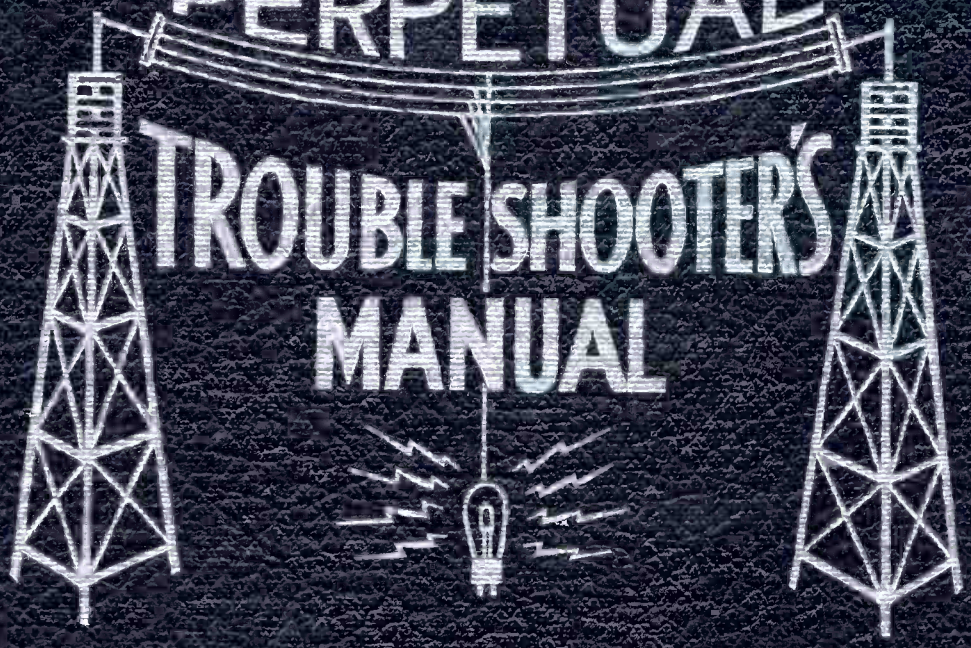
VOLUME IV

PERPETUAL TROUBLE SHOOTER'S MANUAL



JOHN F. RIDER

GALVIN MFG. CO.

MOTOROLA
Antenna data

ANTENNAS

There are various ways to obtain energy or antenna signals. Different makes and types of cars have various conditions and each must be coped with individually. Experience has shown that the roof antenna, if properly installed, is the most satisfactory.

The most satisfactory roof antenna is a piece of copper or galvanized screen, approximately 3 feet square installed between the head-lining and roof of the car. This is done by dropping the headlining back for a distance of one yard or more and tacking the screen to the ribs. The screen should not come closer than 8 inches to the metal on top at the front of the car and to within 4 inches of the metal on the sides of the top.

If after dropping the headlining it is discovered that chicken wire is used in the construction of the top, it will not be satisfactory to install the screen as described in the above paragraph. Instead check the chicken wire with a continuity meter to see if it is grounded. If it is not, a lead may be attached and the chicken wire used as an aerial. If it proves to be grounded it must be freed in the manner described in a later paragraph on "Roof Antenna in Model A Fords".

The following automobile manufacturers announce roof antenna in various 1932 models:

TYPE AUTOMOBILE	YEAR MODEL	REMARKS
Chrysler	1932	Roof antenna with lead-in and provisions for "B" Battery Box.
Dodge	1932	Roof antenna with lead-in and provisions for "B" Battery Box.
DeSoto	1932	Roof antenna with lead-in and provisions for "B" Battery Box.
Plymouth	1932	Roof antenna with lead-in and provisions for "B" Battery Box.
Reo	1932	Equipped with roof antenna and lead-in.
Rockne	1932	Equipped with roof antenna and lead-in.
Studebaker	1932	Equipped with roof antenna and lead-in.
Buick	All Models	$6.00 additional for antenna installation.
Franklin	1932	Roof antenna, no lead-in.
Cunningham	All Models	Additional charge for antenna installation.
Ford	1932	Roof antenna,but no lead-in.

1933 Cars Equipped With

Overhead Aerials

Buick.	33-50	Cadillac	V-12
Buick.	33-60	Cadillac	V-16
Buick.	33-80		
Buick.	33-90	Chevrolet. . . .	....
Cadillac	V-8	Chrysler	6
Chrysler	Royal 8	Oldsmobile . . .	8
Chrysler	Imp. 8		
Chrysler	Imp. Cust. 8	Pierce Arrow . .	836
		Pierce Arrow . .	1236
DeSoto	6	Pierce Arrow . .	1242
		Pierce Arrow . .	1246
Dodge.	6		
Dodge.	8	Plymouth	6
Hupmobile. . . .	321	Pontiac.	8
Hupmobile. . . .	322		
Hupmobile. . . .	326	Reo, Royal . . .	....
LaSalle.	....	Rockne	6
Lincoln.	V-8	Studebaker . . .	6
Lincoln.	V-12	Studebaker . . .	Comm. 8
		Studebaker . . .	Pres. 8
Nash	6		Spd.Pres.
Nash	Std. 8	Studebaker . . .	8
Nash	Spec. 8		
Nash	Adv. 8		
Nash	Amb. 8	Willys	99

CHECK THE ANTENNA

The antennas that are installed by the manufacturers will need to be checked very thoroughly. It can be easily checked by simply trying to peak the antenna stage. If you are unable to reach a peak on the antenna assembly you have either a bad, leaky antenna, or one with too great capacity.

After the set is installed ready for operation, it may be necessary to balance the set with the antenna. This is done by adjustment of the first antenna trimmer. Openings for this adjustment are provided for in the various models.

In making this adjustment be absolutely sure you have properly tuned in a very weak station around 20 or 30 on the dial, adjust the trimmer in and out with a screw driver until the point of maximum volume is reached.

Check for grounded antenna by means of a very sensitive voltmeter, such as 200 volt, 1000 ohm per volt voltmeter placed in series with 200 volts of "B" battery, touching one end of the meter to the antenna and the other end of the batteries to the chassis of the car. With this sensitive meter and this high voltage, you should not get over a 2-volt deflection on the meter, even on a damp day. If you do get over a 2-volt deflection it indicates the antenna is either fully or partially grounded, depending on reading. If a reading is obtained it will be necessary to remove the headlining and cut a strip three or four inches wide out of the screen wire or around its edge, thereby insulating and isolating it from the frame of the car. If a dome light is installed in the car, a circle should be cut out of the screen so it will not be near the dome light.

An effective area of this screen need not be greater than 9 square feet. Bearing this in mind, you will find it necessary to take the headlining down all the way back. Generally to the second rib is sufficient. If, after freeing the screen from the end supports, it is detected that there is a chance of the screen shifting, tacking the screen to one of the ribs will hold it in place.

The lead-in for any of the above type of installations, must be given consideration and it should be brought down on the same side of the car where the Radio is mounted and down the front corner post, either right or left, depending of course on the position of the Radio. On many cars, you will find the windlass is composed of a hollow rubber tube and makes a very nice housing for the lead-in wire and having a distinct electrical advantage insofar as it keeps the wire away from the metal of the car, maintaining the capacity of the lead-in very low.

PLATE ANTENNA

If it is desired, a plate antenna may be used. The plate consists of a piece of metal, approximately 2½ square feet in area, rigidly held to the car and the closer to the ground this is placed, the greater efficiency within of course practical limits. It may be placed under the running boards or fastened to the channel frame. These plates may be obtained from Galvin Manufacturing Corporation on special order, and are fastened by means of clamps to the frame of the car, no drilling being necessary.

In the use of a plate or under-car aerial, some additional shielding may be needed on the antenna lead. If the unshielded portion of the antenna lead is over one foot in length a piece of loom, similar to that used on the shielded part of the lead, should be used to keep the shielding from coming too close to the antenna lead wire. Enough of this loom should be slipped over the wire to reach within about four inches of where the lead attaches to the aerial proper. Braided sheathing is then slipped over this loom, and joined to the shielding of the shielded lead from the set so as to make a continuous shielded lead from the set to within about four inches of aerial proper. The end of shield nearest the aerial should then be grounded to frame of car.

UNDER-CAR ANTENNA

The under-Car antenna consists of a wire fastened from the lower point on the right hand side of the rear axle to the lowest point under the motor, then back to the lowest point on the left hand side of the rear axle, thus forming a "V". At the vertex of the "V" a heavy coil spring should be attached to keep up slack, the spring being insulated from the motor, as well as the other two ends of the wire. The lead-in, of course, is fastened at the vertex.

ROOF ANTENNA ON MODEL "A" FORDS

In the application of the roof antenna on the Model "A" 1930 Fords, when the top is dropped you will notice that No. 2 rib is a steel rib, and it will be necessary in order to get full effect from the antenna. that the screen be cut clear of this steel rib

MOTOROLA Airplane
Type Control Notes

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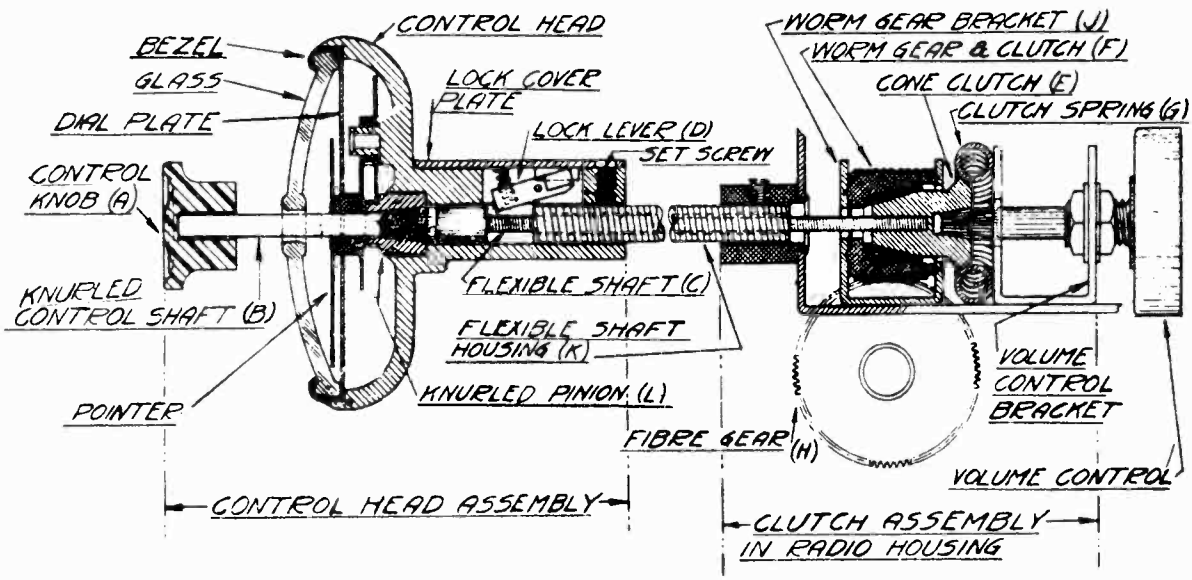

CROSS-SECTION OF AIRPLANE TYPE CONTROL ASSEMBLY.
PATENT APPL'D. FOR.

Adjusting Instructions for Motorola Airplane Type Control

The above cross section view of the Motorola Airplane Type Control identifies the principal parts of the Control Head and Clutch Assembly.

The simplicity of the Assembly and Operation is quickly apparent. A few minutes careful observation of the above cross section view will give you a clear picture of the full Assembly, which can be divided in two main assemblies. (1) The Control Head Assembly which installs on the steering post. (2) The Clutch Assembly which is in the radio set housing.

Two positions operate the control. (1) "Tuning Position." (2) "Volume Control Position." When the knob is pulled toward you it is in the Tuning or "OUT" Position. When pressed toward the control head it is in the Volume Control or "IN" Position which turns set on and off and controls the volume.

Smooth, positive operation in either position is but a matter of simple installation. Therefore, it is important that you spend a few minutes familiarizing yourself with principal parts of the control in relation to the functioning of the Control Head and Clutch Assemblies.

The above cross section view is illustrated as being in the "OUT" Position. The Control Knob (A) is fastened to a Knurled Control Shaft (B) connecting and engaging the Flexible Shaft (C) which runs through the Flexible Housing (K) from the Control Head to the Clutch Assembly.

In the "OUT" Position the Flexible Shaft causes the Cone Clutch (E) to engage inside of the Worm Gear and Clutch (F) operating the Fibre Gear. Note particularly that the Fibre Gear (H) is meshed with the Worm Gear. This Fibre Gear is attached to the shaft of the variable condenser.

The Clutch Spring (G) in the "OUT" Position is in back of the high point on the Cone Clutch (E) bearing pressure on the Cone Clutch into the Worm Gear.

When in the "OUT" Pnsition you will observe that the pointer is engaged with the Knurled Pinion (L). In this position, upon rotation of the knob, the Knurled Control Shaft operates the pointer at the same time the Worm Gear engages the Fibre Gear and rotates the variable condenser.

When the knob is pressed toward the head or "IN" Position, the Knurled Control Shaft and the Worm Gear and Clutch are disengaged, permitting the Flexible Shaft to throw the Cone Clutch into the "ON", "OFF" and Volume Control Positions.

ADJUSTMENT OF THE AIRPLANE TYPE CONTROL

Visualizing the positiveness and simplicity of the action of this Control Assembly, you can readily see there are only two things which can cause the rotation of the Condensers in the Clutch Assembly and the Arrow Pointer in the Control Head to get out of step.

(1) There is a possibility of the Cone Clutch (E) slipping in the Worm Gear (F). The remedy is simple. Merely remove Clutch Spring (G) and cut out a few coils of the spring in order to tighten it ,and replace in position. Occasionally the Fibre Gear may press the Worm Gear too snug. This friction creates a binding which may cause the Clutch to slip. To correct this, slightly relieve the tension of the small spring which you will observe on the chassis that holds the Condenser in place.

(2) The other point to get out of adjustment is where the tapered knurled portion of the Knurled Control Shaft (B) engages the Knurled Pinion (L) in the Control Head Assembly. This can be out of adjustment when the Knurled Control Shaft (B) which is attached to the Flexible Shaft (C) and which is inside the shaft housing, is adjusted too FAR BACK in the Control Head. In this position it WILL NOT ENGAGE the knurled portion of the Knurled Pinion (L). This can also occur when the set screw holding the Flexible Shaft in place in the Control Head becomes loose allowing the entire Flexible Shaft to work back out of position.

It is a very easy matter to determine if adjustment is correct at the Control Head. If you can lock the set it is in proper adjustment. If you cannot lock the set adjust as follows: Put key into position. Pull the knob to the "OUT" Position. Then remove the knob and loosen the set screws. Pull the Flexible Shaft out of the Control Head about an inch and a half. Then REMOVE THE KEY. Re-insert Flexible Shaft into the Control Head, moving it slowly into position, until you hear the lock tumbler "click", which indicates that the Knurled Control Shaft has passed the end of the lock lever. Now pull shaft back slightly. Then tighten tht set screws and the whole assembly will be held in proper position. Replace the tuning knob and key.

NOTE: When re-inserting the Flexible Shaft and when the Knurled Control Shaft passes the lock lever, a slight "click" will be heard when the raised portion on the Knurled Control Shaft passes the lock lever, but when you notice a pronounced "click" and at the same time when the knob end of Knurled Control Shaft extends out of the front of the control about three-quarters of an inch, you can then be sure it is in proper position.

The operation of the ai plane type control is positive in its action and whenever slippag: of the pointer or slippage of the clutch is encountered, one or the other of the above adjustments will correct this condition, and when correctly adjusted after the installation is made it will remain in adjustment thereafter.

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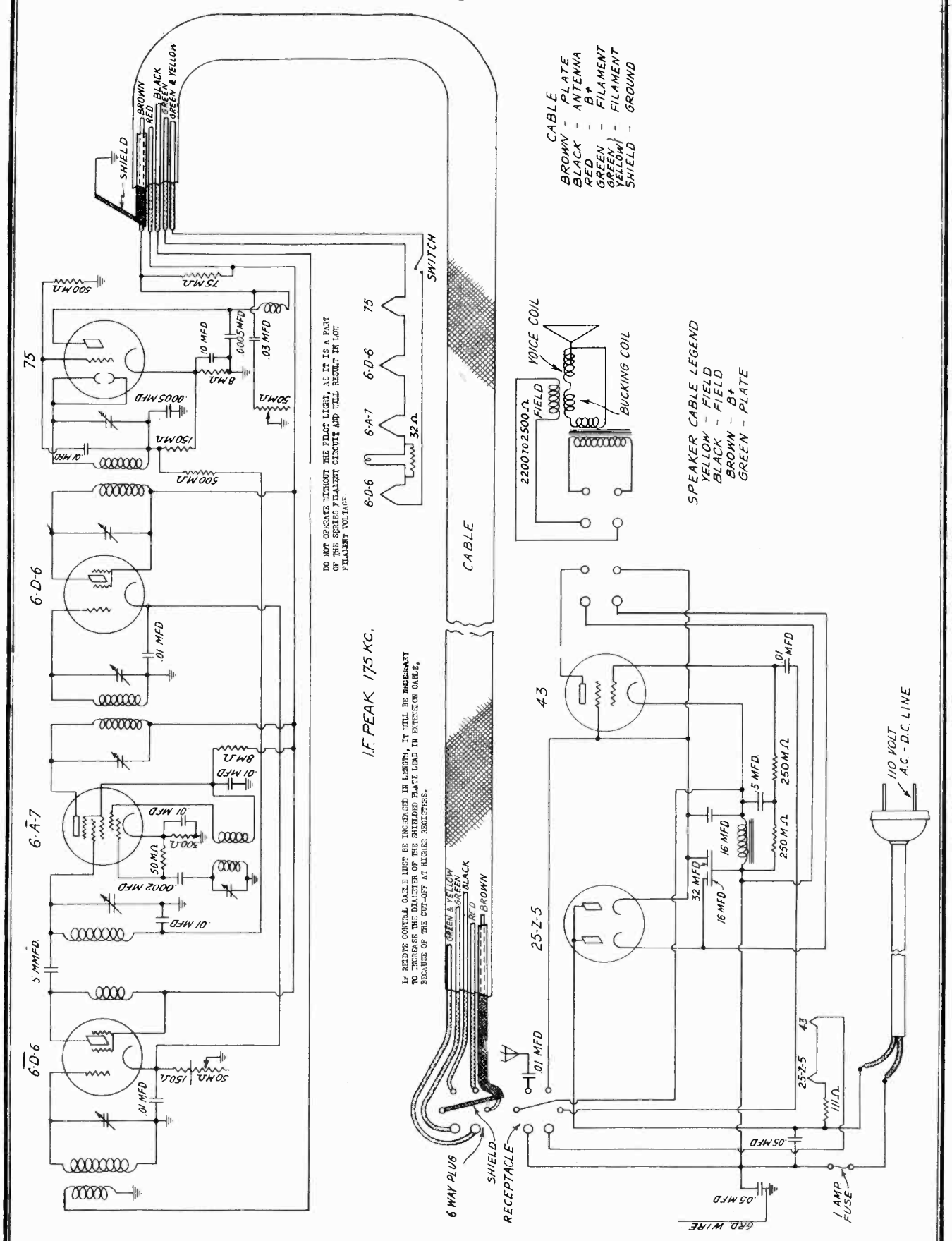
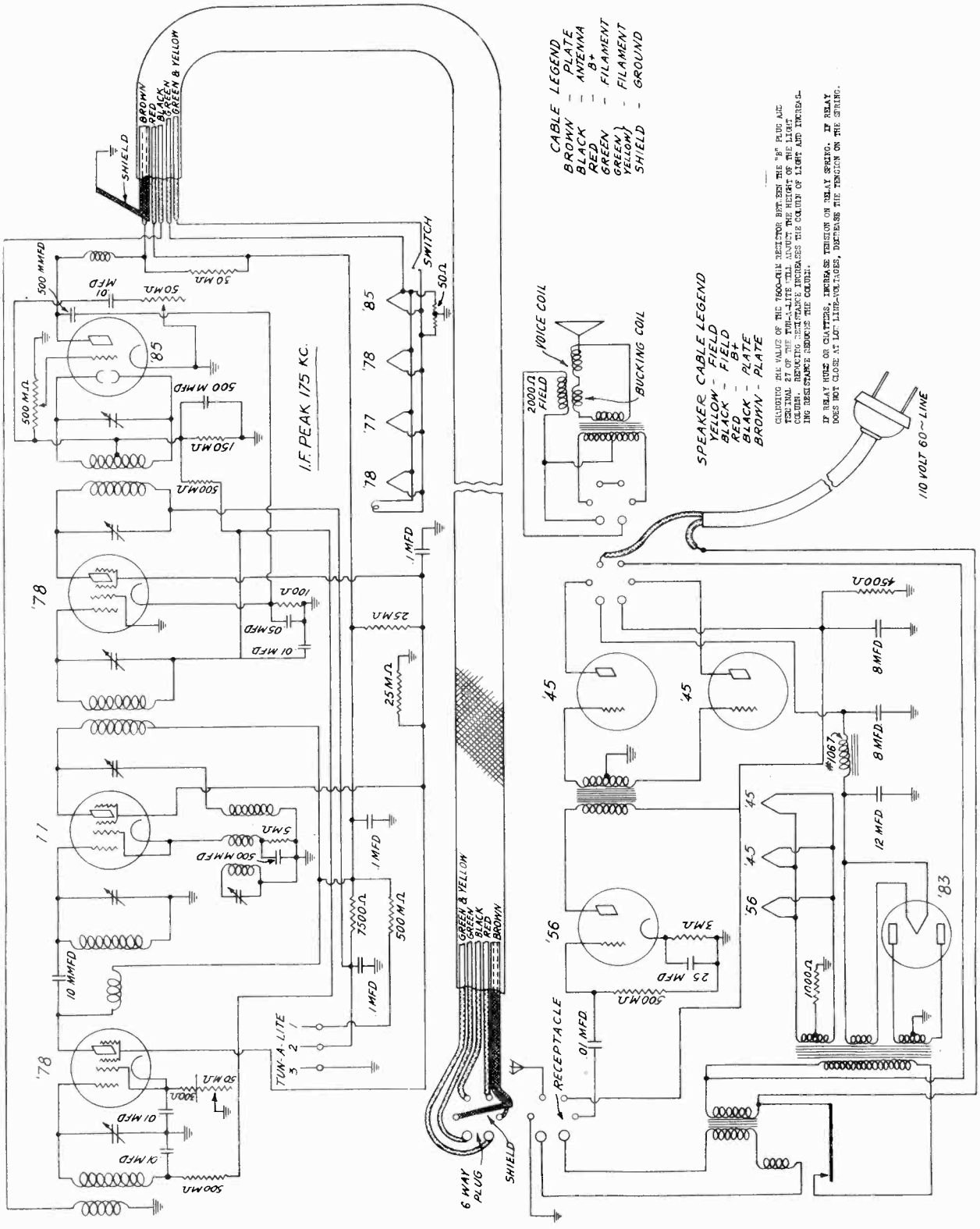
MODEL Motorola J-8
Schematic



MODEL Motorola S-10
Schematic

GALVIN MFG. CO.



GALVIN MFG. CO.

MODEL Motorola 44
Schematic

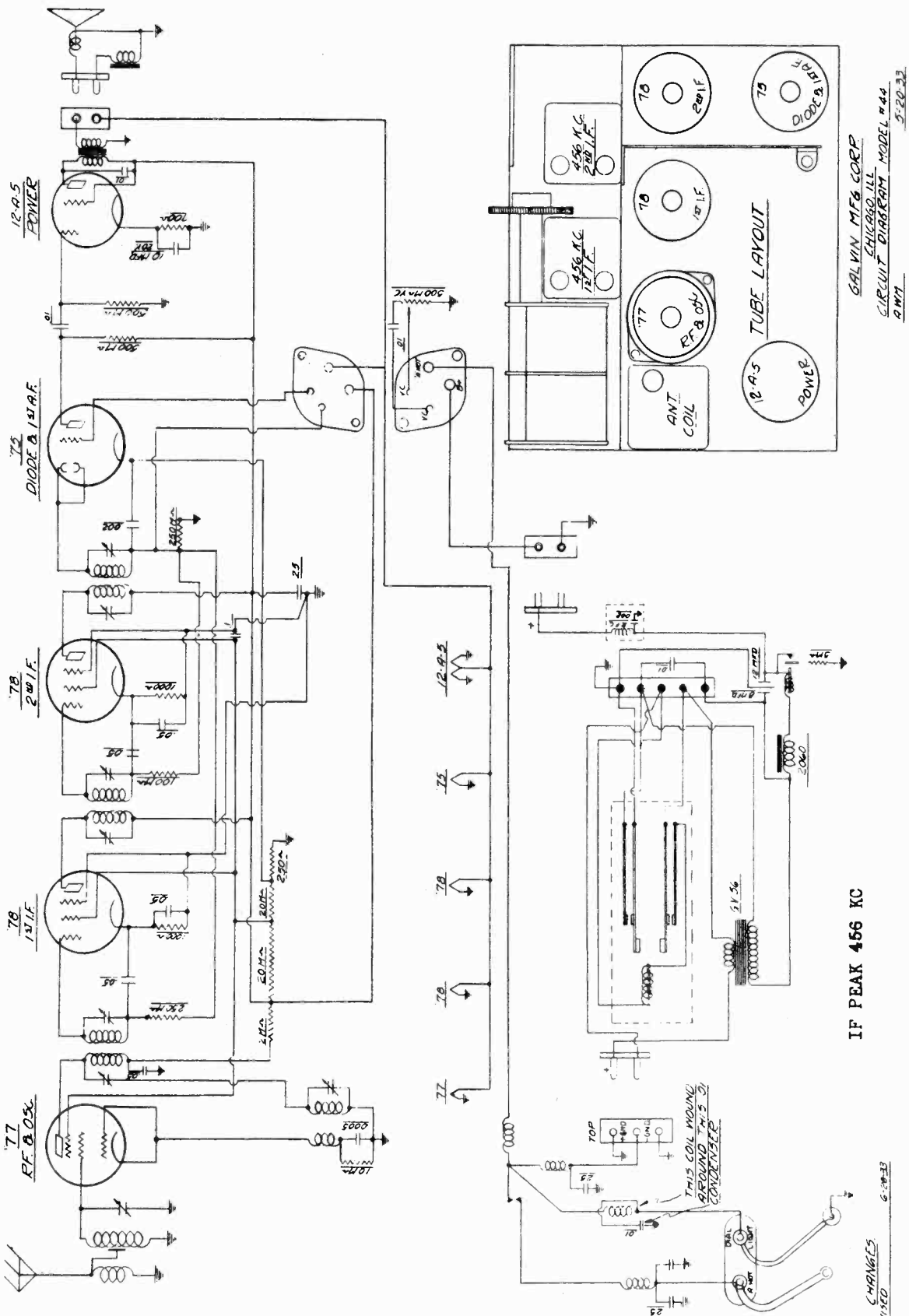


Figure 10

MODEL 44
Data

GALVIN MFG. CO.

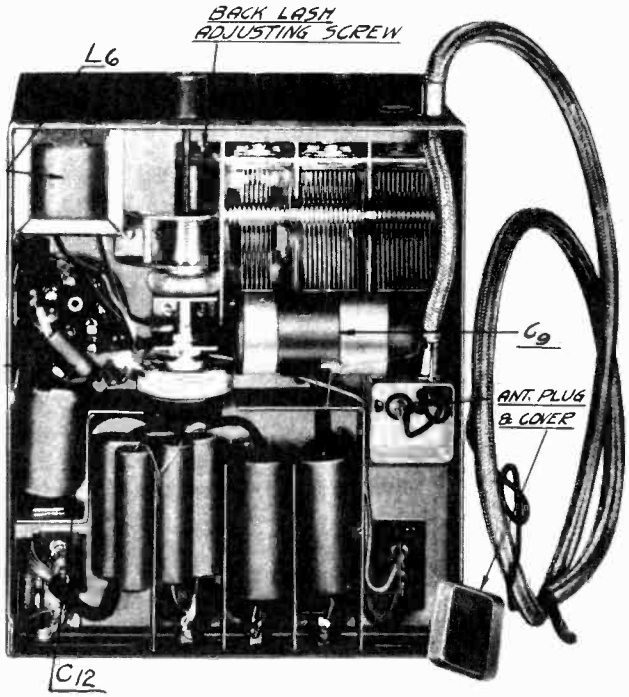


FIGURE 5

The backlash adjusting screw on Model "77" and Model "44".

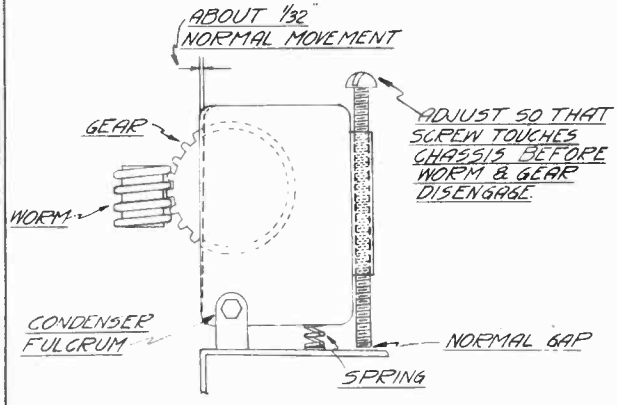


FIGURE 6

MODEL "44"

The Motorola Model "44" is a 5-tube superheterodyne different from the previous Motorola circuits in that it does not have a radio frequency stage. The antenna is fed into a specially designed antenna coil to give the full gain in the antenna coil throughout the broadcast band, which antenna coil feeds into the grid of the type 77 autodyne tube, whose function as an autodyne has been previously described.

From the plate circuit of the "77" it feeds into the first I.F. tube with the grounded end of the secondary left open for the insertion of negative A.V.C. voltages. The plate of this first I.F. feeds into the grid circuit of a second I.F. tube with the grounded end of this secondary left open for the insertion of negative A.V.C. voltages. From the plate of the second I.F. tube it feeds into the diode circuit, with the voltages of the secondary of this transformer being rectified with the diode section of the 75 tube. From the plate of this 75 tube it is resistance coupled into the 12-A-5 power tube.

The 12-A-5 power tube is a low impedance Pentode output tube, it having 2 cathodes plus heaters hooked in parallel. The plate impedance of this tube is low in comparison with all other types of Pentodes. Each and every tube of the set is self-biased and by so doing it allows extreme flexibility in the use of power packs. It will be observed in Figure 9 a view is shown of 3 different packs. Any one of the three will work in the Model "44".

The Motorola eliminode circuit is included in the "44" as shown in Figure all wires being filtered, including the dial light wire.

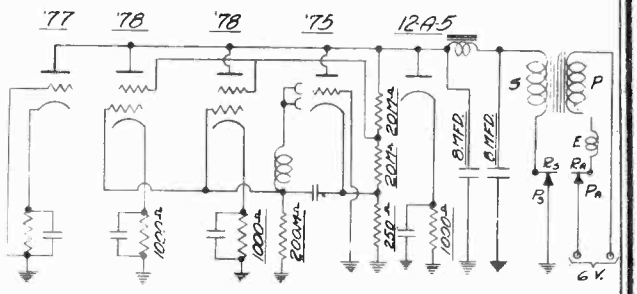


FIGURE 7

Figure 7 shows in simplified form, the method of obtaining bias, principally the 75 tube. You will also observe a simplified "B" supply wiring with all point condensers, etc., left off. This is so the service man can more clearly understand the action of tubeless type power supply.

A little description of the operation of tubeless type "B" supply will install in the serviceman's mind a better feeling of confidence with easier isolation of trouble.

The reed or pendulums marked R_s for secondary side and R_a for primary side are as shown in normal position, that is closed. Upon applying a 6 volt D.C. source at the two terminals marked 6V. the circuit is completed through contact point P_a, through reed R_a, through exciting coil E, then primary of transformer P.

By virtue of the surge of D.C. a flux is immediately set up in the transformer, the flux then producing a voltage much more in the secondary S than in P due to the turn ratio of the two windings. This voltage then, of course, charges up the system.

Due to the current flowing in coil E the reeds are pulled away from their contacts P_s and P_a, but they, being of considerable mass do not move instantly; their motion must be made at their natural period. They are so made mechanically that when the point of saturation of the transformer is reached reed R_s and contact P_s open before contact P_m and reed R_a do. This is accomplished by the amplitude of the secondary being less than the primary (although they are exact in frequency). That allowed the secondary points to open without sparking. Following then the primary points R_a and P_a open, allowing the flux to collapse, this reverse flux discharged through the buffer condenser on secondary and point condenser on primary side.

Since the primary points opened R_a and P_a their exciting coil E could not longer pull on the reed. Due to their natural period they will complete the cycle and return to the original position.

The action of full wave tubeless is identical in principle except the collapse of flux is utilized and aided by use of duplicate windings of P and S on transformer, plus an extra set of points to make reverse contact to reeds.

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MODEL 44
Voltage,
Resistance data
Adjustment notes

TESTING MODEL "44"

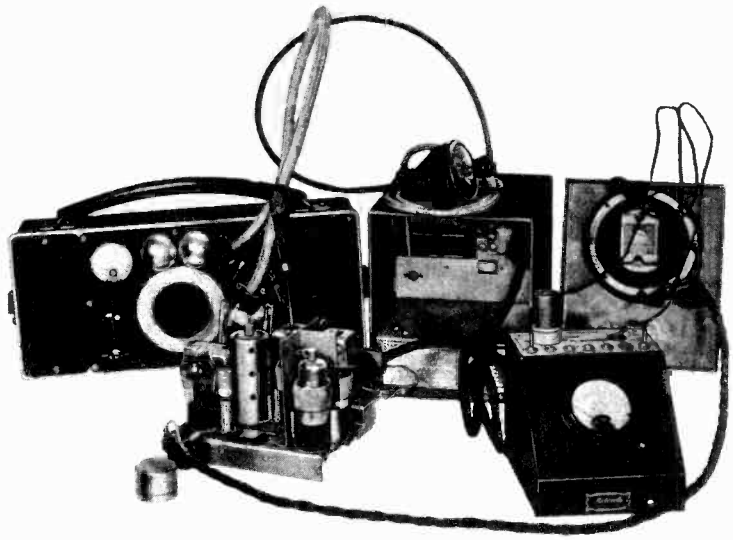


FIGURE 8

The extreme advantage and flexibility of plug-in units is clearly illustrated in Figure 8. Set-up of this nature can be made in the car as well as bench. You will observe in the Figure a Weston Service Oscillator, although any good oscillator should be satisfactory if it attenuates to zero, does not change in frequency when doing so, and at least 30% or better modulation. The Motorola Utility Meter is here shown set for output measurement in its most sensitive position, which is very satisfactory for output measurements across the voice coil where the testing voltage is generally not over 1 volt, maximum of 2.5 volts. The voice coil resistance of the Model "44" speaker is 2.7 ohms.

The oscillator is shown in proper position for I.F. alignment with screw driver in position, for aligning the plate coil of first intermediate transformer. A socket wrench is necessary to align the secondary.

In case it is desired to examine the power pack under operation, two speaker extension cables can be used. This may introduce a little hash but will not interfere in any way with the voltage or an investigation of a bad connection.

With the radio set out as shown in Figure 8 and by referring to Figure 9 , the data given in Table 1 was all taken with a Motorola Utility Meter; or any 1000 per volt voltmeter will be satisfactory.

Figure 9 gives the location of all special positions referred to in the Table. As an additional help we have given a table giving the resistance and inductance of all the coils used in Model "44".

Secondary output transformer (Utah)	.4 ohms	
Primary output transformer	100 ohms	
Primary antenna coil	24 ohms	480 microhenrys
Secondary antenna coil	5 ohms	330 microhenrys
Secondary oscillator coil	4 ohms	137 microhenrys
Primary first I.F.	10 ohms	154 millihenrys
Secondary first I.F.	10 ohms	154 millihenrys
Primary second I.F.	10 ohms	154 millihenrys
Secondary second I.F.	10 ohms	154 millihenrys
Primary diode feeder	15 ohms	2 millihenrys
Secondary diode feeder	15 ohms	2 millihenrys
Speaker voice coil resistance (Utah)	2.7 ohms	

By using the Motorola Utility Meter as a 0 to 1 mill D.C. meter only, the automatic volume control characteristics can be very accurately determined. By placing the 0 to 1 meter across the 200,000 ohm A.V.C. grounding resistor and connecting the antenna onto the radio set:

1. Noise level should produce 1 mill.
2. Strong local stations should produce a 95 mill reading on the meter. The intensity of this reading of course will vary with the field strength of your local station.

By connecting this meter at the .05 condenser in the A.V.C. of the first I.F., as the position shown in Figure 9, the meter should read 1 mill on a station and 0 off station. By connecting the meter between the .05 condenser in the A.V.C. of the second I.F. and ground, the meter should read 15 mills on strong local stations and then go to 0 off stations.

A continued overall audio gain check can be made by applying 110 volts 60 cycle, connecting the grounded end of the 60 cycle to the chassis and working the hot end through a .001 condenser, then completing the circuit through the grid of the 75 tube. With the Motorola Utility Meter connected as shown in Figure 8, a .2 mill reading should be obtained. A slight variation of this might be obtained, but if there is any trouble in the audio circuit it will show up as practically no reading or very slight on the Utility Meter. However, a rough check can be made by just tipping your soldering iron while it is connected to the 110 line onto the grid of the "75". There is enough stray capacity in the soldering iron to produce a 60 cycle hum in the speaker or approximately .2 mill reading on the Utility Meter.

VOLTAGE TEST OF MODEL "44"

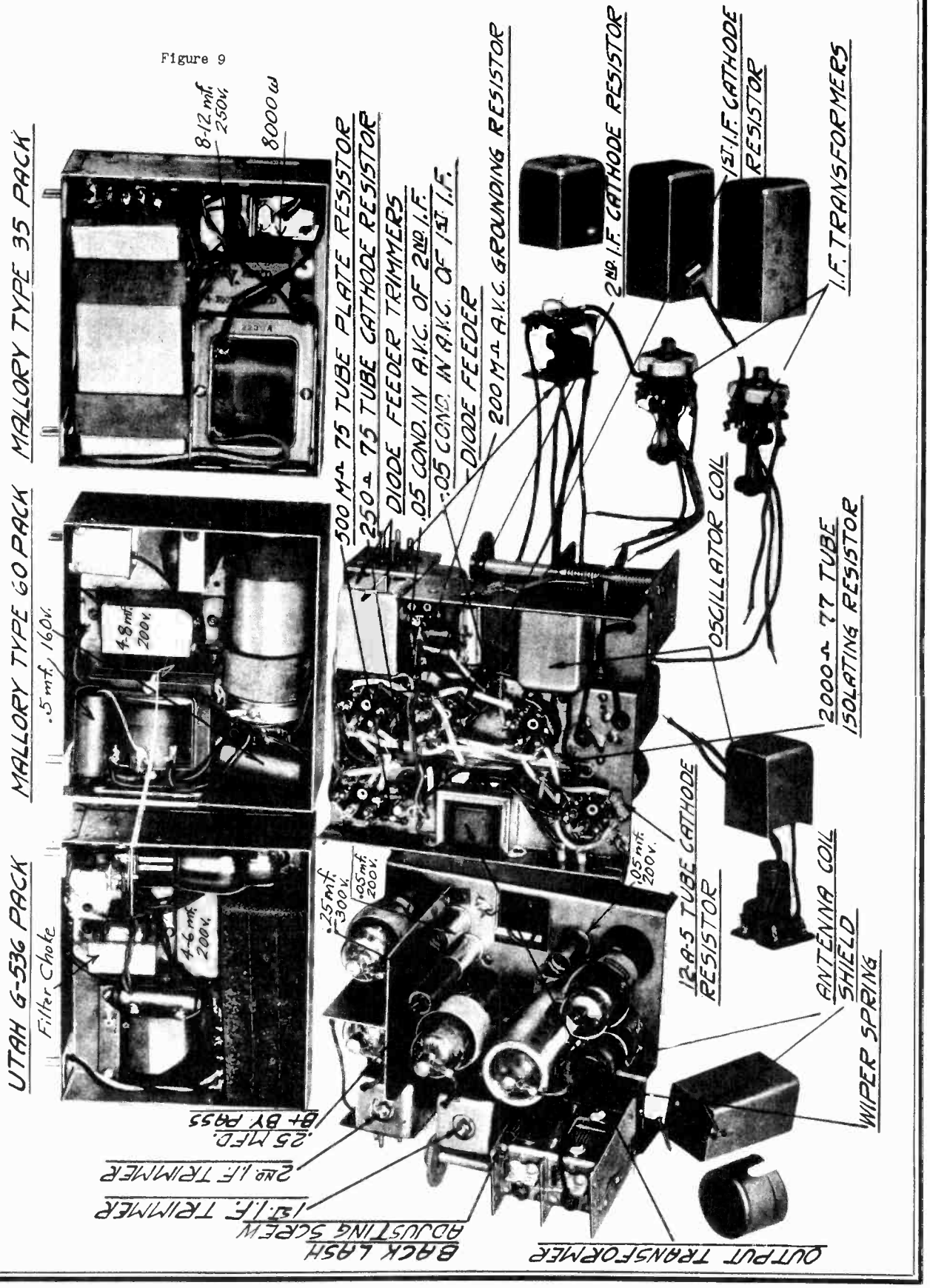
A Battery = 6.5 Volts
Power Supply = 200 Volts

<table>
<tr><td colspan="6">AUTODYNE OR 77 TUBE</td></tr>
<tr><td colspan="4" rowspan="2">Voltage drop across Cathode Resistor</td><td rowspan="2">S.G. Volts</td><td rowspan="2">Drop Across 2000 Ohm Isolating Resistor In Voltage Divider .75 Volts</td></tr>
<tr><td>1500 K.C.</td><td>1000 K.C.</td><td>600 K.C.</td></tr>
<tr><td>No Signal</td><td>4.0 Volts</td><td>5.2 Volts</td><td>10.5 Volts</td><td>112 Volts</td><td></td></tr>
<tr><td>Local Signal</td><td>5.5 Volts</td><td>7.2 Volts</td><td>12.5 Volts</td><td>104 Volts</td><td>.82 Volts</td></tr>
<tr><td colspan="6">1ST AND 2ND I.F. OR 78 TUBE</td></tr>
<tr><td colspan="3">Voltage Drop across Cathode Resistor</td><td colspan="3">S.G.Volts</td></tr>
<tr><td>No Signal
Local Signal</td><td colspan="2">4.0 Volts
1.4 Volts</td><td colspan="3">112 Volts
104 Volts</td></tr>
<tr><td colspan="6">A.V.C. AND 1ST AUDIO OR 75 TUBE</td></tr>
<tr><td colspan="3" rowspan="3">Voltage Drop Across Cathode Resistor. Measurement Made Across 250 ohms at Grounded End of Voltage Divider. 1.1 to not more than 1.5 Volts.</td><td colspan="3">Drop Across 500,000 Ohm Plate Resistor. Use 200 Volt Scale of 1000 Ohm Per Voltmeter</td></tr>
<tr><td colspan="3">No Signal = 80 Volts</td></tr>
<tr><td colspan="3">Local Signal Volume Full On = Peaks Vary 50 to 80 Volts</td></tr>
<tr><td colspan="6">OUTPUT TUBE OR 12-A-5</td></tr>
<tr><td colspan="2" rowspan="2">Two Heaters. Both Should be Lighted.</td><td colspan="2">Voltage Drop Across Cathode Resistor.</td><td colspan="2">D.C. Voltage Drop Across Output Transformer Due to Plate Current.</td></tr>
<tr><td colspan="2">28 Volts</td><td colspan="2">18 Volts</td></tr>
</table>

MODEL 44
Chassis views

GALVIN MFG. CO.

Figure 9



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MODEL 55
Schematic
Alignment

Motorola Model "55" is a 5-tube superheterodyne. The chassis, "B" power supply and dynamic speaker are assembled in one unit. The "55" is so designed that all component parts are assembled on the speaker plate. By removing all screws except the six hexagon head screws and four round head screws located at the edge of the speaker drill, the entire set may be dropped out of the outer housing for servicing or tube replacement.

SERVICING MODEL "55"

After removing the outer housing, the chassis can be inverted and the six hexagon head screws removed. After removing these screws, the speaker plate and speaker may be lifted off and placed at the side of the chassis without disconnecting the speaker wires. After this has been done, all wiring will be exposed and easily accessible for service.

Care should be used in reassembling so the speaker wires do not get pinched under the speaker "pot".

Reference to the circuit diagrams will show that resistance values from the various parts are given so the set may be completely analyzed by resistance method.

ALIGNMENT OF I.F. TRANSFORMERS AND TUNING CONDENSERS

The method of aligning the I.F. transformers at 456 kilocycles and the alignment of the gang tuning condensers is the same as used in Model "77".

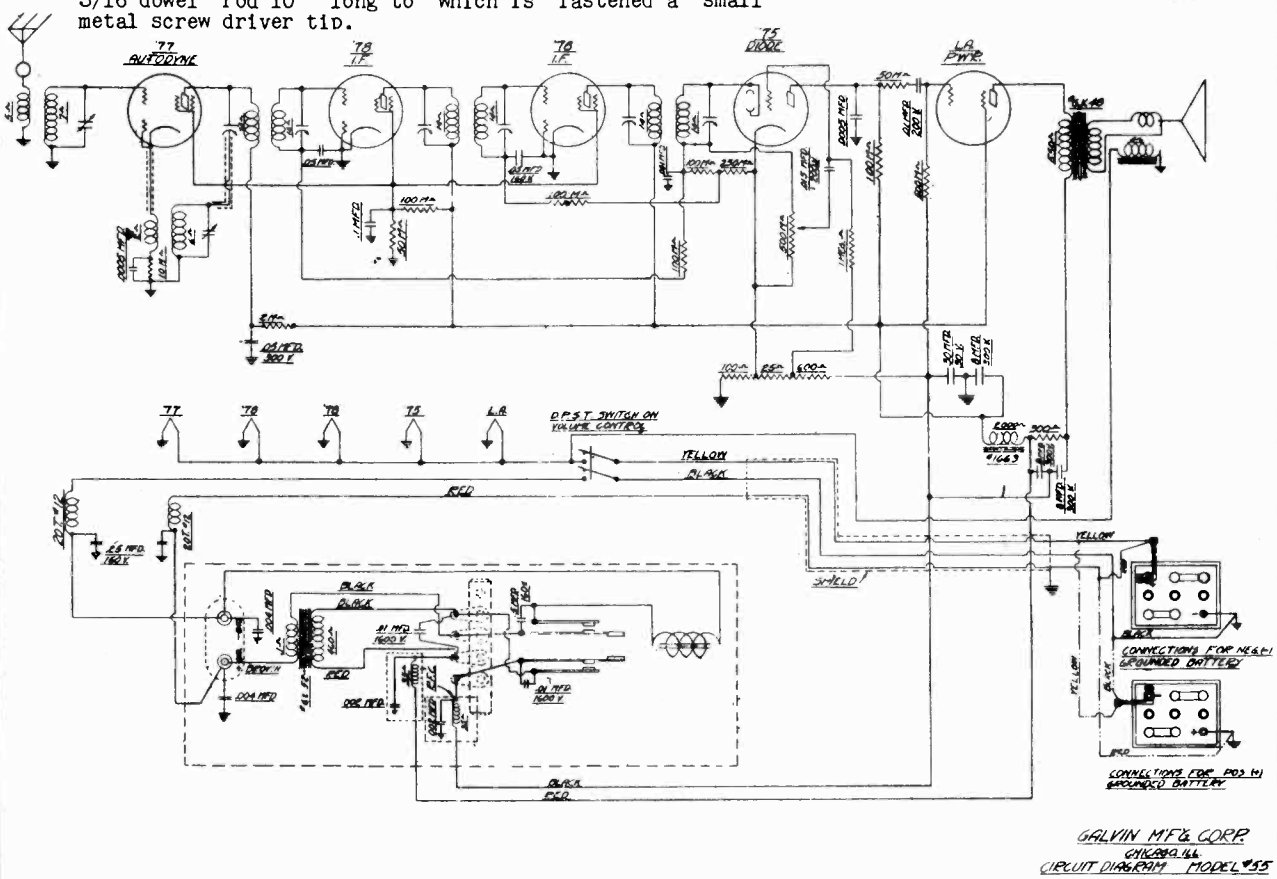
In the alignment of I.F. transformers it will be noted that the third I.F. transformer or diode feeder may be reached with a non-metallic screw driver inserted in the hole provided in the upper part of the chassis located between the first I.F. transformer and the "B" power supply housing. This screw driver may be a piece of 3/16 dowel rod 10" long to which is fastened a small metal screw driver tip.

Any of the various units of the Model "55" may be removed individually for repairing or replacement without disturbing other units.

"B" POWER SUPPLY

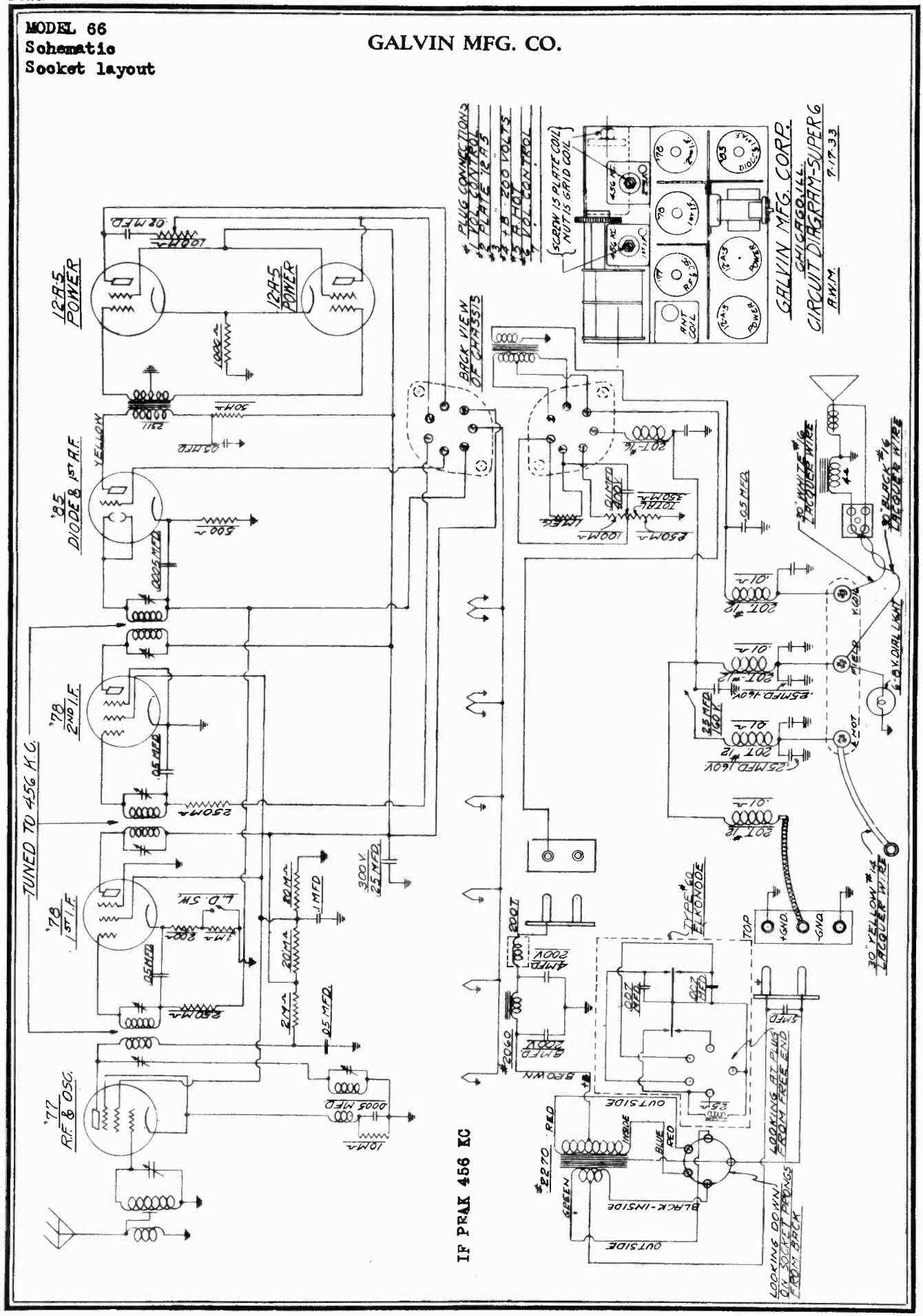
The self-rectifying Elkonode is also used in the Model "55". This along with the power transformer are housed in a single unit in the upper right corner of the chassis. The complete power unit may be removed by disconnecting the two "A" supply leads at the power unit terminal strip and disconnecting the B- (minus and B plus) leads at their respective terminals located on the set chassis. Should the Elkonode require replacement it may be removed by disconnecting the four wires extending from its sponge rubber housing and connecting the new unit as shown in Figure CH-55-B

CAUTION: Do not attempt to make any adjustments to Elkonode.



MODEL 66
Schematic
Socket layout

GALVIN MFG. CO.



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MODEL 77
Schematic

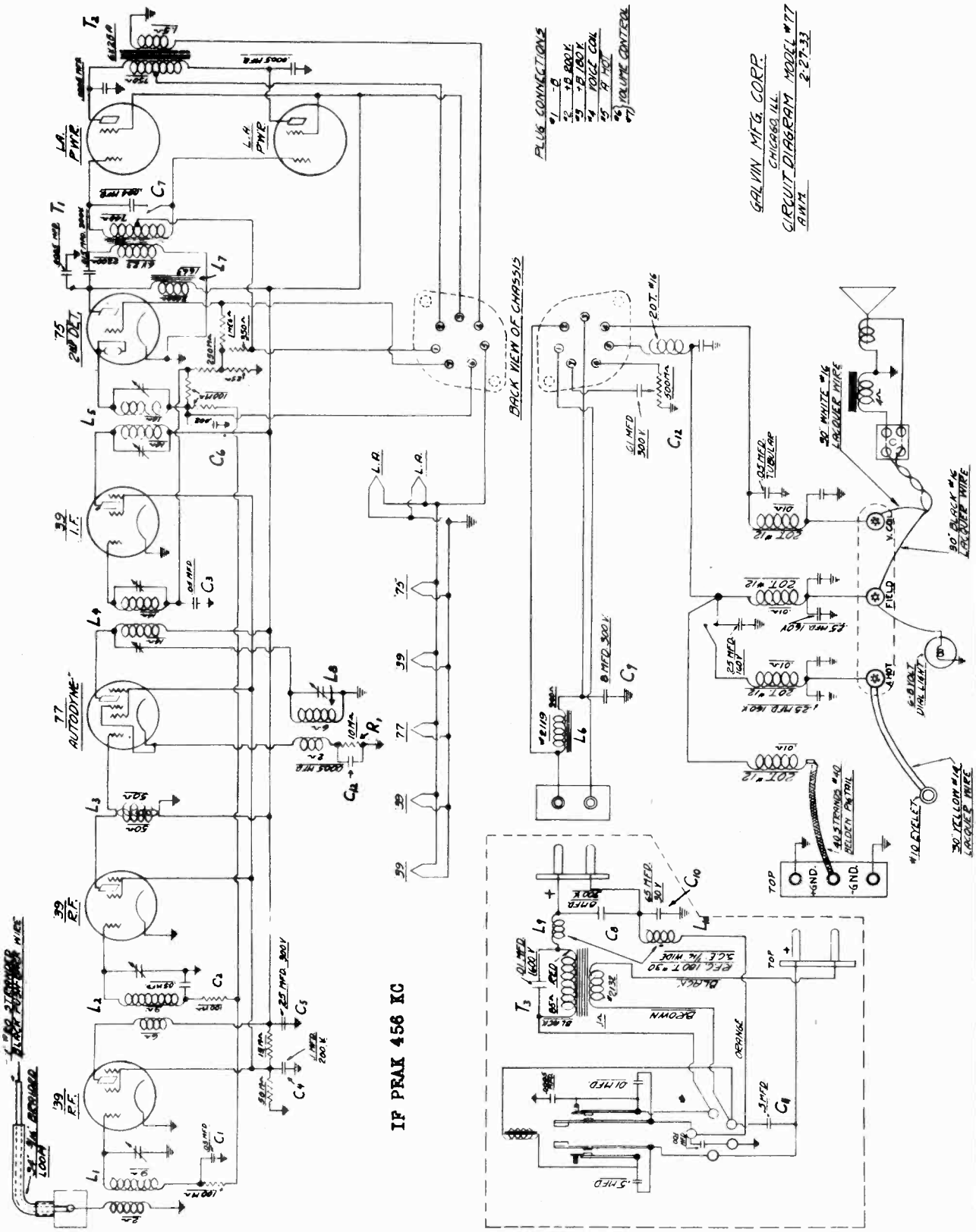
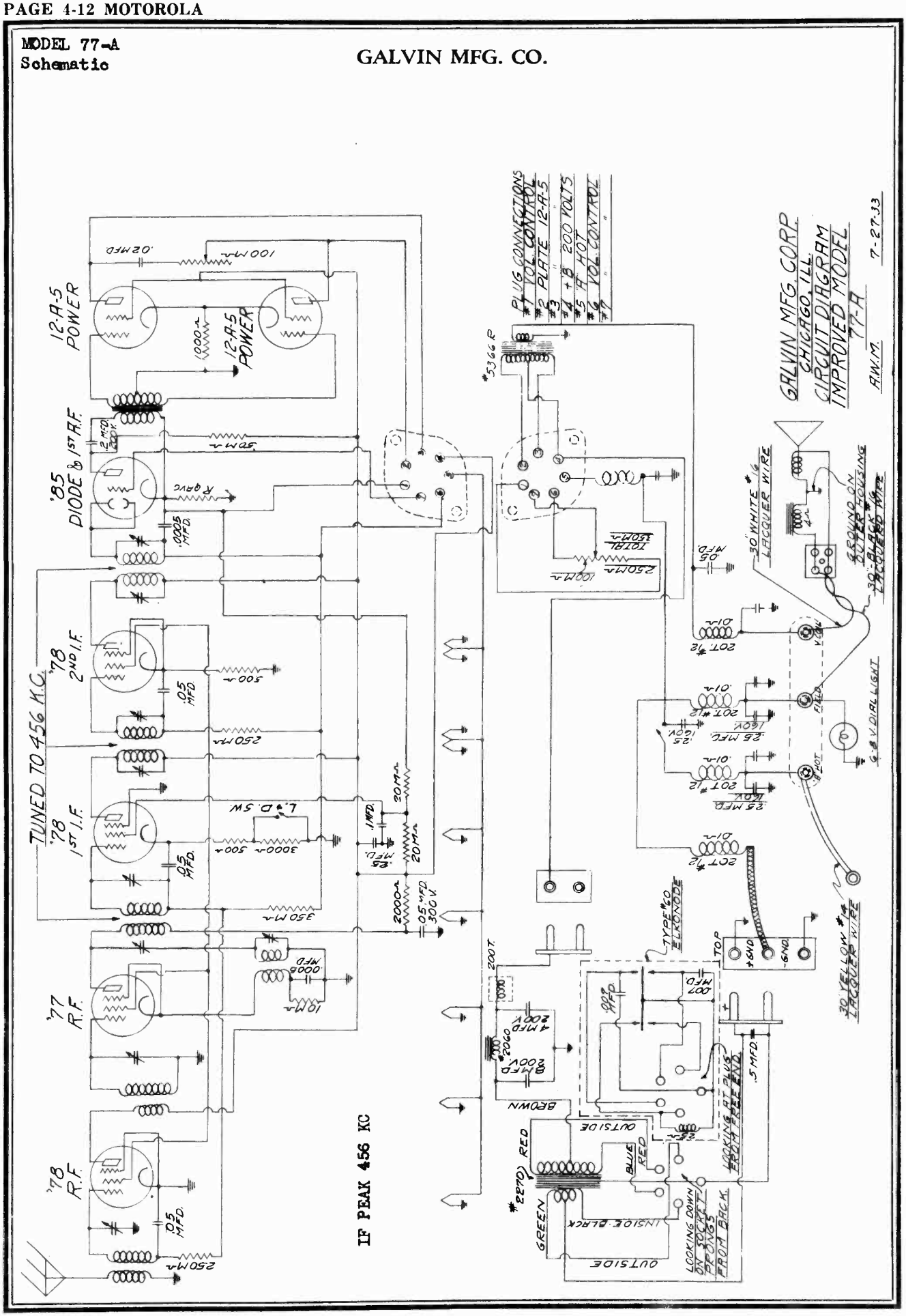


Figure 2

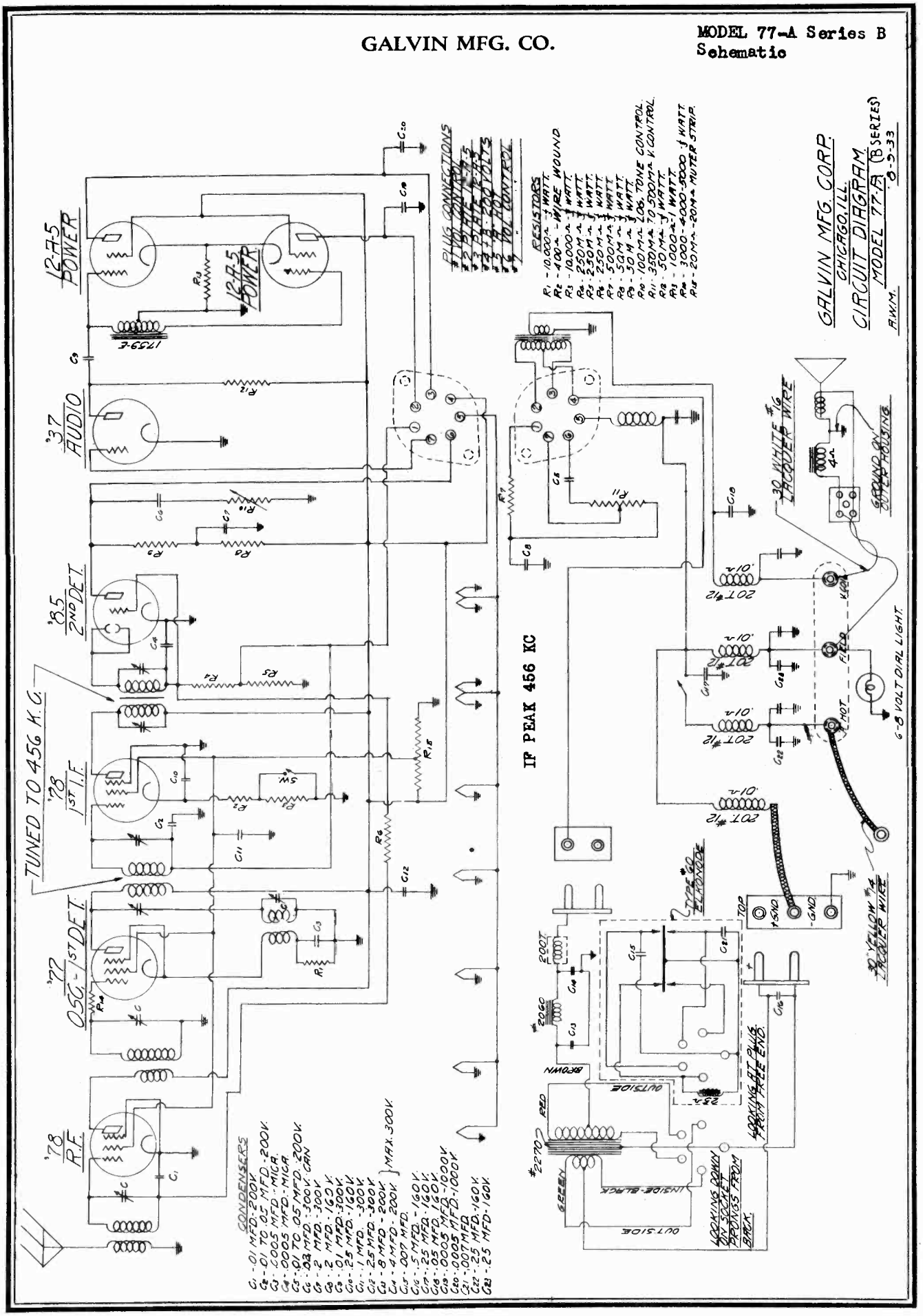
MODEL 77-A
Schematic

GALVIN MFG. CO.



GALVIN MFG. CO.

MODEL 77-A Series B
Schematic



MODEL 77
Chassis views

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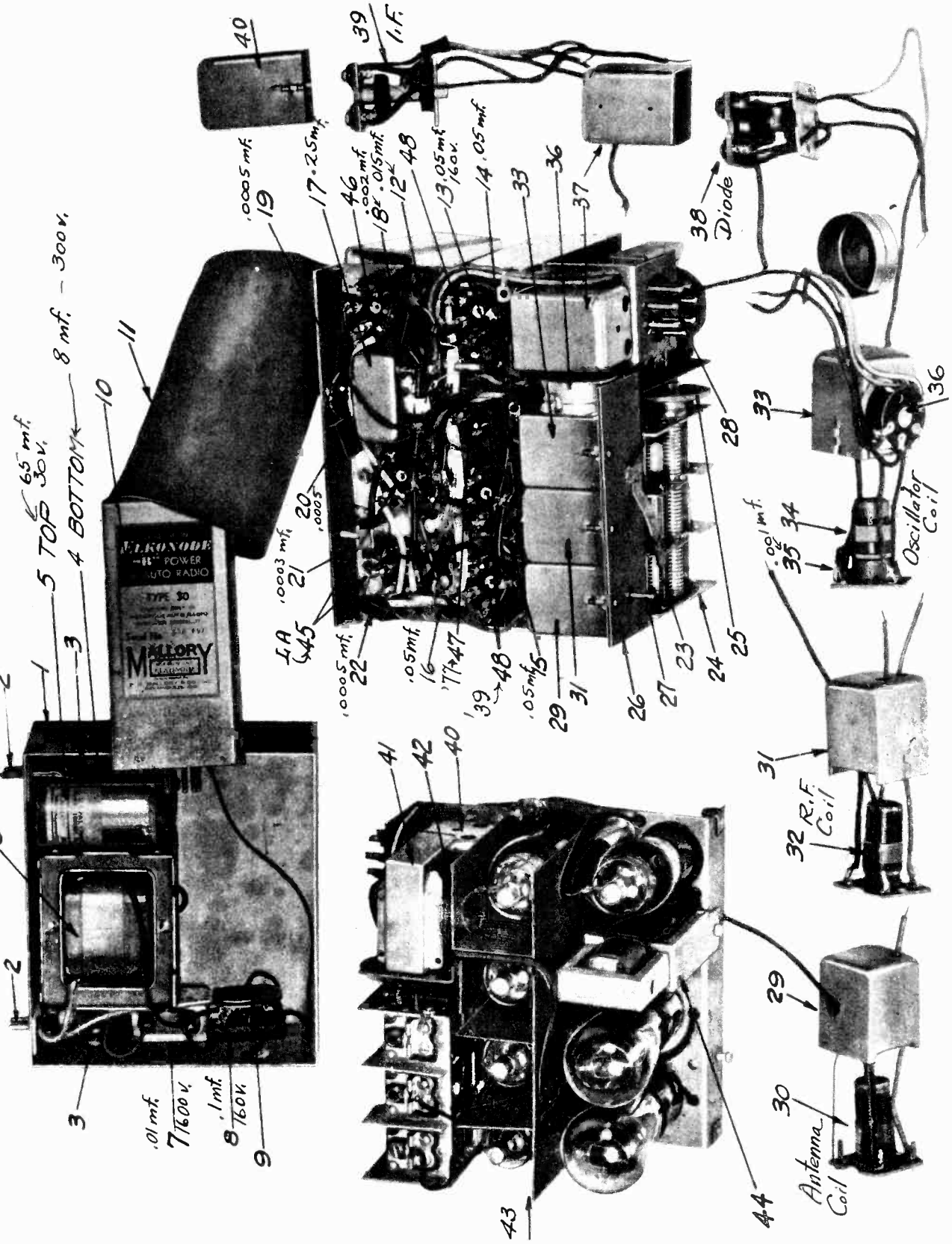

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MODEL 77
Notes

SERVICING "77"

In servicing the Model 77 use of the service extension cable is highly recommended and its convenience either in the car or on a bench is clearly illustrated in Photograph Extension Cable Test, Figure 8, Page 17.

(While photograph shows the Model "44" the same method and instrument apply to the "77") you will note the extension cable plugged into the housing and a test oscillator applied to the grid of the "77" autodyne. The output meter has been connected across the voice coil, one connection at the voice coil, the other connection at the output meter to ground and the output meter set on the one volt scale. This method should be satisfactory in the Model "77" if the percentage of modulation of your local test oscillator is at least 30%, but in case in trying to align the I.F.'s in accordance with information given on Page 9, you find that you are not able to reach satisfactory resonance point with the I.F.'s, then a sensitive D.C. instrument such as a microammeter or not greater than a 0 to 1 milliammeter will have to be placed from terminal No.6 on the chassis plug to ground. This places the meter across the diode network, reading the actual R.F. component in the diode circuit. Then with that combination pronounced peaks can be very easily noticed, provided the I.F. transformers are in proper condition. After the I.F.'s have been properly aligned the procedure, as outlined on Page 9, should be carried out to conclusion. For those servicemen equipped with standard signal generators, the A.V.C. curve of this radio should begin flattening out at 10 microvolts and be on a complete flat portion of the curve at 30 to 40 microvolts and should remain absolutely flat from thereon out to 1 volt.

"77" "B" POWER SUPPLY

Model "77" uses a self-rectifying Elkonode which eliminates the rectifier tube used in former Motorola all-electric models. The yellow "A" lead of the "77" may be connected to any point on the electrical system of the car....ammeter, starter button or battery.

It is necessary to maintain a definite polarity at the Elkonode. For this purpose a polarity changing switch has been provided at the rear of the set housing. The polarity is indicated through a small hold at the lower right rear corner of the set housing. If a red disc appears in the window which reads plus (+) ground, it means that the "B" supply unit is set to be used in cars having the positive side of the battery grounded. If a black disc appears which reads minus (-) ground, it means that the "B" supply unit is set to be used in cars having the negative side of battery grounded. Be sure to determine exactly which side of the car battery is grounded. Then be sure that the marking on the indicator corresponds with it. To change the polarity proceed as follows:

(1) Remove "B" supply unit by prying with screw driver in the slots provided on either side of the "B" power unit.

(2) After removal of the "B" power unit you will observe two receptacles on the rear partition - one on the left and one on the right. The one on the left side requires no adjustments but the one on the right side may be moved up or down in its slot.

(3) Insert a small shank screw driver or ice pick in one of the jacks of this receptacle and adjust up or down for desired indication in window.

(4) Replace "B" power supply.

MAKES OF CARS HAVING "POSITIVE" GROUND - Marmon - De Soto - Cadillac - Pierce-Arrow - Dodge - Packard - Graham - Plymouth - Studebaker - Auburn - Hupp. - Franklin - Rockne - Ford - Chrysler - Nash Twin Ignition.

MAKES OF CARS HAVING "NEGATIVE" GROUND - Reo - Chevrolet - Stutz - Willys-Overland - James Cunningham - Lincoln - Continental - Buick - Oldsmobile - Pontiac - Hudson - Essex - Nash Single Ignition.

For any cars not listed phone earest car distributor or dealer.

Access may be gained to the interior of power supply for service by removing the round head screws which hold the bottom cover plate and remove this plate.

It will be noted that the connections to the Elkonode are made by means of a floating socket and to replace, it is only necessary to pull the Elkonode out of the socket.

CAUTION: When replacing Elkonode make sure that it lies with the label either down or up, but not on the sides. This is extremely important for if placed on the side the vibrating reeds will pull against gravity and their life will be shortened.

REMOVAL OF "77" PARTS FOR REPLACEMENT

Almost all the parts of the chassis assembly, "B" power assembly and outer housing assembly may be removed for replacement without disturbing any other units. There are several, however, which cannot be removed individually. Therefore, to remove the antenna coil, the second R.F. coil or the oscillator coil, it will be necessary to remove the tubes from the chassis and remove the tube shield which is held in place by two sheet metal screws. The screws holding the coil cans may now be reached and removed.

To remove the I.F. transformer it will be necessary to remove the transformer mounting bracket to which the I.F. unit is attached.

To remove the diode feeder, loosen the transformer mounting bracket and it can be moved sufficiently to get at the screws holding the diode feeder unit. To remove volume control unit (located in the rear of the set housing) remove screws holding worm gear bracket and volume control bracket. Disconnect all leads to the switch and volume control. The volume control assembly may now be removed and replaced with a new unit, care being taken in reassembling.

All by-pass condensers except the R.F. plate by-pass are of the tubular type and are set in thimbles in the chassis. Should any one prove defective it may be pushed out and replaced.

On Models "44" and "77" if complaints are made of noisy reception over bumpy road and tapping each tube does not disclose a bad tube, pounding chassis does not show a defective solder joint, tapping roof antenna does not show a vibrating ground, plugs are clean and making good contact, check the condition of ground of variable condenser to chassis. On Model "77" there should be a wire grounding variable condenser to chassis wiper Figure 5. On Model "44" clean off wiper spring to insure its making good ground. Then by placing a screw driver through the antenna trimmer hole check the back-lash in worm gear, driving variable condenser. It frequently occurs when chassis has been exchanged in housing, that the new chassis has not had proper backlash adjustment. This allows the variable to jump off station on bumpy roads and chatter.

MOTOROLA
Testing data
Alignment data

GALVIN MFG. CO.

TESTING PRACTICE

The success of a Superheterodyne rests, to a large extent, on the proper choice and use of an intermediate frequency unit. The frequency to which they are aligned, of course, is determined by the mechanical design of the variable condenser. The plates of the variable condenser used in our design are laid out mechanically to produce a frequency differential of 175 kilocycles, or 456 kilocycles, depending upon model, and if the setting of the oscillator trimmer with respect to the radio frequency trimmer has been disturbed it will be necessary to realign. The realignment is accomplished by the use of an oscillator. The circuit diagram of the oscillator is shown on the left hand side of Figure F with its proper application to a Motorola.

In case an oscillator set-up similar to Figure F, is used, some means of reading the output of this oscillator must be provided. The oscillator may be modulated by inserting a bell ringing transformer at point "X" or the "B"

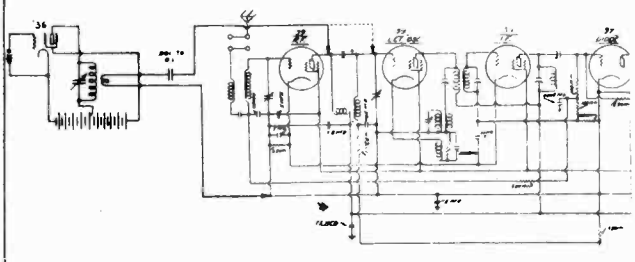


FIGURE F

supply may be taken from the 110 A.C. lines. Since most oscillators furnished with service kits are modulated, the only problem is that of reading the output.

While the ear can be used for some purposes, it is not dependable and when there are so many output meters on the market it is folly to use the ear for any kind of service work except harmonic analysis. It is not recommended that intermediate frequency units be adjusted by the ear or by air test. The only safe and sure way is by means of the modulated oscillator fitted into either one of the two points shown in Figure F, depending, of course, upon the strength of the local oscillator and by reading the output with an output meter across the plate terminal of the speaker or voice coil

ALIGNMENT OF CUT PLATE VARIABLE CONDENSERS

The alignment of cut plate variable condensers, the type used in Motorola, differs from the alignment of the variable condenser with a padder, in that the cut plate condenser has a fixed mechanical ratio between the capacities of its sections. In the past it has been possible with padders to align the condenser with an accuracy of ten degrees of rotation of the condenser plates - that is, it could be set at the high frequency end with all trimmers in alignment and then could be re-aligned at the low frequency end by rocking the condenser while adjusting the padder, thereby finding the point of proper alignment. This procedure cannot be used with a cut plate condenser.

The simplest and easiest way to align a cut plate condenser is as follows: Use a standard test service oscillator and output meter. Connect a 200 mfd. condenser in series with the antenna lead of the oscillator and connect to the antenna of the radio set. CAUTION: Before proceeding be sure that the I. F. transformers have been tuned to exactly I. F. frequency. This is absolutely necessary otherwise the proper alignment of the variable condensers can never be attained. After assurance that the I. F.'s are in correct alignment, set the test oscillator to approximately 1400 kilocycles and apply this energy to the antenna post of the radio set. If this frequency is accurately known you can get approximately the correct starting position by setting the pointer on Model "77" to the indicated frequency. However, if it is not known it is not essential.

Align all three trimmers to 1400 kilocycles. Then move the variable condenser to approximately the 600 kilocycle position and check the alignment of the second radio frequency trimmer. If it is found that the trimmer must be moved either in or out to return to resonance it is an indication that the variable condenser is not at correct starting position for the initial setting of the test oscillator. If, for example, it is found that the trimmer must be screwed down, it is an indication that the radio frequency tuning condenser requires more capacity at the low frequency end. Therefore, return to the initial high frequency setting of the condenser. Change your test oscillator to correspond with this setting of the condenser. It is not necessary to return to the exact setting you originally had. Readjust the second radio frequency trimmer which was moved when it was in the low frequency position. This will restore it to its initial setting of the oscillator trimmer.

Remember the second radio frequency condenser needs more capacity at the low frequency end so it is necessary to move the condenser a few degrees inward, which gives more capacity to this condenser, leaving the test oscillator in the same position. Screw the oscillator trimmer until the signal is brought back, then go over all three trimmers to assure yourself that they are in perfect alignment. Move the variable condensers back to approximately 600 kilocycles and re-check the second radio frequency trimmer the second time, and if the condenser had been moved sufficiently while you were at the high frequency end the R.F. trimmer will show resonance. If it was moved too far it will be indicated by having to move the radio frequency trimmer out instead of having to tighten it, as was necessary in the first trial.

After having found the proper starting point so that the second R.F. and oscillator trimmers are in alignment, the antenna stage should fall in exact alignment with the second radio frequency condenser. If it does not it may be necessary to bend the end plate sections slightly in order to align it with the second R. F. tuning condenser.

In the above set-up caution should be taken to see that the points chosen in which to align the radio set are in channels that are not occupied by a local broadcast station. This often upsets the measurements and you find you are tuning to the heterodyne beat occurring between your local test oscillator and the local broadcast station. This, of course, will tend to give a double peak.

You realize the value of isolating the trouble in a radio before starting to repair it. If the tone quality is bad, the first thing to do is check the output tubes and read their plate currents so as to get a suitable match. If that checks O. K. the following suggestion might be helpful.

Examine the speaker for rubbing voice coil, this being a quite common occurrence in all automobile installations as the speaker in auto radios is exposed to a great deal more direct dust and mechanical vibrations than home set speakers and as a result speaker failures are a little more frequent in auto sets than in home sets. The examination for rubbing a voice coil requires a little practice and we suggest that you get the feel of the cone movement of a speaker known to be good and listen while moving to see if the voice coil is rubbing. Observe while testing this speaker known to be good how easily a voice coil can be made to rub by unequal pressure on the side of the cone. Therefore, while checking the speaker suspected to be bad, profit by the experience gained from the good speaker.

A rubbing voice coil sounds similar to two pieces of sand paper being very lightly rubbed together. If you are still in doubt the application of 50 volts 60 cycle across the two outside terminals of the output transformer, the two "B" terminals, will cause the speaker to pump sufficiently, and if the voice coil is rubbing, noise will emit from the speaker instead of a perfectly free hum.

If the speaker sounds satisfactory see if the hum is equal on both halves of the output transformer, and if the speaker passes the above test it is evidently not the cause of the trouble. A customary set analysis as to the bias readings, etc., should indicate the trouble.

All of the above tests can be simplified if the service man has a spare chassis known to be good or a spare speaker which can be substituted to quickly isolate the trouble.

General Electric Modern Longfellow Grandfather Clock-Radio

Models H-91 and H-91-R

SERVICE NOTES

ELECTRICAL SPECIFICATIONS

Voltage Rating	105–125 Volts
Frequency Rating	50–60 Cycles or 25–40 Cycles
Power Consumption	120 Watts
Recommended Antenna Length	25–75 Feet
Type of Circuit	A. C. Screen Grid Super-Heterodyne
Number of Radiotrons	3 RCA-235, 1 UY-224, 3 UY-227, 2 RCA-247, 1 UX-280—Total of 10
Number of Radio Frequency Stages	One
Type of First Detector	Tuned Input Grid Bias
Number of Intermediate Stages	Two
Type of Second Detector	Power Grid Bias
Type of Automatic Volume Control	UY-227
(Controlling bias voltage on R. F. and I. F. stages by means of drop across resistor in plate circuit)	
Number of Audio Stages	One (Push-Pull)
Type of Rectifier	Full Wave, UX-280
Type of Loudspeaker	Dynamic with Special High Frequency Filter
Wattage Dissipation in Loudspeaker Field	Ten
Undistorted Output	Four Watts

PHYSICAL SPECIFICATIONS

Height	78 Inches
Depth	14¼ Inches
Width	17½ Inches
Weight (Packed for Shipment)	205 Pounds
Weight (Alone)	136 Pounds
Packing Case Dimensions	81½ Inches x 21¼ Inches x 19 Inches

INTRODUCTION

General Electric Radio, Models H-91 and H-91-R are ten tube, Super-Heterodyne type radio receivers incorporated in the cabinet of a massive electric Grandfather clock. Mechanical and electrical excellence together with the beauty of fine period furniture characterize this instrument.

Model H-91 is a straight radio receiver and model H-91-R is of the remote control type. Ten Radiotrons are used, three RCA-235 as R. F., and I. F. stages one UY-224 as first detector, three UY-227 as oscillator, automatic volume control and 2nd detector; two RCA-247 as the power output stage and one UX-280 as the rectifier.

These instruments, with the exception of the cabinet are similar to the model H-51 and H-51-R except than an automatic volume control tube and Radiotrons RCA-235 and RCA-247 in the R. F., I. F. and Power stages, have been included. For service data other than on the remote control unit that is applicable to vertical operation and on the automatic volume control circuit, reference should be made to the Service Notes already issued on the Model H-51 and H-51-R.

MODEL H-91
Schematic

GENERAL ELECTRIC CO.

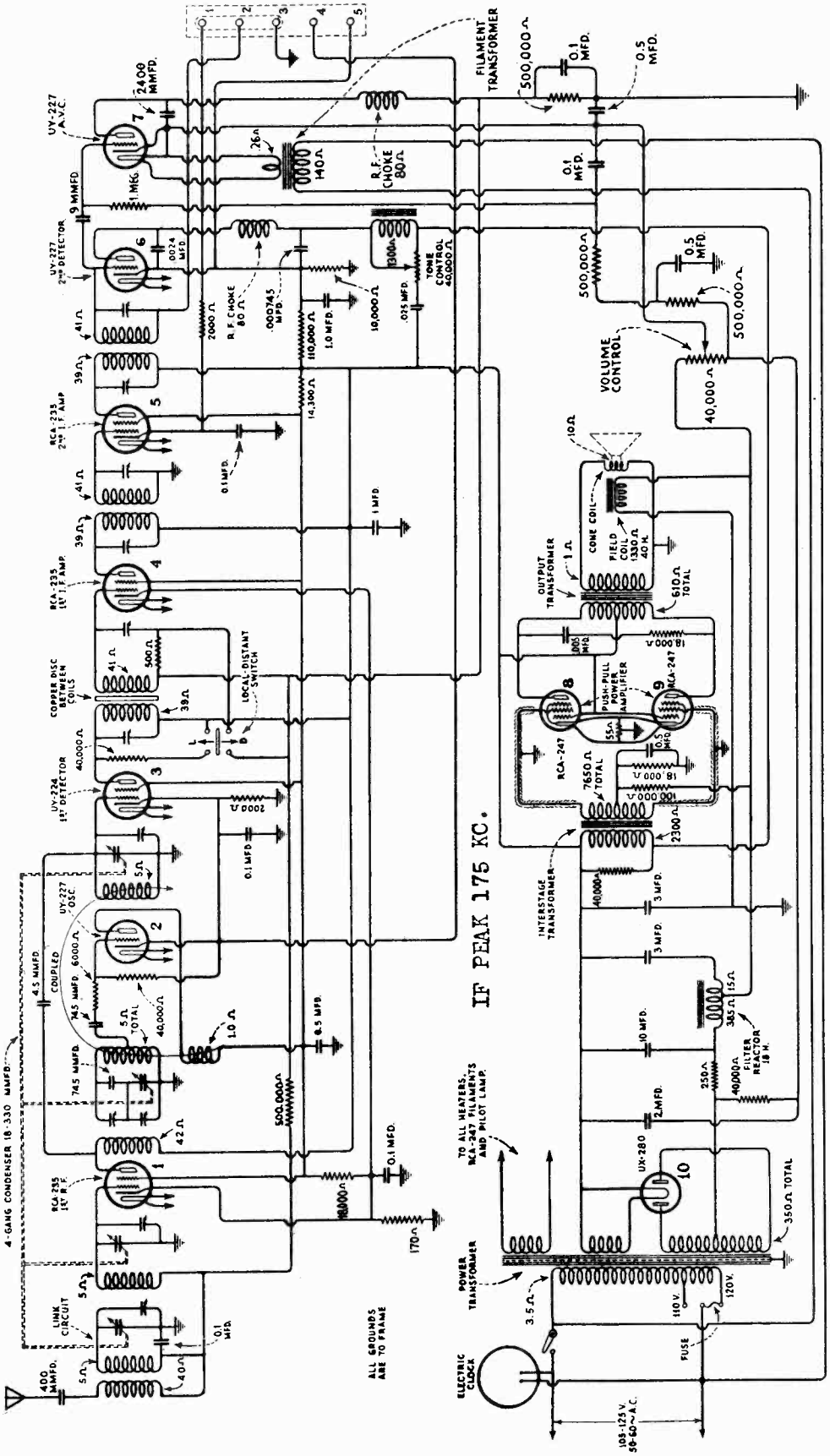


Figure 1—Schematic Diagram of Model H-91

ELECTRICAL DESCRIPTION OF CIRCUIT

With the exception of the automatic volume control, the circuit used in the H-91 and H-91-R is identical to that used in the model H-51. A description of the functioning of the circuit is contained in the H-51 Service Notes. A description of the automatic volume control circuit follows:

The automatic volume control is so arranged that it will maintain the same level of output volume over a wide range of signal intensities. This is accomplished by means of a UY-227 so arranged in the circuit, that its grid swings with that of the second detector and its plate voltage is obtained from a position more negative in the circuit than that of the R. F. and I. F. amplifiers.

