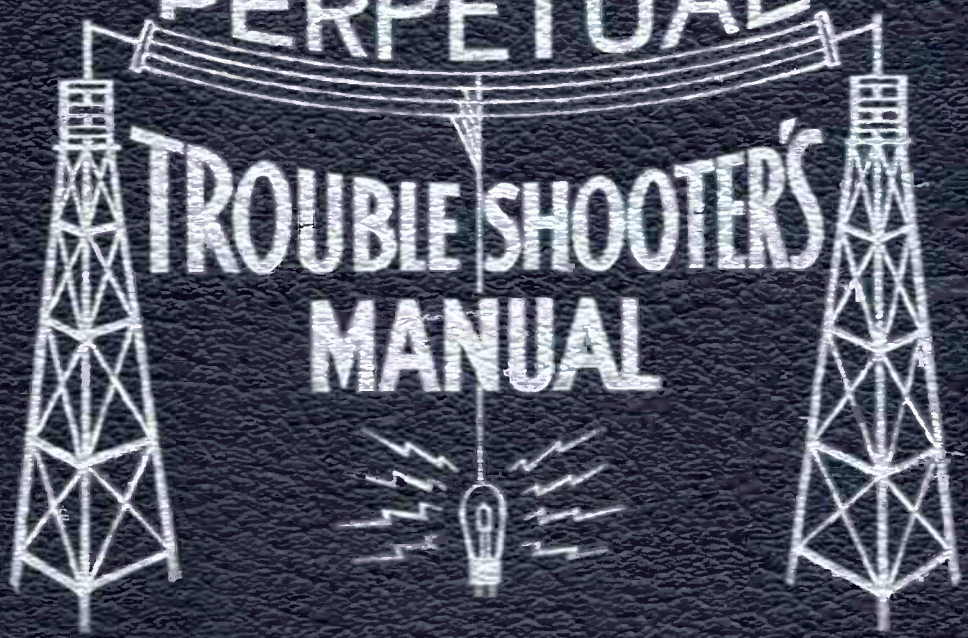
VOLUME VI

PERPETUAL TROUBLE SHOOTER'S MANUAL

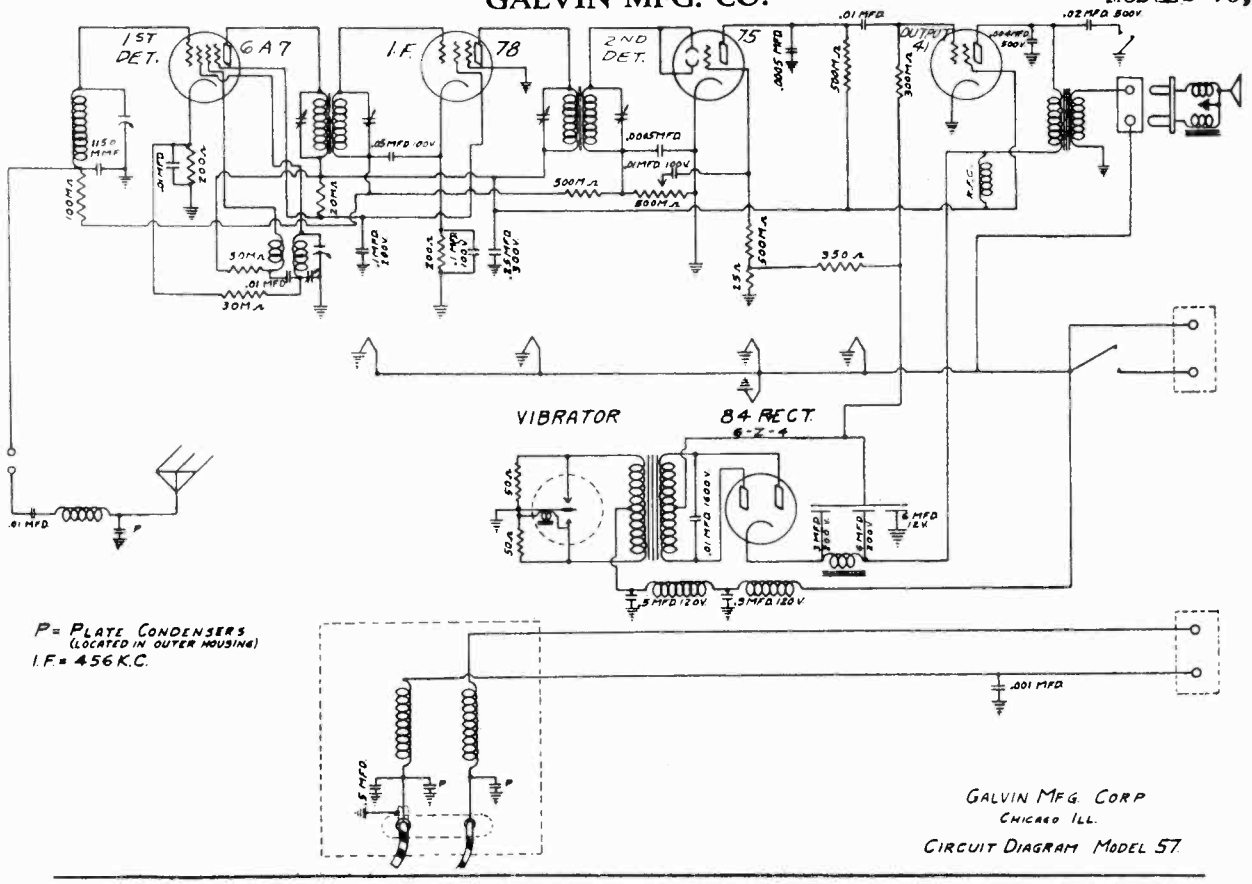


JOHN F. RIDER

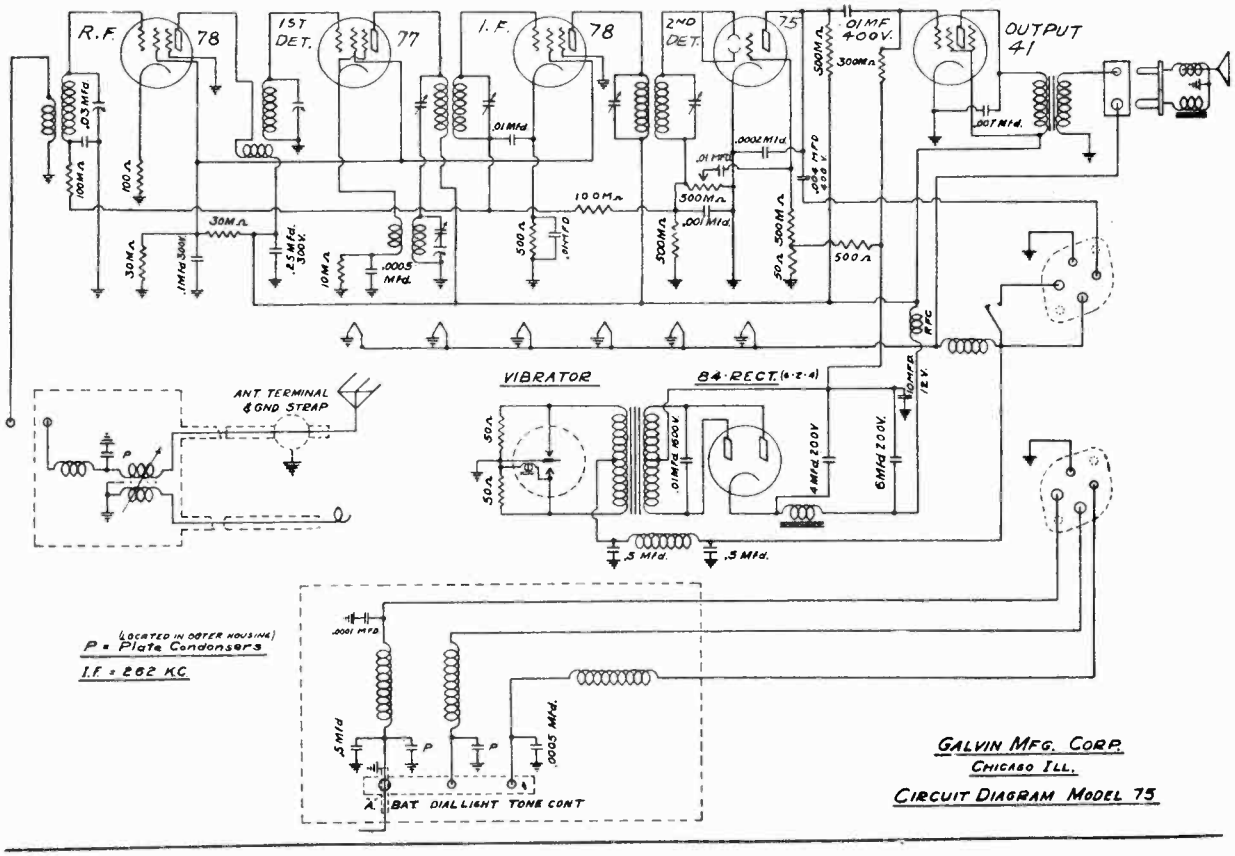
Schematics

MODELS 57, 62
MODELS 75, 79

GALVIN MFG. CO.



Model No. 62 Circuit is the same as Model No. 57 except that No. 62 uses an Iron Core Antenna Coil.



Model No. 79 Circuit is the same as Model No. 75 except that No. 79 uses an Iron Core Antena Coil.

MODELS 75,79
MODELS 100,110
Alignment,Data

GALVIN MFG. CO.

ALIGNMENT PROCEEDURE

ALIGNMENT OF THE I. F. TRANSFORMERS:

Models No. 75, No. 79, No. 100 and No. 110—Connect the feeder from the oscillator to the grid of the No. 77 autodyne tube. Remove the grid connection and connect a 500 M resistor from grid of the tube to ground.

Rotate the variable condensers to full open position.

Set the oscillator to a frequency of 262 K. C. adjust the I. F. and diode feeder trimmers to obtain maximum reading on the output meter.

Models No. 57 and No. 62—the same procedure as above is followed, with the exception that the service oscillator is set at 456 K. C. and the I. F. and diode feeder trimmers are adjusted to that frequency.

ALIGNMENT OF VARIABLE CONDENSERS:

All Models—connect the feeder from a service oscillator to the antenna lead of the set and adjust the oscillator to 1540 K. C. Next, completely open the condenser, going to minimum capacity, and adjust the oscillator trimmer on the condenser gang for greatest reading on the output meter.

Now set the service oscillator to 1400 K. C. and rotate the variable condenser for a peak reading on the output meter of the signal from the oscillator. Then adjust the R. F. and antenna trimmers on the condenser gang for maximum reading of the output meter.

Next set the service oscillator to 600 K. C. Close the condenser gang until the signal is again tuned in and rotate the condensers back and forth while adjusting the oscillator padder condenser for highest reading on the output meter. The variable condensers should now track perfectly and coincide with the dial calibration.

The Models No. 75 and No. 79 may be placed in operation on the service bench by connecting the hot "A" battery lead to one of the large pins of the 4 contact chassis plug. No. service extension cable is required. The Models No. 57 and No. 62 may be operated by connecting the hot "A" lead into the top connection of the two-way receptacle.

The tuning condensers may also be aligned by using the MOTOROLA alignment gauge. When this is used it is only necessary to insert the gauge between the sections of the variable condenser gang. Set the rotor plates of the condensers to the line marked 1400. Adjust all three trimmers to maximum output. Then reset to the 600 K. C. line and adjust the 600 K. C. padder. The balance of the frequency calibration lines on the gauge may be used for further checking if desired.

BENCH SERVICING OF MODELS No. 57, No. 62, No. 75, No. 79, No. 100 and No. 110:

All of the above models are equipped with plug-in chassis so that they may be removed from the set housing without affecting the original installation in the car.

SERVICING THE CONTROL HEAD:

Should the mechanism within the control head require servicing, it may be reached by prying the bezel ring upward as shown in Figure No. 2. This method of removal prevents damage to the bezel ring and it may be reinserted without difficulty. When inserting NEW rings, use an old control head casting, as a jig, inverted over the face of the control being repaired and tap lightly with a hammer to guide ring in place.

Figure (1) shows the rear view of the chassis of Model No. 100 or No. 110, illustrating the method of connecting the speaker to the set on the test bench, thereby eliminating the use of an extension service cable. The connector pin for the Bat. supply lead may be secured from an old tube base.

MODELS 100 (Type 2),110
Schematic, Data

GALVIN MFG. CO.

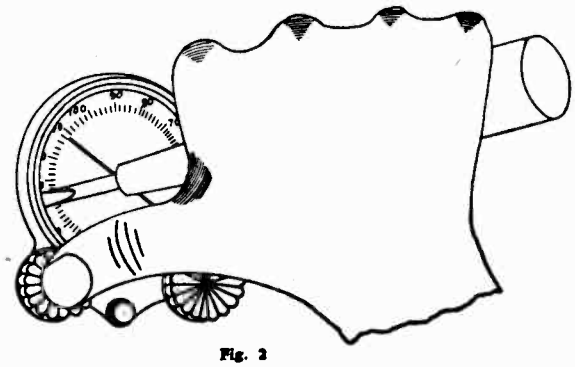


Fig. 2

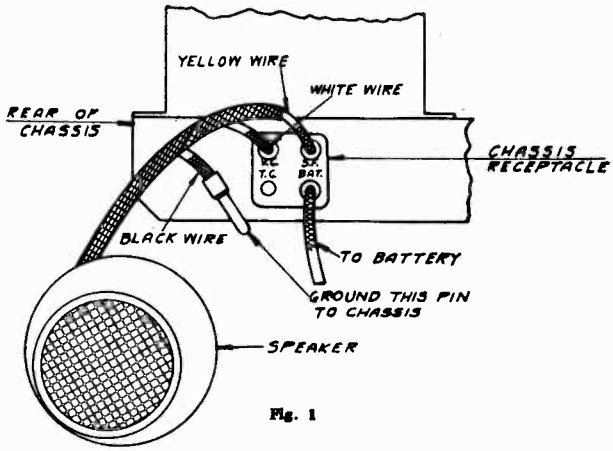
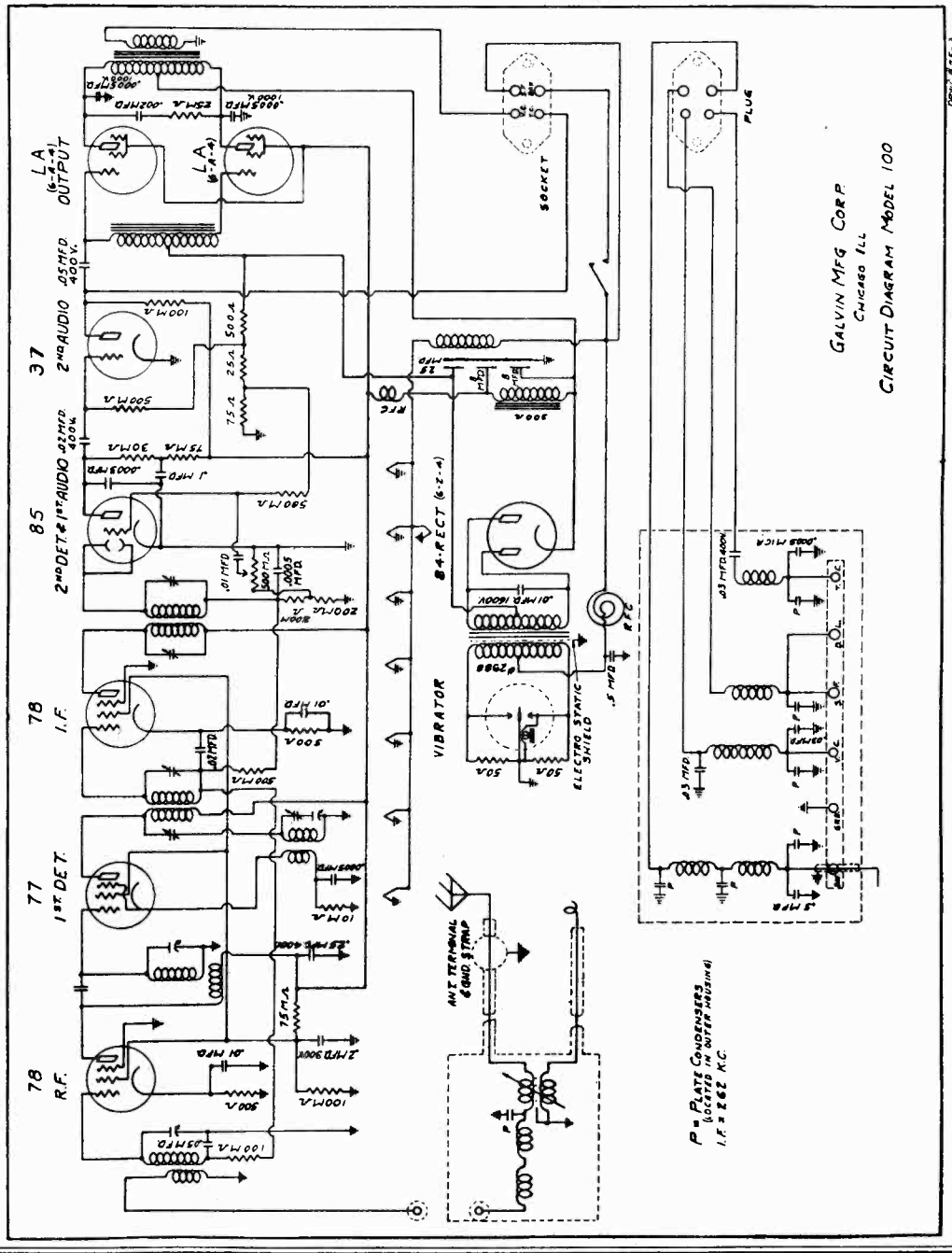


Fig. 1



Model No. 110 Circuit is the same as Model No. 100 except that No. 110 uses an Iron Core Antenna Coil.

NOTES ON MAGIC ELIMINODE

THEORY OF OPERATION

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

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

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

The filter used in the Magic Eliminode operates most effectively at the lower broadcast frequencies, therefore, if when tuning the set from about 600 to 550 K.C. no motor noise is heard, it can be assumed that the noise level is within the range of the Magic Eliminode and the noise then heard when tuning toward 1500 K.C. may be easily balanced out with the movable eliminode coil and complete elimination of motor noise secured.

THE MAGIC ELIMINODE WILL WORK IN ANY CAR OF WELDED STEEL BODY CONSTRUCTION WHEN THE INSTALLATION IS MADE ACCORDING TO INSTRUCTIONS AND THE ACCESSORIES SUPPLIED WITH EACH SET ARE PROPERLY USED.

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

In like manner there will be found many cars in which the filter is so effective that it alone completely eliminates all motor noise and balancing is not required. In that case IT IS UNNECESSARY TO EVEN CONNECT THE INTERFERENCE FEEDER TO THE MOTOROLA.

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

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

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

2nd -- Mount the speaker near the steering column on the left side of the dash.

3rd -- Connect the "A" lead to a convenient point on the 6 volt wiring as close to the starter switch as possible. Insert the speaker, dial light, tone control plugs in the receptacles at the right end of the receiver. Dress wires so that their position is remote to steering column and other wiring, control rods and pipes.

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

5th -- Take the small antenna lead-in junction box that has the short piece of shielded loom attached to it and fish the car antenna lead through this loom until the lead extends into the junction box. Now insert the set antenna lead-in through the ferrule in this box so that the two leads may be spliced together within the box and be totally shielded. SPOT THE SHIELD TO THE FERRULE WITH SOLDER TO SECURE A GOOD GROUND. Next mount the junction box on left side of cowl where paint has been removed and mount it up into the corner post. Bolt the box down firmly so as to secure a perfect ground (THIS IS EXTREMELY IMPORTANT).

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

7th -- Turn on the radio and the car motor and tune the dial across its tuning range to check for interference. IF NO INTERFERENCE IS ENCOUNTERED, the installation is complete and no further work is necessary. DO NOT CONNECT THE INTERFERENCE FEEDER AS IT IS NOT NEEDED.

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

Proceed as follows:

With the set turned on and tuned to about 1200 K.C. remove the volume control shaft bushing from its socket and insert it in the Magic Eliminode socket (located a little to the rear and above volume control socket), and turn volume knob all the way to the left. Next attach the clamp on the free end of the interference feeder to the choke rod, throttle rod or instrument panel. Now turn the volume control knob to the right until the noise is balanced out. If the balancing coil travels its full length before balance is reached, it will be necessary to move the feeder clamp to another spot on the choke or throttle rod or some other point on the car, such as instrument panel, dash, etc., until a point of balance is secured.

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

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

1st ... THAT A GOOD MECHANICAL INSTALLATION AND PERFECT GROUNDING OF EVERY PART OF THE SET IS VERY IMPORTANT. Do not expect a slip-shod installation to give good results.

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

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

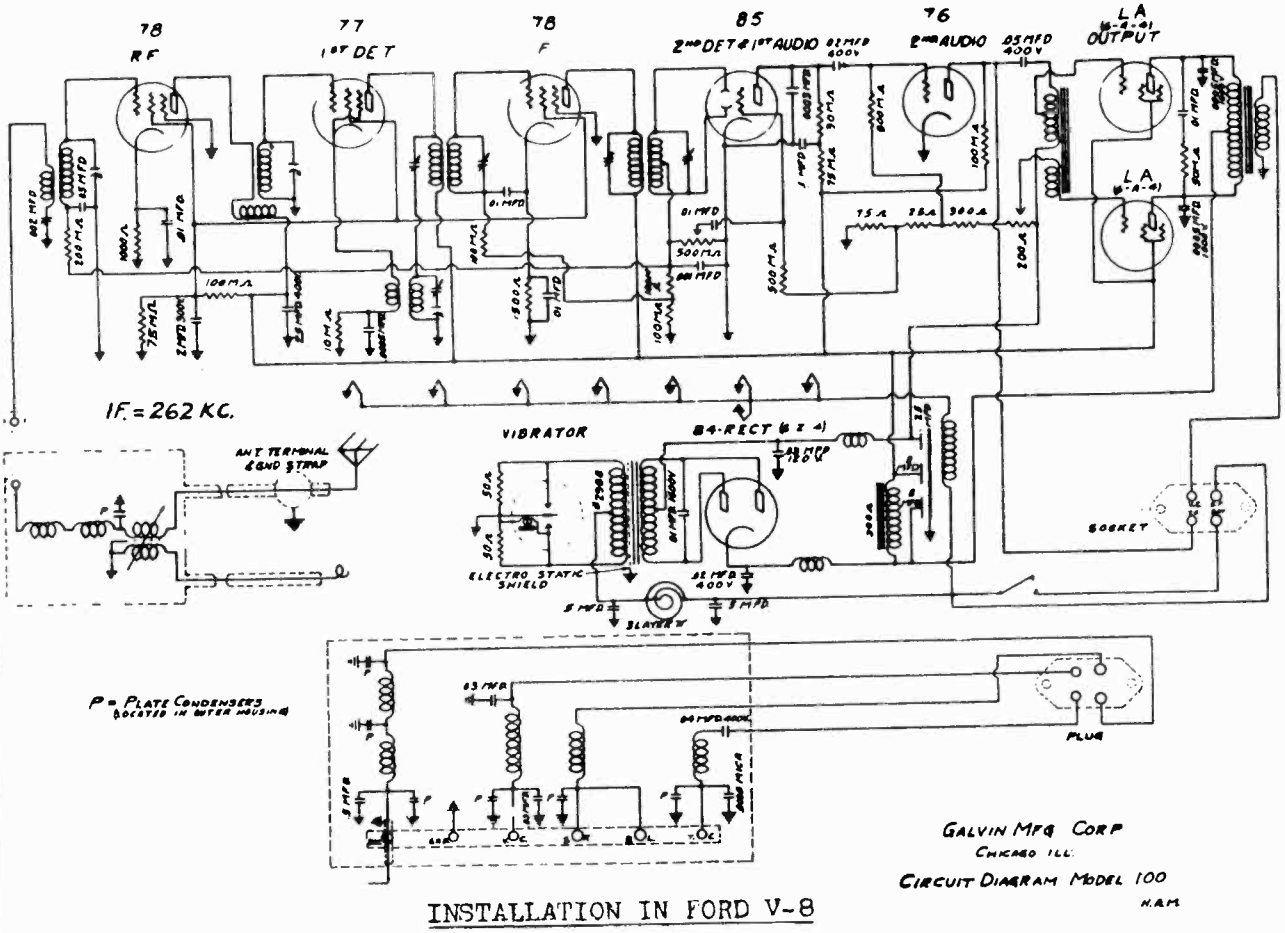
4th ... When balancing out interference keep the hood down and grounded and have the car doors closed.

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

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

MODEL 100 (Type 1)
Schematic
Installation Data

GALVIN MFG. CO.



INSTALLATION IN FORD V-8

When mounting the Model #100 in the motor compartment of the V-8 Ford, be sure to mount it at least 5 inches above the rear spark plug of the left motor block.

If it is mounted too close to spark plugs, interference difficulties may occur.

A special accessory package carrying catalog number MF-37 for Ford motor compartment mounting may be secured from your distributor.

This package includes the following:

1 - Mounting bracket of heavy gauge steel
2 - 2/16" x 1½" bolts for fastening bracket to bulkhead
2 - 5/16" x 3/8" studs for fastening set to bracket
1 - Curved padding compression washer
1 - Drilling templet

FORD IGNITION COIL CONDENSER

A specially constructed condenser (catalog Number M-42) for Ford V-8's may be secured from your distributor.

This condenser should be connected to the primary terminal post of the ignition coil and is provided with a bracket for mounting under one of the engine gear case cover studs.
When installing #75 or #100 in V-8's, connect the interference feeder to the lower lip of the instrument panel - directly above the ignition switch, and at the point where the ignition switch by-pass condenser is grounded.

LOCATION OF THE RADIO SET

The Motorola model 100 should be securely bolted to the dash, and a position for mounting may be selected either in the driver's compartment or in the motor compartment. When selecting a location for the set, consideration should be given to freedom from obstruction and sharp bends in the control shafts that may affect their operation.

Also give consideration to the future servicing of this instrument and mount it in such a position that the chassis may easily be removed for servicing without removal of the complete set housing.

LOCATION OF THE UNIVERSAL AIRPLANE TYPE CONTROL

The Universal Airplane type control head may be mounted on either the right or left side of the steering column with the mounting bracket as in ***figure 1***, or in those cases where an opening has been provided in the instrument panel for the radio controls it may be installed by using the special instrument panel medallion plates and mounting brackets as supplied for the various makes of cars. ***These medallion plates to match the design and finish of the instrument panel, may be secured from your Motorola dealer or distributor. BE SURE TO STATE MAKE AND MODEL OF CAR.***

Fig. 1


Fig. 2

MOUNTING OF THE SET

The Motorola model 100 can be mounted either in the motor or driver's compartment and the following instructions apply to mounting the set in the motor compartment. However, the same general instructions apply when mounting the set in the driver's compartment.

It is especially recommended that extreme care be taken and a good neat mechanical installation be made, particularly to the location of the antenna lead and A lead regarding their proximity to the high tension wire, ignition coils, etc., as this will later help immeasurably in the complete elimination of all ignition interference.

1. Place the cardboard drilling templet in position on the dash and mark the mounting holes for the set.
2. Mark the position for the holes for the shielded aerial lead and the two flexible control shafts, taking care that no sharp bends will occur in the shafts, as this will seriously effect their operation.
3. Locate a suitable position for the speaker, mark the position of the hole for the single speaker mounting stud.

NOTE: To secure the full high fidelity tone designed into this radio set, it is ***EXTREMELY IMPORTANT*** that the speaker be mounted at an angle in the car, as shown in ***figure 3.*** In every car there is a very definite position in which the speaker may be mounted to take full advantage of the cowl resonance and accoustical properties of the car. This position may be determined by trial, by so locating the position of the speaker mounting hole that the speaker may be revolved to any angle on its Universal mounting stud and then after the set has been placed in operation, tune to a radio station of good tonal quality and adjust the angle of the speaker until full bass note response is secured.

4. Drill all holes with a 3/8" drill.
5. Screw the set mounting studs into the tapped holes at the rear of the set.
6. Mount set and speaker in their respective positions, using the large washers to compress against the padding on the dash.

NOTE: ***Before placing the set in position on the dash it is EXTREMELY IMPORTANT that the paint be cleaned around each hole and the special lock washers provided allowed to dig into the metal at these points.***

7. Mount the control head on the steering column or in the instrument panel, as shown in ***figures 1 and 2.***

INSTRUMENT PANEL MOUNTING OF CONTROL

To remove tuning shaft, loosen set screws A, B, and C, ***figure 4.*** To remove volume control shaft, loosen set screw D.

To remove knobs remove set screws E and F. When replacing shafts in control head, insert them to their limit, then release housing about 1/32" to relieve binding.

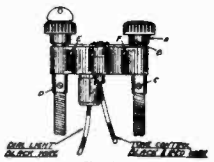


Fig. 4

8. Insert the ***volume control*** shaft in hole ***(A) figure (8)*** in the center of the left end of the receiver by placing the tongue of the flexible shaft into the slot in the volume control shaft, then insert the housing bushing. Insert the tuning control shaft in hole ***C figure 8*** on the left end of the receiver. The shaft fittings are of the self-locking type and may be rigidly secured by turning each approximately a quarter turn to the right. Tighten finger tight only. Do not use wrench or pliers.
9. Insert the plugs on the speaker wires, dial light wire, and tone control wire into their proper receptacles, ***figure (5)*** located at the rear right end of the receiver.

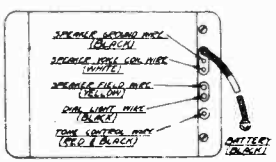
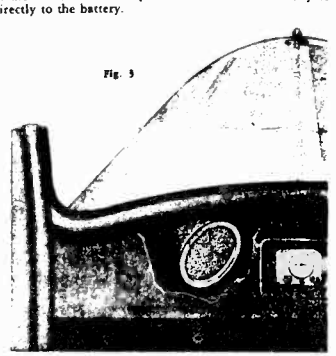


Fig. 5

(a) Insert black speaker wire into 1st receptacle at top marked (G. N. D.) **"ground"**.
(b) White wire into 2nd receptacle marked (V. C.) **"Voice Coil."**.
(c) Yellow wire into 3rd receptacle marked (S. F.) **"Speaker Field"**.
(d) Dial light wire into 4th receptacle marked (D. L.) **"Dial Light"**.
(e) Tone control wire into 5th receptacle marked (T. C.) **"Tone Control"**.

10. Connect the A lead to any convenient 6 volt supply as close to the starter switch as possible. It is not necessary to run it directly to the battery.

Fig. 3



NOTE: ***Do not connect interference feeder until after the set has been tried and the necessity for it is apparent.***

11. Mount the antenna lead junction box to the car body or a welded member, and ***not to the instrument panel,*** then slip the car antenna lead-in through the shielded loom allowing the loom to extend up into the front corner post, as shown in ***figure 6.*** Insert the antenna lead of the receiver into the ferrule provided in the junction box, solder its shield to the box, splice and insulate the lead-in connection and replace cap on junction box.

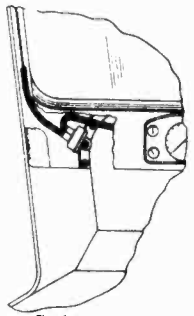


Fig. 6

NOTE: THIS IS THE MOST IMPORTANT POINT IN THE ENTIRE INSTALLATION.

ANTENNA

Practically all automobiles are now equipped with antennas. The lead-in wire will usually be found on the right or left-hand side, behind the instrument panel. If the car is not already equipped, an antenna of nine square feet of screen wire is recommended.

OPERATION

Insert the key in the left-hand control knob. Turn knob slightly to the right until the power switch snaps on. The balance of the revolution controls the volume. The right-hand knob is the station selector. The center knob is the variable tone control. Turn it to the right for bass and to the left for treble.

ADJUSTING THE STATION SELECTOR INDICATOR

Tune in a station of known frequency, preferably about 1000 K.C. Insert a small screw driver in the center rear of the control head and adjust indicator to the frequency of the station being received. ***Figure 7.***


Fig. 7

ADJUSTMENT OF TUNING CONDENSER GEAR

The tuning condenser may be adjusted against its drive pinion by simply turning the cam screw, reached through a hole in the left side of the set housing ***figure (D) (8).*** This hole is covered by a plug button, easily pried off with a screw driver. Turn the screw to the left until a slight drag is felt on the station selector knob, then back off slightly until free movement is obtained and replace plug button.

BALANCING SET TO THE ANTENNA

After the set is installed ready for operation, it may be necessary to balance the set to the antenna. This is done by ajustment of the antenna trimmer, located under a plug button at the top of the set, which may be removed by prying upward with a screw driver. In making this adjustment, tune in a very weak station between 1000 and 1200 on the dial. Adjust the trimmer with a screw driver until the point of maximum volume is reached.

ELIMINATION OF IGNITION INTERFERENCE

Insert the distributor suppressor in the high tension wire not more than two inches from the distributor.

Mount the generator condenser on the generator frame and connect the pigtail connection to the contact on the generator cut-out.

Connect the ***Motorola Dome Lite Filter*** in the dome light wire at the point where the wire enters the front corner post of the car, making sure that filter case is ***well grounded.***

Connect the Motorola ammeter condenser to one side of the ***Ignition Switch*** and to ground.

Place the Motorola floor board shield on the toe boards on the left side of the car under the floor mat and ground it by removing the toe board screws and replacing them through the screen. Except in those cases as noted on the interference chart.

At this point the set should be turned on, the motor started and checked for ignition interference. Tune the set across its tuning range and if no interference is encountered it is unnecessary to connect the interference feeder or to proceed with balancing.

CONNECTING THE INTERFERENCE FEEDER

The purpose of the interference feeder is to feed into the ***Magic Eliminode*** a sufficient amount of interference to counteract that interference being picked up by the car antenna. Therefore, it is necessary to connect it to some point on the motor or instrument panel, choke rod, oil pipe, electrolock cable, etc., that will give the required result. ***(Refer to first column of enclosed Interference Elimination chart).***

BALANCING PROCEDURE

The balancing of the ***Magic Eliminode*** is a very simple procedure. After the set is completely installed it is only necessary to turn the set on, tune it for greatest motor noise intensity, then remove the plug button from the side of the housing marked ***(B) figure (8).***

Remove volume control shaft housing from the set by turning its bushing a quarter turn to the left; remove and insert in hole from which plug button was removed. Turn volume control knob either to the right or left, but in the direction in which the interference decreases. Continue until the interference is entirely eliminated or reduced to its lowest point.

If you find that when turning the knob to the ***right*** the interference gradually decreases, but the end of travel is reached before the interference is eliminated, it indicates that there is ***NOT*** a sufficient amount of interference being fed in by the interference feeder. It will be necessary then to move or connect it to a different point on the engine or car body.

If this condition occurs when turning knob to the ***left,*** it indicates too much interference being fed in, and another pickup point should be selected that will supply a lower value within the range of the ***Magic Eliminode.***

It is always advisable when balancing out interference with the ***Magic Eliminode*** to clamp the car hood down tight with the hood hasps and to sit in the driver's position in the car, because in some extreme cases the interference may have been entirely balanced out but may again appear when the driver takes his position in the car.

After the interference has been eliminated, the volume control shaft should be returned to its original position and the plug button replaced over the ***Magic Eliminode*** balancing shaft ***(B) fig. (8).***

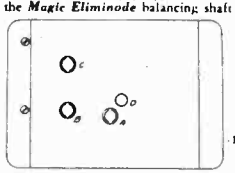


Fig. 8

This adjustment is permanent and will not change unless some change is later made in the car wiring, or the radio set is installed in another car.

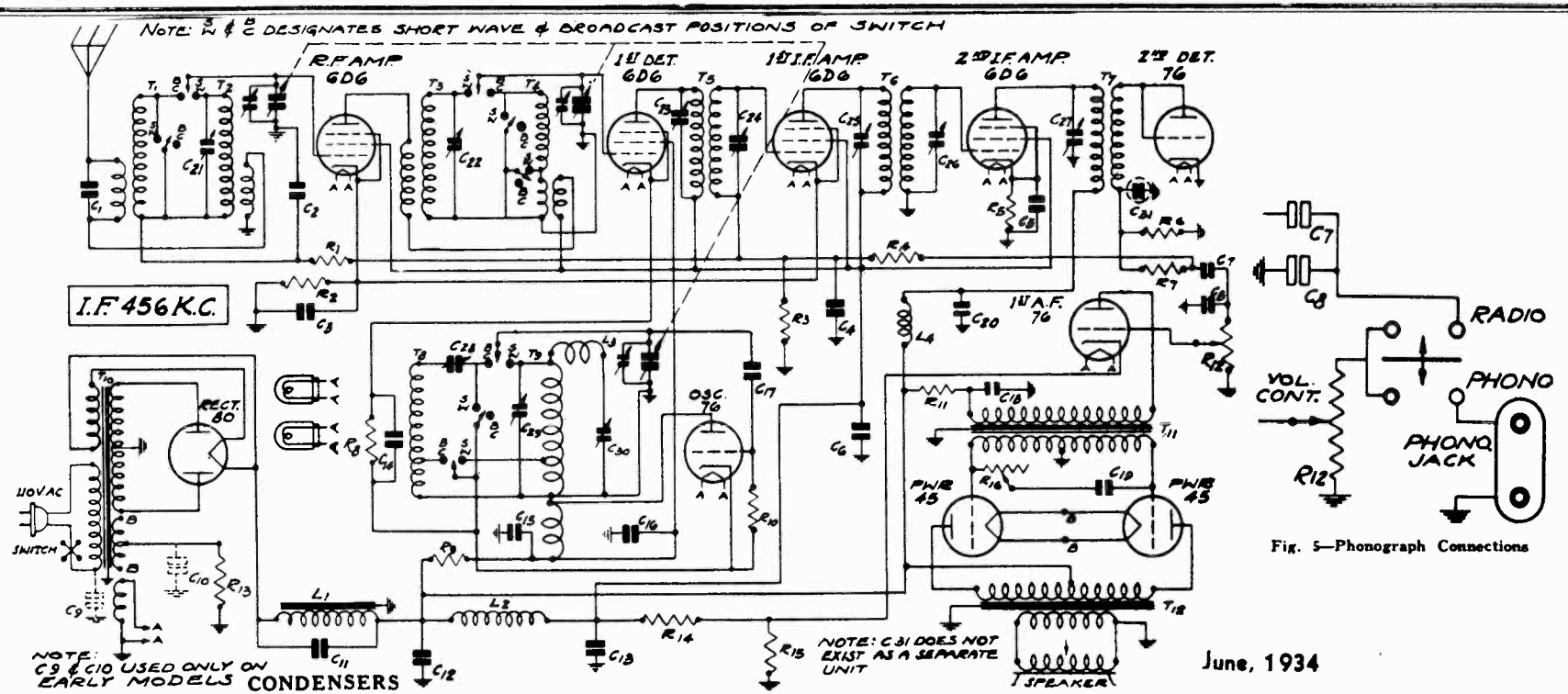


Fig. 5—Phonograph Connections

June, 1934

Fig. 1—Schematic Circuit Diagram

CONDENSERS

Part No.	Code	Capacity	Volts	Type
P-80919	C1	250 mmfd.		Moulded
P-80862	C2	.05 mfd.	200V.	Tubular
P-80888	C3	.25 mfd.	200V.	Tubular
P-80862	C4	.05 mfd.	200V.	Tubular
P-80862	C5	.05 mfd.	200V.	Tubular ....
P-80888	C6	.25 mfd.	200V.	Tubular .....
P-80862	C7	.05 mfd.	200V.	Tubular .....
P-81005	C8	35 mmfd.	600V.	Moulded .....
*P-80997	C9	.01 mfd.	600V.	Condenser in metal can
*P-80888	C10	.25 mfd.	200V.	Tubular .....
P-80985	C11	.15 mfd.	200V.	Tubular .....
P-81039	C12	16.0 mfd.	400V.	Wet Electrolytic .....
P-81018	C13	6.0 mfd.	150V.	Dry Electrolytic .....
	C16	2.0 mfd.	300V.	
	C18	2.0 mfd.	300V.	
P-80862	C14	.05 mfd.	200V.	Tubular .....
P-80864	C15	.10 mfd.	200V.	Tubular .....
P-81005	C17	35 mmfd.	600V.	Moulded .....
P-80863	C19	.004 mfd.	600V.	Tubular .....
P-81041	C20	.10 mfd.	400V.	Tubular .....
P-2102	C21	3-40 mmfd.		Ant. S.W. Trimmer ....
P-2102	C22	3-40 mmfd.		1st Det. S.W. Trimmer
P-2103	C23	200+ 50 mmfd.		Dual Trimmer
	C24	200+ 50 mmfd.		Part of I.F. Assem.
P-2103	C25	200+ 50 mmfd.		Dual Trimmer
	C26	200+ 50 mmfd.		Part of I.F. Assem.
P-1685	C27	70+ 30 mmfd.		3rd I.F. Coil Trimmer
P-2112	C28	300-500 mmfd.		600 K.C. Trimmer ..
P-2102	C29	3-40 mmfd.		Osc. S.W. Trimmer
P-1685	C30	70+ 30 mmfd.		6000 K.C. Trimmer
P-81027		Three Gang Condenser		

RESISTORS

Part No.	Code	Resistance	Watts	Type
P-A95204	R1	200,000 ohm	.2	Carbon .....
P-98023	R2	150 ohm	.5	Flex. Wire Wound ....
P-A95105	R3	1 megohm	.2	Carbon .....
P-A95205	R4	2 megohm	.2	Carbon .....
P-98024	R5	400 ohm	.5	Flex. Wire Wound .....
P-A94304	R6	300,000 ohm	.2	Carbon .....
P-A95104	R7	100,000 ohm	.2	Carbon .....
P-A94252	R8	2,500 ohm	.2	Carbon .....
P-98022	R9	30,000 ohm	2.0	Carbon .....
P-A95104	R10	100,000 ohm	.2	Carbon .....
P-C94303	R11	30,000 ohm	1.0	Carbon .....
P-96005	R12	2 megohm		Volume Control and Switch...
P-98006	R13	780 ohm	3.0	Armored Wire Wound
	R14	6000 ohm	1.4	
	R15	460 ohm	.2	
P-97003	R16	3 megohm		Tone Control .....

*Used in Early Models only.

Part No.	Item
P-50638	Power Transformer 115V. 60 cycles T 10 .....
P-50639	Power Transformer 115V. 25 cycles T 10 .....
P-50640	Power Transformer 115-230V. 40-60 cycles T 10
P-50641	Power Choke L 1 .....
P-50642	Audio Output Transformer T 12 .....
P-50643	Audio Input Transformer T 11 .....
P-5176	Antenna R.F. Trans. T 1 and T 2 less can ...
P-5177	Interstage R.F. Trans. T3 and T4 less can ...
P-5178	Oscillator Coil Assembly T8 and T9 less can ....
P-5186	3rd I. F. Coil T7 less can .....
P-40433	Cans for the above coils .....
P-5184	1st I.F. Coil & Can Assembly T5 .....
P-5185	2nd I.F. Coil & Can Assembly T6 .....
P-5190	H. F. Oscillator Tracking Coil L3 .....
P-5151	I.F. Plate Isolating Reactor L4 .....
P-70702	A.C. Cord & Plug .....
P-1421	Single Insulated Terminal Strip .....
P-1441	Double Insulated Terminal Strip .....
P-2060	Small Knob .....
P-2062	Large Knob .....
P-30342A	Grid Cap only .....
P-30456	Small Pointer .....
P-20912	Large Double End Pointer .....
P-2012	Pilot Light Bulb .....
P-10272	Rubber Mounting Feet .....
P-10320	Glass Crystal .....
P-20875	Crystal Retaining Ring .....
P-2152	8" Dynamic Speaker Mantel L2 .....
P-1968	10" Dynamic Speaker Console L2 .....
P-2101	Three Position Band Change Switch .....
P-20905	Condenser Shield .....
	8" Black Drive Cord (V.C. or T.C. Ind.)
	29" Black Drive Cord (Cond. Drive) .....
P-2126	Pilot Lamp Socket & Clip Assembly ...
P-20911	Bottom Shield .....
P-1011A	Phono-Radio Switch .....
P-1193	Phono Jack .....
P-2025	No. 80 Socket .....
P 1643	No. 45 Socket .....
P-2022	No. 76 Socket .....
P-1883	No. 6D6 Socket .....
P-1637	Speaker Socket .....
P-40434	Tube Shield—Aluminum (for earlier models) ....
P-40424	Tube Shield Base—Aluminum (for earlier models)

Replacing Drive Cord

Remove chassis from cabinet.

Take off the pilot light assembly by lifting off the two sockets and spring clips.

Detach the large pointer by removing the screw at the center of the dial.

Loosen the dial assembly by taking out the two screws which secure the bottom of this assembly to the chassis.

Then lay the complete dial assembly face downward in front of the chassis. It is not necessary to remove the volume control and tone control collars which hold the indicator cords of these two controls in position.

Turn the drive drum until the opening in this drum is approximately vertical and with the hole at the top as shown in Fig. 4.

Remove the tension spring and the old drive cord.

See that the eyelet is in the hole in the drive drum as shown in Fig. 4. Insert one end of the drive cord from the outside through the hole in the eyelet in the drive drum.

Tie the end of the cord which has been inserted in the hole to one end of the tension spring.

Wrap the cord in a clockwise direction (facing front of chassis) around the drive drum approximately one-half turn.

Then tilt the chassis up on its back panel and bring the cord mentioned in the previous paragraph down to the drive shaft. Wrap it two and one-half times around the drive shaft as shown in Fig. 4.

Then bring this cord up from the drive shaft and wrap it around the drive drum approximately one and one fifth turns in a clockwise direction until it is up to the hole in this drum as illustrated.

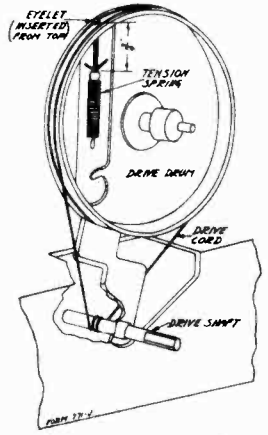


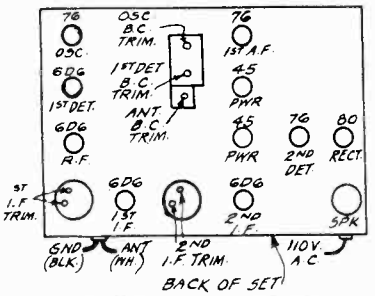
Fig. 4—Drive Cord Replacement

Insert the free end of the cord through the hole in the eyelet and tie it to the end of the tension spring. The end of the spring, when hanging free, should be approximately ¾" from the flange of the drum as shown in Fig. 4. Cut off the surplus length of cord after it is knotted.

Then secure the other end of the tension spring over the spur on the drive drum.

Replace the dial assembly and pointer.

Replace the pilot light assembly after which the chassis may be reinstalled in the cabinet.



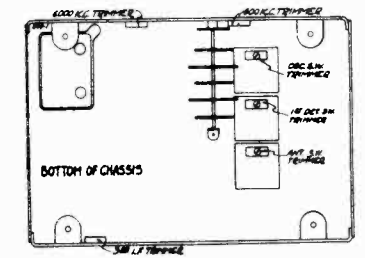


Fig. 2—Tube Arrangement & Location of Trimmers

Voltages at Sockets

LINE VOLTAGE — 115

ANTENNA SHORTED TO GROUND

Type of Tube	Function	Across Fila. or Heater	Plate to Cath.	Screen to Cath	Cath. to Ground	Normal Plate M A.
6D6	R. F.	6.3	95	95	2.8	7.0
6D6	1st Det.	6.3	88	95	9.2	2.9
76	Osc.	6.3	110	—	—	5.0
6D6	1st I. F.	6.3	95	95	2.8	7.0
6D6	2nd I. F.	6.3	300	95	3.3	6.0
76	2nd Det.	6.3	—	—	—	—
76	1st Audio	6.3	160	—	9.0	4.0
45	Output	2.5	245	—	48.0	30.0
80	Rectifier	5.0	890 V. A. C. pl. to pl.			58.0 per plate

Phono Connections

Phonograph connections can be made as shown in Fig. 5. A single pole double throw switch and double pin jack are required. These should be mounted on the back panel of the chassis close to the 2nd detector. The connections are made by opening the diode circuit at the point shown in the illustration and completing the connections to the switch and pin jacks as indicated. A high impedance pick-up should be used. If a low impedance pick-up is used a step-up transformer will be required for sufficient volume. The volume control of the set will regulate the phono volume.

Change in Early Models

In the early models of this receiver the side of the trimmer condenser C27 which is shown in Fig. 1 as connected to ground was connected to the B+ side of the 3rd I. F. coil primary.

Condenser Alignment

Correct alignment is extremely important in connection with all wave receivers. The receivers are all properly aligned at the factory with precision instruments and realignment should not be attempted unless all other possible causes of the faulty operation have first been investigated and unless the service technician has the proper equipment. A signal generator that will provide an accurately calibrated signal of 456 K. C. and accurately calibrated signals over the broadcast and short wave bands, 530-1740 K. C. and 5.8-18.5 M. C., is required. An output indicating meter is also necessary. It will be practically impossible to align the receiver if unsatisfactory apparatus is used.

Use a non-metallic screw driver for the adjustments. The complete procedure is as follows:

Intermediate Frequency Adjustment

Set the signal generator for 456 K. C. Connect the antenna lead of the signal generator to the grid of the 1st detector through a .05 mfd. condenser. Turn the tuning condenser rotor until the plates are completely out. The ground lead from the signal generator goes to the ground lead of the receiver. The volume control should be at the maximum position. Reduce the signal so that A. V. C. action is not obtained.

Then adjust the five I. F. trimmer condensers until maximum output is obtained. The adjusting screws for the 1st and 2nd trimmer condensers are reached from the top of the chassis and are in the round I. F. cans - See Fig. 2. The openings to these trimmer condensers are covered over by small cover plates which are held in position by screws. Loosen these screws until the cover plates can be swung around. **CAUTION - Use an insulated screwdriver for adjusting trimmers to prevent short circuiting to ground.** In the 3rd I. F. coil, only the primary has a variable trimmer condenser. This condenser is mounted on the back panel of the chassis as shown in Fig. 2 and the adjustment screw is reached through a hole in the back panel.

Broadcast Band Adjustment

The broadcast short wave switch should be in the broadcast position. Set the signal generator for 1740 K. C. Turn the rotor to the full open position. The antenna lead from the signal generator is in this instance connected to the antenna lead of the receiver. Reduce the signal so that A. V. C. action is not obtained. Adjust the oscillator broadcast trimmer until maximum output is obtained. This trimmer is on the tuning condenser and its location is shown in Fig. 2.

Then set the signal generator for 1500 K. C. Turn the rotor until maximum output is obtained. Loosen the set screw in the pointer hub and set the pointer at the 1500 K. C. mark on the broadcast band scale. Retighten the hub set screw. Then adjust the antenna and 1st detector broadcast trimmers until maximum output is obtained.

Next set the signal generator for 600 K. C. and adjust the 600 K. C. trimmer. The adjusting screw is reached through a hole in the front panel of the chassis as shown in Fig. 2. Turn the tuning condenser rotor until maximum output is obtained. Then turn the rotor slowly back and forth over this setting at the same time adjusting the 600 K. C. trimmer screw until the highest output is obtained.

Short Wave Band Adjustment

CAUTION—After the broadcast band alignment as described above has been made, do not change the adjustment of any of the broadcast band trimmers.

In aligning the short wave band of the receiver, it will be noted that the signal will be heard with the signal generator set at two points 912 K. C. apart. That is, if the receiver is tuned to 15,000 K. C. a signal will be heard when the signal generator is set at 15,000 K. C. and again at approximately 15,912 K. C. This is due to image reception or the fact that a 456 K. C. beat is obtained when the signal is 456 K. C. lower than the receiver oscillator and also when the signal is 456 K. C. higher than the receiver oscillator. Care should be taken to see that the receiver is tracked with the signal generator adjusted to the lower of the two frequencies at which a signal is heard, in order that the oscillator in the receiver will be 456 K.C. higher in frequency than the signal.

Turn the broadcast short wave switch to the short wave position. Turn the rotor to the full open position. As explained above, the volume control should be at the maximum position and the signal should be reduced to prevent A. V. C. action. Set the signal generator for 18,300 K. C. Then adjust the oscillator short wave trimmer for maximum output. This trimmer is reached from under the chassis and its position is shown in Fig. 2. If a maximum output peak cannot be reached, it may be due to the fact that the antenna and 1st detector short wave trimmers are screwed down too far. Back off these two trimmer screws two or three turns and then adjust the oscillator short wave trimmer for maximum output.

Next set the signal generator for 15,000 K. C. Turn the rotor until maximum output is obtained. Then adjust the antenna and 1st detector short wave trimmers for maximum output.

Next set the signal generator for 6000 K. C. and adjust the 6000 K. C trimmer. This condenser is mounted on the front panel of the chassis as shown in Fig. 2 and is reached through a hole in the front panel. Turn the tuning condenser rotor until maximum output is obtained. Then turn the rotor slowly back and forth over this setting, at the same time adjusting the 6000 K. C. trimmer screw until the highest output is obtained.

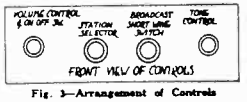


Fig. 3—Arrangement of Controls

D. C. Resistance of Windings

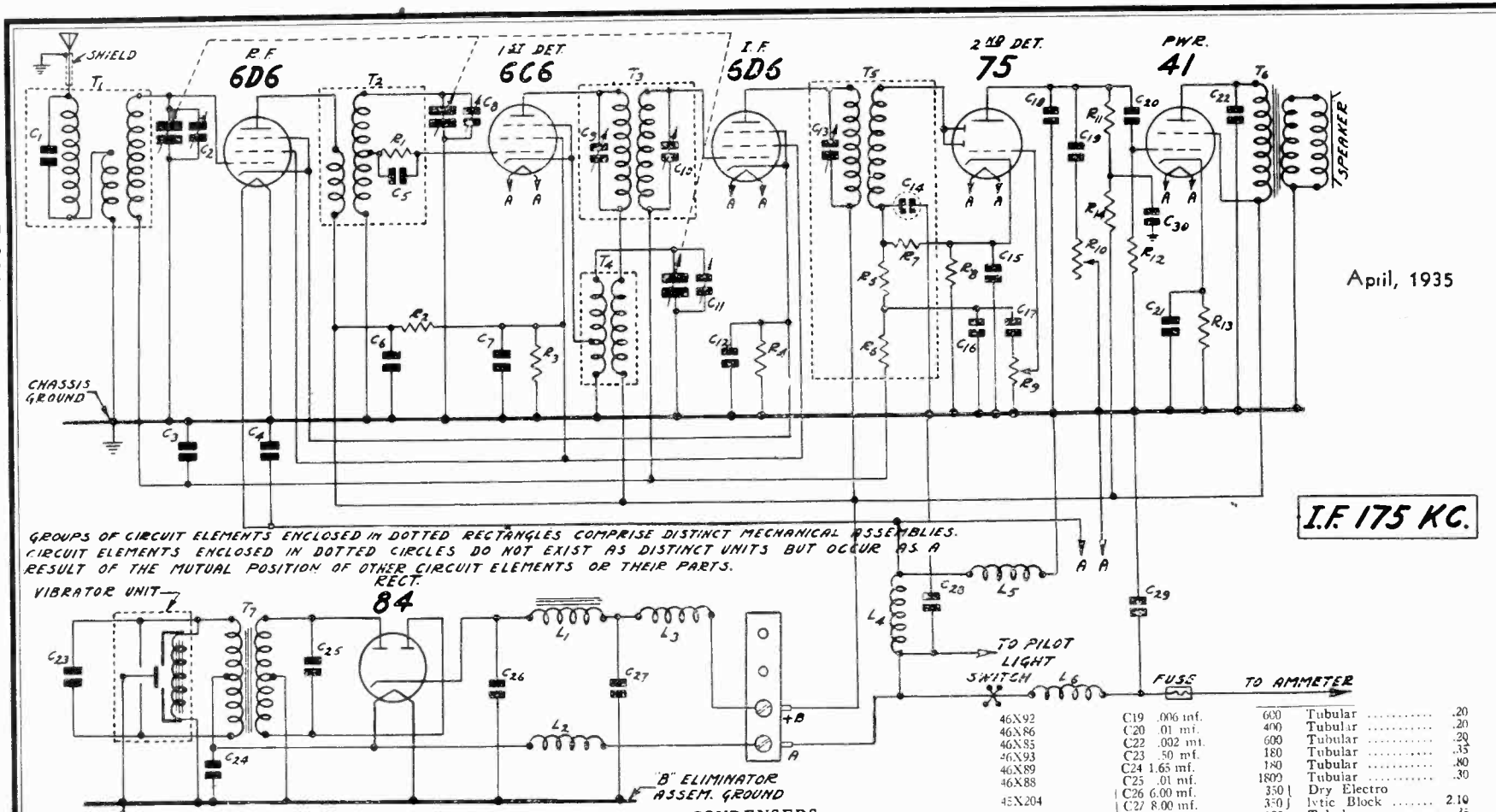
Following are the D.C. resistances of the various windings in the chassis.

Part No.	Item	Code		D.C. Resistance in Ohms
P-5176	S.W. and B.C. Antenna R.F. Transformer Primaries (in series)	T1	T2	27.9
	B.C. Antenna R.F. Transformer Secondary	T1		5.0
	S.W. Antenna R.F. Transformer Secondary	T2		Small
P-5177	S.W. and B.C. Interstage R.F. Transformer Primaries (in series)	T3	T4	2.7
	B.C. Interstage R.F. Transformer Secondary	T4		4.4
	S.W. Interstage R.F. Transformer Secondary	T3		Small
P-5178	S.W. Oscillator Grid Coil	T9		Small
	S.W. Oscillator Plate Coil	T9		.25
	B.C. Oscillator Grid Coil	T8		5.5
P-5190	S.W. Oscillator Tracking Coil	L3		1.27
P-5184	1st I.F. Coil Primary	T5		5.0
	1st I.F. Coil Secondary	T5		5.0
P-5185	2nd I.F. Coil Primary	T6		5.0
	2nd I.F. Coil Secondary	T6		5.0
P-5186	3rd I.F. Coil Primary	T7		9.3
	3rd I.F. Coil Secondary	T7		26.3
P-50643	Audio Input Transformer Primary	T11		2300.
	Audio Input Transformer Secondary Center Tap to Outside	T11		2600.
	Audio Input Transformer Secondary Center Tap to Inside	T11		2000.
P-50642	Audio Output Transformer Primary Center Tap to Outside	T12		360.
	Audio Output Transformer Primary Center Tap to Inside	T12		320.
	Audio Output Transformer Secondary	T12		.44
P-1968	Speaker Voice Coil			3.0
	Speaker Field Coil	T2		5000.
P-10641	Filter Choke	T1		150.
P-50638	Power Transformer 115V. 60 Cycles Pri.	T10		5.3
	Power Transformer 115V. 60 Cycles H.T. Sec. Center Tap to Outside	T10		120.
	Power Transformer 115V. 60 Cycles H.T. Sec. Center Tap to Inside	T10		110.
	Power Transformer 115V. 60 Cycles Sec. (80 Fil.)	T10		Small
	Power Transformer 115V. 60 Cycles Sec. (AA Fil.)	T10		Small
	Power Transformer 115V. 60 Cycles Sec. (BB Fil.)	T10		Small

GAMBLE-SKOGMO, INC.

MODEL 2651
Schematic

April, 1935



GROUPS OF CIRCUIT ELEMENTS ENCLOSED IN DOTTED RECTANGLES COMPRISE DISTINCT MECHANICAL ASSEMBLIES. CIRCUIT ELEMENTS ENCLOSED IN DOTTED CIRCLES DO NOT EXIST AS DISTINCT UNITS BUT OCCUR AS A RESULT OF THE MUTUAL POSITION OF OTHER CIRCUIT ELEMENTS OR THEIR PARTS.

TRANSFORMERS AND COILS

New Part No.	Old Part No.	Description	Code	List Price
51X17-6S	50632	Output Transformer	T6	1.65
9A368-6S		Antenna Coil Assembly (Less Can)	T1	.90
9A369-6S		R.F. Interstage Coil Assembly (Less Can)	T2	1.25
1A23-6S		Dual-Coil Can Assembly Only (for above two coils)		.30
9A371-6S		1st I.F. Coil & Can Assembly Complete	T3	1.70
9A370-6S		Oscillator Coil & Can Assembly Complete	T4	.60
9A372-6S		2nd I.F. Coil & Can Assembly Complete	T5	2.05
9A375-6S		Pilot Light Choke Assembly	L4	.15
9A373-6S		Motor Noise Choke	L6	.25
9A268-6S	5174	R.F. "B" Choke Coil Assembly	L3	.10
9A374-6S		Filament Reactor	L2	.50
53X52-6S	50633	Power Transformer	T7	3.20
52X25-6S	50637	Filter Choke	L1	.90

New Part No.	Old Part No.
47X54	
46X80	
47X50	
47X53	
46X81	
46X83	
*17A32	
†17A33	
46X82	
17A18	1965
45X203	
4 X52	
46X84	
47X52	
46X92	
46X86	
46X85	
46X93	
46X89	
46X88	
45X204	
46X93	
4 X50	
46X94	
14A39	

CONDENSERS

Code	Capacity	Voltage	Type	List Price
C1	.0005 mf.		Moulded	.15
C2	Antenna Trimmer-Part of Gang Condenser			
C3	.05 mf.	180	Tubular	.15
C4	.003 mf.		Moulded	.25
C5	.000035 mf.		Moulded	.10
C6	.10 mf.	400	Tubular	.25
C7	.10 mf.	180	Tubular	.25
C8	1st Detector Trimmer-Part of Gang Condenser			
C9	130-360 mmf.		1st I. F. Trimmer Con-	
C10	130-360 mmf.		densers	.50
C9	70-150 mmf.		1st I. F. Trimmer Con-	
C10	70-150 mmf.		densers	.50
C11	Oscillator Trimmer-Part of Gang Condenser			
C12	.10 mf.	180	Tubular	.25
C13	70-140 mmf. 2nd I.F. Trimmer Condenser			.35
C14	.00025 mf. Part of 2nd I.F. Coil Assembly			
C15	12.00 mf.	25	Dry Electro-	
C21	12.00 mf.	25	lytic Block	1.05
C16	.00025 mf.		Moulded	.15
C17	.01 mf.	180	Tubular	.15
C18	.00025 mf.		Moulded	.15
C19	.006 mf.	600	Tubular	.20
C20	.01 mf.	400	Tubular	.20
C22	.002 mf.	600	Tubular	.20
C23	.50 mf.	180	Tubular	.35
C24	1.65 mf.	180	Tubular	.80
C25	.01 mf.	1800	Tubular	.30
C26	6.00 mf.	350	Dry Electro	
C27	8.00 mf.	350	lytic Block	2.10
C28	.50 mf.	180	Tubular	.35
C29	.003 mf.		Moulded	.25
C30	.25 mf.	300	Tubular	.30
			3 Section Gang Condenser	4.20

RESISTORS

New Part No.	Code	Resistance	Wattage	Type	List Price
A95504	R1	500,000 Ohm	0.2	Carbon	.10
B94153	R2	15,000 Ohm	0.5	Carbon	.15
B94203	R3	20,000 Ohm	0.5	Carbon	.15
43X41	R4	450 Ohm	0.2	Armored Wire	
	R13	800 Ohm	0.3	Wound	.30
A95503	R5	50,000 Ohm	0.2	Carbon	.10
A95105	R6	1.0 Megohm	0.2	Carbon	.10
A94504	R7	500,000 Ohm	0.2	Carbon	.10
A95752	R8	7,500 Ohm	0.2	Carbon	.10
56X200	R9	2.0 Megohm		Volume Control & Switch	1.15
60X201	R10	300,000 Ohm		Tone Control	.75
*A95201	R11	200,000 Ohm	0.2	Carbon	.10
†A95154	R11	150,000 Ohm	0.2	Carbon	.10
A95504	R12	500,000 Ohm	0.2	Carbon	.10
†A95503	R14	50,000 Ohm	0.2	Carbon	.10

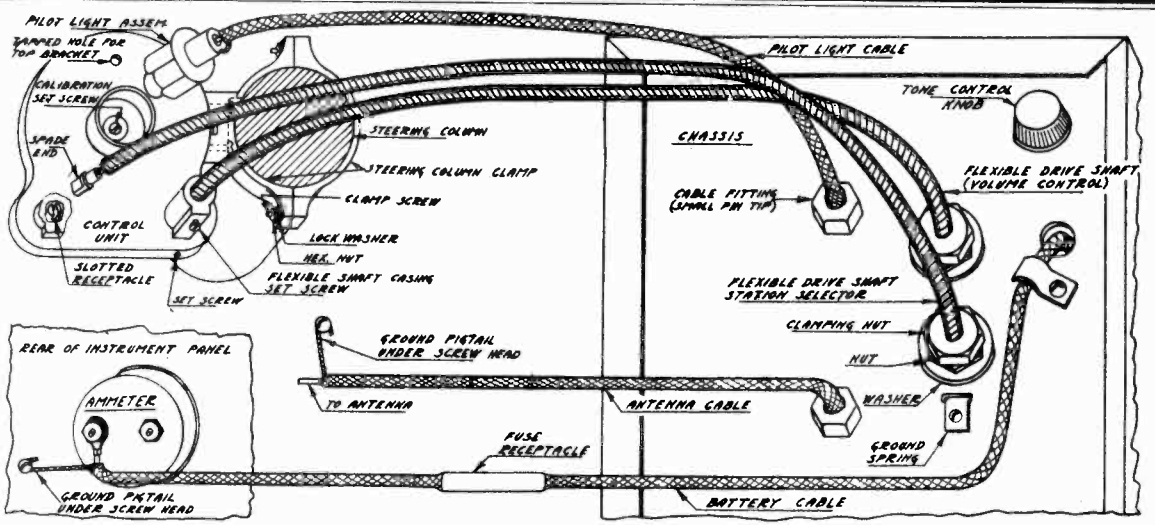


Fig. 4—General Installation View—Control Unit on Steering Column

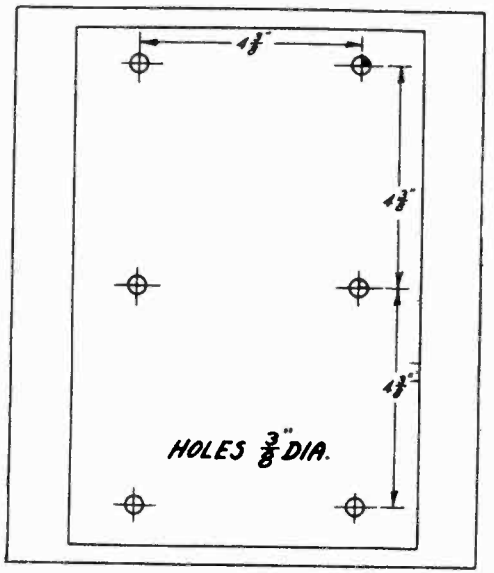


Fig. 2—Location of Mounting Holes

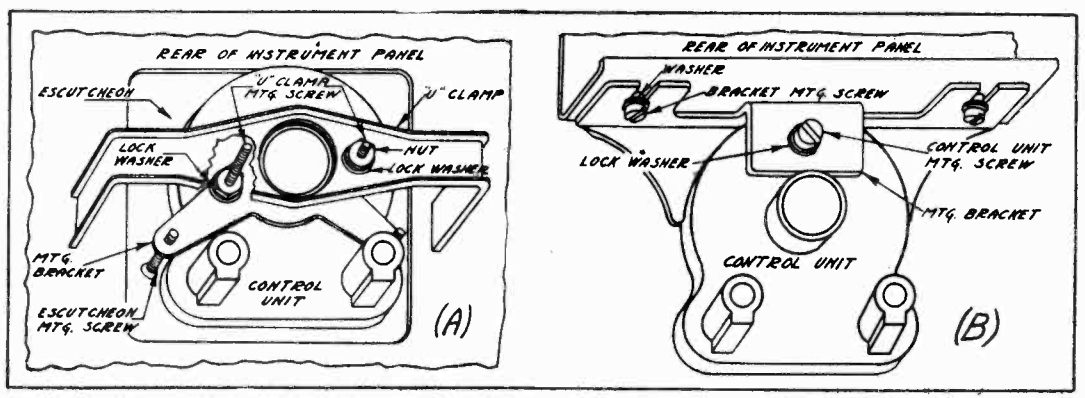


Fig. 5—Mounting Control Unit In and Under the Instrument Panel

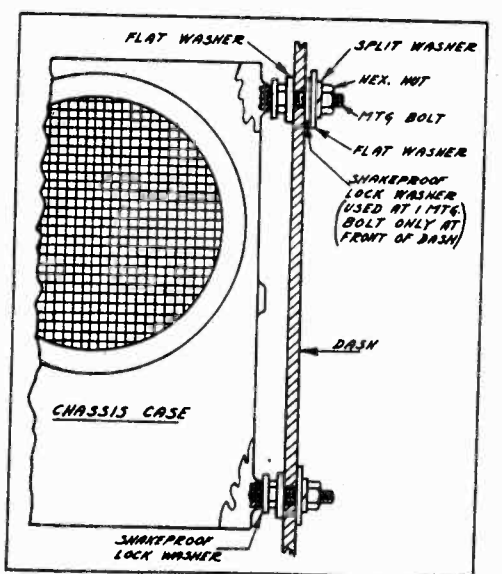


Fig. 3—Details of Chassis Mounting on Dash

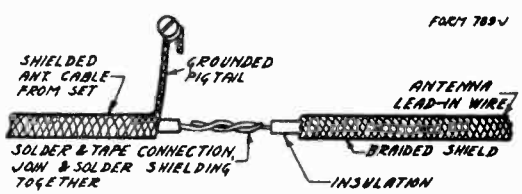


Fig. 7—Extension of Antenna Cable Shield

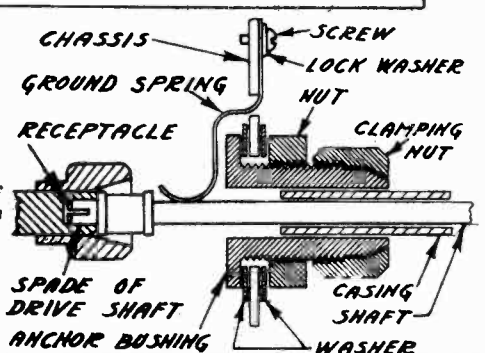


Fig. 6—Details of Flexible Shaft Connection at the Chassis

GAMBLE-SKOGMO, INC.

MODEL 2651
Voltage, Alignment, Socket Trimmers, Resistance Data

I. F. Adjustment

Remove chassis from case.

Establish ground connection between chassis and power supply.

Reconnect A and B wires from power supply to chassis.

Set the signal generator for a signal of 175 KC.

Connect the antenna lead of the signal generator thru a .05 mf. condenser to the stator of the 1st detector (middle) section of the tuning condenser. This can be done by pushing a wire or conductor between the stator plates or by extending an insulated wire thru the hole in the shield over the stator and pushing the wire thru the hole in the lug which extends up from the insulated stator assembly.

Connect the ground lead of the signal generator to the chassis ground.

Short out the oscillator section of the tuning condenser.

Set the volume control at the maximum position.

Attenuate the signal from the signal generator to prevent the levelling off action of the A.V.C.

Then adjust the three I.F. trimmers until maximum output is obtained. The location of these trimmers are shown in Fig. 2.

1650 KC. Adjustment

Set the signal generator for 1650 KC.

Turn the rotor of the tuning condenser to the full open position.

Connect the shielded antenna lead from the chassis through a 250 mmf. condenser to the antenna post of the signal generator.

For this and all subsequent adjustments keep the volume control at the maximum position and attenuate the signal from the signal generator to prevent A. V. C. action.

Adjust the trimmer of the oscillator section of the three gang condenser until maximum output is obtained—see Fig. 2 for location of this trimmer.

1400 K C. Adjustment

Set the signal generator for 1400 KC.

Turn the rotor of the tuning condenser carefully until maximum output is obtained.

Adjust the 1st detector and antenna trimmers for maximum output.

Do not change the setting of the oscillator trimmer.

Voltages at Sockets
Antenna Disconnected - Voltage at Battery 6.1

Type of Tube	Function	Across Heater	Plate to Ground	Screen to Ground	Cath. to Ground	Normal Plate M.A.
6D6	R. F.	5.8	218	100	5.2	5.8
6C6	1st Det. and Osc.	5.8	218	100		2.0
6D6	I. F.	5.8	218	100	5.2	5.8
75	2nd Det. & 1st A. F.	5.8	160 (1)		1.4	2.8
41	Output	5.8	210	220	16.0	16.0
84	Rectifier	5.8				20.0 per plate

Speaker Field ..1.15 Amperes "b" Unit .....3.00 Amperes
Chassis ..... 1.50 Amperes Pilot Lamp .....0.1 Amperes

(1) Measured on 1000 V. Scale (1000 Ohms per volt)

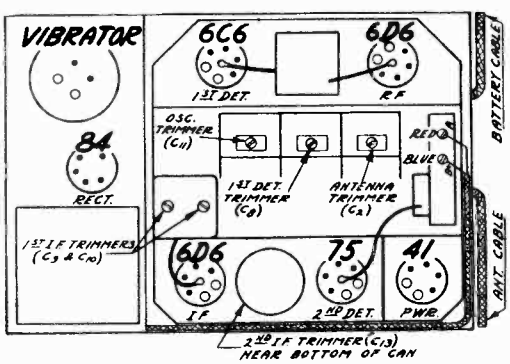


Fig. 2—Tube Arrangement and Trimmers

Adjusting Antenna Trimmer

After the receiver is installed and the car antenna is connected it will be necessary to adjust the antenna trimmer. Tune in a weak signal between 1200 and 1400 KC. with the volume control about three-fourths on. Remove the cover of the chassis case. The antenna trimmer is the trimmer condenser closest to the terminal strip—see Fig. 2. Turn the adjusting screw of this condenser up or down until maximum output is obtained. CAUTION—Do not turn any of the other trimmer adjusting screws for this adjustment.

Calibrating the Receiver

After installing the receiver in the car, it will be necessary to calibrate the control unit. Tune in a station of known frequency at about the center of the dial. At the back of the control unit is a calibration screw—See Fig. 4 in the installation manual enclosed with each receiver. Remove the pilot light assembly.

The calibration screw will be seen at the bottom of the receptacle from which the pilot light assembly is withdrawn. Insert a screwdriver and turn this screw until the pointer on the dial scale is at the frequency of the station being received. **The knob must be held during this adjustment.**

Voltages At Sockets

On the voltage chart are given the voltages at the sockets with all tubes in and the set in operating condition. The antenna should be disconnected.

The voltages can be read with the chassis in the case, by means of an analyzer plug.

If the chassis unit is taken out of the case all of the socket terminals can easily be reached under the chassis with test prods.

If the chassis is taken out, a jumper wire must be connected from the chassis base to the metal wall of the "B" power unit, in order to complete the ground circuit.

D. C. Resistance of Windings

Following are the D. C. resistances of the various windings in the chassis.

New Part No.	ITEM	Code	D. C. Resistance in Ohms
9A368-6S	Antenna Trans. Primaries in Series	T1	6.3
	Antenna Trans. Secondary	T1	2.5
9A369-6S	R.F. Interstage Trans. Pri.	T2	4.5
	R.F. Interstage Trans. Sec. (Center Tap to inside)	T2	1.8
	(Center Tap to ground)		1.3
9A371-6S	1st I.F. Trans. Primary	T3	58.
	1st I.F. Trans. Secondary	T3	58.
9A370-6S	Oscillator Cathode Coil (Total)	T4	3.
	Oscillator Plate Coil	T4	6.
9A372-6S	2nd I.F. Trans. Primary	T5	46.
	2nd I.F. Trans. Secondary	T5	46.
51X17-6S	Output Trans. Primary	T6	440.
	Output Trans. Sec. and Voice coil in parallel	T6	.4
53X72-6S	Power Trans. Primary	T7	.3
	Power Trans. Secondary	T7	500.
52X27-6S	Filter Choke	L1	300.
9A374-6S	Filament Reactor	L2	Small
9A268-6S	R.F "B" Choke	L3	3.5
9A375-6S	Pilot Light Choke Assembly	L4	Small
12A62A	Speaker Field	L5	5.
9A378-6S	Motor Noise Choke	L6	Small

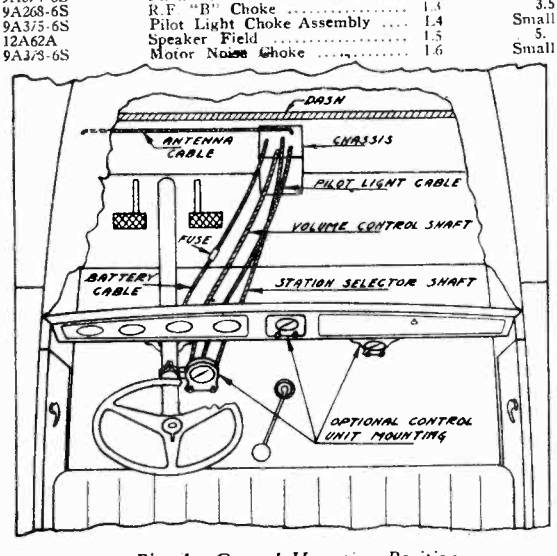
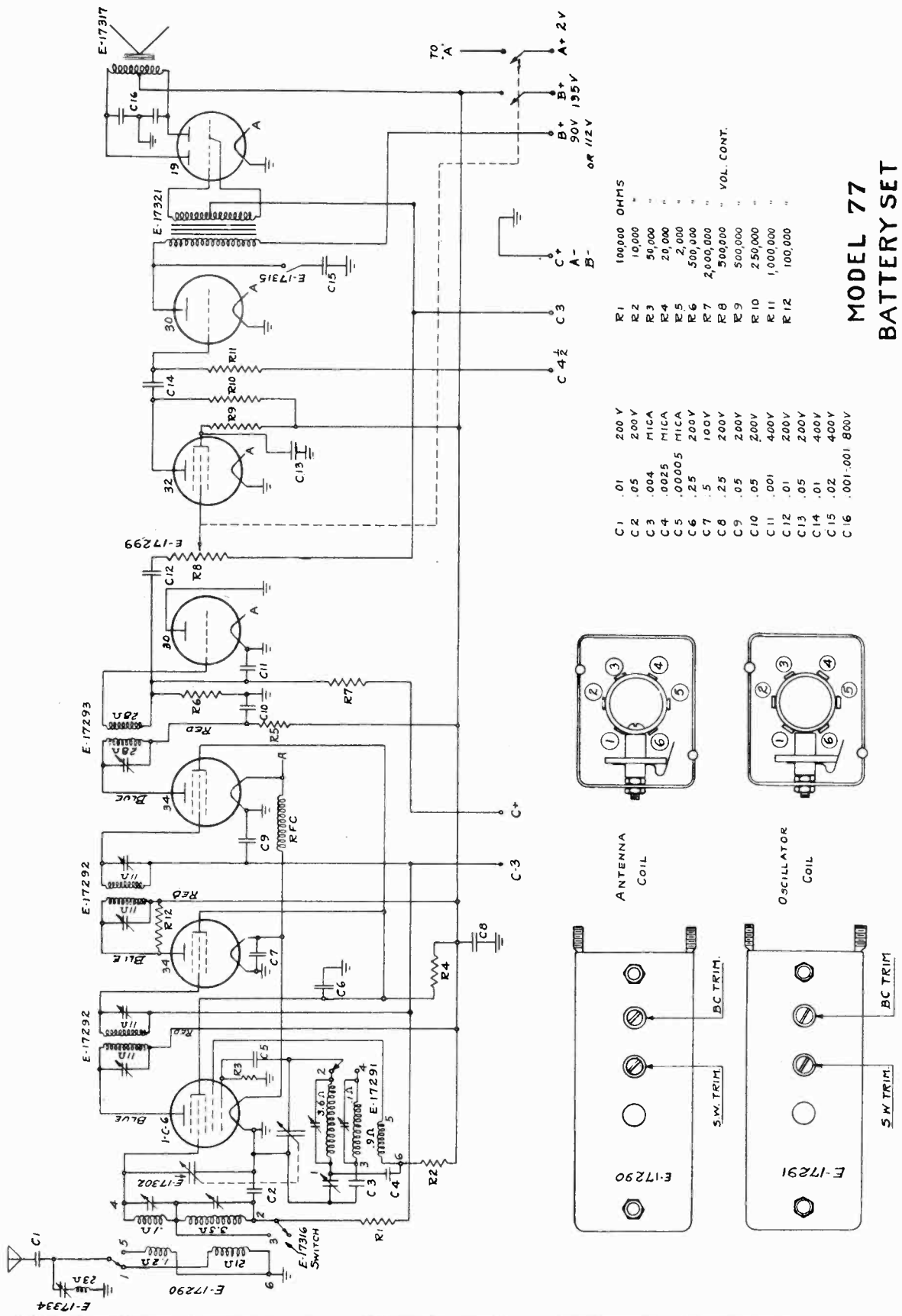


Fig. 1—General Mounting Position

MODEL 77
Schematic

GAMBLE-SKOGMO, INC.



GAMBLE-SKOGMO, INC.

MODELS 27C1, 27C5
Schematic, Voltage
Socket, Trimmers, Parts

RESISTORS

Part No.	Code	Resistance	Wattage	Type
P-A95104	R1	100,000 Ohm	.2	Carbon
P-A93803	R2	30,000 Ohm	.2	Carbon
P-A95104	R3	100,000 Ohm	2	Carbon
P-A93602	R4	6,000 Ohm	.2	Carbon
P-B93902	R5	9,000 Ohm	.5	Carbon
P-A95505	R6	5 Megohm	.2	Carbon
P- 96012	R7	1 Megohm		Volume Control
P-A95505	R8	5 Megohm	.2	Carbon
P-A94603	R9	60,000 Ohm	.2	Carbon
P-A95104	R10	100,000 Ohm	.2	Carbon
P-A95104	R11	100,000 Ohm	.2	Carbon

Voltages at Sockets

ANTENNA SHORTED TO GROUND

Type of Tube	Function	Fila-ment Volt.	Plate to Neg. Filament	Screen to Neg. Filament	Grid to Neg. Filament	Normal Plate M. A.
34	1st Detector	2.0	135	55	3.0 av.	1.90
30	Oscillator	2.0	75		0.0	3.70
34	I. F.	2.0	135	70	3.0 av.	3.00
30	2nd Detector	2.0	2			
34	1st A. F.	2.0	140	65	4.0	2.30
30	2nd A. F.	2.0	135		8.0	3.10
19	Output	2.0	137		6.0	1.00 per plate

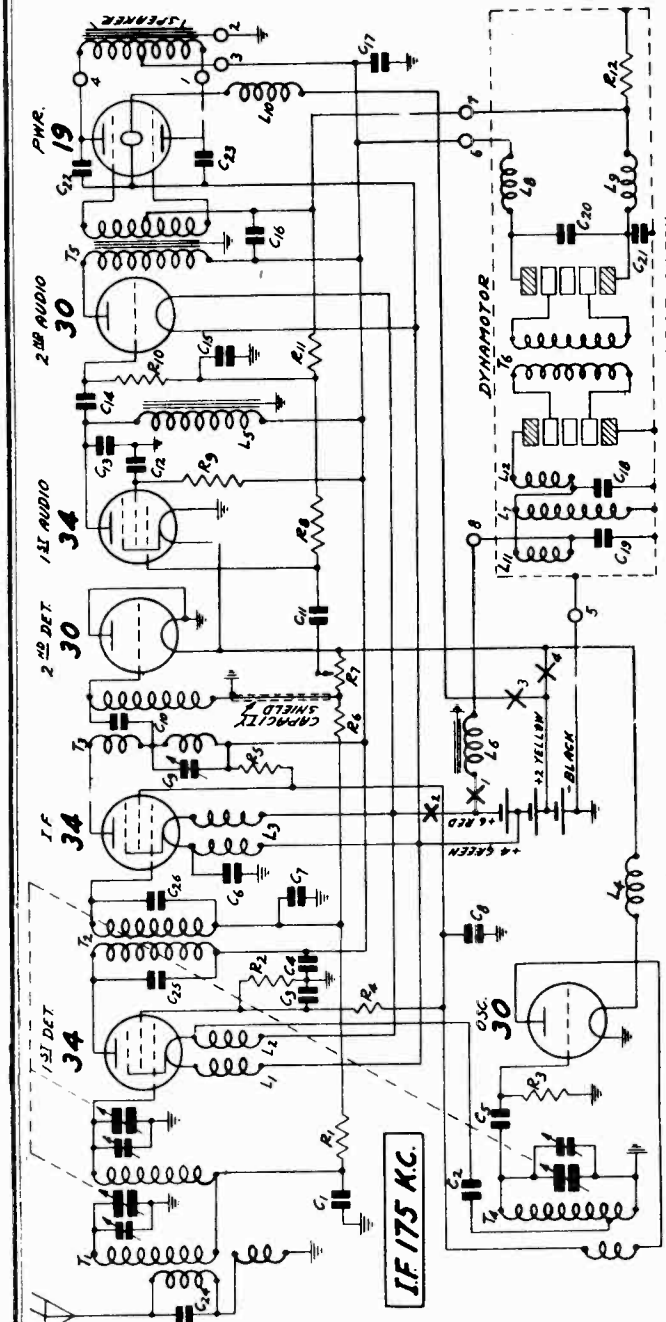


Fig. 1. Schematic Circuit Diagram

CONDENSERS

Part No.	Code	Capacity	Voltage	Type
P-80862	C1	0.050	Mf. 200V	Tubular
P-80862	C2	0.050	Mf. 200V	Tubular
P-80862	C3	0.050	Mf. 200V	Tubular
P-80864	C4	0.100	Mf. 200V	Tubular
P-81801	C5	35	Mmf.	Cap. Part of Osc. Coil Assem.
P-80888	C6	0.250	Mf. 200V	Tubular
P-80862	C7	0.050	Mf. 200V	Tubular
P-80988	C8	1.500	Mf. 140V	Tubular
P-1965	C9	70-140	Mmf.	Trimmer
P-81800	C10	50	Mmf.	Cap. Part of 2nd I.F. Coil Ass.
P-80981	C11	0.010	Mf. 400V	Tubular
P-80888	C12	0.250	Mf. 200V	Tubular
P-80945	C13	500	Mmf.	Moulded
P-80862	C14	0.050	Mf.	Tubular
P-80888	C15	0.250	Mf. 200V	Tubular
P-81014	{C16	16.00	Mf. }	Electrolytic Block
	{C17	16.00	Mf. }	
P-80914	C22	0.002	Mf. 600V	Tubular
P-80914	C23	0.002	Mf. 600V	Tubular
P-81812	C24	200	Mmf.	Cap. Part of Ant. Assem.
P-81807	C25	70	Mmf.	Cap. Part of 1st I.F. Coil Ass.
P-81805	C26	45	Mmf.	Cap. Part of 1st I.F. Coil Ass.
P-81015	Three Gang Condenser			

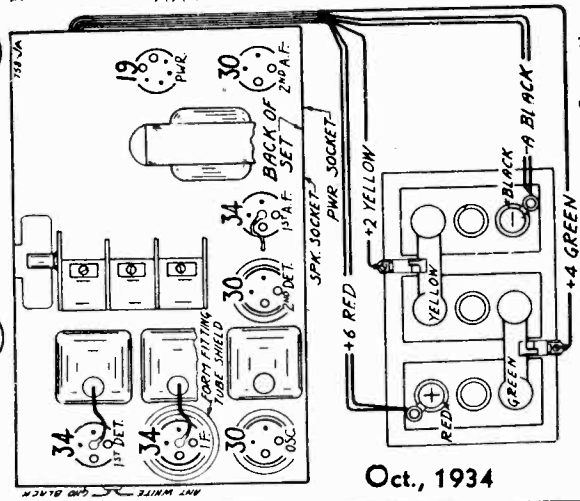


Fig. 2. Location of Tubes and Battery Connections

Oct., 1934

MODELS 27C1, 27C5
Drive Cord Adjustment GAMBLE-SKOGMO, INC.
Alignment, Resistance Data

Condenser Alignment

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

First set the signal generator to a frequency of 175 KC. Connect the antenna lead of the lead generator to the grid of the 1st detector thru a .05 mfd. condenser. The ground lead from the signal generator goes to the ground lead of the receiver. Adjust trimmer condenser C9 on the back panel of the chassis until maximum output is obtained. **A non-metallic screw driver should be used in making this adjustment as the I. F. trimmer is at B+ potential.**

Next set the signal generator for 1730 KC. Turn the rotor to the full open position. The antenna lead from the signal generator is in this instance connected to the antenna lead of the receiver. Adjust the trimmer of the oscillator section of the 3 gang condenser until maximum output is obtained. The oscillator section is the one with the cut plate rotor.

Then set the signal generator for 1400 KC and turn the rotor until maximum output is obtained. Adjust the other two trimmers on the gang condenser for maximum output.

To obtain dial scale calibration tune in an 800 KC signal and set the dial pointer at that mark on the dial scale. When calibrated in this manner, the setting will be approximately correct at both ends of the scale.

The use of the cut plate type of condenser eliminates the necessity of a 600 KC padder and no adjustment at this frequency, therefore, is required.

Replacing Drive Cord

Remove chassis from cabinet.

Take off the pilot light assembly by lifting off the two sockets and spring clips.

Detach the large pointer by removing the screw at the center of the dial.

Loosen the dial assembly by taking out the two screws which secure the bottom of this assembly to the chassis.

Then lay the complete dial assembly face downward in front of the chassis. It is not necessary to remove the volume control and Off-On switch collars which hold the indicator cords of these two controls in position.

Turn the drive drum until the opening in this drum is approximately vertical and with the hole at the top as shown in Fig. 4.

Remove the tension spring and the old drive cord.

See that the eyelet is in the hole in the drive drum as shown in Fig. 4. Insert one end of the drive cord from the outside through the hole in the eyelet in the drive drum.

Tie the end of the cord which has been inserted in the hole to one end of the tension spring.

Wrap the cord in a clockwise direction (facing front of chassis) around the drive drum approximately one-half turn.

Then tilt the chassis up on its back panel and bring the cord mentioned in the previous paragraph down to the drive shaft. Wrap it two and one-half times around the drive shaft as shown in Fig. 4.

Then bring this cord up from the drive shaft and wrap it around the drive drum approximately one and one fifth turns in a clockwise direction until it is up to the hole in this drum as illustrated.

Insert the free end of the cord through the hole in the eyelet and tie it to the end of the tension spring. The end of the spring, when hanging free, should be approximately ¾" from the flange of the drum as shown in Fig. 4. Cut off the surplus length of cord after it is knotted.

Then secure the other end of the tension spring over the spur on the drive drum.

Replace the dial assembly and pointer.

Replace the pilot light assembly after which the chassis may be reinstalled in the cabinet.

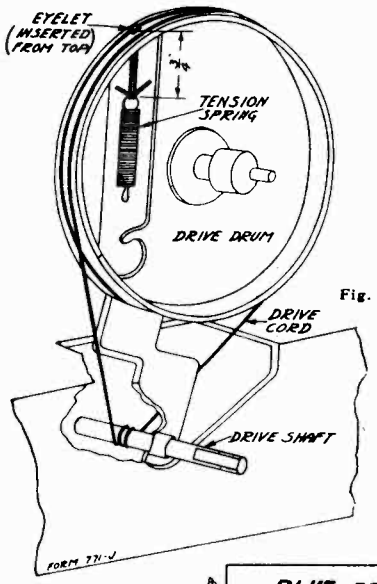


Fig. 4 Drive Cord Replacement.

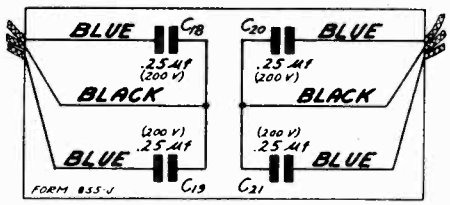


Fig. 3. Four Section Condenser in Power Unit Box

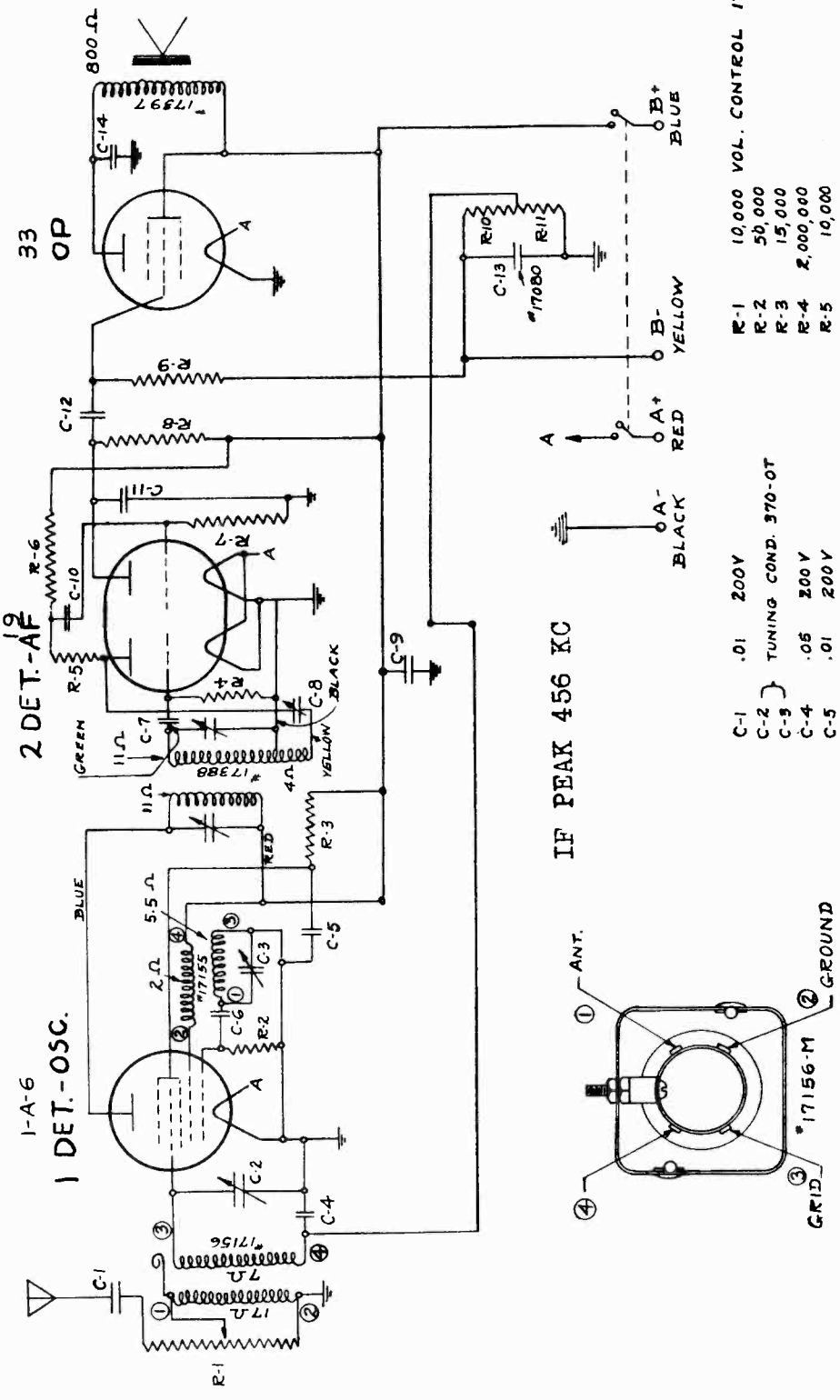
D. C. Resistance of Windings

Following are the D. C. resistances of the various windings in the chassis. The values given below will vary slightly in different sets.

Part No.	Item	Code	D. C. Resistance in Ohms
P-5200	Double Tuned Antenna Transformer, Primaries in series	T1	20.1
	Double Tuned Antenna Transformer Secondary Preselector	T1	3.3
	Double Tuned Antenna Transformer Secondary Detector	T1	3.1
P-5169	Oscillator Grid Coil	T4	3.6
	Oscillator Plate Coil	T4	1.6
P-5170	I. F. Coil Primary	T2	89.
	I. F. Coil Secondary	T2	126.
P-5171	I. F. Reactor Coil Plate Winding	T3	99.
	I. F. Reactor Coil Grid Winding	T3	429.
P-5172	Double Filament Reactor Assembly each section	L1, L2	Small
P-5173	Combined Filament Reactor Assembly each section	L3, L4	Small
P-50621	Audio Plate Reactor	L5	4940.
P-50622	Iron Core Isolating Reactor	L6	Small
P-5222	Filament Reactor	L10	Small
P-50625	Audio Transformer Primary	T5	1066.
	Audio Transformer Secondary (center tap to inside)	T5	614.
	Audio Transformer Secondary (center tap to outside)	T5	666.
P-2010	6" Magnetic Speaker (center tap to inside)		260.
	6" Magnetic Speaker (center tap to outside)		300.

MODEL 430
Schematic

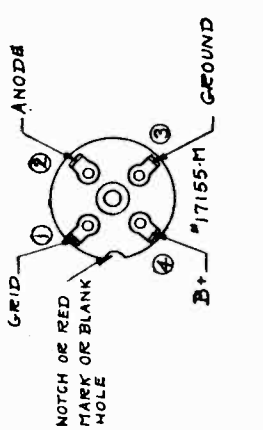
GAMBLE-SKOGMO, INC.



R-1	10,000	VOL. CONTROL 17381
R-2	50,000	
R-3	15,000	
R-4	2,000,000	
R-5	10,000	
R-6	250,000	
R-7	1,000,000	
R-8	250,000	
R-9	1,000,000	
R-10	400	CANDOHM PART 17375
R-11	100	

C-1	.01	200V
C-2 } C-3		TUNING COND. 370-OT
C-4	.05	200 V
C-5	.01	200 V
C-6	.0002	MICA
C-7	.0002	MICA
C-8	.00003	REGENERATION
C-9	.25	200V
C-10	.01	200V
C-11	.0005	600V
C-12	.01	200V
C-13	10 MFD.	25 V ELECTROLYTIC.
C-14	.002	800V

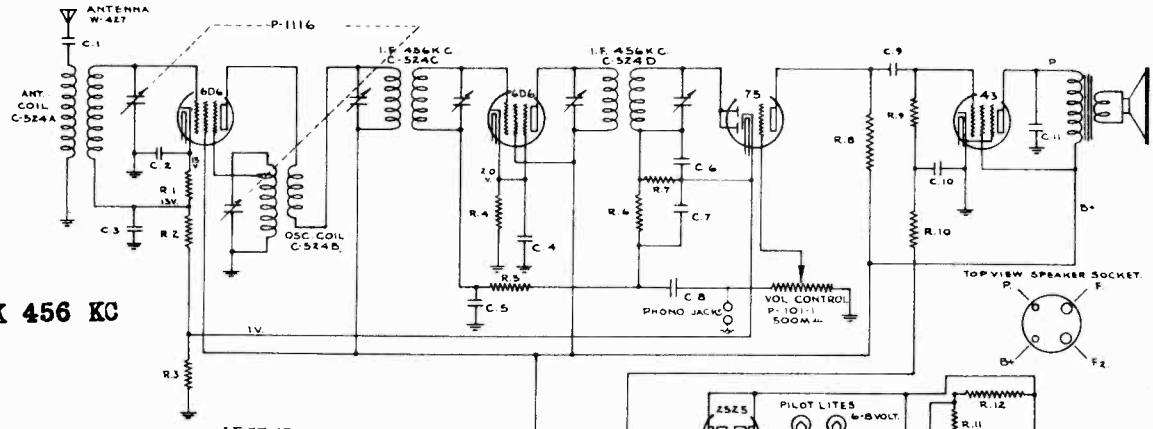
IF PEAK 456 KC



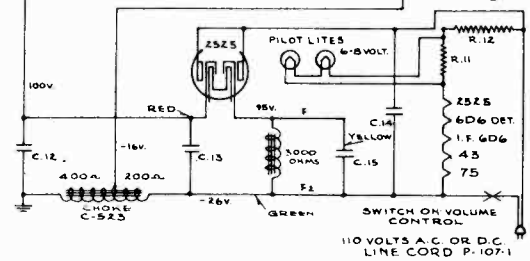
MODEL 430
BATTERY RADIO

MODEL 540
Schematic, Socket
Alignment, Parts
Voltage

GAMBLE-SKOGMO, INC.



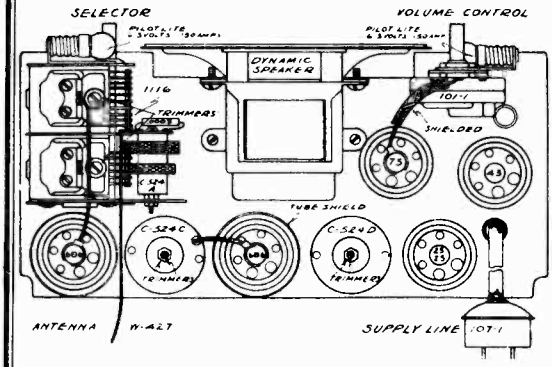
IF PEAK 456 KC



LEGEND

RESISTORS			CONDENSERS		
Nº	VALUE		Nº	VALUE	
R-1	300	*	C-1	.0005	MICA
R-2	2M	*	C-2	.05	200V
R-3	180	*	C-3	.05	200V
R-4	250 R-270		C-4	.05	200V
R-5	250M		C-5	.1	200V
R-6	50M		C-6	.0005	MICA
R-7	250M		C-7	.0005	MICA
R-8	100M		C-8	.01	400V
R-9	300M		C-9	.01	400V
R-10	250M		C-10	.1	200V
R-11	40-300M A. 0.36W P-106-1		C-11	.025	300
R-12	126 IN CORD P-107-1		C-12	5.0 MFD.	C-525D
			C-13	25.0 MFD.	*
			C-14	.1	400V.
			C-15	5.0 MFD	*

NOTE:
* R-1, R-2 & R-3 IN ONE UNIT PART NUMBER R-268.
* C-13 AND C-15 IN ONE UNIT PART NUMBER C-525-C
NUMBERS PREFIXED BY LETTERS ARE PARTS
VOLTAGES TAKEN FROM POINTS INDICATED TO CHASSIS GROUND. VOLUME CONTROL ON FULL MEASURED ON A.C. CURRENT.



Part No.	Description
101-1	Volume Control with Switch
106-1	40 Ohm Resistor-10%
107-1	126 Ohm Special Cord and Plug
C-523	600 Ohm Choke
C-524A	Antenna Coil
C-524B	Oscillator Coil
C-524C	Input I.F. Transformer
C-524D	Output I.F. Transformer
C-525C	5-25 Mfd. Electrolytic Condenser
C-525D	5 Mfd. Electrolytic Condenser
R-268	2480 Ohm Resistor
R-270	250 Ohm Wire Wound Resistor

SERVICE NOTES

Should it be at any time necessary to rebalance this set, the correct procedure is as follows:

1. Volume control on full during all alignment.
2. Variable condenser in minimum capacity position, plates open, at start of all aligning.

I.F. ALIGNMENT

1. To peak I.F. transformers, connect oscillator set at 456 kilocycles to the grid of the 6D6 tube directly in back of the variable condenser and adjust the trimming condensers of the I.F. transformers to resonance (Maximum deflection on an output meter connected across the primary of the speaker input transformer).

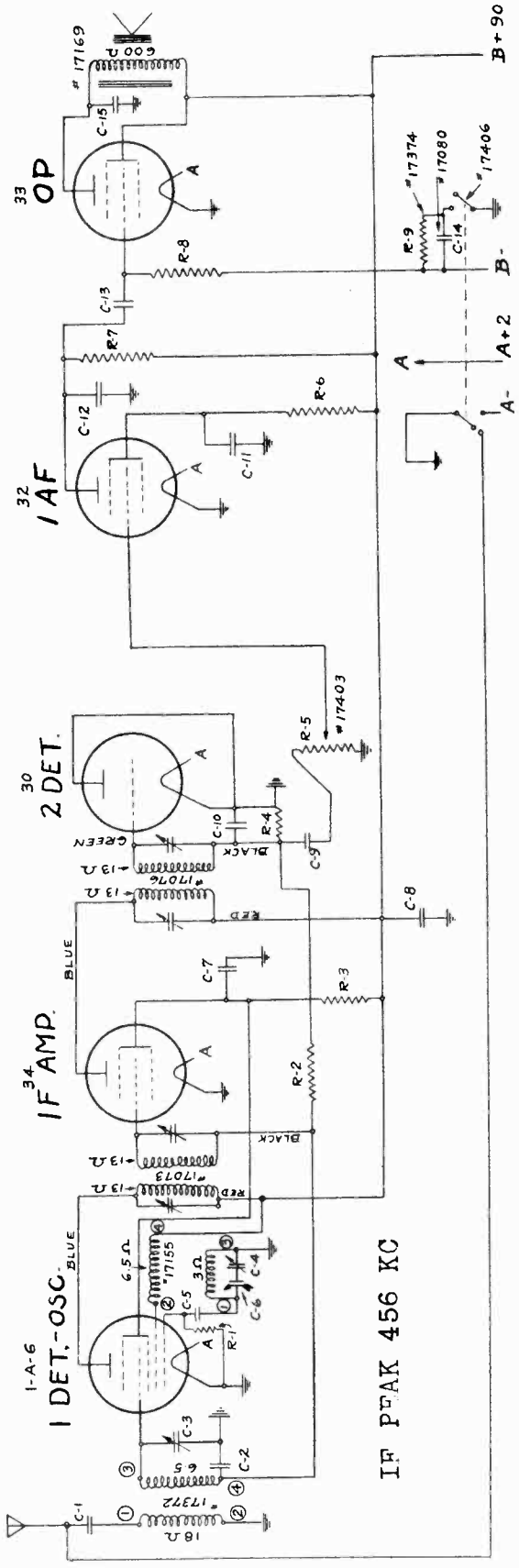
   Each I.F. trimmer has two adjustments, one nut and one screw, both of which are adjustable from the top.

BROADCAST BAND ALIGNMENT

1. Disconnect antenna wire and connect oscillator in series with a 75 mmfd. condenser to the antenna coil. With the variable condenser set at its minimum capacity position, at the extreme right of its rotation, and with an oscillator output adjusted to 1720 kilocycles, adjust trimmer of oscillator section of variable condenser (rear section) to resonance (maximum deflection on an output meter connected across the primary of the speaker input transformer). Next adjust the trimmer condenser of the front section of the variable condenser to resonance.
2. Check alignment at 1400-1200-1000-800-600-530 kilocycles, bending the slotted plates of the front section of the variable condenser only if absolutely necessary.

MODEL 550
Schematic

GAMBLE-SKOGMO, INC.



C-1	.01	200 V	
C-2	.05	200 V	
C-3	.00037	TUNING COND.	
C-4			
C-5	.00002	MICA	
C-6	.0005	PAD	
C-7	.05	200 V	
C-8	.25	200 V	
C-9	.01	200 V	
C-10	.0005	600 V	
C-11	.05	200 V	
C-12	.0005	600 V	
C-13	.01	200 V	
C-14	10 MFD.	25 V	ELECTROLYTIC
C-15	.002	800 V	

R-1	50,000	
R-2	2,000,000	
R-3	15,000	
R-4	500,000	
R-5	500,000	VOL. CONTROL
R-6	500,000	
R-7	250,000	
R-8	1,000,000	
R-9	500	

MODEL 550
BATTERY RADIO

6-10-35 K.R.C

MODEL 575
Schematic, Socket
Voltage, Alignment

GAMBLE-SKOGMO, INC.

Service Notes

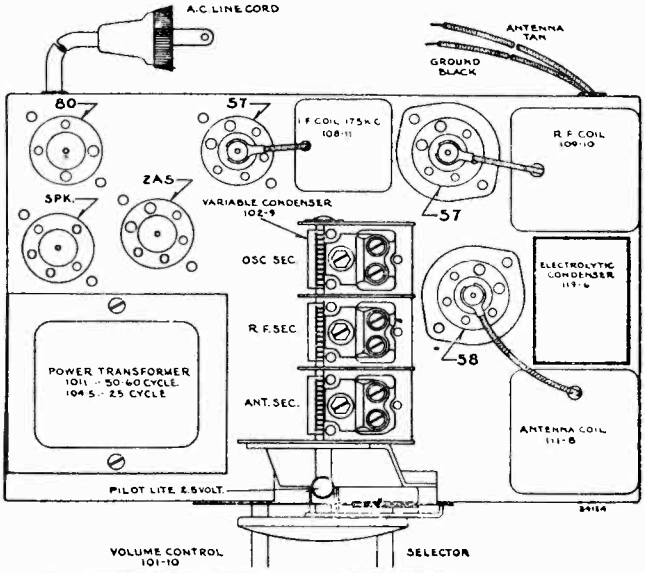
Voltages taken from different points of circuit to chassis are measured with volume control full on, using a voltmeter having a resistance of 1000 ohms per volt. These voltages are indicated on the schematic circuit diagram.

Part No. 145-2

Common Black to Brown	—.003	x 600 Volts
Common Black to Green	—.1	x 200 Volts
Common Black to Red	—.1	x 200 Volts
Common Black to Orange	—.25	x 200 Volts
Blue to Blue	—.05	x 400 Volts

Part No. 145-3

Common Black to Brown	—.1	x 200 Volts
Common Black to Green	—.05	x 200 Volts
Common Black to Orange	—.05	x 200 Volts
Common Black to Yellow	—.05	x 200 Volts



Aligning I. F. Transformer

1. With volume control full on, at extreme right of its rotation, and with variable condenser at its maximum capacity position (extreme right of its rotation) make the following adjustments:

(a) Connect an external oscillator adjusted to 175 kilocycles, in series with a .1 mfd. condenser, to the control grid cap of the type 57 tube located between the R. F. coil (part numbers 109-10) and the I. F. transformer (part number 108-11) and chassis.

(b) Adjust trimming condensers of I. F. transformer (part number 108-11) to resonance. See top view of chassis. Use as a resonance indicator an output meter connected across the primary of the speaker input transformer or between the plate and screen terminals of the type 2A5 tube, by means of an adapter. Maximum deflection of the meter indicates resonance. Care must be taken to use only enough signal to give a readily readable output, as excessive input will result in overload and a false resonance point.

NOTE: The two trimmer condensers which tune the primary and secondary of the I. F. transformer are adjusted by set screws accessible from the back of the chassis.

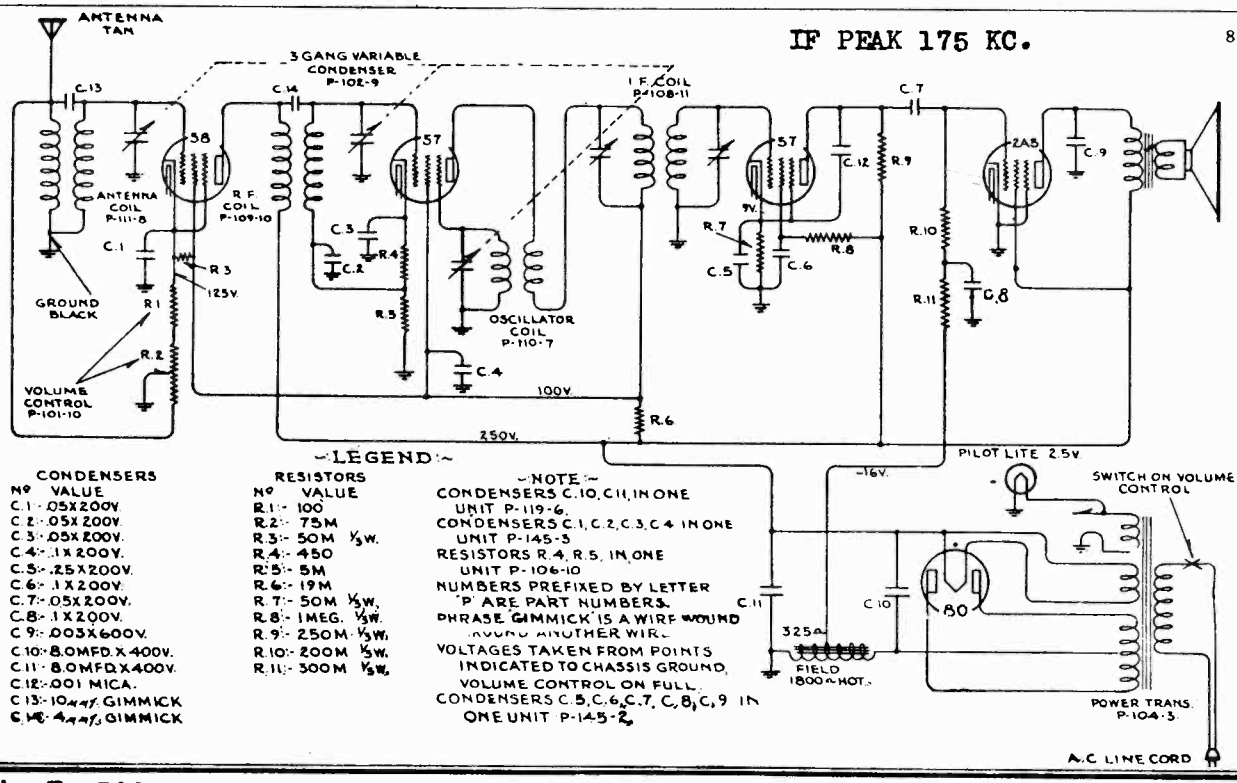
Aligning R. F. and Oscillator Circuits

1. Connect the external oscillator set at 1720 kilocycles and in series with a 200 Mfd. condenser, between the antenna (tan) and ground (black) leads.

(a) With volume control full on and variable condenser plates in minimum capacity position, plates entirely out of mesh (extreme left of its rotation), adjust trimmer of rear oscillator section of variable condenser to resonance.

(b) Shift external oscillator frequency from 1720 to 1400 kilocycles, pick up signal by rotating variable condenser and peak R. F. (center) and antenna (front) section trimmers of variable condenser to resonance.

(c) Check tracking at 1500, 1200, 1000, 800, 600 and 530 kilocycles by changing external oscillator frequency and rotating variable condenser to pick up signal. Adjust slotted end plates of R. F. (center) and antenna (front) sections to increase output, if necessary. DO NOT BEND OSCILLATOR PLATES.



-LEGEND-

CONDENSERS		RESISTORS	
Nº	VALUE	Nº	VALUE
C.1	.05X200V.	R.1	100
C.2	.05X200V.	R.2	75M
C.3	.05X200V.	R.3	50M ½W.
C.4	.1X200V.	R.4	450
C.5	.25X200V.	R.5	5M
C.6	.1X200V.	R.6	19M
C.7	.05X200V.	R.7	50M ½W.
C.8	.1X200V.	R.8	1MEG. ½W.
C.9	.003X600V.	R.9	250M ½W.
C.10	8.0MFD.X400V.	R.10	200M ½W.
C.11	8.0MFD.X400V.	R.11	300M ½W.
C.12	.001 MICA.		
C.13	10 μμf. GIMMICK		
C.14	4 μμf. GIMMICK		

-NOTE-
CONDENSERS C.10, C.11, IN ONE UNIT P-119-6.
CONDENSERS C.1, C.2, C.3, C.4 IN ONE UNIT P-145-3
RESISTORS R.4, R.5, IN ONE UNIT P-106-10
NUMBERS PREFIXED BY LETTER 'P' ARE PART NUMBERS.
PHRASE 'GIMMICK' IS A WIRE WOUND AROUND ANOTHER WIRE.
VOLTAGES TAKEN FROM POINTS INDICATED TO CHASSIS GROUND, VOLUME CONTROL ON FULL.
CONDENSERS C.5, C.6, C.7, C.8, C.9 IN ONE UNIT P-145-2.

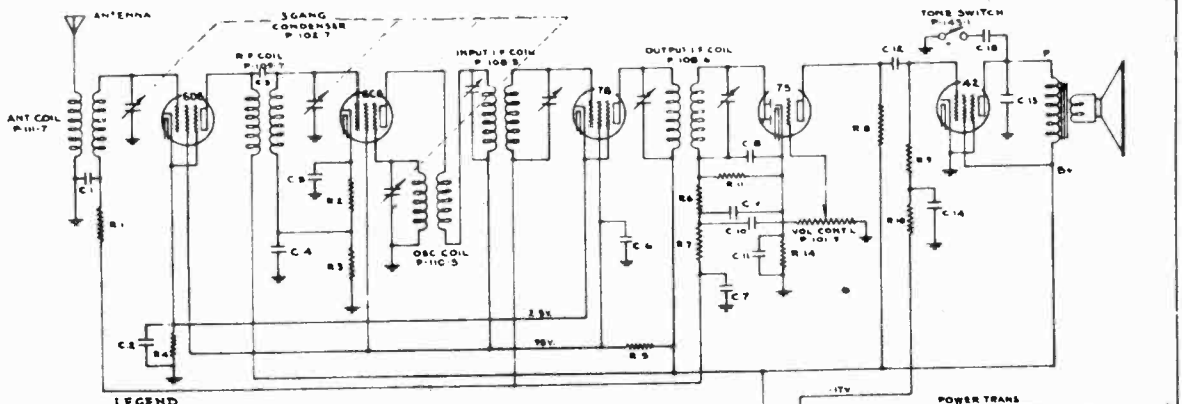
MODEL 670
Schematic, Voltage
Socket, Trimmers

GAMBLE-SKOGMO, INC.

Vibrators can be reconditioned at a cost of $3.00 each, if the old unit is returned.

All resistors are EIA color coded - specify value and/or resistor number (per schematic diagram) and model number.

