RCA Victor

MODEL 812K

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

TECHNICAL INFORMATION AND SERVICE DATA

-1937 No. 18-

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

R-F ALIGNMENT FREQUENCIES

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

Intermediate Frequency ..... 460 kc

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	First I-F Amplifier	
(6)	RCA-6K7	Second I-F Amplifier	
(7)	RCA-6H6	Second Detector, A.V.C., and A.F.C.	
(8)	RCA-6N7	Audio Phase Inverter	
(9)	RCA-6F6	Power Output	
(10)	RCA-6F6	Power Output	
(11)	RCA-5T4	Full-Wave Rectifier	
(12)	RCA-6G5	"Magic Eye" Tuning Tube	

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

POWER SUPPLY RATINGS

Rating A	105-125 volts, 50-60 cycles, 145 watts
Rating B	105-125 volts, 25 cycles, 145 watts
Rating C	105-125/140-160/195-250 volts, 50-60 cycles, 145 watts

POWER OUTPUT

Undistorted	10 watts
Maximum	12½ watts

LOUDSPEAKER

Type	12-inch Electrodynamic
Impedance (v.c.)	11½ ohms at 400 cycles

Mechanical Specifications

Height	42 15/16 inches
Width	28¾ inches
Depth	15 5/16 inches
Weight (net)	90 pounds
Weight (shipping)	118 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) Fidelity
Tuning Drive Ratios (manual)	10 to 1 and 50 to 1

General Description

This receiver employs a twelve-tube, three-band, "Magic Brain" superheterodyne circuit. Features of design include "Electric Tuning" with push-button operation; automatic frequency control; "qumulative-wound" antenna and detector coils; tuned r-f amplifier; magnetite-core adjusted i-f transformers and low-frequency "A" oscillator tracking; two-stage i-f amplifier; automatic volume control; phonograph terminal board; "Magic Eye" tuning tube; twelve-inch electrodynamic loudspeaker; plunger-type, air-dielectric trimming capacitors; two-point aural-compensated volume control; fidelity control; low-frequency tone control; 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. Turn Fidelity control counter-clockwise.
4. Press push button No. 1 and wait until station pointer comes to rest.
5. Turn the "Manual-Electric-Remote" control to "Manual."
6. Remove adjusting key from receptacle on top of station selector drum mechanism.
7. 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.
8. Tune the receiver very carefully by means of the manual tuning knob and the "Magic Eye," to station chosen for No. 1.
9. Remove key.
10. 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.

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.

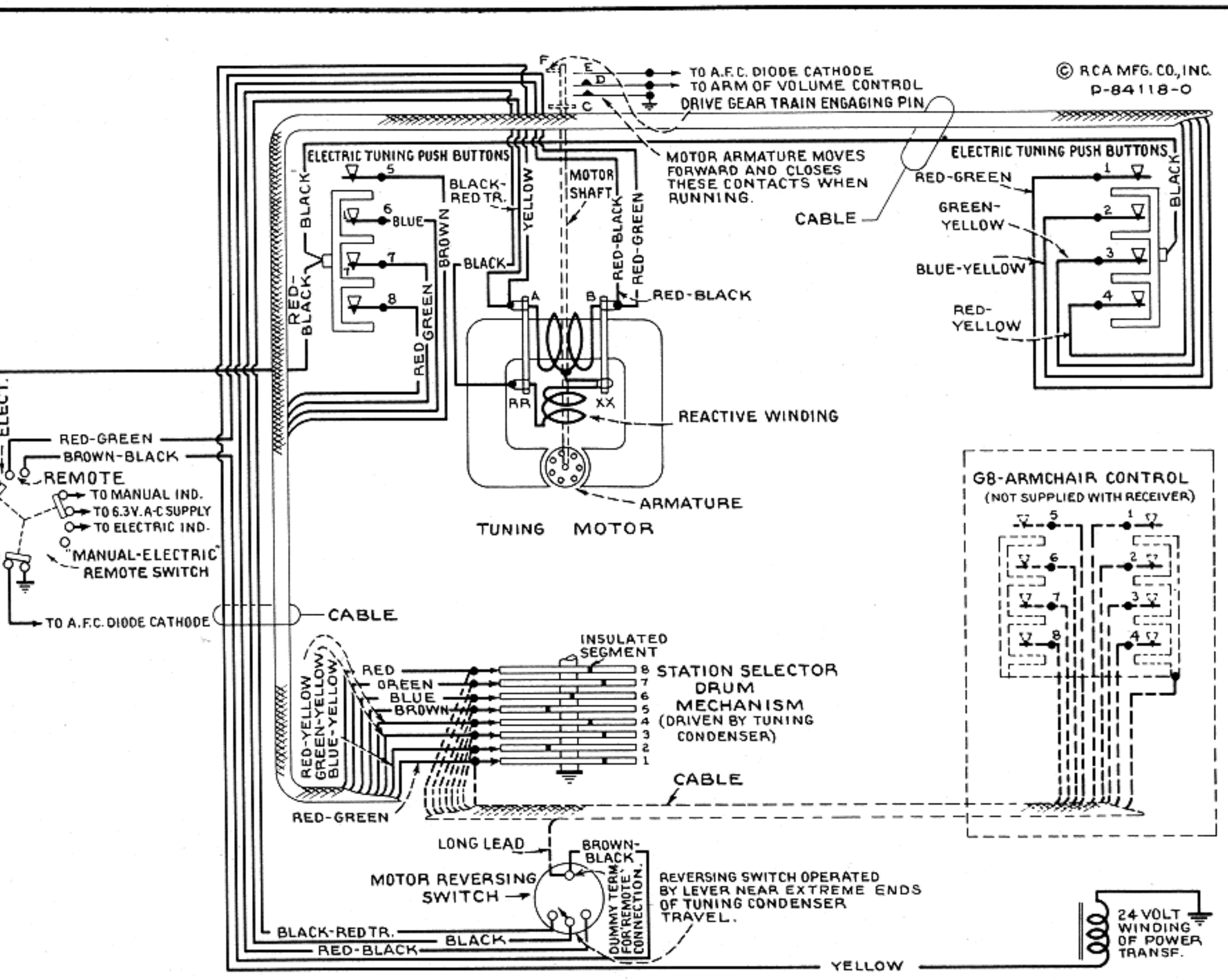


Figure 6—"Electric Tuning" Wiring Diagram
(Viewed from rear of chassis)

