



# RCA Victor

## MODEL 811K

Eleven-Tube, Three-Band, A-C, Superheterodyne Receiver

### TECHNICAL INFORMATION AND SERVICE DATA

-1937 No. 24-

SERVICE DIVISION • RCA MANUFACTURING COMPANY, INC. • CAMDEN, N. J., U. S. A.

*A Service of the Radio Corporation of America*

### Electrical Specifications

#### FREQUENCY RANGES

"Broadcast" (A).....	530-1,720 kc
"Medium Wave" (B).....	2,100-6,800 kc
"Short Wave" (C).....	6,800-23,500 kc

Intermediate Frequency.....	460 kc
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#### RADIOTRON COMPLEMENT

(1) RCA-6K7.....	R-F Amplifier
(2) RCA-6L7.....	First Detector
(3) RCA-6J7.....	Heterodyne Oscillator
(4) RCA-6J7.....	Oscillator Control
(5) RCA-6K7.....	I-F Amplifier

Pilot Lamps (6).....	Mazda No. 46, 6.3 volts, 0.25 amp.
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#### POWER SUPPLY RATINGS

Rating A .....	105-125 volts, 50-60 cycles, 140 watts
Rating B .....	105-125 volts, 25 cycles, 140 watts
Rating C .....	105-125/140-160/195-250 volts, 50-60 cycles, 140 watts

#### POWER OUTPUT

Undistorted .....	10 watts
Maximum.....	12½ watts

#### R-F ALIGNMENT FREQUENCIES

"Short Wave" (C).....	20,000 kc (osc., det., aint.)
"Medium Wave" (B).....	6,000 kc (osc.)
"Broadcast" (A).....	600 kc (osc.), 1,500 kc (osc.)

( 6) RCA-6H6.....	Second Detector, A.V.C., and A.F.C.
( 7) RCA-6N7.....	Audio Phase Inverter
( 8) RCA-6F6.....	Power Output
( 9) RCA-6F6.....	Power Output
(10) RCA-5T4.....	Full-Wave Rectifier
(11) RCA-6G5.....	"Magic Eye" Tuning Tube

Pilot Lamps (6).....	Mazda No. 46, 6.3 volts, 0.25 amp.
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#### LOUDSPEAKER

Type.....	12-inch Electrodynamic
Impedance (v.c.).....	2.2 ohms at 400 cycles

### Mechanical Specifications

Height .....	42 inches
Width .....	28½ inches
Depth .....	15 inches
Weight (net).....	79 pounds
Weight (shipping) .....	99 pounds
Chassis Base Dimensions.....	21 inches x 10½ inches x 3¼ inches
Over-all Chassis Height.....	11½ inches
Operating Controls.....	(1) Power Switch—Speech-Music, (2) Volume, (3) Tuning, (4) Range Selector, (5) Manual-Electric-Remote, (6) Tone
Tuning Drive Ratios (manual).....	10 to 1 and 50 to 1

### General Description

This receiver employs an eleven-tube, three-band, "Magic Brain" superheterodyne circuit. Features of design include "Electric Tuning" with push-button operation; automatic frequency control; "quonitative-wound" antenna and detector coils; tuned r-f amplifier; magnetite-core adjusted i-f transformers and low-frequency "A" oscillator tracking; straight-line dial; automatic volume control; phonograph terminal

board; "Magic-Eye" tuning tube; twelve-inch electrodynamic loudspeaker; plunger-type, air-dielectric trimming capacitors; aural-compensated volume control; tone control; "Music-Speech" switch; audio phase inverter; and push-pull power output stage. In addition, this model has a cabinet incorporating the "Sonic Arc" Magic Voice.

contact strip should be adjusted to the selector drum by placing two selector adjusting keys in the station adjustment strip, positions 1 and 8, loosening contact strip adjusting nuts "Z" and shifting the contact strip until the end contacts are exactly centered on the respective disc insulating segments. More accurate adjustment may be made by silhouetting the point of contact with a piece of white paper held behind the contact. Adjustment will be facilitated by removing complete assembly from rear of tuning condenser by unscrewing the three mounting screws. Contacts and discs must be kept free of dirt, filings, and other extraneous matter.

**Lubrication.**—The dial pointer slide should be greased with petrolatum. This same lubrication should be applied lightly to all gear faces of the drive mechanism and sparingly with a cloth to the station selector discs. Any good household oil, such as "3-IN-ONE," is suitable for the motor shaft bearings. A light grade of engine oil should be used for all gear bearings. Medium viscosity engine oil, similar to "PYROIL" (B), should be applied between the thrust washers on the motor shaft. "CASTORDAG," a mixture of graphite and castor oil, is recommended for use at the selector drum end-bearing slots and at the bearings of cable pulleys.

## Station Adjustment

Any eight stations may be chosen for "Electric" tuning. Remove the two escutcheon plates from the side of the dial, place proper call letter labels in the celluloid windows, and replace escutcheons. Turn the power on and proceed to set up the "Electric" tuning as follows:

1. Set Range Selector to "Broadcast."
2. Turn "Manual-Electric-Remote" control to "Electric."

3. Press push button No. 1 and wait until station pointer comes to rest.
4. Turn the "Manual-Electric-Remote" control to "Manual."
5. Remove adjusting key from receptacle on top of station selector drum mechanism.
6. Insert key in position marked, "1" in station adjustment strip and push the key all the way down to properly fit in slot in disc.
7. Tune the receiver very carefully by means of the manual tuning knob and the "Magic Eye," to station chosen for No. 1.
8. Remove key.
9. Turn the "Manual-Electric-Remote" control to "Electric."

Button No. 1 is now properly set for "Electric" tuning. Proceed similarly for the other seven push buttons, matching each station on the dial with the same number on the station adjustment strip. Repeat the above steps but place the key respectively in positions 2, 3, 4, etc., and in each case tune to the proper station. Now when you press a button the desired station will be tuned in electrically.

**Note.**—In the event that all the push-button switches are locked "in" at once, they may be released by pressing either the upper left-hand or the lower right-hand push buttons (Nos. 1 or 8) in farther than would ordinarily be required.

## Armchair Control

When a Model G-8 armchair control is attached to the receiver as shown in figure 6 it duplicates the action of the push buttons on the front panel when the "Manual-Electric-Remote" control is turned to "Remote" position.

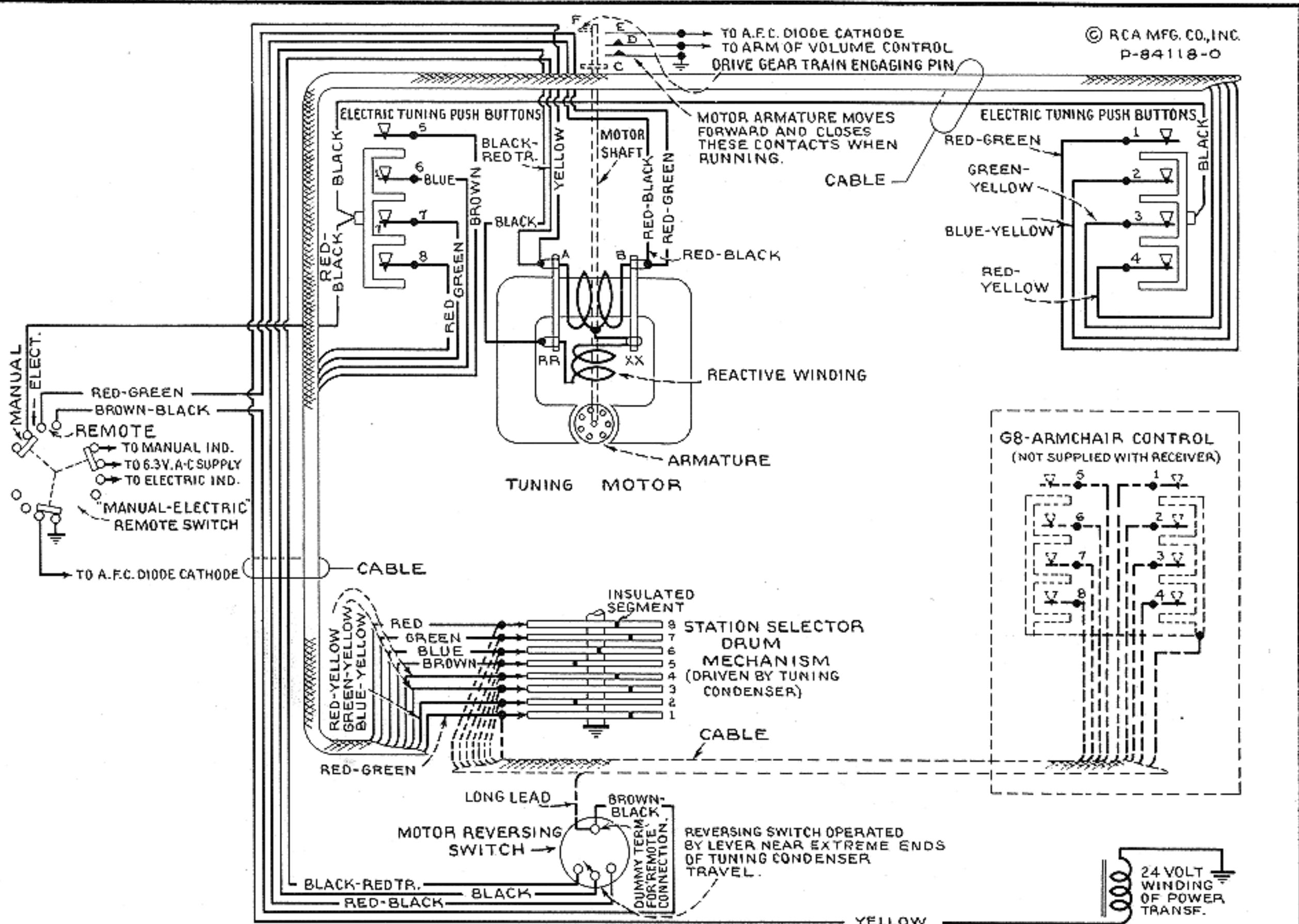


Figure 6—"Electric Tuning" Wiring Diagram  
(Viewed from rear of chassis)