MODEL 670

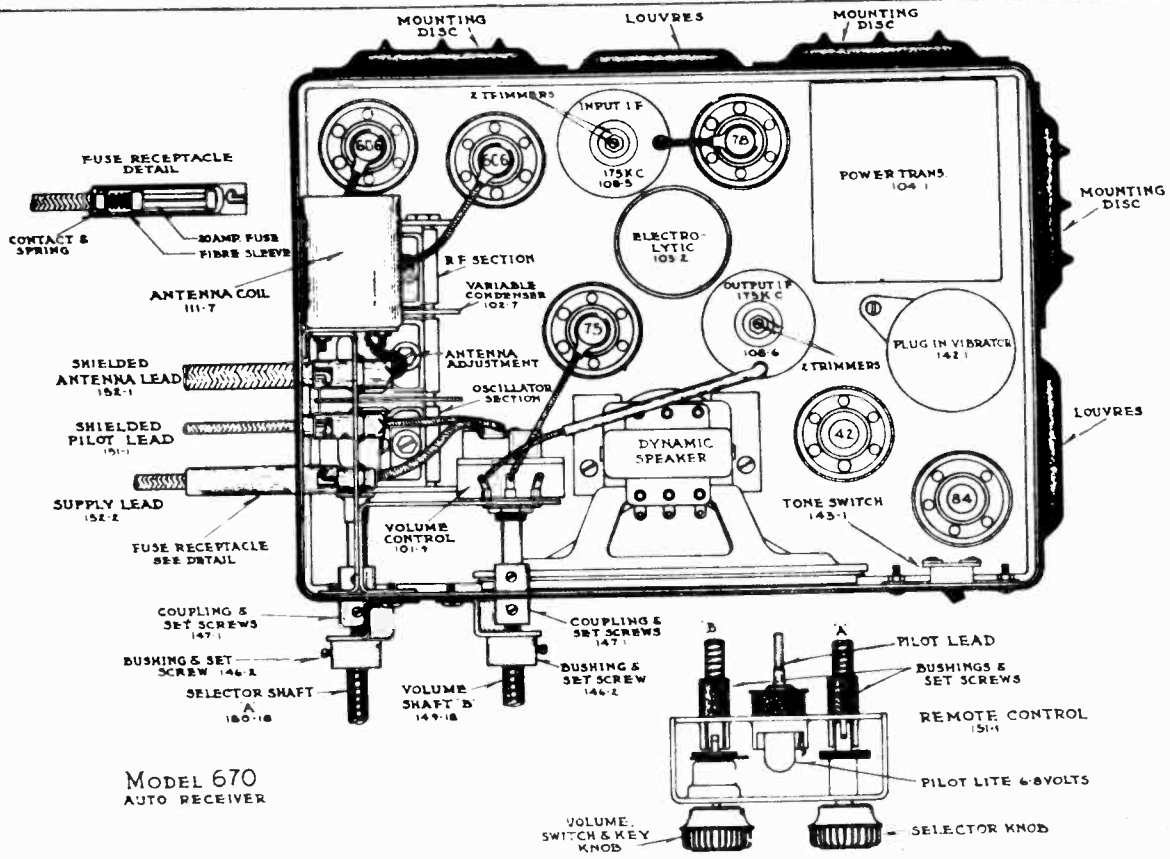


LEGEND

RESISTORS		CONDENSERS	
NO	VALUE	NO	VALUE
R 1 -	250M ½W	C 1 -	.05 X 200V
R 2 -	450Ω	C 2 -	1 X 200V
R 3 -	5M	C 3 -	11.5 mmf GIMMICK
R 4 -	150Ω	C 4 -	.05 X 200V
R 5 -	.1M	C 5 -	.05 X 200V
R 6 -	80M ½W	C 6 -	1 X 200V
R 7 -	250M ½W	C 7 -	1 X 200V
R 8 -	250M ½W	C 8 -	.0005 MICA
R 9 -	200M ½W	C 9 -	.0005 MICA
R 10 -	300M ½W	C 10 -	.01 X 400V
R 11 -	250M ½W	C 11 -	20MFD X 20V
R 12 -	100Ω	C 12 -	.01 X 400V
R 13 -	100Ω	C 13 -	.003 X 600V
R 14 -	4M ½W	C 14 -	1 X 200V
VAR. RESISTOR - 500M (VOL. CONT'L)		C 15 -	1 MFD X 120V
		C 16 -	8 MFD X 350V
		C 17 -	8 MFD X 350V
		C 18 -	.01 X 400V
		C 19 -	.02 X 1000V
		C 20 -	1 MFD X 120V
		C 21 -	.002 MICA

- NOTE -
NUMBERS PREFIXED BY LETTERS ARE PART NUMBERS
VOLTAGES TAKEN FROM POINTS INDICATED TO CHASSIS GROUND VOLUME CONTROL ON FULL.
THE PHRASE GIMMICK MEANS A WIRE WOUND AROUND ANOTHER WIRE
RESISTORS IN ONE UNIT, P-106-3 - R 2, 3, 4, 5.
CONDENSERS IN ONE UNIT, P-105-2 - C 16, 17.
CONDENSERS IN DUAL UNIT - C 2, 7
CONDENSERS IN DUAL UNIT - C 5, 6
RESISTORS AND CONDENSERS IN OUTPUT I.F. CAN P-108-6 - C 8, 9, 10 AND R 6, 7, 11
CONDENSER, C 1, IN ANT. COIL CAN P-111-7

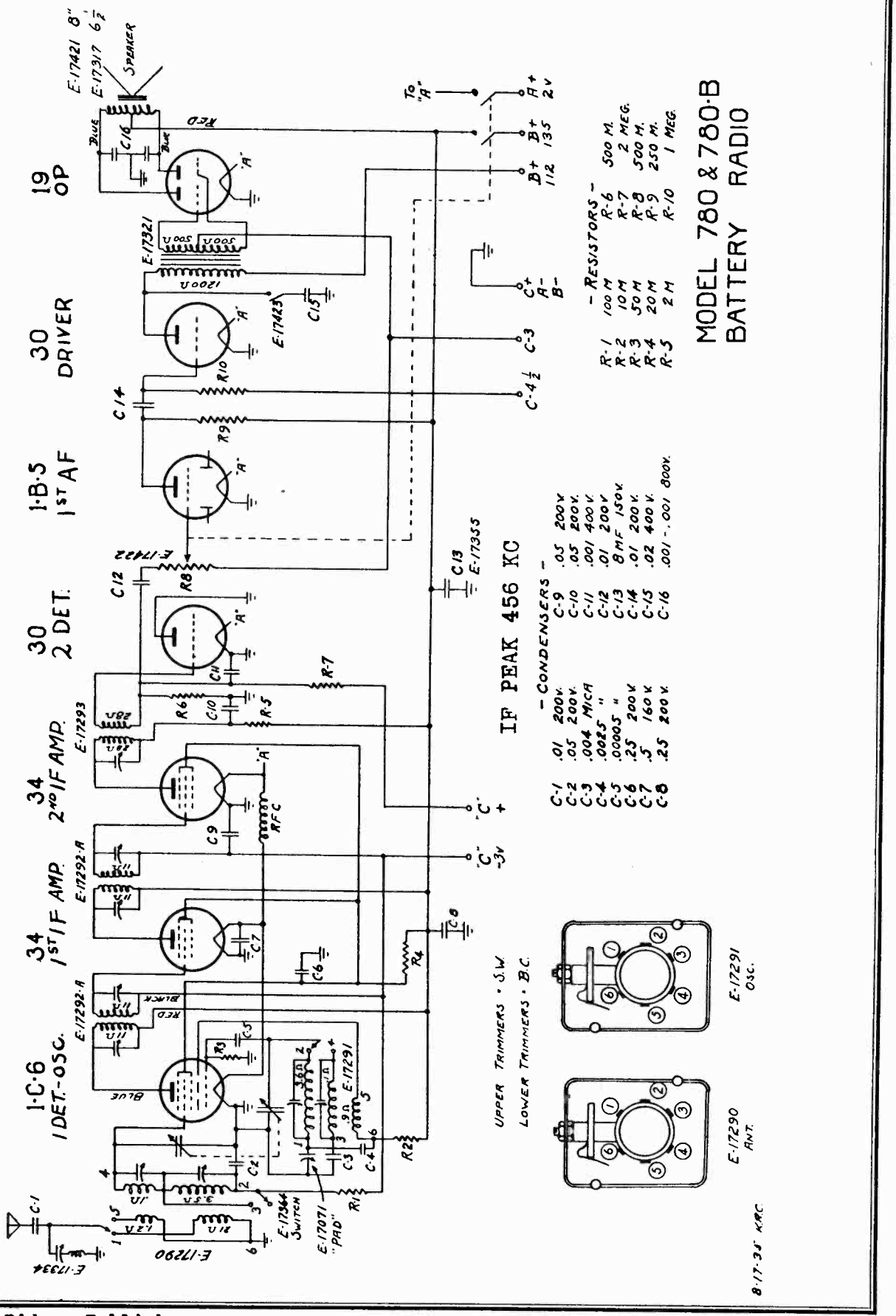
IF PEAK 175 KC.



MODEL 670
AUTO RECEIVER

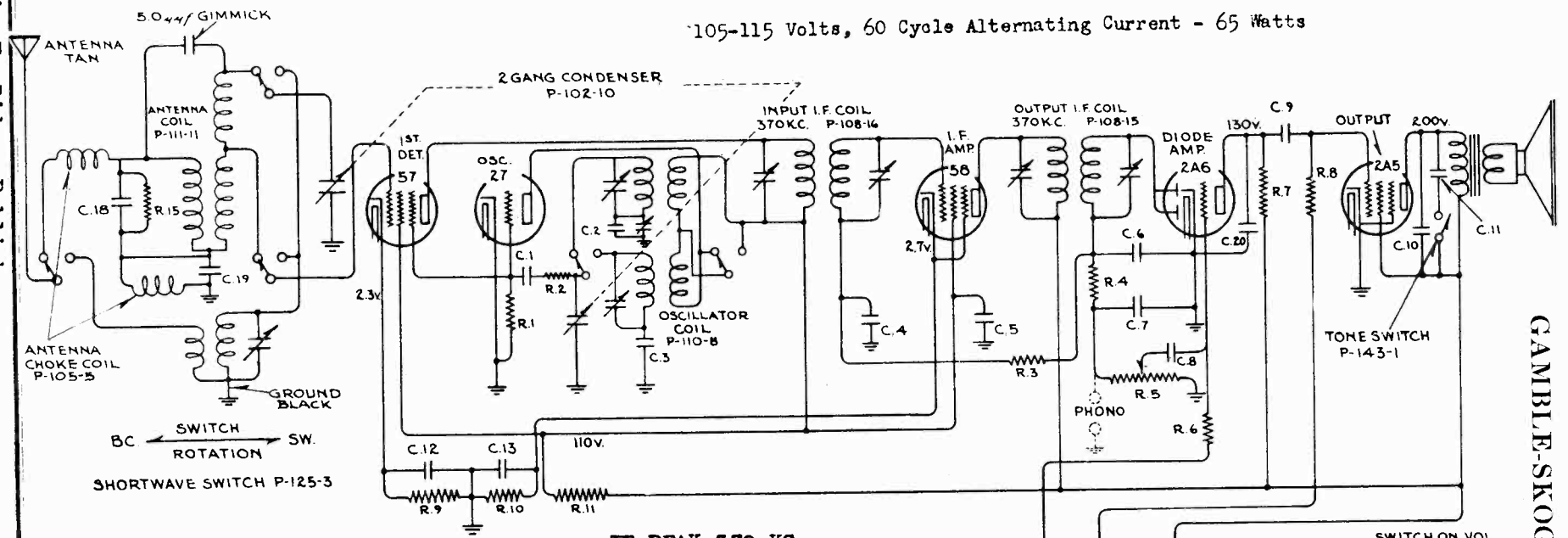
MODELS 780, 780B
Schematic

GAMBLE-SKOGMO, INC.



Standard Broadcast Band 530-1720 Kilocycles
Short Wave Band 5.4-17 Megacycles (17.5 to 55 Meters)

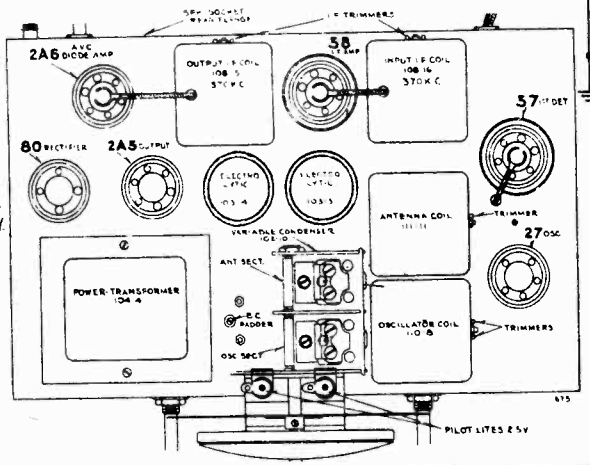
105-115 Volts, 60 Cycle Alternating Current - 65 Watts



IF PEAK 370 KC.

CONDENSERS	
Nº	VALUE
C.1	50 MICA
C.2	490 MICA
C.3	5M MICA
C.4	.05 X 200V.
C.5	.05 X 400V.
C.6	100 MICA
C.7	100 MICA
C.8	.05 X 200V.
C.9	.05 X 400V.
C.10	.003 X 400V.
C.11	.02 X 400V.
C.12	.1 X 200V.
C.13	.1 X 200V.
C.14	.25 X 200V.
C.15	.25 X 200V
C.16	18 MFD. 350V. P-103-3
C.17	16 MFD 400V. P-103-4
C.18	120 μμf.
C.19	.01 μμf.
C.20	.0005 MICA.

RESISTORS		
Nº	VALUE	
R.1	50M.	1/3W.
R.2	50	1/3W.
R.3	500M	1/3W.
R.4	50M	1/3W.
R.5	500M	VOLUME CONTROL P-101-11
R.6	500M	1/3W.
R.7	250M	1/3W.
R.8	250M	1/3W.
R.9	1000	
R.10	275	
R.11	13M	
R.12	25M	1/3W
R.13	250M	1/3W.
R.14	750M	1/3W.
R.15	10M	1/3W.



34265

NOTE:-
CONDENSERS C.10, C.11 IN DUAL UNIT.
" C.14, C.15 " " "
" C.13, C.4 " " "
RESISTORS R.9, R.10, R.11 IN ONE UNIT P-106-13
NUMBERS PREFIXED BY LETTER "P" ARE PART NUMBERS.

VOLTAGES TAKEN FROM POINTS INDICATED TO CHASSIS GROUND. VOLUME CONTROL ON FULL
RESISTORS, R.3, 4, & 6, CONDENSERS C.6, 7, & 8 ARE IN OUTPUT I.F. CAN, P-108-15

GAMBLE-SKOGMO, INC.
MODEL 675
Schematic, Voltage
Socket, Trimmers

MODEL 675
Alignment

GAMBLE-SKOGMO, INC.

SERVICE NOTES

Voltages taken from different points of the circuit are measured with a voltmeter having a resistance of 1000 ohms per volt and are made between the points indicated and the chassis pan. These voltages are indicated on the circuit diagram.

To check for open by-pass condensers, shunt each condenser with another condenser of the same capacity and voltage rating, which is known to be good, until the defective unit is located.

Excessive hum, stuttering, low volume and a reduction in all D.C. voltages is usually caused by a shorted electrolytic condenser, open by-pass condensers frequently cause oscillation and distorted tone.

ALIGNMENT:

No aligning adjustments should be made until the set has been thoroughly checked for all other possible causes of trouble, such as poor installations, low line voltages, defective tubes, condensers and resistors.

ALIGNING I.F. TRANSFORMERS:

1. With volume control full on, at the extreme right of its rotation, and with wave selector switch in the broadcast position, extreme left of its rotation, and with variable condenser at its minimum capacity position, extreme left of its rotation, plates entirely out of mesh, adjust the I.F. transformers (parts number 108-15 and 108-16) in the following manner:
   (a) Connect an external oscillator which has been adjusted to 370 kilocycles, in series with a .1 mfd. condenser to the control grid cap of the type 57 first detector tube (see diagram and chassis).
   (b) Adjust trimming condensers of both I.F. transformers (Parts number 108-15 and 108-16) to resonance. Use as a resonance indicator an output meter connected across the primary of the speaker input transformer or by means of an adapter between plate and screen terminals of type 2A5 output tube. Maximum deflection of the meter indicates resonance. Care should be taken to use only enough signal to give a readily readable output.
   Note: The two adjustments on each transformer are accessible through holes in the transformer cans from the back of the chassis.

BROADCAST BAND ALIGNMENT:

1. Shift frequency of external oscillator to 535 kilocycles and connect in series with a 200 mmfd. condenser to the tan antenna wire and the black ground wire.
   (a) Set the variable condenser in its maximum capacity position, extreme right of its rotation.
   (b) Adjust the broadcast oscillator series trimmer to resonance with oscillator. This trimmer is located between the gang condenser and the power transformer (see top view).
2. Shift frequency of external oscillator to 1712 kilocycles and set variable condenser in its minimum capacity position, extreme left of its rotation, plates entirely out of mesh.
   (a) Adjust the broadcast oscillator shunt trimmer to resonance. This adjustment is the top adjustment in the oscillator coil can, part number 110-8.

SHORT WAVE BAND ALIGNMENT:

1. Set the wave changing switch in the short wave position, extreme right of its rotation, and change external oscillator frequency to 15 megacycles.
   (a) Adjust variable condenser with selector knob so that pointer is opposite the 15 megacycle calibration on the dial.
   (b) Adjust the short wave oscillator shunt trimmer to resonance with the signal (use extreme care and make certain that you do not adjust to resonance with the image instead of the signal). This trimmer is the bottom trimmer (closest to the chassis) on the oscillator coil, part number 110-8, and is accessible from the side of the chassis.
   (c) Adjust the short wave antenna trimmer to resonance (single trimmer in antenna can, part number 111-11, accessible from the side of the chassis, between type 27 and 57 tubes).

NOTES:

Should the planetary vernier dial drive mechanism fail to function properly, it will probably be found to be due to a cracked or broken compression spring. This drive may be dis-assembled by removing the two screws which fasten it to the dial bracket. The part number of the compression spring is 112-31. All of the other dial parts are hardened and should cause no trouble.

MODEL 25
Schematic

GAROD RADIO CO.

SCHEMATIC CIRCUIT
BROADCAST, POLICE & SHORT WAVE
A.C. RECEIVER

USED ON MODEL 25

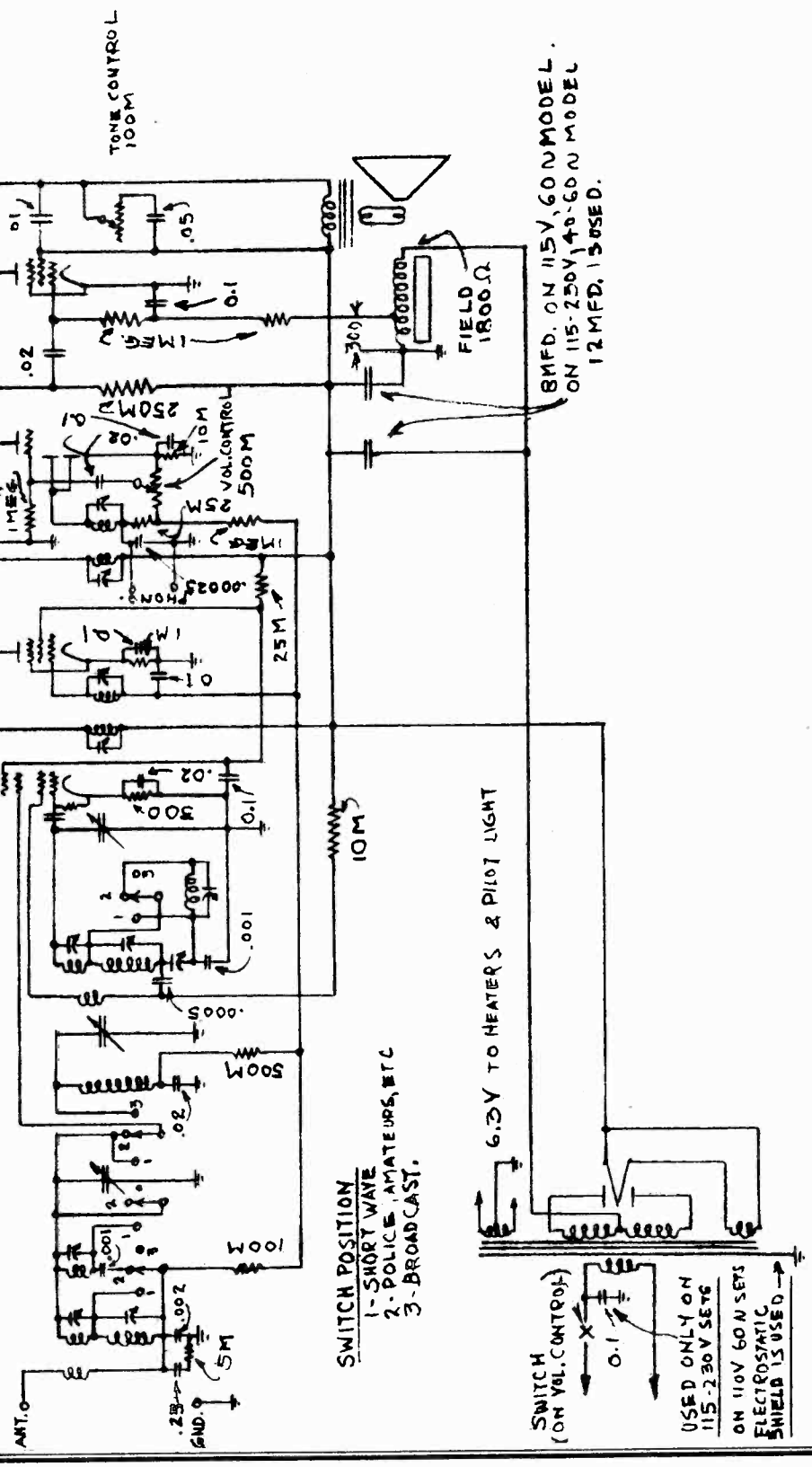
SCALE

DATE 1/2/35
DR. D.S.T.
TR.
CH. J.B.V.
APPROVED

MATERIAL
STOCK PER
FINISH
TOOL NOS.
MAKE ALSO

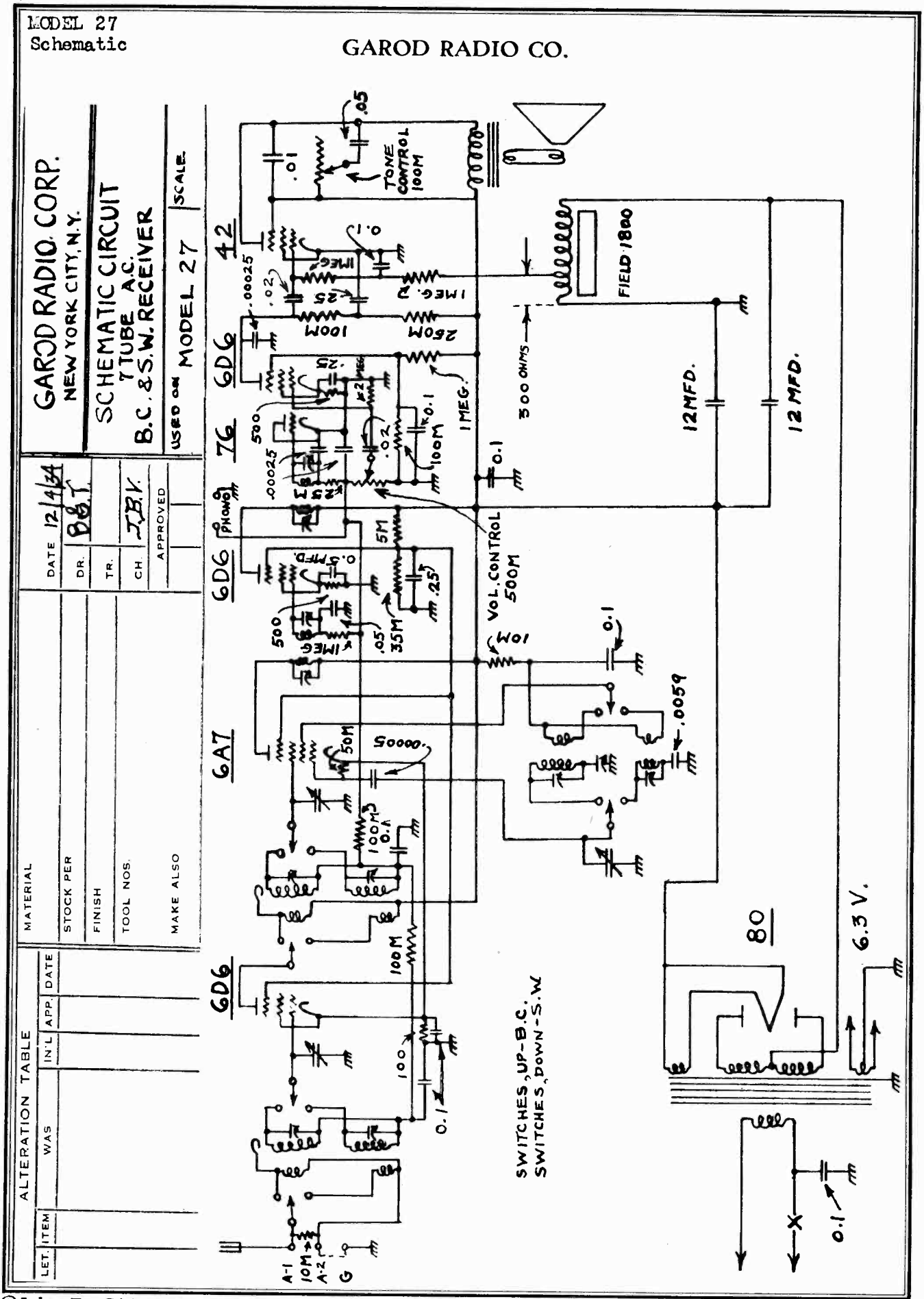
ALTERATION TABLE

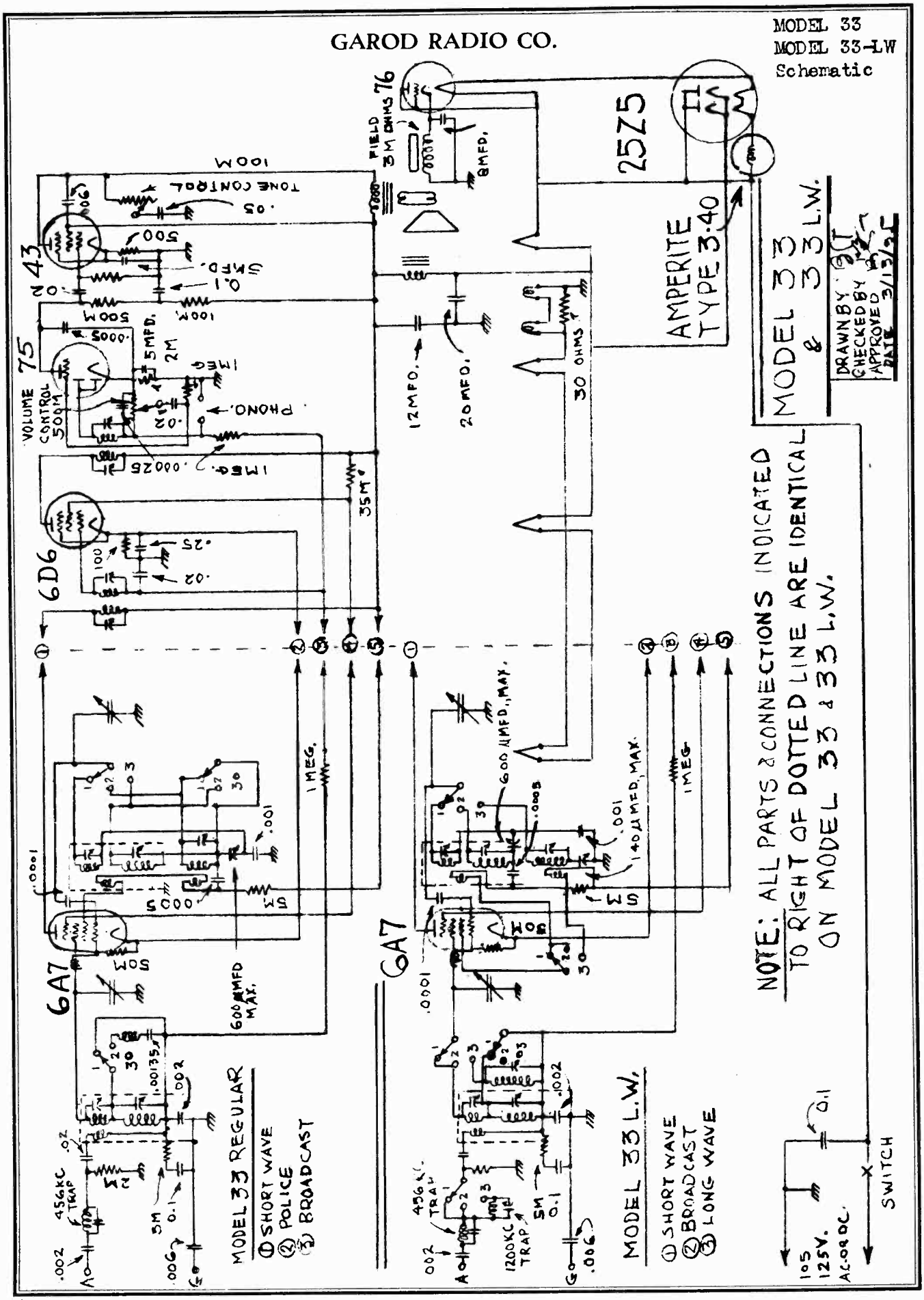
LET.	ITEM	WAS	IN'L	APP.	DATE



MODEL 27
Schematic

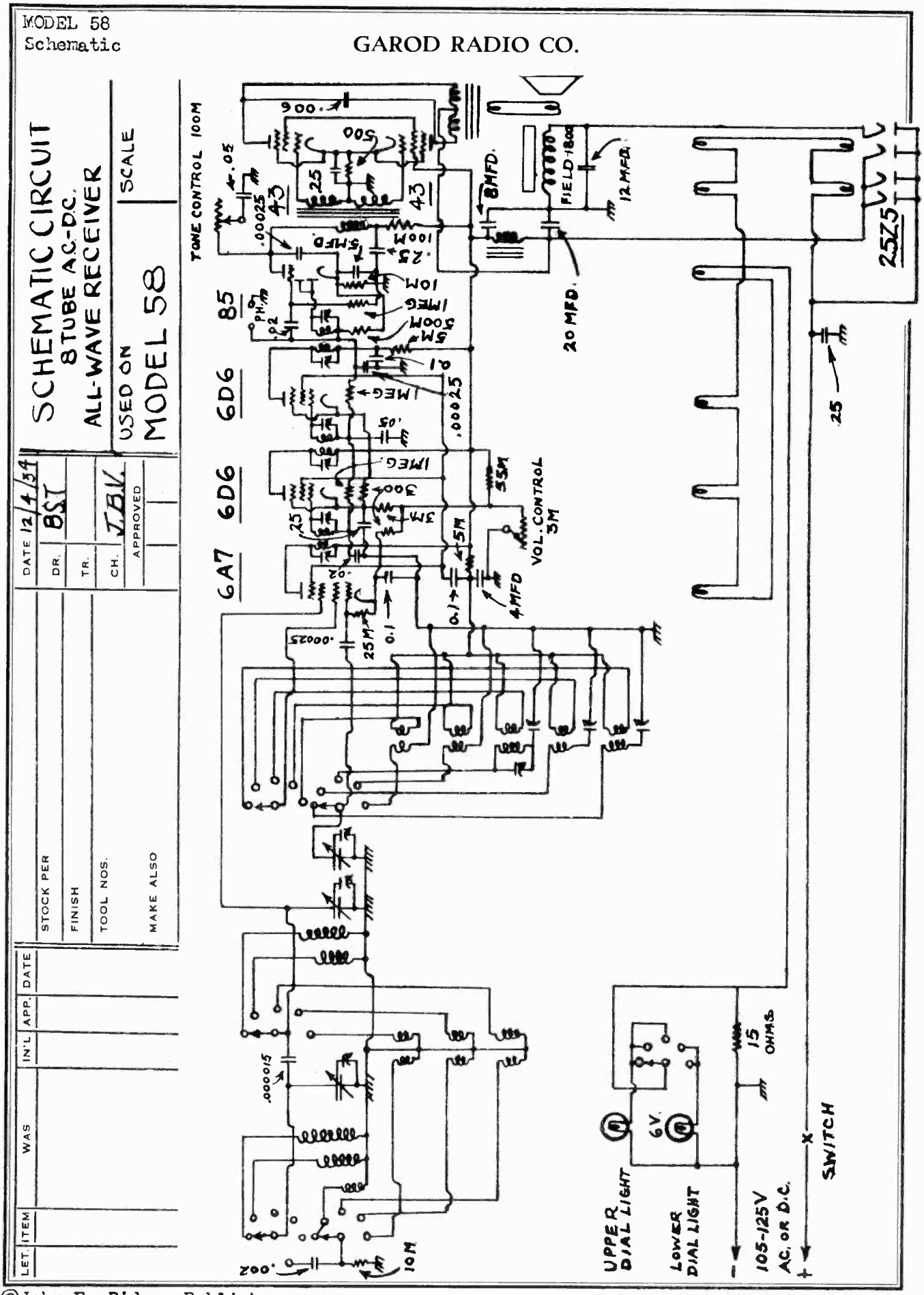
GAROD RADIO CO.





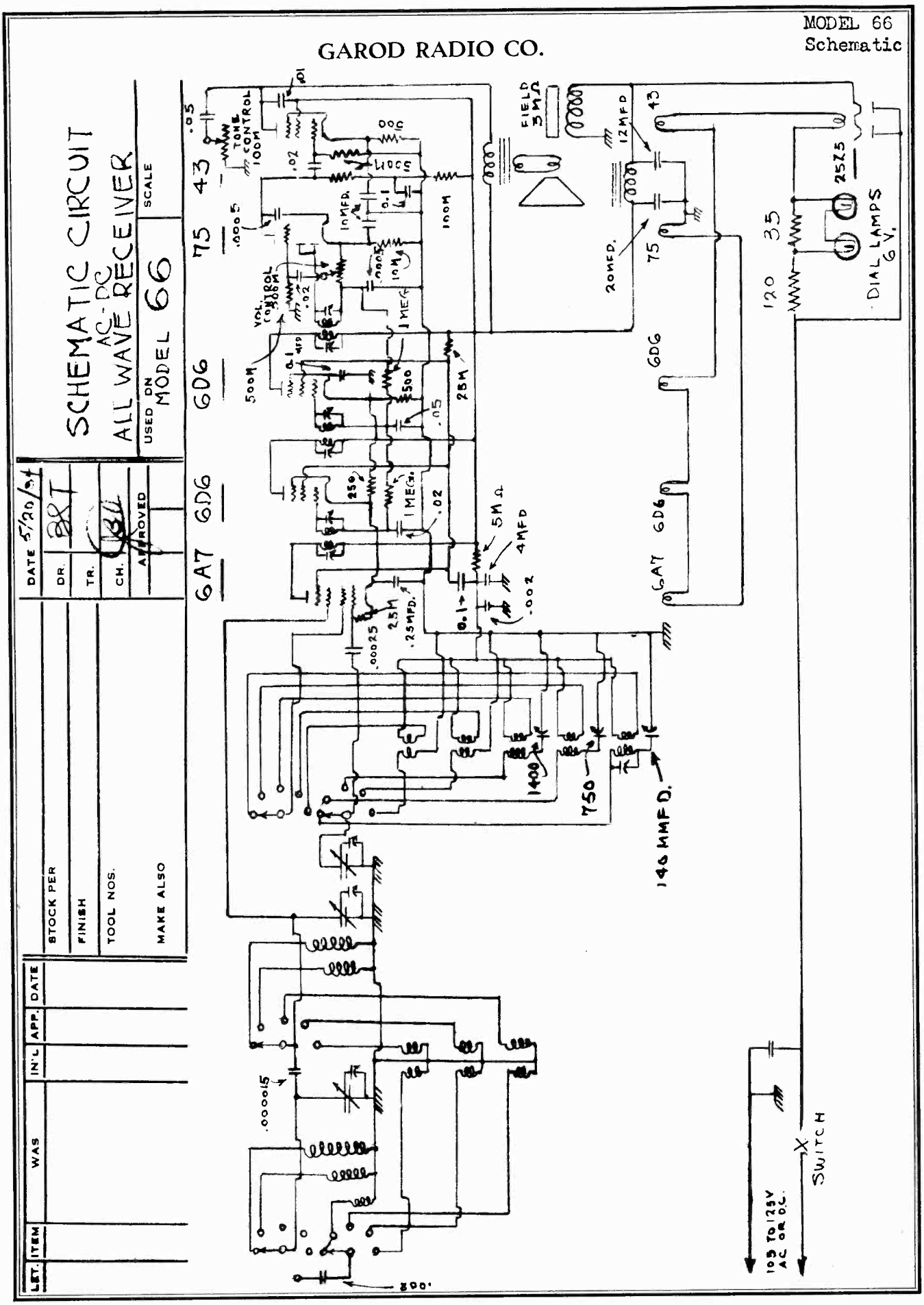
MODEL 58
Schematic

GAROD RADIO CO.



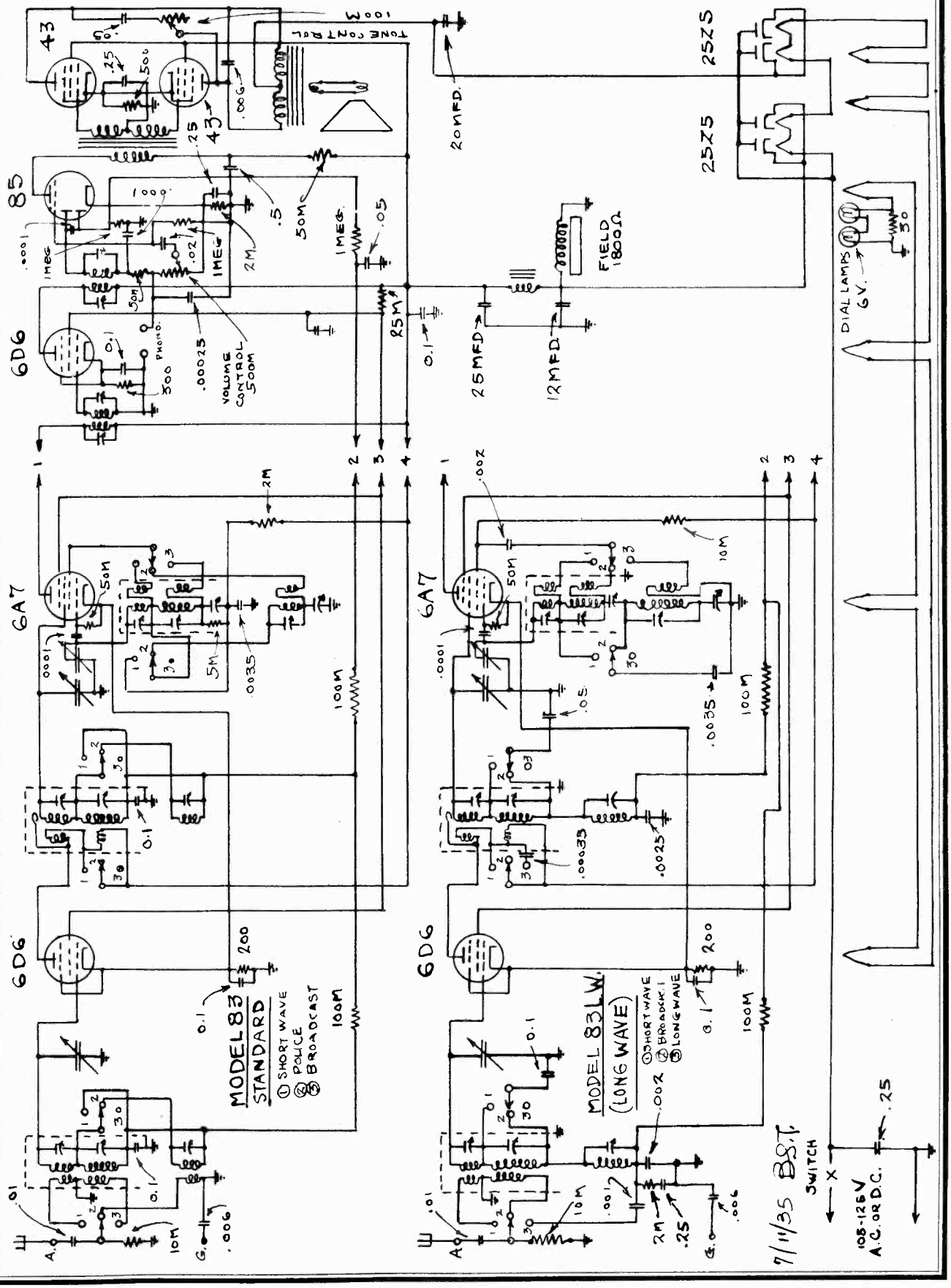
MODEL 66
Schematic

GAROD RADIO CO.



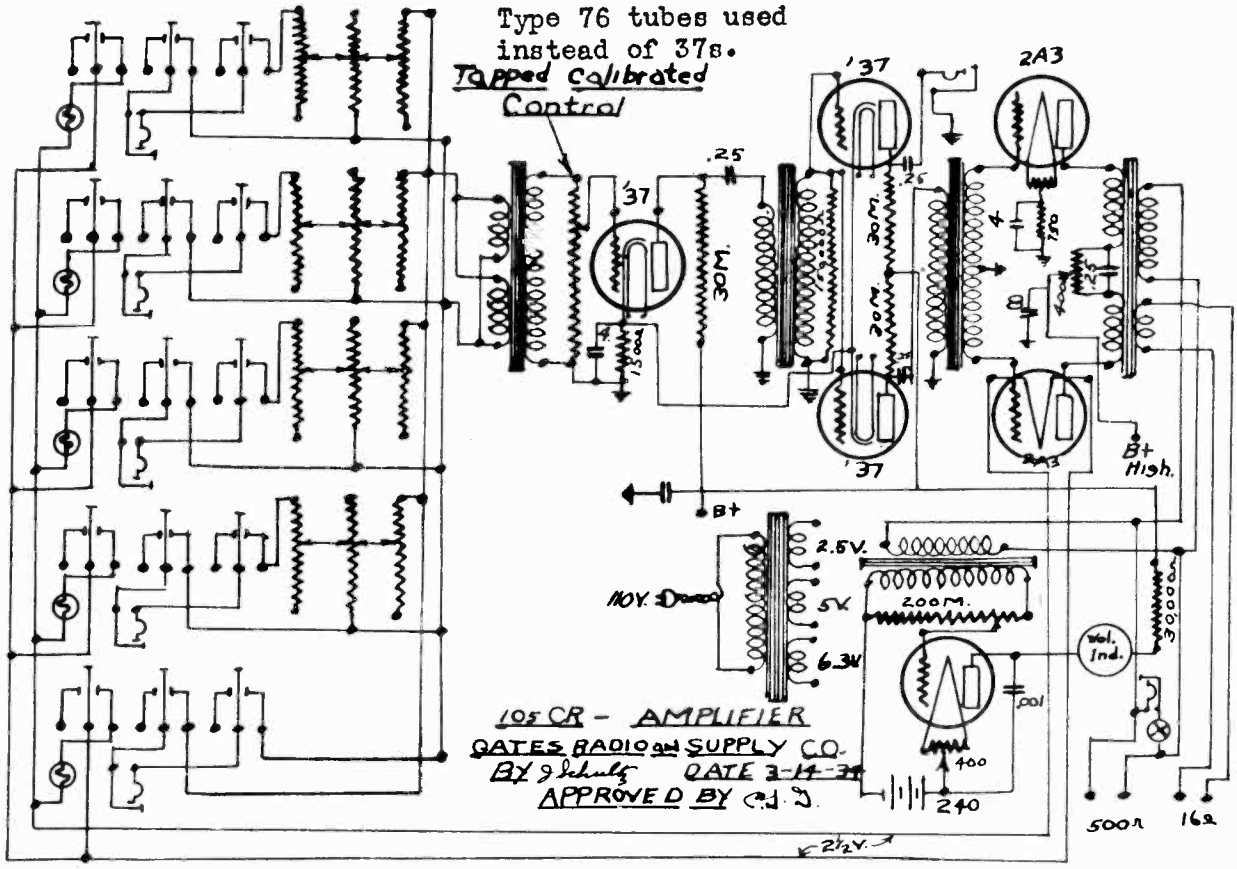
MODEL 83
MODEL 83-LW
Schematics

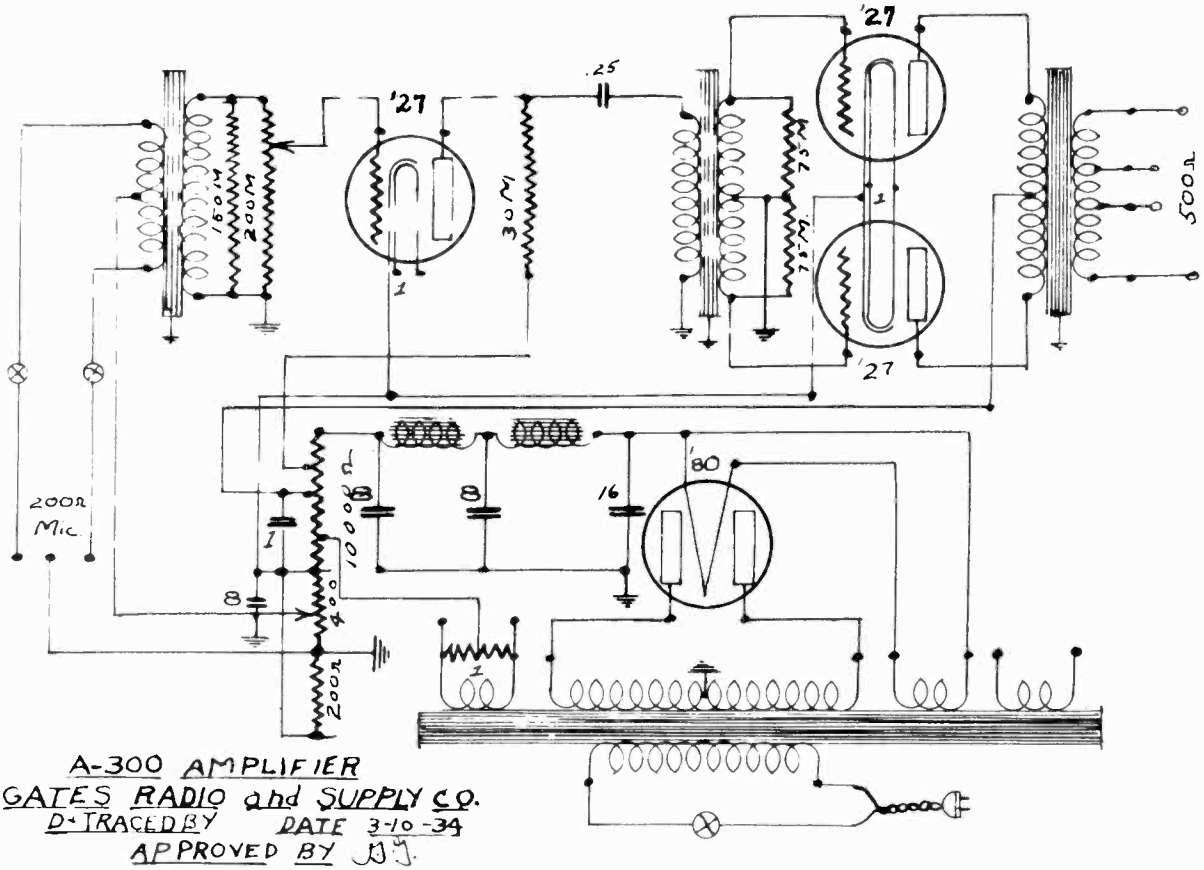
GAROD RADIO CO.



MODEL 105-CR
MODEL A-300
Schematics

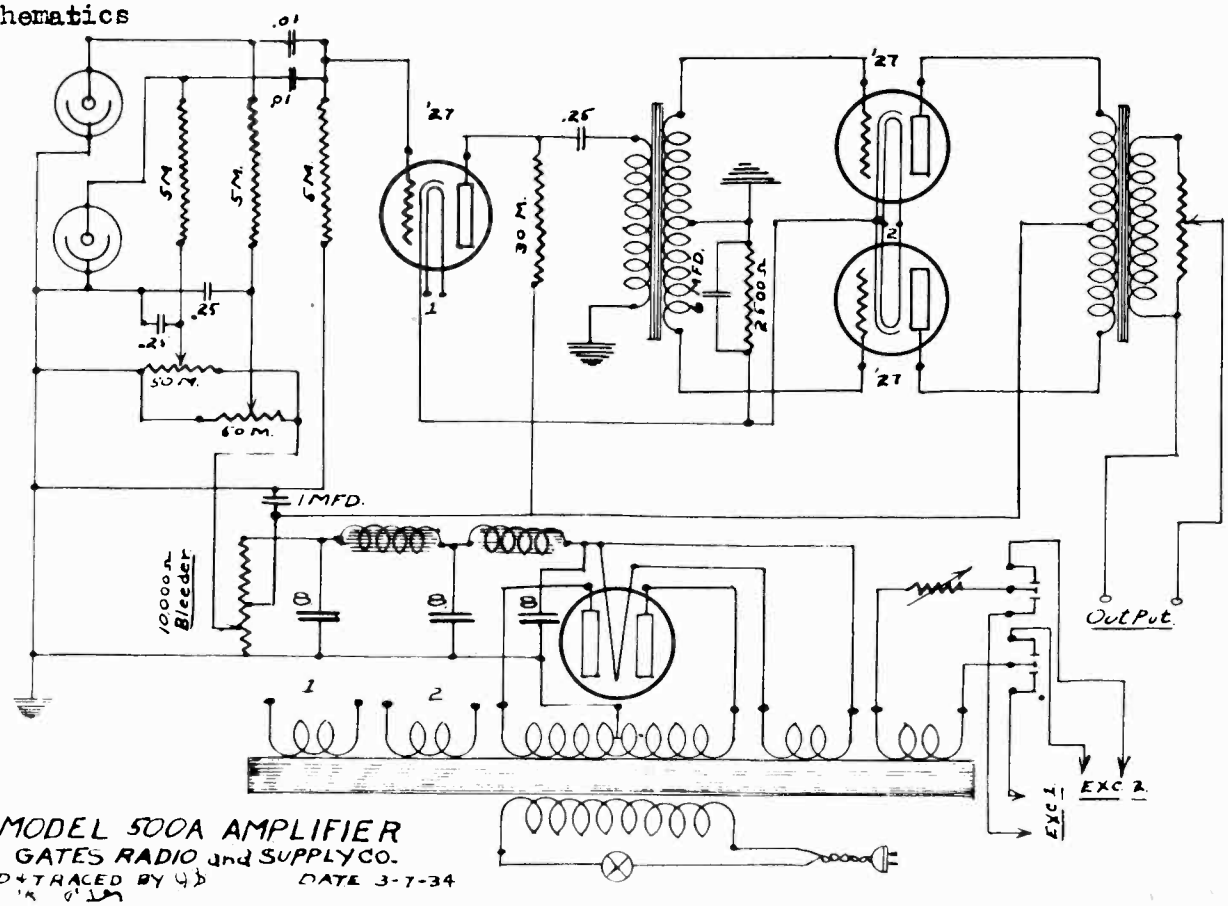
GATES RADIO & SUPPLY CO.





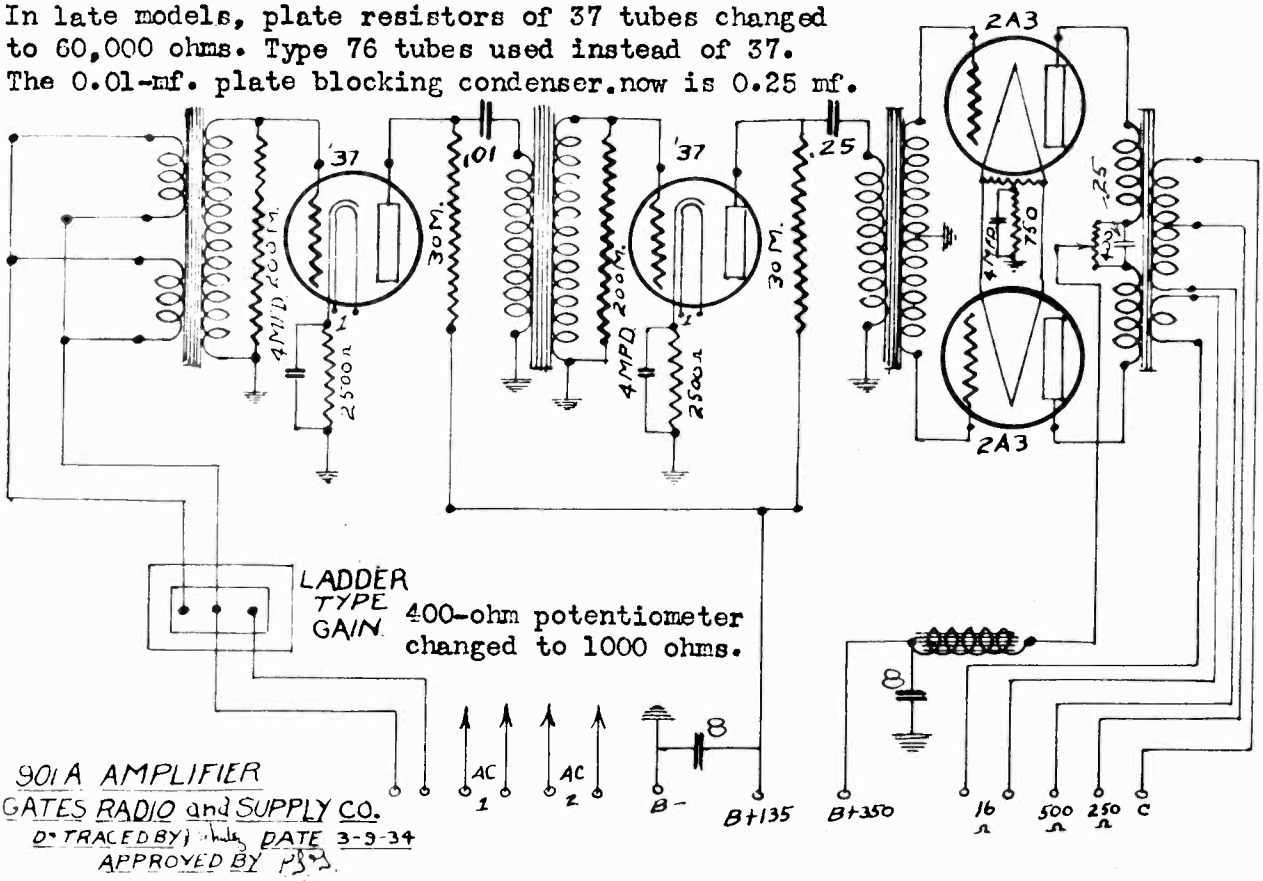
MODEL 500-A
MODEL 901-A
Schematics

GATES RADIO & SUPPLY CO.



MODEL 500A AMPLIFIER
GATES RADIO and SUPPLY CO.
DRAWN BY [illegible] DATE 3-7-34

In late models, plate resistors of 37 tubes changed to 60,000 ohms. Type 76 tubes used instead of 37. The 0.01-mf. plate blocking condenser now is 0.25 mf.



901A AMPLIFIER
GATES RADIO and SUPPLY CO.
DRAWN BY [illegible] DATE 3-9-34
APPROVED BY PSG

"V-DOUBLET" ANTENNA SYSTEM

STOCK NO. KV-100

FOR ALL-WAVE RADIO RECEIVERS

Description of System

With the advent of "all-wave" radio receivers, the antenna installation became a fundamental rather than an incidental problem. Short waves are used primarily because of their ability to travel great distances with relatively low transmitting power. Upon reaching the receiver, therefore, these waves are in general far weaker and fade much more severely than those from stations in the standard broadcast band (540 to 1500 kilocycles). Obviously, the antenna must perform very efficiently in the short-wave spectrum; it must be able to transfer signals to the receiver with negligible loss or reliable results will be practically impossible.

Short-wave broadcasting covers a very wide frequency range, being segregated by international agreement into four principal narrow bands located approximately at 19, 25, 31 and 49 meters. For any given length, a conventional antenna will favor certain frequencies and tend to reject others. Antennas of the conventional single wire or conventional doublet type are therefore quite unsatisfactory, for there is no one length which would operate with any degree of uniformity over the required range. The "V-doublet" antenna system, however, serves the purpose admirably.

As its name implies, this system incorporates a doublet, the center portion of which takes the form of a "V." The factor responsible for the non-uniform sensitivity of a conventional single-wire or doublet antenna is the development of standing waves along its length, which results in points of high and low sensitivity at different frequencies. The "V-doublet" reduces these standing waves because the center portion is tapered, which makes the system somewhat aperiodic. The first high-impedance point is thereby extended out to such a high frequency that efficient pick-up is obtained on the antenna proper, and the high impedance point does not have the usual derogation of signal strength experienced with conventional doublets. The result is a doublet of better uniform sensitivity over the short-wave bands.

Signals intercepted by the doublet are fed to the receiver through a balanced, twisted-pair lead-in (hereinafter called the transmission line). A further function of the tapered "V" is to couple efficiently the fairly high impedance antenna to the low impedance transmission line, in which case the taper performs the function of a transformer. The transmission line is coupled to the receiver through a specially constructed receiver-coupling transformer. The length of the transmission line and coupling ratio of the transformer are correct to afford proper *electrical matching* for greatest energy transfer from the antenna to the receiver.

While natural static is almost negligible in the short-wave spectrum, "man-made" interference is often very severe. Such interference usually is of local origin, being radiated by the house-wiring or by external electrical apparatus, including even the ignition systems of passing automobiles. It is "picked up" mainly by the antenna lead-in, and so, little or nothing can be done with ordinary types of antennas to prevent annoyance from that source. Doublet antennas, however, are particularly advantageous from a standpoint of noise reduction since the transmission line does not form an active part of the system, but serves merely to transfer signals from the doublet to the receiver. In this "V-doublet" system, complete rejection of signals picked up along the transmission line is achieved by virtue of the special balanced design of the receiver-coupling transformer.

There is yet another consideration involved. With an all-wave receiver, the antenna must not sacrifice performance in the standard broadcast and other low-frequency bands in order to obtain good short-wave reception. At the lower frequencies, therefore, this antenna system is converted from its "V-doublet" form to one approximating the conventional "T-type" arrangement so that the transmission line acts as part of the effective length. This change-over is accomplished automatically by the special circuit employed in the receiver-coupling transformer.

Installation

The design of the "V-doublet" antenna system is not complicated and its installation is simple. A typical installation is shown in Fig. 1. In order to intercept radio signals most efficiently, the horizontal portion of the antenna should be at least 30 feet above the effective ground. Ordinarily, the antenna will be erected either upon the roof of a building or suspended between that roof and a near-by tree or pole. For the usual dwelling having a roof and framework of non-metallic materials, the height will be measured with respect to the actual surface of the earth. In the case of a building with metal framework or roof such as a modern apartment house or hotel, effective ground is assumed as the roof of such a building.

Interference Considerations

It is also desirable that the doublet be erected as high as conveniently possible so as to place that portion of the system which intercepts the signal at the maximum distance from any source of man-made interference. Interference "picked up" by the transmission line cannot affect the receiver. The doublet, therefore, should be erected well

Fig. 2A

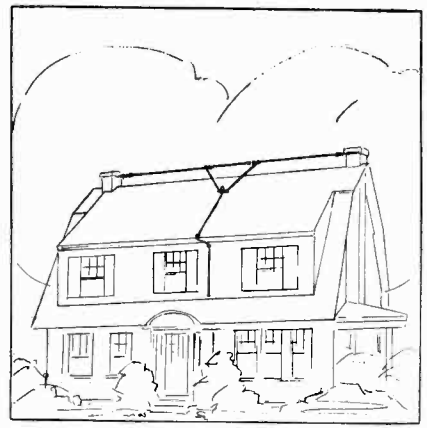


Fig. 2B

remote from sources of interference such as automobile highways, street-railway lines or motor-driven electrical appliances. In some cases it may be necessary to locate the antenna proper as much as 500 feet distant from the receiver, adding the required length of transmission line to the 100-foot length supplied with the kit. To maintain the correct electrical matching, not less than 100 feet of transmission line should be used in any case. If less than 100 feet is required, the excess amount should be coiled up neatly at the end nearest the receiver. As this line has a definite known impedance, do not use any random twisted-pair lamp cord for additional length; use only the genuine transmission line sold by your dealer. Each conductor of the genuine transmission line is covered with special high-grade white rubber insulation and a covering of waterproofed braid is woven over the twisted pair.

Advantage should also be taken of the directional effect of the horizontal arrangement wherever possible. Least interference will be intercepted by the doublet when the span points toward the source of disturbance. This resource will be particularly helpful when the antenna cannot be removed from the field of interference, as in cases where a radio transmitter (such as an amateur station) is operating in the neighborhood.

Alternative Antenna Arrangements

The geometric design of the "V-doublet" lends itself easily to a variety of methods of suspension besides that shown in Fig. 1. Another possible arrangement is suspension from the eaves of a building as shown in Fig. 2A, providing sufficient span and height above ground can be obtained in this manner and the antenna is not run parallel to a metal rain-gutter. Or, if restrictions make it inadvisable to erect masts, the doublet might be suspended between two chimneys, as shown in Fig. 2B, with the plane of the "V" parallel to the roof. The "V" may be rotated about the horizontal legs as axes, to any position desired, and supported at the apex to which the transmission line is attached.

Highest efficiency is obtained by making the legs of the doublet the recommended length. If sufficient ground space is not available to provide the normal span of 51 feet, the legs may be shortened somewhat. This will result, however, in slightly decreased efficiency in the region of the 49-meter band.

Set-up Procedure

The "V-doublet" antenna system proper, consisting of the doublet wires, glass strain insulators and transmission line, is assembled. Use of a soldering iron is therefore not necessary. The receiver end of the transmission line is stripped for ready connection to the receiver-coupling transformer.

Equipment—The following parts are supplied with the kit:

1 Doublet and transmission line assembly.
1 Receiver-coupling transformer.
5 Nail-on insulators.
1 Entrance-tube insulator.
2 Links (for receiver-coupling transformer).
1 Adapter (for receiver-coupling transformer).

Installation—It is desirable to unpack the kit near the place where the doublet is to be suspended. The doublet wires will be found coiled at the top of the package, with the transmission line coiled below. The receiver-coupling transformer and porcelain insulators are wrapped separately in tissue paper. Connecting links and the adapter for the receiver-coupling transformer will be found in the envelope packed with the kit.

First carefully uncoil and lay out the doublet wires and transmission line to form the "V-doublet"

illustrated in Figure 1. Then attach the suspension ropes to the end strain insulators and hang the system as a unit between the masts or intended points of support. If it is necessary to shorten the 20-foot legs of the doublet because of insufficient space, each leg must be shortened by an equal amount. It is important to avoid excessive tension in the doublet or "V" wires or breakage may occur. These wires must not be stretched tightly but should be allowed to sag so that the center portion of the doublet is two or three feet below the end insulators.

Connection to Receiver—The opposite end of the transmission line is brought to the receiver, using the nail-on insulators and entrance-tube insulator at points best suited to the installation. If lightning arresters are desirable or required by local ordinance, two (low-capacity) units should be installed as shown in Fig. 1, Detail "B." Simply remove a small strip of insulation from the transmission line conductors at the lightning arresters, connect the bared portions one to each "antenna" terminal and continue on without cutting the transmission line. The ground terminals of the lightning arresters are made common and connected to a metal stake or pipe driven five to eight feet into the soil.

Fasten the receiver-coupling transformer to the "ANT-GND" terminal board on the receiver chassis, using the two links supplied with the kit. Make certain to install the transformer correctly; the links should be attached to those terminals identified as "A" and "G" on the transformer and the label should face toward the receiver. Connect the end of the transmission line to the terminals marked "T" and "L," leaving any additional length coiled up behind the receiver. Finally, attach a wire from the "GND" terminal to the nearest cold-water pipe as close as possible to the point where the pipe enters the earth, or to some other good ground connection. The latter connection should be as short as possible and preferably made with No. 14 or larger rubber-covered stranded copper wire. On account of the variation in length of lead and type of ground

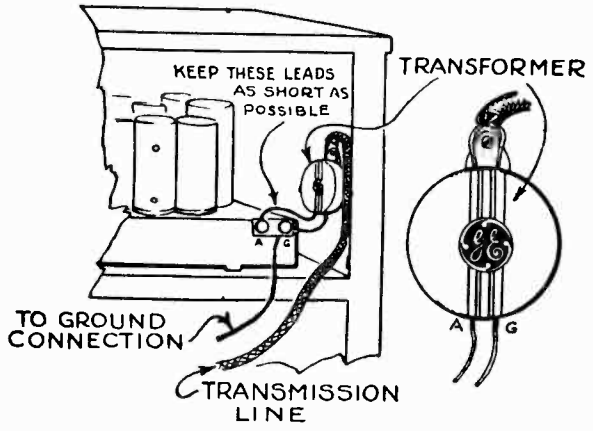


Fig. 3

available, the ground wire and clamp are not furnished with the kit. *The importance of a good ground connection cannot be overestimated*, as the degree of noise reduction obtained will depend to a large extent upon this factor.

In receivers having no "ANT-GND" terminal board, fasten the coupling transformer to the cabinet as near as possible to the chassis, using the adapter supplied with the kit as shown in Fig. 3. To insure most noise elimination, the connection from the "GND" terminal of the transformer should be made directly to the chassis metal with a wire no longer than one inch. The connection from the "ANT" terminal of the transformer to the receiver antenna lead or terminal also should be no longer than necessary and it is important to avoid close proximity of this wire to the dome (grid) clips of the radio tubes.

Installation Service

Although this "V-doublet" antenna system is not difficult to install, many persons nevertheless prefer to have it erected by an experienced radio serviceman. Upon request, your dealer or service engineer will make the complete installation at a nominal charge.

REPLACEMENT PARTS

Insist on genuine factory-tested parts, which may be purchased from authorized dealers.

Stock No.	Description	List Price
KV-101	Wire—Antenna Wire (Roll of 31 feet)	$0.25
KV-102	Wire—Antenna Wire (Roll of 11 feet)	.12
KV-103	Transmission Line (Roll of 100 feet)	3.90
KV-104	Transformer—Receiver-coupling transformer	2.50
KV-105	Link—Connection Link—Connects receiver-coupling transformer to "ANT-GND" terminal board on receiver chassis. Package of 10	.10
KV-106	Adapter—For mounting receiver-coupling transformer on any make of receiver	.10
KV-107	Insulator—Glass Strain Insulator. Package of 5	.50
KV-108	Porcelain Knob—Package of 5	.25
KV-109	Porcelain Tube	.10

GENERAL ELECTRIC CO.

MODEL KV-100
Wiring Details

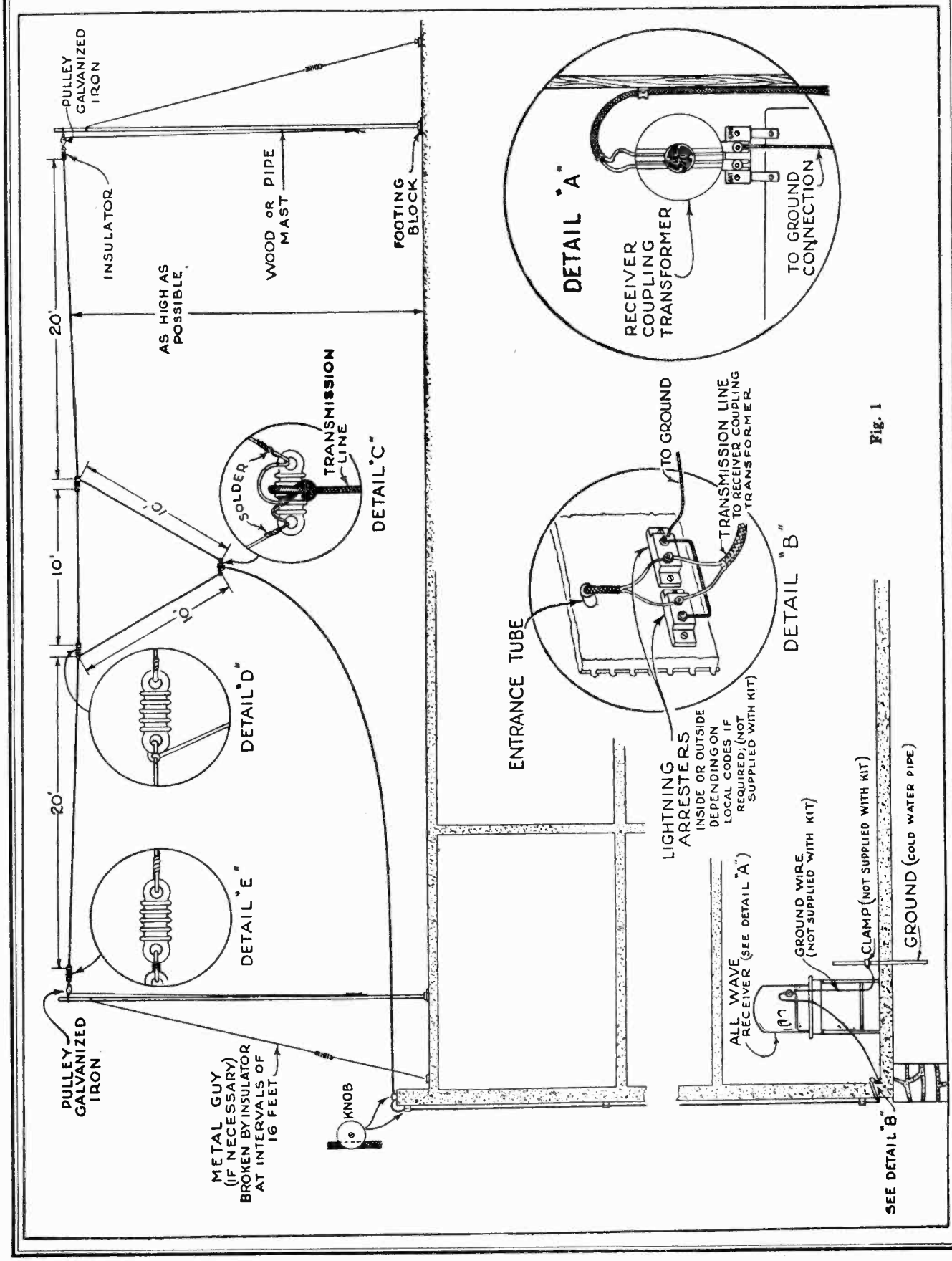


Fig. 1

MODEL A-53
Schematic

GENERAL ELECTRIC CO.

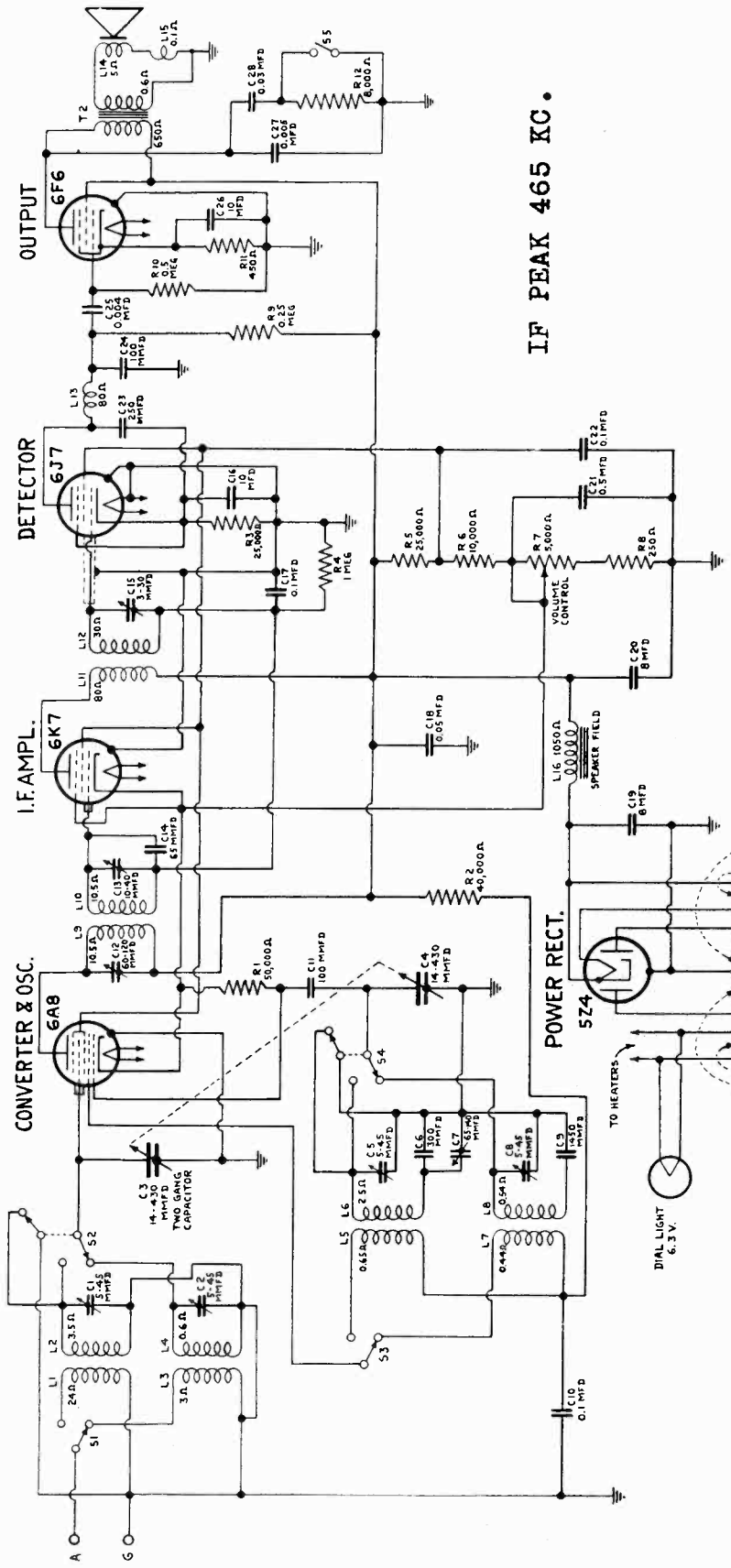


Fig. 2 Schematic Circuit Diagram

Electrical Specifications

Rating Label	Power Supply—Volts	Frequency—Cycles	Power—Watts
A	105–125	50–60	65
C	105–125	25–60	70
V	105–120 115–130	40–60	70
	200–230 220–250		

Tuning Frequency Range

Broadcast 540–1600 kc.
Short Wave 2.4–6.8 mc. (2400–6800 kc.)
Control Drive Ratio: 5 to 1

Electrical Power Output

Undistorted 1.5 watts
Maximum 2.5 watts

Loud-speaker—Electrodynamic

Cone: 7 in. overall, 6 in. effective diameter
Cone coil impedance: 5 ohms at 400 cycles

Alignment Frequencies

	Broadcast	Short-wave
I. F.	465 kc.	
	580 kc.	6000 kc.
	1500 kc.	

July, 1935

MODEL A-53
Chassis Wiring

GENERAL ELECTRIC CO.

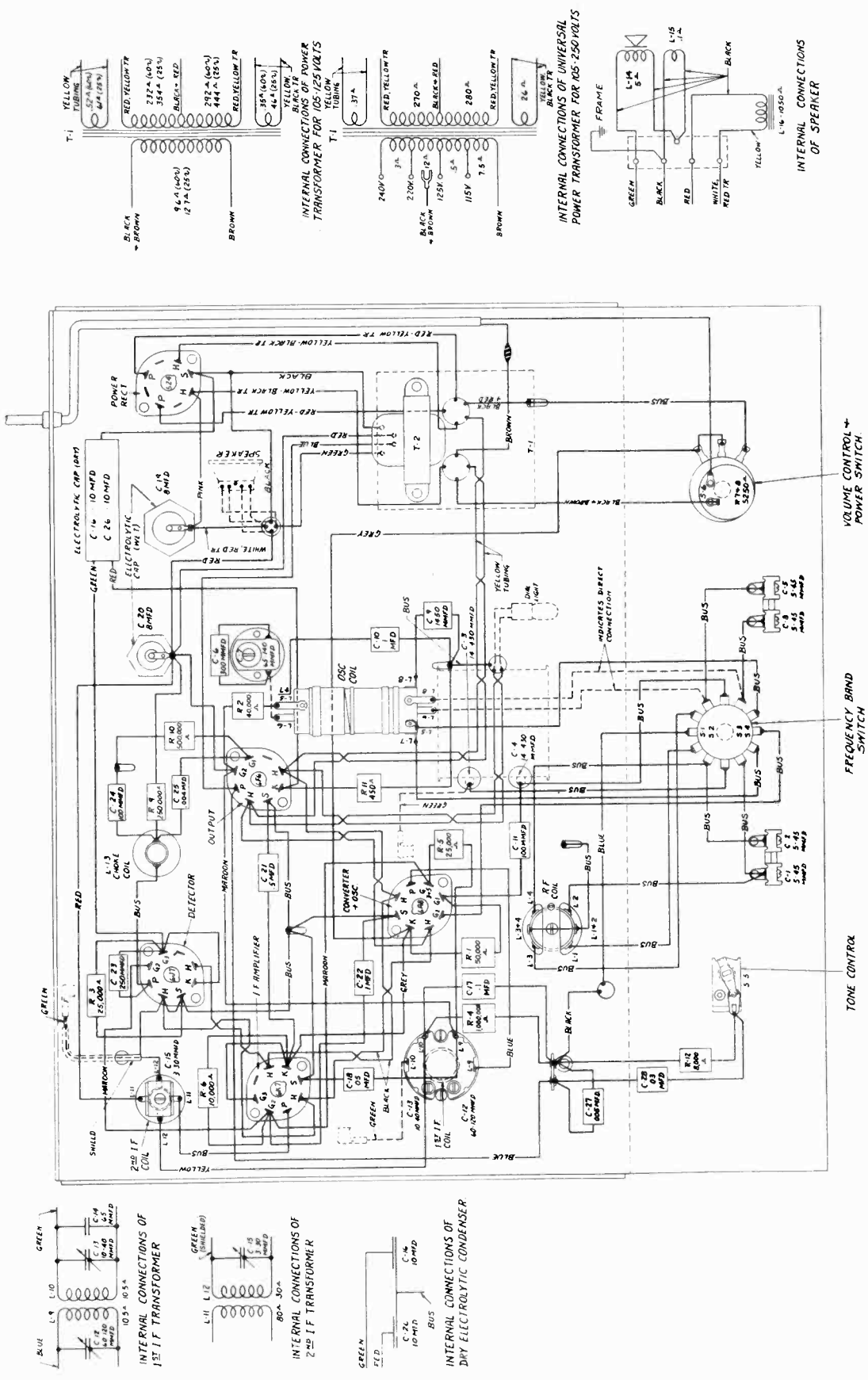


Fig. 3 Chassis Wiring Diagram

Code Interference

In certain localities near to high-powered radio-telegraph stations operating at frequencies in the vicinity of 465 kc., slight code interference may be present on both bands of the receiver. This condition usually occurs over the entire tuning range and is not greatly affected by change of tuning. To overcome this interference, a Wave Trap, such as General Electric Stock No. WT-100, should be installed. The wave trap is connected between the blue and black leads of the receiver, and the antenna lead-in and ground wire, according to the instructions furnished with the trap.

OPERATION

Model A-53 receiver has four controls located as shown below:

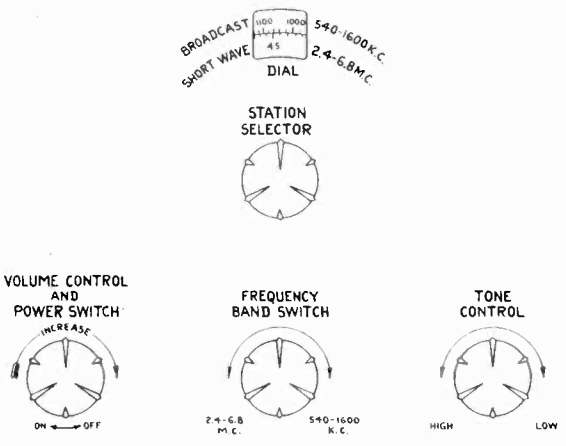


Fig. 1

DESCRIPTION OF ELECTRICAL CIRCUIT

The signal from the antenna is applied to the control grid of the 6A8 tube through the R.F. coil the secondary of which is tuned to the incoming signal by the rear section of the tuning condenser. In the 6A8 tube the incoming signal is combined with the local oscillator signal which is 465 kc. higher in frequency. The local signal is generated by the oscillator section of this tube, and the proper frequency difference is maintained throughout the tuning range by the front section of the tuning condenser in conjunction with the oscillator coil and padding capacitors.

The combination of the two signals produces the intermediate frequency of 465 kc. This particular frequency is chosen to reduce image response and improve short-wave performance. The intermediate frequency amplifier consists of a 6K7 tube and two transformers, the first of which has both primary and secondary tuned. The second transformer is unshielded and has only the secondary tuned to 465 kc.

Control of volume is obtained by the use of a variable resistor in the cathode circuits of the 6A8 and 6K7 tubes.

The output of the I. F. amplifier is applied to the grid of the 6J7 tube, used as a biased power detector. This tube has in its grid circuit a 1-megohm resistor, which is also tied to the grid-return of the 6K7 tube. The purpose of this arrangement is to prevent excessive overloading of the 6J7 detector when the volume control is turned up on a strong signal.

The output of the 6J7 detector is resistance coupled to the grid of the 6F6 power amplifier pentode. The plate circuit of the 6F6 is suitably matched to the loud-speaker by means of a step-down output transformer.

The tone control circuit consists of a .03-mfd. capacitor which is normally connected from the plate of the 6F6 to ground through a resistor. When it is desired to reduce the high frequency output of the receiver, the resistor is short-circuited by the tone control switch connecting the .03-mfd. capacitor directly from the 6F6 plate to ground.

Plate and grid voltages for all tubes are supplied by the power supply system employing a 5Z4 full-wave rectifier tube and utilizing the loud-speaker field as a filter reactor which, together with a suitable network of resistors and capacitors, supplies the required voltages and filtering action.

ALIGNMENT PROCEDURE

Before making any adjustments to the R. F. circuits, it is wise to determine the correctness of the existing alignment. This may be done by supplying a signal from the test oscillator to the receiver and inserting a "tuning wand" into the antenna coil. The "tuning wand" consists of a bakelite rod having a brass cylinder attached to one end, and a small core of finely divided iron compacted into the opposite end. By inserting the brass cylinder end into the antenna coil, the inductance is lowered, increasing its resonant frequency. Inserting the iron-filled end into the coil raises its inductance, lowering its resonant frequency. If the circuits are in exact alignment, inserting either end of the tuning wand in the coil will result in a decrease in output. When an increase in signal is obtained with the iron-filled end of the wand at the 1500-kc. point or the 6.0-mc. point, a decrease in resonant frequency of that circuit by increasing the antenna trimmer capacity is indicated. When an increase in signal is obtained with the brass cylinder, a decrease in antenna trimmer capacity is indicated. In the event that the brass cylinder end causes an increase in output at the 580-kc. point when inserted in the antenna coil, it is necessary to increase the oscillator padder capacity, meanwhile rocking the tuning dial. An increase in output, resulting from inserting the iron-filled end, indicates a decrease in oscillator padder capacity.

GENERAL ELECTRIC CO.

(1) I. F. Alignment

The I. F. amplifier should be tuned to 465 kc.; set the oscillator dial at this frequency. Set the volume control at maximum and short-circuit the antenna and ground leads. Tune the receiver to a point where no signal comes in and ground the chassis.

Connect the test oscillator output between the 6A8 converter tube grid and the chassis. Connect the output meter across the cone coil of the speaker and adjust the oscillator output until a small deflection is observed in the output meter.

The three I. F. trimmers are adjusted in the following sequence:

1. Secondary trimmer on second I. F. transformer.
2. Secondary trimmer on first I. F. transformer.
3. Primary trimmer on first I. F. transformer.

Throughout all adjustments the output should be maintained at a low level by decreasing the test oscillator output as the various stages are brought in line. After these adjustments have been made the same procedure should be repeated as a final check. The I. F. alignment will then be complete.

(2) R. F. Alignment

The R. F. and oscillator transformers are aligned at 580, 1500, and 6000 kc. With the tuning condenser plates fully meshed, line up the pointer and dial by adjusting the dial set screws so that the line at the extreme end of the dial is indicated.

Broadcast Band

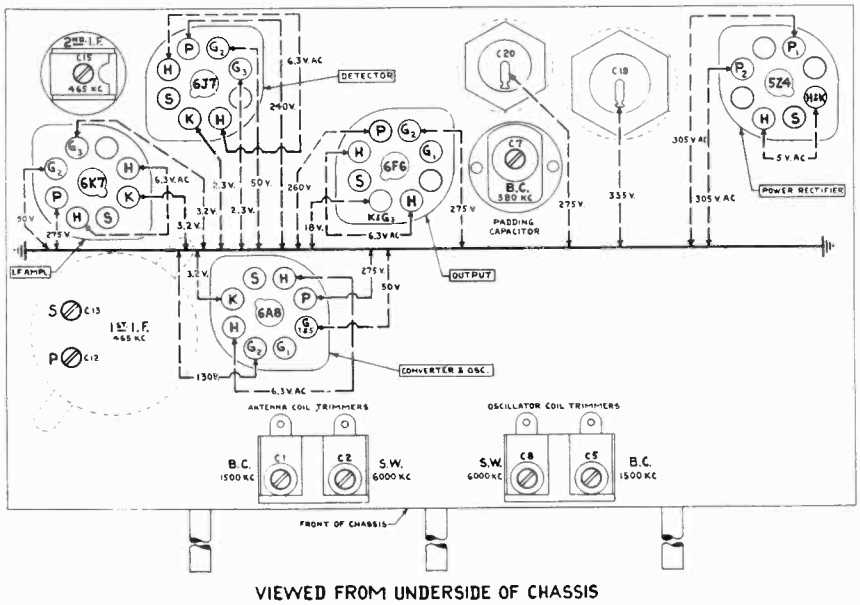
With the band switch in the clockwise position, set the tuning dial to 1500 kc. Set the test oscillator at 1500 kc. and adjust the oscillator trimmer for the broadcast band for maximum output. Next, set the R. F. trimmer for maximum output, taking care that the output from the test oscillator is not high enough to overload any part of the set. After these adjustments, tune the set and the test oscillator to 580 kc. Adjust the broadcast padding capacitor for maximum output while rocking the tuning condenser back and forth until maximum output is obtained. The dial setting after this adjustment may not agree exactly with the frequency, but this is not important.

To complete the broadcast band line-up, repeat the adjustment at 1500 kc. as before.

Short-wave Band

With the frequency band switch in the counter-clockwise position, set the receiver dial to 6.0 mc. Set the test oscillator at 6000 kc. and adjust the short-wave oscillator trimmer for maximum output. Next, set the short-wave R. F. trimmer for maximum output. Repeat these adjustments a second time. After aligning the S. W. band, turn the test oscillator to approximately 6930 kc. with the receiver dial still at 6 mc. Increase the test oscillator output until a signal is heard in the neighborhood of 6930 kc. This is the image frequency and if the set has been properly aligned the sensitivity at this point will be much less than at 6000 kc. In the event the image frequency cannot be found, the alignment should be rechecked at 6.0 mc. It will be noticed that the oscillator trimmer will have two positions at which the signal will give maximum output. The position which gives the lower trimmer capacitance obtained by turning the trimmer screw counterclockwise is the proper adjustment.

When these adjustments have been completed the receiver will be in alignment.



VIEWED FROM UNDERSIDE OF CHASSIS

MODEL A-53
Voltage
Parts

GENERAL ELECTRIC CO.

SOCKET VOLTAGES

Tube	Cathode to Ground Volts	Screen Grid to Ground Volts	Plate to Ground Volts	Plate Current MA	Heater Volts A-c.
6A8 Converter	3.2	50	275	1.5	6.3
Oscillator			130	3.5	
6K7 I. F. Amplifier	3.2	50	275	2.2	6.3
6J7 Detector	2.3	50	*	.12	6.3
6F6 Power Output	18	275	260	33	6.3
5Z4 Rectifier	335		305	27 per plate	5.0

* 6J7 plate voltage is supply voltage (275) minus drop in load resistor.
Measured at 120 volts supply, No signal input. Volume control maximum. Voltmeter 1000 ohms per volt; measurements taken on highest scale giving accurate readable deflection.

REPLACEMENT PARTS

Insist on genuine factory-tested parts, which may be purchased from authorized dealers.

RECEIVER ASSEMBLIES

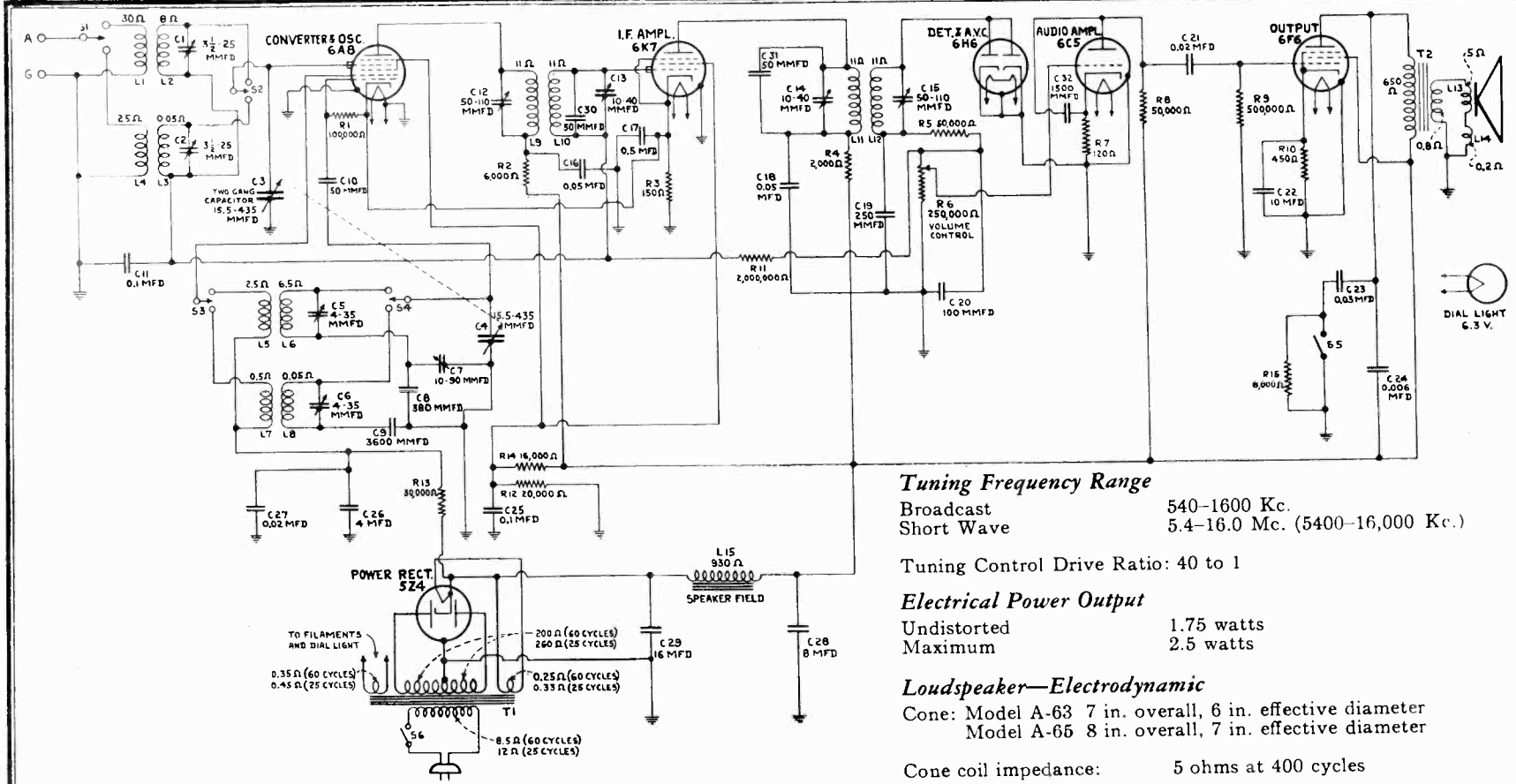
Stock No.	Description	List Price
RB-014	BOARD—Terminal Board	$0.10
RB-113	BRACKET—Lamp Bracket and Indicator	.20
RC-022	CAPACITOR—.004 Mfd, 400 Volts (C-25) Paper Dielectric	.25
RC-029	CAPACITOR—.005 Mfd, 400 Volts (C-27) Paper Dielectric	.30
RC-083	CAPACITOR—.03 Mfd, 400 Volts (C-28) Paper Dielectric	.25
RC-091	CAPACITOR—.05 Mfd, 400 Volts (C-18) Paper Dielectric	.30
RC-096	CAPACITOR—.1 Mfd, 200 Volts (C-17, C-22) Paper Dielectric	.30
RC-123	CAPACITOR—.1 Mfd, 400 Volts (C-10) Paper Dielectric	.35
RC-158	CAPACITOR—.5 Mfd, 200 Volts (C-21) Paper Dielectric	.40
RC-235	CAPACITOR—100 Mmfd, (C-11, C-24) Mica Dielectric	.25
RC-258	CAPACITOR—250 Mmfd, (C-23) Mica Dielectric	.25
RC-267	CAPACITOR—300 Mmfd, (C-6) Mica Dielectric	.25
RC-345	CAPACITOR—1450 Mmfd, (C-9) Mica Dielectric	.35
RC-402	CAPACITOR—8 Mfd, 375 Volts (C-19) Wet Electrolytic	1.10
RC-403	CAPACITOR—8 Mfd, 350 Volts (C-20) Wet Electrolytic	1.00
RC-511	CAPACITOR—Two 10 Mfd, 25 Volts (C-16, C-26) Dry Electrolytic	.80
RC-604	CAPACITOR—Twin 5-45 Mmfd Trimmer Capacitor (C-1, C-2, C-5, C-8)	.45
RC-605	CAPACITOR—65-140 Mmfd Oscillator Padder Capacitor (C-7)	.40
RC-703	CONDENSER—Two-gang Tuning Condenser (C-3, C-4)	2.75
RC-850	CORD—Power Cord with Plug	.65
RD-008	DIAL—Dial Scale and Hub Assembly	.55
RE-003	ESCUTCHEON—Dial Escutcheon	.50
RF-004	FOOT—Chassis Mounting Foot with Cushions	.15
RG-001	GRID CAP—Grid Connection Cap, Pkg of 5	.10
RK-001	KNOB—Tuning, Volume, Tone Control or Band Switch Knob, Pkg. of 5	.50
RL-109	COIL—R. F. Coil Assembly (L-1, L-2, L-3, L-4)	1.25
RL-208	COIL—Oscillator Coil Assembly (L-5, L-6, L-7, L-8)	1.00
RR-027	RESISTOR—25,000 Ohms, ¼ Watt (R-3) Carbon Resistor, Pkg of 5	.70
RR-036	RESISTOR—50,000 Ohms, ¼ Watt (R 1) Carbon Resistor, Pkg of 5	$0.70
RR-062	RESISTOR—250,000 Ohms, ¼ Watt (R-9) Carbon Resistor, Pkg of 5	.70
RR-064	RESISTOR—500,000 Ohms, ¼ Watt (R-10) Carbon Resistor, Pkg of 5	.60
RR-067	RESISTOR—1 Megohm, ¼ Watt (R-4) Carbon Resistor, Pkg of 5	.70
RR-189	RESISTOR—40,000 Ohms, ½ Watt (R-2) Carbon Resistor, Pkg of 5	.80
RR-224	RESISTOR—8000 Ohms, 1 Watt (R 12) Carbon Resistor, Pkg of 5	.85
RR-226	RESISTOR—10,000 Ohms, 1 Watt (R-6) Carbon Resistor, Pkg of 5	1.00
RR-279	RESISTOR—25,000 Ohms, 2 Watts (R-5) Carbon Resistor	.50
RR-339	RESISTOR—450 Ohms, 1 Watt (R-11) Flexible Resistor, Pkg of 5	.70
RS-105	SHIELD—1st I. F. Transformer Shield	.30
RS-200	SOCKET—Eight-pin Tube Socket, Pkg of 5	.75
RS-300	SWITCH—Tone Control Switch (S-5)	.25
RS-304	SWITCH—Frequency Band Switch (S-1, S-2, S-3, S-4)	.75
RT-051	TRANSFORMER—Power Transformer (T-1) 50-60 Cycles, 105-125 Volts (Rating "A")	4.00
RT-052	TRANSFORMER—Power Transformer (T-1) 25-60 Cycles, 105-125 Volts (Rating "C")	6.25
RT-053	TRANSFORMER—Power Transformer (T-1) 40-60 Cycles, 105-130, 200-250 Volts (Rating "V")	7.25
RT-209	TRANSFORMER—First I. F. Transformer (C-12, C-13, C-14, L-9, L-10)	2.00
RT-210	TRANSFORMER—Second I. F. Transformer (C-15, L-11, L-12)	1.10
RT-403	TRANSFORMER—Output Transformer (T-2)	1.50
RV-005	VOLUME CONTROL—Potentiometer, 5250 Ohms (R-8, R-7) and Power Switch (S-6)	1.25
RX-005	SCREW ASSEMBLY—Chassis Mounting Screw Assembly, Pkg of 3	.25

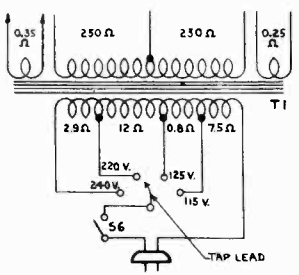
SPEAKER ASSEMBLY

RC-902	CONE—Speaker Cone and Cone Coil	$1.00
RF-103	FIELD—Field Coil Magnet and Cone Support	4.05
RS-001	SPEAKER—Seven-inch Reproducer Complete	6.10

GENERAL ELECTRIC CO.

MODEL A-63, A-65
Schematic Data





105-250 VOLTS
UNIVERSAL TRANSFORMER

IF PEAK 465 KC

Tuning Frequency Range

Broadcast	540–1600 Kc.
Short Wave	5.4–16.0 Mc. (5400–16,000 Kc.)

Tuning Control Drive Ratio: 40 to 1

Electrical Power Output

Undistorted	1.75 watts
Maximum	2.5 watts

Loudspeaker—Electrodynamic

Cone: Model A-63 7 in. overall, 6 in. effective diameter
Model A-65 8 in. overall, 7 in. effective diameter

Cone coil impedance: 5 ohms at 400 cycles

Electrical Specifications

Rating Label	Power Supply (Volts)	Frequency (Cycles)	Power Consumption (Watts)
A	105–125	50–60	75
C	105–125	25–60	80
V	105–120 115–130 200–230 220–250	40–60	80

NOTE: Taps on universal transformers (Rating "V") are accessible by removing the cap cover mounted on the top of the transformer. Schematic and wiring diagrams of the universal transformer are shown in Figures 2 and 3, respectively.

MODELS A-63, A-65
Chassis Wiring

GENERAL ELECTRIC CO.

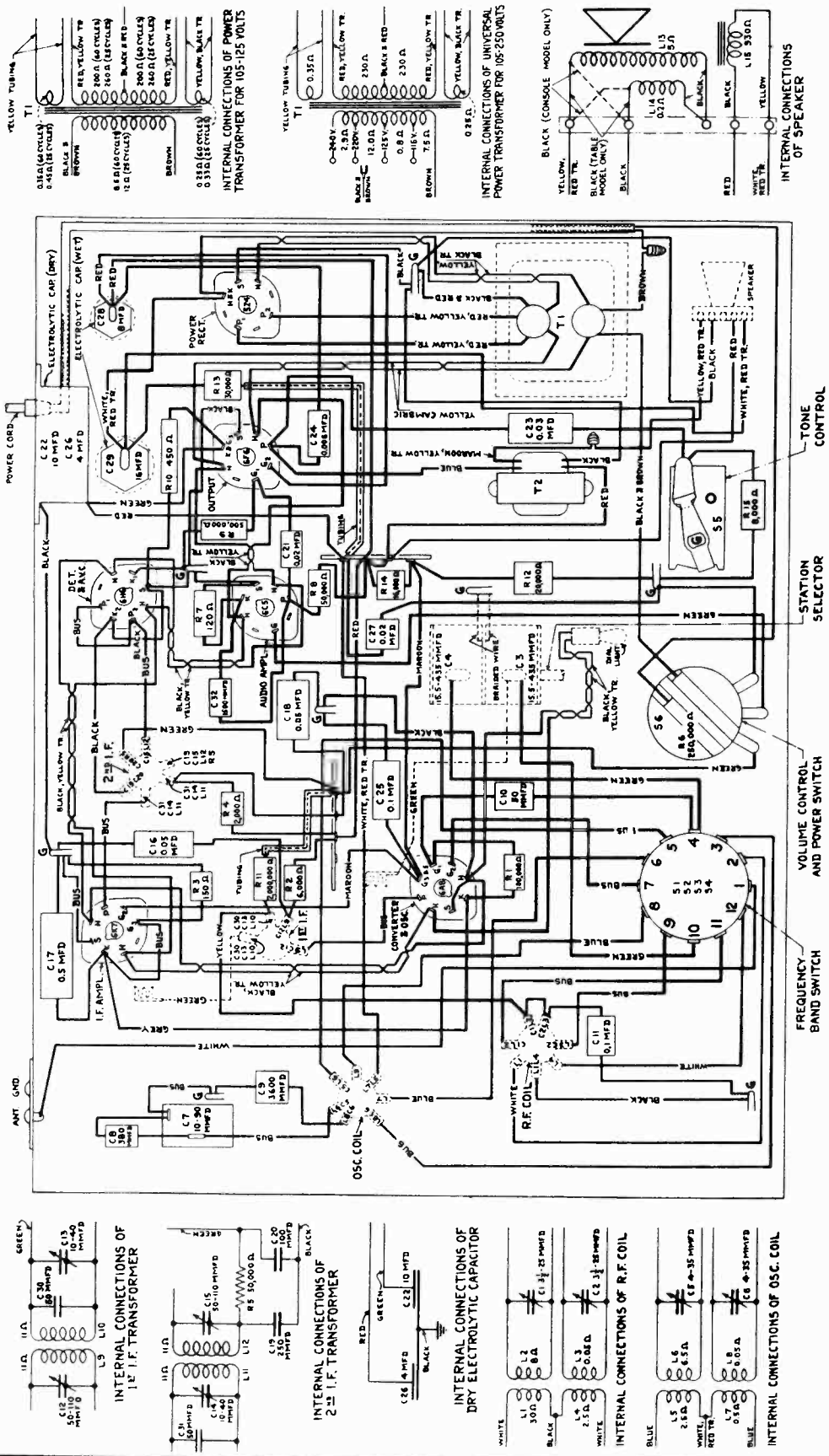


Fig. 3. Chassis Wiring Diagram

GENERAL ELECTRIC CO.

Model A-63 and A-65 receivers have four controls located as shown below:

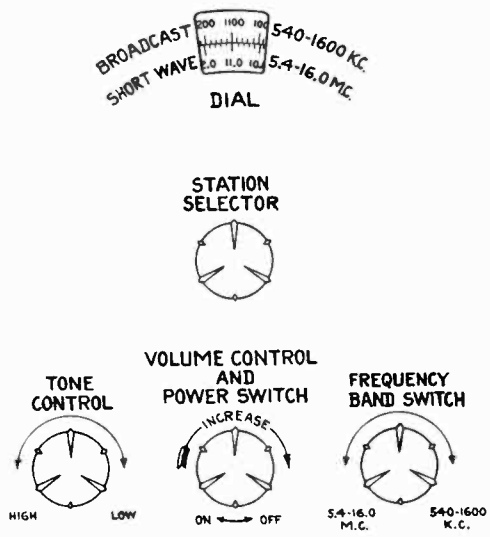


Fig. 1

Code Interference

In certain localities near high-powered radiotelegraph stations operating at frequencies in the vicinity of 465 kc., slight code interference may be present on both bands of the receiver. This condition usually occurs over the entire tuning range and is not affected by change of tuning. To overcome this interference, a Wave Trap, such as General Electric Stock No. WT-100, should be installed. Terminals are spaced so that the wave trap may be connected directly to the antenna and ground terminals of the receiver by means of the links supplied. The "V-Doublet" antenna coupling transformer may be mounted directly on top of the wave trap, as the terminal spacing is the same. General Electric Wave Trap, Stock No. WT-100, is available as an accessory from your General Electric Radio Dealer.

DESCRIPTION OF ELECTRICAL CIRCUIT

Models A-63 and A-65 employ six metal envelope tubes in a superheterodyne circuit giving the excellent selectivity and sensitivity inherent in this type circuit. Separate groups of coils are used for each frequency band. Ample undistorted output is obtained through diode detection and two audio amplifier stages.

The signal from the antenna is applied to the control grid of the 6A8 tube through the R. F. coil, the secondary of which is tuned to the incoming signal by the first section of the main tuning condenser. In the 6A8 tube the incoming signal is combined with the local oscillator signal which is 465 kc. higher in frequency. The local signal is generated by the oscillator elements of this tube, and the proper frequency difference is maintained throughout the tuning range by the second section of the main tuning condenser in conjunction with the oscillator coil and padding capacitors.

The combination of the two signals produces the intermediate frequency of 465 kilocycles. This particular intermediate frequency is chosen to reduce image response and improve short-wave performance. The intermediate frequency amplifier consists of a 6K7 tube and two transformers, each with two tuned circuits.

The output of the I. F. amplifier is applied to the 6H6 diode rectifier, which is a combined detector and automatic volume control tube. The direct current component of the rectified signal produces a voltage drop across R-6. This voltage drop provides automatic bias for the converter and I. F. amplifier tubes and so gives automatic volume control action.

The manual volume control selects the amount of audio signal applied to the grid of the 6C5 first audio amplifier and thus regulates the output of the receiver. The output of the 6C5 tube is resistance coupled to the grid of the 6F6 audio power amplifier pentode. The plate circuit of the 6F6 is suitably matched to the loudspeaker by means of a step-down output transformer.

The tone control circuit consists of a .03-mfd. capacitor which is normally connected from the plate of the 6F6 to ground through a resistor. When it is desired to reduce the high frequency output of the receiver, the resistor is short-circuited by the tone control switch connecting the .03-mfd. capacitor directly from the 6F6 plate to ground.

Plate and grid voltages for all tubes are supplied by the power supply system employing a 5Z4 full-wave rectifier tube and utilizing the loudspeaker field as a filter reactor which, together with a suitable network of resistors and capacitors, supplies the required voltages and filtering action.

ALIGNMENT PROCEDURE

The receiver should first be allowed to run for fifteen minutes in order to reach its approximate normal operating temperature. Before making any adjustments, it is wise to determine the correctness of the existing alignment. This may be done by supplying a signal from the test oscillator to the receiver and inserting a "Tuning Wand" into the coil involved. The "Tuning Wand" consists of a bakelite rod having a brass cylinder attached to one end, and a small core of finely divided iron compacted into the opposite end. By inserting the brass cylinder end into the center of a particular coil, through the opening provided in the top of the shield, the inductance of the coil is lowered, increasing its resonant frequency. Inserting the iron-filled end into the coil raises its inductance, lowering its resonant frequency. If the circuits are in exact alignment, inserting either end of the tuning wand in any coil will result in a decrease in output. When an increase in signal is obtained with the iron-filled end of the wand, a decrease in resonant frequency of that circuit by increasing its trimmer capacity is indicated. When an increase in signal is obtained with the brass cylinder, a decrease in trimmer capacity is indicated.

Changes Indicated by Wand

Wand	Signal	Trimmer adjustment required
Brass cylinder	Decrease	None
Iron filings	Decrease	
Brass cylinder	Increase	Decrease capacity
Iron filings	Decrease	
Brass cylinder	Decrease	Increase capacity
Iron filings	Increase	

In Models A-63 and A-65 the broadcast band R. F. and oscillator coils are located in the upper half of their respective shield cans; the short-wave coils in the lower half.

Alignment Frequencies

I. F.	Broadcast	Short Wave
465 Kc.	600 Kc	15,000 Kc.
	1500 Kc.	

In order to align these receivers properly, it is necessary to have available a modulated test oscillator capable of producing the above alignment frequencies, a non-metallic alignment screwdriver, and an output meter. The location

MODELS A-63, A-65
Alignment
Voltage

GENERAL ELECTRIC CO

of all trimmer capacitors as well as socket voltages is shown in Fig. 4.

1. *I. F. Alignment*

Set the frequency band switch of the receiver in the clockwise position, short-circuit the antenna and ground terminals and tune the receiver so that no signal is heard. Set the volume control at maximum and ground the chassis.

The I. F. amplifier is tuned to 465 kc.; set the test oscillator dial at this frequency. Connect the test oscillator output between the converter tube (6A8) control grid and chassis. Connect the output meter across the cone coil of the speaker and adjust the test oscillator output control so that, with the receiver volume control at maximum, a small deflection is observed in the output meter. During both I. F. and R. F. alignment, the test oscillator signal should be maintained at the lowest level that will give a good output indication.

Adjust the secondary trimmer of the second I. F. transformer until a maximum output reading is obtained. Maintain a small deflection on the output meter throughout alignment by adjusting the test oscillator output. Next, adjust the primary trimmer of the second I. F. transformer for maximum output. Continue this procedure, adjusting the secondary trimmer of the first I. F. transformer, and lastly, the primary trimmer of the first I. F. transformer. After completing this procedure, repeat it a second time for final alignment. The I. F. alignment will then be complete.

2. *R. F. Alignment*

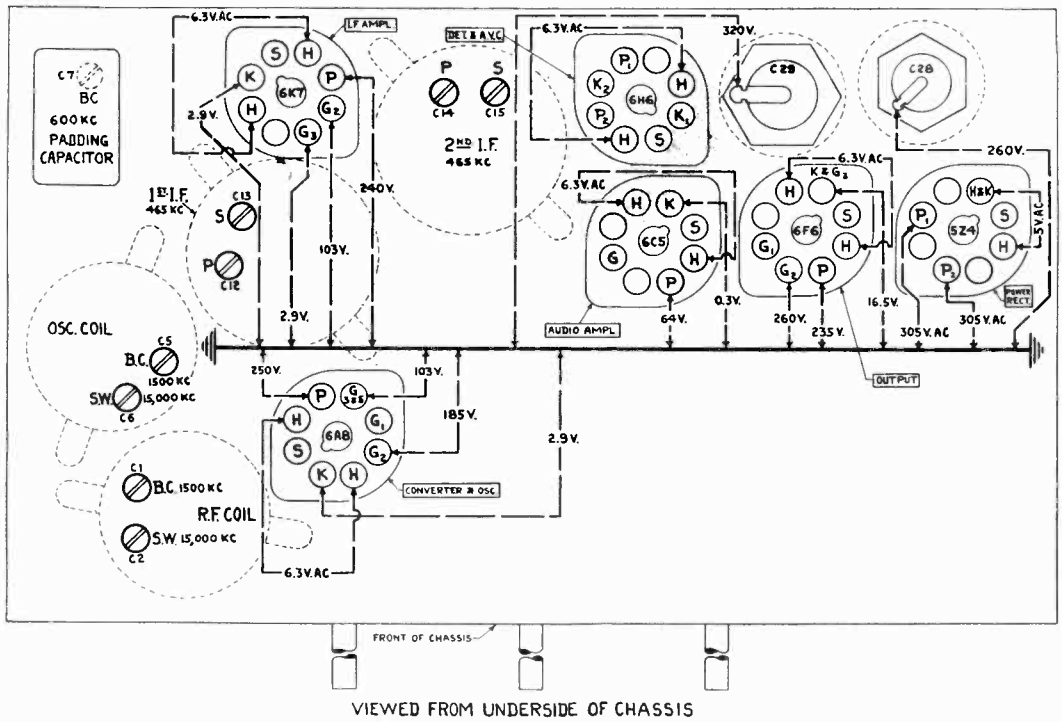
The R. F. and oscillator trimmers are aligned at 600, 1500 and 15,000 kc. Line up the pointer and dial so that with the tuning condenser plates fully meshed, the pointer indicates the mark at the extreme right-hand end of the dial. Make sure the antenna and ground terminals of the receiver are not short circuited and connect to them the output from the test oscillator. Connect the output meter across the speaker cone coil.

Broadcast—With the band switch turned clockwise, set the tuning dial at 1500 kc. Set the test oscillator at this frequency and adjust its output so that with the receiver volume control in its extreme clockwise position, a small deflection is observed on the output meter. Adjust the broadcast oscillator trimmer for maximum output. There, as before, maintain the output meter at a small deflection during the entire alignment process. When optimum adjustment on the broadcast oscillator trimmer is obtained, adjust the broadcast R. F. trimmer for maximum output. Now set the test oscillator and receiver at 600 kc. Adjust the 600 kc. padding capacitor for maximum output while rocking the tuning condenser back and forth through the signal. When this has been done, return to 1500 kc. on the receiver and test oscillator and recheck the alignment for maximum output. When this is done, the broadcast band has been aligned.

Short Wave—Place the band switch in the counterclockwise position and set the receiver and test oscillator at 15,000 kc. Adjust the short-wave oscillator trimmer for maximum output. Next adjust the short-wave R. F. trimmer for maximum output while rocking the tuning condenser back and forth through the signal.

It will be noticed on the short-wave band that the oscillator and R. F. trimmers will have two positions at which the signal will give maximum output. The position which uses the lower trimmer capacitance obtained by turning the screw counterclockwise is the proper adjustment for the oscillator, while the position that uses the higher capacitance is proper for the R. F. trimmer.

When these adjustments have been completed, the receiver will be in alignment.



VIEWED FROM UNDERSIDE OF CHASSIS

Fig. 4 Trimmer Locations and Socket Voltages

MODELS A-63, A-65
Voltage
Parts

GENERAL ELECTRIC CO.

SOCKET VOLTAGES

Tube	Cathode to Ground Volts	Screen Grid to Ground Volts	Plate to Ground Volts	Plate Current MA	Heater Volts A-c.
6A8—Converter	2.9	103	250*	3.5	6.3
Oscillator			185*	4.5	
6K7—I. F.	2.9	103	240	8.5	6.3
6H6—Detector and AVC					6.3
6C5—Audio	0.3		64*	3.6	6.3
6F6—Output	16.5	260	235	30.0	6.3
5Z4—Rectifier	320		305 Rms., A. c.	33 per plate	5.0

Measured at 120 volts supply. No signal input. Volume control maximum. Voltmeter 1000 ohms per volt; measurements taken on highest scale giving accurate readable deflection.

*Measured with meter drawing less than 100 microamperes.

REPLACEMENT PARTS

Insist on genuine factory-tested parts, which may be purchased from authorized dealers.

RECEIVER ASSEMBLIES

Stock No.	Description	List Price
RB-001	BOARD—Antenna Terminal Board	$0.10
RB-002	BOARD—Terminal Board	.15
RB-100	BRACKET—Dial Lamp Socket, Bracket and Pointer	.25
RC-030	CAPACITOR—.006 Mfd. 400 Volt (C-24) Paper Dielectric	.25
RC-080	CAPACITOR—.02 Mfd. 400 Volt (C-21, C-27) Paper Dielectric	.25
RC-083	CAPACITOR—.03 Mfd. 400 Volt (C-23) Paper Dielectric	.25
RC-091	CAPACITOR—.05 Mfd. 400 Volt (C-16, C-18) Paper Dielectric	.30
RC-096	CAPACITOR—.1 Mfd. 200 Volt (C-11, C-25) Paper Dielectric	.30
RC-157	CAPACITOR—.5 Mfd. 200 Volt (C-17) Paper Dielectric	.40
RC-210	CAPACITOR—50 mmfd. (C-10) Mica Dielectric Moulded Case	.25
RC-286	CAPACITOR—380 mmfd. (C-8) Mica Dielectric Moulded Case	.25
RC-346	CAPACITOR—1500 mmfd. (C-32) Mica Dielectric Moulded Case	.35
RC-357	CAPACITOR—3600 mmfd. (C-9) Mica Dielectric Moulded Case	.50
RC-403	CAPACITOR—8 mfd. 350 Volt (C-28) Wet Electrolytic	1.00
RC-409	CAPACITOR—16 mfd. 390 Volt (C-29) Wet Electrolytic	1.25
RC-501	CAPACITOR—One 10 mfd. 25 Volt (C-22), one 4 mfd. 450 Volt (C-26) Dry Electrolytic Pack	1.30
RC-600	CAPACITOR—10-90 mmfd. Trimmer Capacitor (C-7)	.50
RC-700	CONDENSER—Two-gang Tuning Condenser (C-3, C-4)	3.55
RC-800	CABLE—Loudspeaker Cable	.45
RC-850	CORD—Power Cord with Plug	.65
RD-001	DIAL—Dial Scale and Hub Assembly	.50
RE-001	ESCUTCHEON—Dial Escutcheon	.35
RF-001	FOOT—Chassis Mounting Foot with Cushions	.45
RG-001	GRID CAP—Grid Connection Cap, pkg. of 5	.10
RK-001	KNOB—Tuning, Volume, Tone Control or Band Switch Knob, pkg. of 5	.50
RL-100	COIL—R.F. Coil Assembly (L-1, L-2, L-3, L-4, C-1, C-2)	1.95
RL-200	COIL—Oscillator Coil Assembly (L-5, L-6, L-7, L-8, C-5, C-6)	1.85
RR-018	RESISTOR—120 ohms ¼ watt (R-7), Carbon Resistor, pkg. of 5	.60
RR-020	RESISTOR—6000 ohms ¼ watt (R-2), Carbon Resistor, pkg. of 5	.60
RR-050	RESISTOR—100,000 ohms ¼ watt (R-1), Carbon Resistor, pkg. of 5	.70
RR-064	RESISTOR—500,000 ohms ¼ watt (R-9), Carbon Resistor, pkg. of 5	.60
RR-068	RESISTOR—2 megohms, ¼ watt (R-11), Carbon Resistor, pkg. of 5	.60
RR-098	RESISTOR—2000 ohms, ⅓ watt (R-4), Carbon Resistor, pkg. of 5	$0.60
RR-192	RESISTOR—50,000 ohms, ½ watt (R-8), Carbon Resistor, pkg. of 5	.70
RR-224	RESISTOR—8000 ohms, 1 watt (R-15), Carbon Resistor, pkg. of 5	.85
RR-239	RESISTOR—20,000 ohms, 1 watt (R-12), Carbon Resistor, pkg. of 5	.85
RR-241	RESISTOR—30,000 ohms, 1 watt (R-13), Carbon Resistor, pkg. of 5	.85
RR-298	RESISTOR—16,000 ohms, 3 watt (R-14), Carbon Resistor	.50
RR-310	RESISTOR—150 ohms, ⅜ watt (R-3), Flexible Resistor, pkg. of 5	.70
RR-339	RESISTOR—450 ohms, 1 watt (R-10), Flexible Resistor, pkg. of 5	.70
RS-100	SHIELD—R.F. Coil Shield	.30
RS-101	SHIELD—First I.F. Transformer Shield	.30
RS-102	SHIELD—Second I.F. Transformer Shield	.30
RS-114	SHIELD—Oscillator Coil Shield	.30
RS-200	SOCKET—Eight-pin Tube Socket pkg. of 5	.75
RS-300	SWITCH—Tone Control Switch (S-5)	.25
RS-301	SWITCH—Frequency Band Switch (S-1, S-2, S-3, S-4)	.75
RT-061	TRANSFORMER—Power Transformer (T-1) 50-60 cycles 105-125 Volts (Rating "A")	5.55
RT-062	TRANSFORMER—Power Transformer (T-1) 25-60 cycles 105-125 Volts (Rating "C")	8.25
RT-063	TRANSFORMER—Power Transformer (T-1) 40-60 cycles 105-130, 200-250 Volts (Rating "V")	9.35
RT-200	TRANSFORMER—First I.F. Transformer (L-9, L-10, C-12, C-13, C-30)	1.90
RT-201	TRANSFORMER—Second I.F. Transformer (L-11, L-12, C-14, C-15, C-19, C-20, C-31, R-5)	2.30
RT-400	TRANSFORMER—Output Transformer (T-2)	1.10
RV-001	VOLUME CONTROL—Potentiometer 250,000 ohms (R-6) and Power Switch (S-6)	1.10
RX-001	SCREW ASSEMBLY—Chassis Mounting Screws and Washers, pkg. of 4	.10
RX-003	CUSHION ASSEMBLY—Tuning Condenser Mounting Nuts, Washers and Cushions, pkg. of 3	.15

SPEAKER ASSEMBLY A-63

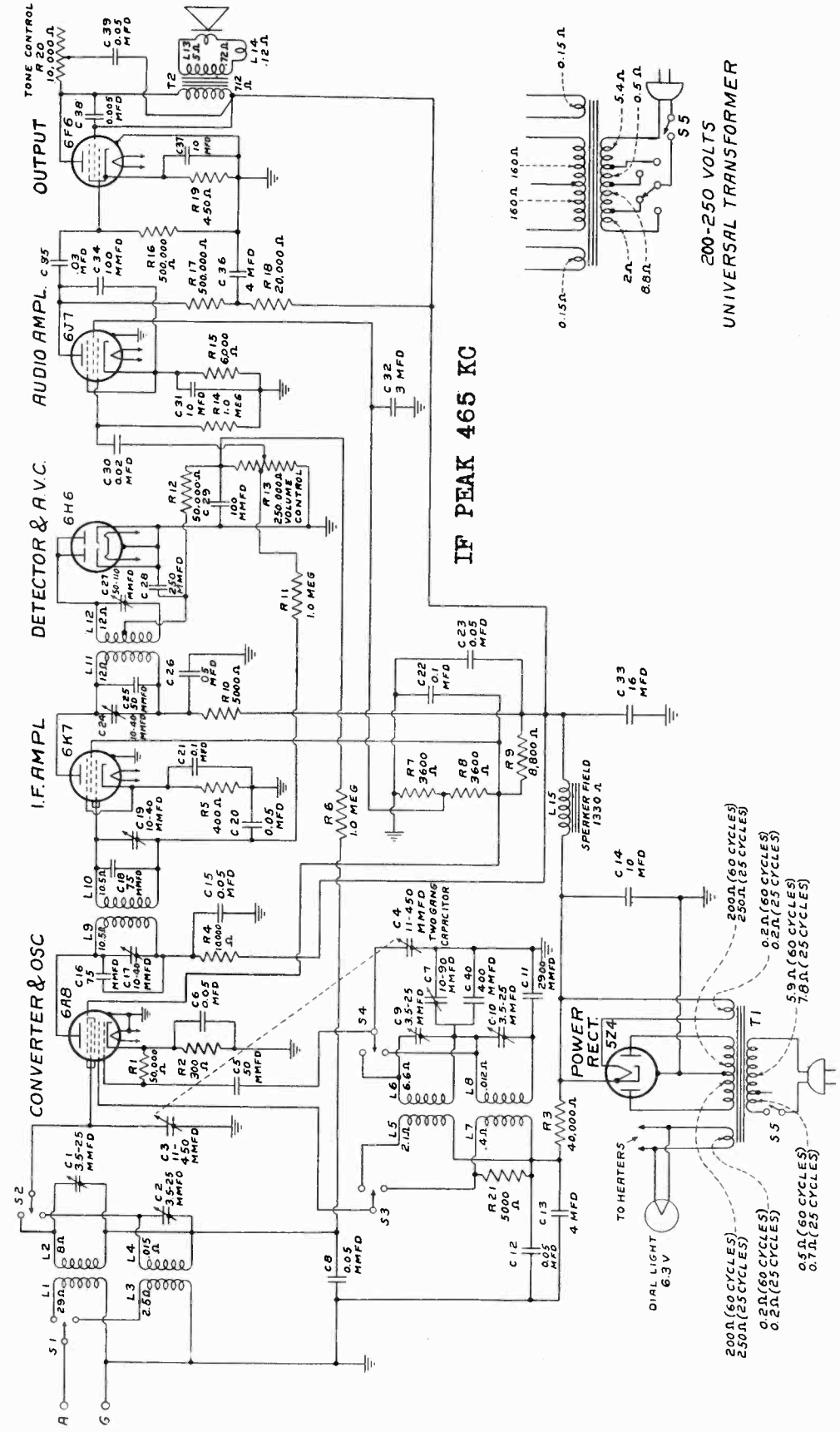
RC-902	CONE—Speaker Cone and Cone Coil	1.00
RF-100	FIELD—Field Coil, Magnet and Cone Support	3.80
RS-012	SPEAKER—Seven-inch Reproducer Unit Complete	6.35

SPEAKER ASSEMBLY A-65

RC-900	CONE—Speaker Cone and Cone Coil	1.00
RF-101	FIELD—Field Coil Magnet and Cone Support	4.45
RS-010	SPEAKER—Eight-inch Reproducer Unit Complete	6.80

MODELS A-64, A-67
Schematic

GENERAL ELECTRIC CO.