REPLACEMENT PARTS

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

STOCK No.	DESCRIPTION
	RECEIVER ASSEMBLIES
14701	Arm—Hub and arm for operating band indicator shutter —located on range switch shaft
14726	Arm—Hub and arm complete with set screws—connects station selector drum to rear of tuning condenser shaft
14517	Board—Antenna and ground terminal board
12717	Board—Phonograph terminal board
5237	Bushing—Variable condenser rubber mounting bushing
13656	Button—Plug button for detector coil shield
14725	Cable—Tuning tube cable and socket
12607	Cap—Shield cap for first or second I.F. transformer
12581	Cap—Shield cap for third or fourth I.F. transformer
11350	Cap—Grid contact cap
12884	Capacitor—Adjustable trimmer (long) (C2, C45, C51)
12714	Capacitor—Adjustable trimmer (med.) (C8, C43)
13200	Capacitor—10 Mmfd. (C52)
14021	Capacitor—22 Mmfd. (C30)
12813	Capacitor—82 Mmfd. (C6)
12720	Capacitor—100 Mmfd. (C26, C60)
12404	Capacitor—120 Mmfd. (C24)
12724	Capacitor—120 Mmfd. (C54)
14712	Capacitor—180 Mmfd. (C21, C23)
14711	Capacitor—220 Mmfd. (C17, C18)
12952	Capacitor—330 Mmfd. (C3, C34, C59)
14710	Capacitor—430 Mmfd. (C11, C15)
13052	Capacitor—470 Mmfd. (C48)
14724	Capacitor—560 Mmfd. (C4)
14723	Capacitor—690 Mmfd. (C47)
12729	Capacitor—1,550 Mmfd. (C46)
12897	Capacitor—4,700 Mmfd. (C5, C49)
14722	Capacitor—5,100 Mmfd. (C44)
4838	Capacitor—.005 Mfd. (C39, C40, C41)
13138	Capacitor—.01 Mfd. (C12, C13, C22, C29, C33)
14393	Capacitor—.01 Mfd. (C36)
11315	Capacitor—.015 Mfd. (C35, C37)
4870	Capacitor—.025 Mfd. (C28)
4886	Capacitor—.05 Mfd. (C20, C56)
4839	Capacitor—0.1 Mfd. (C9, C10, C14)
12484	Capacitor—0.25 Mfd. (C16, C19, C55)
12741	Capacitor—0.5 Mfd. (C27 two in parallel, C38)
5212	Capacitor—16 Mfd. (C58)
14531	Capacitor—25 Mfd. (C57)
14714	Capacitor Pack—Comprising one .015 Mfd. and one .010 Mfd. capacitor, one 27,000 ohm and one 39,000 ohm resistors (C31, C32, R23, R24)
14829	Capacitor Pack—Comprising one 16 Mfd. and one 20 Mfd. sections (C50, C61)
14372	Coil—Antenna coil and shield (L1, L2, L3, L4)
14414	Coil—Detector coil and shield (L5, L6, L7, L8, L9, L10)
14713	Coil—Oscillator coil and shield (L11, L12, L13, L14)
14727	Condenser—3-gang variable tuning condenser, complete with gear train (C1, C7, C53)
5040	Connector—4-contact female connector for reproducer cable
14733	Contact—Spring contact for engaging discs in station selector drum for type 1 contact assembly
30365	Contact—Comprising 8 spring contacts assembled on insulating strip for engaging discs in station selector drum (type 2 contact assembly)
14699	Cord—Indicator pointer drive cord
12006	Core—Adjustable core and stud for I.F. transformer
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
14734	Gear—Intermediate gear assembly—comprising one .749" O.D.—34 tooth—gear and one .291" O.D.—12 tooth pinion assembled
14735	Gear — Intermediate gear assembly — comprising one 1.541" O.D.—72 tooth gear and one .291" O.D.—12 tooth pinion assembled
14736	Gear — Intermediate gear assembly — comprising one 1.541" O.D.—72 tooth gear and one hub assembled
14737	Gear—Throw-out gear and bracket
14716	Holder—Dial scale holder and reflector, complete with holding springs for band indicating shutter
14715	Indicator—Station selector indicator pointer and support
5226	Lamp—Dial or indicating lamp
14719	Link—Link and lever assembly
14730	Motor—Tuning drive motor for 25-cycle models only (T3)
14729	Motor—Tuning drive motor for 60-cycle models only (T3)
14028	Nut—Jamb nut for trimmer, Stock Nos. 12714 and 12884
12471	Plate—Mounting plate for cushion socket—less socket
14741	Plate—Tuning condenser front plate and studs assembled for mounting drive gears
14697	Pulley—Indicator pointer cable pulley
13988	Resistor—10 ohms—carbon type, ½ watt (R40)
11932	Resistor—330 ohms—carbon type, 1/10 watt (R4)
13250	Resistor—330 ohms—carbon type, ½ watt (R14)
5030	Resistor—470 ohms—carbon type, ½ watt (R39)
14720	Resistor—1,000 ohms—carbon type, ½ watt (R2, R8, R43)
14837	Resistor—1,000 ohms—carbon type, 1/10 watt (R6, R15)
14078	Resistor—18,000 ohms—carbon type, 1 watt (R34)
11305	Resistor—22,000 ohms—carbon type, ½ watt (R16)
14721	Resistor—22,000 ohms—carbon type, ½ watt (R13)
5033	Resistor—33,000 ohms—carbon type, 1 watt (R33)
11300	Resistor—33,000 ohms—carbon type, 1/10 watt (R42)
13735	Resistor—33,000 ohms—carbon type, ½ watt (R5)
11646	Resistor—47,000 ohms—carbon type, ½ watt (R25)
14560	Resistor—100,000 ohms—insulated, ½ watt (R27)
5145	Resistor—100,000 ohms—carbon type, ½ watt (R7, R28, R30)
13734	Resistor—120,000 ohms—carbon type, ½ watt (R41)
11453	Resistor—270,000 ohms—carbon type, 1/10 watt (R31, R32)
11172	Resistor—470,000 ohms—carbon type, ½ watt (R17)
11452	Resistor—470,000 ohms—carbon type, 1/10 watt (R19, R20)
11397	Resistor—560,000 ohms—carbon type, 1/10 watt (R1, R3)
12013	Resistor—1 meg.—carbon type, 1/10 watt (R36)
13730	Resistor—1 meg.—carbon type, ½ watt (R26, R44)
11626	Resistor—2.2 meg.—carbon type, ½ watt (R18, R21)
13732	Resistor—10 meg.—carbon type, ½ watt (R35)
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)
14695	Rod—Tie rod for joining lockplate pawls on station selector push-button switches
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
12418	Screw—No. 8-32 x 3/16 milled head set screw for gear, Stock No. 14739
14848	Selector—Station selector drum mechanism—comprising selector contactor discs, spring contacts, and motor reversing switch assembled in metal frame
14374	Shield—Antenna or detector coil shield
14375	Shield—Oscillator coil shield
12008	Shield—I.F. transformer shield
14718	Shutter—Band indicating shutter and arm assembly