# REPLACEMENT PARTS

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

STOCK No.	DESCRIPTION	STOCK No.	DESCRIPTION
	RECEIVER ASSEMBLIES		
14701	Arm—Hub and arm for operating band indicator shutter—located on range switch shaft	14734	Gear—Intermediate gear assembly—comprising one .749" O.D.—34 tooth—gear and one .291" O.D.—12 tooth pinion assembled
14726	Arm—Hub and arm complete with set screws—connects station selector drum to rear of tuning condenser shaft	14735	Gear—Intermediate gear assembly—comprising one 1.541" O.D.—72 tooth gear and one .291" O.D.—12 tooth pinion assembled
14517	Board—Antenna and ground terminal board	14736	Gear—Intermediate gear assembly—comprising one 1.541" O.D.—72 tooth gear and one hub assembled
12717	Board—Phonograph terminal board	14737	Gear—Throw-out gear and bracket
5237	Bushing—Variable condenser rubber mounting bushing	14716	Holder—Dial scale holder and reflector, complete with holding springs for band indicating shutter
13656	Button—Plug button for detector coil shield	14715	Indicator—Station selector indicator pointer and support
14725	Cable—Tuning tube cable and socket	5226	Lamp—Dial or indicating lamp
12607	Cap—Shield cap for first or second I.F. transformer	14719	Link—Link and lever assembly
12581	Cap—Shield cap for third I.F. transformer	14730	Motor—Tuning drive motor for 25-cycle models only (T3)
11350	Cap—Grid contact cap	14729	Motor—Tuning drive motor for 60-cycle models only (T3)
12884	Capacitor—Adjustable trimmer (long) (C2, C45, C51)	14028	Nut—Jamb nut for trimmer, Stock Nos. 12714 and 12884
12714	Capacitor—Adjustable trimmer (med.) (C8, C43)	12471	Plate—Mounting plate for cushion socket—less socket
13200	Capacitor—10 Mmfd. (C52)	14741	Plate—Tuning condenser front plate and studs assembled for mounting drive gears
14021	Capacitor—22 Mmfd. (C61)	14697	Pulley—Indicator pointer cable pulley
12720	Capacitor—100 Mmfd. (C26, C60)	13988	Resistor—10 ohms—carbon type, $\frac{1}{2}$ watt (R40)
14262	Capacitor—109 Mfd. (C62, C63)	11932	Resistor—330 ohms—carbon type, 1/10 watt (R4)
12404	Capacitor—120 Mmfd. (C24)	5030	Resistor—470 ohms—carbon type, $\frac{1}{2}$ watt (R39)
12724	Capacitor—120 Mmfd. (C54)	14720	Resistor—1,000 ohms—carbon type, $\frac{1}{2}$ watt (R2, R43)
14712	Capacitor—180 Mmfd. (C21, C23)	14078	Resistor—18,000 ohms—carbon type, 1 watt (R34)
12952	Capacitor—330 Mmfd. (C3, C34, C59)	11305	Resistor—22,000 ohms—carbon type, $\frac{1}{2}$ watt (R16)
13052	Capacitor—470 Mmfd. (C48)	14721	Resistor—22,000 ohms—carbon type, $\frac{1}{2}$ watt (R13)
14724	Capacitor—560 Mmfd. (C4)	11300	Resistor—33,000 ohms—carbon type, 1/10 watt (R42)
14723	Capacitor—690 Mmfd. (C47)	13735	Resistor—33,000 ohms—carbon type, $\frac{1}{2}$ watt (R5)
12729	Capacitor—1,550 Mmfd. (C46)	12454	Resistor—33,000 ohms—insulated $\frac{1}{2}$ watt (R53)
12897	Capacitor—4,700 Mmfd. (C5, C49)	11646	Resistor—47,000 ohms—carbon type, $\frac{1}{2}$ watt (R25)
14722	Capacitor—5,100 Mmfd. (C44)	11365	Resistor—82,000 ohms—carbon type, $\frac{1}{2}$ watt (R50)
4838	Capacitor—.005 Mfd. (C39, C41)	14560	Resistor—100,000 ohms—insulated, $\frac{1}{2}$ watt (R27)
13138	Capacitor—.01 Mfd. (C29, C33)	5145	Resistor—100,000 ohms—carbon type, $\frac{1}{2}$ watt (R28, R30)
14393	Capacitor—.01 Mfd. (C36)	13734	Resistor—120,000 ohms—carbon type, $\frac{1}{2}$ watt (R41)
11315	Capacitor—.015 Mfd. (C32, C35, C37)	12478	Resistor—150,000 ohms—carbon type, 1/10 watt (R54)
4870	Capacitor—.025 Mfd. (C28)	11453	Resistor—270,000 ohms—carbon type, 1/10 watt (R31, R32)
4886	Capacitor—.05 Mfd. (C56)	11297	Resistor—330,000 ohms—carbon type, 1/10 watt (R51)
4841	Capacitor—.1 Mfd. (C9, C10, C14, C64)	11172	Resistor—470,000 ohms—carbon type, $\frac{1}{2}$ watt (R17)
5170	Capacitor—.25 Mfd. (C19)	11452	Resistor—470,000 ohms—carbon type, 1/10 watt (R20)
4840	Capacitor—.25 Mfd. (C55)	11397	Resistor—560,000 ohms—carbon type, 1/10 watt (R1, R3)
12741	Capacitor—.5 Mfd. (C27 two in parallel, C38)	12013	Resistor—1 meg.—carbon type, 1/10 watt (R36)
5212	Capacitor—16 Mfd. (C58)	13730	Resistor—1 meg.—carbon type, $\frac{1}{2}$ watt (R26, R44)
14531	Capacitor—25 Mfd. (C57)	11626	Resistor—2.2 meg.—carbon type, $\frac{1}{2}$ watt (R18, R21)
14829	Capacitor Pack—Comprising one 16 Mfd. and one 20 Mfd. sections (C50, C65)	13732	Resistor—10 meg.—carbon type, $\frac{1}{2}$ watt (R35)
14372	Coil—Antenna coil and shield (L1, L2, L3, L4)	14692	Resistor—Voltage divider—comprising one 1,100 ohm, one 4,000 ohm, one 6,000 ohm, one 180 ohm and two 90 ohm sections (R9, R10, R11, R12, R37, R38)
14414	Coil—Detector coil and shield (L5, L6, L7, L8, L9, L10)	14695	Rod—Tie rod for joining lockplate pawls on station selector push-button switches
14713	Coil—Oscillator coil and shield (L11, L12, L13, L14)	4669	Screw—No. 8-32 x 5/32 square head set screw for arm, Stock No. 14701, or link, Stock No. 14719, or drum, Stock No. 14693
14727	Condenser—3-gang variable tuning condenser, complete with gear train (C1, C7, C53)	12418	Screw—No. 8-32 x 3/16 milled head set screw for gear, Stock No. 14739
5040	Connector—4-contact female connector for reproducer cable	14848	Selector—Station selector drum mechanism—comprising selector contactor discs, spring contacts, and motor reversing switch assembled in metal frame
14733	Contact—Spring contact for engaging discs in station selector drum for type 1 contact assembly	14374	Shield—Antenna or detector coil shield
30365	Contact—Comprising 8 spring contacts assembled on insulating strip for engaging discs in station selector drum (type 2 contact assembly)	14375	Shield—Oscillator coil shield
14699	Cord—Indicator pointer drive cord	12008	Shield—I.F. transformer shield
12006	Core—Adjustable core and stud for I.F. transformer	14718	Shutter—Band indicating shutter and arm assembly
12800	Core—Adjustable core and stud assembly for oscillator coil		
14717	Dial—Station selector dial scale		
14740	Drive—Tuning condenser vernier drive shaft and pinion gear		
14698	Drum—Drum for indicator drive cord—fastens on tuning condenser shaft		
14731	Drum—Station selector drum rotor—comprising 8 station selector contactor discs assembled on shaft		
14738	Gear—Drive pinion gear and arm		
14739	Gear—Drive gear and set screws—located on tuning condenser knob shaft		

