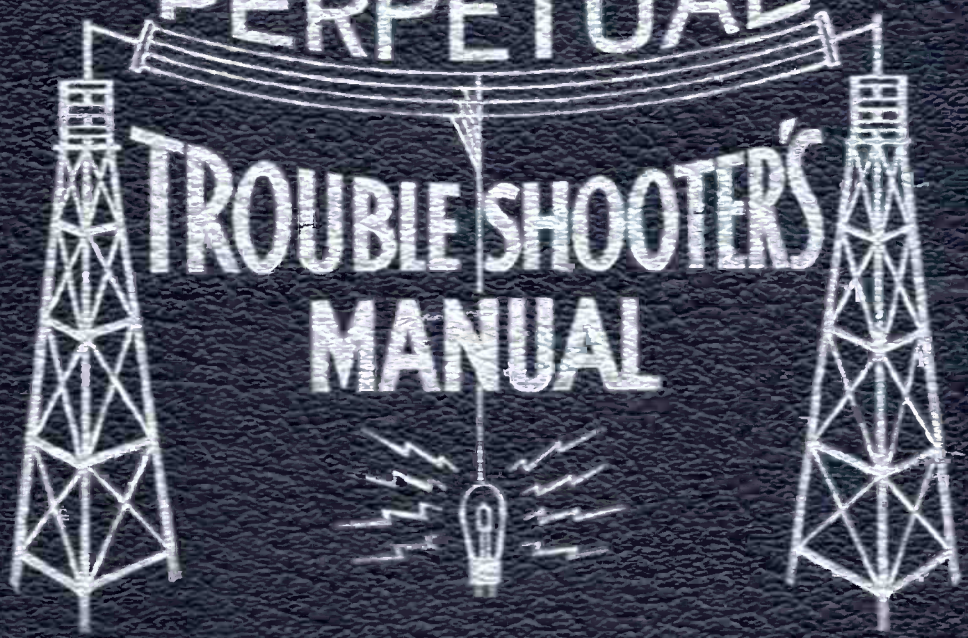
VOLUME VI

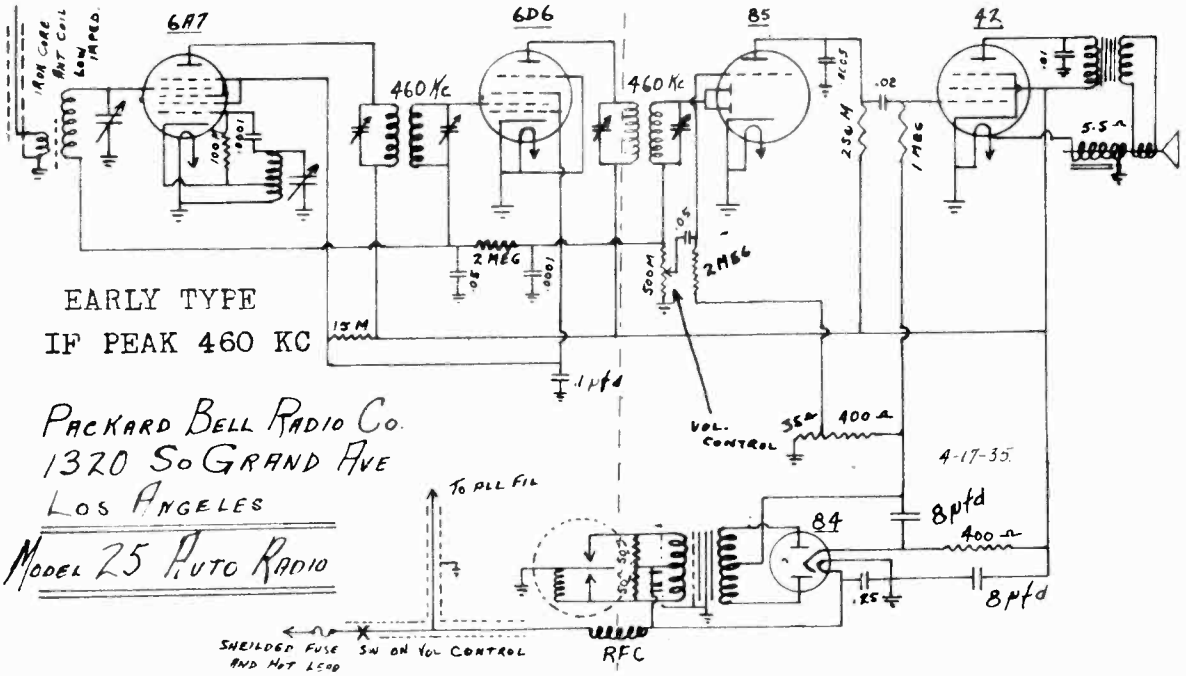
PERPETUAL TROUBLE SHOOTER'S MANUAL



JOHN F. RIDER

MODEL 25
Early, Late
Schematics

PACKARD-BELL CO.

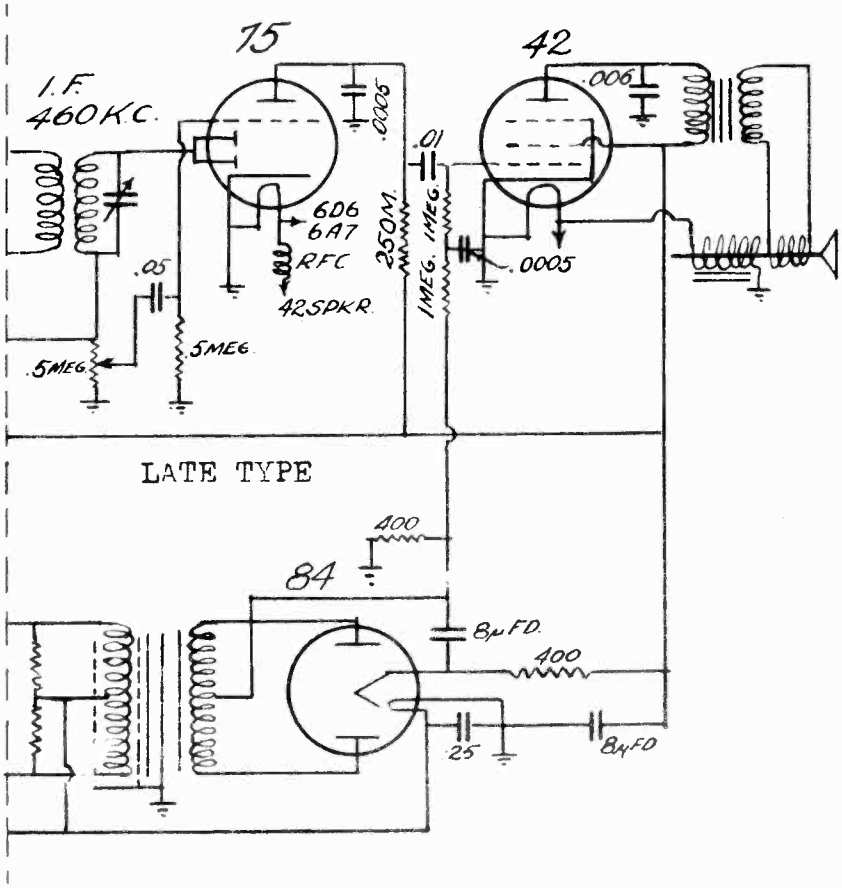


EARLY TYPE
IF PEAK 460 KC

PACKARD BELL RADIO CO.
1320 SO GRAND AVE
LOS ANGELES

MODEL 25 AUTO RADIO

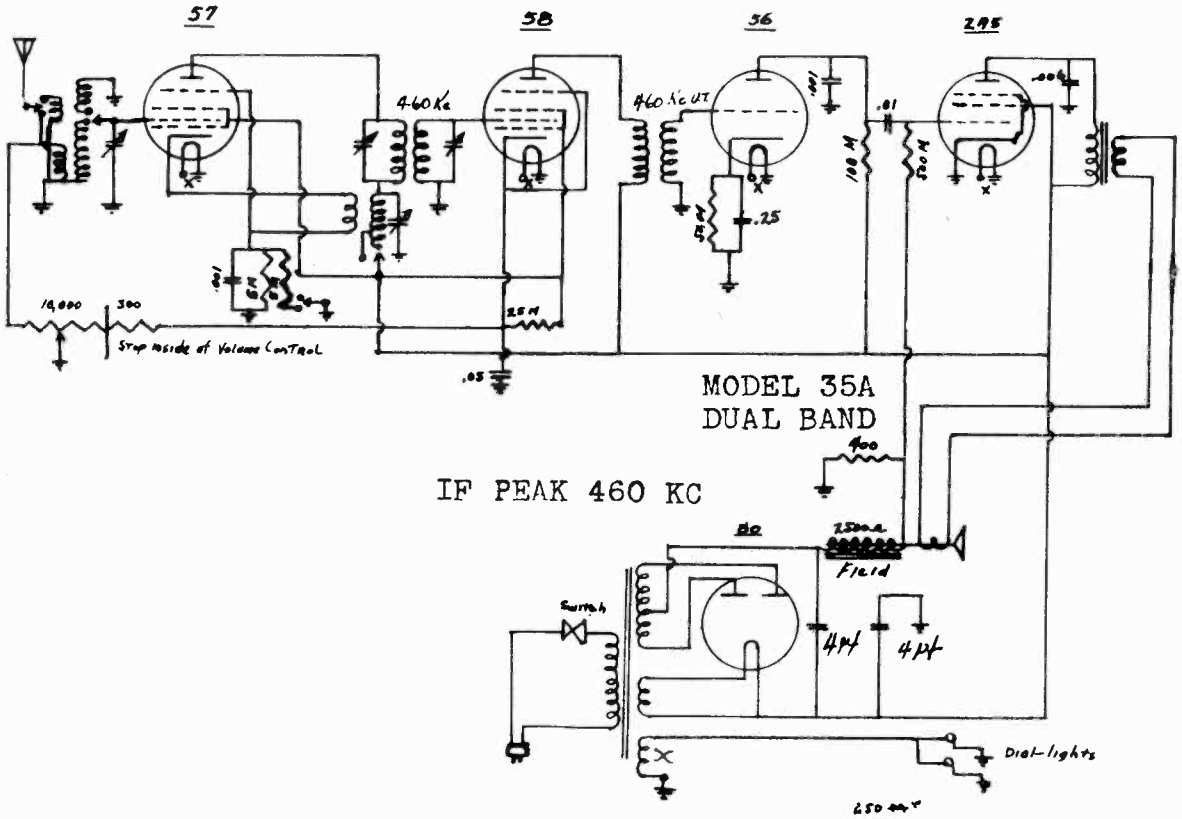
4-17-35



LATE TYPE

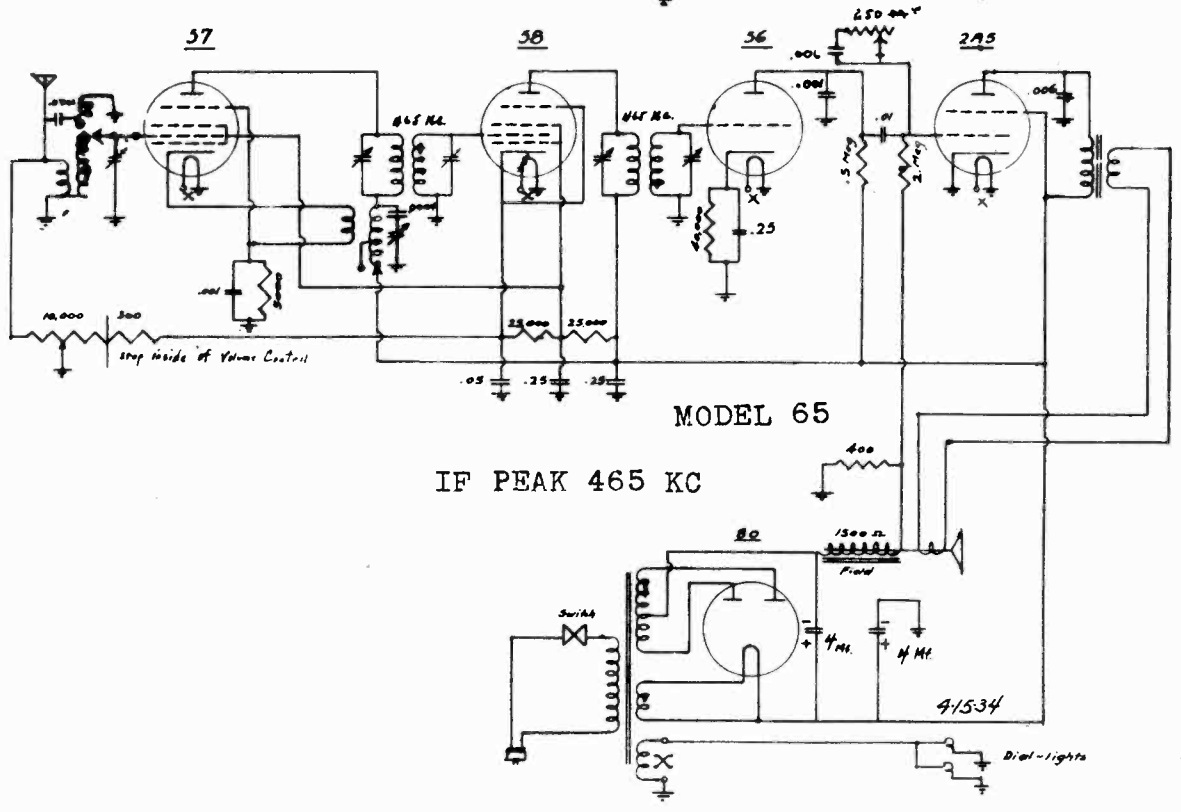
MODEL 35A
MODEL 65
Schematics

PACKARD-BELL CO.



MODEL 35A
DUAL BAND

IF PEAK 460 KC

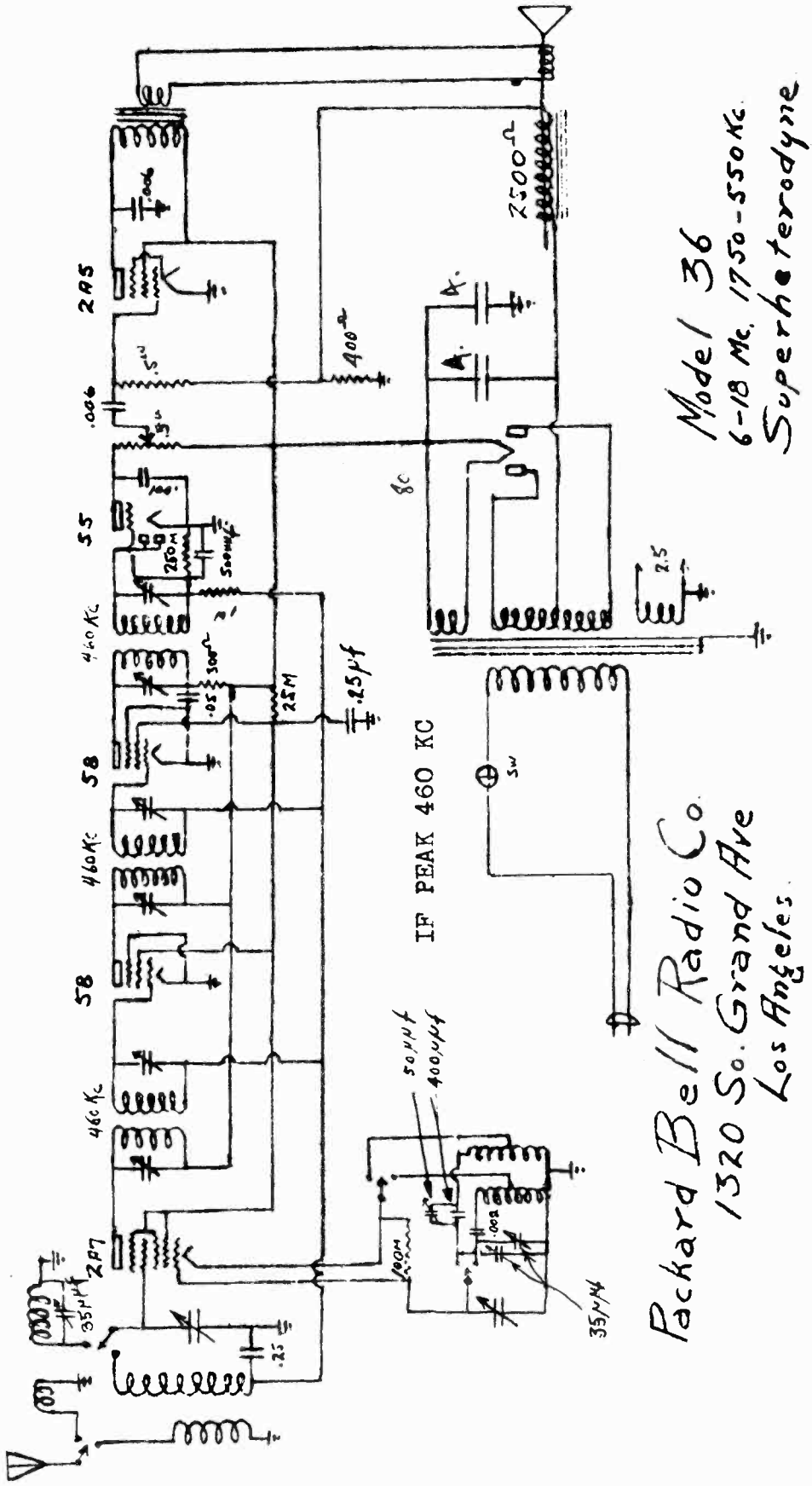


MODEL 65

IF PEAK 465 KC

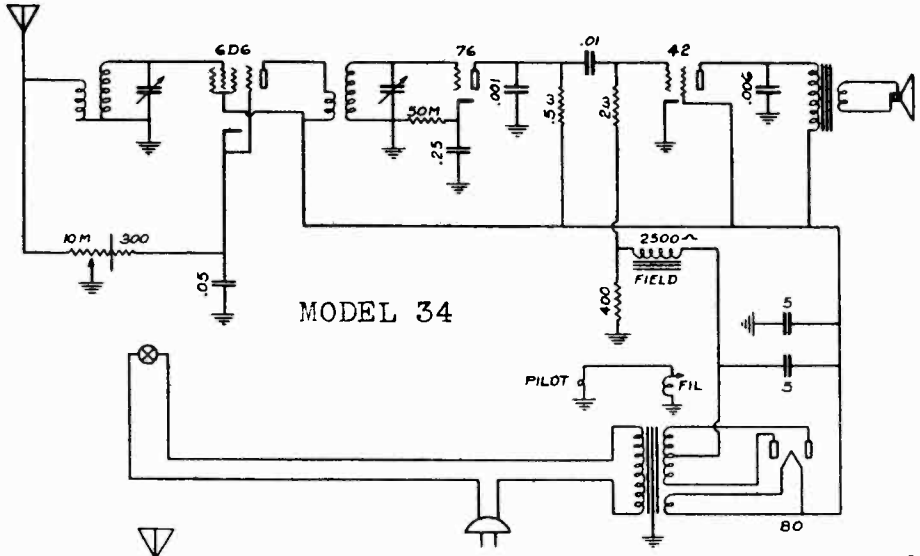
MODEL 36
Schematic

PACKARD-BELL CO.

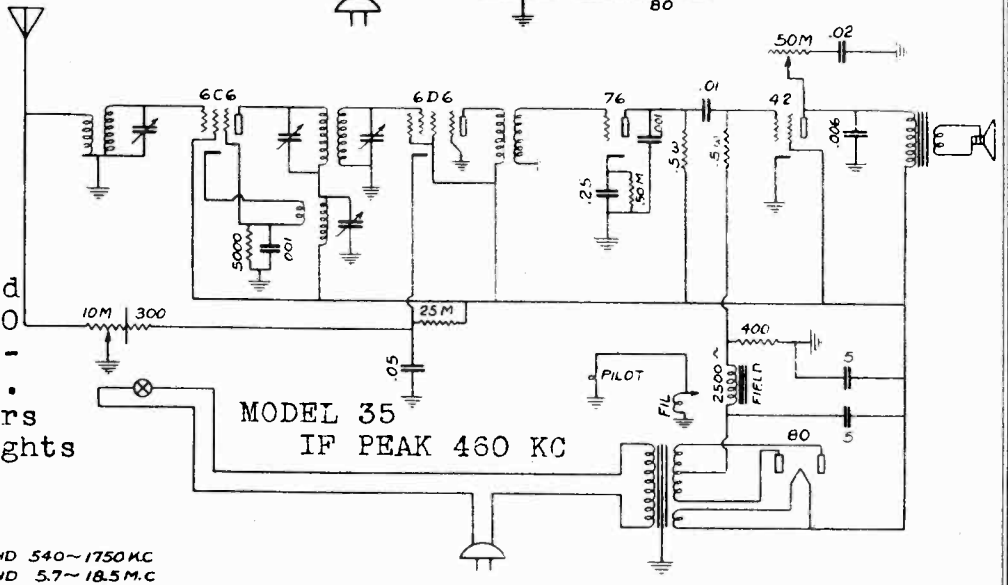


MODEL 34
MODEL 35
MODEL 45M
Schematics

PACKARD-BELL CO.

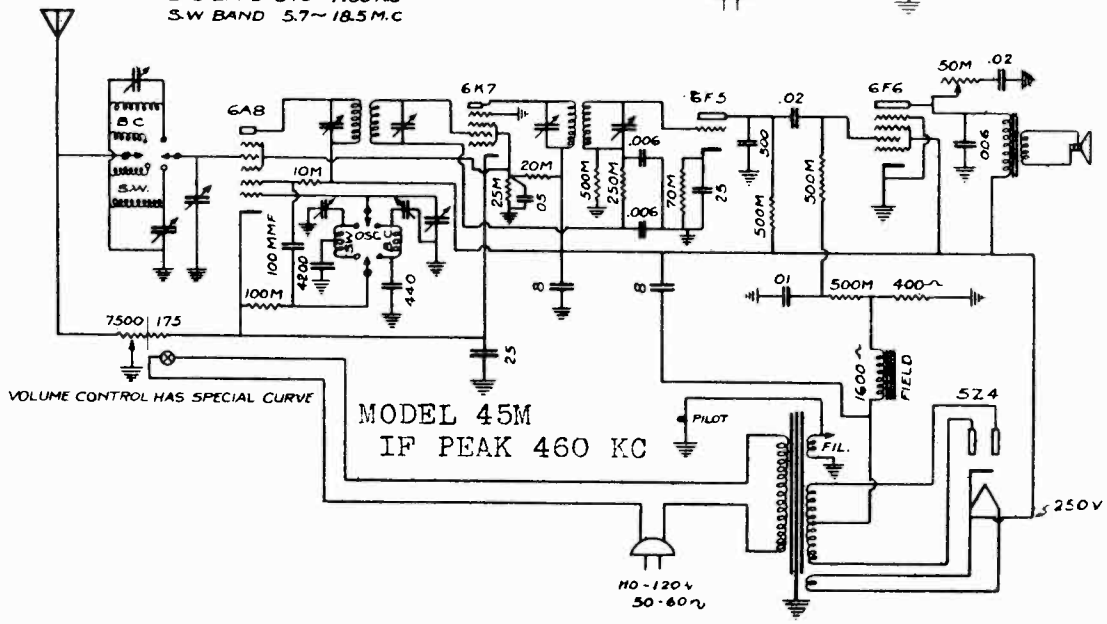


MODEL 34



MODEL 35
IF PEAK 460 KC

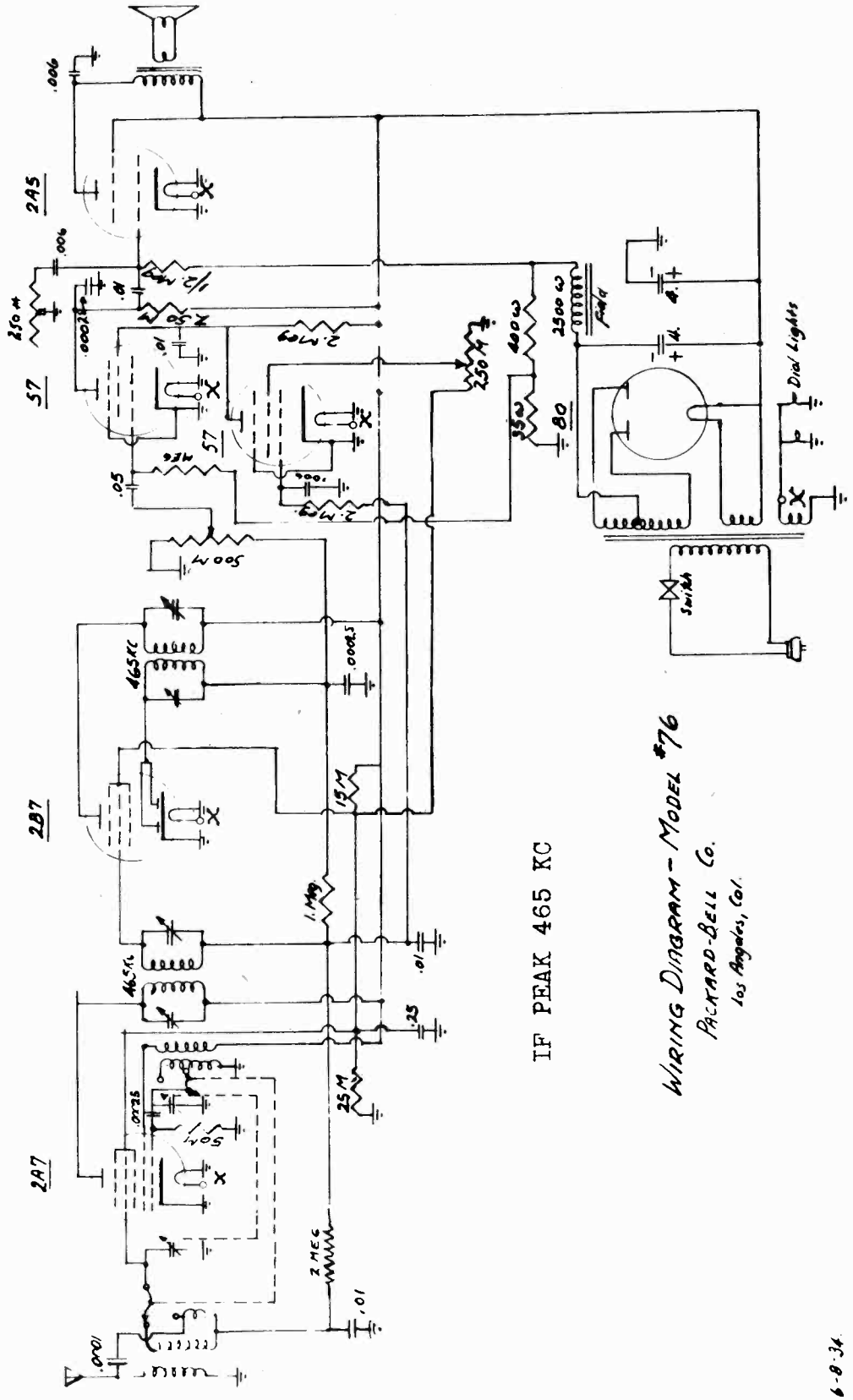
Early model used 57,58,56,2A5, 80 Had no tone control. Used 4mfd. filter condensers and two dial lights



MODEL 45M
IF PEAK 460 KC

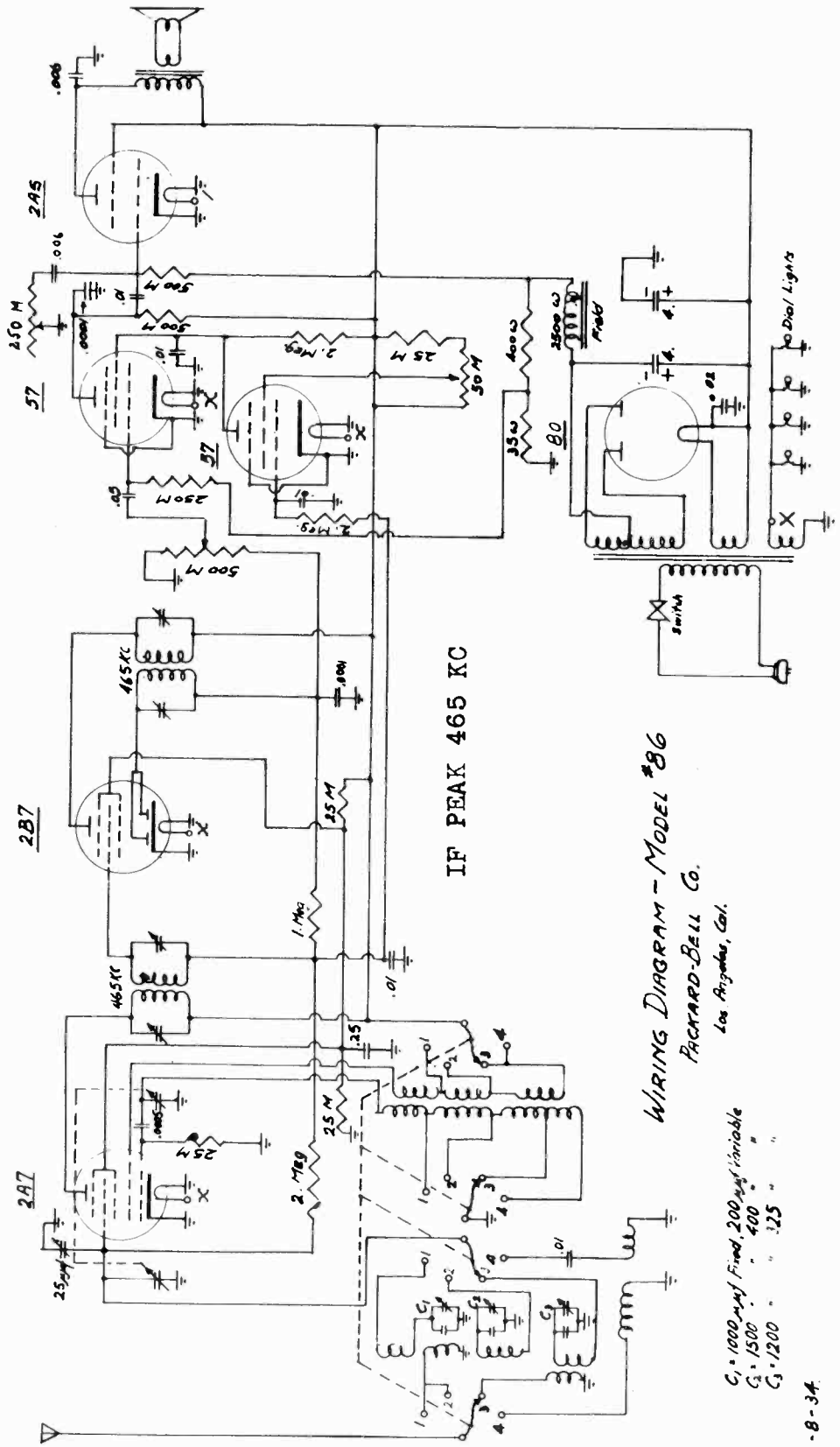
MODEL 76
Schematic

PACKARD-BELL CO.



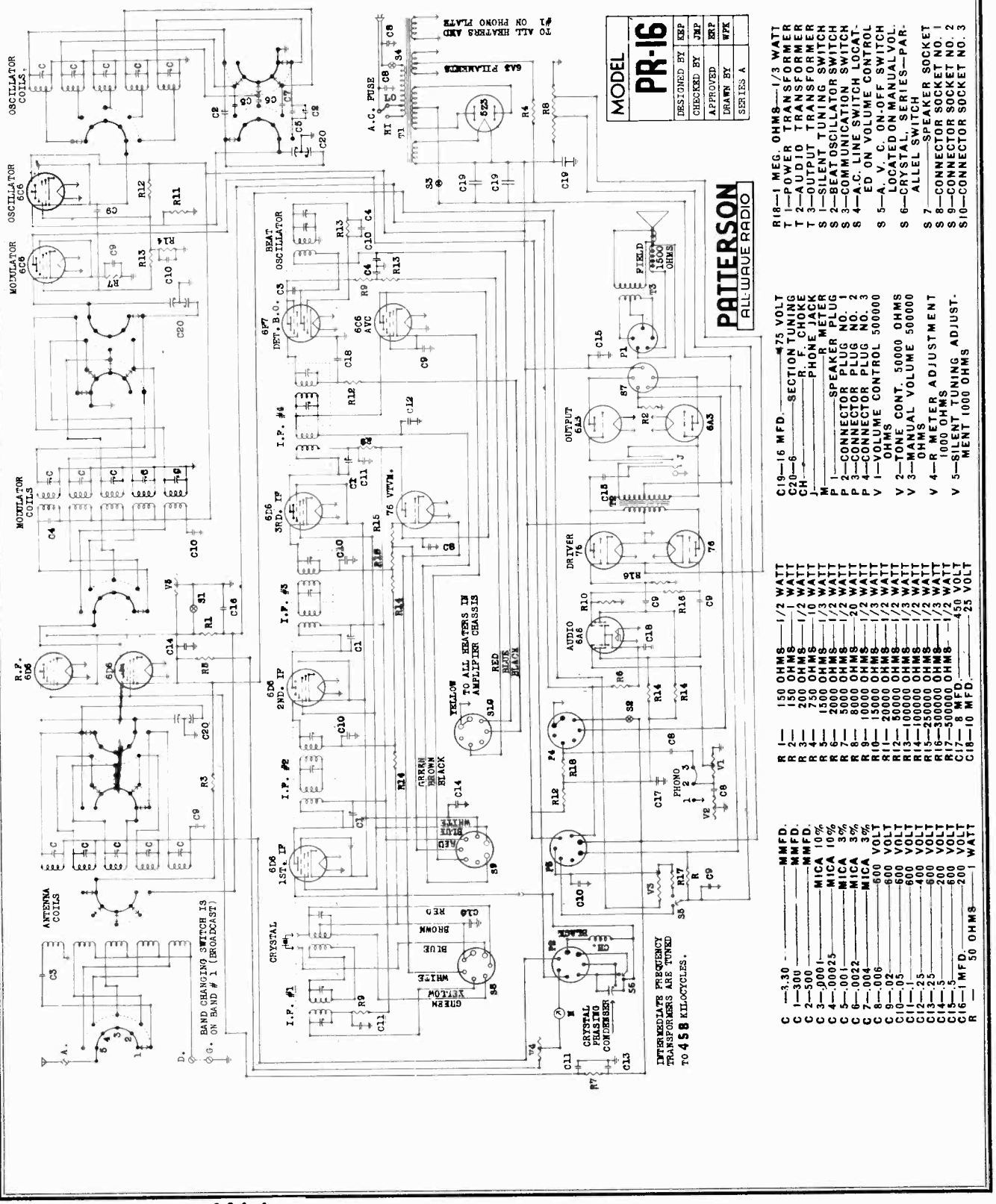
MODEL 86
Schematic

PACKARD-BELL CO.



MODEL PR-16
Schematic

PATTERSON RADIO CO.



MODELS 186AW,286AW,386AW
MODELS 1106AW,2106AW,3106AW
MODELS 1126AW,2126AW,3126AW
Trimmers,Alignment,Part 1

PATTERSON RADIO CO.

Service Notes 8-10-12 Tube Models—Series B—1936

The following instructions are intended for the use of experienced dealers and radio service men in locating and correcting difficulties which may occasionally arise in receiver operation. They are not intended for use of the average set owner. *Do not* attempt any adjustments unless thoroughly qualified and equipped with the special instruments required.

SET LAYOUT—The coil and switch assembly is identical in all three models. The frequency bands covered are also identical.

Figure 2 shows the layout of coils and trimmer condensers for the various frequency bands.

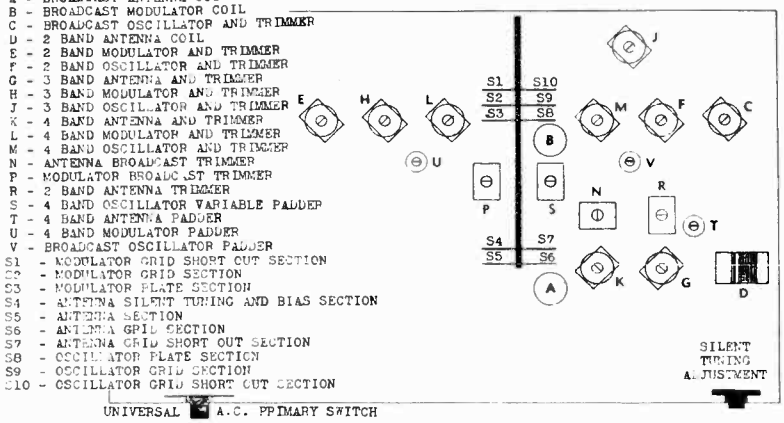


FIG. 2—ADJUSTMENTS FOR REALIGNMENT

Looking down into bottom of chassis, as shown in Figure 2, it will be noted that, with the exception of broadcast antenna and modulator coils, and No. 2 band antenna coil, trimmers are located directly on the coil terminals, and the low frequency pads, where required, are adjacent to the coil involved. The switch sections, as shown in the figure, perform the following functions:

S6 Switches RF grid coils.
S7 Shorts out RF grid coils not in use.
S8 Switches oscillator plate coils.
S9 Switches oscillator grid coils.
S10—Shorts out oscillator grid coils not in use.
S5 Switches antenna coils.
S4 "Kills" silent tuning in all models. Lowers bias on IF and RF in 10 and 12 tube models on all bands except BC.
S3—Switches modulator plate coils.
S2—Switches modulator grid coils.
S1—Shorts out modulator grid coils not in use.

ALIGNMENT OF I. F. AMPLIFIER

NOTE: *Frequency bands referred to in the following instructions are:*

1st Band Broadcast 1500-550 K.C. *3rd Band—12- 4.5 megacycles*
2nd Band 4.5-1.6 megacycles *4th Band—20-11.5 megacycles*

In these and the following instructions for alignment the term "voltmeter" shall be understood to mean "vacuum tube voltmeter" and the term "voltmeter indicates resonance" shall be understood to mean that the vacuum tube voltmeter shows greatest swing toward zero.

MODELS 86AW-186AW-286AW-386AW (8 TUBES)

Turn band selector switch to 2nd band position. Place service oscillator in operation on 458 K.C. Connect grid of voltmeter to A.V.C. Bus and ground of voltmeter to chassis ground. A convenient place to connect the A.V.C. Bus is at the junction of the ¼ megohm resistor and the by-pass condenser located at the bottom of the chassis directly below 4th band antenna coil. Remove grid clips from 6B7, 6D6 1st I.F. and 6A7. Apply output oscillator to grid of 6B7 and adjust trimmers on rear I.F. transformer until voltmeter indicates resonance. Replace grid clip and shield cap on 6B7 and apply oscillator output to grid of 6D6 and adjust trimmers on center I.F. transformer until voltmeter indicates resonance decreasing the oscillator output, if necessary, in order to obtain a good readable indication on voltmeter. Replace grid clip and shield cap on 6D6 and apply oscillator output to grid of 6A7. Adjust trimmers on front I.F. transformer until voltmeter indicates resonance. Now reduce oscillator output and with oscillator input still applied to grid of 6A7 carefully recheck all adjustments in the same order in which they were initially made. This completes the alignment of the I.F. amplifier

MODELS 106AW-1106AW-2106AW-3106AW (10 TUBES) AND 126AW-1126AW-2106AW-3126AW (12 TUBES)

As these models use a separate automatic volume control tube 6C6 and a linear power detector (76) it is advisable to make an inspection of the system used in order to understand its operation and to intelligently analyze and correct such troubles as may arise.

Referring to the circuit diagram (it may be advisable to draw out a skeleton diagram showing the A.V.C. system only) it will be noted that the third I.F. transformer has two secondary windings, one tuned which feeds the grid of the power detector (76) and one untuned which feeds the grid of the 6C6, A. V.C. tune. The grid return of the latter coil returns to the negative side of the power supply. The grid of the 6C6 is then at all times approximately 120-170 volts negative with respect to the chassis. The cathode of the 6C6 returns to the 50 ohm resistance (R) in the negative side of power supply. The voltage drop across this resistor furnishes the necessary grid bias for the tube. The plate of the 6C6 is connected to ground through a 500,000 ohm resistor (R 15) and V 1. The screen of the 6C6 is connected to the cathode and the suppressor is connected to the plate. It is evident, then, that we have a 6C6 connected as a triode and operating as a very sensitive D.C. amplifier. Its grid return is connected to the most negative point of the power supply, its cathode connected to a point slightly less negative (difference due to voltage drop across resistance R) and its plate connected to ground through resistance R 15 and V 1. When no signal is applied to the grid the tube is biased to cut off and no current flows through R 15. A voltmeter connected from plate to ground will show no reading. When a signal is applied to the grid of the tube, current does flow through the plate resistor R 15 and a voltmeter connected from plate to ground will show various readings, the amount of voltage shown depending upon the drop across R 15 due to the current flowing through it. The current flowing through R 15 depends entirely upon the strength of the signal applied to the grid of the 6C6. It is this voltage drop across R 15 which is utilized for the A.V.C. voltage. The A.V.C. bus, therefore, is connected to the plate of the 6C6 tube. It is also well to remember that the grid clip of the 6C6 is "*hot*" with respect to the chassis.

To align intermediate frequency amplifier, remove grid clips from 6A7 and 6D6's, 1st and 2nd I.F. tubes. Place service oscillator in operation on 458 kilocycles. Connect voltmeter grid lead to plate prong on socket of 6C6 and ground lead to chassis ground. Turn band selector switch to 2nd band position. Apply oscillator signal to 6D6 2nd I.F. tube (the one farthest toward back of chassis), adjust trimmer on side next to 6C6 of rear I.F. transformer until voltmeter indicates resonance. Do not attempt to adjust the other trimmer at this time. Replace grid clip and shield cap on 6D6 and apply oscillator signal to grid of 6D6 1st I.F. tube and adjust trimmers of center I.F. transformer until voltmeter indicates resonance, reducing oscillator output, as necessary, to obtain a good readable indication. Replace grid clip and shield cap and apply oscillator output to grid of 6A7 and adjust trimmers of front I.F. transformer until voltmeter indicates resonance. Now further reduce oscillator output and with oscillator output still applied to grid of 6A7 check each adjustment in the order in which they were made. Now adjust the trimmer on the rear I.F. transformer, farthest away from 6C6 until the noise level is maximum and the voltmeter makes a slight dip *away from resonance*. This completes the alignment of the I.F. amplifier.

CALIBRATION OF VARIOUS BANDS—ALL MODELS

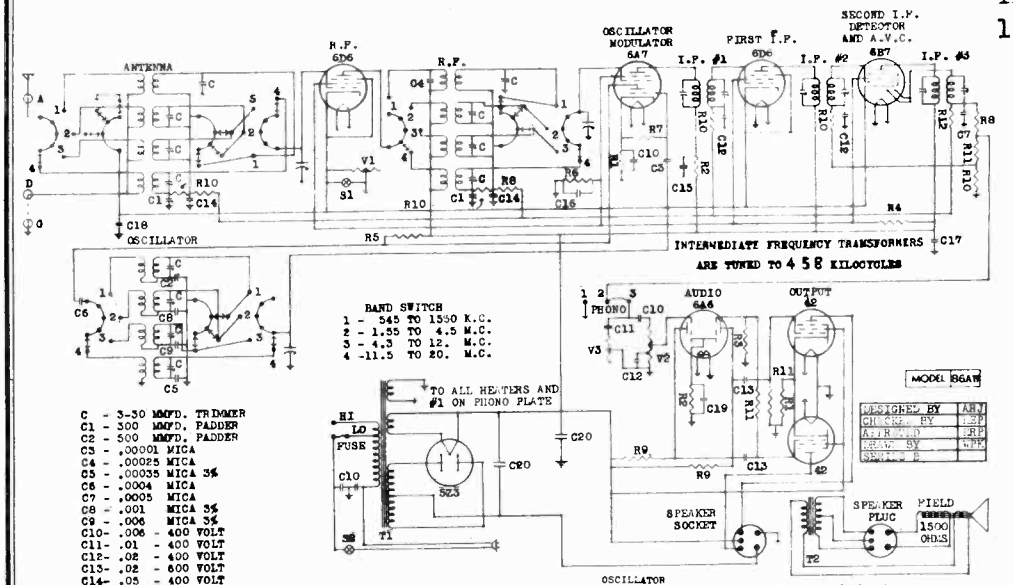
Broadcast Band—1500 - 550 K.C. Connect voltmeter to A.V.C. bus and chassis ground as described under Intermediate Amplifier Alignment. Turn band selector switch to broadcast position. Throw switch for silent tuning to the downward position. Place service oscillator in operation at 1400 K.C. Turn set dial to 1400 K.C. and adjust oscillator trimmer until voltmeter indicates resonance. Now adjust modulator and antenna trimmers, in turn, until voltmeter indicates resonance in each case. Turn set dial to 600 K.C. and set service oscillator at 600 K.C. Adjust oscillator low frequency pad for resonance. Now turn set dial back to 1400 K.C. and set service oscillator at 1400 K.C. Carefully correct oscillator trimmer setting and without moving the dial setting verify and correct the setting of the modulator and R.F. trimmers.

Second Band—4.5 - 1.6 megacycles. Turn band selector switch to second band position. Place high frequency oscillator in operation

Schematics

PATTERSON RADIO CO.

MODELS 186AW, 286AW, 386AW 110BAW, 2106AW, 3106AW 1126AW, 2126AW, 3126AW



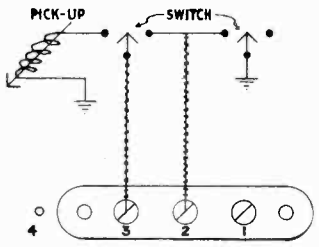
C - 3-30 MMFD. TRIMMER
C1 - 500 MMFD. PADDER
C2 - 500 MMFD. PADDER
C3 - .00001 MICA
C4 - .00025 MICA
C5 - .00035 MICA 3%
C6 - .0004 MICA
C7 - .0005 MICA
C8 - .001 MICA 3%
C9 - .006 MICA 3%
C10- .006 - 400 VOLT
C11- .01 - 400 VOLT
C12- .02 - 400 VOLT
C13- .02 - 600 VOLT
C14- .05 - 400 VOLT
C15- .1 - 400 VOLT
C16- .25 - 400 VOLT
C17- .25 - 600 VOLT
C18- .5 - 200 VOLT
C19- 10 MFD 50 VOLT
C20- 16 MFD 475 VOLT
T1 - POWER TRANSFORMER
T2 - OUTPUT - ON SPEAKER

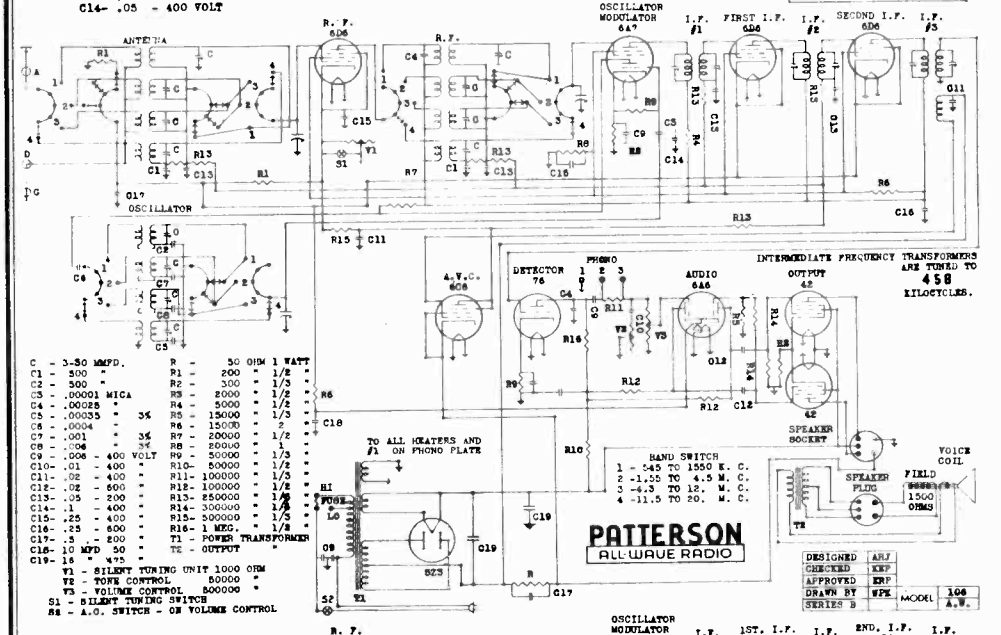
R1 - 300 OHM 1/2 WATT
R2 - 5000 OHM 1/2 WATT
R3 - 15000 OHM 1/3 WATT
R4 - 15000 OHM 2 WATT
R5 - 20000 OHM 1/2 WATT
R6 - 20000 OHM 1 WATT
R7 - 50000 OHM 1/3 WATT
R8 - 100000 OHM 1/3 WATT
R9 - 100000 OHM 1/2 WATT
R10- 250000 OHM 1/3 WATT
R11- 500000 OHM 1/3 WATT
R12- 1 MEG. OHM 1/3 WATT
S1 - SILENT TUNING SWITCH
S2 - A.C. SWITCH-ON VOLUME CONTROL
V1 - SILENT TUNING CONTROL-1000 OHMS
V2 - VOLUME CONTROL -500000 OHMS
V3 - TONE CONTROL -50000 OHMS

MODELS 186AW 286AW 386AW

PHONO-PICKUP

Connect all sets, 8-10-12 in same manner. Remove jumper which connects terminals No. 2 and No. 3. Standard High Impedance pickup must be used. It is essential that leads from terminals No. 2 and No. 3 be shielded and grounded to chassis at No. 4 which hole is provided in all chassis for this purpose. One side of pickup unit must also be grounded.



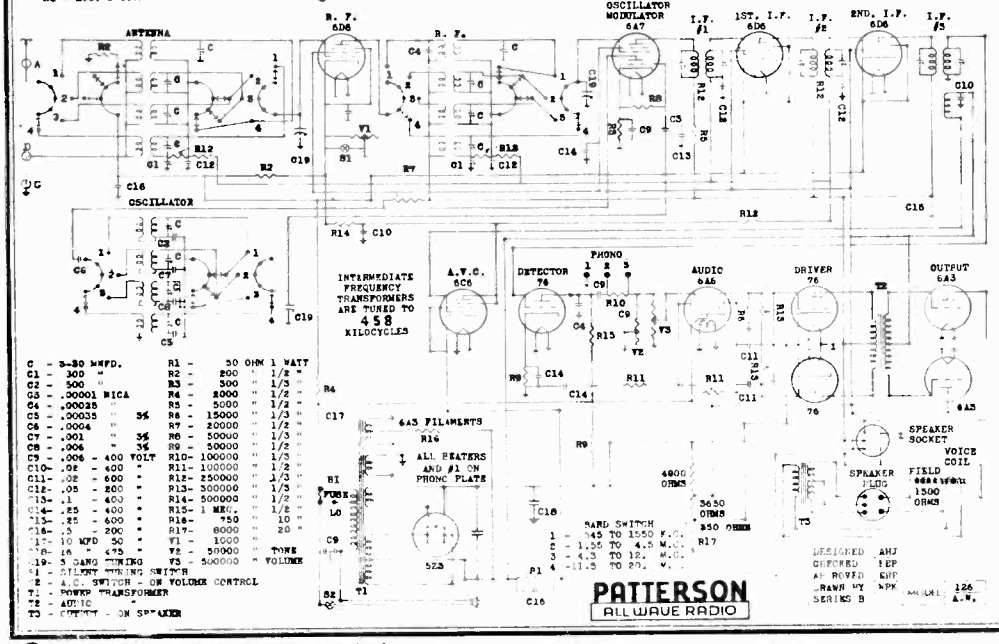


C - 3-30 MMFD.
C1 - 500 "
C2 - 500 "
C3 - .00001 MICA
C4 - .00025 "
C5 - .00035 " 3%
C6 - .0004 "
C7 - .001 " 3%
C8 - .006 " 3%
C9 - .006 - 400 VOLT
C10- .01 - 400 "
C11- .02 - 400 "
C12- .02 - 600 "
C13- .05 - 200 "
C14- .1 - 400 "
C15- .25 - 400 "
C16- .25 - 600 "
C17- .5 - 200 "
C18- 10 MFD 50 "
C19- 16 " 475 "
V1 - SILENT TUNING UNIT 1000 OHM
V2 - TONE CONTROL 50000 "
V3 - VOLUME CONTROL 500000 "
S1 - SILENT TUNING SWITCH
S2 - A.C. SWITCH - ON VOLUME CONTROL

R - 30 OHM 1 WATT
R1 - 200 " 1/2 "
R2 - 300 " 1/3 "
R3 - 2000 " 1/2 "
R4 - 5000 " 1/2 "
R5 - 15000 " 1/3 "
R6 - 15000 " 2 "
R7 - 20000 " 1/2 "
R8 - 50000 " 1 "
R9 - 50000 " 1/3 "
R10- 50000 " 1/2 "
R11- 100000 " 1/3 "
R12- 100000 " 1/2 "
R13- 250000 " 1/3 "
R14- 300000 " 1/3 "
R15- 500000 " 1/3 "
R16- 1 MEG. 1/3 "
T1 - POWER TRANSFORMER
T2 - OUTPUT "

MODELS 1106AW 2106AW 3106AW

This is accomplished by soldering one lead of the unit to the shielded cable mentioned above. If slight hum occurs try reversing pickup leads. Terminal No. 1 is used when it is desired to install a light in the phono section of the cabinet. Use only a 6 volt lamp running a lead from terminal No. 1 to one side of the lamp socket and grounding the other side by connecting to shielded cable in same method as grounding the pickup. Switch used must be two pole, double throw and connected as shown, grounding one pole to shielded cable, same as in above method.



C - 3-30 MMFD.
C1 - 500 "
C2 - 500 "
C3 - .00001 MICA
C4 - .00025 "
C5 - .00035 " 3%
C6 - .0004 "
C7 - .001 " 3%
C8 - .006 " 3%
C9 - .006 - 400 VOLT
C10- .02 - 400 "
C11- .02 - 600 "
C12- .05 - 200 "
C13- .1 - 400 "
C14- .25 - 400 "
C15- .25 - 600 "
C16- .5 - 200 "
C17- 10 MFD 50 "
C18- 16 " 475 "
C19- 3 GANG TUNING
S1 - SILENT TUNING SWITCH
S2 - A.C. SWITCH - ON VOLUME CONTROL
T1 - POWER TRANSFORMER
T2 - AUDIO "
T3 - OUTPUT - ON SPEAKER

R1 - 30 OHM 1 WATT
R2 - 200 " 1/2 "
R3 - 300 " 1/3 "
R4 - 2000 " 1/2 "
R5 - 5000 " 1/2 "
R6 - 150000 " 1/3 "
R7 - 20000 " 1/2 "
R8 - 50000 " 1/3 "
R9 - 50000 " 1/2 "
R10- 100000 " 1/3 "
R11- 100000 " 1/2 "
R12- 250000 " 1/3 "
R13- 300000 " 1/3 "
R14- 500000 " 1/2 "
R15- 1 MEG. 1/2 "
R16- 750 " 10 "
R17- 8000 " 20 "
V1 - 1000 "
V2 - 50000 " TONE
V3 - 500000 " VOLUME

MODELS 1126AW 2126AW 3126AW

MODELS 186AW,286AW,386AW
MODELS 1106AW,2106AW,3106AW
MODELS 1126AW,2126AW,3126AW

PATTERSON RADIO CO.

Voltages,Alignment,Part 2
Parts Lists

at 4 megacycles. Turn set dial to 4 megacycles. Turn modulator trimmer full in. Adjust oscillator trimmer until resonance with H.F. oscillator signal is indicated. Without moving dial, open the modulator trimmer until voltmeter indicates resonance and then in the same manner adjust antenna trimmer for resonance. Verify dial setting and carefully readjust modulator and R.F. trimmers.

Third Band—12 - 4.5 megacycles. Turn band selector switch to 3rd band position. Place H.F. oscillator in operation at 12 megacycles. Turn dial to 12 megacycles. Adjust trimmers in exactly the same manner as described for 2nd band.

Fourth Band—20 - 11.5 megacycles. Turn band selector switch to 4th band position. Place H.F. oscillator in operation at 20 megacycles. Turn set dial to 20 megacycles. Turn modulator trimmer full in and tighten screw on modulator L.F. pad. Adjust oscillator trimmer until voltmeter indicates resonance with H.F. oscillator signal. Without moving dial setting adjust modulator and R.F. trimmers for resonance. Now place H.F. oscillator in operation at 12 megacycles. Turn set dial to 12 megacycles and adjust oscillator L.F. pad until voltmeter indicates resonance with H.F. oscillator signal. Without moving dial setting adjust modulator and antenna low frequency pads for resonance. Reset dial and H.F. oscillator to 20 megacycles and verify setting of modulator and antenna trimmers.

VOLTAGES

The following tables show representative voltages at various points in normal sets:

All Voltages Measured Under The Following Conditions:

No signal-fuse on 110-115 V. side. Line volts 115, 60 cycles. Band Change Switch in B.C. Band Position — Silent Tuning. Control Inoperative. All voltages from various points to chassis ground measured with voltmeter 1000 ohms per volt.

8 TUBE SET

		Plate	Screen	Cathode	Suppressor	
RF	6D6	+250	+80	0	Tied to Cathode	Osc. Plate
Mod. Osc.	6A7	+215	+80	+2.4		+140
1 IF	6D6	+230	+80	0	Tied to Cathode	
2 IF	6B7	+230	+80	0		
1 Audio	6A6	+150*		+4.0		
2 Audio	42	+230	+235	+16.5		
	42	+230	+235	+16.5		

**Each plate measured through 100,000 ohm plate resistor.*

ELECTROLYTIC CONDENSERS

	Center to Ground	Can to Ground
Grounded	+240	0
Insulated	+240	—165 or 120
Speaker Field	Hot Side to Ground	—165 or 120

10 TUBE SET

		Plate	Screen	Cathode	Suppressor	
RF	6D6	+240	+78	0	Tied to Cathode	Osc. Plate
Mod. Osc.	6A7	+220	+78	+2.4		+160
1 IF	6D6	+240	+78	+2.6	Tied to Cathode	
2 IF	6D6	+240	+78	+2.6	Tied to Cathode	
2 Det.	76	+30*		+1.5*		
Inverter	6A6	+120†		+3.6		
Output	42	+240	+245	+16		
Output	42	+240	+245	+16		
AVC	6C6	0	—170 or —120	Tied to Screen	Tied to Plate	Control Grid —175 or —125

**Voltages not accurately measurable due to 1 Meg. plate resistor.*
†Each plate measured through 100,000 ohm plate resistor.

ELECTROLYTIC CONDENSERS

	Center to Ground	Can to Ground
Grounded	+245	0
Insulated	+245	—175 or 125
Speaker Field	Hot Side to Ground	—175 or 125

12 TUBE SET

		Plate	Screen	Cathode	Suppressor	
RF	6D6	+250	+100	0	Tied to Cathode	Osc. Plate
Mod. Osc.	6A7	+230	+100	+3.3		+170
1 IF	6D6	+250	+100	+3.25	Tied to Cathode	
2 IF	6D6	+250	+100	+3.25	Tied to Cathode	
2 Det	76	+40*		+1.75*		
Inverter	6A6	+135†		+4.2		
Driver	76	+245		+11.5		
Driver	76	+245		+11.5		
						Control Grids
Output	2A3	+245		—75 C.T.Fil.		—150
Output	2A3	+245		—75 C.T.Fil.		—150
AVC	6C6	0	—150	Tied to Screen	Tied to Plate	—155

**Voltages not accurately measurable due to 1 Meg. plate resistor.*
†Each plate measured through 100,000 ohm plate resistor.

ELECTROLYTIC CONDENSERS

	Center to Ground	Can to Ground
Grounded	+250	0
Insulated	+250	—155
Speaker Field	Hot Side to Ground	—155

PARTS PRICE LIST NO. 502—SERIES B REPLACEMENT PARTS

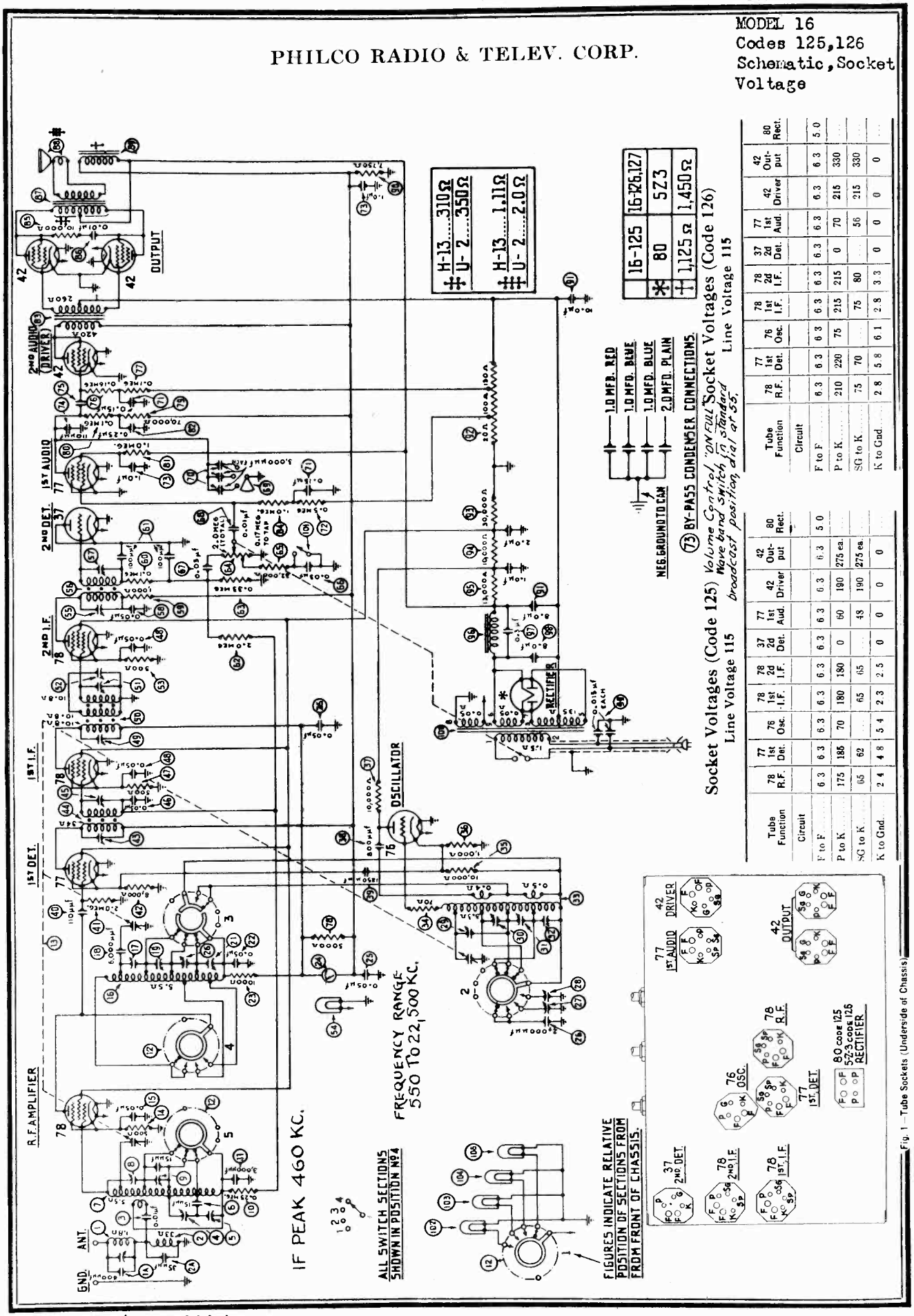
AUGUST 1, 1935 — PRICES SUBJECT TO CHANGE WITHOUT NOTICE — F.O.B. LOS ANGELES

Part No.	DESCRIPTION	List Price
720	Antenna-Doublet Plate A. D. G.	$ .18
721	A. C. Cord and Plug	.35
722	Audio Transformer	2.65
723	Band Changer Disc with Rod—Complete	1.00
724	Band Changer Screw (Flat Head)	.07
725	Band Changer Bakelite Washer	.05
726	Cap —Screen Grid (Per C)	1.00
727	Condenser 8 Mfd.—450 Volt (In Can)	1.00
728	Condenser 16 Mfd.—475 Volt (In Can)	1.25
729	Condenser 10 Mfd.— 25 Volt (Tubular)	.60
730	Condenser .006 —400 Volt	.15
731	Condenser .02 —400 Volt	.15
732	Condenser .05 —400 Volt	.15
733	Condenser .1 —400 Volt	.20
734	Condenser .25 —400 Volt	.25
735	Condenser .5 —200 Volt	.55
736	Condenser 3-30 MMFD.—Trimmer	.15
737	Condenser 300 MMFD.—Padder	.45
738	Condenser 500 MMFD.—Padder	.50
739	Condenser—Mica .0001 —10%	.15
740	Condenser—Mica .00025—10%	.15
741	Condenser—Mica .0004 —10%	.15
742	Condenser—Mica .0004 — 3%	.20
743	Condenser—Mica .001 — 3%	.20
744	Condenser—3 Gang Variable	3.40
745	Coil —B. C. Antenna	1.50
746	Coil —2—3—4 Band Antenna	.75
747	Coil —Broadcast R. F.	1.50
748	Coil —2—3—4 Band R. F.	.75
749	Coil —All Oscillator	1.00
750	Control—Volume	1.10
751	Control—Tone	.80
752	Control—Silent Tuning	.30
753	Dial Disc and Scale	.80
754	Dial Scale Only	.35
755	Dial Drive Vernier Complete	1.25
756	Dial Light—Red Marker	.05
757	Dial Light Socket	.10
758	Dial Lamp—6 Volt	.14
759	Escutcheon Plate	.40
760	Fuse Block	.20
761	Fuse only—2 Amp.	.05
762	Intermediates—Coil only	.40
763	I. F. Trimmer	.35
764	I. F. Shield Can	$ .15
765	Knob —Large Wood	.15
766	Knob —Small Wood	.12
767	Phono Plate	.18
768	Phono Motor	24.00
769	Phono Pickup—Complete	16.80
770	Resistor—Vitreous Enamel— 750 Ohm—10 Watt	.50
771	Resistor—Vitreous Enamel—8000 Ohm—20 Watt	1.30
772	Resistor—Carbon—1/3 Watt—Any Value	.15
773	Resistor—Carbon—1/2 Watt—Any Value	.20
774	Resistor—Carbon— 1 Watt—Any Value	.20
775	Resistor—Carbon— 2 Watt—Any Value	.35
776	Socket —Tube—4—5—6—7 Prong	.12
777	Switch—Band Change	2.50
778	Switch—Silent Tuning	.24
779	Speaker— 8" Complete—1500 Ohm Field	10.00
780	Speaker—12" Complete—1500 Ohm Field	17.50
781	Speaker Field Coil— 8"—1500 Ohm	1.90
782	Speaker Field Coil—12"—1500 Ohm	4.00
783	Speaker Bucking Coil	.30
784	Speaker Output Transformer— 8 & 10	1.90
785	Speaker Output Transformer—12	1.90
786	Speaker Cone and Voice Coil— 8"	2.60
787	Speaker Cone and Voice Coil—12"	4.00
788	Speaker Cord and Plug	.35
789	Tube —76	.90
790	Tube —5Z3	1.20
791	Tube —6A3	1.35
792	Tube —6A6	1.35
793	Tube —6A7	1.30
794	Tube —6C6	1.10
795	Tube —6D6	1.00
796	Transformer—Power 110-130 Volt 50-100 Cycle—8 & 10	7.35
797	Transformer—Power 110-130 Volt 50-100 Cycle—12	9.75
798	Transformer—Power 110-130 Volt 25 Cycle—8 & 10	11.00
799	Transformer—Power 110-130 Volt 25 Cycle—12	14.65
800	Transformer—Power-Universal-110-125 220-250 Volt 50-100 Cycle—8 & 10	9.90
801	Transformer—Power-Universal-110-125 220-250 Volt 50-100 Cycle—12	14.60
802	Transformer Switch for Universal	1.20
803	Transformer—Audio Input	3.25
804	Transformer—Filter Choke	1.25

In Ordering Be Sure to Mention Part Number

PHILCO RADIO & TELEV. CORP.

MODEL 16
Codes 125,126
Schematic, Socket
Voltage



	16-125	16-126,127
*	80	523
†	1,125Ω	1,450Ω

Socket Voltages (Code 125) Volume Control "ON full" Socket Voltages (Code 126)
Line Voltage 115 Wave band Switch in Broadcast position dial at 55. Line Voltage 115

Tube Function	78 R.F.	77 1st Det.	76 Osc.	78 1st I.F.	78 2d I.F.	37 2d Det.	77 1st Aud.	42 Driver	42 Out-put	80 Rect.
Circuit										
F to F	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	5.0
P to K	175	185	70	180	180	0	60	190	275 ea.	
SG to K	65	62		65	65		48	190	275 ea.	
K to Gnd.	2.4	4.8	5.4	2.3	2.5	0	0	0	0	

Tube Function	78 R.F.	77 1st Det.	76 Osc.	78 1st I.F.	78 2d I.F.	37 2d Det.	77 1st Aud.	42 Driver	42 Out-put	80 Rect.
Circuit										
F to F	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	5.0
P to K	210	220	75	215	215	0	70	215	330	
SG to K	75	70		75	80		56	215	330	
K to Gnd.	2.8	5.8	6.1	2.8	3.3	0	0	0	0	

Fig. 1 - Tube Sockets (Underside of Chassis)

MODEL 16
Codes 125,126,127
Alignment,Trimmers

PHILCO RADIO & TELEV. CORP.

Adjusting Compensating Condensers

Model 16 (Codes 125, 126, 127)

Adjustment of I. F.

1. Remove the antenna connection from the receiver, disconnect the grid clip from the first detector (type 77 tube), and connect the "ANT" output terminal of the Model 048 or 024 signal generator to the grid cap of this tube; connect the "GND" terminal of the signal generator to the "GND" terminal of the receiver.

2. Connect the 0 to 20 volt range of the output meter in the Model 048 or 025 tester to the plate prongs of the two output tubes or to the two bottom prongs of the speaker plug.

3. Adjust the signal generator to a frequency of 460 K.C. Place the receiver in operation with the dial turned to the low frequency end of the broadcast band, wave band switch to extreme left, and with the volume control adjusted near its maximum setting. Adjust the signal generator attenuator for approximately half-scale reading of the output meter.

4. Using the Philco fibre adjusting screw driver, part No. 27-7059, adjust the I. F. compensating condensers in the following order to give maximum reading in the output meter: (57), (55), (52), (49), (51), (45), (43). (Fig. 4).

Adjustment of Wave-Trap

1. Connect the signal generator leads to the antenna and ground terminals of the receiver. Replace the grid clip on the first detector grid cap.

2. Set the wave-band switch of the receiver to the extreme left (broadcast position) (Range No. 1, 550-1500 K.C.), and turn the station selector to 550 K.C.

3. With the signal generator in operation at 460 K.C., adjust the wave-trap (1) condenser until a minimum reading is obtained on the output meter. The Philco fibre wrench, part No. 3164, is used for this adjustment.

Adjustment of High Frequency Padders

1. Leaving the output meter connected to the receiver connect the Philco Model 091 signal generator to the antenna and ground terminals of the chassis and place the signal generator in operation.

2. Turn the wave-band switch to Range 4 (extreme right) and adjust the station selector to 18.0 megacycles, at which point the fifth harmonic of the 3600 K.C. signal will be heard. By means of the Philco padder wrench, part No. 3164, adjust the oscillator, R.F. and antenna padders for maximum reading in the output meter and in the order mentioned. These padders are numbered (29), (17) and (8), respectively in figure No. 4. To make certain that the adjustment has been correctly made check the sixth harmonic at 21.6 M.C. on the dial.

3. Turn the wave-band switch to Range 3 (4.1-10.0 M.C.) and adjust the tuning dial to 7.2 M.C. (the second harmonic of the 3600 K.C. signal). Adjust the oscillator, R.F. and antenna padders ((30), (19) and (9), respectively) for maximum output. Check the calibration of the dial at the upper portion of the third band by tuning in the image of the 10.8 M.C. signal at approximately 9.9 on the dial. (If there is an appreciable error in calibration at this point, readjust padder (30) for maximum output. Return the dial to the 7.2 M.C. position, tuning for maximum output. Readjust padders (19) and (9).)

4. Turn the wave-band switch to scale No. 2 (1.5-4.0 M.C.) and tune in the fundamental frequency from the signal generator at 3.6 M.C. Adjust padders (31), (20) and (4) for maximum output.

5. At this point it will again be necessary to make use of the broadcast type signal generator Models 024, 048 or equivalent. Connect the output of this signal generator to the antenna and ground terminals of the chassis. Turn the station selector dial to 1.5 M.C. (Range 2) and adjust the signal generator to the same frequency (1500 K.C.). Adjust padder (27) (nut).

6. Turn the wave-band switch to Range No. 1 (broadcast band) and set the dial at 1500 K.C. Adjust the signal generator to this frequency and adjust padders (32), (21) and (5) for maximum output.

7. Tune the receiver and the signal generator to 600 K.C. and adjust padder (28) (screw) for maximum output.

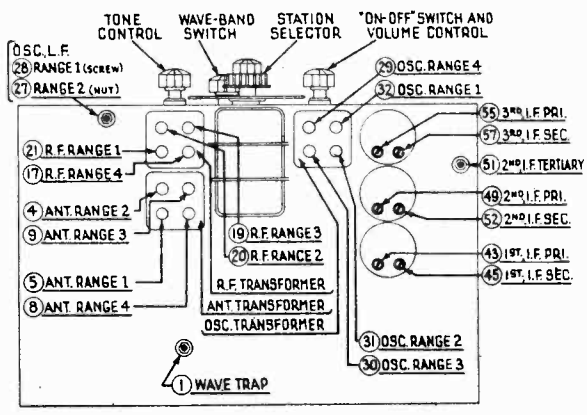


Fig. 4—Locations of Compensating Condensers

Power Transformer Data

Line Voltage 120

Terminals	A.C. Volts	Circuit	Color of Leads
1-2	120	Primary	White
3-5	*720	Plates of Rectifier	Yellow
6-7	5.0	Filament of Rectifier	Blue
8-9	6.3	Filaments	Black
4	...	Center Tap of 3-5	Yellow—Green Tracer

*780 in code 126

MODEL 16
Codes 125,126
Chassis,Parts

PHILCO RADIO & TELEV. CORP.

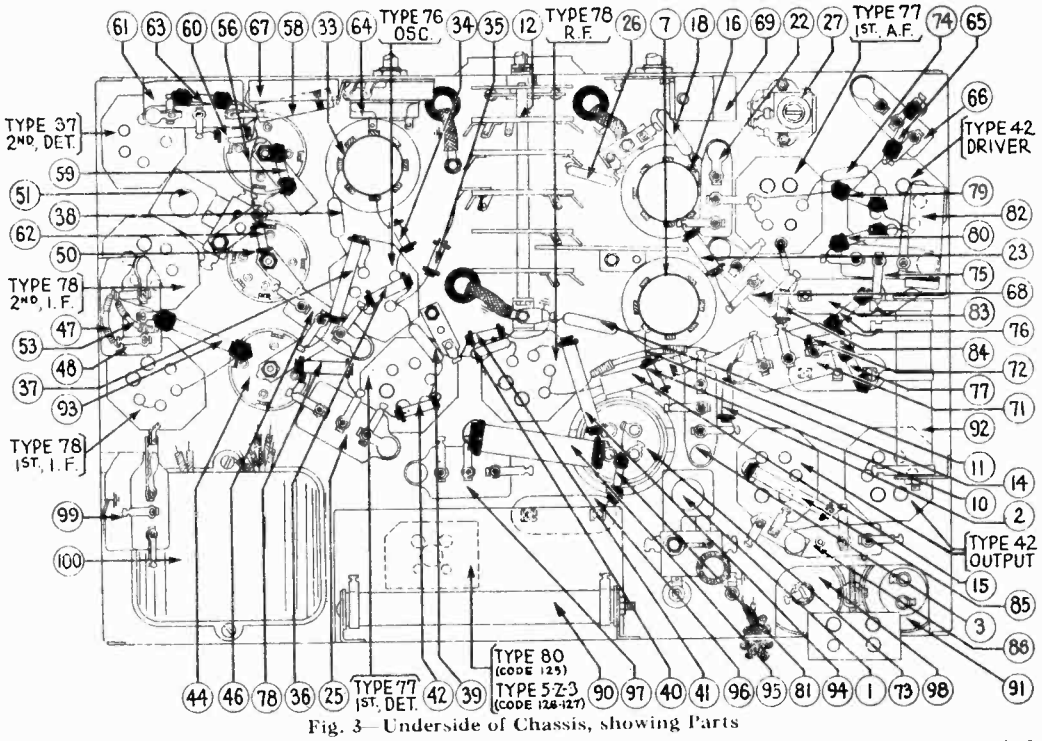


Fig. 3—Underside of Chassis, showing Parts

REPLACEMENT PARTS—MODEL 16—CODES 125 AND 126

Nos. on Diagram	Description	Part No	List Price
①	Wave Trap	38-6019	$0.30
①a	Condenser (.0006 Mfd. Mica	30-1049†	.35
②	Antenna Choke Assembly	32-1515	.30
②a	Condenser (.000035 Mfd. Mica)	30-1044	.35
③	Condenser (.01 Mfd. Bakelite Block)	3903 N	.25
④	Compensating Condenser (Ant. Band 2)	†Part of 31-6026	....
⑤	Compensating Condenser (Ant. Band 1)	†Part of 31-6026	....
⑥	Condenser (.000015 Mfd. Mica)	30-1030	.35
⑦	Ant. Transformer	32-1467	....
⑧	Compensating Condenser (Ant. Band 4)	†Part of 31-6026	....
⑨	Compensating Condenser (Ant. Band 3)	†Part of 31-6026	....
⑨a	Condenser (.000015 Mfd. Mica)	30-1030	.35
⑩	Resistor (.25 Meg.) (Red-Yellow-Yellow)	4410	.20
⑪	Condenser (.003 Mfd. Mica)	7301	.45
⑫	Wave Band Switch	42-1079	3.50
⑬	Tuning Condenser Assembly	31-1350	6.50
⑭	Resistor (500 ohms Flexible Wirewound)	6977	.20
⑮	Condenser (.05 Mfd. Tubular)	30-4020	.35
⑯	R.F. Transformer	32-1468	2.30
⑰	Compensating Condenser (R.F.; Band 4)	†Part of 31-6026	....
⑱	Condenser (.006 Mfd. Mica)	30-1043	.60
⑲	Compensating Condenser (R.F.; Band 3)	†Part of 31-6026	....
⑳	Compensating Condenser (R.F.; Band 2)	†Part of 31-6026	....
㉑	Compensating Condenser (R.F.; Band 1)	†Part of 31-6026	....
㉒	Condenser (.05 Mfd. Bakelite Block)	3615 BL	.35
㉓	Resistor (1000 ohms) (Brown-Black-Red)	5837	.20
㉔	Shadowmeter	45-2028	2.50
㉕	Condenser (.05 Mfd. Twin Bakelite Block)	3615 BS	.40
㉖	Condenser (.002 Mfd. Mica)	30-1042	.40
㉗	Compensating Condenser (Osc. L.F.; Range 2)	31-6028	.85
㉘	Compensating Condenser (Osc. L.F.; Range 1)		
㉙	Compensating Condenser (Osc. H.F.; Range 4)		
㉚	Compensating Condenser (Osc. H.F.; Range 3)	31-6026	.85
㉛	Compensating Condenser (Osc. H.F.; Range 2)		
㉜	Compensating Condenser (Osc. H.F.; Range 1)		
㉝	Oscillator Transformer	32-1469	2.40
㉞	Resistor (70 ohms) (Violet-Black-Black)	33-1129	.20
㉟	Resistor (10000 ohms) (Brown-Black-Orange)	33-1000	.20
㊱	Resistor (1000 ohms) (Brown-Black-Red)	5837	.20
㊲	Resistor (10000 ohms) (Brown-Black-Orange)	3524	.20
㊳	Condenser (.0068 Mfd. Mica)	5878	.35
㊴	Condenser (.00125 Mfd. Mica)	5886	.35
㊵	Condenser (.00011 Mfd. Mica)	4519	.35
㊶	Resistor (2 Meg.) (Red-Black-Green)	33-1025	.20
㊷	Resistor (8000 ohms) (Gray-Black-Red)	33-1157	.20
㊸	Compensating Condenser (1st I.F. Pri.)	Part of ㊹	....
㊹	1st I.F. Transformer	32-1188	.65
㊺	Compensating Condenser (1st I.F. Sec.)	Part of ㊹	....
㊻	Condenser (.05 Mfd. Bakelite Block)	3615 AA	.35
㊼	Resistor (500 ohms Flexible Wirewound)	6977	.20
㊽	Condenser (.05 Mfd. Twin Bakelite Block)	3615 AJ	.40
㊾	Compensating Condenser (2nd I.F. Pri.)	Part of ㊿	....
㊿	2nd I.F. Transformer	32-1470	....
(51)	Compensating Condenser (2nd I.F. Tertiary)	04000R	.45
(52)	Compensating Condenser (2nd I.F. Sec.)	Part of ㊿	....
(53)	Resistor (500 ohms Flexible Wirewound)	6977	.20
(54)	Pilot Lamp for Shadowmeter	Part of (55)	....
(55)	Compensating Condenser (3rd I.F. Pri.)	Part of (56)	....
(56)	3rd I.F. Transformer	32-1188	.65
(57)	Compensating Condenser (3rd I.F. Sec.)	Part of (56)	....
(58)	Condenser (.05 Mfd. Tubular)	30-4123	.35
(59)	Resistor (1000 ohms) (Brown-Black-Red)	5837	.20
(60)	Resistor (.1 Meg.) (White-White-Orange)	6099	.20
(61)	Condenser (.0001 Mfd. Twin Bakelite Block)	8035 B	.25
(62)	Resistor (2 Meg.) (Red-Black-Green)	33-1025	.20
(63)	Resistor (330000 ohms) (Orange-Orange-Yellow)	6046	.20
(64)	Volume Control (350000 ohms total) & On-Off Switch	33-5022	1.45
(65)	Resistor (32000 ohms) (Orange-Red-Orange)	5279	.20

†31-6026: list price $0.85.

Nos. on Diagram	Description	Part No.	List Price
(66)	Condenser (.03 Mfd. Bakelite Block)	8318 F	....
(67)	Condenser (.05 Mfd. Tubular)	30-4020	$0.35
(68)	Condenser (.01 Mfd. Bakelite Block)	3903 G	.25
(69)	Tone Control	30-4204	.75
(70)	Condensers (Inside (69))	Part of (69)	....
(71)	Condenser (.15 Mfd. Bakelite Block)	6287 J	.40
(72)	Resistor (.5 Meg.) (Yellow-White-Yellow)	4517	.20
(73)	Condenser (Electrolytic—1,1, 1,2 Mfd.)	30-2078	2.45
(74)	Condenser (.00011 Mfd. Mica)	30-1031	.35
(75)	Condenser (.05 Mfd. Bakelite Block)	3615 AD	.35
(76)	Resistor (160,000 ohms) (Brown-Blue-Yellow)	5331	.20
(77)	Resistor (.1 Meg.) (White-White-Orange)	4411	.20
(78)	Resistor (5300 ohms) (Green-Black-Red)	5310	.20
(79)	Resistor (70000 ohms) (Violet-Black-Orange)	5385	.20
(80)	Resistor (.1 Meg.) (White-White-Orange)	4411	.20
(81)	Resistor (1 Meg.) (Brown-Black-Green)	4409	.20
(82)	Condenser (.25 Mfd. Tubular)	30-4146	.40
(83)	Audio Transformer	32-7057	2.75
(84)	Resistor (1 Meg.) (Brown-Black-Green)	33-1096	.20
(85)	Resistor (10000 ohms)	3524	.20
(86)	Condenser (.01 Mfd. Bakelite Block)	3903 F	.25
(87)	Output Transformer (U-2)	32-7052	2.00
	(H-13)	32-7078	1.40
(88)	Voice Coil and Cone Assembly (U-2)	36-3061	1.40
	(H-13)	02625	1.20
(89)	Field Coil and Pot Assembly (U-2)	36-3088	8.00
	(H-13)	36-3104	2.70
(90)	Resistor (B.C. Wirewound 7750 ohms)	33-3020	.35
(91)	Condenser (Electrolytic—8 & 10 Mfd.)	30-2045 (code 125)	1.80
		30-2046 (code 126)	1.85
(92)	Resistor (Voltage Divider—20 ohms, 100 ohms, 130 ohms)	33-3021	.20
(93)	Resistor (30000 ohms) (Orange-Black-Orange)	7836	.20
(94)	Resistor (10000 ohms) (Brown-Black-Orange)	3524	.20
(95)	Resistor (13000 ohms) (Brown-Orange-Orange) (3-watt)	6450	.40
(96)	Filter Choke	32-7056	2.20
(97)	Condenser (3 Mfd. Bakelite Block)	6287 F	.40
(98)	Condenser (Electrolytic—8 Mfd.)	30-2023* (code 125)	1.10
		30-2011 (code 126)	1.40
(99)	Condenser (.015 Mfd. Twin)	3793 E	.40
(100)	Power Transformer 60 Cycle 115 Volts (code 125)	32-7291	7.00
	Power Transformer 25 Cycle 115 Volts (code 125)	32-7292	9.25
	Power Transformer 60 Cycle 115 Volts (code 126)	32-7283	7.00
	Power Transformer 25 Cycle 115 Volts (code 126)	32-7284	....
(101)	Bass Compensation Switch (Toggle Type)	3253	.45
(102)	Pilot Lamp (Dial Section)	34-2031	.45
(103)	Pilot Lamp (Dial Section)	34-2031	.12
(104)	Pilot Lamp (Dial Section)	34-2031	.12
(105)	Pilot Lamp (Dial Section)	34-2031	.12
	Tube Socket (4 Prong)	7544	.12
	Tube Socket (5 Prong)	27-6013	.11
	Tube Socket (6 Prong)	7547	.11
	Speaker Socket	7828	.10
	Tube Shield (Short Type)	28-1107	.10
	Tube Shield (Tall Type)	28-1820	.06
	Dial Assembly	31-1287	....
	Dial Scale	27-5064	.60
	Chassis Mounting Screw (code 125)	W 1358A	2.60 C
	Chassis Mounting Screw (code 126)	W 1346	.60 C
	Chassis Mounting Foot	27-4116	.05
	Chassis Mounting Foot Plate	27-7497	.35 C
	Chassis Mounting Washer	29-2089	.35 C
	Knob (Waveband Switch, code 126)	27-4051	.10
	Knob (Volume Control and Tone Control)	27-4052	.10
	Knob (Station Selector)	27-4139	.10
	Knob (Fine Tuning Control)	27-4140	.10
	Bass Compensation Switch Plate	28-2415	.05

*After Run No. 5: 30-2025, list price $1.35.

MODELS 39,39-A
Voltage,Socket
Trimmers,Alignment

PHILCO RADIO & TELEV. CORP.

Models 39 and 39-A

(Battery Operated—Standard and Short Wave)

PHILCO Models 39 and 39-A are battery-operated radio receivers covering two ranges of frequencies: (1) 550 to 1720 kilocycles, which includes standard broadcasts and some police stations; and (2) 5.5 to 16.0 megacycles (5500 to 16000 kilocycles) which includes the majority of American and foreign Short-wave broadcasting stations.

Model 39 is operated from a two-volt storage battery (Philco 172-R) and a special combination dry B and C battery unit (Philco P-968). The latter is to be connected to the receiver by inserting the plug at the end of the battery cable (attached to chassis) into the socket on the dry battery unit.

Model 39-A is to be operated from a dry A battery (Philco type P-896). The 39-A is also supplied with an additional tube, type 6, used as a "Ballast" tube to keep the voltage on the other tube filaments at a constantly correct voltage. The B and C battery unit, type P-968, is the same for Model 39-A as for Model 39.

The socket for the ballast tube exists in both Model 39 and 39-A chasses but in Model 39, the two filament prong holes are shorted by a metal jumper. This jumper must be left in place at all times on Model 39; on Model 39-A it is removed and replaced by the type 6 ballast tube.

Tubes Used—Type 1C6 detector oscillator, type 34 intermediate frequency, type 30 2d detector and A. V. C., type 32 1st audio, type 30 driver and type 19 output (class B).

Current Consumption—A battery: 670 M.A.; B battery: 19 M.A. **Intermediate Frequency**—460 K.C.

Tube Socket Voltages obtained with PHILCO 025 Tester

(All Voltages Measured to Ground)

	1C6	34	30	32	30	19
Plate	130	130	....	45	130	130
Screen Grid	66	66	....	30	....	130
Osc. Plate	112	....	....	....	....	....

Above voltages obtained by use of Philco type 025 Circuit Tester or 048 All-purpose Tester. Both of these units incorporate a high-resistance voltmeter. Tests made by applying test prods to socket terminals underneath chassis (see Fig. 1).

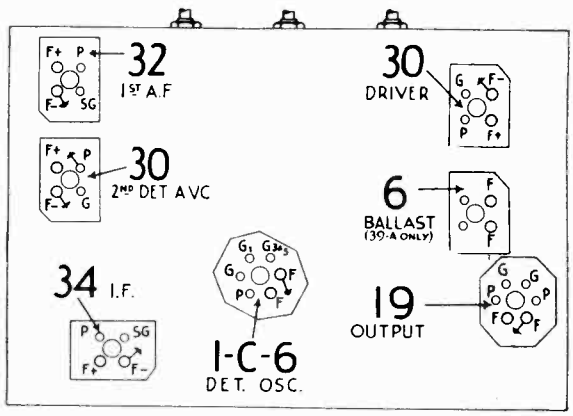


FIG. 1—Bottom View of Tube Sockets for making Voltage Tests

Adjusting Compensating Condensers

The adjustment of compensating condensers in Model 39 requires the use of a signal generator capable of producing a signal on standard broadcast frequencies, and another for the short-waves or high frequencies. For the former we suggest Philco Model 024 Signal Generator, and for the Short-wave, Model 091 Crystal Controlled Oscillator. The Model 024 covers frequencies from 105 to 2000 K. C. and the 091 has a fundamental frequency of 3600 K. C. (3.6 M. C.) any harmonic (multiple) of which may be used.

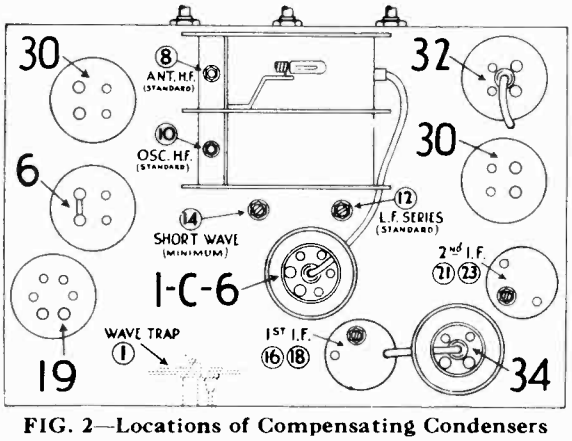


FIG. 2—Locations of Compensating Condensers

Other equipment needed includes some form of output meter, and a suitable insulated handle wrench and screwdriver for adjusting the condensers. Philco equipment available includes Model 025 or 012 output meter and Part 3164 wrench and 27-7059 screwdriver.

First connect the output meter to the plate contacts of the type 19 output tube.

Adjustments are then made in the following order; positions of all compensators (except number ⑨ visible in Fig. 4) are shown in Fig. 2.

Adjustment of the Intermediate Frequency

Remove the grid clip from the type 1C6 tube and connect the "ANT." output terminal of the 024 signal generator to the grid cap of the tube. Connect the "GND" terminal of the signal generator to the "GND" terminal of the receiver chassis.

Set the signal generator at 460 K. C. (the intermediate frequency of Model 39) and with the receiver and signal generator turned on, the wave band switch at left and dial at 600

MODELS 39,39-A
Schematic

PHILCO RADIO & TELEV. CORP.

I. F.—460 K. C.

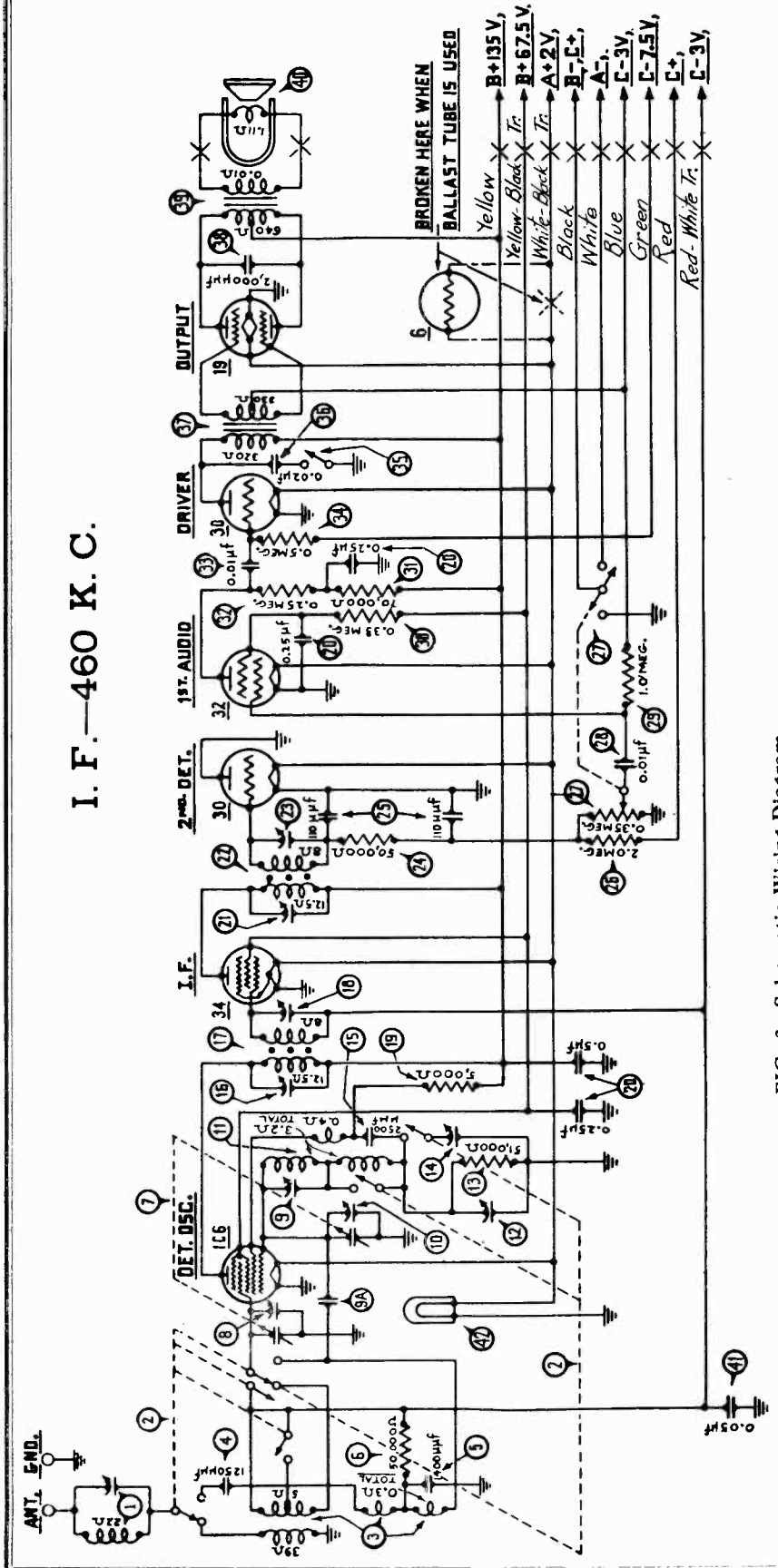
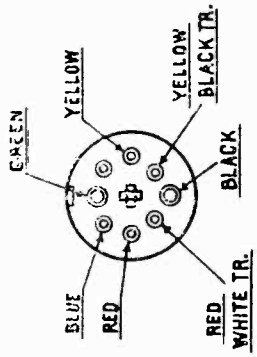


FIG. 3—Schematic Wiring Diagram



Color code of connections from battery cable to plug. "A" battery leads do not come to plug but are brought out of cable just above plug, and polarity marked on metal tag on each lead.

MODELS 39,39-A
Alignment,Part 2
Chassis,Parts

PHILCO RADIO & TELEV. CORP.

K. C., adjust each of the I. F. compensating condensers in turn, to give maximum response in the output meter. If the needle on the meter goes off scale, turn back the attenuator on the signal generator. The two pairs of I. F. compensating condensers are located one pair at the top of each of the two I. F. transformer shields. These are the two metal "cans" near the rear corner of the chassis. Each of the I. F. transformers has a dual compensating condenser mounted at its top, and accessible through a hole in the top of the coil shield. In the dual compensators, the Primary circuit is adjusted by turning the screw; the Secondary circuit is adjusted by turning the hex-head nut. The condenser numbers, referring to Figs. 2 and 3 are ⑯, ⑱, ㉑ and ㉓.

Adjustment of the Wave Trap

Replace the grid clip upon the Detector-Oscillator tube (Type 1C6). Connect the output leads from the 024 signal generator directly to the antenna and ground terminals of the receiver. Set the Wave-Band Switch of the receiver to the standard broadcast band (left position) and the Station Selector at the low frequency (600 K. C.) end. Adjust the Wave Trap condenser to give MINIMUM response to a 460 K. C. signal from the signal generator. The Wave Trap ① is located at rear and underneath the chassis, and is shown in Figs. 2 and 4. It is reached from the rear of the chassis, by inserting the fibre wrench through the hole near rear center of sub-base.

Adjustments for Standard Waves

H. F. end: Set signal generator at 1500 K. C. and dial at 150 (lower scale). Now adjust condensers ⑧ (Antenna) and ⑩ (Oscillator H. F.) to get maximum response. These condensers are located on the tuning condenser assembly and visible in Fig. 2.

L. F. (series): Turn dial to 60 and set signal generator at 600. Adjust condenser ⑫ for maximum output. This is reached from the top, through hole in chassis at rear of tuning condenser (see Fig. 2).

Adjustment of Short-Wave Compensators

The crystal controlled signal generator is used for these adjustments. Connect its leads to antenna and ground posts of set. Turn the wave band switch to the right, and the 091 signal generator "on." H. F. or maximum: Turn the dial of the set to about half way between 14 and 15 megacycles (top scale) and you should there pick up the 4th harmonic (14.4) of the 3.6 M. C. signal. Adjust the S. W. (maximum) compensator ⑨ (see Fig. 4) to give maximum response in the output meter. This compensator is reached from underneath the chassis.

S. W. (minimum): Turn dial of set to a little more than 7 megacycles at which point the second harmonic of the signal generator (7.2 M. C.) should be heard. Adjust condenser ⑭ (S. W. series) for maximum response. This condenser is reached from above, through hole in top of chassis (see Fig. 2).

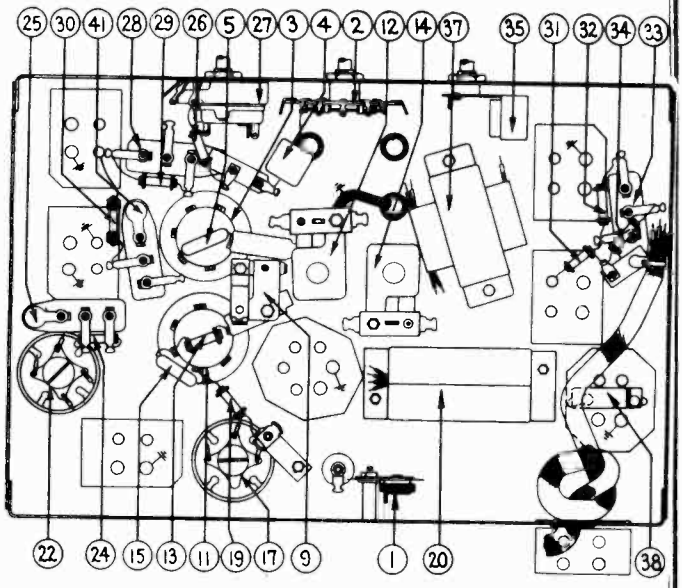


FIG. 4—Bottom View of Chassis

Replacement Parts—Model 39

Nos. on Fig. 3 & 4	Description	Part No.	List Price
①	Wave Trap	38-5994	$0.50
②	Wave Band Switch	42-1092	.90
③	Antenna Transformer	32-1548	1.50
④	Condenser (.00125 mfd. mica)	5886	.35
⑤	Condenser (.0014 mfd. mica)	7007	.35
*⑥	Resistor (50000 ohms) (Green-Brown-Orange)	6098	.20
*⑦	Tuning Condenser Assembly	31-1440	.....
*⑧	Compensating Condenser (Ant.)	Part of ⑦	.....
*⑨	Compensating Condenser (S. W. Maximum)	04000-V	.20
⑨a	Condenser (capacity from twisted wires)	.....	.....
⑩	Compensating Condenser (Osc. H. F. Bdcst)	Part of ⑦	.....
⑪	Oscillator Transformer	32-1549	1.00
⑫	Compensating Condenser (Osc. L. F. Bdcst)	04000-S	.35
⑬	Resistor (50000 ohms) (Green-Brown-Orange)	6098	.20
⑭	Compensating Condenser (Short-wave Minimum)	04000-R	.45
⑮	Condenser (.0025 mfd. mica)	7006	.40
*⑯	Compensating Condenser (1st I. F. pri.)	Part of ⑰	.....
⑰	1st I. F. Transformer	32-1550	1.75
*⑱	Compensating Condenser (1st I. F. sec.)	Part of ⑰	.....
⑲	Resistor (5000 ohms) (Green-Black-Red)	6096	.20
⑳	Condenser (Metal Case, 4 sec.: .5, .25, .25, .25 mfd.)	30-4253	1.20
*㉑	Compensating Condenser (2nd I. F. pri.)	Part of ㉒	.....
㉒	2nd I. F. Transformer	32-1551	1.65
*㉓	Compensating Condenser (2nd I. F. sec.)	Part of ㉒	.....
㉔	Resistor (50,000 ohms) (Green-Brown-Orange)	6098	.20
㉕	Condenser (.0001 mfd. twin bakelite block)	8035-C	.25
㉖	Resistor (2 meg.) (Red-Black-Green)	33-1025	.20
㉗	Volume Control & On-Off Switch	33-5020	1.45

Nos. on Fig. 3 & 4	Description	Part No.		List Price
㉘	Condenser (.01 mfd. bakelite block)	3903-AD		$0.25
㉙	Resistor (1 meg.) (Brown-Black-Green)	33-1096		.20
㉚	Resistor (330000 ohms) (Orange-Orange-Yellow)	6046		.20
㉛	Resistor (70000 ohms) (Violet-Black-Orange)	33-1115		.20
㉜	Resistor (.25 meg.) (Red-Yellow-Yellow)	33-1097		.20
㉝	Condenser (.01 mfd. bakelite block)	3903-AD		.25
㉞	Resistor (5 meg.) (Yellow-White-Yellow)	6097		.20
㉟	Tone Control (2 pt.)	30-4251		.50
*㊱	Condenser (in tone control)	Part of ㉟		.....
㊲	Audio Transformer	7233		1.80
㊳	Condenser (.002 mfd. tubular)	30-4177		.25
*㊴	Output Transformer	32-7286		1.60
*㊵	Cone & Voice Coil Assembly (KR-7 Speaker)	36-3159		.80
㊶	Condenser (.05 mfd. bakelite block)	3615-BC		.35
*㊷	Pilot Lamp (dial)	5316		.23
	Dial Assembly	31-1471		.40
	Tube Shield (fits over base)	8005		.10
	Tube Shield (fits inside base)	28-1107		.10
	Tube Socket (4-prong)	7545		.11
	Tube Socket (6-prong)	7547		.11
	Chassis Mounting Screw	W-567	per C	3.00
	Chassis Mounting Washer (39-B)	5058	per C	.85
	Chassis Mounting Washer (39-F)	W-315A	per C	.50
	Chassis Mounting Washer (rubber)	5189		.04
	Knob	27-4052		.10
	Battery Cable Assembly (with plug)	41-3118		2.25
	Ballast Tube Jumper Wire	28-8061		.014

*Do not show in Fig. 4.

MODEL 97
Schematic, Voltage
Socket, Data

PHILCO RADIO & TELEV. CORP.

Fig. 2. Schematic Diagram of Model 97

NOTE: Condenser marked with an asterisk (*) is not a separate part, but simply a capacity obtained by two wires twisted together.

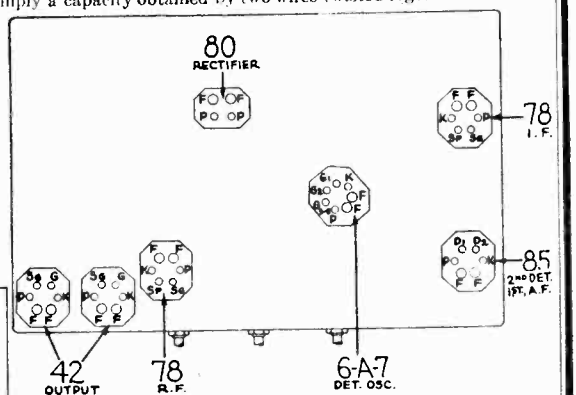


Fig. 1. Tube Sockets as viewed from bottom.

Power Transformer Data

Terminals	A.C. Volts	Current	Circuit	Color
1–2	120	.....	Primary	White
3–5	710	118 M.A.	Secondary	Yellow
6–7	5 0	2 0 A.	Fil. Rect.	Blue
8–9	6 3	3 5 A.	Filaments	Black
4	...	.....	Center Tap of 3-5	Yellow, Green Tracer

Tube Socket Voltages
Measured to Ground

Tube	Point	78 R.F.	6A7 Det. Osc.	78 I.F.	85 2d Det.	42 Output
	P	257	257	265	105	260
SG		97	97	97	...	270
K		2 3	2 6	3	...	...

6A7: G_2 = —14; $G_{3\&5}$ = 179.

Above voltages were obtained by using a PHILCO type 025 Circuit Tester (or 048A All-purpose Tester), using test prods applied to underside of chassis. Volume control at maximum; dial at 55; waveband switch counter-clockwise (band 1). Use Fig. 1 for test points.

NOTE: FIGURES INDICATE RELATIVE POSITIONS OF SWITCH SECTIONS FROM FRONT OF CHASSIS

NOTE: ALL SWITCH SECTIONS SHOWN IN POSITION NO. 3

MODEL 97
Alignment, Trimmers Data

PHILCO RADIO & TELEV. CORP.

Tubes Used: 1 type 78, R.F.; 1 type 6A7, Detector-Oscillator; 1 type 78, I.F.; 1 type 85, 2d Detector and 1st A.F.; 2 type 42 Output; 1 type 80 Rectifier.

Frequency Range: 540-18000 Kilocycles continuous. Divided into three bands, selectable by 3-point waveband switch.

Coverage of Each Band: Band 1, 550-1750 K.C.; Band 2, 1750-5750 K.C.; Band 3, 5750-18000 K.C. (5.75 to 18.0 megacycles).

Tuning Drive: Dual planetary, ball bearing, non-slip cord from tuning shaft to dial shaft. 80 to 1 ratio for slow-speed tuning.

Tuning Meter: Shadow Tuning Meter. Pilot lamp for each waveband. Waveband switch automatically connects for use the lamp illuminating the scale in use only.

Tone Control: 3-position, with fixed bass compensation.

Intermediate Frequency: 460 K.C.

Power Consumption: 90 watts.

The adjustment of the compensating condensers in Model 97 requires a signal generator covering the broadcast and police band, and also one capable of producing a signal at certain frequencies in the short wave band. We recommend the Philco model 024 or 048A instrument for the broadcast frequencies, and the Model 091 crystal controlled short wave signal generator for the "short wave" frequencies. The location of all compensating condensers is shown in Fig. 4.

Adjustment of I. F.

1. Remove the antenna connection from the receiver, disconnect the grid clip from the first detector (type 6A7 tube), and connect the "ANT" output terminal of the Model 048A or 024 signal generator to the grid cap of this tube; connect the "GND" terminal of the signal generator to the "GND" terminal of the receiver.

2. Connect the 0 to 20 volt range of the output meter in the Model 048A or 025 tester to the plate prongs of the two output tubes or to the two bottom prongs of the speaker plug.

3. Adjust the signal generator to a frequency of 460 K.C. Place the receiver in operation with the dial turned to the low frequency end of the broadcast band, wave band switch to extreme left (clockwise), and have the volume control adjusted near its maximum setting. Adjust the signal generator attenuator for approximately half-scale reading of the output meter.

4. The I.F. compensating condensers are located at the tops of the I.F. coil shields (smaller square-top cans) and adjusted thru hole in top. The primary is adjusted by the screw, and the secondary by the nut. Adjust condensers (37) and (39) (2d I.F.) for maximum reading in the output meter, and then condensers (32) and (34) (1st I.F.).

Adjustment of Wave-Trap

1. Connect the signal generator leads to the antenna and ground terminals of the receiver. Replace the grid clip on the 6A7 grid cap.

2. Set the wave-band switch of the receiver to the extreme left (broadcast position) (Range No. 1, 540-1750 K.C.), and turn the station selector to 550 K.C.

3. With the signal generator in operation at 460 K.C., adjust the wave-trap (2) condenser until a MINIMUM reading is obtained on the output meter. The Philco fibre wrench, part No. 3164, is used for this adjustment.

Adjustment of High and Low Frequency Compensators

1. Leaving the output meter connected to the receiver connect the Philco Model 091 signal generator to the antenna and ground terminals of the chassis and place the signal generator in operation.

2. Turn the wave-band switch to Range 3 (extreme right) and adjust the station selector to 18.0 megacycles, at which point the fifth harmonic of the 3600 K.C. signal will be heard. By means of the Philco wrench, part No. 3164, adjust the oscillator S.W., R.F.-S.W. and antenna S.W. compensators for maximum reading in the output meter. These are numbered (21), (14) and (6), respectively in figure No. 2.

3. Turn the wave-band switch to Range 2 (police bands, 1.75 to 5.8 M.C.) and adjust the tuning dial to 3.6 M.C. (the fundamental signal of the signal generator). Adjust the oscillator, R.F. and antenna compensators ((22), (15) and (5), respectively) for maximum output.

5. At this point it will again be necessary to make use of the broadcast type signal generator Models 024, 048A or equivalent. Connect the output of this signal generator to the antenna and ground terminals of the chassis. Turn the station selector dial to 1.8 M.C. (Range 2) and adjust the signal generator to the same frequency (1800 K.C.). Adjust compensator (28) (nut) for maximum output.

6. Turn the wave-band switch to Range No. 1 (broadcast band) and set the dial at 1600 K.C. Set the signal generator at this frequency and adjust compensators (24), (18) and (4) for maximum output.

7. Tune the receiver and the signal generator to 600 K.C. and adjust compensator (25) (screw) for maximum output.

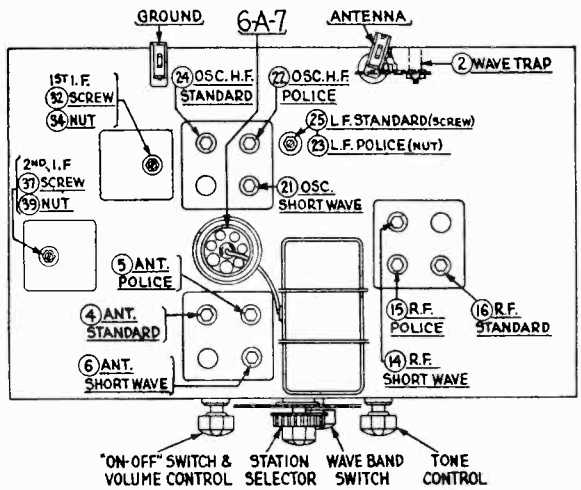


Fig. 4. Locations of Compensating Condensers

MODEL 97
Chassis, Parts

PHILCO RADIO & TELEV. CORP.

Replacement Parts—Model 97

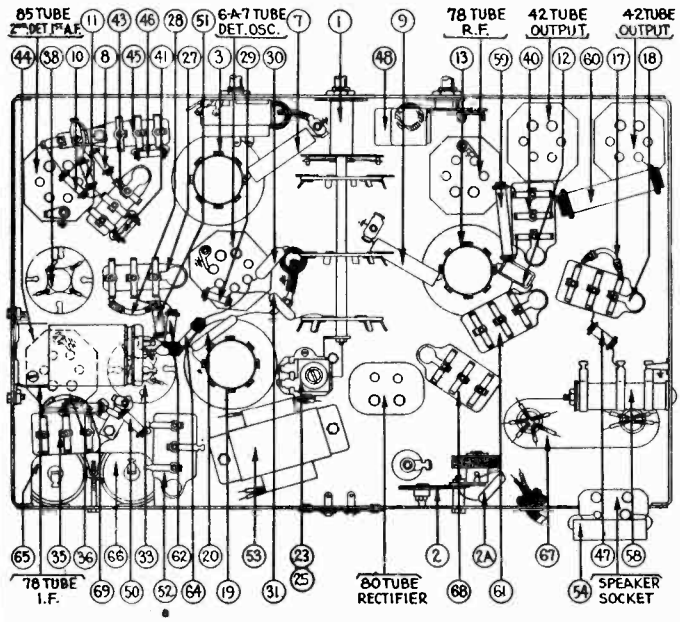


Fig. 3. Bottom View of Chassis

	Description	Part No.	List Price
①	Waveband Switch	42-1104	$2.50
②	Wavetrap	38-6718	1.00
②a	Condenser (.000035 Mfd. Mica)	30-1044	.35
③	Antenna Transformer	32-1635	3.00
④	Compensating Condenser (Antenna, Standard)	Part of ③	....
⑤	Compensating Condenser (Antenna, Police Band)	Part of ③	....
⑥	Compensating Condenser (Antenna, Short Wave)	Part of ③	....
⑦	Condenser (.05 Mfd. Tubular)	30-4020	.35
⑧	Resistor (1 Meg.) (Brown, Black, Green)	33-1096	.20
⑨	Condenser (.05 Mfd. Tubular)	30-4020	.35
⑩	Resistor (2 Meg.) (Red, Black, Green)	33-1172	.20
⑪	Resistor (2 Meg.) (Red, Black, Green)	33-1172	.20
⑫	Condenser (.00011 Mfd. Mica)	30-1031	.35
⑬	R.F. Transformer	32-1636	3.25
⑭	Compensating Condenser (R.F., Short Wave)	Part of ⑬	....
⑮	Compensating Condenser (R.F., Police Band)	Part of ⑬	....
⑯	Compensating Condenser (R.F., Standard)	Part of ⑬	....
⑰	Resistor (300 ohms Flexible) (Orange, Black, Brown)	33-3010	.20
⑱	Condenser (.09 Mfd. Twin Bakelite Block)	4989-DG	.40
⑲	Oscillator Transformer	32-1637	2.50
⑳	Condenser (.0047 Mfd. Mica)	30-1052	.60
㉑	Compensating Condenser (OSC., Short Wave)	Part of ⑲	....
㉒	Compensating Condenser (OSC., H.F. Police)	Part of ⑲	....
㉓	Compensating Condenser (OSC., L.F. Police)	Part of 31-6027	.70
㉔	Compensating Condenser (OSC., H.F. Standard)	Part of ⑲	....
㉕	Compensating Condenser (OSC., L.F. Standard)	Part of 31-6027	.70
㉖	Tuning Condenser Assembly	31-1518	6.75
㉗	Condenser (.05 Mfd. Bakelite Block)	3615-SG	.35
㉘	Resistor (300 ohms Flexible) (Orange, Black, Brown)	33-3010	.20
㉙	Resistor (70000 ohms) (Violet, Black, Orange)	33-1164	.20
㉚	Condenser (.0018 Mfd. Mica)	6018	.40
㉛	Condenser (.00011 Mfd. Mica)	30-1031	$0.35
㉜	Compensating Condenser (1st I.F. Pri.)	Part of ㉝	....
㉝	First I.F. Transformer	32-1631	1.60
㉞	Compensating Condenser (1st I.F. Sec.)	Part of ㉝	....
㉟	Condenser (.05 Mfd. Twin Bakelite Block)	3615-DU	.40
㊱	Resistor (400 ohms Flexible) (Yellow, Black, Brown)	33-3016	.20
㊲	Compensating Condenser (2nd I.F. Pri.)	Part of ㊳	....
㊳	2nd I.F. Transformer	32-1632	1.60
㊴	Compensating Condenser (2nd I.F. Sec.)	Part of ㊳	....
㊵	Condenser (.18 Mfd. Bakelite Block)	4989-DG	.40
㊶	Resistor (20000 ohms) (Red, Black, Orange)	33-1130	.20
㊷	Volume Control (350000 ohms) & On-Off Switch	33-5102	1.45
㊸	Condenser (.00011 Mfd. Twin Bakelite Block)	8035-DG	.25
㊹	Condenser (Electrolytic: 2 Mfd., 2 Mfd., 1 Mfd.)	30-2114	2.25
㊺	Condenser (.01 Mfd. Bakelite Block)	3903-SU	.25
㊻	Resistor (1 Meg.) (Brown, Black, Green)	33-1171	.20
㊼	Resistor (.5 Meg.) (Yellow, White, Yellow)	33-1169	.20
㊽	Tone Control	30-4311	.65
㊾	Condensers in Tone Control	Part of ㊽	....
㊿	Resistor (2900 ohms) (Red, White, Red)	5309	.20
(51)	Resistor (32000 ohms) (Orange, Red, Orange)	3525	.20
(52)	Pilot Lamp	Part of (63)	....
‡(52)a	Condenser (.25 Mfd. Bakelite Block)	6287-P	.40
(53)	Audio Transformer	32-7372	2.50
(54)	Condenser (.001 Mfd. Tubular)	30-4201	.25
(55)	Output Transformer (on Speaker)	2585	1.55
(56)	Speaker Cone & Voice Coil Assembly	K-31 36-3174	.80
		H-21 02625	1.20
(57)	Speaker Field Coil	K-31 36-3463	3.75
		H-21 36-3461	3.75
(58)	B-C Resistor (Wire-Wound 100 ohm, 60 ohms)	33-3208	.20
(59)	Resistor (20000 ohms) (Red, Black, Orange)	33-1130	.20
(60)	Resistor (16000 ohms) (Brown, Blue, Orange)	33-1201	.35
(61)	Condenser (.05 Mfd. Twin Bakelite Block)	3615-DG	.40
(62)	Resistor (15000 ohms) (Brown, Green, Orange)	6208	.20
(63)	Shadow Tuning Meter	45-2028	2.50
(64)	Resistor (10000 ohms) (Brown, Black, Orange)	4412	.20
†(65)	Condenser (Electrolytic—8 Mfd.)	30-2025	1.35
†(66)	Condenser (Electrolytic—12 Mfd.)	30-2117	1.50
(67)	Power Transformer, 115 Volts, 60 Cycles	32-7369	8.00
	115 Volts, 25 Cycles	32-7370	8.25
	230 Volts, 60 Cycles	32-7371	7.75
(68)	Condenser (.015 Mfd. Twin Bakelite Block)	3793-DG	.40
(69)	Resistor (1000 ohms) (Brown, Black, Red)	5837	.20
(70)	Dial Lamp (Standard Band)	34-2031	.12
(71)	Dial Lamp (Police Band)	34-2031	.12
(72)	Dial Lamp (Short-wave Band)	34-2031	.12
(73)	Dial Assembly	31-1513	.75
	Knob (Tone Control, Volume Control)	27-4052	.10
	Knob (Waveband)	27-4051	.10
	Knob (Station Selecte	27-4139	.10
	Knob (Fine Tuning)	27-4140	.10
	Tube Shield Body	28-1107	.10
	Tube Shield Base	28-1110	.04
	Pilot Lamp Assembly	38-6075	.15
	4 Prong Tube Socket	27-6006	.10
	6 Prong Tube Socket	27-6020	.11
	7 Prong Tube Socket	27-6012	.10
	Electric Cord and Plug	L-943A	.60
	Speaker Socket	27-6018	.10
	Chassis Mtg. Screw (97-X)	W-1345-A	2.75C
	Chassis Mtg. Screw (97-B)	W-1346-A	.60C
	Chassis Mtg. Foot (Rubber)	27-4116	.05
	Chassis Mtg. Foot Plate	27-7497	.35C
	Chassis Mtg. Washer	29-2089	.35C
	Bezel	27-4120	.15

‡Omitted after Run 3. Not shown in Fig. 2.
†In Model 97-A (25 cycles) this is Part No. 30-2026.

MODEL 116-B (Code 121)
Chassis, Socket, Voltage PHILCO RADIO & TELEV. CORP.
Trimmers, Data

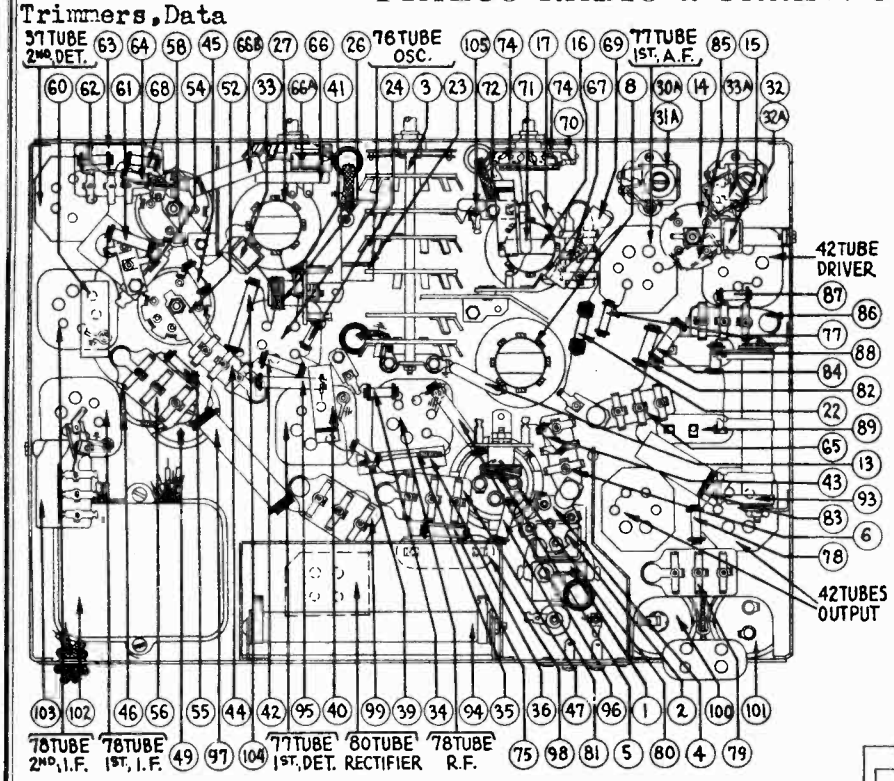


Fig. 4 Bottom View of Chassis

Power Transformer Data

Terminals	A.C. Volts	Current	Circuit	Color
1–2	120	.....	Primary	White
3–5	720	123 M.A.	Secondary	Yellow
6–7	5.0	2.0 A.	Fil. Rect.	Blue
8–9	6.3	5.0 A.	Filaments	Black
4	...	.....	Center Tap of 3–5	Yellow, Green Tracer

Tube Socket Voltages

Measured to Ground—Line Voltage 115

Tube Point	78 R.F.	77 1st Det.	76 Osc.	78 1st I.F.	78 2d I.F.	37 2d Det.	77 1st A.F.	42 Driver	42 Output
P	187	202	75	193	199	0	67	192	279
SG	74	74	...	74	74	..	52	192	279
K	1.8	5.4	5.0	1.8	5.1	..	..	...	...
	80 Rect. Cathode—290V.								

Above voltages were obtained by using a PHILCO type 025 Circuit Tester (or 048A All-purpose Tester), using test prods applied to underside of chassis. Volume control at minimum; dial at 55; waveband switch standard broadcast (band 4). Use Fig. 1 for test points. H-13 Speaker used.

Type Circuit: Superheterodyne, with push-pull pentodes connected as triodes in output; output 10 watts; built in connections for Philco All-wave aerial; aerial selector built into and operated by wave-band switch.

Power Supply: Alternating Current. Voltage and frequency as specified on chassis nameplate.

Tubes Used: Eleven (11) Total: 1 type 78 R.F., 1 type 77 1st detector, 1 type 76 oscillator, 2 type 78 I.F., 1 type 37 2nd detector, 1 type 77 1st audio, 1 type 42 driver, 2 type 42 output, 1 type 80 rectifier.

Wave Bands: Five—(1) Shortwave, daytime; (2) Shortwave, night-time; (3) Police and amateur; (4) Standard Broadcast; (5) Longwave (weather forecasts).

Frequency Ranges: Band (1)—9.7-22.5 Megacycles; Band (2)—4.1-10.0 Megacycles; Band (3)—1.5-4.1 Megacycles; Band (4)—540 to 1500 K.C.; Band (5)—150-390 K.C.

Program Control: 5 positions: (1) Mellow, (2) Brilliant, (3) Speech, (4) Normal, (5) noise reducing. Last two positions recommended for foreign short wave stations.

Tuning Meter: Shadow type tuning meter, mounted directly above scale.

Waveband Indicator: Glowing arrow on tuning scale shifts to proper scale when waveband switch is turned.

Automatic Volume Control: Fully effective on all stations.

Bass Compensation: Automatic: Effective when needed.

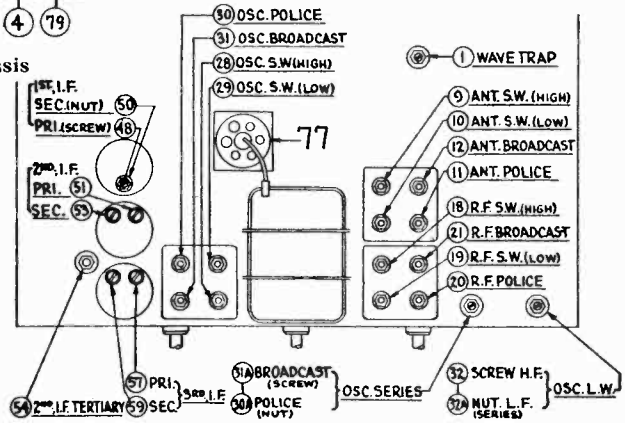


Fig. 2. Locations of Compensating Condensers

Tuning Drive: Dual planetary, ball bearing. 80 to 1 ratio for slow-speed tuning, 10 to 1 for main drive.

Intermediate Frequency: 460 K.C.

Power Consumption: 100 watts.

Speaker: Type H-13.

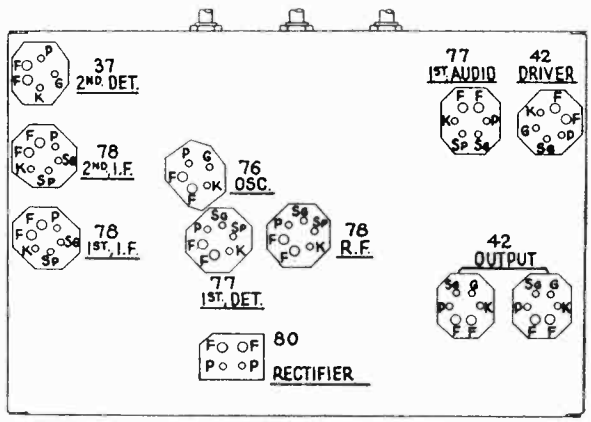
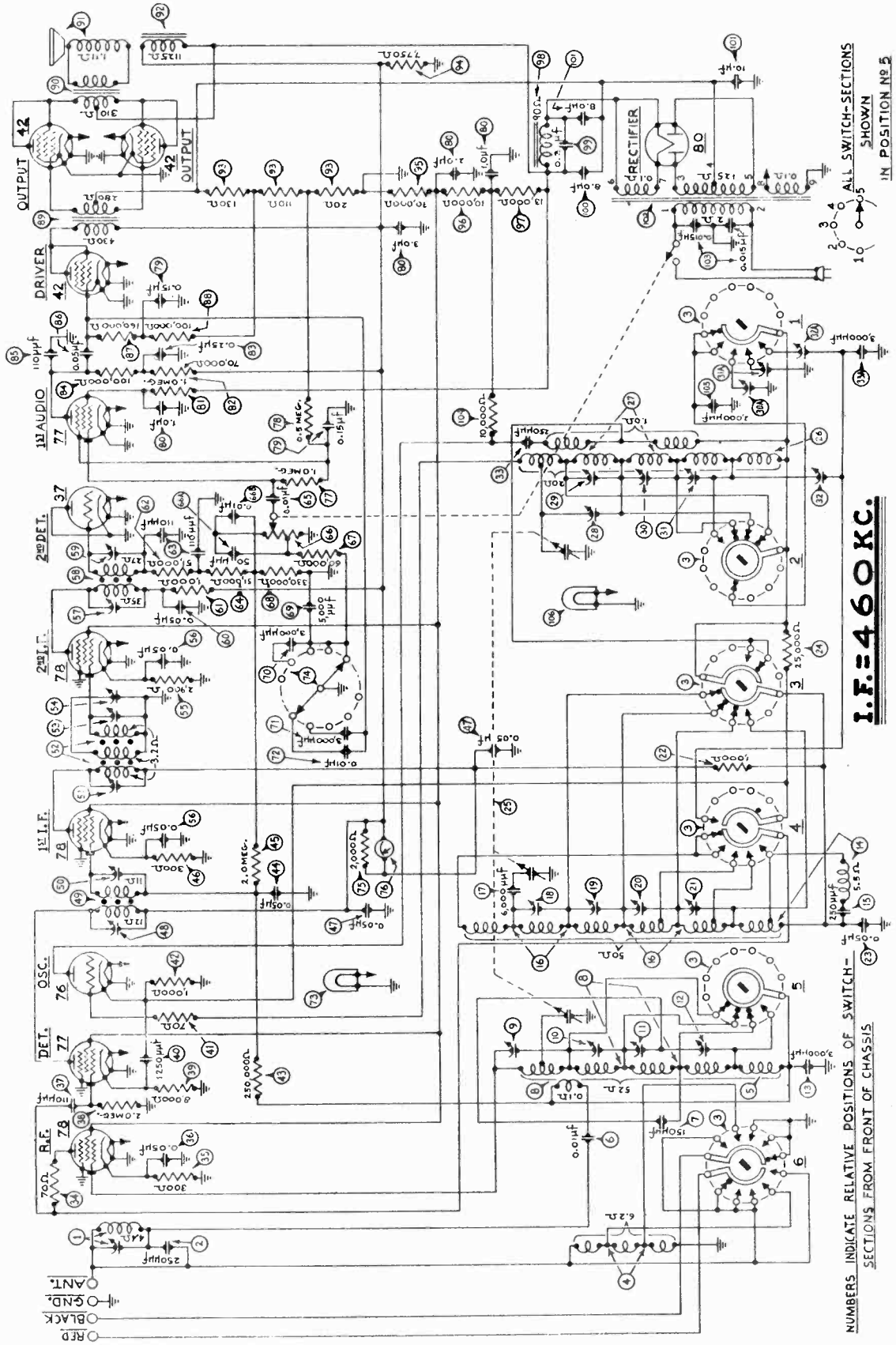


Fig. 1. Tube Sockets as viewed from bottom

MODEL 116-B (Code 121)
Schematic

PHILCO RADIO & TELEV. CORP.



MODEL 116-B (Code 121)
Alignment, Parts

PHILCO RADIO & TELEV. CORP.

Adjustment of compensating condensers in Model 116 requires an accurate signal generator covering long-wave, standard wave, police, and short-wave frequencies. The PHILCO Model 088 All-Wave Signal Generator, having a continuous range of from 100 to 20000 K.C. will be ideal for this purpose.

An output meter is also needed. PHILCO Model 025 Circuit Tester includes a high-grade output meter.

Philco No. 3164 fibre wrench and No. 27-7059 fibre handled screwdriver complete the equipment needed for making these adjustments. The locations of the various compensating condensers is shown in Fig. 2. Connect the output meter to the plate contacts of the output tubes (using the adapters provided with the "025") and set it at the 0-30 volt range.

I.F.—Set the Signal Generator at 460 K.C., and attach its antenna lead to the grid cap of the 77 1st detector tube (having removed the grid clip from the tube). Connect the ground terminal of the Signal Generator to the ground terminal of the set. Turn on the set, turn the waveband switch to standard broadcast (second position from left) and set dial at 55. Turn condenser ⑭ (2nd I.F. tertiary) all the way down before adjusting the other I.F. Compensators. Now with the fibre screwdriver, adjust condensers ⑯ and ⑰ (3rd I.F.), ⑬ and ⑪ (2nd I.F.), and then ⑩ and ⑧ (1st I.F.) until maximum reading is obtained in the output meter. Turn down the "attenuator" on the signal generator if the output meter needle goes off the scale. Now adjust condenser ⑭ (2nd I.F. tertiary for maximum reading).

WAVE TRAP—Connect the Signal Generator antenna and ground leads to the antenna and ground posts of the set. Replace the grid clip on the 77 tube cap. With the signal generator operating at 460 K.C. and the set controls adjusted as for I.F., adjust wavetrap ① until the minimum reading is obtained in the output meter.

	Description	Part No.	List Price
①	Wave Trap	38-6889	$1.00
②	Condenser (.00025 Mfd. Mica)	30-1032	.35
③	Waveband Switch	42-1118	2.60
④	Transmission Line Transformer	32-1608	1.00
⑤	Antenna Transformer (Long Wave)	32-1729	.55
⑥	Condenser (.01 Mfd. Bakelite Block)	3903-SU	.25
⑦	Condenser (.000015 Mfd. Mica)	‡30-1030	.35
⑧	Antenna Transformer (Standard, Police, Short-wave)	32-1735	3.60
⑨	Compensating Condenser (Ant. S.W. High Band)	Part of ⑧	....
⑩	Compensating Condenser (Ant. S.W. Low Band)	Part of ⑧	....
⑪	Compensating Condenser (Ant. Police)	Part of ⑧	....
⑫	Compensating Condenser (Ant. Standard)	Part of ⑧	....
⑬	Condenser (.003 Mfd. Mica)	7301	.45
⑭	R. F. Transformer (Long Wave)	32-1730	1.25
⑮	Condenser (.00025 Mfd. Mica)	30-1038	.35
⑯	R. F. Transformer (Standard, Police, S.W.)	32-1468	2.30
⑰	Condenser (.002 Mfd. Mica)	30-1042	.40
⑱	Compensating Condenser (R.F. Shortwave (High Band)	Part of ⑯	....
⑲	Compensating Condenser (R.F. Shortwave (Low Band)	Part of ⑯	....
⑳	Compensating Condenser (R.F. Police)	Part of ⑯	....
㉑	Compensating Condenser (R.F. Standard)	Part of ⑯	....
㉒	Resistor (1000 ohms) (Brown-Black-Red)	5837	.20
㉓	Condenser (.05 Mfd. Tubular)	30-4123	.35
㉔	Resistor (25000 ohms) (Red-Green-Orange)	33-1013	.20
㉕	Tuning Condenser Assembly	31-1606	5.50
㉖	Oscillator Transformer (Long Wave)	32-1731	55
㉗	Oscillator Transformer (Standard, Police, Shortwave)	32-1736	3.50
㉘	Compensating Condenser (Osc. S.W., High Band)	Part of ㉗	....
㉙	Compensating Condenser (Osc. S.W., Low Band)	Part of ㉗	....
㉚	Compensating Condenser (Osc. Police)	Part of ㉗	....
㉚a	Compensating Condenser (Osc. Police Series)	Part of 31-6027	.70
㉛	Compensating Condenser (Osc. Standard)	Part of ㉗	....
㉛a	Compensating Condenser (Osc. Standard Series)	Part of 31-6027	.70
㉜	Compensating Condenser (Osc. Longwave)	31-6050	.40
㉜a	Compensating Condenser (Osc. Longwave Series)		
㉝	Condenser (.00025 Mfd. Mica)	5858	.35
㉝a	Condenser (.003 Mfd. Mica)	30-1028	.60
㉞	Resistor (70 ohms) (Violet-Black-Black)	33-1129	.20
㉟	Resistor (300 ohms Flexible) (Orange-Black-Brown)	33-3010	.20
㊱	Condenser (.05 Mfd. Tubular)	30-4020	.35
㊲	Condenser (.00011 Mfd. Tubular)	*30-4340	.25
㊳	Resistor (2 Megs.) (Red-Black-Green)	*33-1025	.20
㊴	Resistor (8000 ohms) (Gray-Black-Red)	33-1114	.20
㊵	Condenser (.00125 Mfd. Tubular)	30-4336	.25
㊶	Resistor (70 ohms) (Violet-Black-Black)	33-1129	.20
㊷	Resistor (1000 ohms) (Brown-Black-Red)	5837	.20
㊸	Resistor (240000 ohms (Red-Yellow-Yellow)	33-1097	.20
㊹	Condenser (.05 Mfd. Bakelite Block)	3615-SG	.35
㊺	Resistor (2 Megs.) (Red-Black-Green)	33-1025	$0.20
㊻	Resistor (300 ohms Flexible) (Orange-Black-Black)	33-3010	.20
㊼	Condenser (.05 Mfd. Twin Bakelite Block)	3615-DG	.40
㊽	Compensating Condenser (1st I.F. Primary)	Part of ㊾	....
㊽	First I.F. Transformer	32-1642	2.00
㊾	Compensating Condenser (1st I.F. Secondary)	Part of ㊾	....
㊿	Compensating Condenser (2nd I.F. Primary)	Part of 31-6028	.85
(51)	Second I.F. Transformer	32-1734	1.85
(52)	Compensating Condenser (2nd I.F. Secondary)	Part of 31-6028	.85
(53)	Compensating Condenser (2nd I.F. Tertiary)	04000R	.45
(54)	Resistor (2900 ohms) (Red-White-Red)	5309	.20
(55)	Condenser (.05 Mfd. Twin Bakelite Block)	3615-DG	.40

SHORTWAVE (DAYTIME BAND)—Turn wave band switch to the shortwave (daytime) position (extreme right). Set signal generator at 18 megacycles and dial of set at 18.0 (top scale). Now adjust the oscillator, Antenna, and R.F shortwave compensators in turn, for maximum reading. These are ㉘, ⑨ and ⑱ respectively.