Referring to Figures 1 or 2 it will be seen that when a signal is received the second detector and the automatic volume control grids will swing together due to their grids being connected together through the 9 mmfd. condenser. Assume the grid voltage to be at such a value as to increase the plate current in each tube. Examining the volume control tube we find an increase of plate current will cause a greater voltage drop across the 500,000 ohm resistor than would exist when no signal was tuned in. Examining the connections to each side of this resistor we find that the voltage drop across it constitutes the grid bias for the R. F. and first I. F. amplifier. Thus a loud signal will increase the voltage drop across this resistor and increase the bias on the R. F. and first I. F. amplifier. This in turn reduces the signal at the volume control grid.

The manual volume control is a potentiometer for regulating the bias on the volume control tube, this in turn regulating the amount of plate current in the tube, which consequently regulates the intensity of the input signal applied to the second detector. A setting of the manual volume control that will give maximum plate current will give a maximum bias and a minimum volume. A setting giving minimum plate current will therefore give the greatest volume.

SERVICE DATA

A reference to the Service Notes already published on Models H-31, H-51 and H-51-R will give the details of any service work necessary in Models H-91 and H-91-R. The diagrams are somewhat different however and are contained in the following pages. The replacement parts are given on pages 16, 17 and 18.

(1) R. F., OSCILLATOR AND I. F. ADJUSTMENTS

In making any adjustments on these receivers that involve the use of an output meter to indicate the correct setting of capacitors, the volume control tube will function to defeat the use of an output device. It is therefore necessary to remove the Radiotron UY-227 from the volume control socket and substitute a "dummy" Radiotron UY-227 for it. (A "dummy" Radiotron is one that has one heater prong removed but is otherwise O. K.) Do not attempt to make these adjustments by setting the volume control at maximum as incorrect results will be obtained.

(2) ADJUSTMENT OF ARMATURE IN MODEL H-91-R

The remote control mechanism used in Model H-91-R is the same as that used in the H-51-R with the exception of slight changes made necessary for vertical operation. The spring in the H-51 that holds the armature in the "volume control" position has been omitted. An additional spring has been added at the lower end of the motor to help overcome the effects of gravity. The spring is so adjusted that the volume control voltage (18 volts) will not cause the armature to rise. The station selector voltage (23 volts) however, does cause the armature to rise and thereby engage the station selector gear. To adjust the armature spring in Model H-91-R refer to Figure 3 and proceed as follows:

1. Place the instrument in operation in the usual manner. Remove the cover over the remote control unit. If chassis has been removed from cabinet adjustments *must* be made in a vertical position. Do not use the manual station selector unless the chassis is vertical as damage to the gears will result.
2. Push either the + or the — volume control button on the control panel. The armature should not rise and engage the station selector gear.
3. Push one of the station selector buttons. The armature should rise and completely engage the station selector gear. If this does not occur, then the tension of the spring must be increased.

MODEL H-91-R
Schematic

GENERAL ELECTRIC CO.

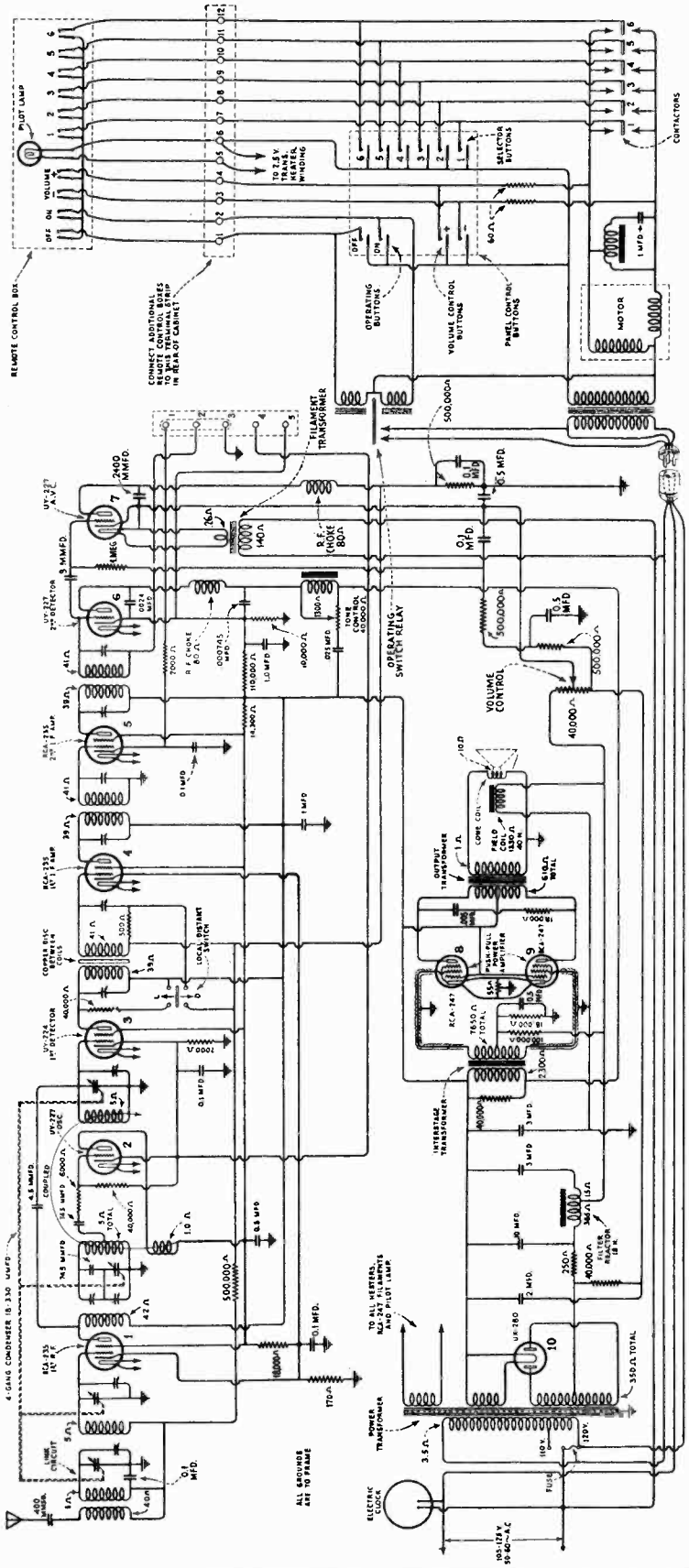


Figure 2—Schematic Diagram of Model H-91-R

IF PEAK 175 KC.

4. With a small end wrench loosen the nuts and increase the tension of the spring until the armature just rises when the volume control buttons are pressed. Then decrease the tension slightly until the armature fails to rise when the volume control buttons are pressed.

When the station selector buttons are pressed the increased speed of the motor will now cause the armature to rise easily and fully engage the station selector gear.

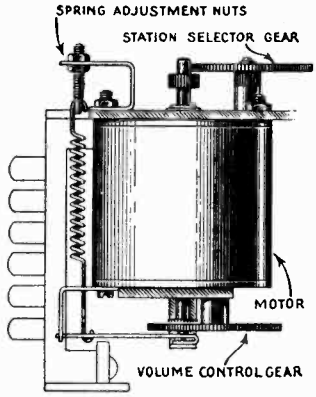


Figure 3—View of remote control motor

(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, 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 and line voltages. 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 Figures 8 and 9.

RADIOTRON SOCKET VOLTAGES

120 VOLTS A. C. LINE

These Voltages are obtained with the usual set analyzer and are not the exact voltages at which the Radiotrons operate.

VOLUME CONTROL AT MINIMUM

Radiotron No.	Cathode to Heater 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.	Screen Grid Current M. A.	Heater or Filament Volts
1	*0	*0	85	240	0	0	2.2
2	10	0	—	60	5.5	—	2.2
3	8.0	8.0	80	230	0.5	0	2.2
4	0	50	85	240	0	0	2.2
5	6.0	6.0	80	230	3.0	0.5	2.2
6	20	20	—	205	0.5	—	2.2
7	0	0	—	20	0	—	2.2
8	—	*12	245	235	22	6.0	2.2
9	—	*12	245	235	22	6.0	2.2

VOLUME CONTROL AT MAXIMUM

Radiotron No.	Cathode to Heater 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.	Screen Grid Current M. A.	Heater or Filament Volts
1	*0	*0	72	235	5.0	0.75	2.2
2	8	0	—	55	5.0	—	2.2
3	6.5	6.5	65	225	0.5	0	2.2
4	0	0	75	240	5.0	0.75	2.2
5	4.5	4.5	70	225	2.5	0.5	2.2
6	20	20	—	200	0.5	—	2.2
7	0	0	—	25	0	—	2.2
8	—	*12	245	235	22	6.0	2.2
9	—	*12	245	235	22	6.0	2.2

* Not true reading due to resistance in circuit.

MODEL H-91
Chassis wiring of receiver

GENERAL ELECTRIC CO.

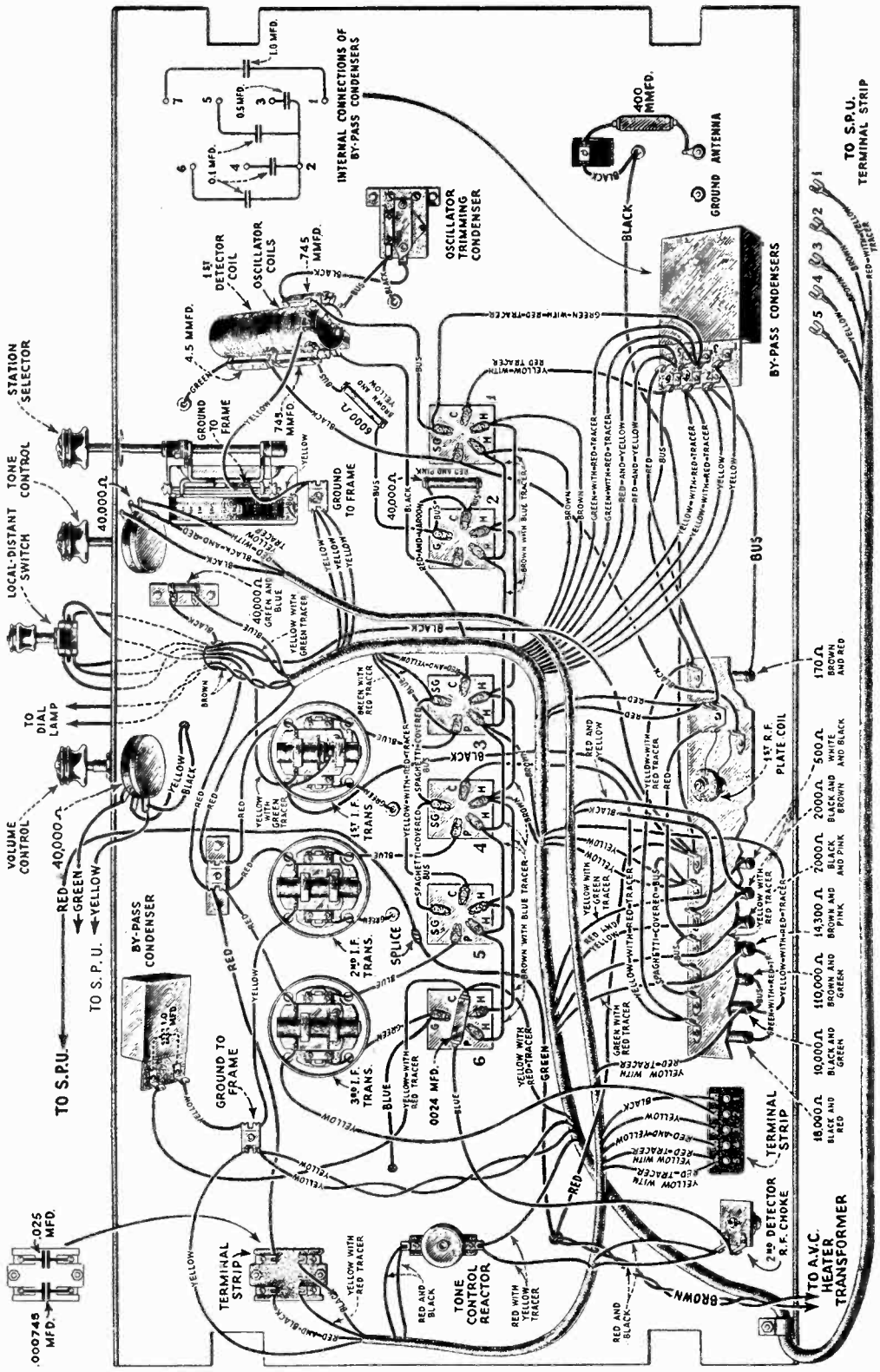


Figure 4—Wiring Diagram of Model H-91 Receiver Assembly

GENERAL ELECTRIC CO.

MODEL H-91-R
Chassis wiring of receiver

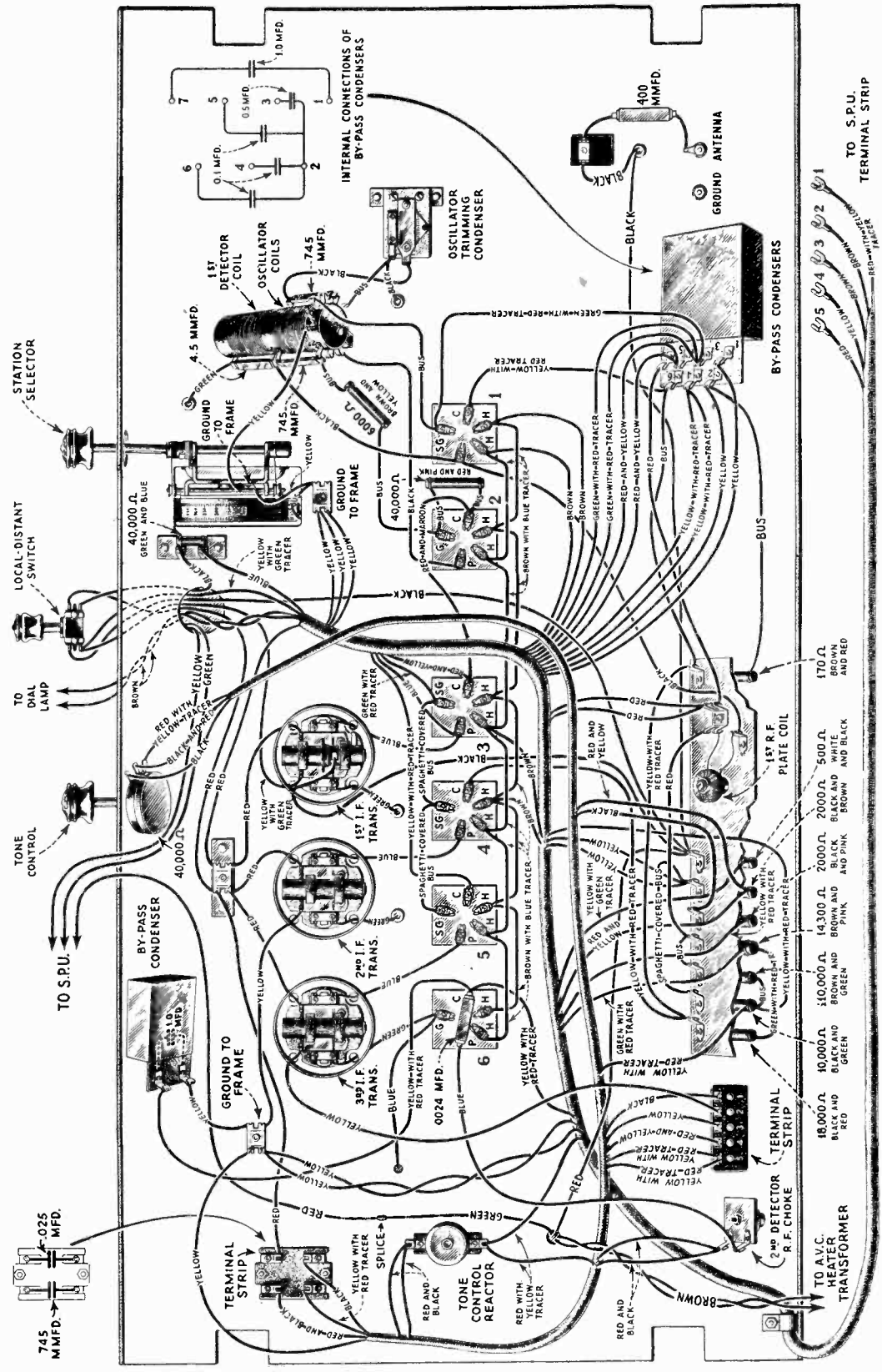


Figure 5—Wiring Diagram of Model H-91-R Receiver Assembly

MODEL H-91 SPU
Chassis wiring

GENERAL ELECTRIC CO.

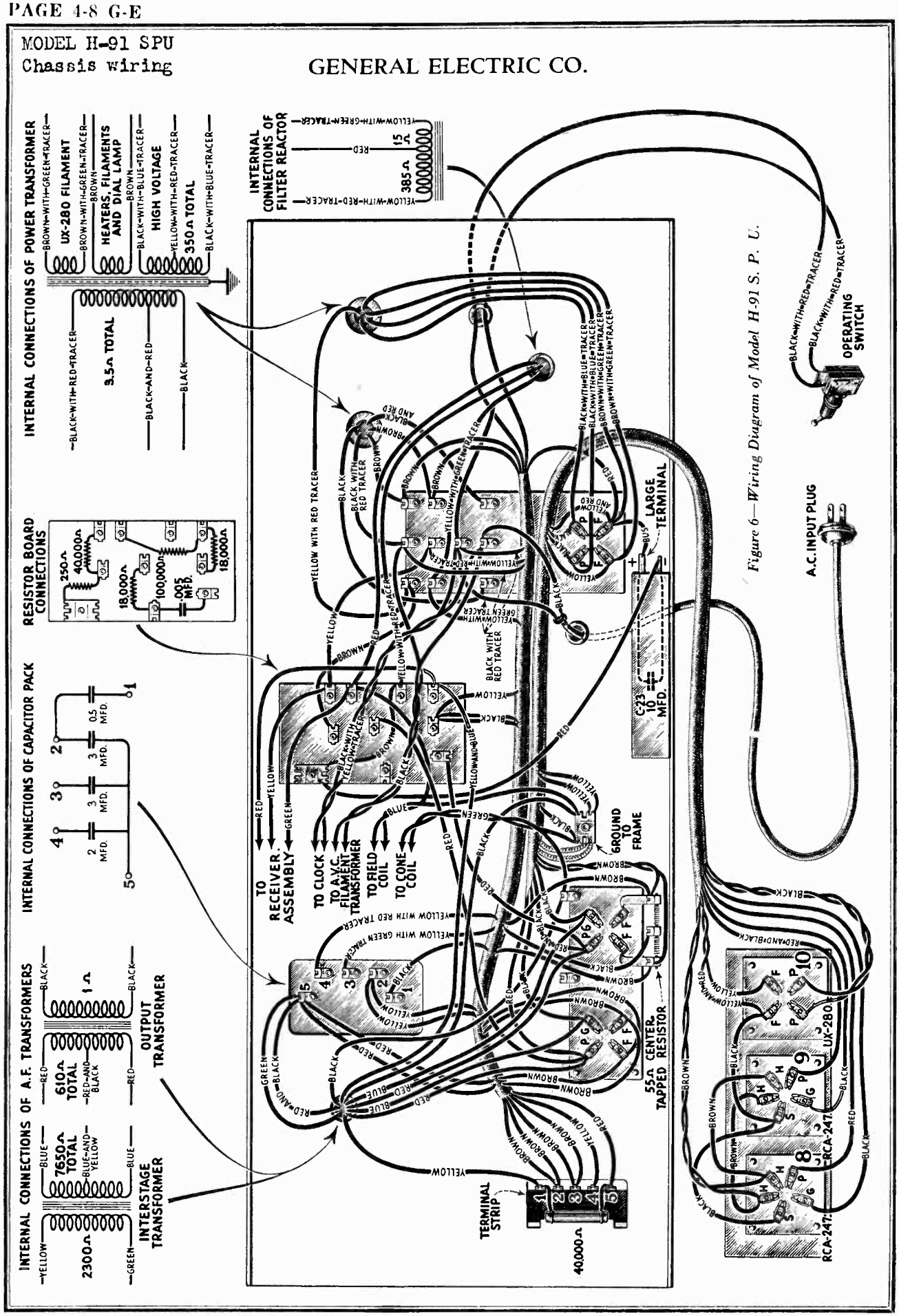


Figure 6—Wiring Diagram of Model H-91 S. P. U.

GENERAL ELECTRIC CO.

MODEL H-91-R SPU
Chassis wiring

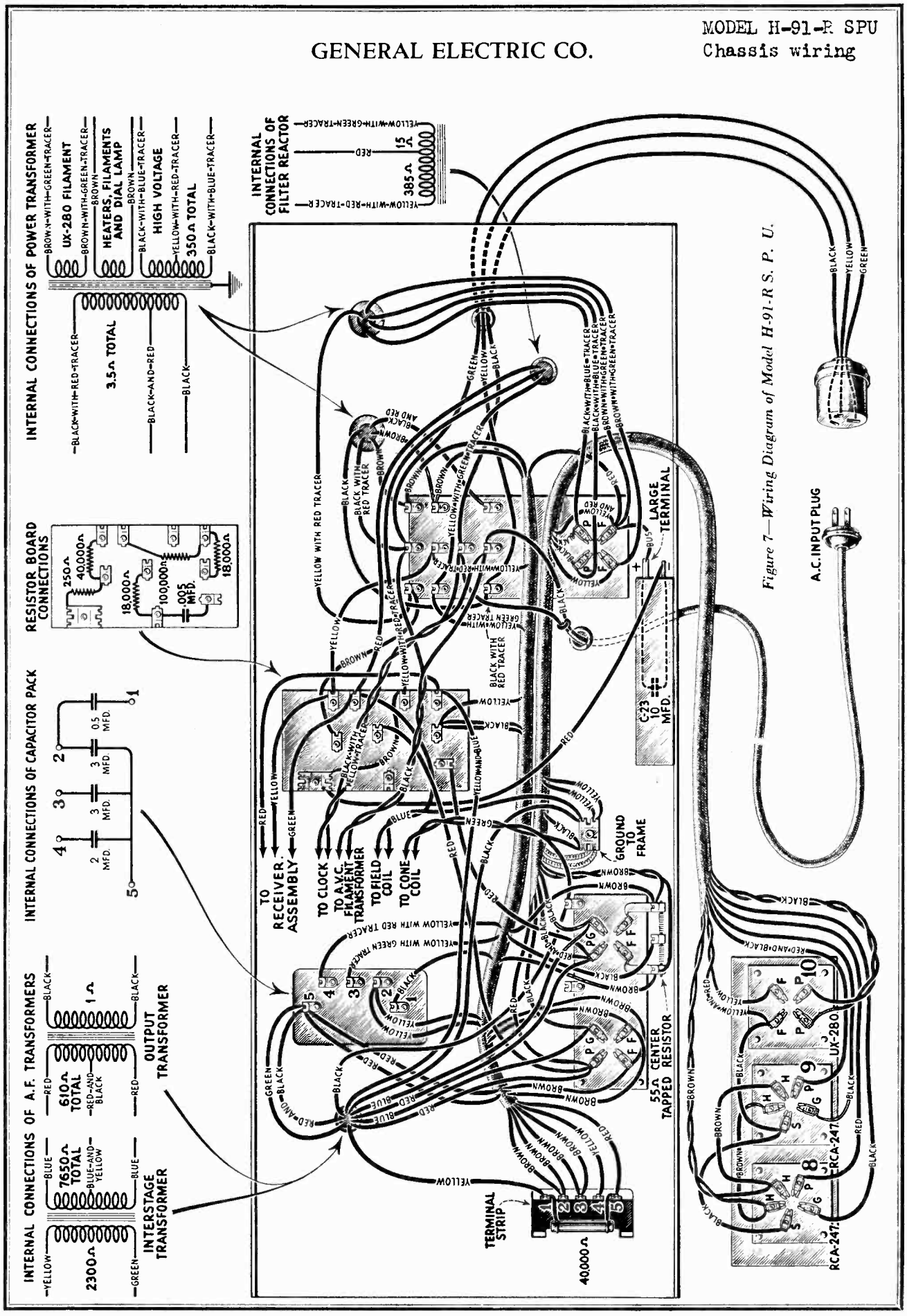


Figure 7—Wiring Diagram of Model H-91-R S. P. U.

MODEL H-91-R
Assembly wiring

GENERAL ELECTRIC CO.

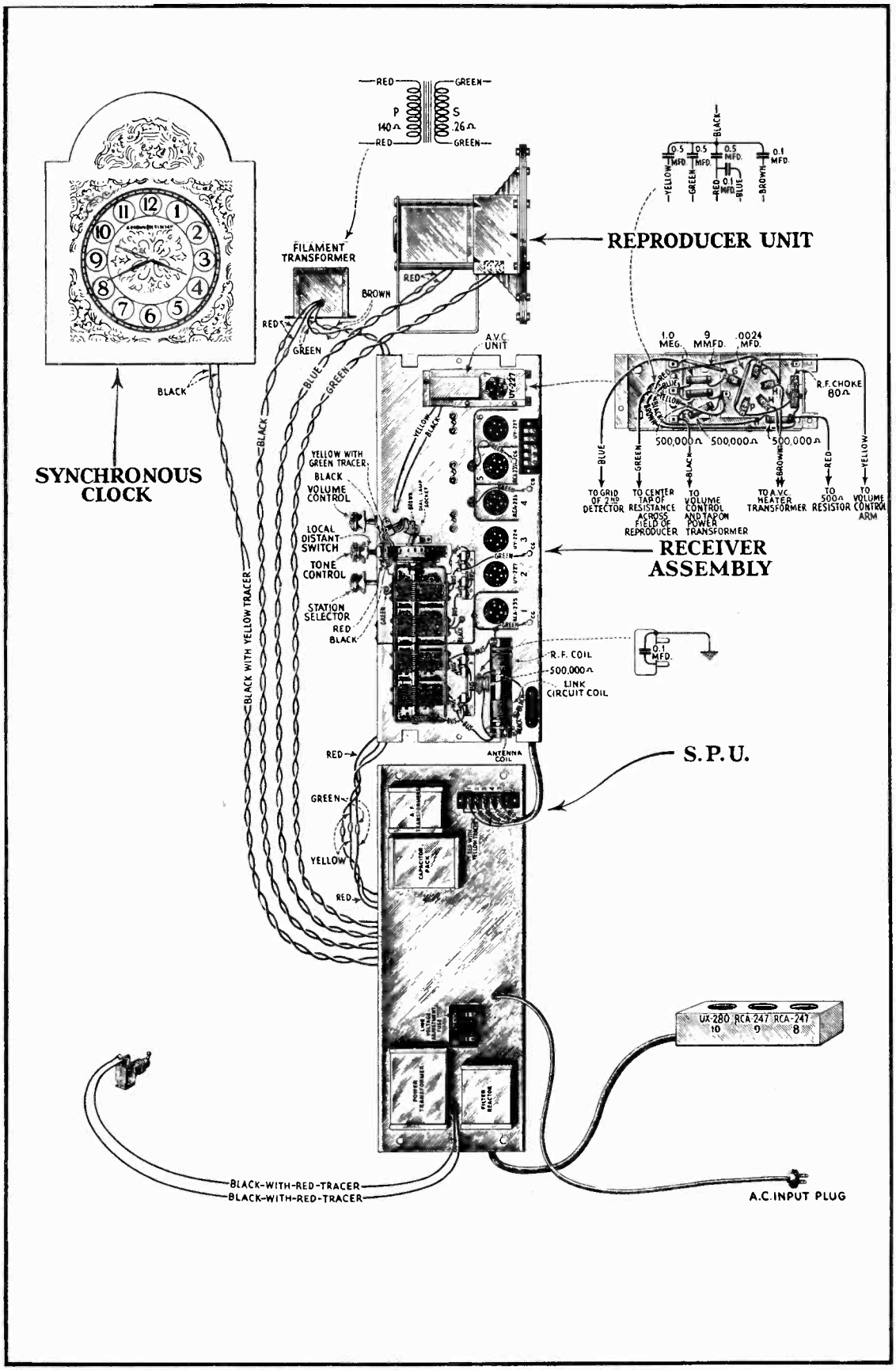


Figure 8—Assembly Wiring of Model H-91

GENERAL ELECTRIC CO.

MODEL H-91
Assembly wiring

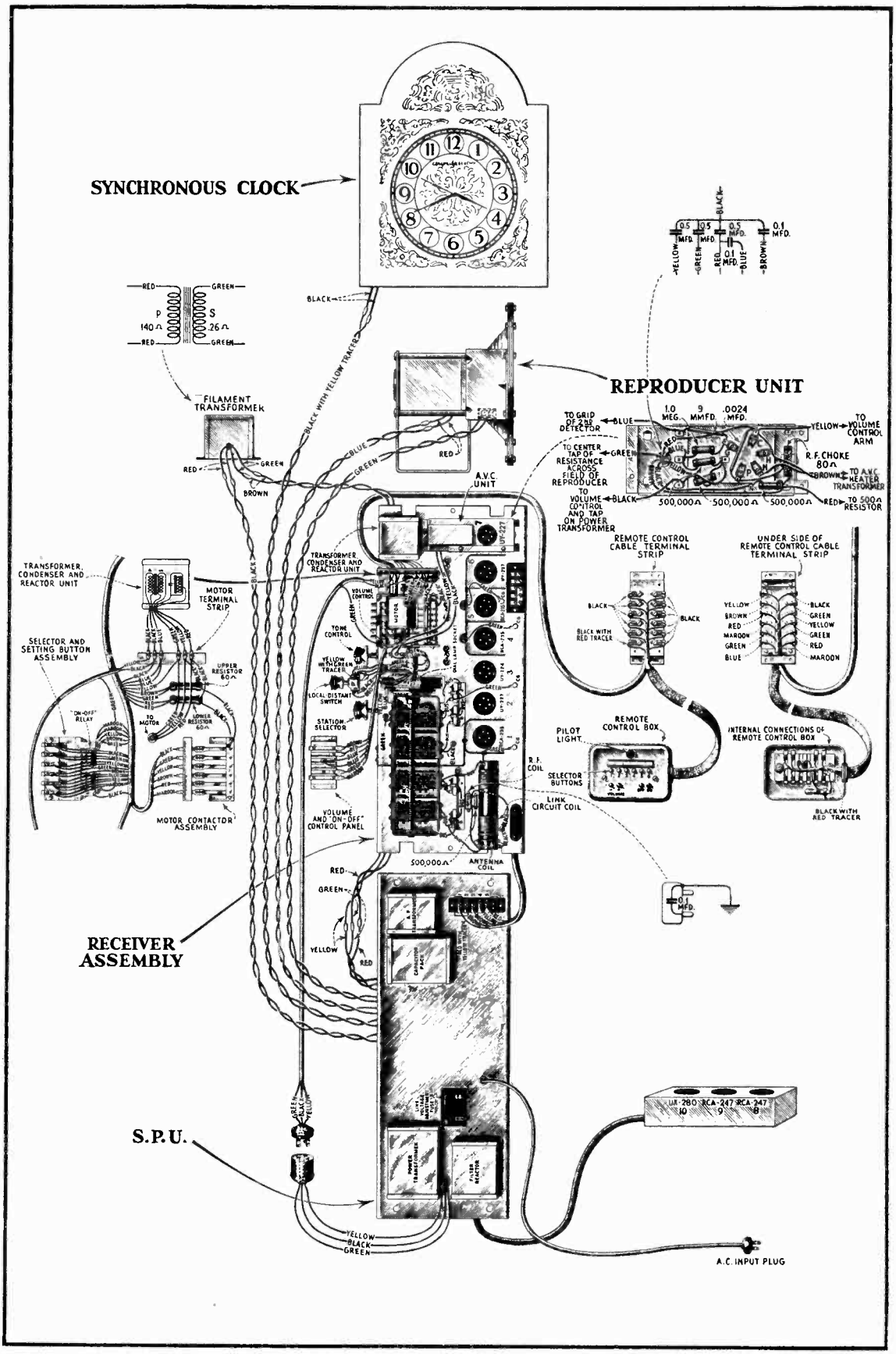


Figure 9—Assembly Wiring of Model H-91-R

MODEL H-91, H-91-R
Parts List

GENERAL ELECTRIC CO.

REPLACEMENT PARTS

Stock No.	DESCRIPTION	List Price
	RECEIVER ASSEMBLY	
2547	Resistor—2,000 ohm—Carbon type—Used as first detector bias or second intermediate bias resistor—Package of 5	$3.00
2563	Resistor—6,000 ohm—Carbon type—Package of 5	3.00
2726	Socket—UY Radiotron socket	.70
2727	Terminal strip — Micarta terminal strip with one terminal, bottom strip, mounting screws, lock washers and nuts	.50
2728	Terminal strip — Micarta terminal strip (top and bottom) with 40,000 ohm resistor	1.00
2729	Shield—Micarta protective shield for top of Radiotron socket	.50
2730	Resistor—18,000 ohm—Carbon type—Used as screen grid bleeder resistor—Package of 5	2.00
2731	Resistor—10,000 ohm—Carbon type—Used as second detector bias resistor—Package of 5	2.00
2732	Resistor—110,000 ohm—Carbon type—Used as second detector bleeder resistor—Package of 5	2.00
2733	Resistor—14,300 ohm—Carbon type—Used as voltage divider resistor—Package of 5	3.00
2734	Capacitor—745 mmfd.—Package of 5	2.20
2735	Resistor—500 ohm—Carbon type—Used in series with secondary coil of first I. F. transformer—Package of 5	2.00
2736	Resistor—170 ohm—Carbon type—Used as amplifier bias resistor—Package of 5	2.00
2738	Coil—R. F. plate coil	.90
2739	Coil—Second detector plate choke coil mounted on Micarta strip	1.00
2740	Cord—Condenser drive cord—Package of 5	1.00
2741	Idler—For condenser drive cord—Package of 5	.80
2742	Spring—Condenser drive cord tension spring—Package of 5	.50
2745	Screws—Special No. 4-40—Used to adjust trimming condenser—Package of 10	.50
2746	Socket—Lamp socket	.50
2747	Cap—Grid contact cap—Package of 5	.50
2748	Binding post—Ground and antenna twin binding post—Complete with washers and nuts	.50
2749	Condenser — Fixed condenser — 2400 mmfd.—Used as second detector plate by-pass condenser	1.50
2753	Knob — Walnut knob — Local-distant switch knob—Package of 5	2.50
2754	Knob — Walnut knob — Station selector, volume control or tone control knob—Package of 5	2.50
2756	Capacitor—0.025 mfd.	.80
2857	Plug—Three prong plug—Male section for H-91-R receiver assembly	.70
3024	Capacitor—Capacity 9 mmfd.—Package of 2	.50
3045	Resistor—40,000 ohm—Package of 5	2.50
3048	Resistor—500,000 ohm—Carbon type—Package of 5	2.50
3076	Resistor—1 megohm—Carbon type—Package of 5	2.50
3085	Capacitor—400 mmfd.	$0.60
G5005	Coil—Automatic volume control R. F. coil	.70
G5019	Terminal strip—Complete with one terminal and insulating strip—For mounting antenna capacitor—Package of 2	.70
6034	Cushions—Sponge rubber cushions—Package of one set of four	1.20
7057	Terminal board assembly—Comprising terminal board with 7 carbon resistors, R. F. plate coil and 5 flexible leads—Assembled	4.50
7058	Capacitor pack—One assembly in metal container—Comprising three 0.1 mfd., one 0.5 mfd. and one 1 mfd. condenser	4.00
7059	Condenser—One 1 mfd. condenser in metal container	1.70
7062	Condenser—Adjustable trimming condenser—Capacity 15 to 70 mmfd.	1.00
7063	Condenser—Adjustable trimming condenser—Capacity 5 to 40 mmfd.	1.00
7064	Switch—Local-distant switch—Package of 5	5.00
7067	Scale—Dial scale—Package of 5	2.00
7071	Capacitor strip—Comprising Micarta strip with one 745 mmfd. by-pass condenser and one 0.025 mfd. tone control condenser	1.80
7072	Terminal strip—With 5 complete terminals and link	.80
7073	Inductor—Tone control inductor	1.00
7074	Potentiometer—Volume control or tone control potentiometer — Complete with mounting nuts and washers	1.80
7101	Cable—Braided cable from tone control potentiometer to inductor, plate choke coil, resistor board, terminal strip and tone control capacitor strip	1.50
G7809	Transformer — First intermediate transformer	3.00
G7810	Capacitor—0.1 mfd. capacitor	1.70
G7811	Capacitor — Comprising three 0.05 mfd. and two 0.1 mfd. in metal container	4.00
8561	Condenser—Tuning condenser assembly—Comprising four condensers, drive, drive cord, spring and dial drum—Assembled—For H-91 only	12.00
8563	Coils—R. F. coil assembly complete with mounting brackets	2.30
8564	Coils—Detector and oscillator coil assembly—Complete with mounting bracket	2.80
8565	Transformer — Second intermediate transformer in metal container	3.00
8566	Transformer — Third intermediate transformer in metal container	3.00
8569	Cable—Receiver wiring cable—Small	1.80
8700	Condenser—Tuning condenser assembly — Comprising 4 condensers, drive, drive cord, spring and dial drum—Assembled—For H-91-R only	12.00
G8905	Cable—Receiver wiring cable—Large	2.60
G8906	Control board—Automatic volume control board—Less resistors and coil assembly	2.50

Order By Stock Number Only

GENERAL ELECTRIC CO.

REPLACEMENT PARTS—Continued

Stock No.	DESCRIPTION	List Price
	AMPLIFIER ASSEMBLY	
2721	Socket—Double socket—On amplifier base	$1.00
2722	Resistor — 55 ohm — Mid.-tapped filament resistor	1.00
2723	Switch—Power line switch—Toggle type—Package of 5	3.00
2725	Fuse—1.5 amperes—Cartridge type fuse—Package of 5—For 60 cycle receivers	.50
2726	Socket—RCA-247 socket	.70
2735	Resistor—500 ohms—Carbon type—Package of 5	2.00
3058	Resistor—100,000 ohms—Carbon type—Package of 5	2.50
3079	Resistor—40,000 ohms—Carbon type—Package of 5	2.50
3099	Capacitor—0.005 mfd.	.75
3173	Plug—Three prong plug—Female end	1.30
3219	Resistor—18,000 ohms—Carbon type—Package of 5	2.75
G5020	Capacitor—10 mfd.—Electrolytic type	1.95
7052	Terminal strip — Micarta terminal strip with terminals and terminal screws	.80
7054	Power cord—Flexible twin conductor with male plug	1.00
7075	Socket—Socket strip assembly—Complete with fuse clips	1.80
7122	Socket—Single socket for Radiotron UX-280—Complete with insulation strip	.60
7123	Socket—Two gang four prong socket	1.00
G7824	Board—Resistor mounting board—Complete less all resistors	.50
G7825	Transformer—Audio transformer assembly	5.50
G7826	Cable—From amplifier to socket assembly	1.70
8553	Capacitor pack—One assembly in metal container—Comprising two 3 mfd., one 2 mfd. and one 0.05 mfd. condenser	16.00
8555	Reactor—Tapped filter reactor	4.00
8556	Transformer—Power transformer 105-120 volts, 50-60 cycles	12.00
8596	Transformer—Power transformer 105-120 volts, 25 cycles	16.00
8597	Condenser—Extra filter condenser for 25 cycles	8.00
G7832	Cable—S. P. U. wiring cable for model H-91	2.00
G7833	Cable—S. P. U. wiring cable for model H-91-R	2.00
10907	Fuse—3 amperes—For 25 cycle models—Package of 5	.50
	REPRODUCER ASSEMBLIES	
7055	Bolt, lock washer and nut assembly—Used to mount cone support—Package of one set of 4	.50
7056	Ring—Felt spacing ring—3" I. D., 1⅞" O. D., 1⅛" thick—Package of one set of 2	.50
8557	Support—Metal cone support with terminal board	1.50
8558	Cone—Complete with voice coil	4.00
8559	Ring—Cone retaining ring	.80
8560	Coil—Field coil	5.00

Stock No.	DESCRIPTION	List Price
	DRIVING UNIT ASSEMBLY H-91-R ONLY	
2837	Button—Bronze colored push button—Package of 2	$0.50
2844	Contactor terminal strip—Complete with six terminals, mounting screws, spacers and nuts	1.20
2846	Gear—Micarta bendix gear, pinion and taper pins—Located near porcelain resistors	1.00
2847	Switch assembly—Operating switch relay—Complete with contactor and mounting screws	5.00
2848	Contactor—Motor contactor—Complete with clamping plate and mounting screws	.60
2850	Plunger — Oxidized finish — Brass plunger—Package of 2	.50
2851	Gear—Micarta, bendix gear, pinion and taper pin—Volume control drive gear	1.00
2852	Gear—Micarta, intermediate drive gear, pinion and taper pin—For volume control	1.00
2853	Gear—Star gear and taper pin—Located on end of condenser shaft and fits into ring gear	1.00
2854	Contact—Contact screw and lock nut—Located on contact strip No. 7158—Package of 5	.50
2855	Switch assembly—Plunger switch—Comprising Micarta strip with six contact blades and two mounting screws	1.20
2856	Spring—Tension spring assembly for plunger—Complete with mounting screws—Package of 5	.50
2857	Plug—Male section of three prong polarity plug	.70
3008	Spring contacts — Remote control relay contact springs—One set of four pairs	.50
3025	Spring — Spiral spring for holding motor thrust arm—Package of 8	.50
3026	Arm—Motor thrust arm	.50
3027	Screw—Tension adjusting screw for spiral spring—Package of 5	.50
7155	Resistor—60 ohm—Porcelain type resistor	.80
7156	Rheostat—Volume control rheostat with bracket and gear assembled—Complete with mounting screws	3.00
7157	Gear—Ring gear with taper pin—Located on end of cam shaft	2.00
7158	Strip—Contact strip—Complete with six contacts, six lock nuts and mounting screws	1.50
7159	Cable—Braided cable—From driving unit to terminal board	2.00
	CONTROL BOX ASSEMBLY H-91-R ONLY	
2833	Button—Red color push button—Package of 2	.50
2834	Button—Red color push button with white insert—Package of 2	.50
2835	Button—Black color push button—Package of 2	.50
2836	Button—Black color push button with white insert—Package of 2	.50
2837	Button—Bronze color push button—Package of 2	.50

Order By Stock Number Only

MODEL H-91, H-91-R
Parts List

GENERAL ELECTRIC CO.

REPLACEMENT PARTS—Continued

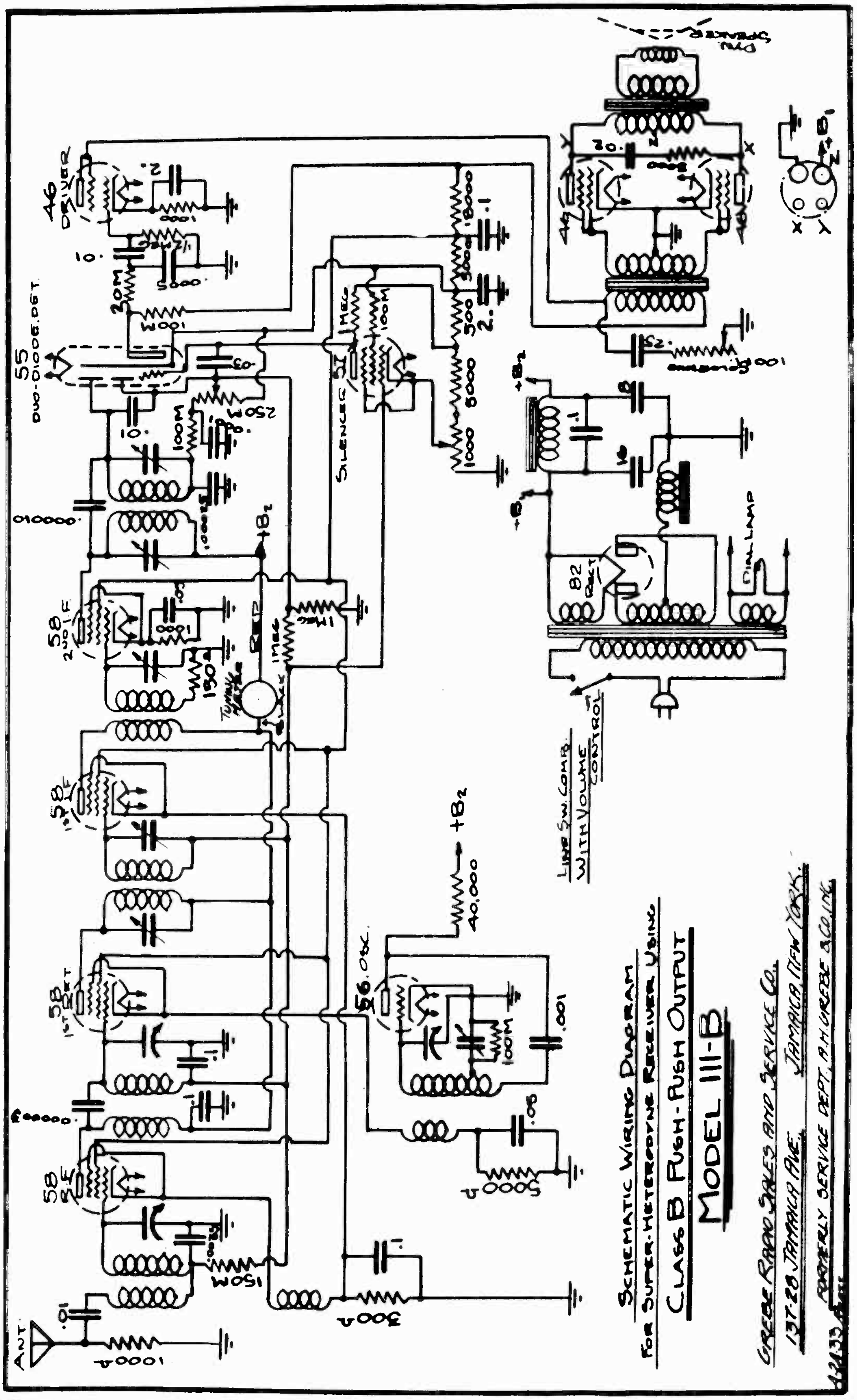
Stock No.	DESCRIPTION	List Price
2838	Bullseye — Pilot lamp indicator — Package of 2	$1.30
2839	Switch assembly—Dilecto strip with 10 contacts (inside of control box) —Package of 5	9.20
2840	Socket—Miniature base pilot lamp socket with mounting bracket, screws, nut and washer	.50
2841	Log strip assembly—Comprising three paper log strips and one metal holder	.50
2842	Cover—Metal cover with mounting screws, rubber bushings, button guide plate and studs	5.00
2843	Base assembly—Comprising base, felt and clamping plate	1.40
7154	Cable—Flat type—25 feet long—Complete with terminals	10.00
7161	Terminal board—Comprising Micarta strip with 12 terminals, 12 screws and 2 mounting brackets, 1 rubber bushing and 4 mounting screws	2.00
8619	Control box assembly—Complete less cable	12.00
8620	Control box assembly—Complete with 25 foot cable	22.00
7160	Cable—Braided cable and male section of polarity plug—From driving unit to power supply	2.00
7162	Switch—Auxiliary switch assembly—Comprising Micarta strip with four contacts and one common plate—Located on control panel	1.50
7163	Escutcheon — Auxiliary switch escutcheon—Complete with mounting screws, nuts and spacer blocks	2.00
8616	Motor—Complete with two pinion gears	16.00
8617	Capacitor pack—In metal container—Complete with mounting screws, lock washers and nuts	11.00

Stock No.	DESCRIPTION	List Price
	TOOLS	
2930	Screw driver—4 inch—Right angle—For remote control adjustments	$0.80
3064	Screw driver—2½ inch—Right angle —For remote control adjustments	.80
3065	Wrench—$\frac{3}{16}$ inch wrench—For remote control contact locking nut adjustments	.50
	CABINET AND CLOCK ASSEMBLIES	
2829	Knob—Door knob and screw—Package of 2	.50
G5004	Hinge—Door hinge with mounting screws—One set of 4	1.50
W5005	Screw and washer—For back panel —Package of 10	.50
G5006	Screw assembly—Comprising clock mounting screw, clock mounting separator, clock mounting nut, clock mounting lock washer—Set of 4 each—Package of 2 sets	.50
G5007	Screw—Dial mounting screws—One set of 8—Package of 4 sets	.50
G5008	Hand—Clock hour, minute and second hand—One set of three hands	.75
G7807	Pad—Cone pad—Package of 2	.50
G8907	Turning—Located on front top center of cabinet	1.10
G8908	Mechanism—Telechron clock mechanism—Less dial and hands—60 cycles	12.25
G8909	Mechanism—Telechron clock mechanism—Less dial and hands—25 cycles	12.25
G8914	Clock—Telechron clock mechanism—Less dial and hands—50 cycles	12.25
G9524	Cabinet—Less control panel	140.00
G9525	Door—Control door	6.00
G9526	Board—L. H. baffle board—Complete with grille cloth	.50
G9527	Board—R. H. baffle board—Complete with grille cloth	.50
G9528	Door—Top glass door	11.25
G9529	Panel—Control panel—For model H-91	6.00
G9530	Panel—Control panel—For model H-91-R	6.50
G9531	Dial—Clock dial	12.25

Order By Stock Number Only

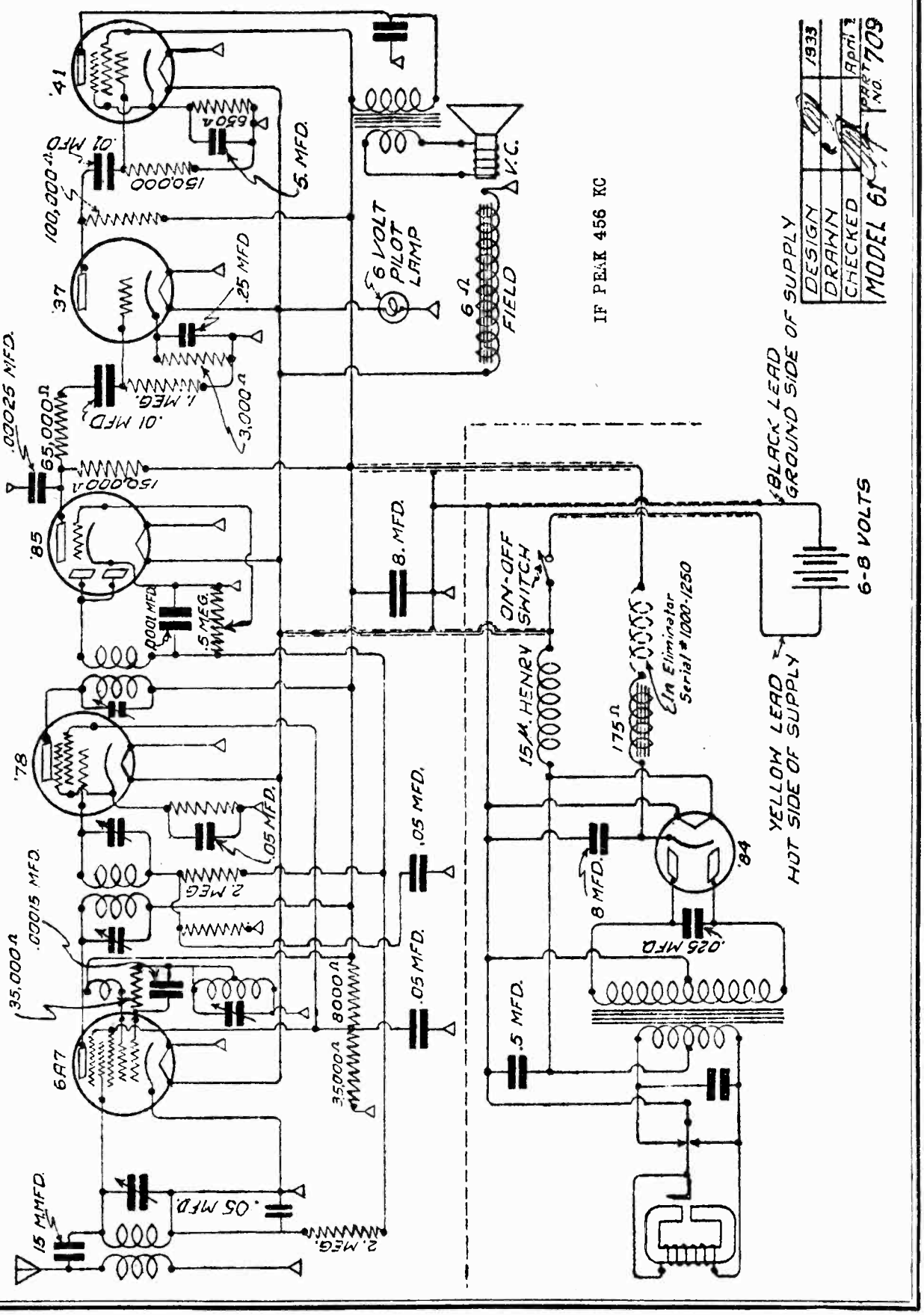
A. H. GREBE & CO.

MODEL HS-11
Schematic



MODEL 61-R
Schematic

A. H. GREBE & CO.

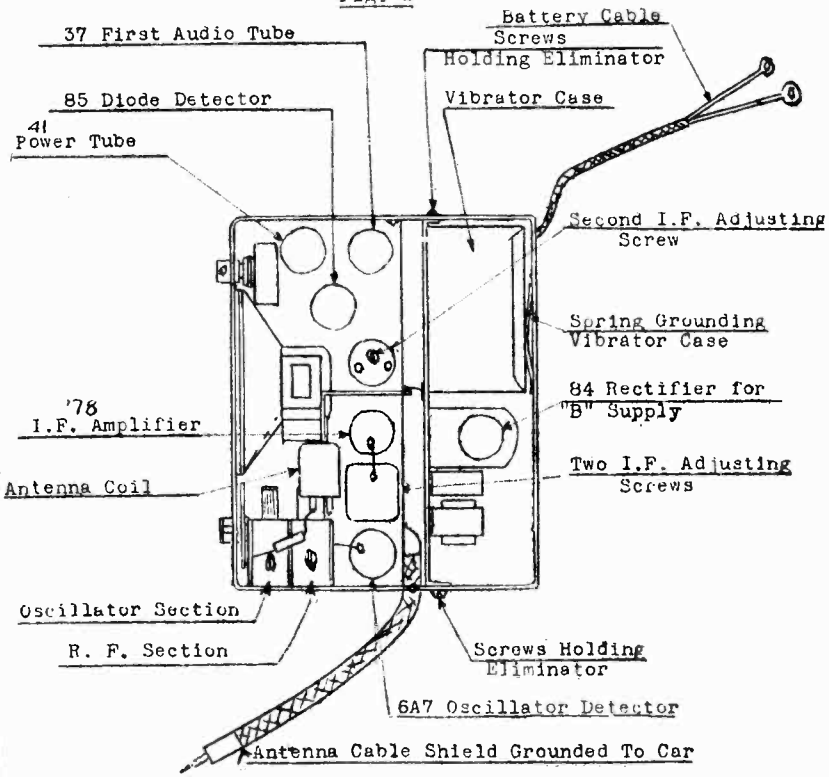


RECEIVER ALIGNMENT — To align the I.F. circuit, an oscillator supplying 456 K.C. should be connected to the control grid of the 6A7 and the variable condenser frame. The grid cap normally on the 6A7 should be removed. The oscillator section of the variable condenser should be short circuited. This may be done by putting a small clip on the terminal of the oscillator condenser trimmer and running a wire to ground. It is preferable to use an output meter for accurate work, which may be connected into circuit of the 41 by means of an adapter having leads brought out from plate and screen through a 5 mfd stopping condenser. See Fig. #4.

The volume control on the receiver should be turned to maximum and the three I.F. adjusting screws shown in Fig. #2 set to give maximum on the output meter. This operation may be performed with the receiver in the can if a pair of long nose pliers or offset screw driver is used.

For R.F. alignment, remove oscillator condenser short circuit, replace grid cap on 6A7 and connect oscillator covering broadcast range to antenna wire and its shield.

Fig. 2



VIBRATOR ADJUSTMENT — To examine vibrator, remove "B" supply unit from can by unsoldering 3 leads. (see Fig.3) removing 6 screws at ends of unit Take cover off vibrator case and vibrator may be removed without unsoldering its lead: wires. It will be seen that there are a top and a bottom set of contacts. The normal clearance on these contacts is .003" to .004" and this may be adjusted with screws provided.

Any dirt on contacts should be removed with pipe cleaner before adjustment. If top clearance is too great vibrator may operate but not close this circuit (operate half wave) and the voltage will be low. If bottom clearance is too great, vibrator will pull down but not vibrate. Too small a bottom clearance may short bottom contacts and cause inoperative vibrator and heavy current drain.

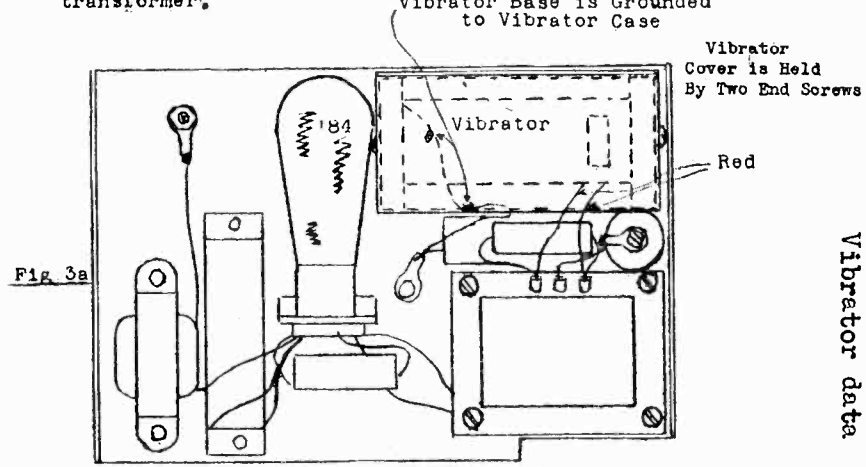
If both contact clearances are small, the vibrator will operate at a higher pitch and voltage, but sparking will occur.

Check of vibrator operation may be made by running three temporary jumpers from "B" supply unit outside can to the receiver, (See Fig.3) and operating the vibrator outside its case so it is visible. The tone should be low pitched, even and regular, and no appreciable sparking should occur. To remove vibrator for replacement purposes, unsolder the three vibrator wires at the terminals of the step up transformer and at the ground terminal near the tube. Leads should be left attached to vibrator.

If set is not available or is in doubtful condition a 4000 ohm load resistance of 5 watts or larger may be used from plus "B" to ground of eliminator in place of set. The 6-volt supply is applied to the two terminals at the vibrator end of "B" unit.

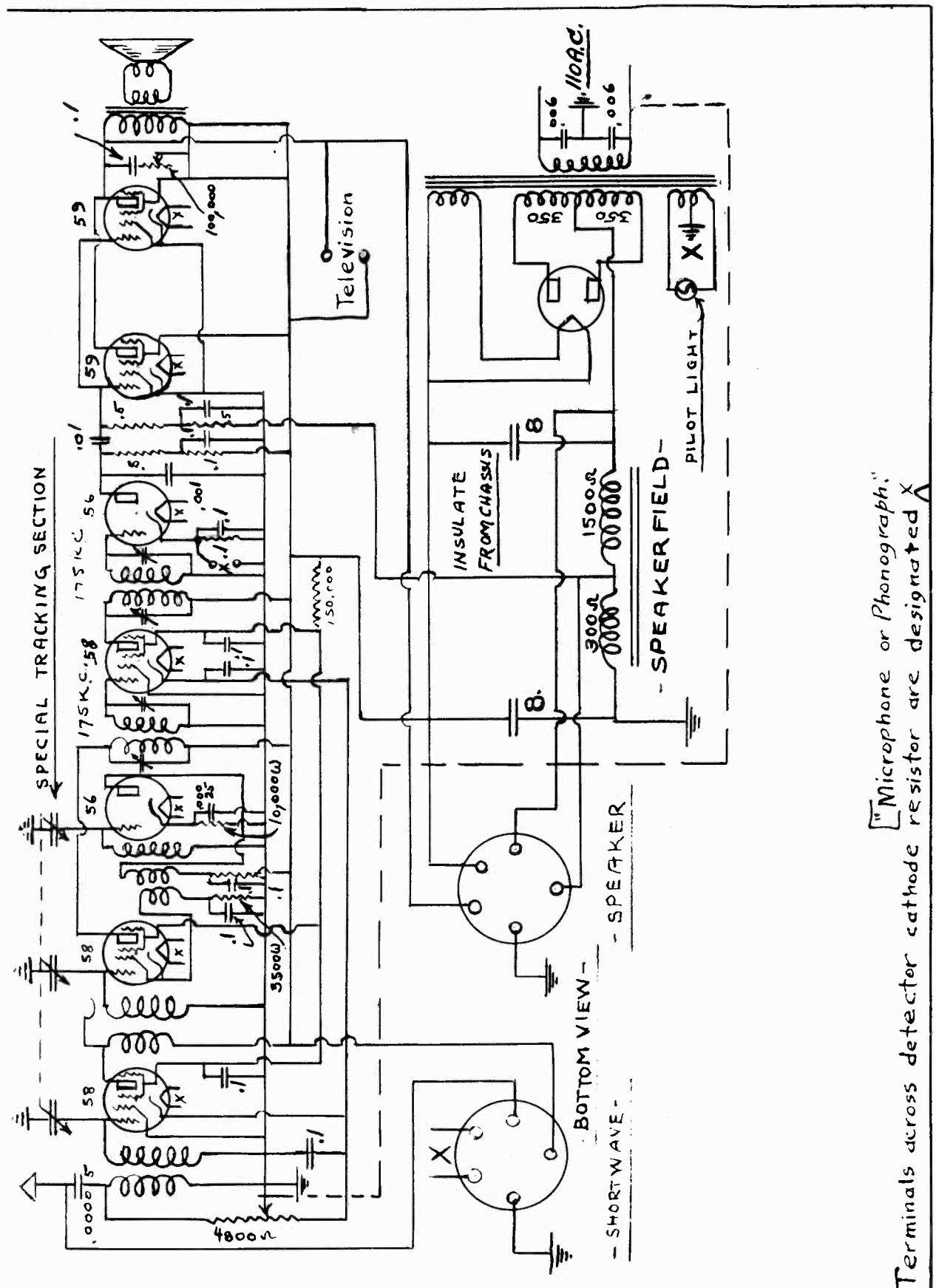
If gaps are okay, and sparking persists, check for dirty contacts or open condenser across primary of stepup transformer.

Fig 3a



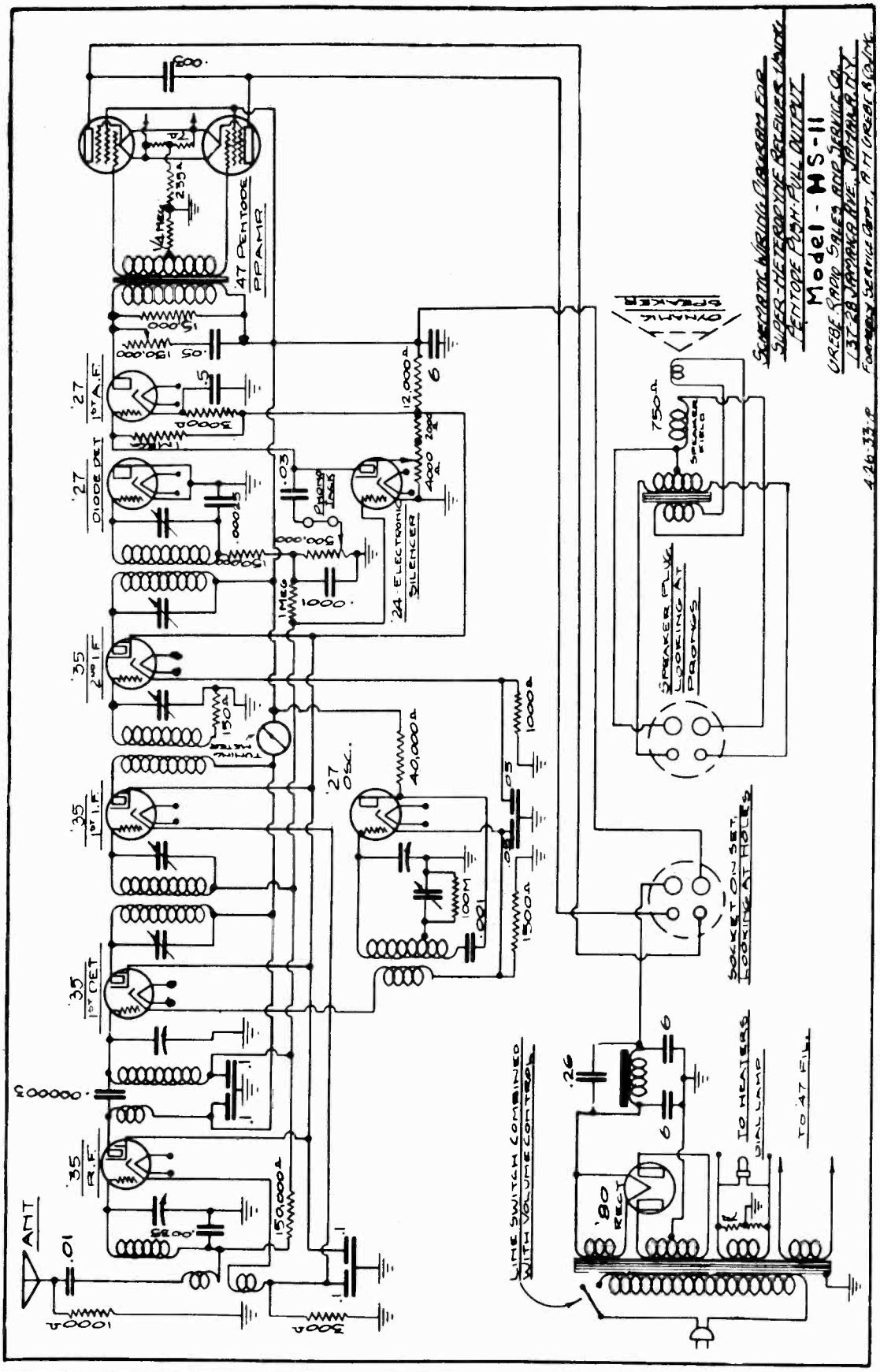
MODEL 89
Schematic

GREBE



A. H. GREBE & CO.

MODEL 111-B
Schematic



GRIGSBY - GRUNOW CO.

MODEL 66
Schematic

SS = Spray Shield

RESISTORS

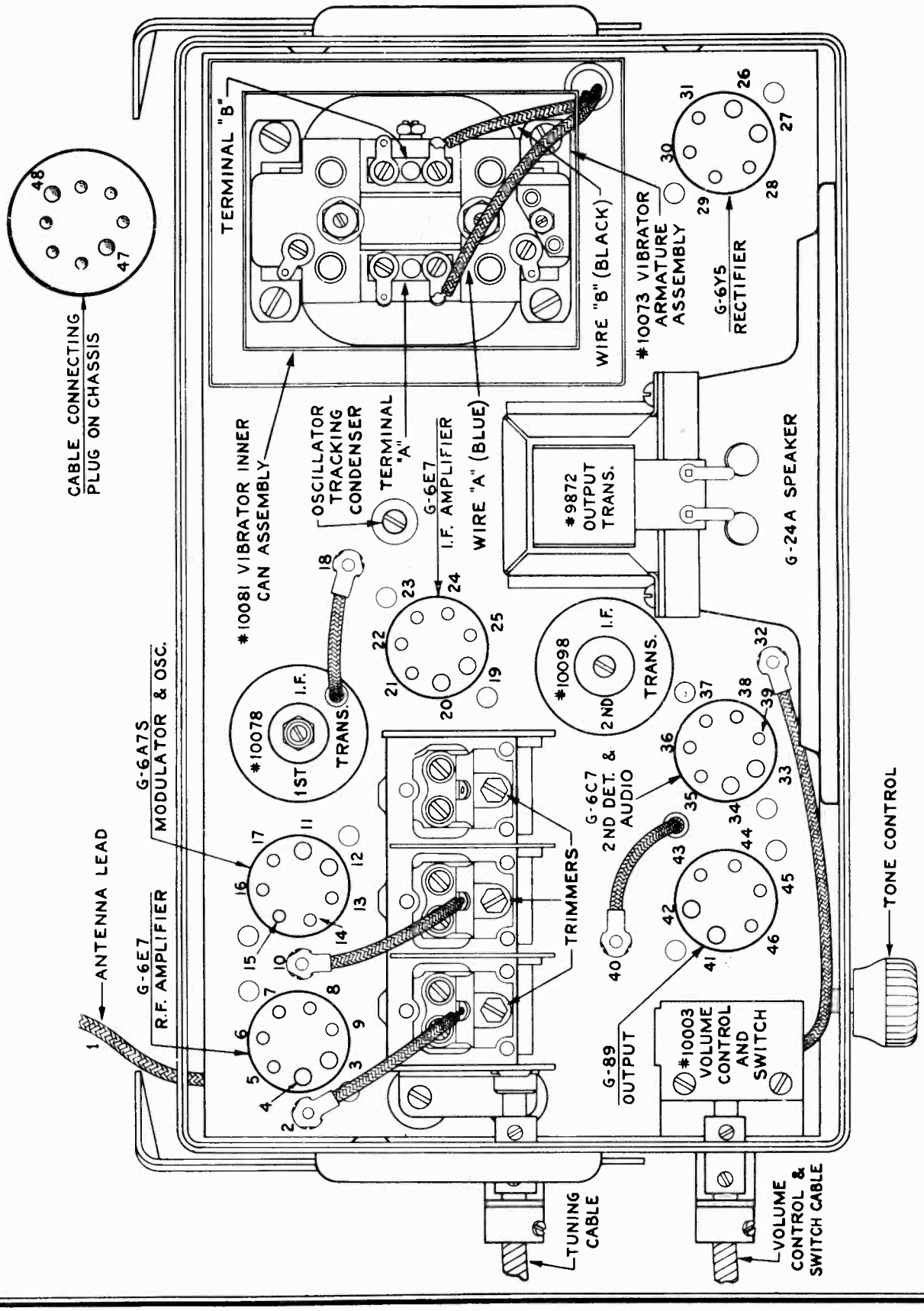
R1 — 300,000	R10 — 10,000
R2 — 250	R11 — 200,000
R3 — 300,000	R12 — 250,000
R4 — 400	R13 — 250,000
R5 — 300,000	R14 — 50,000
R6 — 100,000	R15 — 300,000
R7 — 200,000	R16 — 500,000 GLOBAR
R8 — 2,500	R17 — 50,000
R9 — 10,000	R18 — 1,000,000

CONDENSERS

C1 — .03	C16 — .25
C2 — .03	C17 — .02
C3 — .01	C18 — 8.0
C4 — .1	C19 — 8.0
C5 — .25	C20 — .0005
C6 — .25	C21 — .0005
C7 — .25	C22 — .00025
C8 — .03	C23 — .005
C9 — .0005	C24 — .1
C10 — .03	C25 — .008
C11 — .0005	C26 — .008
C12 — 10.	C27 — .1
C13 — .25	C28 — .5
C14 — .25	C29 — .1
C15 — .03	C30 — .5

MODEL 66
Chassis view

GRIGSBY - GRUNOW CO.



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MODEL 66
Point-to-point data

MODEL 66 RESISTANCE CHART

All readings are taken from designated points to ground except those marked with an asterisk (*) which are taken to terminal No. 29, with all tubes removed from their sockets, volume control turned to maximum clockwise position, and the speaker connected in the circuit.

TERMINAL NUMBER	RESISTANCE IN OHMS	IF RESISTANCE DIFFERS GREATLY FROM VALUE SHOWN, CHECK THE FOLLOWING:
1	21	Primary of antenna coil
2	700,000	Secondary of antenna coil, R-1, C-1, R-5, C-8 and R-6
3	0	Ground connection
4	.135	Primary of vibrator trans., Field Coil, C-30, C-28, C-27 and C-29
5	400	R-4 and C-7
6	0	Ground connection
7	Same as #5	
* 8	10,000	R-10
9	112	Primary of R.F. transformer
10	700,000	Secondary of R.F. transformer, C-2 and R-15
11	Same as #4	
12	0	Ground connection
13	250	R-2 and C-4
14	50,250	R-17
*15	10,000	Secondary of oscillator coil and R-10
16	Same as #8	
*17	88	Primary of 1st I.F. transformer
18	700,000	Secondary of 1st I.F. transformer, C-3, and R-3
19	Same as #4	
20	0	Ground connection
21	Same as #5	
22	0	Ground connection
23	Same as #5	
24	Same as #8	
*25	165	Primary of 2nd I.F. transformer
26	Same as #4	
27	0	Ground connection
28	1250	Secondary of vibrator trans., C-26, C-25, R.F. buzzer choke, and "B" filter choke
29	0	C-18, C-19, C-5 and C-6
30	Same as #28	
31	0	Ground connection
32	210,000	C-10, R-7, R-9, C-14 and C-13
33	Same as #4	
34	0	Ground connection
35	12,500	R-8, R-9, C-12, C-13, C-14 and C-10
36	100,284	Secondary of 2nd I.F. trans., R.F.C., R-6, C-11, C-9 and C-10
37	Same as #36	
38	0	Ground connection
*39	200,035	C-20, C-21, R.F.C., C-15 and R-11
40	500,450	R-13, R-12, C-16 and "B" filter choke
41	Same as #4	
42	0	Ground connection
43	0	Ground connection
44	Same as #43	
*45	0	Connections
46	430	Primary of output transformer
47	0	Ground connection
48	Same as #4	

Due to manufacturing tolerances on carbon resistors, the values given above may be expected to differ plus or minus 15 per cent.

MODEL 66
Installation notes

GRIGSBY - GRUNOW CO.

INSTRUCTIONS FOR INSTALLATION

MOUNTING OF RECEIVER

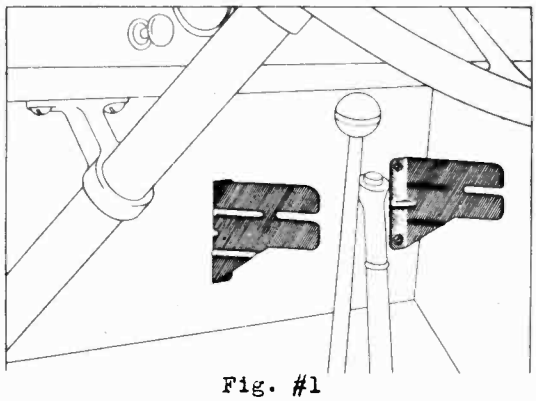


Fig. #1

The receiver is designed to be installed on the inside of the fire-wall behind the instrument panel, preferably in a horizontal position and close enough to the steering column for the control cables to reach the receiver. Only in cases where it is impossible to install in a horizontal position should it be mounted vertically. Mount the two adjustable brackets, one on each end of the receiver, then determine the best location for the receiver by holding it against the fire-wall, being careful to avoid interference with mechanical controls of the car. It may be necessary to reverse the brackets to accomplish this. After the best location has been determined, drill four holes using the template furnished with receiver for marking their location. Figure #1 shows how the brackets should look after being bolted to the fire-wall. Before permanently bolting the receiver to the brackets, the plug of the battery cable should be inserted into the rear of the receiver.

CAUTION - All mounting nuts and bolts must be drawn tight.

CONNECTING CONTROL

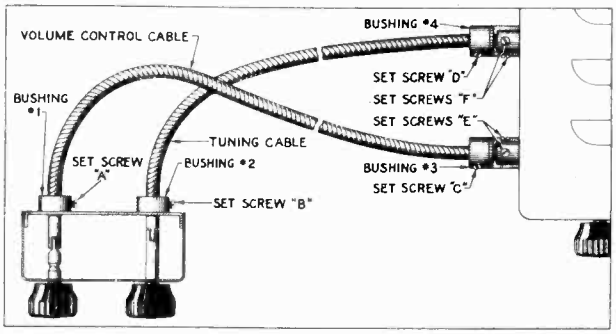


Fig. #2

Two flexible drive shafts are furnished with the Model 66 receiver. The volume control shaft has a slotted fitting on one end while the tuning shaft is similarly provided with a key fitting. To assemble the control unit the end of the volume control shaft with the slotted fitting should be inserted into bushing No. 1 on the control unit. (See Fig. #2). Make sure the outside casing of the shaft goes about five-sixteenths of an inch into the bushing. Then tighten the set screw "A" so that the outer casing of the cable will be securely held. Now connect in the same manner, the key end of the tuning cable to bushing No. 2, securing it with set screw "B". After the two cables are so connected, to sure that the knobs on the control head turn smoothly and without binding. Binding might be caused by the cables being pushed too tightly into the control unit.

The left hand or volume control cable should now be connected to bushing No. 3 on the end of the receiver. Pass the cable through the bushing so that the fitting on the end of the cable fits into the coupling on the volume control and the outer casing of the cable comes flush with the inside edge of bushing No. 3. Tighten set screw "C" so that it will securely hold the outer casing.

Next, connect in the same manner, the tuning cable to bushing No. 4, securing it with set screw "D". If the cables are properly connected they will cross. Set screws "E" and "F" should not be tightened until the control unit and cables are permanently mounted.

Now mount the control unit on the steering column in the most convenient place. Fasten drive cables securely wherever convenient so that they will not interfere with operation of the car, and then tighten the set screws "E" and "F"

GRIGSBY - GRUNOW CO.

MODEL 66
Voltage
Installation data

Battery Terminal Volts	5.5	6.3	7.5
B+ to B- (Volts)	216	261	322
B+ to Ground (Volts)	184	218	257
Total Battery Drain (Amps)	6.15	7.25	8.50

* Measured with 300,000 ohm meter.

All voltages measured with no input signal.

All voltages to ground from socket unless otherwise stated.

in the couplings. If these are tightened before the control unit has been mounted, binding of the controls might result. Binding might also be caused by the bushings on the end of the receiver not being directly in front of the couplings. By loosening the screws that hold the bushings and then re-adjusting the bushings, this condition should be remedied. After control unit and receiver are mounted, they should appear as in Figure #3.

Fig. #3

After the control unit and cables have been connected, the dial pointer should be adjusted. This is accomplished by slowly rotating the tuning control knob to the right until a definite stop is reached. Do not force the knob after the stop has been encountered as this may seriously damage the mechanism. Then rotate the knob slowly to the left until another definite stop is reached. In most cases it will be natural for either the pointer to come to the end of the dial strip before the stop is reached, or for the stop to be reached before the pointer comes to the end of the dial strip. In this manner the dial pointer is automatically adjusted to indicate correct frequency readings.

VOLTAGE TABLE FOR MODEL 66 AUTO RECEIVER

Battery Terminal / Volts	PLATE VOLTS			SCREEN VOLTS			CATHODE VOLTS			GRID VOLTS		
	5.5	6.3	7.5	5.5	6.3	7.5	5.5	6.3	7.5	5.5	6.3	7.5
R. F. (G-6E7)	182	217	256	88	99	109	8.0	9.3	12.5	8.0	9.3	12.5
G-6A7S Det.	182	217	256	88	99	109	2.7	3.4	4.2	2.7	3.4	4.2
G-6A7S Osc.	88	99	109	-	-	-	-	-	-	7.0*	8.0*	8.0*
I. F. (G-6E7)	182	217	256	88	99	109	8.0	9.3	12.5	8.0	9.3	12.5
Audio (G-6C7)	51	60	61	-	-	-	7.5	9.2	9.5	1.8	2.2	2.3
Output (G-89)	177	209	248	184	213	257	-	-	-	23.0	27.0	35.0

MODEL 66
Parts List

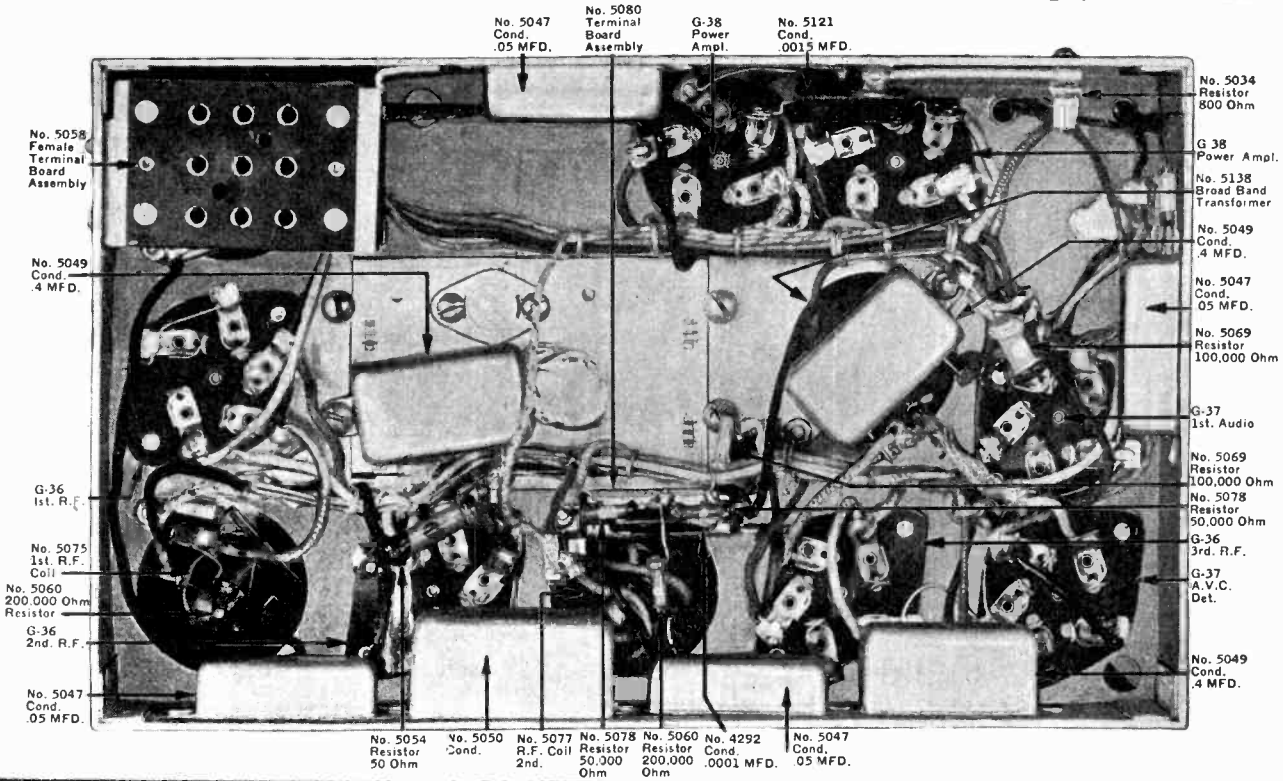
GRIGSBY - GRUNOW CO.

RECEIVER PARTS

PART NO.	DESCRIPTION	LIST PRICE
10065	"A" Battery Cable Assembly with Plug	1.60
9977	"B" Choke Assembly	1.65
8857	Detector Plate R. F. Choke Coil	.60
10057	Choke Coil "A" Supply	.55
10135	R. F. Buzzer Choke Coil	.30
10017	Antenna Coil Assembly Complete	1.60
10018	Antenna Coil Assembly less Can	.95
10020	Oscillator Coil Assembly Complete	.80
10021	Oscillator Coil Assembly less Can	.60
10013	R. F. Coil Assembly Complete	1.75
10014	R. F. Coil Assembly less Can	1.10
10074	Adjustable Condenser for I. F. (Double)	.50
10075	Adjustable Condenser for I. F. (Single)	.35
9984	By-pass Condenser Assembly, C-4 to C-7	1.20
9981	By-pass Condenser Assembly, C-10, C-13, C-14, C-16 and C-17	1.40
9410	Condenser Assembly, .005 Mfd. C-23	.30
8279	Condenser Assembly, .01 Mfd. C-3	.35
9437	Condenser Assembly, .03 Mfd. C-1, C-2, C-8, C-10	.30
10189	Condenser Assembly, .1 Mfd. C-24	.45
10184	Condenser Assembly, .5 Mfd. C-28, C-30	.40
9979	Electrolytic Condensers Dual 8 Mfd. C-18, C-19	2.50
10067	Electrolytic Condenser, 10 Mfd. C-12	.70
6242	Mica Condenser, .0005 Mfd. C-9, C-11, C-20, C-21	.20
6641	Mica Condenser .00025 Mfd. C-22	.25
7253	Resistor 300,000 ohms, R-1, R-3, R-5, R-15	.20
9691	Resistor 250 ohms, R-2	.25
10285	Resistor 400 ohms, R-4	.20
5059	Resistor 100,000 ohms, R-6	.25
9944	Resistor 2,500 ohms, R-8	.20
5219	Resistor 10,000 ohms, R-9	.25
10252	Resistor 10,000 ohms, R-10	.45
5060	Resistor 200,000 ohms, R-11	.30
7259	Resistor 250,000 ohms, R-12, R-13	.25
9887	Resistor - Globar, R-16	.45
7498	Resistor 50,000 ohms, R-17	.20
9223	Resistor 1,000,000 ohms, R-18	.20
9863	Model G-24-A Speaker	6.15
9884	Field Coil (5.4 ohms)	1.20
9876	Cone Assembly	1.30
9872	Output Transformer	1.70
10078	1st I. F. Transformer Assembly Complete	2.30
10079	1st I. F. Transformer Assembly less Can	2.10
10098	2nd I. F. Transformer Assembly Complete	2.70
10099	2nd I. F. Transformer Assembly less Can	2.50
10081	Vibrator Inner Can Assembly	13.00
10073	Vibrator Armature Assembly	6.25
10004	Tone Control	.85
10003	Volume Control & Switch	1.25
9211	Sockets (6 prong)	.15
10107	Sockets (7 prong)	.10
9986	Female Connector Plug - 8 contact	.35
9985	Male Plug (8 prong)	.15
9970	Twin Tip Jack Assembly	.15
9969	Fuse Board Assembly	.30
10101	Fuse 15 Amp.	.05
9999	Gang Condenser	4.15

GRIGSBY - GRUNOW CO.