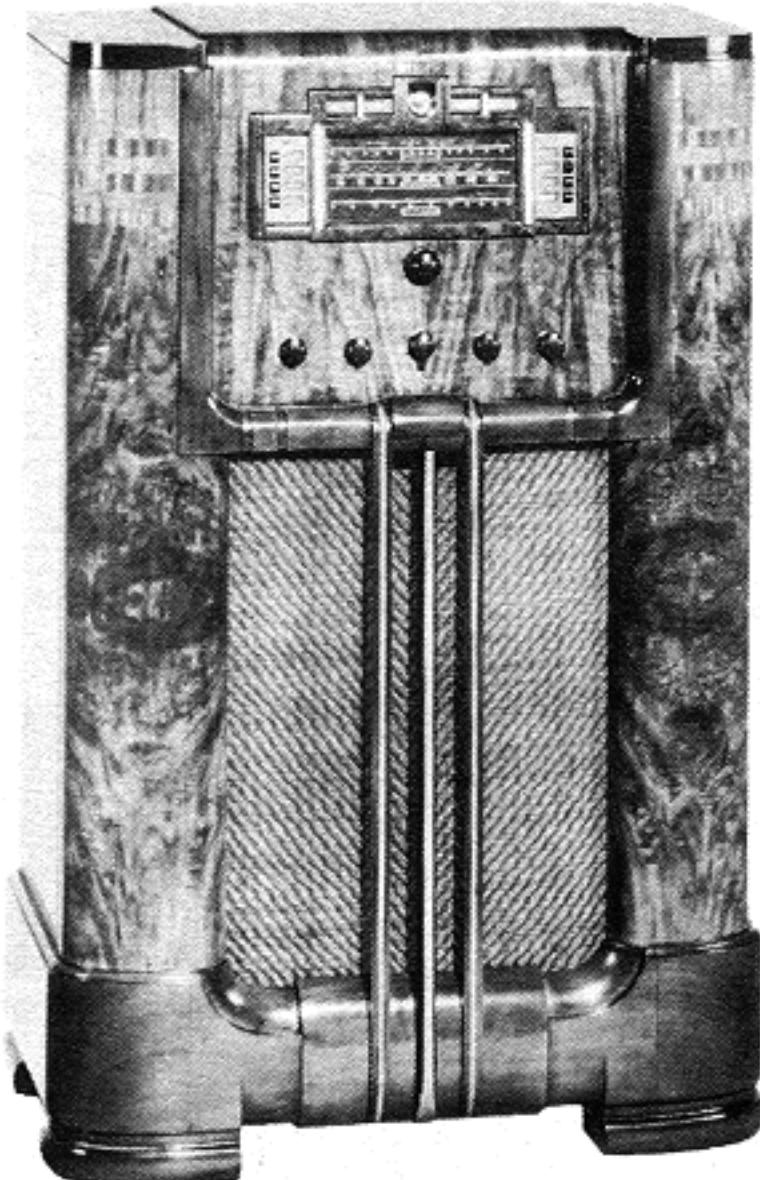
## REPLACEMENT PARTS—(Continued)

STOCK No.	DESCRIPTION	STOCK No.	DESCRIPTION
14696	Slider—Indicator pointer holder and spring		REPRODUCER ASSEMBLIES
11195	Socket—5-contact 5T4 Radiotron socket		(Speaker No. RL-70E2)
11196	Socket—8-contact 6K7, 6L7, 6J7, 6H6, 6F6 or 6N7 Radiotron socket	13866	Cap—Dust cap for cone center
14114	Socket—Dial or indicating lamp socket	11234	Coil—Field coil (L28)
12007	Spring—Retaining spring for core, Stock No. 12006	11469	Coil—Neutralizing coil (L27)
3676	Spring—Tension spring for link and lever, Stock No. 14719	12667	Cone—Reproducer cone, voice coil, center suspension and dust cap (L26)
13638	Spring—Tension spring for cord, Stock No. 14699	5039	Plug—4-contact male plug for reproducer
14694	Spring—Tension spring for lockplate pawl on station selector push-button switches	14535	Reproducer, complete
14742	Stud—Mounting stud for gear and arm, Stock No. 14738	14534	Transformer—Output transformer (T2)
14702	Switch—"Manual - Electric - Remote" switch (S7, S10, S12)	14357	Washer—Spring washer to hold field coil securely
14705	Switch—L.F. tone and power switch (S1, S8, S11)	12038	MISCELLANEOUS ASSEMBLIES
14732	Switch—Motor reversing switch and mounting plate for station selector (S9)	14744	Band—Rubber band for tuning tube
14704	Switch—Range switch (S2, S3, S4, S6)	14745	Bracket—Tuning tube mounting bracket and clamp
14728	Switch—A-F-C and A-F amplification suppression switch (S13)	14747	Button—Automatic station selector push button
14693	Switch—Station selector button switch—comprising four contacts and corresponding lockplates, completely assembled on insulating strips	14750	Card—Call letter cards for station selector
14764	Tone Control—H.F. tone control (R29)	14743	Escutcheon—Station selector and tuning tube escutcheon and crystal—less buttons and station call letter cards
14828	Transformer—First I.F. transformer (L15, L16, C62, C63)	14749	Escutcheon—Station selector and tuning tube escutcheon—complete with crystal, indicating cards, and buttons—less station indicating cards
14765	Transformer—Second I.F. transformer (L20, L21, C21, C23)	14748	Indicator—"Electric-Manual" indicator screen
14709	Transformer—Third I.F. transformer (L22, L23, L24, C24)	14751	Indicator—"Music-Speech" indicator screen
14689	Transformer—Power transformer, 105-125 volts, 50-60 cycle (T1)	14359	Key—Key for use in setting "Electric Tuning" mechanism
14690	Transformer—Power transformer, 105-125 volts, 25-60 cycle (T1)	14688	Knob—Large station selector knob
14691	Transformer—Power transformer, 105-240 volts, 50-60 cycle (T1)	14269	Knob—Range switch knob
13144	Volume Control (R52)	5210	Knob—Volume control, "Manual-Electric-Remote" switch, H.F. tone control, L.F. tone control or small station selector knob
		14746	Screw—Chassis mounting screw and washer assembly
		4982	Shield—Celluloid shield for station call letter cards
		14270	Spring—Retaining spring for knob, Stock No. 14359
			Spring—Retaining spring for knob, Stock Nos. 14269 and 14688

## Circuit Arrangement

The circuit consists of an r-f amplifier stage, first-detector (converter) stage, separate heterodyne-oscillator stage, oscillator control stage, i-f amplifier stage, diode-detector—automatic volume and frequency control stage, audio phase-inverter voltage-amplifier stage, push-pull pentode power-amplifier stage, tuning indicator "Magic Eye," and a full-wave rectifier stage.

The antenna and detector coils are constructed with a special type of winding ("quumulative") to provide increased sensitivity and selectivity on the "A" band. The "A," "B," and "C" sections on both coils are wound on single forms and are series connected. The range selector operates in such a manner that the correct portions are selected for the primary and secondary windings on each band. The "A,"



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"B," and "C" oscillator sections are likewise wound on a single form but are connected so they operate separately. Undesirable interaction of unused windings with the tuned circuits is prevented by shorting out the proper sections with the range selector.

The intermediate-frequency amplifier consists of an RCA-6K7 tube in a transformer-coupled circuit. The windings of all i-f transformers are resonated by fixed capacitors and are adjusted by molded magnetite cores to tune to 460 kc.

The function of the automatic-frequency-control circuit is to automatically change the frequency of the heterodyne oscillator so that the correct i-f frequency is formed for the i-f amplifier. The circuit consists essentially of an i-f discriminator which, as the name implies, discriminates or furnishes control voltage of the correct polarity to an oscillator frequency-control tube for generated i-f carrier frequencies slightly above and below 460 kc, or the frequency to which the i-f amplifier is tuned.

The plate circuit of the RCA-6J7 oscillator control tube is caused to act as an apparent variable inductance in parallel with the "A" band oscillator tuned circuit of which coil L14 is a part. The series combination of resistor R41 and the oscillator control-tube grid to cathode capacitance is also in parallel with the oscillator tuned circuit. Since the resistance of R41 is many times greater than the reactance of the grid-

cathode capacitance, at the oscillator frequency, the r-f current through the combination will be practically in phase with the r-f voltage across the oscillator tuned circuit. However, the r-f voltage impressed across the grid-cathode capacitance section of the combination will lag the r-f voltage across the combination, or the tuned circuit, approximately 90 degrees. The grid-cathode r-f voltage will be amplified by the control tube but will be shifted an additional 180 degrees (grid and plate voltages of all tubes are always opposite in phase) so that the amplified r-f voltage appearing across the plate circuit will now lead the voltage across the combination or the tuned circuit by 90 degrees, or, in other words, the control tube is acting as an equivalent shunt inductance. The amount of this action is determined by the amplification of the tube, which in turn is governed by the grid-cathode bias voltage. In operation a residual bias is developed across the cathode resistor R43. The d-c control grid voltage is fed to the control grid from the discriminator circuit through resistor R44. If this voltage is negative with respect to ground, the amplification of the control tube will be decreased, the apparent plate circuit inductance of the tube increased, which will lower the frequency of the oscillator tube. The converse will occur when the grid voltage is positive with respect to ground.

The action of the discriminator circuit depends upon the fact that a 90-degree phase difference exists between the primary and secondary potentials of a double-tuned loosely-coupled transformer when the resonant frequency is applied and that this phase difference varies as the applied frequency varies; i.e., the maximum resultant response voltage across the primary and secondary windings connected in series will occur at a frequency either lower or higher in frequency than the frequency to which the individual windings are resonated, respectively depending on whether the windings are connected series aiding or opposing.

The discriminator, or third i-f transformer, consists of the primary winding, L24, which is a part of the second i-f transformer secondary tuned circuit (tuned to 460 kc) and the center-tapped secondary, L22. The upper and lower halves of L22 may be considered as two secondary coils, the upper series aiding and the lower series opposing the primary, L24. The magnetite core in L22 is inserted to inductively balance the two halves. The function of coil L23 (magnetite core adjusted), in parallel with L22, is to tune the secondary to 460 kc. Therefore, the maximum voltage will be applied to diode circuit P<sub>2</sub>K<sub>2</sub>, R51, and R54 when the i-f signal frequency is above 460 kc and to the diode circuit P<sub>1</sub>K<sub>1</sub> and R20 when the i-f signal frequency is below 460 kc. Resistor sections R51-R54 and R20 are connected in series between ground and a point leading to the oscillator control tube grid.

