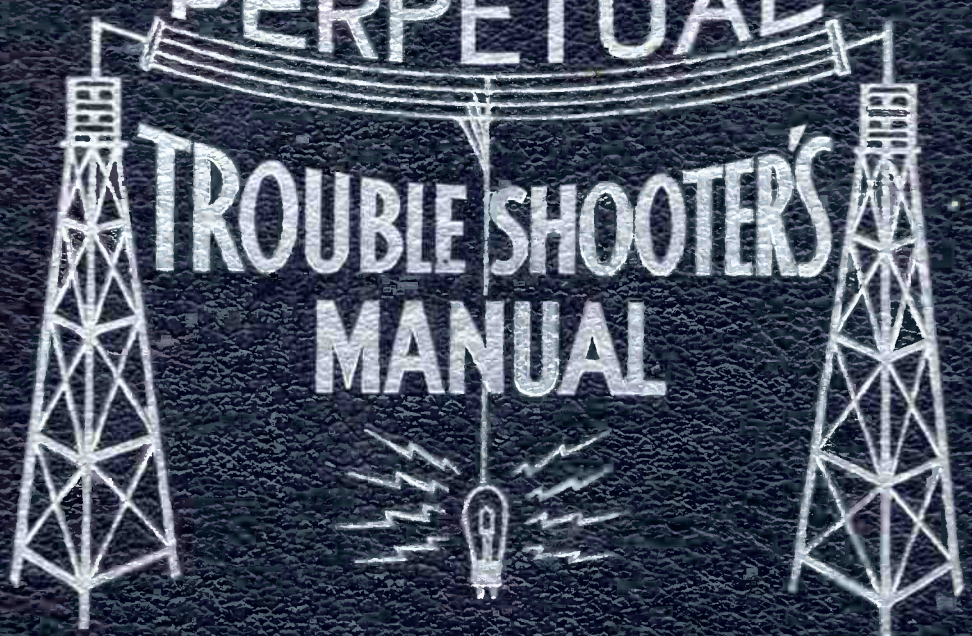
VOLUME II

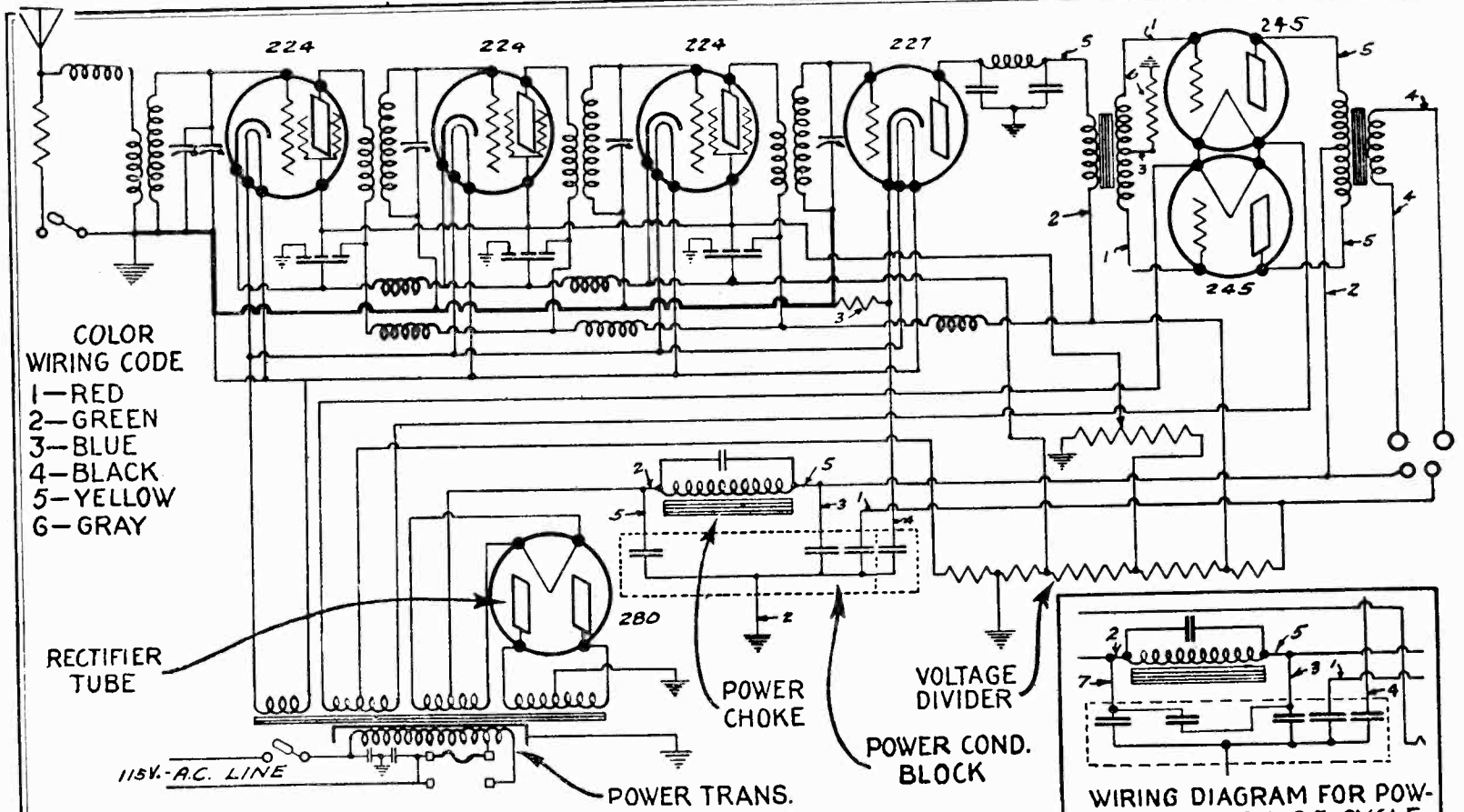
PERPETUAL TROUBLE SHOOTER'S MANUAL



JOHN F. RIDER

GENERAL MOTORS RADIO CORP.

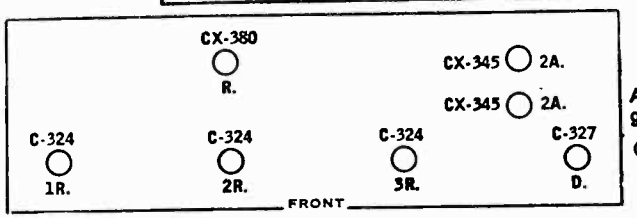
MODEL Dey-Fan A-5005
A-5020
Schematic, Voltage



WIRING DIAGRAM FOR POWER FILTER ON 25 CYCLE RECEIVER

TUBE IN SET ANALYZER

Type of Tube	Position of Tube	"A" Volts	"B" Volts	Con. Grid "C" Volts	Screen Volts	Cathode Volts	Normal Plate Ma.	Gd. Test Ma.
224	1-R. F.	2.2	145	— 3	+66	+ 3	2.0	4.0
224	2-R. F.	2.2	145	— 3	+66	+ 3	2.0	4.0
224	3-R. F.	2.2	145	— 3	+66	+ 3	2.0	4.0
227	Det.	2.2	130	—13	....	+13	....	....
245	A. F.	2.2	220	— 8	....	....	32.0	37.0
245	A. F.	2.2	220	— 8	....	....	32.0	37.0
280	Rect.	4.4	....	....	....	....	105.0	....



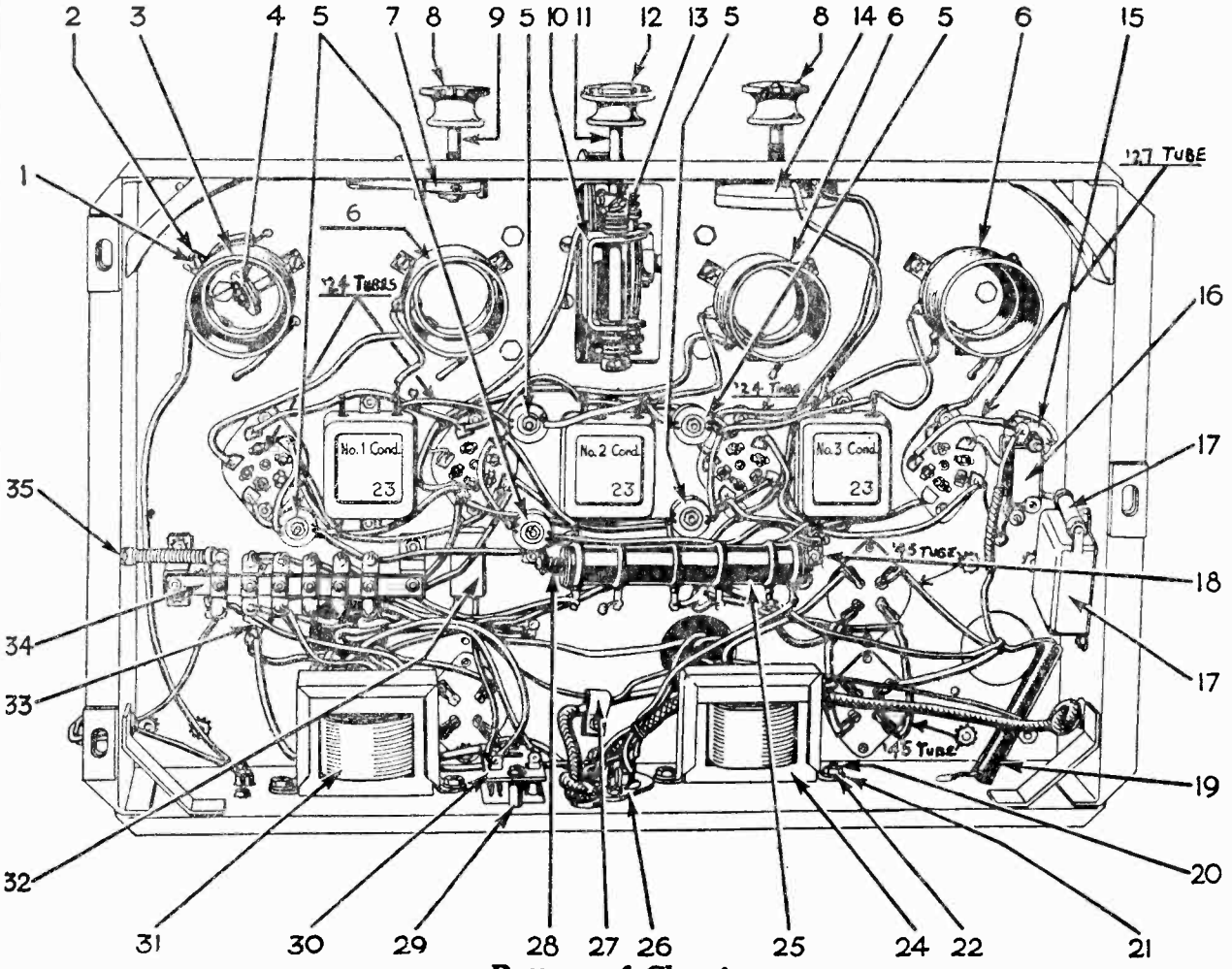
A5005
93, 94
(A.C.)

Line Voltage During Test —110 Volts
Volume Control —On Full
Position of Fuse —115 Volt Clips

MODEL Day-Fan A-5005
A-5020
Chassis

GENERAL MOTORS RADIO CORP.

DAY-FAN
MODEL A-5005
MODEL A-5020



Bottom of Chassis

Illus. No.	Part Number	Description
1	26758	Screw
2	138164	Lock Washer
3	14609	No. 1 R. F. Coil
4	14650	Antenna Coil
5	14556	Choke Coils
6	14603	No. 2, 3, 4 R. F. Coils
7	14766	Trimmer Drive Pulley & Pin
7	26682	Belt
8	14351	Knob
9	26679	Trimmer Shaft
10	14591	Selector Bracket Assem.
11	26175	Selector Shaft
12	14664	Knob-Tuning Condenser
13	14662	Windlass
14	14588	Volume Control
15	14556	Det. Plate Choke
16	1200413	Condenser
17	1201610	Resistor, 25,000 Ohms
17	14686	No. 4 Condenser

Illus. No.	Part Number	Description
18	26568	Mounting Bracket
19	1201604	Resistor, 500,000 Ohms
20	21678	Screw
21	138475	Shake-proof Washer
22	25591	Nut
23	1200473	Condenser, .1-.1-.1 Mfd.
24	14597	Output Transformer
25	1200167	Voltage Divider
26	14594	Speaker Plug Receptacle
27	24981	Strap
28	26562	Spring
29	24901	Spacer
30	1200195	Fuse Block Assem.
31	1200135	Power Choke
32	14738	Line By-Pass Condenser
33	13075	Condenser
34	14566	Terminal Strip Assem.
35	14624	Local and Distance Resistor.

MODELS 120, 130 and 140 CHASSIS MODELS "A" and "B"

The Models "A" and "B" chassis are divided into three groups having slightly different circuits.

Serial Numbers below 29100A and 1700B:

In the original models, with serial numbers below approximately 29100A and 1700B, one side of the Dual Volume Control is in the Antenna circuit between the antenna and the first R. F. coil, with a .0005 mfd. condenser between the antenna and the antenna choke.

The other side of the volume control, together with a 5000 Ohm resistor is in the screen grid circuit of the R. F. stages. In these sets there are two R. F. chokes in the cathode circuit of the R. F. tubes.

Sets with this circuit can be distinguished by the presence of five similar R. F. chokes, one being located near the first 224 tube socket, and four between the second and third 224 tube sockets.

Serial Numbers between 29100A and 62100A, and 1700B and 1964B:

In sets with serial numbers between approximately 29100A and 62100A, and 1700B and 1964B, the .0005 mfd. condenser is not used with the volume control in the antenna circuit.

The other side of the volume control in these sets is in the cathode circuit of the three R. F. Stages. The two R. F. chokes in the 224 cathode circuits are not used, but three 1250 Ohm resistors are used, one in series between the cathode of each 224 tube and the volume control.

Serial Numbers Above 62100A and 1964B:

The circuits of sets with serial numbers above approximately 62100A and 1964B, are practically the same as those in sets with serial numbers between 29100A and 62100A, except that the Audio choke is not used and the Power Condenser Block is replaced by three 8 mfd. Electrolytic Condensers.

Above serial numbers approximately 64372A and 1964B, new R. F. coils are used. These coils have single turn primaries, and are "capacity coupled."

Sets above 62100A and 1964B can be distinguished by the presence of the Electrolytic Condensers.

Sets having the "capacity coupled" R. F. coils can be distinguished by the presence of three R. F. Chokes mounted on brackets at the bases of the R. F. Coil Shields.

Model "B" Chassis:

The circuits of the Model "B" (25 cycle) chassis are the same as those of Model "A" (60 cycle), except that one 1.0 mfd. condenser, Part No. 1200160, is added in parallel with the power choke.

Sets with this circuit can be distinguished by the presence of three resistors between the cathodes of the 224 tubes and the R. F. terminal strip, located between the second and third 224 tube sockets.

Electrolytic Condensers:

To test the Electrolytic condensers used in chassis above 62100A and 1964B use an "Open Test" or "Continuity Test" meter with a 22½ volt battery. The test being made similar to other continuity tests.

It should be noted that by reversing the test leads, different readings will be obtained.

The condenser to be tested should be removed from the chassis and tested as follows:

Pos. Test Point	Neg. Test Point	Correct Reading
Center Terminal	Condenser Can	Hand Should Jump and Return
Condenser Can	Center Terminal	Hand Should Rise Slowly, Almost to Full Scale

If both readings are the same, the condenser is defective and should be replaced. When in doubt try replacing the condenser.

Trimmer Adjustment on Tuning Condensers:

A small Trimmer Condenser is located on each of the four variable condenser units which comprise the Gang Tuning Condenser. The trimmer screws may be adjusted by means of screw-driver, through the holes in the top of condenser shield.

The No. 1 Trimmer (Left side when viewed from the front), should be adjusted when the set is installed as it balances the antenna stage to meet the requirements of the antenna used. This Trimmer should be adjusted by tuning a station whose frequency is at the high end of the scale, near 1400 Kilocycles. No. 2, 3, and 4 Trimmers should be adjusted only when the complaint is very definitely lack of volume or broad tuning.

If the sensitivity or selectivity is not normal, the Trimmers should be adjusted before attempting to calibrate the Tuning Condenser. To adjust the Trimmers, tune in a station around 1400 Kilocycles and turn the volume down by means of the volume control until the station is just audible.

Start with the Trimmer which is on the left side of the chassis, when viewed from the front, and adjust the screw either to the right or left until the loudest signal is obtained. This adjustment should bring the receiver back to normal operation. If not, the Trimmer on the right should be adjusted in the same manner. The two center trimmers should not be adjusted except in rare cases, and extreme care should be taken when adjusting these Trimmers so that the selector Pointer will not be thrown off adjustment and read incorrectly.

Condenser Adjustments:

If the selector pointer will cover only 1500 to 600 Kilocycles on the selector strip, the two-fingered washer has become bent so that the stop washer will slide over it. To correct this, remove the selector shaft assembly and invert the flat, two-fingered washer.

If the Phono-switch will not trip, set the selector pointer at 1460 Kilocycles, loosen the set screws holding the switch lever and turn the switch lever until it just engages the switch. Tighten the set screws in this position.

Selector Strip Adjustment—Mechanical:

If the selector pointer appears to be off mechanically, i. e., if a station close to 700 Kilocycles is off ⅛ inch and a station close to 1400 Kilocycles is also off the same amount, the adjustment of the selector strip to log one station would bring them all into line.

To make such an adjustment, tighten all set screws, then tune in a station of known frequency. Reduce the volume by means of the volume control so that the selector can be set on the exact peak of the incoming wave. Loosen the screws holding the selector strip and shift the strip until it indicates properly the frequency of incoming signal.

If the selector strip cannot be shifted far enough, loosen the set screws by which the selector windlass is attached to the selector shaft and shift the pointer to its approximate position before shifting the selector strip.

Selector Adjustment—Electrical:

The adjustment of the selector electrically, is known as "logging". If it becomes necessary to re-log the set, tune in a station between 550 and 700 Kilocycles, preferably as close to 550 as possible, which is known to be broadcasting exactly on its assigned wave length. Set the selector pointer to log this station accurately as described in the preceeding paragraph.

Then set the pointer on the exact frequency of a station known to be operating at that time between 1350 and 1500 kilocycles. Adjust the volume control until the station is just audible, without moving the pointer, adjust the left trimmer condenser (viewed from the front of the chassis) until maximum volume is obtained. Repeat the operation on the remaining three trimmers, one at a time, going from left to right until the station is peaked exactly on the correct reading.

Now try the station which was used to set the low frequency point and if it logs properly, all other stations will be in line. If the station does not log properly, repeat the above operation.

Hum:

If the No. 245 Tubes are unmatched, or if one or the other is defective, a hum will result which is very similar to what is known as 60 cycle hum. This can be eliminated by replacing one or both of the No. 245 Tubes.

It is to be understood that the No. 245 Tubes may not necessarily be defective. They may operate satisfactorily in another set, but may be merely unmatched with respect to each other.

The No. 227 Detector Tube will sometimes cause a similar trouble, except that the No. 227 Tube causes more of a buzz than a hum. If this buzz or hum cannot be eliminated by switching the 227 Tubes, the defective Tube should be replaced.

Volume Control:

Many complaints of unsatisfactory volume control action are not caused by defective volume controls, but in reality the faulty action is due to variation in the cut-off point of the No. 224 screen grid tubes. It is necessary to have, in the first R. F. stage at least, one tube which has a low cut-off point.

If the complaint is not due to a volume control which is actually defective, it usually can be eliminated by switching the No. 224 tubes from one socket to another until the proper arrangement is obtained.

In chassis with serial numbers between 29100A and 62100A (also 1700B and 1964B) a 7000 Ohm Resistor (Black and Blue) is connected between the cathodes of the screen grid tubes and ground, in parallel with one side of the volume control. When near a powerful local broadcasting station, the volume control, because of this resistor, may not cut the volume down low enough. This can be improved by removing the resistor mentioned. This is resistor No. R-21 shown in the wiring diagram

COMBINATION MODELS No. 150 & 160.

PART 1. THE ELECTRIC PICK-UP & TRANSFORMER

Description:

The electric pick-up provides an electrical means for sound reproduction. The pick-up is composed of three major parts:

1. A permanent magnet.
2. A small generating coil.
3. A vibrating armature which is caused to vibrate by the phonograph needle.

The generating coil is located in the center of the field of the permanent magnet which causes a constant flow of magnetic lines of force through the coil. In order to generate current in the coil, it is necessary to vary the strength of the magnetic field. This is accomplished by placing a vibrating armature in the center of the coil with a needle inserted in the needle holder.

The needle rides in the grooves on the record and as it vibrates back and forth it also causes the armature to vibrate. By the vibration of the armature in the magnetic field, the field strength is varied accordingly and a pulsating current of electricity is generated in the coil. The pulsations of this current correspond to the sound waves of the music, but they are too weak to be audible in the speaker.

The generating coil is connected, through a volume control, to the radio wiring and the electrical pulsations are amplified many times by means of the radio amplifying tubes.

When the pulsations of current generated in the generating coil have passed through the amplifying tubes, they are carried to the speaker unit where they set the diaphragm in motion which generates audible sound waves in the air.

The advantages of this method of reproduction are the ease with which the volume of sound may be varied by the volume control which varies the strength of the electrical pulsations before delivery to the amplifying tubes, and the truer reproduction through the radio speaker.

Servicing:

Adjusting Vibrating Arm:

Place a good needle in the needle holder and a record on the turntable. Turn the power switch on and the selector pointer to the right until the Phono-switch trips. After the tubes have had sufficient time to heat properly, tap the needle lightly with your finger, first on one side and then on the other. Each time the needle is tapped, a click should be heard in the speaker. If the click is louder when striking the needle on one side than it is on the other, the pick-up is out of adjustment. Remove the metal cover from the pick-up and note whether the vibrating arm, which is operated by the needle, is directly in the center of the space between the two pole pieces.

If the vibrating armature is off center, loosen the two brass round head screws which hold the small brass plate in position on the pole pieces. Center the armature between the pole pieces and tighten the brass screws securely.

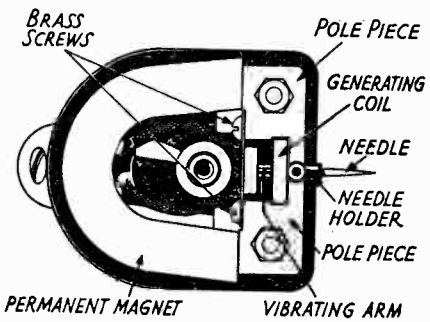


Figure 1

Pick up Transformer - Part No. 1,200,877
Cord Assembly - Part No. 1,200,866
Choke Coil - Part No. 1,200,869
Condenser - Part No. 1,200,418

(Cord Assembly Part No. 12,001,184 used on Models 150-A and B -)

PART 1. THE ELECTRIC PICK-UP & TRANSFORMER (Continued)

Testing for Open Coil or Wiring:

If there is no click at all, when tapping the needle, put the pick-up in place on the record and allow the record to rotate. Place the terminals of a set of ear phones on the two connections of the volume control to which leads from the pick-up connect. Reproduction of the record should be heard faintly.

Provided no sound is heard, remove the pick-up leads from the volume control and check for open circuit in those leads and the pick-up. (Note: Inspect the contacts on the pick-up end of the leads, to insure good contact in the socket on the pick-up.)

Repair Instruction:

Pick-ups that cannot be adjusted properly or that have open coils, should be replaced with new ones and the old ones returned to the nearest service station for repair.

Next Step if Pick-Up is O. K.:

If reproduction of the record can be heard faintly through the ear phones, check the volume control or the connections between the pick-up and the radio unit for the trouble.

Testing Pick-Up Transformer:

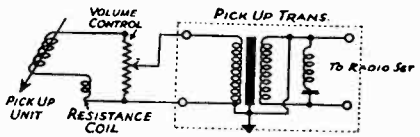


Figure No. 2—Pick-Up Wiring Diagram

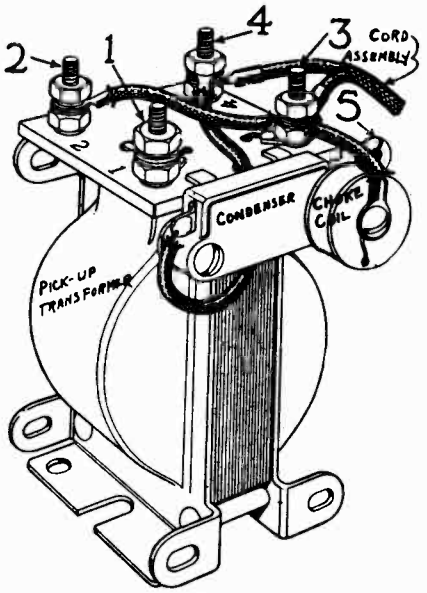


Figure 3

Make the following tests with an open test meter. (See Figure 3 for contact numbers.)

From Contact Number	To Contact Number	Proper Reading	Incorrect Reading Caused by
1	2	Full Scale	Open Winding
3	4	¾ Scale	Open Winding
3	5	Full Scale	Open Choke
Cond. Lead from No. 4	5	*Hand should Jump and Return to Zero	Shorted or Open Condenser

*Blue Condenser Lead must be disconnected from No. 4.

PART 2. INDUCTION DISC MOTOR

Description:

The motor consists of an induction disc of aluminum arranged to revolve between the poles of two sets of field magnets. The coils of the field magnets, commonly called field coils, receive current from the house lighting circuit and are the only parts electrically connected to that circuit.

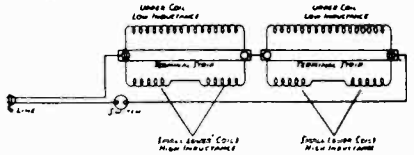


Figure 4—Wiring Diagram of Induction Disc Motor

The main shaft of the motor operates in a vertical position, is supported at the bottom by a single ball bearing, carries the induction disc and turntable, and drives the governor shaft through a set of gears. The speed of the shaft is controlled by a mechanical fly ball governor.

The induction disc motor has no commutator, slip rings, or other moving electrical contacts, and this, with the natural slow speed, makes it very well suited for the service for which it is used.

Servicing:

Any servicing which the motor may require is in general, of a minor nature, and in most cases, adjustments will be mechanical rather than electrical. Two of the most common causes of motor failure are incorrect power voltage and lack of lubrication.

Power Voltage Variation:

High voltage will cause the motor coils to heat excessively and thus destroy the insulation and dry the lubrication.

Low voltage will cause a lack of power and unstable operation. When servicing the induction disc motor, always check the power line voltage at the socket to which the motor is connected and, if possible, while the motor is running. This voltage should be between 105 and 120 volts A. C.

Lubrication:

It is important that the motor be lubricated at least once every six months with the proper lubricants. A motor lubricating chart is shown on the under side of the motor board.

A light grease should be used on the teeth of the drive gear and spiral. The governor bearings, governor friction sleeve and the upper and lower turntable spindle bearings should be lubricated with oil. For lubricating the governor friction leather use Neat's Foot Oil.

Motor Does Not Operate:

If the motor fails to start, first be sure that it is not binding any place and that the turntable turns freely.

If it turns freely, check the wiring for open circuits with an open test meter.

With the switch closed, test across the contacts of the power plug. A full scale reading should be obtained. If not, this will indicate that the switch is defective or some part of the wiring is broken.

A visual inspection of the switch will show whether or not the trouble is in the switch. For information regarding the adjustments of the switch, see page 7.

If the switch is making good contact, check all wiring carefully for broken wires or loose connections.

If a full scale reading of the meter is obtained when testing across the light socket plug points, check the field coils. To determine which coil is defective, if any, it is necessary to test each coil separately.

Continuity Tests:

To do this, remove all connections from the two terminal strips, one located at each end of the motor. Refer to Figure 5 and take a reading across each coil with an open test meter as follows:

No. to No.	Correct Reading	Incorrect Reading Caused by
1A—1B	Full Scale	Open Upper Coil
2A—2B	Full Scale	Open Lower Coil
1C—1D	Full Scale	Open Upper Coil
2C—2D	Full Scale	Open Lower Coil
B— C	Full Scale	Open Wiring

When replacing coils it is necessary to replace both the upper and lower coils as a unit. The core and coil assembly may be taken off by removing the three screws holding the coils to the frame and top plate.

When the coils are replaced, be sure that the wire terminals marked with the same letter are placed together. That is, 1A, 2A and 3A must be attached to the terminal strip at the point "A", etc. See Figure 5.

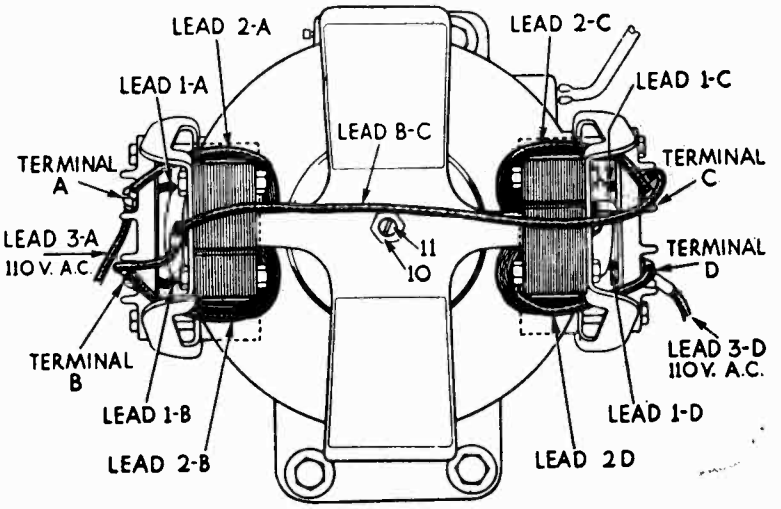


Figure 5

Failure to Maintain Constant Speed:

There are four points to be checked if the motor fails to maintain constant speed.

Hardened or Gummed Lubrication. Examine the moving parts. If necessary, remove them and wash with kerosene. Replace the parts and lubricate them.

Shifting of Motor on Motor Board. In some cases a slight shifting of the motor on the motor board during shipment will cause binding. Loosen the three motor screws, and retighten, alternately, while the motor is running until the binding has been eliminated and the motor runs steadily.

Weak Coils. If the lubrication and mounting of the motor have been examined as described above, and the condition still exists, replace one or both of the motor coils as described under subject "Motor Does Not Operate."

Mechanical Causes. All the points mentioned in subject entitled "Reducing Mechanical Noise" will have a certain effect upon the regulation of speed and should be taken into account even though there is no actual mechanical noise present.

Reducing Hum:

There are a number of causes for hum in the induction disc motor, but in most cases any existing hum can be eliminated by proper adjustment.

Loose Coil Winding on Iron Core. The condition can be corrected by forcing a small wooden wedge between the outside of the coil and the core. It may be necessary to wedge both the upper and lower sections of each coil.

Coil Loose on Top Plate. The three screws holding the coil on the top plate should be tightened securely.

Loose Laminations of Iron Core. The bolts clamping the iron laminations together should be tightened securely. In some cases, however, it may be found that the hum can be minimized by adjusting the tension of these bolts.

COMBINATION MODELS No. 150 & 160

PART 2. INDUCTION DISC MOTOR (Continued)

Motor Not Fastened Securely to Motor Board. Make certain that the nuts holding the motor to the motor board are fastened securely and with equal tension and that the felt washers between the motor and the motor board are not injured.

Motor Not Properly Secured to Cabinet. In many cases motor hum can be eliminated or minimized by adjusting the four screws which hold the motor board to the cabinet. Placing a piece of felt between the motor board and the motor board rail will often help to eliminate hum.

Reducing Mechanical Noise:

There are several features which may cause motor noise other than a hum.

Governor Springs. A noise or rattle may sometimes be caused by loose or broken governor springs. Tighten all the governor spring screws. If this does not stop the noise, loosen the screws on the disc end of the governor springs and allow the motor to run for a minute or so to allow the springs to assume their correct position. Stop the motor and retighten the screws. If any of the springs are broken or badly out of balance, they should be replaced. Removal of the governor can be accomplished by loosening the two governor bearing screws, one at each end of the shaft, and lifting the governor from the frame.

Governor Thrust Bearing The thrust bearing at the disc end of the governor may sometimes cause noise while the motor is running Hold one finger over the end of the bearing and loosen the set screw which holds the bearing in position. Adjust the bearing to the most quiet running position, and retighten the set screw.

Governor Spindle. A bent governor spindle will cause binding in the gears and bearings as well as a noise The bent spindle should be replaced with a new one.

Governor Driving Gear. Remove the turntable spindle as described above and examine the gear for wear. If the wear on the teeth is greater on one side than on the other, the turntable spindle is bent and should be replaced. The gear should also be replaced.

Turntable Spindles and Disc. A bent turntable spindle or a bent or improperly adjusted disc will cause noise. The bent spindle may cause the disc to rub against the iron core of one of the coils as described above. A bent spindle can be detected by placing a pencil flat on the motor board with the point against the spindle. If the pencil point touches the spindle on one side only while the motor is running, the spindle is bent and should be replaced.

Speed Regulation:

The governor will maintain a constant speed of the motor within a range of sudden voltage changes of 15 volts, provided all parts are correctly adjusted.

The speed regulator is adjusted before leaving the factory to that speed which is proper for perfect reproduction, namely 78 revolutions per minute.

However, if this adjustment is altered for any reason it is possible to reset the speed regulator by placing a small piece of white paper on the outer edge of the turntable. By counting the number of times the paper passes a given point per minute, it can be determined whether the speed should be increased or decreased. The motor may be adjusted to the proper speed by turning the speed regulator screw in the direction indicated on the regulator plate.

Removal of Disc:

The motor disc and the governor drive gear are each fastened to the turntable spindle with set screws. When removing the disc loosen the two set screws, and pull the spindle away from the top plate. Care should be observed that the ball bearing on which the lower end of the spindle rests is not lost. When replacing the disc, it will be noted that the spindle is spotted for the governor drive gear and disc set screws, and that these spots are in line with the pin on the turntable spindle

Adjusting Position of Disc:

The disc should be properly aligned between the upper and lower section of each coil so that it does not touch the iron core of either and does not cause binding of the governor gears. In case the disc rubs against the iron, it should be adjusted by means of the spindle adjusting screw 11. See Figure 5, page 5. Loosen the lock nut and turn the screw until the disc is evenly spaced between the upper and lower coils.

PART 3. THE AUTOMATIC SWITCH & BRAKE

Description:

The automatic switch and brake consists of a system of cams and levers operating in such a manner that the movements caused by the eccentric groove at the end of the record trips the switch, forcing a friction leather against the turntable and, at the same time, cutting off the power to the motor.

Servicing:

The switch will ordinarily require no adjustment. In some cases, however, the upper spring shown in Figure 6 may become bent upward far enough to prevent the contacts from coming together when the hand lever is turned.

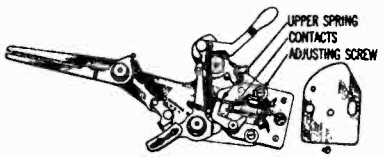


Figure 6

When such a condition is found, bend the upper spring down until the contact points make a firm contact when the hand lever is turned on. When replacing the switch on the brake plate, care should be observed in properly locating the switch on the plate, so that the switch will make and break contact when the hand lever is turned on and off The two adjusting screws can be loosened and the switch moved in the slot until the correct position is located. When the hand lever is in the off position, the contact points should be at least 1/16 inch apart to prevent excessive sparking when the switch is turned off.

Adjustments:

The following adjustments will eliminate a majority of the troubles encountered:

1. Switch Fails to Trip. Bend the lug B (Figure 7) so that there will be less contact at point A

Failure to trip may sometimes be caused by a loose trip arm. Make certain that all screws of this assembly are tight.

2. Switch Trips Before the Completion of a Record. Bend the lug back, so that there will be more contact at point A. (Figure 7.)

Warning: Do not bend the lug too far, as bending too often in opposite directions will snap off the lug

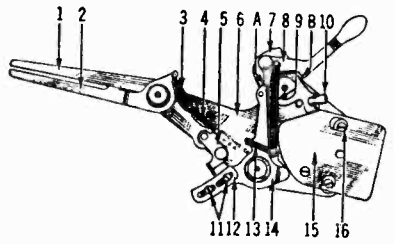


Figure 7

3. The two surfaces at the point A must be square. If they have become worn round, they should be squared with a fine file.

4. If the switch lever 1 swings with the eccentric groove, but the friction lever 2 fails to swing, or swings but slightly, the latch trip 5 is probably caught in a burr on one of the teeth of the latch plate 12. Rub the teeth of the latch plate with a piece of emery cloth, taking off any burrs that may be present.

5. If the latch trip does not engage with the latch plate properly when the tone arm is swung to the starting position, loosen the screw 11, adjust the plate 12 the required amount, and tighten the screws.

Note: The adjusting of the latch plate has nothing to do with the tripping of the latch.

6. If the brake does not stop the turntable soon enough the condition can be remedied by one of the following:

a. Examine the friction leather, making certain it is not worn down too far to make proper contact with the inside rim of the turntable.

b. Increase the tension of the spring 9 (Figure 7) by cutting off one or more of the coils and then replacing the end of the spring over the lug.

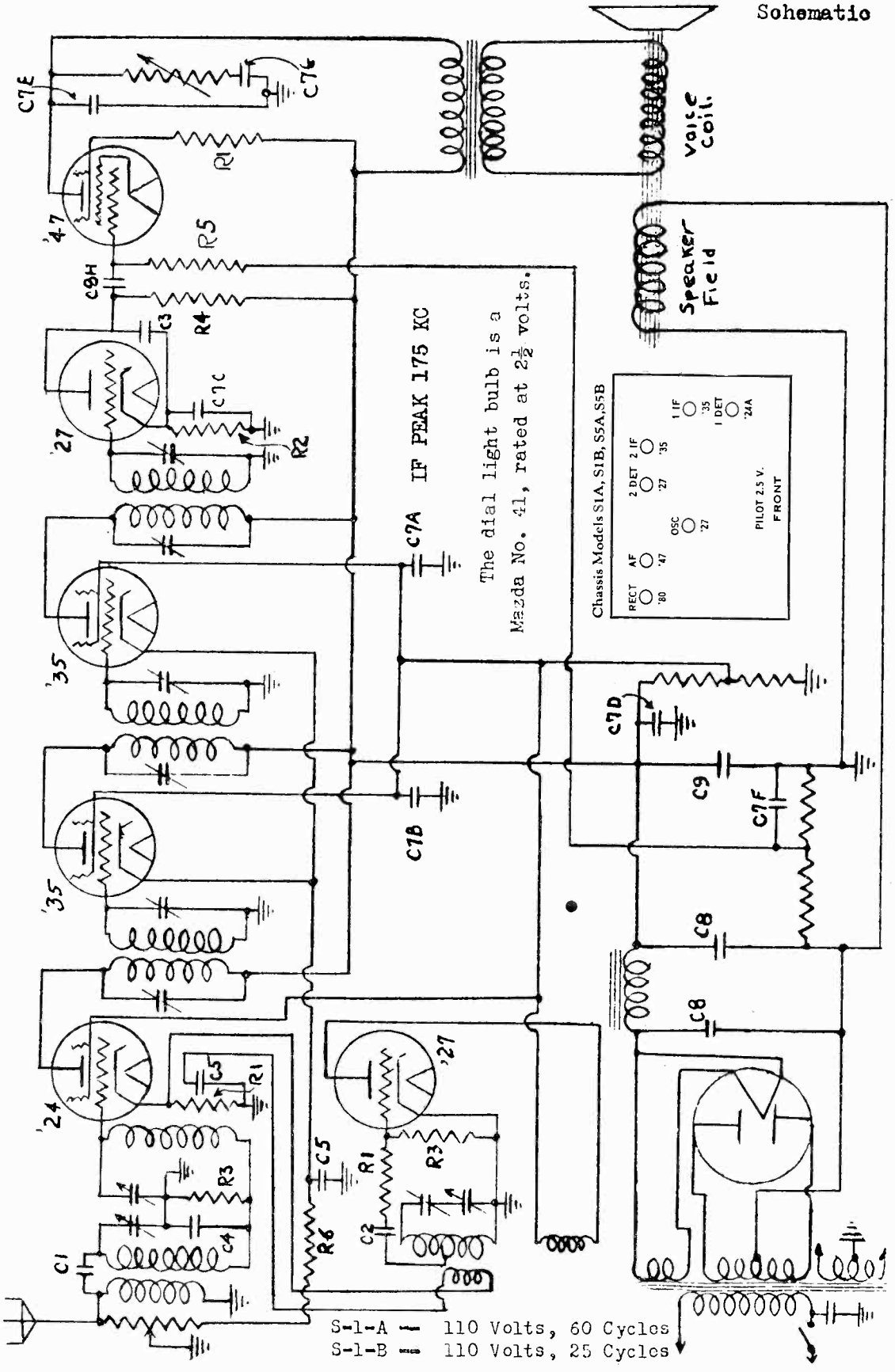
7. If the latch 14 does not strike the lug A when the hand lever is pulled to the ON position:

a. Increase the tension of the spring 13 in the same manner as described above in "B" of 6.

b. Decrease the tension of the spring 4 by stretching the coils if necessary

GENERAL MOTORS RADIO CORP.

MODEL 216, 217
219, 250
(S-1A, S-1B)
Schematic



MODEL 216, 217, 219, 250 SUPERHETERODYNE RECEIVERS. (CHASSIS MODELS S1A & S1B)

MODEL 216,217
219,250
(S-1A, S-1B)
Voltage-Data

GENERAL MOTORS RADIO CORP.

MODEL 216, 217, 219, 250 SUPERHETERODYNE RECEIVERS.

ANTENNA AND GROUND CONNECTIONS

On Models 216, 217 and 219 a special antenna is installed in the cabinet and an antenna and ground terminal strip with three clips is located, on the bottom of the speaker baffle board.

If an outside antenna and ground are used, connect the antenna lead-in wire to the clip marked "A" and the ground wire to the clip marked "G". The jumper wire provided should connect clips marked "G" and "X".

If the local reception special antenna in the cabinet is used, connect the special antenna lead to the clip marked "A". The jumper should connect clips marked "G" and "X".

If the power line is to be used as an antenna, simply connect clips "A" and "X" by means of the jumper. If possible connect a ground wire to clip marked "G".

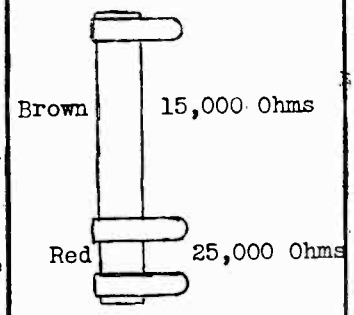
CONDENSERS

NO.	CAPACITY	NO.	CAPACITY	LEAD COLOR
C1	.00001 Mfd.	C7A	.25	Green
C2	.0005 Mfd.	C7B	.25	Green
C3	.002 Mfd.	C7C	.1	Brown
C4	.01 Mfd.	C7D	.25	Terminal
C5	.1-.1 Mfd.	C7E	.006	Red
C6	.1 Mfd.	C7F	.25	Green
		C7G	.03	Blue
		C7H	.03	White-White

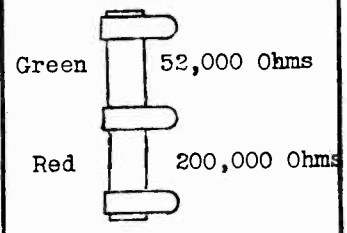
C8 4-4 Mfd. (Electrolytic)
C9 8 Mfd. (Electrolytic)

Condensers C7A to C7H, inclusive, are included in the By-Pass Condenser Pack.

Voltage Divider



Pentode Bias



RESISTORS

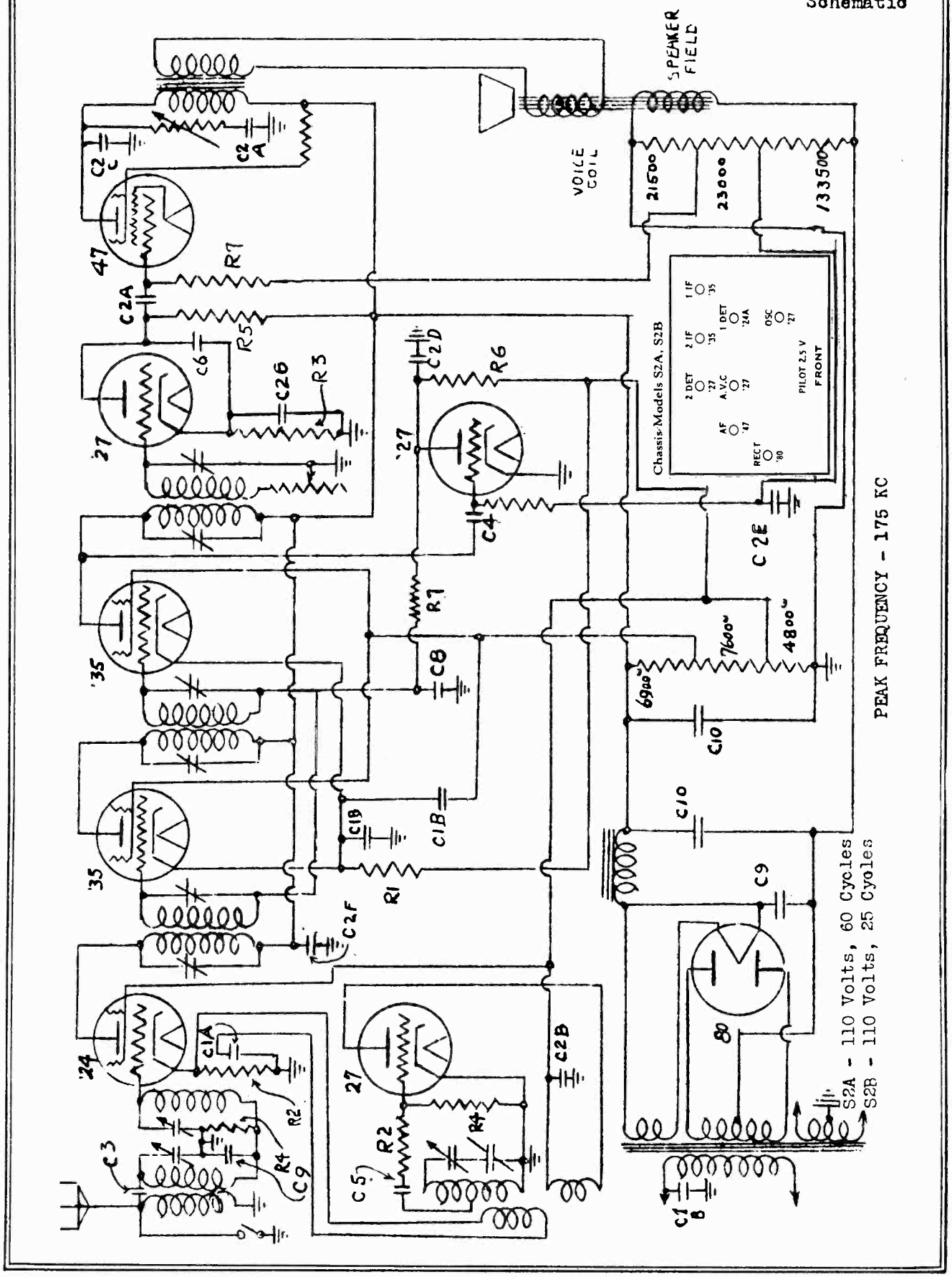
NO.	BODY	END	SPOT	RESISTANCE	WATTS
R1	Yellow	Green	Red	4,500	1/2
R2	Red	Green	Orange	25,000	1/2
R3	Yellow	Black	Orange	40,000	1/2
R4	Brown	Black	Yellow	100,000	1/2
R5	Green	Black	Yellow	500,000	1/2
R6	In Metal Cover			400	

Type of Tube	Position of Tube	Fil. Volts	Plate Volts	Control Grid Volts	Screen Grid Volts	Cathode Volts*	Pentode Screen Volts	Normal Plate M.A.
224	1st Det.	2.1	225	2.0	85	7	--	1
235	1st I.F.	2.1	225	3.3	79	5	--	14
235	2nd I.F.	2.1	225	3.3	75	5	--	13
227	Oscillator	2.15	75	0	--	0	--	5
227	2nd Det.	2.15	125	15.0	--	15	--	1
247	A. F.	2.15	210	1.0	--	--	200	3.5
280	Rect.	4.5	300	--	--	--	--	25-25

Line Volts 110. Volume Control on Full.

