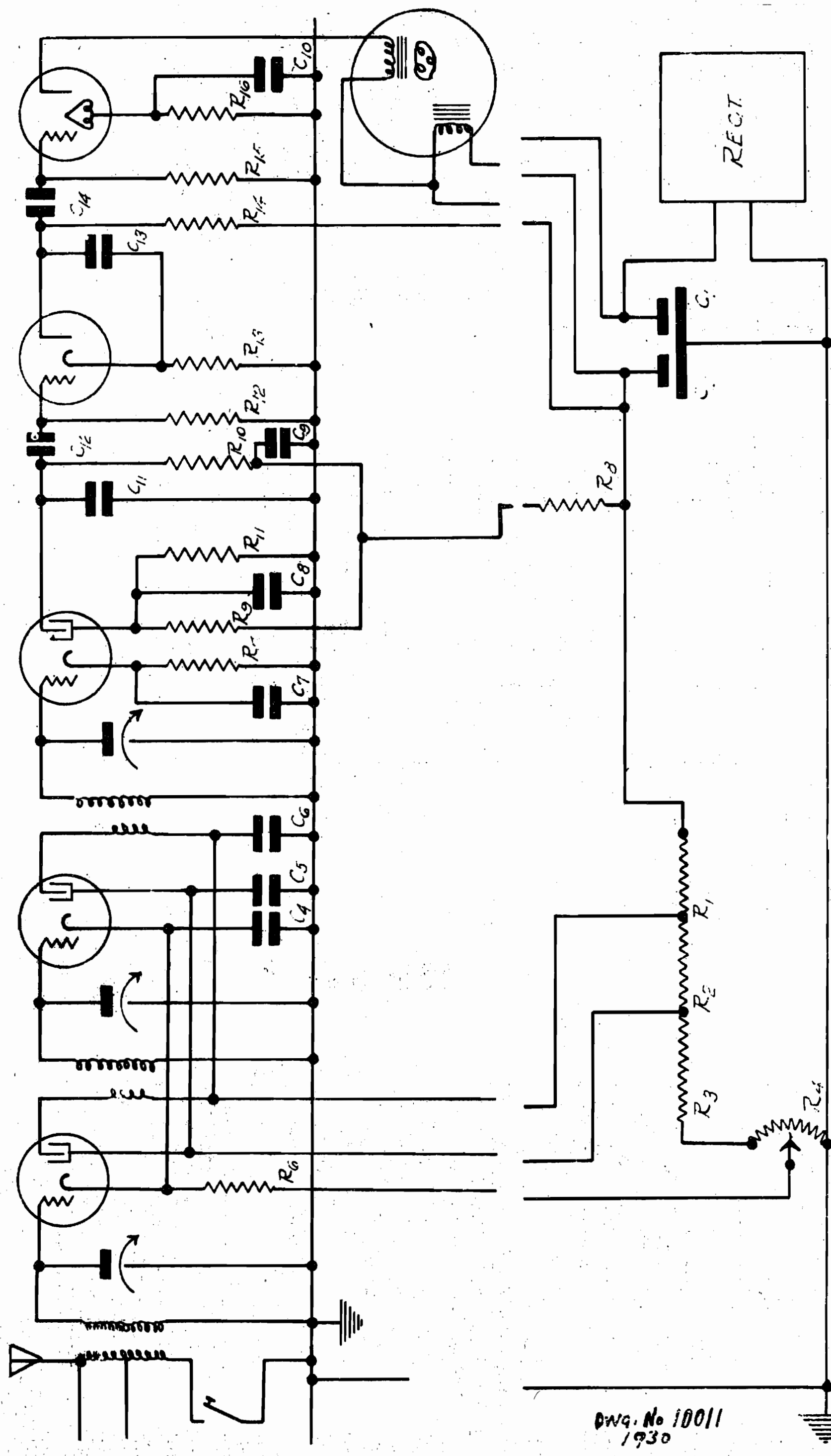


FOUR TUBE "MUSIC MASTER"



SEVEN TUBE "MUSIC MASTER"

WARE MANUFACTURING CORP.



C 1--14	Mfd. Electrolytic	-	First Filter Condenser
C 2--2	" "	-	2nd Filter Condenser
C 3--	" "	-	
C 4--0.1	" 200 V. Paper	-	R. F. Cathodes Bypass
C 5--0.1	" " " "	-	R. F. Screens Bypass
C 6--0.1	" " " "	-	R. F. Plates Bypass
C 7--1.0	" " " "	-	Det. Cathode Bypass
C 8--0.1	" " "	-	Det. Screen Bypass
C 9--0.25	" " "	-	Det. Plate Bypass
C 10-1.0	" " "	-	Power Tube Bias Bypass
C 11-.0005	Mfd. 350 V. Midget	-	Det. Plate to Gnd.
C 12-.006	" " " "	-	Det-1st Audio Coupling
C 13-.02	" " " "	-	1st Audio Plate to K. Bypass
C 14-.006	" " " "	-	1st Audio-Pr. Tube Coupling

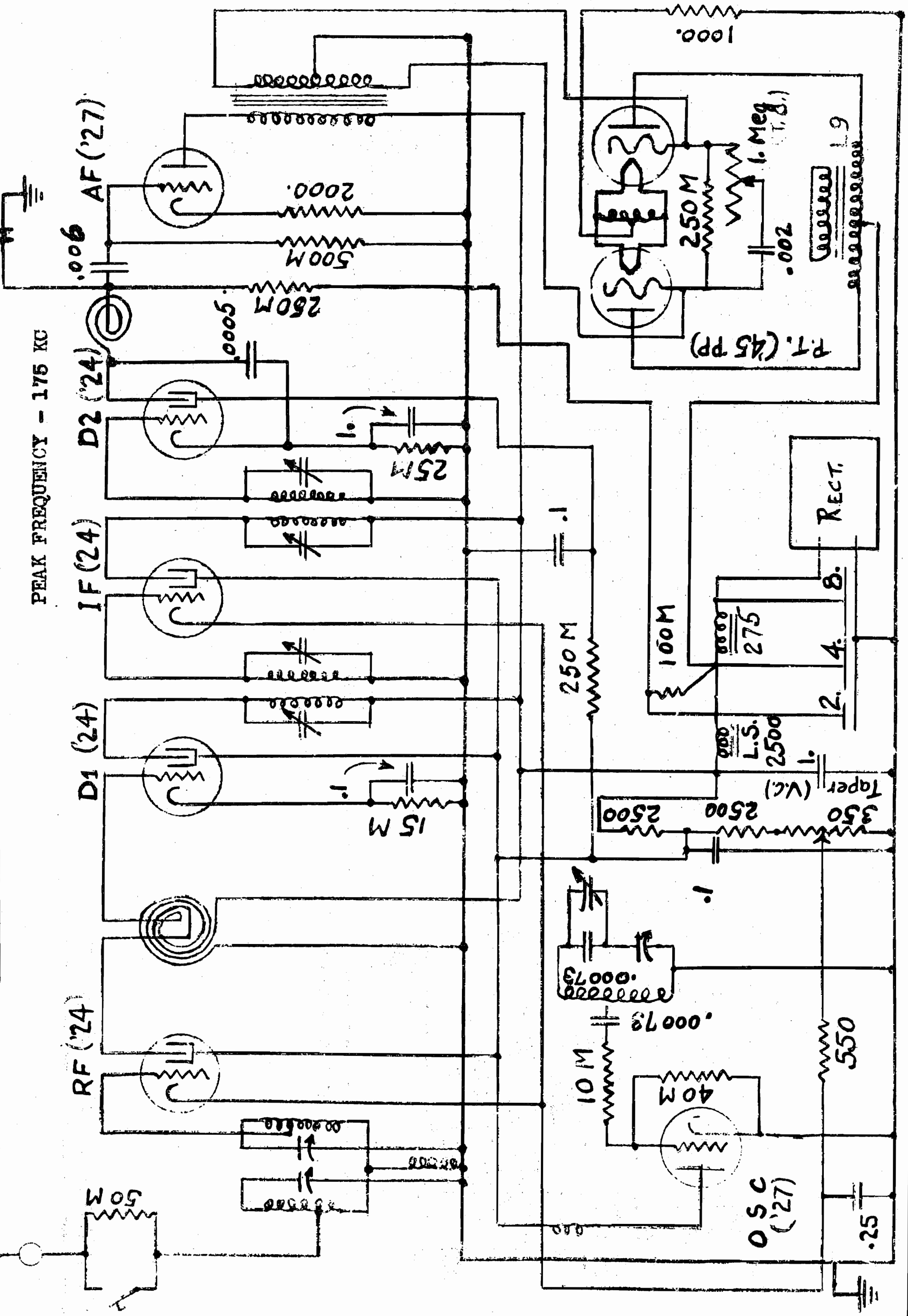
Variable Condenser, 3 Sections 367 M. Mfd. Each.

R 1--7500	ohms 1 watt carbon	-	R. F. Voltage Divider
R 2--10000	" " " "	-	R. F. " "
R 3--7500	" " " "		" " " "
R 4--1000	" Wire Wound Potentiometer-Volume Control		
R 5			
R 6--280	" 1 watt carbon	-	R. F. Bias
R 7--25000	" " " "	-	Det. Bias
R 8--25000	" " " "	-	Det. B. Common to Pl. and S. G.
R 9--$\frac{1}{2}$ Meg.	" $\frac{1}{2}$ " "	-	Det. Screen Supply
R 10-$\frac{1}{4}$ "	" " " "	-	Det. Plate Supply
R 11-75000	" 1 " "	-	Det. Screen Shunt
R 12-$\frac{1}{2}$ Meg.	" 1 " "	-	1st Audio Grid to Ground
R 13-1000	" " " "	-	1st Audio Bias
R 14-25000	" " " "	-	1st Audio Plate Supply
R 15-$\frac{1}{2}$ Meg.	" " " "	-	P.T. Grid to Ground
R 16-1300	" 2 " "	-	P. T. Bias

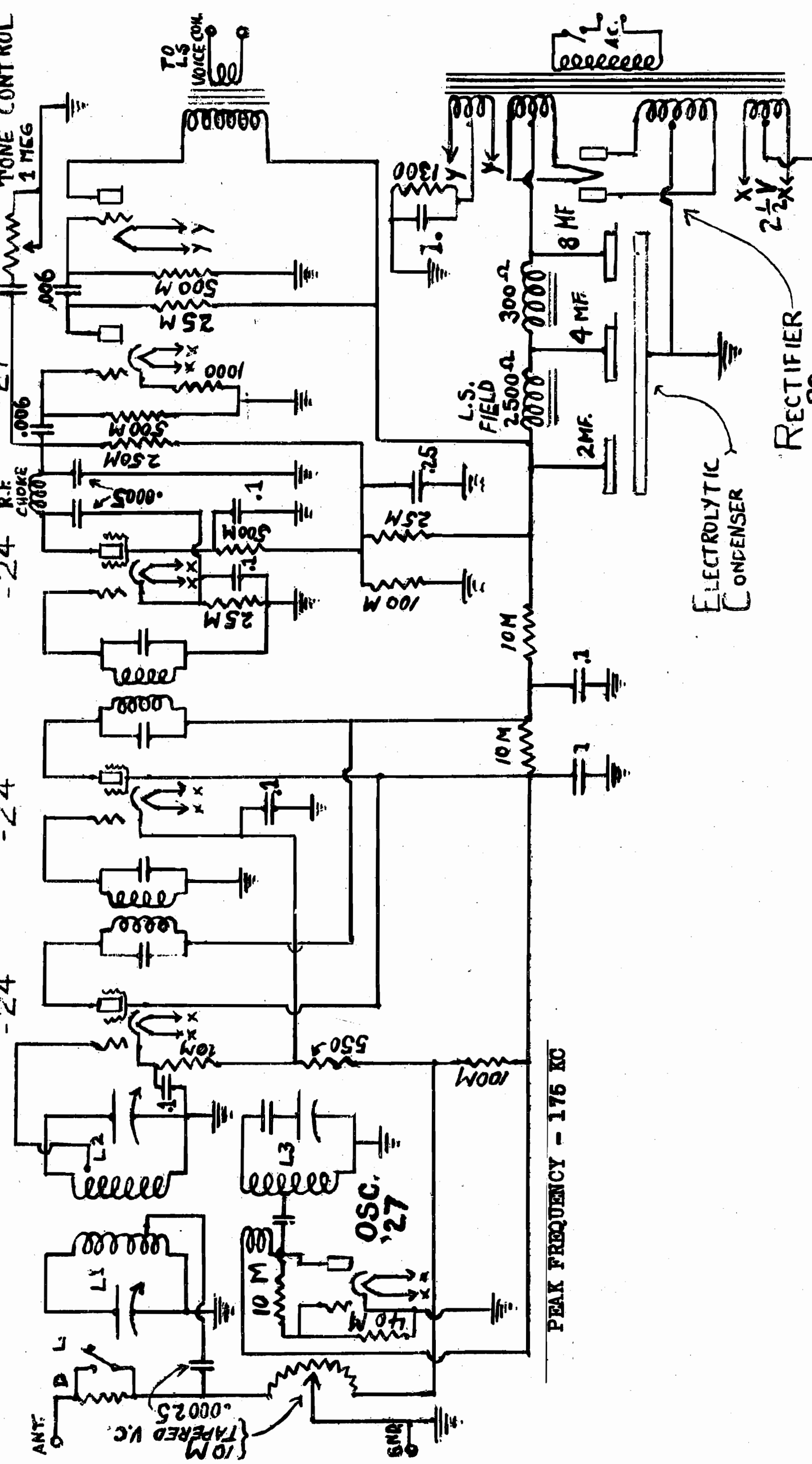
"BANTAM" CHASSIS TYPE B-1 AND B-2

WARE MANUFACTURING CORP.

TYPE S-1 SUPERHETERODYNE



WARE MANUFACTURING CORP.



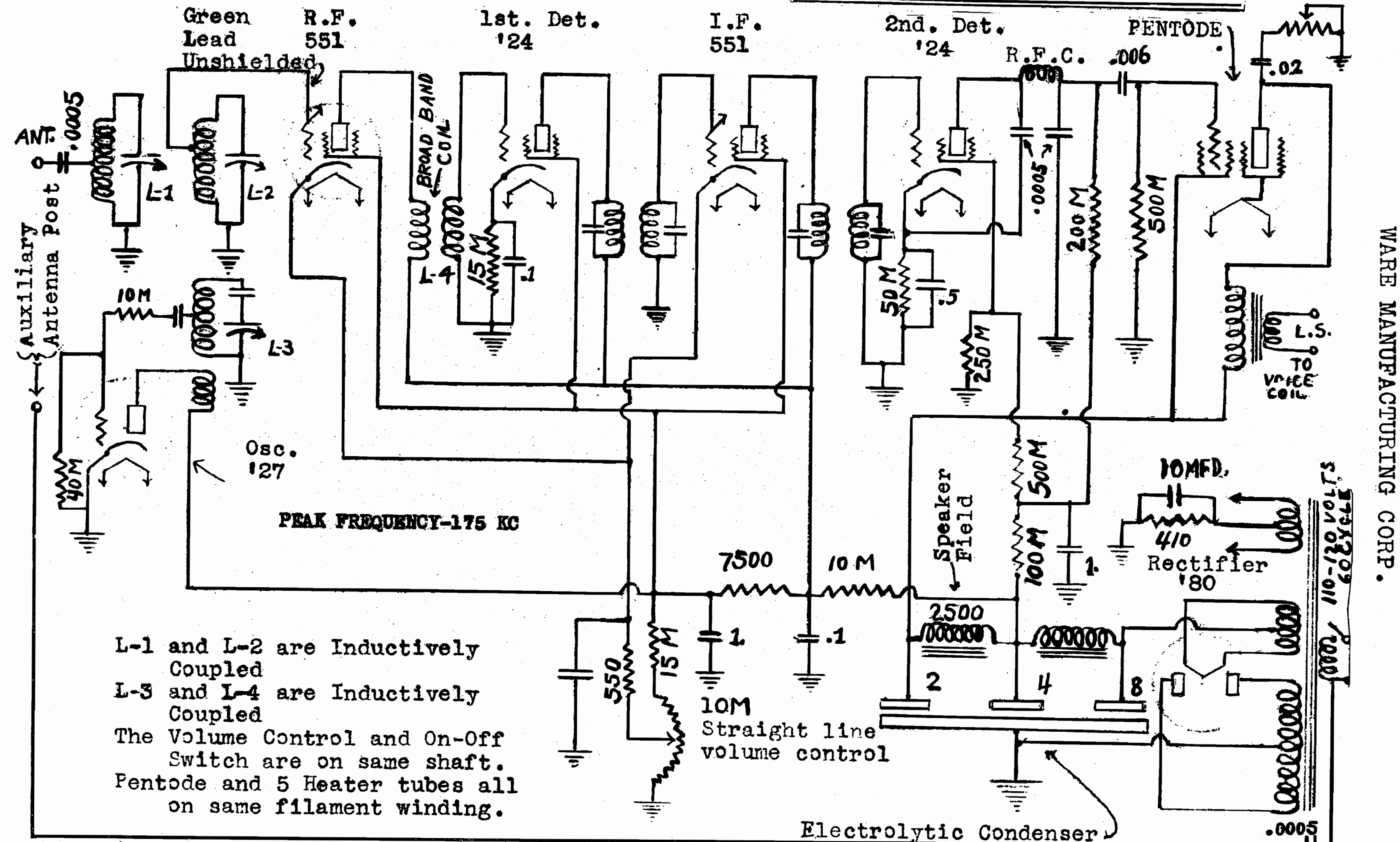
TYPE S.B.-45 SUPERHETERODYNE

On-off switch is located on volume control shaft.
Coils L1 and L3 are inductively coupled to L2.

WARE MANUFACTURING CORP.

TYPE S.B.A. SUPERHETERODYNE

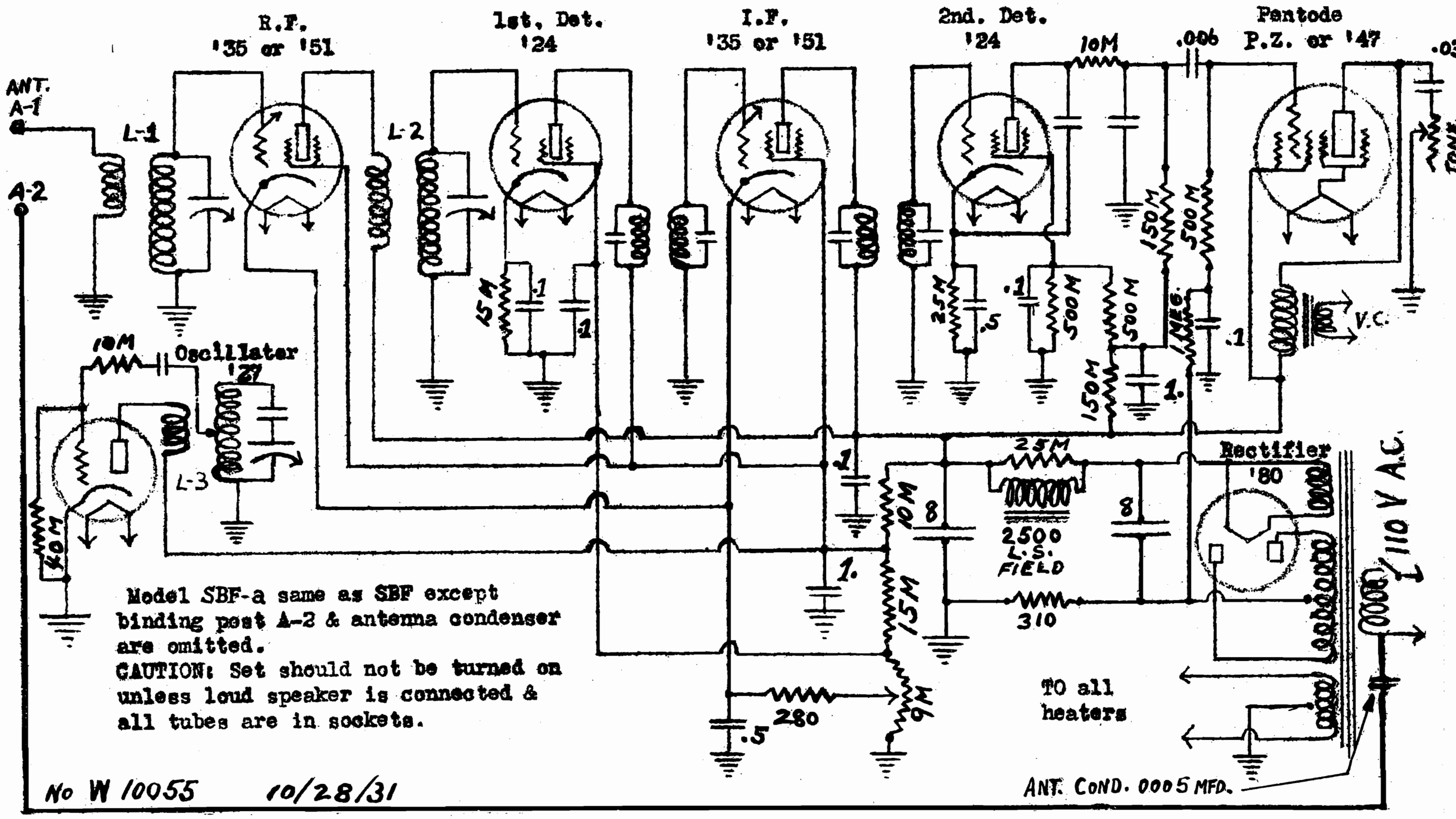
This print covers serial numbers 2000 to 2799 inclusive, also 5500 to 5599 inclusive.