D-c voltages, resulting from diode rectification, across section R51-R54 and section R20 are always in opposition, consequently the oscillator control-tube grid-bias voltage is a differential amount, depending upon the i-f signal strength and its frequency deviation from the nominal value of 460 kc. The polarity of this differential oscillator control-tube grid-bias, with respect to ground, depends on whether the i-f signal frequency is above or below 460 kc, but is always in the direction which will bring the generated i-f frequency nearer to 460 kc. A-f-c action is automatically eliminated for "manual" tuning by grounding diode cathode K<sub>1</sub> through switch S7. A-v-c voltage and audio signal components are developed across resistor section R51-R54.

The RCA-6N7 twin-triode tube is operated as a phase inverter to supply audio signal voltage 180-degrees out-of-phase between the control grids of the two RCA-6F6 power output tubes for push-pull operation. Audio signals applied to the upper triode control grid through volume control R52 are amplified and shifted 180-degrees in phase. A portion of this amplified signal is applied to the lower triode control grid, through capacitor C33 and resistors R26 and R25, where it is amplified to approximately the same level as that in the plate circuit of the upper triode but approximately 180-degrees out-of-phase.

## Service Data

The various diagrams of this booklet contain such information as will be needed to isolate causes for defective operation if such develops. The ratings of the resistors, capacitors, coils, etc., are indicated adjacent to the symbols signifying these parts on the diagrams. Identification titles such as R1, L1, C1, etc., provide reference between the illustrations and Replacement Parts List. The coils, transformer windings, and reactors are rated in terms of d-c resistance to permit continuity checks.

**Precautionary Lead Dress.**—(1) Bus lead from oscillator coil directly to ground must be as short as possible for correct alignment, (2) bus lead from range switch S3 to oscillator section C53 of variable condenser should be  $1\frac{1}{2}$  inches long for correct alignment, (3) bus lead from detector coil to range switch S4 must be as short as possible for correct alignment, (4) bus lead from detector coil to detector section C7 of variable condenser should be  $2\frac{1}{2}$  inches long for correct alignment, (5) detector trimming capacitor C8 lead should connect directly to variable condenser C7, (6) bus lead from antenna section of range switch S2 to chassis ground lance must be as short as possible, (7) bus lead from antenna coil to range switch S2 should be  $2\frac{1}{4}$  inches for correct alignment, (8) bus lead from antenna coil to antenna section C1 of variable condenser must be  $3\frac{7}{8}$  inches over-all with  $\frac{1}{2}$  inch bend at coil end for correct alignment, (9) filament leads should be dressed away from RCA-6N7 grids, pins Nos. 4 and 5, to reduce hum pickup, (10) resistors R41, R43, and R44 in the oscillator control tube circuit must be

kept free of other component parts for satisfactory operation of the a-f-c circuit, (11) capacitor C29 and resistor R16 leads from terminal board to the phonograph terminal board should be as short as possible and dressed away from other parts to reduce hum pickup, (12) filament leads should all be twisted to reduce hum pickup, (13) filament leads should be dressed away from the terminal board near the 3rd i-f transformer. (14) Lead from the range switch S3 to the oscillator cathode socket terminal should be dressed under bus wire on socket to hold this lead down close to chassis.

**Phonograph Attachment.**—A terminal board is provided for connecting a phonograph into the audio-amplifying circuit. RCA Victor Models R-93, R-93-A, R-93-2, or R-94 Record Players should be connected as follows: Remove the link from the phonograph terminal board. Connect green wire in Radio-Record switch cable to terminal 1; yellow to terminal 2; shield to terminal 3; and tape up the red and blue. Connect a 2-conductor twisted cable between the Record Player binding posts and the screw-terminals on Radio-Record switch. If additional volume is desired, connect an RCA Stock No. 9632 transformer between the 2-conductor twisted cable and the screw-terminals on Radio-Record switch as follows: Yellow and brown transformer leads and one side of twisted cable to ground screw-terminal on switch; black transformer lead to other side of twisted cable; and blue transformer lead to other screw-terminal on switch.

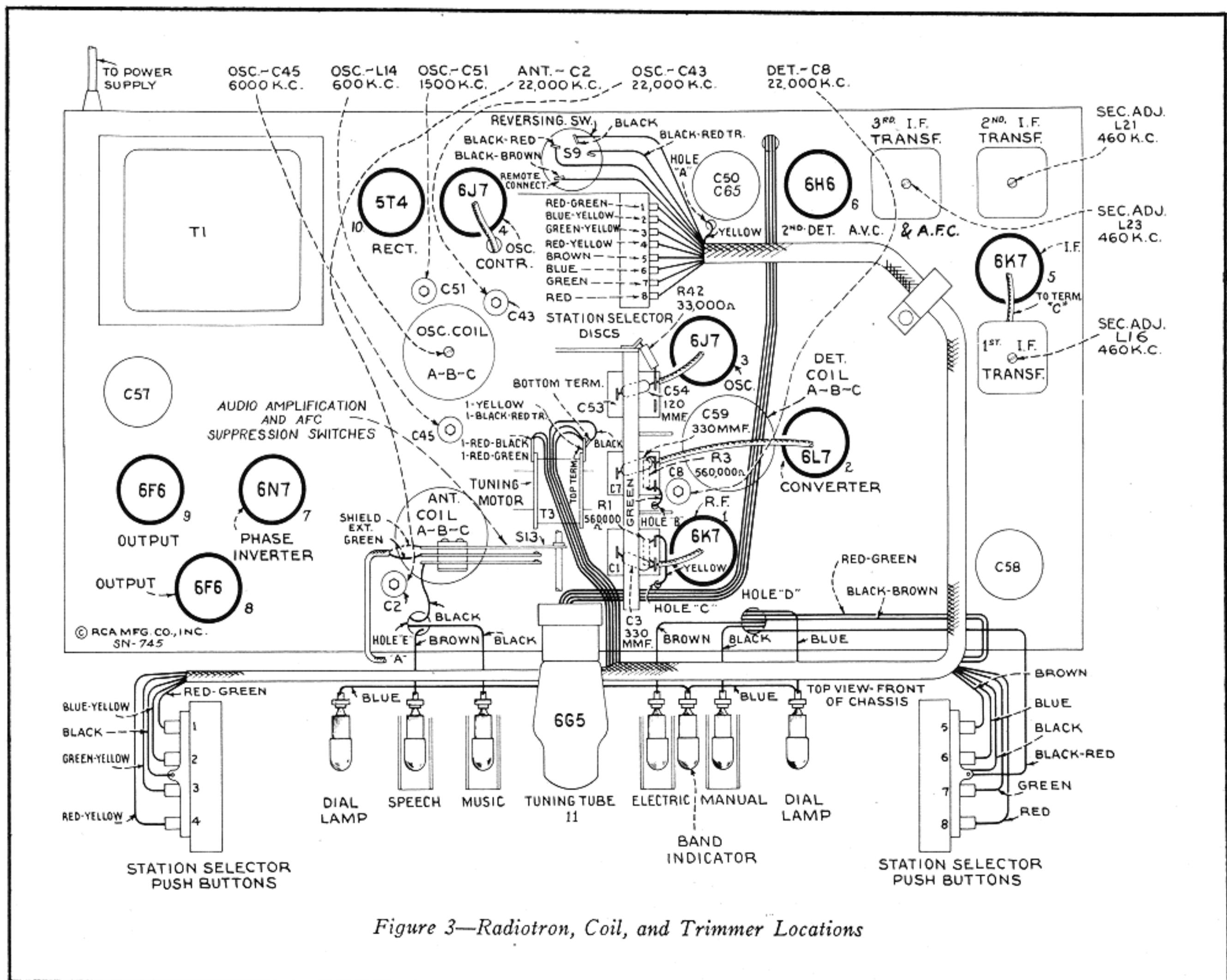


Figure 3—Radiotron, Coil, and Trimmer Locations

**Loudspeaker.**—Centering of the loudspeaker is made in the usual manner with three narrow paper feelers after first removing the front dust cover. This may be removed by softening its cement with a light application of acetone, using

care not to allow the acetone to flow into the air gap. The dust cover should be cemented back in place with ambroid upon completion of adjustment.

## ALIGNMENT PROCEDURE

Calibrate the tuning dial by adjusting dial pointer to the left ends of horizontal calibration lines with the gang tuning-condenser plates in full-mesh position. This is a screw-driver adjustment.

The "Manual-Electric-Remote" switch should be turned to "Manual" (right) during alignment unless otherwise specified.

**CAUTION.**—The magnetite core screw L22 on the bottom of the 3rd i-f transformer has been accurately adjusted, for an exact electrical balance of coil L22 to center tap, during manufacture and should not be disturbed. However, if for any reason the adjustment has been moved from its original position, it will be necessary to mechanically adjust this screw until the end of the stud protrudes exactly 3/16 of an inch (six threads exposed) above the brass bushing prior to any alignment operations.

Perform alignment in proper order, tabulated below, starting with No. 1 and following all operations across, then No. 2, etc. A-f-c discriminator adjustments should follow r-f and i-f adjustments tabulated below. Adjustment locations are shown on figures 3 and 4.

Cathode-ray alignment is preferable; the connections to the chassis are shown on figure 2. If an output indicator is used, connect it across the loudspeaker voice-coil and advance the receiver volume control to full-volume position.

Connect the "low" output terminal of the test oscillator to the receiver chassis for all alignment operations. Regulate the output of the test oscillator so that minimum signal is applied to the receiver to obtain an observable output indication. This will avoid a-v-c action.