MODEL 251
(S-2A, S-2B)
Schematic

GENERAL MOTORS RADIO CORP.



MODEL 251
(S-2A,S-2B)
Voltage-Data

GENERAL MOTORS RADIO CORP.

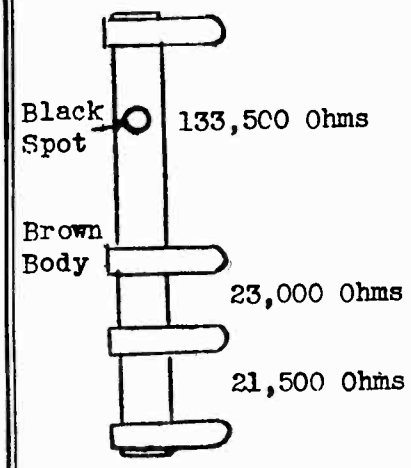
MODEL 251 SUPERHETERODYNE (CHASSIS MODELS S2A & S2B)

Type of Tube	Position of Tube	Fil. Volts	Plate Volts*	Control Grid Volts	Screen Grid Volts	Cathode Volts#	Pentode Screen Volts	Normal Plate MA	Rated Fil. Volts
224	1st Det.	2.1	255	1.9	77	6.0	--	1.0	2.20
235	1st I.F.	2.1	200	.3	100	95.0	--	1.6	2.20
235	2nd I.F.	2.1	200	.3	100	95.0	--	1.6	2.20
227	2nd Det.	2.15	145	.0	--	15.0	--	.5	2.25
227	Osc.	2.15	75	.0	--	0	--	7.0	2.25
227	A.V.C.	2.15	60	.0	--	0	--	.0	2.30
247	A.F.	2.15	235	1.0	--	--	215	30.0	2.30
280	Rect.	4.5	200	--	--	--	--	30-30	4.70

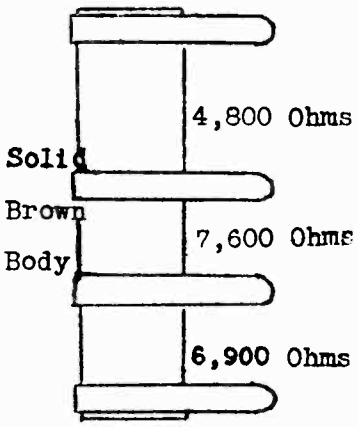
Line Volts 110 Volume on Full

* Use 600 Volt Scale. # Measured from Cathode to Heater.

Pentode Bias



Voltage Divider



No.	Capacity	
C1A	.1 Mfd.	By-Pass Cond. Pack No. 1
C1B	1.0 Mfd.	
C2A	.03 Mfd.	By-Pass Cond. Pack No. 2
C2B	.1 Mfd.	
C2C	.006 Mfd.	
C2D	.25 Mfd.	
C2E	1.0 Mfd.	
C2F	.25 Mfd.	
C2G	.1 Mfd.	
C3	.00001 Mfd.	
C4	.00025 Mfd.	
C5	.00075 Mfd.	
C6	.002 Mfd.	
C7	.01 Mfd.	
C8	1.0 Mfd.	
C9	4.0 Mfd.	(Electrolyt.
C10	8.0 Mfd.	(Electrolyt.

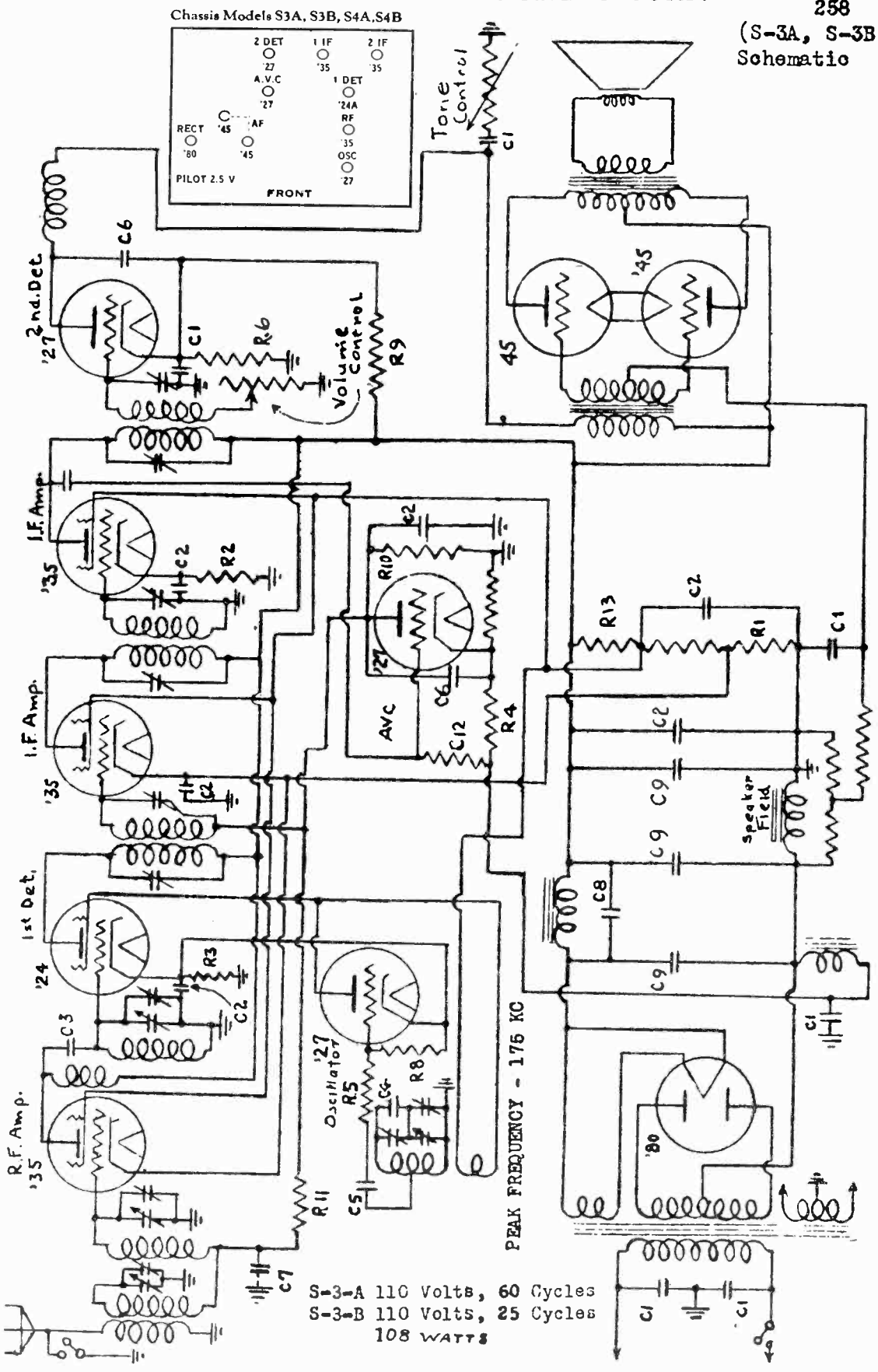
Resistors

No.	Body	End	Spot	Resistance	Watts
R1	Orange	Black	Brown	300	1/2
R2	Yellow	Green	Red	4,500	1/2
R3	Red	Green	Orange	25,000	1/2
R4	Yellow	Black	Orange	40,000	1/2
R5	Brown	Black	Yellow	100,000	1/2
R6	Red	Green	Yellow	250,000	1/2
R7	Green	Black	Yellow	500,000	1/2
R8	Red	Black	Green	2 Megohms	1/2

The dial light bulb is a Mazda No. 41, rated at 2½ volts.

MODEL 252,253,254,
255,256,257,
258
(S-3A, S-3B)
Schematic

GENERAL MOTORS RADIO CORP.



MODEL 252,253,254, 255,256,257, 258
(S-3A, S-3B)
Voltage-Data

GENERAL MOTORS RADIO CORP.

MODELS 252, 253, 254, 255, 256, 257, 258 SUPERHET. RECEIVERS. (CHASSIS MODELS S3A & S3B)

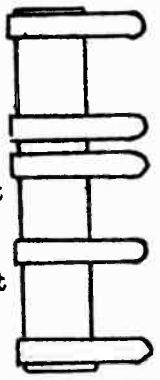
Type of Tube	Position of Tube	Fil. Volts	Plate Volts	Control Grid Volts	Screen Grid Volts	Cathode Volts	Normal Plate M.A.	Grid Change
227	Oscillator	2.1	65	.3	—	7	5	0
235	R. F.	2.1	230	.5	77	2.5	6	3.5
224	1st Det.	2.1	230	5.0	65	5	1	.3
235	1st I.F.	2.1	230	.5	77	3	5	3.5
235	2nd I.F.	2.1	230	5.0	60	10	8	3.5
237	2nd Det.	2.2	205	23.0	—	23	1	4.0
227	A.V.C.	2.2	25	2.5	—	30	0	0
245	A.F.	2.2	230	20.0	—	—	30	35
245	A.F.	2.2	230	20.0		—	30	35
280	Rectifier	4.5	330	—		—	30-30	—

Line Volts, 110 Volume Control on Full

CONDENSERS

No.	CAPACITY
C1	1.0 - 1.0 - .1 - .1 - .1 Mfd.
C2	.5 - .5 - .5 - .1 - .1 - .1 Mfd.
C3	5 Mmfd.
C4	.0007 Mfd.
C5	.00075 Mfd.
C6	.002 Mfd.
C7	.02 Mfd.
C8	.5 Mfd.
C9	8.0 Mfd. (Electrolytic)

245 Bias Resistor



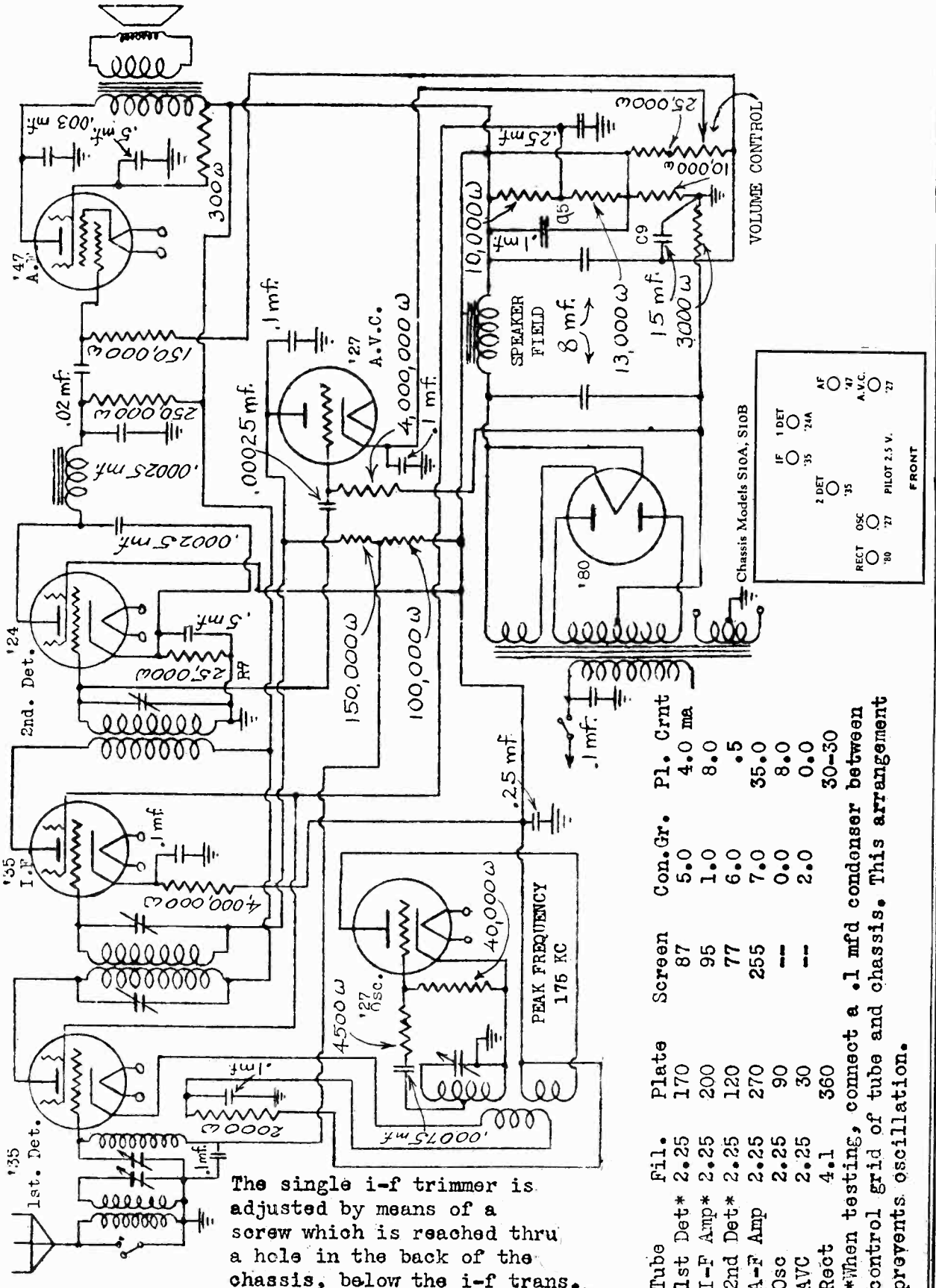
RESISTORS

NO.	BODY	END	SPOT	RESISTANCE	WATTS
R1	Brown	Green	Brown	150	½
R2	Lavender	Green	Brown	750	½
R3		Solid Lavender		1250	½
R4	Green	Black	Orange	50,000	½
R5	Blue	Black	Red	6,000	½
R6	Brown	Black	Orange	10,000	1
R7	Brown	Gray	Orange	18,000	1
R8	Yellow	Black	Orange	40,000	½
R9	Brown	Brown	Yellow	110,000	1
R10	Orange	Black	Yellow	300,000	½
R11	Green	Black	Yellow	500,000	½
R12	Red	Black	Green	2 Megohms	½
R13		Solid Orange		14,550	3

The dial light bulb is a Mazda No. 41, rated at 2½ volts.

MODEL 220
(S-10A, S-10B)
Schematic

GENERAL MOTORS RADIO CORP.



The single i-f trimmer is adjusted by means of a screw which is reached thru a hole in the back of the chassis, below the i-f trans.

Tube	Fil.	Plate	Screen	Con.Gr.	Pl. Crnt
1st Det*	2.25	170	87	5.0	4.0 ma
I-F Amp*	2.25	200	95	1.0	8.0
2nd Det*	2.25	120	77	6.0	.5
A-F Amp	2.25	270	255	7.0	35.0
Osc	2.25	90	--	0.0	8.0
AVC	2.25	30	--	2.0	0.0
Rect	4.1	360			30-30

*When testing, connect a .1 mfd condenser between control grid of tube and chassis. This arrangement prevents oscillation.

MODEL 220
(S-10A,S-10B)
Trimmer Notes

GENERAL MOTORS RADIO CORP.

PEAKING THE I.F. STAGES

CONNECTIONS

(1) Connect the test oscillator to the control grid of the first detector tube, with a fixed .002 Mfd. condenser connected in series between the test oscillator and the grid terminal of the tube. The grid cap and lead must be left in place on the tube. Connect the GND terminals of both the test oscillator and the receiver to a common ground.

NOTE: DO NOT CONNECT TO THE GRID OF ANY OTHER TUBE BECAUSE IT WILL CHANGE THE BIAS VOLTAGE OF THE SET.

If the test oscillator has a dummy antenna which cannot be disconnected, connect a 1 megohm resistor between the test oscillator output terminal and ground.

(2) Remove the 227 oscillator and the 227 A.V.C. tube and plug the dummy oscillator and A.V.C. tubes in their sockets.

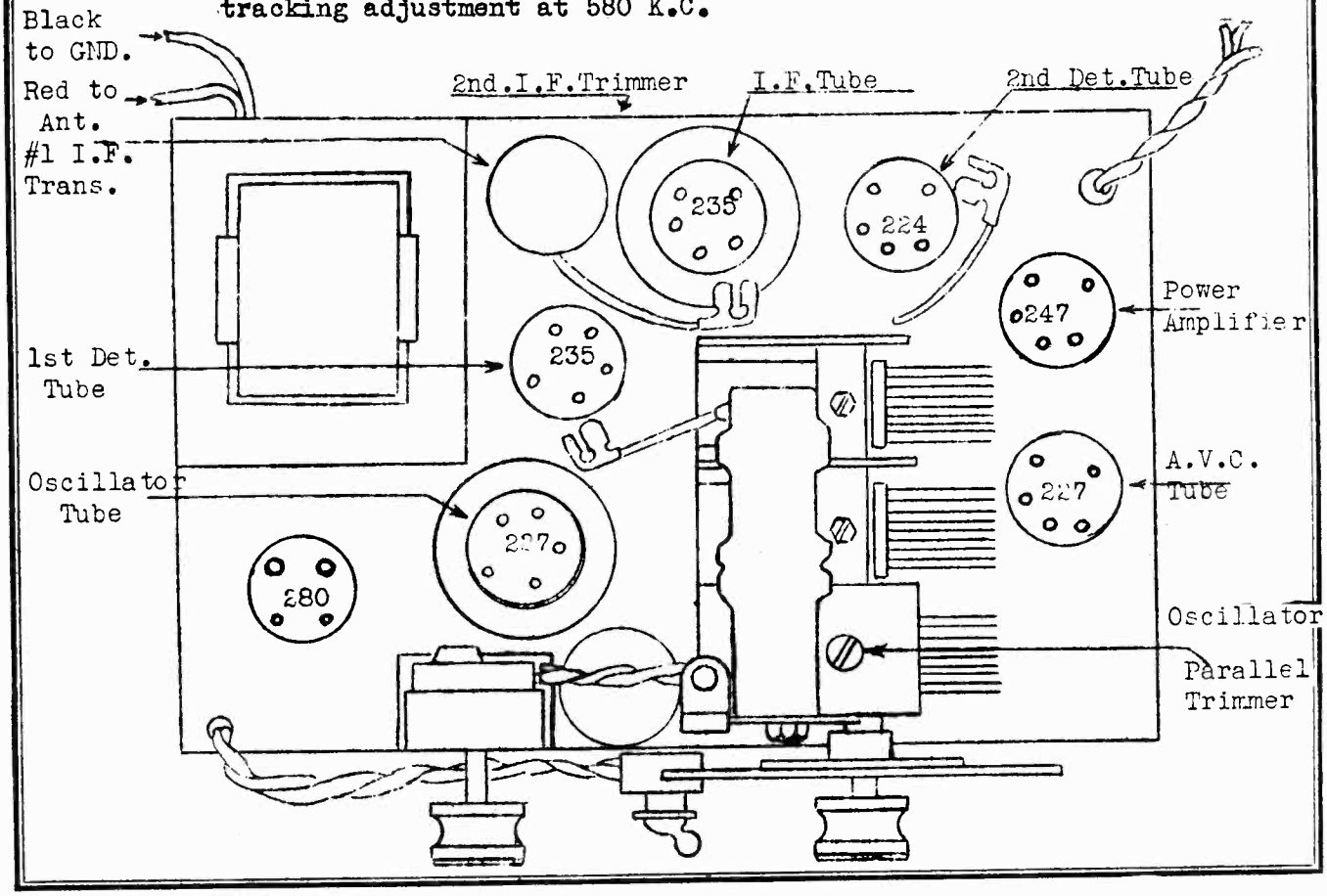
TRACKING PROCEDURE

(1) Feed a signal of exactly 1400 K.C. into the chassis from the test oscillator.

(2) Screw all parallel trimmers down tight and then adjust the oscillator parallel trimmer condenser to obtain a maximum output.

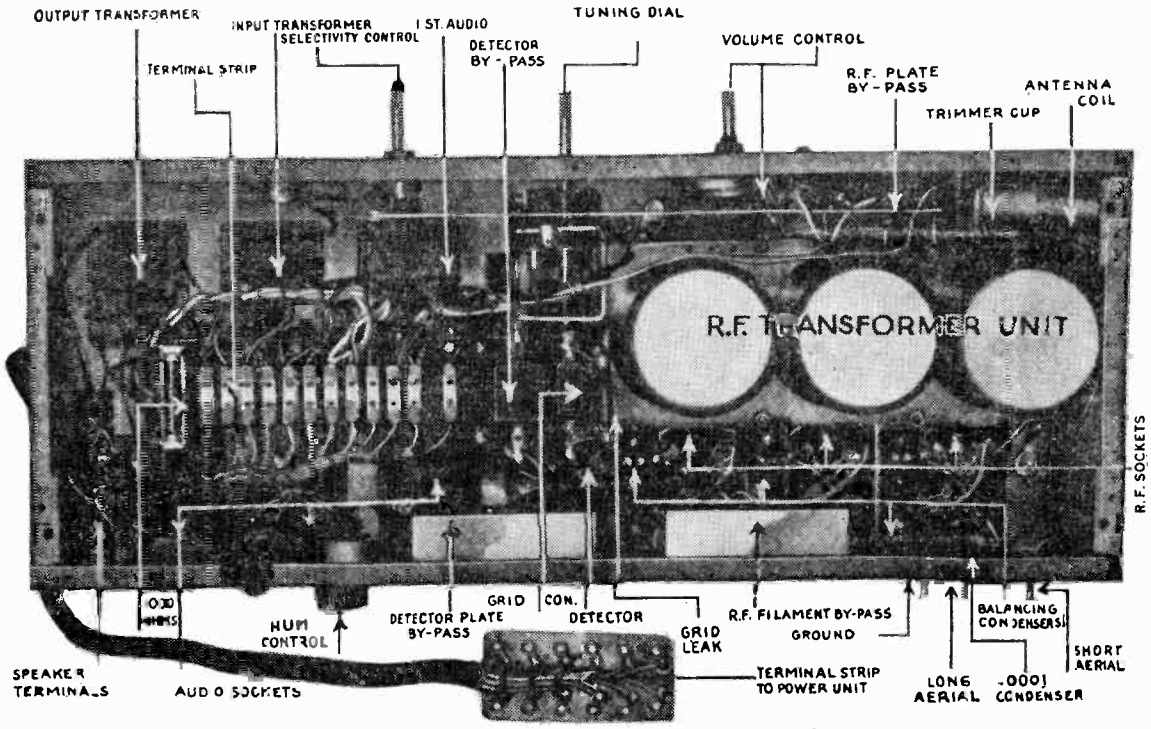
(3) Adjust the remaining parallel trimmer condensers to obtain maximum output.

NOTE: Models S10A or S10B chassis do not employ an oscillator series condenser. It is not necessary to make the tracking adjustment at 580 K.C.

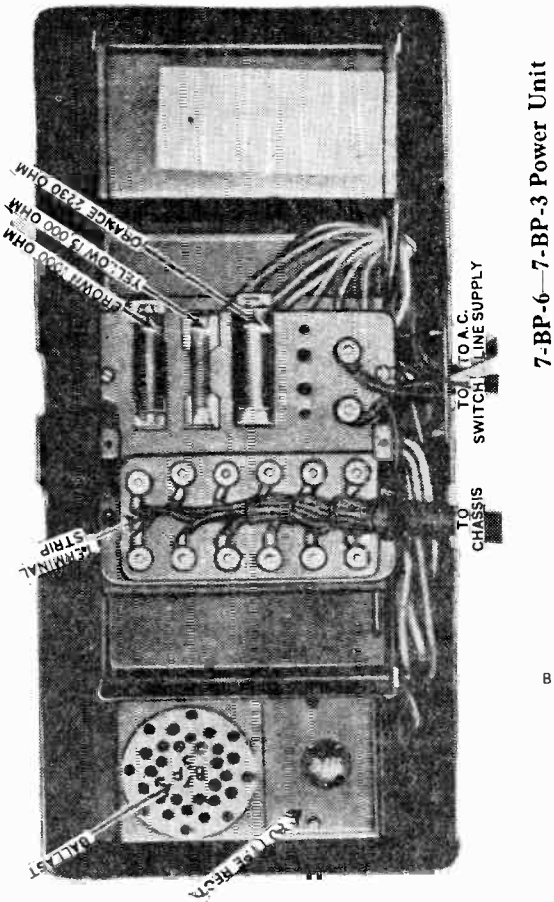


MODEL 70-B
Chassis

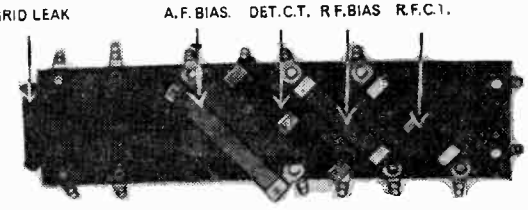
GRIGSBY GRUNOW CO.



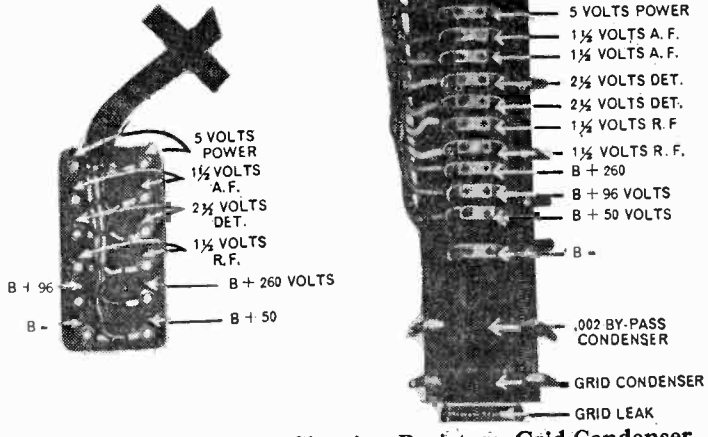
Model 70-B Chassis



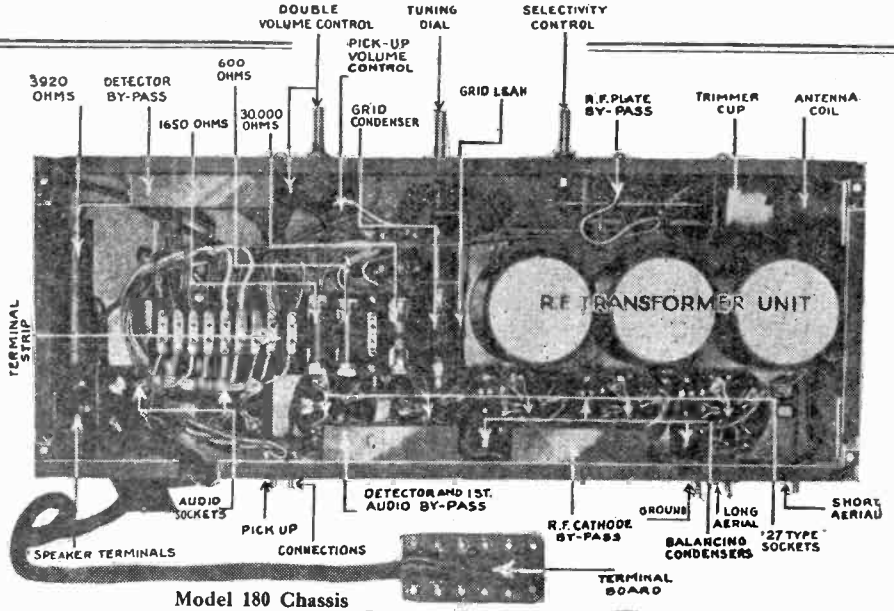
7-BP-6—7-BP-3 Power Unit



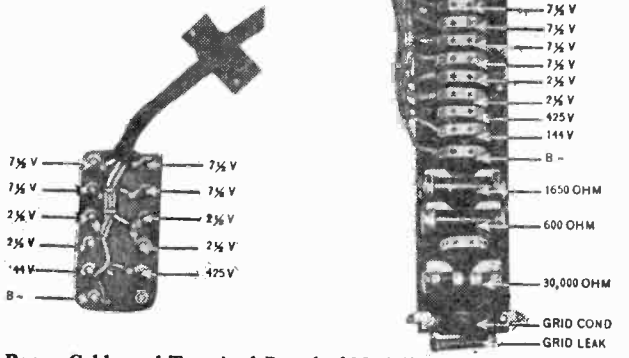
Bottom View of Terminal Board in 70-B Chassis, Showing Resistors Employed



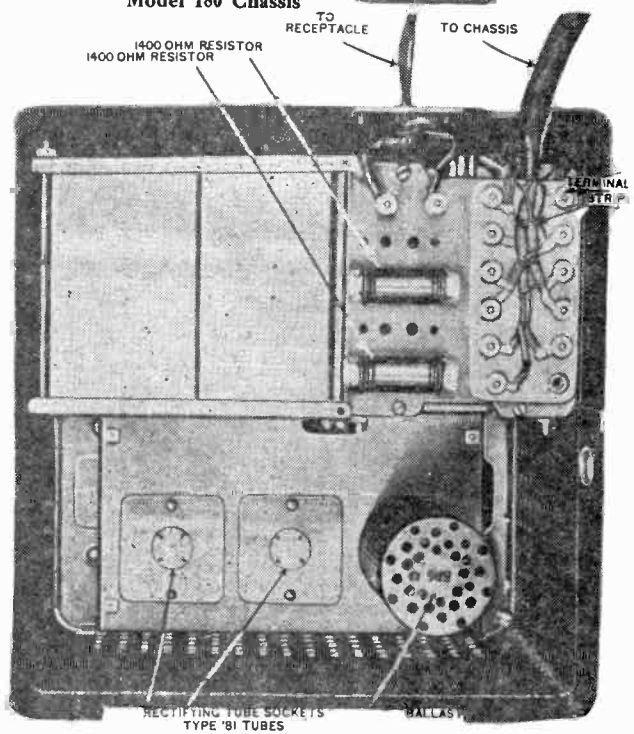
Cable for 70-B Chassis, Showing Resistors, Grid Condenser and Leak, and Voltages at Terminals.



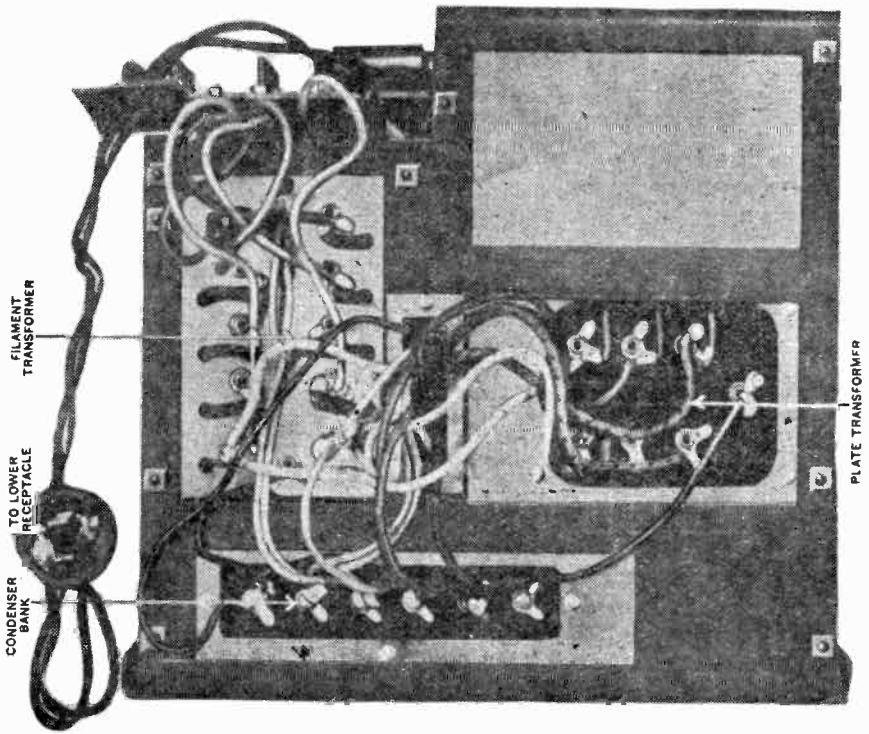
Model 180 Chassis



Power Cable and Terminal Board of Model 180 Chassis, Showing Resistors, Grid Leak and Condenser, and Voltages Supplied.



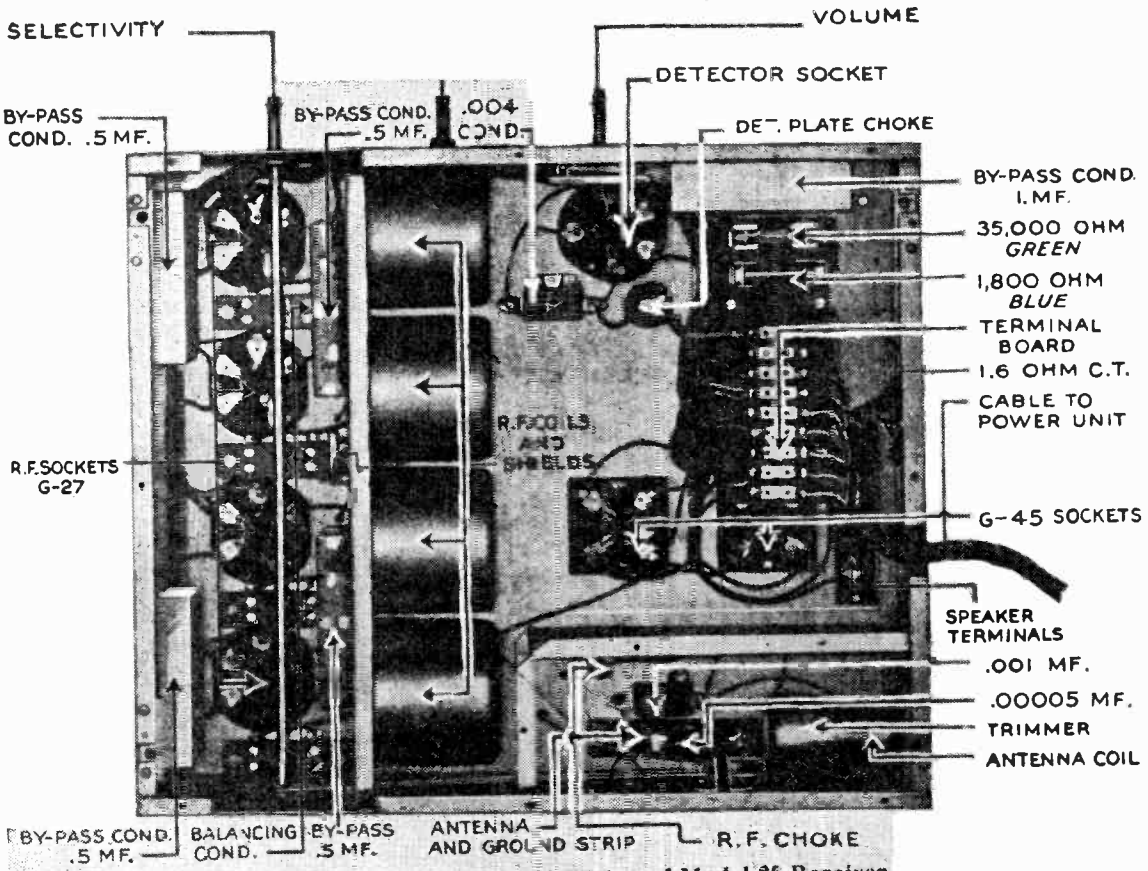
Top View of Model 8-P-6—8-P-3 Power Unit



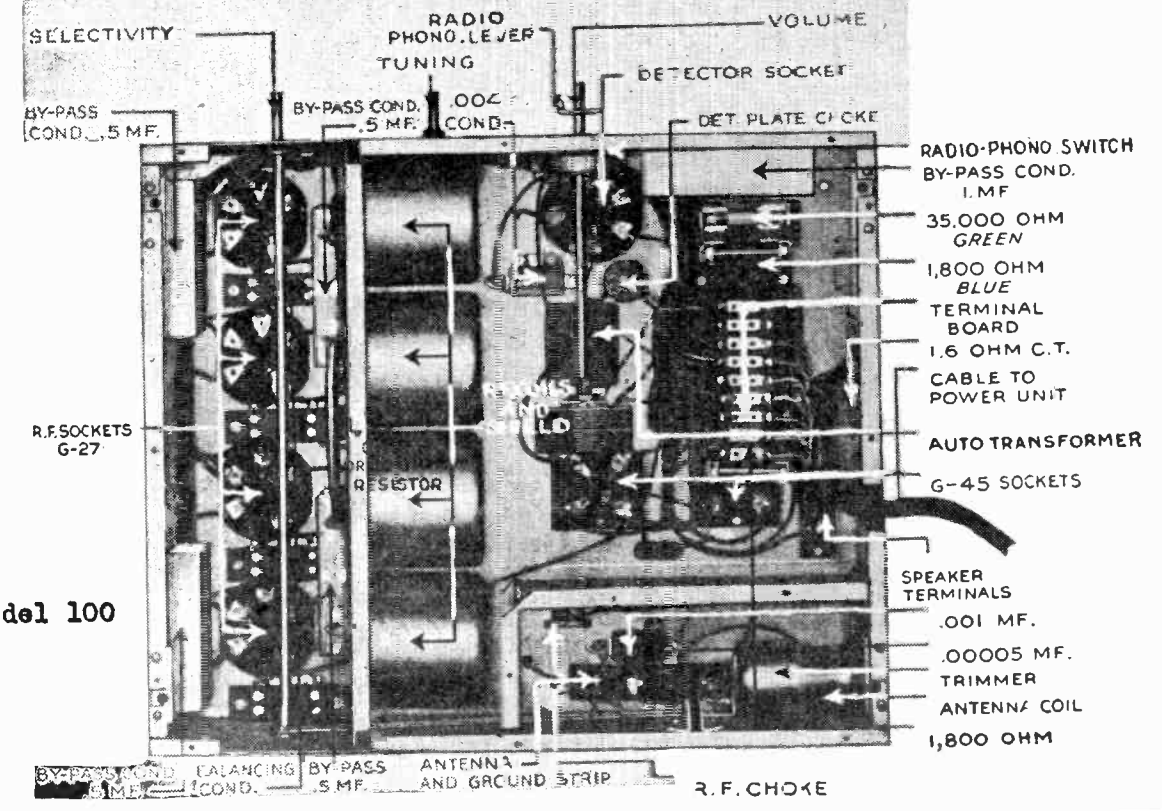
Side View of 8-P-6—8-P-3 Power Unit, Showing Internal Wiring

MODEL 90
MODEL 100
Chassis

GRIGSBY - GRUNOW CO.



Position of Parts, and Wiring of Model 90 Receiver

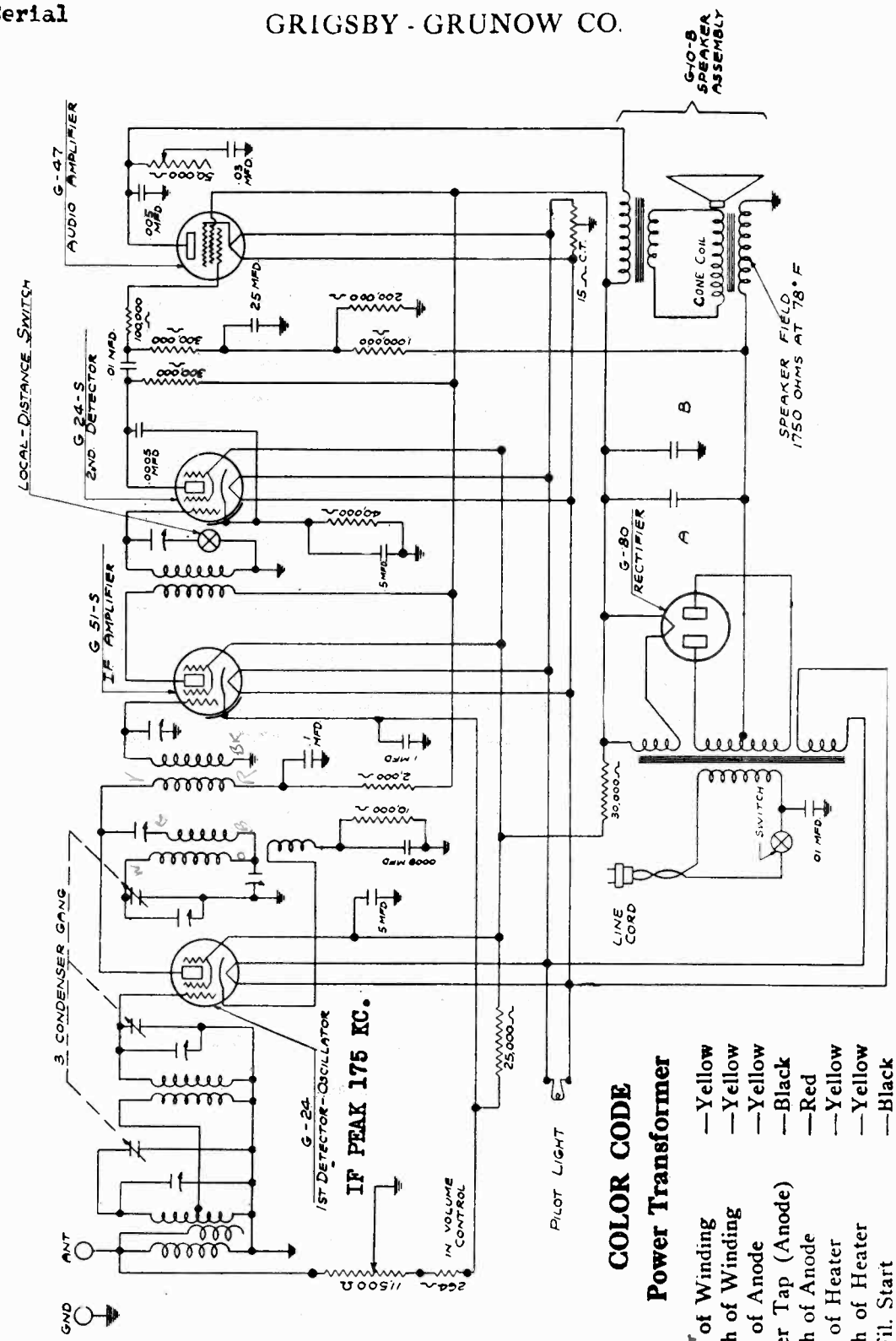


Model 100

MODEL 15
Schematic
Below Serial
65149

GRIGSBY - GRUNOW CO.

SCHEMATIC DIAGRAM OF MAJESTIC SCREEN GRID SUPERHETERODYNE RECEIVER
MODEL 15 (65, 149 INCLUSIVE) CHASSIS 115 AND 230 VOLTS, 25-50 AND 50-60 CYCLES
POWER REQD.—60 WATTS



COLOR CODE

Power Transformer

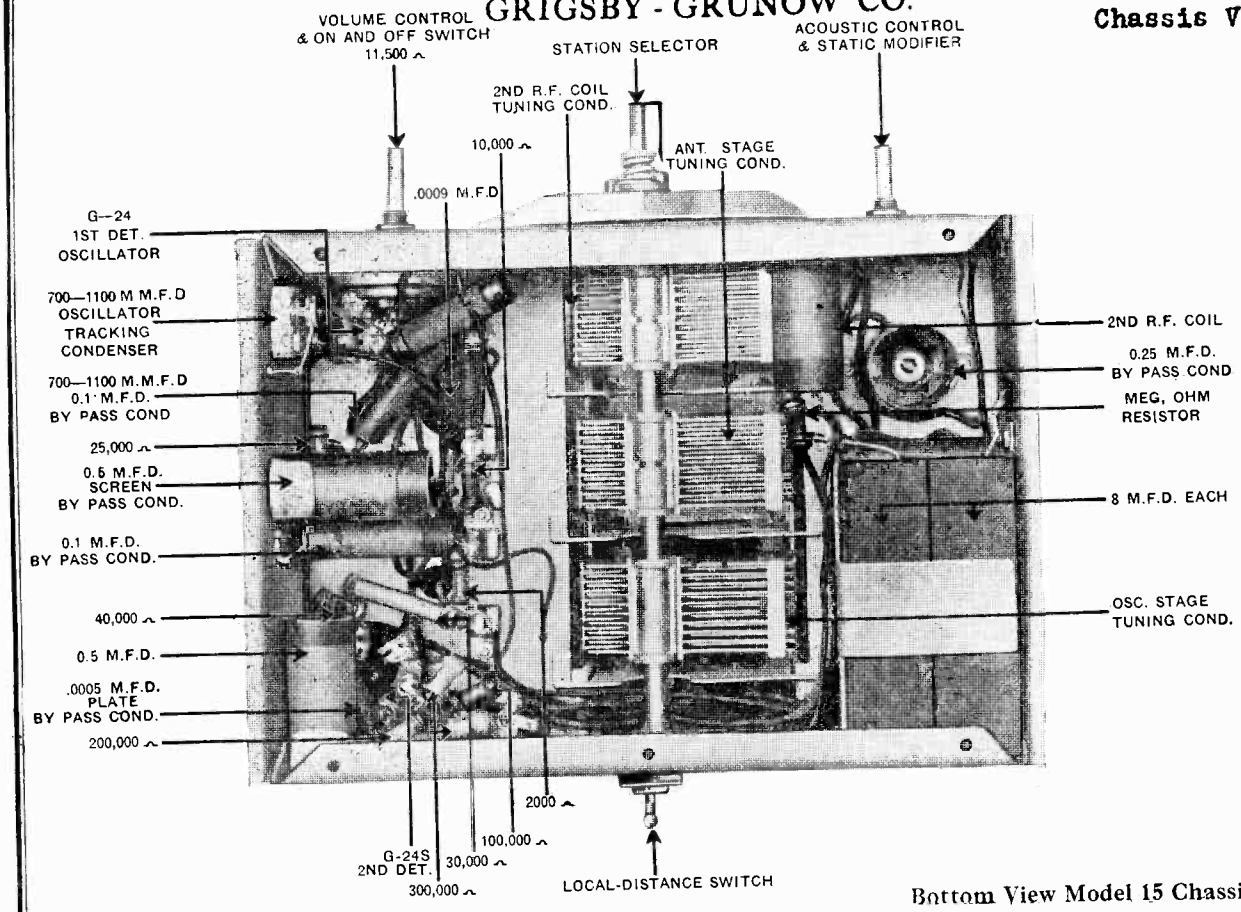
PRI	Start of Winding	—Yellow
	Finish of Winding	—Yellow
	Start of Anode	—Yellow
	Center Tap (Anode)	—Black
	Finish of Anode	—Red
	Start of Heater	—Yellow
	Finish of Heater	—Yellow
280	Fil. Start	—Black
280	Fil. Finish	—Black

MODEL 15 Chassis (up to 65, 149 Incl.) 115-230 V. 25-50 & 50-60 Cycles - 60 Watts.