L-1 and L-2 are Inductively Coupled
L-3 and L-4 are Inductively Coupled
The Volume Control and On-Off Switch are on same shaft.
Pentode and 5 Heater tubes all on same filament winding.

DRWG. No 10052 - 5/13/31

WARE MANUFACTURING CORP.



Model SBF-a same as SBF except binding post A-2 & antenna condenser are omitted.

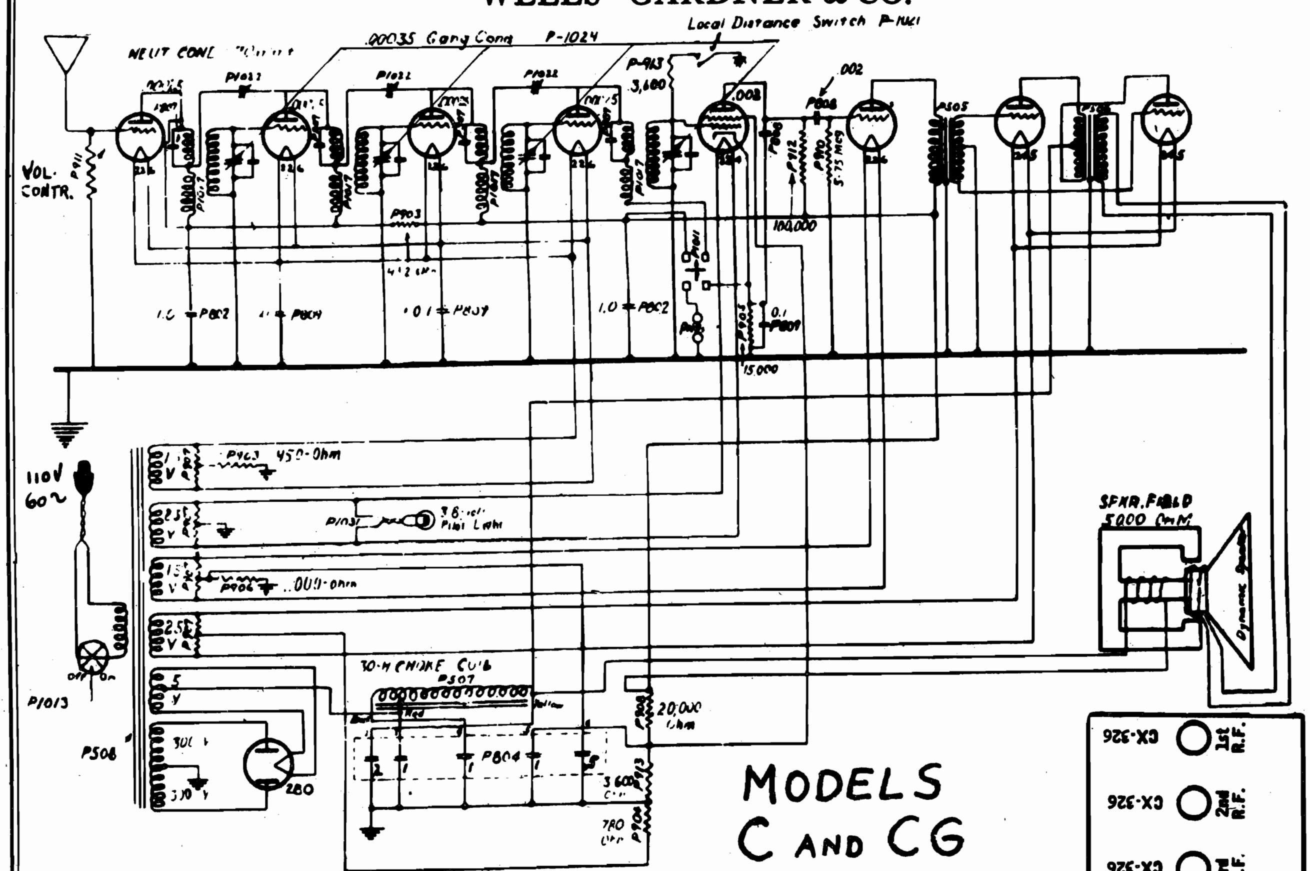
CAUTION: Set should not be turned on unless loud speaker is connected & all tubes are in sockets.

No W 10055 10/28/31

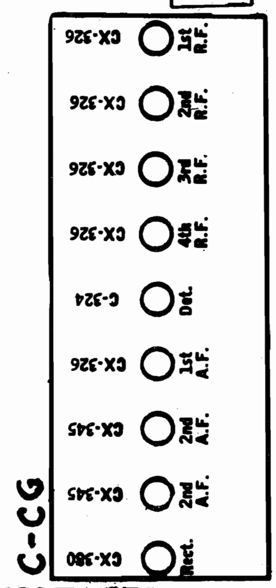
PEAK FREQUENCY-175 KC

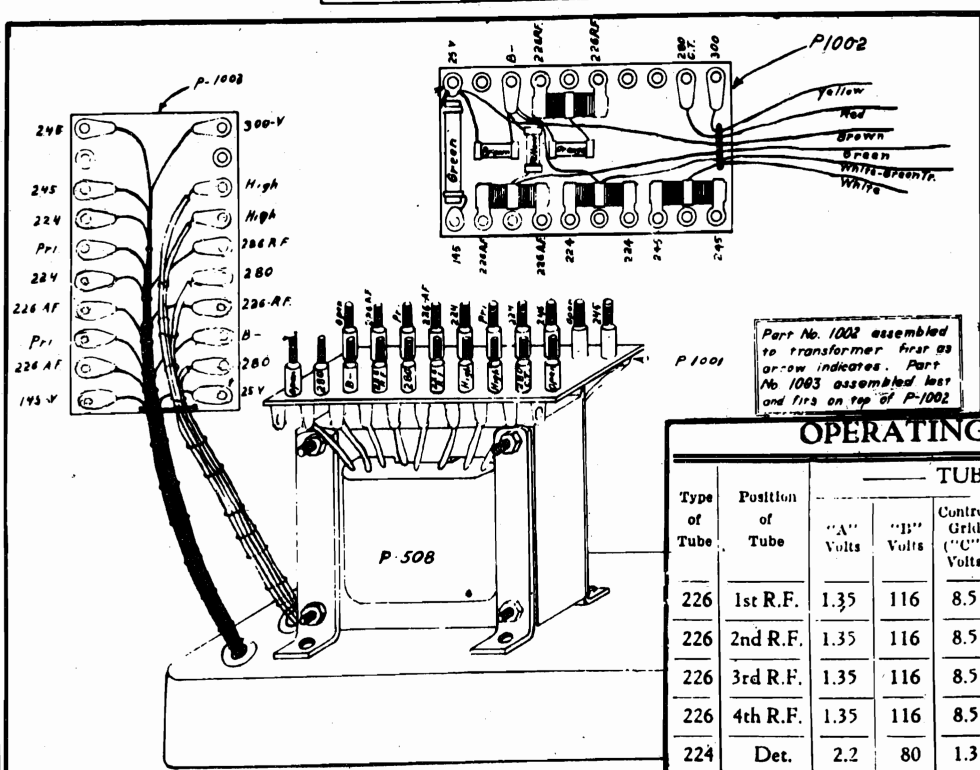
TYPE S.B.F. SUPERHETERODYNE

WELLS - GARDNER & CO.



MODELS C AND CG





Power Transformer and
Terminal Plate Assembly.

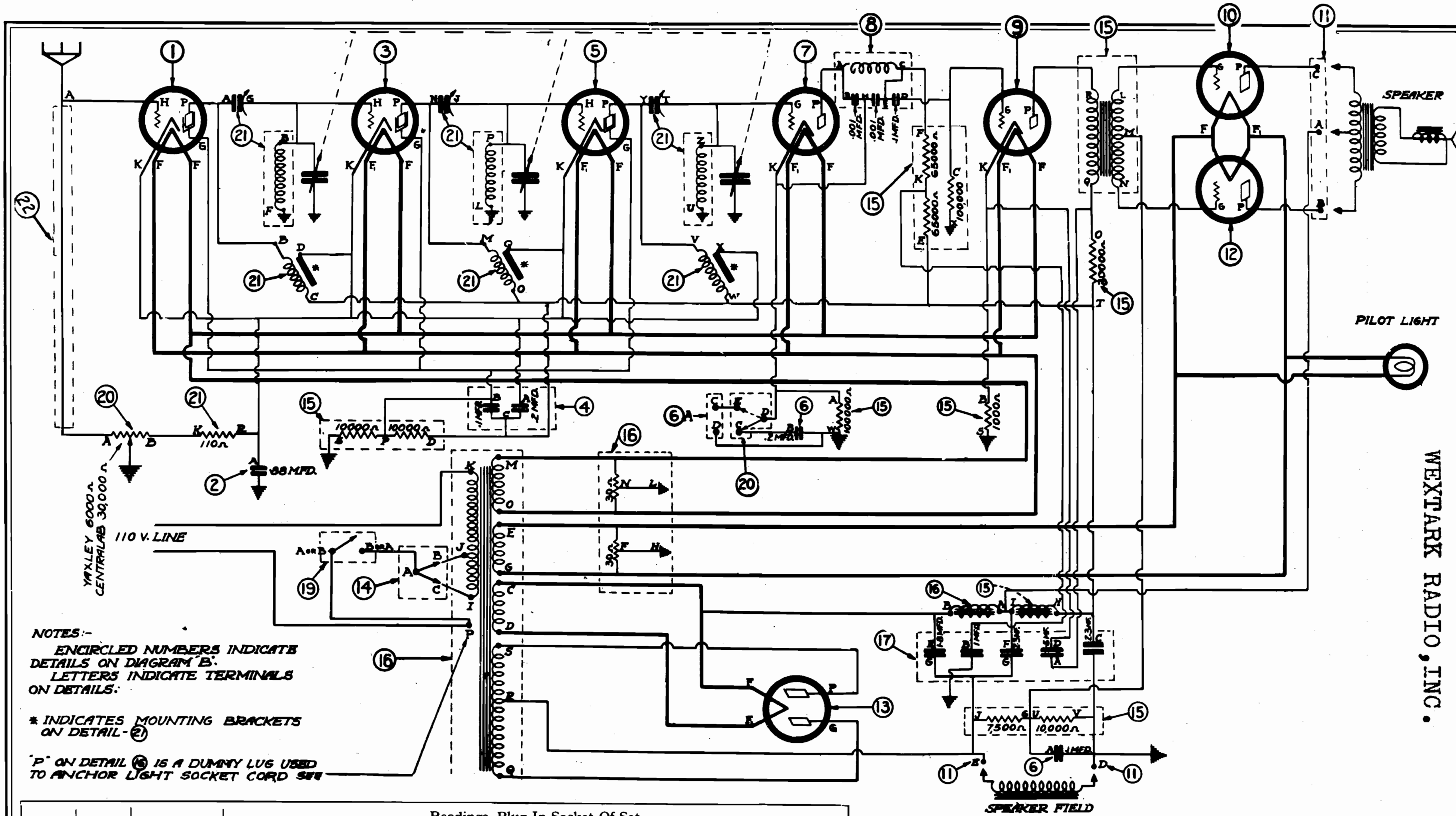
For additional data see Gulbransen
Pages 391 and 392

OPERATING VOLTAGES

Type of Tube	Position of Tube	"A" Volts	"B" Volts	Control Grid ("C") Volts	Screen Volts	Screen Current	Cathode Volts	Normal Ma.	Grid Test Ma.
		TUBE IN TEST SET							
226	1st R.F.	1.35	116	8.5				4.7	8.7
226	2nd R.F.	1.35	116	8.5				4.7	8.7
226	3rd R.F.	1.35	116	8.5				4.7	8.7
226	4th R.F.	1.35	116	8.5				4.7	8.7
224	Det.	2.2	80	1.3	15		—	—	—
226	1st A.F.	1.4	110	1.0	Low reading due to resistance coupling			4.0	5.0
245	2nd A.F.	2.2	232	42				27	32
245	2nd A.F.	2.2	232	42				27	32
280	Rect.	4.6						84	

Line Voltage During Test—115 Volts.

WEXTARK RADIO, INC.



NOTES:-
ENCIRCLED NUMBERS INDICATE DETAILS ON DIAGRAM 'B'.
LETTERS INDICATE TERMINALS ON DETAILS.

* INDICATES MOUNTING BRACKETS ON DETAIL-(21)

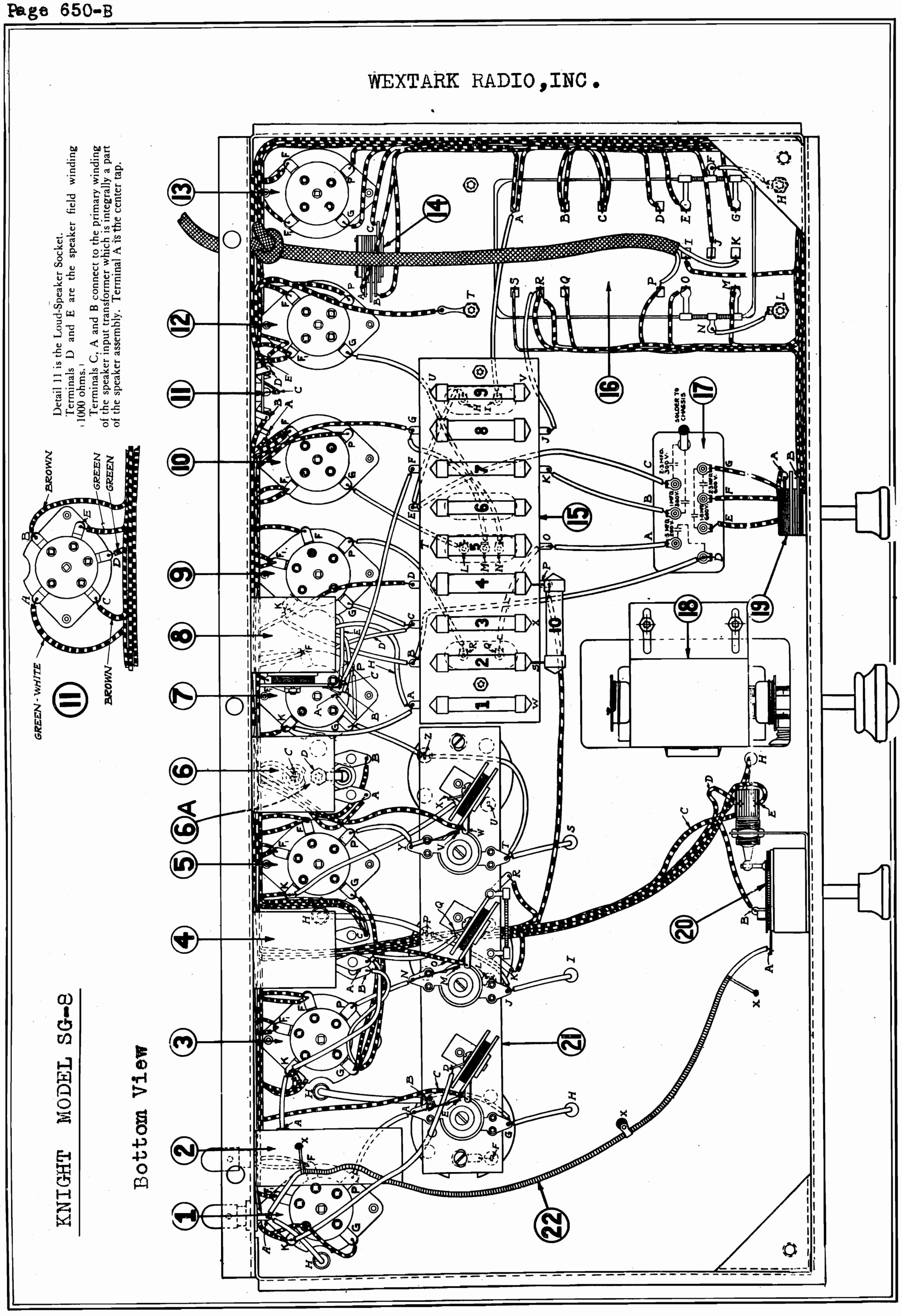
"P" ON DETAIL (16) IS A DUMMY LUG USED TO ANCHOR LIGHT SOCKET CORD S...

KNIGHT MODEL SG-8 (1930)

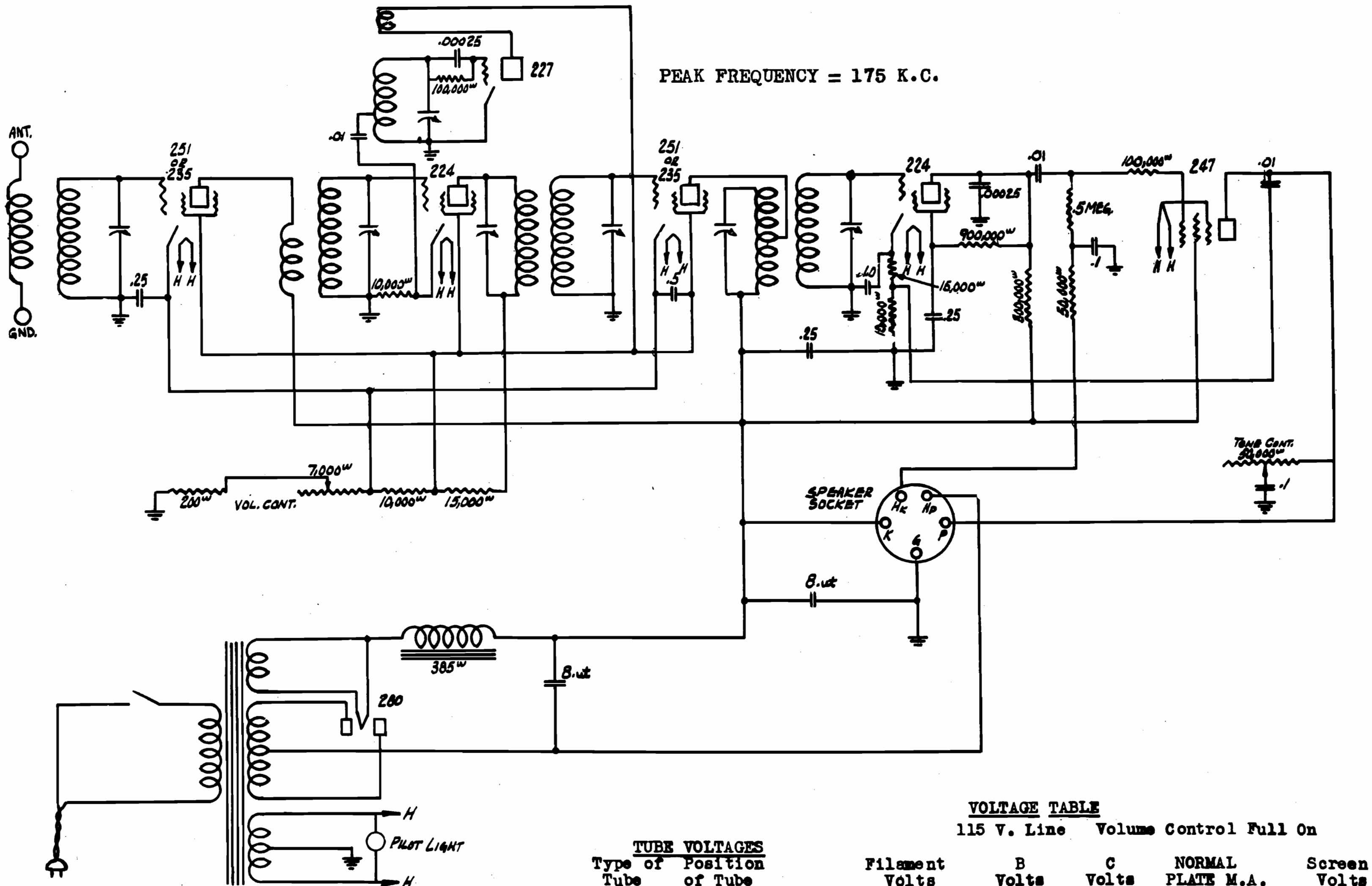
Tube No. In Order (1)	Type Of Tube (2)	Position of Tube 1st. R.F. Det., Etc. (3)	Readings, Plug In Socket Of Set: Tube Out: A Volts (4)	B Volts (5)	Tube In Tester: A Volts (6)	B Volts (7)	C Volts (Control Grid) (8)	Cathode —Heater Volts (9)	Normal Plate M.A. (10)	Plate M.A.Grid Test (11)	Plate Change M.A. (12)	Screen Grid Volts (13)
1	224	1st R.F.	2.45	180	2.4	174	—1.5	1.5	4.5	6.7	2.2	80
2	224	2nd R.F.	2.45	180	2.4	174	—1.5	1.5	4.5	6.7	2.2	80
3	224	3rd R.F.	2.45	180	2.4	174	—1.5	1.5	4.5	6.7	2.2	80
4	227	Det.	2.45	106	2.4	106	—14.5	14.5	.2	....	....	
5	227	1st A.F.	2.45	162	2.4	68	—3.	3.	3.2	3.8	.6	
6	245	2nd.A.F.	2.35	230	2.2	212	—3.8	....	20	23	3.	
7	245	2nd A.F.	2.35	230	2.2	212	—3.8	....	19	22	3.	