MODELS A-64, A-67
Chassis Wiring

GENERAL ELECTRIC CO.

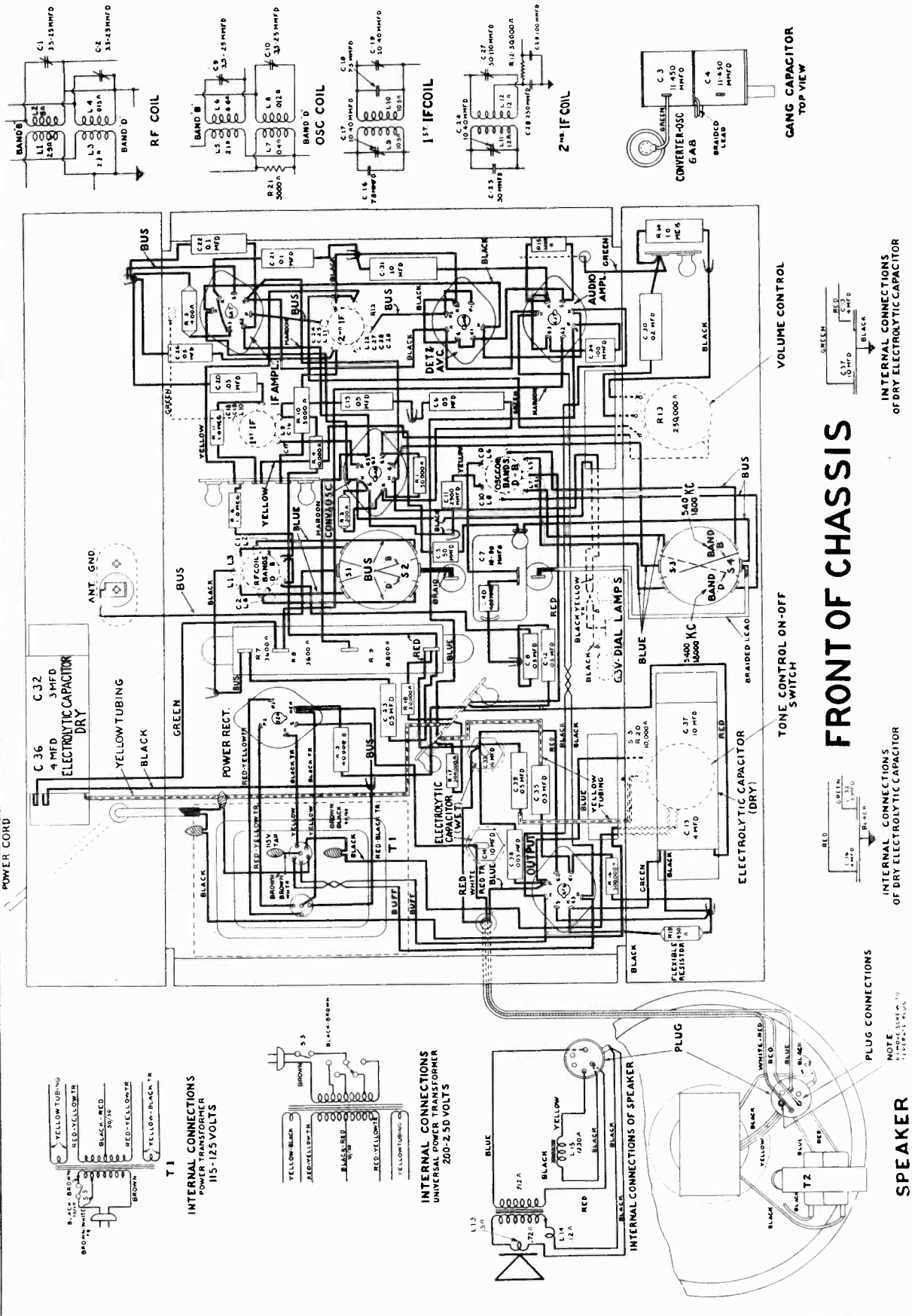


Fig. 3. Chassis Wiring Diagram

SERVICE DATA

Physical Specifications

	A-64	A-67
Model		
Height	19 1/16 in.	39 5/8 in.
Width	14 in.	23 3/4 in.
Depth	10 in.	11 15/16 in.
Weight Packed	33 lb	65 lb

Electrical Specifications

Rating Label	Power Supply (Volts)	Frequency (Cycles)	Power Consumption (Watts)
A	105-130	50-60	85
C	105-130	25-60	90
V	105-130 and 200-250	40-60	90

NOTE: Taps on universal transformers (rating "V") are accessible by removing the cap cover mounted on the top of the transformer. Schematic and wiring diagrams of the universal transformer are shown in Figures 2 and 3, respectively.

Tuning Frequency Range

Broadcast.....540-1800 KC
Short Wave.....5.4-18.0 MC (5400-18,000 KC)

Tuning Control Drive Ratio

Fast Tuning.....5½ to 1
Vernier Tuning....55 to 1

Electrical Power Output

Undistorted.....2.0 Watts
Maximum.....3.0 Watts

Loud-speaker—Electrodynamic

Cone: Model A-64 8 in. overall, 7 in. effective diameter
Model A-67 10¼ in. overall, 9¼ in. effective diameter.
Cone Coil Impedance: 5 ohms at 400 cycles.

Tube

Oscillator and Converter..6A8 Pentagrid Converter
I. F. Amplifier.....6K7 Triple-grid Super-control Amplifier
Detector and AVC.....6H6 Twin Diode
First Audio Amplifier.....6J7 Triple-grid Detector Amplifier
Audio Power Amplifier....6F6 Power Amplifier Pentode
Rectifier.....5Z4 Full-wave Rectifier
Dial Lamps.....MAZDA No. 46.

DESCRIPTION OF ELECTRICAL CIRCUIT

Models A-64 and A-67 employ six metal envelope tubes in a superhetrodyne circuit giving the excellent selectivity and sensitivity inherent in this type circuit. Separate groups of coils are used for each frequency band. Ample undistorted output is obtained through diode detection and two audio amplifier stages.

The signal from the antenna is applied to the ...ol grid of the 6A8 tube through the R. F. coil, the secondary of which is tuned to the incoming signal by the rear section of the main tuning condenser. In the 6A8 tube the incoming signal is combined with the local oscillator signal which is 465 KC higher in frequency. The local signal is generated by the oscillator elements of this tube, and the proper frequency difference is maintained throughout the tuning range by the front section of the main tuning condenser in conjunction with the oscillator coil and padding capacitors.

The combination of the two signals produces the intermediate frequency of 465 kilocycles. This particular intermediate frequency is chosen to reduce image response and improve short-wave performance. The intermediate frequency amplifier consists of a 6K7 tube and two I. F. transformers, each with two tuned circuits.

The output of the I. F. amplifier is applied to the 6H6 diode rectifier, which is a combined detector and automatic volume control tube. The direct current component of the rectified signal produces a voltage drop across R-13. This voltage drop provides automatic bias for the converter and I. F. amplifier tubes and so gives automatic volume control action. Full automatic bias is applied to the converter tube, while a part of this voltage, taken from a tap on R-13, is applied to the I. F. amplifier tube, which handles a somewhat larger signal voltage than the converter tube.

The manual volume control selects the amount of audio signal applied, through coupling capacitor C-30, to the grid of the 6J7 audio amplifier tube, and this regulates the output of the receiver. The output of the 6J7 tube is resistance coupled to the grid of the 6F6 power amplifier pentode. The plate circuit of the 6F6 is suitably matched to the loud-speaker by means of a step-down output transformer.

The tone control circuit consists of a .05-mfd capacitor connected in series with a continuously variable 0-10,000 ohm resistance across the primary of the output transformer. When it is desired to reduce the high frequency output of the receiver, resistance is cut out of the circuit by turning the tone control knob counterclockwise.

Plate and grid voltages for all tubes are supplied by the power supply system employing a 5Z4 full-wave rectifier tube which, together with a suitable network of resistors and capacitors, supplies the required voltages and filtering action.

ALIGNMENT PROCEDURE

The receiver should first be allowed to run for fifteen minutes in order to reach its approximate normal operating temperature. Before making any adjustments, it is wise to determine the correctness of the existing alignment. This may be done by supplying a signal to the receiver from the test oscillator at the alignment frequency and inserting a "Tuning Wand" into the coil involved. The "Tuning Wand" consists of a rod of insulating material having a ring of nonmagnetic metal attached to one end, and a small core of finely divided iron compacted into the opposite end. By inserting the metal ring end into the center of either R. F. coil through the opening provided in the top of the coil shield, the inductance of that coil is lowered, increasing its resonant frequency. Inserting the iron-filled end into the coil raises its inductance, lowering its resonant frequency. If the R. F. circuits are in exact alignment, inserting either end of the tuning wand into the particular R. F. coil being used will result in a decrease in output. When an increase of signal is obtained with the iron-filled end of the wand, a decrease in resonant frequency of that circuit by increasing its trimmer capacity is indicated. When an increase of signal is obtained with the metal ring, a decrease in trimmer capacity is indicated.

Changes Indicated by Wand

Wand	Signal	Trimmer Adjustment Required
Metal Ring	Decrease	None
Iron Filings	Decrease	
Metal Ring	Increase	Decrease capacity
Iron Filings	Decrease	
Metal Ring	Decrease	Increase capacity
Iron Filings	Increase	

In Models A-64 and A-67 the broadcast band R. F. and oscillator coils are located in the upper half of their respective shield cans; the short-wave coils, in the lower half.

ALIGNMENT FREQUENCIES

I. F.	Broadcast	Short-wave
465 KC	580 KC 1740 KC	18,000 KC

In order to align these receivers properly it is necessary to have available:

1. A modulated test oscillator capable of producing the above alignment frequencies.
2. An output indicator, such as a high resistance a-c voltmeter with a maximum scale reading of 3 to 5 volts, or a neon lamp indicator.
3. An alignment tool consisting of an insulating shaft with a small screwdriver blade.

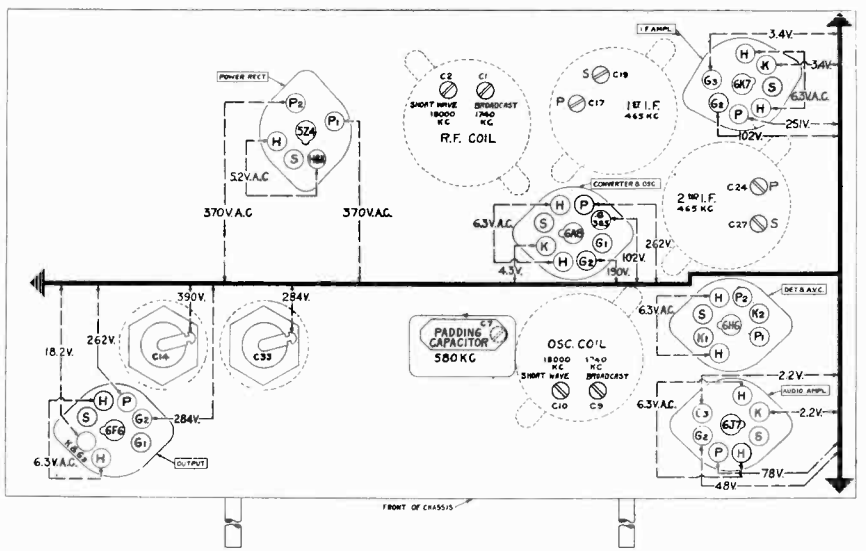
The location of all alignment trimmer capacitors, as well as socket voltages, is shown in Fig. 4.

1. I. F. Alignment

Set the frequency band switch of the receiver to the broadcast position and turn the volume control to maximum (extreme clockwise position). Tune the receiver to some point above 1500 KC so that no signal is heard, short-circuiting the antenna and ground terminals if necessary, and ground the chassis.

Remove the control grid clip (green lead) from the 6A8 tube and connect the test oscillator output between chassis and the dome terminal of the 6A8 tube. The I. F. amplifier is tuned to 465 KC; set the oscillator dial at this frequency. Make sure that a d-c path exists between the output terminals of the test oscillator; if an ohmmeter does not show continuity between the test oscillator terminals, connect a resistor of fairly high resistance between the 6A8 dome terminal and chassis to provide a d-c grid return path.

Connect the output meter across the cone coil of the speaker and adjust the test oscillator output control



VIEWED FROM UNDERSIDE OF CHASSIS

Measured at 125 volts supply. No signal input. Volume control maximum. Voltmeter 1000 ohms per volt; measurements taken on highest scale giving accurate readable deflection.

Fig. 4. Trimmer Locations and Socket Voltages

so that, with the volume control at maximum, a small indication is observed on the output indicator.

Adjust the secondary trimmer of the second I. F. transformer until a peak output reading is obtained. Maintaining a small output indication, adjust next the primary trimmer of the second I. F. transformer for maximum output. Continue this procedure, adjusting the secondary trimmer of the first I. F. transformer, and lastly, the primary trimmer of the first I. F. transformer. After completing this procedure, repeat it a second time for final alignment. The I. F. alignment will then be complete.

During both I. F. and R. F. alignments, the test oscillator signal should be maintained at the lowest level that will give a good output indication, keeping the receiver volume control at maximum and adjusting the test oscillator output control to give the required indication.

2. R. F. Alignment

The R. F. and oscillator trimmers are aligned at 580, 1740 and 18,000 KC. Check the position of the dial pointer as outlined in the section on adjustment of the dial mechanism. Make sure the antenna and ground terminals of the receiver are not short-circuited and connect to them the output from the test oscillator, preferably using a dummny antenna of 250 mmfd. in series with 200 ohms between the test oscillator and receiver antenna terminal. Connect the output indicator across the speaker cone coil.

Broadcast—540-1800 KC.

Set the frequency band switch to the position where the dial indicates the above range. Tune the test oscillator to 1740 KC and set the dial pointer on the receiver to this frequency. Adjust the broadcast oscillator trimmer for maximum output, keeping the receiver volume control at its extreme clockwise position and adjusting the test oscillator output to maintain a small reading on the output indicator. When optimum adjustment on the broadcast oscillator trimmer is obtained, adjust the broadcast R. F. trimmer for maximum output.

Now set the test oscillator at 580 KC and tune the receiver to that frequency. Slowly rocking the tuning condenser back and forth through the signal, adjust the 580 KC padding capacitor for maximum output. When this has been done, return to 1740 KC on the receiver and test oscillator and recheck the alignment for maximum output. The broadcast band should now be in alignment.

Short Wave—5.4-18.0 MC (5400-18,000 KC)

Set the frequency band switch to the position where the dial indicates the above range. Tune the test oscillator at 18,000 KC and set the dial pointer on the receiver to that frequency. Adjust the short-wave oscillator trimmer for maximum output, using the first peak obtained when increasing the capacitance from minimum to maximum.

Check for the image signal which should be received at about 17,070 on the receiver dial. It may be necessary to increase input to the receiver from the test oscillator for this check. Return the receiver to the correct scale reading (18,000 KC) and reduce the test oscillator output to its previous value.

Reduce the capacitance of the R. F trimmer to a minimum. While slowly rocking the tuning condenser back and forth through the 18,000 KC signal, increase the short-wave R. F. trimmer capacitance until a maximum response point is obtained.

It will be noticed on the short-wave band that the oscillator and R. F. trimmers will have two positions at which the signal will give maximum output. The position corresponding to the lower trimmer capacitance obtained by turning the trimmer screw counter-clockwise is the proper adjustment for the oscillator trimmer, while the position corresponding to the higher capacitance is proper for the R. F. trimmer.

When these adjustments have been completed the receiver should be in alignment.

ADJUSTMENT OF DIAL MECHANISM

The dial mechanism is rigidly mounted to the frame of the tuning condenser by means of two removable screws, the complete assembly being rubber-mounted by means of rubber cushions and bushings at points of support. The dial pointer, station selector reduction drive, and tuning condenser drive drum are interconnected by means of the drive cord and drive cable; the frequency band switch, cylindrical dial scale and switch operating shaft, by gear and toggle assemblies.

1. Position of Drum on Condenser Shaft

With set screws (19) loosened and tuning condenser plates fully engaged, place the drum in the position shown in Fig. 5 so that the top rim of the drum is $\frac{3}{64}$ in. away from the mounting plate. Guide (48) should stop at equal distances from each end of the mounting plate slot.

2. Removing and Replacing Scale

Pry out fastener (39) and remove the scale by lowering that end below the ear and taking the scale out of cap assembly (24), holding parts (24), (11) and (7) in place. Replace, locating tabs of caps (24) and (25) in slots of scale. Replace fastener (39).

3. Locating Scale

Loosen the two gear set screws (16). Rotate the scale upward until there is slight tension on spring (11) with the pointer indicating on the broadcast (Band "B") scale. With the frequency band switch in the broadcast position, place gear (7) in mesh with the gear on part (6) and tighten the two set screws (16).

4. Replacing Drive Cord

The position of the dial scale pointer with respect to the tuning condenser drum is held fixed by means of a special metal braid cable connecting the drum with the guide (48). Tension is maintained on the cable through the drum spring (12) and drive cord. To replace either the drive cable or the drive cord, remove the dial scale for convenient access to guide (48). Unhook spring (12) from tab (46) to release tension. Unhook the cable or cord from guide (48) and unwind from the pulleys and drum. To replace the cable, rethread to agree with Fig. 5, and rehook drum spring (12) as shown.

5. Replacing Reduction Drive

To replace the reduction drive, unhook spring (12), loosening the drive cord. Unscrew palnut (44) and remove drive. Replace with new drive and rehook drive cord.

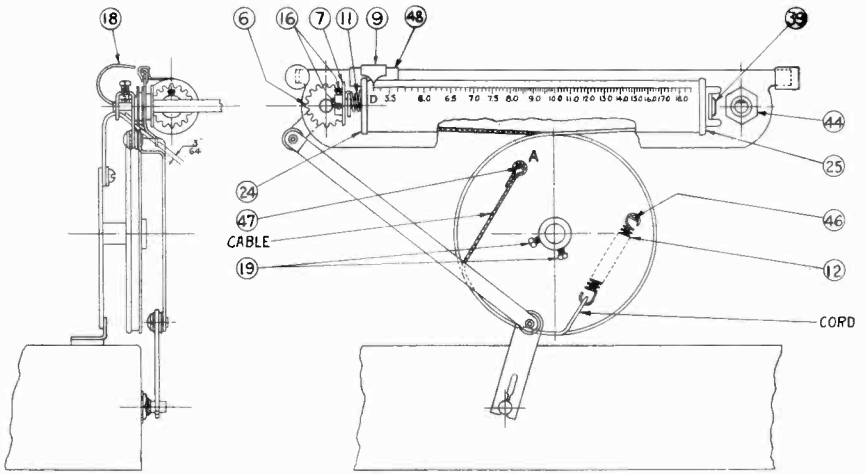


Fig. 5. Dial Mechanism

6. Replacing Toggle Assembly

Loosen the set screw holding the toggle mechanism on shaft (6) and spread the fork on the lower lever arm enough to remove it from the band switch shaft. Replace with new assembly. Rotate shaft (6) clockwise, until there is slight tension on spring (11) with the scale in the Band "B" position. Place upper lever arm in shaft and tighten set screw.

7. Setting Dial Pointer

The dial pointer (9) is soldered to the guide (48). To set the pointer mechanically, turn the tuning condenser rotor so that the plates are fully engaged, and solder the pointer to indicate the extreme left-hand line on the Band "D" scale as shown in Fig. 5.

8. Replacing Dial Lamp

Take hold of the terminals of the lamp bracket and push up until the lamps protrude above the opening in reflector (18). Lamps may then be replaced in socket clips. After replacing lamps, slide the socket mounting bracket back into the mounting clip.

SOCKET VOLTAGES

Tube No.		Cathode to Ground Volts D-c	Screen Grid to Ground Volts D-c	Plate to Ground Volts D-c	Cathode Current M.A.	Heater Volts A-c
6A8	Oscillator	...	...	190	...	...
	Converter	4.3	102	262	12.7	6.3
6K7 I. F. Amplifier		3.4	102	251	8.1	6.3
6H6 Detector and AVC		...	...	...	...	6.3
6J7 Audio Amplifier		2.2	48	78*	.38	6.3
6F6 Output		18.2	284	262	38.7	6.3
5Z4 Power Rectifier		...	...	740/370 Rms	76.1	5.2

Measured at 125 volts supply. No signal input. Volume control maximum. Voltmeter 1000 ohms per volt; measurements taken on highest scale giving accurate readable deflection.

*Measured on 1000-volt scale.

MODELS A-64, A-67
Parts List

GENERAL ELECTRIC CO.

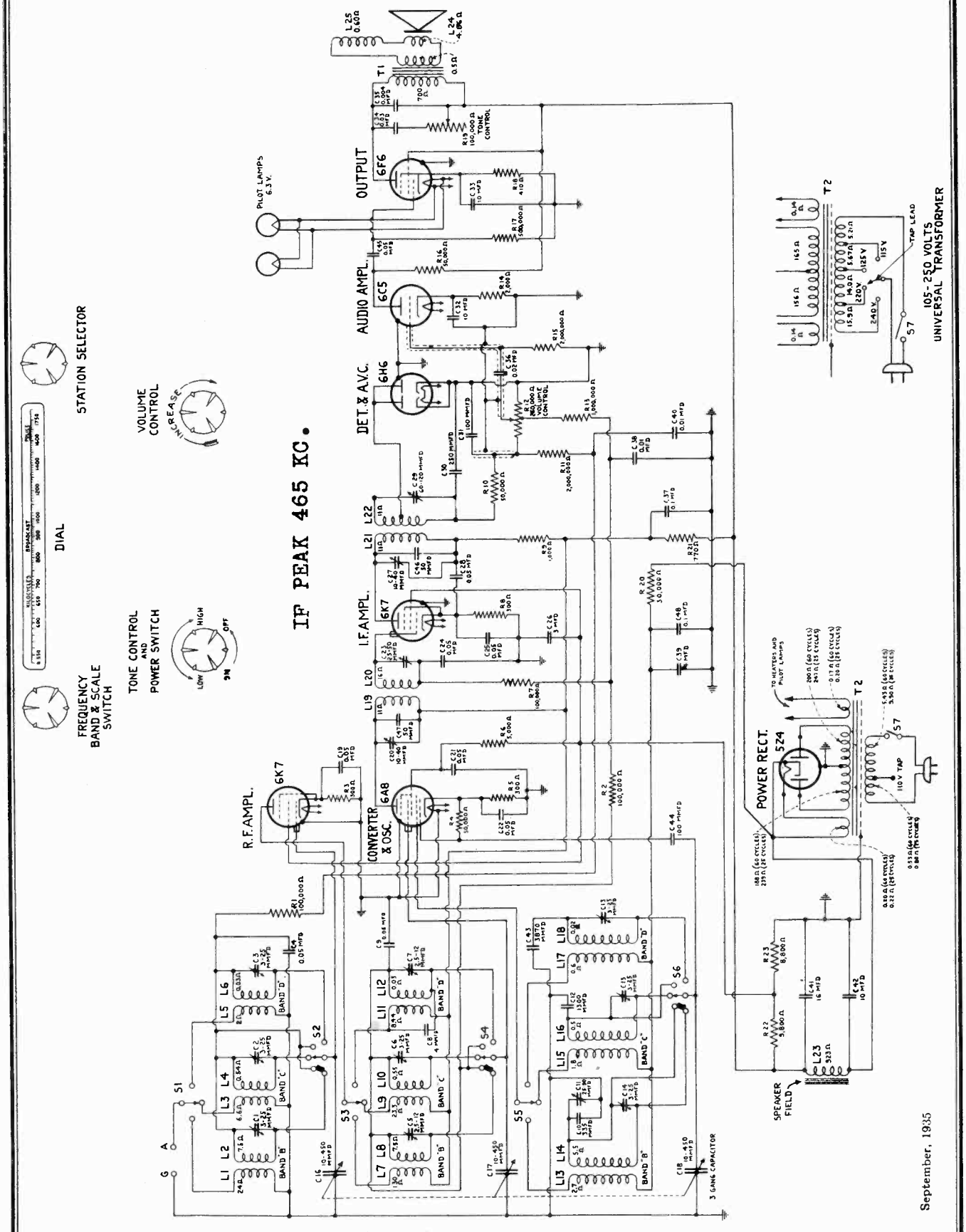
REPLACEMENT PARTS

Insist on genuine factory-tested parts, which may be purchased from authorized dealers

Stock No.	Description	List Price
	RECEIVER ASSEMBLIES	
RB-001	BOARD—Antenna Terminal Board	$0.10
RB-009	BOARD—Terminal Board (Single Terminal)	.15
RB-015	BOARD—Terminal Board (Triple Terminal)	.15
RB-016	BOARD—Terminal Board (For 6J7 Grid Lead)	.10
RB-116	BRACKET—R. H. Front Bracket Assembly	.25
RB-119	BRACKET—L. H. Front Bracket Assembly	.25
RB-200	BRACE—Dial Opening Brace (Model A-64)	.30
RC-029	CAPACITOR—.005 mfd., 400 volts (C-38) Paper Dielectric	.30
RC-046	CAPACITOR—.02 mfd., 200 volts (C-30) Paper Dielectric	.25
RC-072	CAPACITOR—.05 mfd., 200 volts (C-6, C-8, C-20, C-39) Paper Dielectric	.25
RC-083	CAPACITOR—.03 mfd., 400 volts (C-35) Paper Dielectric	.25
RC-091	CAPACITOR—.05 mfd., 400 volts (C-12, C-15, C-23, C-26) Paper Dielectric	.30
RC-096	CAPACITOR—.1 mfd., 200 volts (C-21, C-22) Paper Dielectric	.30
RC-210	CAPACITOR—50 mfd., (C-5) Mica Dielectric	.25
RC-235	CAPACITOR—100 mmfd., (C-34) Mica Dielectric	.25
RC-289	CAPACITOR—400 mmfd., (C-40) Mica Dielectric	.25
RC-352	CAPACITOR—2900 mmfd., (C-11) Mica Dielectric	.40
RC-404	CAPACITOR—10 mfd., 400 volts (C-14) Wet Electrolytic	1.10
RC-407	CAPACITOR—16 mfd., 380 volts (C-33) Wet Electrolytic	1.15
RC-501	CAPACITOR—One 10 mfd., 25 volts (C-37); One 4 mfd., 450 volts (C-13) Dry Electrolytic Pack	1.30
RC-502	CAPACITOR—One 4 mfd., 450 volts (C-36); One 3 mfd., 150 volts (C-32) Dry Electrolytic Pack	1.40
RC-504	CAPACITOR—10 mfd., 25 volts (C-31) Dry Electrolytic	.70
RC-600	CAPACITOR—10-90 mmfd. Trimmer Capacitor (C-7)	.50
RC-704	CONDENSER—Two-gang Tuning Condenser (C-3, C-4)	3.25
RC-804	CABLE—Loud-speaker Cable	.60
RC-853	CORD—Power Cord with Plug	.50
RE-005	ESCUTCHEON—Dial Escutcheon	.80
RF-006	FOOT—Mounting Foot Assembly	.30
RG-001	GRID CAP—Grid Connection Cap, Pkg. of 5	.10
RI-003	INSULATOR—Escutcheon Shaft Insulating Bushing, Pkg. of 10	.40
RK-001	KNOB—Tuning, Volume, Tone Control or Band Switch Knob, Pkg. of 5	.50
RL-108	COIL—R.F. Coil (C-1, C-2, L-1, L-2, L-3, L-4)	2.10
RL-209	COIL—Oscillator Coil (C-9, C-10, L-5, L-6, L-7, L-8, R-21)	1.95
RN-001	NUT—Escutcheon Mounting Nut, Pkg. of 10	.45
RP-014	PLATE—Escutcheon Mounting Plate, Pkg. of 2	.25
RR-017	RESISTOR—6000 ohms, ¼ watt (R-15) Carbon Resistor, Pkg. of 5	.60
RR-021	RESISTOR—10,000 ohms, ¼ watt (R-4) Carbon Resistor, Pkg. of 5	.60
RR-025	RESISTOR—20,000 ohms, ¼ watt (R-18) Carbon Resistor, Pkg. of 5	.60
RR-035	RESISTOR—50,000 ohms, ¼ watt (R-1) Carbon Resistor, Pkg. of 5	.70
RR-065	RESISTOR—500,000 ohms, ¼ watt (R-16, R-17) Carbon Resistor, Pkg. of 5	.65
RR-067	RESISTOR—1,000,000 ohms, ¼ watt (R-6, R-11, R-14) Carbon Resistor, Pkg. of 5	.70
RR-100	RESISTOR—5,000 ohms, 1-3 watt (R-10, R-21) Carbon Resistor, Pkg. of 5	.60
RR-281	RESISTOR—40,000 ohms, 2 watts (R-3) Carbon Resistor	.30
RR-324	RESISTOR—300 ohms, ⅜ watt (R-2) Flexible Resistor, Pkg. of 5	.60
RR-336	RESISTOR—400 ohms, ⅜ watt (R-5) Flexible Resistor, Pkg. of 5	.65
RR-339	RESISTOR—450 ohms, 1 watt (R-19) Flexible Resistor, Pkg. of 5	$0.70
RR-703	RESISTOR—Tapped Resistor (R-7, R-8, R-9)	.60
RS-102	SHIELD—Second I. F. Transformer Shield	.30
RS-113	SHIELD—R. F. Coil Shield	.30
RS-120	SHIELD—First I. F. Transformer Shield	.30
RS-121	SHIELD—Oscillator Coil Shield	.20
RS-200	SOCKET—Eight-pin Tube Socket, Pkg. of 5	.75
RS-204	SOCKET—Five-pin Tube Socket (5Z4), Pkg. of 5	.75
RS-305	SWITCH—Frequency Band Switch with Mounting Nut (S-1, S-2, S-3, S-4)	1.30
RS-605	SUPPORT—Dial Mechanism Support Post	.20
RT-064	TRANSFORMER—Power Transformer (T-1) 50-60 cycles, 105-120 volts (Rating "A")	5.65
RT-065	TRANSFORMER—Power Transformer (T-1) 25-60 cycles, 105-130 volts (Rating "C")	8.50
RT-066	TRANSFORMER—Power Transformer (T-1) 40-60 cycles, 105-130, 200-250 volts (Rating "V")	7.05
RT-211	TRANSFORMER—First I. F. Transformer (C-16, C-17, C-18, C-19, L-9, L-10)	1.95
RT-212	TRANSFORMER—Second I. F. Transformer (C-24, C-25, C-27, C-28, C-29, L-11, L-12, R-12)	2.35
RT-704	TONE CONTROL—Rheostat 10,000 ohms (R-20) and Power Switch (S-5)	1.60
RV-006	VOLUME CONTROL—Potentiometer 250-, 000 ohms (R-13)	.95
RW-002	WINDOW—Dial Window	.15
RX-003	CUSHION ASSEMBLY—Tuning Condenser Mounting Nuts, Washers and Cushions	.15
RX-004	SCREW ASSEMBLY—Chassis Mounting Screws and Washers	.10
	SPEAKER ASSEMBLY A-64	
RC-900	CONE—Eight-inch Speaker Cone and Cone Coil (L-13)	1.00
RP-009	PLUG—Speaker Male Plug Connector	.20
RP-012	PLUG—Speaker Female Plug Connector	.20
RS-008	SPEAKER—Eight-inch Loud-speaker Complete with Output Transformer	10.50
RT-405	TRANSFORMER—Output Transformer (T-2)	1.70
	SPEAKER ASSEMBLY A-67	
RC-901	CONE—10¼-in. Speaker Cone and Cone Coil (L-13)	1.45
RP-009	PLUG—Speaker Male Plug Connector	.20
RP-012	PLUG—Speaker Female Plug Connector	.20
RS-006	SPEAKER—10¼-in. Loud-speaker Complete with Output Transformer	12.75
RT-405	TRANSFORMER—Output Transformer	1.70
	DIAL MECHANISM (See Fig. 5)	
RB-117	BRACKET—Dual Lamp Bracket	.25
RC-805	CABLE—Drive Cable, Pkg. of 5	.80
RC-856	CORD—Drive Cord, Pkg. of 5	.65
RC-954	CAP—Scale Cap Assembly (Gear End) (24)	.10
RC-955	CAP—Scale Cap Assembly (Drive End) (25)	.10
RC-958	CUSHION—Rubber Dial Mounting Cushion, Pkg. of 2	.10
RD-011	DIAL—Dial Mechanism Complete	2.50
RD-006	DRIVE—"Automatic Vernier" Reduction Drive	1.00
RD-013	DRUM—Drive Drum Assembly	.35
RD-014	DIAL—Dial Scale	.75
RF-200	FASTENER—Dial Fastener (39), Pkg. of 10	.10
RG-002	GEAR—Dial Gear Assembly (7)	.15
RG-200	GUIDE—Dial Pointer Guide (48), Pkg. of 5	.15
RP-003	POINTER—Dial Pointer (9), Pkg. of 2	.15
RP-004	PULLEY—Drive Cord Idler Pulley, Pkg. of 2	.10
RP-005	PLATE—Dial Mounting Plate Assembled Complete	.50
RS-401	SPRING—Drum Spring (12), Pkg. of 2	.20
RS-403	SPRING—Dial Spring (11), Pkg. of 2	.10
RS-900	SHAFT—Shaft and Gear Assembly (6)	.15
RT-800	TOGGLE—Toggle Assembly	.25

MODELS A-70, A-75
Schematic

GENERAL ELECTRIC CO.



September, 1935

MODELS A-70,A-75
Chassis Wiring

GENERAL ELECTRIC CO.

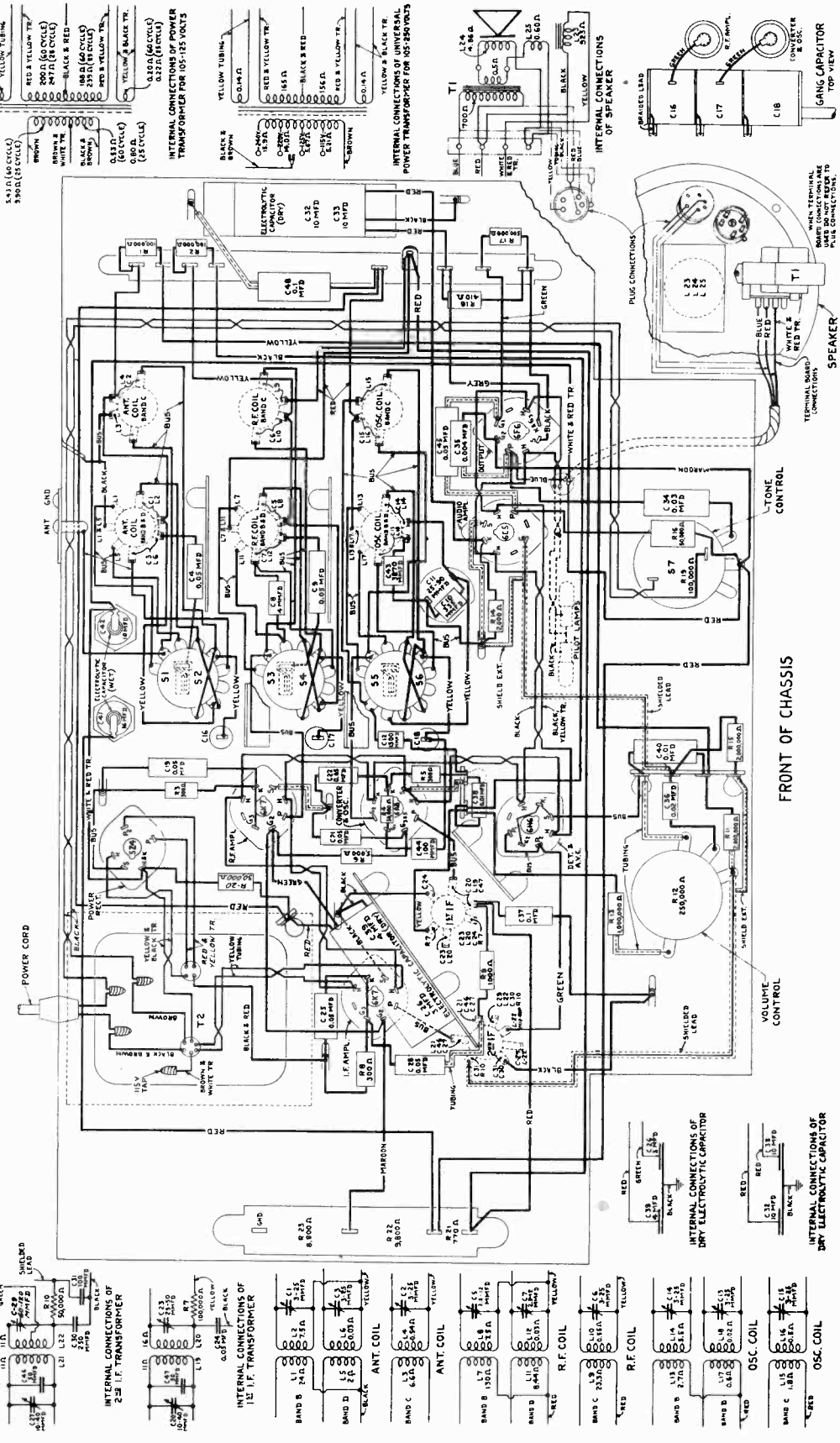


Fig. 3. Chassis Wiring Diagram

ALIGNMENT PROCEDURE

The receiver should first be allowed to run for fifteen minutes in order to reach its approximate normal operating temperature. Before making any adjustments, it is wise to determine the correctness of the existing alignment. This may be done by supplying a signal at the alignment frequency from the test oscillator to the receiver and inserting a "Tuning Wand" into the coil involved. The "Tuning Wand" consists of a bakelite rod having a brass cylinder attached to one end, and a small core of finely divided iron compacted into the opposite end. By inserting the brass cylinder end into the center of a particular coil, through the opening provided in the top of the shield, the inductance of the coil is lowered, increasing its resonant frequency. Inserting the iron-filled end into the coil raises its inductance, lowering its resonant frequency. If the circuits are in exact alignment, inserting either end of the tuning wand in any coil will result in a decrease in output. When an increase in signal is obtained with the iron-filled end of the wand, a decrease in resonant frequency of that circuit by increasing its trimmer capacity is indicated. When an increase in signal is obtained with the brass cylinder, a decrease in trimmer capacity is indicated.

Changes Indicated by Wand		Trimmer Adjustment Required
Wand	Signal	
Brass cylinder	Decrease	None
Iron filings	Decrease	
Brass cylinder	Increase	Decrease capacity
Iron filings	Decrease	
Brass cylinder	Decrease	Increase capacity
Iron filings	Increase	

Fig. 4 shows the location of the antenna, R. F. and oscillator coils for each of the three frequency bands of Model A-70 and A-75 receivers.

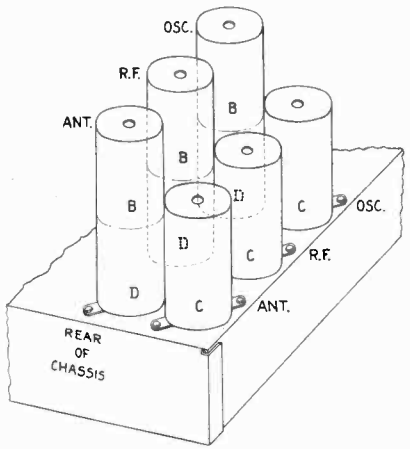


Fig. 4. Coil Locations

ALIGNMENT FREQUENCIES

I. F.	Band "B"	Band "C"	Band "D"
465 kc.	580 kc. 1740 kc.	6000 kc.	18,000 kc.

In order to align these receivers properly, it is necessary to have available the following test equipment:

1. A modulated test oscillator with frequencies available of 465, 580, 1740, 6000, and 18,000 kc.
2. An output indicator, such as a high resistance a-c. voltmeter with a maximum scale reading of 3 to 5 volts, or a neon lamp output indicator.
3. An alignment tool consisting of an insulating shaft with a small screwdriver blade.
4. A tuning wand.

The location of all trimmer capacitors, as well as socket voltages to chassis, is shown in Fig. 5.

1. I. F. Alignment

Set the frequency band switch of the receiver to Band "B," short-circuit the antenna and ground terminals and tune the receiver at some point above 1500 kc. so that no signal is heard. Set the volume control at its maximum position and ground the chassis.

The I. F. amplifier is tuned to 465 kc.; set the test oscillator dial at this frequency. Connect the test oscillator output between the converter tube (6A8) control grid and chassis. Connect the output meter across the cone coil of the speaker and adjust the test oscillator output control so that, with the receiver volume control at maximum, a small deflection is observed in the output meter. During both I. F. and R. F. alignment, the test oscillator signal should be maintained at the lowest level that will give a good readable output indication.

Adjust the secondary trimmer of the second I. F. transformer until a maximum output reading is obtained. Maintain a small deflection on the output meter throughout alignment by adjusting the test oscillator output. Next, adjust the primary trimmer of the second I. F. transformer for maximum output. Continue this procedure, adjusting the secondary trimmer of the first I. F. transformer and lastly the primary trimmer of the first I. F. transformer. After completing this procedure, repeat it a second time for final alignment. The I. F. alignment will then be complete.

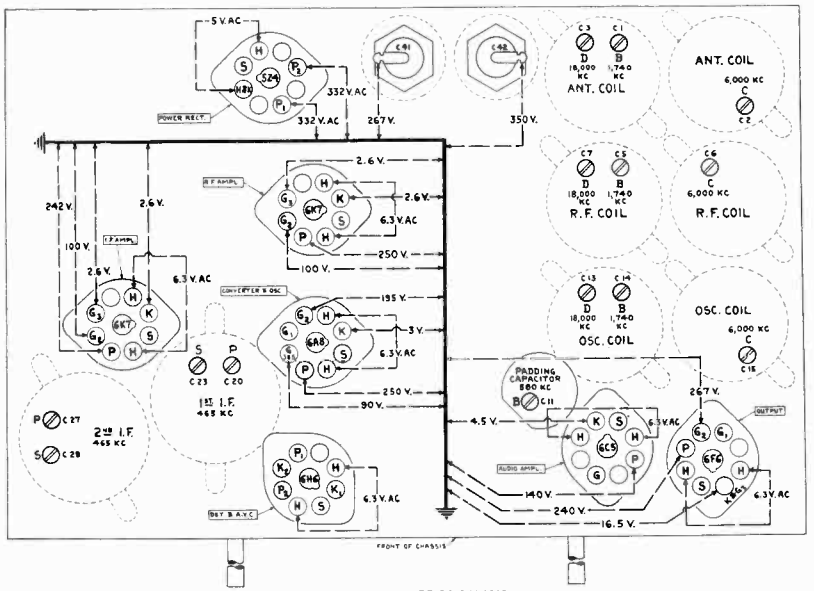
2. R. F. Alignment

Band "B" requires four trimmer adjustments, while Band "C" and Band "D" each require three adjustments. Care should be taken to adjust only the trimmers of the band under test. Check the position of the dial pointer as outlined in the section on adjustment of the dial mechanism. Make sure the antenna and ground terminals of the receiver are not short-circuited and connect to them the output from the test oscillator, preferably using a dummy antenna of 250 mmfd. in series with 200 ohms between the test oscillator and receiver antenna terminal. Connect the output indicator across the speaker cone coil.

Band "B"—540–1740 kc.

Set the frequency band switch to the position where the dial indicates the above range. Tune the test oscillator to 1740 kc. and set the dial pointer on the receiver to this frequency. Adjust the Band "B" oscillator trimmer for maximum output, keeping the receiver volume control at its extreme clockwise position and adjusting the test oscillator output to maintain a small reading on the output indicator. When optimum adjustment on the Band "B" oscillator trimmer is obtained, adjust the Band "B" R. F. and antenna trimmers for maximum output.

Now tune the test oscillator to 580 kc. and set the receiver to that frequency. Slowly rocking the tuning condenser back and forth through the signal, adjust the 580-kc. padding capacitor for maximum output. When this has been done, return to 1740 kc. on the receiver and test oscillator and recheck the alignment for maximum output. Band "B" should now be in alignment.



VIEWED FROM UNDERSIDE OF CHASSIS

Fig. 5. Trimmer Locations and Socket Voltages

Band "C"—1.75–6.0 mc. (1750–6000 kc.)

Set the band switch to the position where the dial indicates the above range. Tune the test oscillator to 6000 kc. and set the dial pointer on the receiver to this frequency. Adjust the Band "C" oscillator trimmer for maximum output, using the first peak obtained when increasing the capacitance from minimum to maximum.

Check for the image signal which should be received at about 5070 kc. on the receiver dial. It should be necessary to increase input to the receiver from the test oscillator for this check. Retune the receiver to the correct scale reading (6000 kc.) and reduce the test oscillator output to its previous value. Then adjust the Band "C" R. F. and antenna trimmers for maximum output.

Band "D"—6.0–19.5 mc. (6000–19,500 kc.)

Set the band switch to the position where the dial indicates the above range. Tune the test oscillator to 18,000 kc. and set the dial pointer on the receiver to this frequency. Adjust the Band "D" oscillator trimmer for maximum output, using the first peak obtained when increasing the capacitance from minimum to maximum.

Check for the image signal which should be received at about 17070 on the receiver dial. It may be necessary to increase input to the receiver from the test oscillator for this check. Retune the receiver to the correct scale reading (18,000 kc.) and reduce the test oscillator output to its previous value.

Reduce the capacitance of the R. F. trimmer to a minimum. While slowly rocking the tuning condenser through the 18,000-kc. point, increase the Band "D" R. F. trimmer capacitance until a maximum response point is obtained. The Band "D" antenna trimmer should next be peaked. It is not necessary to rock the tuning condenser while making this last adjustment.

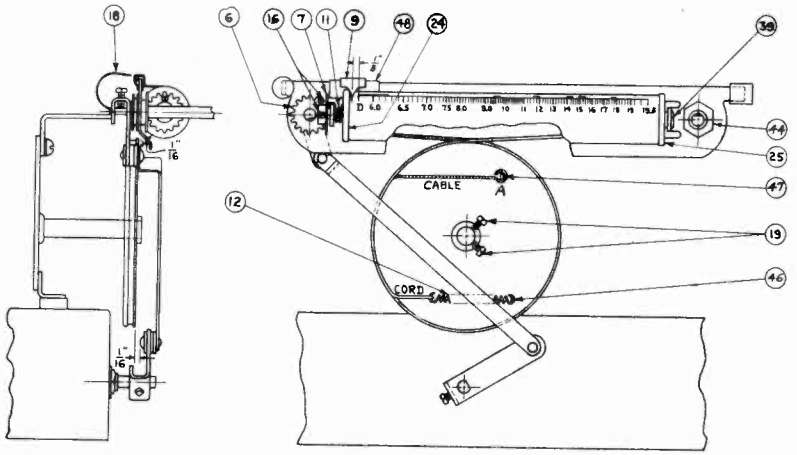


Fig. 6. Dial Mechanism

Adjustment of Dial Mechanism

The dial mechanism is rigidly mounted to the frame of the tuning condenser by means of two removable screws, the complete assembly being rubber-mounted by means of rubber cushions and bushings at points of support. The dial pointer, station selector knob, and tuning condenser drive drum are interconnected by means of the drive cord and drive cable; the frequency band switch, the cylindrical dial scale and switch knob, by gear and toggle assemblies.

1. Position of Drum on Condenser Shaft

With set screws (19) loosened and tuning condenser plates fully engaged, place the drum in the position as shown in Fig. 6 so that drum spring (12) is approximately horizontal, and the top rim of the drum is $\frac{1}{16}$ in. away from the mounting plate. Guide (48) should stop at equal distances from each end of the mounting plate slot.

2. Removing and Replacing Scale

Pry out fastener (39), and remove the scale by lowering that end below the ear and taking the scale out of cap assembly (24), holding parts (24), (11), and (7) in place. Replace, locating tabs of caps (24) and (25) in slots of scale. Replace fastener (39).

3. Locating Scale

Loosen the two gear set screws (16). Rotate the scale upward until there is slight tension on spring (11) with the pointer indicating on the Band "D" scale. With the frequency band switch in the Band "D" position, place gear (7) in mesh with the gear on part (6) and tighten the two set screws (16).

4. Replacing Drive Cord

The position of the dial scale pointer with respect to the tuning condenser drum is held fixed by means of a special metal braid cable connecting the drum with the guide (48). Tension is maintained on the cable through the drum spring (12) and drive cord. To replace either the drive cable or the drive cord, remove the dial scale for convenient access to guide (48). Unhook spring (12) from tab (46) to release tension. Unhook the cable or cord from guide (48) and unwind from the pulleys and drum. To replace the cable rethread to agree with Fig. 6, and rehook drum spring (12) as shown.

5. Replacing Reduction Drive

To replace the reduction drive, unhook spring (12), loosening the drive cord. Unscrew palnut (44) and remove drive. Replace with new drive and rehook drive cord.

6. Replacing Toggle Assembly

Loosen the two set screws holding the toggle mechanism on the band change switch and on shaft (6). Replace with new assembly, setting lower lever arm $\frac{1}{16}$ in. away from the condenser drive drum as shown in Fig. 6, and tighten set screw on frequency band switch shaft. Rotate shaft (6) clockwise until there is slight tension on spring (11) with the scale in the Band "D" position. Place upper lever arm in shaft and tighten set screw.

7. Setting Scale Pointer

The scale pointer is soldered to the slider. To set the pointer mechanically, turn the tuning condenser rotor so that the plates are fully engaged, and solder the pointer to indicate $\frac{1}{8}$ in. to the left of the extreme left-hand line on the Band "D" scale as shown in Fig. 6.

8. Replacing Dial Lamp

Take hold of terminals of lamp bracket and push up until lamps protrude above the opening in reflector (18). Lamps may then be replaced in socket clips. After replacing lamps, slide the socket mounting bracket back into the mounting clip.

SERVICE DATA

Physical Specifications

	A-70	A-75
Model		
Height	$20\frac{3}{8}$ in.	$40\frac{3}{8}$ in.
Width	$14\frac{3}{4}$ in.	$23\frac{3}{8}$ in.
Depth	$11\frac{1}{16}$ in. (Knobs project beyond)	$11\frac{1}{2}$ in. (Knobs project beyond)
Weight packed	34 lb.	68 lb.

Electrical Specifications

Rating Label	Power Supply (Volts)	Frequency (Cycles)	Power Consumption (Watts)
A	105–130	50–60	100
C	105–130	25–60	105
V	105–130 and 200–250	40–60	105

NOTE: Taps on universal transformers (Rating "V") are accessible by removing the cap cover mounted on the top of the transformer. Schematic and wiring diagrams of the universal transformer are shown in Fig. 2 and 3, respectively.

Tuning Frequency Range

Band "B"	540–1750 kc.
Band "C"	1.75–6.0 mc. (1750–6000 kc.)
Band "D"	6.0–19.5 mc. (6000–19,500 kc.)

Tuning Control Drive Ratio

Fast Tuning	$5\frac{1}{2}$ to 1
Vernier Tuning	55 to 1

Electrical Power Output

Undistorted	2.0 watts
Maximum	3.0 watts

Loud-speaker—Electrodynamic

Cone: Model A-70	8 in. overall, 7 in. effective diameter
Model A-75	$10\frac{1}{4}$ in. overall, $9\frac{1}{4}$ in. effective diameter

Cone Coil Impedance: 5 ohms at 400 cycles

Tubes

R. F. Amphfier	6K7 Triple-grid Super-control Amplifier
Converter and Oscillator	6A8 Pentagrid Converter
I. F. Amplifier	6K7 Triple-grid Super-control Amplifier
Detector and AVC	6H6 Twin Diode
Audio Amplifier	6C5 Detector Amplifier Triode
Output	6F6 Power Amplifier Pentode
Power Rectifier	5Z4 Full-wave Rectifier
Dial Lamps	MAZDA No. 46

DESCRIPTION OF ELECTRICAL CIRCUIT

Models A-70 and A-75 employ seven metal envelope tubes to perform the above functions in a superheterodyne circuit, giving the excellent selectivity and sensitivity inherent in this type circuit. Separate groups of coils are used for each frequency band. Ample undistorted output is obtained through diode detection and two audio amplifier stages.

The signal from the antenna is applied to the control grid of the 6K7 R. F. amplifier tube through the antenna coil, the secondary of which is tuned to the incoming signal by the rear section of the main tuning condenser. The secondary of the coil for the band next lower in frequency to the one in use is short-circuited by the band switch to prevent absorption of energy at its resonant frequency which falls in the next higher band.

The amplified radio frequency signal is impressed on the control grid of the 6A8 converter and oscillator tube through the R. F. coil, the secondary of which is tuned to the signal frequency by the center section of the main tuning condenser. In the 6A8 tube the incoming signal is combined with the local oscillator signal which is 465 kc. higher in frequency. The local signal is generated by the oscillator elements of this tube and the proper frequency difference is maintained throughout the tuning range by the front section of the main tuning condenser in conjunction with the oscillator coil and padding capacitors. The oscillator section of the main tuning condenser, although of the same capacity as the other two sections, is larger physically to permit wider spacing of the plates, thereby reducing the possibility of microphonic feedback howl.

The combination of the signal frequency with the local oscillator frequency in the converter tube produces the intermediate frequency of 465 kilocycles. This particular intermediate frequency is chosen to reduce image response and improve short-wave performance. The intermediate frequency amplifier consists of a 6K7 tube and two transformers, each with two tuned circuits.

The output of the I. F. amplifier is applied to the 6H6 diode rectifier, which is a combined detector and automatic volume control tube. The direct current component of the rectified signal produces a voltage drop across R-12. This voltage drop provides automatic bias for the R. F. and I. F. amplifier and converter tubes and so gives automatic volume control action. Full automatic bias voltage is applied to the R. F. amplifier tube, while half this voltage, from the midtap of R-12, is applied to the converter tube and I. F. amplifier, which handle a somewhat larger signal voltage than the R. F. amplifier.

The manual volume control selects the amount of audio signal applied through coupling capacitor C-36 to the grid of the 6C5 audio amplifier tube, and this regulates the output of the receiver. The output of the 6C5 tube is resistance coupled to the grid of the 6F6 power amplifier pentode. The plate circuit of the 6F6 is suitably matched to the loud-speaker by means of a step-down output transformer.

The tone control circuit consists of a .03-mfd. capacitor connected in series with a continuously variable 0-100,000-ohm resistance across the primary of the output transformer. When it is desired to reduce the high frequency output of the receiver, resistance is cut out of the circuit by operating the tone control knob.

Plate and grid voltages for all tubes are supplied by the power supply system employing a 5Z4 full-wave rectifier tube which, together with a suitable network of resistors and capacitors, supplies the required voltages and filtering action.

SOCKET VOLTAGES

Tube No.		Cathode to Ground Volts D.C.	Screen Grid to Ground Volts D.C.	Plate to Ground Volts D.C.	Cathode Current M.A.	Heater Volts A.C.
6K7 R. F.		2.6	100	250	8.7	6.3
6A8	Oscillator	...	...	195	10.0	6.3
	First Detector	3.0	90	250		
6K7 I. F.		2.6	100	242	8.7	6.3
6H6 Second Detector		...	...	...	...	6.3
6C5 1st A. F.		4.5	...	140	2.2	6.3
6F6 A. F. Power		16.5	267	240	42.5	6.3
5Z4 Power Rectifier		...	...	664/332 R.M.S.	85.0	5.0

Measured at 125 volts supply. No signal input. Volume control maximum. Voltmeter 1000 ohms per volt: measurements taken on highest scale giving accurate readable deflection.

REPLACEMENT PARTS

Insist on genuine factory-tested parts, which may be purchased from authorized dealers

Stock No.	Description	List Price
	RECEIVER ASSEMBLIES	
RB-001	BOARD—Antenna Terminal Board	$0.10
RB-005	BOARD—Terminal Board (Supports C-38, R-5)	.10
RB-006	BOARD—Terminal Board (Supports C-36, C-40, R-11, R-15)	.15
RB-017	BOARD—Terminal Board (Supports R-20)	.10
RB-118	BRACKET—Dial Mechanism Support Bracket	.20
RB-200	BRACE—Dial Opening Brace (Model A-70)	.30
RC-022	CAPACITOR—.004 mfd., 400 volts (C-35) Paper Dielectric	.25
RC-034	CAPACITOR—.01 mfd., 200 volts (C-38, C-40) Paper Dielectric	.25
RC-046	CAPACITOR—.02 mfd., 200 volts (C-36) Paper Dielectric	.25
RC-072	CAPACITOR—.05 mfd., 200 volts (C-4, C-19, C-21, C-22, C-25) Paper Dielectric	.25
RC-083	CAPACITOR—.03 mfd., 400 volts (C-34) Paper Dielectric	.25
RC-091	CAPACITOR—.05 mfd., 400 volts (C-29, C-45) Paper Dielectric	.30
RC-123	CAPACITOR—.1 mfd., 400 volts (C-37) Paper Dielectric	.35
RC-202	CAPACITOR—4 mmfd., (C-8) Mica Dielectric	.25
RC-235	CAPACITOR—100 mmfd., (C-44) Mica Dielectric	.25
RC-277	CAPACITOR—335 mmfd., (C-10) Mica Dielectric	.25
RC-344	CAPACITOR—1300 mmfd., (C-12) Mica Dielectric	.35
RC-361	CAPACITOR—3870 mmfd., (C-43) Mica Dielectric	.50
RC-404	CAPACITOR—10 mfd., 440 volts (C-42) Wet Electrolytic	1.10
RC-407	CAPACITOR—16 mfd., 380 volts (C-41) Wet Electrolytic	1.15
RC-502	CAPACITOR—One 4 mfd., 450 volts (C-39); One 3 mfd., 150 volts (C-26) Dry Electrolytic	1.40
RC-503	CAPACITOR—One 10 mfd., 25 volts (C-32); One 10 mfd., 25 volts (C-33) Dry Electrolytic	$1.10
RC-601	CAPACITOR—Trimmer Capacitor, 25-90 mmfd. (C-11)	.40
RC-701	CONDENSER—Three-gang Tuning Condenser (C-16, C-17, C-18)	4.25
RC-854	CORD—Power Cord with Plug	.60
RE-005	ESCUTCHEON—Dial Escutcheon	.80
RF-002	FOOT—Mounting Foot Assembly	.20
RG-001	GRID CAP—Grid Connection Cap, Pkg. of 5	.10
RI-003	INSULATOR—Escutcheon Shaft Insulating Bushing, Pkg. of 10	.40
RK-001	KNOB—Tuning, Volume, Tone Control or Band Switch Knob, Pkg. of 5	.50
RL-001	COIL—Antenna Coil, Bands B and D (C-1, C-3, L-1, L-2, L-5, L-6)	2.25
RL-002	COIL—Antenna Coil, Band C (C-2, L-3, L-4)	1.60
RL-101	COIL—R. F. Coil, Bands B and D (C-5, C-7, L-7, L-8, L-11, L-12)	2.50
RL-102	COIL—R. F. Coil, Band C (C-6, L-9, L-10)	1.60
RL-201	COIL—Oscillator Coil, Bands B and D (C-13, C-14, L-13, L-14, L-17, L-18)	2.10
RL-202	COIL—Oscillator Coil, Band C (C-15, L-15, L-16)	1.70
RN-001	NUT—Escutcheon Mounting Nut, Pkg. of 10	.45
RP-014	PLATE—Escutcheon Mounting Plate, Pkg. of 2	.25
RR-006	RESISTOR—300 ohms, ¼ watt (R-3, R-5, R-8) Carbon Resistor, Pkg. of 5	.70
RR-013	RESISTOR—2000 ohms, ¼ watt (R-14) Carbon Resistor, Pkg. of 5	70
RR-014	RESISTOR—1000 ohms, ¼ watt (R-9) Carbon Resistor, Pkg. of 5	.70
RR-016	RESISTOR—5000 ohms, ¼ watt (R-6) Carbon Resistor, Pkg. of 5	.70
RR-035	RESISTOR—50,000 ohms, ¼ watt (R-4) Carbon Resistor, Pkg. of 5	.70
RR-049	RESISTOR—100,000 ohms, ¼ watt (R-1, R-2) Carbon Resistor, Pkg. of 5	.70
RR-064	RESISTOR—500,000 ohms, ¼ watt (R-17) Carbon Resistor, Pkg. of 5	$0.60
RR-067	RESISTOR—1,000,000 ohms, ¼ watt (R-13) Carbon Resistor, Pkg. of 5	.70
RR-068	RESISTOR—2,000,000 ohms, ¼ watt (R-11, R-15) Carbon Resistor, Pkg. of 5	.60
RR-192	RESISTOR—50,000 ohms, ½ watt (R-16) Carbon Resistor, Pkg. of 5	.70
RR-211	RESISTOR—410 ohms, 1 watt (R-18) Carbon Resistor, Pkg. of 5	1.10
RR-241	RESISTOR—30,000 ohms, 1 watt (R-20) Carbon Resistor, Pkg. of 5	.85
RR-700	RESISTOR—Candohm Resistor (R-21, R-22, R-23)	1.00
RS-103	SHIELD—Antenna or R. F. Coil Shield, Band C	.20
RS-104	SHIELD—Antenna or R. F. Coil Shield, Bands B and D	.25
RS-105	SHIELD—First I. F. Transformer Shield	.30
RS-117	SHIELD—Second I. F. Transformer Shield	.35
RS-118	SHIELD—Oscillator Coil Shield, Band C	.20
RS-119	SHIELD—Oscillator Coil Shield, Bands B and D	.25
RS-150	SHIELD—R. F. Shield (Short)	.10
RS-151	SHIELD—R. F. Shield (Beneath I. F. Transformer)	.15
RS-152	SHIELD—R. F. Shield (Long)	.15
RS-154	SHIELD—R. F. Shield (Beneath 6H6 Tube)	.15
RS-200	SOCKET—Eight-pin Tube Socket, Pkg. of 5	.75
RS-204	SOCKET—Five-pin Tube Socket (5Z4) Pkg. of 5	.75
RS-302	SWITCH—Frequency Band Switch with Mounting Nut (S-1, S-2, S-3, S-4, S-5, S-6)	3.25
RS-700	STRIP—Terminal Strip	.50
RT-071	TRANSFORMER—Power Transformer (T-2) 50-60 cycles, 105-130 volts (Rating "A")	5.75
RT-072	TRANSFORMER—Power Transformer (T-2) 25-60 cycles, 105-130 volts (Rating "C")	8.75
RT-073	TRANSFORMER—Power Transformer (T-2) 40-60 cycles, 105-130, 200-250 Volts (Rating "V")	7.25
RT-202	TRANSFORMER—First I. F. Transformer (C-20, C-23, C-24, C-47, L-19, L-20, R-7)	2.50
RT-203	TRANSFORMER—Second I. F. Transformer (C-27, C-29, C-30, C-31, L-21, L-22, R-10)	2.50
RT-700	TONE CONTROL—Potentiometer, 100,000 ohms, (R-19) and Power Switch (S-7)	.90
RV-002	VOLUME CONTROL—Potentiometer, 250,000 ohms (R-12)	1.15
RW-002	WINDOW—Dial Window	.15
RX-003	CUSHION ASSEMBLY—Tuning Condenser Mounting Nuts, Washers and Cushions	.15
RX-004	SCREW ASSEMBLY—Chassis Mounting Screws and Washers	.10
	SPEAKER ASSEMBLY A-70	
RC-900	CONE—Speaker Cone and Cone Coil (L-24)	$1.00
RP-009	PLUG—Speaker Male Plug Connector	.20
RP-012	PLUG—Speaker Female Plug Connector	.20
RS-009	SPEAKER—Eight-inch Loud-speaker Complete with Output Transformer-speaker Plug Type	9.15
RS-011	SPEAKER—Eight-inch Loud-speaker Complete with Output Transformer—Terminal Strip Type	9.00
RT-402	TRANSFORMER—Output Transformer (T-1) Terminal Strip Type	1.60
RT-405	TRANSFORMER—Output Transformer (T-1) Speaker Plug Type	1.70
	SPEAKER ASSEMBLY A-75	
RC-901	CONE—Speaker Cone and Cone Coil (L-24)	1.45
RP-009	PLUG—Speaker Male Plug Connector	.20
RP-012	PLUG—Speaker Female Plug Connector	.20
RS-018	SPEAKER—10¼-inch Loud-speaker Complete with Output Transformer—Terminal Strip Type	11.50
RS-019	SPEAKER—10¼-inch Loud-speaker Complete with Output Transformer—Speaker Plug Type	11.65
RT-402	TRANSFORMER—Output Transformer (T-1) Terminal Strip Type	1.60
RT-405	TRANSFORMER—Output Transformer (T-1) Speaker Plug Type	1.70
	DIAL MECHANISM	
RB-117	BRACKET—Dual Lamp Bracket	.25
RC-805	CABLE—Drive Cable, Pkg. of 5	.80
RC-856	CORD—Drive Cord, Pkg. of 5	.65
RC-954	CAP—Scale Cap Assembly (Gear End)	.10
RC-955	CAP—Scale Cap (Drive End)	.10
RC-958	CUSHION—Rubber Dial Mounting Cushion, Pkg. of 2	.10
RD-002	DIAL—Dial Mechanism Complete	2.75
RD-006	DRIVE—"Automatic Vernier" Reduction Drive	1.00
RD-013	DRUM—Drive Drum Assembly	.35
RD-015	DIAL—Dial Scale	.75
RP-200	FASTENER—Dial Fastener, Pkg. of 10	.10
RG-002	GEAR—Dial Gear Assembly	.15
RG-200	GUIDE—Dial Pointer Guide, Pkg. of 5	.15
RP-003	POINTER—Dial Pointer, Pkg. of 2	.15
RP-004	PULLEY—Drive Cord Idler Pulley, Pkg. of 2	.10
RP-006	PLATE—Dial Mounting Plate assembled complete	.50
RS-401	SPRING—Drum Spring, Pkg. of 2	.20
RS-403	SPRING—Dial Spring, Pkg. of 2	.10
RS-900	SHAFT—Shaft and Gear Assembly	.15
RT-801	TOGGLE—Toggle Assembly	.25

MODELS A-82, A-87
Schematic

GENERAL ELECTRIC CO.

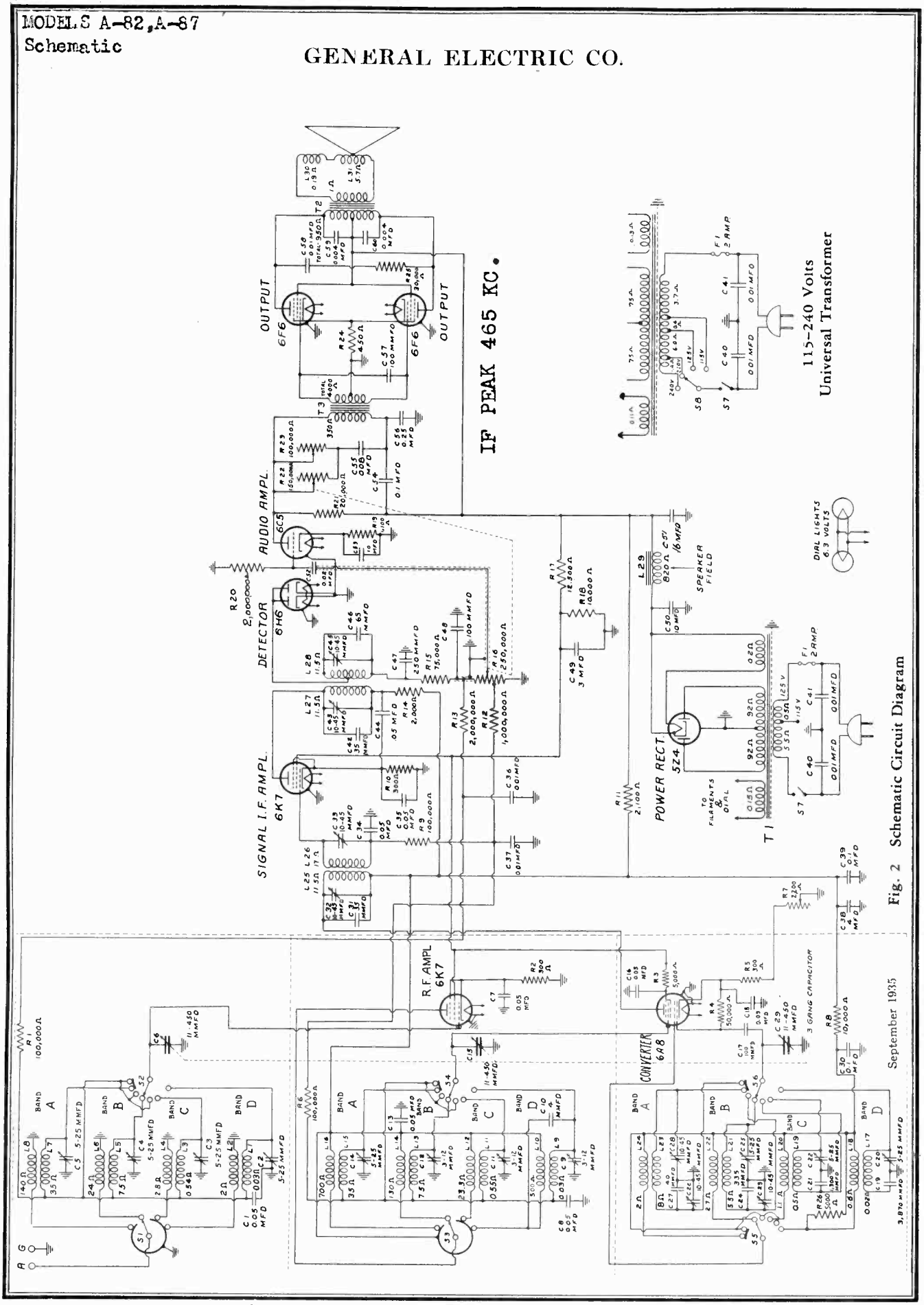


Fig. 2 Schematic Circuit Diagram

September 1935

GENERAL ELECTRIC CO.

MODELS A-82, A-87
Chassis Wiring

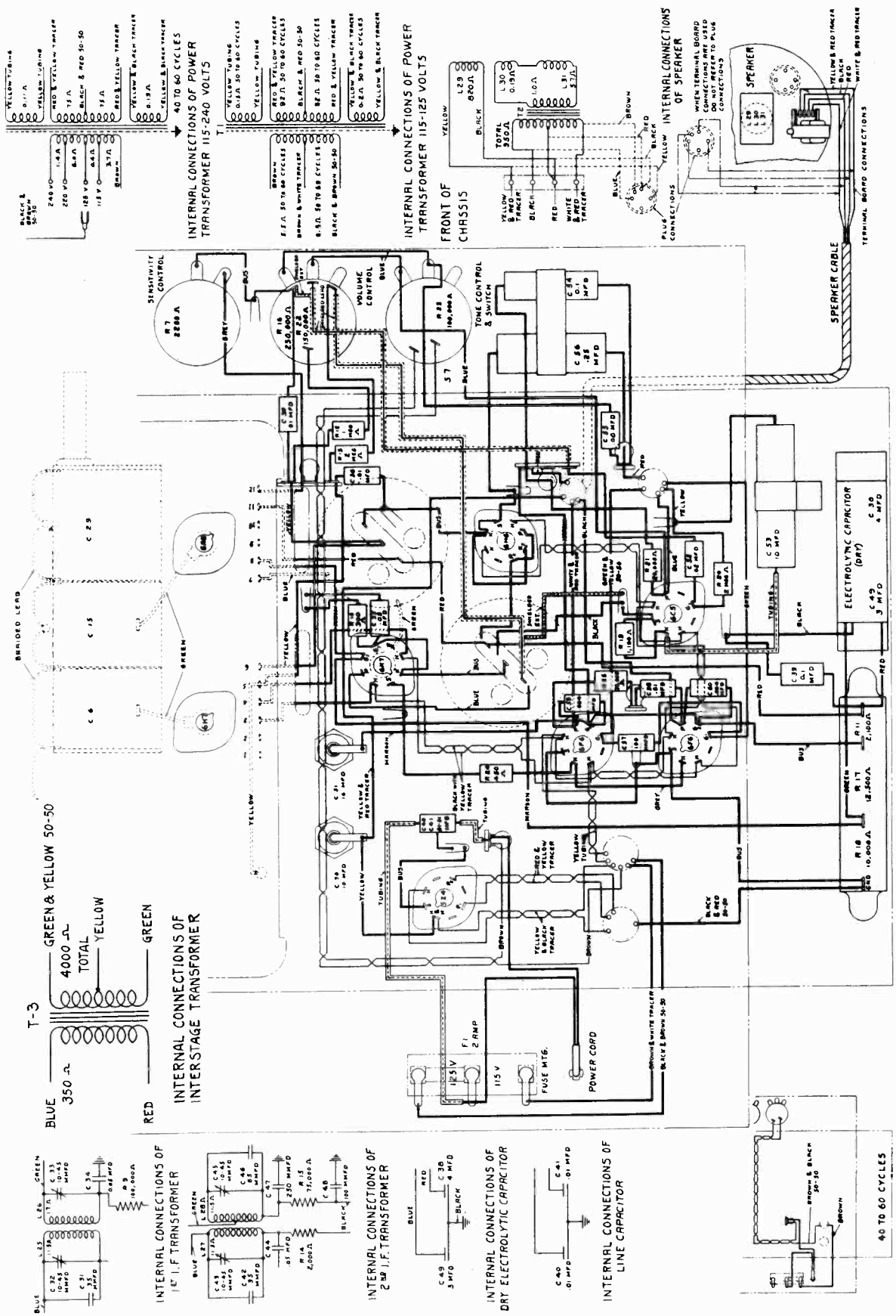


Fig. 3 Chassis Wiring Diagram

(Rating "V" Receivers)

MODELS A-82,A-87
Sentry Box
Chassis Wiring

GENERAL ELECTRIC CO.

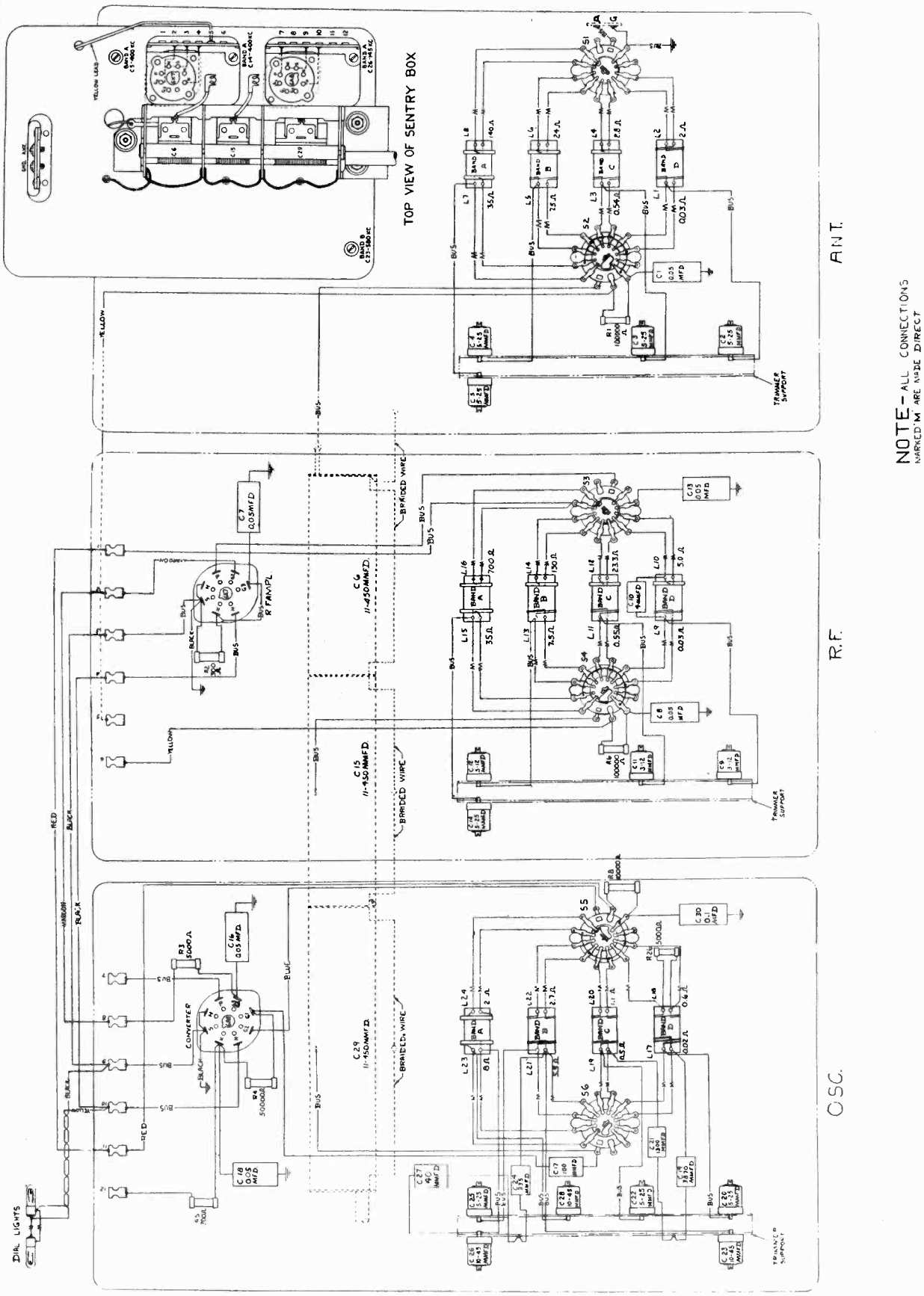


Fig. 4 "Sentry Box" Wiring Diagram

MODELS A-82, A-87
Circuit Data
Alignment

GENERAL ELECTRIC CO.

Electrical Specifications

Rating Label	Power Supply (Volts)	Frequency (Cycles)	Power Consumption (Watts)
A	105–130	50–60	105
C	105–130	25–60	110
V	105–130 and 220–250	40–60	110

NOTE—Taps on universal transformers (Rating "V") are accessible by removing the cap cover on the top of the transformer.

Tuning Frequency Range

Band "A"	140–410 kc
Band "B"	540–1750 kc
Band "C"	1.75–6.0 mc (1750–6000 kc)
Band "D"	6.0–19.5 mc (6000–19,500 kc)

Tuning Control Drive Ratio

Fast Tuning	5½ to 1
Vernier Tuning	55 to 1

Electrical Power Output

Undistorted	5.0 watts
Maximum	7.0 watts

Loud-speaker—Electrodynamic

Cone: Model A-82 10¼ in. overall, 9¼ in. effective diameter

Model A-87 10¼ in. overall, 9¼ in. effective diameter

Cone Coil Impedance: 5 ohms at 400 cycles

DESCRIPTION OF ELECTRICAL CIRCUIT

The signal from the antenna is applied to the control grid of the 6K7 R. F. amplifier tube through the antenna coil, the secondary of which is tuned to the incoming signal by the rear section of the main tuning condenser. The secondary of the coil for the band next lower in frequency to the one in use is short-circuited by the band switch to prevent absorption of energy at its resonant frequency, which falls in the next higher band. The primaries of all coils not in use are also short-circuited by the band switch.

The amplified radio frequency signal is impressed on the control grid of the 6A8 converter and oscillator tube through the R. F. coil, the secondary of which is tuned to the signal frequency by the center section of the main tuning condenser. The sensitivity control consists of a variable resistor in the cathode circuit of the 6A8 converter tube. In the 6A8 tube the incoming signal is combined with the local oscillator signal which is 465 kc higher in frequency. The local signal is generated by the oscillator elements of this tube and the proper frequency difference is maintained throughout the tuning range by the front section of the main tuning condenser in conjunction with the oscillator coil and padding capacitors. The oscillator section of the main tuning condenser, although of the same capacity as the other two sections, is larger physically to permit wider spacing of the plates, thereby reducing the possibility of microphonic feedback howl.

The combination of the signal frequency with the local oscillator frequency in the converter tube produces the intermediate frequency of 465 kilocycles. This particular intermediate frequency is chosen to reduce image response and improve short-wave performance. The intermediate frequency amplifier consists of a 6K7 tube and two transformers, each with two tuned circuits.

The output of the I. F. amplifier is applied to the 6H6 diode rectifier, which is a combined detector and automatic volume control tube. The direct current component of the rectified signal produces a voltage drop across R-16. This voltage drop provides automatic bias for the R. F. and I. F. amplifier tubes and converter tube and so gives automatic volume control action. Full automatic bias is applied to the R. F. amplifier tube, while a part of this voltage, from a tap on R-16, is applied to the converter tube and I. F. amplifier, which handle somewhat larger signal voltage than the R. F. amplifier.

The manual volume control selects the amount of audio signal applied through coupling capacitor C-52 to the grid of the 6C5 audio amplifier tube, and thus regulates the output of the receiver. This is a dual control, the second or lo-note compensation section acting to preserve proper balance between high and low audio frequencies as the volume is changed, by means of a variable 150,000-ohm resistance (R-22) in series with a capacitor (C-55) across the primary of the interstage audio transformer. The tone control consists of a variable 100,000-ohm resistor (R-23) connected in parallel with the lo-note compensation section of the volume control, so as to permit attenuation of the higher audio frequencies as desired.

The output of the 6C5 tube is coupled to the grids of the push-pull 6F6 output pentodes by means of a resistance capacity network working into the interstage audio transformer. The plate circuits of the 6F6 output pentodes are suitably matched to the loud-speaker by means of a step-down output transformer.

Plate and grid voltages for all tubes are supplied by the power supply system employing a 5Z4 full-wave rectifier tube which, together with a suitable network of resistors and capacitors, supplies the required voltages and filtering action.

ALIGNMENT PROCEDURE

Before making any adjustments, it is wise to determine the correctness of the existing alignment. This may be done by supplying a signal from the test oscillator to the receiver and inserting a "Tuning Wand" into the coil involved. The "Tuning Wand" consists of a rod of insulating material having a ring of nonmagnetic metal attached to one end, and a small core of finely divided iron compacted into the opposite end. By inserting the metal ring end into the center of a particular coil through the openings provided in the "Sentry Box" compartment shields, the inductance of the coil is lowered, increasing its resonant frequency. Inserting the iron-filled end into the coil raises its inductance, lowering its resonant frequency. If the circuits are in exact alignment, inserting either end of the tuning wand in any coil will result in a decrease in output. When an increase in signal is obtained with the iron-filled end of the wand, a decrease in resonant frequency of that circuit by increasing its trimmer capacity is indicated. When an increase in signal is obtained with the metal ring, a decrease in trimmer capacity is indicated.

Changes Indicated by Wand

Wand	Signal	Trimmer adjustment required
Metal Ring	Decrease	None
Iron filings	Decrease	
Metal Ring	Increase	Decrease capacity
Iron filings	Decrease	
Metal Ring	Decrease	Increase capacity
Iron filings	Increase	

Fig. 6 shows the location of the antenna, R. F. and oscillator coils for each of the four frequency bands of Models A-82 and A-87 receivers. Openings are provided in the coil shields for insertion of the tuning wand into the antenna or R. F. coil of any band. No provision is made for checking the alignment of the oscillator circuits, as this is easily determined by noting the dial calibration.

Alignment Frequencies

I. F.	Band "A"	Band "B"	Band "C"	Band "D"
465 kc	140 kc	580 kc	6000 kc	18,000 kc
	410 kc	1740 kc		

In order to align these receivers properly, it is necessary to have available the following test equipment:

1. A modulated test oscillator with frequencies available of 140, 410, 465, 580, 1740, 6000, and 18,000 kc
2. An output indicator, such as a high resistance a-c voltmeter with a maximum scale reading of 3 to 5 volts, or a neon lamp indicator.
3. An alignment tool consisting of an insulating shaft with a small screwdriver blade.
4. A tuning wand.

The location of all trimmer capacitors is shown in Fig. 5. *It should be noted that on all "Permaliner" trimmer capacitors, clockwise rotation of the adjusting screw decreases capacity while counterclockwise rotation increases capacity.*

1. *I. F. Alignment*

Set the frequency band switch of the receiver to Band "B," short-circuit the antenna and ground terminals and tune the receiver at some point above 1500 kc so that no signal is heard. Set the volume control and sensitivity control at maximum (extreme clockwise position) and ground the chassis.

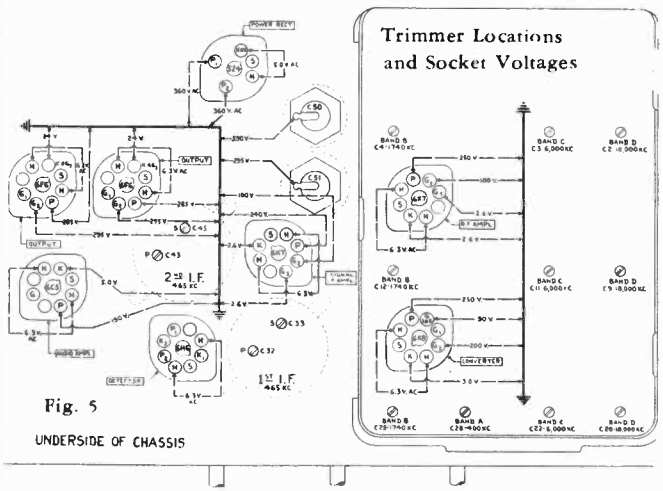


Fig. 5

The I. F. amplifier is tuned to 465 kc; set the test oscillator dial at this frequency. Make sure that a d-c path exists between the output terminals of the test oscillator, then remove the control grid clip (green lead) from the 6A8 tube and connect the test oscillator output between chassis and the dome terminal of the 6A8 tube. Connect the output meter across the cone coil of the speaker and adjust the test oscillator output control so that, with the receiver volume control at maximum, a small deflection is observed on the output meter. During both I. F. and R. F. alignment, the test oscillator signal should be maintained at the lowest level that will give a good readable output indication.

Adjust the secondary trimmer of the second I. F. transformer until a maximum output reading is obtained, maintaining a small deflection on the output meter throughout alignment by adjusting the test oscillator output. Next, adjust the primary trimmer of the second I. F. transformer for maximum output. Continue this procedure, adjusting the secondary trimmer of the first I. F. transformer and lastly the primary trimmer of the first I. F. transformer. After completing this procedure, repeat it a second time for final alignment. The I. F. alignment will then be complete.

2. *R. F. Alignment*

Bands "A" and "B" each require four trimmer adjustments, while Bands "C" and "D" each require three adjustments. Care should be taken to adjust only the trimmers of the band under test. Check the position of the dial pointer with the tuning condenser plates fully engaged as outlined in the section on adjustment of the dial mechanism. Make sure the antenna and ground terminals of the receiver are not short-circuited and connect to them the output from the test oscillator, preferably using a dummy antenna of 250 mmfd in series with 200 ohms between the test oscillator and the receiver antenna terminal. Connect the output indicator across the speaker cone coil.

Band "A," 140-410 kc

Set the frequency band switch to the position where the dial indicates the above range. Tune the test oscillator to 410 kc, and turn the dial pointer on the receiver to this frequency. Adjust the Band "A" oscillator trimmer for maximum output, keeping the receiver volume control at its extreme clockwise position and adjusting the test oscillator output to maintain a small deflection on the output indicator. When optimum adjustment on the Band "A" oscillator trimmer is obtained, adjust the Band "A" R. F. and antenna trimmers for maximum output.

Now tune the test oscillator to 140 kc and set the receiver to that frequency. Slowly rocking the tuning condenser back and forth through the signal, adjust the 140-kc padding capacitor for maximum output. When this has been done, return to 410 kc on the receiver and test oscillator and recheck the alignment for maximum output. This completes alignment of Band "A."

Band "B," 540-1750 kc

Set the frequency band switch to the position where the dial indicates the above range. Tune the test oscillator to 1740 kc and set the dial pointer on the receiver to this frequency. Adjust the Band "B" oscillator trimmer for maximum output, keeping the receiver volume control at its extreme clockwise position and adjusting the test oscillator output to maintain a small reading on the output indicator. When optimum adjustment on the Band "B" oscillator trimmer is obtained, adjust the Band "B" R. F. and antenna trimmers for maximum output.

Now tune the test oscillator to 580 kc and set the receiver to that frequency. Slowly rocking the tuning condenser back and forth through the signal, adjust the 580-kc padding capacitor for maximum output. When this has been done, return to 1740 kc on the receiver and test oscillator and recheck the alignment for maximum output. Band "B" should now be in alignment.

Band "C," 1.75-6.0 mc (1750-6000 kc)

Set the band switch to the position where the dial indicates the above range. Tune the test oscillator to 6000 kc and set the dial pointer on the receiver to this frequency. Adjust the Band "C" oscillator trimmer for maximum output, using the first peak obtained when increasing the capacitance from minimum to maximum.

Check for the image signal which should be received at about 5070 kc on the receiver dial. It should be necessary to increase input to the receiver from the test oscillator for this check. Retune the receiver to the correct scale reading (6000 kc) and adjust the test oscillator output to its previous value. Then adjust the Band "C" R. F. and antenna trimmers for maximum output.

Band "D," 6.0-19.5 mc (6000-19,500 kc)

Set the band switch to the position where the dial indicates the above range. Tune the test oscillator to 18,000 kc and set the dial pointer on the receiver to this frequency. Adjust the Band "D" oscillator trimmer for maximum output, using the first peak obtained when increasing the capacitance from minimum to maximum

Check for the image signal which should be received at about 17,070 on the receiver dial. It may be necessary to increase input to the receiver from the test oscillator for this check. Retune the receiver to the correct scale reading (18,000 kc) and adjust the test oscillator output to its previous value.

Reduce the capacitance of the R. F. trimmer to a minimum. While slowly rocking the tuning condenser through the 18,000-kc point, increase the Band "D" R. F. trimmer capacitance until a maximum response point is obtained. The Band "D" antenna trimmer should now be peaked. It is not

necessary to rock the tuning condenser while making the last adjustment.

When these adjustments have been completed, the receiver will be in alignment.

METHOD OF SERVICE PROCEDURE—SENTRY BOX

The "Sentry Box" assembly includes the tuning condenser and dial mechanism as well as the coil and switch compartments. The complete unit may be dismounted from the chassis by removing the side-fastening bolts, unscrewing the dial mechanism anchoring nut and unsoldering the leads to the chassis from the terminal strips.

In order to remove the coil shield cans it is necessary to take out the frequency band switch shaft. With the "Sentry Box" dismounted from the chassis the dial gears may be disengaged and the switch shaft removed merely by lifting the reduction drive end of the dial assembly, allowing the switch shaft gear to pass the dial scale cap shaft. With the "Sentry Box" mounted in place, removal of the switch shaft requires removing the dial scale gear and cap shaft.

Each compartment shield can houses a bracket assembly comprising the coils, band switch and other component parts associated with that particular circuit. With the band

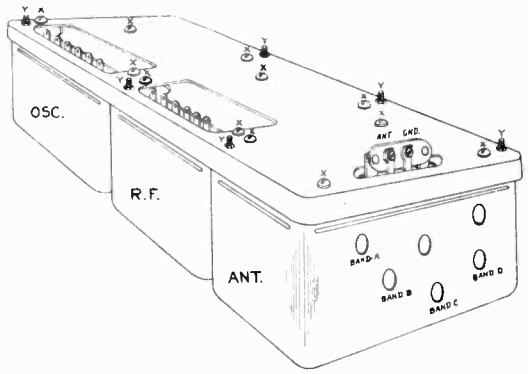


Fig. 6 "Sentry Box" Coil Locations and Assembly

switch shaft out, any shield can be easily removed by unscrewing the two mounting stud nuts ("Y," Fig. 6).

In most cases, coils or Permaliner trimmer capacitors may be replaced merely by removing their particular shield can. It is an easy matter, however, to remove each complete bracket assembly by taking out the mounting bolts ("X," Fig. 6) and unsoldering the bus or braid connections to the tuning condenser. In the case of the R. F. or oscillator units it will also be necessary to unsolder the external leads to the respective terminal boards of these units.

Permaliner trimmers are replaced by unsoldering the bus lead from the trimmer terminal, and then unsoldering the Permaliner case from its mounting cup. The latter operation may require the use of two soldering irons.

Coils are replaceable by merely unsoldering the coil lugs from the switch lugs. If it is necessary to replace a section of the band switch, however, it will be found expedient to remove the complete bracket and coil assembly for easy access to the switch lugs.

ADJUSTMENT OF DIAL MECHANISM

The dial mechanism is rigidly mounted at one end to the tuning condenser frame by two removable screws and anchored to the chassis deck at the other end by a rubber-cushioned nut. The dial pointer, station selector knob, and tuning condenser drive drum are interconnected by means of the drive cord and drive cable; the frequency band switch and cylindrical scale by the switch shaft and scale gears.

1. *Position of Drum on Condenser Shaft*

With set screws (5) loosened and tuning condenser plates fully engaged, place the drum in the position shown in Fig. 7. The drum should be located on the tuning condenser shaft so as to be in line with the drive cord pulleys ($\frac{1}{16}$ in. from the dial mechanism mounting bracket), and so that, with condenser plates fully engaged. guide (38) occupies the position shown in Fig. 7.

2. *Removing and Replacing Scale*

Pry out fastener (40) and remove the scale by lowering the fastener end below the mounting ear. Take the scale out of cap assembly (29). Replace by placing tabs of caps (29) and (30) in slots of scale. Replace fastener (40).

3. *Removing and Replacing Band Switch Shaft*

To remove the band switch shaft with the "Sentry Box" assembled in place, the dial scale cap and gear must be removed. This is done by removing the cylindrical scale as in

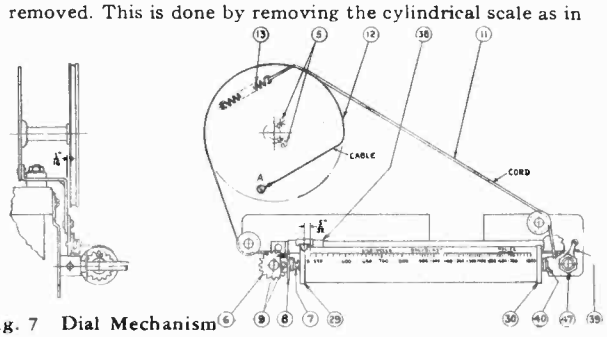


Fig. 7 Dial Mechanism

paragraph 2. Then loosen set screws (9) and remove cap (29), spring (7) and gear (8).

When replacing the switch shaft, note that the shaft will fit the switch gang slots in only one position; turn the shaft before inserting so that the locating button will pass through the keyed side of the slots. Note also that the brass bearing just behind the switch shaft gear determines the forward position of the gear. Insert the bushing just far enough into the index plate hub so that the shaft gear meshes snugly with the scale gear, then tighten the set screw.

4. *Locating Scale*

Loosen the two gear set screws (9). Rotate the scale backward until there is slight tension on spring (7) with the pointer indicating on the Band "A" scale. With the frequency band switch in the Band "A" position, place gear (8) in mesh with the gear on part (6) and tighten the two set screws (9).

5. *Replacing Drive Cord and Drive Cable*

The position of the dial scale pointer with respect to the tuning condenser drum is held fixed by a special metal braid cable (12) connecting the drum with guide (38). Tension is maintained on the cable through the drum spring (13) and drive cord (11). To replace either the drive cable or the drive cord, remove the dial scale for convenient access to guide (38). Unhook spring (13) from its drum tab to release tension. Unhook the cable or cord from guide (38) and unwind from the pulleys and drum. To replace the cable or cord, rethread to agree with Fig. 7, and rehook drum spring (13) as shown.

6. *Replacing Reduction Drive*

To replace the reduction drive, unhook spring (13), loosening the drive cord. Unscrew pal nut (47) and remove drive. Replace with new drive and rehook drive cord.

7. *Setting Scale Pointer*

The scale pointer is soldered to the slider. To set the pointer mechanically, turn the tuning condenser rotor so that the plates are fully engaged, and solder the pointer to indicate a point $\frac{3}{32}$ in. to the left of the extreme left-hand mark on the scale on Band "B."

8. *Replacing Dial Lamp*

The dial lamp sockets are easily accessible by lifting them clear of the dial mechanism. Lamps may then be replaced in their sockets. After replacing lamps, slide the socket clip back onto the mounting bracket.

CIRCUIT ANALYSIS—SENTRY BOX

A table of socket voltages is shown below. If it is found desirable to check voltages at the sockets mounted in the "Sentry Box," only the shield can for the socket measured should be off while measurements are being taken.

MODELS A-82 AND A-87

Voltages at Tube Sockets

Fuse in 125 V. Clip—125 Volts A-C Line—

Maximum Volume and Sensitivity—No Signal

Tube No.	Cathode to Ground Volts D-c	Screen Grid to Ground Volts D-c	Plate to Ground Volts D-c	Cathode Current M.A.	Heater Volts A-c
6K7 R. F.	2.6	100	250	8.7	6.3
6A8 Oscillator			195		
6A8 Converter	3.0	90	250	10.0	6.3
6K7 I. F.	2.6	100	242	8.7	6.3
6H6 Detector					6.3
6C5 A. F.	5.0		195	5.0	6.3
6F6 A. F. Power	24	295	285	26.5	6.3
6F6 A. F. Power	24	295	285	26.5	6.3
5Z4 Rectifier			720/360 Rms	96.0	5.0

REPLACEMENT PARTS

Insist on genuine factory-tested parts, which may be purchased from authorized dealers.

RECEIVER CHASSIS ASSEMBLIES

Stock No.	Description	List Price
RB-007	BOARD—Fuse board, Rating "V" Receivers	$0.40
RB-008	BOARD—Terminal Board (Double terminal)	.10
RB-009	BOARD—Terminal Board (Single terminal)	.15
RB-011	BOARD—Fuse board, Rating "A" or "C" Receivers	.30
RB-200	BRACE—Dial Opening Brace (Model A-82)	.30
RC-022	CAPACITOR—.004 Mfd. 400 Volt (C-59, C-60) Paper Dielectric	.25
RC-034	CAPACITOR—.01 Mfd. 200 Volt (C-36, C-37) Paper Dielectric	.25
RC-040	CAPACITOR—.01 Mfd. 400 Volt (C-58) Paper Dielectric	.25
RC-046	CAPACITOR—.02 Mfd. 200 Volt (C-52) Paper Dielectric	.25
RC-072	CAPACITOR—.05 Mfd. 200 Volt (C-35) Paper Dielectric	.25
RC-094	CAPACITOR—.08 Mfd. 400 Volt (C-55) Paper Dielectric	.25
RC-123	CAPACITOR—.1 Mfd. 400 Volt (C-39, C-54) Paper Dielectric	.35
RC-150	CAPACITOR—.25 Mfd. 400 Volt (C-56) Paper Dielectric	.35
RC-235	CAPACITOR—100 mmfd. (C-57) Mica Dielectric Moulded Case	.25
RC-405	CAPACITOR—10 Mfd. 480 Volt (C-50) Wet Electrolytic	1.15
RC-408	CAPACITOR—16 Mfd. 470 Volt (C-51) Wet Electrolytic	1.15
RC-502	CAPACITOR—One 4 Mfd. 450 Volt (C-38), one 3 Mfd. 150 Volt (C-49) Dry Electrolytic Pack	1.40
RC-504	CAPACITOR—10 Mfd. 25 Volt (C-53) Dry Electrolytic	.80
RC-750	CAPACITOR—Line Capacitor, Two .01 Mfd. (C-40, C-41)	.50
RC-801	CABLE—Speaker Cable	$0.50
RC-851	CORD—Power Cord with Plug	.60
RC-951	CLAMP—For mounting C-54 and C-56	.10
RC-952	CLAMP—For mounting C-53	.10
RE-005	ESCUTCHEON—Dial Escuteheon	.80
RF-003	FOOT—Chassis Mounting Foot with Cushions, pkg. of 2	.30
RI-003	INSULATOR—Escutcheon Shaft Insulator Bushing, pkg. of 10	.40
RK-002	KNOB—Tuning, Volume, Tone, Sensitivity or Band Switch, pkg. of 5	.50
RN-001	NUT—Escutcheon Mounting Nut, pkg. of 10	.45
RP-002	PLATE—Fuse Cover Plate	.15
RP-014	PLATE—Escutcheon Mounting Plate, pkg. of 2	.25
RP-016	PLATE—Dial Mechanism Mounting Plate Assembly	.15
RR-006	RESISTOR—300 ohms ¼ watt (R-10) Carbon Resistor, pkg. of 5	.70
RR-009	RESISTOR—1100 ohms ¼ watt (R-19) Carbon Resistor, pkg. of 5	1.05
RR-067	RESISTOR—1 megohm ¼ watt (R-12) Carbon Resistor, pkg. of 5	.70
RR-068	RESISTOR—2 megohms ¼ watt (R-13, R-20) Carbon Resistor, pkg. of 5	.60
RR-239	RESISTOR—20,000 ohms 1 watt (R-21) Carbon Resistor, pkg. of 5	.85
RR-242	RESISTOR—30,000 ohms 1 watt (R-25) Carbon Resistor, pkg. of 5	.85
RR-250	RESISTOR—450 ohms 2 watt (R-24) Carbon Resistor	.50
RR-701	RESISTOR—Tapped Resistor (R-11, R-17, R-18)	.95
RR-900	REFLECTOR—Dial Lamp Reflector	.15
RS-110	SHIELD—Second I. F. Transformer Shield	.30
RS-115	SHIELD—First I. F. Transformer Shield	.35
RS-200	SOCKET—Eight-pin Tube Socket, pkg. of 5	.75
RS-204	SOCKET—Five-pin Tube Socket, pkg. of 5	.75

REPLACEMENT PARTS (Continued)

Insist on genuine factory-tested parts, which may be purchased from authorized dealers.

Stock No.	Description	List Price
RS-800	SENSITIVITY CONTROL—Rheostat 2200 ohms (R-7)	$0.85
RT-081	TRANSFORMER—Power Transformer (T-1) 50-60 cycles, 105-130 volts (Rating "A")	6.75
RT-082	TRANSFORMER—Power Transformer (T-1) 25-60 cycles, 105-130 volts (Rating "C")	9.70
RT-083	TRANSFORMER—Power Transformer (T-1) 40-60 cycles, 105-130, 200-250 volts (Rating "V")	8.25
RT-204	TRANSFORMER—First I. F. Transformer (C-31, C-32, C-33, C-34, L-25, L-26, R-9)	2.95
RT-205	TRANSFORMER—Second I. F. Transformer (C-42, C-43, C-44, C-45, C-46, C-47, C-48, L-27, L-28, R-14, R-15)	3.30
RT-500	TRANSFORMER—Interstage Audio Transformer (T-3)	2.25
RT-701	TONE CONTROL—Rheostat 100,000 ohms (R-23) and Power Switch (S-7)	1.25
RV-003	VOLUME CONTROL — Potentiometer 250,000 ohms (R-16) and Rheostat 150,000 ohms (R-22)	1.70
RW-002	WINDOW—Dial Window	.15
RX-002	CUSHION ASSEMBLY—Tuning Condenser Mounting Cushions, Nuts and Washers	.10
RX-004	SCREW ASSEMBLY—Chassis Mounting Screws and Washers	.10

"SENTRY BOX" ASSEMBLIES

Stock No.	Description	List Price
RA-001	ASSEMBLY—Antenna Compartment Assembly Complete	$9.00
RA-101	ASSEMBLY—R. F. Compartment Assembly Complete	12.50
RA-201	ASSEMBLY—Oscillator Compartment Assembly Complete	14.75
RB-010	BOARD—R. F. or Oscillator Compartment Terminal Board	.10
RB-012	BOARD—Antenna Terminal Board	.15
RB-103	BRACKET—Antenna Bracket Assembly	.75
RB-104	BRACKET—Oscillator Bracket Assembly	.95
RB-105	BRACKET—R. F. Bracket Assembly	.95
RC-072	CAPACITOR—.05 Mfd. 200 Volt (C-1, C-7, C-8, C-16, C-18) Paper Dielectric	.25
RC-091	CAPACITOR—.05 Mfd. 400 Volt (C-13) Paper Dielectric	.30
RC-096	CAPACITOR—.1 Mfd. 200 Volt (C-30) Paper Dielectric	.30
RC-202	CAPACITOR—4 mmfd. (C-10) Mica Dielectric Moulded Case	.25
RC-235	CAPACITOR—100 mmfd. (C-17) Mica Dielectric Moulded Case	.25
RC-209	CAPACITOR—40 mmfd. (C-27) Mica Dielectric Moulded Case	.25
RC-274	CAPACITOR—335 mmfd. (C-24) Mica Dielectric Moulded Case	.30
RC-344	CAPACITOR—1300 mmfd. (C-21) Mica Dielectric Moulded Case	.35
RC-361	CAPACITOR—3870 mmfd. (C-19) Mica Dielectric Moulded Case	.50
RC-602	CAPACITOR—Permaliner Trimmer Capacitor 10-45 mmfd. (C-23, C-26, C-28)	.50
RC-603	CAPACITOR—Permaliner Trimmer Capacitor 5-25 mmfd. (C-2, C-3, C-4, C-5, C-14, C-20, C-22, C-25)	.50
RC-606	CAPACITOR—Permaliner Trimmer Capacitor 3-12 mmfd. (C-9, C-11, C-12)	.50
RC-702	CONDENSER—Three-gang Tuning Condenser (C-6, C-15, C-29)	4.25
RC-953	CUP—Permaliner Trimmer Capacitor Mounting Cup	.10
RG-001	GRID CAP—Grid Connection Cap, pkg. of 5	.10
RG-100	GUARD—Terminal Strip Guard	.15
RI-001	INDEXING PLATE—Frequency Band Switch Indexing Plate	$0.60
RL-003	COIL—Antenna Coil, Band A (L-7, L-8)	1.00
RL-004	COIL—Antenna Coil, Band B (L-5, L-6)	.70
RL-005	COIL—Antenna Coil, Band C (L-4, L-3)	.65
RL-006	COIL—Antenna Coil, Band D (L-1, L-2)	.60
RL-103	COIL—R. F. Coil, Band A (L-15, L-16)	1.60
RL-104	COIL—R. F. Coil, Band B (L-13, L-14)	.85
RL-105	COIL—R. F. Coil, Band C (L-11, L-12)	.70
RL-106	COIL—R. F. Coil, Band D (L-9, L-10)	.70
RL-204	COIL—Oscillator Coil, Band D (L-17, L-18)	.55
RL-205	COIL—Oscillator Coil, Band C (L-19, L-20)	.60
RL-206	COIL—Oscillator Coil, Band B (L-21, L-22)	.65
RL-207	COIL—Oscillator Coil, Band A (L-23, L-24)	.70
RR-006	RESISTOR—300 ohms ¼ watt (R-2, R-5) Carbon Resistor, pkg. of 5	.70
RR-015	RESISTOR—5000 ohms ¼ watt (R-3, R-26) Carbon Resistor, pkg. of 5	.70
RR-036	RESISTOR—50,000 ohms ½ watt (R-4) Carbon Resistor, pkg. of 5	.70
RR-049	RESISTOR—100,000 ohms ¼ watt (R-1, R-6) Carbon Resistor, pkg. of 5	.70
RR-183	RESISTOR—10,000 ohms ½ watt (R-8) Carbon Resistor, pkg. of 5	.70
RS-106	SHIELD—Oscillator Compartment Shield Can	.90
RS-107	SHIELD—R. F. Compartment Shield Can	.90
RS-108	SHIELD—Antenna Compartment Shield Can	.90
RS-200	SOCKET—Eight-pin Tube Socket, pkg. of 5	.75
RS-303	SWITCH—Antenna or R. F. Band Switch (S-1, S-2, S-3, S-4)	1.20
RS-306	SWITCH—Oscillator Band Switch (S-5, S-6)	1.20
RS-901	SHAFT—Band Switch Shaft and Gear	.25

DIAL MECHANISM ASSEMBLIES

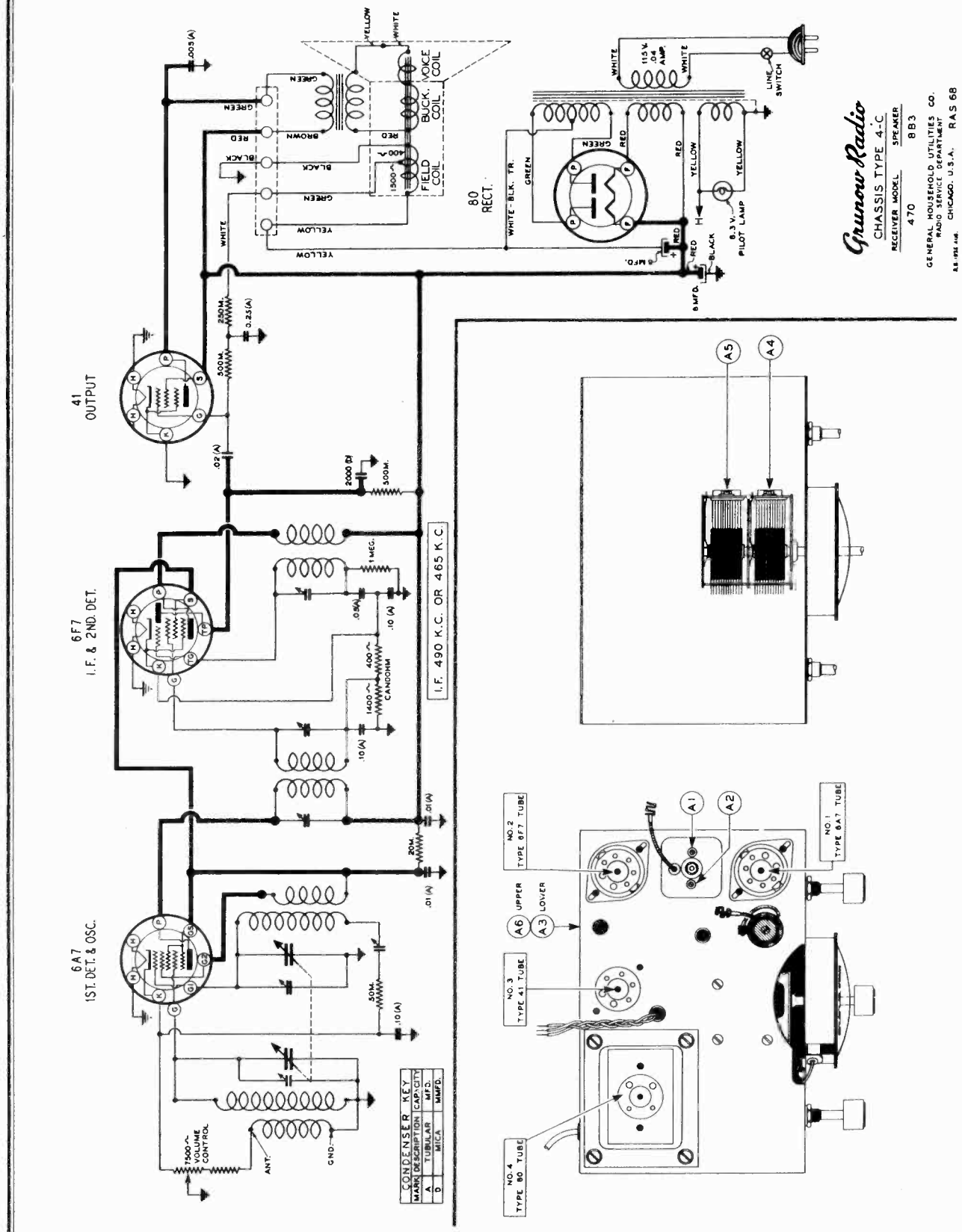
Stock No.	Description	List Price
RB-107	BRACKET—Mounting Bracket Assembly	$0.50
RB-108	BRACKET—Dial Lamp Bracket	.55
RC-802	CABLE—Metal Braid Dial Cable, pkg. of 5	.55
RC-856	CORD—Dial Cord, pkg. of 5	.65
RC-954	CAP—Scale Cap Assembly, Gear End	.10
RC-955	CAP—Scale Cap, Drive End	.10
RD-003	DIAL MECHANISM—Dial Mechanism Complete	2.30
RD-005	DIAL SCALE—Cylindrical Dial Scale	.75
RD-006	DRIVE—Differential Reduction Drive	1.00
RD-013	DRUM—Tuning Condenser Drive Drum	.35
RF-200	FASTENER—Dial Fastener, pkg. of 10	.10
RG-002	GEAR—Dial Gear and Set Screws	.15
RG-200	GUIDE—Dial Pointer Guide, pkg. of 5	.15
RP-003	POINTER—Dial Pointer, pkg. of 2	.15
RS-401	SPRING—Drum Spring, pkg. of 2	.20
RS-403	SPRING—Dial Scale, pkg. of 2	.10

SPEAKER ASSEMBLIES—MODELS A-82 AND A-87

Stock No.	Description	List Price
RC-901	CONE—Speaker Cone and Cone Coil (L-31)	$1.45
RP-012	PLUG—Speaker Female Plug Connector	.20
RP-015	PLUG—Speaker Male Plug Connector	.20
RS-016	SPEAKER—10¼-in. Loud-speaker Complete with Output Transformer—Speaker Plug Type	12.50
RS-017	SPEAKER—10¼-in. Loud-speaker Complete with Output Transformer—Terminal Strip Type	12.35
RT-401	TRANSFORMER—Output Transformer—Terminal Strip Type (T-2)	1.90
RT-406	TRANSFORMER—Output Transformer—Speaker Plug Type (T-2)	1.90

GENERAL HOUSEHOLD UTILITIES CO.

MODEL 470
Chassis 4C
Schematic
Socket, Trimmers



MODEL 470
Chassis 4C
Alignment

GENERAL HOUSEHOLD UTILITIES CO.

SERVICE INSTRUCTIONS GRUNOW 4 C
BROADCAST SUPERHETERODYNE REDEIVER
MODEL - 470
SPEAKER - 8B3

Coupling Condensers of .25 Mfd. and 200 Mmf. should be used when coupling oscillator to receiver during alignment as specified in following paragraphs.

2 - DIAL SETTING:

Turn dial pointer until condensers are full meshed. The dial pointer should be on the horizontal line of the dial.

3 - I.F. ALIGNMENT:

(A) Connect signal lead of oscillator through .25 Mfd. condenser to grid of 6A7 (1st Detector Tube) located on front right hand corner of Chassis. Connect the ground lead to the Chassis.

(B) Place oscillator in operation at 465 or 490 K.C., (see note below) and turn receiver volume control to maximum. (Volume Control should remain at maximum during entire alignment procedure and signal should be attenuated at oscillator to lowest value consistent with obtaining a readable indication on output meter.)

(C) Align three I.F. trimmers (A1 - A2 - A3) located on top of I.F. Transformers. Two on top of 1st I.F. Can and 1 (A3) on rear of Chassis, being the bottom of the two at this position.

4 - 1400 K. C. ALIGNMENT.

(A) Connect signal lead of oscillator to antenna lead (the blue wire leading from rear of Chassis) through 200 Mmf. Condenser.

(B) Set Dial at 1400 K.C. and place oscillator in operation at 1400 K.C.

(C) Align oscillator trimmer (A4), which is the first of the two on the variable condenser as you face Chassis.

(D) Align Antenna Trimmer (A5), which is the second trimmer on variable condenser as you face chassis.

5 - 600 K.C. ALIGNMENT.

(A) Place oscillator in operation at 600 K.C.

(B) Tune in signal to maximum (this point does not have to be exactly at the 600 K.C. dial setting).

(C) Adjust the 600 K.C. trimmer (A6 - located on rear face of Chassis, being the top of the two at this position) in direction of signal increase and at the same time rock the tuning condenser back and forth through resonance. Continue this procedure until maximum signal is obtained on the output meter.

(D) This should be performed with great care so that the alignment is the best that can be obtained, otherwise the selectivity of the set will suffer.

(E) Recheck adjustment on 1400 K.C. antenna trimmer.

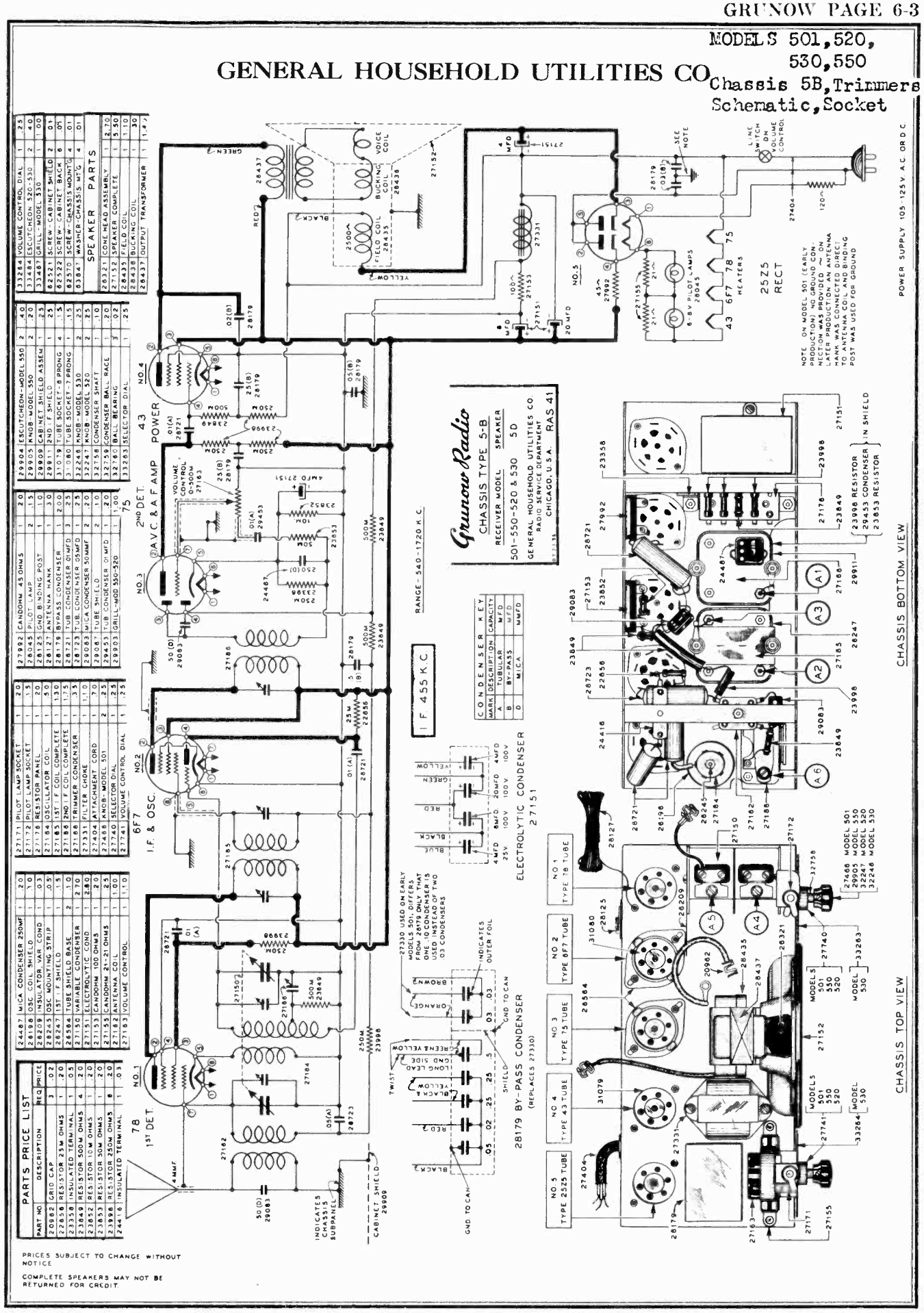
NOTE:-

Due to interference caused by commercial code stations in some locations, it has been necessary to use two I.F. Frequencies on this Receiver, one of 490 K.C. where code interference is in the neighborhood of 455 K.C. and the other where the interfering stations are operating in the 500 K.C. band, we use an I.F. of 465 K.C.

The I.F. Frequencies of the Receiver is stamped on the rear of the Chassis, and if there is any doubt as to I.F. peaking, it is only necessary to apply a variable I.F., signal to the I.F. Amplifier, and maximum output will indicate resonance or frequency at which the I.F.'s were peaked.