Model 15 Chassis
Employed in Havenwood, Ellswood and Sherwood Models

GRIGSBY - GRUNOW CO.

MODEL 15
Chassis Views



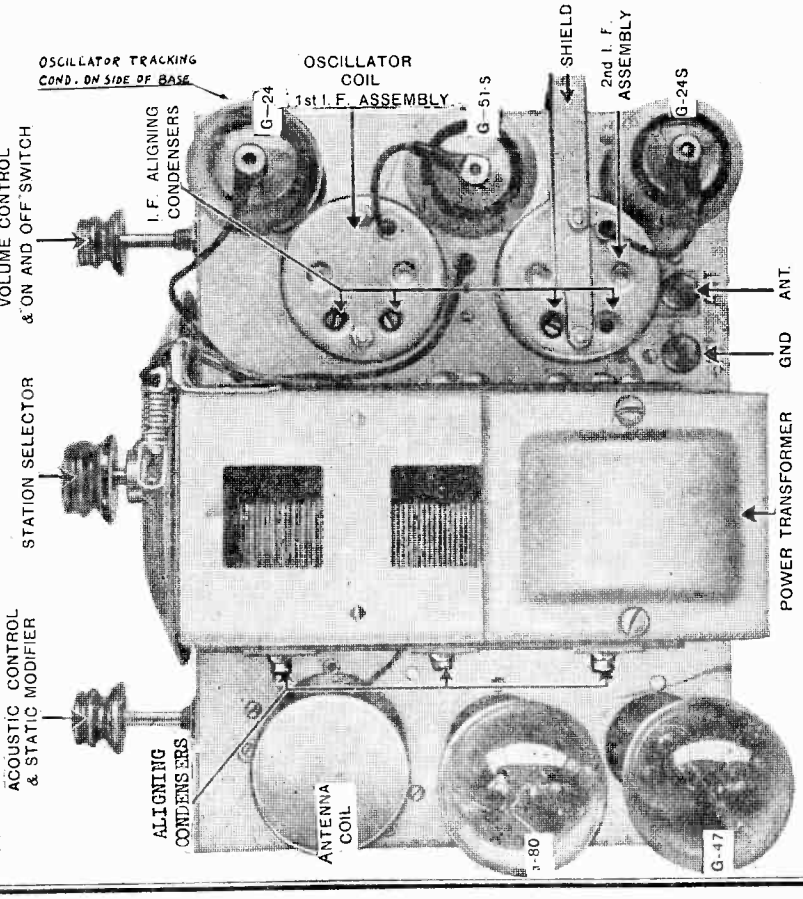
Bottom View Model 15 Chassis

Tube Purpose	Tube Type	Fil. Volts A.C.	Plate Volts D.C.	Grid Volts D.C.	Cathode Volts D.C.	Plate Current M.A.—D.C.	Screen Volts D.C.
1st Det.—Osc.	G-24	2.5	250	.....	9	0.9	90
I. F. Amplifier	G-51-S	2.5	250	.....	3.0**	7.0	90
2nd Detector	G-24-S	2.5	250	-16.5*	9	0.17	90
Power Amplifier	G-47	2.5	250	.....	...	32	250
Rectifier	G-80	5.0	.....	.....	...	54	...

*This cannot be measured with the customary 1000 ohm per volt meter because of the high resistance between the grid and ground. If there is any doubt about the pentode bias, check the 100,000 ohm, 1 megohm, 200,000 and 300,000 ohm resistors and .25 M.F.D. Condenser in this circuit and be sure the speaker field voltage is correct, 112 volts. Also measure the pentode plate and screen voltages and if they are 250 volts, the plate current should be 32 M.A.

**This should rise to 42 when the volume control is turned to minimum.

Table of Voltages to Ground



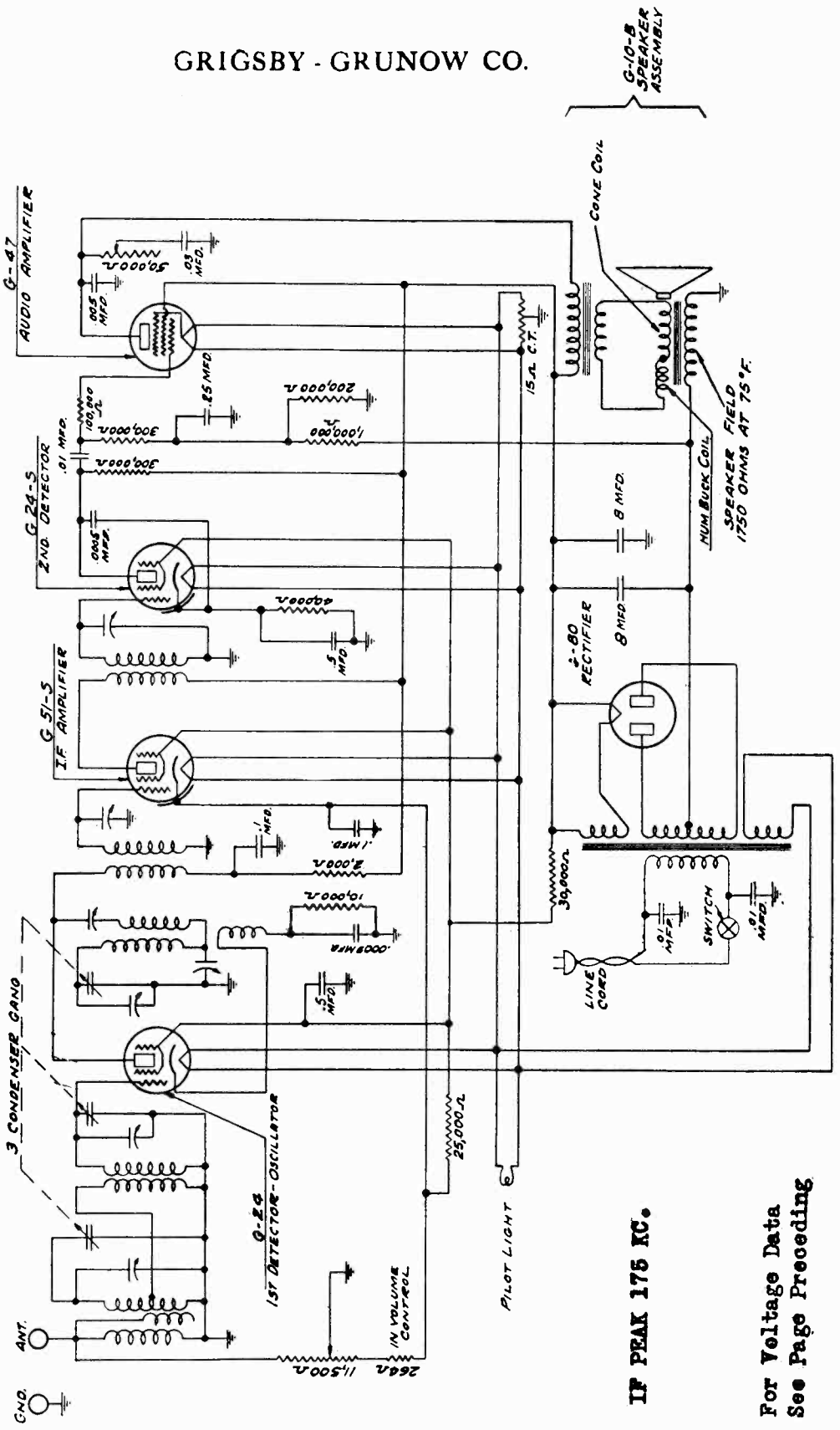
Top View

Model 15 Chassis

MODEL 15,15-B
Schematic
Above Serial
65150

GRIGSBY - GRUNOW CO.

SCHEMATIC DIAGRAM OF MAJESTIC SCREEN GRID SUPERHETERODYNE RECEIVER
MODEL 15 AND 15-B CHASSIS (SERIAL NO. 65,150 AND OVER) 115 AND 230 VOLTS, 25-50 AND 50-60 CYCLES.
POWER REQD.—60 WATTS.



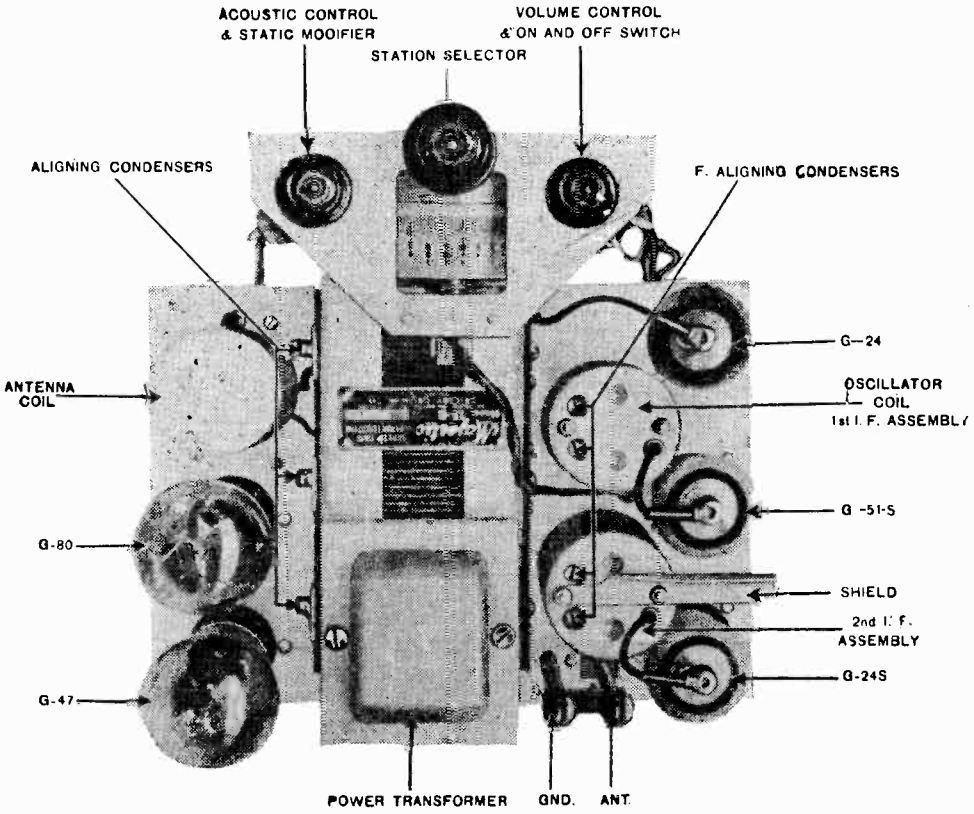
IF PEAK 175 KC.

For Voltage Data
See Page Preceding

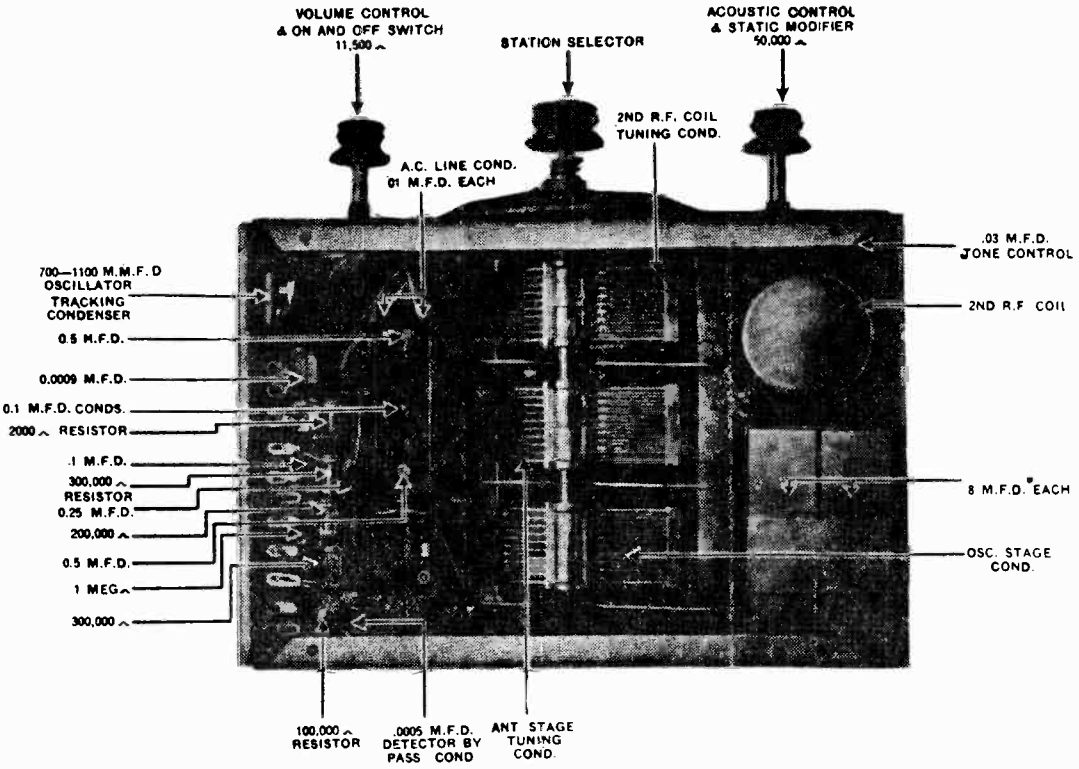
Model 15B Chassis Employed in Fyfewood Model

MODEL 15-B
Chassis Views

GRIGSBY - GRUNOW CO.



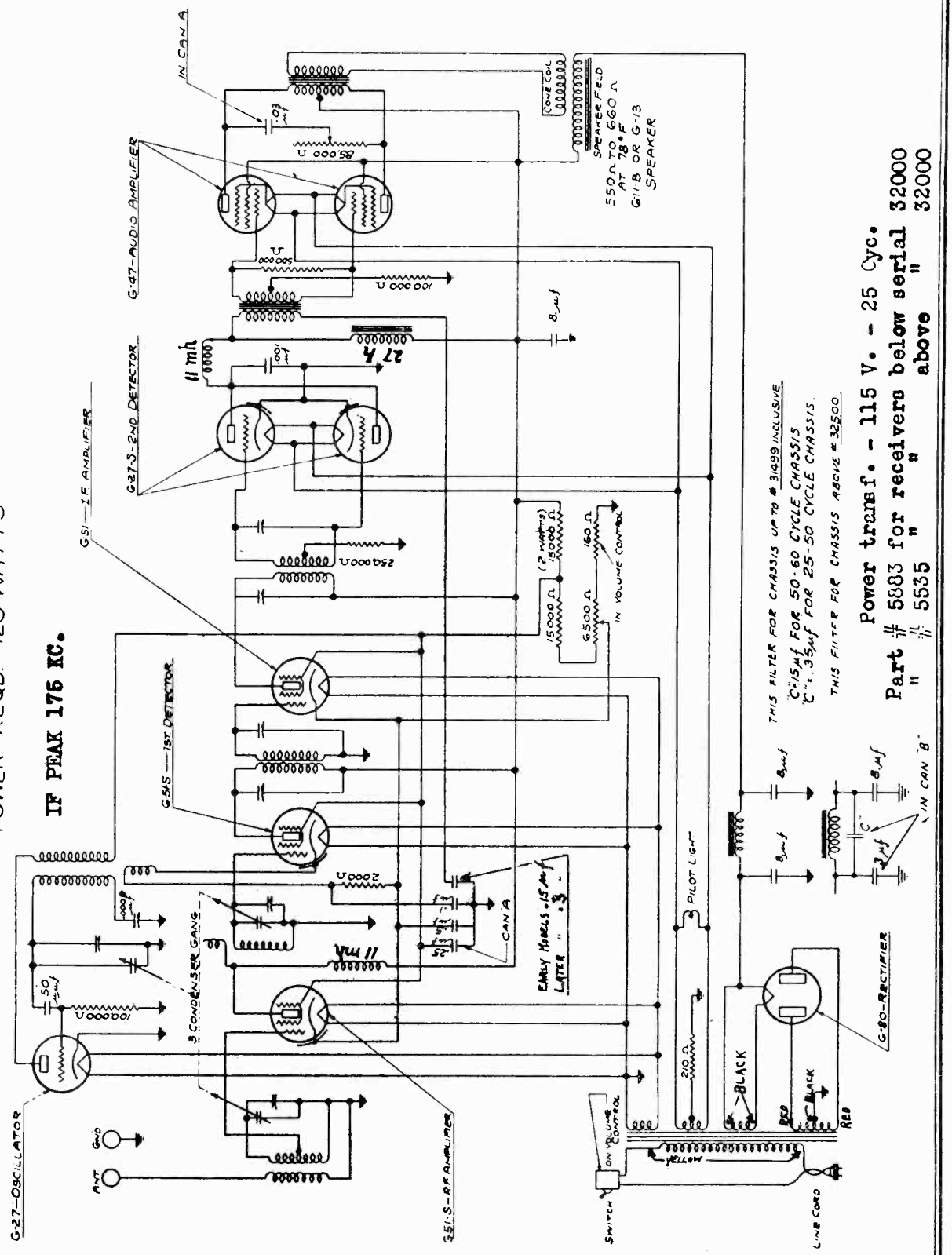
Top View Model 15B Chassis



Bottom View Model 15B Chassis

MODEL 25
Schematic

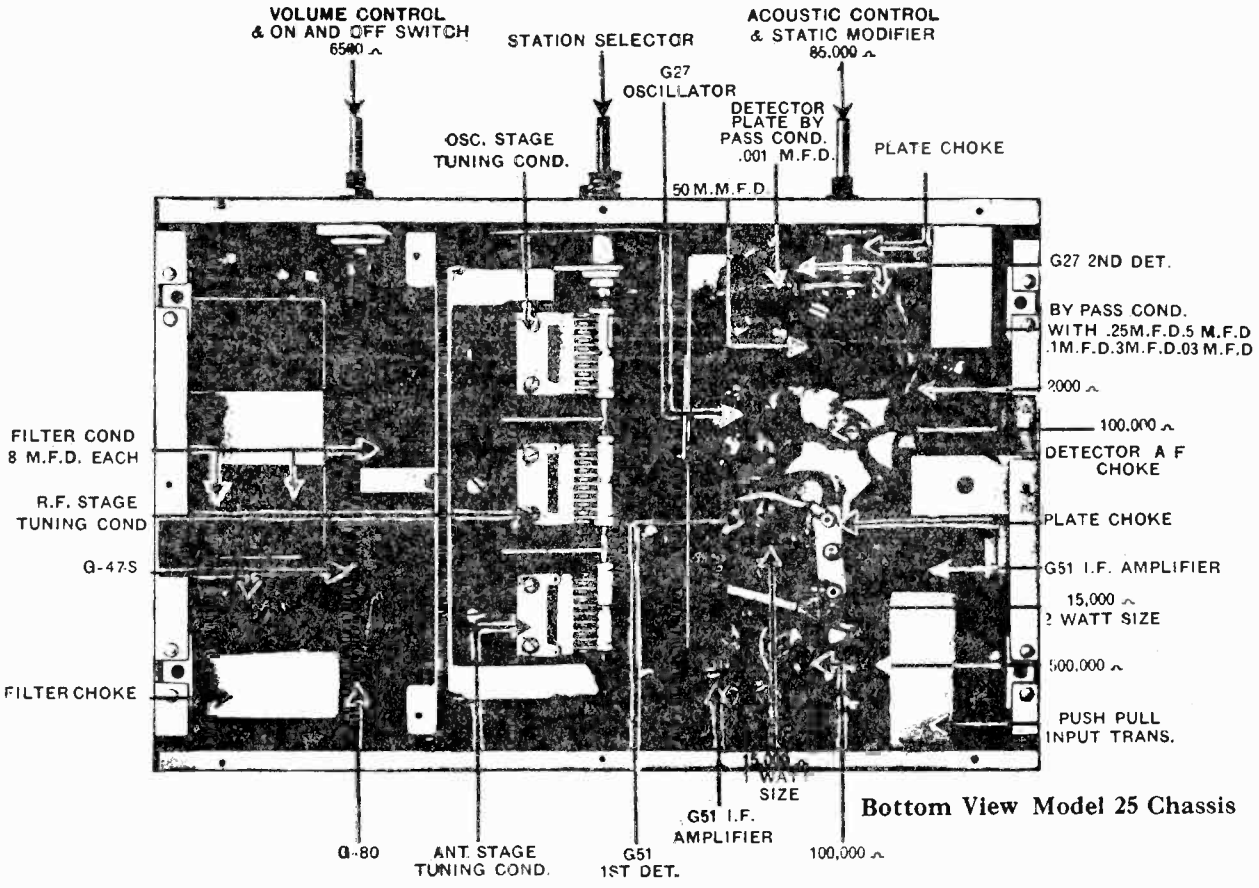
GRIGSBY - GRUNOW CO.



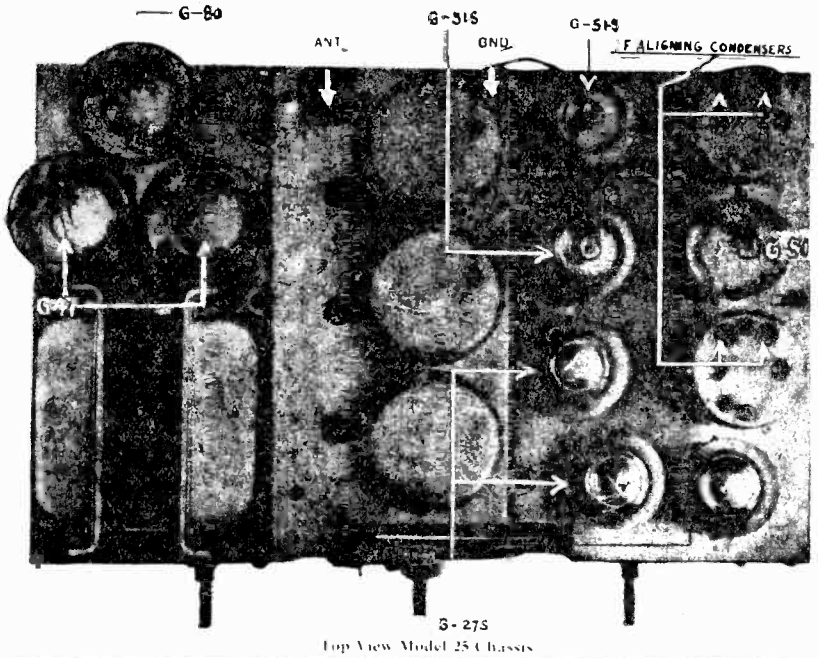
Model 25 Chassis
Employed in Brentwood, Cheltenwood and Brucewood Models

MODEL 25
Chassis Views
Voltage

GRIGSBY - GRUNOW CO.



Bottom View Model 25 Chassis



Top View Model 25 Chassis

Tube Purpose	Type	Fil. Volts A.C.	Plate Volts D.C.	Fil. to Ground D.C.	Cathode Volts	Plate Current M.A. D.C.	Screen Volts
R. F. Amp.	G-51's	2.5	260	—	3.5	5.0	90
1st Det.	G-51's	2.5	260	—	8.0	1.0	90
Osc.	G-27	2.5	90	—	—	3.5	—
I. F.	G-51's	2.5	260	—	3.5	5.5	90
2nd Det.	G-27's	2.5	115	—	—	14	—
2nd Det.	G-27's	2.5	115	—	—	14	—
Power Amp.	G-47	2.5	245	-16.5	—	32	260
Power Amp.	G-47	2.5	245	16.5	—	32	260
Rectifier	G-80	5	400	—	—	120 (Total)	—

D. C. First Condenser 385 Volts
D. C. Second Condenser 180 Volts
Line Voltage 115 Volts

Speaker Field 70 Volts

Volume Control—Maximum

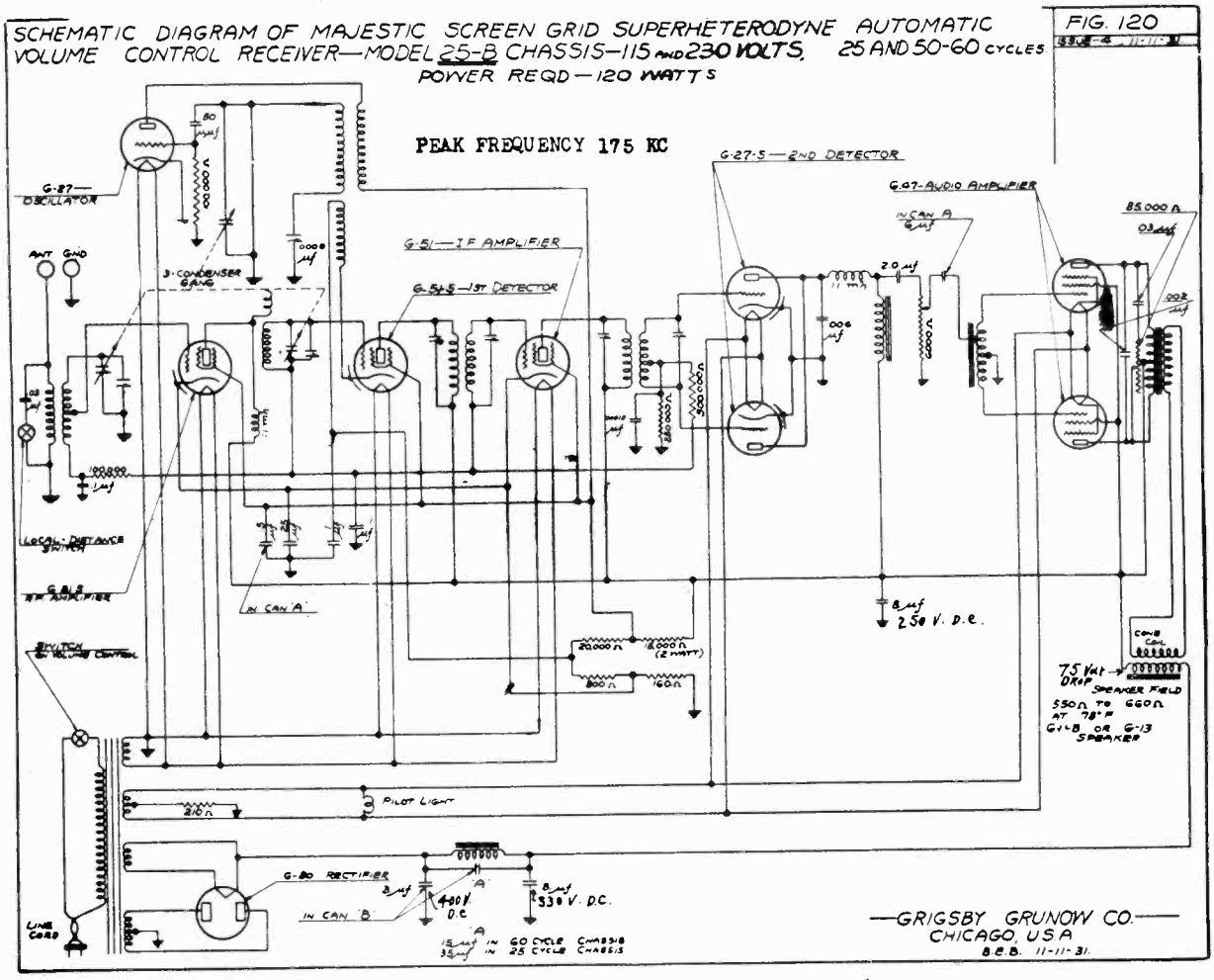
Table of Voltages to Ground
Model 25

MODEL 25-B
251,253,254
Schematic

GRIGSBY - GRUNOW CO.

MAJESTIC MODEL 25-B CHASSIS

RECEIVER MODELS CHELTENWOOD (251)- BRENTWOOD (253)- BRUCEWOOD (254)



The audio system is tuned to give full bass response as low as forty cycles, also an image rejector circuit is used in the pre-selector to reduce image response.

Power Supply System

The power supply system on the Model 25B Chassis consists of a power transformer, G80 rectifier, filter choke (tuned) speaker field 3 mfd. paper condenser and two 8 mfd. electrolytic condensers.

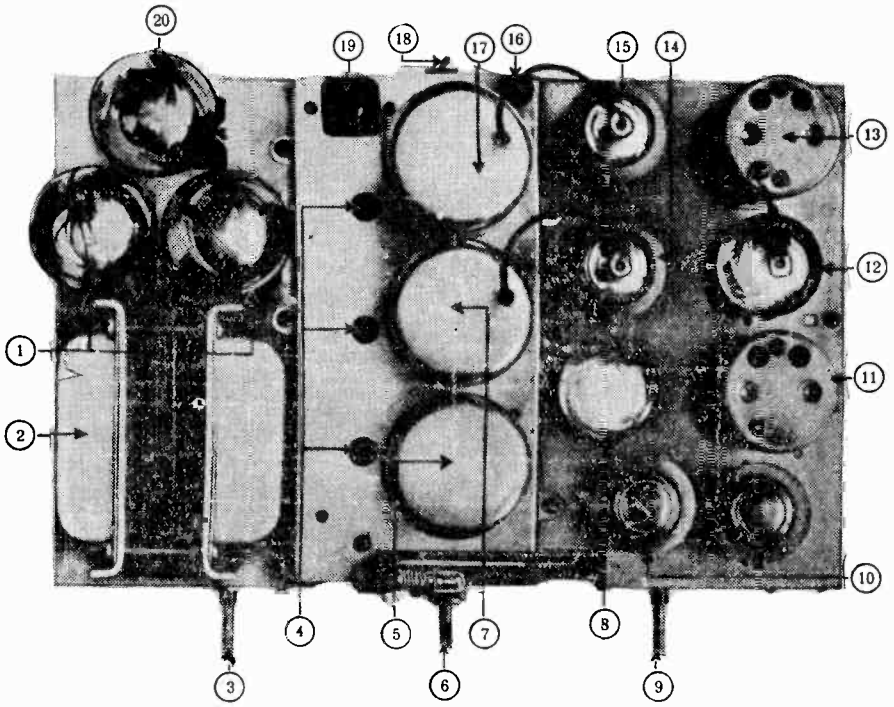
Color Code for Model 25-B Power Transformer

Start of Primary	Yellow	Center Tap No. 1 Heater	Red
Finish of Primary	Yellow	Finish of No. 1 Heater	Black
Start of Anode	Red	Start of No. 2 Heater	Yellow
Center Tap (Anode)	Black	Finish of No. 2 Heater	Yellow
Finish of Anode	Red	Start 5 v. Fil.	Black
Start of No. 1 Heater	Black	Finish 5 v. Fil.	Black

MODEL 25-B				Line 115 Volts		Vol. Contr. Max.		
TUBE	CIRCUIT	FIL.	PLATE	F.to GRID.	CATH.	CURRENT	S.G.VOLTS	S.G.CURRENT
G-51-S	R.F.Amp.	2.5	260	.....	3	4.2	90	1.2
G-51-S	1st Det.	2.5	260	.....	7	1.3	90	.4
G-27	Osc.	2.5	90	.....	....	3.5	.....	.....
G-51-S	I.F.	2.5	260	.....	3	5.	90	1.6
G-27-S	2nd Det.	2.5	135	16	....	14.	.....	.....
G-27-S	2nd Det.	2.5	135	16	....	14.	.....	.....
G-47	Power	2.5	250	16	....	30.	250	7.2
G-47	Power	2.5	250	16	....	30.	250	7.2
G-80	Rect.	5.	....	400	....	120 Total	.....	.....

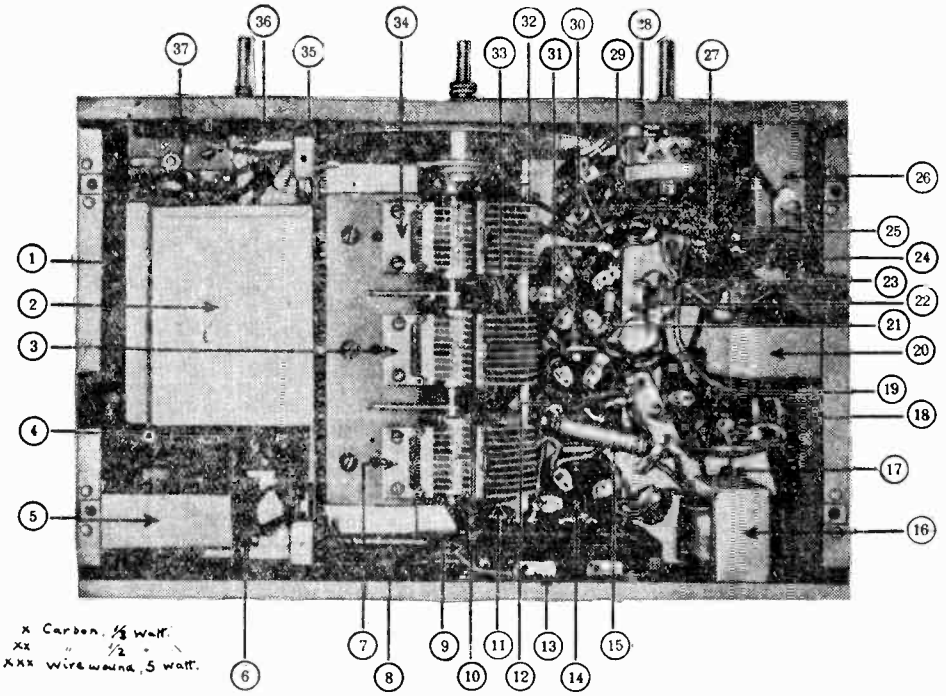
MODEL 25-B
251, 253, 254
Chassis Views

GRIGSBY - GRUNOW CO.



Top View of Model 25B Chassis

1. G47 Pentode Audio Amplifier Tubes
2. Power Transformer
3. Tone Control
4. Aligning Condensers
5. Oscillator Coil
6. Tuning Control
7. R. F. Coil
8. G27 Oscillator Tube
9. Volume Control and Line On-Off Switch
10. G-27-S Second Detector Tubes
11. 2nd I. F. Transformer
12. G-51 I. F. Amplifier Tube
13. First I. F. Transformer
14. G-51-S 1st Detector Tube
15. G-51-S R. F. Amplifier Tube
16. Ground Post
17. Antenna Coil
18. Local-Distance Switch
19. Antenna Post
20. G-80 Rectifier Tube



x Carbon, 1/8 watt.
xx " 1/2 " "
xxx wire wound, 5 watt.

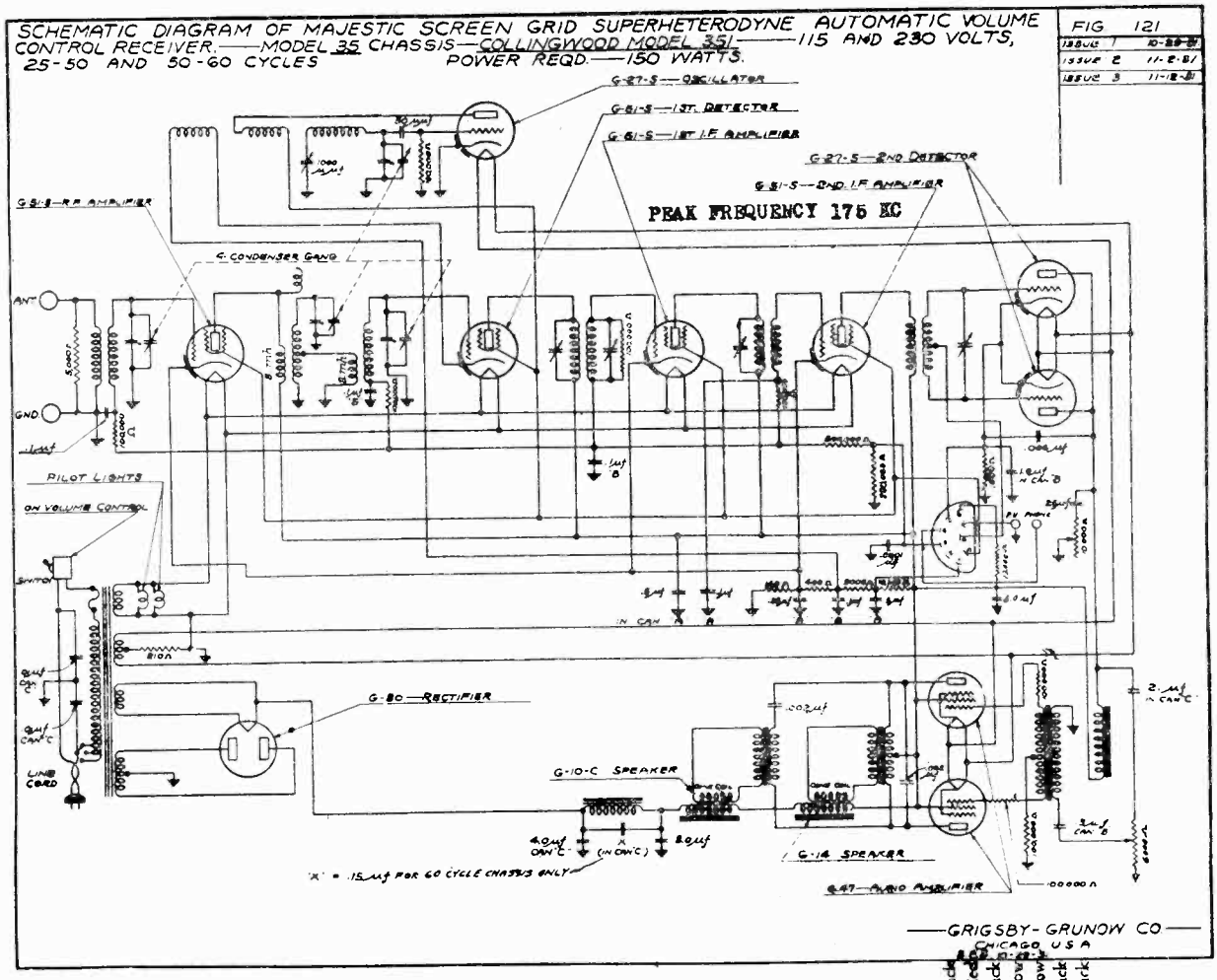
Bottom View of Model 25B Chassis

1. 8 mfd. Cond. (2)
2. 3 mfd. and .15 mfd. Cond.
3. R. F. Stage Tuning Cond.
4. G-47 P.P. Audio Sockets
5. Filter Choke
6. G-80 Rectifier Socket
7. Ant. Stage Tuning Cond.
8. .03 mfd. Local-Distance Cond. (Cartridge)
9. Local-Distance Switch
10. 100,000 Ohm Resistor x
11. .1 mfd. Cond. (Cartridge)
12. G-51-S First Det. Socket
13. "Can C" Cond. Assembly
14. G-51-S R. F. Amplifier Socket
15. 15,000 Ohm Resistor xx
16. Push-Pull Input Choke
17. 160 Ohm Resistor x
18. R. F. Choke
19. G-51-S I. F. Amplifier
20. Det. Plate A. F. Choke
21. 100,000 Ohm Resistor x
22. 250,000 Ohm Resistor x
23. 500,000 Ohm Resistor x
24. 800 Ohm Resistor x
25. 20,000 Ohm Resistor xx
26. "Can A" Cond. Assembly
27. .00015 mfd. Mica Cond.
28. Volume Control and Line Switch
29. .006 Mfd. Mica Cond.
30. G-27-S 2nd Det. Sockets
31. G27 Oscillator Socket
32. .00005 mfd. Mica Cond.
33. .1 mfd. Cond.
34. Oscillator Stage Tuning Cond.
35. Oscillator Tracking Cond.
36. Tone Control
37. .03 mfd. Tone Control Cond.

MODEL 35
351,353
Schematic

GRIGSBY - GRUNOW CO.

MODEL 35 CHASSIS
RECEIVER MODELS ABBEYWOOD (353) and COLLINGWOOD (351)



Radio-Phonograph Switch

Both the COLLINGWOOD and ABBEYWOOD Models have a radio-phonograph switch which is located below the central control or station selector. This switch is turned to the right for radio operation and to the left for phonograph operation. There are pick-up terminals on the Model 35 chassis employed in both these sets, although the COLLINGWOOD Model is not a combination receiver. There should always be a jumper across the pickup terminals when the pickup is not attached.

Power Supply System

The power supply system of the Model 35 chassis consists of a power transformer, G-80 rectifier, a filter choke which is tuned to hum frequency, a 4 mfd. paper condenser, and two 8 mfd. electrolytic condensers. The condenser employed across the filter choke is a .15 mfd. for sixty cycle operation, and a .35 mfd. for twenty-five cycle operation. The output from this filter section passes through the fields of both dynamic speakers which act as additional chokes to the filter circuit.

MODEL 35		Line 115 Volts						
TUBE	CIRCUIT	FIL.	PLATE	F.to GRND.	CATH.	CURRENT	S.G.VOLTS	S.G.CURRENT
G-51-S	R.F.Amp.	2.5	265	.....	4	5	90	0.5
G-51-S	1st Det.	2.5	265	.....	8	1	90	0.5
G-27	Osc.	2.5	90	.....	...	4	.....	.....
H-51-S	1st I.F.	2.5	265	.....	4	5	90	0.5
G-51-S	2nd I.F.	2.5	265	.....	4	5	90	0.5
G-27-S	2nd Det.	2.5	115	.....	...	12	.....	.....
G-27-S	2nd Det.	2.5	115	.....	...	12	.....	.....
G-47	Power	2.5	250	16.5	...	32	260	7
G-47	Power	2.5	250	16.5	...	32	260	7
G-80	Rect.	5.0	...	.....	...	130 Total	.....	.....

Color Code for Model 35 Power Transformer

Start of No. 1 Heater	Black	Start of Primary	Black
Center Tap No. 1 Heater	Red	1st Tap of Primary	Green
Finish of No. 1 Heater	Black	2nd Tap of Primary	Yellow
Start of No. 2 Heater	Yellow	Finish of Primary	Blue
Finish of No. 2 Heater	Yellow	Start of Anode	Red
Start G-80 Filament	Black	Center Tap (Anode)	Black
Finish G-80 Filament	Black	Finish of Anode	Red

MODEL 25-B
MODEL 35
Alignment

GRIGSBY - GRUNOW CO.

Technical Data
Models 25B and 35 Chassis

Procedure for Alignment

WARNING: The Power Line shall never be connected to the receiver until the speaker and tubes are connected in the receiver.

The receiver shall be aligned with the volume control set at maximum and input reduced to keep output below 1 watt.

1. Supply 175 K.C. on 1st detector grid and adjust all I.F. tuning condensers to give maximum sensitivity.
2. Set dial at 1500 K.C. and line up all radio frequency circuits on 1500 K.C. signal for maximum output.
3. Set dial at 550 K.C. and adjust oscillator tracking condenser for maximum sensitivity with 550 K.C. feeding into the set. For each adjustment of the oscillator tracking condenser, there will be a different dial setting for maximum sensitivity. The combination of tracking condenser adjustment and dial setting which gives maximum sensitivity, disregarding calibration is the correct adjustment. If this adjustment falls within 5 K.C. of the 550 K.C. calibration point, readjust trimmers at 1500 K.C. and check dial calibration at 1000 K.C.

Each Receiver Must Be Aligned for Maximum Sensitivity. Check volume control throughout its range for noise, open or short circuit and irregularity of control operation. Check acoustic control over entire range for noise, open, short circuit and operation.

Automatic Volume Control System

The manual control is a 6,000 ohm potentiometer between second detectors and output tubes, operating entirely independent of the automatic control.

Automatic control is accomplished by applying the second detector grid bias on the R.F., Detector and I. F Stages to control their amplification, and by the inherent control of audio amplification in the second detector stage, due to the same bias.

Sensitivity

In cases where low sensitivity is encountered, the first step taken to remedy the condition, should be to check the G51S Tubes, which may be drawing abnormal grid current. This procedure should always be taken prior to any attempt to remedy by aligning the condenser gang.

Method of Biasing

The necessary bias obtained on the R. F., First Detector and I. F. is obtained from a bleeder circuit. The Oscillator is self-biasing with grid current drop across the 100,000 ohm grid resistor. The second detectors are self-biasing from a grid current drop across the 250,000 ohm grid resistor. The pentodes are also self-biasing by the 110 ohm wire-wound resistor in the filament circuit.