Line Voltage 115. Set on Low (1) Volt Tap. Volume Control Position Maximum.

WEXTARK RADIO, INC.



WEXTARK RADIO, INC.



VOLTAGE TABLE

115 V. Line Volume Control Full On

TUBE VOLTAGES

Type of Tube	Position of Tube	Filament Volts	B Volts	C Volts	NORMAL PLATE M.A.	Screen Volts
227	Oscillator	2.4	62.5		4.75	
235	Radio Frequency	2.4	240	2.15	2.75	27
224	1st Detector	2.4	230	4.35	.5	65
235	Intermediate	2.4	237	2.15	2.75	72
224	2nd Detector	2.4	100*	2.1*	2.5	35*
247	Pentode	2.4	250	16.5**	32.5	250
280	Rectifier	4.95			27.ea.plate	

*These readings are only comparative and are not true voltages applied. The volt meter, when the readings are taken at these points, is in series with a very high resistance.

** To read the 247 bias, read between H.K.speaker socket and ground.

KNIGHT 7 TUBE SUPERHETERODYNE 1932 MODEL

WEXTARK RADIO, INC.

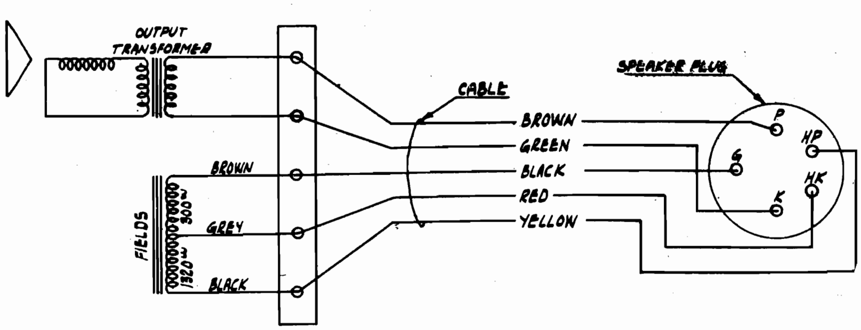
KNIGHT 7 TUBE SUPERHETERODYNE 1932 MODEL

INTERMEDIATE TRANSFORMERS:
The intermediate transformers are of the band pass type and of exceptionally high uniform gain. They are tuned to 175 kilocycles. The intermediate frequency trimmers are mounted on an isolantite base, preventing the transformer from becoming detuned due to the trimmer condensers absorbing moisture or warping. For this reason it should rarely, if ever, be necessary to re-track the intermediate frequency trimmers. In the event that it should be advisable to re-align the intermediate frequency coils, it is absolutely essential that a 175 kilocycle oscillator and an output measuring device be used.

ALIGNMENT OF RECEIVER:
Because of the construction and thorough impregnation of the intermediate coils, the intermediate stages should rarely need re-tracking. Only when an intermediate coil has become defective due either to an open or burned out winding, should it be necessary to re-adjust the intermediate trimmers. Should this occur, it is necessary that an oscillator be used and the intermediate trimmers be adjusted at 175 kilocycles. To align the intermediate stages, connect the high side of the oscillator output to the grid circuit of the first detector, which is done by disconnecting the grid cap of the 224 first detector and connecting the high side of the test oscillator to the control grid of this tube. The ground side of the test oscillator should be connected to the ground post on the chassis. Set the oscillator at 175 kilocycles and adjust the output of the oscillator so that a convenient reading is obtained on the output meter. Be sure that the output from the oscillator is not so large that it will overload the second detector. If during the alignment the meter goes off scale, reduce the output of the test oscillator or adjust the receiver volume control.

The trimmers of the intermediate coils are accessible through the small holes in the top of the intermediate shield can. There are two trimmers to each intermediate coil. Align the grid trimmer of the first intermediate coil. After a maximum reading is obtained by adjusting the grid trimmer on the first int rmediate, adjust the primary for maximum reading and then re-check the grid side to make certain the alignment of the secondary has not been changed by the adjustment of the primary. The same procedure is followed in aligning the second intermediate coils. After both intermediate coils are properly aligned the adjustment of the intermediate stage is complete and they should not be further disturbed.

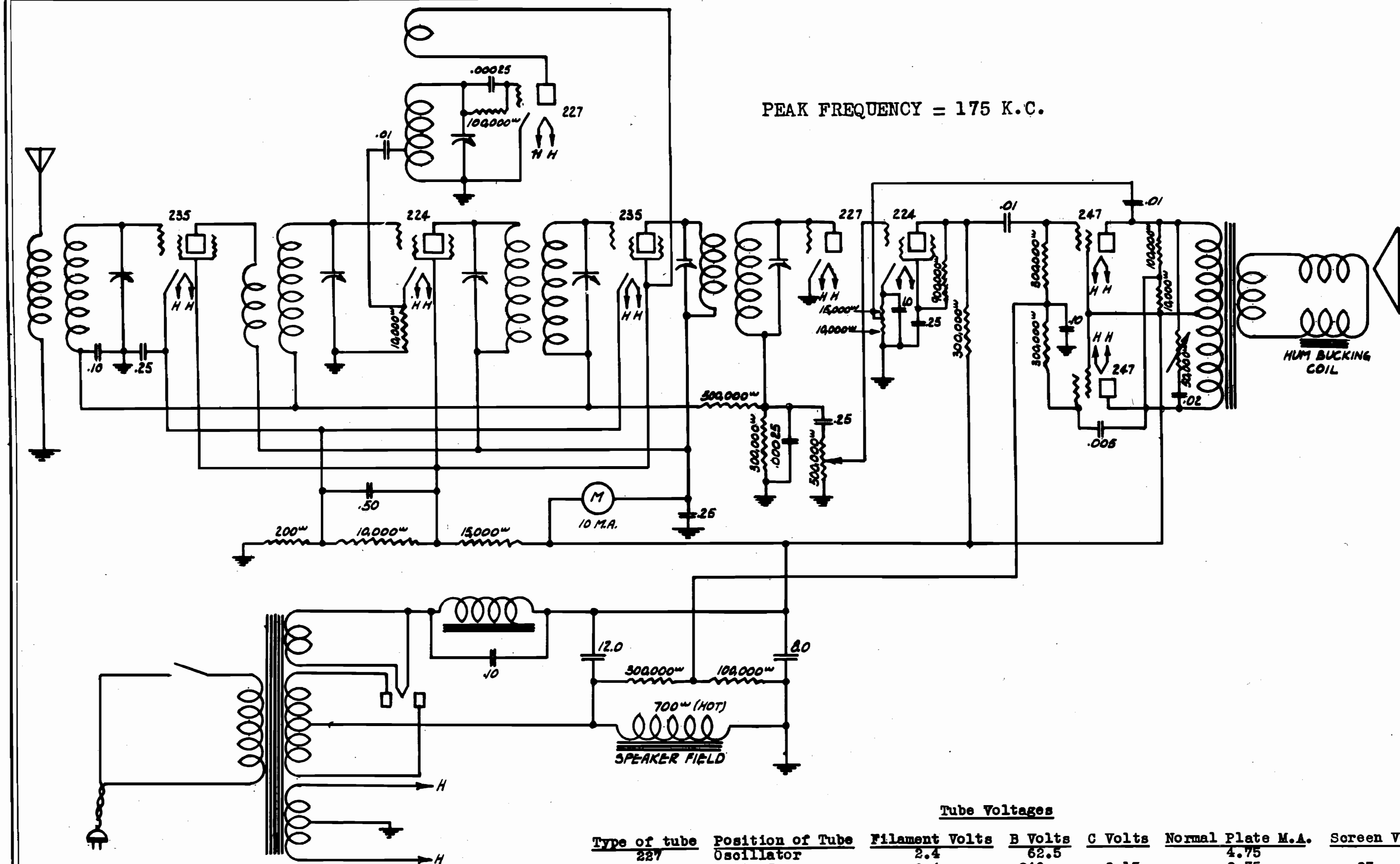
Replace the grid cap on the first detector and connect the oscillator output leads to the antenna and ground posts of the receiver and set the oscillator at 1435 kilocycles. Then tune the receiver to 1435 kilocycles on the dial. It is important that the receiver be tuned to this point. If the receiver is out of the cabinet it will be necessary to use some temporary indicator so that the position 1435 kilocycles on the dial may be accurately located. (This indicator should be set so that when the variable condensers are at the maximum capacity stop the indicator points to the last line on the dial at the low frequency end.) Then track the variable condensers by adjusting the trimmer condensers in the following order: Oscillator, antenna and radio frequency - (reading from the front of the receiver toward the back, the variable condenser sections are : Oscillator, antenna and radio frequency). After the variable condensers have been properly tracked at 1435 kilocycles, adjust the oscillator to 1295 kilocycles. Tune the receiver to this frequency. Check alignment of the condensers at this point by bending the end plate of the rotors in and out, noting the change in reading on the output meter. If when the plates are bent in the reading is increased, it is an indication that that particular section requires more capacity and the end plate should be permanently bent in at this point; or, if when the end plate is bent away, the reading is increased, the end plate should be bent away permanently, as it is an indication that that particular section requires less capacity at that particular point. The variable condensers should be checked in this manner at 1295, 880, 650 and 550 kilocycles. These points have been chosen so as to take advantage of the slots in the end plates of the variable condensers. This procedure of bending plates should rarely be necessary on the oscillator section, as the plates of the oscillator section are especially designed to properly track over the broadcast spectrum, providing the antenna and radio frequency stages are correctly aligned.



ELECTRO DYNAMIC SPEAKER:
The electro dynamic speaker has a tapped field winding - one section of which is 1320 ohms and is utilized as the second choke in the filter circuit. The other section, which is 300 ohms, is used to obtain the proper bias for the 247 tube, as well as acting as an additional filter choke.

WEXTARK RADIO,INC.

PEAK FREQUENCY = 175 K.C.



KNIGHT 9 TUBE SUPERHETERODYNE
1932 MODEL
AUTOMATIC VOLUME CONTROL

Tube Voltages

Type of tube	Position of Tube	Filament Volts	B Volts	C Volts	Normal Plate M.A.	Screen Volts
227	Oscillator	2.4	62.5		4.75	
235	Radio Frequency	2.4	240	2.15	2.75	27
224	1st Detector	2.4	230	4,35	.5	65
235	Intermediate	2.4	237	2.15	2.75	72
227	2nd Detector	2.4				
247	Pentode	2.4	220	8.**	32.5	250
247	Pentode	2.4	220	8.**	32.5	250
280	Rectifier	4.9			47.5 ea.plate	
224	1st Audio	2.4	100	2.1*	.5	35*

115 V. line Volume Control Full On

**To read the 247 bias, read between 247 grid and ground.

*These readings are only comparative and are not true voltages applied. The volt meter, when the readings are taken at these points, is in series with a very high resistance.

WEXTARK RADIO, INC.

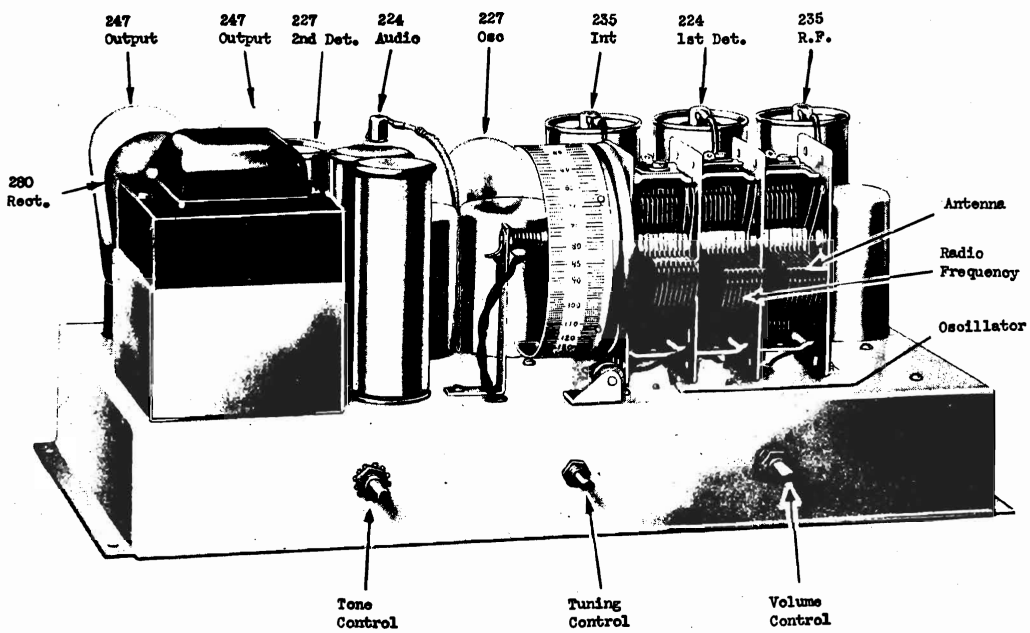
KNIGHT 9 TUBE SUPERHETERODYNE 1932 MODEL
AUTOMATIC VOLUME CONTROL

DYNAMIC SPEAKER

The electro dynamic speaker field winding, which is 700 ohms, is utilized as an additional choke in the filter circuit. The correct bias for the two 247 output tubes is obtained from the voltage drop across the speaker field shunt resistors.

ALIGNMENT

Because of the construction and thorough impregnation of the intermediate coils, the intermediate stages should rarely need retracking. Only when an intermediate coil has become defective due to an open or burned out winding, should it be necessary to readjust the intermediate trimmers. Should this occur, it is necessary that an oscillator be used and the intermediate trimmers be adjusted at 175 kilocycles. To align the intermediate stages, connect the high side of the oscillator output to the grid circuit of the first detector, which is done by disconnecting the grid cap of the 224 first detector and connecting the high side of the test oscillator to the control grid of this tube. The ground side of the test oscillator should be connected to the ground post on the chassis. Set the oscillator at 175 kilocycles and adjust the output of the oscillator so that a convenient reading is obtained on the output meter. Be sure that the output from the oscillator is not so large that it will overload the second detector. If during the alignment the meter goes off scale, reduce the output of the test oscillator or adjust the receiver volume control.



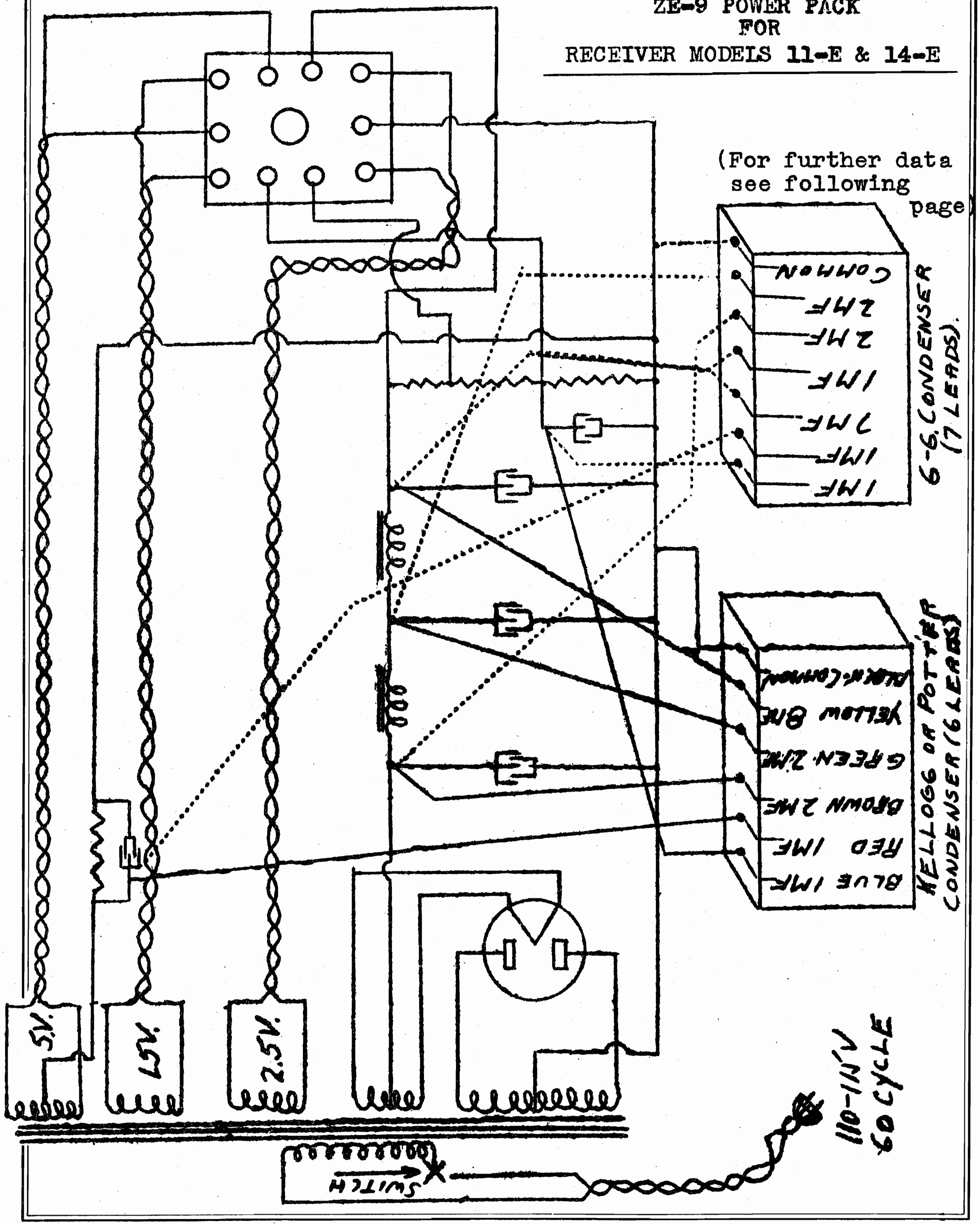
The trimmers of the intermediate coils are accessible through the small holes in the bottom of the chassis. There are two trimmers to each intermediate coil. Align the grid trimmer of the first intermediate coil. After a maximum reading is obtained by adjusting the grid trimmer on the first intermediate, adjust the primary for maximum reading and then recheck the grid side to make certain the alignment of the secondary has not been changed by the adjustment of the primary. The same procedure is followed in aligning the second intermediate coils. After both intermediate coils are properly aligned the adjustment of the intermediate stage is complete and they should not be further disturbed.