GENERAL HOUSEHOLD UTILITIES CO

MODELS 501, 520, 530, 550
Chassis 5B, Trimmers
Schematic, Socket



PARTS PRICE LIST

PART NO.	DESCRIPTION	REQ.	PRICE
20062	GRID CAP	3	.02
22656	RESISTOR 25W OHMS	1	.20
23358	INSULATED TERMINAL	1	.05
23849	RESISTOR 500M OHMS	4	.20
23852	RESISTOR 10M OHMS	1	.20
23853	RESISTOR 50M OHMS	1	.25
23998	RESISTOR 250M OHMS	8	.20
24416	INSULATED TERMINAL	1	.03
24487	MICA CONDENSER 250MF	1	.20
26198	OSC. COIL SHIELD	1	.10
26209	INSULATOR, VAR. COND.	1	.03
26245	OSC. MOUNTING STRIP	1	.05
26247	1ST I.F. COIL SHIELD	1	.15
26364	TUBE SHIELD BASE	2	.10
27150	VARIABLE CONDENSER	1	2.20
27151	ELECTROLYTIC	1	2.40
27155	CARBOHM 100 OHMS	1	.20
27162	CARBOHM 21-21 OHMS	1	.25
27163	ANTENNA COIL	1	1.00
27163	VOLUME CONTROL	1	1.10
27171	PILOT LAMP SOCKET	1	.20
27172	PILOT LAMP SOCKET	1	.15
27176	RESISTOR PANEL	1	.20
27184	OSCILLATOR COIL	1	.50
27185	1ST I.F. COIL COMPLETE	1	1.30
27186	2ND I.F. COIL COMPLETE	1	1.75
27188	TRIMMER CONDENSER	1	.35
27331	FILTER CHOKE	1	1.10
27404	ATTACHMENT CORD	1	.70
27466	KNOB - MODEL 501	2	.25
27740	SELECTOR DIAL	1	.25
27741	VOLUME CONTROL DIAL	1	.25
27992	CANDOHM 45 OHMS	1	.20
28045	PILOT LAMP	2	.15
28125	GND. BINDING POST	1	.10
28172	ANTENNA HANK	1	.30
28179	BY-PASS CONDENSER .01 MFD	3	2.00
28723	TUBE CONDENSER .01 MFD	3	.25
28083	MICA CONDENSER 50 MMF	2	.25
29045	TUBE CONDENSER .01 MFD	2	.20
29903	GRILL - MOD 550-520	1	.20
29904	ESCUTCHEON - MODEL 550	2	.40
29905	KNOB - MODEL 550	2	.20
29909	CABINET SHIELD ASSEM.	1	.25
29911	2ND F. SHIELD	1	.25
31079	TUBE SOCKET - 8 PRONG	4	.15
31080	TUBE SOCKET - 7 PRONG	1	.15
32246	KNOB - MODEL 530	2	.25
32248	KNOB - MODEL 520	2	.25
32758	CONDENSER SHAFT	1	.10
32760	BALL BEARING RACE	3	.02
33263	SELECTOR DIAL	1	.25
33264	VOLUME CONTROL 550-530	2	.40
33265	ESCUTCHEON 520-530	1	.00
33267	GRILL - MODEL 530	1	.00
63842	WASHER-CHASSIS MTG.	4	.01
82521	SCREW - CABINET SHIELD	2	.01
82522	SCREW - CABINET BACK	8	.01
82570	SCREW - CHASSIS MOUNTG.	4	.01

SPEAKER PARTS

28321	CONE HEAD ASSEMBLY	1	2.70
27152	SPEAKER COMPLETE	1	5.50
28435	FIELD COIL	1	1.10
28438	BUCKING COIL	1	.30
28437	OUTPUT TRANSFORMER	1	1.40

PRICES SUBJECT TO CHANGE WITHOUT NOTICE.

COMPLETE SPEAKERS MAY NOT BE RETURNED FOR CREDIT.

MODELS 501,520,
530,550
Chassis 5B
Alignment

GENERAL HOUSEHOLD UTILITIES CO.

JUNE, 1935

SERVICE NOTES AND PARTS LIST

Grunow Radio

Chassis 5B

Models 501-520-530-550

GENERAL HOUSEHOLD UTILITIES COMPANY

31557-2 CHICAGO, U. S. A.

INTRODUCTION

The following characteristics apply to the GRUNOW Radio—Chassis Type 5D:

This model is a 5-tube Super-Heterodyne Broadcast (550 to 1720 K.C.) Receiver using 1-78 tube as a 1st Detector, 1-6F7 tube as an I.F. Amplifier and Oscillator. 1-75 (Duplex-diode high mu triode) tube is used as a 2nd Detector or Signal Rectifier, delayed Automatic Volume Control (AVC) and high gain audio Amplifier. The 43 output tube is a power amplifier pentode and is capable of producing large power output with a relatively small signal input. The rectifier tube is a 25Z5, the output of which is well filtered through the action of the speaker field and the 4, 8, and 20 mfd. electrolytic condensers.

This receiver operates on either A.C. (alternating current) or D.C. (direct current) of 105 to 125 volts.

ALIGNMENT PROCEDURE CHASSIS 5B

Do not attempt to align the 5B Chassis without the proper equipment. Alignment condensers are shown in the accompanying illustrations and are numbered in order of procedure.

1. EQUIPMENT.

A—Test Oscillator.

A modulated oscillator capable of producing signals at 455 K.C., 600 K.C. and 1400 K.C. is necessary for alignment of the 5B Chassis.

B—Output Meter.

This may be any of the standard output meters on the market but should be sufficiently sensitive to provide a good deflection so that extremely strong signals may be read.

C—Coupling Means.

Coupling Condensers of 200 Mmf., 25 Mfd., should be used when coupling oscillator to receiver during alignment as specified in following paragraphs.

2. I. F. ALIGNMENT.

A—Connect signal lead of oscillator through .25 Mfd. condenser to grid of 78 tube (1st Detector Tube). The ground lead to ground post on rear of Chassis.

B—Place oscillator in operation at 455 K.C. and turn receiver volume control to maximum. (Volume Control should remain at maximum during entire alignment procedure and signal should be attenuated at oscillator to lowest value consistent with obtaining a readable indication on output meter).

C—Align three I.F. trimmers (A1—A2—A3) located on under side of Chassis at base of I.F. Coils.

3. DIAL CALIBRATION.

A—With condensers fully meshed dial pointer should be directly over end mark on dial.

B—When Chassis is removed from cabinet it will be necessary to simulate dial escutcheon which incorporates dial pointer.

4. 1400 K.C. ALIGNMENT.

A—Connect signal lead of oscillator through 200 Mmf. Condenser to antenna leading from Chassis.

B—Turn dial to 140 (1400 K.C.) and align 1400 K.C. oscillator trimmer (A4), located forward on variable condenser.

C—Align Antenna Trimmer (A5) which is the second trimmer on variable condenser.

5. 600 K.C. ALIGNMENT.

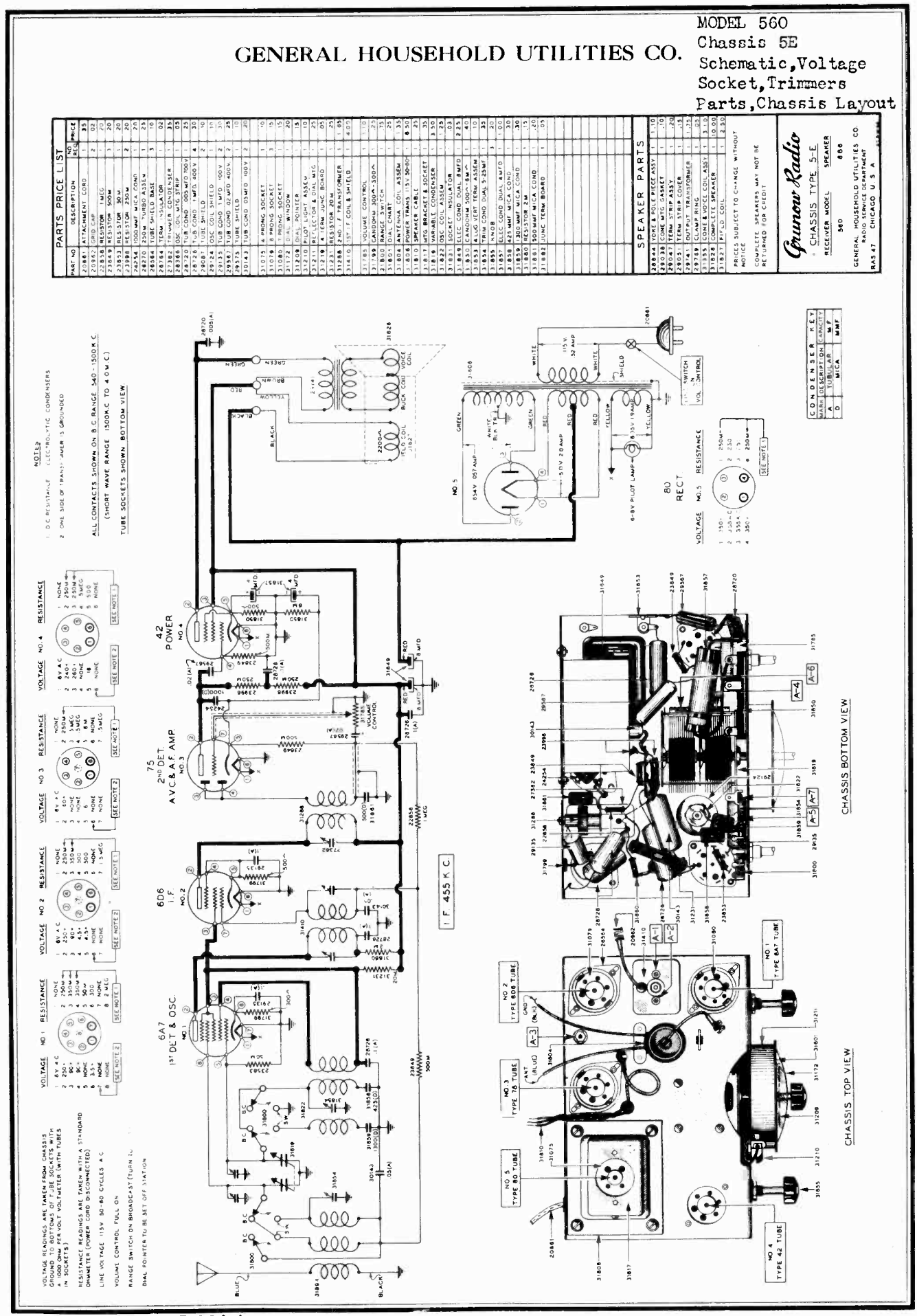
A—Place oscillator in operation at 600 K.C. Tune in signal (this does not have to be exactly on 600 Dial Setting).

B—Adjust 600 K.C. trimmer (A6) located on under side of Chassis directly under variable condenser) in direction of signal increase. Rocking dial knob through resonance until maximum output is obtained.

C—Recheck dial calibration: Over several points on dial.

GENERAL HOUSEHOLD UTILITIES CO.

MODEL 560
Chassis 5E
Schematic, Voltage
Socket, Trimmers
Parts, Chassis Layout



PARTS PRICE LIST			
PART NO	DESCRIPTION	NO REQ	PRICE
20681	ATTACHMENT CORD	1	35
20952	GRID CAP	2	02
22858	RESISTOR 1 MEG	1	20
23849	RESISTOR 500M	1	20
23853	RESISTOR 30M	1	20
23980	RESISTOR 250M	2	20
24254	1000 MMF MICA COND	1	20
28720	250M TURBO ASSEM	1	25
28564	TUBE SHIELD BASE	3	10
28764	TERM INSULATOR	1	02
27382	TRIMMER CONDENSER	1	35
28366	OSC COIL W/G STRIP	1	05
28720	TUB COND 005 MFD 700V	1	25
28726	TUB COND 1 MFD 400 V	4	30
29088	TUB SHIELD 1 MFD 100 V	2	10
29124	OSC COIL SHIELD	1	10
29135	TUB COND 1 MFD 100 V	2	30
29587	TUB COND .02 MFD 400V	2	25
29575	TUBE SHIELD	1	10
30143	TUB COND 03 MFD 400 V	2	20
31075	4 PRONG SOCKET	1	10
31079	8 PRONG SOCKET	3	15
31080	5 PRONG SOCKET	1	15
31172	DIAL WINDOW	1	20
31208	DIAL POINTER	1	15
31210	PILOT LIGHT ASSEM	1	10
31211	REFLECTOR & DIAL MTG	1	25
31219	4 TERM JUNC BOARD	1	05
31231	RESISTOR 20M	1	25
31288	2ND I F TRANSFORMER	1	85
31410	1ST I F COIL & SHIELD	1	60
31785	VOLUME CONTROL	1	1 10
31799	CANDOHM 300A-300A	1	25
31800	RANGE SWITCH	1	75
31801	DIAL CHART	1	25
31804	ANTENNA COIL ASSEM	1	35
31806	POWER TRANS 115V 50-60C	1	8 50
31810	SPEAKER CABLE	1	25
31819	MTG BRACKET SOCKET	1	25
31822	OSC COIL ASSEM	1	25
31831	SOCKET INSULATOR	1	03
31849	ELEC COND DUAL 8MFD	1	2 25
31850	CANDOHM 100A-8MA	1	40
31853	ALIG VERT TERM ASSEM	1	10
31854	TRIM COND DUAL 5-25MF	1	35
31855	CNDB	1	00
31856	ELEC COND DUAL 4MFD	1	50
31858	625 MMF MICA COND	1	30
31859	300 MMF MICA COND	1	30
31880	RESISTOR 2M	1	15
31881	500 MMF MICA COND	1	20
31882	JUNC TERM BOARD	1	05

SPEAKER PARTS			
28644	YOKE & POLE PIECE ASSY	1	1 10
29038	CONE MTG GASKET	1	10
29047	TERM STRIP ASSY	1	20
29053	TERM STRIP COVER	1	15
29141	OUTPUT TRANSFORMER	1	1 25
29789	CLAMP RING	1	05
31355	CONE & VOICE COIL ASSY	1	3 10
31356	COMPLETE SPEAKER	1	10 00
31827	FIELD COIL	1	4 50

PRICES SUBJECT TO CHANGE WITHOUT NOTICE
COMPLETE SPEAKERS MAY NOT BE RETURNED FOR CREDIT

CONDENSER KEY		
MARK	DESCRIPTION	CAPACITY MMF
A	TUBULAR	
D	MICA	

MODEL 560
Chassis 5E
Alignment

GENERAL HOUSEHOLD UTILITIES CO.

November 1934

SERVICE NOTES AND PARTS LIST

Grunow Radio

CHASSIS TYPE 5E
Receiver Model 560
Speaker Type 8B6

GENERAL HOUSEHOLD UTILITIES COMPANY

31568-1 CHICAGO, U. S. A.

INTRODUCTION

The following characteristics apply to the GRUNOW Radio—Chassis 5E:

This model is a 5 tube Super-Heterodyne Dual Wave (540 to 1500 K.C. and 1500 to 4000 K.C.) Receiver using 1-6A7 tube as a 1st Detector and Oscillator, 1-6D6 tube as an I.F. Amplifier, 1-75 tube as a Diode Detector, delayed Automatic Volume Control (AVC) and high gain audio Amplifier. The 42 output tube is a power amplifier pentode and is capable of producing large power output with a relatively small signal input. The rectifier tube is an 80, the output of which is well filtered through the action of the speaker field and the two 8 mfd. electrolytic condensers.

The tuning range is divided into two bands or divisions, one covering the band of 540 to 1500 K.C. and the other 1500 to 4000 K.C. In both bands the following three variable circuits are used: R.F. input, detector or mixer input and oscillator. These circuits are tuned by a 2 gang variable condenser of rugged construction.

The remainder of the circuit is typical and has been designed along lines of what is considered the best engineering practice to date. Parts are all oversize and of the finest quality.

SERVICE DATA

CONTINUITY AND VOLTAGE

Continuity and voltage readings should be taken from the underside of the chassis. The values given on the schematic diagram are average and allow the service man to make a quick check of the chassis constants. The socket layouts given on the schematic diagram show each socket from the underside.

The Range switch is a simple four pole double throw switch.

ALIGNMENT PROCEDURE

Do not attempt to align the 5E Chassis without the proper equipment. Alignment condensers are shown in the accompanying illustrations and are numbered in order of procedure.

1. EQUIPMENT.

a. Test Oscillator.

A modulated oscillator capable of producing signals at 455 K.C.—600 K.C.—1400 K.C., and 3700 K.C. is necessary for alignment of the 6A Chassis.

b. Non-metallic screw driver (all bakelite or fibre) about 6 inches long.

c. Output Meter.

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

d. Coupling Means.

Coupling condensers of 200 Mmf., and .25 Mfd. should be used when coupling oscillator to receiver during alignment as specified in the following paragraphs.

2. DIAL SETTING.

Turn dial knob until condensers are fully meshed.

3. I.F. ALIGNMENT.

a. Connect signal lead of test oscillator to grid of the 6A7 (first detector tube) through a .25 Mfd. condenser. Connect the ground lead to the Chassis.

b. Set dial pointer to 140 and range switch on broadcast position.

c. Place test oscillator in operation at 455 K.C. Turn receiver volume control to maximum.

d. Attenuate test oscillator output to lowest value consistent with obtaining a readable indication on output meter.

e. Adjust the three I.F. trimmers (A1-A2-A3) until maximum output is obtained. During alignment maintain as low a value of signal as will allow obtaining of accurate adjustment.

4. 3700 K.C. ALIGNMENT.

a. Connect signal lead of test oscillator through 200 Mmf. condenser to antenna binding post of Chassis.

b. Connect the ground lead to ground terminal of Chassis.

c. Set range switch to S.W. range.

d. Place test oscillator in operation at 3700 K.C. and set dial pointer on 3700 K.C.

e. Adjust oscillator trimmer (A4) (located on variable condenser).

5. 1400 K.C. ALIGNMENT.

a. Turn range switch to broadcast position.

b. Place test oscillator in operation at 1400 K.C. and set dial pointer at 140.

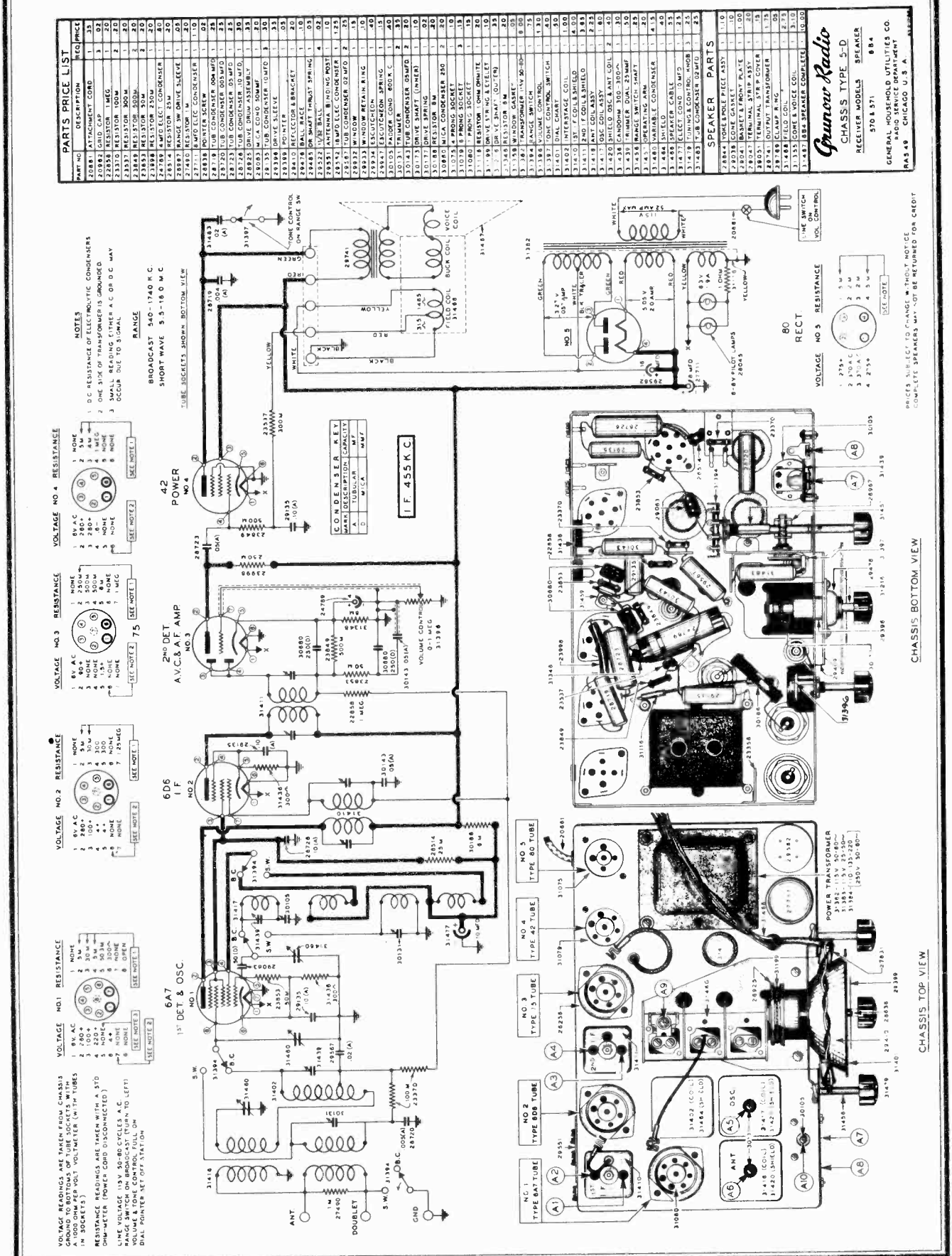
c. Adjust the 1400 K.C. trimmer (A5) located on the front face of the Chassis, the upper right of the two at this location.

d. Adjust the second and third trimmers (A6 and A7)

e. Repeat the 1400 K.C. alignment at least twice.

GENERAL HOUSEHOLD UTILITIES CO.

MODELS 570, 571
Chassis 5D
Schematic, Voltage
Socket, Trimmers, Parts



MODELS 570,571
Chassis 5D
MODELS 570X,571X
Chassis 5DX
MODELS 570Z,571Z
Chassis 5DZ
Alignment

GENERAL HOUSEHOLD UTILITIES CO.

November 1934

SERVICE NOTES AND PARTS LIST

Grunow Radio

CHASSIS TYPE 5D	CHASSIS 5DX	CHASSIS 5DZ
115 volt, 50-60 cycle	115 volt, 25-50 cycle	110-135-220-250 volt, 50-60 cycle
Receiver Models 570-571	Model 570X	Model 570Z
Speaker Types 8B4	Model 571X	Model 571Z

GENERAL HOUSEHOLD UTILITIES COMPANY

31558-1 CHICAGO, U. S. A.

INTRODUCTION

The following characteristics apply to the Grunow Radio—Chassis Type 5D:

This model is a 5-tube Super-Heterodyne Broadcast and Short Wave (550 to 1720 K.C. and 5.5 to 16.00 M.C.) Receiver using 1-6A7 (Pentagrid converter) tube as a 1st Detector and Oscillator. 1-6D6 (Triple-grid super-control) tube as an I.F. Amplifier. 1-75 (Duplex-diode high mu triode) tube is used as a Diode Detector or Signal Rectifier, delayed Automatic Volume Control (AVC) and high gain audio amplifier. The 42 output tube is a power amplifier pentode and is capable of producing large power output with a relatively small signal input. This tube receives its bias through the voltage drop produced in the tapped speaker field. The rectifier tube is an 80, the output of which is well filtered through the action of the speaker field and the 8, 10 and 18 mfd. electrolytic condensers.

The tuning range is divided into two bands or divisions, one covering the band of 550 to 1720 K.C. and the other 5.5 to 16.00 M.C.

ALIGNMENT PROCEDURE

Do not attempt to align the 5D Chassis without the proper equipment. Alignment condensers are shown in the accompanying illustrations and are numbered in order of procedure.

1. EQUIPMENT.

a. Test Oscillator.

A modulated oscillator capable of producing signals at 455 K.C.—600 K.C.—1400 K.C. and 15 M.C. is necessary for alignment of the 5D Chassis.

b. Non-metallic screw driver (all bakelite or fibre) about 6 inches long.

c. Output Meter.

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

d. Coupling Means.

Coupling condensers of 200 Mmf., .25 Mfd., and a 400 Ohm resistor should be used when coupling oscillator to receiver during alignment as specified in the following paragraphs.

e. The receiver should be aligned in a location free from local interference (man made static)—as high frequency disturbances will cause difficulties when the short wave section is being adjusted. (A screen room is to be recommended.)

2. DIAL SETTING.

Turn dial knob until condensers are fully meshed. The dial pointer should be on the horizontal line of the dial.

3. I.F. ALIGNMENT.

a. Connect signal lead of test oscillator to grid of the 6A7 (first detector tube) through a .25 Mfd. condenser. Connect the ground lead to the Chassis.

b. Set dial pointer to 1400 K.C. and range switch on broadcast position.

c. Place test oscillator in operation of 455 K.C. Turn receiver volume control to maximum.

d. Attenuate test oscillator output to lowest value consistent with obtaining a readable indication on output meter.

e. Adjust the four I.F. trimmers (A1-A2-A3-A4) located on the top side of Chassis, until maximum output is obtained. During alignment maintain as low a value of signal as will allow obtaining of accurate adjustment.

4. 15 M.C. ALIGNMENT.

a. Connect signal lead of test oscillator through 400 ohm resistor to antenna binding post of Chassis.

b. Connect the ground lead to ground terminal of Chassis.

c. Set range switch to S.W. range.

d. Place test oscillator in operation at 15 M.C. and set dial pointer on 15 M.C.

e. Adjust trimmer (A5) on top of oscillator coil, trimmer (A6) on top of the antenna coil—to maximum output—(the oscillator and antenna coils are located on left hand side on top of the Chassis).

f. On oscillator alignment use the lower of the images for the oscillator alignment point. It will be noted that there are two settings at which the signal will be received. Use the setting giving most capacity, that is, the setting at which the trimmer screw is farthest in. While adjusting the oscillator and antenna coil trimmers, rock the variable condensers back and forth through resonance until maximum output is obtained.

5. 1400 K.C. ALIGNMENT.

a. Turn range switch to broadcast position.

b. Connect signal lead of test oscillator through 200 Mmf. condenser to antenna binding post.

c. Place test oscillator in operation at 1400 K.C. and set dial pointer on 1400 K.C.

d. Adjust the two trimmers (A7 Oscillator and A8 Detector) located at the left front end of Chassis and trimmer (A9) on 3rd section of variable condensers to maximum output.

6. RECHECK OPERATION No. 4.

(15 M.C. Alignment.)

7. 600 K.C. ALIGNMENT.

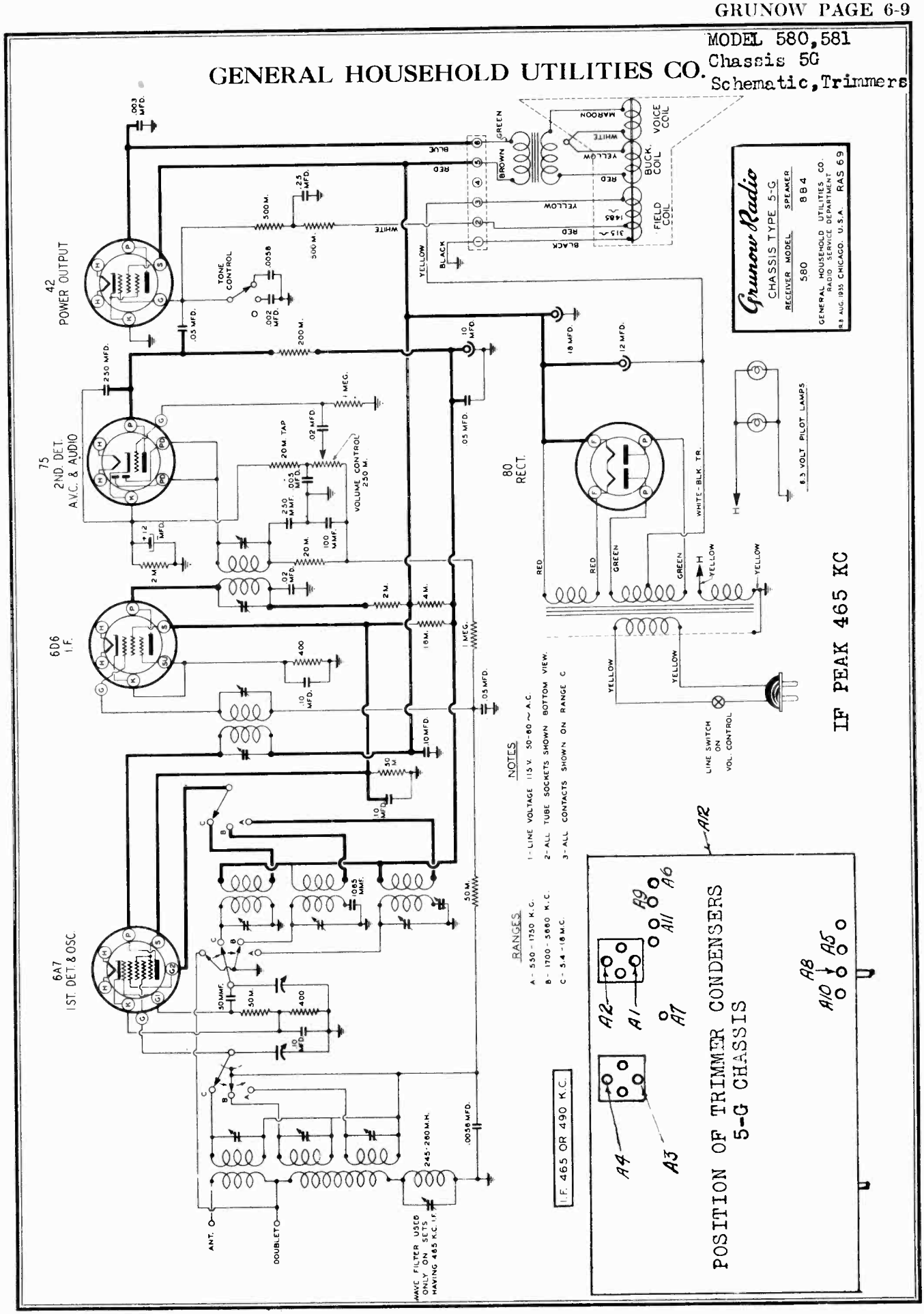
a. Place test oscillator in operation at 600 K.C.

b. Tune in signal to maximum. (This point does not have to be exactly at 600 K.C. dial setting.)

c. Adjust the 600 K.C. padding condenser (A10) (this is the upper of the two trimmers located at the left front end of Chassis), in direction of signal increase; at the same time rock the tuning condenser back and forth through resonance while adjusting padding condenser until maximum output is obtained.

MODEL 580,581
Chassis 5G
Schematic, Trimmers

GENERAL HOUSEHOLD UTILITIES CO.



SERVICE INSTRUCTIONS GRUNOW CHASSIS 5 G
BROADCAST and SHORT WAVE RECEIVER
MODELS 580 - 581
SPEAKERS 8B4 - 884

The frequency range is divided into three bands or divisions, one covering the band of 550 to 1750 K.C. (A), one the band from 1700 to 5680 K.C. (B), and the other from 5.4 to 18 megacycles (C).

CIRCUIT ALIGNMENT PROCEDURE

Do not attempt to align the 5 G Chassis without proper equipment. Alignment condensers are shown in the accompanying illustrations, - I.F. Condensers on top of the I.F. Transformers.

1 - EQUIPMENT:

(A) Test Oscillator

A modulated Oscillator capable of producing signals at the I.F., Broadcast and Short-Wave frequencies is necessary for alignment of the 5 G Chassis.

(B) Insulated Screw Driver - (all bakelite or fibre) about 6" long.

(C) Output Meter.

This may be any of the standard Output Meters, but should be sufficiently sensitive to provide a good deflection at low signal strength.

(D) Coupling Means.

Coupling Condensers of 200 mmf., .25 mfd., and a 400 Ohm resistor should be used when coupling oscillators to receiver during alignment as specified in the procedure.

(E) The Receiver should be aligned in a location free from local interference (interference caused by motors - flashers - automobile ignition, etc.) as high frequency disturbances will cause difficulties when the short wave section is being adjusted. (A screen room is to be recommended.

2 - DIAL SETTING:

Turn dial knob until condensers are fully meshed. The dial pointer (Hour hand) should be on the horizontal line of the dial, pointing to 9 and 3 O'clock. The minute hand should be at 12 O'clock or in a vertical position.

3 - I. F. ALIGNMENT:

Connect signal lead of test oscillator to grid of 6A7 (1st detector tube) through .25 mfd., condenser. Connect the ground lead to the Chassis.

(A) Set Dial pointer to 1400 K.C. and range switch on position "A".

(B) Place test Oscillator in operation at 490 K.C. or 465 K.C. (see note below.) Turn receiver volume control and tone control to maximum.

(C) Attenuate test Oscillator output to lowest value, consistent with obtaining a readable indication on output meter.

(D) Adjust four I.F. Trimmers, A1, A2, A3, A4, located on the I.F. Transformers on top of Chassis. Fig. (1), until maximum output is obtained. During alignment, maintain as low a value of signal as will allow obtaining of accurate adjustment.

4 - 1400 K. C. ALIGNMENT:

(A) Connect signal lead of test oscillator through 200 mmf., condenser to antenna binding post.

(B) Connect the test oscillator ground lead to the ground post of Chassis.

(C) Place test oscillator in operation at 1400 K.C.

(D) Turn dial pointer to 1400 K.C.

(E) Turn range switch to range "A".

(F) Adjust broadcast oscillator trimmer A5, Fig. (1), to maximum output.

(G) Adjust 1st Det. Trimmer (A6), Fig. (1), to maximum output.

5 - 600 K.C. ALIGNMENT:

(A) Place test oscillator in operation at 600 K.C.

(B) Tune in signal to maximum (this point does not have to be exactly at 600 K.C. dial setting).

(C) Adjust the 600 K.C. Padding Condenser (A7), Fig. (1), (which is on top of Chassis to the rear of variable condenser) in direction of signal increases. At same time rock the tuning condenser back and forth through resonance while adjusting padding condenser until maximum output is obtained.

6 - RECHECK 1400 K.C. ALIGNMENT

7 - 5 M. C. ALIGNMENT:

(A) Set Range switch at "B".

(B) Place test Oscillators in operation at 5 M.C.

(C) Turn Dial Pointer to 5 M.C.

(D) Adjust Set Oscillator Trimmer (A8), Fig. (1), to maximum output.

(E) Adjust Detector Trimmer (A9) Fig. (1) to maximum output.

(F) Check Dial Setting at 1800 K.C.

8 - 18 M.C. ALIGNMENT:

(A) Connect signal lead of test oscillator through 400 Ohm resistor to Antenna binding post of Chassis.

(B) Connect the ground lead to ground terminal of chassis.

(C) Set Range Switch to range "C" and turn dial pointer to 18 M.C.

(D) Place Test Oscillator in operation at 18 M.C.

(E) Adjust set Oscillator Trimmers (A10), Fig. (1), to maximum output.

(F) Adjust Detector Trimmers (A11), Fig. (1), to maximum output.

(G) On the 18 M.C. Alignment it will be noted that there are two settings at which the signal will be received. Use the lower of the images for alignment point, that is, the setting giving most capacity or the point at which the trimmer screw is farthest in. Check dial setting at 6 M.C.

NOTE:-

Due to interference caused by commercial code stations in some locations, it has been necessary to use two I.F. Frequencies on this Receiver, one of 490 K.C. where code interference is in the neighborhood of 455 K.C. and the other where the interfering stations are operating in the 500 K.C. band, we use an I.F. of 465 K.C.

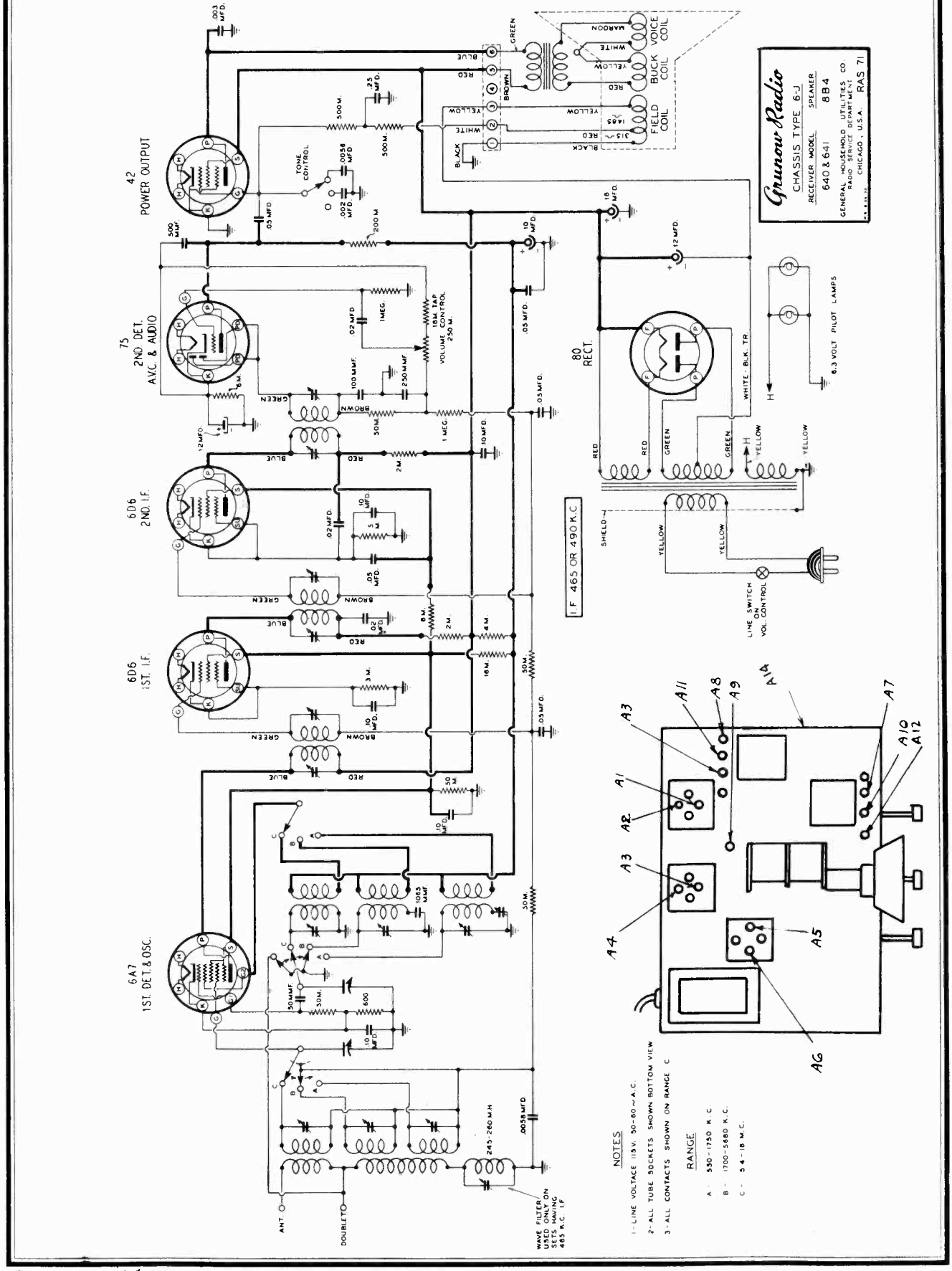
The I. F. Frequencies of the Receiver is stamped on the rear of the Chassis, and if there is any doubt as to I.F., peaking, it is only necessary to apply a variable I.F., signal to the I.F.Amplifier, and maximum output will indicate resonance or frequency at which the I.F.'s were peaked.

To further overcome this form of interference, sets peaked at 465, also incorporate a wave filter in the Antenna circuit. This filter should be tuned to the same frequency as the I.F. Transformers. Tuning is accomplished after the set has been completely aligned by applying the I.F. Frequency signal through to a .0002 Mfd., condenser to the Antenna binding post of the Receiver, and tuning the wave filter condenser, (A12) (located on the right hand side of the Chassis) so that the incoming signal is at minimum output.

In other words, apply a strong 465 K.C. signal to the Receiver Antenna Post thru the .0002 Mfd., Condenser, and tune wave filter so that the output meter indicates minimum.

GENERAL HOUSEHOLD UTILITIES CO.

MODELS 640, 641
Chassis 6J
Schematic
Trimmers



SERVICE INSTRUCTIONS GRUNOW CHASSIS 6 J
BROADCAST and SHORT WAVE RECEIVER
MODELS 640 - 641
SPEAKERS 8B4 -8B4

GENERAL:

The GRUNOW 6 J Chassis is a six tube, 115 V - 50-60 cycle A.C., three band receiver with A.V.C., Tone Control and a "Band Spread" dial. The tubes used are: 6A7 1st Detector and Oscillator, 6D6 1st I.F. Amplifier, 6D6 2nd I.F. Amplifier, 75 2nd Detector, A.V.C., and 1st Audio Amplifier, 42 Power Output tube and an 80 Rectifier tube.

The frequency range is divided into three bands or divisions, one covering the band of 550 to 1750 K.C. (A), one the band from 1700 to 5680 K.C. (B), and the other from 5.4 to 18 megacycles (C).

CIRCUIT ALIGNMENT PROCEDURE

Do not attempt to align the 6 J Chassis without proper equipment. Alignment condensers are shown in the accompanying illustrations, - I.F. Condensers on top of the I.F. Transformers.

1 - EQUIPMENT:
(A) Test Oscillator
A modulated Oscillator capable of producing signals at the I.F. Broadcast and Short-Wave frequencies is necessary for alignment of the 6 J Chassis.
(B) Insulated Screw Driver - (all bakelite or fibre) about 6" long.
(C) Output Meter.
This may be any of the standard Output meters, but should be sufficiently sensitive to provide a good deflection at low signal strength.
(D) Coupling Means.
Coupling Condensers of 200 mmf., .25 mfd., and a 400 Ohm resistor should be used when coupling oscillators to receiver during alignment as specified in the procedure.
(E) The Receiver should be aligned in a location free from local interference (interference caused by motors - flashers - automobile ignition, etc.) as high frequency disturbances will cause difficulties when the short wave section is being adjusted.
(A screen room is to be recommended.)

2 - DIAL SETTING:
Turn dial knob until condensers are fully meshed. The dial pointer (Hour hand) should be on the horizontal line of the dial, pointing to 9 and 3 O'clock. The minute hand should be at 12 O'clock or in a vertical position.

3 - I. F. ALIGNMENT:
Connect signal lead of test oscillator to grid of 6A7 (1st detector tube) through .25 mfd., condenser. Connect the ground lead to the Chassis.
(A) Set Dial pointer to 1400 K.C. and range switch on position "A".
(B) Place test Oscillator in operation at 490 K.C. or 465 K.C. (see Note 1.) Turn receiver volume control and tone control to maximum.
(C) Attenuate test Oscillator output to lowest value, consistent with obtaining a readable indication on output meter.
(D) Adjust six I.F. Trimmers, A1, A2, A3, A4, A5, A6, located on the I.F. Transformers on top of Chassis. Fig. (2), until maximum output is obtained. During alignment, maintain as low a value of signal as will allow obtaining of accurate adjustment.

4 - 1400 K. C. ALIGNMENT:
(A) Connect signal lead of test oscillator through 200-mmf., condenser to Antenna binding post.
(B) Connect the test oscillator ground lead to the groun post of Chassis.
(C) Place test oscillator in operation at 1400 K.C.
(D) Turn dial pointer to 1400 K.C.
(E) Turn range switch to range "A".
(F) Adjust broadcast oscillator trimmer A7, Fig. (2), to maximum output.
(G) Adjust 1st Det. Trimmer (A8), Fig. (2), to maximum output.

5 - 600 K. C. ALIGNMENT:
(A) Place test oscillator in operation at 600 K.C.
(B) Tune in signal to maximum (this point does not have to be exactly at 600 K.C. dial setting).
(C) Adjust the 600 K.C. Padding Condenser (A9), Fig. (2), (which is on top of Chassis to the rear of variable condenser) in direction of signal increases. At same time rock the tuning condenser back and forth through resonance while adjusting padding condenser until maximum output is obtained.

6 - RECHECK 1400 K.C. ALIGNMENT

7 - 5 M. C. ALIGNMENT:
(A) Set Range switch at "B".
(B) Place test Oscillators in operation at 5 M.C.
(C) Turn Dial Pointer to 5 M.C.
(D) Adjust Set Oscillator Trimmer (A10), Fig. (2), to maximum output.
(E) Adjust Detector Trimmer (A11) Fig. (2) to maximum output.
(F) Check Dial Setting at 1800 K.C.

8 - 18 M. C. ALIGNMENT:
(A) Connect signal lead of test oscillator through 400 Ohm resistor to Antenna binding post of Chassis.
(B) Connect the ground lead to ground terminal of chassis.
(C) Set Range Switch to range "C" and turn dial pointer to 18 M.C.
(D) Place Test Oscillator in operation at 18 M.C.
(E) Adjust set oscillator Trimmers (A12) Fig. (2) to maximum output.
(F) Adjust Detector Trimmers (A13), Fig. (2), to maximum output.
(G) On the 18 M.C. Alignment it will be noted that there are two settings at which the signal will be received. Use the lower of the images for alignment point, that is, the setting giving most capacity or the point at which the trimmer screw is farthest in. Check dial setting at 6 M.C.

NOTE:-
Due to interference caused by commercial code stations in some locations, it has been necessary to use two I.F. Frequencies on this Receiver, one of 490 K.C. where code interference is in the neighborhood of 455 K.C. and the other where the interfering stations are operating in the 500 K.C. band, we use an I.F. of 465 K.C.

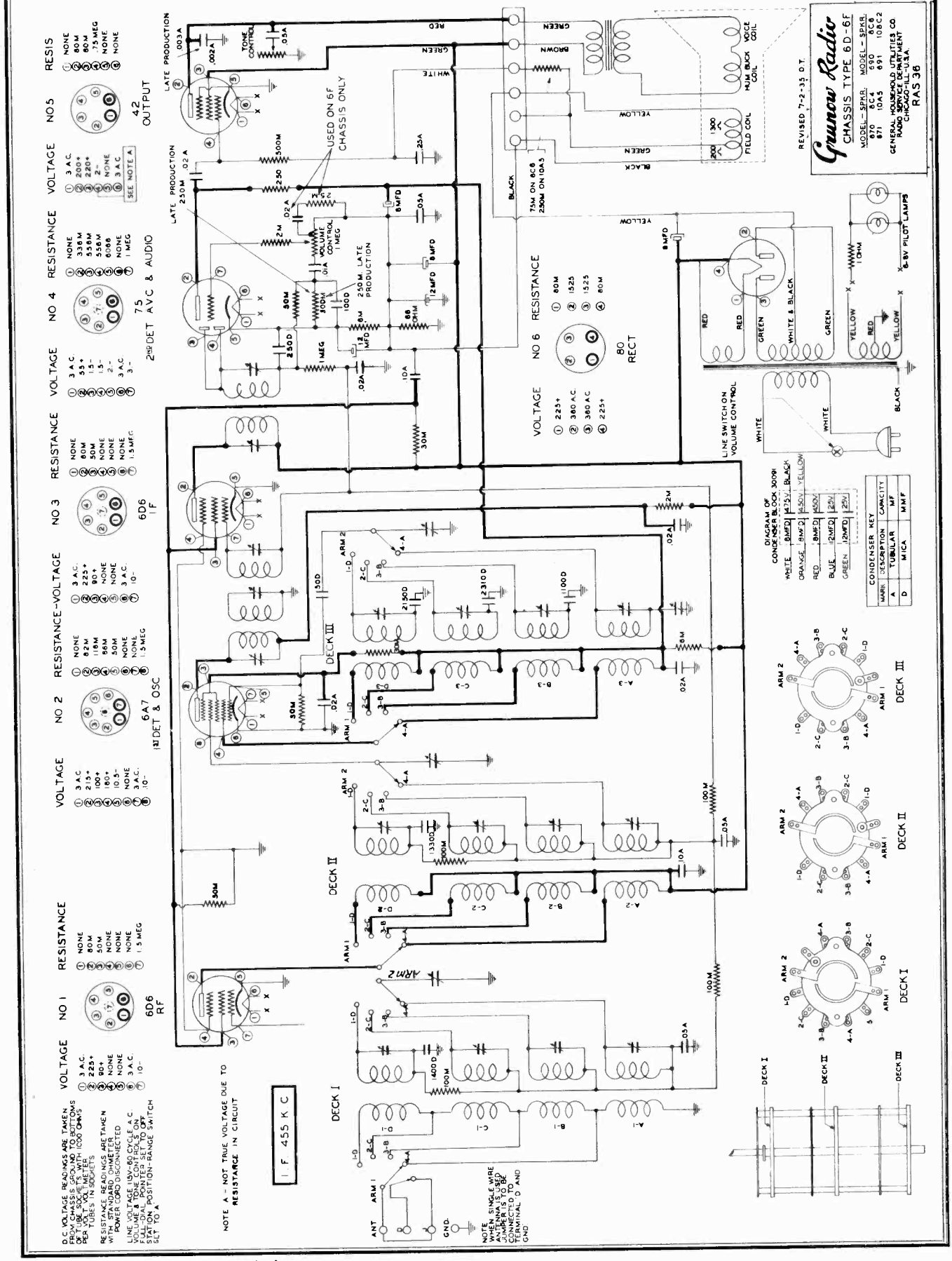
The I.F. Frequencies of the Receiver is stamped on the rear of the Chassis, and if there is any doubt as to I.F. peaking, it is only necessary to apply a variable I.F., signal to the I.F. Amplifier, and maximum output will indicate resonance or frequency at which the I.F.'s were peaked.

To further overcome this form of interference, sets peaked at 465, also incorporate a wave filter in the antenna circuit. This filter should be tuned to the same frequency as the I.F. Transformers. Tuning is accomplished after the set has been completely aligned by applying the I.F. Frequency signal through to a .0002 Mfd., condenser to the antenna binding post of the Receiver, and tuning the wave filter condenser, (A14) (located on the right hand side of the Chassis) so that the incoming signal is at minimum output.

In other words, apply a strong 465 K.C. signal to the Receiver Antenna Post thru the .0002 Mfd., Condenser, and tune wave filter so that the output meter indicates minimum.

MODELS 670,671
Chassis 6D
MODELS 690,691

Chassis 6F
Schematic, Voltage **GENERAL HOUSEHOLD UTILITIES CO.**



MODELS 690,691
Chassis 6F
Alignment,Parts

GENERAL HOUSEHOLD UTILITIES CO.

Supplement to
6D SERVICE NOTES AND PARTS LIST
31561-2

Grunow Radio

CHASSIS TYPE 6-F

Receiver Model 690-691

Speaker Model 8C8-108C2

GENERAL HOUSEHOLD UTILITIES COMPANY

RADIO SERVICE DEPT. CHICAGO, U. S. A.

31561-2 SUP.

JANUARY, 1935

The Grunow Model 6F is identical to the 6D except for the dial arrangement and a slight change in the audio circuit as shown on the schematic diagram on the back of this sheet. Use the alignment procedure as outlined for the 6D and excepting for the few additional parts listed below, the 6D parts list may also be used.

For Alignment of Chassis 6D, see Index

SUPPLEMENTARY PARTS USED ON CHASSIS 6F AND NOT ON CHASSIS 6D

Part No.	Description	No. Used	List Price
22856	Resistor—25M Ohm 1/4 Watt	1	$0.20
28728	Condenser—.25 Mfd. Tubular	1	.30
29621	Tone Control Knob	1	.20
29623	Volume Control Knob	1	.20
29818	Condenser—.003 Mfd. Tubular	1	.25
30100	Drive String and Spring Assembly	1	.15
31119	Range Switch Knob	1	.25
31350	Tuning Knob	1	.30
31710	Drive Drum, Hub and Gear Assembly	1	1.10
31714	Gear Tension Spring	1	.05
31723	Pointer and Pinion Assembly	1	.40
31726	Pinion, Gear and Adjusting Plate Assembly	1	.55
31962	Pointer	1	.10
31987	Variable Condenser	1	4.15
31997	Dial Chart	1	.65

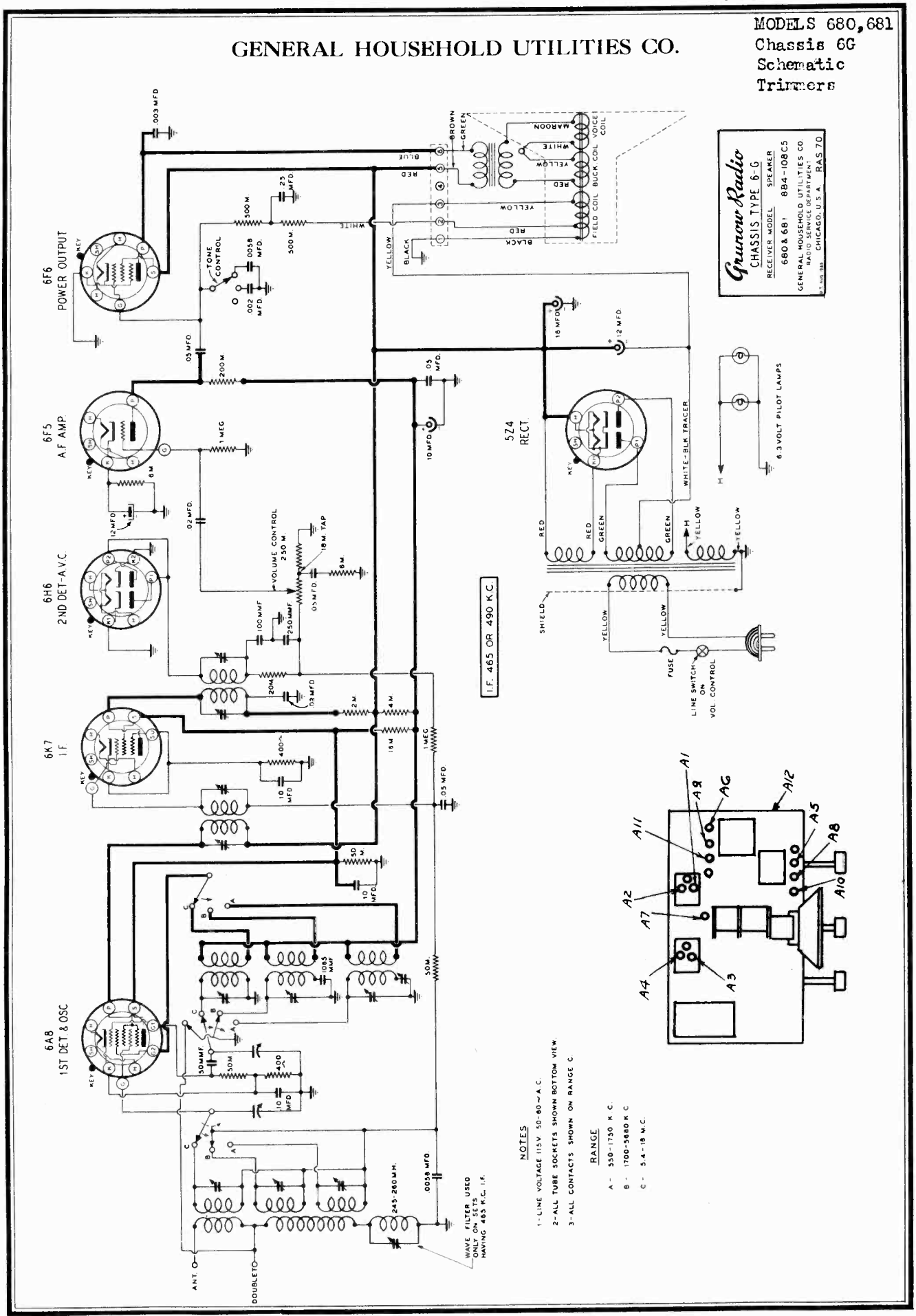
SPEAKER PARTS

29732	Output Transformer (8C8 and 108C2)	$ 1.75
31309	Cone and Voice Coil Assembly (8C8)	3.10
31995	8C8 Speaker Complete	10.50
31996	108C2 Speaker Complete	11.50
32003	Field Coil (108C2)	3.50
32004	Field Coil (8C8)	2.75
32008	Cone and Voice Coil Assembly (108C2)	3.10

(ALL PRICES SUBJECT TO CHANGE WITHOUT NOTICE)

GENERAL HOUSEHOLD UTILITIES CO.

MODELS 680,681
Chassis 6G
Schematic
Trimmers



NOTES

1- LINE VOLTAGE 115 V 50-60 ~ A.C.
2- ALL TUBE SOCKETS SHOWN BOTTOM VIEW.
3- ALL CONTACTS SHOWN ON RANGE C

RANGE

A - 550-1750 K.C.
B - 1700-5680 K.C.
C - 5.4-18 M.C.

SERVICE INSTRUCTIONS GRUNOW CHASSIS 6G
BROADCAST and SHORT WAVE RECEIVER
MODELS 680 - 681
SPEAKERS 8B4 - 108C5

GENERAL:

The GRUNOW 6 G Chassis is a six tube, 115 V - 50-60 cycle A.C., three band receiver with A.V.C., Tone Control and a "Band Spread" dial. The tubes used are: 6A8 1st Detector and Oscillator, 6K7 1st I.F. Amplifier, 6H6 2nd Detector and A.V.C., 6F5 1st Audio Amplifier, 6F6 Power Output tube and a 5Z4 Rectifier Tube.

The frequency range is divided into three bands or divisions, one covering the band of 550 to 1750 K.C. (A), one the band from 1700 to 5680 K.C. (B), and the other from 5.4 to 18 megacycles (C)

CIRCUIT ALIGNMENT PROCEDURE

Do not attempt to align the 6 G Chassis without proper equipment. Alignment condensers are shown in the accompanying illustrations, - I.F. Condensers on top of the I.F. Transformers.

1 - EQUIPMENT:

(A) Test Oscillator

A modulated Oscillator capable of producing signals at the I.F., Broadcast and Short-Wave frequencies is necessary for alignment of the 6 G Chassis.

(B) Insulated Screw Driver - (all bakelite or fibre) about 6" long.

(C) Output Meter.

This may be any of the standard Output Meters, but should be sufficiently sensitive to provide a good deflection at low signal strength.

(D) Coupling Means.

Coupling Condensers of 200 mmf., .25 mfd., and a 400 Ohm resistor should be used when coupling oscillators to receiver during alignment as specified in the procedure.

(E) The receiver should be aligned in a location free from local interference (interference caused by motors - flashers - automobile ignition, etc.) as high frequency disturbances will cause difficulties when the short wave section is being adjusted. (A screen room is to be recommended.)

2 - DIAL SETTING:

Turn dial knob until condensers are fully meshed. The dial pointer (Hour hand) should be on the horizontal line of the dial, pointing to 9 and 3 O'clock. The minute hand should be at 12 O'clock or in a vertical position.

3 - I. F. ALIGNMENT:

Connect signal lead of test oscillator to grid of 6A8 (1st detector tube) through .25 mfd., condenser. Connect the ground lead to the Chassis.

(A) Set Dial pointer to 1400 K.C. and range switch on position "A".

(B) Place test Oscillator in operation at 490 K.C. or 465 K.C. (see note below.) Turn receiver volume control and tone control to maximum.

(C) Attenuate test Oscillator output to lowest value, consistent with obtaining a readable indication on output meter.

(D) Adjust Four I.F. Trimmers, A1, A2, A3, A4, located on the I.F. Transformers on top of Chassis. Fig. (1), until maximum output is obtained. During alignment, maintain as low a value of signal as will allow obtaining of accurate adjustment.

4 - 1400 K.C. ALIGNMENT

(A) Connect signal lead of test oscillator through 200 mmf., condenser to Antenna binding post.

(B) Connect the test oscillator ground lead to the ground post of Chassis.

(C) Place test oscillator in operation at 1400 K.C.

(D) Turn dial pointer to 1400 K.C.

(E) Turn range switch to range "A".

(F) Adjust broadcast oscillator trimmer A5, Fig. (1), to maximum output.

(G) Adjust 1st Det. Trimmer (A6), Fig. (1), to maximum output.

5 - 600 K.C. ALIGNMENT:

(A) Place test oscillator in operation at 600 K.C.

(B) Tune in signal to maximum (this point does not have to be exactly at 600 K.C. dial setting.)

(C) Adjust the 600 K.C. Padding Condenser (A7), Fig. (1), (which is on top of Chassis to the Rear of variable condenser) in directing of signal increases. At same time rock the tuning condenser back and forth through resonance while adjusting padding condenser until maximum output is obtained.

6 - RECHECK 1400 K.C. ALIGNMENT

7 - 5 M. C. ALIGNMENT:

(A) Set Range switch at "B".

(B) Place test Oscillators in operation at 5 M. C.

(C) Turn Dial Pointer at 5 M.C.

(D) Adjust Set Oscillator Trimmer (A8), Fig. (1), to maximum output.

(E) Adjust Detector Trimmer (A9) Fig. (1) to maximum output.

(F) Check Dial Setting at 1800 K.C.

8 - 18 M. C. ALIGNMENT:

(A) Connect signal lead of test oscillator through 400 Ohm resistor to Antenna binding post of Chassis.

(B) Connect the ground lead to ground terminal of chassis.

(C) Set Range Switch to range "C" and turn dial pointer to 18 M.C.

(D) Place Test Oscillator in operation at 18 M.C.

(E) Adjust set oscillator Trimmers (A10) Fig. (1) to maximum output.

(F) Adjust Detector Trimmers (A11), Fig. (1), to maximum output.

(G) On the 18 M.C. Alignment it will be noted that there are two settings at which the signal will be received. Use the lower of the images for alignment point, that is, the setting giving most capacity or the point at which the trimmer screw is farthest in. Check dial setting at 6 M.C.

NOTE:-

Due to interference caused by commercial code stations in some locations, it has been necessary to use two I.F. Frequencies on this Receiver, one of 490 K.C. where code interference is in the neighborhood of 455 K.C. and the other where the interfering stations are operating in the 500 K.C. band, we use an I.F. of 465 K.C.

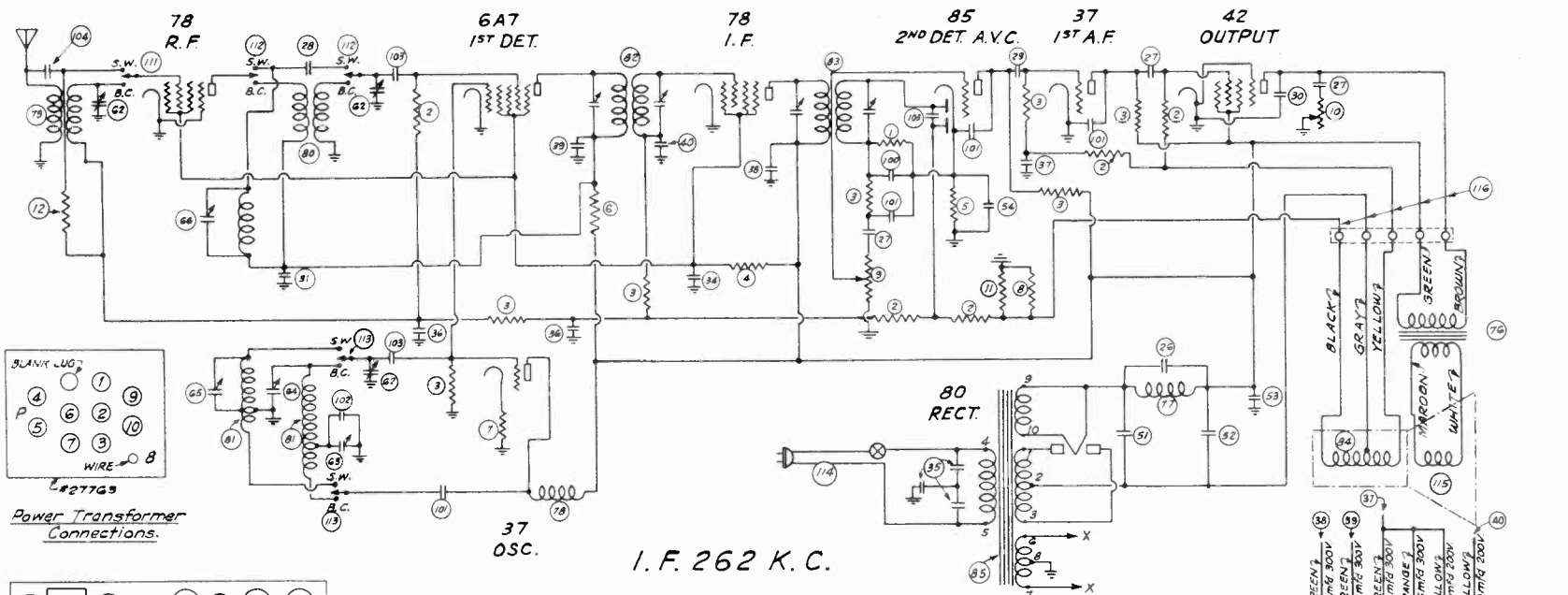
The I. F. Frequencies of the Receiver is stamped on the rear of the Chassis, and if there is any doubt as to I.F. peaking, it is only necessary to apply a variable I.F., signal to the I.F. Amplifier, and Maximum output will indicate resonance or frequency at which the I.F.'s were peaked..

To further overcome this form of interference, sets peaked at 465, also incorporate a waver filter in the Antenna circuit. This filter should be tuned to the same frequency as the I.F. Transformers. Tuning is accomplished after the set has been completely aligned by applying the I.F. Frequency signal through to a .0002 Mfd., condenser to the Antenna binding post of the Receiver, and tuning the wave filter condenser, (A12) (located on the right hand side of the Chassis) so that the incoming signal is at minimum output.

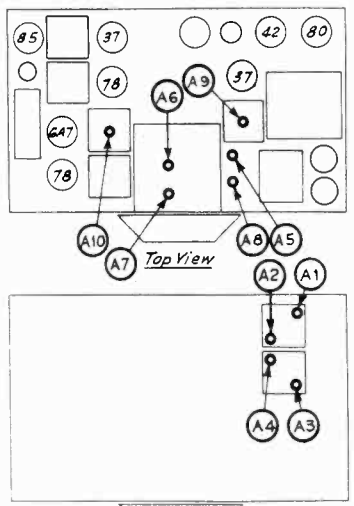
In other words, apply a strong 465 K.C. signal to the Receiver Antenna Post thru the .0002 Mfd., Condenser, and tune wave filter so that the output meter indicates minimum.

GENERAL HOUSEHOLD UTILITIES CO.

MODEL 821
Chassis 8B
Schematic, Trimmers
Socket, Parts



Power Transformer Connections.



LOCATION OF TRIMMER CONDENSERS

Detail Of By-Pass Condenser #27815

RESISTORS					PAPER CONDENSERS					ELECTROLYTIC CONDENSERS				
Item	Part No.	Description	No. Req.	Price	Item	Part No.	Description	No. Req.	Price	Item	Part No.	Description	No. Req.	Price
1	22858	1 Meg. ±20% ½ Watt	1	.20	26	28726	0.1 Mfd. 400 Volt	1	.25	51	27414	8 Mfd. 500 V.	1	1.50
2	23849	500,000 Ohm ±20% ½W.	5	.20	27	28723	0.05 Mfd. 400 Volt	3	.25	52	27413	8 Mfd. 500 V.	1	1.50
3	23853	50,000 Ohm ±20% ½W.	7	.20	28	29567	0.02 Mfd. 400 Volt	1	.25	53	29562	18 Mfd. 300 V.	1	1.25
4	23850	16,000 Ohm ±10% 1 W.	1	.20	29	28721	0.1 Mfd. 500 Volt	1	.25	54	27668	8 Mfd. 25 V.	1	.75
5	22857	10,000 Ohm ±10% 1 W.	1	.20	30	28717	0.002 Mfd. 700 Volt	1	.25					
6	28118	1,000 Ohm ±10% 1 W.	1	.20	31	28725	0.08 Mfd. 400 Volt	1	.25					
7	27784	400 Ohm ±10% ½ W.	1	.20	34	28138	1 Mfd. Can	1	.25	ADJUSTABLE CONDENSERS				
8	31515	80 Ohm ±10% 1 W.	1	.20	35	28043	3-.01 Mfd. Bathtub	1	.80	62	31532	Variable Condenser	1	.450
9	27687	Vol. Control 1 Meg.	1	1.10	36	27524	2-.10 Mfd. 200 V.	1	.75	63	27542	Osc. Trimmer (600K.C.)	1	.60
10	27646	Tone Control	1	.75	37	27815	0.25 Mfd. 200 V.	1	2.00	64	27382	B.C. Osc. Trimmer (1400 K.C.)	1	.35
11	27446	Candohm	1	.80	38		0.10 Mfd. 300 V.	1		65	30131	S.W. Osc. Trimmer	1	.35
12	21348	100,000 Ohm ±20% 1W.	1	.25	39		0.10 Mfd. 300 V.	1		66	30131	S.W. Det. Trimmer	1	.35
TRANSFORMERS & CHOKES					40		0.10 Mfd. 200 V.	1						
76	27591	Output Transformer	1	1.50	MISCELLANEOUS					MICA CONDENSERS				
77	27387	Filter Choke	1	1.50	111	31502	Range Switch, Deck I	1	2.75	Item	Part No.	Description	No. Req.	Price
78	29539	R.F. Choke	1	.60	112		Range Switch, Deck II	1		100	24251	100 MMF ±20%	1	.15
79	31494	Ant. Coil	1	1.00	113		Range Switch, Deck III	1		101	24487	250 MMF ±10%	4	.20
80	31488	Det. Coil	1	.80	114	20861	Line Cord	1	.35	102	24255	500 MMF ±10%	1	.25
81	31498	Osc. Coil	1	1.75	115	31526	10A6 Speaker	1	11.50	103	29083	50 MMF ±20%	3	.20
82	28094	1st I.F. Assy.	1	2.50	116	27562	Speaker Cable	1	.45	104	29597	600 MMF	1	.25
83	31511	2nd I.F. Diode Assy.	1	2.90										
84	27214	Speaker Field	1	2.75										
85	27763	Power Transformer	1	8.00										

Grunow Radio

CHASSIS TYPE 8-B

RECEIVER MODEL	SPEAKER
821	10A6

GENERAL HOUSEHOLD UTILITIES CO.
RADIO SERVICE DEPARTMENT
CHICAGO, ILL.
RAS-35
DT 11-7-34

MODEL 821
Chassis 8B
Alignment

GENERAL HOUSEHOLD UTILITIES CO.

SERVICE NOTES AND PARTS LIST

Grunow Radio

CHASSIS TYPE 8B
Receiver Model 821
Speaker Type 10A6

GENERAL HOUSEHOLD UTILITIES COMPANY

31563-1 Chicago, U. S. A.

INTRODUCTION

The following characteristics apply to the GRUNOW Radio—Chassis 8B.

This model is an 8 tube Super-Hetrodyne Broadcast and Short Wave (550 to 1550 KC and 6.0 to 13 M.C.) Receiver using 1-78 tube as an R.F. amplifier, 1-6A7 tube as a 1st detector, 1-37 tube as an oscillator, 1-78 tube as an I.F. amplifier, 1-85 tube as a Diode detector and delayed Automatic Volume Control (AVC)., 1-37 tube as 1st A.F. amplifier, resistance coupled to the 42 output tube. The 42 tube receives its bias through the voltage drop produced in the tapped speaker field. The rectifier tube is an 80, the output of which is well filtered through the action of the tuned choke, speaker field, the two 8 and one 18 mfd. Electrolytic Condensers.

The tuning range is divided into two bands or divisions, one covering the band of 550 to 1500 K.C., and the other 6.0 to 13 M.C.

ALIGNMENT PROCEDURE

Alignment condensers are shown on the accompanying diagram and are numbered in order of procedure.

1. EQUIPMENT.

a. Test Oscillator.

A modulated oscillator capable of producing signals at 262 K.C. —600 K.C.—1400 K.C. and 12 M.C. is necessary for alignment of the 8B Chassis.

b. Output Meter.

This may be any of the standard output meters on the market but should be sufficiently sensitive to provide a good deflection at low signal strength.

c. Coupling Means.

Coupling Condensers of 200 Mmf., .25 Mfd., and a 400 Ohm resistor should be used when coupling oscillator to receiver during alignment as specified in the following paragraphs.

d. The receiver should be aligned in a location free from local interference (man made static)—as high frequency disturbances will cause difficulties when the short wave section is being adjusted. (A screen room is to be recommended).

2. DIAL SETTING.

Turn dial knob until condensers are fully meshed. The dial pointer should be on the last mark on the low frequency end of the dial.

3. I. F. ALIGNMENT.

a. Connect signal lead of test oscillator to grid of the 6A7—(1st Detector Tube) through .25 Mfd. Condenser. Connect the ground lead to the Chassis.

b. Set Dial pointer to 1400 K.C. and range switch to Broadcast Position.

c. Place test Oscillator in operation at 262 K.C. Turn receiver volume control and tone control to maximum.

d. Attenuate test oscillator output to lowest value consistent with obtaining a readable indication on output meter.

e. Adjust four I. F. Trimmers, A1-A2-A3-A4, located on under side of Chassis, until maximum output is obtained. During alignment, maintain as low a value of signal as will allow obtaining of accurate adjustment.

4. 1400 K.C. ALIGNMENT.

a. Connect signal lead of test oscillator through 200 Mmf. condenser to antenna binding post.

b. Connect the test oscillator ground lead to the ground post of Chassis.

c. Place test oscillator in operation at 1400 K.C.

d. Turn dial pointer to 1400 K.C.

e. Turn Range Switch to Broadcast Range.

f. Adjust 1400 K.C. padding condenser, A5, which is located on top of Chassis on the right of gang condenser toward rear.

g. Adjust 1st Detector Trimmer, A6, which is the center on top of variable condenser.

h. Adjust R.F. Trimmer, A7, which is the first on top of variable condenser.

5. 600 K.C. ALIGNMENT.

a. Place test oscillator in operation at 600 K.C.

b. Tune in signal to maximum (this point does not have to be exactly at 600 K.C. dial setting).

c. Adjust the 600 K.C. Padding Condenser A8 (which is on top of Chassis on right of gang condenser toward front), in direction of signal increases. At same time rock the tuning condenser back and forth through resonance while adjusting padding condenser until maximum output is obtained.

6. 12 M.C. ALIGNMENT.

a. Connect signal lead of test oscillater through 400 Ohm resistor to Antenna binding post of chassis.

b. Connect the ground lead to ground terminal of Chassis.

c. Set Range Switch to Short Wave Range and turn dial pointer to 12 M.C.

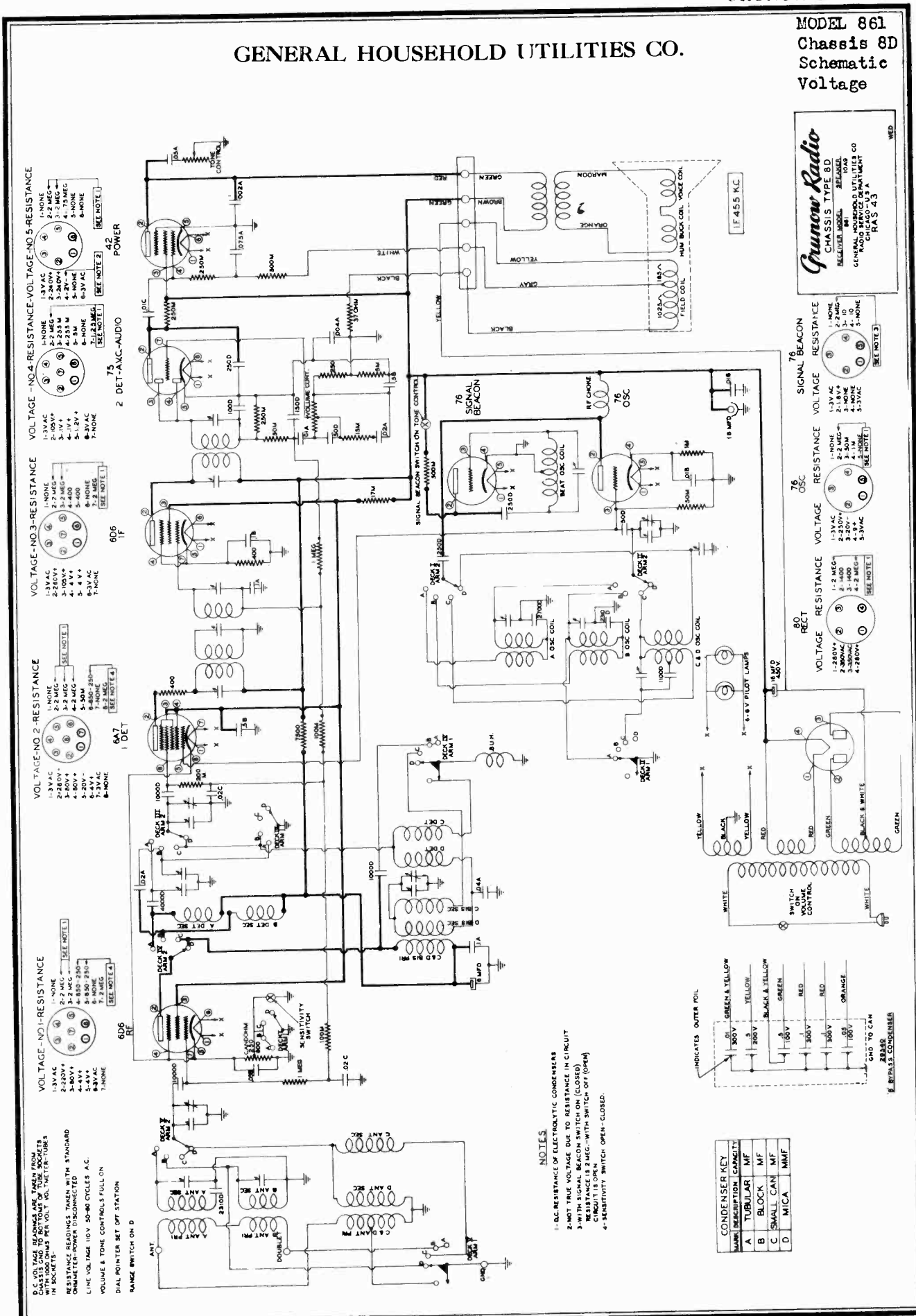
d. Place test oscillator in operation at 12 M.C.

e. Adjust set oscillator trimmer A9 through hole in oscillator transformer shield located on right side of variable condenser on top of Chassis.

f. Adjust detector trimmer A10 through hole in Detector Transformer Shield located on left side of variable condenser on top of Chassis.

GENERAL HOUSEHOLD UTILITIES CO.

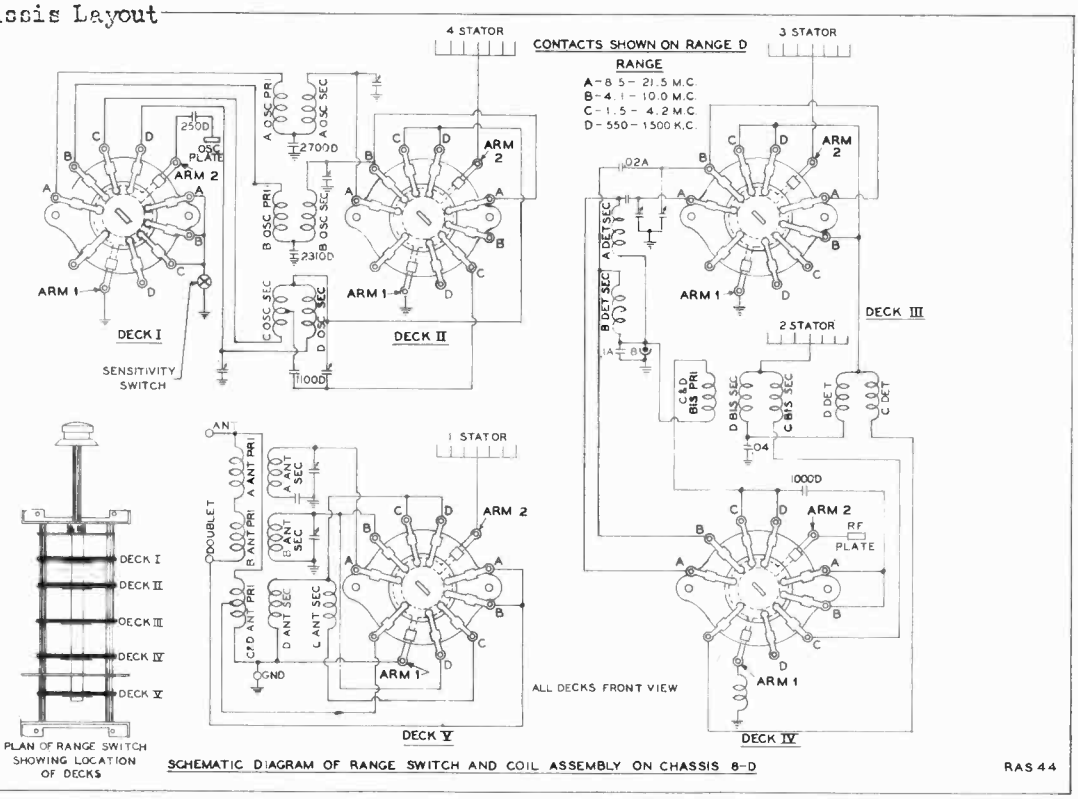
MODEL 861
Chassis 8D
Schematic
Voltage



MODEL 861
Chassis 8D
Switch & Coil Assembly
Trimmers, Chassis Layout

GENERAL HOUSEHOLD UTILITIES CO.

FIGURE 3



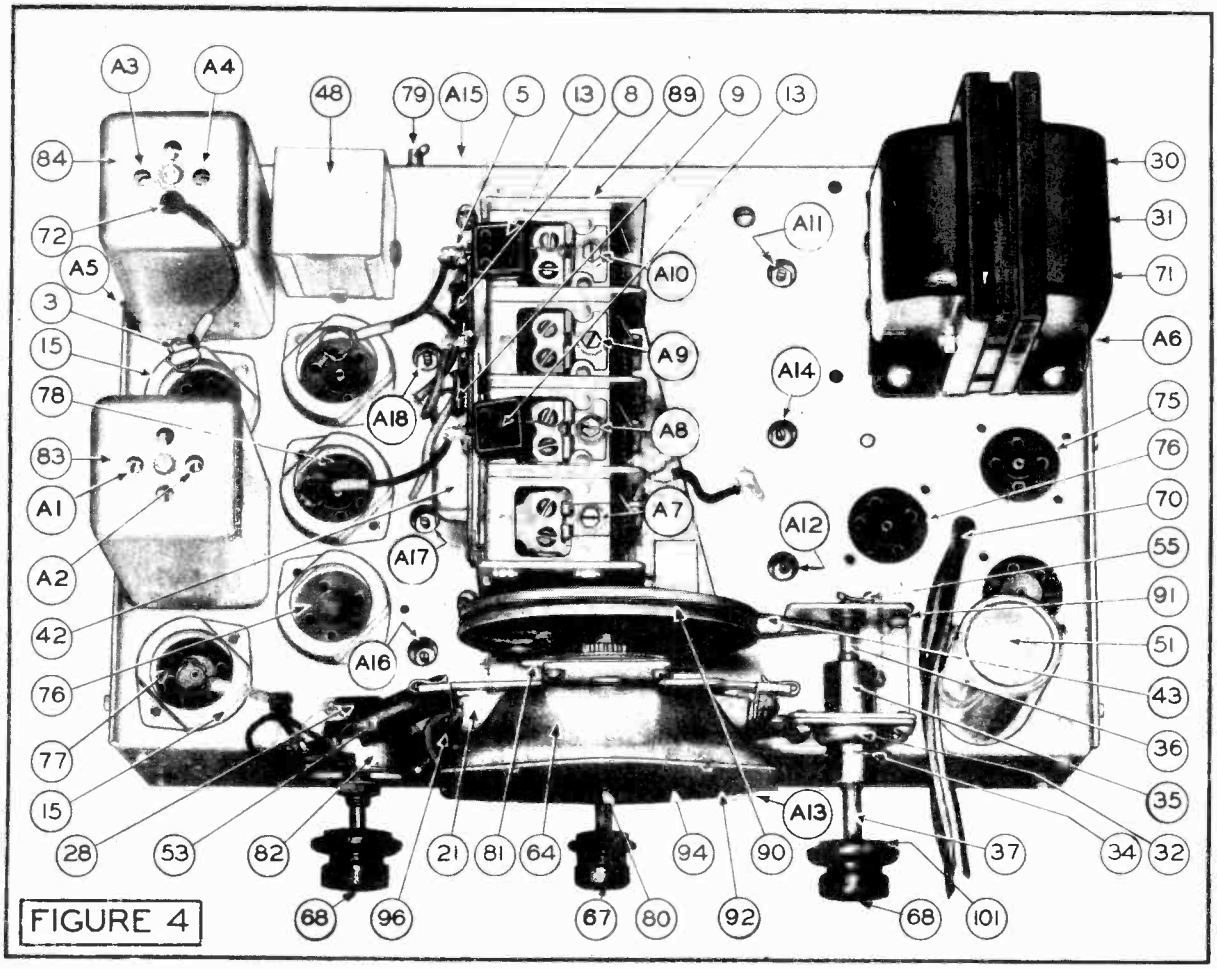


FIGURE 4

January, 1935

Service Notes and Parts List

Grunow Radio

CHASSIS TYPE 8D

Receiver Model	Speaker Model
861	10A9

GENERAL HOUSEHOLD UTILITIES COMPANY
RADIO SERVICE DEPT. CHICAGO, U. S. A.

31567-1

Chassis 8D —115 volt 50-60 cycle
Chassis 8DX—115 volt 25-50 cycle
Power Consumption 75 watts.

Chassis 8DZ { 110—135—220—250 volt / 50-60 cycle

Tubes—2-6D6, 1-6A7, 1-75, 1-42, 2-76, 1-80

INTRODUCTION

The following characteristics apply to the Grunow Radio—Chassis Type 8D.

This model is an 8 tube Super-Heterodyne All Wave (550 to 21,000 KC) Receiver, using 1-6D6 tube as an R. F. Amplifier, 1-6A7 tube as a 1st Detector or mixer—being electronicly coupled to a 76 Oscillator tube, 1-6D6 tube as an I.F. amplifier with the 1st I.F. Transformer of the Bi-Selector type and both 1st and 2nd transformers tuned to 455 K. C. A 75 tube (double diode high mu Triode) is used as a diode detector, delayed Automatic Volume Control (AVC) and a high gain audio amplifier. The 42 output tube receives its bias through the voltage drop produced in the tapped speaker field. A type 76 tube is used as a Signal Beacon or beat oscillator. Plate voltage to the Signal Beacon being applied by closing the switch on the tone control. The rectifier tube is an 80, the output of which is well filtered through the choke action of the speaker field and the 8, 16 and 18 mfd. electrolytic condensers.

The broadcast section of the receiver consists of the following 4 variable tuned circuits: R.F. input, bi-selector, mixed input and oscillator. These circuits are tuned with a 4-gang variable condenser of rugged construction.

The short wave section of the receiver consists of 3 variable tuned circuits, the bi-selector being cut out to prevent losses when the receiver is working at the higher frequencies.

The Signal Beacon is a beat oscillator using a 76 tube, and is a feature of the 8D chassis. When this tube is brought into operation it acts as a local oscillator, with a frequency of 455 K.C. The signal of this oscillating circuit is fed into the I.F. circuit through a short lead that acts as a radiator and beats against the incoming signal at the I.F. frequency. The presence of a station's signal will be indicated by a high pitched "whistle," becoming lower in pitch as "resonance" or exact tuning is approached. The Signal Beacon is also used to receive telegraph or continuous wave signals.

A sensitivity Control is incorporated in the 8D chassis and consists of a switch on the rear of the Chassis. This switch when in position No. 1 reduces the sensitivity by allowing the total resistance of 850 Ohms to be used as a grid bias on the 6D6 R.F. tube and the 6A7 1st Det. tube. When on position No. 2, the bias is changed to 250 Ohms by grounding out the 600-Ohm section and increasing the sensitivity of the receiver. It will be noted by referring to schematic diagram that this control is effective only on the "D" or broadcast range.

The remainder of the circuit is typical and has been designed along the lines of what is considered the best engineering practice to date. Parts are all oversize and of the finest quality.

SERVICE DATA

The Chassis frame is built in such a way that the end plates may be disconnected, allowing easy inspection of the underside of the Chassis assembly. (Fig. 6.)

The range switch and coil assembly is made up in a unit and may be removed for inspection or repair. (Fig. 7.) The removal of this assembly necessitates the unsoldering of 14 wire leads. These leads and the position to which they are connected are marked on the illustrations with letters. The leads A-B-C on the Coil Assembly (Fig. 7) are attached to the points marked A-B-C on the Chassis Assembly (Fig. 5). The leads marked D-E-F-G on the Coil Assembly (Fig. 7) are attached to the points of corresponding letters on the Chassis Assembly (Fig. 6). Leads H, I, J, K, L, M on Coil Assembly are connected as follows:

Lead "H" connects the ground side of the short wave antenna transformer (Red) to the rotor ground of the variable condenser.

Lead "I" connects Arm 2 of Deck 5 to the No. 1 stator of the variable condenser.

Lead "J" is the shielded lead connecting the bi-selector transformer to the No. 2 stator of the variable condenser.

Lead "K" connects Arm 2 of Deck 3 to the No. 3 stator of the variable condenser.

Lead "L" connects the switch assembly ground to the variable condenser rotor ground.

Lead "M" connects Arm 2 of Deck 2 with No. 4 stator of the variable condenser.

Care should be exercised in making these connections. (A soldering iron with a bent point should be used in this operation.)

Lead "N" connects contacts A-B-C of Arm 1 on Deck 1 to the sensitivity control switch and the 250-Ohm bias resistor.

Lead "P" connects the plate of the signal Beacon to an insulator, acting as a pick-up lead.

Continuity and Voltage

Continuity and voltage readings should be taken from the underside of the Chassis. The values given on the schematic diagram are average and allow the service man to make a quick check of the Chassis Constants. The socket layouts given on the schematic diagram show each socket from the underside.

The Range Switch

In servicing the 8D Receiver consider the radio frequency end as four different and distinct radios:

One working from 550 to 1500 K.C. (D Range)
One working from 1500 to 4200 K.C. (C Range)
One working from 4100 to 10000 K.C. (B Range)
One working from 8500 to 21500 K.C. (A Range)

These four radios are put into operation as desired by means of the Range Switch.

When on position "A" the short wave coils covering the range from 8,500 to 21,500 K.C. are connected into the three tuned circuits of the receiver; one coil as an R.F. Transformer, one as the Detector Coupler, and one as the Oscillator Transformer.

On position "B" the 4100 to 10,000 K.C. coils are put into operation.

On position "C" the 1500 to 4200 K.C. coils are shunted across the 550 to 1500 K.C. coils in such a manner as to lower the total inductance of the combined coils and reduce the losses caused by open end coils.

On both the "C" and "D" positions, four coil sets are put into the circuit and the receiver operates as a four-tuned circuit radio. On all four ranges the receiver works at maximum sensitivity and selectivity. All coils and condensers are of such construction that atmospheric and temperature changes have minimum effect.

Each circuit is completely shielded from each other, and the complete range switch and coil assembly may be removed for inspection or repair.

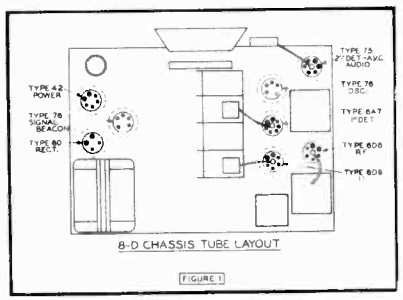


Fig. 1

MODEL 861
Chassis 8D
Alignment Parts

GENERAL HOUSEHOLD UTILITIES CO.

ALIGNMENT PROCEDURE

Do not attempt to align the 8D Chassis without the proper equipment. Alignment condensers are shown in the accompanying illustrations and are numbered in order of procedure.

1. EQUIPMENT

A—Test Oscillator.

A modulated oscillator capable of producing signals at 455 K.C.—600 K.C.—1400 K.C.—3700 K.C.—10 M.C. and 18 M.C. is necessary for alignment of the 8D Chassis.

B—Insulated screw driver—(All bakelite or fibre) about 6" long.

C—Output Meter.

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

D—Coupling Means.

Coupling Condensers of 200 mmf., .25 Mfd. and a 400 Ohm resistor should be used when coupling oscillator to receiver during alignment as specified in the following paragraphs.

E—The receiver should be aligned in a location free from local interference, man made static—as high frequency disturbances will cause difficulties when the short wave section is being adjusted. (A screen room is to be recommended.)

2. DIAL SETTING

Turn dial knob until condensers are fully meshed. The dial pointer (hour hand) should be on the horizontal line of the dial, pointing to 9 and 3 o'clock. The minute hand should be at 12 o'clock or in a vertical position.

3. I. F. ALIGNMENT

Connect signal lead of test oscillator to grid of the 6A7, 1st Detector Tube, through .25 Mfd Condenser. Connect the ground lead to the chassis.

A—Set Dial pointer to 1400 K.C. and range switch on position D.

B—Place test Oscillator in operation at 455 K.C. Turn receiver volume control and tone control to maximum.

C—Attenuate test oscillator output to lowest value consistent with obtaining a readable indication on output meter.

D—Adjust five I.F. Trimmers, A1-A2-A3-A4-A5 (Fig 4), located on the I.F. transformers on top of chassis (2 trimmers are on top of each transformer and one, the Bi-Selector, is at the lower side of the 1st I.F. Transformer), until maximum output is obtained. During alignment maintain as low a value of signal as will allow obtaining of accurate adjustment.

E—Turn the tone control counter clockwise until the Signal Beacon switch snaps on.

F—Adjust Signal Beacon trimmer A6 (Fig. 4), which is located on right hand face of Chassis, to zero beat with the 455 K.C. incoming signal.

4. 1400 K. C. ALIGNMENT

A—Place test oscillator in operation at 1400 K.C.

B—Turn dial pointer to 1400 K.C.

C—Turn range switch to range D.

D—Adjust broadcast oscillator trimmer A7, which is on the variable condenser section nearest the dial to maximum output. It may be necessary to reduce the capacity of the 600 K.C. padder (A11) to about half its capacity before the oscillator will peak at 1400 K.C.)

E—Adjust 1st Det Trimmer A8 (Fig. 4), which is the second from front on top of variable condenser.

F—Adjust Bi-Selector Trimmer A9 (Fig. 4), which is the third from front on top of variable condenser.

G—Adjust Antenna Trimmer A10 (Fig. 4), which is the fourth from the front on top of variable condenser.

5. 600 K. C. ALIGNMENT

A—Place test oscillator in operation at 600 K.C.

B—Tune in signal to maximum (this point does not have to be exactly at 600 K.C. dial setting).

C—Adjust the 600 K.C. Padding Condenser A11 (Fig. 4), which is on top of chassis on right-hand side third from front as you face chassis) in direction of signal increases. At same time rock the tuning condenser back and forth through resonance while adjusting padding condenser until maximum output is obtained.

D—Readjust Oscillator Trimmer (A7) for maximum output with pointer and signal set at 1400 K.C. (see 1400 K.C. Alignment).

6. 3700 K. C. ALIGNMENT

A—Connect signal lead of test oscillator through 200 Mmf condenser to antenna binding post.

B—Connect the test oscillator ground lead to the ground post of chassis.

C—Turn range switch to range "C" and set dial pointer to 3700 K.C.

D—Adjust the 3700 K.C. Oscillator Trimmer A12 (Fig. 4) (which is the first of the three located on top of chassis on the right-hand side as you face it) in direction of signal increase. At same time work the tuning condenser back and forth through resonance while adjusting trimmer condenser until maximum output is obtained.

7. 10 M. C. ALIGNMENT

A—Connect signal lead of test oscillator through 400 Ohm resistor to antenna binding post of chassis.

B—Connect the ground lead to ground terminal of chassis.

C—Set range switch to range "B" and turn dial pointer to 10 M.C.

D—Place Test Oscillator in operation at 10 M.C.

E—Adjust Set Oscillator Trimmer A13 (Fig. 4). (located on front face of chassis).

F—Adjust Detector Trimmer A14 (Fig. 4). (located on right-hand side on top of chassis, second from front).

G—Adjust Antenna Trimmer A15 (Fig. 4) (located on rear face of chassis).

8. 18 M. C. ALIGNMENT

A—Set Range Switch on Range "A".

B—Place Test Oscillator in operation at 18 M.C.

C—Turn Dial Pointer to 18 M.C.

D—Adjust Set Oscillator Trimmer A16 (Fig. 4), located on top of chassis on left of gang condenser, first from front).

E—Adjust Detector Trimmer A17 (Fig. 4), (located second from front on top of chassis on left-hand side).

F—Adjust Antenna Trimmer A18 (Fig. 4), (located third from front on top of chassis on left-hand side).

G—It may be necessary to rock the variable condenser back and forth through resonance while adjusting the Detector (A17) and the Antenna (A18) for maximum output.

PARTS AND PRICE LIST

PART NUMBERS ARE GIVEN ON THE ILLUSTRATION AND THE NUMBERS ARE BROUGHT DOWN IN NUMERICAL ORDER FOR CONVENIENCE

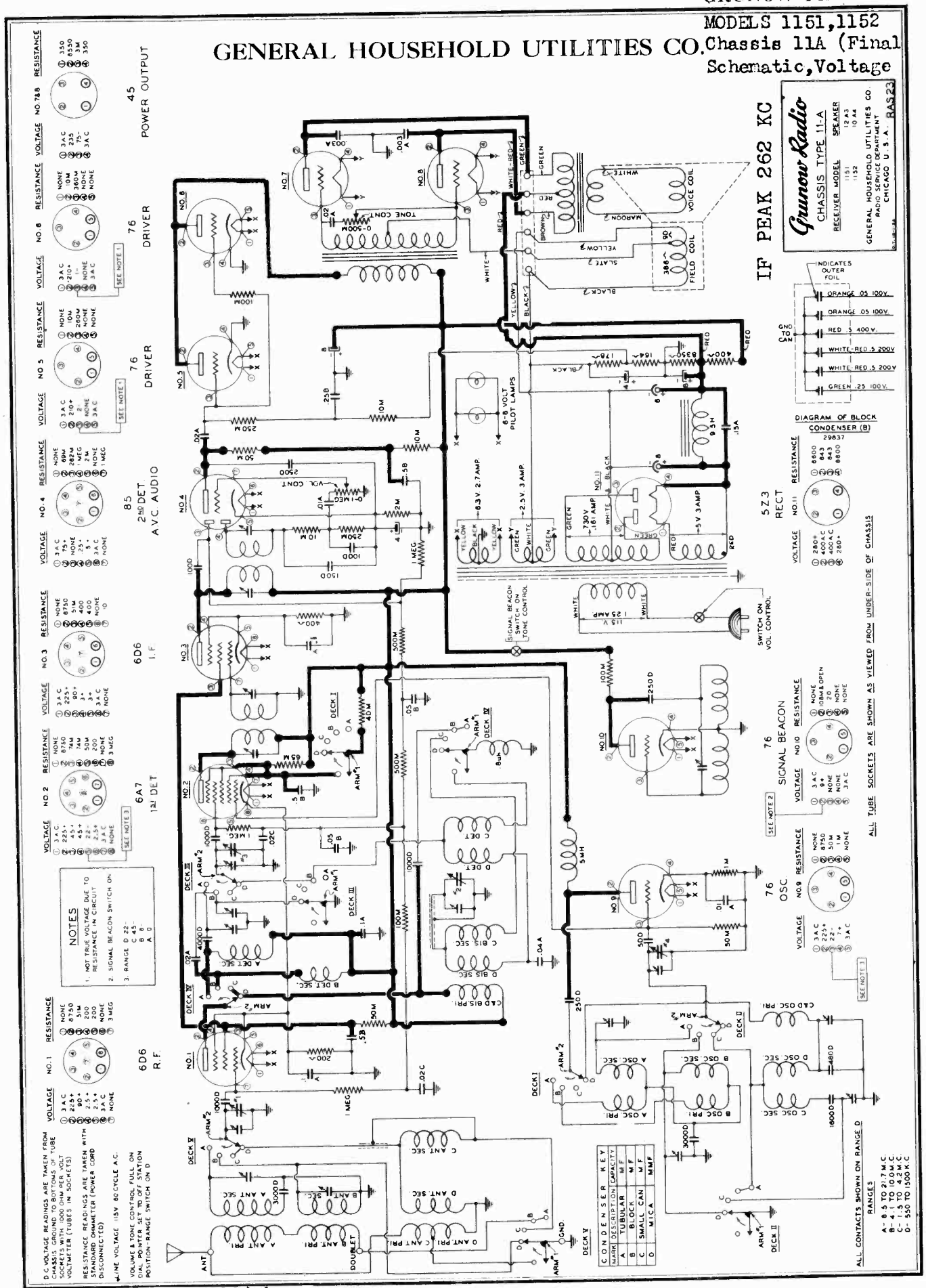
Index No	Part No.	DESCRIPTION	Quantity Required	Price
1	20678	Ground Terminal	1	$ .02
2	20861	Line Cord and Plug	1	.35
3	20962	Grip Cap	4	.02
4	21598	Rubber Grommet	10	.02
5	22858	Resistor, 1 Megohm, Carbon, ½ Watt	3	.20
6	23284	Bakelite Washer	13	.02
7	23358	Insulated Terminal Assy. (single)	3	.10
8	23370	Resistor, 100,000 Ohm, Carbon, ¼ Watt	3	.20
9	23538	Resistor, 200,000 Ohm, Carbon, ¼ Watt	1	.20
10	23849	Resistor, 500,000 Ohm, Carbon, ¼ Watt	3	.20
11	23853	Resistor, 50,000 Ohm, Carbon, ¼ Watt	2	.20
12	23998	Resistor, 250,000 Ohm, Carbon, ¼ Watt	4	.20
	24251	Condenser, 100 MMF, Mica (2nd I.F.)	1	.15
13	24254	Condenser, 1000 MMF, Mica	3	.20
14	24487	Condenser, 250 MMF, Mica	3	.20
15	26256	Tube Shield Base	5	.05
16	27382	Trimmer Condenser Assy.	5	.35
	27455	Tube Shield	1	.15
17	27490	Resistor, 1000 Ohm, Carbon, ½ Watt	1	.20
18	27520	Condenser, 2310 MMF, Mica	1	.45
19	27784	Resistor, 400 Ohm, Carbon, ¼ Watt	2	.20
20	27801	Rubber Grommet	3	.05
	27802	Cup Washers	6	.02
21	27831	Pilot Light Socket, Insulated	2	.15
	28045	Pilot Light Bulb	2	.15
22	28183	Resistor, 7500 Ohm, Carbon, ½ Watt	1	.20
23	28573	Short Wave Coil Shield Assy.	1	.75
24	28638	Dial Pointer Screw	1	.02
25	28717	Condenser, Tubular, .002 Mfd., 700 Volt	1	.25
26	28723	Condenser, Tubular, .05 Mfd., 400 Volt	1	.25
27	28726	Condenser, Tubular, .1 Mfd., 400 Volt	1	.25
28	29083	Condenser, 50 MMF, Mica	2	.20
29	29135	Condenser, Tubular, .1 Mfd., 100 Volt	1	.25
30	29414	Power Transformer, 115 Volt, 50-60 Cycles	1	6.00
31	29416	Power Transformer, 115 Volt, 25-50 Cycles	1	7.25
	29453	Condenser, Tubular, .01 Mfd., 400 Volt (2nd I.F.)	1	.25
32	29476	Ball Race	1	.10
33	29482	Broad Cast Coil Shield Assy.	1	.80
34	29483	Drive Shaft-Stop Spring	1	.05
	29485	Drive Shaft Thrust Spring	1	.05
35	29486	Drive Sleeve	1	.50
36	29487	Drive Shaft, Inner	1	.50
37	29488	Drive Shaft, Outer	1	.75
38	29490	Range Switch	1	4.00
39	29496	Antenna Transformer (Broadcast)	1	1.75
40	29498	1st Detector Transformer (Broadcast)	1	1.25
41	29501	1st Detector Transformer (Short Wave), Black	1	1.25
	29515	Resistor Panel Assy. (includes 295181	1	1.25
42	29518	Condenser, Small Can, .02-.02 Mfd.	1	.75
43	29520	Drive Cable Assy.	1	.10
	29521	3/16" Ball Bearing	1	.01
	29522	11/32" Ball Bearing	4	.02
	29523	Condenser Mounting Bearing	1	.10
	29524	Cable Tension Spring	1	.10
44	29533	Resistor, Candohm, 5000-37 Ohms	1	.40
45	29534	Condenser, Small Can, .01 Mfd.	1	.60
46	29537	Tone Control, 500,000 Ohms	1	1.15
47	29539	Oscillator Plate Choke	1	.60
48	29540	By-Pass Condenser Block	1	2.50
49	29551	Antenna and Doublet Binding Posts Assy.	1	.10
	29552	Escutcheon Window	1	.15
	29553	Window Retaining Ring	1	.10
	29554	Escutcheon	1	.60
50	29558	Condenser, Dry Electrolytic, 16 Mfd., 450 Volt	1	1.90
51	29562	Condenser, Wet Electrolytic, 18 Mfd., 300 Volt	1	1.25
52	29564	Condenser, Tubular, .075 Mfd., 100 Volt	1	.30
53	29567	Condenser, Tubular, .02 Mfd., 400 Volt	1	.25
	29580	Signal Beacon Trimmer Condenser	1	.75
54	29584	Signal Beacon Shield	1	.30
55	29596	Drive Leaf Spring	2	.05
56	29611	Coupling Inductance Coil	1	.25
	29612	Escutcheon Retaining Spring	1	.20
57	29613	Condenser, 4000 MMF, Mica	1	.50
58	29616	Insulated Terminal Assy. (Single)	5	.10
59	29617	Insulated Terminal Assy. (Double)	1	.15
60	29628	Insulated Terminal (4)	1	.10
61	29812	Condenser, Tubular, .04 Mfd., 500 Volt	1	.30
62	29813	Condenser, Tubular, .004 Mfd., 700 Volt	1	.25
	29832	Tube Shield Body	4	.15
63	29836	Trimmer Condenser Assy.	1	.25
64	29893	Reflector Assembly	1	.50
65	29900	Trimmer Condenser Assy.	1	.50
66	29952	Knob (Range Switch)	1	.30
67	29953	Knob (Tone Control)	1	.20
68	29954	Knob (Tuning and Volume)	2	.20
69	29990	Condenser, Tubular, .02 Mfd., 400 Volt	1	.20
70	29997	Speaker Cable	1	.95
71	30006	Power Transformer (110-135-220-250 Volt, 50-60 Cycle)	1	7.50
	30030	Rubber Mtg. Washer, Upper, Black	3	.05
	30031	Rubber Mtg. Washer, Upper, Red	1	.05
	30032	Rubber Mtg. Washer, Lower, Black	4	.02
72	30104	Grommet (Rubber)	2	.02
	30169	Trimmer Condenser (I.F.)	1	.40
73	30198	Condenser, 1100 MMF, Mica	1	.25
74	31052	Condenser, Dry Electrolytic, 8 Mfd., 350 Volt	1	1.25
75	31075	4 Prong Socket	1	.10
76	31078	5 Prong Socket	2	.10
77	31079	6 Prong Socket	4	.15
78	31080	7 Prong Socket	1	.15
	31215	Tube Shield Cap	4	.10
	31360	Window Gasket	1	.05
79	31363	Sensitivity Switch	1	.40
80	31723	Pointer and Pinion Assy.	1	.40
81	31726	Pinion, Gear and Adj. Plate Assy.	1	.55
82	31910	Volume Control	1	1.30
83	31911	1st I.F. Coil and Shield Assy.	1	4.10
84	31912	2nd I.F. Coil and Shield Assy.	1	3.30
	31914	Range Switch and Coil Assy.	1	26.50
85	31916	Trimmer Condenser	1	.35
86	31918	Oscillator Transformer (Broadcast)	1	1.50
87	31919	Oscillator Transformer (Short Wave), Green	1	1.50
88	31936	Signal Beacon Assy.	1	2.25
	31937	Signal Beacon Coil Assy.	1	1.25
89	31942	Variable Condenser, 4 Gang	1	7.50
90	31945	Drive Drum, Hub, and Gear Assy.	1	1.10
91	31947	Mounting Bracket and Bearing Assy.	1	.60
92	31952	Dial Chart	1	.50
93	31958	Resistor, Candohm, 250-600 Ohm	1	.40
94	31962	Pointer	1	.10
95	31964	Resistor, 17,000 Ohm, Carbon, 2 Watt	1	.25
96	31966	Resistor, 15,000 Ohm, Carbon, ¼ Watt	1	.20
97	31967	Vertical Term. Assy., 4 Lug	1	.15
98	32096	Antenna Transformer (Short Wave), Red	1	1.75
	32102	Condenser, 150 MMFD, Mica (2nd I.F.)	1	.20
99	32300	Bi-Selector Transformer (Broadcast)	1	1.50
100	32301	Vertical Insulated Terminal	1	.10
	62578	Chassis Mtg. Screw	4	.02
	62582	Chassis Shipping Screw	2	.02
	63001	Drive Drum Set Screw	2	.02
	63011	Drive Sleeve Set Screw	2	.01
	63838	Felt Knob Washer, 15/16" Dia.	2	.01
	63839	Felt Knob Washer, 3/4" Dia.	2	.01
	63863	Chassis Mtg. Steel Washer	4	.01

SPEAKER PARTS—TYPE 10A9

20010	Speaker Pot and Pole Piece Assy.	$ 1.15
20041	Speaker Pot Clamp	.10
20045	Terminal Strip Cover	.15
20047	Terminal Strip	.10
27240	Cone Gasket	.10
27591	Output Transformer	1.75
28755	Cone and Voice Coil Assy.	3.30
29964	Field Coil Assembly	3.30
31961	Speaker (Complete)	11.50

GENERAL HOUSEHOLD UTILITIES CO.

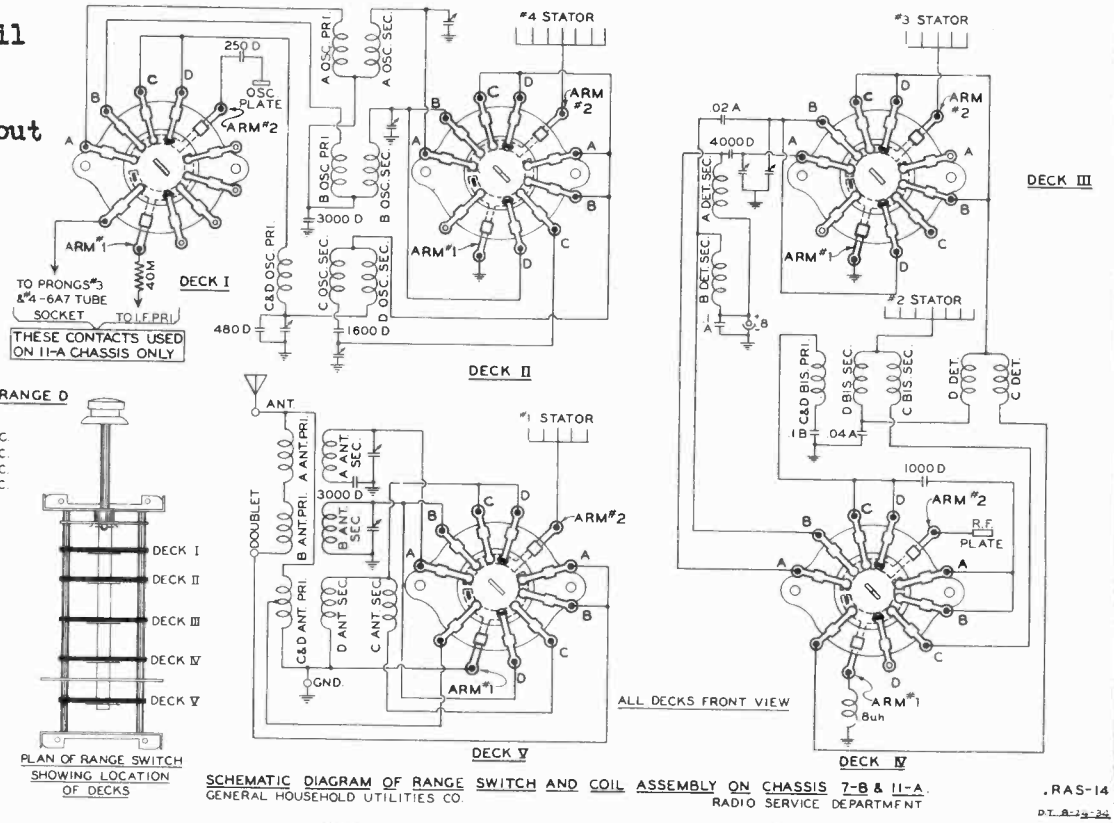
MODELS 1151,1152
Chassis 11A (Final
Schematic, Voltage



MODELS 1151,1152
Chassis 11A
Switch & Coil
Assembly
Trimmers
Chassis Layout

GENERAL HOUSEHOLD UTILITIES CO.

FIGURE 3



CONTACTS SHOWN ON RANGE D

RANGE
A - 8.5 - 21.5 M.C.
B - 4.1 - 10.0 M.C.
C - 1.5 - 4.2 M.C.
D - 550 - 1500 K.C.

PLAN OF RANGE SWITCH SHOWING LOCATION OF DECKS

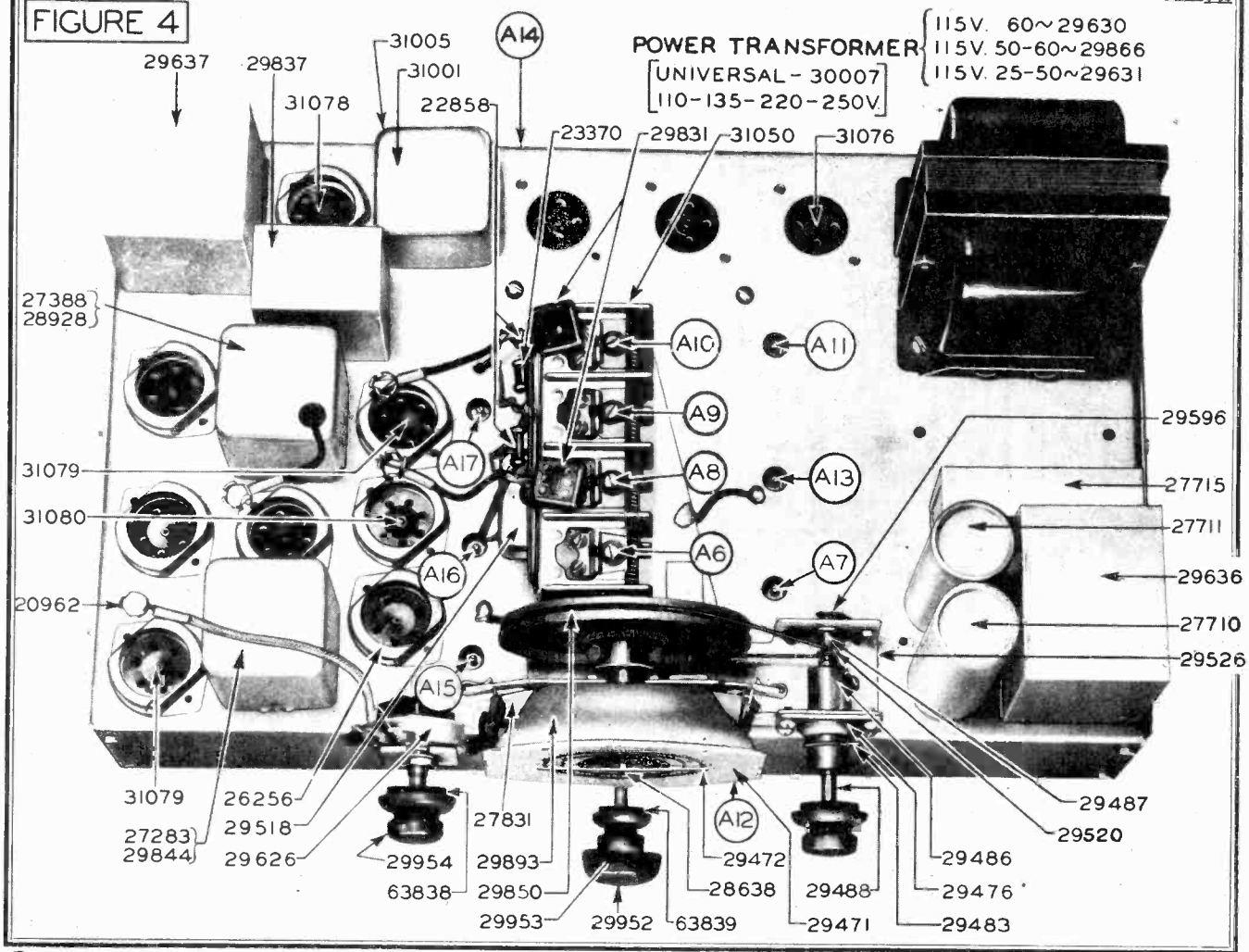
SCHEMATIC DIAGRAM OF RANGE SWITCH AND COIL ASSEMBLY ON CHASSIS 7-B & 11-A.
GENERAL HOUSEHOLD UTILITIES CO.

RADIO SERVICE DEPARTMENT

.RAS-14

D.T. 8-19-34

FIGURE 4



GENERAL HOUSEHOLD UTILITIES CO.

MODELS 1151,1152
Chassis 11A (Final)
Switch Data, Socket

SERVICE DATA

The chassis frame is built in such a way that the end plates may be disconnected allowing easy inspection of the underside of the chassis assembly. (Fig. 6).

The range switch and coil assembly is made up in a unit and may be removed for inspection or repair. (Fig. 7). The removal of this assembly necessitates the unsoldering of 15 wire leads. These leads and the positions to which they are connected are marked on the illustrations with letters. The leads A-B-C on the Coil Assembly (Fig. 7) are attached to the points marked A-B-C on the Chassis Assembly (Fig. 5). The leads marked D-E-F-G on the Coil Assembly (Fig. 7) are attached to the points of corresponding letters on the Chassis Assembly (Fig. 6). Leads H-I-J-K-L-M on Coil Assembly are connected as follows:

Lead "H" connects the ground side of the short wave antenna transformer (Red) to the rotor ground of the variable condenser.

Lead "I" connects Arm 2 of Deck 5 to the No. 1 stator of the variable condenser.

Lead "J" is the shielded lead connecting the bi-selector transformer to the No. 2 stator of the variable condenser.

Lead "K" connects Arm 2 of Deck 3 to the No. 3 stator of the variable condenser.

Lead "L" connects the switch assembly ground to the variable condenser rotor ground.

Lead "M" connects Arm 2 of Deck 2 with No. 4 stator of the variable condenser.

Leads "N" and "O" connect Arm 1 of Deck 1 to the 5th contact on the range switch—shunting a 40,000 ohm resistor when the "C" range is in operation.

Lead "P" connects the plate of the Signal Beacon to an insulator, acting as a pick-up lead. Care should be exercised in making these connections. (A soldering iron with a bent point should be used in this operation).

Continuity and Voltage

Continuity and voltage readings should be taken from the underside of the Chassis. The values given on the schematic diagram are average and allow the service man to make a quick check of the chassis constants. The socket layouts given on the schematic diagram show each socket from the underside.

The Range Switch

In servicing the 11A Receiver, consider the radio frequency end as four different and distinct radios:

One working from 550 to 1500 k.c. (D Range)
One working from 1500 to 4200 k.c. (C Range)
One working from 4100 to 10,000 k.c. (B Range)
One working from 8500 to 21,500 k.c. (A Range)

These four radios are put into operation as desired by means of the Range Switch.

When on position "A" the short wave coils covering the range from 8,500 to 21,500 k.c. are connected into the three tuned circuits of the receiver, one coil as an R.F. Transformer, one as the Detector Coupler, and one as the Oscillator Transformer.

On position "B" the 4100 to 10,000 k.c. coils are put into operation.

On "C" position, the 1500 to 4200 k.c. coils are shunted across the 550 to 1500 k.c. coils in such a manner as to lower the total inductance of the combined coils and reduce the losses caused by open end coils.

On both the "C" and "D" positions, four coil sets are put into the circuit and the receiver operates as a four tuned circuit radio. On all four ranges the receiver works at maximum sensitivity and selectivity. All coils and condensers are of such construction that atmospheric and temperature changes have minimum effect.

Each circuit is completely shielded from each other, and the complete range switch and coil assembly may be removed for inspection or repair.

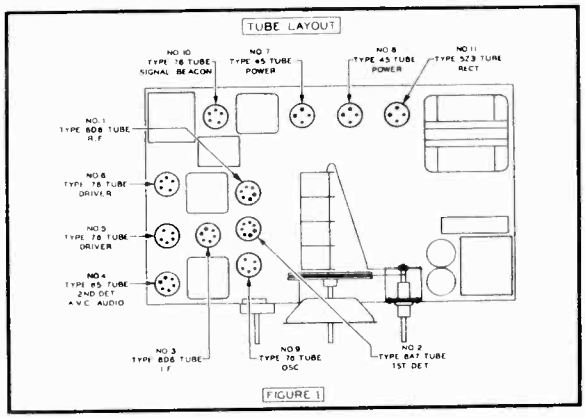


Fig. 1

MODELS 1151,1152
Chassis 11A (Final
Alignment,Parts

GENERAL HOUSEHOLD UTILITIES CO.