SHORTWAVE (NIGHT-TIME BAND)—Turn the waveband switch to position 4 (counting from the left). Set the signal generator and receiver at 9.5 megacycles and adjust the oscillator, antenna and R.F. compensators respectively, in this band for maximum reading. These are ㉙, ⑩ and ⑲.

POLICE AND AMATEUR BAND—Turn the waveband switch to position 3. Set the dial and signal generator at 4.0 megacycles and adjust condensers ㉚, ⑪ and ⑳ respectively for maximum reading.

Set the signal generator at 1600 K.C. and turn the dial to 1.6. Adjust condenser ㉚a (nut), oscillator police series, to maximum reading.

STANDARD BROADCAST BAND—Turn the waveband switch to position 2 (from left). Set the dial and signal generator at 1500 K.C. and adjust condensers ㉑, ⑫ and ㉑ for maximum reading.

Set the dial and signal generator at 600 K.C. and adjust condenser ㉑a (screw), broadcast series, for maximum reading.

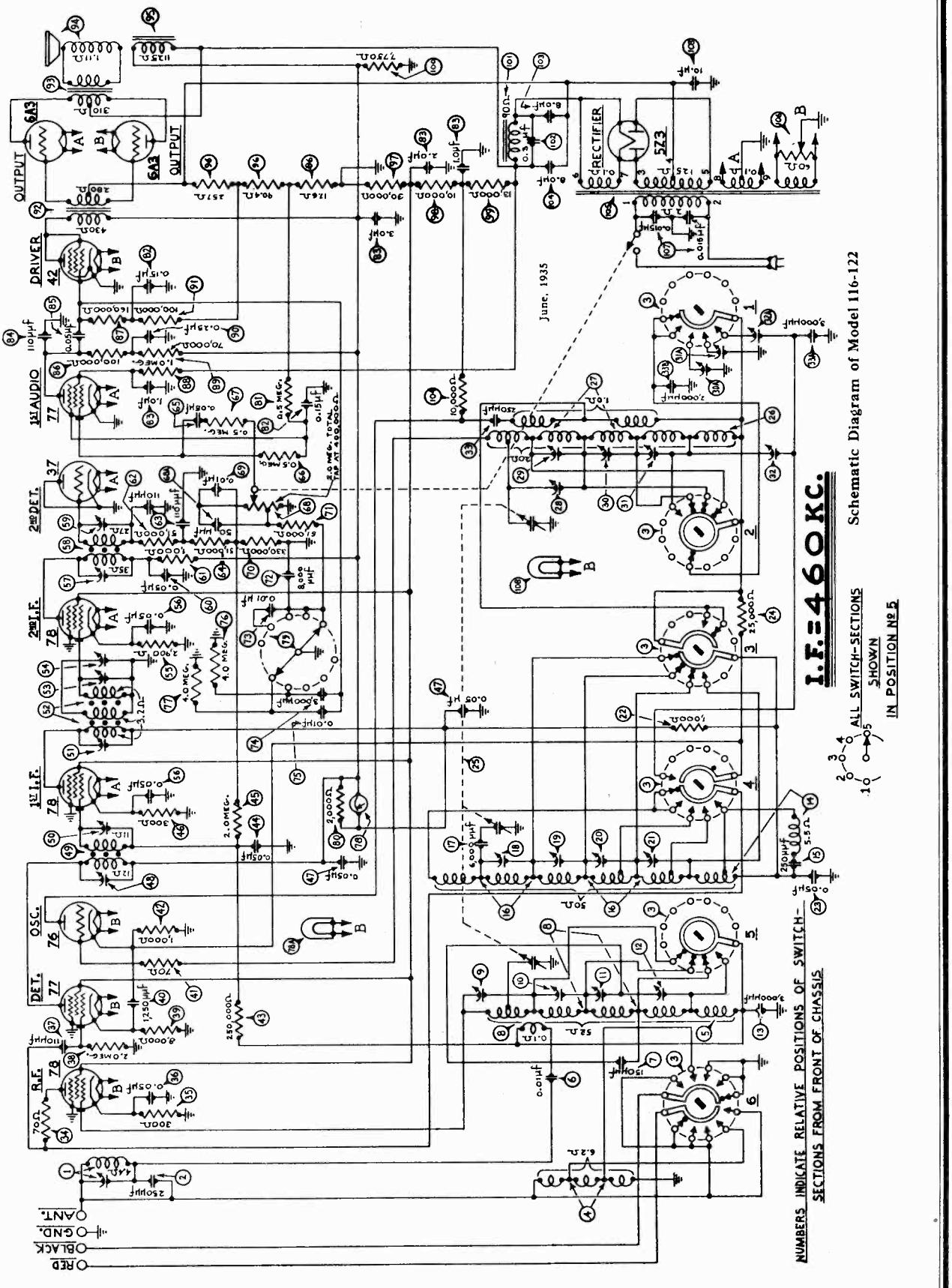
LONGWAVE BAND—Turn waveband switch to position 1 (left). Set the dial and signal generator at 340 K.C. and adjust condenser ㉜ (screw) to maximum. This is the upper end of the longwave (low frequency) band. Finally, set the dial and signal generator at 175 K.C. and adjust condenser ㉜a (nut) for maximum reading. This is the lower end of the longwave band.

(57)	Compensating Condenser (3rd I.F. Primary)	Part of 31-6003	.45
(58)	3rd I.F. Transformer	32-1188	.65
(59)	Compensating Condenser (3rd I.F. Secondary)	Part of 31-6003	.45
(60)	Condenser (.05 Mfd. Tubular)	30-4123	.35
(61)	Resistor (1000 ohms) (Brown-Black-Red)	5837	.20
(62)	Resistor (51000 ohms) (Green-Brown-Orange)	33-1163	.20
(63)	Condenser (.00011 Mfd. Twin Bakelite Block)	8035-DG	.25
(64)	Resistor (51000 ohms) (Green-Brown-Orange)	33-1163	.20
(65)	Condenser (.01 Mfd. Bakelite Block)	3903-SU	.25
(66)	Volume Control and On-Off Switch (See Note Below)	33-5022	1.45
(66a	Condenser (.00005 Mfd. Mica)	30-1029	.35
(66b	Condenser (.05 Mfd. Tubular)	30-4020	.35
(67)	Resistor (60000 ohms) (Blue-Black-Orange)	33-1181	.20
(68)	Resistor (330000 ohms) (Orange-Orange-Yellow)	33-1200	.20
(69)	Condenser (.004 Mfd. Tubular)	30-4185	.40
(70)	Condenser (.004 Mfd. Tubular)	30-4185	.40
(71)	Condenser (.003 Mfd. Mica)	30-1028	.60
(72)	Condenser (.01 Mfd. Tubular)	30-4169	.30
(73)	Pilot Lamp (Shadow Tuning Meter)	Part of (74)	....
(74)	Tone Control Switch	42-1119	.55
(75)	Resistor (2000 ohms) (Red-Black-Red)	6984	.20
(76)	Shadow Tuning Meter	45-2083	2.50
(77)	Resistor (1 Meg.) (Brown-Black-Green)	33-1096	.20
(78)	Resistor (500000 ohms) (Yellow-White-Yellow)	6097	.20
(79)	Condenser (.15 Mfd. Twin Bakelite Block)	6287-DG	.40
(80)	Condenser (Electrolytic—1 Mfd., 3 Mfd., 2 Mfd., 1 Mfd.)	30-2121	2.50
(81)	Resistor (1 Meg.) (Brown-Black-Green)	4409	.20
(82)	Resistor (70000 ohms) (Violet-Black-Orange)	5385	.20
(83)	Condenser (.25 Mfd. Tubular)	30-4134	.45
(84)	Resistor (100000 ohms) (White-White-Yellow)	4411	.20
(85)	Condenser (.00011 Mfd. Mica)	30-1031	.35 *
(86)	Condenser (.05 Mfd. Bakelite Block)	3615-SU	.35
(87)	Resistor (160000 ohms) (Brown-Blue-Orange)	33-1191	.20
(88)	Resistor (100000 ohms) (White-White-Yellow)	33-1165	.20
(89)	Audio Transformer	32-7057	2.75
(90)	Output Transformer	32-7078	1.40
(91)	Cone and Voice Coil Assembly (H-13)	02625	1.20
(92)	Field Coil & Pot Assembly (H-13)	36-3104	2.70
(93)	B.C. Resistor (Wirewound) (20 ohms, 110 ohms, 130 ohms)	33-3021	.20
(94)	Resistor (Wirewound) (7750 ohms)	33-3020	.35
(95)	Resistor (30000 ohms) (Orange-Black-Orange)	7836	.20
(96)	Resistor (10000 ohms) (Brown-Black-Orange)	3524	.20
(97)	Resistor (13000 ohms) (Brown-Orange-Orange)	6450	.40
(98)	Filter Choke	32-7056	2.20
(99)	Condenser (.3 Mfd. Bakelite Block)	**6287-DU	.40
(100)	Condenser (Electrolytic, 8 Mfd.)	‡‡30-2025	1.35
(101)	Condenser (Electrolytic, 8 Mfd., 10 Mfd.)	30-2045	1.80
(102)	Power Transformer {115 V. 60 Cycles	32-7291	7.00
	Power Transformer {115 V. 25 Cycles	32-7292	9.25
	Power Transformer {230 V. 50 Cycles	32-7293	6.75
(103)	Condenser (.015 Mfd. Twin Bakelite Block)	3793-DG	.40
(104)	Resistor (10000 ohms) (Brown-Black-Orange)	3524	.20
(105)	Condenser (.002 Mfd. Mica)	30-1042	.40
(106)	Pilot Lamp (Dial)	34-2039	.15
(107)	Condenser (.006 Mfd. Tubular) (Not shown in Fig. 4)	30-4125	.25
(108)	Condenser (.006 Mfd. Tubular) (Not shown in Fig. 4)	30-4125	.25

*Mounted on top of chassis.
‡Mounted inside ⑧.
**In 25-cycle model, this is part No. 04357.
‡‡In 25-cycle model, this is part No. 30-2026
Note: Volume Control is 2 meg., tapped at 400,000 ohm

MODEL 116-X (Code 122)
Schematic

PHILCO RADIO & TELEV. CORP.



MODEL 116-X (Code 122)
Voltage, Chassis, Socket PHILCO RADIO & TELEV. CORP.
Parts, Data

Model 116X (Code 122)

Type Circuit: Superheterodyne. Push-pull, 6A3 tubes, in output, 15 watts. Built in connections for Philco All-wave Aerial. Aerial Selector operated by waveband switch.

Power Supply: Alternating Current. Voltage and frequency as specified on chassis nameplate.

Tubes Used: Eleven Total: 1 type 78 R.F., 1 type 77 1st detector, 1 type 76 Oscillator, 2 type 78 I.F., 1 type 37 2nd Detector, 1 type 77 1st Audio, 1 type 42 Driver, 2 type 6A3 Output, [redacted] 1 type 5-Z-3.

Wave Bands: Five—(1) Shortwave, daytime; (2) Shortwave, night-time; (3) Police and amateur; (4) Standard broadcast; (5) Longwave (weather forecasts).

Frequency Ranges: Band (1)—9.7-22.5 Megacycles; Band (2)—4.1-10.0 Megacycles; Band (3)—1.5-4.1 Megacycles; Band (4)—540 to 1500 K.C.; Band (5)—150-390 K.C.

Program Control: 5 positions: (1) Mellow, (2) Brilliant, (3) Speech, (4) Normal, (5) Noise-reducing. Last two positions recommended for foreign short wave stations.

Tuning Meter: Shadow type tuning meter, mounted directly above scale.

Waveband Indicator: Glowing arrow on tuning scale shifts to proper scale when waveband switch is turned.

Automatic Volume Control: Fully effective on all stations.

Potentiometer: To compensate for differences in characteristics of 6A3 tubes. Adjust for minimum low-pitched hum when set is in operation, volume at minimum.

Acoustic Clarifiers: Three: mounted on inclined sounding board with speaker.

Bass Compensation: Automatic, effective when needed.

Speaker: Type U-9 (High-fidelity).

Tuning Drive: Dual Planetary, ball-bearing. 80 to 1 ratio for slow-speed tuning, 10 to 1 for main drive.

Intermediate Frequency: 460 K.C.

Power Consumption: 135 watts.

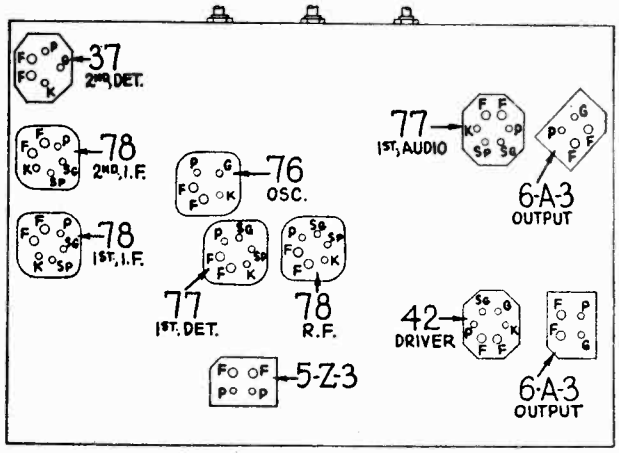


Fig. 1. Tube Sockets as viewed from bottom

Tube Socket Voltages

(Line Voltage 115) All Voltages Measured to Ground

Tube Point	78 R.F.	77 1st Det.	76 Osc.	78 1st I.F.	78 2d I.F.	37 2d Det.	77 1st A.F.	42 Driver	6A3 Output	5Z3
P	207	215	98	208	212	0	95	220	320	...
SG	89	89	...	89	89	..	72	220	320	...
K	2.2	5.2	5.2	2.1	6.4	0	..	....	...	340

Above voltages were obtained by using a PHILCO type 025 Circuit Tester (or 048A All-purpose Tester), using test prods applied to underside of chassis. Volume control at minimum; dial at 55; waveband switch at standard broadcast. Use Fig. 1 for test points. U-9 Speaker used.

Power Transformer Data

Terminals	A.C. Volts	Current	Circuit	Color of Leads
1–2	120	.....	Primary	White
3–5	830	170 M. A.	Secondary	Yellow
6–7	5.0	3.0 A.	Rectifier Filament	Blue
8–9	6.3	2.7 A.	Filaments	Black
4	...	.....	Center Tap of 3–5	Yellow, Green Tracer

Compensating Condensers

Adjustment same as Model 116 Code 121
(Refer to Bulletin No. 222)

Replacement Parts Model 116 (122)

Note: All parts on schematic and base view numbered from ① to ⑭ inclusive are the same as used on model 116B (121). Refer to Bulletin No. 222. Parts subsequent to 64 are listed herewith.

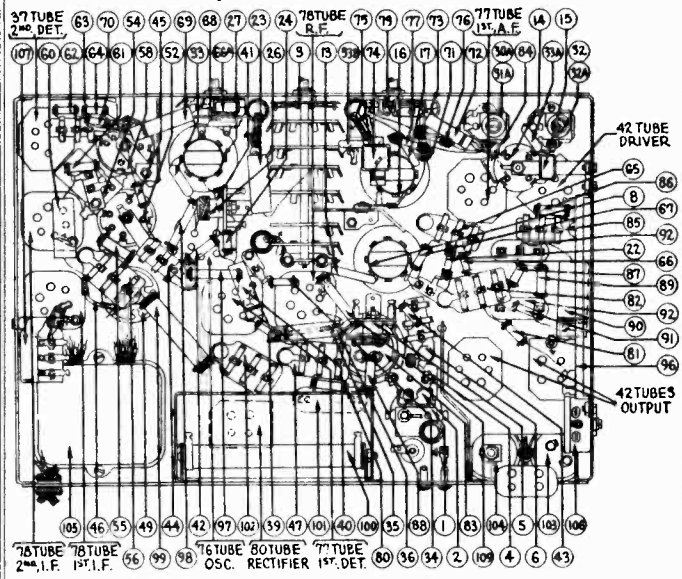


Fig. 2. Base View

	Description	Part No.	List Price
⑭	Condenser (.05 Mfd. Bakelite Block)	3615-SU	$0.35
⑭	Resistor (.5 Meg.) (Yellow-White-Yellow)	6097	.20
⑰	Resistor (.5 Meg.) (Yellow-White-Yellow)	6097	.20

	Description	Part No.	List Price
⑭	Volume Control and On-Off Switch	33-5110	$1.45
⑭a	Condenser (.00005 Mfd. Mica)	30-1029	.35
⑭	Condenser (.01 Mfd. Tubular)	30-4169	.30
⑮	Resistor (330000 ohms) (Orange-Orange-Yellow)	33-1200	.20
⑮	Resistor (51000 ohms) (Green-Brown-Orange)	6098	.20
⑯	Condenser (.008 Mfd. Tubular)	30-4112	.25
⑯	Condenser (.01 Mfd. Tubular)	30-4169	.30
⑯	Condenser (.003 Mfd. Mica)	30-1028	.60
⑰	Condenser (.01 Mfd. Tubular)	30-4169	.30
⑰	Resistor (4 Meg.) (Yellow-Black-Green)	6010	.20
⑰	Resistor (4 Meg.) (Yellow-Black-Green)	6010	.20
⑰	Shadow Tuning Meter	45-2083	2.50
⑰a	Pilot Lamp for Shadow Tuning Meter	Part of ⑰	
⑲	Tone Control Switch	42-1119	.50
⑲	Resistor (2000 ohms) (Red-White-Red)	6984	.20
⑳	Resistor (.5 Meg.) (Yellow-White-Yellow)	6097	.20
㉑	Condenser (.15 Mfd. Twin Bakelite Block)	6287-DU	.40
㉒	Condenser (Electrolytic) (1 Mfd., 3 Mfd., 2 Mfd., 1 Mfd.)	30-2121	2.50
㉓	Condenser (.00011 Mfd. Mica)	30-1031	.35
㉔	Condenser (.05 Mfd. Bakelite Block)	3615-SU	.35
㉕	Resistor (100000 ohms) (White-White-Yellow)	4411	.20
㉖	Resistor (160000 ohms) (Brown-Blue-Yellow)	33-1191	.20
㉗	Resistor (1 Meg.) (Brown-Black-Green)	4409	.20
㉘	Resistor (70000 ohms) (Violet-Black-Orange)	5385	.20
㉙	Condenser (.25 Mfd. Tubular)	30-4134	.45
㉚	Resistor (100000 ohms) (White-White-Orange)	6099	.20
㉛	Audio Transformer	32-7447	3.00
㉜	Output Transformer (On Speaker)	32-7446	1.75
㉝	Cone & Voice Coil Assembly (U-9)	36-3381	1.75
㉞	Field Coil & Pot Assembly (U-9)	36-3088	8.00
㉟	Resistor (Wirewound, Flat Type—17.6, 90.4, 257 ohms)	33-3212	.65
㊱	Resistor (30000 ohms) (Orange-Black-Orange)	7836	.20
㊲	Resistor (10000 ohms) (Brown-Black-Orange)	3524	.20
㊳	Resistor (13000 ohms) (Brown-Orange-Orange)	6450	.40
㊴	Resistor (7750 ohms, Wirewound Porcelain Tube)	33-3020	.35
㊵	Filter Choke	32-7056	2.20
㊶	Condenser (.3 Mfd. Bakelite Block)	6287-DU	.40
㊷	Condenser (Electrolytic) (8 Mfd., 10 Mfd.)	30-2123	1.80
㊸	Condenser (Electrolytic) (8 Mfd.)	30-2011	1.40
㊹	Power Transformer: 115 Volts, 60 Cycles	32-7431	7.50
	Power Transformer: 115 Volts, 25 Cycles	32-7432	12.00
	Power Transformer: 230 Volts, 50 Cycles	32-7433	8.75
㊺	Potentiometer	33-5111	.70
㊻	Condenser (.015 Mfd. Twin Bakelite Block)	3793-DG	.40
㊼	Pilot Lamp (Dial Scales)	34-2064	.09
	4-Prong Socket (6A3 Tubes)	27-6044	.10

PHILCO RADIO & TELEV. CORP.

MODEL 201 (Code 121) Schematic, Parts

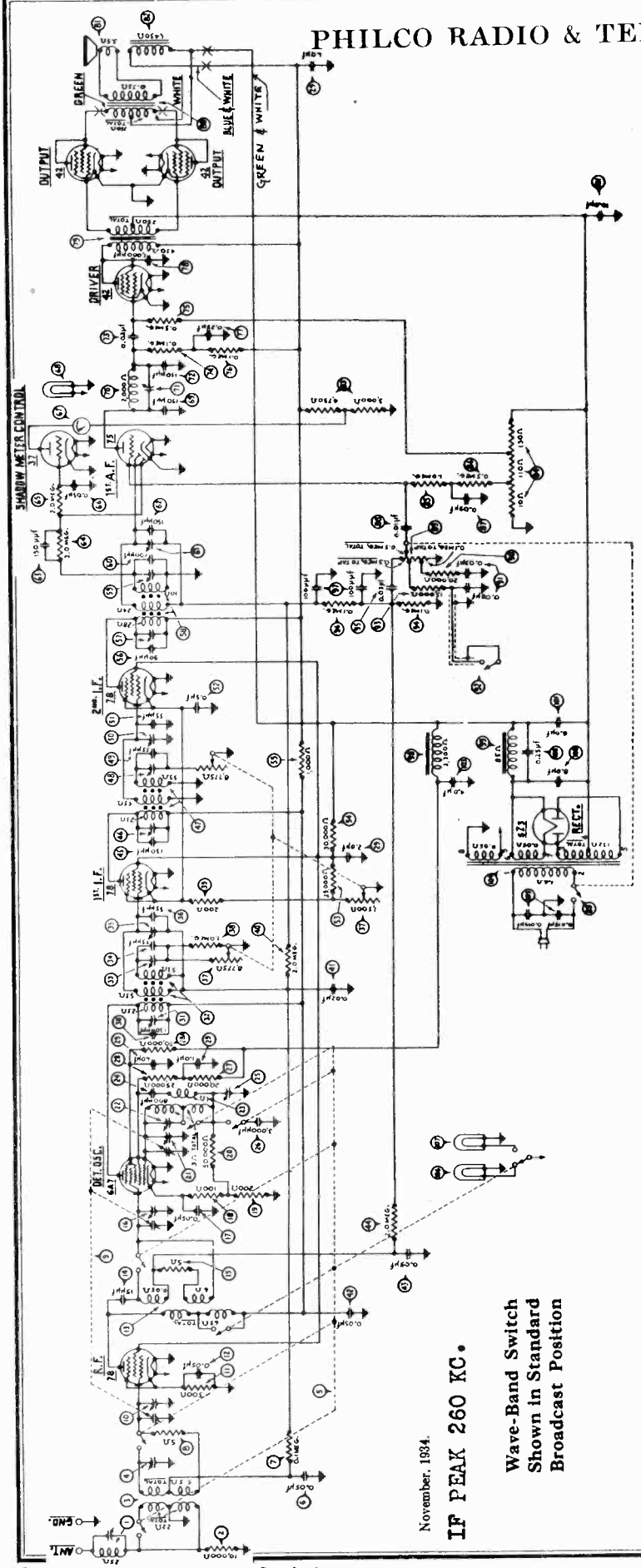


Fig. 2—Model 201 (Code 121) Wiring Diagram

(1)	Wave Trap	38-6248
(2)	Resistor (10000 ohms) (Brown-Black-Orange)	33-1000
(3)	Antenna Transformer	32-1481
(4)	Compensating Condenser (ANT. S. W.)	04000D
(5)	Waveband Switch	42-1093
(6)	Condenser (.05 Mfd. Tubular)	30-4020
(7)	Resistor (.1 Meg.) (White-White-Yellow)	6099
(8)	Resistor (5 ohms Flexible Wire-wound)	33-3186
(9)	Tuning Condenser Assembly	31-1379
(10)	Compensating Condenser (ANT.)	Part of (9)
(11)	Resistor (500 ohms Flexible Wire-wound)	8977
(12)	Condenser (.05 Mfd. Tubular)	30-4020
(13)	Detector Transformer	32-1482
(14)	Condenser (.000015 Mica)	30-1030
(15)	Resistor (5 Ohms Flexible Wire-wound)	33-3186
(16)	Compensating Condenser (DET.)	Part of (9)
(17)	Condenser (.05 Mfd. Tubular)	30-4020
(18)	Resistor (100 ohms Flexible Wire-wound)	33-3187
(19)	Resistor (200 ohms Flexible Wire-wound)	7217
(20)	Resistor (50000 ohms) (Green-Black-Orange)	6098
(21)	Compensating Condenser (OSC. H. F. Bdcst.)	Part of (9)
(22)	Compensating Condenser (OSC. S. W.)	31-6016
(23)	Oscillator Transformer	32-1504
(24)	Condenser (.0008 Mfd. Mica)	5878
(25)	Compensating Condenser (OSC. L. F.)	04000R
(26)	Condenser (.003 Mfd. Mica)	30-1028
(27)	Resistor (20000 ohms) (Red-Black-Orange)	6649
(28)	Resistor (25000 ohms) (Red-Green-Orange)	4516
(29)	Resistor (70000 ohms) (Violet-Black-Orange)	3542
(30)	Condenser (Electrolytic—1, 1, 1 and 2 Mfd.)	30-2080
(31)	Condenser (.00013 Mfd. Mica)	30-1036
(32)	Compensating Condenser (1st I. F. Pri.)	Part of (58)
(33)	1st I. F. Transformer	32-1483
(34)	Compensating Condenser (1st I. F. Tertiary)	04000A
(35)	Condenser (.000055 Mfd. Mica)	30-1045
(36)	Compensating Condenser (1st I. F. Sec.)	Part of (33)
(37)	Condenser (.000055 Mfd. Mica)	30-1045
(38)	Fidelity-Selectivity Control (Wire-wound—8775, 8775 1500 ohms)	33-5083
(39)	Resistor (1 Meg.) (Brown-Black-Green)	33-1096
(40)	Resistor (200 ohms Flexible Wire-wound)	7217
(41)	Resistor (2 Megs.) (Red-Black-Green)	33-1025
(42)	Condenser (.02 Mfd. Tubular)	30-4113
(43)	Condenser (.05 Mfd. Tubular)	30-4020
(44)	Condenser (.05 Mfd. Tubular)	30-4020
(45)	Resistor (2 Megs.) (Red-Black-Green)	33-1025
(46)	Condenser (.00013 Mfd. Mica)	30-1036
(47)	Compensating Condenser (2nd I. F. Pri.)	Part of (48)
(48)	2nd I. F. Transformer	32-1483
(49)	Compensating Condenser (2nd I. F. Tertiary)	04000A
(50)	Condenser (.000055 Mfd. Mica)	30-1045
(51)	Compensating Condenser (2nd I. F. Sec.)	Part of (48)
(52)	Condenser (.000055 Mfd. Mica)	30-1045
(53)	Condenser (.5 & .25 Mfd. Metal Case) (Includes (57))	30-4229
(54)	Resistor (25000 ohms) (Red-Green-Orange)	4516
(55)	Resistor (30000 ohms) (3 watt) (Orange-Black-Orange)	33-1018
(56)	Resistor (1000 ohms) (Brown-Black-Red)	5837
(57)	Condenser (.00009 Mfd. Mica)	30-1046
(58)	Compensating Condenser (3rd I.F. pri.)	Part of (58)
(59)	3rd I. F. Transformer	32-1484
(60)	Compensating Condenser (3rd I. F. Tertiary)	04000X
(61)	Condenser (.0002 Mfd. Mica)	30-1047
(62)	Compensating Condenser (3rd I. F. Sec.)	Part of (59)
(63)	Condenser (.00015 Mfd. Mica)	30-1041
(64)	Condenser (.00015 Mfd. Mica)	30-1033
(65)	Resistor (2 Meg.) (Red-Black-Green)	33-1025
(66)	Resistor (2 Meg.) (Red-Black-Green)	33-1025
(67)	Condenser (.03 Mfd. Tubular)	30-4025
(68)	Shadowmeter	45-2028
(69)	Pilot Lamp (Shadowmeter)	Part of (67)
(69)	Condenser (.00015 Mfd. Mica)	30-1046
(70)	Filter Trap Coil (10 K.C. Trap)	32-7261
(71)	Compensating Condenser (10 K.C. Trap)	04000R
(72)	Condenser (.00015 Mfd. Mica)	30-1041
(73)	Condenser (.02 Mfd. Tubular)	30-4113
(74)	Resistor (.1 Meg.) (White-White-Yellow)	6099
(75)	Resistor (.5 Meg.) (Yellow-White-Yellow)	6097
(76)	Resistor (.1 Meg.) (White-White-Yellow)	6099
(77)	Condenser (.25 Mfd. Metal Case)	Part of (53)
(78)	Condenser (.001 Mfd. Tubular)	30-4201
(79)	Audio Transformer	32-7057
(80)	Output Transformer (On Speaker)	32-7247
(81)	Voice Coil & Cone Assembly (U-7)	36-3381
(82)	Field Coil & Pot Assembly (U-7)	36-3088
(83)	B. C. Wire-wound Resistor (3030, 4750 ohms)	33-3189
(84)	Resistor (Wire-wound) (10, 110, 130 ohms)	33-3137
(85)	Resistor (1 Meg) (Brown-Black-Green)	33-1096
(86)	Resistor (.5 Meg.) (Yellow-White-Yellow)	6097
(87)	Condenser (.09 Mfd. Bakelite Block)	4989D
(88)	Condenser (.01 Mfd. Bakelite Block)	3903G
(89)	Volume Control & On-Off Switch	33-5071
(90)	Resistor (20000 ohms) (Red-Black-Orange)	33-1130
(91)	Condenser (Bass Compensator)	8323B
(92)	Bass Compensation Switch	3253
(93)	Resistor (15000 ohms) (Brown-Green-Orange)	6208
(94)	Resistor (.1 Meg.) (White-White-Orange)	6099
(95)	Condenser (.03 Mfd. Tubular)	30-4025
(96)	Resistor (.1 Meg.) (White-White-Orange)	6099
(97)	Condenser (.0001 Mfd. Twin Bakelite Block)	8035P
(98)	Filter Choke	32-7018
(99)	Filter Choke	32-7056
(100)	Condenser (.25 Mfd. Bakelite Block)	6287S
(101)	Condenser (Electrolytic 8 & 10 Mfd.)	30-2046
(102)	Condenser (Electrolytic 8 Mfd.)	30-2011
(103)	Condenser (Electrolytic 4 Mfd.)	30-2104
(104)	Power Transformer (60 Cycle 115 Volts)	32-7258
	Power Transformer (25 Cycle 115 Volts)	32-7259
(105)	Condenser (.015 Mfd. Twin Bakelite Block)	3793K
(106)	Dial Lamp (Standard Band)	34-2040
(107)	Dial Lamp (Short-wave Band)	34-2040

*Inside I.F. Transformer, so do not show in Fig. 3.

MODEL 201 (Code 121)
Voltage, Socket, Data

PHILCO RADIO & TELEV. CORP.

Tube Socket Voltages

(Line Voltage 115)

	R.F. 78	Det.-Osc. 6A7	1st I.F. 78	2d I.F. 78	Shadow-meter 37	2d Det. 1st A.F. 75	Driver 42	Out-put 42 42
P-K	210	205	205	210	65	115	215	345
SG-K	120	100 (G1-K = 17) (G2-K = 145)	115	115			215	345
K-Gnd.	4.2	3.8	7.8	7.8	0	0	0	0

5Z3, F to Center Tap of Power Trans. Sec.—400 volts

5Z3, F to F—5.0 volts (A.C.)

All other filaments, 6.3 volts (A.C.)

Voltages in table above were obtained by using a high resistance voltmeter and test prods applied to underside of chassis (use Fig. 1). Fidelity control at middle position.

Power Transformer Voltages

Terminals	A.C. Volts	Circuit	Color of Leads
1-2	120	Primary	White
3-5	780	Plates of 5Z3	Yellow
6-7	5.0	Fil. of 5Z3	Blue
8-9	6.3	Filaments	Black
4		Center Tap of 3-5	Yellow Green Tracer

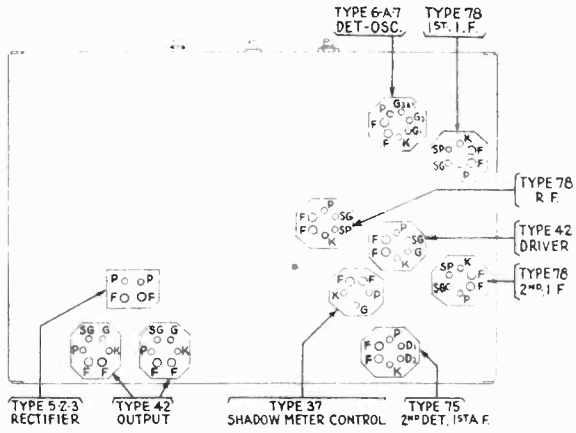


Fig. 1 Tube Sockets as seen from Bottom of Chassis (for Testing Voltages).

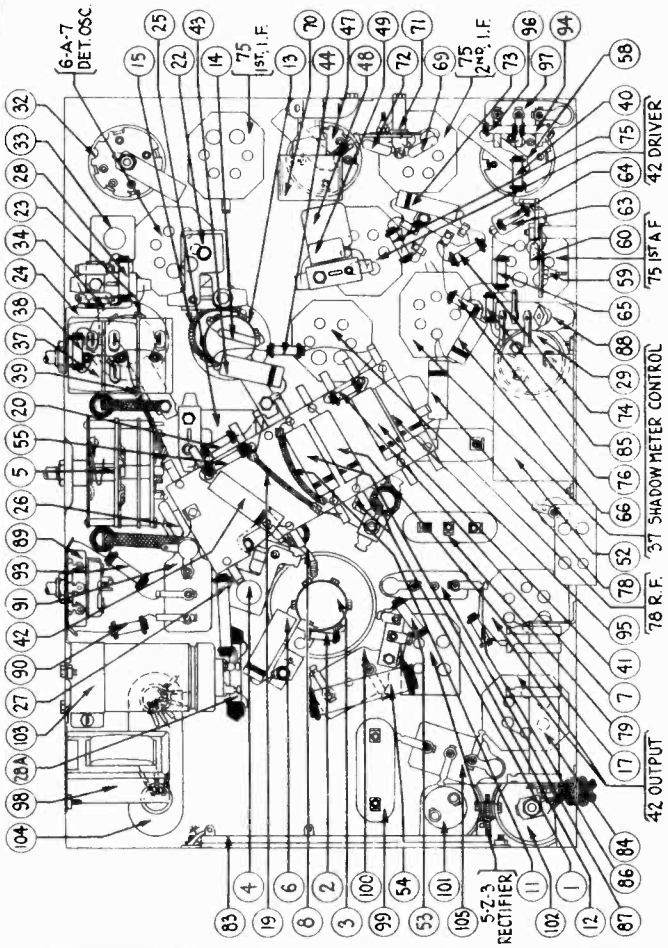


Fig. 3 Bottom View of Chassis, Showing Parts

Model 201

PHILCO Model 201 is a radio receiver incorporating high-fidelity reproduction, the same as in Model 200 (see Service Bulletin No. 201) and also having two frequency ranges, viz.: (1) 540 to 1720 kilocycles, which includes standard broadcasts and some police stations, and (2) 4.2 to 12.0 megacycles which includes the majority of popular short-wave stations. A two-position wave band switch changes reception from one range to the other, and one of the two individual pilot lamps controlled by the wave band switch illuminates whichever scale is in use.

For a description of how high-fidelity reception is accomplished thru the special circuit, speaker, and cabinet used, refer to page 1 of Service Bulletin No. 201. This also describes the "Fidelity-Selectivity" Control which is used in both models, 200 and 201.

Model 201 employs shadow-tuning, bass compensation (turned on or off by a switch on side of cabinet) and automatic volume control. The power consumption is 130 watts. Model 201 is designed for use on alternating current (A.C.) only, of the voltage and frequency specified on the chassis name-plate.

Dial Assembly	31-1205	Tube Socket (7 Prong)	24-6805
Dial Scale	27-5044	Speaker Socket	7828
Knob (Large)	27-4051	Chassis Mtg. Screw	W11861
Knob (Small)	27-4052	Chassis Mtg. Foot	27-4116
Tube Shield	34-1107	Chassis Mtg. Foot Plate	27-7407
Tube Socket (4 Prong)	7514	AC Cord & Plug Assembly	1943A
Tube Socket (5 Prong)	27-6013	Base Compensation Switch Plate	29-2115
Tube Socket (6 Prong)	6417		

Adjusting Compensating Condensers in Model 201

The quality performance of this receiver depends to a great extent upon providing a wide channel through the R.F. and I.F. stages to permit the passage of a broadcast signal without cutting of the side bands.

In order to produce this wide tuning band, the set must be carefully and accurately adjusted. These adjustments will be more critical than in the conventional radio, and the procedure will be somewhat more complicated.

In making the adjustments, it is necessary to use an unmodulated signal generator. The PHILCO Model 048 Set Tester or the Model 024 Signal Generator can be readily adapted for this purpose by the installation of a single-pole double-throw switch, and an additional grid leak resistor, as shown in Figure 4. This switch will adapt the signal generator for either a modulated or an unmodulated signal.

With an unmodulated signal, it is not possible to obtain an indication of output by means of the usual form of output meter. An indirect indication can be obtained, however, through the automatic volume control system by connecting a high resistance voltmeter having a scale reading of 0-5 or 0-10 volts across the R.F. cathode resistor ⑬, shown in the wiring diagram Fig. 2. This connection can be made conveniently through the use of leads equipped with test clips. With this arrangement, maximum output at the second detector will be indicated by a minimum reading of the meter, and vice versa. In other words, the action will be just the opposite of an output meter used to measure audio frequency voltage at the power output stage. With no signal applied to the receiver, the bias voltage indicated by the voltmeter, will be approximately 3.5 volts. This voltage will be reduced by the application of a signal to the R.F. or I.F. input circuits.

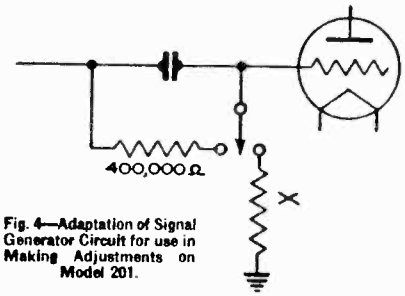


Fig. 4—Adaptation of Signal Generator Circuit for use in Making Adjustments on Model 201.

I. F. ADJUSTMENTS

After preparing the unmodulated signal generator and connecting the voltmeter as directed, proceed as follows:

1. Set the receiver tuning dial at its extreme low frequency position, with the wave-band switch turned to the left (standard broadcast position). Remove the grid clip from the cap of the 6A7 detector-oscillator tube, and connect the signal generator antenna lead in its place. Connect the ground lead from the signal generator to the ground terminal of the chassis. Adjust the signal generator frequency to exactly 260 K. C. Turn the fidelity-selectivity control of the receiver all the way to the left.

2. Adjust the 1st and 2nd I.F. padding condensers ㉝, ㉞, ㊻ and ㊽ for maximum output (minimum meter reading) in the order mentioned. During these adjustments, the output of the signal generator should be regulated to maintain a voltmeter reading of approximately 2 volts.

3. Connect a 500 Mmf. condenser from the plate of the 2nd I.F tube to ground, and adjust padder ㊾ for maximum output.

4. Connect the 500 Mmf. condenser across the secondary of the 3rd I.F transformer and adjust ㊼ for maximum output.

5. Turn the attenuator on the signal generator to maximum and adjust padder ㊽ for minimum width of shadow in the tuning meter.

6. Reduce the output of the signal generator until the voltmeter again reads 2 volts. Turn the fidelity-selectivity control all the way to the right and adjust padders ㊽ and ㊽ for MINIMUM output (maximum meter reading).

7. Leaving the fidelity-selectivity control in the extreme right hand position and tuning the signal generator through 253 K.C. and 267 K.C., two definite peaks at these points should be noted. The meter readings at these two peaks should be equal, but if not, they can be made equal by readjusting padder ㊾.

WAVE TRAP ADJUSTMENTS

8. Adjust the signal generator to exactly 260 K.C. and connect the output leads to the antenna and ground terminals on the chassis. Replace the grid clip on the type 6A7 tube. Turn the fidelity-selectivity control all the way to the left. Leaving the receiver dial at the extreme low frequency position, adjust padder ① for minimum output.

R. F. ADJUSTMENTS—(BROADCAST RANGE)

9. Insert a 250 Mmf. condenser in series with the antenna lead of the signal generator and the antenna terminal on the receiver chassis. Adjust the signal generator and the receiver to 1500 K.C. Turn the fidelity-selectivity control all the way to the left. Adjust padders ㊽, ㊾ and ㊾ for maximum output.

10. Adjust the signal generator and the receiver tuning dial to 600 K.C. Adjust padder ㊾ for maximum output, at the same time rocking the tuning condenser in the chassis back and forth to obtain the setting for the highest possible output.

R. F. ADJUSTMENTS—(SHORT WAVE RANGE)

The PHILCO Model 091 Crystal Controlled Oscillator is required for adjusting the compensating condensers for the short wave tuning range.

11. Connect the antenna and ground leads from the signal generator to the corresponding terminals on the chassis, placing a 400 ohm resistor between the antenna lead of the signal generator and the antenna terminal of the set. (Philco No. 33-3016 flexible resistor will be satisfactory.)

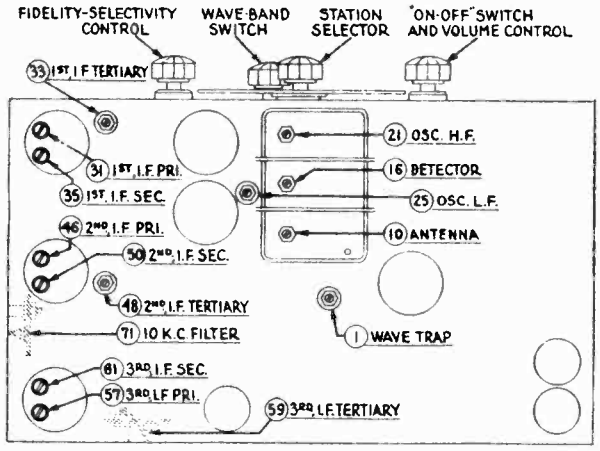


Fig. 5 Locations of Adjusting Condensers

12. Turn the wave-band switch to the right and set the receiver dial at 10.8 M.C. Remove the D.C. voltmeter connections from resistor ⑬ and connect the output meter to the plates of the power output tubes as in adjusting other types of receivers. Adjust the oscillator padder ㊽ and the antenna padder ㉑ for maximum output. These padders are located and adjusted from underneath the chassis and are visible in Fig. 3. When adjusting padder ㊽ two very definite peaks will be found. It is extremely important that the lower capacity setting be used. To make certain that the adjustment has not been made to the image frequency (which would be the case if padder ㊽ were adjusted to the higher capacity setting) turn the receiver dial to approximately 10.3 M.C. at which point the image frequency should be heard, but much more weakly than the signal at 10.8 M.C.

ADJUSTMENT OF 10 K.C. FILTER

The 10 K.C. filter in the audio circuit will rarely require readjustment. As the proper adjustment of this padder (㊾ on diagram) requires an accurately calibrated audio oscillator, it should be reset only in the event that it has been tampered with or in cases where it has become necessary to replace one of the elements of this filter. An emergency adjustment of this filter can be made in the following manner:

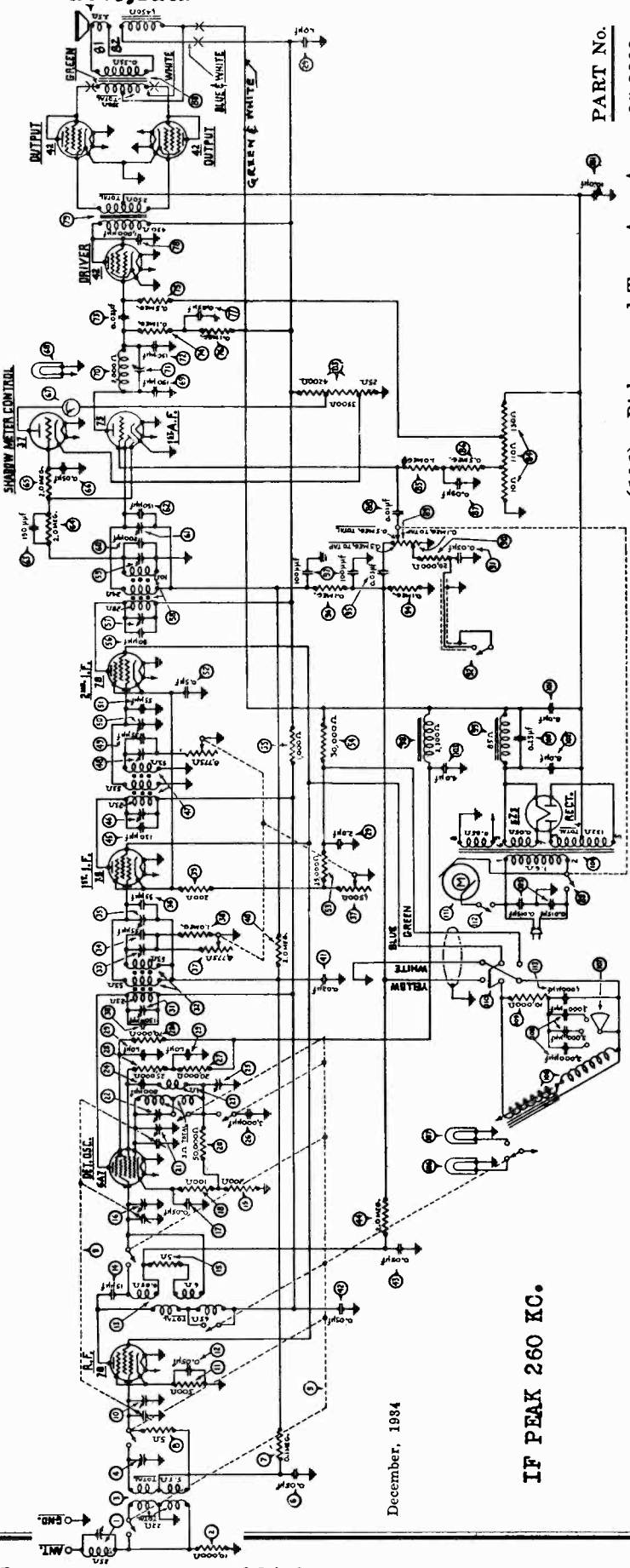
13. Connect the signal generator to the control grid of the type 6A7 tube, leaving the grid clip in place.

14. Leave the output meter connected to the power output circuit as in Paragraph 12.

15. Set the receiver dial at 550 K.C. and wave-band switch at left. At this point, the oscillator in the receiver will be tuned to 810 K.C. The adjustment of the signal generator (switch in unmodulated position) to approximately this same frequency will cause an audible beat note to be heard in the speaker. By means of the signal generator tuning control, reduce the frequency of this beat note until zero beat is reached, at which point the output meter reading will decrease to 0. Turning the receiver dial in either direction will gradually increase the frequency of the audible note so that at 540 or 560 K.C. a 10,000 K.C. note will be heard. At either of these points, the padder ㊾ should be adjusted for minimum reading of the output meter.

MODEL 509-X
Schematic, Data

PHILCO RADIO & TELEV. CORP.



Model 509 — Wiring Diagram

PHILCO Model 509-X is a DeLuxe Radio-Phonograph mounted in a cabinet especially designed to promote high-fidelity reproduction. The Radio chassis is practically identical with Model 201 (see Service Bulletin No. 209), which incorporates high-fidelity reproduction and covers both the standard broadcast band (540-1720 K. C.) of frequencies and a major portion (4.2-12 megacycles) of the short-wave band.

For Service Data on the Phonograph and part numbers of the replaceable parts, refer to Service Bulletin No. 165-E on Model 501 Radio Phonograph, which uses the same type pick-up and automatic Record Changer mechanism.

Note that Part (98), Resistor, 15000 ohms (Part 6208) is omitted in Model 509-X; also the value of the condenser (91) in the bass compensator becomes .03 mfd. instead of .07, and a four-point tone control is added for the phonograph. The control knob for this is on the radio control panel.

Also note that the B. C. resistor (83) has an additional tap in Model 509 and the circuit to it has been slightly changed from that shown in wiring diagram of Model 201 (Bulletin 209).

	PART No.	
(106)	Pick-up and Tone Arm Assem	35-2009
(107)	Tone control (4-position)	30-4239
(108)	Condensers in tone control	Part of (107)
(109)	Resistor (10,000 ohms)	38-1000
(110)	Radio phonograph switch	42-1053
(111)	Phonograph Motor —	
	115 volts, 60 cycles	35-1092
	115 volts, 25 cycles	35-1095
(112)	Phonograph on-off switch	35-1044
(113)	Condenser (.001 mfd. mica)	30-1007
	Field coil and pot assembly	36-3088
	Voice coil and cone assembly	36-3381
	Output transformer	32-7247

Other parts in Model 509-X, which differ from those in Models 201 and 501 are as follows: Diagram No.102, Electrolytic condenser, part No.30-2014; Diagram No.104, Power Transformer, Part No.32-7259; Diagram No.91, .03 mf. condenser (bass comp.), Part No.8318-F.

PHILCO RADIO & TELEV. CORP.

MODEL 610
Schematic, Voltage Data

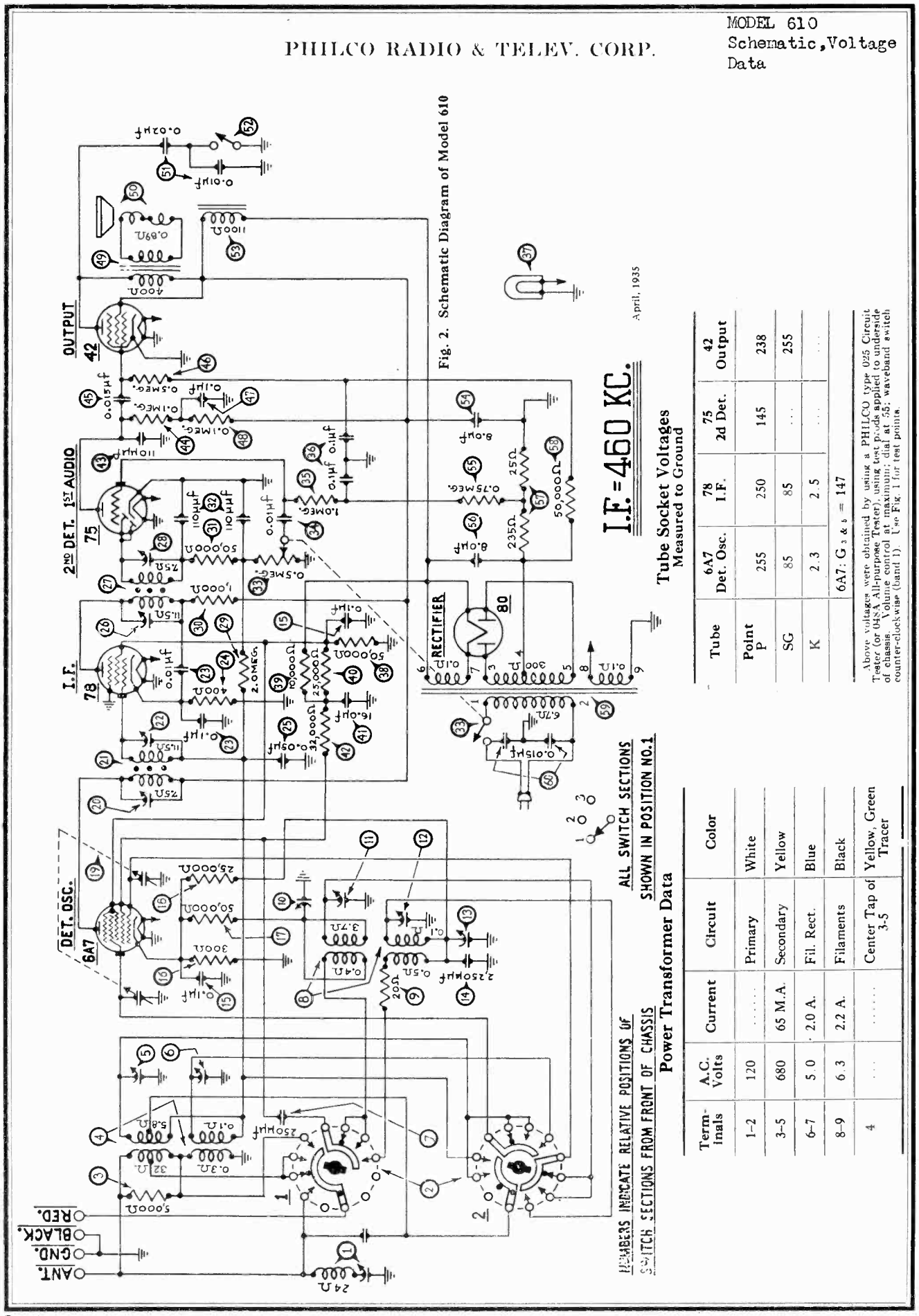


Fig. 2. Schematic Diagram of Model 610

April, 1935

Tube Socket Voltages
Measured to Ground

Tube	6A7 Det. Osc.	78 I.F.	75 2d Det.	42 Output
Point P	255	250	145	238
SG	85	85	...	255
K	2.3	2.5	...	...
6A7: $G_{3\ \&\ 5}$ = 147				

Above voltages were obtained by using a PHILCO type 025 Circuit Tester (or 045A All-purpose Tester), using test prods applied to underside of chassis. Volume control at maximum; dial at 55; waveband switch counter-clockwise (band 1). Use Fig. 1 for test points.

Power Transformer Data

Terminals	A.C. Volts	Current	Circuit	Color
1-2	120	.....	Primary	White
3-5	680	65 M.A.	Secondary	Yellow
6-7	5.0	2.0 A.	Fil. Rect.	Blue
8-9	6.3	2.2 A.	Filaments	Black
4	....	.....	Center Tap of 3-5	Yellow, Green Tracer

MODEL 610
Socket, Trimmers
Alignment, Data

PHILCO RADIO & TELEV. CORP.

Model 610

Type Circuit: Superheterodyne, with pentode output (3 watts); built in connections for Philco All-wave aerial; aerial selector built into and operated by wave-band switch.

Power Supply: Alternating Current. Voltage and frequency as specified on chassis nameplate.

Tubes Used: 1 type 6A7, Detector-Oscillator; 1 type 78, I.F.; 1 type 75, 2d Detector and 1st A.F.; 1 type 42 Output; 1 type 80 Rectifier.

Wave Bands: Three—(1) standard (with some Police); (2) Police; (3) Short-wave.

Coverage of Each Band: Band 1, 530-1720 K.C.; Band 2, 2300 to 2500 K.C. (2.3-2.5 M.C.); Band 3, 5700-18000 K.C. (5.7 to 18.0 megacycles).

Tuning Drive: Dual planetary, ball bearing. 50 to 1 ratio for slow-speed tuning.

Tone Control: 2-position.

Intermediate Frequency: 460 K.C.

Power Consumption: 54 watts.

The adjustment of the compensating condensers in Model 610 requires a signal generator covering the broadcast and police band, and also one capable of producing a signal at certain frequencies in the short wave band. The Philco Model 088 All-Wave Signal Generator covers these requirements perfectly. An output meter is also required. Philco Model 025 or 012 unit is recommended. The location of all compensating condensers is shown in Fig. 4.

Adjustment of I. F.

1. Remove the antenna connection from the receiver, disconnect the grid clip from the first detector (type 6A7 tube), and connect the "ANT" output terminal of the signal generator to the grid cap of this tube; connect the "GND" terminal of the signal generator to the "GND" terminal of the receiver.

2. Connect the 0 to 30 volt range of the output meter to the plate and cathode of the output tube or to the two bottom prongs of the speaker plug.

3. Adjust the signal generator to a frequency of 460 K.C. Place the receiver in operation with the dial turned to the low frequency end of the standard broadcast band, wave band switch to extreme left (clockwise), and have the volume control adjusted near its maximum setting. Adjust the signal generator attenuator for approximately half-scale reading of the output meter.

4. The I.F. compensating condensers are located at the tops of the I.F. coil shields and adjusted by turning the two screws in top. Adjust condensers ㉖ and ㉘ (2d I.F. primary and secondary) for maximum reading in the output meter, and then condensers ⑳ and ㉒ (1st I.F. primary and secondary).

Adjustment of Wave-Trap

1. Connect the signal generator leads to the antenna and ground terminals of the receiver. Replace the grid clip on the 6A7 grid cap.

2. With the wave-band switch of the receiver still in the extreme left (broadcast position), turn the station selector to 550 K.C.

3. With the signal generator in operation at 460 K.C., adjust the wave-trap ① condenser until a MINIMUM reading is obtained on the output meter. The Philco fibre wrench, part No. 3164, is used for this adjustment. The wave-trap compensator is reached from rear of chassis.

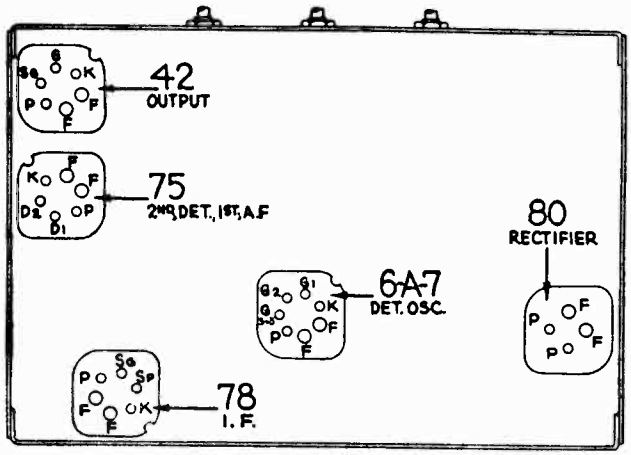


Fig. 1. Tube Sockets as viewed from bottom.

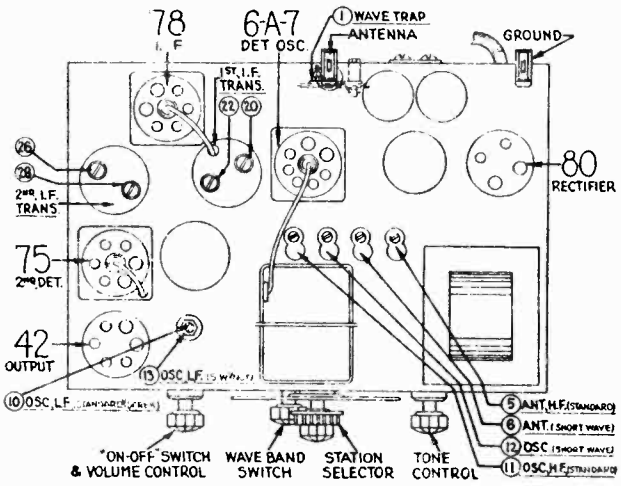


Fig. 2. Locations of Compensating Condensers

Adjustment of High and Low Frequency Compensators

1. With the wave-band switch still at Position No. 1 (broadcast band), set the dial at 1600 K.C. Set the signal generator at this frequency and adjust compensators ⑪ and ⑤ for maximum output. These are the oscillator and antenna "H.F. standard" compensators respectively.

2. Tune the receiver and the signal generator to 600 K.C. and adjust compensator ⑩ (screw) for maximum output. This is the oscillator L.F. standard compensator.

3. Turn the wave-band switch to the extreme right (short-wave band) and adjust the station selector to 18.0 megacycles. By means of the Philco wrench, part No. 3164, adjust the oscillator S.W., and antenna S.W. compensators for maximum reading in the output meter. These are numbered ⑫ and ⑥ respectively in figure No. 4.

4. Turn the tuning dial to 7.2 M.C., and adjust condenser ⑬ osc. L.F., (S.W.) (nut) to maximum signal.

MODEL 610
Chassis, Parts

PHILCO RADIO & TELEV. CORP.

Replacement Parts—Model 610

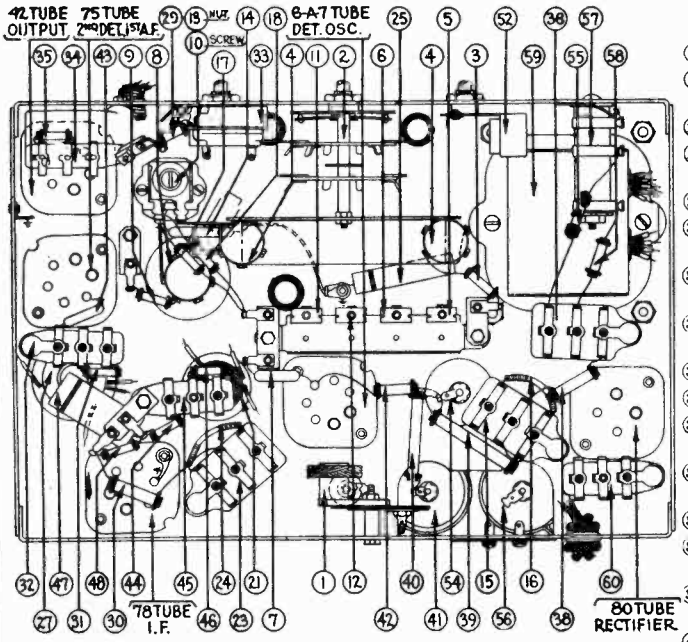


Fig. 3. Bottom View of Chassis

	Description	Part No.	List Price
①	Wavetrap	36-6777	$1.00
②	Waveband Switch	42-1112	1.10
③	Resistor (5000 ohms) (Green, Black, Red)	6096	.20
④	Antenna Transformer	32-1669	1.15
⑤	Compensating Condenser (Antenna, Standard)	Part of 31-6047	.50
⑥	Compensating Condenser (Antenna, S.W.)	Part of 31-6047	.50
⑦	Condenser (.00025 Mfd. Mica)	5858	.35
⑧	Oscillator Transformer	32-1670	1.40
⑨	Resistor (20 ohms) (Red, Black, Black)	33-1206	.20
⑩	Compensating Condenser (Osc. L.F. Standard) (Screw)	Part of 31-6027	.70
⑪	Compensating Condenser (Osc. H.F., Standard)	Part of 31-6047	.50
⑫	Compensating Condenser (Osc. S.W., H.F. End)	Part of 31-6047	.50
⑬	Compensating Condenser (Osc. S.W., L.F. End) (Nut)	Part of 31-6027	.70
⑭	Condenser (.00225 Mfd. Mica)	30-1055	.40
⑮	Condenser (.09 Mfd. Twin Bakelite Block)	4989-DG	.40
⑯	Resistor (300 ohms Flexible) (Orange, Black, Brown)	33-3010	.20
⑰	Resistor (50000 ohms) (Green, Brown, Orange)	6098	.20
⑱	Resistor (25000 ohms) (Red, Green, Orange)	33-1013	.20
⑲	Tuning Condenser Assembly	31-1528	3.75
⑳	Compensating Condenser (1st I.F. Primary)	Part of ㉑	....
㉑	1st I.F. Transformer	32-1671	1.35
㉒	Compensating Condenser (1st I.F. Secondary)	Part of ㉑	....
㉓	Condenser (.09 Mfd., and .01 Mfd. Bakelite Block)	4989-FU	.40
㉔	Resistor (400 ohms Flexible) (Yellow, Black, Brown)	33-3016	.20
㉕	Condenser (.05 Mfd. Tubular)	30-4020	$0.35
㉖	Compensating Condenser (2nd I.F. Primary)	Part of ㉗	....
㉗	2nd I.F. Transformer	32-1672	1.35
㉘	Compensating Condenser (2nd I.F. Secondary)	Part of ㉗	....
㉙	Resistor (2 Megs.) (Red, Black, Green)	33-1025	.20
㉚	Resistor (1000 ohms) (Brown, Black, Red)	5837	.20
㉛	Resistor (50000 ohms) (Green, Brown, Orange)	6098	.20
㉜	Condenser (.00011 Twin Bakelite Block)	8035-DG	.25
㉝	Volume Control & On-Off Switch	33-5106	.85
㉞	Condenser (.01 Mfd. Bakelite Block)	3903-SU	.25
㉟	Resistor (1 Meg.) (Brown, Black, Green)	33-1096	.20
㊱	Condenser (.1 Mfd. Twin Bakelite Block)	4989-DG	.40
㊲	Pilot Lamp	34-2064	.09
㊳	Resistor (50000 ohms) (Green, Brown, Orange)	4237	.20
㊴	Resistor (10000 ohms) (Brown, Black, Orange)	3524	.20
㊵	Resistor (25000 ohms) (Red, Green, Orange)	3656	.20
㊶	Condenser (Electrolytic—16 Mfd.)	30-2118	1.65
㊷	Resistor (32000 ohms) (Orange, Red, Orange)	5279	.20
㊸	Condenser (.00011 Mfd. Mica)	30-1031	.35
㊹	Resistor (.1 Meg.) (Brown, Black, Green)	6099	.20
㊺	Condenser (.015 Mfd. Bakelite Block)	3793-SU	.35
㊻	Resistor (.5 Meg.) (Yellow, White, Yellow)	6097	.20
㊼	Condenser (.1 Mfd. Tubular)	30-4170	.35
㊽	Resistor (.1 Meg.) (White, White, Yellow)	6099	.20
㊾	Output Transformer	32-7019	1.25
㊿	Cone & Voice Coil Assembly (P-27 Speaker)	02861	.65
(51)	Condensers (in Tone Control)	Part of (52)	....
(52)	Tone Control	30-4318	.50
(53)	Field Coil & Pot Assembly (P-27 Speaker)	36-3341	2.75
(54)	Condenser (Electrolytic—8 Mfd.)	30-2025	1.35
(55)	Resistor (750000 ohms) (Violet, Green, Yellow) (½ Watt)	33-1203	.20
(56)	Condenser (Electrolytic) (8 Mfd.)	30-2025	1.35
(57)	Resistor (B.C. Wire-wound, 235 ohms, 25 ohms)	33-3037	.20
(58)	Resistor (50000 ohms) (Green, Brown, Orange)	6098	.20
(59)	Power Transformer (110 volts 60 cycles)	32-7381	4.00
	(110 volts 25 cycles)	32-7382	6.25
	(230 volts 50 cycles)	32-7383	4.50
(60)	Condenser (.015 Mfd. Twin Bakelite Block)	3793-DG	.40
	Dial Assembly	31-1539	.30
	Tube Shield Body	28-2726	.10
	Tube Shield Base	28-2725	.03
	Four Prong Socket	27-6034	.10
	Six Prong Socket	27-6036	.11
	Seven Prong Socket	27-6037	.11
	Knob (Station Selector)	27-4206	.12
	Knob (Fine Tuning)	27-4207	.10
	Knob (Volume, Waveband and Tone Control)	27-4208	.10
	Bezel	27-2928	.35
	Bezel Glass	27-7887	.60

MODEL 611
Parts, Alignment

PHILCO RADIO & TELEV. CORP.

REPLACEMENT PARTS—MODEL 611

Nos. in Figs. 3 & 4	Description	Part No.	List Price
①	Wave Trap	38-6850	$1.10
②	Condenser (.0014 Mfd. Mica)	7007	.30
③	Waveband Switch	42-1112	1.10
④	Condenser—Capacity Obtained by Twisted Wires)	.....	....
⑤	Resistor (5000 ohms) (Green, Black, Red)	33-1001	.20
⑥	Antenna Transformer	32-1781	1.15
⑦	Compensating Condenser (Antenna, Standard)	Part of 31-6047	.50
⑧	Compensating Condenser (Antenna S.W.)	Part of 31-6047	
⑨	Condenser (.00025 Mfd. Mica)	5858	.25
⑩	Resistor (20 ohms) (Red, Black, Black)	33-1206	.20
⑪	Oscillator Transformer	32-1831	1.50
⑫	Compensating Condenser (Osc. L.F. Standard)	Part of 31-6027	.70
⑬	Compensating Condenser (Osc. H.F. Standard)	Part of 31-6047	.50
⑭	Compensating Condenser (Osc. S.W. H.F. End)	Part of 31-6047	
⑮	Compensating Condenser (Osc. S.W. L.F. End)	Part of 31-6027	.70
⑯	Condenser (.00225 Mfd. Mica)	30-1055	.40
⑰	Tuning Condenser Assembly	31-1528	3.75
⑱	Resistor (120000 ohms) (Brown, Red, Yellow)	33-1128	.20
⑲	Resistor (120000 ohms) (Brown, Red, Yellow)	33-1128	.20
⑳	Resistor (200 ohms Flexible) (Red, Black, Black)	7217	.20
㉑	Condenser (.1 Mfd. Twin Bakelite Block)	4989-DG	.40
㉒	Condenser (.05 Mfd. Tubular)	30-4020	.20
㉓	Compensating Condenser (1st I.F. Primary)	Part of ㉔	....
㉔	1st I.F. Transformer	32-1671	1.35
㉕	Compensating Condenser (1st I.F. Secondary)	Part of ㉔	....
㉖	Resistor (300 ohms Flexible) (Orange, Black, Black)	33-3010	.20
㉗	Condenser (.1 Mfd. & .01 Mfd. Bakelite Block)	4989-FU	.40
㉘	Pilot Lamp	34-2068	.16
㉙	Compensating Condenser (2d I.F. Primary)	Part of ㉚	....
㉚	2d I.F. Transformer	32-1672	1.35
㉛	Compensating Condenser (2d I.F. Secondary)	Part of ㉚	....
㉜	Resistor (1000 ohms) (Brown, Black, Red)	5837	.20
㉝	Resistor (2 Megs.) (Red, Black, Green)	33-1025	.20
㉞	Resistor (50000 ohms) (Green, Brown, Orange)	6098	.20
㉟	Condenser (.00011 Mfd. Twin Bakelite Block)	8035-DU	.25
㊱	Condenser (.00011 Mfd Mica)	30-1031	.20
㊲	Condenser (.15 Mfd. Twin Bakelite Block)	6287-DU	.40
㊳	Condenser (.01 Mfd. Bakelite Block)	3903-SU	.25
㊴	Volume Control & On-Off Switch	33-5114	1.45
㊵	Resistor (50000 ohms) (Green, Brown, Orange)	4237	$0.20
㊶	Resistor (13000 ohms) (Brown, Orange, Orange)	3766	.20
㊷	Resistor (15000 ohms) (Brown, Green, Orange)	5278	.20
㊸	Resistor (70000 ohms) (Violet, Black, Orange)	33-1115	.20
㊹	Resistor (240000 ohms) (Red, Yellow, Yellow)	33-1097	.20
㊺	Condenser (.015 Mfd. Bakelite Block)	3793-SU	.35
㊻	Resistor (.5 Meg.) (Yellow, White, Yellow)	6097	.20
㊼	Tone Control	30-4345	.50
㊽	Resistor (400 ohms Flexible) (Yellow, Black, Black)	33-3016	.20
㊾	Condenser (Electrolytic—10 Mfd., 10 Mfd.)	30-2125	1.20
㊿	Condenser (.02 Mfd. Tubular)	30-4215	.20
(51)	Output Transformer	32-7395	1.10
(52)	Cone & Voice Coil Assembly (S-15 Speaker)	36-3157	.80
(53)	Field Coil & Pot Assembly (S-15 Speaker)	36-3519	2.80
(54)	Resistor (20 ohms Flexible) (Red, Black, Black)	33-1206	.20
(55)	Condenser (.25 Mfd. Tubular)	30-4146	.25
(56)	Resistor (1 Meg.) (Brown, Black, Green)	33-1096	.20
(57)	Resistor (.5 Meg.) (Yellow, White, Yellow)	6097	.20
(58)	Condenser (Electrolytic, 16 Mfd.)	30-2124	.75
(59)	Condenser (Electrolytic, 16 Mfd.)	30-2124	.75
(60)	Filter Choke	32-7018	1.50
(61)	Filter Choke	32-7452	.90
(62)	Resistor (15 ohms, 130 ohms—Wirewound)	33-3213	.50
(63)	Condenser (.05 Mfd. Bakelite Block)	3615-SU	.35
	Dial Scale	27-5097	.25
	Dial Hub and Set Screw Assembly	31-1550	.15
	Dial Spring Clamp	28-2837	.10
	Knob (Tone, Volume)	27-4208	.10
	Knob (Waveband)	27-4219	.10
	Knob (Station Selector)	27-4206	.12
	Knob (Fine Tuning)	27-4207	.10
	Socket (6 Prong)	27-6036	.11
	Socket (7 Prong)	27-6037	.11
	Bezel	28-2028	.35
	Bezel Glass	27-2887	.60
	Chassis Mtg. Screw	W-1496A	1.60 per C
	Chassis Mtg. Washer	27-4198	.01
	Tube Shield Body	28-2726	.10
	Tube Shield Base	28-2725	.03

Adjustment of High and Low Frequency Compensators

1. With the wave-band switch still at Position No. 1 (broadcast band), set the dial at 1500 K.C. Set the signal generator at 1.5 M. C. and adjust compensators ⑬ and ⑦ for maximum output. These are the oscillator and antenna "H.F. standard" compensators respectively.

2. Tune the receiver and the signal generator to 600 K.C. and adjust compensator ⑫ (screw) for maximum output. This is the oscillator L.F. standard compensator.

3. Turn the wave-band switch to the extreme right (short-wave band) and adjust the station selector to 18.0 megacycles. Set the signal generator at 18.0 megacycles. Now adjust the oscillator S.W., and antenna S.W. compensators for maximum reading in the output meter. These are numbered ⑭ and ⑧ respectively in figure No. 2.

4. Turn the tuning dial to 6.0 M.C., set the signal generator at 6.0 M.C., and adjust condenser ⑮ osc. L.F., (S.W.) (nut) to maximum signal.

Specifications

Type Circuit: Superheterodyne, with pentode output; built in connections for Philco All-wave aerial; aerial selector built into and operated by wave-band switch.

Power Supply: 115 volts, Alternating or Direct Current.

Tubes Used: 1 type 6A7, Detector-Oscillator; 1 type 78, I.F.; 1 type 75, 2d Detector and 1st A.F.; 1 type 43 Output; 1 type 25Z5 Rectifier.

Wave Bands: Three—(1) Standard (with some Police); (2) Police; (3) Short-wave.

Coverage of Each Band: Band 1, 530-1720 K.C.; Band 2, 2300 to 2500 K.C. (2.3-2.5 M.C.); Band 3, 5700-18000 K.C. (5.7 to 18.0 megacycles).

Tuning Drive: Dual gear drive, ball bearing. 50 to 1 ratio for slow-speed tuning. 6 to 1 on main drive.

Tone Control: 2-position.

Intermediate Frequency: 460 K.C.

Power Consumption: 50 watts.

Speaker: 611-B (Baby Grand): P-28; 611-F (Console): S-15.

MODEL 611
Schematic

PHILCO RADIO & TELEV. CORP.

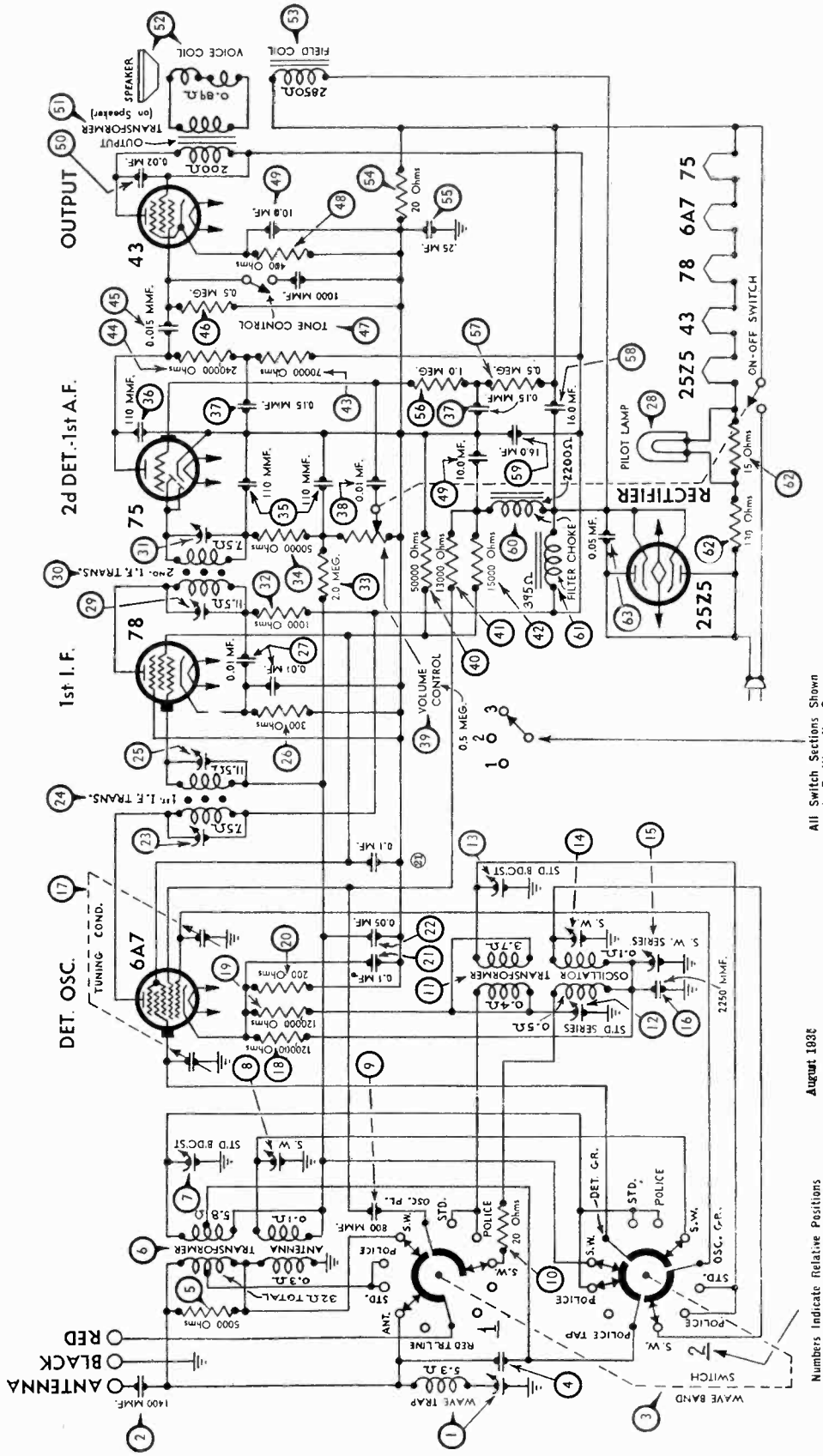


Fig. 3 — Schematic Diagram of Model 611

Note 1: Cathode condenser of 78 tube (lower portion of (27)) is 1 mfd. instead of .01 mfd. shown above.

Note 2: Condenser (9) is .00025 mfd. instead of .0008 mfd. as shown above.

MODEL 611
Alignment, Part 2
Chassis, Socket, Trimmers

PHILCO RADIO & TELEV. CORP.

ADJUSTING COMPENSATING CONDENSERS

The adjustment of the compensating condensers in Model 611 requires a signal generator covering the broadcast and police band, and also one capable of producing a signal at certain frequencies in the short wave band. The Philco Model 088 All-Wave Signal Generator covers these requirements perfectly. An output meter is also required. Philco Model 025 or 012 unit is recommended. The location of all compensating condensers is shown in Fig. 2.

Adjustment of I. F.

1. Remove the antenna connection from the receiver. Remove the grid clip from the first detector (type 6A7 tube), and attach the "ANT" output lead from the signal generator to the grid cap of this tube.

2. Connect the output meter to the plate and cathode of the output tube by means of the adapters provided with the "025" or to the two bottom prongs of the speaker plug. Set it at the 0-30 volt range.

3. Adjust the signal generator to a frequency of 460 K.C. Place the receiver in operation with the dial turned to the low frequency end of the standard broadcast band, wave band switch to extreme left (clockwise), and have the volume control adjusted near its maximum setting. Adjust the signal generator attenuator for approximately half-scale reading of the output meter.

4. The I.F. compensating condensers are located at the tops of the I.F. coil shields and adjusted by turning the two screws in top. Adjust condensers (30) and (31) (2d I.F. primary and secondary) for maximum reading in the output meter, and then condensers (23) and (25) (1st I.F. primary and secondary).

Adjustment of Wave-Trap

1. Connect the signal generator leads to the antenna and ground terminals of the receiver. Replace the grid clip on the 6A7 grid cap.

2. With the wave-band switch of the receiver still in the extreme left (broadcast position), turn the station selector to 550 K.C.

3. With the signal generator in operation at 460 K.C., adjust the wave-trap (1) condenser until a MINIMUM reading is obtained on the output meter. The wave-trap compensator is reached from rear of chassis.

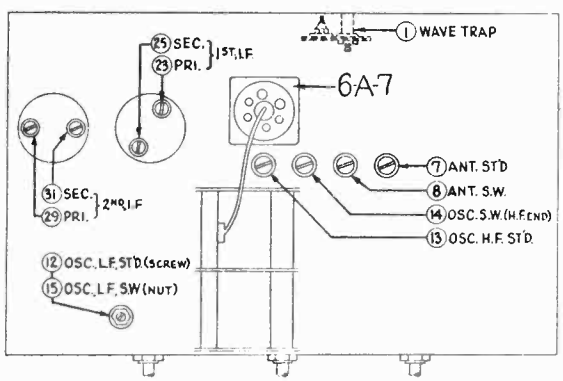


Fig. 2. Locations of Compensating Condensers

Tube Socket Voltages
(Measured at 115 volts A.C.)

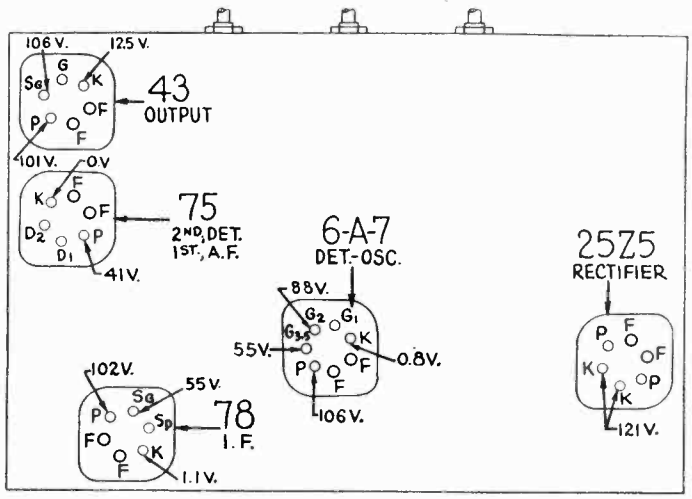
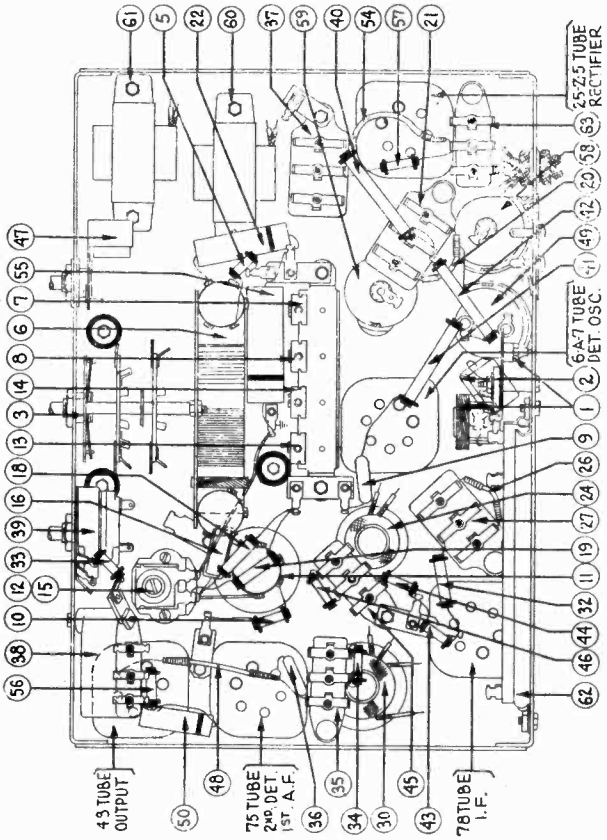


Fig. 1. Tube Sockets as viewed from bottom.

Above voltages were obtained by using a PHILCO type 025 Circuit Tester (or 048A All purpose Tester), using test prods applied to underside of chassis. Volume control at minimum; dial at 55; waveband switch counter-clockwise (band 1). S-15 Speaker used.



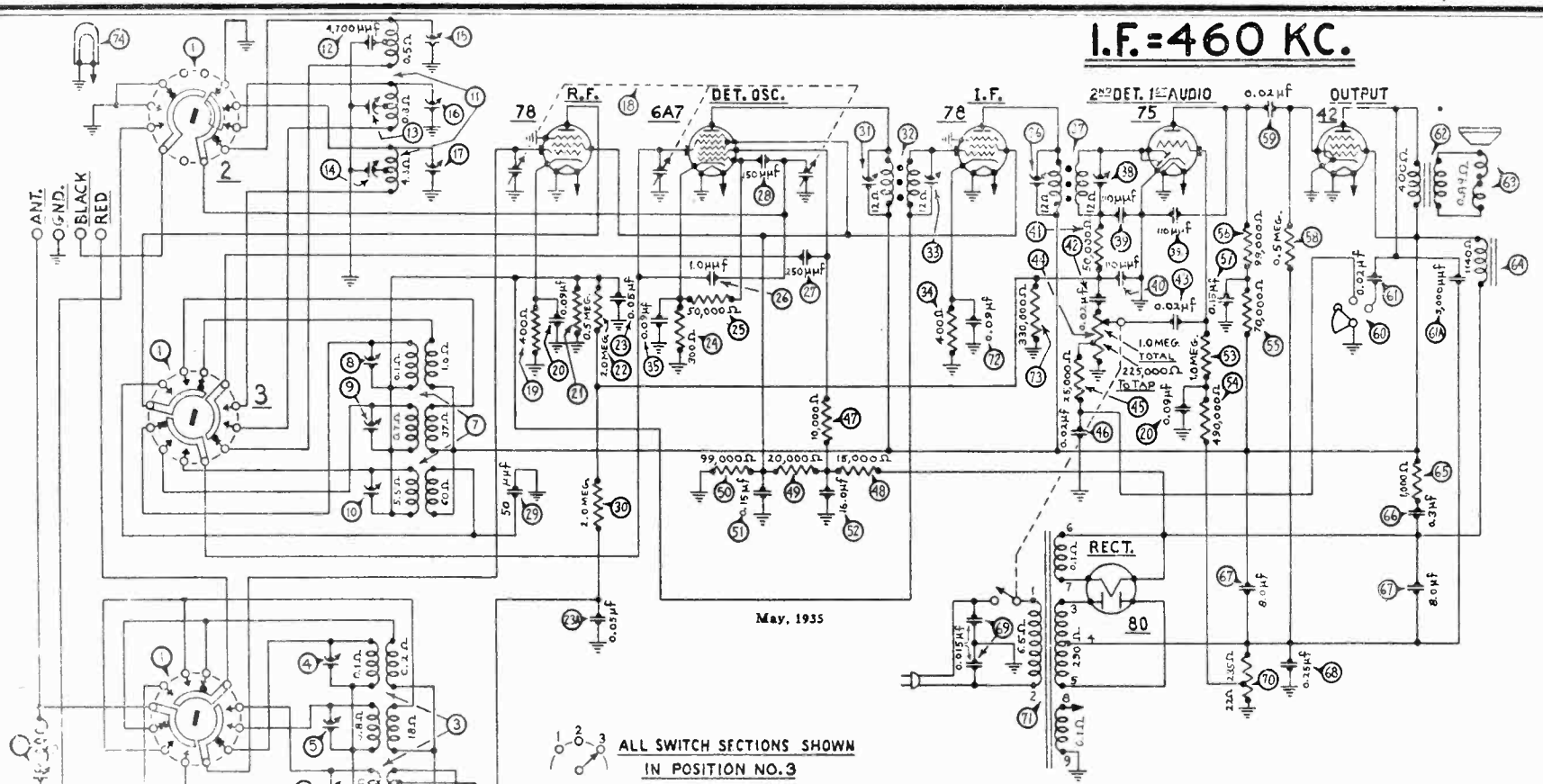


Fig. 3. Schematic Diagram of Model 620

Model 620

Tube Socket Voltages
Measured to Ground

Tube	78 R.F.	6A7 Det. Osc.	78 I.F.	75 2d Det.	42 Output
Point P	258	258	258	153	243
SG	95	95	95	...	258
K	2.65	2.5	2.85	...	...
	6A7: $G_{3\ \&\ 5}$ = 173				

Above voltages were obtained by using a PHILCO type 025 Circuit Tester (or 048A All-purpose Tester), using test prods applied to underside of chassis. Volume control at maximum; dial at 55; waveband switch counter-clockwise (band 1). Use Fig. 1 for test points. Line voltage 115 volts.

Power Transformer Data

Terminals	A.C. Volts	Current	Circuit	Color
1–2	120	.....	Primary	White
3–5	680	65 M.A.	Secondary	Yellow
6–7	5.0	2.0 A.	Fil. Rect.	Blue
8–9	6.3	2.0 A.	Filaments	Black
4	...	.....	Center Tap of 3-5	Yellow, Green Tracer

MODEL 620
Chassis, Parts

PHILCO RADIO & TELEV. CORP.

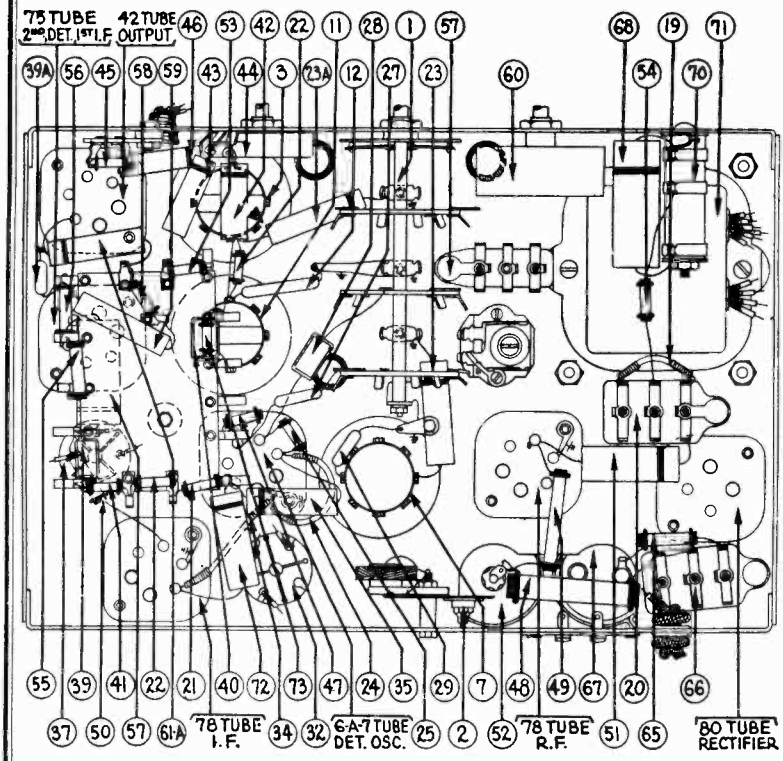


Fig. 4. Bottom View of Chassis

Replacement Parts Model 620

Description	Part No.	List Price
Dial Scale	27-5098	.25
Dial Hub and Set Screw	31-1550	.15
Dial Front Spring	28-2837	.10
Knob (Station Selector)	27-4206	.12
Knob (Fine Tuning)	27-4207	.10
Knob (Waveband)	27-4219	.10
Knob (Tone, Volume)	27-4208	.10
Tube Shield	28-2726	.10
Tube Shield Base	28-2725	.03
Tube Socket (4 Prong)	27-6034	.10
Tube Socket (6 Prong)	27-6036	.11
Tube Socket (7 Prong)	27-6037	.11
Speaker Plug Socket	27-6033	.08
Chassis Mtg. Screw	W-1495	1.50 per C.
Chassis Mtg. Washer (Rubber)	27-4198	.01
Electric Cord and Plug	L-943-A	.60
Bezel	28-2928	.35
Bezel Glass	27-7887	.60

	Description	Part No.	List Price
(1)	Waveband Switch	42-1107	$1.75
(2)	Wavetrap	38-6850	1.10
(3)	Antenna Transformer	32-1699	3.00
(4)	Compensating Condenser (Ant. S.W.)	Part of (3)	....
(5)	Compensating Condenser (Ant. Police)	Part of (3)	....
(6)	Compensating Condenser (Ant. Standard)	Part of (3)	....
(7)	R. F. Transformer	32-1636	3.25
(8)	Compensating Condenser (R.F. Short-Wave)	Part of (7)	....
(9)	Compensating Condenser (R.F. Police)	Part of (7)	....
(10)	Compensating Condenser (R.F. Standard)	Part of (7)	....
(11)	Oscillator Transformer	32-1637	2.50
(12)	Condenser (.0047 Mfd. Mica)	30-1052	.60
(13)	Compensating Condenser (Osc. Police)	Part of (11)	....
(14)	Compensating Condenser (Osc. H.F. Standard)	Part of (11)	....
(15)	Compensating Condenser (Osc. S.W.)	Part of (11)	....
(16)	Compensating Condenser (Osc. L.F. Police)	Part of 31-6027	.70
(17)	Compensating Condenser (Osc. L.F. Standard)	Part of 31-6027	
(18)	Tuning Condenser Assembly	31-1526	2.75
(19)	Resistor (400 ohms Flexible) (Yellow, Black, Brown)	33-3016	.20
(20)	Condenser (.09 Mfd. Twin Bakelite Block)	4989-DG	.40
(21)	Resistor (.5 Meg.) (Yellow, White, Yellow)	6097	.20
(22)	Resistor (2 Megs.) (Red, Black, Green)	33-1025	.20
(23)	Condenser (.05 Mfd. Tubular)	30-4020	.35
(23)A	Condenser (.05 Mfd. Tubular)	30-4020	.35
(24)	Resistor (300 ohms Flexible) (Orange, Black, Brown)	33-3010	.20
(25)	Resistor (50000 ohms) (Green, Brown, Orange)	6098	.20
(26)	Condenser (1 Mmfd.)	Part of (18)	....
(27)	Condenser (.00025 Mfd. Mica)	30-1032	.35
(28)	Condenser (.00015 Mfd. Mica)	30-1033	.35
(29)	Condenser (.00005 Mfd. Mica)	30-1029	.35
(30)	Resistor (2 Megs.) (Red, Black, Green)	33-1025	.20
(31)	Compensating Condenser (1st I.F. Primary)	Part of (32)	....
(32)	1st I.F. Transformer	32-1646	$2.25
(33)	Compensating Condenser (1st I.F. Secondary)	Part of (32)	....
(34)	Resistor (400 ohms Flexible) (Yellow, Black, Brown)	33-3016	.20
(35)	Condenser (.1 Mfd. Tubular)	30-4122	.35
(36)	Compensating Condenser (2nd I.F. Pri.)	Part of (37)	....
(37)	2nd I.F. Transformer	32-1647	2.25
(38)	Compensating Condenser (2nd I.F. Sec.)	Part of (37)	....
(39)	Condenser (.00011 Mfd. Mica)	30-1031	.35
(39)A	Condenser (.00011 Mfd. Mica)	30-1031	.35
(40)	Condenser (.00011 Mfd. Mica)	30-1031	.35
(41)	Resistor (50000 ohms) (Green, Brown, Orange)	6098	.20
(42)	Condenser (.02 Mfd. Tubular)	30-4215	.30
(43)	Condenser (.02 Mfd. Tubular)	30-4215	.30
(44)	Volume Control and On-Off Switch	33-5105	1.45
(45)	Resistor (25000 ohms) (Red, Green, Orange)	33-1013	.20
(46)	Condenser (.02 Mfd. Tubular)	30-4215	.30
(47)	Resistor (10000 ohms) (Brown, Black, Orange)	4412	.20
(48)	Resistor (15000 ohms) (Brown, Green, Orange)	5718	.35
(49)	Resistor (20000 ohms) (Red, Black, Orange)	6649	.20
(50)	Resistor (99000 ohms) (White, White, Yellow)	4411	.20
(51)	Condenser (.15 Mfd. Tubular)	30-4191	.35
(52)	Condenser (16 Mfd. Electrolytic)	30-2118	1.65
(53)	Resistor (1 Meg.) (Brown, Black, Green)	33-1096	.20
(54)	Resistor (.5 meg.) (Yellow, White, Yellow)	6097	.20
(55)	Resistor (70000 ohms) (Violet, Black, Orange)	5385	.20
(56)	Resistor (99000 ohms) (White, White, Yellow)	6099	.20
(57)	Condenser (.1 Mfd. Tubular)	30-4122	.35
(58)	Resistor (.5 meg.) (Yellow, White, Yellow)	6097	.20
(59)	Condenser (.02 Mfd. Tubular)	30-4113	.30
(60)	Tone Control	30-4316	.75
(61)	Condenser in Tone Control	Part of (60)	....
(61)A	Condenser (.003 Mfd. Tubular)	30-4042	.25
(62)	Output Transformer	32-7019	1.25
(63)	Voice Coil & Cone Assembly (S-14 Speaker)	36-3157	.80
(64)	Field Coil & Pot Assembly (S-14 Speaker)	36-3495	2.75
(65)	Resistor (1000 ohms) (Brown, Black, Red)	5837	.20
(66)	Condenser (.3 Mfd. Bakelite Block)	6287-DU	.40
(67)	Condenser (8 Mfd. & 8 Mfd. Electrolytic)	30-2079	2.40
(68)	Condenser (.25 Mfd. Tubular)	30-4146	.40
(69)	Condenser (.015 Mfd. Bakelite Block)	3793-DG	.40
(70)	Resistor (BC Wirewound, 22 ohms, 235 ohms)	33-3037	.20
(71)	Power Transformer (115 Volts 60 Cycles)	32-7381	4.00
	(115 Volts 25 Cycles)	32-7382	6.25
	(230 Volts 50 Cycles)	33-7383	4.50
(72)	Condenser (.1 Mfd. Tubular)	30-4122	.35
(73)	Resistor (330,000 ohms) (Orange, Orange, Yellow)	33-1200	.20
(74)	Pilot Lamp	34-2064	.09

PHILCO RADIO & TELEV. CORP.

MODEL 620
Alignment, Data
Socket, Trimmers

Model 620

Type Circuit: Superheterodyne, with preselector R.F. amplifier, and pentode output (3 watts); built in connections for Philco All-wave aerial; aerial selector built into and operated by wave-band switch.

Power Supply: Alternating Current. Voltage and frequency as specified on chassis nameplate.

Tubes Used: 1 type 78, R.F.; 1 type 6A7, Detector-Oscillator; 1 type 78, I.F.; 1 type 75, 2d Detector and 1st A.F.; 1 type 42 Output; 1 type 80 Rectifier.

Wave Bands: Three—(1) standard (with some Police); (2) Police, Aircraft and Amateur; (3) Short-wave.

Coverage of Each Band: Band 1, 540-1720 K.C.; Band 2, 1750 to 5800 K.C. (1.75-5.8 megacycles); Band 3, 5700-18000 K.C. (5.7 to 18.0 megacycles).

Tuning Drive: Two-speed gear drive, ball bearing. 50 to 1 ratio for slow-speed tuning.

Tone Control: 3-position, with bass compensation effective in first position.

Intermediate Frequency: 460 K.C.

Power Consumption: 65 watts.

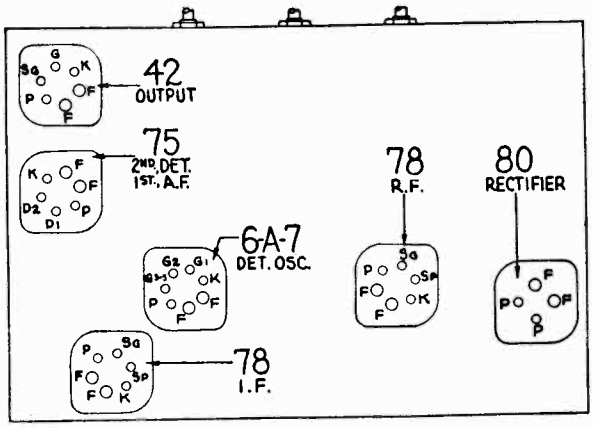


Fig. 1. Tube Sockets as viewed from bottom.

Adjusting Compensating Condensers

The adjustment of the compensating condensers in Model 620 requires a signal generator covering the broadcast and police band, and also one capable of producing a signal at certain frequencies in the short wave band. Philco Model 088 All-wave signal generator is ideal for these requirements. Or you can use the Philco Model 024 or 048A instrument for the broadcast frequencies, and the Model 091 crystal controlled short wave signal generator for the "short-wave" frequencies. The location of all compensating condensers is shown in Fig. 2. An output meter is also needed, such as in Philco Model 025.

Adjustment of I. F.

1. Remove the antenna connection from the receiver, disconnect the grid clip from the first detector (type 6A7 tube), and connect the "ANT" output terminal of the broadcast signal generator to the grid cap of this tube; connect the "GND" terminal of the signal generator to the "GND" terminal of the receiver.

2. Connect the 0 to 30 volt range of the output meter in the Philco 048A or 025 unit to the plate and cathode of the output tube or to the two bottom prongs of the speaker plug.

3. Adjust the signal generator to a frequency of 460 K.C. Place the receiver in operation with the dial turned to the low frequency end of the standard broadcast band, wave band switch to extreme left (clockwise), and have the volume control adjusted near its maximum setting. Adjust the signal generator attenuator for approximately half-scale reading of the output meter.

4. The I.F. compensating condensers are located at the tops of the I.F. coil shields. The primary is adjusted by turning the screw in top and the secondary by the nut. Adjust condensers ㊱ and ㊳ (2d I.F. primary and secondary) for maximum reading in the output meter, and then condensers ㉛ and ㉝ (1st I.F. primary and secondary).

Adjustment of Wave-Trap

1. Connect the signal generator leads to the antenna and ground terminals of the receiver. Replace the grid clip on the 6A7 grid cap.

2. With the wave-band switch of the receiver still in the extreme left (standard band), (540-1720 K.C.), turn the station selector to 55.

3 With the signal generator in operation at 460 K.C., adjust the wave-trap ② condenser until a MINIMUM reading is obtained on the output meter. The Philco fibre wrench, part No. 3164, is used for this adjustment. The wave-trap compensator is reached from rear of chassis.

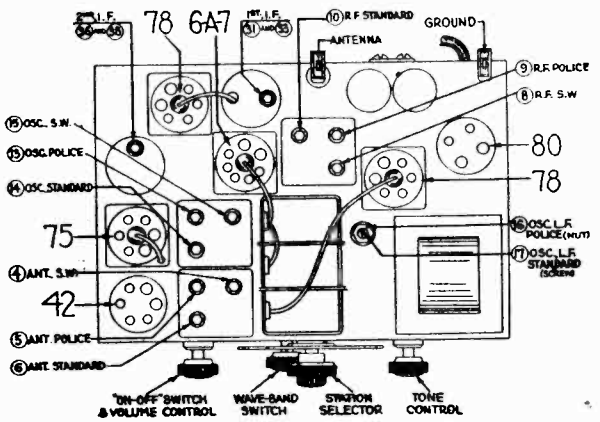


Fig. 2. Locations of Compensating Condensers

Adjustment of High and Low Frequency Compensators

1. With the wave-band switch still at Range No. 1 (broadcast band), set the dial at 1700 K.C. Set the signal generator at this frequency and adjust compensators ⑭, ⑧ and ⑩ for maximum output. These are the oscillator, antenna, and R.F. standard" compensators respectively.

2. Tune the receiver and the signal generator to 600 K.C. and adjust compensator ⑰ (screw) for maximum output. This is the oscillator L.F. standard compensator.

3. Turn the waveband switch to the second (middle) position. Set the dial at 3.6 M.C., at which point the fundamental of the 091 signal will be heard. If the Model 088 signal generator is being used, set it at 3.6 M.C. Adjust condensers ⑬, ⑤ and ⑨ in succession. These are the oscillator, antenna and R.F. police band adjustments.

4. Turn the tuning dial to 1.8 M.C., and set the signal generator (Model 024 or Model 088) at 1800 K.C. Adjust condenser ⑯ (Osc. L.F., police) (nut), to maximum signal.

5. Turn the wave-band switch to Band 3 (extreme right) and adjust the station selector to 18.0 megacycles. Set the signal generator at 18 M.C. By means of the Philco wrench, part No. 3164, adjust the oscillator S.W., antenna S.W. and R.F. S.W. compensators for maximum reading in the output meter. These are numbered ⑱, ④ and ⑧ respectively in figure No. 2.

MODEL 623
Chassis, Parts

PHILCO RADIO & TELEV. CORP.

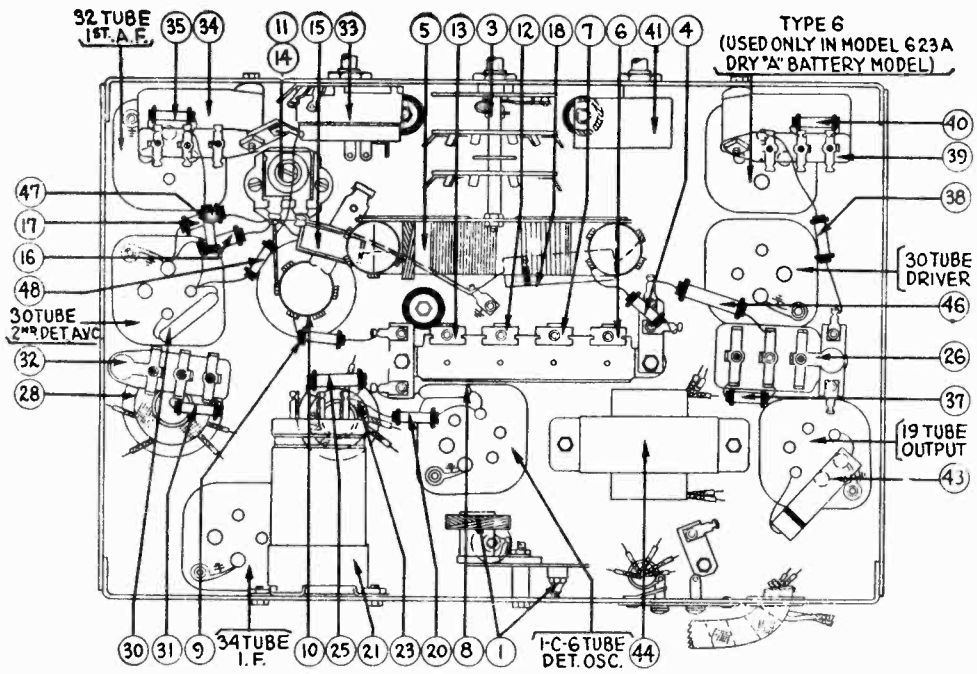


Fig. 4

Replacement Parts—Model 623

Nos. in Figs. 3 & 4	Description	Part No.	List Price
①	Wave Trap	38-6850	$1.10
②	Condenser (Capacity obtained by Twisted Wires)	.....	....
③	Waveband Switch	42-1112	1.10
④	Resistor (10000 ohms) (Brown, Black, Orange)	33-1000	.20
⑤	Antenna Transformer	32-1669	1.15
⑥	Compensating Condenser (Ant. Standard)	Part of 31-6047	.50
⑦	Compensating Condenser (Ant. S.W.)	Part of 31-6047	
⑧	Condenser (.00025 Mfd. Mica)	30-1032	.35
⑨	Resistor (20 ohms) (Red, Black, Black)	33-1206	.20
⑩	Oscillator Transformer	32-1831	1.50
⑪	Compensating Condenser (Osc. L.F. Standard)	Part of 31-6027	.70
⑫	Compensating Condenser (Osc. S.W., H.F. End)	Part of 31-6047	.50
⑬	Compensating Condenser (Osc. H.F. Standard)	Part of 31-6047	
⑭	Compensating Condenser (Osc. S.W. Series)	Part of 31-6027	.70
⑮	Condenser (.00225 Mfd. Mica)	30-1055	.40
⑯	Resistor (25000 ohms) (Red, Green, Orange)	33-1013	.20
⑰	Resistor (25000 ohms) (Red, Green, Orange)	33-1013	.20
⑱	Condenser (.05 Mfd. Tubular)	30-4020	.35
⑲	Tuning Condenser Assembly	31-1526	2.75
⑳	Resistor (5000 ohms) (Green, Black, Red)	6096	.20
㉑	Condenser (Electrolytic) (4 Mfd., 8 Mfd., 2 Mfd.)	30-2127	1.50
㉒	Compensating Condenser (1st I.F. Primary)	Part of ㉔	....
㉓	1st I.F. Transformer	32-1793	1.35
㉔	Compensating Condenser (1st I.F. Secondary)	Part of ㉔	....
㉕	Resistor (2000 ohms) (Red, Black, Red)	33-1028	.20
㉖	Condenser (.15 Mfd. Bakelite Block)	6287-SG	.35
㉗	Compensating Condenser (2nd I.F. Primary)	Part of ㉙	....
㉘	2nd I.F. Transformer	32-1672	1.35
㉙	Compensating Condenser (2nd I.F. Secondary)	Part of ㉙	....
㉚	Condenser (.006 Mfd. Mica)	6359	.60
㉛	Resistor (50000 ohms) (Green, Brown, Orange)	6098	.20
㉜	Condenser (.00011 Mfd. Twin Bakelite Block)	8035-DG	.25
㉝	Volume Control and On-Off Switch	33-5115	1.45
㉞	Condenser (.01 Mfd. Bakelite Block)	3903-SU	.25
㉟	Resistor (1 Meg.) (Brown, Black, Orange)	33-1096	.20
㊱	Pilot Lamp	34-2065	.35

*Not shown in Fig. 4

Nos. in Figs. 3 & 4	Description	Part No.	List Price
㊲	Resistor (330000 ohms) (Orange, Orange, Yellow)	33-1200	$0.20
㊳	Resistor (250000 ohms) (Red, Yellow, Yellow)	33-1097	.20
㊴	Condenser (.01 Mfd. Bakelite Block)	3903-SU	.25
㊵	Resistor (.5 Meg.) (Yellow, White, Yellow)	6097	.20
㊶	Tone Control	30-4344	.50
㊷	Audio Transformer (On Top of Chassis)	32-7454	1.60
㊸	Condenser (.002 Mfd. Tubular)	30-4177	.25
㊹	Output Transformer (On Chassis)	32-7453	1.50
㊺	Cone & Voice Coil Assembly (KR-8 Speaker)	36-3159	.80
㊻	Resistor (1000 ohms) (Brown, Black, Red)	5837	.20
㊼	Resistor (2 Meg.) (Red, Black, Green)	33-1025	.20
㊽	Resistor (2 Meg.) (Red, Black, Green)	33-1025	.20
*㊾	Condenser (.00015 Mfd. Mica)	30-1033	.35
*㊿	Resistor (.5 Meg.) (Yellow, White, Yellow)	6097	.20
	Dial Scale	27-5097	.25
	Dial Hub Assembly	31-1550	.15
	Dial Spring Clamp	28-2837	.10
	‡Bezel (623-B)	‡28-3163	.50
	‡‡Bezel Glass (623-B)	‡‡27-8006	.55
	Tube Socket (4-Prong)	27-6044	.10
	Tube Socket (6-Prong)	27-6036	.11
	Tube Shield (Round)	8005	.10
	Tube Shield Base (Round)	8004	.01
	Tube Shield (Square)	28-2726	.10
	Tube Shield Base (Square)	28-2725	.03
	Knob (Waveband)	27-4219	.10
	Knob (Tone, Volume)	27-4208	.10
	Knob (Station Selector)	27-4206	.12
	Knob (Slow Speed)	27-4207	.10
	Chassis Mtg. Screw	W-1496A	1.60 C
	Chassis Mtg. Washer (Rubber)	27-4198	.01
	Chassis Mtg. Bumper (Rubber)	27-4197	2.50 per C
	Battery Cable	41-3143	1.25
	Ballast Tube Socket Jumper Wire	28-8061	.014
	‡623-F Bezel	28-3164	.50
	‡‡623-F Bezel Glass	27-8007	.55

MODEL 623
Schematic
Socket, Trimmers

PHILCO RADIO & TELEV. CORP.

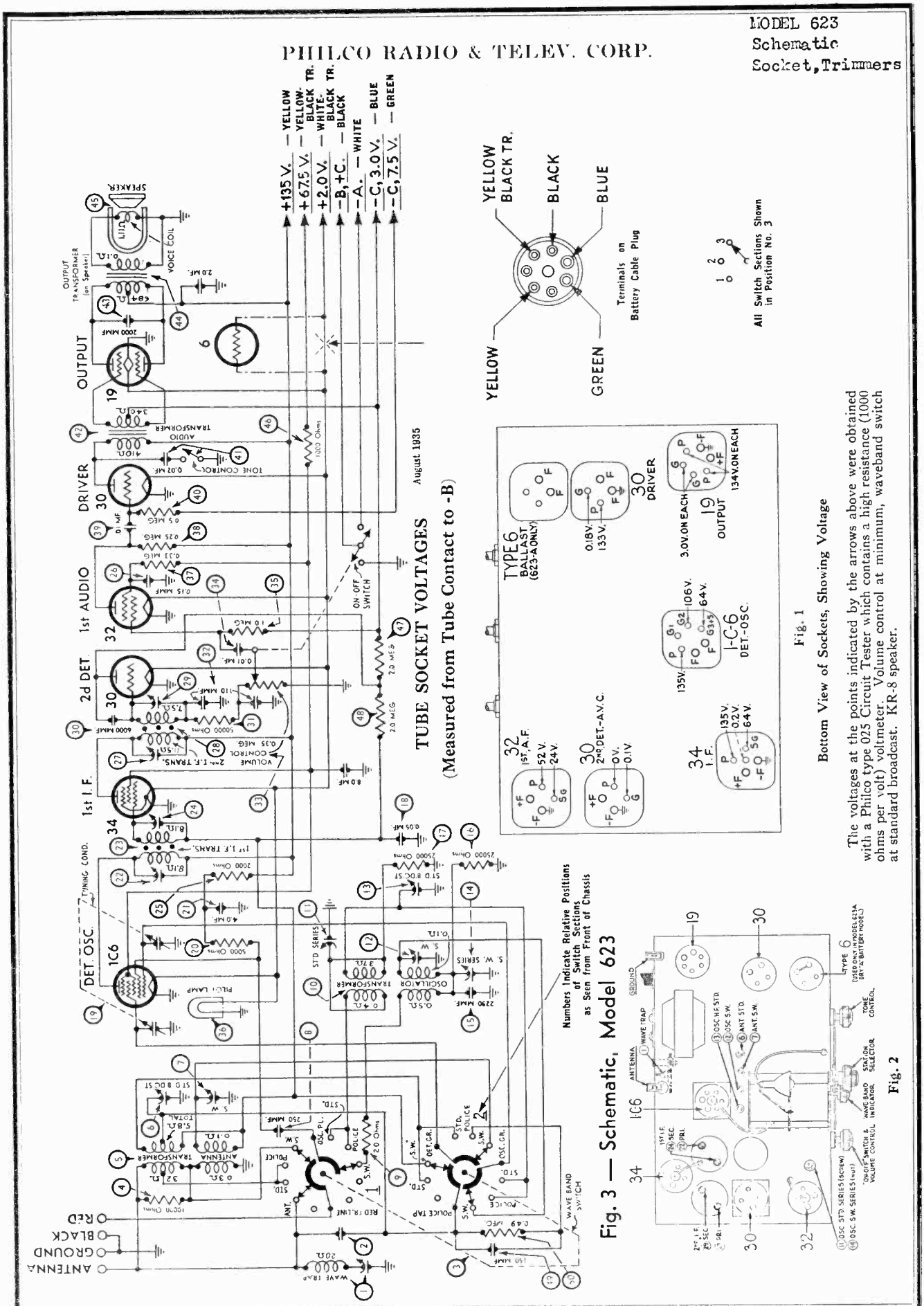


Fig. 1

Bottom View of Sockets, Showing Voltage

The voltages at the points indicated by the arrows above were obtained with a Philco type 025 Circuit Tester which contains a high resistance (1000 ohms per volt) voltmeter. Volume control at minimum, waveband switch at standard broadcast. KR-8 speaker.

Fig. 3 — Schematic, Model 623

Fig. 2

John F. Rider, Publisher

MODEL 623
Alignment, Data

PHILCO RADIO & TELEV. CORP.

Model 623

Adjusting Compensating Condensers

General Specifications

Type Circuit: Superheterodyne, with Class B output; built in connections for Philco All-wave aerial; aerial selector built into and operated by wave-band switch.

Power Supply: Battery operated; Model 623 uses a 2-volt storage battery (Philco 172-R). Model 623-A uses dry A battery (Philco P-896). Both sets use a dry combination "B" & "C" battery unit (Philco P-9068). This has a socket into which the plug on the battery cable attached to chassis is to be inserted.

Tubes Used: 1 type 1C6, Detector-Oscillator; 1 type 34, I.F.; 1 type 30, 2d Detector and A.V.C.; 1 type 32 1st A.F.; 1 type 30, driver; 1 type 19 output. Model 623-A has also a ballast tube, type 6, to maintain constant filament voltage on all tubes. The socket for this tube exists in both 623 and 623-A chassis, but in the former, the type 6 tube is not used, and the filament contacts of the socket are shorted by a metal jumper.

Wave Bands: Three—(1) Standard (with some Police); (2) Police; (3) Short-wave.

Coverage of Each Band: Band 1, 530–1720 K.C.; Band 2, 2300 to 2500 K.C. (2.3–2.5 M.C.); Band 3, 5700–18,000 K.C. (5.7 to 18.0 megacycles).

Tuning Drive: Dual gear drive, ball bearing. 50 to 1 ratio for slow-speed tuning, 6 to 1 on main shaft.

Tone Control: 2-Position.

Intermediate Frequency: 460 K.C.

Current Consumption: A battery, .67A; B battery, 19 M.A.

The adjustment of the compensating condensers in Model 623 requires a signal generator covering the broadcast and police band, and also one capable of producing a signal at certain frequencies in the short wave band. The Philco Model 088 All-Wave Signal Generator covers these requirements perfectly. An output meter is also required. Philco Model 025 or 012 unit is recommended. The location of all compensating condensers is shown in Fig. 2.

Adjustment of I.F.

1. Remove the antenna connection from the receiver, disconnect the grid clip from the first detector (type 1C6 tube), and connect the "ANT" output terminal of the signal generator to the grid cap of this tube; connect the "GND" terminal of the signal generator to the "GND" terminal of the receiver.

2. Connect the "025" output meter adapter leads to the plate and one filament contact of the type 30 driver tube. Set it at the 0–30 volt range.

Adjustment of High and Low Frequency Compensators

1. With the wave-band switch still at Position No. 1 (broadcast band), set the dial at 150 K.C. Set the signal generator at 1.5 M. C. and adjust compensators ⑬ and ⑥ for maximum output. These are the oscillator and antenna "H.F. standard" compensators respectively.

2. Tune the receiver and the signal generator to 600 K.C. and adjust compensator ⑪ (screw) for maximum output. This is the oscillator standard series (L.F.) compensator.

3. Turn the wave-band switch to the extreme right (short-wave band) and adjust the station selector to 18.0 megacycles. Set the signal generator at 18 M.C. Adjust the oscillator S.W., and antenna S.W. compensators for maximum reading in the output meter. These are numbered ⑫ and ⑦ respectively in figure No. 2.

4. Turn the tuning dial to 6.0 M.C., set the signal generator at 6.0 M.C., and adjust condenser ⑭ osc. series (S.W.) (nut) to maximum signal.

3. Adjust the signal generator to a frequency of 460 K.C. Place the receiver in operation with the dial turned to the low frequency end of the standard broadcast band, wave band switch to extreme left (clockwise), and have the volume control adjusted near its maximum setting. Adjust the signal generator attenuator for approximately half-scale reading of the output meter.

4. The I.F. compensating condensers are located at the tops of the I.F. coil shields and adjusted by turning the two screws in top. Adjust condensers ㉗ and ㉙ (2d I.F. primary and secondary) for maximum reading in the output meter, and then condensers ㉒ and ㉔ (1st I.F. primary and secondary).

Adjustment of Wave-Trap

1. Connect the signal generator leads to the antenna and ground terminals of the receiver. Replace the grid clip on the 1C6 grid cap.

2. With the wave-band switch of the receiver still in the extreme left (broadcast position), turn the station selector to 550 K.C.

3. With the signal generator in operation at 460 K.C., adjust the wave-trap ① condenser until a MINIMUM reading is obtained on the output meter. The wave-trap compensator is reached from rear of chassis.

MODEL 630
Schematic

PHILCO RADIO & TELEV. CORP.

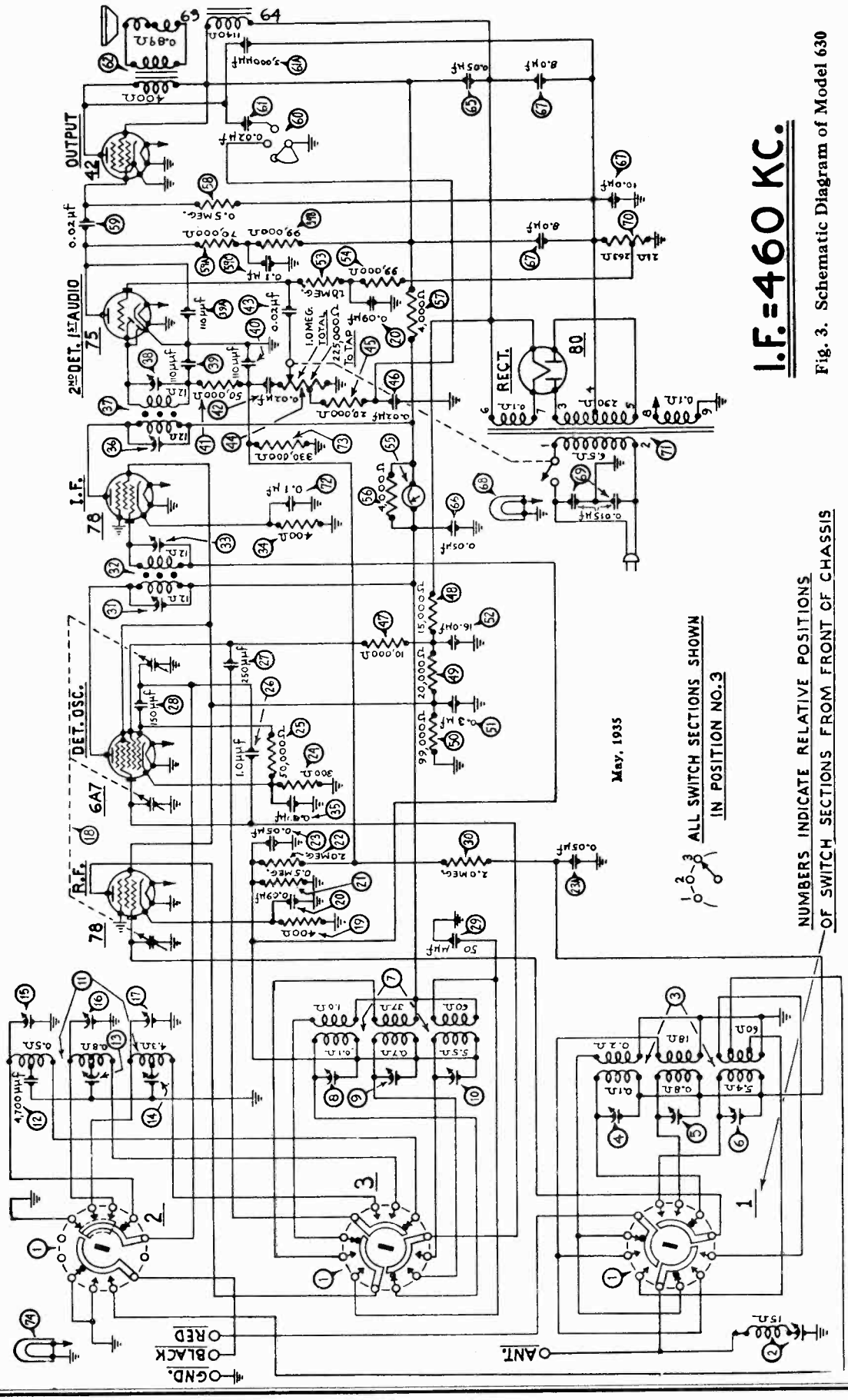


Fig. 3. Schematic Diagram of Model 630

MODEL 630
Voltage, Trimmers
Chassis, Alignment
Data

PHILCO RADIO & TELEV. CORP.

Type Circuit: Superheterodyne, with preselector R.F. amplifier, and pentode output (5 watts); built in connections for Philco All-wave aerial; aerial selector built into and operated by wave-band switch.

Power Supply: Alternating Current. Voltage and frequency as specified on chassis nameplate.

Tubes Used: 1 type 78, R.F.; 1 type 6A7, Detector-Oscillator; 1 type 78, I.F.; 1 type 75, 2d Detector and 1st A.F.; 1 type 42 Output; 1 type 80 Rectifier.

Wave Bands: Three—(1) standard (with some Police); (2) Police, Aircraft and Amateur; (3) Short-wave.

Coverage of Each Band: Band 1, 540-1720 K.C.; Band 2, 1750 to 5800 K.C. (1.75-5.8 megacycles); Band 3, 5700-18000 K.C. (5.7 to 18.0 megacycles).

Tuning Drive: Two-speed gear drive, ball bearing. 50 to 1 ratio for slow-speed tuning.

Tone Control: 3-position, with bass compensation effective in first position.

Intermediate Frequency: 460 K.C.

Power Consumption: 70 watts.

Tube Socket Voltages
Measured to Ground

Tube	78 R.F.	6A7 Det. Osc.	78 I.F.	75 2d Det.	42 Output
Point P	245	245	245	188	298
SG	102	102	102	. .	311
K	2 7	2.6	2.6	. . .	. .
	6A7: $G_{3\ \&\ 5}$ = 175				

Above voltages were obtained by using a PHILCO type 025 Circuit Tester (or 048A All-purpose Tester), using test prods applied to underside of chassis. Volume control at maximum; dial at 55; waveband switch counter-clockwise (band 1). Use Fig. 1 for test points. Line voltage 115 volts.

Adjustment of High and Low Frequency Compensators

1. With the wave-band switch still at Range No. 1 (broadcast band), set the dial at 1700 K.C. Set the signal generator at this frequency and adjust compensators ⑭, ⑥ and ⑩ for maximum output. These are the oscillator, antenna, and R.F. "standard" compensators respectively.

2. Tune the receiver and the signal generator to 600 K.C and adjust compensator ⑰ (screw) for maximum output This is the oscillator L.F. standard compensator.

3. Turn the waveband switch to the second (middle) position. Set the dial at 3.6 M.C. at which point the fundamental of the 091 signal will be heard. If the Model 088 Signal Generator is being used, set it at 3.6 M.C. Adjust condensers ⑬, ⑤ and ⑨ in succession. These are the oscillator, antenna and R.F. police band adjustments.

4. Turn the tuning dial to 1.8 M.C., and set the signal generator (Model 026 or Model 088) at 1800 K.C. Adjust condenser ⑯ (Osc. L.F., police) (nut), to maximum signal.

5. Turn the wave-band switch to Band 3 (extreme right) and adjust the station selector to 18.0 megacycles. Set the signal generator at 18 M.C. By means of the Philco wrench, part No. 3164, adjust the oscillator S.W., antenna S.W. and R.F. S.W. compensators for maximum reading in the output meter. These are numbered ⑮, ④ and ⑧ respectively in figure No. 2.

Power Transformer Data

Terminals	A.C. Volts	Current	Circuit	Color
1–2	120	. . . . .	Primary	White
3–5	746	78 M.A.	Secondary	Yellow
6–7	5.0	2.0 A.	Fil. Rect.	Blue
8–9	6.3	2.25 A.	Filaments	Black
4	. . .	. . . . .	Center Tap of 3-5	Yellow, Green Tracer

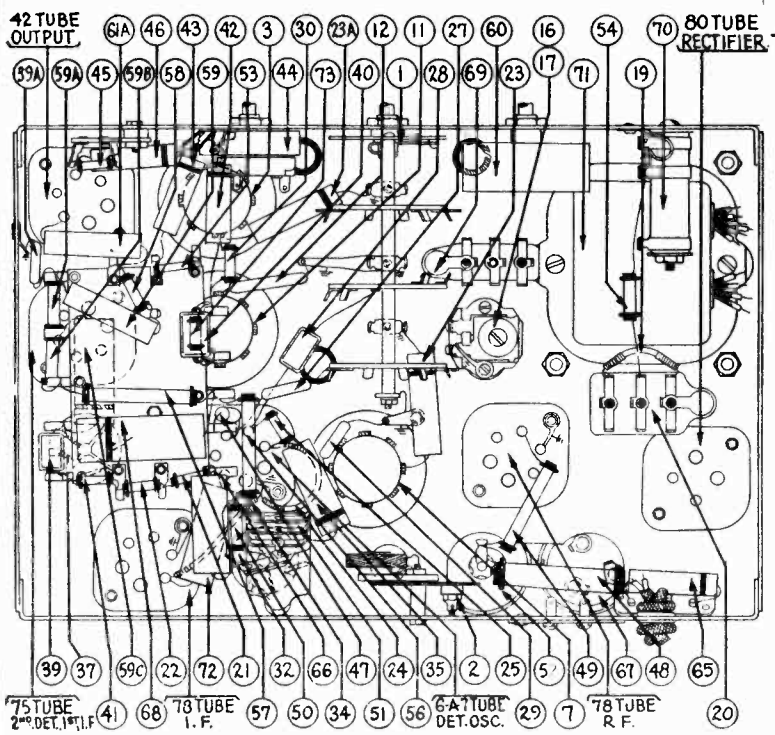


Fig. 4 Bottom View of Chassis

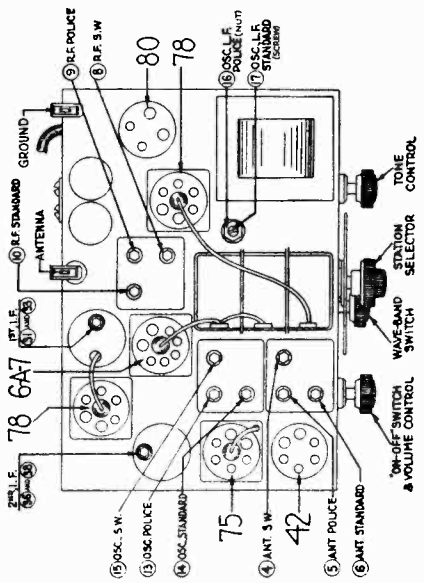


Fig. 2. Location of Compensating Condensers

PHILCO RADIO & TELEV. CORP.