Replace the grid cap on the first detector and connect the oscillator output leads to the antenna and ground posts of the receiver and set the oscillator at 1435 kilocycles. Then tune the receiver to 1435 kilocycles on the dial. It is important that the receiver be tuned to this point. If the receiver is out of the cabinet it will be necessary to use some temporary indicator so that the position 1435 kilocyles on the the dial may be accurately located. (This indicator should be set so that when the variable condensers are at the maximum capacity stop the indicator points to the last line on the dial at the low frequency end.) Then track the variable condensers by adjusting the trimmer condensers in the following order: Oscillator, antenna and radio frequency - (reading from the front of the receiver toward the back, the variable condenser sections are: Oscillator, antenna and radio frequency). After the variable condensers have been properly tracked at 1435 kilocycles, adjust the oscillator to 1295 kilocycles. Tune the receiver to this frequency. Check alignment of the condensers at this point by bending the end plate of the rotors in and out, noting the change in reading on the output meter. If when the plates are bent in the reading is increased, it is an indication that that particular section requires more capacity and the end plate should be permanently bent in at this point; or, if when the end plate is bent away the reading is increased the end plate should be bent away permanently, as it is an indication that that particular section requires less capacity at that particular point. The variable condensers should be checked in this manner at 1295, 880, 650 and 550 kilocycles. These points have been chosen so as to take advantage of the slots in the end plates of the variable condensers. This procedure of bending plates should rarely be necessary on the oscillator section, as the plates of the oscillator section are especially designed to properly track over the broadcast spectrum, providing the antenna and radio frequency stages are correctly aligned.

ZENITH RADIO CORP.

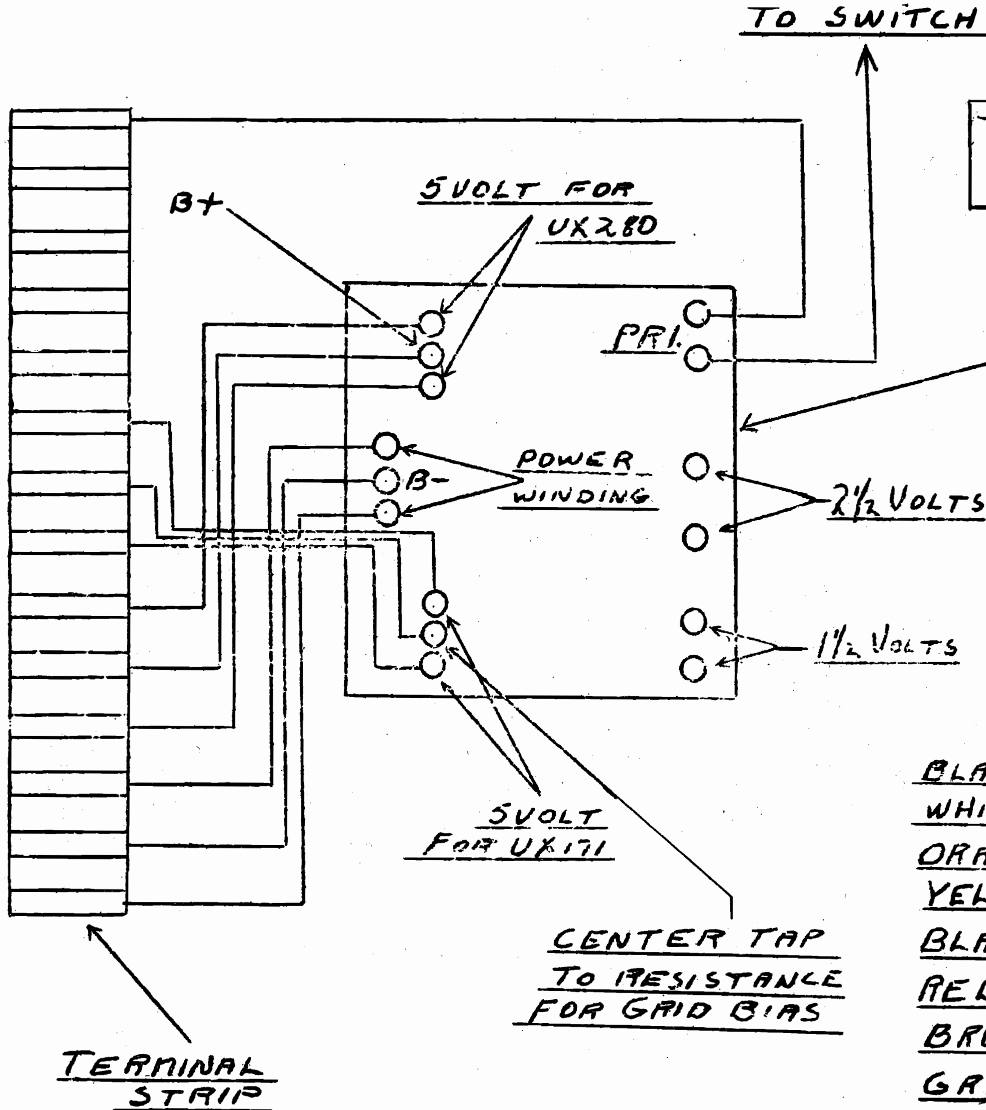
ZE-9 POWER PACK FOR RECEIVER MODELS 11-E & 14-E

(For further data see following page)



ZENITH RADIO CORP.

TRANSFORMER SCHEME FOR
ZENITH POWER UNIT ZE9.



IF TERMINAL STRIP ON POWER UNIT HAS 18 CONTACTS 2½ AND 1½ VOLT LEADS ARE ATTACHED TO STRIP. OTHERWISE CONNECTED TO MULTICABLE.

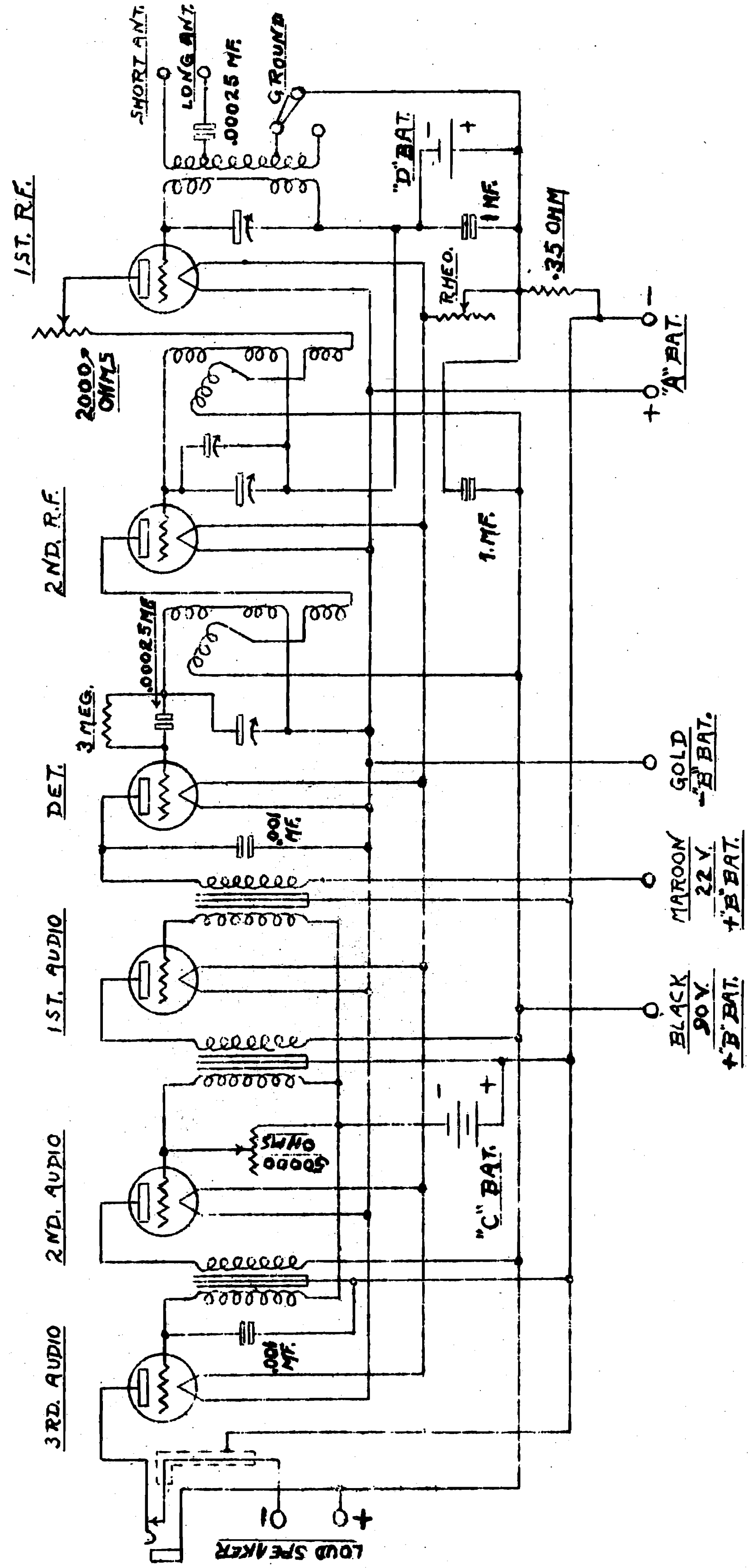
MULTICABLE CODE.

BLACK WITH RED MARKER — 5 VOLTS
WHITE - - - - - - - - - - - - - - 5 "
ORANGE - - - - - - - - - - - - - - 2½ "
YELLOW - - - - - - - - - - - - - 1½ "
BLACK - - - - - - - - - - - - - GND
RED - - - - - - - - - - - - - - 220 "
BROWN - - - - - - - - - - - - - 100 "
GREEN - - - - - - - - - - - - - 45 "

ZE-9 POWER PACK FOR RECEIVER MODELS 11-E & 14-E

NOTE - Model 11-E Serial Numbers 48657 To 51050
" 14-E " " 605420 " 607147

ZENITH RADIO CORP.

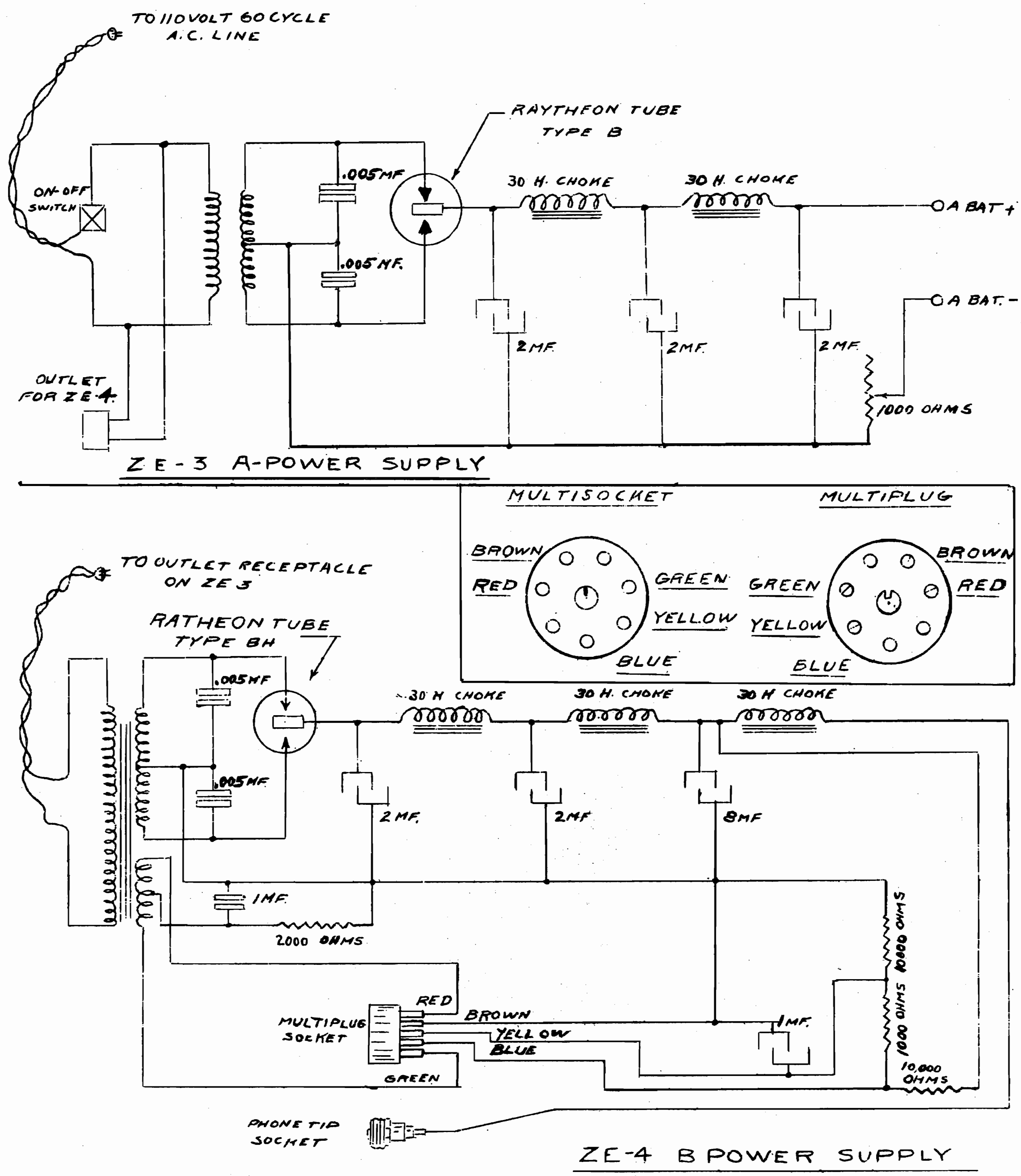


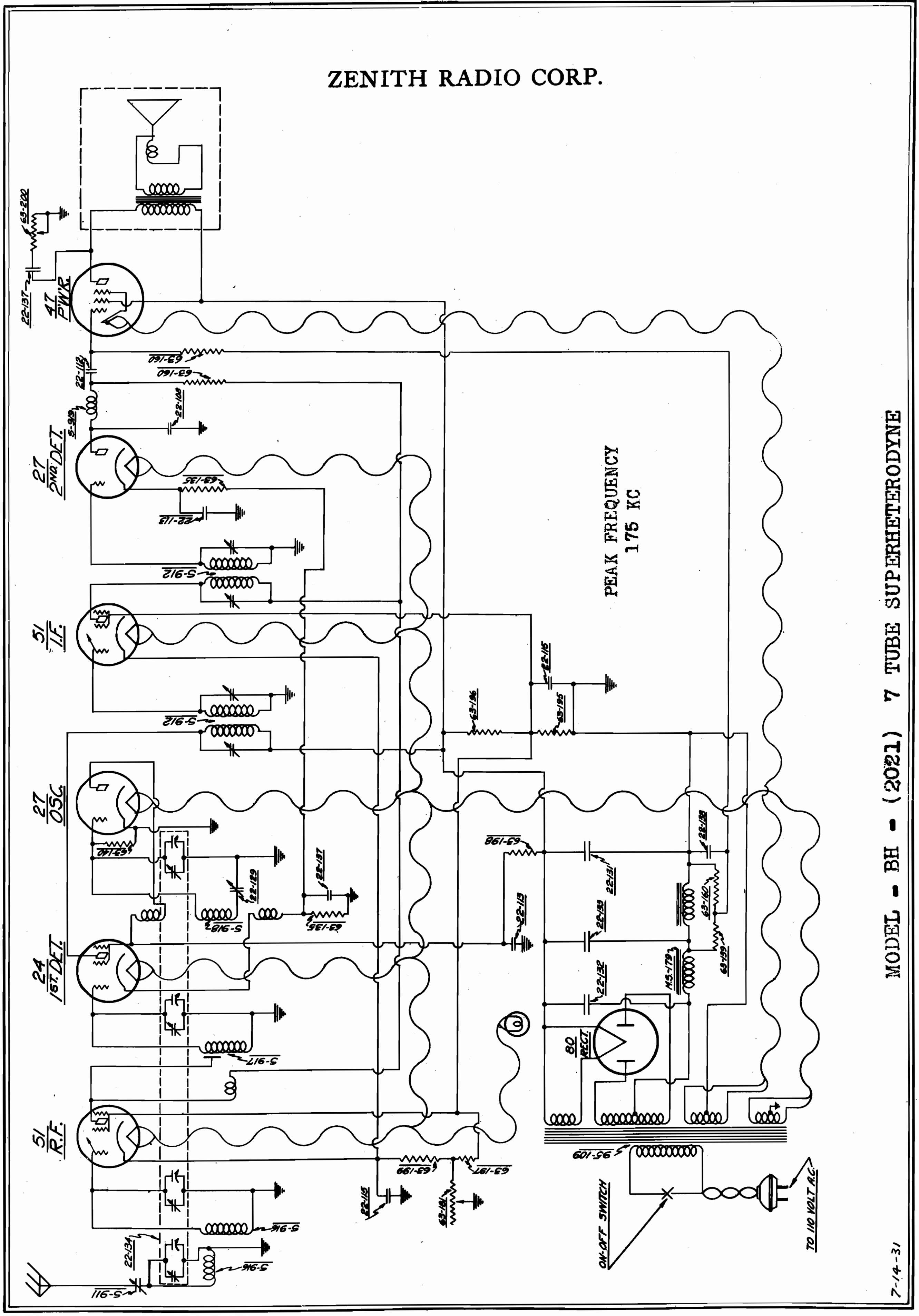
"SUPER - ZENITH" VOLUME CONTROL TYPE
(For battery operation)

("SUPER - ZENITH" model 27, shown on page 657)

ZENITH RADIO CORP.

ZE-3 "A" POWER & ZE-4 "B" POWER UNITS FOR "SUPER ZENITH" MODEL 27 (Page 657)




ZENITH RADIO CORP.
PEAK FREQUENCY
175 KC
MODEL - BH - (2021) 7 TUBE SUPERHETERODYNE
47 PWR.
27 2ND DET.
51 I.F.
27 OSC.
24 1ST. DET.
51 R.F.
80 RECT.
ON-OFF SWITCH
TO 110 VOLT A.C.
7-14-31

ZENITH RADIO CORP.