MODEL 110
Chassis view
Voltage, Parts List



CHASSIS PARTS

PART No.	DESCRIPTION	DEALER'S NET PRICE
5083	Antenna Coil	$1.08
5025	Battery Can, without cover	.72
5026	Cover for Battery Can	.45
4641	By-Pass Condenser, Generator	.32
	Cables	
5020	Control Cable	1.38
5022	"A" Battery Cable	.37
5023	"B" Battery Cable	.49
5151	Drive Cable, 8 ft.	.95
5177	Drive Cable, 10 ft.	1.67
5178	Drive Cable, 12 ft.	1.89
5179	Drive Cable, 14 ft.	3.14
5100	Chassis Container Cover	.11
5033	Chassis Container Mounting Strap	.08
5149	Clamp, for Steering Column	.11
5150	Clock Spring, Flat	.22
5145	Collet Assembly	.22
	Condensers	
4292	.0001 MFD.	.16
5121	.0015 MFD.	.15
5047	.05 MFD.	.25
5140	.25 MFD.	.33
5049	.4 MFD.	.30
5050	.6 MFD.	.49
5064	Condenser, Gang	2.95
5146	Condenser Pulley	.27
5102	Control Unit, Complete	7.42
5185	Control Terminal Board	.54
5147	Dial Lamp, 6 Volt. See Page 95.	
5196	Dial Drive Shaft	.29
5182	Dial Strip	.16
5183	Dial Strip and Gear Assembly	.51
5118	Fuse, 1/8 Amp.	.10
4663	Fuse, 10 Amp. for Control Unit	.08
5119	Fuse Clip	.03
5170	Gasket for Lid, Rubber	.06
5088	Input Transformer, Grid Clip Assembly	2.29
5148	Key	.06
5144	Knob for Selector	.22
5143	Knob for Volume Control	.16
5153	Output Transformer	.90
	Resistors	
5054	50 Ohm	.13
4621	750 Ohm	.13
5034	800 Ohm	.12

CHASSIS PARTS

PART No.	DESCRIPTION	DEALER'S NET PRICE
5078	50,000 Ohm	$0.13
5059	100,000 Ohm	.13
5060	200,000 Ohm	.12
5075	R. F. 1st Coil, Comp.	1.08
5077	R. F. Coil, 2nd Comp.	.99
	Screws and Nuts	
2285	Screw for Control Clamp Per 10	.02
2269	Screw 8/32x1⅜" Per 10	.03
2331	Nut for Above Per 10	.02
2462	Screw R. H. I. M. 12/24x2⅜"	.01
2603	Nut for Above	
2339	Nut 10/32 Per 10	.04
2460	Washer for Nut No. 2339 Per 10	.04
5152	Switch Assembly Comp.	.54
4640	Suppressor for Spark Plug	.21½
5199	Suppressor, Screw Type	.21½
5122	Suppressor for Distributor	.21½
5010	Terminal Board, Male	.08
5008	Terminal Board, Female	.09
5138	Transformer, Broad Band	.89
5069	Tube Socket, G-36	.12
5070	Tube Socket, G-37	.12
5071	Tube Socket, G-38	.12
5072	Volume Control	.60

SPEAKER

5135	Speaker Complete with Output Transformer, Magnavox	$4.17
61619	Speaker Cabinet, Less Back	1.57
61618	Speaker Back, Complete	.18
5116	Speaker Bracket	.05
5021	Speaker Cable	1.31
5116	Speaker Mounting Brackets	.05
5194	Cone for Magnavox	1.25
5195	Cone for Utah	1.30
5188	Field Coil (Magnavox)	.95
5189	Field Coil (Utah)	.90

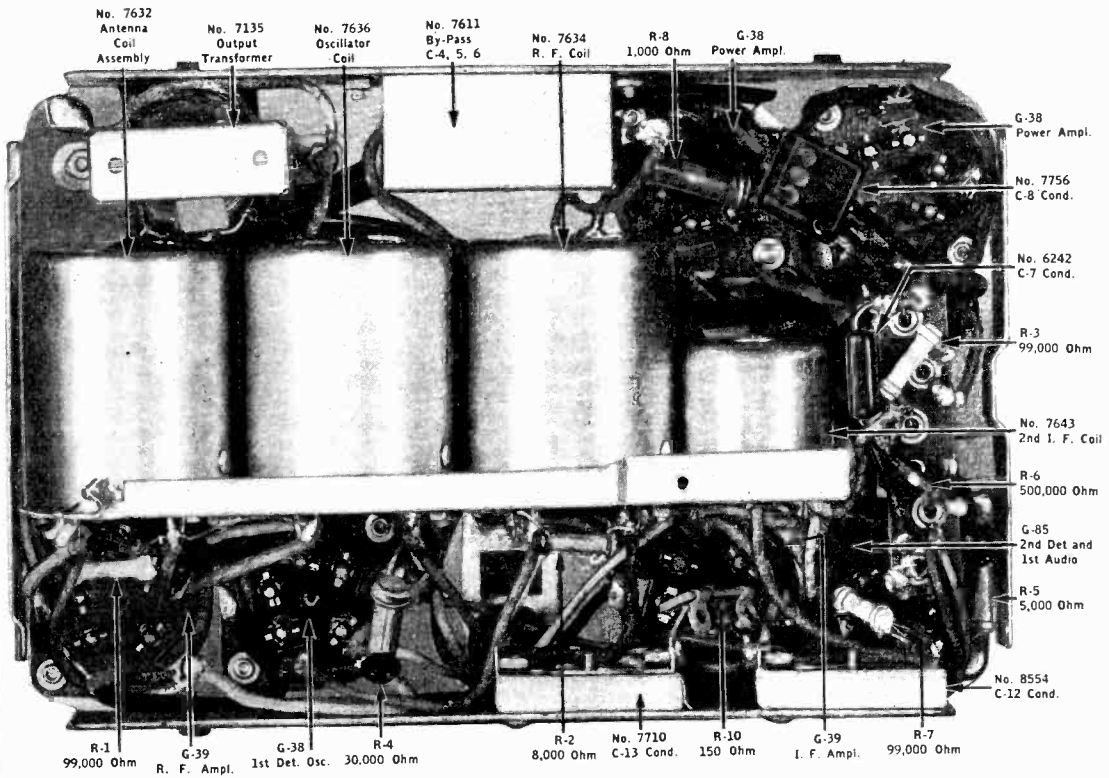
TABLE OF VOLTAGES

Purpose	Type	Fil. D.C.	Plate D.C.	Screen D.C.	Cathode D.C.
1st R. F.	G-36	6.3	175	90	0
2nd R. F.	G-36	6.3	175	90	0
3rd R. F.	G-36	6.3	175	90	0
Diode Det. & A.V.C.	G-37	6.3	7.5	...	7.5
1st Audio	G-37	6.3	50	...	0
P. P. Power	G-38	6.3	150	180	12
P. P. Power	G-38	6.3	150	180	12

Tube

MODEL 114
Chassis view
Voltage
Parts List, Notes

GRIGSBY - GRUNOW CO.



CHASSIS PARTS

PART No.	DESCRIPTION	DEALER'S NET PRICE
7632	Antenna Coil Assembly, Less Can	$0.81
7746	Antenna Spring and Bracket Assembly	.05
7611	By-Pass Condenser C-4, C-5, C-6	.67
8575	Chassis Container	1.16
	Condensers	
6242	.0005 MFD., C-7	.12
7756	.0015 MFD.	.11
	Condenser Assembly	
8279	.01 MFD.	.19
7693	.03 MFD.	.16
8554	Adjustable, C-12	.12
7710	Adjustable, C-13	.32
7210	Adjustable for I. F. Transformer, C-11	.14
8286	Condenser, Electrolytic 5. MFD., C-9	.39
7784	Condenser, Electrolytic 20 MFD.	.32
7619	Condenser, Three Gang	2.95
8563	Condenser Pully	.49
7664	Lid Gasket	.09
7676	Lid for Container	.18
8323	I. F. Transformer Assembly, 1st	1.23
7643	I. F. Transformer Assembly, 2nd	.54
7636	Oscillator Coil Assembly, Less Can	.54
7135	Output Transformer Assembly	1.08
	Resistors	
7751	150 Ohm, R-10	.11
7606	1,000 Ohm, R-8	.11
7125	2,000 Ohm, R-5	.11
7672	8,000 Ohm, R-2	.11
7755	30,000 Ohm, R-4	.11
7671	99,000 Ohm, R-1, 3 7	.11
7482	500,000 Ohm, R-6	.11
7634	R. F. Coil Assembly, Less Can	.67
7615	Transformer Assembly, Push-Pull Input	1.67
	Tube Sockets	
7705	5-Contact plain	.06
7762	5-Contact for G-38	.06
7763	5-Contact for G-39	.06
7608	6-Contact for G-85	.06

"B"—SUPPLY PARTS

8254	"A" Supply Choke Assembly	$0.49
7674	"B" Supply Container	.89
7739	"B" Filter Choke Assembly	.62

All Above Prices Subject to 2% Federal Tax

TABLE OF VOLTAGES

Tube	Purpose in Circuit	Plate Voltage	Screen Voltage	Cathode Voltage
G-39	R.F. Amplifier	180	85	0
G-38	1st Detector Oscillator	180	85	15.
G-39	I.F. Amplifier	180	85	1.1
G-85	2nd Detector and 1st Audio Amplifier	A.F. Plate 50	...	2
G-38	Power Amplifier	170	180	17
G-38	Power Amplifier	170	180	17

NOTE: Measurements made with a 1000 ohm per volt, 300 volt range, D.C. voltmeter, all tubes in their sockets and receiver connected to a storage battery supply delivering **6 volts** at the cable terminals, under load.

Tubes should be previously tested to assure that they are in good condition.

Readings to be taken from designated points to ground, with the condenser gang fully meshed and with no signal supplied to the receiver.

THE CIRCUIT

Superheterodyne with "B" Supply of the motor type.

AUTOMATIC VOLUME CONTROL

Referring to the schematic diagram it will be seen that the signal voltage across the 2nd I.F. coil (L-11) is rectified by the diode plates of the G-85 second detector tube, causing space current to flow around the circuit composed of the diode plates, cathode, resistor R-5, volume control R-7; and resistor R-3. This in turn establishes a direct current voltage across R-3 in which the end toward the plates is negative with respect to the end toward the cathode. As the grids of the G-39 tubes are connected to the negative potential end of R-3, these grids become negative with respect to ground and hence negative with respect to their own cathodes.

This negative bias reduces the mutual conductance and hence the amplification of the G-39 tubes. The signal at the coil L-11 is, therefore, reduced until a balanced condition is reached. It will be evident that the effect is to maintain practically constant the signal at the diode plates independently of the received strength, within the limits of the A.V.C. system. This does away with blasting and fading.

By connecting the two diode plates together it is possible to obtain almost twice as much A.V.C. voltage as could be obtained with the full wave connection, and it is possible to obtain good A.V.C. at the small signals encountered in automotive receivers.

GRIGSBY - GRUNOW CO.

MODEL 116
Chassis views
Alignment data

ALIGNMENT

If, for any reason it becomes necessary to align the Model No. 116 Auto Radio, the following procedure should be carefully followed.

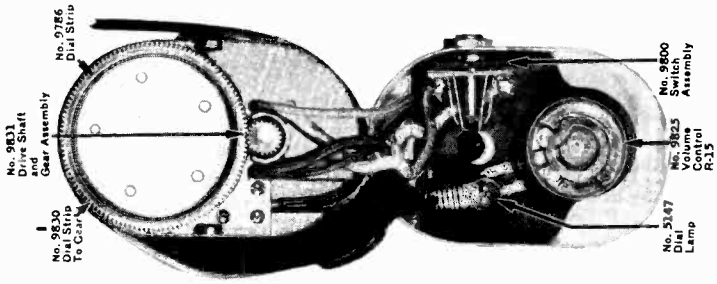
It will be necessary to remove the chassis container and cover to align the receiver.

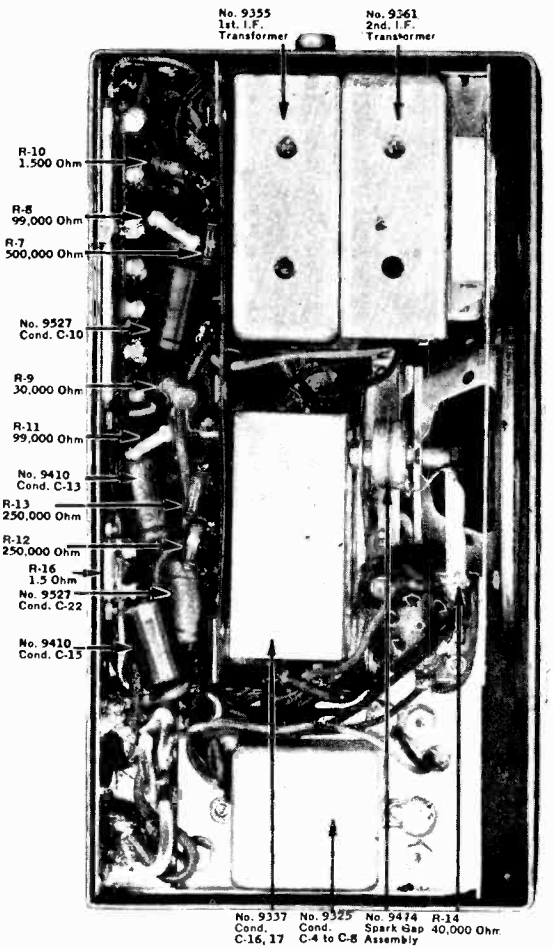
1. Set the volume control at maximum, insert all tubes in their proper sockets and connect the battery cable to a six (6) volt storage battery.
2. Supply a 456 Kilocycle signal to the grid of the first detector tube and align for maximum output the three (3) I.F. aligning condensers that are located on the bottom right hand side of the chassis and the one (1) I.F. aligning condenser located on the upper part of the chassis behind the speaker.

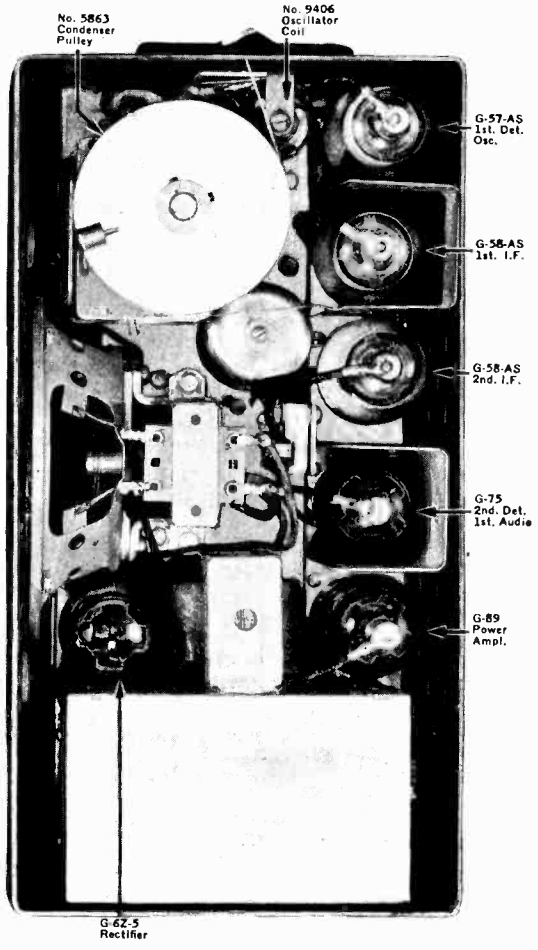
The shielding is to be connected to the grounded side of the battery and the two wires emerging from the shielding are both connected to the hot side. The polarity of the battery need not be considered when making these connections. When making the ground connections, scrape away any corrosion, paint or rust so as to make a good electrical contact.

TO OBTAIN BEST RESULTS FROM THIS RECEIVER, ADVANCE THE CAR GENERATOR TO KEEP THE STORAGE BATTERY FULLY CHARGED.

The cable must be securely clamped and must not come in contact with the battery in order to avoid the possibility of corrosion and shorting the battery.







MODEL 400-A, 411-A, 413-A
Schematic, Notes

GRIGSBY - GRUNOW CO.

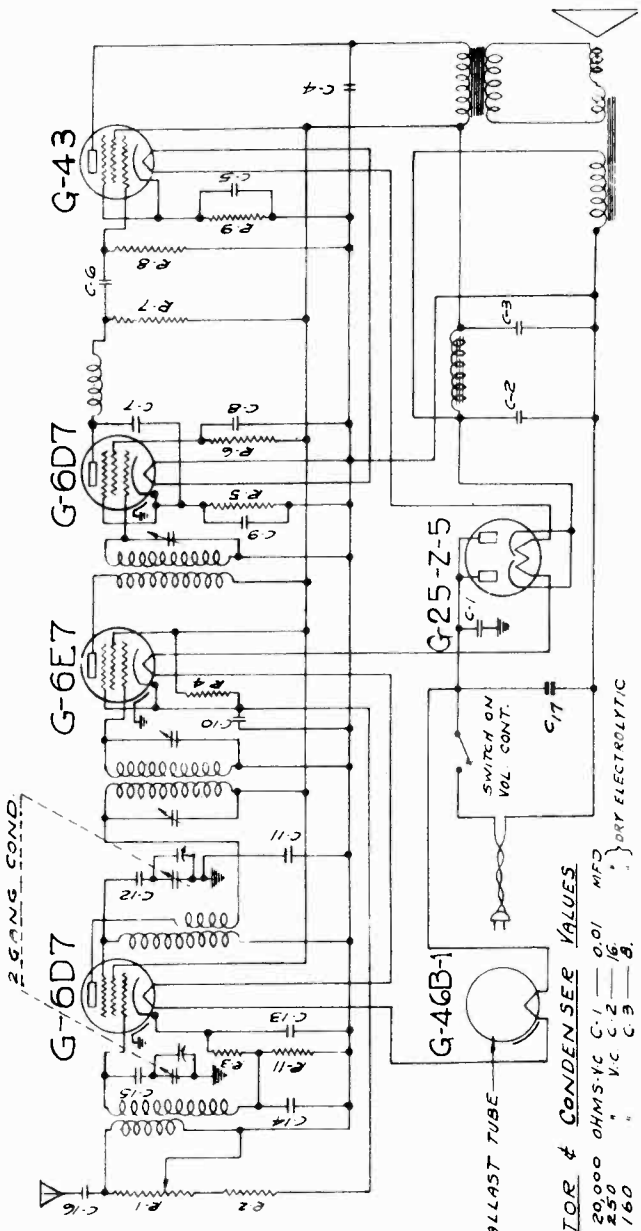
TABLE OF VOLTAGES TO "B—"

Purpose	Tube Type	Filament A.C.-D.C.	Plate D.C.	Screen D.C.	Cathode D.C.
Modulator and Oscillator	G-6D7	6.3	105	105	13
I. F. Amp.	G-6E7	6.3	105	105	*3 to 30
2nd Det.	G-6D7	6.3	18	18	2
Power Output	G-43	25.0	96	105	16
Rectifier	G-25-Z5	25.0	...	...	118
Ballast	G-46B-1	46.1	...	...	...

Line Voltage—115 A. C.

*Varies according to setting of volume control

SCHEMATIC DIAGRAM OF MAJESTIC SCREEN GRID A.C.-D.C. SUPERHETERODYNE RECEIVER MODEL - 400-A



TUBES

The type G-6D7 is a seven prong tube with a grid cap connection. It is electrically the same as the G-57A-S except that the filament requires only 300 milliamperes instead of 400 milliamperes. This tube is spray shielded and the spray shield is connected to the seventh prong on the base instead of to the cathode, as is usually the practice.

The G-6E7 tube differs from the G-58A-S in the same respects that the G-6D7 differs from the G-57A-S.

The G-46B-1 ballast dissipates 46.1 volts at 300 milliamperes.

In view of the fact that the current consumption for the filaments of all the tubes used in the 400-A chassis is 300 milliamperes, it is not necessary to use the 500 resistor, R-10.

RESISTOR & CONDENSER VALUES

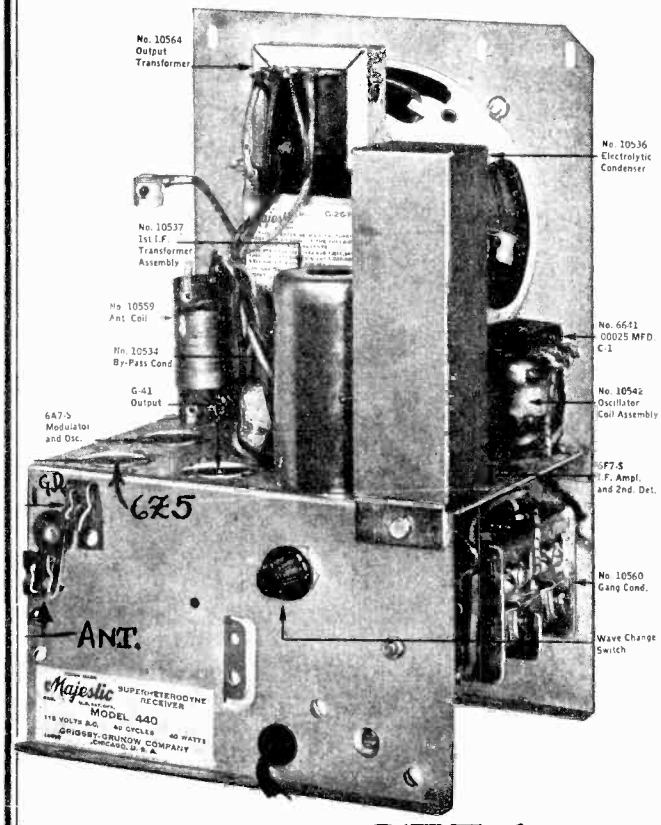
R1 — 20,000 OHMS	C1 — 0.01 MFD			
R2 — 250 "	C2 — 16 "	} DRY ELECTROLYTIC		
R3 — 160 "	C3 — 8. "			
R4 — 60 000 "	C4 — 0.01 "			
R5 — 50,000 "	C5 — .0 "	DRY ELECTROLYTIC		
R6 — 1,000,000 "	C6 — 0.10 "			
R7 — 500,000 "	C7 — 0.0005 "			
R8 — 500,000 "	C8 — 0.10 "			
R9 — 700 "	C9 — 0.25 "			
R10 — 2500 "	C10 — 0.25 "			
R11 —	C11 — 0.25 "			
	C12 — 0.01 "			
	C13 — 0.25 "			
	C14 — 0.10 "			
	C15 — 0.01 "			
	C16 — 0.001 "			
	C17 — 0.10 "			

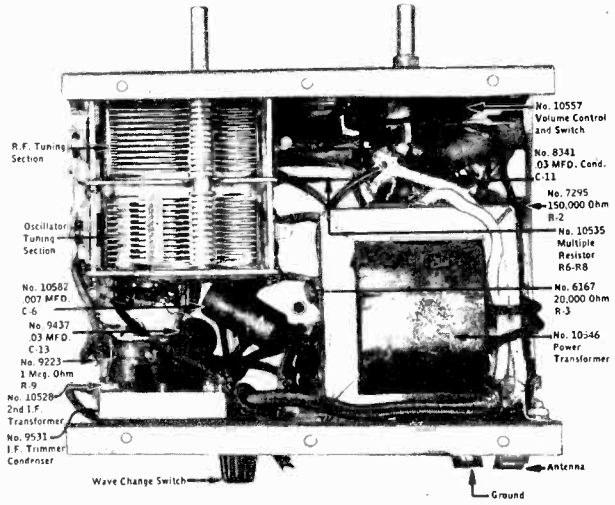
Notes on this page denote differences between chassis of Model 400 and Model 400-A.

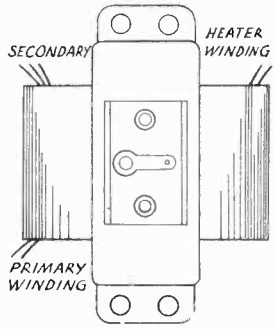
GRIGSBY-GRUNOW CO
CHICAGO, U.S.A.
L.W.W. 4-14-33

GRIGSBY - GRUNOW CO.

MODEL 44,49,194,440
Chassis views
Voltage, Parts List







Power Transformer Connections

CHASSIS 440

Models 44, 49 and 194

TABLE OF VOLTAGES

Purpose	Tube Type	Fil. Volt A.C.	Plate Volts	Screen Volts D.C.	Cathode Volts D.C.
Modulator	6A7-S	6.3	255 D.C.	92	3.5 to 40
Oscillator	6A7-S	6.3	92 D.C.	—	3.5 to 40
I. F. Amp.	6F7-S	6.3	255 D.C.	92	12
2nd Det.	6F7-S	6.3	*100 D.C.	—	12
Output	41	6.3	240 D.C.	255	18
Rectifier	6Z5	6.3(Parallel)	285 A.C.	—	315

Line Voltage—115 Volts, 60 Cycle. *Measured with 600,000 ohm Meter.

THE CIRCUIT

The chassis 440 employs an exceedingly efficient superheterodyne circuit utilizing four tubes including a rectifier. In the combination of tubes as shown above, a performance quality equal to six tubes is realized.

TWO WAVE BAND RECEPTION

Reception is provided on two wave bands. One position of the switch gives reception between 535 and 1530 kilocycles, and the second position between 1470 and 3500 kilocycles.

SPEAKER

Model G-26-F with a field resistance of 980 ohms is capable of tremendous amount of power for its size. Faithful reproduction over a wide range of the musical scale is given without distortion.

CONTROLS

On the back of the chassis is located the wave switch knob. Clockwise direction gives short wave and counter-clockwise direction gives the regular broadcast reception.
The combination volume control and the "on-off" switch is located on the right hand side while the tuning control is located on the left.
The addition of zero to the numbers on the dial will give the frequency reading in kilocycles. The inner circle of numbers is for the broadcast and the outer circle for the short wave band.

MISCELLANEOUS

The output is approximately 2.5 watts. The recommended antenna length for outside aerial is 50 feet.

ALIGNMENT PROCEDURE

1. Set wave switch in broadcast position (counter-clockwise as viewed from rear of receiver), volume control in maximum volume position and turn gang condenser to full mesh.
2. Supply a 456 kilocycle signal to the 6A7 converter grid and align the three I. F. tuning condensers for maximum sensitivity.
3. Supply a 1500 kilocycle signal to the input of the receiver, and after tuning the receiver to this signal, align the oscillator and radio frequency circuits for maximum sensitivity.

CHASSIS PARTS

PART No.	DESCRIPTION
10531	Chassis Only, Model 440
10559	Antenna Coil Assembly, Complete
10543	Antenna Coil Assembly
10534	By-Pass Condenser Assembly, C-2, 3, 5, 7, 14
	Condenser Assembly
10582	.007 MFD., C-6
8341	.03 MFD., C-11
9437	.03 MFD., C-13
10536	Condenser, Electrolytic, 6-4-10 MFD., C-8, 9, 10
	Condenser, Mica
6641	.00025 MFD., C-1
8990	.001 MFD., C-4
10560	Condenser, Two Gang
10572	Fahnestock Clip ..... 4 for
10537	I. F. Transformer, 1st, Complete
10538	I. F. Transformer Coil, 1st
10528	I. F. Transformer Assembly, 2nd, Complete
10541	I. F. Transformer Coil, 2nd
9531	I. F. Trimmer Condenser
10529	Oscillator Coil Assembly, Complete
10542	Oscillator Coil Complete
10546	Power Transformer Assembly
	Resistors
6167	20,000 Ohm, R-3
7295	150,000 Ohm, R-2
7482	500,000 Ohm, R-5
10571	700,000 Ohm, R-4
9223	1,000,000 Ohm, R-9
10535	Wire Wound, R-6 to R-8

MODEL 44,49,194 (440)
Schematic, Parts List
Point-to-point data
Socket layout

GRIGSBY - GRUNOW CO.

RESISTANCE VALUES

ANTENNA COIL
Primary ..... .795 ohm
Secondary
Total ..... 5.22 ohm
Tap to Ground 3.77 ohm

OSCILLATOR COIL
Primary ..... 1.73 ohm
Secondary
Total ..... 2.93 ohm
Tap to Ground 1.81 ohm

1ST I. F. TRANSFORMER
Primary ..... 26.5 ohm
Secondary ..... 27 ohm

2ND I. F. TRANSFORMER
Primary ..... 55.5 ohm
Secondary ..... 55.5 ohm

FILTER CHOKE
980 ohm

OUTPUT TRANSFORMER
Primary ..... 550 ohm

FIELD COIL
980 ohm

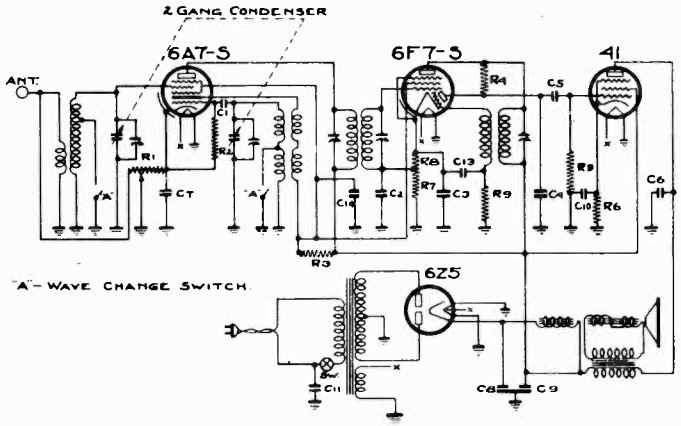
HIGH VOLTAGE SECONDARY
Each Side..... 405 ohm

VOICE COIL
1.8 ohm

SCHEMATIC DIAGRAM OF MAJESTIC MODEL 440 RECEIVER

Fig. 184

Revision	Issue	Mgmo
6-20-33	1	8039
7-16-33	2	8089



CONDENSER VALUES

No.	Mfds.	No.	Mfds.
C1	.00025	C8	6.0
C2	.01	C9	4.0
C3	.5	C10	10.0
C4	.001	C11	.03
C5	.03	C12	
C6	.007	C13	.03
C7	.1	C14	.25

RESISTANCE VALUES

No.	Ohms	No.	Ohms
R1	7,500 V.C.	R6	500
R2	150,000	R7	1500
R3	20,000	R8	300
R4	700,000	R9	1000,000
R5	500,000	R10	

IF PEAK 456 KC

GRIGSBY-GRUNOW CO. CHICAGO, ILL. 6-20-33

L. J. WOOMER

Schematic Diagram Chassis 440

CHASSIS PARTS

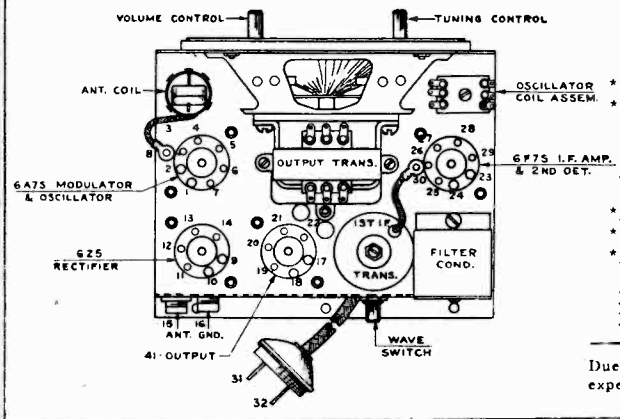
PART No.	DESCRIPTION
	Tube Socket
10107	7 Prong
10758	6 Prong
10557	Volume Control and Line Switch
10544	Wave Change Switch

MODEL G-26-F SPEAKER

10581	Model G-26-F Speaker Complete
9476	Cone Assembly
10563	Field Coil (980 Ohm)
9593	Hum-Buck Coil
10564	Output Transformer Assembly

CABINET PARTS MODELS 44 AND 49

67164	Cabinet Model 44, Complete
67184	Cabinet Model 49, Complete
67170	Baffle
10597	Escutcheon
67178	Grill Cloth
	Per Unit 8¾" x 7¼"
	Per yard, 50 inches wide
	Knobs
10598	For Controls
7401	For Wave Switch



RESISTANCE TABLE

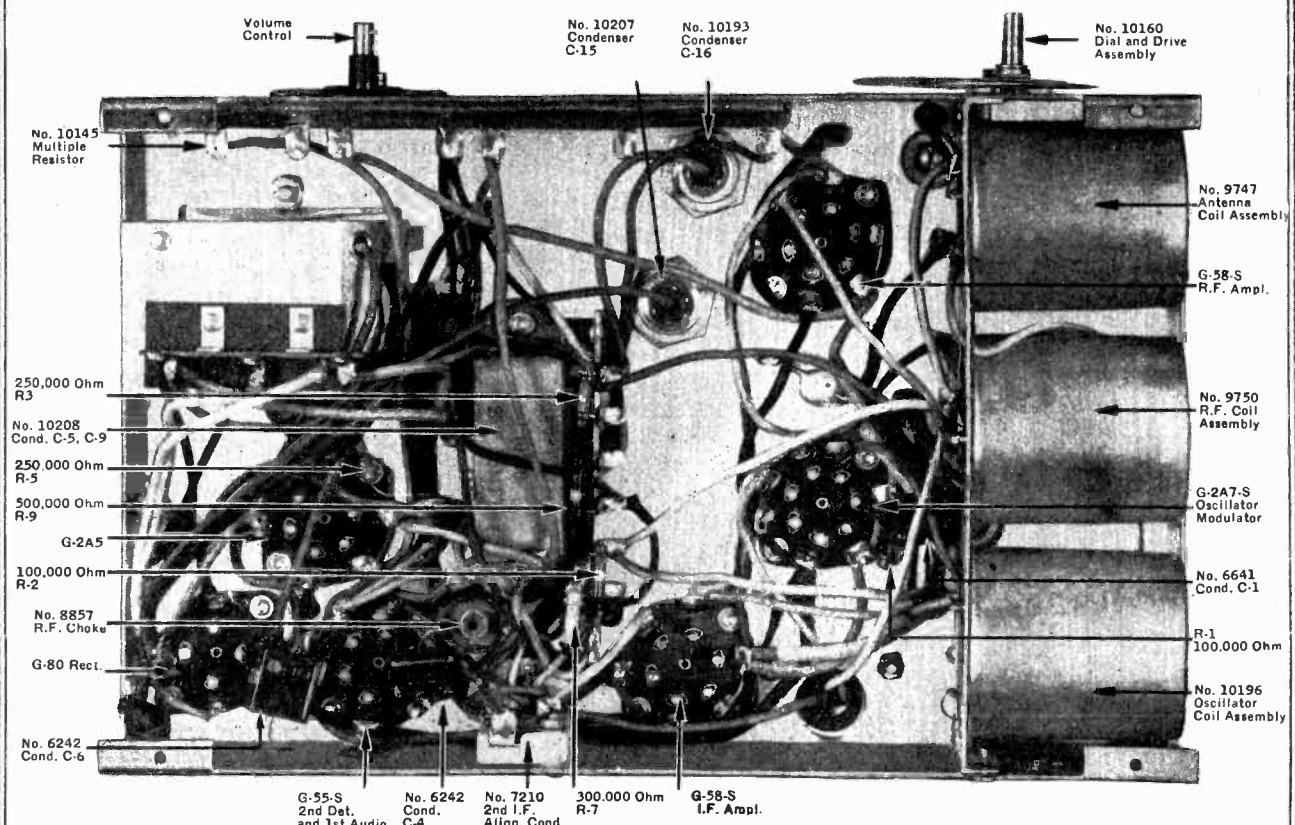
All readings are taken from designated points to ground except those marked with an asterisk (*) which are taken to terminal No. 12, with all tubes removed from their sockets, volume control turned to maximum clockwise position, and the speaker connected in the circuit.

Terminal Number	Resistance In Ohms	If Resistance Differs Greatly From Value Shown, Check the Following
1	.34	Filament connection and ground connection
2	0	Ground connection
3	0	Volume control and C-7
4	150,000	C-1 & R-2. Also see terminal No. 2
*5	20,982	Pri. of oscillator coil, R-3 and filter choke
*6	20,980	R-3 and C-14
*7	1,006	Pri. of 1st I. F. trans.
8	5.22	Secondary of ant. coil
9	Same	as No. 1
10	0	Ground connection
11	405	One-half of hi-voltage secondary
12	Very high	C-8, C-9 and filter choke
13	Same	as No. 11
14	0	Ground connection
15	.79	Pri. of antenna coil
16	0	Ground connection
17	Same	as No. 1
18	Same	as No. 2
19	500	R-6 and C-10
20	500,000	R-5 and C-5
*21	980	Filter choke
*22	1,530	Pri. of output trans. and C-6. Also term. No. 21
23	Same	as No. 2
24	Same	as No. 1
25	1,800	R-7, R-8, C-2 and C-3
26	1,000,000	Secondary of 2nd I. F., R-9 and C-13
*27	701,035	C-4, R-4 and pri. of 2nd I. F. trans.
*28	20,980	R-3 and C-14
*29	1,035	Pri. of 2nd I. F. trans. and filter choke
30	1,527	Sec. of 1st I. F. trans., C-2 and R-7
31	0	C-11, A. C. switch and pri. of power trans.
32	Same	as No. 31

Due to manufacturing tolerances on carbon resistors, the values given above may be expected to differ plus or minus 15 per cent.

GRIGSBY - GRUNOW CO.

MODEL 460,461,463
Chassis view, Voltage
Parts List, Notes



CHASSIS 460

Models 461 and 463

TABLE OF VOLTAGES

Tube Purpose	Type	Filament Volts—A.C.	Plate Volts—D.C.	Screen Volts—D.C.	Cathode Volts—D.C.
R. F. Amp.	G-58-S	2.5	260	92	4.2
Modulator Oscillator	G-2A7-S	2.5	260 92	92 ...	4.2
I. F. Amp.	G-58-S	2.5	260	92	4.2
2nd Det. and 1st A.F.	G-55-S	2.5	*Triode 65	...	23.0
Output	G-2A5	2.5	243	260	15.0
Rectifier	G-80	5.0	...	...	...

Rectifier Filament to Ground—340 volts D.C
Line Voltage—115 volts A.C.
Volume Control in Maximum Position.

*NOTE: Actual voltage at plate of tube. This reading will be much lower when a common voltmeter is used to measure this voltage because of the drop across the 250,000 ohm plate resistor.

THE CIRCUIT

The six tube Model 460 chassis employed in the Model 461 and 463 receivers is largely conventional except for the delayed A.V.C. system and the improved pre-selector system. The circuit continuity is as follows: G-58-S R.F. Amplifier, G-2A7-S Composite Modulator Oscillator, G-58-S I.F. Amplifier, G-55-S Second Detector and First Audio Amplifier, G-2A5 Pentode Output and G-80 Rectifier. The improved pre-selector circuit gives a greater image attenuation and greater stage gain, resulting in a much lower percentage of noise for a given output level. In these receivers very careful design work was carried out to insure excellent high frequency response, giving greater clarity and brilliance.

DELAYED AUTOMATIC VOLUME CONTROL

The Model 460 has a new A.V.C. circuit incorporated in it which follows the modern trend of having an improved over-load and A.V.C. action, but without the customary disadvantages of the more conventional circuits. This is accomplished by utilizing one diode plate for audio development only, and the other for A.V.C. voltage only. It is, therefore, possible to design an audio circuit and an A.V.C. circuit of optimum constants without any sacrifice of one to aid the other as has been the case in previous receivers. The result of this is a much greater power output for very weak, as well as strong, signals and a very constant output level over an extremely wide range of signal inputs, which of course, effectively overcomes "fading."

DESCRIPTION OF NEW TUBES

The G-2A7-S Pentagrid Converter is used in a composite oscillator modulator circuit and has two definite advantages. First, it gives a very flat sensitivity over the band covered and second, it makes it possible to control this stage with the automatic volume control voltage. The filament requires .80 amperes at 2.5 volts.

The G-2A5 is a new Power Amplifier Pentode capable of giving a large power output with a relatively small input signal voltage. The power handling ability of the G-2A5 is essentially the same as that of the G-59 with pentode connection. The filament requires 1.75 amperes at 2.5 volts.

CHASSIS PARTS

PART No.	DESCRIPTION	DEALER'S NET PRICE
10137	Chassis 460, Complete	$21.60
9747	Antenna Coil, Complete with Can	.62
9748	Antenna Coil Assembly, Less Can	.51
10143	By Pass Condenser Assembly, C-2, 3, 17, 18	.68
10144	By Pass Condenser Assembly, C-7, 8, C-10 to C-14	1.00
.0200	Cable, Internal Chassis	.14
10193	Condenser, Electrolytic, 8 MFD., C-16	.76
10208	Condenser, Electrolytic, 10-10 MFD., C-5, 9	.59
10207	Condenser, Electrolytic, 16 MFD., C-15	1.16
6641	Condenser, Mica, .00025 MFD., C-1	.13
6242	Condenser, Mica, .0005 MFD., C-4, 6	.12
9753	Condenser, Three Gang	2.24
10160	Dial and Drive Assembly	.59
10148	I. F. Transformer Assembly, 1st Complete	.92
10149	I. F. Transformer Assembly, 1st, Less Can	.78
10253	I. F. Transformer Coil, 2nd	.51
10196	Oscillator Coil, Complete with Can	.38
10197	Oscillator Coil Assembly, Less Can	.27
10190	Power Transformer Assembly	2.35
10278	Power Transformer Universal	4.32
	RESISTORS	
5059	100,000 Ohm, R-1, 2	.13
7259	250,000 Ohm, R-3, 5	.11
7253	300,000 Ohm, R-7	.12
7482	500,000 Ohm, R-9	.11
10145	Wire Wound, Multiple, R-6, 10, 11, 12, 13, 14	.51
8857	R. F. Choke Assembly	.32
9750	R. F. Coil Assembly, Complete with Can	.62
9751	R. F. Coil Assembly, Less Can	.51
10753	Spring for Tension on Drive Assembly	.07
10242	Tone Control and Switch (2 Leads and 2 Lugs)	.68
9587	Tube Socket, 4 Prong	.05
10758	Tube Socket, 6 Prong	.07
10107	Tube Socket, 7 Prong	.06
10183	Volume Control	.49

MODEL 460,461,463
Schematic, Alignment,
Color codes, Notes

GRIGSBY - GRUNOW CO.

RESISTANCE VALUES

ANTENNA COIL
Primary ...22.16 ohm
Secondary (total) .. 5.38 ohm

R. F. COIL
Primary ..146 ohm
Secondary (total). 5.15 ohm

OSCILLATOR COIL
Primary .... 2.7 ohm
Secondary ..2.13 ohm

1st I. F. TRANSFORMER
Primary ....125 ohm
Secondary . 122 ohm

2nd I. F. TRANSFORMER
Primary....148 ohm
Secondary
Audio .... 69.3 ohm
A.V.C. ... 68.3 ohm

OUTPUT TRANSFORMER
Primary .... 500 ohm

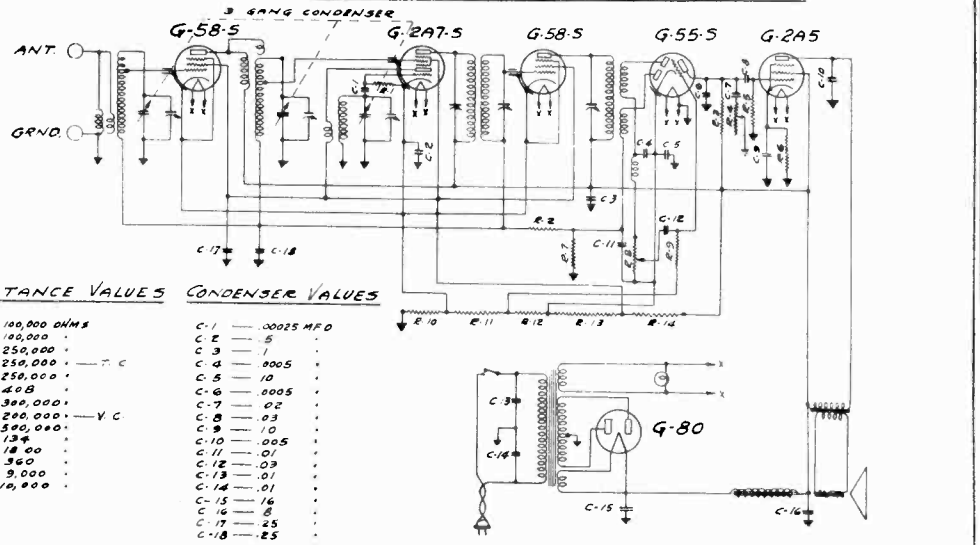
FIELD COIL
.....1070 ohm

HIGH VOLTAGE SECONDARY
Each Side...360 ohm

FIG - 181

REVISIONS	NO.	MEMO
5-26-33	1	7962
6-15-33	2	8010

SCHEMATIC DIAGRAM OF MAJESTIC MODEL - 460 RECEIVER



RESISTANCE VALUES

R-1 — 100,000 OHMS
R-2 — 100,000 "
R-3 — 250,000 "
R-4 — 250,000 " — V. C.
R-5 — 250,000 "
R-6 — 408 "
R-7 — 300,000 "
R-8 — 200,000 " — V. C.
R-9 — 500,000 "
R-10 — 134 "
R-11 — 1800 "
R-12 — 360 "
R-13 — 9,000 "
R-14 — 10,000 "

CONDENSER VALUES

C-1 — .00025 MFD
C-2 — .5 "
C-3 — .1 "
C-4 — .0005 "
C-5 — .10 "
C-6 — .0005 "
C-7 — .02 "
C-8 — .03 "
C-9 — .10 "
C-10 — .005 "
C-11 — .01 "
C-12 — .03 "
C-13 — .01 "
C-14 — .01 "
C-15 — 16 "
C-16 — 8 "
C-17 — .25 "
C-18 — .25 "

IF PEAK 175 KC

GRIGSBY-GRUNOW CO
CHICAGO, ILL

Schematic Diagram Chassis 460

SPEAKER MODEL G-24-C

PART No.	DESCRIPTION	DEALER'S NET PRICE
10171	Model G-24-C Speaker Complete	$3.73
9876	CONE Assembly	.70
10173	Field Coil (1070 Ohm)	1.00
10174	Humbuck Coil	.05
10175	Output Transformer Complete	.70

CABINET PARTS Model 461

67138	Cabinet Only, Model 461	$8.10
10246	Escutcheon, Main	.19
10268	Escutcheon for Volume Control	.19
67134	Escutcheon Plate for Tone Control	.19
70609	Escutcheon Screws, Chrome Finish. Per 10	.01
67133	Grill	.65
10245	Knobs	.08
67141	Packing Carton	.59
2841	Screws, 1", with fancy Chrome Heads	.04
10002	Tube Shield Caps	.06

CABINET PARTS Model 463

67100	Cabinet Only, Model 463	$8.37
10220	Escutcheon Plate, Main	.22
67096	Escutcheon Plate for Tone Control	.19
66912	Grill Cloth Per Sq. Ft.	.14
67086	Grill-Metal	1.00
10216	Knobs	.08
67097	Packing Carton	.54
10002	Tube Shield Caps	.06

ALIGNMENT PROCEDURE

1—The receiver must be aligned with volume control in maximum position.

2—Supply a 175 K.C. signal to the grid of the G-2A7-S modulator tube, and adjust the three I.F. tuning condensers for maximum sensitivity.

3—Set the gang condenser in minimum capacity position (all the way out of mesh), supply a 1730 K.C. signal to the input of the receiver and align the three gang condenser trimmers for maximum sensitivity.

After the receiver is aligned the sensitivity for 100 milliwatts output at 30% modulation should be 10 microvolts or less.

WIRING COLOR CODE

With the hope that we shall eventually have a uniform color code, we are setting up the following tentative specifications:

Blue—Yellow Tracer	— High V. from Rect. (filter input)
Red	— B Plus
Orange	— Cathodes
White	— Screen
Blue	— Filament
Black	— Filament and Grounds
Green	— Grid Returns
Brown	— Cathode Returns
Black—Red Tracer	— Grid
White—Red Tracer	— Grid (Cond.)
Orange—Black Tracer	— Suppressor Grid
Black—Yellow Tracer	— Special Plate
Blue—Red Tracer	— Special Screens
Yellow	— All Plates
White R.C.	— A.V.C. Circuits
Yellow R.C.	— Special A.V.C. Circuits
Black and Red Twisted	— Pilot Lamp

For some time to come there will be cases where substitutions will be made for the purpose of using up inventory. There may also be cases which arise where it will be impossible to obtain the specific wire when needed, in which case a substitution will be made. In general, however, the above code will be strictly adhered to.

COLOR CODE FOR CONDENSERS AND RESISTORS
Standard R.M.A. Code

FIGURE CODE

Ten colors have been assigned to the figures as follows:

0—Black	2—Red	4—Yellow	6—Blue	8—Gray
1—Brown	3—Orange	5—Green	7—Purple	9—White

RESISTORS

Using the above code, the body of the resistor is colored to represent the first figure of the resistance value.

One end of the resistor is colored to represent the second figure of the resistance value. A dot, located within the body color, represents the number of ciphers following the first two figures.

EXAMPLES: Brown body, black end and yellow dot—100,000 ohms.
Purple body, red end, and brown dot— 720 ohms.

MICA CONDENSERS

The three colored dots on a mica condenser indicate its capacity and the two colored dots, its D.C. working voltage.

On condensers having three dots on one side and two on the other, the designations are to be read with the capacity rating (3 dots) at the bottom, while on condensers having all five dots on one side the designations are to be read with the capacity rating on the top.

CAPACITY: Referring to the "figure code" the first color indicates the first digit of the capacity expressed in Mmfd. (micro-microfarads).
The second color indicates the second digit of the capacity expressed in Mmfd.
The third color indicates the number of ciphers following the second digit of the capacity.

EXAMPLES: Red, green and brown dots— 250 mmfd. or .00025 mfd.
Brown, black and red dots—1000 mmfd. or .001 mfd.

VOLTAGE: Referring to the "figure code" the first colored dot indicates multiples of 100 volts and the second one indicates multiples of 10 volts.

EXAMPLES: Orange and green dots—350 volts.
Blue and black dots —600 volts.

GRIGSBY - GRUNOW CO.

MODEL 490,491,493
Circuit notes

THE CIRCUIT

The six tube Model 490 chassis employed in the Models 491 and 493 is designed for operation on 32 volt direct current lighting systems. It is practically identical to the Model 460 chassis in the radio frequency end except that it employs 6 volt tubes instead of 2.5 volt tubes. A type 85-S tube is employed as a second detector and first audio frequency amplifier and a type 42 for the output stage. The rectifier is a 6Y5 of the mercury vapor full wave type.

The normal line voltage on which the chassis is designed to operate is 35 volts. Under no circumstances should it ever be connected to a 110 volt source, either A.C. or D.C. The set operates over a line voltage of 26 to 45 volts.

The chassis is equipped with two fuses rated at 3 amperes and these should never be replaced with fuses of higher rating. Due to the series parallel connection of the tube heaters the line switch must never be left "on" if a tube is to be changed or taken out of the socket for any reason. If this precaution is not observed the tube in parallel with the one removed will be greatly overloaded and there is danger of the tube heater being burned out. If a tube should burn out in service, the receiver should be turned "off" and left "off" until a replacement is effected. It is also important that the receiver be turned "off" if the pilot light burns out. The defective pilot light should be replaced as quickly as possible with one rated at 200 milliamperes at 6.3 volts. A larger size pilot lamp will overload the 42 and 6Y5 heaters.

SPEAKER

The Model G-24-H dynamic speaker is employed in conjunction with the Model 490 chassis in both the Model 491 and 493 receivers. This speaker is adequate in size to handle with excellent fidelity all normal output levels necessary for home receivers. The field coil has a resistance of 14.5 ohms at 70° F. and it is connected in series with the tube heaters.

SERVICE SUGGESTIONS

It is imperative that an excellent ground be installed and connected to the chassis. Either a galvanized pipe driven at least three feet into the earth in a damp place or, if available, a lightning rod ground conductor at its grounded end should be used for a ground return.

In order to eliminate any possibility of picking up noise, the antenna and line cord should be kept apart at the back of the receiver. If excessive interference is being experienced, it will be well to inspect the antenna lead-in to see that it is as far away as possible from all lighting plant wiring, and at right angles to whatever wiring it might be necessary to pass, including that in the walls.

The chassis is non-polarized and therefore it makes no difference which side of the line cord goes to the positive or negative side of the direct current line.

MODEL 490,491,493
Vibrator notes,
Voltage

GRIGSBY - GRUNOW CO.

VIBRATOR ARMATURE ADJUSTMENT

The vibrator adjustment is a very delicate procedure and under no circumstances should it be attempted without meters in the circuit. A primary circuit D.C. ammeter (0 to 1 Amp.) is the most important indicator used during adjustments, and should be connected in series with the fuse of the vibrator circuit. A 0-300 D.C. voltmeter, 1,000 ohms per volt, should be connected between ground and "B" plus. A 0-100 D.C. milliammeter should be connected between ground and the ground end of the "B" filter choke, which is first removed from ground.

With normal tubes which have been heating at least one minute, the following values should be read when the vibrator is properly adjusted:

INPUT	OUTPUT
35 Volts, .58 Amperes	285 Volts, 53 Milliamperes

If the voltage at the vibrator is higher or lower than 35 volts, the other readings will be correspondingly more or less. The following table gives the output voltage at different line voltages:

LINE VOLTS	TOTAL "B" VOLTS
26	220
30	250
35	285
40	325

Readjustment of the vibrator will be necessary if for the above input voltage the output current and voltage are low.

After long continued operation the vibrator contacts may become sufficiently worn that they will require readjustment, the surfaces of the contacts should the be honed with a carborundum stone until they are flat and bright. It is necessary only to remove high points and scale which may have formed, and it is not necessary to endeavor to hone out the deeper pits which may have formed on the contact surfaces.

The simplest and most usual adjustment required is a slight increase of spring tension by turning down the spring tension adjusting screw one or two turns. This adjustment is not critical, but if one or two turns do not improve the operation this adjustment should be locked, and attention turned to the contact adjusting screws. Do not attempt to turn any adjusting screws without first loosening the lock nuts, and do not try any one adjustment as final without tightening the lock nut, as tightening the nut is apt to change things.

The second adjustment, and the one likely to do the most good, is to turn the #1 contact adjusting screw (the one farthest from the spring tension adjustment) down very carefully, at the same time watching the ammeter. Usually not more than 1/8 to 3/8 of a turn will be necessary, but when the right adjustment is reached the ammeter will show .58 ampere. If the armature suddenly begins to clatter against the core, the #1 contact is down too far and should be

GRIGSBY - GRUNOW CO

MODEL 490,491,493
Vibrator notes
Coil resistances

backed off. If proper operation is not obtained by adjusting the #1 contact it should be set at a little less than .58 ampere and attention turned to the #2 contact (the one closest to the spring tension adjusting screw). Turn the #2 adjusting screw down carefully until the ammeter shows .58 ampere at standard output. The vibrator should then be operating steadily and smoothly, and the input fluctuation should be very little. If after a few trial adjustments the vibrator is obviously completely out of adjustment it is wise to proceed as follows:

Turn the #2 contact all the way out so that it does not make contact to the armature. Turn the #1 contact down until the armature clatters against the core, then back it off about 1/2 turn so that the clatter stops. Then turn down the #2 contact until the ammeter reading starts to rise and adjust to .58 ampere. Note that a point will be reached in this adjustment at which the output current and voltage do not increase even though the input current is increased. This point will be near .58 ampere input, and is the point of correct adjustment.

If the reflection of a green arc is seen from the #1 contact it is necessary to check the vibrator adjustment again. A vibrator operating with a green arc is apt to be a source of r.f. interference in the receiver. Incidentally, have no alarm if r.f. interference, or "buzzer noise" is observed while both lids are off the vibrator container. Usually, a green arc at the #1 contact is an indication of too much tension on the adjusting spring, or of a no-load condition in the output circuit - the latter being no fault of vibrator adjustment.

Before closing the vibrator container after adjustments have been made, make sure that all connections and lock-nuts are tight.

MISCELLANEOUS RESISTANCES

ANTENNA COIL	
Primary	22.16 ohms
Secondary (total)	5.38 ohms
R.F. COIL	
Primary	146 ohms
Secondary (total)	5.15 ohms
OSCILLATOR COIL	
Primary	2.7 ohms
Secondary	2.13 ohms
IST I.F. TRANSFORMER	
Primary	125 ohms
Secondary	122 ohms
2ND I.F. TRANSFORMER	
Primary	148 ohms
A.V.C. Secondary	68.3 ohms
Audio Secondary	69.3 ohms
OUTPUT TRANSFORMER	
Primary	450 ohms
Secondary	.238 ohms
SPEAKER	
Field	14.5 ohms
Voice Coil	1.8 ohms
VIBRATOR TRANSFORMER	
Primary (total)	5.06 ohms
Secondary (total)	644 ohms
CHOKES	
R.F. Choke	85 ohms
Audio Choke (Filter) Total	500 ohms
Audio Choke (Filter) Tap to Grd	435 ohms
R.F. Buzzer Choke	65 ohms
R.F. Choke (Fuse to Vibrator)	.09 ohms
R.F. Choke (Line Filter)	.09 ohms
R.F. Choke (Line Filter)	.09 ohms

MODEL 490,491,493
Alignment, Voltage

GRIGSBY - GRUNOW CO.

ALIGNMENT PROCEDURE

1. The volume control and tone control should be set at maximum clockwise position

2. Supply a 175 k.c. signal to the 6A7-S modulator grid and adjust all the I. F. aligning condensers for maximum sensitivity.

*3. Turn the gang condenser completely in mesh. Set the dial to the gauge mark beyond 540 k.c., and lock dial in place.

4. With gang condenser in minimum capacity position (out of mesh), supply a 1730 k.c. signal to the input of the receiver and align the three (3) radio frequency circuits for maximum sensitivity.

NOTE:- The power line should never be connected to the receiver until the pilot light and all tubes are inserted and the speaker connected to the set.

* Paragraph #3 is only followed when it is necessary to recalibrate the dial.

TABLE OF VOLTAGES

(To Ground)

TUBE TYPE	PURPOSE	FILAMENT VOLTS-D.C.	FILAMENT AMPERES-D.C	PLATE VOLTS-D.C.	SCREEN VOLTS-D.C.	CATHODE VOLTS-D.C.	GRID VOLTS
6E7	R.F. AMP.	‡6.3	.3	256	103	4.7	0
6A7-S	Modulator	‡6.3	.3	256	103	4.7	0
	Oscillator			103	---		
6E7	I.F. AMP.	‡6.3	.3	256	103	4.7	0
85-S	2nd Det.& 1st Audio	‡6.3	.3	*Triode 64	---	24	0
42	Output	‡6.3	.7	226	256	0	24
6Y5	Rectifier	‡6.3	.8	---	---	256	---

LINE VOLTAGE - 35 Volts D.C.

*NOTE: Actual voltage at plate of tube. This reading will be much lower when a common voltmeter is used to measure this voltage because of the drop across the 250,000 ohm plate resister.

‡ These values may vary considerably with different tubes; from 5.7 to 6.8 volts.

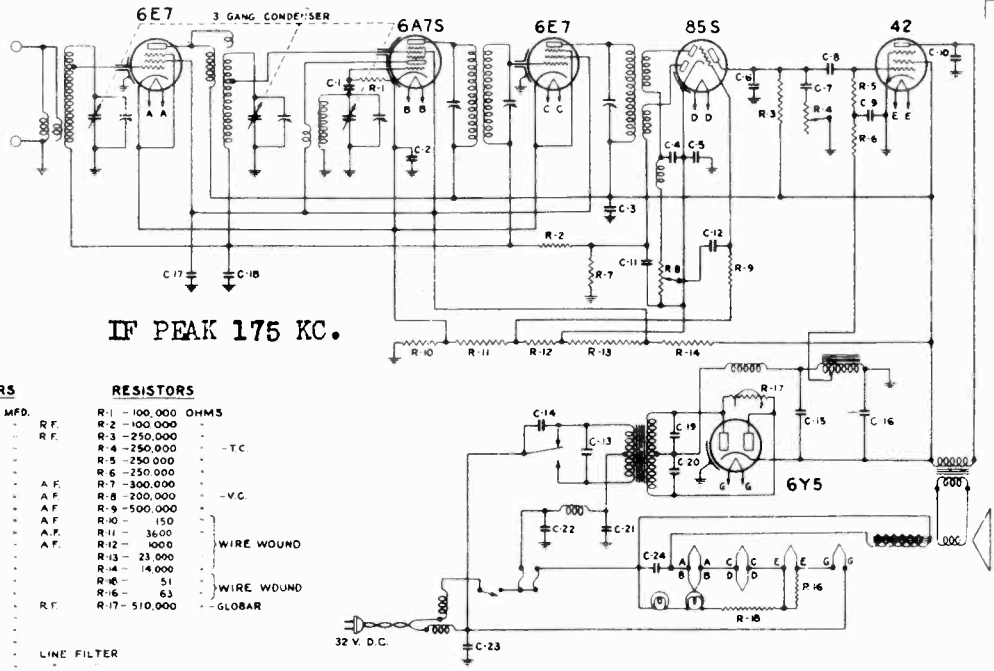
GRIGSBY - GRUNOW CO.

MODEL 490,491,493
Schematic
Socket layout
Condenser assembly

SCHEMATIC DIAGRAM OF MAJESTIC MODEL 490 RECEIVER

FIG. - 186

REVISIONS	ISSUE	MEMO.
1-18-33	1	8090
12-9-33	2	8497



CONDENSERS

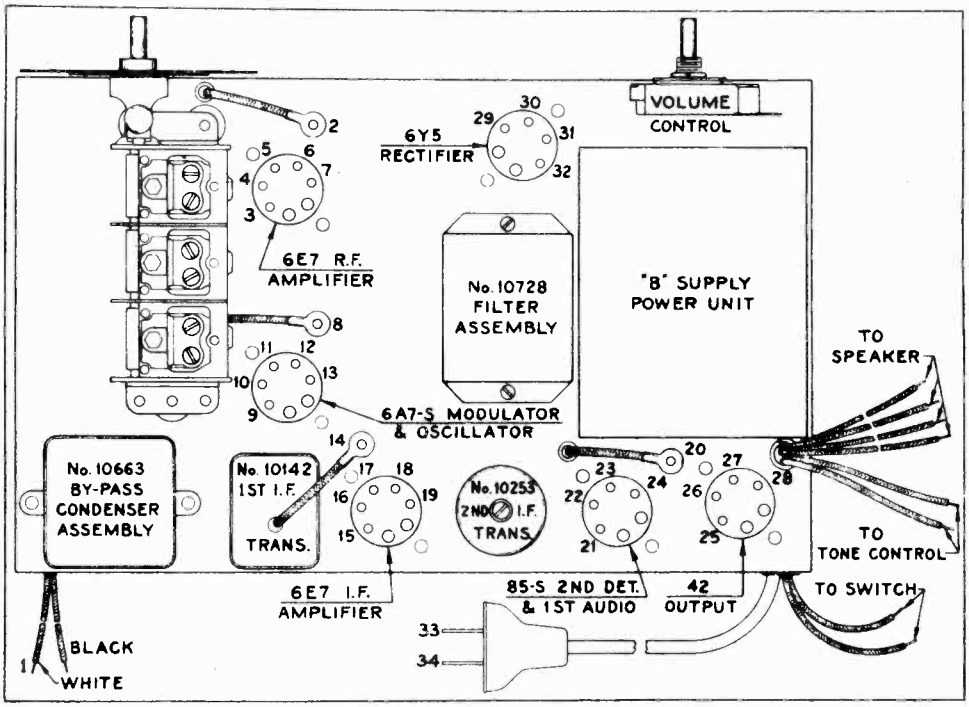
C-1	.00025 MFD.	
C-2	.5	R.F.
C-3	.1	R.F.
C-4	.0005	
C-5	.10	
C-6	.0005	
C-7	.02	A.F.
C-8	.03	A.F.
C-9	.25	A.F.
C-10	.005	A.F.
C-11	.01	A.F.
C-12	.03	A.F.
C-13	.5	
C-14	.5	
C-15	.8	
C-16	.8	
C-17	.25	R.F.
C-18	.5	
C-19	.008	
C-20	.008	
C-21	.5	LINE FILTER
C-22	.5	"
C-23	.5	"
C-24	.10	N.P.

RESISTORS

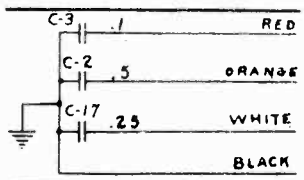
R-1	100,000	OHMS
R-2	100,000	"
R-3	250,000	"
R-4	250,000	" - T.C.
R-5	250,000	"
R-6	250,000	"
R-7	300,000	"
R-8	200,000	" - V.C.
R-9	500,000	"
R-10	150	" WIRE WOUND
R-11	3600	"
R-12	1000	"
R-13	23,000	"
R-14	14,000	"
R-15	51	" WIRE WOUND
R-16	63	"
R-17	510,000	" - GLOBAR

GRIGSBY-GRUNOW CO.
CHICAGO, U.S.A.

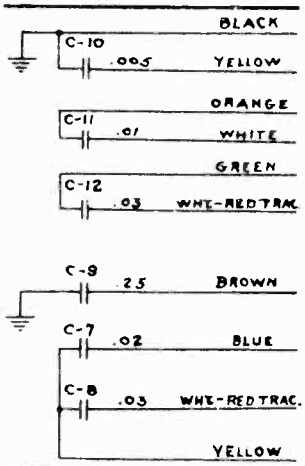
SCHEMATIC DIAGRAM OF MODEL 490 CHASSIS



RESISTANCE CHART DIAGRAM.



PART #10663 BYPASS CONDENSER ASSEMBLY



PART #10637 BYPASS CONDENSER ASSEMBLY

MODEL 490,491,493
Point-to-point data

GRIGSBY - GRUNOW CO.

RESISTANCE CHART

All readings are taken from designated points to ground except those marked with an asterisk (*) which are taken to terminal No. 30, with all tubes removed from their sockets, and the speaker connected in the circuit.

TERMINAL NO.	RESISTANCE IN OHMS	IF RESISTANCE DIFFERS GREATLY FROM VALUE SHOWN, CHECK THE FOLLOWING
1	22.16	Primary of antenna coil.
2	400,004	Secondary of antenna coil, C-18,R-2,R-7,and C-11.
3	150	R-10 & C-2.
4	0	Ground connection
5	Same as #3	
*6	14,000	R-14.
6	Open	C-17, C-16 or C-15.
*7	146	Primary of R.F. coil.
7	Open	C-3, Also see terminal #6.
8	400,004	Secondary of R.F. coil, C-18, R-2, R-7 and C-11.
9	Same as #3	
10	100,150	R-1, C-1, C-2 and R-10.
*11	14,002.7	Primary of oscillator coil and R-14.
12	Same as #6	
*13	125	Primary of 1st I.F. transformer
14	400,122	Secondary of 1st I.F. trans.,R-2,R-7,C-18 & C-11.
15	Same as #3	
16	0	Ground Connection
17	Same as #3	
18	Same as #6	
19	148	Primary of 2nd I.F. transformer
20	503,750	R-9, R-10, R-11, C-12 and C-2.
21	4,750	C-5,R-12,R-11 and R-10.
†22	204,904.3	Audio Sec. of 2nd I.F.,R.F.choke,R-8,C-5,C-12. R-12, R-11, and R-10
†23	300,068.3	A.V.C. sec. of 2nd I.F., R-7 and C-11
* 24	250,000	R-3.
24	Open	C-6, C-7 and C-8
25	0	Ground connection
26	500,436	R-5, C-9, R-6 and filter choke
*27	0	Connections
*28	450	Primary of output transformer
28	Open	C-10 and primary of output transformer
29	822	Secondary of "B"supply trans.,C-20,C-19, R.F. buzzer choke and filter choke
30	Open	C-15, C-16, C-10, C-3 and C-17
31	Same as #29	
32	0	Ground connection.
33	Open	C-23, C-22 and C-21.
34	Same as #33	

†The connections to these two diode plates may be reversed without any apparent effect.

NOTE: - Due to manufacturing tolerances on carbon resistors the values shown above may be expected to differ plus or minus 15 per cent.

GRIGSBY - GRUNOW CO.

MODEL 490,491,493
Parts List

MODEL 490 CHASSIS PARTS

PART NO.	DESCRIPTION	DEALER'S NET PRICE
10728	"A" Filter Assembly (Includes C-21,22,23 & 3 chokes)	$ 2.25
9747	Antenna Coil	.62
10637	By-Pass Condenser, C-7 to C-12	1.26
10663	By-Pass Condenser, C-2, 3, 17, R.F.	.63
10740	Cable, Shielded for Volume Control	.12
8857	Choke Assembly, R.F.	.32
10641	Choke Coil Assembly, "B"	.96
10638	Choke Coil Assembly, R.F. Buzzer	.34
10184	Condenser Assembly, .5 Mfd., C-18	.22
10630	Condenser, Electrolytic, Dual 8 & 10 Mfd., C-15,16,5	1.62
10946	Condenser, Electrolytic, 10 Mfd., C-24	.54
6641	Condenser, Mica, .00025 Mfd., C-1	.13
6242	Condenser, Mica, .0005 Mfd., C-4, 6	.12
9753	Condenser Gang	2.24
10160	Dial and Drive Assembly	.59
5147	Dial Lamp	.08
998	Fuse, 3 Amp.	.03
10725	Fuse Board and Bracket Assembly	.12
10148	I.F. Transformer, 1st, Complete	.92
10149	I.F. Transformer, 1st, Less Can	.78
10253	I.F. Transformer, 2nd	.51
10196	Oscillator Coil	.38
	RESISTORS	
5059	100,000 Ohm, R-1, 2	.13
7259	250,000 Ohm, R-3, 5, 6	.11
7253	300,000 Ohm, R-7	.12
7482	500,000 Ohm, R-4	.11
10675	Globar, R-17	.24
10636	Multiple, Wire Wound, R-10 to R-14	.59
10727	Multiple, Wire Wound, R-15, 16	.28
9750	R.F. Coil	.62
11597	Tone Control and Line Switch	.68
10758	Tube Socket, 6 prong	.07
10107	Tube Socket, 7 prong	.06

MODEL 490,491,493
Parts List

GRIGSBY - GRUNOW CO.

PART NO.	DESCRIPTION	DEALER'S NET PRICE
10648	Vibrator Assembly, Complete	$ 8.10
10655	Vibrator Armature Assembly	3.50
10649	Vibrator Inner Can Assembly	7.44
10664	Volume Control	.51

MODEL G-24-H SPEAKER

10610	Model G-24-H Speaker Complete	$ 3.66
9876	Cone Assembly	.70
10612	Field Coil (14.5 Ohm)	.78
9084	Gasket for Cone Assembly	.02
10613	Output Transformer Assembly	.93

CABINET PARTS-MODEL 491

67735	Cabinet only, Model 491	$ 3.90
2840	Chassis Mounting Screws	.01
10999	Escutcheon Plate, Dial	.16
10998	Escutcheon Plate, Volume	.16
67544	Escutcheon, Name Plate, "Majestic"	.10
2895	Fancy Head Thru-Bolts, No. 8-32 x 1" 2 for	.01
66912	Grill Cloth, 8" High by 10" Wide per Sq.ft.	.14
10222	Knob, Round	.07
10245	Knob, Square	.08
10002	Tube Shield Caps	.06
12019	Celluloid for Volume Escutcheon	.05

CABINET PARTS-MODEL 493

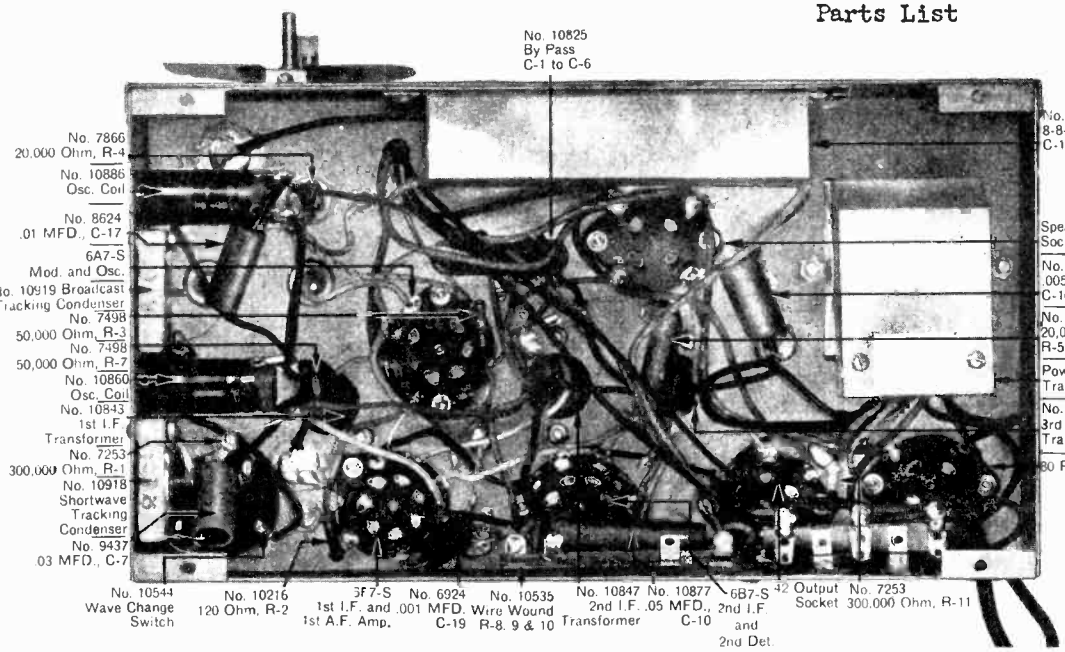
68441	Cabinet only, Model 493	$ 17.35
2840	Chassis Mounting Screws	.01
10999	Escutcheon Plate, Dial	.16
10998	Escutcheon Plate, Volume	.16
2455	Escutcheon Screws 10 for	.04
2564	Fancy Head Thru-Bolts, No. 8-32 x 1¼" 10 for	.10
66912	Grill Cloth, 15" High by 12" Wide per Sq.Ft.	.14
10222	Knob, Round	.07
10245	Knob, Square	.08
10002	Tube Shield Caps	.06
12019	Celluloid for Vol. Escutcheon	.05

-- ******** --

10816	Vibrator Adjustment Wrench, Small	$ 1.00
10817	Vibrator Adjustment Wrench, Large	1.75

GRIGSBY - GRUNOW CO.

MODEL 55,59,75,195,560,566
(Chassis 500)
Chassis view, Alignment
Parts List



CHASSIS 500

Models 55, 59, 75, 195, 560 and 566

THE CIRCUIT

Chassis 500 is in many ways a radical departure from conventional design and accomplishes the maximum performance with a minimum number of tubes through the use of the new Majestic DUO-VALVE tubes and circuit.

Good pre-selection is obtained through the use of an extremely low loss antenna coil. The tuned antenna circuit is fed into a duo-valve 6A7-S, which serves the double purpose of oscillator and modulator. The intermediate frequency output of this tube is fed through a double tuned I. F. transformer into the first intermediate frequency amplifier, the pentode section of the duo-valve 6F7-S. This is coupled through the second I. F. transformer to the pentode section of the duo-valve 6B7-S. The intermediate frequency output of this tube is then fed separately into the two diode plates of the same tube. One of these diodes is used for the audio or signal channel, and the other for automatic volume control. The use of separate diodes for these two purposes results in exceptional fidelity, since the audio diode is not negatively biased, and results in extremely good automatic volume control action, since full automatic volume control may be exercised on three of the tubes of the five-tube set. The detected audio output of the 6B7 diode is then fed into the grid of the triode section of the duo-valve 6F7-S where it is amplified, finally driving the 42 output tube. The familiar type 80 tube is used as the power supply rectifier.

TWO WAVE BAND RECEPTION

Reception is provided on two wave bands, the broadcast band extending from 535 to 1550 K. C., the short wave band overlapping it from 1480 to 4440 K. C. The change from one band to the other is accomplished by the turn of a switch located on top of the chassis frame and easily accessible from the rear of the cabinet.

CONTROLS

A decidedly new feature is employed in the mechanical construction of the dial assembly and drive shaft. The gang condenser is fitted with a planetary drive, having a ratio of 5½ to 1. The knob is attached to the inner shaft while the dial scale and rotor plates of the gang condenser are attached to the outer drive making fine adjustment of condenser possible.

ALIGNMENT PROCEDURE

Chassis 500

The receiver must be aligned with the volume control in maximum position.

1. Set wave change switch in broadcast position and gang condenser in full mesh. Supply a 456 kilocycle signal to the 6A7 converter grid and align all the I. F. tuning condensers for maximum sensitivity.

2.* Turn the gang condenser completely out of mesh. Set the dial to the calibration line for 4400 K. C. and lock the dial to the condenser shaft.

3. Set the dial at 1500 K. C. and after supplying a 1500 K. C. signal to the input of the receiver, align the gang condenser trimmers for maximum output.

4. Set wave change switch to short wave position. Supply a 1500 K. C. signal to the input of the receiver and then tune the shortwave tracking condenser (rear of left side of chassis) and the gang condenser simultaneously for maximum output. For each adjustment of the tracking condenser there will be a different gang condenser setting which gives maximum output. The combination of gang setting and tracking condenser adjustment which gives maximum output, disregarding setting, is the correct adjustment.

5. Set wave change switch to broadcast position. Supply a 600 K. C. signal to the input of the receiver and then adjust the broadcast tracking condenser (front of left side of chassis) and the gang condenser simultaneously for maximum output. Adjustment should be made in the same manner as directed in paragraph No. 4. If necessary, readjust gang condenser trimmers as in No. 3 above.

*Note—Paragraph No. 2 is only followed when it is necessary to replace or recalibrate the dial.

CHASSIS PARTS

PART No.	DESCRIPTION	DEALER'S NET PRICE
10857	Antenna Coil Assembly	$ 0.66
10828	By-Pass Condenser Assembly, C-1 to C-6	.96
7310	Condenser Assembly, .03 MFD., C-9	.13
	Condenser, Cartridge	
9437	.03 MFD., C-7	.16
10877	.05 MFD., C-10	.16
8624	.01 MFD., C-17	.19
9410	.005 MFD., C-18	.16
10827	Condenser, Electrolytic, 8-8-10 MFD., C-11, 12, 13	1.32
	Condenser, Mica	
6641	.00025 MFD., C-16	.13
6242	.0005 MFD., C-15	.12
8990	.001 MFD., C-14	.14
10918	Condenser, Trimmer, Short Wave	.34
10919	Condenser, Trimmer, Broadcast Wave	.19
10871	Condenser, Two Gang	1.32
10870	Dial Scale	.18
10858	Dial Light Bulb, 6.3 Volt	.08
10572	Fahnestock Clip, Antenna, 4 for	.05
9459	Fahnestock Clip, Ground, 4 for	.05
10843	I. F. Transformer Assembly, 1st Complete	1.49
11705	I. F. Transformer Assembly, 2nd Complete	1.32
10852	I. F. Transformer Assembly, 3rd Complete	2.41
10860	Oscillator Coil Assembly, Low Frequency	.29
10866	Oscillator Coil Assembly, High Frequency	.36
10835	Power Transformer, 115 Volt, 50-60 Cycle	2.52
11201	Power Transformer, Universal, 115-240 Volts, 25-133 Cycle	5.61
	Resistors	
0126	120 Ohm, R-2	.11
7481	10,000 Ohm, R-6	.11
7866	20,000 Ohm, R-4	.13
10875	20,000 Ohm, R-5	.21
9058	20,000 Ohm, R-14	.11
7498	50,000 Ohm, R-3, 7	.12
5060	200,000 Ohm, R-13, 15	.12
7253	300,000 Ohm, R-1, 11, 12	.12
10535	Multiple Wire Wound, R-8, 9, 10	.21
	Sockets, Tube	
10840	4 Prong, Rectifier and Speaker Socket	.06
10758	6 Prong	.07
10107	7 Prong	.06
10868	Volume Control	.69
10544	Wave Change Switch	.23
10293	WRENCH for balancing I. F. Transformers	.81

MODEL G-26-H SPEAKER

Used in Cabinets 55, 59, 195 and 566
This type speaker incorporated in chassis

10881	Model G-26-H Speaker Complete	$ 3.25
9476	Cone Assembly	.51
10883	Field Coil (980 Ohm)	.60
8839	Gasket for Cone	.03
10891	Humbuck Coil	.10
10884	Output Transformer Assembly	.78
f0319	Plug, Male, 4 Prong	.05

MODEL G-24-M SPEAKER

Used in Models 75 and 560

11390	Model G-24-M Speaker Complete	$ 4.14
9876	Cone Assembly	.70
11385	Field Coil (1,000 Ohm)	1.02
9084	Gasket for Cone	.02
11387	Output Transformer	.84

MODEL 55,59,75,195,560,566
(Chassis 500)
Schematic, Parts List
Point-to-point data, Coil resistances, Socket layout

GRIGSBY - GRUNOW CO.

RESISTANCE VALUES

ANTENNA COIL
Primary .....27 ohms
Secondary .....3.9 ohms

HI-FREQUENCY OSCILLATOR COIL
Primary .....1.3 ohms
Secondary .....1.1 ohms

LOW FREQUENCY OSCILLATOR COIL
4.5 ohms

1ST I. F. TRANSFORMER
Primary .....20 ohms
Secondary .....20 ohms

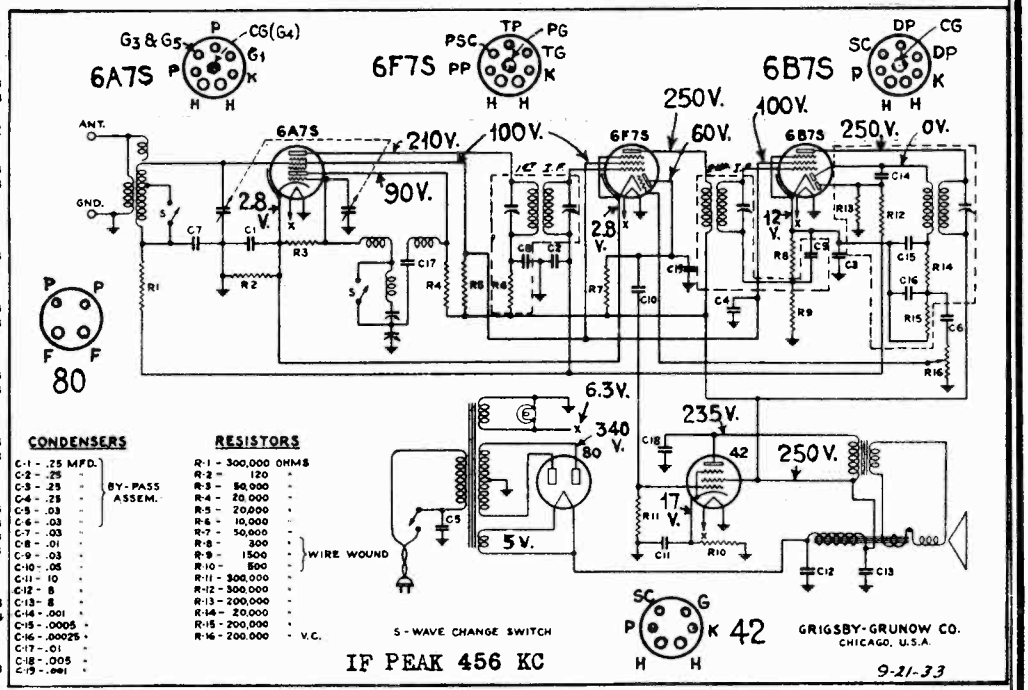
2ND I. F. TRANSFORMER
Primary .....20 ohms
Secondary .....20 ohms

3RD I. F. TRANSFORMER
Primary .....46 ohms
Secondary .....46 ohms

POWER TRANSFORMER
Primary .....9.7 ohms
Hi-voltage sec. .....982 ohms
Heater winding .....36 ohms
Rectifier filament .....24 ohms

SPEAKER
Voice coil .....1.35 ohms
Field coil .....980 ohms

OUTPUT TRANSFORMER
Primary .....425 ohms



CABINET PARTS MODEL 55

PART No.	DESCRIPTION	DEALER'S NET PRICE
67336	Model 55 Cabinet only	$ 6.18
2828	Chassis Mounting Screws.....Per 10	.05
67326	Escutcheon Plate	.16
70609	Escutcheon Screws for above.....Per 10	.01
61181	Felt discs for bottom.....Per Pair	.01
67325	Grill—Aluminum	.34
67327	Grill Cloth—5⅛" H. x 6⅝" W.....Per Sq. Ft.	.20
67331	Knobs for controls	.08
7401	Knob for wave change switch	.03
7433	Spring for Wave Change Knob (7401)	.01

CABINET PARTS MODEL 59

67353	Model 59 Cabinet only	$ 9.21
2828	Chassis Mounting Screws.....Per 10	.05
10246	Escutcheon Plate (Dial)	.19
10268	Escutcheon Plate (Volume)	.19
70609	Escutcheon Screws.....Per 10	.01
61181	Felt discs for bottom.....Per Pair	.01
67346	Grill—Aluminum	.84
67327	Grill Cloth—8¾" H. x 6⅞" W.....Per Sq. Ft.	.20
67351	Knobs for Control	.08
7401	Knob for Wave Change Switch	.03
67352	Nameplate—Majestic	.03

CABINET PARTS MODEL 75

68362	Model 75 Cabinet only	$26.40
10999	Escutcheon Plate (Dial)	.16
10998	Escutcheon Plate (Volume)	.16
2895	Fancy Head Thru Bolts No. 8—32x1".....2 for	.01
66459	Grill Cloth, 8" H. x 8" W.....Per Sq. Ft.	.16
10222	Knobs for controls	.07
7401	Knob for Wave Change Switch	.03

CABINET PARTS MODEL 195

67697	Model 195 Cabinet only	$ 3.60
2828	Chassis Mounting Screws.....10 for	.05
10999	Escutcheon Plate (Dial)	.16
10998	Escutcheon Plate (Volume)	.16
10222	Knobs for Control	.07
7401	Knob for Wave Change Switch	.03
66912	Grill Cloth—8" H. x 10" W.....Per Sq. Ft.	.14

CABINET PARTS MODEL 560

67807	Model 560 Cabinet only	$17.28
10999	Escutcheon Plate (Dial)	.16
10998	Escutcheon Plate (Volume)	.16
2895	Fancy Head Thru Bolts No. 8—32x1".....2 for	.01
66912	Grill Cloth, 15" H. x 12" W.....Per Sq. Ft.	.14
10222	Knobs for control	.07
7401	Knob for Wave Change Switch	.03
67544	Name Plate—Majestic	.10

CABINET PARTS MODEL 566

68151	Model 566 Cabinet only	$16.80
68145	Drawer Pulls	.18
10999	Escutcheon Plate (Dial)	.16
66912	Grill Cloth, 9" H. x 7½" W.....Per Sq. Ft.	.14
68144	Knobs for controls	.08
7401	Knob for Wave Change Switch	.03
67544	Name Plate—Majestic	.10

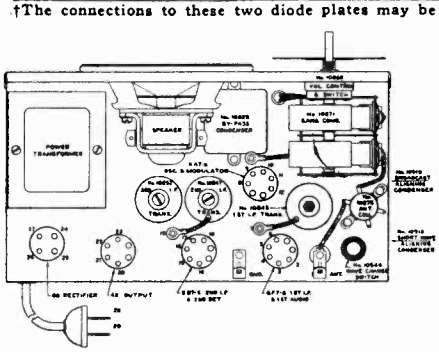
RESISTANCE CHART

All readings are taken from designated points to ground except those marked with an asterisk (*) which are taken to terminal No. 25, with all tubes removed from their sockets, volume control in maximum position and the speaker connected in the circuit.