REPLACEMENT PARTS—(Continued)

STOCK No.	DESCRIPTION
14696	Slider—Indicator pointer holder and spring
11195	Socket—5-contact 5T4 Radiotron socket
11196	Socket—8-contact 6K7, 6L7, 6J7, 6H6, 6F6 or 6N7 Radiotron socket
14114	Socket—Dial or indicating lamp socket
12007	Spring—Retaining spring for core, Stock No. 12006
3676	Spring—Tension spring for link and lever, Stock No. 14719
13638	Spring—Tension spring for cord, Stock No. 14699
14694	Spring—Tension spring for lockplate pawl on station selector push-button switches
14742	Stud—Mounting stud for gear and arm, Stock No. 14738
14702	Switch—"Manual - Electric - Remote" switch (S7, S10, S12)
14705	Switch—L.F. tone and power switch (S1, S8, S11)
14732	Switch—Motor reversing switch and mounting plate for station selector (S9)
14704	Switch—Range switch (S2, S3, S4, S6)
14728	Switch—A-F-C and A-F amplication suppression switch (S13)
14693	Switch—Station selector button switch—comprising four contacts and corresponding lockplates, completely assembled on insulating strips
14703	Tone Control—H.F. tone control (R29, S5)
14706	Transformer—First I.F. transformer (L15, L16, L17, C11, C15)
14707	Transformer—Second I.F. transformer (L18, L19, L29, C17, C18)
14708	Transformer—Third I.F. transformer (L20, L21, C21, C23)
14709	Transformer—Fourth I.F. transformer (L22, L23, L24, C24)
14689	Transformer—Power transformer, 105-125 volts, 50-60 cycle (T1)
14690	Transformer—Power transformer, 105-125 volts, 25-60 cycle (T1)
14691	Transformer—Power transformer, 105-240 volts, 50-60 cycle (T1)
12861	Volume Control (R22)

STOCK No.	DESCRIPTION
	REPRODUCER ASSEMBLIES (Speaker No. RL76-1)
14606	Cap—Dust cap for cone center
14603	Coil—Field coil (L28)
14604	Coil—Neutralizing coil (L27)
14602	Cone—Reproducer cone, voice coil, center suspension and dust cap (L26)
5039	Plug—4-contact male plug for reproducer
14600	Reproducer, complete
14601	Transformer—Output transformer (T2, C42)
14357	Washer—Spring washer to hold field coil securely
	MISCELLANEOUS ASSEMBLIES
12038	Band—Rubber band for tuning tube
14744	Bracket—Tuning tube mounting bracket and clamp
14745	Button—Automatic station selector push button
14747	Card—Call letter cards for station selector
14750	Escutcheon—Station selector and tuning tube escutcheon and crystal—less buttons and station call letter cards
14743	Escutcheon—Station selector and tuning tube escutcheon —complete with crystal, indicating cards, and buttons —less station indicating cards
14749	Indicator—"Electric-Manual" indicator screen
14748	Indicator—"Music-Speech" indicator screen
14751	Key—Key for use in setting "Electric Tuning" mechanism
14359	Knob—Large station selector knob
14688	Knob—Range switch knob
14269	Knob—Volume control, "Manual-Electric-Remote" switch, H.F. tone control, L.F. tone control or small station selector knob
5210	Screw—Chassis mounting screw and washer assembly
14746	Shield—Celluloid shield for station call letter cards
4982	Spring—Retaining spring for knob, Stock No. 14359
14270	Spring—Retaining spring for knob, Stock Nos. 14269 and 14688