MODEL 630
Alignment,Part 2
Socket,Parts

Replacement Parts—Model 630

	Description	Part No.	List Price
①	Wave Band Switch	42-1107	$1.75
②	Wavetrap	38-6850	1.10
③	Antenna Transformer	32-1699	3.00
④	Compensating Condenser (Ant. S.W.)	Part of ③	....
⑤	Compensating Condenser (Ant. Police)	Part of ③	....
⑥	Compensating Condenser (Ant. Standard)	Part of ③	....
⑦	R. F. Transformer	32-1636	3.25
⑧	Compensating Condenser (R.F. Short-Wave)	Part of ⑦	....
⑨	Compensating Condenser (R.F. Police)	Part of ⑦	....
⑩	Compensating Condenser (R.F. Standard)	Part of ⑦	....
⑪	Oscillator Transformer	32-1637	2.50
⑫	Condenser (.0047 Mfd. Mica)	30-1052	.60
⑬	Compensating Condenser (Osc. Police)	Part of ⑪	....
⑭	Compensating Condenser (Osc. H. F. Standard)	Part of ⑪	....
⑮	Compensating Condenser (Osc. S. W.)	Part of ⑪	....
⑯	Compensating Condenser (Osc. L.F. Police)	Part of 31-6027	.70
⑰	Compensating Condenser (Osc. L.F. Standard)	Part of 31-6027	
⑱	Tuning Condenser Assembly	31-1526	2.75
⑲	Resistor (400 ohms Flexible) (Yellow, Black, Brown)	33-3016	.20
⑳	Condenser (.09 Mfd. Twin Bakelite Block)	4989-DG	.40
㉑	Resistor (.5 Meg.) (Yellow, White, Yellow)	6097	.20
㉒	Resistor (2 Megs.) (Red, Black, Green)	33-1025	.20
㉓	Condenser (.05 Mfd. Tubular)	30-4020	.35
㉓a	Condenser (.05 Mfd. Tubular)	30-4020	.35
㉔	Resistor (300 ohms Flexible) (Orange, Black, Brown)	33-3010	.20
㉕	Resistor (50000 ohms) (Green, Brown, Orange)	6098	.20
㉖	Condenser (1 Mmfd.)	Part of ⑱	....
㉗	Condenser (.00025 Mfd. Mica)	30-1032	.35
㉘	Condenser (.00015 Mfd. Mica)	30-1033	.35
㉙	Condenser (.00005 Mfd. Mica)	30-1029	.35
㉚	Resistor (2 Megs.) (Red, Black, Green)	33-1025	.20
㉛	Compensating Condenser (1st I.F. Primary)	Part of ㉜	....
㉜	1st I.F. Transformer	32-1646	$2.25
㉝	Compensating Condenser (1st I.F. Secondary)	Part of ㉜	....
㉞	Resistor (400 ohms Flexible) (Yellow, Black, Brown)	33-3016	.20
㉟	Condenser (.1 Mfd. Tubular)	30-4122	.35
㊱	Compensating Condenser (2nd I.F. Pri.)	Part of ㊲	....
㊲	2nd I.F. Transformer	32-1647	2.25
㊳	Compensating Condenser (2nd I.F. Sec.)	Part of ㊲	....
㊴	Condenser (.00011 Mfd. Mica)	30-1031	.35
㊴a	Condenser (.00011 Mfd. Mica)	30-1031	.35
㊵	Condenser (.00011 Mfd. Mica)	30-1031	.35
㊶	Resistor (50000 ohms) (Green, Brown, Orange)	6098	.20
㊷	Condenser (.02 Mfd. Tubular)	30-4215	.30
㊸	Condenser (.02 Mfd. Tubular)	30-4215	.30
㊹	Volume Control and On-Off Switch	33-5105	1.45
㊺	Resistor (20000 ohms) (Red, Black, Orange)	33-1178	.20
㊻	Condenser (.02 Mfd. Tubular)	30-4215	.30
㊼	Resistor (10000 ohms) (Brown, Black, Orange)	4412	.20
㊽	Resistor (15000 ohms) (Brown, Black, Orange)	5718	.35
㊾	Resistor (20000 ohms) (Red, Black, Orange)	6649*	.20
㊿	Resistor (99000 ohms) (White, White, Orange)	6099‡	.20
(51)	Condenser (.3 Mfd. Bakelite Block)	6287-DG	.40
(52)	Condenser (16 Mfd. Electrolytic)	30-2118	1.65
(53)	Resistor (1 Meg.) (Brown, Black, Green)	33-1096	.20
(54)	Resistor (99000 ohms) (White, White, Orange)	6099	.20
(55)	Shadow Tuning Meter	45-2086	2.00
(56)	Resistor (4000 ohms) (Yellow, Black, Red)	33-1040	.20
(57)	Resistor (4000 ohms) (Yellow, Black, Red)	7832	.20
(58)	Resistor (.5 meg.) (Yellow, White, Yellow)	6097	.20
(59)	Condenser (.02 Mfd. Tubular)	30-4113	.30
(59)a	Resistor (70000 ohms) (Violet, Black, Orange)	5385	.20
(59)b	Resistor (99000 ohms) (White, White, Orange)	6099	.20
(59)c	Condenser (.1 Mfd. Tubular)	30-4122	.35
(60)	Tone Control (3 position)	30-4332	.75
(61)	Condenser in Tone Control	Part of (60)	....
(61)a	Condenser (.003 Mfd. Tubular)	30-4042	.25
(62)	Output Transformer	32-7178	1.60
(63)	Voice Coil & Cone Assembly (K-32)	36-3159	.80
(64)	Field Coil & Pot Assembly (K-32)	36-3498	3.25
(65)	Condenser (.05 Mfd. Tubular)	30-4020	.35
(66)	Condenser (.05 Mfd. Tubular)	30-4020	.35
(67)	Condenser (8 Mfd., 8 Mfd., 10 Mfd. Electrolytic)	30-2073	2.15
(68)	Pilot Lamp (Shadow Tuning Meter)	Part of (55)	....
(69)	Condenser (.015 Mfd. Twin Bakelite Block)	3793-DG	.40
(70)	Resistor (BC Wires and -21 ohms, 263 ohms)	33-3069	.25
(71)	Power Transformer (115 Volts 60 Cycles)	32-7384	5.50
	(115 Volts 25 Cycles)	32-7385	7.75
	(230 Volts 50 Cycles)	33-7386	5.75
(72)	Condenser (.1 Mfd. Tubular)	30-4122	.35
(73)	Resistor (330,000 ohms) (Orange, Orange, Yellow)	33-1200	.20
(74)	Pilot Lamp	34-2064	.09

*After Run 2, this is 10000 ohms, Part 3524.
‡After Run 2, this is 20000 ohms, Part 6650

Adjusting Compensating Condensers

The adjustment of the compensating condensers in Model 630 requires a signal generator covering the broadcast and police band, and also one capable of producing a signal at certain frequencies in the short wave band. Philco Model 088 All-wave signal generator is ideal for these requirements. Or you can use the Philco Model 024 or 048A instrument for the broadcast frequencies, and the Model 091 crystal controlled short wave signal generator for the "short wave" frequencies. The location of all compensating condensers is shown in Fig. 2. An output meter is also needed, such as in Philco Model 025

Adjustment of I. F.

1. Remove the antenna connection from the receiver, disconnect the grid clip from the first detector (type 6A7 tube), and connect the "ANT" output terminal of the broadcast signal generator to the grid cap of this tube; connect the "GND" terminal of the signal generator to the "GND" terminal of the receiver.

2. Connect the 0 to 30 volt range of the output meter in the Philco 048A or 025 unit to the plate and cathode of the output tube or to the two bottom prongs of the speaker plug.

3. Adjust the signal generator to a frequency of 460 K.C. Place the receiver in operation with the dial turned to the low frequency end of the standard broadcast band, wave band switch to extreme left (clockwise), and have the volume control adjusted near its maximum setting. Adjust the signal generator attenuator for approximately half-scale reading of the output meter.

4. The I.F. compensating condensers are located at the tops of the I.F. coil shields. The primary is adjusted by turning the screw in top and the secondary by the nut. Adjust condensers ㊱ and ㊳ (2d I.F. primary and secondary) for maximum reading in the output meter, and then condensers ㉑ and ㉓ (1st I.F. primary and secondary).

Adjustment of Wave-Trap

1. Connect the signal generator leads to the antenna and ground terminals of the receiver. Replace the grid clip on the 6A7 grid cap.

2. With the wave-band switch of the receiver still in the extreme left (standard band), (540-1720 K.C.), turn the station selector to 55.

3. With the signal generator in operation at 460 K.C., adjust the wave-trap ② condenser until a MINIMUM reading is obtained on the output meter. The Philco fibre wrench, part No. 3164, is used for this adjustment. The wave-trap compensator is reached from rear of chassis.

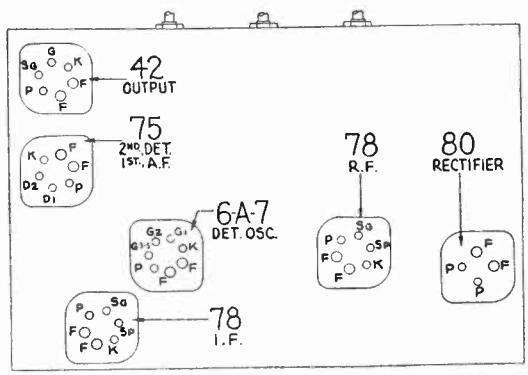


Fig. 1. Tube Sockets as viewed from bottom

MODEL 640
Chassis
Parts

PHILCO RADIO & TELEV. CORP.

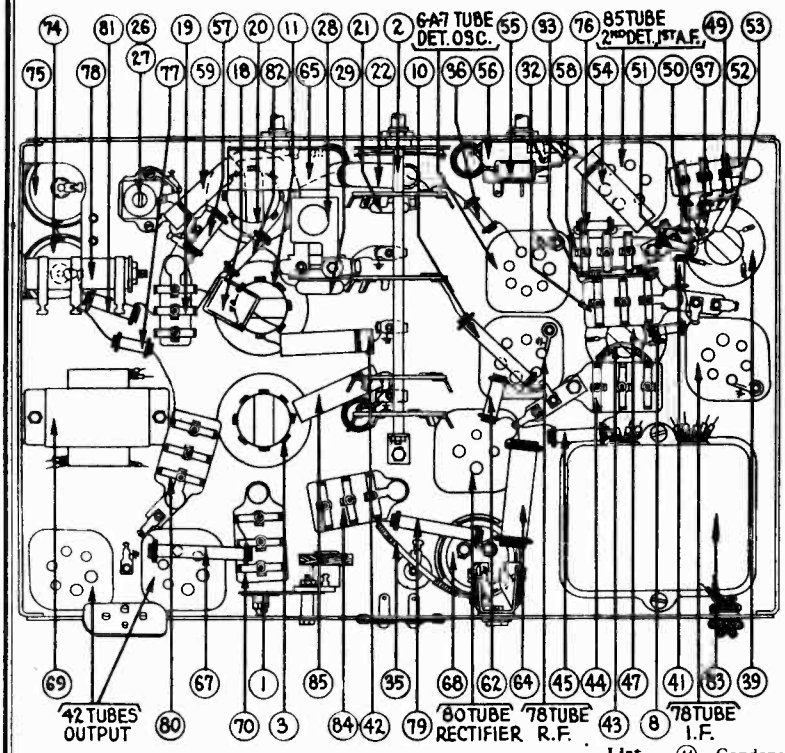


Fig. 3. Bottom View of Chassis

Replacement Parts Model 640

	Description	Part No.	List Price
1	Wave Trap	38-6850	$1.10
2	Waveband Switch	42-1114	2.50
3	Antenna Transformer	32-1708	4.00
4	Compensating Condenser (Ant.) (Police)	Part of 3	....
5	Compensating Condenser (Ant.) (Standard)	Part of 3	....
6	Compensating Condenser (Ant.) (Longwave)	Part of 3	....
7	Compensating Condenser (Ant.) (Shortwave)	Part of 3	....
8	Resistor (.5 meg. (Yellow-White-Yellow)	6097	.20
10	Resistor (25000 ohms) (Red-Green-Yellow)	3656	.20
11	R.F. Transformer	32-1709	3.75
12	Compensating Condenser (R.F. Longwave)	Part of 11	....
13	Compensating Condenser (R.F. Broadcast)	Part of 11	....
14	Compensating Condenser (R.F. Police)	Part of 11	....
15	Compensating Condenser (R.F. Shortwave)	Part of 11	....
16	Condenser	Part of 11	....
17	Condenser	Part of 11	....
18	Condenser (.0018 Mfd. Mica)	6018	.40
19	Condenser (.05 Mfd. Bakelite Block)	3615-SG	.35
20	Oscillator Transformer	32-1710	3.00
21	Condenser (.000015 Mfd. Mica)	30-1030	.35
22	Condenser (.01 Mfd. Tubular)	*30-4145	.25
23	Compensating Condenser (Osc. S.W.)	Part of 22	....
24	Compensating Condenser (Osc. Longwave)	Part of 22	....
25	Compensating Condenser (Osc. B.C. & Police)	Part of 22	....
26	Compensating Condenser (Osc. L.W. Series)	Part of 31-6044	.50
27	Compensating Condenser (Osc. B.C. Series)	Part of 31-6044	
28	Compensating Condenser (Osc. S.W. Series)	04000-R	.45
29	Condenser (.0022 Mfd. Mica)	30-1057	.40
31	Tuning Condenser Assembly	31-1555	4.50
32	Condenser (.09 Mfd. Twin Bakelite)	4989-DG	.40
33	Resistor (300 ohms) (Orange-Black-Black)	33-3010	.20
34	Condenser (.05 Mfd Tubular) (On top of chassis)	30-4327	.20
35	Resistor (300 ohms Flexible) (Orange-Black-Black)	33-3010	.20
36	Resistor (50000 ohms) (Green-Brown-Orange)	6098	.20
37	Resistor (2 Megs. (Red-Black-Green)	33-1025	.20
38	Compensating Condenser (1st I.F. Primary)	Part of 39	....
39	1st I.F. Transformer	32-1711	$2.00
40	Compensating Condenser (1st I.F. Secondary)	Part of 39	....
41	Resistor (2 Megs.) (Red-Black-Green)	33-1025	.20
42	Condenser (.05 Mfd. Tubular)	30-4020	.35
43	Resistor (300 ohms Flexible) (Orange-Black-Black)	33-3010	20
44	Condenser (.05 Mfd. Twin Bakelite Block)	3615-DU	.40
45	Resistor (1000 ohms) (Brown-Black-Red)	5837	.20
46	Compensating Condenser (2d I.F. Primary)	Part of 47	....
47	2d I.F. Transformer	32-1712	2.00
48	Compensating Condenser (2d I.F. Secondary)	Part of 47	....
49	Resistor (330000 ohms) (Orange-Orange-Yellow)	33-1200	.20
50	Resistor (25000 ohms) (Red-Green-Orange)	33-1013	.20
51	Resistor (50000 ohms) (Green-Brown-Orange)	6098	.20
52	Condenser (.00025 Mfd. Bakelite Block)	8317-SG	.25
53	Condenser (.00011 Mfd. Mica)	30-1031	.35
54	Condenser (.05 Mfd. Tubular)	30-4020	.35
55	Condenser (.00011 Mfd. Mica)	30-1031	.35
56	Volume Control and On-Off Switch	33-5113	1.45
57	Resistor (20000 ohms) (Red-Black-Orange)	6650	.20
58	Condenser (.01 Mfd. Bakelite Block)	3903-SU	.35
59	Condenser (.03 Mfd. Mica)	30-4025	.30
60	Condenser (in Tone Control)	Part of 66	....
61	Shadow Tuning Meter	45-2080	2.50
62	Resistor (4000 ohms) (Yellow-Black-Red)	33-1040	.20
63	Pilot Lamp (Shadow Tuning Meter)	Part of 61	....
64	Resistor (16000 ohms) (Brown-Blue-Orange)	33-1201	.35
65	Tone Control	30-4333	.75
66	Condensers in Tone Control	Part of 65	....
67	Resistor (32000 ohms) (Orange-Red-Orange)	3525	.20
68	Condenser (Electrolytic) (2 Mfd., 2 Mfd., 1 Mfd.)	30-2114	2.25
69	Audio Transformer	32-7471	2.10
70	Condenser (.002 Mfd. Twin Bakelite Block)	7296-DU	.30
72	Voice Coil & Cone Assembly	K-31	36-3159	.80
		H-21	02625	1.20
73	Field Coil & Pot Assembly	K-31	36-3463	3.75
		H-21	36-3461	3.75
74	Condenser (8 Mfd. Electrolytic)	30-2025	1.35
75	Condenser (12 Mfd. Electrolytic)	30-2117	1.50
76	Resistor (1 Meg.) (Brown-Black-Green)	33-1171	.20
77	Resistor (.5 Meg.) (Yellow-White-Yellow)	33-1169	.20
78	Resistor (B.C. Wirewound, 60 Ohms, 100 Ohms)	33-3208	.20
79	Resistor (20000 ohms) (Red-Black-Orange)	6649	.20
80	Condenser (.09 Mfd. Twin Bakelite Block)	4989-DG	.40
81	Resistor (15000 ohms) (Brown-Green-Orange)	6208	.20
82	Resistor (15000 ohms) (Brown-Green-Orange)	6208	.20
83	Power Transformer (115 Volts 60 Cycles)	32-7462	6.00
84	Condenser (.015 Mfd Twin Bakelite Block)	3793-DG	.40
85	Condenser (.05 Mfd. Tubular)	30-4020	.35

*After Run 2, this is 30-1032 Mica, List .35.

Description	Part No.	List Price
Dial Scale	27-5103	.30
Dial Hub and Set Screw Assembly	31-1550	.15
Dial Spring Clamp	28-2837	.10
Tube Shield	28-2726	.10
Tube Shield Base	28-2725	.03
Socket (4-Prong)	27-6034	.10
Socket (6-Prong)	27-6036	.11
Socket (7-Prong)	27-6037	.11
Socket (Speaker Plug)	27-6033	.08
Knob (Station Selector)	27-4206	.12
Knob (Fine Tuning)	27-4207	.10
Knob (Waveband)	27-4219	.10
Knob (Volume Control or Tone Control)	27-4208	.10
Bezel	28-2933	.35
Glass	27-7931	.60
Chassis Mtg. Screw	W-1495	1.50 per C
Chassis Mtg. Washer	27-4198	.01
Chassis Mtg. Rubber Bumper	27-4197	..

MODEL 640
Schematic

PHILCO RADIO & TELEV. CORP.

I.F.=460 KC.

ALL SWITCH SECTIONS SHOWN IN POSITION NO.4

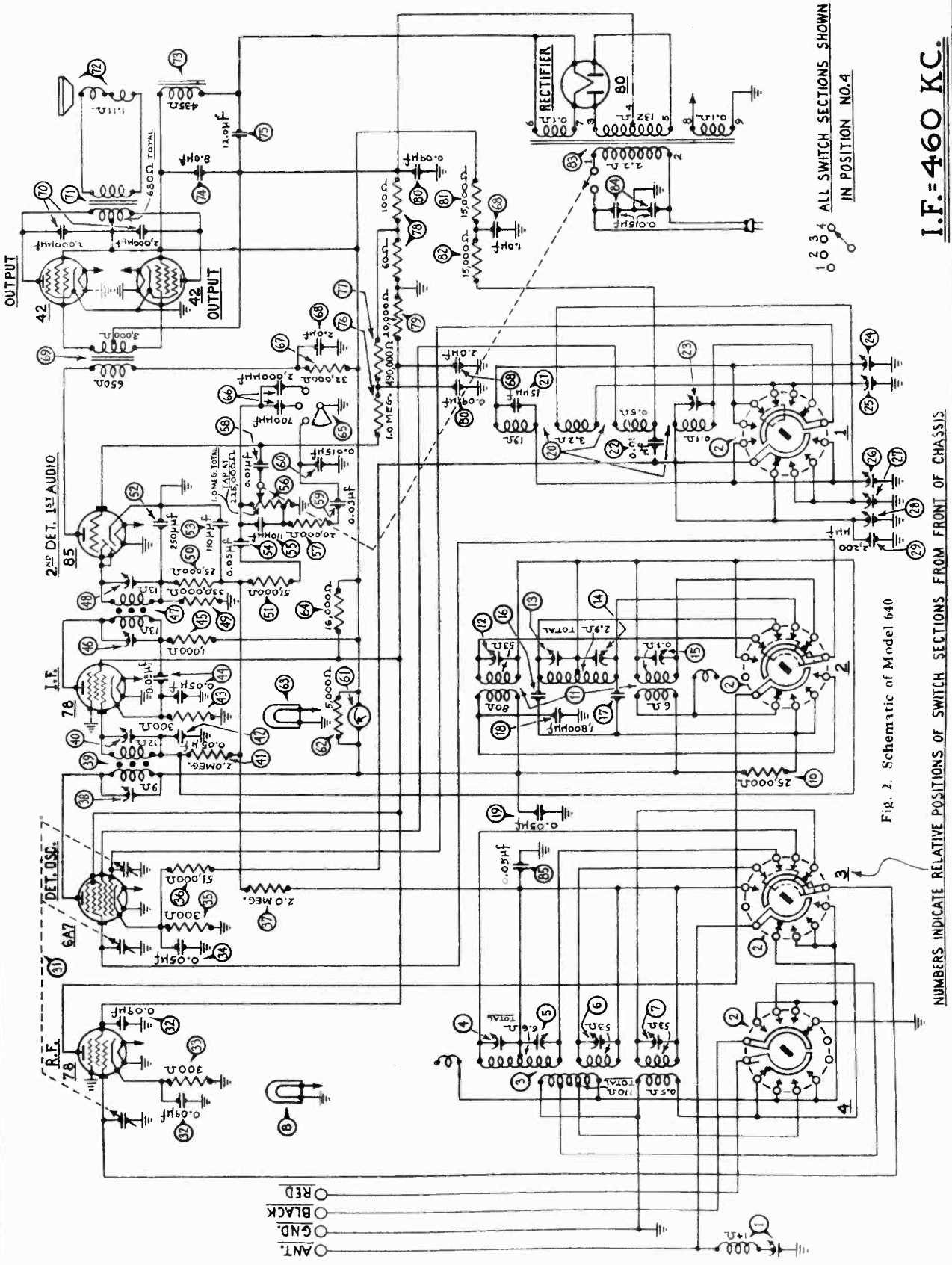


Fig. 2. Schematic of Model 640

NUMBERS INDICATE RELATIVE POSITIONS OF SWITCH SECTIONS FROM FRONT OF CHASSIS

MODEL 640
Socket, Voltage
Trimmers, Alignment

PHILCO RADIO & TELEV. CORP.

Model 640

Type Circuit: Superheterodyne, with preselector R.F. amplifier, and push-pull output (7 watts); built in connections for Philco All-wave aerial; aerial selector built into and operated by wave-band switch.

Power Supply: Alternating Current. Voltage and frequency as specified on chassis nameplate.

Tubes Used: 1 type 78, R.F.; 1 type 6A7, Detector-Oscillator; 1 type 78, I.F.; 1 type 85, 2d Detector and 1st A.F.; 2 type 42 Push-Pull Output; 1 type 80 Rectifier

Wave Bands: Four: (1) Long-wave (U. S. Weather Forecasts); (2) Standard (with some Police); (3) Police; (4) Short-wave.

Coverage of Each Band: Band 1, 145 to 390 K.C.; Band 2, 540-1720 K.C.; Band 3, 2.2 to 2.6 M.C.; Band 4, 5800-18000 K.C. (5.8 to 18.0 megacycles).

Tuning Drive: Dual planetary, ball bearing. 80 to 1 ratio for slow-speed tuning, 10 to 1 on main shaft.

Tone Control: 4-position, with bass compensation effective in first position (counter-clockwise).

Intermediate Frequency: 460 K.C.

Power Consumption: 85 watts.

Speaker: 6401B (Code 121); K-31, 640X (Code 122); H-21.

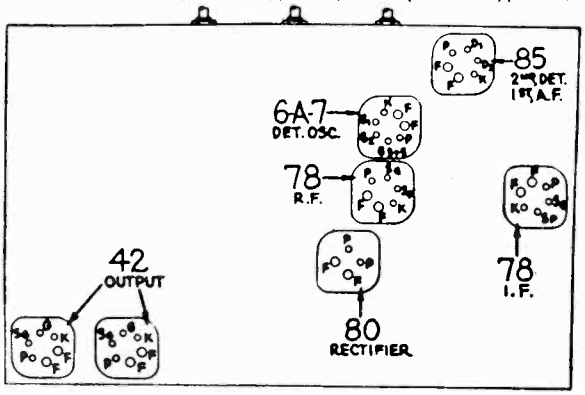


Fig. 1. Tube Sockets as viewed from bottom.

Power Transformer Data

Terminals	A.C. Volts	Current	Circuit	Color
1-2	120		Primary	White
3-5	710	118 M.A.	Secondary	Yellow
6-7	5.0	2.0 A.	Fil. Rect.	Blue
8-9	6.3	3.5 A.	Filaments	Black
4			Center Tap of 3-5	Yellow, Green Tracer

Tube Socket Voltages (Line Voltage 115)

Measured to Ground

Tube	78 R.F.	6A7 Det. Osc.	78 I.F.	85 2d Det.	42 Output
Point P	71	240	242	102	240
SG	91	91	91		250
K	2.1	2.2	2.3		

6A7: G_3 & G_5 = 102V. 80 Fil.—Gnd.: 300V.

Above voltages were obtained by using a PHILCO type 025 Circuit Tester (or 048A All-purpose Tester) using test prods applied to underside of chassis. Volume control at minimum, dial at 55; waveband switch at standard broadcast. Use Fig. 1 for test points. Type K-31 speaker employed.

Adjustment of compensating condensers in Model 640 requires an accurate signal generator covering long-wave, standard wave, police, and short-wave frequencies. The PHILCO Model 088 All-Wave Signal Generator, having a continuous range of from 100 to 20000 K.C., is ideal for this purpose.

An output meter is also needed. PHILCO Model 025 Circuit Tester includes a high grade output meter.

Philco No. 3164 fibre wrench and No. 27-7059 fibre handled screwdriver complete the equipment needed for making these adjustments. The locations of the various compensating condensers is shown in Fig. 2. Connect the output meter to the plate contacts of the 42 output tubes (using the adapters provided with the "025") and set it at the 0-30 volt range.

I.F.—Set the Signal Generator at 460 K.C., and attach its antenna lead to the grid cap of the 6A7 tube on the Model 640 (having removed the grid clip from the tube). Connect the ground terminal of the Signal Generator to the ground terminal of the set. Turn on the set, turn the waveband switch to second position (standard) and set dial at 55. Now with the fibre screwdriver, adjust condensers (40) and (38) (2d I.F.) and then (39) and (40) (1st I.F.) until maximum reading is obtained in the output meter. Turn down the "attenuator" on the signal generator if the output meter needle goes off the scale.

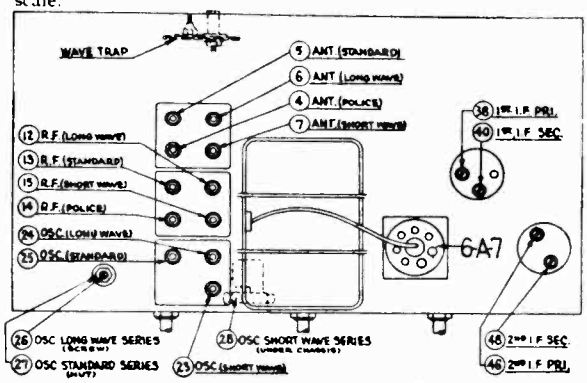


Fig. 2. Locations of Compensating Condensers

WAVE TRAP—Connect the Signal Generator antenna and ground leads to the antenna and ground posts of the set. Replace the grid clip on the 6A7 tube cap. With the signal generator operating at 460 K.C. and the set controls adjusted as for I.F., adjust wavetrap (1) until the minimum reading is obtained in the out-put meter.

SHORTWAVE—Turn waveband switch to position 4 (extreme right). Set signal generator at 18 megacycles and dial of set at 18.0 (top scale). Now adjust the oscillator, R.F., and Antenna compensators in turn, for maximum reading. These are (28), (15) and (7) respectively.

Turn the dial to 6.0 M.C., set the signal generator at 6.0 M.C., and adjust condenser (26) for maximum reading. This compensator is located underneath the chassis and reached from underneath. (See Fig. 3).

STANDARD WAVE—Turn waveband switch to position 2 (standard broadcast), set signal generator at 1500 and dial of set at 150. Now adjust the oscillator, R.F., and antenna "Standard" condensers. These are (25), (13) and (5) respectively.

Now turn the dial to 60, set signal generator at 600 and adjust condenser (27) (oscillator standard-series) (nut) for maximum reading.

POLICE BAND—Turn waveband switch to position 3 from left (police band); set dial at 2.4 and signal generator at 2400 K.C. Adjust condensers (14) and (4) for maximum reading. (Antenna and R.F. Police.)

LONG WAVE (Weather) BAND—Turn waveband switch to position 1 (left) (Longwave). Set dial at 35 and signal generator at 350 K.C. Adjust condensers (24), (12) and (6) (oscillator, R.F., and Antenna Longwave) for maximum reading.

Turn dial to 17, signal generator to 170 and adjust condenser (26) (longwave series) (screw) for maximum reading

PHILCO RADIO & TELEV. CORP.

MODEL 650
Schematic

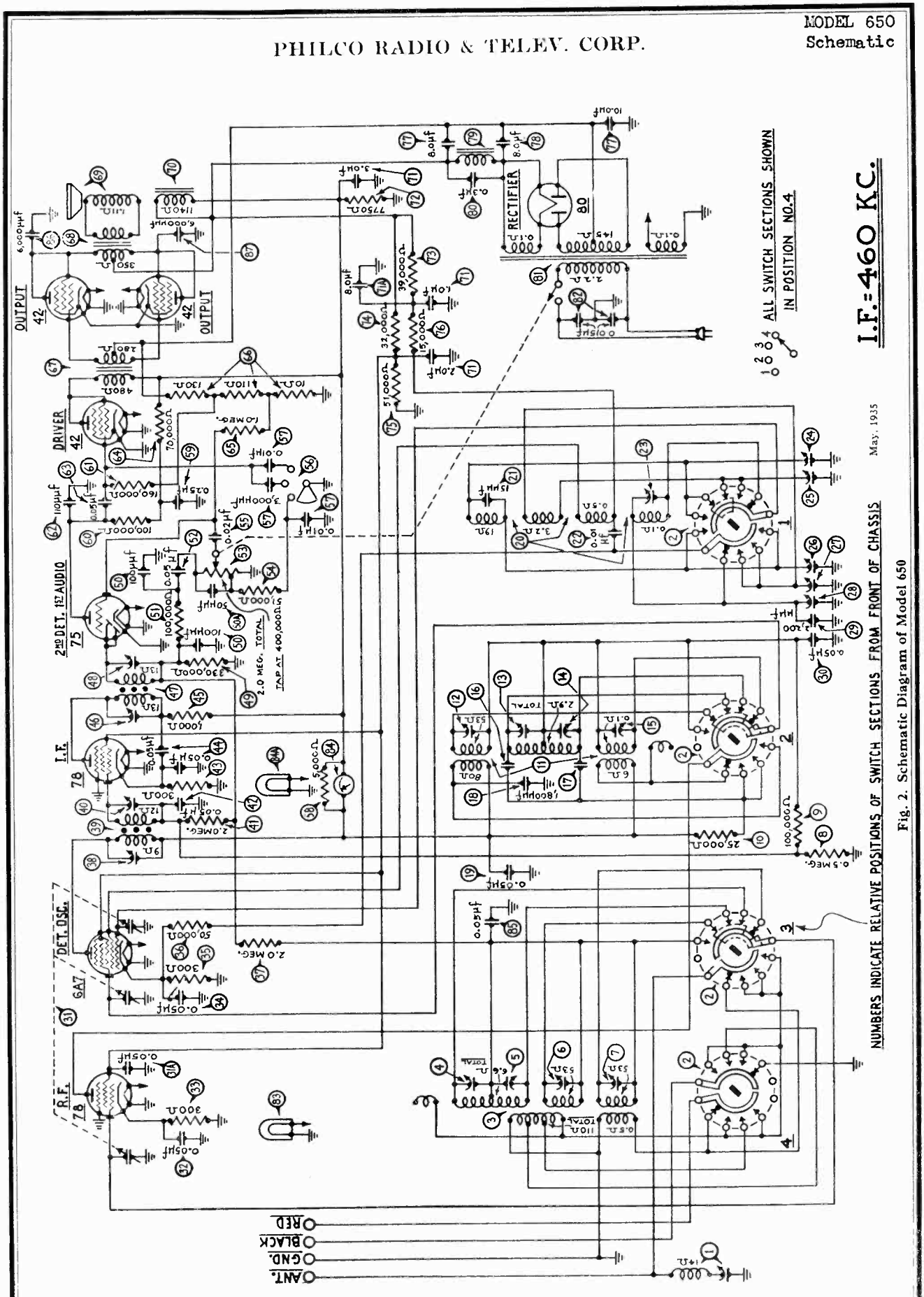


Fig. 2. Schematic Diagram of Model 650

MODEL 650
Alignment, Trimmers
Voltage, Data

PHILCO RADIO & TELEV. CORP.

Adjusting Compensating Condensers

Adjustment of compensating condensers in Model 650 requires an accurate signal generator covering long-wave, standard wave, police, and short-wave frequencies. The PHILCO Model 088 All-Wave Signal Generator, having a continuous range of from 100 to 20000 K.C., is ideal for this purpose.

An output meter is also needed. PHILCO Model 025 Circuit Tester includes a high grade output meter.

Philco No. 3164 fibre wrench and No. 27-7059 fibre-handled screwdriver complete the equipment needed for making these adjustments. The locations of the various compensating condensers is shown in Fig. 2. Connect the output meter to the plate contacts of the 42 output tubes (using the adapters provided with the "025") and set it at the 0-30 volt range.

I.F.—Set the Signal Generator at 460 K.C., and attach its antenna lead to the grid cap of the 6A7 tube on the Model 650 (having removed the grid clip from the tube). Connect the ground terminal of the Signal Generator to the ground terminal of the set. Turn on the set, turn the waveband switch to second position (standard) and set dial at 55. Now with the fibre screwdriver, adjust condensers ㊻ and ㊽ (2d I.F.) and then ㊳ and ㊵ (1st I.F.) until maximum reading is obtained in the output meter. Turn down the "attenuator" on the signal generator if the output meter needle goes off the scale.

Tube Socket Voltages (Line Voltage 115)
Measured to Ground

Tube	78 R.F.	6A7 Det. Osc.	78 I.F.	75 2d Det.	42 Driver	42 Output
Point P	55	200	200	115	200	300
SG	90	90	90	...	200	300
K	2.2	2.3	2.6	...	...	...
	6A7: $G_{3\ \&\ 5}$ = 155					

Above voltages were obtained by using a PHILCO type 025 Circuit Tester (or 048A All-purpose Tester), using test prods applied to underside of chassis. Volume control at minimum; dial at 55; waveband switch counter-clockwise (band 1). Use Fig. 1 for test points. Type K-17 speaker employed.

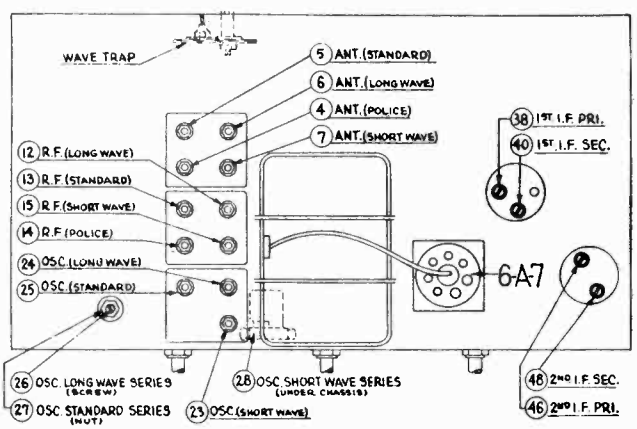


Fig. 2. Locations of Compensating Condensers

WAVE TRAP—Connect the Signal Generator antenna and ground leads to the antenna and ground posts of the set. Replace the grid clip on the 6A7 tube cap. With the signal generator operating at 460 K.C. and the set controls adjusted as for I.F., adjust wavetrap ① until the minimum reading is obtained in the out-put meter.

SHORTWAVE—Turn waveband switch to position 4 (extreme right). Set signal generator at 18 megacycles and dial of set at 18.0 (top scale). Now adjust the oscillator, R.F., and Antenna compensators in turn, for maximum reading. These are ㉘, ⑮ and ⑦ respectively.

Turn the dial to 6.0 M.C., set the signal generator at 6.0 M.C., and adjust condenser ㉘ for maximum reading. This compensator is located underneath the chassis and reached from underneath. (See Fig. 3).

STANDARD WAVE—Turn waveband switch to position 2 (standard broadcast), set signal generator at 1500 and dial of set at 150. Now adjust the oscillator, R.F., and antenna "Standard" condensers. These are ㉕, ⑬ and ⑤ respectively.

Now turn the dial to 60, set signal generator at 600 and adjust condenser ㉗ (oscillator standard-series) (nut) for maximum reading.

POLICE BAND—Turn waveband switch to position 3 from left (police band); set dial at 2.4 and signal generator at 2400 K.C. Adjust condensers ④ and ⑭ for maxmium reading. (Antenna and R.F. Police.)

LONG WAVE (Weather) BAND—Turn waveband switch to position 1 (left) (Longwave). Set dial at 35 and signal generator at 350 K.C. Adjust condensers ㉔, ⑫ and ⑥ (oscillator, R.F., and Antenna Longwave) for maximum reading.

Turn dial to 17, signal generator to 170 and adjust condenser ㉖ (longwave series) (screw) for maximum reading.

Type Circuit: Superheterodyne, with preselector R.F. amplifier, and push-pull pentode output (10 watts); built in connections for Philco All-wave aerial; aerial selector built into and operated by wave-band switch.

Power Supply: Alternating Current. Voltage and frequency as specified on chassis nameplate.

Tubes Used: 1 type 78, R.F.; 1 type 6A7, Detector-Oscillator; 1 type 78, I.F.; 1 type 75, 2d Detector and 1st A.F.; 1 type 42 Driver; 2 type 42 Push-Pull Output; 1 type 80 Rectifier.

Wave Bands: Four: (1) Long-wave (U.S. Weather Forecasts); (2) Standard (with some Police); (3) Police; (4) Short-wave.

Coverage of Each Band: Band 1, 145 to 390 K.C.; Band 2, 540-1720 K.C.; Band 3, 2.2 to 2.6 M.C.; Band 4, 5800-18000 K.C. (5.8 to 18.0 megacycles).

Tuning Drive: Dual planetary, ball bearing. 80 to 1 ratio for slow-speed tuning.

Tone Control: 4-position, with bass compensation effective in first position (counter-clockwise).

Intermediate Frequency: 460 K.C.

Power Consumption: 98 watts.

Speaker: 650B (Code 121); K-17, 650X, 650MX, 650-H, (Code 122); H-13.

PHILCO RADIO & TELEV. CORP.

MODEL 650
Chassis, Socket
Parts, Data

Replacement Parts—Model 650

	Description	Part No.	List Price
1	Wave Trap	38-6850	$1.10
2	Waveband Switch	42-1114	2.50
3	Antenna Transformer	32-1708	4.00
4	Compensating Condenser (Ant.) (Police)	Part of 3	....
5	Compensating Condenser (Ant.) (Standard)	Part of 3	....
6	Compensating Condenser (Ant.) (Longwave)	Part of 3	....
7	Compensating Condenser (Ant.) (Shortwave)	Part of 3	....
8	Resistor (.5 meg.) (Yellow-White-Yellow)	▲6097	.20
9	Resistor (100000 ohms) (White-White-Yellow)	6099	.20
10	Resistor (25000 ohms) (Red-Green-Yellow)	3656	.20
11	R.F. Transformer	32-1709	3.75
12	Compensating Condenser (R.F. Longwave)	Part of 11	....
13	Compensating Condenser (R.F. Broadcast)	Part of 11	....
14	Compensating Condenser (R.F. Police)	Part of 11	....
15	Compensating Condenser (R.F. Shortwave)	Part of 11	....
16	Condenser	Part of 11	....
17	Condenser	Part of 11	....
18	Condenser (.0018 Mfd. Mica)	6018	.40
19	Condenser (.05 Mfd. Bakelite Block)	3615-SG	.35
20	Oscillator Transformer	32-1710	3.00
21	Condenser (.000015 Mfd. Mica)	30-1030	.35
22	Condenser (.01 Mfd. Tubular)	*30-4145	.25
23	Compensating Condenser (Osc. S.W.)	Part of 22	....
24	Compensating Condenser (Osc. Longwave)	Part of 22	....
25	Compensating Condenser (Osc. B.C. & Police)	Part of 22	....
26	Compensating Condenser (Osc. L.W. Series)	Part of 31-6044	.50
27	Compensating Condenser (Osc. B.C. Series)	Part of 31-6044	
28	Compensating Condenser (Osc. S.W. Series)	04000-R	.45
29	Condenser (.0022 Mfd. Mica)	30-1057	.40
30	Condenser (.05 Mfd. Tubular)	30-4020	.35
31	Tuning Condenser Assembly	31-1555	4.50
31a	Condenser (.05 Mfd. Bakelite Block)	3615-SG	.35
32	Condenser (.05 Mfd. Tubular)	30-4020	.35
33	Resistor (300 ohms) (Orange-Black-Black)	33-3010	.20
34	Condenser (.05 Mfd. Tubular) (On top of chassis)	30-4327	.20
35	Resistor (300 ohms Flexible) (Orange-Black-Black)	33-3010	.20
36	Resistor (50000 ohms) (Green-Brown-Orange)	6098	.20
37	Resistor (2 Megs.) (Red-Black-Green)	33-1025	.20
38	Compensating Condenser (1st I.F. Primary)	Part of 39	....
39	1st I.F. Transformer	32-1711	2.00
40	Compensating Condenser (1st I.F. Secondary)	Part of 39	....
41	Resistor (2 Megs.) (Red-Black-Green)	33-1025	$0.20
42	Condenser (.05 Mfd. Tubular)	30-4020	.35
43	Resistor (300 ohms Flexible) (Orange-Black-Black)	33-3010	.20
44	Condenser (.05 Mfd. Twin Bakelite Block)	3615-DU	.40
45	Resistor (1000 ohms) (Brown-Black-Red)	5837	.20
46	Compensating Condenser (2d I.F. Primary)	Part of 47	....
47	2d I.F. Transformer	32-1712	2.00
48	Compensating Condenser (2d I.F. Secondary)	Part of 47	....
49	Resistor (330000 ohms) (Orange-Orange-Yellow)	33-1200	.20
50	Condenser (.00011 Mfd. Twin Bakelite Block)	8035-DG	.25
50a	Condenser (.00005 Mfd. Mica) (Not shown Fig. 3)	30-1029	.35
51	Resistor (100000 ohms) (White-White-Orange)	6099	.20
52	Condenser (.05 Mfd. Tubular)	30-4020	.35
53	Volume Control and On-Off Switch	33-5108	1.45
54	Resistor (51000 ohms) (Green-Brown-Orange)	6098	.20
55	Condenser (.02 Mfd. Tubular)	30-4113	.30
56	Tone Control	30-4343	.75
57	Condensers in Tone Control	Part of 56	....
58	Resistor (5000 ohms) (Green-Black-Red)	5310	.20
59	Condenser (.25 Mfd. Tubular)	30-4134	.40
60	Resistor (100000 ohms) (White-White-Orange)	6099	.20
61	Resistor (160000 ohms) (Brown-Blue-Yellow)	33-1191	.20
62	Condenser (.00011 Mfd. Mica)	30-1031	.35
63	Condenser (.05 Mfd. Bakelite Block)	3615-SU	.35
64	Resistor (70000 ohms) (Violet-Black-Orange)	5385	.20
65	Resistor (1 Meg.) (Brown-Black-Green)	33-1096	.20
66	B.C. Resistor (Wirewound) (10 ohms, 110 ohms, 130 ohms)	33-3137	.30
67	Input Transformer	32-7114	2.00
68	Output Transformer	32-7078	1.40
69	Cone and Voice Coil Assembly (H-13)	02625	1.20
	Cone and Voice Coil Assembly (K-17)	02996	.90
70	Field Coil and Pot Assembly (H-13 or K-17)	36-3104	2.70
71	Condenser (Electrolytic—3 Mfd., 1 Mfd., 2 Mfd.)	30-2122	1.85
72	Resistor (Wirewound) (7750 ohms)	33-3211	1.60
73	Resistor (39000 ohms) (Orange-White-Orange)	33-1027	.20
74	Resistor (32000 ohms) (Orange-Red-Orange)	33-1026	.35
75	Resistor (51000 ohms) (Green-Brown-Orange)	4237	.20
76	Resistor (15000 ohms) (Brown-Green-Orange)	6208	.20
77	Condenser (Electrolytic—8 Mfd., 10 Mfd.)	30-2045	1.80
78	Condenser (Electrolytic—8 Mfd.)	†30-2025	1.10
79	Filter Choke	32-7115	1.80
80	Condenser (.3 Mfd. Bakelite Block)	*6287-DU	.40
81	Power Transformer: 110 Volts 60 Cycles	32-7402	4.50
	Power Transformer: 110 Volts 25 Cycles	32-7403	9.00
	Power Transformer: 230 Volts 50 Cycles	32-7404	7.50
82	Condenser (.015 Mfd. Twin Bakelite Block)	3793-DG	.40
83	Pilot Lamp (Dial)	34-2064	.09
84	Shadow Tuning Meter	**45-2086	2.00
84a	Pilot Lamp (Shadowmeter)	Part of 84	....
85	Condenser (.05 Mfd. Tubular)	30-4020	.35
86	Condenser (.006 Mfd. Tubular)	30-4125	.25
87	Condenser (.006 Mfd. Tubular)	30-4125	.25

▲ Omitted after Run 5.

*In Model 650A (115 Volts 25 Cycles) this is part No. 04357, List .75.

†In Code 122 (650X, 650MX, 650H) this is part No. 30-2014, List 1.50.

**In Code 122 (650X, 650MX, 650H) this is part No. 45-2082.

* After Run 2, this is 30-1032 mica, List .35.

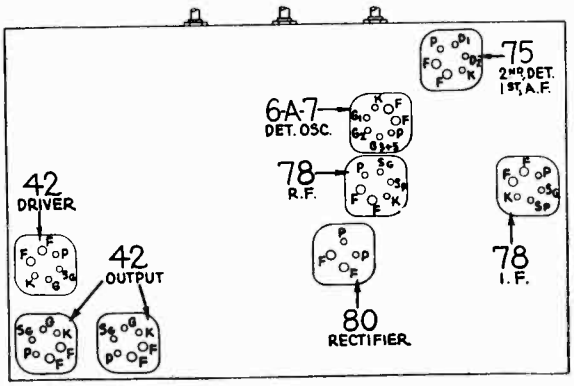


Fig. 1. Tube Sockets as viewed from bottom.

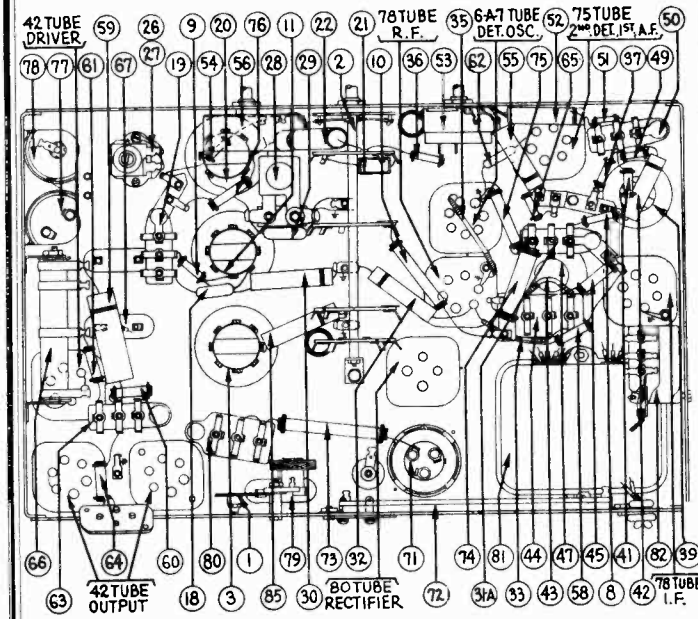


Fig. 3. Bottom View of Chassis

Power Transformer Data

Terminals	A.C. Volts	Current	Circuit	Color
1–2	120	.....	Primary	White
3–5	760	140 M.A.	Secondary	Yellow
6–7	5.0	2.0 A.	Fil. Rect.	Blue
8–9	6.3	3.75 A.	Filaments	Black
4	...	.....	Center Tap of 3–5	Yellow, Green Tracer

MODEL 660
Alignment
Trimmers

PHILCO RADIO & TELEV. CORP.

ADJUSTING COMPENSATING CONDENSERS

Adjustment of compensating condensers in Model 660 requires an accurate signal generator covering long-wave, standard wave, police, and short-wave frequencies. The PHILCO Model 088 All-Wave Signal Generator, having a continuous range of from 100 to 20,000 K.C. (all fundamental frequencies) will be ideal for this purpose.

An output meter is also needed. PHILCO Model 025 Circuit Tester includes a high-grade output meter.

Philco No. 3164 fibre wrench and No. 27-7059 fibre handled screwdriver complete the equipment needed for making these adjustments. The locations of the various compensating condensers are shown in Fig. 2. Connect the output meter to the plate contacts of the output tubes (using the adapters provided with the "025") and set it at the 0-30 volt range.

I.F.—Set the Signal Generator at 460 K.C., and attach its antenna lead to the grid cap of the 77 1st detector tube (having removed the grid clip from the tube). Connect the ground terminal of the Signal Generator to the ground terminal of the set. Turn on the set, turn the waveband switch to standard broadcast (second position from left) and set dial at 60. Turn condenser (51) (2nd I.F. tertiary) all the way down before adjusting the other I.F. Compensators. Now with the fibre screwdriver, adjust condensers (57) and (55) (3rd I.F.), (52) and (49) (2nd I.F.), and then (42) and (40) (1st I.F.) until maximum reading is obtained in the output meter. Turn down the "attenuator" on the signal generator if the output meter needle goes off the scale. Now adjust condenser (51) (2nd I.F. tertiary) for maximum reading.

WAVE TRAP—Connect the Signal Generator antenna lead to the grid cap of the 78 R.F. tube. Replace the grid clip on the 77 tube cap. With the signal generator operating at 460 K.C. and the set controls adjusted as for I.F., adjust wavetrap (24) until the **minimum** reading is obtained in the output meter.

SHORTWAVE—Turn wave band switch to the shortwave position (extreme right). Set signal generator at 18 megacycles and dial of set at 18.0 (top scale). Now adjust the oscillator, Antenna, and R.F. shortwave compensators in turn, for maximum reading. These are (21), (13) and (7) respectively.

POLICE AND AMATEUR BAND—Turn the waveband switch to position 3 (from left). Set the dial and signal generator at 4.5 megacycles and adjust condensers (27), (12) and (6) respectively for maximum reading.

Set the signal generator at 1800 K.C. and turn the dial to 1.8. Adjust condenser (18) (nut), oscillator police series, to maximum reading.

STANDARD BROADCAST BAND—Turn the waveband switch to position 2 (from left). Set the dial and signal generator at 1500 K.C. and adjust condensers (29), (10) and (4) for maximum reading.

Set the dial and signal generator at 600 K.C. and adjust condenser (16) (screw), broadcast series, for maximum reading.

LONGWAVE BAND—Turn waveband switch to position 1 (left). Set the dial and signal generator at 340 K.C. and adjust condenser (28) (screw) to maximum. Then adjust (11) and (5) for maximum reading. Finally, set the dial and signal generator at 175 K.C. and adjust condenser (17) (nut) for maximum reading. This is the longwave series compensator.

General Specifications

Type Circuit: Superheterodyne, with push-pull pentodes connected as triodes in output; output 10 watts; built in connections for Philco All-wave aerial; aerial selector built into and operated by wave-band switch.

Power Supply: Alternating Current. Voltage and frequency as specified on chassis nameplate.

Tubes Used: Ten (10) Total: 1 type 78 R.F., 1 type 77 1st detector, 1 type 76 oscillator, 2 type 78 I.F., 1 type 75 2nd detector 1st audio, 1 type 42 driver, 2 type 42 output, 1 type 80 rectifier.

Wave Bands: Four—(1) Shortwave; (2) Police and amateur; (3) Standard Broadcast; (4) Longwave (weather forecasts).

Frequency Ranges: Band (1)—5.7-18.0 Megacycles; Band (2)—1.75-5.8 Megacycles; Band (3)—540 to 1750 K.C.; Band (4)—150-390 K.C.

Program Control: 4 positions: (1) Mellow, (2) Brilliant, (3) Normal, (4) Noise reducing. Last two positions recommended for foreign short wave stations.

Tuning Meter: Shadow type tuning meter, mounted directly above scale.

Waveband Indicator: Glowing arrow on tuning scale shifts to proper scale when waveband switch is turned.

Automatic Volume Control: Fully effective on all stations.

Bass Compensation: Automatic: Effective on first two positions of program control, with volume control turned down.

Tuning Drive: Dual planetary, ball bearing. 80 to 1 ratio for slow-speed tuning, 10 to 1 on main knob.

Intermediate Frequency: 460 K.C.

Power Consumption: 90 watts.

Speaker: Type H-13.

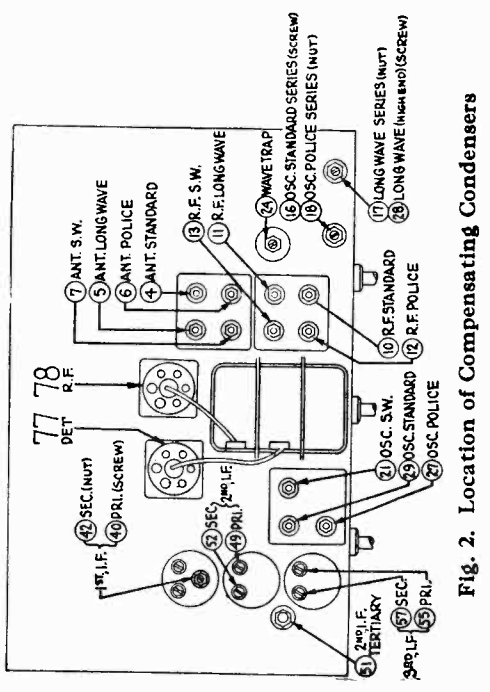


Fig. 2. Location of Compensating Condensers

MODEL 660
Schematic

PHILCO RADIO & TELEV. CORP.

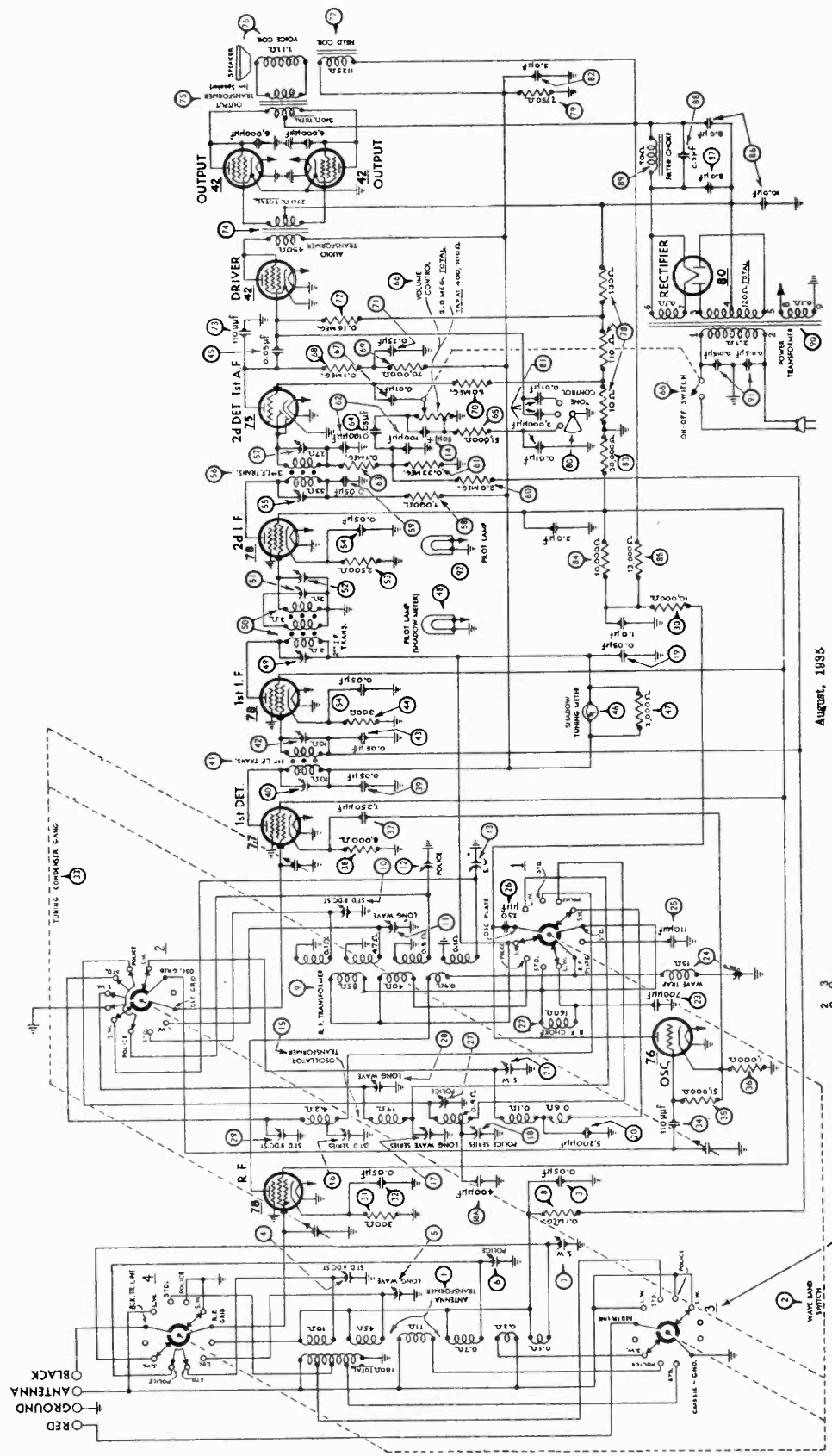


Figure 3 — Schematic Diagram — Model 660

MODEL 660
Socket, Chassis
Parts List

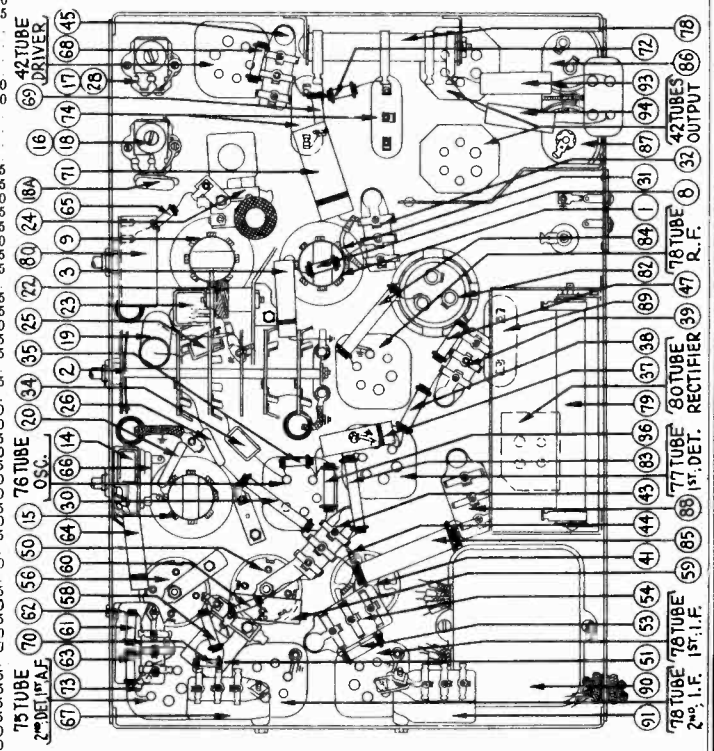
PHILCO RADIO & TELEV. CORP.

REPLACEMENT PARTS—MODEL 660

①	Antenna Transformer	32-1750	$3.25
②	Waveband Switch	42-1120	2.50
③	Condenser (.05 Mfd. Tubular)	30-4020	.35
④	Compensating Condenser (Ant. Standard)	Part of ①	....
⑤	Compensating Condenser (Ant. Longwave)	Part of ①	....
⑥	Compensating Condenser (Ant. Police)	Part of ①	....
⑦	Compensating Condenser (Ant. Shortwave)	Part of ①	....
⑧	Resistor (.1 Meg.) (White, White, Orange)	4411	.20
⑨	R. F. Transformer	32-1751	3.00
⑩	Compensating Condenser (R. F. Standard)	Part of ⑨	....
⑪	Compensating Condenser (R. F. Longwave)	Part of ⑨	....
⑫	Compensating Condenser (R. F. Police)	Part of ⑨	....
⑬	Compensating Condenser (R. F. Shortwave)	Part of ⑨	....
⑭	Condenser (.00005 Mfd. Mica)	30-1029	.35
⑮	Oscillator Transformer	32-1752	2.25
⑯	Compensating Condenser (Standard Series)	Part o 31-6027	.70
⑰	Compensating Condenser (Longwave Series)	Part of 31-6054	.45
⑱a	Condenser (.00041 Mfd. Mica)	30-1000	.35
⑲	Compensating Condenser (Osc. Police Series)	Part of 31-6027	.70
⑳	Condenser (.05 Mfd. Tubular)	30-4123	.35
㉑	Condenser (.0052 Mfd. Mica)	30-1058	.55
㉒	Compensating Condenser (Osc. Shortwave)	Part of ⑱	....
㉓	R. F. Choke	32-1745	.65
㉔	Condenser (.007 Mfd. Mica)	5863	.35
㉕	Wave Trap	38-6850	1.10
㉖	Condenser (.00011 Mfd. Mica)	30-1031	.35
㉗	Condenser (.00025 Mfd. Mica)	30-1032	.35
㉘	Compensating Condenser (Osc. Police)	Part of ㉑	....
㉙	Compensating Condenser (Longwave H. F. End)	Part of 31-6054	.45
㉚	Compensating Condenser (Osc. Standard)	Part of ⑲	....
㉛	Resistor (10000 ohms) (Brown, Black, Orange)	3524	.20
㉜	Resistor (300 ohms Flexible) (Orange, Black, Black)	33-3010	.20
㉝	Condenser (.05 Mfd. Bakelite Block)	3615-SG	.35
㉞	Tuning Condenser Assembly	31-1609	5.50
㉟	Condenser (.00011 Mfd. Mica)	30-1031	.35
㊱	Resistor (51000 ohms) (Green, Brown, Orange)	6098	.20
㊲	Resistor (1000 ohms) (Brown, Black, Red)	5837	.20
㊳	Condenser (.00125 Mfd. Tubular)	30-4336	.25
㊴	Resistor (8000 ohms) (Gray, Black, Red)	5638	.20
㊵	Condenser (.05 Mfd. Bakelite Block)	3615-SG	.35
㊶	Compensating Condenser (1st I. F. Primary)	Part of ㊷	....
㊷	1st I. F. Transformer	*32-1642	2.00
㊸	Compensating Condenser (1st I. F. Secondary)	Part of ㊷	....
㊹	Condenser (.05 Mfd. Bakelite Block)	3615-SG	.35
㊺	Resistor (300 ohms Flexible) (Orange, Black, Black)	33-3010	.20
㊻	Condenser (.05 Mfd. Bakelite Block)	3615-SU	.35
㊼	Shadow Tuning Meter	°45-2083	2.50
㊽	Resistor (2000 ohms) (Red, Black, Red)	6984	.20
㊾	Pilot Lamp (Shadow Tuning Meter)	Part of ㊼	....
㊿	Compensating Condenser (2nd I. F. Primary)	Part of 31-6028	.85
(51)	2nd I. F Transformer	‡32-1734	1.85
(52)	Compensating Condenser (2nd I. F. Tertiary)	04000-R	.45
(53)	Compensating Condenser (2nd I. F. Secondary)	Part of 31-6028	.85
(54)	Resistor (2500 ohms) (Red, Green, Red)	7775	.20
(55)	Condenser (.05 Mfd. Twin Bakelite Block)	3615-DG	.40
(56)	Compensating Condenser (3rd I. F. Primary)	Part of 31-6003	.45
(57)	Third I. F. Transformer	▲32-1188	.65
(58)	Compensating Condenser (3rd I. F. Secondary)	Part of 31-6003	.45
(59)	Resistor (1000 ohms) (Brown, Black, Red)	5837	.20
(60)	Condenser (.05 Mfd. Tubular)	30-4123	$0.35
(61)	Resistor (2 Megs.) (Red, Black, Green)	33-1025	.20
(62)	Resistor (330000 ohms) (Orange, Orange, Yellow)	33-1200	.20
(63)	Condenser (.00011 Mfd. Twin Bakelite Block)	8035-DG	.25
(64)	Resistor (.1 Meg.) (White, White, Yellow)	6099	.20
(65)	Condenser (.05 Mfd. Tubular)	30-4020	.35
(66)	Resistor (50000 ohms) (Green, Brown, Orange)	6098	.20
(67)	Volume Control & On-Off Switch	33-5110	1.45
(68)	Condenser (.01 Mfd. Bakelite Block)	3903-SU	.25
(69)	Resistor (.1 Meg.) (White, White, Yellow)	6099	.20
(70)	Resistor (70000 ohms) (Violet, Black, Orange)	5385	.20
(71)	Resistor (1 Meg.) (Brown, Black, Green)	33-1096	.20
(72)	Condenser (.25 Mfd. Tubular)	30-4134	.45
(73)	Resistor (160000 ohms) (Brown, Blue, Orange)	33-1191	.20
(74)	Condenser (.00011 Mfd. Mica)	30-1031	.35
(75)	Audio Transformer	32-7057	2.75
(76)	Output Transformer	32-7078	1.40
(77)	Cone & Voice Coil Assembly (H-13)	02625	1.20
(78)	Field Coil & Pot Assembly (H-13)	36-3104	2.70
(79)	Resistor (B. C., Wirewound) (10 ohms, 110 ohms, 130 ohms)	33-3137	.30
(80)	Resistor (Wirewound, 7750 ohms)	33-2020	.35
(81)	Tone Control	30-4343	.75
(82)	Condensers in Tone Control	Part of ㊾	....
(83)	Condenser (Electrolytic) (3 Mfd., 2 Mfd., 1 Mfd.)	30-2122	1.85
(84)	Resistor (30000 ohms) (Orange, Black, Orange)	7836	.20
(85)	Resistor (10000 ohms) (Brown, Black, Orange)	3524	.20
(86)	Resistor (13000 ohms) (Brown, Orange, Orange)	6450	.40
(87)	Condenser (Electrolytic: 8 Mfd., 10 Mfd.)	30-2045	1.80
(88)	Condenser (Electrolytic: 8 Mfd.)	30-2025	1.35
(89)	Condenser (.3 Mfd. Bakelite Block)	6287-DG	.40
(90)	Filter Choke	32-7056	2.20
(91)	Power Transformer 115 Volts 60 Cycles	32-7440	6.00
	115 Volts 25 Cycles	32-7441	8.75
	230 Volts 50 Cycles	32-7442	6.75
(92)	Condenser (.015 Mfd. Twin Bakelite Block)	3793-DG	.40
(93)	Pilot Lamp (Dial)	34-2039	.15
(94)	Condenser (.006 Mfd. Tubular)	30-4125	.25
(95)	Condenser (.006 Mfd. Tubular)	30-4125	.25

* Code 122: 32-1864 ° Code 122: 45-2086

‡ Code 122: 32-1865 ▲ Code 122: 32-1866



Tube Socket and Power Transformer Voltages
Line Voltage 115

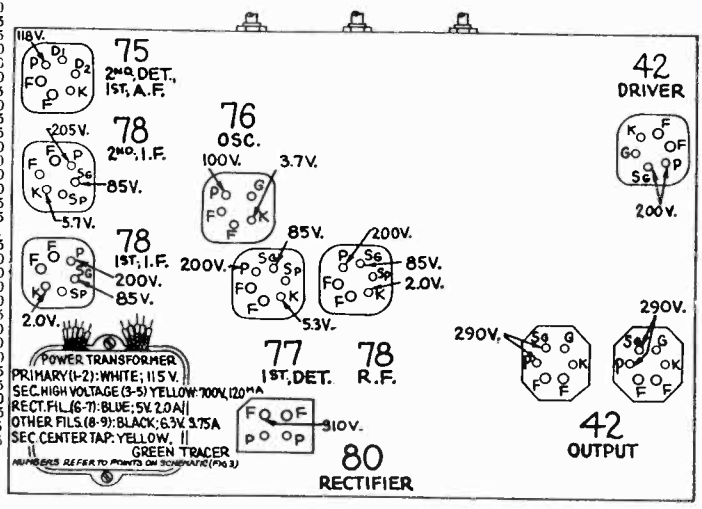
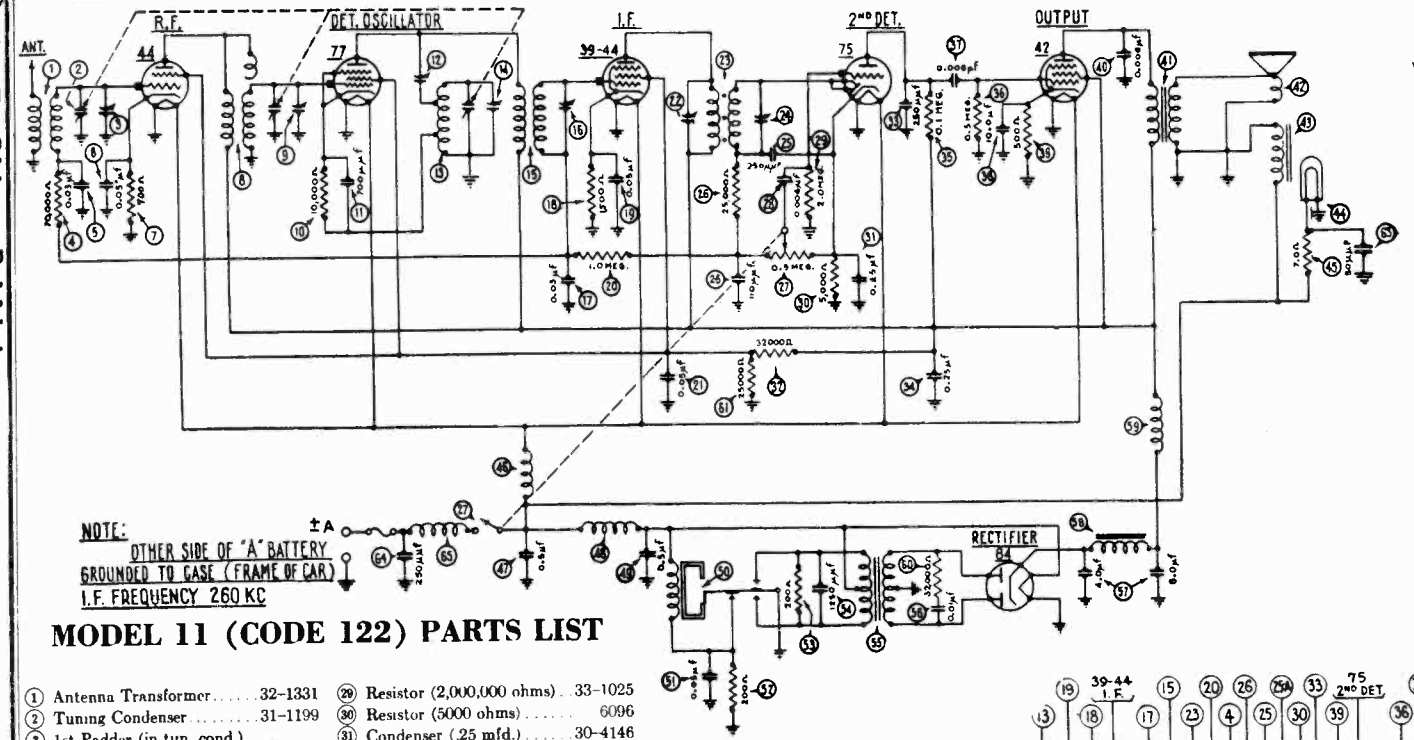


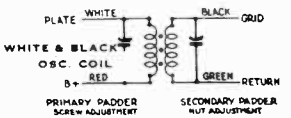
Fig. 1. Sockets as Viewed from Bottom

Socket voltages (measured to ground) obtained at points indicated by arrows. Above voltages were obtained by using a PHILCO type 025 Circuit Tester (or 048A All-purpose Tester), using test prods applied to sockets on underside of chassis. Volume control at minimum; dial at 60; waveband switch at standard broadcast (2d position from left). H-13 Speaker used.

PHILCO RADIO & TELEV. CORP.

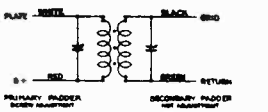
MODEL 11 (Code 122) Schematic, Chassis Parts List Transformer Data





1st I. F. Transformer
32-1329

FIG. 1



2nd I. F. Transformer
32-1237

MODEL 11 (CODE 122) PARTS LIST

(1)	Antenna Transformer	32-1331	(29)	Resistor (2,000,000 ohms)	33-1025
(2)	Tuning Condenser	31-1199	(30)	Resistor (5000 ohms)	6096
(3)	1st Padder (in tun. cond.)		(31)	Condenser (.25 mfd.)	30-4146
(4)	Resistor (70,000 ohms)	33-1115	(32)	Resistor (32,000 ohms)	3525
(5)	Condenser (.03 mfd.)	30-4025	(33)	Condenser (.00025 mfd.)	30-1032
(6)	Condenser (.05 mfd.)	30-4020	(34)	Condenser (.25 mfd.)	04360
(7)	Resistor (700 ohms)	6443	(35)	Resistor (100,000 ohms)	6099
(8)	R. F. Transformer	32-1332	(36)	Resistor (500,000 ohms)	6097
(9)	2nd Padder (in tun. cond.)		(37)	Condenser (.006 mfd.)	30-4125
(10)	Resistor (10,000 ohms)	33-1000	(38)	Condenser (10 mfd.)	30-2072
(11)	Condenser (.0007 mfd.)	5863	(39)	Resistor (500 ohms)	33-3031
(12)	Padder (Pri. 1st I. F. Tran.)		(40)	Condenser (.006 mfd.)	30-4024
(13)	Oscillator Transformer	32-1333	(41)	Output Transformer	32-7245
(14)	3rd Padder (in tun. cond.)		(42)	Cone & Voice Coil	36-3157
(15)	1st I. F. Transformer	32-1329	(43)	Field Coil Assembly	36-3046
(16)	Padder (Sec. 1st I. F. Tran.)		(44)	Pilot Lamp	34-2031
(17)	Condenser (.03 mfd.)	30-4025	(45)	Resistor (7 ohms)	33-3035
(18)	Resistor (1500 ohms)	33-3047	(46)	"A" Choke	32-1402
(19)	Condenser (.05 mfd.)	30-4020	(47)	Condenser (.5 mfd.)	30-4147
(20)	Resistor (1,000,000 ohms)	33-1096	(48)	Vibrator Choke	32-1282
(21)	Condenser (.05 mfd.)	30-4020	(49)	Condenser (.5 mfd.)	30-4015
(22)	Padder (Pri. 2nd I. F. Tran.)		(50)	Vibrator	38-5036
(23)	2nd I. F. Transformer	32-1237	(51)	Condenser (.05 mfd.)	30-4039
(24)	Padder (Sec. 2nd I. F. Tran.)		(52)	Resistor (200 ohms)	7217
(25)	Condenser (.00025 mfd.)	30-1032	(53)	Resistor (200 ohms)	7217
(25)	Condenser (.00011 mfd.)	30-1031	(54)	Condenser (.00125 mfd.)	5886
(26)	Resistor (25,000 ohms)	33-1013	(55)	Power Transformer	32-7216
(27)	Vol. Con. & Switch Assm.	38-5534	(56)	Condenser (.01 mfd.)	30-4051
(28)	Condenser (.006 mfd.)	30-4125	(57)	Condenser (4-8-10 mfd.)	30-2072
(58)	"B" Choke	32-7215		Spark Plug Resistor	33-1015
(59)	R. F. Choke	32-1251		Distributor Resistor	33-1113E
(60)	Resistor (32,000 ohms)	3525		Interference Condenser	30-4007
(61)	Resistor (25,000 ohms)	33-1013		Nuts (mounting)	W55A
(63)	Condenser (.00005 mfd.)	30-1029		Battery Cable	38-5296
(64)	Condenser (.00025 mfd.)	30-1032		Acorn Nut	W821
(65)	"A" Choke	32-1374		Fuse	7227
				Fuse Insulator	27-7131
				Studs	28-6036
				Bracket	6035
				Strap	04344
				Strap Pad	6206
				Knob	27-4058
				Glass	27-7325
				Gasket (for glass)	27-7509
				Pointer	28-1957
				Face Assembly	42-5175
				Control Housing Cover	29-7064
				Control Unit Assembly	42-5107

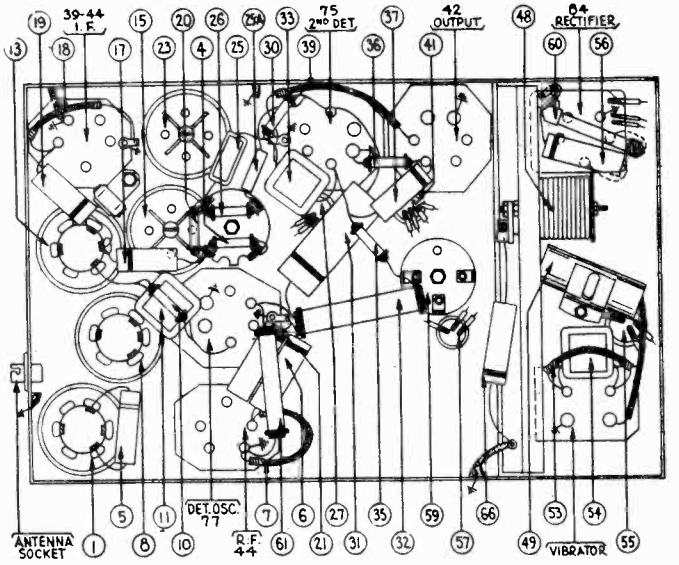


FIG. 4

MODEL 11 (Code 122)
Alignment, Socket Trimmers

PHILCO RADIO & TELEV. CORP.

MODEL 11 (CODE 122) RECEIVER

THE PHILCO auto radio Model 11 (Code 122) is a new Philco development in single-unit automobile radio. It is compact, easy to install and will give exceptional performance.

A superheterodyne, using six of the latest tubes designed for automobile radio, it has a genuine Philco electro-dynamic speaker, the same type that is used in many of the larger home radio receivers. A three-section tuning condenser giving improved selectivity, remarkable sensitivity and tone, inherently quiet circuits and other improvements make this model one of the outstanding and most popular automobile radios.

Added to this, the ease of installation characteristic of this model (only one unit to install, one lead to the antenna and one lead to the ammeter) and the handy, attractive steering-column control which makes this model universal in its use are additional features which make the Model 11 a very desirable one for the dealer and for the owner.

I. F. TRANSFORMER AND PADDERS

The new style I. F. transformer complete with padders is used in the Model 11 (Code 122).

The padders are placed in the top of the shield can one above the other.

The primary padder is adjusted by means of the screw slot, accessible through the hole in the top of the shield can. The secondary padder is adjusted by means of the small hex nut, also accessible through the hole in the top of the shield. (See Figs. 1 and 2.)

The coil windings terminate in leads instead of terminals or lugs. The color scheme of the leads is given in Fig. 1.

If replacements are ever necessary, replace the entire coil assembly 32-1329 for the first I. F. stage and 32-1237 for the second I. F. stage. Neither the coil nor the padders will be furnished separately. Order only by the above numbers.

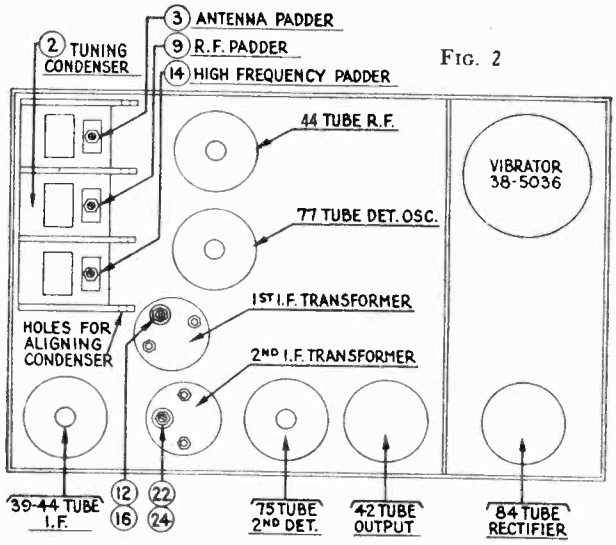


FIG. 2

MODEL 11 (CODE 122) ADJUSTMENTS

All adjustments have been carefully checked at the factory. If, however, it is found necessary to readjust the padding condensers, this procedure must be followed carefully. Do not attempt to make any adjustments until the procedure is clearly understood or without the use of a good oscillator or signal generator and output meter. The Philco Set Tester 048 is highly recommended for this procedure and for all service work.

The Receiver must be connected to a six-volt storage battery and turned on for operation. It is assumed that tubes have been checked and that the Receiver is in good condition except for the padding adjustments.

Remove the speaker lid from the Receiver. Remove the grid cap terminal from the 77 tube (for location see Fig. 2).

Set up the signal generator and adjust it to exactly 260 K. C. Connect the generator lead to the grid cap of the 77 tube. (See Fig. 2.) The output meter must be connected.

The Receiver volume control must be turned on to approximately full volume and the attenuator in the generator set for a half-scale reading of the output meter.

The padders ㉒ and ㉔ are adjusted first (Figs. 2 and 3). Turn the adjusting screw ㉒ all the way in. A metal screwdriver can be used for this. Then, with generator attenuator set so there is approximately half-scale reading, adjust the nut ㉔ with a fibre wrench for the maximum reading on the output meter.

Then adjust the screw ㉒ for maximum reading on the meter. This adjustment is critical. Note the maximum reading obtainable and then turn the screw in again and readjust, just bringing the adjustment up to the maximum reading. Do not pass it and then back off.

Repeat the above procedure with the condensers ⑫ and ⑯.

After padding the I. F. stages, remove the generator lead from the 77 tube and reconnect the grid lead to the 77 tube. Set the generator to 1600 K. C and then connect the generator lead to the antenna lead.

There are four holes in line, one in each of the sections of the tuning condenser housing. (See Fig. 2.) Place a nail of the size that fits snugly through the holes and then turn the condenser plates out of mesh until they strike against the nail.

With the tuning condenser in this position adjust the high-frequency padder ⑭ until the maximum reading is obtained in the output meter. This is the true setting for 1600 K. C., 160 on the dial scale.

Next turn the condenser plates in mesh to 140 on the scale, 1400 K. C., and set the signal generator for 1400 K. C. The R. F. padder ⑨ and the antenna padder ③ are next adjusted for the maximum reading on the output meter.

Recheck the adjustments and then remove all test leads. If this procedure has been carefully followed and an accurately calibrated oscillator or signal generator used, the Receiver is adjusted properly.

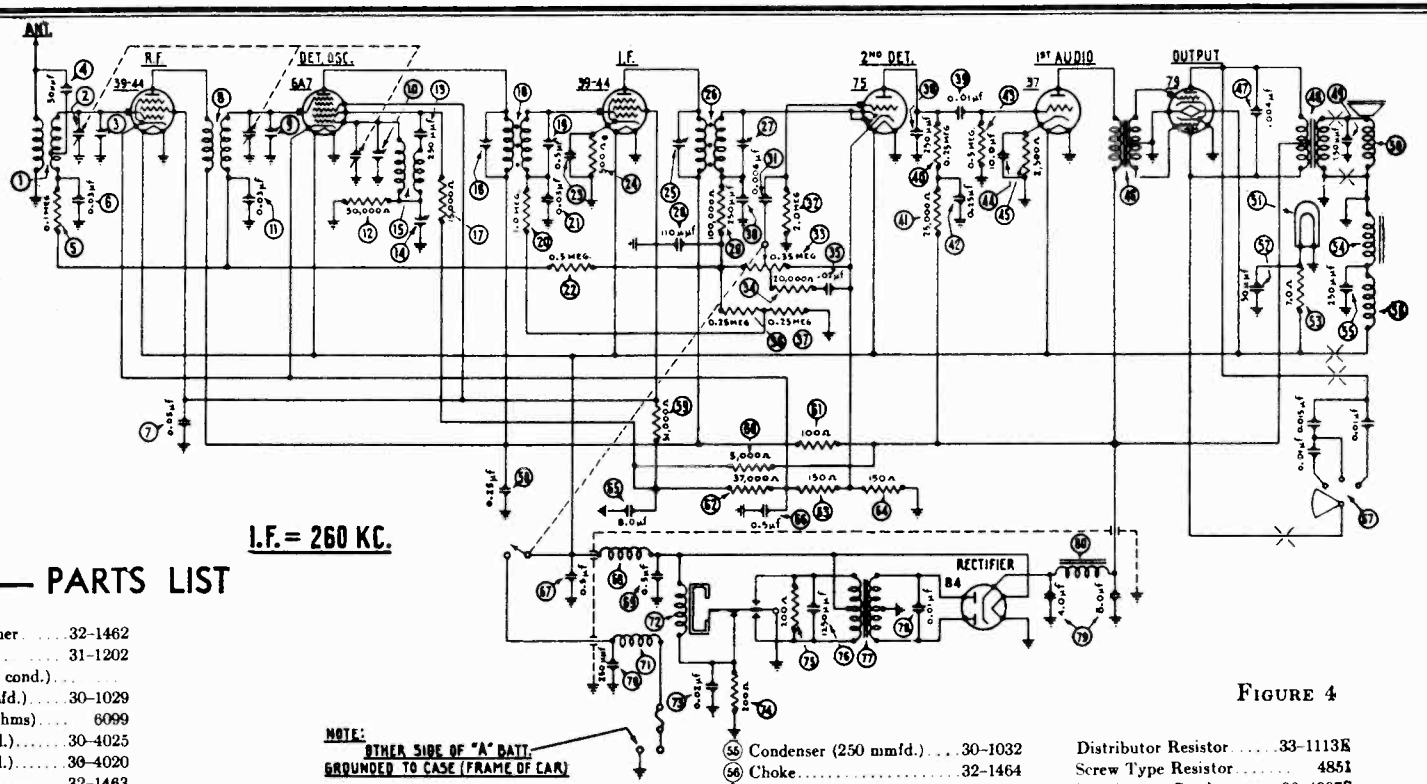


FIGURE 4

MODEL 802 — PARTS LIST

(1)	Antenna Transformer	32-1462
(2)	Tuning Condenser	31-1202
(3)	1st Padder (in tun. cond.)	
(4)	Condenser (50 mmfd.)	30-1029
(5)	Resistor (100,000 ohms)	6099
(6)	Condenser (.03 mfd.)	30-4025
(7)	Condenser (.05 mfd.)	30-4020
(8)	R. F. Transformer	32-1463
(9)	2nd Padder (in tun. cond.)	
(10)	3rd Padder (in tun. cond.)	
(11)	Condenser (.03 mfd.)	30-4025
(12)	Resistor (50,000 ohms)	6098
(13)	Condenser (250 mmfd.)	3082
(14)	Padder	30-6012
(15)	Oscillator Transformer	32-1222
(16)	Padder (Pri. 1st I. F. Trans.)	
(17)	Resistor (15,000 ohms)	6208
(18)	First I. F. Transformer	32-1471
(19)	Padder (Sec. 1st I. F. Trans.)	
(20)	Resistor (1,000,000 ohms)	33-1096
(21)	Condenser (.03 mfd.)	30-4025
(22)	Resistor (500,000 ohms)	6097
(23)	Condenser (.5 mfd.)	30-4058
(24)	Resistor (500 ohms)	6977
(25)	Padder (Pri. 2nd I. F. Trans)	
(26)	Second I. F. Transformer	32-1449
(27)	Padder (Sec. 2nd I. F. Trans.)	
(28)	Condenser (110 mmfd.)	30-1031
(29)	Resistor (100,000 ohms)	6099
(30)	Condenser (250 mmfd.)	30-1032
(31)	Condenser (.006 mfd.)	30-4125
(32)	Resistor (2,000,000 ohms)	33-1025
(33)	Vol. Cont. & Sw. Assembly	38-5851
(34)	Resistor (20,000 ohms)	33-1130
(35)	Condenser (.02 mfd.)	30-4215
(36)	Resistor (250,000 ohms)	33-1097
(37)	Resistor (250,000 ohms)	33-1097
(38)	Condenser (250 mmfd.)	30-1032
(39)	Condenser (.01 mfd.)	30-4145
(40)	Resistor (250,000 ohms)	33-1097
(41)	Resistor (25,000 ohms)	33-1013
(42)	Condenser (.25 mfd.)	30-4135
(43)	Resistor (500,000 ohms)	6097
(44)	Condenser (10 mfd.)	30-4135
(45)	Resistor (2500 ohms)	33-1100
(46)	Input Transformer	32-7206
(47)	Condenser (.004 mfd.)	30-4185
(48)	Output Transformer	32-7205
(49)	Condenser (250 mmfd.)	30-1032
(50)	Cone & Voice Coil	36-3159
(51)	Pilot Lamp	34-2040
(52)	Condenser (50 mmfd.)	30-1029
(53)	Resistor (7 ohms)	33-3130
(54)	Field Coil Assembly	02795
(55)	Condenser (250 mmfd.)	30-1032
(56)	Choke	32-1464
(57)	Tone Control	30-4208
(58)	Condenser (.25 mfd.)	30-4134
(59)	Resistor (51,000 ohms)	4237
(60)	Resistor (5000 ohms)	33-1070
(61)	Resistor (100 ohms)	33-3023
(62)	Resistor (37,000 ohms)	33-1098
(63)	Resistor (150 ohms)	33-3045
(64)	Resistor (150 ohms)	33-3045
(65)	Condenser (8 mfd.)	30-4135
(66)	Condenser (.5 mfd.)	30-4018
(67)	Condenser (.5 mfd.)	30-4015
(68)	Vibrator Choke	32-1474
(69)	Condenser (.5 mfd.)	30-4047
(70)	Condenser (250 mmfd.)	32-1466
(71)	"A" Choke	32-1466
(72)	Vibrator	38-5036
(73)	Condenser (.02 mfd.)	30-4039
(74)	Resistor (200 ohms)	7217
(75)	Resistor (200 ohms)	7217
(76)	Condenser (1250 mmfd.)	5886
(77)	Power Transformer	32-7098
(78)	Condenser (.01 mfd.)	30-4051
(79)	Filter Condenser (4-8 mfd.)	30-2015
(80)	"B" Choke	32-7104
	Spark Plug Resistors	33-1015E

Distributor Resistor	33-1113E
Screw Type Resistor	4851
Interference Condenser	30-4007S
Studs	28-6036
Nuts (Mounting)	W55A
Ammeter Cable	38-5296
Speaker Cable	41-3112
Antenna Lead	38-5131
Acorn Nut	W821
Fuse	7227
Fuse Insulator	27-7131
Control Assembly	42-5256
Bracket (Control)	6035
Strap (Control)	04344
Knob	27-4058
Knob Spring	28-1738
Glass	27-7325
Glass Gasket	27-7509
Pointer	28-1957
Flexible Shaft	28-8206
Face Assembly	42-5255
Control Cover	28-7037
4-prong Socket	27-6006
5-prong Socket	27-6014
6-prong Socket	27-6020
7-prong Socket	27-6005
Auto Radio Lock Switch	42-1076

MODEL 805

Alignment

Socket, Trimmers

PHILCO RADIO & TELEV. CORP.

I. F. TRANSFORMER AND PADDERS

The I. F. transformers are assembled complete with padding condensers.

The padders are placed in the top of the shield can, one above the other.

The primary padder is adjusted by means of the screw slot, accessible through the hole in the top of the shield can. The secondary padder is adjusted by means of the small hex nut, also accessible through the hole in the top of the shield. (See Figs. 1 and 2.)

The coil windings terminate in leads instead of terminals or lugs. The color scheme of the leads is given in Fig. 1.

If replacements are ever necessary, replace the entire coil assembly 32-1650 for the first I. F. stage and 32-1651 for the second I. F. stage. Neither the coil nor the padders will be furnished separately. Order only by the above numbers.

MODEL 805 ADJUSTMENTS

All adjustments have been carefully checked at the factory. If, however, it is found necessary to readjust the padding condensers, this procedure must be followed carefully. Do not attempt to make any adjustments until the procedure is clearly understood or without the use of a good oscillator or signal generator and output meter. The PHILCO set Tester 048 is highly recommended for this procedure and for all service work.

The Receiver must be connected to a six-volt storage battery and set up for operation. It is assumed that tubes have been checked and that the Receiver is in good condition except for the padding adjustments.

Remove the cover from the Receiver and disconnect the grid clip from the 78 tube, I. F. stage. (For location see Fig. 2)

Set up the signal generator and adjust it to exactly 260 K. C. Connect the generator lead to the grid cap of the 78 tube, and ground the shield to the Receiver housing.

Connect one lead from the output meter to the plate of the 41 tube and the other lead to the Receiver housing. The Receiver volume control must be turned to approximately full volume, and the attenuator in the generator set for a half-scale reading of the output meter.

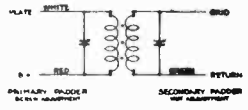


FIGURE 1

The secondary nut padder ㉕ must be adjusted for maximum reading in the output meter. Then adjust the primary screw padder ㉓ for maximum reading.

Remove the generator lead from the 78 tube and reconnect the grid clip.

Disconnect the grid clip from the 6A7 tube, and connect the generator lead to the grid cap of this tube. The secondary nut padder ⑳ must be adjusted for maximum reading in the output meter. Then adjust the primary screw padder ⑱ for maximum reading.

Readjust padders ㉕ and ㉓ for maximum reading on the output meter.

After padding the second I. F. stage, remove the generator lead from the 6A7 tube and reconnect the grid clip. Adjust the generator to 1600 K. C., and then connect the generator lead to the antenna lead, using a 150 mmfd. condenser in series between the two leads. Ground the shield to the Receiver housing.

Turn the Tuning Condenser Plates fully out of mesh.

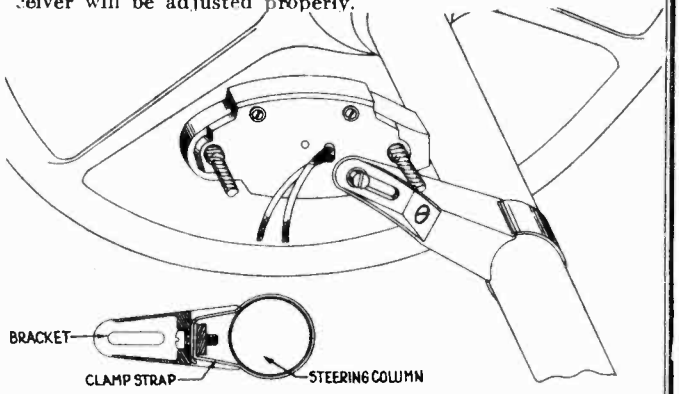
With the tuning condenser in this position, adjust the high-frequency padder ⑫ until the maximum reading is obtained in the output meter. This is the true setting for 1600 K. C., 160 on the dial scale. Adjust the padders ⑪ and ⑤ in the same manner.

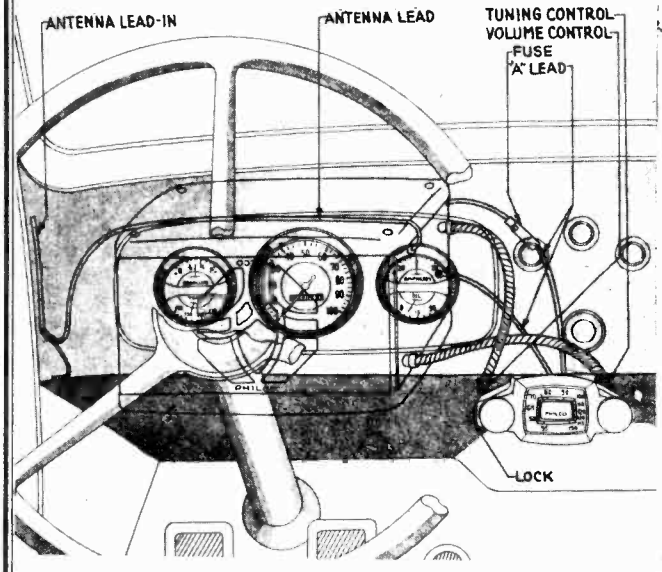
Turn the tuning condenser plates in mesh to approximately 580 on the dial scale, and adjust the signal generator to 580 K. C. Roll the tuning condenser and adjust the series padder ⑯ for the maximum meter reading.

Readjust the padder ⑫ at 1600 K. C.

Tune the condenser to 1400 K. C. and adjust the padders ⑪ and ⑤ for the maximum reading.

If this procedure has been carefully followed and an accurately calibrated oscillator or signal generator used, the Receiver will be adjusted properly.





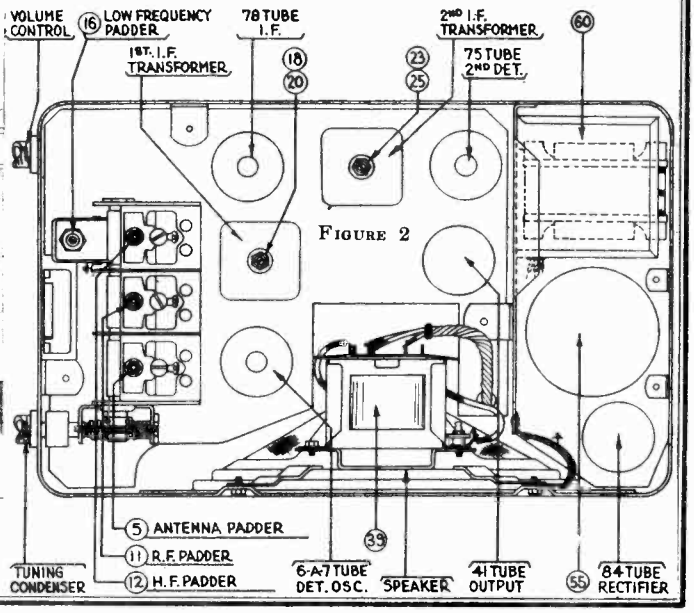


FIGURE 2

PHILCO RADIO & TELEVISION CORP.

MODEL 805
Schematic, Chassis
Parts List

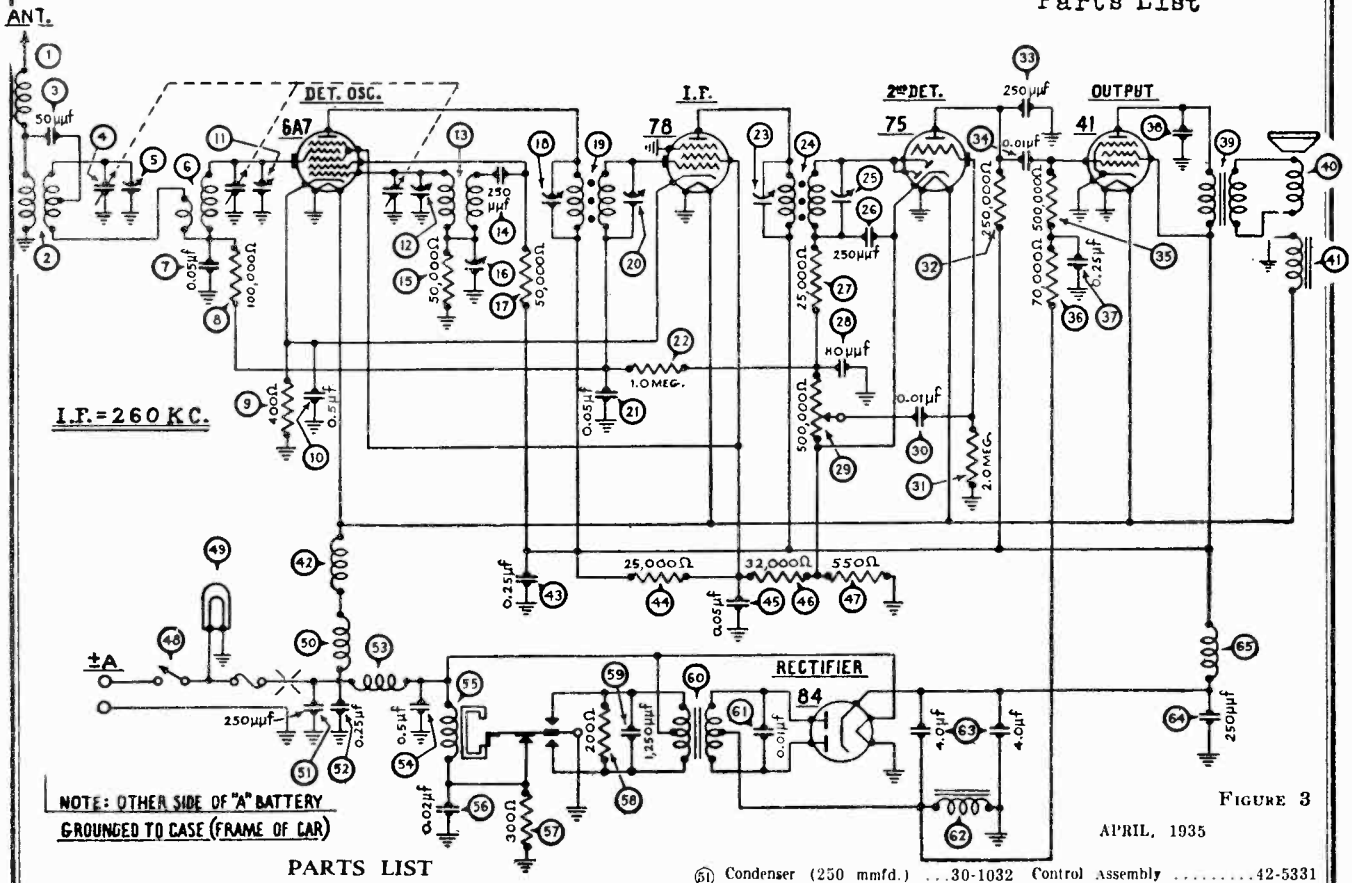


FIGURE 3

APRIL, 1935

PARTS LIST

No.	Description	Part No.
(1)	Antenna Choke	32-1372
(2)	Antenna Transformer	32-1655
(3)	Condenser (50 mmfd.)	4587
(4)	Tuning Condenser	31-1483
(5)	First Padder (on tun. cond.)	
(6)	R. F. Transformer	32-1656
(7)	Condenser (.05 mfd.)	30-4020
(8)	Resistor (100,000 ohms)	6099
(9)	Resistor (400 ohms)	33-3016
(10)	Condenser (.5 mfd.)	30-4227
(11)	Second Padder (on tun. cond.)	
(12)	Third Padder (on tun. cond.)	
(13)	Oscillator Transformer	32-1657
(14)	Condenser (250 mmfd.)	30-1032
(15)	Resistor (50,000 ohms)	33-1163
(16)	Fourth Padder (on tun. cond.)	
(17)	Resistor (50,000 ohms)	6098
(18)	Padder (Pri. 1st I. F. Transf.)	
(19)	First I. F. Transformer	32-1650
(20)	Padder (Sec. 1st I. F. Transf.)	
(21)	Condenser (.05 mfd.)	30-4020
(22)	Resistor (1,000,000 ohms)	33-1096
(23)	Padder (Pri. 2nd I. F. Transf.)	
(24)	Second I. F. Transformer	32-1651
(25)	Padder (Sec. 2nd I. F. Transf.)	
(26)	Condenser (250 mmfd.)	30-1032
(27)	Resistor (25,000 ohms)	33-1013
(28)	Condenser (110 mmfd.)	30-1031
(29)	Volume Control — (500,000 ohms)	38-6635
(30)	Condenser (.01 mfd.)	30-4124
(31)	Resistor (2,000,000 ohms)	33-1025
(32)	Resistor (250,000 ohms)	33-1097
(33)	Condenser (250 mmfd.)	30-1032
(34)	Condenser (.01 mfd.)	30-4169
(35)	Resistor (500,000 ohms)	6097
(36)	Resistor (70,000 ohms)	33-1115
(37)	Condenser (.25 mfd.)	30-4146
(38)	Condenser (8000 mmfd.)	30-4317
(39)	Output Transformer	32-7019
(40)	Cone and Voice Coil	36-3406
(41)	Field Coil Assembly	36-3405
(42)	"A" Choke	32-1377
(43)	Condenser (.25 mfd.)	30-4134
(44)	Resistor (25,000 ohms)	3656
(45)	Condenser (.05 mfd.)	30-4020
(46)	Resistor (32,000 ohms)	3525
(47)	Resistor (550 ohms)	33-3031
(48)	On-Off Switch Assembly	42-5336
(49)	Pilot Lamp	34-2039
(50)	"A" Choke	32-1644
(51)	Condenser (250 mmfd.)	30-1032
(52)	Condenser (.25 mfd.)	30-4146
(53)	Vibrator Choke	32-1625
(54)	Condenser (.5 mfd.)	30-4227
(55)	Vibrator	38-5036
(56)	Condenser (.02 mfd.)	30-4039
(57)	Resistor (300 ohms)	33-3010
(58)	Resistor (200 ohms)	7217
(59)	Condenser (1250 mmfd.)	5886
(60)	Power Transformer	32-7352
(61)	Condenser (.01 mfd.)	30-4051
(62)	Filter Choke	32-7351
(63)	Filter Condenser (4-4 mfd.)	30-2115
(64)	Condenser (250 mmfd.)	30-1032
(65)	"B" Choke	32-1281
	Fuse	7227
	Fuse Insulator	27-7729
	Antenna Lead	38-5131
	Flexible Shaft (21")	28-8354
	Flexible Shaft (28")	28-8355
	Lock Cylinder Assembly	42-5337
	Control Assembly	42-5331
	Glass and Dial Assembly*	27-7835
	Pointer Assembly	42-5335
	Bezel Plate	28-7108
	Knobs	27-4187
	Keys	28-2782
	Control Mtg. Bracket (dash)	29-2773
	Control Mtg. Bracket (steering)	6035
	Steering Mtg. Kit (28")	45-1133
	Studs (Set Mtg.)	28-6272
	Nuts (Set Mtg.)	W98A
	Spark Plug Resistor	33-1196
	Distributor Resistor	33-1196
	Interference Condenser	30-4007

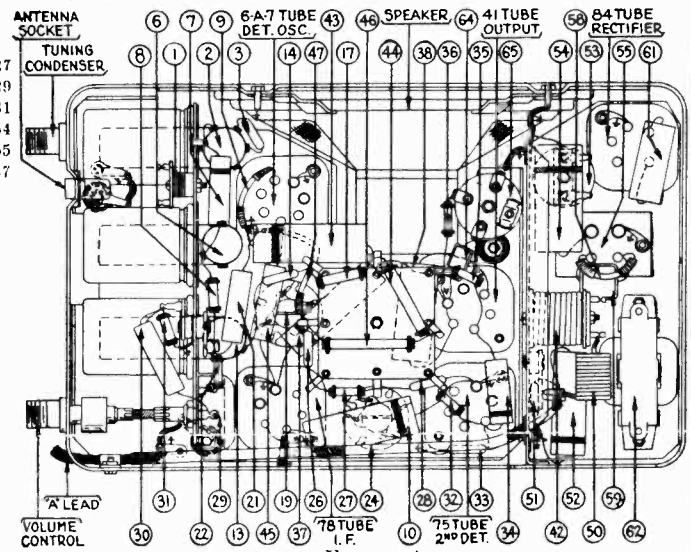


FIGURE 4

MODEL 806
Alignment, Socket Trimmers

PHILCO RADIO & TELEV. CORP.

I. F. TRANSFORMER AND PADDERS

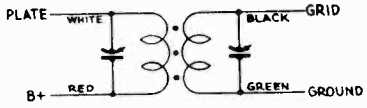
The first I. F. transformer is assembled complete with padding condensers. The second I. F. transformer is assembled complete with a padding condenser, two resistors and two mica condensers.

The padders are placed in the top of the shield can, one above the other.

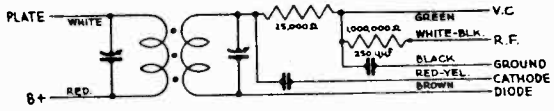
The primary padder is adjusted by means of the screw slot, accessible through the hole in the top of the shield can. The secondary padder is adjusted by means of the small hex nut, also accessible through the hole in the top of the shield. (See Figs. 1 and 2.)

The coil windings terminate in leads instead of terminals or lugs. The color scheme of the leads is given in Fig. 1.

If replacements are ever necessary, replace the entire coil assembly 32-1621 for the first I. F. stage and 32-1622 for the second I. F. stage. Neither the coil nor the padders will be furnished separately. Order only by the above numbers.



1st I. F. Transformer 32-1621



2nd I. F. Transformer 32-1622

FIG. 1

MODEL 806 ADJUSTMENTS

All adjustments have been carefully checked at the factory. If, however, it is found necessary to readjust the padding condensers, this procedure must be followed carefully. Do not attempt to make any adjustments until the procedure is clearly understood or without the use of a good oscillator or signal generator and output meter. The PHILCO Set Tester 048 is highly recommended for this procedure and for all service work.

The Receiver must be connected to a six-volt storage battery and set up for operation. It is assumed that tubes have been checked and that the Receiver is in good condition except for the padding adjustments.

Remove the cover from the Receiver and disconnect the grid clip from the 78 tube, I. F. stage. (For location see Fig. 2.)

Set up the signal generator and adjust it to exactly 260 K.C. Connect the generator lead to the grid cap of the 78 tube, and ground the shield to the Receiver housing.

Connect one lead from the output meter to the plate of the 41 tube and the other lead to the Receiver housing. The Receiver volume control must be turned to approximately full volume, and the attenuator in the generator set for a half-scale reading of the output meter.

The secondary nut padder (26) must be adjusted for maximum reading in the output meter. Then adjust the primary screw padder (23) for maximum reading.

Remove the generator lead from the 78 tube and reconnect the grid clip.

Disconnect the grid clip from the 6A7 tube, and connect the generator lead to the grid cap of this tube. The secondary nut padder (21) must be adjusted for maximum reading in the output meter. Then adjust the primary screw padder (19) for maximum reading.

After padding the first I. F. stage, remove the generator lead from the 6A7 tube and reconnect the grid clip. Adjust the generator to 1580 K.C., and then connect the generator lead to the antenna lead, using a 200 mmfd. condenser in series between the two leads. Ground the shield to the Receiver housing.

Turn the tuning condenser plates fully out of mesh. Place a slip of paper, .006 inch thick between stator plates and the heel of the rotor plates. Turn the rotor plates back until they just strike the paper.

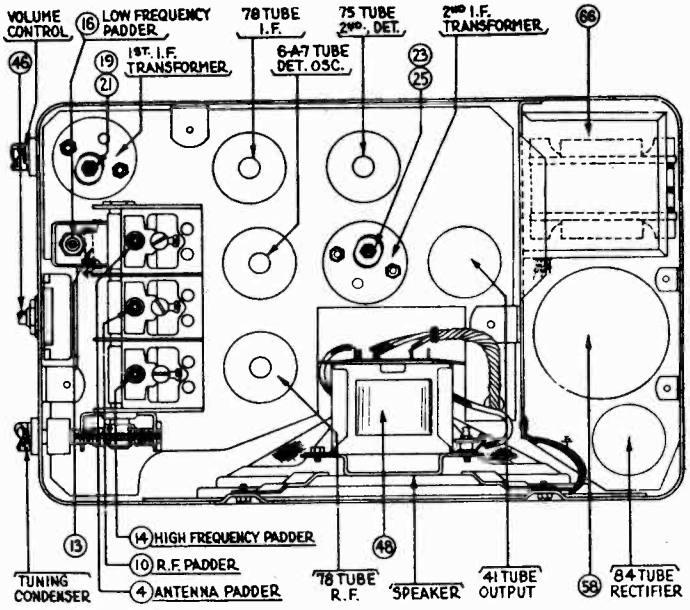


FIG. 2

PHILCO RADIO & TELEV. CORP.

MODEL 806
Schematic, Chassis Parts List

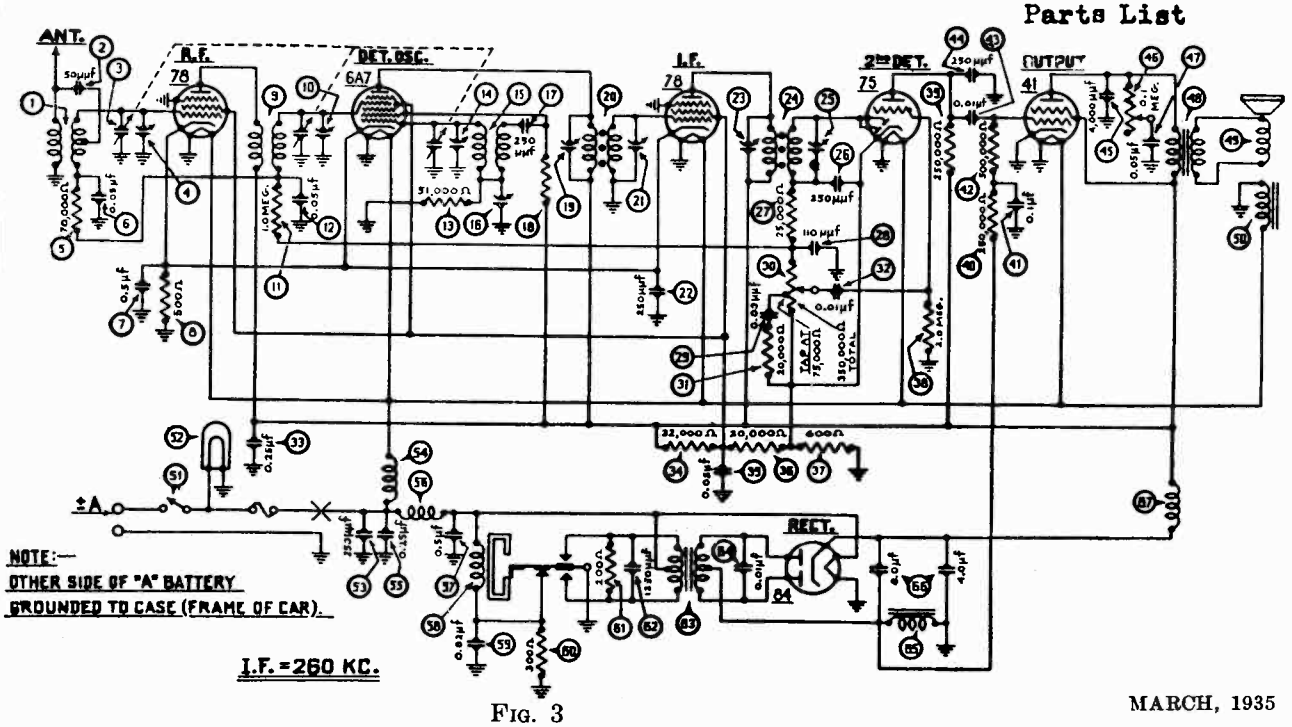


FIG. 3

MARCH, 1935

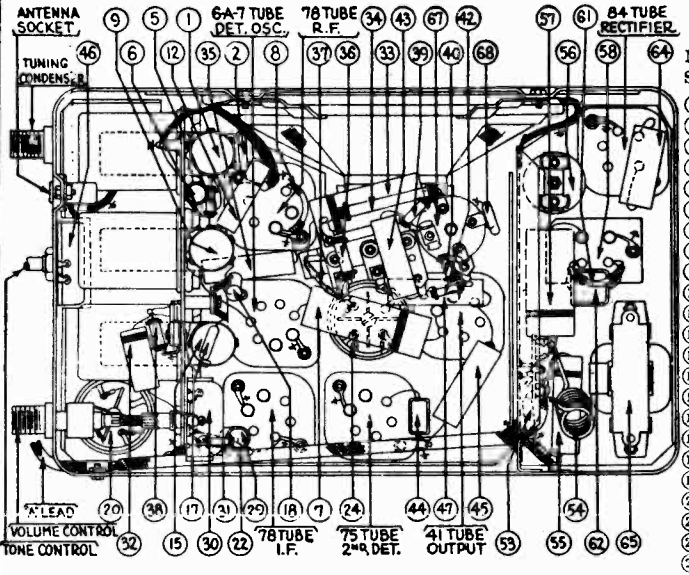


FIG. 4

With the tuning condenser in this position, adjust the high-frequency padder ⑭ until the maximum reading is obtained in the output meter. This is the true setting for 1580 K.C., 158 on the dial scale. Adjust the padders ⑩ and ④ in the same manner.

Remove the paper and turn the tuning condenser plates in mesh to approximately 60 on the dial scale, and adjust the signal generator to 600 K.C. Roll the tuning condenser and adjust the series padder ⑯ for the maximum meter reading.

Readjust the padder ⑭ at 1580 K.C.

Tune the condenser to 1400 K.C. and adjust the padders ⑩ and ④ for the maximum reading.

If this procedure has been carefully followed and an accurately calibrated oscillator or signal generator used, the Receiver will be adjusted properly.

NOTE—A condenser, ⑱, Part No. 30-1032 (250 mmfd.), has been added to the Receiver. One side is connected between the choke ⑰ and the 4 mfd. section of ⑱, and the other side to ground.

MODEL 806 PARTS LIST

No. Shown on Schematic	Description	Part No.
①	Antenna Transformer	32-1618
②	Condenser (50 mmfd.)	4587
③	Tuning Condenser	31-1483
④	First Padder (on tun. cond.)	
⑤	Resistor (70,000 ohms)	33-1115
⑥	Condenser (.05 mfd.)	30-4020
⑦	Condenser (.5 mfd.)	30-4227
⑧	Resistor (600 ohms)	33-3209
⑨	R. F. Transformer	32-1619
⑩	Second Padder (on tun. cond.)	
⑪	Resistor (1,000,000 ohms)	33-1096
⑫	Condenser (.05 mfd.)	30-4020
⑬	Resistor (51,000 ohms)	6098
⑭	Third Padder (on tun. cond.)	
⑮	Oscillator Transformer	32-1620
⑯	Fourth Padder (on tun. cond.)	
⑰	Condenser (250 mmfd.)	30-1032
⑱	Resistor (51,000 ohms)	33-1163
⑲	Padder (Pri. 1st I. F. Tran.)	
⑳	First I. F. Transformer	32-1621
㉑	Padder (Sec. 1st I. F. Tran.)	
㉒	Condenser (250 mmfd.)	30-1032
㉓	Padder (Pri. 2nd I. F. Tran.)	
㉔	Second I. F. Transformer	32-1622
㉕	Padder (Sec. 2nd I. F. Tran.)	
㉖	Condenser (250 mmfd.)	30-1032
㉗	Resistor (25,000 ohms)	33-1013
㉘	Condenser (110 mmfd.)	30-1031
㉙	Condenser (.03 mfd.)	30-4025
㉚	Vol. Con. & Coupling Assm.	38-6605
㉛	Resistor (20,000 ohms)	33-1178
㉜	Condenser (.01 mfd.)	30-4169
㉝	Condenser (.25 mfd.)	30-4134
㉞	Resistor (32,000 ohms)	3525
㉟	Condenser (.05 mfd.)	30-4020
㊱	Resistor (20,000 ohms)	6650
㊲	Resistor (600 ohms)	33-3207
㊳	Resistor (2,000,000 ohms)	33-1025
㊴	Resistor (250,000 ohms)	33-1097
㊵	Resistor (250,000 ohms)	33-1097
㊶	Condenser (.1 mfd.)	30-4122
㊷	Resistor (500,000 ohms)	6097
㊸	Condenser (.01 mfd.)	30-4145
㊹	Condenser (250 mmfd.)	30-1032
㊺	Condenser (4000 mmfd.)	30-4185
㊻	Tone Control	33-5101
㊼	Condenser (.05 mfd.)	30-4012
㊽	Output Transformer	32-7019
㊾	Cone & Voice Coil	36-3406
㊿	Field coil Assembly	36-3405
(51)	"On" & "Off" Switch Assm.	42-5836
(52)	Pilot Lamp	34-2039
(53)	Condenser (250 mmfd.)	30-1032
(54)	"A" Choke	32-1644
(55)	Condenser (.25 mfd.)	30-4146
(56)	Vibrator Choke	32-1625
(57)	Condenser (.5 mfd.)	30-4227
(58)	Vibrator	38-5036
(59)	Condenser (.02 mfd.)	30-4039
(60)	Resistor (300 ohms)	33-3010
(61)	Resistor (200 ohms)	7217
(62)	Condenser (1250 mmfd.)	5886
(63)	Power Transformers	32-7352
(64)	Condenser (.01 mfd.)	30-4051
(65)	Filter Choke	32-7351
(66)	Filter Condenser	30-2109
(67)	R. F. Choke	32-1348
(68)	Condenser (250 mmfd.)	30-1032
	Control Assembly	42-5331
	Glass and Dial	27-7835
	Pointer Assembly	42-5335
	Bezel Plate	28-7108
	Knobs	27-4187
	Control Mounting Bracket	29-2773
	Keys	28-2782
	Studs (Set Mtg.)	28-6272
	Nuts (Set Mtg.)	W98A
	Spark Plug Resistors	33-1195
	Distributor Resistor	33-1196
	Interference Condensers	30-4007
	Fuse	7227
	Fuse Insulator	27-7729
	Antenna Lead	38-5131
	Flexible Shaft (21")	28-8354
	Flexible Shaft (28")	28-8355
	Lock Cylinder Assembly	42-5337
	28" Shaft Kit	45-1133

GENERAL INSTALLATION

ANTENNA—In cars equipped with a top antenna, the antenna lead-in is usually brought down one of the windshield pillars and coiled behind the cowl trim panel. In such cases, the antenna lead (Receiver) must be spliced to the antenna lead-in as close as possible to the corner post and the shield pigtail on the lead grounded.

In cars having an all metal top, the Philco special under-car antenna should be installed (Part No. 45-1128 Kit). The shielded lead-in must be spliced to the shielded antenna lead and the shielding grounded. In all cases, cut off all excess lead-in, tape the splice and keep the lead-in out of the motor compartment.

RECEIVER AND SPEAKER INSTALLATION—The Receiver and Speaker must be installed under the cowl on the dash. Be sure that in the location selected, there is ample foot room and that they do not in any way interfere with the operation of the control pedals and ventilators. The Receiver can be installed on the right side of the dash, in the center or on the left side, above the steering column, while the Speaker can be installed on one side of the Receiver. Fig. 3 shows a typical installation with the Receiver on the left side.

The standard mounting for the Receiver is with three studs. Figure 1 shows a detailed view of the Receiver installed on the right side of the dash, using three studs for mounting the Receiver. When installed on the right side or the left side, the control coupling end of the Receiver must be towards the center of the dash. When installed in the center of the dash, the control coupling end must be towards the control unit. Cardboard templates are furnished so that the mounting bolt hole locations can be easily and accurately marked on the dash.

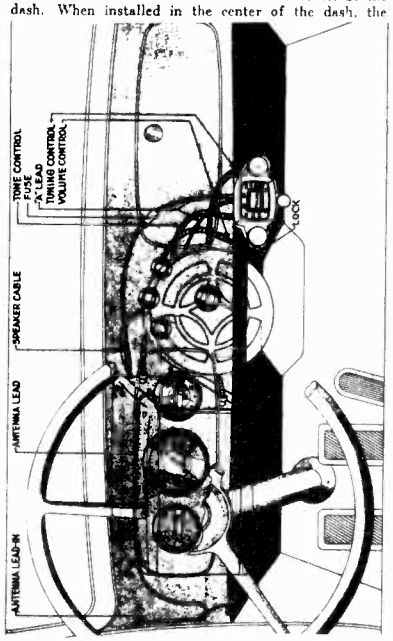


FIGURE 3

The dash on some 1935 cars is drilled for two Receiver mounting bolts. An extra set of bolt holes is provided in the Receiver housing for installation in these cars.

Before installing the Receiver, turn the volume control coupling counter-clockwise as far as it will go.

CONTROL UNIT—The control unit can be fastened to the bottom edge of the instrument board or on the steering column. Figure 2 shows how the control and the mounting bracket must be assembled on the steering column. Figure 3 shows a typical installation of the control on the instrument board. When used in this manner, bolt the "L" bracket to the rear of the control. Drill two holes in the instrument board flange in the desired location and fasten the bracket securely to the instrument board.

Unlock the control unit and turn the volume control knob clockwise half a turn. Seat the volume control shaft end in the proper coupling on the Receiver housing and fasten the shaft casing nut securely. The volume control must be turned counter-clockwise as far as it will go. Then remove the knob and loosen the set screw in the shaft end. Turn the shaft counter-clockwise until the switch in the control head snaps "off." Tighten the set screw and replace the knob.

The tuning control and tone control flexible shafts must be coupled in their respective bushings on the Receiver housing. The knurled casing nuts must be securely tightened. Fig. 1 and Fig. 3 show the locations of the shaft bushings on the Receiver housing.

In case the control unit is mounted on the steering column and the Receiver is installed at the extreme right of the dash, it will be necessary to replace the standard 21" flexible shafts with 28" shafts and extend the "A" lead. A special kit, Part No. 45-1133 can be obtained in exchange for the standard shafts.

CABLE CONNECTIONS—Place the fuse and fuse insulator in the metal fuse housing in the control "A" lead. Couple this to the short Receiver lead and then connect the other "A" lead to the ammeter stud on the rear of the instrument board.

The speaker cable must be connected into the socket on the speaker housing. The antenna lead must be connected in its socket on the end of the Receiver housing. (See Figures 1 and 3).

FLEXIBLE SHAFT ADJUSTMENTS—With the Receiver turned on for operation, tune in a broadcast station of known frequency. Remove the knob and loosen the set screws on the shaft end. Turn the shaft until the control pointer indicates the proper channel (add 0 to the channel number for frequency in kilocycles). Tighten the set screws and replace the knob.

STANDARD SUPPRESSION—The standard spark plug resistors (33-1195) can be installed on the spark plugs of practically all cars. Likewise the distributor resistor (33-1196) can be connected in the high tension center lead to the distributor.

Disconnect the high tension leads to the spark plugs. Cut off the terminal end of the lead and screw the small elbow-type resistor on the lead. The resistor can then be snapped on the terminal of the spark plug. To avoid confusion when the leads cannot be identified easily, install the resistor and make all connections on one lead at a time.

Remove the coil to distributor high tension lead from the distributor head and cut the lead two inches from the end. Screw the resistor to the short end and then screw the resistor into the main lead. Reconnect the terminal end of the lead to the distributor.

In case the spark plugs are not equipped with a suitable terminal, the standard ferrules can be obtained and placed on the plugs. Cars equipped with twin ignition require a spark plug resistor on each plug. Cars equipped with two ignition coils require two distributor resistors.

Two interference condensers are furnished — one must be connected to the generator side of the cut-out, the other to the battery side of the primary of the ignition coil or to the ignition switch. The condenser bracket must be fastened securely to a grounded metal part of the car. The condenser on the generator usually can be fastened to the generator housing under the same screw that holds the cut-out, while the coil condenser can usually be fastened under the coil mounting bolts.

In some cases, it may be necessary to connect an additional condenser to the ammeter or to the dome light lead at the corner post.

There may be some interference caused by an excessive gap between the distributor rotor and the high-tension contacts. This can be overcome by lengthening the contact end of the rotor. Place the metal end of the rotor on a steel block and peen or hammer it with a small machinist's hammer. Dress the end with a file so that it retains its original shape. The rotor should not brush or wipe the contacts, but should just clear them.

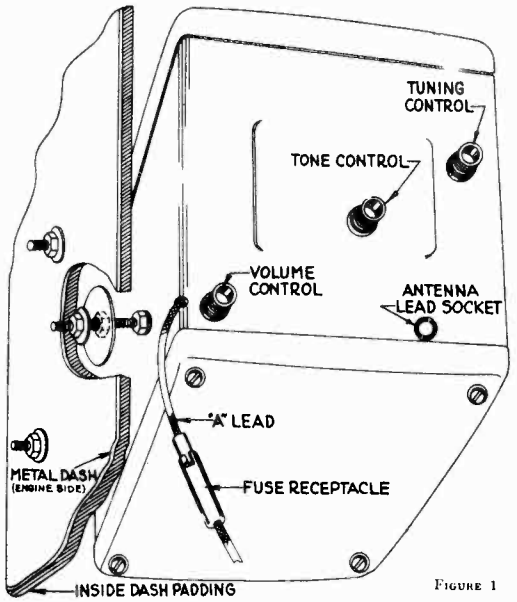


FIGURE 1

OPERATION

To operate the Receiver, the control must first be unlocked. The left-hand knob on the control is a combination switch and volume control. Turn the volume control knob clockwise. The first range of motion operates the Receiver switch; from there on it is the manual volume control.

With the volume control turned on half-way, allow the tubes to heat up. Then turn the right-hand knob (the station selector) to tune in the various programs. The numbers on the dial are channel numbers which, with the addition of "0" to the number correspond to the frequency in kilocycles. Adjust the volume to a suitable level and recheck the tuning. The Receiver must be tuned so that the maximum signal is obtained. Since the Receiver is extremely selective, it is of the utmost importance that the Receiver be tuned right on the station. Careless tuning off to one side even though the signal is still heard, results in very poor tone quality and very mushy reception.

The full range tone control knob is on the control unit. Adjust this control to the tone most pleasing. Speech is clearest when the control is set for "brilliant" — while orchestras will usually sound best when the control is set for a deeper tone.

Another use of the tone control is as a static modifier. When driving through an extremely noisy location, the tone control should be set for mellow or deep. This will subdue the harsh, rasping static.

Except on very weak signals, the automatic volume control maintains the same volume level while driving along without continually manipulating the manual volume control, cuts out external interference, counteracts fading and prevents blasting of local stations while tuning. It is virtually impossible, however, to maintain satisfactory reception while driving under bridges or in places which are totally shielded, known as dead spots.

The Receiver should be turned off by turning the volume control knob counter-clockwise until the switch clicks "off". The control can then be locked with the key.

PHILCO RADIO & TELEV. CORP.

MODEL 808
Schematic
Parts, Notes

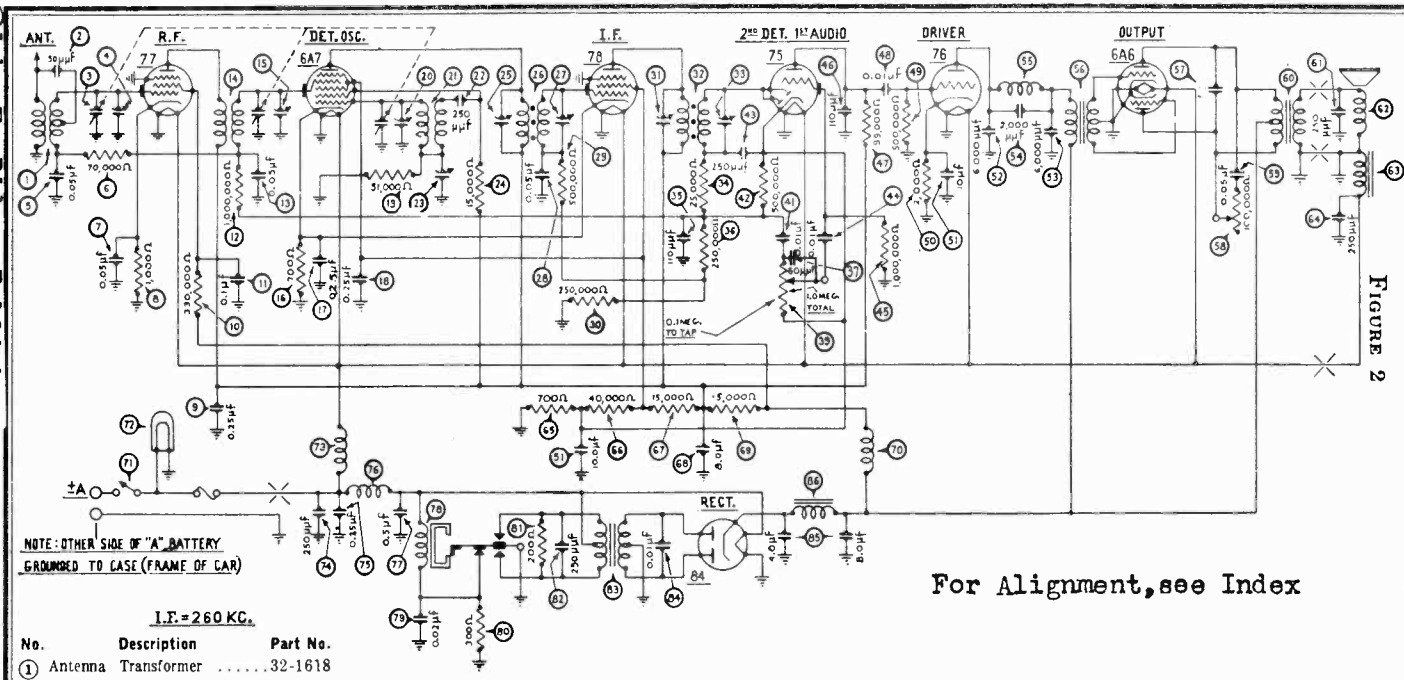
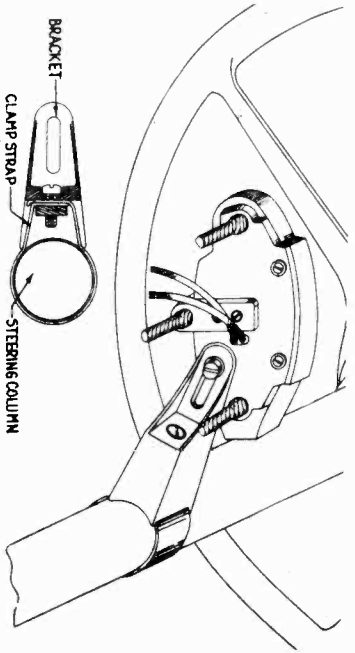


FIGURE 2



For Alignment, see Index

MODEL 808 — PARTS LIST

I.F. = 260 KC.

No.	Description	Part No.
(1)	Antenna Transformer	32-1618
(2)	Condenser (50 mfd.)	30-1029
(3)	Tuning Condenser	31-1490
(4)	First Padder (on tun. cond.)	
(5)	Condenser (.05 mfd.)	30-4020
(6)	Resistor (70,000 ohms)	33-1115
(7)	Condenser (.05 mfd.)	30-4020
(8)	Resistor (1000 ohms)	33-3017
(9)	Condenser (.25 mfd.)	30-4134
(10)	Resistor (330,000 ohms)	33-1200
(11)	Condenser (.1 mfd.)	30-4170
(12)	Resistor (1,000,000 ohms)	33-1096
(13)	Condenser (.05 mfd.)	30-4020
(14)	R. F. Transformer	32-1619
(15)	Second Padder (on tun. cond.)	
(16)	Resistor (700 ohms)	6443
(17)	Condenser (.25 mfd.)	30-4146
(18)	Condenser (.25 mfd.)	30-4146
(19)	Resistor (51,000 ohms)	4518
(20)	Third Padder (on tun. cond.)	
(21)	Oscillator Transformer	32-1620
(22)	Condenser (250 mmfd.)	30-1032
(23)	Fourth Padder (on tun. cond.)	
(24)	Resistor (15,000 ohms)	33-1177
(25)	Padder (Pri. 1st I. F. Transf.)	
(26)	First I. F. Transformer	32-1621
(27)	Padder (Sec. 1st I. F. Trans.)	
(28)	Condenser (.05 mfd.)	30-4020
(29)	Resistor (500,000 ohms)	6097
(30)	Resistor (250,000 ohms)	33-1097
(31)	Padder (Pri. 2nd I. F. Trans.)	
(32)	Second I. F. Transformer	32-1630
(33)	Padder (Sec. 2nd I. F. Trans.)	
(34)	Resistor (25,000 ohms)	33-1013
(35)	Condenser (110 mmfd.)	30-1031
(36)	Resistor (250,000 ohms)	33-1097
(37)	Condenser (50 mmfd.)	30-1029
(39)	Volume Control (1,000,000 ohms)	38-6636
(41)	Condenser (.01 mfd.)	30-4124
(42)	Resistor (500,000 ohms)	6097
(43)	Condenser (250 mmfd.)	30-1032
(44)	Condenser (.01 mfd.)	30-4169
(45)	Resistor (1,000,000 ohms)	33-1096
(46)	Condenser (110 mmfd.)	30-1031
(47)	Resistor (99,000 ohms)	6099
(48)	Condenser (.01 mfd.)	30-4124
(49)	Resistor (500,000 ohms)	6097
(50)	Resistor (2000 ohms)	33-1029
(51)	Condenser (10 — 10 mfd.)	30-2111
(52)	Condenser (6000 mmfd.)	30-4125
(53)	Condenser (6000 mmfd.)	30-4125
(54)	Condenser (2000 mmfd.)	30-4177
(55)	Choke	32-1281
(56)	Input Transformer	32-7356
(57)	Condenser (4000 mmfd.)	30-4185
(58)	Tone Control (100,000 ohms)	33-5096
(59)	Condenser (.05 mfd.)	30-4025
(60)	Output Transformer	32-7355
(61)	Condenser (250 mmfd.)	30-1032
(62)	Cone and Voice Coil	36-3441
(63)	Field Coil Assembly	36-3454
(64)	Condenser (250 mmfd.)	30-1032
(65)	Resistor (700 ohms)	6443
(66)	Resistor (40,000 ohms)	33-1044
(67)	Resistor (15,000 ohms)	5278
(68)	Condenser (8 mfd.)	30-2110
(69)	Resistor (5000 ohms)	3526
(70)	R. F. Choke	32-7368
(71)	On and Off Switch	42-5336
(72)	Pilot Lamp	34-2039
(73)	"A" Choke	32-1644
(74)	Condenser (250 mmfd.)	30-1032
(75)	Condenser (.25 mfd.)	30-4146
(76)	Vibrator Choke	32-1607
(77)	Condenser (.5 mfd.)	30-4227
(78)	Vibrator	38-5036
(79)	Condenser (.02 mfd.)	30-4039
(80)	Resistor (300 ohms)	30-3010
(81)	Resistor (200 ohms)	7217
(82)	Condenser (1250 mmfd.)	5886
(83)	Power Transformer	32-7352
(84)	Condenser (.01 mfd.)	30-4051
(85)	Filter Condenser (4-8 mfd.)	30-2112
(86)	Filter Choke	32-7104
(87)	Antenna Choke	32-1372
(88)	"A" Choke	32-1438
(89)	Condenser (250 mmfd.)	30-1032
	Control Assembly	42-5332
	Glass and Dial	27-7835
	Pointer Assembly	42-5335
	Bezel Plate	28-7108
	Knobs	27-4187
	Control mtg. Bracket (Dash)	29-2773
	Control mtg. Bracket (Steering)	6035
	Strap	04344
	Strap Pad	6206
	Keys	28-2782
	Studs (set mtg.)	28-6272
	Nuts (set mtg.)	W98A
	Stud (speaker mtg.)	6122
	Nut (speaker mtg.)	W55A
	Spark Plug Resistors	33-1195
	Distributor Resistor	33-1196
	Interference Condenser	30-4007
	Fuse	7227
	Fuse Insulator	27-7729
	Antenna Lead	38-5131
	Lock Cylinder Assembly	42-5337
	Control Shaft 21"	28-8354
	Control Shaft 28"	28-8355
	Tone Control Shaft (21")	28-8356
	Tone Control Shaft (28")	28-8358

NOTE: An antenna choke (88) Part No. 32-1372 has been added to the Receiver. This is connected in series with the antenna lead, and the antenna transformer (1) and condenser (2).