"Off" and "On" Line Switch

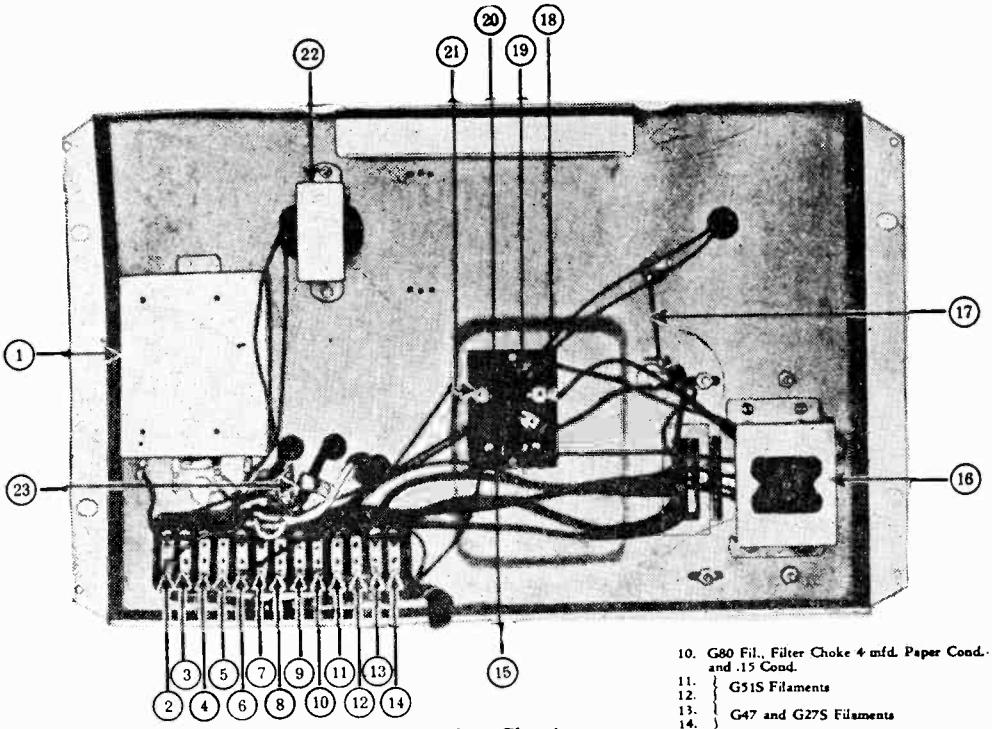
The "Off" and "On" Line Switch is attached to the volume control shaft. Turning the volume control completely to the left shuts the receiver off. The first fifteen degrees rotation of the control to the right will turn the receiver on. The balance of rotation to the right controls the volume of the receiver.

1. 3rd I. F. Transformer Alignment
2. G27S Push-Pull Detector Tubes
3. Phonograph Pickup Connections
4. G47 Pentode Tubes
5. Gang Aligning Condensers
6. G27S Oscillator Tube
7. G80 Rectifier Tube
8. G51S R. F. Tube
9. 2nd I. F. Transformer
10. G51S 2nd I. F. Tube
11. 1st I. F. Transformer
12. G51S 1st I. F. Tube
13. G51S 1st Detector Tube
14. Volume Control On-Off Line Switch
15. Station Selector
16. Acoustic Control

Top View of Model 35 Chassis

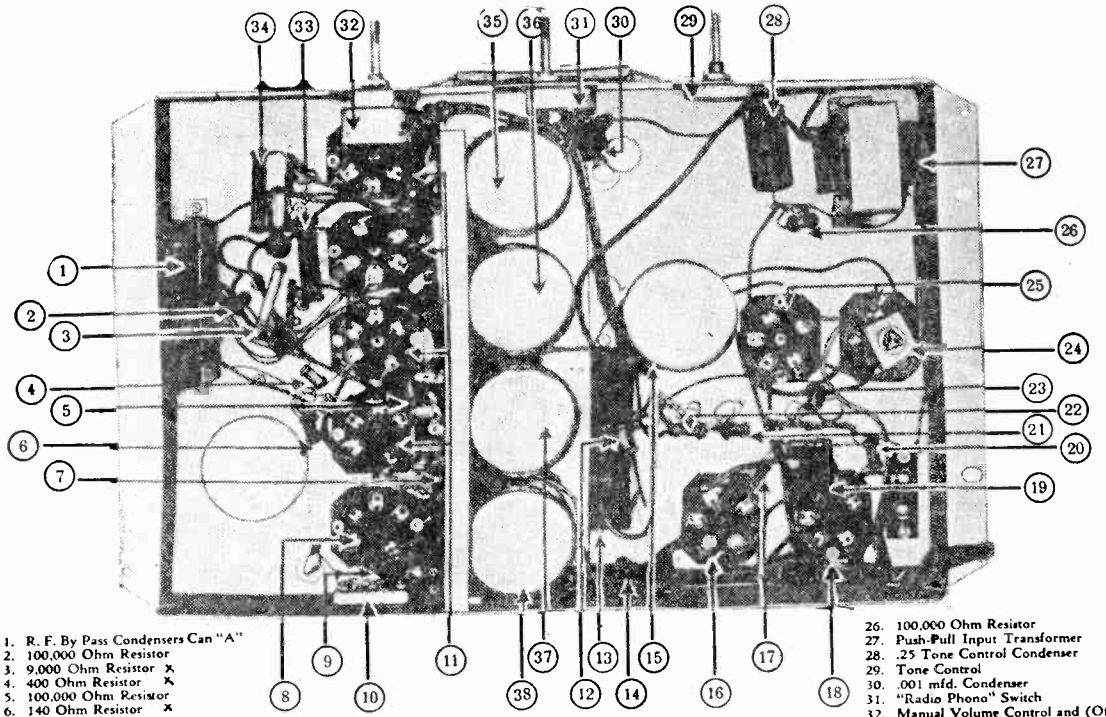
MODEL 35
351,353
Chassis Views

GRIGSBY - GRUNOW CO.



View Showing Power Supply Circuit of Model 35 Chassis

1. 2—8 mfd. Electrolytic Condensers
2. 285 V. to G47 Screens, 8 mfd. Electrolytic Cond. Det. Audio Choke and G14 Speaker Field
3. 2 mfd. Cond. Det. Audio Choke and Second Det. Plates
4. 2 mfd. Cond. and Volume Control
5. 110 V. Line Cord—On and Off Switch and .01 Cond.
6. 110 V. Line Cord—Primary Switch and .01 Cond.
7. G47 Plate and Input to Speakers
8. G47 Plate and Input to Speakers
9. Power Filter Choke G-10C Speaker Field, .15 Cond. and 8 mfd. Electrolytic Cond.
10. G80 Fil., Filter Choke 4 mfd. Paper Cond. and .15 Cond.
11. } G51S Filaments
12. }
13. } G47 and G27S Filaments
14. }
15. Fuse
16. G80 Rectifier Socket
17. 210 Ohm Resistor
18. 125 V. Primary Tap
19. 115 V. Primary Tap
20. 105 V. Primary Tap
21. Line
22. Audio Frequency Choke
23. Junction G10C—G14 Speaker Fields



Interior View of Model 35 Chassis

1. R. F. By Pass Condensers Can "A"
2. 100,000 Ohm Resistor
3. 9,000 Ohm Resistor ½
4. 400 Ohm Resistor ½
5. 100,000 Ohm Resistor
6. 140 Ohm Resistor ½
7. .1 mfd. Condenser
8. G27S Oscillator Tube Socket
9. 100,000 Ohm Resistor
10. Oscillator Tracking Condenser
11. G51S Tube Sockets
12. 100,000 Ohm Resistor
13. R. F. By Pass Condenser Can "B"
14. 5000 Ohm Resistor ½
15. 3rd I. F. Transformer
16. } G47S Tube Sockets
18. }
17. 100,000 Ohm Resistor
19. .002 mfd. Condenser (Mica)
20. 100,000 Ohm Resistor
21. 250,000 Ohm Resistor ½ (½ Carbon)
22. 500,000 Ohm Resistor ½
23. 1000 Ohm Resistor ½
24. .006 mfd. Condenser (Mica)
25. G27S Push-Pull Detector Sockets
26. 100,000 Ohm Resistor
27. Push-Pull Input Transformer
28. .25 Tone Control Condenser
29. Tone Control
30. .001 mfd. Condenser
31. "Radio Phono" Switch
32. Manual Volume Control and (Off and On) Line Switch
33. 10,000 Ohm Resistor } wire
34. 13,000 Ohm Resistor } wound
35. Link R. F. Coil
36. R. F. Coil
37. Antenna Coil
38. Oscillator Coil

MODEL 25-B
MODEL 35
Speaker Conn.

GRIGSBY - GRUNOW CO.

MAJESTIC CHASSIS MODELS 25-B and 35

CHASSIS 25-B	
DYNAMIC SPEAKER	
MODEL	G-10-C
" "	G-13-B
	G-14
	G-14-B
CHASSIS 35	
DYNAMIC SPEAKER	
MODEL	G-11-B
"	G-13

G-10-C Speaker
COLLINGWOOD Model

1 Primary Plate Lead Terminal
2 .002 Cond. Plate Terminal
3 Speaker Field Terminals
4 Voice Coil & Secondary Junct.
5 Primary & .002 Cond. Junction

G-14 Speaker
COLLINGWOOD Model

1 Voice Coil & Output Sec. Junct.
2 Field Coil & Primary Tap Junct.
3 Primary Plate Lead Terminals
Field Coil Terminal

G-14-B Speaker
ABBEYWOOD Model

1 Output Sec. & Voice Coil of G-14-B & G-13-B Junction
2 Voice Coil of G-13-B & Output Secondary Junction
3 Voice Coil of G-14-B & Output Secondary Junction
4 Field Coil & Primary Tap Junct.
5 Primary Plate Lead Terminals
6 Field Coil Terminals

G-13-B Speaker
ABBEYWOOD Model

1 Voice Coil & Output Sec. Junct.
2 Field Coil Terminals

Models G-10-C, G-13-B, G-14 and G-14-B Dynamic Speakers Employed in Models Collingwood and Abbeywood

Both the COLLINGWOOD and ABBEYWOOD Models are equipped with twin speakers. The COLLINGWOOD Model employs the G-10-C, a small dynamic speaker (field resistance 200 ohms) for the high notes and the G-14, a large dynamic speaker (field resistance 750 ohms) for the low notes. The ABBEYWOOD Model employs the G-13-B dynamic speaker (field resistance 300 ohms) for the high notes and the G-14-B dynamic speaker (field resistance 550 ohms) for the low notes. The voice coil of the G-14-B is excited by one-half of the secondary of the output transformer which is located in the base of the speaker, and the voice coil of the G-13-B is excited by the other one-half of the same secondary. These speakers operating simultaneously produce an almost flat audio frequency response curve that gives these receivers a truly faithful reproduction.

G-13 Speaker
BRENTWOOD and BRUCEWOOD Models

1 Field Coil Terminal
2 Voice Coil & Output Sec. Junct.
3 Field Coil & Primary Tap Junct.
4 Primary Plate Lead Terminals

G-11-B Speaker
CHELTENWOOD Model

1 Primary Plate Lead Terminals
2 Field Coil Terminal
3 Voice Coil & Output Secondary Junct.
4 Field Coil & Primary Tap Junction

Models G-11-B and G-13 Dynamic Speakers Employed in Models Cheltenwood, Brentwood and Brucewood

The Models G-11-B and G-13 Dynamic Speakers have a field resistance of 570 ohms at 78° F. The G-11-B Speaker which is employed in the Cheltenwood Model, has a field structure of heavy "U" construction, and a 9.5" paper weight cone which responds readily to the slightest excitation. The output transformer with its terminal board is rigidly fastened to the cone housing. The G-13 speaker, which is employed in the Brentwood and Brucewood Models, has a field structure of heavy "U" construction mounted on a 6" base which is also used as a case for the output transformer. The 12" cone is a special made paper weight cone which responds readily to the slightest excitation.

Instructions for Care and Operation of Automatic Record Changer Employed in the Majestic Model 353 Receiver

IMPORTANT.—The following instruction should be used in operating the MAJESTIC Automatic Record Changer employed in the Model 353 Abbeywood Receiver.

WARNING.—Before attempting to operate the automatic record changer, three screws which pass through the base plate of the record changer and the wood shelf, should be loosened so that the chassis is resting freely on the rubber cushions.

WARNING.—At no time for any reason should the turntable be stopped by hand. If this warning is not adhered to, serious damage may result.

RECORDS.—It is possible to play the two types of records available for home entertainment, that is, the ordinary records and the new long playing records. Each of these two types can be obtained in both twelve and ten inch diameter. The approximate playing time of these records is as follows:

Ordinary Records.	*New Long Playing Records.*
10 inch—2½ minutes.	10 inch—10 minutes.
12 inch—3½ minutes.	12 inch—15 minutes.

SPEED.—The standard record turns at a speed of 78 revolutions per minute, whereas the long playing record turns at the rate of 33 1/3 revolutions per minute. The mechanism is provided with a speed control lever to give either of these speeds, as required.

SWITCHES.—The line switch for the phonograph motor is located near the front of the turn table.

Directly under the main tuning dial is the "Radio-Phonograph" switch, which should be thrown to phonograph position for record playing. The line switch for the radio receiver is incorporated in the volume control assembly, which is located to the left of the phonograph switch.

NEEDLES.—The long playing records should be played using only the special needles designed for this type of record. After the special needle has once been removed from the pick-up head, do not use it again. Replace with a new one.

Do not play ordinary records with the special needle designed for long playing records.

Instructions for Setting Selector Device

It will be noted that to the right of the turn table there is a selector lever for the purpose of playing ten inch records automatic, ten inch records repeat, twelve inch records repeat, and universal or manual operation.

10" AUTOMATIC.—This is the only position in which the ten inch records are changed automatically.

10" REPEAT.—In this position, the mechanism will repeat the playing of the same record as many times as desired.

12" REPEAT.—The mechanism in this position will keep repeating a 12" standard record. Do not, however, attempt to repeat a 12" long playing record as it should be played manually with the lever in the universal position.

"UNIVERSAL."—In this position, the automatic changing and the repeat mechanism are not in operation, and the playing is controlled manually as with the ordinary phonograph. This position should always be used for playing the 12" long playing record and may be used for playing standard records.

Instructions for Operating Automatic Record Changer

Select the desired records and place them carefully in the record holder or magazine. The record at the bottom of the magazine will be the first one to be played.

The automatic changing magazine handles from one to ten of the 10" records. Do not mix standard records with long playing records in the magazine for automatic playing, as each type requires a different speed and a different type of needle.

It is best to place the first record on the table by hand and start the needle very carefully in the first groove with the selector lever in the "Universal" position; then the lever may be turned to the automatic position if desired, after which the changer will operate as outlined in paragraph II under "Instructions for Setting Selector Device." This procedure protects the needle and the record, and assures longer life for both.

REJECT LEVER.—While playing in the automatic position, if it is desired to interrupt the record and to play the following one, pull forward the reject lever which is located to the right of the turn table. This will cause the mechanism to go through a complete cycle of changing the record.

RELOADING.—When all of the records have been played through, and the magazine is empty, the mechanism will repeat the last record over and over. In reloading the magazine, switch off the motor at the time the magazine has travelled to the extreme left position, and carefully remove the stack of records from the turn table. Then replace them in the magazine in any desired sequence, with the side facing up which you desire to play. ***The magazine may be swung up and down, but do not try to force it sideways manually.***

ARM REST.—When changing records, the pick-up should be placed on the rest, to the right. If it cannot be placed there without straining, this is a sign that the automatic mechanism has not completed its cycle. In this case, hold the pick-up loosely, turn on the motor switch and wait until the record magazine has moved to the extreme left, which will allow the pick-up to be placed on its rest.

Instructions for Operating Manually

By placing the lever in the "UNIVERSAL" position, the records will be played manually. The 12 inch long playing records should always be played in this position.

Oiling

Every two or three months, the turn table should be removed and three or four drops of oil placed in each of the six holes provided.

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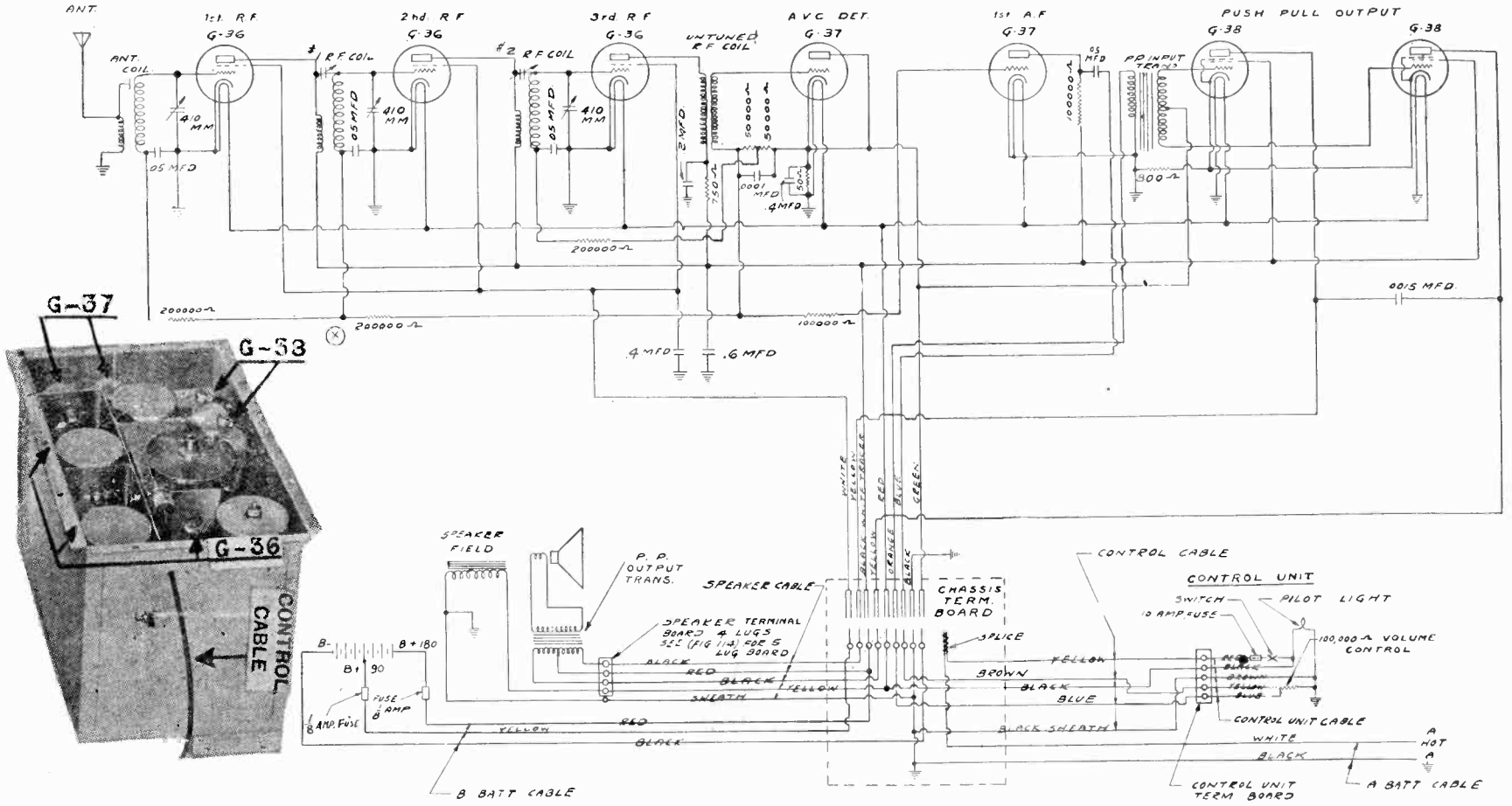
All leads marked "A" plus signify the ungrounded side of the car battery, and not necessarily the positive side.



Note on Alignment of Gang Condenser: Should a receiver need realignment in the field, a station should be tuned in at approximately 1300 kilocycles and the alignment made in the usual manner. In case one alignment condenser will not indicate a peak of sensitivity, slightly advance or retard the tuning control and proceed to readjust the alignment condenser as before.

Note on Automatic Volume Control System: The Model 110 chassis utilizes an automatic volume control system in combination with a diode detector, the G-37 detector serving both functions.

Majestic Model 110
Auto Radio

MODEL 120
Schematic

GRIGSBY - GRUNOW CO.

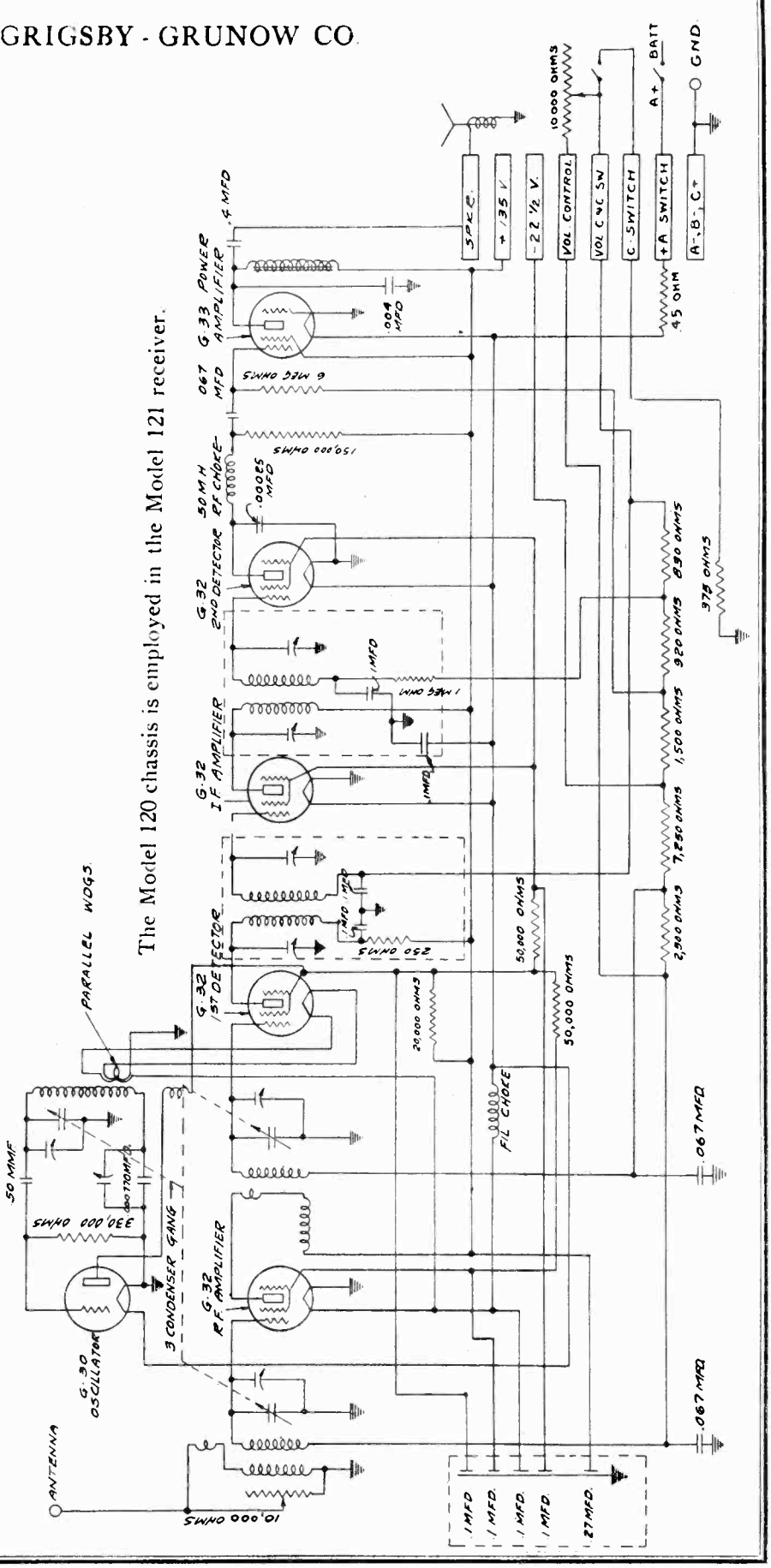
BIAS VOLTAGES

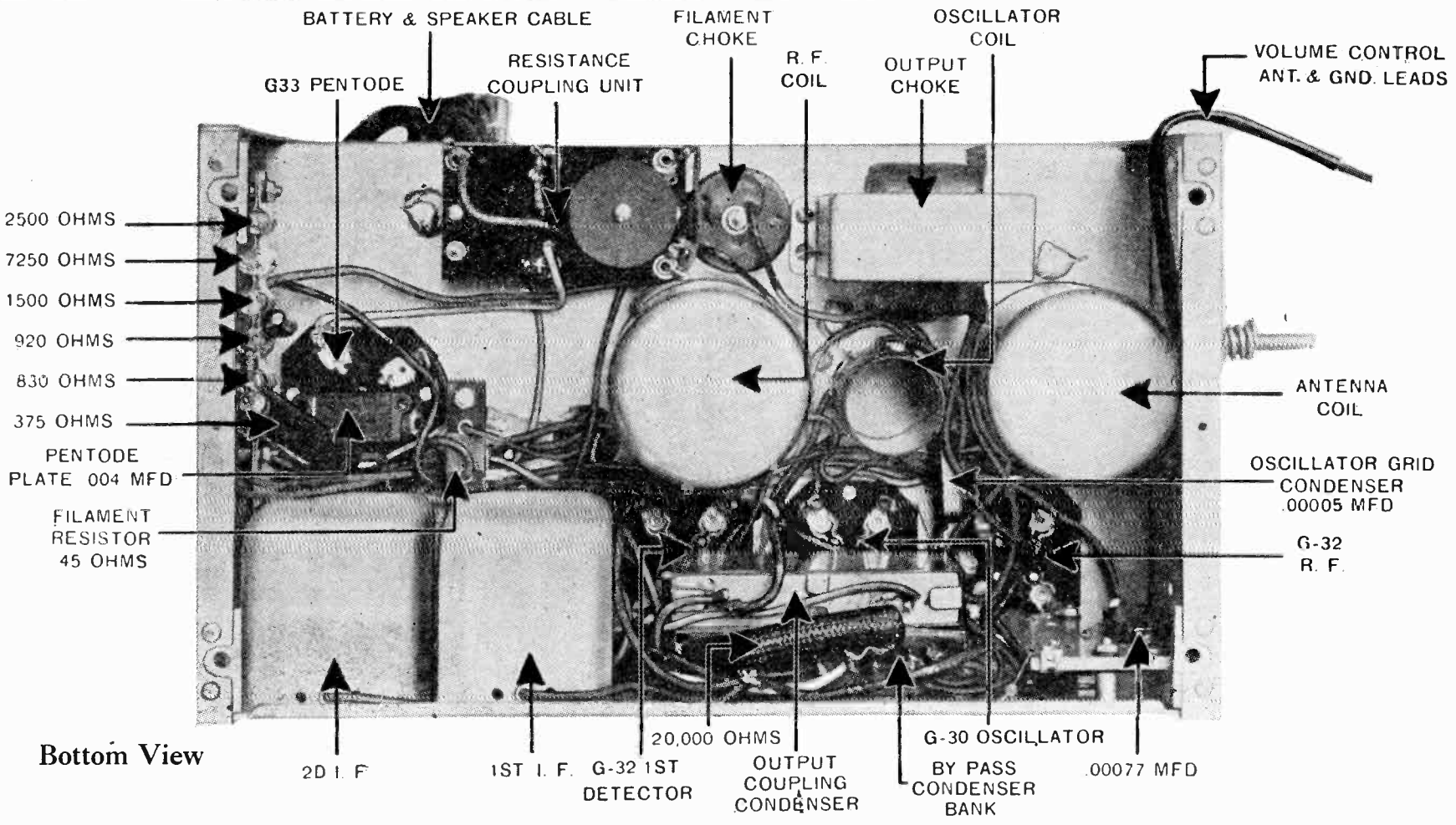
	Volume Control at Maximum		Volume Control at Minimum
R.F.	3 volts	R.F.	11 volts
Osc.	0 volts	Osc.	0 volts
1st Det.	8 volts	1st Det.	14 volts
I.F.	3 volts	I.F.	3 volts
2nd Det.	8 volts	2nd Det.	8 volts
Pentode	13.5 volts	Pentode	13.5 volts

IF PEAK 175 KC.

SCHEMATIC DIAGRAM OF MAJESTIC SCREEN GRID SUPERHETRODYNE HOME BATTERY RECEIVER MODEL -120

The Model 120 chassis is employed in the Model 121 receiver.





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MODEL 120
Chassis View

Volume Control and Switch Connections

Antenna section of volume control—Red and Black.
"C" bias section of volume control—Blue and Yellow.
"A" battery side of switch—Red.
Jumper switch to volume control—Blue.
Switch to "C" bias—White.

Battery Connections

3 wire cable plus 135 volts—Red.
minus 22½ volts—Green.
plus "C" minus "B"—Black.

2 wire cable to speaker—Red and Black and Red.
minus "A" Black.

Model 120 Chassis

MODEL 120
Notes

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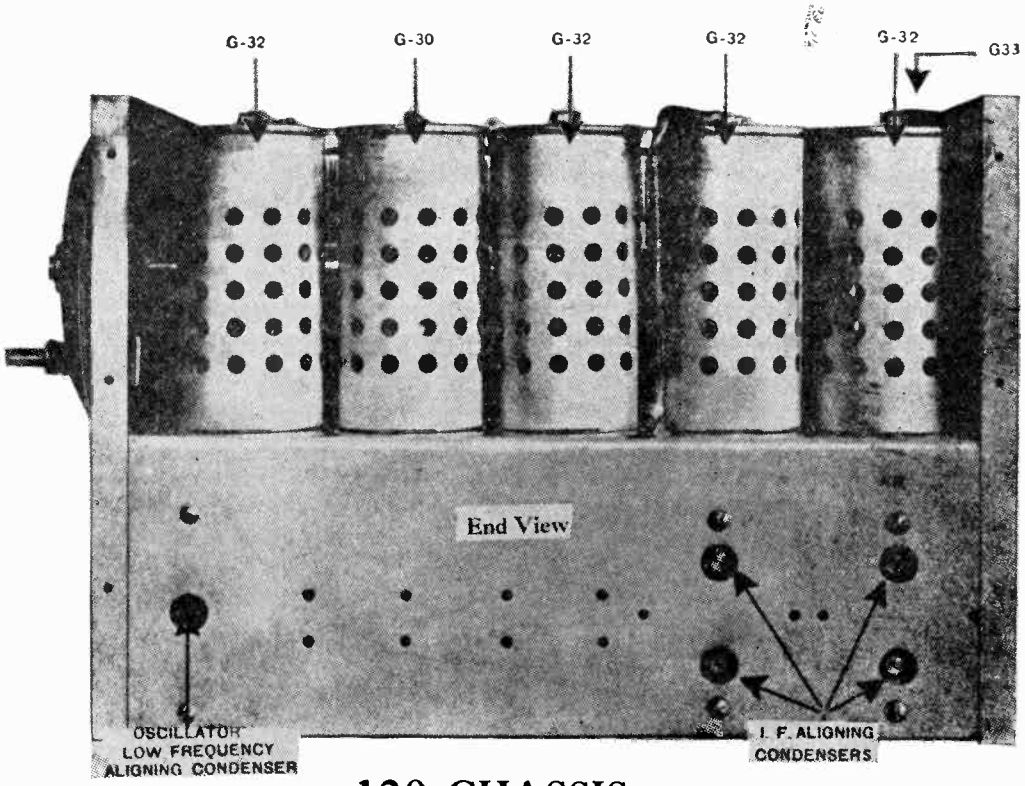


120 CHASSIS

I. F. Transformers Alignment

1. Connect oscillator for intermediate frequency alignment and set it in operation.

2. Align each aligning condenser on the intermediate frequency transformers to give maximum signal output.

3. After all four condensers have been aligned at 175 kilocycles, this stage should not be again adjusted.

R. F. and Oscillator Alignment

1. Tune in station in the vicinity of 1,500 kilocycles, or put output of local oscillator (if available) into receiver

2. Align R. F. stages and oscillator tuning condenser The position of these condensers is shown on illustrated photograph in this manual.

Oscillator Tracking Condenser Alignment

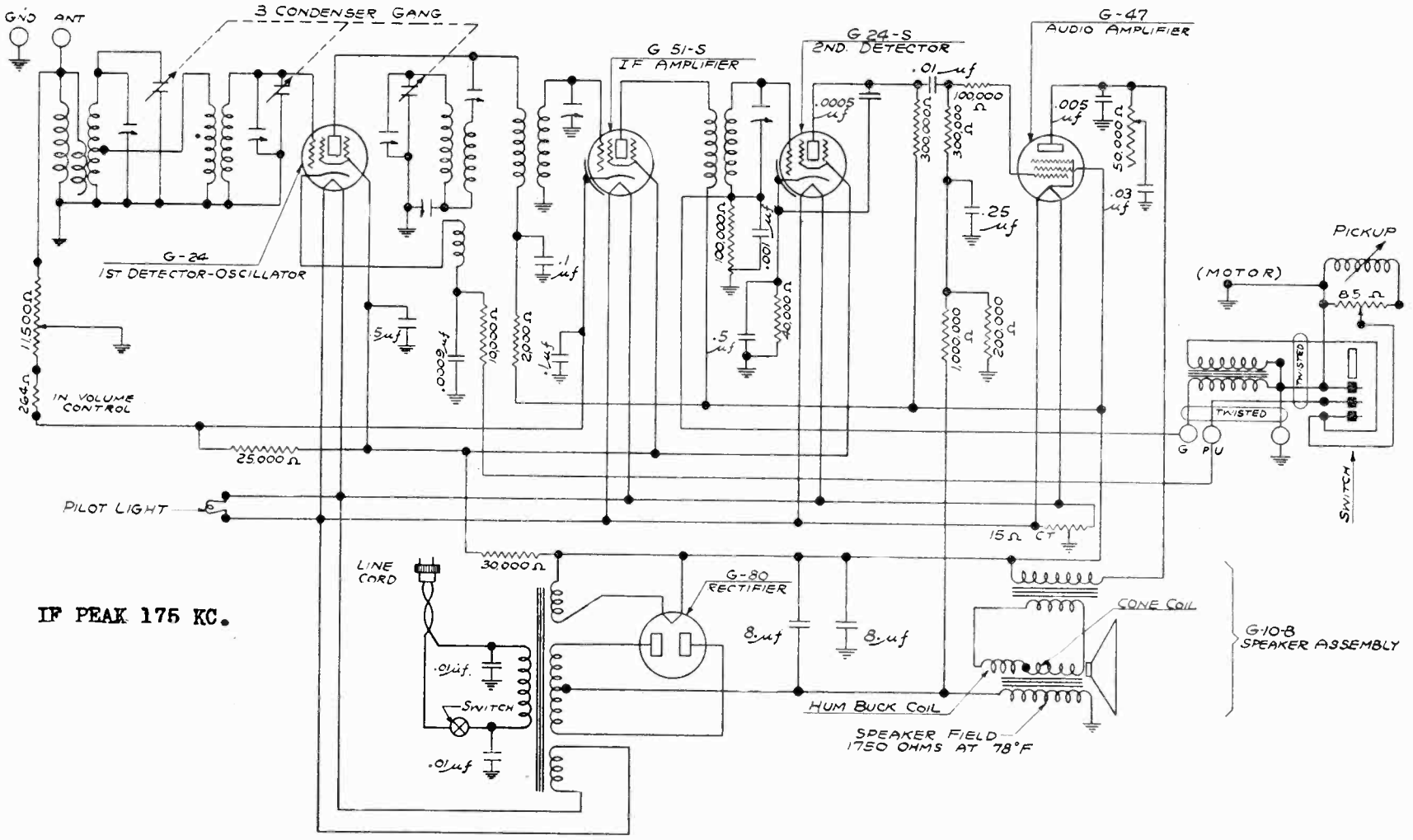
1. Tune in local oscillator to 600 kilocycles.

2. Adjust both tuning control and tracking condenser simultaneously to give maximum signal as noted on output meter. This will be obtained by rocking tuning control across resonance point, while adjusting tracking condenser to give maximum output at the point of resonance. This operation cannot be performed without local oscillator and output meter.

Check

Check the alignment previously made of R. F. and oscillator aligning condensers in the vicinity of 1,500 kilocycles.

SCHEMATIC DIAGRAM OF MAJESTIC SCREEN GRID SUPERHETERODYNE RECEIVER AND ELECTRIC PHONOGRAPH COMBINATION. MODEL 150 CHASSIS——
115 AND 230 VOLTS, 25-50 AND 50-60 CYCLES.
POWER REQD. — 90 WATTS WITH MOTOR.



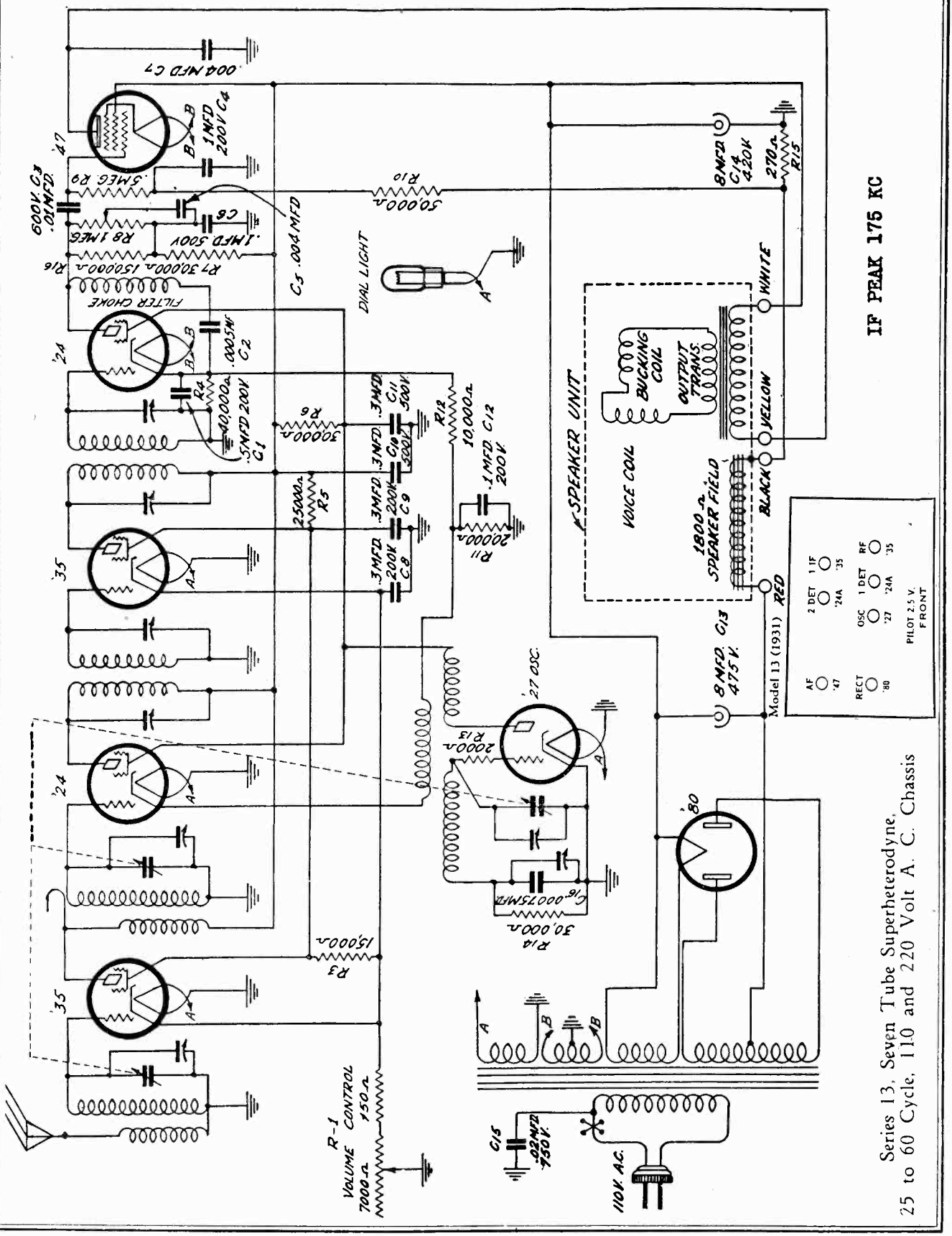
Model 150 Chassis Employed in Castlewood Phonograph Combination Model

GRIGSBY GRUNOW CO.

MODEL 150
Schematic

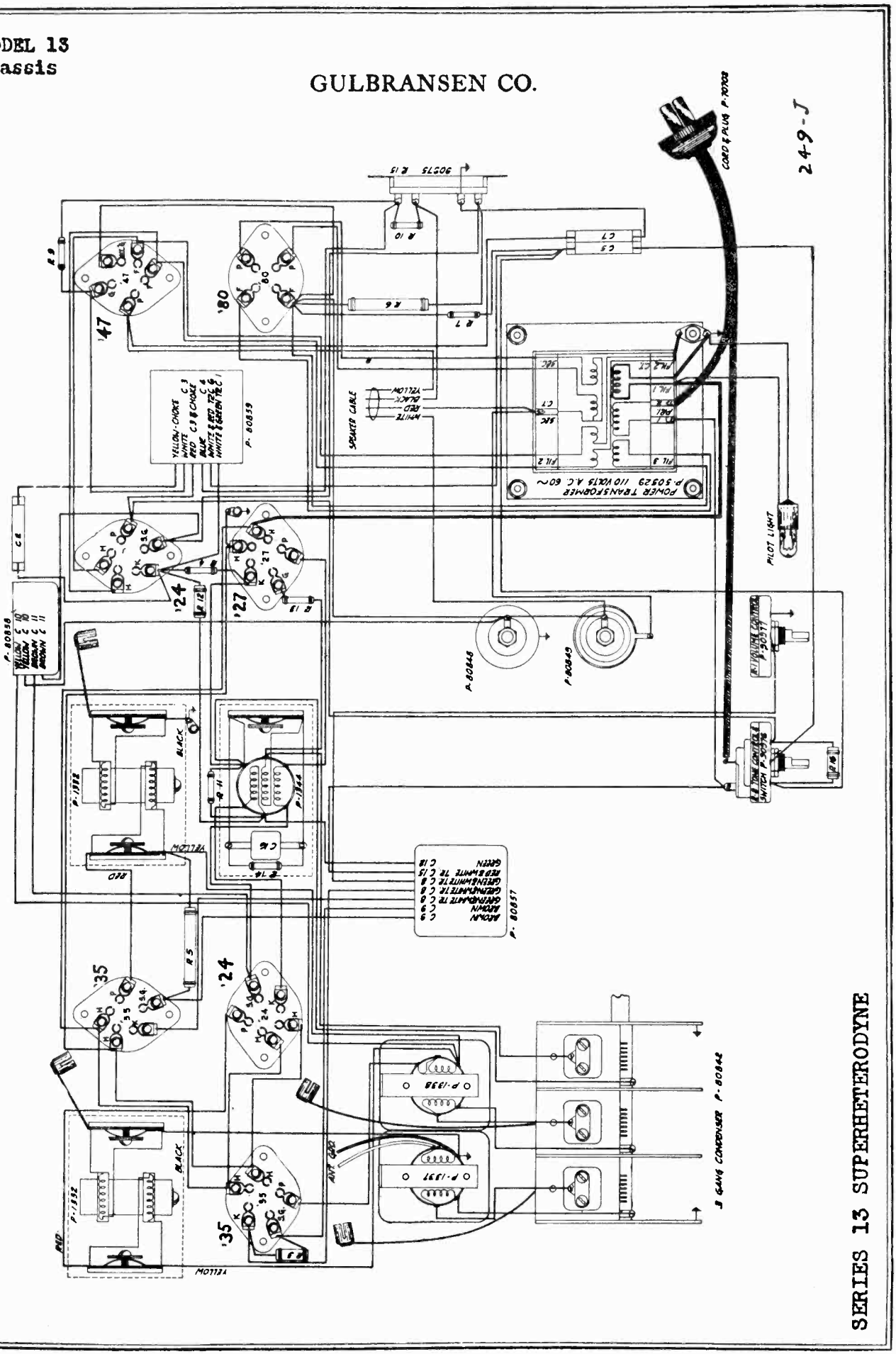
GULBRANSEN CO.

MODEL 13
Schematic



Series 13, Seven Tube Superheterodyne,
25 to 60 Cycle, 110 and 220 Volt A. C. Chassis

MODEL 13
Chassis



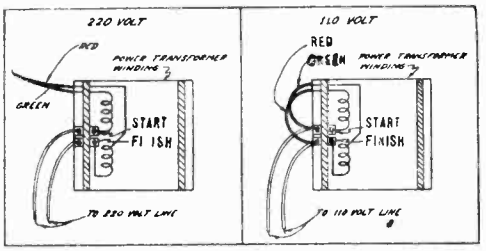
MODEL 13
Voltage-Data

GULBRANSEN CO.

POWER TRANSFORMER

One side of the 110 volt line is connected to the terminal marked Pri. 2" and the other side to one switch terminal on the receiver. The switch completes the circuit to the "Pri. 1" terminal.

The 25 cycle transformer is especially designed for operation on 110 volt, 25 cycle current but may also be used on any 110 volt, A.C. supply having a higher frequency.



Receivers having a 220 volt, 40 to 60 cycle power transformer may also be operated on 110 volt, 40 to 60 cycle current when connections on the primary of the transformer have been changed.

The red and green wires shown in the sketch, (220 volt) must be disconnected and then connected as shown in the 110 volt sketch. No other changes are necessary.

CONDENSERS AND RESISTORS

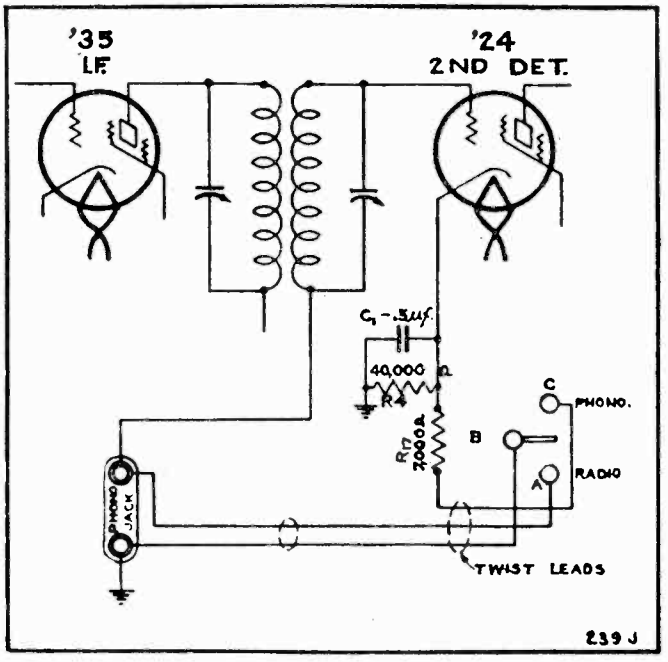
Three blocks contain the majority of condensers. The choke in the plate circuit of the second detector tube is also contained in one of these blocks. The common leads of condenser blocks No. 1 and No. 2 are grounded. C1, C4, and C6 in block No. 3 have a common lead which is grounded, and the choke and C3 in this block have a common lead connected to the plate of the 2nd detector.