Terminal Number	Resistance In Ohms	If resistance differs greatly from value shown, check the following
1	27	Primary of antenna coil.
2	120	R-2 and C-1.
3	200,000	Volume Control.
4	Very high	C-4, C-10, C-13, C-12 and C-8.
*4	50,980	R-7 and field coil.
*5	20,980	R-5 and field coil.
*6	1,000	Primary of 2nd I. F. Transformer and field coil.
7	500,020	Secondary of 1st I. F. Trans. C-2, R-12 and R-13.
8	Same as No. 2	
9	50,120	R-2, R-3 and C-1.
*10	20,980	R-4 and field coil.
*11	Same as No. 5	
*12	11,000	Primary of 1st I. F. Transformer, R-6 and field coil.
13	800,003.9	Secondary of ant. coil, C-7 and R-1. Also see terminal No. 7.
14	1,800	R-8, C-9, C-3 and R-9.
†15	200,000	R-13.
†16	221,846	R-14, C-15, C-16, R-15, C-6, C-3, C-9, R-8 and R-9.
*17	Same as No. *5	
*18	1,026	Primary of 3rd I. F. Transformer and field coil.
19	1,520	Secondary of 2nd I. F. Transformer, R-9, C-9, R-8 and C-3.
20	500	R-10 and C-11.
21	300,000	R-11.
*22	980	Field coil.
*23	1,405	Primary of output transformer and field coil.
*24	.24	Rectifier filament winding.
25	Very high	C-12, C-13, C-8 and C-4.
26	490	Hi-voltage secondary of power transformer.
27	490	Hi-voltage secondary of power transformer.
28	Open	Primary of power transformer, C-5 and "On-off" Switch.
29	Open	See terminal No. 28.

†The connections to these two diode plates may be reversed with no effect.

Due to manufacturing tolerances on carbon resistors, the values given above may be expected to differ plus or minus 15 per cent.



POWER TRANSFORMER COLOR CODE
115 Volt, 50-60 Cycle

Primary.....Stranded yellow
Hi-voltage.....Stranded red
Hi-voltage C.T...Stranded black
Heater.....Solid black
Rect. filament.....Solid yellow

INTERFERENCE REJECTOR

Eliminates interference from stations on frequencies within close proximity to intermediate frequency.

No. 11491 .....$0.52½

GRIGSBY - GRUNOW CO.

MODEL 95, 105
(Chassis 520)
Notes

TECHNICAL DATA PERTAINING TO MODEL 520 CHASSIS
(Employed in Models 95 and 105 Receivers)

THE CIRCUIT

The six tube Model 520 chassis employed in the No. 95 Console and No. 105 Table Models is designed for efficient battery operation. The batteries required for its operation are as follows:-

1 - Air-cell "A" battery or equivalent
3 - 45 volt "B" batteries
1 - 22½ volt "C" battery

The receiver employs an intermediate frequency of 175 k.c. and the tuning range is between 535 and 1730 k.c. The current consumption from the "B" batteries is approximately 30 milliamperes, which is very low considering the excellent performance and power of the receiver.

A double pole switch is employed to turn the receiver "on" and "off". One pole of the switch is connected between the positive side of the "A" battery and ground and the other pole is connected between the negative side of the "B" batteries and ground; thus, when the set is in the "off" position, there is no flow of current from any of the batteries.

Control of the volume is obtained by using a 200,000 ohm potentiometer which varies the audio input to the grid of the type 25 tube. This method of volume control in no way effects the sensitivity or fidelity of the receiver.

It is imperative that a good ground connection be employed with the receiver. Unlike receivers designed for operation on alternating current where a ground return is sometimes unnecessary due to the fact that a return is obtained through the A.C. line, it is very important that the receiver employ a good ground connection.

DELAYED AUTOMATIC VOLUME CONTROL

In the automatic volume control system employed in the Model 520 chassis, one diode plate of the 25 tube is used for audio development only, and the other diode plate for A.V.C. development only. With this arrangement it is possible to get away from negatively biasing the audio circuit; resulting in better fidelity and greater A.V.C. action.

SPEAKER

The speaker employed in conjunction with the Model 520 chassis is of the permanent magnet dynamic type. The large magnet employed on this speaker provides field flux about equal to that obtained in the conventional field coil excited type dynamic speaker. The use of the permanent magnet for field excitation greatly reduces the amount of current that would be consumed from the "B" batteries to operate a dynamic speaker. The output and excellent fidelity obtained from this permanent magnet dynamic speaker is comparable to that obtained from the field coil excited type dynamic speaker.

MODEL 95, 105
(Chassis 520)
Voltage, Alignment
Coil resistances

GRIGSBY - GRUNOW CO.

ALIGNMENT PROCEDURE

1 - The receiver must be aligned with volume control in maximum position.

2 - Supply a 175 k.c. signal to the grid of the 1A6 modulator tube and adjust the three I.F. tuning condensers for maximum sensitivity.

3 - Set the gang condenser in minimum capacity position (all the way out of mesh), supply a 1730 k.c. signal to the input of the receiver and align the three gang condenser trimmers for maximum sensitivity.

TABLE OF VOLTAGES

(To Ground)

TYPE	PURPOSE	PLATE VOLTS	SCREEN VOLTS	GRID VOLTS
34	R.F. Amp.	135	67.5	-3
1A6	Modulator	135	67.5	-3
	Oscillator	67.5	----	0
34	I.F. Amp.	135	67.5	-3
25	2nd Det. & 1st Audio	Triode *70	----	-3
33	Output	130	135	-16.5

* Actual voltage at plate of tube. This reading will be much lower when a common voltmeter is used to measure this voltage because of the drop across the 300,000 ohm plate resistor, R-6.

NOTE: The voltages shown above are taken with "A", "B" and "C" voltages supplied to the receiver as indicated on the schematic diagram.

MISCELLANEOUS RESISTANCES

ANTENNA COIL
Primary - 22.16 ohms
Sec. (Total) - 5.38 ohms

R.F. COIL
Primary - 146 ohms
Sec. (Total) - 5.15 ohms

OSCILLATOR COIL
Primary - 2.7 ohms
Sec. - 2.13 ohms

IST. I.F. TRANSFORMER
Primary - 125 ohms
Sec. - 122 ohms

2ND I.F. TRANSFORMER
Primary - 148 ohms
Audio Sec. - 69.3 ohms
A.V.C. Sec. - 68.3 ohms

OUTPUT TRANSFORMER
Primary - 450 ohms
Sec. - .42 ohms

R.F. CHOKE ---- 85 ohms

VOICE COIL ---- 1.73 ohms

BATTERY CABLE COLOR CODE

Red - B+ 135 Volts
White - B+ 67½ Volts
Brown - B-
Blue - A-
Black - A+

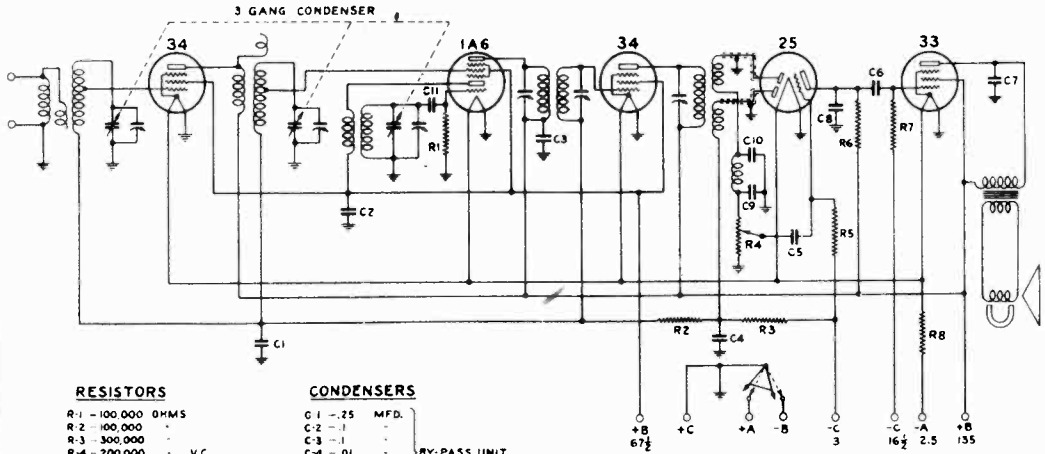
GRIGSBY - GRUNOW CO.

MODEL 95, 105
(Chassis 520)
Schematic, Socket layout
Condenser assembly

FIG. 191

REVISIONS	ISSUE	MEMO
10 2 33	1	6324

SCHEMATIC DIAGRAM OF MAJESTIC MODEL 520 BATTERY RECEIVER



RESISTORS

R-1	100,000	OHMS
R-2	100,000	-
R-3	300,000	-
R-4	200,000	- V.C.
R-5	500,000	-
R-6	300,000	-
R-7	500,000	-
R-8	0.66	-

CONDENSERS

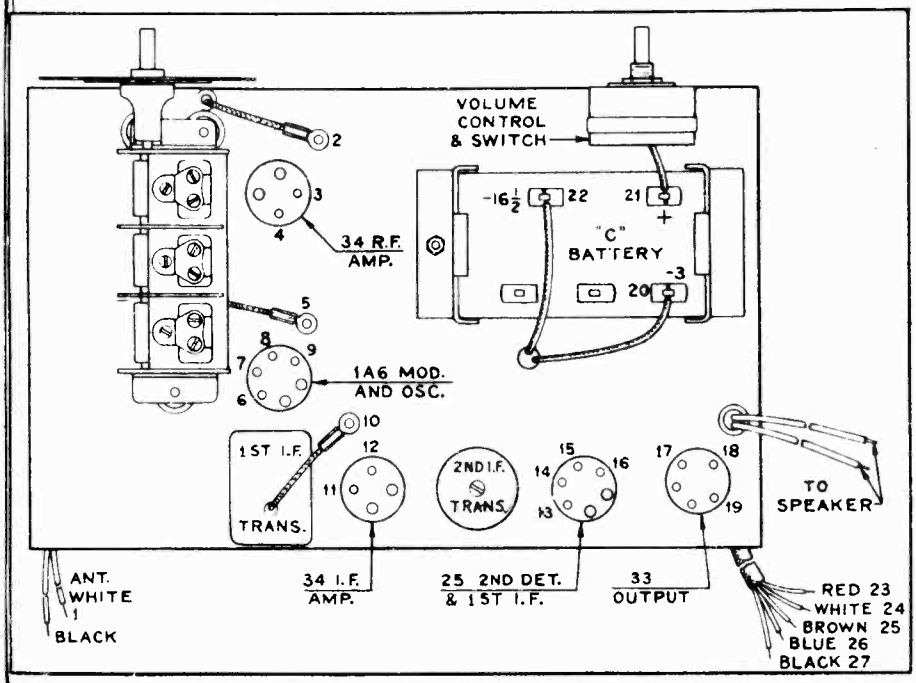
C-1	.25	MFD.
C-2	.1	-
C-3	.1	-
C-4	.01	-
C-5	.03	-
C-6	.03	-
C-7	.005	-
C-8	.0005	-
C-9	.0005	-
C-10	.0005	-
C-11	.00025	-

BY-PASS UNIT

IF PEAK 175 KC.

GRIGSBY-GRUNOW CO.
CHICAGO, U.S.A.

SCHEMATIC DIAGRAM OF MODEL 520 CHASSIS



RESISTANCE CHART DIAGRAM

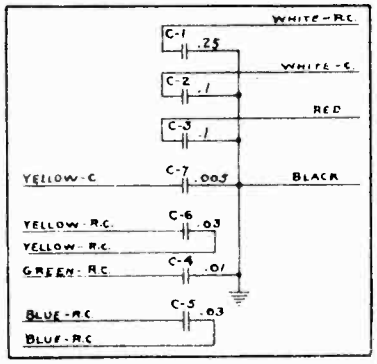


Diagram showing internal connections of #11245 Bypass Condenser Assembly. Reference numbers correspond to those used in the schematic diagram.

MODEL 95, 105
(Chassis 520)
Point-to-point data

GRIGSBY - GRUNOW CO.

RESISTANCE CHART

All readings are taken between the two designated terminals with speaker connected, all tubes removed from their sockets, batteries disconnected and switch in "on" position.

FROM TERMINAL	TO TERMINAL	RESISTANCE IN OHMS	IF RESISTANCE DIFFERS GREATLY FROM VALUE SHOWN CHECK THE FOLLOWING :
1	Ground	22.16	Primary of Ant. Coil
2	20	400,004	Sec. of ant. Coil, R-2 and R-3
2	Ground	Open	C-1, C-4 and C-5.
3	24	0	Connections.
3	Ground	Open	C-2.
4	23	146	Pri. of R.F. Coil
4	Ground	Open	C-3, C-8 and C-7.
5	20	400,004	Sec. of R.F. Coil, R-2 and R-3.
6	24	0	Connections
7	Ground	100,000	R-1 and C-11
8	24	2.7	Pri. of Osc. Coil.
9	23	125	Pri. of 1st I.F. Trans.
10	20	400,122	Sec. of 1st I.F. Trans., R-2 and R-3.
11	24	0	Connections.
12	23	148	Pri. of 2nd I.F. Trans.
13	20	500,000	R-5.
13	Ground	Open	C-5
14	20	300,068.3	A.V.C. secondary of 2nd I.F. Trans. and R-3.
15	Ground	200,154.3	Audio sec. of 2nd I.F. Trans.,R.F.C.,R-4,C-10 &C-9.
16	23	300,000	R-6
16	Ground	Open	C-8, C-3 and C-7
16	18	Open	C-6.
17	23	0	Connections.
18	22	500,000	R-7.
19	23	450	Primary of output trans.
20	Ground	Open	C-4, C-1, and C-5.
21	Ground	0	Connections.
23	Ground	Open	C-7, C-8 and C-3.
24	Ground	Open	C-2.
25	Ground	0	Connections and switch
27	Ground	0	Connections and switch

Due to manufacturing tolerances on carbon resistors, the readings given above may be expected to differ plus or minus 15 per cent.

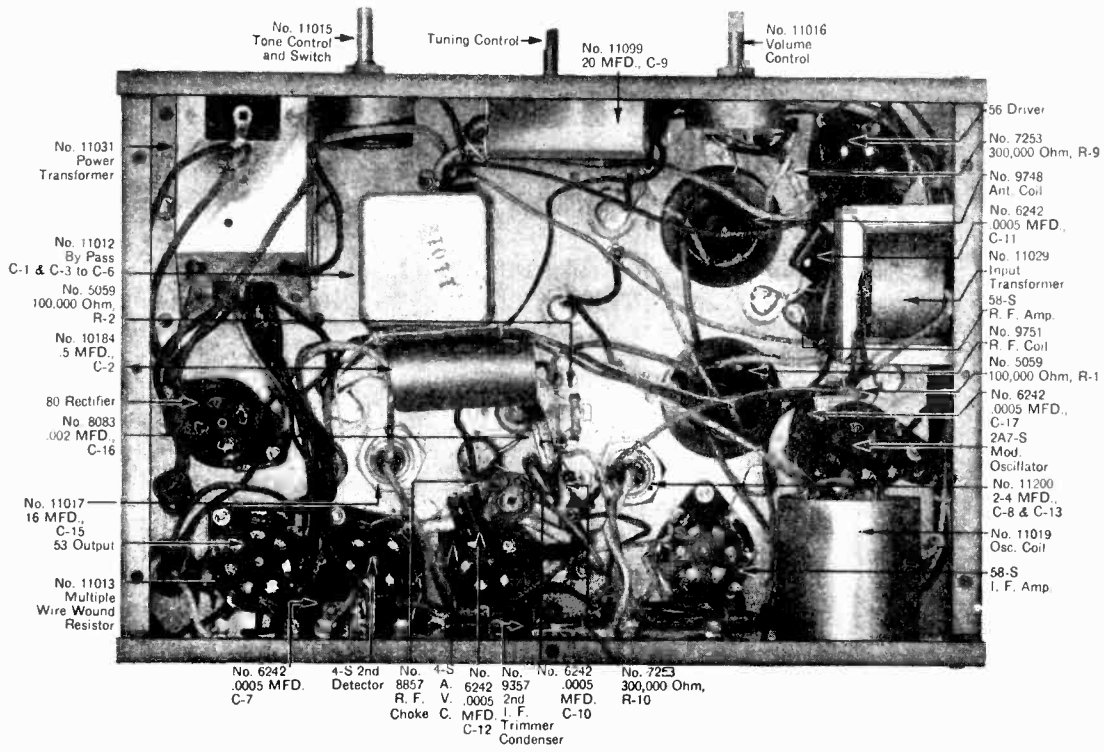
GRIGSBY - GRUNOW CO.

MODEL 95, 105 (Chassis 520)
Parts List

PART NO.	CHASSIS PARTS	DEALER'S NET PRICE
11241	Chassis Only, Model 520	$ 15.00
9748	Antenna Coil	.51
11636	Battery Cable (Console Model 95)	.48
11637	Battery Cable (Table Model 105)	.76
11245	By-Pass Condenser Assembly, C-1 to C-7	1.15
6641	Condenser, Mica, .00025 MFD., C-11	.13
6242	Condenser, Mica, .0005 MFD., C-8, 9, 10	.12
9753	Condenser, Three Gang	2.24
11248	Dial and Drive Assembly	.72
10753	Spring for above Dial Assembly	.02
10148	I.F. Transformer, 1st.	.92
11361	I.F. Transformer, 2nd.	.78
10197	Oscillator Coil	.27
	RESISTORS	
5059	100,000 ohm, R-1, 2	.13
7253	300,000 ohm, R-3, 6	.12
7482	500,000 ohm, R-5, 7	.11
11256	Wire Wound with Terminal Strip, R-8	.22
8857	R.F. Choke Assembly	.32
9751	R.F. Coil	.51
	TUBE SOCKETS	
10840	4 Prong	.06
9659	5 Prong	.06
10758	6 Prong	.07
11378	Volume Control and Switch	.65
	SPEAKER PARTS	
11383	P.M. Dynamic Speaker, Complete	6.90
11608	Cone Assembly	1.71
11609	Output Transformer	1.47
11610	Permanent Magnet with Cone Assembly	3.30
	CABINET PARTS - MODELS 95 and 105	
68413	Cabinet Model 95, Complete	18.25
67714	Cabinet Model 105, Complete	3.90
11546	Escutcheon Plate, Dial	.15
10998	Escutcheon Plate, Volume	.16
10222	Knobs for Control	.07
12019	Celluloid for Volume Escutcheon	.05

MODEL 85, 86, 998
(Chassis 800)
Chassis view, Voltage
Notes, Parts List

GRIGSBY - GRUNOW CO.



CHASSIS 800

Models 85, 86 and 998

TABLE OF VOLTAGES

Tube Type	Purpose	Plate	Screen D.C.	Cathode D.C.	Grid D.C.
58-S	R. F. Amp.	250 D.C.	103	0	—3
2A7-S	Modulator	250 D.C.	103	0	—3
	Oscillator	103 D.C.	...	0	0
58-S	I. F. Amp.	250 D.C.	103	0	—3
4-S	2nd Det.	0 D.C.	...	12.5	...
4-S	A. V. C.	0 D.C.	...	12.5	...
56	Driver	245 D.C.	...	12.5	0
53	Output	245 D.C.	...	—3	—3
80	Rectifier	315 A.C.	...	...	...

Line Voltage—115 Volts A.C.

THE CIRCUIT

Chassis 800 provides full range tone control, police call reception, excellent automatic volume control and class "B" output from a single tube. Due to the dual operation of one of the tubes, nine tube performance is realized.

The intermediate frequency is 175 K. C. The tuning range is 535 to 1730 K. C. A separate 4-S tube is used for the audio or signal channel, and another 4-S tube for the automatic volume control.

CLASS "B" OUTPUT

Part of the circuit consists of class "B" amplification for which a type 56 tube is used as a driver and a type 53 tube as the output. This output tube is a double triode amplifier having two plates and two control grids, thus doing the work of two tubes and making possible tremendous output.

ALIGNMENT PROCEDURE

The receiver must be aligned with the volume control in maximum position.

1. Supply a 175 K. C. signal to 2A7-S converter grid and adjust the 3 I. F. aligning condensers for maximum sensitivity. Use a weak signal that is just strong enough to give a reading on the output meter.

*2. Turn the gang condenser completely in mesh. Set the dial to the gauge mark beyond 540 K. C. and secure it to the gang condenser shaft.

3. With the gang condenser completely out of mesh, supply a 1730 K. C. signal to the input of the receiver and align the 3 gang condenser trimmers for maximum sensitivity.

*Note—Paragraph No. 2 is only followed when it is necessary to replace or recalibrate the dial.

ALWAYS USE A GOOD OUTPUT METER TO INDICATE MAXIMUM SENSITIVITY.

CHASSIS PARTS

PART No.	DESCRIPTION	DEALER'S NET PRICE
9748	Antenna Coil	$0.51
11012	By-Pass Condenser Assembly, C-1 and C-3 to C-6	1.23
7210	Condenser Assembly for I. F., ADJUSTABLE	.14
10184	Condenser, .5 MFD., C-2	.22
	Condenser, Electrolytic	
11200	2-4 MFD., C-8 and C-13	.61
11017	16 MFD., C-15	1.20
11099	20 MFD., C-9	.48
	Condenser, Mica	
6242	.0005 MFD., C-7, 10, 11, 12, 17	.12
8083	.002 MFD., C-16	.14
11022	Condenser, Gang	2.49
11025	Dial and Drive Assembly	.70
1741	Dial Light, 2.5 Volt. See Main Catalog Page 95	
7821	I. F. Transformer Assembly, 1st	1.09
11014	I. F. Transformer Coil, 2nd	.49
11019	Oscillator Coil	.39
	RESISTORS	
5059	100,000 Ohm, R-1, 2	.13
7253	300,000 Ohm, R-9, 10	.12
11013	Multiple, Wire Wound, R-3 to R-8	.78
8857	R. F. Choke Coil Assembly	.32
9751	R. F. Coil	.51
	TRANFORMERS	
11029	Input Audio	1.22
11031	Power, 115 Volt, 60 Cycle	2.85
11036	Power, Universal, 110-240 Volts, 25-133 Cycle	7.41
11015	Tone Control and Line Switch	.45
	TUBE SOCKETS	
11011	4 Prong, Rectifier	.07
8852	5 Prong	.06
8851	6 Prong	.08
11010	7 Prong, for 2A7 and 53	.08
11016	Volume Control	.66

MODEL G-22-L SPEAKER

11054	Model G-22-L Speaker Complete	$6.12
9118	Cone Assembly	.73
8361	Condenser Assembly, .07 MFD., C-14	.23
8925	Field Coil (970 Ohm)	1.40
8932	Gasket for Cone	.11
9149	Output Transformer	.97

CABINET PARTS MODEL 998

68308	Model 998 Cabinet Only	
2537	Chassis Mounting Screws	$0.02
68306	Escutcheon Plate—Chromium	.21
2455	Escutcheon Screws—Chromium Per 10	.04
2841	Fancy Head Thru Bolts for Speaker	.04
67327	Grill Cloth, 20½" H. x 11½" W. Per Sq. Ft.	.20
68302	Knob for Controls	.08
2626	Rubber Washers for Mounting Chassis	.01

GRIGSBY - GRUNOW CO.

MODEL 85, 86, 998
(Chassis 800)
Schematic, Parts List
Socket layout,
Point-to-point data

RESISTANCE VALUES

ANTENNA COIL
Primary .....21 ohms
Secondary .....5.3 ohms

R. F. COIL
Primary .....142 ohms
Secondary .....5.2 ohms

OSCILLATOR COIL
Primary .....2.6 ohms
Secondary .....2.3 ohms

1ST I. F. TRANSFORMER
Primary .....89 ohms
Secondary .....92 ohms

2ND I.F. TRANSFORMER
Primary .....140 ohms
A. V. C. Secondary..70 ohms
Audio Secondary ...70 ohms

R. F. C.
85 ohms

INPUT TRANSFORMER
Primary .....780 ohms
Total Secondary...282 ohms

OUTPUT TRANSFORMER
Primary .....395 ohms

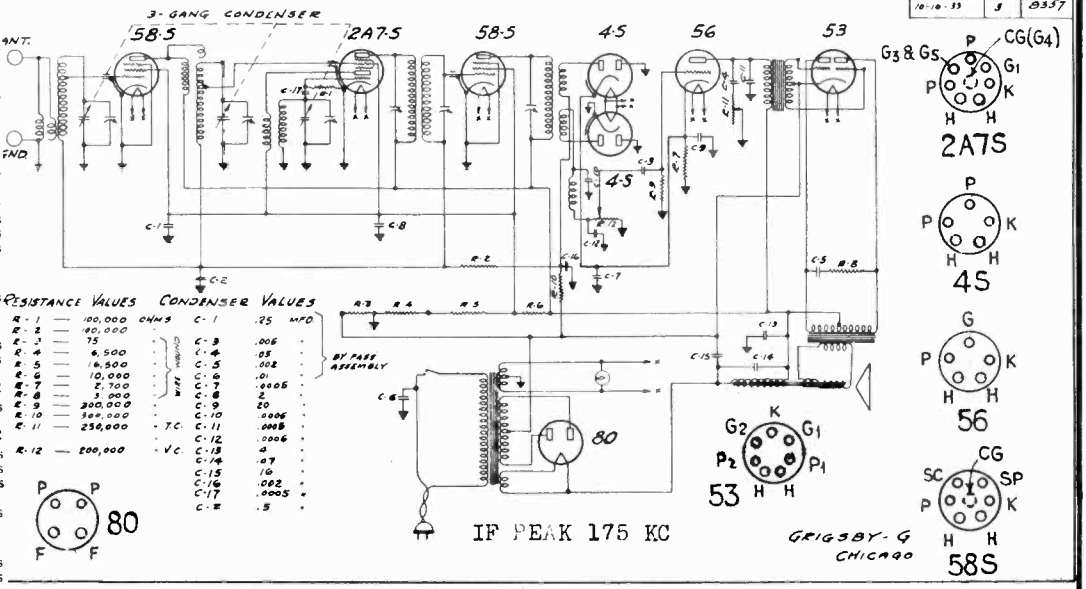
POWER TRANSFORMER
Primary .....4.3 ohms
Heater .....035 ohms
Rectifier Filament .17 ohms
Hi-Volt Sec. (total)
320 ohms

SPEAKER
Field Coil.....970 ohms
Voice Coil .....2.25 ohms

SCHEMATIC DIAGRAM OF MAJESTIC MODEL 800 RECEIVER

FIG-188

REVISIONS	IRS.	MEMO
9-6-33	1	8257
9-21-33	2	8288
10-16-33	3	8357

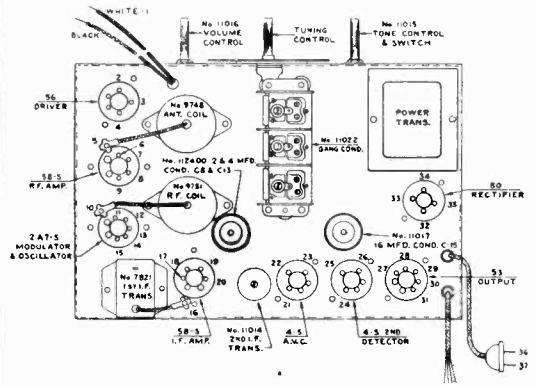


CABINET PARTS MODEL 85

PART No.	DESCRIPTION	DEALER'S NET PRICE
67650	Model 85 Cabinet Only	$51.06
67651	Base Bracket, Right	.30
67640	Base Bracket, Left	.30
66588	Bullet Catches and Strike	.02
67627	Doors	2.99
67462	Door Pulls	.87
7888	Escutcheon Plate	.16
2455	Escutcheon Screws Per 10	.04
67327	Grill Cloth, 12⅛" H. x 14¾" W. Per Sq. Ft.	.20
67649	Hinge for Bottom. Specify Left or Right	.12
67648	Hinge, Left Top	.12
67652	Hinge, Right Top	.12
67641	Knob for Controls	.06
67637	Post, Right Front	.30
67639	Post, Right Rear	.27
67636	Post, Left Front	.30
67638	Post, Left Rear	.27

CABINET PARTS MODEL 86

67546	Model 86 Cabinet Only	$33.02
2537	Chassis Mounting Screws	.02
7888	Escutcheon Plate	.16
2455	Escutcheon Screws Per 10	.04
2564	Fancy Head Thru Bolts for Speaker Per 10	.10
67392	Grill Cloth, 18¼" H. x 10" W. Per Sq. Ft.	.21
10222	Knob for Controls	.07
2626	Rubber Washers for Mounting Chassis	.01



POWER TRANSFORMER COLOR CODE

115 Volts, 50-60 cycle

Primary	Stranded yellow	Heater	Solid black
Hi-voltage	Stranded red	Heater C. T.	Stranded black
Hi-Voltage C. T.	Stranded brown	Rectifier filament	Solid yellow

Schematic Diagram Chassis 800

RESISTANCE CHART

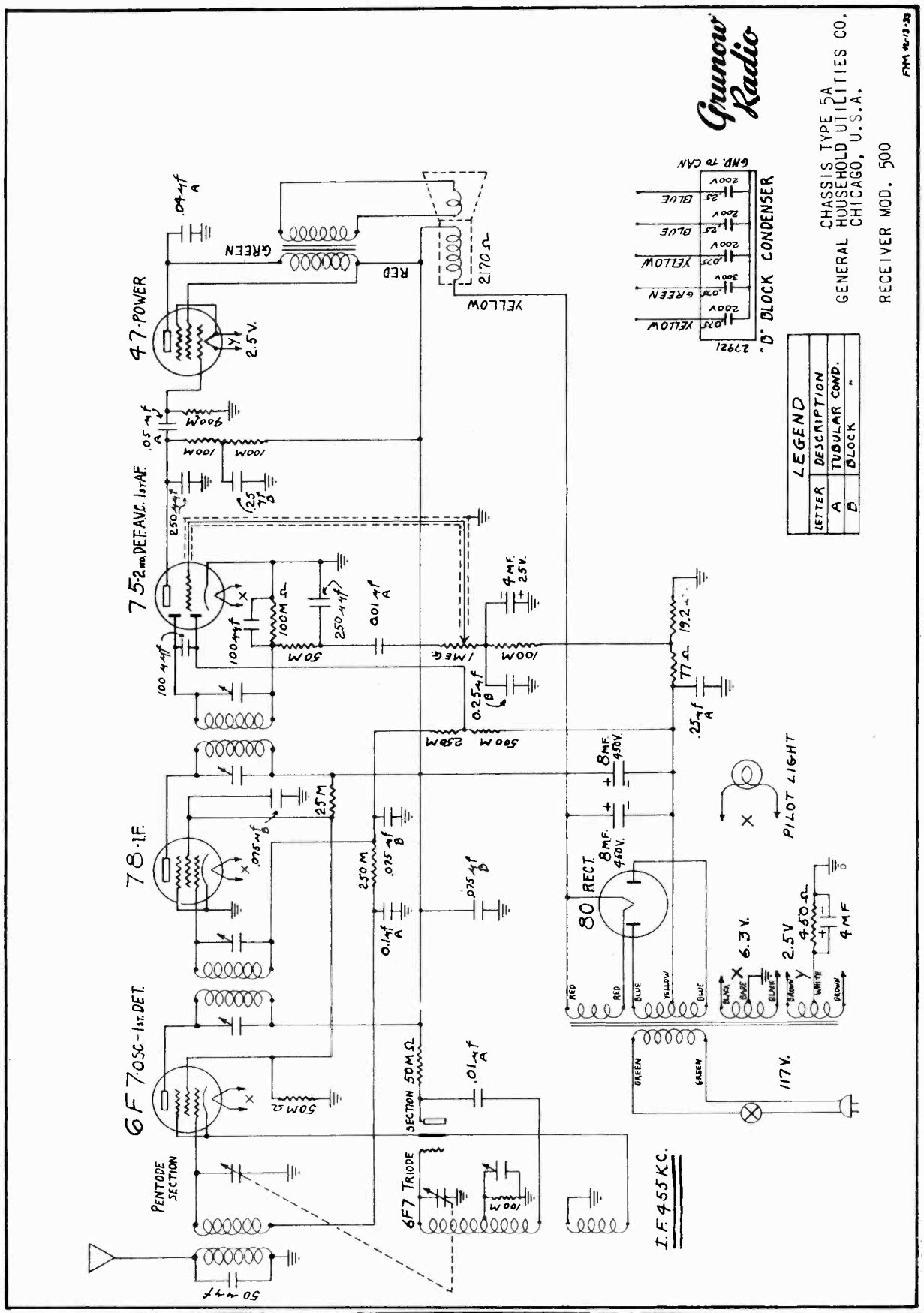
All readings are taken from designated points to ground except those marked with an asterisk (*) which are taken to terminal No. 33, with all tubes removed from their sockets, and the speaker connected in the circuit.

Terminal Number	Resistance In Ohms	If resistance differs greatly from value shown, check the following
1	21	Primary of Antenna coil.
2	2,700	R-7 and C-9.
3	300,000	R-9 and C-3.
4	Very high	C-4, C-11, C-13, C-14 and C-15.
*4	1,750	Primary of input transformer and field coil.
5	400,078.3	Secondary of ant. coil, C-2, R-2, C-16, R-10 and R-3.
6	0	Ground connection.
7	0	Ground connection.
8	23,000	R-4, R-5, C-7, C-13, C-1 and C-8.
*8	10,970	R-6, and field coil.
*9	1,112	Primary of R.F. coil and field coil.
10	400,078.3	Secondary of R.F. coil, C-2, R-2, C-16, R-10 and R-3.
11	0	Ground connection.
12	100,000	R-1 and C-17.
*13	10,972.6	Primary of oscillator coil, R-6 and field coil.
14	Same as No. 8	
*14	Same as No. *8	
*15	1,059	Primary of 1st I. F. Transformer and field coil.
16	400,167	Secondary of 1st I. F. Trans., R-2, C-16, R-10 and R-3.
17	0	Ground connection.
18	0	Ground connection.
19	Same as No. 8	
*20	1,110	Primary of 2nd I. F. Transformer and field coil.
21	6,500	R-4 and C-7.
22	300,145	A. V. C. secondary of 2nd I. F. Trans., C-16, R-10 and R-3.
23	0	Ground connection.
24	0	Ground connection.
25	200,155	Audio secondary of 2nd I. F. Trans., R. F. C., C-10, C-12 and R-12.
26	0	Ground connection.
27	Very high	Primary of output trans. for ground, C-13 and C-15.
*27	1,167	Primary of output transformer and field coil.
28	216	Secondary of input transformer and R-3.
29	75	R-3.
30	Same as No. 28	
31	Same as No. 27	
*31	Same as No. *27	
32	Very high	C-15, C-14 and C-13.
33	Same as No. 32	
34	235	Hi-voltage Secondary and R-3.
35	Same as No. 34	
36	Open	C-6, line switch and primary of power transformer.
37	Same as No. 36	

Due to manufacturing tolerances on carton resistors, the readings given above may be expected to differ plus or minus 15 per cent.

GENERAL HOUSEHOLD UTILITIES CO.

MODEL 500
(Chassis 5-A)
Schematic, Condenser assembly



MODEL 500
(Chassis 5-A) Parts List

GENERAL HOUSEHOLD UTILITIES CO.

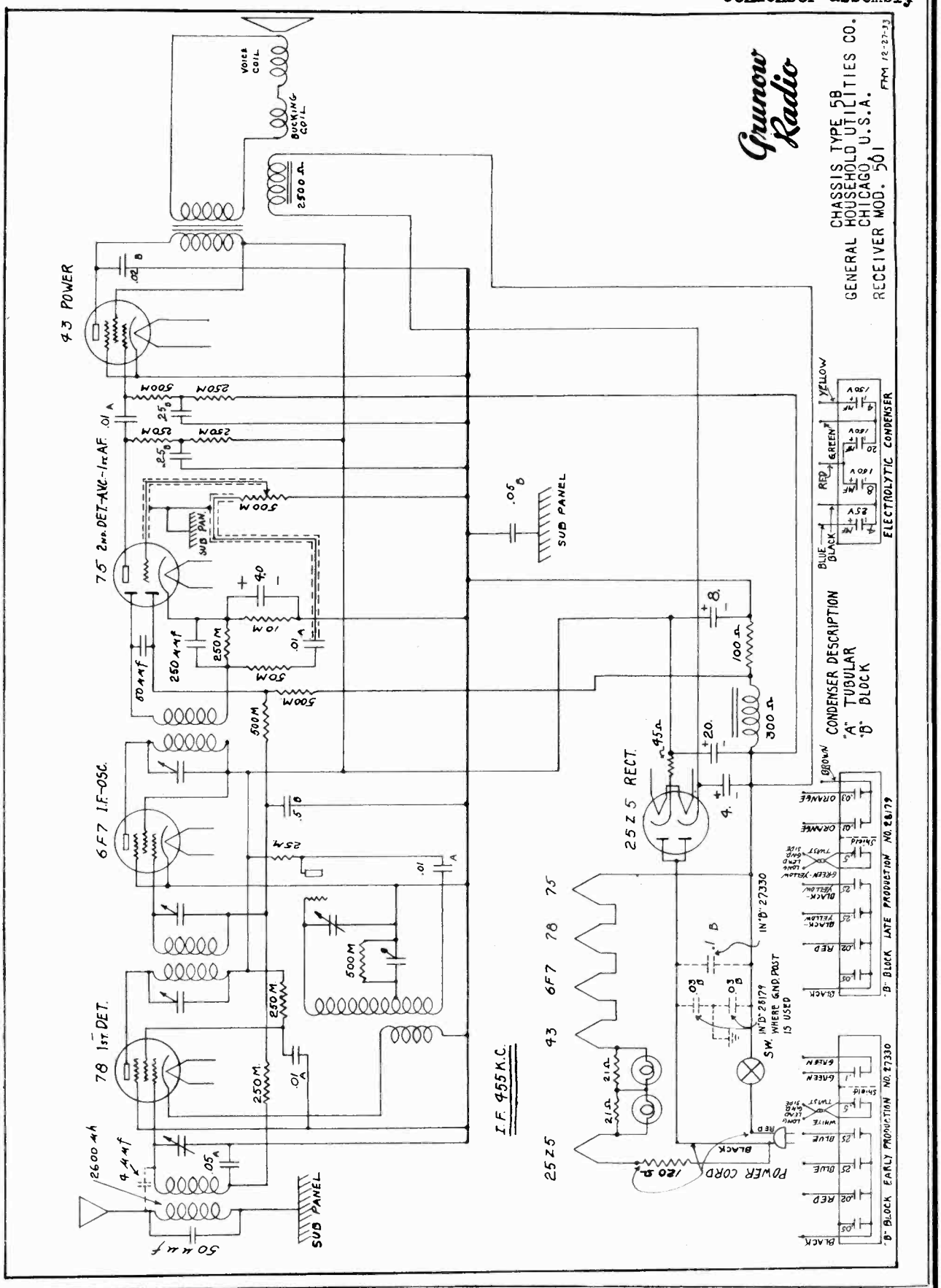
PARTS PRICE LIST
5A CHASSIS

Part No.	Description	No. Req.	List Price
20861	Line Cord & Plug	1	.35
20929	Resistor, 50,000 Ohm Carbon, 1 Watt	1	.25
20962	Grid Cap Only	3	.02
22333	Ant. Binding Post Assembly	1	.10
22757	Tube Socket - 47	1	.15
23368	Resistor, 400,000 Ohm Carbon, 1/4 Watt	1	.25
23370	" 100,000 " " 1/4 "	5	.25
23849	" 500,000 " " 1/4 "	1	.25
23853	" 50,000 " " 1/4 "	2	.25
23998	" 250,000 " " 1/4 "	2	.25
24251	Condenser, 100 Mmf. Mica	2	.20
24487	Condenser, 250 Mmf. Mica	2	.20
24789	Electrolytic Condenser, 4 Mfd. - 25 Volt	1	.60
26217	Tube Socket - 75	1	.15
26218	" " - 78	1	.15
26219	" " - (6F7)	1	.15
26514	Resistor, 25,000 Ohm Carbon, 1/2 Watt	1	.25
26564	Tube Shield Base	2	.10
26814	Tube Socket - 80	1	.15
26898	Tube Shield (Goat)	2	.10
27172	Pilot Light Bracket Assembly	1	.15
27188	Trimmer Assembly (Oscillator)	1	.35
27283	Shield Can for 2nd I.F. Transformer	1	.40
27492	Walnut Knob - Station Selector and Volume Control	2	.15
27712	Electrolytic Condenser, 8 Mfd. 450 Volt	1	1.15
27713	" " 8 " 450 Volt (Chrome)	1	1.20
27828	Power Transformer	1	4.00
27830	Tuning Condenser	1	2.40
27834	Volume Control	1	1.10
27835	Insulated Terminal (1 lug)	2	.05
27836	Resistor, 450 - 19.2 - 77 Ohm, Wire Wound	1	.30
27838	Electrolytic Condenser, 4 Mfd. - 25 Volt (Dry)	1	.50
27914	Shield Assembly (Antenna Coil)	1	.15
27918	2nd I.F. Transformer, - Less Shield Can	1	2.90
27919	1st I.F. Transformer with Shield Can	1	1.50
27921	Bypass Condenser Block	1	2.00
27926	Antenna Transformer	1	.90
27927	Terminal Strip (3 Lug)	1	.05
27928	Oscillator Transformer	1	.70
27930	Resistor Panel & Lug Assembly	1	.10
27935	Dial Plate & Chart	1	.30
28045	Pilot Lamp 6-8 Volt	1	.15
28721	Condenser, .01 Mfd. 400 Volt, Tubular	2	.25
28722	" .04 " 400 " "	1	.25
28723	" .05 " 400 " "	1	.25
28728	" .25 " 200 " "	1	.25
63839	Felt Knob Washer 3/4"	2	.01
	SPEAKER PARTS		
27936	6" Electrodynamic Speaker	1	8.00
28837	Cone & Voice Coil Assembly	1	2.60
28838	Output Transformer with Mounting Bracket	1	2.25
28839	Field Coil	1	2.50
28840	Terminal Strip	1	.15

COMPLETE SPEAKERS MAY NOT BE RETURNED FOR CREDIT

GENERAL HOUSEHOLD UTILITIES CO.

MODEL 501
(Chassis 5-B)
Schematic
Condenser assembly



MODEL 501
(Chassis 5-B)
Parts List

GENERAL HOUSEHOLD UTILITIES CO.

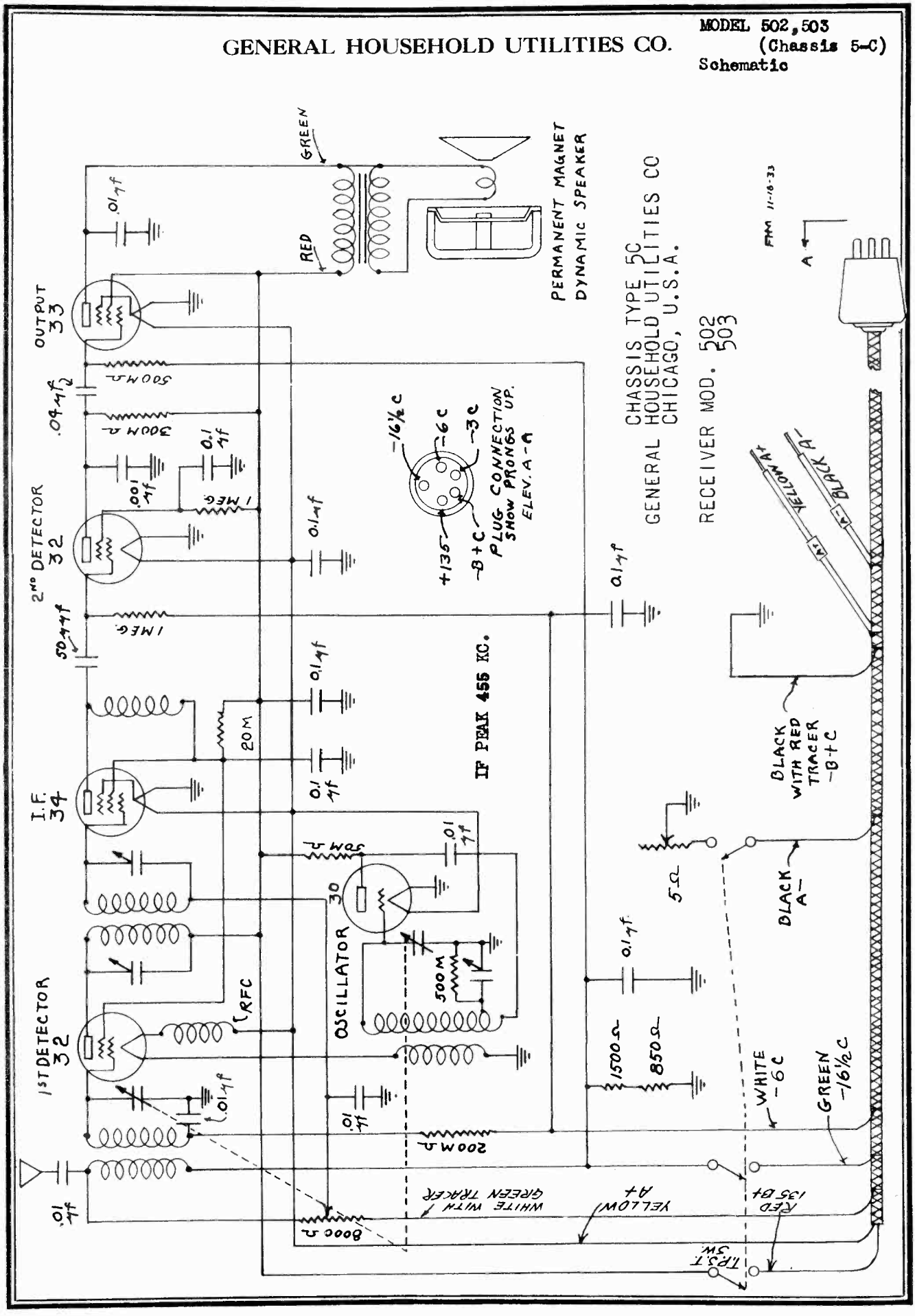
PARTS PRICE LIST
5B CHASSIS

Part No.	Description	No. Used in Set	List Price Each
20962	Grid Cap Only	3	.02
22333	Insulated Antenna Binding Post	1	.10
22856	Resistor, 25,000 Ohm, 1/4 Watt	1	.25
23358	Vertical Insulated Terminal	1	.05
23849	Resistor, 500,000 Ohm Carbon, 1/4 Watt	3	.25
23852	Resistor, 10,000 Ohm Carbon, 1/4 Watt	1	.25
23853	Resistor, 50,000 Ohm Carbon, 1/4 Watt	1	.25
23998	Resistor, 250,000 Ohm Carbon, 1/4 Watt	6	.25
24355	Condenser, 50 Mmf. Mica	1	.20
24416	Terminal Assembly	1	.03
24487	Condenser, 250 Mmf. Mica	1	.20
26198	Oscillator Transformer Shield Can	1	.10
26215	Tube Socket - 25Z5	I	.15
26216	Tube Socket - 43	1	.15
26217	Tube Socket - 75	1	.15
26218	Tube Socket - 78	1	.15
26219	Tube Socket - 6F7	1	.15
26247	I.F. Transformer Shield Can	2	.15
26564	Tube Shield Base	2	.10
26898	Tube Shield (Goat)	2	.10
27151	Electrolytic Filter Condenser Block	1	2.75
27153	Resistor, 100 Ohm, Wire wound	1	.20
27155	Resistor, 21 - 21 Ohm, Wire wound Tapped	1	.25
27163	Volume Control and Power Switch	1	1.10
27170	Tuning Condenser Assembly	1	2.75
27171	Volume Control Pilot Lamp Socket Assembly	1	.25
27182	Tuning Condenser Pilot Lamp Socket Assembly	1	.25
27184	Oscillator Transformer	1	.50
27185	1st I.F. Transformer	1	1.30
27186	2nd I.F. Transformer	1	1.75
27188	Oscillator Trimmer Condenser	1	.35
27330	Bypass Condenser Block (Replace with 28179)	1	2.50
27331	Filter Choke Assembly	1	1.10
27404	Power Cord	1	.70
27466	Control Knobs	2	.25
27643	Antenna Hank with Terminal	1	.35
27686	Antenna Transformer Assembly	1	1.15
27740	Selector Dial Assembly	1	.25
27741	Volume Control Dial Assembly	1	.25
27992	Resistor, 45 Ohm Wire Wound	1	.20
28045	Pilot Lamp	1	.15
28125	Insulated Ground Binding Post	1	.10
28127	Antenna Hank less terminal	1	.30
28179	Bypass Condenser Block (Replaces 27330)	1	2.50
28721	Condenser, Tubular, .01 Mfd. 400 Volt	4	.25
28723	Condenser, Tubular, .05 Mfd. 400 Volt	1	.25
	SPEAKER PARTS		
26321	Cone Head Assembly	1	2.70
27152	5" Electrodynamic Speaker	1	5.50
28435	Field Coil	1	1.10
28436	Bucking Coil	1	.30
28437	Output Transformer	1	1.40

COMPLETE SPEAKERS MAY NOT BE RETURNED FOR CREDIT.

GENERAL HOUSEHOLD UTILITIES CO.

MODEL 502, 503
(Chassis 5-C)
Schematic



MODEL 502,503
(Chassis 5-C) GENERAL HOUSEHOLD UTILITIES CO.
Part List

PARTS PRICE LIST

5C CHASSIS

Part No.	Description	No. Req.	List Price
20929	Resistor, 50,000 Ohm Carbon, 1 Watt	1	.25
20962	Grid Cap Only	3	.02
21598	Rubber Grommet	1	.02
22713	Knob 1 1/8" Bakelite	1	.20
22858	Resistor, 1 Meg. Carbon, 1/4 Watt	2	.25
23369	Resistor, 20,000 Ohm Carbon, 1/4 Watt	1	.25
23537	" 300,000 " " 1/4 "	1	.25
23538	" 200,000 " " 1/4 "	1	.25
23849	" 500,000 " " 1/4 "	2	.25
24254	Condenser, .001 Mfd. Mica	1	.25
24355	" 50 Mmf. Mica	1	.20
24372	Insulated Terminal Strip (2 Lug)	1	.05
24467	Tube Shield Bracket	1	.05
25189	Tube Socket - 34	1	.15
25190	" " - 32	2	.15
25191	" " - 30	1	.15
25229	Terminal Strip & Bracket Assembly (2 Lug)	2	.10
25630	Tube Socket - 33	1	.15
26098	Rheostat (5 Ohm)	1	.75
26099	Volume Control	1	.90
26108	Resistor, 1500 - 850 Ohm - Wire Wound	1	.20
26114	Oscillator Transformer	1	.75
26115	Antenna Transformer	1	.75
26120	Dial Chart Assembly	1	.35
26127	Trimmer Assembly (Oscillator)	1	.35
26129	Variable Condenser Assembly	1	2.00
26130	Choke Coil Assembly (Filament)	1	.30
26131	I.F. Plate Coil Assembly	1	.45
26273	Battery Switch	1	1.50
27492	Walnut Knob 7/8"	3	.15
27549	Tube Shield (Aluminum)	1	.25
27601	Battery Cable with Plug	1	1.15
27602	Shield Top (I.F.)	1	.15
27750	Oscillator & I.F. Assembly (Combination)	1	2.75
27753	Coil Shield Assembly (Antenna)	1	.30
28721	Condenser, .01 Mfd. 500 Volt Tubular	4	.25
28722	" .04 " 500 " "	1	.25
28726	" .1 " 400 " "	7	.25
28948	Battery Cable Plug	1	.30

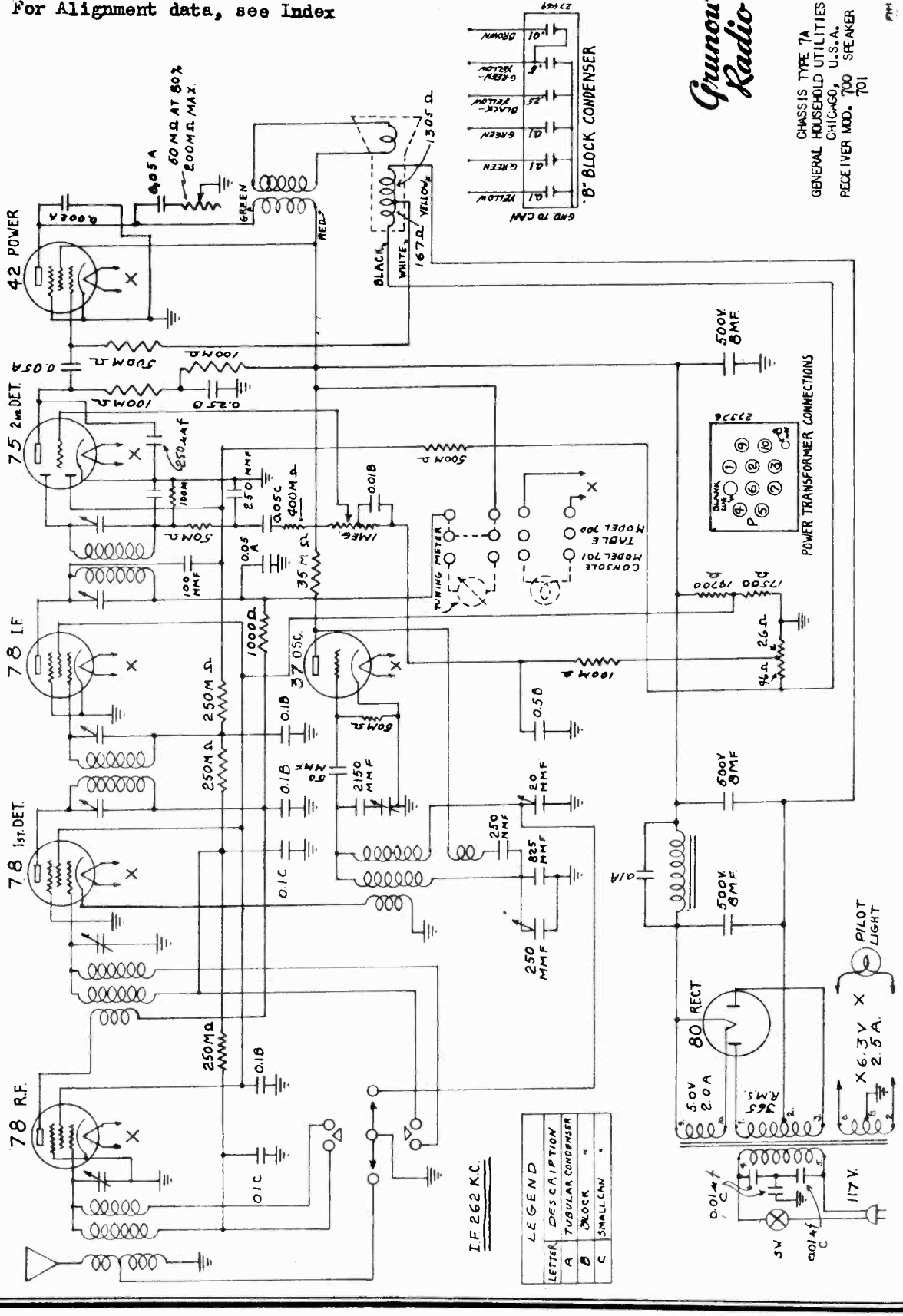
SPEAKER PARTS

26883	6" Permanent Magnet Speaker	1	16.00
28841	Magnet Housing Assembly	1	10.00
28842	Transformer & Bracket Assembly	1	2.50
28843	Cone, Voice Coil & Terminal Strip Assembly	1	2.75
	COMPLETE SPEAKERS MAY NOT BE RETURNED FOR CREDIT		

GENERAL HOUSEHOLD UTILITIES CO.

MODEL 700 w/8A1 Spkr
(Chassis 7-A)
MODEL 701 w/10A2 Spkr
(Chassis 7-A)
Schematic
Condenser assembly

For Alignment data, see Index



MODEL 700,701
(Chassis 7-A) GENERAL HOUSEHOLD UTILITIES CO.
Parts List

7A CHASSIS

Part No.	Description	No. Req.	List Price
20141	Headless Set Screw 8/32 x 1/4"	2	.01
20861	Line Cord and Plug	1	.35
20962	Grid Cap Only	4	.02
22333	Insulated Antenna Binding Post	1	.10
23358	Vertical Insulated Terminal	3	.05
23368	Resistor, 400,000 Ohm Carbon, 1/4 Watt	1	.25
23370	Resistor, 100,000 Ohm Carbon, 1/4 Watt	4	.25
23849	Resistor, 500,000 Ohm Carbon, 1/4 Watt	2	.25
23853	Resistor, 50,000 Ohm Carbon, 1/4 Watt	2	.25
23998	Resistor, 250,000 Ohm Carbon, 1/4 Watt	3	.25
24251	Condenser, 100 Mmf., Mica	2	.20
24254	Condenser, 1000 Mmf., Mica	1	.25
24355	Condenser 50 Mmf., Mica	3	.20
24487	Condenser 250 Mmf., Mica	3	.20
26217	Tube Socket - 75	1	.15
26218	Tube Socket - 78	3	.15
26256	Tube Shield Base	5	.05
26814	Tube Socket - 80	1	.15
27251	Variable Tuning Condenser, 3 Gang	1	3.75
27254	Drive Drum Spring	1	.05
27259	Drive Shaft Bearing	1	.15
27260	Drive Shaft	1	.05
27297	Drive Cable Assembly	1	.10
27299	Dial Pointer Bracket & Pointer Assembly	1	.15
27300	Dial Chart Assembly	1	.80
27301	Resistor Panel Assembly - less resistors	1	.15
27303	Pilot Light Socket Assembly	1	.25
27329	Variable Condenser Shield	1	.60
27374	Tube Socket - 37	1	.15
27375	" " - 42	1	.15
27376	Power Transformer	1	6.00
27382	Trimmer Condenser Assembly (Broadcast)	1	.35
27384	Trimmer Condenser Assembly (Oscillator)	1	.75
27387	Filter Choke	1	1.50
27388	I.F. Transformer Shield Can	1	.30
27390	Oscillator Transformer Shield Can	1	.30
27393	1st Detector Transformer	1	.85
27395	Antenna Transformer	1	1.15
27407	Oscillator Transformer	1	1.80
27413	Electrolytic Condenser, 8 Mfd. 500 Volt	2	1.25
27414	Electrolytic Condenser, 8 Mfd. 500 Volt	1	1.50
27416	Resistor, 14,700 - 17,500 - 26 - 46 Ohm, Wire Wound	1	.75
27417	Range Switch	1	.75
27418	Line Switch	1	.35
27419	Volume Control	1	1.00
27420	Tone Control	1	.75
27450	1st I.F. Transformer	1	1.60
27451	2nd I.F. Transformer	1	1.50
27453	Tube Shield Cap - 78	4	.10
27454	Tube Shield Body - 78	4	.15
27455	Tube Shield - 37	1	.15
27467	Condenser, .05 Mfd. - 200 Volt (Type "C")	1	.50
27468	Resistor, 35,000 Ohm Carbon, 1 Watt	1	.25
27469	Bypass Condenser Block	1	2.50
27490	Resistor, 1,000 Ohm Carbon, 1/4 Watt	1	.25
27492	Walnut Knob, Tone - Volume - Power Switch	3	.15
27508	Walnut Knob, Station Selector	1	.20
27520	Condenser, 2310 Mmf. Mica	1	.50
27524	Condenser .1 - .1 Mfd. 200 Volt (Type "C")	1	.75
27589	Walnut Knob, 7/8" (Range Switch)	1	.25
27617	Drive Drum Assembly	1	.50
27644	Tuning Meter Bracket	1	.10
27661	Tuning Meter with Lamp	1	2.50
27854	Condenser .01 - .01 Mfd. 200 Volt (Type "C")	1	1.00
27972	Condenser .01 - .01 - .01 Mfd. 200 Volt (Type "C")	1	1.25
28045	Pilot Lamp	1	.15
28135	Tube Shield - 42	1	.25
28326	Thumb Screw	2	.05
28377	Condenser, 825 Mmf. Mica	1	.25
28378	" 2150 " "	1	.50
28717	" .002 " 700 Volt (Tubular)	1	.25
28723	Condenser .05 Mmf. 400 Volt (Tubular)	3	.25
28726	Condenser .1 Mmf. 400 Volt (Tubular)	1	.25
28757	Tuning Meter Lamp	1	.15
63838	Felt Knob Washer 7/8"	1	.01
63839	" " " 3/4"	3	.01

SPEAKER PARTS

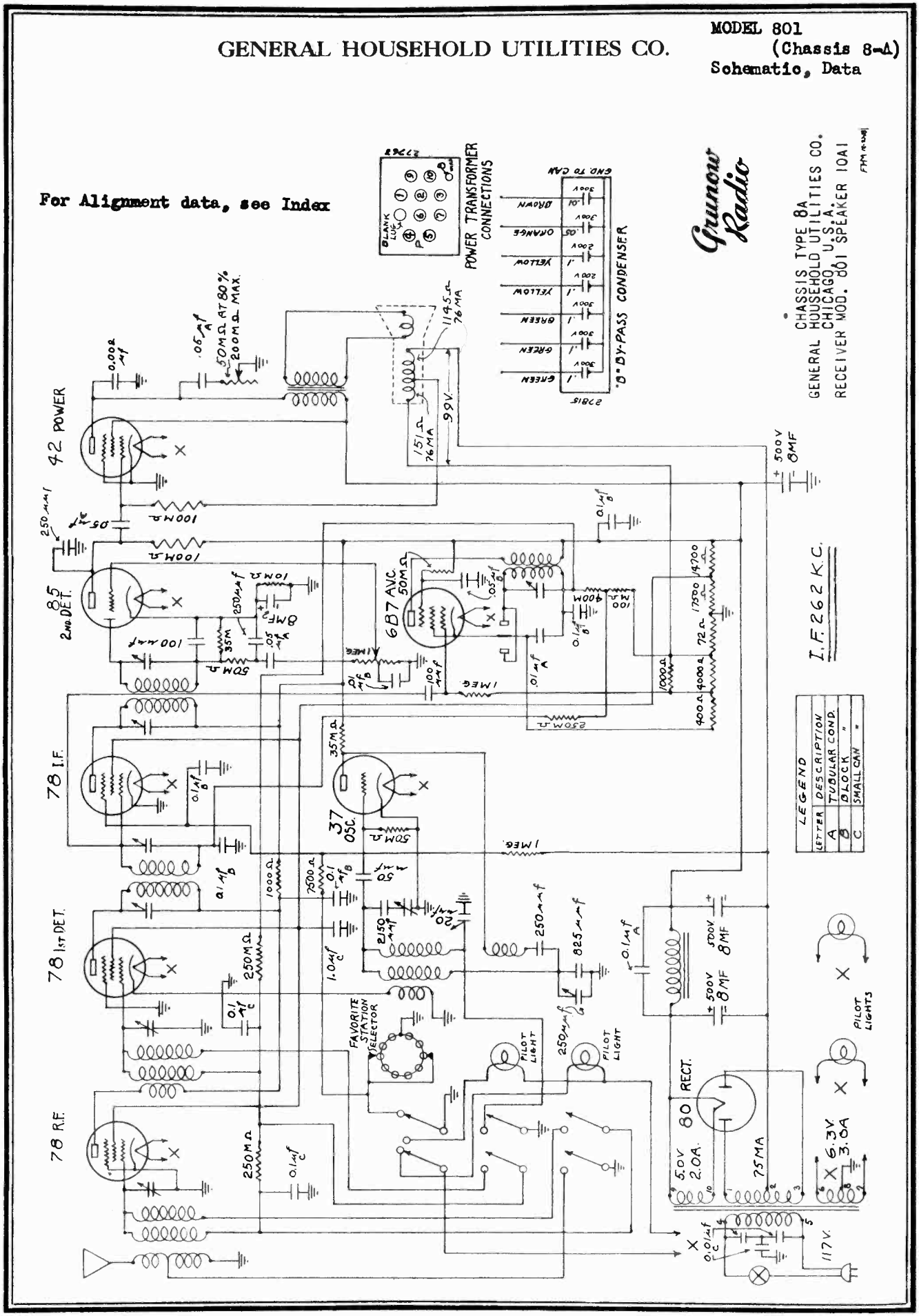
27245	Type 8 A 1 Speaker - Model 700	1	8.50
27624	Type 10 A 2 Speaker- Model 701	1	11.00
20047	Speaker Terminal Strip	1	.25
20048	Terminal Strip Cover	1	.15
27213	Field Coil for 8 A 1 Speaker	1	2.50
27506	Field Coil for 10 A 2 Speaker	1	2.75
27591	Output Transformer for 8 A 1 and 10 A 2 Speaker	1	2.00
28754	Cone and Voice Coil Assembly for 8 A 1 Speaker	1	3.10
28755	Cone and Voice Coil Assembly for 10 A 2 Speaker	1	3.30

COMPLETE SPEAKERS MAY NOT BE RETURNED FOR CREDIT

Prices Subject to change without notice.

GENERAL HOUSEHOLD UTILITIES CO.

MODEL 801
(Chassis 8-A)
Schematic, Data



MODEL 801
(Chassis 8-A) GENERAL HOUSEHOLD UTILITIES CO.
Parts List

PARTS PRICE LIST

8A CHASSIS

Part No.	Description	No. Req.	List Price
20141	Headless Set Screw 8/32 x 1/4	2	.01
20861	Line Cord & Plug	1	.35
20962	Grid Cap Only	5	.02
22333	Antenna Binding Post Assembly	1	.10
22857	Resistor, 10,000 Ohm Carbon, 1 Watt	1	.25
22858	Resistor, 1 Megohm Carbon, 1/4 Watt	1	.25
23358	Vertical Insulated Terminal	1	.05
23368	Resistor, 400,000 Ohm Carbon, 1/4 Watt	1	.25
23370	Resistor, 100,000 Ohm Carbon 1/4 Watt	3	.25
23853	Resistor, 50,000 Ohm Carbon, 1/4 Watt	1	.25
23998	Resistor, 250,000 Ohm Carbon, 1/4 Watt	3	.25
24251	Condenser, 100 Mmf. Mica.	2	.20
24254	Condenser, 1000 Mmf. Mica	1	.25
24355	Condenser, 50 Mmf. Mica	1	.20
24487	Condenser, 250 Mmf. Mica	1	.20
24754	Tube Socket - 85	1	.15
26218	Tube Socket - 78	3	.15
26256	Tube Shield Base	6	.05
26814	Tube Socket (80)	1	.15
27165	Pilot Lamp	4	.15
27260	Drive Shaft	1	.05
27269	Tuning Condenser - 3 Gang	1	4.50
27272	Electrolytic Condenser Shield	1	.30
27276	Thumb Screw	2	.10
27301	Resistor Panel - Less resistors	1	.15
27342	Pilot Light Shield	2	.05
27374	Tube Socket - 37	1	.15
27375	Tube Socket - 42	1	.15
27382	Trimmer Assembly (Broadcast)	1	.35
27387	Filter Choke Assembly	1	1.50
27413	Electrolytic Condenser, 9 Mfd. 500 Volt	2	1.25
27414	Electrolytic Condenser, 8 Mfd. 500 Volt (Chrome)	1	1.50
27446	Resistor, 400 - 4,000 - 72 - 17,500 Ohm (Wire Wound)	1	.80
27453	Tube Shield Cap	5	.10
27454	Tube Shield Body	5	.15
27455	Tube Shield - 37 - Not used on all sets	1	.15
27465	Volume & Tone Control Shaft Bracket	3	.10
27468	Resistor, 35,000 Carbon, 1 Watt	2	.25
27487	Tube Socket - 6B7	1	.15
27488	Speaker Cable Socket	1	.15
27490	Resistor, 100 Ohm Carbon, 1/4 Watt	2	.25
27492	Walnut Knob - Tone and Volume Control	2	.15
27508	Walnut Knob - Station Selector	1	.20
27520	Condenser, 2310 Mmf. Mica	1	.50
27524	Condenser .1 - .1 - 200 Volt (Type "C")	1	.75
27533	Selector Switch Assembly	1	3.50
27542	Trimmer Assembly (Oscillator)	1	.75
27614	Station Finder Clamp Nut	6	.02
27617	Drive Drum & Bushing Assembly	1	.50
27628	Dial Chart Assembly	1	1.60
27646	Tone Control	1	.75
27667	Walnut Knob (Range Switch)	1	.20
27668	Electrolytic Condenser, 8 Mfd. 25 Volt	1	.75
27687	Volume Control	1	1.15
27763	Power Transformer	1	7.00
27805	Oscillator Transformer	1	1.60
27806	Oscillator Transformer Shield Can	1	.30
27808	3rd I.F. Transformer (AVC)	1	1.00
27809	1st Detector Transformer	1	.60
27810	Antenna Transformer	1	1.50
27811	Dual Coil Shield Can	1	.65
27812	1st I.F. Transformer with Shield Can	1	2.10
27813	2nd I.F. Transformer - less Shield Can	1	1.90
27815	Bypass Condenser Block	1	2.30
27821	Condenser - Resistor Panel & Bracket Assembly	1	.15
27823	Variable Condenser Cover Assembly	1	.60
27824	A.V.C. I.F. Shield Can Assembly	1	.25
27829	Dial Pointer Bracket & Pointer Assembly	1	.10
27832	Dial Pilot Light Socket Assembly	1	.25
27886	Si-Lec-Trol Screw Driver	1	.10
27976	Volume and Tone Control Dial Assembly	2	.30
27977	Volume Control Pilot Light Socket Assembly	1	.25
27978	Tone Control Pilot Light Socket Assembly	1	.25
28011	Contact Plate Lug and Insulator (Si-Lec-Trol)	2	.25
28015	Shifter Cam. Plate & Pigtail Assembly	1	.75
28016	Station Finder Arm & Contact	10	.10
28017	Contact Plate Shifting Arm and Mtg. Hub	1	.50
28135	Tube Shield - 42 - (Not used on all sets)	1	.25
28138	Condenser 1 Mfd. (Type "B")	1	1.25
28172	Station Finder Clamp Nut	4	.02
28326	Thumb Screw	2	.05
28377	Condenser 825 Mmf. Mica	1	.25
28378	Condenser 2150 Mmf. Mica	1	.50
28532	Drive Cable Assembly	1	.30
28717	Condenser, .002 Mfd. 700 Volt - Tubular	1	.25
28723	Condenser, .05 " 400 Volt - Tubular	3	.25
28726	Condenser, .1 " 400 Volt - Tubular	2	.25
61054	Screw, Filister Head (Si-Lec-Trol)	10	.02
63001	Hex. Head Dial Set Screw	3	.04
63829	Washer, Si-Lec-Trol Finder Arm	10	.01
63838	Felt Knob Washer 1 1/8"	1	.01
63839	" " " 7/8 "	3	.01

SPEAKER

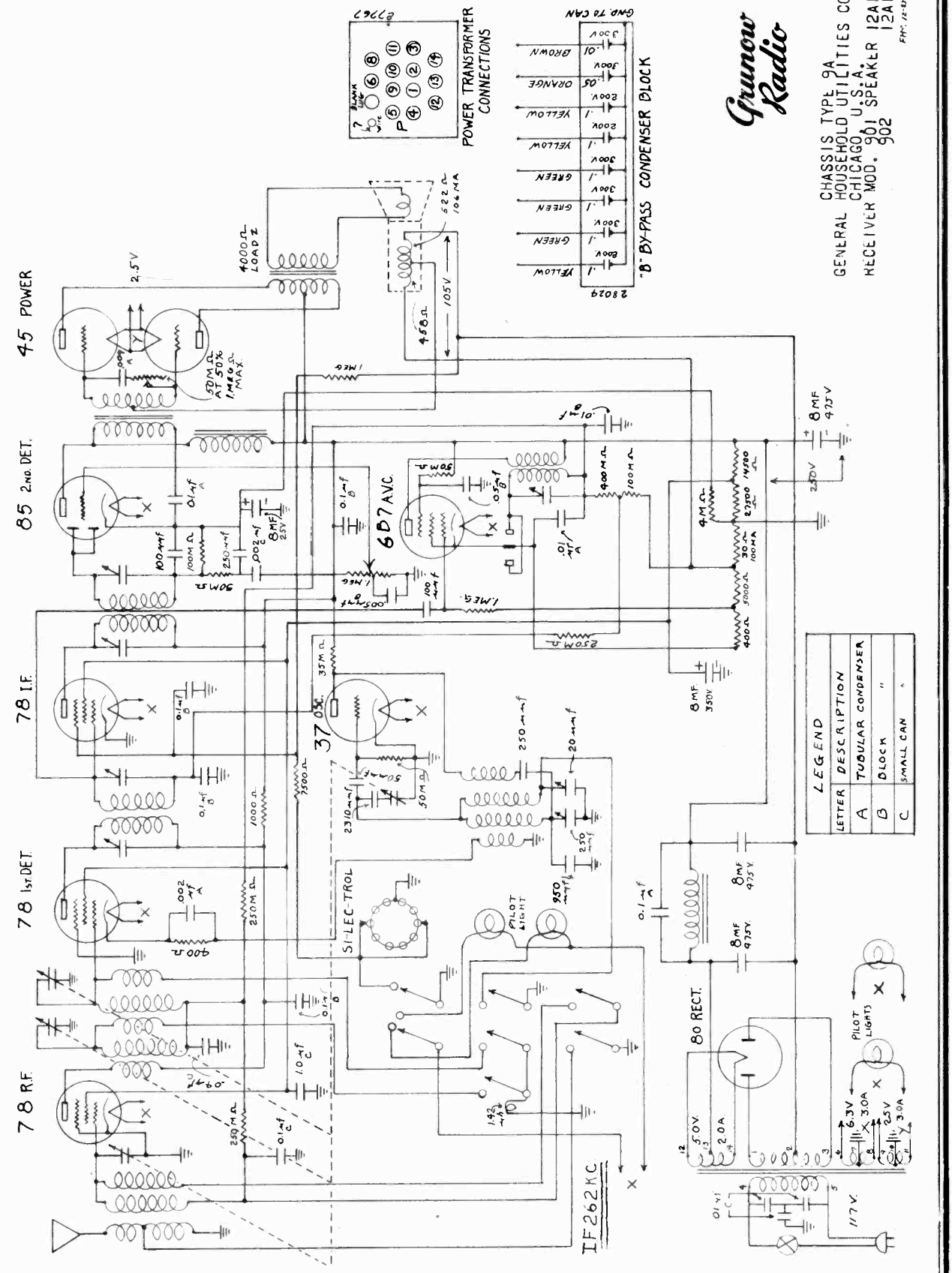
27247	10A1 Speaker Complete	1	11.00
20047	Terminal Strip	1	.25
20048	Terminal Strip Cover	1	.15
27839	Speaker Cable Plug	1	.35
27840	Speaker Cable, less plug	1	.35
27506	Field Coil	1	3.00
27591	Output Transformer	1	2.00
28755	Cone and Voice Coil Assembly	1	3.30

COMPLETE SPEAKERS MAY NOT BE RETURNED FOR CREDIT
Prices subject to change without notice.

GENERAL HOUSEHOLD UTILITIES CO.

MODEL 901, 902
(Chassis 9-A)
Schematic, Data

For Alignment data, see Index



MODEL 901, 902
(Chassis 9-A) GENERAL HOUSEHOLD UTILITIES CO.
Parts List

PARTS PRICE LIST

9A CHASSIS

Part No.	Description	No. Req.	List Price
20141	Dial Set Screw 8 - 32 x 1/4"	2	.01
20861	Line Cord & Plug	1	.35
20962	Grid Cap	5	.02
21348	Resistor, 100,000 Ohm, Carbon 1 Watt	1	.25
22333	Antenna Binding Post Assembly	1	.10
22858	Resistor, Carbon, 1 Meg.	1	.25
23187	Sponge Rubber Mtg. Washers 9/16" Thick	4	.05
23188	Sponge Rubber Mtg. Washers 3/8" Thick	4	.05
23358	Vertical Insulated Terminal, 1 Lug	5	.05
23370	Resistor, 100,000 Ohm Carbon, 1/4 Watt	2	.25
23853	Resistor, 50,000 Ohm Carbon, 1/4 Watt	4	.25
24251	Condenser, 100 Mmf. Mica	3	.20
24254	" 1000 Mmf. Mica	1	.25
24355	" 50 " "	1	.20
24487	" 250 " "	1	.20
24754	Tube Socket - 85	1	.15
26218	" " - 78	3	.15
26256	Tube Shield Base	6	.05
26814	Tube Socket - 80	1	.15
27033	Vertical Insulated Terminal, 2 Lug	2	.05
27254	Tuning Condenser Drive Spring	1	.05
27259	Tuning Condenser Drive Shaft Bearing	1	.15
27260	Tuning Condenser Drive Shaft	1	.05
27342	Pilot Light Shield	2	.05
27374	Tube Socket - 37	1	.15
27382	Trimmer Assembly - Broadcast	1	.35
27447	Resistor, 400 - 5,000 - 30 - 4,000 Ohm Wire Wound	1	.60
27453	Tube Shield Cap	5	.10
27454	Tube Shield Body	5	.15
27455	Tube Shield	1	.15
27465	Tone, Volume Control & Switch Mtg. Bracket	3	.10
27468	Resistor, 35,000 Ohm, Carbon, 1 Watt	1	.25
27487	Tube Socket - 6B7	1	.15
27488	Speaker Socket	1	.15
27489	Tube Socket - 45	2	.15
27490	Resistor, 1000 Ohm, 1/4 Watt	1	.25
27492	Walnut Knob, Tone and Volume Control	2	.15
27508	Walnut Knob, Station Selector	1	.20
27520	Condenser, 2310 Mmf. Mica	1	.50
27534	Selector Switch	1	3.50
27540	Resistor, 27,500 - 14,500 Ohm, Wire Wound	1	.65
27542	Trimmer Assembly (Oscillator)	1	.60
27614	Station Finder Clamp Nut (Si-Lec-Trol)	6	.02
27616	Contact Plate Shift Arm	1	.20
27617	Drive Cable Drum & Bushing Assembly	1	.50
27645	Volume Control	1	1.15
27667	Walnut Knob, Si-Lec-Trol	1	.20
27670	Dual Electrolytic Condenser, 8 Mfd. 350 V - 8 Mfd. 25 V	1	1.60
27710	Electrolytic Condenser, 8 Mfd.- 475 Volt (Chrome)	1	1.15
27711	Electrolytic Condenser, 8 Mfd. - 475 Volt	2	1.10
27726	Audio Choke Assembly	1	1.50
27748	Dial Assembly	1	1.60
27767	Power Transformer Assembly	1	10.50
27777	Filter Choke Assembly	1	2.65
27779	Audio Transformer	1	3.60
27784	Resistor, 400 Ohm, Carbon, 1/4 Watt	1	.25
27790	Dual Condenser, .04 - .1 Mfd. Type C	1	.70
27812	1st I.F. Transformer with Shield Can	1	2.10
27829	Dial Indicator Assembly	1	.15
27832	Dial Pilot Light Socket Assembly	1	.25
27887	Thumb Screw	1	.05
27974	Coupling Inductance Coil Assembly - 1.42 MH	1	.25
27976	Tone and Volume Control Dial	2	.50
28000	3rd I.F. Transformer - AVC	1	1.70
28002	R.F. Coil Shield Can Assembly (3 Stage)	1	.85
28006	Oscillator Transformer	1	2.50
28011	Contact Plate Lug & Insulator - (Si-Lec-Trol)	2	.25
28015	Shifter Cam Plate & Pig Tail (Si-Lec-Trol)	1	.75
28016	Finder Arm & Contact (Si-Lec-Trol)	10	.10
28017	Contact Plate Shifting Arm & Mtg. Bracket (Si-Lec-Trol)	1	.50
28024	Bypass Condenser Block	1	2.25
28033	Resistor Panel Assembly - Less Resistors	1	.20
28035	1st Detector Transformer	1	.85
28036	Antenna Transformer	1	1.40
28037	Bi-Selector Transformer	1	1.20
28038	Variable Condenser Cover Assembly	1	.45
28045	6 - 8 Volt Pilot Light	4	.15
28064	Volume Control Pilot Light Socket	1	.25
28150	2nd I.F. Transformer	1	2.80
28172	Station Finder Clamp Nut	6	.02
28183	Resistor, 7500 Ohms Carbon, 1 Watt	1	.25
28300	Tube Shield - 37	1	.25
28302	Resistor, 1000 Ohm, Wire Wound	1	.30
28316	Tone Control	1	.75
28326	Thumb Screw - Pilot Light	1	.04
28400	Electrolytic Condenser, 8 Mfd. - 475 Volt Dual	1	2.40
28441	Condenser, 950 Mmf. Mica	1	.25
28532	Dial Drive Cable	1	.30
28717	Condenser, .002 Mfd. - 700 Volt Tubular	1	.25
28719	Condenser, .004 Mfd. - 700 Volt Tubular	1	.25
28721	Condenser, .01 Mfd. - 500 Volt Tubular	1	.25
28726	Condenser, .1 Mfd. - 400 Volt Tubular	1	.25
61054	Finder Arm Fil. Head Screw (Si-Lec-Trol)	10	.02
63001	Hex Head Set Screw 10/32	3	.04
63829	Station Finder Arm Washer (Si-Lec-Trol)	10	.01
63838	Felt Knob Washer 1 1/8"	1	.01
63839	" " " 7/8 "	3	.01

SPEAKER

20047	Terminal Strip	1	.25
20048	Terminal Strip Cover	1	.15
27248	Speaker Complete 12A1	1	14.00
27507	Field Coil Assembly	1	4.30
27682	Output Transformer	1	2.25
27839	Speaker Cable Plug	1	.35
27841	Speaker Cable Less Plug	1	.55
28756	Cone & Voice Coil Assembly	1	4.00

COMPLETE SPEAKERS MAY NOT BE RETURNED FOR CREDIT

Prices subject to change without notice.

ALIGNMENT PROCEDURE

DUAL WAVE RECEIVERS

Chassis Type 7A, 8A and 9A

1. EQUIPMENT -

(a) Oscillator.

A modulated oscillator capable of producing signals at 262 Kilocycles, 600 Kilocycles, and 1400 Kilocycles is necessary for alignment of the Dual-Wave Grunow receivers. There are a number of standard test oscillators on the market which meet these requirements and which also supply standard frequencies of 130 Kilocycles, 175 Kilocycles, 455 Kilocycles and 1000 Kilocycles in addition to the three frequencies necessary in aligning the above Grunow receivers. Such an oscillator is described in the bulletins of Clough-Brengle Company and Weston Electrical Instrument Corporation.

(b) Output Meter.

This may be any of the standard output meters available on the market but should be sufficiently sensitive to provide a good deflection at low signal strength, and should also incorporate an adjustable shunt so that extremely strong signals may be read.

(c) Coupling Condensers.

Coupling Condensers of .0002 and .25 Mfd. should be provided for coupling the oscillator to the receiver during alignment. These are necessary to prevent disturbance of the receiver bias voltages.

2. I. F. ALIGNMENT -

Place oscillator in operation at 262 Kilocycles and connect signal lead through .25 Mfd. condenser to control grid contact of the first detector tube. Connect output meter in accordance with instructions accompanying the meter, and turn receiver Volume Control to maximum. Attenuate oscillator output to the lowest value possible consistent with obtaining a readable indication on the output meter. Refer to the chassis layout diagrams in this bulletin for the location of the I.F. Trimmer screws and adjust these screws until maximum output is indicated upon the output meter.

If readjustment of the trimmers increases the output to a considerable extent the oscillator signal should be reduced further, always maintaining it at as low a value as will allow obtaining of accurate adjustment.

MODEL 700,701,801
901,902 GENERAL HOUSEHOLD UTILITIES CO.
Alignment

3. A.V.C. TRANSFORMER ALIGNMENT -

This adjustment is made on Chassis 8A and 9A, which utilize shunt A.V.C., but not on Chassis 7A.

Connect the shunt across the Output Meter or disconnect the Output Meter from the receiver. Then increase the output of the oscillator to maximum or to the point where the receiver begins to distort. Reduce the output volume to a low value by means of the receiver Volume Control and remove the shunt from the output meter or reconnect the meter to the receiver.

Turn the A.V.C. Trimmer screw in a clockwise direction to the point of minimum capacity without paying attention to the reading of the output meter. Then gradually turn this screw in a counter-clockwise direction, watching the action of the Output Meter while increasing the capacity of the trimmer. A graphical picture of the results obtained in this adjustment is given in Fig. 2 which shows that as the capacity of the trimmer is increased an output peak will be reached, followed by a dropping off in output to a minimum value. Further increase of the trimmer capacity causes the output to again rise to a peak after which it drops to a low value, which is not affected by further increase of the trimmer capacity. The proper setting of this trimmer is that which gives the minimum output between the two high output peaks.

Be very careful in making this adjustment that the trimmer is adjusted to give operation between the two output peaks, rather than the minimum output obtained by either a high or low capacity setting.

4. SHORTWAVE ALIGNMENT

Place the oscillator in operation at 600 Kilocycles and connect signal lead to Antenna Binding Post through a .002 Mfd. Condenser. Throw the receiver Band Selector Switch to the shortwave position.

Check setting of Tuning Dial by turning dial until condenser rotor plates are fully meshed. The last mark on the shortwave dial calibration should now be directly over the dial indicator. If it is not, loosen the three screws which hold the Tuning Dial on its hub and set dial correctly.

Set the Tuning Dial to exactly 3.6 Megacycles (6th harmonic of 600 K.C.) and adjust Oscillator Trimmer (See Chassis layout diagrams for location) until maximum output is indicated on the output meter. In adjusting the Oscillator Trimmer, it will be noted that there are two settings at which the signal will be received. Use the setting giving least capacity, that is, the setting at which the trimmer screw is farthest out.

5. 1400 KILOCYCLE ALIGNMENT -

Place oscillator in operation at 1400 Kilocycles and throw Band Selector Switch to broadcast position. Turn the Tuning Dial until it reads exactly 1400 Kilocycles.

Adjust the 1400 Kilocycle Trimmer until the maximum output is indicated upon the output meter. Then adjust R.F. and first detector trimmers for maximum output. On the 9A Chassis also adjust the Bi-Selector Trimmer. These adjustments should be made in rotation at least three times as they interlock to a certain extent.

6. 600 KILOCYCLE ALIGNMENT -

(a) Tune in 600 K.C. signal regardless of where it appears on dial.