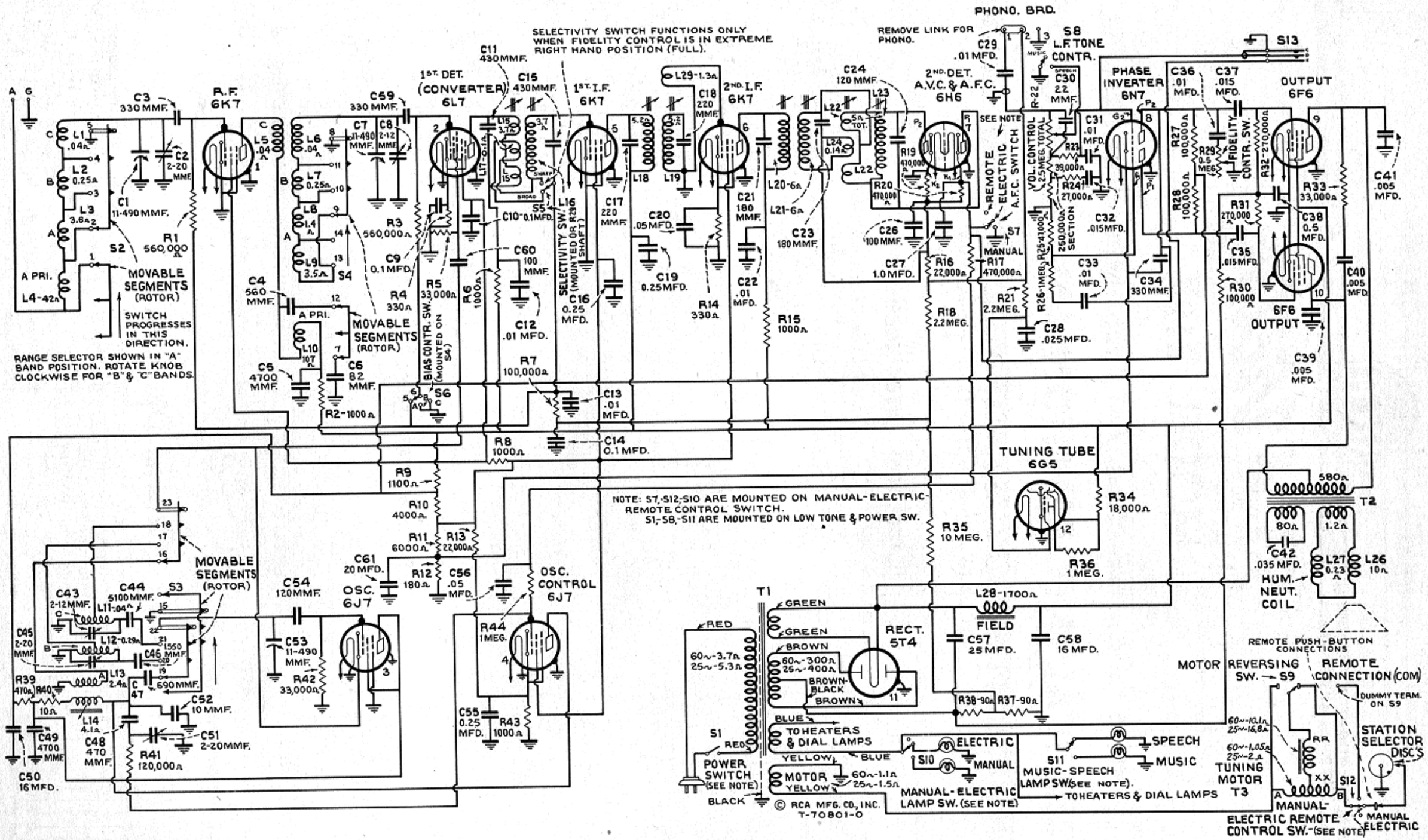


Figure 1—Schematic Circuit Diagram

SPEAKER CONNECTIONS

COMPENSATOR PACK CONNECTIONS

ANT. COIL CONNECTIONS

DET. COIL CONNECTIONS

OSC. COIL CONNECTIONS

UNIVERSAL TRANS. CONNECTIONS

1ST. I. F. TRANS. CONNECTIONS

2ND. I. F. TRANS. CONNECTIONS

3RD. I. F. TRANS. CONNECTIONS

TUNING CABLE CONNECTIONS

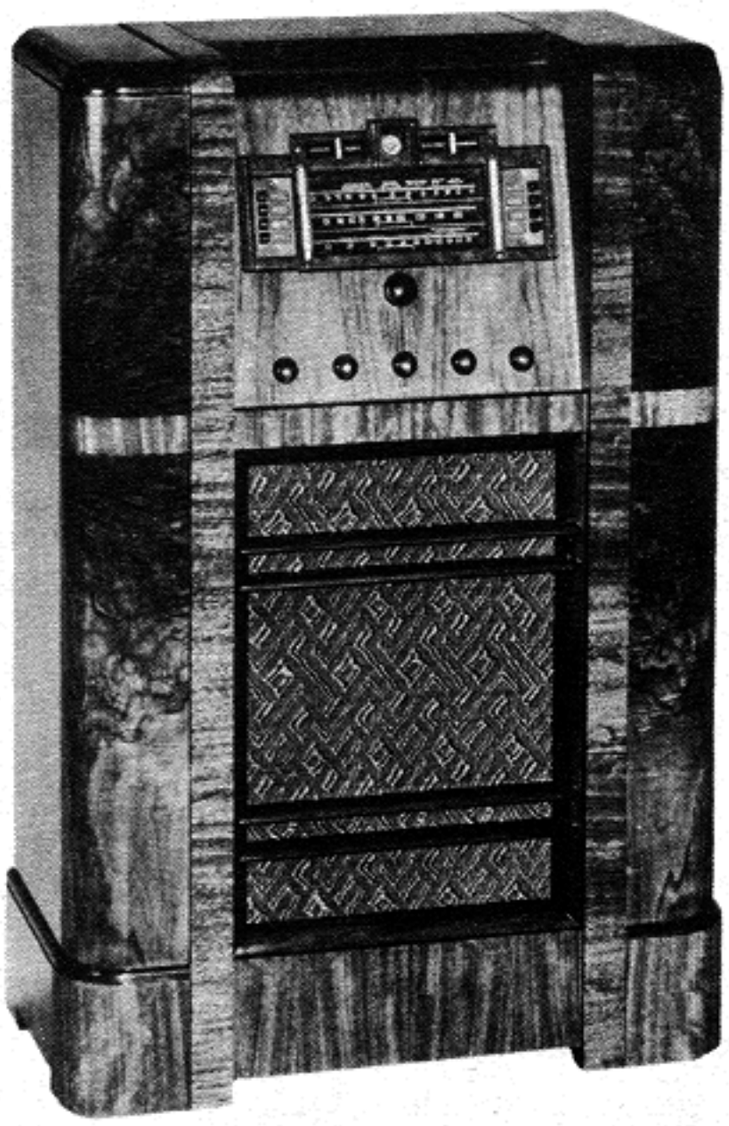
4TH. I. F. TRANSF. CONNECTIONS

Figure 2—Chassis Wiring Diagram

Circuit Arrangement

The circuit consists ot an r-f amplifier stage, first-detector (converter) stage, separate heterodyne-oscillator stage, oscillator control stage, two i-f amplifier stages, 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 ("qumulative") 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 two RCA-6K7 tubes in a two-stage 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. A third winding, L17, in the first i-f transformer, closely coupled to the primary, L15, is placed in series with the main secondary L16 when the fidelity control switch S5 is thrown to "broad" position (see figure 1), thereby increasing the coupling between the primary and secondary circuits with a consequent broadening of the band width of the i-f amplifier, permitting higher fidelity reception.