PARTS AND PRICE LIST

PART NUMBERS ARE GIVEN ON THE ILLUSTRATION AND THE NUMBERS ARE BROUGHT DOWN IN NUMERICAL ORDER FOR CONVENIENCE

Part No.	Description	No. used	List Price
20678	Ground Terminal	1	$ .02
20861	Attachment Cord	1	.35
20929	Resistor, 50,000 Ohm Carbon, 1 Watt	2	.20
20962	Grid Cap	4	.02
21598	Rubber Grommet	16	.02
22858	Resistor, 1 Meg. Carbon, 1/4 watt	3	.20
23284	Bakelite Washer	13	.02
23358	Insulated Terminal, Single	3	.05
23370	Resistor, 100,000 ohm Carbon, 1/4 watt	3	.20
23849	Resistor, 500,000 ohm Carbon, 1/4 watt	2	.20
23852	Resistor, 10,000 ohm Carbon, 1/4 watt	3	.20
23853	Resistor, 50,000 ohm Carbon, 1/4 watt	1	.20
23998	Resistor, 250,000 ohm Carbon, 1/4 watt	2	.20
24251	Condenser, 100 Mmf. Mica	3	.15
24487	Condenser, 250 Mmf. Mica	3	.20
24789	Condenser, 4 Mfd. 25 Volt Dry Electrolytic	1	.60
26256	Tube Shield Base	8	.05
27033	Insulated Terminal, Double	2	.05
27283	2d I. F. Transformer Shield	1	.35
27382	Trimmer Condenser	5	$ .35
27388	1st I. F. Transformer Shield	1	.30
27422	Electrolytic Step Washer	2	.02
27455	Tube Shield—7b	4	.15
27477	Electrolytic Plain Washer	2	.02
27478	Electrolytic Ground Terminal	2	.02
27490	Resistor, 1000 ohm Carbon 1/4 watt	1	.02
27710	Condenser, 8 Mfd. 475 Volt Wet Electrolytic (Chrome)	1	1.15
27711	Condenser, 8 Mfd. 475 Volt Wet Electrolytic	1	1.10
27715	Condenser, 4 Mfd. 350 Volt—8 Mfd. 100 Volt Dry Electrolytic	1	1.90
27784	Resistor, 400 ohm Carbon 1/4 watt	1	.20
27801	Rubber Grommet	3	.05
27802	Cup Washer	6	.02
27831	Pilot Lamp Socket, Insulated	2	.15
28045	Pilot Lamp 6-8 Volt	2	.15
28184	Electrolytic Lock Washer	1	.02
28421	Resistor, 2,000 ohm Carbon, 1/4 watt	1	.20
28573	Short Wave Coil Shield Assembly	1	$ .75
28638	Dial Pointer Screw	1	.02
28726	Condenser, .1 Mfd. 400 Volt tubular	1	.25
28876	Condenser, .02 Mfd. 400 Volt tubular	1	.25
28928	1st I. F. Transformer (Includes 27388)	1	2.90
29011	Resistor, 40,000 ohm Carbon, 1 watt	1	.20
29074	Condenser, 250-100 Mmf. Mica	1	.30
29083	Condenser, 50 Mmf. Mica	1	.20
29135	Condenser, .1 Mfd. 100 Volt tubular	2	.25
29453	Condenser, .01 Mfd. 100 Volt tubular	2	.20
29471	Dial Chart — for General Instrument Condenser only—see 30033	1	.50
29472	Dial Pointer	1	.05
29476	Ball Race	1	.10
29482	Broadcast Coil &Shield Assembly	1	.80
29483	Drive Shaft Stop Spring	1	.05
29486	Drive Sleeve	1	.50
29487	Drive Shaft—Inner	1	.50
29488	Drive Shaft—Outer	1	.75
29496	Antenna Transformer—Broadcast	1	1.75
29497	Bi-Selector Transformer—Broadcast	1	1.50
29498	1st Detector Transformer—Broadcast	1	1.25
29499	Oscillator Transformer—Broadcast	1	1.50
29500	Antenna Transformer—Short Wave	1	1.75
29501	1st Det. Transformer—Short Wave	1	1.25
29502	Oscillator Transformer—Short Wave	1	1.50
29508	Trimmer Condenser Assembly — Includes 29989	1	.75
29509	Range Switch and Coil Assembly	1	26.50
29515	Resistor Panel Assembly — Includes 29518	1	1.25
29518	Condenser, .02-.02 Mfd. (Small Can)	1	.75
29520	Drive Cable with Eyelets	1	.10
29521	Ball Bearing, 3/16"	1	.01
29522	Ball Bearing, 11/32"	4	.02
29524	Cable Tension Spring	1	.10
29526	Condenser Mounting Bracket Ass'bly	1	.60
29539	Oscillator Plate Choke	1	.60
29551	Antenna and Doublet Binding Post Assembly	1	.10
29552	Escutcheon Window	1	.15
29553	Window Retaining Ring	1	.10
29554	Escutcheon	1	.60
29563	Resistor, 65,000 ohm Carbon, 1/2 watt	1	.20
29566	Condenser, 1,600 Mmf. Mica	1	.30
29567	Condenser, .02 Mfd. 400 Volt tubular	1	.25
29580	Signal Beacon Trimmer Condenser	1	.75
29582	Signal Beacon Coil Assembly	1	1.25
29596	Drive Leaf Spring	2	.05
29611	Coupling Inductance Coil	1	.25
29612	Escutcheon Retaining Spring	1	.20
29613	Condenser, 4,000 Mmf. Mica	1	.50
29616	Insulated Terminal—Single	1	.10
29617	Insulated Terminal—Double	1	.15
29626	Volume Control	1	1.30
29627	Tone Control	1	1.15
29628	Insulated Terminal (4)	3	.10
29630	Power Transformer, 115 Volt, 60 Cycles only	1	8.85
29631	Power Transformer, 115 Volt, 25-50 Cycles only	1	11.50
29632	Condenser, 8 Mfd. 300 Volt Dry Electrolytic	1	1.15
29636	Filter Choke	1	2.60
29637	Audio Input Transformer	1	4.10
29640	Resistor, 200 ohm Carbon, 1/4 watt	1	.20
29641	Resistor, Candohm	1	1.10
29652	Condenser, 150 Mmf. Mica	1	.15
29662	Condenser, .15 Mfd. 200 Volt tubular	1	.30
29812	Condenser, .04 Mfd. 500 Volt tubular	1	.30
29813	Condenser, .004 Mfd. 700 Volt tubular	1	$ .25
29818	Condenser, .003 Mfd. 700 Volt tubular	2	.25
29830	Condenser, 3,000 Mmf. Mica	2	.40
29831	Condenser, 1,000 Mmf. Mica	2	.30
29832	Tube Shield Body	4	.15
29836	Trimmer Condenser Assembly	1	.25
29837	Bypass Condenser Block	1	2.70
29844	2d I. F. Transformer Assembly	1	3.60
29850	Drive Drum Assembly	1	1.10
29866	Power Transformer 115 Volt, 50-60 Cycles	1	9.50
29893	Reflector Assembly	1	.50
29896	Speaker Cable	1	.95
29900	Trimmer Condenser Assembly	1	.50
29952	Knob—Range Switch	1	.30
29953	Knob—Tone Control	1	.20
29954	Knob—Selector or Volume Control	2	.20
29957	Decalcomania—"A, B, C, D"	1	.10
29989	Condenser, 480 Mmf. Mica	1	.30
29990	Condenser, .02 Mfd. 400 Volt tubular	1	.20
30007	Power Transformer 110-135-220-250 Volt, 50-60 Cycles	1	12.90
30030	Chassis Mounting Washer — Upper (Black)	3	.05
30031	Chassis Mounting Washer — Upper (Red)	1	.05
30032	Chassis Mounting Washer—Lower	4	.02
30033	Dial Chart—for Reliance Condenser only	1	.50
30034	Tuning Condenser, 4 Gang, Reliance	1	7.50
31001	Signal Beacon Assembly	1	2.25
31005	Signal Beacon Shield Can	1	.30
31050	Tuning Condenser, 4 Gang—General Instrument	1	7.50
31076	Tube Socket—4 Prong	3	.10
31078	Tube Socket—5 Prong	4	.10
31079	Tube Socket—6 Prong	3	.15
31080	Tube Socket—7 Prong	1	.15
31215	Tube Shield Cap	4	.10
62571	Chassis Mounting Screw	4	.02
62572	Chassis Shipping Screw	2	.02
63001	Drive Drum Set Screw	2	.02
63011	Drive Sleeve Set Screw	2	.01
63838	Felt Knob Washer—15/16" Dia.	2	.01
63839	Felt Knob Washer—3/4" Dia.	2	.01
63863	Steel Chassis Mounting Washer	4	.01

SPEAKER PARTS

Part No.	Description	List Price
	TYPE 10A4	
20010	Pot and Pole Piece Assembly	$ 1.15
20041	Pot Clamp	.10
20045	Terminal Strip Cover	.15
20047	Terminal Strip	.10
27240	Cone Mtg. Gasket	.10
28755	Cone and Voice Coil Assembly	3.30
29781	Output Transformer	2.00
29783	Field Coil	3.30
31166	Speaker Comp.	11.50
	SPEAKER TYPE 12A3	
20045	Terminal Strip Cover	.15
20047	Terminal Strip	.10
27208	Pot and Pole Piece Assembly	1.60
27242	Cone Mtg. Gasket	.10
26979	Speaker Comp.	14.50
29753	Output Transformer	2.00
29758	Field Coil	4.25
31310	Cone and Voice Coil Assembly	4.00

ALIGNMENT PROCEDURE

Do not attempt to align the 11A Chassis without the proper equipment. Alignment condensers are shown in the accompanying illustrations and are numbered in order of procedure.

1. EQUIPMENT.

a—Test Oscillator.

A modulated oscillator capable of producing signals at 262 K.C.—600 K.C.—1400 K.C.—3700 K.C.—10 M.C. and 20 M.C. is necessary for alignment of the 11A chassis.

b—Insulated screw driver—(All bakelite or fibre) about 6" long.

c—Output Meter.

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

d—Coupling Means.

Coupling Condensers of 200 mmf., .25 Mfd., and a 400 Ohm resistor should be used when coupling oscillator to receiver during alignment as specified in the following paragraphs.

e—The receiver should be aligned in a location free from local interference (man made static)—as high frequency disturbances will cause difficulties when the short wave section is being adjusted. (A screen room is to be recommended).

2. DIAL SETTING.

Turn dial knob until condensers are fully meshed. The dial pointer should be on the horizontal line of the dial.

3. I. F. ALIGNMENT.

Connect signal lead of test oscillator to grid of the 6A7—(1st Detector Tube) through .25 Mfd. Condenser. Connect the ground lead to the Chassis.

a—Set Dial pointer to 1400 K.C. and range switch on position D.

b—Place test Oscillator in operation at 262 K.C. Turn receiver volume control and tone control to maximum.

c—Attenuate test oscillator output to lowest valve consistent with obtaining a readable indication on output meter.

d—Adjust four I. F. Trimmers, A1-A2-A3-A4 Fig. 6, located on under side of chassis, until maximum output is obtained. During alignment, maintain as low a value of signal as will allow obtaining of accurate adjustment.

e—Turn the tone control counter clockwise until the Signal Beacon switch snaps on.

f—Adjust Signal Beacon trimmer, A5, Fig. 6, located on under side of Chassis to zero beat with the 262 K.C. incoming signal.

4. 3700 K.C. ALIGNMENT.

a—Connect signal lead of test oscillator through 200 Mmf condenser to Antenna binding post.

b—Connect the test oscillator ground lead to the ground post of Chassis.

c—Turn range switch to range "C" and set dial pointer to 3700 K.C.

d—Align Set Oscillator or front trimmer A6, Fig. 4, on variable condenser. It may be necessary to approximate adjustment of the other three trimmers on variable condenser to obtain sufficient sensitivity to make 3700 K.C. adjustment.

5. 1400 K.C. ALIGNMENT.

a—Place test oscillator in operation at 1400 K.C.

b—Turn dial pointer to 1400 K.C.

c—Turn Range Switch to range D.

d—Adjust 1400 K.C. padding condenser, A7. Fig. 4, which is the first of three located on top of Chassis on the right hand side as you face it.

e—Adjust 1st Det. Trimmer A8, Fig. 4, which is the second from front on top of variable condenser.

f—Adjust Bi-selector trimmer A9, Fig. 4, which is the third from front on top of variable condenser.

g—Adjust Antenna Trimmer A10, Fig. 4, which is the fourth from the front on top of variable condenser.

6. 600 K.C. ALIGNMENT.

a—Place test oscillator in operation at 600 K.C.

b—Tune in signal to maximum (this point does not have to be exactly at 600 K.C. dial setting).

c—Adjust the 600 K.C. Padding Condenser A11, Fig. 4, (which is on Top of Chassis on right hand side third from front as you face Chassis), in direction of signal increases. At same time rock the tuning condenser back and forth through resonance while, adjusting padding condenser until maximum output is obtained.

7. 10 M.C. ALIGNMENT.

a—Connect signal lead of test oscillator through 400 Ohm resistor to Antenna binding post of Chassis.

b—Connect the ground lead to ground terminal of Chassis.

c—Set Range Switch to Range "B" and turn dial pointer to 10 M.C.

d—Place test oscillator in operation at 10 M. C.

e—Adjust set oscillator trimmer A12, Fig. 4, (located on front face of chassis).

f—Adjust detector trimmer A13, Fig. 4, (located on right hand side on top of Chassis second from front).

g—Adjust antenna trimmer A14, Fig. 4, (located on rear face of Chassis).

8. 20 M.C. ALIGNMENT.

a—Set Range Switch on Range A.

b—Place Test Oscillator in operation at 20 M.C.

c—Turn Dial Pointer to 20 M.C.

d—Adjust Set Oscillator trimmer A15, Fig. 4, (located on top of Chassis on left of gang condenser, first from front).

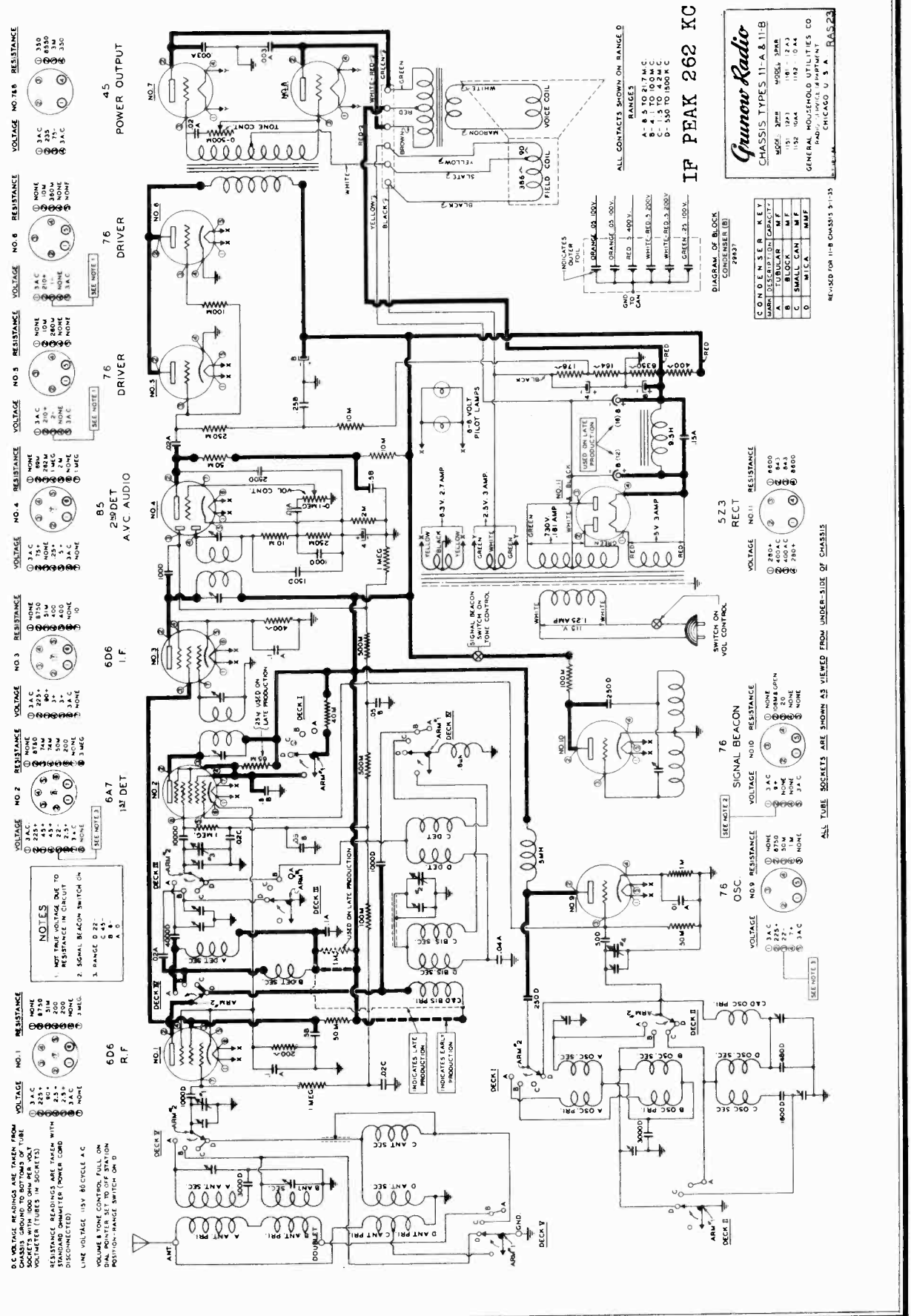
e—Adjust Detector trimmer A16, Fig. 4, (located second from front on top of Chassis on left hand side).

• f—Adjust Antenna trimmer A17, Fig. 4, (located third from front on top of Chassis on left hand side).

MODELS 1151,1152,
1161,1162
Chassis 11A(Type 2)

GENERAL HOUSEHOLD UTILITIES CO.

Chassis 11B
Schematic,
Voltage,Data



MODELS 1151,1152
1161,1162
Chassis 11A,11B
Parts List

GENERAL HOUSEHOLD UTILITIES CO.

11-A & 11-B
TYPE 2

JANUARY 1935

Supplement to Service Notes and Parts List 31565-2

Grunow Radio

CHASSIS TYPE 11-A AND 11-B

Receiver Model	Speaker Model
1151	12A3
1152	10A4
1161	12A3
1162	10A4

GENERAL HOUSEHOLD UTILITIES COMPANY

RADIO SERVICE DEPT. CHICAGO, U. S. A.

31565-2 SUP.

Chassis 11A —115 volt, 60 cycle
Chassis 11AW—115 volt, 50-60 cycle
Chassis 11AX —115 volt, 25-50 cycle
Chassis 11B —115 volt, 50-60 cycle
Power Consumption 145 watts.

Chassis 11AZ { 110-135-220-250 volt, 50-60 cycle
Chassis 11BZ { 110-135-220-250 volt, 50-60 cycle

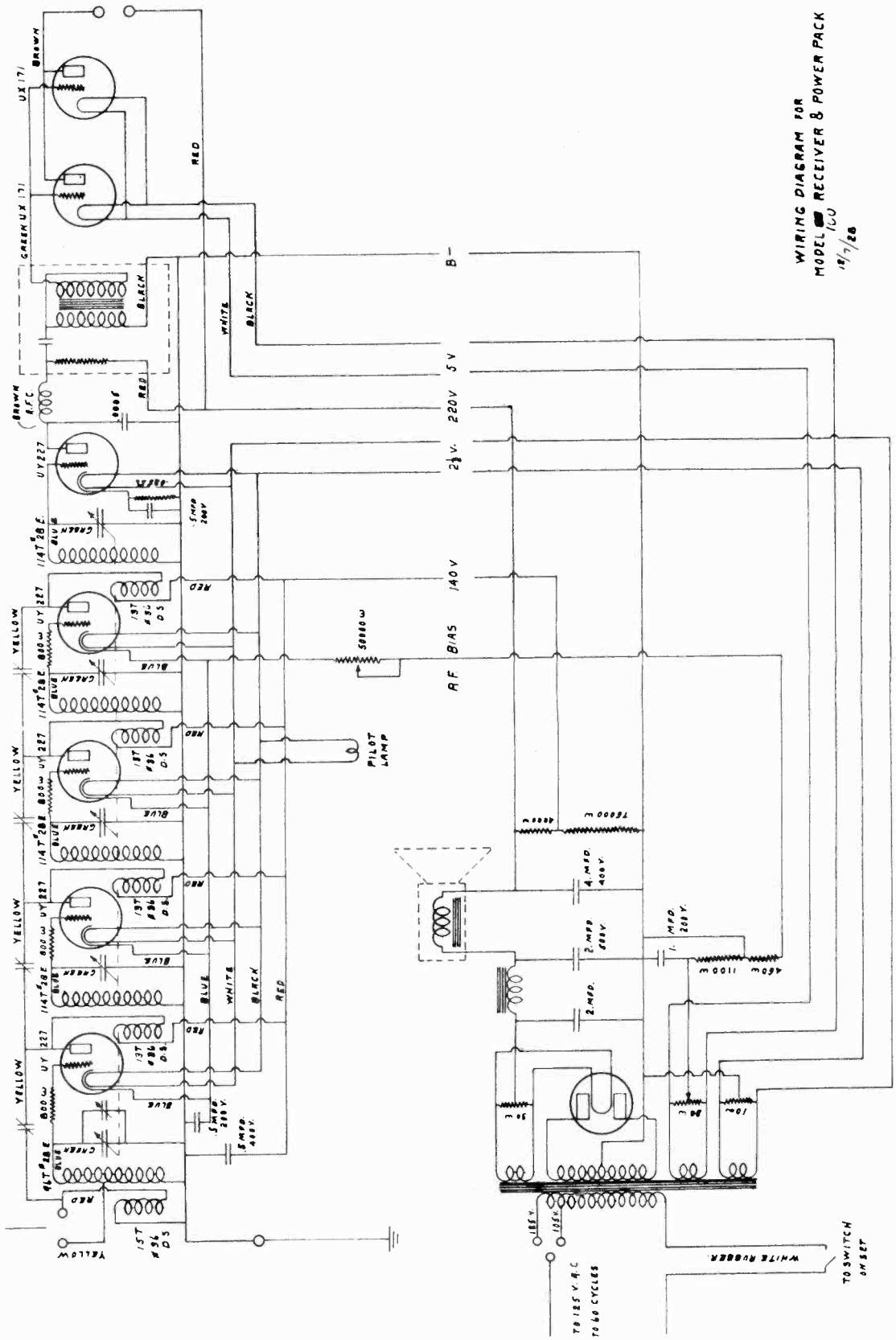
Tubes: 1-6D6, 1-6A7, 1-6D6, 1-85, 4-76, 2-45, 1-5Z3

SUPPLEMENTARY PARTS USED ON LATE PRODUCTION OF CHASSIS 11A AND ALSO ON CHASSIS 11B

Part No.	Description	No. Used	List Price
20705	25,000 Ohm Carbon Resistor 1 Watt	1	$0.20
24254	1,000 Mmf. Mica Condenser	3	.20
29485	Drive Shaft Thrust Spring	1	.05
29621	Tone Control Knob	1	.20
29622	Range Switch Knob	1	.25
29623	Tuning or Volume Control Knob	2	.20
31205	Electrolytic Insulator	1	.05
31360	Window Gasket	1	.02
31483	02 Mfd. 500 Volt Tubular Condenser	1	.25
31629	16 Mfd. 350 Volt Wet Elec. Condenser	1	1.25
31723	Pointer and Pinion Assembly	1	.40
31726	Pinion Gear and Plate Assembly	1	$0.55
31743	12 Mfd. 450 Volt Wet Elec. Condenser	1	1.35
31860	2,000 Ohm Carbon Resistor, ¼ Watt	1	.20
31942	4-Gang Tuning Condenser	1	7.50
31945	Drive Drum and Gear Assembly	1	1.10
31947	Condenser Mounting Bracket	1	.75
31962	Pointer—Large	1	.05
32292	Dial Chart	1	.50
63325	Elec. Condenser Nut	2	.03
63578	Chassis Mounting Screw	4	.01
63582	Chassis Shipping Screw	2	.01
64334	Elec. Condenser Lockwasher	2	.01

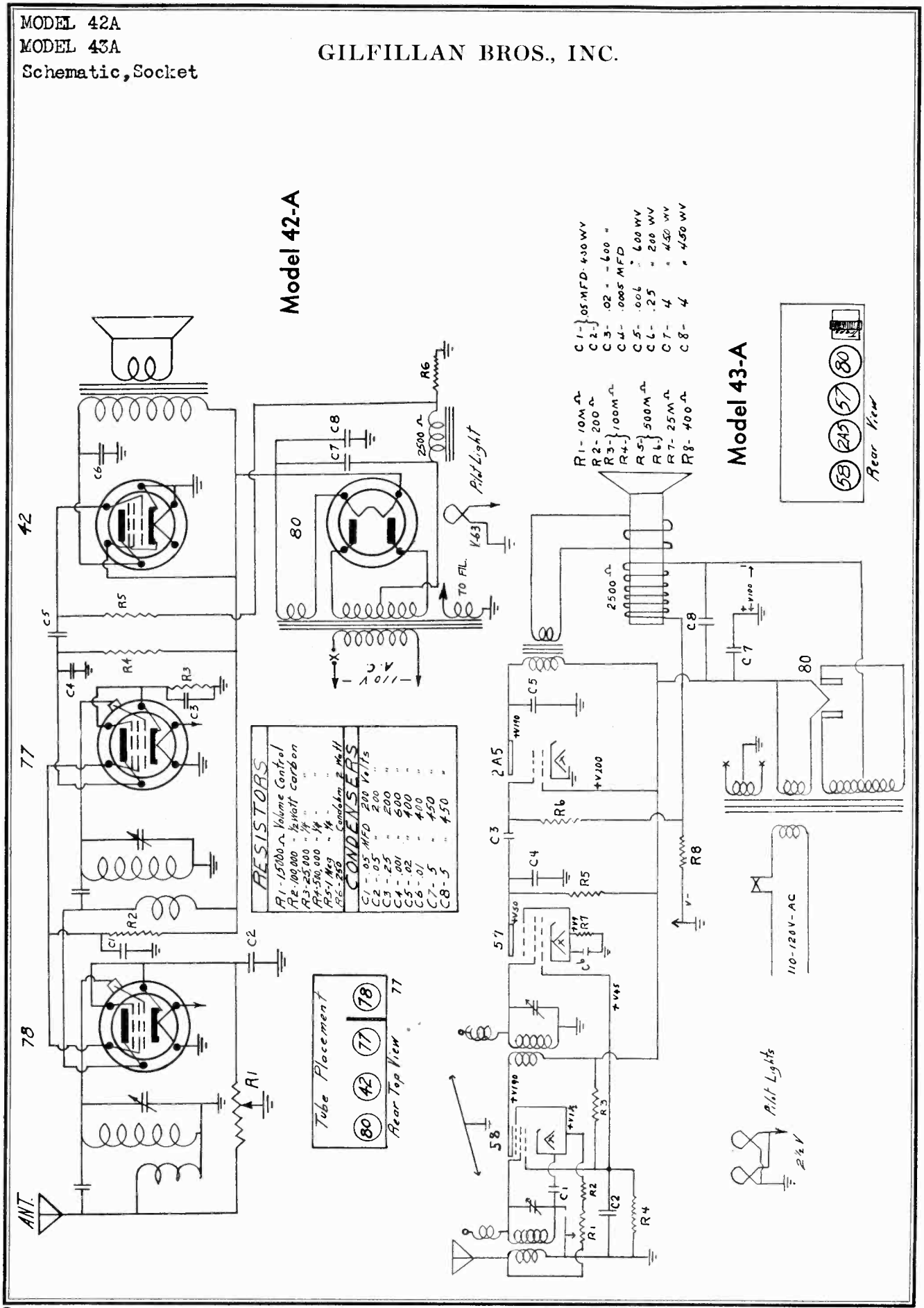
GILFILLAN BROS., INC.

MODELS 35,100
With PP. 71s
Schematic



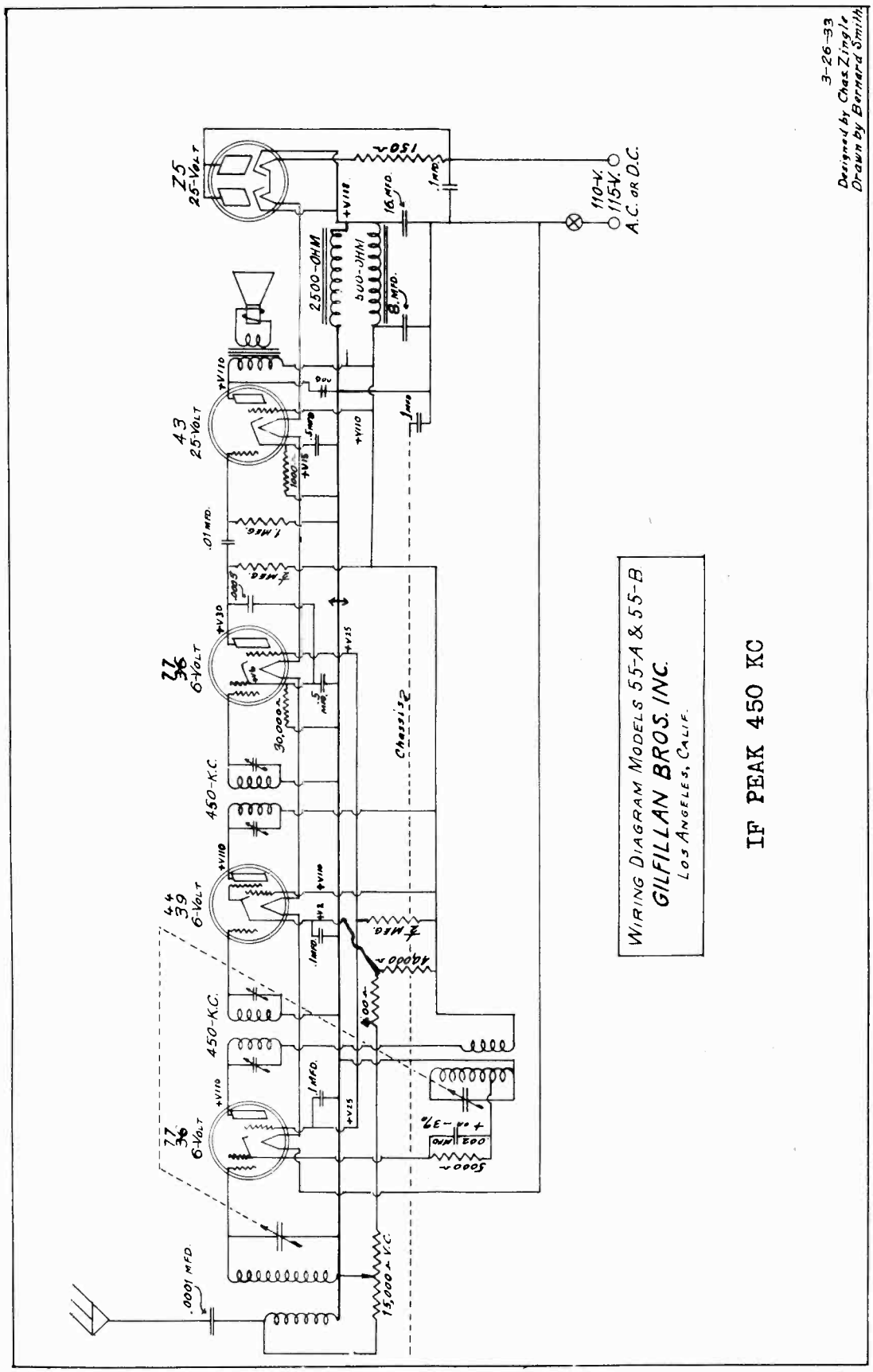
MODEL 42A
MODEL 43A
Schematic, Socket

GILFILLAN BROS., INC.



MODELS 55A, 55B
Schematic

GILFILLAN BROS., INC.

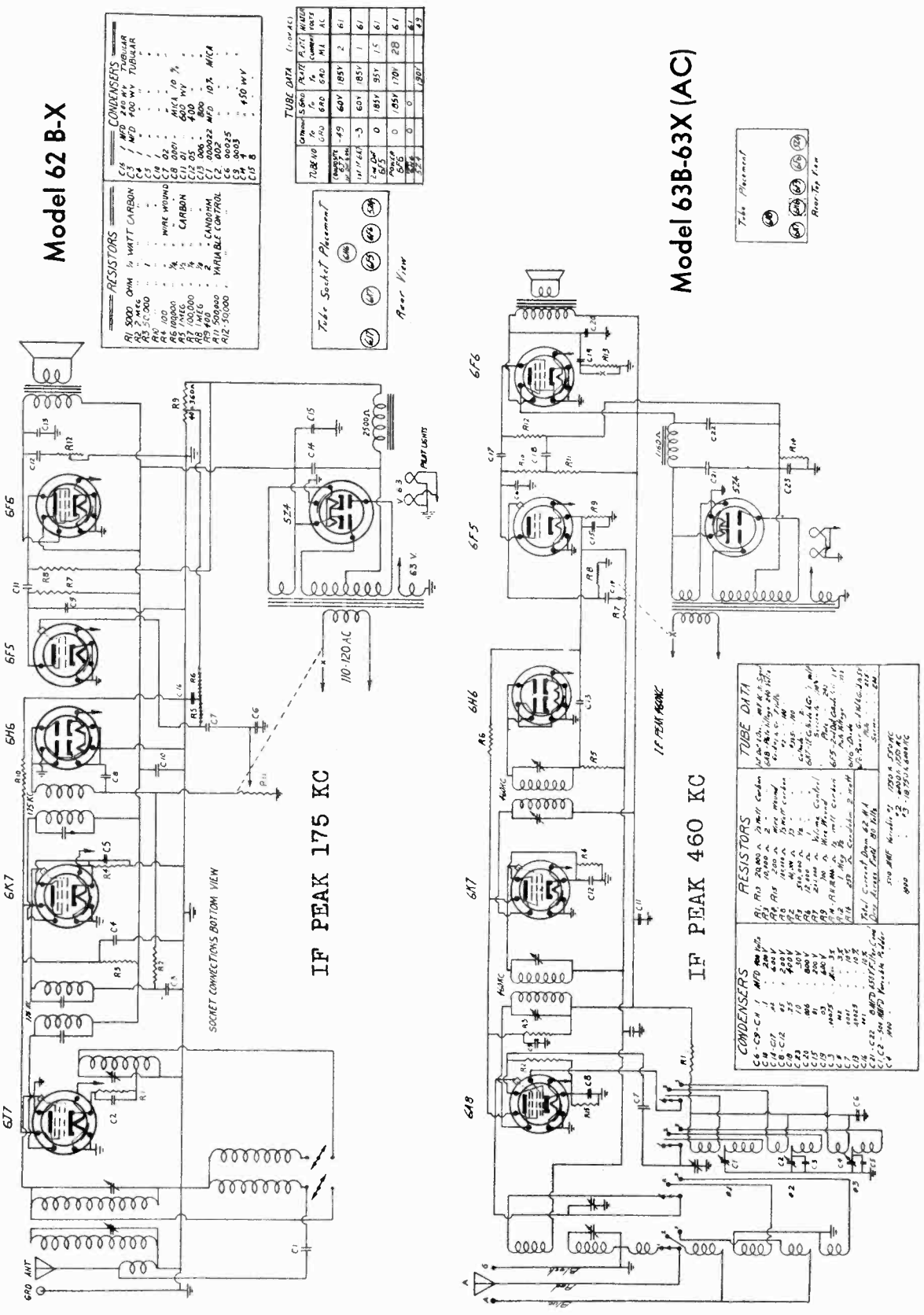


WIRING DIAGRAM MODELS 55-A & 55-B
GILFILLAN BROS. INC.
LOS ANGELES, CALIF.

IF PEAK 450 KC

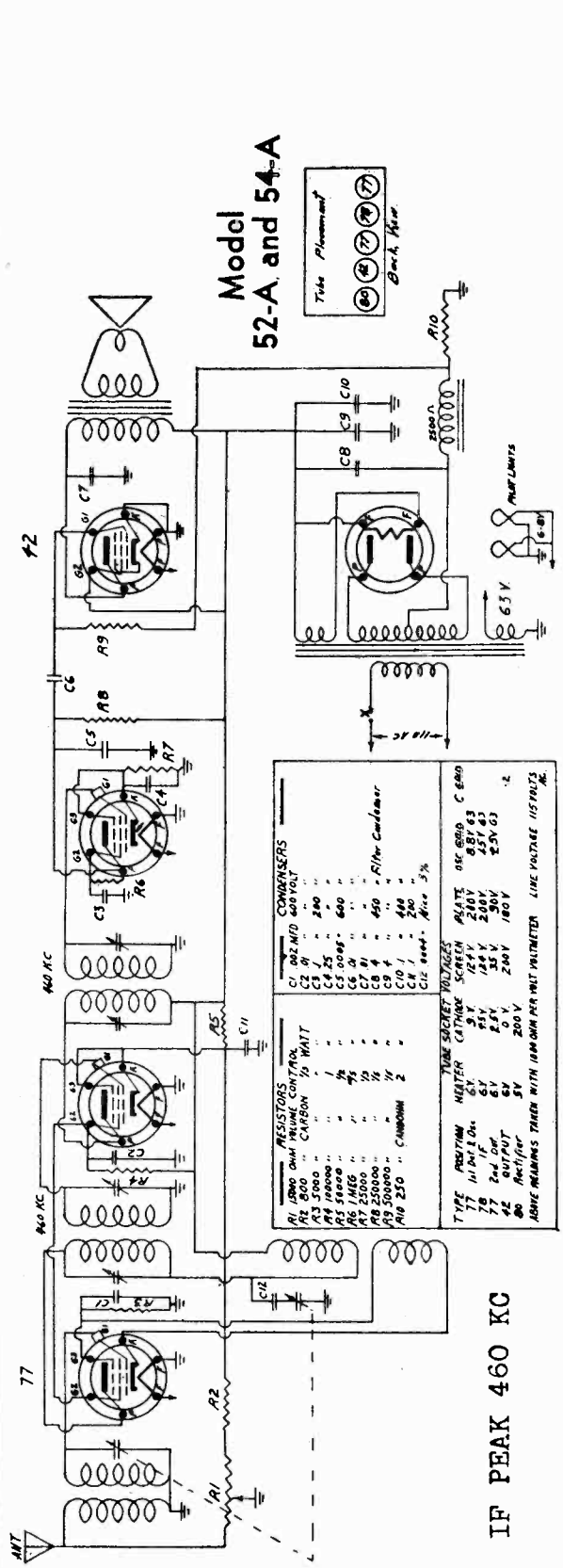
MODEL 62B-X
MODELS 63B,63X
Schematics
Socket

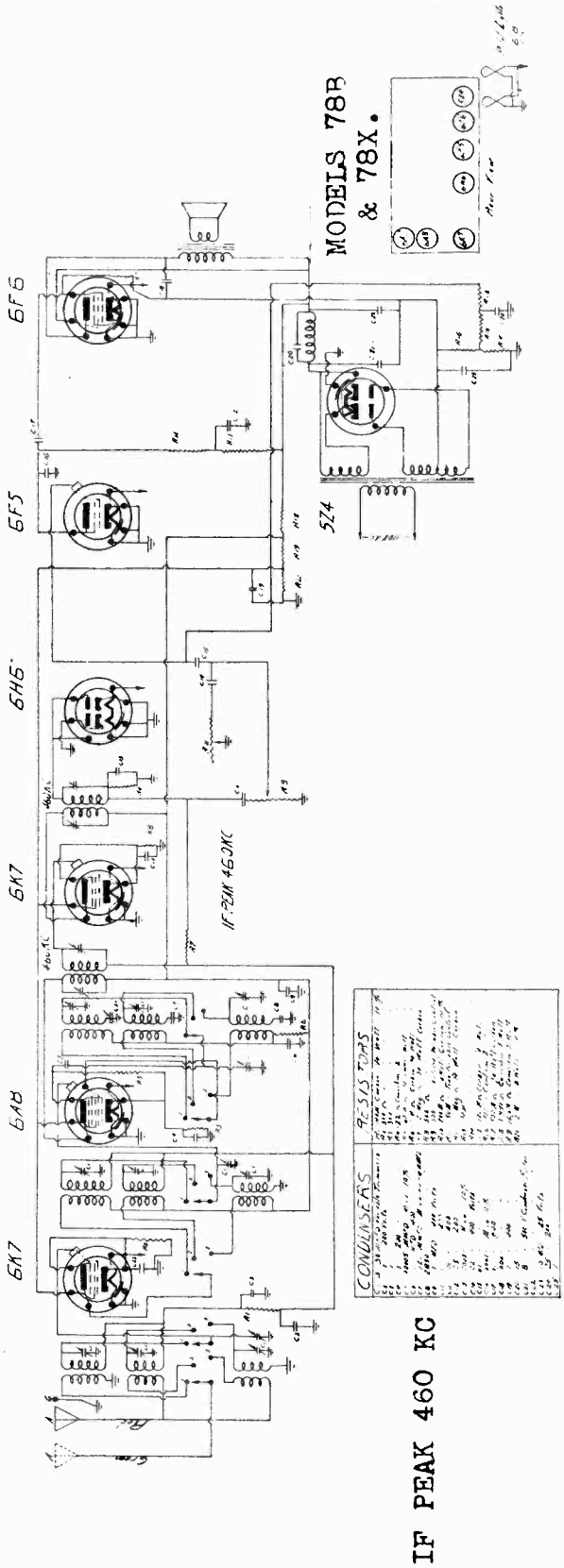
GILFILLAN BROS., INC.



MODELS 52A, 54A
MODELS 78B, 78X
Schematics, Socket

GILFILLAN BROS., INC.

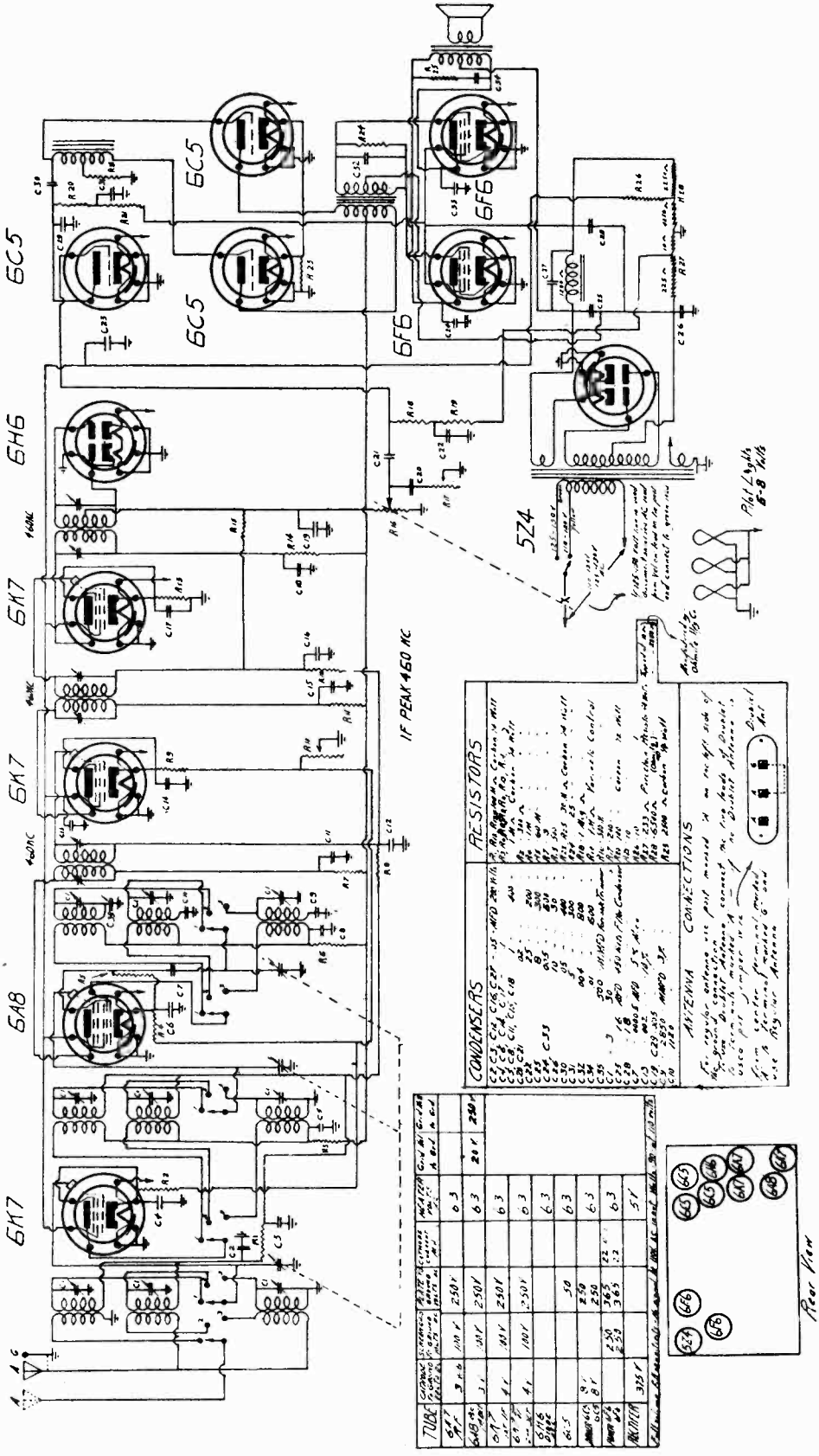




MODELS 116B,116X
MODELS 117B,117X
Schematic,Socket
Voltage

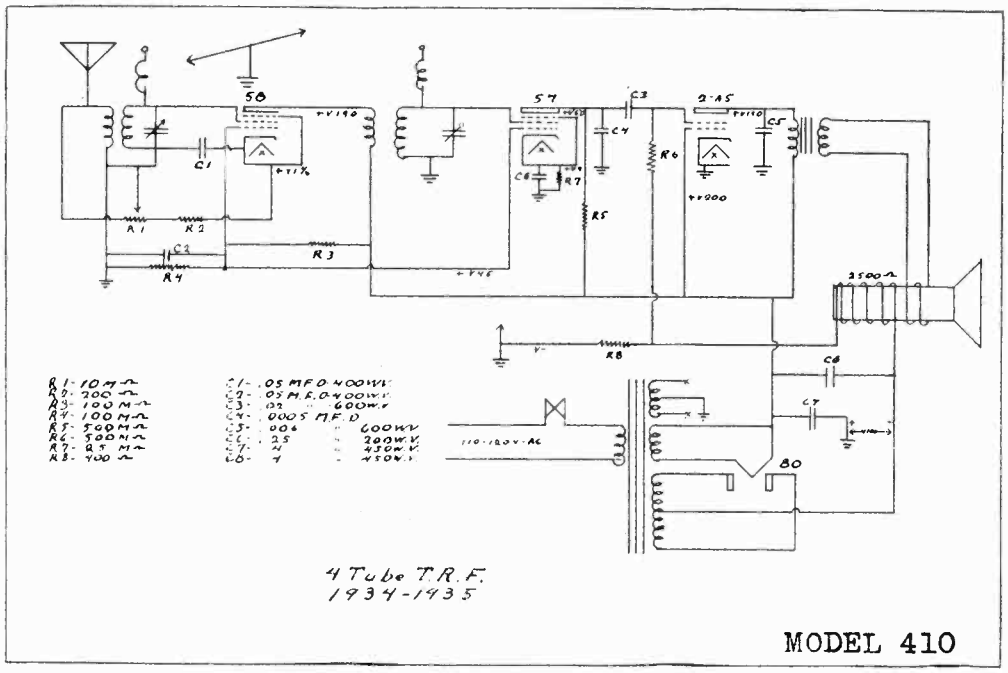
GILFILLAN BROS., INC.

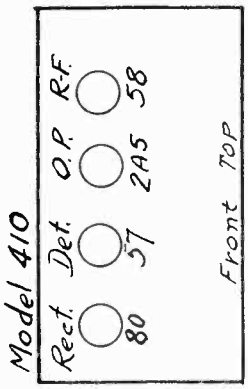
Models 116B-116X & 117B-117X (AC)

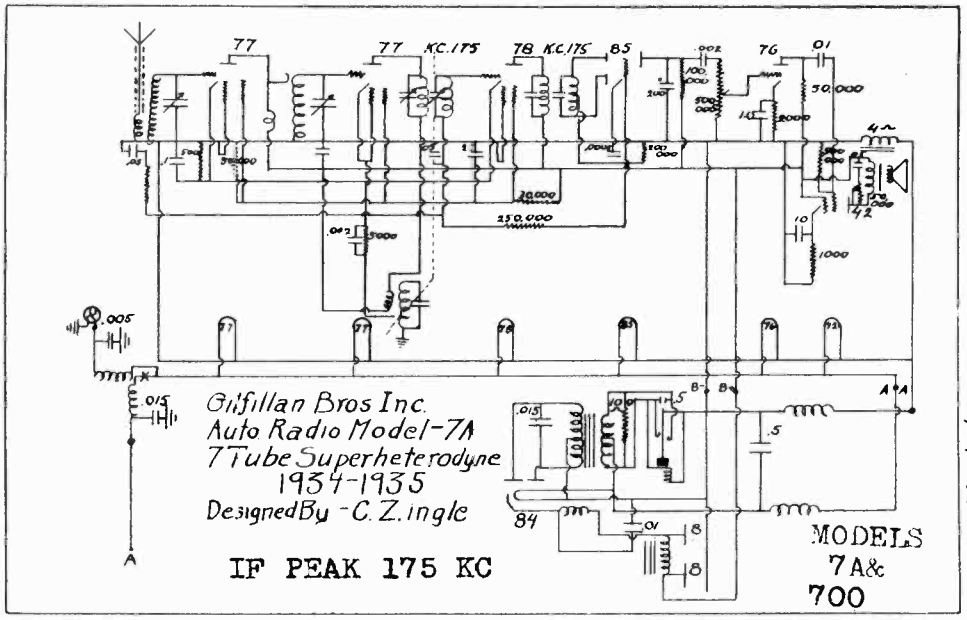


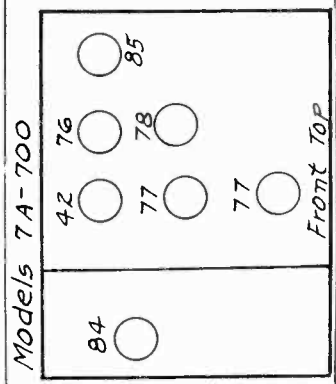
GILFILLAN BROS., INC.

MODELS 7A, 700
MODEL 410
Schematics
Socket









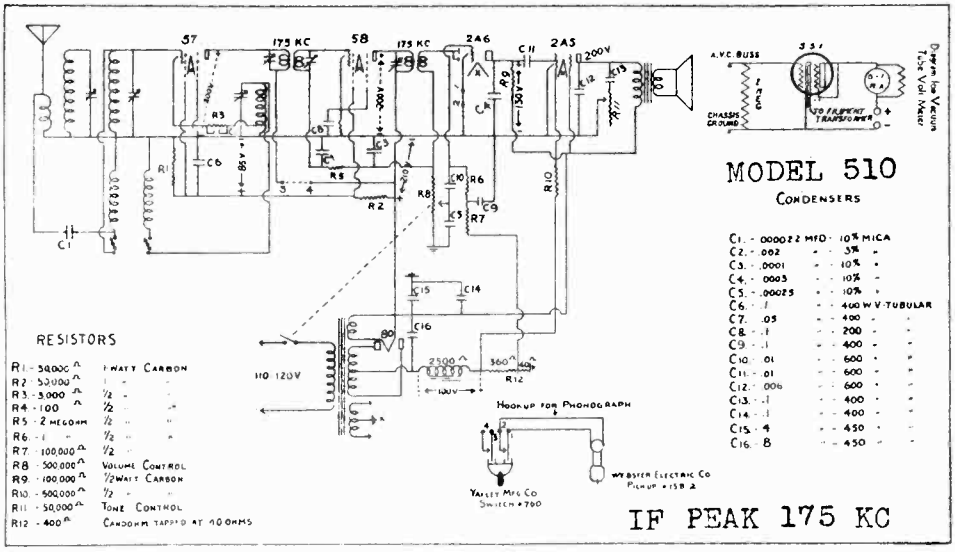
Locate convenient space under automobile dash for mounting of chassis and speaker. Triangle chassis mounting plate will serve as template for the drilling of the necessary holes. Bolt in the plate, then hook chassis on to plate and fasten with thumb screw. Drill hole for speaker and fasten up with nut. Install remote control to steering post or convenient position on dash and connect drives to set. Connect "A" lead to 'Hot side' of generator or to + battery lead. Other small lead goes to pilot lamp in remote control head and heavy shielded lead to aerial.

Install spark plug supressors and cut-outs if needed.

To set dial pointer, spin drive knob to right until it can go no further and then turn back to left as far as possible. Pointer will then be set in exact calibration to condenser gang.

MODELS 510, 520
Schematic, Socket
Alignment, Data

GILFILLAN BROS., INC.



SERVICE DATA, FIVE TUBE SUPER-HETERODYNE, 1934-1935

All models have automatic volume control of the diode type, controlling the first detector as well as the high frequency amplifier tubes. This A.V.C. makes it impossible to service and rebalance without a meter of the type to be described. This meter will work on any make or type of A.V.C., provided care is used. It can not be damaged by improper connection of the leads.

PARTS REQUIRED FOR VACUUM TUBE VOLT METER

1—0 to 1 or 0 to 1.5 milliampmeter.
1—Bell ringing transformer with secondary of 6-10 volts.
1—5 prong socket.
1—551 tube.
1—2 megohn grid leak.
1—10 ohm rheostat.
1—45 volt B battery.
Clips, Box, Cord, Hookup Wire.

USING VACUUM TUBE VOLT METER

The cathode clip is connected to the cathodes of the tubes controlled by the A.V.C. The buss clip is connected to the A.V.C. buss in front of the isolating resistor.

Adjust rheostat shunt until meter shows full scale reading.

All balancing is done with maximum peak indicated by the meter swing toward O. Sensitivity of various receivers can be checked by the swing of meter from a known station. Short Wave fading can be seen by tuning in the station with meter connected to set.

REBALANCING

Do not rebalance a set until you are sure it requires it. 99 per cent of the sets do not need it. We do not find one case in one hundred that really should be rebalanced.

INTERMEDIATES

Connect a 175 K.C. oscillator to the first detector grid (No. 57 tube) leaving grid cap in place. Set dial at 1400 K.C. Hook up vacuum tube volt meter as described and carefully adjust 3 screws on top of Intermediates for maximum gain (minimum reading of meter). Don't flat top any stages. Have all shields in place. Keep volume control at lowest level.

CONDENSER GANG

Set dial at 1400 K.C. when gang is at minimum position and tighten dial set screws. Tune in a station (or use an oscillator) to a known frequency signal around 1400 K.C. Carefully adjust oscillator section of gang until frequency is correct on dial.

If the intermediates are balanced on 175 K.C., the dial will now track within 5 K.C. over the entire dial.

Adjust first detector section for maximum gain and follow by adjusting band pass trimmers.

Don't bend any condenser plates unless absolutely necessary.

OVERLOADING—OR POOR QUALITY AT LOW VOLUME

The chief cause of this trouble is too long an antenna. A powerful local station will cause the R. F. tubes to block. Check this by disconnecting the antenna on the station causing the trouble. If too close to a powerful station, installing a switch in the aerial circuit helps this. In rare cases the set seems to overload and the A.V.C. works too quickly on all stations.

Check the following:

Disconnect 2 meg. resistor from A.V.C. buss at tie point. Have all tubes cold. Use high voltage, high resistance ohmmeter capable of reading 25 megohms and test from ground to A.V.C. buss for leakage. After condensers have charged, no leakage should be shown. This must read around 100 megohms to ground.

If slight leakage is observed, disconnect bypass condensers from buss until defective one is found. Sometimes moisture is found on coil terminals. Scrape this clear.

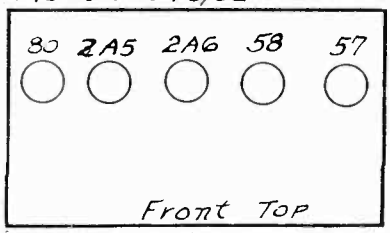
NOISY OPERATION (Not Static)

A defective tube will cause a sharp 60 cycle R.F. pickup. This is most prominent on low frequency. Replace with a good tube.

In many cases it is found that the noise cannot be eliminated by servicing the receiver. Noise may enter into the light lines or via the antenna. The only way to check the source is to turn off one after another all electrical apparatus in the vicinity of the set.

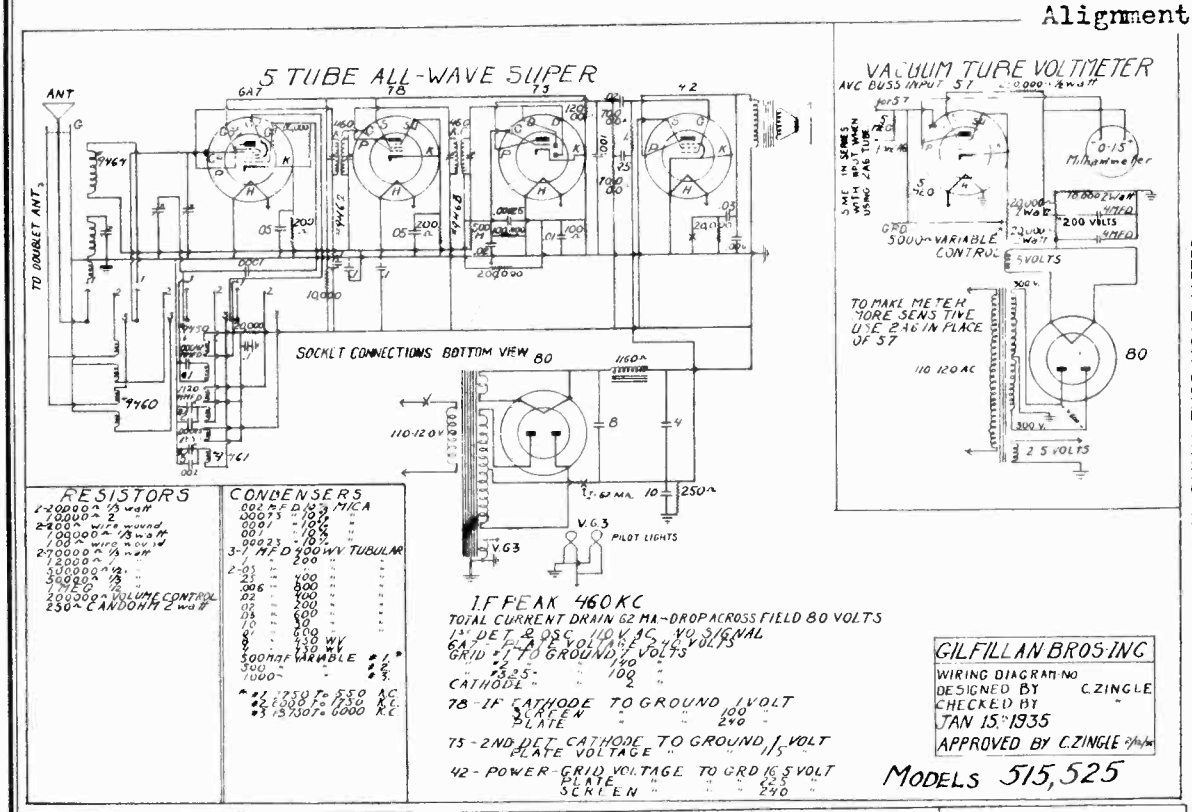
There is no freak or trick antenna that will eliminate natural static.

Models 510, 520



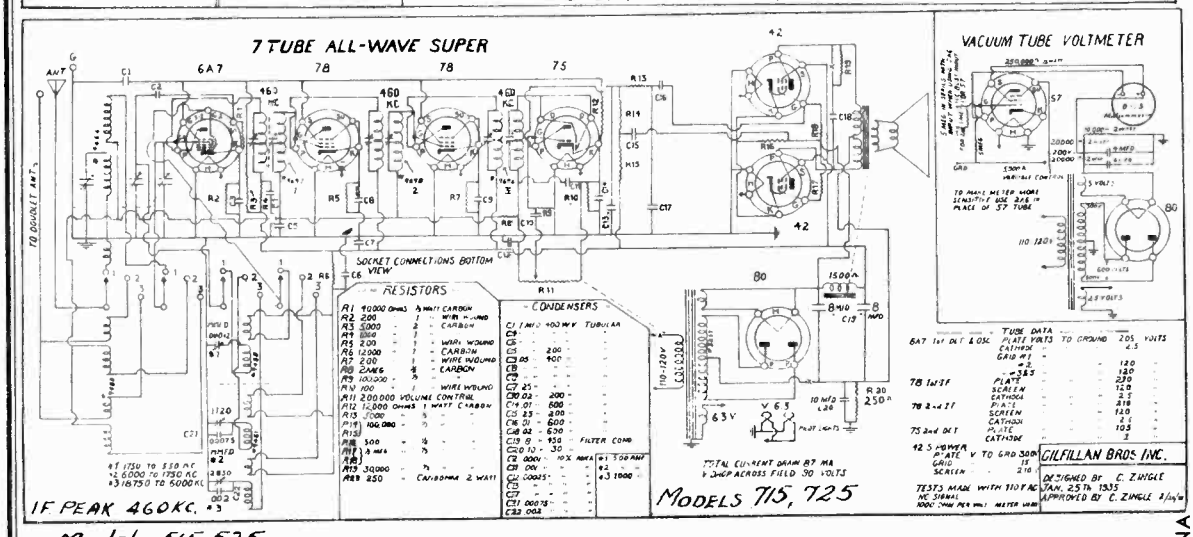
GILFILLAN BROS., INC.

MODELS 515, 525
MODELS 715, 725
Schematics, Socket
Alignment, Data

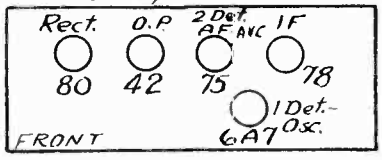


VACUUM TUBE VOLT METER

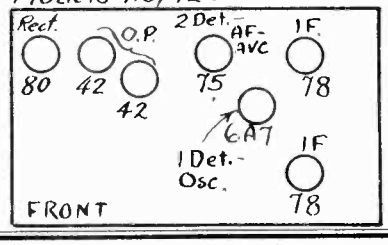
First adjust variable control so meter shows full scale reading. Connect input to A.V.C. buss tie post in chassis. Black leads from I.F.'s are a.v.c. leads. Maximum signal peak is indicated by meter swing toward O. Strength of carrier waves from broadcast and short wave stations will show on meter.



Models 515, 525



Models 715, 725



INTERMEDIATES

I.F. frequency is 460 K.C. To check I.F.'s, connect up vacuum tube volt meter as described. Turn dial till variable condenser plates are out. Make sure your oscillator is on 460 K.C., connect out-put of oscillator to grid of 6A7, leave grid cap in place and adjust trimmer screws on top of Intermediates for maximum gain (Minimum reading on meter).

NOISY OPERATION (Not Static)

A defective tube will cause a sharp 60 cycle r.f. pickup. Tube with loose elements will show up by lightly tapping the top of the tube with the eraser on a pencil.

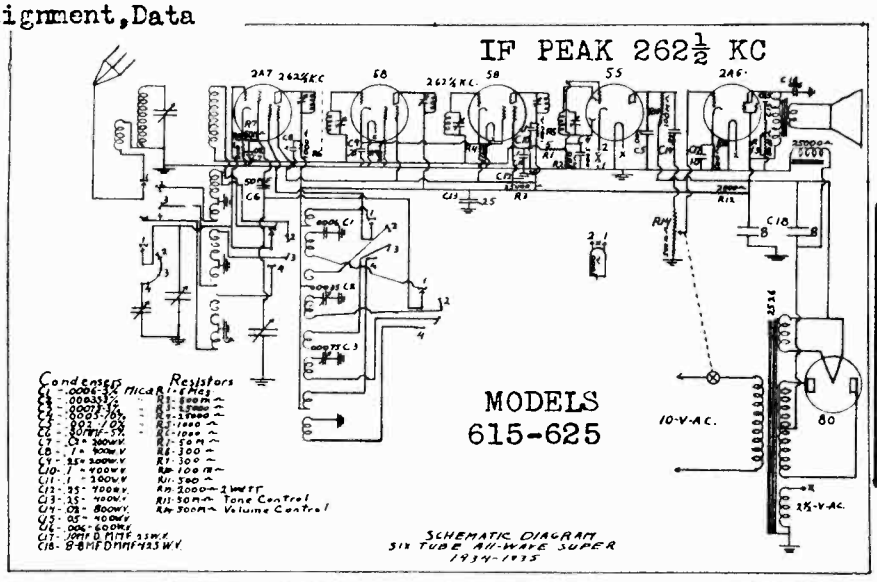
To determine if a 6A7 is oscillating on all bands, check each band by touching lug of ocsillator (center) section on variable with finger, a dull click will be heard if tube is oscillating properly.

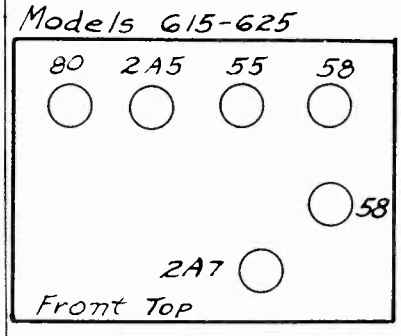
DOUBLET ANTENNA

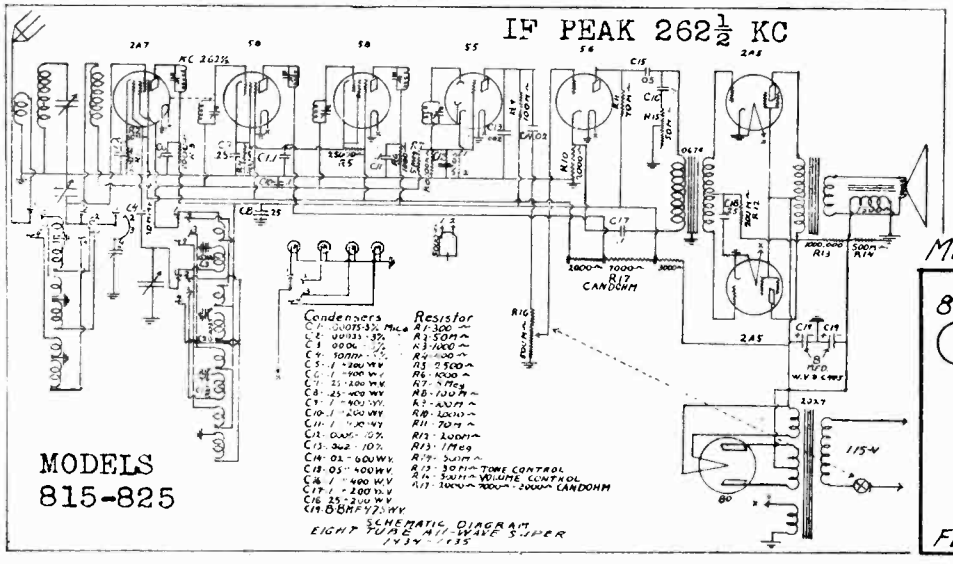
When using a doublet antenna the green lead goes to the long doublet lead and the white lead to the short doublet lead. Red always goes to ground. When set is on broadcast band the switch selects the long doublet lead and short one is not used. When doublet system is not employed white and red leads go to ground, and green lead to the antenna.

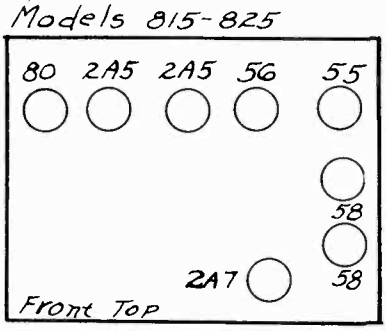
MODELS 615,625
MODELS 815,825
Schematics, Socket
Alignment, Data

GILFILLAN BROS., INC.









USING VACUUM TUBE VOLT METER

The cathode clip is connected to the cathodes of the tubes controlled by the A.V.C. The buss clip is connected to the A.V.C. buss in front of the isolating resistor.

Adjust rheostat shunt until meter shows full scale reading.

All balancing is done with maximum peak indicated by the meter swing toward O. Sensitivity of various receivers can be checked by the swing of meter from a known station. Short Wave fading can be seen by tuning in the station with meter connected to set.

REBALANCING

Do not rebalance a set until you are sure it requires it. 99 per cent of the sets do not need it. We do not find one case in one hundred that really should be rebalanced.

INTERMEDIATES

Connect a 262½ K. C. oscillator to the first detector grid (No. 2-A 7 tube) leaving grid cap in place. Set dial at 1400 K.C. Hook up vacuum tube meter as described and carefully adjust 3 screws on top of Intermediates for maximum gain (minimum reading of meter). Don't flat top any stages. Have all shields in place. Keep volume control at lowest level.

CONDENSER GANG

Set dial at 1400 K.C. when gang is at minimum position and tighten dial set screws. Tune in a station (or use an oscillator) to a known frequency signal around 1400 K.C. Carefully adjust oscillator section of gang until frequency is correct on dial.

If the intermediates are balanced on 262½ K.C., the dial will now track within 5 K.C. over the entire dial.

Adjust first detector section for maximum gain and follow by adjusting band pass trimmers.

Don't bend any condenser plates unless absolutely necessary.

OVERLOADING—OR POOR QUALITY AT LOW VOLUME

The chief cause of this trouble is too long an antenna. A powerful local station will cause the R. F. tubes to block. Check this by disconnecting the antenna on the station causing the trouble. If too close to a powerful station, installing a switch in the aerial circuit helps this. In rare cases the set seems to overload and the A.V.C. works too quickly on all stations.

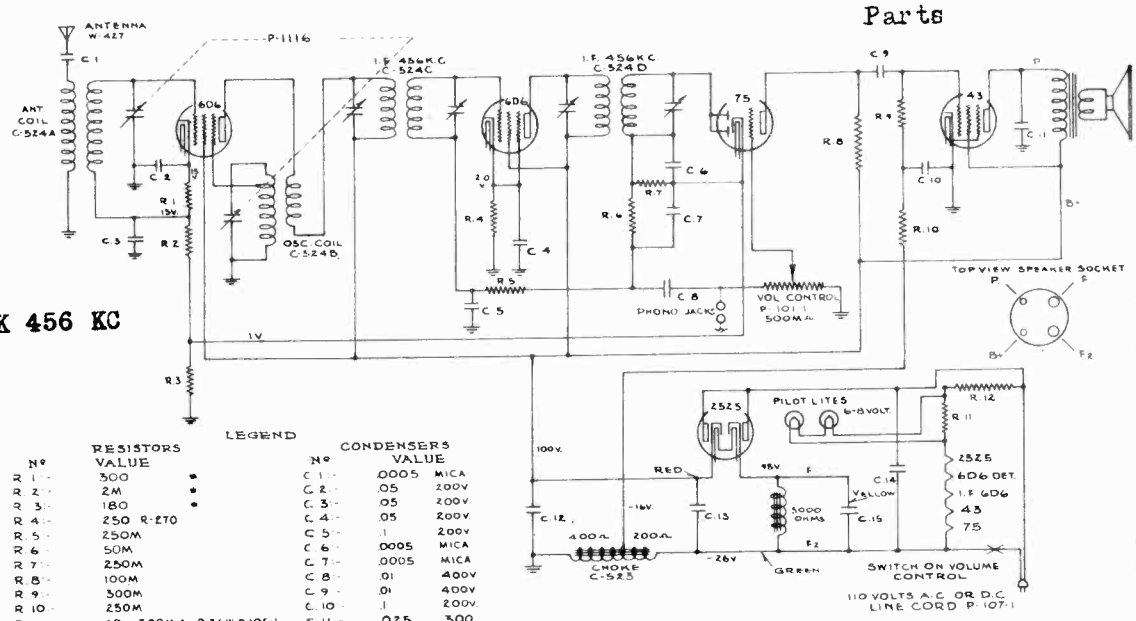
Check the following:

Disconnect 2 meg. resistor from A.V.C. buss at tie point. Have all tubes cold. Use high voltage, high resistance ohmmeter capable of reading 25 megohms and test from ground to A.V.C. buss for leakage. After condensers have charged, no leakage should be shown. This must read around 100 megohms to ground.

If slight leakage is observed, disconnect bypass condensers from buss until defective one is found. Sometimes moisture is found on coil terminals. Scrape this clear.

GOODYEAR SERVICE

MODEL 540
Schematic, Voltage
Socket, Alignment
Parts

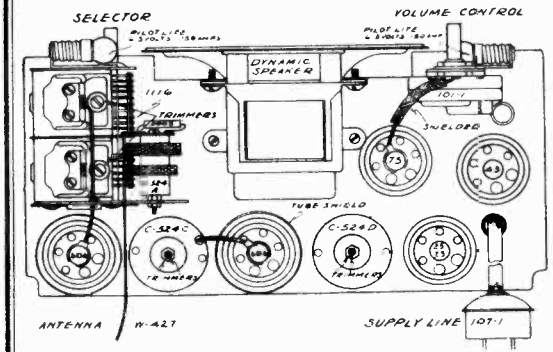


IF PEAK 456 KC

LEGEND

RESISTORS			CONDENSERS		
Nº	VALUE		Nº	VALUE	
R 1 -	300	*	C 1 -	.0005	MICA
R 2 -	2M	*	C 2 -	.05	200V
R 3 -	180	*	C 3 -	.05	200V
R 4 -	250 R-270		C 4 -	.05	200V
R 5 -	250M		C 5 -	.1	200V
R 6 -	50M		C 6 -	.0005	MICA
R 7 -	250M		C 7 -	.0005	MICA
R 8 -	100M		C 8 -	.01	400V
R 9 -	300M		C 9 -	.01	400V
R 10 -	250M		C 10 -	.1	200V
R 11 -	40 A. 300M.A. 0.36W.P-106-1		C 11 -	.025	300
R 12 -	126 IN CORD P107-1		C 12 -	5.0 MFD.	C-525D
			C 13 -	25.0 MFD	*
			C 14 -	.1	400V.
			C 15 -	5.0 MFD	*

NOTE
* R.1, R.2 & R.3 IN ONE UNIT PART NUMBER R-268.
* C. 15 AND C. 15 IN ONE UNIT PART NUMBER C-525-C
NUMBERS PREFIXED BY LETTERS ARE PARTS.
VOLTAGES TAKEN FROM POINTS INDICATED TO CHASSIS GROUND. VOLUME CONTROL ON FULL. MEASURED ON A.C. CURRENT.



Part No.	Description
101-1	Volume Control with Switch
106-1	40 Ohm Resistor-10%
107-1	126 Ohm Special Cord and Plug
C-523	600 Ohm Choke
C-524A	Antenna Coil
C-524B	Oscillator Coil
C-524C	Input I.F. Transformer
C-524D	Output I.F. Transformer
C-525C	5-25 Mfd. Electrolytic Condenser
C-525D	5 Mfd. Electrolytic Condenser
R-268	2480 Ohm Resistor
R-270	250 Ohm Wire Wound Resistor

SERVICE NOTES

Should it be at any time necessary to rebalance this set, the correct procedure is as follows:

1. Volume control on full during all alignment.
2. Variable condenser in minimum capacity position, plates open, at start of all aligning.

I.F. ALIGNMENT

1. To peak I.F. transformers, connect oscillator set at 456 kilocycles to the grid of the 6D6 tube directly in back of the variable condenser and adjust the trimming condensers of the I.F. transformers to resonance (Maximum deflection on an output meter connected across the primary of the speaker input transformer).

   Each I.F. trimmer has two adjustments, one nut and one screw, both of which are adjustable from the top.

BROADCAST BAND ALIGNMENT

1. Disconnect antenna wire and connect oscillator in series with a 75 mmfd. condenser to the antenna coil. With the variable condenser set at its minimum capacity position, at the extreme right of its rotation, and with an oscillator output adjusted to 1720 kilocycles, adjust trimmer of oscillator section of variable condenser (rear section) to resonance (maximum deflection on an output meter connected across the primary of the speaker input transformer). Next adjust the trimmer condenser of the front section of the variable condenser to resonance.
2. Check alignment at 1400-1200-1000-800-600-530 kilocycles, bending the slotted plates of the front section of the variable condenser only if absolutely necessary.

MODEL 575
Schematic, Voltage
Socket, Trimmers
Alignment

GOODYEAR SERVICE

Service Notes

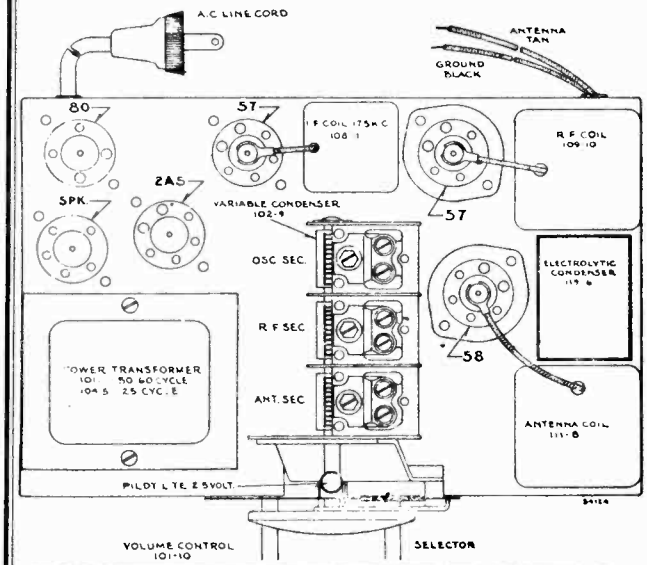
Voltages taken from different points of circuit to chassis are measured with volume control full on, using a voltmeter having a resistance of 1000 ohms per volt. These voltages are indicated on the schematic circuit diagram.

Part No. 145-2

Common Black to Brown	—.003	x 600 Volts
Common Black to Green	— .1	x 200 Volts
Common Black to Red	—.1	x 200 Volts
Common Black to Orange	—.25	x 200 Volts
Blue to Blue	—.05	x 400 Volts

Part No. 145-3

Common Black to Brown	—.1	x 200 Volts
Common Black to Green	—.05	x 200 Volts
Common Black to Orange	—.05	x 200 Volts
Common Black to Yellow	—.05	x 200 Volts



Aligning I. F. Transformer

1. With volume control full on, at extreme right of its rotation, and with variable condenser at its maximum capacity position (extreme right of its rotation) make the following adjustments:

(a) Connect an external oscillator adjusted to 175 kilocycles, in series with a .1 mfd. condenser, to the control grid cap of the type 57 tube located between the R. F. coil (part numbers 109-10) and the I. F. transformer (part number 108-11) and chassis.

(b) Adjust trimming condensers of I. F. transformer (part number 108-11) to resonance. See top view of chassis. Use as a resonance indicator an output meter connected across the primary of the speaker input transformer or between the plate and screen terminals of the type 2A5 tube, by means of an adapter. Maximum deflection of the meter indicates resonance. Care must be taken to use only enough signal to give a readily readable output, as excessive input will result in overload and a false resonance point.

NOTE: The two trimmer condensers which tune the primary and secondary of the I. F. transformer are adjusted by set screws accessible from the back of the chassis.

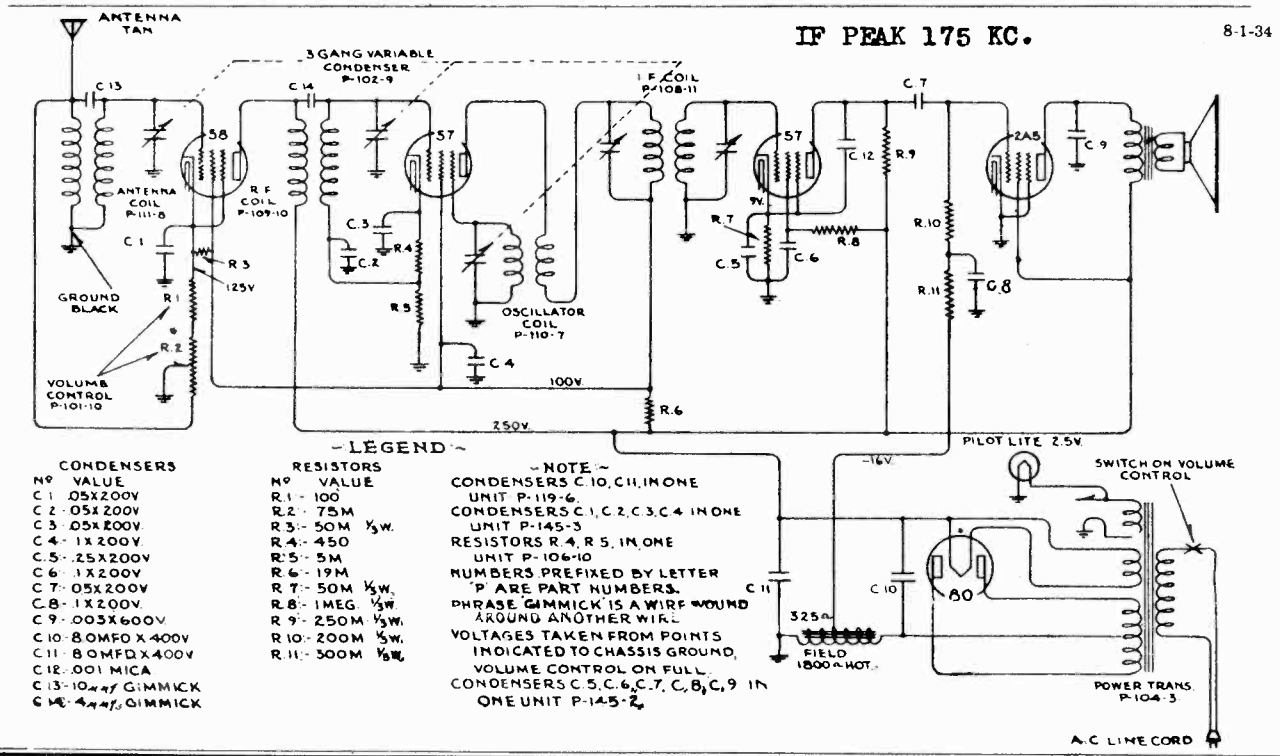
Aligning R. F. and Oscillator Circuits

1. Connect the external oscillator set at 1720 kilocycles and in series with a 200 Mfd. condenser, between the antenna (tan) and ground (black) leads.

(a) With volume control full on and variable condenser plates in minimum capacity position, plates entirely out of mesh (extreme left of its rotation), adjust trimmer of rear oscillator section of variable condenser to resonance.

(b) Shift external oscillator frequency from 1720 to 1400 kilocycles, pick up signal by rotating variable condenser and peak R. F. (center) and antenna (front) section trimmers of variable condenser to resonance.

(c) Check tracking at 1500, 1200, 1000, 800, 600 and 530 kilocycles by changing external oscillator frequency and rotating variable condenser to pick up signal. Adjust slotted end plates of R. F. (center) and antenna (front) sections to increase output, if necessary. DO NOT BEND OSCILLATOR PLATES.



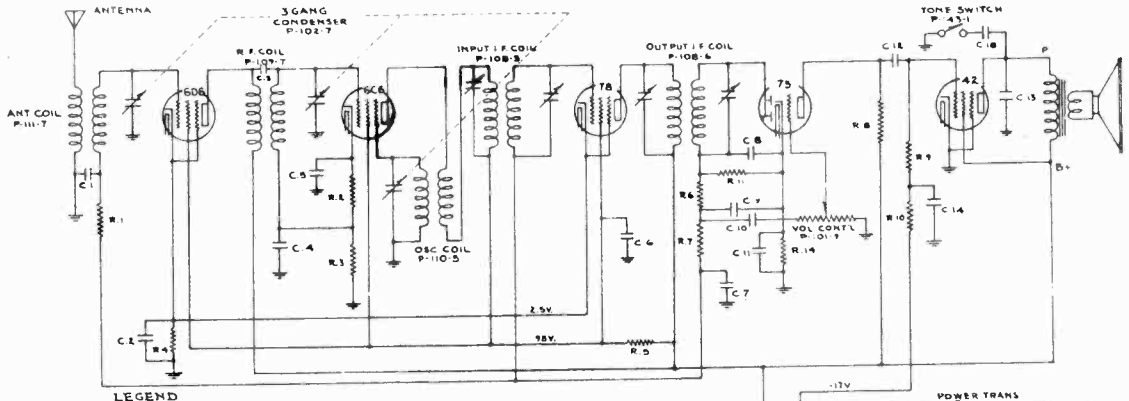
MODEL 670
Schematic, Voltage
Socket, Trimmers

GOODYEAR SERVICE

Vibrators can be reconditioned at a cost of $3.00 each, if the old unit is returned.

All resistors are RMA color coded - specify value and/or resistor number (per schematic diagram) and model number.

MODEL 670



LEGEND

RESISTORS

No	VALUE
R 1 -	250M 1/2 W
R 2 -	450Ω
R 3 -	5M
R 4 -	150Ω
R 5 -	1 9M
R 6 -	50M 1/2 W
R 7 -	250M 1/2 W
R 8 -	250M 1/2 W
R 9 -	200M 1/2 W
R 10 -	300M 1/2 W
R 11 -	250M 1/2 W
R 12 -	100Ω
R 13 -	100Ω
R 14 -	4M 1/2 W
VAR. RESISTOR - 500M (VOL. CONT'L)	

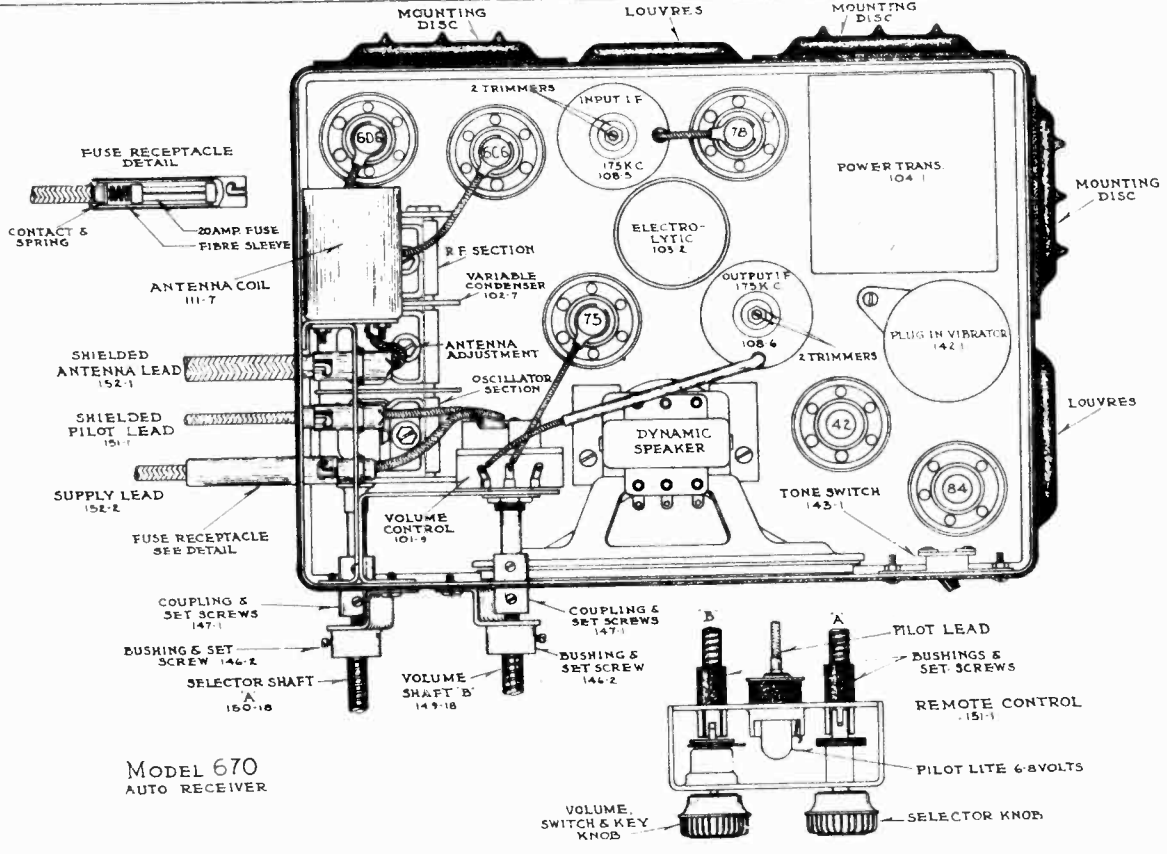
CONDENSERS

No	VALUE
C 1 -	.05 X 200V
C 2 -	.1 X 200V
C. 3 -	11.5 μμf GIMMICK
C. 4 -	.05 X 200V
C. 5 -	.05 X 200V.
C. 6 -	1 X 200V.
C 7 -	1 X 200V.
C. 8 -	.0005 MICA
C. 9 -	.0005 MICA
C. 10 -	.01 X 400V
C. 11 -	20 MFD. X 20V.
C 12 -	.01 X 400V.
C. 13 -	.003 X 600V
C. 14 -	1 X 200V
C. 15 -	1 MFD X 120V.
C 16 -	8 MFD. X 350V
C 17 -	8 MFD. X 350V
C. 18 -	.01 X 400V
C. 19 -	.02 X 1000V
C 20 -	1 MFD X 120V
C 21 -	.002 MICA

NOTE
NUMBERS PREFIXED BY LETTERS ARE PART NUMBERS
VOLTAGES TAKEN FROM POINTS INDICATED TO CHASSIS GROUND VOLUME CONTROL ON FULL
THE PHRASE GIMMICK MEANS A WIRE WOUND AROUND ANOTHER WIRE
RESISTORS IN ONE UNIT, P-106-3 - R 2, 3, 4, 5
CONDENSERS IN ONE UNIT, P-105-2 C 16 17
CONDENSERS IN DUAL UNIT - C 2, 7
CONDENSERS IN DUAL UNIT - C 5, 6
RESISTORS AND CONDENSERS IN OUTPUT I.F. CAN P-108-6 - C 8, 9, 10 AND R 6, 7, 11
CONDENSER, C 1, IN ANT. COIL CAN P-111-7.

IF PEAK 175 KC.

34153



MODEL 670
AUTO RECEIVER

MODEL 670
Alignment
Elimination Notes

GOODYEAR SERVICE

ELIMINATION OF MOTOR NOISE:

In some few cases, such as Buicks, it is necessary to use screw type suppressors. Cut lead about two inches from distributor and screw one end of suppressor into the wire attached to distributor, screw wire from coil into other end of suppressor.

Generator capacitor, number 148-1, is connected to generator side of cutout. The ground side of capacitor can be fastened to the generator housing under the same screw that holds the relay housing to generator. In some cases, an additional capacitor, number 148-1, (obtainable from your dealer) must be installed between the battery side of ignition coil and the car frame.

If after connecting suppressors and condensers as outlined above there is still motor noise, make the following tests:

Shield high tension leads.

Bond flexible shaft leads, such as free wheeling, which run close to distributor, radiating ignition interference which is picked up by the antenna inside of car.

Cars using wooden floor boards, place a grounded copper screen under toe board.

Excessive gap between distributor rotor and high tension contacts, replace with a special radio rotor arm or build up end with solder and dress end with file so that its original shape is retained. The rotor should not brush or wipe the contacts, but should just clear them.

In some cases, such as V-8 Ford, it is necessary to pull battery and primary leads out of special tube which houses high tension leads, shield and ground these leads. Also on V-8 Fords it is necessary to install a capacitor at primary terminal of coil housing.

Additional suppressors can be obtained from your dealer.

The ignition system of car must be kept in good condition.

Fouled plugs or plugs with improperly adjusted gaps will affect the operation of receiver as well as of the automobile. Burned or poorly adjusted braker points will also impair the performance. It is advisable to advance the generator charging rate in order to compensate for the additional drain of the receiver on car storage battery.

It is sometimes necessary to connect a condenser (148-3) between the hot side of the dome light switch and ground.

BALANCING SET TO ANTENNA:

When this set has been installed and is ready for operation, it may be found necessary (depending on antenna) to balance set to this antenna. This is accomplished as follows:

With the receiver tuned to a very weak station, about 150 to 1400 (1300 to 1400 kilocycles) on the dial, adjust the antenna trimmer with a screw driver until maximum volume is attained. To reach the antenna trimmer remove the plug button from the top of the case.

••••••••••••••••
SERVICE NOTES
••••••••••••••••

Should it ever be necessary or desirable to re-align this receiver, the proper method is as follows:

Adjustments can be made with the receiver mounted in the cabinet, being necessary only to remove the top cover.

I.F. ALIGNMENT:

1. With variable condenser at its maximum capacity position and with volume control full on, connect in series with a .1 mfd. condenser, an oscillator set at 175 kilocycles to the grid cap of the 6SA tube.
2. Adjust trimming condensers of both input and output I.F. transformers, parts number 136-5 and 136-6 (see top view of chassis) to resonance with oscillator, as indicated on an output meter connected across the primary terminals of the speaker input transformer. Maximum defleotion on the meter indicates resonance

Note: Each I.F. transformer trimmer has two adjustments, one nut and one screw, both of which are adjustable through the top of the can.

FREQUENCY ALIGNMENT:

1. Attach oscillator connected in series with a 200 mmfd. condenser to the antenna lead and with the variable condenser at its minimum capacity position (extreme right of its rotation) and with an oscillator set at 1550 kilocycles, adjust condenser trimmer of oscillator section (shaft end) to resonance.
2. Re-set oscillator to 1400 kilocycles, rotate variable condenser to pick up signal, adjust antenna and R.F. trimmers to resonance.
3. Check alignment at 1200-1000-800-600-530 kilocycles by setting oscillator to these frequencies and picking up signal by rotating condenser.
4. Bend slotted plates of antenna and R.F. sections only if necessary. UNDER NO CIRCUMSTANCES BEND PLATES OF OSCILLATOR SECTION.

NOTES:

Voltages from chassis to different points are indicated on schematic circuit diagram, and should be measured with a volt meter having a resistance of 1000 ohms per volt.

Failure to operate, noisy or weak reception, may be due to defective tubes or poor contact between cap on top of tube and grid clip.

Tubes may be checked by replacing with another tube which is known to be good.

If fuse blows out frequently, and insulating sleeve has been properly placed over fuse, the trouble probably is in the vibrator and vibrator should be replaced.

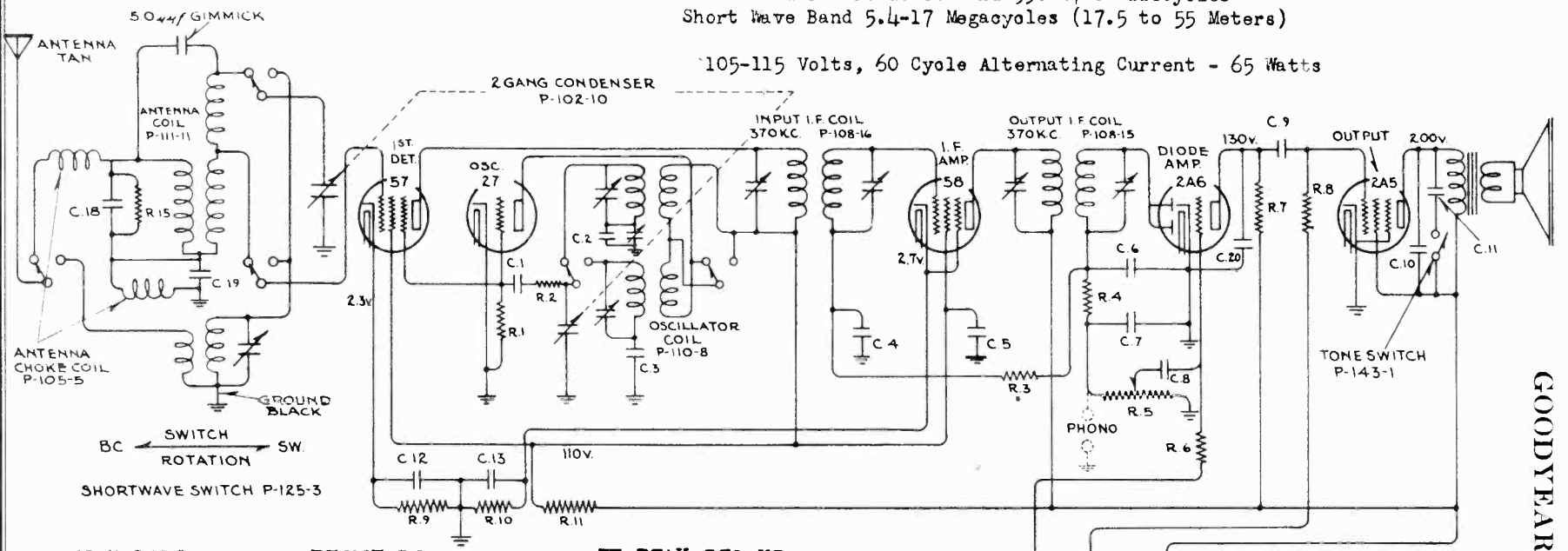
NEVER ATTEMPT TO ADJUST VIBRATOR POINTS.

GOODYEAR SERVICE

MODEL 675
Schematic, Voltage
Socket, Trimmers

Standard Broadcast Band 530-1720 Kilocycles
Short Wave Band 5.4-17 Megacycles (17.5 to 55 Meters)

105-115 Volts, 60 Cycle Alternating Current - 65 Watts



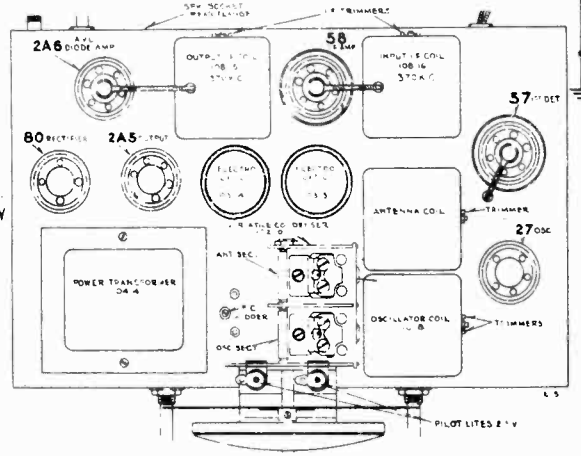
IF PEAK 370 KC.

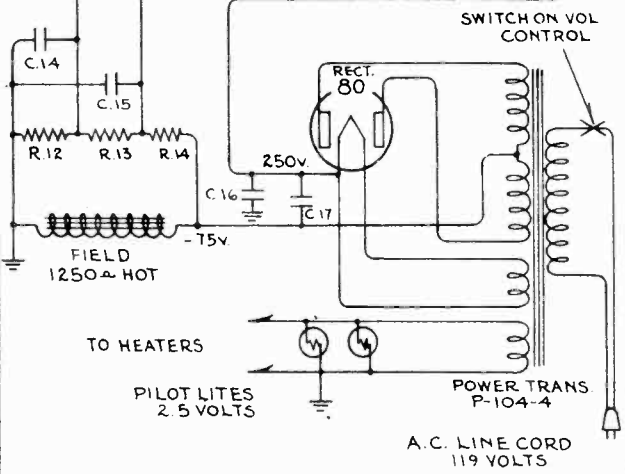
CONDENSERS		RESISTORS		
Nº	VALUE	Nº	VALUE	
C.1 -	50 MICA	R.1 -	50M.	1/3W.
C.2 -	490 MICA	R.2 -	50	1/3W.
C.3 -	5M MICA	R.3 -	500M	1/3W.
C.4 -	.05 X 200V	R.4 -	50M	1/3W.
C.5 -	.05 X 400V.	R.5 -	500M	VOLUME CONTROL P-101-11
C.6 -	100 MICA	R.6 -	500M	1/3W.
C.7 -	100 MICA	R.7 -	250M	1/3W.
C.8 -	.05 X 200V.	R.8 -	250M	1/3W.
C.9 -	.05 X 400V.	R.9 -	1000	
C.10 -	.003 X 400V.	R.10 -	275	
C.11 -	.02 X 400V.	R.11 -	13M	
C.12 -	.1 X 200V.	R.12 -	25M	1/3W
C.13 -	.1 X 200V.	R.13 -	250M	1/3W
C.14 -	.25 X 200V.	R.14 -	750M	1/3W.
C.15 -	.25 X 200V	R.15 -	10M	1/3W
C.16 -	18 MFD. 350V. P-103-3			
C.17 -	16 MFD. 400V. P-103-4			
C.18 -	120 μμf.			
C.19 -	.01 μμf.	C.20 - .0005 MICA.		

- NOTE -

CONDENSERS C.10, C.11 IN DUAL UNIT
" C.14, C.15 " " "
" C.13, C.4 " " "

RESISTORS R.9, R.10, R.11 IN ONE UNIT P-106-13
NUMBERS PREFIXED BY LETTER 'P' ARE PART NUMBERS.





34265

VOLTAGES TAKEN FROM POINTS INDICATED TO CHASSIS GROUND. VOLUME CONTROL ON FULL
RESISTORS, R.3, 4, & 6, CONDENSERS C.6, 7, & 8 ARE IN OUTPUT I.F. CAN, P-108-15

MODEL 675
Alignment

GOODYEAR SERVICE

SERVICE NOTES

Voltages taken from different points of the circuit are measured with a voltmeter having a resistance of 1000 ohms per volt and are made between the points indicated and the chassis pan. These voltages are indicated on the circuit diagram.

To check for open by-pass condensers, shunt each condenser with another condenser of the same capacity and voltage rating, which is known to be good, until the defective unit is located.

Excessive hum, stuttering, low volume and a reduction in all D.C. voltages is usually caused by a shorted electrolytic condenser, open by-pass condensers frequently cause oscillation and distorted tone.

ALIGNMENT:

No aligning adjustments should be made until the set has been thoroughly checked for all other possible causes of trouble, such as poor installations, low line voltages, defective tubes, condensers and resistors.

ALIGNING I.F. TRANSFORMERS:

1. With volume control full on, at the extreme right of its rotation, and with wave selector switch in the broadcast position, extreme left of its rotation, and with variable condenser at its minimum capacity position, extreme left of its rotation, plates entirely out of mesh, adjust the I.F. transformers (parts number 108-15 and 108-16) in the following manner:
   (a) Connect an external oscillator which has been adjusted to 370 kilocycles, in series with a .1 mfd. condenser to the control grid cap of the type 57 first detector tube (see diagram and chassis).
   (b) Adjust trimming condensers of both I.F. transformers (Parts number 108-15 and 108-16) to resonance. Use as a resonance indicator an output meter connected across the primary of the speaker input transformer or by means of an adapter between plate and screen terminals of type 2A5 output tube. Maximum deflection of the meter indicates resonance. Care should be taken to use only enough signal to give a readily readable output.
   Note: The two adjustments on each transformer are accessible through holes in the transformer cans from the back of the chassis.

BROADCAST BAND ALIGNMENT:

1. Shift frequency of external oscillator to 535 kilocycles and connect in series with a 200 mmfd. condenser to the tan antenna wire and the black ground wire.
   (a) Set the variable condenser in its maximum capacity position, extreme right of its rotation.
   (b) Adjust the broadcast oscillator series trimmer to resonance with oscillator. This trimmer is located between the gang condenser and the power transformer (see top view).
2. Shift frequency of external oscillator to 1712 kilocycles and set variable condenser in its minimum capacity position, extreme left of its rotation, plates entirely out of mesh.
   (a) Adjust the broadcast oscillator shunt trimmer to resonance. This adjustment is the top adjustment in the oscillator coil can, part number 110-8.

SHORT WAVE BAND ALIGNMENT:

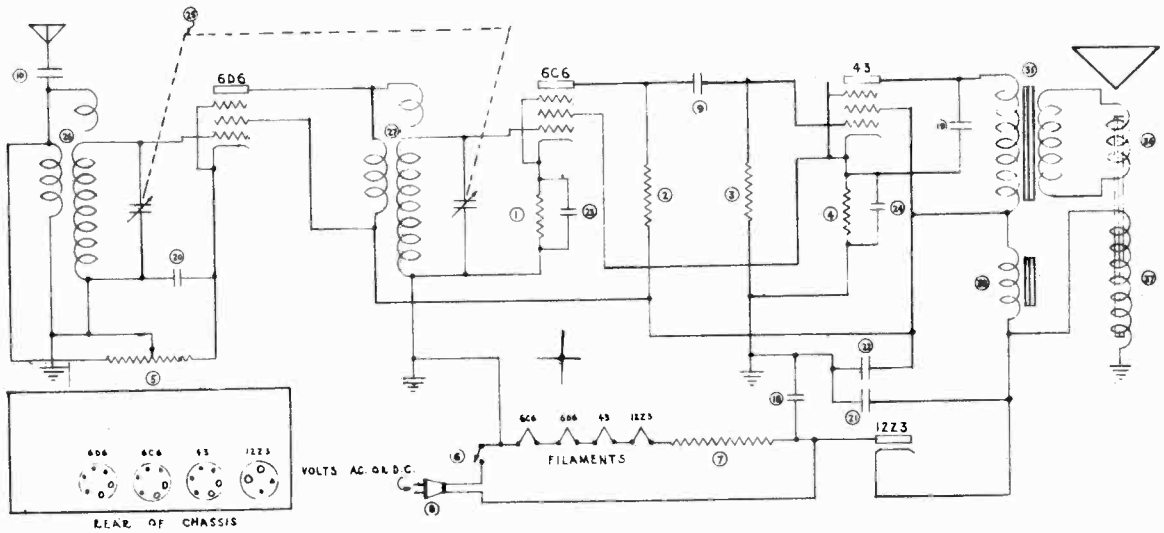
1. Set the wave changing switch in the short wave position, extreme right of its rotation, and change external oscillator frequency to 15 megacycles.
   (a) Adjust variable condenser with selector knob so that pointer is opposite the 15 megacycle calibration on the dial.
   (b) Adjust the short wave oscillator shunt trimmer to resonance with the signal (use extreme care and make certain that you do not adjust to resonance with the image instead of the signal). This trimmer is the bottom trimmer (closest to the chassis) on the oscillator coil, part number 110-8, and is accessible from the side of the chassis.
   (c) Adjust the short wave antenna trimmer to resonance (single trimmer in antenna can, part number 111-11, accessible from the side of the chassis, between type 27 and 57 tubes).

NOTES:

Should the planetary vernier dial drive mechanism fail to function properly, it will probably be found to be due to a cracked or broken compression spring. This drive may be dis-assembled by removing the two screws which fasten it to the dial bracket. The part number of the compression spring is 112-31. All of the other dial parts are hardened and should cause no trouble.

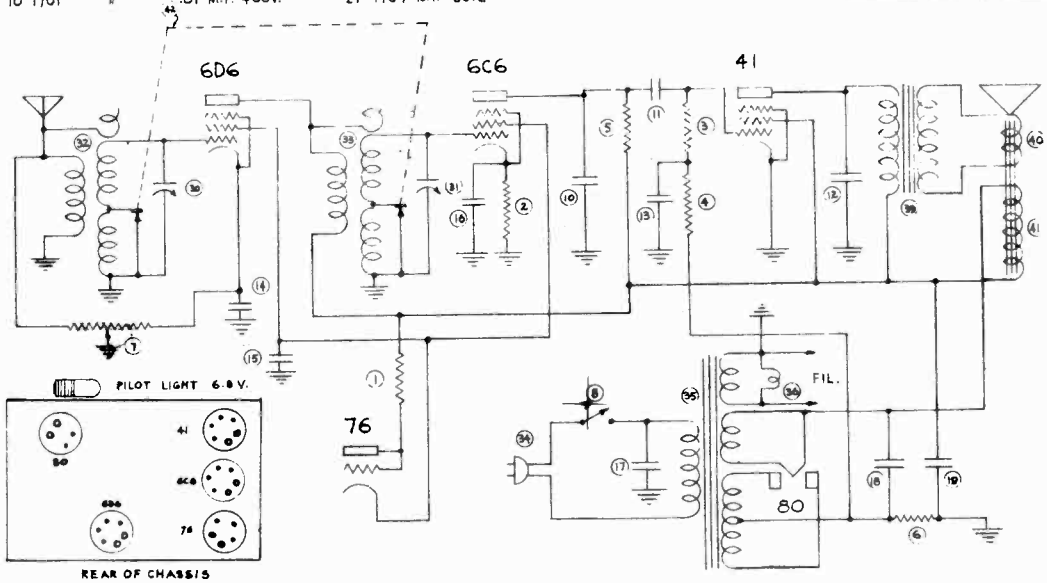
MODEL 45
MODEL 52
Schematic, Socket

HALSON RADIO MFG. CO.



1	1413	RESISTOR 29000Ω ½ WATT	
2	1414	" 490,000Ω "	
3	1415	" 990,000Ω "	
4	1412	" 610Ω ½ WATT	
5	1405	VOL. CONTROL	25,000Ω
6	1405	LINE SWITCH	
7	1417	RESISTANCE	220Ω
8	1417	LINE CORD & PLUG	
9	1416	CONDENSER	.001 M.F. 600V.
10	1101	"	.01 M.F. 400V.
18	1102	CONDENSER	.02 M.F. 400V.
19	"	"	" " "
20	1040	"	.05 M.F. 200V.
21	1408	ELEC. COND.	16 M.F. 150V.
22	1408	" "	8 M.F. 150V.
23	1408	" "	5 M.F. 35V.
24	1408	" "	5 M.F. 35V.
25	1404	VARIABLE COND.	370 M.M.F.
26	1406	ANTENNA COIL	
27	1407	R.F. COIL	
35	1418	OUTPUT TRANS.	
36	SPKR	VOICE COIL	
37	ASSY	FIELD COIL	3500Ω (HOT)
38	1281	FILTER CHOKE	400Ω

CIRCUIT DIAGRAM			MODEL 45
DRAWN BY S. H. E-24	CHECKED BY	APPROVED BY	HALSON NUMBER 45
HALSON RADIO MFG. CORP. N.Y.C.			

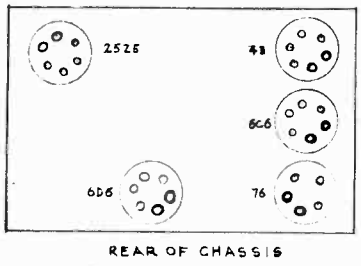


1	1158	RESISTOR	110,000Ω 1 WATT
2	1160	"	51,000Ω ½ "
3	1165	"	260,000Ω " "
4	"	"	" " "
5	1029	"	" 1 "
6	1292	"	400Ω 1 "
7	1209	VOLUME CONTROL	25,000Ω
8	1209	LINE SWITCH	
10	1098	CONDENSER	510 M.M.F. MICA
11	1101	CONDENSER	.01 M.F. 400V.
12	1385	"	" " 600V.
13	1040	"	.05 " 200V.
14	"	"	" " "
15	1036	"	.1 " "
16	1103	"	.25 " "
17	1102	"	.02 " 400V.
18	1437	ELECTROLYTIC COND.	8 M.F. 500V.
19	"	"	" " "
30	1432	VARIABLE COND.	370 M.M.F.
31	"	"	" " "
32	1433	ANTENNA COIL	
33	1438	R.F. COIL	
34	1115	LINE CORD & PLUG	
35	1434	POWER TRANSFORMER	
36	1086	PILOT LIGHT	6.3 V.
39	1431	OUTPUT TRANS.	
40	SPKR	VOICE COIL	
41	ASSY	FIELD COIL	2000Ω
42	1439	WAVE CHANGE SWITCH	

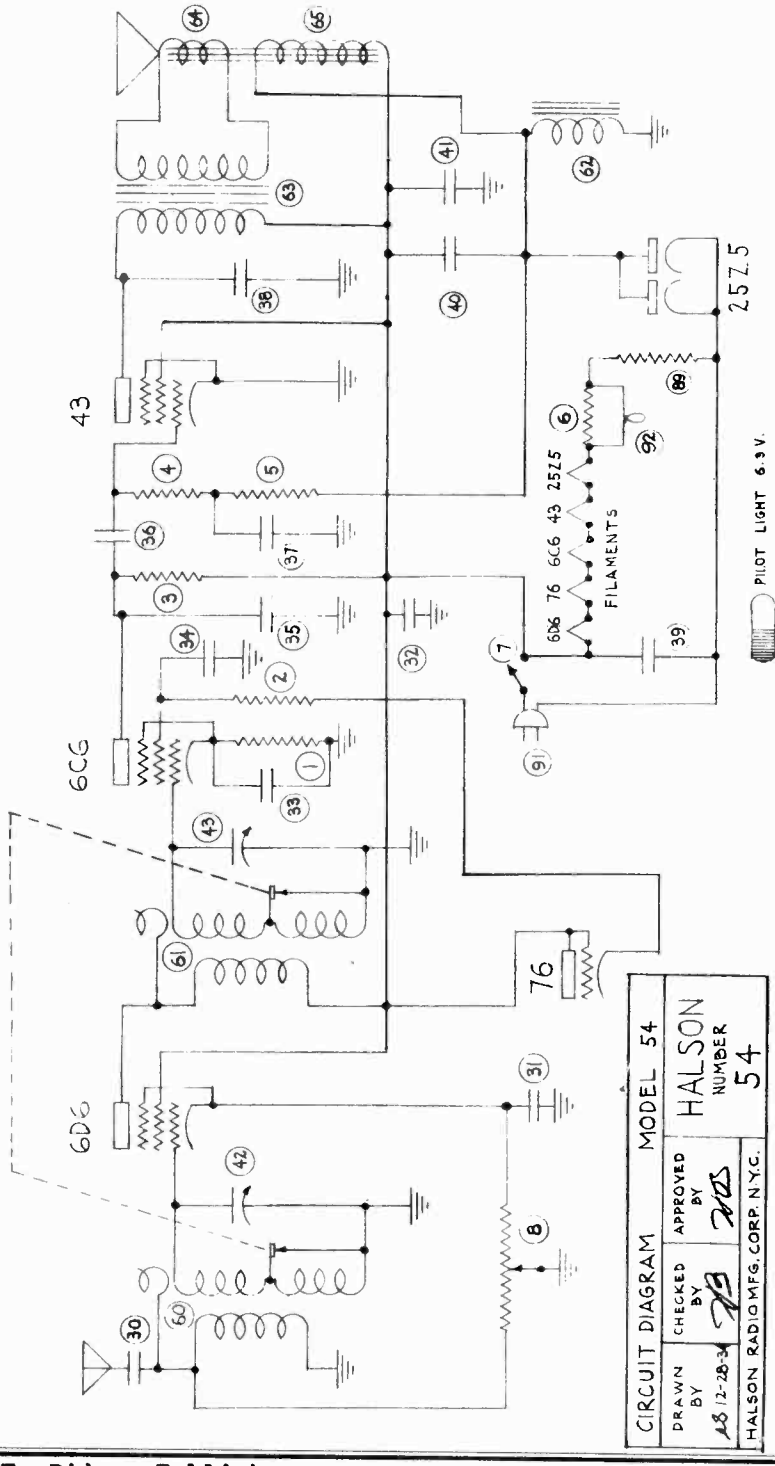
CIRCUIT DIAGRAM			MODEL 52
DRAWN BY AS 12-8-34	CHECKED BY	APPROVED BY	HALSON NUMBER 52
HALSON RADIO MFG. CORP. N.Y.C.			

MODEL 54
Schematic
Socket

HALSON RADIO CORP.



REAR OF CHASSIS



CIRCUIT DIAGRAM	MODEL 54	
DRAWN BY JB 12-28-34	CHECKED BY JB	APPROVED BY JRS
HALSON RADIO MFG. CORP. N.Y.C.		HALSON NUMBER 54

1	1027	RESISTOR	31,000Ω	¼ WATT	30	1101	CONDENSER	.01 M.F.	400V.	38	1102	CONDENSER	.02 M.F.	400V.	62	1281	FILTER CHOKE 430Ω
2	1094	"	1.1 MEGΩ	" "	31	1040	"	.05 "	200V.	39	"	"	"	"	63	1441	OUTPUT TRANS.
3	1029	"	260,000Ω	" "	32	1036	"	.1 "	"	40	1440	ELEC. COND.	16 M.F.	150 V.	64	SPKR	VOICE COIL
4	1165	"	"	¼ "	33	1103	"	.25 "	"	41		"	"	"	65	ASSY	FIELD COIL 2300Ω (HOT)
5	"	"	"	" "	34	1036	"	.1 "	"	42	1432	VARIABLE COND.	370 M.M.F.		89	1394	RESISTANCE 140Ω
6	1016	"	20Ω	2 "	35	1098	"	510 M.M.F.	MICA	43		"	"		91		LINE CORD & PLUG
7	1209	LINE SWITCH			36	1101	"	.01 M.F.	400V.	60	1433	ANTENNA COIL			92	1086	PILOT LIGHT 6.3 V.
8		VOLUME CONTROL 25,000Ω			37	1103	"	.25 "	200V.	61	1438	R.F. COIL			93	1439	WAVE CHANGE SWITCH

HALSON RADIO CORP.

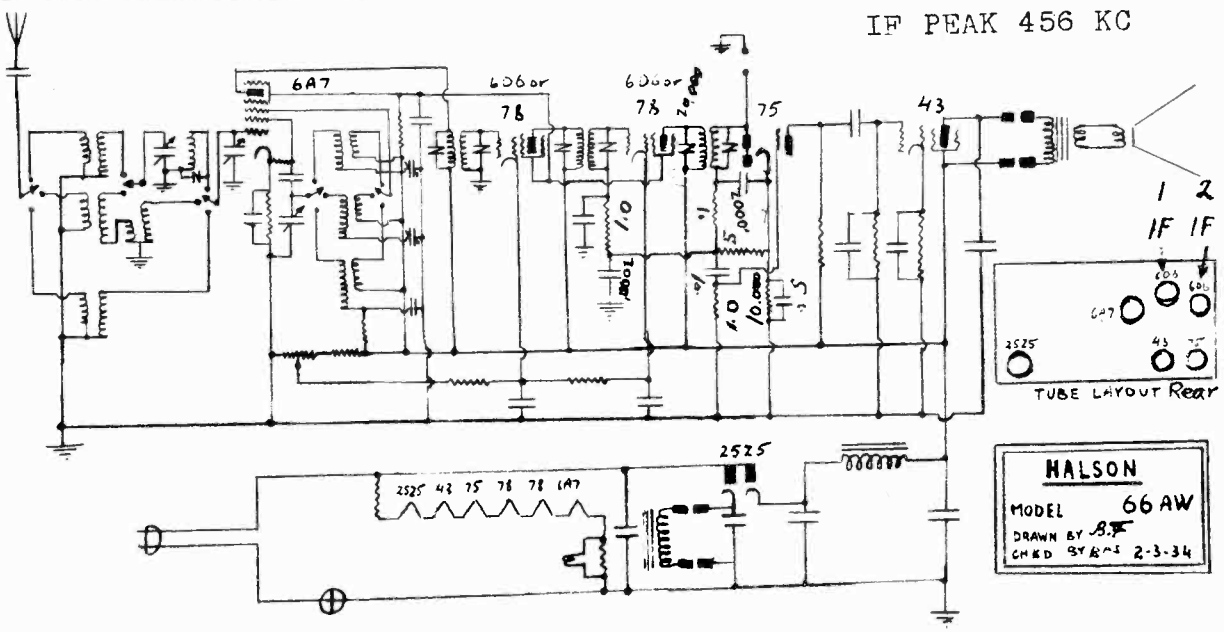
MODEL 66-AW
Schematic, Socket
Notes, Parts

Halson Model 66-AW is a six tube superheterodyne radio operating either on AC or DC. The wave bands are divided in three distinct steps, namely: No. 1 from 15 to 55 meters, No.2 from 180 to 550 meters, and No. 3 from 1000 to 2000 meters. Unless otherwise specified, all stock sets are designed to operate on any 110 volts lighting outlets.

INSTALLATION The set as furnished is complete in every detail for efficient operation. Connect the line and resistor cord to any convenient outlet, unroll the antenna wire and stretch same around the room. (Note) If operated on DC current, should the tubes light and no reception can be heard, reverse the outlet plug for correct polarization.
Make sure that all tubes are inserted in the right socket, the diagram herein shown, gives you the tube lay-out. Some locations differ from others, the self enclosed antenna is generally sufficient for local and near-by broadcastings, also under auspicious weather conditions for short-wave, but we recommend a short outside antenna well insulated for more efficient long distance receptions.

OPERATION The left hand knob controls the switch and volume control. Turn it clockwise to start receiver, adjust the volume to the desired degree. For short-wave operation, turn volume control till the set begins oscillation, short-wave reception best can be heard with least disturbances and noises slightly back of the oscillation point.
Center knob marked 1. 2. 3. indicates the three different wave-bands the set has been designed to operate. No. 1 is the short-wave, No. 2 the Broadcast, No. 3 the Long Wave.
(Note) This knob automatically changes the positions of the dial readings for each individual wave-band.
The right hand knob is the station selector and operates the dial, which is calibrated in megacycles for the short-wave band and in kilocycles for the broadcast and long-wave band.
TO SHUT OFF THE SET - turn the left knob counterclockwise (to the left) until the switch can be heard to snap off.