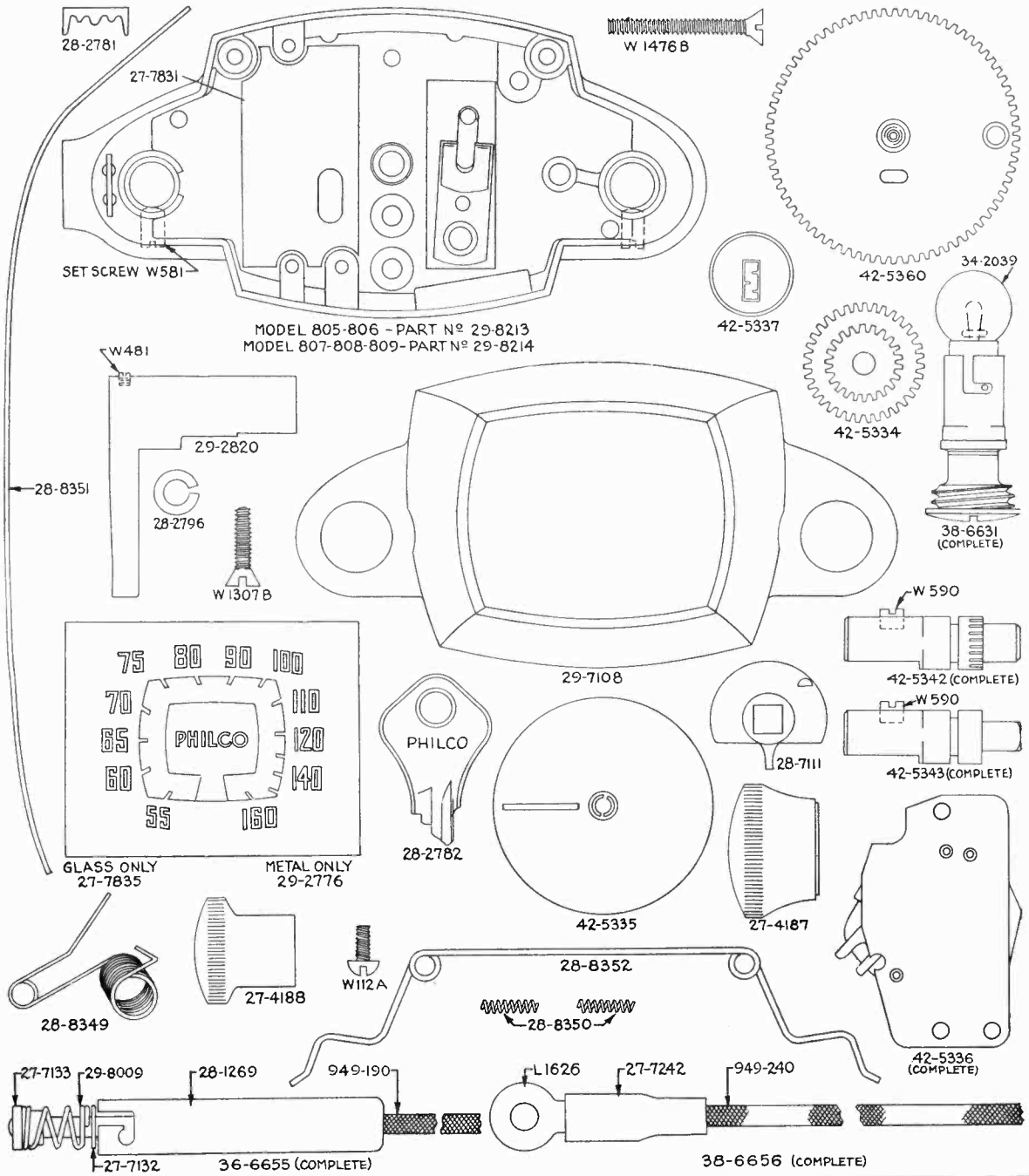
A Filter Choke (88) Part No. 32-1438 has been added to the Receiver. This is connected in series with one side of Choke (73) and the tube filaments.

A Condenser (89) Part No. 30-1032 has been added to the Receiver. One side is connected between this new Choke and Choke (73), and the other side to ground.

MODELS 805,806,808,809
Parts Details,Parts

PHILCO RADIO & TELEV. CORP.

Control Unit Assembly — Models 805, 806, 807, 808 and 809



Part No.	Description
L-1626	Sleeve
W-112A	Screw (bracket mtg.)
W-481	Set Screw
W-581	Set Screw
W-590	Set Screw
W-1307B	Screw (tone control mtg.)
W-1476B	Screw (control cover mtg.)
27-4187	Tuning and Volume Control Knob
27-4188	Tone Control Knob
27-7132	Washer
27-7133	Contact
27-7831	Insulator
27-7835	Glass and Dial
28-1269	Fuse Housing
28-2781	Lock Indexing Plate
28-2782	Key
28-7111	Switch Operating Disc
28-8349	Spring (anti back lash)
28-8350	Springs (Lock)
28-8351	Spring (glass holder)
28-8352	Spring (shaft retaining)
28-8354	Flexible Shaft (21")
28-8355	Flexible Shaft (28")
28-8356	Tone Control Shaft (21")
28-8358	Tone Control Shaft (28")
29-2776	Glass Holder
29-2820	Tone Control Shaft Mtg. Bracket
29-7108	Control Cover
29-8009	Spring (fuse housing assembly)
29-8213	Control Housing and Set Screw (805-806)
29-8214	Control Housing and Set Screw (807-808-809)
34-2039	Pilot Lamp
38-6631	Pilot Lamp Assembly
38-6655	Fuse Terminal Assembly
38-6656	Ammeter Lead Assembly
42-5331	Complete Control (805-806)
42-5332	Complete Control (808-809))
42-5334	Intermediate Gear and Shaft
42-5335	Pointer disc assembly
42-5336	Switch and bracket assembly
42-5337	Lock cylinder assembly
42-5342	Tuning Shaft and Set Screw
42-5343	Volume Shaft and Set Screw
42-5360	Pointer gear and stop assembly
949-240	Wire

MODEL 809

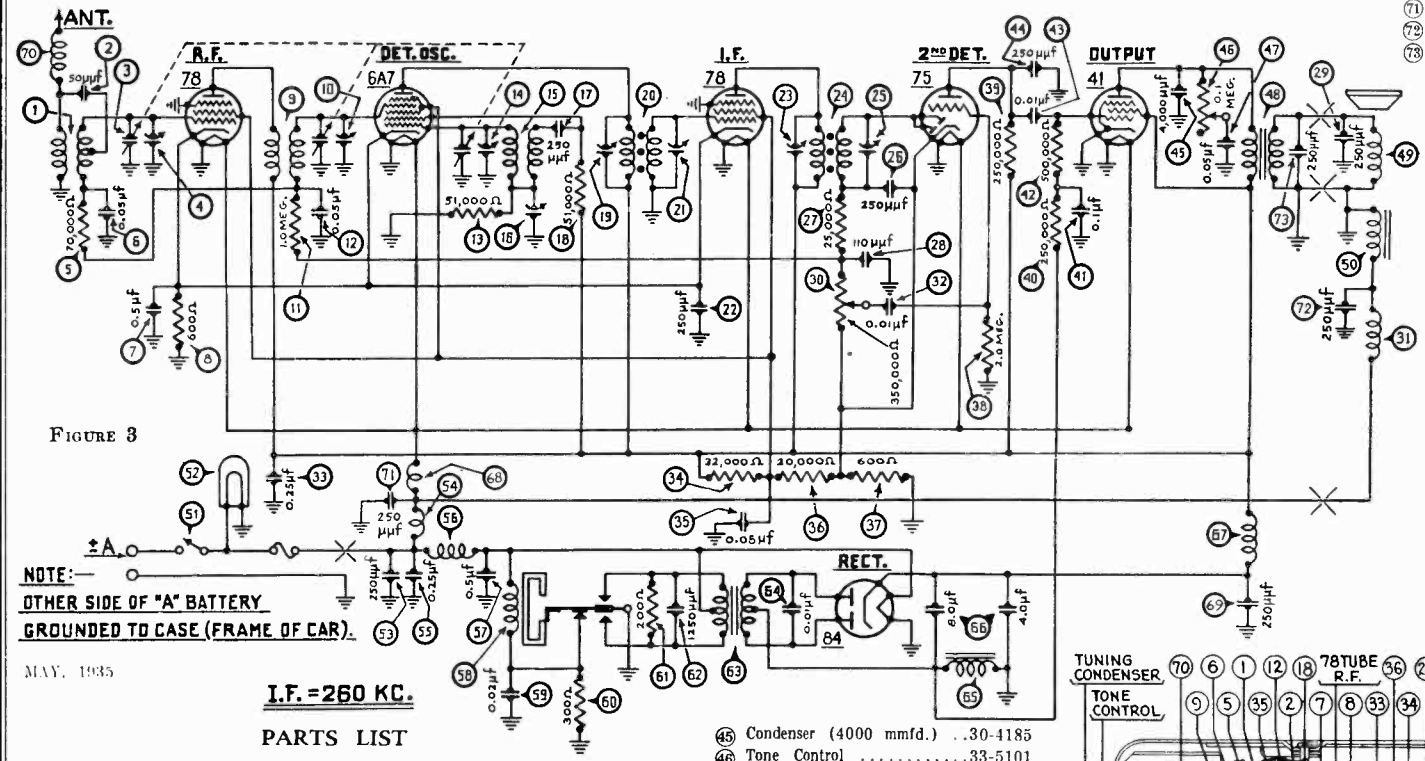


FIGURE 3

MAY, 1935

PARTS LIST

(1)	Antenna Transformer	32-1618	
(2)	Condenser (50 mmfd.)	4587	
(3)	Tuning Condenser	31-1483	
(4)	First Padder (on tun. cond.)	.....	
(5)	Resistor (70,000 ohms)	33-1115	
(6)	Condenser (.05 mfd.)	30-4020	
(7)	Condenser (.5 mfd.)	30-4227	
(8)	Resistor (600 ohms)	33-3209	
(9)	R. F. Transformer	32-1619	
(10)	Second Padder (on tun. cond.)	.....	
(11)	Resistor (1,000,000 ohms)	.33-1096	
(12)	Condenser (.05 mfd.)	30-4020	
(13)	Resistor (51,000 ohms)	6098	
(14)	Third Padder (on tun. cond.)	.....	
(15)	Oscillator Transformer	32-1620	
(16)	Fourth Padder (on tun. cond.)	.....	
(17)	Condenser (250 mmfd.)	30-1032	
(18)	Resistor (51,000 ohms)	33-1163	
(19)	Padder (Pri. 1st I. F. Tran.)	....	
(20)	First I. F. Transformer	32-1621	
(21)	Padder (Sec. 1st I. F. Tran.)	....	
(22)	Condenser (250 mmfd.)	30-1032	
(23)	Padder (Pri. 2nd I. F. Tran.)	....	
(24)	Second I. F. Transformer	..32-1622	
(25)	Padder (Sec. 2nd I. F. Tran.)	....	
(26)	Condenser (250 mmfd.)	30-1032	
(27)	Resistor (25,000 ohms)	33-1013	
(28)	Condenser (110 mmfd.)	30-1031	
(29)	Condenser (250 mmfd.)	...30-1032	
(30)	Vol. Con. & Coupling Assm.	38-6605	
(31)	Choke	32-1464	
(32)	Condenser (.01 mfd.)	30-4169	
(33)	Condenser (.25 mfd.)	30-4134	
(34)	Resistor (32,000 ohms)	3525	
(35)	Condenser (.05 mfd.)	30-4020	
(36)	Resistor (20,000 ohms)	6650	
(37)	Resistor (600 ohms)	33-3207	
(38)	Resistor (2,000,000 ohms)	.33-1025	
(39)	Resistor (250,000 ohms)	..33-1097	
(40)	Resistor (250,000 ohms)	...33-1097	
(41)	Condenser (.1 mfd.)	30-4122	
(42)	Resistor (500,000 ohms)	6097	
(43)	Condenser (.01 mfd.)	30-4145	
(44)	Condenser (250 mmfd.)	30-1032	
(45)	Condenser (4000 mmfd.)	..30-4185	
(46)	Tone Control	33-5101	
(47)	Condenser (.05 mfd.)	30-4012	
(48)	Output Transformer	2598	
(49)	Cone & Voice Coil	36-3159	
(50)	Field-coil Assembly	02795	
(51)	"On"&"Off" Switch Assm.	42-5336	
(52)	Pilot Lamp	34-2039	
(53)	Condenser (250 mmfd.)	...30-1032	
(54)	"A" Choke	32-1644	
(55)	Condenser (.25 mfd.)	30-4146	
(56)	Vibrator Choke	32-1377	
(57)	Condenser (.5 mfd.)	30-4227	
(58)	Vibrator	38-5036	
(59)	Condenser (.02 mfd.)	30-4039	
(60)	Resistor (300 ohms)	33-3010	
(61)	Resistor (200 ohms)	7217	
(62)	Condenser (1250 mmfd.)	5886	
(63)	Power Transformer	32-7352	
(64)	Condenser (.01 mfd.)	30-4051	
(65)	Filter Choke	32-7351	
(66)	Filter Condenser	30-2109	
(67)	R. F. Choke	32-1348	
(68)	"A" Choke	32-1438	
(69)	Condenser (250 mmfd.)	30-1032	
(70)	Antenna Choke	32-1637	
(71)	Condenser (250 mmfd.)	30-1032	
(72)	Condenser (250 mmfd.)	30-1032	
(73)	Condenser (250 mmfd.)	30-1032	
	Control Assembly	42-5332	
	Glass and Dial	27-7835	
	Pointer Assembly	42-5335	
	Bezel Plate	28-7108	
	Knobs (Tuning-Volume)	27-4187	
	Knob (Tone Control)	27-4052	
	Stud (Spker Mtg.)	6122	
	Control Mounting Bracket	.29-2773	
	Keys	28-2782	
	Studs (Set Mtg.)	28-6298	
	Nuts (Set Mtg.)	.....W98A	
	Spark Plug Resistors	33-1195	
	Distributor Resistor	33-1196	
	Interference Condensers	30-4007	
	Fuse	7217	
	Fuse Insulator	27-7729	
	Antenna Lead	38-5131	
	Flexible Shaft (21")	28-8354	
	Flexible Shaft (28")	28-8355	
	Tone Control Shaft (21")	..28-8356	
	Tone Control Shaft (28")	..28-8358	
	Lock Cylinder Assembly	42-5337	
	28" Shaft Kit	45-1133	

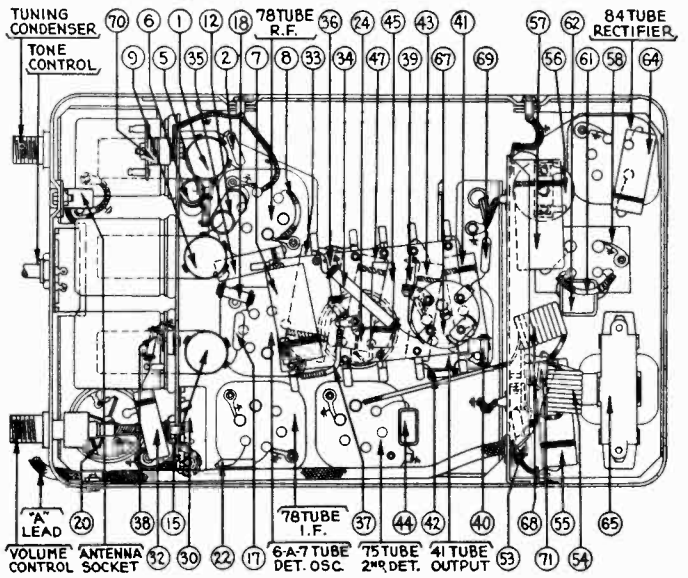


FIGURE 4

PHILCO RADIO & TELEV. CORP.

MODEL 809
Schematic
Chassis, Parts

MODELS 808,809
Trimmers,Alignment

PHILCO RADIO & TELEV. CORP.

I. F. Transformer and Padders (Models 808-809)

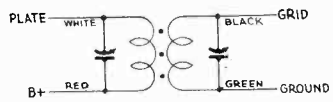
The first I. F. transformer is assembled complete with padding condensers. The second I. F. transformer is assembled complete with padding condensers and a network of resistors and mica condensers.

The padders are placed in the top of the shield can, one above the other.

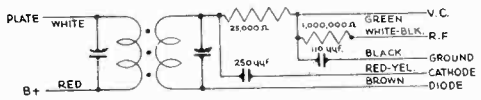
The primary padder is adjusted by means of the screw slot, accessible through the hole in the top of the shield can. The secondary padder is adjusted by means of the small hex nut, also accessible through the hole in the top of the shield. (See Figures 5-6-7).

The coil windings terminate in leads instead of terminals or lugs. The color scheme of the leads is given in Fig. 5.

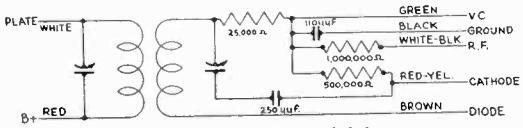
If replacements are ever necessary, replace the entire coil assembly 32-1621 for the first I. F. stage and 32-1630 (Model 808) and 32-1622 (Model 809) for the second I. F. stage. Neither the coil nor the padders will be furnished separately. Order only by the above numbers.



PART No. 32-1621 (Model 808 - 809)



PART No. 32-1622 (Model 809)



PART No. 32-1630 (Model 808)

FIGURE 5

Model 808 Adjustments

All adjustments have been carefully checked at the factory. If, however, it is found necessary to readjust the padding condensers, this procedure must be followed carefully. Do not attempt to make any adjustments until the procedure is clearly understood or without the use of a good oscillator or signal generator and output meter. The PHILCO SET TESTER 048 is highly recommended for this procedure and for all service work.

The Receiver must be connected to a six-volt storage battery and set up for operation. It is assumed that tubes have been checked and that the Receiver is in good condition except for the padding adjustments.

Remove the cover from the Receiver and disconnect the grid clip from the 78 tube, I. F. stage. (For location see Fig. 6).

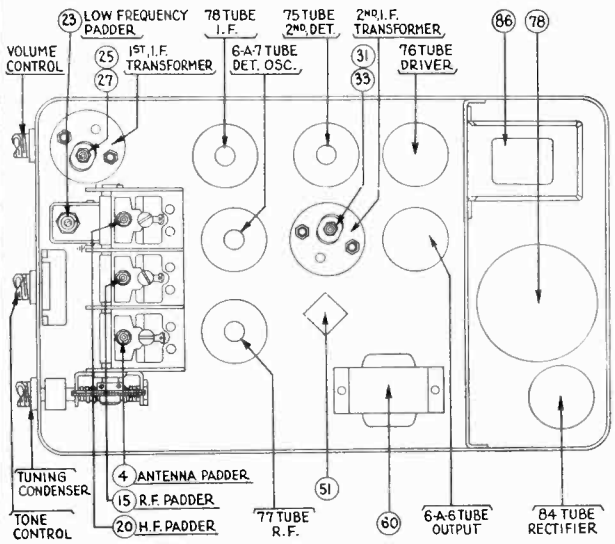


FIGURE 6

Set up the signal generator and adjust it to exactly 260 K. C. Connect the generator lead to the grid cap of the 78 tube, and ground the shield to the Receiver housing.

Connect one lead from the output meter to the plate of the output tube and the other lead to the Receiver housing. The Receiver volume control must be turned to approximately full volume, and the attenuator in the generator set for a half-scale reading of the output meter.

1. The secondary nut padder (33) must be adjusted for maximum reading in the output meter. Then adjust the primary screw padder (31) for maximum reading.

2. Remove the generator lead from the 78 tube and reconnect the grid clip.

3. Disconnect the grid clip from the 6A7 tube and connect the generator lead to the grid cap of this tube. The secondary nut padder (27) must be adjusted for maximum reading in the output meter. Then adjust the primary screw padder (25) for maximum reading.

4. After padding the first I. F. stage remove the generator lead from the 6A7 tube and reconnect the grid clip. Adjust the generator to 1600 K. C. and then connect the generator lead to the antenna lead, using a 150 mmfd. condenser in series between the two leads, ground the shield to the Receiver housing.

5. Turn the tuning condenser out of mesh as far as it will go. With the tuning condenser in this position adjust the high frequency padder (20) until the maximum reading is obtained in the output meter. This is the true setting for 1600 K. C. 160 on the dial scale. Adjust the padders (15) and (4) in the same manner.

6. Turn the tuning condenser plates in mesh to approximately 580 on the dial scale and adjust the signal generator to 580 K. C. Roll the tuning condenser and adjust the series padder (23) for maximum reading.

7. Readjust padder (20) at 1600 K. C.

8. Turn the condenser to 1400 K. C. and adjust the padders (15) and (4) for maximum reading.

If this procedure has been carefully followed and an accurately calibrated oscillator or signal generator has been used, the Receiver will be adjusted properly.

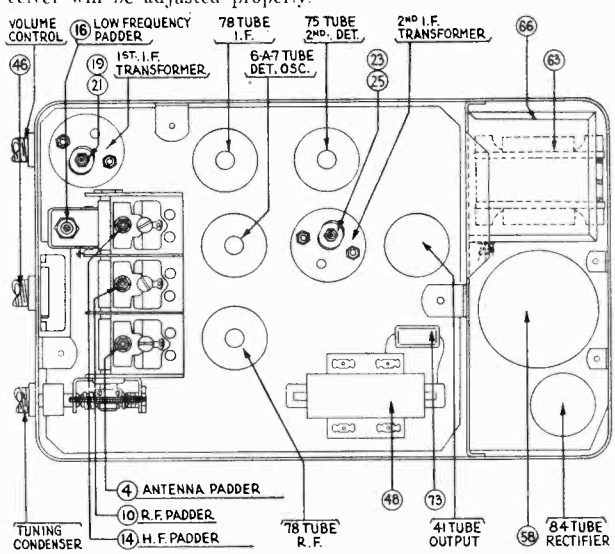


FIGURE 7

Model 809 Adjustments

Adjustments for the Model 809 are practically the same as for the Model 808. (For location of padders, See Fig. 7).

In step 1 — adjust the secondary nut padder (25) and the primary screw padder (23)

In step 3 — adjust the secondary nut padders (21) and the primary screw padder (19)

In step 5 — adjust padders (14), (10) and (4)

In step 6 — adjust padder (16)

In step 7 — adjust padder (14)

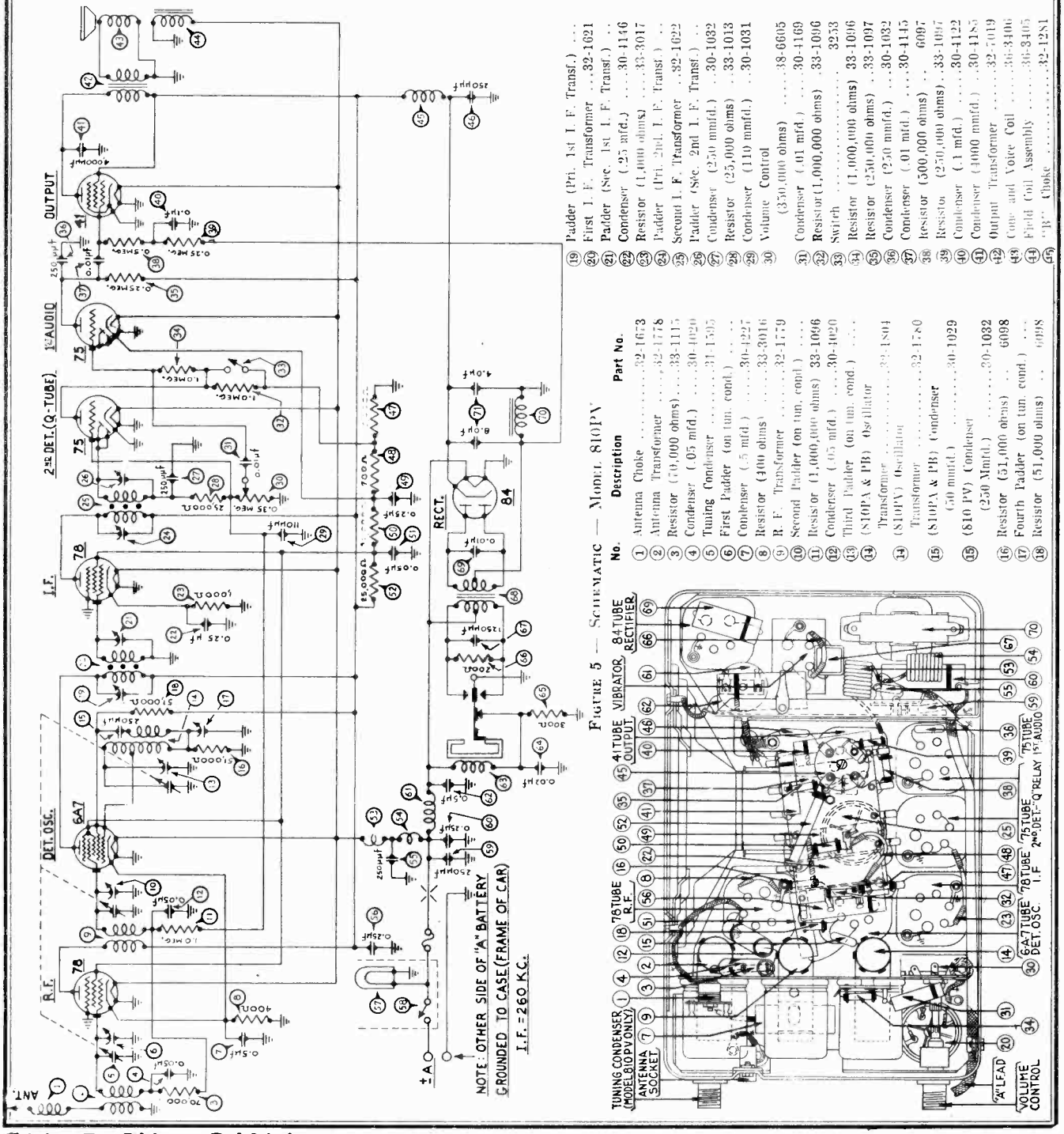
In step 8 — adjust padders (10) and (4)

PHILCO RADIO & TELEV. CORP.

MODEL 810-PV
Schematic, Chassis
MODELS 810PA, 810PB, 810PV
Parts List

No.	Description	Part No.
(1)	Antenna Choke	32-1673
(2)	Antenna Transformer	32-1778
(3)	Resistor (70,000 ohms)	33-1115
(4)	Condenser (.05 mfd.)	30-4020
(5)	Tuning Condenser	31-1505
(6)	First Padder (on tun. cond.)	
(7)	Condenser (.5 mfd.)	30-4227
(8)	Resistor (400 ohms)	33-3016
(9)	R. F. Transformer	32-1779
(10)	Second Padder (on tun. cond.)	
(11)	Resistor (1,000,000 ohms)	33-1096
(12)	Condenser (.05 mfd.)	30-4020
(13)	Third Padder (on tun. cond.)	
(14)	(810PA & PB) Oscillator Transformer	32-1804
(14)	(810PV) Oscillator Transformer	32-1780
(15)	(810PA & PB) Condenser (50 mmfd.)	30-1029
(15)	(810 PV) Condenser (250 Mmfd.)	30-1032
(16)	Resistor (51,000 ohms)	6098
(17)	Fourth Padder (on tun. cond.)	
(18)	Resistor (51,000 ohms)	6098
(19)	Padder (Pri. 1st I. F. Transf.)	
(20)	First I. F. Transformer	32-1621
(21)	Padder (Sec. 1st I. F. Transf.)	
(22)	Condenser (.25 mfd.)	30-4146
(23)	Resistor (1,000 ohms)	33-3017
(24)	Padder (Pri. 2nd I. F. Transf.)	
(25)	Second I. F. Transformer	32-1622
(26)	Padder (Sec. 2nd I. F. Transf.)	
(27)	Condenser (250 mmfd.)	30-1032
(28)	Resistor (25,000 ohms)	33-1013
(29)	Condenser (110 mmfd.)	30-1031
(30)	Volume Control (350,000 ohms)	38-6605
(31)	Condenser (.01 mfd.)	30-4169
(32)	Resistor (1,000,000 ohms)	33-1096
(33)	Switch	3253
(34)	Resistor (1,000,000 ohms)	33-1096
(35)	Resistor (250,000 ohms)	33-1097
(36)	Condenser (250 mmfd.)	30-1032
(37)	Condenser (.01 mfd.)	30-4145
(38)	Resistor (500,000 ohms)	6097
(39)	Resistor (250,000 ohms)	33-1097
(40)	Condenser (.1 mfd.)	30-4122
(41)	Condenser (4000 mmfd.)	30-4185
(42)	Output Transformer	32-7019
(43)	Cone and Voice Coil	36-3406
(44)	Field Coil Assembly	36-3405
(45)	"B" Choke	32-1281
(46)	Condenser (250 mmfd.)	30-1032
(47)	Resistor (10,000 ohms)	4112
(48)	Resistor (700 ohms)	33-3019
(49)	Condenser (.25 mfd.)	30-4146
(50)	Resistor (25,000 ohms)	4516
(51)	Condenser (.05 mfd.)	30-4020
(52)	Resistor (25,000 ohms)	3656
(53)	"A" Choke	32-1318
(54)	"A" Choke	32-1644
(55)	Condenser (250 mmfd.)	30-1032
(56)	Condenser (.25 mfd.)	30-4134
(57)	Pilot Lamp	34-2040
(58)	On and Off Switch Assembly	
	Model 810P only	42-5362
(59)	Condenser (250 mmfd.)	30-1032
(60)	Condenser (.25 mfd.)	30-4146
(61)	Vibrator Choke	32-1377
(62)	Condenser (.5 mfd.)	30-4227
(63)	Vibrator	38-5030
(64)	Condenser (.02 mfd.)	30-4051
(65)	Resistor (300 ohms)	33-3010
(66)	Resistor (200 ohms)	7217
(67)	Condenser (1250 mmfd.)	5886
(68)	Power Transformer	32-7352
(69)	Condenser (.01 mfd.)	30-4051
(70)	Filter Choke	32-7351
(71)	Filter Condenser (4—8 mfd.)	30-2109
(72)	Cystal (Model 810PA) 1875 K. C. Receiver Range 1565 K.C. to 1665 K.C.	45-2101
	1970 K.C. Receiver Range 1660 K.C. to 1760 K.C.	45-2102
(72)	Crystal (Model 810PB) 2410 K. C. Receiver Range 2100 K.C. to 2200 K.C.	45-2103
	2510 K.C. Receiver Range 2200 K.C. to 2300 K.C.	45-2104
	2610 K.C. Receiver Range 2300 K.C. to 2400 K.C.	45-2105
	2710 K. C. Receiver Range 2400 K.C. to 2500 K.C.	45-2106
	Receiver Mfg. Bracket	29-1791
	Receiver Mfg. Plate	29-1792
	Mfg. Bolt	W1316A
	Nut	W55A
	Control Mfg. Strap	01344
	Control Mfg. Bracket	6035
	Key	6091
	Dial (Model 810PV only)	27-3126
	Knobs	27-4058
	Screens (Cover Mfg.)	W2718
	Fuse	7227
	Fuse Insulators	27-7729

FIGURE 5 — SCHEMATIC — MODEL 810PV



HOUSING, PLATING, FINISH All are single unit Receivers, housed in containers 11 inches long by 7¾ inches wide by 7 inches deep. All corners are rounded, the chassis, housing and covers are all steel and are plated to prevent rusting. They are given an exterior black wrinkle finish.

MOUNTING BRACKETS The Receivers are furnished with metal mounting brackets. One bracket is bolted to the inside of the dash, the other bracket is fastened to back of the Receiver. The Receiver bracket engages on the dash bracket and is fastened by a single small screw. This makes the installation and removal of the Receiver a simple, rapid operation. The Receiver may be installed with the tubes upright or inverted, depending on the location of the Receiver in the car.

CONTROL SHAFTS, CONNECTIONS The volume control and (in case of 810PV) the tuning control shaft, the "A" battery and the antenna connectors are located on one end of the housing. The shafts are the rapid coupling type with the locking gland nut at the Receiver end. The "A" battery and antenna connections are the quick, detachable bayonet locking type, with the "A" fuse placed in the "A" lead.

FLOATING CHASSIS AND CONDENSER The Receiver chassis is shock mounted within the housing, actually floating on live rubber bushings. The tuning condenser is likewise rubber mounted.

CONDENSER DRIVE The condenser drive gear ratio (Model 810PV) is 16:1. This eliminates practically all back lash and due to the mechanism used, prevents the tuning condenser from detuning from vibration. This high gear ratio also makes accurate tuning much easier.

CONTROL UNIT A steering column control unit, with illuminated dial (calibrated for the Model 810PV) is used.

SUPERHETERODYNE RANGE 810PV DRIFT A superheterodyne circuit is used for the 810PV, also the 810PA and PB. The frequency coverage of the Model 810PV is from 1575 K.C. to 2600 K.C. continuously in one band. The oscillator and I.F. circuits are especially designed to reduce frequency drift to a minimum. The Models

RANGE 810PA AND 810PB 810PA and 810PB, the fixed frequency Receiver, can be furnished adjusted for any one particular frequency within the limits of the regular police band, i.e. the Model PA covers from 1575 K.C. to 1750 K.C. and the Model 810PB covers from 2100 K.C. to 2500 K.C.

CRYSTAL CONTROL A crystal controlled oscillator circuit is employed in the Model 810PA and 810PB. The crystal control naturally holds the oscillator on the required frequency, and is responsible, in a large measure, for the greatly improved performance of this Receiver.

TUBE EQUIPMENT The tubes used in the 810PV and 810PA and 810PB are:

78 Tube—Tuned R.F. Amplifier with A.V.C.
6A7 Tube—First Detector—Oscillator Modulator with A.V.C.
78 Tube—I.F. Amplifier.
75 Tube—Second Detector and "Q" Relay Stage.
75 Tube—First A.F. Amplifier with "Q" Control.
41 Tube—Power Output Stage.
84 Tube—Full Wave Rectifier.

A.V.C. Both the R.F. stage and the first detector oscillator modulator stage have full automatic volume control supplied by the diode detector. In addition to this, the Receiver also has a "Q" or carrier relay circuit. The function of this circuit is to

"Q" CIRCUIT completely silence the Receiver when tuned off carrier, or when the carrier goes off the air. The correct values of the resistor network have been determined and used for satisfactory city operation where it is desirable to exclude street car noises, etc. A switch is provided on the face of the Receiver to open or close this circuit, since, when in remote sections of the territory, where the police transmitter signal might be very weak, slight additional sensitivity can be obtained with the "Q" circuit cut out. This "Q" circuit should not be confused with the convential squelch circuit. The "Q" relay circuit operates on a carrier field strength equivalent to approximately 3 microvolts in the antenna. A carrier below this strength is almost always of insufficient strength to give satisfactory reception, especially in noisy locations.

DYNAMIC SPEAKER SPECIAL AUDIO A full powered electro-dynamic speaker is used to give clarity of reproduction and better articulation. The audio and the speaker circuits are especially designed to give the best reproduction of the voice frequencies. The Receiver and speaker are capable of delivering considerably greater undistorted output than is normally required.

POWER SUPPLY The power supply is self contained and is not polarized. The Receiver can be installed in any car without reversing battery connections. Philco's full-wave Vibrator (more than three-quarters of a million in successful operation during the past three years) is used.

These models are without peer and are the most modern police Receivers obtainable. They represent the best designing, engineering and production skill in the industry.

ADJUSTMENTS
MODELS 810PA AND 810PB

The fited frequency Auto Radio Receivers are identical, except for the crystals used to obtain the various oscillator frequencies.

The Receivers, when used with the proper crystals, can be adjusted for any specified frequency between the limits of 1575 K.C. and 1750 K.C. (Model 810PA) and 2100 K.C. and 2500 K.C. (Model 810PB). Six crystals are used to obtain these frequencies. The crystal frequency, however, is no indication of the Receiver frequency adjustment.

The frequency of the crystal required for any Receiver frequency within the range of frequencies quoted above, is between 210 K.C. and 310 K.C. higher than the desired frequency. The crystal frequencies, together with the frequency coverage of the Receiver with each crystal, are:

FREQ. OF CRYSTAL	RANGE OF RECEIVER	PART No. CRYSTAL
1875 K.C.	1565-1665 K.C.	45-2101
1970 K.C.	1660-1760 K.C.	45-2102
2410 K.C.	2100-2200 K.C.	45-2103
2510 K.C.	2200-2300 K.C.	45-2104
2610 K.C.	2300-2400 K.C.	45-2105
2710 K.C.	2400-2500 K.C	45-2106

The I.F. frequency used in each Receiver is the difference between the frequency of the crystal in the Receiver and the frequency of the transmitter, i.e.: the transmitter frequency is 2422 K.C., the crystal used is 2710 K.C., the difference is 288 K.C., which is the frequency to which the I.F. amplifier must be tuned.

The Receivers are carefully adjusted to the required frequency at the factory and ordinarily need no readjustments except when the transmitter frequency is changed. Then the Receiver must be padded while warm and repadded after the Receiver has operated for several hours.

The Receiver must be set up for operation and the volume control set at maximum. The Receiver "Q" switch must be in the off position, cutting out the carrier relay circuit. Use a quality modulated oscillator or signal generator for the test signal, with an output meter connected across the output stage. The signal from the signal generator should be attenuated so that the output signal is just sufficient to actuate the output meter. The signal should not be strong enough to operate the automatic volume control.

I. F. STAGES— The padding condensers are placed in the top of the I.F. coil shield can. The primary padder is adjusted by means of the screw slot, accessible through the hole in the top of the shield can. The secondary padder is adjusted by means of the small hex nut, also accessible through the hole in the top of the shield.

Remove the grid lead from the 78 I. F. amplifier tube. The signal generator must be set exactly on the predetermined frequency and the output connected to the grid of the amplifier tube. Adjust the padders ㉔, ㉙ on the second I. F. transformer for maximum output. Reconnect the grid lead.

In like manner, connect the signal generator output to the grid of the 6A7 detector oscillator tube and adjust the padders ⑱ and ㉑ on the first I. F. transformer.

Check the adjustments of the second I. F. transformer and the first I. F. transformer.

R. F. — Tune the signal generator to the frequency of the transmitter and connect the output of the generator to the Receiver antenna lead, through a 200 mmfd. dummy antenna.

The variable condenser is locked in place with two set screws. Adjust these and tune the variable condenser to the input frequency. If the crystal oscillator circuit does not function at first, loosen the padder ⑬ on the oscillator section of the tuning condenser and also the series padder ⑰. If the oscillator output is low, it can be increased by adjusting the padder ⑬ for the higher frequencies and the padder ⑰ for the lower frequencies.

Adjust the R.F. and detector padders ⑥ and ⑩ for maximum output. If after adjusting, they are loose, back out the tuning condenser slightly — or if they are too tight, turn the condenser in slightly. Then readjust the padders.

On the Model 810PA (lower frequency band) adjust the series padder ⑰ for maximum output reading and on the Model 810PB (higher frequency band) adjust the high frequency padder ⑬. The adjustment will not give a sharp peak, but it is possible to adjust for the maximum output. After this is obtained, back off the adjusting nut a half turn.

After completing these adjustments, recheck all the padders. This time, using a carefully calibrated signal generator, or better still, test tone from the police transmitter, connected to the Receiver antenna lead through a 200 mmfd. dummy antenna. Recheck the padders ⑥, ⑩, ⑬ and ⑰ on the gang condenser. Using the same signal, adjust the second I.F. and first I.F. padders for maximum output.

DO NOT OPEN THE CRYSTAL HOLDER. If, for any reason whatever it has been opened, the crystal and plates should be very carefully cleaned with carbon tetrachloride. After cleaning, the crystal must not be touched by the fingers. Use a clean cloth for handling.

ADJUSTMENTS — MODEL 810PV

Remove the grid lead from the 78 I.F. amplifier tube. Connect a 260 K.C. signal to the grid of the amplifier tube and adjust the padders ㉔ and ㉙ on the second I.F. transformer for maximum output. Reconnect the grid lead.

In a like manner, connect the 260 K.C. signal to the grid of the 6A7 detector oscillator tube and adjust the padders on the first I.F. transformer.

R. F. — Connect a 2600 K.C. signal to the grid of the 78 R. F. amplifier tube. Set the tuning condenser at minimum capacity, using a strip of bond paper as a guage under the heel of the rotor plates.

Adjust the first detector and oscillator padders ⑩ and ⑬ for maximum output.

Reset the signal generator for a 1600 K.C. signal. Tune in the signal and roll the variable condenser while adjusting the oscillator series padders ⑰.

Recheck the oscillator padder adjustment at 2600 K.C. Connect the signal generator to the Receiver antenna lead using a 200 mmfd. condenser dummy antenna and adjust the antenna padder ⑥ at 2600 K.C.

The Model 810PV is a variable Auto Radio Receiver with a frequency range of 1560 K.C. to 2600 K.C. The scale is calibrated only between 1575 K.C. and 1750 K.C., and between 2100 K.C. and 2500 K.C., since these are the conventional emergency police bands. The Model 810PV has an intermediate frequency of 260 K.C. and does not employ crystal control.

The Receiver must be set up for operation and the volume control set at maximum. The Receiver "Q" switch must be in the off position, cutting out the carrier relay circuit. Use a quality modulated oscillator or signal generator for the test signal, with an output meter connected across the output stage. The signal from the signal generator should be attenuated so that the output signal is just sufficient to actuate the output meter. The signal should not be strong enough to operate the automatic volume control.

I. F. — The padding condensers are placed in the top of the I. F. coil shield can. The primary padder is adjusted by means of the screw slot, accessible through the hole in the top of the shield can. The secondary padder is adjusted by means of the small hex nut, also accessible through the hole in the top of the shield.

PHILCO RADIO & TELEV. CORP.

MODELS 810PA, 810PB
Schematic, Trimmers
Data

FOR PARTS LIST SEE INDEX

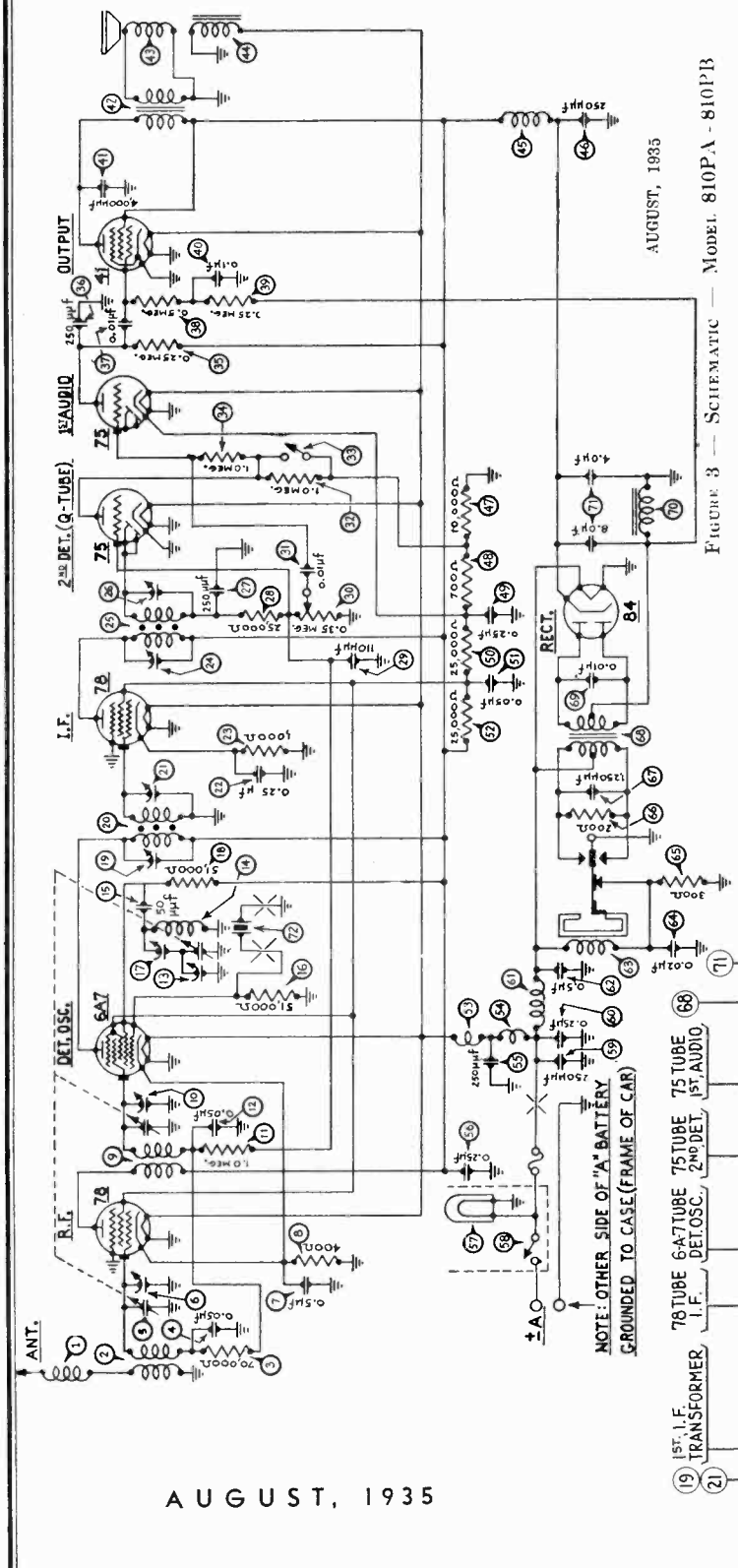


FIGURE 3 — SCHEMATIC — MODEL 810PA - 810PB

AUGUST, 1935

I. F. TRANSFORMERS

The coil windings terminate in leads instead of terminals or lugs. The color scheme of the leads is given in Figures 1 and 2.

If replacements are ever necessary, replace the entire coil assembly 32-1621 for the first I. F. stage and 32-1622 for the second I. F. stage. Neither the coil nor the padders will be furnished separately. Order only by the above numbers.

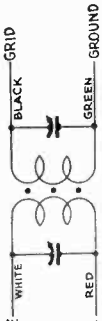


FIGURE 1—PART No. 32-1621 (1st I. F. Transformer)

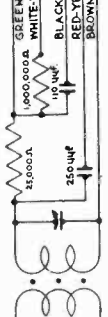


FIGURE 2—PART No. 32-1622 (2nd I. F. Transformer)

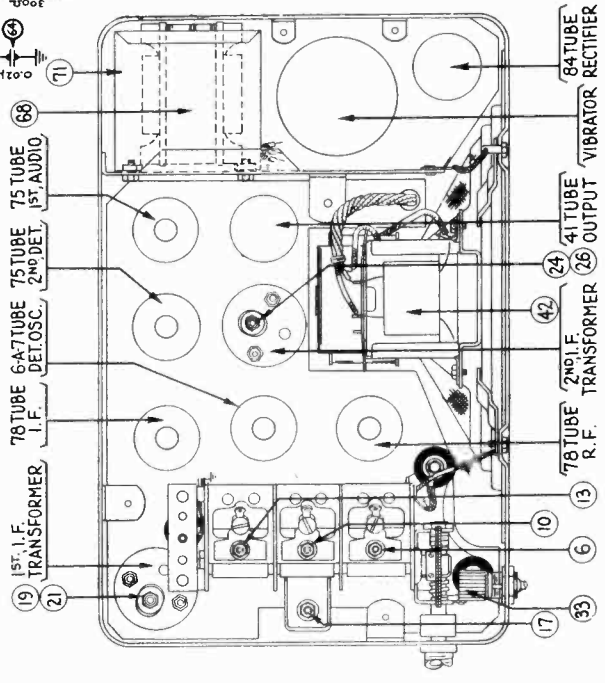


FIGURE 4 — TOP VIEW

AUGUST, 1935

MODEL FT-6
Alignment
Socket, Trimmers

PHILCO RADIO & TELEV. CORP.

MODEL FT-6 RECEIVER

THE new Ford auto radio incorporates new advanced principles of circuit and tube design. A totally new idea in sound distribution and musical fidelity is built into a dynamic speaker located above the occupants' heads in the header-bar of the car. Other features of the set are two-unit construction with separate speaker, highly developed Automatic Volume Control, illuminated custom-built instrument panel control, mounting in the ash receptacle opening.

The Receiver is mounted directly above the steering column out of sight and out of the way.

I. F. TRANSFORMER AND PADDERS

The I. F. transformers are assembled complete with padding condensers.

The padders are placed in the top of the shield can one above the other.

The primary padder is adjusted by means of the screw slot, accessible through the hole in the top of the shield can. The secondary padder is adjusted by means of the small hex nut, also accessible through the hole in the top of the shield. (See Figs. 1 and 2.)

The coil windings terminate in leads instead of terminals or lugs. The color scheme of the leads is given in Fig. 1.

If replacements are ever necessary, replace the entire coil assembly 32-1329 for the first I. F. stage and 32-1237 for the second I. F. stage. Neither the coil nor the padders will be furnished separately. Order only by the above numbers.

1st I. F. Transformer 32-1329 — 2nd I. F. Transformer 32-1237

FIG. 1

MODEL FT-6 ADJUSTMENTS

All adjustments have been carefully checked at the factory. If, however, it is found necessary to readjust the padding condensers, this procedure must be followed carefully. Do not attempt to make any adjustments until the procedure is clearly understood or without the use of a good oscillator or signal generator and output meter. The PHILCO Set Tester 048 is highly recommended for this procedure and for all service work.

The Receiver must be connected to a six-volt storage battery and set up for operation. It is assumed that tubes have been checked and that the Receiver is in good condition except for the padding adjustments.

Remove the cover from the Receiver and disconnect the grid clip from the 77 tube. (For location see Fig. 2.)

Set up the signal generator and adjust it to exactly 260 K.C. Connect the generator lead to the grid cap of the 77 tube, and ground the shield to the Receiver housing.

Connect one lead from the output meter to the plate of the 42 tube and the other lead to the receiver housing. The Receiver volume control must be turned to approximately full volume and the attenuator in the generator set for a half-scale reading of the output meter.

The primary screw padders ㉔ and ⑭ must be screwed all the way in. (Figs. 2 and 3.) The secondary nut padders ㉘ and ⑲ must then be adjusted. These padders should be adjusted for maximum reading on the output meter.

The screw padders ㉔ and ⑭ must be adjusted next.

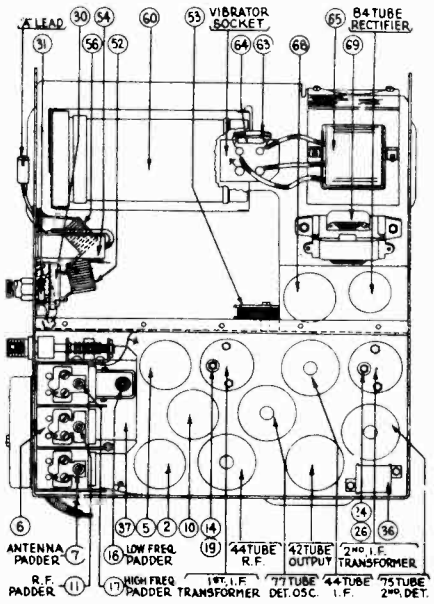


FIG. 2

Adjust the screw on each padder for maximum reading on the meter. This adjustment is critical. Note the maximum reading obtainable. Turn the screw in again and readjust, just bringing the adjustment up to the maximum reading. Do not pass it and then back off.

After padding the I. F. stages, remove the generator lead from the 77 tube and reconnect the grid clip to the 77 tube. Adjust the generator to 1580 K.C. and then connect the generator lead to the antenna lead. Ground the shield to the receiver housing.

Using a piece of paper approximately .006 inch in thickness, place it under the heel of the tuning condenser between the stator and rotor plates and turn the tuning condenser until the rotor plates strike this paper.

With the tuning condenser in this position, adjust the high-frequency padder ⑰ until the maximum reading is obtained in the output meter. This is the true setting for 1580 K.C., 158 on the dial scale. Adjust condensers ⑪ and ⑦ in the same manner.

Remove the paper and turn the tuning condenser plates in mesh to approximately 60 on the scale, and adjust the signal generator to 600 K.C. Roll the tuning condenser and adjust the series padder ⑯ for the maximum meter reading.

Readjust the padder ⑰ at 1580 K.C.

Tune the gang to 1400 K.C. and adjust padders ⑪ and ⑦ to maximum.

If this procedure has been carefully followed and an accurately calibrated oscillator or signal generator used, the receiver will be adjusted properly.

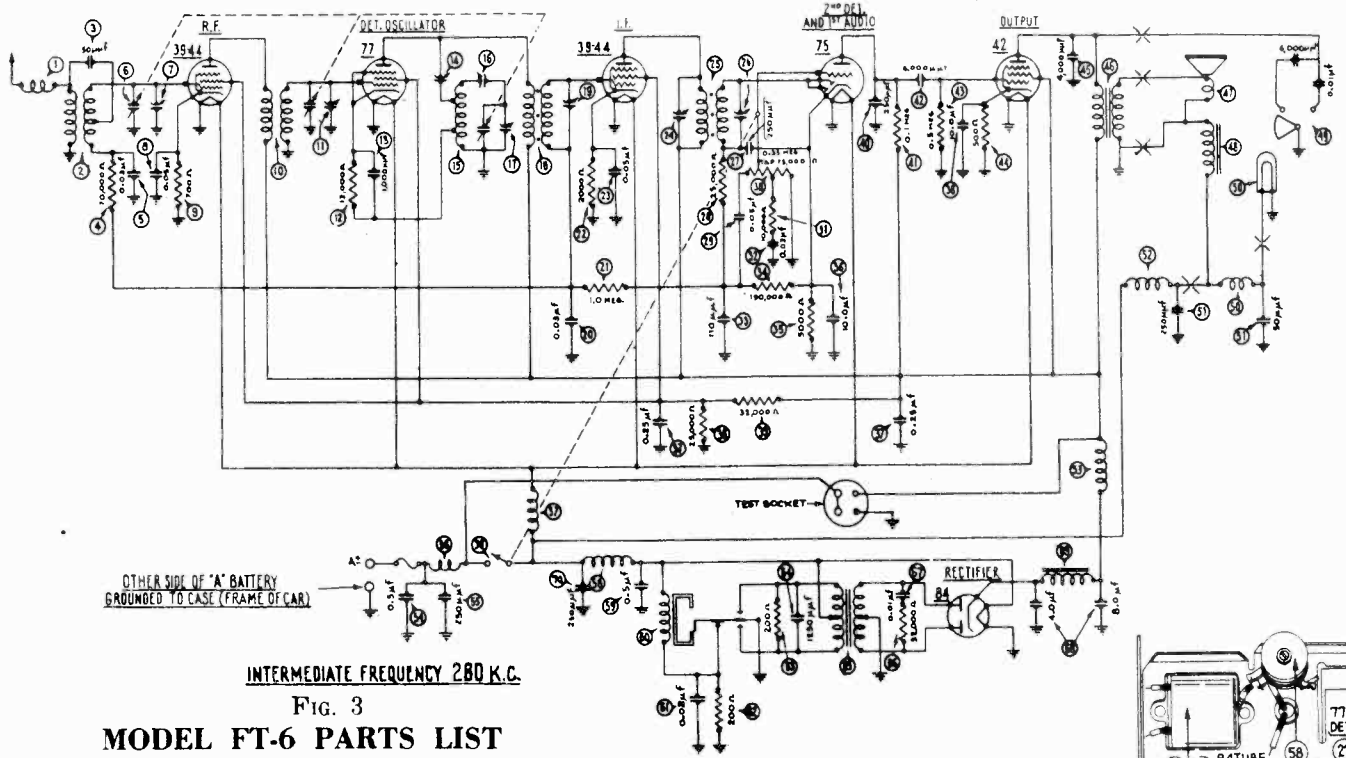


FIG. 3

MODEL FT-6 PARTS LIST

No. Shown on Schematic	Description	Part No.
1	Antenna Choke	32-1372
2	Antenna Transformer	32-1535
3	Condenser (50 mmfd.)	30-1029
4	Resistor (70,000 ohms)	33-1115
5	Condenser (.03 mfd.)	30-4025
6	Tuning Condenser	31-1459
7	1st Padder (on tun. cond.)	
8	Condenser (.05 mfd.)	30-4020
9	Resistor (700 ohms)	6443
10	R. F. Transformer	32-1536
11	2nd Padder (on tun. cond.)	
12	Resistor (11,000 ohms)	33-1194
13	Condenser (1000 mmfd.)	30-1007
14	Padder (Pri. 1st I. F. Trans.)	
15	Oscillator Transformer	32-1537
16	3rd Padder (on tun. cond.)	
17	4th Padder (on tun. cond.)	
18	First I. F. Transformer	32-1329
19	Padder (Sec. 1st I. F. Trans.)	
20	Condenser (.03 mfd.)	30-4025
21	Resistor (1.0 meg.)	33-1096
22	Resistor (2000 ohms)	33-3048
23	Condenser (.05 mfd.)	30-4020
24	Padder (Pri. 2nd I. F. Trans.)	
25	Second I. F. Transformer	32-1237
26	Padder (Sec. 2nd I. F. Trans.)	
27	Condenser (250 mmfd.)	30-1032
28	Resistor (25,000 ohms)	33-1013
29	Condenser (.05 mfd.)	30-4020
30	Vol. Con. & Switch Assm.	33-5067
31	Resistor (10,000 ohms)	33-1000
32	Condenser (.03 mfd.)	30-4025
33	Condenser (110 mmfd.)	30-1031
34	Resistor (190,000 ohms)	33-1116
35	Resistor (5000 ohms)	6096
36	Condenser (10-10 mfd.)	30-2076
37	Condenser (.25-.25 mfd.)	30-4126
38	Resistor (25,000 ohms)	3656
39	Resistor (32,000 ohms)	3525
40	Condenser (250 mmfd.)	30-1032
41	Resistor (.1 meg.)	6099
42	Condenser (6000 mmfd.)	30-4125
43	Resistor (.5 meg.)	6097
44	Resistor (500 ohms)	33-3031
45	Condenser (4000 mmfd.)	30-4185
46	Output Transformer	32-7347
47	Cone and Voice Coil	02861
48	Field Coil Assembly	36-3097
49	Tone Control	30-4243
50	Pilot Lamp	34-2039
51	Condenser (250 mmfd.)	30-1032
52	Choke	32-1374
53	R. F. Choke	32-1078
54	Condenser (.5 mfd.)	30-4018
55	Condenser (250 mmfd.)	30-1032
56	"A" Choke	32-1374
57	"A" Choke	32-1368
58	Vibrator Choke	32-1367
59	Condenser (.5 mfd.)	30-4227
60	Vibrator	38-5036
61	Condenser (.02 mfd.)	30-4039
62	Resistor (200 ohms)	7217
63	Resistor (200 ohms)	7217
64	Condenser (1250 mmfd.)	5886
65	Power Transformer	32-7232
66	Resistor (32,000 ohms)	3525
67	Condenser (.01 mfd.)	30-4051
68	Filter Condenser (4-8 mfd.)	30-2030
69	"B" Choke	32-7233
70	Condenser (110 mmfd.)	30-1031

4 prong Socket	27-6006
5-prong Socket	27-6014
6-prong Socket	27-6020
Spark Plug Resistor	33-1015
Spark Plug Terminal	28-6179
Interference Cond. (Gen.)	30-4181
Interference Cond. (Dist.)	30-4176
Face Assembly	42-5302
Glass for Control	27-7757
Knobs	27-4171
Pointer	28-2605
Flexible Shaft (Tuning)	28-8331
Flexible Shaft (Volume)	28-8332
Ammeter Cable	38-5749
Fuse	7227
Fuse Insulator	27-7131
Antenna Lead	L1741
"T" Bolt (set mounting)	28-8161
Nut (set mounting)	W518A
Speaker Cable	41-3125
Tow Strap	36-3432
"U" Clamp Control Mtg.	29-2699

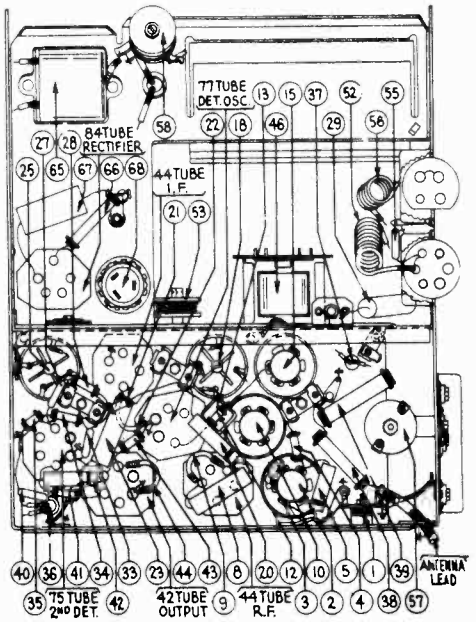


FIG. 4

JANUARY, 1935

MODEL FT-9 Ford
Alignment, Data
Chassis, Trimmers

PHILCO RADIO & TELEV. CORP.

FORD PHILCO RADIO MODEL FT9

I. F. Transformers and Padders

Model FT9

The I. F. transformers are assembled complete with padding condensers.

Both the primary and the secondary padders are placed side by side in the top of the transformer shield can. The adjusting screws are accessible thru the holes in the top of the shield. (See Fig. 2).

The coil windings terminate in leads instead of terminals or lugs. The color scheme of the leads is given in Fig. 1.

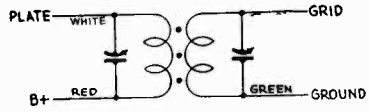


FIGURE 1

If replacements are ever necessary, replace the entire coil assembly, 32-1928 for the first I. F. stage and 32-1929 for the second I. F. stage. Neither the coil nor the padders will be furnished separately. Order only by the above numbers.

Model FT9 Adjustments

All padding adjustments are carefully made at the factory and ordinarily no readjustments are necessary. However, when readjustments to the Model FT9 are required, the procedure given below must be followed in detail.

Equipment

Fully charged heavy duty storage battery or 6-volt power pack, 048A Philco Set Tester, 3164 Padding wrench, 27-7159 Padding screw driver.

General

OUTPUT METER — The output meter must be connected by means of an adapter to the plate of the type 41 output tube and to the Receiver chassis.

SIGNAL GENERATOR — With the Receiver and signal generator set up for operation at the prescribed frequency, turn the Receiver volume control on full and set the signal generator attenuator so that a half scale reading is obtained on the output meter. The signal in the speaker should be audible but not loud.

The shielding on the signal generator output lead must be connected to the Receiver housing.

The tone control should be turned to the brilliant position.

I. F. — Adjust the signal generator to exactly 260 K. C. Connect the generator lead to the grid cap of the 78 I. F. tube in series with a .1 mfd. condenser.

Adjust the secondary screw padder ㉕ on the second I. F. transformer for maximum reading on the output meter. Then adjust the primary screw padder ㉓ for maximum reading. (See Fig. 2 for location of padders).

Remove the generator lead from the 78 tube.

Connect the generator lead to the grid cap of the 6A7 tube in series with a .1 mfd. condenser. Adjust the secondary screw padder ㉒ on the first I. F. transformer for maximum reading on the output meter. Then adjust the primary screw padder ⑳ for maximum reading. (See Figure 2 for location of padders).

HIGH FREQUENCY AND R. F. — After padding the first I. F. stage remove the generator lead from the 6A7 tube. Adjust the signal generator to 1600 K. C. and then connect the generator lead to the grid cap of the 78 R. F. tube in series with a .1 mfd. condenser.

Turn the tuning condenser plates out of mesh as far as they will go. With the tuning condenser in this position, adjust the high frequency padder ⑯ and the R. F. padder ⑬ until the maximum reading is obtained on the output meter. This is the true setting for 1600 K. C., 160 on the dial scale.

LOW FREQUENCY — Turn the tuning condenser plates in mesh to approximately 580 K. C., 58 on the dial scale and adjust the signal generator to 580 K. C. Roll the tuning condenser and adjust the low frequency padder screw ⑮ for maximum reading on the output meter.

HIGH FREQUENCY RE-ADJUSTMENT — Turn the tuning condenser plates out of mesh as far as they will go and adjust the signal generator to 1600 K. C. Then adjust the high frequency padder ⑯ again for maximum reading on the output meter.

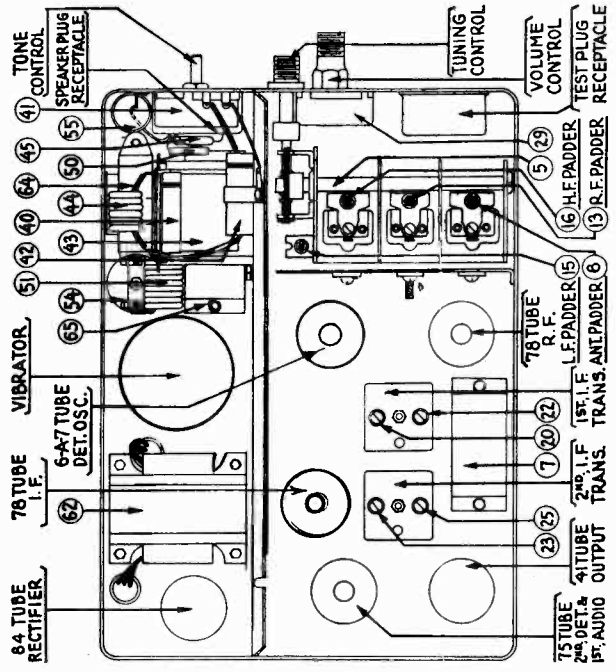


FIGURE 2 — *FT9 Top View*

ANTENNA — Connect the generator lead to the antenna lead using a 125 mmfd. condenser in series between the two leads. Turn the tuning condenser to 1400 K. C. and set the generator for 1400 K. C. Adjust the padders ⑮ and ⑥ for maximum reading on the output meter.

If this procedure has been carefully followed and an accurately calibrated oscillator or signal generator has been used, the Receiver will be adjusted properly.

NOTE: When the antenna stage adjustment is made with the Receiver installed in the car, the Receiver antenna lead must be connected to the car antenna in the usual manner. The signal generator output lead should be connected to a wire placed near the car antenna but not connected to it.

MODEL FT-9 Ford
Schematic, Chassis
Parts List

PHILCO RADIO & TELEV. CORP.

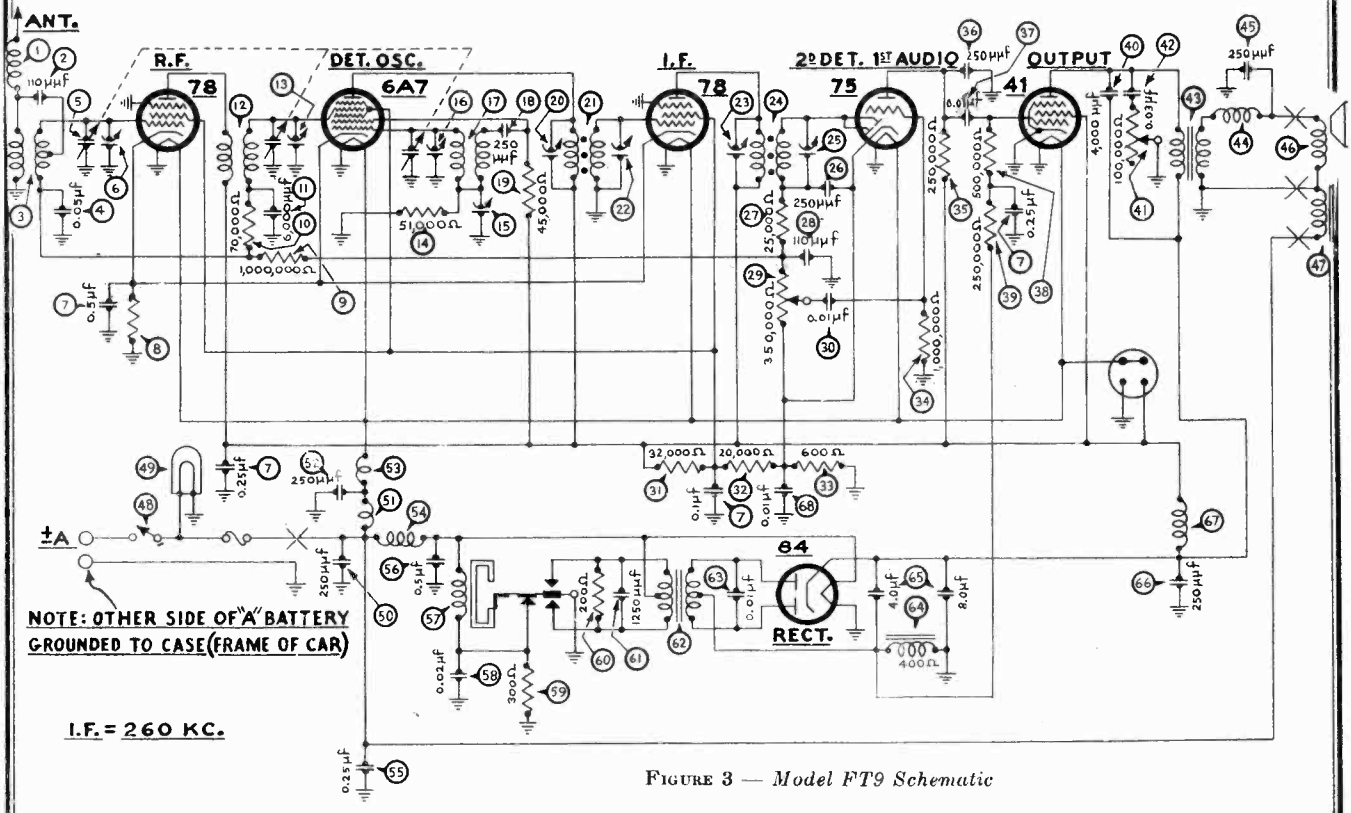


FIGURE 3 — *Model FT9 Schematic*

MODEL FT-9 — PARTS LIST

No.	Description	Part No.
(1)	Tone Control (100,000 ohms)	33-5101
(42)	Condenser (.03 mfd.)	30-4380
(43)	Output Transformer	32-7495
(44)	Choke	32-1644
(45)	Condenser (250 mmfd.)	30-1032
(46)	Cone and Voice Coil	36-3526
(47)	Field Coil Assembly	32-9236
(48)	On and Off Switch	42-5422
(49)	Pilot Lamp	34-2039
(50)	Condenser (250 mmfd.)	30-1032
(51)	"A" Choke	32-1644
(52)	Condenser (250 mmfd.)	30-1032
(53)	Choke	32-1930
(54)	Vibrator Choke	32-1968
(55)	Condenser (.25 mfd.)	30-4146
(56)	Condenser (.5 mfd.)	30-4047
(57)	Vibrator	38-5036
(58)	Condenser (.02 mfd.)	30-4039
(59)	Resistor (300 ohms)	33-3130
(60)	Resistor (200 ohms)	33-1210
(61)	Condenser (1250 mmfd.)	5886
(62)	Power Transformer	32-7488
(63)	Condenser (.01 mfd.)	30-4381
(64)	Filter Choke	32-7491
(65)	Filter Condenser	30-2134
(66)	Condenser (250 mmfd.)	30-1032
(67)	R. F. Choke	32-1932
(68)	Condenser (.01 mfd.)	30-4124
	Four-hole Socket	27-6044
	Five-hole socket	27-6035
	Six-hole Socket	27-6036
	Seven-hole Socket	27-6037
	Tuning and Volume Shaft	38-8435
	Pilot Lamp Assembly	38-7217
	Glass	27-7757
	Face Assembly	28-3444
	Pointer	28-2605
	Knob	27-4249
	"U" Clamp (control mtg.)	29-2699
	Wing Nut (control mtg.)	W1321
	Tee Bolt (set mtg.)	28-6161
	Nut (set mtg.)	W518A

No.	Description	Part No.
(1)	Antenna Choke	38-7219
(2)	Condenser (110 mmfd.)	30-1031
(3)	Antenna Transformer	32-1939
(4)	Condenser (.05 mfd.)	30-4020
(5)	Tuning Condenser	31-1674
(6)	First Padder (on tun. cond.)	
(7)	Condenser .1-.25-.25-.5 mfd.)	30-4374
(8)	Resistor (400 ohms)	33-1211
(9)	Resistor (1,000,000 ohms)	33-1096
(10)	Resistor (70,000 ohms)	33-1115
(11)	Condenser (6000 mmfd.)	30-4125
(12)	R. F. Transformer	32-1926
(13)	Second Padder (on tun. cond.)	
(14)	Resistor (51,000 ohms)	6098
(15)	Low Frequency Padder	31-6066
(16)	Third Padder (on tun. cond.)	
(17)	Oscillator Transformer	32-1927
(18)	Condenser (250 mmfd.)	30-1032
(19)	Resistor (45,000 ohms)	5256
(20)	Padder (Pri 1st I.F. transf.)	
(21)	First I. F. Transformer	32-1928
(22)	Padder (Sec. 1st I. F. transf.)	
(23)	Padder (Prt. 2nd I.F. transf.)	
(24)	Second I. F. transformer	32-1929
(25)	Padder (Sec. 2nd I.F. transf.)	
(26)	Condenser (250 mmfd.)	30-1032
(27)	Resistor (25,000 ohms)	33-1013
(28)	Condenser (110 mmfd.)	30-1031
(29)	Volume Control (350,000 ohms)	33-5139
(30)	Condenser (.01 mfd.)	30-4124
(31)	Resistor (32,000 ohms)	3525
(32)	Resistor (20,000 ohms)	6650
(33)	Resistor (600 ohms)	33-1212
(34)	Resistor (1,000,000 ohms)	33-1096
(35)	Resistor (250,000 ohms)	33-1097
(36)	Condenser (250 mmfd.)	30-1032
(37)	Condenser (.01 mfd.)	30-4145
(38)	Resistor (500,000 ohms)	6097
(39)	Resistor (250,000 ohms)	33-1097
(40)	Condenser (4000 mmfd.)	30-4185

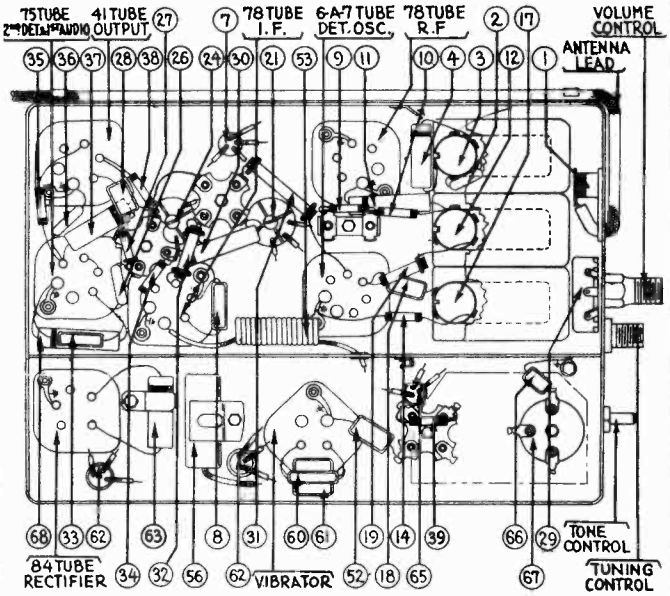


FIGURE 4 — *Model FT9 Base View*

No.	Description	Part No.
	Fuse	7227
	Fuse Insulator	27-7729
	Distributor Condenser	30-4176
	Generator Condenser	30-4184
	Gas gauge Condenser	30-4387
	Dome Light Condenser	30-4388
	Oil Gauge Condenser	30-4307
	Speaker Cable	41-3167
	Tow Strap	36-3432
	Antenna Lead	L-1921
	Receiver Housing	38-1567

MODEL G (Code 122)
Dodge, Chrysler

PHILCO RADIO & TELEV. CORP.

Plymouth
Schematic, Chassis, Parts

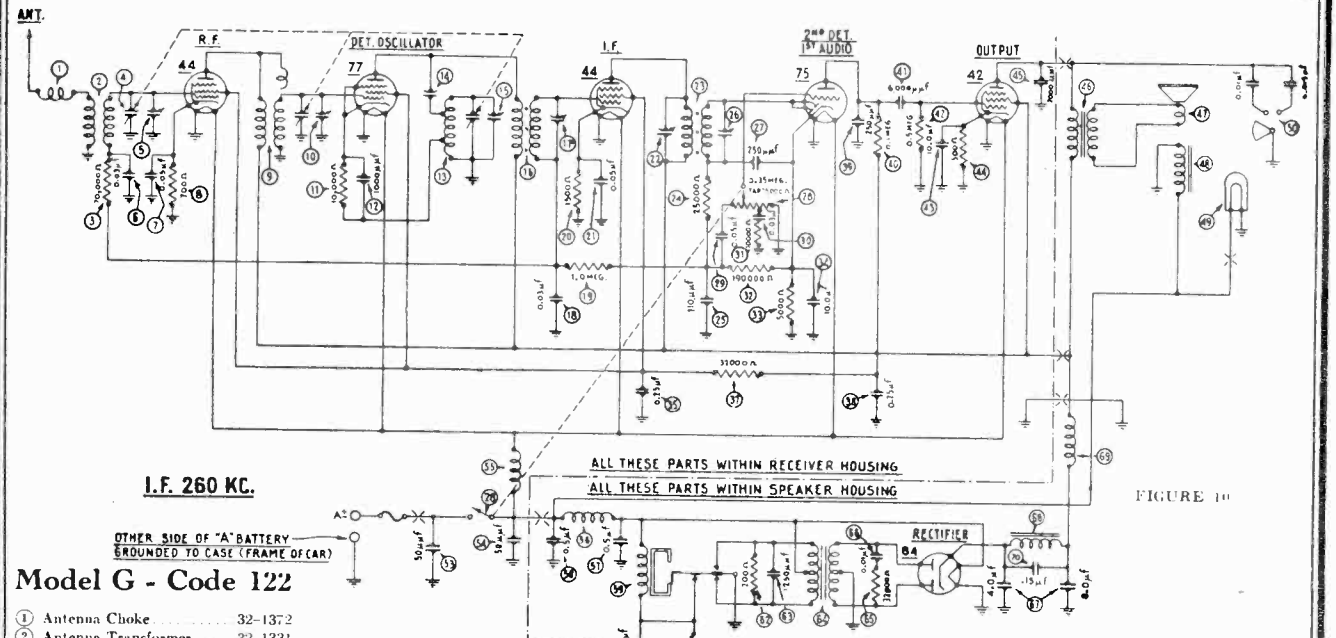


FIGURE 10

Model G - Code 122

(1)	Antenna Choke	32-1372
(2)	Antenna Transformer	32-1331
(3)	Resistor (70,000 ohms)	33-1115
(4)	Tuning Condenser	31-1214
(5)	First Padder (on Tun. Cond.)	
(6)	Condenser (.03 mfd.)	30-4025
(7)	Condenser (.05 mfd.)	30-4020
(8)	Resistor (700 ohms)	6443
(9)	R. F. Transformer	32-1332
(10)	Second Padder (on Tun. Cond.)	
(11)	Resistor (10,000 ohms)	33-1000
(12)	Condenser (1000 mmfd.)	33-1007
(13)	Oscillator Transformer	32-1333
(14)	Padder (Pri. 1st I. F. Trans.)	
(15)	Third Padder (on Tun. Cond.)	
(16)	First I. F. Transformer	32-1329
(17)	Padder (Sec. 2nd I. F. Trans.)	
(18)	Condenser (.03 mfd.)	30-4025
(19)	Resistor (1,000,000 ohms)	33-1096
(20)	Resistor (1500 ohms)	33-3047
(21)	Condenser (.05 mfd.)	30-4020
(22)	Padder (Pri. 2nd I. F. Trans.)	
(23)	Second I. F. Transformer	32-1237
(24)	Resistor (25,000 ohms)	33-1013
(25)	Condenser (.00011 mfd.)	30-1031
(26)	Padder (Sec. 2nd I. F. Trans.)	
(27)	Condenser (.00025 mfd.)	30-1032
(28)	Volume Control and Switch Assembly	33-5067
(29)	Condenser (.05 mfd.)	30-4020
(30)	Condenser (.03 mfd.)	30-4025
(31)	Resistor (10,000 ohms)	33-1000
(32)	Resistor (190,000 ohms)	33-1116
(33)	Resistor (5000 ohms)	6096
(34)	Condenser (10 mfd.)	30-2076
(35)	Condenser (.25 mfd.)	30-4126
(37)	Resistor (32,000 ohms)	3525
(38)	Condenser (.25 mfd.)	30-4126
(39)	Condenser (.00025 mfd.)	30-1032
(40)	Resistor (100,000 ohms)	6099
(41)	Condenser (.006 mfd.)	30-4125
(42)	Resistor (500,000 ohms)	6097
(43)	Condenser (10 mfd.)	30-2076
(44)	Resistor (500 ohms)	33-3031
(45)	Condenser (.004 mfd.)	30-4185
(46)	Output Transformer	32-7042
(47)	Cone and Voice Coil	36-3157
(48)	Field Coil Assembly	36-3097
(49)	Pilot Lamp	34-2031
(50)	Tone Control	30-4189
(53)	Condenser (.00005 mfd.)	30-1029
(54)	Condenser (.00005 mfd.)	30-1029
(55)	"A" Choke	32-1432
(56)	Vibrator Choke	32-1260
(57)	Condenser (.5 mfd.)	30-4047
(58)	Condenser (.5 mfd.)	30-4015
(59)	Vibrator	38-5036
(60)	Condenser (.05 mfd.)	30-4039
(61)	Resistor (200 ohms)	7217

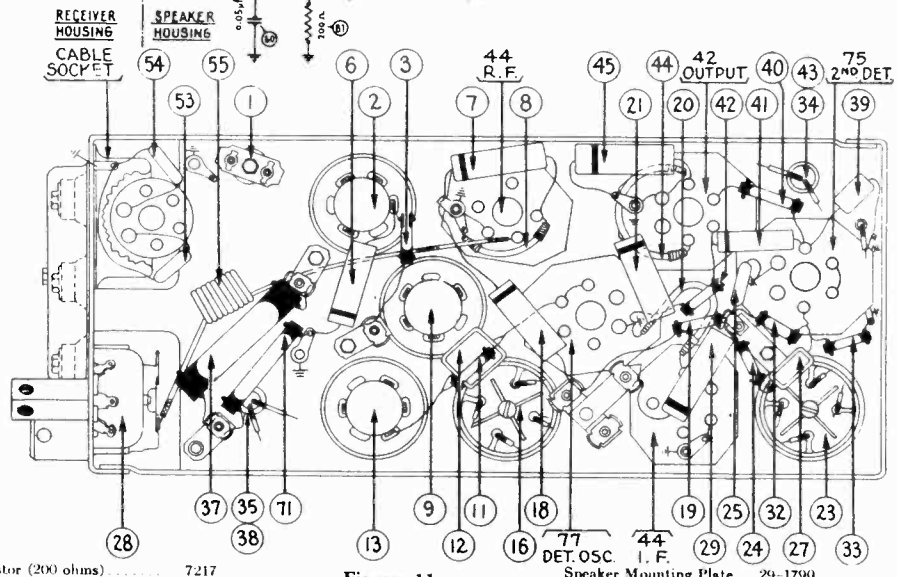


Figure 11

(62)	Resistor (200 ohms)	7217
(63)	Condenser (.00125 mfd.)	5886
(64)	Power Transformer	32-7253
(65)	Resistor (3 2,000 ohms)	3525
(66)	Condenser (.01 mfd.)	30-4051
(67)	Filter Condenser (4-8 mfd.)	30-2030
(68)	Filter Choke	32-7254
(69)	R. F. Choke	32-1260
(70)	Condenser (.15 mfd.)	30-4191
(71)	Resistor (25,000 ohms.)	3656
	Spark Plug Resistor	33-1015
	Distributor Resistor	33-1113E
	1 mfd. Condenser	4522S
	½ mfd. Condenser	30-4007
	Glass for Control	27-7325

DODGE MODEL G-Code 122
Above items are identical for Dodge Model G-Code 122. See following items for additional accessories:

Dial Assembly	42-5204
Pointer	28-1764
Control Assembly	42-5196
Knobs—Volume	27-4080
Knobs—Tuning	27-4079
Knob Springs	28-1738
Bezel Assembly	42-5115
Interconnecting Cable	41-3065
Ammeter Cable	38-5704
Terminal	L-1626
Flexible Shaft—Tuning	28-8188
Flexible Shaft—Volume	28-8198
Speaker Mounting Plate	29-1790
Speaker Mounting Bracket	29-1791
Receiver Mounting Plate	29-1792
Receiver Mounting Bracket	29-1848
Carriage Bolt	W-1316A
Fuse	7227
Fuse Insulator	27-7131

CHRYSLER MODEL G-Code 122
Items 1 to 71 and next five are identical for Chrysler Model G, Code 122. See following items for additional accessories:

Dial Assembly	42-5204
Pointer	28-1825
Control Assembly	42-5194
Knobs—Volume	27-4072
Knobs—Tuning	27-4071
Knob Springs	28-1738
Bezel Assembly	42-5115
Interconnecting Cable	41-3065
Ammeter Cable	38-5704
Terminal	L-1626
Flexible Shaft—Tuning	28-8188
Flexible Shaft—Volume	28-8198
Speaker Mounting Bracket	29-1791
Speaker Mounting Plate	29-1790
Receiver Mounting Plate	29-1792
Receiver Mounting Bracket	29-1848
Carriage Bolt	W-1316A
Fuse	7227
Fuse Insulator	27-7131

PLYMOUTH MODEL G-Code 122
Items 1 to 71 and next five are identical for Plymouth Model G-Code 122. See following items for additional accessories:

Dial Assembly	42-5205
Pointer	28-1763
Control Assembly	42-5197
Knobs—Volume	27-4084
Knobs—Tuning	27-4083
Knob Springs	28-1738
Bezel Assembly	42-5115
Interconnecting Cable	41-3065
Ammeter Cable	38-5704
Terminal	L-1626
Flexible Shaft—Tuning	28-8188
Flexible Shaft—Volume	28-8198
Speaker Mounting Plate	29-1790
Speaker Mounting Bracket	29-1791
Receiver Mounting Plate	29-1792
Receiver Mounting Bracket	29-1848
Carriage Bolt	W-1316A
Fuse	7227
Fuse Insulator	27-7131

Note 1. Adjust the High Frequency padders (15) at 1600 K. C.

Note 2. A 25,000 ohm resistor, part number 3656, (71) on the parts list and base view has been added to the receiver. One end is connected to the screen grid lead for the R. F. Osc. and I. F. tubes and the other end is grounded.

PHILCO RADIO & TELEV. CORP.

MODEL G (Code 122)
Chrysler Code CU & CV
Airflow Custom-Built
Installation Data

Installation Instructions - Chrysler Model - Codes CU and CV

THESE instructions have been carefully prepared for your use in installing the Chrysler Airflow Custom Built Radio by Philco in the 1934 Chrysler Airflow Model — Code CU-CV cars. Read thoroughly, then follow the instructions carefully in every detail.

Speaker Installation

Refer to Figure 1. This gives detailed dimensions for the location and drilling of the holes in the instrument board reinforcing brace on which the speaker will be mounted. Dimensions shown are along the surface of the brace. The speaker mounting brackets must be bolted to the sides of the speaker. To do this, place the speaker on the bench face down with the tone control knob on the right-hand side, attaching the brackets as follows: The smallest angle bracket must be bolted to the side towards you, the longest angle bracket to the left side with the part having the elongated hole directed

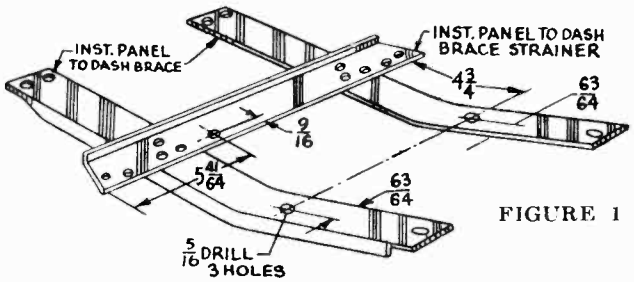


FIGURE 1

away from the speaker. The other bracket must be bolted to the right-hand side of the speaker with the part having the elongated hole turned under the speaker. Refer to Figure 2. The speaker should now be mounted in the car, placing it between the right-hand instrument board brace and the emergency brake control, locating the elongated holes in the speaker mounting brackets over the holes previously drilled in the braces. Bolt it securely in place with the three cadmium plated ¼—20 bolts and nuts supplied for this purpose. Be sure to use lockwashers under the nuts. The left, lower corner of the right cowl ventilator fly screen will interfere with the speaker. This may be remedied by bending this corner out of the way with a pair of pliers.

Instrument Panel Control

Remove the right hand ash receiver assembly. Remove the knobs from the control assembly by pulling them off the control head shafts. Then loosen the set screws in front that secure the flexible control shafts in place and the set screws in the rear of the housing that secure the control shaft housings in place. Remove the shaft assemblies from the control head. Install the control head in the instrument panel and fasten securely, using the U-shaped clamp supplied for this purpose, together with the nut and lockwasher. See Figure 3.

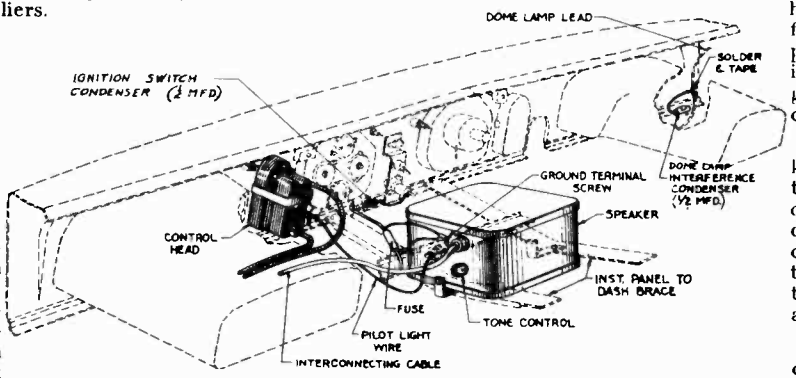


FIGURE 2

Receiver and Cable Installation

Before placing the Receiver in the under-carriage mounting box, the flexible cable housing set screws in the collars must be placed in position so they will be accessible from the top. Wrap the cardboard liner around the Receiver, bending it on the scored lines. Then place the Receiver in the undercarriage box with the shaft coupling collars and plug receptacle in line with their respective holes in the end of the box. The rectangular cardboard liner must be placed between the Receiver and the blank end of the box.

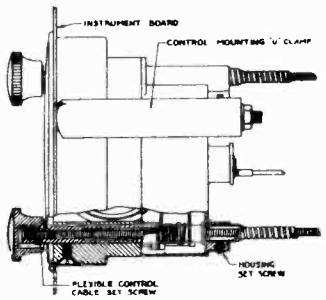


FIGURE 3

Connecting Remote Control Cables to the Receiver

1. Place the grommet caps and rubber grommets on the control shaft housings in the same manner in which they are assembled on the speaker cable. Insert the shafts in their respective couplings on the Receiver and tighten the housing retaining set screws. Secure the grommet caps to the mounting box with the 8-32 screws provided for this purpose. Be sure to use a fibre washer and a lockwasher under the head of each screw.

2. Install the six-hole plug in its receptacle in the Receiver, grounding the eye terminal on the end of the shield pigtail box with 8-32 screws, using a fibre washer and a lockwasher under the head of each screw. (The fibre washers are for the purpose of water-proofing). Then secure the grommet cap to the cable cover plate.

3. Place the rubber gasket around the edge of the box and then put the cover on, forcing it well down on the box, being certain that the ends of the gasket butt together to insure a water-tight assembly.

4. Remove the right cowl quarter-kick - pad. Then run the cables along the body side rail under the floor board and up through the opening in the floor board riser provided for the speedometer cable. See Fig. 4. In bodies where the hole in the toeboard riser is not large enough or obstructed and will not permit the passage of the plug on the speaker end of the cable it will be necessary to remove the floorboard and make a ½" slot in the toeboard riser into the speedometer cable channel to allow the cables to be assembled in place. Do not attempt to remove the plug from the end of the cable. Fasten them in the clips provided in the frame channel adjacent to the speedometer cable. Plug the four hole plug into its receptacle in the speaker. Place the volume control cable (with the red mark)

MODEL G (Code 122)
Chrysler Code CU & CV PHILCO RADIO & TELEV. CORP. Installation Data, Part 2
Airflow Custom-Built Parts List

INSTALLATION INSTRUCTIONS - CHRYSLER MODEL -

in the top of the control head and the tuning control cable (unpainted) in the bottom. Securely tighten the cable housing retaining set screws in the rear of the control head and then tighten the shaft retaining set screws in the control head shafts. Then replace the cowl quarter kick-pad.

5. Figure 5 shows the method of mounting the radio receiver under the right-hand front seat stool mounting bolt with the 1-¾" x 5/16" bolt provided in the radio package. The front bracket is secured to the floorboard using the bolt removed from where the rear bracket is mounted.

Before tightening the receiver in place, be sure that the cover is flush with the floorboard. If the wood shim that is between the floorboard and the frame mounting bracket interferes, the interfering part may be removed by the use of a wood chisel.

6. See Figure 6. Secure the control and speaker cables by means of the clip provided for this purpose.

7. The antenna lead wire from the roof will be found in the under body side rail and should be connected to the antenna lead branch of the speaker cable, as shown in Figure 5. Make a twisted splice, using plenty of tape to insure a water tight joint, grounding the eye terminal on the end of the antenna lead pigtail to the body side rail.

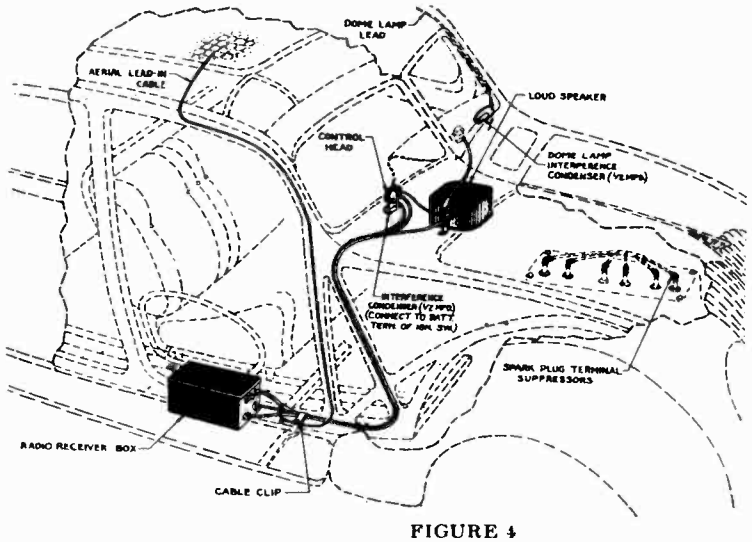


FIGURE 4

Battery Connections

Connect the battery lead to the fuse terminal of the ammeter. Place the fuse and fuse insulator in the metal fuse housing of the battery cable and connect it to the small bayonet fuse connector which branches out of the speaker cable close to the speaker. The three shield terminals must be connected under the grounding screw provided for this purpose near the speaker receptacle.

Adjustment

Turn on the Receiver and tune in a station whose frequency in kilocycles is known. (The numbers on the dial represent channel numbers which with the addition of a cipher become the frequency numbers). Loosen the set screw on the front of the tuning control shaft without detuning the Receiver. Turn the shaft until the indicator points to the correct number on the dial. Tighten the set screw securely and then replace the knobs on the shafts.

Motor Interference Suppression

Cut the elbow terminals from the spark plug cables and screw on the moulded bakelite elbow suppressors. Connect the suppressors to the spark plugs. Cut off the end of the distributor center lead cable and screw the straight molded resistor into the lead. Then plug this into the distributor cap. Install a one microfarad by-pass condenser on the generator. Mount it on the generator frame under the screw that holds the generator relay in place. Connect the condenser lead under the screw that connects the generator battery lead to the relay. (See Figures 7 and 8).

There may be some interference caused by an excessive gap between the distributor rotor and the high tension contacts. This can be overcome by lengthening the contact end of the rotor.

The following procedure should be carefully followed: Remove the distributor cap and chalk, the inside faces of the stationary contacts. Remove the rotor and place the contact end on a small anvil or steel block. Peen or hammer the end carefully with a small machinist's hammer. Replace the rotor and the cap, then turn the motor over a few times, using the starter only. After a few revolutions, examine the distributor cap to see if the rotor has scraped or touched any of the stationary contacts in the cap. If so, dress lightly with a fine file. Repeat the above operation until the rotor just clears the contacts.

Occasionally you may find a distributor cap which is out of round or with a short electrode. This condition does not affect the operation of the car, but sometimes makes satisfactory elimination impossible. If such a condition is found, take the defective cap to the nearest United Motors Service Station and exchange it for a new one.

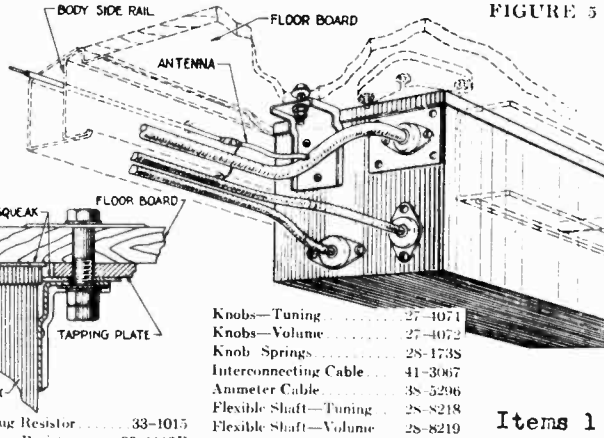


FIGURE 5

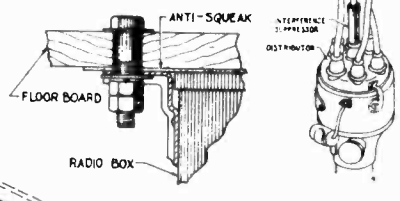


FIGURE 7

FIGURE 8

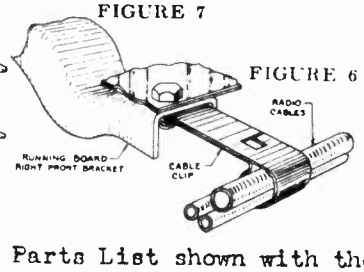


FIGURE 6

Spark Plug Resistor	33-1015
Distributor Resistor	33-1113E
½ mfd. Condenser	30-4007
Front Cover	28-1767
Dial and Drum Assembly	42-5202
Control Assembly	42-5193
Cable Spring	28-8203
Knobs—Tuning	27-4071
Knobs—Volume	27-4072
Knob Springs	28-1738
Interconnecting Cable	41-3067
Ammeter Cable	38-5296
Flexible Shaft—Tuning	28-8218
Flexible Shaft—Volume	28-8219
Fuse	7227
Fuse Insulator	27-7131
Speaker Mounting Bracket	29-1847
Speaker Mounting Bracket	29-1846
Speaker Mounting Bracket	29-1851
"U" Clamp	29-1808

Items 1 to 71 of the Parts List shown with the schematic diagram of Model G (Code 122) are identical for Model G (Code 122) Chrysler Code CU and CV. See items at left for additional accessories.

MODEL G (Code 122)
DeSoto Code SE
Airflow Custom-Built

PHILCO RADIO & TELEV. CORP.

Installation Instructions - DeSoto Model - Code SE

THESE INSTRUCTIONS have been carefully prepared for your use in installing the De Soto Airflow Custom-Built Radio by Philco in the 1934 De Soto Airflow Model — Code SE cars. Read thoroughly then follow the instructions carefully in every detail.

Carefully unpack the carton and check the contents with the material packing list. Examine the parts and compare with the illustrations given in these instructions so that you may become familiar with them and thus make the installation easily and quickly.

Speaker Installation

Refer to Figure 1. This gives detailed dimensions for the location and drilling of the holes in the instrument board reinforcing brace on which the speaker will be mounted. Dimensions shown are along the surface of the brace. The speaker mounting brackets must be bolted to the sides of the speaker. To do this, place the speaker on the bench face down with the tone control knob on the right-hand side, attaching the brackets as follows: The smallest angle bracket must be bolted to the side towards you, the longest angle bracket to the left side with the part having the elongated hole directed

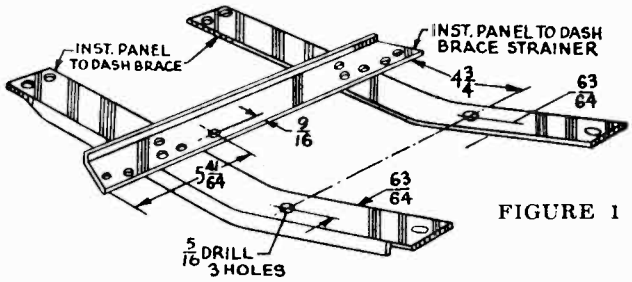


FIGURE 1

away from the speaker. The other bracket must be bolted to the right-hand side of the speaker with the part having the elongated hole turned under the speaker. Refer to Figure 2. The speaker should now be mounted in the car, placing it between the right-hand instrument board brace and the emergency brake control, locating the elongated holes in the speaker mounting brackets over the holes previously drilled in the braces. Bolt it securely in place with the three cadmium plated ¼—20 bolts and nuts supplied for this purpose. Be sure to use lockwashers under the nuts. The left, lower corner of the right cowl ventilator fly screen will interfere with the speaker. This may be remedied by bending this corner out of the way with a pair of pliers.

Instrument Panel Control

Remove the De Soto medallion plate from the center of the instrument panel. To do this, it is necessary to remove the two retaining nuts from the back of the instrument panel.

Remove the knobs from the control assembly by pulling them off the control head shafts. Then loosen the set screws in front that secure the flexible control shafts in place and the set screws in the rear of the housing that secure the control shaft housings in place. Remove the shaft assemblies from the control head. Install the control head in the instrument panel and fasten securely, using the U-shaped clamp supplied for this purpose, together with the nuts and lockwashers. See Figure 3.

Receiver and Cable Installation

Before placing the Receiver in the under-carriage mounting box, the flexible cable housing set screws in the collars must be placed in position so they will be accessible from the top. Wrap the cardboard liner around the Receiver, bending it on the scored lines. Then place the Receiver in the undercarriage box with the shaft coupling collars and plug receptacle in line with their respective holes in the end of the box. The rectangular cardboard liner must be placed between the Receiver and the blank end of the box.

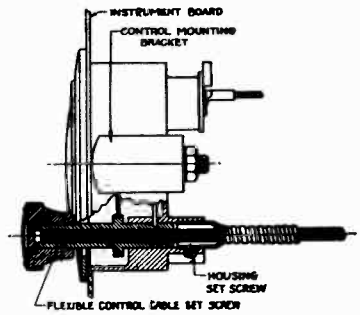


FIGURE 3

Connecting Remote Control Cables to the Receiver

1. Place the grommet caps and rubber grommets on the control shaft housings in the same manner in which they are assembled on the speaker cable. Insert the shafts in their respective couplings on the Receiver and tighten the housing retaining set screws. Secure the grommet caps to the mounting box with the 8-32 screws provided for this purpose. Be sure to use a fibre washer and a lockwasher under the head of each screw.

2. Install the six-hole plug in its receptacle in the Receiver, grounding the eye terminal on the end of the shield pigtail under one of the Receiver cover screws. Secure the cable cover plate to the box with 8-32 screws, using a fibre washer and a lockwasher under the head of each screw. (The fibre washers are for the purpose of water-proofing). Then secure the grommet cap to the cable cover plate.

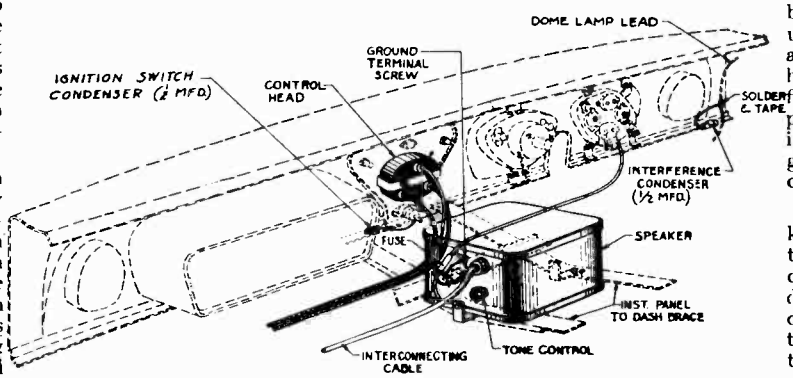


FIGURE 2

3. Place the rubber gasket around the edge of the box and then put the cover on, forcing it well down on the box, being certain that the ends of the gasket butt together to insure a water-tight assembly.

4. Remove the right cowl quarter kick-pad. Then run the cables along the body side rail under the floor board and up through the opening in the floor board riser provided for the speedometer cable. See Fig. 4. In bodies where the hole in the toeboard riser is not large enough or obstructed and will not permit the passage of the plug on the speaker end of the cable it will be necessary to remove the floorboard and make a ½" slot in the toeboard riser into the speedometer cable channel to allow the cables to be assembled in place. Do not attempt to remove the plug from the end of the cable. Fasten them in the clips provided

MODEL G (Code 122) Installation Data, Part 2
DeSoto Code SE PHILCO RADIO & TELEV. CORP.
Airflow Custom-Built

in the frame channel adjacent to the speedometer cable. Plug the four-hole plug into its receptacle in the speaker. Place the volume control cable (with the red mark) in the left-hand side of the control head and the tuning control cable (unpainted in the right-hand side. Securely tighten the cable housing, retaining set screws in the rear of the control head and then tighten the shaft retaining set screws in the control head shafts. Then replace the cowl quarter kick pad.

5. Figure 5 shows the method of mounting the radio receiver under the right-hand front seat stool mounting bolt with the 1-¾" x 5/16" bolt provided in the radio package. The front bracket is secured to the floorboard using the bolt removed from where the rear bracket is mounted.

Before tightening the receiver in place, be sure that the cover is flush with the floorboard. If the wood shim that is between the floorboard and the frame mounting bracket interferes, the interfering part may be removed by the use of

6. See Figure 6. Secure the control and speaker cables by means of the clip provided for this purpose.

7. The antenna lead wire from the roof will be found in the under body side rail and should be connected to the antenna lead branch of the speaker cable, as shown in Figure 5. Make a twisted splice, using plenty of tape to insure a water tight joint, grounding the eye terminal on the end of the antenna lead pigtail to the body side rail.

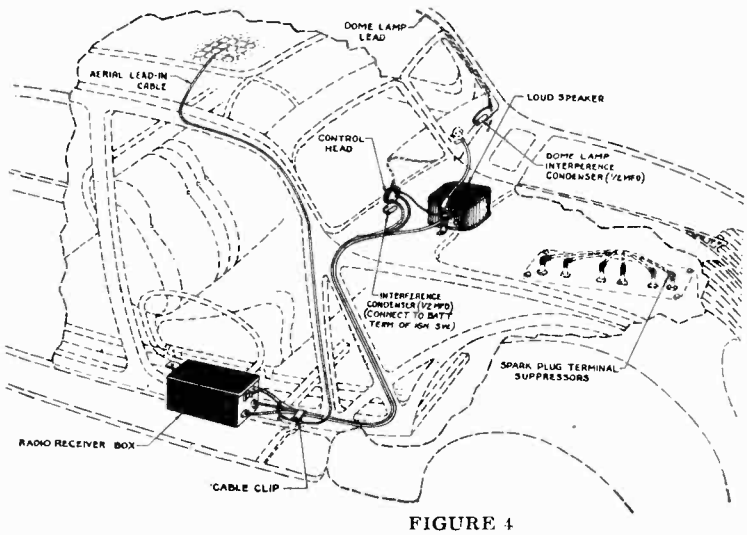


FIGURE 4

Battery Connections

Connect the battery lead to the fuse terminal of the ammeter. Place the fuse and the fuse insulator in the metal fuse housing of the battery cable and connect it to the small bayonet fuse connector which branches out of the speaker cable close to the speaker. The three shield terminals must be connected under the grounding screw provided for this purpose near the speaker receptacle.

Adjustment

Turn on the Receiver and tune in a station whose frequency in kilocycles is known. (The numbers on the dial represent channel numbers which with the addition of a cipher become the frequency numbers). Loosen the set screw on the front of the tuning control shaft without detuning the Receiver. Turn the shaft until the indicator points to the correct number on the dial. Tighten the set screw securely and then replace the knobs on the shafts.

Motor Interference Suppression

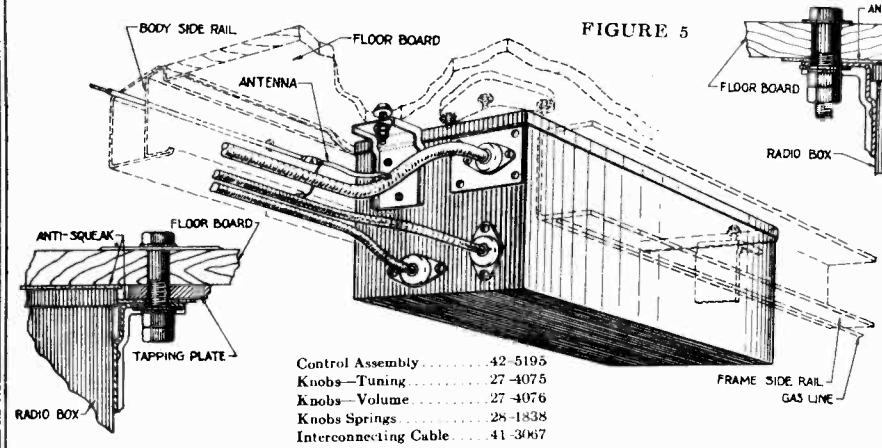
Cut the elbow terminals from the spark plug cables and screw on the moulded bakelite elbow suppressors. Connect the suppressors to the spark plugs. Cut off the end of the distributor center lead cable and screw the straight molded resistor into the lead. Then plug this into the distributor cap. Install a one microfarad by-pass condenser on the generator. Mount it on the generator frame under the screw that holds the generator relay in place. Connect the condenser lead under the screw that connects the generator battery lead to the relay. (See Figures 7 and 8).

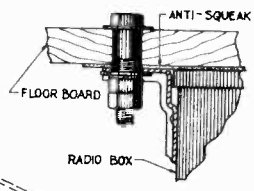
There may be some interference caused by an excessive gap between the distributor rotor and the high tension contacts. This can be overcome by lengthening the contact end of the rotor.

The following procedure should be carefully followed: Remove the distributor cap and chalk the inside faces of the stationary contacts. Remove the rotor and place the contact end on a small anvil or steel block. Peen or hammer the end carefully with a small machinist's hammer. Replace the rotor and the cap, then turn the motor over a few times, using the starter only. After a few revolutions, examine the distributor cap to see if the rotor has scraped or touched any of the stationary contacts in the cap. If so, dress lightly with a fine file. Repeat the above operation until the rotor just clears the contacts.

Occasionally you may find a distributor cap which is out of round or with a short electrode. This condition does not affect the operation of the car, but sometimes makes satisfactory elimination impossible. If such a condition is found, take the defective cap to the nearest United Motors Service Station and exchange it for a new one.

FIGURE 5





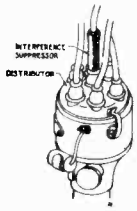


FIGURE 7

FIGURE 8

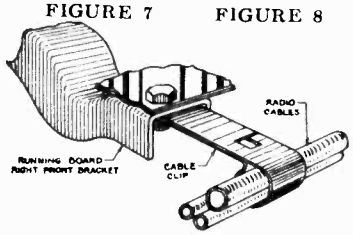


FIGURE 6

Spark Plug Resistor	33-1015
Distributor Resistor	33-1113E
½ mfd. Condenser	30-4007
Glass for Control	27-7325
Bezel Assembly	42-5115
Dial Assembly	42-5200
Pointer	28-3094
Control Assembly	42-5195
Knobs—Tuning	27-4075
Knobs—Volume	27-4076
Knobs Springs	28-1838
Interconnecting Cable	41-3067
Ammeter Cable	38-5296
Flexible Shaft—Tuning	28-8201
Flexible Shaft—Volume	28-8202
Fuse	7227
Fuse Insulator	27-7131
Speaker Mounting Bracket	29-1847
Speaker Mounting Bracket	29-1846
Speaker Mounting Bracket	29-1851
"U" Clamp	29-1705

Items 1 to 71 of the Parts List shown with the schematic diagram of Model G (Code 122) are identical for Model G (Code 122) DeSoto Code SE. See items at left for additional accessories.

INSTALLATION INSTRUCTIONS

Plymouth Model Code PJ **De Soto Model Code SF**
Dodge Model Code DU
Chrysler Model Code CZ **Chrysler Model Code C-6**

THESE INSTRUCTIONS have been prepared for your use in installing the DeLuxe Custom-Built Rad Read thru thoroughly, then follow the instructions carefully in every detail when making the installation.

Carefully unpack the cartons and check the contents with the material packing lists. Examine the parts and co pare them with illustrations given in these instructions so that you may become familiar with them and thus ma the installation easily and quickly.

This new DeLuxe Custom Built radio mounts on the dash above the steering column.

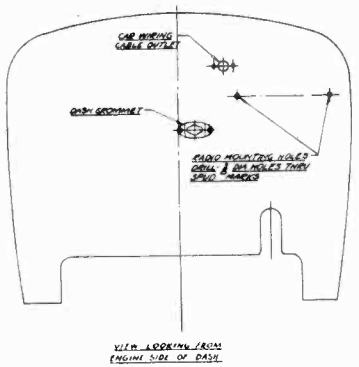


FIGURE 1

Receiver Installation

1. Remove the car lighting fuse from the back of the ammeter.

2. Drill two $\frac{3}{16}$" holes in the dash. Refer to Figure 1 for the location of the center punch marks on the dash. After drilling, remove the paint from the dash for a distance of $\frac{3}{4}$" around the holes to insure good ground contact.

3. The two $\frac{3}{8}$" "T" bolts supplied in the radio package must be placed in these holes in the dash from the inside of the car. Put the washers and nuts on the ends of the bolts, but do not tighten.

4. Pull forward on the knob of the ash receiver to remove it. It is also necessary to take out the ash receiver wind deflector. This can be done after removing the three retaining nuts.

5. The shielded antenna lead supplied in the radio package must be connected to the car antenna lead-in that comes down the front left-hand corner post. The bare ends of the two leads must be twisted together and taped. Make the splice as close as possible to the corner post.

The shield pig-tail of the antenna lead must be grounded to the cowl. To do this, drill a $\frac{1}{8}$" hole in the cowl in front of the hood line. Use an 8-32 bolt and connect the pig-tail eyelet under the nut. (See Figure 4).

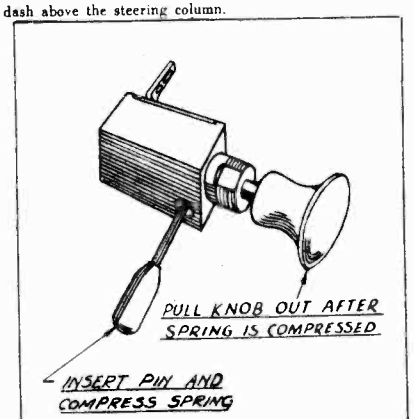


FIGURE 2

For Plymouth Model, Code PJ Only

1. Remove the short auxiliary brace from between the lower part of the instrument board and the brace that supports the cowl ventilator regulator mechanism.

2. Remove the head lamp switch. Pull the control knob out all the way. There is a small hole in the top of the switch, close to the instrument panel. Insert a nail or small screw driver in the hole and press down, at the same time pulling on the knob and thereby freeing the shaft. Remove the switch retaining nut on the front of the instrument panel. The switch can now be moved out of the way. DO NOT disconnect the wires attached to the switch.

6. Before installing the Receiver, place the gear shift lever in "LOW" and pull back the emergency hand brake lever as far as possible. Slide the Receiver into place above the steering column, hook the "T" bolts in the lugs on the side of the Receiver housing and then tighten the "T" bolt nuts on the engine side.

7. Connect the antenna lead in its receptacle on the end of the Receiver housing (See Figure 3)

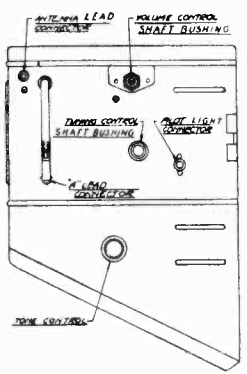


FIGURE 3

Control Installation

1. Install the control unit on the instrument panel, fitting it in the opening left by the removal of the ash receiver.

2. Fasten the control in place by means of the "U" clamp and nuts.

3. The volume control flexible shaft is on the left and must be coupled in the upper shaft bushing on the end of the Receiver housing (See Figure 3). The knurled shaft nut must be tightened securely.

4. Before connecting the tuning condenser flexible shaft, use a small screw driver and turn the variable condenser coupling in the Receiver in a counter-clockwise direction as far as it will go.

5. Turn the right-hand (tuning control) knob so that the pointer indicates "54" on the dial.

6. The tuning control flexible shaft must be coupled in the proper shaft bushing on the end of the Receiver housing (see Figure 3). The knurled shaft nut must be tightened securely.

7. Connect the terminal on the pilot light wire to its receptacle on the end of the Receiver housing (see Figure 3).

Power Connections

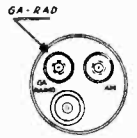


FIGURE 5

1. Connect the terminal end of the "A" lead to the switch terminal GA-RAD. Refer to Figure 5, showing the back of the ignition switch.

2. Place the fuse and fuse insulator in the small metal fuse housing on the end of the "A" lead and connect it to the short Receiver "A" lead (see Figure 3).

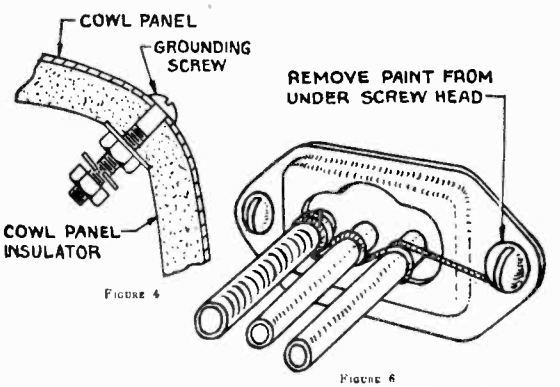


FIGURE 4

FIGURE 6

For Plymouth Model, Code PJ Only

Replace the auxiliary brace and the headlight switch referred to in the special Plymouth instructions under "Receiver Installation."

Motor Interference Suppression

1. Cut the elbow terminals from the spark plug cables and screw on the molded bakelite elbow suppressor terminals.

2. Screw the straight molded resistor on the end of the distributor center lead cable.

3. Plug this into the distributor cap.

4. Install a one mfd. by-pass condenser on the generator. Mount it on the generator frame under the screw that holds the generator relay in place. Connect the condenser lead under the screw that connects the battery lead to the relay.

5. Connect a $\frac{1}{2}$ mfd. condenser to the dome light lead as close as possible to the point where it enters the right front corner post. This connection must be soldered and taped.

6. Drill a $\frac{1}{8}$" hole in the cowl in front of the hood line close to the corner post. Fasten the dome light condenser to the under side of the cowl using the 8-32 bolt and nut furnished for this purpose.

7. Ground the steering column to the dash. There is a hole in the steering column near the dash opening seal for a No. 8 — $\frac{1}{4}$" self-tapping screw. Scrape the paint off around this hole. Using the bare stranded wire with the two eye terminals, place one terminal under one of the screws that holds the steering column dash seal in place. The other end must be fastened to the steering column with a No. 8 — $\frac{1}{4}$" self-tapping screw.

8. If there is no hole in the steering column near the dash opening seal for a No. 8 — $\frac{1}{4}$" self-tapping screw, scrape the paint from the column near the dash opening seal, solder on a piece of the No. 14 bare stranded wire supplied and ground this wire under one of the screws that holds the steering column dash seal in place.

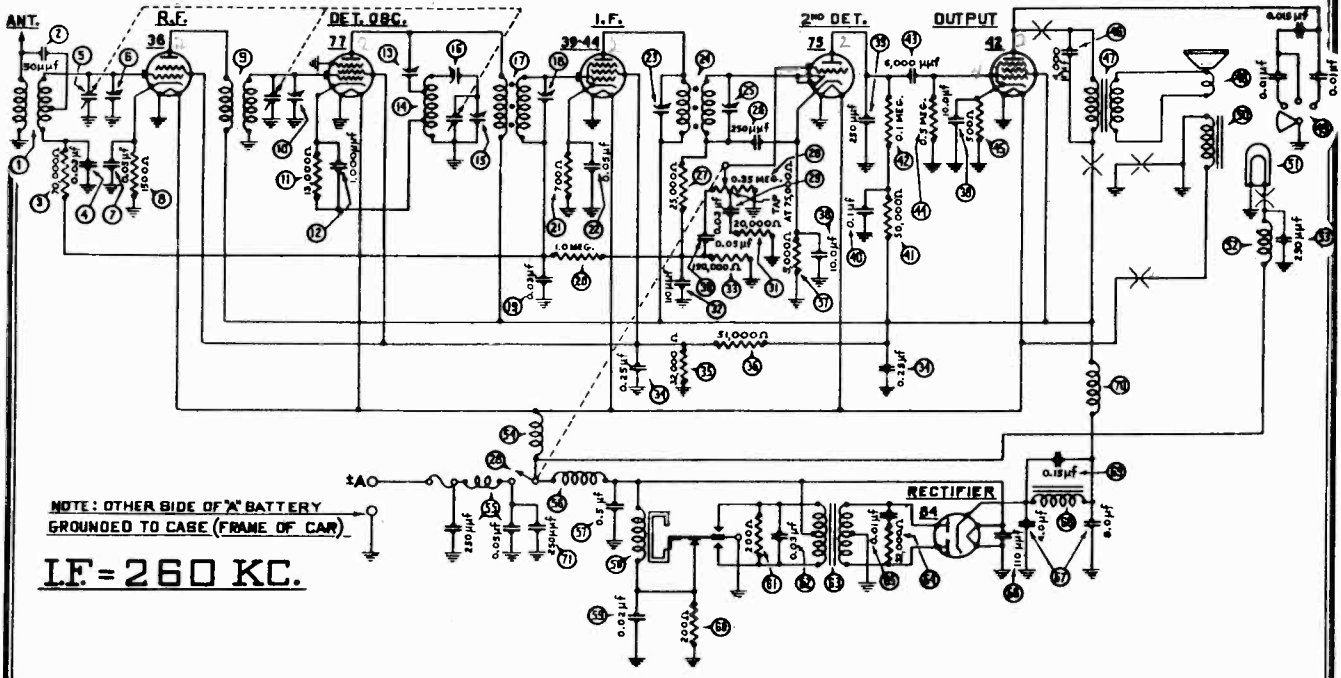
9. Ground the speedometer cable, oil line and temperature indicator tube where they enter the dash under one of the gromet cap screws with the No. 14 stranded wire provided. (See Figure 6).

10. Replace the car lighting fuse — test the lights and horn.

11. An additional $\frac{1}{2}$ mfd. condenser may at times be used to advantage. Mount this condenser on the bottom ledge of the instrument board and connect it to one of the terminals of the ammeter or ignition switch directly behind the instrument panel.

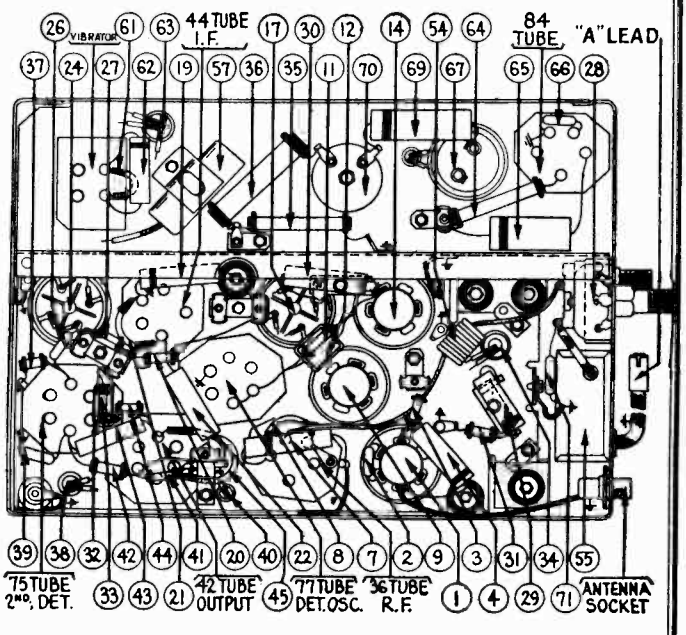
Note: See auto index vol.II for various indexing of several cars for this page 2-13

MODEL CT-2 Chrysler
MODEL CT-5 DeSoto SG, PHILCO RADIO & TELEV. CORP.
Plymouth Code PJ SF
Dodge Code DU
Chrysler Code CZ,C-C
Schematic,Chassis,Parts



Parts List - CT-2 Chrysler De Luxe Custom Built Radio

(1)	Antenna Transformer	32-1535	
(2)	Condenser (50 mmfd.)	30-1029	
(3)	Resistor (70,000 ohms)	33-1115	
(4)	Condenser (.03 mfd.)	30-4025	
(5)	Tuning Condenser	31-1425	
(6)	1st Padder (on tun. cond.)		
(7)	Condenser (.05 mfd.)	30-4020	
(8)	Resistor (1500 ohms)	33-3047	
(9)	R. F. Transformer	32-1536	
(10)	2nd Padder (on tun. cond.)		
(11)	Resistor (11,000 ohms)	33-1194	
(12)	Condenser (1000 mmfd.)	30-1007	
(13)	Padder (Pri. 1st I. F. Tran.)		
(14)	Oscillator Transformer	32-1537	
(15)	3rd Padder (on tun. cond.)		
(16)	4th Padder (on tun. cond.)		
(17)	First I. F. Transformer	32-1538	
(18)	Padder (Sec. 1st I. F. Tran.)		
(19)	Condenser (.03 mfd.)	30-4025	
(20)	Resistor (1 meg.)	33-1096	
(21)	Resistor (700 ohms)	6443	
(22)	Condenser (.05 mfd.)	30-4020	
(23)	Padder (Pri. 2nd I. F. Tran.)		
(24)	Second I. F. Transformer	32-1449	
(25)	Padder (Sec. 2nd I. F. Tran.)		
(26)	Condenser (250 mmfd.)	30-1032	
(27)	Resistor (25,000 ohms)	33-1161	
(28)	Vol. Con. & Switch Assm.	33-5088	
(29)	Condenser (.03 mfd.)	30-4025	
(30)	Condenser (.05 mfd.)	30-4020	
(31)	Resistor (20,000 ohms)	33-1130	
(32)	Condenser (110 mmfd.)	30-1031	
(33)	Resistor (190,000 ohms)	33-1116	
(34)	Condenser (.25-.25 mfd.)	30-4231	
(35)	Resistor (32,000 ohms)	3525	
(36)	Resistor (51,000 ohms)	5868	
(37)	Resistor (5,000 ohms)	6096	
(38)	Condenser (10-10 mfd.)	30-2076	
(39)	Condenser (250 mmfd.)	30-1032	
(40)	Condenser (.1 mfd.)	30-4170	
(41)	Resistor (50,000 ohms)	6098	
(42)	Resistor (.1 meg.)	6099	
(43)	Condenser (6000 mmfd.)	30-4125	
(44)	Resistor (.5 meg.)	6097	
(45)	Resistor (500 ohms)	33-3031	
(46)	Condenser (4000 mmfd.)	30-4185	
(47)	Output Transformer	2598	
(48)	Cone & Voice Coil	36-3159	
*(49)	Tone Control	30-4138	
(50)	Field Coil Assembly	02795	
(51)	Pilot Lamp	34-2036	
(52)	Choke	32-1374	
(53)	Condenser (250 mmfd.)	30-1032	
(54)	"A" Choke	32-1374	
(55)	Interference Filter	32-1534	
(56)	Vibrator Choke	32-1563	
(57)	Condenser (.5 mfd.)	30-4015	
(58)	Vibrator	38-5036	
(59)	Condenser (.02 mfd.)	30-4039	
(60)	Resistor (200 ohms)	7217	
(61)	Resistor (200 ohms)	7217	
(62)	Condenser (.03 mfd.)	30-4025	
(63)	Power Transformer	32-7315	
(64)	Resistor (32,000 ohms)	3525	
(65)	Condenser (.01 mfd.)	30-4051	
(66)	Condenser (110 mmfd.)	30-1031	
(67)	Filter Cond. (4-8 mfd.)	30-2107	
(68)	"B" Choke	32-7254	
(69)	Condenser (.15 mfd.)	30-4191	
(70)	R. F. Choke	32-1530	
(71)	Condenser (250 mmfd.)	30-1032	
	*Ground Clip	28-2488	
	Spark Plug Resistor	33-1015	
	Distributor Resistor	33-1113	
	Interference Cond. (1 mfd.)	4522	
	Interference Cond. (½ mfd.)	30-4007	
	*"T" Bolt (Set Mtg.)	28-6161	
	*Nut (Set Mtg.)	W518	
	Fuse	7227	
	Fuse Insulator	27-7729	
	*Antenna Lead	38-6355	
	*"A" Lead	38-6551	
	*"U" Clamp (Control Mtg.)	29-1705	
	*Nut (Control Mtg.)	W317A	



Glass	27-7325	
*Face Assembly (Chrysler)	28-2500	
*Face Assembly (Plymouth)	28-2498	
*Face Assembly (Dodge)	28-2496	
*Face Assembly (DeSoto)	28-2497	
*Pointer (Chrysler)	28-2503	
*Pointer (Plymouth)	28-2505	
*Pointer (Dodge)	28-2506	
*Pointer (DeSoto)	28-2504	
*Knob (Chrysler)	27-4163	
*Knob (Plymouth Economy)	27-4156	
*Knob (Plymouth DeLuxe)	27-4159	
*Knob (Dodge)	27-4155	
*Knob (DeSoto)	27-4153	
*Flex. Shaft (Tun.) (Dodge)	28-8319	
*Flex. Shaft (Vol.) (Dodge)	28-8320	
*Flex. Shaft (Tun.) (Plym., DeSoto, Chrysler)	28-8317	
*Flex. Shaft (Vol.) (Plym., DeSoto, Chrysler)	28-8318	

PHILCO RADIO & TELEV. CORP.

MODEL CT-5 DeLuxe
Chrysler Airflow,
Installation Data

Installation Instructions - Chrysler Airflow Models - Codes C-1, C-2 and C-3

THESE INSTRUCTIONS have been prepared for your use in installing the DeLuxe Custom-Built Radio. Read through thoroughly, then follow the instructions carefully in every detail when making the installation.

Carefully unpack the cartons and check the contents with the material packing lists so that you may become familiar with all the parts and thereby make the installation easily and quickly.

This new DeLuxe Custom-Built Radio is mounted on a special bracket under the cowl on the left-hand side. The speaker is mounted on the "H" shaped instrument board to dash brace.

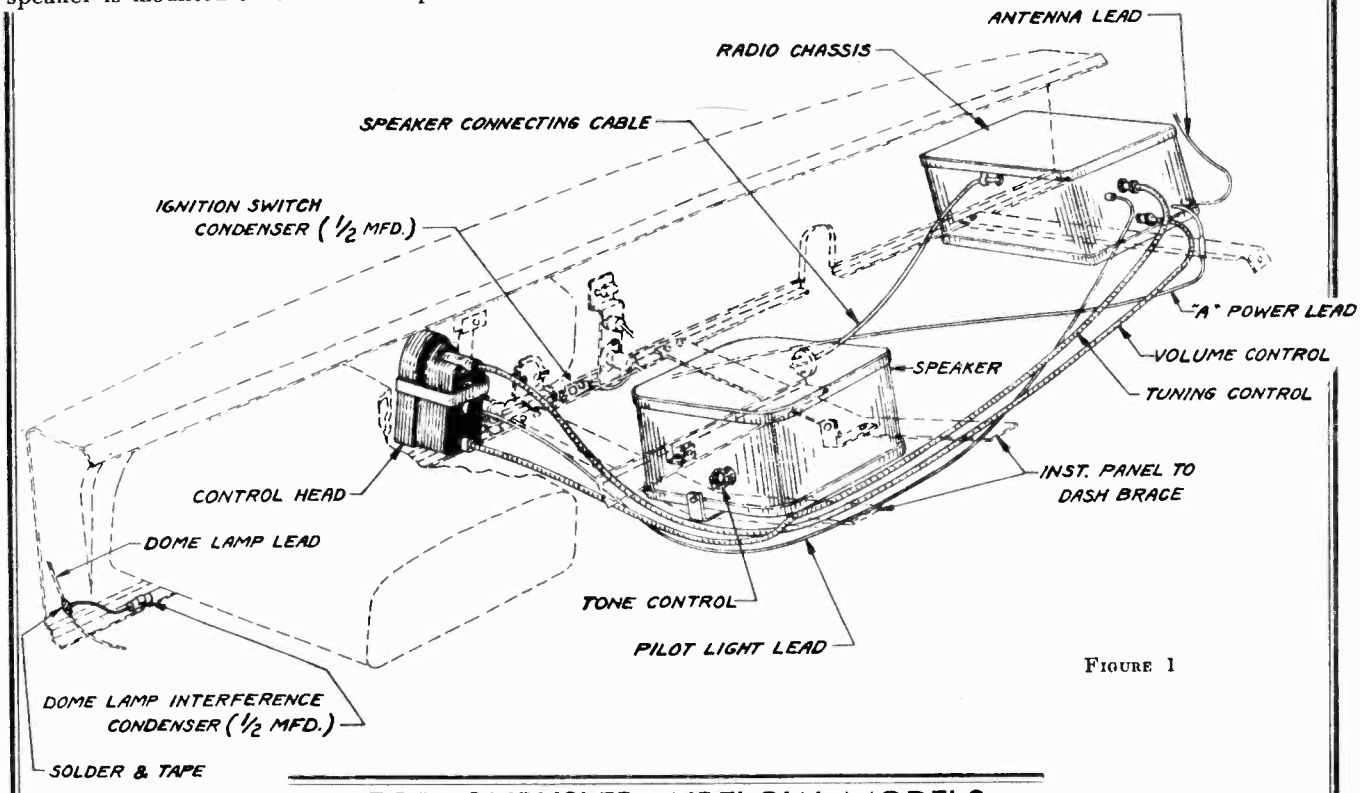


FIGURE 1

FOR CHRYSLER AIRFLOW MODELS
CODE C-2 and C-3 ONLY

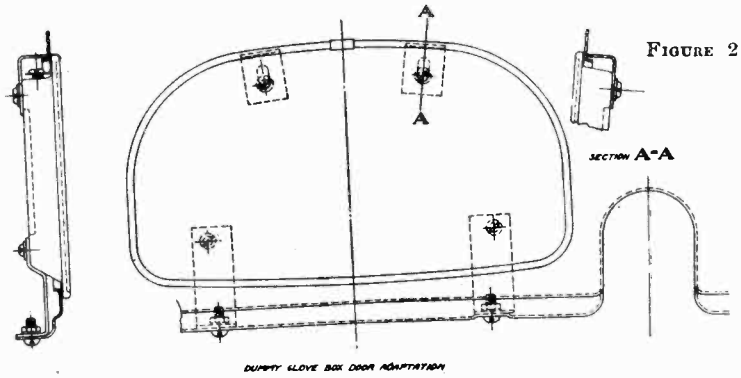


FIGURE 2

Remove the left hand glove compartment, door, hinge and fastener. Replace the glove compartment door and fasten with the four special adapter brackets. See Figure 2.