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 fourth i-f transformer, consists of the primary winding, L24, which is a part of the third 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_2K_2 and R19 when the i-f signal frequency is above 460 kc and to the diode circuit P_1K_1 and R20 when the i-f signal frequency is below 460 kc. Resistors R19 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 R19 and 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_1 through switch S7. A-v-c voltage and audio signal components are developed across resistor R19.

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 R22 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 1½ 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 2½ 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 2¼ inches for correct alignment, (8) bus lead from antenna coil to antenna section C1 of variable condenser must be 3⅞ inches over-all with ½ 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 4th 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.

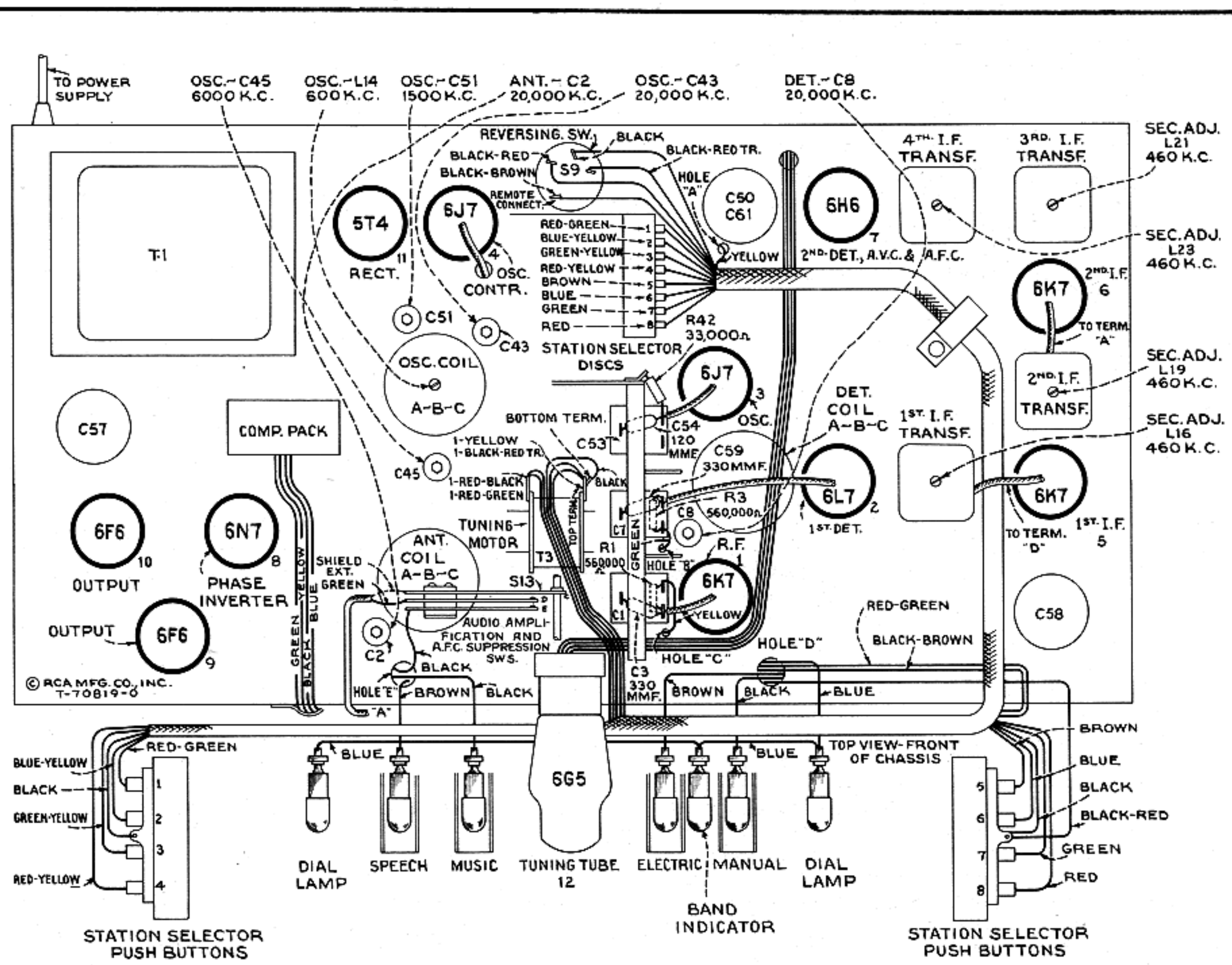


Figure 3—Radiotron, Coil, and Trimmer Locations

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 "Fidelity" control should be turned counter-clockwise during all alignment operations. 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 4th i-f transformer has been accurately adjusted, for an exact electral 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	—	—	—	—	—	4th I-F Trans.	L23	Turn Extreme Counter-clockwise
2	6K7 2nd I-F Grid Cap	.001 Mfd.	460 kc	"A" Left	No Signal 550-750 kc	3rd I-F Trans.	L20 and L21	Max. (peak)
3	6K7 1st I-F Grid Cap	.001 Mfd.	460 kc	"A"	No Signal 550-750 kc	2nd I-F Trans.	L18 and L19	Max. (peak)
4	6L7 Det. Grid Cap	.001 Mfd.	460 kc	"A"	No Signal 550-750 kc	1st I-F Trans.	L15 and L16	Max. (peak)