(b) Change the value of the padding condenser in either direction and retune signal. If the output has increased, it is indicated that the direction in which the padding condenser was turned is correct and that this operation of adjusting the padding condenser and then the dial should be continued until maximum output is obtained.

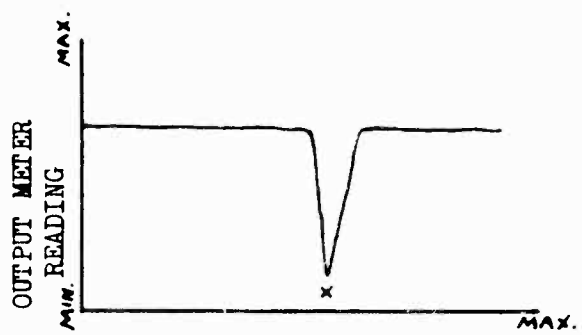
(c) If the first adjustment of the padding condenser shows a decrease, it is an indication that it must be turned the opposite direction.

(d) THIS OPERATION IN ITS ENTIRETY IS TO BE PERFORMED IRRESPECTIVE OF DIAL SETTING.

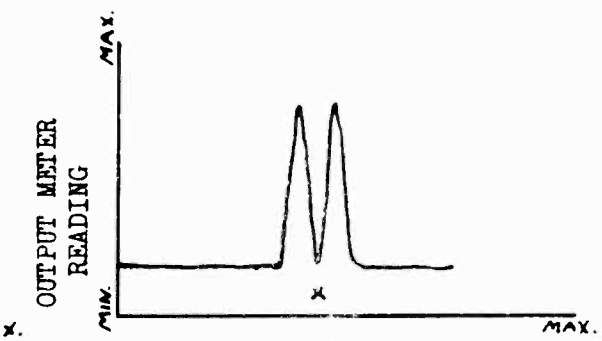
(e) In most instances it is wise to retune the oscillator trimmer condenser at the high frequency position to insure against its being affected by a large change necessitated in the Oscillator Series Padding Condensers.

7. DIAL CALIBRATION -

If after all trimmer and padding condensers have been adjusted to maximum output (omitting of course, the shunt AVC circuits in the 8A, 9A and 9B Chassis) the dial calibration is found to be incorrect it will be necessary to reset the dial on the hub of the condenser shaft or drive hub, as the case may be. Do not loosen the set screws on the drive hubs that are used to fasten the hub to the condenser shaft, but use the three set screws in the front of the dial for this purpose.



CAPACITY OF A.V.C. TRIMMER
CHASSIS TYPE 8A



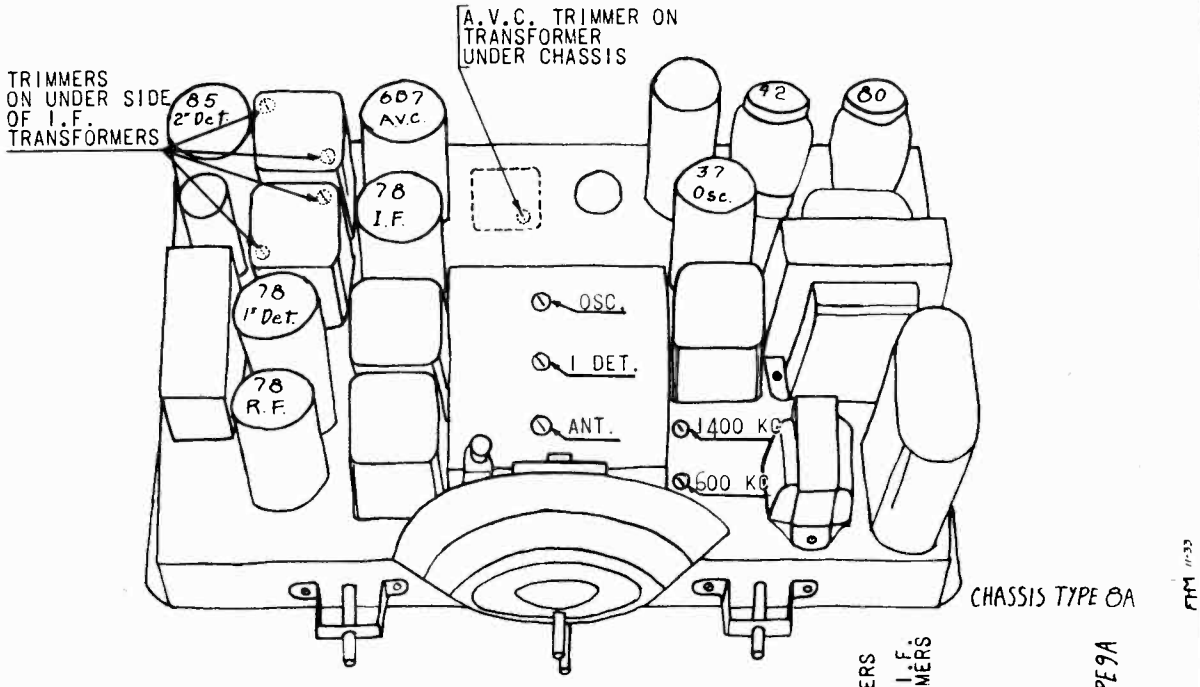
CAPACITY OF A.V.C. TRIMMER
CHASSIS TYPE 9A

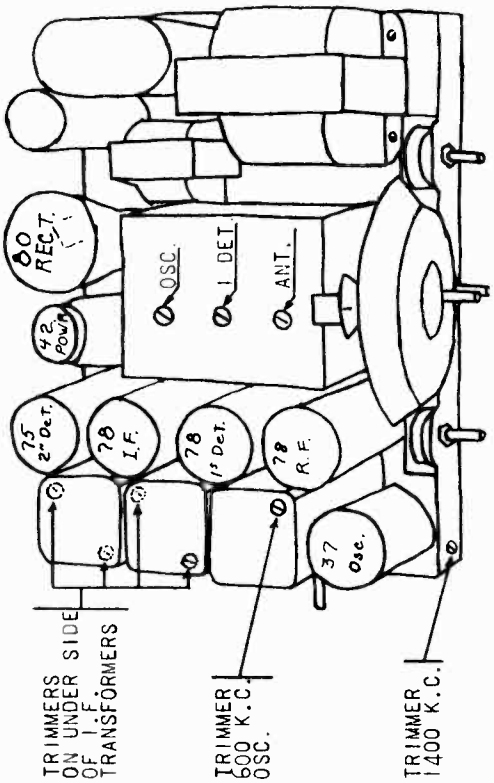
Fig.2.

MODEL 700,701,801
901,902

GENERAL HOUSEHOLD UTILITIES CO.

Socket layouts





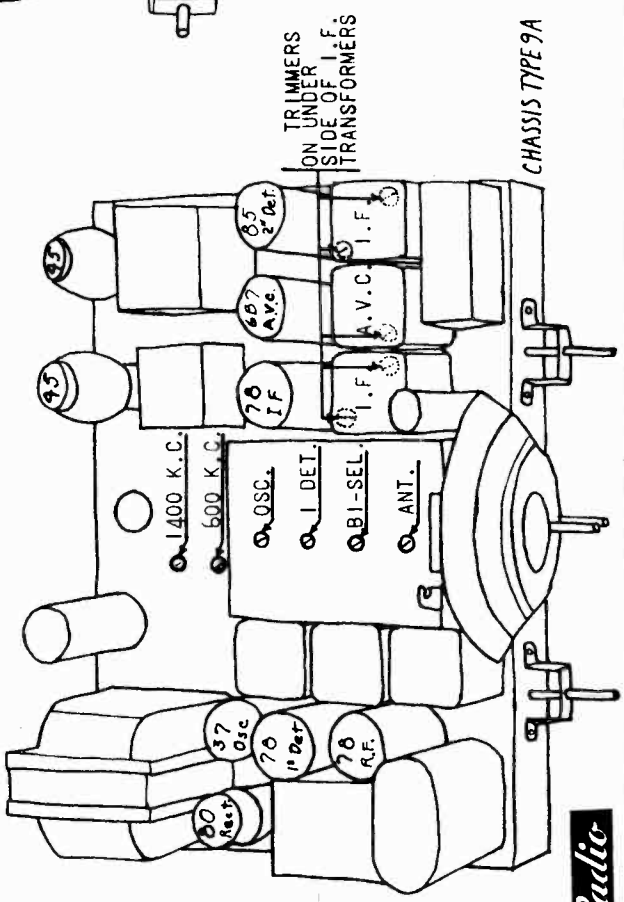
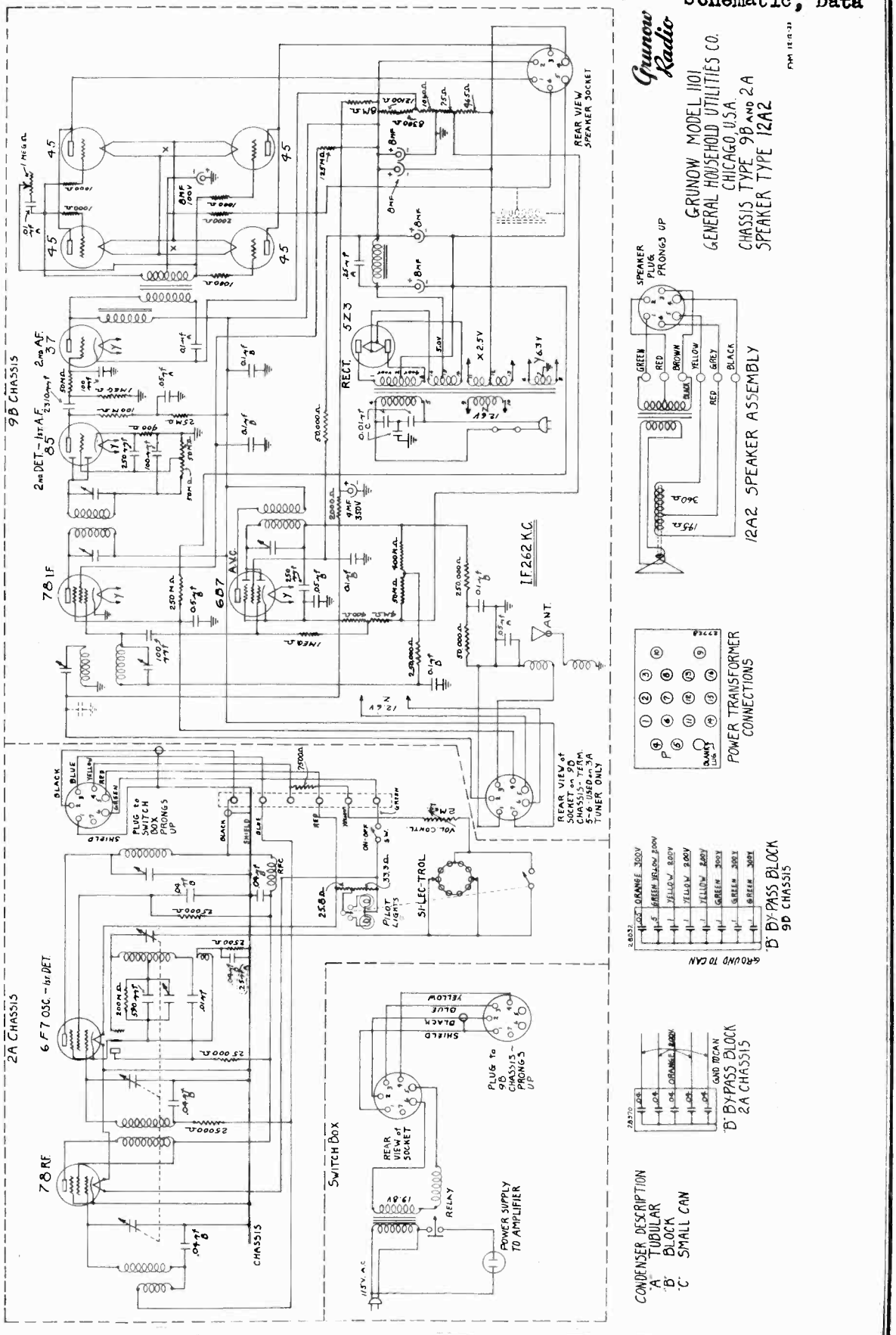


Fig 1.

Grunow Radio

GENERAL HOUSEHOLD UTILITIES CO.

MODEL 1101
Chassis 9-B, 2-A)
Schematic, Data



Grunow Radio
GRUNOW MODEL 1101
GENERAL HOUSEHOLD UTILITIES CO.
CHICAGO U.S.A.
CHASSIS TYPE 9B AND 2A
SPEAKER TYPE 12A2

MODEL 1101
(Chassis 9-B,2-A) GENERAL HOUSEHOLD UTILITIES CO.
Alignment;

Alignment Procedure --- GRUNOW MODEL 1101
Chassis 2A & 9B

I. F. ALIGNMENT

A. Connect signal lead of oscillator to grid of 6F7 (1st. Detector) tube in 2A Chassis through .25 mfd. condenser and ground lead of oscillator to 2A Chassis.
B. Place oscillator in operation at 262 K.C.
C. Turn receiver volume control to maximum.
D. Attenuate oscillator output to lowest value consistent with obtaining a readable indication on the output meter.
E. Adjust the five (5) I. F. Trimmers on the 2A and 9B chassis until maximum output is indicated on the output meter.
F. During alignment, maintain as low a value of signal as will allow obtaining of accurate adjustment.

DIAL SETTING

a. The last mark on the low frequency end of the dial should be directly over the dial indicator.
b. To set dial correctly, turn dial knob to low frequency end until condenser is fully meshed, then loosen three set screws that hold dial and reset, then tighten screws.

1400 K. C. ALIGNMENT

a. Connect signal lead of oscillator through .0002 mfd. condenser to antenna binding post and ground lead to ground post of 9B Chassis.
b. Place oscillator in operation at 1400 K.C.
c. Turn tuning dial to exactly 1400 K.C.
d. Align oscillator trimmer to maximum output.
e. Align antenna trimmer to maximum output.
f. Align 1st. Detector trimmer to maximum output.
g. Repeat operation d-e-f in rotation at least three times.

600 K. C. ALIGNMENT

a. Place oscillator in operation at 600 K.C.
b. Tune in signal to maximum (this point does not have to be exactly at the 600 K.C. dial setting)
c. Adjust the 600 K.C. Trimmer (padding condenser) in the direction of greatest signal increase and at the same time turn the 2A dial back and forth through resonance. Continue this procedure until maximum signal is obtained on the output meter.

A.V.C. ALIGNMENT

a. Place oscillator in operation at 600 K.C. as above.
b. Connect shunt across the output meter or disconnect the output meter from the receiver. Then increase the output of the oscillator to maximum or to the point where the receiver begins to distort. Reduce the output volume to a low value by means of the receiver volume control and remove the shunt from the output meter or reconnect the meter to the receiver.

GENERAL HOUSEHOLD UTILITIES CO

MODEL 1101
(Chassis 9-B, 2-A)
Socket layout
Alignment

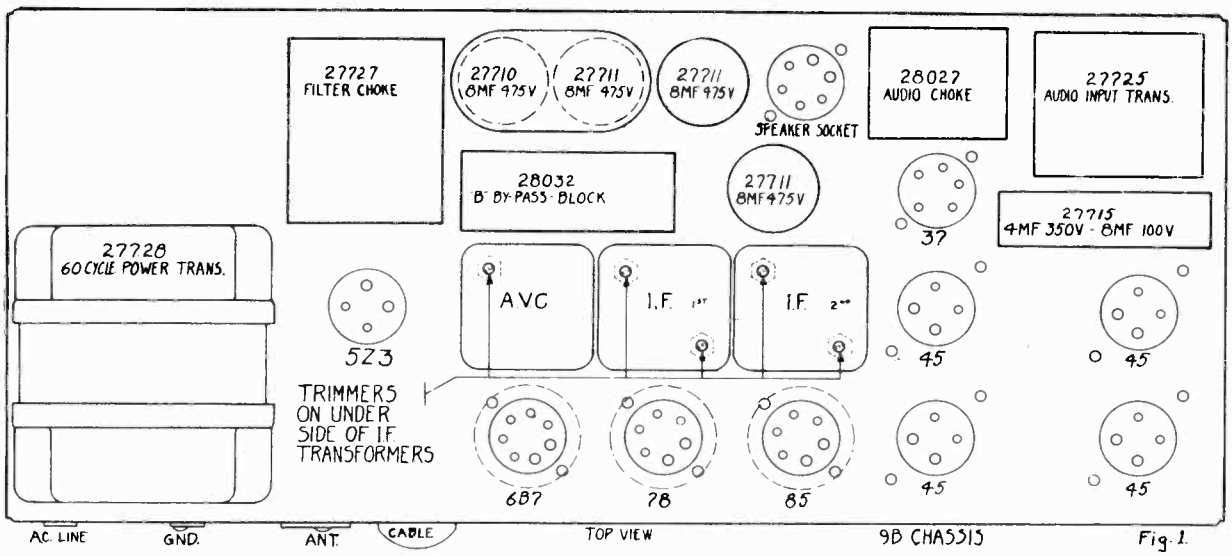
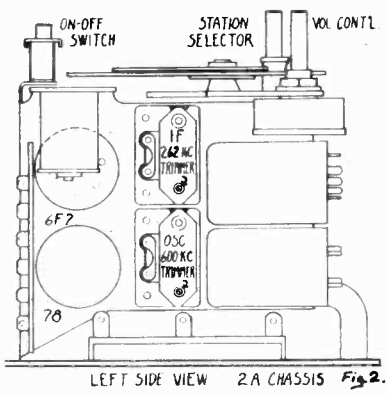
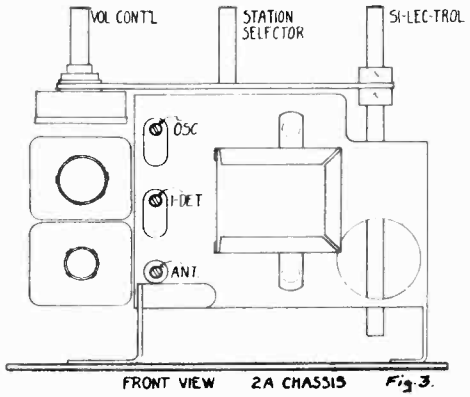


Fig. 1.



LEFT SIDE VIEW 2A CHASSIS Fig. 2.



FRONT VIEW 2A CHASSIS Fig. 3.

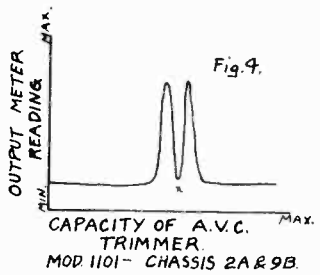


Fig. 4.

Alignment Procedure (Continued)

c. Turn the A.V.C. trimmer screw in a clockwise direction to the point of minimum capacity without paying attention to the reading of the output meter. Then gradually turn this screw in a counter-clockwise direction, watching the action of the output meter while increasing the capacity of the trimmer. A graphical picture of the results obtained in this adjustment is given in Figure 4 which shows that as the capacity of the trimmer is increased an output peak will be reached, followed by a dropping off in output to a minimum value. Further increase of the trimmer capacity causes the output to again rise to a peak after which it drops to a low value, which is not affected by further increase of the trimmer capacity. The proper setting of this trimmer is that which gives the minimum out-put between the two high output peaks.

d. Be very careful in making this adjustment that the trimmer is adjusted to give operation between the two output peaks, rather than the minimum output obtained by either a high or low capacity setting.

e. After the A.V.C. has been adjusted, it may be necessary in some cases to re-align the I.F. system to obtain maximum gain.

MODEL 1101
(Chassis 9-B,2-A) GENERAL HOUSEHOLD UTILITIES CO.

MODEL 1101

Part No.	Description	No. Req.	Price
	TUNER (2A CHASSIS)		
20962	Grid Cap Only	2	.02
22856	Resistor, 25,000 Ohm, Carbon, 1/4 Watt	1	.25
23538	Resistor, 200,000 Ohm, Carbon, 1/4 Watt	1	.25
26199	Oscillator Transformer Mounting Washer	1	.02
26218	Tube Socket - 78	1	.15
26219	Tube Socket - 6F7	1	.15
27342	Pilot Light Shield	1	.02
27492	Walnut Knob	3	.15
27614	Finder Arm Clamp Nut	6	.02
27722	Power Switch	1	.35
27733	Interstage Coil Shield	1	.20
27734	Oscillator Transformer Shield	1	.20
27739	Trimmer Condenser Assembly	2	.35
27784	Resistor, 400 Ohm Carbon, 1/4 Watt (Replace with 28746)	1	.25
27788	Removable Cover	1	.15
27831	Pilot Lamp Bracket Assembly	1	.15
27853	Pilot Lamp Switch	1	.95
27886	Screw Driver	1	.10
27887	Thumb Screw	1	.02
27890	Crank Arm	1	.02
27891	Connecting Rod	1	.02
27971	Volume Control	1	.80
27985	Resistor, 33.3-25.8 Ohm, Wire Wound	1	.50
28020	Shifter Cam Plate Assembly	1	.30
28045	Pilot Lamp	2	.15
28086	Antenna Transformer Shield Assembly	1	.20
28093	Dial Indicator	1	.15
28172	Station Finder Arm Clamp Nut	4	.02
28174	Resistor, 7500 Ohm, Carbon, 1/4 Watt	1	.25
28341	Disengager Shaft Assembly	1	.80
28343	Contact Arm and Hub Assembly	1	2.00
28354	Remote Control Cable, less plug	1	2.75
28365	Oscillator Transformer	1	.90
28366	Oscillator Transformer Mounting Strip	1	.05
28368	Interstage Coil Assembly	1	1.40
28370	Bypass Condenser Block	1	1.35
28375	Remote Control Cable Plug	1	.40
28404	R.F. and I.F. Choke Assembly	1	1.25
28405	Terminal Strip Assembly	1	.30
28409	Tuning Condenser, 3 Gang	1	4.25
28414	Station Finder Arm and Contact	10	.10
28416	Antenna Transformer	1	.75
28424	Dial Chart Assembly	1	1.35
28450	Condenser, 590 Mmf. Mica (Replace with 28585)	1	.20
28585	Condenser, 570 Mmf. Mica, (Supersedes 28450)	1	.20
28721	Condenser, .01 Mfd., 400 Volt Tubular	2	.25
28728	Condenser, .25 Mfd., 100 Volt Tubular	1	.25
28746	Resistor, 2500 Ohm Carbon, 1/4 Watt (Supersedes 27784)	1	.25
61054	Station Finder Arm Screw	10	.02
63829	Washer, Station Finder Arm	10	.01
63839	Felt Knob Washer	3	.01
	RELAY BOX		
28455	Relay Box Complete	1	11.00
20861	Line Cord and Plug	1	.35
27730	Control Cord Socket	1	.15
28350	Relay Box Cover	1	.45
28355	Control Cable, less Plug	1	.45
28375	Control Cable Plug	1	.40
28443	Line Socket	1	.50
28458	Relay	1	3.00
28465	Power Transformer, 105 - 125 Volts, 50 - 60 Cycles	1	2.50
	AMPLIFIER (9B CHASSIS)		
20962	Grid Cap Only	3	.02
21348	Resistor, 100,000 Ohm, Carbon, 1 Watt	1	.25
21598	Rubber Grommet	3	.02
22027	Fibre Grommet	3	.02
22333	Antenna Binding Post Assembly	1	.10

MODEL 1101

GENERAL HOUSEHOLD UTILITIES CO.

MODEL 1101 (Chassis 9-B)
Parts List

MODEL 1101

Part No.	Description	No. Req.	Price
	AMPLIFIER (9B CHASSIS) (Continued)		
22846	I.F. Coil Assembly	1	.50
22858	Resistor, 1 Meg. Carbon, 1/4 Watt	1	.25
23119	Intermediate Shield	1	.10
23358	Vertical Insulated Terminal Assembly	5	.05
23368	Resistor, 400,000 Ohm, Carbon, 1/4 Watt	1	.25
23370	" 100,000 " " 1/4 "	2	.25
23853	" 50,000 " " 1/4 "	4	.25
23998	" 250,000 " "	3	.25
24251	Condenser, 100 Mmf. Mica	3	.20
24487	Condenser, 250 Mmf. Mica	1	.20
24754	Tube Socket - 85	1	.15
26218	Tube Socket - 78	1	.15
26232	Round Shield Cap	1	.05
26256	Tube Shield Base	3	.05
26552	R.F. and Ant. Shield Can Eyebolt Assembly	1	.20
27272	Electrolytic Shield Can Assembly	1	.25
27282	I.F. Shield Can Assembly	1	.35
27283	" " " "	1	.40
27301	Resistor Panel Bracket Assembly	2	.15
27347	Tube Socket - 37	1	.15
27388	I.F. Shield Can Assembly	1	.30
27445	Resistor, 400 - 4,000 Ohm (Wire Wound)	1	.50
27448	" (" ")	1	1.50
27477	Electrolytic Plain Washer	3	.02
27478	Electrolytic Ground Terminal	2	.02
27487	Tube Socket (6B7)	1	.15
27488	Speaker Cable Socket	1	.15
27489	Tube Socket - 45	4	.15
27490	Resistor, 1000 Ohm, 1/4 Watt	4	.25
27710	Electrolytic Condenser, 8 Mfd. 475 Volt (Chrome)	1	1.15
27711	Electrolytic Condenser, 8 Mfd. 475 Volt	3	1.10
27715	Dual Electrolytic Condenser, 8 Mfd. - 100 Volt-4 Mfd.- 350 Volt	1	1.90
27723	Tube Socket - 5Z3	1	.15
27725	Audio Input Transformer Assembly	1	4.00
27726	Audio Choke Assembly	1	1.50
27727	Filter Choke Assembly	1	3.00
27728	Power Transformer Assembly	1	12.00
27730	Cable Socket (7 Prong)	1	.15
28032	Bypass Condenser Assembly	1	2.75
28043	Condenser, .01 - .01 - .01 Mfd. Type "C"	1	.80
28380	I.F. Input Assembly	1	2.60
28381	A.V.C. & I.F. Assembly	1	2.35
28382	I.F. Diode Assembly	1	2.70
28385	Vertical Terminal & Resistor Panel Assembly	1	.85
28399	Vertical Insulated Terminal	1	.05
28401	Resistor, 8,000 Ohm (Wire Wound)	1	.40
28403	Tone Control	1	.75
28420	Resistor, 5,000 Ohm, Carbon, 1 Watt	1	.25
28421	" 2,000 " " 1 Watt	1	.25
28438	" 150,000 " " 1/2 Watt	1	.25
28449	" 125,000 " " 1/2 Watt	1	.25
28451	Junction Terminal Board	1	.05
28721	Condenser, .01-500 Volt, Tubular	1	.25
28723	" .05-400 " "	1	.25
28726	" .1 -400 " "	1	.25
28728	" .25-100 " "	1	.25
	SPEAKER PARTS		
27625	12A2 Speaker Complete	1	15.00
20047	Terminal Strip	1	.25
20048	Terminal Strip Cover	1	.15
27215	Field Coil	1	4.50
27706	Output Transformer	1	2.50
27839	Speaker Cable Plug	1	.35
27841	Speaker Cable, Less Plug	1	.55
28756	Cone & Voice Coil Assembly	1	4.00

COMPLETE SPEAKERS MAY NOT BE RETURNED FOR CREDIT

GULBRANSEN CO.

MODEL V6Z2
Schematic
Voltage

	Across Heater	Plate to Cathode	Screen to Cathode	Grid to Cathode	Normal Plate MA
78 R.F.	6.1	182	80	3*	7.0
77 1st Det. & Osc.	6.1	178	77	5**	1.3**
78 I.F.	6.1	182	80	3.*	7.0
75 2nd Det. 1st Audio	6.1	70x		1.4*	.35
41 Output	6.1	172.5	176.5	12.5xx	16.0
84 Rect.	6.1	205			17.5 per plate

*-Cathode to Ground.**-Subject to Variation. x-Triode Plate to Cathode
xx-Read Across 400-Ohm Resistor, R13

Fig 7—Location of Tubes

Trying Out the Set and Adjusting

After the wiring has all been completed and before the chassis is permanently installed, try out the set and adjust the antenna trimmer. The location of the tubes is shown in Fig. 7. To adjust the antenna trimmer, tune in a weak signal between 1200 and 1400 K.C. with the volume control about three-fourths on. On one end of the chassis box is a small metal plate. Remove this plate. Directly under the hole in the chassis box is the antenna trimmer condenser screw. Turn this adjusting screw up or down until maximum output is obtained.

MODEL V6Z2
Alignment
Antenna notes

GULBRANSEN CO.

Condenser Alignment

Misalignment or mistracking of condensers generally manifests itself in broad tuning and lack of volume at portions or all of the broadcast band. The receivers are all properly aligned at the factory with precision instruments and realignment should not be attempted unless all other possible causes of the faulty operation have first been investigated and unless the service technician has the proper equipment. A signal generator that will provide accurately calibrated signals over the broadcast band and accurately calibrated signals at and around 262 K.C., the intermediate frequency and an output indicating meter are desirable.

First set the signal generator at approximately 262 K.C. Connect the antenna lead from the generator to the control grid of the I.F. 78 tube, through a .05 mfd. condenser. The ground lead of the generator goes to the ground of the receiver. Turn the rotor plates of the tuning condenser completely out and keep the signal weak enough to prevent A.V.C. action. Note from Fig. 9 that the second I.F. transformer is self tuned and cannot be adjusted. Adjust the frequency of the signal generator until the output meter shows maximum output. The intermediate frequency setting of the generator is then correct, although it may be a very small percentage higher or lower than 262 K.C.

Next connect the signal lead from the signal generator to the grid of the 1st detector tube through a .05 mfd. condenser. Then adjust the two intermediate frequency condensers for maximum output. One of the I.F. condenser screws is reached through the hole on the top of the 1st I.F. assembly can. The other I.F. condenser screw is reached from the bottom of the sub-panel through a hole at the bottom of this assembly.

Now set the signal generator for a signal of exactly 1400 K.C. The antenna lead from the generator is, in this instance, connected to the antenna lead of the receiver. Connect the flexible drive shaft to the chassis if it has been disconnected. As explained previously, the dial scale should be at the low frequency end stop when the rotor is completely in mesh. Then turn the station selector knob until the dial scale is at 1400 K.C.

Then adjust the three trimmer condensers on the gang tuning condenser for maximum output, adjusting the oscillator section first.

Next, set the signal generator for a signal of 600 K.C. and adjust the oscillator 600 K.C. trimmer. The adjusting screw for this condenser is reached through a hole in the back wall of the sub-panel.

A non-metallic screwdriver is necessary for this adjustment. Turn the tuning condenser rotor until maximum output is obtained. Then turn the rotor slowly back and forth over this setting, at the same time adjusting the 600 K.C. trimmer screw until the highest output is obtained.

Then set the signal generator again for a signal of 1400 K.C. and check the adjustment of the tuning condenser trimmers at this frequency for maximum output.

Antenna

A roof antenna is recommended, as by far the best results will be obtained. A large percentage of cars at the present time come equipped by the factory with built-in roof antennas. In those cars which do not have an antenna, one will have to be put in.

First determine if the top has a grounded chicken wire mesh. To do this, use a continuity meter. By means of a wire, attach a darning needle to one of the prods. Poke the darning needle into the roof material and turn it around until it comes in contact with the chicken wire. Then ground the other prod and if the continuity meter shows a complete circuit, the chicken wire mesh is grounded. In a case of this kind, it will be necessary to get inside of the roof and it is advisable to employ the services of an auto "top man" or an upholsterer.

It will be necessary to remove the top material and cut away the chicken wire from the side supports until it is at least 3" away from ground at any point. It should also be at least 3" away from the dome light and the dome light wiring. The chicken wire may then be laced to the points from which it was cut with a heavy, waxed cord. The chicken wire will then make a satisfactory antenna, or a copper screen may be used.

If the chicken wire is not grounded, it may be used as the antenna by taking down the roof material at one corner and soldering the lead-in wire to it. If it is not desired to take down the roof material a piece of copper screening can be tacked to the roof on the inside of the car. At least six square feet should be used. Keep it at least 3" away from any grounded metal parts on all sides. After the screen is in place, it can be covered over with cloth which matches the roof material. Solder the lead-in wire to the screen and bring it down the front corner post nearest to the set.

Another, and a very simple way in which an antenna can be secured to the inside of the car roof is to use one of the car-roof antennas which are now being made up especially for this purpose. There is one type of antenna which consists of copper strips laid back and forth between two pieces of cardboard. The cardboard is then covered over with material which matches the roof material. This antenna can be had in several colors and is tacked in place on the inside of the car roof in a few minutes.

GULBRANSEN CO.

MODEL V6Z2
Service notes

If the Receiver Fails to Operate

"A" Fuse— Check the "A" line fuse in the chassis box.

"A" Line Open—See if power is being supplied to the speaker, tube heaters, and "B" eliminator.

"B" Eliminator Not Working—See if the "B" eliminator is in proper working order by checking the high voltage points at the tube plate terminals (see Fig. 9).

Antenna and Lead—See if antenna is properly connected to lead-in wire and antenna lead from set. Be sure antenna system is not grounded at any point.

All Tubes Not Inserted—See if all tubes are inserted as per Fig. 7.

Defective Tubes—Try out a new set of tested tubes.

Grid Caps Not Connected—See if all grid caps are properly connected to top of top grid connection tubes.

Variable Condenser Plates Shorted—Check condenser sections in chassis carefully for foreign particles or rotor stator rubbing.

Weak Reception

Defective Tubes—Try out a new set of tested tubes and note any difference in performance.

Poor Antenna—To try out the effectiveness of the antenna used, check the volume against the volume when using a straight length of wire about 15' long, run out of the car through one of the windows. If, upon test, the external wire is found to be much superior as far as volume is concerned, the antenna is not satisfactory and will have to be re-vamped or a new one installed. The antenna or lead-in may be too near grounded metal portions of the car frame or body resulting in a high capacity to ground. There may be grounded metal mesh in the car roof. There may be a poor soldered connection between the antenna, lead-in, or antenna lead from the set. The antenna system may be partially grounded at some point.

Antenna Trimmer Not Adjusted—See article "Trying Out the Set and Adjusting."

Car in Shielded Location—If the car is within or near a steel structure, the signals may be weakened by absorption.

Storage Battery Run Down—Check the condition of the battery.

Defective "B" Eliminator—Check "B" voltage at sockets (see voltage chart and Fig. 9).

Misalignment of Variable Tuning Condensers—Instructions for realigning are contained in this manual. Do not, however, attempt realignment unless other causes of low volume have first been investigated.

Wrong Voltages—Check voltages at the sockets (see voltage chart).

Other Causes of Low Volume—Defective speaker, poor battery, antenna, grid cap or other connections, defective A.V.C. system in the receiver, and various opens, grounds and shorts in the receiver assembly.

Distorted Reproduction

Receiver Oscillating—See article on oscillation.

Defective Tubes—Try out a new set of tubes.

Incorrect Voltages—Check the voltages at the sockets (see voltage chart).

Incorrect Tuning—The signal must be carefully tuned in to the clearest and loudest point. It must not be tuned "off resonance."

Defective Speaker—Try out a new one if it is available.

Defective Audio System in the Receiver—Make continuity resistance tests using as a guide Fig. 9.

Signal Transmission—Quality fading in the signal transmission can cause poor tone quality.

Oscillation

Cover of Box—May not be on or if on, may not be sufficiently tightened down.

Off Characteristic Tubes—Tubes whose characteristics vary considerably from the standard may cause oscillation. Try out some new ones.

Open Bypass Condensers—Check the bypass condensers and leads to them for open circuit.

Poor Ground Connections—Check the ground connections in the chassis for poor contact.

Grid Caps and Leads—The grid caps may not be making good contact to the tops of the tubes or the wires of the grid caps may be too close together.

MODEL V6Z2
Service notes

GULBRANSEN CO.

Care and Maintenance

Advancing Generator Charging Rate

The installation of the automobile radio imposes an additional drain on the car storage battery. This can be compensated for by advancing the charging rate of the car generator. Check the state of charge of the storage battery about a week after the installation of the automobile radio is made and adjust the charging rate accordingly.

Tubes

The type of tubes used and location of these tubes in the chassis are shown in Fig. 7. These tubes are of a sturdy, rugged construction designed especially for an auto receiver. Most of them, under normal usage, will last for many months and in some cases, years. Some of them, however, may become faulty after a few months of operation.

For that reason, it is advisable to secure a new set of tested tubes at intervals of three to six months and have these inserted in the receiver one at a time, noting any difference in performance.

Pilot Lamp

The pilot lamp is located in the control unit. A 6-8 volt miniature base lamp is used. To replace the lamp, first turn the receiver off. Remove the two control knobs and the key entry nut. Then take out the screw holding the control box cover in place after which the cover can be taken off. The pilot lamp socket is secured to a spring clip which is on a bracket in the control unit. Push this clip and socket over far enough to get at the lamp, after which the bulb can be replaced and the control unit reassembled.

Fuse

A 10 amp. automobile fuse is used for the "A" line. This fuse is mounted on a block on the power transformer in the chassis. To change the fuse, it will be necessary to remove the cover of the chassis box.

Electrical Condition of Car

Dirty spark plugs, incorrect spacing of distributor points, faulty distributor condenser, and various other items in the car electrical system can cause noisy operation. If the customer complains of noise in the receiver after it has been in use for some time, check the items mentioned as well as other parts of the car electrical system for poor connections, grounds, and other faults which may be responsible for the noise.

Circuit

The circuit consists of an antenna stage, a 78 R.F. stage, a 77 1st detector-oscillator stage, a 78 I.F. stage, a 75 dual diode-triode tube, which functions as a diode 2nd-detector and triode 1st audio stage, and a single 41 output stage. An 84 full wave rectifier is used in the power unit. The intermediate frequency is 262 K.C. The diode current establishes a drop across a resistor which is used as additional bias voltage for the R.F. and I.F. tubes giving automatic volume control action. Noise suppression between stations is obtained by the resistor in the cathode circuit of the 75 tube, the drop across which must be overcome before rectification in this tube begins. The manual volume control varies the audio voltage applied to the grid of the 75 tube.

A vibrator interrupts the current through the primary of the power transformer in the power unit. This, together with the turns ratio in this transformer, results in the high voltage AC being present in the secondary of the transformer. The full wave rectifier tube, filter choke, and filter condensers convert this high voltage AC into high voltage DC for the plate and screen circuits.

Current for the receiver is obtained from the car storage battery.

Rattle

If rattle is experienced when a signal is being received, it is, in practically all cases, due to mechanical vibration at some point in the chassis. Inspect the chassis and look for a loose tube shield or a loose part at some point which can rattle against another part. When the vibrating part is found, secure it in place in some manner. This can generally be done with a wedge made of a piece of paper, cardboard or wood. Rattle may, in some instances, be due to a loose cover. If this is the case, remove the cover and bend the edge of the chassis box outward between the screw holes so that the cover will fit tightly when it is put on.

GULBRANSEN CO.

MODEL v6Z2
Parts List

Replacement Parts for Series V6Z2 Receivers

CHASSIS PARTS

Part No.	Description	List Price
P-1780	No. 75 Tube Socket	$0.10
P-1761	No. 77 Tube Socket	.10
P-1762	No. 78 Tube Socket	.10
P-1665	No. 41 Tube Socket	.10
P-1803	No. 84 Tube Socket	.10
P-1805	Single Pin Jack	.10
P-1799	Tube Shield Assembly	.25
P-20681	Chassis Box	4.00
P-20657	Chassis Box Cover	1.10
P-20680	Angle Plate	.25
P-70740	Shielded Antenna Lead	.40
P-70744	Shielded "A" Battery Lead	1.15
P-1824	Anchor Bushing, complete with nuts and washers	.35
P-1804	Vibrator Unit (in cast metal case)	6.00
P-10266	Vibrator Unit Rubber Cushion, pair	.10
P-20660	Vibrator Unit Box	.70
P-20661	Vibrator Unit Box Cover	.20
P-1572	Fuse Clip Assembly	.10
P-10260	Cardboard Baffle	.20
P-1624	10 Amp. Fuse	.10
P-1774	Electrodynamic Speaker	3.75
P-20675	Volume Control and Pinion Gear Bracket	.15
P-20545	Pinion Bearing	.10
P-20546	Pinion Compression Spring	.10
P-20544	Pinion Bracket	.10
P-20586	Drive Pinion	.10
P-20585	Cond. Drive Gear	.25
P-30417	Volume Control Coupling	.10
P-10263	Rubber Tube Bumper—Square	.10
P-10210	Rubber Tube Bumper—Round	.10
P-10213	Rubber Band for Tube	.10
P-50569	Filter Choke Assembly	1.60
P-50585	Power Trans. Assembly—Less condensers and brackets	3.25
P-5099	Antenna R. F. Transformer—Less Can	1.20
P-5065	Interstage R. F. Transformer—Less Can	1.00
P-5105	Second I. F. Transformer and Can Assembly	.95
P-5096	First I. F. and Oscillator Transformer and Can Assembly	2.70
P-5097	Single Solenoid "A" Choke	.25
P-40431	Antenna R. F. Can	.15
P-1826	Interstage R. F. Can	.10

Resistors

Part No.	Code No.	Resistance	Type	List Price
P-A95105	R-1	1 Megohm	Carbon	$0.25
P-A95105	R-2	1 Megohm	Carbon	.25
P-B94261	R-3	260 ohm	Carbon	.35
P-A95504	R-4	.5 Megohm	Carbon	.25
P-A95104	R-5	100,000 ohm	Carbon	.25
P-A94402	R-6	4,000 ohm	Carbon	.20
P-A91061	R-7	0-500,000 ohm	Volume Control and Switch	$1.15
P-A95104	R-8	100,000 ohm	Carbon	.25
P-A95104	R-9	100,000 ohm	Carbon	.25
P-A94402	R-10	4,000 ohm	Carbon	.20
P-B94153	R-11	15,000 ohm	Carbon	.25
P-B94203	R-12	20,000 ohm	Carbon	.25
P-C94401	R-13	400 ohm	Carbon	.20

Condensers

Part No.	Code No.	Capacity	Voltage	Type	List Price
P-80862	C-1	.05 mfd.	200 V.	Tubular	$0.30
P-80888	C-2	.25 mfd.	200 V.	Tubular	.35
P-80821-B	C-4	.001 mfd.	600 V.	Molded	.25
P-80937	C-7	4.0 mfd.		Electrolytic Block in can	1.25
	C-11	4.0 mfd.			
P-80919	C-8	.00025 mfd.	600 V.	Molded	.20
P-80945	C-9	.0005 mfd.	600 V.	Molded	.15
P-80898	C-10	.006 mfd.	600 V.	Tubular	.15
P-80945	C-12	.0005 mfd.	600 V.	Molded	.15
P-80966	C-14	.008 mfd.	600 V.	Tubular	.20
P-80963	C-15	.04 mfd.	400 V.	Dual Tubular	.30
	C-16	.04 mfd.	400 V.		
P-80960	C-17	.4 mfd.	15 V.	In Metal Can	.50
P-80959	C-18	.003 mfd.	600 V.	Molded	.35
P-80956	C-19	8.0 mfd.	225 V.	Electrolytic Block in Can	2.25
	C-20	20.0 mfd.	25 V.		
	C-21	8.0 mfd.	225 V.		
P-80955	C-3	.1 mfd.	300 V.	Bypass Block in Can	1.35
	C-5	.05 mfd.	200 V.		
	C-6	.1 mfd.	200 V.		
	C-13	.05 mfd.	300 V.		
P-1539	600 K. C. Trimmer Condenser				.45
P-80957	Three-Gang Variable Condenser				3.00

CONTROL UNIT PARTS

Part No.	Description	List Price
P-1816	Celluloid Dial Strip Only	$0.15
P-1825	Dial Gear and Strip Assembly	.40
P-20509B	Control Unit Swivel	.15
P-20510A	Steering Post Apron	.30
P-20511	Steering Post Clamp	.15
P-20689	Control Unit Cover	.35
P-70746	Pilot Lamp Cable Only	.40
P-1415A	Pilot Lamp Socket and Clip	.15
P-1563A	6-8 Volt Pilot Lamp	.25
P-20692	Volume Control Drive Shaft	.10
P-20703	Drive Shaft Pinion	.15
P-20691	Dial Gear Pinion (Hollow Center)	.15
P-30413	Entry Plate Assembly for Key	.30
P-30414	Key	.15
P-1813	Small Knob	.15
P-1814	Large Knob	.20

ADDITIONAL ITEMS

1 — 1550	14" Flexible Drive Shaft	.90 ea.
1 — 1553	20" Flexible Drive Shaft	1.25 ea.
1 — 1551	34" Flexible Drive Shaft	1.65 ea.
1 — 1552	45" Flexible Drive Shaft	2.00 ea.
1 — 91011	Spark Plug Suppressor	.50 ea.
1 — 91012	Distributor Suppressor, Wood Screw Ends	.50 ea.

MODEL V6Z2
Mounting notes

GULBRANSEN CO.

Mounting the Chassis

The chassis is mounted on the dash by means of two brackets as shown in Fig. 2. Two mounting screws are used to secure each bracket to the end of

Before mounting the chassis read the section on "Attaching the Flexible Drive Shafts."

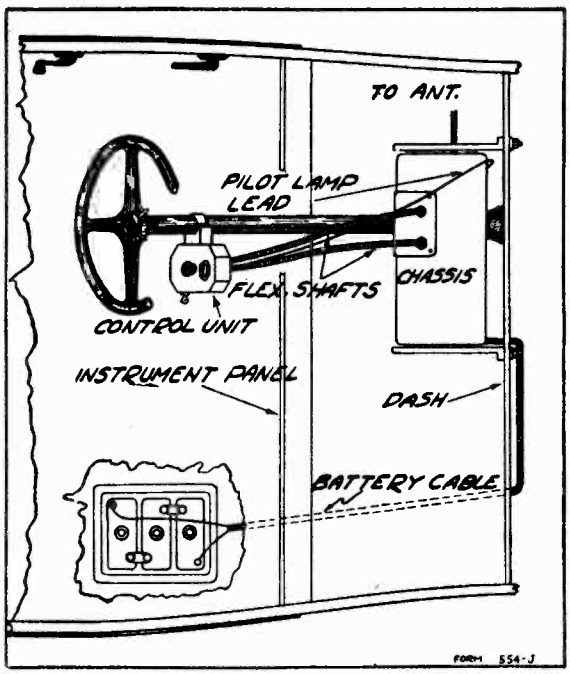


Fig. 2—General Installation—Top View

the chassis box. Six embossings with inset nuts are provided on each end of the chassis box. Any two of these may be used for the bracket screws, thus providing great flexibility in mounting.

Each nut has a mounting screw in it and if any of these are in the way of the mounting bracket, they can be taken out.

The chassis should be mounted with the speaker grill facing toward the driver. In this position, the anchor bushings in which the flexible drive shafts are placed will come out of the top.

The location of the chassis will very often depend on the space available. To the left of the center, as shown in Fig. 2, is a good location. The chassis should be mounted in such a way that the flexible drive shafts to the control unit will be in as straight a line as possible or with large radius bends. *In general, it will be advisable to consider the possibility of a car heater installation at the right side of the dash (facing forward).* In practically every case no difficulty will be experienced in mounting the heater and chassis on the dash.

The possibility of interference with the legs of the driver or passenger in the front seat and the possibility of interference with the controls of the car should also be considered before the location of the chassis is definitely decided on.

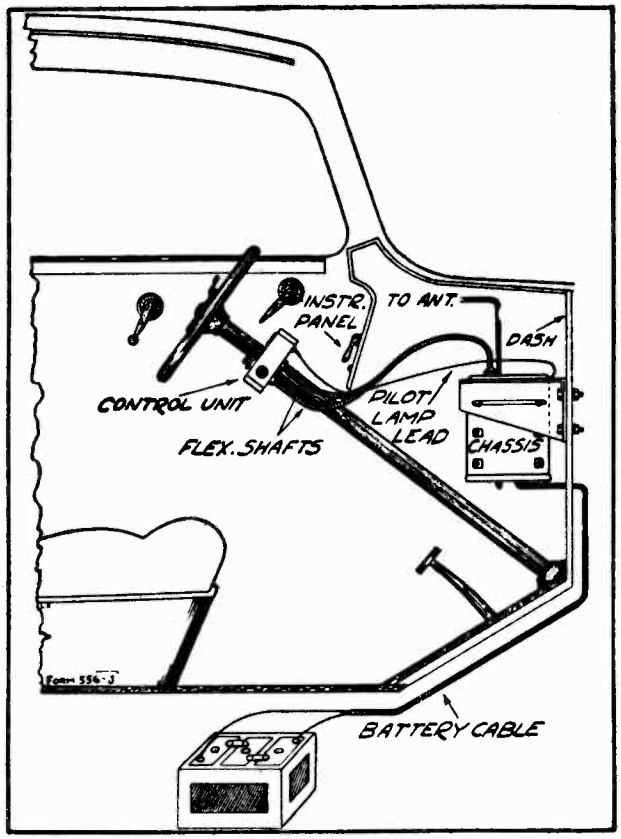


Fig. 3—General Installation—Side View

When the location is decided on, drill the four mounting holes required. The location and size of these holes is shown in Fig. 4. A template for drilling these holes is supplied with the receiver. Four ¼" mounting bolts, four washers, four lockwashers, and four nuts are provided. The mounting bolt is put through the bracket and dash with the shank

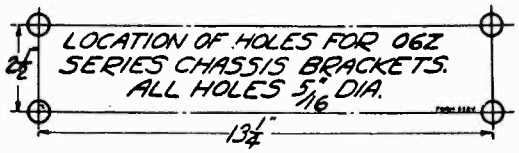


Fig. 4—Mounting Hole Location

extending into the engine compartment. A washer, the lockwasher and nut, are then put on. Mount the brackets permanently, but do not mount the chassis permanently until all connections are completed, the tubes are all inserted, the receiver tried out, and the antenna trimmer adjusted (explained later).

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MODEL V6Z2
Flexible drive

Attaching the Flexible Drive Shafts

After the control unit and chassis are in position, the flexible drive shafts may be attached. Two 34" shafts are supplied, unless otherwise specified. These shafts may also be had in 14", 20", and 45" lengths.

The flexible drive shafts should always be installed with a minimum amount of bending. Always keep the radius of the bend as large as possible.

The 34" shafts supplied with the receiver may be cut to a shorter length if necessary. The shaft (inside portion) should first be brazed at the point to be cut. It should then be cut with a three-corner file or edge of a grinding wheel. *Do not use a hack saw.* After the shaft is cut, file it down in one place a slight amount to provide a flat surface for the set screw. The casing which is 1½" shorter must be cut to correspond. This should be tinned or brazed first at the point to be cut and may then be cut with a hack saw.

After the length and position of the shafts is decided on they may be secured to the chassis. The shafts are already secured at the control unit. It is advisable to attach the flexible shafts with the chassis on the mounting brackets, but if the chassis is accessible, it may be removed from the brackets. Keep it as close to its regular position as possible so that the flexible shaft will not turn after the chassis is replaced on the brackets. In general, it may be moved up or down, but should not be moved sideways or be turned. Just over the speaker grill on the chassis box will be seen an angle plate. Remove this plate. Before proceeding further with attachment of the shafts see if the receiver is in working order by operating it with the cover off and necessary connections completed, as explained further in this manual.

In Fig. 5 is shown a cross-sectional view of the flexible drive shaft connections at the chassis end. First put the angle plate on the chassis box temporarily with two screws. Then center the volume control anchor bushing on this plate. To do this, loosen the nut which holds this bushing in place (see Fig. 5). Center the bushing by eye so that the center of it is in a line with the center of the volume control coupling. Then tighten the nut down.

Next, take the angle plate off. Extend the volume control flexible shaft and casing several inches through the hole in the anchor bushing of the angle plate so that the plate will be on the casing and out of the way. Turn the volume control coupling counter-clockwise until the switch is snapped to the off position. Lock the receiver on the control unit and turn the volume control knob counter-clockwise until it is in the locked position. Then loosen both set screws in the volume control coupling and insert the flexible shaft in the coupling (see Fig. 5). Tighten the outer set screw first on one of the *four flat faces* of the flexible shaft and then tighten the inner set screw. For purposes of illustration, the set screws in Fig. 5 are shown extending sideways in the coupling, but should actually extend towards the box opening in order to get at them. Then temporarily place the chassis on the mounting brackets if it has been taken off and check the operation of the switch, volume control, and lock. The switch should be off when the volume control knob is in the locked position. It may be necessary to loosen the inner set screw and do a slight amount of adjusting until the proper setting is obtained.

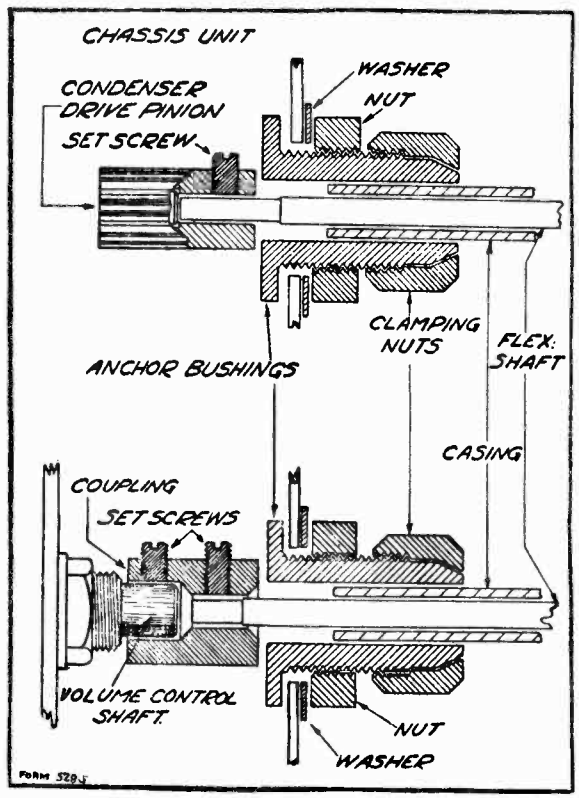

Fig. 5—Details of Flexible Drive Shaft Connections

To attach the tuning condenser flexible shaft, first center the anchor bushing by eye as was explained above. Then extend the tuning condenser flexible shaft into the hole at the center of the tuning condenser drive pinion. Turn the large gear on the tuning condenser rotor shaft until the rotor plates are completely in mesh. Then turn the station selector knob on the control unit until the dial gear is at the low frequency end stop. The set screw in the drive pinion should then be tightened down on one of the four flat faces of the shaft.

The operation of this control should also be tried out after the shaft is in place. In order to get accurate calibration it may be necessary in some instances to loosen the set screw of the large gear on the tuning condenser rotor shaft and adjust the setting of this gear.

Next, slide the angle plate into position and fasten it in place by means of the four screws. Then tighten down the clamping nuts on the two flexible shaft casings, *but do not tighten these nuts excessively.*

MODEL V6Z2
Control unit

GULBRANSEN CO.

Mounting the Control Unit

The control unit is mounted on the steering column under the steering wheel as shown in Figs. 2 and 3. A clamp is used to hold it in position.

The outer portion of the clamp is screwed to the inner portion by means of the four 8-32x3/8" fillister head screws supplied with the receiver. See Fig. 1.

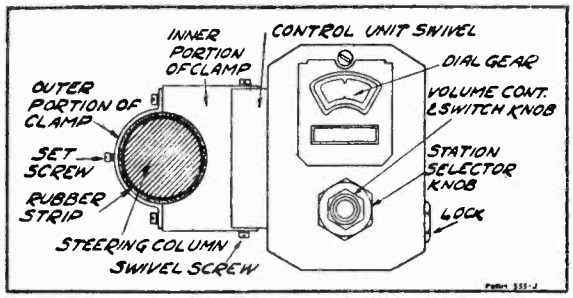

Fig. 1—Method of Mounting Control Unit

Two rubber strips are provided, one 1/8" thick and the other 1/16" thick. These are wrapped around the steering column under the clamp. Either or both of these strips may be used, depending on the thickness of the column. Wrap the rubber strips around the column in such a way as to allow the set screws which hold the clamp in position to pass through. When the clamp is in place, take the two 8-32 headless cup point set screws and screw them down on the steering column through the tapped holes in the clamp.

The control unit is generally about 4" below the wheel, but this will vary with individual cases. The length of the drive shaft and interference with driver's legs will also govern the location of the control unit.

There are two screws which hold the inside portion of the clamp to the control unit swivel. By loosening these two screws, the box can be swung around if such a position is handier from the standpoint of the person operating the set. Instructions for attaching the pilot lamp lead are contained in the article "Completing the Wiring Connections."

Completing the Wiring Connections

Pilot Lamp

The pilot lamp lead is in a shielded cable which extends out from the control unit box. On the rear wall of the chassis, near one of the ends, will be seen a tip jack. Insert the tip on the end of the pilot lamp lead into this jack. There is also a pigtail or shield extension at the end of this lead. Ground this pigtail with one of the angle plate screws (see Fig. 6). Double up the pilot lamp lead if it is too long—*Do not cut this lead.*

Antenna Cable

Bring the antenna cable of the receiver in the most direct manner possible to the lead-in from the antenna and connect it to the latter. Keep it as high as possible and as far away from any car wiring as possible. Care should be taken not to have the antenna wire come in contact with the shield wires. Ground the pigtail of the antenna cable shield at the antenna end. The pigtail of this shield at the chassis end is grounded under one of the chassis mounting screws.

In some cases the shielded antenna lead from the receiver is not long enough to reach to the column at which the antenna lead-in comes down. In a case of this kind, cover the exposed portion of the lead-in wire with braided shield from the point where it leaves the column to the point of connection to the antenna lead of the receiver. Connect the two wires together and connect the two shields together, care being taken that no strand of the shield touches the antenna wire.

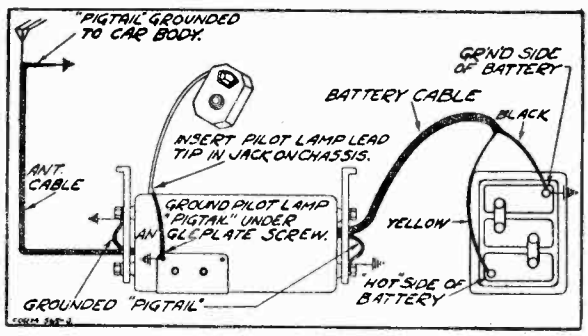

Fig. 6—External Wiring Connections

Battery Cable

The battery cable should be brought over to the storage battery in the most convenient manner possible. In Figs. 2 and 3 it is shown passing through a hole in the dash, thence down and under the floor board to the battery. In other installations, it may be more convenient to bring this cable down in back of one of the side pads and thence to the battery. The lug on the yellow lead of this cable is connected to the "Hot" or ungrounded side of the battery (the "Hot" or ungrounded side may be positive or negative, depending on the make of car). The lug on the black lead is connected to the grounded side of the battery. The pigtail of the shield of this cable at the chassis end should be grounded under one of the chassis mounting screws.

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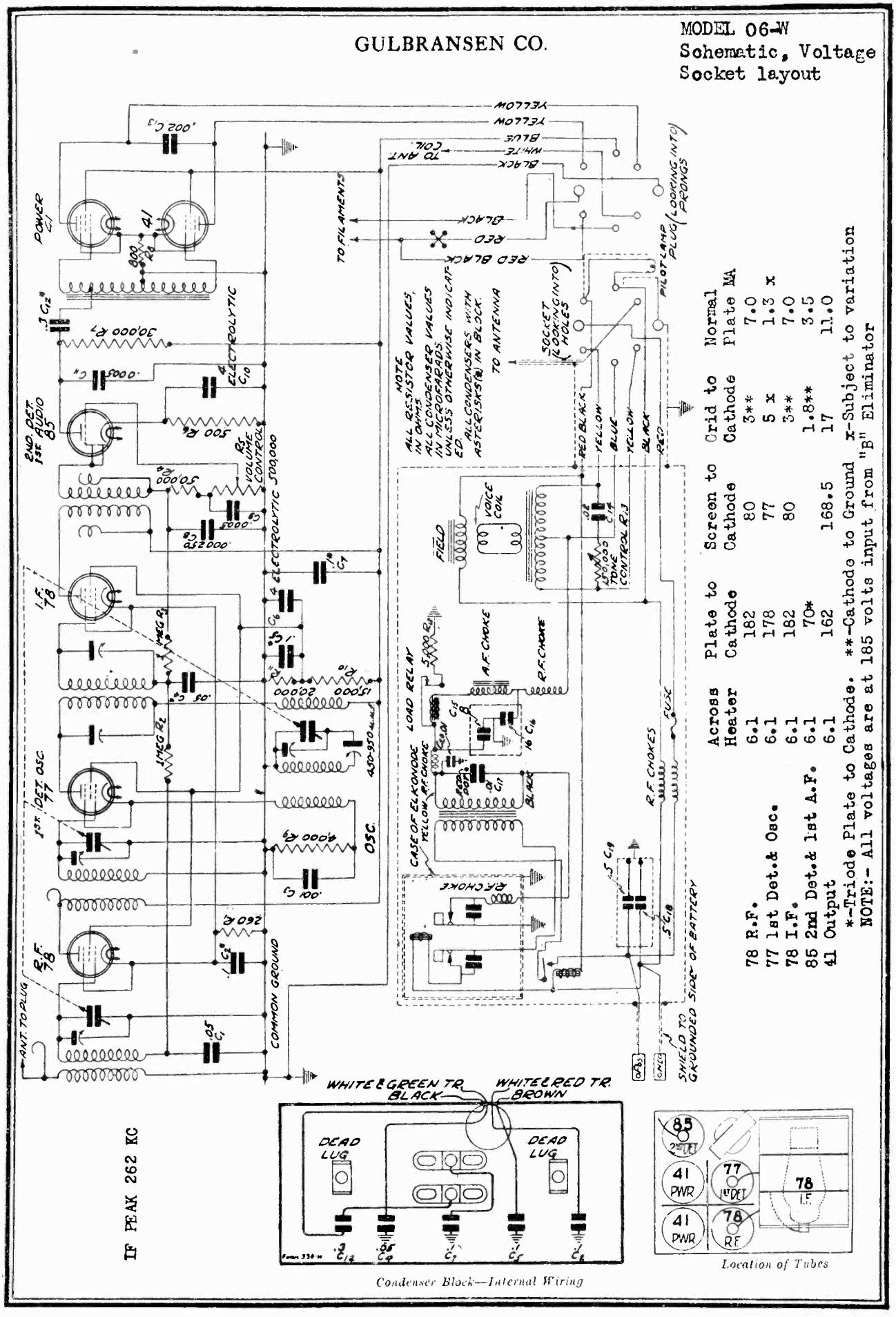
MODEL 06-W
Schematic, Voltage
Socket layout



Condenser Block—Internal Wiring

Location of Tubes

	Across Heater	Plate to Cathode	Screen to Cathode	Grid to Cathode	Normal Plate MA
78 R.F.	6.1	182	80	3**	7.0
77 1st Det.& Osc.	6.1	178	77	5 x	1.3 x
78 I.F.	6.1	182	80	3**	7.0
85 2nd Det.& 1st A.F.	6.1	70*		1.8**	3.5
41 Output	6.1	162	168.5	17	11.0

*-Triode Plate to Cathode. **-Cathode to Ground x-Subject to variation
NOTE:- All voltages are at 185 volts input from "B" Eliminator

MODEL 06-W
Alignment

GULBRANSEN CO.

Condenser Alignment

Misalignment or mistracking of condensers generally manifests itself in broad tuning and lack of volume at portions or all of the broadcast band. The receivers are all properly aligned at the factory with precision instruments and realignment should not be attempted unless all other possible causes of the faulty operation have first been investigated and unless the service technician has the proper equipment. A signal generator that will provide accurately calibrated signals over the broadcast band and accurately calibrated signals at and around 262 K.C., the intermediate frequency and an output indicating meter are desirable.

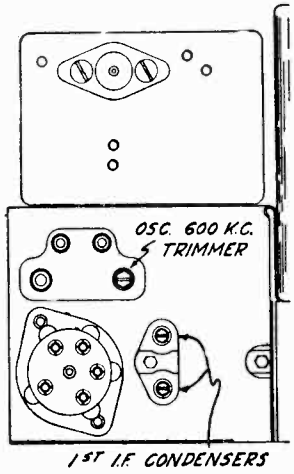


Fig. 12—Location of Trimmers

First set the signal generator at approximately 262 K.C. Connect the antenna lead from the generator to the control grid of the I.F. 78 tube, through a .05 mfd. condenser. The ground lead of the generator goes to the ground of the receiver. Turn the rotor plates of the tuning condenser completely out and keep the signal weak enough to prevent A.V.C. action. Note from Fig. 10 that the second I.F. transformer is self tuned and cannot be adjusted. Adjust the frequency of the signal generator until the output meter shows maximum output. The intermediate frequency setting of the generator is then correct, although it may be a very small percentage higher or lower than 262 K.C.

Next connect the signal lead from the signal generator to the grid of the 1st detector tube through a .05 mfd. condenser. Then adjust the two intermediate frequency condensers for maximum output. The location of the adjusting screws for these condensers is shown in Fig. 12.

Now set the signal generator for a signal of exactly 1400 K.C. The antenna lead from the generator is, in this instance, connected to the antenna lead of the receiver. Connect the flexible drive shaft to the chassis if it has been disconnected. As explained previously, the dial scale should be at the low frequency end stop when the rotor is completely in mesh. Then turn the station selector knob until the dial scale is at 1400 K.C.

Then adjust the three trimmer condensers on the gang tuning condenser for maximum output, adjusting the oscillator section first (section farthest from drive gear).

Next set the signal generator for a signal of 600 K.C. and adjust the oscillator 600 K.C. trimmer. The location of this condenser is shown in Fig. 12.

A non-metallic screwdriver is necessary for this adjustment. Turn the tuning condenser rotor until maximum output is obtained. Then turn the rotor slowly back and forth over this setting, at the same time adjusting the 600 K.C. trimmer screw until the highest output is obtained.

Then set the signal generator again for a signal of 1400 K.C. and check the adjustment of the tuning condenser trimmers at this frequency for maximum output.

Circuit

The circuit consists of an antenna stage, a 78 R.F. stage, a 77 1st detector-oscillator stage, a 78 I.F. stage, an 85 duo-diode-triode tube which functions as a diode 2nd detector and triode 1st audio stage, and two 41 tubes in a semi-Class "B" output stage. The intermediate frequency is 262 K.C. The diode current establishes a drop across a resistor which is used as additional bias voltage for the R.F. and I.F. tubes giving automatic volume control action. Noise suppression between stations is obtained by the resistor in the cathode circuit of the 85 tube, the drop across which must be overcome before rectification on this tube begins. The manual volume control varies the audio voltage applied to the grid of the 85 tube.

The "B" eliminator and speaker are in one box. A vibrator interrupts the current through the primary of the transformer in the "B" eliminator. Another vibrator in the secondary circuit operating at the same frequency acts as a rectifier. The on-off relay in the "B" eliminator closes the primary circuit when the set switch is turned on. The load relay provides a load current for the secondary circuit if the "B" line is drawing less than normal current.

Trying Out the Set and Adjusting

After the wiring has all been completed and before the chassis is permanently installed, try out the set and adjust the antenna trimmer condenser. The location of the tubes is shown in Fig. 8. Do not start the engine of the car yet.

To adjust the antenna trimmer, tune in a weak signal between 1200 and 1400 KC with the volume control about three-quarters on. On one end of the chassis box is a small metal plate. Remove the two screws which hold this plate in place. Directly under the hole in the chassis box is the antenna trimmer condenser screw. Turn this adjusting screw up or down until maximum output is obtained.

If the receiver fails to operate, check the items as given under the article by that name.

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MODEL 06-W
Mounting data

Mounting the Control Unit

The control unit is mounted on the steering column under the steering wheel as shown in Figs. 1 and 2. A clamp is used to hold it in position.

The outer portion of the clamp is screwed to the inner portion by means of the four 8-32x3/8" fillister head screws supplied with the receiver.

Two rubber strips are provided, one 1/8" thick and the other 1/16" thick. These are wrapped around the steering column under the clamp. Either or both of these strips may be used, depending on the thickness of the column. Wrap the rubber strips around the column in such a way as to allow the set screws which hold the clamp in position to pass through. When the clamp is in place, take the two 8-32 headless cup point set screws and screw them down on the steering column through the holes in the clamp.

The control unit is generally about 4" below the wheel, but this will vary with individual cases. The length of the drive shaft and interference with driver's legs will also govern the location of the control unit.

There are two screws which hold the inside portion of the clamp to the bracket on the box. By loosening these two screws, the box can be swung around if such a position is handier from the standpoint of the person operating the set. Instructions for attaching the pilot lamp are contained in the article "Completing the Wiring Connections."

Mounting the Chassis

The chassis is mounted in back of the dash as shown in Figs. 1 and 2. It should be mounted in such a way that the flexible drive shafts to the control unit will be in as straight a line as possible. The chassis is mounted with the anchor bushing into which the flexible drive shafts go, facing the control unit. In the illustrations mentioned above, the chassis is on the right side of the dash which is a good location from the standpoint of flexible drive shaft arrangement. *Before mounting the chassis read the section on "Attaching the Flexible Drive Shafts."*

The chassis is secured to the dash by means of the dash mounting plate (see Fig. 3). First drill the three mounting holes required for the dash mounting plate. The location and size of these holes is shown in Fig. 3. A template for drilling these holes is supplied with the set. Three 4" square head mounting bolts are supplied. Take two of these,

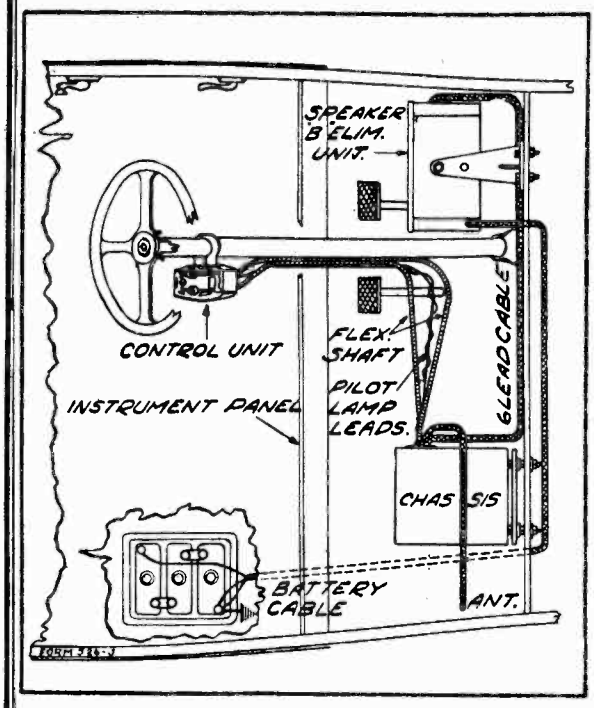

Fig. 1—General Installation—Top View

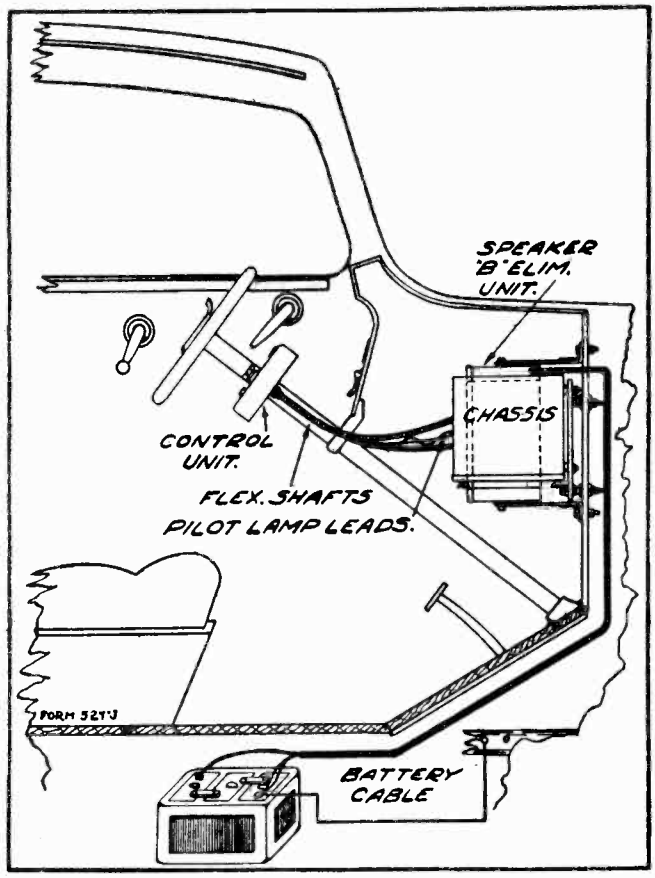

Fig. 2—General Installation—Side View

MODEL 06-W
Mounting data

GULBRANSEN CO.

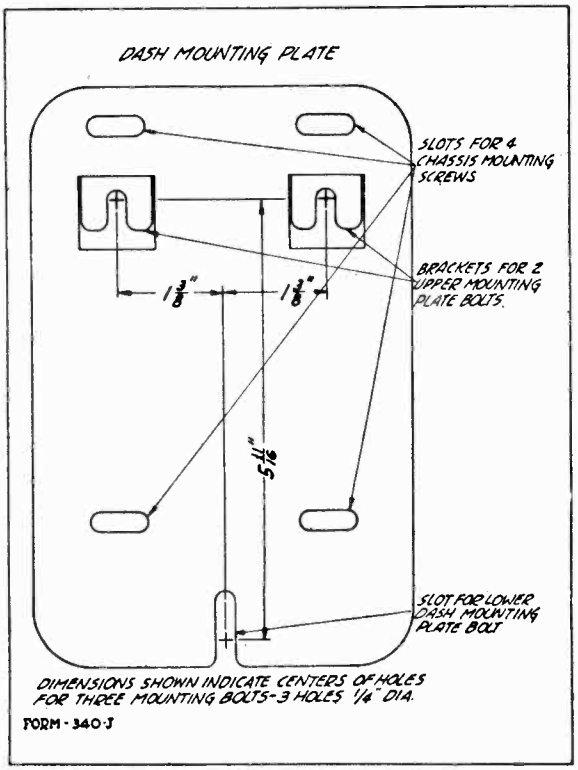

Fig. 3—Dash Mounting Plate

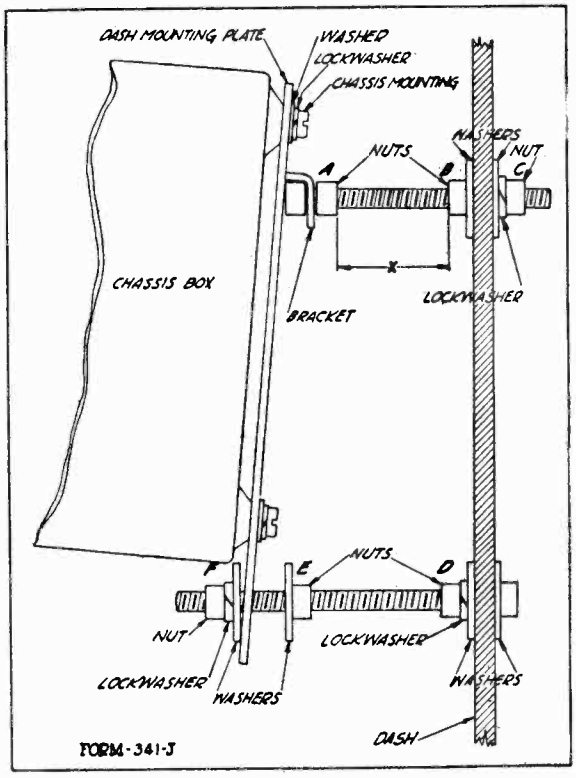

Fig. 4—Details of Chassis Mounting on Dash

which will be used for the upper part of the mounting plate and screw on nut "A" (see Fig. 4). The nut should be just far enough away from the head of the bolt to permit the bracket of the mounting plate to slip down as shown in the illustration. Then put on nut "B" and the washer, after which the two bolts can be put through the dash, with the shanks extending into the engine compartment, as shown in Fig. 4. A washer, lockwasher, and nut are then put on these bolts from the front of the dash to hold them in place.

The distance "X" between nuts "A" and "B" determines how far out the chassis is mounted from the dash. When there is a lot of apparatus in back of the dash, such as wires, tubing, etc., the chassis will have to set out far enough to clear it. However, in most cars, there is no interfering apparatus and therefore the distance "X" will be zero.

Then put a washer on the third mounting bolt and put this bolt through the lower mounting hole with the head on the engine side of the dash, as shown in the illustration. Put on a washer, lockwasher, and nut "D" and tighten it up. Then put on nut "E" with a washer as shown. Nut "E" should be screwed down until it is about ¼" from nut "D," when distance "X," as explained above, is zero.

Next, secure the dash mounting plate to the chassis box by means of the four chassis mounting screws. Note that the broad or narrow face of the chassis box can be secured to the dash mounting plate. Use whichever side will be best from the standpoint of attachment of the flexible drive shafts.

All the tubes should be in the sockets, the antenna trimmer adjusted (as explained later) and the flexible drive shafts connected before the chassis is permanently installed. Complete information on the latter procedure is contained in the article on attaching the flexible drive shafts.

The four mounting screws pass through the four slots in the mounting plate (Fig. 3). After they are in place and tight, the dash mounting plate with chassis attached is slipped over the three mounting bolts. The two upper brackets on the plate slip down in back of nut "A" as shown in Fig. 4 and the slot at the bottom of the plate slips over the shank of the lower mounting bolt in back of nut "E." The plate will then hang with the bottom farther away from the dash than the top. A washer, lockwasher, and nut "F" are then put on the lower mounting bolt. Nut "F" is screwed on until the mounting plate is tight up against the washer in back of nut "E." In this position, the bracket at the top of the mounting plate should butt up against nut "A" and be tight. Also the mounting plate will be approximately parallel with the dash.

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MODEL 06-W
Speaker data

Mounting the Speaker-"B" Eliminator

The speaker-"B" eliminator is mounted on the back of the dash by means of two brackets, as shown in Fig. 5. Usually the space available will govern the location of the speaker and position of it on the mounting brackets. However, the matter of acoustics should be given careful consideration. One of the most desirable positions from the standpoint of acoustics is that shown by the solid lines in Fig. 5 (A). In this position the sound waves travel in the most direct lines toward the listener. After the speaker is mounted and regardless of the position of the brackets, loosen the bracket bolts and turn it to several positions in order to get the best one from the standpoint of tone quality.

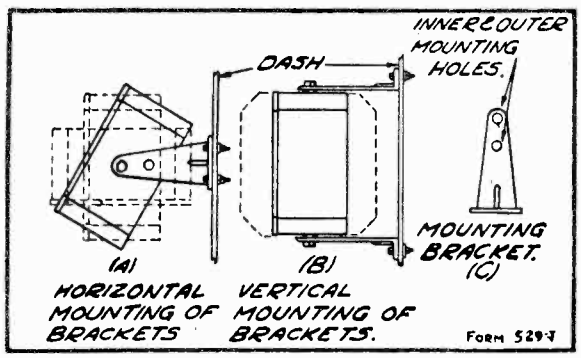

Fig. 5—Method of Mounting Speaker

Other considerations governing the location of the speaker are the cables and the tone control. The speaker should be so mounted that the two shielded cables, one to the storage battery and one to the chassis, will be long enough and can be most conveniently brought over. The tone control knob on the speaker box should be preferably on the bottom, so that it can be reached easily.

After the position of the speaker is decided on, drill the four $\frac{5}{16}$" holes required for the bracket mounting bolts. A template for these holes is supplied with the receiver. The holes are arranged in a rectangle. The centers of the holes, the small dimension are $2\frac{3}{8}$" apart and the long dimension 10" apart. In Fig. 5 is shown how the brackets can be mounted horizontally (A) or vertically (B), and the different positions in which the speaker itself can be placed. There are two holes in each bracket as shown in Fig. 5 (C) which determine the distance of the speaker box from the dash. The grilled portion of the box at the front should face the listener.

Antenna

A roof antenna is recommended, as by far the best results will be obtained. A large percentage of cars at the present time come equipped by the factory with built-in roof antennas. In those cars which do not have an antenna, one will have to be put in.

First determine if the top has a grounded chicken wire mesh. To do this, use a continuity meter. By means of a wire, attach a darning needle to one of the prods. Poke the darning needle into the roof material and turn it around until it comes in contact with the chicken wire. Then ground the other prod and if the continuity meter shows a complete circuit, the chicken wire mesh is grounded. In a case of this kind, it will be necessary to get inside of the roof and it is advisable to employ the services of an auto "top man" or an upholsterer.

It will be necessary to remove the top material and cut away the chicken wire from the side supports until it is at least 3" away from the ground at any point. It should also be at least 3" away from the dome light and the dome light wiring. The chicken wire may then be laced to the points from which it was cut with a heavy, waxed cord. The chicken wire will then make a satisfactory antenna, or a copper screen may be used.

If the chicken wire is not grounded, it may be used as the antenna by taking down the roof material at one corner and soldering the lead-in wire to it. If it is not desired to take down the roof material a piece of copper screening can be tacked to the roof on the inside of the car. At least six square feet should be used. Keep it at least 3" away from any grounded metal parts on all sides. After the screen is in place, it can be covered over with cloth which matches the roof material. Solder the lead-in wire to the screen and bring it down the front corner post nearest to the set.

Another, and a very simple way in which an antenna can be secured to the inside of the car roof is to use a car-roof antenna which is made up especially for this purpose. This antenna consists of copper strips laid back and forth between two pieces of cardboard and the center being covered over with material which matches the roof material. It can be had in several colors and is tacked in place on the inside of the car roof in a few minutes.

MODEL 06-M
Flexible drive

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Attaching the Flexible Drive Shafts

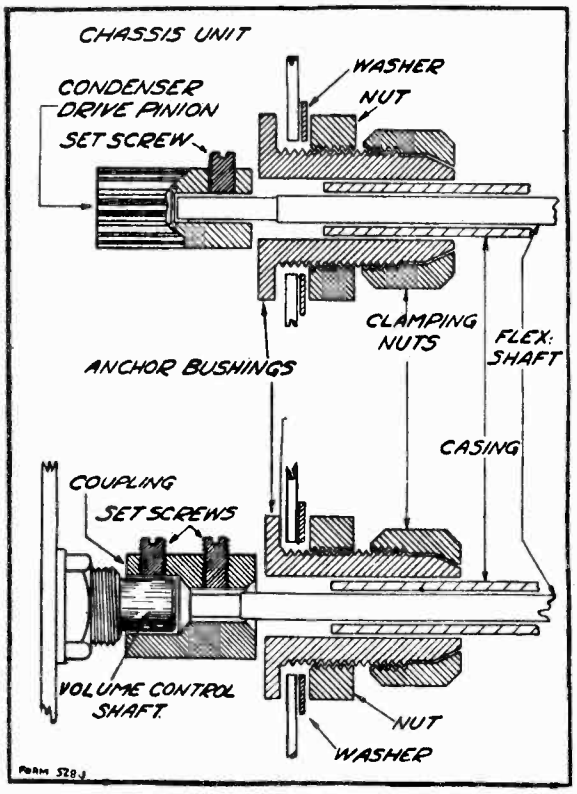

Fig. 6—Details of Flexible Drive Shaft Connections

After the control unit and chassis are in position, the flexible drive shafts may be attached. Two 34" shafts are supplied, unless otherwise specified. These shafts may also be had in 14", 20", and 45" lengths.

The flexible drive shafts should be put on with a minimum amount of bending. In general, one large radius 90° bend is all that is necessary.

The 34" shafts supplied with the receiver may be cut to a shorter length if necessary. The shaft (inside portion) should first be brazed at the point to be cut. It should then be cut with a three-corner file or edge of a grinding wheel.* *Do not use a hack saw.* The casing which is 1½" shorter must be cut to correspond. This should be tinned or brazed first at the point to be cut and may then be cut with a hack saw.

After the length and position of the shafts is decided on, remove the chassis and mounting plate from the mounting bolts. As the shafts are already secured at the control unit, it is necessary only to secure them at the chassis end. Before attaching the shafts, see if the set is in working order. Put the 8-prong socket in place on the chassis and operate the set with the cover off.

In Fig. 6 is shown a cross-sectional view of the flexible drive shaft connections at the chassis end. First put the tube cover plate on the chassis box temporarily with two screws. This is the large plate held in position ordinarily by means of five screws. Then center the volume control anchor bushing on this plate. To do this, loosen the nut which holds this bushing in place (see Fig. 6). Center the bushing by eye so that the center of it is in a line with the center of the volume control coupling. Then tighten the nut down.

Next, take the tube cover plate off. Extend the volume control flexible shaft and casing several inches through the hole in the anchor bushing of the tube cover plate so that the plate will be on the casing and out of the way. Turn the volume control coupling counter-clockwise until the switch is snapped to the off position. Lock the receiver on the control unit and turn the volume control knob counter-clockwise until it is in the locked position. Then loosen both set screws in the volume control coupling and insert the flexible shaft in the coupling (see Fig. 6). Tighten the outer set screw first on one of the four flat faces of the flexible shaft and then tighten the inner set screw. Then again temporarily hang the chassis on the mounting bolts. Next, check the operation of the switch, volume control and lock. The switch should be off when the volume control knob is in the locked position. It may be necessary to loosen the inner set screw and do a slight amount of adjusting until the proper setting is obtained.

Next, slide the tube cover plate into position and fasten it in place by means of the five screws. Then tighten down the clamping nut on the volume control shaft casing but *do not tighten this nut excessively.*

To attach the tuning condenser flexible shaft, first center the anchor bushing by eye as was explained above. Then extend the tuning condenser flexible shaft into the hole at the center of the tuning condenser drive pinion. With the rotor plates completely in mesh, turn the dial gear in the control unit until it is at the low frequency end stop. The set screw may then be tightened and the clamping nut secured on the casing as was explained above. In some instances, it may be necessary to loosen the set screw of the large gear on the tuning condenser rotor shaft and adjust the setting of this gear in order to get an accurate calibration.

*If the flexible shaft is cut as mentioned above, file it down in one place a slight amount to provide a flat surface for the set-screw.