ANALYZER CHART

All voltages taken with a 1,000 ohm per volt voltmeter on the scale indicated in the column headed "Meter Scale." Turn the volume all the way on and connect the antenna and ground leads together. The grid, plate, and screen grid voltages are measured to cathode of the '24 and '35 tubes and to filament of the '47 tube.

The grid voltage on the '27 oscillator cannot be taken except with a very sensitive, low scale voltmeter. The voltage is approximately .05 volts when the A.C. line voltage is 110 volts.

Tube	Circuit	Meter Scale	110 V.
R.F. ('35)	Grid	0—10	1.9
	Screen Grid	0—100	63.
	Plate	0—250	225.
1st Det. '24	Grid	0—25	14.5
	Screen Grid	0—100	65.
	Plate	0—250	220.
Int. '35	Grid	0—10	1.9
	Screen Grid	0—100	63.
	Plate	0—250	225.
2nd Det. '24	Grid	0—25	14.5
	Screen Grid	0—100	65.
	Plate	0—250	135.
Osc. '27	Grid		
	Plate	0—100	80.
Aud. '47 (See Caution Above)	Grid	0—10	2.7
	Accelerating Grid	0—250	225.
	Plate	0—250	205.
'80 Rect.	Filament to Ground	0—1000	233



Phonograph Hook-up

SERIES 13 SUPERHETERODYNE

PHONO RADIO INSTALLATION

When phonograph equipment is to be connected to a receiver, the installation should be of a permanent nature. The circuit shown in Fig. 2 is the best possible method of permanently connecting phonograph equipment to this chassis. The circuit consists of a pickup with self-contained volume control, connected in the grid circuit of the second detector tube.

PICKUP AND PHONO TRANSFORMER

To obtain good tone and volume, a pickup with medium or low impedance and a transformer are recommended for use with this receiver. A pickup with high impedance should be used when a transformer is not available.

INSTALLATION

The following parts must be supplied from the factory to make the installation:

1 Volume control, Stock No. P-90978
1 7,000 ohm Resistor, Stock No. P-90979
1 Tip Jack Assembly, Stock No. P-1193

The volume control must be mounted in the same position as the original. The switch is operated by turning the volume control knob to the left as far as possible. The connections on the volume control are the same as on the original.

Removal of the license plate on the rear of the chassis will disclose a slot with small holes at each end. The tip jack assembly should be bolted to the chassis (inside), through the small holes. Bolt the license plate through the small holes, directly above its original position.

Locate the black wire under the chassis, leading from the secondary of the second intermediate transformer. This transformer is directly behind the gang condenser. Disconnect this wire where it is grounded on the chassis and solder the end to the tip jack nearest the center of the back of the chassis. If it does not reach to the tip jack, splice an extra length of wire to it but make the lead as short as possible. Solder and tape the splice so it is firm and well insulated.

Ground the OPPOSITE tip jack on the chassis by soldering one end of a short length of wire on the jack and the opposite end on a lug placed under the nut on the bolt holding the nearest end of the tip jack assembly.

Solder one end of the 7,000 ohm resistor (R17, Fig. 2) to the cathode connection on the second detector tube socket.

Three wires, twisted together and long enough to reach from the switch on the volume control (around the closed ends of the R.F. transformer shields), to the tip jacks are connected as shown in Fig. 2.

Wire No. 1 connects the grounded tip jack and the switch terminal farthest from the center of the volume control.

Wire No. 2 connects the jack on which the black lead from the I.F. transformer is connected, and the raised switch terminal near the center.

Wire No. 3 connects one end of the 7,000 ohm resistor and the remaining open lug on the switch.

When the receiver volume control is turned to the left as far as possible, the S.P.D.T. switch is thrown and opens the circuit from "A" (Fig. 2) to "B" and closes the circuit from "B" to "C."

This action places the pickup in the circuit and connects the 7,000 ohm resistor so that a proper grid bias is obtained for phonograph reproduction.

If a transformer is used, a ratio of 4 to 1 will prove satisfactory. The secondary is connected to the tip jacks and the primary to the pickup cords.

Reversing the pickup leads will determine the correct position in which they should be left. Some pickups have one side grounded and that side should be connected to the grounded pickup jack in the receiver.

If the pickup is disconnected, a wire "jumper" MUST be placed across the tip jacks before broadcast signals may be received. *The receiver must never be turned on for even a moment without the jumper in place.* A jumper will close the circuit between "A" and "B." This grounds the circuit, thereby placing the proper grid bias on the detector tube, even though the volume control may be thrown to the phonograph position. This jumper may be a piece of solid wire, the ends of which are bent at right angles and plugged into the tip jacks.

RESISTORS

Diagram Key	Part No.	Resistance in ohms	Type	IDENTIFICATION Base	End	Dot
R1	P-90976		Vol. Cont.			
R1	P-90978		Vol. Cont.	With Phonograph Switch		
R3	P-90905-B	15,000	Carbon	Brown	Green	Orange
R4	P-90916-B	40,000	Carbon	Yellow	Black	Orange
R5	P-90927-A	25,000	Carbon	Red	Green	Orange
R6	P-90926-A	30,000	Carbon	Orange	Black	Orange
R7	P-90956	30,000	Carbon	Orange	Black	Orange
R8	P-90977	1 Meg.	Tone Cont.			
R9	P-90938-A	500,000	Carbon	Green	Black	Yellow
R10	P-90941-A	50,000	Carbon	Green	Black	Orange
R11	P-90959-A	20,000	Carbon	Red	Black	Orange
R12	P-90930-C	10,000	Carbon	Brown	Black	Orange
R13	P-90906-B	2,000	Carbon	Red	Black	Red
R14	P-90956-A	30,000	Carbon	Orange	Black	Orange
R15	P-90975-A	270	Candohm			
R16	P-90963-A	150,000	Carbon	Brown	Green	Yellow
R17	P-90979	7,000	Carbon	Lavender	Black	Red

For phonograph installation

CONDENSERS

Key No.	Part No.	Capacity	Type	Voltage Rating	Indentification Mark
C12	P-80857-A	1 mfd.	Block	200 V.	White, Green Tr.
C8	Block	3 mfd.	Block	200 V	Brown
C9	No. 1	3 mfd.	Block	200 V	White, Red Tr
C15		02 mfd.	Block	750 V	Green
C10	P-80858	3 mfd.	Block	500 V	Brown
C11	Block No. 2	3 mfd.	Block	500 V.	Yellow
C1	P-80859-C	5 mfd.	Block	200 V	White and Red
C3	Block	01 mfd.	Block	600 V	White, Red Tr
C6	No. 3	1 mfd.	Block	500 V	Blue
C4		1 mfd.	Block	200 V	Yellow and Red
Choke					White, Green Tr
C2	P-80855	0005 mfd.	Moulded		Red
C5	P-80860	.004 mfd.	Moulded		Tan
C7	P-80860	004 mfd.	Moulded		Tan
C13	P-80848-Hi.	8.0 mfd.	Electrolytic		Red
C14	P-80849-Lo.	8.0 mfd.	Electrolytic		Green
C16	P-80856	00075 mfd	Moulded		Violet
	P-80842-D	Complete Gang Assembly with Shield (No Dial Assembly)			

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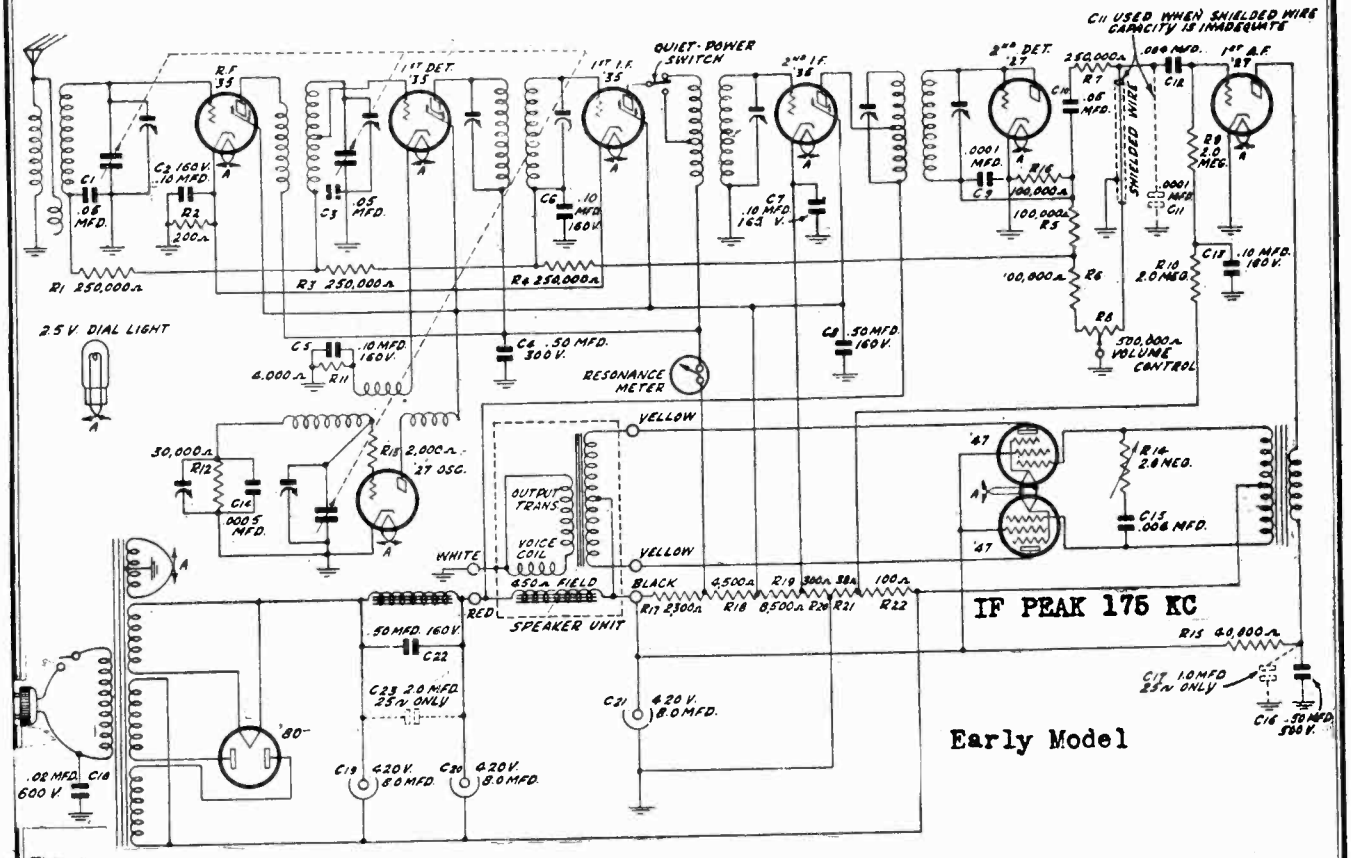
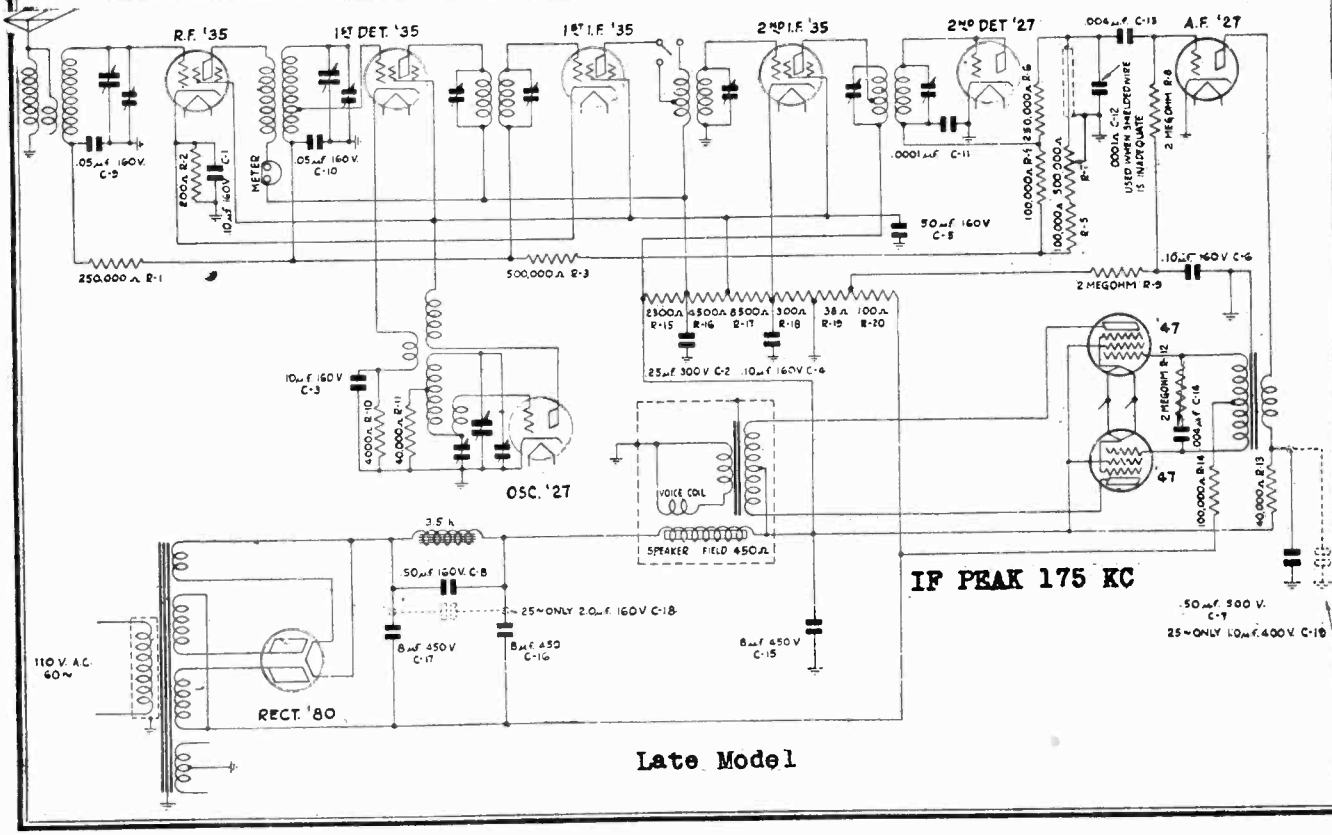
MODEL 20 Series
Schematic
Early-Late





MODEL 20 Series
Voltage
Alignment

GULBRANSEN CO.

ALIGNMENT

A thorough check of the receiver should be made before any attempt is made to re-align any circuits Examine the antenna and ground connections. Test all the tubes and check all voltages to determine if the failure of the receiver to operate properly is not due to some fault other than mis-alignment. A superheterodyne receiver must be accurately aligned to be selective and sensitive. This receiver has been accurately aligned at the factory and, due to the mechanical design of the gang and adjustable condensers, will not lose its alignment unless damaged by abuse or accident.

A modulated test oscillator and an output meter MUST be used when aligning this receiver to insure accurate alignment. It is important that the oscillator deliver a signal at exactly 175 K.C. in addition to frequencies in the broadcast band.

The adjustable condensers which tune the secondaries of the I. F. transformers are located under the hole in top of the shield where the grid lead to the tube is brought out. The condensers which tune the primaries of the first and third I. F. transformers are located under the small hole opposite. The capacity of each condenser is varied by rotating the small adjustment screw under the hole.

A trimmer condenser is mounted over each condenser in the gang and is adjusted by turning the screw located under the hole in top of the gang shield. The shield should not be removed.

The oscillator 600 K C. tracking condenser is located under the hole in the oscillator unit shield.

Make each adjustment in the order given below or the receiver may be thrown further out of alignment and it will then be a difficult task to align it properly.

The receiver and test oscillator must be well grounded and the output kept within the range of the output meter at all times. All shields must be in place when making the adjustments.

Tube	Circuit	Meter Scale	90 V.	100 V.	110 V.	120 V.
R.F '35	Screen					
	Grid	0—100	67.	75.	82.	90.
	Plate	0—250	136.	151.	166.	181.
1st Det '35	Screen					
	Grid	0—100	63	70.	77.	84.
	Plate	0—250	132.	147.	163.	179.
Oscillator '27	Plate	0—100	70	77	85.	92.
1st I.F '35	Screen					
	Grid	0—100	67	75	82.	90.
	Plate	0—250	136.	151.	166.	181.
2nd I F '35	Screen					
	Grid	0—100	65.	72.	79.	86.
	Plate	0—1000	227.	252.	277.	303.
1st A.F. '27	Plate	0-100	87.	95.	104.	115.
2nd A F. '47	Grid	0-25	12.7	14.	15.4	17.
	Accelerating Grid	0-1000	192	208.	235.	252.
	Plate	0-1000	180	200.	220.	240.
80 Rect	Current (Both Plates)	0-100	89. M.A.	98. M.A.	108. M.A.	118. M.A.
(See below)	Plate to Plate voltage	0-1000	547	568.	690.	712.

GULBRANSEN CO.

MODEL 20 Series
Parts List
Socket- Data

Part No.	Name	List Price
P-20408	Tube Shield Base	.10
P-1193	Laminated Phono Jack	.15
P-1336	Control Knob	.25
P-1092	Grid Clip Assembly	.10
P-20365	Wire Clamp	.10
P-1273	Dial Light Bulb, 2.5 volts	.25
P-1011	S. P. D. T. Switch (Quiet-Power or Phono)	.70
P-1384	Resonance Meter	2.75
P-50534	Power Supply Choke	1.40
P-10180	Rubber Chassis Support (Large)	.10
P-10181	Rubber Chassis Support (Small)	.10
P-1146	Terminal Strip (Large)	.15
P-1173	Terminal Strip (Small)	.10
P-20422	Chassis Mounting Stud	.10
P-1388	Dial Escutcheon Plate (Give Model number of set)	.60
P-20286	Resistor Spring Mtg. Bracket	.10
P-1054	On-Off Toggle Switch	.75
P-80889	3 Gang Condenser less drive for rubber pinion drive only	6.40
P-1383-B	Drive Bracket & Bearing Assembly	.30
P-30365	Bushing for rubber pinion	.10
P-10182	Rubber pinion	.10
P-20473	Drive Shaft	.10
P-1394	Dial Strip & Bracket Assembly	.45
P-1382	Drive Disc Hub & Fulcrum Assembly	.25
P-1393	Indicator Assembly	.25
P-80866	3 Gang Condenser less drive for friction drive models	6.40
*P-1128	Drive Bracket & Bearing Assembly	.15
*P-1197-B	Friction Drive Shaft Assembly	.25
*P-1340	Dial Strip	.20
*P-20283	Dial Drum	.40

*Asterisk refers to parts used on drum dial models.

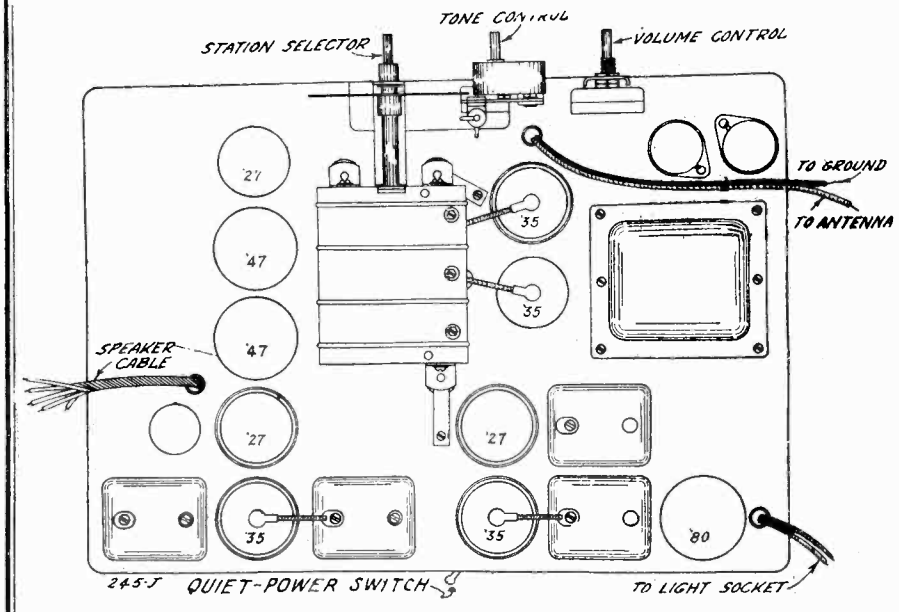
RESISTORS

Part No.	Key No.	Resistance	Type	List Price
P-90954-B	R1	250,000	Carbon	$ .25
P-90935-A	R2	200	Carbon	.25
P-90938	R3	500,000	Carbon	.25
P-90912-A	R4	100,000	Carbon	.25
P-90912-A	R5	100,000	Carbon	.25
P-90954-B	R6	250,000	Carbon	.25
P-90980	R7	0—500,000	Volume Control	1.35
P-90923-A	R8	2 meg.	Carbon	.25
P-90923-A	R9	2 meg.	Carbon	.25
P-90947	R10	4,000	Carbon	.20
P-90916	R11	40,000	Carbon	.25
P-90986-B	R12	0—2 meg.	Tone Control	.95
P-90945	R13	40,000	Carbon	.10
P-90912-A	R14	100,000	Carbon	.25
P-91000	R15	2,300	Vitreous Enamel Resistor	1.80
	R16	4,500		
	R17	8,500		
	R18	300		
	R19	38		
	R20	100		

CONDENSERS

Part No.	Key No.	Capacity	Type	Voltage Rating		List Price
P-80862	C9	.05	Tubular	160 V.		$0.30
P-80862	C10	.05	Tubular	160 V.		.30
P-80865	C11	.0001	Molded			.20
P-80865	C12	.0001	Molded			.20
P-80863	C13	.004	Tubular			.25
P-80863	C14	.004	Tubular			.25
P-80901	C15	8.0	Electrolytic	450 V.		1.50
P-80900	C16	8.0	Electrolytic	450 V.		1.60
P-80900	C17	8.0	Electrolytic	450 V.		1.60
P-80861-F (Block)	C1	.1	Block	160 V.	White, Green Tr.	3.20
	C2	.25		300 V.	Blue	
	C3	.1		160 V.	White, Green Tr.	
	C4	.1		160 V.	White, Red Tr.	
	C5	.5		160 V.	Brown	
	C6	.1		160 V.	White	
	C7	.5		500 V.	Red	
	C8	.5		160 V.	Yellow (2 Leads)	
P-80879	C18	2.0	Block	160 V.	(25 cy. only)	2.20
	C19	1.0		400 V.	(25 cy. only)	

Common Black Lead



Key No.	Capacity	Lead Color	Lead Color
C22	.5 mfd.	Yellow	Yellow
C16	.5 mfd.	Common Black	Red
C4	.5 mfd.	Common Black	Blue
C8	.5 mfd.	Common Black	Brown
C5	.1 mfd.	Common Black	White, Green Tr.
C2	.1 mfd.	Common Black	White, Green Tr.
C7	.1 mfd.	Common Black	White, Red Tr.
C6	.1 mfd.	Black, White Tr.	Black, White Tr.
C13	.1 mfd.	White . .	White

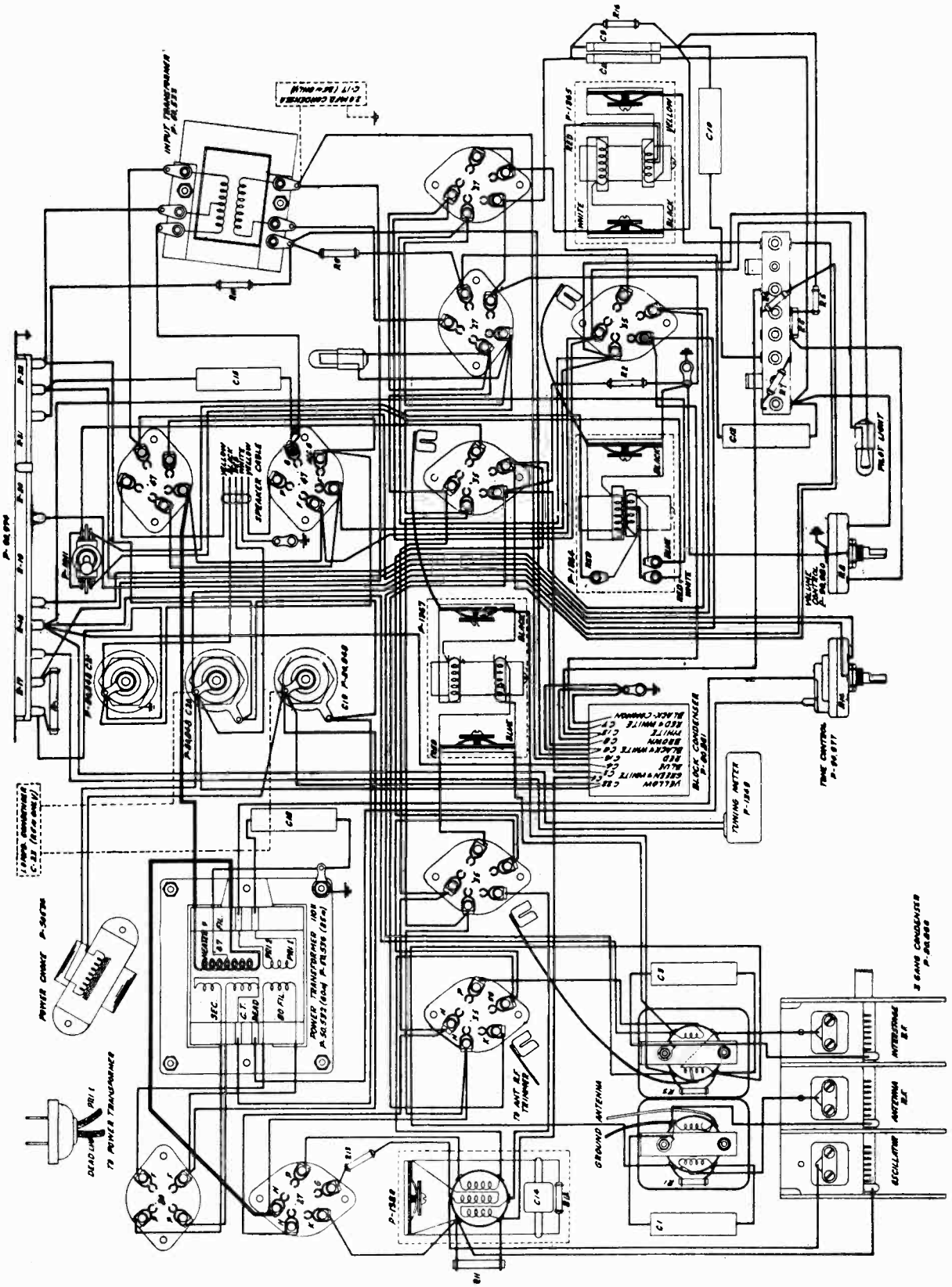
Referring to sections C6 and C13 in the above list, it will be noted that these have two leads each with the same color code. This was changed in a later model to one lead each, the other lead of each section being connected to the common black lead.

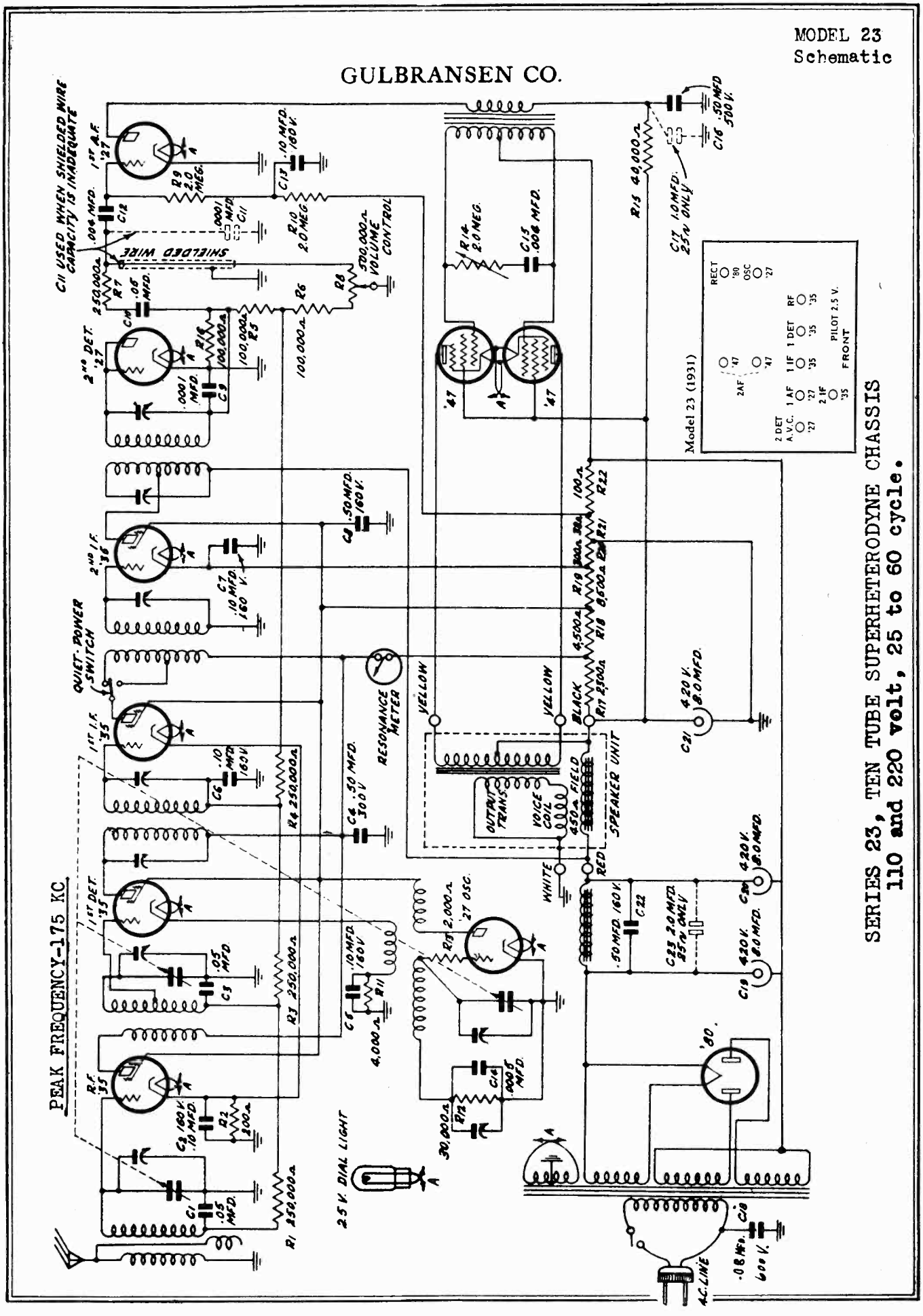
At a later date, two further changes in this condenser block were made. Section C6 which bypassed the grid return of the first I.F. tube to ground was discontinued and section C4 was changed to .25 mfd. These changes bring the block up to date.

The key numbers (C5, etc.) in the above description of the condenser block refer to the key numbers as shown in the schematic circuit diagram of the early chassis, The key numbers of the condenser block as shown in the parts list in the foregoing service manual conform with the key numbers as shown in the schematic of the present chassis, Fig. 1 As explained at the beginning of this supplement, the two sets of key numbers do not coincide.

MODEL 23
Chassis

GULBRANSEN CO.





MODEL 23
Parts List
Phono Data

GULBRANSEN CO.

SERIES 23 SUPERHETERODYNE

PHONO PICKUP INSTALLATION

The following parts must be supplied from the factory to make the installation:

1 S. P. D. T. Switch, Stock No. P-1011

1 Tip Jack Assembly, Stock No. P-1193.

Removal of the license plate on the rear of the chassis will disclose a slot with small holes at each end. The tip jack assembly should be bolted, inside, through the small holes.

Drill a 31/64" hole one inch from the tip jack nearest the center of the rear of the chassis and place the barrel of the switch through the hole with the body of the switch in a horizontal position.

The terminal strip mounted in the left front corner of the base has the resistor, R7, (Red body, green end, yellow dot), connected to the first and second terminals on the end of the strip nearest the center of the chassis. One end of the .05 mfd. condenser, C10, is also connected to the second terminal. See Fig. 4.

Disconnect the resistor, R7, at the second terminal of the strip. Splice a piece of wire to the disconnected end of the resistor and connect the other end of the wire to two terminals, one on each end and on the same side of the switch.

Connect another wire to the terminal where the resistor was disconnected and connect the other end to one of the two open terminals on the switch.

The remaining open terminal on the switch is then connected to the tip jack nearest the corner of the chassis base.

Ground the opposite tip jack on the grounded terminal of the candohm resistor.

Make all wires and connections short, firm, and well insulated.

When the switch is thrown so that the circuit from "A" to "B," is open and the circuit from "B" to "C" is closed, the pickup is then properly connected for phonograph reproduction. The switch is thrown in the opposite direction for the reception of broadcast signals.

Reversing the pickup leads will determine the correct position in which they should be left. Some pick-ups have one side grounded and that side should be connected to the grounded pickup jack in the receiver.

C6 and C13 contained in the block have one side grounded and the balance of the condensers in the block, with the exception of C22, have a common lead which is also grounded. C22 tunes the choke in the power supply.
C17 and C23 are used in the 25 cycle chassis only, as shown in the schematic diagram.

RESISTORS

Part No.	Key No.	Resistance	Type	Base	End	Dot
P-90954-B	R1	250.000	Carbon	Red	Green	Yellow
P-90935-A	R2	200	Carbon	Red	Black	Brown
P-90954-B	R3	250.000	Carbon	Red	Green	Yellow
P-90954-B	R4	250.000	Carbon	Red	Green	Yellow
P-90912-A	R5	100,000	Carbon	Brown	Black	Yellow
P-90912-A	R6	100.000	Carbon	Brown	Black	Yellow
P-90954-B	R7	250.000	Carbon	Red	Green	Yellow
P-90980	R8	500.000	Volume Control			
P-90923-A	R9	2 meg	Carbon	Red	Black	Green
P-90923-A	R10	2 meg.	Carbon	Red	Black	Green
P-90947	R11	4,000	Carbon	Yellow	Black	Red
P-90956-A	R12	30.000	Carbon	Orange	Black	Orange
P-90906-C	R13	2.000	Carbon	Red	Black	Red
P-90977-B	R14	2 meg	Tone Control			
P-90945	R15	40.000	Carbon	Yellow	Black	Orange
P-90912-A	R16	100.000	Carbon	Brown	Black	Yellow
P-90974-C	R17	2,300	Candohm			
	R18	4,500				
	R19	8,500				
	R20	300				
	R21	38				
	R22	100				

CONDENSERS

Part No.	Key No.	Capacity	Type	Voltage Rating	Identification
P-80862	C1	.05	Tubular		Red - Orange
P-80862	C3	.05	Tubular		Red - Orange
P-80865	C9	.0001	Moulded		Red - Orange
P-80862	C10	.05	Tubular		Red - Orange
P-80865	C11	.0001	Moulded		Red - Orange
P-80863	C12	.004	Tubular		Tan - Orange
P-80867	C14	.0005	Moulded		Red - Orange - Blue
P-80863	C15	.004	Tubular		Tan - Orange
P-80869	C17	1.0			
P-80868	C18	.02	Tubular		Green - Orange
P-80848-A	C19	8.0	Electrolytic	420 V.	Orange
P-80848-A	C20	8.0	Electrolytic	420 V.	Orange
P-80848-A	C21	8.0	Electrolytic	420 V.	Orange
P-80870	C23	2.0			
P-80861-B (Block)	C2	.1	Block	160 V.	White, Green Tr.
	C4	.5	Block	300 V.	Blue
	C5	.1	Block	160 V.	White, Green Tr.
	C6	.1	Block	160 V.	Black, White Tr.
	C7	.1	Block	600 V.	White, Red Tr.
	C8	.5	Block	160 V.	Brown
	C13	.1	Block	160 V.	White
	C16	.5	Block	500 V.	Red
	C22	.5	Block	160 V.	Yellow (2)
P-80866	Complete Gang Assembly with Shield (no dial assembly)				

MODEL 23
Voltage
Phono Data

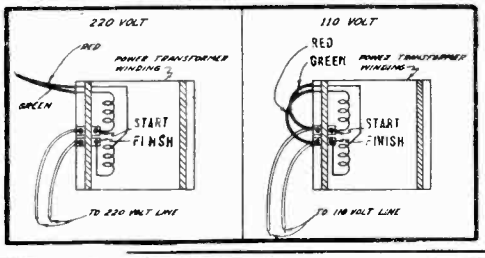
GULBRANSEN CO.

SERIES 23 SUPERHETERODYNE

POWER TRANSFORMER

Fig. 4 shows the 110 volt power transformer connections. One side of the 110 volt A. C. line is connected to the terminal marked "Pri. 1" and the other side to the open terminal, on the opposite side of the winding, which is in turn connected to one terminal of the switch on the receiver. The switch completes the circuit to the "Pri. 2" terminal.

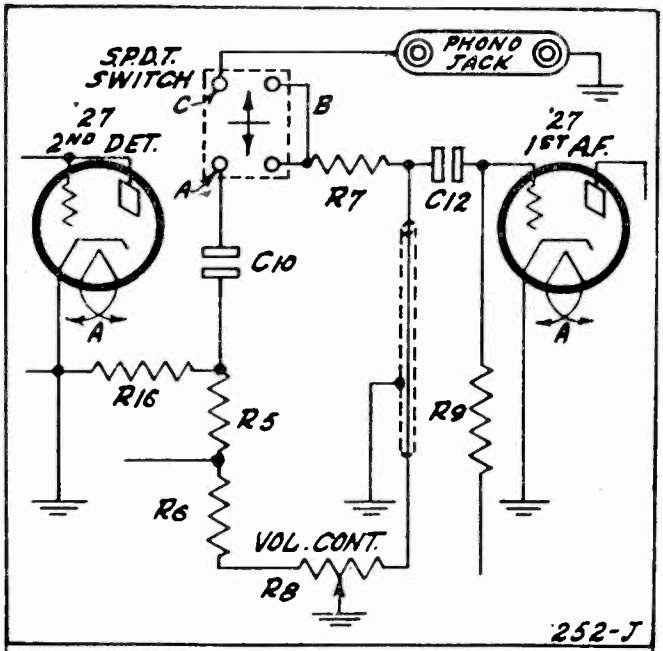
The 25 cycle transformer is especially designed to operate on 110 volt, 25 cycle current, but may also be operated on any 110 v. A. C. supply having a higher frequency, after the condensers C17 and C23 have been disconnected.



Receivers having a 220 volt, 40 to 60 cycle power transformer may also be operated on 110 volt, 40 to 60 cycle current when connections on the primary of the transformer have been changed.

The red and green wires shown in the 220 volt sketch, must be disconnected and then connected as shown in the 110 volt sketch. No other changes are necessary.

Tube	Circuit	Meter Scale	110 V.
R.F. '35	Screen		
	Grid	0—100	82.
	Plate	0—250	166.
1st Det. '35	Screen		
	Grid	0—100	77.
	Plate	0—250	163.
Oscillator '27	Plate	0—100	85.
1st I.F. '35	Screen		
	Grid	0—100	82.
	Plate	0—250	166.
2nd I.F. '35	Screen		
	Grid	0—100	79.
	Plate	0—1000	277.
1st A.F. '27	Plate	0-100	104.
2nd A.F. '47	Grid	0-25	15.4
	Accelerating Grid	0-1000	235.
	Plate	0-1000	220.
'80 Rect.	Current (Both Plates)	0-100	108. M.A.
(See below)	Plate to Plate voltage	0-1000	690.



Phonograph Hook-up

The '80 rectifier plate voltages shown are the totals of both plates, measured from each plate to center tap of high voltage secondary

All voltages taken with a 1,000 ohm per volt voltmeter on the scale in the column headed "Meter Scale." Turn the volume all the way on, connect the antenna and ground leads together and turn the gang condenser plates all the way out. CHECK THE LINE VOLTAGE.

The measurement of grid bias voltages (except on the 47 pentodes) is not recommended, as this causes an abnormal rise in plate current which is injurious to the tube. Further, the measurement of actual grid bias voltages is impossible due to the high resistance in the grid circuits. When the receiver does not function properly and the trouble is apparently due to improper grid bias on any tube or tubes, the cause of the trouble may be determined by applying the proper continuity tests.

CAUTION: IN ORDER THAT THE EFFICIENCY OF EACH TUBE MAY BE COMPARED WITH THAT OF OTHER TUBES OF THE SAME TYPE, THEY MUST NOT BE TESTED IN THE SOCKET IN WHICH THEY ARE USED. TEST ALL '35 TUBES IN THE SECOND I. F. SOCKET AND TEST THE '27 TUBES IN THE FIRST A. F. SOCKET. TAKE THE VOLTAGE READINGS AT THE SOCKET IN WHICH THE TUBE IS USED.

MODEL 23
Data

GULBRANSEN CO.

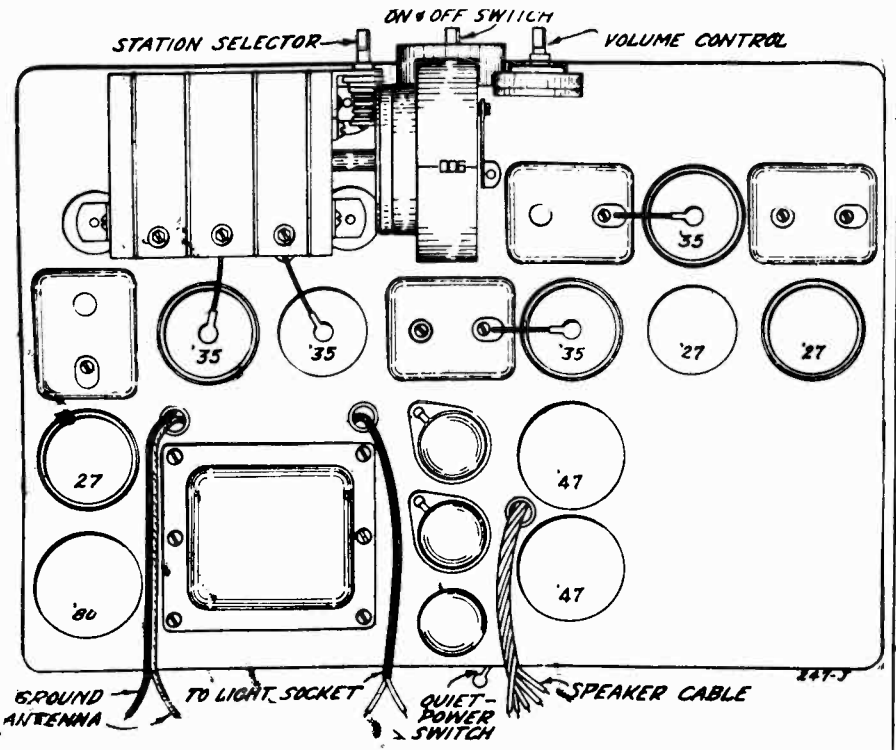
SERIES 23
SUPERHETERODYNE

REVISED MODEL

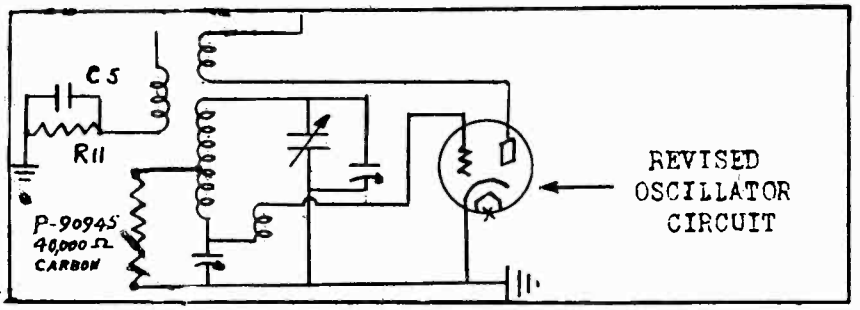
A green p aint mark on the left rear corner of a chassis indicates the following changes:

(1) Combination tone control and "On-Off" switch replaced by two separate units. The tone control is mounted and connected as previously but "On-Off switch is on side of cabinet.

(2) Intermediate transformers assembled together with their adjustable tuning condensers in a round shield. Condensers are adjusted by inserting screwdriver trough the holes provided underneath base, directly below transformer assembly. Early models are adjusted through hole in top of (rectangular) shield



TOP VIEW OF EARLY MODEL RECEIVER



(3) The oscillator coil, its shield, and the 600 K.C. tracking condensor are all mounted separately on the base. The tracking condensor adjustment screw will be found near the left rear corner of the oscillator coil shield. The .0005 mfd. condensor (C14) is not used and the 30,000 ohm resistor (R12) is replaced by a 40,000 ohm resistor mounted between a coil lug and the tracking condensor. The revised oscillator circuit is shown herewith:

The parts affected by the change, are listed below with corresponding parts numbers:

OLD NUMBER		NEW NUMBER
Tone Control & "On-Off" Switch	P-90977	"On-Off" Switch--P-1054 Tone Control--P-90986-A
1st L.F. Transformer Assembly	P-1367	1st I.F. Assembly--P-1424 2nd I.F. Assembly--P-1425
2nd I.F. Transformer Assembly	P-1364	3rd I.F. Assembly--P-1426 Oscillator Coil--P-1400
3rd I.F. Transformer Assembly	P-1365	Coil Shield--P-40412 600 K.C. Tracking Conden.--P-1385-A
Oscillator Unit Assembly	P-1366	40,000 Ohm Carbon Resistor-P-90945

MODEL 13
MODEL 23
Alignment

GULBRANSEN CO.
ALIGNMENT

A thorough check of the receiver should be made before any attempt is made to re-align any circuits. Examine the antenna and ground connections. Test all the tubes and check all voltages to determine if the failure of the receiver to operate properly is not due to some fault other than mis-alignment. A superheterodyne receiver must be accurately aligned to be selective and sensitive. This receiver has been accurately aligned at the factory and, due to the mechanical design of the gang and adjustable condensers, will not lose its alignment unless damaged by abuse or accident.

A modulated test oscillator and an output meter MUST be used when aligning this receiver to insure accurate alignment. It is important that the oscillator deliver a signal at exactly 175 K.C. in addition to frequencies in the broadcast band.

The adjustable condensers which tune the secondaries of the intermediate transformers are located under the hole in top of the shield where the grid lead to the tube is brought out. The condensers which tune the primaries are located under the small hole opposite. The capacity of each condenser is varied by rotating the small adjustment screw under the hole.

Make each adjustment in the order given below or the receiver may be thrown further out of alignment and it will then be a difficult task to align it properly.