Antenna Lead

The shielded antenna lead must be connected to the car antenna lead-in that comes down the front left-hand corner post. The bare ends of the two leads must be twisted together and taped. Make the splice as close as possible to the corner post. The shield pig-tail of the antenna lead must be grounded.

ReceiverInstallation

(See Figure 1)

1. Remove the car lighting fuse from the back of the ammeter.

2. Bolt the Receiver fast to the special set-mounting bracket so that when installed in the car, the control coupling end of the Receiver faces the dash of the car. The bracket, together with the nuts and lockwashers are provided in the accessory kits.

3. Drill a 1/4" hole in the flange of the instrument board 6 5/8" to the left of the steering column opening in the instrument board.

4. Rest the flat part of the Receiver mounting bracket on the flange of the instrument board over the hole just drilled and place the 3/4" 10-32 bolt through the hole in the flange of the instrument panel and the Receiver mounting bracket. Put on the nut but do not tighten at this time.

Installation Instructions — Chrysler Airflow Models — Codes C-1, C-2 and C-3

5. Raise the Receiver as high as the switch lock-to-coil cable permits and mark the location for the bolt hole on the dash.

6. Drill a ⅜" hole through the dash.

7. Using the 1¼" bolt and nut, fasten the mounting bracket securely to the dash. The nut must be on the engine side.

8. Tighten the bolt that fastens the mounting bracket to the instrument board.

Speaker Installation

(See Figures 1, 3 and 5)

1. Refer to Figure 3 which shows the location of the holes in the reinforcing brace on which the speaker is to be mounted.

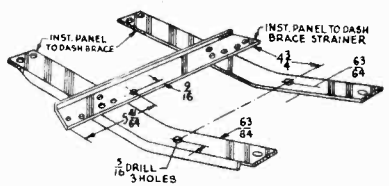
2. The speaker mounting brackets must be bolted to the sides of the speaker before it is installed in the car.

3. Place the speaker on the work bench, face down with the tone control knob to the right. The small angle bracket with the cage nut must be bolted to the side nearest you. The longest angle bracket must be bolted to the left side of the speaker with the part having the elongated hole directed away from the speaker. The third bracket must be bolted to the right-hand side of the speaker with the caged nut turned under the speaker.

4. Loosen the bolt on the right hand bracket at the dash to which is attached the instrument board reinforcing brace. Slip the "U" shim (furnished in the accessory kit) between the bracket and the brace and then tighten the bolt. (See Figure 5).

5. Place the speaker on the instrument board brace face down with the tone control to the right and securely fasten with the three ¼" No. 20 bolts, nuts and lockwashers.

6. The Receiver connecting cable must be plugged into its receptacle in the speaker.



Control Installation

1. Install the control unit on the instrument board, fitting it in the opening left by the removal of the ash receptacle.

2. Fasten the control head in place by means of the "U" clamp and nuts. (See Figure 6)

3. The volume control flexible shaft is at the top and must be coupled in the lower shaft bushing on the end of the Receiver housing (see Figure 1). The knurled shaft nut must be tightened securely.

4. Before connecting the tuning condenser flexible shaft, use a small screw driver and turn the variable condenser coupling in the Receiver in a counter-clockwise direction as far as it will go.

5. Turn the bottom (tuning control) knob so that the indicator points to "54" on the dial.

6. The tuning control flexible shaft must be coupled in the proper shaft bushing on the end of the Receiver housing (see Figure 1). The knurled shaft nut must be tightened securely.

7. Connect the terminal on the pilot light wire to its receptacle on the end of the Receiver housing (see Figure 1).

8. Connect the antenna lead to its receptacle on the end of the Receiver housing (see Figure 1).

Power Connections

For installations in Code C-1 cars, connect the terminal end of the "A" lead to the switch terminal GA-RAD. Refer to Figure 4 showing the back of the ignition switch.

CODE C-2 and C-3 ONLY

In Code C-2 and C-3 cars, connect the terminal end of the "A" lead to the fuse terminal of the ammeter.

Place the fuse and fuse insulator in the small metal fuse housing on the end of the "A" lead and connect it to the short Receiver "A" lead.

CODE C-1 — IGNITION SWITCH

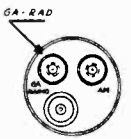


FIGURE 4

REAR VIEW OF IGNITION SWITCH

Motor Interference Suppression

1. Cut the elbow terminals from the spark plug cables and screw on the molded bakelite elbow suppressor terminals. Snap the resistors on the plug terminals.

2. Screw the straight molded resistor on the distributor end of the distributor center lead cable.

3. Plug this into the distributor cap.

4. Install a one mfd. by-pass condenser on the generator. Mount it on the generator frame under the screw that holds the generator relay in place. Connect the condenser lead under the screw that connects the battery lead to the relay.

5. Connect a ½ mfd. condenser to the dome light lead as close as possible to the point where it enters the right front corner post. This connection must be soldered and taped. Drill a ¼" hole in the flange of the instrument board 2" from where it joins the cowl on the right side. Remove the paint from around the hole and fasten the condenser to the flange with an 8-32 bolt and nut.

6. Ground the steering column to the dash. There is a hole in the steering column near the dash opening seal for a No. 8—¼" self-tapping screw. Scrape the paint off around this hole. Using the bare stranded wire with the two eye terminals, place one terminal under one of the screws that holds the steering column dash seal in place. The other end must be fastened to the steering column with a No. 8—¼" self-tapping screw.

7. If there is no hole in the steering column near the dash opening seal for a No. 8—¼" self-tapping screw, scrape the paint from the column near the dash opening seal, solder on a piece of the No. 14 bare stranded wire and ground this wire under one of the screws that holds the steering column dash seal in place.

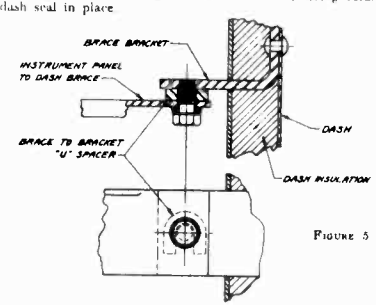


FIGURE 5

8. Ground the oil line and temperature indicator tube where they enter the dash under one of the grounct cap screws with the No. 14 stranded wire (see Figure 7).

9. Replace the car lighting fuse — test the lights and horn.

10. An additional ½ mfd. condenser may be used to advantage at times. Mount this condenser on the bottom ledge of the instrument board and connect it to one of the terminals of the ammeter or ignition switch behind the instrument board.

CODE C-2 and C-3 ONLY

11. In case there is any motor interference in Code C-2 or C-3 cars, caused by an excessive gap between the distributor rotor and the high tension contacts in the distributor head, this can be overcome by extending the metal end of the rotor.

Follow this procedure carefully: Remove the distributor cap and chalk the inside faces of the stationary contacts. Remove the rotor and place the contact end on a small anvil or steel block. Peen or hammer the end carefully with a small machinists' hammer. Replace the rotor and the cap and then turn the motor over with the ignition turned off.

After a few revolutions, examine the distributor cap to see if the rotor has scraped or touched any of the stationary contacts in the cap. If so, dress lightly with a fine file.

Ignition Switch

CODE C-1 ONLY

When the ignition switch key is in its center position all circuits are disconnected and locked.

When the switch key is turned to the left, the gas gauge registers and the battery supply is connected to the radio.

When the key is turned to the right, the gas gauge registers and the battery supply is connected to the ignition circuit and to the radio.

Operating Instructions

To operate the Receiver, the ignition switch key must first be turned either to the right or to the left, as described above. The upper knob on the radio control is a combination switch and volume control. Turn the volume control knob clockwise. The first range of motion operates the Receiver switch. From there on, it is the manual volume control.

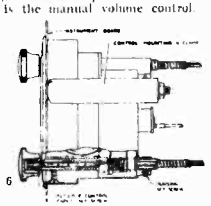


FIGURE 6

With the volume control turned on half way, allow the tubes to heat up. Then turn the lower knob (the station selector) to tune in the various programs. The numbers on the dial represent channel numbers which, with the addition of "0" to the number, correspond to the frequencies in kilocycles. Adjust the volume to a suitable level and recheck the tuning. The Receiver must be tuned so that the maximum signal is obtained. Since the Receiver is extremely selective, it is of the utmost importance that the Receiver be tuned right on the station. Careless tuning off to one side, even though the signal is still heard, results in very poor tone quality and very mushy reception.

The tone control knob is on the right hand side of the speaker housing (see Figure 1). It should be adjusted to the tone most pleasing. There are four (4) positions: brilliant, bright, mellow and deep. Speech is clearest when in bright or brilliant, while usually orchestras will sound best on bright or mellow.

Another use of the tone control is as a static modifier. When driving through extremely noisy locations, the tone control should be set on mellow or deep. This will subdue the harsh, rasping static.

Except on very weak signals, the automatic volume control maintains the same volume level while driving along without continually manipulating the manual volume control, cuts out external interferences, counteracts fading and prevents blasting of local stations while tuning. It is virtually impossible, however, to maintain satisfactory reception while driving under bridges or in places which are totally shielded, known as dead spots.

IMPORTANT—When turning off the Receiver, be sure the volume control is turned counter-clockwise until a click is heard and the dial light goes out, otherwise the Receiver will continue to operate and discharge the battery.

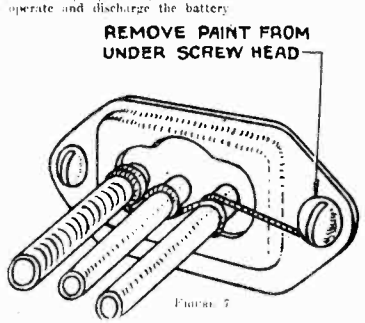


FIGURE 7

Items 1 to 72 of the Parts List for PT-5 Packard DeLuxe Custom Built Model 120 are identical for the CT-5 DeLuxe Custom Built Radio for Chrysler Airflow, Codes C-1, C-2 and C-3.

See the items listed below, for additional accessories.

*Ground Clip	28-2488	*Glove Box Door Brkt. (Upper)	29-2021	*Knob	27-4101
Spark Plug Resistor	33-1015	*Glove Box Door Brkt. (Lower R. H.)	29-2022	*Flex. Shaft (Tun.)	28-8324
Distributor Resistor	33-1113	*Glove Box Door Brkt. (Lower L. H.)	29-2023	*Flex Shaft (Vol.)	28-8325
Interference Cond. (1 mfd.)	4522	*Bolt (Set Mtg. Front)	W14410	*Speaker Cable	41-3126
Interference Cond (½ mfd.)	130-4007	*Bolt (Set Mtg. Rear)	W13331	*Speaker Mtg. Brkt. (R.H.)	36-3428
Fuse	7227	*Nut (Set Mtg. Front)	W98B	*Speaker Mtg. Brkt. (L.H.)	20-2587
Fuse Insulator	27-7131	*Nut (Set Mtg. Rear)	W317B	*Speaker Mtg. Brkt. (Rear)	36-3429
*Antenna Lead	38-6356	*Brake Assembly	42-5203	*Screw (Speaker Mtg.)	W99B
*"A" Lead	38-6352			*Screw (Speaker Mtg.)	aV285B
*"U" Clamp (Control Mtg.)	29-1808			*Nut (Speaker Mtg.)	W98B
*Nut (Control Mtg.)	W99A				

Installation Instructions - DeSoto Airflow Model - Code SG

THESE INSTRUCTIONS have been prepared for your use in installing the DeLuxe Custom-Built Radio. Read through thoroughly, then follow the instructions carefully in every detail when making the installation.

Carefully unpack the cartons and check the contents with the material packing lists so that you may become familiar with all the parts and thereby make the installation easily and quickly.

This new DeLuxe Custom-Built Radio is mounted on a special bracket under the cowl on the left-hand side. The speaker is mounted on the "H" shaped instrument board to dash brace.

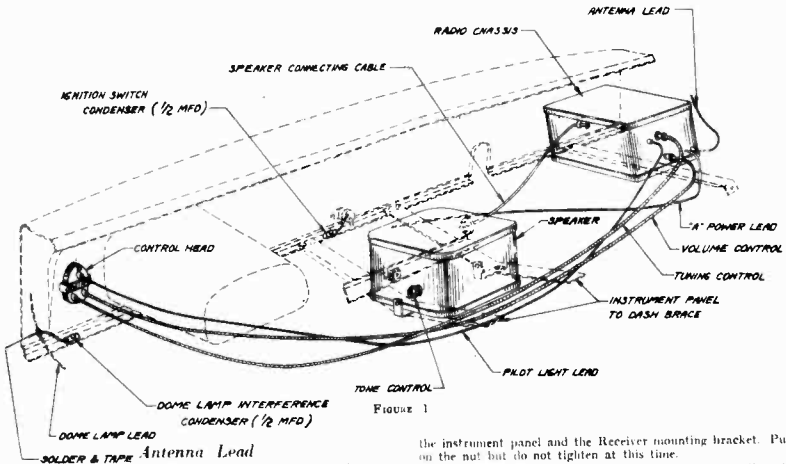


FIGURE 1

Antenna Lead

The shielded antenna lead must be connected to the car antenna lead-in that comes down the front left-hand corner post. The bare ends of the two leads must be twisted together and taped. Make the splice as close as possible to the corner post. The shield pig-tail of the antenna lead must be grounded

Receiver Installation

(See Figure 1)

1. Remove the car lighting fuse from the back of the ammeter.

2. Bolt the Receiver fast to the special set-mounting bracket so that when installed in the car, the control coupling end of the Receiver faces the dash of the car. The bracket, together with the nuts and lockwashers are provided in the accessory kits.

3. Drill a ¼" hole in the flange of the instrument board 6⅝" to the left of the steering column opening in the instrument board.

4. Rest the flat part of the Receiver mounting bracket on the flange of the instrument board over the hole just drilled and place the ⅝" 10-32 bolt through the hole in the flange of the instrument panel and the Receiver mounting bracket. Put on the nut but do not tighten at this time.

5. Raise the Receiver as high as the switch lock-to-coil cable permits and mark the location for the bolt hole on the dash.

6. Drill a ¼" hole through the dash.

7. Using the 1¾" bolt and nut, fasten the mounting bracket securely to the dash. The nut must be on the engine side.

8. Tighten the bolt that fastens the mounting bracket to the instrument board.

Speaker Installation

(See Figures 1, 2 and 3)

1. Refer to Figure 2 which shows the location of the holes in the reinforcing brace on which the speaker is to be mounted.

2. The speaker mounting brackets must be bolted to the sides of the speaker before it is installed in the car.

3. Place the speaker on the work bench, face down with the tone control knob to the right. The small angle bracket with the cage nut must be bolted to the side nearest you. The longest angle bracket must be bolted to the left side of the speaker with the part having the elongated hole directed away from the speaker. The third bracket must be bolted to the right-hand side of the speaker with the caged nut turned under the speaker.

4. Loosen the bolt on the right-hand bracket at the dash to which is attached the instrument board reinforcing brace. Slip the "U" shim (furnished in the accessory kit) between the bracket and the brace and then tighten the bolt. (See Figure 3).

5. Place the speaker on the instrument board brace face down with the tone control to the right and securely fasten with the three (3) ¼" No. 20 bolts, nuts and lockwashers.

6. The Receiver connecting cable must be plugged into its receptacle in the speaker.

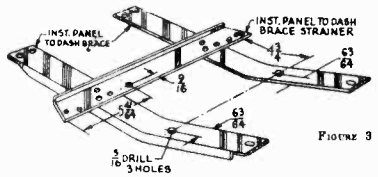


FIGURE 3

FIGURE 2

Control Installation

(See Figure 4)

1. Install the control unit on the instrument board, fitting it in the opening left by the removal of the ash receptacle.

2. Fasten the control head in place by means of the "U" clamp and nuts. (See Figure 4).

3. The volume control flexible shaft is on the left and must be coupled in the lower shaft bushing on the end of the Receiver housing (see Figure 1). The knurled shaft nut must be tightened securely.

4. Before connecting the tuning condenser flexible shaft, use a small screw driver and turn the variable condenser coupling in the Receiver in a counter-clockwise direction as far as it will go.

5. Turn the right-hand (tuning control) knob so that the pointer indicates "54" on the dial.

6. The tuning control flexible shaft must be coupled in the proper shaft bushing on the end of the Receiver housing (see Figure1). The knurled shaft nut must be tightened securely.

7. Connect the terminal on the pilot light wire to its receptacle on the end of the Receiver housing (see Figure 1).

8. Connect the antenna lead to its receptacle on the end of the Receiver housing (see Figure 1).

Power Connections

(See Figure 5)

1. Connect the terminal end of the "A" lead to the switch terminal GA-RAD. Refer to Figure 5 showing the back of the ignition switch.

2. Place the fuse and fuse insulator in the small metal fuse housing on the end of the "A" lead and connect it to the short Receiver "A" lead.

Motor Interference Suppression

1. Cut the elbow terminals from the spark plug cables and screw on the molded bakelite elbow suppressor terminals. Snap the resistors on the plug terminals.

2. Screw the straight molded resistor on the distributor end of the distributor center lead cable.

3. Plug this into the distributor cap.

4. Install a one mfd. by-pass condenser on the generator. Mount it on the generator frame under the screw that holds the generator relay in place. Connect the condenser lead under the screw that connects the battery lead to the relay.

5. Connect a ½ mfd. condenser to the dome light lead as close as possible to the point where it enters the right front corner post. This connection must be soldered and taped. Drill a ⅛" hole in the flange of the instrument board 2" from where it joins the cowl on the right side. Remove the paint from around the hole and fasten the condenser to the flange with an 8-32 bolt and nut.

6. Ground the steering column to the dash. There is a hole in the steering column near the dash opening seal for a No. 8—¼" self-tapping screw. Scrape the paint off around this hole. Using the bare stranded wire with the two-eye terminals, place one terminal under one of the screws that holds the steering column dash seal in place. The other end must be fastened to the steering column with a No. 8—¼" self-tapping screw.

7. If there is no hole in the steering column near the dash opening seal for a No. 8—¼" self-tapping screw, scrape the paint from the column near the dash opening seal, solder on a piece of the No. 14 bare stranded wire and ground this wire under one of the screws that holds the steering column dash seal in place.

8. Ground the oil line and temperature indicator tube where they enter the dash under one of the gromet cap screws with the No. 14 stranded wire (see Figure 6).

9. Replace the car lighting fuse — test the lights and horn.

10. An additional ½ mfd. condenser may be used to advantage at times. Mount this condenser on the bottom ledge of the instrument board and connect it to one of the terminals of the ammeter or ignition switch behind the instrument board.

Ignition Switch

When the ignition switch key is in its center position all circuits are disconnected and locked.

When the switch key is turned to the left, the gas gauge registers and the battery supply is connected to the radio.

When the key is turned to the right, the gas gauge registers and the battery supply is connected to the ignition circuit and to the radio.

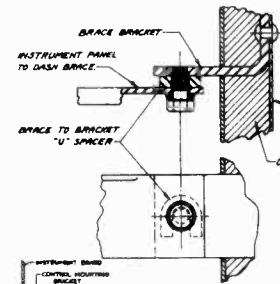


FIGURE 8

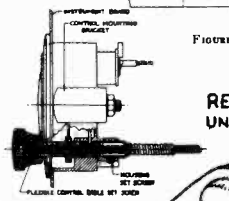


FIGURE 4

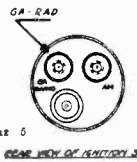


FIGURE 5

REAR VIEW OF IGNITION SWITCH

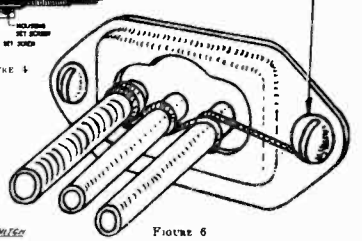
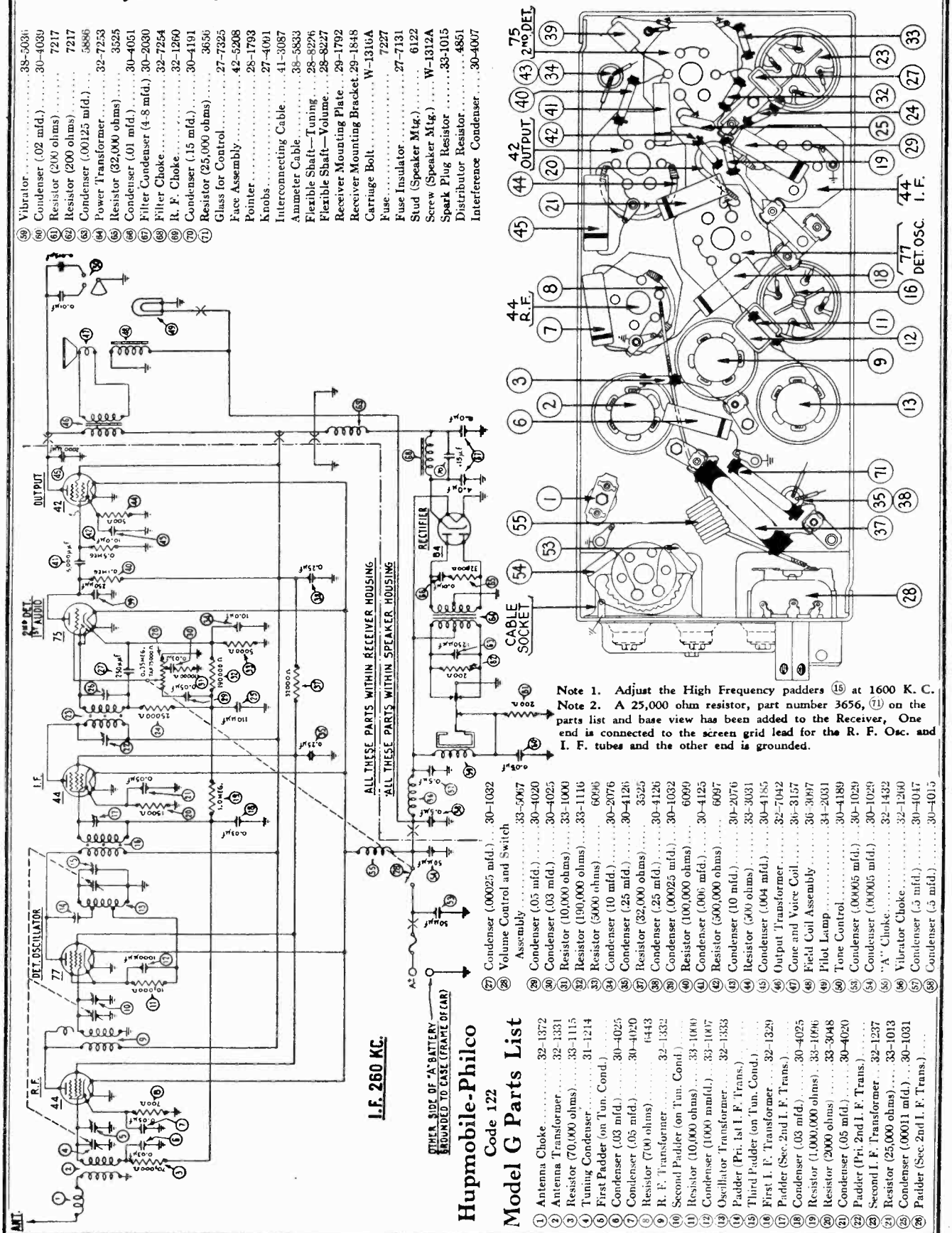


FIGURE 6

Items 1 to 71 of the Parts List for CT-2 Chrysler DeLuxe Custom Built Set are identical for DeSoto Airflow Code SG, Model CT-5. See the items on the right for additional accessories.

*Ground Clip	28-2488	*"U" Clamp (Control Mtg.)	29-1772	*Knob (DeSoto)	27-4167
Spark Plug Resistor	33-1015	*Nut (Control Mtg.)	W965A	*Flex. Shaft (Tun.) (DeSoto)	28-8322
Distributor Resistor	33-1113	*Bolt (Set Mtg. Front)	W1441B	*Flex. Shaft (Vol.) (DeSoto)	28-8323
Interference Cond. (1 mfd.)	4522	*Bolt (Set Mtg. Rear)	W1333B	*Speaker Cable	41-3126
Interference Cond. (½ mfd.)	30-4007	*Nut (Set Mtg. Front)	W98B	*Speaker Mtg. Brkt. (R. H.)	36-3428
Fuse	7227	*Nut (Set Mtg. Rear)	W317B	*Speaker Mtg. Brkt. (L. H.)	29-2287
Fuse Insulator	27-7131	Glass	27-7325	*Speaker Mtg. Brkt. (Rear)	36-3429
*Antenna Lead	38-6355	*Face Assembly (DeSoto)	28-2549	*Screw (Speaker Mtg.)	W99B
*"A" Lead	38-6352	*Pointer (DeSoto)	28-2494	*Screw (Speaker Mtg.)	W2958

MODEL G (Code 122) Hup
For J,T & W Cars PHILCO RADIO & TELEV. CORP.
Schematic,Chassis,Parts



Hupmobile-Philco
Code 122
Model G Parts List

(1)	Antenna Choke	32-1372	
(2)	Antenna Transformer	32-1331	
(3)	Resistor (70,000 ohms)	33-1115	
(4)	Tuning Condenser	31-1214	
(5)	First Padder (on Tun. Cond.)	6096	
(6)	Condenser (.03 mfd.)	30-4025	
(7)	Condenser (.05 mfd.)	30-4020	
(8)	Resistor (700 ohms)	6443	
(9)	R. F. Transformer	32-1332	
(10)	Second Padder (on Tun. Cond.)	6099	
(11)	Resistor (10,000 ohms)	33-1008	
(12)	Condenser (1000 mmfd.)	33-1007	
(13)	Oscillator Transformer	32-1333	
(14)	Padder (Pri. 1st I. F. Trans.)	6443	
(15)	Third Padder (on Tun. Cond.)	6099	
(16)	First I. F. Transformer	32-1329	
(17)	Padder (Sec. 2nd I. F. Trans.)	6443	
(18)	Condenser (.03 mfd.)	30-4025	
(19)	Resistor (1,000,000 ohms)	33-1096	
(20)	Resistor (2000 ohms)	33-3048	
(21)	Condenser (.05 mfd.)	30-4020	
(22)	Padder (Pri. 2nd I. F. Trans.)	6443	
(23)	Second I. F. Transformer	32-1237	
(24)	Resistor (25,000 ohms)	33-1013	
(25)	Condenser (.00011 mfd.)	30-1031	
(26)	Padder (Sec. 2nd I. F. Trans.)	6443	
(27)	Condenser (.00025 mfd.)	30-1032	
(28)	Volume Control and Switch Assembly	33-5067	
(29)	Condenser (.05 mfd.)	30-4020	
(30)	Condenser (.03 mfd.)	30-4025	
(31)	Resistor (10,000 ohms)	33-1000	
(32)	Resistor (190,000 ohms)	33-1116	
(33)	Resistor (3000 ohms)	6096	
(34)	Condenser (10 mfd.)	30-2076	
(35)	Condenser (.25 mfd.)	30-4126	
(37)	Resistor (32,000 ohms)	3525	
(38)	Condenser (.25 mfd.)	30-4126	
(39)	Condenser (.00025 mfd.)	30-1032	
(40)	Resistor (100,000 ohms)	6099	
(41)	Condenser (.006 mfd.)	30-4125	
(42)	Resistor (300,000 ohms)	6097	
(43)	Condenser (10 mfd.)	30-2076	
(44)	Resistor (500 ohms)	33-3031	
(45)	Condenser (.004 mfd.)	30-4185	
(46)	Output Transformer	32-7042	
(47)	Cone and Voice Coil	36-3157	
(48)	Field Coil Assembly	36-3097	
(49)	Pilot Lamp	34-2031	
(50)	Tone Control	30-4189	
(53)	Condenser (.00005 mfd.)	30-1029	
(54)	Condenser (.00005 mfd.)	30-1029	
(55)	"A" Choke	32-1432	
(56)	Vibrator Choke	32-1260	
(57)	Condenser (.5 mfd.)	30-4047	
(58)	Condenser (.5 mfd.)	30-4015	
(59)	Vibrator	38-5030	
(60)	Condenser (.02 mfd.)	30-4039	
(61)	Resistor (200 ohms)	7217	
(62)	Resistor (200 ohms)	7217	
(63)	Condenser (.00125 mfd.)	3886	
(64)	Power Transformer	32-7253	
(65)	Resistor (32,000 ohms)	3525	
(66)	Condenser (.01 mfd.)	30-4051	
(67)	Filter Condenser (4-8 mfd.)	30-2030	
(68)	Filter Choke	32-7254	
(69)	R. F. Choke	32-1260	
(70)	Condenser (.15 mfd.)	30-4191	
(71)	Resistor (25,000 ohms)	3656	
	Glass for Control	27-7325	
	Face Assembly	42-5208	
	Pointer	28-1793	
	Knobs	27-4091	
	Interconnecting Cable	41-3087	
	Ammeter Cable	38-5833	
	Flexible Shaft—Tuning	28-8296	
	Flexible Shaft—Volume	28-8227	
	Receiver Mounting Plate	29-1792	
	Receiver Mounting Bracket	29-1848	
	Carriage Bolt	W-1310A	
	Fuse	7227	
	Fuse Insulator	27-7131	
	Stud (Speaker Mtg.)	6122	
	Screw (Speaker Mtg.)	W-1312A	
	Spark Plug Resistor	33-1015	
	Distributor Resistor	4861	
	Interference Condenser	30-4007	

Note 1. Adjust the High Frequency padders (16) at 1600 K. C.
Note 2. A 25,000 ohm resistor, part number 3656, (71) on the parts list and base view has been added to the Receiver, One end is connected to the screen grid lead for the R. F. Osc. and I. F. tubes and the other end is grounded.

PHILCO RADIO & TELEV. CORP.

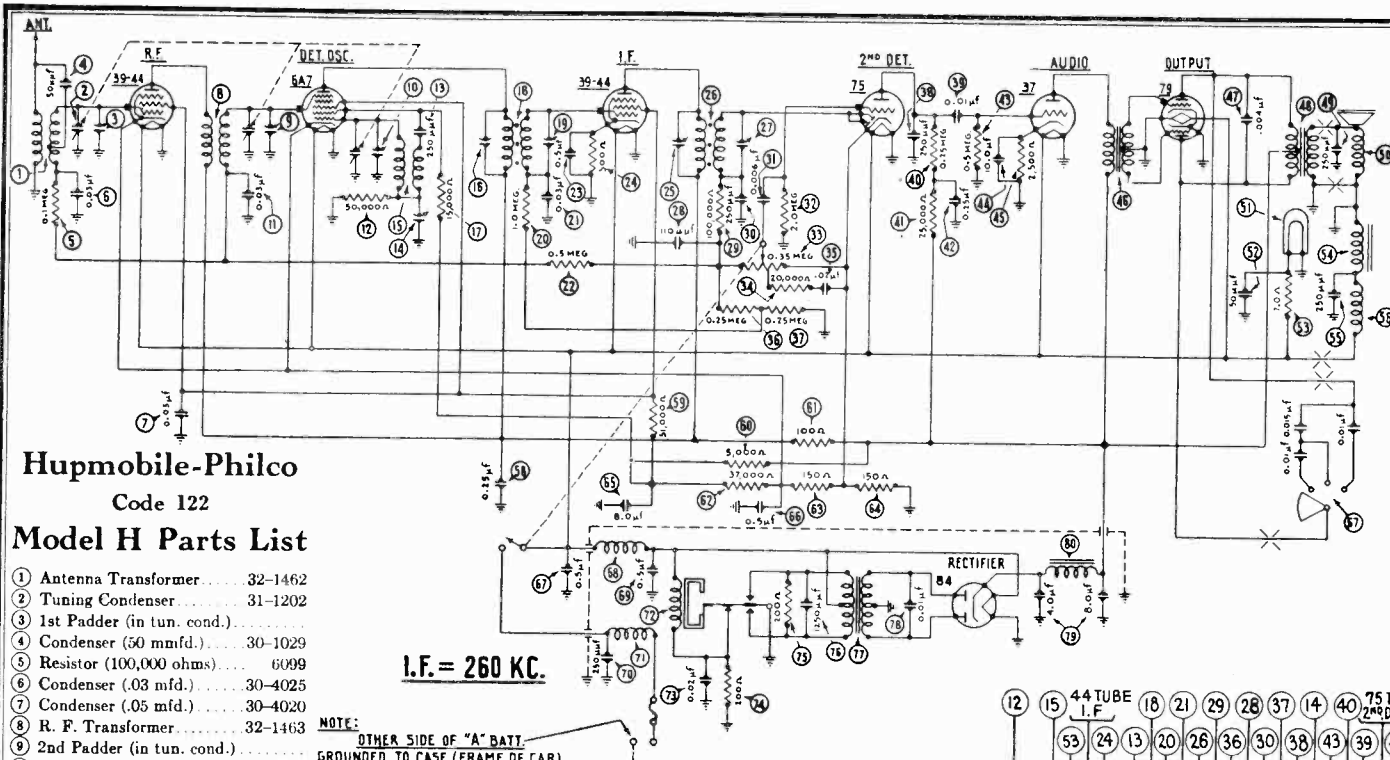
MODEL G, Hupmobile For J, T, & W Cars Schematic, Chassis Parts List

Note 1. Adjust the High Frequency padders (15) at 1600 K. C.

Note 2. A 25,000 ohm resistor, part number 3656, (71) on the parts list and base view has been added to the Receiver. One end is connected to the screen grid lead for the R. F. Osc. and I. F. tubes and the other end is grounded.

Hupmobile-Philco Model G Parts List

(1)	Antenna Choke	32-1372	
(2)	Antenna Transformer	32-1331	
(3)	Resistor (70,000 ohms)	33-1115	
(4)	Tuning Condenser	31-1214	
(5)	First Padder (on Tun. Cond.)		
(6)	Condenser (.03 mfd.)	30-4025	
(7)	Condenser (.05 mfd.)	30-4020	
(8)	Resistor (700 ohms)	6443	
(9)	R. F. Transformer	32-1332	
(10)	Second Padder (on Tun. Cond.)		
(11)	Resistor (10,000 ohms)	33-1000	
(12)	Condenser (1000 mmfd.)	33-1007	
(13)	Oscillator Transformer	32-1333	
(14)	Padder (Pri. 1st I. F. Trans.)		
(15)	Third Padder (on Tun. Cond.)		
(16)	First I. F. Transformer	32-1329	
(17)	Padder (Sec. 2nd I. F. Trans.)		
(18)	Condenser (.03 mfd.)	30-4025	
(19)	Resistor (1,000,000 ohms)	33-1096	
(20)	Resistor (1500 ohms)	33-3047	
(21)	Condenser (.05 mfd.)	30-4020	
(22)	Padder (Pri. 2nd I. F. Trans.)		
(23)	Second I. F. Transformer	32-1237	
(24)	Resistor (25,000 ohms)	33-1013	
(25)	Condenser (.00011 mfd.)	30-1031	
(26)	Padder (Sec. 2nd I. F. Trans.)		
(27)	Condenser (.00025 mfd.)	30-1032	
(28)	Volume Control and Switch Assembly	33-5067	
(29)	Condenser (.05 mfd.)	30-4020	
(30)	Condenser (.03 mfd.)	30-4025	
(31)	Resistor (10,000 ohms)	33-1000	
(32)	Resistor (190,000 ohms)	33-1116	
(33)	Resistor (5000 ohms)	6096	
(34)	Condenser (10 mfd.)	30-2076	
(35)	Condenser (.25 mfd.)	30-4126	
(37)	Resistor (32,000 ohms)	3525	
(36)	Condenser (.25 mfd.)	30-4126	
(39)	Condenser (.00025 mfd.)	30-1032	
(40)	Resistor (100,000 ohms)	6099	
(41)	Condenser (.006 mfd.)	30-4125	
(42)	Resistor (500,000 ohms)	6097	
(43)	Condenser (10 mfd.)	30-2076	
(44)	Resistor (500 ohms)	33-3031	
(45)	Condenser (.004 mfd.)	30-4185	
(46)	Output Transformer	32-7042	
(47)	Cone and Voice Coil	36-3157	
(48)	Field Coil Assembly	36-3097	
(49)	Pilot Lamp	34-2031	
(50)	Tone Control	30-4189	
(53)	Condenser (.00005 mfd.)	30-1029	
(54)	Condenser (.00005 mfd.)	30-1029	
(55)	"A" Choke	32-1432	
(56)	Vibrator Choke	32-1260	
(57)	Condenser (.5 mfd.)	30-4047	
(58)	Condenser (.5 mfd.)	30-4015	
(59)	Vibrator	38-3036	
(60)	Condenser (.05 mfd.)	30-4039	
(61)	Resistor (200 ohms)	7217	
(62)	Resistor (200 ohms)	7217	
(63)	Condenser (.00125 mfd.)	5886	
(64)	Power Transformer	32-7253	
(65)	Resistor (32,000 ohms)	3525	
(66)	Condenser (.01 mfd.)	30-4051	
(67)	Filter Condenser (4-8 mfd.)	30-2030	
(68)	Filter Choke	32-7254	
(69)	R. F. Choke	32-1260	
(70)	Condenser (.15 mfd.)	30-4191	
(71)	Resistor (25,000 ohms)	3656	
	Glass for Control	27-7325	
	Face Assembly	42-5125	
	Pointer	28-1793	
	Knobs	27-4091	
	Interconnecting Cable	41-3087	
	Ammeter Cable	38-5833	
	Flexible Shaft—Tuning	28-8226	
	Flexible Shaft—Volume	28-8227	
	Receiver Mounting Plate	29-1792	
	Receiver Mounting Bracket	29-1848	
	Carriage Bolt	W-1316A	
	Fuse	7227	
	Fuse Insulator	27-7131	
	Stud (Speaker Mtg.)	6122	
	Screw (Speaker Mtg.)	W-1312A	



Hupmobile-Philco

Code 122

Model H Parts List

(1)	Antenna Transformer	32-1462	
(2)	Tuning Condenser	31-1202	
(3)	1st Padder (in tun. cond.)		
(4)	Condenser (50 mmfd.)	30-1029	
(5)	Resistor (100,000 ohms)	6099	
(6)	Condenser (.03 mfd.)	30-4025	
(7)	Condenser (.05 mfd.)	30-4020	
(8)	R. F. Transformer	32-1463	
(9)	2nd Padder (in tun. cond.)		
(10)	3rd Padder (in tun. cond.)		
(11)	Condenser (.03 mfd.)	30-4025	
(12)	Resistor (50,000 ohms)	6098	
(13)	Condenser (250 mmfd.)	3082	
(14)	Padder	30-6012	
(15)	Oscillator Transformer	32-1222	
(16)	Padder (Pri. 1st I. F. Trans.)		
(17)	Resistor (15,000 ohms)	6208	
(18)	First I. F. Transformer	32-1471	
(19)	Padder (Sec. 1st I. F. Trans.)		
(20)	Resistor (1,000,000 ohms)	33-1096	
(21)	Condenser (.03 mfd.)	30-4025	
(22)	Resistor (500,000 ohms)	6097	
(23)	Condenser (.5 mfd.)	30-4058	
(24)	Resistor (500 ohms)	6977	
(25)	Padder (Pri. 2nd I. F. Trans.)		
(26)	Second I. F. Transformer	32-1449	
(27)	Padder (Sec. 2nd I. F. Trans.)		
(28)	Condenser (110 mmfd.)	30-1031	
(29)	Resistor (100,000 ohms)	6099	
(30)	Condenser (250 mmfd.)	30-1032	
(31)	Condenser (.006 mfd.)	30-4125	
(32)	Resistor (2,000,000 ohms)	33-1025	
(33)	Vol. Cont. & Sw. Assembly	38-5851	
(34)	Resistor (20,000 ohms)	33-1130	
(35)	Condenser (.02 mfd.)	30-4215	
(36)	Resistor (250,000 ohms)	33-1097	
(37)	Resistor (250,000 ohms)	33-1097	
(38)	Condenser (250 mmfd.)	30-1032	
(39)	Condenser (.01 mfd.)	30-4145	
(40)	Resistor (250,000 ohms)	33-1097	
(41)	Resistor (25,000 ohms)	33-1013	
(42)	Condenser (.25 mfd.)	30-4135	
(43)	Resistor (500,000 ohms)	6097	
	ondenser (10 mfd.)	30-4135	
(45)	Resistor (2500 ohms)	33-1100	
(46)	Input Transformer	32-7206	
(47)	Condenser (.004 mfd.)	30-4185	
(48)	Output Transformer	32-7205	
(49)	Condenser (250 mmfd.)	30-1032	
(50)	Cone & Voice Coil	36-3159	
(51)	Pilot Lamp	34-2040	
(52)	Condenser (50 mmfd.)	30-1029	
(53)	Resistor (7 ohms)	33-3130	
(54)	Field Coil Assembly	02795	
(55)	Condenser (250 mmfd.)	30-1032	
(56)	Choke	32-1464	
(57)	Tone Control	30-4208	
(58)	Condenser (.25 mfd.)	30-4134	
(59)	Resistor (51,000 ohms)	4237	
(60)	Resistor (5000 ohms)	33-1070	
(61)	Resistor (100 ohms)	33-3023	
(62)	Resistor (37,000 ohms)	33-1098	
(63)	Resistor (150 ohms)	33-3045	
(64)	Resistor (150 ohms)	33-3045	
(65)	Condenser (8 mfd.)	30-4135	
(66)	Condenser (.5 mfd.)	30-4018	
(67)	Condenser (.5 mfd.)	30-4015	
(68)	Vibrator Choke	32-1474	
(69)	Condenser (.5 mfd.)	30-4047	
(70)	Condenser (250 mmfd.)	32-1466	
(71)	"A" Choke	32-1466	
(72)	Vibrator	38-5036	
(73)	Condenser (.02 mfd.)	30-4039	
(74)	Resistor (200 ohms)	7217	
(75)	Resistor (200 ohms)	7217	
(76)	Condenser (1250 mmfd.)	5886	
(77)	Power Transformer	32-7098	
(78)	Condenser (.01 mfd.)	30-4051	
(79)	Filter Condenser (4-8 mfd.)	30-2015	
(80)	"B" Choke	32-7104	
	Interference Condenser	4522S	
	Studs (Rec. Mtg.)	28-6036	
	Nuts (mounting)	W55	
	Battery Cable	38-5296	
	Antenna Lead	38-5674	
	Acorn Nut	W821	
	Fuse	7227	
	Fuse Insulator	27-7131	
	Knob	27-4091	
	Glass	27-7325	
	Glass Gasket	27-7509	
	Pointer	28-1793	
	Shaft	28-8214	
	Face Assembly	42-5125	
	Speaker Cable	41-3113	
	Pilot Lamp Assembly	38-5889	

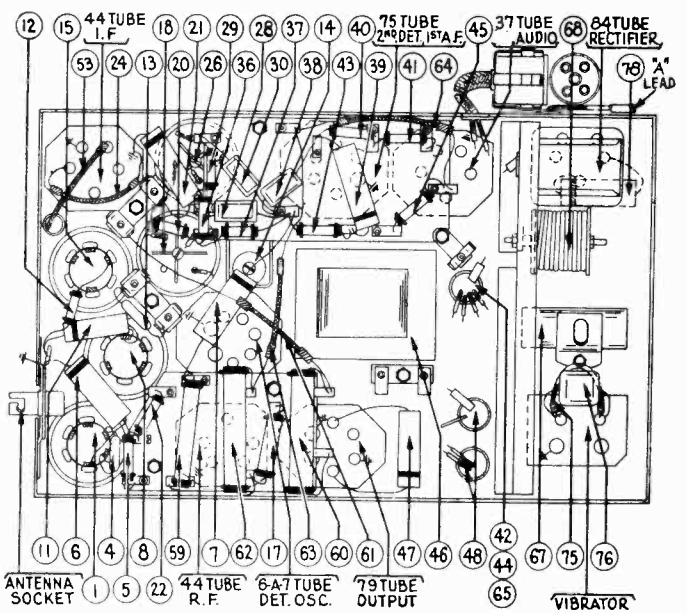


FIGURE 7

PHILCO RADIO & TELEV. CORP.

MODEL H, Hupmobile
For J, T, & W Cars
Schematic, Chassis
Parts List

I. F. 260 KC.

Hupmobile-Philco Model H Parts List

(1)	Antenna Transformer	32-1220	
(2)	Tuning Condenser	31-1202	
(3)	1st Padder (in tun. cond.)	6099	
(4)	Resistor (100,000 ohms)	30-4025	
(5)	Condenser (.03 mfd.)	30-4020	
(6)	Condenser (.05 mfd.)	32-1221	
(7)	R. F. Transformer	30-4025	
(8)	Condenser (.03 mfd.)	6099	
(9)	2nd Padder (in tun. cond.)	6098	
(10)	3rd Padder (in tun. cond.)	6208	
(11)	Resistor (50,000 ohms)	32-1222	
(12)	Oscillator Transformer	3082	
(13)	Condenser (.00025 mfd.)	31-6012	
(14)	Padder	6208	
(15)	Resistor (15,000 ohms)	32-1236	
(16)	Padder (Primary 1st I. F.)	33-1096	
(17)	First I. F. Transformer	30-4025	
(18)	Resistor (1,000,000 ohms)	30-4038	
(19)	Padder (Secondary 1st I. F.)	6977	
(20)	Condenser (.03 mfd.)	6097	
(21)	Condenser (.5 mfd.)	30-1020	
(22)	Resistor (500 ohms)	30-1020	
(23)	Resistor (500,000 ohms)	32-1237	
(24)	Condenser (.00011-.00025)		
(25)	Padder (Primary 2nd I. F.)		
(26)	Second I. F. Transformer		
(27)	Padder (Secondary 2nd I. F.)	33-1013	
(28)	Resistor (25,000 ohms)	30-4125	
(29)	Condenser (.006 mfd.)	38-5534	
(30)	Volume Control Assembly	33-1025	
(31)	Resistor (2,000,000 ohms)	33-1097	
(32)	Resistor (250,000 ohms)	33-1097	
(33)	Resistor (250,000 ohms)	5858	
(34)	Condenser (.00025 mfd.)	33-1097	
(35)	Resistor (250,000 ohms)	33-1013	
(36)	Resistor (25,000 ohms)	30-4145	
(37)	Condenser (.01 mfd.)	30-4135	
(38)	Condenser (.25-8-10 mfd.)	6097	
(39)	Resistor (500,000 ohms)	33-1100	
(40)	Resistor (2500 ohms)	32-7206	
(41)	Input Transformer	6608	
(42)	Pilot Lamp	33-3130	
(43)	Resistor (7 ohms)	30-4024	
(44)	Condenser (.006 mfd.)	32-7205	
(45)	Output Transformer	36-3159	
(46)	Cone and Voice Coil	30-3130	
(47)	Field Coil Assembly	30-4142	
(48)	Tone Control	30-4134	
(49)	Condenser (.25 mfd.)	33-1070	
(50)	Resistor (5,000 ohms)	6649	
(51)	Resistor (20,000 ohms)	33-1098	
(52)	Resistor (37,000 ohms)	30-4018	
(53)	Condenser (.5 mfd.)	7217	
(54)	Resistor (200 ohms)	33-3023	
(55)	Resistor (100 ohms)	33-3023	
(56)	Resistor (100 ohms)	30-4015	
(57)	Condenser (.5 mfd.)		

(58)	Vibrator Choke	32-1335
(59)	Condenser (.5 mfd.)	30-4115
(60)	Vibrator Unit	38-5036
(61)	Condenser (.05 mfd.)	30-4039
(62)	Resistor (200 ohms)	7217
(63)	Resistor (200 ohms)	7217
(64)	Condenser (.00125 mfd.)	5886
(65)	Power Transformer	32-7098
(66)	Condenser (.01 mfd.)	30-4051
(67)	Filter Condenser (4-8 mfd.)	30-2015
(68)	"B" Choke	32-7104
	Interference Condenser	45225
	Studs	29-6036
	Nuts (mounting)	W55
	Battery Cable	38-5296
	Antenna Lead	38-5674
	Acorn Nut	W821
	Fuse	7227
	Fuse Insulator	27-7131
	Knob	27-4091
	Glass	27-7325
	Glass Gasket	27-7509
	Pointer	28-1793
	Shaft	28-8214
	Face Assembly	42-5125

MODELS G,G (Code 122),H, H (Code 122),R PHILCO RADIO & TELEV. CORP.

Hupmobile For J,T & W

THESE INSTRUCTIONS have been carefully prepared for your use in installing the Models G, H, and R radio Receivers in Series W, J and T Hupmobile cars. Read these instructions carefully before beginning the installation.

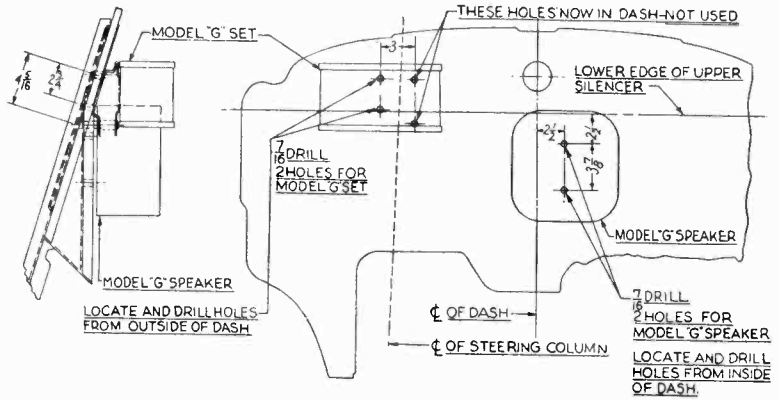


FIGURE 1

THESE DIMENSIONS ARE FOR "J" & "T" DASHES ONLY
"G" RADIO SET.

Antenna Lead

The antenna lead in all closed cars of Series W will be found at the base of the left-hand windshield pillar. In all closed cars of the J and T Series, the antenna lead will be found at the base of the right pillar.

Speaker Location (Models G and H)

In Series J and T Cars

The Model G speaker vibrator unit, and the Model H speaker must be mounted near the center of the car by means of two 8/16" studs which are screwed into two holes provided on the back of the speaker. Mount the Model G speaker with the tone control to the left (from driver's seat).

Refer to Figure 1 for the Model G and Figure 2 for the Model H speaker mounting hole locations. Cut the mounting studs to 2¾" overall before installing. Place the card board and felt baffle between the back of the H speaker and the dash.

In Series W Cars

Mount the Model G speaker vibrator unit over the steering column with the cable plug socket toward the right and the Model H speaker, with the plug socket on top. Cut the speaker mounting studs to 2¾" overall before installing. Place the cardboard and felt baffle between the back of the Model H speaker and the dash. Refer to Figure 8 for the location of the holes in the dash.

Receiver Location (Models G, H and R)

In Series J and T Cars

Figures 1 and 2 also show detailed dimensions for locating the mounting bolt holes for the Models G, H and R Receivers in the Series J and T cars. The Receiver must be mounted on the dash so that the control shafts enter from the right side.

In Series W Cars

Figure 8 also shows detailed dimensions for locating the mounting bolt holes for the Models G, H and R Receivers in the Series W cars. The Receiver must be mounted on the dash so that the control shafts enter from the left side.

When installing the Model G, bend out the bottom lip of the dash mounting bracket before fastening the bracket to the dash. The top face of the Receiver, when installed, will then be parallel to the silencer pad and the long hold-down screw and spacer at the bottom of the bracket will be centered.

Fasten the Receiver mounting plate to the back of the Receiver with four hex-head sheet metal screws (one side of the bracket and part of the side of the Receiver housing have been left unpainted to insure good contact). After locating the holes for the dash mounting bracket, fasten it in place and then hook on the Receiver. Place the spacer between the dash and the Receiver brackets and tighten the long hold-down screw.

In order to obtain the maximum foot clearance in the series W cars, when installing the Models H and R, the Receiver must be mounted so that the top face is against the silencer pad. The Receiver must be tilted upwards and the full length of the bottom stud utilized as shown in Figure 8.

Connections

Model G

The connecting cable must be plugged into the outlets on both the Receiver and Speaker housings. The shield terminals on the cable ends must be grounded to the housings under hex-head screws close to the plug connectors.

The antenna lead which branches from the connecting cable close to the Receiver must be spliced, soldered and taped to the car lead-in wire at the base of the front pillar (left-hand in series W, right-hand in series J and T). Cut off all excess lead-in wire and ground the antenna lead shield terminal on the flange of the instrument board.

Models H and R

The speaker cable from the Model H Receiver must be plugged into the outlet on the speaker housing and the shield pigtail grounded to the rim of the speaker housing. The antenna lead (Models H and R) must be spliced, soldered and taped to the car lead-in at the base of the front pillar (left-hand in series W, right-hand in series J and T). Cut off all excess lead-in wire and ground the antenna lead shield terminal on the flange of the instrument board.

Models G, H and R Ammeter Lead

Place the fuse and fuse insulator in the metal fuse receptacle and connect to the Receiver battery lead. Connect the eyelet terminal of the lead to the ammeter.

Instrument Board Control

Remove the ash receiver. Loosen the two nuts behind the instrument board and take out the ash receiver bezel. Install the radio control from the front of the panel. Put the U clamp on the back of the control and tighten the wing nuts to hold the control in place. The cowl ventilator handle must pass between the flexible shafts on all Series W cars.

Connect the flexible shafts to the Receiver. The Model G shafts are equipped with male and female fittings. In series W cars, the male end must be coupled to the lower bushing and the female end to the upper bushing. In series J and T cars, the Model G Receiver is completely turned around so that the male shaft end connects to the upper bushing and the female end connects to the lower bushing.

Models H and R control shafts are both equipped with male fittings. The tuning or right-hand shaft must be coupled to the bushing nearest the small triangular shield on the end of the Receiver housing. The volume control or left-hand shaft must be coupled to the other bushing. The set screws on the coupling bushings must be loosened sufficiently to allow the shaft housing to be seated. After the flexible shafts have been properly coupled, tighten the set screws again. The dial light lead pin terminal must be connected in its socket which is on the side of the speaker on the Model G and on the control end on the Models H and R Receivers.

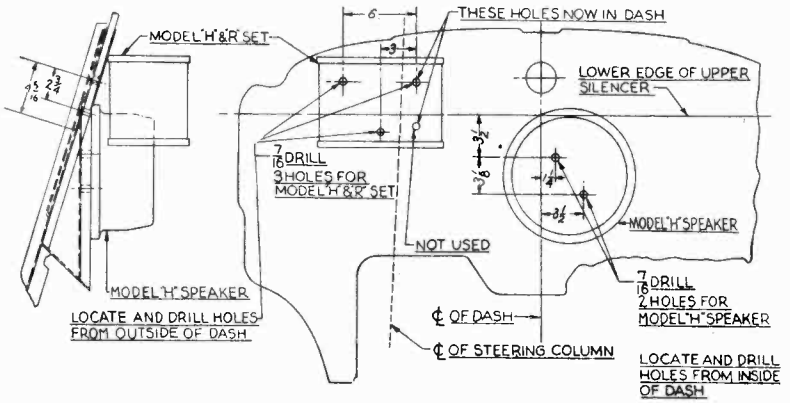


FIGURE 2

THESE DIMENSIONS ARE FOR "J" & "T" DASHES ONLY.
"H" & "R" RADIO SET.

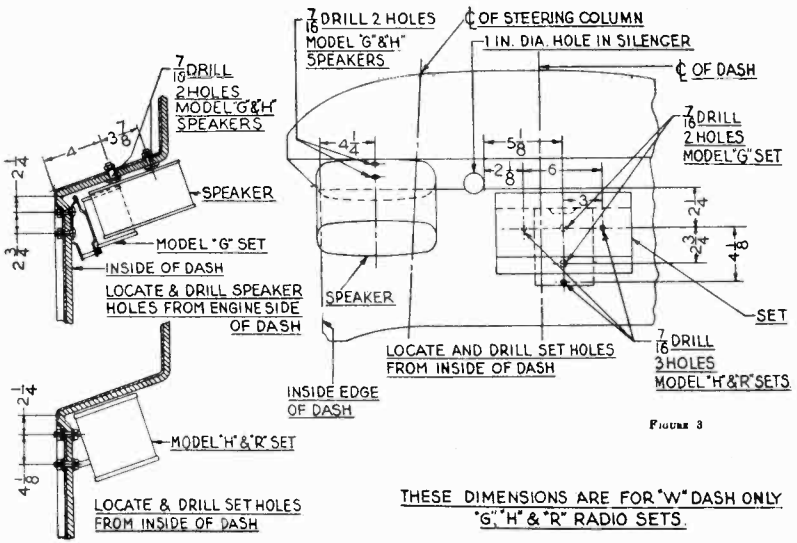


FIGURE 3

THESE DIMENSIONS ARE FOR "W" DASH ONLY
"G", "H" & "R" RADIO SETS.

Adjustment

Turn on the Receiver and tune in a station whose frequency in kilocycles is known. (The numbers on the dial represent channel numbers which, with the addition of a cipher, become the frequency numbers). Pull the knob from the right-hand control shaft and loosen the set screw. Turn the shaft until the indicator points to the correct number on the dial. Then tighten the set screw and replace the knob, and re-check with other stations for correct setting of the dial.

PHILCO RADIO & TELEV. CORP.

MODEL R Hupmobile
For J,T & W Cars
Schematic,Chassis
Parts List

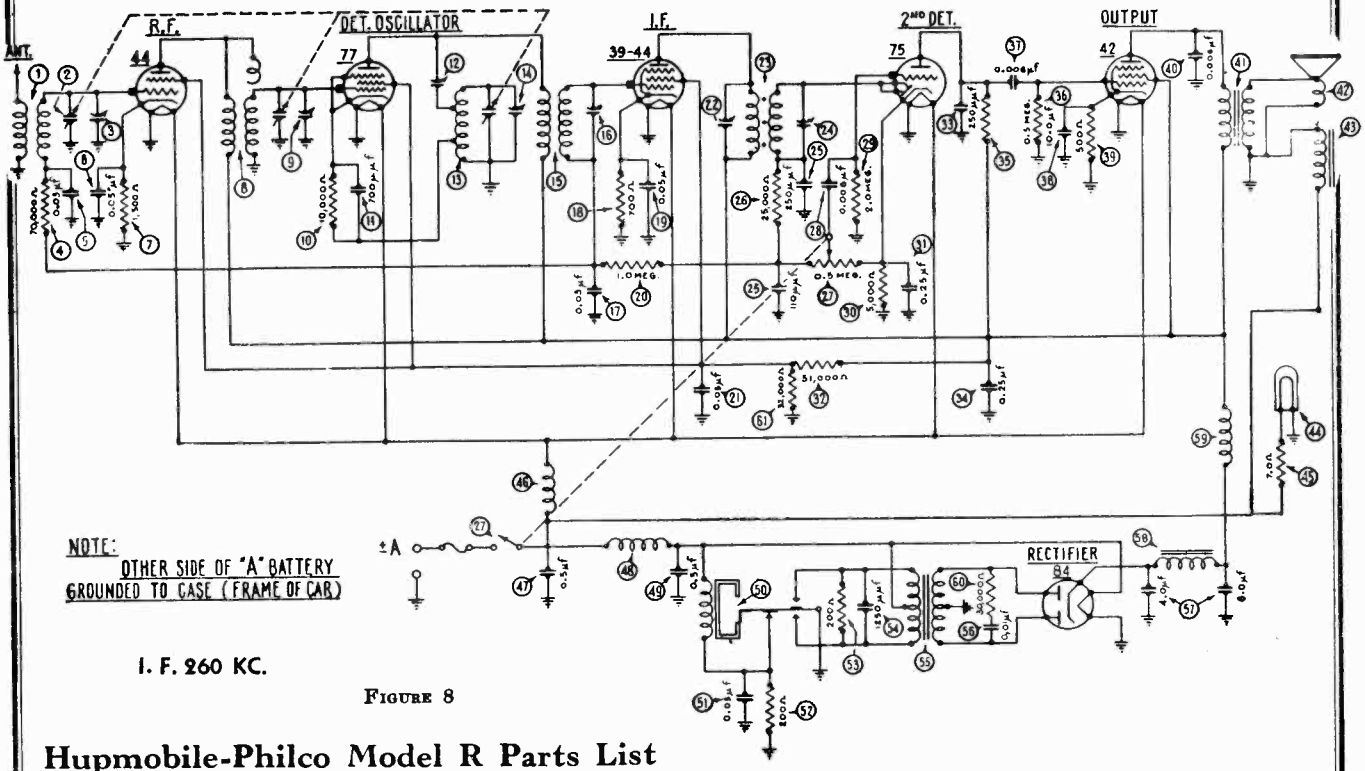


FIGURE 8

Hupmobile-Philco Model R Parts List

(1)	Antenna Transformer	32-1331	
(2)	Tuning Condenser	31-1164	
(3)	1st Padder (on tun. cond.)		
(4)	Resistor (70,000 ohms)	33-1115	
(5)	Condenser (.03 mfd.)	30-4025	
(6)	Condenser (.05 mfd.)	30-4020	
(7)	Resistor (1500 ohms)	33-3047	
(8)	R. F. Transformer	32-1332	
(9)	2nd Padder (on tun. cond.)		
(10)	Resistor (10,000 ohms)	33-1000	
(11)	Condenser (.0007 mfd.)	5863	
(12)	Padder (Pri. 1st I. F. Tran.)		
(13)	Oscillator Transformer	32-1333	
(14)	3rd Padder (on tun. cond.)		
(15)	1st I. F. Transformer	32-1329	
(16)	Padder (Sec. 1st I. F. Tran.)		
(17)	Condenser (.03 mfd.)	30-4025	
(18)	Resistor (700 ohms)	6443	
(19)	Condenser (.05 mfd.)	30-4020	
(20)	Resistor (1,000,000 ohms)	33-1096	
(21)	Condenser (.05 mfd.)	30-4020	
(22)	Padders (Prim. 2nd I. F.)		
(23)	2nd I. F. Transformer	32-1237	
(24)	Padder (Sec. I. F. Tran.)		
(25)	Cond. (.00011-.00025 mfd.)	30-1020	
(26)	Resistor (25,000 ohms)	33-1013	
(27)	Vol. Con. & Switch Assm.	38-5534	
(28)	Condenser (.006 mfd.)	30-4125	
(29)	Resistor (2,000,000 ohms)	$33\text{-}102_5$	
(30)	Resistor (5000 ohms)	609_6	
(31)	Condenser (.25 mfd.)	$30\text{-}414_6$	
(32)	Resistor (51,000 ohms)	586_8	
(33)	Condenser (.00025 mfd.)	308_2	
(34)	Condenser (.25 mfd.)	0436_0	
(35)	Resistor (100,000 ohms)	6099	
(36)	Resistor (500,000 ohms)	6097	
(37)	Condenser (.006 mfd.)	30-4125	
(38)	Condenser (10 mfd.)	30-2072	
(39)	Resistor (500 ohms)	33-3031	
(40)	Condenser (.006 mfd.)	30-4024	
(41)	Output Transformer	32-7214	
(42)	Cone & Voice Coil	02861	
(43)	Field Coil Assembly	36-3097	
(44)	Pilot Light	6608	
(45)	Resistor (7 ohms)	33-3035	
(46)	"A" Choke	32-1286	
(47)	Condenser (.5 mfd.)	30-4047	
(48)	Vibrator Choke	32-1235	
(49)	Condenser (.5 mfd.)	30-4147	
(50)	Vibrator Unit	38-5036	
(51)	Condenser (.05 mfd.)	30-4039	
(52)	Resistor (200 ohms)	7217	
(53)	Resistor (200 ohms)	7217	
(54)	Condenser (.00125 mfd)	5886	
(55)	Power Transformer	32-7216	
(56)	Condenser (.01 mfd.)	30-4051	
(57)	Condenser (4.-8. mfd.)	30-2072	
(58)	"B" Choke	32-7215	
(59)	R F Choke	32-1281	
(60)	Resistor (30,000 ohms)	7836	
(61)	Resistor (32,000 ohms)	3525	
	Spark Plug Resistor	33-1015	
	Distributor Resistor	4851	
	Interference Cond. (½ mfd.)	30-4007	
	Face Assembly	42-5208	
	Glass for Control	27-7325	
	Pointer	28-1957	
	Knobs	27-4091	
	Stud	28-6036	
	Battery Cable	38-5833	
	Nut	W55A	
	Antenna Lead	38-5682	
	Fuse	7227	
	Fuse Insulator	27-7131	
	Shafts	28-8214	

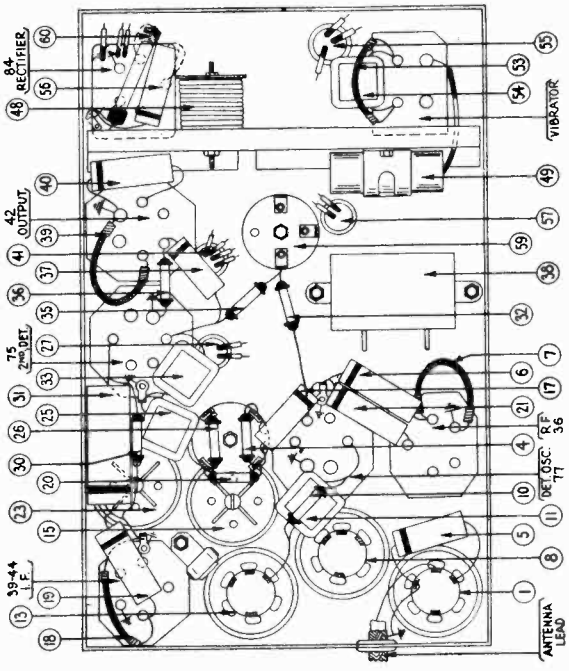
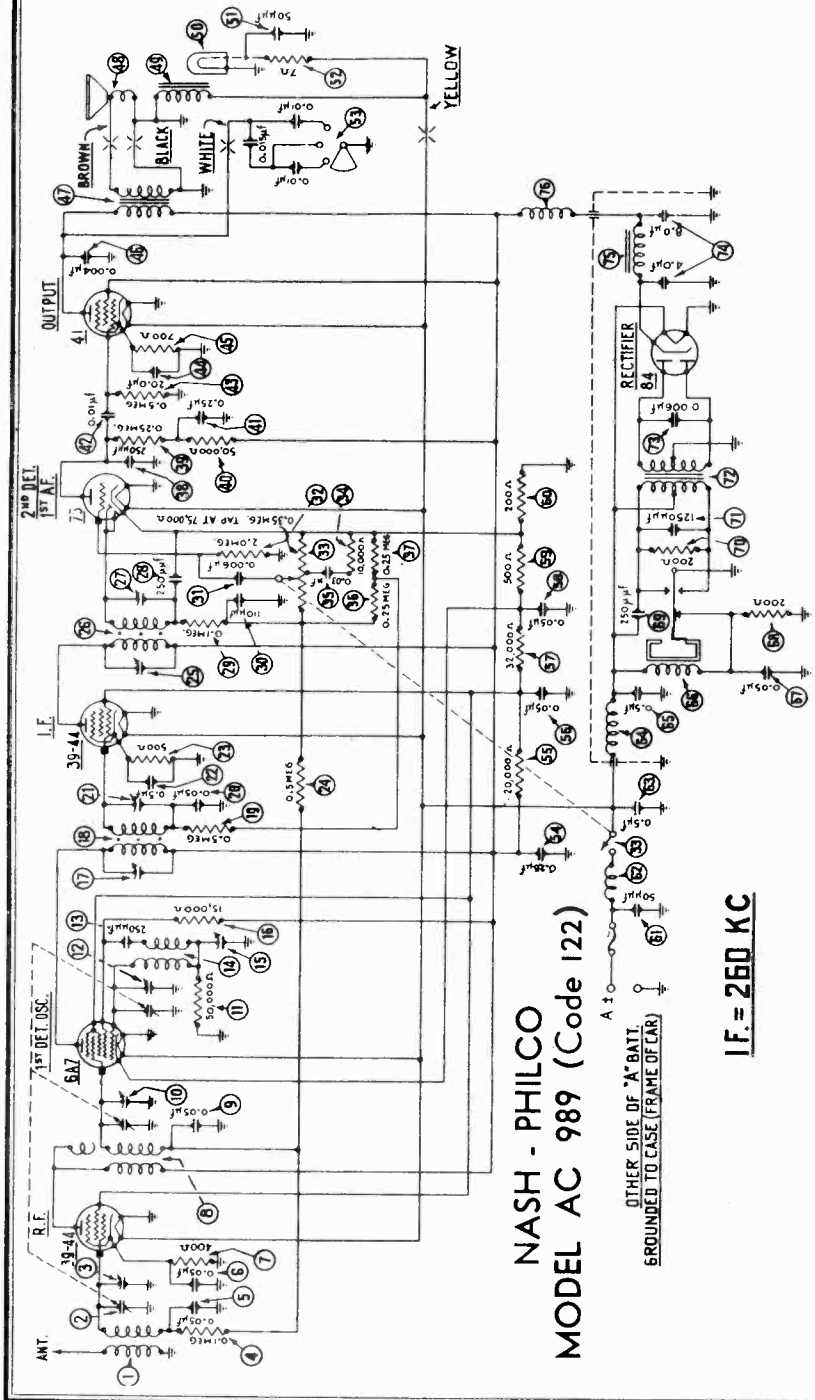


FIGURE 9

MODEL D
Nash AC-989 (Code 122
Schematic, Parts List

PHILCO RADIO & TELEV. CORP.

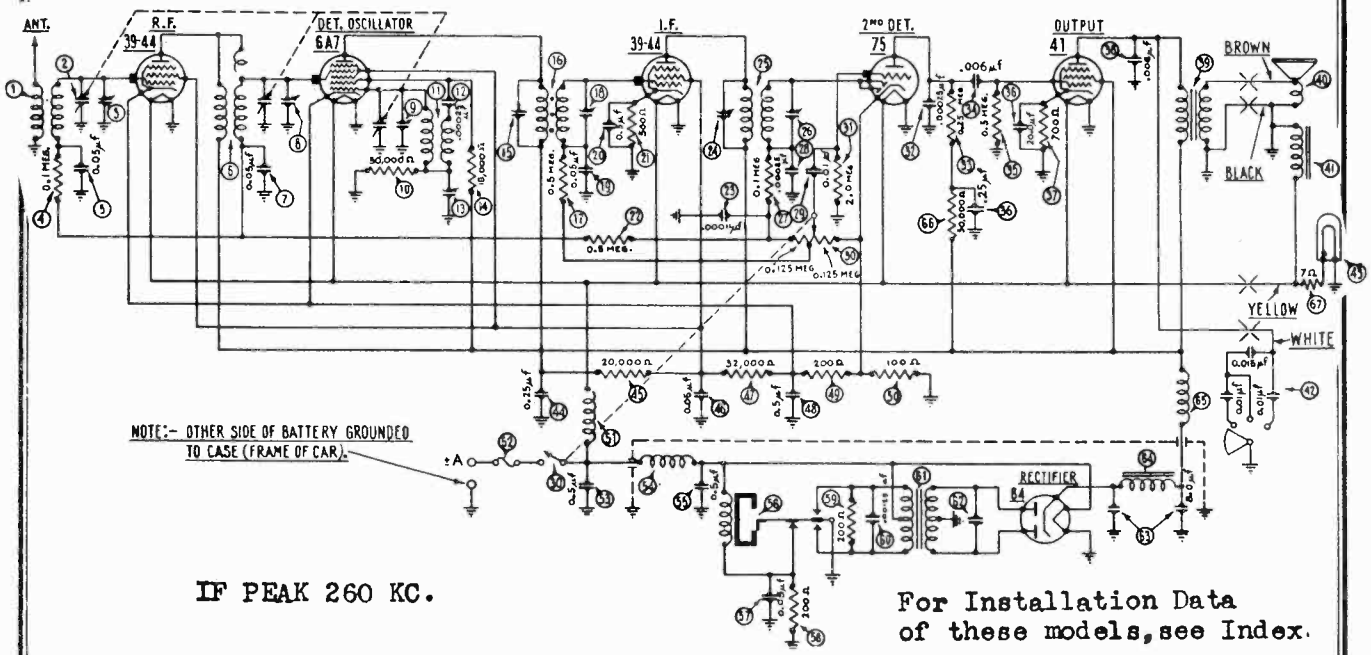


(1) Antenna Transformer	32-1220	(24) Resistor (500,000 ohms)	6097	(47) Output Transformer	32-7102	(70) Resistor (200 ohms)	7217
(2) Tuning Condenser	31-1083	(25) Padder (Pri. 2nd I. F. Trans.)		(48) Cone and Voice Coil	36-3139	(71) Condenser (.00125 mfd.)	3886
(3) First Padder (in tun. cond.)		(26) Second I. F. Transformer	32-1237	(49) Field Coil Assembly	36-3130	(72) Power Transformer	32-7131
(4) Resistor (100,000 ohms)	6099	(27) Padder (Sec. 2nd I. F. Trans.)		(50) Pilot Lamp	34-2039	(73) Condenser (.006 mfd.)	30-4024
(5) Condenser (.05 mfd.)	30-4020	(28) Condenser (.00025 mfd.)	30-1032	(51) Condenser (.00005 mfd.)	30-1029	(74) Filter Condenser (4-8 mfd.)	30-2015
(6) Condenser (.05 mfd.)	30-4020	(29) Resistor (100,000 ohms)	6099	(52) Resistor (7 ohms)	33-3035	(75) Filter Choke	32-7104
(7) Resistor (400 ohms)	33-3016	(30) Condenser (.00011 mfd.)	30-1031	(53) Tone Control	30-4056	(76) R. F. Choke	32-1281
(8) R. F. Transformer	32-1221	(31) Condenser (.006 mfd.)	30-4125	(54) Condenser (.25 mfd.)	04380	Spark Plug Resistors	33-1101
(9) Condenser (.05 mfd.)	30-4020	(32) Resistor (2,000,000 ohms)	33-1025	(55) Resistor (20,000 ohms)	6649	Spark Plug Resistors	33-1102
(10) Second Padder (in tun. cond.)		(33) Vol. Control & Sw. Assembly	38-5035	(56) Condenser (.05 mfd.)	30-4020	Distributor Resistor	33-1103
(11) Resistor (50,000 ohms)	6098	(34) Resistor (10,000 ohms)	33-1000	(57) Resistor (32,000 ohms)	3525	Interference Condenser	30-4007
(12) Third Padder (in tun. cond.)		(35) Condenser (.03 mfd.)	30-4025	(58) Condenser (.05 mfd.)	30-4020	Studs	28-6102
(13) Condenser (.00025 mfd.)	30-1032	(36) Resistor (250,000 ohms)	33-1097	(59) Resistor (500 ohms)	6977	Nuts (mounting)	W55A
(14) Oscillator Transformer	32-1222	(37) Resistor (250,000 ohms)	33-1097	(60) Resistor (200 ohms)	7217	Battery Cable	38-5296
(15) Padder	040005	(38) Condenser (.00025 mfd.)	30-1032	(61) Condenser (.00005 mfd.)	30-1029	Antenna Lead	38-5131
(16) Resistor (15,000 ohms)	6208	(39) Resistor (250,000 ohms)	3768	(62) Choke	32-1374	Acorn Nut	W821
(17) Padder (Pri. 1st I. F. Trans.)		(40) Resistor (50,000 ohms)	4237	(63) Condenser (.5 mfd.)	30-4061	Dial	27-5034
(18) First I. F. Transformer	32-1236	(41) Condenser (.25 mfd.)	30-4065	(64) Vibrator Choke	32-1259	Knob (volume)	27-4045
(19) Resistor (500,000 ohms)	6097	(42) Condenser (.01 mfd.)	30-4169	(65) Condenser (.5 mfd.)	30-4061	Knob (tuning)	03064
(20) Condenser (.05 mfd.)	30-4020	(43) Resistor (500,000 ohms)	6097	(66) Vibrator	38-5036	Flexible Shaft (volume)	28-8182
(21) Padder (Sec. 1st I. F. Trans.)		(44) Condenser (20 mfd.)	30-4065	(67) Condenser (.05 mfd.)	30-4039	Flexible Shaft (tuning)	28-8181
(22) Condenser (.5 mfd.)	30-4058	(45) Resistor (700 ohms)	33-3019	(68) Resistor (200 ohms)	7217		
(23) Resistor (500 ohms)	6977	(46) Condenser (.004 mfd.)	30-4185	(69) Condenser (.00025 mfd.)	5858		

MODELS C & D Nash (AC-989)
Schematic, Parts

PHILCO RADIO & TELEV. CORP

MODEL AC-206 Studebaker
MODEL ME Pierce-Arrow



IF PEAK 260 KC.

For Installation Data of these models, see Index.

(1) Antenna Transformer	32-1220	(22) Resistor (500,000 ohms)	6097	(43) Pilot Lamp	6608	(64) B Chokes	32-7038
(2) Tuning Condenser	31-1083	(23) Condenser (.00011 mfd.)	4519	(44) Condenser (.25 mfd.)	04360	(65) R. F. Chokes	32-1078
(3) 1st Padder (in tuning cond.)		(24) Padder (prim. 2nd I.F.)	31-6008	(45) Resistor (20,000 ohms)	6649	(66) Resistor (50,000 ohms)	4237
(4) Resistor (100,000 ohms)	6099	(25) I.F. Transformer (2nd)	32-1237	(46) Condenser (.05 mfd.)	30-4020	(67) Resistor (7 ohms)	5110
(5) Condenser (.05 mfd.)	30-4020	(26) Padder (secondary 2nd I.F.)	31-6008	(47) Resistor (32,000 ohms)	3525	Spark Plug Resistors	4531
(6) R.F. Transformer	32-1221	(27) Resistor (100,000 ohms)	6099	(48) Condenser (.5 mfd.)	30-4048	Distributor Resistor	4546
(7) Condenser (.05 mfd.)	30-4020	(28) Condenser (.00025 mfd.)	3082	(49) Resistor (200 ohms)	7217	Screw Type Resistor	4851
(8) 2nd Padder (in tuning cond.)		(29) Condenser (.01 mfd.)	30-4051	(50) Resistor (100 ohms)	7838	Interference Condenser	30-4007
(9) 3rd Padder (in tuning cond.)		(30) Vol. Control Assembly	38-5280	(51) A Choke	32-1268	Dial	27-5022
(10) Resistor (50,000 ohms)	6098	(31) Resistor (2,000,000 ohms)	33-1025	(52) 15 Amp. Fuse	7227	Studs—4½" Special	28-6102
(11) Oscillator Transformer	32-1222	(32) Condenser (.00025 mfd.)	5858	(53) Condenser (.5 mfd.)	30-4061	Nuts (mounting)	W55
(12) Condenser (.00025 mfd.)	3082	(33) Resistor (250,000 ohms)	3768	(54) Vibrator Choke	32-1259	Knob	03064
(13) Padder	04000S	(34) Condenser (.006 mfd.)	30-4024	(55) Condenser (.5 mfd.)	30-4061	Battery Cable	38-5296
(14) Resistor (15,000 ohms)	6208	(35) Resistor (500,000 ohms)	6097	(56) Vibrator	38-5036	Antenna Lead	38-5131
(15) Padder (prim. 1st I.F.)	31-6007	(36) Condenser (20 mfd.; 25 mfd.)	30-4065	(57) Condenser (.05 mfd.)	30-4039	Instrument Panel Control	42-5088
(16) I.F. Transformer (1st)	32-1236	(37) Resistor (700 ohms)	33-3019	(58) Resistor (200 ohms)	7217	Acorn Nut	W821
(17) Resistor (500,000 ohms)	6097	(38) Condenser (.006 mfd.)	30-4024	(59) Resistor (200 ohms)	7217	De Luxe Control Assembly	42-5097
(18) Padder (secondary 1st I.F.)	31-6007	(39) Output Transformer	32-7102	(60) Condenser (.00125 mfd.)	5886	Standard Control Assembly	42-5101
(19) Condenser (.05 mfd.)	30-4020	(40) Cone and Coil	36-3020	(61) Power Transformer	32-7131	Steering Col. Control Assem.	42-5096
(20) Condenser (.5 mfd.)	30-4058	(41) Field Coil Assembly	36-3130	(62) Condenser (.006 mfd.)	30-4024	Gasket	27-7290
(21) Resistor (500 ohms)	6977	(42) Tone Control	30-4056	(63) Filter Condenser	30-2015	Nash Control Plate	28-7025

Above is Model D Nash-Philco (AC-989). Model C Nash-Philco (AC-989) is similar except that a 42 output tube is used and resistor #37 is 550 ohms, part number 6977.

Studebaker Model AC-206.

This is same as above and is available with 42 output tube and resistor #37 changed to 550 ohms, part number 6977. Items 1 to 67 in above list are identical for Model AC-206. See following items for additional accessories

Spark Plug Resistors	4531
Distributor Resistor	4546
Screw Type Resistor	4851
Interference Condenser	30-4007
Dial	27-5027
Studs	28-6036
Nuts (mounting)	W55
Knobs	03064
Battery Cable	38-5296
Antenna Lead	38-5161
Instrument PanelControl	42-5088
Acorn Nut	W821
Steering Column Control	42-5087

Pierce-Arrow Model ME

This is same as above except a 42 tube is used in the output and resistor #37 is changed to 550 ohms, part number 6977. Also volume control assembly's part number is changed to 38-5511. Other numbered items in above list are identical for the Model ME. See items below for additional accessories.

Spark Plug Resistors	33-1015	Right Hand Mtg. (Walnut)	42-5126
Distributor Resistor	33-1019	Left Hand Mtg. (Walnut)	42-5127
Screw Type Resistor	4851	Right Hand Mtg. (Black)	42-5128
Interference Condenser	4522	Left Hand Mtg. (Black)	42-5129
Studs (Set Mtg.)	28-6036	Knobs (Black)	27-4058
Nuts (Mounting)	W55A	Knobs (Walnut)	27-4098
Battery Cable	38-5296	Tuning and Volume Shaft Assembly, 28" Long	28-8206
Antenna Lead	38-5131	Face Assembly	42-5130
Fuse Insulator	27-7131	Pointer	28-1805
Speaker (Model A15)	36-1048	Face Gasket	27-7331
Stud (Model A15)	28-6132	Glass	27-7325
Wood Block (Spker. Mtg.)	27-7359	Glass Gasket	27-7327
Speaker Back Plate	27-7360	Gasket (Panel to Casting)	27-7346
Cardboard & Felt Assem.	2697A	Speaker Cable Assembly	41-3069
Control Unit Assembly			

MODELS C & D
Nash AC-989
Nash AC-989 (Code 122)
Installation Data

PHILCO RADIO & TELEV. CORP.

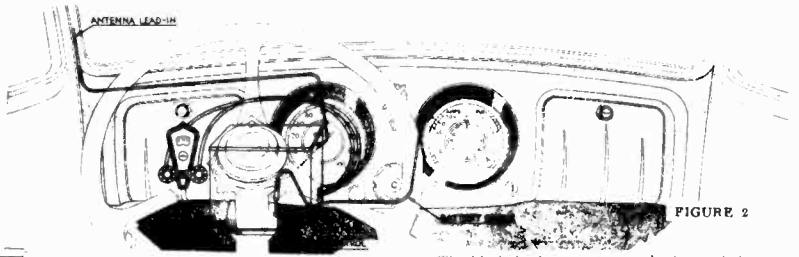


FIGURE 2

THESE INSTRUCTIONS have been carefully prepared for your use in installing the Model D Nash-Philco automobile radio Receiver in the 1934 model Nash cars. Read thoroughly, then follow the instructions carefully in every detail.

Antenna

The antenna lead in the 1934 Nash closed cars is brought down the left front pillar post and is coiled behind the left cowl trim panels.

Receiver Location and Installation

Refer to Figure 1 which gives detailed dimensions for the location of the holes to be drilled in all models. These dimensions are shown from the engine side of the dash. On all current model cars, the carburetor air cleaner and silencer should be removed until the Receiver is bolted in place. This will facilitate drilling the holes in the dash.

On all 1290 models the Receiver must be spaced away from the dash approximately two inches to clear all pulleys and cables. On the 1220 and 1280 models the Receiver should be spaced far enough away from the dash to give ample clearance for the speaker cover flange and keep the Receiver in a vertical position.

In fastening the studs to the Receiver the lock washer is placed between the Receiver and the shoulder on the bolt. The large flat washer is used against the padding on the inside of the dash. Extra nuts are furnished to be used as spacers. Mount the Receiver with the control shaft couplings towards the center of the car and with the speaker facing down. See Figure 2. On the 1220 and 1280 models the throttle control wire should be disconnected to facilitate installation.

Instrument Board Control

A dummy door is provided with cutouts in which the control unit is mounted. Remove the standard door from the instrument board by taking out the two stove bolts at the bottom and loosening the nut on the rear of the cigar lighter. Disconnect the lighter wire at the fuse block. On cars not equipped with a cigar lighter the door is fastened in place with a knob and stove bolts. Install the control door on the instrument board. The greatest care must be used so as not to mar or scratch the finish.

When no provision is made in a car for instrument board mounting, a steering column control assembly may be secured from your distributor or the Nash Factory. This assembly is furnished with an adjustable strap and bracket and may be mounted to the right side or above the steering column. In assembling the strap and bracket be sure that the round nut clinched on the strap is against the steering column. This will prevent the round nut from being torn from the strap.

The black lead coming from the back of the control unit is the pilot light lead which must be connected under the pilot light terminal screw head on the speaker panel.

Connecting Control Shafts

The flexible shafts are coupled to the control unit when shipped from the factory. The right-hand knob on the control is the tuning control — the left-hand knob is the volume control and switch. The volume control must be locked with the key at the control. The flexible shafts should be dressed above the steering column dash bracket towards the center of the car and then curved down and around to the couplings on the Receiver. Loosen the small set screws and the clamp screws on the shaft couplings and clamp brackets. The volume control and switch in the Receiver must be turned all the way off (counter clockwise). The volume control coupling is the one nearest the front edge of the Receiver. The tuning control coupling is nearest the dash.

Seat the casings and shafts in the brackets and shaft couplings. Loosen the bracket mounting screws sufficiently so that the shafts and couplings are correctly aligned. Then tighten the casing clamp screws and the coupling set screws, and finally tighten the bracket mounting screws.

Battery Connections (SEE FIG. 2)

Connect the battery cable to the Receiver. The small end at the Receiver must be plugged into the fuse housing receptacle on the battery lead. The other end of the battery lead must be connected to the ammeter and the cable dressed up out of the way. Be sure the fuse and fuse insulator are placed in the fuse housing before connecting the cable to the Receiver.

Antenna Lead (SEE FIG. 2)

A shielded antenna lead is provided for connecting the Receiver to the roof antenna. This lead must be plugged into the bayonet type receptacle on the side of the Receiver. Splice to the antenna lead-in as close as possible to the left front pillar, cutting off all the excess car lead-in. The shield pig-tail must be grounded to the flange of the instrument board.

Lining Up The Receiver

The dial in the control is calibrated in channel numbers, which with the addition of a cipher indicate the frequencies in kilocycles, i.e. 70 on the dial represents 700 kilocycles.

Tune in a broadcast station of known frequency and then loosen the coupling screws on the tuning shaft. Turn the dial to the proper number and tighten set screws again. Then recheck the dial setting.

Ignition and Generator Interference Suppression

Install spark plug resistors on all spark plugs. On the right side of the motor the spark plug porcelains are covered with a rubber sleeve. When the sleeves are replaced, make sure that they are pushed down far enough to completely cover the porcelain on the plugs. Dipping the rubber sleeves in gasoline will make this operation very easy.

Cut the coil to distributor high tension lead about one inch from the distributor head and install the screw type suppressor.

Install a by-pass condenser on the generator and connect the condenser lead to the generator side of the cutout relay. The condenser must be fastened in place under the relay mounting screw.

The other by-pass condenser must be mounted behind the instrument board and the lead connected to the ammeter. Fasten the condenser mounting bracket under one of the instrument mounting screws. On some cars, this condenser may be more effective when connected to the dome light wire. In such cases, the condenser lead must be spliced to the dome light wire at the right pillar post and the condenser mounted on the instrument board flange.

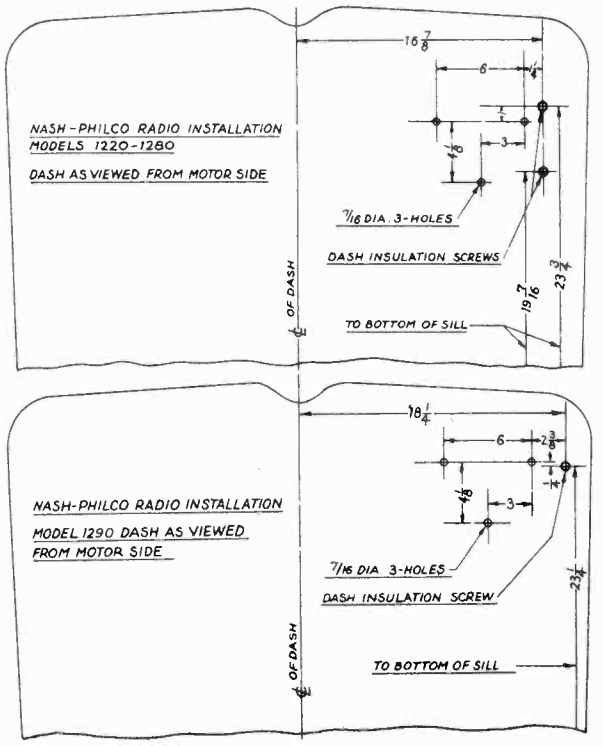


FIGURE 1

Ordinarily these operations will eliminate all ignition interference. Should there still be some objectionable interference, the distributor rotor arms must be peened out in order to minimize the sparking in the distributor head. Both ends of the rotor must be peened.

Peening the Rotor Arm

Place one end of the rotor on a steel block and peen with a small machinist's hammer, extending it for the first trial about .005 inch. Great care must be taken in performing the operation to make sure the rotor arm itself does not strike the stationary electrodes. Repeat this operation until there is just sufficient clearance (.002 inch to .005 inch) between the end of the rotor arm and the stationary electrodes in the distributor cap.

Dress the end of the rotor with a file to its original shape. Without turning on the ignition, press the starter and then examine the rotor arm and the stationary electrodes to be sure that the steel arm is not striking the stationary electrodes.

To judge whether or not the rotor has been lengthened sufficiently, place a thick layer of chalk on each of the stationary electrodes. If there is evidence of the rotor touching the stationary electrodes, file off about .001 inch and recheck.

After the one end of the rotor arm has been peened, repeat the procedure with the other end. When both ends of the motor have been properly peened, replace the rotor and distributor cap.

If there is a tendency for the motor to lope or roll at idling speed, remove the spark plugs and set the gaps to .030 inch. It may be necessary to change slightly the carburetor idle adjustment.

MODEL AC-206 Studebaker

PHILCO RADIO & TELEV. CORP. MODEL AC-236 Studebaker

Installation Data

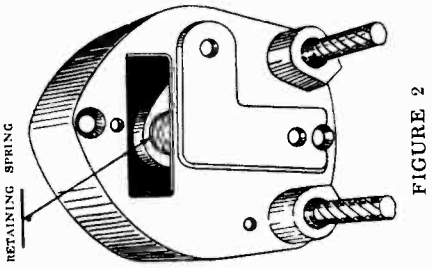


FIGURE 2

Receiver Location and Installation

Refer to Fig. 1 showing the location of the holes in the dash. Locate one of the holes and mark with a sharp punch; then use the template furnished with the Receiver to locate the remaining two holes. These holes should be drilled with a 7/16" drill.

Install the Receiver with the control connections to the left side of the car with the speaker facing down. (see Fig. 3)

Control Unit

The control unit is mounted on a panel which replaces the dummy door on the left side of the instrument board. These panels are held in place by means of four small metal tabs which pass through corresponding slots in the instrument board proper and are bent to one side. Care should be taken to fasten this panel securely so it does not rattle or mar the finish.

The control is furnished with a blank lock cylinder which must be crushed to match the car keys. This operation must be completed before the control is installed on the instrument board.

Instructions for Fitting Car Key to Control Lock

1. Remove the knobs and take off the control unit from the door.

2. Remove the hex-head screw in the rear and take out the pilot lamp bracket.

3. Reach in through the oblong opening in the back of the control unit with a medium size screw driver and press down on the brass retaining lock spring, at the same time working the lock cylinder forward. (See Fig. 2).

4. Insert the car key in the lock cylinder and crush in the same manner that you crush the standard lock, with pliers or vise.

5. Assemble the dial and spring on the cylinder. Push down the retaining spring and replace the lock in the same relative position that it had when removed. With the key in the lock push the lock back, working the lock pin in place in the slot in the lock bar in back of the lock. Push the lock in until the retaining spring snaps in place.

6. Ressemble the control on the panel.

Steering Colu mn Control Unit

For installation in Studebaker cars prior to the 1934 models a special steering column control kit is available,

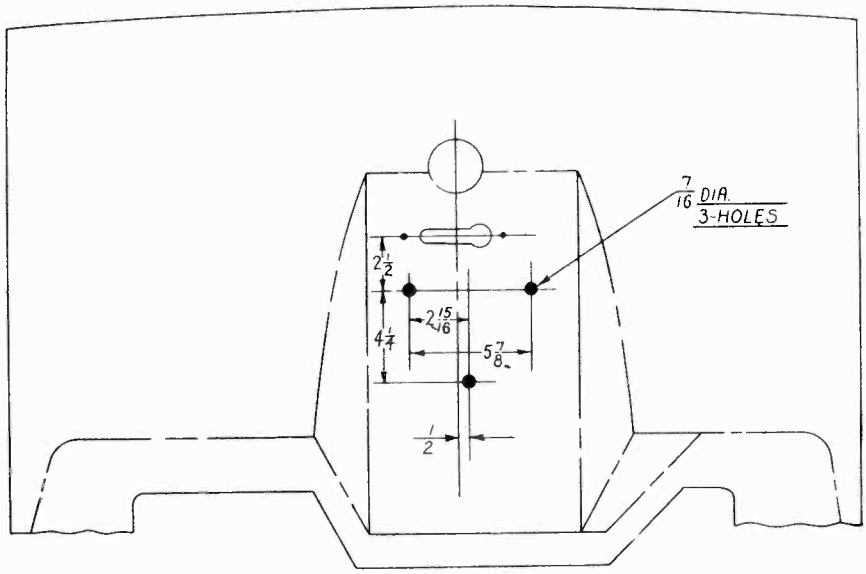


FIGURE 1

Studebaker Stock No. AC-207. This kit includes a steering column control unit with the proper length flexible shafts and all the necessary hardware for installation on the steering column.

Control Shaft Installation

Turn the volume control (lower knob in panel mounting, left hand knob in steering column mounting) to a position where the key will lock it. Loosen the set screws in both shaft couplings and connect the volume control shaft to the rear coupling (nearest the dash). Then connect the tuning control shaft in the front coupling (nearest the front seat) and tighten all the set screws.

Battery Cable Connection (See Fig. 3)

Connect the battery cable to the Receiver by means of the fuse housing connector which fastens by inserting and making a slight turn clockwise, the other end must be connected to the right side of the ammeter and the cable dressed up behind the Receiver. Be sure the fuse and fuse insulator are placed in the fuse housing before the battery cable is connected to the Receiver.

The antenna cable must be plugged into the receptacle on the left side of the Receiver near the top and run along the instrument board to the left hand windshield post where it must be connected to the car antenna lead and the shielding grounded. Connect the black wire from the dial light on the control unit under the screw on the lower left side of the speaker face.

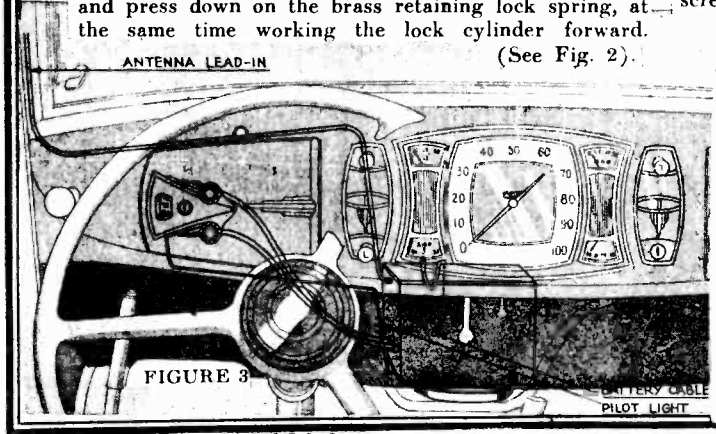
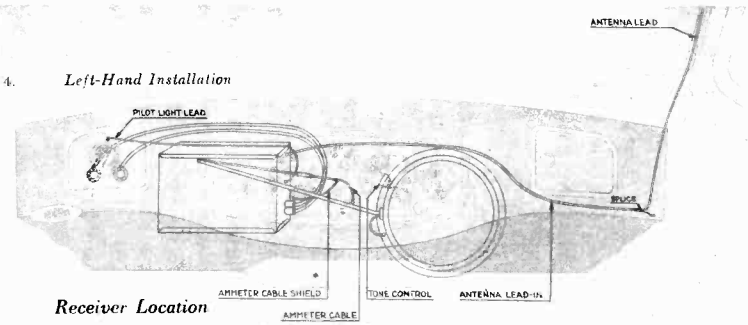


FIGURE 3

FIGURE 4. *Left-Hand Installation*



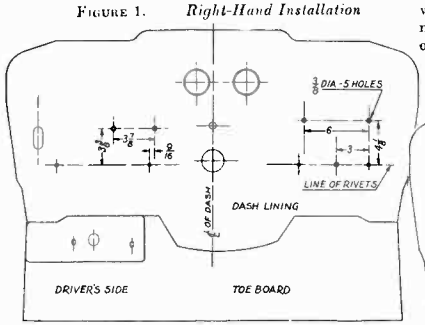
Receiver Location

If the installation of the Receiver is to be made on the right side of the car use the dimensions given in Figure 1. Refer to Figure 2 for the dimensions when the Receiver is to be mounted on the left side of the car.

Before locating and drilling the holes for the left-hand installation, remove the left glove box. The box is fastened at the instrument board by four short bolts and nuts, two at the top and two at the bottom. Those at the bottom are very easily removed, while those at the top can be removed by extending the hand up between the cowl and the box and holding the nuts while the bolts are removed. Two more bolts at the rear right side should also be removed and the bracket bent over to one side. Remove the left glove box door by loosening the two screws that fasten the door hinge to the instrument board. A similar procedure is used for removing the right glove box and door when making right-hand installations.

Locate and drill the three 7/16" holes from the inside of the dash, in accordance with Figure 1 or Figure 2 as required. The holes must be located accurately, otherwise there is danger of drilling through the windshield wiper tube which is located between the inner

FIGURE 1. *Right-Hand Installation*



and outer dash. Fasten the three studs into the threaded holes on the Receiver and mount the Receiver as shown in Figure 3 for right-hand installation and Figure 4 for left-hand installation. By cutting 3/8" from all three studs, the Receiver can be mounted without removing the bottom stud.

Use the large lockwashers between the stud shoulders and the Receiver. The large flat washers should be used against the padding behind the Receiver. The high-tension conduit should be bent slightly forward to prevent interference with the Receiver mounting studs.

Speaker Location

The speaker is mounted with the tone control towards the center of the car. Extra long bolts and a block of wood are provided so that the speaker can be mounted squarely on the dash. The hole locations are given in Figure 1 and Figure 2.

The felt edge on the round cardboard should be placed next to the rim of the speaker housing and the circular piece of fibre placed in back of cardboard with the cut-out toward the center of the car. The felt and fibre improve the tone of the speaker and keep out dust and must be used.

Wiring Connections

Refer to Figure 3 or 4 as Required

The antenna shielded lead-in should be soldered and taped to the car antenna lead. This lead-in is provided with a plug-in connection which fits into a female connector on the side of the Receiver. The shield pigtail on the end of this lead-in must be grounded to the

FIGURE 2. *Left-Hand Installation*

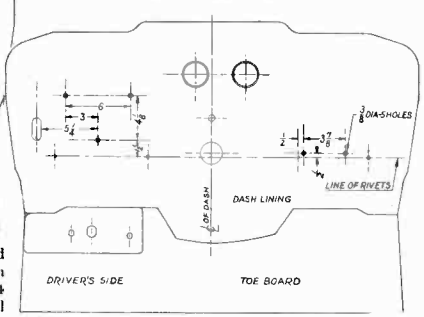
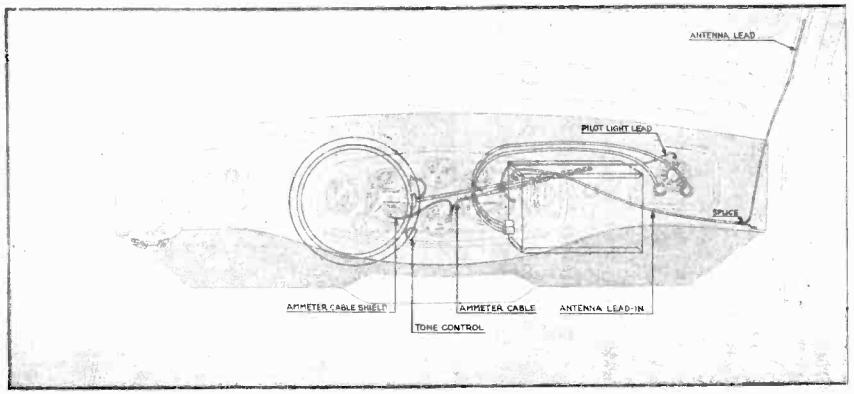


FIGURE 3. *Right-Hand Installation*



flange of the instrument board with a small bolt and nut close to the point where the antenna lead leaves the front pillar.

All excess antenna lead must be cut off or it will be difficult to eliminate ignition noise.

Connect the ammeter lead to the ammeter and the shielding on this lead (black wire) under a metal screw behind the speedometer. Insert the fuse insulator and fuse in the metal fuse housing and connect to the Receiver lead. The shield connection (black wire) on the Receiver end must be grounded under a sheet metal screw on the Receiver.

The speaker cable must be plugged into the socket in the speaker and the shield pigtail grounded under a nut on the rim of the speaker housing.

Glove Box Door Control

Since the glove box door has already been removed, attach the radio control and dress the flexible control shafts and dial light wire over the top of the Receiver. Refer to Fig. 3 or Fig. 4 as required.

Control Shaft Installation

The flexible shafts each have a split end which engages a pin in the bushing in the Receiver. The right-hand control knob is the station selector. The end of the station selector shaft must be coupled (plugged-in) to the bushing nearest the rubber mounting washers on the end of the Receiver housing. Line up the split end of the shaft with the pin and push it in as far as it will go. Tighten the set screws on the shaft housing bushings. The same procedure must be followed for the left-hand (Switch and Volume Control) shaft.

Turn on the Receiver and tune in a station whose frequency in kilocycles is known. (The numbers on the dial represent channel numbers which, with the addition of a cipher, become the frequency numbers). Pull the knob from the right-hand control shaft and loosen the set screw found there. Turn the shaft until the indicator points to the correct number on the dial. Then tighten the set screw and replace the knob. A finer adjustment can be made if this is done on a station between 1000 and 1500 kilocycles.

Wind the dial light wire around the flexible shafts and insert the pilot light connector in the hole in the Receiver housing just above the flexible shaft bushings.

Ignition and Generator Interference Supression

Two interference condensers are supplied — one must be fastened under the inside generator relay leg and the lead connected to the battery side of the relay. The second condenser must be fastened under an ignition coil mounting screw and the lead connected to the *ammeter side* of the coil.

Cut the spark plug terminals from the spark plug wires and screw on the spark plug resistors and snap them in place. Cut each distributor-to-coil high-tension wire about 1" from the distributor and screw into it a distributor resistor. Then screw the distributor end of the lead into the resistor and plug into the distributor cap again. Peen the distributor rotor to reduce sparking at this point. Place the end of the rotor on a flat steel block and peen with a machinists hammer. Both ends must be treated with a double coil system. The more care taken on this operation the better the interference elimination will be. Chalk the end of the rotor each time it is peened to gauge the clearance. See that all high-tension wires entering the distributor cap are seated properly.

These operations should give good elimination; however, in severe cases, all rods and tubes entering the dash should be bound together and grounded to the metal dash. Speaker, antenna and ammeter cables should be dressed and fastened in the position which gives the least motor interference.

THE INSTRUCTIONS have been carefully prepared for your use in installing the Model "J" Nash-Philco automobile radio Receiver in the 1934 Model LAFAYETTE cars. Read thoroughly, then follow the instructions carefully in every detail.

Antenna

The antenna lead in the 1934 Lafayette closed cars is brought down the left front pillor post and is coiled behind the left cowl trim panel.

Instrument Board Control

The instrument board control can be installed more conveniently if this is done as the first operation.

Remove the left dummy ash receptacle door by removing the three nuts behind the instrument panel. Refer to Fig. 1 for dimensions. Paste a piece of paper 1½" wide, 2½" long, over the two lower holes. Pierce holes through the paper with a pencil and draw a center line between them. Drop a vertical line down 18/32" from the center of these holes and mark with a center punch. Drill a ⅜" hole. Remove the paper and elongate the hole horizontally with a round file, as shown on Fig. 1. The control shaft holes should now be enlarged with a ⅜" drill. With a round file, notch the top of the large hole, as shown on Fig. 1. Remove the burrs. Assemble the felt washer between the control head casting and the back of the instrument board. Mount the cover plate and assemble with the two flat-head machine screws. Dress the flexible control shafts over the top of the instrument board-to-dash bracket.

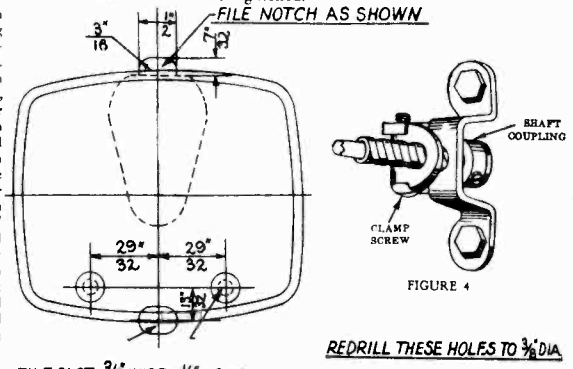


FIGURE 1

FIGURE 4

Receiver Location and Installation

Holes for the two top mounting studs are provided in the metal dash. The single hole on the bottom is occupied by a padding fastening bolt. The locations of these holes are shown in Fig. 2. On certain bodies these holes must be slotted downward a half inch.

Install the mounting studs in the dash holes. Drop the steering column to its lowest position by loosening the two bolts on the steering column bracket. This will facilitate the installation of the radio behind the steering column.

In fastening the studs to the Receiver, the lock washer must be placed between the Receiver and the shoulder on the bolt. The large flat washer must be placed against the padding on the inside of the dash. Mount the Receiver with the control shaft couplings toward the center of the car and with the speaker facing down. See Fig. 8.

Slip the radio in place, and screw the studs into the holes in the Receiver housing from the outside of the dash. This operation can be made easier if the end of the studs entering the set are slightly tapered.

After the radio is installed, the steering column must be returned to its original position and tightened.

Connecting Control Shafts

The flexible shafts are coupled to the control unit when shipped from the factory. The right-hand knob on the control is the tuning control—the left-hand knob is the volume control and switch. The volume control must be locked with the key at the control. The flexible shafts should be dressed above the instrument board-to-dash bracket towards the center of the car and then curved down and around to the couplings on the Receiver. Loosen the small set screws and the clamp screws on the shaft couplings and clamp brackets. See Fig. 4. The volume control and switch in the Receiver must be turned all the way off (counter clockwise). The volume control coupling is the one nearest the front edge of the Receiver. The tuning control coupling is nearest the dash.

Seat the casings and shafts in the brackets and shaft couplings. Loosen the bracket mounting screws sufficiently so that the shafts and couplings are correctly aligned. Then tighten the casing clamp screws and the coupling set screws, and finally tighten the bracket mounting screws.

Battery Connections

Insert the fuse and fuse insulator in the fuse receptacle and connect to the Receiver battery lead as shown in Fig. 3. Connect the black-white lead of the battery cable to the battery side of the ammeter.

The black lead at each end of the battery cable is the shield lead which must be grounded to the back of the instrument panel and under one of the nuts on the Receiver housing. Exercise care when making these connections. The cable must be dressed and secured in place.

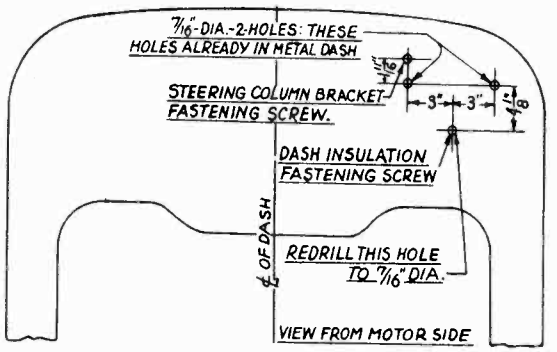


FIGURE 2

The black lead coming from the rear of the control unit must be plugged into the pilot lamp terminal on the speaker panel.

Antenna Lead

Splice the antenna lead to the antenna lead-in as close as possible to the corner post, dressing it in place above or in back of the Receiver. The shield on the lead must be grounded close to the corner post.

The dial in the control is calibrated in channel numbers, which with the addition of a cipher indicate the frequencies in kilocycles, i.e., 70 on the dial represents 700 kilocycles.

Tune in a broadcast station of known frequency and then loosen the coupling screws on the tuning shaft. Turn the dial to the proper number and tighten set screws again. Then re-check the dial setting.

Ignition and Generator Interference Suppression

A spark plug resistor must be installed on each spark plug. Cut off the angle snap-on terminal from the high-tension lead and screw the spark plug resistor into the lead as far as it will go. Snap the resistor on the spark plug. Cut the distributor-to-coil lead 2" from the distributor and screw distributor resistor into the lead. Then screw the end of the lead into the resistor and reconnect to the distributor.

Install a by-pass condenser on the generator and connect the condenser lead to the generator side of the cut-out relay. The condenser must be fastened in place under the relay mounting screw.

The second condenser must be fastened under the left coil mounting screw and the lead connected to the ammeter side of the coil primary.

In some cars it may be necessary to connect a condenser to the dome light wire. The condenser lead must be spliced to the dome light wire at the right pillar post and the condenser mounted on the instrument board flange.

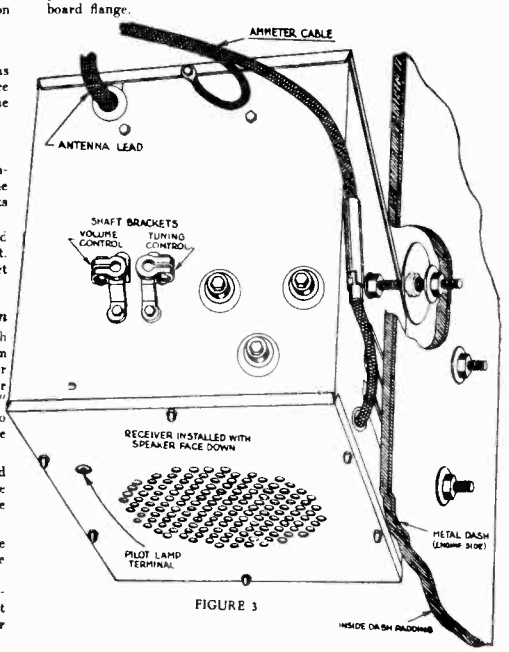


FIGURE 3

MODEL Junior AC-236 Stud
MODEL J Nash (AC-1189 PHILCO RADIO & TELEV. CORP. Schematic, Parts List
Lafayette 110 Series

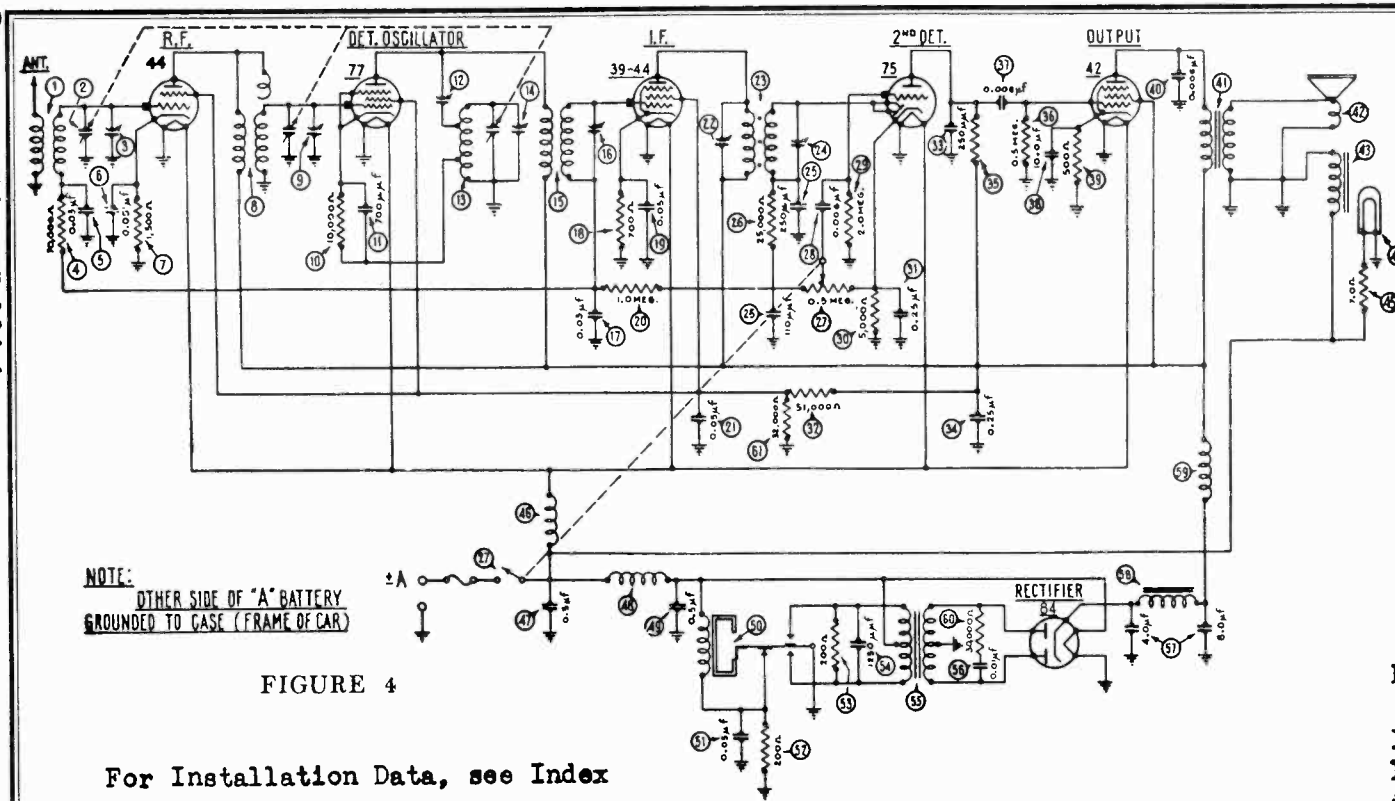


FIGURE 4

For Installation Data, see Index

STUDEBAKER JUNIOR MODEL AC-236 PARTS LIST

(1) Antenna Transformer	32-1331	(21) Condenser (.05 mfd.)	30-4020
(2) Tuning Condenser	31-1149	(22) Padders (Prim. 2nd I. F.)	
(3) 1st Padder (on tun. cond.)		(23) 2nd I. F. Transformer	32-1237
(4) Resistor (70,000 ohms)	33-1115	(24) Padder (Sec. 2nd I.F. Tran.)	
(5) Condenser (.03 mfd.)	30-4025	(25) Cond. (.00011-.00025 mfd.)	30-1020
(6) Condenser (.05 mfd.)	30-4020	(26) Resistor (25,000 ohms)	33-1013
(7) Resistor (1500 ohms)	33-3047	(27) Vol. Con. & Switch Assm.	33-5058
(8) R. F. Transformer	32-1332	(28) Condenser (.006 mfd.)	30-4125
(9) 2nd Padder (on tun. cond.)		(29) Resistor (2,000,000 ohms)	33-1025
(10) Resistor (10,000 ohms)	33-1000	(30) Resistor (5000 ohms)	33-1001
(11) Condenser (.0007 mfd.)	5863	(31) Condenser (.25 mfd.)	30-4146
(12) Padder (Pri. 1st I. F. Tran.)		(32) Resistor (51,000 ohms)	5868
(13) Oscillator Transformer	32-1333	(33) Condenser (.00025 mfd.)	3082
(14) 3rd Padder (on tun. cond.)		(34) Condenser (.25 mfd.)	04360
(15) 1st I. F. Transformer	32-1329	(35) Resistor (100,000 ohms)	6099
(16) Padder (Sec. 1st I. F. Tran.)		(36) Resistor (500,000 ohms)	6097
(17) Condenser (.03 mfd.)	30-4025	(37) Condenser (.006 mfd.)	30-4125
(18) Resistor (700 ohms)	6443	(38) Condenser (10 mfd.)	7440
(19) Condenser (.05 mfd.)	30-4020	(39) Resistor (500 ohms)	33-3031
(20) Resistor (1,000,000 ohms)	33-1096	(40) Condenser (.006 mfd.)	30-4024

(41) Output Transformer	32-7214	(61) Resistor (32,000 ohms)	3525
(42) Cone & Voice Coil	02861	Spark Plug Resistor	4531
(43) Field Coil Assembly	36-3097	Distributor Resistor	4546
(44) Pilot Light	6608	Screw Type Resistor	4851
(45) Resistor (7 ohms)	33-3035	Interference Condenser	30-4007
(46) "A" Choke	32-1268	Dial	27-5040
(47) Condenser (.5 mfd.)	30-4047	Studs	28-6036
(48) Vibrator Choke	32-1235	Nuts (mounting)	W55A
(49) Condenser (.5 mfd.)	30-4147	Knobs (tuning)	03334
(50) Vibrator Unit	38-5036	Knobs (volume)	06886
(51) Condenser (.05 mfd.)	30-4039	Battery Cable	38-5296
(52) Resistor (200 ohms)	7217	Acorn Nut	W821
(53) Resistor (200 ohms)	7217	Fuse	7227
(54) Condenser (.00125 mfd.)	5886	Fuse Insulator	27-7131
(55) Power Transformer	32-7216	4-Prong Socket	27-6006
(56) Condenser (.01 mfd.)	30-4051	5-Prong Socket	27-6014
(57) Condenser (4.—8. mfd.)	30-2072	6-Prong Socket	6417
(58) "B" Choke	32-7215	Instrument Panel Control	42-5164
(59) R. F. Choke	32-1281	Steering Column Control	42-5165
(60) Resistor (30,000 ohms)	7836		

Model J Nash-Philco Lafayette 110 Series Model AC-1189

Items 1 to 61 in the list at the left are identical for Model AC-1189. See following items for additional accessories.

Spark Plug Resistors	33-1101
Distributor Resistor	33-1103
Screw-Type Resistor	4851
Interference Condenser	30-4007
Dial	27-5041
4-Prong Socket	27-6006
5-Prong Socket	27-6014
6-Prong Socket	6417
Studs	28-6036
Nuts (Mounting)	W55
Knob	03064
Battery Cable	38-5296
Instrument Panel Control	42-5169
Fuse	7227
Fuse Insulator	27-7131
Keys	6091

Model J Nash-Philco Model AC-1289

Items 1 to 61 in the list at the left are identical for Model AC-1289. See following items for additional accessories.

Ins. Panel Control DeLuxe	42-5183
Ins. Panel Con. Standard	42-5182
Fuse	7227
Fuse Insulator	27-7131
Keys	6091
4-Prong Socket	27-6006
5-Prong Socket	27-6014
6-Prong Socket	6417
Spark Plug Resistors	33-1101
Distributor Resistor	33-1103
Screw-Type Resistor	4851
Interference Condenser	30-4007
Dial	27-5041
Studs	28-6102
Nuts (Mounting)	W55
Knob	03064
Battery Cable	38-5296

MODEL Q Nash (AC-1089)

PHILCO RADIO & TELEV. CORP For Lafayette 110 Series

Schematic, Parts List

FIGURE 5

NASH - PHILCO MODEL AC 1089 PARTS LIST

(1) Antenna Transformer	32-1331	(23) 2nd I. F. Transformer	32-1237	(45) Resistor (7 ohms)	33-3035	Spark Plug Resistors	33-1101
(2) Tuning Condenser	31-1340	(24) Padder (Sec. 2nd I. F. Tran.)		(46) "A" Choke	32-1402		33-1102
(3) 1st Padder (in tun. cond.)		(25) Condenser (.00025 mfd.)	30-1032	(47) Condenser (.5 mfd.)	30-4184	Distributor Resistor	33-1103
(4) Resistor (70,000 ohms)	33-1115	(25A) Condenser (.00011 mfd.)	30-1031	(48) Vibrator Choke	32-1235	Interference Condenser	30-4007
(5) Condenser (.03 mfd.)	30-4025	(26) Resistor (25,000 ohms)	33-1013	(49) Condenser (.5 mfd.)	30-4015	Nuts (mounting)	W554
(6) Condenser (.05 mfd.)	30-4020	(27) Vol. Con. & Switch Assm.	38-5606	(50) Vibrator	38-5036	Battery Cable	38-5296
(7) Resistor (700 ohms)	6443	(28) Condenser (.006 mfd.)	30-4125	(51) Condenser (.02 mfd.)	30-4039	Acorn Nut	W821
(8) R. F. Transformer	32-1332	(29) Resistor (2,000,000 ohms)	33-1025	(52) Resistor (200 ohms)	7217	Fuse	7227
(9) 2nd Padder (in tun. cond.)		(30) Resistor (5000 ohms)	6096	(53) Resistor (200 ohms)	7217	Fuse Insulator	27-7131
(10) Resistor (10,000 ohms)	33-1000	(31) Condenser (.25 mfd.)	30-4146	(54) Condenser (.00125 mfd.)	5886	Studs	28-6036
(11) Condenser (.00025 mfd.)	30-1032	(32) Resistor (32,000 ohms)	3525	(55) Power Transformer	32-7216	Knob	03064
(12) Padder (Pri. 1st I. F. Tran.)		(33) Condenser (.00025 mfd.)	3082	(56) Condenser (.01 mfd.)	30-4051	Dial	27-5041
(13) Oscillator Transformer	32-1333	(34) Condenser (.25 mfd.)	04360	(57) Condenser (4-8-10 mfd.)	30-2072	Antenna Lead	38-5131
(14) 3rd Padder (in tun. cond.)		(35) Resistor (100,000 ohms)	6099	(58) "B" Choke	32-7215	4-prong Socket	27-6015
(15) 1st I. F. Transformer	32-1329	(36) Resistor (500,000 ohms)	6097	(59) R. F. Choke	32-1281	5-prong Socket	27-6014
(16) Padder (Sec. 1st I. F. Tran.)		(37) Condenser (.006 mfd.)	30-4125	(60) Resistor (32,000 ohms)	3525	6-prong Socket	27-6020
(17) Condenser (.03 mfd.)	30-4025	(38) Condenser (10 mfd.)	30-2072	(61) Resistor (25,000 ohms)	33-1013	Shaft (volume)	28-8182
(18) Resistor (2000 ohms)	33-3048	(39) Resistor (500 ohms)	33-3031	(62) Tone Control	30-4180	Shaft (tuning)	28-8181
(19) Condenser (.05 mfd.)	30-4020	(41) Output Transformer	32-7245	(63) Condenser (.00005 mfd.)	30-1029		
(20) Resistor (1,000,000 ohms)	33-1096	(42) Cone & Voice Coil	36-3157	(64) Condenser (.00025 mfd.)	30-1032		
(21) Condenser (.05 mfd.)	30-4020	(43) Field Coil Assembly	36-3046	(65) "A" Choke	32-1374		
(22) Padder (Pri. 2nd I. F. Tran.)		(44) Pilot Lamp	34-2031				

General Installation Instructions
FOR 110 SERIES LAFAYETTE CARS

Custom Built by Philco — Sold Exclusively by Nash Dealers

THE INSTRUCTIONS have been carefully prepared for your use in installing the Model Q Nash-Philco automobile radio Receiver in the 1934 Model LAFAYETTE cars. Read thoroughly, then follow the instructions carefully in every detail.

Antenna

The antenna lead in the 1934 Lafayette closed cars is brought down the left front pillor post and is coiled behind the left cowl trim panel.

Instrument Board Control

The instrument board control can be installed more conveniently if this is done as the first operation.

Remove the left dummy ash receptacle door by removing the three nuts behind the instrument panel. Refer to Fig. 1 for dimensions. Paste a piece of paper 1½" wide, 2½" long, over the two lower holes. Pierce holes through the paper with a pencil and draw a center line between them. Drop a vertical line down 13/32" from the center of these holes and mark with a center punch. Drill a ⅜" hole. Remove the paper and elongate the hole horizontally with a round file, as shown on Fig. 1. The control shaft holes should now be enlarged with a ⅜" drill. With a round file, notch the top of the large hole, as shown on Fig. 1. Remove the burrs. Assemble the felt washer between the control head casting and the back of the instrument board. Mount the cover plate and assemble with the two flat-head machine screws. Dress the flexible control shafts over the top of the instrument board-to-dash bracket.

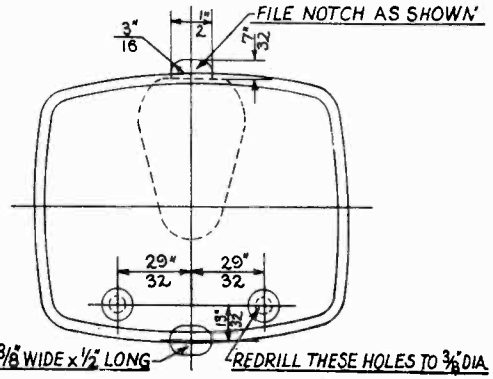


FIGURE 1

Receiver Location and Installation

Holes for the two top mounting studs are provided in the metal dash. The single hole on the bottom is occupied by a padding fastening bolt. The locations of these holes are shown in Fig. 2. On certain bodies these holes must be slotted downward a half inch.

Install the mounting studs in the dash holes. Drop the steering column to its lowest position by loosening the two bolts on the steering column bracket. This will facilitate the installation of the radio behind the steering column.

In fastening the studs to the Receiver, the lock washer must be placed between the Receiver and the shoulder on the bolt. The large flat washer must be placed against the padding on the inside of the dash. Mount the Receiver with the control shaft couplings toward the center of the car and with the speaker facing down. See Fig. 3.

Slip the radio in place, and screw the studs into the holes in the Receiver housing from the outside of the dash. This operation can be made easier if the end of the studs entering the set are slightly tapered.

After the radio is installed, the steering column must be returned to its original position and tightened.

Connecting Control Shafts

The flexible shafts are coupled to the control unit when shipped from the factory. The right-hand knob on the control is the tuning control—the left-hand knob is the volume control and switch. The volume control must be locked with the key at the control. The flexible shafts should be dressed above the instrument board-to-dash bracket towards the center of the car and then curved down and around to the couplings on the Receiver. Loosen the small set screws and the clamp screws on the shaft couplings and clamp brackets. See Fig. 4. The volume control and switch in the Receiver must be turned all the way off (counter clockwise). The volume control coupling is the one nearest the front edge of the Receiver. The tuning control coupling is nearest the dash.

Seat the casings and shafts in the brackets and shaft couplings. Loosen the bracket mounting screws sufficiently so that the shafts and couplings are correctly aligned. Then tighten the casing clamp screws and the coupling set screws, and finally tighten the bracket mounting screws.

Battery Connections

Insert the fuse and fuse insulator in the fuse receptacle and connect to the Receiver battery lead as shown in Fig. 3. Connect the black-white lead of the battery cable to the battery side of the ammeter.

The black lead at each end of the battery cable is the shield lead which must be grounded to the back of the instrument panel and under one of the nuts on the Receiver housing. Exercise care when making these connections. The cable must be dressed and secured in place.

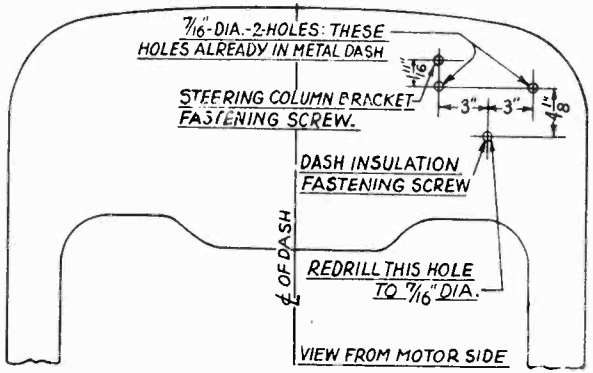


FIGURE 2

The black lead coming from the rear of the control unit must be plugged into the pilot lamp terminal on the speaker panel.

Antenna Lead

Splice the antenna lead to the antenna lead-in as close as possible to the corner post, dressing it in place above or in back of the Receiver. The shield on the lead must be grounded close to the corner post.

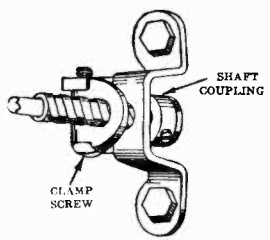


FIGURE 4

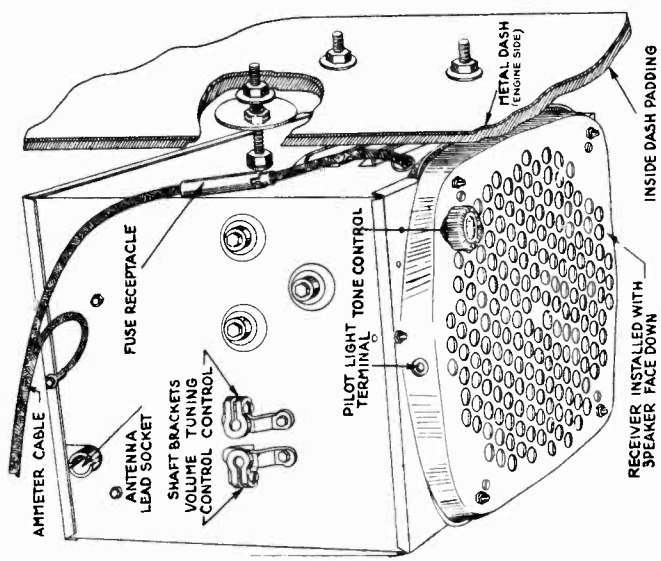


FIGURE 3

PHILCO RADIO & TELEV. CORP.

MODEL PA Packard Schematic, Chassis Wiring, Parts List

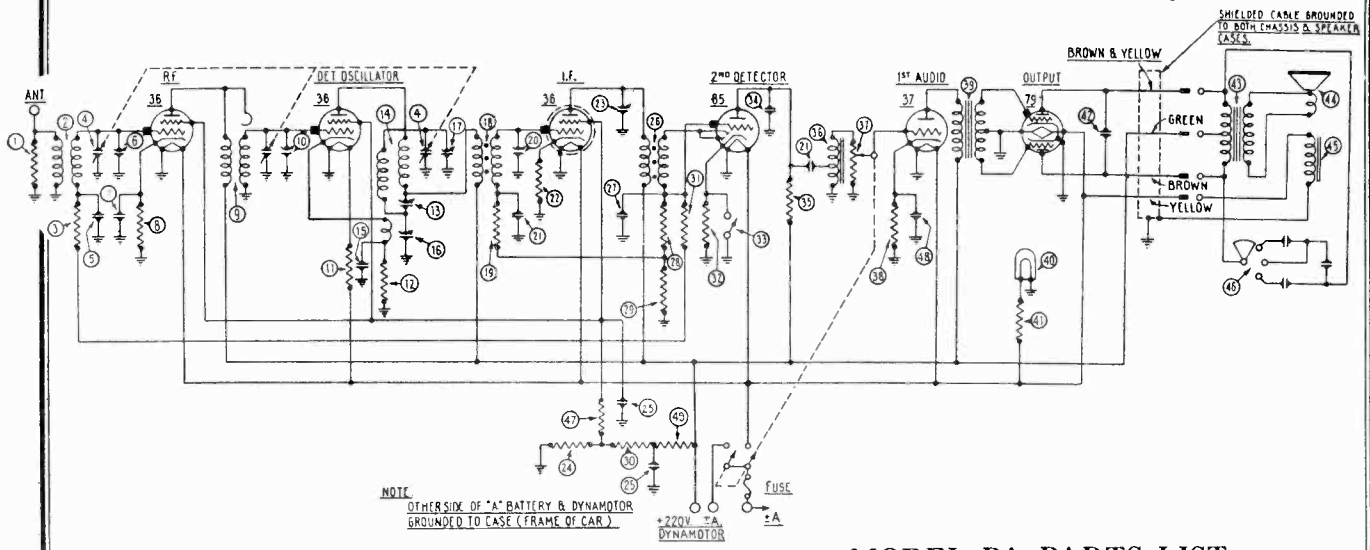


DIAGRAM C

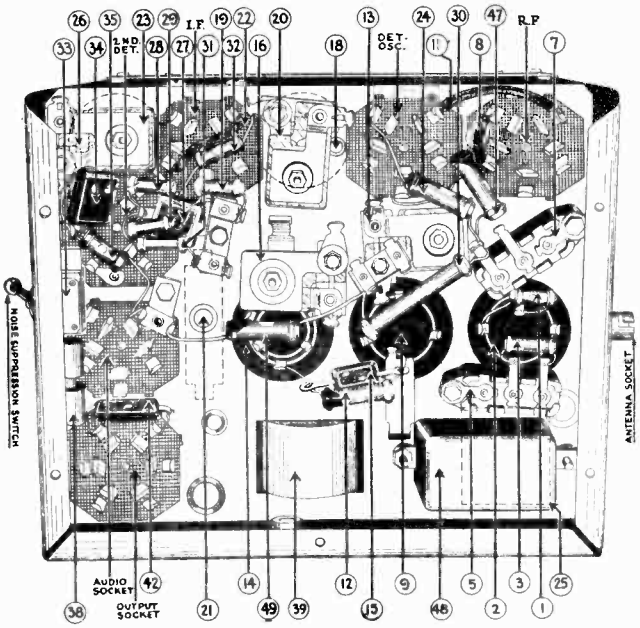


DIAGRAM D

MODEL PA PARTS LIST

No. in Figs. 1 and 2	Description	Part No.
(1)	Resistor (5,000 ohm)	6016
(2)	Antenna Coil	06914
(3)	Resistor (100,000 ohm)	6099
(4)	Tuning Condenser	04308
(5)	By-pass Condenser (.05 mfd.)	3615-AN
(6)	Compensator section on tuning condenser	
(7)	By-pass Condenser	3615-AY
(8)	Resistor (500 ohm)	6977
(9)	R. F. Transformer	06915
(10)	Compensator section on tuning condenser	
(11)	Resistor (2.7 ohm)	6511
(12)	Resistor (13,000 ohm)	8267
(13)	Compensator	04000-J
(14)	Oscillator Coil	06916
(15)	Condenser (.0007 mfd.)	4520
(16)	Compensating Condenser	04000-S
(17)	Compensator section on tuning condenser	
(18)	First I. F. Transformer	06632
(19)	Resistor (500,000 ohm)	6097
(20)	Compensating Cond.	04000-X
(21)	Condenser (.05 mfd. .15 mfd.)	06091
(22)	Resistor (500 ohm)	6977
(23)	Compensating Cond.	04000-X
(24)	Resistor (20,000 ohm)	6650
(25)	Cond. (.5 mfd., .25 mfd.)	06088
(26)	Second I. F. Transformer	05970
(27)	Condenser (.00025 mfd.)	3082
(28)	Resistor (100,000 ohm)	6099

No. in Figs. 1 and 2	Description	Part No.
(29)	Resistor (100,000 ohm)	6099
(30)	Resistor (20,000 ohm)	6649
(31)	Resistor (500,000 ohm)	6097
(32)	Resistor (5,000 ohm)	6096
(33)	Switch	5462
(34)	Condenser (.00125 mfd.)	5886
(35)	Resistor (50,000 ohm)	4518
(36)	Audio Transformer	7552
(37)	Volume Control	7525
(38)	Resistor (2,500 ohm)	7775
(39)	Input Transformer	7652
(40)	Pilot Lamp	6608
(41)	Resistor (7 ohm)	5110
(42)	Condenser (.06 mfd.)	6359
(43)	Output Transformer	2515
(44)	Speaker Coil and Cone	02823
(45)	Speaker Field Pot	02795
(46)	Tone Control	05366
(47)	Resistor (25,000 ohm)	4516
(48)	Condenser	7774
(49)	Resistor (8,000 ohm)	7835
	Dial	3255
	Battery Cable	41-3035
	Antenna Lead	38-5161
	Packard Dynamotor	41-1005
	Key	6091
	Studs	28-6088
	Nuts (Studs)	W-55
	Spark Plug Resistor	33-1016
	Distributor Resistor	33-1017
	Spark Plug Terminals	28-6053
	Intereference Condenser	4522

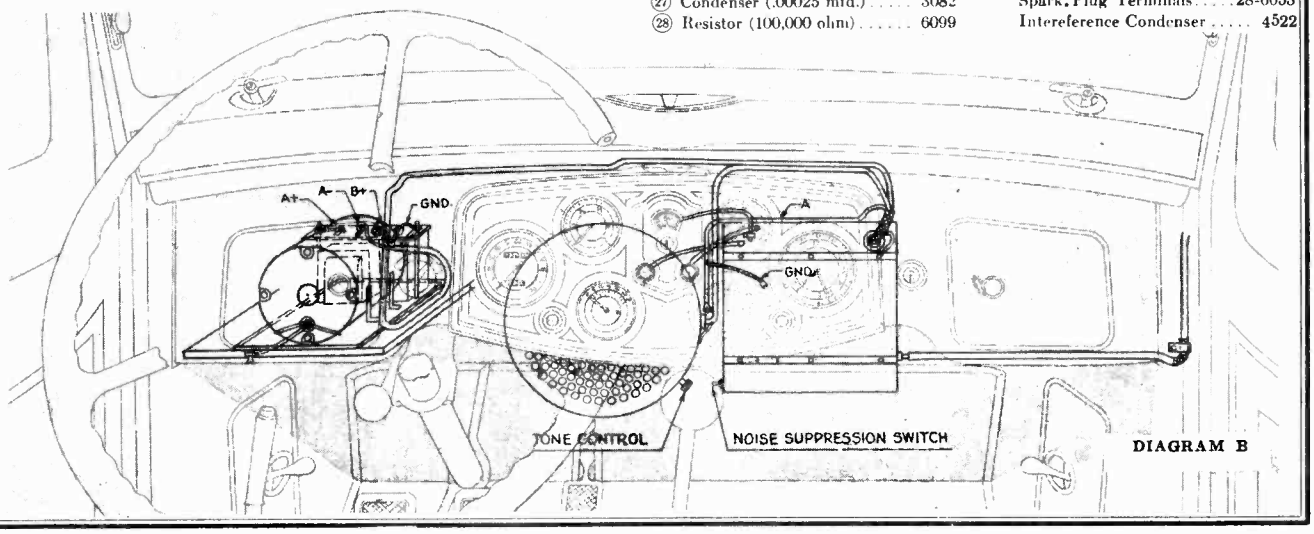


DIAGRAM B

MODEL PA Packard Installation Data

PHILCO RADIO & TELEV. CORP.