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MODEL 06-W
Wiring notes
Maintenance

Completing the Wiring Connections

Pilot Lamp

The pilot lamp cable is 4 feet long and is attached to the 8-prong socket. At the end of the cable is the pilot lamp socket and spring clip. After the control unit and chassis are mounted, remove the cover of the control unit by taking off the two knobs, the key entry nut and the cover screw. Bring the pilot lamp

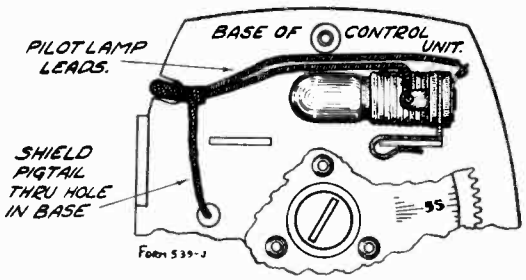

Fig. 7—Pilot Lamp Attachment

cable through the notch at the side of the back of the unit. Then, clip the pilot lamp socket clip over the right hand bracket as shown in Fig. 7, with the two leads going over the top of the lamp as illustrated. It is not necessary to remove the dial gear. There is a "pigtail" on the end of the shield of the pilot lamp cable. Pull this "pigtail" through the hole beneath the slot, as shown in the illustration. Then insert the round head 3/8" 8-32 screw through this hole with the head on the outside of the box and secure it in place with the lockwasher and nut provided. This holds the "pigtail" in position and grounds it. Cut off the excess length of "pigtail." Double up the pilot lamp leads if too long—do not cut them.

Antenna Cable

Bring the antenna cable of the receiver in the most direct manner possible to the lead-in from the antenna and connect it to the latter. Keep it as high as possible and as far away from any car wiring as possible. Care should be taken not to have the antenna wire come in contact with the shield wires. Ground the shield of the antenna cable at the antenna end.

Battery Cable and Six Lead Cable

The battery cable should be brought over to the storage battery in the most convenient manner possible. In Figs. 1 and 2 it is shown passing through a hole in the dash, thence down and under the floor board to the battery. In other installations, it may be more convenient to bring this cable down in back of one of the side pads and thence to the battery. The lug on the lead marked "positive" is connected to the positive side of the battery and the lug on the negatively marked lead is connected to the negative side of the battery. Ground the pigtail of the shield by screwing the No. 6 Parker Kalon screw through the end of the pigtail and through the hole in the lug which is grounded.

The six-lead cable between the chassis and the speaker—"B" eliminator is usually brought over along the dash in the most convenient manner possible.

Care and Maintenance

Advancing Generator Charging Rate

The installation of the automobile radio imposes an additional drain on the car storage battery. This can be compensated for by advancing the charging rate of the car generator. Check the state of charge of the storage battery about a week after the installation of the automobile radio is made and adjust the charging rate accordingly.

Tubes

The type of tubes used and location of these tubes in the chassis are shown in Fig. 8. These tubes are of a sturdy, rugged construction designed especially for an auto receiver. Most of them, under normal usage, will last for many months and in some cases, years. Some of them, however, may become faulty after a few months of operation.

For that reason, it is advisable to secure a new set of tested tubes at intervals of three to six months and have these inserted in the receiver one at a time, noting any difference in performance.

Pilot Lamp

The pilot lamp is located in the control unit. A 6-8 volt miniature base lamp is used. To replace the lamp, first turn the receiver off. Remove the two control knobs and the key entry nut. Then take out the screw holding the control box cover in place after which the cover can be taken off. The pilot lamp socket is secured to a spring clip which is on a bracket in the control unit. Push this clip and socket over far enough to get at the lamp, after which the bulb can be replaced and the control unit reassembled.

Fuse

A 10 amp. automobile fuse is used for the "A" line. This fuse is mounted in the speaker—"B" eliminator box and is on one of the walls near the back. To change the fuse, it will be necessary to loosen the bracket bolts so that the box can be swung around to get at the back.

Electrical Condition of Car

Dirty spark plugs, incorrect spacing of distributor points, faulty distributor condenser, and various other items in the car electrical system can cause noisy operation. If the customer complains of noise in the receiver after it has been in use for some time, check the items mentioned as well as other parts of the car electrical system for poor connections, grounds, and other faults which may be responsible for the noise.

MODEL 06-W
Service notes

GULBRANSEN CO.

If the Receiver Fails to Operate

"A" Fuse—Check the "A" line fuse in the speaker box.

"A" Line Open—See if power is being supplied to the speaker, tube heaters, and "B" eliminator.

"B" Eliminator Not Working—See if the "B" eliminator is in proper working order by checking the high voltage points at the speaker-terminal strip and at the tube plate terminals (see Fig. 10).

Antenna and Lead—See if antenna is properly connected to lead-in wire and antenna lead from set. Be sure antenna system is not grounded at any point.

All Tubes Not Inserted—See if all tubes are inserted as per Fig. 8.

Grid Caps Not Connected—See if all grid caps are properly connected to top of top grid connection tubes.

Variable Condenser Plates Shorted—Check condenser sections in chassis carefully for foreign particles or rotor stator rubbing.

Reversed Storage Battery Connections—Check storage battery connections for correctness.

Weak Reception

Defective Tubes—Try out a new set of tested tubes and note any difference in performance.

Poor Antenna—To try out the effectiveness of the antenna used, check the volume against the volume when using a straight length of wire about 15' long, run out of the car through one of the windows. If, upon test, the external wire is found to be much superior as far as volume is concerned, the antenna is not satisfactory and will have to be re-vamped or a new one installed. The antenna or lead-in may be too near grounded metal portions of the car frame or body resulting in a high capacity to ground. There may be grounded metal mesh in the car roof. There may be a poor soldered connection between the antenna, lead-in, or antenna lead from the set. The antenna system may be partially grounded at some point.

Antenna Trimmer Not Adjusted—See article "Trying Out the Set and Adjusting."

Car in Shielded Location—If the car is within or near a steel structure, the signals may be weakened by absorption.

Storage Battery Run Down—Check the condition of the battery.

Defective "B" Eliminator—Check "B" voltage at sockets and speaker terminal strip (see voltage chart and Fig. 10).

Misalignment of Variable Tuning Condensers—Instructions for realigning are contained in this manual. Do not, however, attempt realignment unless other causes of low volume have first been investigated.

Wrong Voltages—Check voltages at the sockets (see voltage chart).

Other Causes of Low Volume—Defective speaker, poor battery, antenna, grid cap or other connections, defective A.V.C. system in the receiver, and various opens, grounds and shorts in the receiver assembly.

Distorted Reproduction

Receiver Oscillating—See article on oscillation.

Defective Tubes—Try out a new set of tubes.

Incorrect Voltages—Check the voltages at the socket (see voltage chart).

Incorrect Tuning—The signal must be carefully tuned in to the clearest and loudest point. It must not be tuned "off resonance."

Defective Speaker—Try out a new one if it is available.

Defective Audio System in the Receiver—Make continuity resistance tests using as a guide Fig. 10.

Signal Transmission—Quality fading in the signal transmission can cause poor tone quality.

Oscillation

Cover of Box—May not be on or if on, may not be sufficiently tightened down.

Off Characteristic Tubes—Tubes whose characteristics vary considerably from the standard may cause oscillation. Try out some new ones.

Open Bypass Condensers—Check the bypass condensers and leads to them for open circuit.

Poor Ground Connections—Check the ground connections in the chassis and speaker—"B" eliminator box for poor contact.

Grid Caps and Leads—The grid caps may not be making good contact to the tops of the tubes or the wires of the grid caps may be too close together.

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MODEL Z6Z1
Schematic, Voltage
Socket layout

		Across Heater	Plate to Cathode	Screen to Cathode	Grid to Cathode	Normal Plate MA
78	R.F.	6.1	182	80	3*	**7.0**
77	1st Det. & Osc.	6.1	178	77	5**	**1.3-***
78	I.F.	6.1	182	80	3.*	**7.0**
75	2nd Det. 1st Audio	6.1	70x		1.4*	.35
41	Output	6.1	172.5	176.5	12.5	16.0
84	Rect.	6.1	205			17.5per plate

*-Cathode to Ground. **-Subject to Variation. x-Triode plate to Cathode
xx-Read Across 400-Ohm Resistor, R13

Trying Out the Set and Adjusting

After the wiring has all been completed and before the chassis is permanently installed, try out the set and adjust the antenna trimmer. The location of the tubes is shown in Fig. 8. To adjust the antenna trimmer, tune in a weak signal between 1200 and 1400 K.C. with the volume control about three-fourths on. On one end of the chassis box are two small metal plates. Remove the smaller of these two plates. Directly under the hole in the chassis box is the antenna trimmer condenser screw. Turn this adjusting screw up or down until maximum output is obtained.

MODEL Z6Z1
Alignment, Wiring

GULBRANSEN CO.

Condenser Alignment

Misalignment or mistracking of condensers generally manifests itself in broad tuning and lack of volume at portions or all of the broadcast band. The receivers are all properly aligned at the factory with precision instruments and realignment should not be attempted unless all other possible causes of the faulty operation have first been investigated and unless the service technician has the proper equipment. A signal generator that will provide accurately calibrated signals over the broadcast band and accurately calibrated signals at and around 262 K.C., the intermediate frequency and an output indicating meter are desirable.

First set the signal generator at approximately 262 K.C. Connect the antenna lead from the generator to the control grid of the I.F. 78 tube, through a .05 mfd. condenser. The ground lead of the generator goes to the ground of the receiver. Turn the rotor plates of the tuning condenser completely out and keep the signal weak enough to prevent A.V.C. action. Note from Fig. 10 that the second I.F. transformer is self tuned and cannot be adjusted. Adjust the frequency of the signal generator until the output meter shows maximum output. The intermediate frequency setting of the generator is then correct, although it may be a very small percentage higher or lower than 262 K.C.

Next connect the signal lead from the signal generator to the grid of the 1st detector tube through a 05 mfd. condenser. Then adjust the two intermediate frequency condensers for maximum output. One of the I.F. condenser screws is reached through the hole on the top of the 1st I.F. assembly can. The other I.F. condenser screw is reached from the bottom of the sub-panel through a hole at the bottom of this assembly.

Now set the signal generator for a signal of exactly 1400 K.C. The antenna lead from the generator is, in this instance, connected to the antenna lead of the receiver. Connect the flexible drive shaft to the chassis if it has been disconnected. As explained previously, the dial scale should be at the low frequency end stop when the rotor is completely in mesh. Then turn the station selector knob until the dial scale is at 1400 K.C.

Then adjust the three trimmer condensers on the gang tuning condenser for maximum output, adjusting the oscillator section first.

Next, set the signal generator for a signal of 600 K.C. and adjust the oscillator 600 K.C. trimmer. The adjusting screw for this condenser is reached through a hole in the back wall of the sub-panel.

A non-metallic screwdriver is necessary for this adjustment. Turn the tuning condenser rotor until maximum output is obtained. Then turn the rotor slowly back and forth over this setting, at the same time adjusting the 600 K.C. trimmer screw until the highest output is obtained.

Then set the signal generator again for a signal of 1400 K.C. and check the adjustment of the tuning condenser trimmers at this frequency for maximum output.

Completing the Wiring Connections

Antenna Cable

Bring the antenna cable of the receiver in the most direct manner possible to the lead-in from the antenna and connect it to the latter. Keep it as high as possible and as far away from any car wiring as possible. Care should be taken not to have the antenna wire come in contact with the shield wires. Ground the pigtail of the antenna cable shield at the antenna end. The pigtail of this shield at the chassis end is grounded under one of the chassis mounting screws.

In some cases the shielded antenna lead from the receiver is not long enough to reach to the column at which the antenna lead-in comes down. In a case of this kind, cover the exposed portion of the lead-in wire with loom and braided shield from the point where it leaves the column to the point of connection to the antenna lead of the receiver. Connect the two wires together and connect the two shields together, care being taken that no strand of the shield touches the antenna wire.

Battery Cable

The battery cable should be brought over to the storage battery in the most convenient manner possible. In Figs. 4 and 5 it is shown passing through a hole in the dash, thence down and under the floor board to the battery. In other installations, it may be more convenient to bring this cable down in back of one of the side pads and thence to the battery. The lug on the yellow lead of this cable is connected to the "Hot" or ungrounded side of the battery (the "Hot" or ungrounded side may be positive or negative, depending on the make of car). The lug on the black lead is connected to the grounded side of the battery. The pigtail of the shield of this cable at the chassis end should be grounded under one of the chassis mounting screws.

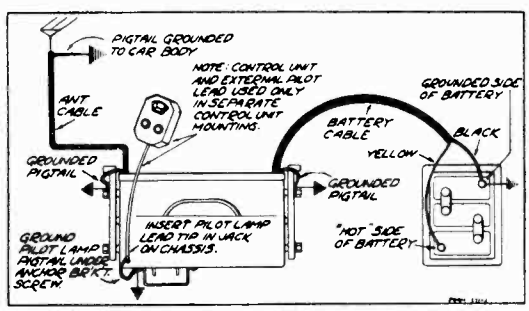

Fig. 7—External Wiring Connections

Pilot Lamp (For Separate Control Unit Only)

When a separate control unit is used connect the pilot lamp as follows:

The pilot lamp lead is in a shielded cable which extends out from the control unit box. On the rear wall of the chassis, near one of the ends, will be seen a tip jack. Insert the tip on the end of the pilot lamp lead into this jack. There is also a pigtail or shield extension at the end of this lead. Ground this pigtail with one of the anchor bracket screws (see Fig. 7). Double up the pilot lamp lead if it is too long—*Do not cut this lead.*

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MODEL Z6Z1
Antenna
Mounting notes

Antenna

A roof antenna is recommended, as by far the best results will be obtained. A large percentage of cars at the present time come equipped by the factory with built-in roof antennas. In those cars which do not have an antenna, one will have to be put in.

First determine if the top has a grounded chicken wire mesh. To do this, use a continuity meter. By means of a wire, attach a darning needle to one of the prods. Poke the darning needle into the roof material and turn it around until it comes in contact with the chicken wire. Then ground the other prod and if the continuity meter shows a complete circuit, the chicken wire mesh is grounded. In a case of this kind, it will be necessary to get inside of the roof and it is advisable to employ the services of an auto "top man" or an upholsterer.

It will be necessary to remove the top material and cut away the chicken wire from the side supports until it is at least 3" away from ground at any point. It should also be at least 3" away from the dome light and the dome light wiring. The chicken wire may then be laced to the points from which it was cut with a heavy, waxed cord. The chicken wire will then make a satisfactory antenna, or a copper screen may be used.

If the chicken wire is not grounded, it may be used as the antenna by taking down the roof material at one corner and soldering the lead-in wire to it. If it is not desired to take down the roof material a piece of copper screening can be tacked to the roof on the inside of the car. At least six square feet should be used. Keep it at least 3" away from any grounded metal parts on all sides. After the screen is in place, it can be covered over with cloth which matches the roof material. Solder the lead-in wire to the screen and bring it down the front corner post nearest to the set.

Another, and a very simple way in which an antenna can be secured to the inside of the car roof is to use one of the car-roof antennas which are now being made up especially for this purpose. There is one type of antenna which consists of copper strips laid back and forth between two pieces of cardboard. The cardboard is then covered over with material which matches the roof material. This antenna can be had in several colors and is tacked in place on the inside of the car roof in a few minutes.

Integral Mounting of Chassis

By integral or all-in-one mounting of the chassis is meant operating the receiver by means of the controls on the chassis box (and not with a separate control unit). This method is the simplest, as no changes are required on the receiver. It can be installed in several ways, as explained below and as illustrated in Fig. 1. Still other methods of mounting and locations for the chassis will suggest themselves, depending on the space available and variations in the construction of different cars.

Floor or Shelf Mounting

In Fig. 1(A) is shown how the chassis can be placed on the floor in front of the front seat. There are four rubber mounting feet on the bottom of the box, on which it stands. It may also be placed in back of the front seat (B) so as to be in the rear compartment of the car. In some cars, there is room enough between the two front seats for the chassis box to be placed. In coupes, the chassis may be placed on the shelf in back of the seat. Still other locations, as mentioned above, can be used, depending on the space available in different cars.

After the position is decided on, the chassis is permanently mounted in place by means of the two case mounting feet supplied for this method of mounting. These mounting feet are shown in Fig. 1. One side of the foot, which is a small angle bracket, is secured to the end of the chassis box by means of one of the chassis mounting screws. The other side of the foot is screwed to the floor board or surface on which the chassis is resting, with a wood screw. The two feet are placed diagonally, that is on one end of the chassis box it is at the front, while on the other end it is at the rear.

Flush Mounting of Chassis

In Fig. 1(C) is also shown how the chassis can be mounted on the dash by means of brackets, in such a way that the front portion of the box with the controls, is flush, or nearly so, with the instrument panel. This is a very desirable method of installation, as the receiver is rigidly in place, out of the way, and the controls are very accessible.

When mounted this way, two side case brackets (long type) are used, one on each end of the box, as shown in Fig. 1. Two mounting screws are generally used to secure each bracket to the end of the chassis box. Three may be used in cases where the distance between the instrument panel and dash is small. Six embossings with inset nuts are provided on each end of the chassis box. Any two of these or

MODEL Z6Z1
Mounting notes

GULBRANSEN CO.

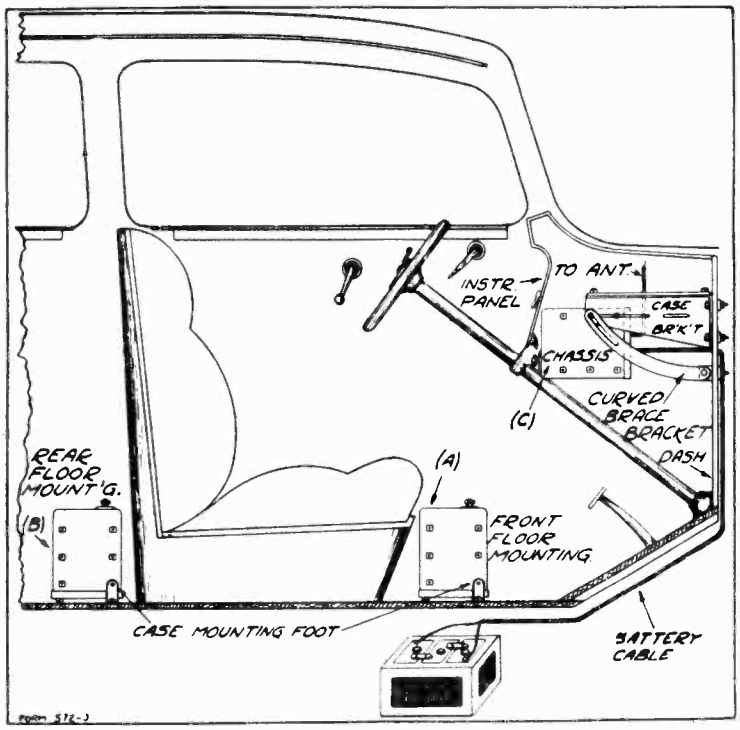

Fig. 1—Integral Mounting—Side View

three, as mentioned above, may be used for the bracket screws, which, together with the slots in the brackets, provides great flexibility in mounting. In addition to the side case brackets, two curved brace brackets and one cross strap brace as shown in Figs. 1 and 2 are used.

The chassis should be mounted as close to the center of the instrument panel as possible. This makes the controls accessible to people in either front seat. As stated above, it should be mounted so that the front side of the box with the controls, is flush or nearly so with the instrument panel of the automobile. If car apparatus or space available prevent the mounting of the chassis at the center, it may have to be moved to either side. In some instances, it can be mounted at the center of the instrument panel, but may have to be moved down and nearer to the dash than as shown in Fig. 1. Consideration should be given to the possibility of interference with the legs of the driver or passenger in the front seat and also to the possibility of interference with the controls of the car, such as pedals, gear shift lever, and hand brake lever, before the location is definitely decided on. The possibility of a car heater installation may also be considered. After the location is decided on, drill the four mounting holes required. The location and size of these holes is shown in Fig. 3. A template for drilling these holes is supplied with the receiver. Six 1/4" mounting bolts, six washers, six lockwashers and six nuts are provided. The mounting bolt is put through the bracket and dash with the shank extending into the engine compartment. A washer, the lockwasher and nut, are then put on. Mount the brackets permanently, but do not mount the chassis permanently until the wiring connections are completed, the tubes are all inserted, the receiver tried out, and the antenna trimmer adjusted (explained later).

When the case brackets are in place, the curved brace brackets can be installed. These can be put on in a number of different ways. The front or back case bracket screw can be used and the brace bracket itself can be mounted upward or downward. As a general rule it is mounted on the bracket screw farthest away from the dash and downward as shown in Fig. 1. The small angle brackets supplied with the receiver are secured at the base of the curved brace brackets as shown in Figs. 1 and 2, by means of the No. 10-32 3/8" Round Head Screw, nut and washer supplied. After the position of the brace brackets is decided on, put them in place and start the holes for them with a center punch. These brackets are bolted to the dash in the same manner as explained above for the case brackets.

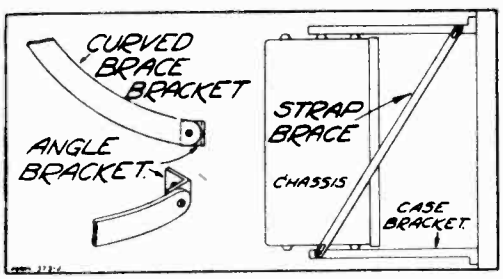

Fig. 2—Angle Brackets and Strap Brace

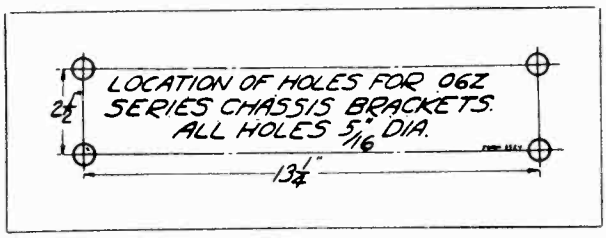

Fig. 3—Mounting Hole Location

Next, put the strap brace in place. This is mounted diagonally across the two brace brackets as shown in Fig. 2. There is a tapped hole at either end of the top flange of the case brackets which are used for this purpose. Two 10-32 1/4" long bolts are provided for the strap brace.

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MODEL Z6Z1
Control unit

Separate Control Unit Mounting of Chassis

In this method of mounting, the chassis is mounted on the dash and is operated from a separate remote control unit which is on the steering column. Two flexible shafts mechanically connect the control unit and the chassis. This method of mounting is very desirable as the controls are most accessible to the driver. The items required for this method of mounting are shown in the installation list at the back of the manual. The procedure for this method of installation is as follows:

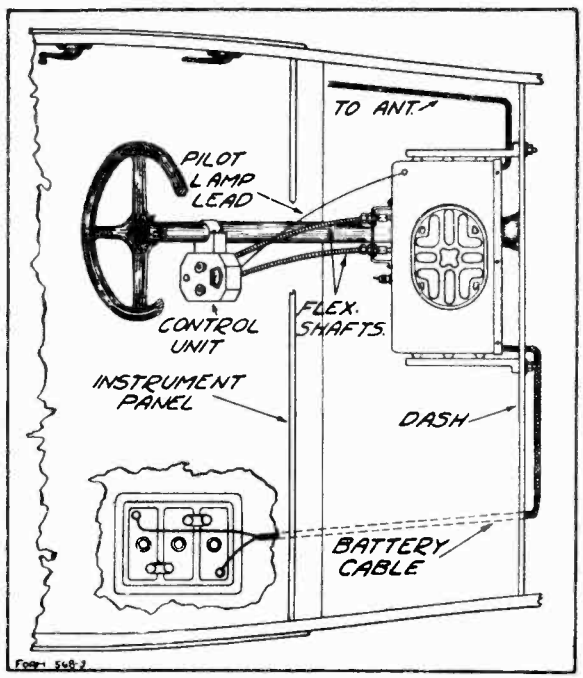


Fig. 4—Chassis with Control Unit—Top View

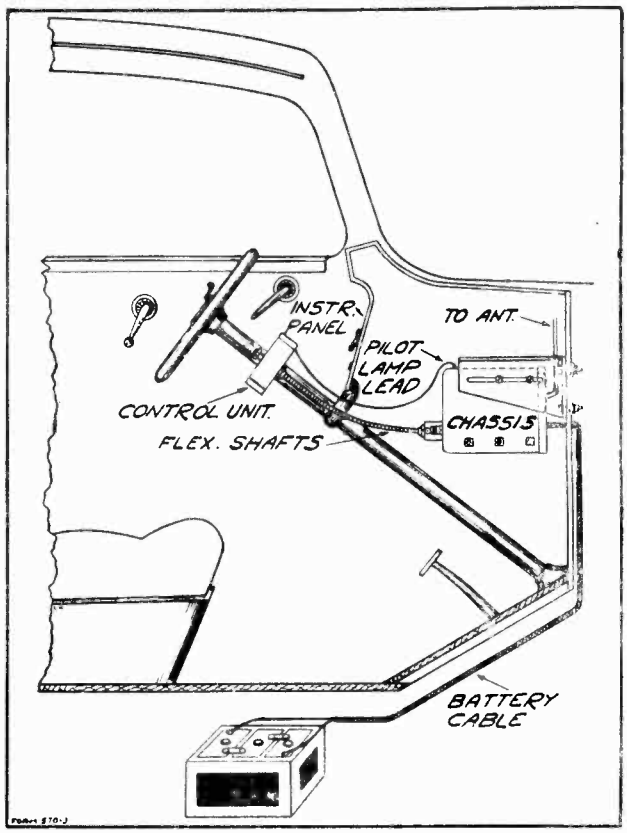


Fig. 5—Chassis with Control Unit—Side View

Mounting the Control Unit

The control unit is mounted on the steering column under the steering wheel as shown in Figs. 4 and 5. A clamp is used to hold it in position.

The outer portion of the clamp is screwed to the inner portion by means of the four 8-32x3/8" fillister head screws supplied with the receiver.

Two rubber strips are provided, one 1/8" thick and the other 1/16" thick. These are wrapped around the steering column under the clamp. Either or both of these strips may be used, depending on the thickness of the column. Wrap the rubber strips around the column in such a way as to allow the set screws which hold the clamp in position to pass through. When the clamp is in place, take the two 8-32 headless cup point set screws and screw them down on the steering column through the tapped holes in the clamp.

The control unit is generally about 4" below the wheel, but this will vary with individual cases. The length of the drive shaft and interference with driver's legs will also govern the location of the control unit.

There are two screws which hold the inside portion of the clamp to the control unit swivel. By loosening these two screws, the box can be swung around if such a position is handier from the standpoint of the person operating the set. Instructions for attaching the pilot lamp lead are contained in the article "Completing the Wiring Connections."

Mounting the Chassis

The chassis is mounted on the dash by means of two short brackets, as shown in Figs. 4 and 5. Two or three mounting screws are used to secure each bracket to the end of the chassis box. Three are used if the chassis is close to the dash and two if it is set out some distance. In general, keep the chassis as close to the dash as possible. The procedure for attaching the brackets to the chassis box and to the dash is the same as explained above for mounting the side case brackets under the article, "Flush Mounting of Chassis." No curved brace brackets or strap braces are used in this method of mounting.

The chassis should be mounted with the speaker grill facing down and the side with lock and controls facing the listener, as shown in Fig. 4. Before mounting the chassis, the flexible drive shaft con-

MODEL Z6Z1
Flexible drive

GULBRANSEN CO.

nections as explained in the next article must be made.

The location of the chassis will very often depend on the space available. To the left of the center, as shown in Fig. 4, is a good location. The chassis should be mounted in such a way that the flexible drive shafts to the control unit will be in as straight a line as possible or with large radius bends. *In general, it will be advisable to consider the possibility of a car heater installation at the right side of the dash (facing forward).* In practically every case no difficulty will be experienced in mounting the heater and chassis on the dash. The chassis should be mounted in such a way that the lock *which remains on the chassis box will be accessible.*

The possibility of interference with people in the front seats and with car controls, as mentioned previously, should also be considered.

When the location is decided on, drill the four mounting holes required as shown in Fig. 3 and proceed as explained above. Mount the brackets permanently, but do not mount the chassis permanently until the wiring connections are completed, all tubes are in the sockets, the flexible drive shafts connected, and the antenna trimmer adjusted (explained later).

Attaching the Flexible Drive Shafts

After the control unit is mounted and the chassis is temporarily mounted, the flexible drive shafts may be attached. Two 34" shafts are supplied unless otherwise specified. These shafts may also be had in 14", 20" and 45" lengths.

The flexible drive shafts should always be installed with a minimum amount of bending. Always keep the radius of the bend as large as possible. The larger the radius of the bend, the easier the shaft will turn.

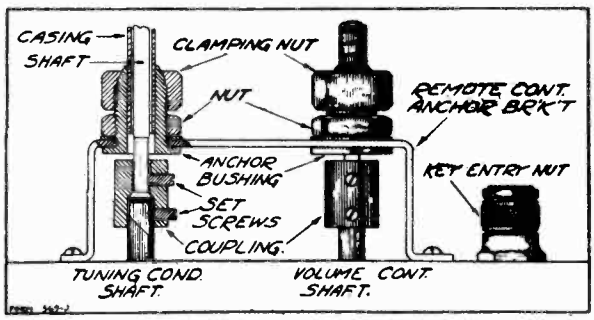


Fig. 6—Details of Flexible Drive Shaft Connections

The 34" shafts supplied with the receiver may be cut to a shorter length if necessary. The shaft (inside portion) should first be brazed at the point to be cut. It should then be cut with a three-corner file or edge of a grinding wheel. *Do not use a hack saw.* After the shaft is cut, file it down in one place a slight amount to provide a flat surface for the set screw. The casing which is 1½" shorter must be cut to correspond. This should be tinned or brazed first at the point to be cut and may then be cut with a hack saw.

It is advisable to attach the flexible shafts with the chassis on the mounting brackets, but if the chassis is inaccessible, it may be removed from the brackets. Keep it as close to its regular position as possible so that the flexible shaft will not turn after the chassis is replaced on the brackets. In general, it may be moved up or down, but should not be moved sideways or be turned.

To attach the flexible shafts to the chassis, first turn the on-off switch knob to the off position and the station selector knob to the low frequency end stop. Then remove the two knobs. These two knobs are then put on the control unit. Loosen the set screws on the two couplings and slip them over the two shafts as shown in Fig. 6. Then secure the remote control anchor bracket in place on the chassis box by means of the four 6-32-¼" screws. The dial gear and pilot lamp remain in the chassis box.

Next, center the two anchor bushings on the anchor bracket. To do this, first loosen the nut which holds the bushing in place. Center the bushing so that the center of it is in line with the center of the shaft below. Then tighten the nut. Turn the on-off switch and volume control knob on the control unit to the extreme counter-clockwise position. Then extend the volume control flexible shaft into the coupling and tighten the two set screws in this coupling. The outside set screw should be tightened down *on one of the four flat faces* of the shaft. Then tighten down the clamping nut on the volume control shaft casing, *but do not tighten this nut excessively.*

To attach the tuning condenser flexible shaft, proceed in the same manner as above, except that the dial gear in the control unit should first be turned to the low frequency end stop. After the two shafts are connected, mount the chassis in place temporarily if it has been taken off and check the operation of both tuning condenser and volume control. The switch should be off when the volume control knob is in the locked position. It may be necessary to loosen the inner set screw and do a slight amount of adjusting until the proper setting is obtained. In case the dial gear in the control unit is not correctly calibrated or does not coincide with the dial gear calibration in the chassis box, further adjustment of this control can be brought about in the same manner, that is, by first loosening the inner set screw of the coupling. The clamping nut of the tuning condenser shaft anchor bushing is tightened down as explained above.

GULBRANSEN CO

MODEL Z6Z1
Service notes

If the Receiver Fails to Operate

"A" Fuse—Check the "A" line fuse in the chassis box.

"A" Line Open—See if power is being supplied to the speaker, tube heaters, and "B" eliminator.

"B" Eliminator Not Working—See if the "B" eliminator is in proper working order by checking the high voltage points at the tube plate terminals (see Fig. 10).

Antenna and Lead—See if antenna is properly connected to lead-in wire and antenna lead from set. Be sure antenna system is not grounded at any point.

All Tubes Not Inserted—See if all tubes are inserted as per Fig. 8.

Defective Tubes—Try out a new set of tested tubes.

Grid Caps Not Connected—See if all grid caps are properly connected to top of top grid connection tubes.

Variable Condenser Plates Shorted—Check condenser sections in chassis carefully for foreign particles or rotor stator rubbing.

Weak Reception

Defective Tubes—Try out a new set of tested tubes and note any difference in performance.

Poor Antenna—To try out the effectiveness of the antenna used, check the volume against the volume when using a straight length of wire about 15' long, run out of the car through one of the windows. If, upon test, the external wire is found to be much superior as far as volume is concerned, the antenna is not satisfactory and will have to be re-vamped or a new one installed. The antenna or lead-in may be too near grounded metal portions of the car frame or body resulting in a high capacity to ground. There may be grounded metal mesh in the car roof. There may be a poor soldered connection between the antenna, lead-in, or antenna lead from the set. The antenna system may be partially grounded at some point.

Antenna Trimmer Not Adjusted—See article "Trying Out the Set and Adjusting."

Car in Shielded Location—If the car is within or near a steel structure, the signals may be weakened by absorption.

Storage Battery Run Down—Check the condition of the battery.

Defective "B" Eliminator—Check "B" voltage at sockets (see voltage chart and Fig. 10).

Misalignment of Variable Tuning Condensers—Instructions for realigning are contained in this manual. Do not, however, attempt realignment unless other causes of low volume have first been investigated.

Wrong Voltages—Check voltages at the sockets (see voltage chart).

Other Causes of Low Volume—Defective speaker, poor battery, antenna, grid cap or other connections, defective A.V.C. system in the receiver, and various opens, grounds and shorts in the receiver assembly.

Distorted Reproduction

Receiver Oscillating—See article on oscillation.

Defective Tubes—Try out a new set of tubes.

Incorrect Voltages—Check the voltages at the sockets (see voltage chart).

Incorrect Tuning—The signal must be carefully tuned in to the clearest and loudest point. It must not be tuned "off resonance."

Defective Speaker—Try out a new one if it is available.

Defective Audio System in the Receiver—Make continuity resistance tests using as a guide Fig. 10.

Signal Transmission—Quality fading in the signal transmission can cause poor tone quality.

Oscillation

Cover of Box—May not be on or if on, may not be sufficiently tightened down.

Off Characteristic Tubes—Tubes whose characteristics vary considerably from the standard may cause oscillation. Try out some new ones.

Open Bypass Condensers—Check the bypass condensers and leads to them for open circuit.

Poor Ground Connections—Check the ground connections in the chassis for poor contact.

Grid Caps and Leads—The grid caps may not be making good contact to the tops of the tubes or the wires of the grid caps may be too close together.

MODEL Z6Z1
Parts List

GULBRANSEN CO.

Replacement Parts for Series Z6Z1 Receivers

CHASSIS PARTS

Part No.	Description	List Price
P-1780	No. 75 Tube Socket	$0.10
P-1761	No. 77 Tube Socket	.10
P-1762	No. 78 Tube Socket	.10
P-1665	No. 41 Tube Socket	.10
P-1803	No. 84 Tube Socket	.10
P-1805	Single Pin Jack	.10
P-1799	Tube Shield Assembly	.25
P-20656	Chassis Box	4.00
P-20657	Chassis Box Cover	1.10
P-70740	Shielded Antenna Lead	.40
P-70744	Shielded "A" Battery Lead	1.15
P-1804	Vibrator Unit (in cast metal case)	6.00
P-10266	Vibrator Unit Rubber Cushion, pair	.10
P-20660	Vibrator Unit Box	.70
P-20661	Vibrator Unit Box Cover	.20
P-1572	Fuse Clip Assembly	.10
P-10260	Cardboard Baffle	.20
P-1624	10 Amp. Fuse	.10
P-1774	Electrodynamic Speaker	3.75
P-20585	Cond. Drive Gear	.25
P-1801	Volume Control and Drive Bracket	.30
P-20635	Cond. Drive Pinion	.15
P-20677	Pinion Adjustment Plate	.10
P-20614	Lock Lever	.10
P-20658	Tension Spring	.10
P-30419	Entry Plate Assembly	.10
P-1830	Dial Gear and Strip Assembly	.40
P-1816	Celluloid Dial Strip only	.15
P-1810	Pilot Lamp Socket and Spring Clip	.10
P-1563	6-8 Volt Pilot Lamp	.25
P-10263	Rubber Tube Bumper—Square	.10
P-10210	Rubber Tube Bumper—Round	.10
P-10213	Rubber Band for Tube	.10
P-50569	Filter Choke Assembly	1.60
P-50585	Power Trans. Assembly—Less condensers and brackets	3.25
P-5099	Antenna R. F. Transformer—Less Can	1.20
P-5065	Interstage R. F. Transformer—Less Can	1.00
P-5105	Second I. F. Transformer and Can Assembly	.95
P-5096	First I. F. and Oscillator Transformer and Can Assembly	2.70
P-5097	Single Solenoid "A" Choke	.25
P-40431	Antenna R. F. Can	.15
P-1826	Interstage R. F. Can	.10

Resistors

Part No.	Code No.	Resistance	Type	List Price
P-A95103	R-1	1 Megohm	Carbon	$0.25
P-A95105	R-2	1 Megohm	Carbon	.25
P-B94261	R-3	260 ohm	Carbon	.35
P-A95504	R-4	.5 Megohm	Carbon	.25
P-A95104	R-5	100,000 ohm	Carbon	.25
P-A94402	R-6	4,000 ohm	Carbon	.20
P-91066	R-7	0-500,00 ohm	Volume Control and Switch	$1.15
P-A95104	R-8	100,000 ohm	Carbon	.25
P-A95104	R-9	100,000 ohm	Carbon	.25
P-A94402	R-10	4,000 ohm	Carbon	.20
P-B94153	R-11	15,000 ohm	Carbon	.25
P-B94203	R-12	20,000 ohm	Carbon	.25
P-C94401	R-13	400 ohm	Carbon	.20

Condensers

Part No.	Code No.	Capacity	Voltage	Type	List Price
P-80862	C-1	.05 mfd.	200 V.	Tubular	$0.30
P-80888	C-2	.25 mfd.	200 V.	Tubular	.35
P-80821-B	C-4	.001 mfd.	600 V.	Molded	.25
P-80937	C-7	4.0 mfd.		Electrolytic Block in can	1.25
	C-11	4.0 mfd.			
P-80919	C-8	.00025 mfd.	600 V.	Molded	.20
P-80945	C-9	.0005 mfd.	600 V.	Molded	.15
P-80898	C-10	.006 mfd.	600 V.	Tubular	15
P-80945	C-12	.0005 mfd.	600 V.	Molded	15
P-80966	C-14	.008 mfd.	600 V.	Tubular	20
P-80963	C-15	.04 mfd.	400 V.	Dual Tubular	.30
	C-16	.04 mfd.	400 V.		
P-80960	C-17	.4 mfd.	15 V.	In Metal Can	.50
P-80959	C-18	.003 mfd.	600 V.	Molded	.35
P-80956	C-19	8.0 mfd.	225 V.	Electrolytic Block in Can	2.25
	C-20	20.0 mfd.	25 V.		
	C-21	8.0 mfd.	225 V.		
P-80955	C-3	.1 mfd.	300 V.	Bypass Block in Can	1.35
	C-5	.05 mfd.	200 V.		
	C-6	.1 mfd.	200 V.		
	C-13	.05 mfd.	300 V.		
P-1539	600 K. C. Trimmer Condenser				.45
P-80957	Three-Gang Variable Condenser				3.00

CONTROL UNIT PARTS

(When Separate Control Unit Is Used)

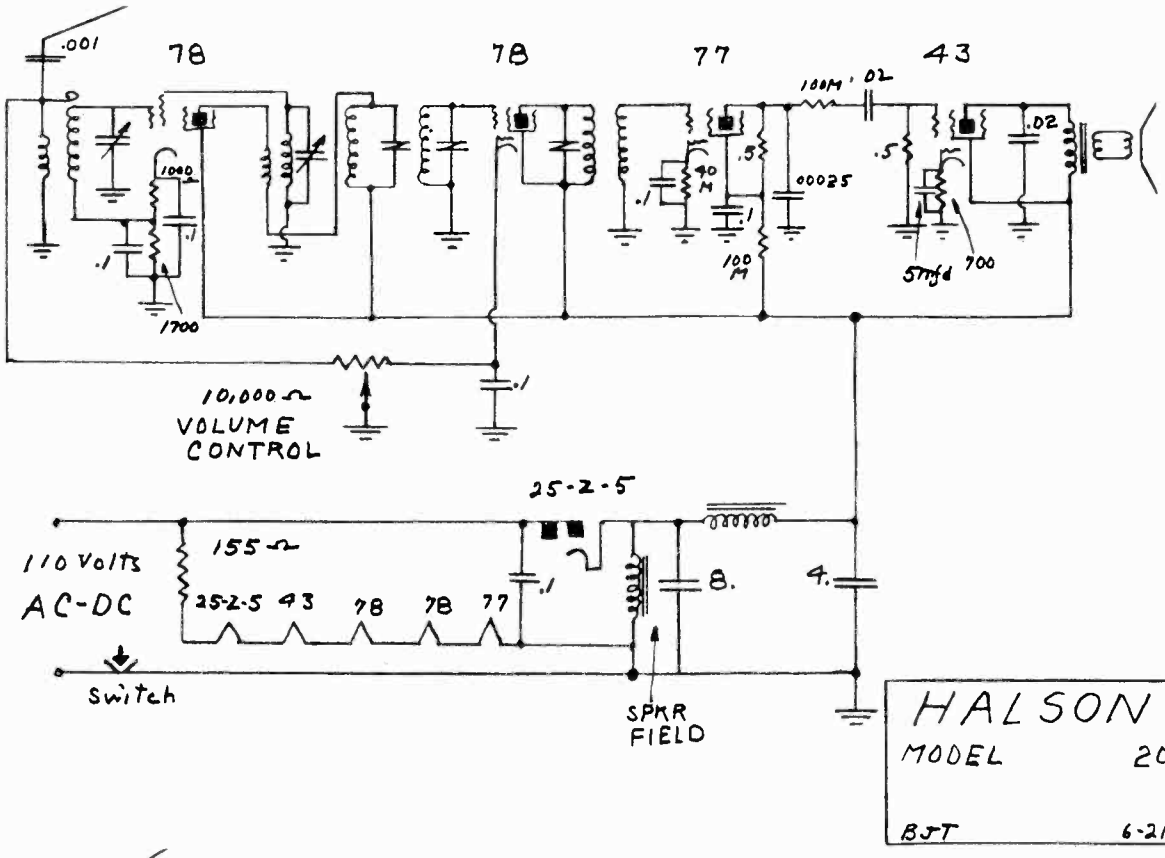
Part No.	Description	List Price
P-1816	Celluloid Dial Strip	$0.15
P-1825	Dial Gear and Strip Assembly	.40
P-20509B	Control Unit Swivel	.15
P-20510A	Steering Post Apron	.30
P-20511	Steering Post Clamp	.15
P-20693	Control Box Cover	.35
P-20635	Cond. Drive Pinion	.15
P-70746	Pilot Lamp Cable only	.40
P-1415A	Pilot Lamp Socket and Clip	.15
P-1563A	6-8 Volt Pilot Lamp	.25
P-30426	Ornamental Plug	.10
P-30414	Key	.15

ITEMS WHICH MAY BE REQUIRED IN SOME CASES

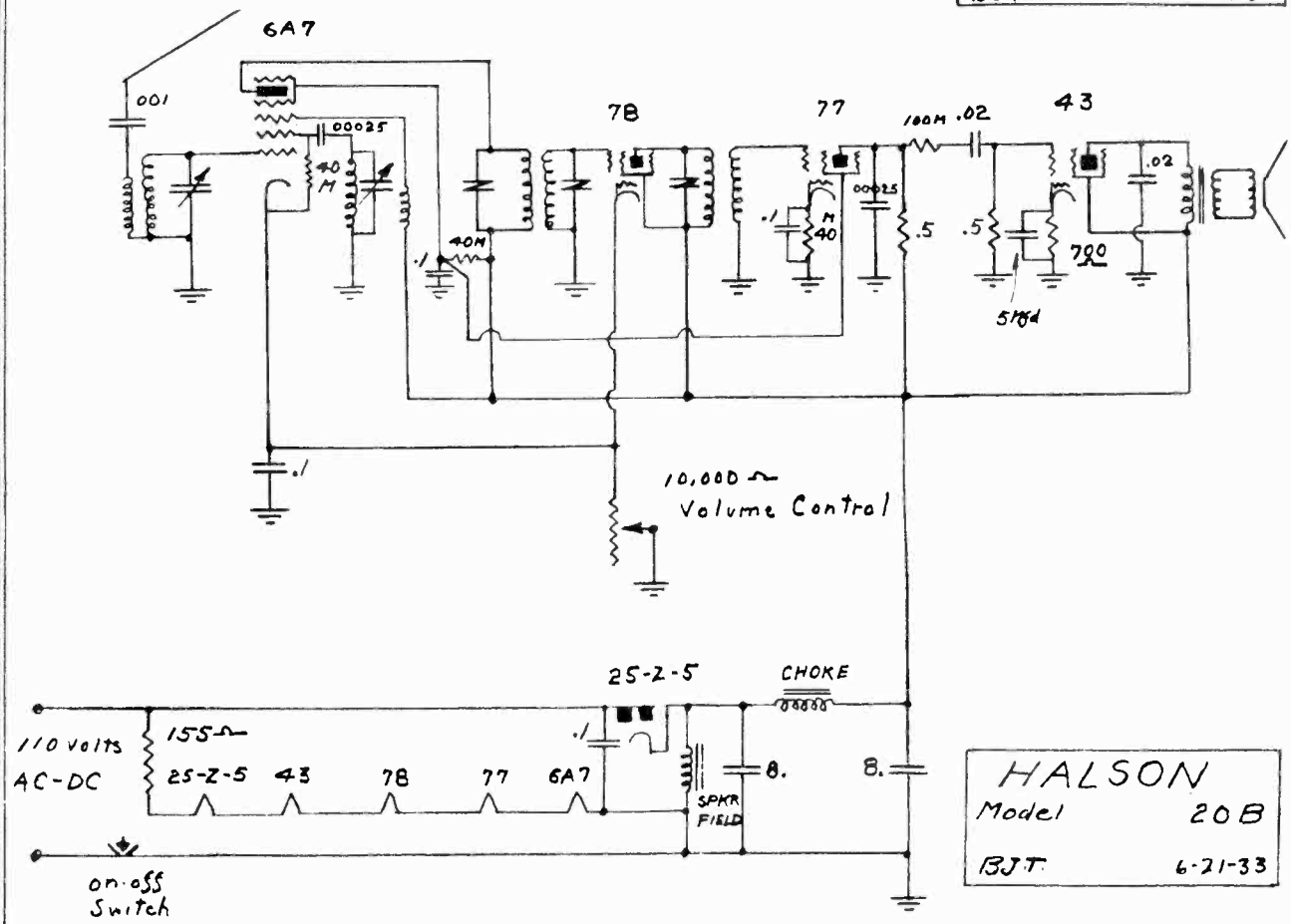
1 — 1550	14" Flexible Drive Shaft—For Control Unit Mounting	$ .90 ea.
1 — 1553	20" Flexible Drive Shaft—For Control Unit Mounting	1.25 ea.
1 — 1551	34" Flexible Drive Shaft—For Control Unit Mounting	1.65 ea.
1 — 1552	45" Flexible Drive Shaft—For Control Unit Mounting	2.00 ea.
1 — 91011	Spark Plug Suppressor—All methods of mounting	.50 ea.
1 — 91012	Distributor Suppressor, Wood Screw Ends—All methods of mounting	.50 ea.

MODEL 20-A
MODEL 20-B
Schematics

HALSON RADIO CORP.



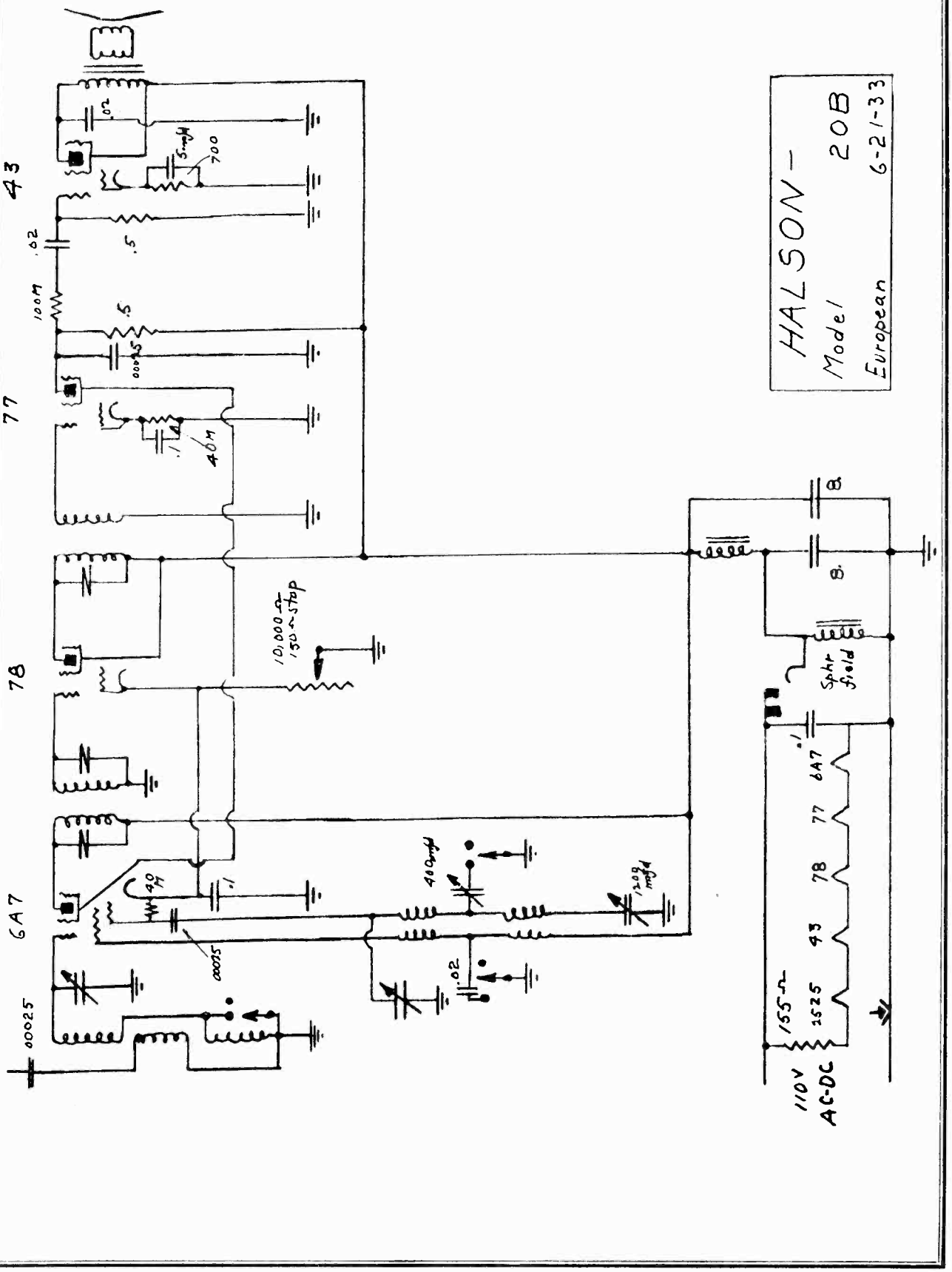
HALSON
MODEL 20A
BJT 6-21-33



HALSON
Model 20B
BJT 6-21-33

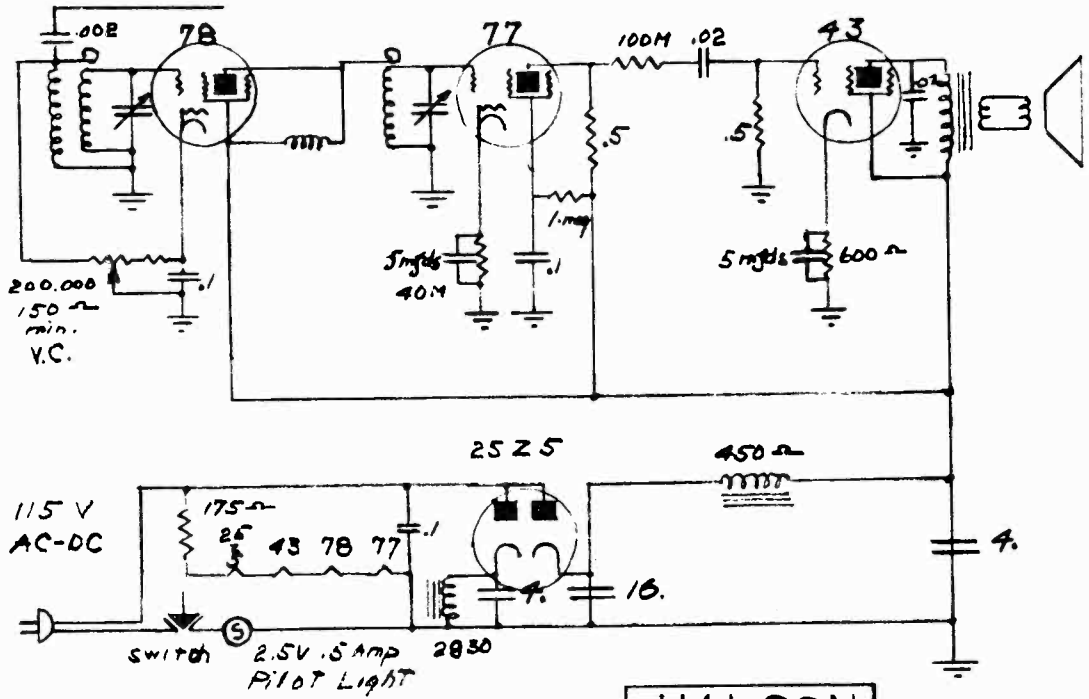
MODEL 20-B
Schematic

HALSON RADIO CORP.



HALSON RADIO CORP.

MODEL N.S. 40
Schematic
MODEL N.S. 50
Schematic



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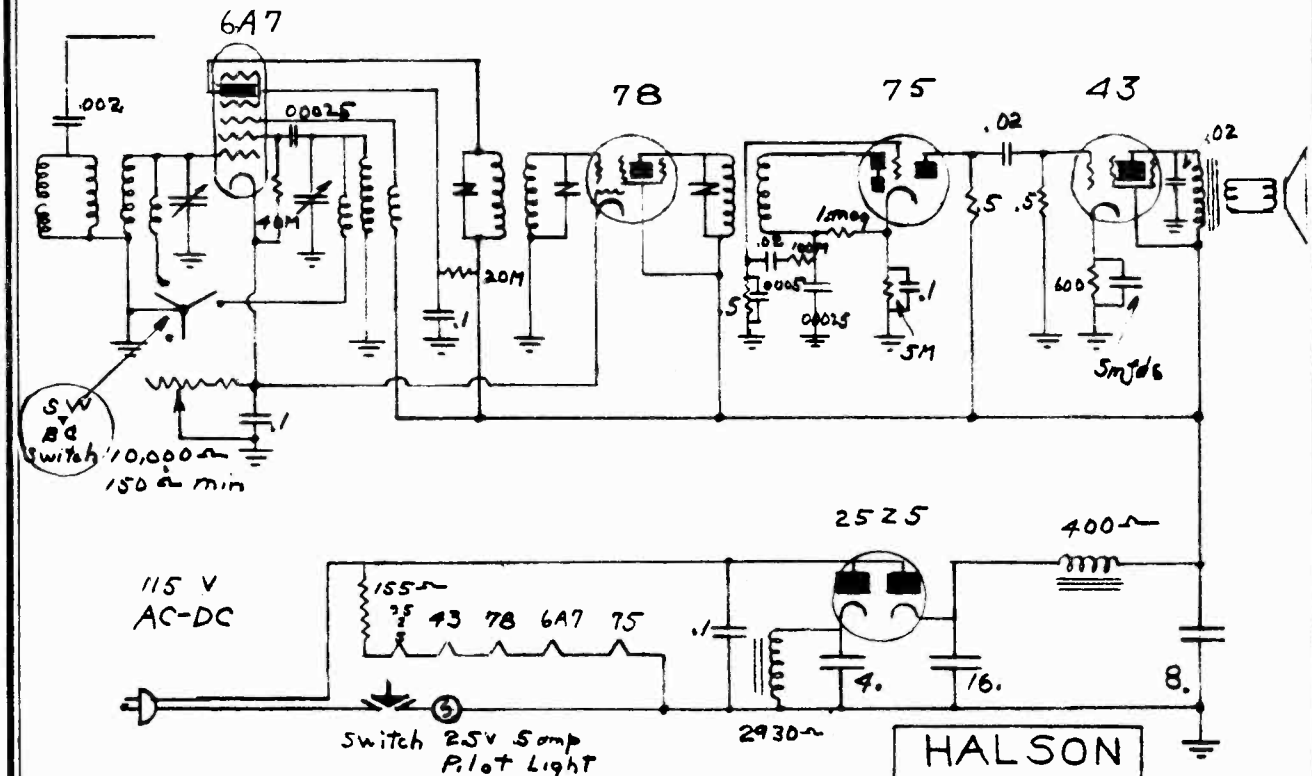

HALSON
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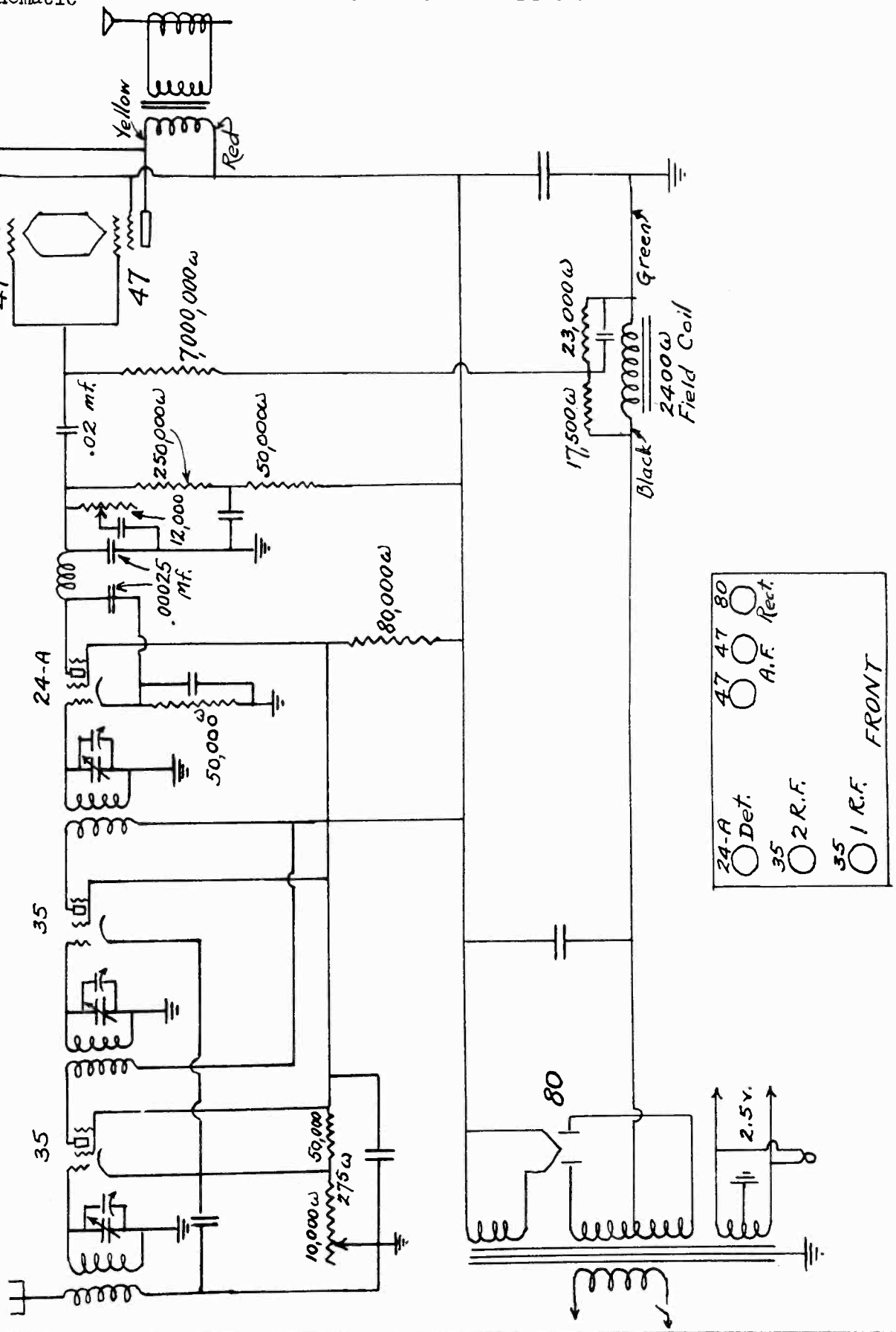
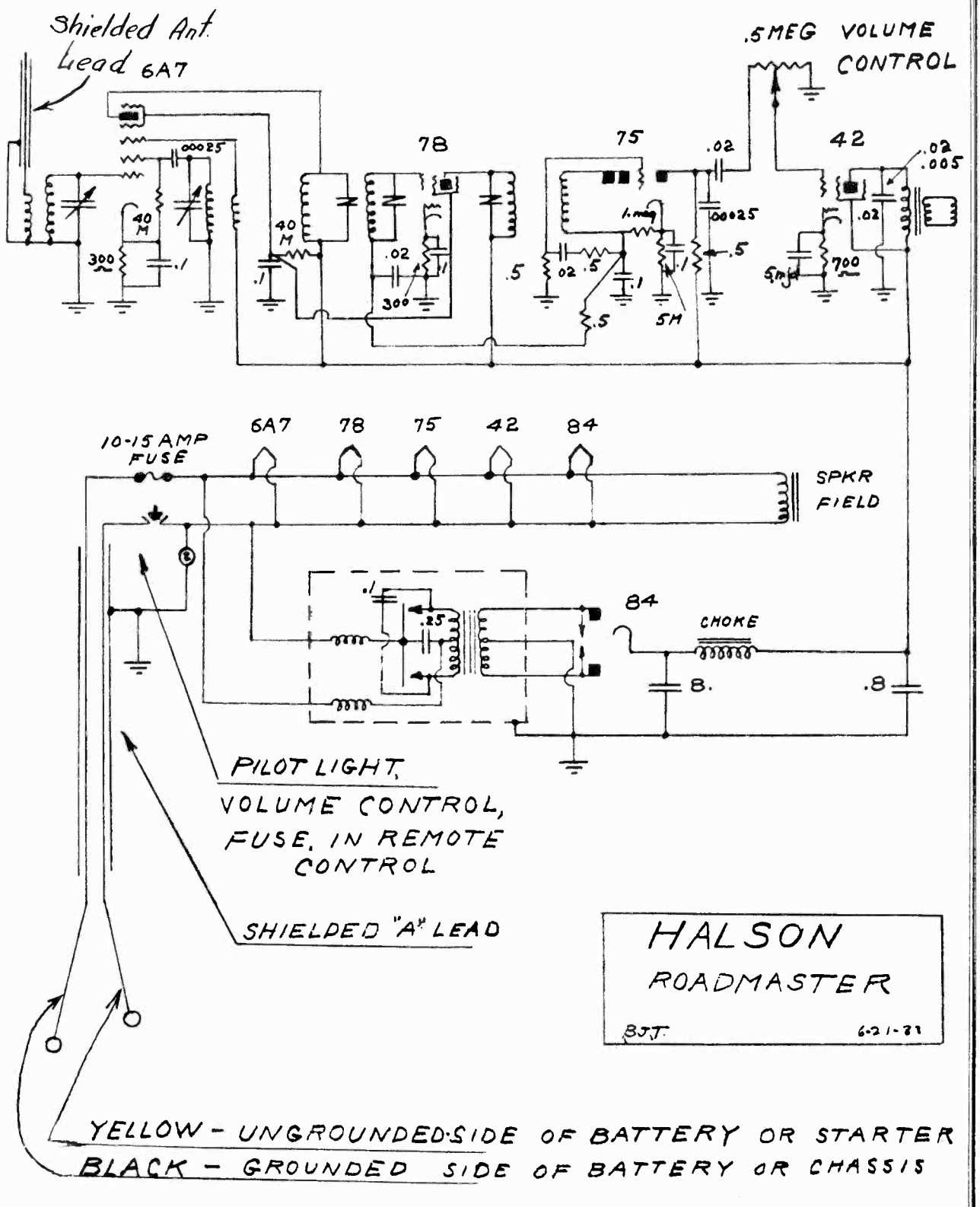
MODEL 610
Schematic

HALSON RADIO CORP.



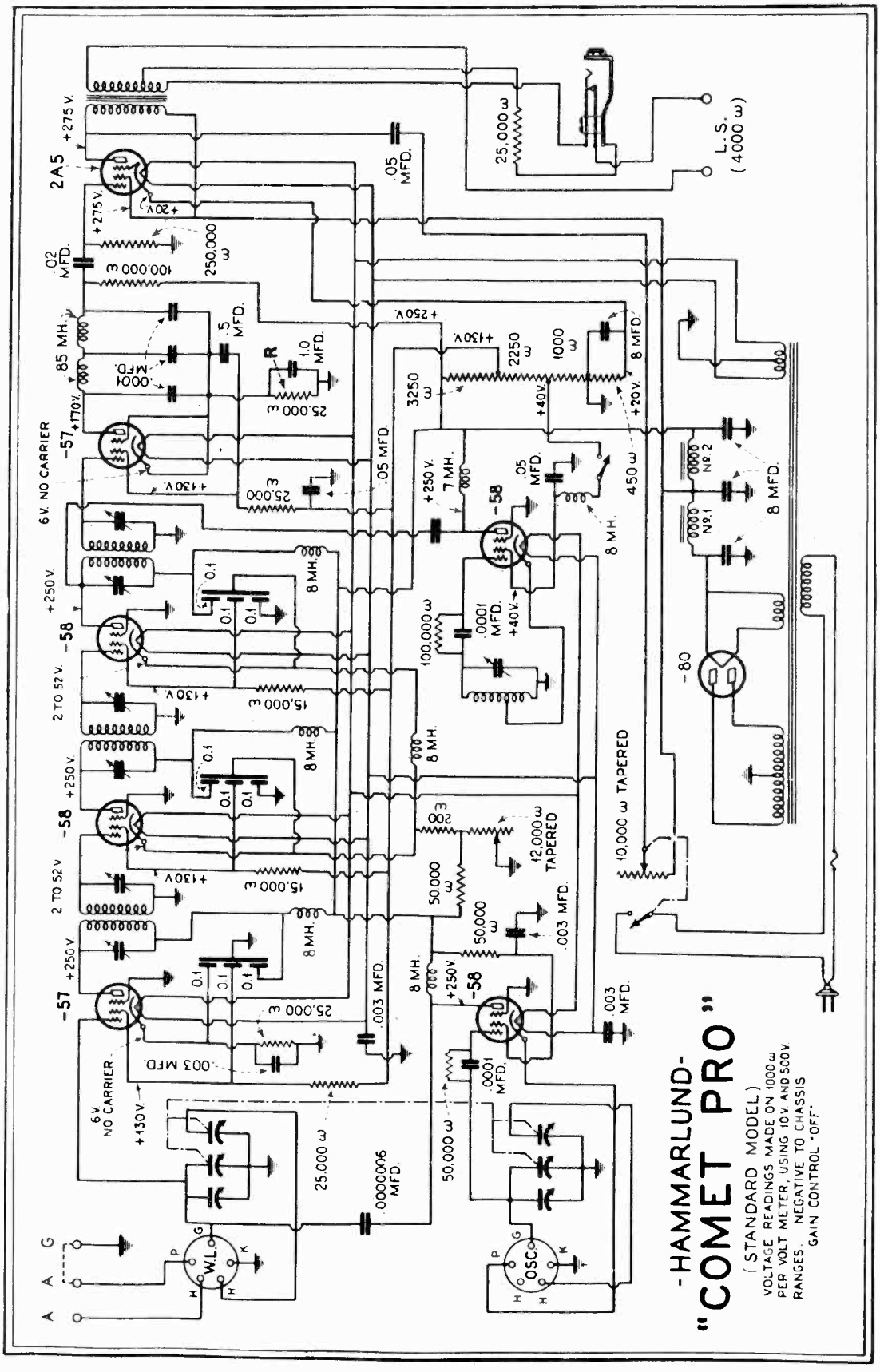
HALSON RADIO CORP.

MODEL "Roadmaster"
Schematic



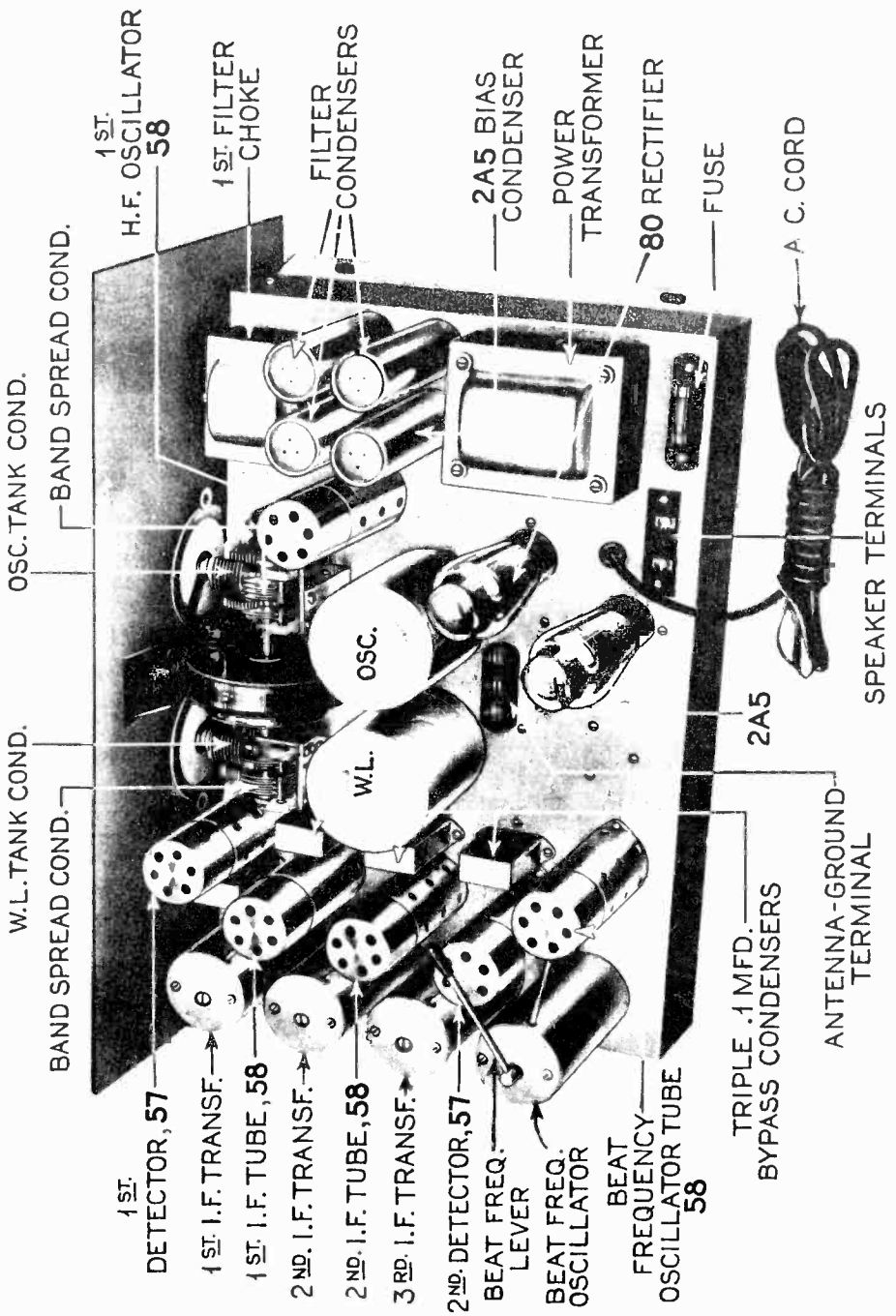
HAMMARLUND MFG. CO.

MODEL "Comet Pro"
(Standard)
Schematic



MODEL "Comet Pro"
(Standard)
Chassis view

HAMMARLUND MFG. CO.

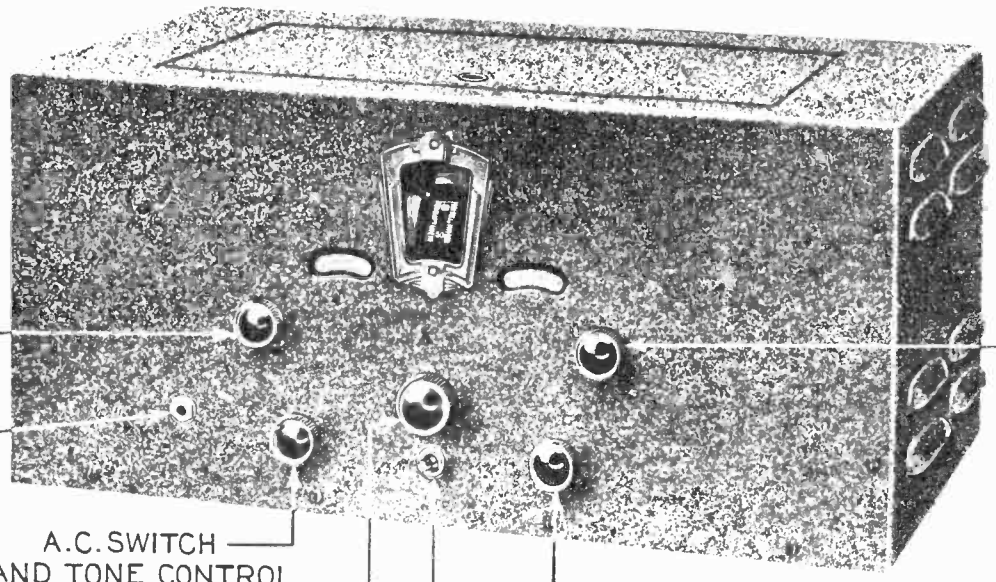


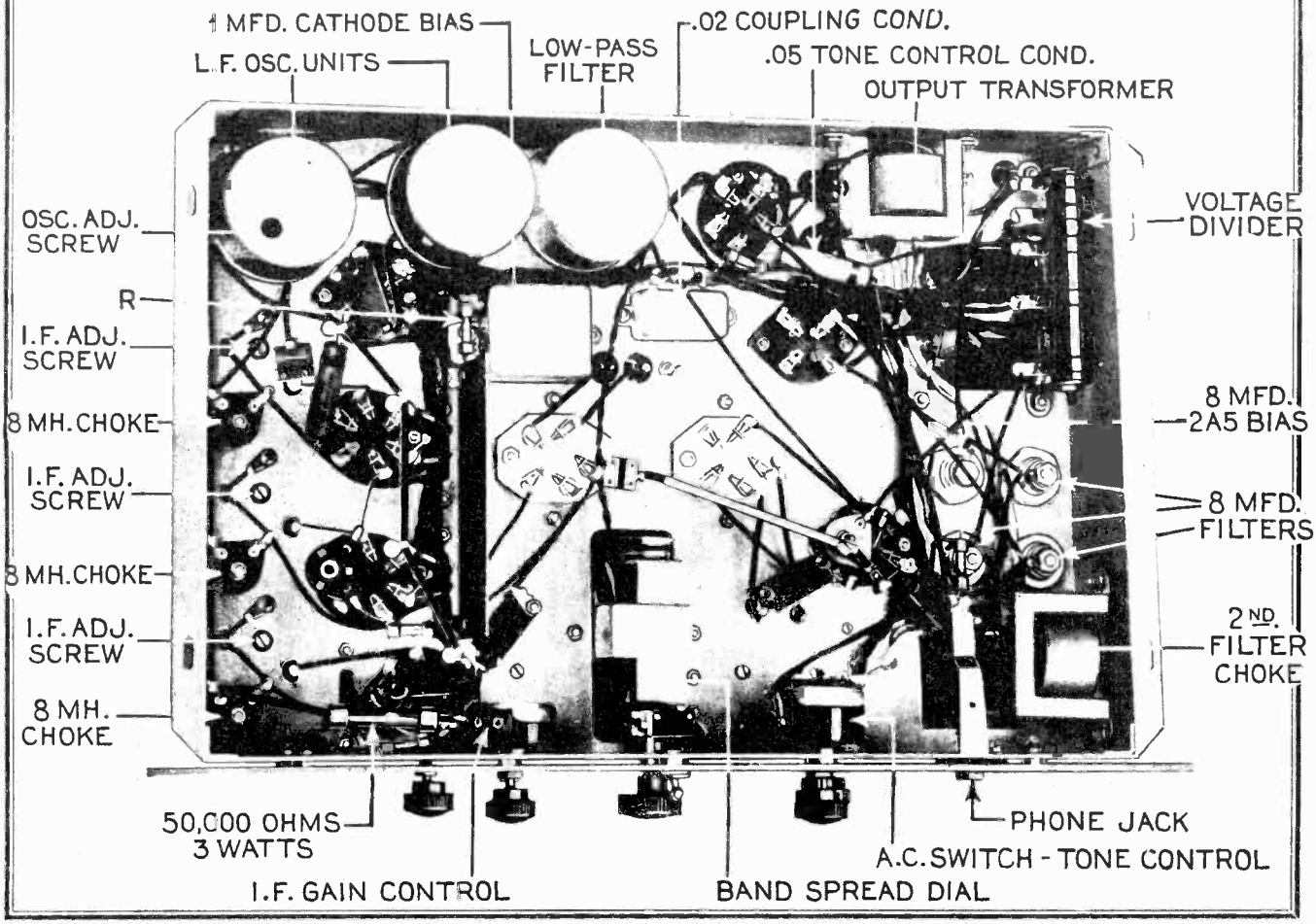
formers. Finally repeat this whole process, readjusting each condenser a second time to insure exactness of resonance.

After the i.f. stages are thus accurately lined up, turn on the heterodyne-beat oscillator and set its top lever so that it points diagonally away from the rear right-hand corner of the chassis. Then adjust the bottom adjustment screw on this transformer for exact zero beat. When this has been accomplished the receiver is in accurate alignment.

HAMMARLUND MFG. CO.

MODEL "Comet Pro"
(Standard)
Chassis view





SERVICE DATA

Should it be necessary to remove the Comet "Pro" chassis from its shield cabinet it is easily accomplished by removing the four machine screws which extend through the bottom of the cabinet and the twelve screws around the edge of the front panel. The entire panel and chassis assembly may then be slipped out of the cabinet by drawing it forward. When thus removed all parts and wiring located beneath the chassis are exposed for examination or test. The shield cans found under the chassis may be removed if necessary by pulling them off.

The voltage values at various points of the circuit and the values of all resistors and condensers are shown on the circuit diagram.

Should the "Pro" fail to function in its normal manner at any time the recommended procedure is to first carefully check up on the antenna and ground. Then check the tubes as they are, of course, the most vulnerable part of any well-designed and well-built receiver. Beyond this the entire receiver should next be checked for "shorts" or "opens" and in this a test of the voltages as shown in the circuit diagram will be simple and helpful. The voltages shown are those read on the 10 volt and 500 volt ranges of a standard meter having a sensitivity of 1000 ohms per volt. If a meter offering lower resistance is employed in checking, some of these readings will vary considerably and due allowance must accordingly be made for this factor of error. In making these tests the sensitivity control should be set at the full "off" position.

It is also desirable to disconnect the antenna - or at least detune the receiver so that no signal is present in the circuits under measurement. In measuring cathode voltages on the two i.f. tubes the gain control should be swung through its entire range to show minimum and maximum bias. The voltage should vary from approximately 3 volts to 50 volts, respectively.

While the use of air-dielectric variable condensers for tuning the i.f. and beat-frequency oscillator transformers provide an exceptional degree of permanence of adjustment, it is of course possible that eventually some of these circuits may become slightly detuned. In such an event they may be realigned in the following manner.

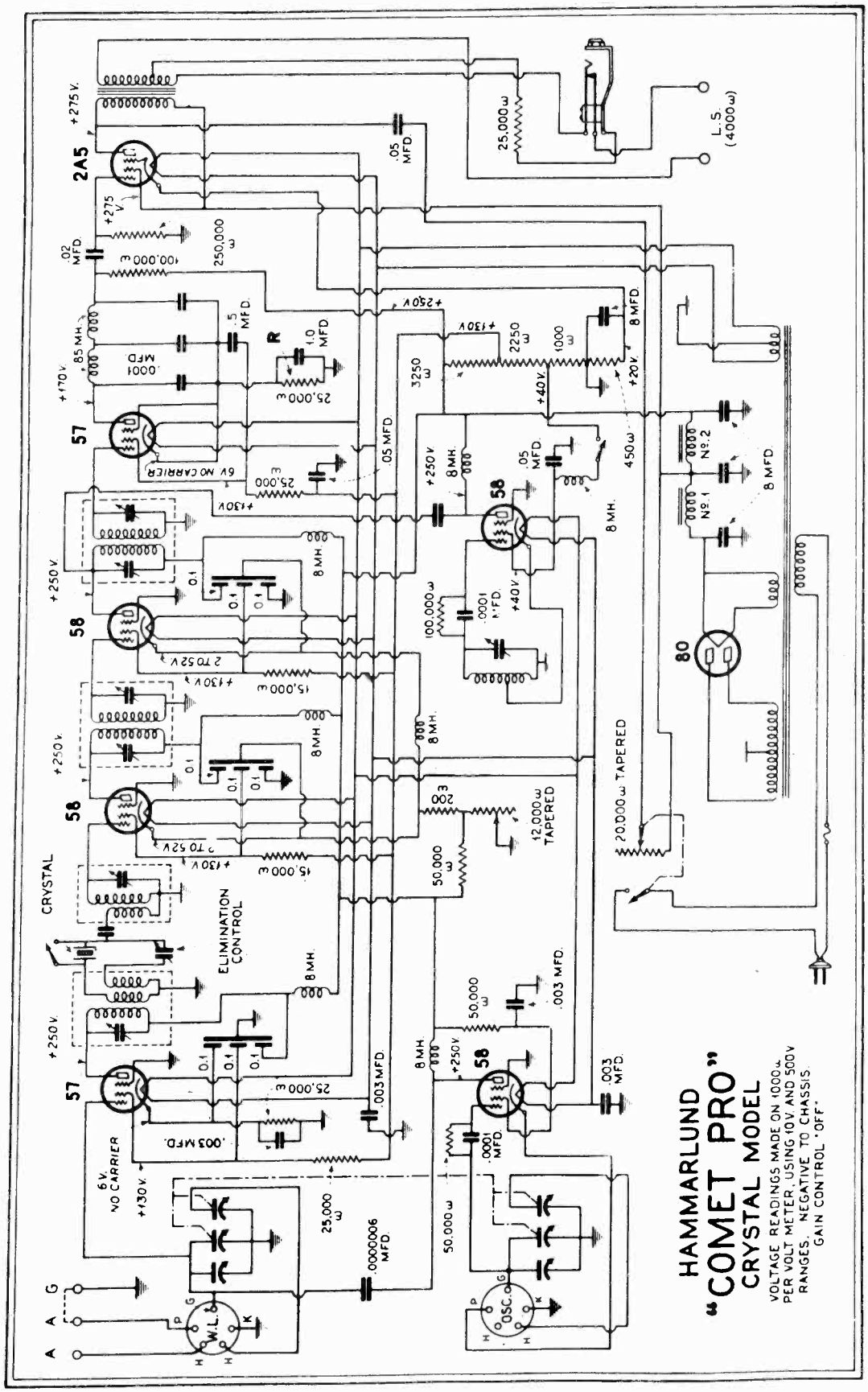
First remove the chassis from the cabinet and prop it up on its rear edge so that both the top and bottom are accessible. Then connect the 10 ohm range of a 1000 ohm per volt voltmeter across the 25,000 ohm resistor between the cathode of the second detector and ground. This resistor is marked "R" in the view of the bottom of the chassis, as shown on page 9. This meter will function as a resonance indicator, showing maximum deflection when exact resonance is obtained.

Next provide a signal source. If an oscillator is available, tune it to 465 kc. and couple it to the receiver. If such an oscillator is not at hand the carrier of a fairly powerful station may be employed provided the station selected is one which is free from fading and interference. This signal should be tuned in on the receiver in the usual way and the gain control adjusted to cause an increase of about 2 volts in the voltmeter reading.

The actual alignment can now proceed. First adjust the bottom condensers of the three i.f. transformers. These are accessible from the under side of the chassis. Adjust them one after the other until maximum deflection of the resonance indicating meter is obtained. If the meter reading increases materially during this process retard the gain control to bring it back to the original plus 2 volts reading. Then make a similar adjustment of the condensers at the tops of the three i.f. trans

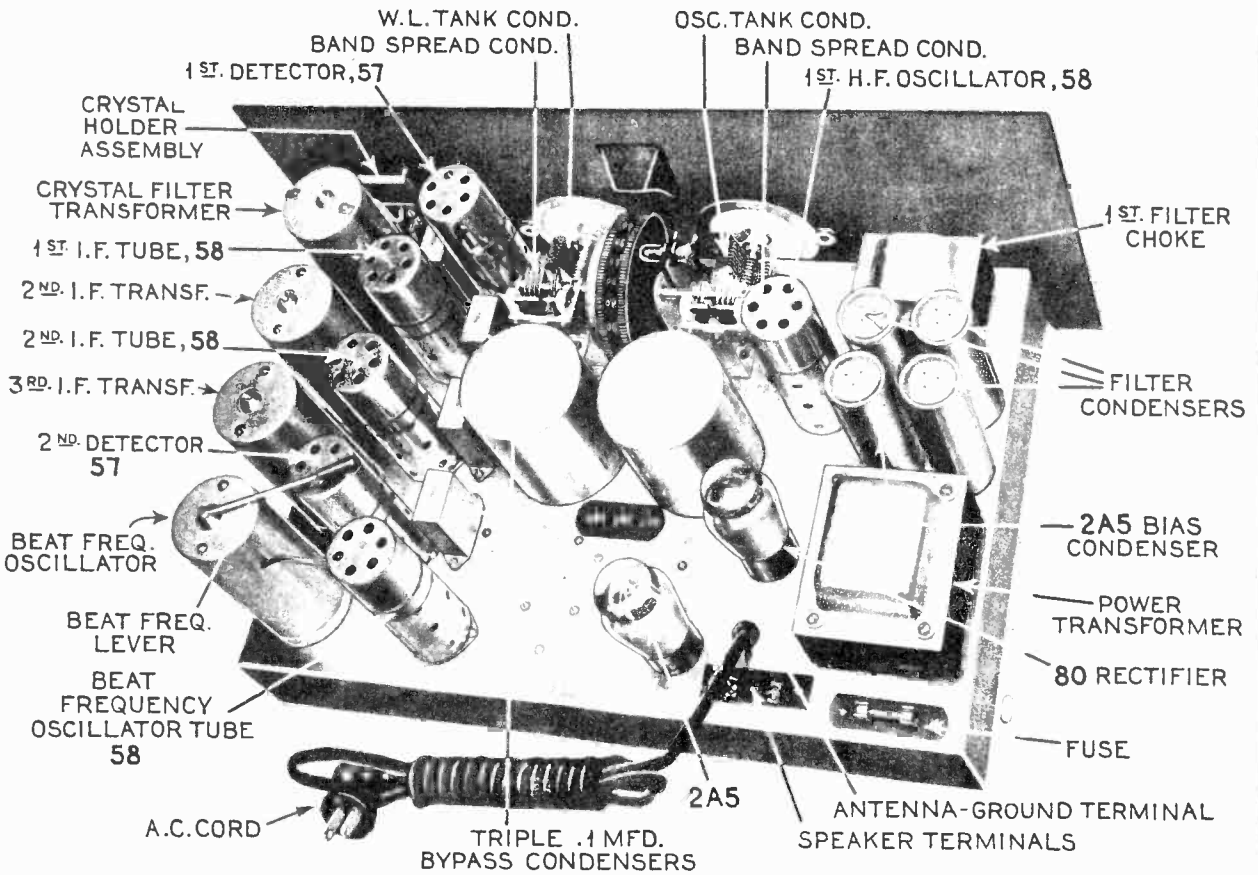
HAMMARLUND MFG. CO.