The term "Dummy antenna" means the device which must be connected between the "high" test-oscillator output and the point of connection to the receiver in order to obtain ideal alignment. "No signal, 550-750 kc" means that the receiver should be tuned to a point between 550 and 750 kc where no signal or interference is received from a station or local (heterodyne) oscillator.

For further details on alignment, refer to booklet "RCA Victor Receiver Alignment."

Order of Alignment	Test Oscillator			Range-Selector	Receiver Dial Setting	Circuit to Adjust	Adjustment Symbols	Adjust to Obtain
	Connection to Receiver	Dummy Antenna	Frequency Setting					
1	—	—	—	—	—	3rd I-F Trans.	L23	Turn Extreme Counter-clockwise
2	6K7 I-F Grid Cap	.001 Mfd.	460 kc	"A" Left	No Signal 550-750 kc	2nd I-F Trans.	L20 and L21	Max. (peak)
3	6L7 Det. Grid Cap	.001 Mfd.	460 kc	"A"	No Signal 550-750 kc	1st I-F Trans.	L15 and L16	Max. (peak)
4	Ant.	300 Ohms	20,000 kc	"C" Right	20,000 kc	"C" Osc.	C43	Max. (peak)*
5	Ant.	300 Ohms	20,000 kc	"C"	Rock thru 20,000 kc	"C" Det.	C8	Max. (peak)†
6	Ant.	300 Ohms	20,000 kc	"C"	20,000 kc	"C" Ant.	C2	Max. (peak)‡
7	Ant.	300 Ohms	6,000 kc	"B" Center	6,000 kc	"B" Osc.	C45	Max. (peak)*
8	Ant.	200 Mmfd.	600 kc	"A" Left	600 kc	"A" Osc.	L14	Max. (peak)
9	Ant.	200 Mmfd.	1,500 kc	"A"	1,500 kc	"A" Osc.	C51	Max. (peak)
10	Ant.	200 Mmfd.	600 kc	"A"	600 kc	"A" Osc.	L14	Max. (peak)
11	Ant.	200 Mmfd.	1,500 kc	"A"	1,500 kc	"A" Osc.	C51	Max. (peak)
12	Proceed to A-F-C Discriminator Adjustments Outlined Below							

\* Use minimum capacity peak if two peaks can be obtained.

† Use maximum capacity peak if two peaks can be obtained.

‡ After this adjustment, check for image signal by shifting receiver dial to 19,080 kc.

**A-F-C Discriminator Adjustments.**—These adjustments are rather critical and should be performed with extreme care. Improper adjustment may result in complete failure of the oscillator control tube to function or else may cause it to detune the oscillator instead of tuning it to the signal. It is assumed that the magnetite core adjusting screw L23 (top of

3rd i-f transformer) has been turned all the way out (extreme counter-clockwise) prior to the preceding tabulated adjustments. Adjustments are as follows: Remove spring "N" on link and arm assembly which connects the "Manual-Electric-Remote" switch shaft to the throw-out gear bracket. Connect antenna to receiver antenna "A" terminal. With the "Manual-

"Electric-Remote" switch in "Manual" (right) position, tune in a strong local station near 600 kc or the low-frequency end of the "A" band as accurately as possible by means of the tuning tube "Magic Eye." The most accurate adjustment will be obtained by adjusting the "vernier" tuning knob mid-way between the two points where the eye just appears to start to open. This will place the generated i-f carrier signal frequency exactly in the center of the i-f amplifier response curve (should be 460 kc if i-f amplifier was properly aligned) and is the frequency to which the a-f-c discriminator (3rd i-f transformer) should be tuned to resonance. Without disturbing any of the receiver adjustments, place the "high" test-oscillator lead about  $\frac{3}{4}$  of an inch from the grid cap lead of the RCA-6K7 i-f amplifier tube, adjust the test-oscillator output to maximum, turn test-oscillator "Modulation" off, and carefully zero-beat the test-oscillator frequency (approximately 460 kc) with the i-f carrier signal. Avoid placing the test-oscillator lead nearer to the grid cap lead than specified above, as doing so will tend to detune the i-f amplifier. It may be necessary to reduce the local station signal, during this operation, by shortening antenna lead or grounding antenna "A" terminal to chassis in order to increase the loudness of the beat note sufficiently for accurate zero-beat adjustment.

Throw "Manual-Electric-Remote" switch to "Electric" (center) position. A high whistle or beat note will now be heard. Turn the magnetite core screw L23 (top of 3rd i-f transformer) slowly clockwise. As this screw is turned, the beat note will first increase to a high audio frequency and will then decrease to a zero-beat and then increase in fre-

quency again. The point of exact zero-beat is the position for correct adjustment of the discriminator. Zero-beat should also still exist when the "Manual-Electric-Remote" switch is thrown back to "Manual" position. The adjustment is now