These instructions are intended to assist you when installing the Packard De Luxe Car Radio and should be carefully read before starting work. The installation is not complicated and no special troubles should be encountered if instructions are followed.

Antenna

All enclosed cars manufactured after January 1, 1933, are equipped with a roof type antenna, the lead-in from which is brought down inside the right front pillar post and routed behind the cowl trim panel. Antennas suitable for open and convertible jobs can be secured from the Factory on special orders and are easily installed by snapping in place. Detailed information on these units can be secured by writing the Accessory Division of the Packard Motor Car Company.

On earlier cars that are not equipped with a roof antenna, the under-car type can be used with a reduction in efficiency of approximately 35 per cent.

Receiver and Speaker Location

Refer to the diagram "A", showing location of the holes to be drilled. Locate one of the receiver stud holes and mark with a sharp punch; then use the template furnished to locate the remaining two holes. Use this same procedure for the speaker, drilling with 7/16-inch drill. On Packard Twelve models you may find it difficult to locate and drill the speaker holes from the motor side of the dash, and if so, this work can be done from the body side, providing care is taken to avoid cutting the vacuum and oil lines.

On Packard Eight models the receiver must be spaced out enough to allow the speedometer cable to pass behind it. This can be accomplished by placing two or three flat washers on the lower mounting stud before bolting in place, using the larger washer furnished, next to the insulating material.

Mount the speaker with the tone control to the right side of the car, which permits easy operation. The felt baffle should be mounted on studs between speaker and dash.

Control Unit

On cars where provision has been made to mount the control unit in the instrument panel a finish plate is used to fill the opening. Remove this plate by loosening the three hold down clamps at the rear of the instrument panel. The radio control unit can then be put in place (using the gasket formerly provided for the plate) and secured by the three hold-down clamps.

Note.—As the finish on instrument panels varies with different models of Packard cars, it may be desirable to match the finish plate of the radio control unit to the panel. The Packard Motor Car Company can supply control unit finish plates to match the various instrument panels.

When no provision has been made to mount the control unit in the instrument panel, it should be located on the steering column, either at the right side of the post or in a vertical position directly above it. A generally satisfactory location is to the right, approximately six inches below the steering wheel hub. Cut off the metal strap to proper length and mount bracket, using the long machine screw with one turn of friction tape between column and strap. Mount control unit on bracket in a vertical position.

Lining Up Receiver

As the tuning dial is calibrated in kilocycles, it may be necessary to line it up with the receiver, so stations may be tuned in at the proper point, this being accomplished as follows:

Set the tuning dial to line up with the extra division below 150 and insert a blunt-pointed wire or match through the small hole located at the back of the control unit close to the tuning knob. Next carefully press the tuning dial out of mesh with the gear and while holding it so, turn the knob to the extreme counter-clockwise limit and release the tuning dial. It should now line up and can be checked by tuning in stations whose operating frequency is known.

Control Shaft Installation

Remove the front cover plate from the receiver. Turn the left-hand knob (volume control) to a point where the key will lock it firmly in position. Insert this shaft and conduit into the left-hand receptacle on the front of receiver and tighten set screw. Next turn the dial to line up with the extra division below 150 and turn the condenser unit so the plates are completely out of mesh, at which point the screw in the brass coupler should be accessible. Next insert the tuning shaft and conduit in the right hand receptacle on front of receiver, locking them in position with their respective set screws.

When the control unit is mounted on the steering column, fasten the two flexible shafts to the bottom edge of the instrument panel with a small clamp, this being so located as to make the best appearance and provide the smoothest operation. Cover these flexible shafts and the dial light wire with the small piece of loom (supplied with set) to prevent the shafts coming in contact with the ammeter terminals in the instrument board.

Battery Cable Location and Connections
(See diagram "B")

Plug the cable into the receptacle at the front of the receiver and run the battery portion sharply upwards to the recess above the instrument board and follow this recess to the left-side glove compartment, where the dynamotor cable passes into the glove compartment through a hole located near the forward edge of the box. The "A" or two-wire cable should be run to the ammeter, keeping it as close to the instrument board as possible. Connect the feed wire (small closed terminal) to the discharge side of the ammeter and the shield (equipped with spade terminal—wire marked "GND") should be grounded under the lower clock clamp screw. Connect the black wire from the dial light on the control unit to the fahnstock terminal on the face of the receiver. The speaker cable is plugged into the receptacle on the speaker and the ground tabs on the cables are fastened under a screw head on the receiver and speaker. The antenna lead-in should then be plugged into the receiver, the cable being carried along the dash in the rear of the right glove compartment, using the glove compartment rear bracket as a means of support. This lead-in should be spliced to the antenna lead-in, which will be found coiled and taped back of the cowl trim panel. Any excess cable should be cut off, using enough lead-in to make a neat installation. The lead-in provided with the receiver is equipped with pigtail ground, which should be wrapped around the antenna lead-in shield and carefully taped.

Operating Instructions

The receiver is placed in operation by turning the left-hand knob on the control head in a clockwise position. After tubes have been warmed up a minute or so, resonance will be indicated by a rushing sound, and any station within range can be tuned in by manipulating the right-hand knob, after which the volume is set to the desired level with the left. The small snap switch on the left end of the receiver cabinet should be pulled to the rear (towards the front seat) for maximum sensitivity when operating in the country or quiet part of the city. When driving close to the broadcast station being received or in a noisy location, smoother operation and quieter tuning can often be obtained by throwing this switch forward.

Ordinarily the tone control (on the loud speaker) should be fully opened by tuning in a clockwise direction and then turned back (counter-clockwise) one or two notches, which will give the best compromise between tonal brilliancy and minimum noise. When operating extremely noisy parts of the city, however (as when following a street car), it will sometimes be advisable to turn this control in a clockwise direction as far as it will go. When operating in the immediate vicinity of a power line or car tracks, crackling or snapping noises are quite likely to be in evidence, due to leakage

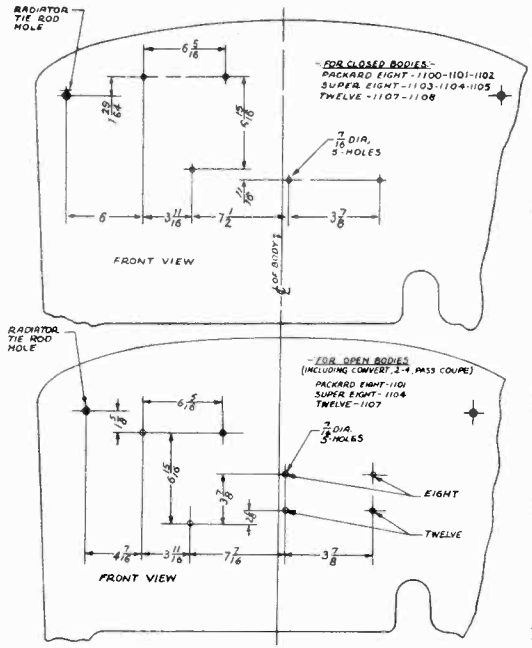


DIAGRAM A

PACKARD DE LUXE RADIO—Installation Dash Layout for Packard Models 1100, 1101, 1102, 1103, 1105, 1107, 1108

of high voltage to ground. This man-made static cannot be eliminated by any receiver, but its effects will be minimized if the dial is set to bring in the most powerful local station. Man-made as well as natural static is amplified along with the radio signal, and naturally the powerful local needs less amplification, thus enabling it to ride over unwanted noises.

When turning off the receiver be sure the left-hand knob is turned counter-clockwise until a definite click is heard, otherwise the receiver may continue to operate and run down the battery.

Dynamotor

The dynamotor is so designed that it can be installed in the left-hand glove compartment. Pull the dynamotor cable through the hole in the upper corner of the box and connect the white lead of this cable to the "A" terminal of the dynamotor. The blue lead must then be connected to the "B plus" terminal and the shield on the cable grounded under the left-hand terminal strip nut. Slide the complete unit into the glove compartment, making sure that the rubber mat is not doubled up and that the cables are dressed neatly in place. The dynamotor grounding strip must be securely attached to the instrument board and a convenient mount is easily provided by replacing the left-hand screw that holds the glove compartment to the panel with a longer one.

On open models the rubber mat must be removed to permit the dynamotor to slide through the glove compartment door. Following the installation of the dynamotor as previously described, the rubber mat can be attached to the dynamotor in the glove compartment, replacing the rivets with small screws.

Ignition and Generator Interference Suppression

On the twelve-cylinder cars provision has been made to mount a condenser in the coil bracket, using the right front coil mounting screw as a means of attachment. The condenser can be installed by passing the condenser lead through the hole provided in the coil bracket and attaching to one of the terminals on the lower side of the coil to which a brass strip is fastened. Replace the unit and tighten nuts, making certain that the condenser case is grounded through the enamel. Locate the second condenser under outside generator relay mounting screw and connect wire to the battery terminal of relay.

On eight-cylinder cars it will generally be best to locate the first condenser under the clock clamp screw with the wire fastened to the ammeter side of ignition switch. The generator condenser is then mounted as previously described.

Cut off the spark plug terminals from the high tension wires and screw on the resistor units, after which the small round nuts (furnished with set) can be screwed on to the spark plugs and the resistors snapped in place. Cut distributor to coil high tension wires about one inch from distributor head and insert "screw-in" type distributor resistors. When the rest of the installation is carefully made, the resistor between coil and distributor will sometimes be unnecessary, thus tending to improve throttling and idling. In all cases, however, spark plug gap should be increased from the standard .025" to .030". Spark plugs with built-in resistors can be used in place of the detachable type if desired, in which case the terminals on the spark plug wires are not cut off.

To check for ignition interference, disconnect the antenna lead-in from set. Turn on receiver and start engine. If there is any noise coming through the speaker from the electrical system of the car when the volume control is about three-fourths open and the local-long distance switch pointing to rear of car, carefully relocate speaker cable and battery cable to a point where the noise is reduced to a minimum. If relocation of these two cables does not practically eliminate ignition interference, it will then be advisable to peen the distributor rotor arm.

Peening the Rotor Arm

Place the ends of the rotor on a steel block and peen with a small machinist hammer, extending them about .005". Both ends must be so treated with a double coil system.

The greatest care must be taken in performing the operation to make sure the rotor arm itself does not strike the stationary contacts after the rotor and cap are replaced. Without turning on the ignition key, press the starter and then examine the rotor arm and the contact points to be sure that the steel part of the arm is not striking the stationary contacts.

Start the motor again and the volume of noise should now be down to a minimum. If not, relocate the speaker and battery cables slightly. If generator interference is encountered, it can usually be eliminated by cleaning the commutator and rescating the brushes. This noise can easily be isolated by speeding up the engine and cutting off ignition to make sure it is not responsible.

Connect the antenna lead to the receiver, recheck for noise and relocate speaker and battery cables if necessary.

PHILCO RADIO & TELEV. CORP.

MODEL PB Packard
Schematic, Chassis
Parts List, Socket

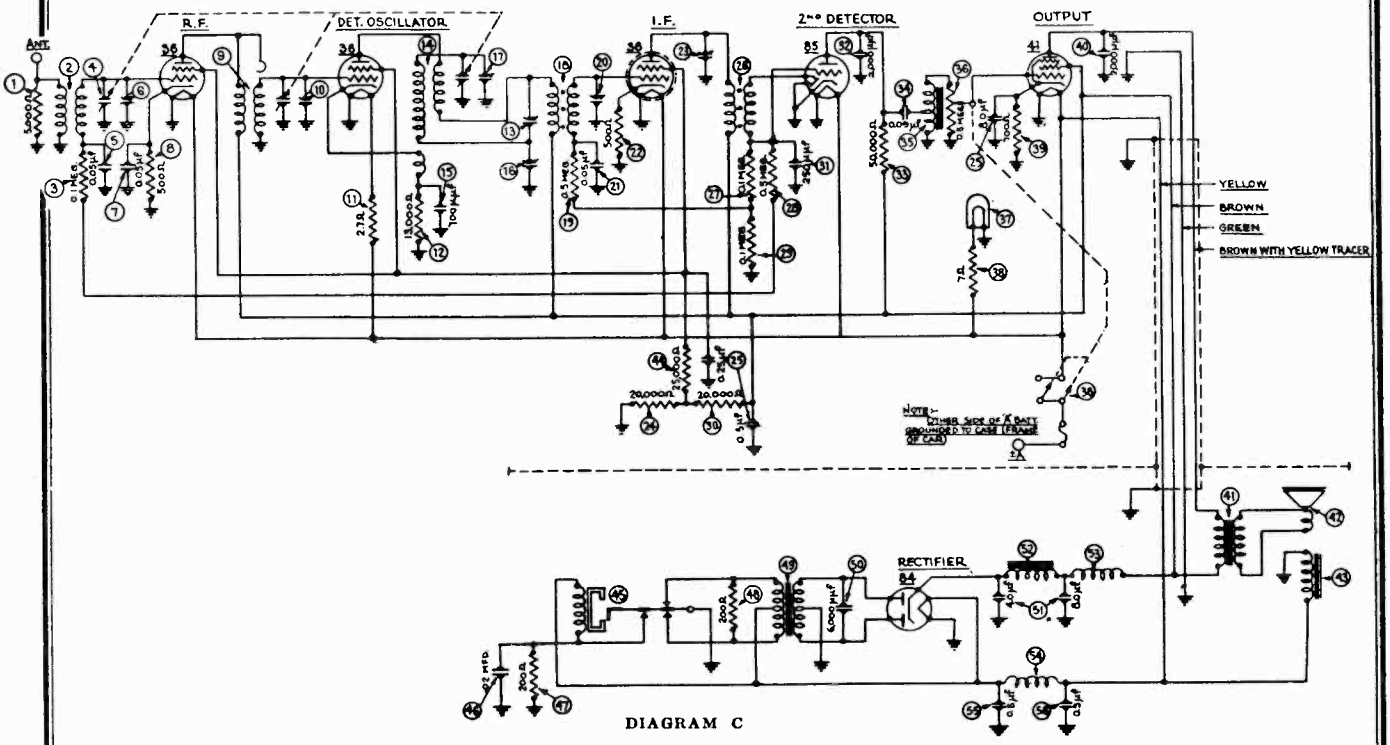


DIAGRAM C

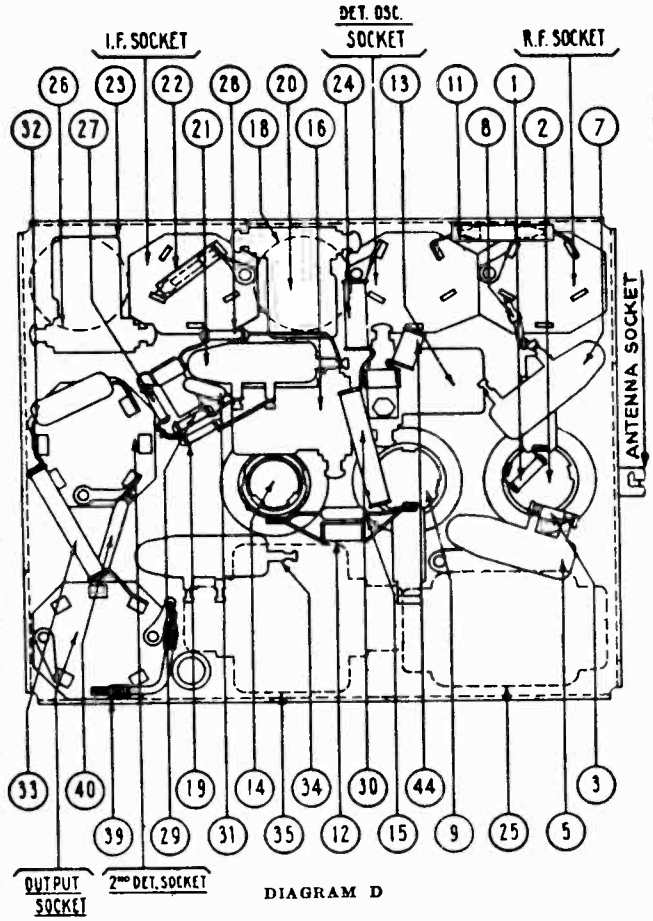


DIAGRAM D

MODEL PB PARTS LIST

No. in Diagrams C & D	Description	Part No.
(1)	Resistor (5,000 ohm)	6096
(2)	Antenna Transformer	32-1197
(3)	Resistor (100,000 ohm)	6099
(4)	Tuning Condenser	04308
(5)	By-pass Condenser (.05 mfd.)	3615-AN
(6)	R. F. Transformer	32-1198
(7)	By-pass Condenser (.05 mfd.)	3615-AT
(8)	Resistor (500 ohm)	6977
(9)	Detector Coil	03915
(10)	Compensator section on tuning condenser	
(11)	Resistor (2.7 ohm)	6511
(12)	Resistor (13,000 ohm)	8267
(13)	Compensating Cond.	04000-J
(14)	Oscillator Coil	06916
(15)	Condenser (.0007 mfd.)	4520
(16)	Compensating Cond.	04000-S
(17)	Compensator section on tuning condenser	
(18)	First I. F. Transformer	06932
(19)	Resistor (500,000 ohm)	6097
(20)	Compensating Cond.	04000-X
(21)	Condenser (.05 mfd.)	3615-AK
(22)	Resistor (500 ohm)	6977
(23)	Compensating Cond.	04000-X
(24)	Resistor (20,000 ohm)	6650
(25)	Condenser (.25 mfd., .5 mfd., 8 mfd.)	04354
(26)	Second I. F. Transformer	05970
(27)	Resistor (100,000 ohm)	6099
(28)	Resistor (500,000 ohm)	6097
(29)	Resistor (100,000 ohm)	6099
(30)	Resistor (20,000 ohm)	6649
(31)	Condenser (.00025 mfd.)	3082
(32)	Condenser (.0002 mfd.)	4059
(33)	Resistor (50,000 ohm)	4237

No. in Diagrams C & D	Description	Part No.
(34)	Condenser (.09 mfd.)	4989-Y
(35)	Audio Transformer	7535
(36)	Volume Control (500,000 ohm) and switch	7525
(37)	Pilot Lamp	6608
(38)	Resistor (7 ohm)	5110
(39)	Resistor (700 ohm)	6443
(40)	Condenser (.002 mfd.)	6853
(41)	Output Transformer	2598
(42)	Cone and Coil	36-3020
(43)	Field Coil	33-3140
(44)	Resistor (25,000 ohm)	4516
(45)	Vibrator	38-5036
(46)	Condenser (.05 mfd.)	30-4039
(47)	Resistor (200 ohm)	7217
(48)	Resistor (200 ohm)	7217
(49)	Power Transformer	32-7110
(50)	Condenser (.006 mfd.)	6359
(51)	Filter Condenser (4 mfd., 8 mfd.)	30-2030
(52)	Filter Choke	32-7118
(53)	R. F. Choke	32-1068
(54)	"A" Choke	32 1259
(55)	Condenser (.5 mfd.)	30-4015
(56)	Condenser (.5 mfd.)	30-4015
	Fuse (15A.)	7227
	Dial	8255
	"A" Battery Lead	41-3042
	Speaker Power Cable	41-3044
	Antenna Lead	38-5161
	Key	6091
	Studs	28-6088
	Nuts (Studs)	W-55
	Spark Plug Resistor	33-1016
	Distributor Resistor	33-1017
	Spark Plug Terminal	28-6053
	Interference Condenser	4522

PACKARD STANDARD CAR RADIO GENERAL INSTALLATION INSTRUCTIONS

Antenna

All closed cars manufactured after January 1, 1933, are equipped with a roof-type antenna, the lead-in from which is brought down inside the right front pillar post and coiled behind the cowl trim panel.

Antennas suitable for open and convertible jobs can be secured from the Factory on special orders and are easily installed by snapping in place. Detailed information on these units can be secured by writing the Accessory Division of the Packard Motor Car Company.

On earlier cars that are not equipped with a roof antenna, the undercar type can be used with a reduction in efficiency of approximately 35 per cent.

Installation Preparation

Although it is not really necessary to remove the right-hand glove compartment, some will find it an advantage to take it out until the installation is completed.

Receiver and Speaker Location

Refer to the cuts showing location of the holes to be drilled. Locate one of the receiver stud holes and mark with a sharp punch; then use the template furnished to locate the remaining two holes. Use this same procedure for the speaker, drilling with 7/16-inch drill. On Packard Twelve models, you may find it difficult to locate and drill the speaker holes from the motor side of the dash, and if so, this work can be done from the body side, provided care is taken to avoid cutting the vacuum and oil lines.

On Packard Eight models, the receiver must be spaced out enough to allow the speedometer cable to pass behind it. This can be accomplished by placing two or three flat washers on the lower mounting stud before bolting in place, using the large washer furnished, next to the insulating material.

Instrument Board Control Unit

On cars where provision has been made to mount the control unit in the instrument panel, a finish plate is used to fill the opening. Remove this plate by loosening the three hold-down clamps at the rear of the instrument panel. The radio control unit can then be put in place (using the gasket formerly provided for the plate) and secured by the three hold-down clamps.

NOTE.—As the finish on instrument panels varies with different models of Packard cars, it may be desirable to match the finish plate of the radio control unit to the panel. The Packard Motor Car Company can supply control unit finish plates to match the various instrument panels.

Steering Column Control Unit

When no provision has been made to mount the control head in the instrument panel, a special unit should be obtained from the Accessory Division. This should be located on the steering column, either at the right side of the post or in a vertical position directly above it. A generally satisfactory location is to the right approximately six inches below the steering wheel hub. Cut off the metal strap to proper length and mount bracket, using the long machine screw with one turn of friction tape between column and strap. Mount control unit on bracket in a vertical position.

Fasten the two flexible shafts to the bottom edge of the instrument panel with a small clamp, this being so located as to make the best appearance and provide the smoothest operation. Cover these flexible shafts and the dial light wire with the small piece of loom (supplied with set) to prevent the shafts coming in contact with the ammeter terminals in the instrument board.

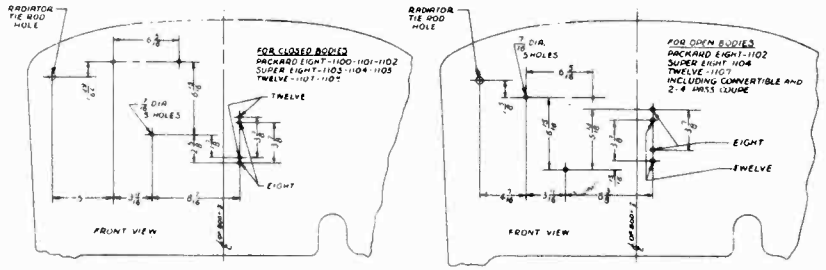
Control Shaft Installation

Remove the front cover plate from the receiver. Turn the left-hand knob (volume control) to a point where the key will lock it firmly in position. Insert this shaft and conduit into the left-hand receptacle on the front of receiver and tighten set screw. Next turn the dial to line up with the extra division below 150 and turn the condenser unit so the plates are completely out of mesh, at which point the screw in the brass coupler should be accessible. Next insert the tuning shaft and conduit in the right-hand receptacle on front of receiver, locking them in position with their respective set screws.

Battery Cable Location and Connections

Plug the cable into the receptacle at the front of the receiver and run the speaker cable over to that unit, plugging it in top. The "A" or two-wire cable should be run to the ammeter, keeping it as close to the instrument board as possible. Connect the hot wire (small closed terminal) to the discharge side of the ammeter and the shield (equipped with spade terminal) should be grounded under the lower clock clamp screw. Connect the black wire from the dial light on the control unit to the fahnestock terminal on the face of the receiver. The ground tab on the cable is fastened under a screw head on the receiver. The detachable part of the antenna lead-in should then be attached to the shielded wire that comes down through the right-hand pillar post after the latter has been cut to the proper dimension. Ordinarily the splice should be made fairly close to the pillar post, with one shield telescoping over the other and snugly conneted after the splice has been properly taped to prevent any likelihood of short circuits. The lead is then carried up over the glove box and down on the left-hand side, where it is attached to the receiver lead by means of the bayonet lock.

NOTE.—On bodies where the antenna lead-in has not been provided with a grounded shield, it will be necessary to remove the cowl trim panel, so the shield of the detachable antenna lead-in can be grounded as close to the pillar post as possible.



RADIO INSTALLATION DASH LAYOUT FOR PACKARD MODELS 1100-1101-1102-1103-1104-1105-1107-1108

DIAGRAM A

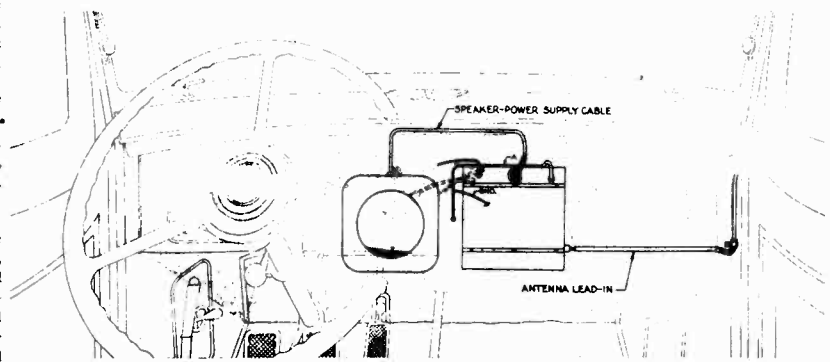


DIAGRAM B

Lining Up Receiver

As the tuning dial is calibrated in kilocycles, it may be necessary to line it up with the receiver, so stations may be tuned in at the proper point, this being accomplished as follows:

Set the tuning dial to line up with the extra division below 150 and insert a blunt-pointed wire or match through the small hole located at the back of the control unit. Next carefully press the tuning dial out of mesh with the gear, and while holding it so, turn the knob to the extreme counter-clockwise limit and release the tuning dial. It should now line up and can be checked by tuning in stations whose operating frequency is known.

Operating Instructions

The receiver is placed in operation by turning the left-hand knob on the control head in a clockwise position. After tubes have been warmed up, a minute or so, resonance will be indicated by a rushing sound, and any station within range can be tuned in by manipulating the right-hand knob, after which the volume is set to the desired level with the left.

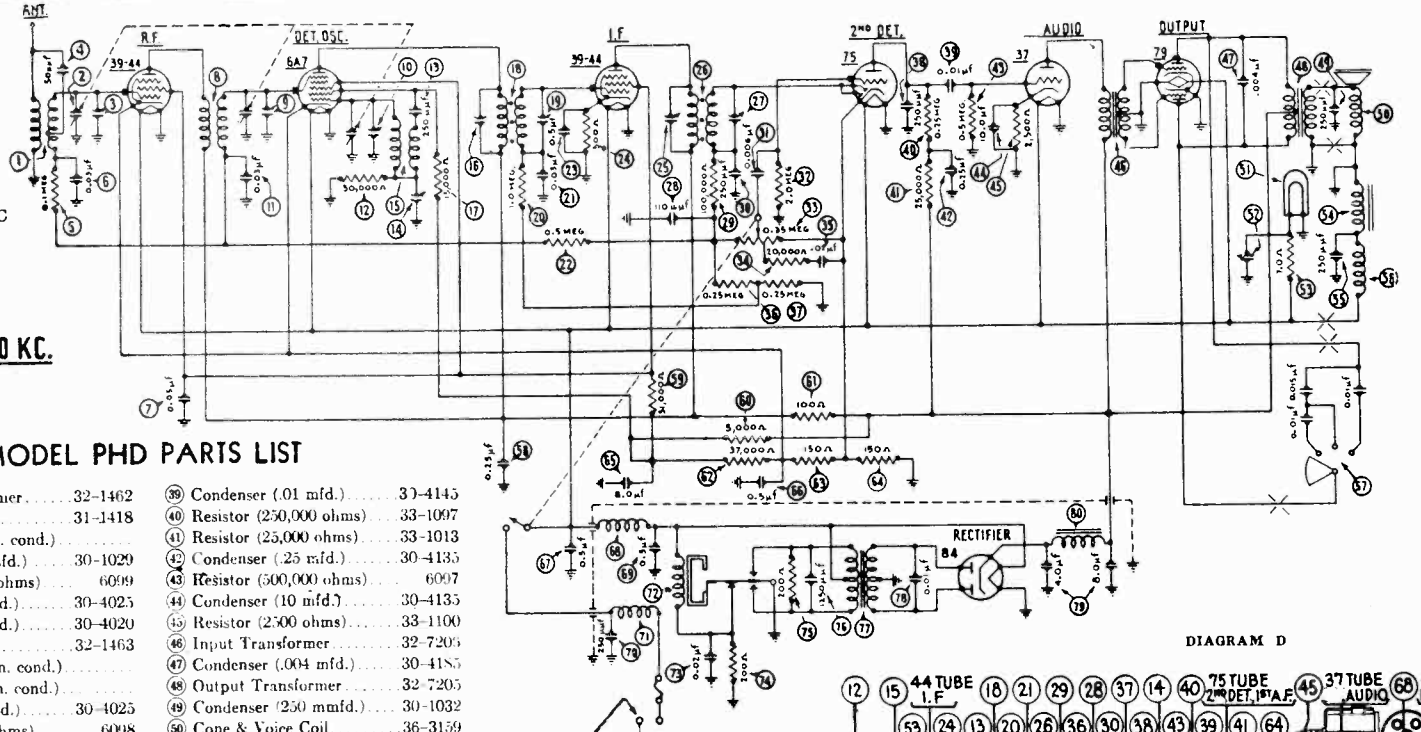
When operating in the immediate vicinity of a power line or car tracks, crackling or snapping noises are quite likely to be in evidence, due to leakage of high voltage to ground. This man-made static cannot be eliminated by any receiver, but its effects will be minimized if the dial is set to bring in the most powerful local station. Man-made as well as natural static is amplified along with the radio signal, and naturally the powerful local needs less amplification, thus enabling it to ride over unwanted noises.

When turning off the receiver be sure the left-hand knob is turned counter-clockwise until a definite click is heard, otherwise the receiver may continue to operate and run down the battery.

PHILCO RADIO & TELEV. CORP.

MODEL PHD Packard
Schematic, Chassis
Socket, Parts

DIAGRAM C



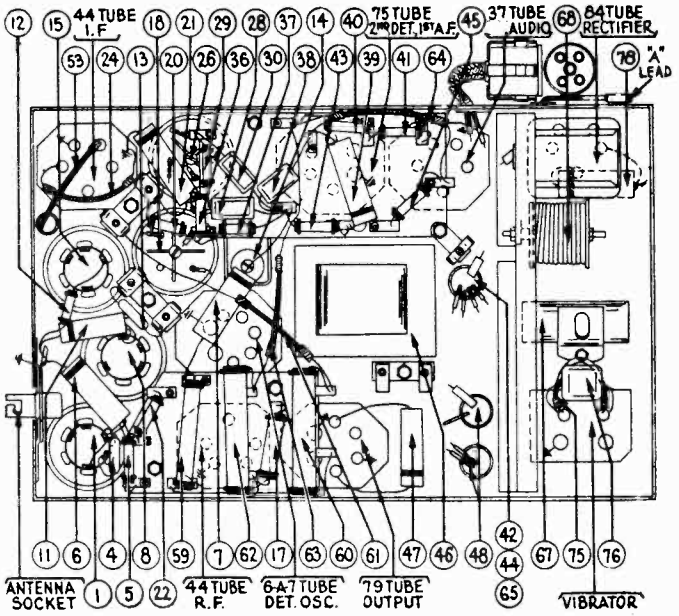
MODEL PHD PARTS LIST

(1)	Antenna Transformer	32-1462	
(2)	Tuning Condenser	31-1418	
(3)	1st Padder (in tun. cond.)		
(4)	Condenser (50 mmfd.)	30-1029	
(5)	Resistor (100,000 ohms)	6099	
(6)	Condenser (.03 mfd.)	30-4025	
(7)	Condenser (.05 mfd.)	30-4020	
(8)	R. F. Transformer	32-1463	
(9)	2nd Padder (in tun. cond.)		
(10)	3rd Padder (in tun. cond.)		
(11)	Condenser (.03 mfd.)	30-4025	
(12)	Resistor (50,000 ohms)	6098	
(13)	Condenser (250 mmfd.)	30-1032	
(14)	Padder	30-6012	
(15)	Oscillator Transformer	32-1222	
(16)	Padder (Pri. 1st I. F. Trans.)		
(17)	Resistor (15,000 ohms)	6208	
(18)	First I. F. Transformer	32-1471	
(19)	Padder (Sec. 1st I. F. Trans.)		
(20)	Resistor (1,000,000 ohms)	33-1096	
(21)	Condenser (.03 mfd.)	30-4025	
(22)	Resistor (500,000 ohms)	6097	
(23)	Condenser (.5 mfd.)	30-4078	
(24)	Resistor (500 ohms)	6977	
(25)	Padder (Pri. 2nd I. F. Trans.)		
(26)	Second I. F. Transformer	32-1449	
(27)	Padder (Sec. 2nd I. F. Trans.)		
(28)	Condenser (110 mmfd.)	30-1031	
(29)	Resistor (100,000 ohms)	6099	
(30)	Condenser (250 mmfd.)	30-1032	
(31)	Condenser (.006 mfd.)	30-4125	
(32)	Resistor (2,000,000 ohms)	33-1025	
(33)	Vol. Cont. & Sw. Assembly	38-6022	
(34)	Resistor (20,000 ohms)	33-1130	
(35)	Condenser (.02 mfd.)	30-4215	
(36)	Resistor (250,000 ohms)	33-1097	
(37)	Resistor (250,000 ohms)	33-1097	
(38)	Condenser (250 mmfd.)	30-1032	
(39)	Condenser (.01 mfd.)	30-4145	
(40)	Resistor (250,000 ohms)	33-1097	
(41)	Resistor (25,000 ohms)	33-1013	
(42)	Condenser (.25 mfd.)	30-4135	
(43)	Resistor (500,000 ohms)	6097	
(44)	Condenser (10 mfd.)	30-4135	
(45)	Resistor (2500 ohms)	33-1100	
(46)	Input Transformer	32-7205	
(47)	Condenser (.004 mfd.)	30-4185	
(48)	Output Transformer	32-7205	
(49)	Condenser (250 mmfd.)	30-1032	
(50)	Cone & Voice Coil	36-3159	
(51)	Pilot Lamp	34-2040	
(52)	Condenser (250 mmfd.)	30-1032	
(53)	Resistor (7 ohms)	33-3136	
(54)	Field Coil Assembly	02795	
(55)	Condenser (250 mmfd.)	30-1032	
(56)	Choke	32-1464	
(57)	Tone Control	30-4208	
(58)	Condenser (.25 mfd.)	30-4134	
(59)	Resistor (51,000 ohms)	4237	
(60)	Resistor (5000 ohms)	33-1070	
(61)	Resistor (100 ohms)	33-3023	
(62)	Resistor (37,000 ohms)	33-1098	
(63)	Resistor (150 ohms)	33-3045	
(64)	Resistor (150 ohms)	33-3045	
(65)	Condenser (8 mfd.)	30-4135	
(66)	Condenser (.5 mfd.)	30-4048	
(67)	Condenser (.5 mfd.)	30-4015	
(68)	Vibrator Choke	32-1474	
(69)	Condenser (.5 mfd.)	30-4047	
(70)	Condenser (250 mmfd.)	32-1466	
(71)	"A" Choke	32-1466	
(72)	Vibrator	38-5036	
(73)	Condenser (.02 mfd.)	30-4039	
(74)	Resistor (200 ohms)	7217	
(75)	Resistor (200 ohms)	7217	
(76)	Condenser (1250 mmfd.)	5886	

NOTE: OTHER SIDE OF "A" BATT. GROUNDED TO CASE (FRAME OF CAR)

(77)	Power Transformer	32-7098
(78)	Condenser (.01 mfd.)	30-4051
(79)	Filter Condenser (4-8 mfd.)	30-2015
(80)	"B" Choke	32-7104
	Dial	27-5022
	Antenna Lead	38-5131
	Mounting Studs	28-6231
	Mounting Nuts	W55A
	Spark Plug Resistor	33-1015E
	Distributor Resistor	4851E
	Interference Condenser	4522S
	Interference Condenser	30-4007
	Spark Plug Terminals	28-6053
	4 Hole Socket	27-6006
	5 Hole Socket	27-6014
	6 Hole Socket	27-6020
	7 Hole Socket	27-6005
	Knobs	27-4146
	Knob Springs	28-1738
	"A" Switch Assembly	38-6023
	"A" Switch	42-1080

DIAGRAM D



PHILCO RADIO & TELEV. CORP.

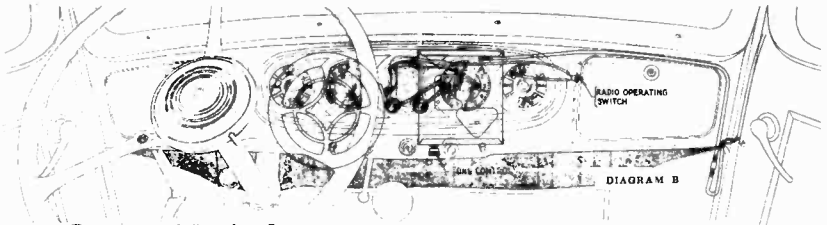


DIAGRAM B

Receiver and Speaker Location

Holes are provided in the dash for radio installation on all Twelfth Series Packard cars. These holes are plugged with snap buttons which can easily be removed with a screw driver. The inside dash liner is not punched and before making the installation corresponding holes should be cut through the cardboard dash liner with a knife.

For dash drilling information on cars previous to Twelfth Series, refer to the diagram "A", showing location of the holes to be drilled. Locate one of the receiver stud holes and mark with a sharp punch; then use the template furnished to locate the remaining two holes. Use this same procedure for the speaker, drilling with 7/16 drill. On Packard Twelve models you may find it difficult to locate and drill the speaker holes from the motor side of the dash and, if so, this work can be done from the body side, providing care is taken to avoid cutting the vacuum and oil lines.

On Packard Eight models the Receiver must be spaced out enough to allow the speedometer cable to pass behind it. This can be accomplished by placing two or three flat washers on the lower mounting stud before bolting in place, using the larger washer furnished, next to the insulating material. The felt baffle should be mounted on the studs between the speaker and dash. On twelve cylinder cars previous to Twelfth Series it is necessary to cut away a portion of the speaker rim to provide clearance for the vacuum connection on the dash.

Control Unit

On Eleventh and Twelfth Series cars, where provision has been made to mount the control unit in the instrument panel, a finish plate is used to fill the opening. Remove this plate by loosening the hold-down clamps at the rear of the instrument panel. The radio control unit can then be put in place (using the gasket provided for the plate) and secured by the same fastening clamps.

When no provision has been made to mount the control unit in the instrument panel, it should be located on the steering column, either at the right side of the post or in a vertical position directly above it. A generally satisfactory location is to the right, approximately six inches below the steering wheel hub. Cut off the metal strap to the proper length and mount bracket, using the long machine screw with one turn of friction tape between column and strap. Mount control unit on bracket in a vertical position.

The radio control locking switch on the Twelfth Series Receiver should be located in the right glove compartment, a hole for which is located in the wall of the compartment near the door. This provides a means of locking the radio when the occasion demands.

NOTE: As the shape of the instrument panel control units vary between Eleventh and Twelfth Series models, it is desirable to supply the proper control head for the car on which the installation is made. The Packard Motor Car Company can supply control units with the proper length control cables for Eleventh Series panel installations as well as previous models where the steering column control unit is required.

Control Shaft Installation

The tuning control knob is on the right of the control panel — the combination switch and volume control knob is on the left. The flexible control shafts are coupled to the short shafts in the control panel on which the knobs are placed.

Insert the flexible control cables into the proper shaft housing bracket on the Receiver. Turn the knobs until the slotted male coupling on the shaft is seated in the female coupling in the Receiver so that the pin in the female end is fully engaged in the slotted male end.

Tighten the shaft housing fastening nuts which hold the control cables in place on the Receiver.

IMPORTANT: Be sure the controls are attached to the proper couplings on the Receiver. The volume control shaft operated by left knob engages with the coupling nearest the Receiver and to the left.

On installing the control shafts on non-current models, where a special control head is used provided with a lock, insert the cables in their proper position in the Receiver as outlined above.

Remove the left-hand knob and loosen the set screw in the knob shaft. Turn this shaft to a point where the key will lock it firmly in position and retighten the set screw.

Battery Cable Location and Connections

(SEE DIAGRAM "B")

The "A" or two-wire cable should be run over the top of the set to the ammeter. NOTE: On Twelfth Series installations this lead is provided with a switch to be mounted in the wall of the right glove compartment with the control accessible from the inside.

Connect the feed wire (small eyelet terminal) to the discharge side of the ammeter. Connect the black wire from the dial light on the control unit to the small jack terminal on the end of the Receiver.

The speaker cable must then be plugged into the receptacle on the speaker. The antenna lead-in should be plugged into the Receiver, the cable being carried over the set and right glove compartment. This lead-in should be spliced to the antenna lead-in which will be found coiled and taped back of the cowl trim panel. Any excess lead should be cut off, using just enough lead-in to make a neat installation. The lead-in provided with the Receiver is equipped with a shield which should be wrapped around the antenna lead-in shield and carefully taped.

The radio fuse is located in the "A" cable in a small tubular housing and is very plainly marked.

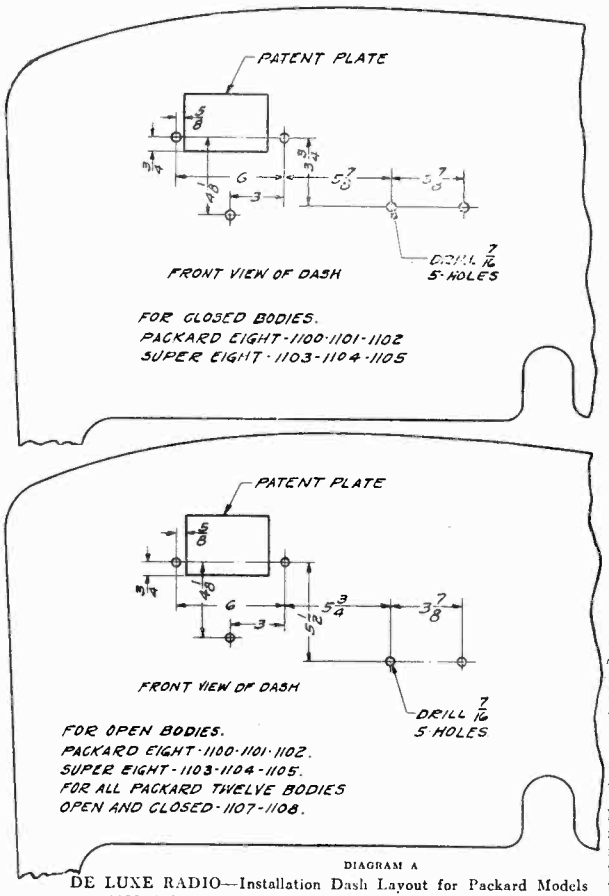


DIAGRAM A

DE LUXE RADIO—Installation Dash Layout for Packard Models 1100, 1101, 1102, 1103, 1105, 1107, 1108

On the twelve-cylinder cars, provision has been made to mount a condenser on the coil bracket, using the right front coil mounting screw as a means of attachment. The condenser can be installed by passing the condenser lead through the hole provided in the coil bracket and attaching to the terminal on the lower side of the coil to which a brass strip is fastened. Replace the unit and tighten nuts, making certain that the condenser case is grounded through the enamel. Locate the second condenser under outside generator relay mounting screw and connect the lead to the battery terminal of relay.

On eight-cylinder cars it will generally be best to locate the first condenser under the lower instrument light housing screw with the wire fastened to the ammeter side of the ignition switch.

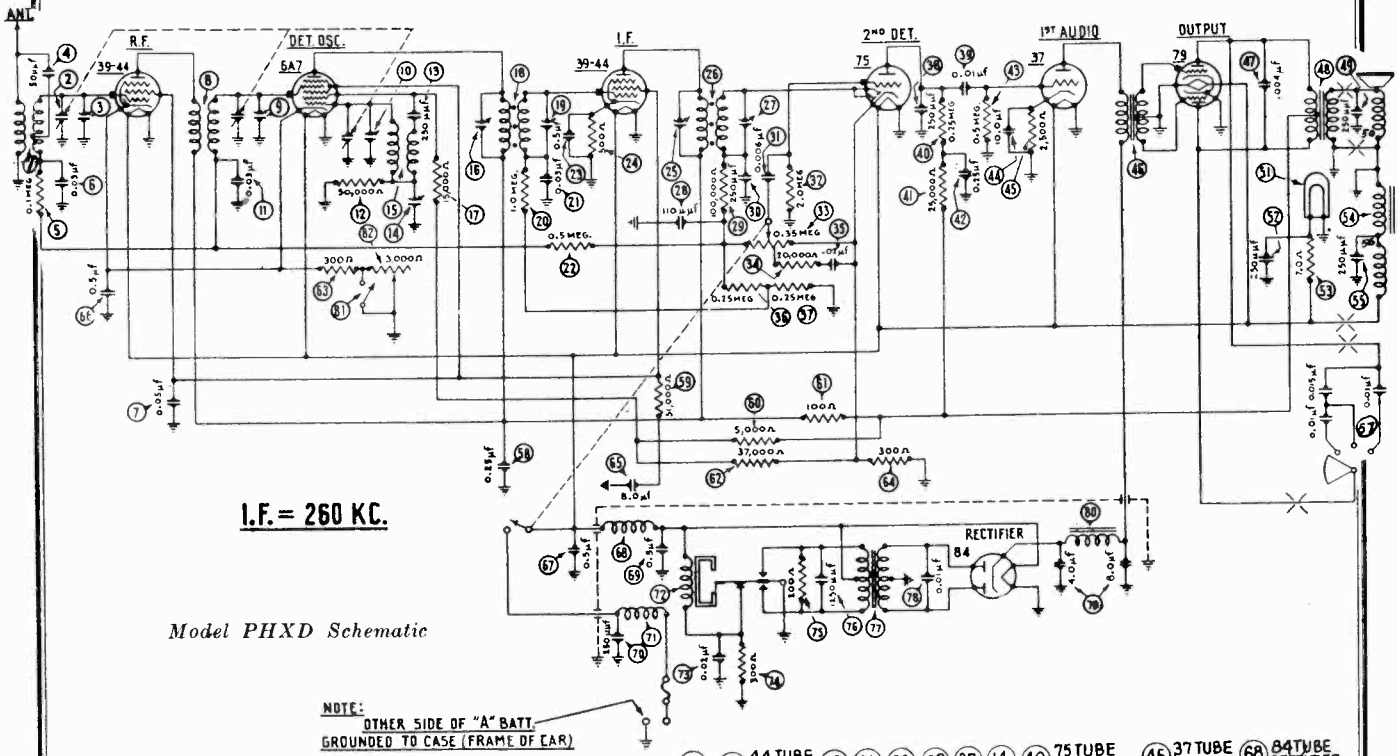
The generator condenser is then mounted as previously described.

All Twelfth Series, twelve-cylinder cars are equipped with resistors as standard equipment, it being only necessary to install the two coil wire resistors provided with the set. On eight-cylinder models and non-current models, cut off the spark plug terminals from the high tension wires and screw on the resistor units, after which the small round nuts (furnished with the set) can be screwed onto the spark plugs and the resistors snapped in place. Cut distributor to coil high tension wires about one inch from distributor head and insert "screw in" type distributor resistors. When the rest of the installation is carefully made, the resistors will sometimes be unnecessary between the coil and distributor. In all cases, however, the spark plug gap should be increased from the standard .025" to .030".

To check for ignition interference, disconnect the antenna lead-in from the set. Turn on Receiver and start the engine. If there is any noise coming through the speaker from the electrical system of the car when the volume control is about three-fourths open and the dial set between stations, carefully relocate speaker and battery cables to a point where the noise is reduced to a minimum. If relocation of these cables does not practically eliminate the ignition disturbances, it will then be advisable to peen the distributor arm.

PHILCO RADIO & TELEV. CORP.

MODEL PHXD Packard
Schematic, Chassis
Parts List



Model PHXD Schematic

MODEL PHXD PARTS LIST

No.	Description	Part No.
(1)	Antenna Transformer	32-1462
(2)	Tuning Condenser	31-1418
(3)	First Padder (on tun. cond.)	
(4)	Condenser (50 mmfd.)	30-1029
(5)	Resistor (100,000 ohms)	6099
(6)	Condenser (.03 mfd.)	30-4025
(7)	Condenser (.05 mfd.)	30-4020
(8)	R. F. Transformer	32-1463
(9)	Second Padder (on tun. cond.)	
(10)	Third Padder (on tun. cond.)	
(11)	Condenser (.03 mfd.)	30-4025
(12)	Resistor (50,000 ohms)	6098
(13)	Condenser (250 mmfd.)	30-1032
(14)	Padder	31-6012
(15)	Oscillator Transformer	32-1222
(16)	Padder (Pri. 1st I. F. Trans.)	
(17)	Resistor (15,000 ohms)	6208
(18)	First I. F. Transformer	32-1471
(19)	Padder (Sec. 1st I. F. Trans.)	
(20)	Resistor (1,000,000 ohms)	33-1096
(21)	Condenser (.03 mfd.)	30-4025
(22)	Resistor (500,000 ohms)	6097
(23)	Condenser (.5 mfd.)	30-4058
(24)	Resistor (500 ohms)	6077
(25)	Padder (Pri. 2nd I. F. Trans.)	
(26)	Second I. F. Transformer	32-1495
(27)	Padder (Sec. 2nd I. F. Trans.)	
(28)	Condenser (110 mmfd.)	30-1031
(29)	Resistor (100,000 ohms)	6099
(30)	Condenser (250 mmfd.)	30-1032
(31)	Condenser (.006 mfd.)	30-4125
(32)	Resistor (2,000,000 ohms)	33-1025
(33)	Vol. Cont. & Sw. Assembly	38-6022
(34)	Resistor (20,000 ohms)	33-1130
(35)	Condenser (.02 mfd.)	30-4215
(36)	Resistor (250,000 ohms)	33-1097
(37)	Resistor (250,000 ohms)	33-1097
(38)	Condenser (250 mmfd.)	30-1032
(39)	Condenser (.01 mfd.)	30-4145
(40)	Resistor (250,000 ohms)	33-1097
(41)	Resistor (25,000 ohms)	33-1013
(42)	Condenser (.25 mfd.)	30-4135
(43)	Resistor (500,000 ohms)	6097
(44)	Condenser (.10 mfd.)	30-4135
(45)	Resistor (2500 ohms)	33-1100
	Input Transformers	32-7206
	Condenser (.004 mfd.)	30-4185
	Output Transformer	32-7205
	Condenser (250 mmfd.)	30-1032
	Cone & Voice Coil	36-3159
	Pilot Lamp	34-2040
	Condenser (250 mmfd.)	30-1032
	Resistor (. ohms)	33-3130
	Field Coil Assembly	02795
	Condenser (250 mmfd.)	30-1032
	Choke	32-1464
	Tone Control	30-4208
	Condenser (.25 mfd.)	30-4134
	Resistor (51,000 ohms)	4237
	Resistor (5000 ohms)	33-1070
	Resistor (100 ohms)	33-3023
	Resistor (37,000 ohms)	33-1098
	Resistor (300 ohms)	33-3121
	Resistor (300 ohms)	33-3121
	Condenser (8 mfd.)	30-4135
	Condenser (.5 mfd.)	30-4048
	Condenser (.5 mfd.)	30-4015
	Vibrator Choke	32-1474
	Condenser (.5 mfd.)	30-4210
	Interference Filter	32-1466
	Interference Filter	32-1466
	Vibrator	38-5036
	Condenser (.02 mfd.)	30-4039
	Resistor (300 ohms)	33-3010
	Resistor (200 ohms)	7217
	Condenser (1250 mmfd.)	5886
	Power Transformer	32-7098
	Condenser (.01 mfd.)	30-4051

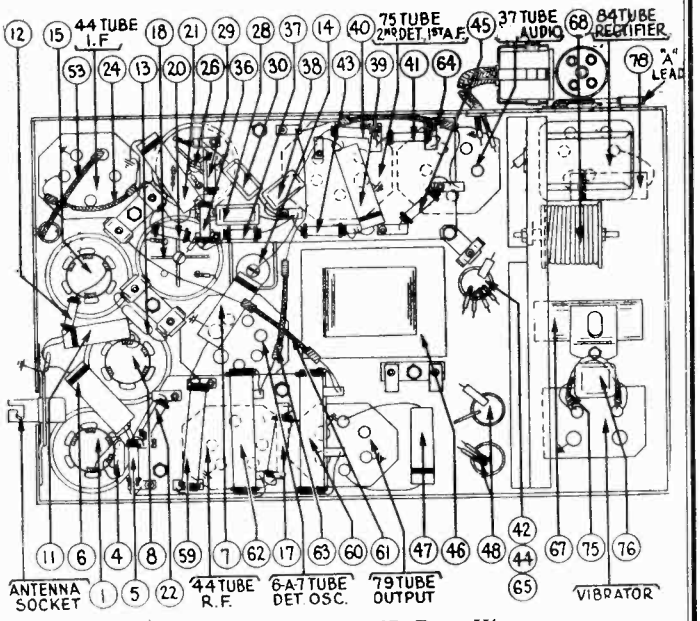


FIGURE 2 — *Model PHXD Base View*

No.	Description	Part No.
(79)	Filter Condenser (4-8 mfd.)	30-2015
(80)	"B" Choke	32-7104
(81)	Sensitivity Control Switch	42-1140
(82)	Sensitivity Control	33-5130
	Dial	27-5070
	Antenna Lead	38-5131
	Mounting Studs	28-6231
	Mounting Nuts	W55A
	Spark Plug Resistor	23-1015E
	Distributor Resistor	4851E
	Interference Condenser	4522S
	Interference Condenser	30-4007

Description	Part No.
Spark Plug Terminals	28-6053
4 Hole Socket	27-6006
5 Hole Socket	27-6014
6 Hole Socket	27-6020
7 Hole Socket	27-6005
Knobs	27-4146
Knob Springs	28-1738
"A" Cable and Switch Assembly	38-6023
"A" Switch	42-1080
Flexible Shaft (Tun.)	28-8268
Flexible Shaft (Vol.)	28-8269
Receiver Housing	29-2285

Note: A choke, Part Number 32-1374 has been added. This is connected in series between Pilot Lamp (51) and Condenser (52) and Resistor (58).

MODEL PHXD Packard
Socket, Trimmers
Alignment

PHILCO RADIO & TELEV. CORP.

I. F. Transformers and Padders
Model PHXD

The I. F. transformers are assembled complete with padding condensers.

The padders are placed in the top of the shield can, one above the other.

The primary padder is adjusted by means of the screw slot, accessible through the hole in the top of the shield can. The secondary padder is adjusted by means of the small hex nut, also accessible through the hole in the top of the shield. (See Figure 8).

The coil windings terminate in leads instead of terminals or lugs. The color scheme of the leads is given in Figure 7.

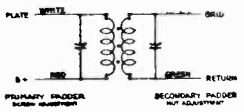


FIGURE 7

If replacements are ever necessary, replace the entire coil assembly, 32-1471 for the first I. F. stage and 32-1449 for the second I. F. stage. Neither the coil nor the padders will be furnished separately. Order only by the above numbers.

Model PHXD Adjustments

All padding adjustments are carefully made at the factory and ordinarily no readjustments are necessary. However, when readjustments to the Model PHXD are required, the procedure given below must be followed in detail.

Equipment

Full charged heavy duty storage battery or 6-volt power pack, 048 Philco Set Tester, 3164 Padding Wrench, 27-7159 Padding Screw Driver.

General

OUTPUT METER — The output meter must be connected by means of an adapter to one of the plates of the type 79 output tube and to the Receiver chassis.

SIGNAL GENERATOR — With the Receiver and signal generator set up for operation at the prescribed frequency, turn the Receiver volume control on full and set the signal generator attenuator so that a half scale reading is obtained on the output meter. The signal in the speaker should be audible but not loud.

The shielding on the signal generator output lead must be connected to the Receiver housing.

The sensitivity switch must be in the "distance" position. The tone control should be turned to the brilliant position.

Remove the cover from the Receiver. The antenna lead must be disconnected.

I. F.—Adjust the signal generator to exactly 260 K. C. Connect the generator lead to the grid cap of the 39-44 I. F. tube, in series with a .1 mfd. condenser.

Adjust the secondary nut padder ㉗ on the second I. F. transformer for maximum reading on the output meter. Then adjust the primary screw padder ㉕ for maximum reading. (See Figure 8 for location of padders). Note the maximum reading obtained and then turn the screw in again and readjust, just bringing the adjustment up to the maximum reading. Do not pass it and then back off. This adjustment is critical.

Remove the generator lead from the 39-44 tube.

Connect the generator lead to the grid cap of the 6A7 tube in series with a .1 mfd. condenser. Adjust the secondary nut padder ⑲ on the first I. F. transformer for maximum reading on the output meter. Then adjust the primary screw padder ⑯ for maximum reading. (See Figure 8 for location of padders). Note the maximum reading obtained and then turn the screw in again and readjust, just bringing the adjustment up to the maximum reading. Do not pass it and then back off. This adjustment is critical.

HIGH FREQUENCY AND R. F. — After padding the first I. F. stage remove the generator lead from the 6A7 tube. Adjust the signal generator to 1500 K. C., and then connect the generator lead to the grid cap of the 39-44 R. F. tube in series with a .1 mfd. condenser.

Using a piece of paper approximately .006" thick as a gauge between the heel of the rotor plates and the stator plates, turn the rotor plates until they strike against the paper. With the tuning condenser in this position, adjust the high frequency padder ⑩ and the R. F. padder ⑨ until the maximum reading is obtained on the output meter. This is the true setting for the 1500 K. C., 150 on the dial scale.

LOW FREQUENCY—Turn the tuning condenser plates in mesh to approximately 580 K. C., 58 on the dial scale and adjust the signal generator to 580 K. C. Roll the tuning condenser and adjust the low frequency padder ⑭ for maximum reading on the output meter.

HIGH FREQUENCY READJUSTMENT—Next turn the tuning condenser plates out of mesh to 1500 K. C., 150 on the dial scale, and adjust the signal generator to 1500 K. C. Then adjust the high frequency padder ⑩ for maximum reading on the output meter.

ANTENNA AND R. F.—Connect the generator lead to the antenna lead using a 200 mmfd. condenser in series between the two leads and the .1 mfd. condenser. Turn the tuning condenser to 1400 K. C., and set the generator for 1400 K. C. Adjust the padders ⑨ and ③ for maximum reading on the output meter.

If this procedure has been carefully followed and an accurately calibrated oscillator or signal generator has been used, the Receiver will be adjusted properly.

NOTE: When the antenna stage adjustment is made with the Receiver installed in the car, the Receiver antenna lead must be connected to the car antenna in the usual manner. The signal generator output lead should be connected to a wire placed near the car antenna but not connected to it.

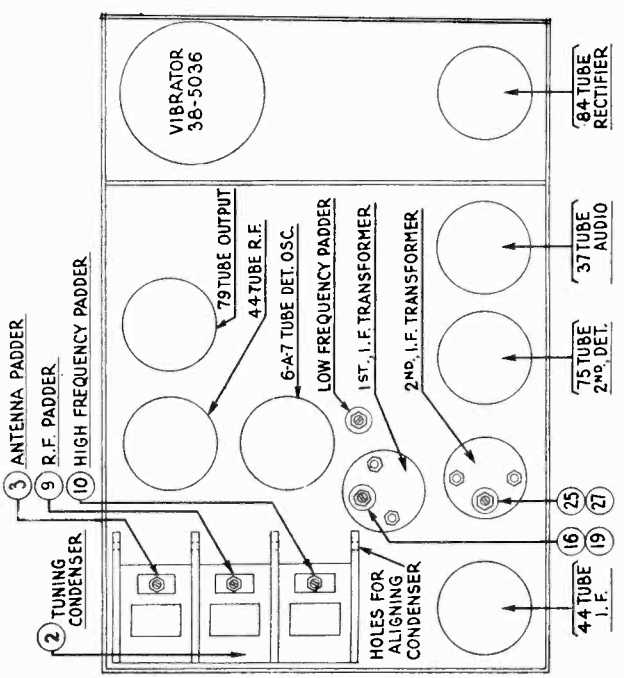


FIGURE 8 — *Model PHXD—Top View*

MODEL PT-5 Packard
Model 120 Cars
Schematic, Socket, Chassis
Parts List

PHILCO RADIO & TELEV. CORP.

MODEL CT-5 Chrysler
Codes C1, C2 & C3

FIGURE 2

FIGURE 3

For Installation Data, see Index

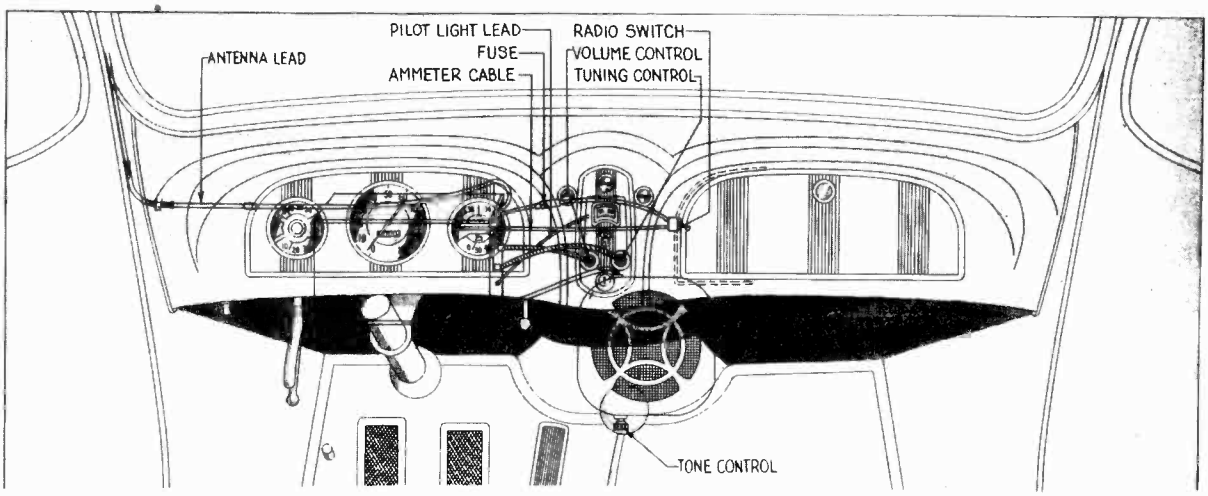
Parts List - PT-5 Packard De Luxe Custom Built Radio Model 120

(1) Antenna Transformer	32-1535	(37) Resistor (5,000 ohms)	6096	(62) Condenser (.03 mfd.)	30-4025
(2) Condenser (50 mmfd.)	30-1029	(38) Condenser (10-10 mfd.)	30-2076	(63) Power Transformer	32-7315
(3) Resistor (70,000 ohms)	33-1115	(39) Condenser (250 mmfd.)	30-1032	(64) Resistor (32,000 ohms)	3525
(4) Condenser (.03 mfd.)	30-4025	(40) Condenser (.1 mfd.)	30-4170	(65) Condenser (.01 mfd.)	30-4051
*(5) Tuning Condenser	31-1425	(41) Resistor (50,000 ohms)	6098	(66) Condenser (110 mmfd.)	30-1031
*(6) 1st Padder (on tun. cond.)		(42) Resistor (.1 meg.)	6099	(67) Filter Cond. (4-8 mfd.)	30-2107
(7) Condenser (.05 mfd.)	30-4020	(43) Condenser (6000 mmfd.)	30-4125	(68) "B" Choke	32-7254
(8) Resistor (1500 ohms)	33-3047	(44) Resistor (.5 meg.)	6097	(69) Condenser (.15 mfd.)	30-4191
(9) R. F. Transformer	32-1536	(45) Resistor (500 ohms)	33-3031	(70) R. F. Choke	32-1530
*(10) 2nd Padder (on tun. cond.)		(46) Condenser (4000 mmfd.)	30-4185	(71) Condenser (250 mmfd.)	30-1032
(11) Resistor (11,000 ohms)	33-1194	(47) Output Transformer	2598	(72) Resister (7 ohms)	33-3130
(12) Condenser (1000 mmfd.)	30-1007	(48) Cone & Voice Coil	36-3159	*Ground Clip	28-2488
(13) Padder (Pri. 1st I. F. Tran.)		(49) Tone Control	30-4127	Spark Plug Resistor	33-1015
(14) Oscillator Transformer	32-1537	(50) Field Coil Assembly	02795	Distributor Resistor	4851
*(15) 3rd Padder (on tun. cond.)		(51) Pilot Lamp	34-2040	Interference Cond. (1 mfd.)	4522
*(16) 4th Padder (on tun. cond.)		(52) Choke	32-1374	InterferenceCond. (½mfd.)	30-4007
(17) First I. F. Transformer	32-1538	(53) Condenser (250 mmfd.)	30-1032	*"T" Bolt (Set Mtg.)	28-6268
(18) Padder (Sec. 1st I. F. Tran.)		(54) "A" Choke	32-1374	*Nut (Set Mtg.)	W518A
(19) Condenser (.03 mfd.)	30-4025	(55) Interference Filter	32-1534	Fuse	7227
(20) Oscillator Transformer	32-1537	(56) Vibrator Choke	32-1563	Fuse Insulator	27-7729
*(21) 3rd Padder (on tun. cond.)		(57) Condenser (.5 mfd.)	30-4015	*Antenna Lead	38-5131
*(22) 4th Padder (on tun. cond.)		(58) Vibrator	38-5096	*"A" Lead	38-6468
(23) Second I. F. Transformer	32-1449	(59) Condenser (.02 mfd.)	30-4039		
(24) Padder (Sec. 2nd I. F. Tran.)		(60) Resistor (200 ohms)	7217		
(25) Condenser (250 mmfd.)	30-1032	(61) Resistor (200 ohms)	7217		
(26) Resistor (25,000 ohms)	33-1161				
(27) Vol. Co., & Switch Assm.	33-5088				
(28) Condenser (.03 mfd.)	30-4025				
(29) Condenser (.05 mfd.)	30-4020				
(30) Resistor (20,000 ohms)	33-1130				
(31) Condenser (110 mmfd.)	30-1031				
(32) Resistor (190,000 ohms)	33-1116				
(33) Condenser (.25-.25 mfd.)	30-4231				
(34) Resistor (32,000 ohms)	3525				
(35) Resistor (51,000 ohms)	5868				

MODEL PT-5 Packard
Model 120 Cars
Installation Data

PHILCO RADIO & TELEV. CORP.

PACKARD CUSTOM CAR RADIO - - MODEL 120 GENERAL INSTALLATION INSTRUCTIONS



Receiver and Speaker Location

(SEE FIGURE 1)

Holes are provided in the dash for radio installation in all model 120 Packard cars. These holes are plugged with snap buttons which can be removed easily with a screw driver. The inside dash liner is not punched, so before making the installation, corresponding holes should be cut or drilled through the cardboard dash liner. Two T bolts are used to fasten the Receiver in place.

Install the Receiver above the steering column. Screw the two studs into the back of the speaker and locate it near the center of the dash, a few inches above the top of the toe boards, with the tone control down. NOTE: After the Receiver has been securely fastened in place be sure to dress the speedometer cable, avoiding all sharp bends.

Control Unit

On Model 120 cars, provision has been made to install the control unit in the ash receptacle opening. Remove the ash receptacle and cut the upper and lower wire hinges. This permits the removal of the wire hinge as well as the upper ash receptacle cover. Fasten the radio control unit in place, using the starter button and ignition switch fastening studs.

The black dial light lead coming from the rear of the control must be connected to the small jack terminal in the end of the Receiver housing.

Control Shafts

The flexible shaft on the left of the control is the volume control shaft and must be coupled in the shaft bushing nearest the dash, on the end of the Receiver housing. After the shaft has been properly seated, the knurled casing nut must be securely tightened.

Next couple the tuning control flexible shaft in the proper coupling on the Receiver and tighten the casing nut.

Cable Connections

There is a hole in the wall of the right glove compartment for installing the radio control locking switch. After installing the switch, place the "A" fuse and insulator in the fuse housing and connect it to the Receiver "A" lead. Connect the eyelet terminal of the lead to the discharge side of the ammeter. Locking the compartment provides a means of locking the radio when the occasion demands.

Connect the speaker cable plug in the receptacle on the side of the speaker housing.

The antenna lead must be spliced to the car antenna lead-in as close to the corner post as possible. All excess lead-in must be cut off and the splice taped. The shield pigtail must be wrapped around the lead-in shielding and carefully taped. Connect the antenna lead in its receptacle on the end of the Receiver housing.

Generator and Motor Interference Suppression

Cut the distributor-to-coil high tension lead about two inches from the distributor cap and insert the screw-in type resistor in the lead.

Using a piece of emery cloth, clean the speedometer and ignition coil cable at the dash where it enters the motor compartment. Solder the end of the braided strap to the oil pressure gauge line tubing and wind the braided strap tightly around each of the tubes and cables coming through the dash at this point. The braid must then be soldered to pressure gauge tubing again and the eyelet in the braided strap grounded to the dash. The toe board-to-dash fastening screw, directly above the point where these cables come through the dash, furnishes a convenient place to ground the braid

PHILCO RADIO & TELEV. CORP.

MODEL PT-14 Packard
Schematic, Chassis
Parts List

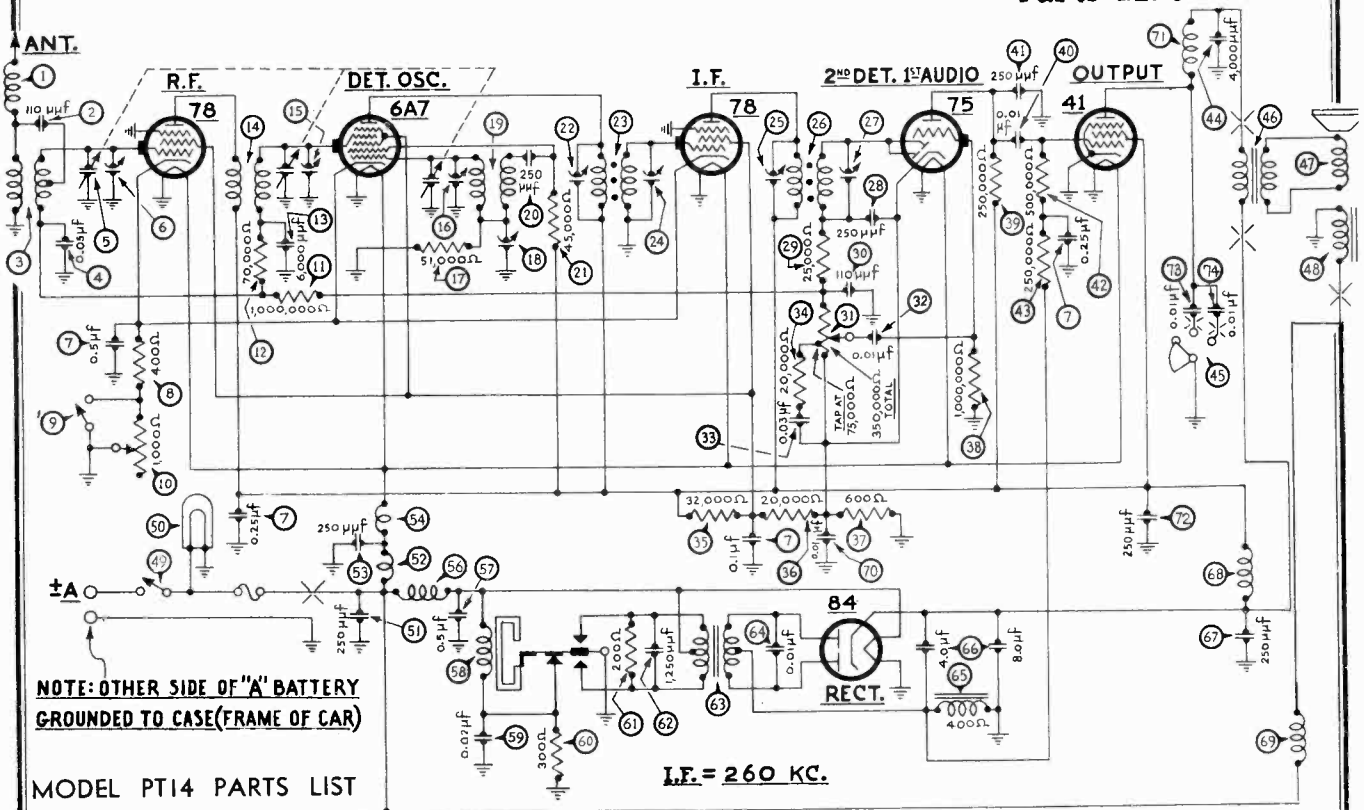


FIGURE 3 — *Model PT14 Schematic*

MODEL PT14 PARTS LIST

No.	Description	Part No.
(1)	Antenna Choke	38-7210
(2)	Condenser (110 mmfd.)	30-1031
(3)	Antenna Transformer	32-1934
(4)	Condenser (.05 mfd.)	30-4020
(5)	Tuning Condenser	31-1674
(A)	First padder (on tun. cond.)	45
(7)	Condenser (.1-.25-.25-.5 mfd.)	30-4375
(8)	Resistor (400 ohms)	33-1211
(9)	Sensitivity Control Switch	42-1140
(10)	Sensitivity Control	33-5129
(11)	Resistor (1,000,000 ohms)	33-1096
(12)	Resistor (70,000 ohms)	33 1115
(13)	Condenser (6000 mmfd.)	30-4125
(14)	R. F. Transformer	32-1926
(15)	Second Padder (on tun. cond.)	
(16)	Third Padder (on tun. cond.)	48
(17)	Resistor (51,000 ohms)	6098
(18)	Low Frequency Padder	31-6066
(19)	Oscillator Transformer	32-1927
(20)	Condenser (250 mmfd.)	30-1032
(21)	Resistor (45,000 ohms)	5256
(22)	Padder (Pri. 1st I. F. Trans.)	
(23)	First I. F. Transformer	32-1928
(24)	Padder (Sec. 1st. I. F. Trans.)	
(25)	Padder (Pri. 2nd I. F. Trans.)	
(26)	Second I. F. Transformer	32-1929
(27)	Padder (Sec. 2nd I. F. Trans.)	
(28)	Condenser (250 mmfd.)	30-1032
(29)	Resistor (25,000 ohms)	33-1013
(30)	Condenser (110 mmfd.)	30-1031
(31)	Volume Control (350,000 ohms)	33-5121
(32)	Condenser (.01 mfd.)	30-4124
(33)	Condenser (.03 mfd.)	30-4025
(34)	Resistor (20,000 ohms)	33-1178
(35)	Resistor (32,000 ohms)	3525
(36)	Resistor (20,000 ohms)	5649
(37)	Resistor (600 ohms)	33-1212
(38)	Resistor (1,000,000 ohms)	33-1096
(39)	Resistor (250,000 ohms)	33-1097
(40)	Condenser (.01 mfd.)	30-4145
(41)	Condenser (250 mfd.)	30-1032
(42)	Resistor (500,000 ohms)	6097
(43)	Resistor (250,000 ohms)	33-1097
(44)	Condenser (4000 mmfd.)	30-4185
(45)	Tone Control Switch	42-1139
(46)	Output Transformer (Dash) Speaker)	2598
(46)	Output Transformer (Header Bar Speaker)	32-7507
(47)	Cone and Voice Coil (Dash) Speaker)	36-3159
(47)	Cone & Voice Coil (Header Bar Speaker)	36-3526
(48)	Field Coil Assembly (Dash) Speaker)	02795
(48)	Field Coil Assembly (Header Bar Speaker)	32-9236
(49)	On and Off Switch	42-5362
(50)	Pilot Lamp	34-2040
(51)	Condenser (250 mmfd.)	30-1032
(52)	"A" Choke	32-1644
(53)	Condenser (250 mmfd.)	30-1032
(54)	Choke	32-1930
(55)	Condenser (.5 mfd.)	30-4047
(56)	Vibrator Choke	32-1933
(57)	Condenser (.5 mfd.)	30-4047
(58)	Vibrator	38-5036
(59)	Condenser (.02 mfd.)	30-4039
(60)	Resistor (300 ohms)	33-3130
(61)	Resistor (200 ohms)	33-1210
(62)	Condenser (1250 mfd.)	5886
(63)	Power Transformer	32-7488
(64)	Condenser (.01 mfd.)	30-4381
(65)	Filter Choke	32-7491
(66)	Filter Condenser 4-8 mfd.)	30-2134
(67)	Condenser (250 mmfd.)	30-1032
(68)	R. F. Choke	32-1932
(69)	"A" Choke	32-1464
(70)	Condenser (.01 mfd.)	30-4124
(71)	Choke	32-1382
(72)	Condenser (250 mmfd.)	30-1032
(73)	Condenser (.01 mfd.)	30-4051
(74)	Condenser (.01 mfd.)	30-4051

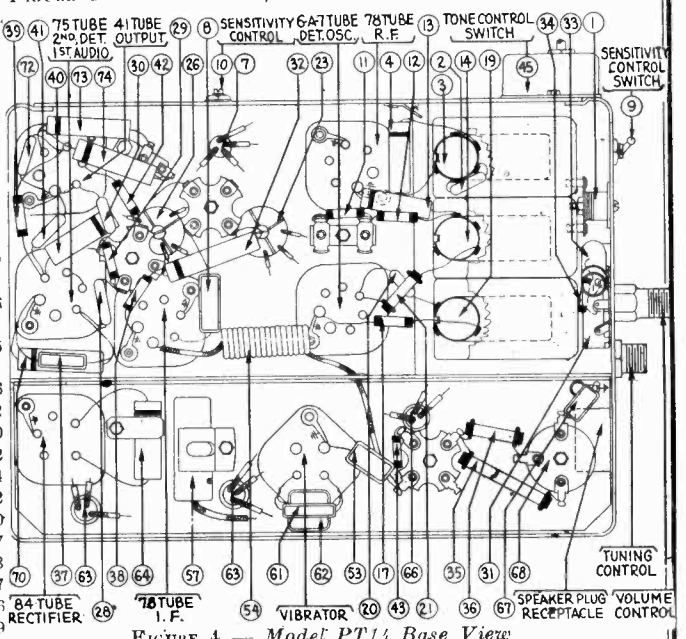


FIGURE 4 — *Model PT14 Base View*

MODEL PT-14 Packard
Alignment, Socket
Trimmers

PHILCO RADIO & TELEV. CORP.

I. F. Transformers and Padders

Model PT14

The I. F. transformers are assembled complete with padding condensers.

Both the primary and the secondary padders are placed side by side in the top of the transformer shield can. The adjusting screws are accessible thru the holes in the top of the shield. (See Fig. 6).

The coil windings terminate in leads instead of terminals or lugs. The color scheme of the leads is given in Fig. 5.

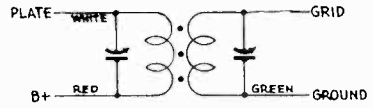


FIGURE 5

If replacements are ever necessary, replace the entire coil assembly, 32-1928 for the first I. F. stage and 32-1929 for the second I. F. stage. Neither the coil nor the padders will be furnished separately. Order only by the above numbers.

Model PT14 Adjustments

All padding adjustments are carefully made at the factory and ordinarily no readjustments are necessary. However, when readjustments to the Model PT14 are required, the procedure given below must be followed in detail.

Equipment

Fully charged heavy duty storage battery or 6-volt power pack, 048A Philco Set Tester, 3164 Padding wrench, 27-7159 Padding screw driver.

General

OUTPUT METER — The output meter must be connected by means of an adapter to the plate of the type 41 output tube and to the Receiver chassis.

SIGNAL GENERATOR — With the Receiver and signal generator set up for operation at the prescribed frequency, turn the Receiver volume control on full and set the signal generator attenuator so that a half scale reading is obtained on the output meter. The signal in the speaker should be audible but not loud.

The shielding on the signal generator output lead must be connected to the Receiver housing.

The sensitivity switch must be in the "distance" position. The tone control should be turned to the brilliant position.

Remove the cover from the Receiver. The antenna lead must be disconnected.

I. F. — Adjust the signal generator to exactly 260 K. C. Connect the generator lead to the grid cap of the 78 I. F. tube in series with a .1 mfd. condenser.

Adjust the secondary screw padder ㉗ on the second I. F transformer for maximum reading on the output meter. Then adjust the primary screw padder ㉕ for maximum reading (See Fig. 6 for location of padders).

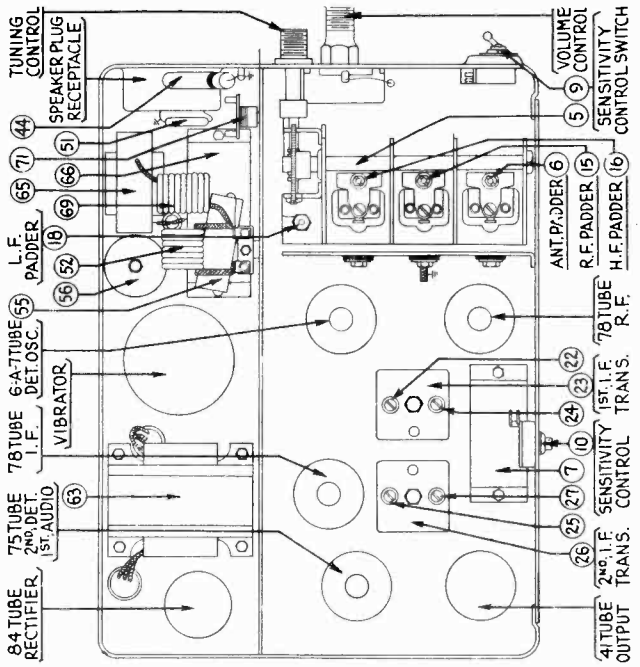
Remove the generator lead from the 78 tube.

Connect the generator lead to the grid cap of the 6A7 tube in series with a .1 mfd. condenser. Adjust the secondary screw padder ㉔ on the first I. F. transformer for maximum reading on the output meter. Then adjust the primary screw padder ㉒ for maximum reading. (See Figure 6 for location of padders).

ANTENNA — Connect the generator lead to the antenna lead using a 230 mmfd. condenser in series between the two leads and the .1 mfd. condenser. Turn the tuning condenser to 1400 K. C. and set the generator for 1400 K. C. Adjust the padders ⑮ and ⑥ for maximum reading on the output meter.

If this procedure has been carefully followed and an accurately calibrated oscillator or signal generator has been used, the Receiver will be adjusted properly.

NOTE: When the antenna stage adjustment is made with the Receiver installed in the car, the Receiver antenna lead must be connected to the car antenna in the usual manner. The signal generator output lead should be connected to a wire placed near the car antenna but not connected to it.



HIGH FREQUENCY AND R. F. — After padding the first I. F. stage remove the generator lead from the 6A7 tube. Adjust the signal generator to 1600 K. C. and then connect the generator lead to the grid cap of the 78 R. F. tube in series with a .1 mfd. condenser.

Turn the tuning condenser plates out of mesh as far as they will go. With the tuning condenser in this position, adjust the high frequency padder ⑯ and the R. F. padder ⑮ until the maximum reading is obtained on the output meter. This is the true setting for 1600 K. C., 160 on the dial scale.

LOW FREQUENCY — Turn the tuning condenser plates in mesh to approximately 580 K. C., 58 on the dial scale and adjust the signal generator to 580 K. C. Roll the tuning condenser and adjust the low frequency padder ⑱ for maximum reading on the output meter.

HIGH FREQUENCY RE-ADJUSTMENT — Turn the tuning condenser plates out of mesh as far as they will go and adjust the signal generator to 1600 K. C. Then adjust the high frequency padder ⑯ again for maximum reading on the output meter.

MODEL AC-266 Studebaker
MODEL MT-3 Pierce
MODEL RT-3 Reo DeLuxe
Schematic, Socket, Parts

PHILCO RADIO & TELEV. CORP

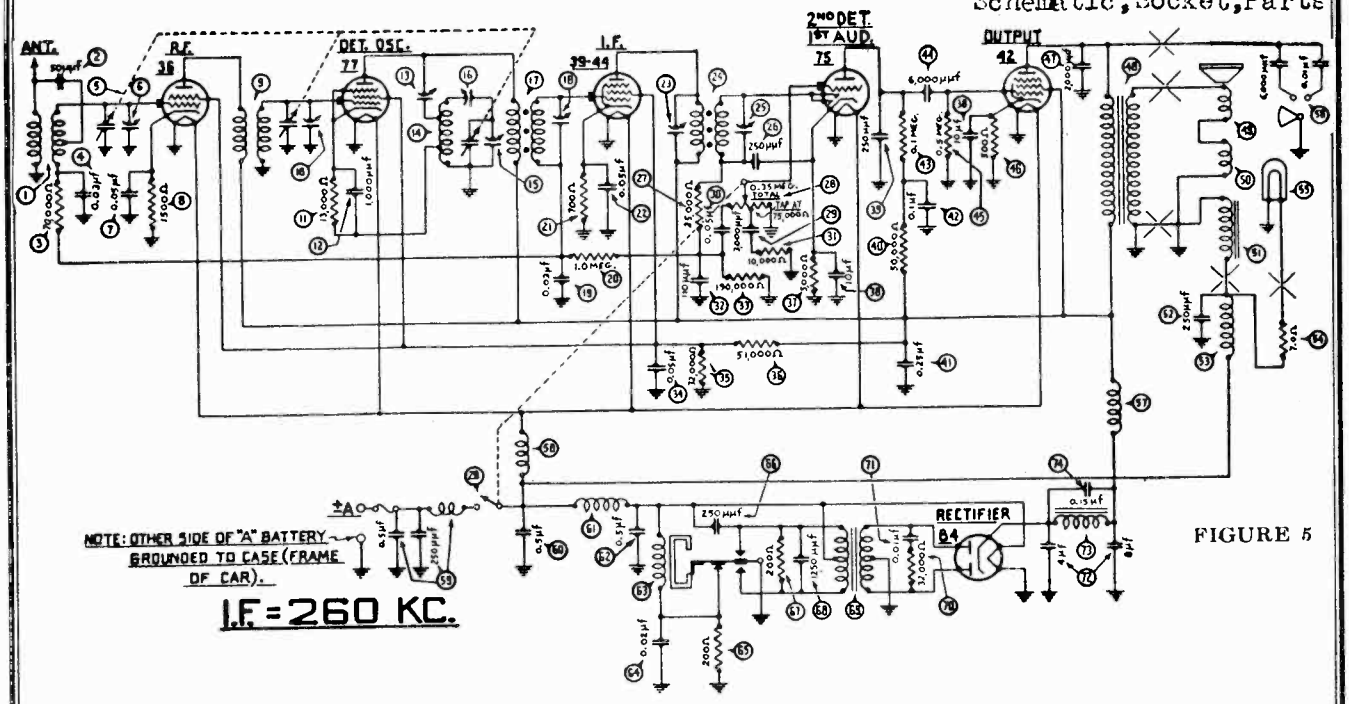


FIGURE 5

PARTS LIST ST3 - STUDEBAKER DE LUXE MODEL **AC-266**

(1)	Antenna Transformer	32-1535	(41)	Condenser (.25 mfd.)	04360
(2)	Condenser (50 mmfd.)	30-1029	(42)	Condenser (.1 mfd.)	30-4170
(3)	Resistor (70,000 ohms)	33-1115	(43)	Resistor (.1 meg.)	6099
(4)	Condenser (.03 mfd.)	30-4025	(44)	Condenser (6000 mmfd.)	30-4125
*(5)	Tuning Condenser	31-1419	(45)	Resistor (.5 meg.)	6097
(6)	1st Padder (on tun. cond.)		(46)	Resistor (500 ohms)	33-3031
(7)	Condenser (.05 mfd.)	30-4020	(47)	Condenser (2000 mmfd.)	30-4177
(8)	Resistor (1500 ohms)	33-3047	(48)	Output Transformer	32-7318
(9)	R. F. Transformer	32-1536	*(49)	Cone & Voice Coil	45-2062
(10)	2nd Padder (on tun. cond.)		*(50)	Bucking Coil	45-2066
(11)	Resistor (11,000 ohms)	33-1194	*(51)	Field Coil	45-2065
(12)	Condenser (1000 mmfd.)	5215	(52)	Condenser (250 mmfd.)	30-1032
(13)	Padder (Pri. 1st I. F. Tran.)		(53)	Choke	32-1374
(14)	Oscillator Transformer	32-1537	(54)	Resistor (7 ohms)	33-3035
(15)	3rd Padder (on tun. cond.)		(55)	Pilot Lamp	34-2040
(16)	4th Padder (on tun. cond.)		(56)	Tone Control	30-4243
(17)	1st I. F. Transformer	32-1538	(57)	Choke	32-1539
(18)	Padder (Sec. 1st I. F. Tran.)		(58)	"A" Choke	32-1282
(19)	Condenser (.03 mfd.)	30-4025	(59)	Interference Filter	32-1544
(20)	Resistor (1 meg.)	33-1171	(60)	Condenser (.5 mfd.)	30-4210
(21)	Resistor (700 ohms)	6443	(61)	Vibrator Choke	32-1281
(22)	Condenser (.05 mfd.)	30-4020	(62)	Condenser (.5 mfd.)	30-4047
(23)	Padder (Pri. 2nd I. F. Tran.)		(63)	Vibrator	38-5036
(24)	2nd I. F. Transformer	32-1449	(64)	Condenser (.02 mfd.)	30-4039
(25)	Padder (Sec. 2nd I. F. Tran.)		(65)	Resistor (200 ohms)	7217
(26)	Condenser (250 mmfd.)	30-1032	(66)	Condenser (250 mmfd.)	30-1032
(27)	Resistor (25,000 ohms)	33-1161	(67)	Resistor (200 ohms)	7217
(28)	Vol. Con. & Switch Assm.	38-6297	(68)	Condenser (1250 mmfd.)	5886
(29)	Condenser (3000 mmfd.)	30-4042	(69)	Power Transformer	32-7216
(30)	Condenser (.05 mfd.)	30-4020	(70)	Resistor (32,000 ohms)	3525
(31)	Resistor (10,000 ohms)	33-1000	(71)	Condenser (.01 mfd.)	30-4051
(32)	Condenser (110 mmfd.)	30-1031	(72)	Filter Cond. (4-8 mfd.)	30-2105
(33)	Resistor (190,000 ohms)	33-1116	(73)	Filter Choke	32-7215
(34)	Condenser (.05 mfd.)	30-4020	(74)	Condenser (.15 mfd.)	30-4191
(35)	Resistor (32,000 ohms)	3525	(75)	Antenna Choke	32-1372
(36)	Resistor (51,000 ohms)	5868		*Spark Plug Resistor	33-1192
(37)	Resistor (5000 ohms)	33-1155		Distributor Resistor	4851
(38)	Condenser (10-10 mfd.)	30-2106		Interference Condenser	30-4007
(39)	Condenser (250 mmfd.)	30-1032		4-prong Socket	27-6006
(40)	Resistor (50,000 ohms)	33-1163		5-prong Socket	27-6014

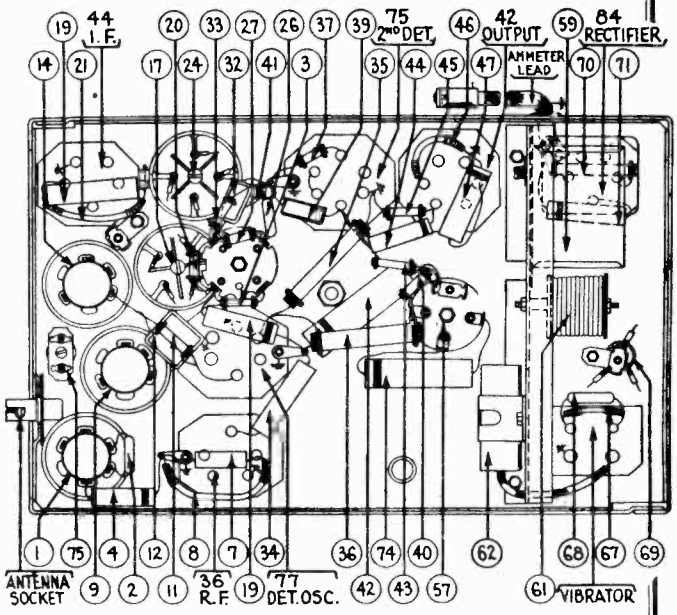


FIGURE 6

6-prong Socket	27-6020	*Knob	27-4098
Antenna Lead	38-5131	Knob (tone control)	03064
*Ammeter Lead	38-6339	*Lock (Less Keys)	28-8166
*Stud	28-6231	*Speaker Cable (speaker end)	36-3350
Nuts (set mtg.)	W55A	*Knob (President)	27-4058
*Flexible Shaft	28-8336	*Flexible Shaft (President)	28-8284
*Dial	27-5073		

An Antenna Choke, Part No. 32-1372 (75) on the Parts List and Base View has been added. This is connected in series with the Antenna Lead and the Antenna Transformer (1) and Condenser (2).

NOTE: The items marked with an asterisk are rarely required for service and in many cases will not be carried in stock by the local service station. In such cases it will be necessary to order these parts from Philco Transitone, Phila., Chicago, or San Francisco.

THESE INSTRUCTIONS have been carefully prepared for your use in installing the Studebaker DeLuxe Radio (Stock No. AC-266) in the 1935 model Studebaker cars. Read thoroughly, then follow the instructions carefully in every detail.

Antenna

All closed cars manufactured after July 1, 1931, are equipped with the roof-type antenna. The lead-in is brought down the left windshield post and is coiled up behind the left cowl trim panel. An antenna designed especially for convertible models can be secured from the Studebaker factory through the Accessory Division.

Receiver Location and Installation

Refer to Fig. 1 showing the location of the holes in the dash. Locate one of the holes and mark with a sharp punch; then use the template furnished with the Receiver to locate the remaining two holes. These holes should be drilled with a 7/16" drill.

Install the Receiver with the control connections to the left side of the car. (See Fig. 3).

Control Unit

The control unit is mounted on a panel which replaces the dummy door on the left side of the instrument board. This door is held in place by means of three bolts (one at each end and one at the bottom). Care should be taken to fasten the control panel securely so it does not rattle.

The control is furnished with a blank lock cylinder which must be crushed to match the car keys. This operation must be completed before the control is installed on the instrument board.

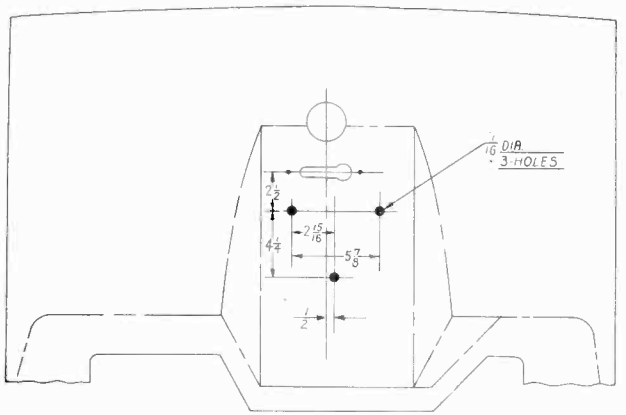


FIGURE 1

Instructions for Fitting Car Key to Control Lock

1. Remove the knobs and take off the control unit from the panel.

2. Remove the pilot lamp socket assembly in the rear of the control.

3. Reach in through the opening in the back of the control unit with a medium size screw driver and press down on the brass retaining lock spring, at the same time working the lock cylinder forward. (See Fig. 2).

4. Insert the car key in the lock cylinder and crush in the same manner that you crush the standard lock, with pliers or vise.

5. Assemble the dial and spring on the cylinder. Push down the retaining spring and replace the lock in the same relative position that it had when removed. With the key in the lock push the lock back, working the lock pin in place in the slot in the lock bar in back of the lock. Push the lock in until the retaining spring snaps in place.

6. Reassemble the control on the panel.

Control Shaft Installation

The control must be unlocked so that the volume control shaft is free. Then connect the volume control flexible shaft (left hand) to the rear coupling on the end of the Receiver. Be sure the coupling is properly seated and then tighten the knurled casing retaining nut. Next connect the tuning control shaft in a like manner to the front coupling.

The black lead coming from the back of control must be coupled to the short connector that branches from the speaker cable at the plug.

"A" Or Battery Cable (See FIGURE 4)

Connect the "A" or battery cable to the Receiver lead. The fuse housing connector couples by inserting the small end and making a slight turn clockwise. The other end of the cable must be connected to the right side of the ammeter. The shield pigtail at each end of the cable must be grounded under a convenient screw and the cable dressed up behind the Receiver. Be sure the fuse and fuse insulator are in place in the fuse housing before the cable is connected.

Antenna Lead

The antenna lead must be connected in the receptacle on the left end of the Receiver near the top and run along the instrument board to the left-hand windshield post. The lead must be spliced to the car antenna lead-in. Solder and tape the splice. The shield pigtail must be grounded. Cut off the excess lead-in before making the splice.

Speaker Cable and Speaker Installation (Fig. 3 and 4)

Determine the location of the metal frame for mounting the speaker in the center above the windshield. (See Fig. 4). This can be felt thru the headlining. Then slit the headlining vertically and horizontally inside the frame. Carefully cut away the headlining to within one inch of the frame. This will make a circular hole two inches smaller in diameter than the frame.

Connect the speaker cable plug in the socket on the lid of the Receiver and then fish the cable up the right windshield post. To do this, first feed a piece of iron or fish wire across the header and down the right windshield post. A piece of cotton sleeving is furnished with each set. This must be slipped over the end of the cable and then drawn tight with the fingers. Fasten to the wire and then carefully pull the wire and cable up the post, across the header and out the speaker opening.

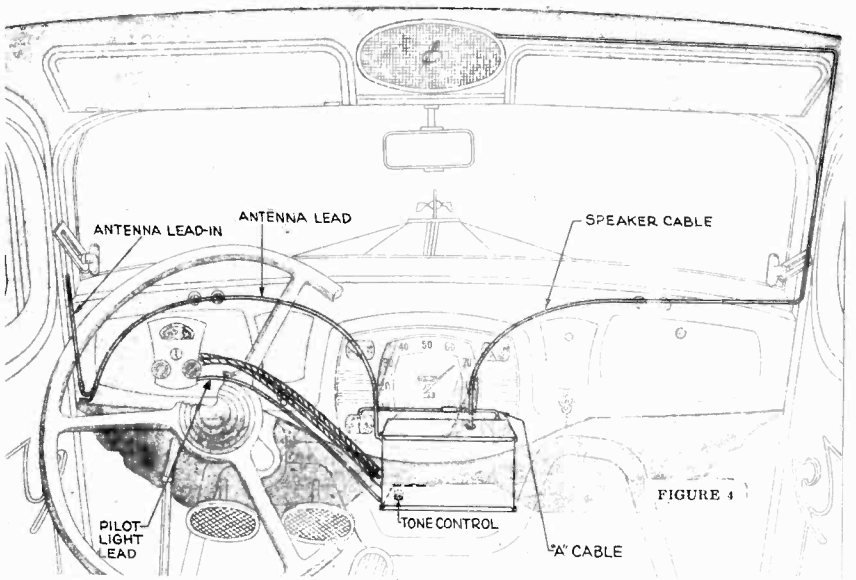


FIGURE 4

The ends of the speaker cable are equipped with small tip connectors which plug into the sockets on the side of the speaker. The sockets are marked with green, yellow and black paint to correspond with the colors of the speaker cable leads. The leads must be connected to the sockets of corresponding colors.

The speaker must be fastened in the opening provided with four self tapping screws (see fig. 3 and 4). The connections on the speaker must be down so that they cannot be pulled out by any strain on the cable.

The grille and bezel must next be fastened in place. The location of the four screw holes is shown in Fig. 3. The cardboard spacer must be placed between the grille and the headlining.

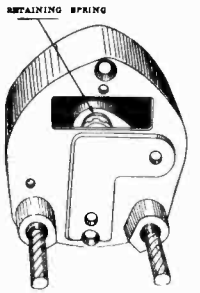


FIGURE 2

Control Adjustments

Turn the left-hand (volume control) knob counter-clockwise to the "off" position. Pull off the knob and loosen the set screw on the shaft. Then turn the shaft until it can be locked in place with the control lock. Tighten the set screw securely and replace the knob.

This adjustment must be made so that the radio can be turned "off" and the control locked.

The right hand knob is the tuning control knob. With the Receiver turned on, tune in a station whose frequency in kilocycles is known. The numbers on the dial represent the frequency in kilocycles with the last "0" omitted. With the known station accurately tuned in, pull off the knob and loosen the set screw. Then turn the shaft until the proper frequency is indicated on the dial. Tighten the set screw securely and replace the knob.

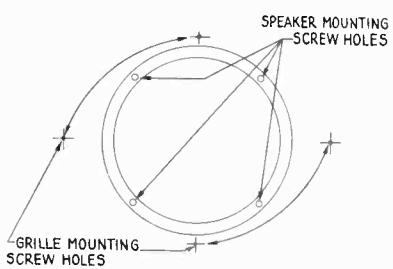


FIGURE 3

PHILCO RADIO & TELEV. CORP.

MODEL RT-3 Reo DeLuxe
(Part No.5485)
Installation Data, Parts

These instructions have been carefully prepared for your use in installing the Reo DeLuxe Radio (Part No. 5485) in the 1935 Reo cars. Read thoroughly, then follow the instructions carefully in every detail.

Antenna

All Reo closed cars manufactured after January 1, 1933, are equipped with a roof type antenna. The lead-in is brought down the right-hand windshield post and is coiled behind the right cowl trim panel.

Receiver Location and Installation

Install the Receiver above the steering column on the left hand side of the car, allowing adequate foot clearance at the

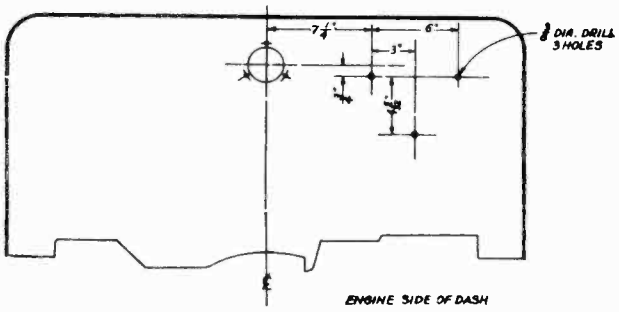


FIGURE 1

pedals. Refer to Figure 1 for the location of the bolt holes in the dash and drill three ⅜" holes. Assemble the bolts and fasten the Receiver securely to the dash. The control end of the Receiver must face the center of the car.

Control Unit

In 1935 cars, provision has been made to install the control unit in the ash receptacle opening in the instrument board. Unscrew the ash receptacle door knob to release the face plate. This exposes the two bolts which hold the two clamp brackets against the back of the instrument board. Remove these and take out the ash receptacle.

Fasten the radio control unit in place on the instrument board. Place the "U" clamp over the studs on the back of of the control and tighten the wing nuts to draw the control flush with instrument board. (See Figure 2).

Control Shafts

The flexible shaft on the right of the control is the tuning control shaft. This must be coupled in the shaft bushing nearest the dash, on the end of the Receiver housing. After the shaft has been properly seated, the knurled casing nut must be securely tightened.

Next couple the volume control shaft in the proper bushing on the Receiver and tighten the knurled casing nut.

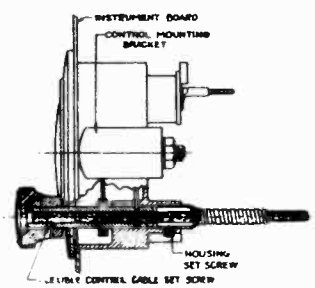


FIGURE 2

The black lead coming from the back of the control unit must be coupled to the short connector on the lead branching from the speaker cable plug.

"A" Lead

Place the "A" fuse and insulator in the fuse housing and connect it to the Receiver "A" lead. Connect the eyelet terminal of the lead to the right side of the ammeter.

Antenna Lead

The antenna lead must be spliced to the car antenna lead-in as close to the right corner post as possible. All excess lead-in must be cut off and the splice soldered and taped. Dress the lead along the instrument board and over the top of the glove compartment. The shield pigtail must be grounded under a

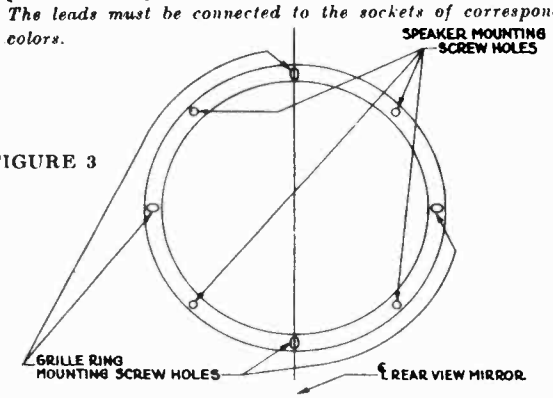
Speaker Cable and Speaker Installation

Determine the location of the opening for mounting the speaker in the center above the windshield. This can be felt through the headlining. Then slit the headlining vertically and horizontally inside the frame. Carefully cut away the headlining to within one inch of the opening. This will make a circular hole two inches smaller in diameter than the opening.

Connect the speaker cable plug in the socket on the lid of the Receiver and then fish the cable up the left windshield post. A fish wire is tacked to the headlining trim panel and is used to pull the speaker cable up the left pillar. A piece of cotton sleeving or tow strap is furnished with each set. This must be slipped over the end of the three wires on the cable and then drawn tight with the fingers. Fasten to the wire and then carefully pull the wire and cable up the post, across the header and out the speaker opening.

The ends of the speaker cable are equipped with small tip connectors which plug into the sockets on the side of the speaker. The sockets are marked with green, yellow and black paint to correspond with the colors of the speaker cable leads. *The leads must be connected to the sockets of corresponding colors.*

FIGURE 3



The speaker must be fastened in the speaker opening with wood screws. In mounting the speaker, be sure to mount it with the slotted holes in a vertical line with rear view mirror. The connections on the speaker must be down so that they cannot be pulled out by any strain on the cable. (See Figure 3).

The speaker grille and bezel must next be fastened in place, using four chrome plated oval head wood screws as furnished. The cardboard spacer must be placed between the grille and the headlining.

Items 1 to 75 of the Parts List for the Studebaker ST-3, DeLuxe Model AC-266 are identical for Reo DeLuxe Model RT-3. See the items below for additional accessories.

6 prong Socket	27-6020	Spark Plug Resistor	33-1101
Antenna Lead	38-5131	Distributor Resistor	33-1113
*Ammeter Lead	38-6595	Interference Condenser	30-4007
Stud (Set Mtg.)	28-6231	4-prong Socket	27-6006
Nuts (set mtg.)	W55A	5-prong Socket	27-6014
•Flexible Shaft (Tuning)	28-8317	Knob	27-4182
*Flexible Shaft (Volume)	28-8318	Knob (tone control)	03064
•Pointer	28-2510	*Speaker Cable (speakerend)	41-3128
		*Tow Strap	36-3403
		Glass	27-7325
		*Face Assembly	28-2206
		"U" Clamp	29-1705
		Nuts (Control Mtg.)	W317A

THESE INSTRUCTIONS have been carefully prepared for your use in installing the Pierce-Arrow Philco Auto Radio, with EAR LEVEL RECEPTION, Model MT3, in the 1935 Series Pierce-Arrow cars. Read the instructions carefully and be sure you understand each step of the installation before proceeding with the work.

Antenna

All closed cars of the 1935 series are equipped with a roof-type antenna. The antenna lead-in is coiled behind the left cowl trim panel. In the 1935 series open cars, the antenna is in the roof and the lead-in coiled behind the rumble seat left side kick pad.

The shielded antenna lead must be connected to the car lead-in as close as possible to the corner post. Splice the bare ends together and then solder and tape the connection. Cut off all the excess lead-in, and ground the shield pigtail under a convenient screwhead.

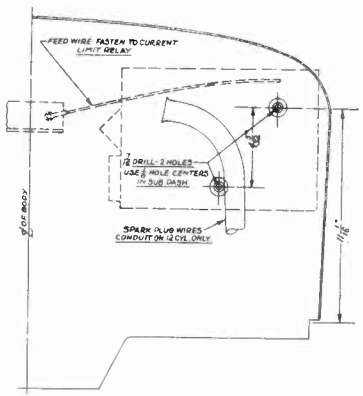


FIGURE 1

Receiver Location

Refer to Figure 1 for the location of the 1/16" hole in the dash. These holes must be enlarged to 7/16". Fasten the studs to the Receiver housing and then mount it on the dash with the control end of the Receiver facing the center of the car.

Control Unit

Take off the two nuts and spacers and remove the medallion plate from the left side of the instrument board. Remove the knobs from the control unit and then install it in the opening. Fasten it in place on the two studs on the back of the instrument board, using the medallion, nuts and washers. Replace the knobs on the control shafts. See Figures 2 and 3.

Items 1 to 75 of the Parts List for the Studebaker ST-3, DeLuxe Model AC-266 are identical Pierce-Arrow DeLuxe Model MT-3. See the items on the right for additional accessories.

Speaker Cable and Speaker Installation
(CLOSED CARS)

Determine the location of the opening for mounting the speaker in the center above the windshield. This can be felt through the headlining. Slit the headlining vertically and horizontally and carefully cut away the headlining to within one inch of the opening. This will make a circular hole two inches smaller in diameter than the opening.

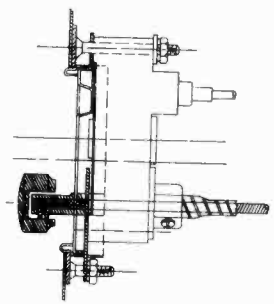


FIGURE 2

Connect the speaker cable plug in the socket on the lid of the Receiver and then fish the cable up the left windshield post. A fish cord is tacked to the headlining trim panel and is used to pull the speaker cable up the left pillar. A piece of cotton sleeving on tow strap is furnished with each set. This must be slipped over the end of the cable and then drawn tight with the fingers. Fasten to the cord and then carefully pull the cord and cable up the post, across the header and out the speaker opening.

The ends of the speaker cable are equipped with small tip connectors which plug into the sockets on the side of the speaker. The sockets are marked with green, yellow and black paint to correspond with the colors of the speaker cable leads. The leads must be connected to the sockets of corresponding colors. The connections on the speaker must be down so that they cannot be pulled out easily.

Fasten the speaker in the opening with wood screws and then install the speaker grille and bezel.

Spark Plug Resistor	33-1015		
Distributor Resistor	4851		
Interference Condenser	30-4007		
4-prong Socket	27-6006	*Flexible Shaft	28-4341
5-prong Socket	27-6014	*Dial	27-5084
6-prong Socket	27-6020	Knob	27-4098
Antenna Lead	38-5131	Knob (tone control)	03064
*Ammeter Lead	38-6545	*Speaker Cable (speaker end)	38-3350
Stud	28-6036	*Tow-Strap	36-3403
Nuts (set mtg.)	W35A		

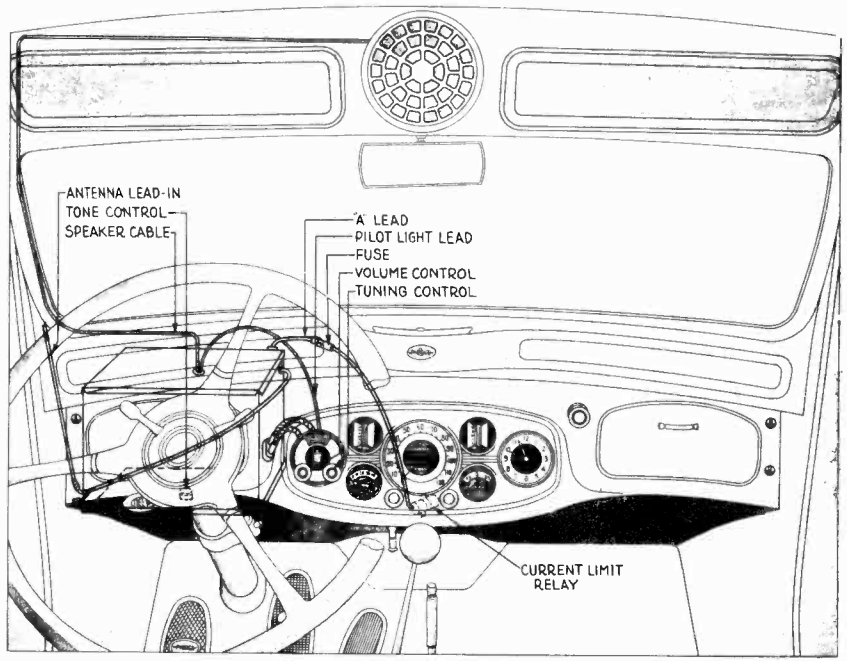


FIGURE 3

Speaker Cable and Speaker Installation
(OPEN CARS)

In open cars, the speaker location is in the right kick pad, under the cowl. The speaker mounting block can be felt thru the carpet of the kick pad. Cut the carpet vertically and horizontally inside the block and carefully trim the carpet to the edge of the cardboard circle under the carpet. Connect the speaker cable to the Receiver and then run the cable over and down inside the right kick pad.

Connect the cable to the speaker as described under Speaker Cable and Speaker Installation for closed cars.

Fasten the speaker to the mounting block with wood screws and then install the grille and bezel.

Connections

Connect the terminal end of the "A" lead to the left side of the current limit relay. Place the fuse and fuse insulator in the fuse housing and connect it to the Receiver lead.

The pilot light lead coming from the back of the control must be coupled to the short connector that branches from the speaker cable at the plug.

The antenna lead must be connected to its receptacle in the end of the Receiver housing and dressed in place.

Flexible Shafts

Connect the tuning control flexible shaft (right hand) to the rear coupling on the end of the Receiver. Be sure the coupling is properly seated and then tighten the knurled casing nut. Next connect the volume control shaft in a like manner to the front coupling.

Control Adjustments

The right-hand knob is the tuning control knob. With the Receiver turned on, tune in a station whose frequency in kilocycles is known. The numbers on the dial represent the frequency in kilocycles with the last "0" omitted. With the known station accurately tuned in, pull off the knob and loosen the set screw (See Fig. 2). Then turn the shaft until the proper frequency is indicated on the dial. Tighten the set screw securely and replace the knob.

Ignition and Generator Interference Suppression

Two interference condensers are supplied — one must be fastened under the inside generator relay leg and the lead connected to the battery side of the relay. The second condenser must be fastened under an ignition coil mounting screw and the lead connected to the *ammeter side* of the coil.

Cut the spark plug terminals from the spark plug wires and screw on the spark plug resistors and snap them in place on the spark plug terminals. Cut each distributor-to-coil high-tension wire about 1" from the distributor and screw into it a distributor resistor. Then screw the distributor end of the lead into the resistor and plug into the distributor cap again.

PHILCO RADIO & TELEV. CORP.

MODEL R
Schematic, Chassis
Parts List

FIGURE 9

FIGURE 10

(1)	Antenna Transformer	32-1331	
(2)	Tuning Condenser	31-1164	
(3)	1st Padder (on tun. cond.)		
(4)	Resistor (70,000 ohms)	33-1115	
(5)	Condenser (.03 mfd.)	30-4025	
(6)	Condenser (.05 mfd.)	30-4020	
(7)	Resistor (1500 ohms)	33-3047	
(8)	R. F. Transformer	32-1332	
(9)	2nd Padder (on tun. cond.)		
(10)	Resistor (10,000 ohms)	33-1000	
(11)	Condenser (.0007 mfd.)	5863	
(12)	Padder (Pri. 1st I. F. Tran.)		
(13)	Oscillator Transformer	32-1333	
(14)	3rd Padder (on tun. cond.)		
(15)	1st I. F. Transformer	32-1329	
(16)	Padder (Sec. 1st I. F. Tran.		
(17)	Condenser (.03 mfd.)	30-4025	
(18)	Resistor (700 ohms)	6443	
(19)	Condenser (.05 mfd.)	30-4020	
(20)	Resistor (1,000,000 ohms)	33-1096	
(21)	Condenser (.05 mfd.)	30-4020	
(22) (23)	Padders (Prim. 2nd I. F.)		
(24)	2nd I. F. Transformer	32-1237	
(25)	Padder (Sec. I. F. Tran.)		
(26)	Cond. (.00011-.00025 mfd.)	30-1020	
(27)	Resistor (25,000 ohms)	33-1013	
(28)	Vol. Con. & Switch Assm.	33-3058	
(29)	Condenser (.006 mfd.)	30-4125	
(30)	Resistor (2,000,000 ohms)	33-1025	
(31)	Resistor (5000 ohms)	6096	
(32)	Condenser (.25 mfd.)	30-4146	
(33)	Resistor (51,000 ohms)	5868	
(34)	Condenser (.00025 mfd.)	3082	
(35)	Condenser (.25 mfd.)	04380	
(36)	Resistor (100,000 ohms)	6099	
(37)	Resistor (500,000 ohms)	6097	
(38)	Condenser (.006 mfd.)	30-4125	
(39)	Condenser (10 mfd.)	7440	
(40)	Resistor (500 ohms)	33-3031	
(41)	Condenser (.006 mfd.)	30-4024	
(42)	Output Transformer	32-7214	
(43)	Cone & Voice Coil	02861	
(44)	Field Coil Assembly	36-3097	
(45)	Pilot Light	6608	
(46)	Resistor (7 ohms)	33-3035	
(47)	"A" Choke	32-1268	
(48)	Condenser (.5 mfd.)	30-4047	
(49)	Vibrator Choke	32-1235	
(50)	Condenser (.5 mfd.)	30-4147	
(51)	Vibrator Unit	38-6036	
(52)	Condenser (.05 mfd.)	30-4039	
(53)	Resistor (200 ohms)	7217	
(54)	Resistor (200 ohms)	7217	
(55)	Condenser (.00125 mfd.)	5886	
(56)	Power Transformer	32-7216	
(57)	Condenser (.01 mfd.)	30-4051	
(58)	Condenser (4.—8. mfd.)	30-2072	
(59)	"B" Choke	32-7215	
(60)	R F Choke	32-1281	
(61)	Resistor (30,000 ohms)	7836	
	Resistor (32,000 ohms)	3525	
	Spark Plug Resistor	33-1015	
	Distributor Resistor	33-1113E	
	Screw Type Resistor	4851	
	Interference Cond. (½ mfd.)	30-4007	
	Interference Cond. (1 mfd.)	4522	
	Fence Assembly	42-5176	
	Glass for Control	27-7325	
	Pointer	28-1991	
	Control Assembly	42-5174	
	Knobs	27-4058	
	Knob Spring	28-1738	
	Bezel Assembly	42-5115	
	Battery Cable	38-5704	
	Stud	28-6036	
	Nut	W55	
	4-prong Socket	27-6006	
	5-prong Socket	27-6014	
	6-prong Socket	6417	
	Antenna Lead	38-5703	
	Fuse	7227	
	Fuse Insulator	27-7131	
	Shafts	28-8234	

Installation Instructions - Standard Model - Part No. 628808

THESE INSTRUCTIONS have been carefully prepared for your use in installing the Standard Custom-Built Model R Radio, by Philco. Read thoroughly, then follow the instructions carefully in every detail.

Carefully unpack the cartons and check the contents with the material packing lists. Examine the parts and compare them with illustrations given in these instructions so that you may become familiar with them and thus make the installation easily and quickly.

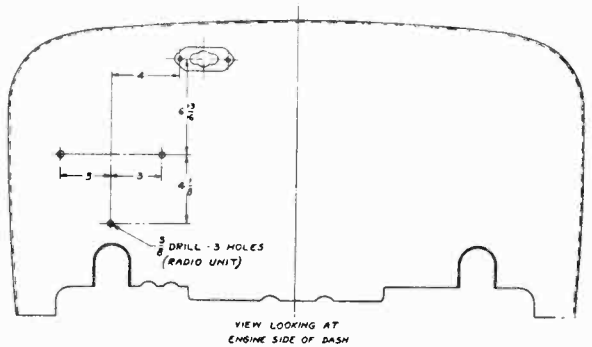


FIGURE 1

Receiver Location

Refer to Figure 1, which gives detailed dimensions for the location and drilling of the holes in the dash. All dimensions are shown from the engine side of the dash. Remove the paint from the dash for ¾" around the holes to insure good ground contact. After drilling the holes, install the three mounting studs in the back of the Receiver so that when the Receiver is mounted in the car, the control cables will come out toward the center and the speaker will face toward the toe boards. Before installing, the three spacing nuts should be put on the mounting studs, so that there will be ¾" spacing between the Receiver and the dash lining. (See Figure 2 and 3).

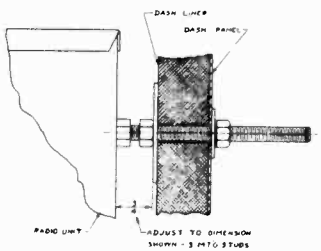


FIGURE 2

Antenna Lead

Splice the shielded Receiver antenna lead to the car lead-in as close as possible to windshield pillar post, cutting off all excessive lead-in. Tape this connection securely. All unshielded lead must be pushed back up the windshield pillar. The shielding pigtail must be grounded to the body cowl panel as close as possible to the "A" pillar. Drill a ⅛" hole where the hood overlaps and use the 8-32 bolt, washers, and nuts supplied for this purpose. Remove the paint from around the hole, to secure a good ground connection. (See Figure 4)

Ammeter Lead

Place the fuse and fuse insulator in the metal fuse holder and connect it to the black and white wire coming from the back of the Receiver. Determine the correct length for connection to the ammeter output terminal, cut the wire and strip the insulation, then solder on the eye terminal and connect it to the ammeter output terminal.

Instrument Panel Control

Remove the ash receiver from the panel with an upward pull.

Remove the ash receiver bezel from the panel by compressing the retaining tabs at the bottom of the bezel assembly. This can be done best by using a screwdriver and working from in back of the instrument panel. While pushing up on an end tab, pull the bezel forward and it will come out.

Loosen the two (2) screws which secure the instrument board brace to the instrument board flange. The cradle assembly can be slid forward then. Next, loosen the bolts on the brace in back of the instrument panel and remove the toggle spring. Slide the entire assembly forward and remove. Figure 5 gives the details of the ash receiver assembly while Figure 6 gives an enlarged view of the section A in Figure 5. Be sure to tighten all bolts and screws that were loosened for this operation.

Loosen the car lighting switch to permit more working space. While this operation is not absolutely necessary, it makes the following operation easier.

Push the flexible shafts of the control through the opening in the panel and install the control unit in this opening.

The "U" retaining clamp must be placed over the studs on the back of the control and the hex-nuts tightened to draw the control bezel flush with the instrument panel. (See Figure 7). Replace and tighten the car lighting switch.

The knob on the left of the control is the switch and volume control. Its cable should be installed in the flexible cable coupling bushing on the Receiver nearest the dash. The right-hand knob is the tuning control. The flexible cable from this point should be installed in the other control coupling bushing.

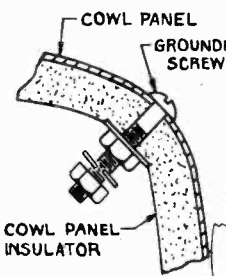


FIGURE 4

The set screws on the coupling bushings must be loosened sufficiently to allow the shaft housings and couplings to be properly seated. After the shafts have been coupled, tighten the set screws again. The dial light connector should now be pushed into its receptacle on the speaker panel.

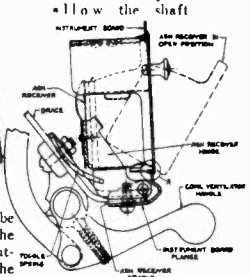


FIGURE 5

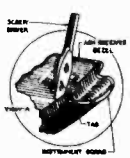


FIGURE 6

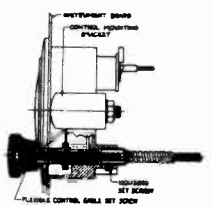


FIGURE 7

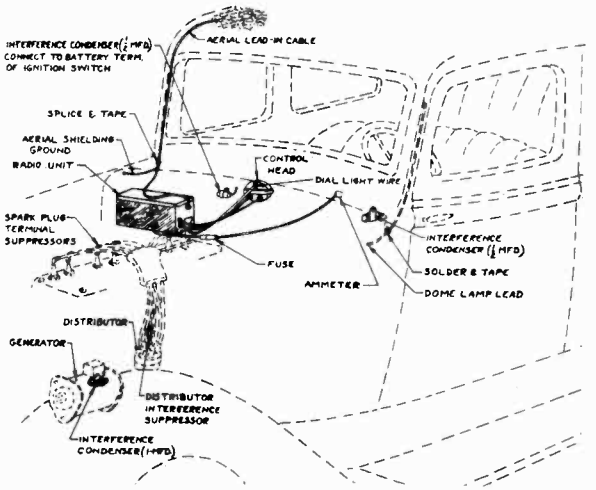


FIGURE 3

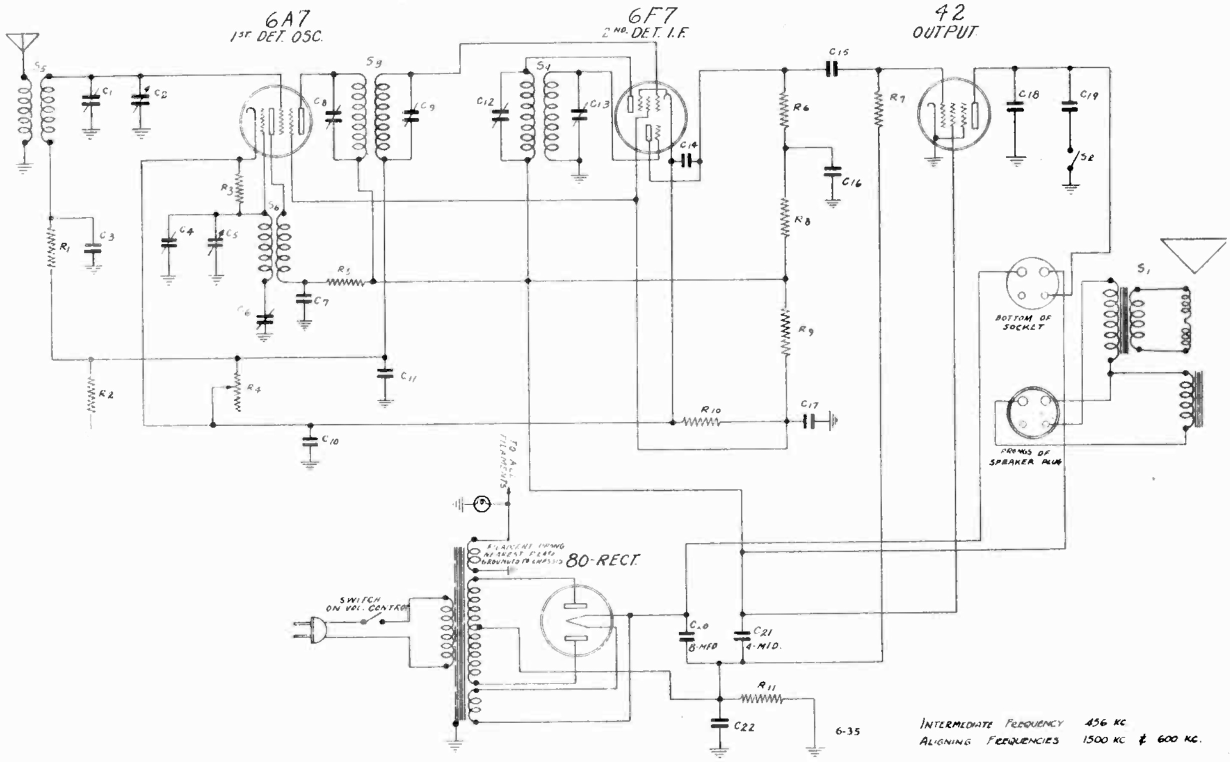
Adjustment

Turn on the Receiver and tune in a station whose frequency in kilocycles is known. (The numbers on the dial represent channel numbers which, with the addition of a cipher, become the frequency numbers.) Pull the knob from the right-hand control shaft and loosen the set screw found there. See Figure 7. Turn the shaft until the indicator points to the correct number on the dial. Then tighten the set screw and replace the knob.

MODEL 41
Schematic, Voltage Alignment, Socket Trimmers

PILOT RADIO CORP.

SCHEMATIC DIAGRAM PILOT MODEL No. 41



Model 41 Broadcast Receiver

Range: 170 Meters—550 Meters (1,770 kc.—545 kc.)

REALIGNMENT: Should the receiver require realignment, the outlined procedure below should be followed. For best results an external modulated oscillator with adequate frequency range, and a visual output meter, should be used.

Before connecting the chassis to the power line, reconnect the speaker cable in its socket at the rear of the chassis.

I. F. ALIGNMENT: When aligning the intermediate Frequency Amplifier, the external oscillator must be set at 456 kc. The tuning condenser should be set at maximum capacity. Connect the antenna lead of the external oscillator to the control grid of the type 6F7 tube in the I. F. Amplifier stage through a .002 mfd. fixed condenser. Connect the ground lead of the external oscillator to the receiver ground lead. The I. F. alignment capacitors are located at the top of the shielded I. F. Transformers. Rotate the adjusting screw of each capacitor on I. F. Unit No. 2 slowly until maximum output is noted. On completion of this operation, remove the external oscillator leads from the type 6F7 I. F. Amplifier tube and connect it in the same manner to the control grid at the top of the type 6A7 tube.

Now rotate each adjustment screw on I. F. Unit No. 1 for maximum output. During these operations, use the least possible input to prevent broadening of the resonance peaks.

In order to obtain the most accurate realignment of the I. F. Amplifier, it is essential to repeat the alignment process in both I. F. units with the external oscillator leads connected across the control grid of the 6A7 tube.

BROADCAST ALIGNMENT: After the I. F. Amplifier is completely realigned, connect the external oscillator leads to the receiver antenna and ground leads. Adjust the tuning control pointer at the 1500 kc. mark. Adjust the broadcast band oscillator trimmer to maximum response. Adjust the signal section trimmer in the same manner.

Next adjust the 600 kc. padder condenser. Set the external oscillator at 600 kc. Rotate the receiver tuning control until resonance is indicated. Then rock the tuning control back and forth about this resonance position, and at the same time adjust the padder condenser for the highest resonance peak.

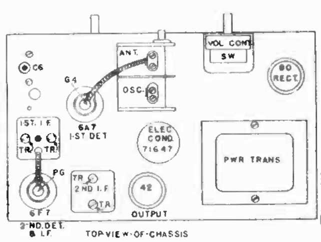
Now repeat the 1500 kc. trimmer adjustment, following in every detail the procedure previously described.

CAUTION: When making repairs on the receiver, use only ROSIN CORE SOLDER. NEVER USE SOLDERING PASTE OR ACID FLUXES OF ANY TYPE.