The receiver and test oscillator must be well grounded and the output kept within the range of the output meter at all times.

All shields must be in place when making the adjustments.

INTERMEDIATE CIRCUITS

Tune the test oscillator to exactly 175 K.C. and connect its output to the grid of the first detector tube after removing the clip on the lead from the gang condenser.

Adjust the primary and secondary of the first intermediate transformer for greatest volume.

Follow the same procedure on the second intermediate transformer and then turn the receiver off.

Disconnect one end of the speaker voice coil and connect the output meter across the secondary of the speaker coupling transformer. Short the oscillator tuning condenser (in the gang) by grounding the stator plates with a screw driver.

Turn the receiver on and adjust the output until the output meter shows a small or medium scale deflection.

Adjust the primary of the first intermediate transformer for the greatest deflection on the output meter.

Adjust the secondary in the same manner.

Follow the same procedure on the second intermediate transformer and then check the settings of all condensers to make certain the maximum output has been obtained.

When the above instructions have been followed, remove the test oscillator coupling and replace the grid lead on the first detector, and also remove the screw driver shorting the oscillator tuning condenser.

GANG CONDENSERS

Couple the test oscillator output to the antenna, (white wire), on the receiver.

Tune the oscillator to 1400 K.C. and carefully tune the receiver to the signal.

A trimmer condenser is mounted over each condenser in the gang and is adjusted by turning the screw located under the hole in top of the gang shield. The shield should not be removed. Adjust each trimmer condenser for maximum deflection on the output meter.

OSCILLATOR

Tune the test oscillator to 600 K.C. and tune the receiver to the signal. Then after turning the receiver off, disconnect the output meter and replace the voice coil lead which was disconnected.

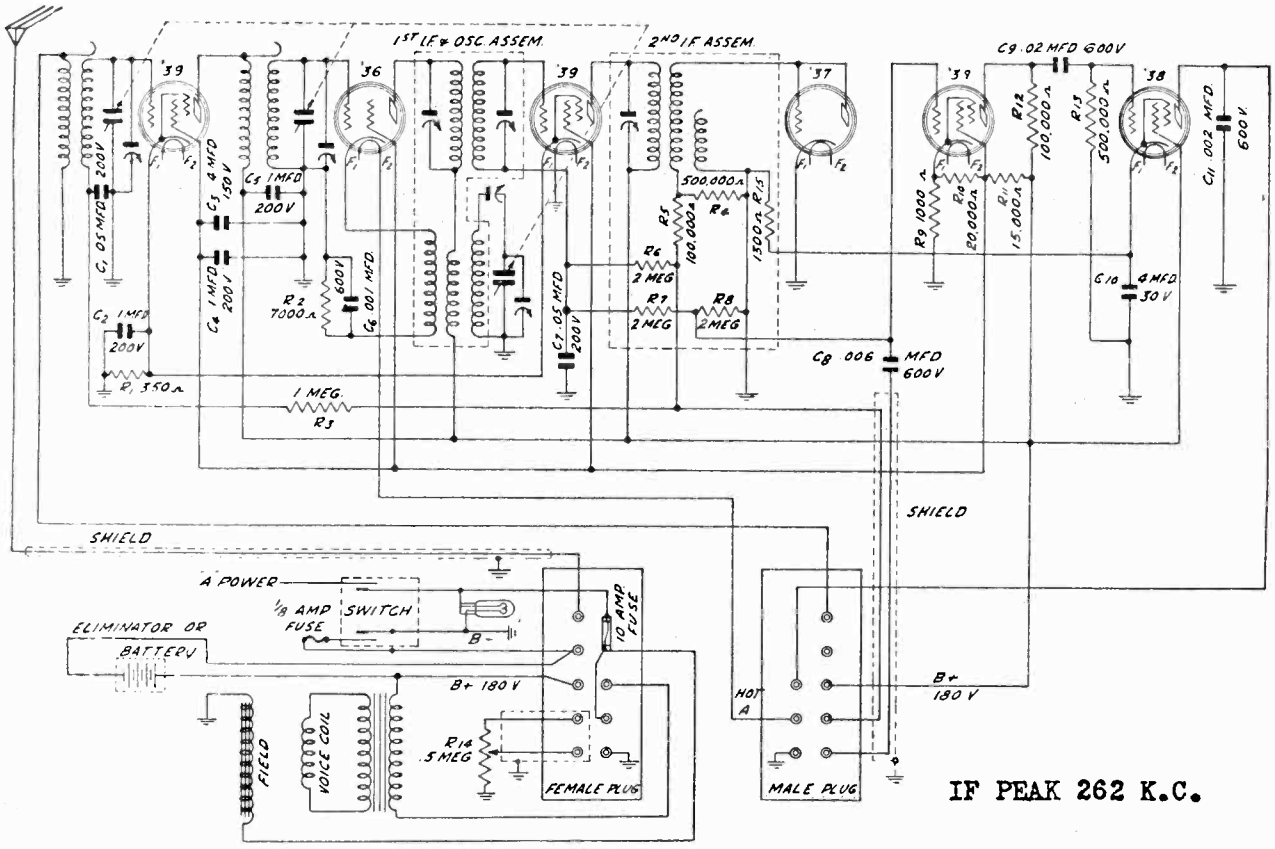
Turn the receiver on and rotate the adjusting screw on the 600 K.C. tracking condenser under the hole in top of the oscillator transformer shield. Rock the gang condenser back and forth across the signal at the same time and listen closely until the maximum volume is obtained. The tracking condenser is then properly adjusted and remains fixed thereafter.

The receiver should be accurately aligned if the above instructions have been followed and no further adjustments need be made.

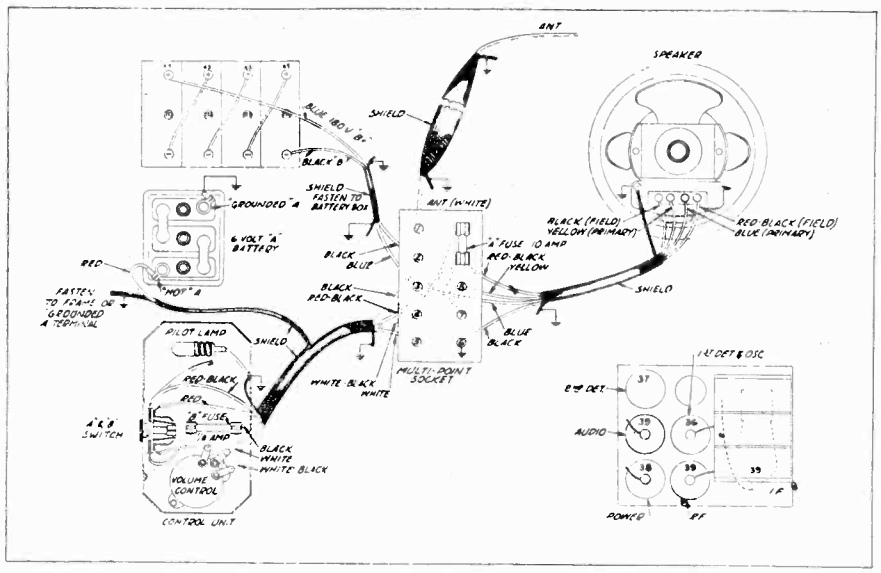
SERIES 13 AND SERIES 23 SUPERHETERODYNE

GULBRANSEN CO.

MODEL 362



IF PEAK 262 K.C.



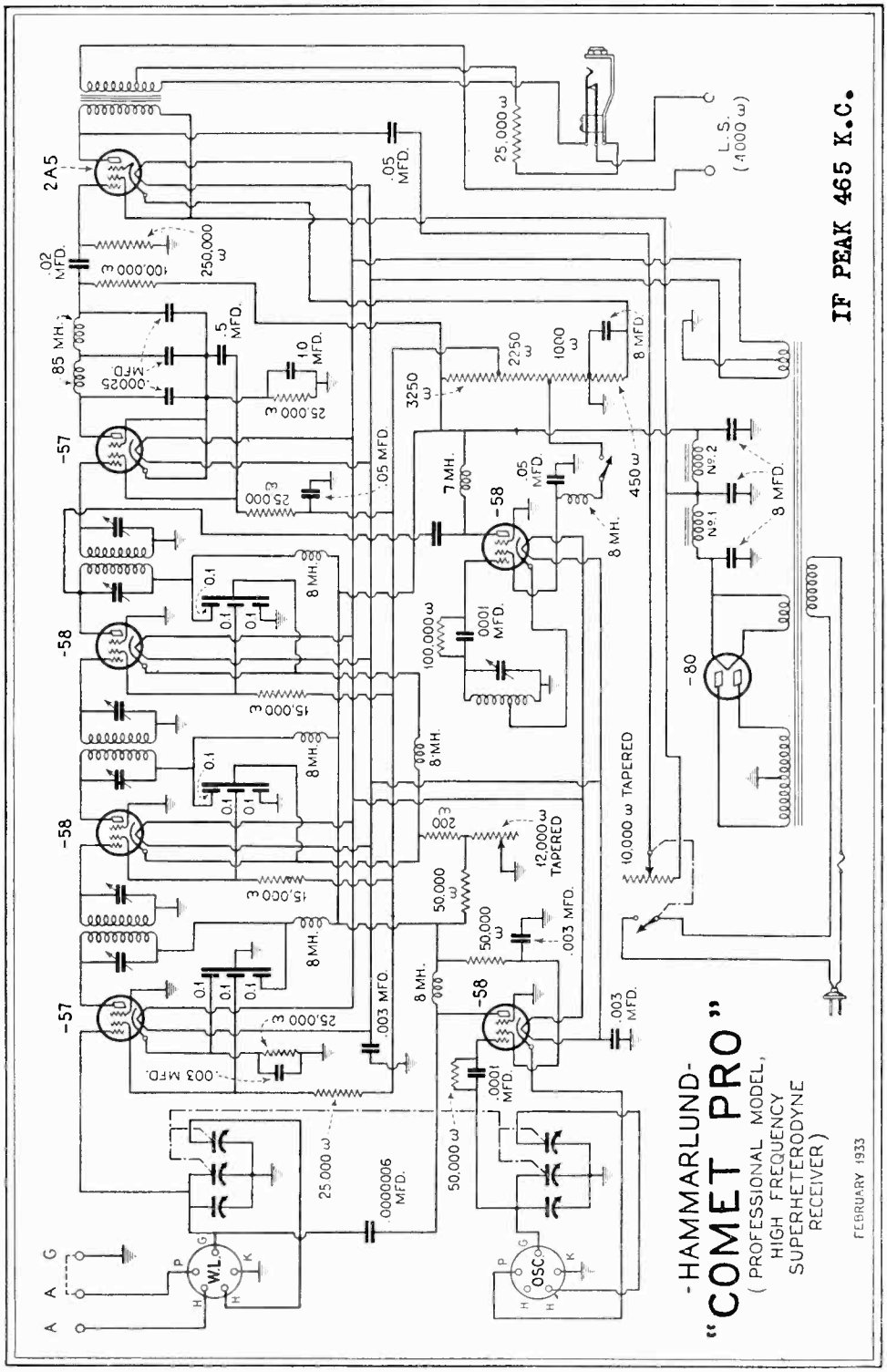
VOLTAGE DATA

Tube	*Plate*	*Screen*	*Grid*	*Plate MA.*
R-F.	177	80	3	3.6
1st Det.	173	76	7*	.9*
I-F.	177	80	3	3.6
2nd Det.	0	0	0	0
1st A-F.	54	77	6	1.2
Output	159	165	15.5	10.0

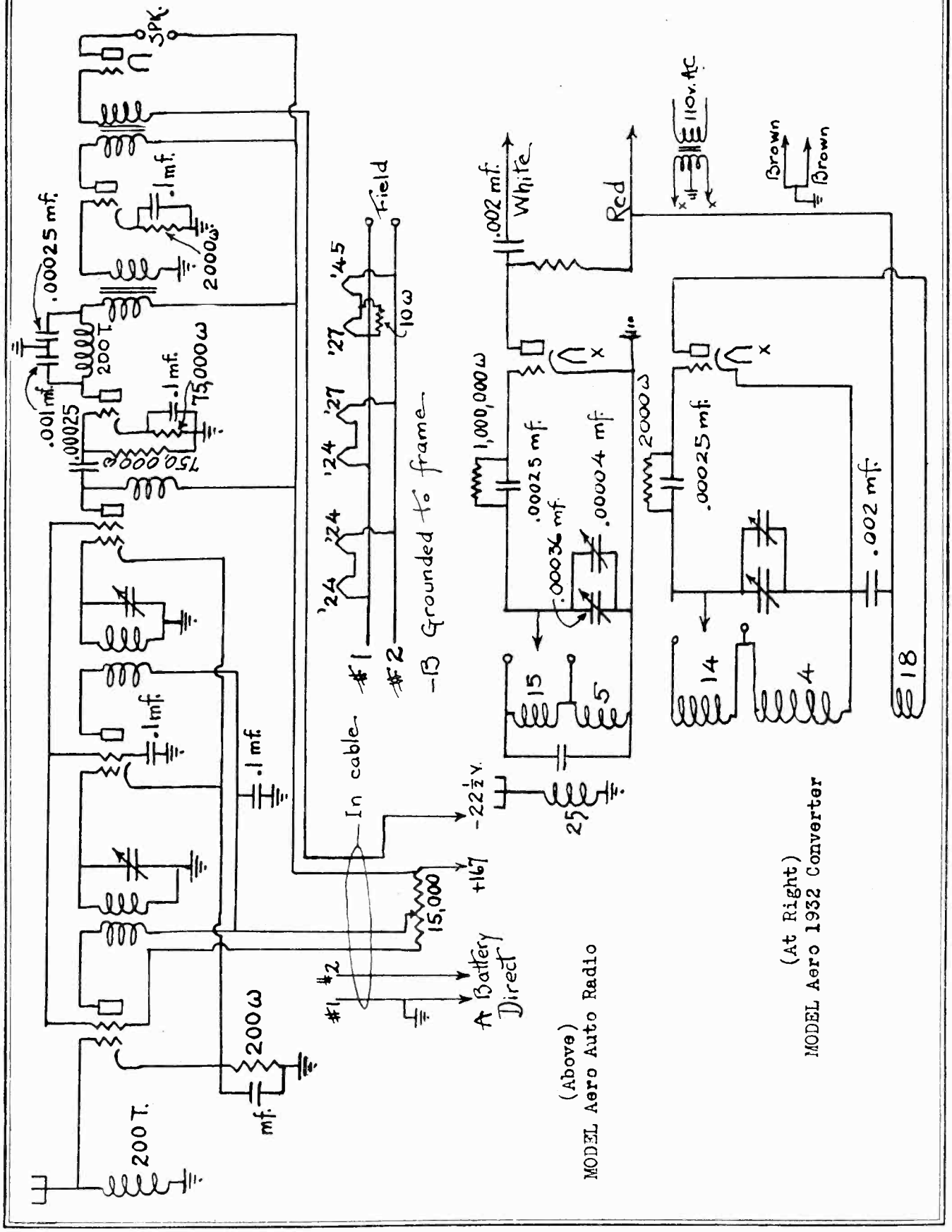
* Will vary with dial setting.

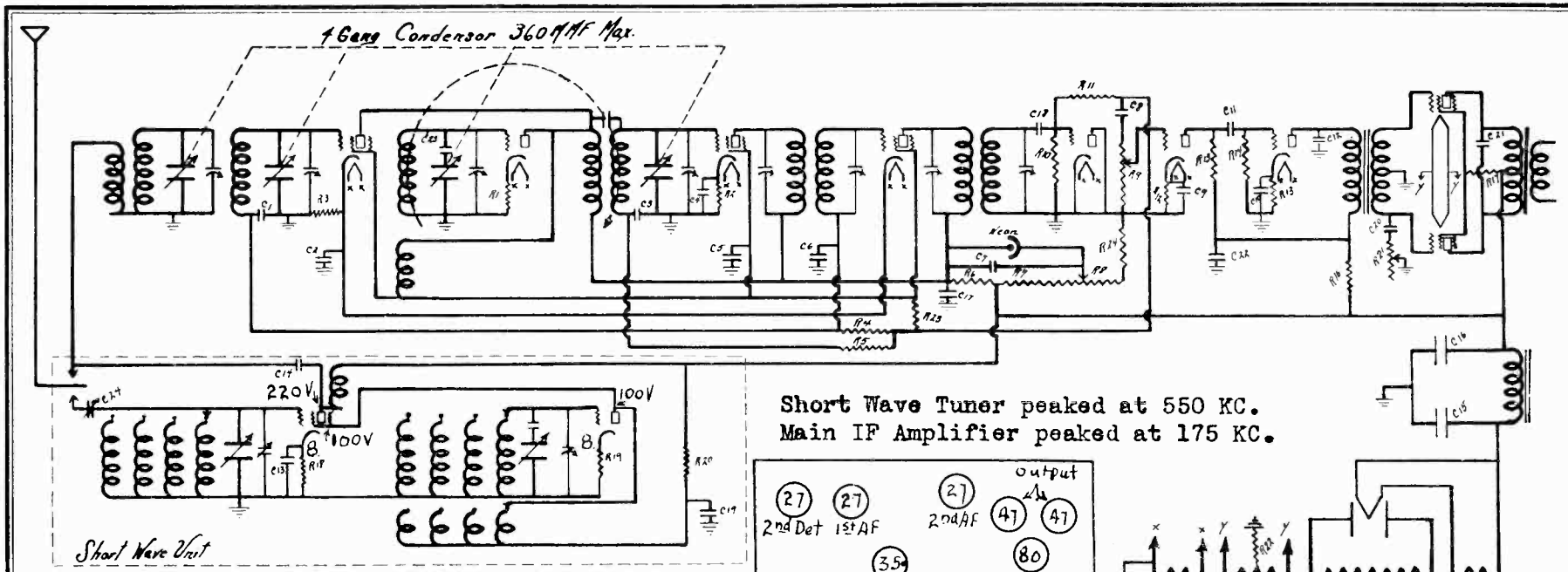
HAMMARLUND MFG. CO.

MODEL Comet Pro
February 1933

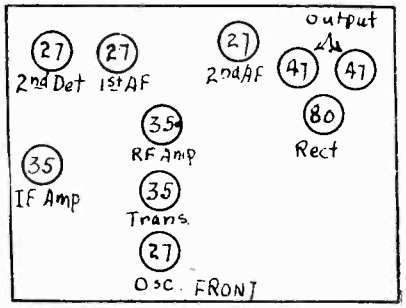


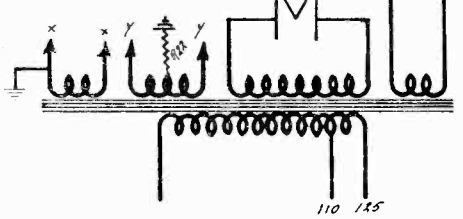
CHARLES HOODWIN CO. MODEL Aero Auto Radio
MODEL Aero 1932 Converter





Short Wave Tuner peaked at 550 KC.
Main IF Amplifier peaked at 175 KC.





Tiffany Tone
Model 101 - 110
Herbert H. Horn Radio Mfg. Co.
1629 So. Hill St. Los Angeles

C1	.1	C16	8.	R1	1,000	1 Watt	
C2	.1	C17	.1	R2	2,500	"	
C3	.1	C18	15 MMFD	R3	300	"	
C4	.1	*C19	.02	R4	500,000	"	
C5	.1	C20	.1	R5	500,000	"	
C6	.1	C21	.005	R6	2,500	"	
C7	.1	C22	2.	R7	50,000	"	
C8	.02	C23	.001	R8	10,000	Variable	
C9	.25	C24	15 MMFD	R9	500,000	Variable	
C10	.25			R10	500,000	1 Watt	
C11	.02			R11	250,000		
C12	.01			R12	2,000		
*C13	.02			R13	100,000		
*C14	.00025			R14	500,000		
C15	8.			R15	2,000		

R16	20,000		
R17	1,500		
*R18	10,000		
*R19	1,000		
*R20	20,000		
R21	500,000		
R22	300		
R23	20,000		
R24	5,000		

*The items noted are in the shortwave tuning unit which is enclosed by a dotted line on the schematic diagram.

MODEL Tiffany Tone 101, 110
Alignment Data

HERBERT H. HORN

VOLTAGE TABLE
No Signal Input To Receiver

No.	Type	Function	Plate	Screen	Cathode	Heater
1	335	RF Amp	187	80	2.8*	2.1
2	335	Trans	187	80	2.8*	2.1
3	327	Osc.	80	-	4.2*	2.1
4	335	IF Amp	187	80	2.8*	2.1
5	327	Det.	-	-	-	2.1
6	327	1st AF	30*	-	4.9*	2.1
7	227	2nd AF	115	-	7.2*	2.1
8	347	Output	210	205	13.1*	2.3
9	347	Output	210	205	13.1*	2.3
10	280	Rect.				4.8

* Voltmeter resistance 50,000 ohms. All other voltages measured with 250,000 ohm voltmeter. Chassis is negative for all readings.

IF TRANSFORMER ADJUSTMENT

There are four i-f transformers. Both the grid and plate circuits of each must be tuned sharply to 175 kc. The condenser adjusting screws are accessible from the underside of the chassis; there being two slotted screws protruding through the insulated base of each transformer.

LINE UP OF GANG CONDENSERS

The four sections of the gang condenser function as follows: The first section, looking at the rear of the chassis tunes the selector stage. The second section tunes the grid circuit of the r-f amplifier. The third section tunes the grid circuit of the translator tube and the fourth section tunes the oscillator. The fourth section is that nearest the front of the chassis. The first three must track together at signal frequency, which is the desired signal frequency. The oscillator section on the other hand must track 175 kc higher than the signal frequency.

THE SHORT WAVE TUNER

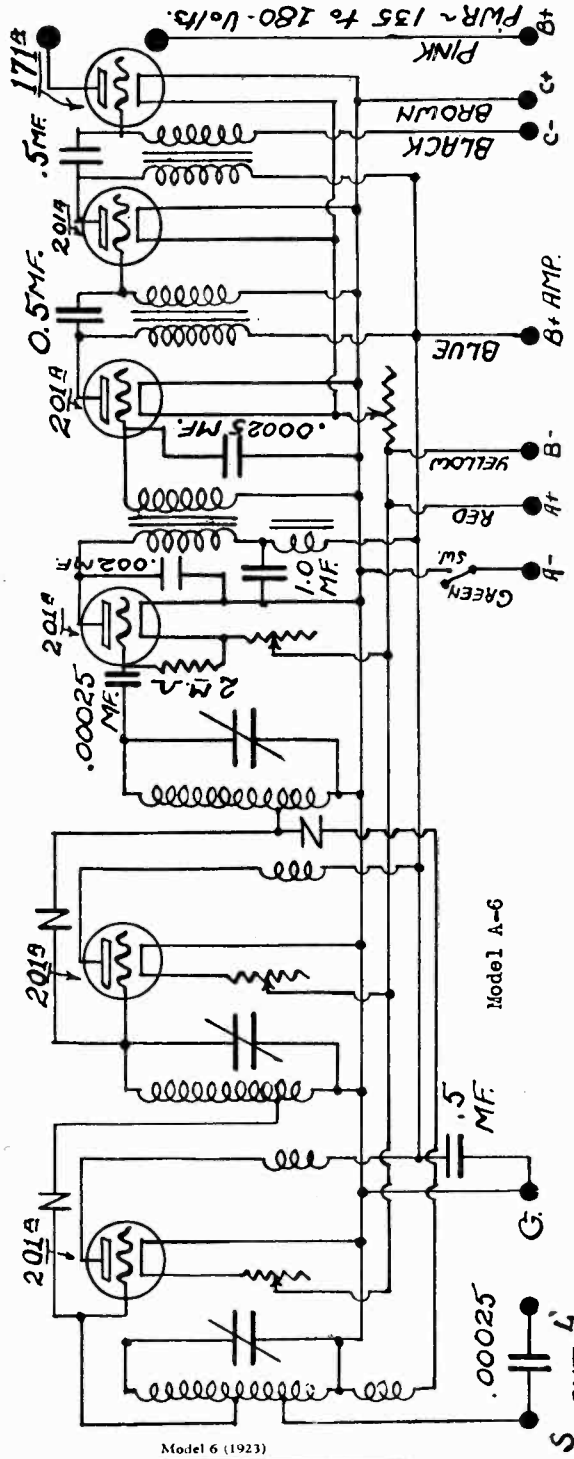
The short wave tuner consists fundamentally of two tuned circuits and two tubes, one of which is a 224 operating at short wave signal frequency as a first detector ans the other tube is a 227 oscillator tuned to 550 kc higher than the desired short wave signal frequency. The resultant beat of 550 kc is fed into the antenna post of the broadcast part of the complete receiver chassis, which operates as an 550 kc intermediate frequency amplifier during short wave reception. The dial of the broadcast receiver must be set to 550 kc during short wave reception.

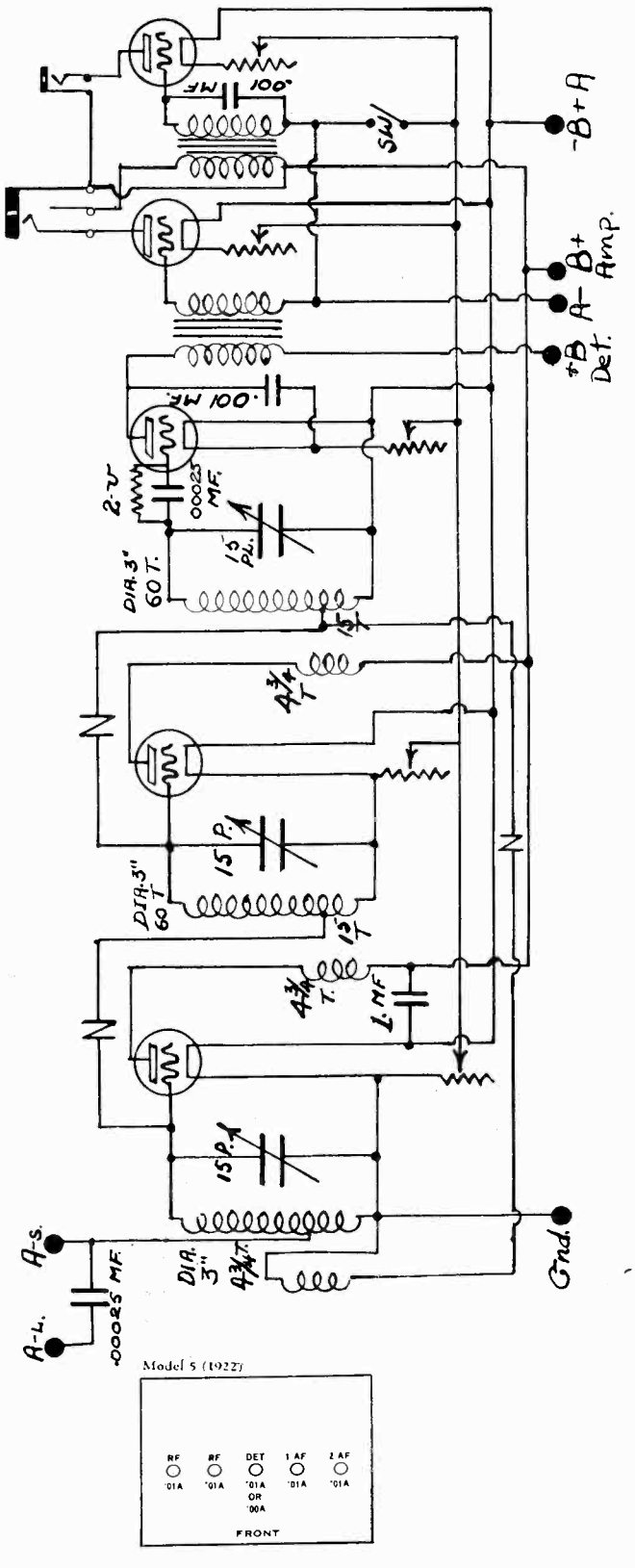
To balance: Set band selector switch on position C - set dials on about 10. The front section of the two gang condenser tunes the detector stage to signal frequency; the back section tunes the oscillator coils to a frequency 550 kc greater than signal frequency. If the small variable condenser, which is paralleled with the detector condenser, will not resonate its circuit within its capacity range, it will be necessary to change the trimmer located on the oscillator section of the main tuning condenser. This may be done by tuning in a signal and rotating the variable trimmer to maximum resonance; if this point is reached with the balancing condenser plates at maximum capacity, it will be necessary to reduce the oscillator trimmer capacity, and if the resonance point is approached with the balancing condenser at minimum capacity, it will be necessary to add capacity to the oscillator trimmer. This should be regulated so the balancing condenser peaks with the plates about half way out, with the short wave tuning dial set at 50.

The approximate setting of the oscillator trimmer may be obtained by turning the adjusting screw down tight and then relasing it two full turns.

HOWARD RADIO CO.

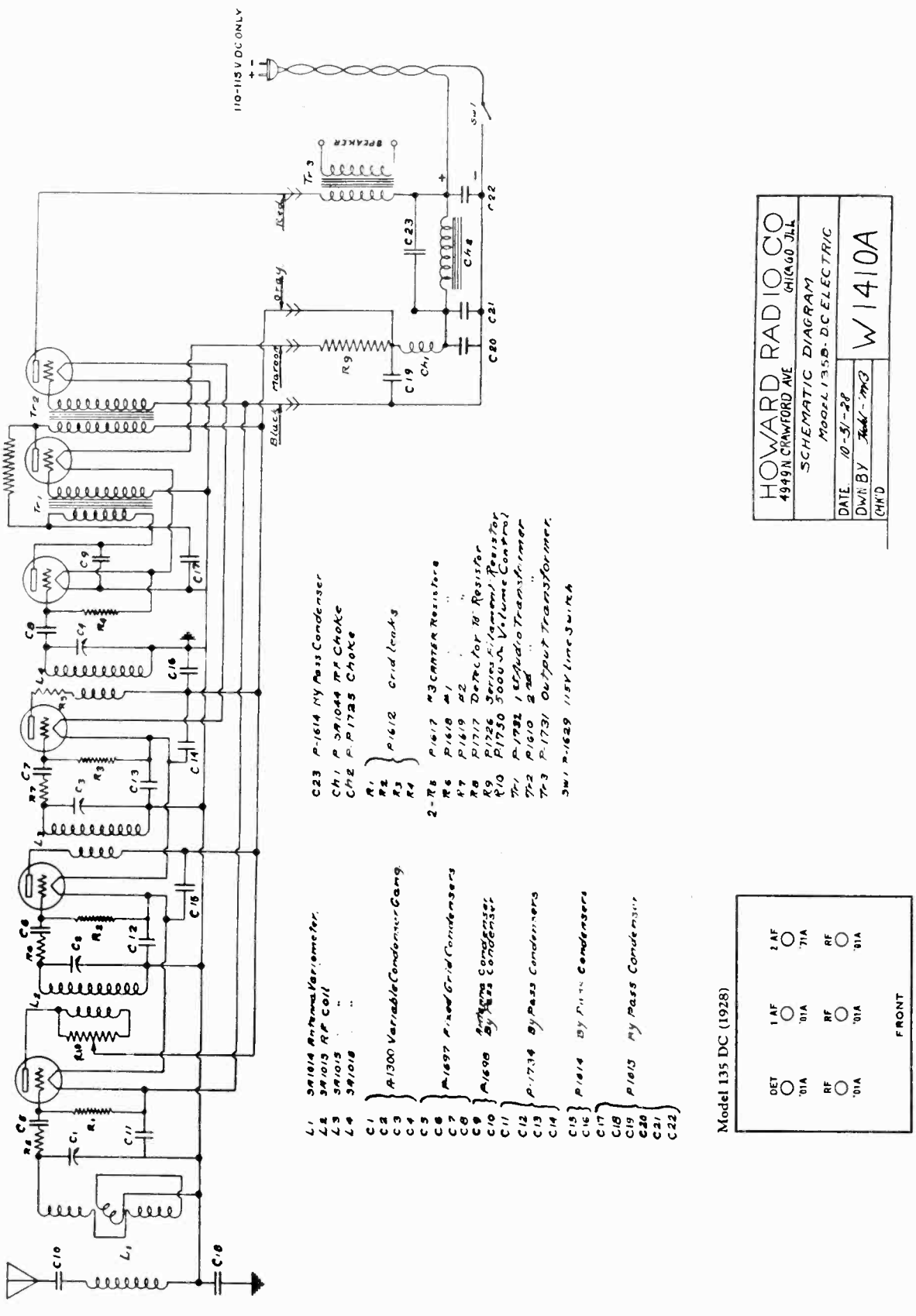
MODEL A-5
MODEL A-6





HOWARD RADIO CO

MODEL 135 D.C.



L1	341014	Antenna Variometer
L2	341015	RF Coil
L3	341015	" "
L4	341018	" "
C1	P-1300	Variable Condenser Gang
C2		
C3		
C4		
C5		
C6	P-1697	Fixed Grid Condensers
C7		
C8		
C9	P-1698	Antenna Condenser By Pass Condenser
C10		
C11		
C12	P-1734	By Pass Condensers
C13		
C14		
C15	P-1614	By Pass Condensers
C16		
C17		
C18	P-1613	My Pass Condensers
C19		
C20		
C21		
C22		
C23	P-1614	My Pass Condenser
Ch1	P 341044	RF Choke
Ch2	P-1725	Choke
R1	P-1612	Grid Leaks
R2		
R3		
R4		
2-R5	P-1617	3 Center Resistors
R6	P-1618	#1 " "
R7	P-1619	#2 " "
R8	P-1717	Detector 1M Resistor
R9	P-1726	Series Filament Resistor
R10	P-1730	3000 Ω Volume Control
Tr1	P-1731	1 Audio Transformer
Tr2	P-1610	2 " "
Tr3	P-1731	Output Transformer
SW1	P-1629	115V Line Switch

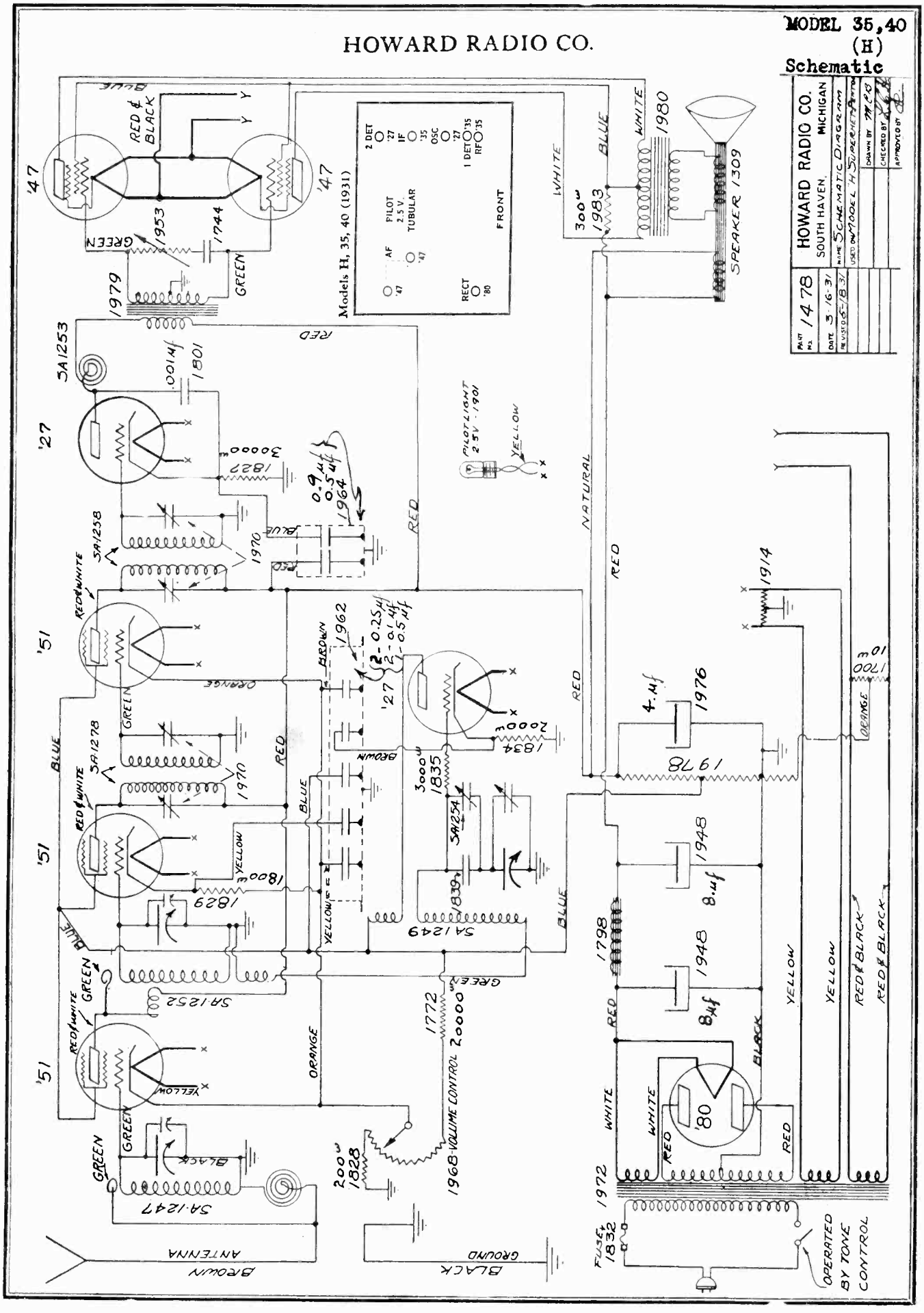
HOWARD RADIO CO
4949 N CRAWFORD AVE CHICAGO ILL.

SCHEMATIC DIAGRAM
MODEL 135B - DC ELECTRIC

DATE 10-31-28
DWN BY Todd-MO
CHK'D

W1410A

Model 135 DC (1928)



MODEL 35,40
(H)
Alignment Data.

HOWARD RADIO CO.

MODEL "H"

ADJUSTMENTS The 175 kc. oscillator must be accurately tuned to 175 kc. and only 175 kc. If this precaution is not observed it will be impossible to align the oscillator to the rest of the set and the set will not operate correctly as the oscillator is designed for exact 175 kc. operation.

The second intermediate frequency amplifier transformer shield can is removed and one side of the small variator condenser is disconnected from the primary coil. This coil is connected so that it still is in the plate circuit of the tube but the tuning condenser is not connected in the circuit. Now remove the grid cap from the intermediate amplifier tube and connect a 3 megohm resistor from the control grid to ground. Now connect the output from the 175 kc. oscillator to the grid of the intermediate frequency amplifier tube and tune the secondary for maximum deflection of the output meter. (Low voltage alternating current meter, 0 to 3 volts, connected across the voice coil of speaker). Now remove the shield can and connect the small tuning condenser that was previously removed back across the primary coil. With the 175 kc. oscillator connected the same as before, tune the primary for a maximum deflection of the output meter. (Caution: Do not under any circumstances try to retune the secondary after having tuned the primary. **This is important.**) After having tuned this stage proceed to the next intermediate frequency:

(b) Replace the grid cap on the intermediate frequency amplifier and proceed to the first detector tube. Remove this tube cap and connect the 175 kc. oscillator as before, being sure to connect the 3 megohm resistor from control grid to ground. Now proceed to tune the intermediate frequency transformer by tuning the secondary first for maximum deflection of the output meter and then tuning the primary for maximum deflection. Tuning this transformer must be done very carefully as the selectivity of the whole receiver depends entirely on the tuning of this transformer.

(c) To line up the radio frequency amplifier and detector stages, remove the oscillator tube and the second detector tube. Unsolder the connection on the plate terminal of first detector tube socket and solder a wire from this terminal to the plate terminal of the second detector tube socket. Now set the Test Oscillator (R. F. Generator) which tunes over the broadcast frequency range to 1400 kcs. Connect the output of this oscillator to the aerial and ground wires of the receiver. Now make sure that when the tuning condensers are all in maximum capacity that the pointer on the escutcheon lines up with the line just beyond the 550 kc. dial mark and then turn the dial until the escutcheon pointer lines up with the 1400 kc. line on the dial. The tuning condenser trimmers should now be adjusted until a maximum deflection is shown by the output meter. Now set the oscillator to 1000 kcs. Turn the dial to 1000 kcs. and then secure maximum deflection on the output meter by moving the serated plates of the variable condenser in or out as the case may be. Repeat the same procedure at 600 kcs. as was used at 1000 kcs. (Do not touch the trimmer condensers after having once set them at 1400 kcs.). Unsolder the wire connecting the first detector plate terminal to the second detector plate terminal. Resolder the wire that was originally unsoldered from the first detector plate terminal. Now replace the oscillator and second detector tubes.

(d) To line up the oscillator tune the set to 1400 kcs. and adjust the oscillator tuning condenser trimmer (the last hole of the three holes in a line on the top of the tuning condenser housing) as viewed from the front of the set, (see Fig. 1) until a maximum reading is secured on the output meter. Adjust the Test Oscillator to 600 kcs. and tune the receiver to 600 kcs. Now adjust the oscillator series condenser trimmer (the hex. nut in the hole to the left of the oscillator tuning condenser trimmer hole) until a maximum deflection is secured on the output meter. Now reset the Test Oscillator to 1400 kcs. and retune the set to 1400 kcs. and make adjustments if any are necessary on the oscillator tuning condenser trimmer. It is very seldon necessary to make any readjustments at 1400 kcs. after they have once been made.

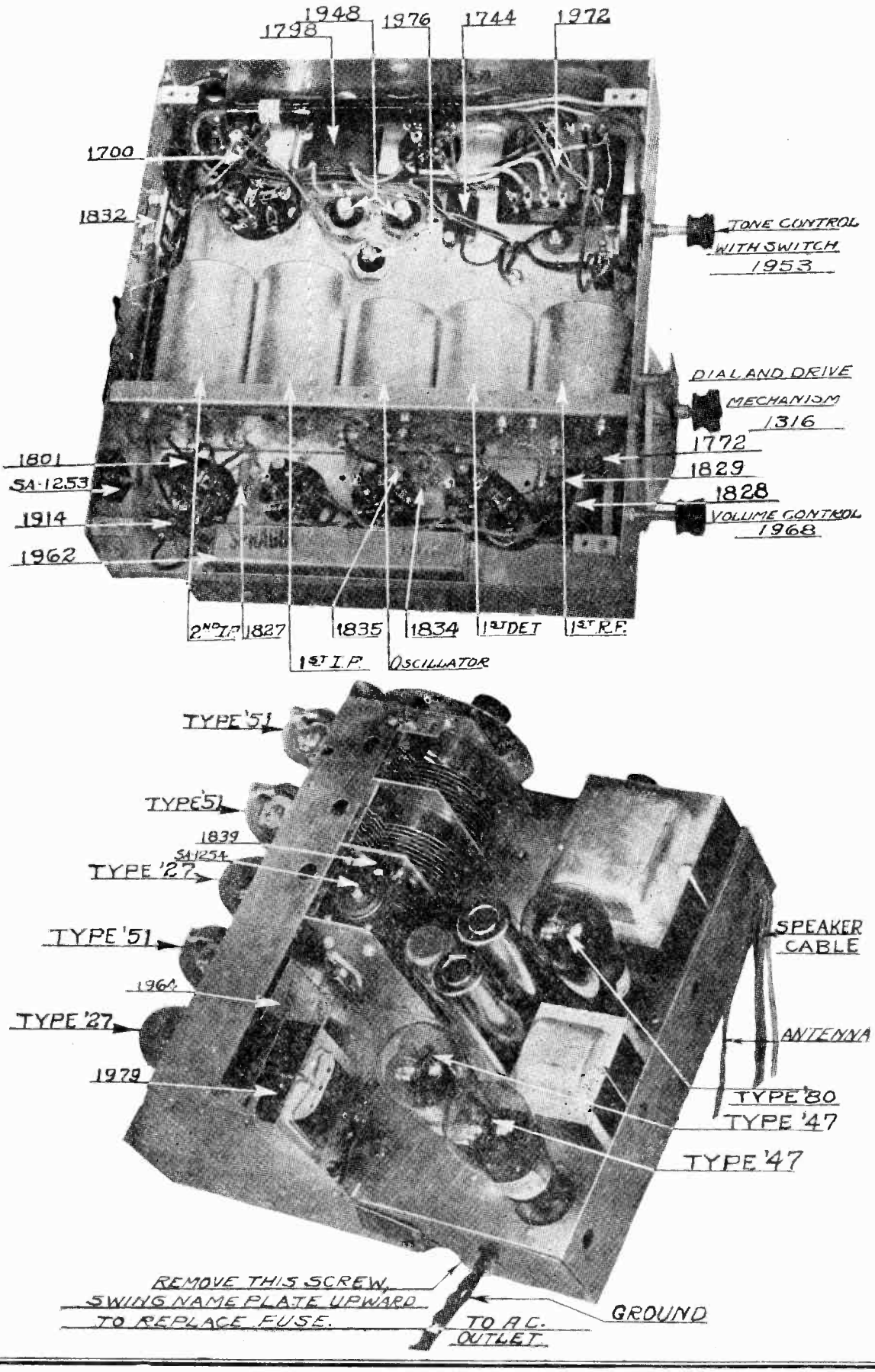
Now tune the Test Oscillator to 1000 kcs. and tune the set to 1000 kcs. Try adjusting the antenna trimmer condenser to determine whether the oscillator aligns at this frequency. If the antenna trimmer must increase capacity to give maximum deflection of output meter the oscillator tuning condenser serated plates should be moved out. If the antenna trimmer condenser is decreased in capacity the oscillator tuning condenser serated plates should be bent in towards the stator plates.

The Test Oscillator must again be set to 1400 kcs. and the set retuned to 1400 kcs. to make sure that the antenna trimmer condenser has been correctly reset after the oscillator adjustment has been made at 1000 kcs.

In making tests after having made adjustments according to the foregoing paragraphs, it is necessary to replace the tube and coil can shields before making the tests.

HOWARD RADIO CO.

MODEL H
Chassis
Top-Bottom View



1. **Specifications.**

The Howard Model AVH receiver is a superheterodyne receiver similar to the Model H receiver with the addition of an Automatic Volume Control.

2. **Schematic Circuit.**

Drav g 1481 shows a schematic diagram of the Model AVH. Since the Model "H" and Model "AVH" are nearly identical, it will only be necessary to show wherein the two differ

In the radio chassis the following differencies are noted.

The first radio frequency transformer SA-1267 is not grounded as in the Model "H". A non-inductive .1 mfd. condenser is connected between the end of this coil and ground. This condenser provides an insulation as far as direct current is concerned for the grid of the radio frequency amplifier tube. From a radio frequency standpoint, this condenser offers a low impedance path to ground for the radio frequency voltage. Since this condenser and the tuning condenser are in series across the tuning coil it is necessary that this condenser be large in order to have small effect on the tuning capacity.