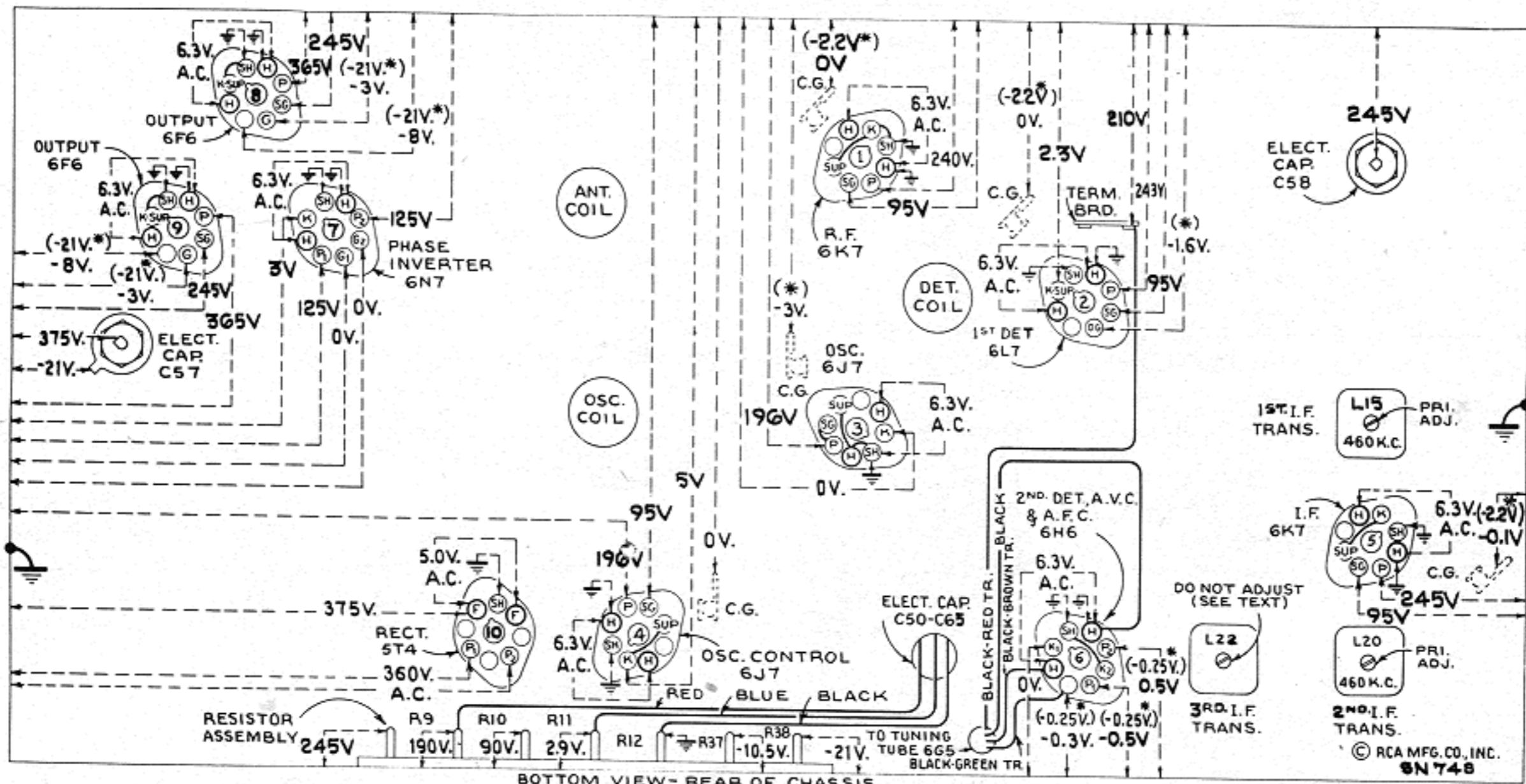
### Radiotron Cathode Current Readings

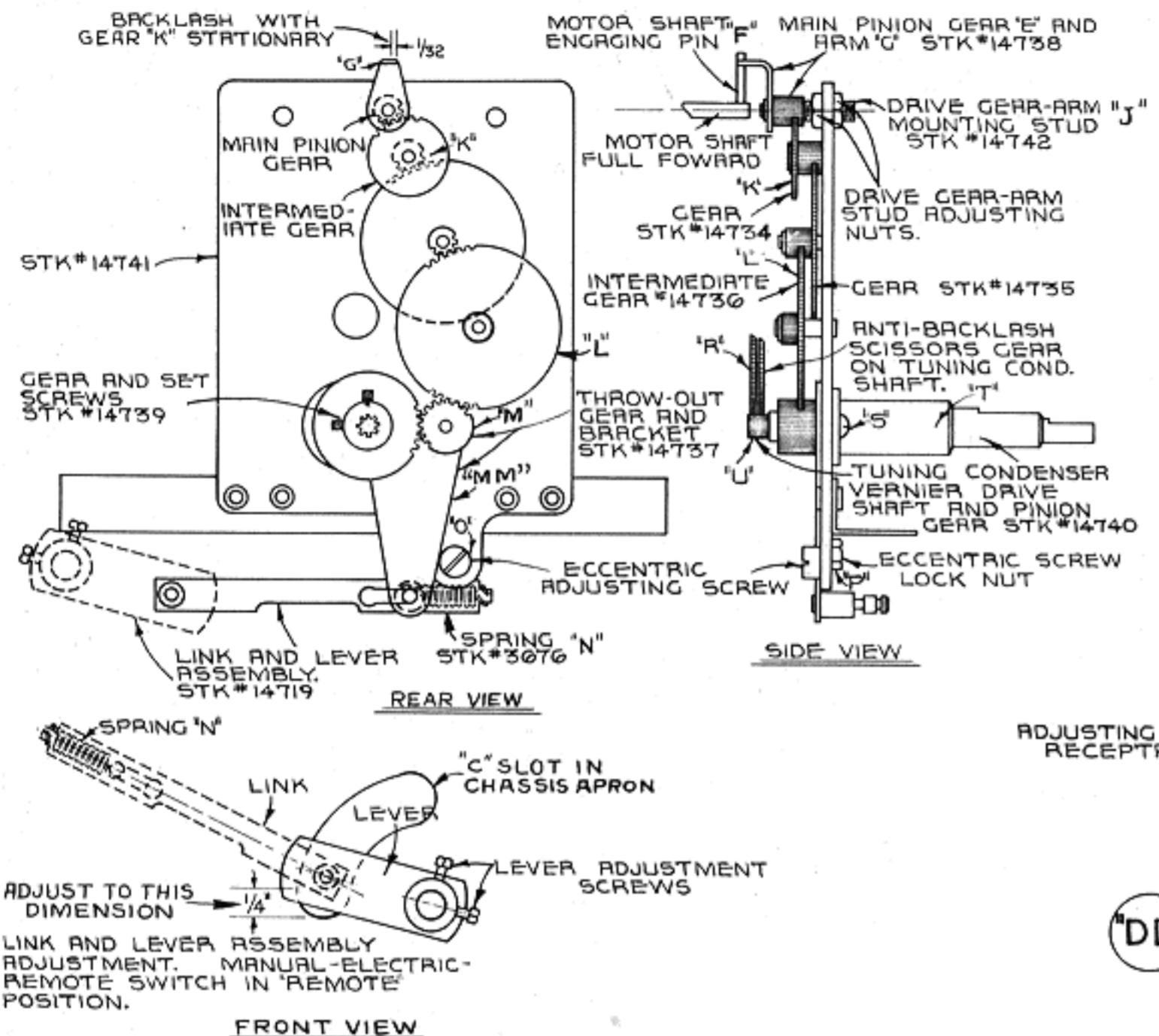
Measured with Milliammeter Connected at Tube Socket Cathode Terminals Under Conditions Similar to Those of Voltage Measurements

(1) RCA-6K7—R.F. Amp.	8.5 ma.
(2) RCA-6L7—1st Det.	7 ma.
(3) RCA-6J7—Osc.	10 ma.
(4) RCA-6J7—Osc. Control.	1.2 ma.
(5) RCA-6K7—I.F. Amp.	8.5 ma.
(6) RCA-6H6—2nd Det., A.V.C. and A.F.C.	—
(7) RCA-6N7—Phase Inverter	1.8 ma.
(8) RCA-6F6—Output	26 ma.
(9) RCA-6F6—Output	26 ma.
(10) RCA-5T4—Rectifier	112 ma.*
(11) RCA-6G5—Tuning Tube	2.5 ma.

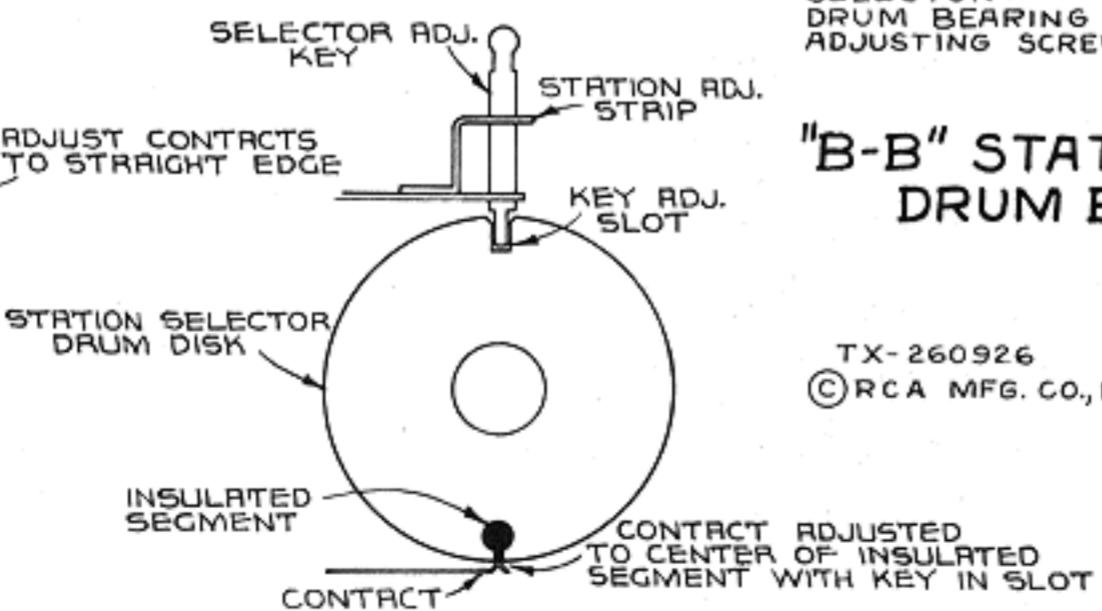
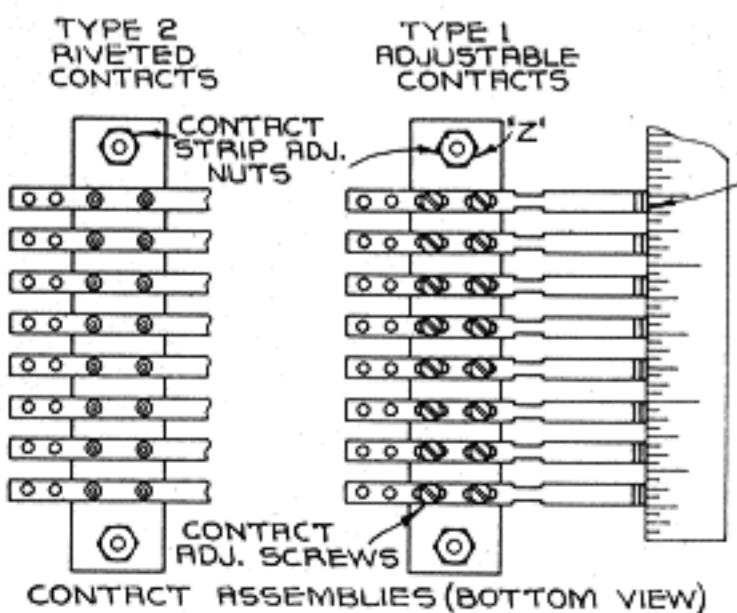
(\*Cannot be measured at socket)

complete and may be checked by slightly detuning the receiver above and below the local station frequency with the "Manual-Electric-Remote" in "Manual" position, switching to "Electric" position, and noting the oscillator pull-in. Replace spring "N."