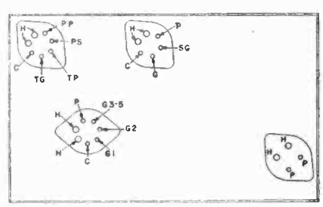
CONDENSERS		
DESIGNATION	PART NO.	DESCRIPTION
C1, C4		TRIMMERS ON GANG COND.
C2, C5	71646	2 GANG COND.
C3 C11 C17	22055 M	.1-200 V. PAPER TUBULAR
C6	71503 A	250 500 MMFD. PADDER
C7 C15	22055-C	.05 600V. PAPER TUBULAR
C8 C9		TRIMMERS IN 1ST. I.F. TRANS
C12 C13		TRIMMERS IN 2ND. I.F. TRANS.
C10	22055-F	.25-200V. PAPER TUBULAR
C14	27726	.0002 MFD. MICA
C16	22055 AB	.1-600V. PAPER TUBULAR
C18	22055-U	.01-1000 V. PAPER TUBULAR
C19	22055 V	.03-1000V PAPER TUBULAR
C20 C21	71647	4 8MFD 450V. ELEC. COND.
C22	22055-S	.5-200V. PAPER TUBULAR

RESISTORS		
DESIGNATION	PART NO.	DESCRIPTION
R1	13031	100,000 .25 WATT
R2	13028	1,000-OHMS .25 WATT
R3 R8	13164	50,000 OHMS .25 WATT
R4	71656	VOL. CONTROL & SW. 5000 WIRE 150 MIN.
R5 R10	13074	20,000-OHMS .25 WATT
R6	13171	250,000-OHMS .25 WATT
R7	13072	750,000 OHMS .25 WATT
R9	13126	25,000-OHMS .5 WATT
R11	13059	250 OHMS 1 WATT

MISC.		
DESIGNATION	PART NO.	DESCRIPTION
S1	40775	SPEAKER 1400 OHM FIELD
S2	71657	TONE CONTROL SWITCH
S3	70936-4	1ST I.F. TRANS.
S4	70937-4	2ND. I.F. TRANS.
S5	71685	ANT. COIL
S6	71701	OSC. COIL



TOP-VIEW-OF-CHASSIS



BOTTOM-VIEW-TUBE-LAYOUT

VOLTAGES MEASURED AT TUBE SOCKETS

	Det. Osc. 6A7	Amp. Det. 6F7	Audio Output 42
PLATE	220	220	210
SCREEN	66	66	237
CATHODE	18	18	*16
FILAMENT	6.3	6.3	6.3

Speaker field volts—85 volts.
Anode grid of 6A7—150 volts.
Triode plate of 6F7—95 volts.
Plate and screen voltages measured to cathode.
Cathode voltages measured to chassis frame.

Rectifier
80
335 Volts D.C. from Filament to transformer center tap.

4.9

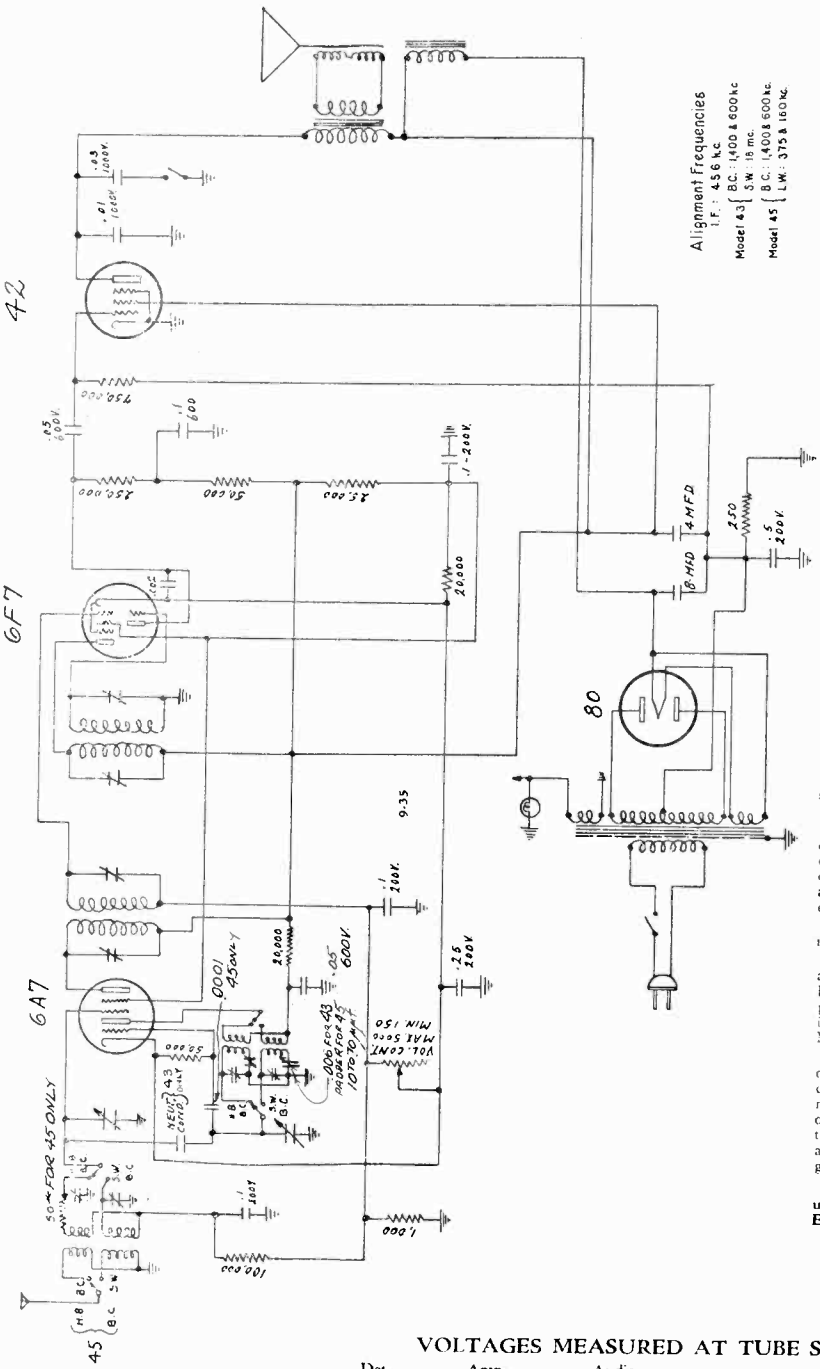
*Measured across 250 ohm resistor, R-11.
Measurements made with voltmeter of 1,000 ohms per volt.

MODELS 43,45
Schematic, Voltage
Alignment

PILOT RADIO CORP.

Model 43 Short-Wave Broadcast Receiver

Range: 16-52.6 M. and 178-550 M. (18,800-5700 kc. and 1680-545 kc.)



REALIGNMENT: Should the receiver require realignment, the outlined procedure below should be followed. For best results an external modulated oscillator with adequate frequency range, and a visual output meter, should be used.

Before connecting the chassis to the power line, reconnect the speaker cable in its socket at the rear of the chassis.

I. F. ALIGNMENT: When aligning the intermediate Frequency Amplifier, the external oscillator must be set at 456 kc. The tuning condenser should be set at maximum capacity. Connect the antenna lead of the external oscillator to the control grid of the type 6F7 tube in the I. F. Amplifier stage through a 0.1 mfd. fixed condenser. Connect the ground lead of the external oscillator to the receiver ground clip. The I. F. alignment capacitors are located at the top of the shielded I. F. Transformers. Rotate the adjusting screw of each capacitor on I. F. Unit No. 2 slowly until maximum output is noted. On completion of this operation, remove the external oscillator leads from the type 6F7 I. F. Amplifier tube and connect it in the same manner to the control grid at the top of the type 6A7 tube.

Now rotate each adjustment screw on I. F. Unit No. 1 for maximum output. During these operations, use the least possible input to prevent broadening of the resonance peaks.

In order to obtain the most accurate realignment of the I. F. Amplifier, it is essential to repeat the alignment process in both I. F. units with the external oscillator leads connected across the control grid of the 6A7 tube.

BROADCAST ALIGNMENT: After the I. F. Amplifier is completely realigned, connect the external oscillator leads to the receiver antenna and ground leads, this time with a .0002 mfd. condenser in the antenna lead. Adjust the tuning control pointer at the 1400 kc. mark. Adjust the broadcast band oscillator trimmer to maximum response. Adjust the signal section trimmer in the same manner.

Next adjust the 600 kc. padder condenser. Set the external oscillator at 600 kc. Rotate the receiver tuning control until resonance is indicated. Then rock the tuning control back and forth about this resonance position, and at the same time adjust the padder condenser for the highest resonance peak.

Now repeat the 1400 kc. trimmer adjustment, following in every detail the procedure previously described.

SHORT-WAVE ALIGNMENT: The procedure in aligning the short-wave bands is identical with that for the broadcast with the exception of the adjustment of the padder condenser. A 400 ohm resistor should be inserted in the antenna lead. The alignment frequency is 16.8 Meters—(17,800 kc.)

Turn the Band Switch to the right. Tune the external oscillator to 16.8 meters. Tune the receiver so that the dial pointer is in a position coincidental with the 16.8 meter indication on the dial scale. Adjust the short wave oscillator trimmer for maximum response. Next adjust the signal circuit trimmer for maximum resonance. Repeat all adjustments to assure correct alignment, rocking the gang condenser to right or left for maximum gain.

CAUTION: When making repairs on the receiver, use only ROSIN CORE SOLDER. NEVER USE SOLDERING PASTE OR ACID FLUXES OF ANY TYPE.

VOLTAGES MEASURED AT TUBE SOCKETS

	Det. Osc.	Amp. Det.	Audio Output
	6A7	6F7	42
PLATE	220	220	210
SCREEN	66	66	237
CATHODE	18	18	*16
FILAMENT	6.3	6.3	6.3

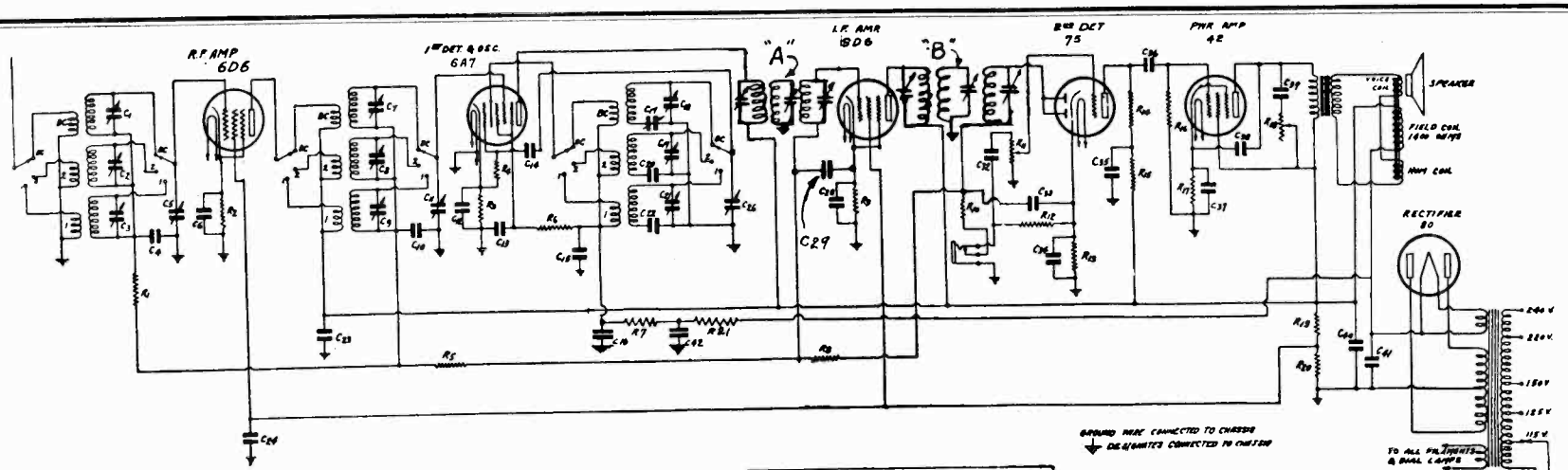
Speaker field volts—85 volts.
Anode grid of 6A7—150 volts.
Triode plate of 6F7—95 volts.

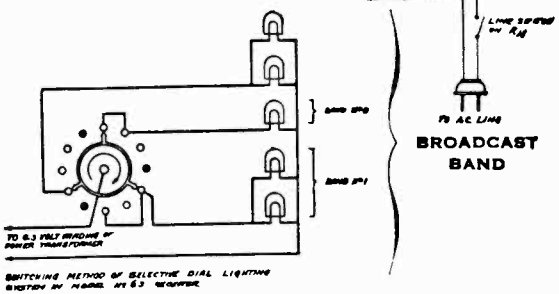
Plate and screen voltages measured to cathode.
Cathode voltages measured to chassis frame.

Rectifier
80
335 Volts D.C. from Filament to transformer center tap.

4.9

*Measured across 250 ohm resistor, R-11.
Measurements made with voltmeter of 1,000 ohms per volt.





SWITCHING METHOD OF SELECTIVE DIAL LIGHTING SYSTEM IN MODEL NO. 63 RECEIVER

Note. In Model 63 receivers where the serial number is lower than 20000 the I. F. amplifiar is designed with double tuned transformers. Coils "A" and "B" do not appear in those chassis.

CONDENSERS

DESIGNATION	PART NO.	DESCRIPTION
C_1, C_2, C_3	70969-A	TRIMMER STRIP ON BAND SW UNIT
C_4, C_{10}, C_{24}	22055-I	.05 MFDS-200V TUBULAR PAPER
C_5, C_{11}, C_{25}	70957	496 MMFDS 3 GANG VARIABLE
C_7, C_8, C_9	70969-A	TRIMMER STRIP ON BAND SW UNIT
C_{12}, C_{13}, C_{28}	22055-M	.10 MFDS-200V TUBULAR PAPER
C_{14}, C_{16}	22055-P	.05 MFDS-400V TUBULAR PAPER
C_{15}, C_{16}	27723	.0005 MFD MICA
C_{17}, C_{18} C_{42}	71106	2 MFDS 475V ELECTROLYTIC
C_{19}	16052-A	450 MMFD PADDER
C_{20}, C_{21}, C_{31}	70969-A	TRIMMER STRIP ON BAND SW UNIT
C_{22}	27717	.0028 MFD MICA
C_{26}	27732	.0016 MFD MICA
C_{23}, C_{24}, C_{35}	22086-L	.10 MFDS-400V TUBULAR PAPER
C_{27}, C_{32}, C_{43}	70936	TRIMMERS IN 1ST I.F. TRANS CAN
C_{29}, C_{30}, C_{44}	70937	TRIMMERS IN 2ND I.F. TRANS CAN
C_{33}, C_{34}	22055-A	.01 MFD-600V TUBULAR PAPER
C_{36}	27712	.0005 MFD. MICA
C_{36}, C_{37}	70971	DUAL 8 MFD-25V TUBULAR ELECTRO.
C_{38}	22086-Q	.005 MFD-600V TUBULAR PAPER
C_{39}	22055-C	.05 MFD-600V TUBULAR PAPER
C_{40}, C_{41}	71106	2-8MFDS-475V ELECTROLYTIC BLOCK

RESISTORS

DESIGNATION	PART NO.	DESCRIPTION
R_1, R_3, R_{15}	13081	100,000 OHMS .25 WATT CARBON
R_2, R_7, R_9	13115	400-OHMS .25 WATT CARBON
R_{20}, R_{40}, R_{42}	13164	50,000-OHMS .25 WATT CARBON
R_4	13048	30,000-OHMS .25 WATT CARBON
R_7	13053	10,000-OHM 1 WATT CARBON
R_8	13091	1-MEGOHM .25 WATT CARBON
R_{11}	70935	75,000-OHMS VOLUME CONTROL
R_{12}	13147	300,000-OHMS .25 WATT CARBON
R_{13}	13149	6000-OHMS .25 WATT CARBON
R_{14}	13171	25,000-OHMS .25 WATT CARBON
R_{16}	13026	50,000-OHMS .25 WATT CARBON
R_{17}	13108	410-OHMS 1 WATT CARBON
R_{18}	70986	100,000-OHMS TONE CONTROL & SWITCH
R_{19}	13092	30,000-OHMS 1 WATT CARBON
R_{21}	13083	10,000-OHMS 1 WATT CARBON

IF PEAK 456 KC

RECEIVER DESCRIPTION

Operating Voltages—115, 125, 150, 220, 240 volts, Alternating Current.
Frequency Rating —50 to 60 cycles.
Power Consumption—70 Watts.
Tubes —1 type 6A7
2 type 6D6
1 type 75
1 type 42
1 type 80
Circuit —One stage of Tuned Radio Frequency amplification for all frequencies, electron-coupled oscillator-modulator, diode detector, class "A" pentode output stage, automatic volume control.
Wavelength Range —From 550 meters to 16 meters (545 kc to 18,800 kc).
Undistorted power output—3 watts.
Intermediate Frequency — 456 kc.
Tube Functions —Type 6D6: R. F. amplifier for all bands.
Type 6A7: Electron emission control oscillator-detector.
Type 6D6: I. F. amplifier.
Type 75: Duo-diode detector-amplifier.
Type 42: Class "A" power pentode.
Type 80: Full-wave rectifier for power supply.

VOLTAGES

The D. C. voltages measured at the tube sockets of the set should be read with a high resistance voltmeter of at least 1000 ohms per volt.

	RECTIFIER	R.F.	OSC. DET.	I.F.	DIODE DET.	POWER PENTODE
	Type 80	Type 6D6	Type 6A7	Type 6D6	Type 75	Type 42
Plate		235	235	235	120*	210
Cathode		4.	4.5	4.	1.5	14.
Screen		90	90	90		230
Filament	6.3	6.3	6.3	6.3	6.3	6.3

*Voltages measured through 250,000 ohm plate resistor.

Speaker field voltage 110 volts. All plate voltages measured to cathode. All screen voltages measured to cathode. All cathode voltages measured to chassis frame.

SERVICE INFORMATION

REMOVAL OF CHASSIS FROM CABINET:

To remove the chassis from the cabinet proceed as follows:

Be certain that the line cord is removed from the power outlet socket.

Remove the "slip-on" knobs and felt washers from the controls on the front panel.

Remove the speaker plug from the socket at the rear of the chassis.

Remove the four mounting screws, located underneath the cabinet.

REALIGNMENT: Should the receiver require realignment, the outlined procedure below should be followed. In the service information sheet, the location and function of the various alignment capacitors are clearly illustrated. For best results an external modulated oscillator with adequate frequency range, and a visual output meter, should be used.

Before connecting the chassis to the power line, reconnect the speaker cable in its socket at the rear of the chassis.

I. F. ALIGNMENT: When aligning the Intermediate Frequency Amplifier, the external oscillator must be set at 456 kc. The Band Selector Switch should be in the position marked "Broadcast," and the tuning condenser should be set at maximum capacity. Connect the "antenna" lead of the external oscillator to the control grid of the type 6D6 tube in the I. F. Amplifier stage through a .002 mfd. fixed condenser. Connect the "ground" lead of the external oscillator to the receiver ground lead. The I. F. alignment capacitors are located at the SIDE of the shielded I. F. Transformers. Rotate the adjusting screw of each capacitor on I. F. Unit No. 2 slowly until maximum output is noted. On completion of this operation, remove the external oscillator lead from the type 6D6 I. F. amplifier tube and connect it in the same manner to the control grid at the top of the type 6A7 tube.

Now rotate each adjustment screw on I. F. Unit No. 1 for maximum output. During these operations, use the least possible input to prevent broadening of the resonance peaks.

In order to obtain the most accurate realignment of the I. F. amplifier, it is essential to repeat the alignment process in both I. F. Units.

BROADCAST ALIGNMENT: After the I. F. amplifier is completely realigned, connect the external oscillator leads to the receiver antenna and ground leads. Set the Band Selector Switch in the "Broadcast" position and place the tuning control pointer at the 1400 kc. mark. Adjust the broadcast band oscillator trimmer (See illustration on Service Information Sheet) to maximum response.

Next adjust the interstage alignment trimmer for maximum response. Finally adjust the antenna section trimmer in the same manner.

Next adjust the 600 kc. padder condenser, located in the lower rear section of the band switch, under the chassis. Set the external oscillator at 600 kc. Rotate the receiver tuning control until resonance is indicated. Then rock the tuning control back and forth about this resonance position, and at the same time adjust the padder condenser for the highest resonance peak.

Now repeat the 1400 kc. trimmer adjustment, following in every detail the procedure previously described.

ALIGNMENT OF THE SHORT-WAVE BANDS:—The procedure in aligning the short wave-bands is identical with that for the broadcast with the exception of the adjustment of the padder condenser. The alignment frequencies are as follows:

Band 2: 49 Meters (6,100 kc.)
Band 1: 16.8 Meters—(17,800 kc.)

When aligning Band 2, set the Band Selector Switch in the position marked "Band 2." Set the tuning control pointer at the 49 meter mark. Set the external oscillator at 49 meters. Adjust the oscillator alignment capacitor on Band 2 for maximum output. Next adjust the interstage and antenna section alignment capacitors for maximum output.

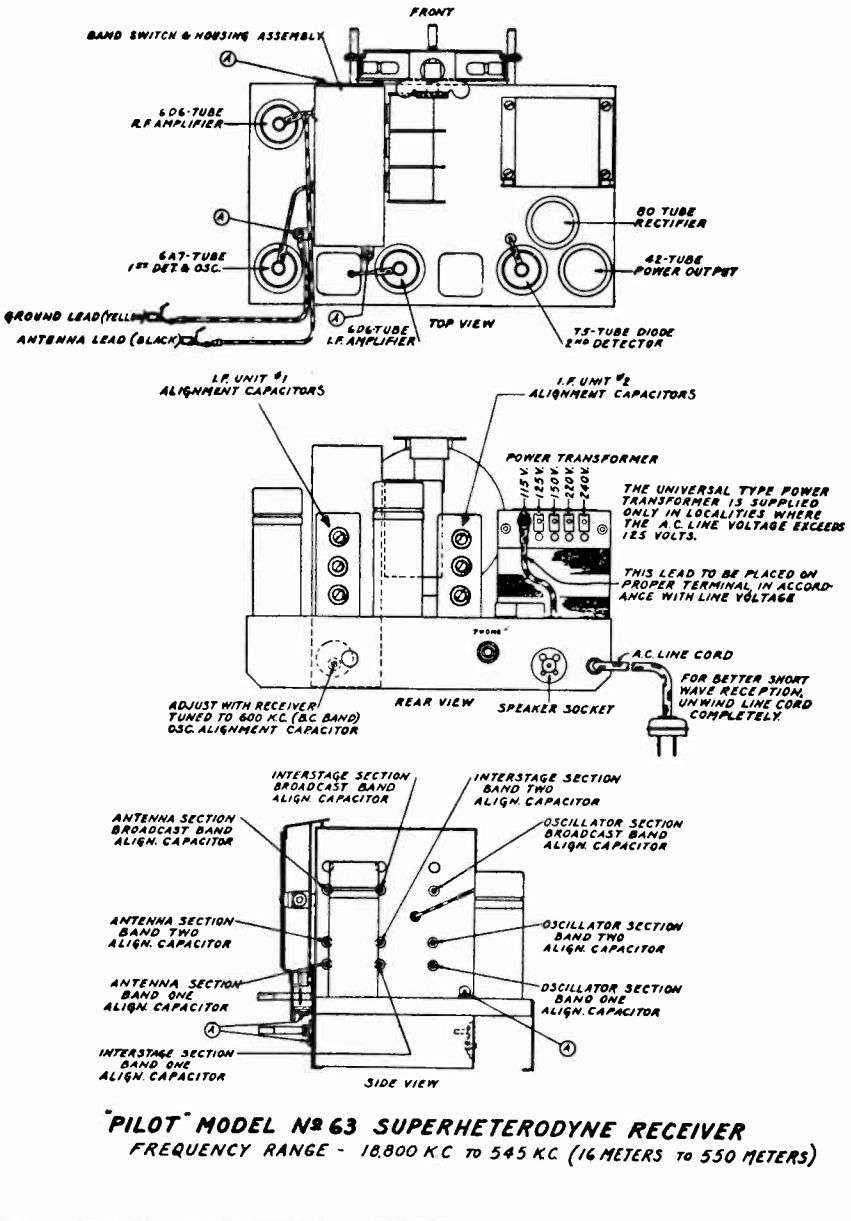
To align Band 1, set the Band Selector Swith in the position marked "Band 1." Set the tuning control pointer at the 16.8 meter mark. Set the external oscillator at 16.8 meters. Adjust the oscillator section alignment capacitor on Band 1 for maximum output.

Proceed next to align the interstage section of Band 1. In doing this, it is essential to rock the tuning control back and forth about the resonance position and at the same time to adjust the trimmer for the highest resonance peak. Next align the antenna section for maximum sensitivity.

REMOVAL OF BAND SELECTOR SWITCH ASSEMBLY: Should it be necessary to remove the switch assembly, this is easily done by removing the screws marked "A" on the Service Information Sheet. Before doing this, however, it is essential to unsolder the leads between the switch and the chassis. Also remove the screw beneath the Dial Drive Assembly, which secures the dial assembly to the chassis.

It is advisable to realign the receiver after reinstalling the switch assembly.

SERVICE INFORMATION SHEET



"PILOT" MODEL No. 63 SUPERHETERODYNE RECEIVER

FREQUENCY RANGE - 18,800 K.C. TO 545 K.C. (16 METERS TO 550 METERS)

PILOT RADIO CORP.

MODELS X-63, X-65
Schematic, Socket
Trimmers

Wavelength Range—From 550 meters to 16 meters (545 kc. to 18,800 kc.).
Undistorted power output—3 watts.
Intermediate Frequency—456 kc.

MISCELLANEOUS LIST FOR MODEL X63		
SYMBOL	PART NO.	DESCRIPTION
S1	71531-B	1ST. TRANSFORMER FOR I.F. AMP.
S 2	71532-B	2ND. TRANSFORMER FOR I.F. AMP.
S 3	71544	PWR. TRANSFORMER 118 V. 60 CY.
	71381	" " UNIVERSAL V. 60 CY.
	71538	" " UNIVERSAL V. 25 CY.
S 4	40771	SPEAKER 8"
	40784	SPEAKER 12"
	7I9I8-A	BAND SWITCH AND COIL ASSEMBLY
MISCELLANEOUS LIST FOR MODEL X65		
SAME AS MODEL X63 EXCEPT FOLLOWING:		
	7I9I8-B	BAND SWITCH AND COIL ASSEMBLY

CONDENSERS FOR MODEL X63		
SYMBOL	PART NO.	DESCRIPTION
C1,C2,C3	70969-C	TRIMMER STRIP ON BAND SW. HOUSING
C4,C10,C28	22035-I	0.05 MFD. 200 V. TUBULAR PAPER
C5,C11,C26	71921	450 MMFDS. 3 GANG VARIABLE
C6,C12,C27	22035-M	0.1 MFD. 200 V. TUBULAR PAPER
C7,C8,C9	70969-C	TRIMMER STRIP ON BAND SW. HOUSING
C13,C15	22035-P	0.05 MFD. 400 V. TUBULAR PAPER
C14	27723-W	0.00005 MFD. MICA
C16,C43	7I915	2 MFD. 475 V. ELECTROLYTIC
C31		5 MFD. 25 V. ELECTROLYTIC
C17	7I303-A	250-300 MMFDS. PADDER
C18,C19,C21	70969-D	TRIMMER STRIP ON BAND SW. HOUSING
C20	27743-W	1370 MMFDS. MICA
C22	R7Z20-W	2878 MMFDS. MICA
C23	E2035-AB	0.25 MFD. 200 V. TUBULAR PAPER
C24, C32	E2035-AB	0.1 MFD. 600 V. TUBULAR PAPER
C25	71575	NEUTRALIZING CONDENSER
C29, C33	22715-A	0.01 MFD. 500 V. TUBULAR PAPER
C30	27701-W	0.00025 MFD. MICA
C34	71578	10 MFDS. 25 V. ELECTROLYTIC
C37, C38		8 MFDS. 475 V. ELECTROLYTIC
C35	22035-R	0.003 MFD. 1000 V. TUBULAR PAPER
C36	22035-C	0.05 MFD. 600 V. TUBULAR PAPER
C44	27737-O	10 MMFD. MICA
SAME AS FOR MODEL X65 EXCEPT ONES GIVEN BELOW:		
C1,C2,C3, C39	70969-A	TRIMMER STRIP ON BAND SW. HOUSING
C7,C8,C9, C40	70969-A	TRIMMER STRIP ON BAND SW. HOUSING
C17, C42	71577-C	DUAL PADDER 285-500 & 30-150 MMFDS.
C18,C19,C21, & C41	70969-B	TRIMMER STRIP ON BAND SW. HOUSING
C45	27701-O	250 MMFDS. MICA

RESISTORS FOR MODEL X63		
SYMBOL	PART NO.	DESCRIPTION
R1, R5, R15	13031	100,000 OHMS 1/4 WATT CARBON
R2, R3, R9	13115	400 OHMS 1/4 WATT CARBON
R4, R10, R20	13164	80,000 OHMS 1/4 WATT CARBON
R6	13068	30,000 OHMS 1/2 WATT CARBON
R7, R21	13053	10,000 OHMS 1 WATT CARBON
R8	13091	1 MEGOHM 1/4 WATT CARBON
R11	71913	750,000 OHMS VOLUME CONTROL
R12	13147	300,000 OHMS 1/4 WATT CARBON
R13	13149	6,000 OHMS 1/4 WATT CARBON
R14	13171	250,000 OHMS 1/4 WATT CARBON
R16	13024	500,000 OHMS 1/4 WATT CARBON
R17	13108	410 OHMS 1 WATT CARBON
R18	7I914	100,000 OHMS TONE CONTROL & SWITCH
R19	13092	30,000 OHMS 1 WATT CARBON
RESISTORS FOR MODEL X65		
SAME AS FOR MODEL X63 WITH ADDED ONES BELOW:		
R22	13089	250 OHMS 1/4 WATT CARBON
R23	13164	50,000 OHMS 1/4 WATT CARBON

MODELS X-63, X-65
Voltage, Parts
Alignment

PILOT RADIO CORP.

TUBE SOCKETS

Part No.	
70927	4-Prong Bakelite Base Tube Socket
70863	6-Prong Bakelite Base Tube Socket
70864	7-Prong Bakelite Base Tube Socket

TUBE SHIELDS

70865	Tube Shield Base
71857	Tube Shield Base, Long 4¼"
71858	Tube Shield Base, Short 3⅞"

SPEAKER AND PARTS

40771	8" Dynamic Speaker
40784	12" Dynamic Speaker
70509	Steel Speaker Mounting Bushing
70002	Rubber Grommet

POWER TRANSFORMER

71381	Replacement Unit

TUNING EQUIPMENT

71531-B	1st I.F. Transformer
71532-B	2nd I.F. Transformer
71921	3-Gang Tuning Condenser
71910-A	Band Switch and Coil Assembly completely mounted in shield, with gang condenser, for Model X-63
71910-B	Band Switch Assembly as above for Model X-65
70918	Dial Escutcheon
70910-2	Dial Crystal
70919	Dial Crystal Retaining Ring
71911	2-Speed Dial Drive Mechanism
70998	Dial Drive Disc
71539-K	Dial Scale and Holder Assembly Model X-63
71539-L	Dial Scale and Holder Assembly Model X-65
70934	Pointer
642	Pointer Holding Screw
71056	Pointer Spacing Washer
70953-B	Band Switch Escutcheon Model X-63
70953-J	Band Switch Escutcheon Model X-65
71282	Dial Light Bulb—Bayonet Base 6.3 Volts

LINE CORD

70885	Cord without Plug
70003	American Type Plug
70889	European Type Plug
71311	British Type Plug

REALIGNMENT: Should the receiver require realignment, the outlined procedure below should be followed. For best results an external modulated oscillator with adequate frequency range, and a visual output meter, should be used.

Before connecting the chassis to the power line, reconnect the speaker cable in its socket at the rear of the chassis.

SWITCHES AND CONTROLS

Part No.	
71914	Tone Control and Switch
71913	Volume Control
70953-A	Volume Control Escutcheon
71620	Small Knob with Dot
71977	Large Set Screw Knob
70950	Phonograph Jack

PAPER CONDENSERS

22055-A	.01	mfd.	600 Volt
22055-C	.05	mfd.	600 Volt
22055-I	.05	mfd.	200 Volt
22055-M	.1	mfd.	200 Volt
22055-P	.05	mfd.	400 Volt
22055-R	.005	mfd.	1000 Volt
22055-AB	.1	mfd.	600 Volt
22055-AH	.25	mfd.	500 Volt

MICA CONDENSERS

27701	.00025 mfd.
27723-O	.00005 mfd.
27737-O	.00001 mfd.
27743	.00137 mfd. Padding Condensers
27744	.00287 mfd. Padding Condensers

CARBON RESISTANCE

¼ Watt All Resistance Values
½ Watt All Resistance Values

PADDING CONDENSERS

71503-A	.00025—.0005 mfd. Model X-63
71577-C	.00003—.00015 mfd. and .00025—.0005 mfd. Dual Type Model X-65

ELECTROLYTIC CONDENSERS

71915	2-2 mfd. 475 Volt and 5 mfd. 25 Volts
71916	8-8 mfd. 475 Volt and 10 mfd. 25 Volts

Type 75: Duo-Diode detector-amplifier.
Type 42: Class "A" power pentode.
Type 80: Full-wave rectifier for power supply.

VOLTAGES

The D. C. voltages measured at the tube sockets of the set should be read with a high resistance voltmeter of at least 1000 ohms per volt.

	R. F. Type 6D6	OSC. DET. Type 6A7	I. F. Type 6D6	DIODE DET. Type 75	POWER PENT. Type 42	RECTIFIER Type 80
Plate	250	250**	250	100*	225	
Cathode	3.5	4	3.5	1.5	15	
Screen	90	90	90		250	
Filament	6.3	6.3	6.3	6.3	6.3	

*Voltages measured through 250,000 ohm plate resistor.
**Anode grid of 6A7 tube 160 volts.
Speaker field voltage 100 volts. All plate voltages measured to ground. All screen voltages measured to ground. All cathode voltages measured to ground.

The location of the R. F. alignment trimmer condensers is on the side of the band switch. The trimmers in the lowest row are those for aligning Band 1. Those in the second row from the bottom are for Band 2. Those in the third row up are for the Broadcast. In the Model X65 there is an additional row of trimmers located immediately above those for the Broadcast.

The padder condenser is located under the rear section of the band switch. In the Model X65 an additional padder for the Highband range is located at the right of the Broadcast padder. Access to the padder condenser is made through a hole provided in the rear of the chassis frame.

I. F. ALIGNMENT: When aligning the Intermediate Frequency Amplifier, the external oscillator must be set at 456 kc. The Band Selector Switch should be in the position marked "Broadcast," and the tuning condenser should be set at maximum capacity. Connect the "antenna" lead of the external oscillator to the control grid of the type 6D6 tube in the I. F. Amplifier stage through a .1 mfd. fixed condenser. Connect the "ground" lead of the external oscillator to the receiver ground lead. The I. F. alignment capacitors are located at the side of the shielded I. F. Transformers. Rotate the adjusting screw of each capacitor on I. F. Unit No. 2 slowly until maximum output is noted. On completion of this operation, remove the external oscillator lead from the type 6D6 I. F. amplifier tube and connect it in the same manner to the control grid at the top of the type 6A7 tube.

Now rotate each adjustment screw on I. F. Unit No. 1 for maximum output. During these operations, use the least possible input to prevent broadening of the resonance peaks.

In order to obtain the most accurate realignment of the I. F. amplifier, it is essential to repeat the alignment process in both I. F. Units.

BROADCAST ALIGNMENT: After the I. F. amplifier is completely realigned, connect the external oscillator leads to the receiver antenna and ground leads. Set the Band Selector Switch in the "Broadcast" position and place the tuning control pointer at the 1500 kc. mark. Adjust the broadcast band oscillator trimmer.

Next adjust the interstage alignment trimmer for maximum response. Finally adjust the antenna section trimmer in the same manner.

Next adjust the 600 kc. padder condenser, located in the lower rear section of the band switch, under the chassis. Set the external oscillator at 600 kc. Rotate the receiver tuning control until resonance is indicated. Then rock the tuning control back and forth about this resonance position, and at the same time adjust the padder condenser for the highest resonance peak.

Now repeat the 1500 kc. trimmer adjustment, following in every detail the procedure previously described.

ALIGNMENT OF THE SHORT WAVE-BANDS:—

The procedure in aligning the short wave-bands is identical with that for the broadcast with the exception of the adjustment of the padder condenser. The alignment frequencies are as follows:

Band 2: 50 Meters (6,000 kc.)
Band 1: 16.6 Meters—(18,000 kc.)

When aligning Band 2, set the Band Selector Switch in the position marked "Band 2." Set the tuning control pointer at the 50 meters. Adjust the oscillator alignment capacitor on Band 2 for maximum output. Next adjust the interstage and antenna section alignment capacitors for maximum output.

To align Band 1, set the Band Selector Switch in the position marked "Band 1." Set the tuning control pointer at the 16.6 meter mark. Set the external oscillator at 16.6 meters. Adjust the oscillator section alignment capacitor on Band 1 for maximum output.

Proceed next to align the interstage section of Band 1. In doing this, it is essential to rock the tuning control back and forth about the resonance position and at the same time to adjust the trimmer for the highest resonance peak. Next align the antenna section for maximum sensitivity.

NOTE.

The above alignment positions refer to the Model X-63 only, which is calibrated in frequency. The alignment points for the Model X-65, which is calibrated in meters only, is as follows:

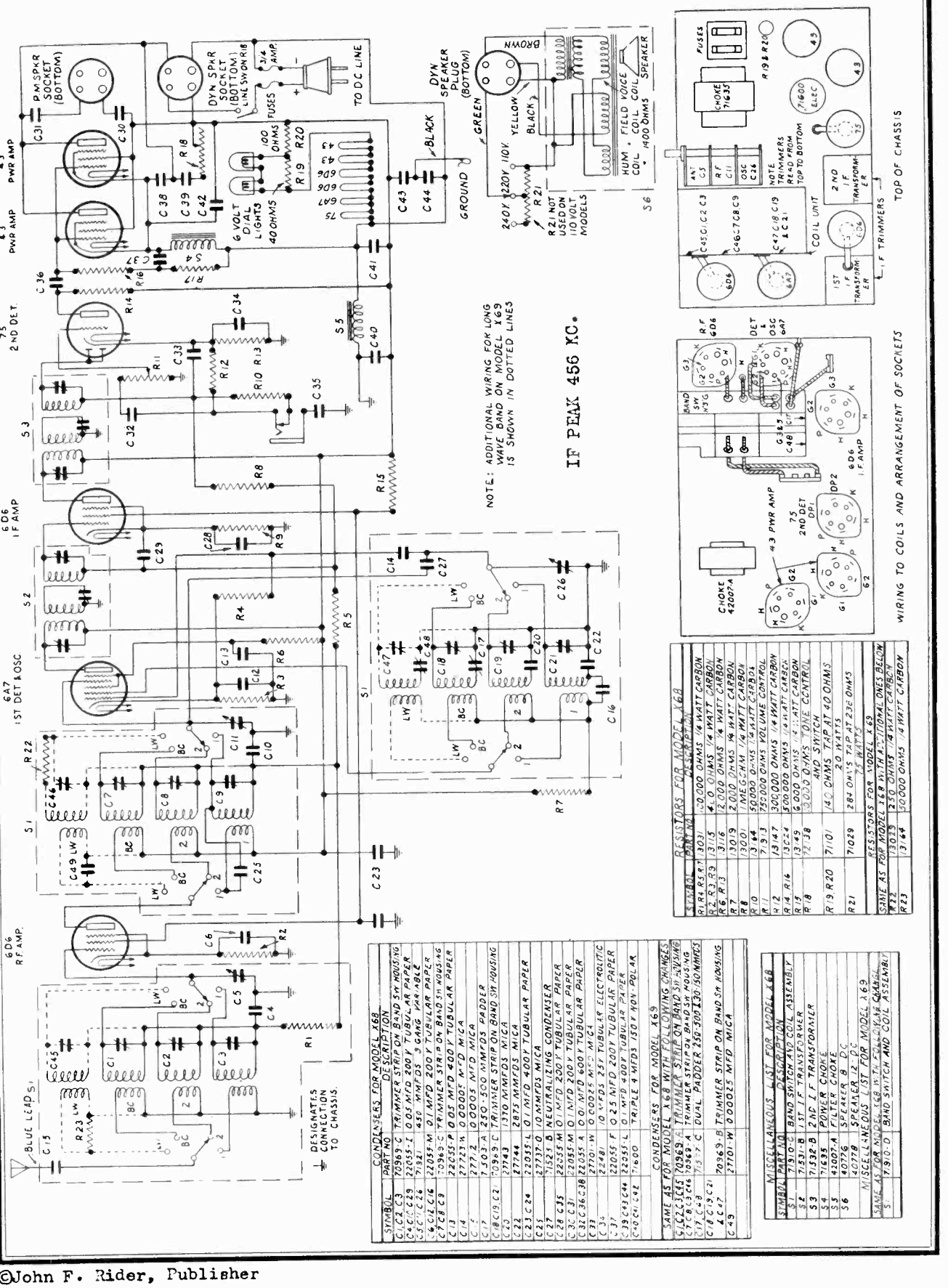
High Band	Align at 750 meters. Pad at 2,000 meters.
Broadcast	Align at 200 meters. Pad at 500 meters.
Band 2	Align at 49 meters.
Band 1	Align at 17 meters.

REMOVAL OF BAND SELECTOR SWITCH ASSEMBLY: Should it be necessary to remove the switch assembly, this is easily done by removing the supporting screws. Before doing this, however, it is essential to unsolder the leads between the switch and the chassis.

It is advisable to realign the receiver after reinstalling the switch assembly.

PILOT RADIO CORP.

MODELS X-68, X-69
Schematic, Socket
Trimmers



RESISTORS FOR MODEL X68

SYMBOL	PART NO	DESCRIPTION
R1, R4, R5, R7	3031	20,000 OHMS 1/4 WATT CARBON
R2, R3, R9	3115	40,000 OHMS 1/4 WATT CARBON
R6, R13	3116	12,000 OHMS 1/4 WATT CARBON
R7	3019	2,000 OHMS 1/4 WATT CARBON
R8	3001	1 MEGOHM 1/4 WATT CARBON
R10	364	50000 OHMS 1/4 WATT CARBON
R11	7913	150000 OHMS VOLUME CONTROL
R12	3147	300,000 OHMS 1/4 WATT CARBON
R14, R16	3224	500,000 OHMS 1/4 WATT CARBON
R15	3149	6,000 OHMS 1/4 WATT CARBON
R18	7938	3000 OHMS TONE CONTROL AND SWITCH
R19, R20	7101	140 OHMS TAP AT 40 OHMS 20 WATTS
R21	7029	284 OHMS TAP AT 230 OHMS 75 WATTS

RESISTORS FOR MODEL X69

SAME AS FOR MODEL X68 WITH ADDITIONAL ONES BELOW		
R12	3018	250 OHMS 1/4 WATT CARBON
R23	364	50000 OHMS 1/4 WATT CARBON

CONDENSERS FOR MODEL X68

SYMBOL	PART NO	DESCRIPTION
C1, C2, C3	70969-C	TRIMMER STRIP ON BAND SW HOUSING
C4, C5, C29	22055-I	0.05 MFD 200 V TUBULAR PAPER
C6, C7, C26	7921	438 MMFDS 3 GANG VARIABLE
C8, C12, C16	22055-M	0.1 MFD 200 V TUBULAR PAPER
C9, C18, C19	70969-C	TRIMMER STRIP ON BAND SW HOUSING
C10, C11, C24	22055-P	0.05 MFD 400 V TUBULAR PAPER
C13, C14, C15	27723-W	0.00005 MFD MICA
C17	27712-A	0.00005 MFD MICA
C20, C21, C22	7503-A	250-500 MMFDS PADDER
C23, C25, C27	70969-C	TRIMMER STRIP ON BAND SW HOUSING
C28, C35, C36, C38	27743	1310 MMFDS MICA
C30, C31, C32	27744	2875 MMFDS MICA
C33, C34, C37	22055-L	0.1 MFD 400 V TUBULAR PAPER
C39, C40, C41	27737-D	.0 MMFDS MICA
C42, C43, C44	27723-B	NEUTRALIZING CONDENSER
C45, C46, C47	22055-M	0.1 MFD 200 V TUBULAR PAPER
C48, C49 LW	22055-M	0.1 MFD 200 V TUBULAR PAPER
	22055-A	0.00 MFD 600 V TUBULAR PAPER
	27701-W	0.00025 MFD MICA
	22481	10 MFDS 25 V TUBULAR ELECTROLYTIC
	22055-F	0.25 MFD 200 V TUBULAR PAPER
	22055-L	0.1 MFD 400 V TUBULAR PAPER
	7600	TRIPLE 4 MFDS 150 V NON-POLAR

CONDENSERS FOR MODEL X69

SAME AS FOR MODEL X68 WITH FOLLOWING CHANGES		
C1, C2, C3, C45	70969-A	TRIMMER STRIP ON BAND SW HOUSING
C4, C5, C46	70969-A	TRIMMER STRIP ON BAND SW HOUSING
C17, C18	7537-C	DUAL PADDER 250-500 150-300 MMFDS
C19, C21		
C47	70969-B	TRIMMER STRIP ON BAND SW HOUSING
C49	27701-W	0.00025 MFD MICA

MISCELLANEOUS LIST FOR MODEL X68

SYMBOL	PART NO	DESCRIPTION
S1	7910-C	BAND SWITCH AND COIL ASSEMBLY
S2	7531-B	1ST I.F. TRANSFORMER
S3	7532-B	2ND I.F. TRANSFORMER
S4	7635	POWER CHOKE
S5	42007-A	FILTER CHOKE
S6	40776	SPEAKER 8" DC
	40778	SPEAKER 12" DC

MISCELLANEOUS LIST FOR MODEL X69

SAME AS FOR MODEL X68 WITH FOLLOWING CHANGE		
S1	7910-D	BAND SWITCH AND COIL ASSEMBLY

MODELS X-68, X-69
Voltage, Parts
Alignment

PILOT RADIO CORP.

Model X68 D. C. All-Wave Receiver

Range: 16 Meters—550 Meters (18,800 kc.—545 kc.)

Model X69 D. C. Long-Wave Receiver

(For Sale in Eureopean Area Only)

Range: 16 Meters—550 Meters (18,800 kc.—545 kc.)
732 Meters—2,140 Meers (410 kc.—140 kc.)

LIST OF REPLACEMENT PARTS FOR PILOT MODELS

TUBE SOCKETS

Part No.	
70927	4-prong bakelite-base tube socket
70863	6-prong bakelite-base tube socket
70864	7-prong bakelite-base tube socket

TUBE SHIELDS

71857	Tube shield 3 in. long
71858	Tube shield 2⅜ in. long

CHOKES

42007-A	Small choke
71635	Large choke

TUNING EQUIPMENT

71531-B	1st I. F. transformer
71532-B	2nd I. F. transformer
71921	3-gang tuning condenser
71910-C	Band switch and coil assembly completely mounted in shield, with 3-gang condenser, for Model X68
71910-D	Band switch assembly, as above, for Model X69

CONTROLS AND SWITCHES

71911	2-speed dial-driving mechanism
70998	Dial drive disc
72163-2	Dial scale X68
72165-2	Dial scale X69
70934	Pointer
642	Pointer holding screw
71056	Pointer spacing washer
70918	Dial escutcheon
70910	Dial crystal
70919	Crystal retaining ring
70953-A	Volume escutcheon
70953-B	Band switch escutcheon for Model 68
70953-C	Band switch escutcheon for Model 69
71618	Large tuning knob
71619	Small knob
71620	Small knob with white dot
72138	Tone control and switch
70950	Phonograph jack
70422	Dial lamp

PAPER CONDENSERS

Part No.	
22055-I	.05 mfd. 200 volts
22055-M	.1 mfd. 200 volts
22055-F	.25 mfd. 200 volts
22055-L	.1 mfd. 400 volts
22055-A	.01 mfd. 600 volts
22055-P	.05 mfd. 400 volts

MICA CONDENSERS

27712	.0005 mfd.
27701	.00025 mfd.

ELECTROLYTIC CONDENSERS

71600	Electrolytic Condenser block
22481	10. mfd., 25 volts

WIRE WOUND RESISTOR

71101	Line resistor

LINE FUSE

70053-D	Line fuse .75 amp.

LOUD SPEAKER AND PARTS

40776	8-in. speaker, 110 v., D.C., table model
40777	8-in. speaker and resistance assembly, 220-240 v., D.C., table model

CARBON RESISTORS

¼ watt, all resistance values
½ watt, all resistance values

CORD AND PLUG

71399	Cord and plug

SERVICE INFORMATION

REMOVAL OF CHASSIS FROM CABINET:

To remove the chassis from the cabinet proceed as follows:

Be certain that the line cord is removed from the power outlet socket.

Remove the slip-on knobs and felt washers from the controls on the front panel.

Remove the speaker plug from the socket at the rear of the chassis.

Remove the four mounting screws, located underneath the cabinet.

REALIGNMENT: Should the receiver require realignment, the outlined procedure below should be followed. For best results an external modulated oscillator with adequate frequency range, and a visual output meter, should be used.

Before connecting the chassis to the power line, reconnect the speaker cable in its socket at the rear of the chassis.

The location of the R. F. alignment trimmer condensers is on the side of the band switch. The trimmers in the lowest row are those for aligning Band 1. Those in the second row from the bottom are for Band 2. Those in the third row up are for the Broadcast. In the Model X69 there is an additional row of trimmers located immediately above those for the Broadcast.

The padder condenser is located under the rear section of the band switch. In the Model X69 an additional padder for the Highband range is located at the right of the Broadcast padder. Access to the padder condenser is made through a hole provided in the rear of the chassis frame.

I. F. ALIGNMENT: When aligning the Intermediate Frequency Amplifier, the external oscillator must be set at 456 kc. The Band Selector Switch should be in the position marked "Broadcast", and the tuning condenser should be set at maximum capacity. Connect the "antenna" lead of the external oscillator to the control grid of the type 6D6 tube in the I. F. Amplifier stage through a .1 mfd. fixed condenser. Connect the "ground" lead of the external oscillator to the receiver ground lead. The I. F. alignment capacitors are located at the side of the shielded I. F. Transformers. Rotate the adjusting screw of each capacitor on I. F. Unit No. 2 slowly until maximum output is noted. On completion of this operation, remove the external oscillator lead from the type 6D6 I. F. amplifier tube and connect it in the same manner to the control grid at the top of the type 6A7 tube.

Now rotate each adjustment screw on I. F. Unit No. 1 for maximum output. During these operations, use the least possible input to prevent broadening of the resonance peaks.

In order to obtain the most accurate realignment of the I. F. amplifier, it is essential to repeat the alignment process in both I. F. Units, with the external oscillator connected to the 6A7 grid.

BROADCAST ALIGNMENT: After the I. F. amplifier is completely realigned, connect the external oscillator leads to the receiver antenna and ground leads. Set the Band Selector Switch in the Broadcast position and place the tuning control pointer at the 1500 kc. mark. Insert a .0002 mfd. condenser in series with the antenna lead. Adjust the broadcast band oscillator trimmer to maximum response.

Next adjust the interstage alignment trimmer for maximum response. Finally adjust the antenna section trimmer in the same manner.

Next adjust the 600 kc. padder condenser, located in the lower rear section of the band switch, under the chassis. Set the external oscillator at 600 kc. Rotate the receiver tuning control until resonance is indicated. Then rock the tuning control back and forth about this resonance position, and at the same time adjust the padder condenser for the highest resonance peak.

Now repeat the 1500 kc. trimmer adjustment, following in every detail the procedure previously described.

ALIGNMENT OF THE SHORT-WAVE BANDS:—The procedure in aligning the short-wave bands is identical with that for the broadcast with the exception of the adjustment of the padder condenser and the use of a 400 ohm resistor in the antenna lead. The alignment frequencies are as follows:

Band 2: 49 Meters—(6,100 kc.)
Band 1: 16.8 Meters—(17,800 kc.)

When aligning Band 2, set the Band Selector Switch in the position marked "Band 2". Set the tuning control pointer at the 49 meter mark. Set the external oscillator at 49 meters. Adjust the oscillator alignment capacitor on Band 2 for maximum output. Next adjust the interstage and antenna section alignment capacitors for maximum output.

To align Band 1, set the Band Selector Switch in the position marked "Band 1". Set the tuning control pointer at the 16.8 meter mark. Set the external oscillator at 16.8 meters. Adjust the oscillator section alignment capacitor on Band 1 for maximum output.

Proceed next to align the interstage section of Band 1. In doing this, it is essential to rock the tuning control back and forth about the resonance position and at the same time to adjust the trimmer for the highest resonance peak. Next align the antenna section for maximum sensitivity.

LONG WAVE ALIGNMENT: This is similar to the broadcast band. Align at 750 meters. Adjust the padder at 1900 meters.

REMOVAL OF BAND SELECTOR SWITCH ASSEMBLY: Should it be necessary to remove the switch assembly, this is easily done by removing the assembly mounting screws. Before doing this, however, it is essential to unsolder the leads between the switch and the chassis. Also remove the screw beneath the Dial Drive Assembly, which secures the dial assembly to the chassis.

It is advisable to realign the receiver after reinstalling the switch assembly.

CAUTION: When making repairs on the receiver, use only ROSIN CORE SOLDER. NEVER USE SOLDERING PASTE OR ACID FLUXES OF ANY TYPE.

CHARACTERISTICS

Operating Voltage: 110 Volts—Direct Current.

Power Consumption: 50 Watts.

Tubes: One type 6A7, two type 6D6, one type 75, two type 43.

Circuit: One stage of Tuned Radio Frequency amplification for all frequencies, electron-coupled oscillator-modulator, automatic volume control.

Wavelength Range: From 550 meters to 16 meters (545 kc. to 18,800 kc.). Long Wave covers 732-2,140 meters (410-140 kc.) also.

Undistorted Power Output: 2 watts.

Intermediate Frequency: 456 kc.

Tube Functions: Type 6D6—R. F. amplifier for all bands. Type 6A7—Electron emission control oscillator detector; Type 6D6—I. F. amplifier; Type 75—Duo-diode detector-amplifier; Type 43—Class "A" power pentodes in parallel.

TABLE OF VOLTAGES

VOLTAGES: The D. C. voltages measured at the tube sockets of the set should be read with a high resistance voltmeter of at least 1,000 ohms per volt.

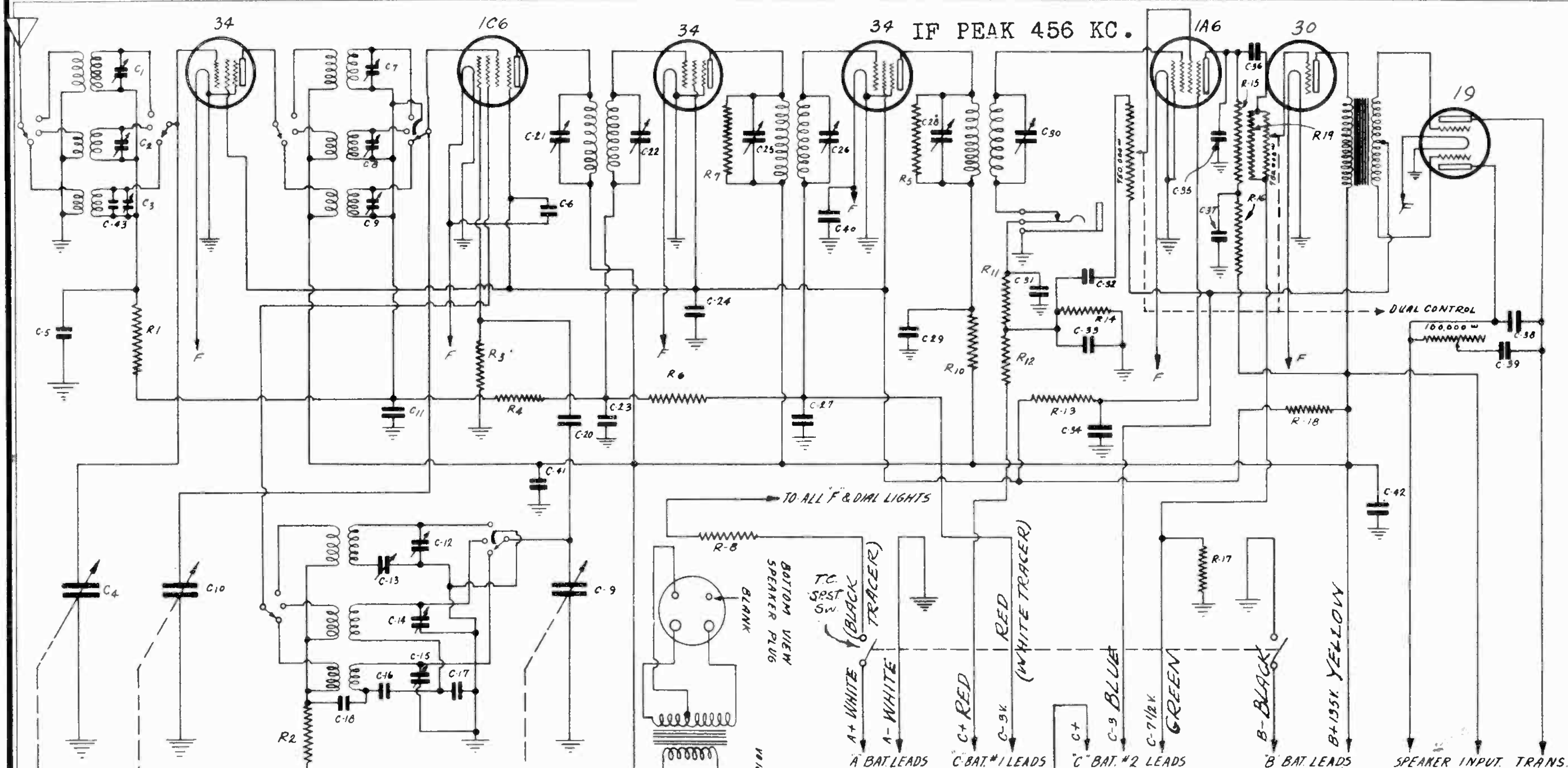
	R.F.	OSC. 1-DET.	I. F.	DIODE 2-DET.	AUDIO OUTPUT	
Tube:	6D6	6A7	6D6	75	43	43
Plate:	100	100*	100	35**	97	97
Screen:	81	60	81		103	103
Cathode:	2.7	3.	2.7	1.2***	15.****	15.****
Filament:	6.3	6.3	6.3	6.3	25.	25.

* Anode Grid—92 volts.
** Measured through Plate Resistor.
*** Measured on 30 volt scale.
**** Measured across 71,635 choke.
All voltages to chassis ground.

Dial lights 8.6 volts across both lamps in series.
Speaker Field 110 volts.

MODELS 73,75
Schematic

PILOT RADIO CORP.



MODELS 73,75

HIGH BAND: Model 75 for sale in European area only. The operation procedure of the high band section is similar to that of the broadcast and short wave ranges. To operate this receiver on the high-band, rotate the band switch knob to the position marked HIGH BAND on the band switch escutcheon.

CONDENSERS		
	PART No.	DESIGNATION
C43	27737	.00001-MICA
C1-2-3-7-8-9-12-14-15	70969-A	TRIMMER STRIP ON BAND SW. HOUSING
C4-C10-C19	71229	450 MMFD. 3 GANG VARIABLE
C5-C11-C23-C27-C29	22055-I	.05-MFD. 200V. TUBULAR PAPER
C13	16052-A	450 MFD. PADDER
C6-C41	22055-F	.25-MFD. 200V. TUBULAR PAPER
C-16	27735	.003-MFD. ± 5% MICA
C-17	27717	.0028 MFD. MICA
C18 C34 C37	22055-M	.1 MFD. 200V. TUBULAR PAPER
C20	27723-O	.00005-MFD. MICA
C21 C22	70936	TRIMMERS 1ST I.F.
C-24 C-40	22055-S	.5 MFD. 200V. TUBULAR PAPER
C26 C25	70936-A	TRIMMERS 2ND I.F.
C28 C30	70936 B	TRIMMERS 3RD I.F.
C31 C33	28016	.0001-MFD. MICA
C-32 C39	22055-A	.01-MFD. 600V. TUBULAR PAPER
C35	27726	.0002 MFD MICA
C-36	22055-P	.05 MFD. 400V. TUBULAR PAPER

RESISTORS		
DESIGNATION	PART NO.	DESCRIPTION
R1-R4 R6-R19	13031	100,000 Ω .25 WATT CARBON
R2	13149	6,000 Ω .25 WATT CARBON
R3-R5-R7-R11-R16	13164	50,000 Ω .25 WATT CARBON
R8	13178	.3-1 WATT WIRE
R10	13113	4000 Ω .25 WATT CARBON
R12	13001	1 MEG. .25 WATT CARBON
R13	13074	20,000 Ω .25 WATT CARBON
R14	13024	500,000 Ω .25 WATT CARBON
R15	13171	250,000 Ω .25 WATT CARBON
R17	13117	15,000 Ω .25 WATT CARBON
R18	13013	10,000 Ω .5 WATT CARBON

C38	27704	.002 MFD. MICA
C42	71203	8 MFD. 200V. DRY ELEC.

NOTE
THIS D'W'G. REVISED FROM D'W'G. NO. 25094-8 DATED 7/31/34 (DRAWN ON PAPER)

ALL DIMENSIONS UNLESS OTHERWISE SPECIFIED MUST BE HELD TO A TOLERANCE OF ± .005"

GROSS WEIGHT INCLUDING SCRAP	W'GHT PER ___ P'CS ___ LBS
NET WEIGHT	" " ___ " ___ "

RAW MATERIAL

LENGTH	WIDTH	THICK	DIA.

ALTERATIONS (9) - R19 WAS ON OTHER SIDE OF CONTROL - E.F. 2/1/35

FINISH

CLASSIFICATION: MODEL 73

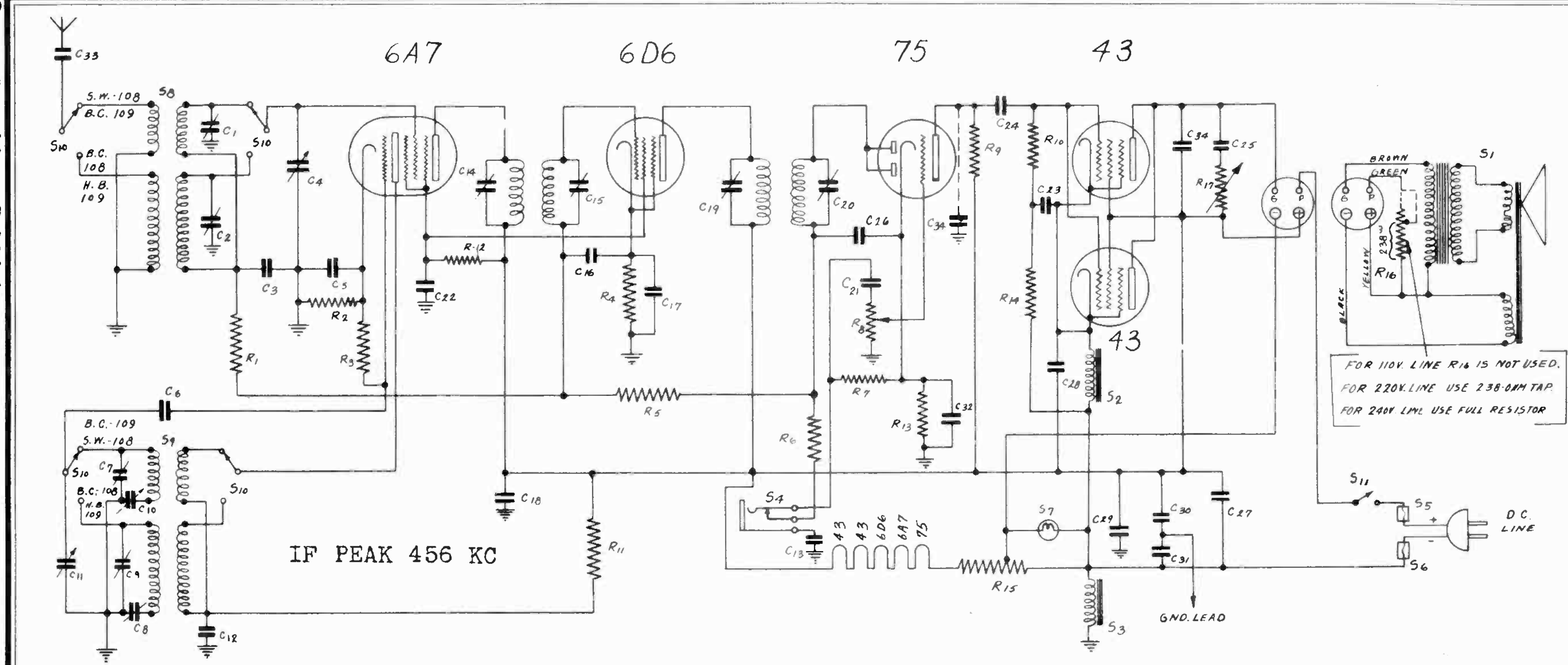
THIS PRINT SUPERSEDES ALL OTHERS PRIOR TO [redacted]

DO NOT SCALE THIS PRINT

PILOT RADIO CORPORATION
LONG ISLAND CITY, N. Y. U. S. A.
7 TUBE AIR CELL REC. (CIRCUIT DIAGRAM) MODEL 73
MATERIAL
SCALE NONE DATE 1/31/35
DRAWN BY E. F.
CHECKED BY
APPROVED BY
DRWG. NO. 25094-9

MODELS 108,109
Schematic

PILOT RADIO CORP.



CONDENSERS		
DESIGNATION	PART NO.	DESCRIPTION
C1 C2 C7 C9	71168	TRIMMER ON BAND SW.
C3 C5 C16	22055-I	.05 MFD. 200V. PAPER
C4 C11	71181	2 GANG COND. 406 MMFD.
C6	27723	50 MMFD. MICA
C8	16052 A	SINGLE PAPPER
C10	27734	6000 MMFD. MICA
C12 C18 C22	22055-P	.05 MFD. 400V. PAPER
C14 C15	71166	TRIMMER 1ST I.F.
C17 C13	22055-M	.1 MFD. 200V PAPER
C19 C20	70937	TRIMMER 2ND I.F.
C21 C24 C34	22055-A	.01 MFD. 600V. PAPER
C23	22055-F	.25 MFD. 200V. PAPER
C25 C30 C31	22055 L	.1 MFD. 400V. PAPER
C26 C33	27712	500 MMFD. MICA
C27 C28 C29	71600	TRIPLE 4 MFD. 150V. N.P.
C32	22481	5 MFD. 25V. ELEC COND.

RESISTORS		
DESIGNATION	PART NO.	DESCRIPTION
R1 R14	13031	100,000 OHMS .25 WATT
R4	13115	400 OHMS .25 WATT
R3 R6	13164	50,000 OHMS .25 WATT
R5	13001	1,000,000 OHMS .25 WATT
R7	13147	300,000 OHMS .25 WATT
R8	71211	750,000 OHM VOLUME CONTROL
R2	13029	250 OHMS .25 WATT
R9 R10	13024	500,000 OHMS .25 WATT
R11	13073	3,000 OHMS .5 WATT
R12	13149	6,000 OHMS .25 WATT
R13	13116	12,000 OHMS .25 WATT
R15	71601	170 OHMS TAPPED AT 40-20 WATTS
R16	71029	284 OHMS TAPPED AT 238-55 WATTS
R17	71634	10,000 OHMS TONE CONTROL

MISC		
DESIGNATION	PART NO.	DESCRIPTION
S1	40785	SPKER 1400 Ω FIELD-PAR. #3'S.
S2	71635	FILTER CHOKE 312 Ω 10 HENRIES
S3	42007	FILTER CHOKE
S4	70950	PHONO JACK
S5, S6	70053-B	FUSES .6 AMPS.
S7	70422-B	DIAL LAMP 6.3V. .3 AMPS.
S8	71169	ANT. COIL
S9	71170	OSC. COIL
S10	71172	BAND SWITCH
S11	ON 71211	LINE SWITCH (ON R8-71211)

REVISIONS FOR MAKING 109 REC.		
R2	13131	600 OHMS .25 WATT
S8	71173	ANT. COIL
S9	71174	OSC. COIL
C8, C10	71577-C	DUAL PADDER C8 - 250-300 MMFD. C10 - 30-150 MMFD.
C34	27712	500 MMFD. MICA (FOR 109 ONLY)

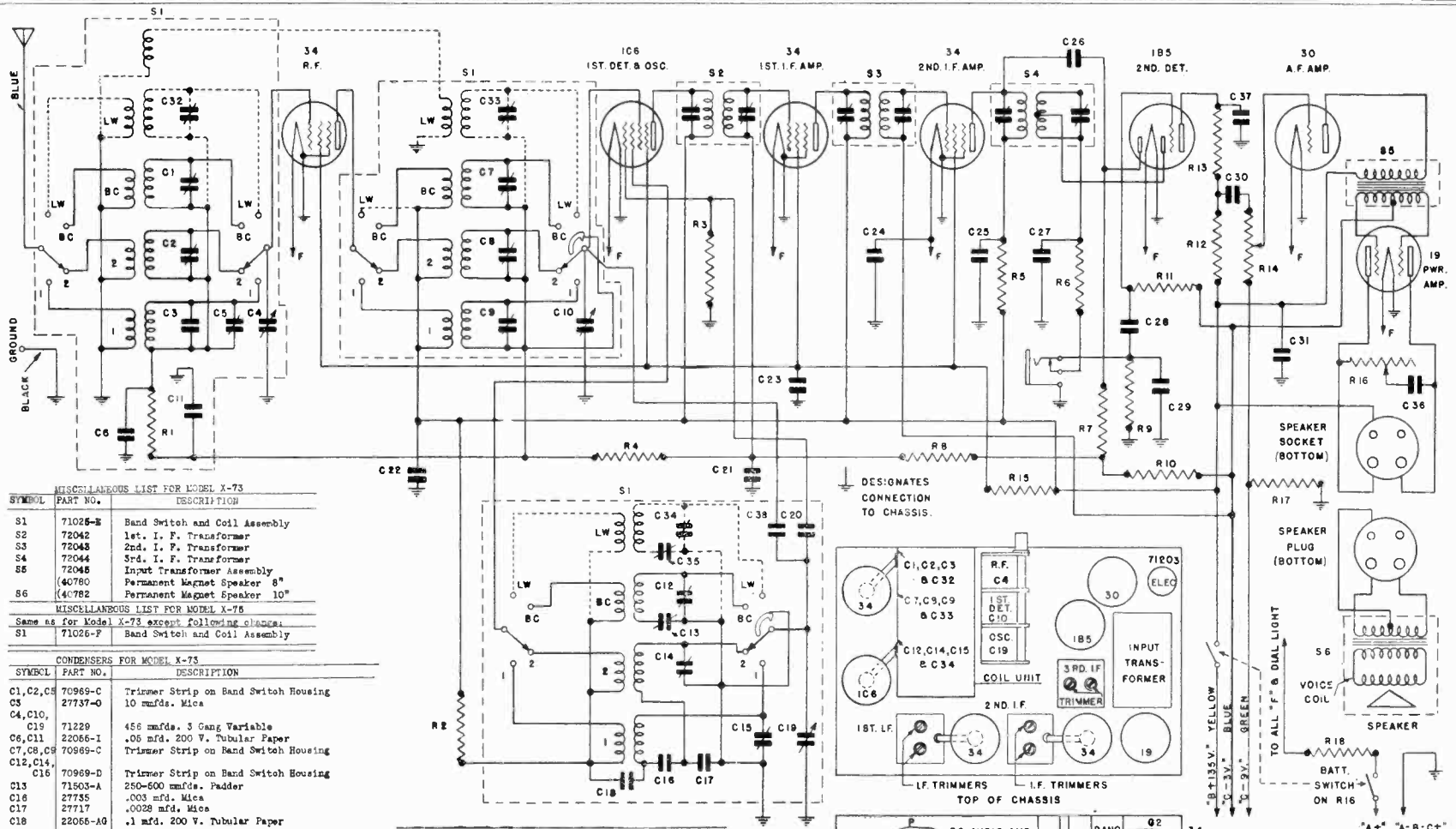
ALL DIMENSIONS UNLESS OTHERWISE SPECIFIED MUST BE HELD TO A TOLERANCE OF ± .005"

GROSS WEIGHT INCLUDING SCRAP — W'GHT PER ___ PCS ___ LBS — RAW MATERIAL: LENGTH, WIDTH, THICK, DIA
NET WEIGHT
ALTERATIONS — FINISH
CLASSIFICATION: MODEL 108 / 109
THIS PRINT SUPERSEDES ALL OTHERS PRIOR TO [redacted]
DO NOT SCALE THIS PRINT

PILOT RADIO CORPORATION
LONG ISLAND CITY, N. Y. U. S. A.
SCHEMATIC DIAGRAM MODEL 108-109
MATERIAL
SCALE NONE — DATE 3/13/35
DRAWN BY E.F.
CHECKED BY
APPROVED BY
DRWG NO 25104

PILOT RADIO CORP.

MODELS X-73, X-75 Schematic, Socket Trimmers



MISCELLANEOUS LIST FOR MODEL X-73

SYMBOL	PART NO.	DESCRIPTION
S1	71025-E	Band Switch and Coil Assembly
S2	72042	1st. I. F. Transformer
S3	72043	2nd. I. F. Transformer
S4	72044	3rd. I. F. Transformer
S5	72045	Input Transformer Assembly
	(40780	Permanent Magnet Speaker 8"
S6	(40782	Permanent Magnet Speaker 10"

MISCELLANEOUS LIST FOR MODEL X-75

Same as for Model X-73 except following changes.

S1	71026-F	Band Switch and Coil Assembly

CONDENSERS FOR MODEL X-73

SYMBOL	PART NO.	DESCRIPTION
C1,C2,C5	70969-C	Trimmer Strip on Band Switch Housing
C3	27737-O	10 mmfds. Mica
C4,C10, C19	71229	456 mmfds. 3 Gang Variable
C6,C11	22056-I	.05 mfd. 200 V. Tubular Paper
C7,C8,C9	70969-C	Trimmer Strip on Band Switch Housing
C12,C14, C16	70969-D	Trimmer Strip on Band Switch Housing
C13	71503-A	250-600 mmfds. Padder
C16	27735	.003 mfd. Mica
C17	27717	.0028 mfd. Mica
C18	22056-AG	.1 mfd. 200 V. Tubular Paper
C20	27723-O	50 mmfds. Mica
C21,C25	22055-I	.05 mfd. 200 V. Tubular Paper
C22	22056-F	.25 mfd. 200 V. Tubular Paper
C23	22055-S	.5 mfd. 200 V. Tubular Paper
C24	22056-AK	1 mfd. 200 V. Tubular Paper
C26	27723-W	50 mmfds Mica
C27,C29	28016	100 mmfds. Mica
C28,C30	22065-A	.01 600 V. Tubular Paper
C31	71203	8 mfd. 200 V. Electrolytic
C36	22065-AJ	.03 mfd. 600 V. Tubular Paper
C37	27712	.0005 mfd. Mica
C38	71526-B	Neutralizing Condenser Assy.

CONDENSERS FOR MODEL X-75

Same as for Model X-73 with following changes.

SYMBOL	PART NO.	DESCRIPTION
C1,C2,C5 C32	(70969-A	Trimmer Strip on Band Switch Housing
C7,C8,C9 C33	(70969-A	Trimmer Strip on Band Switch Housing
C12,C15, C14,C34	(70969-B	Trimmer Strip on Band Switch Housing
C13,C36	71577-C	Dual Padder 250-500 and 30-150 mmfds.

RESISTORS FOR MODEL X-73 & X-75

SYMBOL	PART NO.	DESCRIPTION
R1, R4	13031	100,000 Ohms ½ Watt Carbon
R2, R5	13149	6,000 Ohms ½ Watt Carbon
R3,R6,R12	13164	50,000 Ohms ½ Watt Carbon
R7,R10	13024	500,000 Ohms ½ Watt Carbon
R8,R11	13001	1 megohm ½ Watt Carbon
R9	13147	300,000 Ohms ½ Watt Carbon
R13	13074	20,000 Ohms ½ Watt Carbon
R14	71913	750,000 Ohms Volume Control
R15	13117	15,000 Ohms ½ Watt Carbon
R16	71914	100,000 Ohms Tone Control & Switch
R17	13180	18,000 Ohms ½ Watt Carbon
R18	13178	.5 Ohm 1 Watt Flexible

MODEL X-75 A.W.
16-550 M. & 750-2000M.

MODEL X-73 16-550M.

9/1935

IF PEAK 456 KC.

MODELS X-73, X-75
Voltage, Parts
Alignment

PILOT RADIO CORP.

SERVICE INFORMATION

REMOVAL OF CHASSIS FROM CABINET:

To remove the chassis from the cabinet proceed as follows:

Remove the "slip-on" knobs and felt washers from the controls on the front panel.

Remove the speaker plug from the socket at the rear of the chassis.

Remove the four mounting screws, located underneath the cabinet.

REALIGNMENT: Should the receiver require realignment, the outlined procedure below should be followed. For best results, an external modulated oscillator with adequate frequency range and a visual output meter, should be used.

Before connecting the chassis to the batteries reconnect the speaker cable in its socket at the rear of the chassis.

I. F. ALIGNMENT: When aligning the Intermediate Frequency Amplifier, the external oscillator must be set at 456 kc. The Band Switch should be in the position marked "Broadcast," and the tuning condenser should be set at maximum capacity. When aligning the receiver on all positions, the volume control and the tone control should be turned to the maximum clockwise position. Connect the antenna lead of the external oscillator to the control grid of the 34 tube in the 2nd I. F. Amplifier through .002 mfd. fixed condenser. Connect the ground lead of the external oscillator to the receiver ground lead. The I. F. alignment trimmers are located at the top of the shielded I. F. Transformers. Rotate the adjusting screw of each capacitor on I. F. Unit No. 3 slowly until maximum output is noted. On completion of this operation, remove the external oscillator lead from the 34 2nd I. F. amplifier tube and connect it in the same manner to the control grid of the 34 1st I. F. amplifier tube. Now rotate each adjustment screw on I. F. Unit No. 2 for maximum output. Following this, connect the external oscillator leads to the control grid of the 1C6 tube. Adjust each trimmer on the I. F. Unit No. 1 for maximum gain.

During these operations, use the least possible input to prevent broadening of the resonance peaks.

In order to obtain the most accurate realignment of the I. F. amplifier, it is essential to repeat the alignment process in all I. F. Units, with the external oscillator leads connected across the control grid of the 1C6 tube.

BROADCAST ALIGNMENT: After the I. F. amplifier is completely realigned, connect the external oscillator leads to the receiver antenna and ground leads. Set the Band Selector Switch in the "Broadcast" position and place the tuning control pointer at the 1400 kc. mark. Adjust the broadcast band oscillator trimmer to maximum response.

Next adjust the interstage alignment trimmer for maximum response. Finally adjust the antenna section trimmer in the same manner.

Next adjust the 600 kc. padder condenser, located in the lower rear section of the band switch, under the chassis. Set the external oscillator at 600 kc. Rotate the receiver tuning control until resonance is indicated. Then rock the tuning control back and forth about this resonance position, and at the same time adjust the padder condenser for the highest resonance peak.

Now repeat the 1400 kc. trimmer adjustment, following in every detail the procedure previously described.

ALIGNMENT OF THE SHORT-WAVE BANDS:—The procedure in aligning the short wave-bands is identical with that for the broadcast with the exception of the adjustment of the padder condenser. The alignment frequencies are as follows:

Band 2: 49 Meters (6,100 kc.)
Band 1: 16.8 Meters—(17,800 kc.)

When aligning Band 2, set the Band Selector Switch in the position marked "Band 2." Set the tuning control pointer at the 49 meter mark. Set the external oscillator at 49 meters. Adjust the oscillator alignment capacitor on Band 2 for maximum output. Next adjust the interstage and antenna section alignment capacitors for maximum output.

To align Band 1, set the Band Selector Switch in the position marked "Band 1." Set the tuning control pointer at the 16.8 meter mark. Set the external oscillator at 16.8 meters. Adjust the oscillator section alignment capacitor on Band 1 for maximum output.

Proceed next to align the interstage section of Band 1. In doing this, it is essential to rock the tuning control back and forth about the resonance position and at the same time to adjust the trimmer for the highest resonance peak. Next align the antenna section for maximum sensitivity.

REMOVAL OF BAND SELECTOR SWITCH ASSEMBLY: Should it be necessary to remove the switch assembly, this is easily done by removing the screws which hold it in place, and unsoldering the leads between the switch and the chassis. Also remove the screw beneath the Dial Drive Assembly, which secures the dial assembly to the chassis.

It is advisable to realign the receiver after reinstalling the switch assembly.

CAUTION: When making repairs on the receiver, use only ROSIN CORE SOLDER. NEVER USE SOLDERING PASTE OR ACID FLUXES OF ANY TYPE.

CHARACTERISTICS

Batteries Required: One Eveready Air Cell or 2.2-volt storage battery, three 45-volt B batteries, one 7½-volt C battery, and one 4½-volt C battery.

Tubes: Three 34's, one 1C6, one 1A6, one 19, and one 30.

Wavelength Range: Model 73 — 16 to 550 meters (18,800 to 545 kc.)

Model 75 — 16 to 550 meters and 750 to 2,000 meters. (18,800 to 545 kc. and 400 to 150 kc.) (EXPORT ONLY)

Undistorted Power Output: 1.9 watts.

I. F. Alignment Frequency: 456 kc.

Circuit. All-wave superheterodyne, with one stage of R. F. on all bands.

Output: Class B amplifier.

Air Cell Life: When operating a Pilot 73 or 75, the No. SA-600 Air Cell will have a total operating life of at least 750 hours.

TABLE OF VOLTAGE MEASUREMENTS

	R.F. No. 34	Osc. Det. No. 1C6	1st I. F. No. 34	2nd I. F. No. 34
Plate Volts	145	145	145	130
Screen Volts	65	65	65	65
Fil. Volts	2.2	2.2	2.2	2.2

	Det. No. 1A6	Driver No. 30	"B" Amp. No. 19
Plate Volts	50*	135	145 both plates
Screen Volts	28**		
Fil. Volts	2.2	2.2	2.2

* Measured through .25 meg. plate resistor.
** Measured through 20,000-ohm resistor.

Note 1: All voltages are measured to chassis frame.

Note 2: These measurements should be made with 145 volts B battery.

Note 3: Anode grid of 1C6 should show 115 volts.

List of Replacement Parts for Pilot Models X73 & X75

TUBE SOCKETS

Part No.	
70927	4-prong bakelite-base tube socket.
70863	6-prong bakelite-base tube socket.

TUBE SHIELDS

70865	Tube shield base, 1⅜ ins. diameter.
71125	Tube shield base, 1⅞ ins. diameter.
70801-B	Small tube shield, 3¼ ins. long
71126	Large tube shield, 4⅛ ins. long
70802	Tube shield cover for above.

SPEAKER AND PARTS

40780	8-in. permanent magnet speaker.
40782	10-in permanent magnet speaker.
70509	Steel speaker mounting bushing.
70002	Rubber grommet for speaker mounting.

AUDIO TRANSFORMERS

71112	A. F. transformer.

TUNING EQUIPMENT

70936-B	1st I. F. transformer.
70936-B	2nd I. F. transformer.
71129	3rd I. F. transformer.
71229	3-gang tuning condenser.
71025-E	Band switch and coil assembly completely mounted in shield, with 3-gang condenser, for Model 73.
71025-F	Band switch assembly, as above, for Model 75.
70918	Dial escutcheon.
70910	Dial Crystal.
70919	Dial crystal retaining ring.
71028	2-speed dial driving mechanism.
70998	Dial drive disc.
71000-A	Dial scale and holder assembly.
70934	Pointer.
642	Pointer holding screw.
71056	Spacing Washer.
70953-B	Band switch escutcheon for Model 73.
70953-C	Band switch escutcheon for Model 75.
70432-B	Dial light bulb, screw base, 2. volts, 60 ma. Part No. 71750

SWITCHES AND CONTROLS

71127	Tone control and switch
71111	Dual volume control.
70953-A	Volume control escutcheon.
71619	Small knob.
71620	Small knob with dot.
71618	Large tuning knob.
70950	Phonograph jack.

PAPER CONDENSERS

22055-I	.05 mfd., 200v.
22055-M	.10 mfd., 200v.
22055-F	.25 mfd., 200v.
22055-S	.50 mfd., 200v.
22055-P	.05 mfd., 400v.
22055-A	.01 mfd., 600v.

MICA CONDENSERS

27737-O	.000010 mfd.
27735	.00300 mfd.
27717	.002800 mfd.
27723-O	.000050 mfd.
28016	.000100 mfd.
27726	.000200 mfd.
27704	.002000 mfd.

ELECTROLYTIC CONDENSER

71203	Electrolytic condenser.

PADDING CONDENSER

71503-A	.000450 mfd. max.

WIRE WOUND RESISTOR

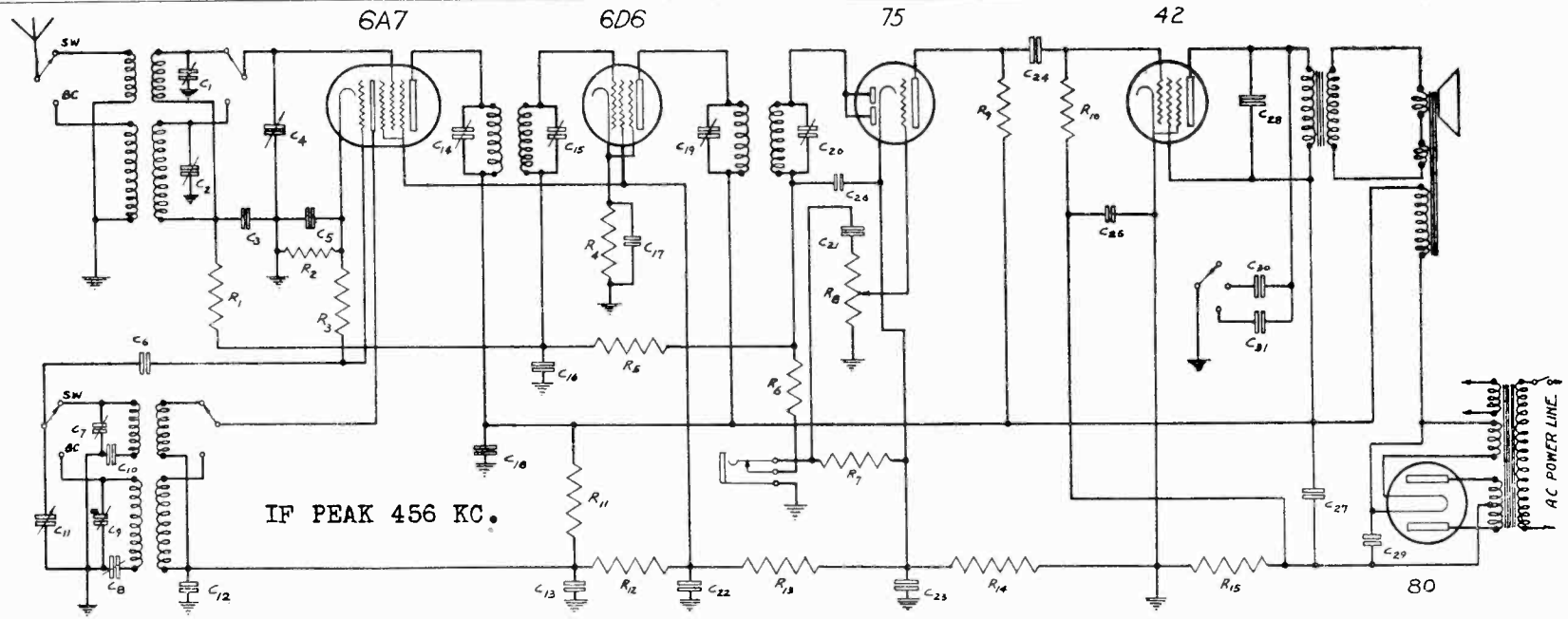
13178	.3 ohm, 1 watt.

CARBON RESISTORS

¼-watt, all resistance values.
½-watt, all resistance values.

BATTERY CABLE

71110	Battery cable.



CONDENSERS		
DESIGNATION	PART NO	DESCRIPTION
C_1 C_2 C_7 C_9	71168	TRIMMER ON BAND SW.
C_3 C_5 C_{14}	22055-I	.05 MFD. 200 VOLT PAPER
C_4 C_{11}	71181	2 GANG COND. 406 MMF.
C_6	27723	50 MICRO-MFD. MICA
C_8	16052-A	SINGLE PADDER
C_{10}	27734	6000 MICRO-MFD. MICA
C_{12} C_{22}	22055-P	.05 MFD. 400 V. PAPER
C_{13}	71215	4 MFD. 450 V. ELEC.
C_{14} C_{15}	71166	TRIMMER 1ST I.F.
C_{17}	22055-M	.1 MFD. 200 V. PAPER
C_{19} C_{20}	70937	TRIMMER 2ND I.F.
C_{21} C_{24}	22055-A	.01 600 V. PAPER
C_{23}	22055-F	.25 MFD. 200 V PAPER
C_{25}	22055-S	.5 MFD. 200 V PAPER
C_{26}	27712	500 MICRO-MFD. MICA.
C_{27} C_{29}	71045-B	DUAL 8 MFD. 475 V. (CAN)
C_{28}	22055-R	.005 MFD. 1000 V. PAPER
C_{30}	22055-U	.01 MF. 1000 V. PAPER
C_{31}	22055-V	.03 MF. 1000 V. PAPER.
C18		.05 MFD. 600 V. PAPER

RESISTORS		
DESIGNATION	PART NO.	DESCRIPTION
R_1	13031	100,000 OHMS .25 WATT
R_2 R_4	13115	400 OHMS .25 WATT.
R_3 R_6	13164	50,000 OHMS .25 WATT.
R_5	13001	1,000,000 OHMS .25 WATT.
R_7	13147	300,000 OHMS .25 WATT
R_8	71211	750,000 VOLUME CONTROL
R_9	13171	250,000 OHMS .25 WATT
R_{10}	13024	500,000 OHMS .25 WATT.
R_{11}	13073	3000 OHMS .5 WATT
R_{12}	13129	15,000 OHMS 1 WATT
R_{13}	13148	30,000 OHMS .25 WATT.
R_{14}	13130	420 OHMS .25 WATT.
R_{15}	13059	250 OHMS 1 WATT.

All screen voltages measured to cathode. All cathode voltages measured to chassis frame.
** Grid bias voltage for No. 42 tube obtained across R-15 (250 ohms resistor).
***Filament to chassis ground 315 Volts D. C.
Anode grid of 6A7 to cathode—175 Volts.

RECEIVER DESCRIPTION

Operating Voltages—115, 125, 150, 220, 240 volts, Alternating Current.
Frequency Rating —50 to 60 cycles.
Power Consumption—60 Watts.
Tubes— —1 type 6A7, 1 type 6D6, 1 type 75, 1 type 42, 1 type 80.
Wavelength Range —16 meters to 52.6 meters—178.5 meters to 550 meters.
Undistorted power output—3 watts.
Intermediate Frequency—456 kc.
Tube Functions —Type 6A7: Electron emission control oscillator-detector.
Type 6D6: I. F. Amplifier.
Type 75: Duo-diode detector amplifier.
Type 42: Class "A" power pentode.
Type 80: Full-wave rectifier for power supply.

VOLTAGES

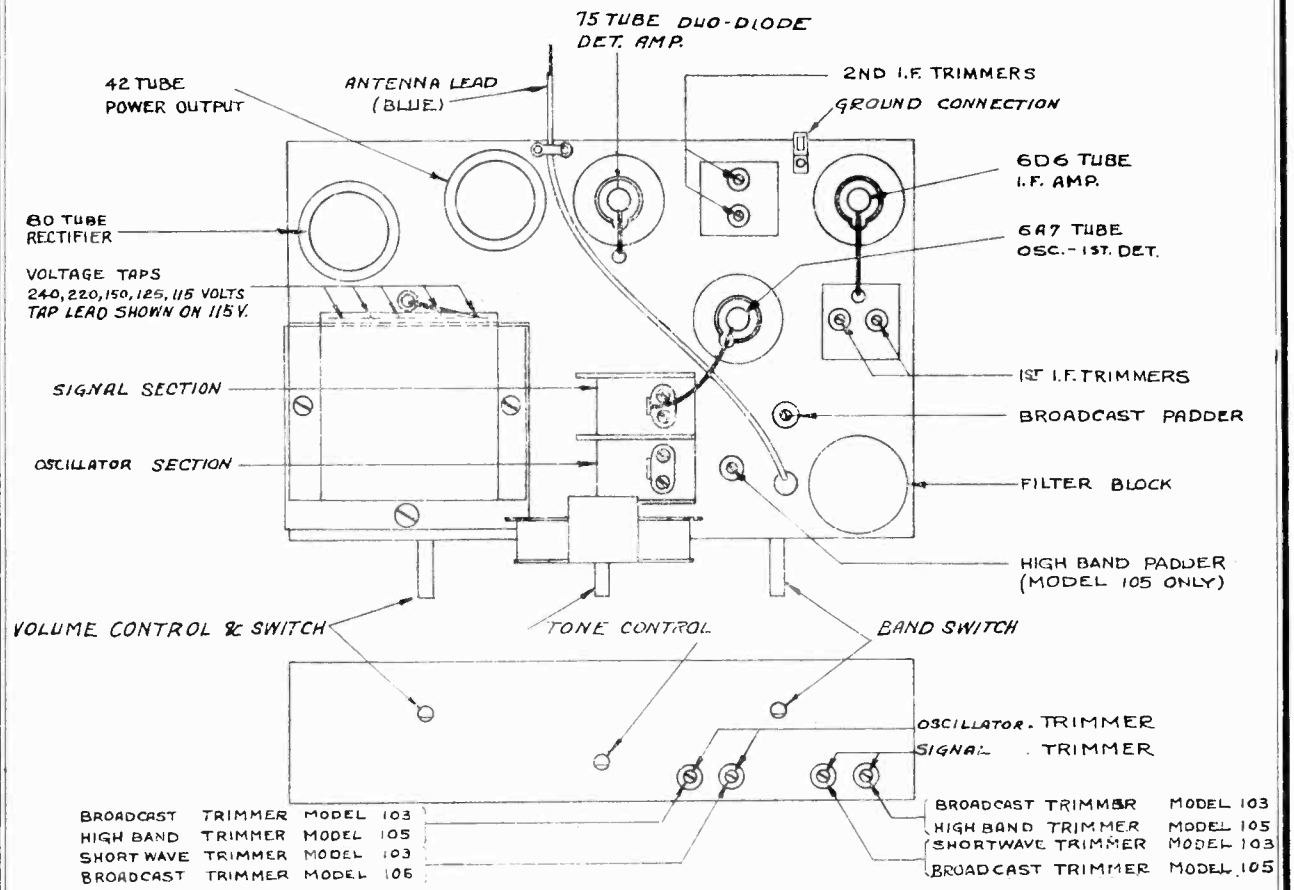
The D. C. Voltages measured at the tube sockets of the set shoud be read with a high resistance voltmeter of at least 1000 ohms per volt.

	OSC. DET. Type 6A7	I. F. Type 6D6	DIODE DET. Type 75	POWER PENTODE Type 42	RECTIFIER Type 80
Plate	230	230	105*	205	***
Cathode	4.	3.8	1.4	**	
Screen	85	85		230	
Filament	6.3	6.3	6.3	6.3	

*Voltages measured through 250,000 ohm plate resistor.
Speaker field voltage 90 volts. All plate voltages measured to cathode.

MODELS 103,105
Socket,Trimmers
Alignment

PILOT RADIO CORP.



REALIGNMENT: Should the receiver require realignment, the outlined procedure below should be followed. In the service information sheet, the location and function of the various alignment capacitors are clearly illustrated. For best results an external modulated oscillator with adequate frequency range, and a visual output meter, should be used.

Before connecting the chassis to the power line, reconnect the speaker cable in its socket at the rear of the chassis.

I. F. ALIGNMENT: When aligning the intermediate Frequency Amplifier, the external oscillator must be set at 456 kc. The Band Switch should he in the position marked "Broadcast," and the tuning condenser should be set at maximum capacity. Connect the "antenna" lead of the external oscillator to the control grid of the type 6D6 tube in the I. F. Amplifier stage through a .002 mfd. fixed condenser. Connect the "ground" lead of the external oscillator to the receiver ground lead. The I. F. alignment capacitors are located at the top of the shielded I. F. Transformers. Rotate the adjusting screw of each capacitor on I. F. Unit No. 2 slowly until maximum output is noted. On completion of this operation, remove the external oscillator leads from the type 6D6 I. F. Amplifier tube and connect it in the same manner to the control grid at the top of the type 6A7 tube.

Now rotate each adjustment screw on I. F. Unit No. 1 for maximum output. During these operations, use the least possible input to prevent broadening of the resonance peaks.

In order to obtain the most accurate realignment of the I. F. Amplifier, it is essential to repeat the alignment process in both I. F. units with the external oscillator leads connected across the control grid of the 6A7 tube.

BROADCAST ALIGNMENT: After the I. F. amplifier is completely realigned, connect the external oscillator leads to the receiver antenna and ground leads. Set the Band Switch in the "Broadcast" position and place the tuning control pointer at the 1400 kc. mark. Adjust the broadcast band oscillator trimmer to maximum response. Adjust the signal section trimmer in the same manner.

Next adjust the 600 kc. padder condenser. Set the external oscillator at 600 kc. Rotate the receiver tuning control until resonance is indicated. Then rock the tuning control back and forth about this resonance position, and at the same time adjust the padder condenser for the highest resonance peak.

Now repeat the 1400 kc. trimmer adjustment, following in every detail the procedure previously described.

ALIGNMENT OF THE SHORT-WAVE BANDS: The procedure in aligning the short wave-bands is identical with that for the broadcast with the exception of the adjustment of the padder condenser. The alignment frequency is;

16.8 Meters—(17,800 kc.)

Turn the Band Switch to the right. Tune the external oscillator to 16.8 meters. Tune the receiver so that the dial pointer is in a position coincidental with the 16.8 meter indication on the dial scale. Adjust the short wave oscillator trimmer for maximum response. Next adjust the signal circuit trimmer for maximum resonance. Repeat all adjustments to assure correct alignment, rocking the gang condenser to right or left for maximum gain.

THE HIGH BAND ALIGNMENT: Procedure in the Model 105 is similar to the Broadcast section of that receiver. Align at 375 k.c. Adjust the padder at 160 k.c.

Should it be necessary to remove the band switch assembly, it is advisable to realign the receiver after reinstalling.

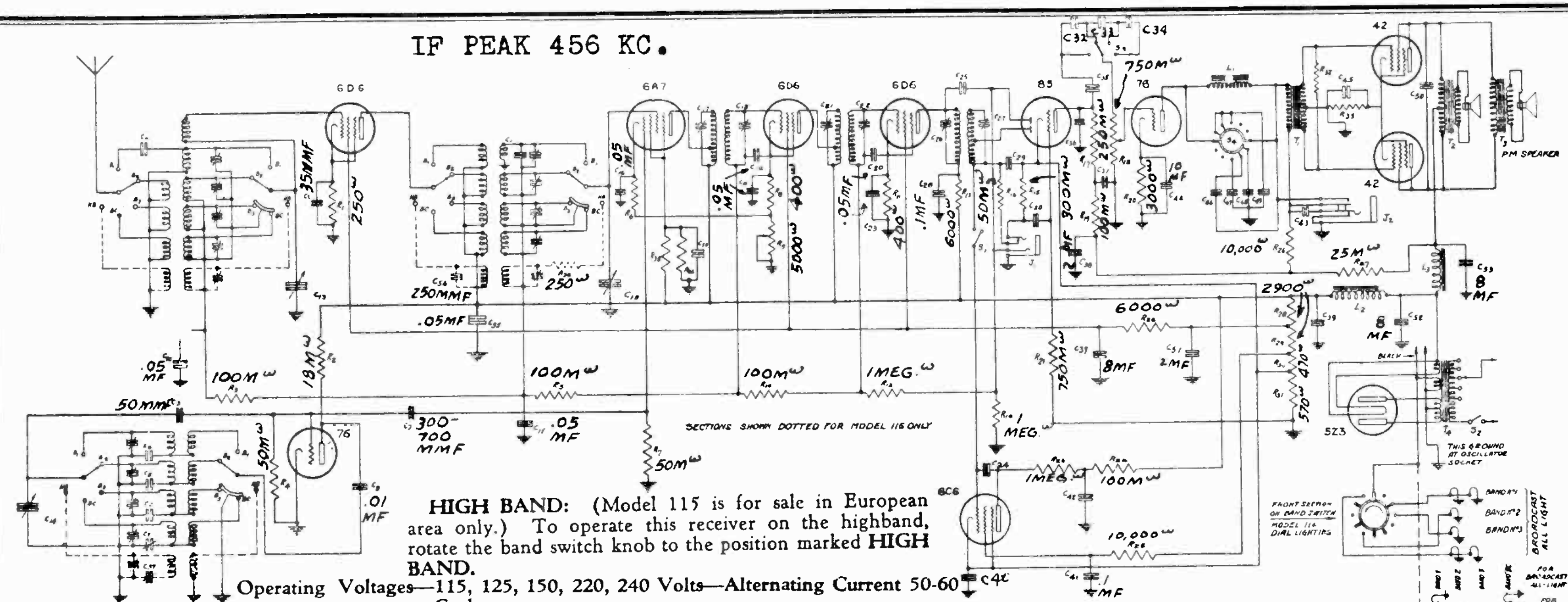
MODEL 103 SHORTWAVE—BROADCAST RECEIVER. The Model 103 is a Shortwave and Broadcast receiver. The Shortwave band embraces all of the internationally assigned Shortwave transmission frequencies from 18800 kc. to 5700 kc., (16 meters to 52.6 meters). The Broadcast band includes all frequencies from 1680 kc. to 545 kc., (178.5 meters to 550 meters).

MODEL 105 HIGHBAND—BROADCAST RECEIVER: (For sale in European area only). The Model 105 is a Highband and Broadcast receiver. The Highband range extends from 380 kc. to 140 kc., (789 meters to 2142 meters). The operation procedure of the Model 105 is similar to the Model 103 except for the Band Switch position. To operate this receiver on the Highband section, rotate the Band Switch knob to the counterclockwise position. With this knob in the clockwise position, the receiver will function on the standard broadcast band. The Highband calibration may be observed on the lower portion of the dial scale.

MODELS 114,115
Schematic,Voltage

PILOT RADIO CORP.

IF PEAK 456 KC.



HIGH BAND: (Model 115 is for sale in European area only.) To operate this receiver on the highband, rotate the band switch knob to the position marked **HIGH BAND.**

Operating Voltages—115, 125, 150, 220, 240 Volts—Alternating Current 50-60 Cycles.

CONDENSERS

DESIGNATION	PART NO	DESCRIPTION
C_{9}	27736	25 MICRO-MFD MICA
C_{10}	27740-0	35 MICRO-MFD MICA
$C_2\ C_5\ C_8\ C_{14}\ C_{19}\ C_{20}$	22055 I	.05 MFD 200 VOLT PAPER
$C_{24}\ C_{30}\ C_3 - C_{10}$	"	" "
$C_3\ C_4\ C_{25}$	27723-0	50 MICRO MFD MICA
C_4	27738	2870 MICRO-MFD MICA
C_5	28018	1480 " "
C_6	27741	160 " "
C_7	71503-D	300-700 MMF (114 ONLY)
C_8	22055-N	.01 MFD 400 VOLT PAPER
$C_{11}\ C_{12}\ C_{13}$	71585	3 GANG TUNING COND.
$C_{17}\ C_{18}$	71261	TRIMMER CONDS 1ST I F TRANS
$C_{21}\ C_{22}$	71343	TRIMMER CONDS 2ND I F TRANS
$C_{26}\ C_{27}$	71262	TRIMMER CONDS 3RD I F TRANS
$C_{26}\ C_{29}\ C_{35}$	27712	500 MICRO-MFD MICA
$C_{28}\ C_{31}\ C_{42}\ C_{55}$	22055-AB	1 MFD 600 VOLT PAPER
C_{32}	27711	1000 MICRO MFD MICA
$C_{33}\ C_{56}$	27701-C	250 MICRO-MFD MICA

CONDENSERS

DESIGNATION	PART NO	DESCRIPTION	
$C_{36}\ C_{43}$	22055-C	.05 MFD 600 VOLT PAPER	
C_{36}	27720	200 MICRO-MFD MICA.	
C_{38}	71589	2 MFD 450 VOLT	ELECTROLYTIC IN ONE CAN
C_{39}		8 MFD 450 VOLT	
C_{40}		10 MFD 25 VOLT	
C_{41}	22055-M	.1 MFD 200 VOLT PAPER	
C_{44}	71590	10 MFD 25 VOLT IN ONE	
C_{45}		10 MFD 50 VOLT CAN	
$C_{46}\ C_{47}\ C_{49}$	22055-R	.005 MFD 1000 VOLT	
C_{48}	22055-AD	.02 MFD 1000 VOLT	
C_{50}	22055-AA	.005 MFD 1500 VOLT	
C_{51}	71586	2 MFD 200 VOLT IN ONE	
$C_{52}\ C_{53}$		8 MFD 475 VOLT CAN	
C_{54}	22055-P	.05 MFD 400 VOLT PAPER	
C_{57}	71577 C	30-... MICRO MFD PADDER	
C_{7}	71577-C	250-500 MMFD (115 ONLY)	

RESISTORS

DESIGNATION	PART NO	DESCRIPTION
$R_1\ R_{30}$	13029	250 OHM .25 WATT
R_2	13179	18,000 OHM 2 WATT
$R_3\ R_5\ R_{10}\ R_{19}\ R_{24}\ R_{25}$	13031	100 000 OHM .25 WATT
R_{12}	13031	100 000 OHM .25 WATT
$R_4\ R_7\ R_{16}\ R_{36}$	13144	50 000 OHM .25 WATT
$R_6\ R_8\ R_{11}$	13115	400 OHM .25 WATT
R_9	71667	5000 OHM VARIABLE WIRE WOUND
$R_{11}\ R_{14}\ R_{23}$	13001	1 000 000 OHM .25 WATT
R_{13}	13149	6000 OHM .25 WATT
R_{15}	13147	300,000 OHM .25 WATT
R_{17}	13171	250,000 OHM .25 WATT
R_{18}	71566	750,000 OHM VARIABLE
R_{20}	13133	3000 OHM .25 WATT
R_{21}	13072	750 000 OHM .25 WATT
R_{22}	13052	6000 OHM 5 WATT
R_{26}	13030	10 000 OHM .25 WATT
R_{27}	13126	25 000 OHM 5 WATT

RESISTORS

DESIGNATION	PART NO	DESCRIPTION
R_{28}	71256	2900 OHM
R_{29}		2090 OHM
R_{30}		470 OHM
R_{31}		570 OHM
R_{33}	13132	750 OHM 3 WATT WIRE WOUND
R_{34}	13092	30,000 OHM 1 WATT

MISC

DESIGNATION	PART NO	DESCRIPTION
S_1	ON 71567	INTER-STATION CLARIFIER SW ON R_9
S_2	ON 71566	POWER SUPPLY SWITCH ON R_{18}
S_3	71592	BASE ACCENTUATOR SWITCH
S_4	71258	TONE CONTROL SWITCH
J_1	71272	PHONO JACK
J_2	71273	HEAD PHONE JACK
L_1	71271	TONE CONTROL CHOKE
L_2	71276 10" 71277 12"	SPEAKER FIELD WINDING 1400ω
L_3	71315	POWER FILTER CHOKE
T_1	71271	AUDIO PUSH PULL INPUT TRANS
T_2	71276 10" 71277 12"	SPEAKER-P P INPUT TRANSFORMER
T_3	44508 8" 44708 10"	P M SPEAKER-INPUT TRANSFORMER
T_4	71274	POWER SUPPLY TRANSFORMER

Power Consumption—120 Watts.

Tubes 1—6A7 1—6C6 2—76 1—5Z3
3—6D6 1—85 2—42

Wavelength range—From 12.7 to 550 meters (23,560 kc. to 545 kc.)

Undistorted power output—12 Watts.

I. F. —456 kc.

Type of circuit —All wave Superhetrodyne with TRF stage on all bands, A. V. C., Class "A" Prime push pull power output stage.

Line Volts=115

*Voltages measured through plate resistor.

**Measured on 100V Scale.

***A. C. Voltage plate to chassis.

Speaker field voltage-volts. All plate voltages measure to cathode. All screen voltage measure to cathode. All cathode voltages measure to chassis frame.

The D. C. Voltages measure at the tube sockets of the set should be read with a high resistance voltmeter of at least 1,000 ohms per volt.

	R.F. Amp. 6D6	1st. Det. 6A7	Oscillator 76	1st. I. F. Amp. 6D6	2nd. I. F. Amp. 6D6
Plate	253	252	145	252	210
Cathode	2.5	2.65	0	3.2	3.2
Screen	90	74	....	89	89
Filament	6.3	6.3	6.3	6.3	6.3

	Diode Detector 85	Audio Driver 76	Class "A Prime Audio Output" 42 42	Inter Channel Clarifier	6C6 Rectifier 5Z3
Plate	105*	210	330	20	375***
Cathode	22**	10.5	33	21.5	375***
Screen	....	....	....	8.7	....
Filament	6.3	6.3	6.3	6.3	5

SERVICE INFORMATION

REMOVAL OF CHASSIS FROM CABINET:

To remove the chassis from the cabinet proceed as follows:

Be certain that the line cord is removed from the power outlet socket.

Unfasten the base accentuator switch on the side of the cabinet.

Remove the "slip-on" knobs and felt washers from the controls on the front panel.

Remove the speaker plug from the socket at the rear of the chassis.

Remove the four mounting screws, located underneath the cabinet.

REALIGNMENT: Should the receiver require realignment, the outlined procedure below should be followed. In the service information sheet, the location and function of the various alignment capacitors are clearly illustrated. For best results, an external modulated oscillator with adequate frequency range and a visual output meter, should be used.

Before connecting the chassis to the power line, reconnect the speaker cable in its socket at the rear of the chassis.

I. F. ALIGNMENT: When aligning the Intermediate Frequency Amplifier, the external oscillator must be set at 456 kc. The Band Switch should be in the position marked "Broadcast," and the tuning condenser should be set at maximum capacity. When aligning the receiver on all positions, the volume control and the tone control should be turned to the maximum clockwise position. The inter-channel clarifier should be turned off. (Knob in maximum counter-clockwise position.) Connect the antenna lead of the external oscillator to the control grid of the 6D6 tube in the 2nd I. F. Amplifier through .002 mfd. fixed condenser. Connect the ground lead of the external oscillator to the receiver ground lead. The I. F. alignment trimmers are located at the top of the shielded I. F. Transformers. Rotate the adjusting screw of each capacitor on I. F. Unit No. 3 slowly until maximum output is noted. On completion of this operation, remove the external oscillator lead from the 6D6 2nd. I. F. amplifier tube and connect it in the same manner to the control grid of the 6D6 1st I. F. amplifier tube. Now rotate each adjustment screw on I. F. Unit No. 2 for maximum output. Following this, connect the external oscillator leads to the control grid of the 6A7 tube. Adjust each trimmer on the I. F. Unit No. 1 for maximum gain.

During these operations, use the least possible input to prevent broadening of the resonance peaks.

In order to obtain the most accurate realignment of the I. F. amplifier, it is essential to repeat the alignment process in all I. F. Units, with the external oscillator leads connected across the control grid of the 6A7 tube.

BROADCAST ALIGNMENT: After the I. F. amplifier is completely realigned, connect the external oscillator leads to the receiver antenna and ground leads. Set the Band Switch in the "Broadcast" position and place the tuning control pointer at the 1500 kc. mark. Tune the external oscillator to 1500 kc. Adjust the broadcast band oscillator trimmer to maximum response.

Next adjust the interstage alignment trimmer for maximum response. Finally adjust the antenna section trimmer in the same manner.

Next adjust the 600 kc. padder condenser, located in the lower rear section of the band switch, under the chassis. Set the external oscillator at 600 kc. Rotate the receiver tuning control until resonance position, and at the same time adjust the padder condenser for the highest peak.

Now repeat the 1500 kc. trimmer adjustment, following in every detail the procedure previously described.

The alignment frequencies are as follows:

Band 3—67.38 meters— 4,450 kc.
Band 2—30.04 meters— 9,980 kc.
Band 1—13. meters—23,000 kc.

When aligning Band 3, set the Band Switch in the position marked Band 3. Rotate the tuning condenser to the extreme high frequency end of the range. Set the external oscillator at 4450 kc. Adjust the Band 3 oscillator trimmer for maximum sensitivity. Next adjust the interstage and antenna trimmer condensers for maximum sensitivity. Check the overall sensitivity of the band at several points along the dial scale.

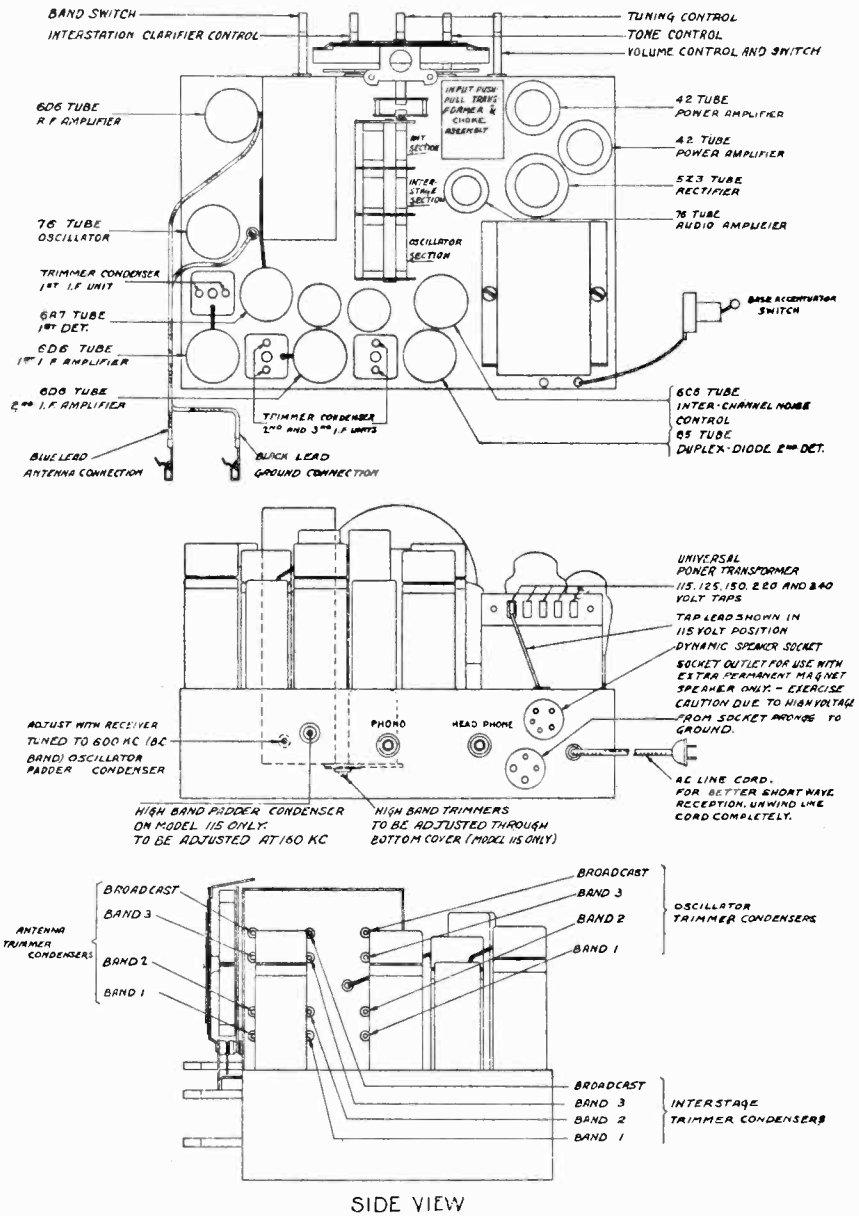
Align Band 2 in a similar manner. The alignment frequency is 9980 kc. (30.04 meters).

The alignment of Band 1 requires greater care due to the higher frequencies covered by this band. The alignment frequency is 23000 kc. or 13 meters. Set the external oscillator at 13 meters. Rotate the tuning condenser of the receiver until the dial pointer is co-incidental with the 13 meter indication on the dial scale. Adjust the oscillator trimmer condenser for maximum sensitivity. Proceed next to align the interstage section. In doing this it is essential to rock the tuning control back and forth about the resonance position and at the same time to adjust the trimmer for the highest resonant peak. Next align the antenna section for maximum sensitivity.

THE HIGHBAND ALIGNMENT procedure in the Model 115 is similar to that of the broadcast. Turn the Band Switch to the High Band position. The alignment frequency is 375 kc. Adjust the padder condenser at 160 kc.

REMOVAL OF BAND SELECTOR SWITCH ASSEMBLY: Should it be necessary to remove the switch assembly, it is advisable to realign the receiver after reinstalling it.

CAUTION: When making repairs on the receiver, use only **ROSIN CORE SOLDER. NEVER USE SOLDERING PASTE OR ACID FLUXES OF ANY TYPE.**

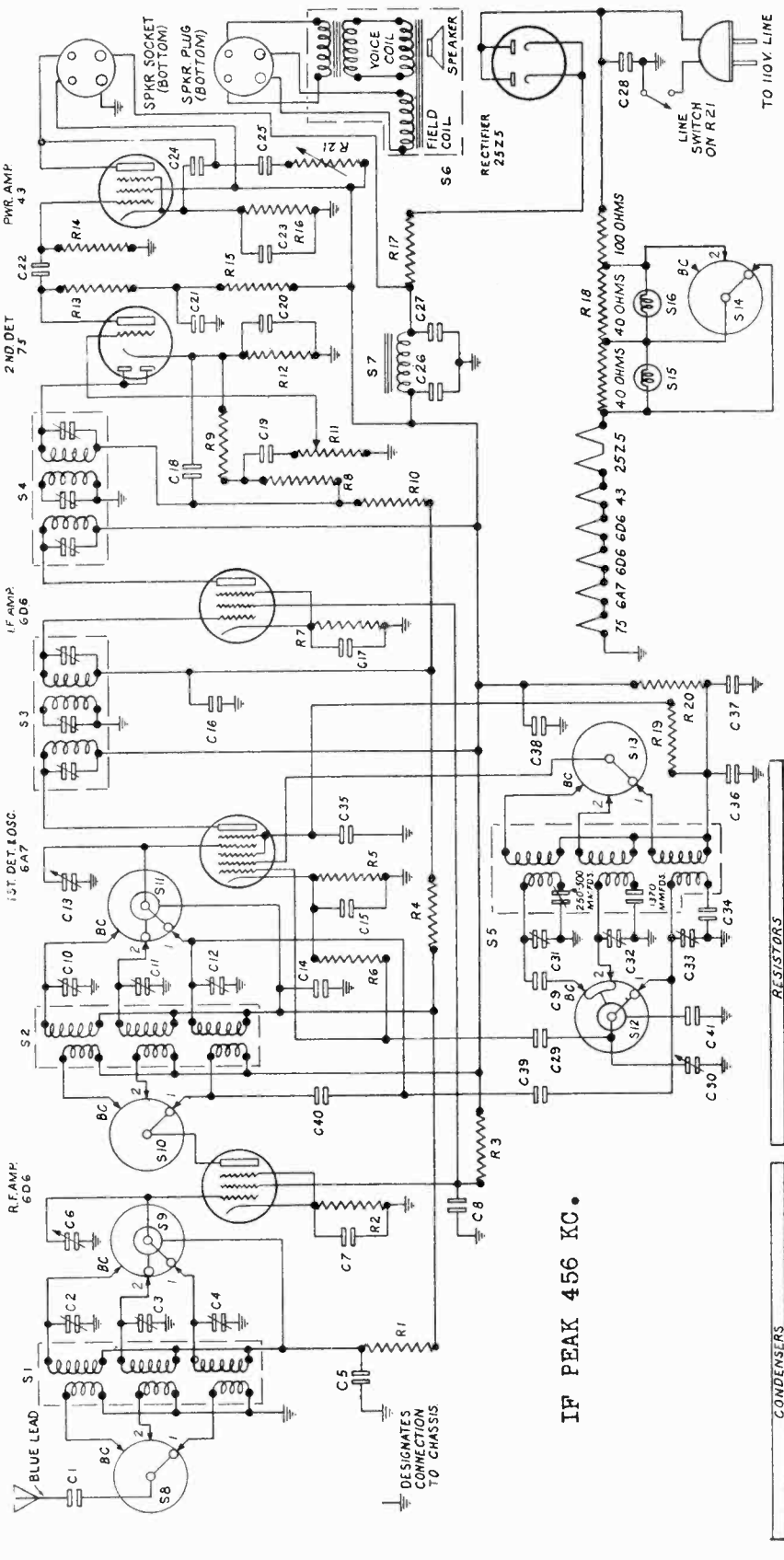


SIDE VIEW

CHASSIS ILLUSTRATION PILOT MODELS 114-115

PILOT RADIO CORP.

MODEL 123
Schematic



IF PEAK 456 KC.

MISCELLANEOUS		
DESIGNATION	PART NO	DESCRIPTION
S1	72079	ANTENNA COIL
S2	72077	DETECTOR COIL
S3	71679	1ST I.F. TRANSFORMER
S4	71678	2 ND I.F. TRANSFORMER
S5	72078	OSCILLATOR COIL
S6	40785	SPEAKER - 2500 OHM FIELD
S7	71685	FILTER CHOME - 450 OHMS
S8, S9, S10, S11, S12, S13, S14	72113	BAND SWITCH
S15, S16	70422-B	PILOT LIGHT - 6.3 V 0.3 AMP

CONDENSERS		
DESIGNATION	PART NO	DESCRIPTION
C1	27712	0.0005 MFD MICA
C2, C3, C4	71674	3 GANG TRIMMER STRIP
C5, C7, C8, C6	22035-J	0.05 MFD 200 V PAPER
C6, C13, C30	71650	3 GANG VARIABLE
C10, C15, C17	22055-M	0.1 MFD 200 V PAPER
C18, C25	22055-P	0.05 MFD 400 V PAPER
C9, C41	22055-W	0.01 MFD 400 V PAPER
C11, C12	71674	3 GANG TRIMMER STRIP
C19	27701-W	0.00025 MFD MICA
C21, 22, C28	22055-A	0.01 MFD 600 V PAPER
C20, C23	71675	10-10 MFD 25 V ELECTROLYTIC
C24, C38	22055-L	0.1 MFD 400 V PAPER
C29	22055-G	0.0005 MFD 600 V
C26		20 MFD 150 V ELECTROLYTIC
C27	71676	16 MFD " "
C37		8 MFD " "
C31, C32, C33	27723-W	50 MMFDS MICA
C34	71674	3 GANG TRIMMER STRIP
C35, C36	27742	0.0023 MFD MICA
C39, C40	22055-P	0.05 MFD 400 V PAPER
C39	71675-A	NEUTRALIZING
C40	27727-Q	10 MMFDS MICA

RESISTORS		
DESIGNATION	PART NO	DESCRIPTION
R1, R4	13031	100,000 OHMS 1/4 WATT CARBON
R2, R3, R7	13115	400 OHMS 1/4 WATT CARBON
R3, R19	13143	6,000 OHMS 1/4 WATT CARBON
R6, R8, R15	13168	30,000 OHMS 1/4 WATT CARBON
R9	13147	300,000 OHMS 1/4 WATT CARBON
R10	13001	1 MEGOHM 1/4 WATT CARBON
R11 TO 955	71657	750,000 OHMS VOLUME CONTROL
R12	13116	12,000 OHMS 1/4 WATT CARBON
R13, R14	13024	500,000 OHMS 1/4 WATT CARBON
R16	13146	600 OHMS 1/2 WATT CARBON
R17	13172	30 OHMS 1/2 WATT CARBON
R18	71683	160 OHMS TAPPED 100 OHMS, 15 WATTS, 40 OHMS, 6 WATTS, 40 OHMS, 6 WATTS, WIRE WOUND
R20	13073	3,000 OHMS 1/2 WATT CARBON
R21	~~71680~~ 10954	100,000 OHMS TONE CONTROL AND SWITCH

LIST OF REPLACEMENT PARTS FOR PILOT MODEL 123

Part No.		Part No.	
	TUBE SOCKETS		**ESCUTCHEON PLATES**
70927	4-prong bakelite-base tube socket	70953-B	Band switch escutcheon plate
70863	6-prong bakelite-base tube socket	71145	Dial escutcheon plate
70864	7-prong bakelite-base tube socket	70953-H	Tone control ecutcheon plate
	TUBE SHIELDS		**PAPER CONDENSERS**
71857	Tube shield 3½ in. long	22055-I	.05 mfd., 200 volts
71858	Tube shield 3¼ in. long	22055-M	.1 mfd., 200 volts
70865	Tube shield base	22055-P	.05 mfd., 400 volts
		22055-L	.1 mfd., 400 volts
	SPEAKER	22055-A	.01 mfd., 600 volts
		22055-R	.005 mfd., 1000 volts
40789	6 in. dynamic speaker		
			NEUTRALIZING CONDENSER
	TUNING EQUIPMENT	71525	Neutralizing condenser assembly
71679	1st I. F. transformer		
71678	2nd I. F. transformer		**MICA ASSEMBLY**
71650	3-gang tuning condenser	27712	.0005 mfd.
71703	Condenser drive assembly	27737	.00001 mfd.
71725	Drive disc assembly	27723	.00005 mfd.
71704-A	Dial scale and holder assembly	27742	.0023 mfd.
71178	Dial pointer	27701	.00025 mfd.
642	Dial pointer holding screw		
71056	Dial pointer spacing washer		**CARBON RESISTORS**
71183	Dial crystal		
70422-B	Dial light bulb screw base		¼-watt all resistance values
19627	Dial light socket assembly		½-watt all resistance values
	SWITCHES AND CONTROLS		**WIRE-WOUND RESISTOR**
71632	Band switch assembly for Model 123		
70954	Tone control and switch	71683	Wire-wound resistor
70955	Volume control		
			TRIMMER CONDENSERS
	KNOBS	71674	Triple trimmer
71619	Knob for volume and tone controls		
71620	Knob for band switch control		**ELECTROLYTIC CONDENSER**
71691	Knob for tuning control	71675	10-10 mfd.
		71676	20-16-8 mfd.
	COILS		
71735	Oscillator coil complete with can Model 123		**CHOKES**
71736	R. F. coil complete with can Model 123		
71737	Antenna coil complete with can Model 123	42007-B	Choke coil

REALIGNMENT: Should the receiver require realignment, the outlined procedure below should be followed. In the schematic wiring diagram the location and function of the various alignment capacitors are clearly illustrated. For best results an external modulated oscillator with adequate frequency range, and a visual output meter should be used.

Before connecting the chassis to the power line, reconnect the speaker cable in its socket at the top of the chassis.

I. F. ALIGNMENT: When aligning the Intermediate Frequency Amplifier, the external oscillator must be set at 456 kc. The Band Selector Switch should be in the position marked "Broadcast", and the tuning condenser should be set at maximum capacity. Connect the "antenna" lead of the external oscillator to the control grid of the type 6D6 tube in the I. F. Amplifier stage through a .1 mfd. fixed condenser. Connect the "ground" lead of the external oscillator to the receiver chassis. The I. F. alignment capacitors are located at the side of the shielded I. F. Transformers. Rotate the adjusting screw of each capacitor on I. F. Unit No. 2 slowly until maximum output is noted. On completion of this operation, remove the external oscillator lead from the type 6D6 I. F. amplifier tube and connect it in the same manner to the control grid at the top of the type 6A7 tube.

Now rotate each adjustment screw on I. F. Unit No. 1 for maximum output. During these operations, use the least possible input to prevent broadening of the resonance peaks.

In order to obtain the most accurate realignment of the I. F. Amplifier, it is essential to repeat the alignment process in both I. F. Units, with the external oscillator connected to the 6A7 tube.

BROADCAST ALIGNMENT: After the I. F. Amplifier is completely realigned, connect the external oscillator leads to the receiver antenna and chassis, this time with a 200 mmf. condenser in the antenna lead. Set the Band Selector Switch in the "Broadcast" position and place the tuning control pointer at the 1500 kc. mark. Adjust the broadcast band oscillator trimmer to maximum response.

Next adjust the interstage alignment trimmer for maximum response. Finally adjust the antenna section trimmer in the same manner.

Next adjust the 600 kc. padder condenser, located on the top of the oscillator coil. Set the external oscillator at 600 kc. Rotate the receiver tuning control until resonance is indicated. Then rock the tuning control back and forth about this resonance position, and at the same time adjust the padder condenser for the highest response.

Now repeat the 1500 kc. trimmer adjustment, following in every detail the procedure previously described.

ALIGNMENT OF THE SHORT WAVE BANDS: The procedure in aligning the short wave bands is identical with that for the broadcast with the exception of the adjustment of the padder condenser. A 400-ohm resistor should be connected in the antenna lead. The alignment frequency of Band 1 is 16.8 Meters—(17,800 kc) and of Band 2, 6 Meters.

Turn the Band Switch to Band 1. Tune the external oscillator to 16.8 meters. Tune the receiver so that the dial pointer is in a position coincidental with the 16.8 meter indication on the dial scale. Adjust Band 1 oscillator trimmer for maximum response. Next adjust the signal circuit trimmer for maximum resonance. Repeat all adjustments to assure correct alignment, rocking the gang condenser to right or left for maximum gain. Then align Band 2 in the same manner at 6 meters.

NOTE: Should it be necessary to remove any part of the band switch assembly, it is advisable to realign the receiver after reinstalling.

	R.F. AMP.	OSC.-1st DET.	I.F. AMP.	2nd DET. DIODE	AUDIO OUTPUT	DUAL RECTIFIER
	6D6	6A7	6D6	75	43	25Z5
PLATE	96	96	96	45*	91	——
SCREEN	80	65	80	——	95	——
CATHODE	2.6	2.25	2.6	.5	12.5	120**
FILAMENT	6.3	6.3	6.3	6.3	25	25

NOTE: The D.C. voltages measured at the tube sockets of the set should be read with a high resistance voltmeter of at least 1,000 ohms per volt.

All voltages measured to chassis.
Speaker field voltage 118 volts.
Anode Grid of 6A7 81 volts.
* Measured through Plate Resistor.
** Cathode to chassis.
NOTE: These measurements should be made with the volume control turned to the right, and with the tuning adjusted at "No signal" position on dial.

Power Consumption ..... 50 Watts

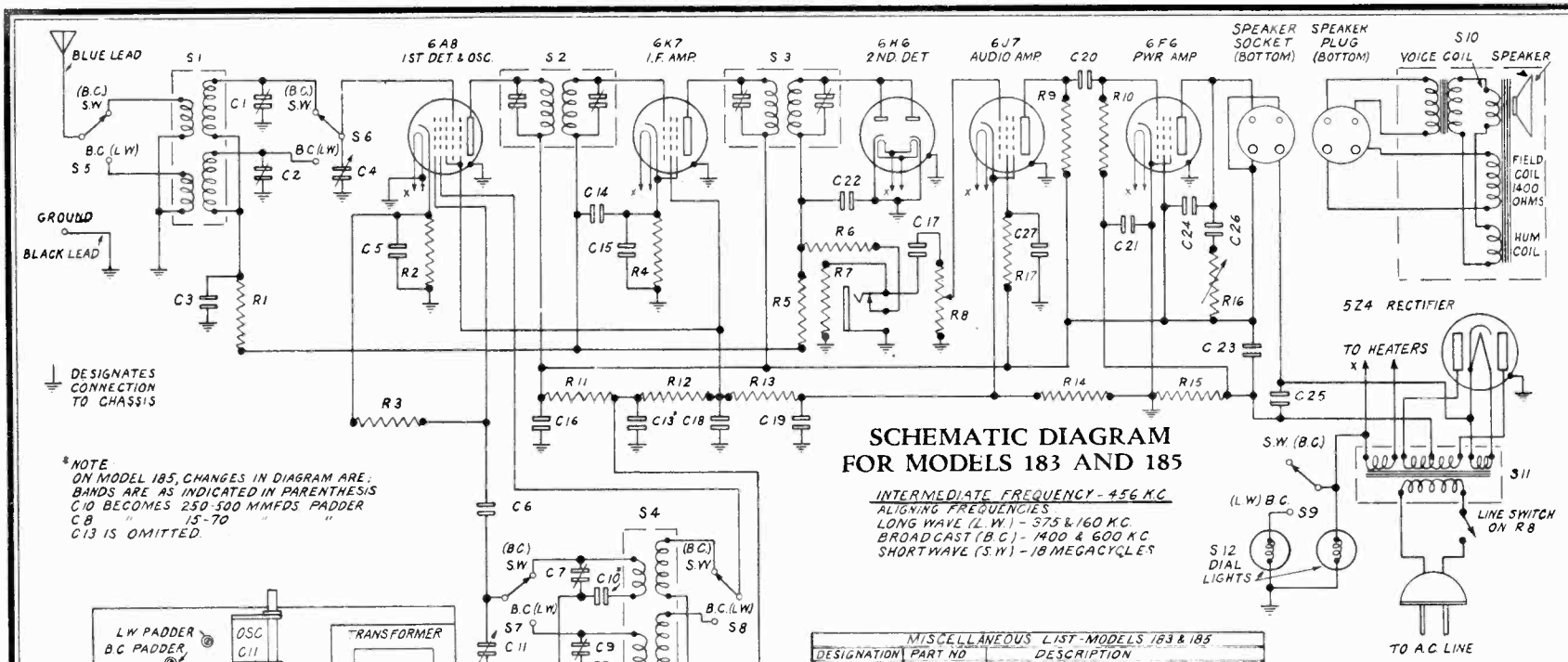
Line Volts ..... 110-125 volts A.C.-D.C.

I. F. Frequency ..... 456 Kc.

Power Output ..... 1 Watt

PILOT RADIO CORP.

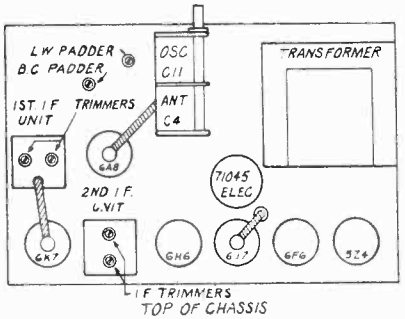
MODELS 183, 185
Schematic, Socket
Trimmers

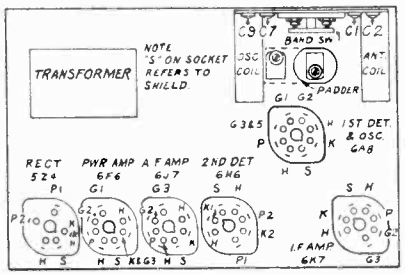


*NOTE
ON MODEL 185, CHANGES IN DIAGRAM ARE:
BANDS ARE AS INDICATED IN PARENTHESIS
C10 BECOMES 250-500 MMFDS. PADDER
C8 " 15-70 " "
C13 IS OMITTED.