The second radio frequency transformer SA-1268 is constructed in the same manner as the first radio frequency transformer as far as grounding is concerned and needs no further explanation. For actual physical construction refer to section 2 of Model "H" Service Manual)

The first intermediate frequency transformer SA-1278 also has an isolating condenser in the grid circuit. This condenser serves the same purpose as those in the radio frequency transformers.

The initial operating bias for the various tubes is secured by means of individual resistors in each cathode circuit. The plate current flowing through this resistor causes a voltage drop across it which places the cathode positive with respect to ground. Since the grid is effectively at ground potential this is the same as placing a negative voltage on the grid. It is necessary to bias these tubes individually so that there is no common impedance which might give rise to reaction between the tubes. Each resistor is by-passed to form a low impedance path for radio frequency around the resistor.

3. **Automatic Volume Control.**

The Automatic Volume Control is actuated by means of a type 227 tube and in order to explain its operation it is necessary to explain its action under condition of no signal being received and then its action when a signal is being received.

The tube is connected so that the grid is at absolute -B potential by means of a 2 megohm resistor (P-1889). The cathode of the tube is connected to a point on the voltage divider which is at +24 volts with respect to -B or thegrid. There exists then between the cathode and the grid a potential difference of 24 volts with the grid negative by this amount. The plate of this tube connects to ground by means of two 150,000 ohm resistors (P-1888). Since ground is connected to +124 volts with respect to -B there exists between the cathode and the plate a potential difference of 100 volts. In order to by-pass any radio frequency energy which may appear on the plate a non-inductive condenser (P-1893) is connected from the plate of the Automatic Volume Control tube to the cathode.

With the condition of no signal there exists a bias of 24 volts and a plate voltage of 100 volts. Under these conditions there is no plate current flowing and the tube is said to be cut-off. Since no plate current is flowing there exists no voltage drop across the plate circuit resistors and, therefore, there is no bias voltage on the grids of the controlled tubes. The only bias on the r.f., 1st det. and i.f. is caused by the respective voltage drops across their cathode resistors. These resistors are designed to give the most sensitive operating point.

Now let us consider the case of a received signal. The signal passes through the receiver to the second detector grid. Here the AVC (automatic volume control) tube grid and the second detector grid are in parallel. The signal voltage is fed to the grid of the AVC tube by means of a small fixed condenser P-1892. This signal voltage swings back and forth with its center coinciding with the initial bias on the AVC tube. It will be seen that during the positive half at the cycle, the peak voltage of the signal swing substracts from the original bias voltage. This means that the instantaneous bias on the tube is less than the original bias and the tube begins to draw current in the plate circuit. Since this current flows in the resistors in the plate circuit of the AVC tube, there exists a voltage drop across these resistors. Also the flow of the electrons is from plate to ground so that the plate becomes negative with respect to ground. Now since the original potential of the cathodes of the r.f., 1st. det. and i.f. tube is positive with respect to ground, it follows that if the grids of the respective tubes are connected to resistor in the plate circuit of the AVC tube, that any potential existing across this resistor is added to the original bias and makes the grids more negative than the original bias by the amount of the voltage drop across the resistor in the AVC tube plate.

It is at once apparent that the greater the signal voltage appearing at the grid of the AVC tube, the more plate current will flow in plate circuit. An increase in plate current means an increase in bias on the r.f., 1st det. and i.f. tubes. An increased bias on these tubes means less amplification and therefore, less grid swing on the second detector and AVC tube. This cycle goes on until a constant voltage is obtained across the second detector input or in other words until a condition of equilibrium is reached.

The action of the AVC is to maintain a constant voltage across the grid of the second detector regardless of the voltage of the incoming signal. Since this voltage remains constant this means that the audio output also remains constant.

In order to connect the grids of the various tubes to the AVC resistor, it is necessary to insert decoupling resistors P-1897 in each grid lead. These resistors are of such value so that in conjunction with the isolating condenser, they form a resistance capacity filter section so that any modulation from the AVC tube does not reach the grids of the other tubes.

Due to certain detector characteristics it is not advisable to control the 1st detector tube as much as is necessary with the r.f. and i.f. tubes. The grid return of the 1st detector, therefore, goes to the center tap of the two resistors in the plate circuit of the AVC tube while the grid return of the r.f. and i.f. tubes go directly to the plate of the AVC tube.

4. **Volume Level Control.**

In the automatic volume control set the receiver is designed so that the maximum audio output is just below the point of overload of the audio power tube. Since this value of output is far more than necessary for normal room volume, it is necessary to introduce some type of volume level control in order that the customer may adjust the output to any desired value. In order to accomplish this a variable resistor is shunted across the secondary of the input transformer to the pentode tubes. By adjusting this control, the volume may be set at any desired level and once adjusted need not be adjusted until it is desired to receive an extremely distant station which has a field strength too weak to operate the automatic volume control.

5. **Tone Control.**

Since the volume level control on the Model AVH is connected where the tone control is normally connected, it was necessary to re-design the tone control for a new location. The tone control consists of two condensers P-1845 and a variable resistor P-1881. This combination is connected in series across the plates of the two pentodes. The action of this control is the same as that on the Model H in that as less resistance is included between the two condensers, they become more effective in by-passing the higher audio frequencies and at the same time they tune the primary of the output transformer to a lower audio frequency

6. **Visual Tuning Meter.**

Since the Automatic Volume Control tends to hold the audio output of the set to a certain definite volume level, it will be at once apparent that the main tuning dial may be rotated quite a distance without any appreciable change in audio volume. This means that the point of resonance is hard to distinguish. In order to tune the receiver to absolute resonance, a visual tuning meter is used. This meter is connected in series with the plate supply voltage of the three controlled tubes. As the bias increases on these tubes as the receiver is tuned to resonance, the plate current decreases. This decrease in plate current is recorded by the meter. A station is in exact resonance when the tubes are drawing their minimum plate current for a given signal strength. At this condition the best tonal qualities are realized from the set. It is important that the service man and dealer both understand this tuning so that the customer may be instructed in the correct manner of tuning his radio set. This broadness of tuning is only apparent and does not effect the selectivity of the receiver. This action is explained fully in the instruction pamphlet with each receiver and should be thoroughly understood so that an explanation can be given the customer.

7. **Power Pack.**

The power pack is of the conventional type and is similar to the Model H with a few exceptions.

The power transformer has a separate winding for the heater of the AVC tube. This is necessary because if the heater were grounded as the other heaters, it would place 100 volts potential difference between cathode and heater and it is possible that rectification might take place between these two elements which would hinder the action of the AVC tube.

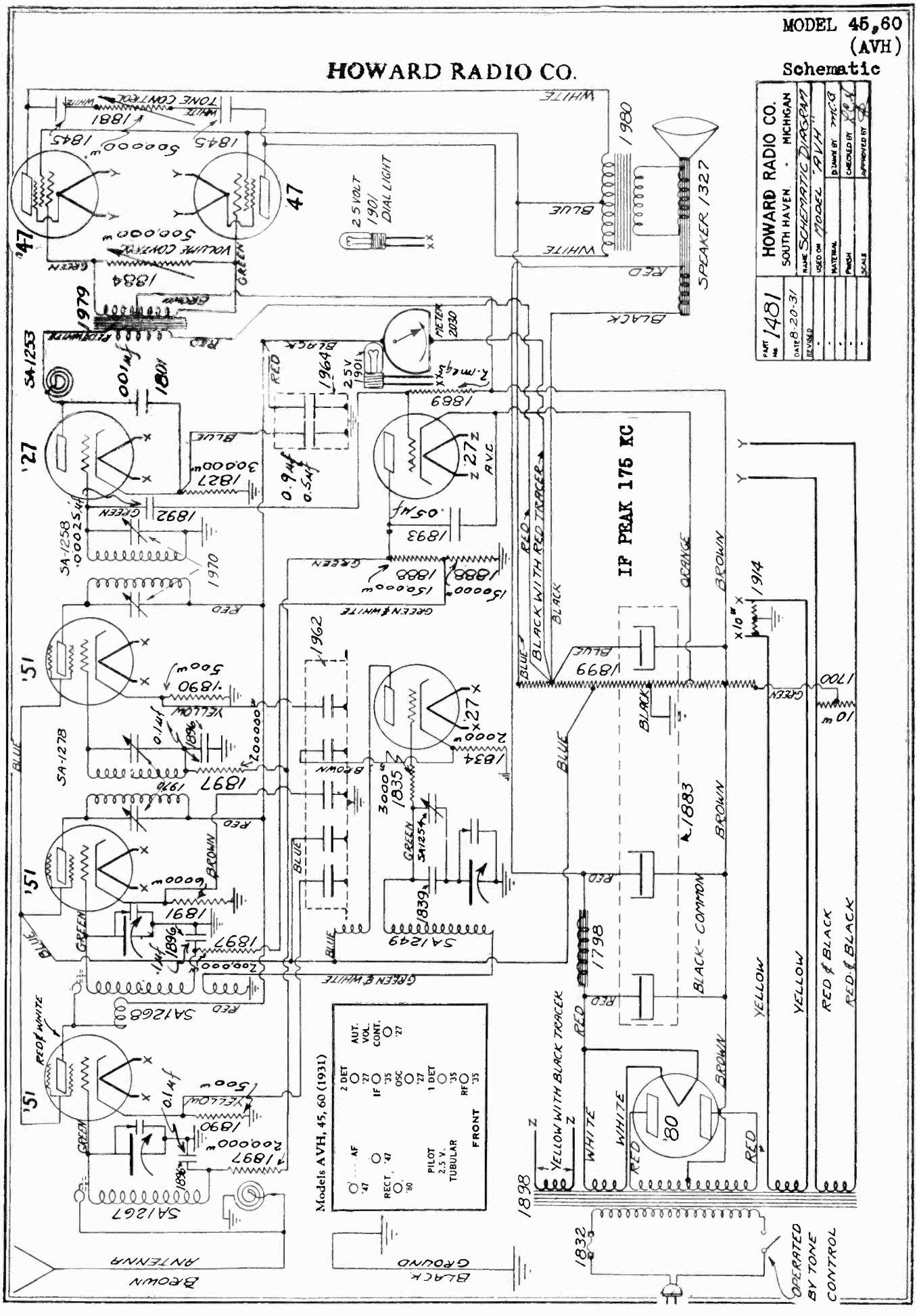
The HV. secondary of this power transformer is also changed to give an increased high voltage. This increase is necessary because the AVC tube requires an additional 124 volts for operation.

Since an additional 124 volts is required above the usual 180 volts for plate operation this means that from +B to -B on the voltage divider resistor there is a total of 304 volts. As our power tubes require only 250 volts plate and 16.5 volts bias it is at once apparent that they may be connected betwen +B and -B with suitable resistors to drop the voltages to the correct operating voltages.

The speaker field is connected the same as in the Model "H" but since the total current of the set now flows through the speaker field the resistance of the field is only 350 ohms instead of 2400 ohms as in the standard Model H.

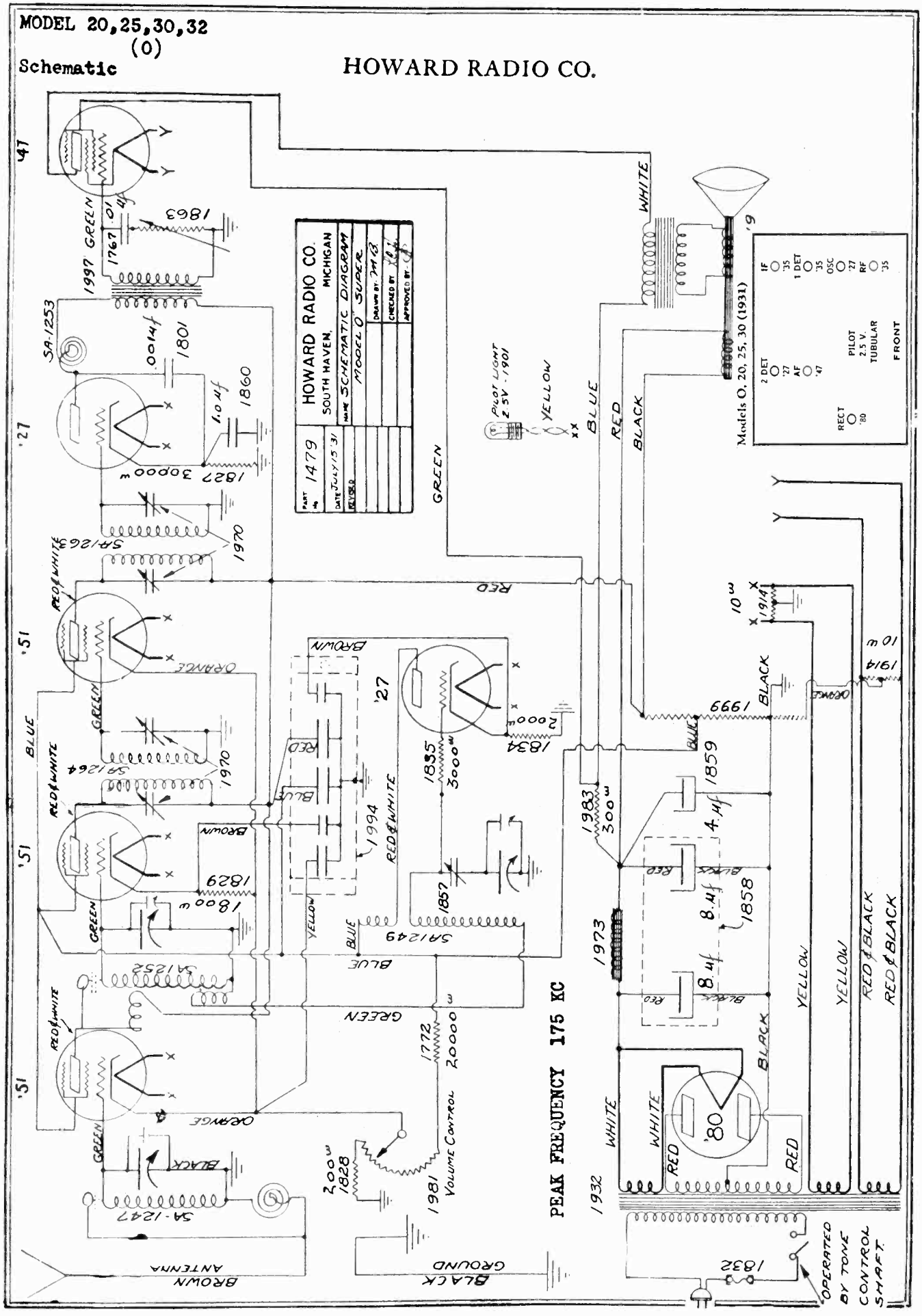
The filter condensers on the Model AVH are of the dry electrolytic type since there would exist a potential difference between the case and the chassis if the wet electrolytic were used which might shock the user if he happened to touch the can of the condenser and the chassis. These dry electrolytic condensers are housed in a container which is at ground or chassis potential so that this danger is eliminated.

Two pilot lights are used on the Model AVH, one for illuminating the dial and the other for illuminating the meter.



MODEL 20,25,30,32
(0)
Schematic

HOWARD RADIO CO.



Schematic Circuit

The schematic circuit of this receiver is shown in Dwg. No. 1479. The antenna connects to the set by means of the brown flexible lead shown in Fig. 1. The ground also connects to the set by means of a black flexible lead also shown in Fig. 1. (In later models binding posts are provided for antenna and ground.)

Inside the set, the antenna lead goes to a high inductance primary. The other end of this inductance grounds to the metal chassis. From the antenna end of this inductance a single turn of wire is coupled capacitively to the secondary of the radio frequency transformer. This coil is made in this manner so that the amplification will be equal throughout the frequency band. The secondary is tuned by means of a section of a three gang condenser. One end of this secondary connects to the control grid of the radio frequency amplifier tube while the other end is grounded.

The plate circuit of the radio frequency amplifier tube connects to +B voltage through a high impedance choke coil. The plate circuit of the r.f. amplifier is coupled to the secondary circuit by means of a single turn of wire in close physical relation to the grid end of the secondary coil which connects to the grid of the first detector or mixer tube. This single turn gives the necessary capacity coupling to produce uniform amplification over the broadcast frequency spectrum. The secondary coil of this transformer is tuned by a second section of the three gang variable tuning condenser. As with the secondary of the radio frequency amplifier transformer, one end of this coil is connected to the control grid of the first detector tube. The other end of this secondary coil is grounded to the chassis.

In order to introduce the oscillator voltage into the grid circuit of the mixer or first detector tube a small coil is wound in inductive relation to the secondary coil at the grounded end of the secondary. This small coupling coil is insulated from the secondary by means of a pyralin strip.

This small coil is a part of the oscillator inductance. Tuning of the oscillator is accomplished by means of the third section of the three gang variable tuning condenser, which has in series with it a fixed padding capacitor. This padding condenser has across it a small trimmer condenser. This condenser tunes the oscillator to an exact frequency at the low frequency end of the spectrum. One end of the oscillator coil is grounded through the 1st detector coupling coil while the other end connects to the control grid of the oscillator tube by means of a resistor P-1835 (Dwg. 1479). This resistor is used to stabilize the oscillator voltage over the frequency range. The plate circuit of the oscillator contains the conventional tickler coil, and is connected to the screen grid voltage tap for its plate voltage. The oscillator is of the biased type having a bias resistor connected from the cathode to ground. This resistor is by-passed by a section of the by-pass condenser block.

Voltage and Current Readings Howard Model "O"

Tube No.	Type	Position	A Volts	B Volts	Screen Volts	C Volts	Plate Current M.A.	Screen Current
1	551	1st R.F.	2.20	180	92	— 3.5	5.4	
2	227	Osc.	2.20	88		—10.0	2.8	
3	551	1st Det.	2.25	175	90	— 8.0	2.5	
4	551	I.F.	2.25	180	92	— 3.5	6.2	
5	227	2nd Det.	2.30	160		—17.0	0.6	
6	247	Audio	2.35	260	270	—21.0	25.0	4.2
7	280	Recitfier	4.60	350–350				

Line voltage, 115 volts. Volume Control, Full On.

(1) Alignment

IMPORTANT. The 175 kcs. oscillator must be accurately tuned to 175 kcs. If this precaution is not observed it will be impossible to align the oscillator to the rest of the set and the set will not operate correctly as the oscillator is designed for exact 175 kcs. operation.

This set is designed slightly different from the Model H superheterodyne in that the second intermediate frequency transformer is not overcoupled.

The following alignment procedure should be followed:

A Intermediate Transformer Alignment.

1. Remove grid cap from intermediate frequency amplifier tube and connect the control grid of this tube to a 2 or 3 megohm resistor. Connect other end of this resistor to ground.

2. Connect output of 175 kc. oscillator to control grid circuit of this tube.

3. Tune secondary of intermediate transformer for maximum deflection of output meter. (Low voltage alternating current meter, 0-3 volts connected across voice coil of speaker.)

4. Tune primary of intermediate transformer for maximum deflection of output meter. Retune secondary to make sure tuning of primary has not affected the resonant point of secondary.

5. Replace grid cap as originally. Remove grid cap of the 1st detector and connect the 3 megohm resistor from control grid to ground. Connect the output of 175 kc. oscillator to control grid of 1st detector.

6. Tune secondary of 1st intermediate frequency transformer to 175 as shown by maximum deflection of output meter.

7. Now tune primary of this transformer to 175 as indicated by maximum deflection of output meter. Retune secondary to see it has not been affected by primary tuning.

8. Retune second intermediate frequency transformer to make sure it is exactly tuned at 175 kc. as there may be some change in tuning when the 1st detector is connected in the circuit.

No. 1 Radio Frequency Amplifier Alignment.

1. After aligning IF transformers, replace 1st detector grid cap. Unsolder the wire connecting the plate of the 1st detector tube to the IF transformer. Remove oscillator tube and 2nd detector tubes. Connect the plate terminal of 1st detector tube to the plate terminal of the second detector socket.

2. Rotate the condenser in clockwise direction as far as they will go. Make sure that when the rotors of the condenser are all in that the starting mark on the dial aligns with the pointers on the escutcheon. This starting mark is the line just beyond the 550 kc. line on the dial. (See Fig. 1.)

3. Set test oscillator (RF Generator) which tunes over broadcast band to 1400 kc. Connect antenna and ground wires to oscillator. Tune set to 1400, as shown on dial. Adjust trimmer on first and third variable condensers for maximum deflection of output meter.

4. Now tune oscillator 1000 kcs. and tune set to 1000 kcs. as shown on the dial. Adjust for maximum deflection on output meter by moving serated plates on rotor of tuning condensers in or out as the case may be. **Do not** adjust trimmer condensers at this frequency.

5. Repeat process in paragraph 4 at 600 kcs.

6. Remove wire soldered from 1st detector plate terminal to second detector plate terminal and resolder wire from intermediate frequency transformer to plate terminal of 1st detector as originally connected.

Oscillator Alignment.

1. Set test oscillator to 1400 kcs. Tune set to 1400 kcs. and adjust oscillator or second (middle) tuning condenser trimmer for maximum output as shown on the output meter. (Oscillator trimmer condenser second hole of the three in line.)

2. Set test oscillator to 600 kcs. Tune set to 600 kcs. Adjust oscillator padding condenser (single hole to left of three holes in line) for maximum deflection of output meter.

3. Reset test oscillator again to 1400 kcs. and retune set to 1400 kcs. Readjust oscillator trimmer if necessary. This adjustment is very seldom necessary if the other adjustments are made correctly.

4. Now tune test oscillator to 1000 kcs. and tune set to 1000 kcs. Try adjusting antenna trimmer condenser to determine whether the oscillator aligns at this frequency. If the antenna trimmer must increase in capacity to give maximum deflection of output meter the oscillator tuning condenser serated plates should be moved out. If the antenna trimmer condenser is decreased in capacity the oscillator tuning condenser serated plates should be bent in towards the stator plates. It must be remembered that a small capacity change in the oscillator circuit means a tremendous frequency change, and this adjustment must be made very carefully.

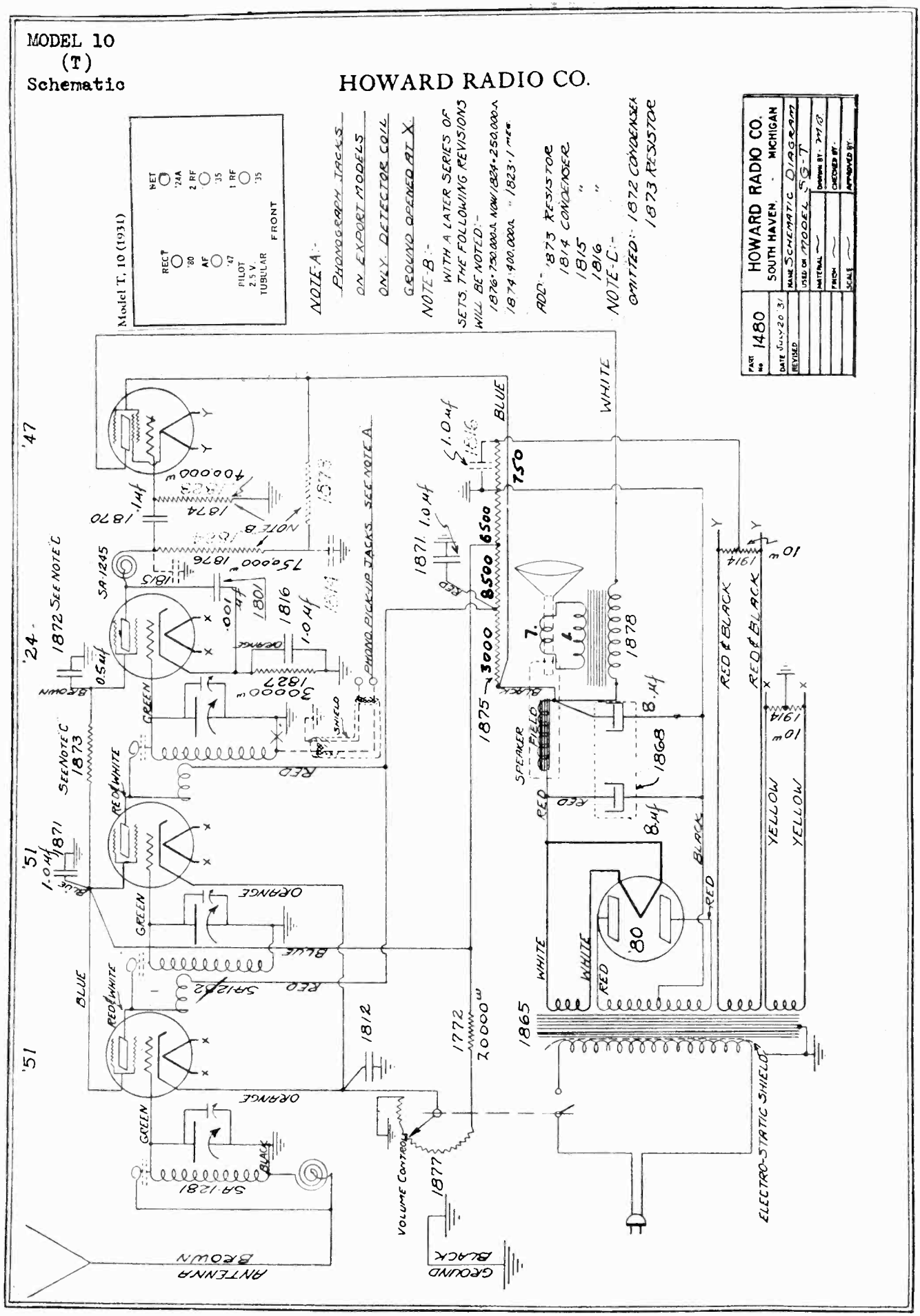
5. Now adjust test oscillator to 1400 kcs. and retune set at 1400 kcs. to make sure that the antenna trimmer condenser has been reset to its original position after Test 4 has been made.

In making the above tests it is necessary before making each test, to replace all shielding.

The foregoing tests are of a delicate nature, and it is essential that each one be made carefully before going to the next test

MODEL 10
(T)
Schematic

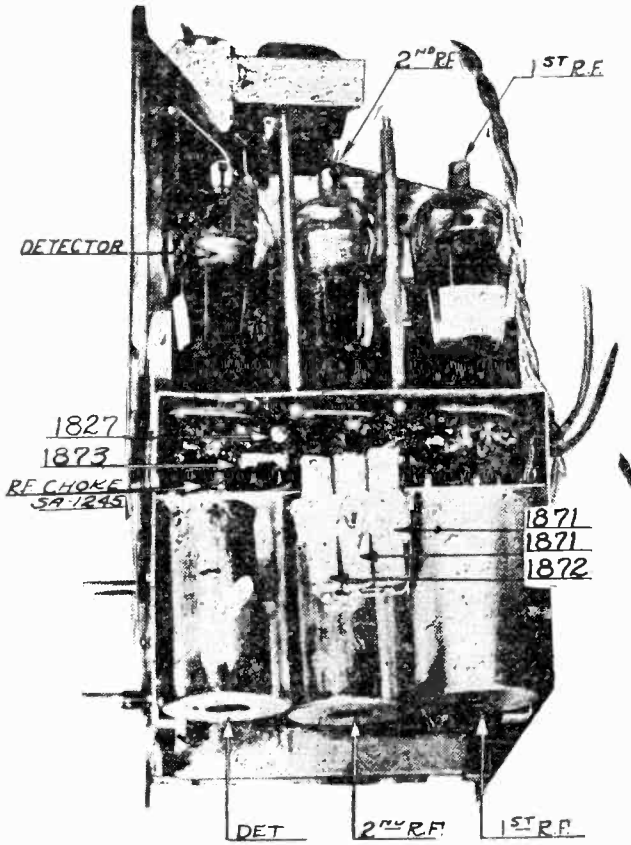
HOWARD RADIO CO.

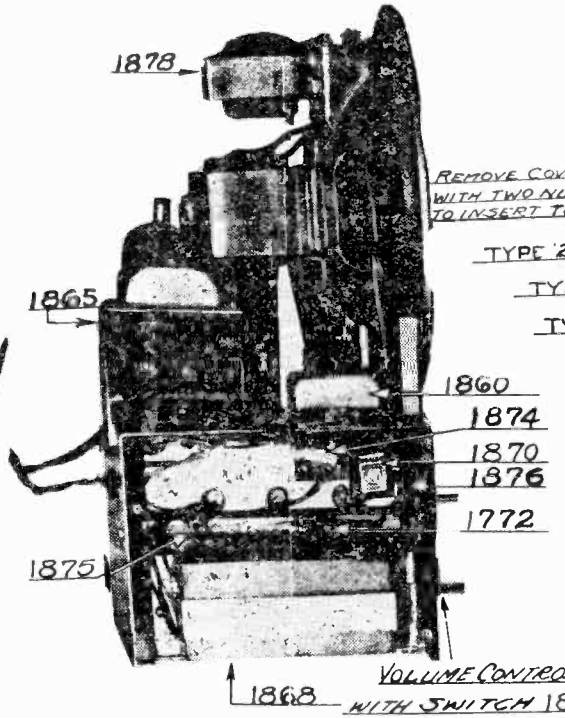


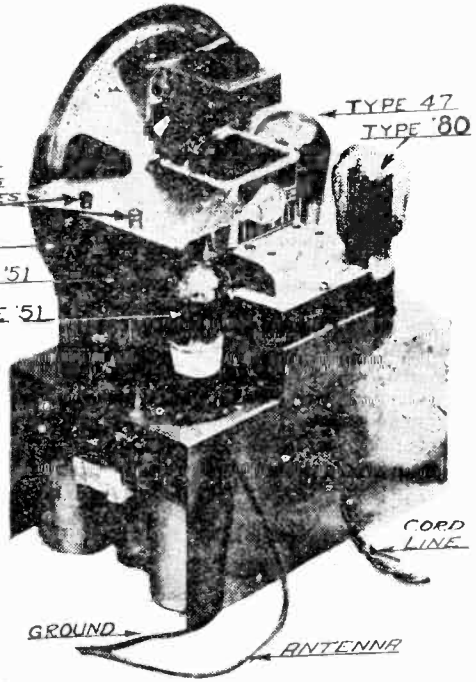
HOWARD RADIO CO.

MODEL 10 (T)

Alignment Data







1323	Condenser, variable tuning condenser, 3 gang	1870	Condenser 1 mfd. Sprague Type G.
1325	Tuning mechanism (complete with scale)	1871	Condenser 1.0 mfd. Elkon 200 volt rating
1562	Line cord, 8½ ft., with H. & H. Bakelite plug	1872	Condenser .5 mfd. Elkon 200 volt rating
1702	Socket type, No. 280	1873	Resistance 100,000 ohms, ½ watt
1703	Socket type, No. 224	1874	Resistance 400,000 ohms, ½ watt
1705	Socket type, No. 551	1875	Resistor "B" stick
1772	Resistor 20,000 ohms ½ watt	1876	Resistor 750,000 ohms, ½ watt
1801	Condenser .001 mfd. Fixed mica	1877	Volume Control (on-off switch included)
1812	Condenser .5 mfd.	1914	Resistor 10 ohms center tapped type 7E-10.
1827	Resistance 30,000 ohms, ½ watt		
1847	Socket type, No. 247		
1816	Consender 1.0 mfd.		
1865	Power Transformer, No. H.R. 55		
1868	Condenser 16 mfd. (2-8 mfd. sections)		

Sub-Assembly Parts List

SA-1245	R.F. Choke coil
SA-1281	Radio Frequency Transformer (Antenna)
SA-1282	Radio Frequency Transformer (Interstage)

R.F Amplifiers:

The secondary of the first radio frequency transformer is connected between the grid of the 1st r.f. amplifier tube and ground. This secondary is tuned by means of one section of a three-gang variable condenser.

The cathode of this tube connects directly to the volume control. The volume control will be discussed under a separate section.

The screen grids of the radio frequency amplifier tubes connect together and then to a point on the voltage divider resistor which applies the correct operating potential on the screens. In order to prevent common coupling impedance these screens are by-passed to ground by means of a condenser. This eliminates a possibility of oscillation from this source.

Connected between the source of B voltage and the plate of the first radio frequency amplifier tube is a high inductance choke coil. This coil is located in the top of the second radio frequency transformer but in physical relation to the secondary of this transformer so that there is no electromagnetic coupling. Connected to the plate end of this choke is a wire which is in close physical relation to the grid end of the secondary of this transformer. As in the case of the 1st r.f. transformer, this turn gives a small capacity coupling. The combination of the choke and small capacity formed by the single turn of wire gives a frequency characteristic which is substantially flat over the frequency range.

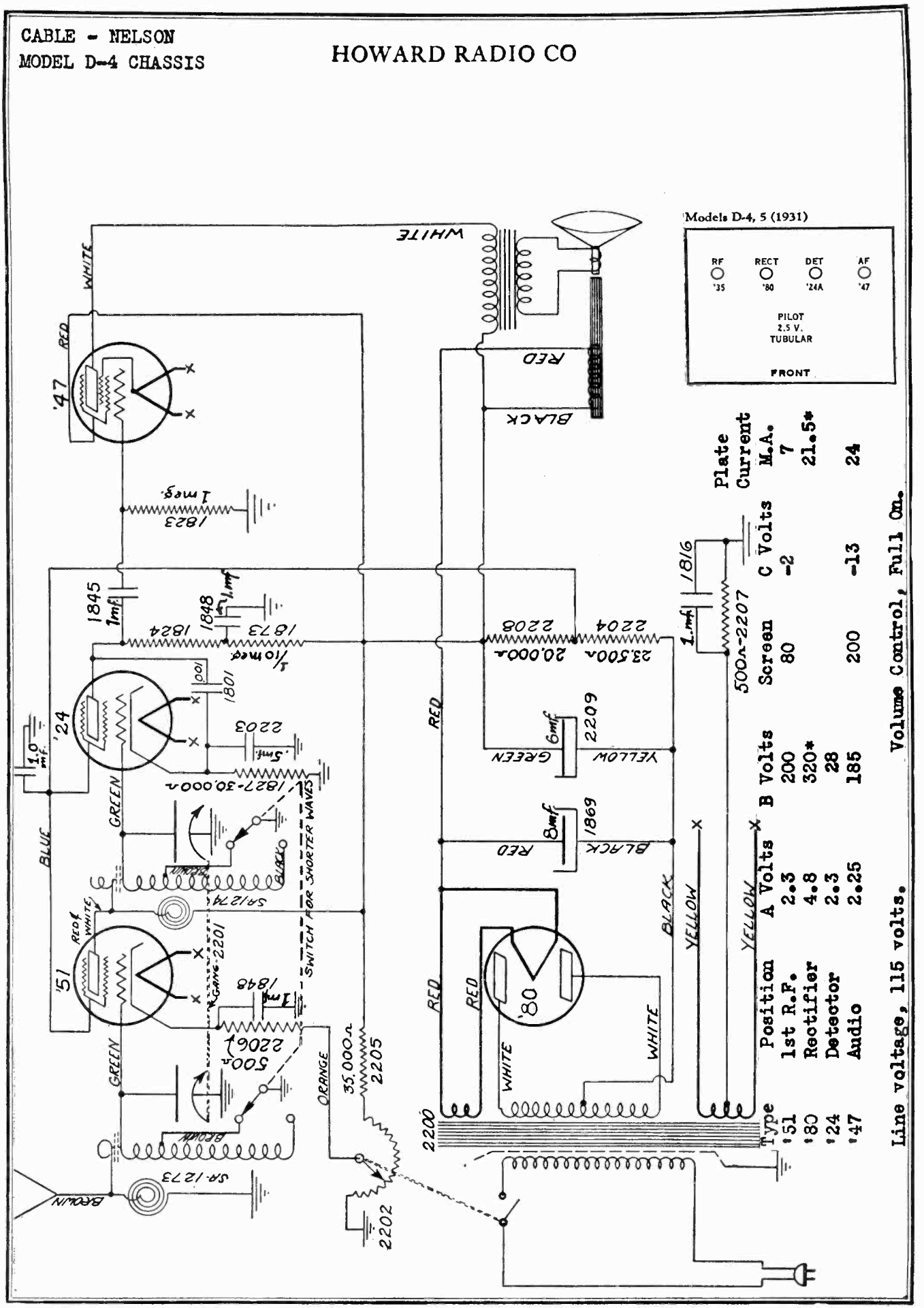
The secondary of the second transformer is similar to the one used in the 1st r.f. transformer and is tuned by means of the second section of the variable tuning condenser. It is connected between grid and ground of the second radio frequency amplifier tube.

The cathode and screen of this tube are connected the same as the first radio frequency amplifier and need no further description.

The third radio frequency transformer is a duplicate of the second radio frequency transformer and therefore, needs no description. On export models, the ground lead of this transformer is connected to a phonograph jack, and the other terminal of the phonograph jack is connected to ground. In the radio position these jacks are shorted by means of a switch. In the phono. position, this switch is opened and the pick-up is plugged into the jacks. It is necessary to tune the radio set to some point on the dial where there is no signals from a broadcast station coming in, otherwise the radio signals will feed through and interfere with the phono music.

CABLE - NELSON
MODEL D-4 CHASSIS

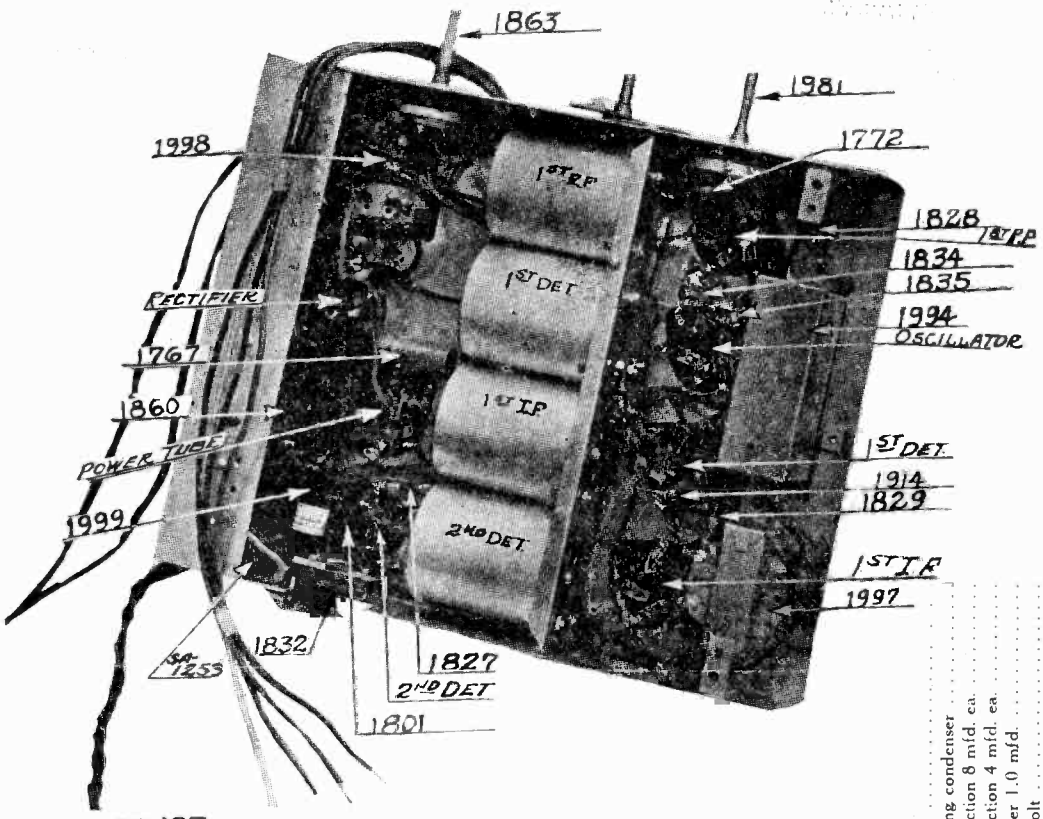
HOWARD RADIO CO

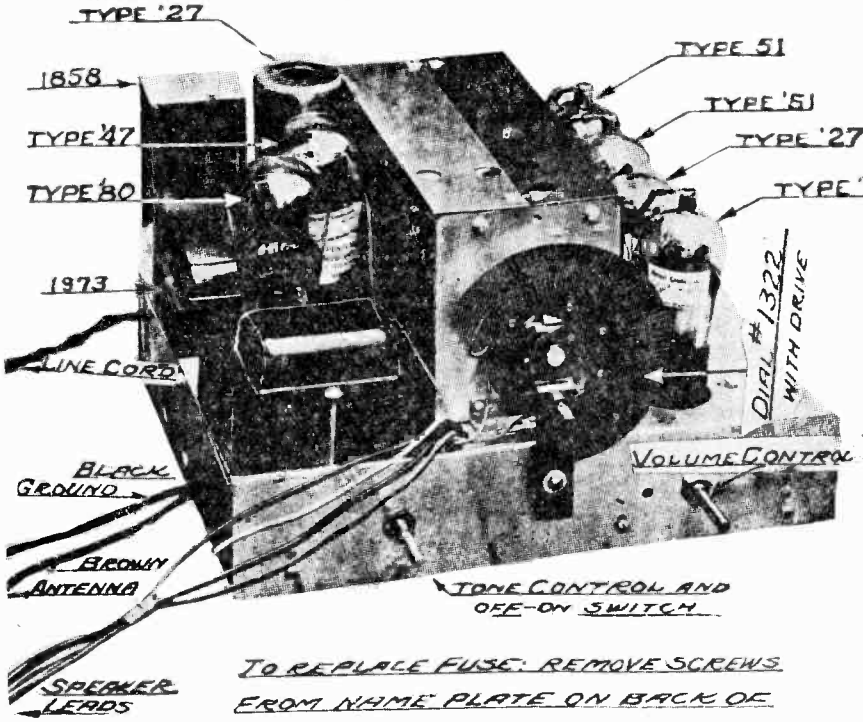


Type	Position	A Volts	B Volts	Screen	C Volts	Plate Current M.A.
'51	1st R.F.	2.3	200	80	-2	7
'80	Rectifier	4.8	320*			21.5*
'24	Detector	2.3	28			
'47	Audio	2.25	185	200	-13	24

HOWARD RADIO CO.

MODEL O
Chassis
Top-Bottom View





TO REPLACE FUSE: REMOVE SCREWS FROM NAME PLATE ON BACK OF CHASSIS.