Variable Condenser Assembly

22-134	Four Gang Condenser	$ 6.00
S-905	Dial Drum Assembly	1.10
S-769	Pilot Lamp Bracket and Socket	.15
100-18	2½ Volt Pilot Lamp	.25
11-3	Pulley String (27") ... net	.10
80-69	Dial String Tension Spring	.01
S-963	Dial Pointer Mask and Bracket	.25

Fixed Condensers

22-108	.002 mfd. (2nd Detector Plate)	.35
22-112	.1 " (Audio Coupling)	.35
22-113	.5 " (See Footnote)	.50
22-115	.1 " (See Footnote)	.35
22-129	Padder Condenser (Variable)	.75
22-132	4. mfd. 450 Volt (Filter)	.85
22-133	2. " 450 Volt (Filter)	.80
22-137	.05 " (See Footnote)	.25
22-138	.2 " (Pentode Grid)	.25

Resistors

63-135	25M ohm (See Footnote)	.30
63-139	500M " (Pentode Bias)	.30
63-140	1meg" (Oscillator Grid)	.30
63-160	100M " (See Footnote)	.30
63-181	Volume Control and Switch	1.50
63-195	12M ohm (Voltage Divider)	.50
63-196	6M " (Voltage Divider)	.50
63-197	17M " (R.F. & I.F. Screen)	.30
63-198	30M " (1st Detector Screen)	.30
63-199	150 " Wire Wound (R.F. & I.F. Cathode)	.30
63-200	Tone Control	1.00

Coils

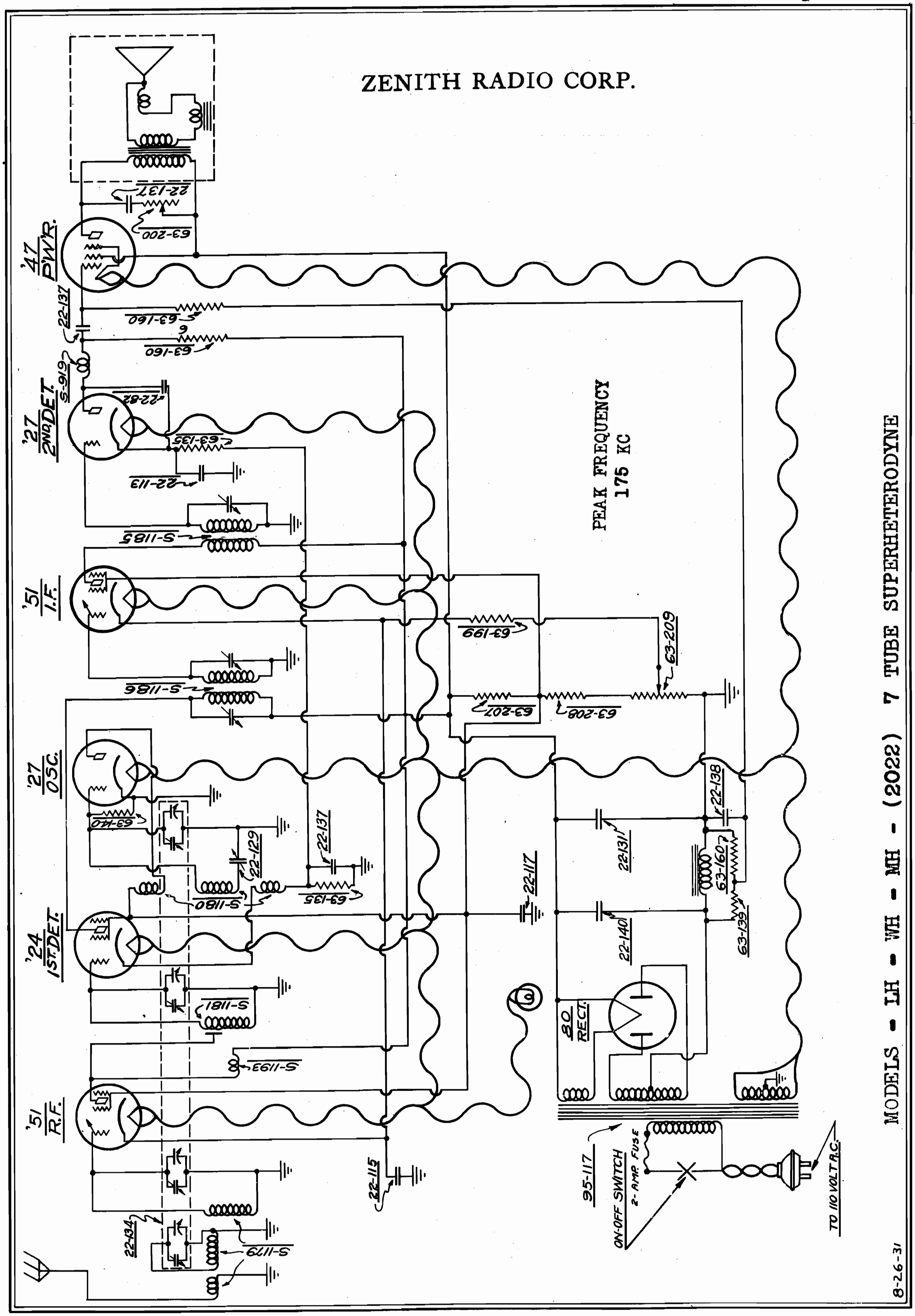
S-916	Pre-Selector or 1st R. F.	.75
S-917	1st Detector Coil Complete with Choke and Band	1.25
S-918	Oscillator Coil Complete	1.25
S-912	Intermediate Transformer (Specify with or without Grid Lead)	2.50
S-919	2nd Detector Plate Choke	.60

Miscellaneous

49-39	Dynamic Speaker	9.50
MS-179	Filter Choke	1.00
95-108	60 Cycle Power Transformer	4.50
95-111	25 Cycle Power Transformer	6.75
95-112	220 Volt Power Transformer	6.75
S-911	Antenna Series Condenser Assembly	.85
26-23	Calibrated Dial Strip	.20
46-56	Control Knobs	.25
83-228	Speaker Terminal Strip	.15
52-27	Speaker Cord	.25
78-36	Z-51 Tube Socket	.20
78-37	Z-27 Tube Socket	.20
78-38	Z-24 Tube Socket	.20
78-39	Z-47 Tube Socket	.20
78-40	Z-80 Tube Socket	.20

Note: 22-113 - Two used - Bypass 1st Detector Screen and 2nd Detector Cathode.
Note: 22-115 - Two used - Bypass R. F. - I. F. Screens and 1st R. F. Cathode.
Note: 22-137 - Two used - Tone Control and 1st Detector Cathode.
Note: 63-160 - Three used - 2nd Detector Plate, Pentode Grid and Pentode Bias.
Note: 63-135 - Two used - 1st and 2nd Detector Cathodes.

ZENITH RADIO CORP.



MODELS - LH - WH - MH - (2022) 7 TUBE SUPERHETERODYNE

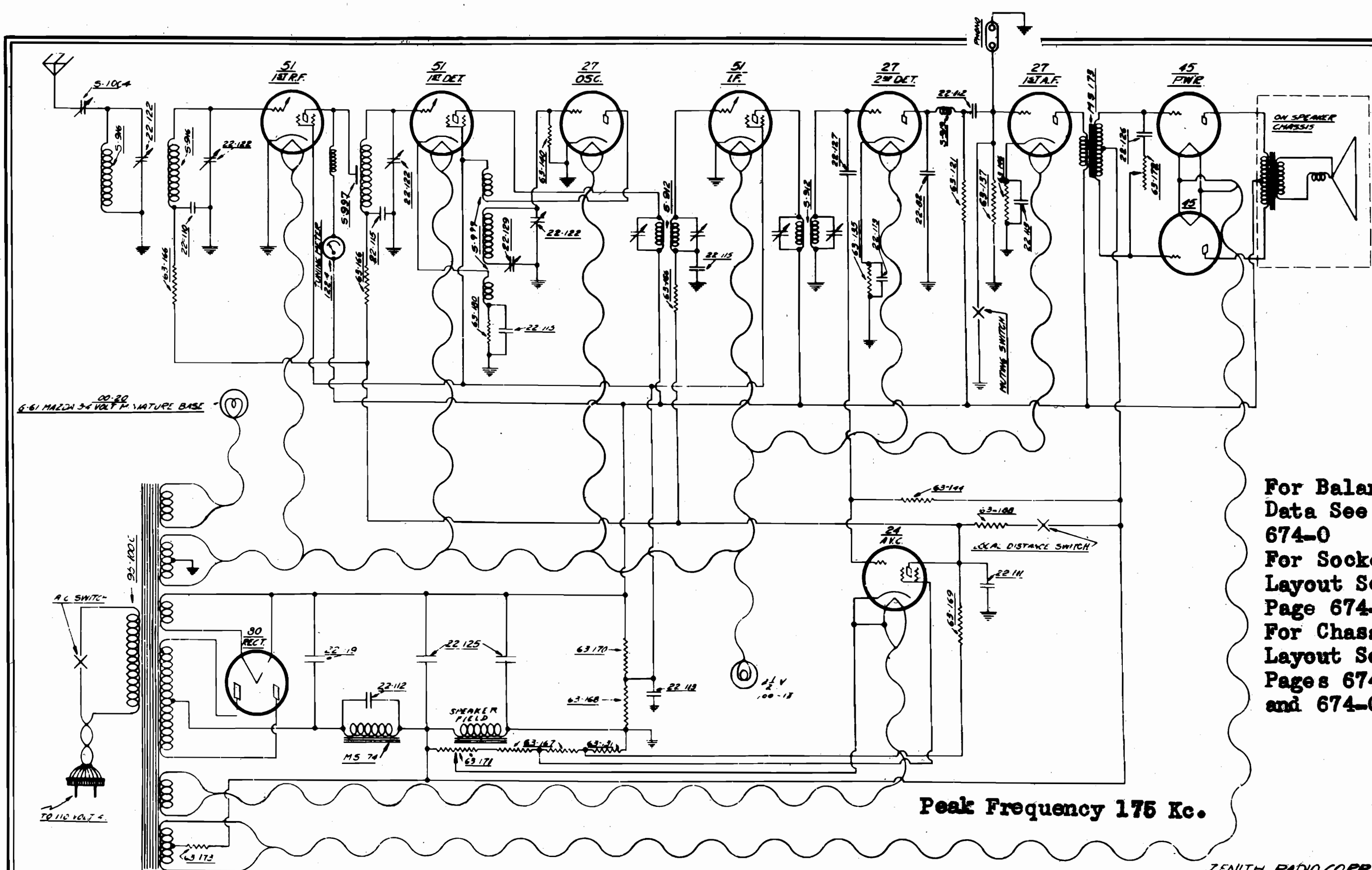
ZENITH RADIO CORP.

MODELS - LH - WH - MH - (2022) 7 TUBE SUPERHETERODYNE

	Variable Condenser Assembly	
22-134	Four Gang Condenser	$ 6.00
S-1191	Dial Drum Assembly	.80
11-3	Pulley String ... per ft	.10
26-28	Dial Strip	.10
80-69	Dial String Cable Tension Spring	.01
100-18	2½ volt Pilot Lamp	.25
S-769	Dial Lamp Socket Assembly (Less Lamp)	.15
	Fixed Condensers	
22-82	.001 mfd ... (2nd Detector Plate)	.30
22-113	.5 " ... (2nd Detector Cathode)	.50
22-115	.1 " ... (R.F. & I.F. Cathode)	.35
22-117	.5 " ... (R.F. & 1st Detector Screen)	.50
22-129	Padder	.75
22-131	6. mfd ... (Power Filter)	1.25
* 22-137	.05 " ... (3 used, see footnote)	.25
22-138	.2 " ... (Power Grid)	.25
22-140	8. " ... (Power Filter)	1.50
	Resistors	
63-135	25M ohm ... (1st,2nd Detector Cathode)	.30
63-139	500M " ... (Power Grid)	.30
63-140	1meg" ... (Oscillator Grid)	.30
63-160	100M " ... (2nd Det.Plate & Power Grid)	.30
63-199	250 " ... (R.F.& I.F.Cathode, Flexible)	.30
63-200	Tone Control	1.00
63-207	10M ohm ... (Voltage Divider, Wire Wound)	.35
63-208	12M " ... (Voltage Divider)	.30
63-209	Volume Control and Switch Assembly	1.25
	Coils	
S-919	2nd Detector Plate Coil	.60
S-1179	R. F. Pre-Selector	1.50
S-1180	Oscillator Coil	.90
S-1181	Detector Coil	.90
S-1185	2nd I. F. Transformer ... (175 K. C.)	1.50
S-1186	1st I. F. Transformer ... (175 K. C.)	1.40
S-1193	R. F. Plate Choke and Bracket	.50
	Miscellaneous	
49-40	Dynamic Speaker for LH and WH	8.00
49-41	Dynamic Speaker for MH	8.50
46-58	Control Knobs, all sets, three used	.10
52-27	Speaker Cable	.25
57-326	Escutcheon Plate, all sets	.30
78-36	Z-51 Tube Socket	.20
78-37	Z-27 " "	.20
78-38	Z-24 " "	.20
78-39	Z-47 " "	.20
78-40	Z-80 " "	.20
83-228	Speaker Cable Terminal Strip	.15
93-138	Felt Washer for Control Knob	.01
95-117	60 cycle 110 volt Power Transformer) ... (Specify with or	4.50
95-118	25 cycle 110 volt Power Transformer) ... without fuse	6.75
95-121	60 cycle 220 volt Power Transformer) ... clip assembly).	6.75
136-2	2 amp Fuses	.10
S-1151	Heat Insulating Shield	.30
S-1183	Antenna and Ground Mounting Plate Complete	.25
S-1184	Variable Condenser Shield	.85
MS-180	Tube Shield Assembly	.60

IMPORTANT: GIVE SERIAL NUMBER OF RECEIVER ON ALL PARTS ORDERS.
A. F. COUPLING, TONE CONTROL, AND 1ST DETECTOR CATHODE.

ZENITH RADIO CORP.



For Balancing Data See Page 674-0
For Socket Layout See Page 674-0
For Chassis Layout See Pages 674-N and 674-0

Peak Frequency 175 Kc.

ZENITH RADIO CORP.
CHICAGO ILL.
MODEL 2014 10 TUBE SUPERHETERODYNE

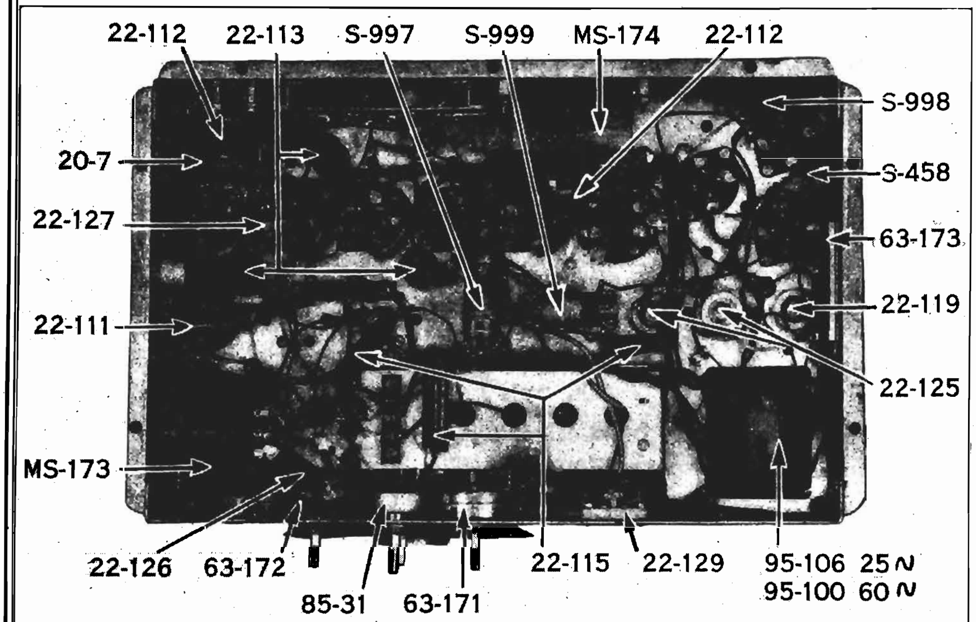
MODELS 91 and 92 Superheterodyne

A Z-24 automatic volume control tube keeps the volume of the incoming signal constant by varying the grid bias voltage on the 1st R. F., 1st detector, and I. F. stages, in relation to the change of R. F. energy amplified before the 2nd detector. The three grid returns mentioned are coupled to the plate of the automatic volume control tube through three limiting resistors, while the 2nd detector grid couples to the volume control tube grid through a small fixed condenser. Any variation in signal strength on the 2nd detector grid is transferred to the automatic volume control tube which, proportionately varies the voltage drop across the volume control tube plate resistor which changes the bias of the three tubes mentioned.

The local distance switch simply shunts a resistor from plate to cathode of the automatic volume control tube when in the local position, thereby placing a constant bias on the three R. F. stages.

ZENITH RADIO CORP.

Models 91 and 92



Socket Voltages

Type	Position	Fil. Volts	Plate Volts	Control Grid Volts	Cathode Volts	Plate M. A.	S. G. Volts
Z-51	1st. R. F.	2.25	175	.2	0	7.	100
Z-51	1st. Det.	2.25	175	3.5	.4	3.5	90
Z-27	Osc.	2.2	70	0	0	8.5	0
Z-51	I. F.	2.2	200	4	0	2.5	115
Z-27	2nd. Det.	2.2	115	0	9.	.5	0
Z-27	1st. Aud.	2.2	145	0	13.	6.5	0
Z-45	P. P.	2.2	275	54.	0	30.	0
Z-45	P. P.	2.2	275	54.	0	30.	0
Z-24	A. V. C.	2.2	35	.4	0	0	54
Z-80	Rect.	4.8	355	0	0	76.	0

Voltage readings taken with a Weston type 566 tester. Manual volume control in maximum position and antenna and ground disconnected. Line voltage 112.

CONDENSERS

22- 82	.001 Mfd.		(2nd Det. Plate)	$ .30
22-110	.1 Mfd.		(R. F.)	.50
22-111	.03 Mfd.		(A.V.C. Plate)	.30
22-112	.1 Mfd.		(2 Used. See Footnote)	.35
22-113	.5 Mfd.		(3 Used. See Footnote)	.50
22-115	.1 Mfd.		(3 Used. See Footnote)	.30
22-119	6. Mfd.		(High Voltage Electrolytic)	1.50
22-122	Four Gang Variable			7.00
22-125	8. Mfd.		(Low Voltage Electrolytic. 2 Used)	1.50
22-126	.006 Mfd.		(Tone Control)	.55
22-127	.000025 Mfd.		(A.V.C. Coupling)	.35
22-129	Oscillator, Padding			.75

RESISTORS

63-111	2M Ohm	1 Watt	(1st A. F. Cathode)	$ .30
63-121	100M Ohm	1 Watt	(2nd Det. Plate)	.30
63-131	400 Ohm	1/2 Watt	(A.V.C. Voltage Divider)	.30
63-135	25M Ohm	1/2 Watt	(2nd Detector Cathode)	.30
63-137	250M Ohm	1/2 Watt	(1st A. F. Grid)	.30
63-140	1 Meg. Ohm	1/2 Watt	(Oscillator Grid)	.30
63-144	3 Meg. Ohm	1/2 Watt	(A.V.C. Grid)	.30
63-146	2M Ohm	1/2 Watt	(1st A. F. Cathode)	.30
63-166	1400 Ohm	1/4 Watt	(3 Used. See Footnote)	.30
63-167	8M Ohm	1 Watt	(A.V.C. Divider)	.30
63-168	3600 Ohm	2 Watt	(Plate Voltage Divider)	.50
63-169	400M Ohm	1/2 Watt	(A.V.C. Plate)	.30
63-170	2800 Ohm	2 Watt	(Plate Voltage Divider)	.50
63-171	Manual Volume Control and Switch Assembly			1.65
63-172	Tone Control			1.00
63-173	750 Ohm	Metal Mounting	(Power Tube Bias)	.40
63-180	1M Ohm	1/2 Watt	(1st Detector Cathode)	.30
63-188	4 1/2 Meg. Ohm	1/2 Watt	(A.V.C. Plate)	.30

Note: All resistors employed in this receiver are marked in accordance with R. M. A. standards. Color code charts may be obtained by writing direct to the Erie Resistor Corp., Erie, Pa.

S-912	Intermediate Transformer Complete (2 Used) (Specify with or without grid lead)	$2.50
S-916	Antenna and 1st R. F. Coils	.75
S-997	1st Detector Complete	1.25
S-999	Oscillator Coil Complete	1.25

Note: 22-112 Filter Choke By-pass and 1st Audio Coupling Condensers.
22-113 1st R. F., 1st Det. and I. F. Screen. 2nd Det. and A. F. Cathode.
22-115 2nd Det. and I. F. Grid Return. 1st Det. Cathode.
63-166 1st R. F., 1st Det. and I. F. Grid Return Resistor.

ZENITH RADIO CORP.