5	Ant.	300 Ohms	20,000 kc	"C" Right	20,000 kc	"C" Osc.	C43	Max. (peak)*
6	Ant.	300 Ohms	20,000 kc	"C"	Rock thru 20,000 kc	"C" Det.	C8	Max. (peak)†
7	Ant.	300 Ohms	20,000 kc	"C"	20,000 kc	"C" Ant.	C2	Max. (peak)‡
8	Ant.	300 Ohms	6,000 kc	"B" Center	6,000 kc	"B" Osc.	C45	Max. (peak)*
9	Ant.	200 Mmfd.	600 kc	"A" Left	600 kc	"A" Osc.	L14	Max. (peak)
10	Ant.	200 Mmfd.	1,500 kc	"A"	1,500 kc	"A" Osc.	C51	Max. (peak)
11	Ant.	200 Mmfd.	600 kc	"A"	600 kc	"A" Osc.	L14	Max. (peak)
12	Ant.	200 Mmfd.	1,500 kc	"A"	1,500 kc	"A" Osc.	C51	Max. (peak)
13	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 4th 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. Turn "Fidelity" control counter-clockwise. Connect antenna to re-

ceiver 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 (4th i-f transformer) should be tuned to resonance. Without disturbing any of the receiver adjustments, place the "high" test-oscillator lead about ¾ of an inch from the grid cap lead of the RCA-6K7, 1st 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 4th 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 frequency 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 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."

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.	5.0 ma.
(2)	RCA-6L7—1st Det.....	6.0 ma.
(3)	RCA-6J7—Osc.	8.5 ma.
(4)	RCA-6J7—Osc. Control.....	1.2 ma.
(5)	RCA-6K7—1st I-F Amp.....	6.0 ma.
(6)	RCA-6K7—2nd I-F Amp.....	7.5 ma.
(7)	RCA-6H6—2nd Det., A.V.C. and A.F.C.	—— ma.
(8)	RCA-6N7—Phase Inverter.....	1.8 ma.
(9)	RCA-6F6—Output	26 ma.
(10)	RCA-6F6—Output	26 ma.
(11)	RCA-5T4—Rectifier	118 ma.*
(12)	RCA-6G5—Tuning Tube.....	2.5 ma.

(*Cannot be measured at socket)

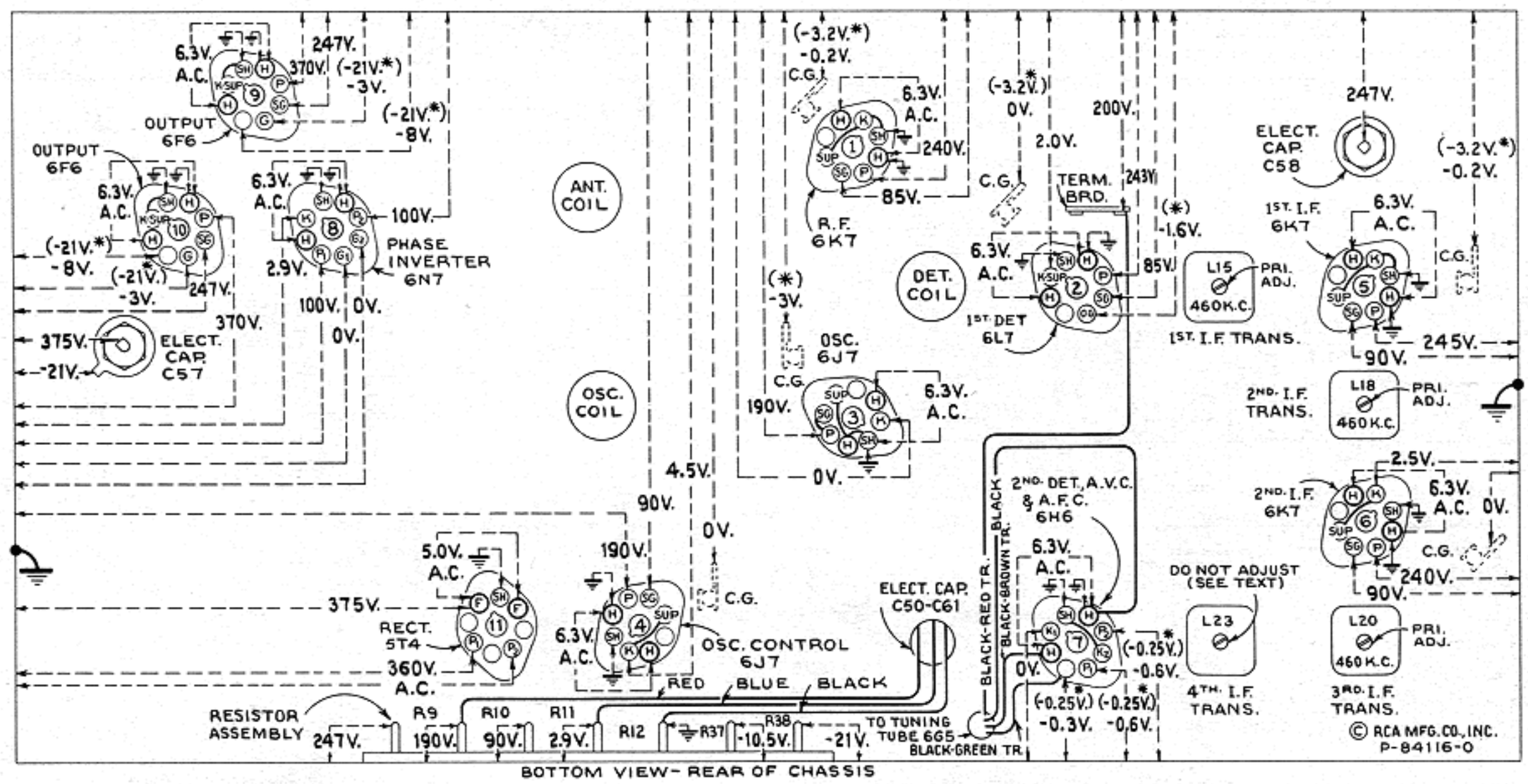
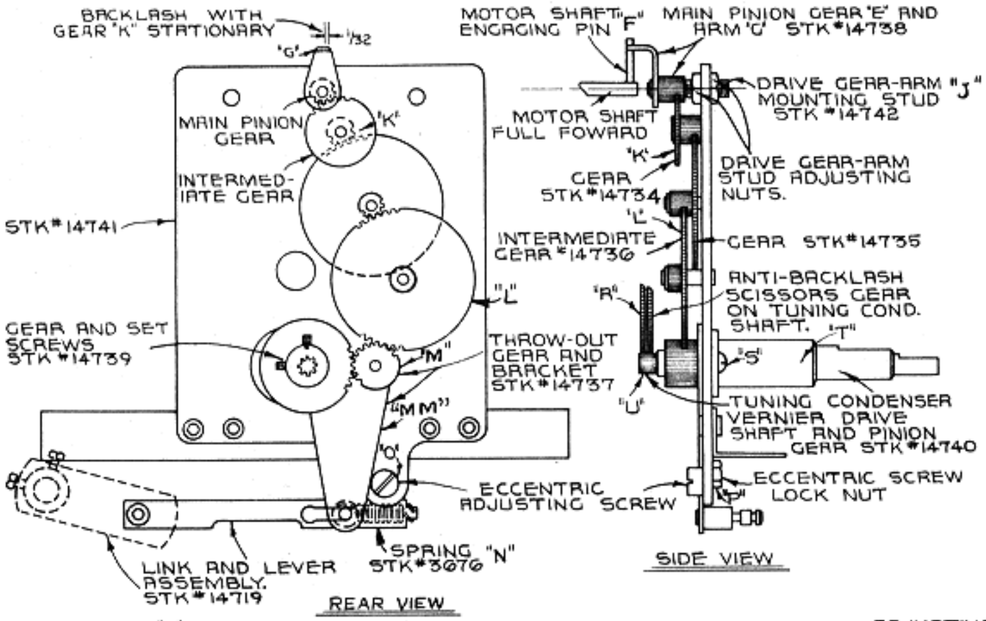