MINOR REASONS FOR FAILURE OF SET TO PROPERLY FUNCTION Defective tubes, grid caps off tubes, volume control not fully turned on, tubes not properly inserted in their respective sockets, shorted aerial, defective plug, or wiring connection loose in socket.

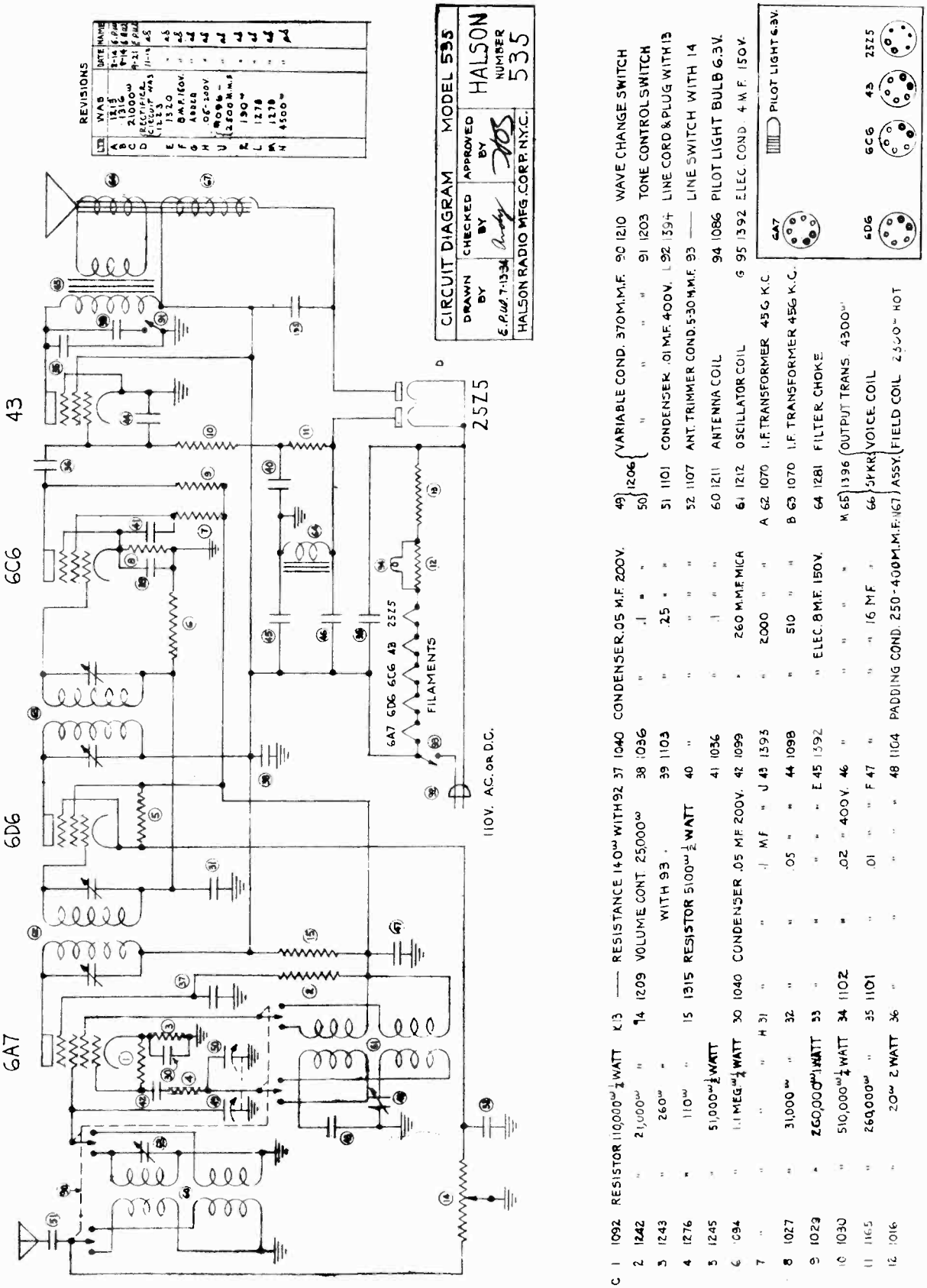


REPLACEMENT PARTS LIST

6601 Volume Control
6602 6" Dynamic Speaker
6603 Replacement Coils per set
6604 Choke
6605 3 sections switch
6606 Electrolitic Condenser
6607 Tubular Condenser (from 1 mfd. to .002 mfd.
6608 Mica Condensers from 0002 to 0025
6609 Resistors 11/3 W
6610 Line Cord and Resistor
6611 5 mfd. Condenser
6612 1 watt resistor
6613 20 W. Resistor
6614 Set of extra tubes

MODEL 535
Schematic, Socket
Parts List

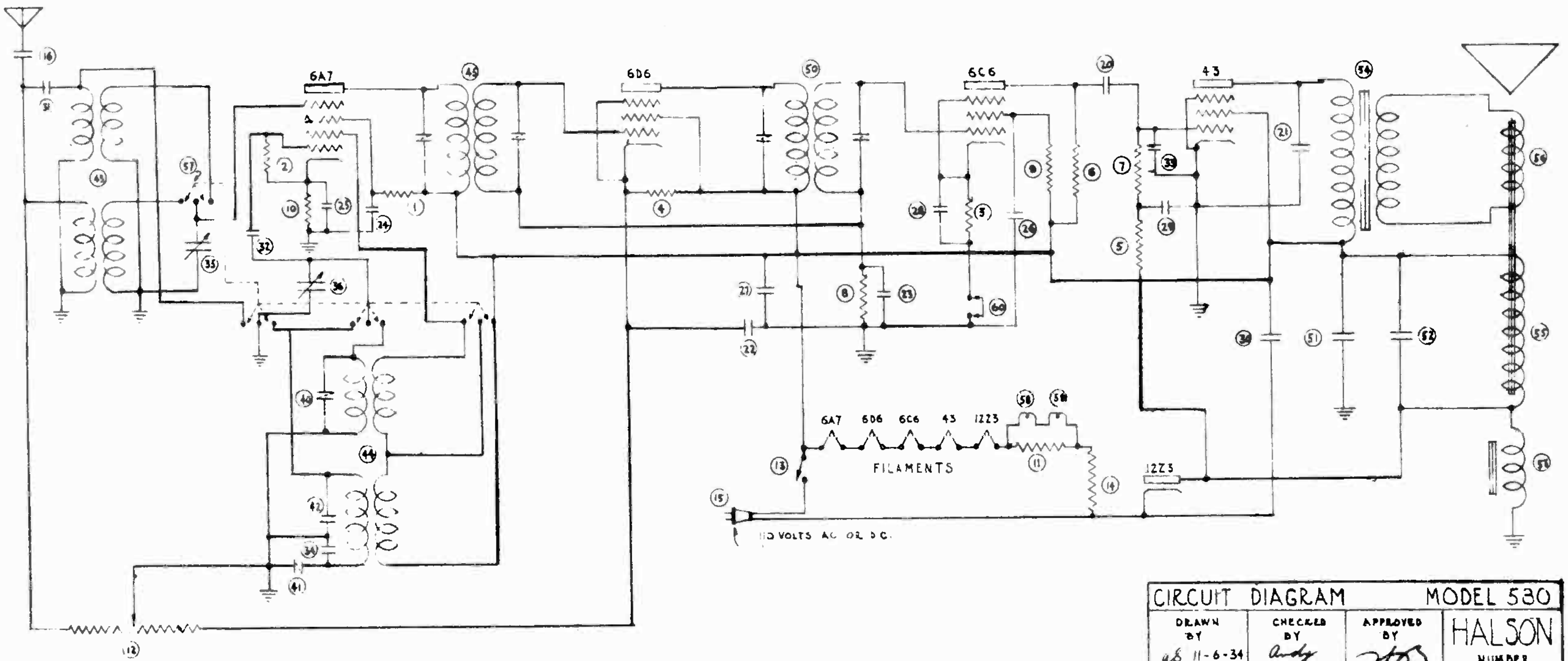
HALSON RADIO CORP.



C 1	1092	RESISTOR 10,000Ω ½ WATT	K 13	—	RESISTANCE 140Ω WITH 92	37	1040	CONDENSER .05 M.F. 200V.	49	1206	VARIABLE COND. 370 M.M.F.	90 1210 WAVE CHANGE SWITCH
2	1242	" 25,000Ω "	14	1209	VOLUME CONT. 25,000Ω	38	1036	" .1 " "	50	1206	" " " "	91 1203 TONE CONTROL SWITCH
3	1243	" 250Ω "			WITH 93 .	39	1103	" .25 " "	51	1101	CONDENSER .01 M.F. 400V.	92 1394 LINE CORD & PLUG WITH 13
4	1276	" 110Ω "	15	1315	RESISTOR 5100Ω ½ WATT	40	"	" " " "	52	1107	ANT. TRIMMER COND. 5-30 M.M.F.	93 — LINE SWITCH WITH 14
5	1245	" 50,000Ω ½ WATT				41	1036	" .1 " "	60	1211	ANTENNA COIL	94 1086 PILOT LIGHT BULB 6.3V.
6	1094	" 1.1 MEG. Ω ¼ WATT	30	1040	CONDENSER .05 MF 200V.	42	1099	" 260 M.M.F. MICA	61	1212	OSCILLATOR COIL	G 95 1392 ELEC. COND. 4 M.F. 150V.
7	"	" " H 31 "			" .1 M.F " J 43		1393	" 2000 " "	A	62 1070	I.F. TRANSFORMER 456 K.C.	
8	1027	" 31,000 Ω "	32	"	" .05 " "	44	1098	" 510 " "	B	63 1070	I.F. TRANSFORMER 456 K.C.	
9	1029	" 260,000Ω ¼ WATT	33	"	" " " E 45		1392	" ELEC. 8 M.F. 150V.	64	1281	FILTER CHOKE	
10	1030	" 510,000Ω ¼ WATT	34	1102	" .02 " 400V.	46	"	" " " "	M	65	1396 (OUTPUT TRANS 4300Ω	
11	1165	" 260,000Ω "	35	1101	" .01 " "	F 47	"	" 16 M.F "	66		SPKR. VOICE COIL	
12	1016	" 20Ω 2 WATT	36	"	" " "	48	1104	PADDING COND. 250-400 M.M.F.	W	67	ASSY. FIELD COIL 2500Ω HOT	

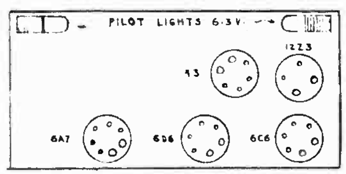
MODEL 580
Schematic, Socket
Parts List

HALSON RADIO CORP.



CIRCUIT DIAGRAM			MODEL 530
DRAWN BY ab 11-6-34	CHECKED BY Andy	APPROVED BY	HALSON NUMBER 580
HALSON RADIO MFG. CORP. N.Y.C.			

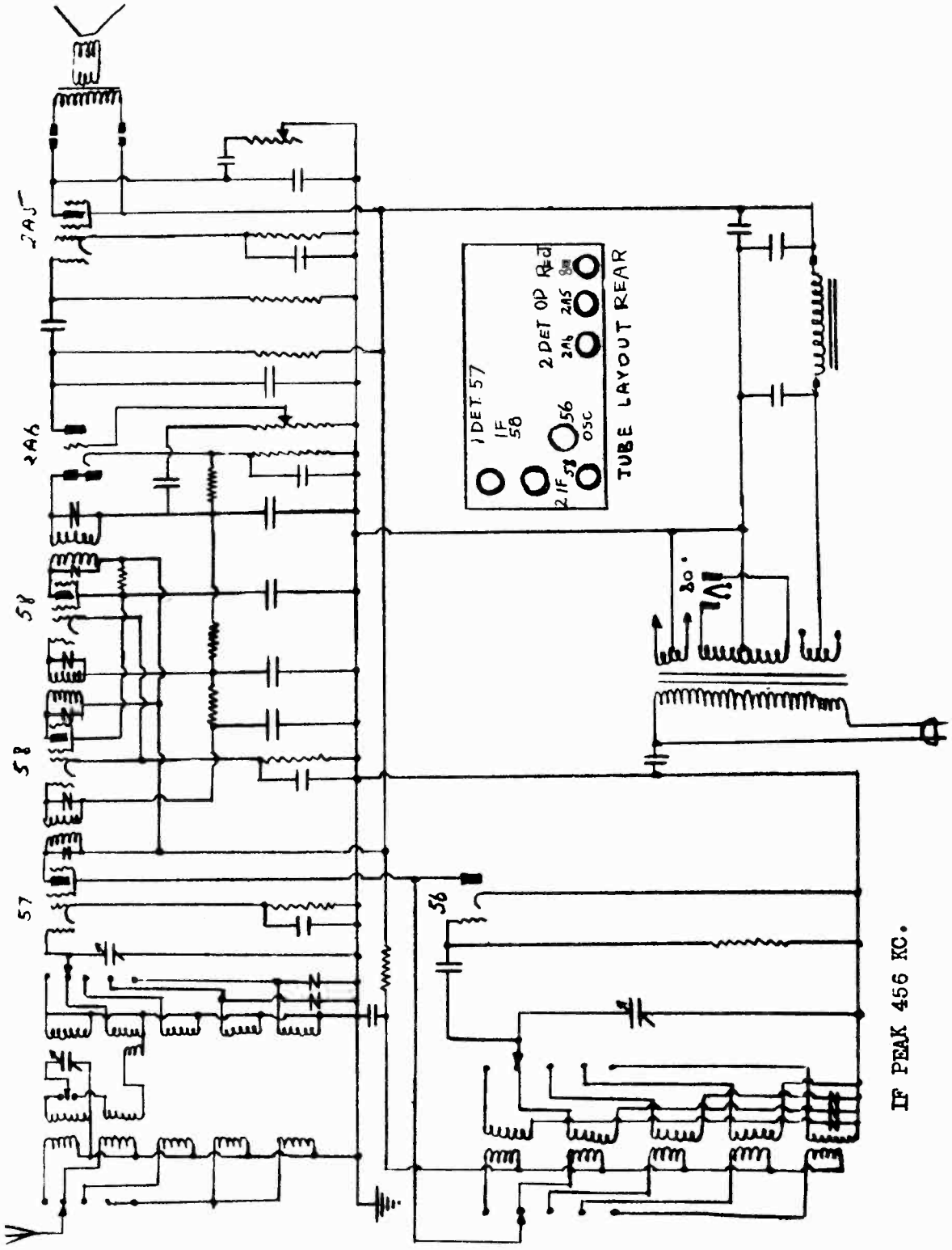
1	1267	RESISTOR	11,000 Ω	1/4 WATT
2	1242	"	21,000 Ω	"
3	1027	"	31,000 Ω	"
4	1245	"	51,000 Ω	1/2 WATT
5	1165	"	260,000 Ω	1/4 WATT
6	"	"	"	"
7	1030	"	510,000 Ω	"
8	1094	"	1,100,000 Ω	"
9	"	"	"	"
10	1243	"	260 Ω	"
11	1374	"	40 Ω	4 WATT
12, 13	1366	VOLUME CONTROL / LINE SWITCH	25,000 Ω	
14, 15	1376	RESISTANCE / LINE CORD & PLUG	170 Ω	
16	1101	CONDENSER	.01 M.F.	400V.
20	1101	CONDENSER	.01 M.F.	400V.
21	"	"	" "	"
22	1040	"	.05 M.F.	200V.
23	"	"	" "	"
24	"	"	" "	"
25	"	"	" "	"
26	1036	"	.1 M.F.	200V.
27	"	"	" "	"
28	1103	"	.25 M.F.	200V.
29	"	"	" "	"
30	"	"	" "	"
31	1097	"	110 M.M.F.	MICA
32	1099	"	260 "	"
33	1098	"	510 "	"
34	1389	"	150 "	"
35, 36	1368	VARIABLE COND	370 M.M.F. / 250 M.M.F.	
40	1107	B'C'ST TRIMMER COND.	5-30 M.M.F.	
41, 42	1262	L.W. PADDING COND. / L.W. TRIMMING COND.	50-120 M.M.F. / 5-30 M.M.F.	
43	1390	ANTENNA COIL		
44	1391	OSCILLATOR COIL		
45	1070	I.F. TRANSFORMER	1ST	456 K.C.
50	"	" "	2ND	" "
51, 52	1381	ELEC. CONDENSER	16 M.F. / 8 "	150V / "
53	1281	FILTER CHOKE	400 Ω	
54	1369	OUTPUT TRANS.	4300 Ω	
55	SPKR.	FIELD COIL	4500 Ω	
56	ASS'Y	VOICE COIL		
57	1362	WAVE CHANGE SWITCH		
58	1086	PILOT BULB	6.3 VOLTS	
59	"	" "	"	
60	1325	PHONO JACK		



REAR OF CHASSIS

MODEL 770-AW
Schematic
Socket

HALSON RADIO CORP.



MODEL 22 (2Types)
Schematic,Voltage

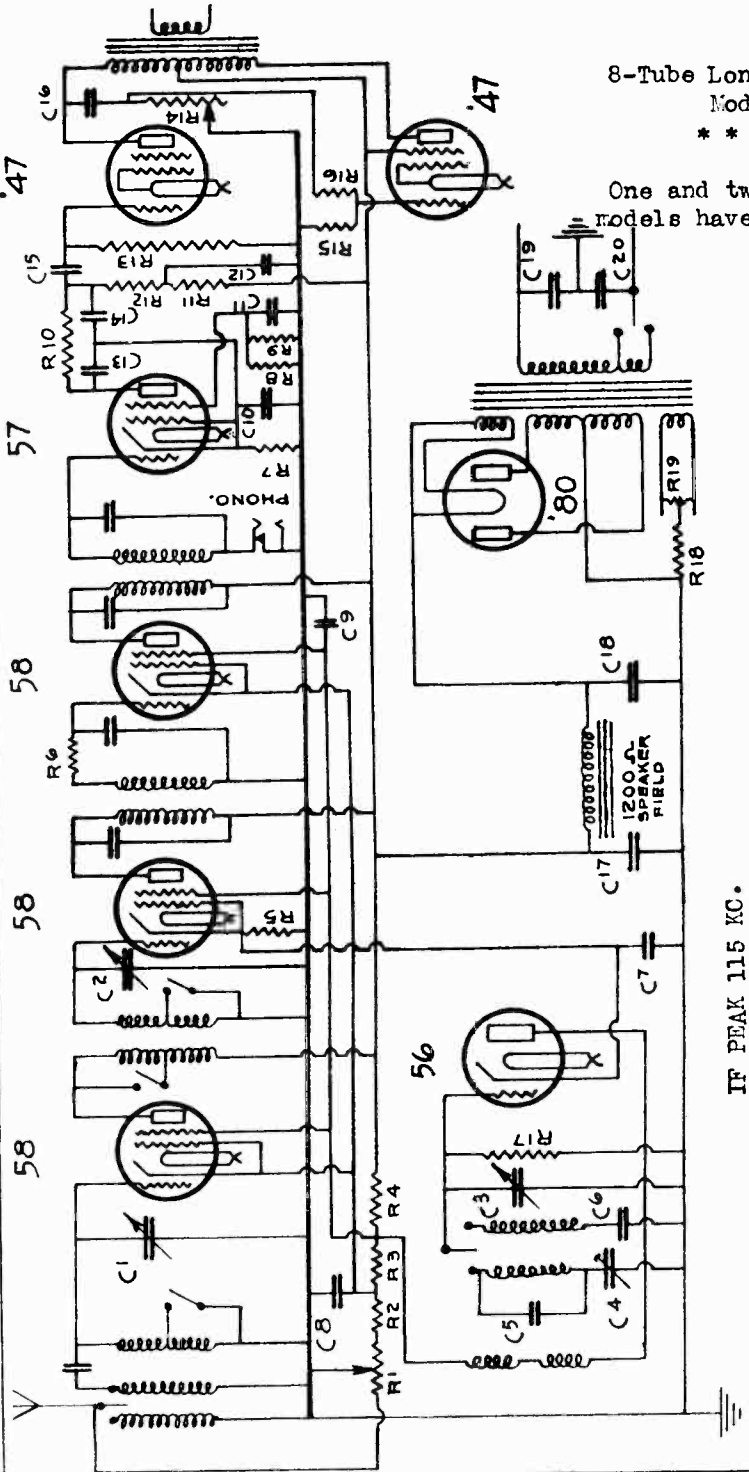
HETRO ELECTRICAL INDUSTRIES, INC.

VOLTAGE TESTS. All voltage tests made with volume control on full and no signal in set; "SS" means single-speaker models; "DS" means two-speaker models. Plates of 58 to ground SS 225-235 v.,DS 240-250 v. Screen of 58 to ground, SS 70-80 v.,DS 75-85 v. Cathode of RF and IF, 1-2 v. all models. Cathode 1st Det. and Osc. 2-3 v. all models. Plate of 56 to ground, SS 70-80 v. DS 75-85 v. Plate of 57 to ground 10-12 all models. Screen of 57 to ground 11-13 v. all models. Cathode of 57 to ground 3-4 v. all models. Plates of 47s to ground SS 220-230 v., DS 230-240 v. Across speaker field 120-130 v. for SS; DS 170-180 v. All heaters 2.4-2.6 v. all models. Filament 80 tube 4.8-5.2 v. Center tap of heaters to ground SS 17-18 v., DS 18-19 v. Plate of 80 to ground SS 350-370 v. AC, DS 400-420 v. AC.

8-Tube Long-Wave (200-2000 Meters)
Model 22

* * * * * * * *

One and two-speakers models. Two-speaker models have two 4000-ohm speakers in parallel.



IF PEAK 115 KC.

C1 C2 C3 - .00036 VARIABLE
C4 - 450 MMF "
C5 - 50 MMF "
C6 - .002 MICA +-3%
C7 - .001 MICA "
C8 - - - 200 V.
C9 - - - 200 V.
C10 - - .5 200 V.
C11 - - - 200 V.
C12 - - .00025 MICA 400 V.
C13 - .00025 " "
C14 - .00025 " "
C15 - .006, 400 V.
C16 - .05 400 V.
C17 - 8 MF 450 V.
C18 - 8 MF 450 V.
C19 - .01 400 V.
C20 - .01 400 V.

R1 12000 Ω VOL. CONTROL } COMBINED
R2 200 Ω FIXED BIAS }
R3 25000 Ω 1 WATT
R4 20000 Ω 2 " "
R5 450 Ω 1 " "
R6 300 Ω 1/3 " "
R7 50000 Ω 1/2 " "
R8 .5 MEG. 1/2 " "
R9 1. MEG. 1/2 " "
R10 150000 1/2 " "
R11 .25 MEG. 1/2 " "
R12 .5 MEG. 1/2 " "
R13 .5 " 1 " "
R14 20000 Ω TONE CONTROL
R15 10000 Ω 1/2 WATT
R16 .25 MEG. 1/2 " "
R17 .25 " 1/2 " "
R18 250 Ω 2 " "
R19 20 Ω CENTER TAPPED

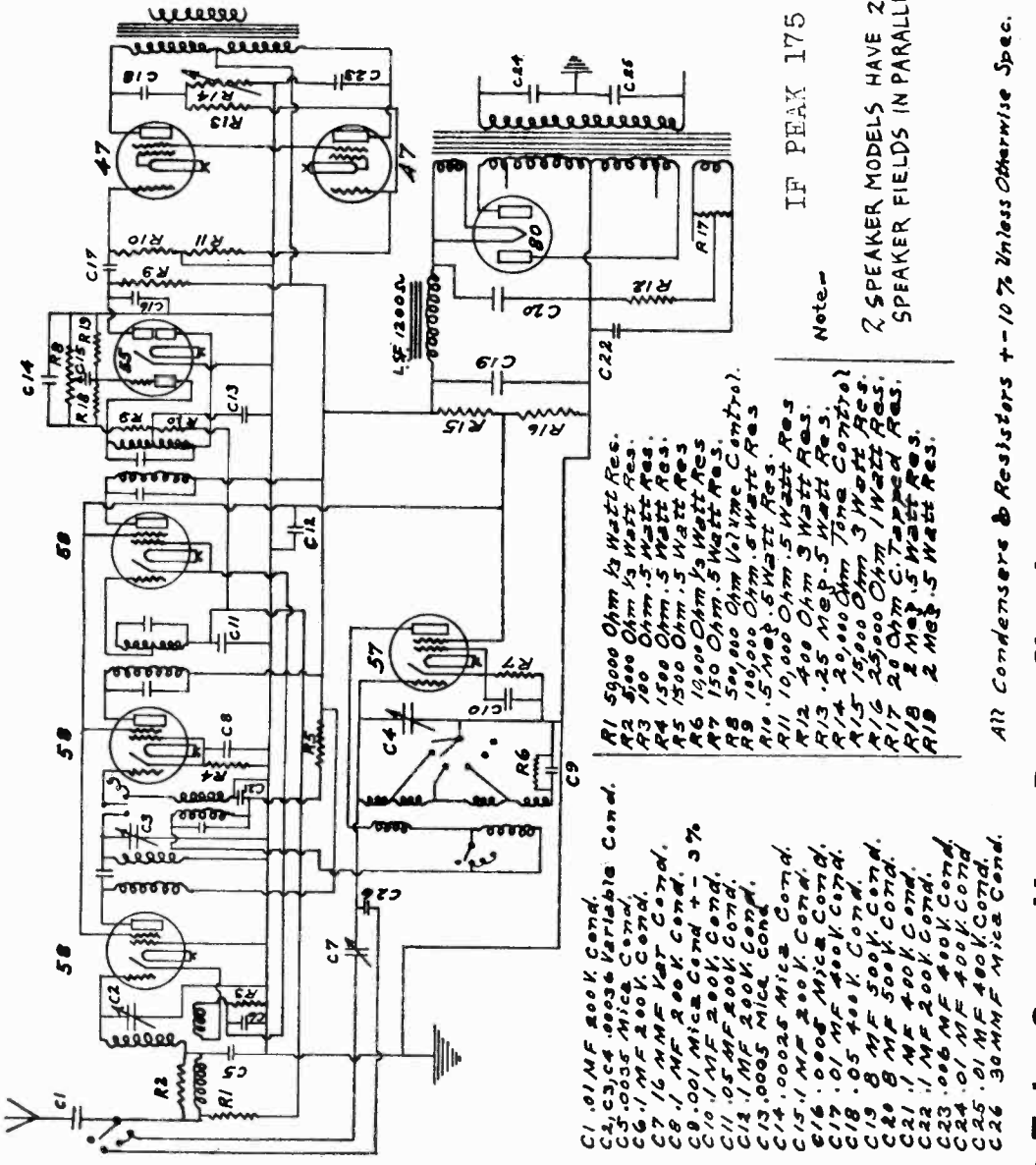
ALL CONDENSERS & RESISTORS ± 10% UNLESS OTHERWISE SPECIFIED

MODEL 31 (2Types)
Schematic, Voltage

HETRO ELECTRICAL INDUSTRIES, INC.

VOLTAGE TESTS. Taken from places named to Ground. Plates of 58 tubes single speaker 225-235 v. double speaker 240-250 v. Screen grid 58 tubes 90-100 and 95-105 v. Cathode RF and IF tubes 1 to 2 v. Cathode 1st Det. 6 to 8 v. Plate Osc. tube 210-220 v., single speaker; 215-225 v. double speaker. Screen grid Osc. tube 90-100 single speaker; 95-105 double speaker. Cathode Osc. tube 1 v. Audio plate of 55 tube 20-30 v. Plates of 247 tubes 220-230 v. single speaker; 230-240 v. double speaker. Across speaker field 120-130 v. single speaker; 170-180 v. double speaker. All heaters 2.4 to 2.6 v. Filament 280 tube 4.8 to 5.2 v. Center tap of heaters to ground 17-18 v. single models; 18-19 v. double models. 280 plate to ground 350-370 v. AC, single speaker models and 400-420 v. AC, double speaker models.

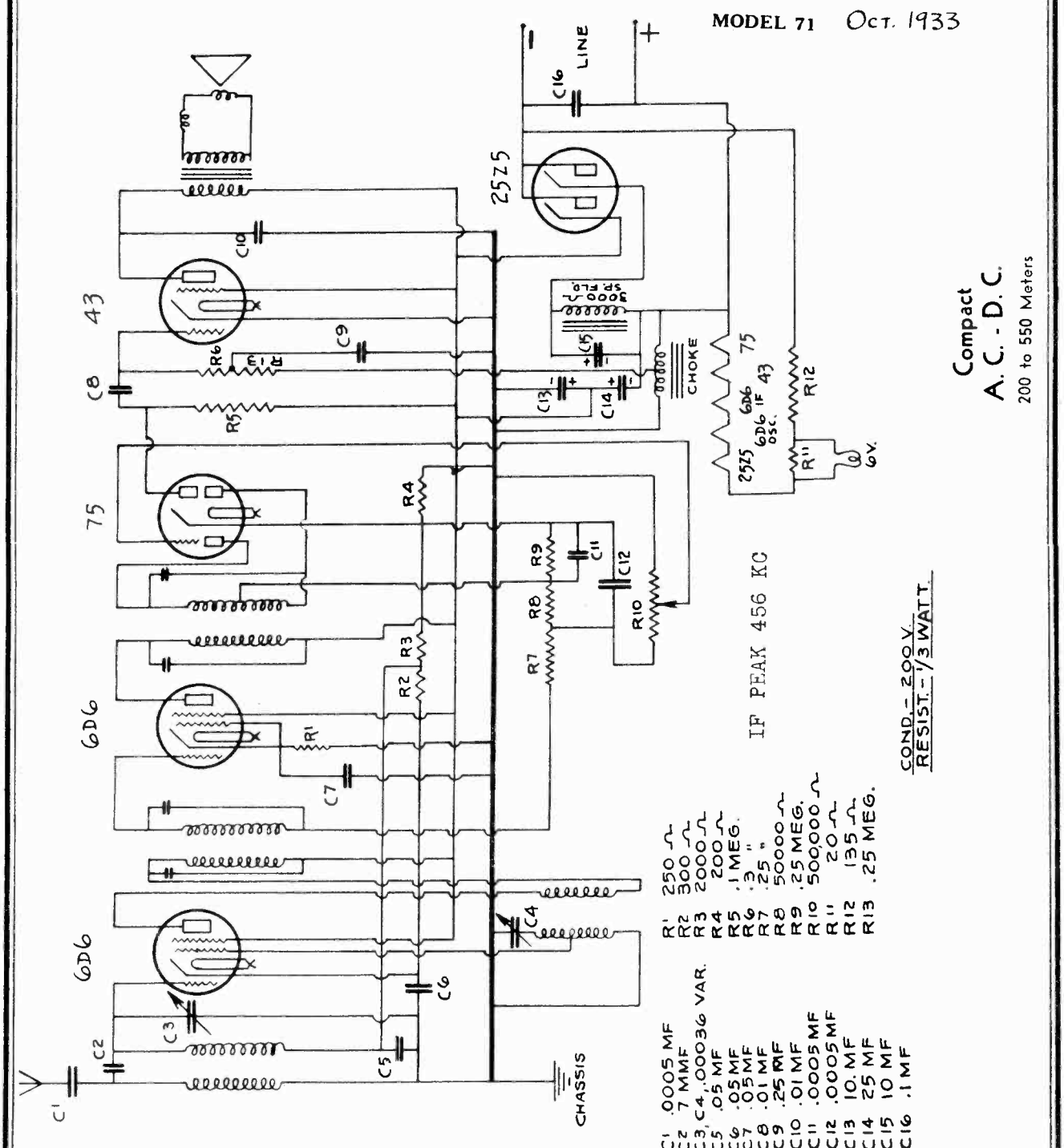
OCT. 1933



MODEL 71
Schematic
Voltage

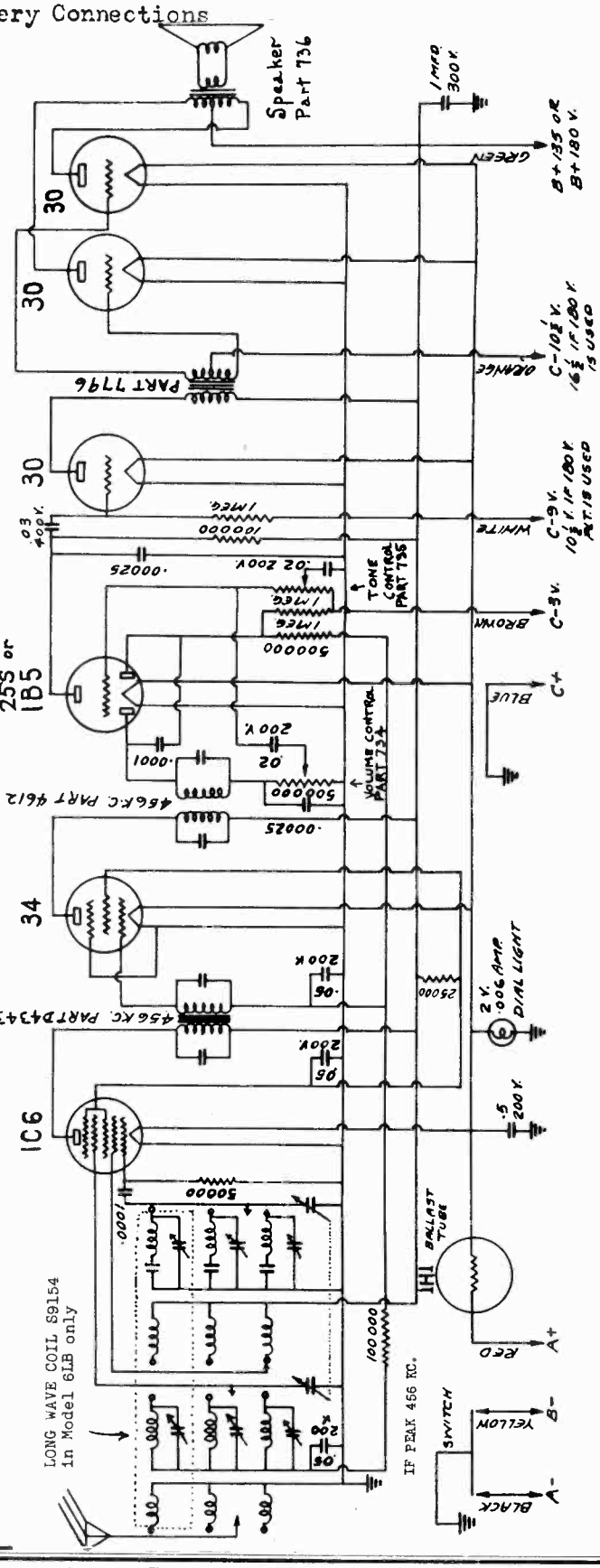
HETRO ELECTRICAL INDUSTRIES, INC.

All D. C. voltages given were tested on 250 volt 1000 ohms per volt meter, tests made with volume control on full and no signal in receiver. Plates of 6D6 tubes to chassis 110-115 volts. Screen of 6D6 tubes to chassis 112-117 v. Cathode oscillator tube to chassis 18-20 v. Suppressor grid of oscillator 15-17 v. Cathode 6D6, 2-3 v. Plate of 75, 40-45 v. Cathode of 75, 1-2 v. Plate of 43 100-105 v. Across speaker 100-105 v. Control grid 43, 4-6 v. negative. Heaters to chassis 30-35 v. HEATERS OF ALL TUBES IN SERIES. If one tube burns out the receiver will not operate.

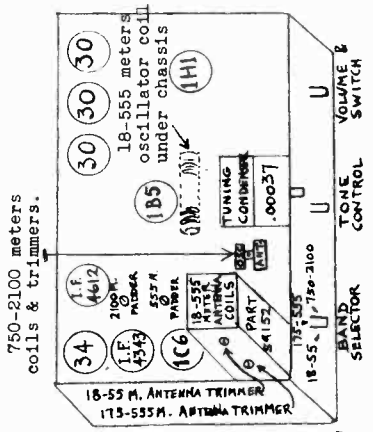


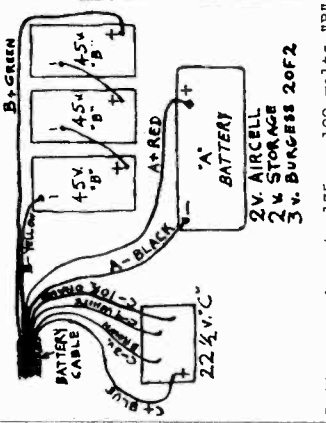
MODELS 6LB, 6SB
Schematic, Socket
Trimmers, Alignment
Battery Connections

HETRO ELECTRICAL INDUSTRIES, INC.



Before connecting the batteries be sure that the switch is in the "off" position; volume control knob must be all the way to left.
Check all the battery connections very carefully or serious damage to the tubes may result. Make sure that all the tubes are firmly inserted in their sockets. Use a good antenna from 75 to 100 ft. long and a good ground for best results.
In battery operated receivers the two most common causes of low volume are run down batteries and defective tubes. Test your batteries from time to time. If no tube tester is available, procure a new set of tubes, or a set that is operating satisfactorily in another receiver. Insert these in the chassis one at the time and note any difference in performance. Misalignment or poor tracking of tuning condenser may also be the cause, but do not try to align the receiver in case of low volume unless other causes have first been investigated.
The aligning of the I.F. transformers is done in the regular manner. The I.F. frequency is 456 K.C. The first I.F. has iron core and the selectivity and sensitivity of the receiver are greatly affected by its alignment. Alignment of the Short Wave band should be done at about 19 meters, the broad cast band at 1500 K.C. and the long wave band at about 350 K.C. If no signal generator is available these adjustments may be effected with a transmitting signal, but anyone without some technical knowledge should not attempt to align the set. All receivers are carefully adjusted before leaving the factory. The oscillator trimmers seldom need attention.





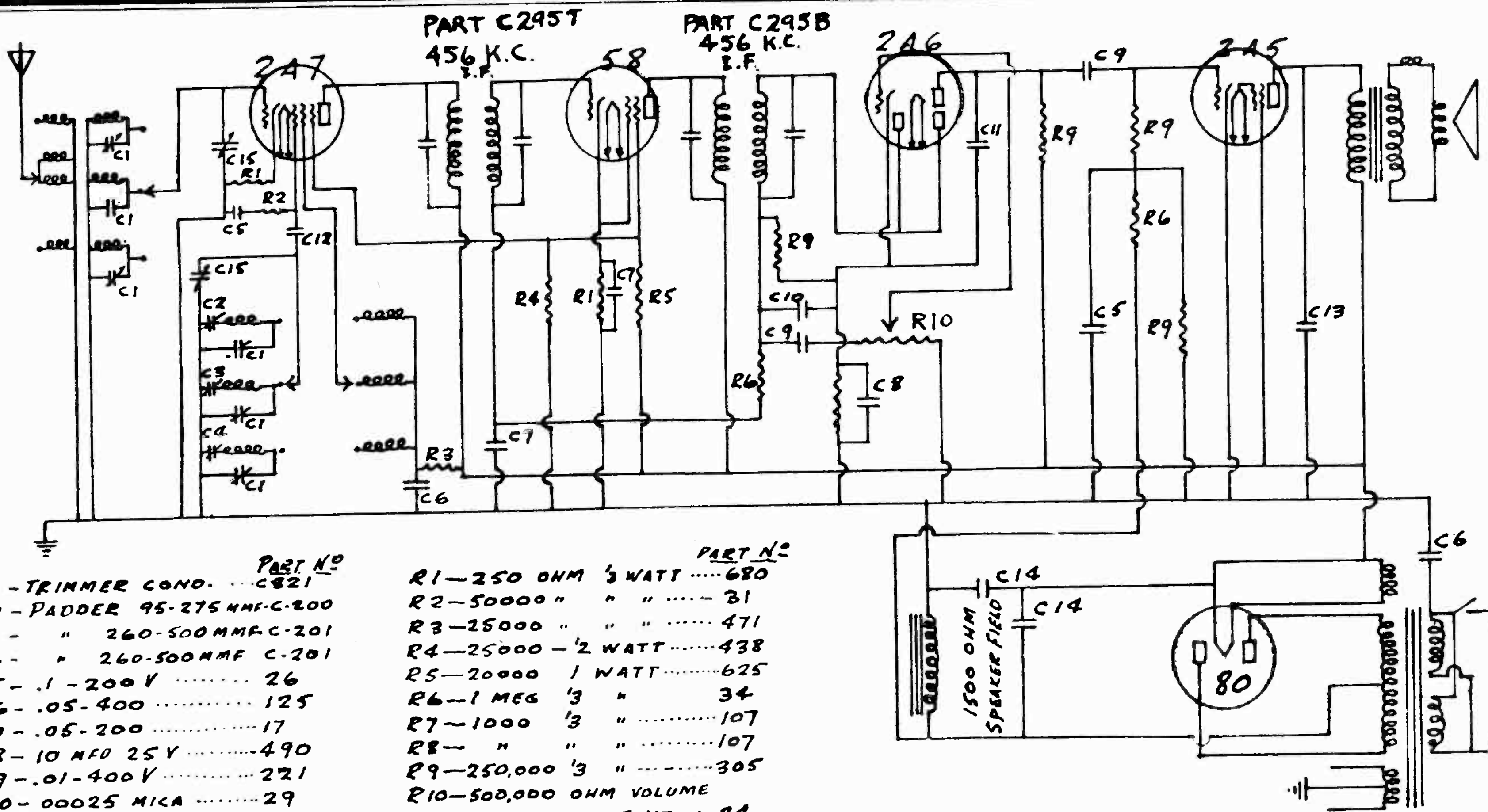
Battery equipment: 135 or 180 volts "B"
22 1/2 volts "C"
2 or 3 volts "A"

7 TUBE BATTERY RECEIVERS
Model 6SB 18-52 175-555 meters.
Model 6LB 18-52 175-555 750-2100 meters.

JULY - 1935

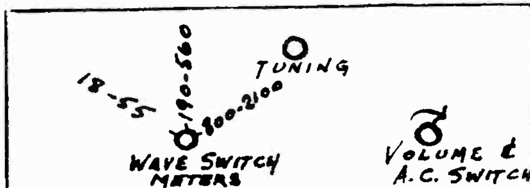
MODELS 207,257
Schematic,Parts

HETRO ELECTRICAL INDUSTRIES, INC.

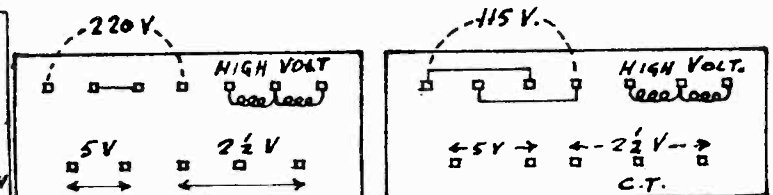


	Part No
C1 - TRIMMER COND.	C821
C2 - PADDER 95-275 MMF	C-200
C3 - " 260-500 MMF	C-201
C4 - " 260-500 MMF	C-201
C5 - .1 - 200 V	26
C6 - .05 - 400	125
C7 - .05 - 200	17
C8 - 10 MFD 25 V	490
C9 - .01 - 400 V	221
C10 - 00025 MICA	29
C11 - 00026 "	103
C12 - 0001 "	73
C13 - 006 400 VOLT	126
C14 - 8 MFD. ELEC. COND	623
C15 - 370 M.M.F.	605
C16 - .002 MICA	628

	Part No
R1 — 250 OHM 1/3 WATT	680
R2 — 50000 " " "	31
R3 — 25000 " " "	471
R4 — 25000 — 1/2 WATT	438
R5 — 20000 1 WATT	625
R6 — 1 MEG 1/3 "	34
R7 — 1000 1/3 "	107
R8 — " " "	107
R9 — 250,000 1/3 "	305
R10 — 500,000 OHM VOLUME CONTROL AND SWITCH	84

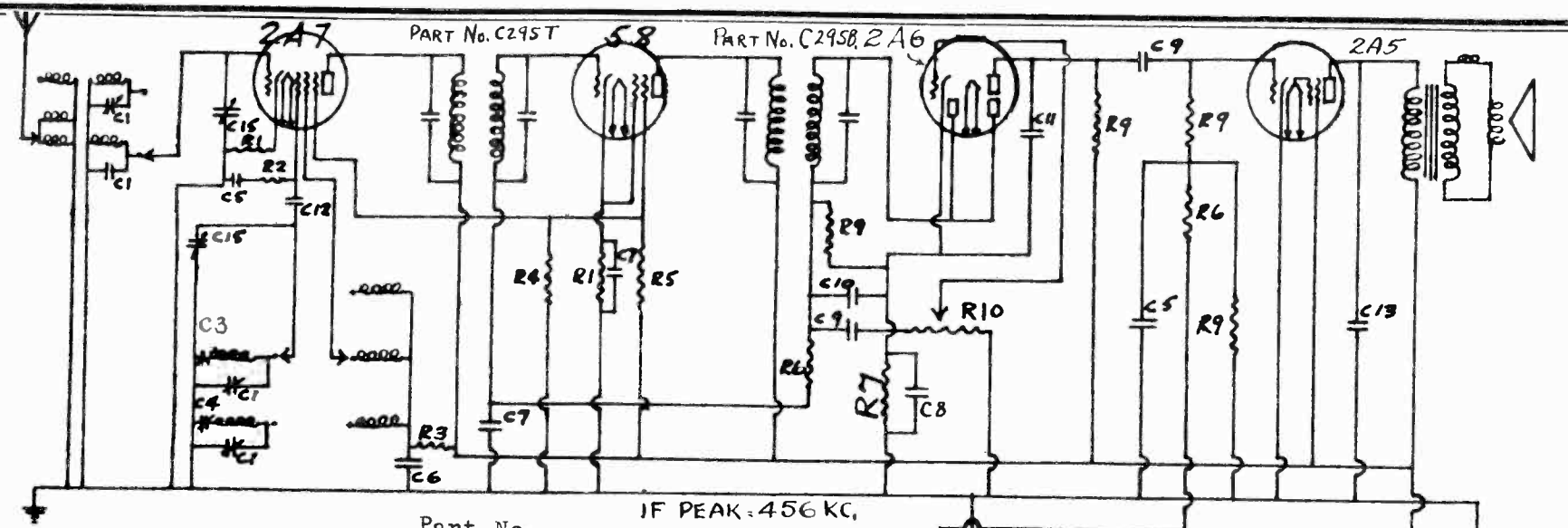


PANEL LAYOUT

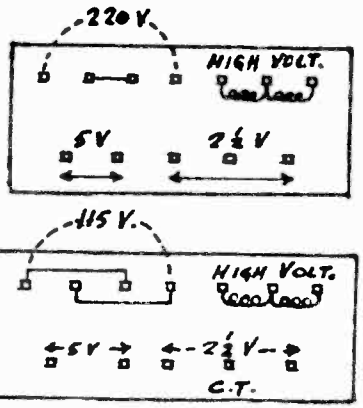


POWER TRANSFORMER CONNECTIONS FOR 220 & 115 V.

5 TUBE A.C.
18-55 190-560 750-2100 METERS
· AUG. 1934 ·
MODEL 207-257



	Part No.
C1 Trimmer Condenser	C821
C3 Padder 260-500 MMf.	C201
C4 " " " "	C201
C5 .1 200 v. Condenser	26
C6 .05 400 v. "	125
C7 .05 200 v. "	17
C8 10 Mfd. 25 v. "	490
C9 .01 400 v. "	221
C10 .00025 mica "	29
C11 .0005 " "	103
C12 .0001 " "	73
C13 .006 400 v. "	126
C14 8 mfd. electrolytic	623
C15 370 MMf. Var. cond.	605
C16 .002 mica cond.	628
R1 250 ohm 1/3 watt	680
R2 50.000 ohm 1/3 watt	31
R3 25.000 " " "	471
R4 25.000 " 1/2 "	438
R5 20.000 " 1 "	625
R6 1 megohm 1/3 "	34
R7 R8 1000 ohm " "	107
R9 250.000 " " "	305
R10 500.000 " volume control and A.C. switch	84

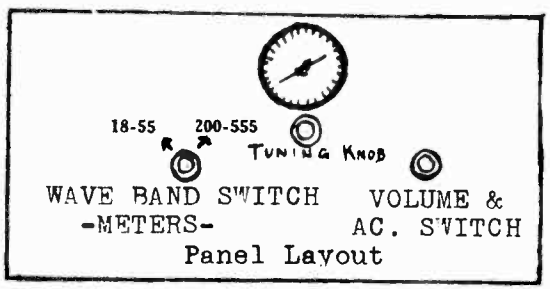


POWER TRANSFORMER CONNECTIONS
FOR 200 & 115 volts A.C.

5 Tube A. C.

18 to 55 – 200 to 555 meters

MODEL 209-259



Panel Layout

AUG. 1934

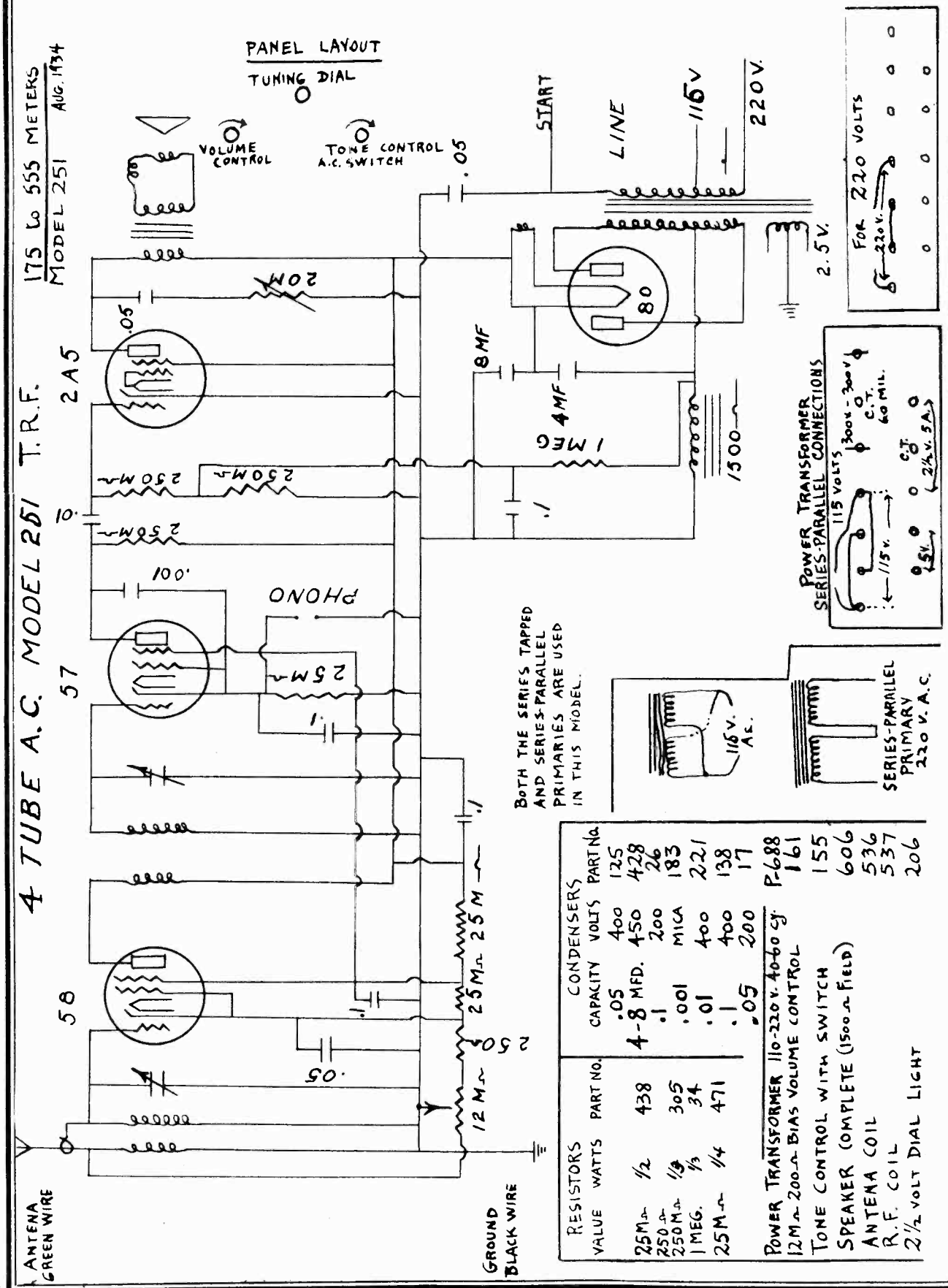
PRINTED IN U.S.A.

HETRO ELECTRICAL INDUSTRIES, INC.

MODEL 251
Schematic

4 TUBE A.C. MODEL 251 T.R.F.

175 to 555 METERS
MODEL 251 AUG. 1934



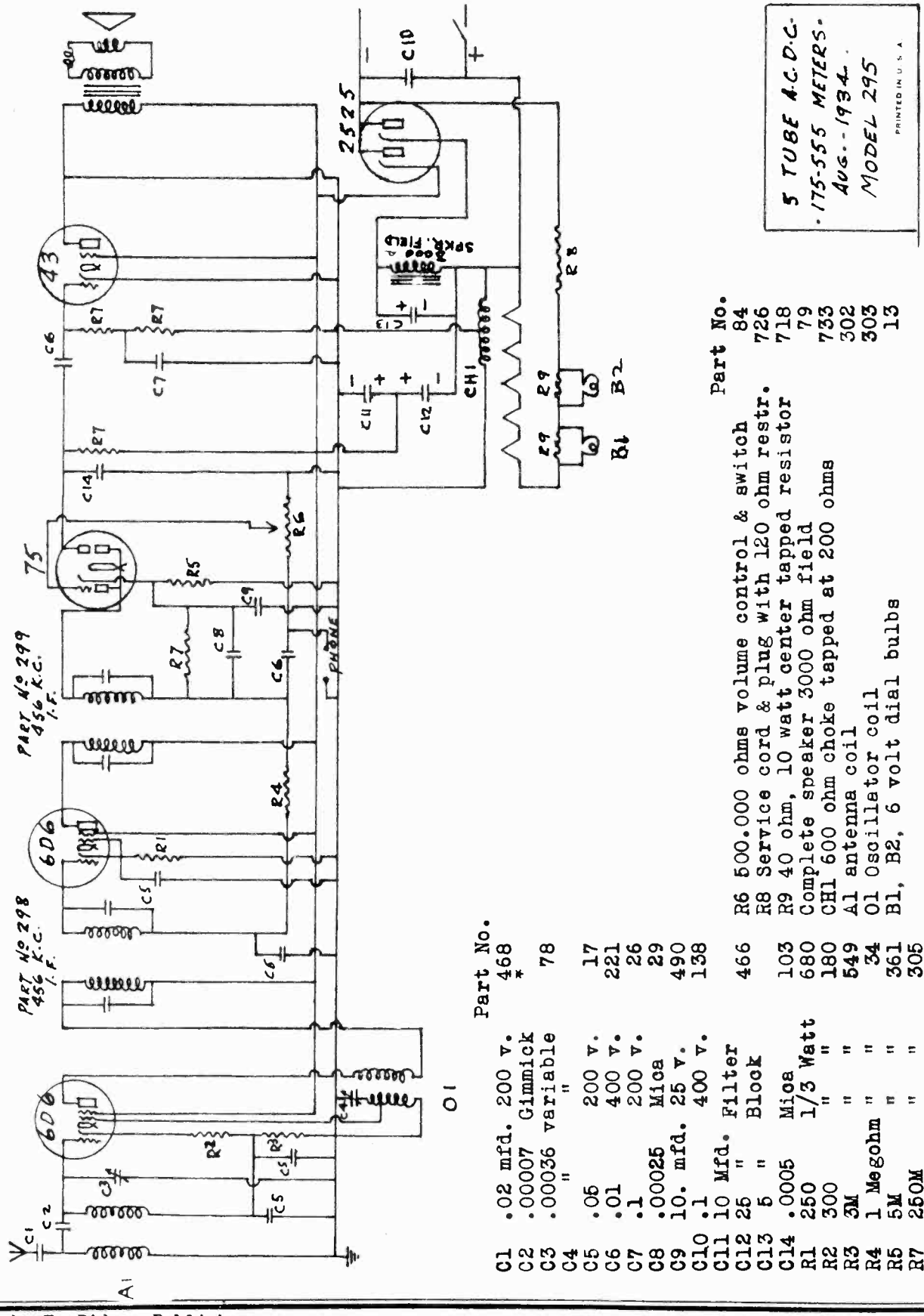
RESISTORS VALUE	WATTS	PART NO.
25M~	½	438
250~	⅓	305
250M~	⅓	34
1 MEG.	⅓	471
25M~	¼	

CONDENSERS CAPACITY	VOLTS	PART No.
.05	400	125
4-8 MFD.	450	428
.1	200	26
.001	MICA	183
.01	400	221
.1	400	138
.05	200	17

POWER TRANSFORMER 110-220 V. 40-60 cy.	P-688
12M~ 200~ BIAS VOLUME CONTROL	161
TONE CONTROL WITH SWITCH	155
SPEAKER (COMPLETE (1500~ FIELD)	606
ANTENA COIL	536
R.F. COIL	537
2½ VOLT DIAL LIGHT	206

MODEL 295
Schematic
Parts

HETRO ELECTRICAL INDUSTRIES, INC.



		Part No.
C1	.02 mfd. 200 v.	468
C2	.00007 Gimmick	*
C3	.00036 variable	78
C4	" "	
C5	.06 200 v.	17
C6	.01 400 v.	221
C7	.1 200 v.	26
C8	.00025 Mica	29
C9	10. mfd. 25 v.	490
C10	.1 400 v.	138
C11	10 Mfd. Filter	466
C12	25 " Block	
C13	5 "	
C14	.0005 Mica	103
R1	250 1/3 Watt	680
R2	300 " "	180
R3	3M " "	549
R4	1 Megohm " "	34
R5	5M " "	361
R7	250M " "	305

		Part No.
R6	500.000 ohms volume control & switch	84
R8	Service cord & plug with 120 ohm restr.	726
R9	40 ohm, 10 watt center tapped resistor	718
	Complete speaker 3000 ohm field	79
CH1	600 ohm choke tapped at 200 ohms	733
A1	antenna coil	302
O1	Oscillator coil	303
B1, B2	6 volt dial bulbs	13

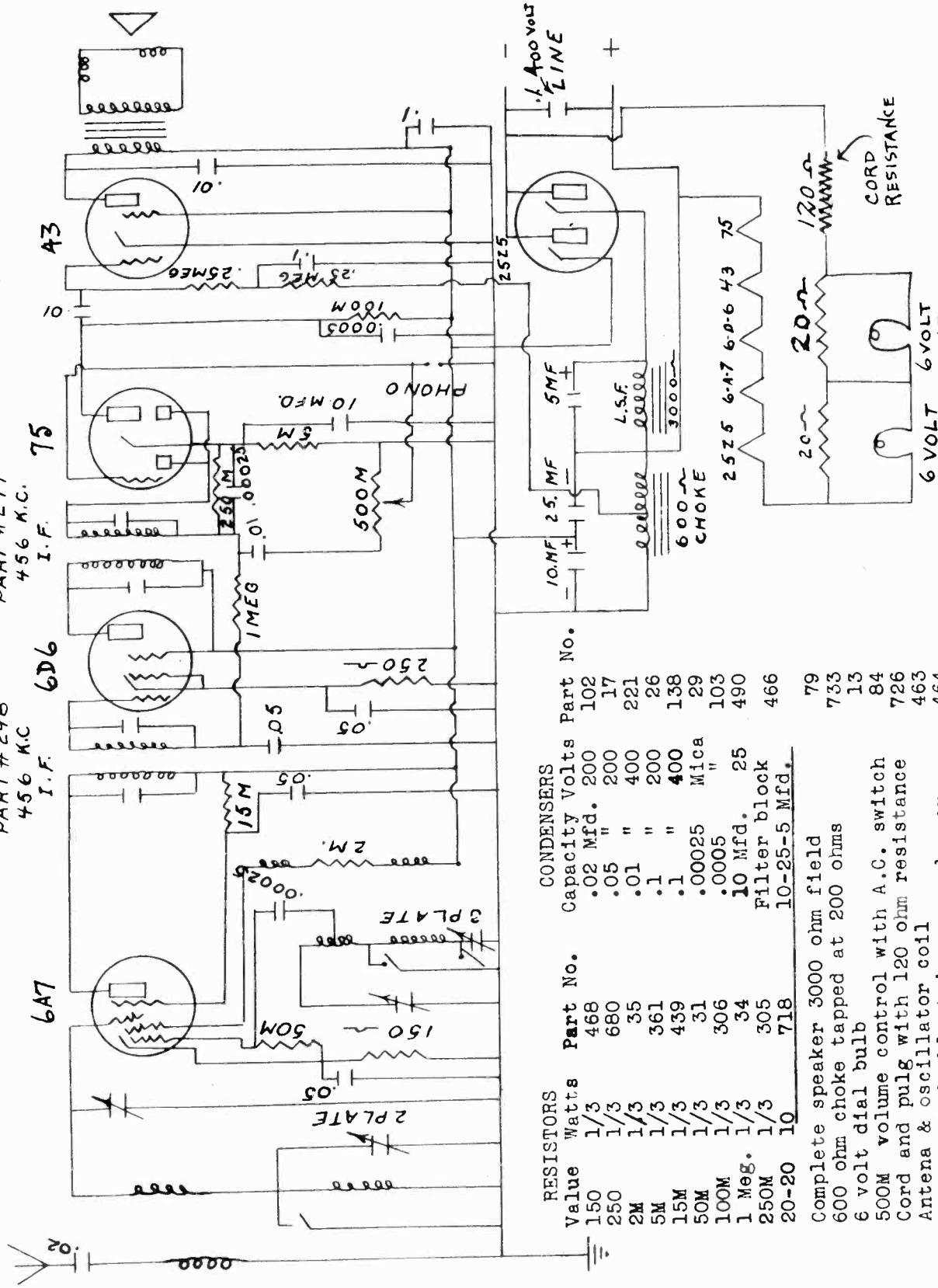
*The phrase gimmick designates a wire wound around another wire

HETRO ELECTRICAL INDUSTRIES, INC.

MODEL 297
Schematic
Parts

MODEL 297 5 TUBE A.C.D.C. 200-2200 METERS

AUG. 1934



RESISTORS

Value	Watts	Part No.
150	1/3	468
250	1/3	680
2M	1/3	35
5M	1/3	361
15M	1/3	439
50M	1/3	31
100M	1/3	306
1 Meg.	1/3	34
250M	1/3	305
20-20	10	718

CONDENSERS

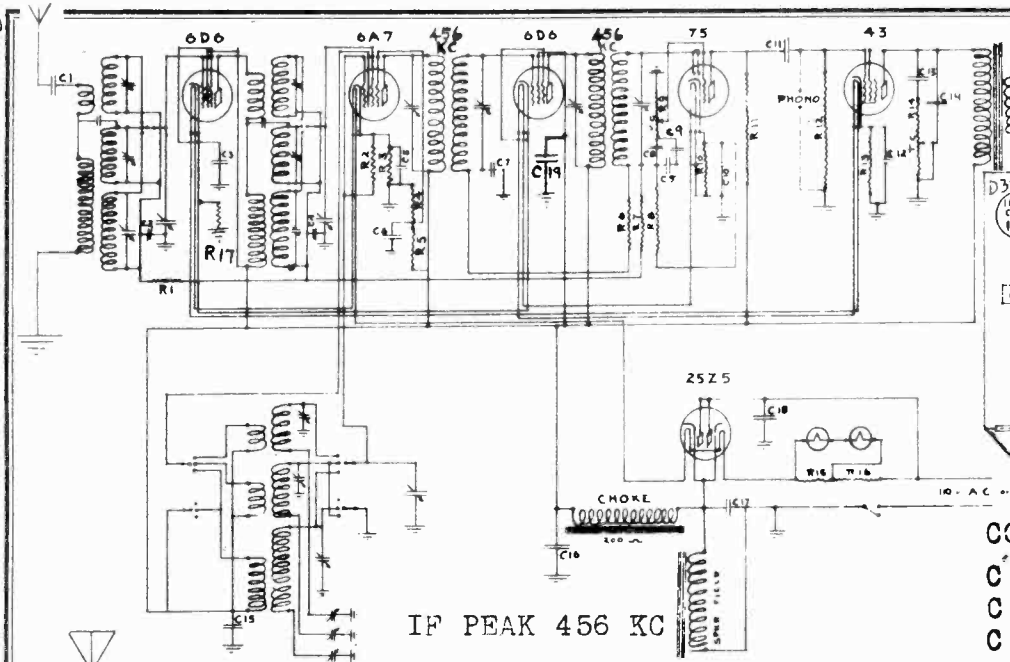
Capacity	Volts	Part No.
.02 Mfd.	200	102
.05 "	200	17
.01 "	400	221
.1 "	200	26
.1 "	400	138
.00025	Mica	29
.0005	"	103
10 Mfd.	25	490
Filter block		466
10-25-5 Mfd.		

Complete speaker 3000 ohm field	79
600 ohm choke tapped at 200 ohms	733
6 volt dial bulb	13
500M volume control with A.C. switch	84
Cord and pulg with 120 ohm resistance	726
Antena & oscillator coil	463
Long wave double trimmer condenser	464

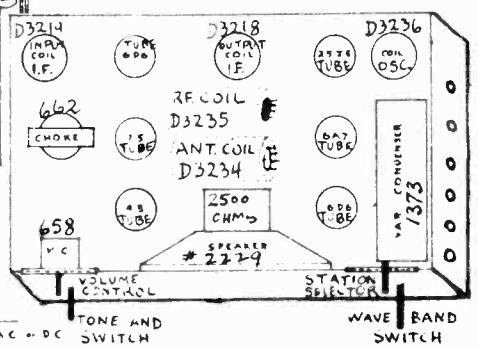
MODEL 412
MODEL 466

HETRO ELECTRICAL INDUSTRIES, INC.

Schematic, Socket



6 tube AC-DC 18-50, 200-555 and 800-2200 metres. #412-466

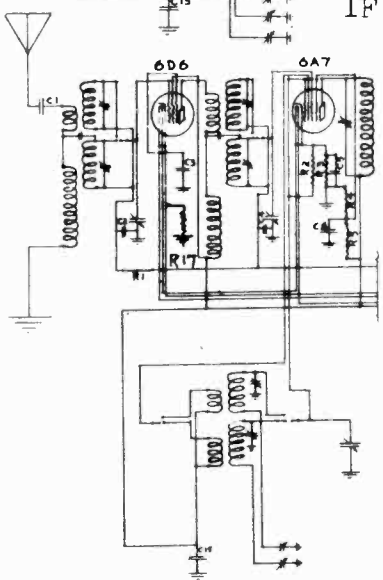


TRIMMERS

Metres	
200-550	OSC.
18-50	OSC.
200-550	R.F.
18-50	R.F.
200-550	ANT.
18-50	ANT.

IF PEAK 456 KC

Speaker, 2500 ohm field, 43 out-put; Part #2229.
Volume control Part #658
Tone control Part #657
Filter choke Part #662
Wave band switch #663
Trimmer strip #D3538
Input I.F. transformer D3219
Output " " D3218



R.F AND OSCILLATOR SECTION

TUNING COILS

ANT.	18-550 meters	#D3234
OSC.	" " "	#D3236
R.F.	" " "	#D3235
ANT.	200-2200 "	#D4324
OSC.	" " "	#D4326
R.F.	" " "	#D4325

CONDENSERS VOLTS

C 1	.006	400
C 2	.05	200
C 3	.25	200
C 4	.05	200
C 5	.1	200
C 6	.1	200
C 7	.1	200
C 8	.006	200
C 9	.0001	Mica
C10	10.0	25
C11	.02	200
C12	10.0	200
C13	.02	200
C14	.006	200
C15	.1	200
C16	16.0	200
C17	24.0	200
C18	.05	200
C19	.5	200

RESISTORS WATTS

R 1	250M	ohm 1/3
R 2	25M	" "
R 3	250	" "
R 4	10M	" "
R 5	4M	" "
R 6	1 MEG.	" "
R 7	1	" "
R 8	100M	" "
R 9	500M	Volume Control
R10	10M	ohm 1/3
R11	250M	" "
R12	500M	" "
R13	500	" "
R14	100M	Tone Control
R15	53	Line
R16	115	Filament
R17	250	ohm 1/3

#412 18-50 200-550 metres
Balance of circuit same as #466

Condensers 3,5,6,7,15 in one container #C8056
Condensers 12,16,17 in one container #C2092
Resistors 15.16 are one unit. Part #659

HETRO ELECTRICAL INDUSTRIES, INC.

MODEL 6-Tube AC Schematic, Voltage Socket, Trimmers Alignment

. 6 TUBE A.C.
. 15-2100 METERS

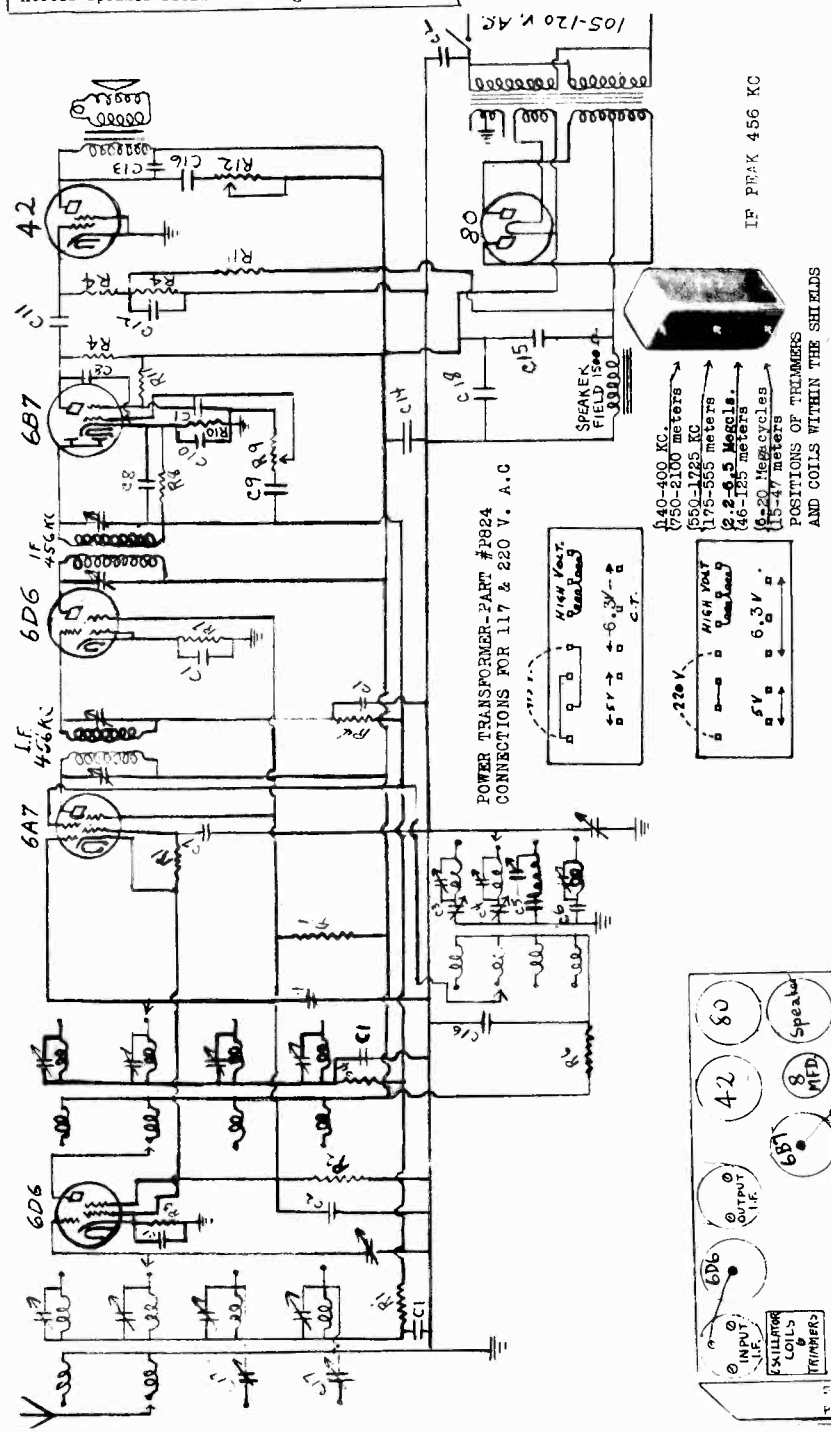
APPROXIMATE NORMAL TUBE VOLTAGES MEASURED WITH A 0-300 VOLT, 1000 OHM PER VOLT D.C. VOLTMETER WITH VOLUME CONTROL IN FULL POSITION

Tubes	Plate	Screen	Cathode	Grid
42	225-235	230-240	0	1 to 2-
6B7	35-45	25-35	3½-4½	
6D6 IF.	230-240	70-80	3½-4½	
6D6 RF.	230-240	70-80	3½-4½	
6A7 Det.	230-240	70-80	3½-4½	
6A7 Osc.	155-165	- -	- -	

Across speaker field 85-95 negative.

CONDENSERS
C 1 .05 Mfd. 200 volts
C 2 .1 " 400 "
C 3 3 plate padder.
C 4 5 plate padder
C 5 .003 mica
C 6 .005 "
C 7 .0005 "
C 8 .00025 "
C 9 .01 Mfd. 400 volts
C10 10. " 25 "
C11 .02 " 400 "
C12 .1 " 200 "
C13 .006 " 400 "
C14 .5 " 400 "
C15 8. " Electrolytic
C16 .05 " 400 volts
C17 30 mmfd. trimmers
C18 30. Mfd. Electrolytic

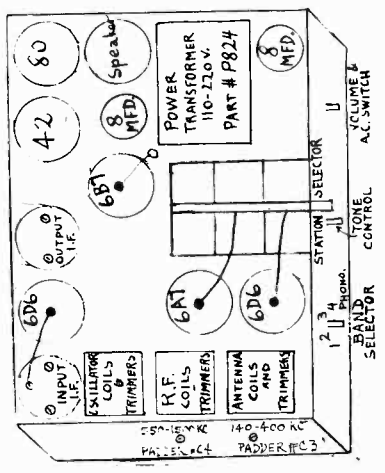
RESISTORS
R 1 50,000 ohms 1/3 watt
R 2 25,000 " 1/2 "
R 3 250 " 1/3 "
R 4 50,000 " " "
R 5 15,000 " " "
R 6 20,000 " " "
R 7 500 " " "
R 8 300,000 " " "
R 9 500,000 " volume with A.C. switch
R10 5,000 ohms 1/3 watt
R11 1 megohm " "
R12 40,000 ohms tone control



ALIGNMENT: The use of a service oscillator or signal generator is imperative.

I.F. TRANSFORMERS: Connect the signal generator to the grid of the 6A7 tube through a .05 mfd. or smaller capacity condenser, set the rotor plates of the tuning condenser completely out and adjust the trimmers on top of the I.F. transformers to a 456 KC signal from the generator. Volume control must be at maximum and the signal from the generator attenuated to a minimum so that no action is obtained from the automatic volume control.

ANTENNA, R.F., and OSCILLATOR stages. Connect the antenna and ground leads of the generator to the antenna and ground of the receiver. To align first short wave band set the generator and the receiver at 16 megacycles, adjust the trimmers of this band to maximum output. The same procedure is to be followed in aligning the other bands and adjustments should be made at the following frequencies: Second short-wave band at 6 megacycles (6000 KC.); Medium-wave #3 at 1500 KC.; Extra long-wave #4 at 300 KC. See diagram for trimmer and coil positions inside of shields. The OSCILLATOR trimmers will affect the dial setting and should not be changed unless absolutely necessary. CAUTION: DO NOT ATTEMPT TO ALIGN THE RECEIVER UNLESS YOU HAVE SOME EXPERIENCE. IF THE RECEIVER PERFORMS WELL DO NOT RE-ALIGN. Signal generators usually emit a harmonic signal of slightly higher frequency than the fundamental and in adjusting the lower setting should be used. All adjustments should be made with a minimum input signal from the generator.



BAND SELECTOR SWITCH POSITIONS
1-Short waves 6 to 20 megacycles 15-47 meters
2-Short Waves 2.2 to 6.5 " 46-125 "
3-Medium waves-Broadcast 550-1725 KC. 175-555 M.
4-Extra long waves 140-400 KC. 750-2100 meters
Extreme right position for phonograph operation

MODEL 6-Tube AC-DC
Schematic, Voltage
Socket, Trimmers
Alignment

HETRO ELECTRICAL INDUSTRIES, INC.

These models should not be used with currents higher than 125 volts without an external voltage reducer. Do not remove tubes or speaker while the receiver is operating. Do not use a ground connection unless in series with a condenser of at least 400 volts test. If after the set has been connected to D.C. for 1 minute fails to operate, reverse the the plug in the current outlet.

ALIGNMENT: The use of a service oscillator or signal generator is imperative.

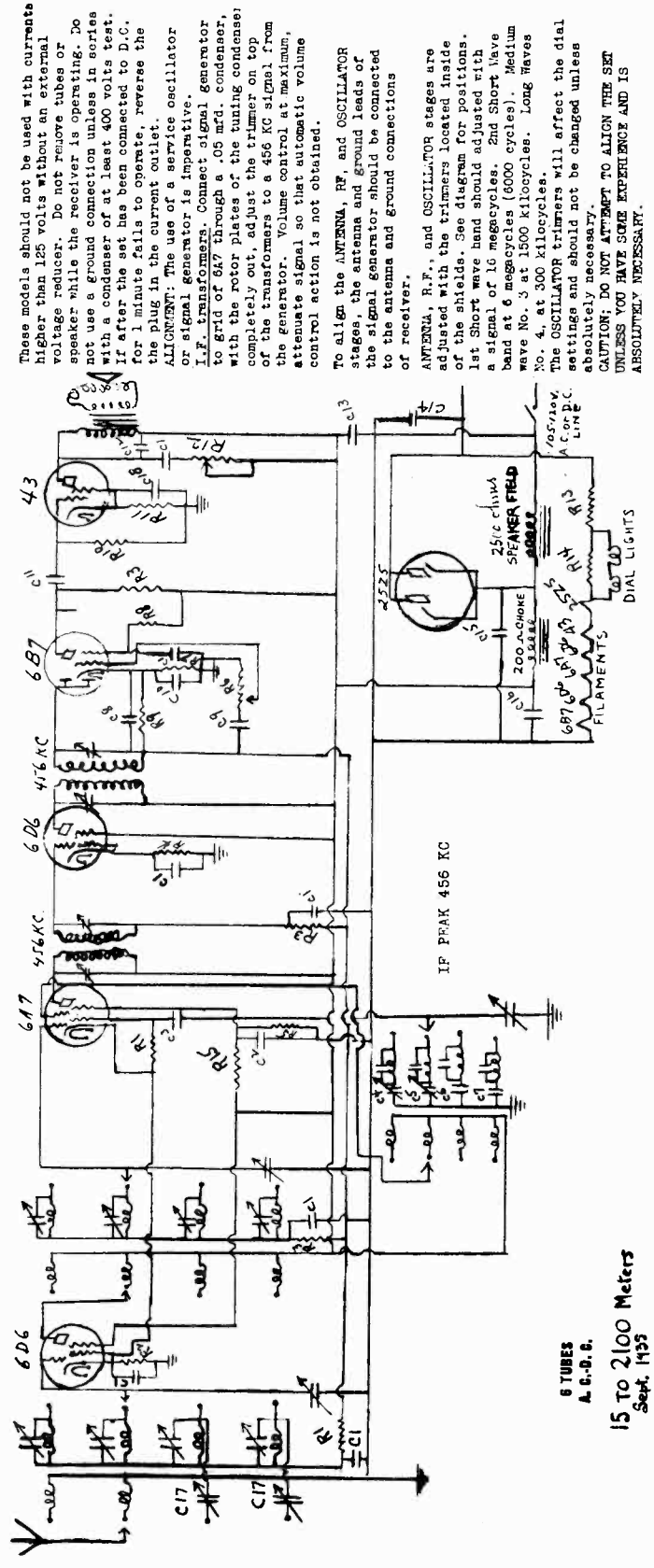
I.F. transformers. Connect signal generator to grid of 6A7 through a .05 mfd. condenser, with the rotor plates of the tuning condenser completely out, adjust the trimmer on top of the transformers to a 456 KC signal from the generator. Volume control at maximum, attenuate signal so that automatic volume control action is not obtained.

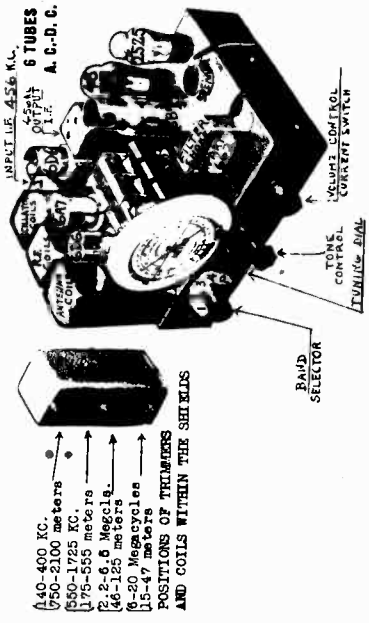
To align the ANTENNA, RF, and OSCILLATOR stages, the antenna and ground leads of the signal generator should be connected to the antenna and ground connections of receiver.

ANTENNA, R.F., and OSCILLATOR stages are adjusted with the trimmers located inside of the shields. See diagram for positions. 1st Short wave band should adjusted with a signal of 16 megacycles. 2nd Short Wave band at 6 megacycles (6000 cycles). Medium wave No. 3 at 1500 kilocycles. Long Waves No. 4, at 300 kilocycles.

The OSCILLATOR trimmers will affect the dial settings and should not be changed unless absolutely necessary.

CAUTION; DO NOT ATTEMPT TO ALIGN THE SET UNLESS YOU HAVE SOME EXPERIENCE AND IS ABSOLUTELY NECESSARY.





APPROXIMATE NORMAL TUBE VOLTAGES MEASURED WITH A 0-300 VOLT, 1000 OHM PER VOLT DC. VOLTMETER. VOLUME CONTROL IN FULL POSITION.

Tubes	Plate	Screen	Cathode
43	90 to 100	95 to 105	13 to 15
6B7	15 to 20	10 to 15	1 to 1½
6D6 I.F.	95 to 105	95 to 105	2½ to 3½
6D6 R.F.	95 to 105	95 to 105	3 to 4
6A7 Det.	95 to 105	60 to 70	3 to 4

6A7 Oscillator plate voltage 95 to 105
Across speaker field 95 to 105 volts D.C.

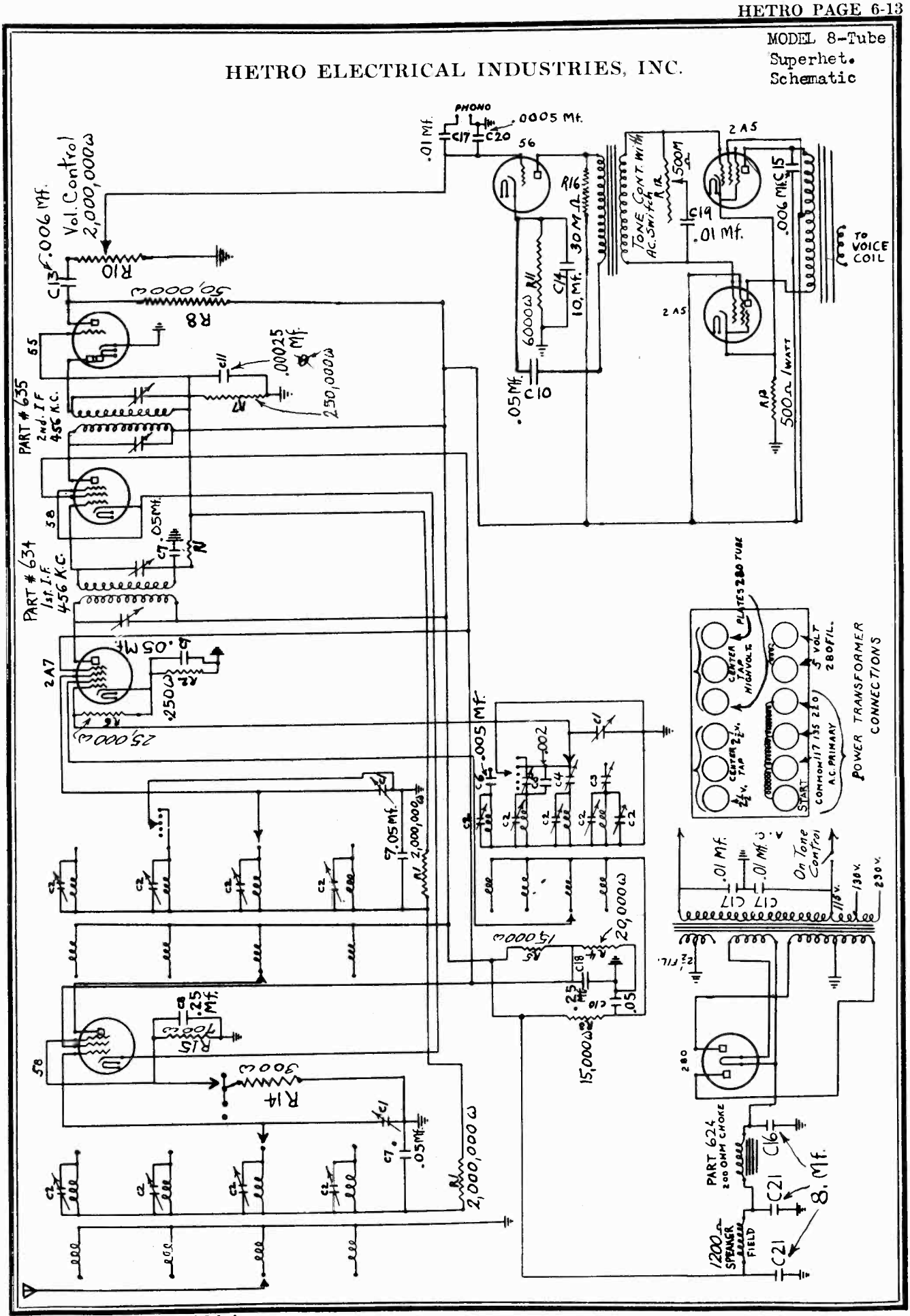
BAND SELECTOR SWITCH POSITIONS
1-Short waves 6 to 20 megacycles 15-47 meters
2-Short waves 2.2 to 6.5 " 46-125 "
3-Medium waves-Broadcast 550-1725 KC. 175-555 M.
4-Extra long waves 140-400 KC. 750-2100 meters
Extreme right position for phonograph operation

CONDENSERS
C 1 .05 mfd. 200 volts
C 2 .1 " " "
C 3 .0005 mica
C 4 3 plate padder
C 5 " " "
C 6 .003 mica
C 7 .005 "
C 8 .00025 "
C 9 .01 mfd. 400 volts
C10 .10 " 25 "
C11 .02 " 400 "
C12 .006 " " "
C13 .5 " 200 "
C14 .05 " 400 "
*C15 24. " 200 "
*C16 16. " " "
C17 30 mmfd. Trimmer
*C18 10. mfd. 25 volts.
*C15, C16, C18 are in one container. Part #C2092

RESISTORS
R 1 50,000 ohms 1/3 watt
R 2 200 " " "
R 3 250,000 " " "
R 4 250 " " "
R 5 10,000 " " "
R 6 500,000 " volume control with line switch.
R 7 3,000 ohms 1/3 watt
R 8 1 megohm " "
R 9 300,000 ohms " "
R10 500,000 " " "
R11 500 " " "
R12 40,000 " Tone control
*R13 115 " One unit
*R14 53 " "
R15 4,000 " 1/3 watt
*R13, R14 are in a single unit Candohm. Part #659

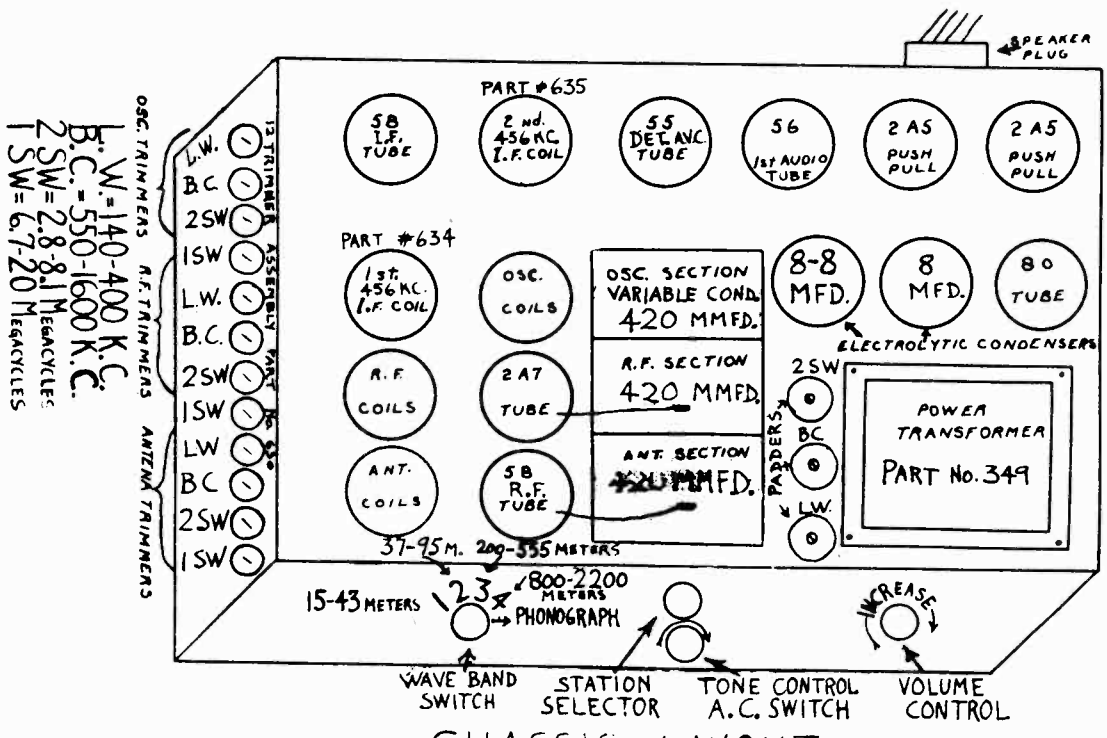
MODEL 8-Tube
Superhet.
Schematic

HETRO ELECTRICAL INDUSTRIES, INC.



MODEL 8-Tube Superhet. Voltage, Socket Trimmers, Parts

HETRO ELECTRICAL INDUSTRIES, INC.



CHASSIS LAYOUT

8 TUBE SUPERHETERODYNE
Tuning Ranges

15 to 100, 200 to 555, 800 to 2100 Meters

SWITCH POSITIONS:

No. 1 - 15 to 43	Meters - 20 - 6.7	Megacycles
No. 2 - 37 to 95	Meters - 8.1- 2.8	Megacycles
No. 3 -200 to 555	Meters -1600 - 550	Kilocycles
No. 4 -800 to 2100	Meters - 140 - 400	Kilocycles

TUBE - SOCKET - VOLTAGES - 115 VOLT A.C. LINE

Tubes	Screen Grid to Ground	Plate to Ground	Cathode to Ground	Filament Heater-Volts
55 2nd. Det. A.V.C.	-	30-40	-	2.3-2.5 A.C.
56 A.F. Driver	-	225-235	10-12	2.3-2.5 A.C.
58 I.F.	70-80	225-235	3½-4	2.3-2.5 A.C.
58 R.F.	70-80	225-235	3½-4	2.3-2.5 A.C.
2A5 Push-Pull	230-245	225-235	18-22	2.3-2.5 A.C.
2A7 Det. Sec.	70-80	225-235	2-3	2.3-2.5 A.C.
" Osc. Sec.	-	150-160	-	2.3-2.5 A.C.

80 Rectifier Filament to Ground 335 to 350 Volts
Across Filament 4.8 to 5 Volts A.C.
Voltage drop across Speaker Field 95 to 105 Volts.
Voltage drop across Filter Choke 14 to 16 Volts.
All voltages taken with 250-500 Volt, 1000 ohms per volt meter.
Volume control on full and no signal in Receiver.

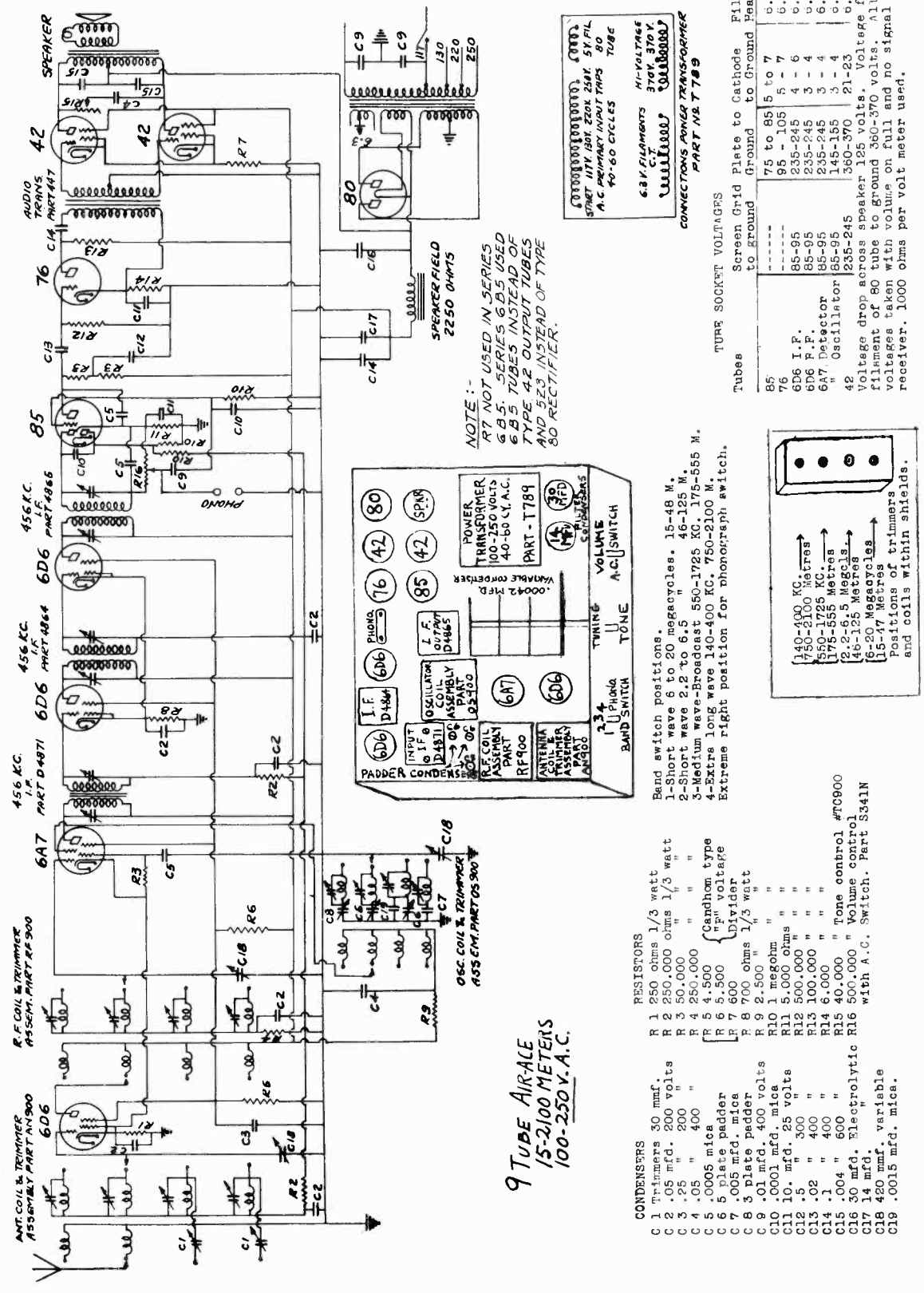
CONDENSERS		Part No.	
C 1	.00042 var.	425	
C 2	Trimmers	630	2 plates
C 3	Padders	629	5 plates
C 4	"	629	
C 5	" ,002 mica	629	
C 6	.005 mica	627	
C 7	.05 200 volts	17	
C 8	.25 200 "	442	
C 9	.05 200 "	17	
C10	.05 400 "	125	
C11	.00025 mica	29	
C13	.006 400 volts	126	
C14	10 Mfd. 25 volts	490	
C15	.006 400 volts	126	
C16	8 Mfd. 600 volts	622	
C17	.01 400 volts	221	
C18	.25 200 "	442	
C19	.01 400 "	221	
C20	.0005 mica	103	
C21	8-8 Mfd. 500 volt	604	

RESISTORS				PART NO.
R 1	2 Megohm	1/4	watt	33
R 2	250 ohm	1/4	"	567
R 3	15M "	1/4	"	439
R 4	20M "	1	"	625
R 5	15M "	3	"	389
R 6	25M "	1/4	"	471
R 7	250M "	1/4	"	305
R 8	50M "	1/4	"	31
R11	6M "	1/4	"	656
R13	500 "	1	"	626
R10	2Meg. volume control			410
R12	500M ohm tone control and A.C. Switch			418
R14	300 ohm	1/3	watt	180
R15	700 ohm	1/3	"	548
R16	30M ohm	1.3	"	487

Oct. 1934

HETRO ELECTRICAL INDUSTRIES, INC.

MODEL 9-Tube Air-Ace Schematic, Socket Trimmers, Voltage



CONDENSERS

C 1 Trimmers 30 mmf.
C 2 .05 mfd. 200 volts
C 3 .25 " 200 "
C 4 .05 " 400 "
C 5 .0005 mica
C 6 5 plate padder
C 7 .005 mfd. mica
C 8 3 plate padder
C 9 .01 mfd. 400 volts
C10 .0001 mfd. mica
C11 10. mfd. 25 volts
C12 .5 " 300 "
C13 .02 " 400 "
C14 .1 " 400 "
C15 .004 " 600 "
C16 30 mfd. Electrolytic
C17 14 mfd. " "
C18 420 mmf. variable
C19 .0015 mfd. mica.

RESISTORS

R 1 250 ohms 1/3 watt
R 2 250.000 ohms 1/3 watt
R 3 50.000 " " "
R 4 250.000 " " "
R 5 4.500 } Candhom type
R 6 5.500 } "P" voltage
R 7 600 } divider
R 8 700 ohms 1/3 watt
R 9 2.500 " " "
R10 1 megohm " "
R11 5.000 ohms " "
R12 500.000 " " "
R13 100.000 " " "
R14 6.000 " " "
R15 40.000 " Tone control #TC900
R16 500.000 " Volume control with A.C. Switch. Part S341N

Band switch positions.
1-Short wave 6 to 20 megacycles. 15-48 M.
2-Short wave 2.2 to 6.5 " 46-125 M.
3-Medium wave-Broadcast 550-1725 KC. 175-555 M.
4-Extra long wave 140-400 KC. 750-2100 M.
Extreme right position for phonograph switch.

TUBE SOCKET VOLTAGES

Tubes	Screen Grid to Ground	Plate to Ground	Cathode to Ground	Filament Heater
85	------	75 to 85	5 to 7	6.3
76	------	95 - 105	5 - 7	6.3
6D6 I.F.	85-95	235-245	4 - 6	6.3
6D6 R.F.	85-95	235-245	3 - 4	6.3
6A7 Detector	85-95	235-245	3 - 4	6.3
" Oscillator	85-95	145-155	3 - 4	6.3
42	235-245	360-370	21-23	6.3

Voltage drop across speaker 125 volts. Voltage from filament of 80 tube to ground 360-370 volts. All voltages taken with volume on full and no signal in receiver. 1000 ohms per volt meter used.

OPERATION

CONTROLS: The Four control knobs in the front of the cabinet serve the following purposes.

WAVE BAND SWITCH: (Left hand knob) Has 5 positions. #1 corresponds with (1) on the dial and covers 15-48 meters (6 to 20 megacycles); #2 corresponds with (2) on the dial and covers 46-125 meters (2.2 to 6.5 megacycles); #3 corresponds with (3) on the dial and covers 175-555 meters (1725 to 550 kilocycles); #4 corresponds with (4) on the dial and covers 750-2100 meters (130 to 410 kilocycles). The 5 position is for phonograph reproduction.

STATION SELECTOR: (Upper Middle Dual Knob) Large knob has a 9 to 1 tuning speed. Small knob has a speed of 45 to 1 for finer tuning.
POWER SWITCH AND VOLUME CONTROL: (Right hand knob).
TONE CONTROL: (Lower middle knob).

PROCEDURE: Remove all carton and packing from inside of cabinet. Make sure that tubes and tube shields are well inserted. Connect Antenna to screw marked "A" and Ground to screw marked "G" in back of the chassis. Attach the power cord to the electrical outlet, first making sure that the available current is alternating and the voltage within 10% of the voltage specified in the rating tag supplied with the receiver. The actual operation is simple. However, the full possibilities of any short-wave receiver cannot be attained until the user has become familiar with the handling of the different controls.
(1) Set the Band switch for the desired range. (2) Turn the power switch clockwise, this will illuminate the dial. Allow one minute for the tubes to heat. (3) Advance volume control half way and with the large selector knob turn the black pointer to frequency or wavelength of the desired station. With the small selector knob rotate very slowly the Band Spread (Red) pointer over a 15 point radius on each side of the setting, advancing the volume control and repeating the tuning process if necessary, until the signal is heard. (4) After receiving the signal, turn Volume Control to low level. Readjust the station selector to the very exact point where the quality of the tone is best. This setting minimizes the background noise. (5) Adjust the Volume Control to the desired level. (6) Adjust tone control to desired bass response by turning clockwise, further advance in this direction decreases treble response and noise interference. (7) When through operating, turn the Volume Control knob to its extreme counter-clockwise position to switch "off" the power. (8) For phonograph operation the Band Switch should be turned to the extreme clockwise position and the magnetic pickup terminals should be inserted in the receptaole marked "PHONO" located near the rear of the chassis. (Phonograph combinations are supplied with a switch to connect or disconnect the pickup from the set). (9) The Volume and Tone controls in the set also regulate the phonograph reproduction, but an additional Volume Control in the pickup is helpful.
Do not remove the speaker or tubes from their sockets while the set is in operation.

SERVICING

If the receiver does not oscillate in the high frequencies, try another 6A7 tube. Check all plate and screen voltages. The power transformer is practically universal and by simply moving one connection in the primary, the receiver may be operated with any A.C. current from 100 to 260 volts. Make sure that the tuning dial does not touch the cabinet or the dial escutcheon and that the chassis is mounted on the rubber supports provided. The screws holding the chassis to the cabinet should be fairly loose. This will prevent microphonic noises caused by the speaker vibration, particularly while receiving short waves.
ALIGNMENT and ADJUSTMENT: The I.F. frequency is 456 KC. and the I.F. transformers are adjusted in the usual manner through the trimmers located on the top side. If necessary to align the I.F. amplifier, place the Band Switch on position #3 and start with the output I.F. stage, then the interstage and finally the input I.F. which is an iron core transformer. Use an Oscillator or Signal Generator and be sure that the signal is very weak in order that the Automatic Volume Control remains inactive. If the peak is correct, rotating the variable condenser should not change the signal output.

HETRO ELECTRICAL INDUSTRIES, INC.

THE ALIGNMENT OF THE ANTENNA, R.F. AND OSCILLATOR tuning coils has been greatly simplified by having the trimmers and coils connected together and mounted within the same shields. Proceed as follows: BAND No. 1: Set Band Switch at No. 1 and adjust again. With a Signal Generator, generate an 18 megacycles signal and tune the receiver to it. Then adjust to maximum output the trimmers of the Antenna, R.F. and Oscillator stages in #1 band (6 to 20 megacycles) located at the bottom of each coil assembly. (2) Also set the Signal Generator at 9 or 10 megacycles. If no Signal Generator is available, the signal from a 16 or 19 meter short wave station may be used while the receiver is tuned to it. BAND No. 2: Set the Band Switch at No. 2 position. Set the Signal Generator at 6 megacycles, tune the set to the signal, adjust to maximum output the trimmers of the Antenna, R.F. and Oscillator stages in #2 band (2.2-6.5 megacycles) located second from the bottom in all coil assemblies. Set the Signal Generator at 2000 KC. and adjust the padder condenser C6 nearest to the back of the chassis to maximum output. Check again at 6 megacycles. If Signal Generator is not available a 47 or 49 meter short wave station may be used. BAND No. 3: Place Band Switch in No. 3 position, set the Signal Generator at 1500 KC., tune the set to the signal. If a Signal Generator is not available, tune in a station at about this frequency and adjust to maximum output the Antenna, R.F. and Oscillator coil trimmers (550-1725 KC.) third from the bottom in all coil assemblies; set the Signal Generator at 600 KC., tune the receiver to the signal and adjust the padder condenser in this band, (the other C6) to maximum output, then tune again to 1500 KC. and reset. BAND No. 4: With Band Switch in No. 4 position, set the Signal Generator to 350 KC tune the set to the signal and adjust trimmers of the 140 to 400 KC. band, (located at the top of the coil assemblies) to maximum output, set the Signal Generator at 150 KC., tune the receiver to the signal and adjust the padder C8 to maximum volume, turn the set to 350 KC. and recheck.
This completes the alignment. All sets are carefully adjusted before leaving the factory and will require little or no adjustment, particularly the Oscillator trimmers and the padder condensers, which should not be touched unless absolutely necessary. The alignment should be done preferably with a Signal Generator or Oscillator and by someone with some experience. Variation of the Oscillator trimmers and the padder condensers will vary the dial calibration. All adjustments should be done very slowly. A 1/2 turn of the screws should be sufficient in most cases. CAUTION: If the receiver is not performing correctly, before attempting to re-align the receiver be sure that the Antenna is not touching the ground, that all tubes are good and that the grid caps are not "shorted" to the shields. If the receiver performs well, do not re-align. When aligning use an insulated screw driver. Alladjustments should be made with a minimum input signal. Signal generators usually emit a harmonic signal of slightly higher frequency than the fundamental and in adjusting the lower of the settings should be used. When adjusting the R.F. rotate slightly the receiver dial and reset again to the generator signal because the latter is often changed by the R.F.

NOTES ON SHORT-WAVE RECEPTION

Antenna and Ground—The efficiency of any antenna varies greatly with the frequency of incoming radio waves, a given length being excellent at certain frequencies and comparatively poor at others.

From a practical standpoint, however, very good results will be obtained using two antennas of different length, one 24-29 feet for short-wave reception and the other 50-100 feet for reception in the long-wave, standard broadcast.

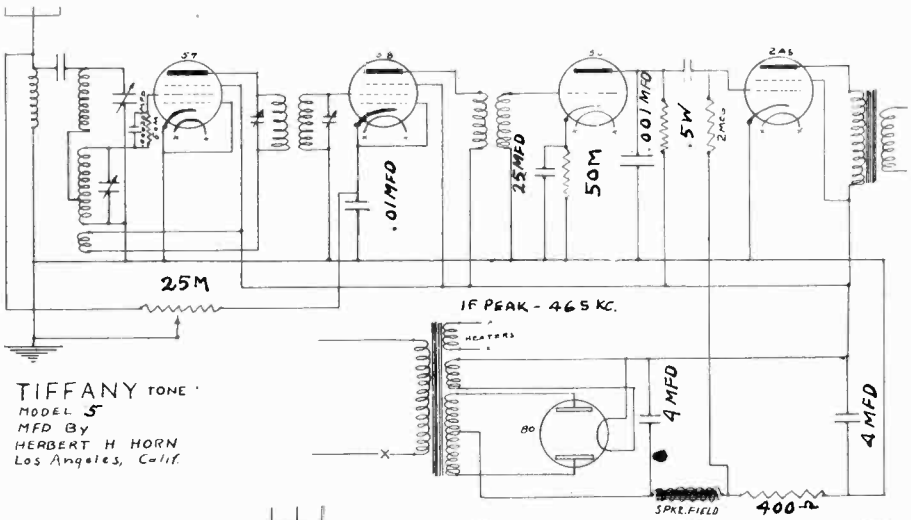
The shorter antenna may be used alone if preferred but probably will not be satisfactory for receiving distant or low-power stations in the standard broadcast band. Further, no advantage will be gained by its use on the shorter wavelengths unless it can be installed so that the majority of its length is unshielded (not contained in a building of metallic construction) and sufficiently remote from sources of man-made interference (such as housewiring, power lines, streetrailways and passing automobiles) to prevent excessive noise. If these conditions cannot be fulfilled, it will be preferable to erect a single antenna of compromise length (100-105 feet overall) which, in addition to providing excellent results in the standard broadcast band, will also favor reception in the short-wave broadcast bands located at 49 31 25 and 19 meters.

Good reception in many installations will be obtained without connecting the instrument to an external ground since the power line characteristics often render a separate radio ground unnecessary. In any case, however, best results will be insured by grounding the set in the conventional manner to a water-pipe or radiator or to a metallic pipe or stake driven from five to eight feet into the soil. The ground lead when used should be short, preferably not more than 15 feet in length, and connected to a clean portion of the pipe or stake surface by means of an approved ground clamp.

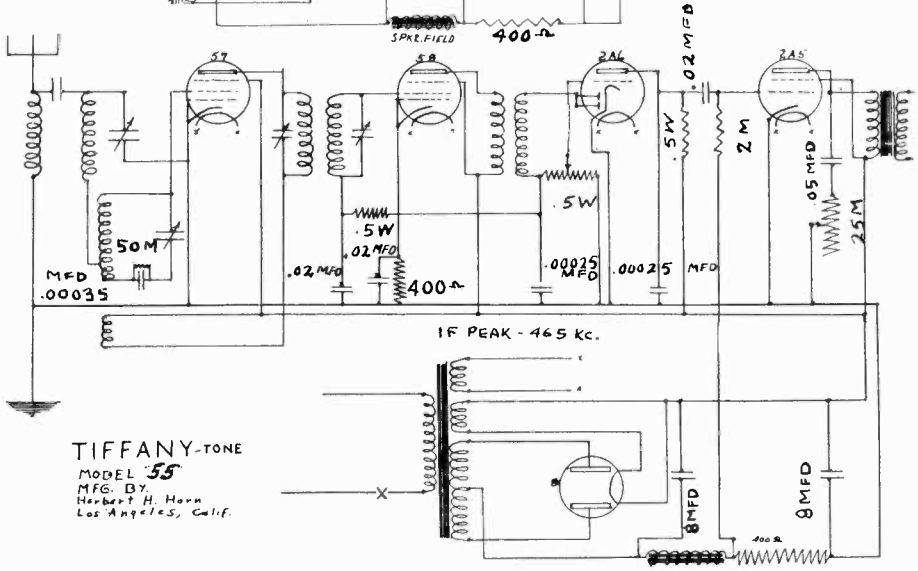
PRINTED IN U.S.A.

MODEL 5
MODEL 55
MODEL 77
Schematics

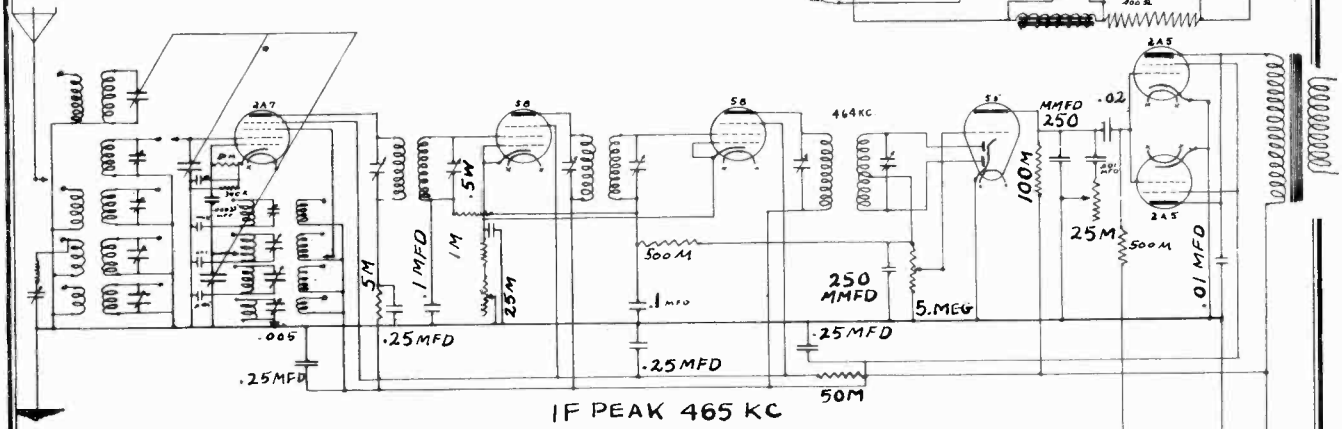
HERBERT H. HORN

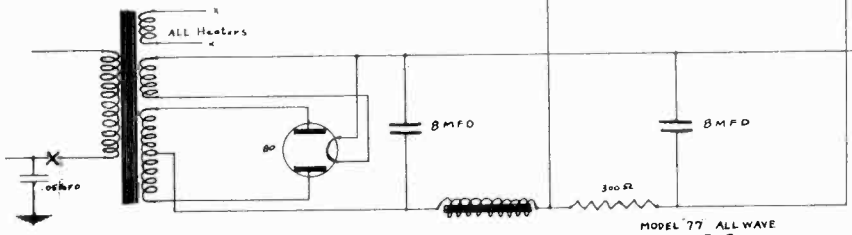


TIFFANY TONE
MODEL 5
MFD BY
HERBERT H HORN
Los Angeles, Calif.



TIFFANY-TONE
MODEL 55
MFG. BY.
Herbert H. Horn
Los Angeles, Calif.





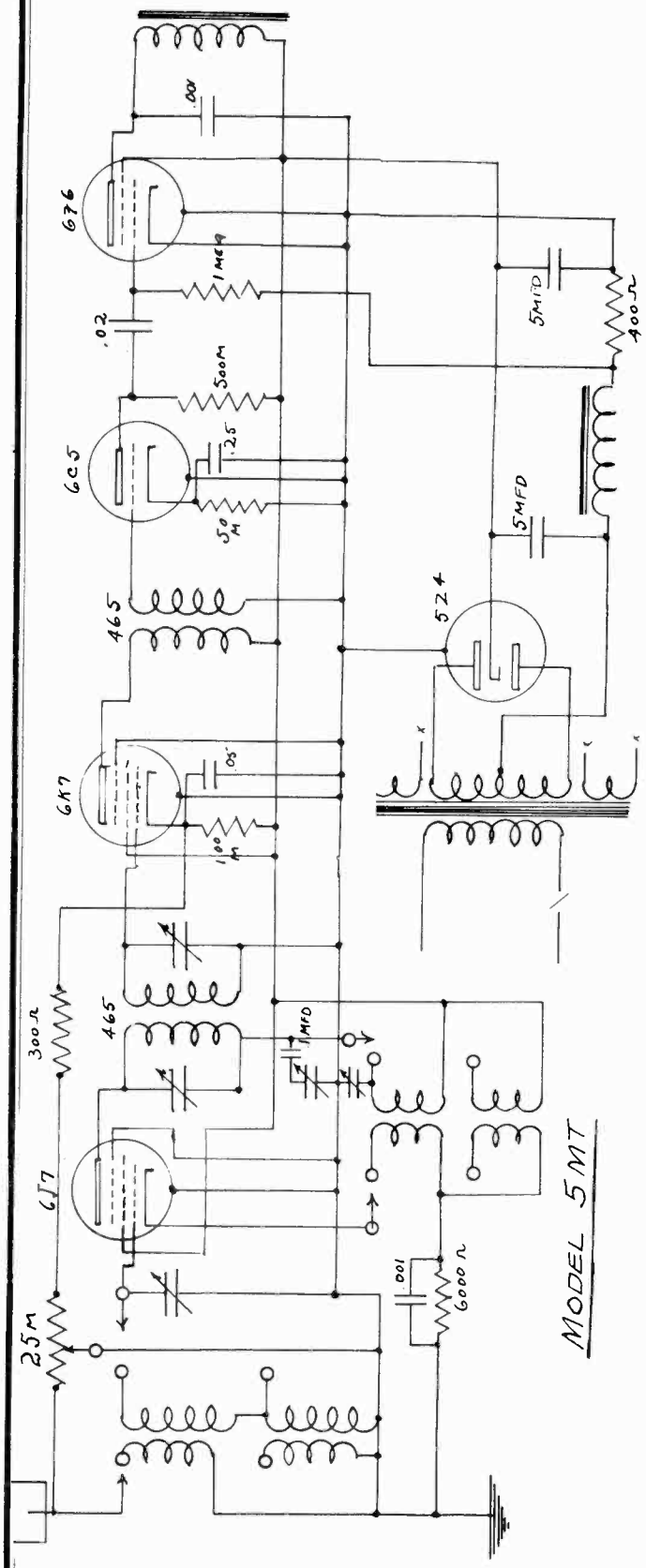
R = OHMS
W = 1000
MFD = MMFD
M = 1000

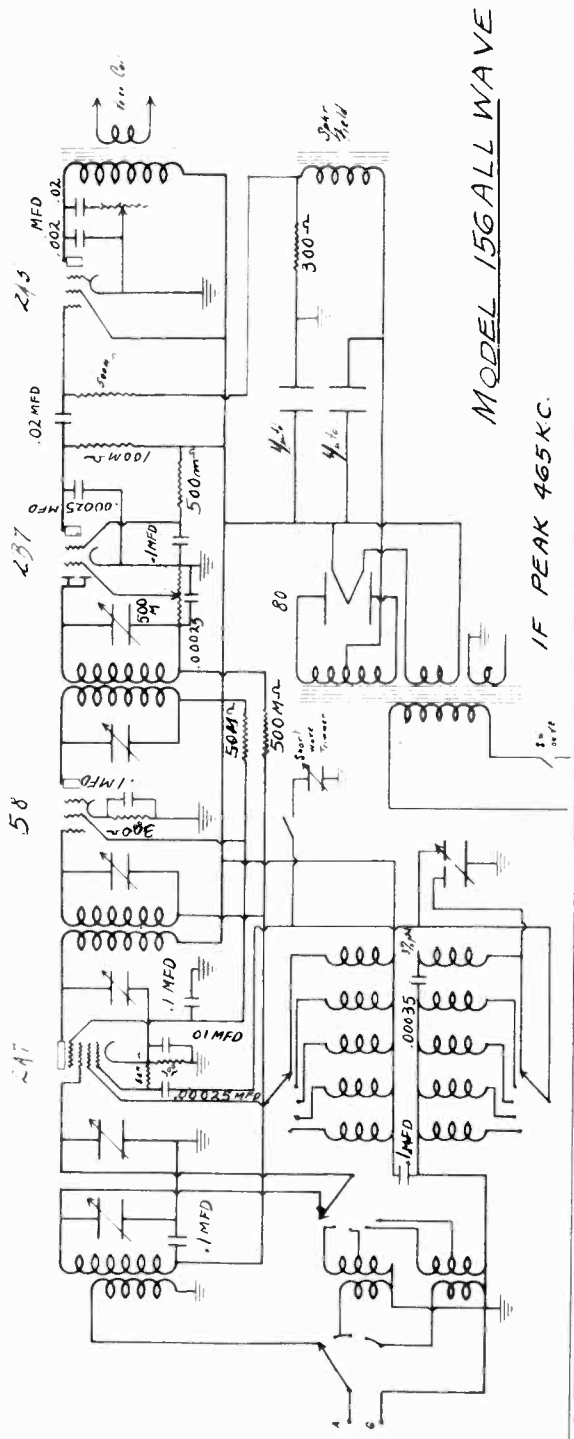
TIFFANY TONE

MODEL 77 ALL WAVE
MFG BY
Herbert H. Horn.
Los Angeles, Calif.