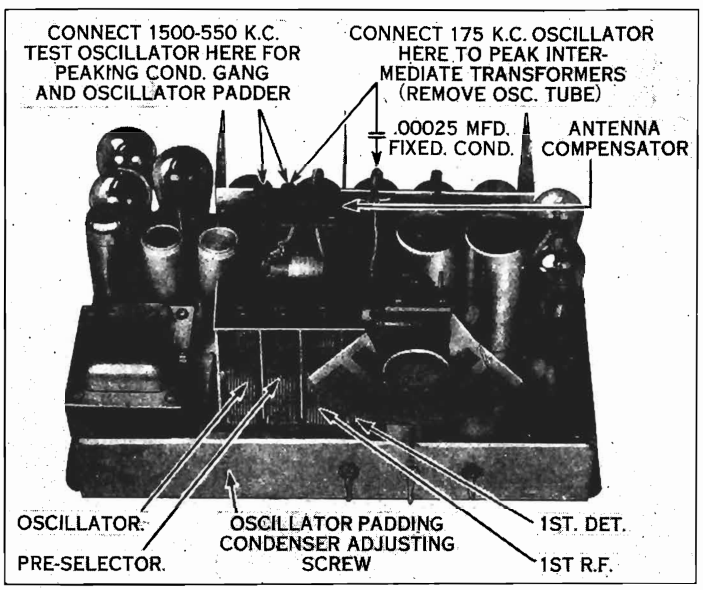
MODELS 91-92

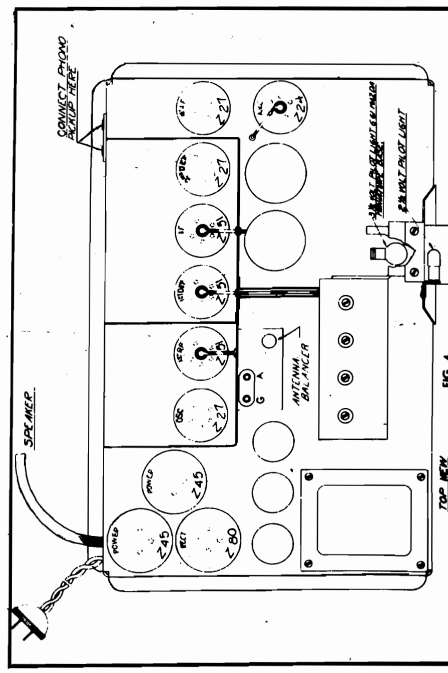
Balancing Chassis

Every Zenith Superheterodyne Receiver is carefully balanced on laboratory equipment before leaving the factory and should not require further attention in this respect. However, in the event that some part of the R. F. circuit has been changed, or the adjustments shifted by mishandling, the chassis may be rebalanced as follows:

If an oscillator is available more accurate results will be obtained. It should be accurately calibrated from 1500 to 550 kilocycles and should also have provision for generating a 175 kilocycle signal. In cases where an oscillator is not available a fairly good result may be had by listening to stations which operate as nearly as possible to the extreme ends of the dial. Although an output meter will give most accurate results, satisfactory adjustments can be made simply by listening to the speaker.

The chassis should be removed from the cabinet so that all adjustments are easily accessible. Next place the test oscillator in operation and connect it direct to the antenna and ground posts of the receiver. It should then be set to 1500 kilocycles and the receiver tuned to the same reading on the dial. If the oscillator is not accurate the stations will not be received on their proper calibration. If a station is used for this purpose, the dial pointer should first be set to the exact frequency of the station being received. Beginning with the variable condenser tuning section at the extreme left, which tunes the oscillator circuit, the trimmer should be regulated for maximum response, in either the loud speaker or output meter. It will be noticed that the second section does not employ a vernier adjustment. This stage is resonated by adjusting the antenna compensator knob as explained in the instruction card. The third, or 1st R. F. trimmer, is adjusted in the same manner as the oscillator. If at any time the volume reaches a very high level, so that it is not possible to determine slight changes, it should be reduced by means of the volume control knob so as to be barely audible. The fourth, or 1st detector section, is next in order and its trimmer should also be adjusted for resonance.



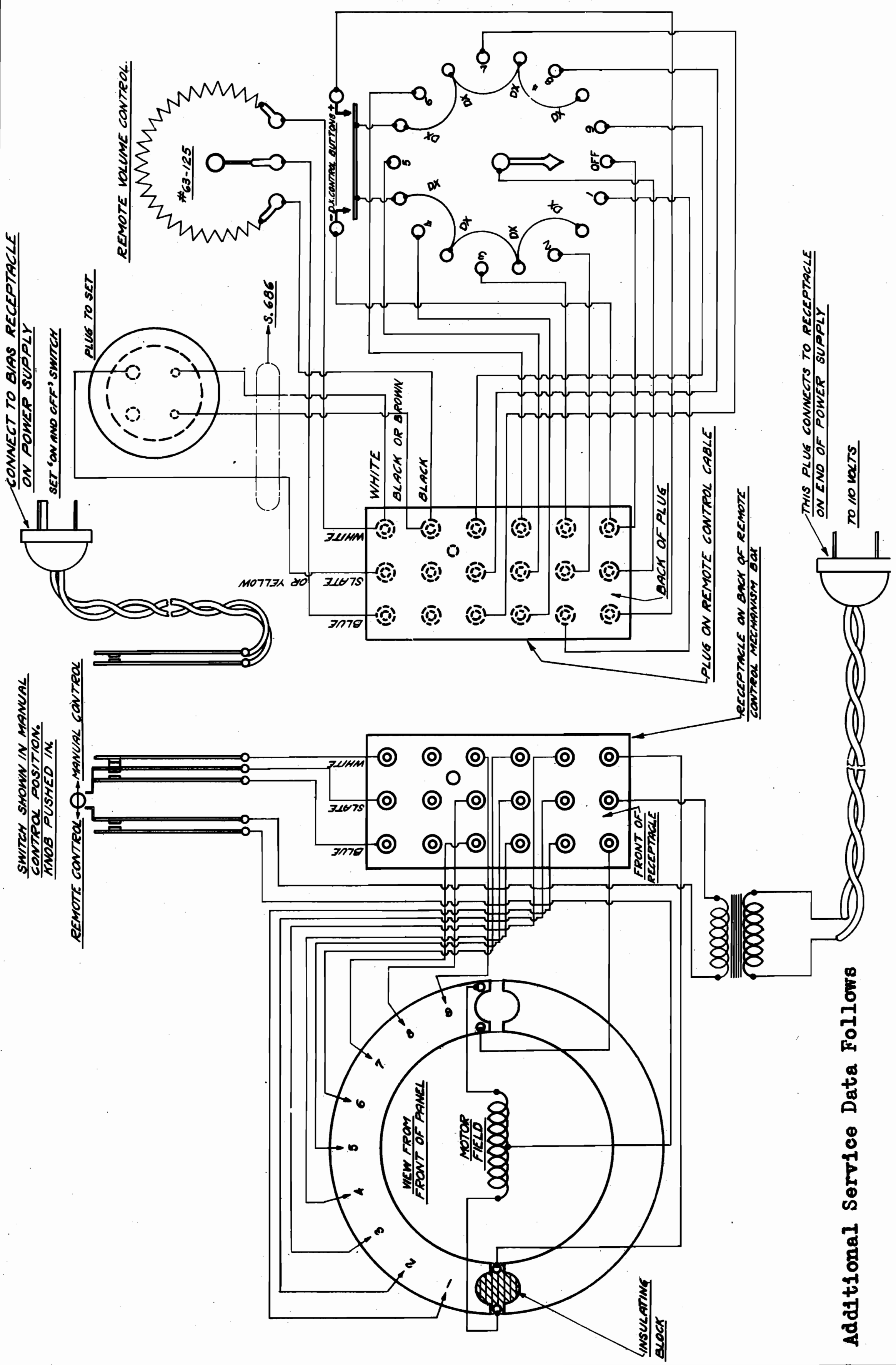


TUBE LAYOUT - Showing Position and Circuit Function of each.

After the vernier adjustments have been completed the test oscillator should be set at 550 kilocycles and the dial of the receiver turned until the oscillator signal is tuned in. Now the oscillator padding condenser (see fig. 3) should be very carefully adjusted with a screw driver for maximum output of the receiver, while rocking the tuning condenser back and forth over the signal. This padding adjustment brings the oscillating circuit of the receiver in resonance with the remaining tuned circuits and, thereby, enables it to tract accurately over the entire scale. The receiver will now operate at full efficiency and all stations will be received at their proper calibration. If this is not found to be entirely so, the entire balancing operation should be repeated.

The intermediate transformers used in the ten tube Superheterodyne have been accurately peaked at 175 kilocycles on a temperature controlled crystal oscillator before leaving the factory. It is not recommended that their adjustments be tampered with unless an oscillator is available which is very accurately calibrated at 175 kilocycles, or unless the serviceman is absolutely certain the trouble lies in their adjustment. However, if it is necessary to check the adjustments, the 175 K. C. test oscillator may be connected to the grid terminal of the 1st detector through a .00025 fixed condenser. The ground lead of the test oscillator is connected to the ground post of the receiver. The oscillator tube must be removed from the chassis while this operation is being performed. Four adjusting screws are provided under the chassis directly beneath the intermediate transformers, which tune the plate circuit of the 1st detector, grid and plate circuits of the I. F. stage, and grid circuit of the second detector. (See wiring diagram.) Beginning with the 2nd detector grid vernier, each adjusting screw should, in turn, be set for maximum signal output from the speaker or output meter. For best results the verniers should be gone over twice in the same rotation always keeping the output from the test oscillator at the weakest possible strength in order to determine slight variations in volume.

ZENITH RADIO CORP.

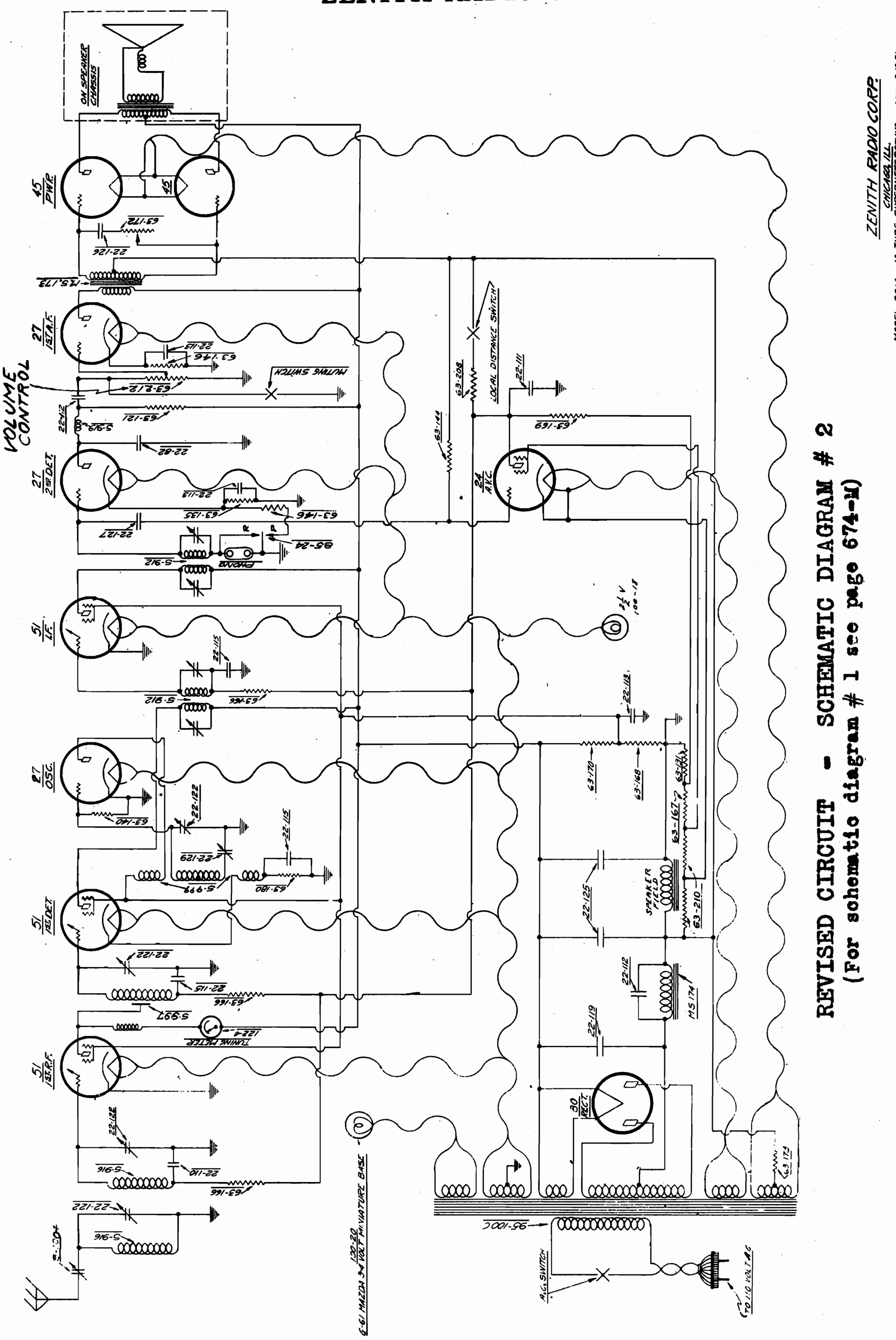


WIRING DIAGRAM OF ZENITH REMOTE CONTROL

Additional Service Data Follows

ZENITH RADIO CORP.

PEAK FREQUENCY 175 KC



REVISED CIRCUIT - SCHEMATIC DIAGRAM # 2

(For schematic diagram # 1 see page 674-M)

MODEL 91 (2014) FOR SERIAL NUMBERS AFTER 373,334

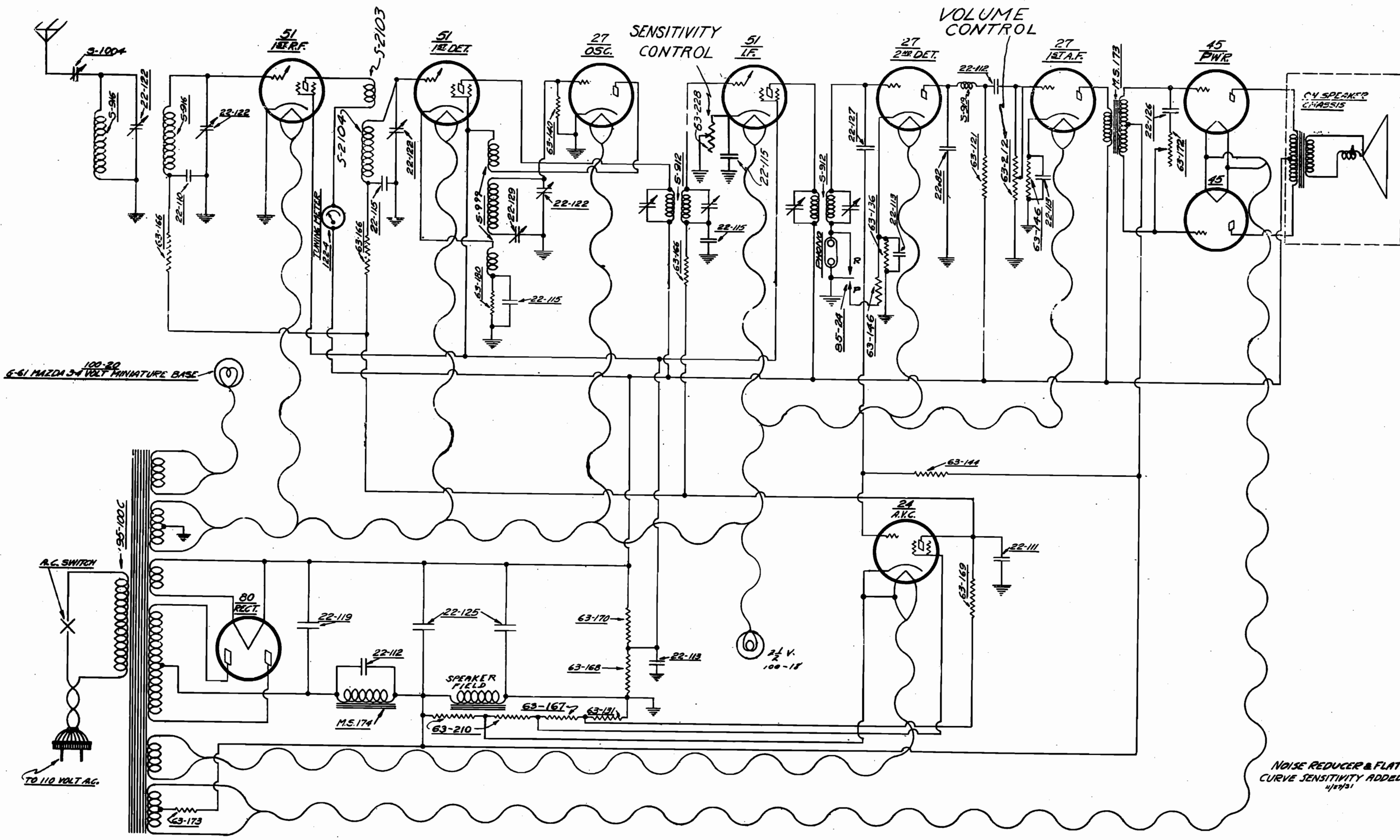
MODEL 92 (2014) FOR SERIAL NUMBERS AFTER 301,394

For Further Data refer to page 674-P-3

4B

ZENITH RADIO CORP.

PEAK FREQUENCY 175 KC



REVISED CIRCUIT - SCHEMATIC DIAGRAM # 3

ZENITH RADIO CORP.
CHICAGO, ILL.
MODEL 2014 10 TUBE SUPERHETERODYNE. A.W.H. 6-19-31.

MODEL 91 (2014) FOR SERIAL NUMBERS AFTER 375,532
MODEL 92 (2014) FOR SERIAL NUMBERS AFTER 302,007

For further data refer to page 674-P-3

ZENITH RADIO CORP.

* MODEL 91 (2014) SERIAL NUMBERS AFTER 373,334
* MODEL 92 (2014) SERIAL NUMBERS AFTER 301,394 (4B)

In all receivers,bearing serial numbers 373,334 on model 91 and 301,394 on model 92,or higher,the manual control has been removed from the A.V.C. cathode and placed in the grid circuit of the first A.F. stage. A tapped resistor takes the place of the original control. By use of this new system,the automatic volume control operates independently and at full efficiency,manual volume being controlled by varying the audio output.

Since the A.V.C. or R.F. circuit remains constant,the tuning meter will show maximum swing on the station at any manual control setting. Originally the meter action decreased as the volume was lowered.

All voltages,tube locations and parts listed on pages 674-M, 674-N and 674-0 apply directly and are to be used when servicing either type of set. The balancing process remains unchanged.

The parts list shown previously,except for the substitutions given below,should be used when ordering replacement components.

PARTS CHANGE.

1 Audio volume control,part # 63-212	List	$ 1.65
1 Center tapped resistor,part # 63-210	List	$ 0.50

Deduct the 63-171 volume control.

* Refer to schematic diagram on page 674-P-1

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* MODEL 91 (2014) SERIAL NUMBERS AFTER 375,532
* MODEL 92 (2014) SERIAL NUMBERS AFTER 302,007 (4C)

All ten-tube Zenith Superheterodynes after the above serial numbers will incorporate a variable Sensitivity Control in place of the original Local-Distance switch. The diagram (*) indicates its position as being connected into the I.F. cathode. In addition to the control unit the first detector coil has been replaced by one having slightly different construction to provide equal sensitivity over the entire tuning range. It is not advisable to make this change in receivers subsequent to the above numbers,for the reason that each complete set of chassis coils must be inductively matched,otherwise the efficiency of the receiver will be seriously affected.

With the exception of the above all data given on pages 674-M, 674-N and 674-0,such as method of balancing,tube layout,etc.,should be followed closely when repairs or adjustments are necessary.