### "A-A" DRIVE GEAR TRAIN ASSEMBLY

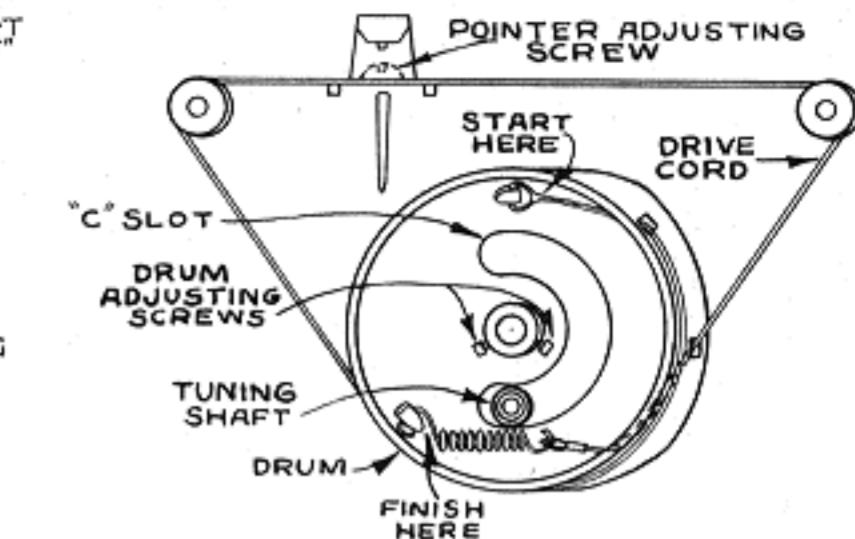
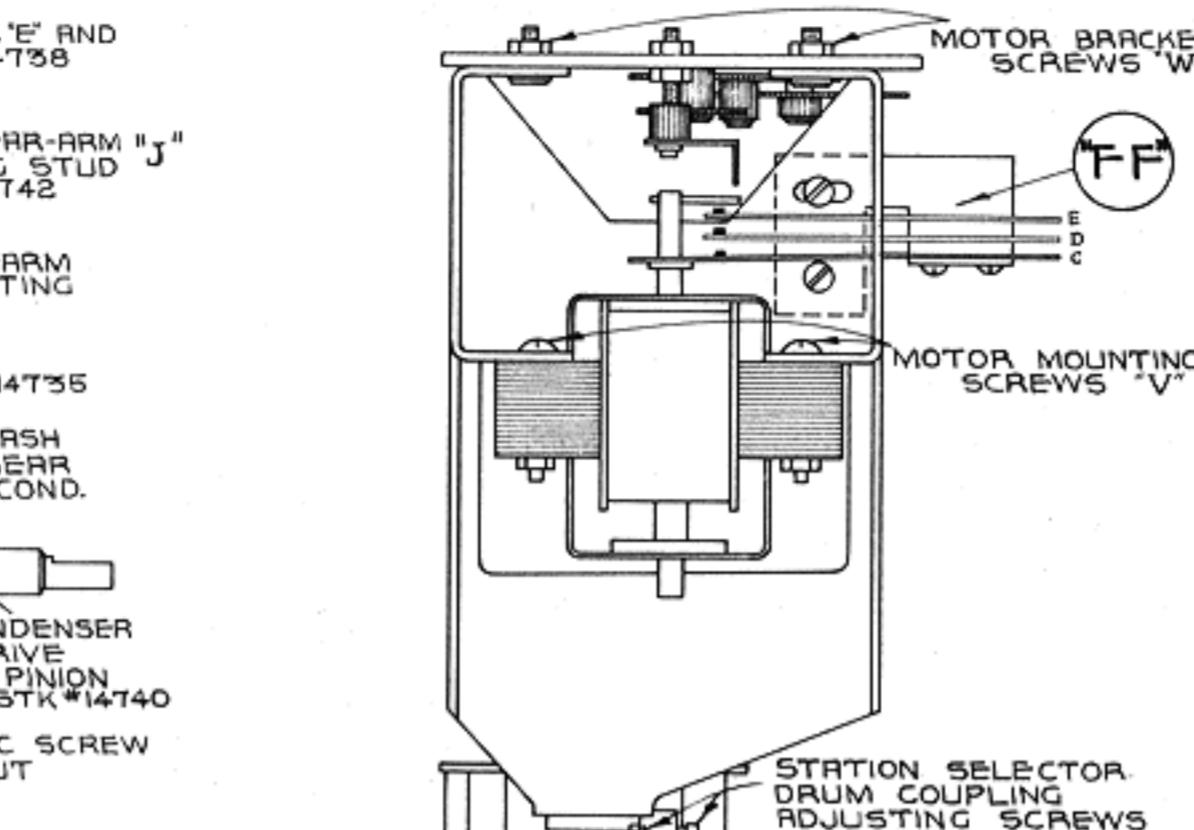


### "B-B" STATION SELECTOR DRUM BEARING.

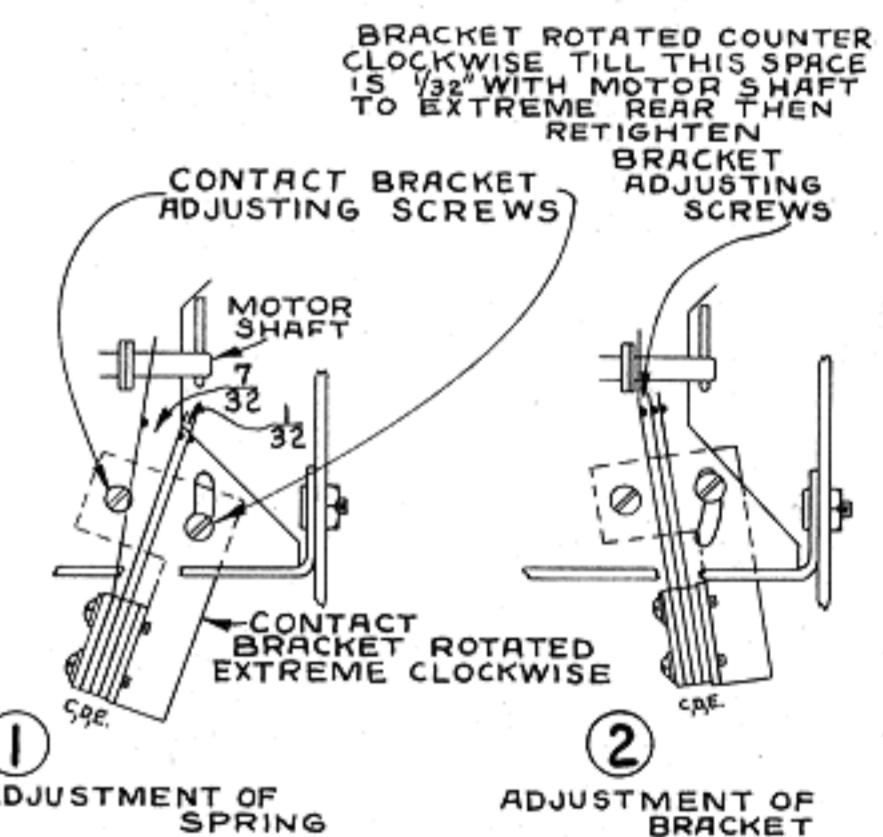
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### "D-D" STATION SELECTOR DRUM CONTACT ADJUSTMENTS

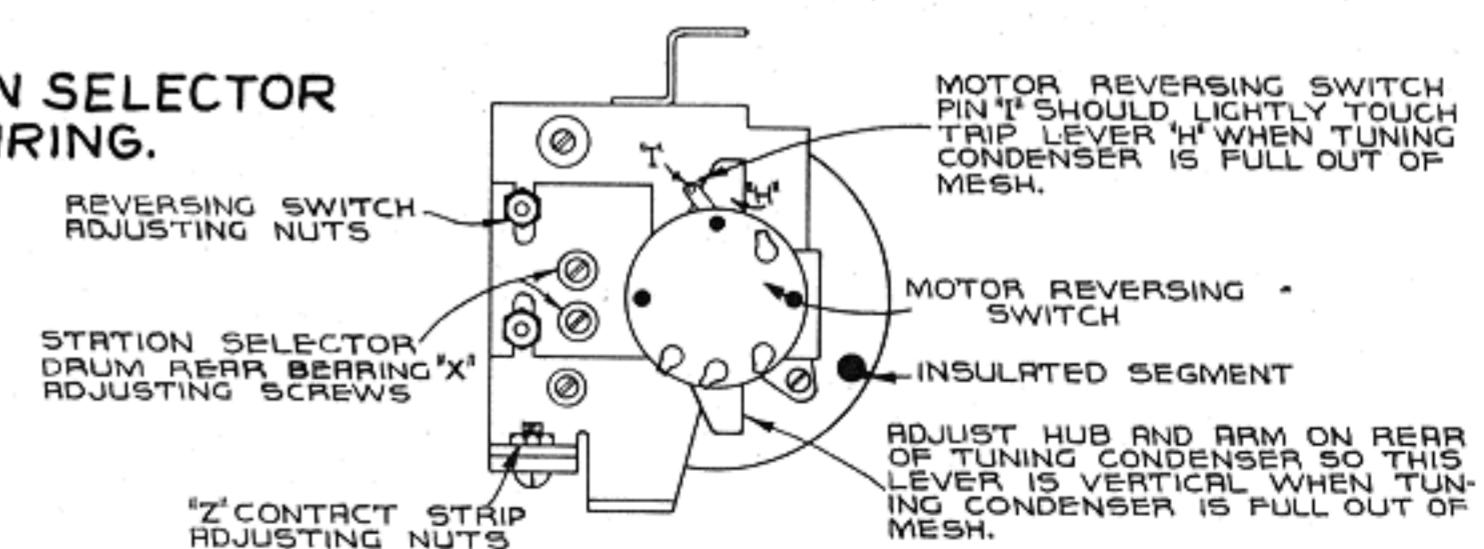
Figure 5—"Electric Tuning" Mechanism Adjustments



### TUNING CONDENSER INDICATOR DRIVE



### "F-F" AFC AND AF AMPLIFICATION SUPPRESSION SWITCHES.



### "C-C" MOTOR REVERSING SWITCH ADJUSTMENT.

# ELECTRIC TUNING

## Principle of Operation

The electric tuning mechanism consists essentially of a quick engaging and dis-engaging reversible electric motor, tuning condenser driving gear train, and eight mechanically interlocked (pushing one button releases all others) station selector push buttons respectively wired to eight adjustable station selector contactor discs (each with a motor stopping insulated segment) mounted on a drum which is direct-coupled to the gang tuning condenser shaft. The arrangement permits any one of eight pre-determined stations to be electrically tuned in by merely touching the correct push button.