MODEL 5MT
MODEL 156 AW
Schematics

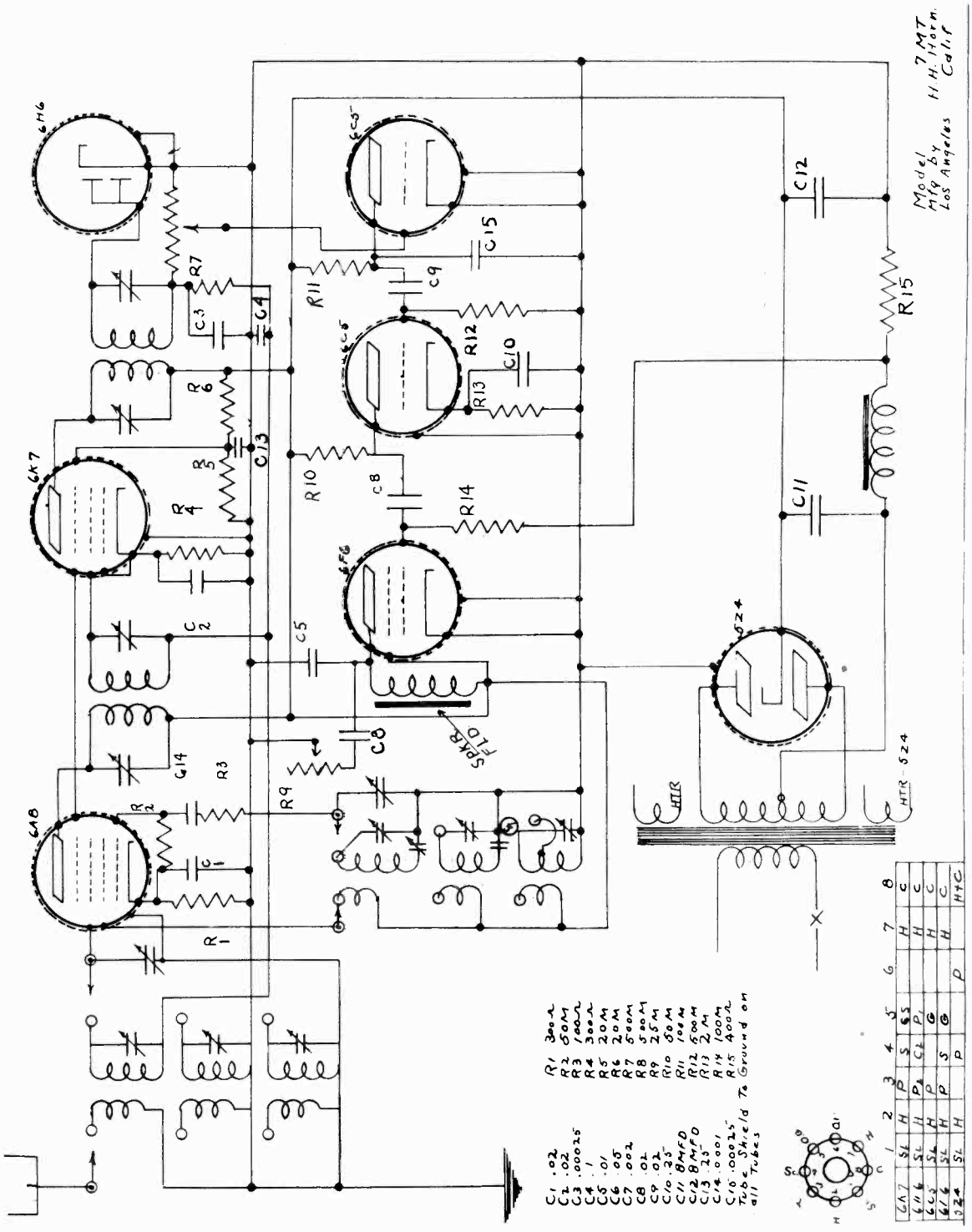
HERBERT H. HORN





MODEL 7MT
Schematic

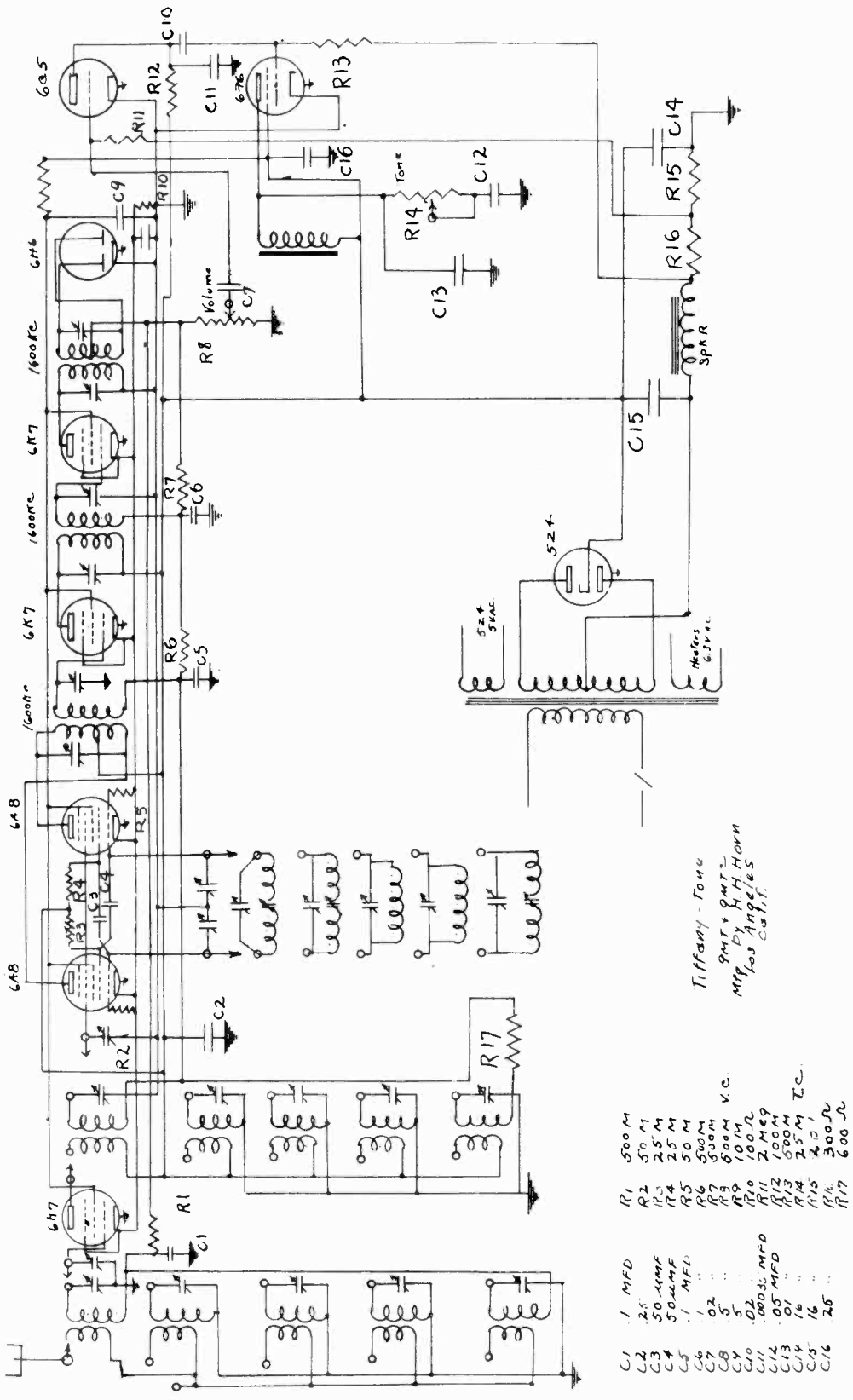
HERBERT H. HORN

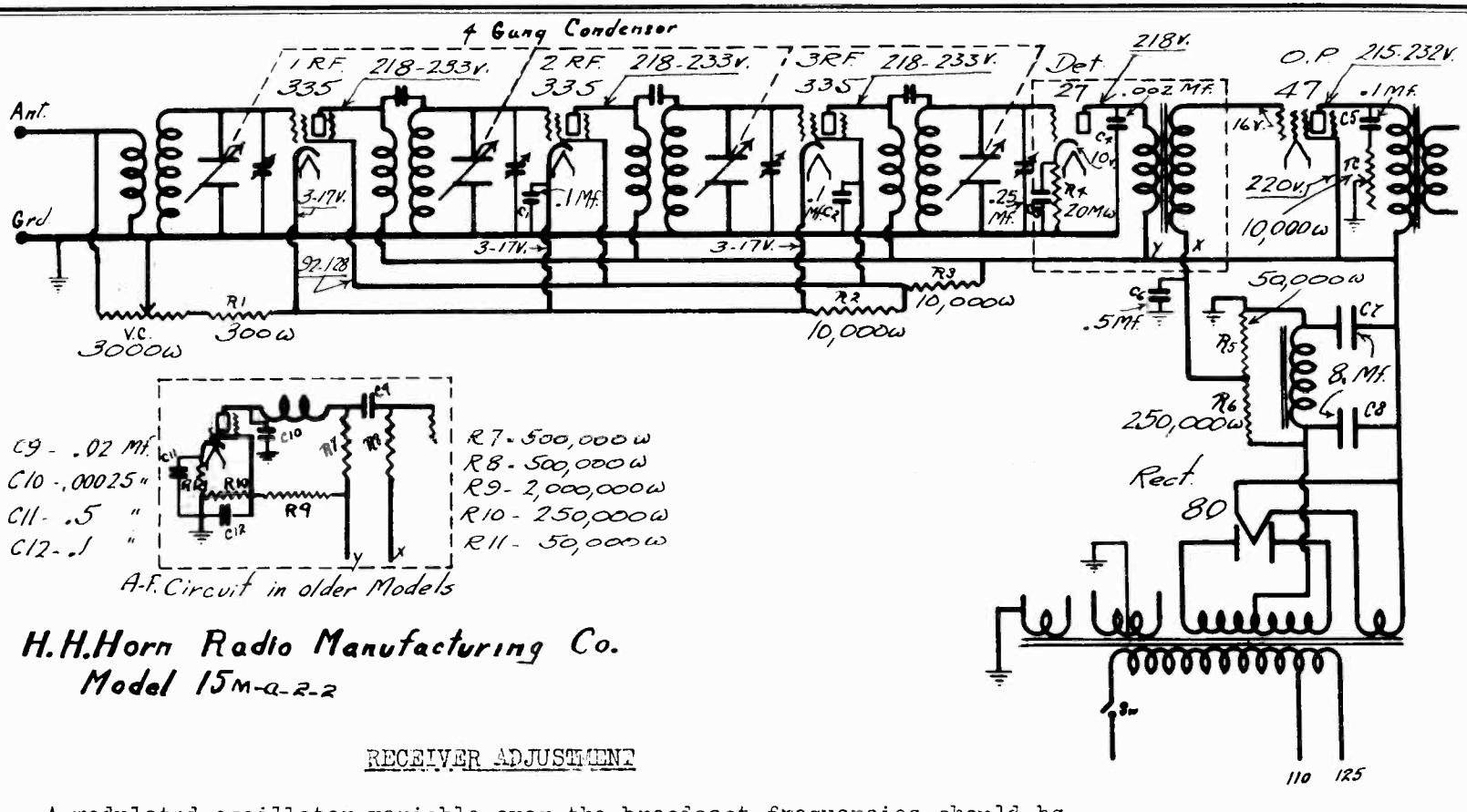


	1	2	3	4	5	6	7	8
GAT	SL	H	P	S	SS		H	C
6H6	SL	H	P	C	P		H	C
6K7	SL	H	P	G			H	C
6J8	SL	H	P	S	G	P	H	C
5Z4	SL	H	P					H+C

MODELS 9MT, 9MTC
Schematic

HERBERT H. HORN





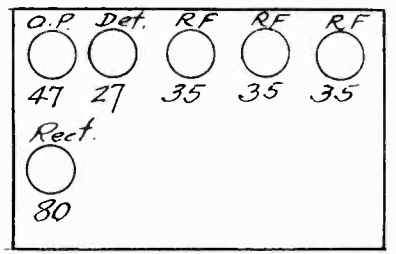
H.H.Horn Radio Manufacturing Co.
Model 15M-a-2-2

RECEIVER ADJUSTMENT

A modulated oscillator variable over the broadcast frequencies should be used in the alignment of the receiver. The use of an output meter will insure accuracy where the ear might tend to be inaccurate.

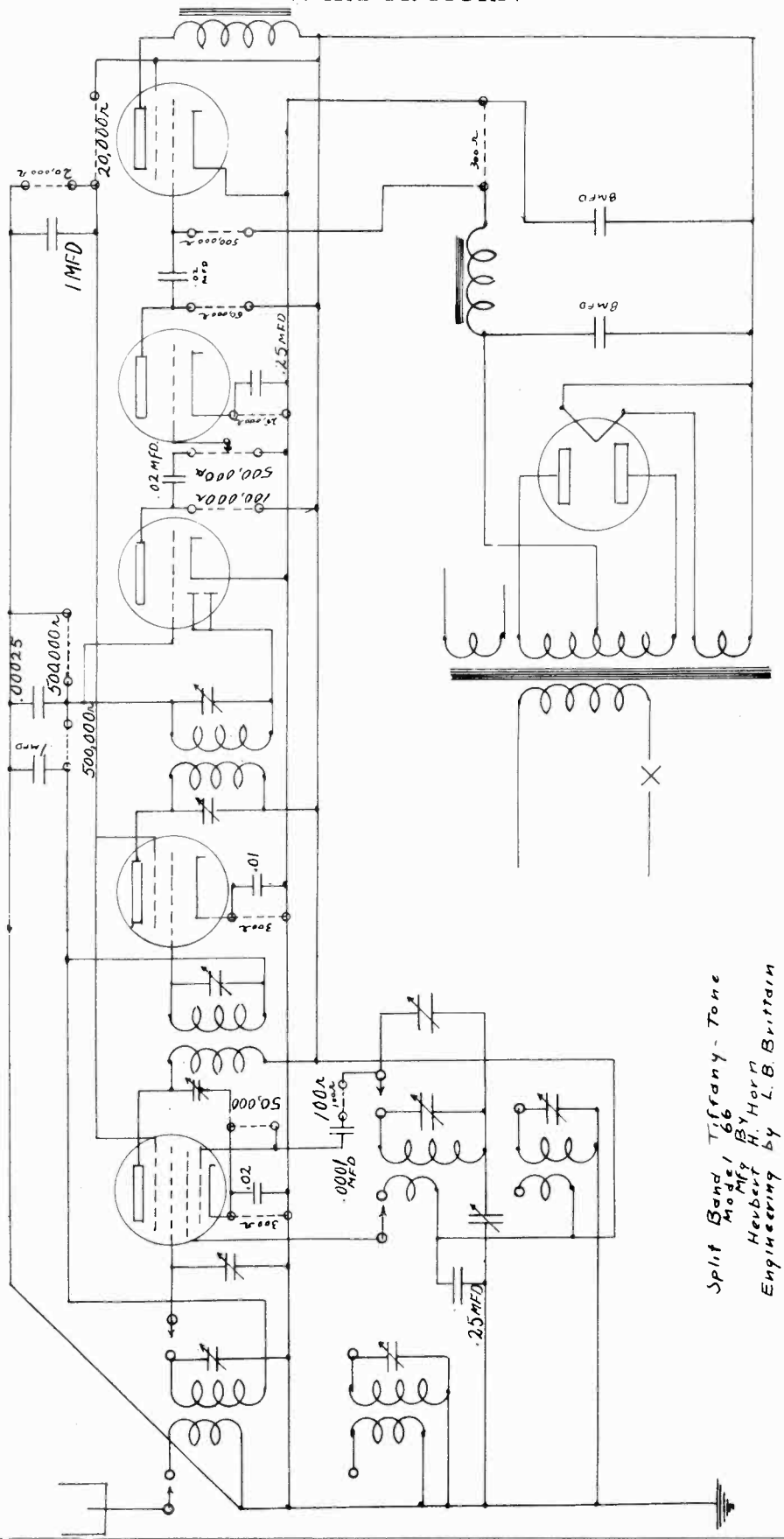
Turn the capacitators on R.F. coils to maximum and turn one half turn back. This adjustment should not vary except on a long aerial which may necessitate unscrewing them further.

The condenser trimmers should be adjusted at approximately 1300 K.C. The maximum sensitivity for the rest of the band should be obtained by spreading the split rotor plates. It may be necessary to go over the trimmers and plate spreading several times before the gang is properly balanced. Time expended in properly adjusting a receiver is well spent.



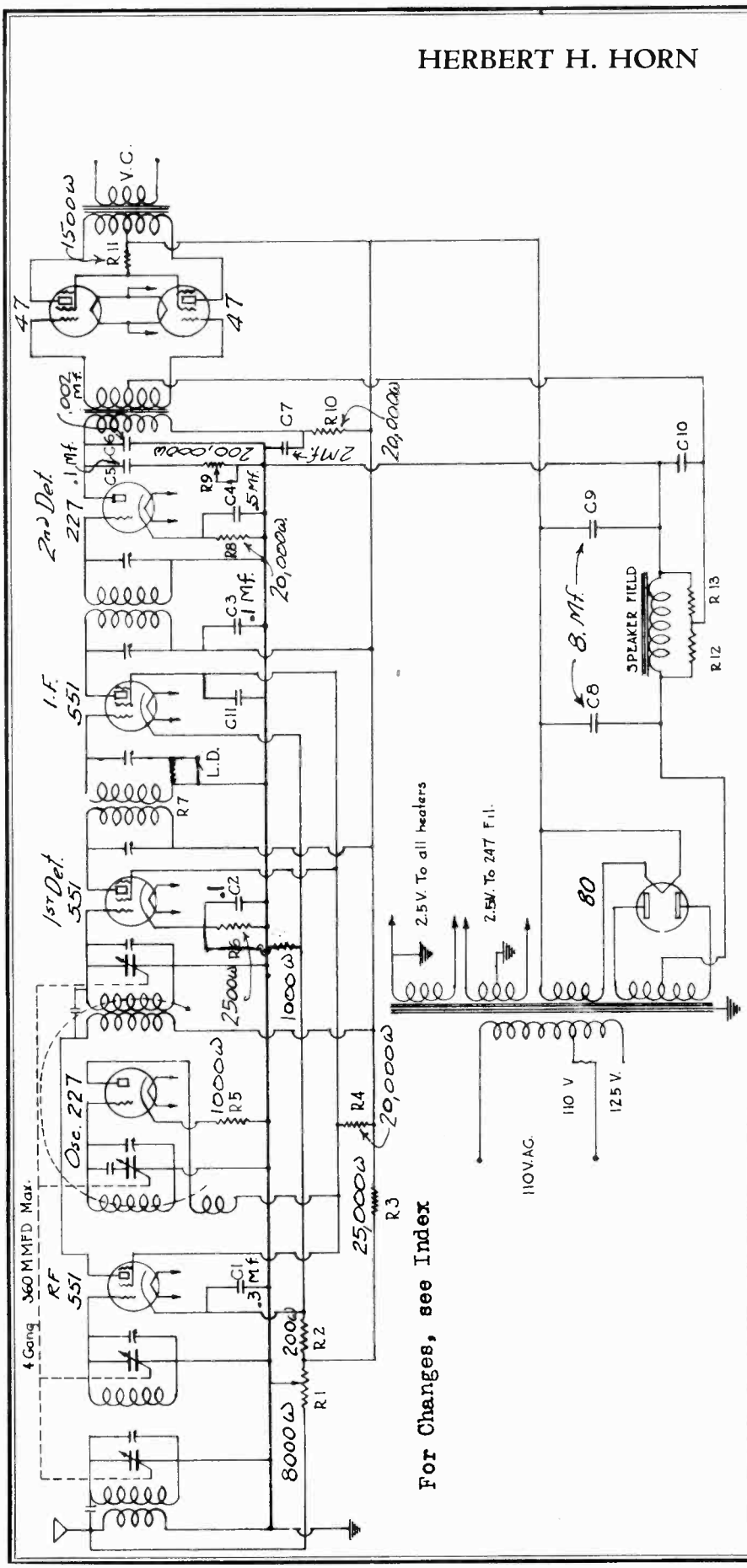
MODEL 66
Schematic

HERBERT H. HORN



HERBERT H. HORN

MODELS 79,99,109
Schematic
Voltage
Socket



VOLTAGES

TUBE	VOLUME CONTROL AT MAXIMUM PLATE	SCREEN	CATHODE	VOLUME CONTROL AT MINIMUM PLATE	SCREEN	CATHODE
51 RF.	225	94	3.5*	250	112	33*
27 Osc.	94	---	4.0*	112	---	5*
51 1 Det.	225	94	3.5*	250	112	33*
51 IF.	225	94	3.5*	250	112	33*
27 2 Det.	180	---	20.0*	195	---	22*
47 O.P.	225	215	16.5*	243	235	17.5*

*Voltmeter resistance 50,000 ohms. All other voltages measured with 250,000 ohm-meter. Filament voltage 2.1, except for 47s which is 2.3 volts.

ADJUSTMENT OF INTERMEDIATE FREQUENCY CONDENSERS.

There are two intermediate frequency transformers. Both the grid a and plate circuits of each must be tuned sharply to 175 kilocycles. The condenser adjustments are accessible from the under side of the chassis, there being two slotted screws protruding through the insulated base of each intermediate.

A modulated oscillator, accurately calibrated to 175 kilocycles, and some form of output meter is necessary. Connect the output of the oscillator to the control grid cap of the translator tube, removing the normal grid lead. The ground terminal of the oscillator must be connected to the ground terminal of the set. Connect the output meter as specified by its manufacturer. Turn the set on, adjust the volume control of the set and the output control of the oscillator until the oscillator signal is audible in the speaker and indicated on the output meter.

Be sure that the "local-distance" switch on the set is in the "distance" position. Then adjust the four intermediate condenser screws for maximum output, reducing the oscillator output when necessary to keep the indicating meter within its scale range. Go over the four adjustments twice to make sure that they are peaked as closely as possible. This completes the I.F. tuning adjustments.

* * * * * * * * *

LINE-UP ADJUSTMENTS OF THE GANG CONDENSER

The four sections of the tuning 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 (nearest the front of the chassis) tunes the oscillator. The first three must track together at signal frequency, while the oscillator circuit must maintain a frequency 175 kilocycles higher than the signal frequency.

A modulated oscillator variable over the broadcast frequencies and accurately calibrated must be used in connection with an output meter. It should be equipped with a dummy antenna and attenuator.

Connect the output of the oscillator through the dummy antenna to the antenna and ground posts of the receiver. Connect the output meter as before. Set the oscillator at 1200 KC and the dial on the set at 1200 KC. Then adjust the oscillator section trimmer, translator, R.F., and pre-selector output. Do not again change the trimmers but establish resonance over the tuning range by bending the vanes of the split rotor plates as necessary.

The following changes have been made on all current production sets:

The tone control, composed of a 200,000 ohm variable resistor in series with a .1 MFD condenser is shunted from one power tube grid to ground. This control is R9 and C5 on the diagram placed in the new position.

The speaker field which is used as the filter choke has been shifted from the negative side of the power supply to the positive making a conventional brute force filter.

The resistors #12 and #13 have been omitted and the grid return of the pentode tubes has been run direct to ground. The bias for the pentode tubes has been run direct to ground. The bias for the pentode tubes is now obtained by the drop across a 300 ohm resistor in series with the pentode filament center tap and ground making the filament 16½ volts positive in relation to the grid return to ground. With this type of circuit it is possible to secure a correct reading of the bias with a standard set analyzer.

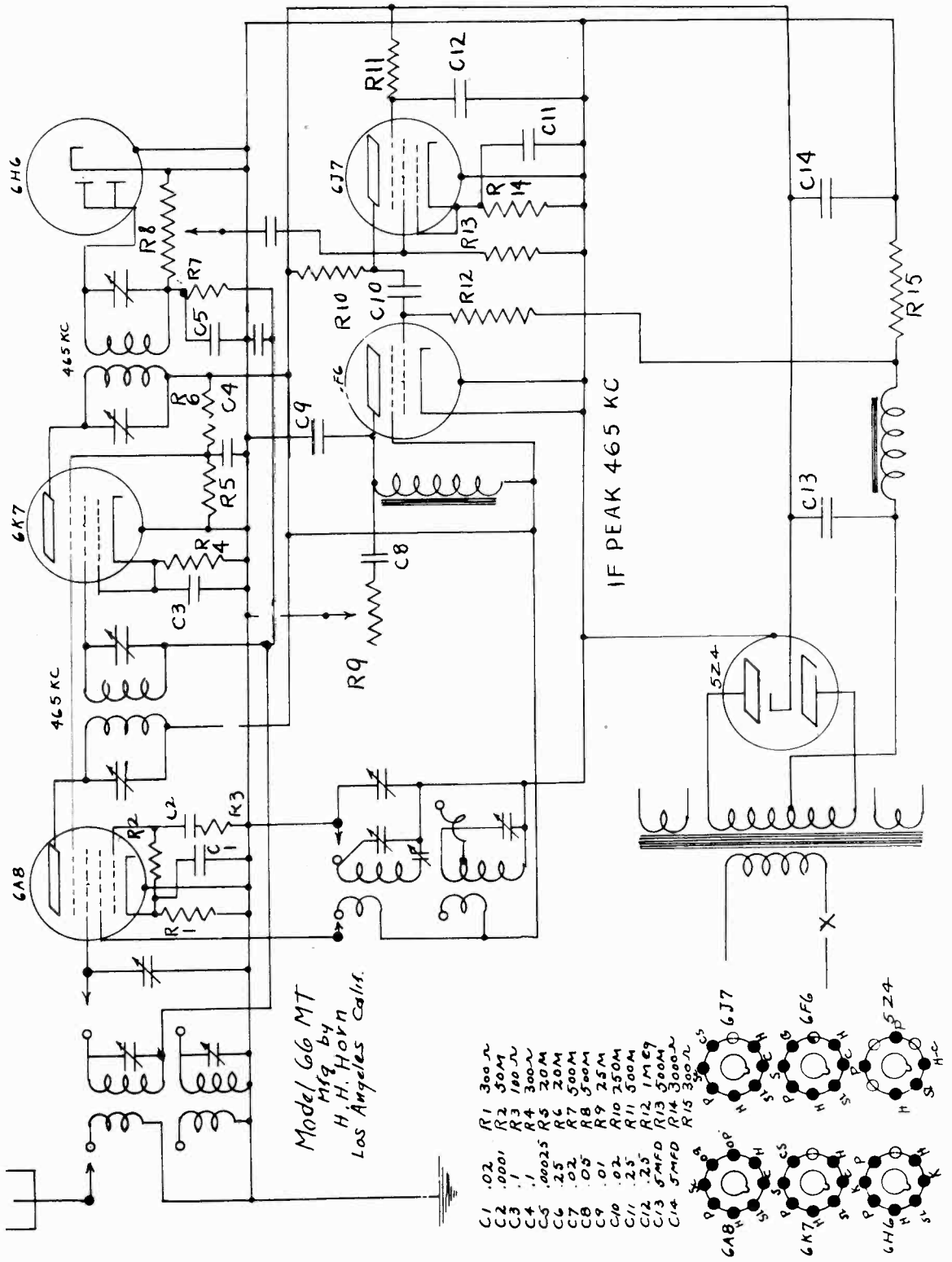
The circuit and other data in this manual applies to both the 8 and 10 tube models. The two tubes in the 10 tube model are connected in the following manner:

One 27 tube is used in parallel with the 27 second detector shown on diagram. This tube is added at this point to increase the voltage output capacity of the second detector stage, consequently increasing the overload point to a considerably greater level than it is possible to obtain with a single tube.

One 27 tube is used as a ballast tube on the cathode supply to the R.F. tubes, thus enabling the volume control to smoothly control the volume on powerful local stations. The plate of this tube is run to the high voltage, the grid to the point between R1 and R2, and the cathode through a 2,000 ohm resistor to the cathode side of R2.

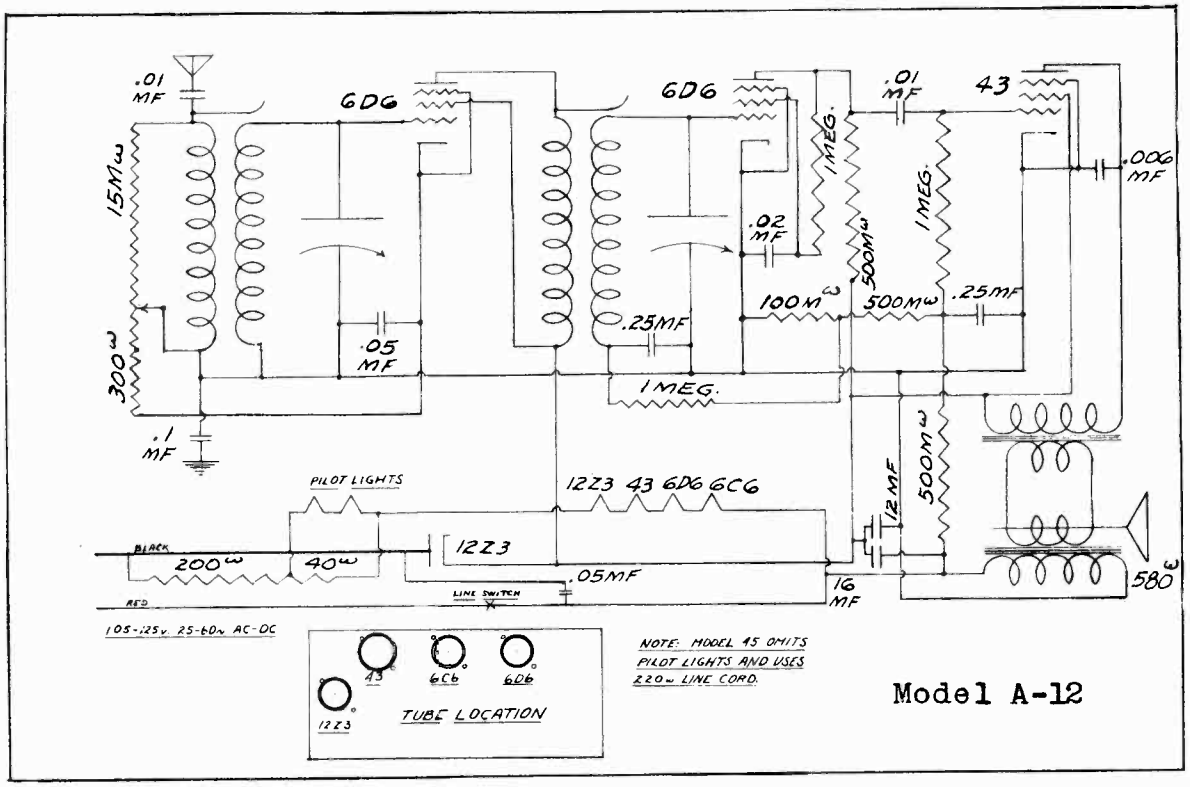
MODEL 66MT
Schematic

HERBERT H. HORN

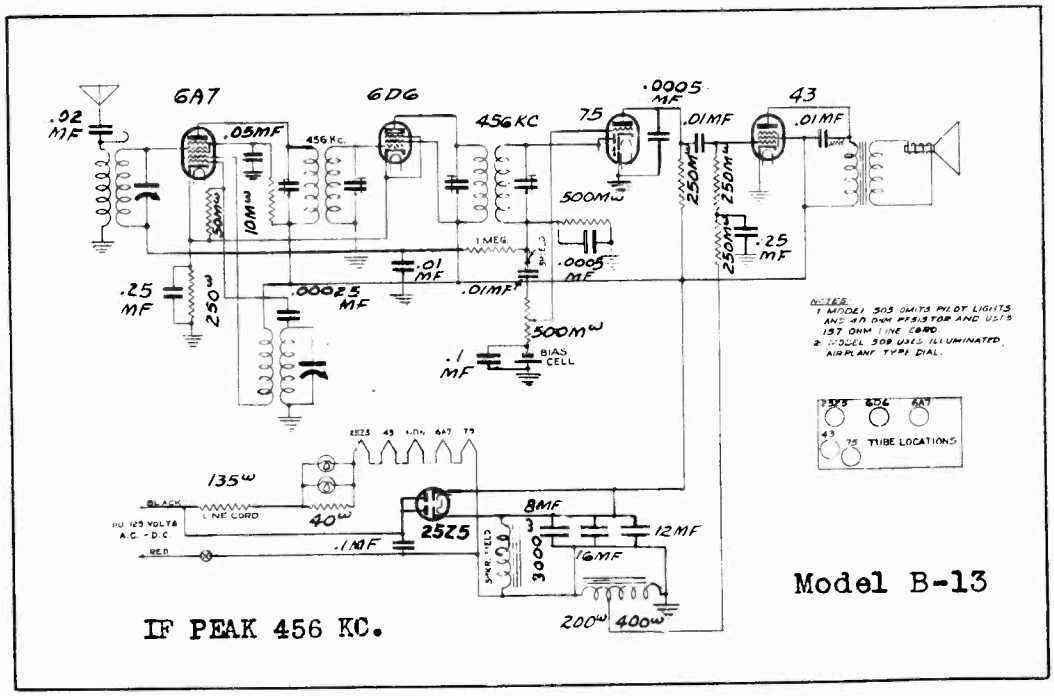


MODEL A-12
MODEL B-13
Schematics
Socket

HOWARD RADIO CO.



Model A-12

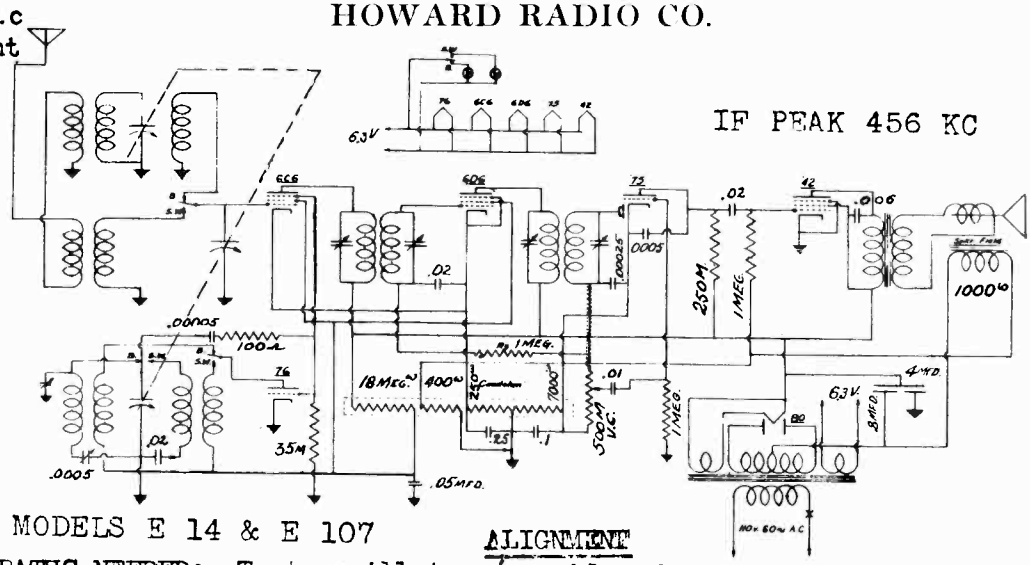


Model B-13

IF PEAK 456 KC.

MODELS E-14,E-107
Schematic
Alignment

HOWARD RADIO CO.



MODELS E 14 & E 107 ALIGNMENT

APPARATUS NEEDED: Test oscillator (capable of covering three bands: 456-465 K.C., 540-1700 K.C. and 6-15 megacycles), and an output meter or 0-3 AC voltmeter placed in parallel with speaker voice coil.

PROCEDURE: The I.F. circuits must first be aligned. Remove oscillator tube (76) from set, set test oscillator to 456 K.C., and connect test oscillator to grid of first detector tube (6C6). Deflection on output meter should then be adjusted to maximum by adjusting the trimmer screws on the I.F. transformers. It may be that during this and subsequent procedure, the output meter may go off scale, but this may be corrected by reducing oscillator output until the needle on output meter is again on scale.

NOTE: Although these receivers are adjusted to 456 K.C. I.F. frequency at the factory, it may be advisable to use 465 K.C. I.F. frequency, instead, in order to reduce code interference in some parts of the country. It is entirely feasible to use 465 K.C. I.F. frequency without changing either I.F. transformers, R. F. or oscillator coils.

The R.F. and oscillator circuits must now be aligned. Replace the oscillator tube in set chassis and connect test oscillator to the antenna and ground leads. Set test oscillator to 1700 K.C., and after turning band switch to broadcast position, rotate tuning knob until dial scale on chassis reads 1700. The oscillator trimmer condenser, found by turning chassis upside down, is then adjusted for maximum deflection on output meter, after which, the trimmer condensers located on the main tuning condenser are also rotated until output meter again reads maximum deflection.

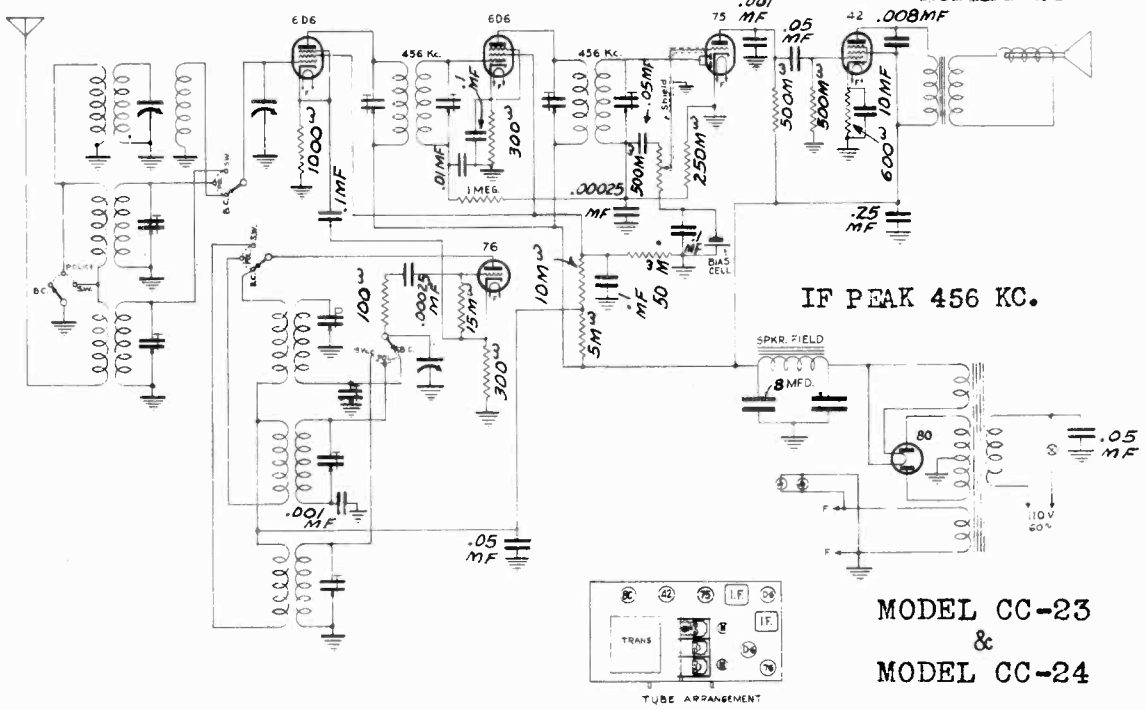
To finish alignment of broadcast band, set test oscillator to 550 K.C., and adjust the pad condenser found on the top and right hand side of the chassis. For best results in aligning the 550 K.C. end of the broadcast band, the tuning condenser should be "rocked" back and forth across the signal, and the padding condenser adjusted at the same time, until maximum deflection is gained on the output meter. The 1700 K.C. position should then be re-checked, as adjusting the padding condenser often throws off the high frequency alignment.

By rotating the band change switch to the short wave position and setting the dial scale to read 15 megacycles the set is ready to adjust on the short wave band. Set test oscillator to 15 megacycles and adjust the oscillator trimming condenser, located on front short wave coil, until output meter reads maximum. Lastly, adjust trimming condenser on back short wave coil to read maximum deflection on output meter, and the set is completely aligned and ready for best reception.

Schematics, Socket

HOWARD RADIO CO.

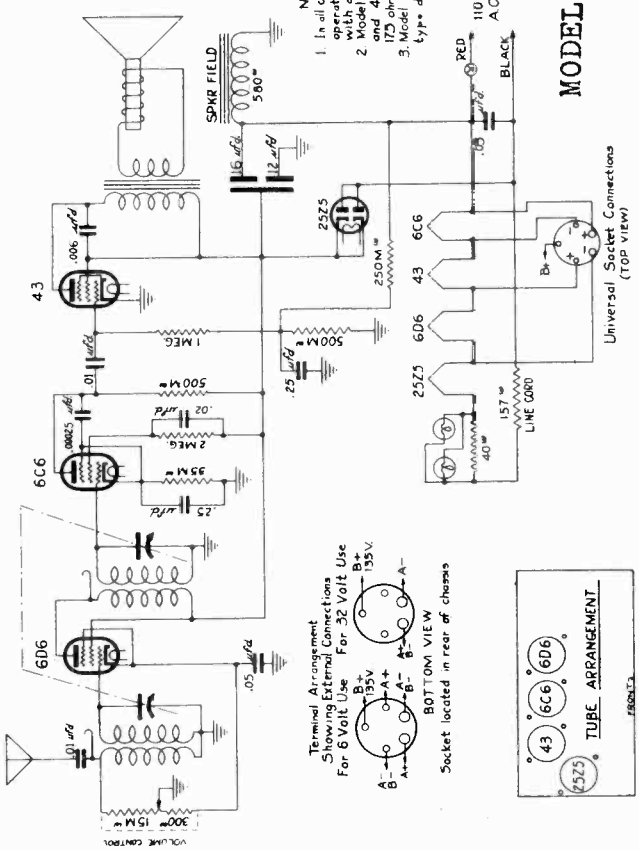
MODELS CC-23, CC-24
MODEL AA-25
MODEL G-26



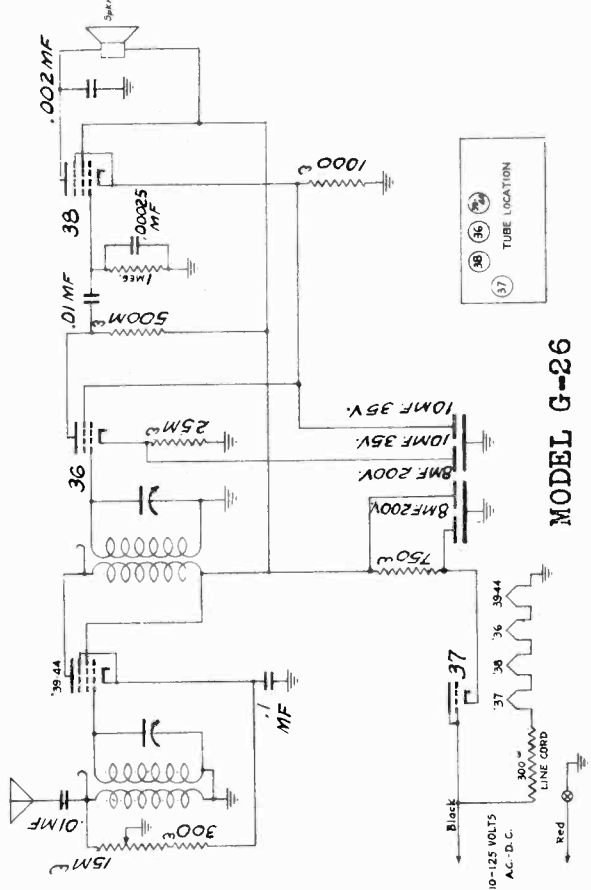
MODEL CC-23
&
MODEL CC-24

MODEL AA-25

NOTES:
1. In all cases of 6 and 32 Volt operation, replace the 43 tube with a 41 Tube.
2. Model 405 omits pilot lights and 40 ohm resistor and uses 175 ohm line cord
3. Model 409 uses illuminated Airplane type dial.

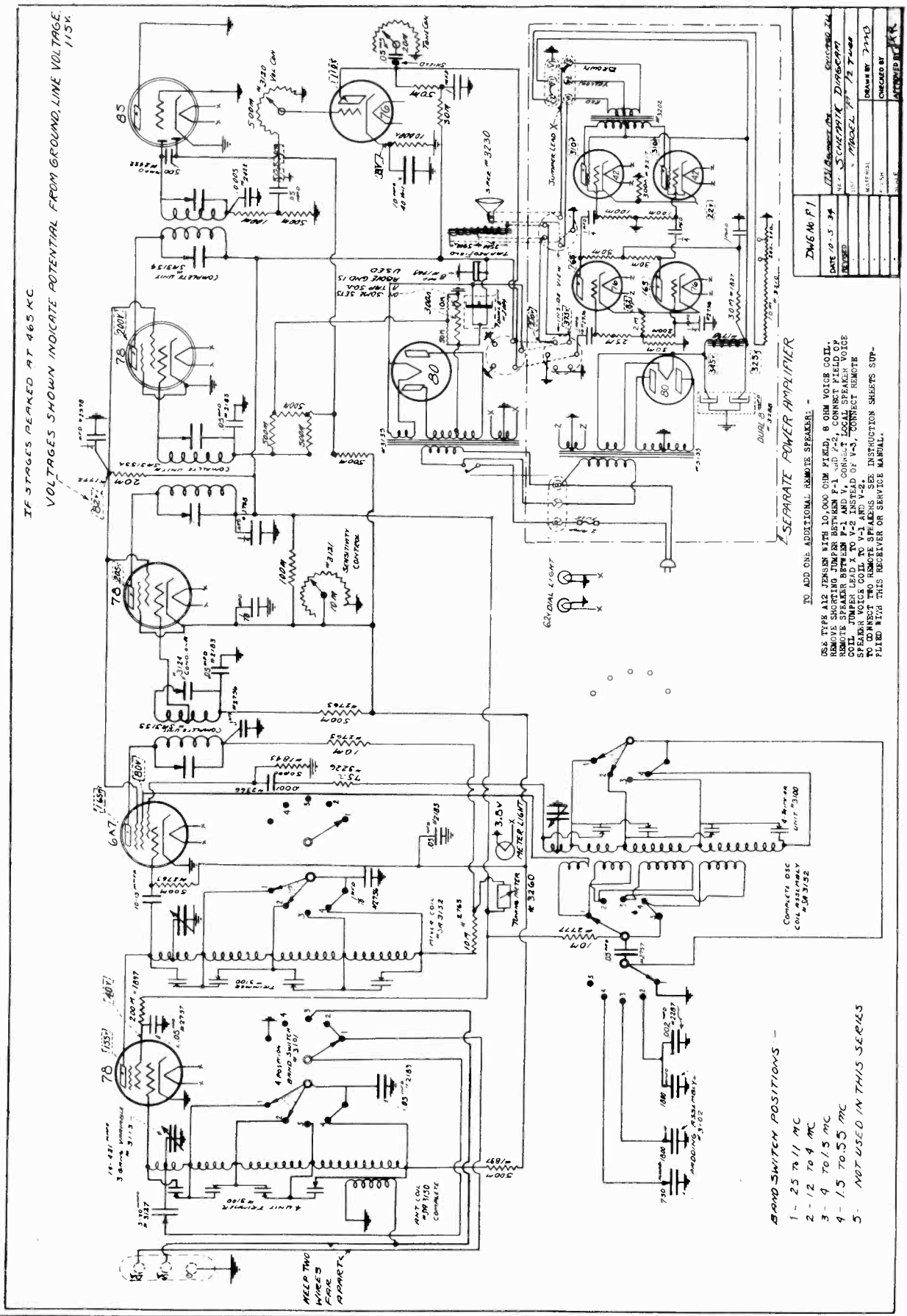


MODEL G-26



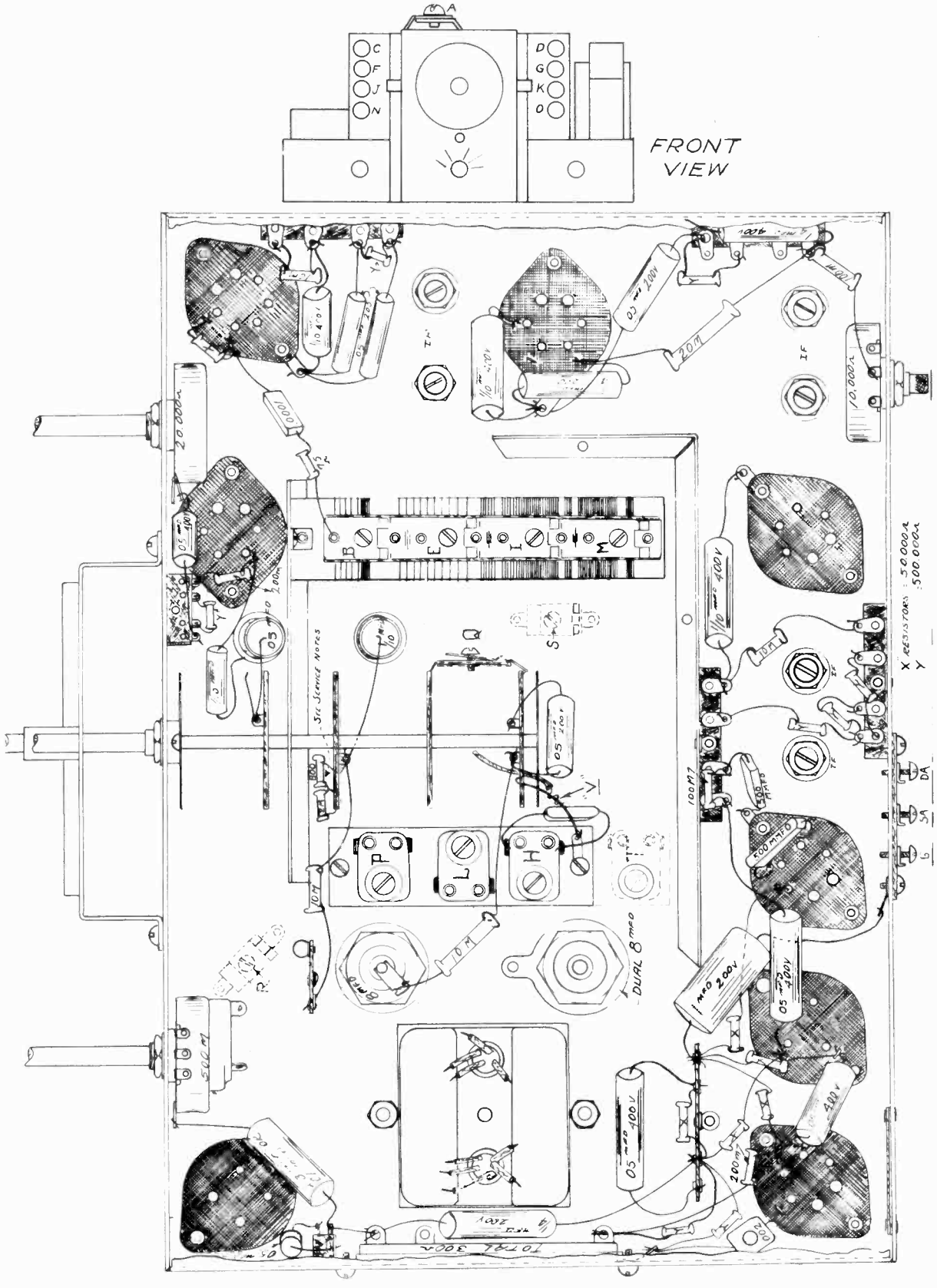
MODEL F
Schematic, Voltage

HOWARD RADIO CO.



MODELS D,F
Chassis Wiring

HOWARD RADIO CO.



MODELS D,F
Alignment

HOWARD RADIO CO.

THE PROCEDURE TO ALIGN THE I.F. STAGES

The IF's are aligned in the usual system of feeding the intermediate frequency of 465 KC into the grid of the 6A7 1st Detector tube.

Make certain that the sensitivity adjustment (which is the knurled shaft extending from the back of the chassis) is turned all the way to the right when gaining the IF, RF or Oscillator circuits.

The two trimmers in each of the three IF Coil Cans should be very carefully tuned to resonance as they are very critical and will greatly affect the performance of the receiver.

The sensitivity of the IF stages should be between 10 and 20 Microvolts.

On some of the models the trimmer screws extend through the bottom of the chassis as per pictorial view. On other styles the trimmers are reached through the top of each IF shield can.

3. NOTES ON ALIGNING THE R.F. AND OSCILLATOR CIRCUITS

(a) After the IF's are aligned, the various circuits may be aligned in the order given below.

(b) Keep the sensitivity adjustment all the way on to the right as before.

(c) It is not necessary that the oscillator be taken out of its socket when aligning any of the RF circuits.

(d) Always adjust the oscillator stage before the RF in any particular band.

(e) Before adjusting any band, make certain that the pointer of the station indicator is set on the last line when the dial is turned all the way to the right, on above 560 - at this point the variable condenser should be all the way in to maximum capacity. See pictorial.

(f) The plates on the variable condenser should be bent to make the KC readings on the dial line up ONLY on the Broadcast Band.

(g) Always seal the trimmers with wax or collidon after their adjustment.

(h) After the high frequency adjustments have been made on short wave bands, the test oscillator or generator should be advanced to 930 KC higher in frequency - the output voltage of generator advanced considerably and notice of the image signal of receiver oscillator falls at this point. In case this signal is not heard, the adjustment of the receiver oscillator has been incorrectly made. As an example:-

After the third short wave band has been adjusted at 20 M.C. it should be possible to move the test oscillator to 20 + 930 KC and hear the signal.

(i) Before starting with the alignment adjust antenna series condenser A - without the use of the signal generator - by turning the screw all the way down to maximum capacity, and then unloosen the screw about one half turn.

(j) Start with the third (highest frequency). Short wave band as follows:-

4. THIRD SHORT WAVE BAND

Refer to the pictorial views of the chassis.

Rotate band switch all the way to left to 25-11 Megacycle setting.

Set dial hand to 24 Megacycles.

Peak trimmer B to 24 Megacycles from the signal generator fed into the antenna.

If the set is far out of alignment, it may be necessary to use a heavy input from the generator and also vary the Antenna Coil and Mixer Coil Trimmers C and D until the heavy signal is not necessary. Make the final adjustment on C and D after the oscillator B trimmer is set.

Next, set the dial hand to 12 Megacycles on the same band and with a 12 Megacycle signal, resonance may be checked and corrected by shifting the ground lead at "V" (see pictorial) by sliding it in either direction as necessary along the bare ground wire for the greatest gain.

As mentioned above in paragraph three - the image signal may be checked to determine if the adjustments have been made on the correct signal.

5. SECOND SHORT WAVE BAND

Rotate band switch to 12-4 Megacycles.

Set dial hand to 12 Megacycles.

Peak trimmer E at 12 Megacycles.

Peak Trimmers F and G in the RF circuits on the same frequency.

Set dial hand to 4⅛ Megacycles on the same band.

Adjust padding condenser H to the 4⅛ Megacycle signal.

6. FIRST SHORT WAVE BAND

Rotate band switch to 4-1.5 Megacycles.

Set dial hand to 4 Megacycles.

Peak Trimmer I to 4 Megacycles.

Peak Trimmers J and K in the R.F. circuits to the same frequency.

Set dial hand to 1.5 Megacycles.

Adjust Padding Condensor L to resonance with 1.5 Megacycles.

7. BROADCAST BAND

Rotate band switch to "B" position.

Set dial hand to 1500 Kilocycles.

Peak Trimmer M to 1500 Kilocycles.

Peak Trimmers N and O to 1500 Kilocycles.

Set dial to 550 Kilocycles.

Adjust Padding Condenser P to resonance with 550 Kilocycles.

Recheck dial at 1500 Kilocycles.

Check the middle of the dial at 950 Kilocycles for example and bend the plates of the variable condenser if necessary to line up with the calibration.

8. THE LONG WAVE

This adjustment applies to sets that have the extra band from 150 Kilocycles to 350 Kilocycles attached.

The alignment trimmers are shown in dotted lines on the Pictorial Diagram.

Rotate band switch to its fifth position - all the way to the right.

Set dial hand to 350 Kilocycles.

Peak Trimmer Q to 350 Kilocycles from the signal generator.

Peak Trimmers R and S in the RF circuits to the same frequency.

Set dial hand to 150 Kilocycles.

Adjust Padding Condenser T at 150 Kilocycles.

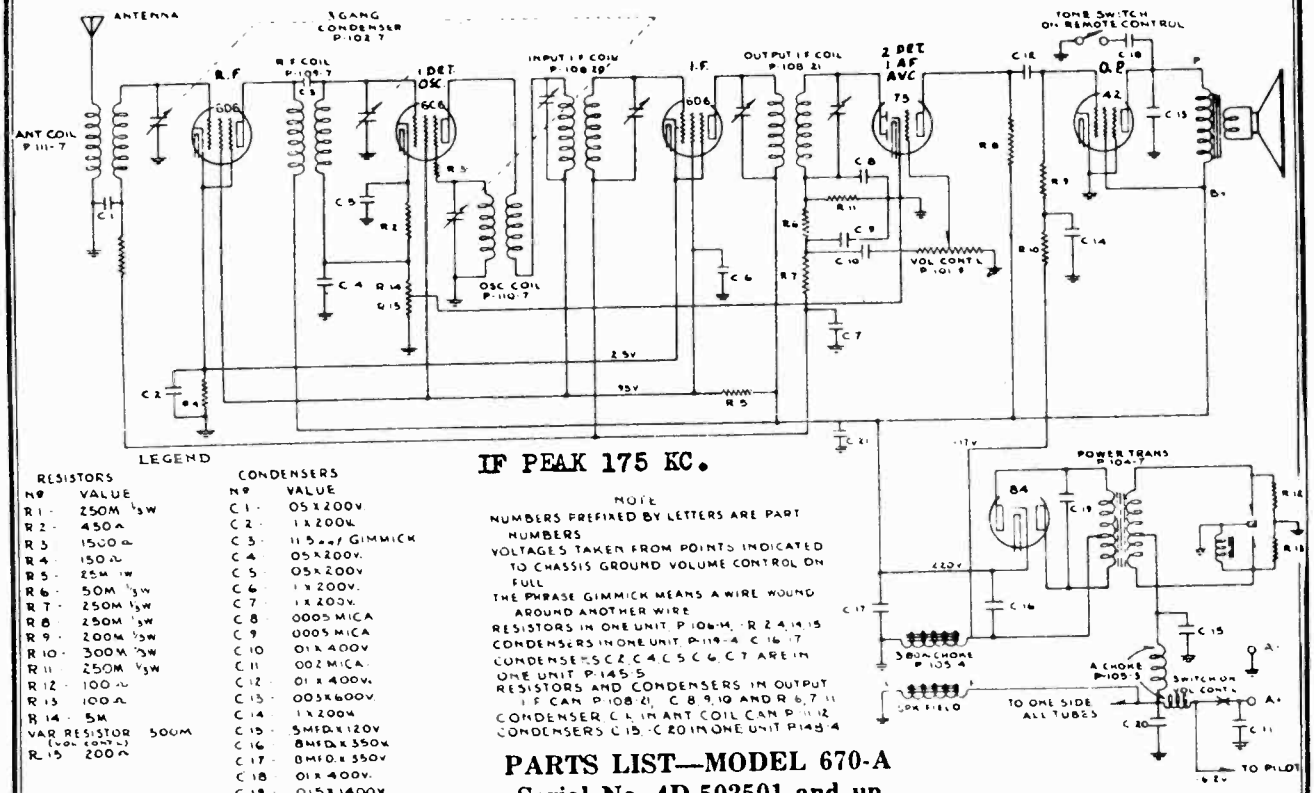
9. NOTES

(a) On some series the two resistors - 800 and 2000 ohm, have been added.

(b) Refer to schematic #4903 showing changes, if any, that have been made since sets were in production.

HOWARD RADIO CO.

MODELS 670-A, HA-1
Schematic, Voltage
Parts



RESISTORS

No	VALUE
R 1	250M ½W
R 2	450Ω
R 3	1500Ω
R 4	150Ω
R 5	25M 1W
R 6	50M ½W
R 7	250M ½W
R 8	250M ½W
R 9	200M ½W
R 10	300M ½W
R 11	250M ½W
R 12	100Ω
R 13	100Ω
R 14	5M
VAR RESISTOR (VOL CONT'L)	500M
R 15	200Ω

CONDENSERS

No	VALUE
C 1	05 x 200V
C 2	1 x 200V
C 3	1.5 mmf GIMMICK
C 4	05 x 200V.
C 5	05 x 200V
C 6	1 x 200V.
C 7	1 x 200V.
C 8	0005 MICA
C 9	0005 MICA
C 10	01 x 400V
C 11	002 MICA
C 12	01 x 400V.
C 13	005 x 600V
C 14	1 x 200V
C 15	5MFD x 120V
C 16	8MFD x 350V
C 17	8MFD x 350V
C 18	01 x 400V.
C 19	.015 x 1400V
C 20	5MFD x 120V.
C 21	01 x 400V

PARTS LIST—MODEL 670-A
Serial No. 4D-502501 and up

When ordering parts, always specify part and model number as well as serial number of chassis.

Part No.	Description
101-9	Volume Control with Switch
101-12	Tone Control Assembly, complete
102-7	Three Gang Geared Variable Condenser
104-6	Vibrator Transformer
105-3	"A" Choke—40T—No. 16E—½" Dia.
105-4	380 Ohm Filter Choke
106-6	200 Ohm Center Tapped Resistor
106-14	5800 Ohm Metal Clad Resistor
108-20	Input I. F. Transformer completely assembled in can (175 K. C.)
108-21	Output I. F. Transformer complete with can, but less resistor and Condenser Assembly (175 K. C.)
	Resistor and Condenser Assembly for 108-21
109-7	R. F. Coil
110-7	Osc Coil & bracket
111-7	Antenna Coil
112-43	Volume Control Shaft complete with knob
115-18	Special partition shield
115-22	Tube shield
116-5	6-8 Volt T-50 pilot lamp
116-6	Pilot light assembly, complete, less bulb
119-4	8-8 Mfd. x 350 Volt Electrolytic Filter Condenser
142-1	Plug-In Vibrator
145-5	.4 Mfd. By-Pass Block
146-14	Special bracket including battery antenna, pilot light and tone control cable fittings, but less antenna coil volume control
148-4	Dual .5 Mfd. 120 Volt Condenser
161-1	20 Ampere fuse
147-1	Selector Control Coupling
147-2	Bushing and bracket complete
147-11	Volume control coupling
135-5	⅜x3" carriage bolt
140-3	Container complete with top and bottom
148-1	.5 Mfd. Generator Condenser
148-3	.5 Mfd. Ammeter Condenser
149-18	Volume Control Shaft—18"
149-24	Volume Control Shaft—24"
150-18	Selector Shaft—18"

Part No.	Description
150-24	Selector Shaft—24"
151-2	Remote Control Head, less flexible shafts, less tone control and pilot assemblies, but with knobs and mounting hardware
152-1	Antenna cable
152-2	Battery cable
131-5	Black bakelite remote control knobs
146-8	Die Cast Remote Control Mounting Bracket
146-12	Steering Column Strap
168-1	Spark-plug type suppressor
168-2	Distributor plug-type suppressor
168-3	Cable type suppressor
168-4	Special Ford spark-plug suppressor
	Unless otherwise listed, all Carbon Resistors
	Unless otherwise listed, all Single Section Tubular Paper By-Pass Condensers
	Unless otherwise listed, all Dual Section Tubular Paper By-Pass Condensers
	Unless otherwise listed, all Molded Mica Condensers
	All Sockets
167-1	Dynamic Speakers
	Plate antenna (clamps to frame of car)

Note: Part No. 145-5 consisting of five separate sections can be replaced with tubular single section condensers at 25c each. It will not be necessary to replace the entire unit should any section thereof fail.

Vibrators can be reconditioned at a cost of $3.00 each, if the old unit is returned.

All resistors are RMA color coded—specify value and/or resistor number (per schematic diagram) and model number.

When ordering condensers, specify part number, model number and/or capacitor (per schematic diagram) and model number.

We cannot supply speaker cones only. We can replace a speaker on which a cone has been damaged for $1.50, if defective speaker is returned, transportation charges prepaid.

MODEL 670-A, HA-1
Alignment, Notes

HOWARD RADIO CO.

BALANCING SET TO ANTENNA:

When this set has been installed and is ready for operation it may be found necessary (depending on antenna) to balance set to this antenna. This is accomplished as follows:

With the receiver tuned to a very weak station, about 130 to 140 (1300 to 1400 kilocycles) on the dial, adjust the antenna trimmer with a screw driver until maximum volume is attained. To reach the antenna trimmer remove the plug button from the top of the case.

I. F. ALIGNMENT:

1. With variable condenser at its maximum capacity position and with volume control full on, connect in series with a .1 mfd. condenser, an oscillator set at 175 kilocycles to the grid cap of the 6C6 tube.

2. Adjust trimming condensers of both input and output I. F. transformers, parts number 108-20 and 108-21 (see top view of chassis) to resonance with an oscillator, as indicated on an output meter connected across the primary terminals of the speaker input transformer or between the plate and screen terminals of the type 42 output tube. The connection to the tube can be made by means of an adapter. Maximum deflection on the output meter indicates resonance.

Note: Each I. F. transformer has two adjustments, both of these adjustments on both transformers are accessible through holes located in the back of the case between the two mounting plates and directly under the louvres.

R. F. ALIGNMENT:

1. Attach oscillator connected in series with a 200 mmfd. condenser to the antenna lead and with the variable condenser at its minimum capacity position (extreme right of its rotation) and with an oscillator set at 1550 kilocycles, adjust condenser trimmer of oscillator section (Front shaft end) to resonance.

2. Re-set oscillator to 1400 kilocycles, rotate variable condenser to pick up signal, adjust antenna (center section) and R. F. (rear section) trimmers to resonance.

3. Check alignment at 1500-1000-800-600-530 kilocycles by setting oscillator to these frequencies and picking up signal by rotating condenser.

4. Bend slotted plates of antenna and R. F. sections only if necessary. UNDER NO CIRCUMSTANCES BEND PLATES OF OSCILLATOR SECTION.

NOTES:

Voltages from chassis to different points are indicated on schematic circuit diagram, and should be measured with a voltmeter having a resistance of 1000 ohms per volt.

Failure to operate, noisy or weak reception, may be due to defective tubes or poor contact between cap on top of tube and grid clip.

Tubes may be checked by replacing with another tube which is known to be good.

If fuse blows out frequently, and insulating sleeve has been properly placed over fuse, the trouble probably is in the vibrator and vibrator should be replaced.

NEVER ATTEMPT TO ADJUST VIBRATOR POINTS.

Case rattles may be due to one or more of the following:

Loose screws in top or bottom covers. Loose elements in tubes. Loose tube shield. Loose R. F. coil shield. Loose grill cloth.

RECEIVER INSTALLATION:

Determine most satisfactory or desirable mounting position. In most cases it will be found that the receiver can be mounted on the car bulk head, above and to the right of the steering post.

Use the cardboard template which is the same size as set and mark location for two mounting bolts, if mounted on the long side and one bolt if on the short side.

Then drill two (2) one-half inch (½") holes, making certain that the paint around the hole on the engine side of fire wall or bulk head is scraped clean to insure a good ground connection between receiver and the frame of the car. Assemble brackets number 146-2 to case with self-tapping screws.

Insert bolts through dash, assemble plain, lockwashers and nuts on engine side, then hang receiver over bolt heads and tighten nuts securely.

Mount the remote control unit on steering column by means of mounting bracket or attach to instrument panel or under dash (see illustration).

Two flexible shafts are furnished, one with a slotted fitting on one end, which is the volume control shaft (number 149-18), the other is the selector shaft, with key fitting at one end (number 150-18).

Make certain that the outer casings of flexible shafts go into remote control bushings for approximately five-sixteenths of an inch and tighten set screws to secure cables. If cables are pushed too far into remote control head, shafts will not turn freely. Always try to install drive shafts in as straight a line as possible from remote control to set. AVOID SHARP BENDS IN CABLES.

IMPORTANT—READ CAREFULLY:

We are prepared to exchange, without charge, our standard number 149-18 and 150-18, eighteen inch cables for twenty-four inch cables, number 149-24 and 150-24. You will find that 99% of the installations can be made with the standard eighteen inch cables, and bear in mind that the shorter the cable, the smoother the drive.

DIAL ADJUSTMENT:

Mount control head to steering column by means of bracket and strap or under dash by means of bracket or to instrument panel (see illustrations). Attach cables as above. Tune set to some station of a known frequency (between 800 and 1200 K.C.), hold selector knob, then with a screw driver adjust the slotted screw on back of the control head, and in that way adjust the dial pointer to the correct frequency setting.

CONNECTIONS TO BATTERY:

The battery cable, number 152-2, (red wire with fuse receptacle at one end and terminal lug at other end) must be connected to battery terminal of ammeter. At the same time connect ammeter capacitor, number 148-3, to battery terminal of ammeter, other end of condenser to any convenient grounded screw on back of instrument panel. Make certain that insulating sleeve is slipped over fuse when fuse is placed in receptacle, before inserting in receiver (see illustration). All bypass leads should be as short as possible.

When connected properly, the discharge due to current drawn by the receiver should not indicate on the ammeter. This is important, since if improperly connected, as shown by the deflection of ammeter, additional motor interference may be encountered.

PILOT LIGHT:

Pilot light assembly, part number 116-6, a shielded cable, plugs into the set and to the rear of the remote control unit (see illustrations).

TONE CONTROL:

The tone control assembly, part number 101-12, attaches to the back of the remote control head by means of a special screw and plugs into the set (see illustrations).

ANTENNA CONNECTION:

The antenna is connected to the receiver by means of the antenna cable, number 152-1. The antenna wire is the single black wire projecting from the end of the cable. Splice this wire to the roof antenna lead and ground the pig-tail shielding as close to the corner post of the car as possible.

OPERATION:

Place key (knob) in lock of left hand control of the remote control unit. After waiting approximately 45 seconds for tubes to heat up, rotate station selector, right hand knob, until a desirable program is heard. De-tuning will very seriously affect the tone quality of this receiver. Tone control knob located between two black knobs (see illustrations) is a BASS and TREBLE switch, it is not a variable tone control. Turning it to the right makes the BASS connection, turning it to the left makes the TREBLE connection. You will note that the BASS position assists materially in reducing interference from static, street car lines and other high pitched disturbances.

MOTOR NOISE SUPPRESSION:

The ignition system of every automobile generates high frequency electrical interference. This high frequency interference arising from the ignition coil, the distributor and the spark plugs must be properly suppressed in order to obtain satisfactory reception. Each car will present more or less an individual problem but there is a definite procedure to follow which holds true in every case.

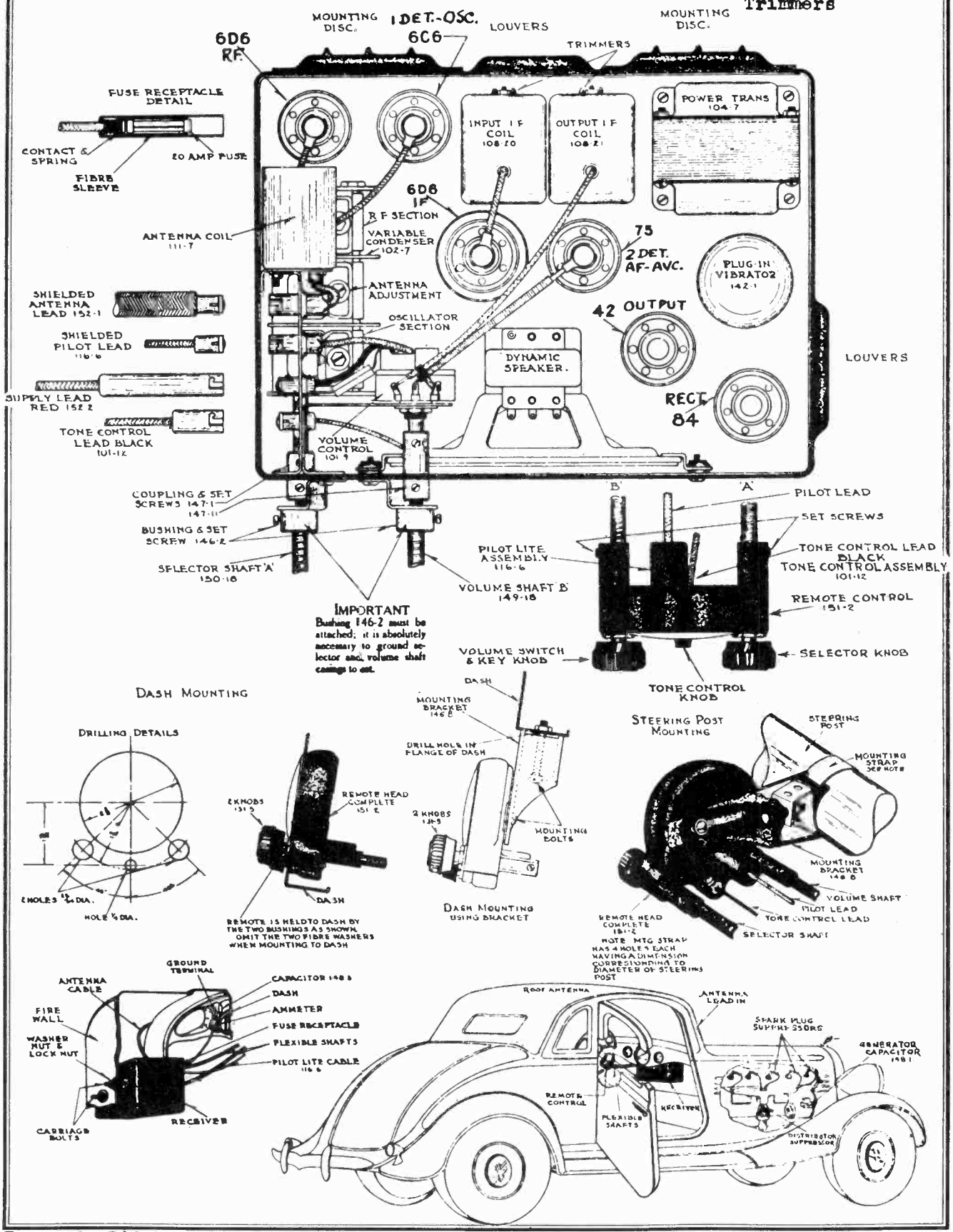
This first essential procedure is to disconnect the high tension leads to the spark plugs and attach the spark plug suppressors (168-1) (for V 8 Fords 168-4) the special distributor type suppressor (166-2) which is inserted in the center contact of the distributor as indicated in the illustration of a typical installation. (NOTE V 8 FORD USES NO DISTRIBUTOR SUPPRESSOR.) For cap type distributor, exchange the standard plug type distributor suppressor (166-2) for a special cable type suppressor (168-3) from your dealer. In some few cases, such as Buicks it is sometimes necessary to use cable type (168-3) suppressors. This type of suppressor is inserted in the leads running from the distributor to the spark plugs and which are concealed underneath the metal plate which covers the spark plugs.

After the spark and distributor suppressors have been properly fastened the next in importance is the generator condenser (148-1), this filters a high pitched whining noise which would otherwise be heard as the motor is accelerated.

It is sometimes necessary in cars where the ignition coil is located under the dash, to use an additional capacitor (148-1) obtainable from your dealer. It must be installed between the battery side of the ignition coil and the frame of the car. Next connect capacitor (148-3) from the battery side of ammeter to frame of car. This is necessary in practically every installation and a good connection to the frame of the car is of utmost importance.

HOWARD RADIO CO.

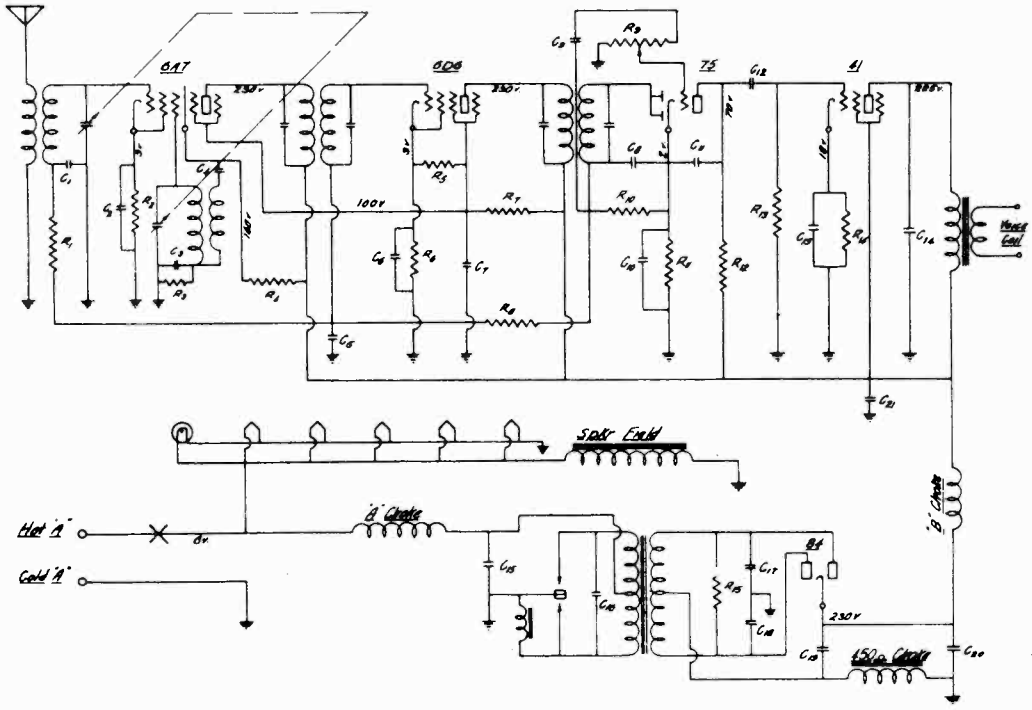
MODEL 670-A, HA-1
Socket Layout
Parts Details
Trimmers



MODELS 52, 502, HA-2
Schematic, Socket

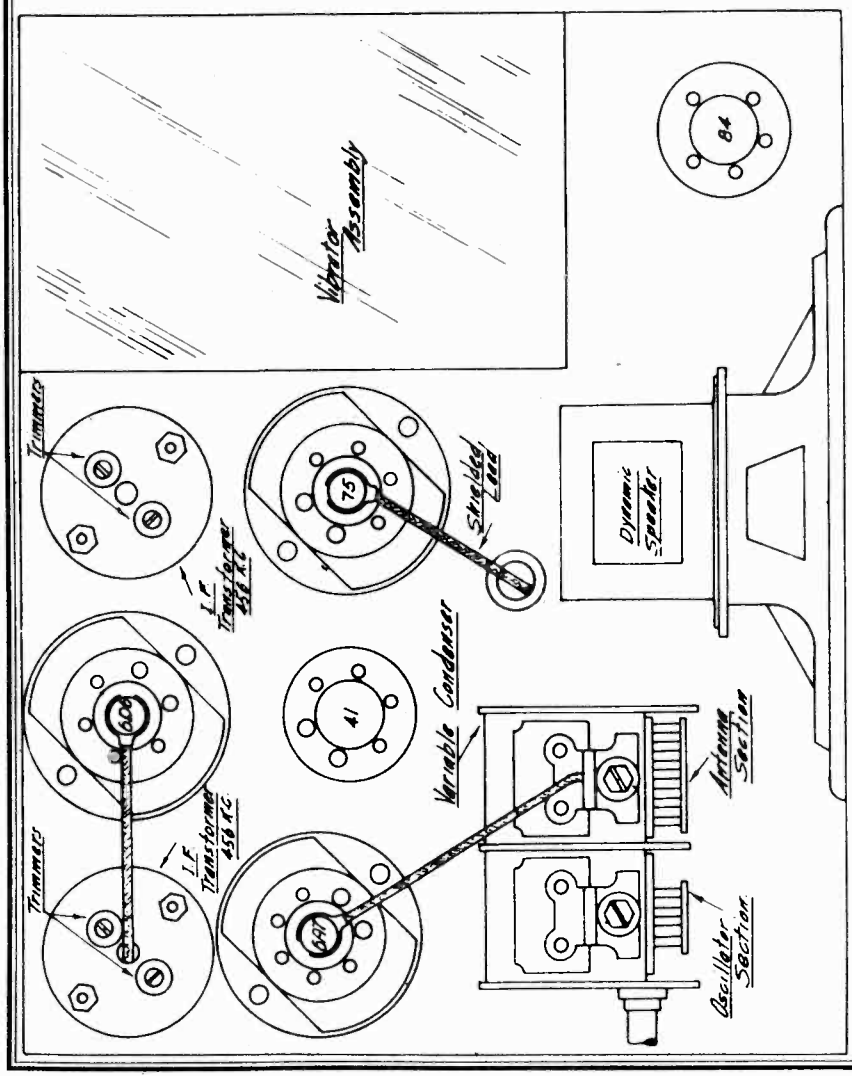
HOWARD RADIO CO.

Trimmers, Notes



CIRCUIT DATA			
R	Ω	C	MFD
1	500M	1	.05
2	250	2	.1
3	50M	3	.01
4	1.5M	4	.002
5	35M	5	.05
6	250	6	.1
7	1.5M	7	.1
8	1 Meg	8	.0005
9	500M VC	9	.02
10	250M	10	Mount 25V
11	5M	11	.0005
12	250M	12	.02
13	250M	13	Mount 25V
14	750	14	.005
15	500M	15	.5
		16	.5
4-30-34		17	.008
		18	.008
Drawing No 105		19	0
		20	0
		21	.25
Model 502 Auto Receiver			
Drawn By S.	Chkd By		

Voltages taken from points indicated to chassis ground

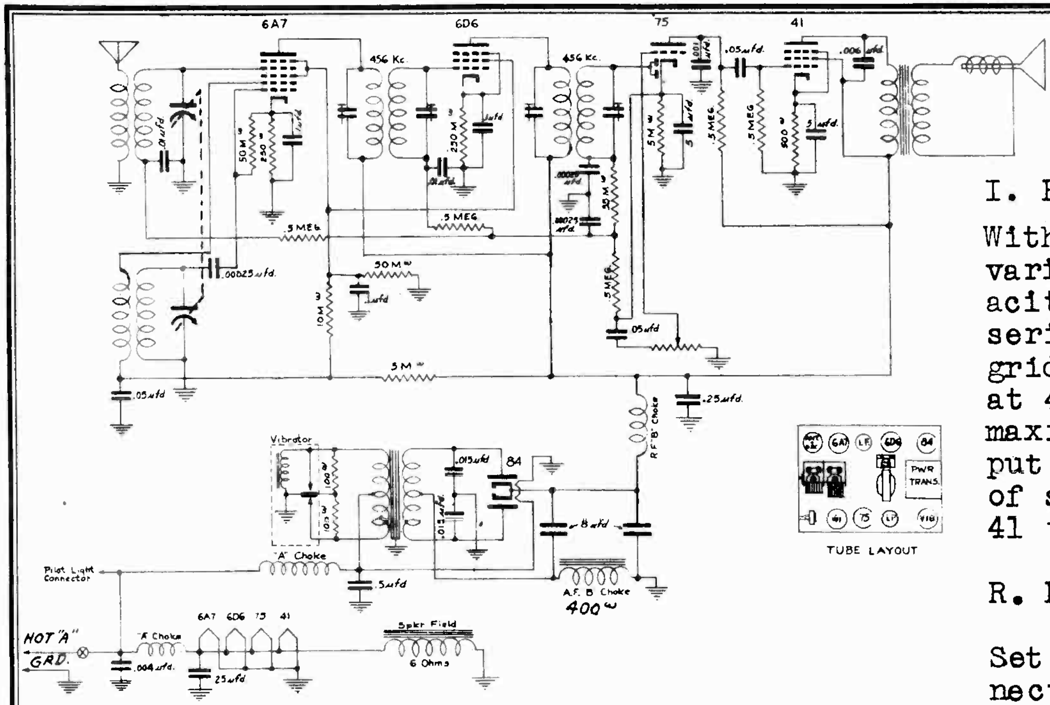


DIAL ADJUSTMENT:

After the control unit and cables have been connected to the set the dial pointer must be adjusted. To do this, rotate the tuning control knob slowly to either right or left until a definite stop is reached; do not force the knob after the stop, as this will damage the control mechanism. Now rotate the knob slowly in the opposite direction until another stop is reached. The pointer will usually come to the end of the dial strip before the stop is reached. It is in this manner that the dial is automatically adjusted to indicate the correct frequency to which the receiver is tuned.

MODEL HA-3
Schematic, Socket
Alignment, Notes

HOWARD RADIO CO.



TUBE LAYOUT

I. F. Alignment:

With volume control turned on full and variable gang condenser at maximum capacity, attach test oscillator lead in series with a 250 mmf. condenser to grid of 6A7 tube. Set test oscillator at 456 KC and adjust I.F. trimmers for maximum output as indicated on an output meter connected across voice coil of speaker or from plate and screen of 41 tube.

R. F. Alignment:

Set test oscillator at 1500 KC and connect to antenna of receiver. Rotate variable gang condenser to minimum capacity and back off slightly. Adjust trimmer on oscillator section of gang condenser (first section from shaft end) to resonance indicated by maximum output. Re-set test oscillator at 1400 KC and rotate variable condenser until oscillator signal is picked up. Adjust antenna (rear section) to resonance. Check alignment at 1400, 1000, 600, and 550 kilocycles by setting test oscillator to these frequencies and rotate condenser until signal is picked up. Off tracking at 1000 and 600 kilocycles may be compensated for by slightly bending the slotted plates of the antenna section of the gang condenser. DO NOT BEND PLATES OF OSCILLATOR SECTION.

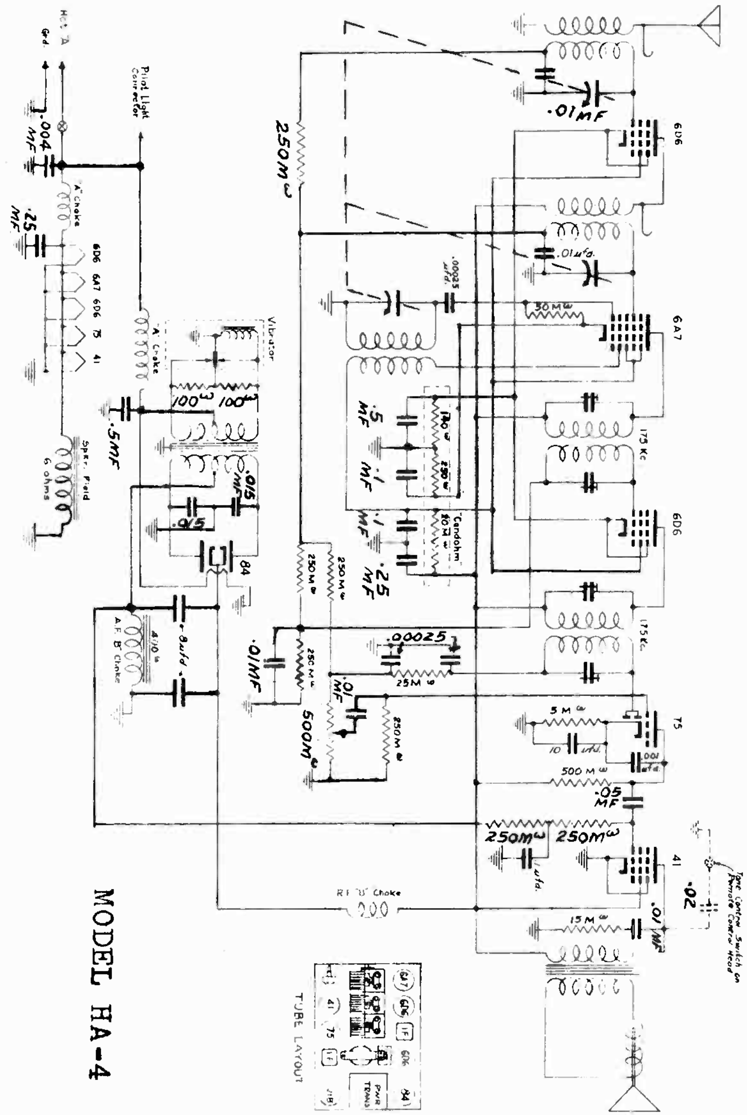
IF PEAK 456 KC.

DIAL ADJUSTMENT:

After the control unit and cables have been connected to the set the dial pointer must be adjusted. To do this, rotate the tuning control knob slowly either right or left until a definite stop is reached; do not force the knob after the stop, as this will damage the control mechanism. Now rotate the knob slowly in the opposite direction until another stop is reached. The pointer will usually come to the end of the dial strip before the stop is reached. It is in this manner that the dial is automatically adjusted to indicate the correct frequency to which the receiver is tuned.

MODEL HA-4
Schematic, Socket
Alignment

HOWARD RADIO CO.



MODEL HA-4

IF Peak 175 kc.

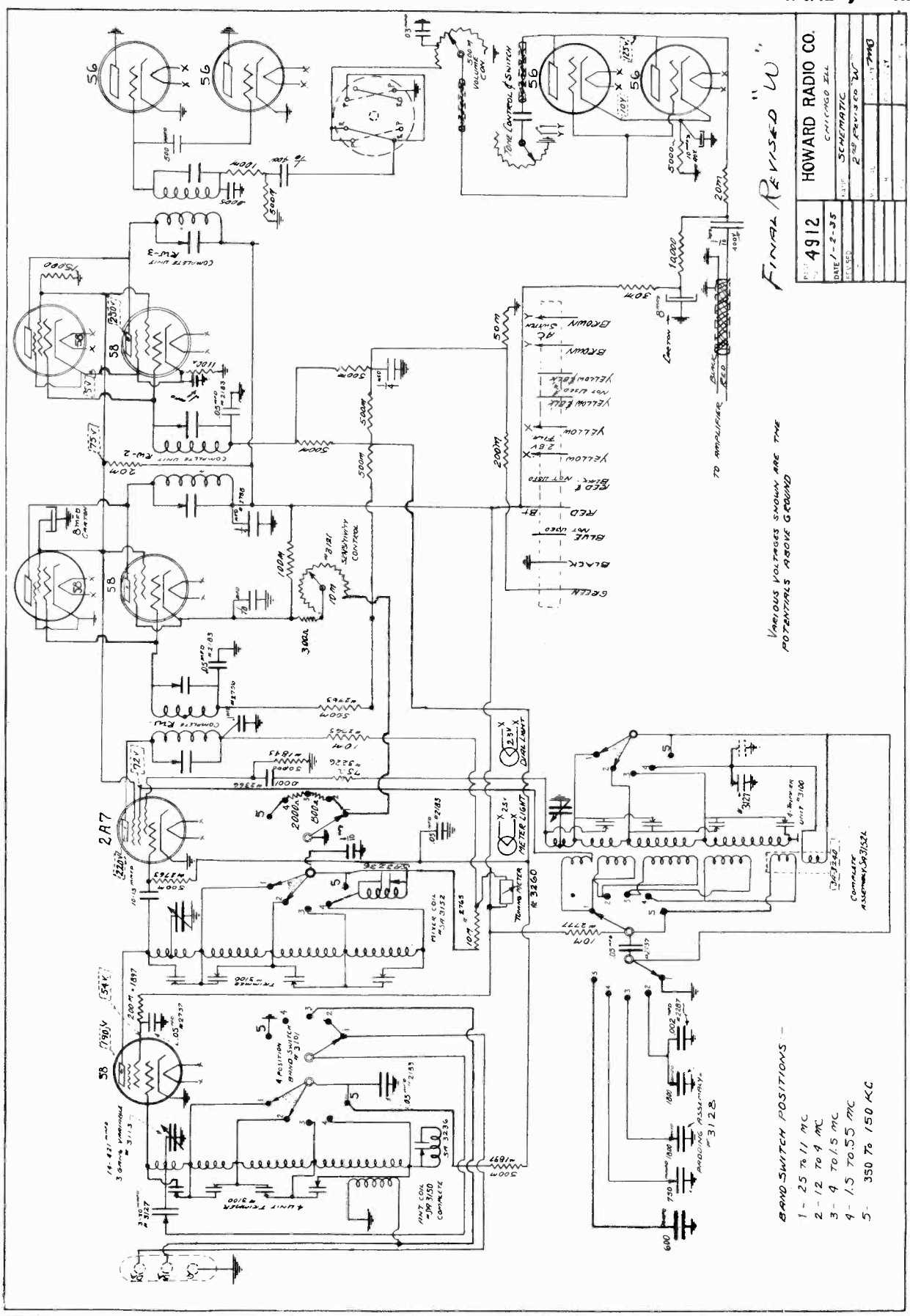
I. F. Alignment:
With volume control turned on full and variable gang condenser at maximum capacity, attach test oscillator lead in series with a 250 mmf. condenser to grid of 6A7 tube. Set test oscillator at 175 KC and adjust I.F. trimmers for maximum output as indicated on an output meter connected across voice coil of speaker or from plate and screen of 41 tube.

R. F. Alignment:
Set test oscillator at 1550 KC and connect to antenna of receiver. Rotate variable gang condenser to minimum capacity and back off slightly. Adjust trimmer on oscillator section of gang condenser (first section from shaft end) to resonance indicated by maximum output. Re-set test oscillator of 1400 KC and rotate variable condenser until oscillator signal is picked up. Adjust antenna trimmer (rear section) and R. F. trimmer (center section) to resonance. Check alignment at 1400, 1000, 600, 550 kilocycles by setting test oscillator to these frequencies and rotate condenser until signal is picked up. Off tracking at 1000 and 600 kilocycles may be compensated for by slightly bending the slotted plates of the antenna and R. F. section of the gang condenser. DO NOT BEND PLATES OF OSCILLATOR SECTION.

DIAL ADJUSTMENT:
To correctly adjust dial pointer, tune set to a station of known frequency or turn selector knob to end of tuning range in either direction and adjust screw in back of remote head until dial pointer reaches correct frequency setting.

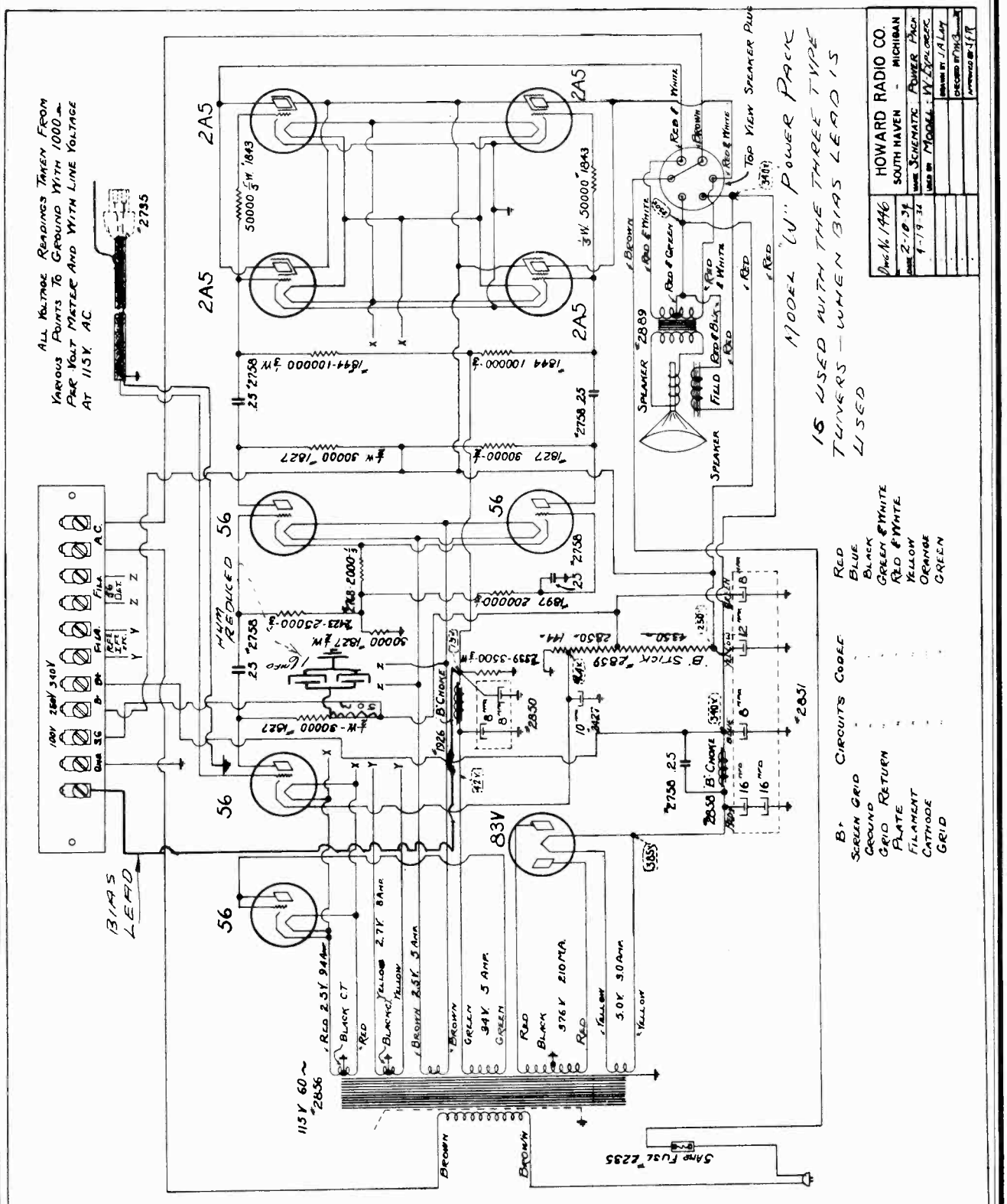
HOWARD RADIO CO.

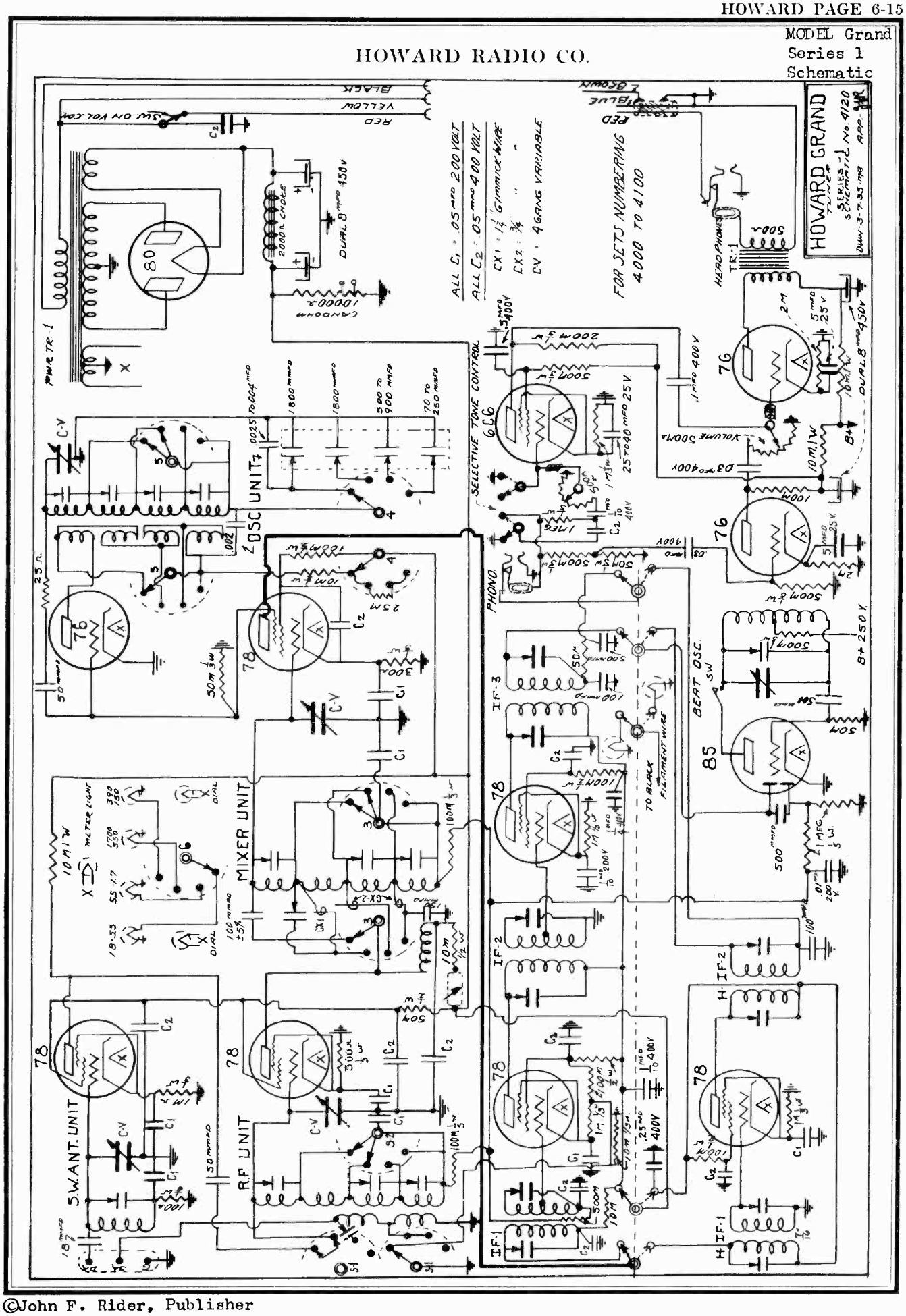
MODEL W, Explorer
Final Revised
Schematic, Voltage



MODEL W, Explorer
Final Revised.
Power Power Schematic

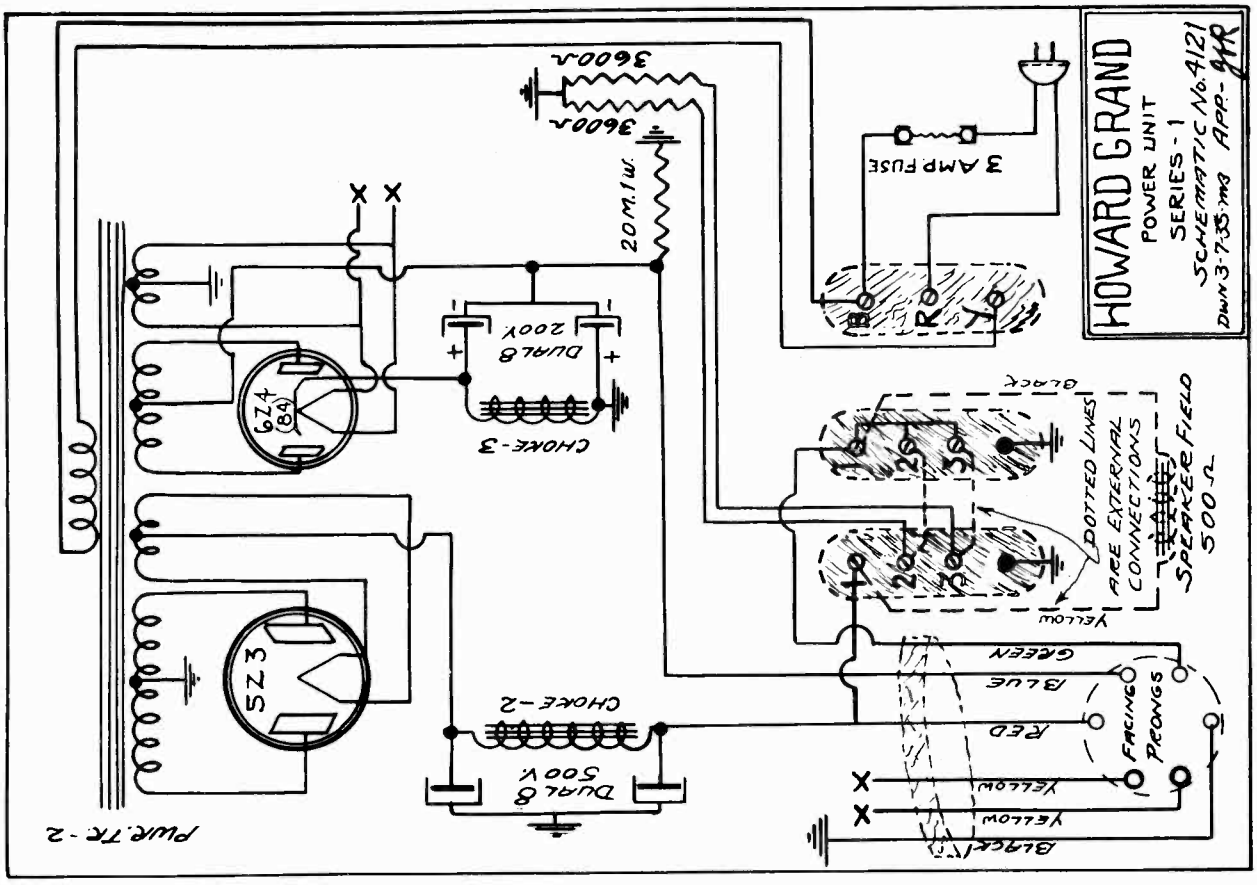
HOWARD RADIO CO.

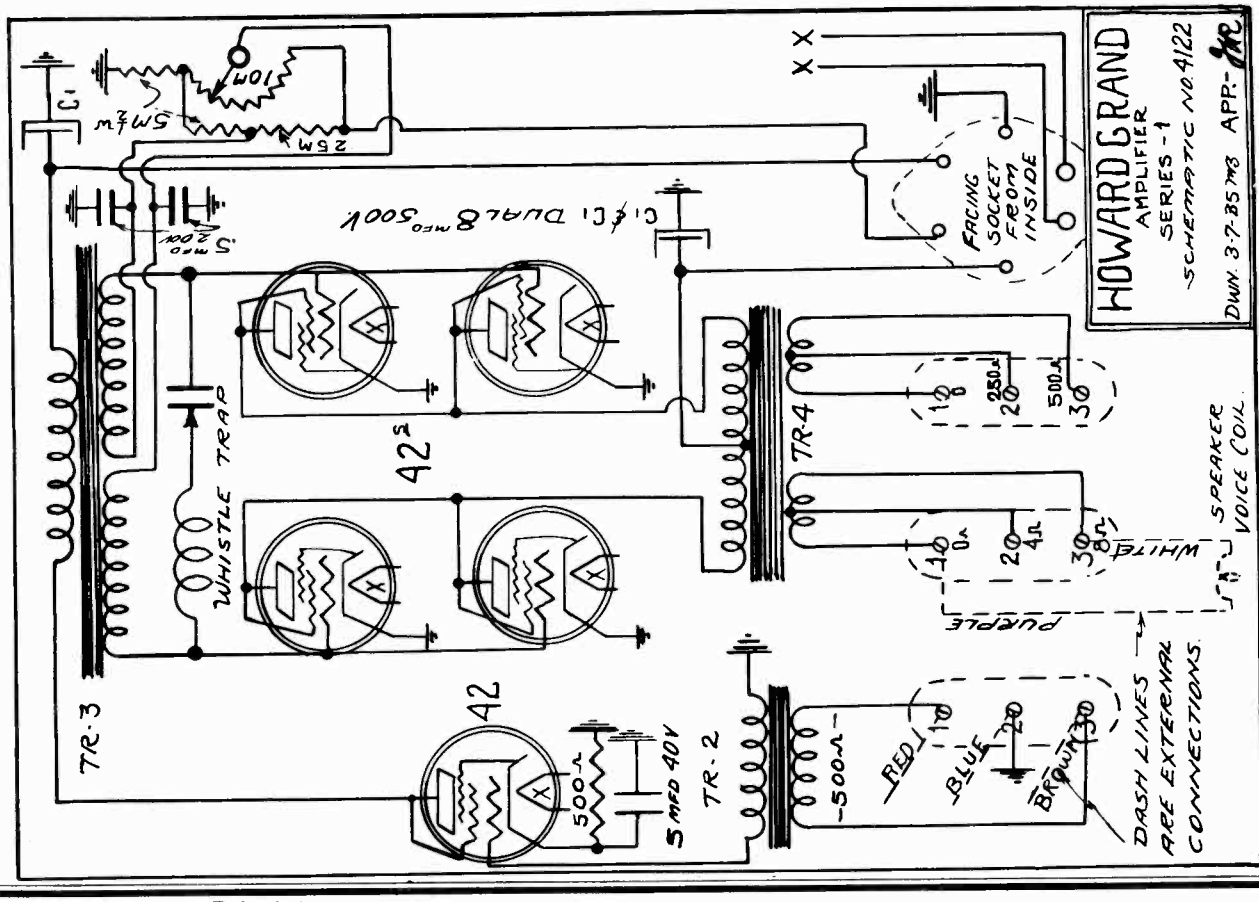




MODEL Grand, Series 1
Amplifier & SPU Schematics

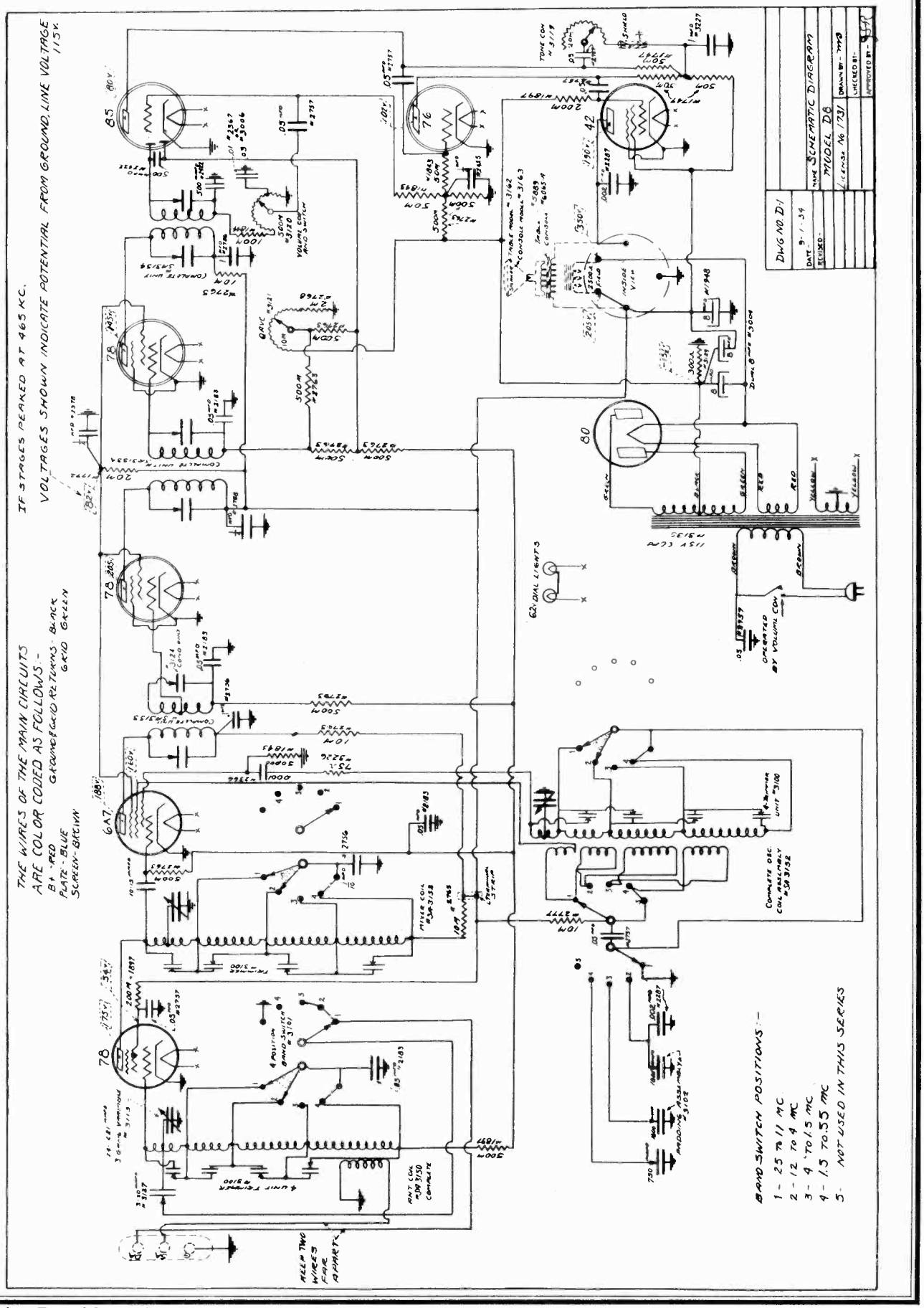
HOWARD RADIO CO.





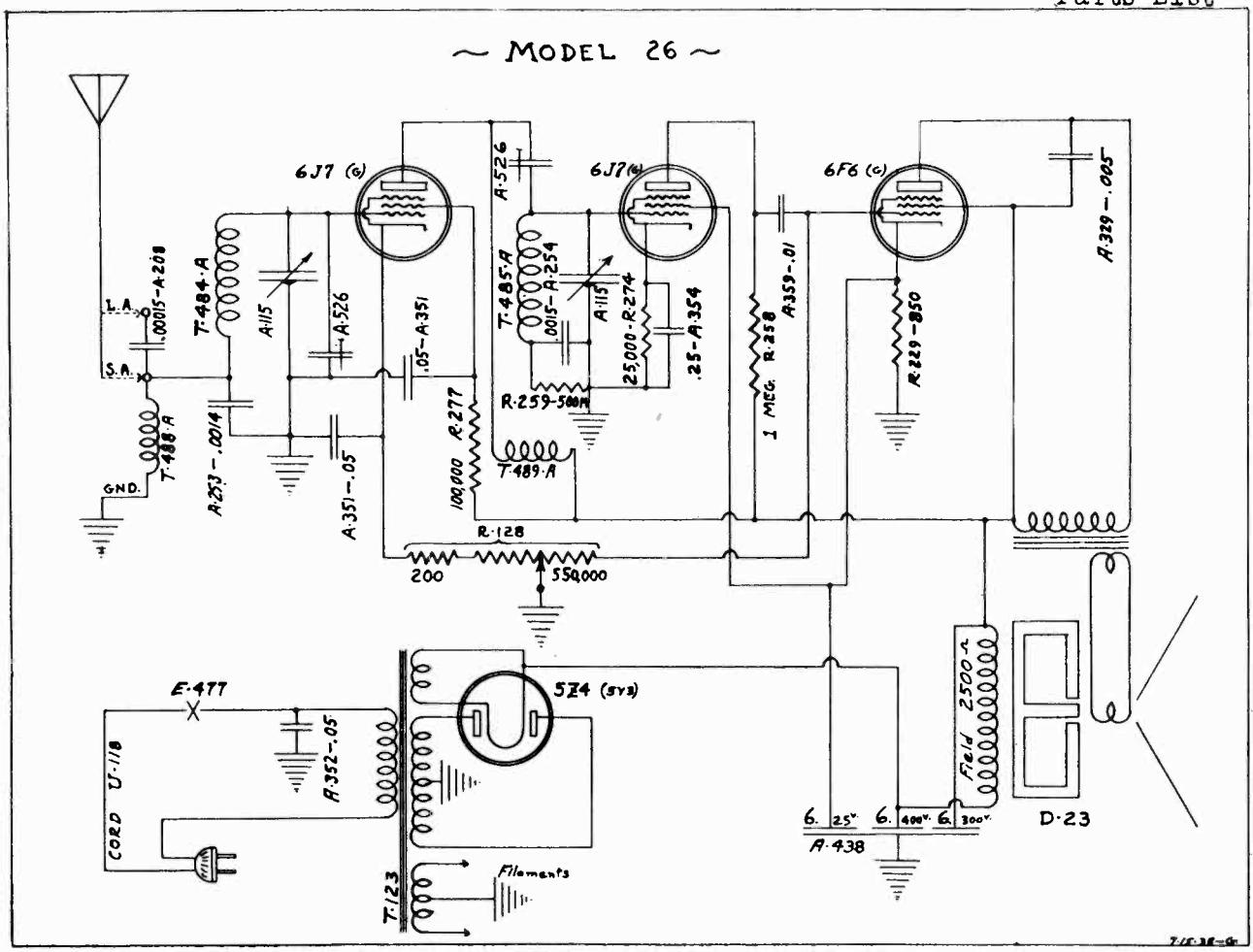
HOWARD RADIO CO.

MODEL D-8
Schematic, Voltage



MODELS 26,226
Schematic
Parts List

INTERNATIONAL RADIO CORP.



PARTS LIST

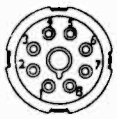
Part No.	Description	List Price
A-115	2 gang tuning condenser	$1.85
A-208	150 mmf. mica condenser	.20
A-253	1400 mmf. mica condenser	.20
A-254	1500 mmf. mica condenser	.20
A-329	.005 mf., 600 v. paper condenser	.15
A-351	.05 mf., 200 v. paper condenser	.15
A-352	.05 mf., 300 v. paper condenser	.15
A-354	.25 mf., 25 v. paper condenser	.20
A-359	.01 mf., 400 v. paper condenser	.15
A-438	Electrolytic filter condenser block	1.35
A-526	Semi-variable trimmer condenser	.15
D-23	Dynamic speaker	3.50
E-157	1" knob	.15
E-158	13/16" knob	.15
E-259	Dial pointer	.05
E-267	Dial scale	.25
E-472	6-8 volt pilot light bulb	.15
E-476	Antenna-ground binding post strip	.10
E-477	A.C. power switch	.25
E-483	Pilot light socket	.10
H-53	6J7 tube socket	.10
H-56	6F6 tube socket	.10
H-57	5Y3 tube socket	.10
R-128	Volume control	.55
R-229	850 ohm, 1/2 w. carbon resistor	.20
R-258	1 megohm, 1/3 w. carbon resistor	.20
R-259	500M ohm, 1/3 w. carbon resistor	.20
R-274	25M ohm, 1/3 w. carbon resistor	.20
R-277	100M ohm, 1 w. carbon resistor	.20
T-123	Power transformer	2.35
T-484A	Antenna coil	.75
T-485A	Detector coil	.75
T-488A	Choke	.20
T-489A	Choke	.20
U-118	A.C. cord and plug	.30
U-207	4 wire speaker cable	.20
X-341	Cabinet (model 26)	5.30
X-348	Cabinet (model 226)	5.30

September, 1935 *Prices subject to change without notice*

MODELS 26,226
Voltage
Alignment,Data

INTERNATIONAL RADIO CORP.

AVERAGE SOCKET VOLTAGES



Bottom View of Socket. VOLTAGES SHOWN ARE FROM TUBE PINS TO GROUND

POSITION	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8
6J7	R. F	Shell	HTR.	250	95	0	—	HTR.	7
6J7	Det.	Shell	HTR.	25	20	10	—	HTR.	10
6F6	A. F.	Shell	HTR.	240	250	0	—	HTR.	20
5Z4	Rect.	Shell	345	—	A.C.	—	A.C.	—	345

Line 118 volts. Volume Control Full On. 10% Variation Allowable.

This chassis is a four tube tuned-radio-frequency receiver designed to operate from 115 volts, 60 cycle A.C. power lines. It tunes the band of 1760 to 540 kilocycles. The following tubes are employed:

6J7 (metal) or 6J7G (glass) Radio frequency
6J7 (metal) or 6J7G (glass) Detector
6F6 (metal) or 6F6G (glass) Pentode output
5Z4 (metal) or 5Y3 (glass) Rectifier

The metal and glass tubes are interchangeable but when changing from one type to the other it is advisable to realign for perfect resonance.

ANTENNA LENGTH

S. A. binding post accommodates antenna of 25 to 60 feet including lead-in.
L. A. binding post, over 60 feet (useful in remote sections).

ALIGNMENT DATA

The rear section of the 2 gang condenser tunes the R. F. stage; the front section the detector. The R. F. section only, has a trimmer condenser connected across it. The small semi-adjustable condenser attached to the detector section is the coupling condenser connected between the R. F. tube plate and Detector control grid.

Alignment may be accomplished using either a signal generator or weak broadcast signals although the signal generator is preferable. An output meter should be connected from the plate of the 6F6 tube to ground (blue and black speaker wires).

Set signal generator at 1400 kilocycles and feed signal to antenna binding post. Keep the output from signal generator as low as possible. Tune in signal on radio and make adjustments for maximum output. Rock the tuning condenser back and forth across the signal while adjusting the R. F. trimmer for resonance.

Next check the alignment at 1000 Kc. Insert a thin bakelite, celluloid or mica feeler strip between the plates of the variable condensers to determine whether the circuits are properly matched. The action is this—the dielectric constant of the celluloid feeler strip being higher than that of the air it displaces, results in an increase of capacity. Open the variable condenser just enough to indicate two or three points below maximum signal. As the feeler is inserted the meter reading should indicate increasing signal and then decreasing as the feeler is inserted farther. This procedure should be followed on both sections. Should the meter fail to show an increase in signal as the strip is inserted in one section this indicates too great a capacity for the section. This may be corrected by bending the outside rotor plates out at the point where they begin to mesh with the stator.