The following alteration makes the parts list on page 674-N directly applicable to the improved models:

DEDUCT

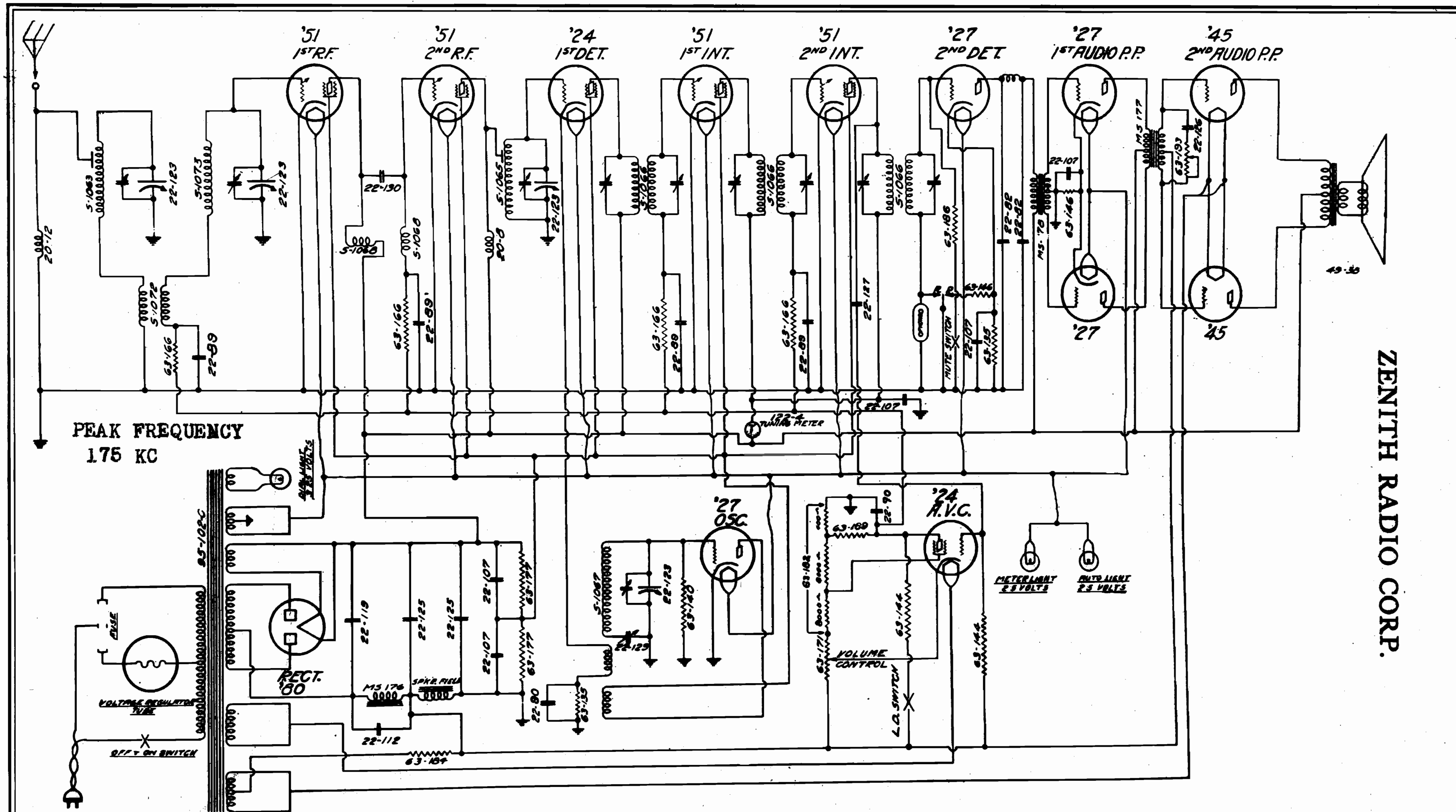
1 Local-Distance switch,part	# 85-31	List	$ 0.85
1 First detector coil, "	# S-997	"	1.25
1 Eight megohm resitor "	# 63-224	"	0.30
1 250,00 ohm resistor "	# 63,135	"	0.30

ADD

1 Sensitivity Control, part	# 63-228	List	$ 1.00
1 Det. coil assembly "	# S-2104	"	1.25
1 Bypass condenser, "	# 22-115	"	0.30
1 50,000 ohm resistor, "	# 63-136	"	0.30

* Refer to schematic diagram on page 674-P-2

ZENITH RADIO CORP.



SCHEMATIC DIAGRAM #1

(For revised circuit see page 674-P-8)

It should be noted that the phonograph pick-up switch and jacks are connected in the grid return circuit of the second detector, consequently a howl will be heard if the phono switch is thrown to the phono position without a phono pick-up having been attached. Be sure this action is taken into consideration when servicing the receiver or if there is a complaint of very weak reception accompanied by a very peculiar howl.

It should be noted that the line fuse provided in the rear of the chassis has two positions. The fuse should normally be used in the "Regulator Tube In" position. If the regulator tube becomes defective and a replacement is not immediately available, the fuse may be placed in the "Regulator Tube Out" clips. Do not leave the voltage regulator tube out permanently since line fluctuation or high voltage may cause damage to the tubes or power transformer.

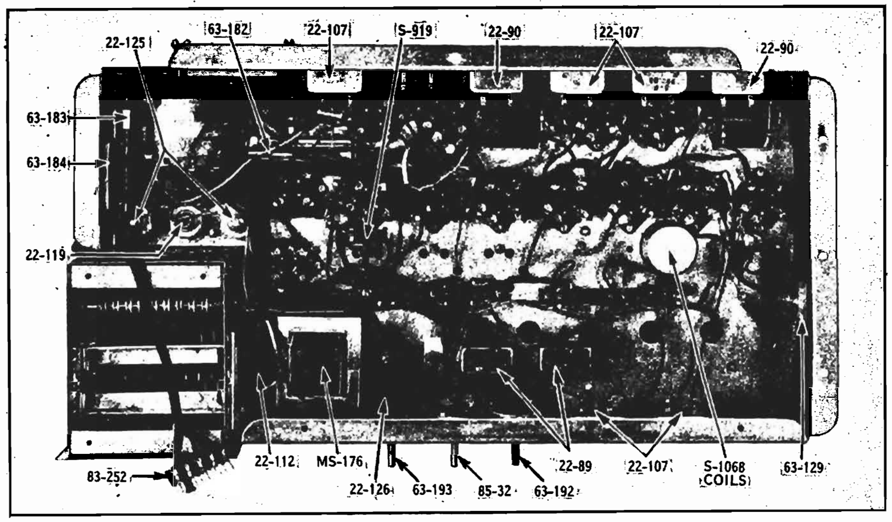
ZENITH RADIO CORP.
CHICAGO, ILL.
14 TUBE SUPERHETERODYNE
MODEL 2017
(SERIAL NOS. 450,001 TO 450,450 ONLY)

MODEL 103 (2017) 14 TUBE SUPERHETERODYNE
SERIAL NUMBERS 450,001 TO 450,450

Voltage data and socket layout on page 674-P-6

ZENITH RADIO CORP.

MODEL 103 (2017) 14 TUBE SUPERHETERODYNE



MISCELLANEOUS

19-21	Grid Clip	.02
44-4	Phono Jack Base Assembly	.30
46-49	Tuning Knob	.25
46-55	Control Knob (3 used)	.20
49-38	Dynamic Speaker	25.00
52-25	Speaker Multicord	.45
57-308	Dial Escutcheon Plate	.80
57-309	Meter Escutcheon Plate	.35
73-8	Small Set Screw for Auto Coupling	.01
78-36	Z-51 Socket	.20
78-37	Z-27 Socket	.20
78-38	Z-24 Socket	.20
78-40	Z-80 Socket	.20
78-41	Z-45 Socket	.20
78-42	Amperite Socket	.15
83-252	Speaker Multicord Terminal Strip	.20
85-24	Phono Switch	.75
85-32	Local Distance and Mute Switch	1.00
93-147	Electrolytic Condenser Insulating Washer	.02
95-102	110 volt 60 cycle Power Transformer	8.00
95-116	110 volt 25 cycle Power Transformer	13.50
114-6	Large Set Screw for Auto Coupling	.05
136-2	2 amp Fuse	.10
143-11	Auto Coupling Collar	.85
S-1037	Auto Control Shaft Assembly	.90
MS-176	Power Choke	4.00
MS-177	Audio Transformer (Six Lead)	5.50
MS-178	Audio Transformer (Five Lead)	5.50

CONDENSERS

22-82	.001	Mfd. ...(2nd Detector Plate)	$ .30
22-89	.1	Mfd. ...(2 used, see footnote)	.85
22-90	.1	Mfd. ...(2 used, see footnote)	.55
22-107	.1	Mfd. ...(5 used, see footnote)	.85
22-112	.1	Mfd. ...(Choke Bypass)	.35
22-119	6.	Mfd. ...(Electrolytic)	2.50
22-123	Four Gang Variable		10.00
22-125	8.	Mfd. ...(Electrolytic)	1.50
22-126	.006	Mfd. ...(Tone Control)	.55
22-127	.000025	Mfd. ...(A. V. C. Coupling)	.35
22-129	Padder		.75
22-130	.0001	Mfd. ...(R. F. Coupling)	.20

COILS

20-8	2nd R. F. Plate Choke	.50
20-12	Antenna Choke	.50
S-919	2nd Detector Plate Choke and Bracket	.60
S-1063	Pre-Selector (Coil Only)	2.00
S-1073	1st R. F. (Coil Only)	.90
S-1065	1st Detector (Coil Only)	1.80
S-1066	I. F. Transformer (Specify with or without Grid Lead)	2.85
S-1067	Oscillator (Coil Only)	1.65
S-1068	2nd R. F. Untuned Transformer	2.00
S-1072	Coupling Coil	.90

RESISTORS

63-135	25M	Ohm... (1st, 2nd Detector Cathode)	.30
63-140	1 Meg	Ohm... (Oscillator Grid)	.30
63-146	2M	Ohm... (2nd Detector and A. F.)	.30
63-166	1400	Ohm... (R. F. and I. F. Grid Return)	.30
63-169	400M	Ohm... (A. V. C. Plate)	.30
63-182	16400	Ohm... (A. V. C. Divider, Metal Mtg.)	.75
63-183	6M	Ohm... (Voltage Divider, see footnote)	.65
63-184	750	Ohm... (Power Bias)	.30
63-186	5M	Ohm... (2nd Detector Grid)	.30
63-192	Volume Control and Switch Assembly		1.75
63-193	Tone Control		1.00
63-144	3 Meg	Ohm... (A. V. C. Grid)	.30

DIAL ASSEMBLY

S-1003	Dial Light Socket and Clip (less lamp)	$ .60
S-1009	Tuning Shaft and Bracket Assembly	1.50
S-1010	Drum Gear and Cam	.85
S-1106	Dial Pointer and Reflector Plate	1.50
S-1110	Dial Strip and Bracket	.85
6-14	Pointer Arm Bearing	.20
15-12	Dial Light Clip	.35
76-110	Dial Elevator Shaft	.10
80-72	Pointer Arm Tension Spring	.08
94-119	Roller Bearings	.08
100-18	2½ volt Meter Lamp	.25
100-20	3¼ volt Dial Lamp	.60
122-4	Tuning Meter and Cord	2.25
148-3	Dial Elevator Arm	.35

Note: 22-89 1st, 2nd, R. F. and 1st, 2nd, I. F. Grids.
22-90 1st Detector Cathode and A. V. C. Plate.
22-107 2nd Detector Cathode, 1st A. F. Bias, I. F. Plate and Voltage Divider.
63-183 Specify—Porcelain or Metal Mounted Type.

IMPORTANT: GIVE SERIAL NUMBER OF RECEIVER ON ALL PARTS ORDERS.
ALL PRICES ARE SUBJECT TO REGULAR DISCOUNT AND CHANGE WITHOUT NOTICE.

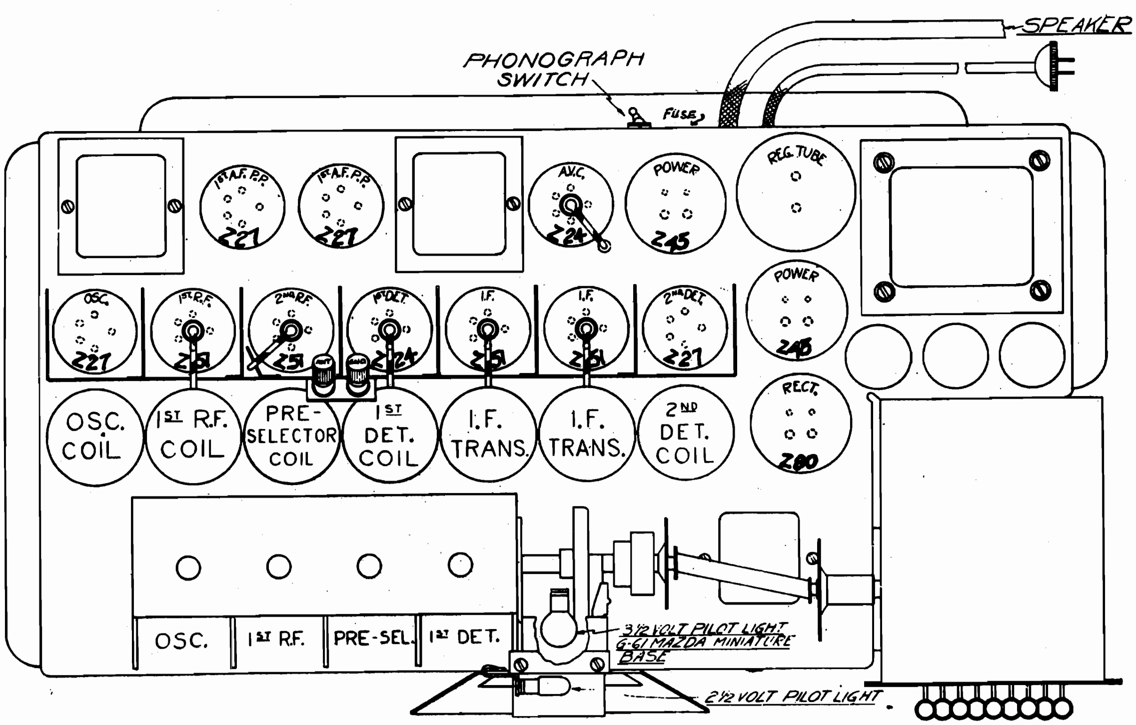
ZENITH RADIO CORP.

MODEL 103 (2017) 14 TUBE SUPERHETERODYNE

Socket Voltages

Type	Position	Fil. Volts	Plate Volts	Control Grid Volts	Cathode Volts	Plate M. A.	S. G. Volts
Z-51	1st. R. F.	2.2	185	— 9.	0.	2.5	80
Z-51	2nd. R. F.	2.2	200	— 3.9	0.	3.	84
Z-24	1st Det.	2.2	185	0.	+ 7.	.25	70
Z-27	Osc.	2.2	80	0.	0.	7.	0
Z-51	I. F.	2.2	185	— 4.	0.	3.	90
Z-51	I. F.	2.2	185	— 4.	0.	2.	90
Z-27	2nd. Det.	2.2	185	0.	+17.5	.5	0
Z-27	1st. P. P.	2.2	165	0.	+12.5	3.	0
Z-27	1st. P. P.	2.2	165	0.	+12.5	3.	0
Z-45	2nd. P. P.	2.3	240	—48.	0.	36.	0
Z-45	2nd. P. P.	2.3	240	—48.	0.	36.	0
Z-24	A. V. C.	2.3	30	— .4	0.	0.	45
Z-80	Rect.	5	350	0.	0.	70.	0
	Vol. Reg.	Con-	tin-	uity	test	only.	

Voltage readings taken with a Weston model 566 type 3 tester. Manual volume control in maximum position and antenna and ground disconnected. Line voltage 112



TUBE LAYOUT - Showing Position and Circuit Function of each.

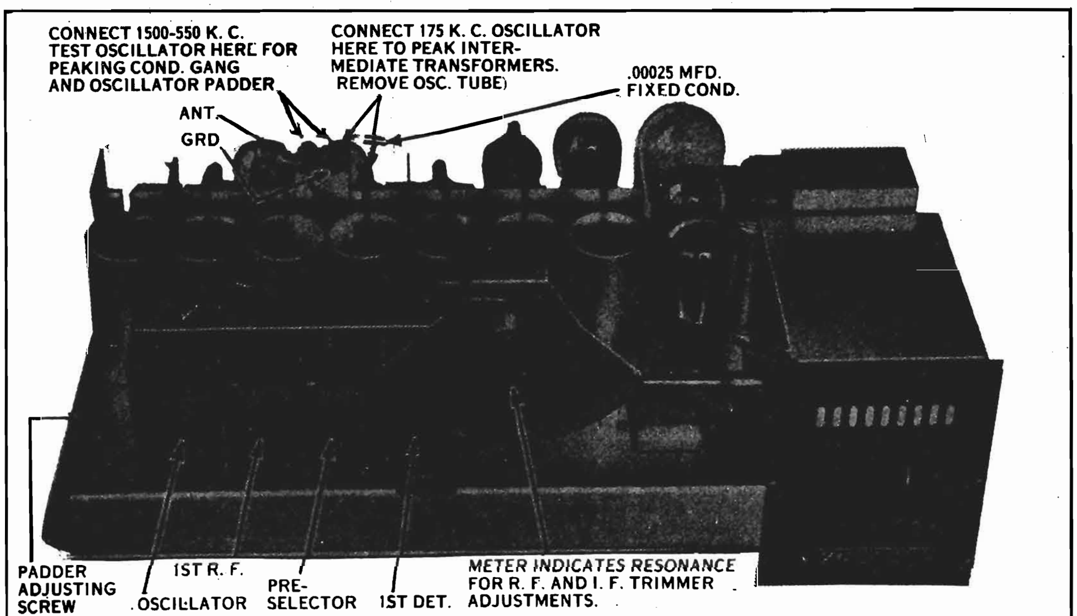
ZENITH RADIO CORP.

Balancing Chassis

Each Zenith Superheterodyne receiver is carefully balanced on a temperature controlled Crystal Oscillator before leaving the factory and should require no further attention in this respect. However, in the event that a part of the R. F. circuit has been changed or the phasing adjustments shifted by mishandling, the chassis may be re-balanced as follows:

A test oscillator will give more accurate results and is, therefore, recommended in preference to use of a broadcast signal. It should be calibrated from 1500 to 550 K. C. and also provide a 175 K. C. signal. An output meter is not required since the tuning meter on the set is connected to the intermediate stages in such a way that it shows a variation during adjustment of any R. F. or intermediate circuit of the set. It is only necessary to watch the tuning meter for greatest swing to the right when adjusting the R. F. and I. F. trimmer condensers.

The chassis should be removed from the cabinet for this operation so that all adjustments are easily accessible. The test oscillator should be set to 1500 K. C. and attached to the antenna and ground posts. If a broadcast signal is used, tune to a station as near to 1500 K. C. as it is possible to hear. In this case the dial must point to the exact frequency on which the station operates.



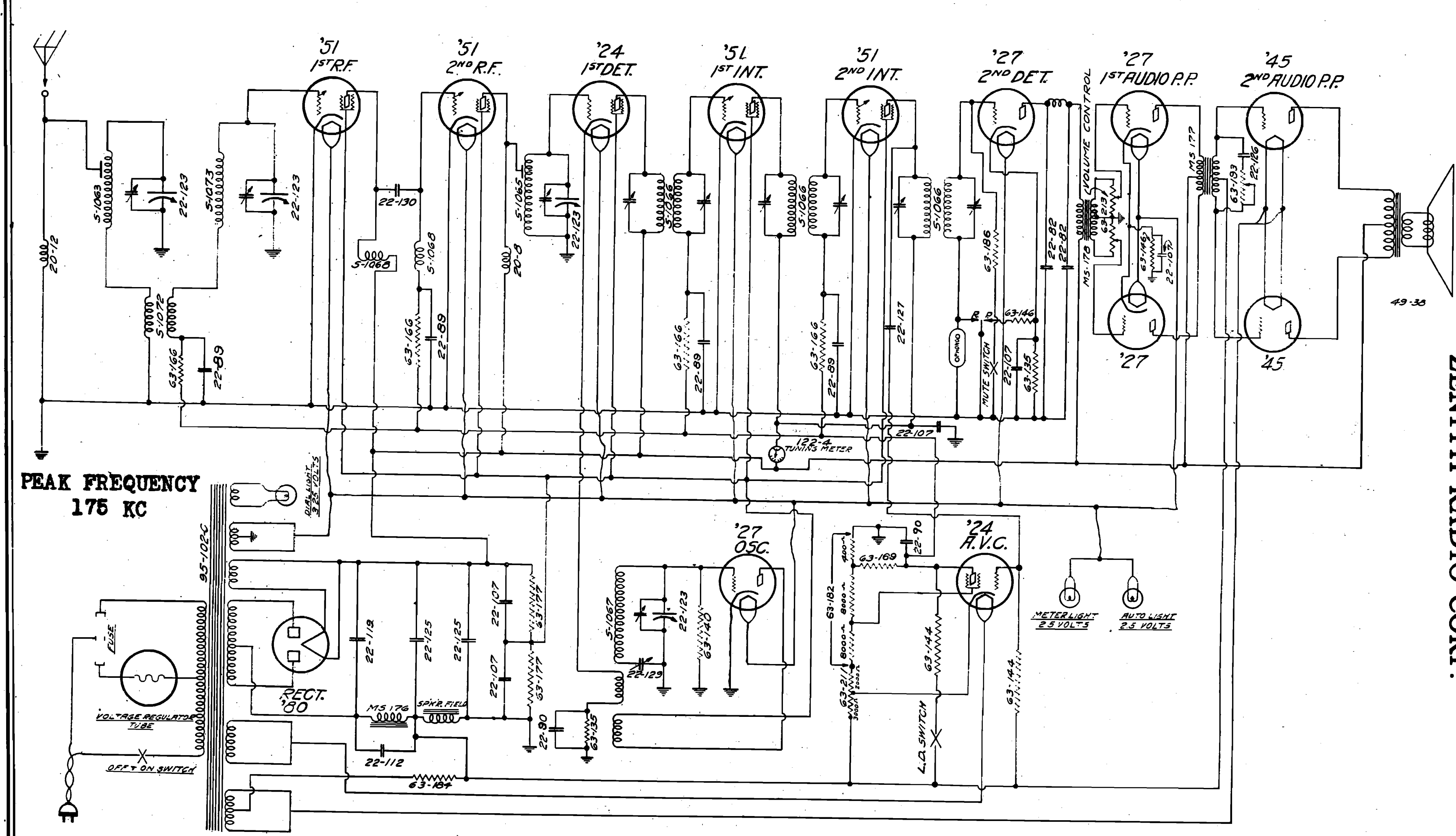
First turn the trimmer provided on the oscillator section of the condenser gang (See fig. 2) and peak for greatest deflection, to the right, of the tuning meter. The second section from the left tunes the 1st R. F. stage and is next in order. Also peak for the greatest swing of the meter. The preselector or third, and the 1st detector or fourth sections follow in turn and are adjusted in the same manner. The second R. F. stage is of the fixed impedance type and therefore requires no adjustment. The untuned coils are concealed beneath the chassis in a small round shield.