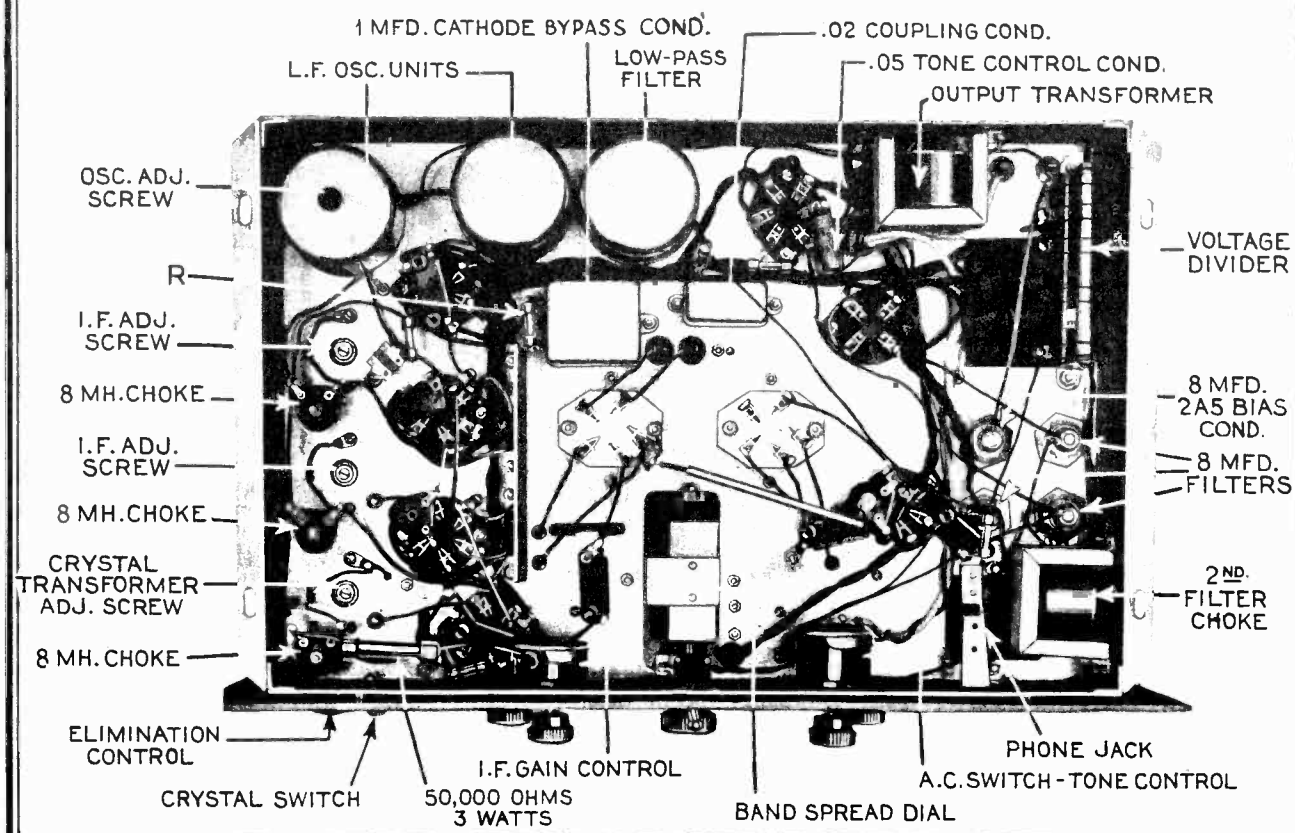
MODEL "Comet Pro"
(Crystal)
Schematic



MODEL "Comet Pro"
(Crystal)
Chassis views

HAMMARLUND MFG. CO.





SERVICE DATA

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The voltage values at various points of the circuit and the values of all resistors and condensers are shown on the circuit diagram.

Should the "Pro" fail to function in its normal manner at any time the recommended procedure is to first carefully check up on the antenna and ground. Then check the tubes as they are, of course, the most vulnerable part of any well-designed and well-built receiver. Beyond this the entire receiver should next be checked for "shorts" or "opens" and in this a test of the voltages as shown in the circuit diagram will be simple and helpful. The voltages shown are those read on the 10 volt and 500 volt ranges of a standard meter having a sensitivity of 1000 ohms per volt. If a meter offering lower resistance is employed in checking, some of these readings will vary considerably and due allowance must accordingly be made for this factor of error. In making these tests the sensitivity control should be set at the full "off" position.

It is also desirable to disconnect the antenna - or at least detune the receiver so that no signal is present in the circuits under measurement. In measuring cathode voltages on the two i.f. tubes the gain control should be swung through its entire range to show minimum and maximum bias. The voltage should vary from approximately 3 volts to 50 volts, respectively.

While the use of air-dielectric variable condensers for tuning the i.f. and beat-frequency oscillator transformers provide an exceptional degree of permanence of adjustment, it is of course possible that eventually some of these circuits may become slightly detuned. In such an event they may be realigned in the following manner.

First remove the chassis from the cabinet and prop it up on its rear edge so that both the top and bottom are accessible. Then connect the 10 volts range of a 1000 ohm per volt voltmeter across the 25,000 ohm resistor between the cathode of the second detector and ground. This resistor is marked "R" in the view of the bottom of the chassis, as shown on page 9. This meter will function as a resonance indicator, showing maximum deflection when exact resonance is obtained.

Next provide a signal source. If an oscillator is available, tune it to 465 kc. and couple it to the receiver. If such an oscillator is not at hand the carrier of a fairly powerful station may be employed provided the station selected is one which is free from fading and interference. This signal should be tuned in on the receiver in the usual way and the gain control adjusted to cause an increase of about 2 volts in the voltmeter reading.

The actual alignment can now proceed. First adjust the bottom condensers of the three i.f. transformers. These are accessible from the under side of the chassis. Adjust them one after the other until maximum deflection of the resonance indicating meter is obtained. If the meter reading increases materially during this process retard the gain control to bring it back to the original plus 2 volts reading. Then make a similar adjustment of the condensers at the tops of the three i.f. transformers.

MODEL "Comet Pro"
(Crystal)
Service notes

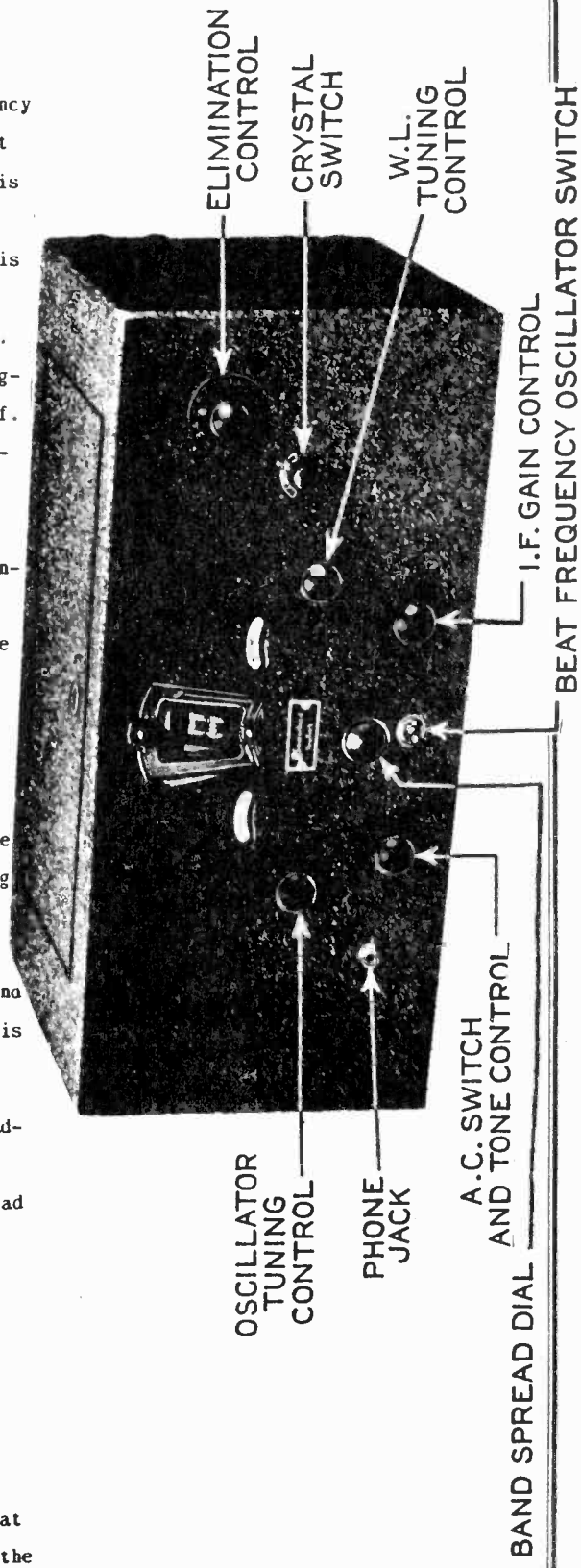
HAMMARLUND MFG. CO.

The i.f. amplifier is now accurately aligned at a frequency which is presumed to be 465 kc. but it may not be exactly that frequency. In any event steps must now be taken to retune this amplifier to exact resonance with the crystal frequency which may be slightly more or less than 465 kc. To proceed with this adjustment plug in the "DD" coils (or the special "EE" broadcast-band coils if available) and tune in a broadcast station. A local station is to be preferred because a rather strong signal which is not subject to fading is required. Or, if an r.f. oscillator which can be tuned to the broadcast range is available it may be used as the signal source, instead of a broadcast station. Whatever signal is used tune it in precisely, with the two tank-tuning controls, leaving the band-spread control set at 50. Then retard the sensitivity control to some point below the halfway adjustment. This is necessary because if the receiver is adjusted for high sensitivity, the weaker, spurious resonant frequencies of the crystal may cause confusion, particularly as one such point occurs less than 10 kc. from the primary resonant frequency.

Now, throw the crystal into the circuit and, watching the resonance indicator meter closely, move the band-spread tuning control very slowly a slight distance one way and then the other from 50 until a sudden increase is noticed in the meter reading indicating resonance with the crystal. Adjust the band spread dial exactly for maximum deflection of the meter at this point.

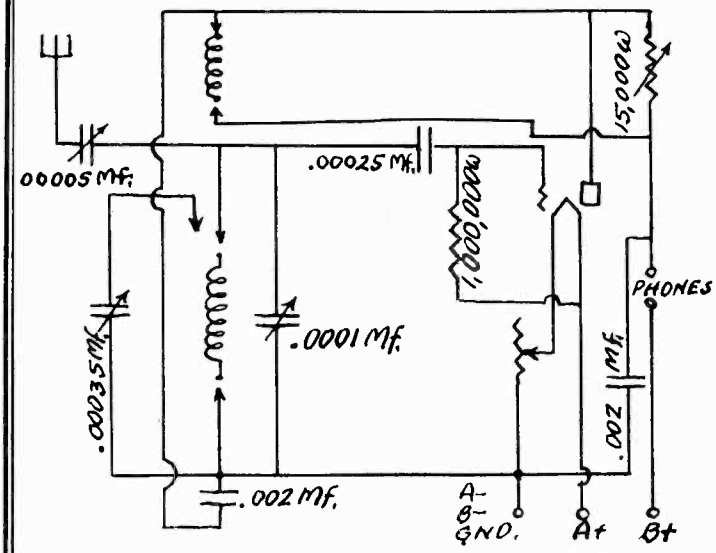
Next the crystal switch is turned "off" and the bottom adjustment screws of the i.f. transformers are retuned to this new frequency. The crystal is again cut in and the band-spread control retuned for the point where the meter "kicks up." Cutting the crystal out once more, the top adjustments of the i.f. transformers are made. At this point the i.f. amplifier should be in exact resonance with the crystal frequency, but just to make double sure it is advisable to repeat the whole process.

After the i.f. stages are thus accurately lined up, turn on the heterodyne-beat oscillator and set its top lever so that it points diagonally away from the rear-right-hand corner of the chassis. Then adjust the bottom adjustment screw on this transformer for exact zero beat. When this has been accomplished the receiver is in accurate alignment.

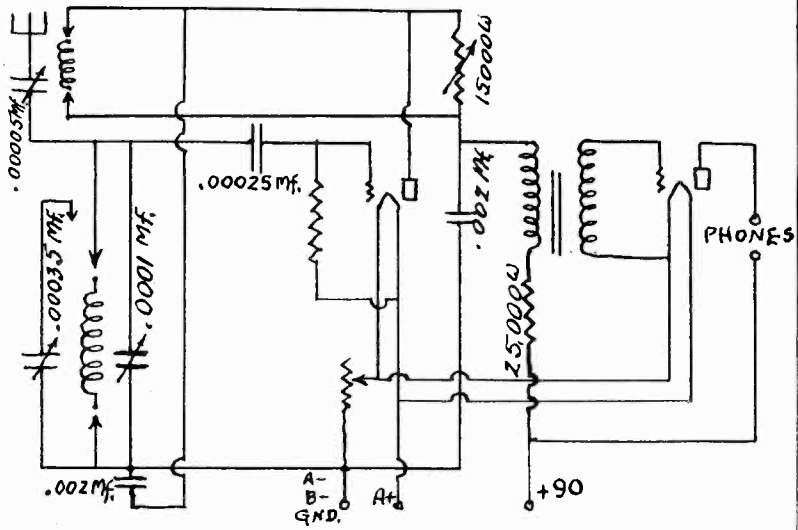


CHARLES HOODWIN CO.

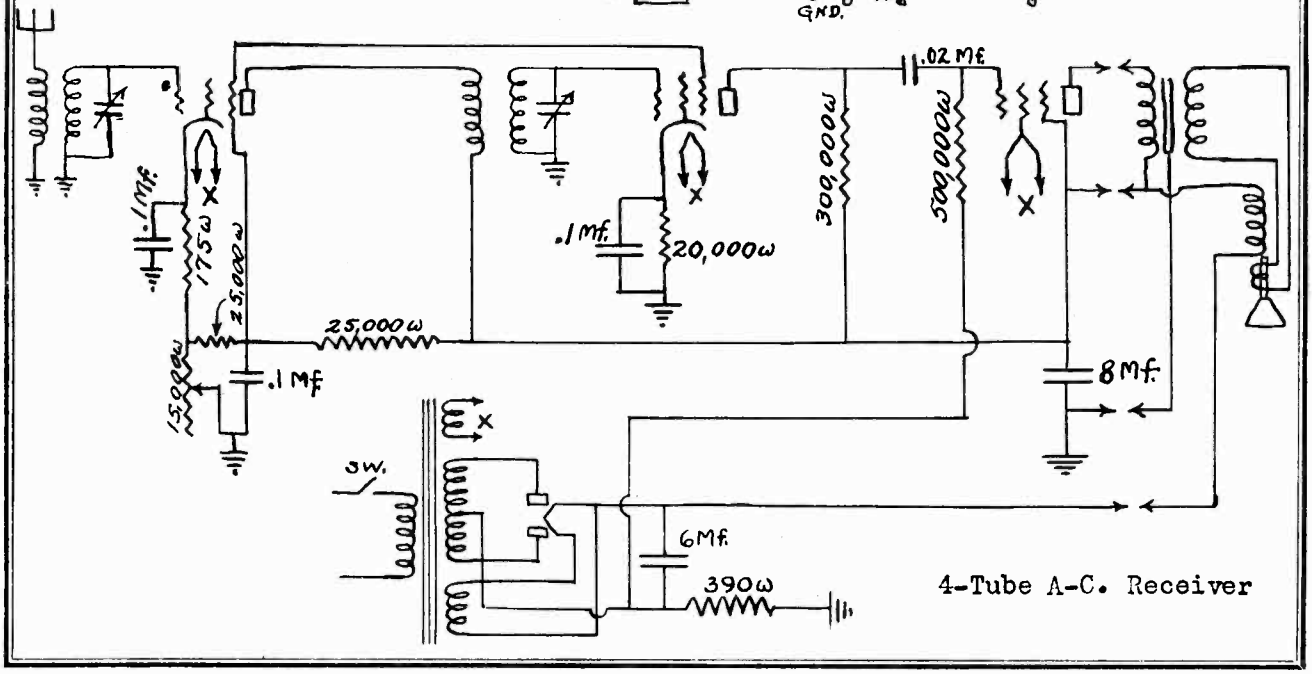
MODEL 1 Tube SW
MODEL 2 Tube SW
MODEL 4 Tube AC
Schematics



1-Tube Short-Wave Receiver



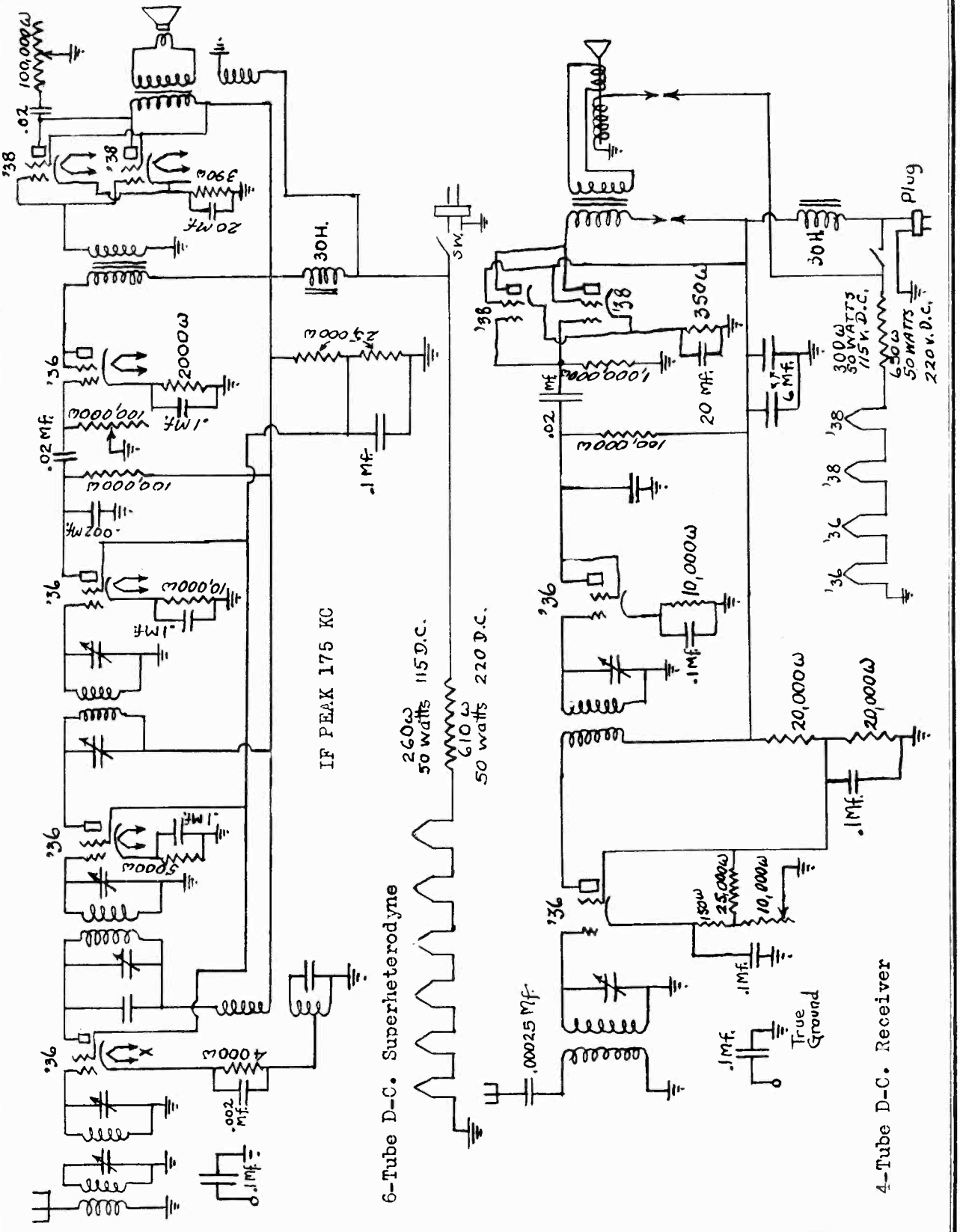
2-Tube World-Wide Receiver



4-Tube A-C. Receiver

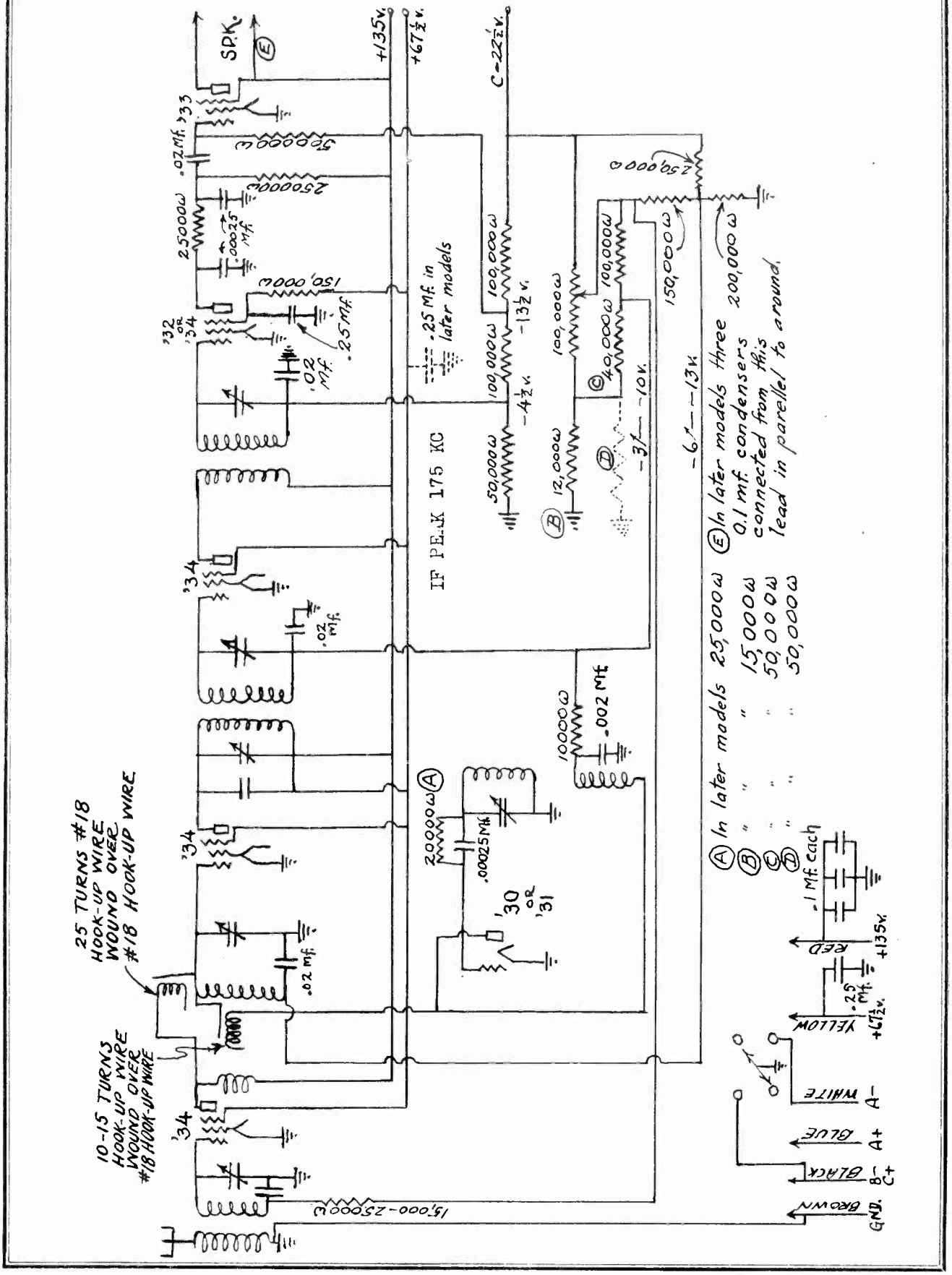
MODEL 4 Tube DC
MODEL 6 Tube DC Super
Schematics

CHARLES HOODWIN CO.



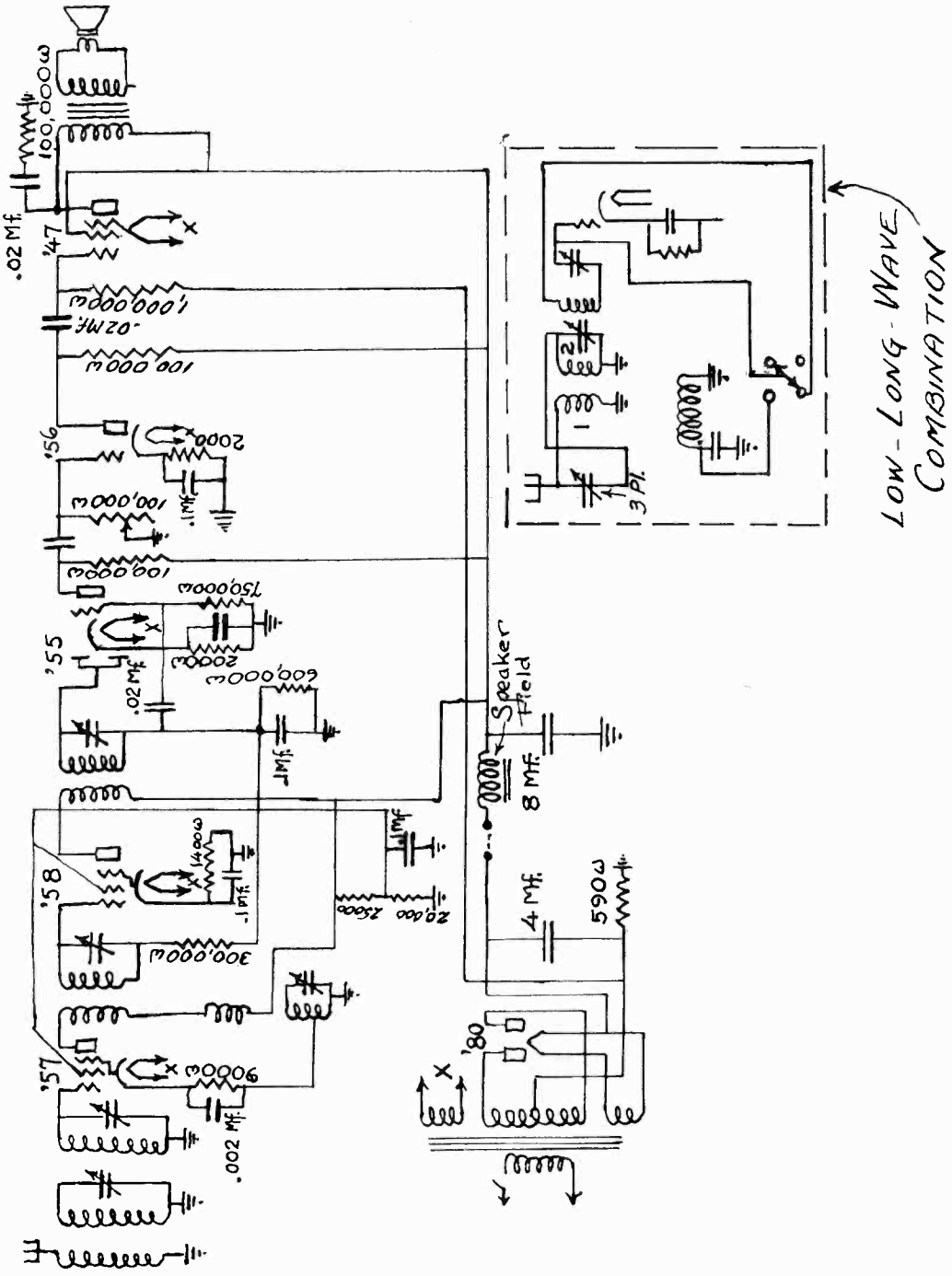
CHARLES HOODWIN CO.

MODEL 6 Tube Batt. Super
Schematic



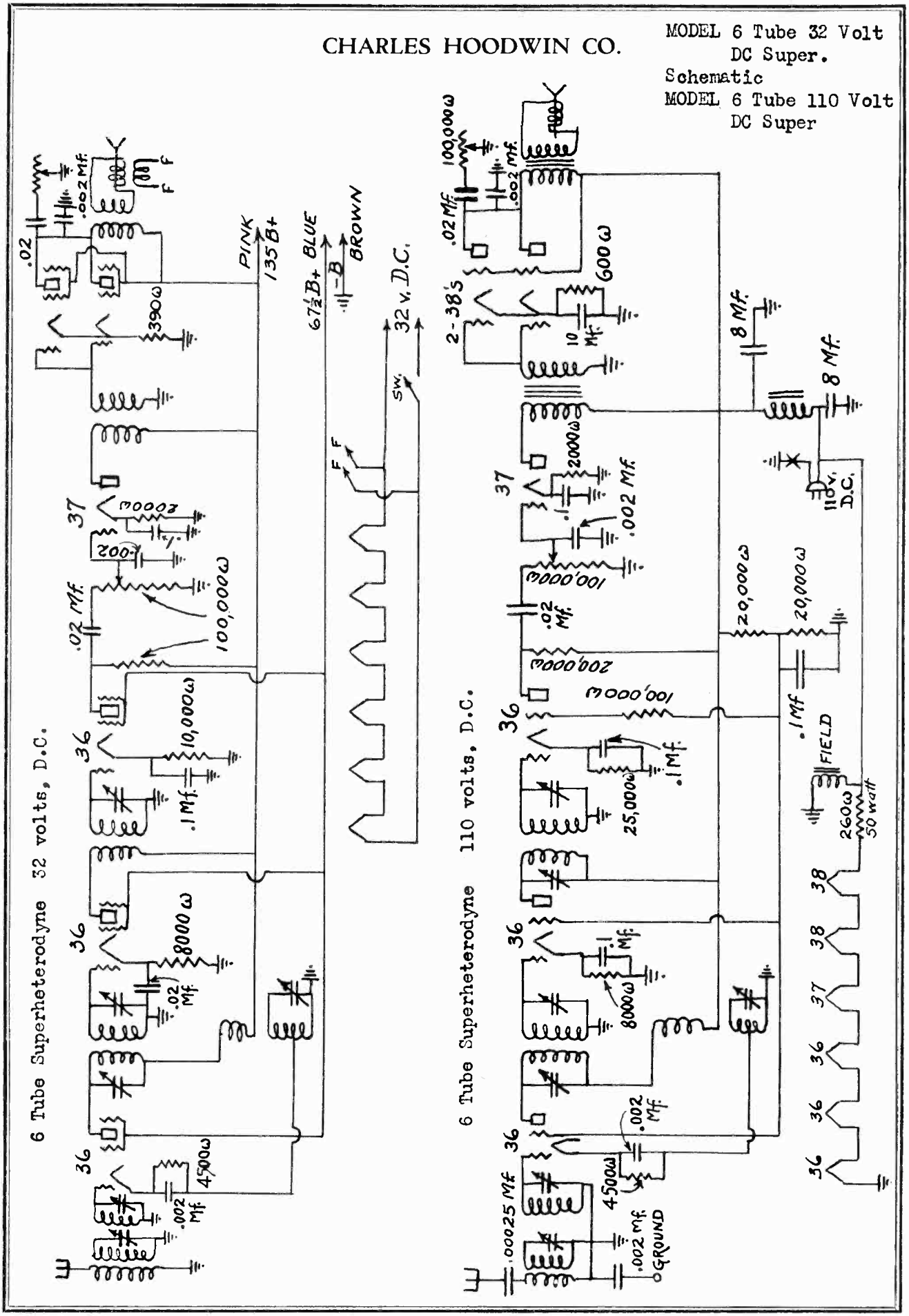
MODEL 6 Tube AC Super
Schematic

CHARLES HOODWIN CO.



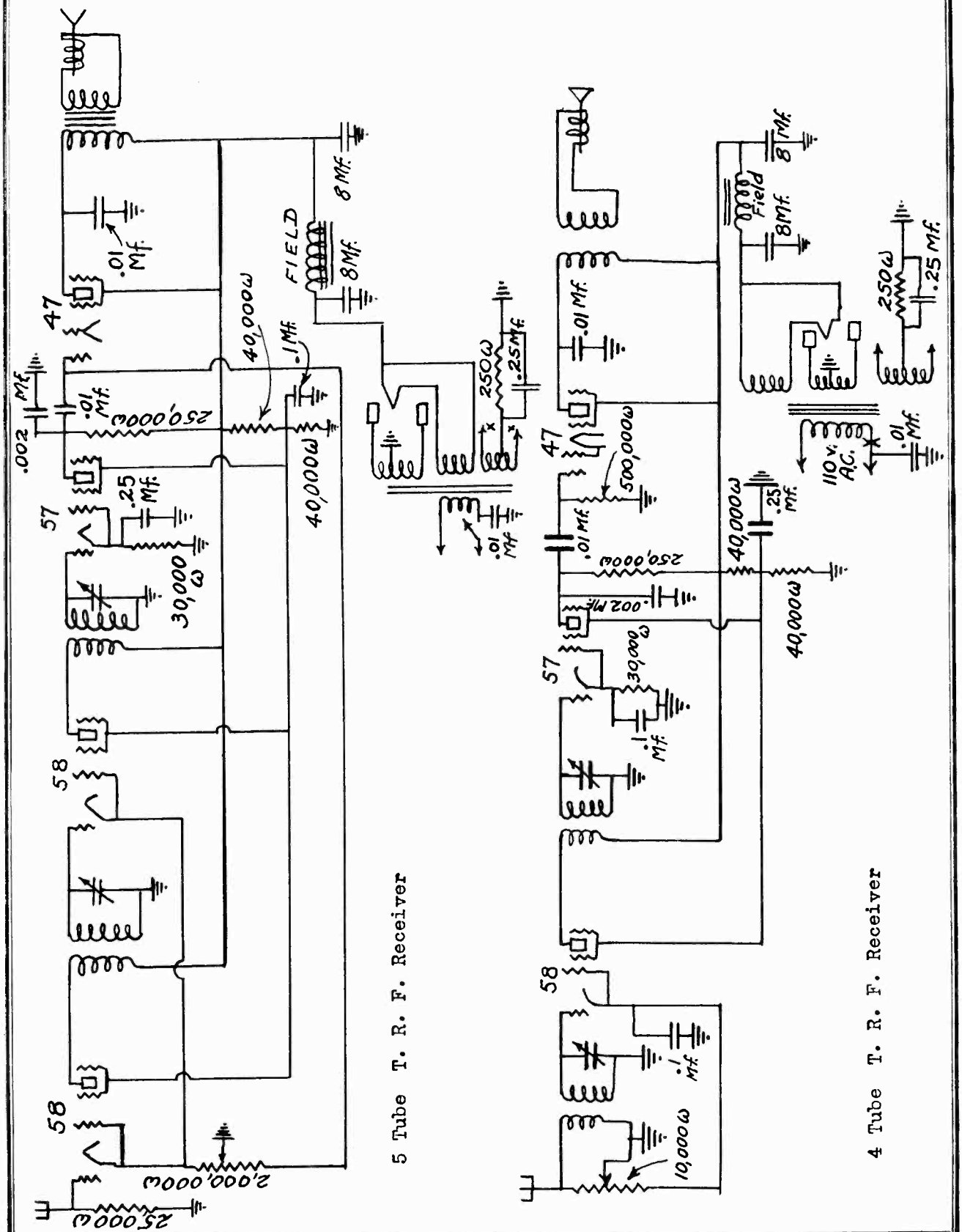
CHARLES HOODWIN CO.

MODEL 6 Tube 32 Volt DC Super.
Schematic
MODEL 6 Tube 110 Volt DC Super



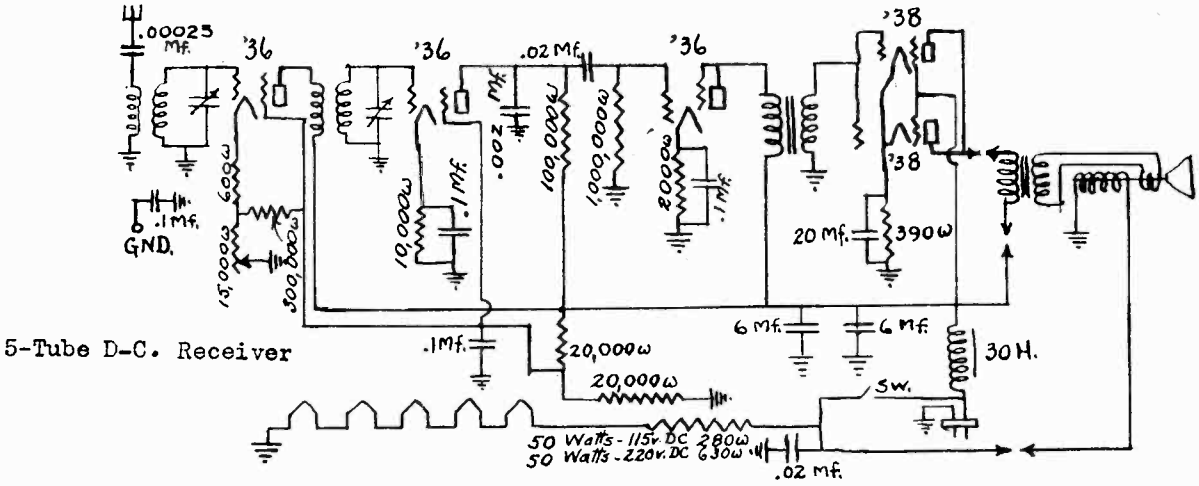
MODEL 5 Tube TRF
MODEL 4 Tube TRF
Schematic

CHARLES HOODWIN CO.

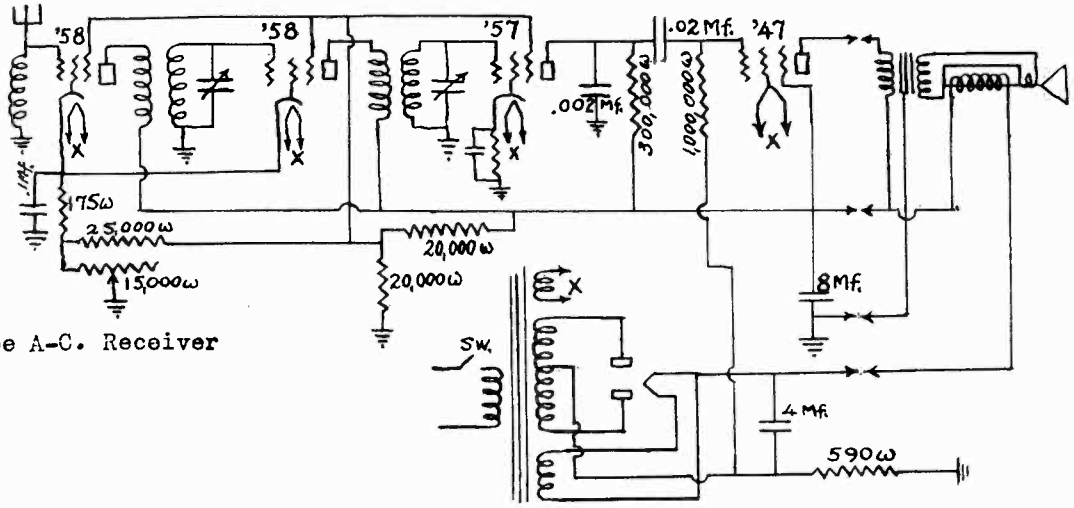


CHARLES HOODWIN CO.

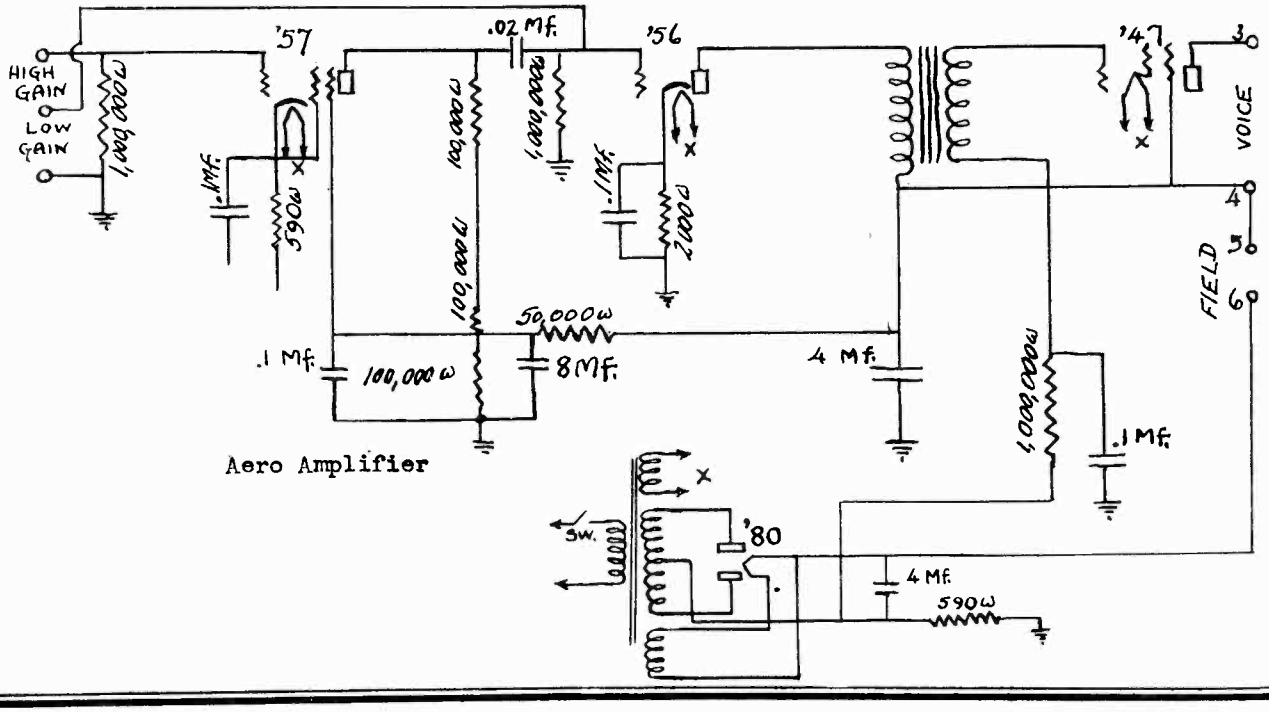
MODEL 5 Tube DC
MODEL 5 Tube AC
MODEL Aero AF Amp.
Schematics



5-Tube D-C. Receiver



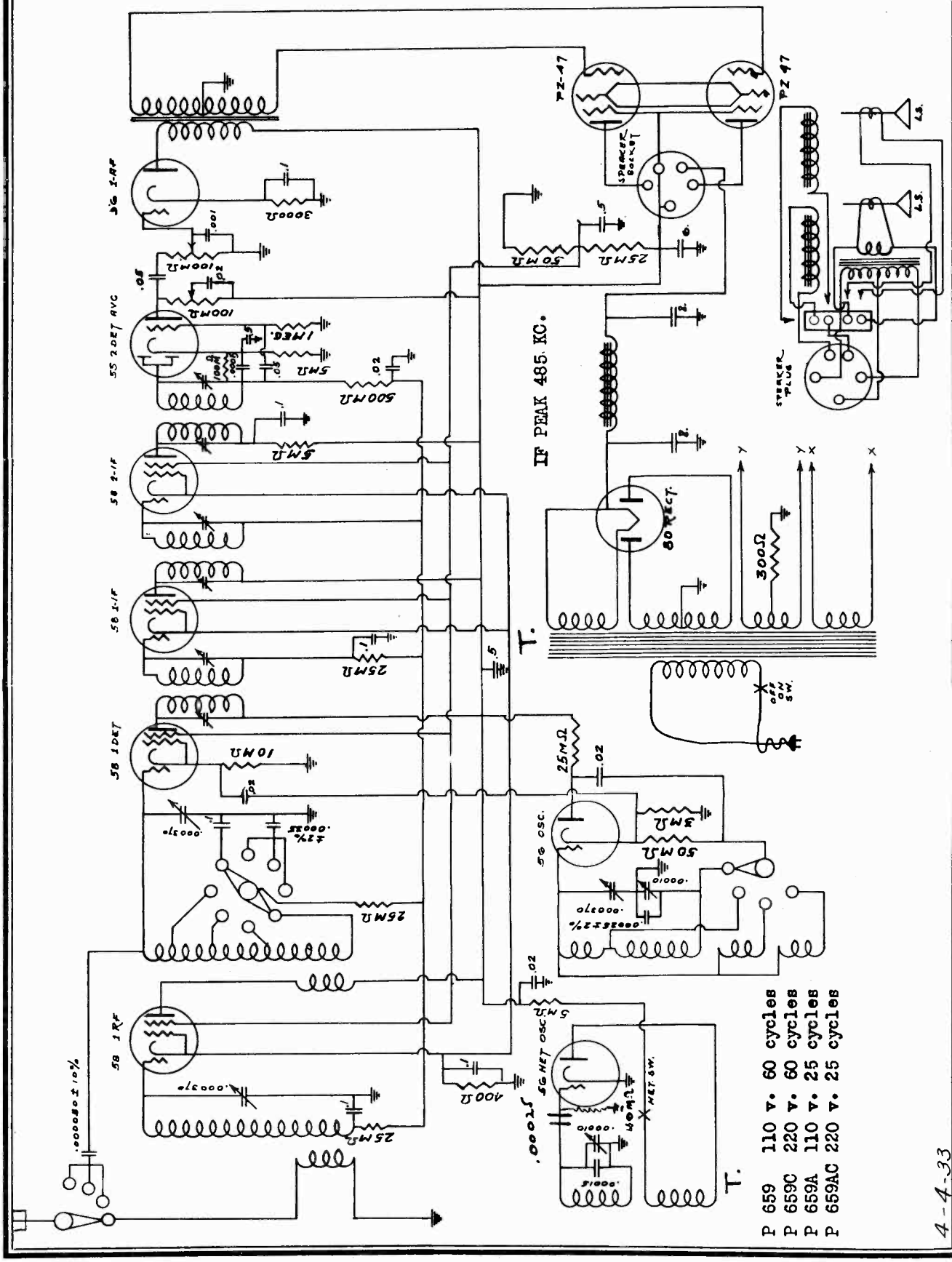
5-Tube A-C. Receiver



Aero Amplifier

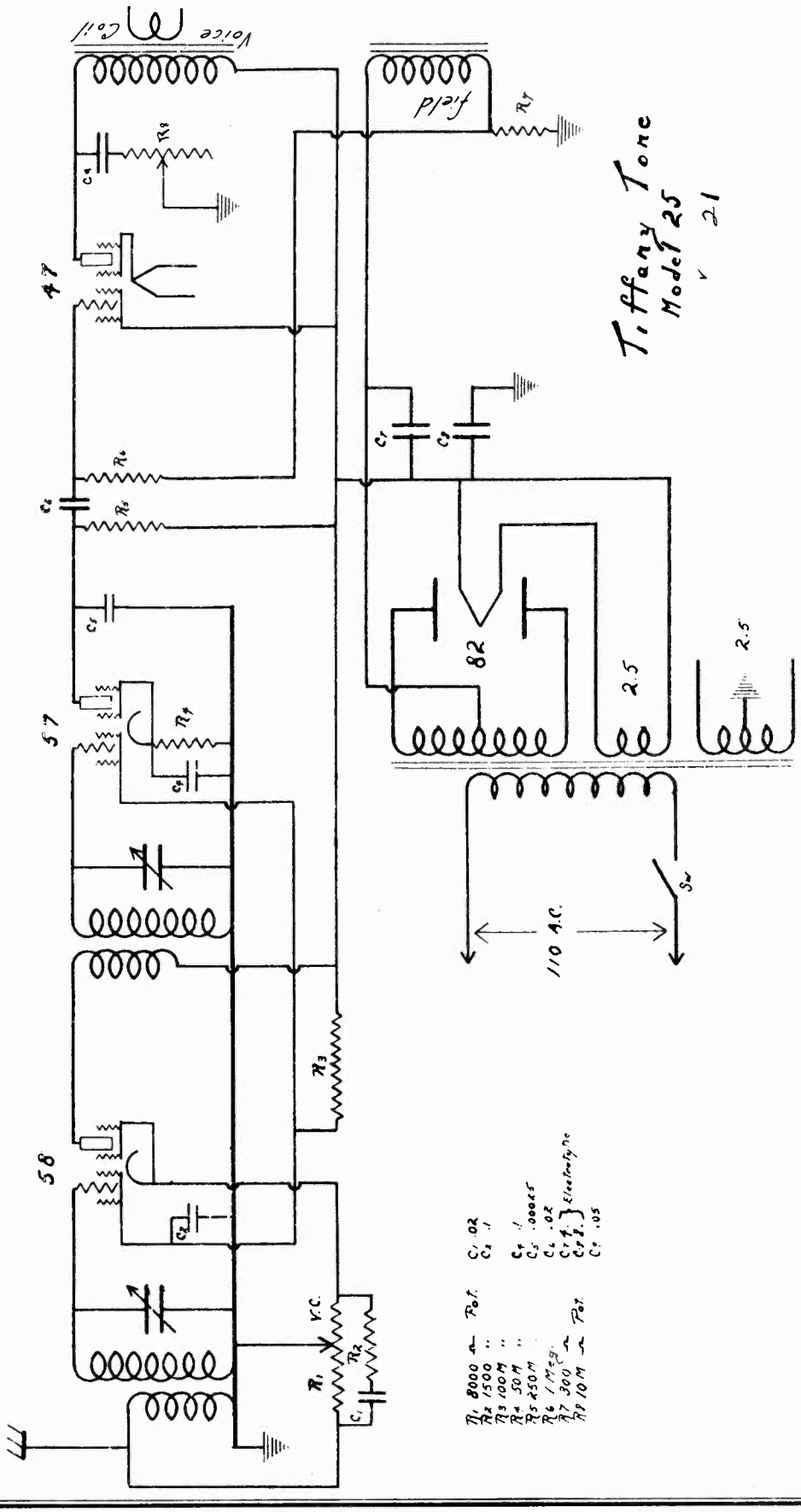
MODEL "International Aero"
11 Tube All-Wave
Schematic

CHARLES HOODWIN CO.



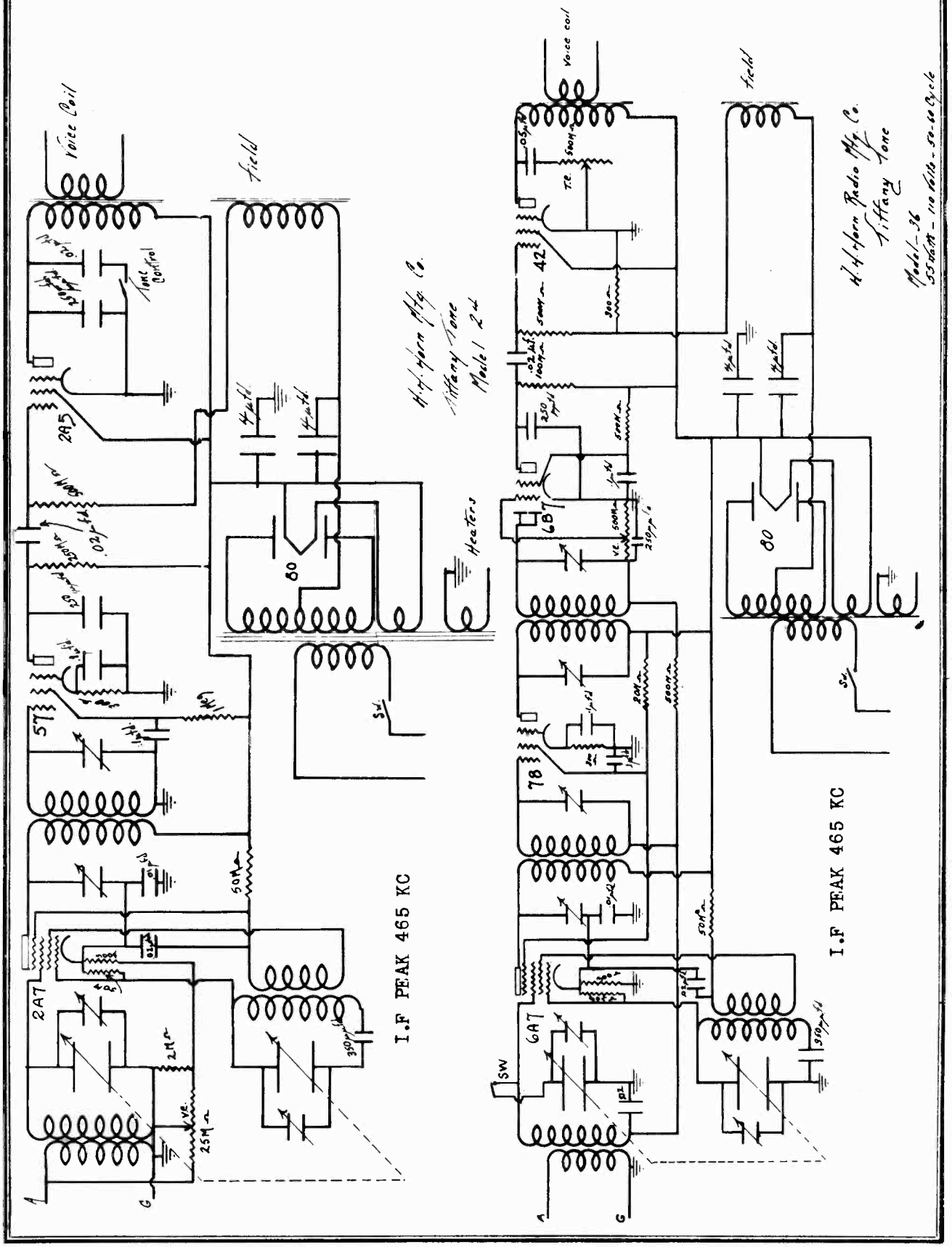
HERBERT H. HORN

MODEL 21,25
Schematic



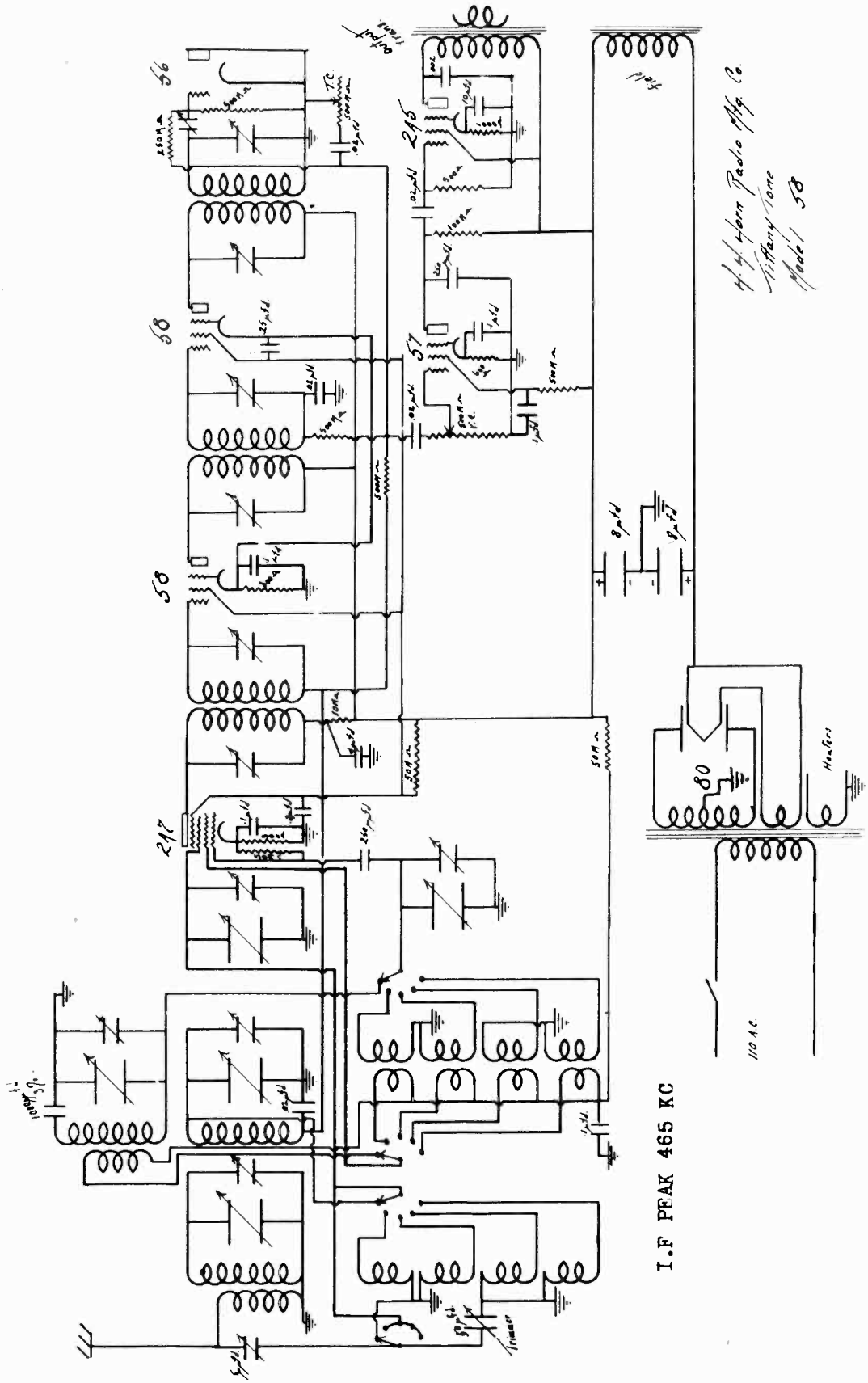
MODEL 24
MODEL 36
Schematic

HERBERT H. HORN



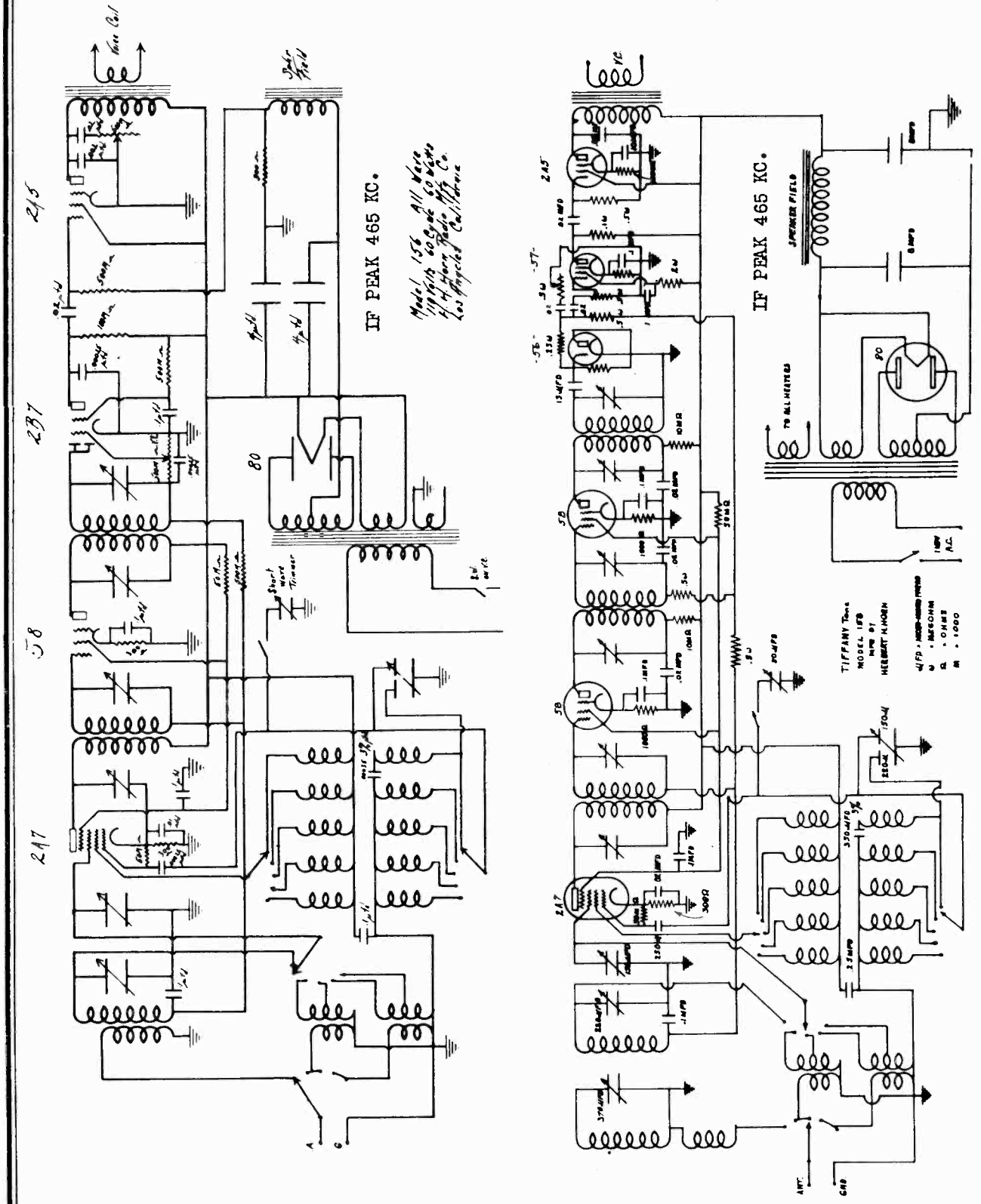
HERBERT H. HORN

MODEL 58
Schematic



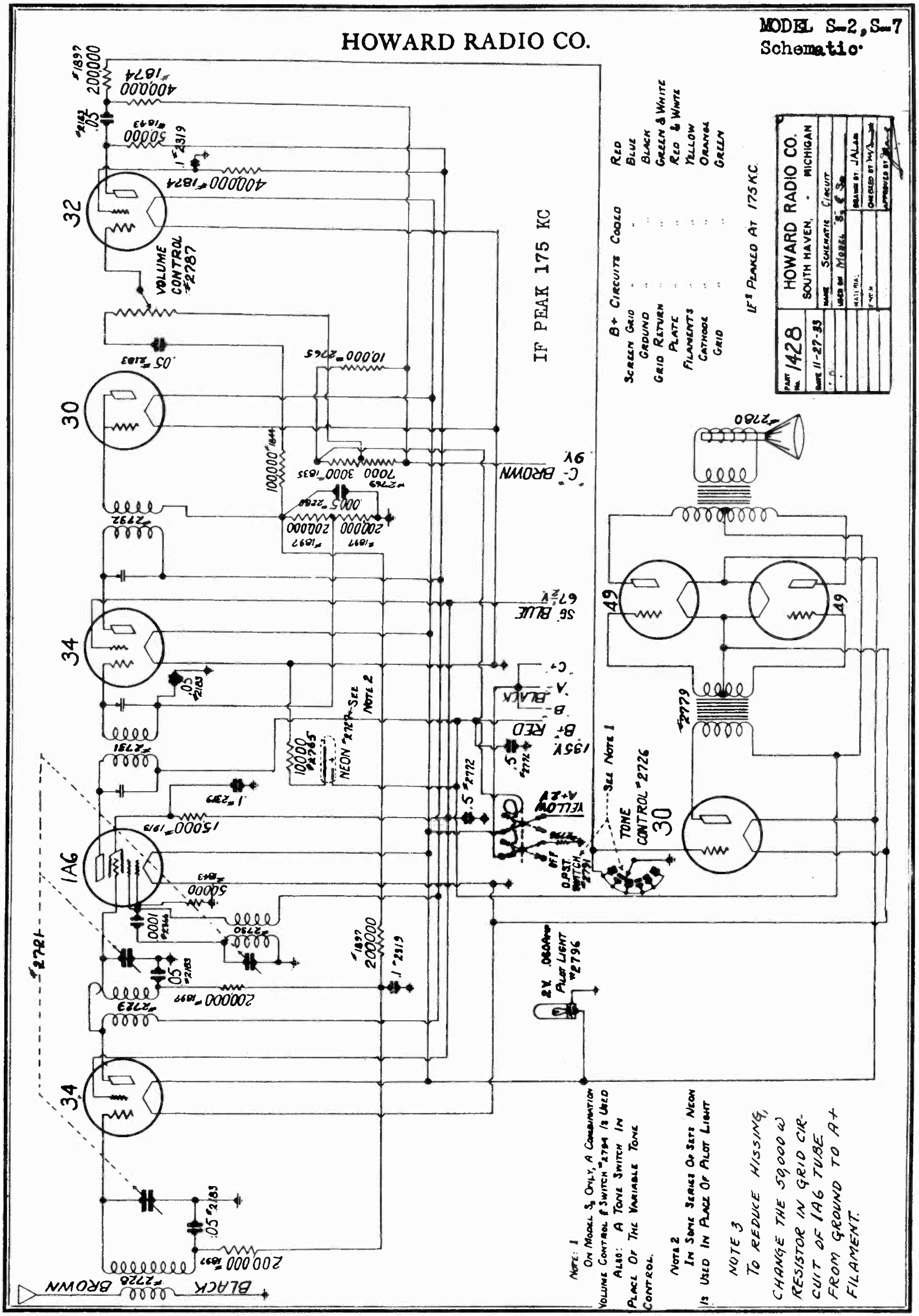
MODEL 156
MODEL 158
Schematic

HERBERT H. HORN



HOWARD RADIO CO.

MODEL S-2, S-7
Schematic



MODEL Q
Alignment Data

HOWARD RADIO CO.

ALIGNMENT

The R.F. and oscillator stages are adjusted in the usual way.

Set the pointer on the dial to about 540 with the condenser rotors fully in.

Align the set at 1400 with the pointer slightly less than 1400 or about 1395.

The I.Fs are tuned to 170 K.C. as mentioned above.

NOTE B -- In certain localities near certain stations there may be a point on the dial where a so-called "tweet" is objectionable; a few lesser tweets are natural and to be expected. However, if necessary, the I.Fs can be changed to a slightly different frequency such as 171 K.C. or 169 K.C. or any point where the tweet will be shifted to a point where it is not objectionable. It is not advisable to go more than 5 K.C. each way from 170 K.C.

NOTE C -- When making the alignment in any circuit with a signal generator, always keep the input low so that overloading will not take place and a more accurate adjustment can be made.

NOTE D -- The phonograph attachment can be made (if the set has not been ordered for phonograph arrangement and is already changed) by feeding the high impedance pick-up directly into the grid of the 77 Audio tube. The volume control wiring can be revised to also control the phonograph reproduction. However, if the arrangement is only for temporary use, merely without removing chassis from cabinet remove the grid cap and feed directly into the 77 tube.

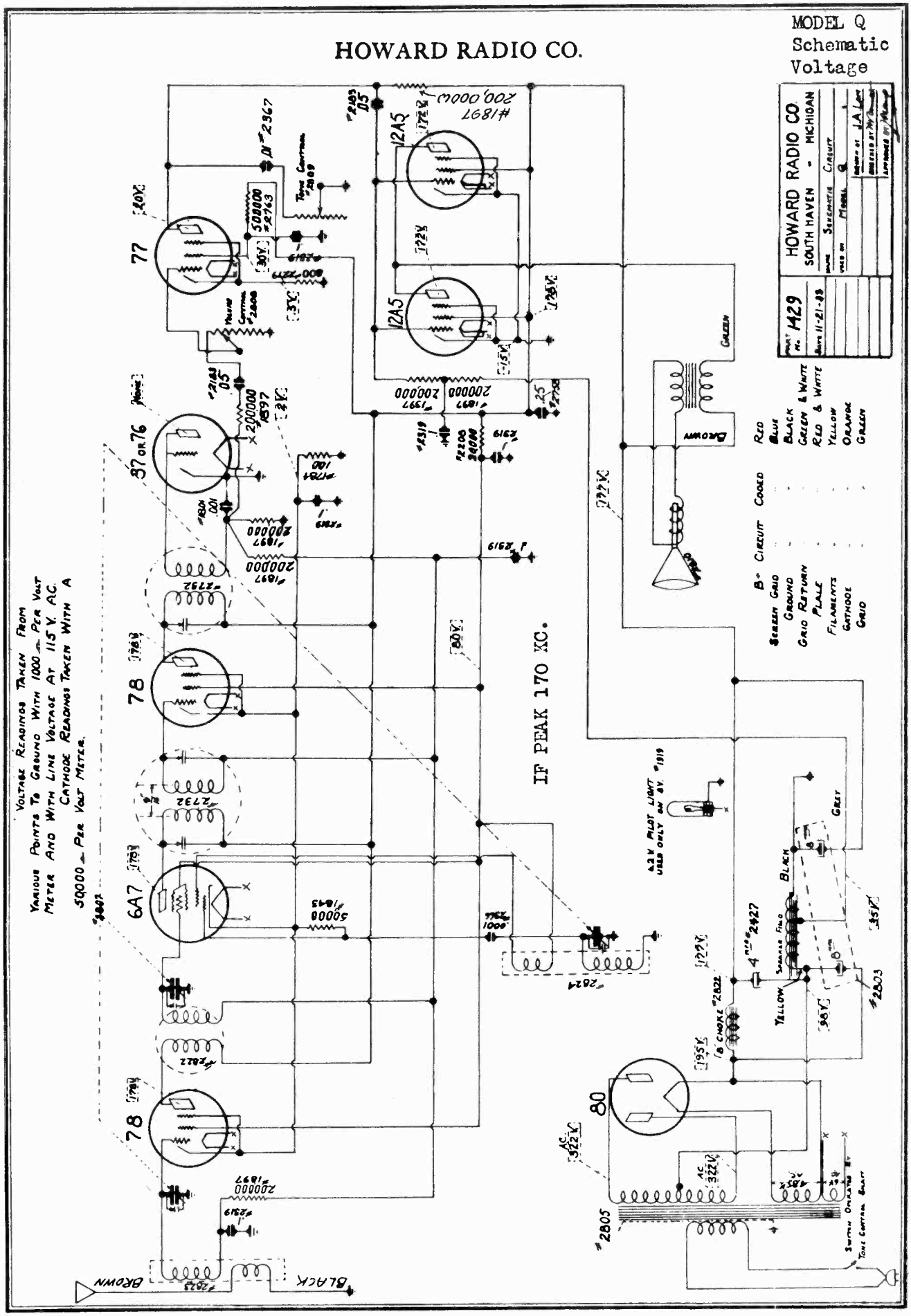
NOTE E -- In case of oscillation, it is suggested that the .1 mfd condenser #2319 on the common cathode circuits of the three tubes be changed to a .25 mfd condenser.

This condenser has already been changed on sets starting with number 70550 and also on certain sets between 70400 and 70550.

NOTE F -- On sets with serial number 70400 and above, the last I.F. stage is changed to a double tuned unit. This is for the purpose of improving the selectivity. The part number of this unit is 2731.

NOTE G -- When checking for oscillation, be sure the tube shields are properly grounded.

NOTE H -- Motor-boating may be caused by rosin connections around the grid returns of the AVC circuits.



MODEL X-2,X-3,X-8
Alignment Data

HOWARD RADIO CO.

GAINING

This receiver uses an intermediate frequency of 175 kc. There are no over-coupled stages in this receiver, and due to the fact that the Neon light operates as a vacuum tube voltmeter, you may use the Neon light as a tuning indicator in the following manner: 175 kc fed into the grid of the 6-A-7 may be increased to the point where the Neon light begins to get dim. Then tune the three I.F. circuits until the light either goes out or dims somewhat. If the light goes out, decrease the input from your oscillator until it lights again; then gain the set again. Keep this up until you can't make the Neon light dim. This will indicate exact resonance. The same procedure can be taken with the R.F. circuit; also the oscillator. The oscillator circuit is a so-called cut plate condenser, and it is only necessary to adjust this receiver at 1400 kc, and then check at 600 kc. If 600 kc does not come on the right place, adjust the plates of this condenser slightly to take care of this condition.

ADJUSTMENT OF THE TUNING MECHANISM

The proper amount of friction between the rubber pulley and the large drive pulley is obtained by merely loosening the screw just left of the tuning shaft, and since the screw hole is elongated, this allows the rubber to be pressed against the drive pulley. If this pressure is made too tight, the tuning knob will turn too hard. Not enough pressure will naturally cause slipping. The best way to determine the right amount of friction is to turn the variable condenser to maximum rotation of the top of the dial and adjust the friction rubber until it is tight, yet not so tight that it can not be slipped by using extra effort to do so.

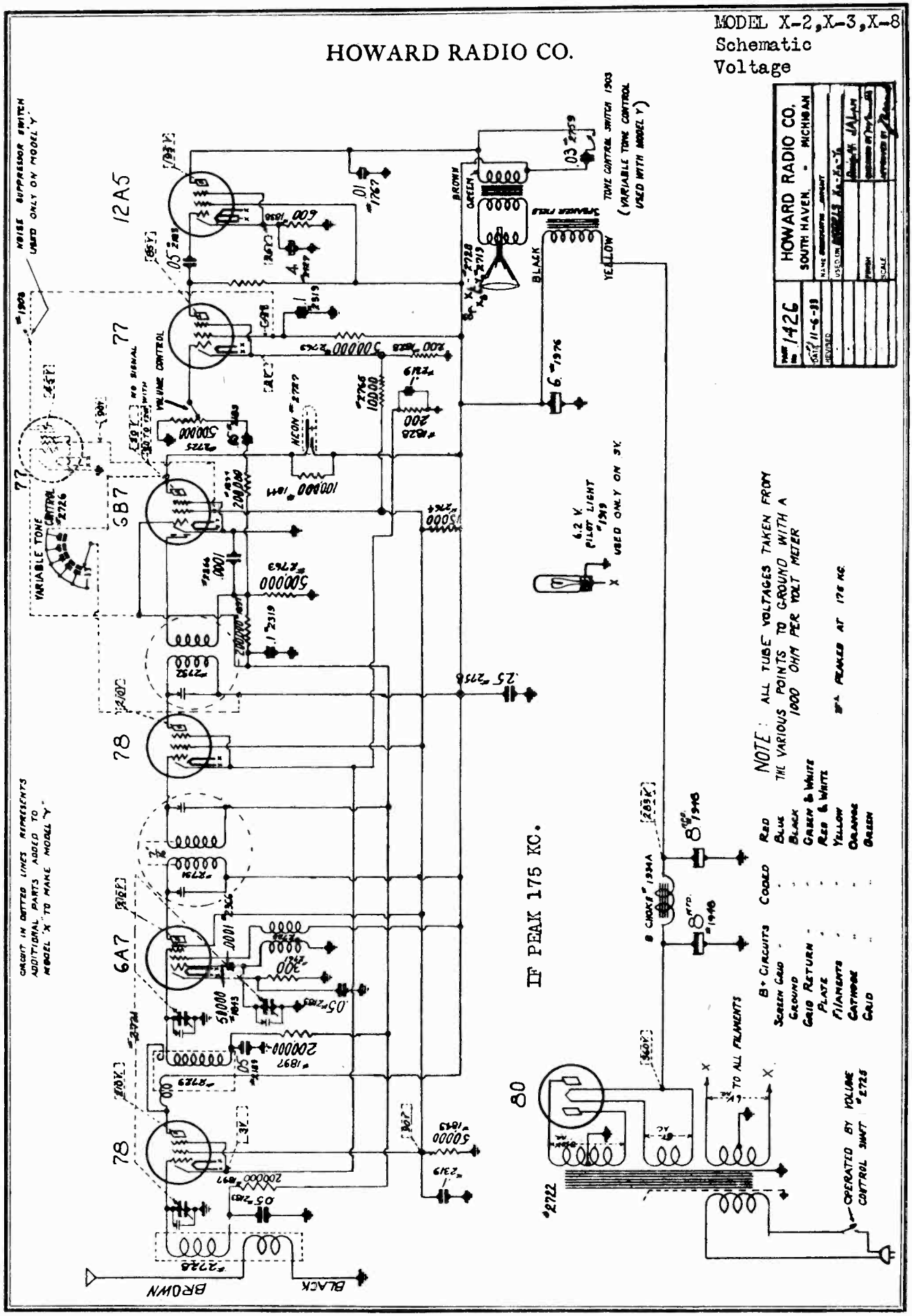
Slack in the drive cord may be taken up by loosening the screw holding the lug on the drive pulley and pulling the string tighter by shifting the lug. (On some of the earlier sets the lug is not used and the slack in the cord is taken up by removing the same screw and twisting the loop end of the cord around a few times.

The moving indicator is pulled up and down with the drive cord connected at opposite corners. This is to avoid any danger of back-lash. This also means that the slider only rides against the outside edges of the slide track at only two points.

The adjustment between the slider and the track is accomplished by loosening the right-hand track at each end and allowing sufficient clearance. Too much clearance will cause the slider to tilt, while not enough will cause it to bind and the drive to turn hard. This track is lubricated with oil-dag.

NOTE 1 - In certain localities, especially close to the broadcasting stations, trouble may be encountered that the volume control will not bring the signal down to complete shut-off even when the control is turned to the extreme left rotation. This may be corrected by isolating the 77 Audio tube in regard to the common cathode from the rest by inserting an 800 ohm resistor from the cathode to ground and disconnect the wire running from that point to the other cathodes.

NOTE 2 - The sensitivity of these receivers is very good. Therefore, it may be advisable in noisy districts to place a 50,000 or 100,000 ohm resistor across one of the I.F. primaries. The sensitivity is so high that this will not impair the performance of the set to any extent.



MODEL Z-4
Alignment Data

HOWARD RADIO CO.

GAINING

This receiver uses an intermediate frequency of 175 kc. There are no over-coupled stages in this receiver, and due to the fact that the Neon light operates as a vacuum tube voltmeter, you may use the Neon light as a tuning indicator in the following manner: 175 kc fed into the grid of the 6-A-7 may be increased to the point where the Neon light begins to get dim. Then tune the three I.F. circuits until the light either goes out or dims somewhat. If the light goes out, decrease the input from your oscillator until it lights again; then gain the set again. Keep this up until you can't make the Neon light dim. This will indicate exact resonance. The same procedure can be taken with the R.F. circuit; also the oscillator. The oscillator circuit is a so-called cut plate condenser, and it is only necessary to adjust this receiver at 1400 kc, and then check at 600 kc. If 600 kc does not come on the right place, adjust the plates of this condenser slightly to take care of this condition.

ADJUSTMENT OF THE TUNING MECHANISM

The proper amount of friction between the rubber pulley and the large drive pulley is obtained by merely loosening the screw just left of the tuning shaft, and since the screw hole is elongated, this allows the rubber to be pressed against the drive pulley. If this pressure is made too tight, the tuning knob will turn too hard. Not enough pressure will naturally cause slipping. The best way to determine the right amount of friction is to turn the variable condenser to maximum rotation of the top of the dial and adjust the friction rubber until it is tight, yet not so tight that it can not be slipped by using extra effort to do so.

Slack in the drive cord may be taken up by loosening the screw holding the lug on the drive pulley and pulling the string tighter by shifting the lug. (On some of the earlier sets the lug is not used and the slack in the cord is taken up by removing the same screw and twisting the loop end of the cord around a few times.)

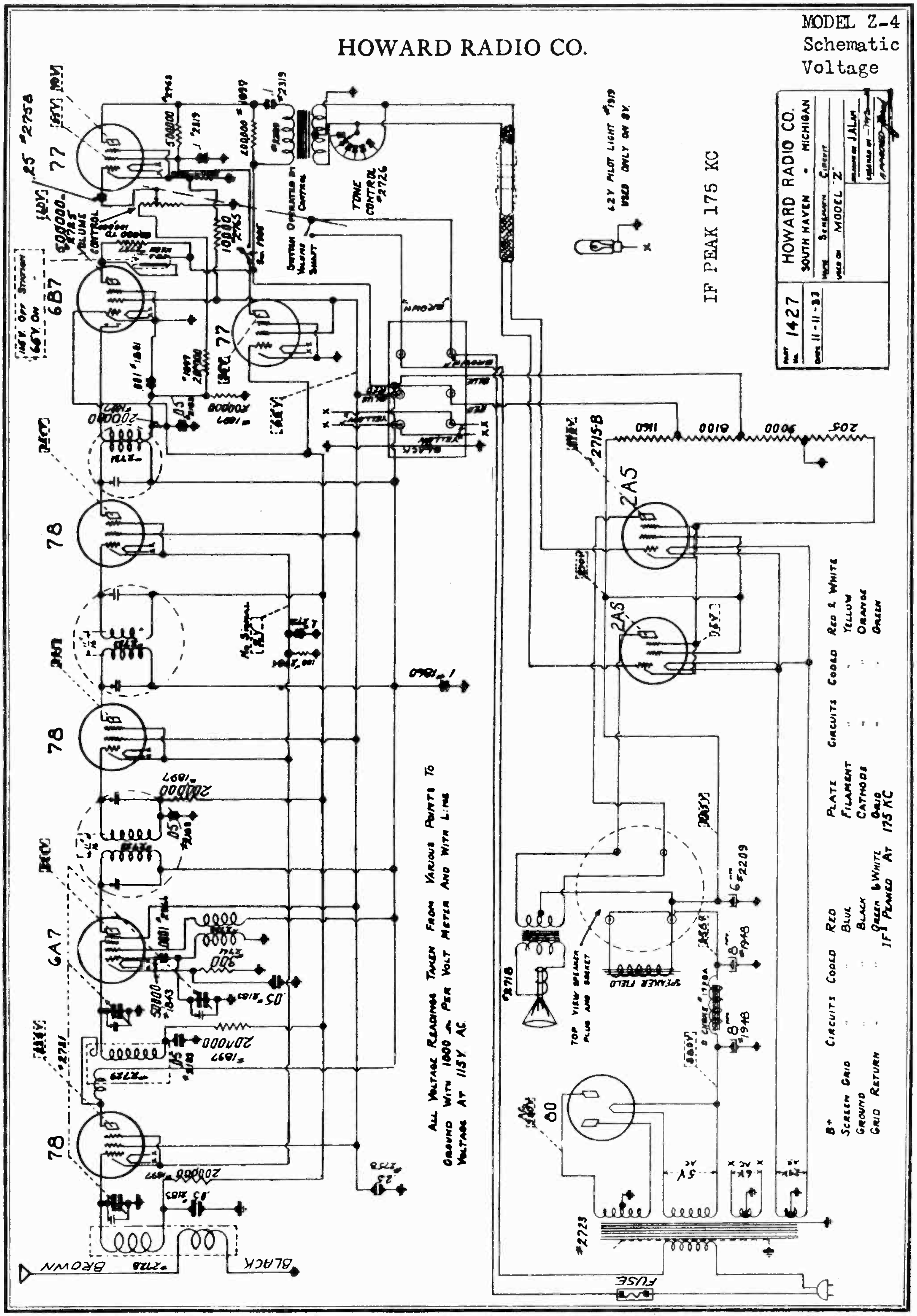
The moving indicator is pulled up and down with the drive cord connected at opposite corners. This is to avoid any danger of back-lash. This also means that the slider only rides against the outside edges of the slide track at only two points.

The adjustment between the slider and the track is accomplished by loosening the right-hand track at each end and allowing sufficient clearance. Too much clearance will cause the slider to tilt, while not enough will cause it to bind and the drive to turn hard. This track is lubricated with oil-dag.

The 6-volt pilot light is only being used on 3 volts and should never burn out. If the light goes out, check first to determine if the bulb is merely loose in its socket.

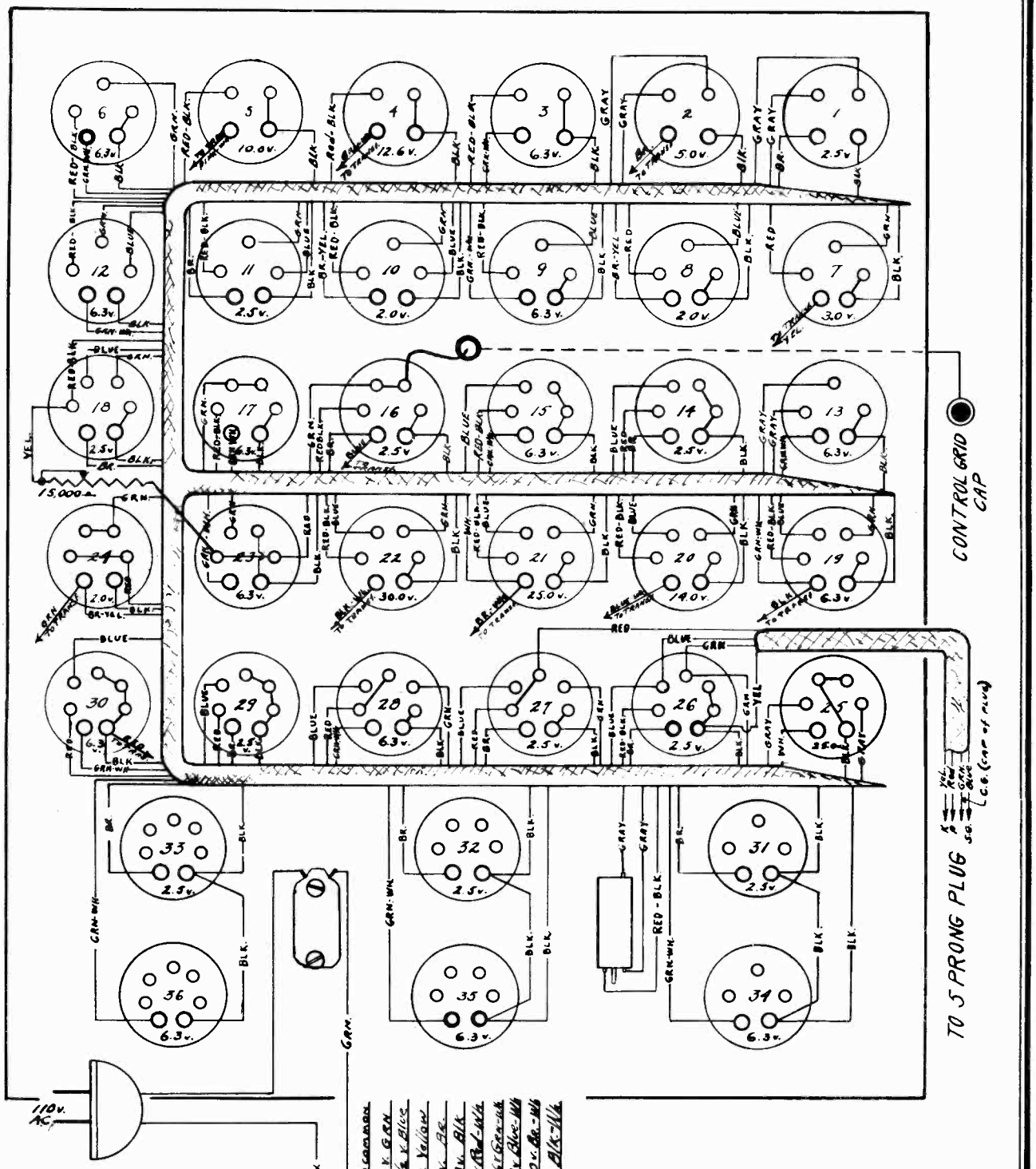
HOWARD RADIO CO.