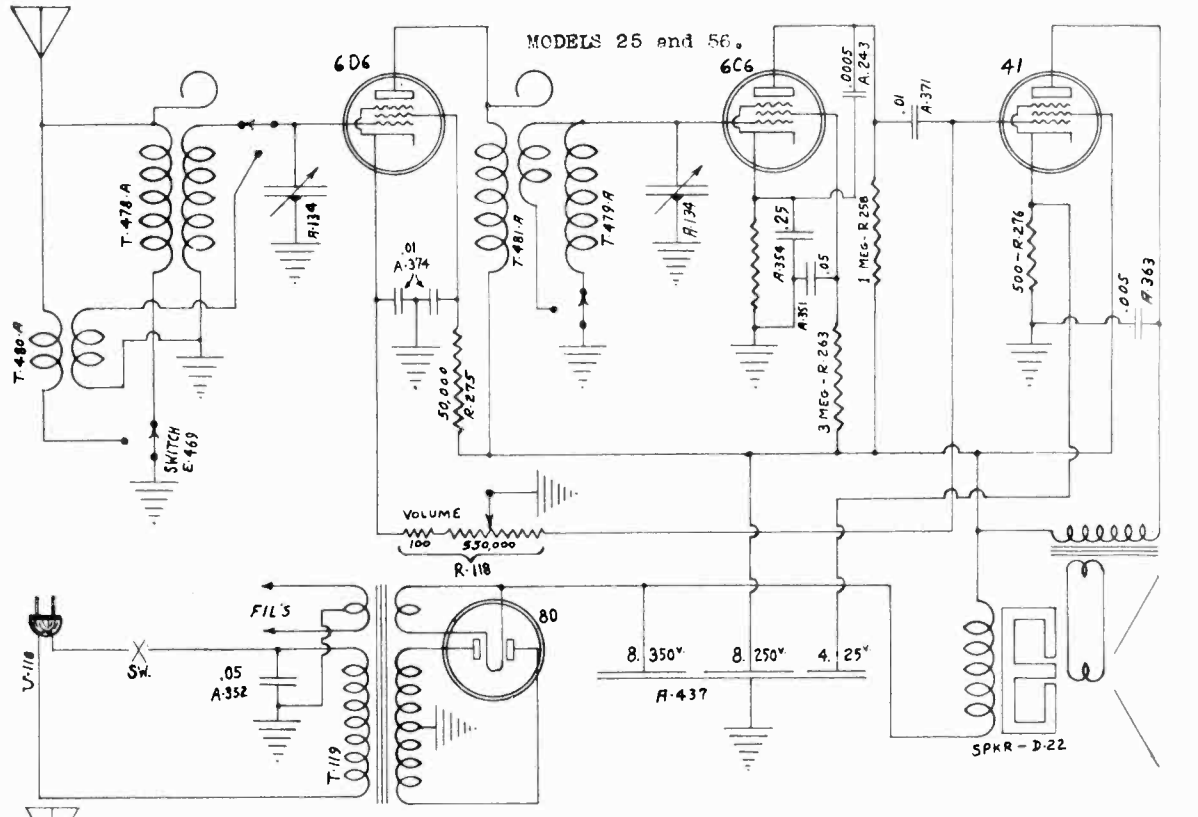
After checking the alignment at 1000 Kc. repeat the process at 600 Kc.

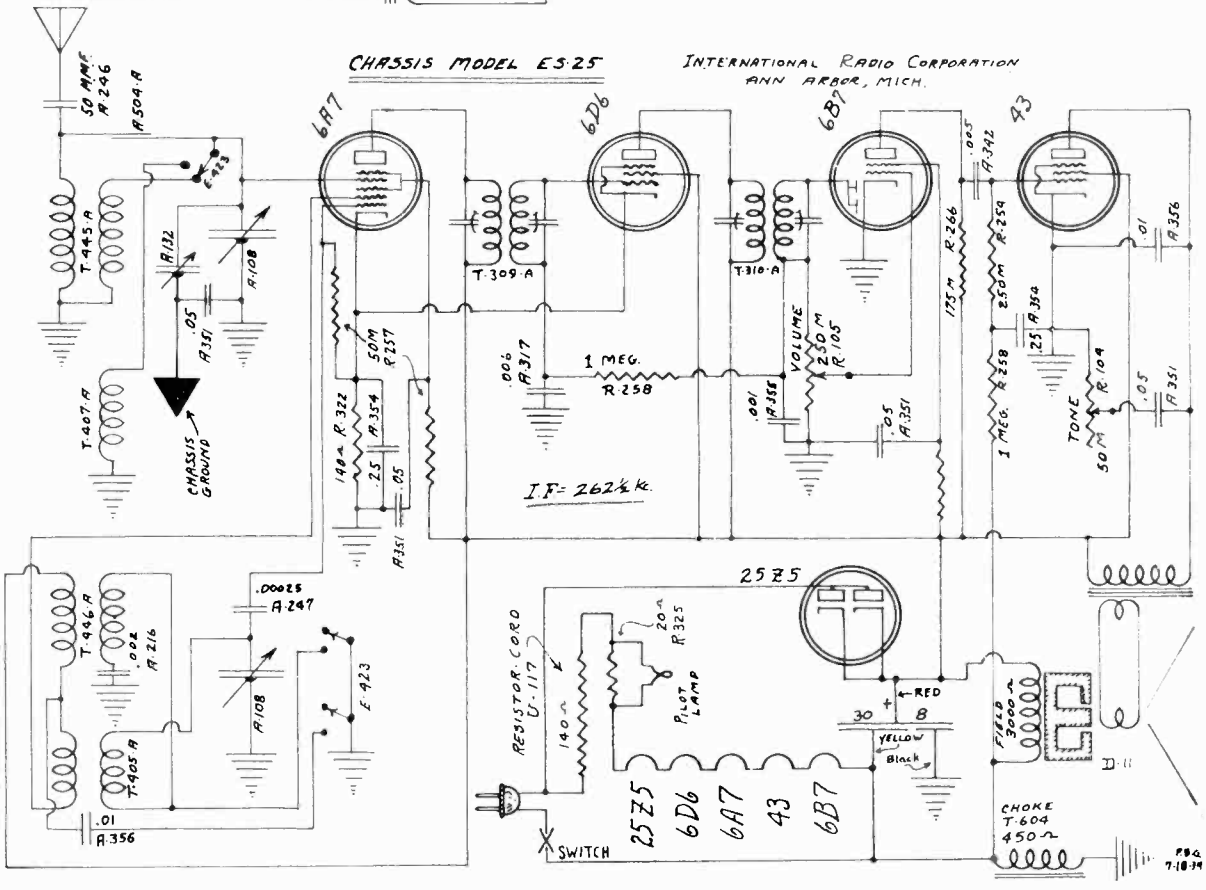
INTERSTAGE COUPLING CONDENSER

The interstage coupling condenser connected between the plate of the R.F. tube and control grid of the detector should be adjusted so there is slight oscillation at the high frequency end of the band when the volume control is in full on position. Slight oscillation may be noticed also at the low frequency end.

MODELS 25,56
MODEL ES-25
Schematics

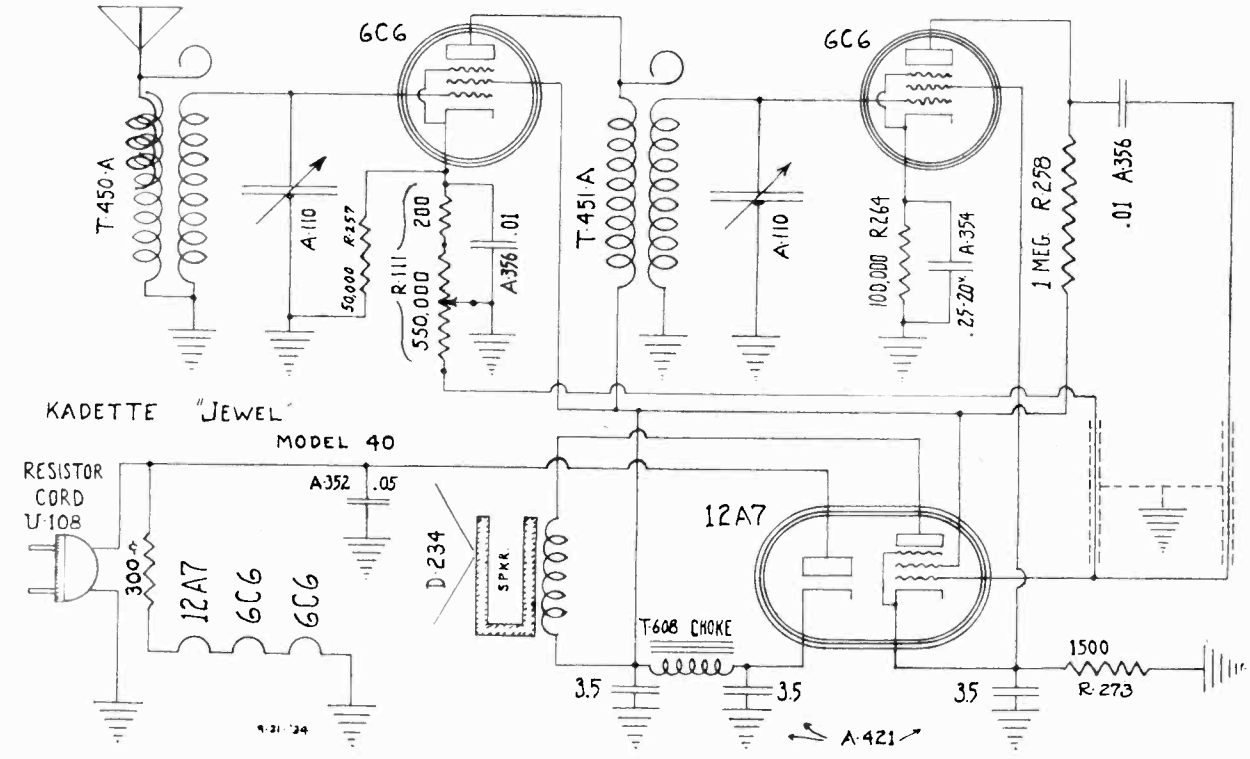
INTERNATIONAL RADIO CORP.



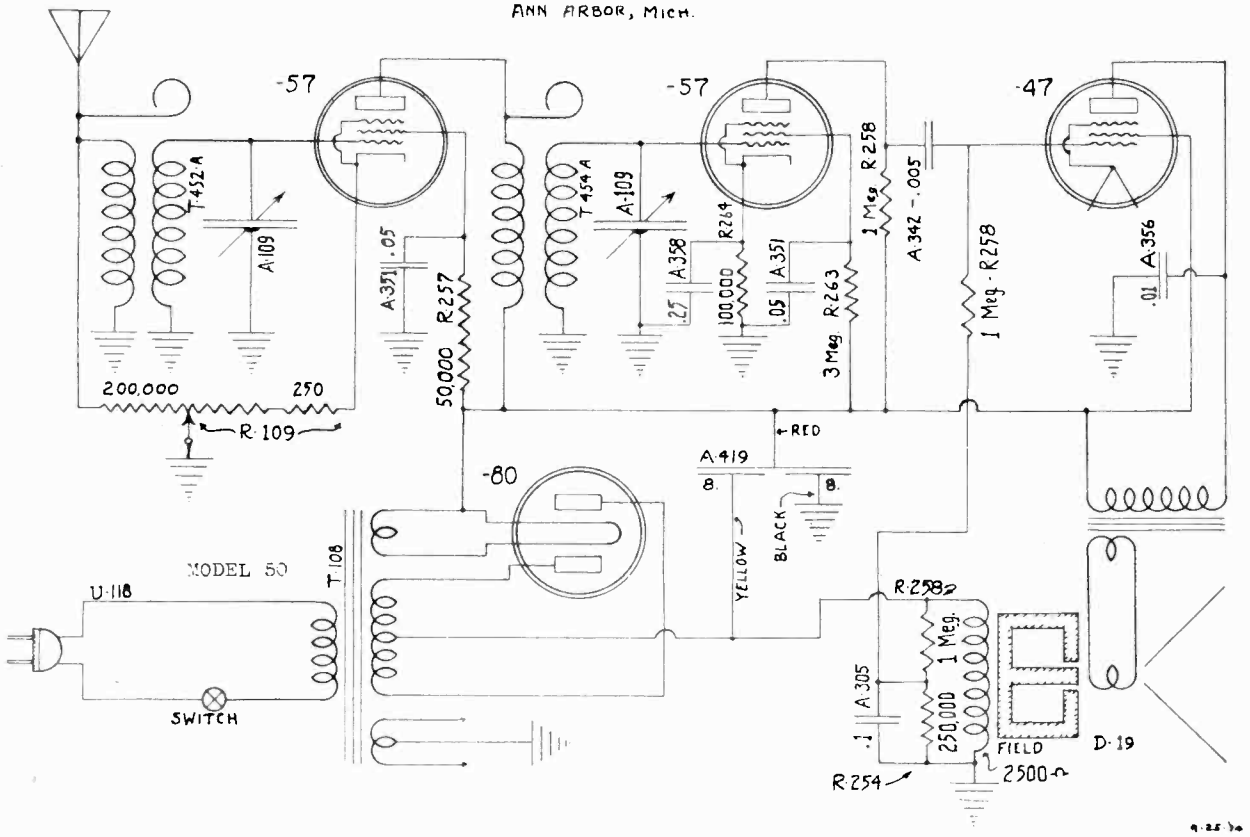


MODEL 40, Jewel
MODEL 50
Schematics

INTERNATIONAL RADIO CORP.

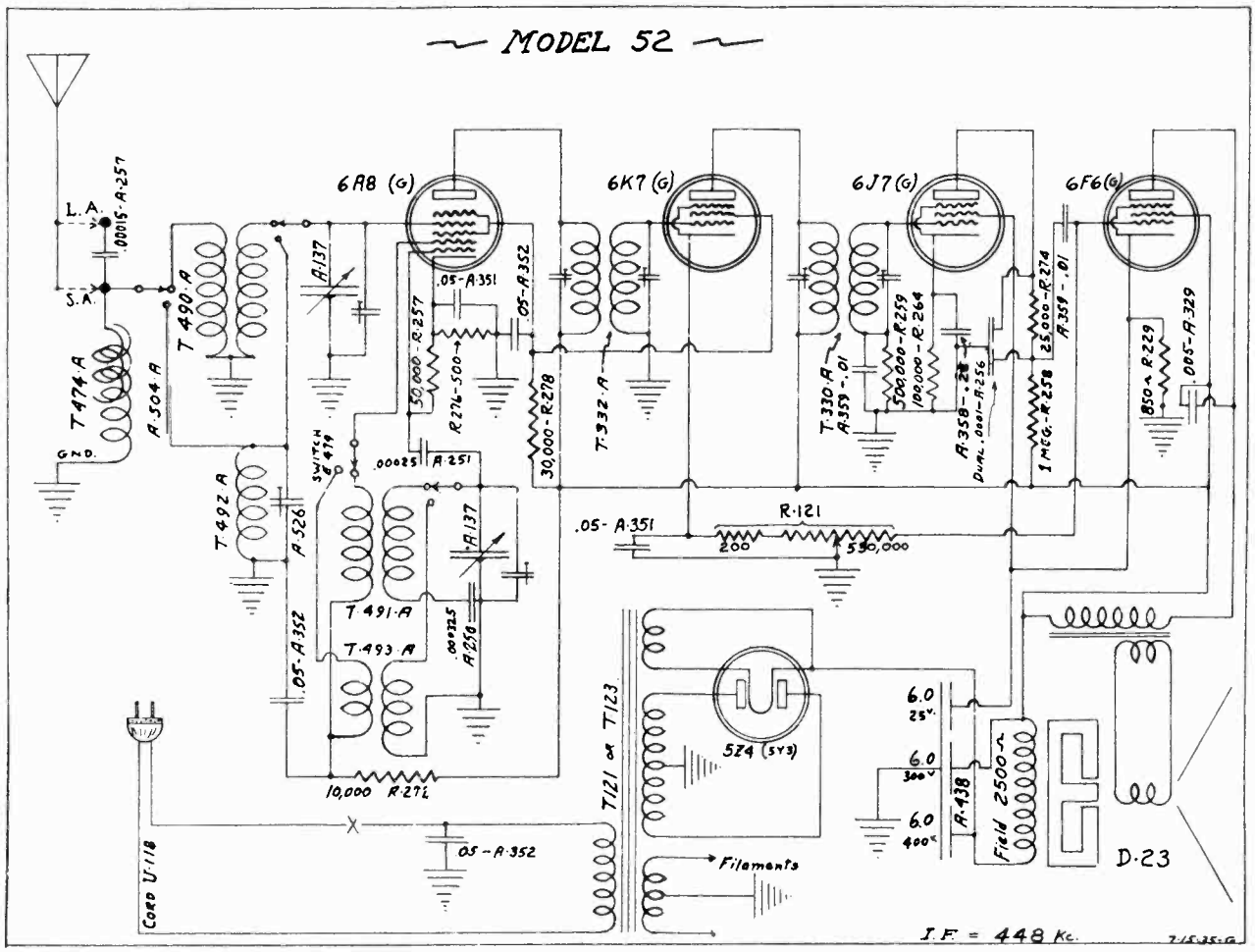


INTERNATIONAL RADIO CORPORATION
ANN ARBOR, MICH.



MODEL 52
Schematic
Parts

INTERNATIONAL RADIO CORP.



PARTS LIST

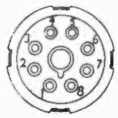
Part No.	Description	List Price
A-137	2 gang tuning condenser	$1.65
A-208	150 mmf. mica condenser	.20
A-250	325 mmf. mica condenser	.20
A-251	.00025 mf. mica condenser	.20
A-256	Dual .0001 mf. mica condenser	.20
A-329	.005 mf., 600v. paper condenser	.15
A-351	.05 mf., 200v. paper condenser	.15
A-352	.05 mf., 300v. paper condenser	.15
A-358	.25 mf., 120v. paper condenser	.20
A-359	.01 mf., 400v. paper condenser	.15
A-438	6-6-6 mf. electrolytic filter condenser	1.35
A-526	Semi-variable trimmer condenser	.15
D-29	5 inch dynamic speaker	3.50
E-157	Black and silver knobs	.15
E-160	Black and silver knob with yellow and red dots	.15
E-265	Dial assembly	1.50
E-472	Pilot light bulbs 6-8 volts	.15
E-476	Antenna and ground strip	.10
E-479	Wave band switch	.45
H-49	6A8 tube socket	.10
H-53	6J7 tube socket	.10
H-54	6K7 tube socket	.10
H-56	6F6 tube socket	.10
H-57	5Y3 tube socket	.10
R-121	Volume control with power switch	.75
R-229	850 ohm, 1/2 w. carbon resistor	.20
R-257	50M ohm, 1/3 w. carbon resistor	.20
R-258	1 megohm, 1/3 w. carbon resistor	.20
R-259	500M ohm, 1/3 w. carbon resistor	.20
R-264	100M ohm, 1/3 w. carbon resistor	.20
R-272	10M ohm, 1/3 w. carbon resistor	.20
R-274	25M ohm, 1/3 w. carbon resistor	.20
R-276	500 ohm, 1/3 w. carbon resistor	.20
R-278	30M ohm, 1 w. carbon resistor	.20
S-102	Goat tube shield	.10
T-121	Power transformer	2.35
T-330A	2nd I.F. transformer	1.25
T-332A	1st I.F. transformer	1.25
T-474A	448 Kc. wave trap	.35
T-490A	Broadcast detector coil	1.00
T-491A	Broadcast oscillator coil	1.00
T-492A	Short wave detector coil	.35
T-493A	Short wave oscillator coil	.35
U-118	A.C. cord and plug	.30
U-206	4 wire speaker cable	.20
X-343	Cabinet	5.70

September, 1935 *Prices Subject to Change Without Notice*

MODEL 52
Voltage
Alignment

INTERNATIONAL RADIO CORP.

AVERAGE SOCKET VOLTAGES



Bottom View of Socket. VOLTAGES SHOWN ARE FROM TUBE PINS TO GROUND

	POSITION	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8
6A8	Det.-Osc.	Shell	HTR.	195	70	— 10	140	HTR.	3
6K7	I. F.	Shell	HTR.	210	90	1.5	—	HTR.	1.5
6J7	2nd Det.	Shell	HTR.	50	15	4	—	HTR.	.4
6F6	A. F.	Shell	HTR.	200	210	0	—	HTR.	15
5Z4	Rect.	Shell	300	—	A.C.	—	A.C.	—	300

Line 118 volts. Switch on Broadcast Position. Volume Control Full On. 10% Variation Allowable.

Model 52 is designed to operate from 115 volts, 60 cycle alternating current power lines. It is a two band receiver covering the American broadcast and Foreign short wave bands.

The following tubes are employed:

6A8 (metal) or 6A8G (glass) 1st Detector-Oscillator
6K7 (metal) or 6K7G (glass) I.F. Amplifier
6J7 (metal) or 6J7G (glass) 2nd Detector
6F6 (metal) or 6F6G (glass) Pentode output
5Z4 (metal) or 5Y3 (glass) Rectifier

The metal and glass tubes are interchangeable but when changing from one type to the other it is advisable to realign for perfect resonance. The 6J7G tube should be shielded but shielding may be omitted when using the all metal 6J7.

ALIGNMENT

The standard type of output meter should be used to indicate signal strength. It should be connected from the plate (pin No. 3) of the 6F6 to ground. The signal from the signal generator *must be kept at a very low level.*

ESSENTIAL DATA: The intermediate frequency used is 448 Kc. On the broadcast band the oscillator frequency is 448 Kc. higher than the signal frequency. On the short wave band it is 448 Kc. lower than the signal frequency.

Aligning should be done on the following frequencies: Broadcast band 1400 and 600 kilocycles; Short wave band 12 and 6 megacycles.

It is permissible to bend condenser plates when aligning the broadcast band but not the short wave band.

INTERMEDIATES: To align the I.F. circuits, set the signal generator to 448 Kc. and feed its modulated signal direct to the antenna. Short out the oscillator section of the two gang condenser. Adjust the first I.F. transformer trimmers for maximum meter reading. Go over both adjustments at least three or four times for accuracy. Repeat this process on the second I.F. transformer. If adjustments are not made accurately, selectivity will be poor and I.F. oscillation may result.

BROADCAST BAND: Place the band change switch on Broadcast position. Turn the dial to 1400 Kc. and feed a *very weak* 1400 Kc. modulated signal from your signal generator to the antenna. Adjust the broadcast oscillator trimmer (on condenser gang) for maximum reading.

There is no adjustable padder condenser in this model so resonance on the low frequency end is accomplished by bending plates on the tuning condensers.

SHORT WAVE BAND: There is a separate trimmer condenser across the short wave detector coil. It is mounted on the bottom of the chassis at the end. Adjustment should be made at 12 megacycles. Instead of bending condenser plates at 6 megacycles, alignment is accomplished by spreading or crowding turns on the short wave detector coil. If much crowding or spreading is necessary it is advisable to go back and recheck at 12 megacycles.

MICROPHONIC HOWL

The tuning condenser is cushion mounted to eliminate vibration. Do not allow the dial to touch the escutcheon plate on the cabinet or a microphonic condition will be created.

MODELS 53,553
Early and Late
Alignment

INTERNATIONAL RADIO CORP.

Models 53 & 553

This chassis is designed to operate from 115 volt, 60 cycle, alternating current power lines. It is a three band receiver covering the American broadcast, police and airport, and Foreign shortwave bands. The following tubes are employed:

6A8 (metal) or 6A8G (glass) 1st Detector-Oscillator
*6J7 (metal) or 6J7G (glass) 2nd Detector
6F6 (metal) or 6F6G (glass) Pentode output
6K7 (metal) or 6K7G (glass) 1. F. Amplifier
* 75 (glass) 2nd Detector, A.V.C. and 1st A.F.
5Z4 (metal) or 5Y3 (glass) Rectifier

*6J7 or 6J7G used in first production; 75 used in later production.

The metal and glass tubes are interchangeable but when changing from one type to the other it is advisable to realign for perfect resonance. Glass counterpart types should be shielded. The metal tubes need not be. Shielding provisions are provided. The 75 tube must be shielded at all times.

TWO CIRCUITS

It will be noted by referring to the circuit diagram that sets of early production did not incorporate A.V.C. In later production the 6J7 tube has been replaced with a 75 and A.V.C. added. In other respects the two circuits are identical.

ALIGNMENT

The standard type of output meter should be used to indicate signal strength. It should be connected from the plate (pin No. 3) of the 6F6 to ground. Tone control should be turned "high." The signal from the signal generator *must be kept at a very low level.*

ESSENTIAL DATA: The intermediate frequency employed is 448 Kc. On the broadcast and middle bands the oscillator frequency is 448 kilocycles higher than the signal frequency. On the short wave band it is 448 kilocycles lower than the signal frequency.

Aligning should be done on the following frequencies: Broadcast band, 1,400 and 600 Kc.; Middle band, 6,000 and 2,400 Kc.; Short wave band 15 megacycles.

Do not bend tuning condenser plates when aligning or it will be impossible to make all three bands track correctly.
The front section of the two gang condenser is the oscillator section, the rear section the first detector.

INTERMEDIATES: To align the I.F. circuits, set the signal generator to 448 Kc. and feed its modulated signal direct to the antenna. Short out the oscillator section of the two gang condenser. Adjust the first I.F. transformer trimmers for maximum meter reading. Go over both adjustments at least three or four times for accuracy. Repeat this process on the second I.F. transformer. If adjustments are not made accurately, selectivity will be poor and I. F. oscillation may result.

BROADCAST BAND: Place the band change switch on Broadcast position. Turn the dial to 1400 Kc. and feed a very weak 1400 Kc. modulated signal from your signal generator to the antenna. Adjust the Broadcast oscillator trimmer (see sketch) for maximum reading. Although a trimmer is provided for the Broadcast detector coil it will be found not connected in many sets as it is not necessary in obtaining correct balance.

Turn dial and signal generator to 600 Kc. and rock the padder into correct adjustment. This is accomplished by very slowly adjusting the padder condenser and at the same time turning the dial slightly back and forth across 600 Kc. until an adjustment is obtained producing maximum output. Go back to 1400 Kc. and readjust the oscillator trimmer slightly if necessary. Then recheck padder at 600 Kc.

MIDDLE BAND: Turn the band change switch to the middle position and tune radio and signal generator to 6000 Kc. Adjust the oscillator trimmer and then the detector trimmer for maximum output.

Rock in the padder condenser at 2400 Kc. Then recheck at 6000 Kc. and 2400 Kc.

SHORT WAVE BAND: Turn band change switch to short wave band. Tune radio and signal generator to 15 megacycles and adjust trimmers. No padder condenser is used on the short wave band so no other adjustments are necessary. On this band the oscillator frequency is 448 Kc. lower than the signal frequency

MICROPHONIC HOWL

The 2 gang condenser is cushion mounted to eliminate vibration of the plates. Do not allow the dial to touch the escutcheon plate on the cabinet or a microphonic condition will be created.

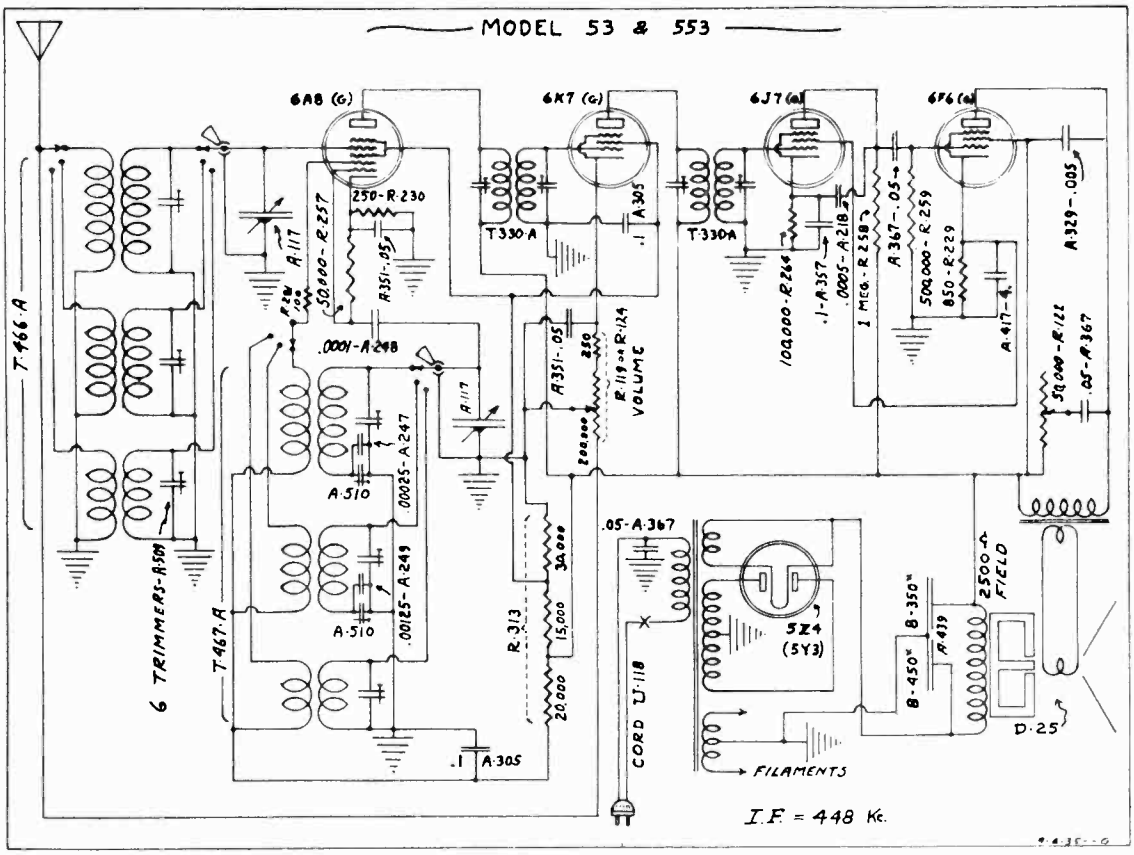
LONG WAVE-EXPORT MODEL

Model 53 is also built with a four position switch (part number E-482) and an extra set of coils tuning the foreign long wave band. The order of band change switch positions is broadcast, mid-band, short wave, long wave band. Alignment—adjust long wave trimmers at 350 Kc. and rock in long wave padder at 160 Kc. See sketch for location of coils and condensers.

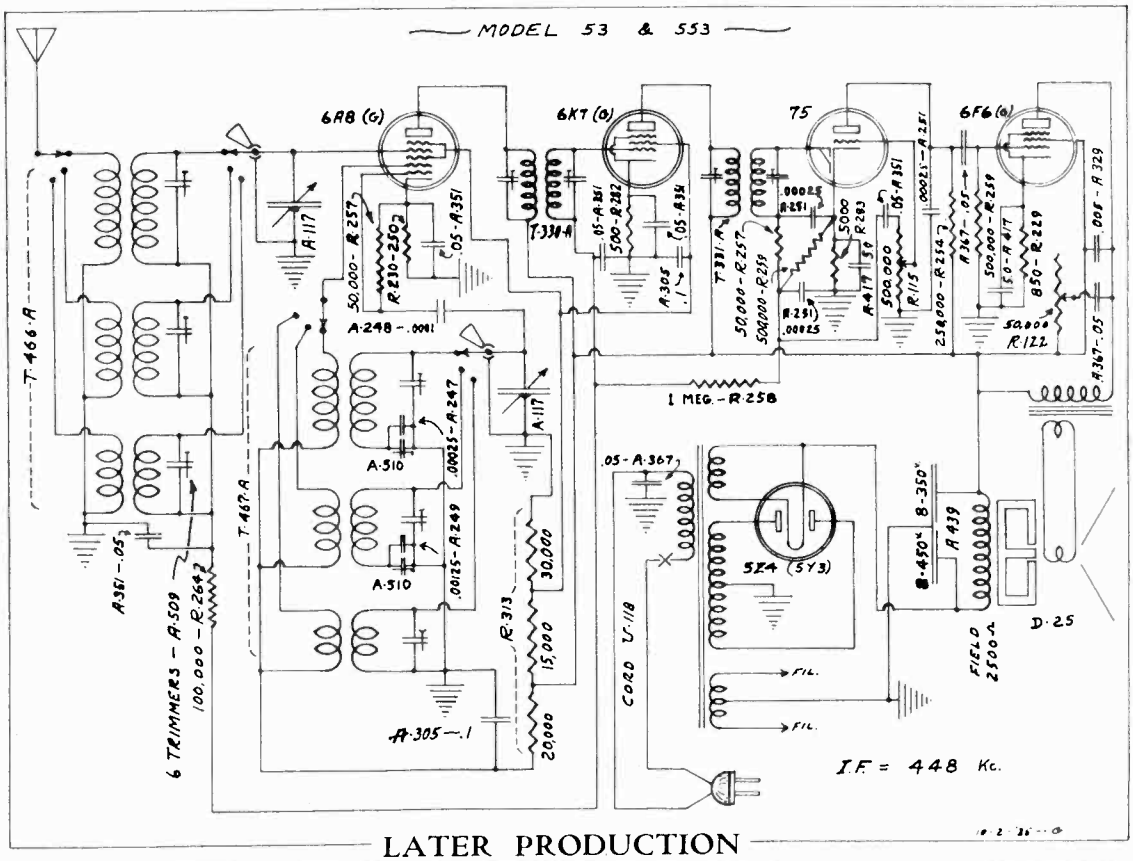
Some export sets also contain a 25 cycle power transformer (part number T-502) which has a tapped primary winding allowing operation from 125, 150 or 250 volt A.C. power lines The tap switch is made available by removing part of the cover of the power transformer. 25 cycle sets may be used on 60 cycle although the converse is not true.

MODELS 53, 553
Early and Late
Schematics

INTERNATIONAL RADIO CORP.



FIRST PRODUCTION

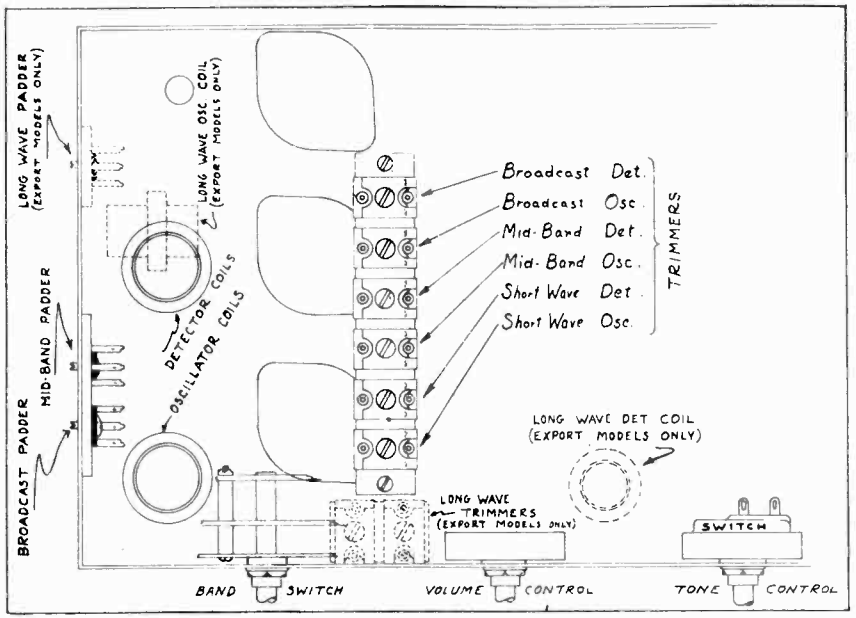


LATER PRODUCTION

PARTS PRICE LIST

MODELS 53 & 553

Part No.	Description	List Price
A-117	2 gang tuning condenser	$2.00
A-218	.0005 mf. mica condenser	.20
A-247	.00025 mf. mica condenser	.20
A-248	.0001 mf. mica condenser	.20
A-249	.00125 mf. mica condenser	.20
A-251	.00025 mf. mica condenser	.20
A-305	.1 mf., 200 v. paper condenser	.15
A-329	.005 mf., 600 v. paper condenser	.15
A-351	.05 mf., 200 v. paper condenser	.15
A-357	.1 mf., 25 v. paper condenser	.15
A-367	.05 mf., 400 v. paper condenser	.15
A-117	4 mf., 25 v. electrolytic condenser	.55
A-439	Electrolytic filter condenser	1.30
A-509	6 gang trimmer condenser	.55
A-510	Dual padder condenser	.45
A-515	Single padder (long wave model only)	.25
A-527	Dual trimmer condenser (long wave model only)	.20
D-25	Dynamic speaker	1.35
E-155	1 inch knob	.15
E-156	13/16 inch knob	.15
E-159	1 inch knob with colored dots	.20
E-269	Dial assembly	1.65
E-271	Dial assembly (for Long wave model)	1.65
E-472	Pilot lamps, 6-8 volt	.15
E-480	3 position band change switch	1.00
E-482	4 position band change switch—(long wave model)	1.50
E-484	Antenna-ground binding post strip	.10
H-25	7S tube socket	.10
H-49	6A8 tube socket	.10
H-53	6J7 tube socket	.10
H-54	6K7 tube socket	.10
H-56	6F6 tube socket	.10
H-57	5Z4 tube socket	.10
R-115	Volume control	.55
R-119 or R-124	Volume control	.60
R-122	Tone control with power switch	.70
R-229	850 ohm, 1/2 w. carbon resistor	.20
R-230	250 ohm, 1/3 w. carbon resistor	.20
R-254	250M ohm, 1/3 w. carbon resistor	.20
R-257	50M ohm, 1/3 w. carbon resistor	.20
R-258	1 megohm, 1/3 w. carbon resistor	.20
R-259	500M ohm, 1/3 w. carbon resistor	.20
R-264	100M ohm, 1/3 w. carbon resistor	.20
R-281	100 ohm, 1/3 w. carbon resistor	.20
R-282	500 ohm, 1/3 w. carbon resistor	.20
R-283	5000 ohm, 1/3 w. carbon resistor	.20
R-313	Candohm resistor, 20M-15M-30M ohms	.55
S-102	Goat tube shield	.10
T-122	Power transformer (60 cycle)	2.50
T-330A	IF transformer	1.25
T-166A	Detector coil	1.75
T-167A	Oscillator coil	1.75
T-168A	L. W. Detector coil (long wave model only)	.85
T-169A	L. W. Oscillator coil (long wave model only)	.85
T-502	Power transformer, 25 cycle, tapped-primary (Export models only)	6.50
U-118	A. C. cord and plug	.30
U-206	4 wire speaker cable	.20
X-311	Cabinet (Model 53)	7.50
X-319	Cabinet (Model 553)	7.25



Bottom View of Socket. VOLTAGES SHOWN ARE FROM TUBE PINS TO GROUND

Position	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8
6A8	Det.-Osc.	Shell	HTR.	265	98	—5	138	HTR.	1
6K7	I. F.	Shell	HTR.	265	98	1	—	HTR.	1
*6J7	2nd Det.	Shell	HTR.	55	20	5	—	HTR.	5
6F6	A. F.	Shell	HTR.	255	265	0	—	HTR.	20
5Z4	Rect.	Shell	390	—	A.C.	—	A.C.	—	390

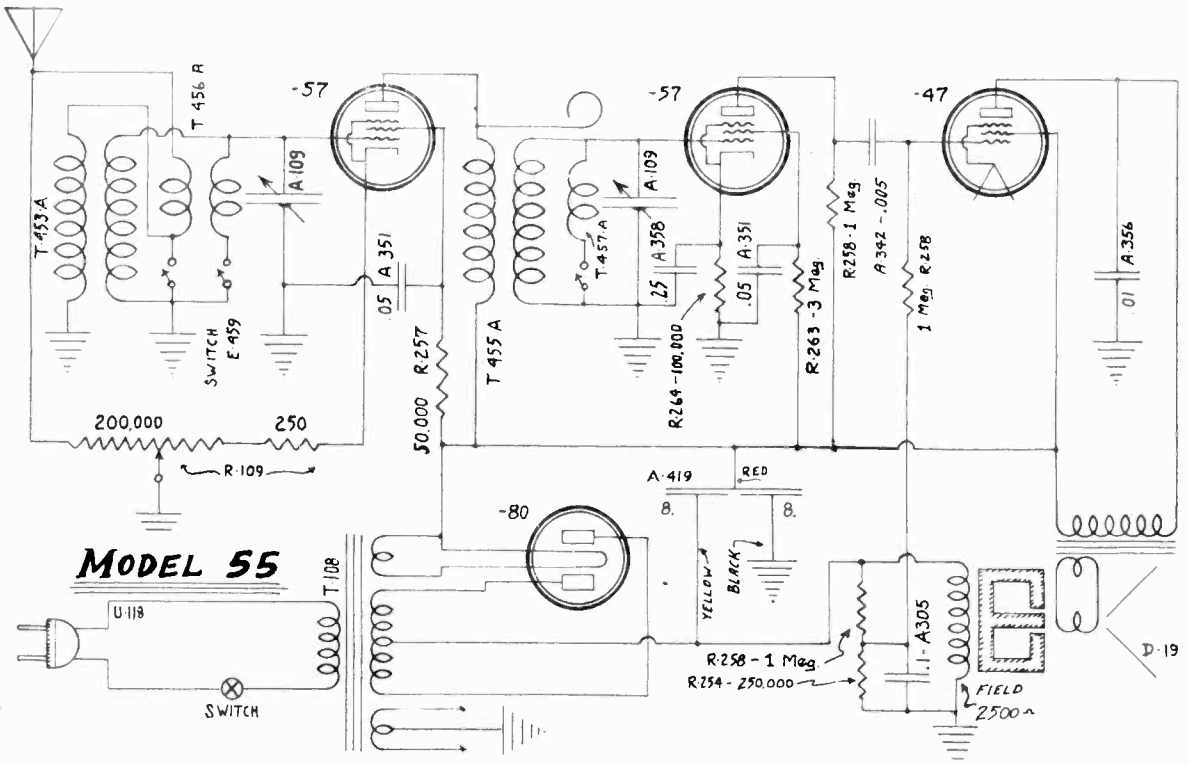
	Position	E_K	E_P	E_{DP}
*75	2nd Det.	1.5	95	0

*6J7 used in early production—75 in later production.

Line 118 Volts. Switch On Broadcast Position. Volume Control Full On. 10% Variation Allowable.

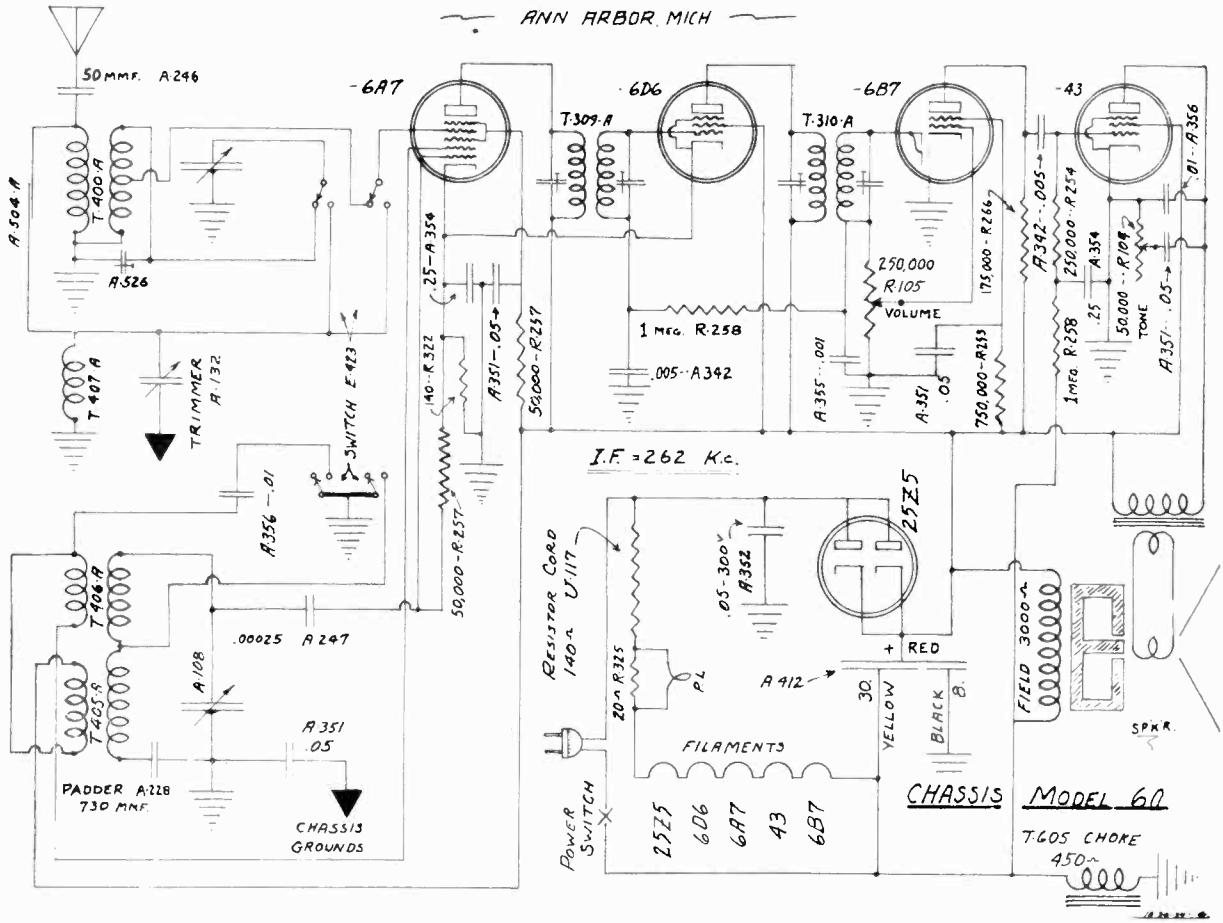
MODEL 55
MODEL 60
Schematics

INTERNATIONAL RADIO CORP.



MODEL 55

INTERNATIONAL RADIO CORPORATION
ANN ARBOR, MICH.

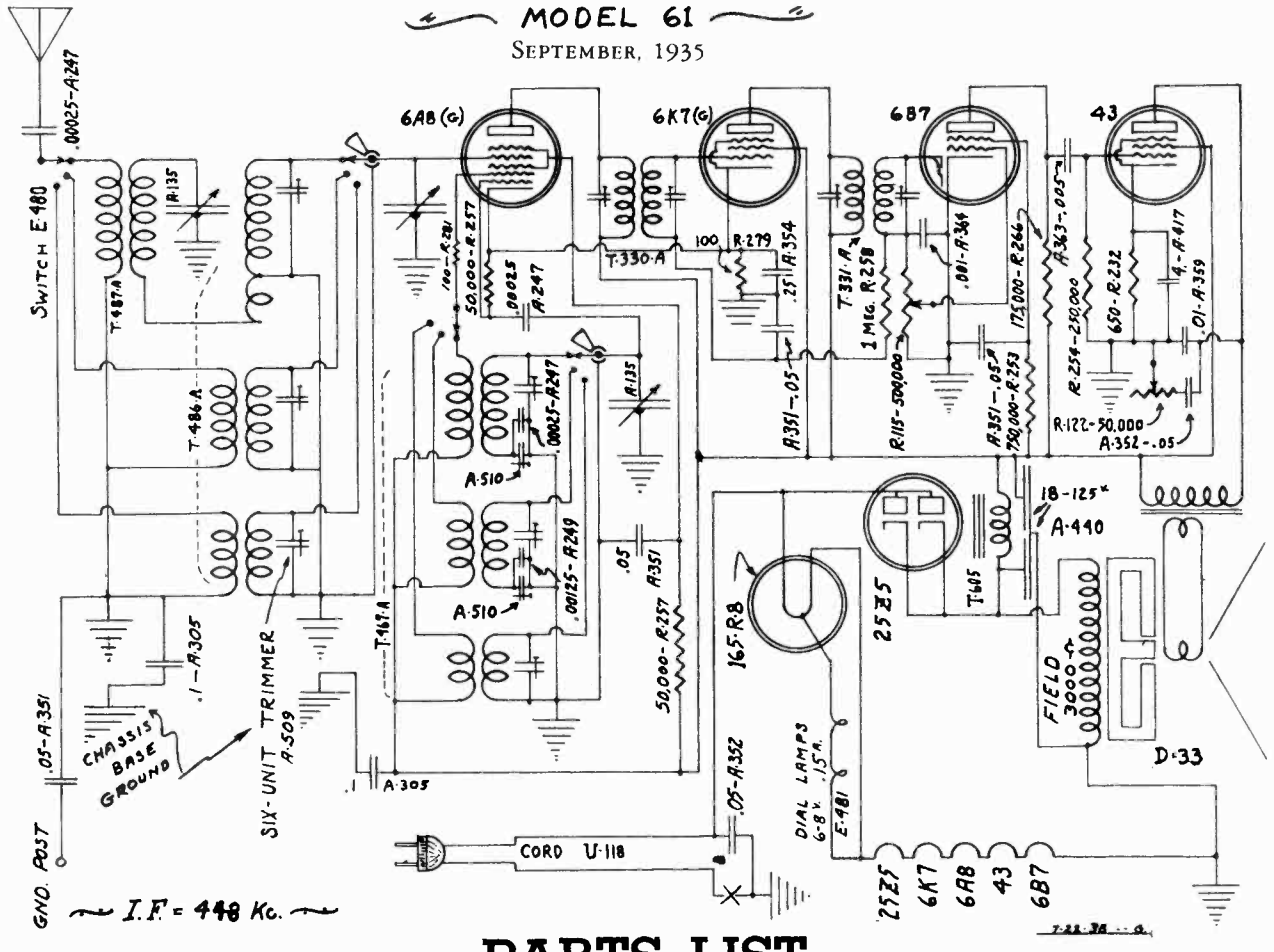


MODEL 61, 661
Schematic
Parts

INTERNATIONAL RADIO CORP.

MODEL 61

SEPTEMBER, 1935



PARTS LIST

PART NO.	DESCRIPTION	LIST PRICE
A-135	3 gang tuning condenser	$2.80
A-247	.00025 mf. mica condenser	.20
A-249	.00125 mf. mica condenser	.20
A-305	1 mf., 200 v. paper condenser	.15
A-351	.05 mf., 200 v. paper condenser	.15
A-352	.05 mf., 300 v. paper condenser	.15
A-354	.25 mf., 25v. paper condenser	.20
A-359	.01 mf., 400 v. paper condenser	.15
A-363	.005 mf., 400 v. paper condenser	.15
A-364	.001 mf., 400 v. paper condenser	.15
A-417	5 mf., 25 v. electrolytic condenser	.55
A-440	Electrolytic filter condenser	1.25
A-509	6 gang trimmer condenser	.55
A-510	Dual padder condenser	.45
A-515	Single padder (long wave model only)	.25
A-527	Dual trimmer condenser (long wave model only)	.20
D-33	Dynamic speaker	3.50
E-155	1 inch knob	.15
E-156	13/16 inch knob	.15
E-159	1 inch knob with colored dots	.20
E-269	Dial assembly	1.65
E-271	Dial assembly (for long wave model)	1.65
E-460	Antenna-ground binding post strip	.10
E-480	3 position band change switch	1.00
E-481	Special pilot lamps 6-8 v., .15 amperes	.15
E-482	4 position band change switch (long wave model)	1.50
H-18	25Z5 tube socket	.10
H-20	6B7 tube socket	.10
H-21	43 tube socket	.10
H-49	6A8 tube socket	.10
H-54	6K7 tube socket	.10
H-58	165R8 tube socket	.10
R-115	Volume control	.55
R-122	Tone control with power switch	.70
R-232	650 ohm, 1/2 w. carbon resistor	.20
R-253	750M ohm, 1/3 w. carbon resistor	.20
R-254	250M ohm, 1/3 w. carbon resistor	.20
R-257	50M ohm. 1/3 w. carbon resistor	.20
R-258	1 megohm, 1/3 w. carbon resistor	.20
R-266	175M ohm, 1/3 w. carbon resistor	.20
R-279	100 ohm, 1/3 w. carbon resistor	.20
R-281	100 ohm, 1/3 w. carbon resistor	.20
S-102	Goat tube shield	.10
T-330A	1st I.F. transformer	1.25
T-331A	2nd I.F. transformer	1.25
T-467A	Oscillator coil (long wave model only)	1.75
T-468A	L. W. Detector coil	.85
T-469A	L. W. Oscillator coil (long wave model only)	.85
T-486A	Detector coil	1.75
T-487A	Antenna coil	1.00
T-605	Filter choke	.65
U-118	A.C. cord and plug	.30
U-206	Four wire speaker cable	.20
X-345	Cabinet (Model 61)	8.50
X-350	Cabinet (Model 661)	8.00

This chassis is designed to operate from 115 volt power lines, either alternating or direct current. It is a three band receiver covering the American broadcast, police and airport, and Foreign short wave bands.

The following tubes are employed:

6A8 (metal) or 6A8G (glass) 1st Detector-Oscillator
6K7 (metal) or 6K7G (glass) I.F. amplifier
6B7 (glass) 2nd detector, A.V.C. and 1st A.F
43 (glass) Pentode output
25Z5 (glass) Rectifier
165R8 (glass) Regulator

The metal and glass tubes are interchangeable but when changing from one type to the other it is advisable to realign for perfect resonance. Glass counterpart types should be shielded, the metal tubes need not be. Shielding provisions are provided.

ALIGNMENT

The standard type of output meter should be used to indicate signal strength. It should be connected from the plate of the 43 tube to ground. Tone control should be turned "high". The signal from the signal generator *must be kept at a very low level.*

ESSENTIAL DATA: The intermediate frequency employed is 448 Kc. On the broadcast and middle bands the oscillator frequency is 448 kilocycles higher than the signal frequency. On the short wave band it is 448 kilocycles lower than the signal frequency.

Aligning should be done on the following frequencies: Broadcast band, 1400 and 600 Kc.; Middle band, 6000 and 2400 Kc; Short wave band 15 megacycles.

In aligning on broadcast band it is permissible to bend plates on the *band pass section only* of the three gang condenser. Do not bend plates when aligning the middle and short wave bands.

The front section of the three gang condenser is the oscillator section; the middle section, first detector; the rear section, band pass. The band pass is in circuit only on the broadcast band.

INTERMEDIATES: To align the IF circuits first remove the grid clip from the 6A8 tube and connect a 1/2 meg. resistance from the 6A8 grid (top of tube terminal) to ground. Set the signal generator to 448 Kc. and feed its modulated signal direct to the grid of the 6A8 through a 100 mmf. condenser. Adjust the first IF transformer trimmers for maximum meter reading. Go over both adjustments at least three or four times for accuracy. Repeat this process on the second IF transformer. If adjustments are not made accurately selectivity will be poor and IF may oscillate.

BROADCAST BAND: Place the band change switch on Broadcast position. Turn the dial to 1400 Kc. and feed a *very weak* 1400 Kc. modulated signal from your signal generator to the antenna. Adjust the Broadcast oscillator trimmer (see sketch) and band pass trimmer (on condenser gang) for maximum reading. Although a trimmer is provided for the Broadcast detector coil it will be found not connected on many sets as it is not necessary in obtaining correct balance.

Turn dial and signal generator to 600 Kc. and rock the padder into correct adjustment. This is accomplished by very slowly adjusting the padder condenser and at the same time turning the dial slightly back and forth across 600 Kc. until an adjustment is obtained producing maximum output. Go back to 1400 Kc. and readjust the oscillator trimmer slightly if necessary. Then recheck padder at 600 Kc. It is permissible to bend plates on the band pass section only in resonating circuits.

MIDDLE BAND: Turn the band change switch to the middle position and tune radio and signal generator to 6000 Kc. Adjust the oscillator trimmer and then the detector trimmer for maximum output.

Rock in the padder condenser 2400 Kc. Then recheck at 6000 Kc. and 2400 Kc.

SHORT WAVE BAND: Turn band change switch to short wave band. Tune radio and signal generator to 15 megacycles and adjust trimmers. No padder condenser is used on the short wave band so no other adjustments are necessary. On this band the oscillator frequency is 448 Kc. lower than the signal frequency.

PILOT LAMPS

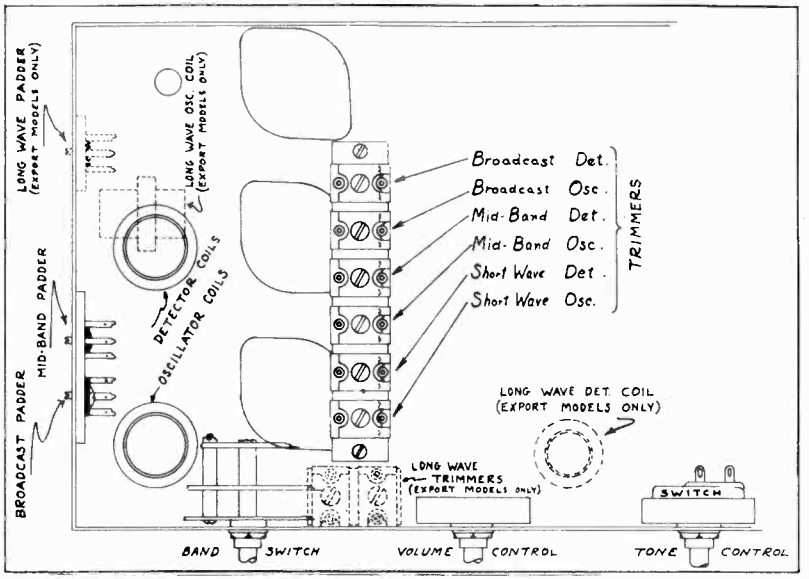
The pilot lamps are special 6-8 volt drawing only .15 amperes. It is necessary lamps of this rating only be used. In ordering specify our part number E-481.

MICROPHONIC HOWL

The tuning condenser is cushion mounted to eliminate vibration. Do not allow the dial to touch the escutcheon plate on the cabinet or a microphonic condition will be created.

LONG WAVE-EXPORT MODEL

Model 61 is also built with a four position switch (part number E-482) and an extra set of coils tuning the foreign long wave band. The order of band change switch positions is broadcast, mid-band, short wave, long wave band. Alignment—adjust long wave trimmers at 350 Kc. and rock in long wave padder at 160 Kc. See sketch for location of coils and condensers.



AVERAGE SOCKET VOLTAGES

Bottom View of Socket. VOLTAGES SHOWN ARE FROM TUBE PINS TO GROUND

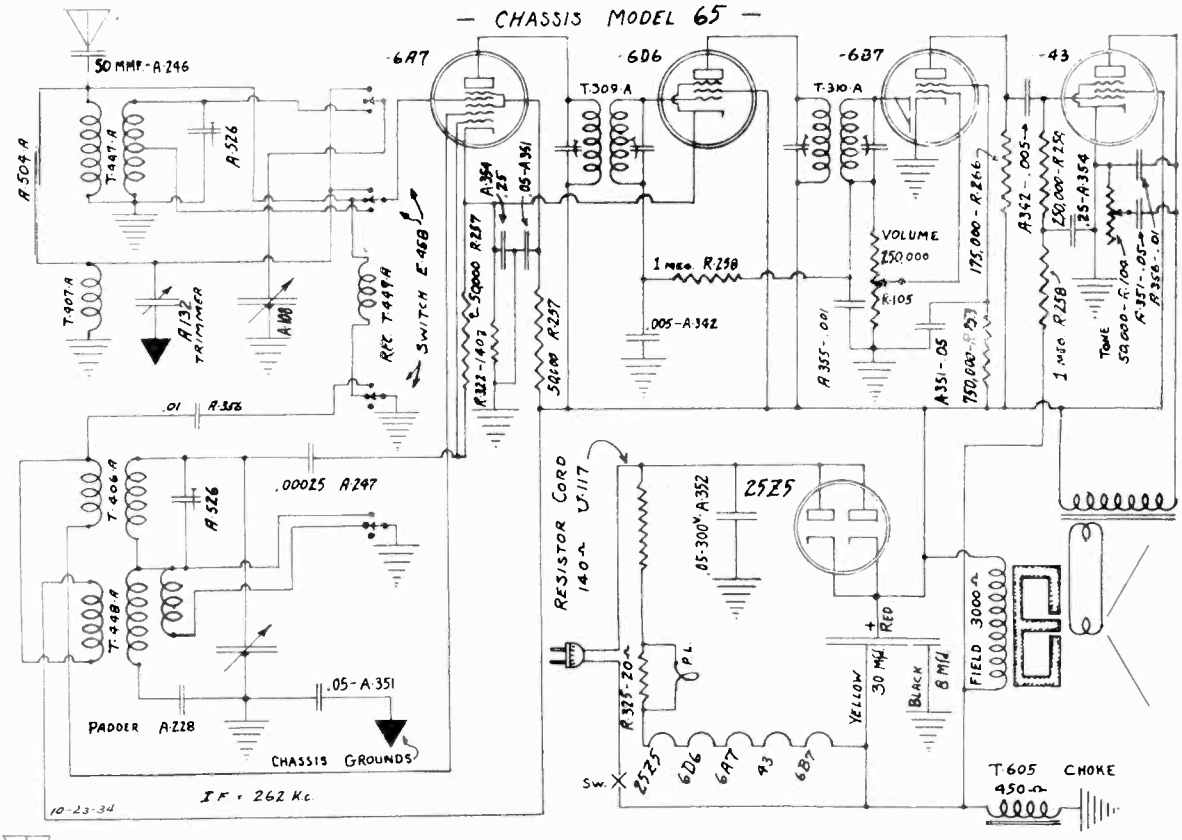
	Position	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8
6A8	Det.-Osc.	Shell	HTR.	90	27	0	90	HTR.	0
6K7	I. F.	Shell	HTR.	90	90	0	—	HTR.	0
		E_K	E_{G2}	E_P	E_{DP}				
6B7	2nd Det.	0	7	12	0				
43	A. F.	12	90	85	—				
25Z5	Rect.	105	—	A.C.	—				

Line 118 Volts. Switch On Broadcast Position. Volume Control Full On. 10% Variation Allowable.

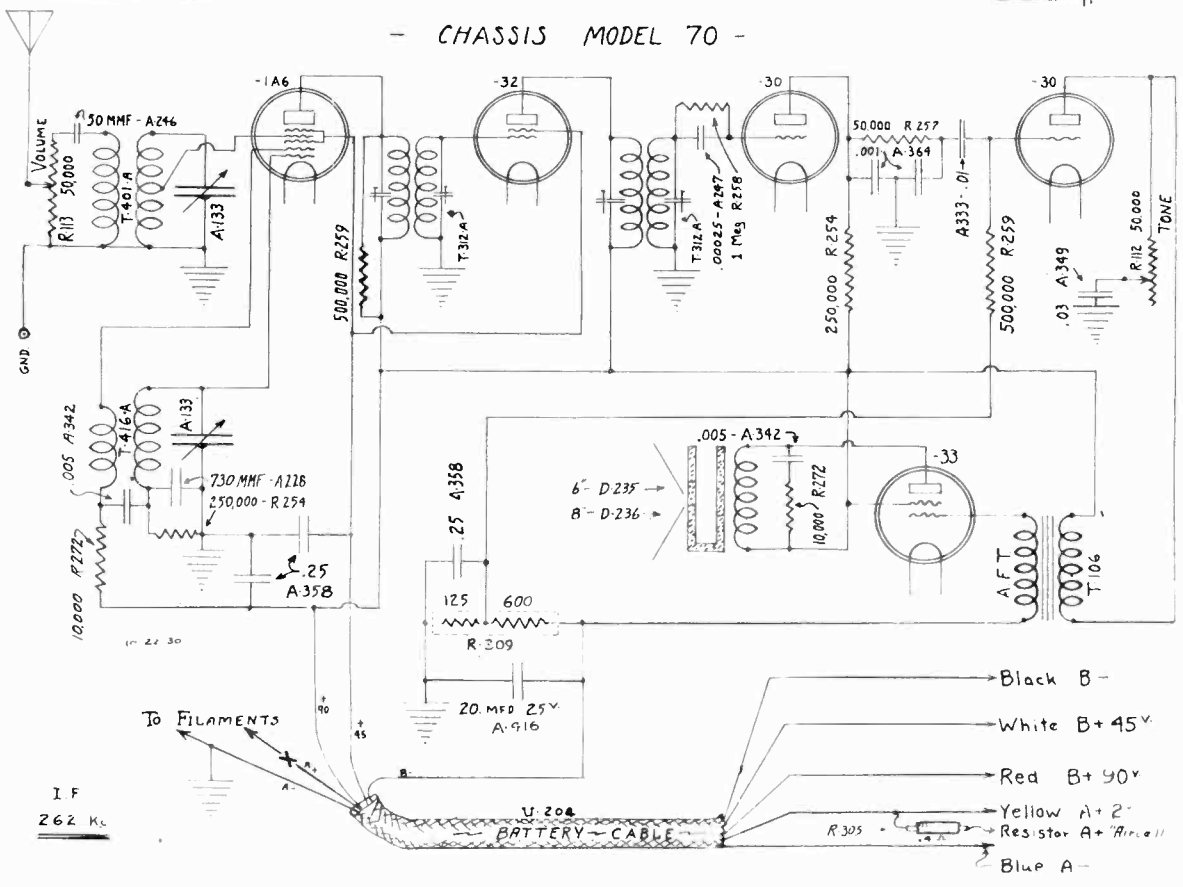
MODEL 65
MODEL 70
Schematics

INTERNATIONAL RADIO CORP.

— CHASSIS MODEL 65 —

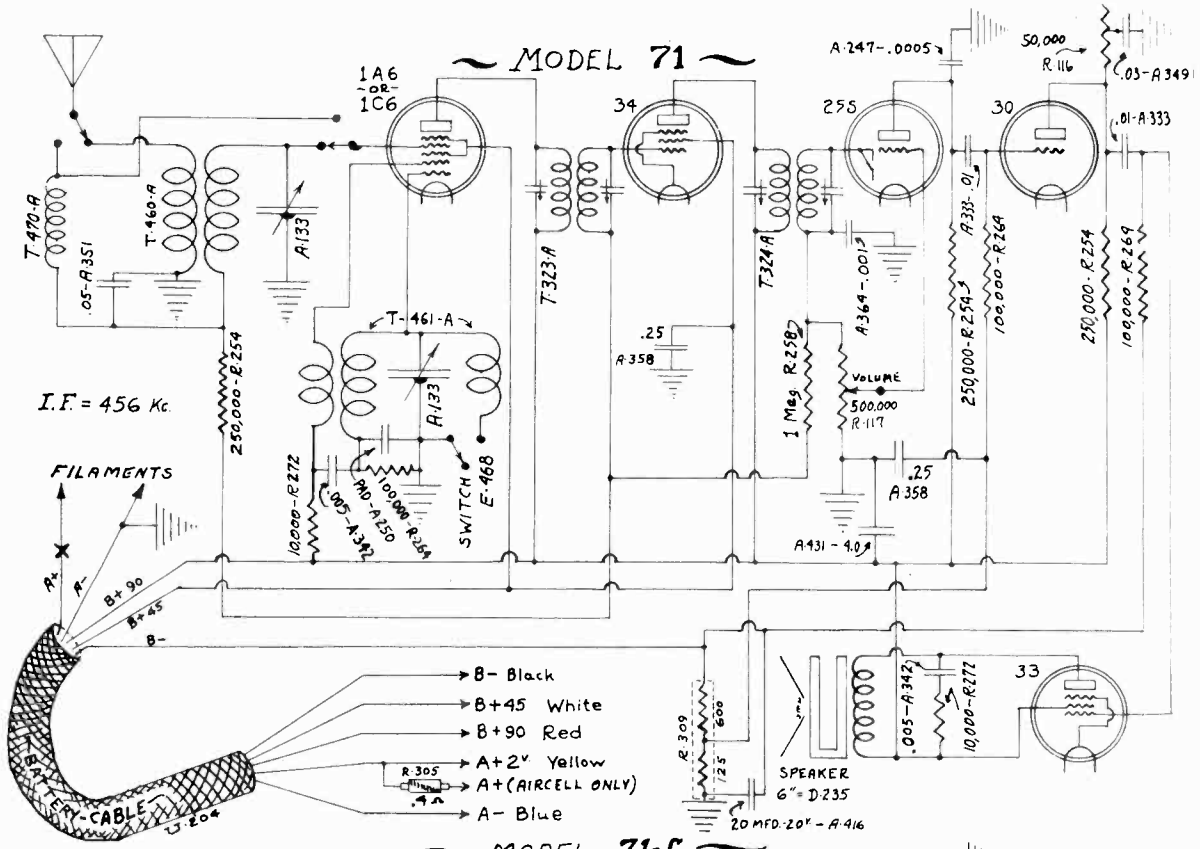


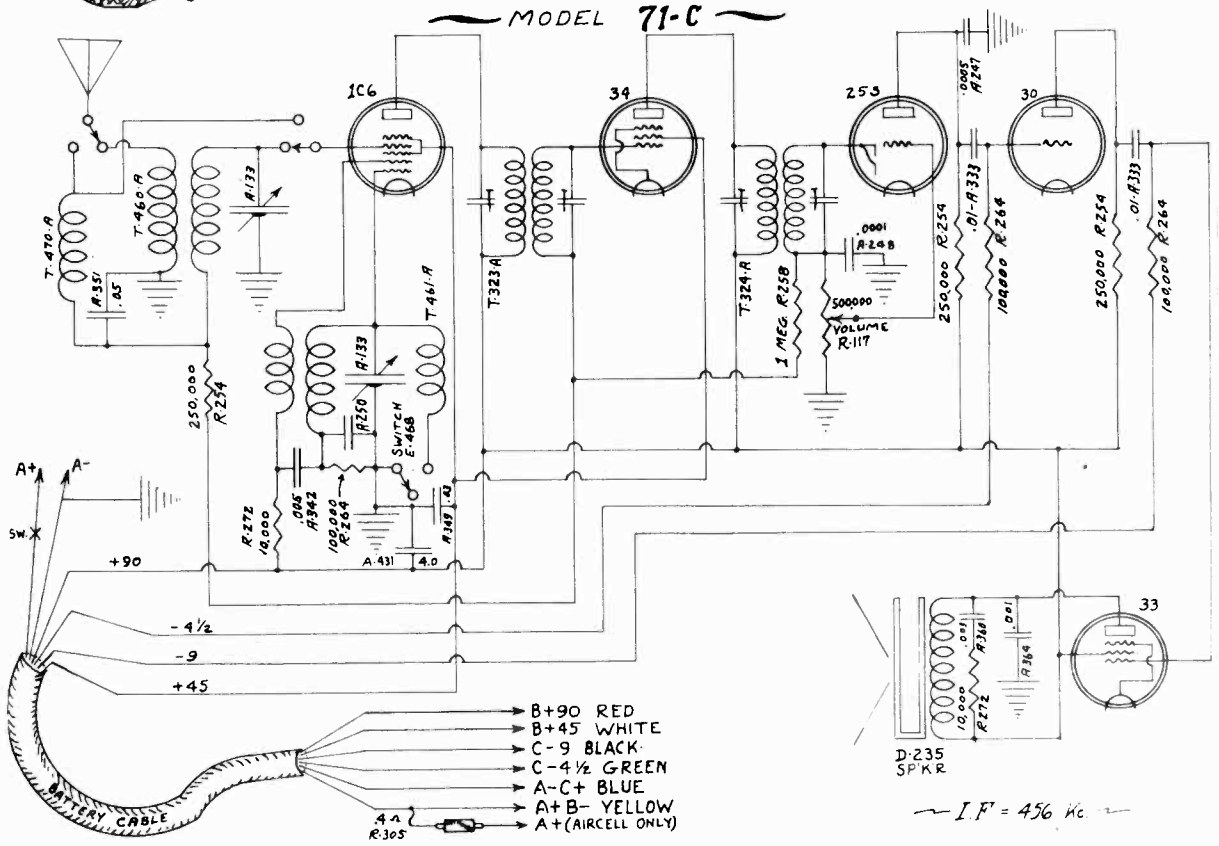
— CHASSIS MODEL 70 —



MODEL 71
MODEL 71C
Schematics

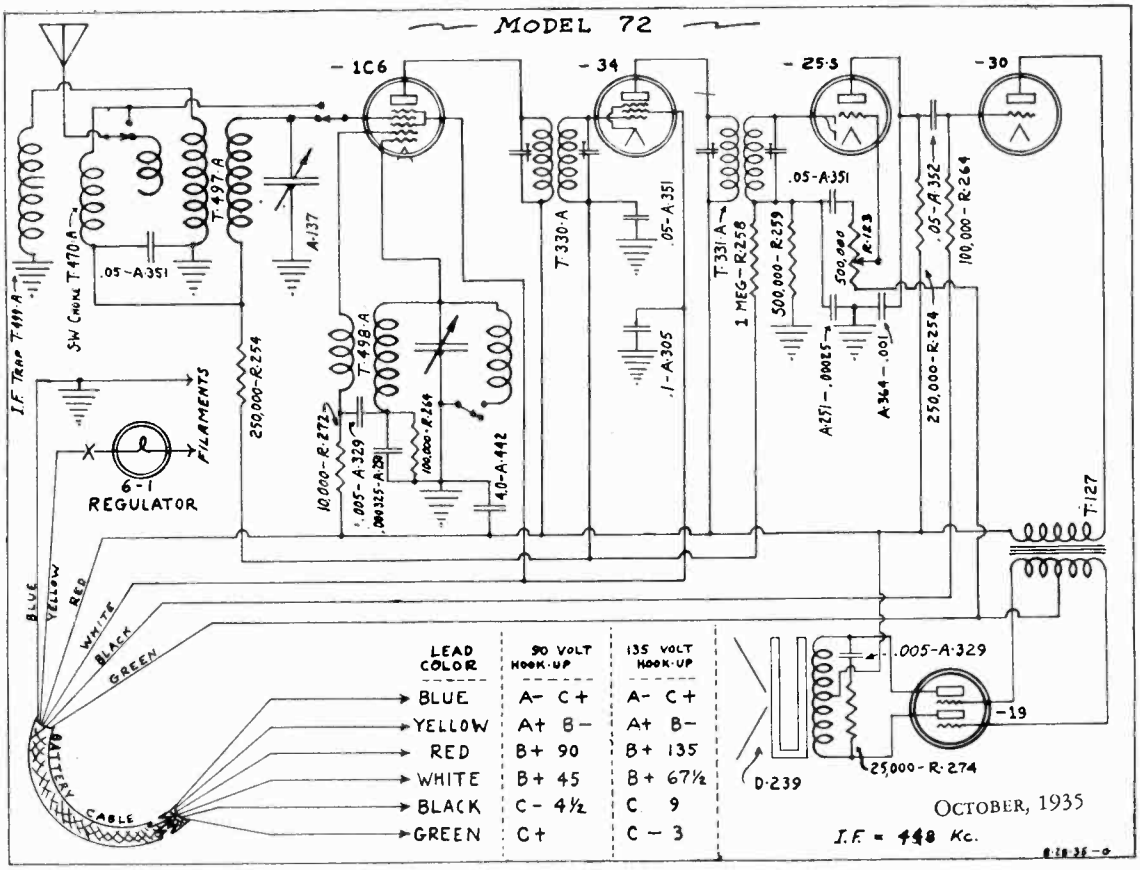
INTERNATIONAL RADIO CORP.





MODEL 72
Schematic
Alignment

INTERNATIONAL RADIO CORP.



ESSENTIAL DATA: The intermediate frequency employed is 448 Kc. On the broadcast band the oscillator frequency is 448 kilocycles higher than the signal frequency. On the short wave band it is 448 kilocycles lower than the signal frequency.

The rear section of the two gang condenser is the oscillator section; the front section, first detector.

INTERMEDIATES: To align the I.F. Circuits, set the signal generator to 448Kc. and feed its modulated signal direct to the antenna. Short out the oscillator section of the two gang condenser. Adjust the first I. F. transformer trimmers for maximum meter reading. Go over both adjustments at least three or four times for accuracy. Repeat this process on the second I.F. transformer. If adjustments are not made accurately, selectivity will be poor and I.F. oscillation may result. Due to the I.F. trap in the antenna circuit a strong signal is necessary.

BROADCAST BAND: Place the band change switch on Broadcast position. Turn the dial to 1400 Kc. and feed a *very weak* 1400 Kc. modulated signal from your signal generator to the antenna. Adjust the broadcast oscillator trimmer for maximum reading. On most sets the detector trimmer has its adjusting screw purposely removed.

There is no adjustable padder condenser in this model so resonance on the low frequency end is accomplished by bending plates on the tuning condensers. Check the alignment at 1000 Kc. Insert a thin bakelite, celluloid or mica feeler strip between the plates of the variable condensers to determine whether the circuits are properly matched. The action is this—the dielectric constant of the celluloid feeler strip being higher than that of the air it displaces, results in an increase of capacity. Open the variable condenser just enough to indicate two or three points below maximum signal. As the feeler is inserted the meter reading should indicate increasing signal and then decreasing as the feeler is inserted farther. This procedure should be followed on both sections. Should the meter fail to show an increase in signal as the strip is inserted in one section this indicates too great a capacity for that section. This may be corrected by bending the outside rotor plates out at the point where they begin to mesh with the stator.

After checking the alignment at 1000 Kc. repeat the process at 600 Kc.

SHORTWAVE BAND: No alignment necessary due to untuned detector circuit.

MODEL 72
Parts List

INTERNATIONAL RADIO CORP.

PARTS PRICE LIST

MODEL 72

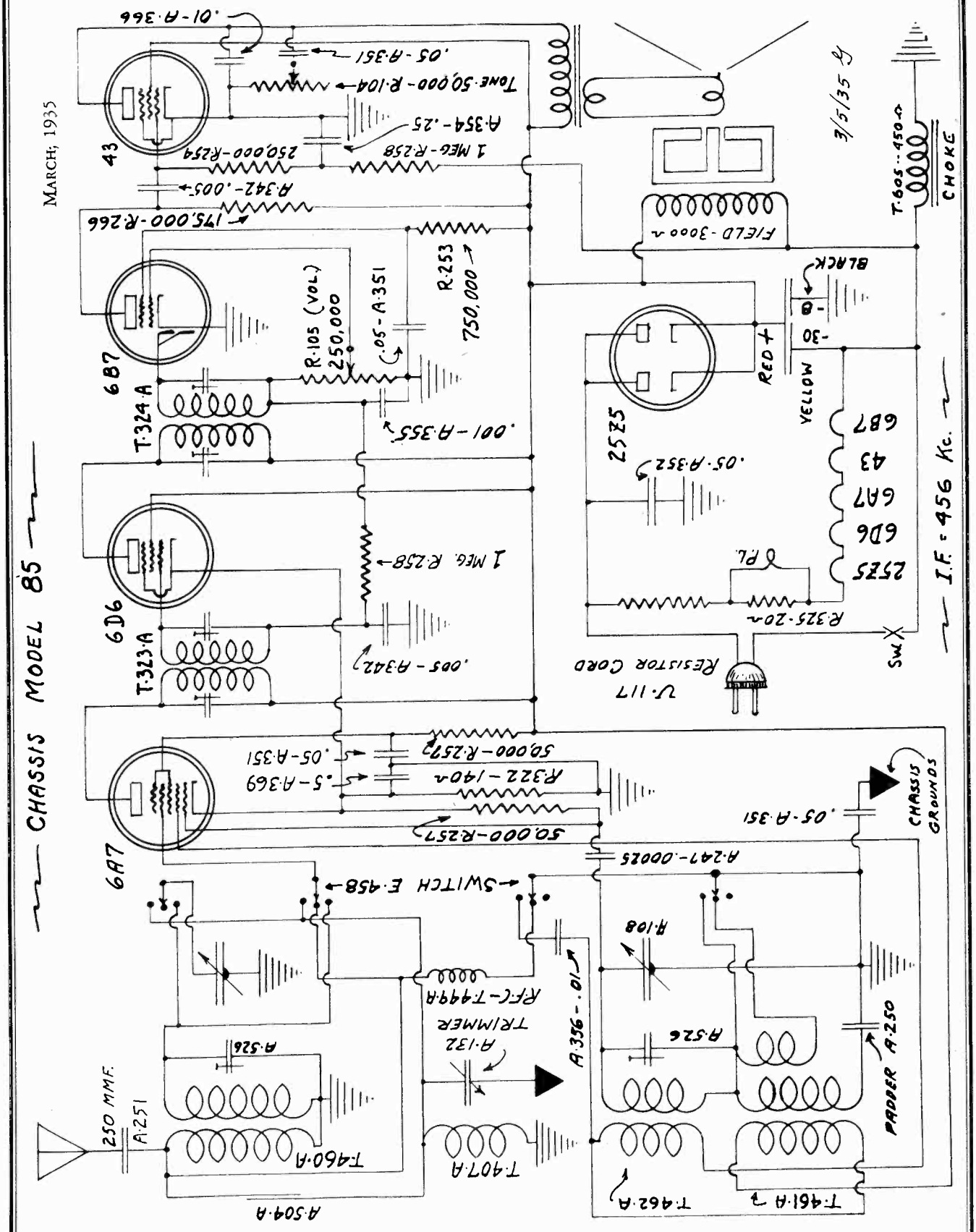
PART NO.	DESCRIPTION	LIST PRICE
A-137	2 gang tuning condenser	$1.65
A-250	325 mmf. mica padder condenser	.20
A-251	250 mmf. mica condenser	.20
A-305	.1 mf., 200 v. paper condenser	.15
A-329	.005 mf., 600 v. paper condenser	.15
A-351	.05 mf., 200 v. paper condenser	.15
A-352	.05 mf., 300 v. paper condenser	.15
A-364	.001 mf., 400 v. paper condenser	.15
A-442	4 mf. electrolytic condenser	.65
D-239	Magnetic speaker	5.00
E-157	Large knob	.15
E-160	Small knob	.15
E-270	Dial assembly	1.50
E-479	Wave band switch	.45
E-486	Antenna-ground binding post strip	.10
H-33	30 tube socket	.10
H-45	25S tube socket	.10
H-46	34 tube socket	.10
H-58	6-1 regulator socket	.10
H-59	1C6 tube socket	.10
H-60	19 tube socket	.10
R-123	Volume control and switch	.65
R-254	250M ohm carbon resistor	.20
R-258	1 megohm carbon resistor	.20
R-259	500M ohm carbon resistor	.20
R-264	100M ohm carbon resistor	.20
R-272	10M ohm carbon resistor	.20
R-274	25M ohm carbon resistor	.20
S-102	Goat tube shield	.10
T-127	Push pull class B audio transformer	1.10
T-330A	1st I.F. transformer	1.25
T-331A	2nd I. F. transformer	1.25
T-470A	Short wave choke	.50
T-497A	Detector coil	1.00
T-498A	Oscillator coil	1.00
T-499A	I. F. trap	.35
U-208	Battery cable	.60
X-353	Cabinet	8.25

Prices Subject to Change Without Notice

MODEL 85
Schematic

INTERNATIONAL RADIO CORP.

MARCH, 1935



MODEL 85 is an AC-DC receiver designed to operate from 110-volt power lines. It tunes the American broadcast band, police band and Foreign short wave bands.

INTERMEDIATE FREQUENCY

Sets bearing serial numbers under 185499 use an intermediate frequency of 262KC.

Sets bearing serial numbers over 185498 use an intermediate frequency of 456KC.

ALIGNMENT

The standard type of AC output meter should be used to indicate signal strength. It should be connected from the plate of the 43 tube to the circuit ground (variable condenser frame). The signal from the test oscillator must be kept at a very low level to get below the A.V.C. action.

A microammeter may be used to indicate signal strength if preferred (see Manual of General Service Information). One lead from the meter should be attached to the circuit ground and the other to the terminal of the volume control to which is connected a 1 megohm resistor.

To adjust 262KC IF circuits set the test oscillator to 262KC and couple it to the antenna wire of the set (wave band switch should be on B/C position). Short out oscillator section of 2 gang tuning condenser (rear section). Adjust IF transformers for maximum meter reading. Go over adjustments at least twice for accuracy. Use fibre screw driver.

To adjust 456KC IF circuits first remove grid clip from 6A7 tube and connect a 500M ohm resistance from the 6A7 grid (top of tube terminal) to ground. Set test oscillator to 456 KC and feed its signal direct to the grid of the 6A7. Short out oscillator section of 2 gang tuning condenser and proceed as in above paragraph.

Before aligning RF circuits see that the dial is correctly adjusted. With the 2 gang condenser all the way out of mesh the dial pointer should be on the 5000 KC mark.

Place band change switch on B/C position. The trimmer across the B/C antenna coil is located on the bottom of the chassis at the end. It should be set at approximately minimum capacity. Set the test oscillator to 1500 KC and couple to the antenna wire of the set. With the dial pointer on 1500 KC adjust the oscillator trimmer (on 2 gang condenser) for maximum signal. Shift the 2 gang condenser slightly to one side or the other of 1500 KC and continue adjustments for maximum signal. The correct balance between oscillator and antenna circuits will be found very close to the 1500 KC mark on the dial.

Check alignment at 1000 and 600KC (see Manual of General Service Information).

Turn wave band switch to extreme left and turn dial to about 19 meters, adjust test oscillator so it is producing a signal at approximately 19 meters. Turn tuning condenser slightly back and forth, at the same time adjusting the short wave oscillator trimmer (mounted beside S.W. oscillator coil) for maximum signal. The two plate vernier condenser on top of the chassis should be out of mesh while this is being done.

Tune test oscillator and radio to about 49 meters and check for resonance. Do not bend condenser plates to align but spread or crowd together turns on the short wave antenna coil (see Manual of General Service Information.) The two plate vernier condenser on top of the chassis should be in mesh while this is being done.

AVERAGE TUBE OPERATING VOLTAGES

Position	Tube	Ek	Eg^1	Eg^2	Eg^3	Ep	Edp
1st Det-Osc.	6A7	.8	Det. 0 Osc. 0	50	—	Det. 110 Osc. 110	—
IF Amp.	6D6	.8	*	110	.8	110	—
2nd Det-AVC	6B7	0	.4	45	—	80	*
Power Amp.	43	0	.2	110	—	110	—
Rectifier	25Z5	110	—	—	—	—	—

k—Cathode; g^1—Control grid; g^2—Screen grid; g^3—Suppressor grid; p—Plate; dp—Diode plates; *—Depends on applied signal strength. All voltages measured from indicated points to circuit ground. Line voltage 115 volts.

PARTS PRICE LIST--Model 85

Part No.	Description	List Price
A-132	Trimmer condenser	$ .75
A-133	2 gang tuning condenser	1.75
*A-288	.00073 mfd. mica padder condenser	.25
*A-246	50 mmfd mica condenser	.20
A-247	.00025 mfd. mica condenser	.20
**A-250	.000325 mfd. mica padder condenser	.25
**A-251	250 mmfd. mica condenser	.20
A-342	.005 mfd. paper condenser 200 volt	.15
A-351	.05 mfd. paper condenser 200 volt	.15
A-352	.05 mfd. paper condenser 400 volt	.15
A-354	.25 mfd. paper condenser 100 volt	.15
A-355	.001 mfd. paper condenser 200 volt	.15
A-356	.01 mfd. paper condenser 200 volt	.15
A-412	8-30 mfd. electrolytic filter condenser	1.65
A-526	Semi-variable trimmer condenser	.15
D-11	Dynamic speaker 6-inch	5.50
E-114	Large tuning knob	.15
E-115	Small knob	.15
E-256	Dial	1.85
E-405	Pilot light	.15
E-458	3 position band change switch	1.00
H-17	6A7 tube socket	.10
H-18	25Z5 tube socket	.10
H-19	6D6 tube socket	.10
H-20	6B7 tube socket	.10
H-21	43 tube socket	.10
I-306	Speaker terminal strip	.20
R-104	50M ohm tone control	.50
R-105	250M ohm volume control with switch	.75
R-253	750M ohm resistor	.20
R-254	250M ohm resistor	.20
R-257	50M ohm resistor	.20
R-258	1 meg. resistor	.20
R-266	175M ohm resistor	.20
R-322	140 ohm flexible resistor	.20
R-325	20 ohm "Candohm" resistor	.25
S-102	Goat tube shield	.15
*T-315A	1st IF coil assembly	1.25
*T-316A	2nd IF coil assembly	1.25
**T-323A	1st IF coil assembly	1.25
**T-324A	2nd IF coil assembly	1.25
*T-406A	S. W. oscillator coil	.30
T-407A	S. W. antenna coil	.25
*T-447A	B. C. antenna coil	.85
*T-448A	B. C. oscillator coil	.90
T-449A	R. F. C.	.25
**T-460A	B. C. antenna coil	.85
**T-461A	B. C. oscillator coil	.90
**T-462A	S. W. oscillator coil	.30
T-605	Filter choke	.65
U-117	Power cord	.55
	Cabinet complete	7.00

*Serial numbers under 185499 intermediate frequency is 262 Kc.
**Serial numbers above 185498 intermediate frequency is 456 Kc.

Prices subject to change without notice

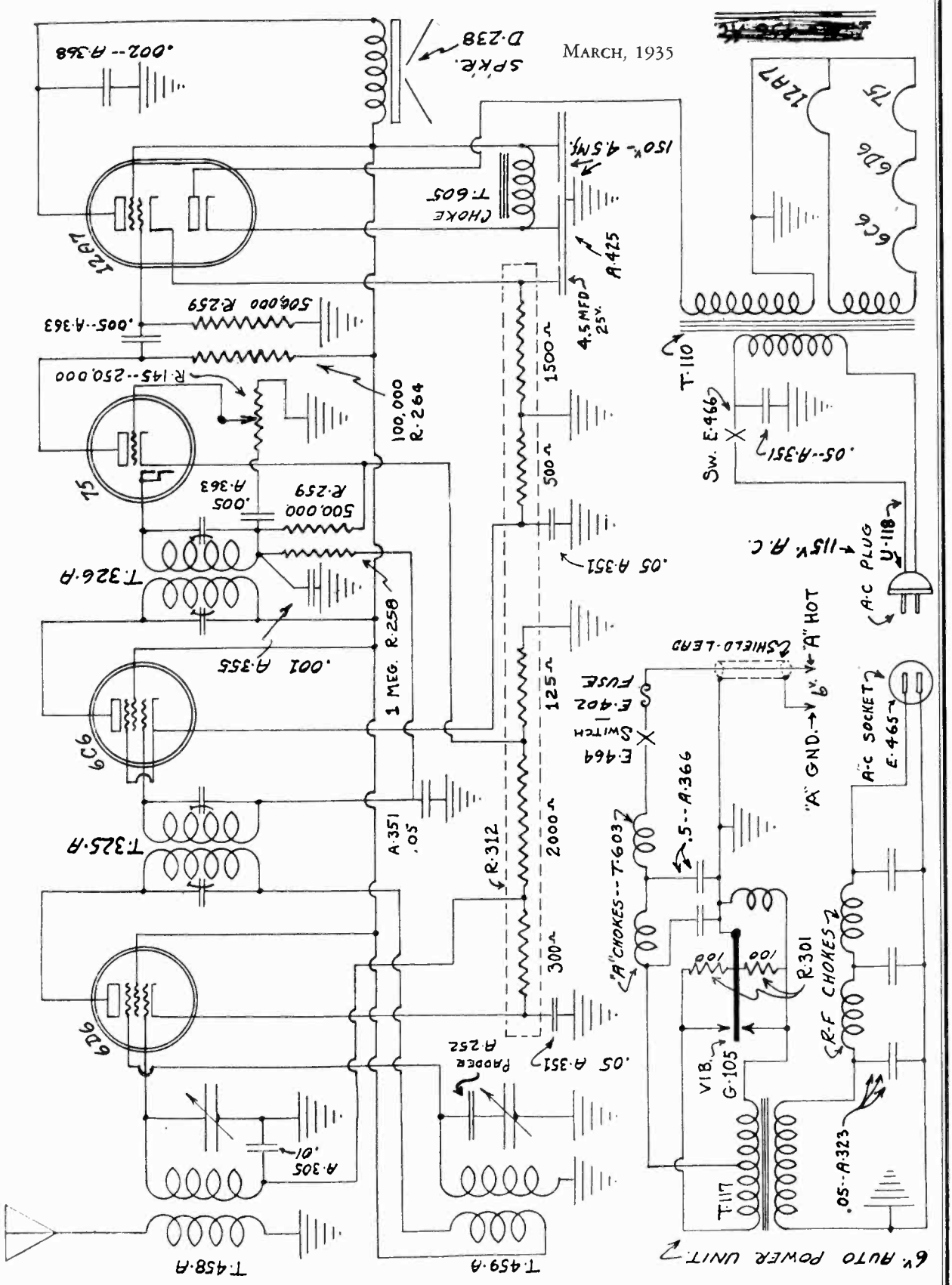
ALWAYS ORDER BY PART NUMBER

MODEL 90
Schematic

INTERNATIONAL RADIO CORP.

MARCH, 1935

INTERNATIONAL RADIO CORPORATION -- MODEL 90 RECEIVER & AUTO POWER UNIT.



MODEL 90
Alignment
Voltage, Parts

INTERNATIONAL RADIO CORP.

PARTS PRICE LIST

MODEL 90 AUTO POWER UNIT

Part No.	Description	List Price
A-323	.05 mfd. tubular paper condenser, 400v.	.15
A-366	.5-.5 mfd. special filter condenser, 160v.	.60
B-166	metal case with top and bottom	1.00
E-402	15 amp. fuse	.05
E-464	toggle switch	.50
E-465	A.C. outlet	.70
F-6	fuse holder	.10
F-19	ammeter clip	.05
G-105	vibrator	3.25
H-43	vibrator socket	.10
R-301	200 ohm wire wound center tapped resistor	.15
T-117	power transformer	2.00

MODEL 90 32-VOLT UNIT

Parts same as auto power unit with following exceptions

Part No.	Description	List Price
G-106	vibrator	$3.25
T-118	power transformer	2.20

MODEL 90 RADIO

Part No.	Description	List Price
A-113	.2 gang tuning condenser	$1.85
A-228	.730 mmfd. Mica padder condenser	.25
*A-248	.0001 mfd. Mica antenna series condenser	.20
A-305	.1 mfd. tubular condenser, 200v.	.15
A-351	.05 mfd. tubular condenser, 200v.	.15
A-352	.05 mfd. tubular condenser, 300v.	.15
A-355	.001 mfd. tubular condenser, 200v.	.15
A-363	.005 mfd. tubular condenser, 400v.	.15
A-368	.002 mfd. tubular condenser, 300v.	.15
A-425	.4.5-4.5-4.5 mfd. electrolytic filter condenser	.90
D-238	5 inch speaker	4.25
E-133M	large tuning knob	.10
E-148G	small knob	.10
E-466	rotary power switch	.35
H-19	6D6 tube socket	.10
H-25	75 tube socket	.10
H-41	6C6 tube socket	.10
H-42	12A7 tube socket	.10
R-145	.250M ohm volume control	.50
R-254	.250M ohm carbon resistor	.20
R-258	.1 megohm carbon resistor	.20
R-259	.500M ohm carbon resistor	.20
R-264	.100M ohm carbon resistor	.20
R-312	special candohm resistor	.45
S-114	goat tube shield	.15
T-110	power transformer	1.75
*T-317A	1st IF coil assembly	1.25
*T-318A	2nd IF coil assembly	1.25
**T-325A	1st IF coil assembly	1.25
**T-326A	2nd IF coil assembly	1.25
**T-458A	antenna coil assembly	.85
**T-459A	oscillator coil assembly	.90
*T-463A	antenna coil assembly	.85
*T-464A	oscillator coil assembly	.90
T-605	filter choke	.65
U-118	A.C. cord and plug	.30
WL20	antenna wire 22 ft.	.10
	cabinet (less back)	2.00
	back only	1.00

*Serial numbers under ~~6500~~ use 262IF
**Serial numbers over ~~6500~~ 6501 use 456IF

Prices subject to change without notice

INTERMEDIATE FREQUENCY

Sets bearing serial numbers under ~~6500~~ use an intermediate frequency of 262 K.C.

Sets bearing serial numbers over ~~6500~~ 6501 use an intermediate frequency of 456 K.C.

ALIGNMENT

The standard type of AC output meter should be used to indicate signal strength. It should be connected from the plate prong of the 12A7 amplifier section to ground. The signal from the test oscillator must be kept at a very low level to get below the A.V.C. action.

To adjust IF circuits first turn the tuning condenser to a setting approximating 600KC. Do not short out the oscillator section of the 2 gang condenser. Set test oscillator to correct intermediate frequency and attach to antenna of set. Adjust primary and secondary of 1st IF transformer for maximum reading on meter. Repeat with 2nd IF transformer and then go over all adjustments a second time. Fibre screw driver and socket wrench are necessary for accuracy.

Next set the test oscillator to 1500 KC. Turn the 2 gang condenser so the plates are just slightly meshed (about 1/8 inch). Adjust trimmers on both sections for maximum signal.

If coils have been changed it may be necessary to bend plates at 1000 KC and 550 KC. See Manual of General Service Information for instructions. Do not bend plates on the oscillator section (rear) unless absolutely necessary.

SPEAKER ADJUSTMENT

To adjust speaker remove cover plate from speaker unit. Two screws will be found at each end of the unit within the magnets. When adjusting either pair of screws, one is to be loosened slightly and the other tightened. You will notice this moves the armature slightly to one side. The air gap on both sides of the armature should be the same.

6 VOLT POWER UNIT

The power unit should deliver between 110 and 120 volts AC under the load of the set. Low output usually indicates a poor vibrator or the set may be drawing an abnormal amount of current.

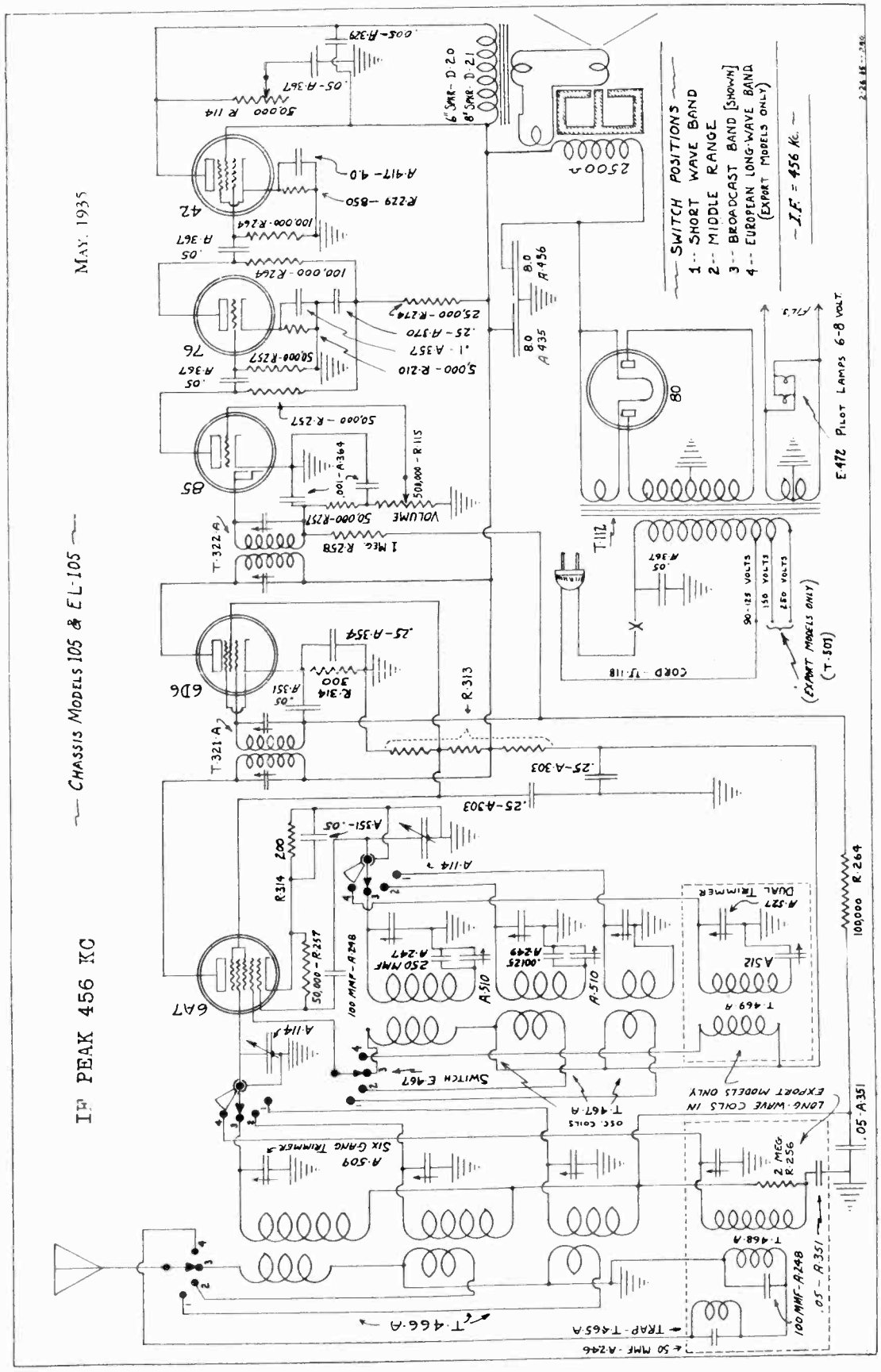
AVERAGE TUBE OPERATING VOLTAGES

Position	Tube	Ek	Eg¹	Eg²	Eg³	Ep	Edp
1st Det-Osc.	6D6	18	15	110	0	110	—
IF amp.	6C6	2.7	*	110	2.7	110	—
2nd Det-AVC	75	1	0	—	—	75	*
Rect-Pwr. amp.	12A7	Amp. 11 Rect. 120	0	115	—	Amp. 110 Rect 120AC	—

K—Cathode; g¹—Control grid; g²—Screen grid; g³—Suppressor grid; p—Plate; dp—Diode plates; *—Depends on applied signal strength. All voltages measured from indicated points to ground. Line voltage 115 volts.

MODELS 105, EL-105
1050
Schematic

INTERNATIONAL RADIO CORP.



MODELS 105,1050
Alignment,Voltage Trimmers, Parts

INTERNATIONAL RADIO CORP.

Models 105 and 1050 are A.C. receivers designed to operate from 115 volt power lines. They tune the American broadcast band, police and airport bands, and Foreign short wave bands. The models built for export also tune the European long wave band and because of the tapped power transformer in these models they may be operated on A.C. lines up to 250 volts. (See circuit diagram. Switch is available by removing part of cover of power transformer.)

ALIGNMENT

The standard type of AC output meter should be used to indicate signal strength. It should be connected from the plate of the 42 tube to ground. Tone control should be turned "high." The signal from the test oscillator *must be kept at a very low level.*

To align the IF circuits first remove the grid clip from the 6A7 tube and connect a 50,000 ohm resistance from the 6A7 grid (top of tube terminal) to ground. Short out both sections of the 2 gang tuning condenser. Set the test oscillator to 456KC and feed its modulated signal direct to the grid of the 6A7. Adjust the first IF transformer trimmers for maximum meter reading. Go over both adjustments at least three or four times for accuracy. Repeat this process on the second IF transformer. If adjustments are not made accurately selectivity will be poor and IF may oscillate.

Before aligning RF circuits see that the dial is correctly adjusted. With the 2 gang condenser at full mesh the pointer should be on 540 Kc.

BROADCAST BAND

Place the band change switch on Broadcast position. Turn the dial to 2000 KC. and feed a *very weak* 2000 KC. modulated signal from your test oscillator to the antenna. Adjust the broadcast oscillator trimmer (see sketch) for maximum reading. Usually no trimmer is needed across the broadcast antenna coil.

Turn dial and test oscillator to 600 KC. and rock the padder into correct adjustment. This is accomplished by very slowly adjusting the padder condenser and at the same time turning the dial slightly back and forth across 600 KC. until an adjustment is obtained producing maximum output. Go back to 2000 KC. and readjust the oscillator trimmer slightly if necessary. Then recheck padder at 600 KC.

MIDDLE BAND

Turn the band change switch to the middle position and tune radio and test oscillator to 6000 KC. Adjust the oscillator trimmer and then the antenna trimmer for maximum output.

Rock in the padder condenser at 2400 KC. Then recheck at 6000 KC. and 2400 KC.

SHORT WAVE BAND

Turn band change switch to short wave band. Tune radio and test oscillator to 16.5 megacycles and adjust trimmers. Generally the oscillator trimmer will be very loose. No padder condenser is used on the short wave band so no other adjustments are necessary.

EUROPEAN LONG WAVE BAND

Alignment instructions are same as for broadcast band. Align at 350 and 160 KC.

MICROPHONIC HOWL

The 2 gang condenser is cushion mounted to eliminate vibration of the plates. Do not allow the dial to touch the escutcheon plate on the cabinet or a microphonic condition will be created.

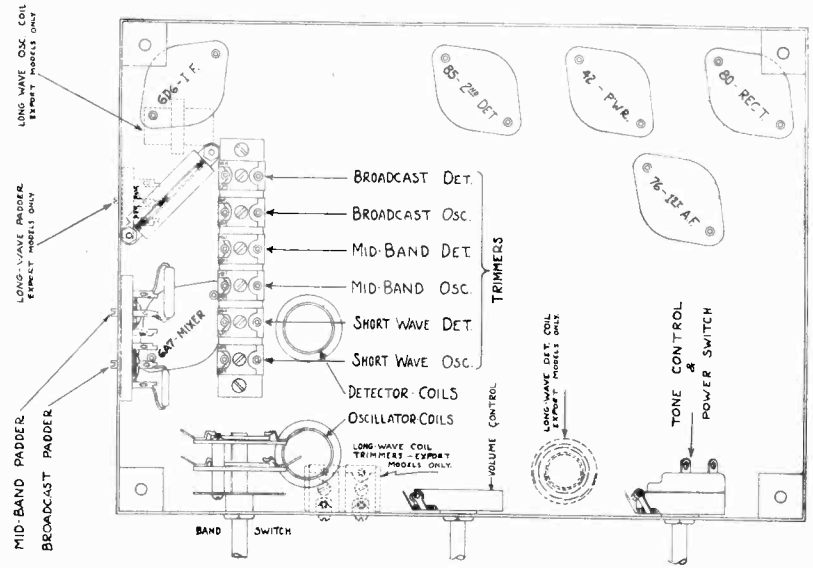
PILOT LIGHTS

In sets built prior to publication of this bulletin the pilot lights were wired in series and 3.8 volt bulbs were used (bur part number E-405). If they burn out in an unreasonably short time it is suggested that the sockets be rewired to parallel connection and the number E-472, 6-8 volt bulbs be used.

AVERAGE TUBE OPERATING VOLTAGES

Position	Tube	Ek	Eg^1	Eg^2	Eg^3	Ep	Edp
1st Det-Osc.	6A7	2	Det. * Osc.-1	100	—	Det. 230 Osc. 145	—
IF Amp.	6D6	2	*	100	2	230	—
2nd Det-AVC	85	0	0	—	—	40	*
1st AF Amp.	76	5	0	—	—	65	—
Power Amp.	42	20	0	230	—	215	—
Rectifier	80	Fil. 270	—	—	—	—	—

k—Cathode; g^1—Control grid; g^2—Screen grid; g^3—Suppressor grid; p—Plate, dp—Diode plates; *—Depends on applied signal strength. All voltages measured from indicated points to ground using 1000 ohm per volt D.C. voltmeter. Line voltage 115 volts.



PARTS PRICE LIST--Models 105 & 1050

Part No.	Description	Price
A-114	Two gang tuning condenser	$1.90
A-247	.00025 mfd. mica condenser	.20
A-248	.0001 mfd. mica condenser	.20
A-249	.00125 mfd. mica condenser	.20
A-303	.25 mfd. tubular condenser, 200 volt	.15
A-329	.005 mfd. tubular condenser, 600 volt	.15
A-351	.05 mfd. tubular condenser, 200 volt	.15
A-354	.25 mfd. tubular condenser, 25 volt	.15
A-357	.1 mfd. tubular condenser, 25 volt	.15
A-364	.001 mfd. tubular condenser, 400 volt	.15
A-367	.05 mfd. tubular condenser, 400 volt	.15
A-370	.25 mfd. tubular condenser, 300 volt	.15
A-417	4 mfd. (or larger) electrolytic condenser, 25 v	.50
A-435	.8 mfd. electrolytic filter condenser	.75
A-436	.8 mfd. electrolytic filter condenser	.75
A-509	Six gang trimmer condenser unit	.60
A-510	Dual padder condensers	.45
D-20	Six inch dynamic speaker for Model 105	4.85
D-21	Eight inch dynamic speaker for Model 1050	5.60
E-114	Large tuning knob	.15
E-115	Small knob with gold line	.15
E-116	Large knob with gold line	.15
E-257	Dial assembly	1.85
E-405	Pilot lamps, 3.8 volts for series connection	.15
E-460	Antenna and ground binding post strip	.20
E-467	Wave band switch (3 position)	1.25
E-471	Wave band switch (4 position, export models)	1.35
E-472	Pilot lamps, 6-8 volt for parallel connection	.15
H-17	6A7 tube socket	.10
H-19	6D6 tube socket	.10
H-26	76 tube socket	.10
H-29	85 tube socket	.10
H-36	42 tube socket	.10
H-40	80 tube socket	.10
H-44	Speaker connection socket	.10
R-114	Tone control with power switch, 50M ohms	.70
R-115	Volume control, 500M ohms	.50
R-210	5M ohm carbon resistor, 1/3 Watt	.20
R-229	850 ohm carbon resistor, ½ Watt	.20
R-257	50M ohm carbon resistor, 1/3 Watt	.20
R-258	1 megohm carbon resistor, 1/3 Watt	.20
R-264	100M ohm carbon resistor, 1/3 Watt	.20
R-274	25M ohm carbon resistor, 1/3 Watt	.20
R-313	Candohm resistor, 20M ohm-15M ohm-30M ohm	.50
R-314	Candohm resistor, 200 ohm-300 ohm	.25
S-102	Goat tube shield	.15
S-116	Coil shield	.15
T-112	Power transformer	2.75
T-321A	1st IF transformer	1.25
T-322A	2nd IF transformer	1.25
T-466A	Antenna coil assembly	1.50
T-467A	Oscillator coil assembly	1.50
T-468A	Long wave antenna coil (export models only)	.70
T-469A	Long wave oscillator coil (export models only)	.70
T-501	Power transformer (export models only)	6.35
U-118	A.C. power cord and plug	.30
X-335	Model 105 cabinet	9.50
X-336	Model 1050 cabinet	25.75

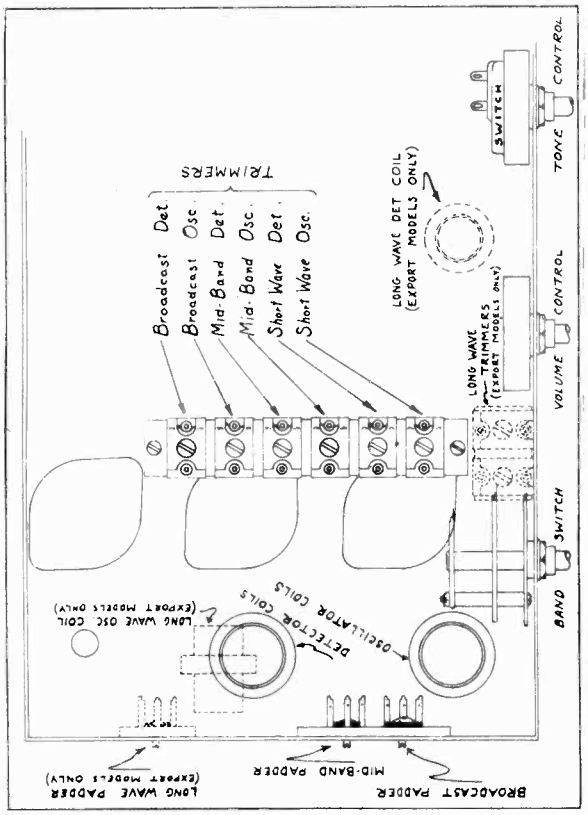
Prices subject to change without notice

ALWAYS ORDER BY PART NUMBER

MODELS 120,1200,2200

INTERNATIONAL RADIO CORP.

Schematic, Trimmers Voltage

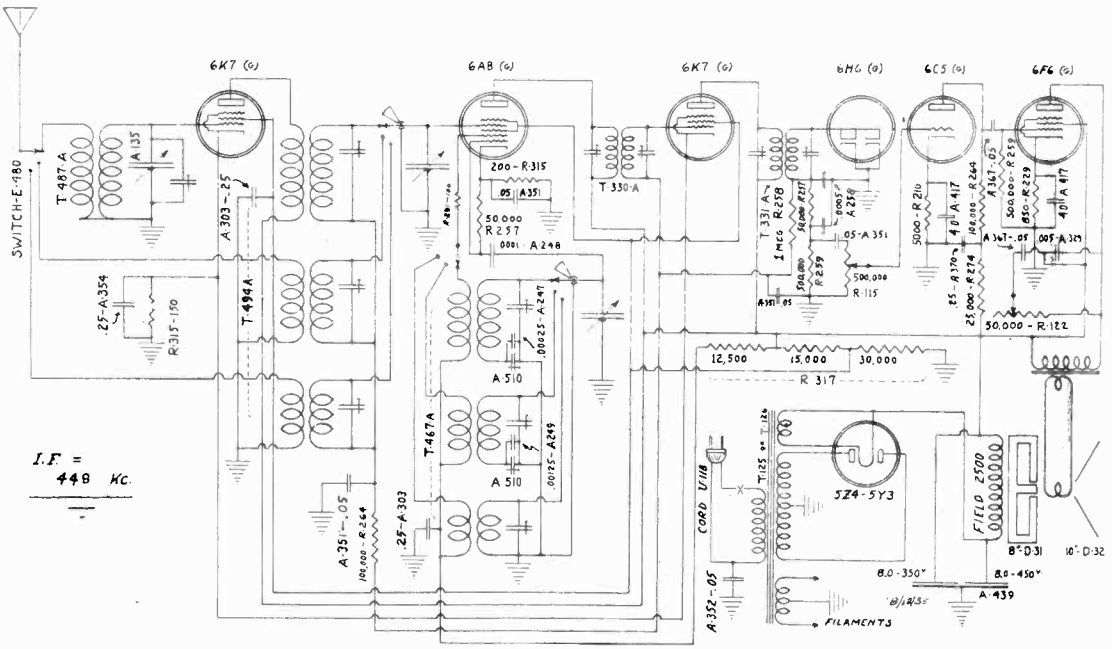


Bottom View of Socket

Voltages shown are from tube pins to ground

Position	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8
6K7 R. F.	Shell	HTR.	210	80	1.5	—	HTR.	1.5
6A8 Det.-Osc.	Shell	HTR.	210	80	0	150	HTR.	1.5
6K7 I. F.	Shell	HTR.	210	80	1.5	—	HTR.	1.5
6H6 2nd Det.	Shell	HTR.	0	0	0	—	HTR.	0
6C5 1st A.F.	Shell	HTR.	80	—	0	—	HTR.	5
6F6 2nd A.F.	Shell	HTR.	200	210	0	—	HTR.	15
5Z4 Rect.	Shell	345	—	A.C.	—	A.C.	—	345

Line 118 Volts. Switch on Broadcast Position. Volume Control Full On. 10% Variation Allowable.



MODELS 120,1200
2200
Alignment,Parts

INTERNATIONAL RADIO CORP.

This chassis is designed to operate from 115 volt, 60 cycle, alternating current power lines. It is a three band receiver covering the American broadcast, police and airport, and Foreign short wave bands.

The following tubes are employed:

6K7 (metal) or 6K7G (glass) R.F. amplifier
6A8 (metal) or 6A8G (glass) 1st Detector-Oscillator
6K7 (metal) or 6K7G (glass) I.F. amplifier
6H6 (metal) or 6H6G (glass) Diode detector
6C5 (metal) or 6C5G (glass) A.F. amplifier
6F6 (metal) or 6F6G (glass) Pentode output
5Z4 (metal) or 5Y3 (glass) Rectifier

The metal and glass tubes are interchangeable but when changing from one type to the other it is advisable to realign for perfect resonance. Glass counterpart types should be shielded, the metal tubes need not be. Shielding provisions are provided.

ALIGNMENT

The standard type of output meter should be used to indicate signal strength. It should be connected from the plate (pin No. 3) of the 6F6 to ground. Tone control should be turned "high". The signal from the signal generator *must be kept at a very low level.*

ESSENTIAL DATA: The intermediate frequency employed is 448 Kc. On the broadcast and middle bands the oscillator frequency is 448 kilocycles higher than the signal frequency. On the short wave band it is 448 kilocycles lower than the signal frequency.

Aligning should be done on the following frequencies: Broadcast band, 1400 and 600 Kc.; Middle band, 6000 and 2400 Kc.; Short wave band 15 megacycles.

In aligning on broadcast band it is permissible to bend plates on the *R. F. section only* of the three gang condenser. Do not bend plates when aligning the middle and short wave bands.

The front section of the three gang condenser is the oscillator section; the middle section, first detector; the rear section, R.F. amplifier. The R.F. amplifier is in circuit only on the broadcast band.

INTERMEDIATES: To align the I.F. circuits, set the signal generator to 448 Kc. and feed its modulated signal direct to the antenna. Short out the oscillator section of the three gang condenser. Adjust the first I.F. transformer trimmers for maximum meter reading. Go over both adjustments at least three or four times for accuracy. Repeat this process on the second I.F. transformer. If adjustments are not made accurately, selectivity will be poor and I.F. oscillation may result.

BROADCAST BAND: Place the band change switch on Broadcast position. Turn the dial to 1400 Kc. and feed a *very weak* 1400 Kc. modulated signal from your signal generator to the antenna. Adjust the Broadcast oscillator trimmer (see sketch) and R.F. stage trimmer (on condenser gang) for maximum reading. Although a trimmer is provided for the Broadcast detector coil it will be found not connected on many sets as it is not necessary in obtaining correct balance.

Turn dial and signal generator to 600 Kc. and rock the padder into correct adjustment. This is accomplished by very slowly adjusting the padder condenser and at the same time turning the dial slightly back and forth across 600 Kc. until an adjustment is obtained producing maximum output. Go back to 1400 Kc. and readjust the oscillator trimmer slightly if necessary. Then recheck padder at 600 Kc. It is permissible to bend plates on the R.F. section only in resonating circuits.

MIDDLE BAND: Turn the band change switch to the middle position and tune radio and signal generator to 6000 Kc. Adjust the oscillator trimmer and then the detector trimmer for maximum output.

Rock in the padder condenser at 2400 Kc. Then recheck at 6000 Kc. and 2400 Kc.

SHORT WAVE BAND: Turn band change switch to short wave band. Tune radio and signal generator to 15 megacycles and adjust trimmers. No padder condenser is used on the short wave band so no other adjustments are necessary. On this band the oscillator frequency is 448 Kc. lower than the signal frequency.

MICROPHONIC HOWL

The tuning condenser is cushion mounted to eliminate vibration. Do not allow the dial to touch the escutcheon plate on the cabinet or a microphonic condition will be created.

LONG WAVE-EXPORT MODELS

These models are also built with a four position switch (part number E-482) and an extra set of coils tuning the foreign long wave band. The order of band change switch positions is broadcast, midband, short wave, long wave band. Alignment—adjust long wave trimmers at 350 Kc. and rock in long wave padder at 160 Kc. See sketch for location of coils and condensers.

Some export sets also contain a 25 cycle power transformer (part number T-502) which has a tapped primary winding allowing operation from 125, 150 or 250 volt A.C. power lines. The tap switch is made available by removing part of the cover of the power transformer. 25 cycle sets may be used on 60 cycle although the converse is not true.

PARTS LIST

PART NO.	DESCRIPTION	
A-135	3 gang tuning condenser	$2.80
A-247	.00025 mf. mica condenser	.20
A-248	.001 mf. mica condenser	.20
A-249	.00125 mf. mica condenser	.20
A-258	.0005 mf. mica condenser	.20
A-303	.25 mf., 200 v. paper cond	.20
A-329	.005 mf., 600 v. paper cond	.15
A-351	.05 mf., 200 v. paper cond	.15
A-352	.05 mf., 300 v. paper cond	.15
A-354	.25 mf., 25 v. paper cond	.20
A-367	.05 mf., 400 v. paper cond	.15
A-370	.25 mf., 300 v. paper cond	.20
A-417	5 mf., 25 v. electrolytic cond	.55
A-439	Electrolytic filter condenser	1.30
A-509	6 gang trimmer condenser	.55
A-510	Dual padder condenser	.45
A-515	Single padder (long wave Mod.	.25
A-527	Dual trimmer condenser	.20
D-31	.8 inch Dynamic speaker #120	4.50
D-32	10 inch Dynamic speaker	7.50
E-154	Duo dial knob	.20
E-155	1 inch knob	.15
E-156	13/16 inch knob	.15
E-159	1 inch knob with colored dots	.20
E-266	Dial assembly	2.50
E-272	Dial assembly (long wave models	2.50
E-460	Antenna-ground binding post strip	.10
E-472	Pilot lamps, 6-8 volt	.15
E-480	3 position band change switch	1.00
E-482	4 position band change switch	1.50
H-49	6A8 tube socket	.10
H-50	6C5 tube socket	.10
H-52	6H6 tube socket	.10
H-54	6K7 tube socket	.10
H-56	6F6 tube socket	.10
H-57	5Z4 tube socket	.10
R-115	Volume control	.55
R-122	Tone control with power switch	.70
R-210	5M ohm, 1/3 w. carbon resistor	.20
R-229	850 ohm, 1/2 w. carbon res	.20
R-257	50M ohm, 1/3 w. carbon res	.20
R-258	1 megohm, 1/3 w. carbon res	.20
R-259	500M ohm, 1/3 w. carbon res	.20
R-264	100M ohm, 1/3 w. carbon resis	.20
R-274	25M ohm, 1/3 w. carbon resistor	.20
R-281	100 ohm, 1/3 w. carbon resistor	.20
R-315	Candohm resistor 150-200 ohms	.25
R-317	Candohm resistor, 12,500-15M-30	.55
S-102	Goat tube shield	.10
T-126	Power transformer (60 cycle)	2.50
T-330A	1st I.F. transformer	1.25
T-331A	2nd I.F. transformer	1.25
T-467A	Oscillator coil	1.75
T-468A	L. W. Detector coil (long w.w.	.85
T-469A	L. W. Oscillator coil (long w.	.85
T-487A	Antenna coil	1.00
T-494A	Detector coil	1.75
T-502	Power transformer, 25 cycle	6.50
U-118	A.C. cord and plug	.30
U-206	4 wire speaker cable	.20