When the trimmers have been resonated, set the dial to 550 K. C. and tune the test oscillator until it is heard clearly in the speaker. This may also be done by tuning to a station at or near 550 K. C. Turn the oscillator padding condenser screw for greatest swing to the right on the tuning meter, while rocking the dial back and forth over the signal. The padder adjusting screw will be found on the left side of the chassis base when looking from the front. (See Figure 2.)

The six intermediate adjusting screws provided beneath the chassis, directly under the intermediate transformers (See fig. 5) are to be used only when it is absolutely certain that trouble lies at that point. If it is necessary to change the setting connect an accurate 175 K. C. test oscillator to the ground post and to the 1st detector grid cap through a .00025 mfd. fixed condenser. The oscillator tube must be removed for this operation. Beginning with the first detector plate screw (the one farthest to the left when viewing the chassis from underneath with the control shafts at the top) each one is tuned for maximum swing of the tuning meter. The procedure applies to all but the last or second detector grid vernier. The meter is not effected by this circuit, therefore, it will be necessary to turn it to a point which gives greatest volume from the speaker.

ZENITH RADIO CORP.

PEAK FREQUENCY
175 KC



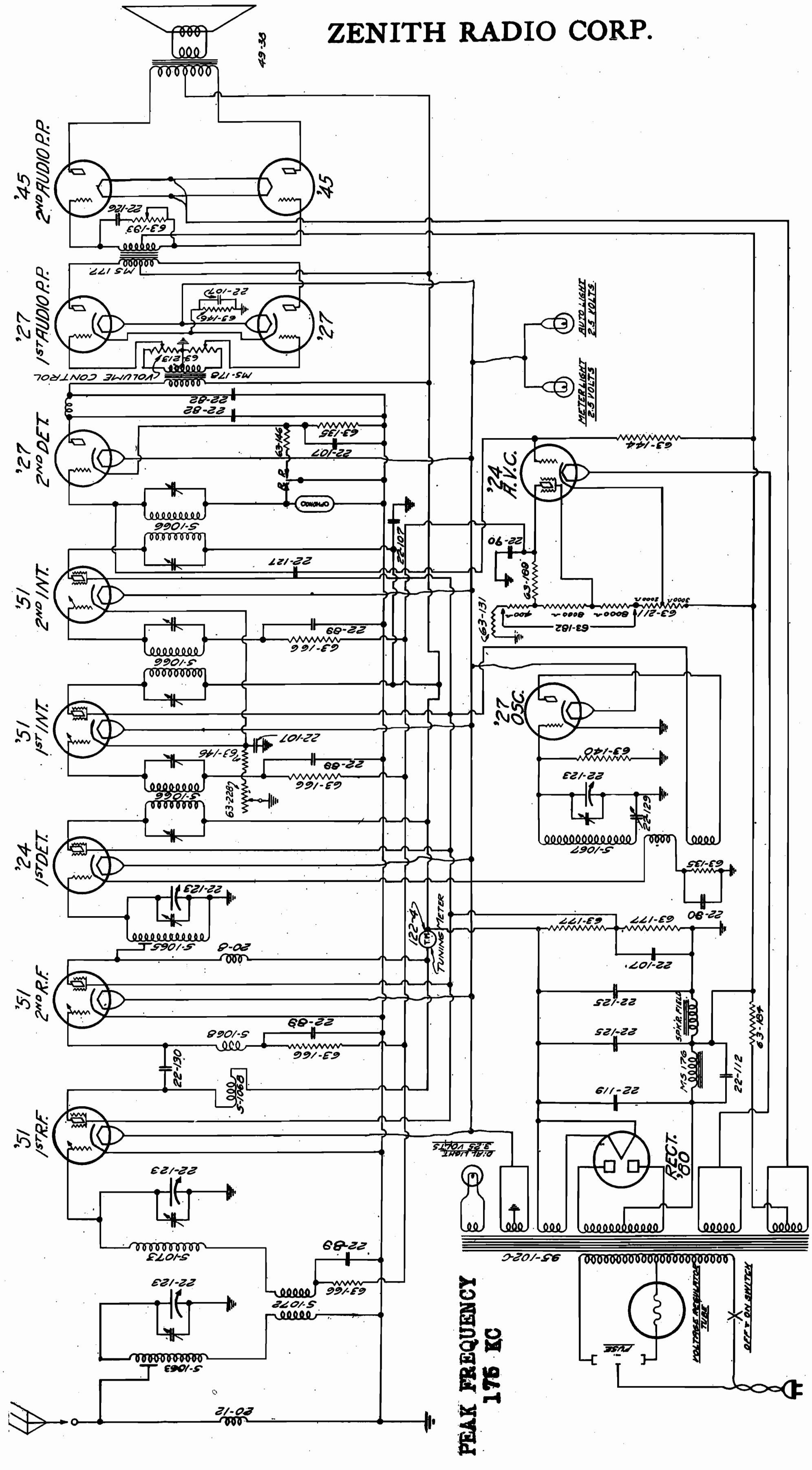
SCHEMATIC DIAGRAM #2 (For diagram #1 see page 674-P-5)

ZENITH RADIO CORP.
CHICAGO, ILL.
14 TUBE SUPERHETERODYNE
MODEL 2017
(SERIAL NOS. AFTER 450,451 ONLY)

MODEL 103 (2017) SERIAL NUMBERS AFTER 450,451 ONLY.

For further data refer to page 674-P-10

ZENITH RADIO CORP.



PEAK FREQUENCY 175 KC

ZENITH RADIO CORP.
CHICAGO, ILL.
14 TUBE SUPERHETERODYNE
MODEL 2017

MODEL 103 (2017) SERIAL NUMBERS AFTER 451,260

For further data refer to page 674-P-10

ZENITH RADIO CORP.

MODEL 103 (2017) 14 TUBE SUPERHETERODYNE

MODEL 103 (2017) SERIAL NUMBERS AFTER 450,451
(Schematic Diagram Page 674-P-8)

5B

This supplement covers an improvement in the Model 103, fourteen tube Superheterodyne. It is confined entirely to the Manual volume control circuit as may be seen by comparing the diagram on page 674-P-8 with the schematic shown on page 674-P-4. In all receivers produced bearing serial number 450,451 or higher this change is incorporated.

The manual control has been removed from the A.V.C. cathode and placed in the grid circuit of the 1st A.F. stage. A tapped resistor takes the place of the original control. By use of this system, the automatic volume control operates independently and at full efficiency, manual volume being controlled by varying the audio output.

It should be noted that since the A.V.C. or R.F. circuit remains constant, the tuning meter will show maximum swing on the station at any manual control setting. Originally the meter action decreased as the volume was lowered.

All data listed on pages 674-P-5, 674-6, 674-7 apply directly and are to be used when servicing either type set. The balancing process remains unchanges. The parts list shown previously, except for the substitutions given below, should be used when ordering replacement components.

PARTS CHANGE
(Receivers bearing No. 450, 451 or higher, only)

1 Couble section Audio Volume Control,	Part No. 630212	List...........$3.00
1 Center tapped resistor,	Part No. 63-211	List...........$0.50
Deduct the 63-171 volume control,		

MODEL 103 (2017) SERIAL NUMBERS AFTER 451, 260
(Schematic diagram on page 674-P-9)

5C

All Zenith fourteen-tube Superheterodynes after serial number 451, 260, incorporate a variable Sensitivity Control in place of the original Local-Distance switch. This improvement gives more flexible adjustment of the sensitivity thereby reducing the noise between stations for the type of reception desired. Since it constitutes only a few minor parts changes the data on pages 674-P-5, 674-P-6, 674-P-7, may be followed in making repairs of adjustments.

The change consists essentially of inserting a variable bias resistor into the I.F. cathode returns and transfer of the tuning meter from the I.F. in the R.F. circuit. It is absolutely essential that the meter be changed in the event that this improvement is added in the field, otherwise practically no reading will be obtained when the sensitivity control is used in a lower position.

It should be also noted that the 22-107 bypass condenser, employed in receivers subsequent to number 451,260, has been omitted from the plate to screen circuit and is now used to bypass the I.F. cathodes. a 2,000 ohm limiting resistor is connected in series from this point to the sensitivity control.

In addition to the improvements listed the A.V.C. coupling condenser No. 22-127 has been transferred from the plate of the second I.F. stage to the grid of the second detector. The 400 ohm resistor 63-131 in series with the 630182 divider lowers the overall sensitivity to a more controllable level.

With the following changes, the parts list given on pages 674-P-5 will apply directly.

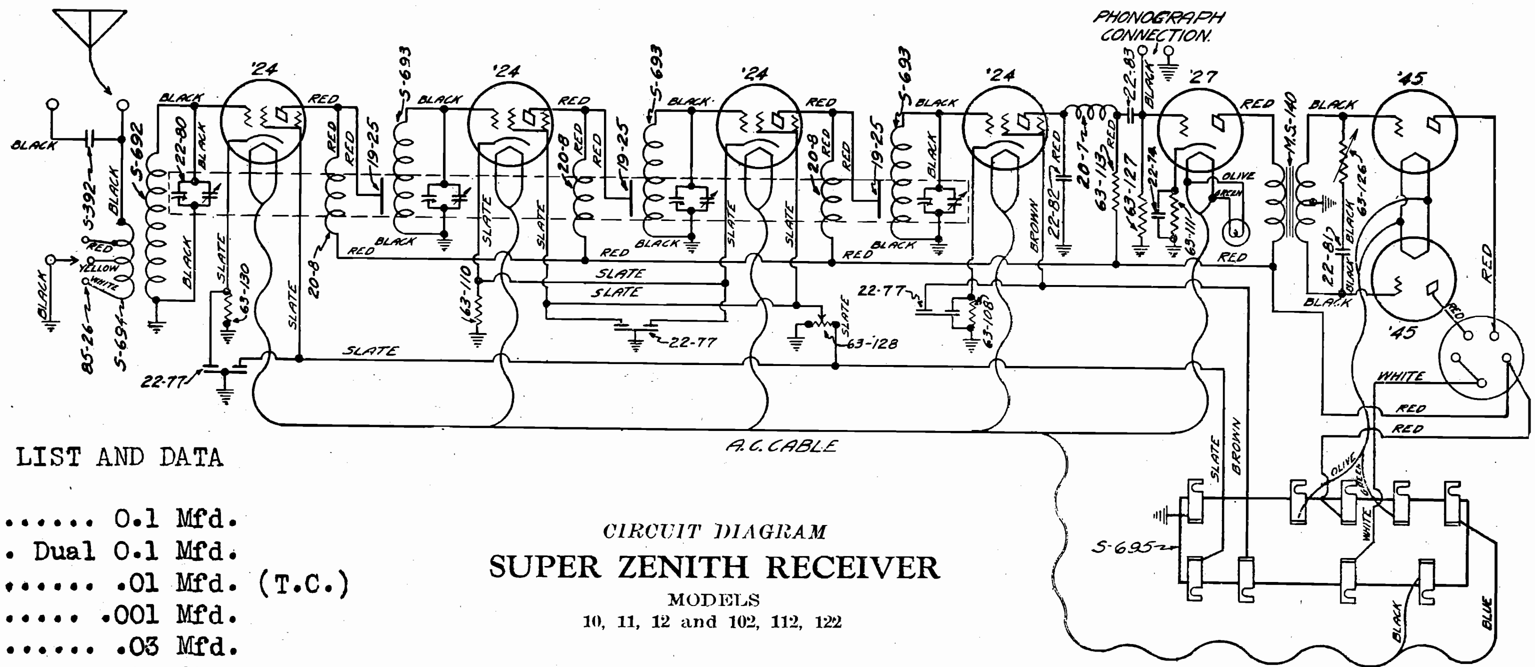
DEDUCT

	No.	Description	List
1	85-32	Local-Distance switch........	$ .85
1	63-144	3megohm $\frac{1}{2}$ watt resistor........	.30

ADD

1	63-228	Sensitivity Control........	1.00
1	63-131	400 ohm $\frac{1}{2}$ watt resistor........	.30
1	63-146	2,000 ohm $\frac{1}{2}$ watt resistor........	.30

ZENITH RADIO CORP.



CIRCUIT DIAGRAM

SUPER ZENITH RECEIVER

MODELS

10, 11, 12 and 102, 112, 122

PARTS LIST AND DATA

22-74......... 0.1 Mfd.
22-77.... Dual 0.1 Mfd.
22-81......... .01 Mfd. (T.C.)
22-82......... .001 Mfd.
22-83......... .03 Mfd.
63-108.......50000 Ohms-green
63-110......... 400 Ohms-yellow
63-111....... 2000 Ohms-black
63-113......250000 Ohms-white
63-127.......... 1 Meg.-brown
63-128.......50000 Ohms (V.C.)
63-130.........800 Ohms-bl-yel.

POWER UNITS
MODELS 10, 11, 12

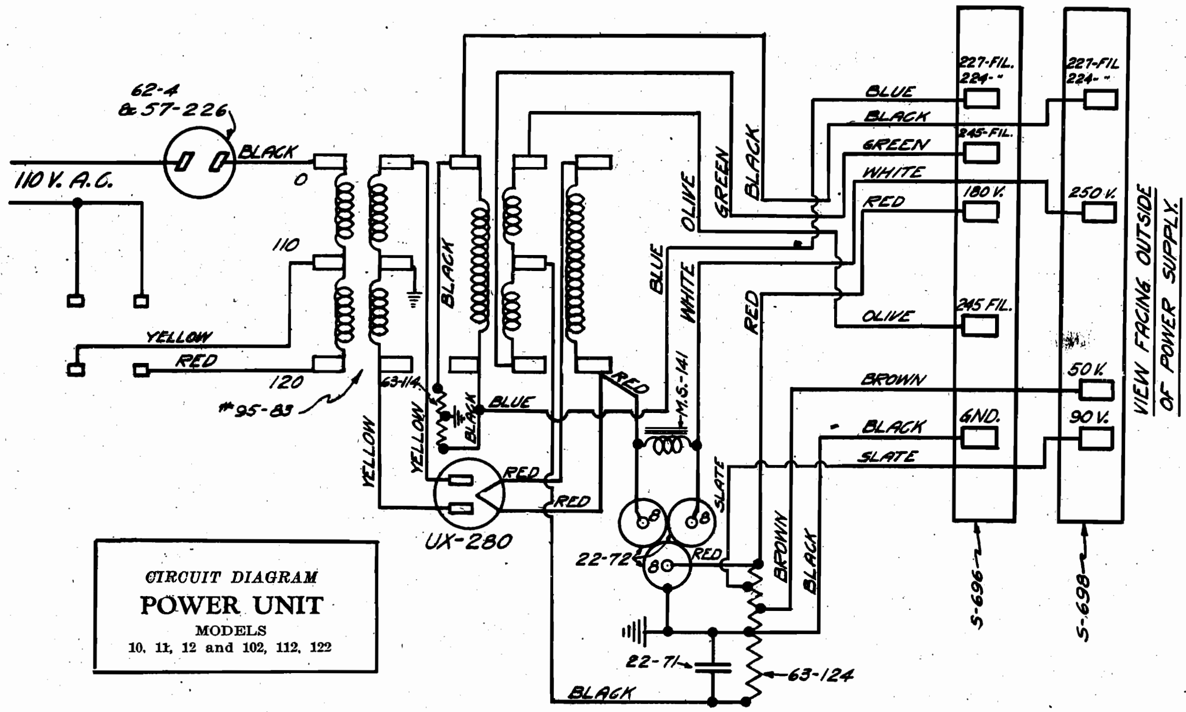
22-71......... 1.0 Mfd.
22-72......... 8.0 Mfd.(Elect)
63-114........ 10 Ohm (C.T.)
63-124..... 10450 Ohm V. Div.
95-83... Power Transformer
95-84... Power Transformer for models 102, 112, 122, 25 cycle sets.

VOLTAGE READINGS AT SOCKETS USING WESTON 547 ANALYZER

Line Voltage 115. Fuse in 120 Volt Clips. Vol. Contr. in Max. Pos'n.

TYPE	POSITION	FIL. VOLTS	PLATE VOLTS	GRID VOLTS	SCREEN VOLTS	NORMAL PLATE M.A.	GRID TEST M. A.
224	1st R.F.	2.3	185	3.25	90	4	7
224	2nd R.F.	2.3	185	3.4	90	4	7.5
224	3rd R.F.	2.3	185	3.3	90	4	7.5
224	Det.	2.3	90	3	30	.25	.75
227	1st A.F.	2.3	170	12	—	6	7
245	P.P.	2.3	245	50	—	28	37
245	P.P.	2.3	245	50	—	28	37

ZENITH RADIO CORP.



CIRCUIT DIAGRAM
POWER UNIT
MODELS
10, 11, 12 and 102, 112, 122

A new development in the form of capacity coupling is used between the R. F. stages. Close examination will reveal the fact that it comprises a single band of bus-bar wire. This band is connected from the plate terminal of the preceding R. F. stage and coupled to the grid coil of the following R. F. stage. The position of this band is permanently adjusted at the factory and should never be altered or tampered with unless the available line voltage is extremely low.

The distance from the coupling band to the grid or top end of the R. F. coil entirely governs the stage coupling and efficiency of the set. If this band is too close to the grid end, excessive coupling will result, causing a decided lack of selectivity. If the band is placed too low, the result will be a lack of sensitivity. Midway between the coil winding is the exact and most efficient operating position. If it is found necessary to reset this band, insulating cement or other fastening substance should be applied to hold it in position, since loose vibration would cause frequency flutter.

The R. F. plate chokes are concealed beneath the R. F. coil base, between the base and sub-panel. These chokes have an inductance of 6.75 M. H. and can be distinguished from the detector plate choke by the fact that they have 150 less turns. If an occasion arises which necessitates removing an R. F. choke, the serviceman should make certain that the 1/8" spacing is maintained between the choke and the R. F. coil base. To neglect this important adjustment may cause erratic operation of the receiver

Occasionally, and especially if the receiver has remained idle for a long length of time, it may have a tendency to oscillate. This is always due to poor contact between the wipers and rotor bearings of the variable condenser gang. It may be overcome by cleaning both parts with fine sandpaper or by revolving the dial several times to remove oxidization at that point.

BALANCING

When resonating the variable condenser system for most efficient receiver performance, it will be noticed that an entirely new and fool-proof system of locking the verniers has been employed. The large locking nut may be loosened with a No. 6 Spintite wrench and the vernier screw turned with a small pointed screw driver.

Proper method of balancing is accomplished by setting the antenna input control first on the No. 1 position. A station of low wavelength should be tuned to resonance on the dial. Adjust each trimmer condenser to exact resonance or so that it is set to peak volume. After this has been done, the input control should be set to the No. 2 position and the antenna section trimmer readjusted.

Upon completion, make certain that the wavelength of the station chosen corresponds to the proper wavelength reading on the drum dial.

SPECIAL NOTICE

Alfred Hardy

If you will return this notice we will forward to you the sheets which contain the electrical values of the various resistors and fixed condensers utilized in the Atwater-Kent receivers shown in this issue of the Perpetual Trouble Shooter's Manual. (Vol. 2)

We have gone to great pains and considerable expense to secure this information and we want to be certain, because of the fact that the data is shown on pages other than those which bear the Atwater-Kent diagrams, that the information reaches the proper hands.

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