MODEL Z-4
Schematic
Voltage



INSULINE CORP. OF AMERICA

MODEL Auxiliary Tube Checker
Schematic



ISSUE 2. AUG. 7, 1933

The following changes made in cable color code. (Transformer lead colors unchanged.)

RED-WH. Replaced by RED-BLK
TAN - BR.-YEL
BLUE-WH. - GRN.-WH.

AUXILIARY TUBE TESTER	
DATE~AUG. 3, 1933.	
DRAWN~F.H.	MODEL~ A.C. 25~ or 60~
CHECKED~B.E.	
DESIGNED~R.H.S.	
APPROVED~A.G.H.	

INSULINE CORP. OF AMERICA.
23-25 PARK PLACE, NEW YORK, N.Y. U.S.A.

MODEL Auxiliary Tube Checker Chart

INSULINE CORP. OF AMERICA

AUXILIARY TUBE TESTER SOCKET CHART

1	2	3	4	5	6
82 2Y3	80 83 5Z3 RE-1 AG	1 1-V KR1	12Z3	KR96-31	37 67

7	8	9	10	11	12
485	15 G2 G4	'36 64 '38 65 '39 68 '44	'33 '49	'46 '47 PZ	'52 LA 6A4

13	14	15	16	17	18
84 KR98-28 6Z4	'57 '58	77 87F 78 88F 89 6C6 6D6	55 90 29 AH Wund.2.5 v. 2A6	75 85 69 Wund.6.3 v. 92	2A5 PZH 95

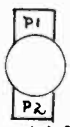
⊙ Grid Clip Lead

19	20	21	22	23	24
41 42	18	43	48	79 6Y5	19

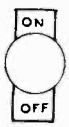
25	26	27	28	29	30
25Z5	59 2B6	2A7 2F7	6A7 6E7 6F7	2B7 2D7	6B7 6D7

Preheater Sockets

31	32	33
5 prongs 2.5 v.	6 prongs 2.5 v.	7 prongs 2.5 v.



Rectifier Switch

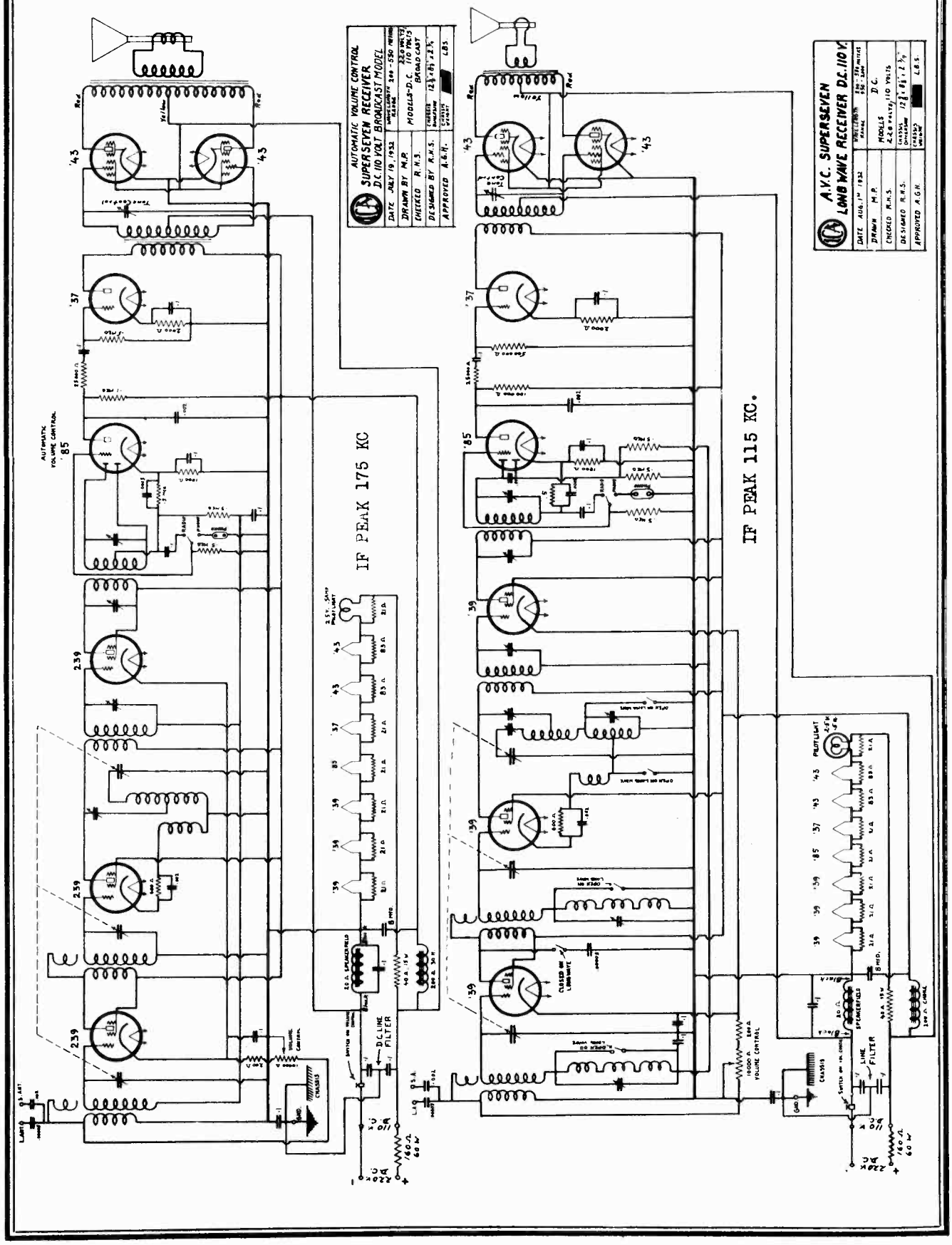


Power Switch

34	35	36
5 prongs 6.3 v.	6 prongs 6.3 v.	7 prongs 6.3 v.

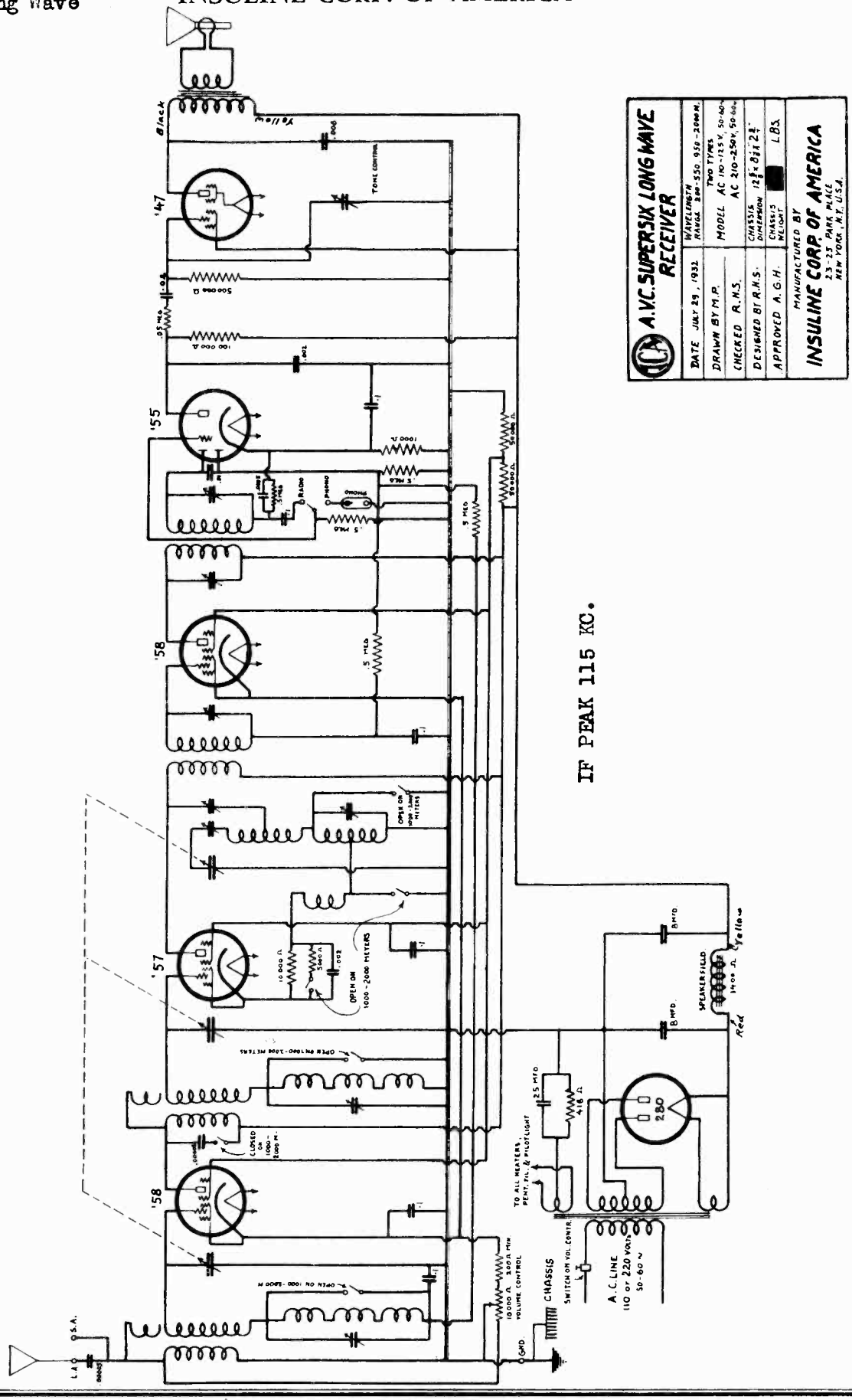
INSULINE CORP. OF AMERICA

MODEL DC 110 Volt AVC
Super Seven
Long Wave
Broadcast



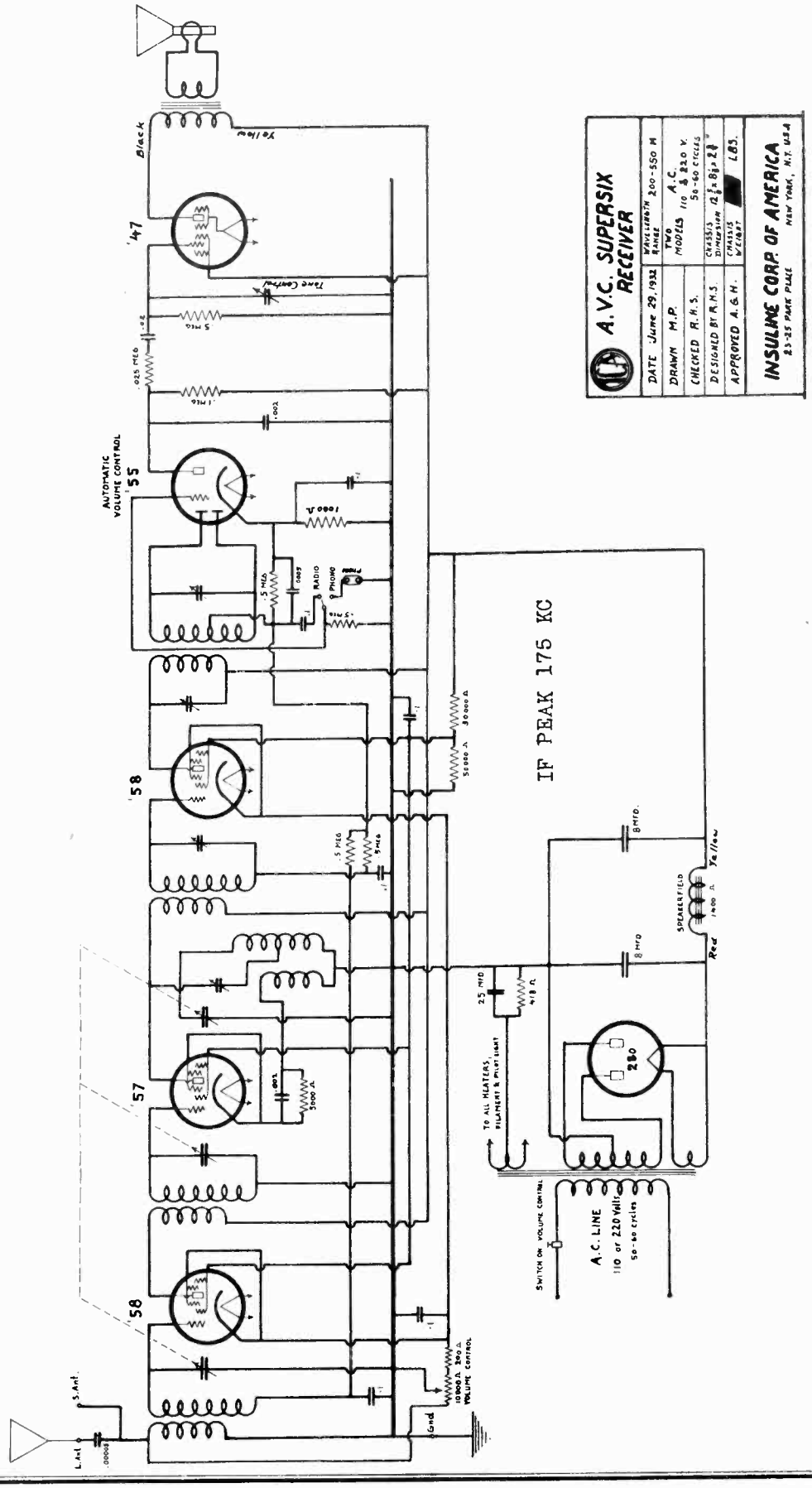
MODEL Super Six AVC
Long Wave

INSULINE CORP. OF AMERICA



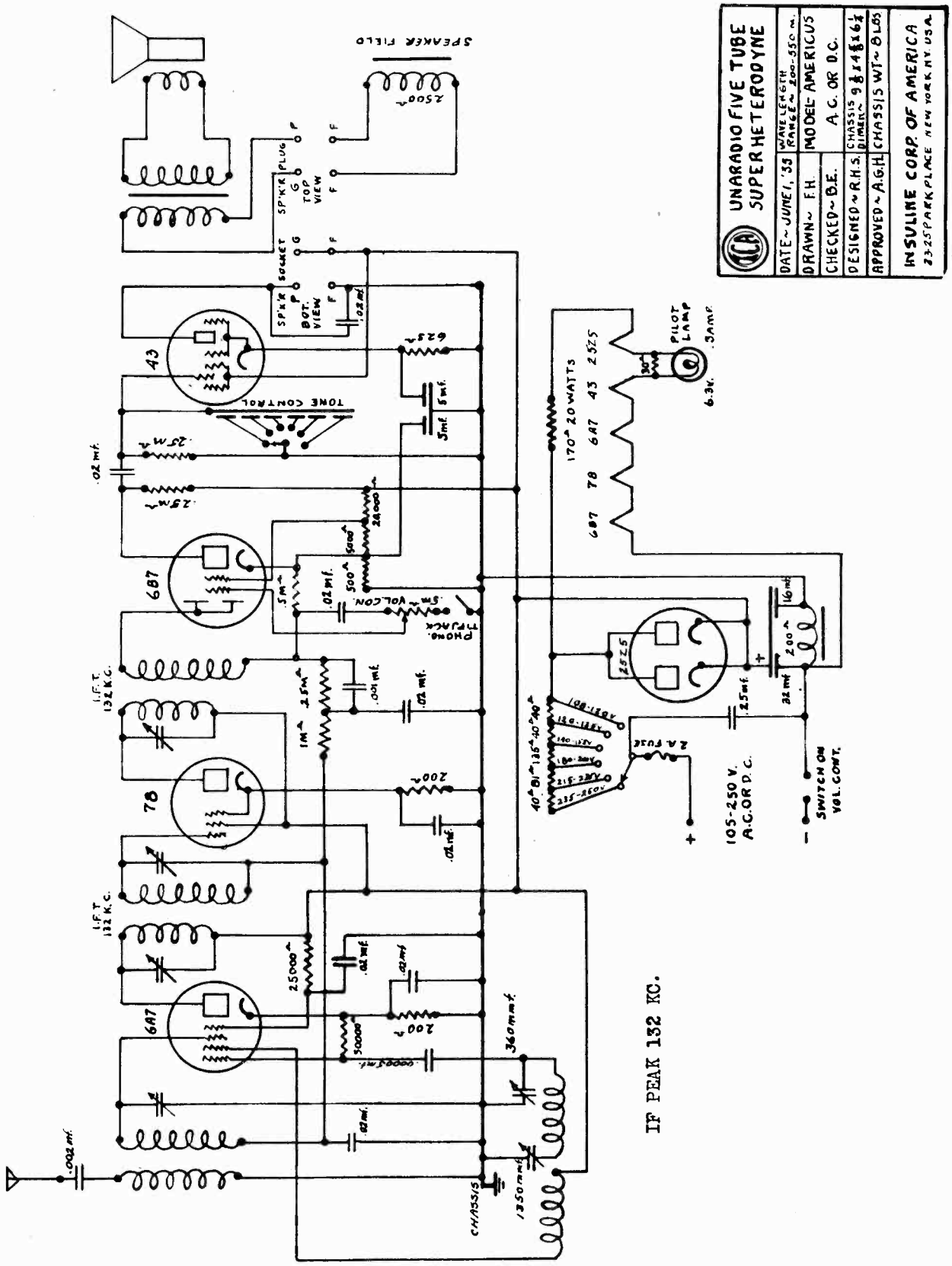
INSULINE CORP. OF AMERICA

MODEL Super Six AVC
Broadcast



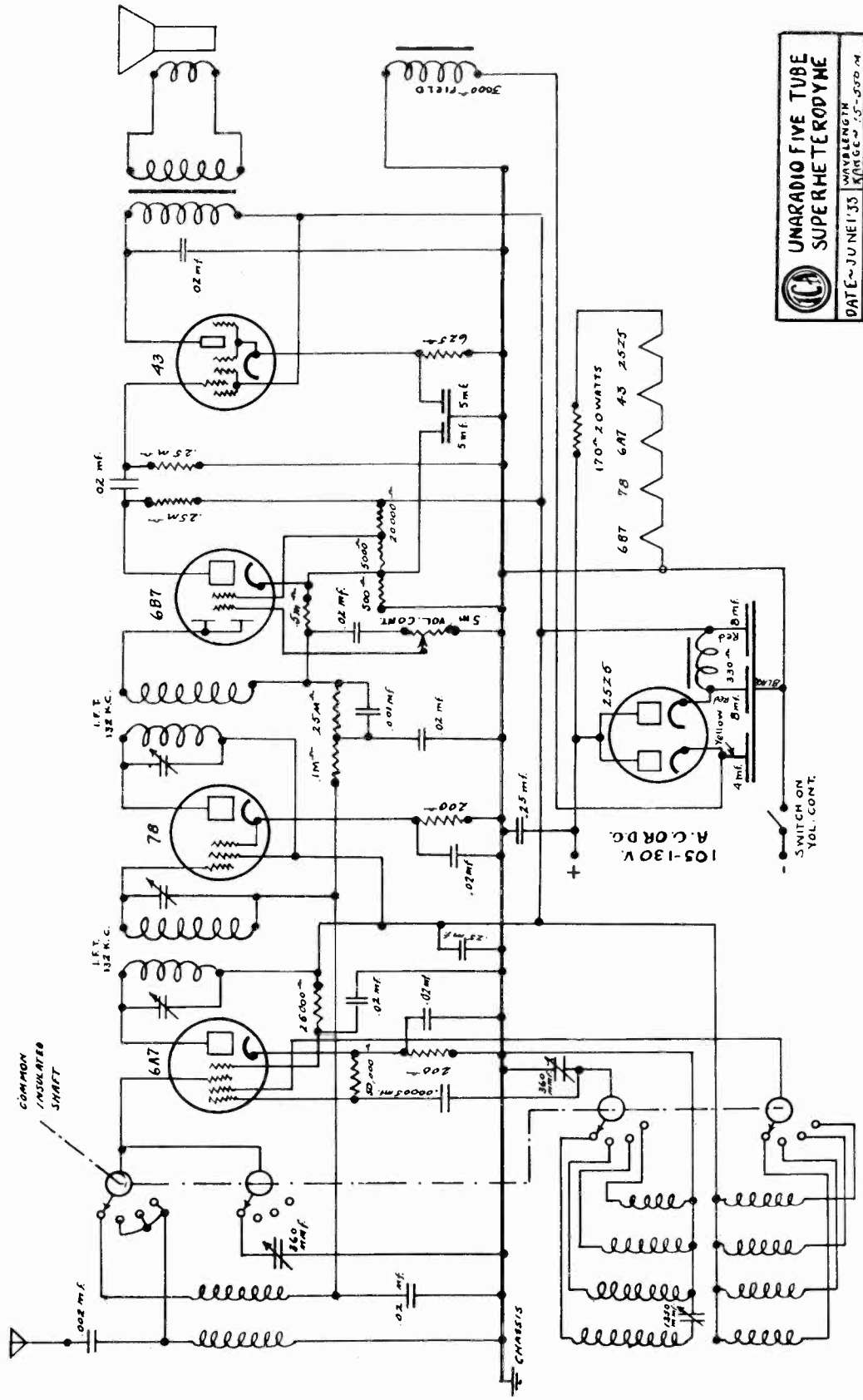
MODEL 5 Tube Unaradio
Super. AC-DC
"Americus"

INSULINE CORP. OF AMERICA



INSULINE CORP. OF AMERICA

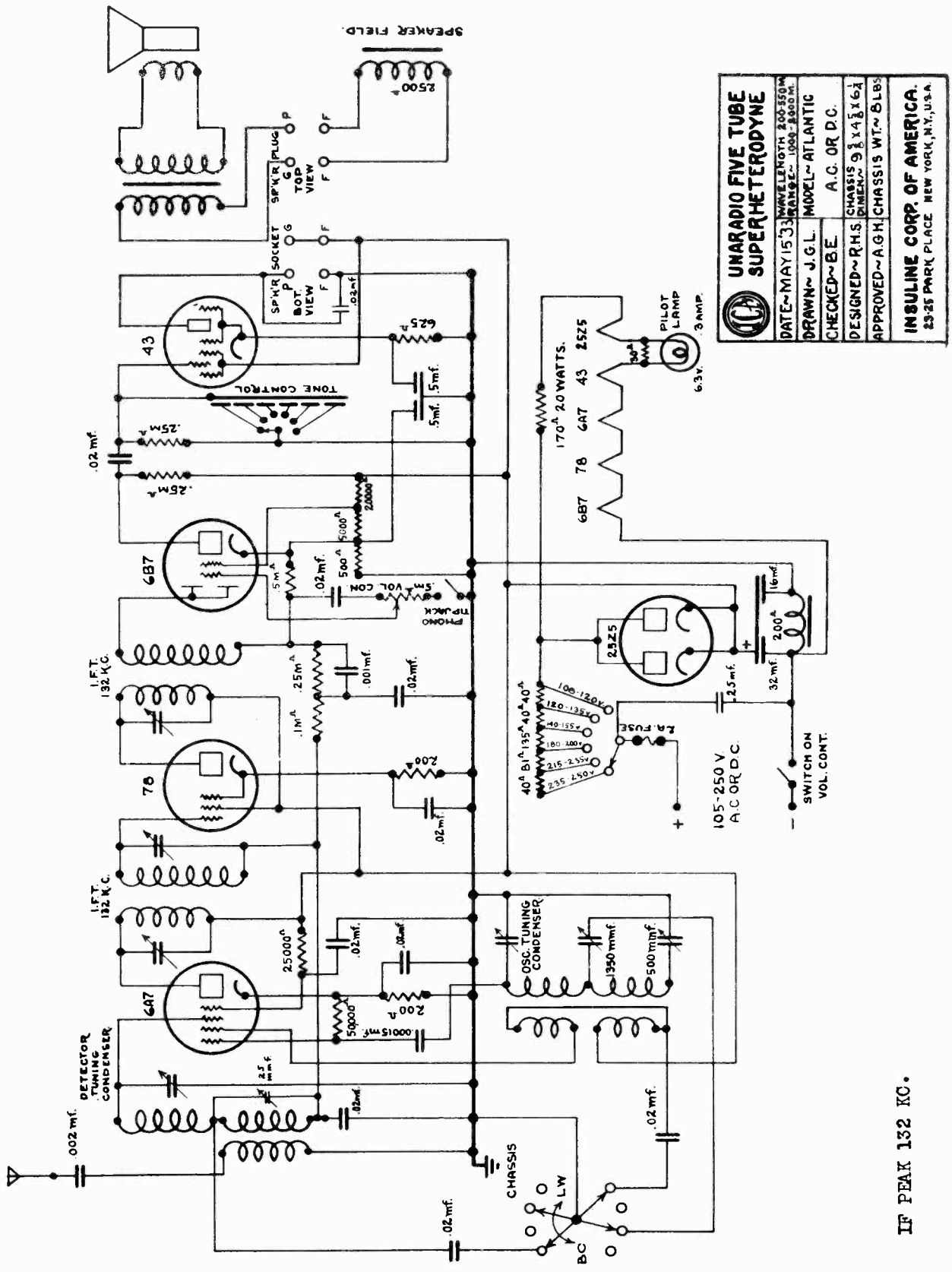
MODEL 5 Tube Unaradio
Super. AC-DC
"Aiglon"



IF PEAK 132 KC.

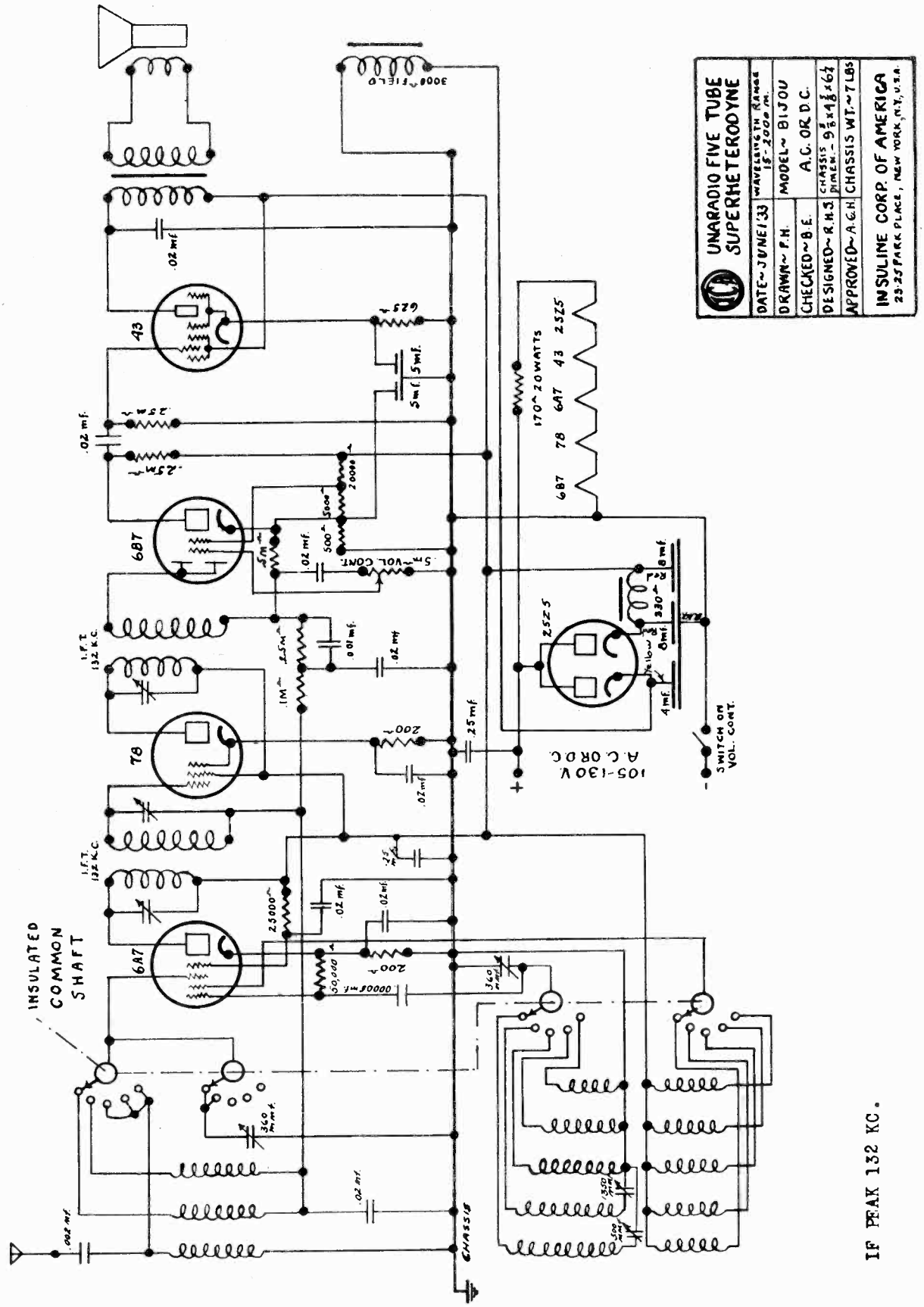
MODEL 5 Tube Unaradio
Super. AC-DC
"Atlantic"

INSULINE CORP. OF AMERICA



INSULINE CORP. OF AMERICA

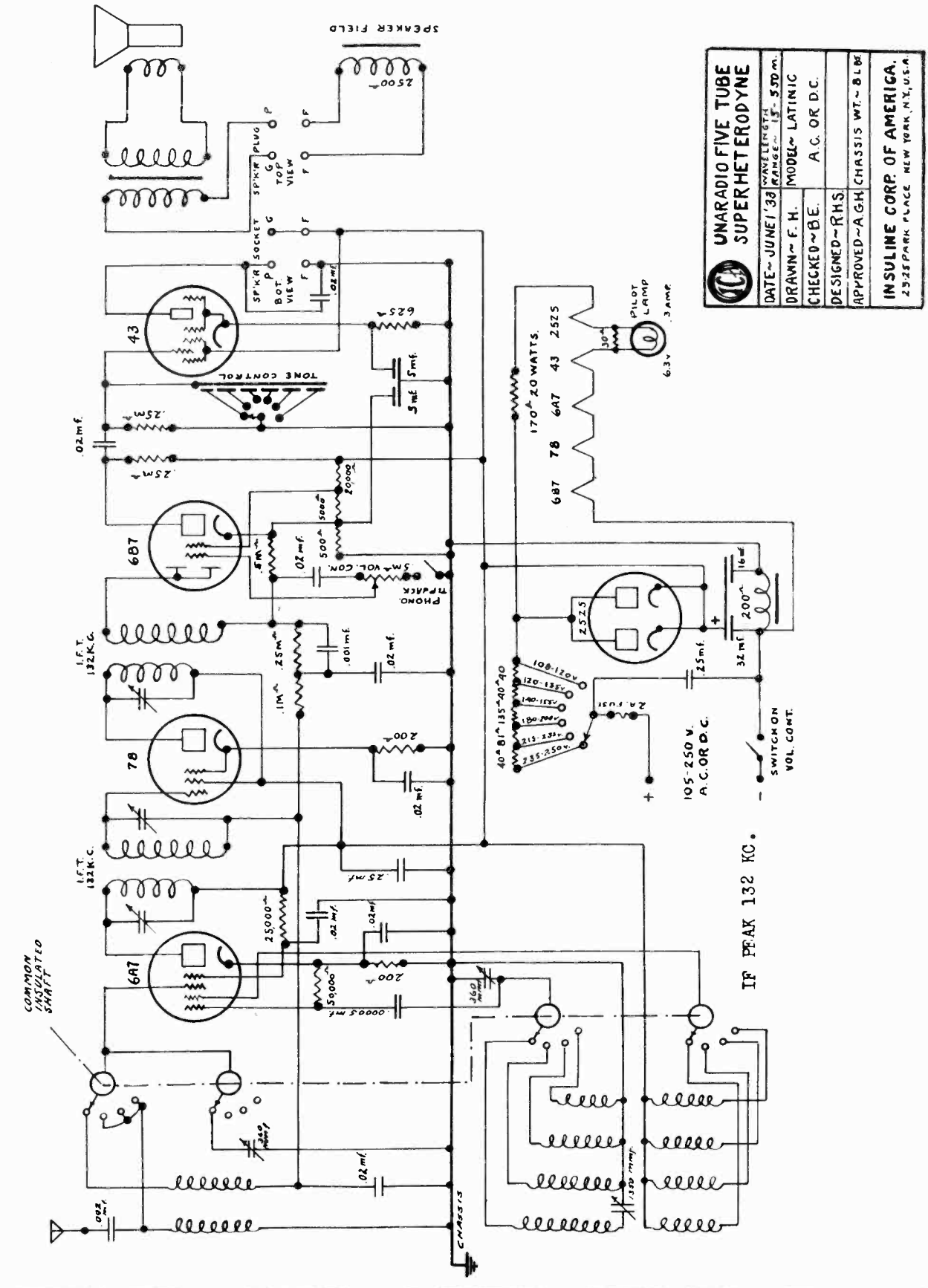
MODEL 5 Tube Unaradio
Super. AC-DC
"Bijou"



IF PEAK 132 KC.

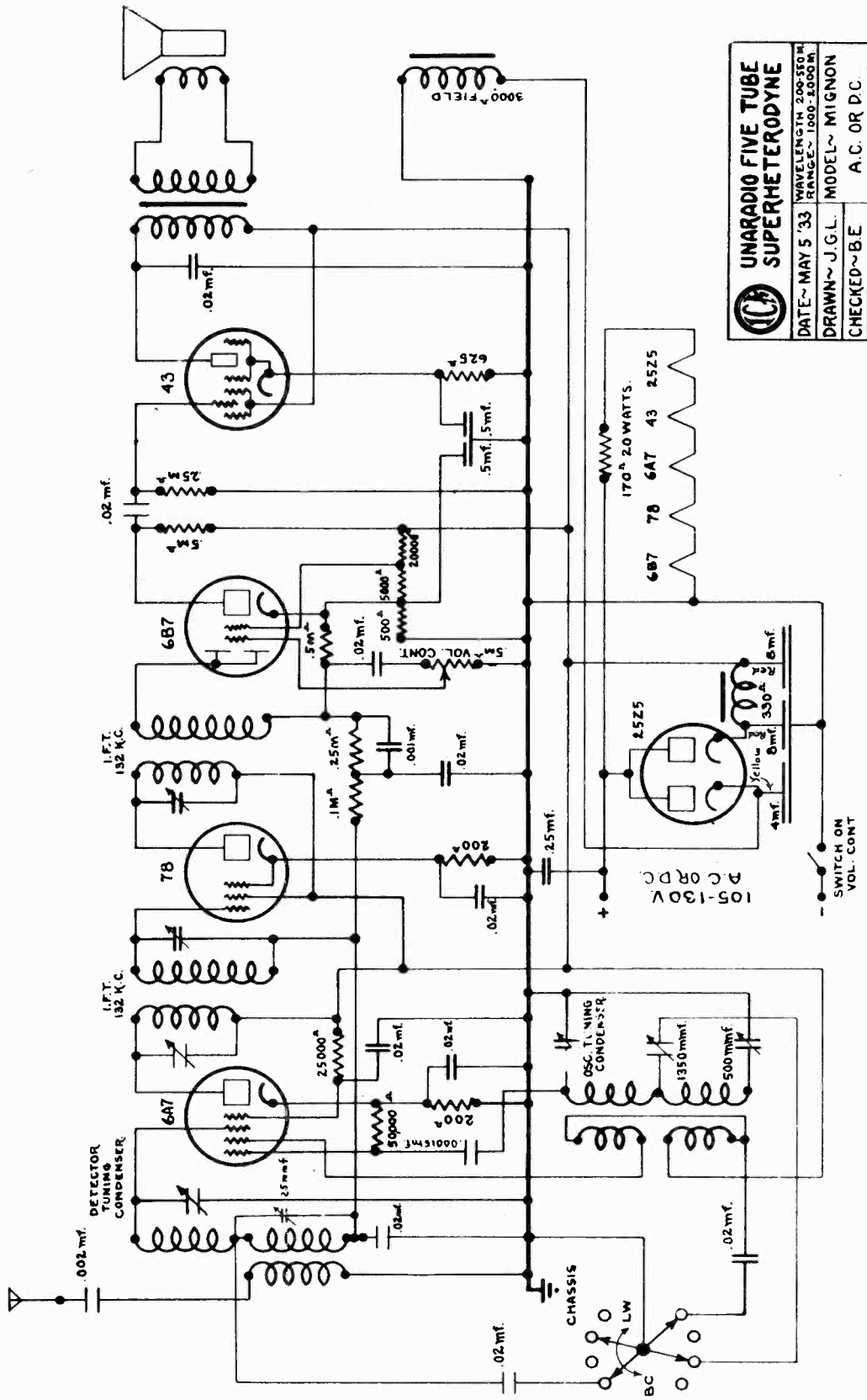
MODEL 5 Tube Unaradio
Super. AC-DC
"Latinic"

INSULINE CORP. OF AMERICA



INSULINE CORP. OF AMERICA

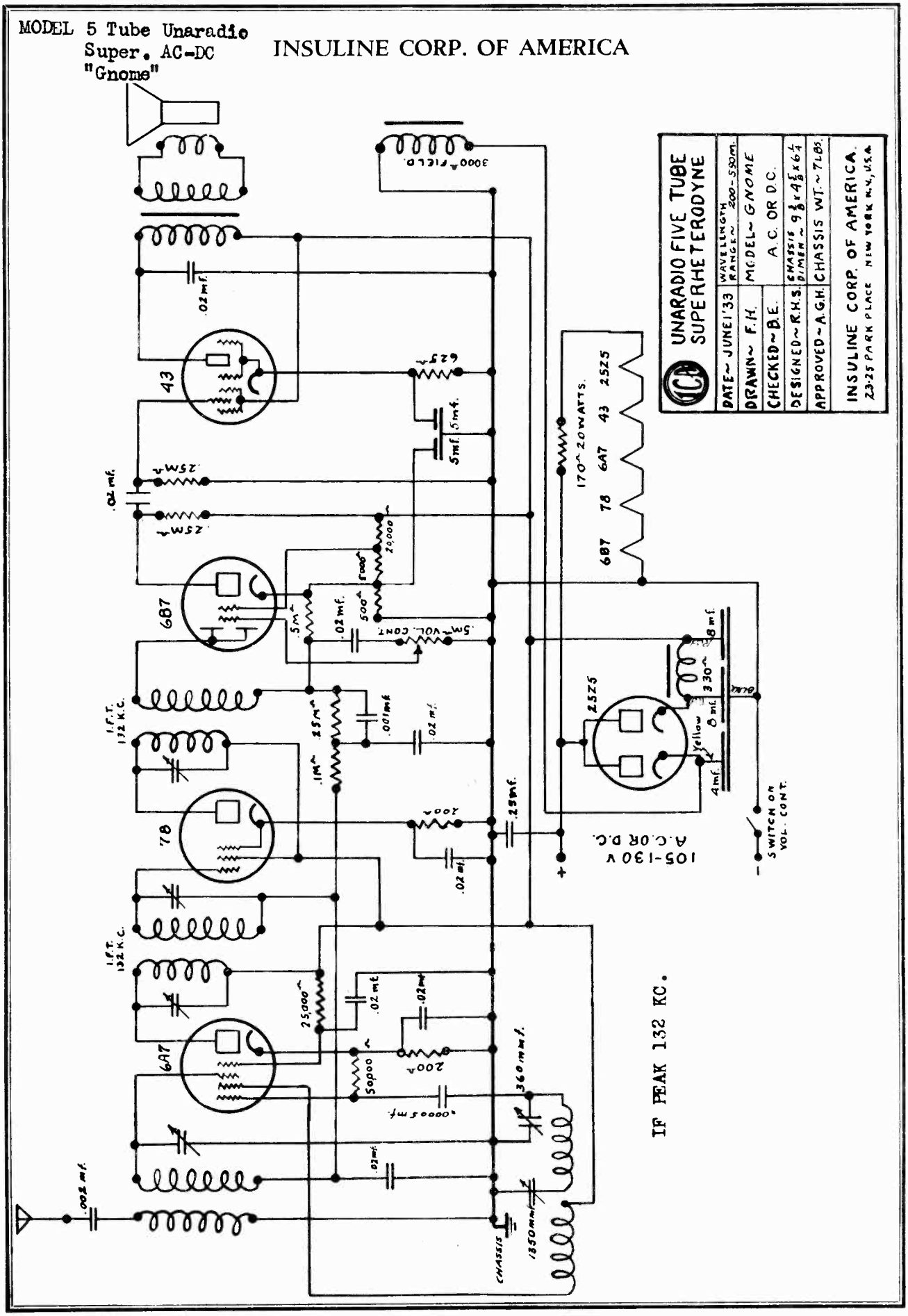
MODEL 5 Tube Unaradio
Super. AC-DC
"Mignon"



IF PEAK 132 KC.

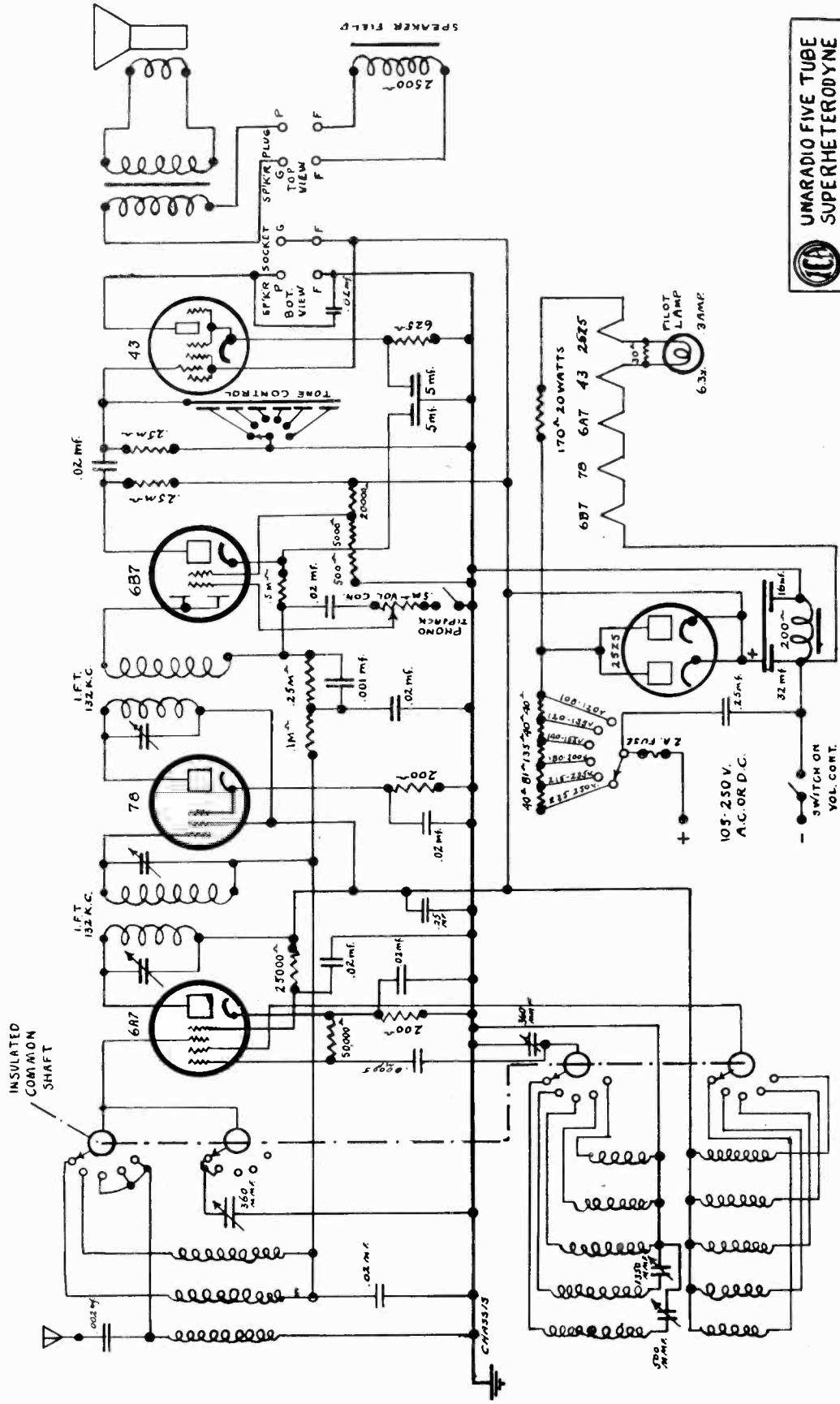
MODEL 5 Tube Unaradio Super. AC-DC "Gnome"

INSULINE CORP. OF AMERICA



INSULINE CORP. OF AMERICA

MODEL 5 Tube Unaradio
Super. AC-DC
"Pacific"



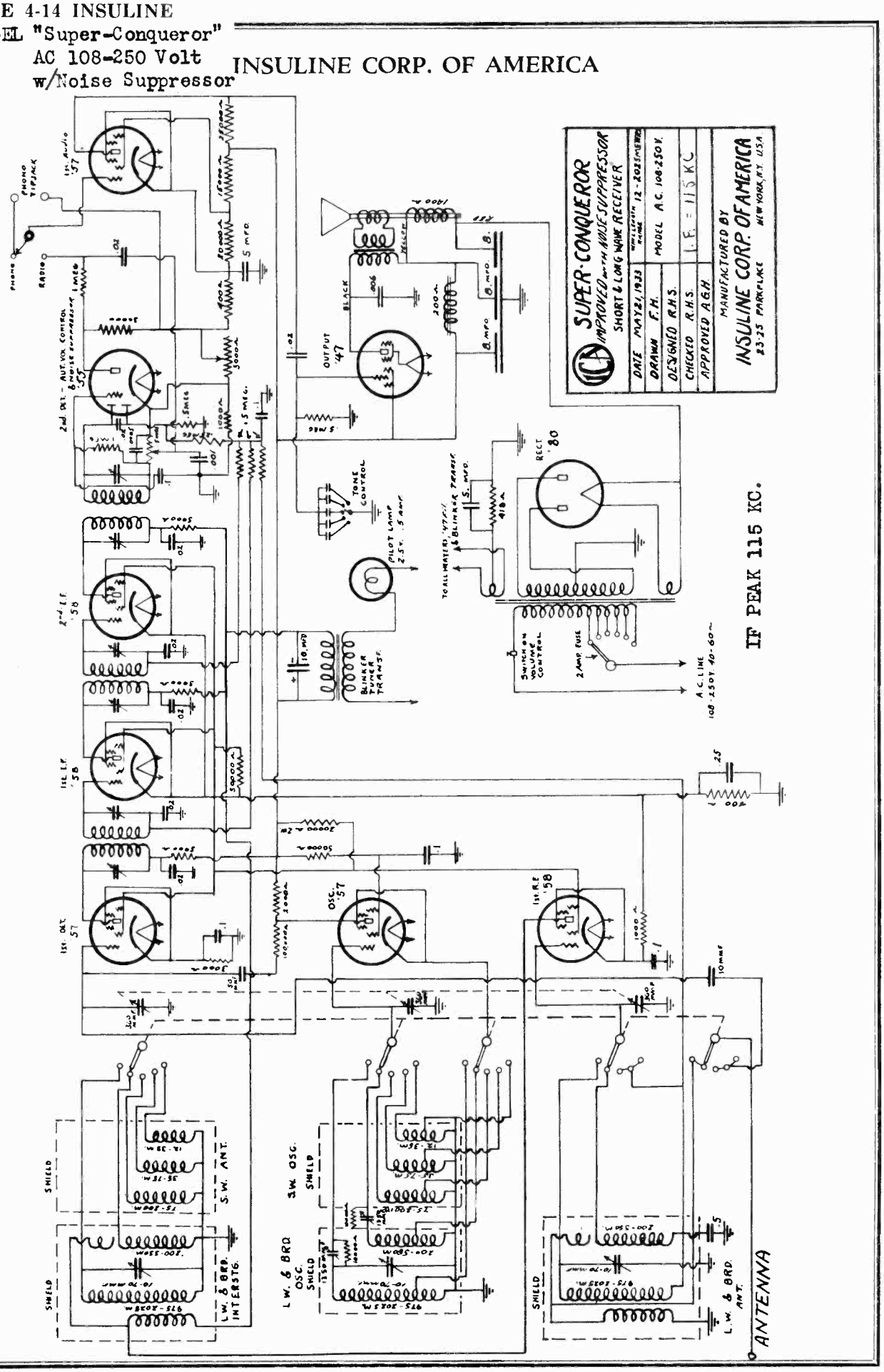
UNARADIO FIVE TUBE SUPERHETERODYNE

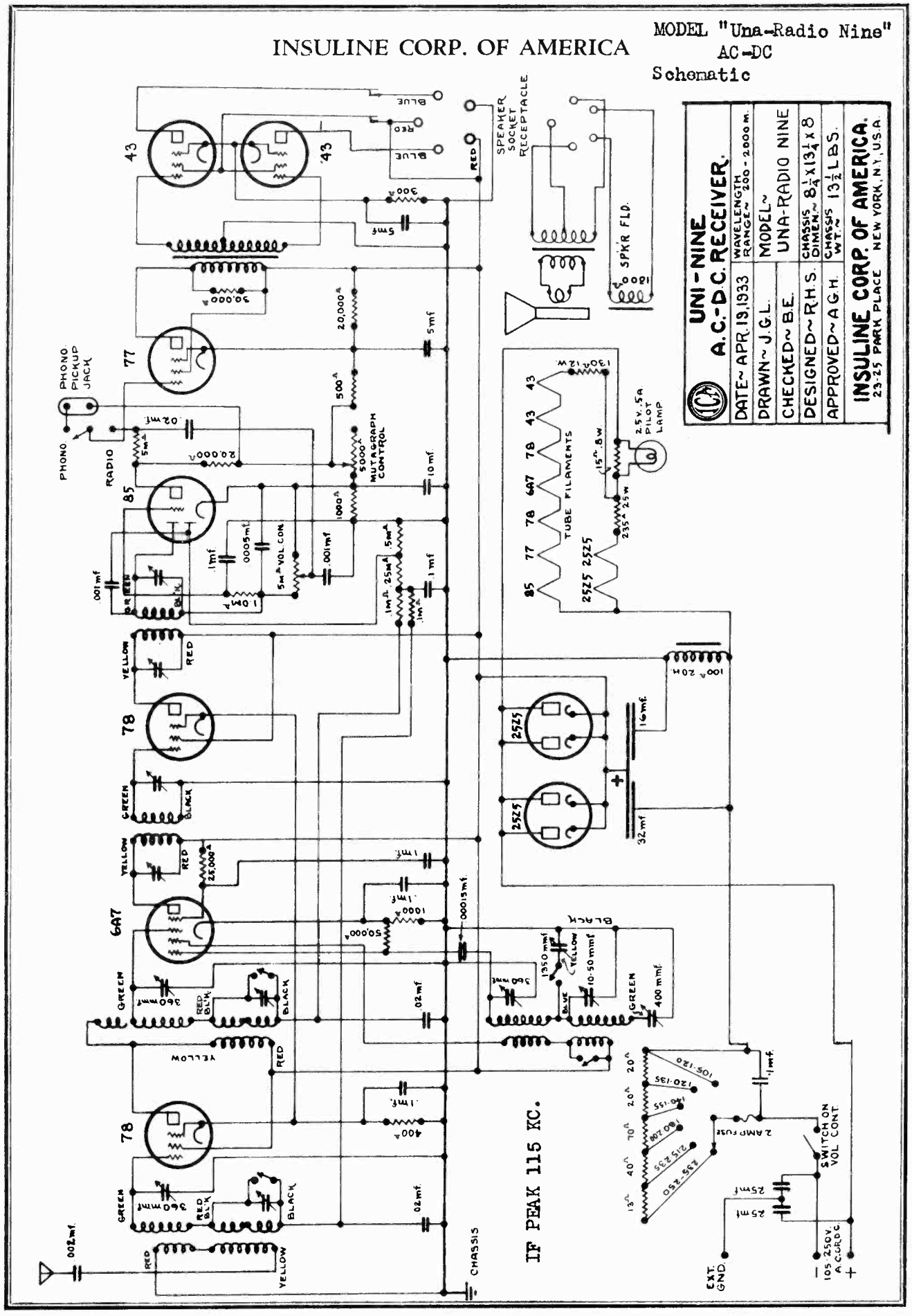
DATE~JUNE 1'33	WAVELENGTH RANGE 15 - 2000 M.		
DRAWN~F.H.	MODEL~ PACIFIC		
CHECKED~BE	A.C. OR D.C.		
DESIGNED~RHS.			
APPROVED~A.G.H.	CHASSIS WT.~ 8 Lbs.		

INSULINE CORP. OF AMERICA.
2325 PARK PLACE NEW YORK, N.Y., U.S.A.

MODEL "Super-Conqueror"
AC 108-250 Volt
w/Noise Suppressor

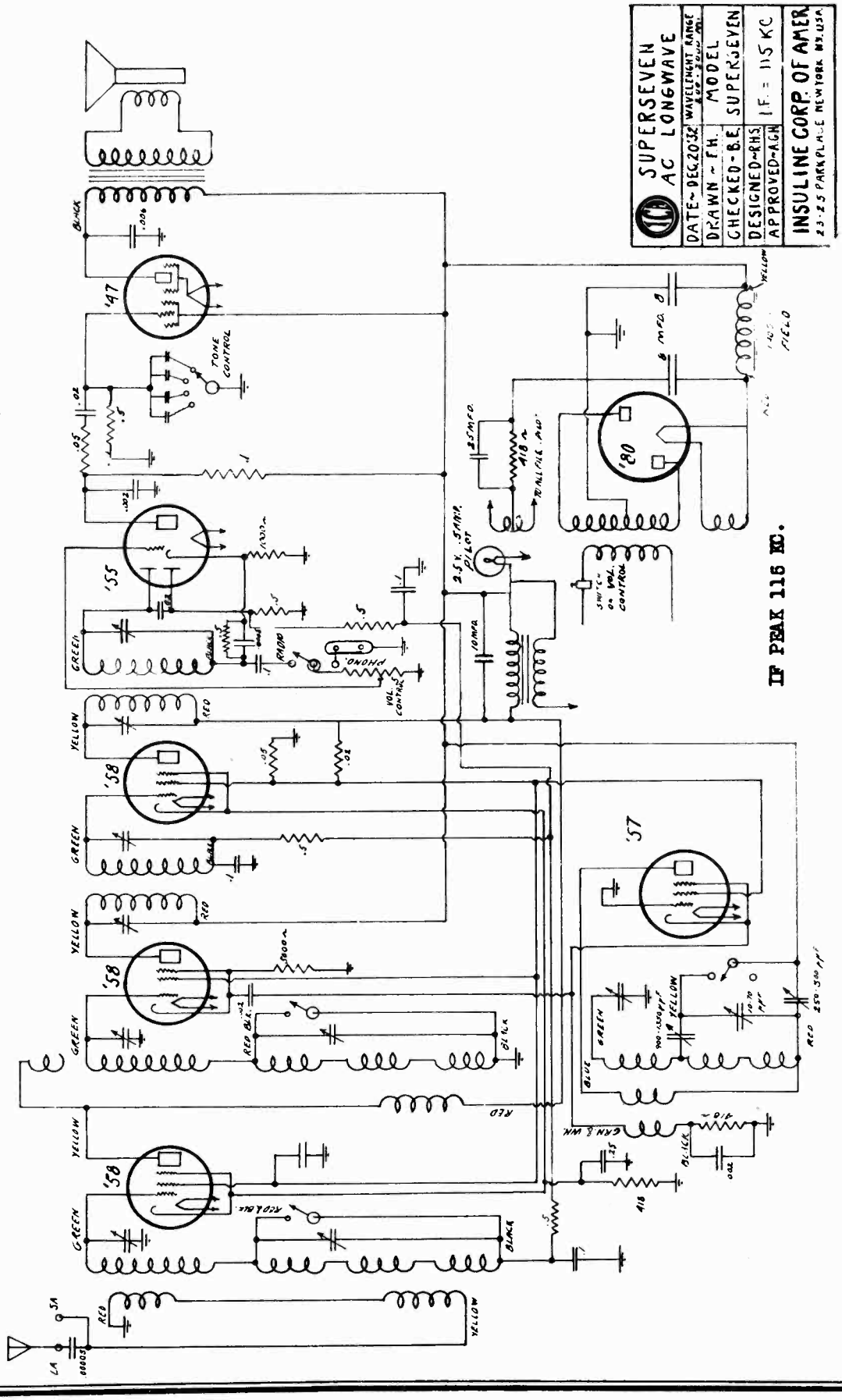
INSULINE CORP. OF AMERICA





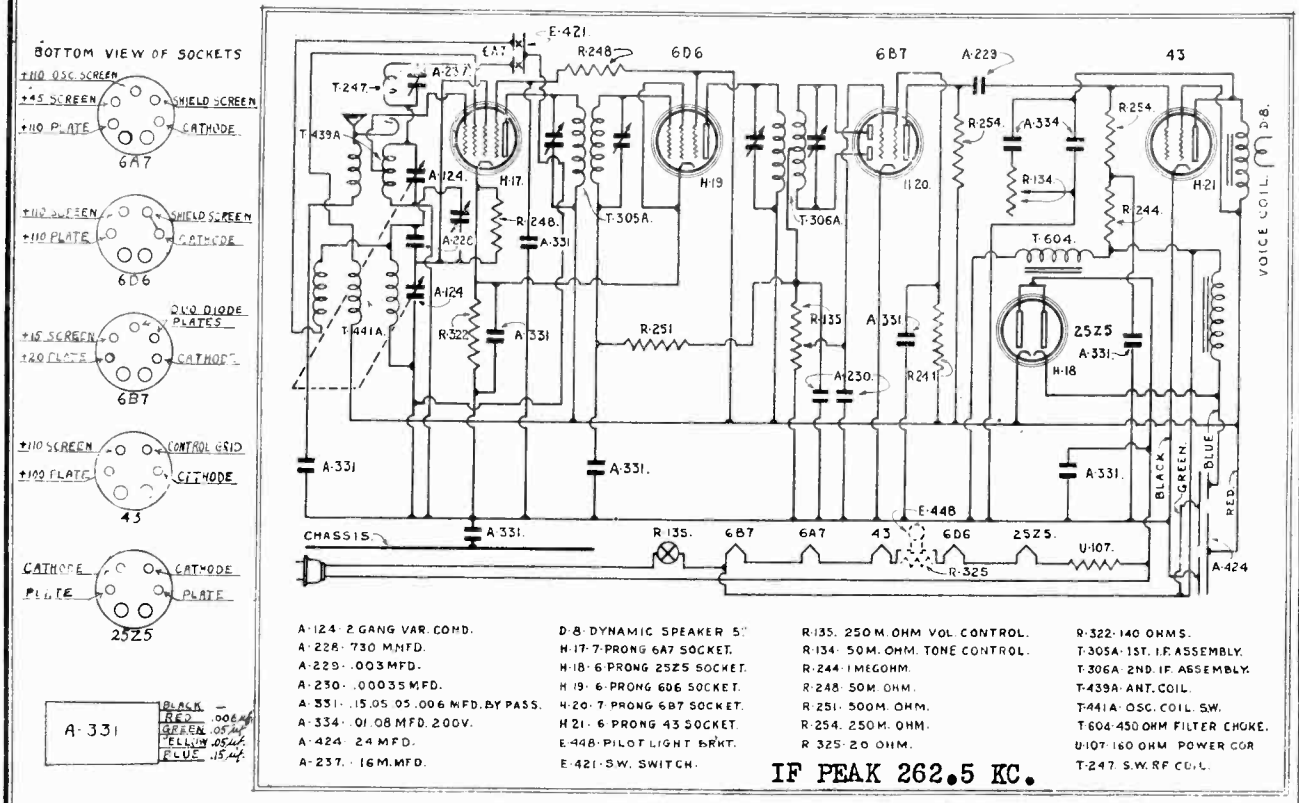
MODEL "Superseven"
AC Long Wave

INSULINE CORP. OF AMERICA



MODEL A, B Kadette

INTERNATIONAL RADIO CORP. Schematic, Parts List



A-124 · 2 GANG VAR. COND.
A-228 · 730 MMFD.
A-229 · .003 MFD.
A-230 · .00035 MFD.
A-331 · .15, .05, .05, .006 MFD. BY PASS.
A-334 · .01, .08 MFD. 200V.
A-424 · 2 MFD.
A-237 · 16 MM. MFD.

D-8 · DYNAMIC SPEAKER 5"
H-17 · 7-PRONG 6A7 SOCKET.
H-18 · 6-PRONG 25Z5 SOCKET.
H-19 · 6-PRONG 6D6 SOCKET.
H-20 · 7-PRONG 6B7 SOCKET.
H-21 · 6-PRONG 43 SOCKET.
E-448 · PILOT LIGHT BRKT.
E-421 · S.W. SWITCH.

R-135 · 250 M. OHM VOL. CONTROL.
R-134 · 50 M. OHM. TONE CONTROL.
R-244 · 1 MEGOHM.
R-248 · 50 M. OHM.
R-251 · 500 M. OHM.
R-254 · 250 M. OHM.
R-325 · 20 OHM.

R-322 · 140 OHMS.
T-305A · 1ST. I.F. ASSEMBLY.
T-306A · 2ND. I.F. ASSEMBLY.
T-439A · ANT. COIL.
T-441A · OSC. COIL. S.W.
T-604 · 450 OHM FILTER CHOKE.
U-107 · 160 OHM POWER COR
T-247 · S.W. RF COIL.

IF PEAK 262.5 KC.

PART NO.	NAME	LIST PRICE
A-124	Two gang condenser	$ 1.50
A-228	.00073 Mfd. mica condenser	.20
A-229	.003 Mfd. mica condenser	.20
A-230	.00035 Mfd. mica condenser	.20
A-237	16 Mmfd. condenser	.15
A-331	.006 Mfd. paper condenser .05 Mfd. paper condenser .05 Mfd. paper condenser .15 Mfd. paper condenser	.40
A-334	.08 Mfd. paper condenser .01 Mfd. paper condenser	.15
A-424	Electrolytic condenser	1.35
D-8	Dynamic Speaker	3.50
E-131	B Knob, Large	.10
E-140	B Knob, Small	.10
E-133	A Knob, Large	.10
E-132	A Knob, Small	.10
E-405	Pilot Light	.15
E-421	Short wave switch	.45
E-448	Pilot Light bracket and socket	.15
H-17	6A7 Tube Socket	.10
H-18	25Z5 Tube Socket	.10
H-19	6D6 Tube Socket	.10
H-20	6B7 Tube Socket	.10
H-21	43 Tube Socket	.10
R-134	Tone Control	.55
R-135	Volume Control and Switch	.70
R-244	1 Meg. resistor	.20
R-248	50 M ohm resistor	.20
R-251	500 M ohm resistor	.20
R-254	250 M ohm resistor	.20
R-322	150 ohm flexible resistor	.15
R-325	20 ohm wire wound resistor	.25
T-247	SW RF coil	.20
T-305A	1st IF assembly, 262½ Kc.	1.50
T-306A	2nd IF assembly, 262½ Kc.	1.50
T-439A	Antenna coil assembly	.75
T-441A	Oscillator coil assembly	1.00
T-604	Choke	.60
U-107	Power Cord and Plug	.50
WL-20	Antenna wire, 22 feet	.10
Model A Bakelite Standard Mahogany Cabinet only		1.75
Model A Bakelite Standard Mahogany Back only		1.25
Model A Bakelite Circassian Walnut Cabinet only		2.50
Model A Bakelite Circassian Walnut Back only		1.50
Model A Plaskon Ivory Cabinet only		2.50
Model A Plaskon Ivory Back only		1.50
Model B Standard Cabinet with Back		2.75
Model B DeLuxe and Special Colors Cabinet with Back		3.75

Instructions for Balancing and Aligning

Great accuracy can be maintained using equipment such as listed but a fair degree of accuracy can be obtained when adjusting entirely by ear if adjustments are made on a very weak signal. By a weak signal is meant one that can be just easily heard when the volume control is in the "Full On" position. A weak signal is necessary to get below the action of the automatic volume control. The following instructions will apply to either method.

Since this model uses an A. V. C. tube it is impractical to use the conventional AC output meter in the output circuit when balancing the set. Instead a sensitive micro-ammeter is used to measure the bias potential applied by the A. V. C. tube to the 6D6 IF amplifier. A one megohm variable resistor (our part R-133) is placed in one of the leads of the meter. The positive lead is fastened to the ground which is the rotor plates or frame of the variable condenser while the negative lead is attached to the mid-point of the secondary of the second IF (the bottom connection of the volume control). To align the IF units, connect the test oscillator output wire to the grid of the 6A7 tube. The positive lead of the meter is to be inserted between the plates of the oscillator section of the variable condenser in such a manner as to short out this condenser so that the oscillator is not operating. This is the section nearest the rear of the set. Turn the test oscillator to 262½ kilocycles and with the volume control turned full "ON" the modulated signal from the test oscillator will be heard through the speaker of the set. An indication will also be noted on the micro-ammeter. CAUTION—Keep the one megohm variable resistor attached to the micro-ammeter so adjusted that all of its resistance is in series with the meter movement when first putting same into use. This acts not only as a protective device but serves to adjust the scale readings to the most convenient part of the dial. With the No. 4 insulated trimmer wrench adjust the four nuts at the ends of the IF units. This must be done very carefully and one at a time. The result desired is to obtain the greatest possible deflection of the micro-ammeter, or when adjusting by ear, the greatest volume.

When the IF's have been properly checked, the next step is to adjust the alignment of the 2-gang variable condenser on broadcast band. Be sure the switch in the rear of the set is turned to the long wave, i.e. broadcast, side. Remove the positive lead of the meter from between the plates of the oscillator condenser and attach same to the frame of the variable condenser. It has been found quite convenient to slide the wire beneath the wiper spring of this section. Remove the test oscillator output wire from the 6A7 grid clip and attach it through a .0001 mfd. fixed condenser to the antenna wire. With the test oscillator set at 1500 kilocylces, open up the variable condenser until maximum reading is indicated on the micro-ammeter. Adjust the trimmer on the antenna section of the variable condenser until maximum reading of the meter is indicated.

Next turn the test oscillator to 550 kilocycles and close the condenser slightly back and forth while tightening or loosening the screw which adjusts to the point of highest indication on the meter. When this has been found, rock the condenser slightly back and forth while tightening or loosening the screw which adjusts the series padder condenser on the end of the oscillator coil. By tightening or loosening this screw the series capacity of the oscillator circuit can be so fixed that the antenna and oscillator circuits are properly matched.

Next reset the test oscillator to 1000 kilocycles and with a thin bakelite, celluloid, or mica feeler strip inserted between the plates of the variable condenser determine whether or not the circuits are properly matched. The action is this—the dielectric constant of the celluloid feeler strip being higher than that of the air it displaces results in an increase of capacity. Open the variable condenser just enough to indicate two to three points below maximum reading on the micro-ammeter. By inserting the feeler strip the reading on the meter should first rise to approximately the previous maximum indicated and drop back as the strip is inserted farther into the condenser. This method should be used on both sections. Should the meter fail to show a rise when the strip is inserted in either one of the sections, too great a capacity is indicated for that particular section. This can be corrected by bending the outside rotor plates out at the point where they enter the stator. If it has been necessary to bend plates at the 1000 kilocycle setting, it will be necessary to recheck the 550 setting.

To adjust the short wave section. snap the switch in the rear of the set to the short wave position. Select a harmonic of the test oscillator which is found with the rotor condenser plates in approximately the same position found while the set was being aligned at 1500 kilocycles on the broadcast band. With the insulated screw driver adjust the small trimmer condenser attached to the short wave antenna coil until maximum reading of the micro-ammeter is obtained. Next, select another harmonic of the test oscillator which will be found with the rotor plates of the variable condenser at about the same position that was experienced at the 550 kilocycle test of the broadcast band. Open the variable condenser just enough to cause a two or three point drop from maximum on the micro-ammeter and with the insulated feeler strip once more determine whether or not the condenser sections are in alignment. Should the antenna stage appear to have too little capacity, it will be necessary to spread very carefully one or two turns of the short wave winding of the oscillator coil. This is the narrow winding next the padder on the oscillator coil. Great care must be taken that the wire is not broken while being spread. On the other hand if the antenna section appears to have too much capacity, a few turns may be spread on the short wave antenna coil.

Do not change the adjustment of the trimmers on the condenser gang or the padder condenser on the oscillator coil when checking on the short wave position.

INTERNATIONAL RADIO CORP.

MODEL F Kadette Jr. (Four types) Schematic, Parts List

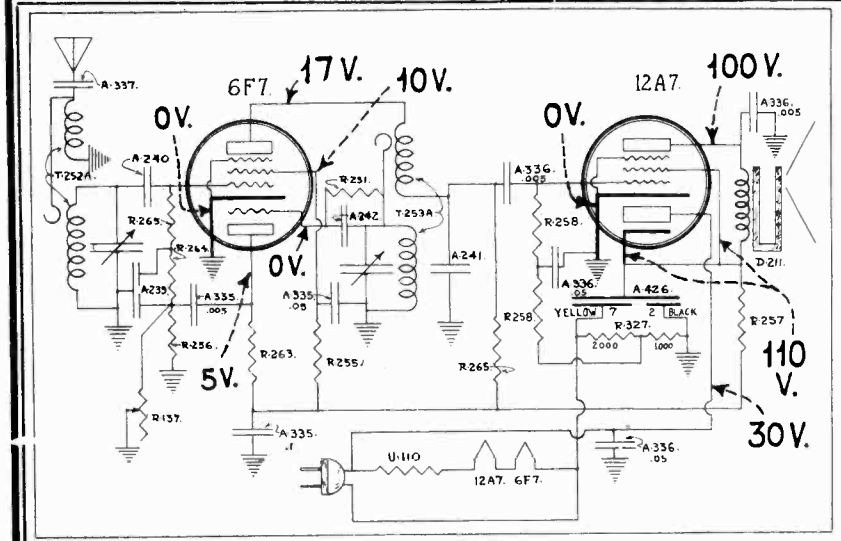


DIAGRAM NO. 1

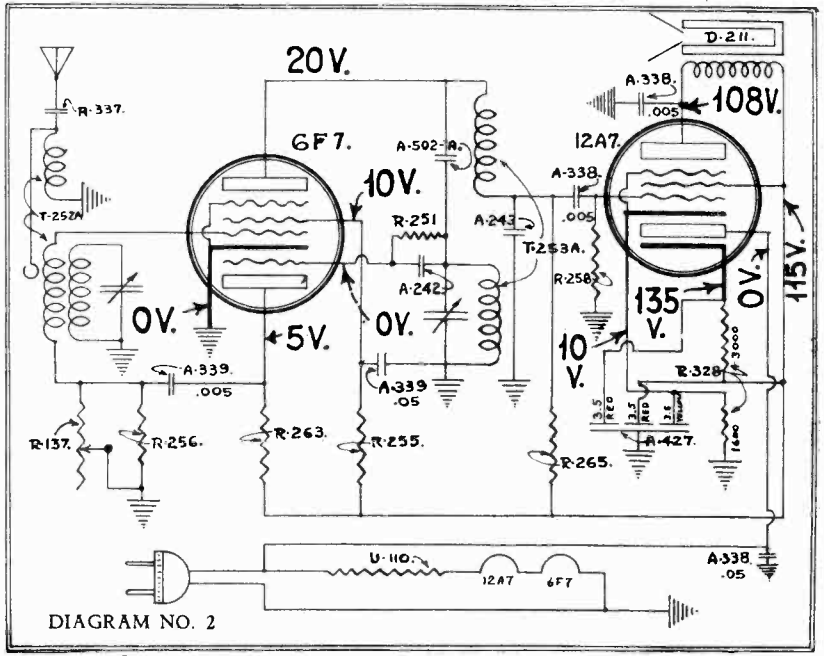


DIAGRAM NO. 2

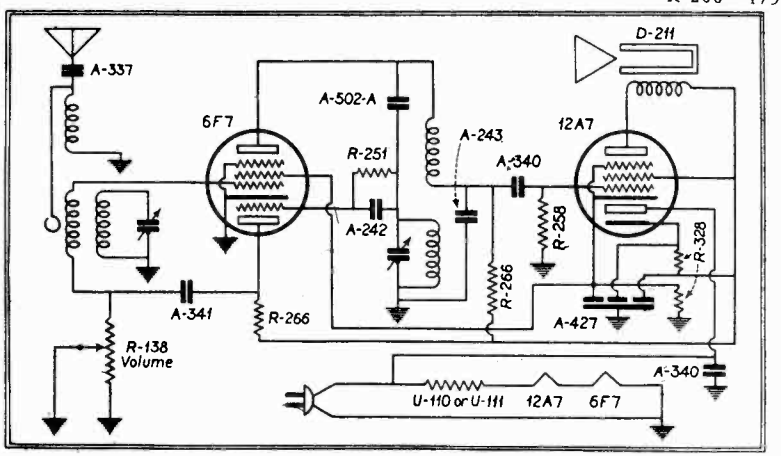
A-239 dual .00025 mfd.
A-240 .00025 mfd.
A-241 .0001 mfd.
A-242 .00025 mfd.
A-335 values on diagram.
A-336 values on diagram.
A-337 .001 mfd.
A-426 values on diagram.
R-137 2½ meg. vol. cont.

R-251 ½ meg.
R-255 1¼ meg.
R-256 2 meg.
R-257 50 M ohms.
R-258 1 meg.
R-263 3 meg.
R-265 ¼ meg.
R-327 2000-1000 ohm.

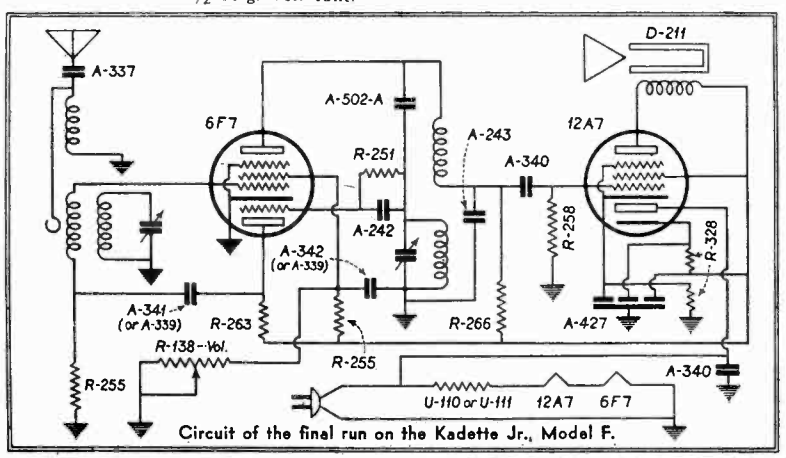
A-243 .0005 mfd
A-340 { .005 mfd grid coupling / .05 mfd line bypass
A-341 .005 mfd
A-342 .005 mfd
A-346 .007 mfd
R-138 1¾ meg.
R-266 175 M ohms

A-242 .00025 mfd.
A-243 .0005 mfd.
A-337 .001 mfd.
A-338 values on diagram.
A-339 values on diagram.
A-427 values on diagram.
A-502A 18 mmfd. coupling.
R-137 2½ meg. vol. cont.

R-251 ½ meg.
R-255 1¼ meg.
R-256 2 meg.
R-258 1 meg.
R-263 3 meg.
R-265 ¼ meg.
R-328 3000-1600 ohm.



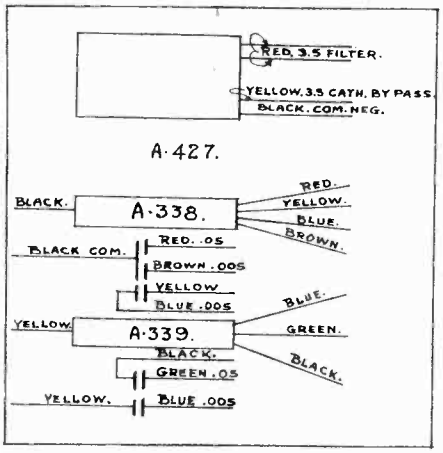
The circuit diagram of the third type of the Kadette Jr., Model F.

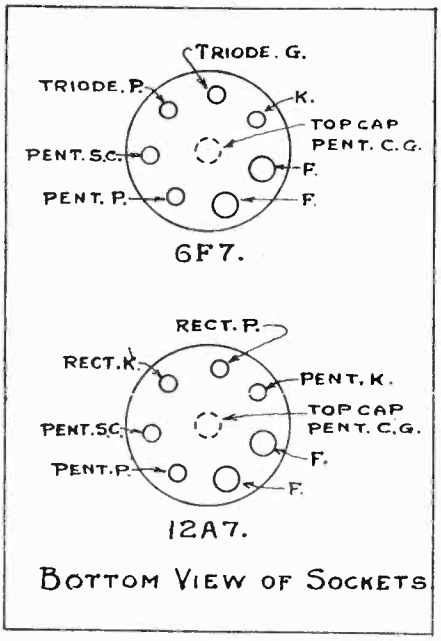


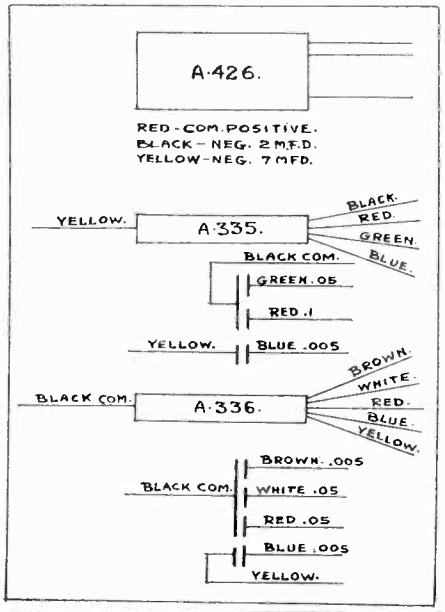
Circuit of the final run on the Kadette Jr., Model F.

MODEL F Kadette Jr.
Voltage, Condensers, Notes

INTERNATIONAL RADIO CORP.







POWER CORD

Please refer to the circuit diagram. It will be noted there is a 330 ohm resistance in series with the tube filaments. This resistance is contained in the power cord and causes the cord to become quite warm when the set is in operation. This heat is not dangerous as the resistance wire is enclosed in a layer of asbestos, however, the cord should be kept out in the open to allow the heat generated to radiate. *The power cord should not be shortened* as this would decrease the resistance and the filament voltage would rise to the point where the tubes would burn out rapidly.

Voltage Readings

The following voltage readings are approximate when set is operated on a 115 volt AC line with volume control in full on position.

Readings taken with a 1000 ohm per volt 300 volt D. C. voltmeter. Readings taken from socket prongs to chassis which is B-. The circuit diagrams show two different circuits, one having the filter in the negative leg and the latest having the filter in the positive leg. The Muter metal covered resistance above the 12A7 socket in the first circuit has only 3 lugs while in the latest circuit it has 4. By noticing this part you may easily distinguish between the two types.

FIRST CIRCUIT

6F7		12A7	
Pentode plate	17	Pentode plate	100
Pentode screen	10	Pentode screen	110
Triode plate	5	Rectifier cathode	110
Triode grid	0	Rectifier plate	-30
Cathode	0	Pentode cathode	0

Second Circuit

6F7		12A7	
Pentode plate	20	Pentode plate	108
Pentode screen	10	Pentode screen	115
Triode plate	5	Rectifier cathode	135
Triode grid	0	Rectifier plate	0
Cathode	0	Pentode cathode	10

CIRCUITS 3 AND 4

6F7		12A7	
Pentode plate	33	Pentode plate	107
Pentode screen	10	Pentode screen	115
Triode plate	5	Rectifier cathode	135
Triode grid	0	Rectifier plate	0
Cathode	0	Pentode cathode	10

INSTRUCTIONS FOR BALANCING AND ALIGNING

Adjustments have been carefully made at the factory and should not need to be changed unless it has been necessary to replace a coil or the adjustments have been tampered with. The trimmers on the variable condenser may be adjusted by ear. However, greater accuracy may be had by using an oscillator and output meter. If this equipment is not available a weak broadcast signal may be substituted for the oscillator signal and adjustments made for greatest volume.

If an oscillator is to provide the signal for balancing it should be coupled to the antenna wire on the receiver and an output meter should be connected from the 12A7 pentode plate to chassis. The output meter may consist of a 0-5 or 0-10 volt AC meter with a .1 mfd. condenser inserted in one lead.

It will be noted there are three trimmer screws on each section of the variable condenser. Adjust the condenser so the leading edge of the condenser rotor is at the middle of the first split stator section. The dial reading for this setting is about 25. Tune the oscillator to this frequency which is approximately 1000 KC. Adjust the two diagonally opposite trimmer screws for maximum output. Then in succession change the condenser setting to center of 2nd and 3rd sections re-balancing in same manner for maximum output not re-trimming preceeding split plates. Then re-seal with wax.

INTERNATIONAL RADIO CORP.

MODEL F Kadette Jr.
Parts List, Notes

PART NO.	NAME	LIST PRICE
A-125	Variable condenser assem. less dial	$3.00
A-239	Dual .00025 mfd. mica condenser	.35
A-240	.00025 mfd. mica condenser	.20
A-241	.0001 mfd. mica condenser	.20
A-242	.00025 mfd. mica condenser	.20
A-335	.05 mfd. paper condenser .1 mfd. paper condenser .005 mfd. paper condenser	.50
A-336	.005 mfd. paper condenser .05 mfd. paper condenser .05 mfd. paper condenser .005 mfd. paper condenser	.60
A-337	.001 mfd. paper condenser	.15
A-338	.05 mfd. paper condenser .005 mfd. paper condenser .005 mfd. paper condenser	.50
A-339	.05 mfd. paper condenser .005 mfd. paper condenser	.40
A-426	2 mfd. 7 mfd. electrolytic condenser	.90
A-427	3½ mfd., 3½ mfd., 3½ mfd. electrolytic con.	1.00
A-502A	18 mmfd. coupling condenser	.10
B-136	Volume control slider bracket	.05
E-144	Volume control slider with knob	.15
E-233	Calibrated dial strip only	.10
E-234	Dial wheel with calibrated strip	.40
H-22	6F7 socket	.10
H-23	Output socket	.10
H-121	4 prong female socket	.10
I-120	Special volume control screws	.07
R-137	Volume control resistor strip -2½ meg	.20
R-251	½ megohm resistor	.20
R-255	1¼ megohm resistor	.20
R-256	2 megohm resistor	.20
R-257	50M ohm resistor	.20
R-258	1 megohm resistor	.20
R-263	3 megohm resistor	.20
R-265	¼ megohm resistor	.20
R-327	2000-1000 ohm metal covered resistor	.25
R-328	3000-1600 ohm metal covered resistor	.25
S-311	Volume control springs	.02
T-252A	Antenna coil assembly	.90
T-253A	R. F. coil assembly	.90
U-110	Power cord (no switch)	1.25
U-111	Power cord (with switch)	2.00
Model F. Cabinet only-less back (specify color)		2.00
Model F Back only (specify color)		.50

Supplementary Parts Price List

A-243	.0005 mfd. mica condenser	$ .20
A-340	.05-.005 mfd. paper condenser	.50
A-341	.005 mfd. paper condenser	.50
A-342	.005 mfd. paper condenser	.15
A-346	.007 mfd. paper condenser	.15
D-215	Speaker cone only	.35
D-217	Speaker coil	.70
D-230A	Complete speaker assembly with volume control	3.00
R-138	1¾ meg. volume control strip (2 lugs)	.20
R-266	175 M ohm resistor	.20

By Pass Condensers

In ordering parts for your service stock, a saving can be effected in regard to the "fire cracker type" condensers mounted vertically at each side of the speaker. In diagram No. 1 these are Nos. A-335 and A-336.

In diagram No. 2 part No. A-339 is the same as A-335, with the exception that the .1 mfd section (red wire) is omitted. A-338 is the same as A-336 with one .05 mfd section (white wire) left out.

In diagrams Nos. 3 and 4 these "firecrackers" are A-340 and A-341. The A-340 may be made from A-336 by cutting off the brown and white wires. The A-341 may be made from A-335 by cutting off the black, green and red wires.

The A-335 and A-336 condensers may therefore be used for repairs in any of the circuits and it will not be necessary to carry the later numbers in your service stock.

CHANGES IN CIRCUIT

There have been a few minor changes in the circuit since the first sets were produced. Diagram No. 1 shows the original circuit. A few of these were produced and then the circuit was changed so that the 6F7 circuit was the same as in diagram No. 2 while the 12A7 circuit remained the same. The last change is shown in diagram No. 2.

If it is necessary to replace an antenna coil in one of the early sets it is suggested that the latest coils be used and the 6F7 circuit be changed to conform with Diagram No. 2.

It will be noted there are two secondaries on the T252A antenna coil in diagram No. 2. The secondary winding is of "Litz" wire consisting of one heavy strand surrounded by nine fine strands. The heavy strand is separated from the others and connects to the control grid of the 6F7. The nine fine strands are tuned by the variable condenser.

The circuits shown in diagrams Nos. 3 and 4 greatly resemble diagram No. 2 in Service Bulletin F-1. It will be noted however the system of controlling volume has been changed somewhat. Also the values of some condensers and resistors have been changed and some condensers and resistors omitted.