The operation may be more readily understood by reference to figures 1, 5, and 6. When the motor is not energized, the armature is pushed to the rear or slightly out of the magnetic center by tension of contact spring "C" and the motor shaft is dis-engaged from the driving gear train. Pressing in any one of the eight push buttons will complete the motor circuit through a station selector contactor disc, assuming that the "Manual-Electric-Remote" switch is in "Electric" position and that the insulated segment in the contactor disc is not opposite its contactor. As the motor starts, the armature will be drawn forward, due to solenoid action, and the pin "F" on the end of its shaft will engage the arm "G" on the small main pinion gear, thereby driving the tuning mechanism. At the same time contact springs "E" and "D" will be grounded, causing suppression of audio amplification and automatic frequency control during the tuning cycle. The motor will continue to operate until the insulated segment in the selector disc breaks the motor circuit, whereupon spring "C" will instantly dis-engage the motor pin "F" from the arm "G" on the small pinion driving gear and open contacts "E" and "D." Pushing another button will cause the above mentioned cycle to be repeated except that the motor will be interrupted by the insulated segment on a corresponding disc. The discs are individually adjustable on a drum mechanism, providing a choice of eight "Electric Tuned" "Broadcast" stations. The arrangement of the motor is such that its rotation will continue in the same direction regardless of the number of "Electric" tuning cycles until the tuning condenser approaches either full-out or full-in of mesh, whereupon lever "H" trips switch S9 which reverses the direction of rotation. A throw-out idler gear is link-coupled to the "Manual-Electric-Remote" control to disconnect the motor drive gear train when the control is thrown to "Manual" position.

## Mechanism Adjustments

The electric tuning mechanism is designed to be as simple in construction and as fool proof in operation as is possible. In order to maintain the accurate results possible with this device care must be taken in effecting any repairs or adjustments. Reference should be made to figure 5 and the following:

**A-F-C and A-F Amplification Suppression Switches.**—This switch assembly is located on the motor bracket and closes due to solenoid action of motor armature. The tension of the long contact spring "C" is important in bringing about quick dis-engagement of the motor and in permitting the motor to pull into mesh with the drive mechanism. Normal adjustment is attained when the short springs "D" and "E" are aligned exactly straight with contact points separated approximately  $1/32$  of an inch and with the spring "C" spaced approximately  $7/32$  of an inch from spring "D" at the point of contact. If necessary, in order to obtain positive pull-in and quick dis-engagement of the motor, the tension of spring "C" should be increased or decreased by bending. This action should be checked with the front apron of the chassis raised two inches higher than the rear. Contacts of the switch must be kept clean. Crocus cloth or a relay burnisher may be used for this purpose.

**Motor Reversing Switch.**—It is necessary to automatically stop and reverse the drive motor before the tuning condenser reaches the ends of its travel. Approximately 175 degrees of

sweep is required, and the reversal must take place above 1,700 kc and below 540 kc but not too near the limits of the scale. The coupling between the station selector drum and the tuning condenser shaft should be attached so that the reversing switch trip lever "H" is exactly vertical when the condenser is full-out of mesh. There should be  $1/32$  of an inch clearance between the end of the condenser shaft and the selector drum shaft. While the trip lever is in this position the reversing switch bracket should be adjusted by means of its elongated mounting holes until the switch pin "I" just lightly touches trip lever "H."

**Main Pinion Gear.**—Clearance between the small high-speed pinion gear "E" and the intermediate gear "K" determines the amount of mechanical noise produced. Correct adjustment will give approximately  $1/32$  of an inch movement of back lash at the end of pinion arm "G" when gear "K" is held stationary. Arm "G" must also be adjusted for correct mesh with motor shaft drive pin "F." With the motor shaft completely forward and pinion "E" tight against its front bearing, the pinion mounting stud "J" should be adjusted so that pin "F" meshes its full thickness with the rotating arm "G." An increase of this mesh will increase over travel on tuning while a decrease of mesh will decrease the over travel. The elongated hole in the front bracket allows sufficient movement of the mounting stud "J" to permit above mentioned gear mesh adjustment.

**"Manual-Electric-Remote" Changeover.**—(1) Link and lever adjustment—To properly line up the mechanical link between the switch shaft and throw-out gear bracket "MM," the set screws holding the link lever on the switch shaft must be loosened, the switch turned to the "Remote" position (extreme left) and the link lever revolved until the distance between the bottom of its link-connecting pin (extends through chassis apron) and the bottom of the "C" slot, in front apron of chassis, is exactly  $1/4$  of an inch. If this adjustment is not properly made, correct operation of "Electric" or "Remote" tuning will not result. (2) Throw-out Gear Adjustment—To obtain smooth operation on "Electric" or "Remote" positions it is important that the proper clearance is maintained between the throw-out gear "M" and the intermediate gear "L." With the "Manual-Electric-Remote" control thrown to "Remote" position (extreme left) adjust the mesh between these gears by means of the eccentric screw "O" and lock nut "P" on the throw-out gear bracket "MM" until there is approximately  $1/64$  of an inch backlash of gear "L" when gear "M" is held stationary.

**Vernier Tuning.**—In case it becomes necessary to remove tuning condenser drive shaft "T," it should be replaced by sliding anti-backlash gear "R" on condenser shaft apart so that compression amounting to one tooth on the gear is obtained in the springs. Adjust mesh of gear "R" with pinion gear "U" on vernier shaft before tightening screws "S" so that smooth tuning is obtained throughout the range.

**Motor Alignment.**—The motor shaft must be exactly aligned with the axis of the pinion gear with which it engages. This may be adjusted by loosening the mounting screws "V" of the motor and aligning shaft by sight. Correct alignment may be tested by slowly rotating motor and observing the relation between the pin "F" of the motor shaft and the arm "G" on the pinion. The relation of the two should remain the same throughout the revolution. Additional movement for adjustment may be obtained by the motor bracket screws "W" if necessary.

**Station Selector Drum.**—(1) Bearing Adjustment—The selector drum may be removed by unscrewing the two bearing adjusting screws "X" on the front and rear bearings and sliding shaft out of slots on frame. To replace drum, the reverse procedure should be followed holding bearing adjusting plates "Y" firmly against the shaft and tightening adjusting screws. (2) Contact adjustment—Two types of contact strips are used. They are designated on figure 5, as types 1 and 2, on which the individual contacts are respectively adjustable and fixed. On type 1, the individual contacts should be adjusted by setting the end contact springs near the mid-position of their travel and aligning the remaining springs to them by means of a straight edge. Either type of

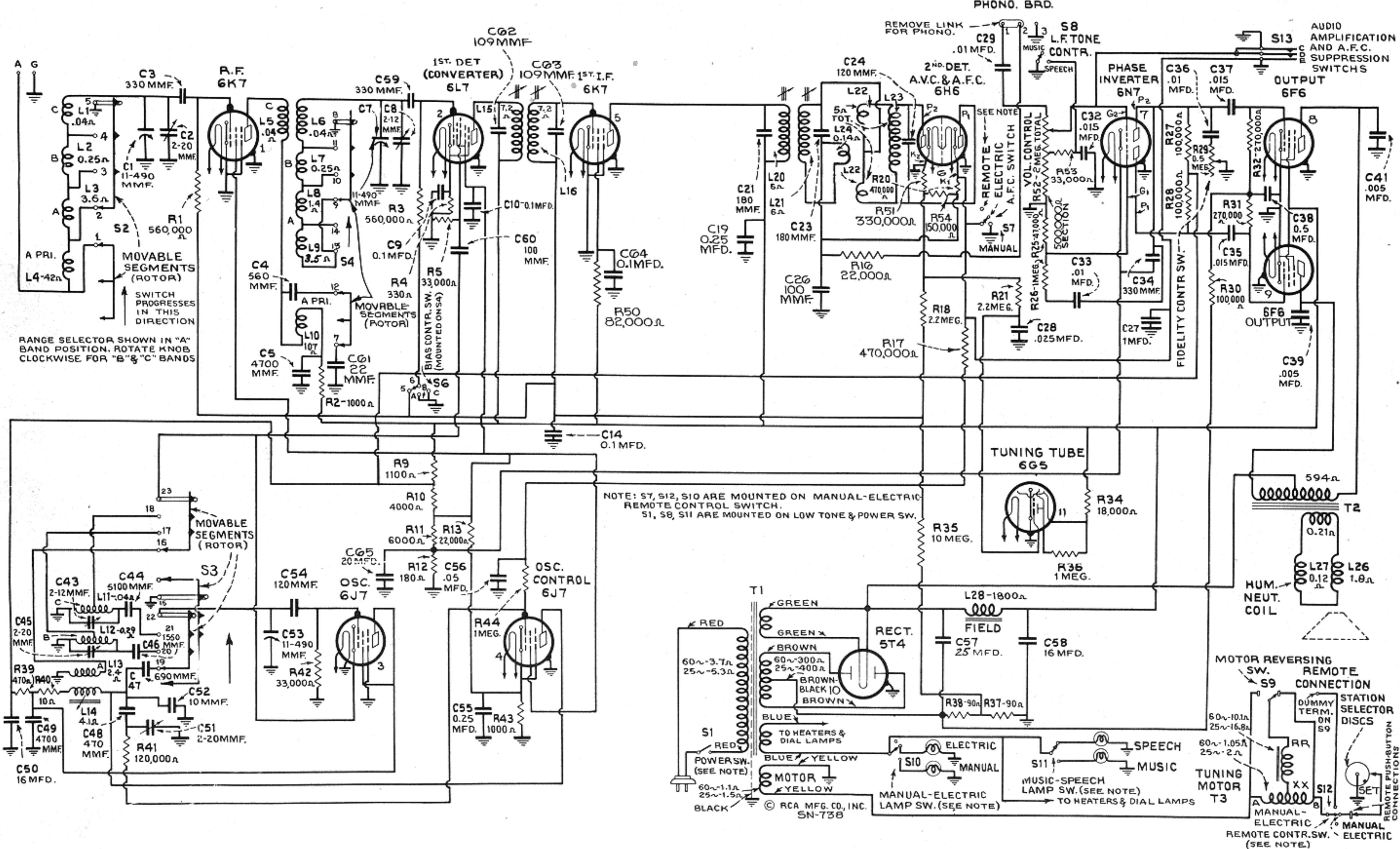


Figure 1—Schematic Circuit Diagram