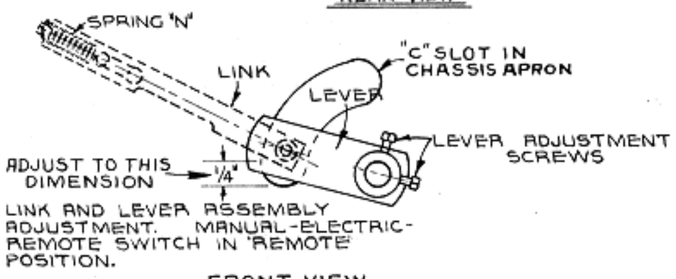
Figure 4—Radiotron Socket Voltages, Coil, and Trimmer Locations

Measured at 115 volts, 60-cycle supply—Tuned to approximately 1,000 kc ("Broadcast")—"Manual" control—No signal being received—Volume control minimum—Fidelity control optional

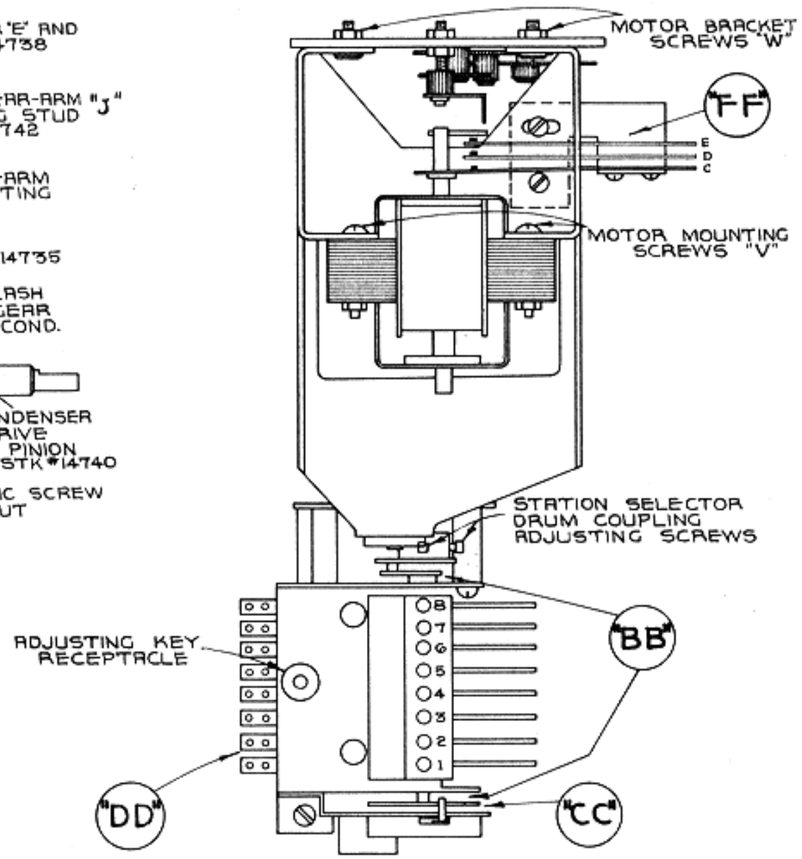
Note: Two voltage values are shown for some readings. The value shown in parentheses with asterisk (*) indicates operating conditions without voltmeter loading. The other value (generally lower) is the actual measured voltage and differs from the value shown in parentheses because of the additional loading of the voltmeter.