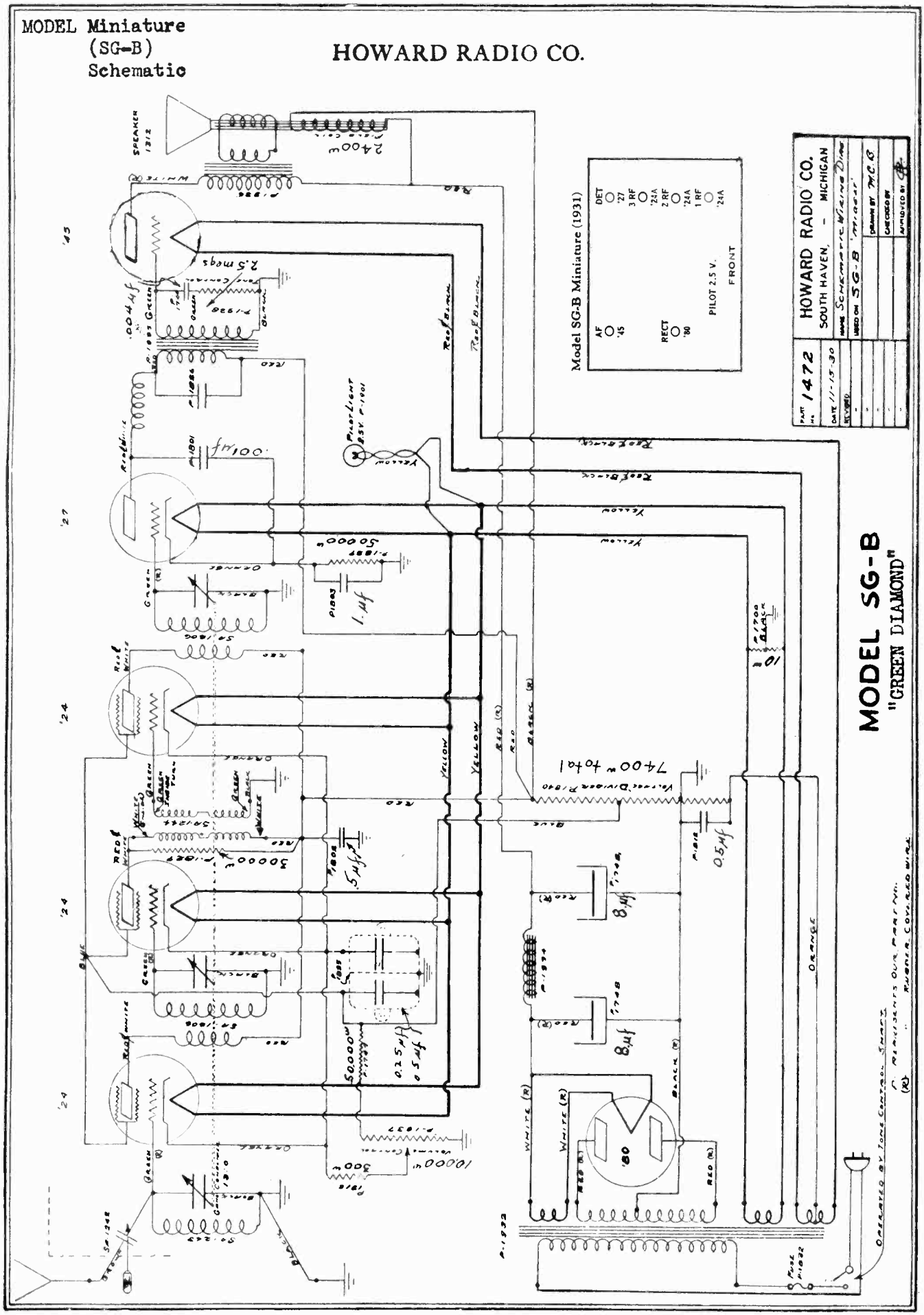
Part No.	Description
1263	IF transformer coils 11/16" spacing
1264	IF transformer coils 1" spacing
1318	Variable tuning condenser
1322	Dial drive mechanism and scale No. 2042
562	AC line cord and plugs
1702	Socket No. 280
1704	Socket No. 227
1705	Socket No. 551
1767	Condenser .01 mfd.
1772	Resistor, 20,000 ohms, ½ watt
1801	Condenser .001 mfd.
1827	Resistor 30,000 ohms ½ watt
1828	Resistor 200 ohms ½ watt
1829	Resistor 1800 ohms ½ watt
1832	Fuse 2 amp. A.G.
1834	Resistor 2,000 ohms ½ watt
1835	Resistor 3,000 ohms 1 3 watt
1847	Socket No. 247
1857	Oscillator padding condenser
1858	Filter cond. 2 section 8 mfd. ea.
1859	Filter cond. 1 section 4 mfd. ea.
1860	By-pass condenser 1.0 mfd.
1901	Pilot light 2.5 volt
1914	Resistor 10 ohm center-tapped
1932	Power transformer
1863	Tone control and power switch
1970	IF transformer tuning condenser (variators)
1973	Choke coil, power pack
1981	Volume control
1983	Resistor 300 ohm, 5 watt
1994	By-pass condenser block
1997	Audio transformer
1999	Resistor (voltage divider)

Sub-Assemblies

SA-1247	Antenna radio frequency transformer
SA-1249	Oscillator tuning coil
SA-1252	Radio frequency transformer
SA-1253	Detector radio frequency choke coil

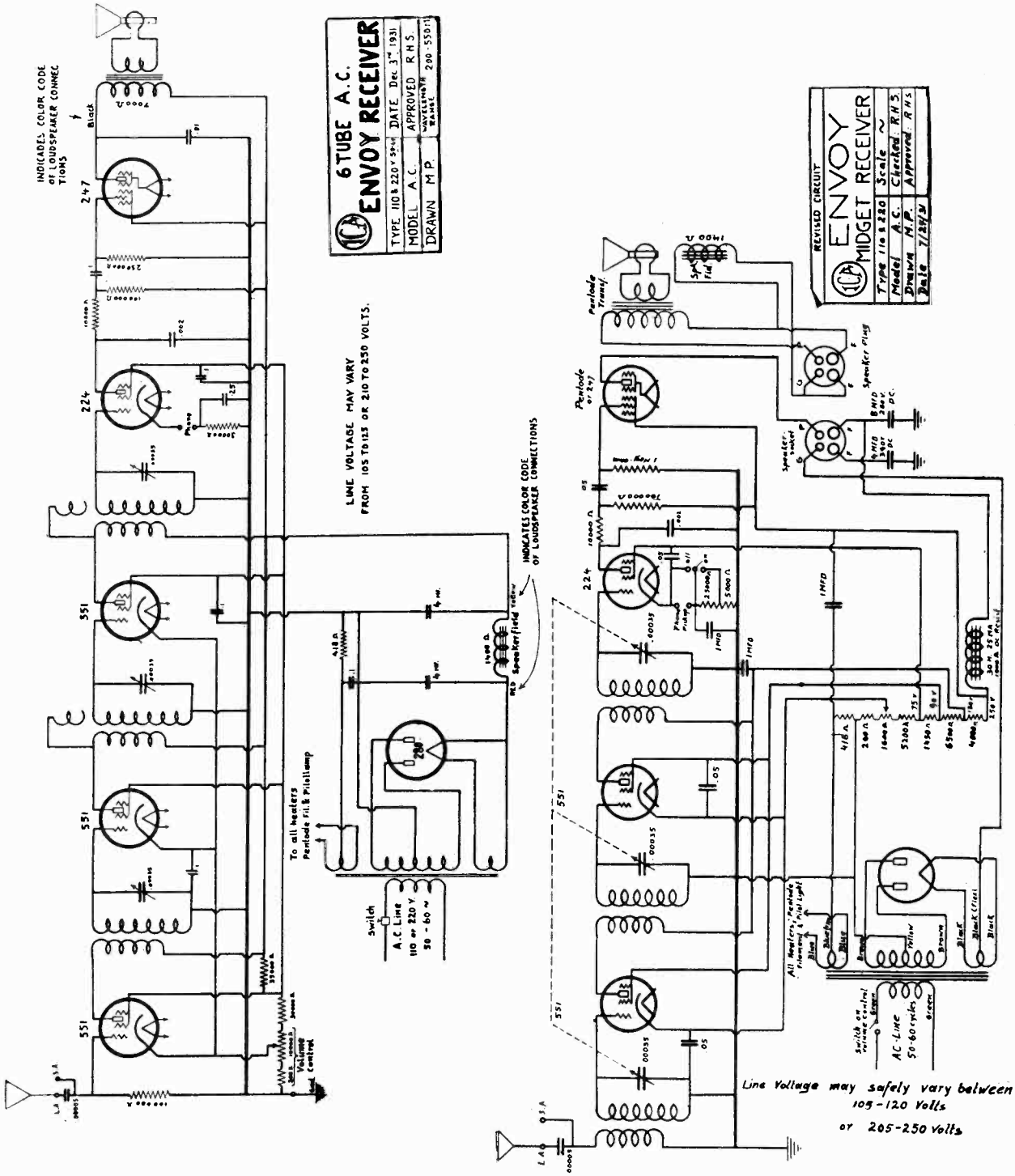
MODEL Miniature
(SG-B)
Schematic

HOWARD RADIO CO.



INSULINE CORP. OF AMERICA

MODEL Envoy
6 Tube AC
MODEL Envoy
Midget

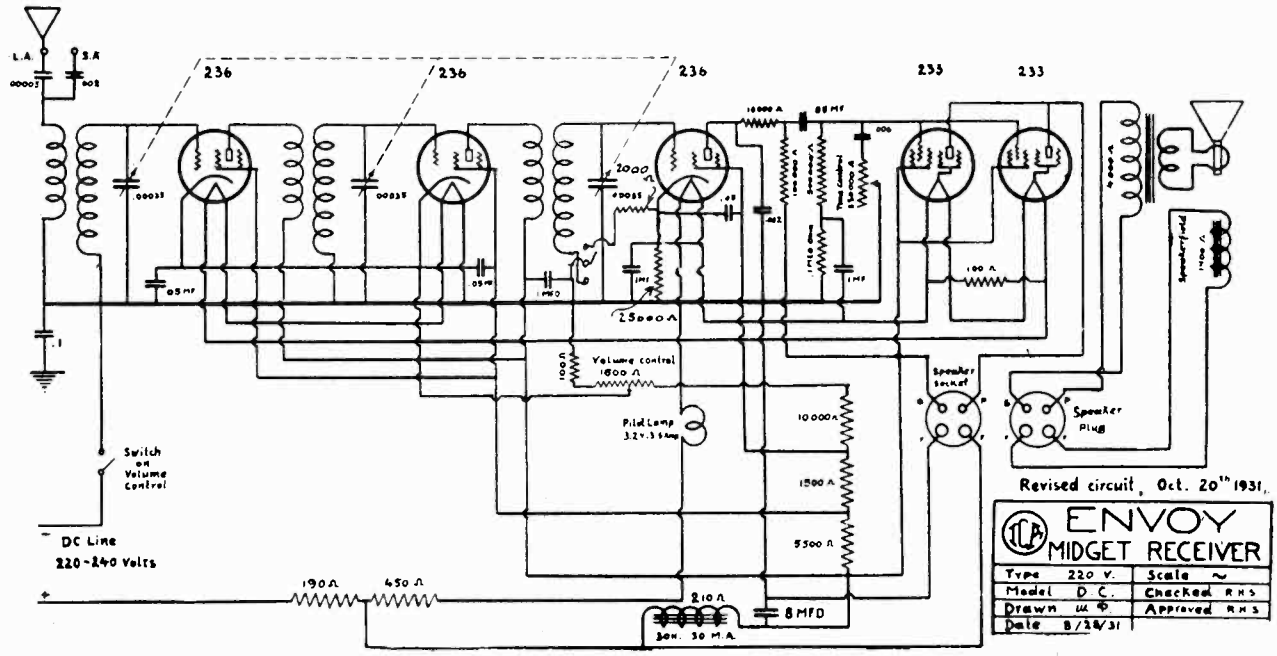


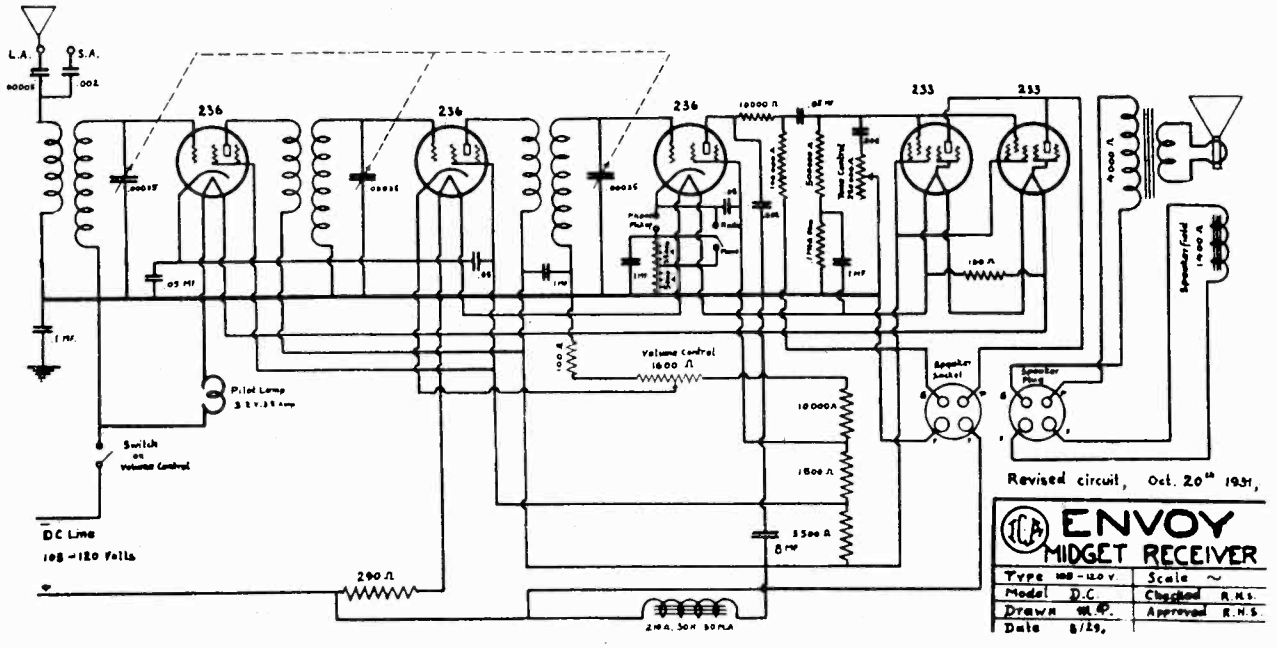
"ENVOY" 6-TUBE AC RECEIVER

"ENVOY" AC MIDGET RECEIVER

MODEL Envoy
Midget DC
(Revised)
2 Types

INSULINE CORP. OF AMERICA



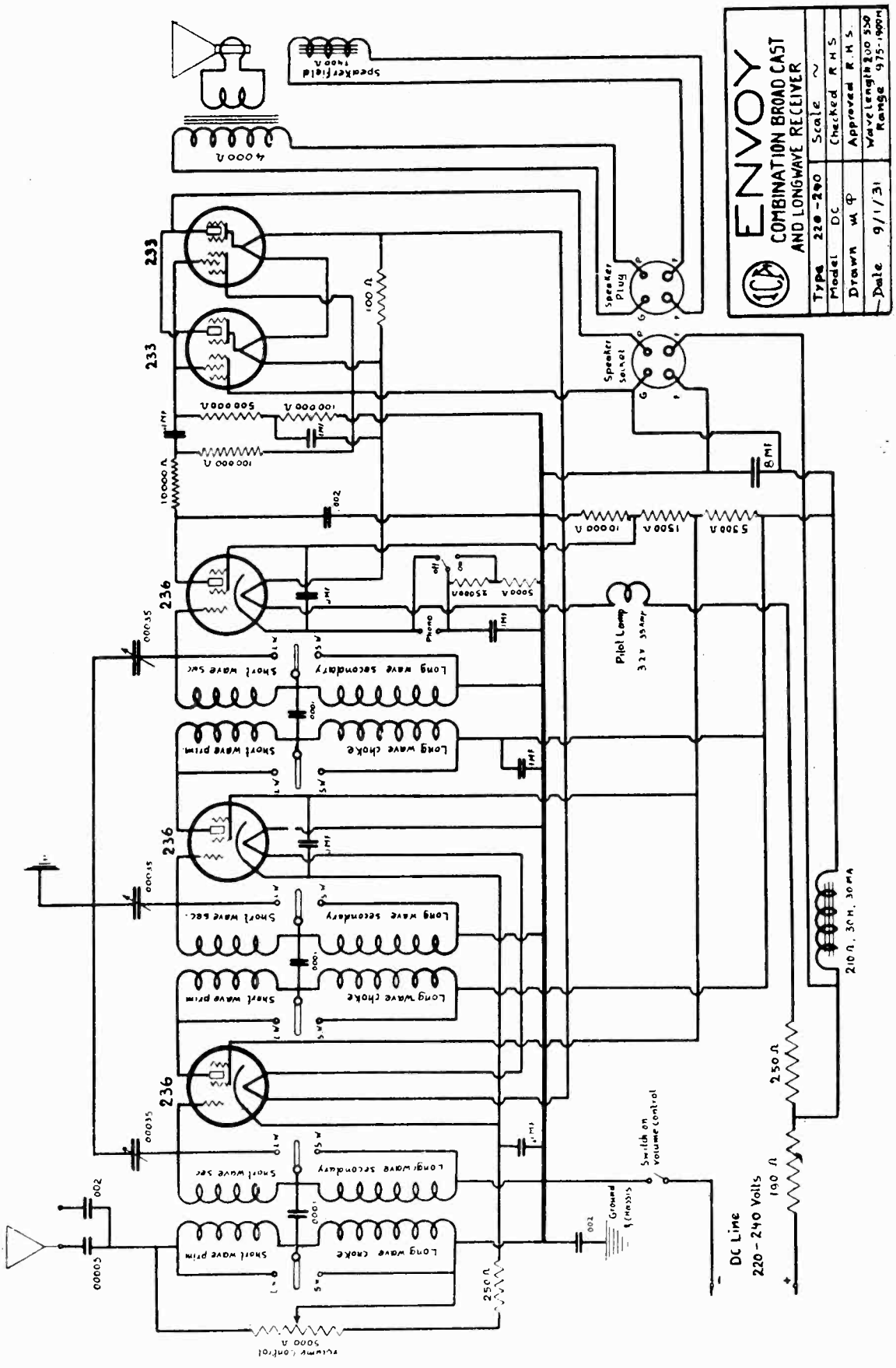


"ENVOY" DC MIDGET RECEIVER (220 V)

"ENVOY" DC MIDGET RECEIVER (105-120 V)

INSULINE CORP. OF AMERICA

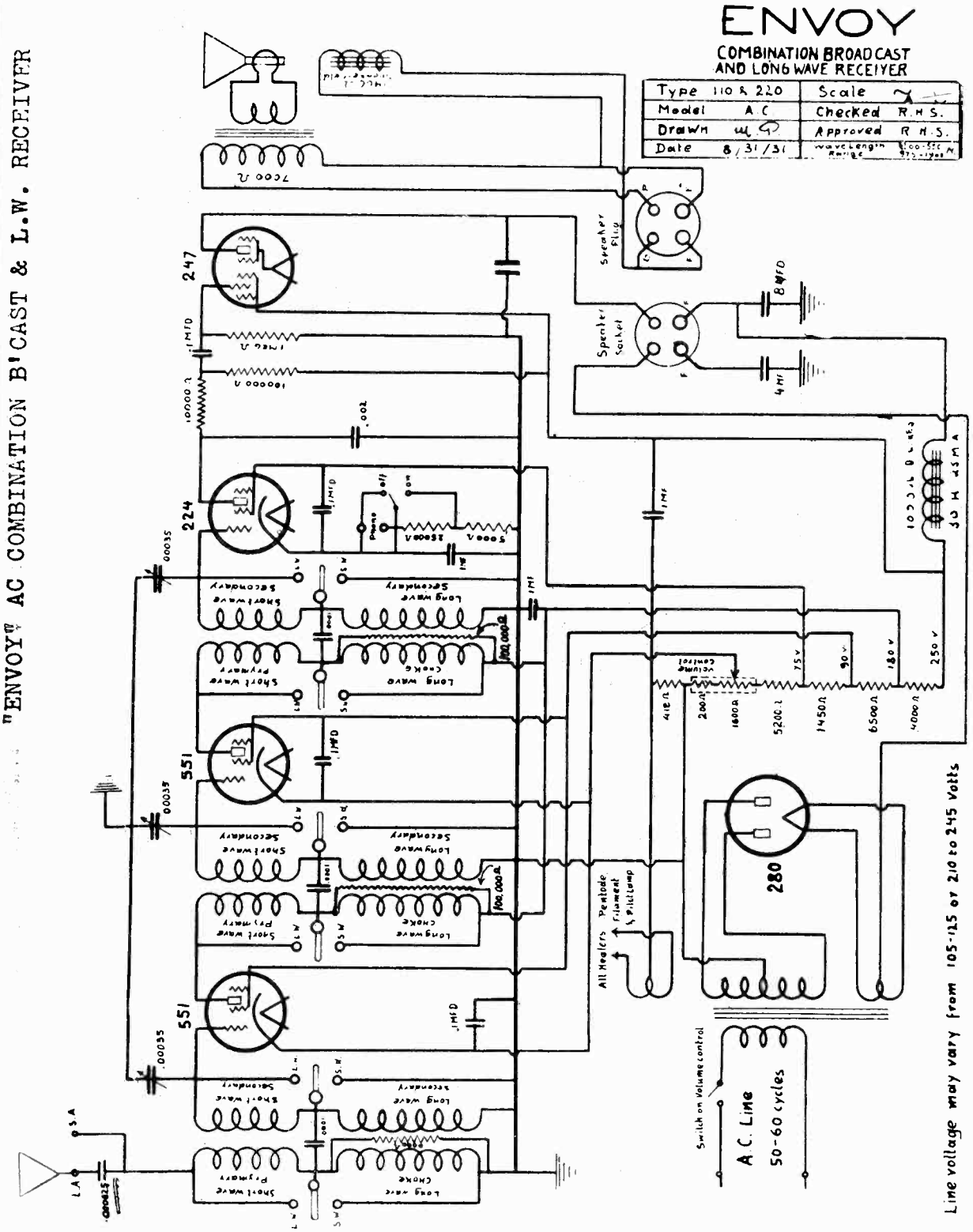
MODEL Envoy
Broadcast-Long Wave DC



"ENVOY" DC COMBINATION B'CAST & L.W. RECEIVER

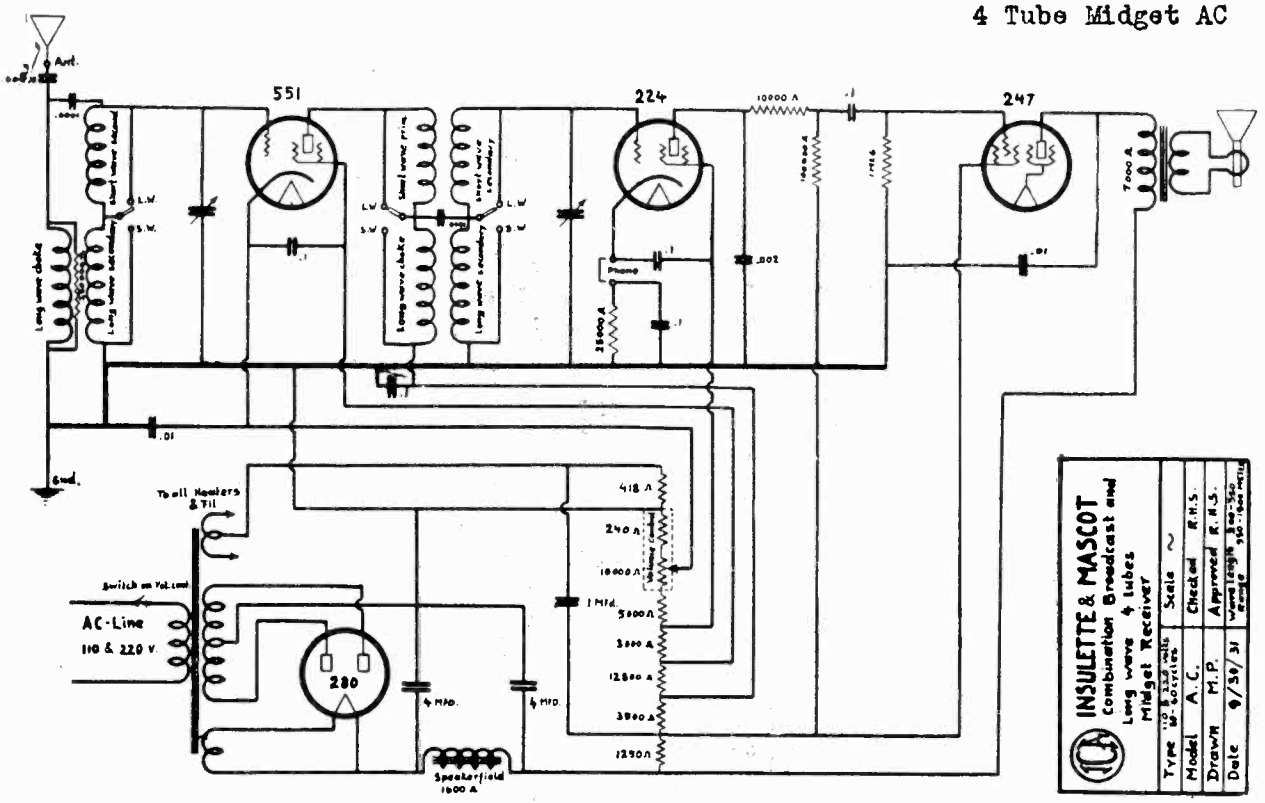
MODEL Envoy
Broadcast-Long Wave AC # INSULINE CORP. OF AMERICA

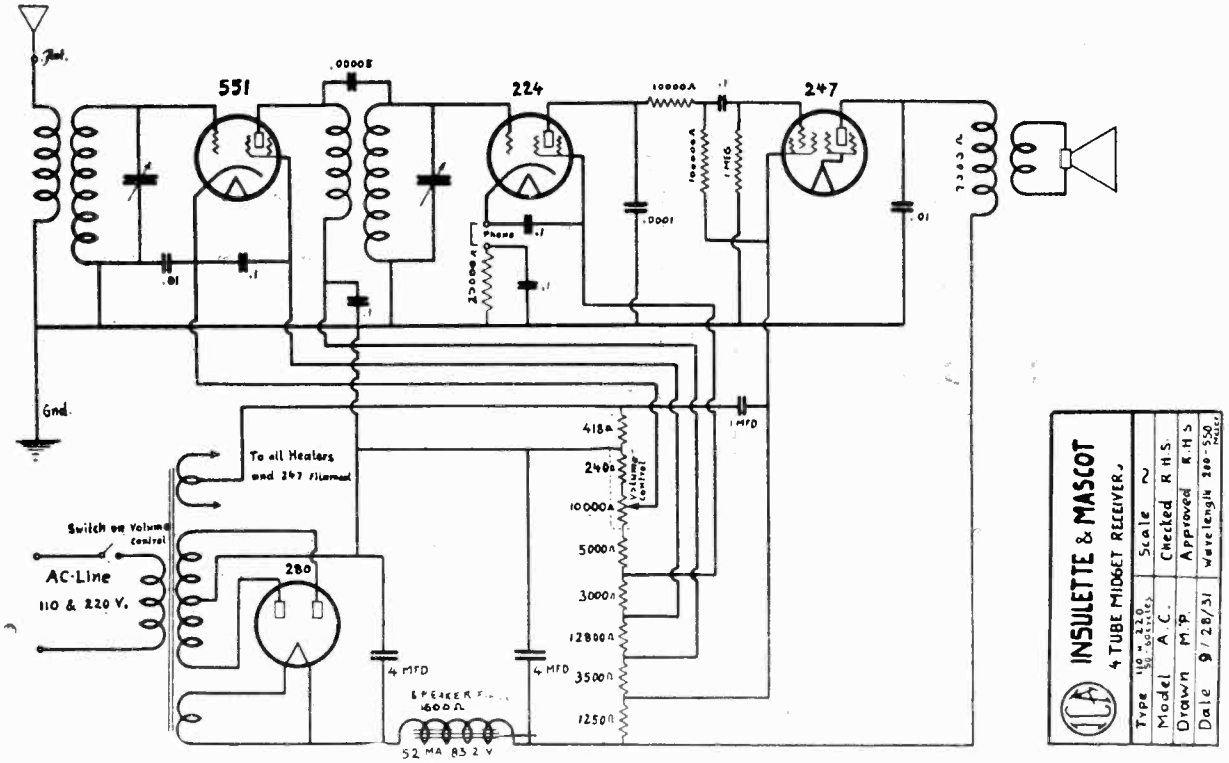
"ENVOY" AC COMBINATION B'CAST & L.W. RECEIVER



MODEL Insulette & Mascot
4 Tube Midget AC
Broadcast-Long Wave
4 Tube Midget AC

INSULINE CORP. OF AMERICA



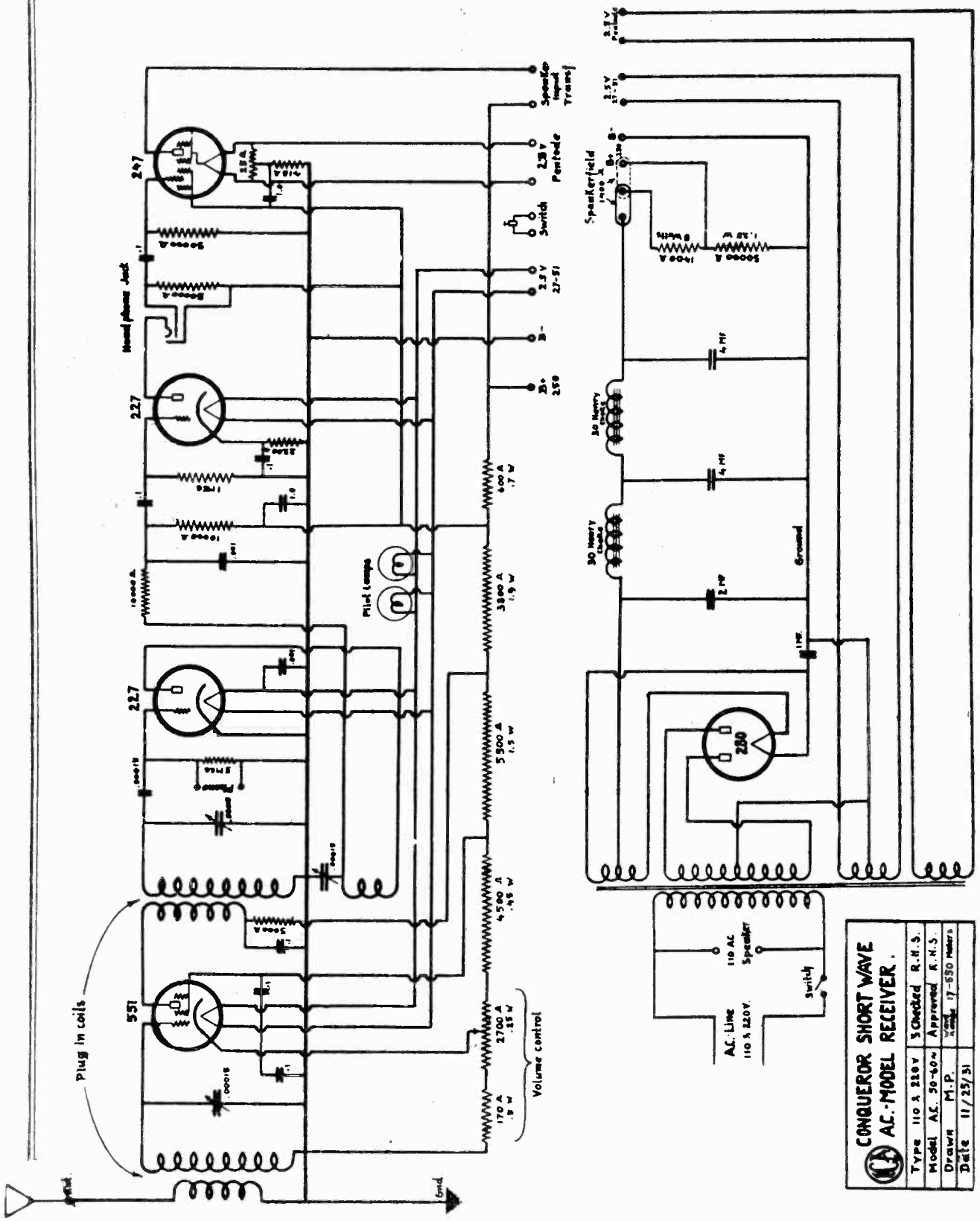


"INSULETTE" & "MASCOT"
4 TUBE MIDGET RECEIVER

"INSULETTE" & "MASCOT"
4 TUBE COMBINATION B'CAST & L.W.
MIDGET RECEIVER

MODEL Conquerer
Short Wave AC

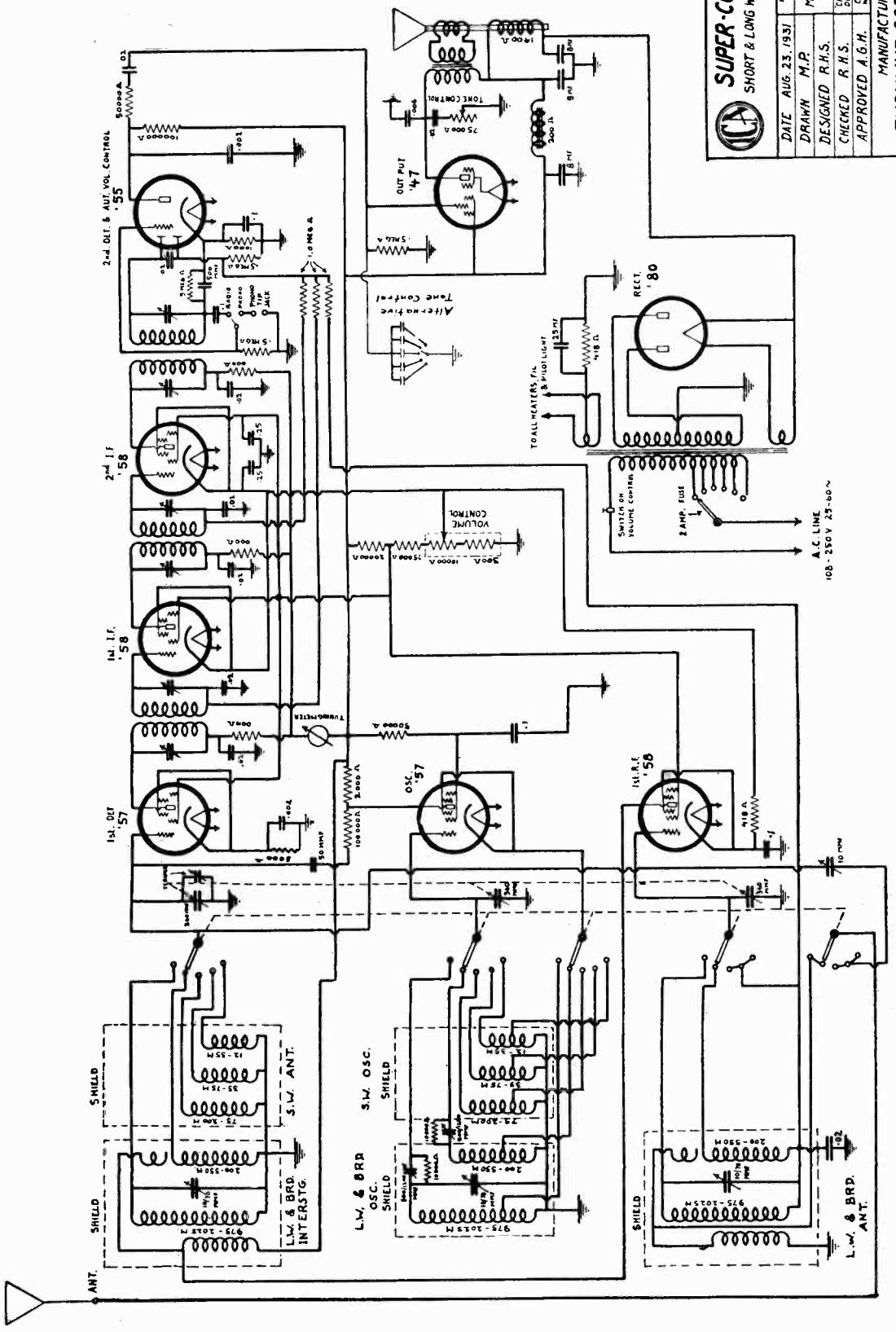
INSULINE CORP. OF AMERICA



" CONQUEROR" SHORT WAVE A.C. MODEL RECEIVER

MODEL Super-Conquerer
Short & Long Wave AC

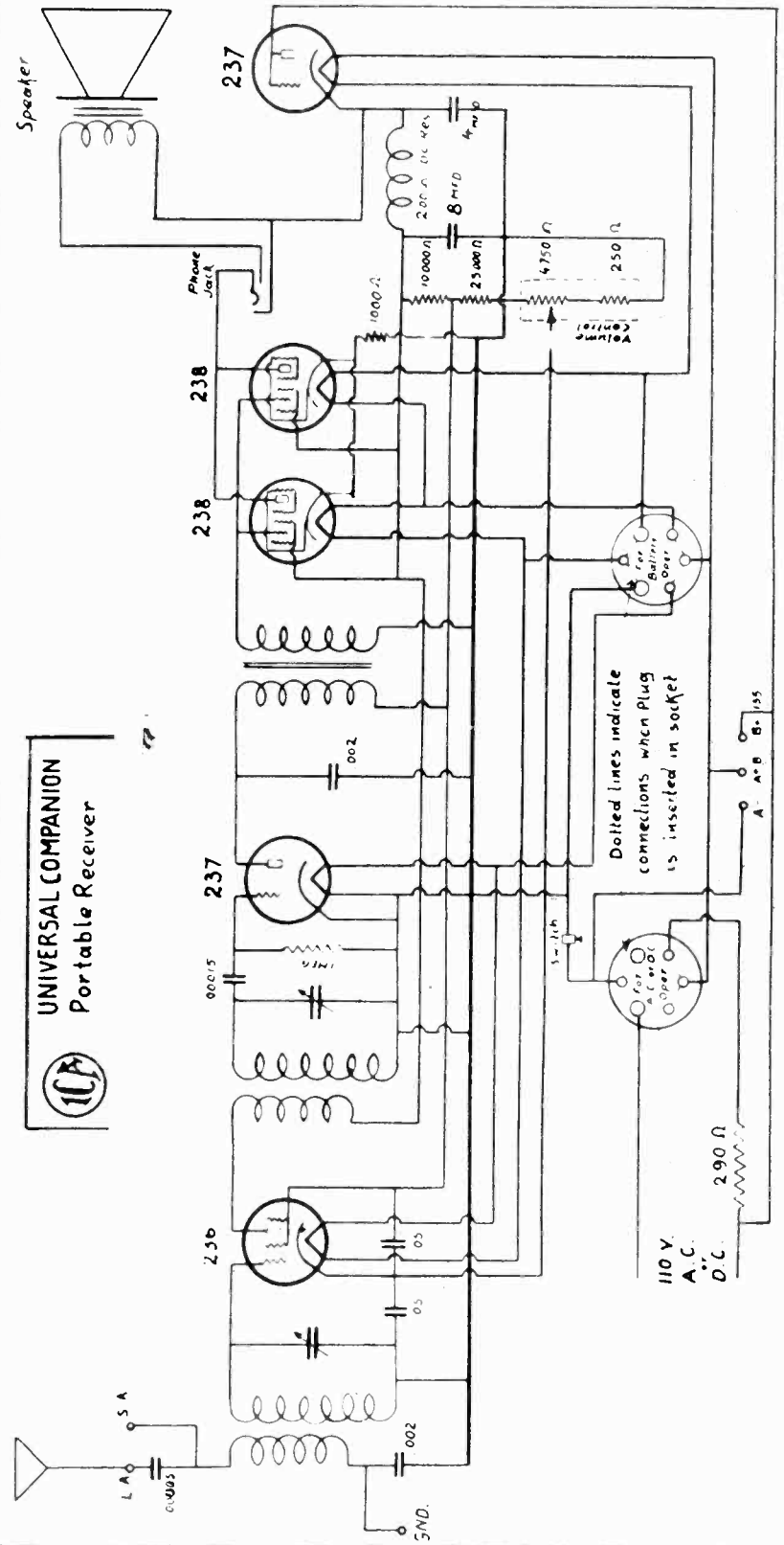
INSULINE CORP. OF AMERICA



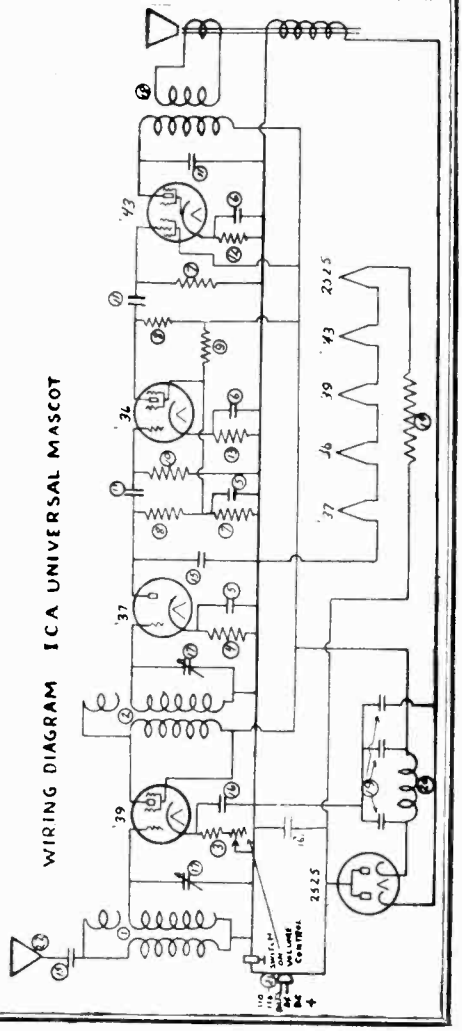
MODEL Universal Companion
AC-DC-Battery
Portable

MODEL Universal Mascot
AC-DC

INSULINE CORP. OF AMERICA

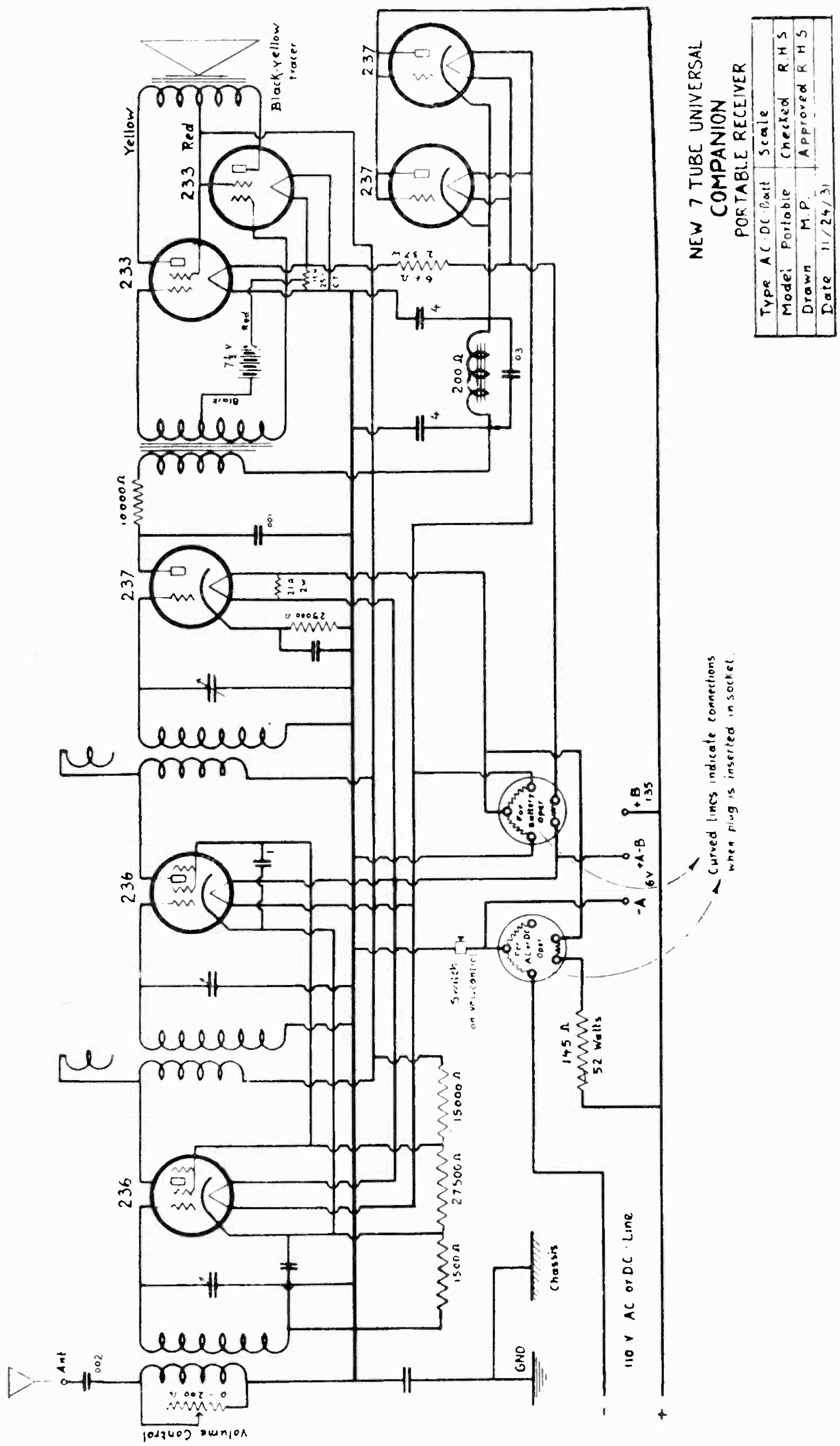


#3	300-300,000 ohms	#17	.00035 mfd
#4	30,000 ohms	#19	8.-8.-4. mfd
#5	.25 mfd 200 V.	#20	330 ohm choke
#6	5.-5. mfd Electro.		
#7	100,000 ohms		
#8	50,000 ohms		
#9	75,000 ohms		
#10	500,000 ohms		
#11	.02 mfd 200 V		
#12	600 ohms		
#13	2000 ohms		
#14	170 ohms		
#15	.002 mfd		
#16	.1 mfd 200 V		



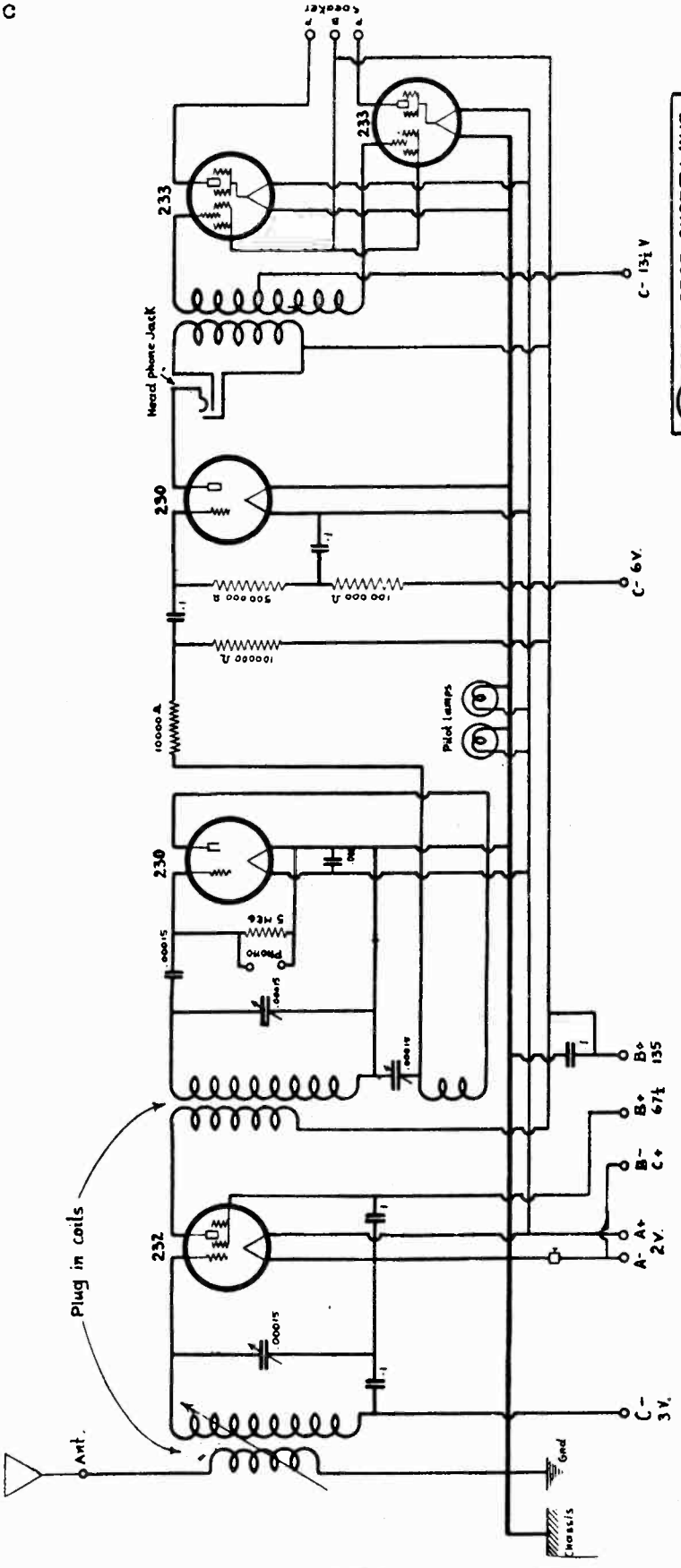
MODEL Universal Companion
AC-DC-Battery
Portable (Revised)

INSULINE CORP. OF AMERICA



MODEL "Conqueror SW. Battery Schematic

INSULINE CORP. OF AMERICA



NOTE: LOUD SPEAKER OR SPEAKER COUPLING TRANSFORMER SHOULD HAVE AN IMPEDANCE OF 7500 OHMS EACH SIDE OF CENTER TAP FOR MAXIMUM UNDISTORTED OUTPUT

CONQUEROR SHORT WAVE BATTERY MODEL RECEIVER

Type BATTERY	Scale
Drawn M.P.	Checked R.H.S.
Date 11.27.31.	Approved R.H.S.

Meters 17 – 550 meters

"CONQUEROR" S.W. BATTERY MODEL RECEIVER