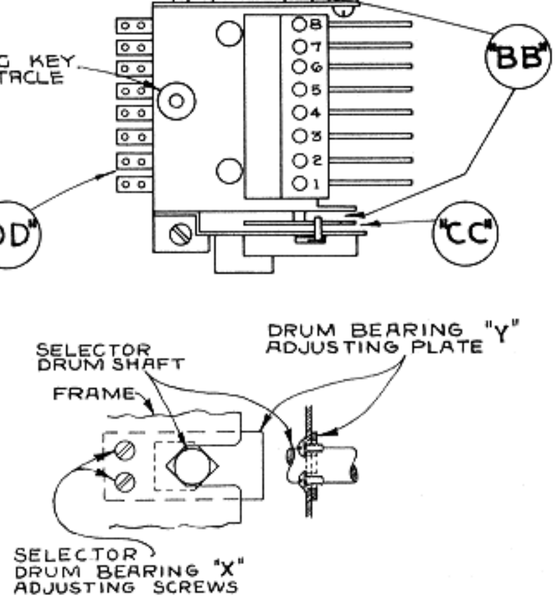
Voltage values as specified should hold within ±20% when the receiver is normally operative at its rated line voltage. To duplicate the conditions under which the voltages were measured requires a 1,000-ohm-per-volt d-c meter, having ranges of 10, 50, 250, and 500 volts. Use the nearest range above the specified measured voltage. A-c voltages were measured with a corresponding a-c meter.



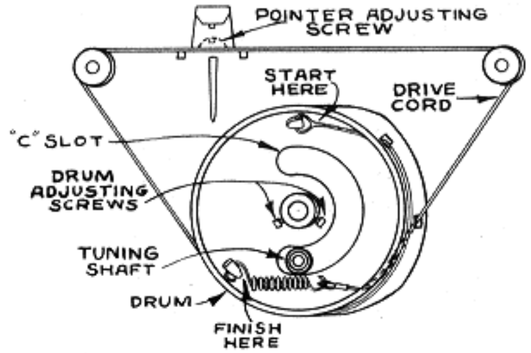


"A-A" DRIVE GEAR TRAIN ASSEMBLY



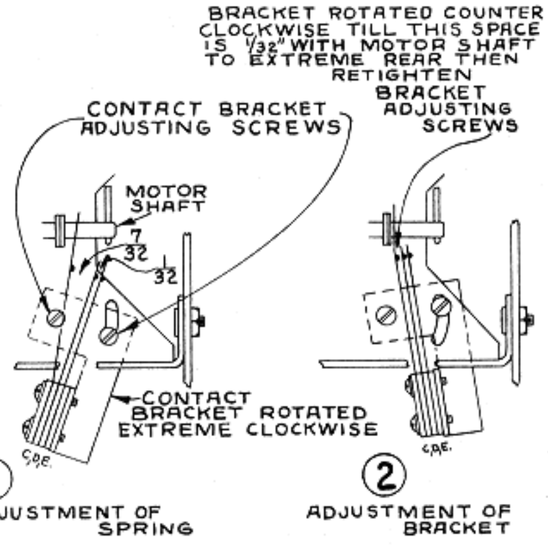


"B-B" STATION SELECTOR DRUM BEARING.

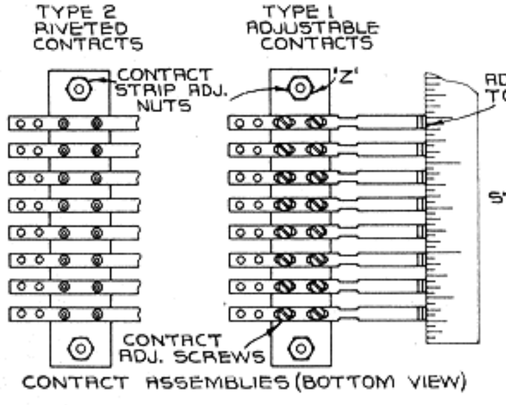


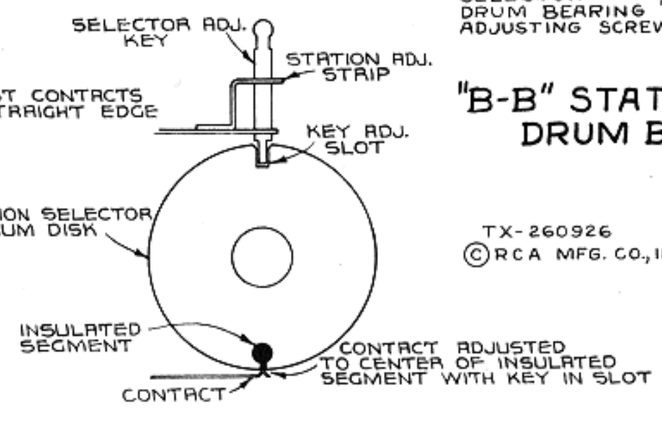
CAUTION:- ADJUST INDICATOR DRUM ON SHAFT SO THAT "C" SLOT IS CLEAR OF TUNING CONDENSER "VERNIER" DRIVE SHAFT FOR CONDENSER FULL-OUT AND FULL-IN MESH POSITIONS.

TUNING CONDENSER INDICATOR DRIVE

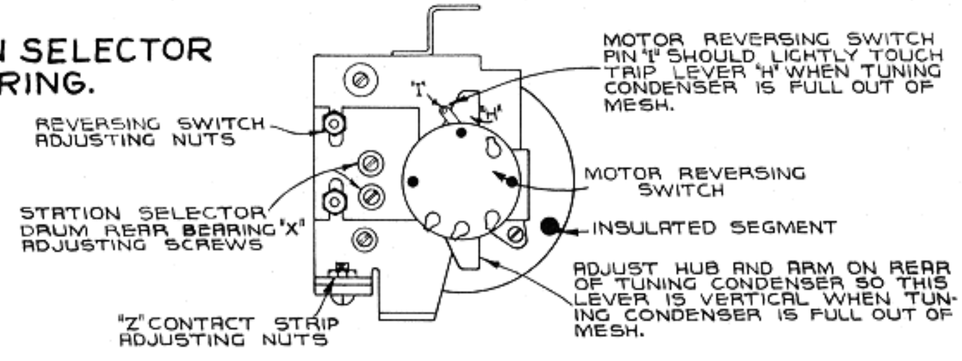


"F-F" A.F.C. AND A.F. AMPLIFICATION SUPPRESSION SWITCHES.





"D-D" STATION SELECTOR DRUM CONTACT ADJUSTMENTS



"C-C" MOTOR REVERSING SWITCH ADJUSTMENT.

Figure 5—"Electric Tuning" Mechanism Adjustments

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 ¼ 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