SCHEMATIC DIAGRAM FOR MODELS 183 AND 185

INTERMEDIATE FREQUENCY - 456 KC.
ALIGNING FREQUENCIES:
LONG WAVE (L.W.) - 375 & 160 KC.
BROADCAST (B.C.) - 1400 & 600 KC.
SHORT WAVE (S.W.) - 18 MEGACYCLES





MISCELLANEOUS LIST - MODELS 183 & 185

DESIGNATION	PART NO	DESCRIPTION
S1	71169	ANTENNA COIL - MODEL 183
S2	72060	1ST I.F. TRANSFORMER
S3	72061	2ND I.F. TRANSFORMER
S4	71170	OSCILLATOR COIL - MODEL 183
S5, S6, S7 S8, S9	71948	BAND SWITCH
S10	40775	SPEAKER 6"
S11	71239-U	PWR TRANSFORMER UNIVERSAL 60 CYCLE
	71238-S	PWR " SINGLE TAP " "
S12	71282	DIAL LIGHTS 6.3 VOLTS
S1	71173	ANTENNA COIL - MODEL 185
S4	71174	OSCILLATOR COIL - MODEL 185

CONDENSERS - MODEL 183

DESIGNATION	PART NO	DESCRIPTION
C1, C2, C7, C9	71168	TRIMMER STRIP
C3, C14	22055-1	0.05 MFD 200 V PAPER
C4, C11	72070	406 MMFDS 2 GANG VAR
C5, C15	22055-M	0.1 MFD 200 V PAPER
C6	27723-W	50 MMFDS MICA
C8	71503-A	250-500 MMFDS PADDER
C10	27734	6000 MMFDS MICA
C12, C18	22055-P	0.05 MFD 400 V PAPER
C13	72168	4 MFD 450 V ELECTROLYTIC
C16, C26, C27	22055-C	0.05 MFD 600 V PAPER
C17, C20	22055-A	0.01 MFD 600 V PAPER
C19	22481	10 MFD 25 V ELECTROLYTIC
C21	22055-S	0.5 MFD 200 V PAPER
C22	27701-W	250 MMFDS MICA
C23, C25	71045	DUAL 8 MFD 475 V ELECTROLYTIC
C24	22055-R	0.005 MFD 1000 V PAPER
		*CONDENSERS - MODEL 185
SAME AS FOR MODEL 183 WITH FOLLOWING CHANGES		
C8, C10	71577-F	DUAL PADDER (250/500 & 15/70)

RESISTORS - MODELS 183 & 185

DESIGNATION	PART NO	DESCRIPTION
R1	13031	100,000 OHMS 1/4 WATT
R2	13003	300 OHMS 1/4 WATT
R3, R6	13164	50,000 OHMS 1/4 WATT
R4	13115	400 OHMS 1/4 WATT
R5, R17	13001	1 MEGOHM 1/4 WATT
R7	13147	300,000 OHMS 1/4 WATT
R8	71211	750,000 OHMS VOLUME CONTROL & SWITCH
R9	13171	250,000 OHMS 1/4 WATT
R10	13024	500,000 OHMS 1/4 WATT
R11	13073	3,000 OHMS 1/2 WATT
R12	13129	15,000 OHMS 1 WATT
R13	13148	30,000 OHMS 1/4 WATT
R14	13028	1,000 OHMS 1/4 WATT
R15	13059	250 OHMS 1 WATT
R16	71615	100,000 OHMS TONE CONTROL

MODELS 183,185
Voltage,Parts
Alignment

PILOT RADIO CORP.

REMOVAL OF CHASSIS FROM CABINET:

To remove the chassis from the cabinet proceed as follows:

Be certain that the line cord is removed from the power outlet socket. Remove the slip-on knobs and felt washers from the controls on the front panel.

Remove the speaker plug from the socket at the rear of the chassis.

Remove the four mounting screws, located underneath the cabinet.

REALIGNMENT: Should the receiver require realignment, the procedure outlined below should be followed. For best results an external modulated oscillator with adequate frequency range, and a visual output meter, should be used.

Before connecting the chassis to the power line, reconnect the speaker cable in its socket at the rear of the chassis.

I. F. ALIGNMENT: When aligning the intermediate Frequency Amplifier, the external oscillator must be set at 456 KC. The tuning condenser should be set at maximum capacity. Connect the antenna lead of the external oscillator to the control grid of the type 6K7 tube in the I.F. Amplifier stage through a .1 mfd. fixed condenser. Connect the ground lead of the external oscillator to the receiver ground clip. The I.F. alignment capacitors are located at the top of the shielded I. F. Transformers. Rotate the adjusting screw of each capacitor on I. F. Unit No. 2 slowly until maximum output is noted. On completion of this operation, remove the external oscillator leads from the type 6K7 I. F. Amplifier tube and connect it in the same manner to the control grid at the top of the type 6A8 tube.

Now rotate each adjustment screw on I. F. Unit No. 1 for maximum output. During these operations, use the least possible input to prevent broadening of the resonance peaks.

In order to obtain the most accurate realignment of the I. F. Amplifier, it is essential to repeat the alignment process in both I. F. units with the external oscillator leads connected across the control grid of the 6A8 tube.

BROADCAST ALIGNMENT: After the I. F. Amplifier is completely realigned, connect the external oscillator leads to the receiver antenna through a .002 mfd. condenser. Adjust the tuning control pointer at the 1400 KC mark. Adjust the broadcast band oscillator trimmer to the maximum response. Adjust the signal section trimmer in the same manner.

Next adjust the 600 KC padder condenser. Set the external oscillator at 600 KC. Rotate the receiver tuning control until resonance is indicated. Then rock the tuning control back and forth about this resonance position, and at the same time adjust the padder condenser for the highest resonance peak.

Now repeat the 1400 KC trimmer adjustment, following in every detail the procedure previously described.

SHORT-WAVE ALIGNMENT: The procedure in aligning the short-wave bands is identical with that for the broadcast, except that the padder condenser does not require adjustment. A 400-ohm resistor should be inserted in the antenna lead. The alignment frequency is 16.8 Meters—(17,800 kc.)

Turn the Band Switch to the right. Tune the external oscillator to 16.8 meters. Tune the receiver so that the dial pointer is in a position coincidental with the 16.8 meter indication on the dial scale. Adjust the short-wave oscillator trimmer for maximum response. Next adjust the signal circuit trimmer for maximum resonance. Repeat all adjustments to assure correct alignment, rocking the gang condenser to right or left for maximum gain.

LONG-WAVE ALIGNMENT: Procedure in the Model 185 is similar to the Broadcast section of this receiver. Align at 375 KC. Adjust the padder at 160 KC.

Should it be necessary to remove the band switch assembly, it is advisable to realign the receiver after reinstalling.

CAUTION: When making repairs on the receiver, use only ROSIN CORE SOLDER. NEVER USE SOLDERING PASTE OR ACID FLUXES OF ANY TYPE.

RECEIVER DESCRIPTION

Operating Voltages—115, 125, 150, 220, 240 volts, Alternating Current.
Frequency Rating —50 to 60 cycles.
Power Consumption—60 Watts.
Tubes —1 type 6A8
1 type 6K7
1 type 6H6
1 type 6J7
1 type 6F6
1 type 5Z4
Circuit —Electron-coupled oscillator-modulator, diode dectector, Class "A" pentode output stage, automatic volume control.
Wavelength Range—Model 183—16.2 meters to 52.6 meters.
178 meters to 550 meters.
Model 185—178 meters to 550 meters.
EXPORT ONLY 789 meters to 2142 meters.
Undistorted power output—3 watts.
Intermediate Frequency—456 KC.
Tube Functions —Type 6A8: Electron emission control oscillator-detector.
Type 6K7: I. F. amplifier.
Type 6H6: Duo-diode detector and automatic volume control.
Type 6J7: Audio amplifier.
Type 6F6: Class "A" power pentode.
Type 5Z4: Full-wave rectifier for power supply.

VOLTAGES

The D. C. voltages measured at the tube sockets of the set should be read with a high resistance voltmeter of at least 1000 ohms per volt.

	Osc.-Det. Type 6A8	I. F. Type 6K7	Diode Det. Type 6H6	Audio Amp. Type 6J7	Power Pentode Type 6F6	Rectifier Type 5Z4
Plate	250**	250	.....	70*	225	.....
Cathode	3.5	3.5	.....	4.5	16***	.....
Screen	95	95	.....	60*	250	.....
Filament	6.3	6.3	6.3	6.3	6.3	5.0

*Voltages measured through resistor.
**Anode grid of 6A8 tube, 210 volts.
***Measured across 250 ohm resistor.

Speaker field voltage 100 volts. All plate voltages measured to ground. All screen voltages measured to ground. All cathode voltages measured to ground.

LIST OF REPLACEMENT PARTS FOR PILOT MODELS 183 AND 185

TUBE SOCKETS

Part No.	
72080	Socket for 6A8 Tube
72081	Socket for 6K7 Tube
72082	Socket for 6J7 Tube
72083	Socket for 6H6 Tube
72084	Socket for 6F6 Tube
72085	Socket for 5Z4 Tube

TUNING EQUIPMENT

71169	Antenna Coil, Model 183
71173	Antenna Coil, Model 185
71170	Oscillator Coil, Model 183
71174	Oscillator Coil, Model 185
72060	1st I.F. Transformer
72061	2nd I.F. Transformer
72070	2-gang Tuning Condenser
72062	Band switch and Coil Assembly, Model 183
72064	Band switch and Coil Assembly, Model 185

PAPER CONDENSERS

22055-R	.005 mfd.	1,000 Volts	72072
22055-A	.01 mfd.	600 Volts	71725
22055-I	.05 mfd.	200 Volts	72183
22055-P	.05 mfd.	400 Volts	72185
22055-C	.05 mfd.	600 Volts	71178
22055-M	.1 mfd.	200 Volts	642
22055-S	.5 mfd.	200 Volts	71056

MICA CONDENSERS

27701-W	.00025 mfd.	71145
27723-W	.00005 mfd.	71182
27734	.006 mfd.	72177

ELECTROLYTIC CONDENSERS

72168	4. mfd.	450 Volts	72176
22481	10. mfd.	25 Volts	71211
71045	8.-8. mfd.	475 Volts	71615

CONTROLS AND SWITCHES

2-speed Dial Driving Mechanism only	71503-A	70950	Phonograph Jack
Dial Drive Disc and Hub	71577-F	71282	Dial Lamp
Dial Scale, Model 183			
Dial Scale, Model 185			
Pointer			
Pointer Holding Screw			
Pointer Spacing Washer			
Dial Escutcheon			
Dial Crystal			
Control Knob			
Small Knob with White Dot			
Volume Control and Switch			
Tone Control			

POWER TRANSFORMER

71336	Power Transformer, Universal Type, 60 cycles
71238-5	Power Transformer, non-adjustable, 60 cycles, 110-125 V.

PADDING CONDENSERS

71503-A	Single Padder, Model 183
71577-F	Dual Padded, Model 185

CARBON RESISTORS

	¼ Watt
	½ Watt
	1 Watt

LOUDSPEAKER

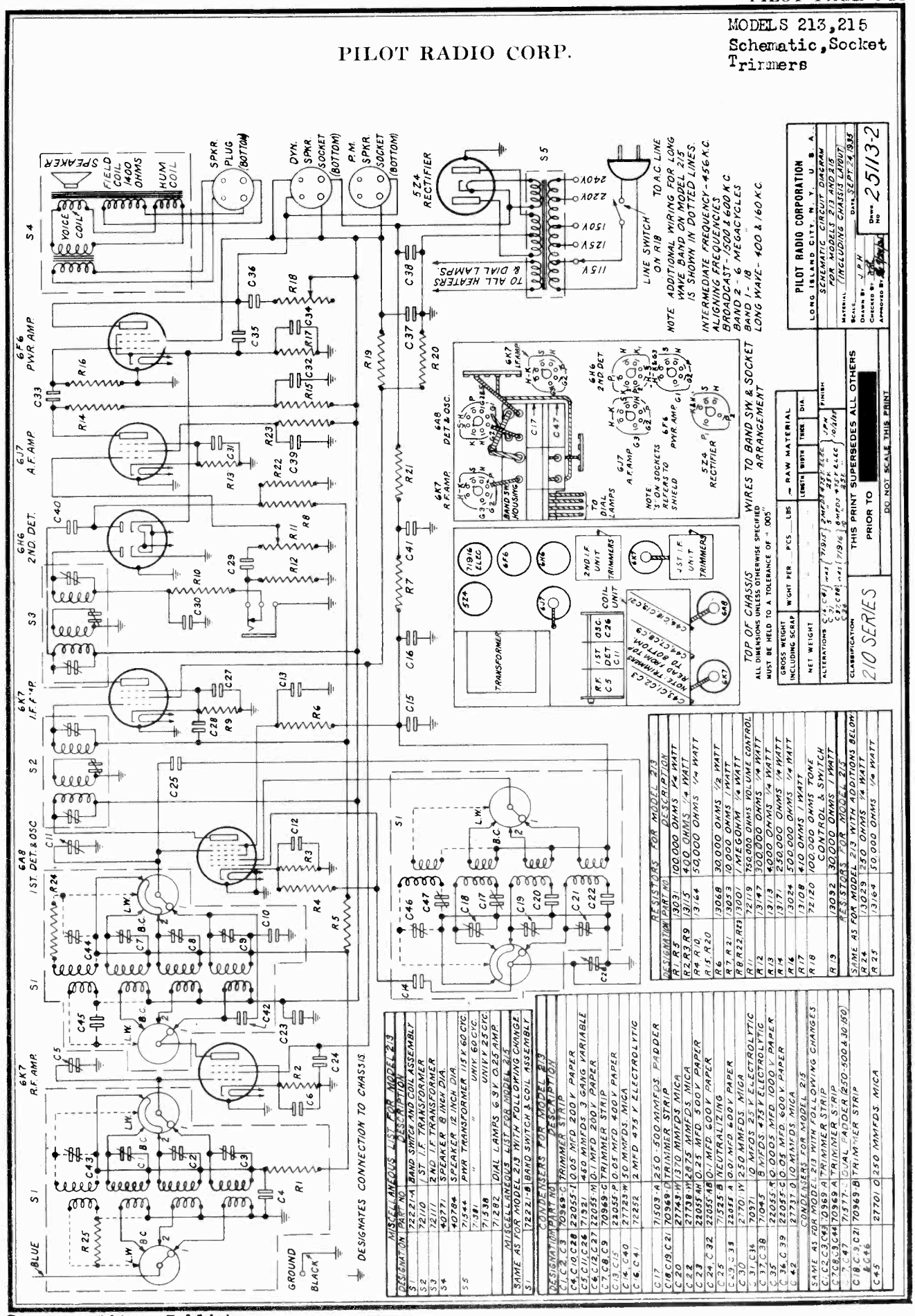
40775	Loudspeaker
70927-B	Loudspeaker Socket
	Loudspeaker Plug

CORD AND PLUG

58032	8 ft. Cord
	Plug

PILOT RADIO CORP.

MODELS 213, 215
Schematic, Socket
Trimmers



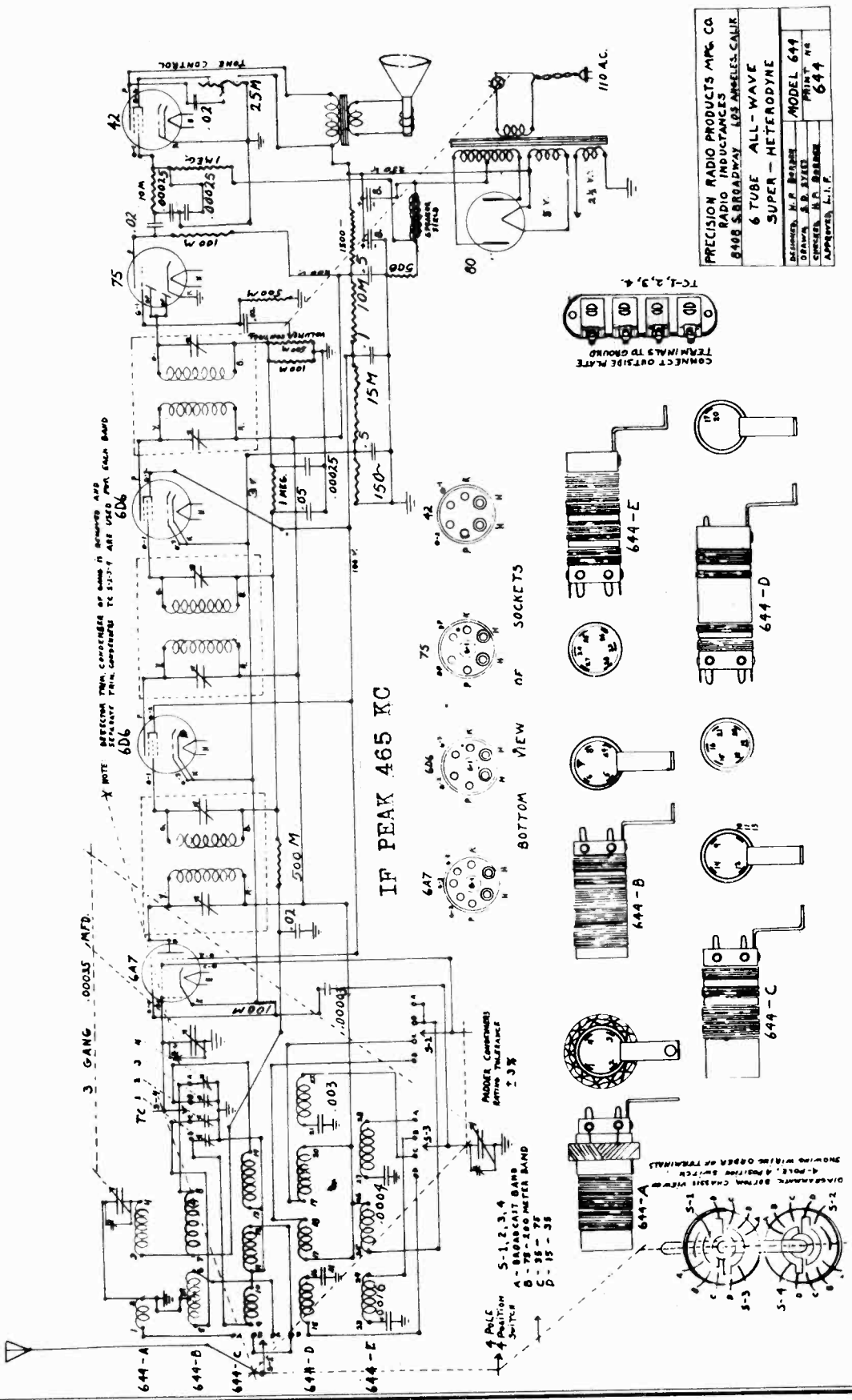
MISCELLANEOUS LIST FOR MODEL 213		
DESIGNATION	PART NO.	DESCRIPTION
S1	72221-A	BAND SWITCH AND COIL ASSEMBLY
S2	72110	1ST I.F. TRANSFORMER
S3	72111	2ND I.F. TRANSFORMER
S4	40771	SPEAKER 8 INCH DIA.
S5	40784	SPEAKER 12 INCH DIA.
	71344	PWR TRANSFORMER 115 V 60 CYC.
	7381	" UNIV 60 CYC.
	71338	" UNIV 25 CYC.
	71282	DIAL LAMPS 6.3 V 0.25 AMP.
MISCELLANEOUS LIST FOR MODEL 215		
SAME AS FOR MODEL 213 WITH FOLLOWING CHANGE		
S1	72221-B	BAND SWITCH & COIL ASSEMBLY

CONDENSERS FOR MODEL 213		
DESIGNATION	PART NO.	DESCRIPTION
C1, C2, C3	70969-C	TRIMMER STRIP
C4, C10, C28	22055-J	0.05 MFD 200 V PAPER
C5, C11, C26	71321	450 MMFDS. 3 GANG VARIABLE
C6, C12, C27	22055-M	0.1 MFD 200 V PAPER
C7, C8, C9	70969-G	TRIMMER STRIP
C13, C15	22055-P	0.05 MFD 400 V PAPER
C14, C40	27723-M	50 MMFDS. MICA
C16, C41	72252	2 MFD 475 V ELECTROLYTIC
C17	71503-A	250-500 MMFDS. PADDER
C18, C19, C21	70969-D	TRIMMER STRIP
C20	27743-M	370 MMFDS MICA
C22	27738-M	2875 MMFDS MICA
C23	22055-M	0.25 MFD 300 V PAPER
C24, C32	22055-N	0.1 MFD 600 V PAPER
C25	71525-B	NEUTRALIZING
C29, C33	22055-A	0.01 MFD 600 V PAPER
C30	27701-W	250 MMFDS MICA
C31, C34	70971	10 MFDS 25 V ELECTROLYTIC
C37, C38	71045	8 MFDS 475 V ELECTROLYTIC
C35	22055-K	0.0005 MFD 1000 V PAPER
C36, C39	22055-G	0.05 MFD 600 V PAPER
C42	27737-D	10 MMFDS MICA
CONDENSERS FOR MODEL 215		
SAME AS FOR MODEL 213 WITH FOLLOWING CHANGES		
C1, C2, C3, C43	70969-A	TRIMMER STRIP
C7, C8, C9, C44	70969-A	TRIMMER STRIP
C17, C47	71577-D	DIAL PADDER (250-500 & 30-150)
C18, C19, C21, C46	70969-B	TRIMMER STRIP
C45	27701-D	250 MMFDS MICA

RESISTORS FOR MODEL 213		
DESIGNATION	PART NO.	DESCRIPTION
R1, R25	3031	100,000 OHMS 1/4 WATT
R2, R3, R9	3115	400 OHMS 1/4 WATT
R4, R10	3164	50,000 OHMS 1/4 WATT
R5, R20	3068	30,000 OHMS 1/2 WATT
R6	3053	10,000 OHMS 1 WATT
R7, R21	3001	1 MEGOHM 1/4 WATT
R8, R22, R23	72119	750,000 OHMS VOLUME CONTROL
R11	3147	300,000 OHMS 1/4 WATT
R12	3113	4000 OHMS 1/4 WATT
R13	3171	250,000 OHMS 1/4 WATT
R14	3024	500,000 OHMS 1/4 WATT
R16	13108	410 OHMS 1 WATT
R17	72120	100,000 OHMS TONE CONTROL & SWITCH
R18	3092	30,000 OHMS 1 WATT
R19	RESISTORS FOR MODEL 215	
SAME AS FOR MODEL 213 WITH ADDITIONS BELOW		
R24	3029	250 OHMS 1/4 WATT
R25	3164	50,000 OHMS 1/4 WATT

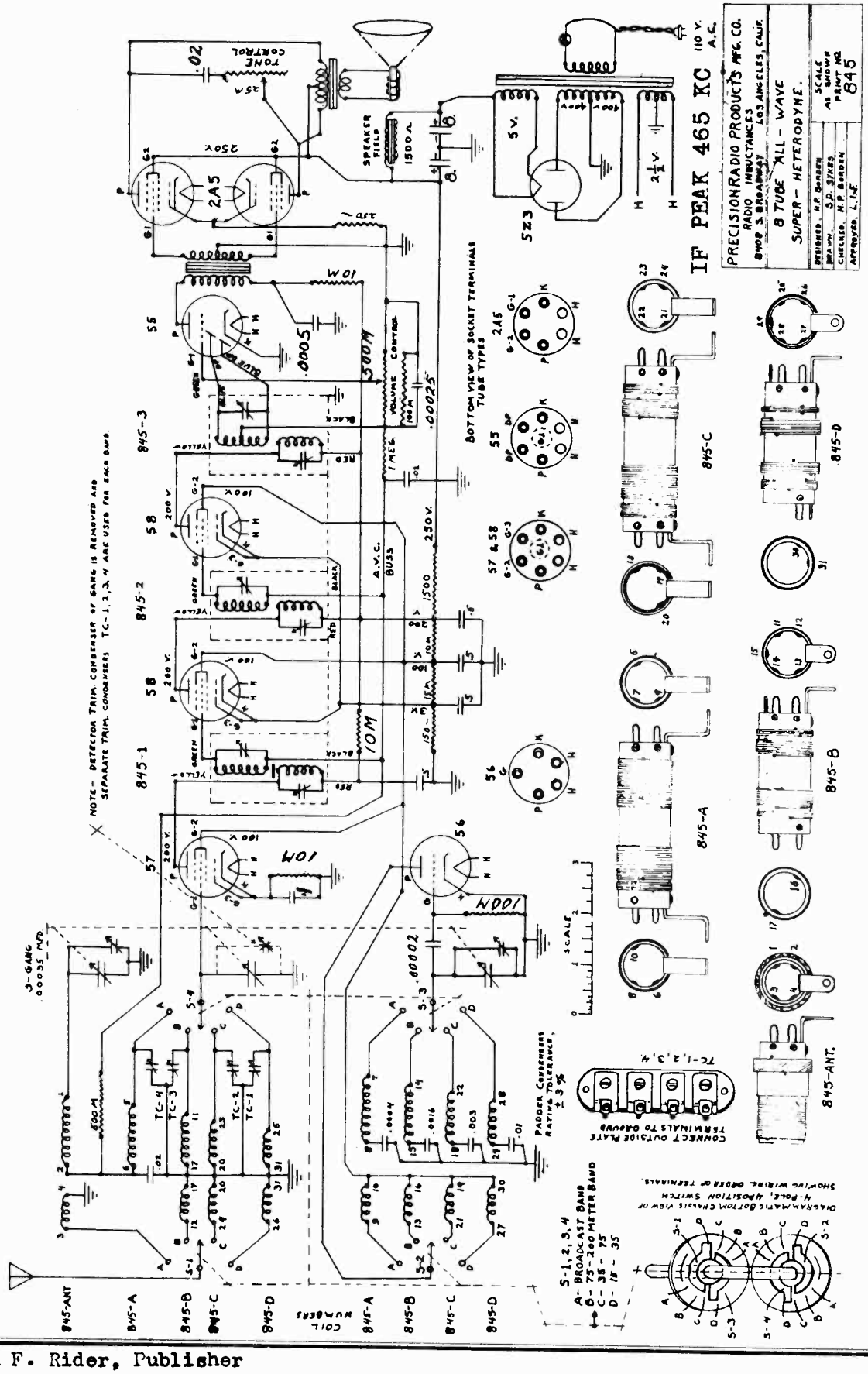
MODEL 6-Tube A-W. Superhet. Schematic

PRECISION RADIO PRODUCTS MFG. CO



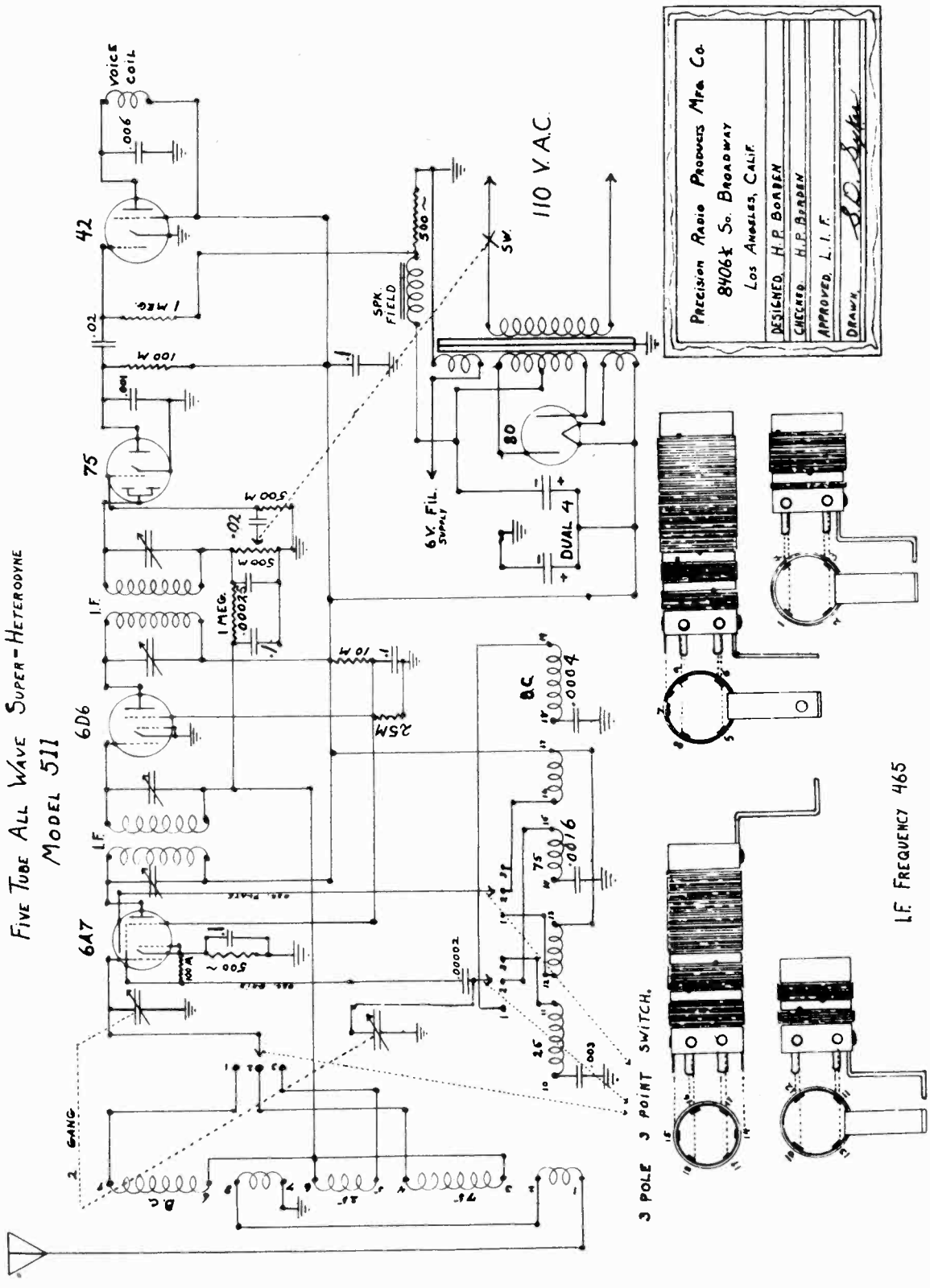
MODEL 8-Tube A-W.
Superhet.
Schematic

PRECISION RADIO PRODUCTS MFG. CO.



MODEL 511
Schematic

PRECISION RADIO PRODUCTS MFG. CO.



RCA MFG. CO., INC.

MODEL M-101
Schematic
Transformer Data

IF PEAK 175 KC.

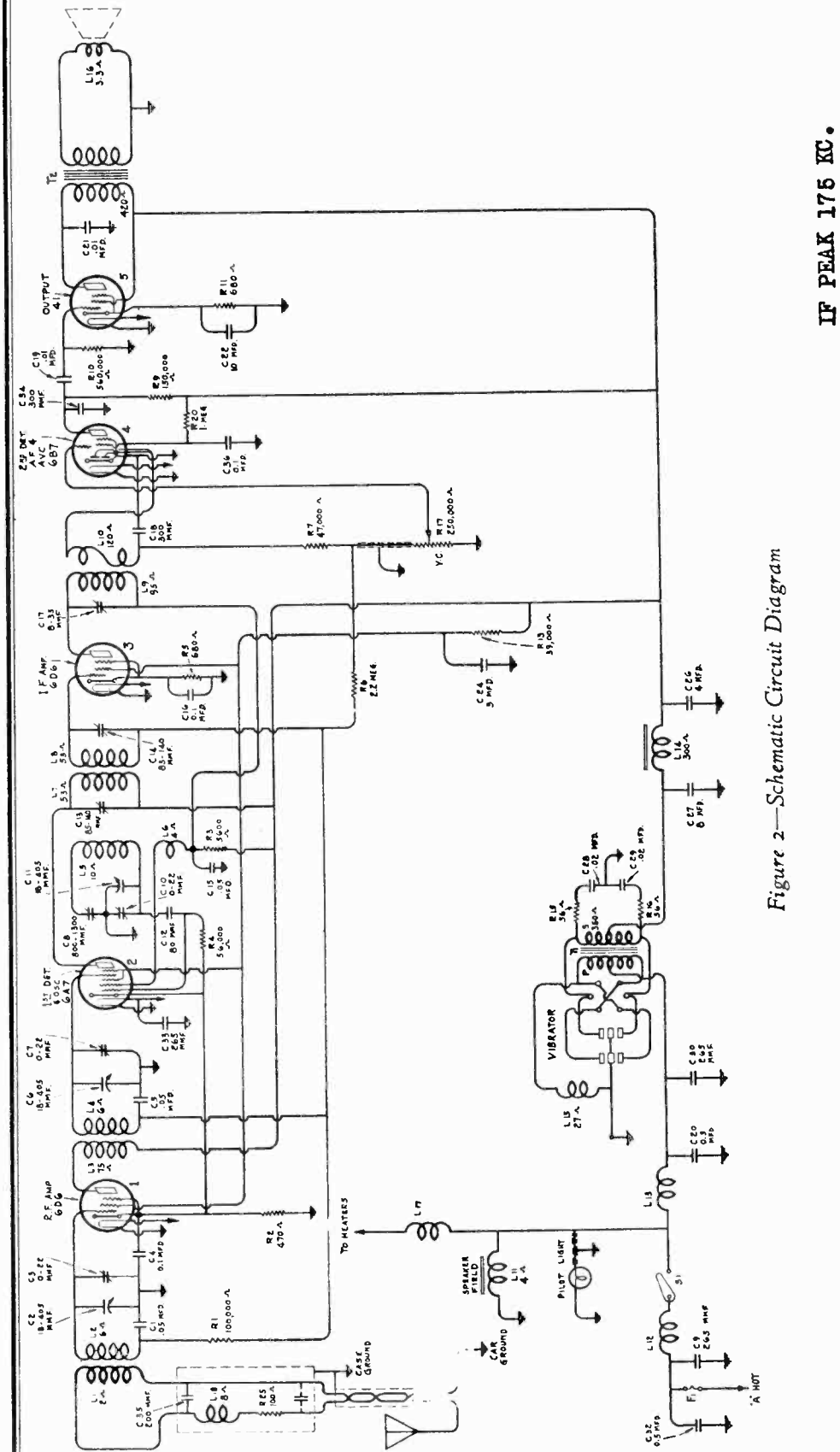
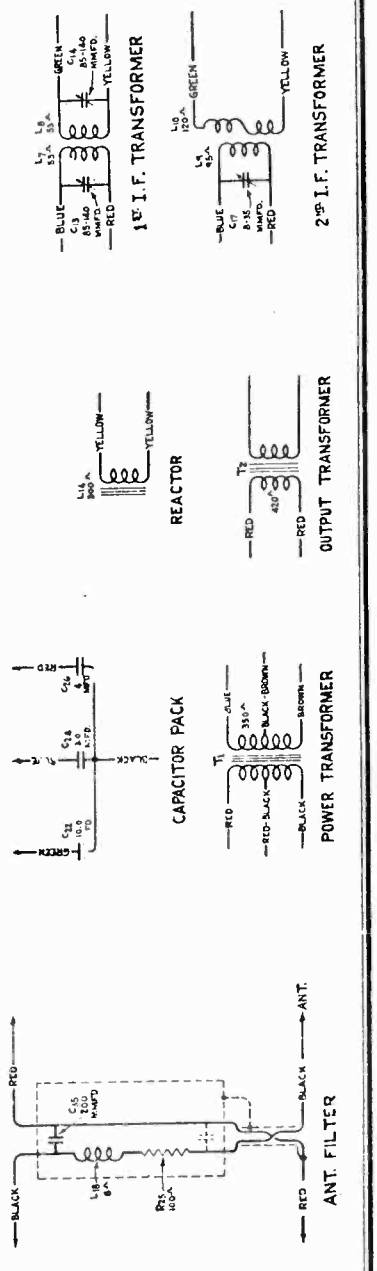


Figure 2—Schematic Circuit Diagram



LINE-UP ADJUSTMENTS

As in all standard receivers, this instrument must be in correct electrical alignment in order to obtain maximum efficiency and best quality of performance. The circuits should be re-aligned after each major servicing or repair operation, and whenever there are positive indications that the adjustments have deviated from normal by ordinary usage. These indications will be present together and will have the nature of low sensitivity, poor tone quality, and irregular double-peaked tuning.

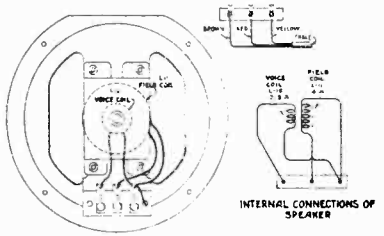


Figure 1—Loudspeaker Wiring

The important requirements in re-adjusting the line-up trimmers are the use of proper oscillator and indication equipment and adherence to a definite procedure.

(1) PREPARATORY DETAILS

(a) Dial Calibration—The tuning-condenser flexible shaft operates the dial pointer through a gear mechanism within the control unit. To adjust their mechanical relations so that accurate scale calibration obtains—Rotate the station selector knob until the variable tuning capacitor is at full mesh, which will carry the dial pointer to its minimum frequency position; then remove the tuning knob, loosen the set screw in the bushing and rotate the bushing until the pointer sets exactly opposite the last radial line at the low frequency end of the scale. (The line referred to is the second one counter-clockwise of the 550 kc. mark.)

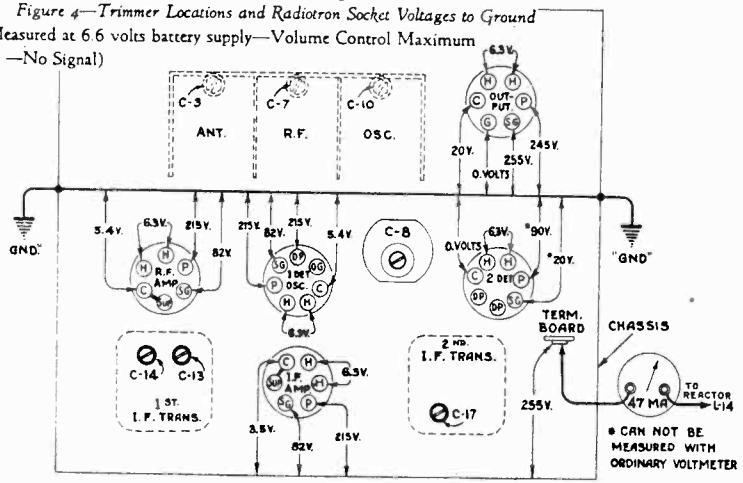
(b) General Procedure—The "Output Indicator" should be attached to the voice coil circuit of the loudspeaker, and for each adjustment, the oscillator output increased until a noticeable registration or glow occurs on the indicator. The signal from the oscillator should be held as low as possible consistent with getting a good indication, with the receiver volume control set at its maximum position. This method of procedure prevents the automatic volume control from affecting the adjustments.

(2) I. F. ADJUSTMENTS

Three trimmers are provided in the i-f system, two on the first transformer and one on the second transformer. The locations of the adjustment screws are shown in Figure 4.

(a) Tune the "Full Range Oscillator" to 175 kc. and connect its output to the first detector control grid and chassis ground. Tune the station selector to a point where no signals are received.

Figure 4—Trimmer Locations and Radiotron Socket Voltages to Ground
(Measured at 6.6 volts battery supply—Volume Control Maximum —No Signal)



(b) Tune each of the trimmer capacitors, C17, C14 and C13, in order. C17 should be set for maximum (peak) output. C14 and C13 should be roughly adjusted for maximum output and then carefully "trimmed" so that a flat-topped response is obtained. This may be checked by shifting the external oscillator frequency through a range two kilocycles each side of 175 kc. and noting whether or not the receiver output remains substantially constant.

(3) R. F. DETECTOR AND OSCILLATOR ADJUSTMENTS

Three high-frequency adjusting capacitors are provided for alignment at 1400 kc., and one trimmer is used for the low frequency line-up at 600 kc. The "Full Range Oscillator" should be connected to the antenna-ground input at the outer end of the lead-in shield through a 300-ohm series resistance in the antenna side.

(a) Tune the external oscillator to a frequency of 1400 kc. and turn the station selector knob until the dial pointer is at the 1400 kc. scale marking.

(b) Adjust the oscillator trimmer, C10; the detector trimmer, C7; and the r-f trimmer, C3, for maximum (peak) receiver output.

(c) Set the external oscillator to a frequency of 600 kc. and rotate the station selector until this signal is accurately tuned on the receiver. Adjust the oscillator trimmer C8, simultaneously rocking the tuning condenser slowly through the signal until the maximum obtainable output results from the two combined operations. This adjustment should be made irrespective of dial calibration.

(d) Recheck the adjustment of the 1400 kc. oscillator trimmer, as in (b), to correct any reflective errors caused by the procedure of (c).

RADIOTRONS

Under ordinary usage within the ratings specified for voltage supply, tube life will be consistent with that obtained in other applications. Their deterioration and approach to failure is usually evidenced by noisy or intermittent operation, loss of sensitivity and distorted tone quality.

It is not feasible to test the Radiotrons in the receiver sockets, due to likelihood of errors being caused by the associated circuits. Their removal and check with standard tube-testing apparatus is therefore advisable.

In this receiver the Radiotrons are compactly placed and snugly fitted into tight-gripping sockets to protect against vibration and to insure positive electrical connections. They should be withdrawn by exerting a direct pull on the tube.

To replace the tubes having the form-fitting shields, attach the shield to the tube and orient the grid lead opening in proper relation to the tube base, and insert the tube into its socket so that the shield clamps slide into their correct position on the outer surface of the shield.

CIRCUIT VOLTAGES

The voltages indicated at the socket contacts on Figure 4 will serve to assist in analyzing defective circuit conditions. The values specified should hold within ±20% when the receiver is normally operative. They are actual operating values and do not take into account inaccuracies due to voltmeter resistance. A meter having a multiplier of at least 1000 ohms per volt should be used, and the amount of circuit resistance shunted by the meter resistance duly considered when the two are comparable.

SYNCHRONOUS RECTIFIER-VIBRATOR

The vibrator power unit used in this receiver is of rugged design and construction. It has been carefully adjusted by means of special equipment to insure quiet operation over an extensive period of life. No adjustments should be attempted on a vibrator suspected to be in defective condition, but a renewal installed. A convenient plug-in base is provided for effecting a quick replacement.

SPEAKER CONE ALIGNMENT

In the event the cone coil becomes misaligned, it will be necessary to correct its position by an adjustment provided on the speaker assembly. A small round-head brass screw installed on pole piece adjacent to the terminal strip is used to clamp the cone coil mounting. To center the cone, loosen the screw and insert a small 1/16" rod or nail into the hole next to the screw and pry the coil mounting into the position giving normal speaker operation. The screw should then be retightened.

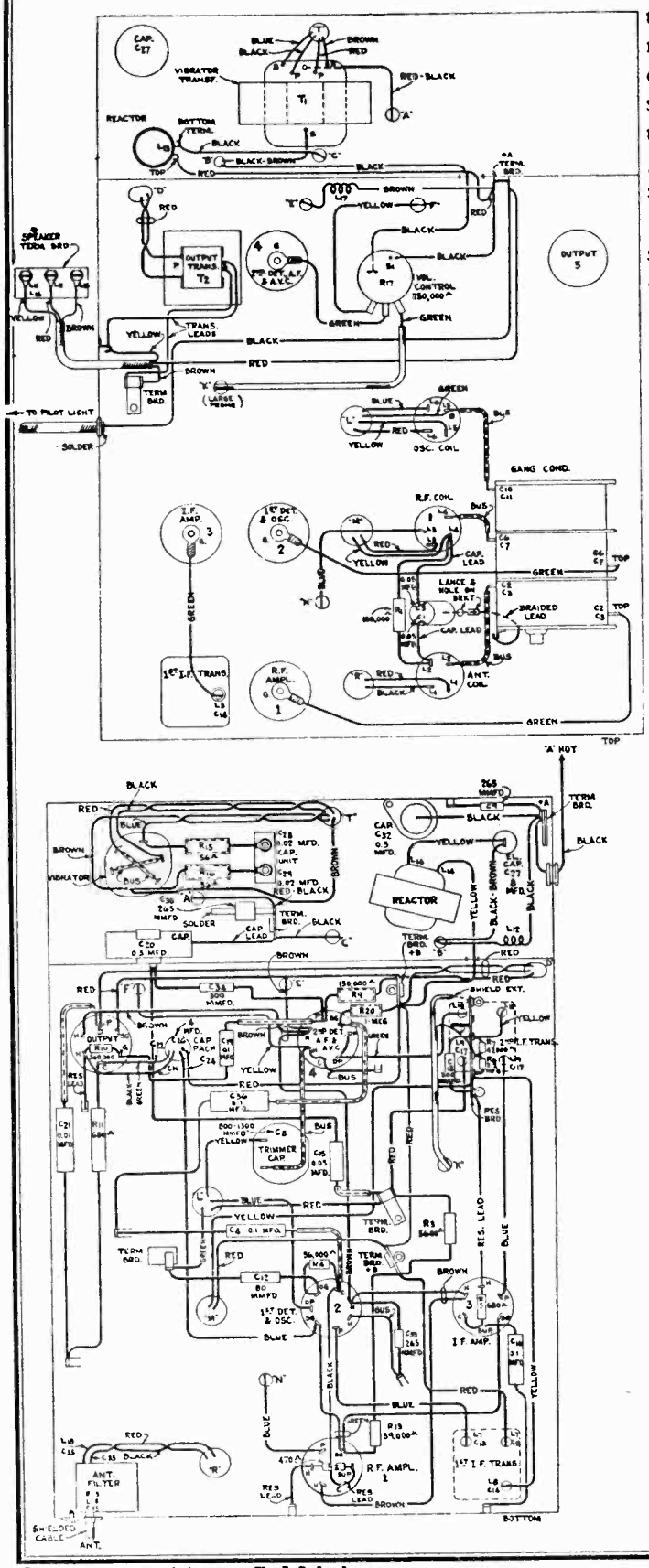
TUNING CONDENSER DRIVE

Smooth control should be obtained over the entire tuning range of the variable condenser. If there is any irregularity noticed, the following corrective steps should be taken:

Check the action of the gear mechanism for presence of binding or backlash at every point within the

RCA MFG. CO., INC.

MODEL M-101
Chassis Wiring
Service Notes



tuning range. A bind may be due to improper mesh between the small pinion gear and large gears on the rotor shaft. To correct such a condition, remove the coupling on the pinion of the tuning gear, insert a screw-driver through the hole in the case and loosen the two screws holding gear plate. The mesh of the gears should be adjusted to a position which gives smooth operation.

Gear back-lash is prevented by the compression spring between the large gears on the rotor shaft. To check for this back-lash, rotate the pinion slowly in both directions, observing the free gear (on rotor shaft) carefully to determine if it shifts without turning the rotor.

MISCELLANEOUS SERVICE HINTS

If back-lash is apparent, the large gear assembly should be removed and the free gear moved (against the spring compression) 2 to 3½ teeth in relation to the fixed gear and the assembly slid in place on the shaft and in mesh with the pinion. The set screws should then be securely tightened.

(a) The grounding of the outer end of the antenna lead shield is quite critical, in that ignition interference may be minimized by selecting the proper point of attachment to the car frame, determined by experiment for each individual installation.

(b) In some cars, ignition interference may be introduced through lack of antenna lead shielding. In such cases, a shield should be placed over the exposed section of antenna lead and carried as near as possible to the actual antenna. It should be solidly grounded.

(c) Interference in the form of a grating scratch may arise from static collecting on the front wheels of some cars due to road surface friction in dry weather. The insulation caused by the grease of the wheel hub enables this action to develop. A number of devices are available through automotive supply dealers which are designed to eliminate this type of trouble. They all serve to form a grounding tie between the hub and the axle, and thus drain the static to the frame of the car (ground).

(d) If the flexible tuning shaft is installed so that it protrudes through the insulating coupling at the receiver end and makes intermittent contact with the metal of the pinion gear, some r-f disturbance will result. The shaft should therefore be inserted into the coupling just far enough to be properly secured by the set screw.

(e) The screws holding the chassis to the case must all be in place and tightly installed, inasmuch as they appreciably affect the ground resistance of the assembly and will consequently have a bearing on the amount of ignition noise received.

REPLACEMENT PARTS

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

Stock No.	Description	List Price
	RECEIVER ASSEMBLIES	
4993	Bumper—Rubber bumper—Used under variable condenser bracket assembly—Package of 5	$0.25
4244	Cap—Grid contact cap—Package of 5	.20
4955	Capacitor—Adjustable capacitor (C8)	.48
5021	Capacitor—80 mmfd. (C12)	.22
5078	Capacitor—265 mmfd. (C9, C30, C33)	.24
4248	Capacitor—300 mmfd. (C18, C34)	.22
4882	Capacitor—.01 mfd. (C21)	.20
4858	Capacitor—.01 mfd. (C19)	.25
4791	Capacitor—0.1 mfd. (C4, C16)	.24
4885	Capacitor—0.1 mfd. (C36)	.28
4886	Capacitor—.05 mfd. (C15)	.20
5019	Capacitor—.5 mfd. (C32)	.42
4960	Capacitor—.5 mfd. (C20)	.46
4961	Capacitor—8.0 mfd.	1.28
4964	Capacitor pack—Comprising two .02 mfd. capacitors (C28, C29)	1.02
5016	Capacitor pack—Comprising two .05 mfd. capacitors (C1, C5)	.26
4958	Capacitor pack—Comprising one 3. mfd., one 10. mfd. and one 4. mfd. capacitors (C22, C24, C26)	1.34
5020	Clamp—Metal clamp with screw—For antenna filter shielded cable—Package of 5	.14
5074	Clamp—Radiotron shield clamp	.14
4930	Coil—Antenna coil (L1, L2)	.74
4968	Coil—Choke coil (L12)	.14
4969	Coil—Choke coil (15 turns—approximately 23 inches—length) (L17)	.14
6967	Coil—Oscillator coil (L5, L6)	.52
6956	Coil—R. F. coil (L3, L4)	.80
4948	Condenser—3 ¼ variable tuning condenser (C2, C3, C9, C10, C11)	3.81
4954	Filter—Antenna filter (L18, C35, R25)	1.46
4972	Lead—Power lead with male section of connector—Chassis end	.20
7766	Lead—Power lead with clip and female section of fuse connector	.30
4966	Lead—Single connector dial lamp lead—With female section of connector—Chassis end	.30
4962	Reactor (L14)	.88
4963	Reactor (L13)	.38
5034	Resistor—56 ohms—Carbon type—½ watt (R15, R16)—Package of 5	1.00
5030	Resistor—470 ohms—Carbon type—¼ watt (R2)—Package of 5	1.00
5031	Resistor—680 ohms—Carbon type—¼ watt (R5)—Package of 5	1.00
5026	Resistor—680 ohms—Carbon type—1 watt (R11)—Package of 5	1.10
5175	Resistor — 5600 ohms — Carbon type — ½ watt (R3)—Package of 5	1.00
5176	Resistor — 39,000 ohms — Carbon type — 1 watt (R13)	.22
5132	Resistor — 47,000 ohms — Carbon type — 1/10 watt (R7)—Package of 5	$0.75
5029	Resistor — 56,000 ohms — Carbon type — ¼ watt (R4)—Package of 5	1.00
3118	Resistor — 100,000 ohms — Carbon type — ¼ watt (R1)—Package of 5	1.00
5027	Resistor — 150,000 ohms — Carbon type — ¼ watt (R9)—Package of 5	1.00
5035	Resistor — 560,000 ohms — Carbon type — ¼ watt (R10)—Package of 5	1.00
3033	Resistor—1 megohm—Carbon type—¼ watt (R20)—Package of 5	1.00
5131	Resistor—2,200,000 ohms—Carbon type—1/10 watt (R6)—Package of 5	.75
5129	Ring—Radiotron shield ring—Package of 5	.10
3584	Ring—Retaining ring for antenna, r-f, or oscillator coils—Package of 5	.40
3623	Shield—Antenna, r-f, or oscillator coil shield	.30
4953	Shield—First intermediate frequency transformer shield	.24
4956	Shield—Second intermediate frequency transformer shield	.30
5037	Shield—Radiotron shield	.15
4946	Socket—6-contact Radiotron socket	.18
4959	Socket—6-contact vibrator socket	.18
4947	Socket—7-contact Radiotron socket	.18
4951	Transformer—First intermediate frequency transformer (L7, L8, C13, C14)	1.26
4952	Transformer—Second intermediate frequency transformer (L9, L10, C17)	1.76
4957	Transformer—Output transformer (T2)	1.18
7859	Transformer—Vibrator transformer (T1)	2.02
7857	Vibrator—Complete (L15)	5.64
5018	Volume control (R17, S1)	1.00
	CONTROL BOX ASSEMBLIES	
4987	Bezel—Station selector dial bezel	.42
7855	Box—Control box—Complete	3.86
7864	Bracket—Mounting bracket and rear section of control box housing	.30
4988	Crystal—Station selector dial crystal	.38
4989	Dial—Station selector dial	.20
4981	Gear—18-tooth intermediate drive gear	.15
4978	Gear—Indicator drive gear and shaft	.42
7862	Housing—Front section of control box housing	.28
7863	Housing—Center section of control box housing	.32
4990	Indicator—Station selector (pointer) indicator	.10
4985	Knob—Station selector or volume control knob—Package of 5	.62
4991	Lamp—Dial lamp—Package of 5	.74
7856	Plate—Bearing plate assembly—Comprising plate gear and shaft, volume control shaft, station selector shaft, pinion and spring	1.22
4986	Screw—Oval fillister head machine screw—Fastens bracket and center section of control box housing—Package of 5	.25

REPLACEMENT PARTS (Continued)

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

Stock No.	Description	List Price
5042	Screw—No. 8-32-⅛-inch headless set-screw for station selector or volume control shaft—Package of 10	$0.25
4983	Shaft—Station selector drive shaft	.16
4979	Shaft—Volume control drive shaft	.16
4984	Socket—Dial lamp socket	.16
4982	Spring—Holding spring for station selector or volume control knob—Package of 10	.26
4980	Spring—Tension spring—Package of 5	.15
	FLEXIBLE SHAFT ASSEMBLIES	
5000	Bracket—Volume or tuning condenser flexible shaft bracket—Bracket mounted on housing	.30
4994	Nut—Knurled locking nut for condenser drive or volume control flexible shafts	.10
7854	Shaft—Tuning condenser—Flexible (steering column) drive shaft—31¾ inches long	1.08
7856	Shaft—Volume control or tuning condenser—Flexible (dash mounting) drive shaft—9⅜ inches long	.58
7855	Shaft—Volume control—Flexible (steering column) shaft—28¾ inches long	1.00
	REPRODUCER ASSEMBLIES	
4970	Cable—3-conductor reproducer cable	1.02
9602	Cone—Reproducer cone (L16)	.75
9576	Housing—Reproducer housing—Top cover of receiver	1.08
9577	Reproducer—Complete (L11, L16)	4.32
4995	Screw—Reproducer mounting screw—Package of 10	.15
	HOUSING ASSEMBLIES	
7868	Case — Receiver housing assembly — Complete	1.76
7869	Cover—Bottom cover of receiver housing assembly	$0.32
4999	Screw—No. 8-¼-inch slotted hex head self-tapping screw—Used to assemble housing—Package of 5	.12
	MISCELLANEOUS PARTS	
4287	Body—Antenna connector body—Package of 10	.40
4289	Body—Fuse connector body—Package of 10	.35
5188	Cable—Two conductor antenna cable approximately 40¾ in. long with male section of connector	.40
4288	Cap—Antenna or fuse connector cap—Package of 10	.36
5025	Capacitor—0.5 mfd. generator capacitor	.40
6516	Connector—Fuse connector complete	.16
4973	Coupling—Tuning condenser shaft coupling	.30
4974	Coupling—Volume control shaft coupling	.36
4286	Ferrule—Antenna or fuse connector ferrule and bushing—Package of 10	.38
5023	Fuse—15-ampere—Package of 5	.40
4290	Insulator—Fuse connector insulator—Package of 10	.35
4975	Lead—Dial lamp lead—Control box end	.38
3903	Screw—No. 8-32-3/16-inch headless set-screw for couplings—Package of 20	.36
4284	Spring—Antenna or fuse connector spring—Package of 10	.30
4992	Stud—Receiver mounting stud and nuts—Package of 3	.22
5064	Stud—Variable condenser bracket mounting assembly comprising one stud, one bushing, one washer, and one lockwasher	.12
5024	Suppressor—Distributor suppressor	.38

MODEL 103
Schematic
Voltage

RCA MFG. CO., INC.

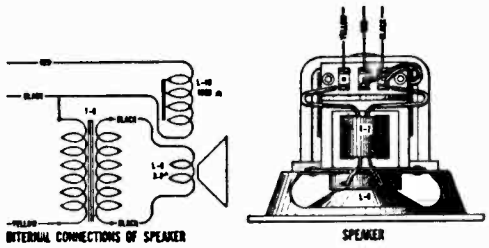
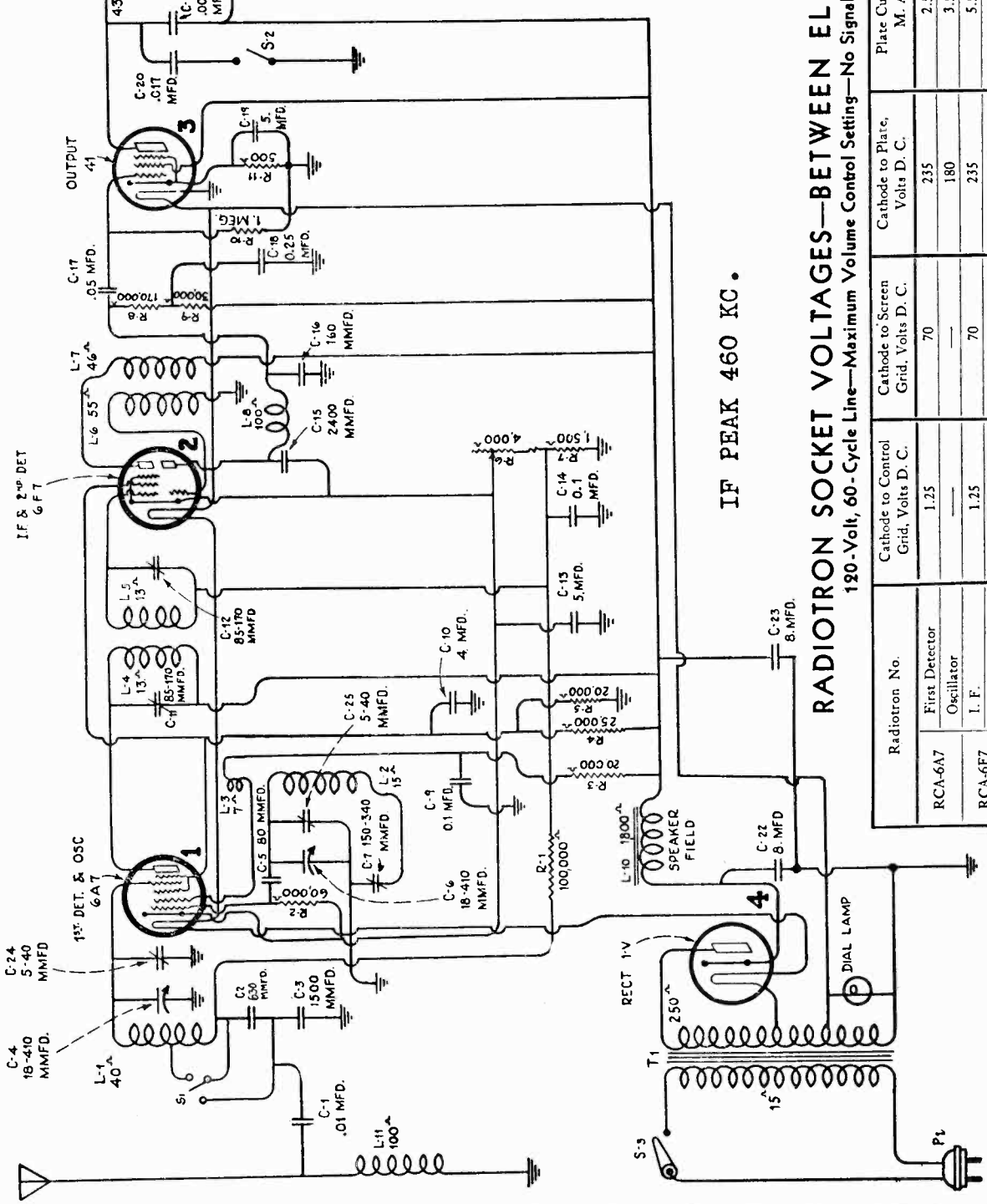


Figure 5—Loudspeaker Wiring



RADIOTRON SOCKET VOLTAGES—BETWEEN ELEMENTS

120-Volt, 60-Cycle Line—Maximum Volume Control Setting—No Signal

Radiotron No.		Cathode to Control Grid, Volts D. C.	Cathode to Screen Grid, Volts D. C.	Cathode to Plate, Volts D. C.	Plate Current, M. A.	Heater or Filament, Volts
RCA-6A7	First Detector	1.25	70	235	2.5	6.3
	Oscillator	—	—	180	3.5	
RCA-6F7	I. F.	1.25	70	235	5.5	6.3
	Second Detector	19.0	—	145*	0.4	
RCA-41 Output		17.0	240	230	26.5	6.3
RCA-1-V Rectifier		—	—	335 R.M.S.	50.0	6.3

*Actual voltage cannot be measured with ordinary voltmeter.

MODEL 103
Chassis Wiring

RCA MFG. CO., INC.

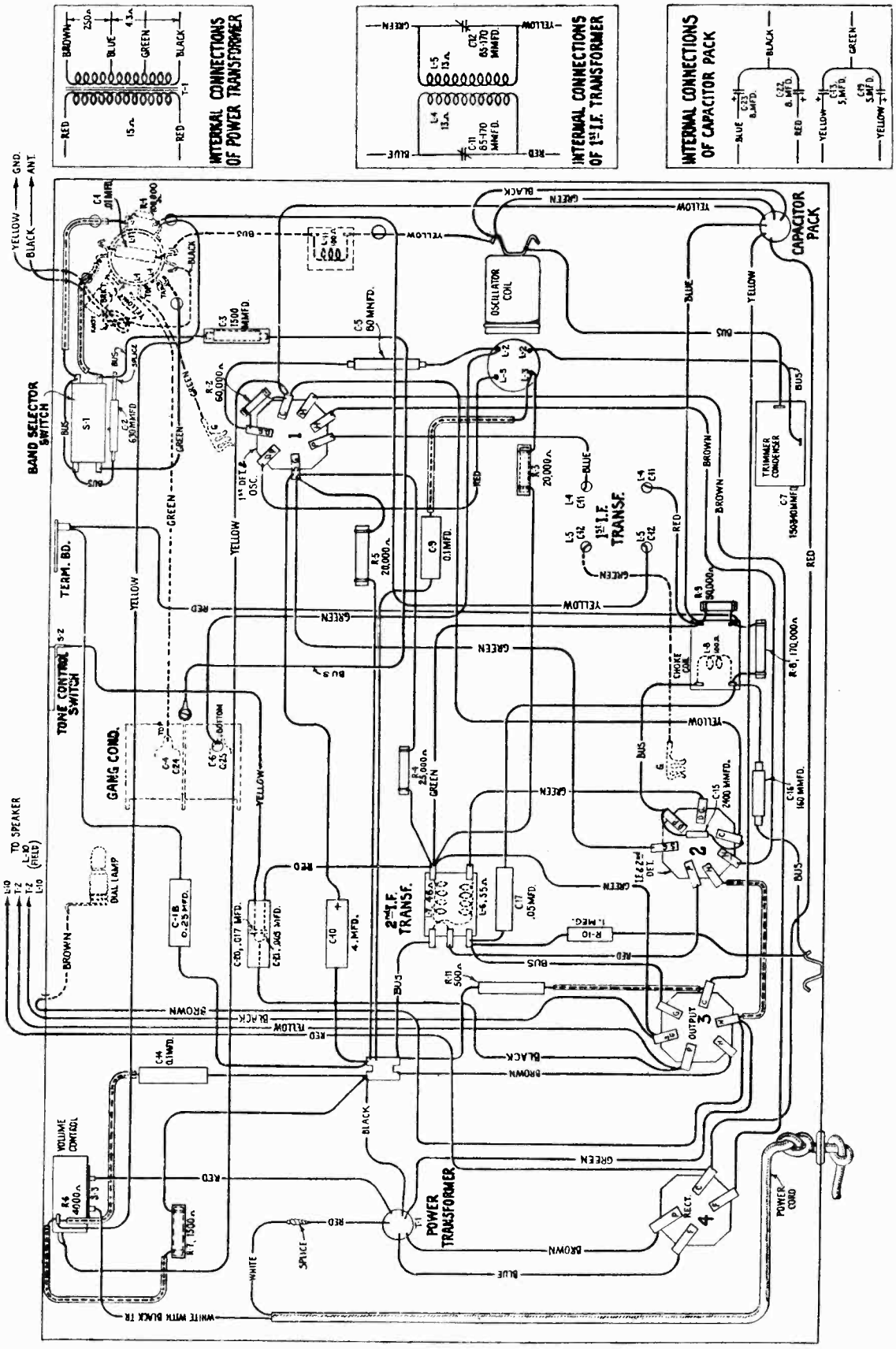


Figure 2—Chassis Wiring Diagram

RCA MFG. CO., INC.

MODEL 103
Circuit Data, Socket Trimmers, Voltage Alignment, Parts

DESCRIPTION OF ELECTRICAL CIRCUIT

The first stage is a combined detector and oscillator using an RCA Radiotron 6A7. The two functions are obtained through means of individual tuned circuits. On the detector tuning coil a tap is made, so that a portion of the coil can be short-circuited by switch contacts and thus extend the tuning of the receiver to the higher frequency range. The oscillator second harmonic is used to produce the intermediate frequency for the upper tuning range. The oscillator circuit is arranged to have the low-frequency trimmer capacitor attached in series with the inductance, permitting accuracy in its adjustment to be easily secured, and to give a more uniform sensitivity over the tuning range.

In the following stage, the I. F. amplification and final detection take place in the dual-purpose RCA 6F7. The input section of this tube constitutes a screen-grid I. F. amplifier, with the output elements arranged to perform as a triode detector.

One RCA-41, a Pentode type, is employed in the audio output stage.

The rectifying unit consists of an RCA-1-v, a cathode-type, half-wave tube. Its high voltage is supplied from the power transformer secondary, which is a single winding tapped at various points for furnishing heater current to all Radiotrons of the receiver. The heater of the RCA-41 stage and the pilot lamp are supplied by one section of the secondary winding, and the remaining three heaters are connected series to receive supply from a 19-volt section of the same winding.

Voltage Rating	105–125 Volts
Frequency Ratings	25-60 or 50-60 Cycles
Power Consumption	40 Watts at 115 Volts
Number and Type of Radiotrons	1 RCA-6A7, 1 RCA-6F7, 1 RCA-41, 1 RCA-1V—Total 4
Tuning Frequency Ranges	540-1500 K. C. and 1600-3500 K. C.
Intermediate Frequency	460 K. C.
Maximum Undistorted Output	1.9 Watts
Maximum Output	3 Watts
Line-up Frequencies	460 K. C., 600 K. C. and 1400 K. C.

SERVICE DATA

(1) ALIGNMENT PROCEDURE

Locations of the alignment condensers are indicated on Figure 3. There are five adjustments necessary. Before attempting to align the receiver, the antenna must be disconnected to obviate any interference that may be caused by pickup on a local station. The adjusting should then be performed in order as follows:

(a) *First I. F. Transformer*—Connect the output of an external oscillator, which is set to produce a 460 KC. signal, from the RCA-6A7 detector grid to chassis-ground. Tune the primary and secondary trimmers C-11 and C-12, respectively, for maximum receiver output.

(b) *Receiver Oscillator and Detector*—Two adjustments are provided. The first is accomplished by feeding a 1400 KC. signal from an external oscillator into the antenna-ground terminals. Set the tuning dial at 1400, and adjust the two trimmers of the tuning condenser for maximum receiver output. For the second oscillator adjustment, a signal of 600 KC. is required from the external source, fed into the antenna-ground connections. The trimmer for this frequency appears on the rear of the chassis. Adjust this trimmer, simultaneously rocking the tuning condenser through the signal, until maximum receiver output is obtained. Reading of the dial should fall within reasonable limits of accuracy at the 600 KC. point.

(2) VOLTAGE READINGS

In Figure 3, voltage values from tube contacts to ground are shown. They are the actual operating values and should be checked with the tubes in place. The table of Figure 4 lists the operating voltages and currents, referred to cathode, and measurable by means of a socket adaptor or set analyzer.

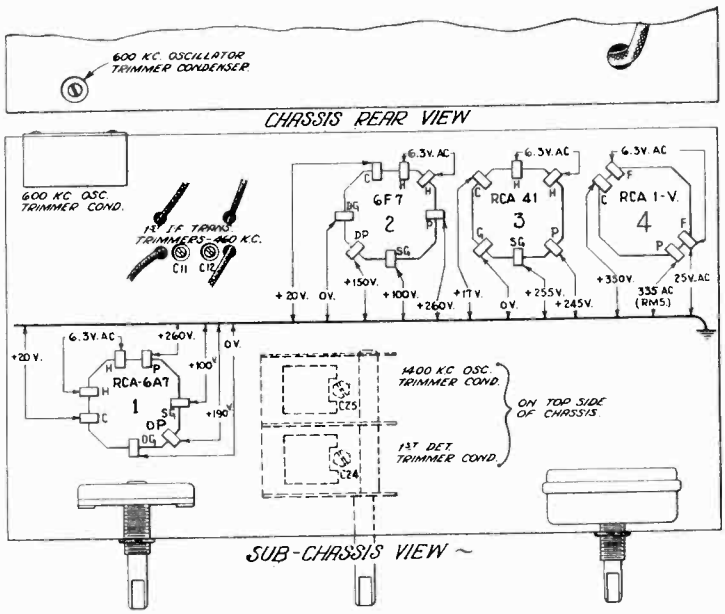


Figure 3—Line-Up Capacitor Locations and Miscellaneous Voltages at Radiotron Sockets, 120-Volt, 60-Cycle Line—Volume Control at Maximum—No Signal

REPLACEMENT PARTS

Stock No.	Description	List Price
	RECEIVER ASSEMBLIES	
2747	Cap—Contact cap—Package of 5	$0.50
4000	Capacitor—Adjustable capacitor (C7)	.78
4887	Capacitor—0.0025 mfd. (C15)	.18
3701	Capacitor—0.01 mfd. (C1)	.30
4886	Capacitor—0.05 mfd. (C17)	.20
4885	Capacitor—0.1 mfd. (C14)	.28
4835	Capacitor—0.1 mfd. (C9)	.28
3597	Capacitor—0.25 mfd. (C18)	.40
3459	Capacitor—80 mmfd. (C5)	.44
3865	Capacitor—160 mmfd. (C16)	.30
3933	Capacitor—630 mmfd. (C2)	.32
3873	Capacitor—1500 mmfd. (C3)	.30
6832	Capacitor—4.0 mfd. (C10)	.85
6787	Capacitor—Comprising one 0.005 mfd. and one 0.017 mfd. capacitors (C20, C21)	.30
6661	Capacitor pack—Comprising two 5.0 mfd. and two 8.0 mfd capacitors (C13, C19, C22, C23)	2.70
6666	Coil—Antenna coil (L1, C1, R1)	1.08
4018	Coil—Choke coil (L11)	.90
3857	Coil—Detector choke coil (L8)	.90
6664	Coil—Oscillator coil (L2, L3)	.94
6660	Condenser—2-gang variable condenser (C4, C6, C24, C25)	2.78
4890	Dial—Station selector dial	.58
4085	Knob—Station selector knob—Package of 5	.60
4884	Insulator—Radiotron Socket Insulator	.10
4132	Knob—Volume control, tone control or range switch knob—Package of 5	.55
3886	Reflector—Dial light reflector	.30
3632	Resistor—500 ohms—Carbon type—1 watt (R11)—Package of 5	1.10
3047	Resistor—1,500 ohms—Carbon type—½ watt (R7)—Package of 5	1.00
3602	Resistor—60,000 ohms—Carbon type—¼ watt (R2)—Package of 5	1.00
6114	Resistor—20,000 ohms—Carbon type—1 watt (R3, R5)—Package of 5	1.10
3889	Resistor—25,000 ohms—Carbon type—3 watt (R4)	$0.25
3077	Resistor—30,000 ohms—Carbon type—½ watt (R9)—Package of 5	1.00
3118	Resistor—100,000 ohms—Carbon type—¼ watt (R1)—Package of 5	1.00
3869	Resistor—170,000 ohms—Carbon type—½ watt (R8)—Package of 5	1.00
3076	Resistor—1 megohm—Carbon type—½ watt (R10)—Package of 5	1.00
3584	Ring—Oscillator coil retaining ring—Package of 5	.40
4087	Screw—Chassis mounting screw and washer—Package of 4	.22
6665	Shield—Oscillator coil shield and mounting bracket	.34
4104	Shield—Radiotron shield	.20
3858	Socket—Dial lamp socket and bracket	.26
4784	Socket—4-contact Radiotron socket	.15
4785	Socket—6-contact Radiotron socket	.15
4787	Socket—7-contact Radiotron socket	.15
6668	Switch—Range switch (S1)	.58
6669	Switch—Tone control switch (S2)	.50
9464	Transformer—Power transformer—105-125 volts—50-60 cycles (T1)	3.20
9465	Transformer—Power transformer—105-125 volts—25-40 cycles	4.38
9466	Transformer—Power transformer—200-250 volts—50-60 cycles	3.28
6662	Transformer—First intermediate frequency transformer (L4, L5, C11, C12)	2.34
6663	Transformer—Second intermediate frequency transformer (L6, L7)	1.06
6667	Volume control (R6, S3)	1.58
	REPRODUCER ASSEMBLIES	
9548	Coil assembly—Comprising field coil, magnet and cone support (L10)	3.08
9588	Cone—Reproducer cone (L9)—Package of 5	3.55
9547	Reproducer complete	5.45
4803	Transformer—Output transformer	1.45

MODEL M-104,M-108
Circuit Notes

RCA MFG. CO., INC.

DESCRIPTION OF ELECTRICAL CIRCUIT

The electrical arrangement of the receiver is pictured in the schematic of Figure 2. A corresponding wiring layout is shown in Figure 3, where the actual physical relations of parts and coding of conductors are given.

Five Radiotrons are used, forming the total tube complement around which the superheterodyne circuit is built. In sequence, there is an r-f stage, a dual first detector–oscillator stage, a single i-f stage, a second detector–audio amplifier–a.v.c. stage, and a pentode output stage. Five tuned circuits operate upon the desired signal to strengthen its magnitude and reject the undesired signals and interference.

Current for operation of the receiver is obtained from a standard 6.3 volt storage battery. This current is filtered through several chokes and by-passed to ground by a number of capacitors before being applied to the Radiotron filaments and the high voltage conversion unit. The number and arrangement of the filter elements is such as to gain a very great reduction in the amount of interference conducted into the r-f circuits by the current supply wiring.

The following details elaborate the functions and features of the various stages of the receiver:

Starting at the antenna, an r-f signal is impressed across a special transmission line, which in conjunction with a "noise filter," acts selectively to the entire standard broadcast range and drastically attenuates signals and interference outside the limits of the band (540–1600 kc.). Instead of the ground for the antenna input coil appearing at the usual point on the chassis frame, the low end of the coil is extended as part of the transmission line to the outer termination of the antenna lead-in shield, where it grounds to the frame of the car. With this arrangement, the r-f disturbances circulating in the car frame (ground) do not become mutual to the receiver input. The transmission line section of the antenna lead-in also has characteristics favorable to the operation of the "noise filter." Its length, conductor sizes, insulation, etc., are precisely designed to have a critical capacitance (represented by dotted lines on schematic), which resonates with the inductance of the input system to produce a band-pass filter having an acceptance band between 540 kc. and 1600 kc., and sharply defined cut-off below and above these two limits. By using this antenna filter system and minimizing capacity coupling between primary and secondary of antenna coupling transformer, it is generally possible to dispense with the usual spark plug and distributor suppressors, without encountering serious interference on latest types of cars.

The signal is passed from the input coil by transformer action to the r-f stage control grid. An RCA-6D6 at this point performs the function of an r-f amplifier, its super-control property being adapted as means of preventing cross-modulation and securing a wide range of automatic volume control. The first (front) section of the tuning condenser is connected to sharply tune the secondary of the antenna coupling transformer.

A second r-f coupling transformer transmits the signal to the following receiver stage, which comprises a combination first detector and local oscillator. The secondary inductance of this transformer is tuned by the second (center) section of the variable capacitor and connects to the detector grid of the RCA-6A7 Radiotron. By proper arrangement of the several elements within this tube, a local oscillator system is established, which generates the correct frequency and causes it to mix with the incoming signal. The difference frequency beat (i-f) of these two combined signals is detected by the tube and transferred by a closely coupled transformer to the intermediate frequency amplifier tube, an RCA-6D6. Both windings of this i-f transformer are tuned by trimmers. The second i-f transformer which joins the RCA-6D6 tube to the second detector stage has only one trimmer, that being in shunt with its primary winding.

The RCA-6B7 second detector stage receives the i-f signal on its diode plates. Detection takes place as a result of the rectifying action of the diodes and develops a current through resistors R7 and R17. The d-c voltage drop in the resistance R7 plus R17 is used for automatically regulating the control grid bias of the r-f and first detector stage, and thus the amplification becomes dependent upon the signal strength. This process (a.v.c.) compensates for fading signals and reduction of signals due to change of antenna direction and shielding effects of buildings, bridges, etc. A smaller portion of the d-c voltage obtained by detection is tapped from the juncture of R7 and R17 and carried to the control grid of the i-f stage. This likewise furnishes automatic volume control.

The audio and d-c components of the detected signal are selected from the manual volume control resistor (R17) by its movable arm, and applied to the control grid of the RCA-6B7; amplification results and the signal passes on to the power output stage. The variable d-c applied to the grid prevents overload. A resistance-capacitance coupling system conveys the signal from the second detector stage to the RCA-41 output tube. In this coupling arrangement, a "speech" control is used for shorting capacitor C34, the effect in the open position being attenuation of the lower frequencies and consequent improvement of speech intelligibility. The circuit composed of R21 and C37 effects the proper fidelity balance.

The power amplifier stage delivers to the loudspeaker a high level audio signal. Correct matching relations between the speaker and output stage are maintained by the output transformer.

RCA MFG. CO., INC.

MODELS M-104, M-108
Schematic
Speaker Wiring

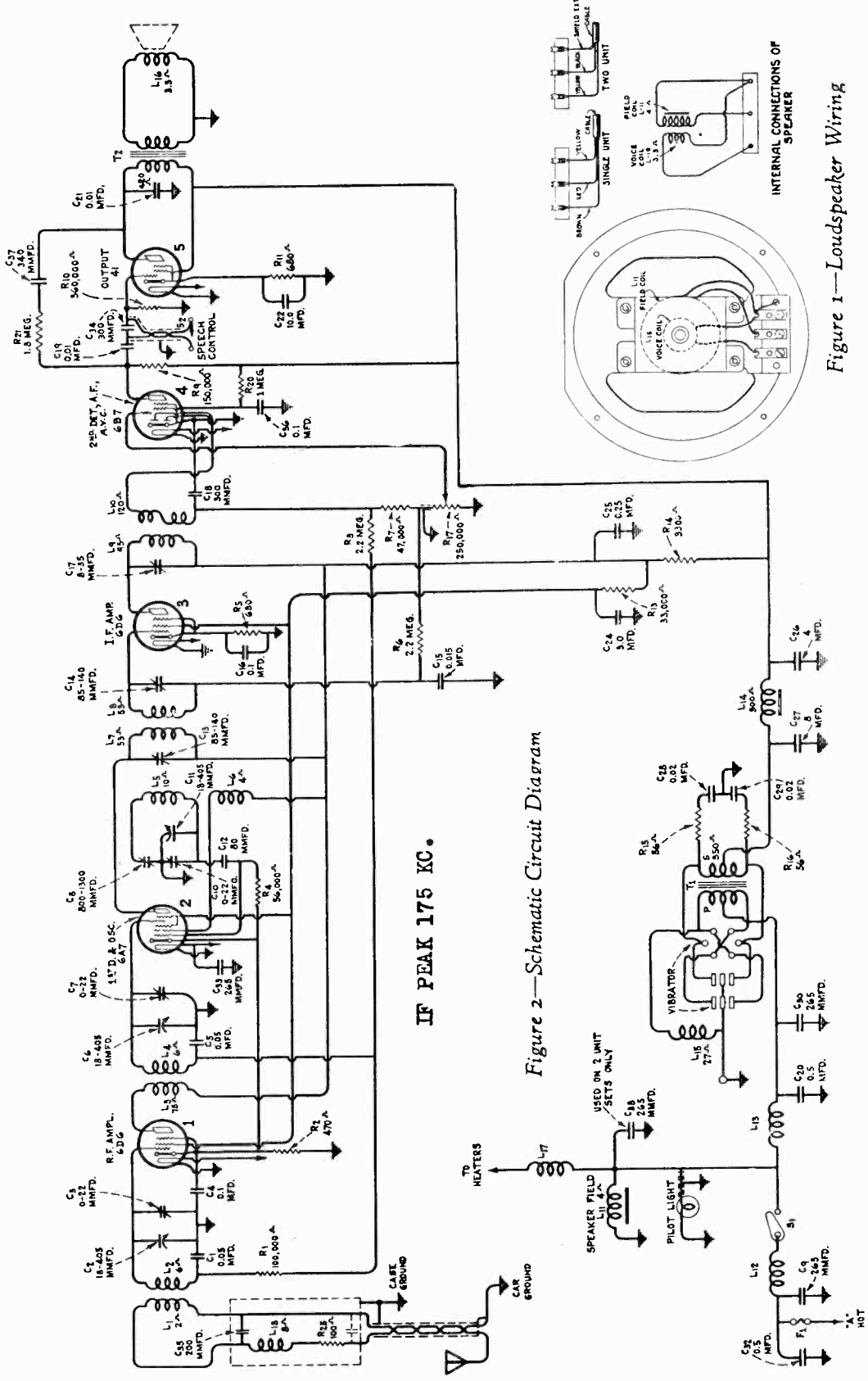


Figure 2—Schematic Circuit Diagram

Figure 1—Loudspeaker Wiring

RCA Model M-104 and G.E. Model D-51 are single-unit receivers, containing the radio chassis, power conversion adjunct and loud speaker in one housing. RCA Model M-108 and G.E. Model D-52 are double-unit receivers, utilizing a chassis and its power conversion equipment similar to those above, assembled in one case, but with the loud speaker mounted individually in a separate case.

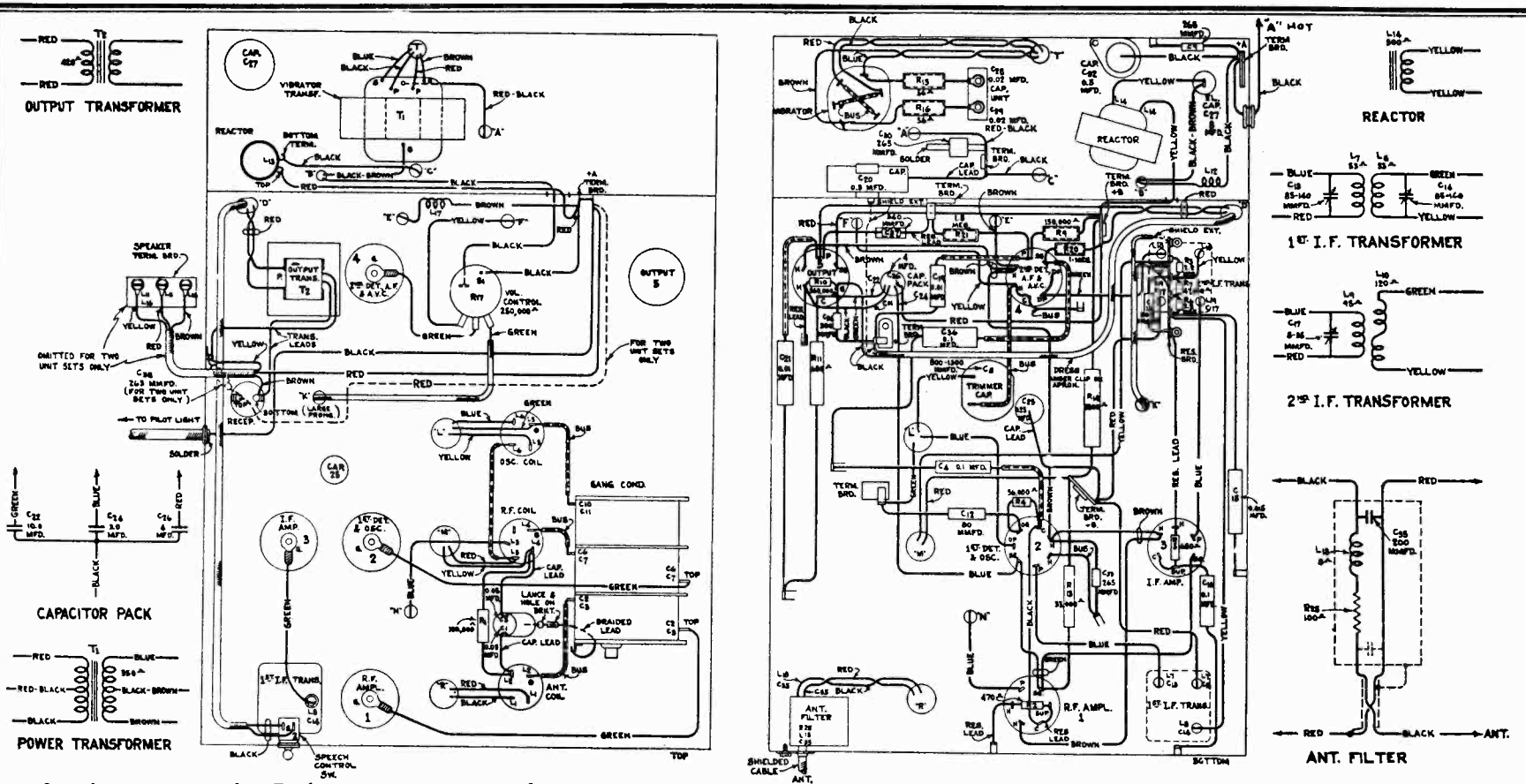


Figure 3—Chassis Wiring Diagram

In this receiver the Radiotrons are compactly placed and snugly fitted into tight-gripping sockets to protect against vibration and to insure positive electrical connections. They should be withdrawn by exerting a direct pull on the tube.

To replace the tubes having the form-fitting shields, attach the shield to the tube and orient the grid lead opening in proper relation to the tube base, and insert the tube into its socket so that the shield clamps slide into their correct position on the outer surface of the shield.

Heater connections of the Radiotrons are wired multiple, and supplied through a carefully filtered system. One heater terminal of each tube is grounded.

High voltage for plate and bias supply is generated by inversion, transformation and mechanical rectification; these three functions occurring in the "synchronous rectifier-vibrator." This vibrator is adapted for convenient removability by having its base constructed for "plug-in" mounting. Simple means are provided for correcting the vibrator input to agree with the ground polarity of the car by having the vibrator reversible. The vibrator may be inserted in two possible positions. As normally shipped, it is plugged in to operate with "positive" car ground. On a car having "negative ground," it will be necessary to withdraw the vibrator, rotate the unit 180 degrees and re-insert into the new position.

(1) PREPARATORY DETAILS

(a) Dial Calibration—The tuning-condenser flexible shaft operates the dial pointer through a gear mechanism within the control unit. To adjust their mechanical relations so that accurate scale calibration obtains:—Rotate the station selector knob until the variable tuning capacitor is at full mesh, which will carry the dial pointer to its minimum frequency position; then remove the tuning knob, loosen the set screw in the bushing and rotate the bushing until the pointer sets exactly opposite the last radial line at the low frequency end of the scale. (The line referred to is the second one counter-clockwise of the 550 kc. mark.)

(b) General Procedure—The "Output Indicator" should be attached to the voice coil circuit of the loudspeaker, and for each adjustment, the oscillator output increased until a noticeable registration or glow occurs on the indicator. The signal from the oscillator should be held as low as possible consistent with getting a good indication, with the receiver volume control set at its maximum position. This method of procedure prevents the automatic volume control from affecting the adjustments.

(2) I. F. ADJUSTMENTS

Three trimmers are provided in the i-f system, two on the first transformer and one on the second transformer. The locations of the adjustment screws are shown in Figure 4.

(a) Tune the "Full Range Oscillator" to 175 kc. and connect its output to the first detector control grid and chassis ground. Tune the station selector to a point where no signals are received.

(b) Tune each of the trimmer capacitors, C17, C14 and C13, in order. C17 should be set for maximum (peak) output. C14 and C13 should be roughly adjusted for maximum output and then carefully "trimmed" so that a flat-topped response is obtained. This may be checked by shifting the external oscillator frequency through a range two kilocycles each side of 175 kc. and noting whether or not the receiver output remains substantially constant.

(3) R. F. DETECTOR AND OSCILLATOR ADJUSTMENTS

Three high-frequency adjusting capacitors are provided for alignment at 1400 kc., and one trimmer is used for the low frequency line-up at 600 kc. The "Full Range Oscillator" should be connected to the antenna-ground input at the outer end of the lead-in shield through a 300-ohm series resistance in the antenna side.

(a) Tune the external oscillator to a frequency of 1400 kc. and turn the station selector knob until the dial pointer is at the 1400 kc. scale marking.

(b) Adjust the oscillator trimmer, C-10; the detector trimmer, C7; and the r-f trimmer, C3, for maximum (peak) receiver output.

(c) Set the external oscillator to a frequency of 600 kc. and rotate the station selector until this signal is accurately tuned on the receiver. Adjust the oscillator trimmer C8, simultaneously rocking the tuning condenser slowly through the signal until the maximum obtainable output results from the two combined operations. This adjustment should be made irrespective of dial calibration.

(d) Recheck the adjustment of the 1400 kc. oscillator trimmer, as in (b), to correct any reflective errors caused by the procedure of (c).

CIRCUIT VOLTAGES

The voltages indicated at the socket contacts on Figure 4 will serve to assist in analizing defective circuit conditions. The values specified should hold within ±20% when the receiver is normally operative. They are actual operating values and do not take into account inaccuracies due to voltmeter resistance. A meter having a multiplier of at least 1000 ohms per volt should be used, and the amount of circuit resistance shunted by the meter resistance duly considered when the two are comparable.

SYNCHRONOUS RECTIFIER-VIBRATOR

The vibrator power unit used in this receiver is of rugged design and construction. It has been carefully adjusted by means of special equipment to insure quiet operation over an extensive period of life. No adjustments should be attempted on a vibrator suspected to be in defective condition, but a renewal installed. A convenient plug-in base is provided for effecting a quick replacement.

SPEAKER CONE ALIGNMENT

In the event the cone coil becomes mis-aligned, it will be necessary to correct its position by an adjustment provided on the speaker assembly. A small round-head brass screw installed on pole piece adjacent to the terminal strip is used to clamp the cone coil mounting. To center the cone, loosen the screw and insert a small 1/16" rod or nail into the hole next to the screw and pry the coil mounting into the position giving normal speaker operation. The screw should then be retightened.

TUNING CONDENSER DRIVE

Smooth control should be obtained over the entire tuning range of the variable condenser. If there is any irregularity noticed, the following corrective steps should be taken:

Check the action of the gear mechanism for presence of binding or backlash at every point within the tuning range. A bind may be due to improper mesh between the small pinion gear and large gears on the rotor shaft. To correct such a condition, remove the coupling on the pinion of the tuning gear, insert a screw-driver through the hole in the case and loosen the two screws holding gear plate. The mesh of the gears should be adjusted to a position which gives smooth operation.

Gear back-lash is prevented by the compression spring between the large gears on the rotor shaft. To check for this back-lash, rotate the pinion slowly in both directions, observing the free gear (on rotor shaft) carefully to determine if it shifts without turning the rotor.

If back-lash is apparent, the large gear assembly should be removed and the free gear moved (against the spring compression) 2 to 3½ teeth in relation to the fixed gear and the assembly slid in place on the shaft and in mesh with the pinion. The set screws should then be securely tightened.

MISCELLANEOUS SERVICE HINTS

(a) The grounding of the outer end of the antenna input lead is quite critical, in that ignition interference may be minimized by selecting the proper point of attachment to the car frame, determined by experiment for each individual installation.

(b) In some cars, ignition interference may be introduced through lack of antenna lead shielding. In such cases, a shield should be placed over the exposed section of antenna lead and carried as near as possible to the actual antenna. It should be solidly grounded.

(c) Interference in the form of a grating scratch may arise from static collecting on the front wheels of some cars due to road surface friction in dry weather. The insulation caused by the grease of the wheel hub enables this action to develop. A number of devices are available through automotive supply dealers which are designed to eliminate this type of trouble. They all serve to form a grounding tie between the hub and the axle, and thus drain the static to the frame of the car (ground).

(d) If the flexible tuning shaft is installed so that it protrudes through the insulating coupling at the receiver end and makes intermittent contact with the metal of the pinion gear, some r-f disturbance will result. The shaft should therefore be inserted into the coupling just far enough to be properly secured by the set screw.

(e) The screws holding the chassis to the case must all be in place and tightly installed, inasmuch as they appreciably affect the ground resistance of the assembly and will consequently have a bearing on the amount of ignition noise received.

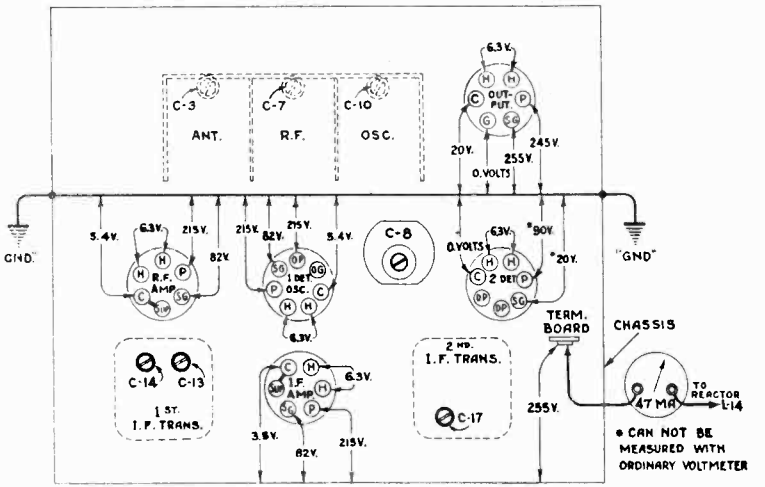


Figure 4—Trimmer Locations and Radiotron Socket Voltages to Ground
(Measured at 6.6 volts battery supply—Volume Control Maximum—No Signal)

Stock No.	Description	List Price
	RECEIVER ASSEMBLIES	
4993	Bumper—Rubber bumper—Used under variable condenser bracket assembly—Package of 5	$0.25
4965	Cable—2-conductor shielded—Approximately 17 inches long—To speech control switch	.36
4244	Cap—Grid contact cap—Package of 5	.20
4955	Capacitor—Adjustable capacitor (C8)	.48
5021	Capacitor—80 mmfd. (C12)	.22
5078	Capacitor—265 mmfd. (C9, C30, C33, C38)	.24
3981	Capacitor—300 mmfd. (C34)	.30
4248	Capacitor—300 mmfd. (C18)	.22
5022	Capacitor—340 mmfd. (C37)	.20
4882	Capacitor—.01 mfd. (C21)	.20
4883	Capacitor—.01 mfd. (C19)	.20
4791	Capacitor—0.1 mfd. (C4, C16)	.24
4885	Capacitor—0.1 mfd. (C36)	.28
4792	Capacitor—.015 mfd. (C15)	.22
4967	Capacitor—.25 mfd. (C25)	.46
5019	Capacitor—.5 mfd. (C32)	.42
4960	Capacitor—.5 mfd. (C20)	.46
4961	Capacitor—8.0 mfd. (C27)	1.28
4964	Capacitor pack—Comprising two .02 mfd. capacitors (C28, C29)	1.02
5015	Capacitor pack—Comprising two .05 mfd. capacitors (C1, C5)	.26
4938	Capacitor pack—Comprising one 3. mfd., one 10. mfd. and one 4. mfd. capacitors (C22, C24, C26)	1.34
5020	Clamp—Metal clamp with screw—For antenna filter shielded cable—Package of 5	.14
4950	Coil—Antenna coil (L1, L2)	.74
4968	Coil—Choke coil (L12)	.14
4969	Coil—Choke coil (15 turns—approximately 23 inches—length) (L17)	.14
6967	Coil—Oscillator coil (L5, L6)	.52
6966	Coil—r-f coil (L3, L4)	.80
4948	Condenser—3-gang variable tuning condenser (C2, C3, C6, C7, C10, C11)	3.81
4954	Filter—Antenna filter (L18, C35, R25)	1.46
4972	Lead—Power lead with male section of connector—Chassis end	.20
7766	Lead—Power lead with clip and female section of fuse connector	.30
4966	Lead—Single connector dial lamp lead—With female section of connector—Chassis end	.30
4962	Reactor (L14)	.88
4963	Reactor (L13)	.38
5034	Resistor—56 ohms—Carbon type—½ watt (R15, R16)—Package of 5	1.00
5030	Resistor—470 ohms—Carbon type—¼ watt (R2)—Package of 5	1.00
5031	Resistor—680 ohms—Carbon type—¼ watt (R5)—Package of 5	1.00
5026	Resistor—680 ohms—Carbon type—1 watt (R11)—Package of 5	1.10
5032	Resistor—3300 ohms—Carbon type—2 watts (R14)	.22
5033	Resistor — 33,000 ohms — Carbon type — 1 watt (R13)—Package of 5	1.10
5132	Resistor — 47,000 ohms — Carbon type — 1/10 watt (R7)—Package of 5	$0.75
5029	Resistor — 56,000 ohms — Carbon type — ¼ watt (R4)—Package of 5	1.00
3118	Resistor — 100,000 ohms — Carbon type — ¼ watt (R1)—Package of 5	1.00
5027	Resistor — 150,000 ohms — Carbon type — ½ watt (R9)—Package of 5	1.00
5035	Resistor — 560,000 ohms — Carbon type — ¼ watt (R10)—Package of 5	1.00
3033	Resistor—1 megohm—Carbon type—¼ watt (R20)—Package of 5	1.00
5028	Resistor—1.8 megohm—Carbon type—¼ watt (R21)—Package of 5	1.00
5131	Resistor—2,200,000 ohms—Carbon type—1/10 watt (R3, R6)—Package of 5	.75
5129	Ring—Radiotron shield ring—Package of 5	.10
3584	Ring—Retaining ring for antenna, r-f, or oscillator coil—Package of 5	.40
3623	Shield—Antenna, r-f, or oscillator coil shield	.30
4953	Shield—First intermediate frequency transformer shield	.24
4956	Shield—Second intermediate frequency transformer shield	.30
5037	Shield—Radiotron shield	.15
4946	Socket—6-contact Radiotron socket	.18
4959	Socket—6-contact vibrator socket	.18
4947	Socket—7-contact Radiotron socket	.18
5001	Switch—Speech control switch (S2)	.66
4951	Transformer—First intermediate frequency transformer (L7, L8, C13, C14)	1.26
4952	Transformer—Second intermediate frequency transformer (L9, L10, C17)	1.76
4957	Transformer—Output transformer (T2)	1.18
7859	Transformer—Vibrator transformer (T1)	2.02
7857	Vibrator—Complete (L15)	5.64
5018	Volume control (R17, S1)	1.00
	CONTROL BOX ASSEMBLIES	
4987	Bezel—Station selector dial bezel	.42
G7866	Box—Control box—Complete	3.86
7864	Bracket—Mounting bracket and rear section of control box housing	.30
4988	Crystal—Station selector dial crystal	.38
G5083	Dial—Station selector dial	.20
4981	Gear—18-tooth intermediate drive gear	.15
4978	Gear—Indicator drive gear and shaft	.42
7862	Housing—Front section of control box housing	.28
7863	Housing—Center section of control box housing	.32
4990	Indicator—Station selector (pointer) indicator	.10
4985	Knob—Station selector or volume control knob—Package of 5	.62
4991	Lamp—Dial lamp—Package of 5	.74
7866	Plate—Bearing plate assembly—Comprising plate, gear and shaft, volume control shaft, station selector shaft, pinion and spring	1.22
4986	Screw—Oval fillister head machine screw—Fastens bracket and center section of control box housing	.25

Stock No.	Description	List Price
5042	Screw—No. 8-32-3/16-inch headless set-screw for station selector or volume control shaft—Package of 10	$0.25
4983	Shaft—Station selector drive shaft	.16
4979	Shaft—Volume control drive shaft	.16
4984	Socket—Dial lamp socket	.16
4982	Spring—Holding spring for station selector or volume control knob—Package of 10	.26
4980	Spring—Tension spring—Package of 5	.15
	FLEXIBLE SHAFT ASSEMBLIES	
5000	Bracket—Volume or tuning condenser flexible shaft bracket—Bracket mounted on housing	.30
4994	Nut—Knurled locking nut for condenser driv or volume control flexible shafts	.10
7854	Shaft—Tuning condenser—Flexible (steering column) drive shaft—31⅜ inches long	1.08
7856	Shaft—Volume control or tuning condenser—Flexible (dash mounting) drive shaft—9⅜ inches long	.58
7855	Shaft—Volume control—Flexible (steering column) shaft—28¾ inches long	1.00
	REPRODUCER ASSEMBLIES	
4970	Cable—3-conductor reproducer cable (M104)	1.02
5079	Cable—2-conductor shielded—With pin tips—for M108	.86
9602	Cone—Reproducer cone (L16)	.75
9576	Housing—Reproducer housing—Top cover of Receiver for M104	1.08
7873	Housing—Reproducer housing complete for M108	2.10
5133	Pin—Large and small contact pins for reproducer cable—Package of 10	.35
9577	Reproducer—Complete (L11, L16)	4.32
4995	Screw—Reproducer mounting screw—Package of 10	$0.15
4977	Socket—Reproducer cable pin socket	.18
	HOUSING ASSEMBLIES	
7868	Case — Receiver housing assembly — Complete (M104)	1.76
7869	Cover—Bottom cover of receiver housing assembly (M104 and M108)	.32
7870	Cover—Top cover of receiver housing assembly (Model M108)	.26
4999	Screw—No. 8-¼-inch slotted hex head self-tapping screw—Used to assemble housing—Package of 5	.12
	MISCELLANEOUS PARTS	
4287	Body—Antenna connector body—Package of 10	.40
4289	Body—Fuse connector body—Package of 10	.35
4288	Cap—Antenna or fuse connector cap—Package of 10	.36
4293	Capacitor—0.5 mfd. ammeter capacitor	.60
5025	Capacitor—0.5 mfd. generator capacitor	.40
6516	Connector—Fuse connector complete	.16
4973	Coupling—Tuning condenser shaft coupling	.30
4974	Coupling—Volume control shaft coupling	.36
4286	Ferrule—Antenna or fuse connector ferrule and bushing—Package of 10	.38
5023	Fuse—15-ampere—Package of 5	.40
4290	Insulator—Fuse connector insulator—Package of 10	.35
4976	Lead—Antenna lead assembly	.16
4975	Lead—Dial lamp lead—Control box end	.38
3903	Screw—No. 8-32-3/16-inch headless set-screw for couplings—Package of 20	.36
4284	Spring—Antenna or fuse connector spring—Package of 10	.30
4992	Stud—Receiver mounting stud and nuts—Package of 3	.22
5024	Suppressor—Distributor suppressor	.38

MODEL M-109
Schematic

RCA MFG. CO., INC.

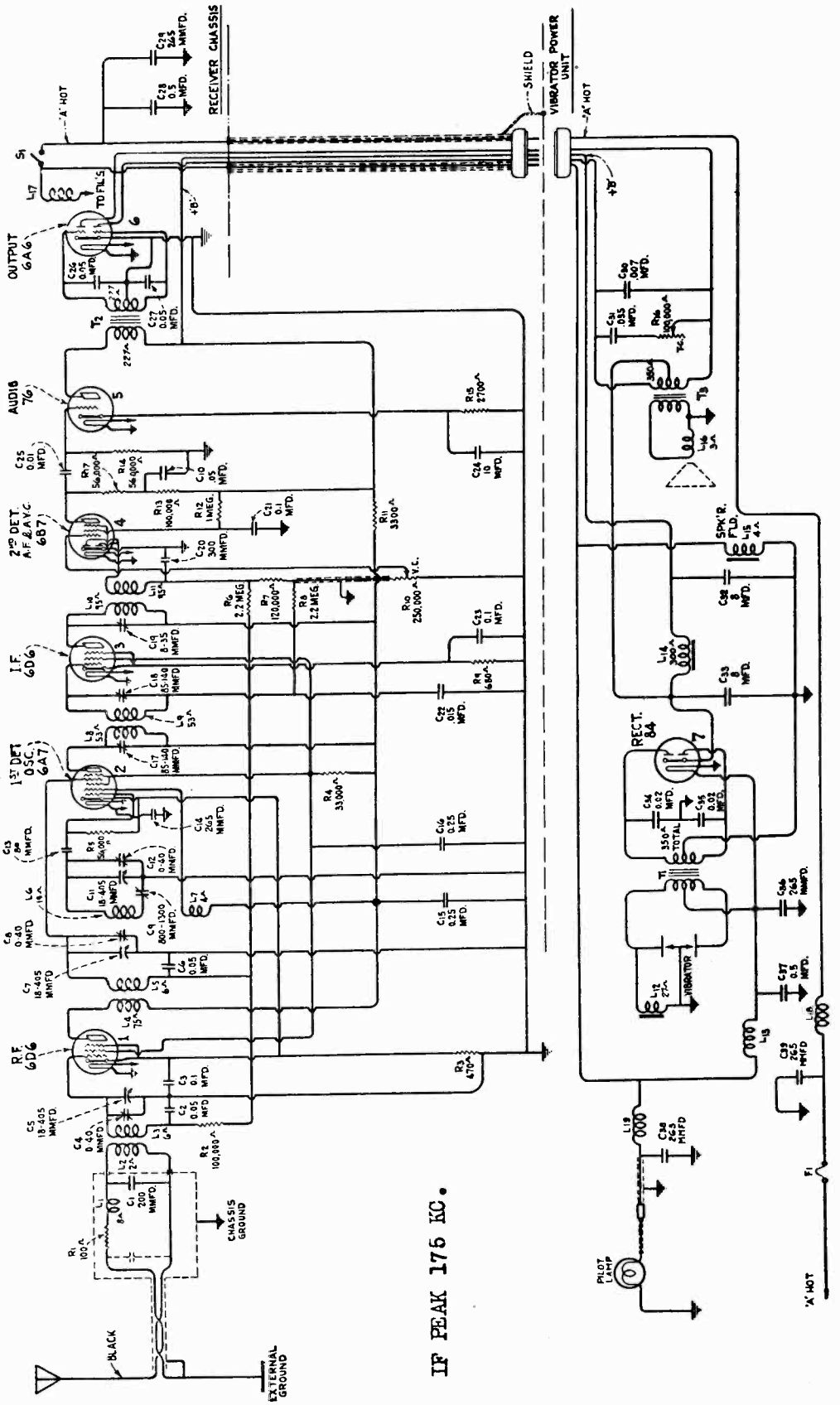


Figure 3—Schematic Circuit Diagram

MODEL M-109
Chassis Wiring

RCA MFG. CO., INC.

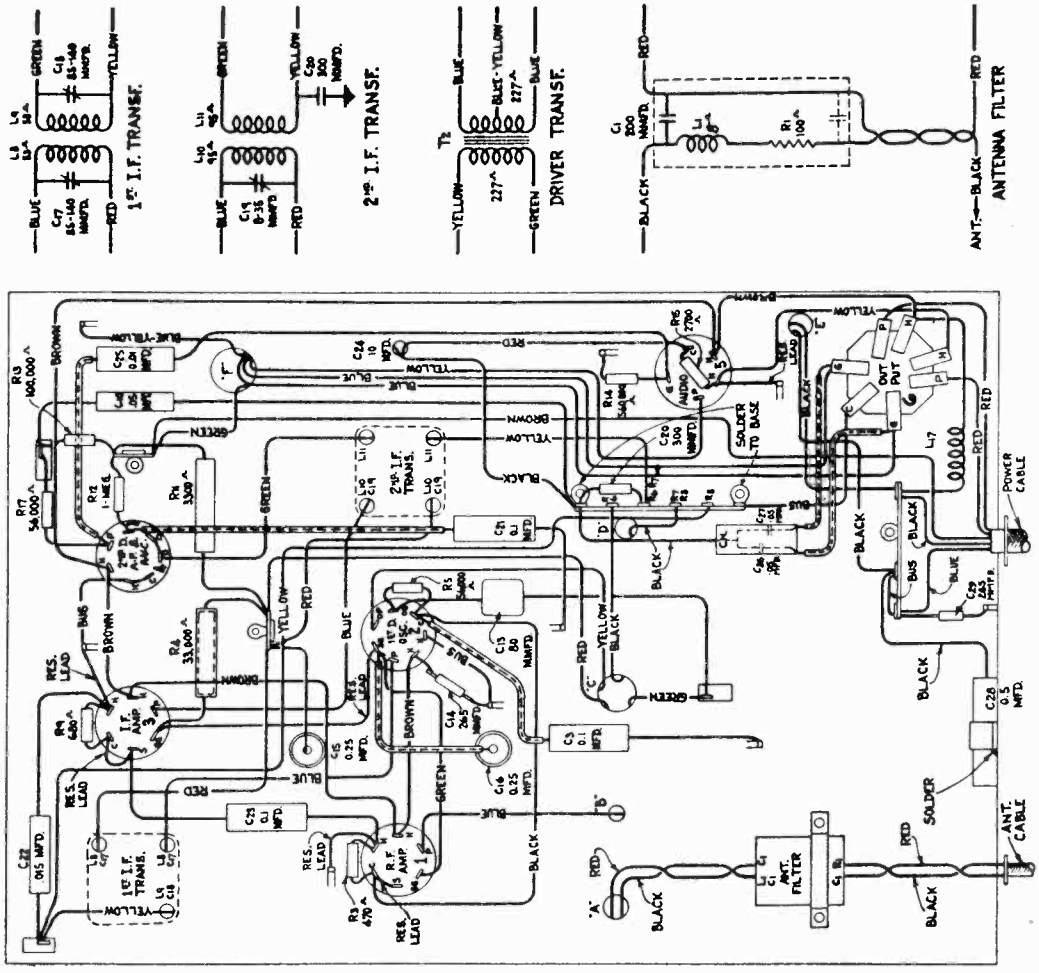


Figure 4—Chassis Wiring Diagram

Preparatory Details

(a) **Dial Calibration**—The tuning condenser flexible shaft engages a gear system within the control unit which actuates the dial pointer. To adjust the mechanical relations of the variable condenser and the dial pointer so that accurate calibration is obtained:—rotate the station selector knob until the variable capacitor is at full mesh, which will carry the dial pointer to its minimum frequency position; then remove the tuning knob, loosen the set screw in the bushing and rotate the bushing until the pointer sets exactly opposite the last radial line at the low-frequency end of the scale. (The line referred to is the second one counter-clockwise of the 550 kc. marking.)

(b) **General Procedure**—The "Output Indicator" should be attached to the voice coil or speaker input circuit; and for each adjustment, the oscillator output increased until a noticeable registration or glow occurs on the indicator. The signal from the oscillator should be held as low as possible consistent with getting a good indication, with the receiver volume control at its maximum position. This method of procedure prevents the automatic volume control from affecting the adjustments.

I-F Adjustments

Three trimmers are provided in the i-f system. Two are located on the first i-f transformer, and one on the second i-f transformer. Their physical positions are shown in Figure 5. To correct their alignment proceed as follows:

(a) Connect the output of the "Full Range Oscillator" to the first detector grid and ground, and adjust its frequency to 175 kc. Tune the station selector to a point where no signals are received.

(b) Tune each of the trimmer capacitors C19, C18 and C17 in order. C19 should be set for maximum (peak) output. C18 and C17 should be roughly adjusted for maximum output and then carefully "trimmed" so that a flat-topped response is obtained. This may be checked by shifting the external oscillator frequency through a range two kilocycles each side of the 175 kc. and noting whether or not the receiver output remains substantially constant.

R. F., Detector and Oscillator Adjustments

Three adjustments are used at the high-frequency end of the tuning range. They are located on the gang condenser as shown by the diagram of Figure 5. One trimmer (C9) is used in the oscillator circuit for alignment at 600 kc., it being located as shown in Figure 5.

The external oscillator should be connected to the antenna-ground input at the outer end of the lead-in shield through a 300-ohm resistor in the antenna side. Tuning should be done as follows:

(a) Adjust the frequency of the external oscillator to 1400 kc. and turn the station selector until the dial pointer is at the 1400 kc. marking.

(b) Tune the oscillator high-frequency trimmer, C12, the detector trimmer C8 and the r-f trimmer C4 for maximum receiver output.

(c) Set the external oscillator to a frequency of 600 kc. and rotate the station selector until this signal is accurately tuned. Then adjust the oscillator trimmer C9, simultaneously rocking the tuning condenser slowly through the signal until maximum obtainable output results from the two combined operations. This adjustment should be made irrespective of dial calibration.

(d) Recheck the adjustment of the 1400 kc. oscillator trimmer (C12) as in (b) to correct any reflective errors caused by the procedure of (c).

Tuning Condenser Drive

The coupling of the flexible drive shaft to the variable tuning condenser is through a worm-gear arrangement. Figure 6 shows the two gears and their positions. Smooth operation should be obtained over the entire tuning range. The presence of binding or backlash may cause irregularity in the tuning. To correct these conditions, it will be necessary to remove the chassis from the case and the following procedure applied:—Loosen the two screws behind the condenser drive gear which clamp the worm-gear support plate, and shift the plate upward or downward to change the degree of gear mesh and tension of the spring as required for smooth operation. The screws should then be carefully re-tightened.

Pilot Lamp

A novel type of mounting is provided for the pilot lamp. It consists of a miniature socket attached to a heavy screw which threads into the case of the control unit. The head of this screw is accessible from the underside of the control unit and may be removed with a large screwdriver whenever it becomes necessary to replace the pilot lamp. The power switch should be turned to "off" in order to prevent blowing the fuse if the lamp socket should come in contact with the grounded control case.

Power Unit Interrupter

The mechanical interrupter used in combination with a tube rectifier in the power unit is constructed so as to be conveniently exchanged. Its base is of the "plug-in" type. The adjustments of this device have been correctly set during manufacture by means of special equipment. They should therefore be left undisturbed. In cases of faulty operation, a renewal should be installed.

Speaker Cone Alignment

In the event the cone coil becomes mis-aligned, it will be necessary to correct its centering by an adjustment provided on the speaker assembly. The coil is supported by an external spider. Two round-head brass screws secure its mounting. To center the cone, loosen these two screws and insert a small rod or nail into the hole adjacent to one of these screws and pry the cone mounting into the position which gives normal operation.

Miscellaneous Service Hints

1. The grounding of the outer end of the antenna lead shield is quite critical in that ignition interference may be minimized by selecting the proper point of attachment to the car frame, determined by experiment for each individual installation.

2.. In some cars, ignition interference may be introduced through lack of sufficient shielding on the antenna lead-in. In such cases, a shield should be placed over the exposed section of lead and carried as near to the antenna as possible. It should be solidly grounded.

DESCRIPTION OF ELECTRICAL CIRCUIT

The electrical arrangement of the receiver is shown in the schematic of Figure 3. A corresponding wiring layout is shown in Figure 4, where the actual physical relations and coding of conductors are given.

The tube line-up in the superheterodyne circuit consists of seven Radiotrons. In sequence, there is an r-f stage, a dual first detector and oscillator stage, a single i-f stage, a combined second detector-audio amplifier-a.v.c. stage, an audio driver stage, a push-pull power output stage, and a full-wave rectifier. There are five circuits which are tuned to the signal desired, to strengthen its magnitude and reject undesired signals and interference.

The following describes the functions of the various stages of the receiver: Beginning at the antenna circuit, there is a special transmission line and "noise filter" circuit, which, in conjunction with the tuned input system, acts selectively to the entire broadcast range and drastically attenuates signals and interference outside the limits of the band (540–1600 kc.). These properties of the filter circuit and minimizing of primary to secondary capacity coupling in first r-f transformer cause a very great reduction of the ignition noise present when the car is in operation. The ground of the input coil does not appear at the usual point on the chassis frame, but instead is extended as part of the antenna transmission line lead-in to the outer termination of the shield, where it grounds to the frame of the car. This arrangement prevents r-f disturbances which are circulating in the car frame (ground) from becoming mutual to the receiver input. The characteristics of the transmission line section of the antenna lead-in are such as to favor the operation of the noise filter. Its distributed capacitance due to length, conductor sizes, insulation, etc., is of such value as to operate with the inductance and capacitance elements of the input system to obtain a "band-pass" filtering effect. The filter has an acceptance band between 540 kc. and 1600 kc., and sharply defined cut-off below and above these two limits. It is generally possible, because of this input arrangement, to dispense with the usual spark-plug and distributor suppressors without encountering substantial ignition interference on latest types of cars.

After passing through the input filter the signal is applied by transformer action to the control grid of the r-f stage. An RCA-6D6 at this point performs the function of an r-f amplifier, its super-control property being adapted as means of preventing cross-modulation and securing a wide range of volume control. The first (front) section of the tuning condenser is connected to sharply tune the secondary of the antenna coupling transformer.

A second r-f coupling transformer transmits the signal to the following receiver stage, which comprises a combination first detector and local oscillator. The secondary inductance of this transformer is tuned by the second (center) section of the variable capacitor and connects to the detector grid of the RCA-6A7 Radiotron. The local oscillator circuit is established by mutual arrangement of the several elements within this tube. Here the incoming signal is mixed with the local oscillator frequency. The difference frequency beat (i. f.) of these two combined signals is detected by the tube and transferred by a closely coupled transformer to the intermediate-frequency amplifier tube, an RCA-6D6. Both windings of this i-f transformer are tuned by trimmers. The second i-f transformer which joins the RCA-6D6 to the second detector stage has only one trimmer, that being in shunt with its primary winding.

The RCA-6B7 second detector stage receives the i-f signal on its diode plates. Detection takes place as a result of the rectifying action of the diodes and develops a current through the resistors R7 and R10. The d-c voltage drop across the resistance R7 plus R10 is used for automatically regulating the control grid bias of the r-f and first detector stages. The amplification thus becomes dependent upon the signal strength. This process (a.v.c.) compensates for fading signals and tendency toward reduction of signals due to change of antenna direction and shielding effect of buildings, etc. A smaller portion of the d-c voltage obtained by detection is tapped from the juncture of R7 and R10 and is carried to the control grid of the i-f stage. This likewise furnishes automatic volume control, but in a smaller degree.

The audio and d-c components of the detected signal are selected from the resistor R10 by its movable arm and applied to the control grid of the RCA-6B7. The d-c obtained from the signal and applied to the grid prevents overload as the volume control is advanced. Amplification results and the signal passes on to the audio-driver stage. The RCA-76 Radiotron used as an a-f amplifier is resistance-capacitance coupled to the detector stage output. Its plate is matched to the power output stage by a transformer.

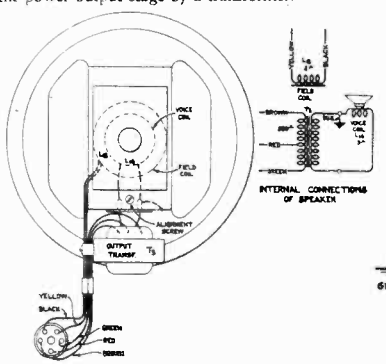


Figure 1—Loudspeaker Wiring

The output stage utilizes an RCA-6A6 tube which performs as a push-pull type. It delivers a high level-high quality signal to the remote loudspeaker unit.

The power supply system consists of a mechanical vibrator for interrupting the d-c from the battery in order to transform the current to high voltage, which in turn is rectified by a full-wave tube, an RCA-84. The vibrator used is adapted for convenient removability by having its base constructed for "plug-in" mounting.

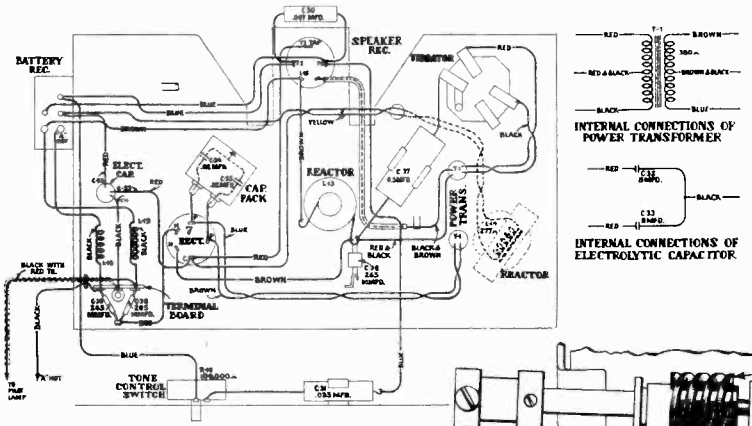


Figure 2—Power Unit Wiring

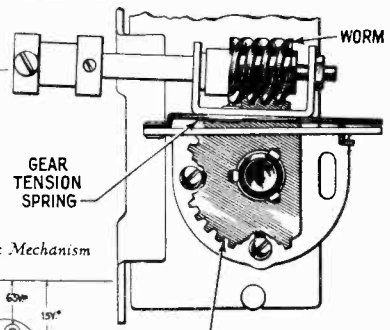


Figure 6—Condenser Drive Mechanism

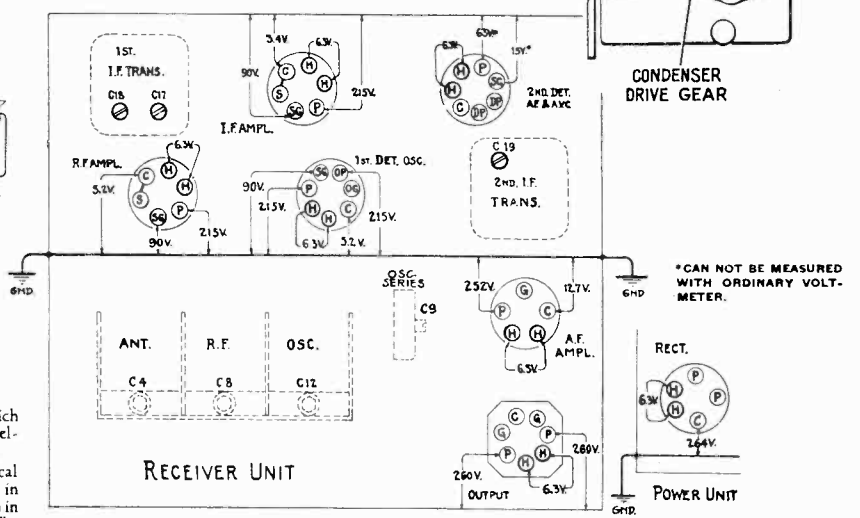


Figure 5—Trimmer Locations and Radiotron Socket Voltages to Ground
(Measured at 6.6 volts battery—Volume Control Maximum—No Signal)

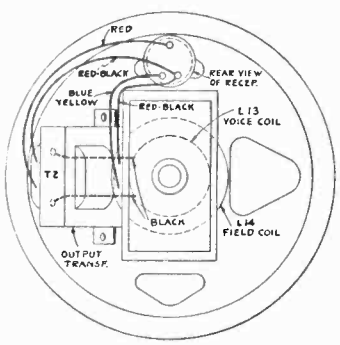
RCA MFG. CO., INC.

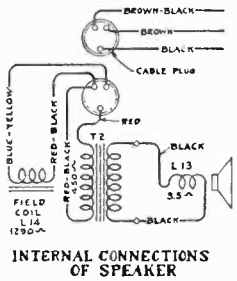
Stock No.	Description	List Price
	RECEIVER ASSEMBLIES	
4993	Bumper — Rubber bumper for condenser mounting bracket—Package of 5	$0.25
4955	Capacitor — Adjustable trimmer capacitor (C9)	.48
4246	Capacitor—80 mmfd. (C13)	.24
5078	Capacitor—200 mmfd. (C14, C29)	.24
4248	Capacitor—300 mmfd. (C20)	.22
4792	Capacitor—0.015 mfd. (C22)	.22
4882	Capacitor—0.01 mfd. (C25)	.20
4886	Capacitor—0.05 mfd. (C10)	.20
4885	Capacitor—0.1 mfd. (C21)	.28
4841	Capacitor—0.1 mfd. (C3, C23)	.22
4967	Capacitor—0.25 mfd. (C15, C16)	.46
4011	Capacitor—0.5 mfd. generator capacitor	.60
5054	Capacitor—10 mfd. (C24)	1.80
4243	Capacitor pack—Comprising two 0.05 mfd. capacitors (C2, C6, C26, C27)	.35
5074	Clamp—Radiotron shield clamp	.14
4950	Coil—Antenna coil (L3, L4)	.74
5142	Coil—Choke coil (L17)	.15
6967	Coil—Oscillator coil (L6, L7)	.52
6966	Coil—R.F. coil (L4, L5)	.80
5061	Condenser—3-gang variable tuning condenser (C4, C5, C7, C8, C11, C12)	3.68
5018	Volume control (R10)	1.00
5163	Filter—Antenna filter (R1, C1, L1)	1.45
5062	Gear—Condenser drive gear—Located on condenser drive shaft	.12
5030	Resistor—Carbon type—½ watt—470 ohms (R3)—Package of 5	1.00
5031	Resistor—680 ohms—Carbon type—½ watt (R9)—Package of 5	1.00
5144	Resistor — 2700 ohms — Carbon type — ½ watt (R15)—Package of 5	1.00
5147	Resistor — 3300 ohms — Carbon type — 1 watt (R11)	.22
5033	Resistor — 33,000 ohms — Carbon type — 1 watt (R4)—Package of 5	1.10
5029	Resistor—56,000 ohms—Carbon type—½ watt (R5, R17)—Package of 5	1.00
3118	Resistor—100,000 ohms—Carbon type—½ watt (R2, R13)—Package of 5	1.00
5035	Resistor—560,000 ohms—Carbon type—½ watt (R14)—Package of 5	1.00
3033	Resistor—1 megohm—Carbon type—½ watt (R12)—Package of 5	1.00
3584	Ring—Antenna, r-f, or oscillator coil retaining ring—Package of 5	$0.40
5129	Ring—Radiotron shield ring—Package of 5	.10
4953	Shield—First intermediate frequency transformer shield	.24
4956	Shield—Second intermediate frequency transformer shield	.30
5037	Shield—Radiotron shield	.15
5058	Socket—5-contact Radiotron socket	.18
4946	Socket—6-contact Radiotron socket	.18
4947	Socket—7-contact Radiotron socket	.18
5060	Socket—7-prong Radiotron output socket	.20
5064	Stud—Variable condenser bracket mounting assembly—Comprising one stud, one bushing, one washer and one lockwasher	.12
5057	Transformer—Driver transformer (T2)	1.00
5055	Transformer—First intermediate frequency transformer (L8, L9, C17, C18)	1.32
5056	Transformer—Second intermediate frequency transformer (L10, L11, C19)	1.42
5063	Worm—Condenser drive worm gear	.54
	POWER UNIT ASSEMBLIES	
5078	Capacitor—200 mmfd. (C36, C38, C39)	.24
5148	Capacitor—0.007 mfd. (C30)	.20
5073	Capacitor—0.035 mfd. high-frequency tone control capacitor (C31)	.44
4490	Capacitor—0.5 mfd. (C37)	.62
5070	Capacitor pack—Comprising two 0.02 mfd. capacitors (C34, C35)	.74
5069	Capacitor pack—Comprising two 8 mfd. capacitors (C32, C33)	1.76
5075	Clamp—Mounting clamp for capacitor—Stock No. 4490	.08
5068	Cup—Grounding cup	.10
4693	Clamp—Mounting clamp for capacitor—Stock No. 5069	.15
5143	Coil—Choke coil (L18, L19)	.15
5072	Tone control (R16)	.82
4085	Knob—Tone control knob—Package of 5	.60
7778	Reactor—Filter reactor (L13)	.45
5066	Reactor—Filter reactor (L14)	.88
5071	Receptacle—Power cable plug female receptacle—5-contact—Female section	.20
6980	Socket—4-contact vibrator socket	.20
5058	Socket—5-contact Radiotron socket or reproducer plug receptacle	$0.18
5065	Transformer—Power transformer (T1)	2.48
5067	Vibrator—Complete (L12)	3.66
	CABLE ASSEMBLIES	
4976	Cable—Antenna lead assembly—Single-conductor with male section of antenna connector	.16
7766	Cable—Power lead with clip and female section of fuse connector—To ammeter	.30
5059	Cable—Main power cable—Complete—With male section of connector plug, fuse connector and fuse, ammeter clip and female section of pilot light cable connector	1.50
5150	Cap—Cap for power cable plug	.22
5149	Plug—Power cable plug—Less cap	.20
	FLEXIBLE SHAFT ASSEMBLIES	
5000	Bracket—Flexible drive shaft connection bracket—Mounted on housing	.30
4973	Coupling—Tuning condenser flexible drive shaft coupling	.30
5141	Coupling—Volume control flexible drive shaft coupling	.36
3903	Screw—No. 8-32-3/16" headless set screw for flexible drive shaft coupling—Package of 20	.36
7855	Shaft—Tuning condenser or volume control flexible drive shaft—Approximately 28 3/4" long	1.00
	CONTROL BOX ASSEMBLIES	
4987	Bezel—Station selector dial bezel	.42
7865	Box—Control box—Complete	3.86
7864	Bracket—Mounting bracket and rear section of control box housing	.30
4988	Crystal—Station selector dial crystal	.38
4989	Dial—Station selector dial	.20
4981	Gear—18-tooth intermediate drive gear	.15
4978	Gear—Indicator drive gear and shaft	.42
7862	Housing—Front section of control box housing	.28
7863	Housing—Center section of control box housing	.32
4990	Indicator—Station selector (pointer) indicator	.10
4985	Knob—Station selector or volume control knob—Package of 5	.62
4991	Lamp—Dial lamp—Package of 5	$0.74
7866	Plate—Bearing plate assembly—Comprising plate, gear and shaft, volume control shaft, station selector shaft, pinion and spring	1.22
4986	Screw—Oval fillister head machine screw—Fastens bracket and center section of control box housing	.25
5042	Screw—No. 8-32-1/16" headless set screw for station selector or volume control shaft—Package of 10	.25
4983	Shaft—Station selector drive shaft	.16
4979	Shaft—Volume control drive shaft	.16
4984	Socket—Dial lamp socket	.16
4982	Spring—Holding spring for station selector or volume control knob—Package of 10	.26
4980	Spring—Tension spring—Package of 5	.15
5011	Strap—Control box mounting strap	.25
	REPRODUCER ASSEMBLIES	
9597	Coil—Field coil (L15)	2.62
9598	Cone—Reproducer cone (L16)—Package of 5	3.90
9596	Reproducer—Complete	8.00
4995	Screw—Reproducer mounting screw—Package of 10	.15
5090	Transformer—Output transformer (T3)	2.62
	MISCELLANEOUS ASSEMBLIES	
4244	Cap—Grid contact cap—Package of 5	.20
4293	Capacitor—0.5 mfd. ammeter capacitor	.60
5025	Capacitor—0.5 mfd. generator capacitor	.40
7871	Case—Complete—With top and bottom cover—Less screws	3.28
7952	Cover—Bottom cover of receiver case—Less screws	.35
7953	Cover—Top cover of receiving case—Less screws	.35
5023	Fuse—15-ampere—Package of 5	.40
4985	Knob—Package of 5	.62
4999	Screw—No. 8-¼" slotted hex-head self-tapping screw—Package of 5	.12
5037	Shield—Radiotron shield	.15
4992	Stud—Receiver mounting stud, nut and washer—Package of 3	.22
5024	Suppressor—Distributor suppressor	.38
5067	Vibrator—Complete	3.66

MODELS 117,214
Circuit Notes

RCA MFG. CO., INC.

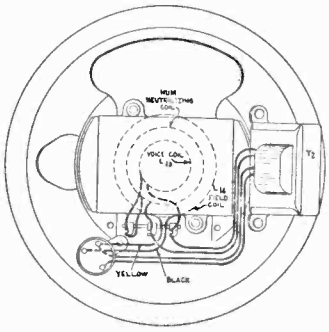
Loud Speaker Data
Voltage, Trimmers
Socket

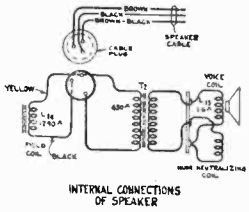




INTERNAL CONNECTIONS OF SPEAKER

Figure 3—Loudspeaker Wiring (Table Model)





INTERNAL CONNECTIONS OF SPEAKER

Figure 4—Loudspeaker Wiring (Console Model)

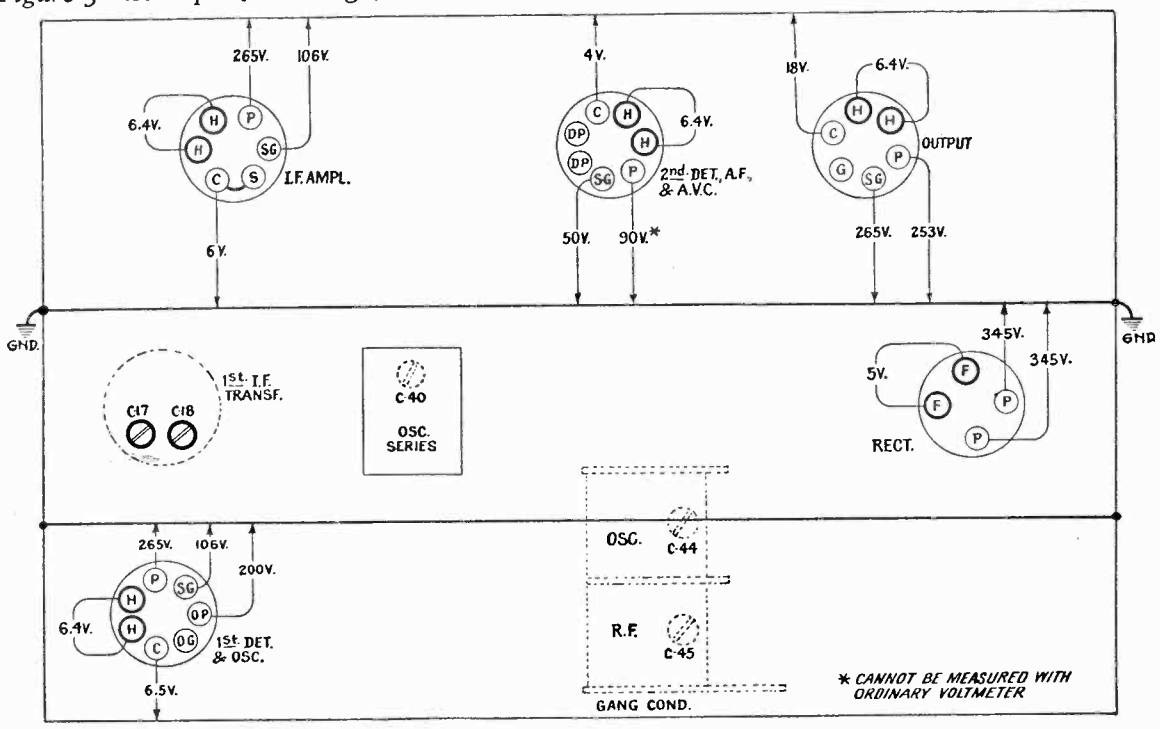


Figure 5—Trimmer Locations and Radiotron Socket Voltages

(Measured at 115 volts line supply—Maximum Volume Control—No Signal)

Five Radiotrons are associated in combination with a Superheterodyne circuit. Two of the Radiotrons are applied so as to obtain plural functions, thereby gaining more than the adequate results normally expected of a five-tube receiver. In the first stage of the circuit an RCA-6A7 pentagrid converter tube is employed as detector and local oscillator, the related external high-frequency circuits consisting of a tuned antenna transformer with a short-wave tap, and a three-winding oscillator coil assembly with changeover switches ganged to the antenna transformer s-w switch. Within the first detector tube, mixing of the signal and oscillator voltages is accomplished through electron coupling, the i-f appearing in the plate circuit.

The i-f system operates at 460 kc. as the basic frequency. The presence of the natural period transformer at the i-f output should be especially noted. Its use minimizes the number of line-up adjustments.

The combined second detector-audio amplifier-a.v.c. stage utilizes an RCA-6B7, a duplex-diode pentode Radiotron. One diode connects directly to ground, the other is used for detection. Part of the detected signal is filtered to remove the audible fluctuations and is applied to the first and second stages as a means of providing automatic volume control. The audio component of the detected signal is amplified by the RCA-6B7 and conveyed to a resistance-capacitance coupling network.

A power amplifier pentode, RCA-41, is used in the output stage and is coupled by a transformer to the low impedance voice coil of the speaker.

Full-wave rectification is employed in the power-supply stage. The speaker field winding serves in the filter circuit as a reactor.

RCA MFG. CO., INC.

MODELS 117,214
Schematic

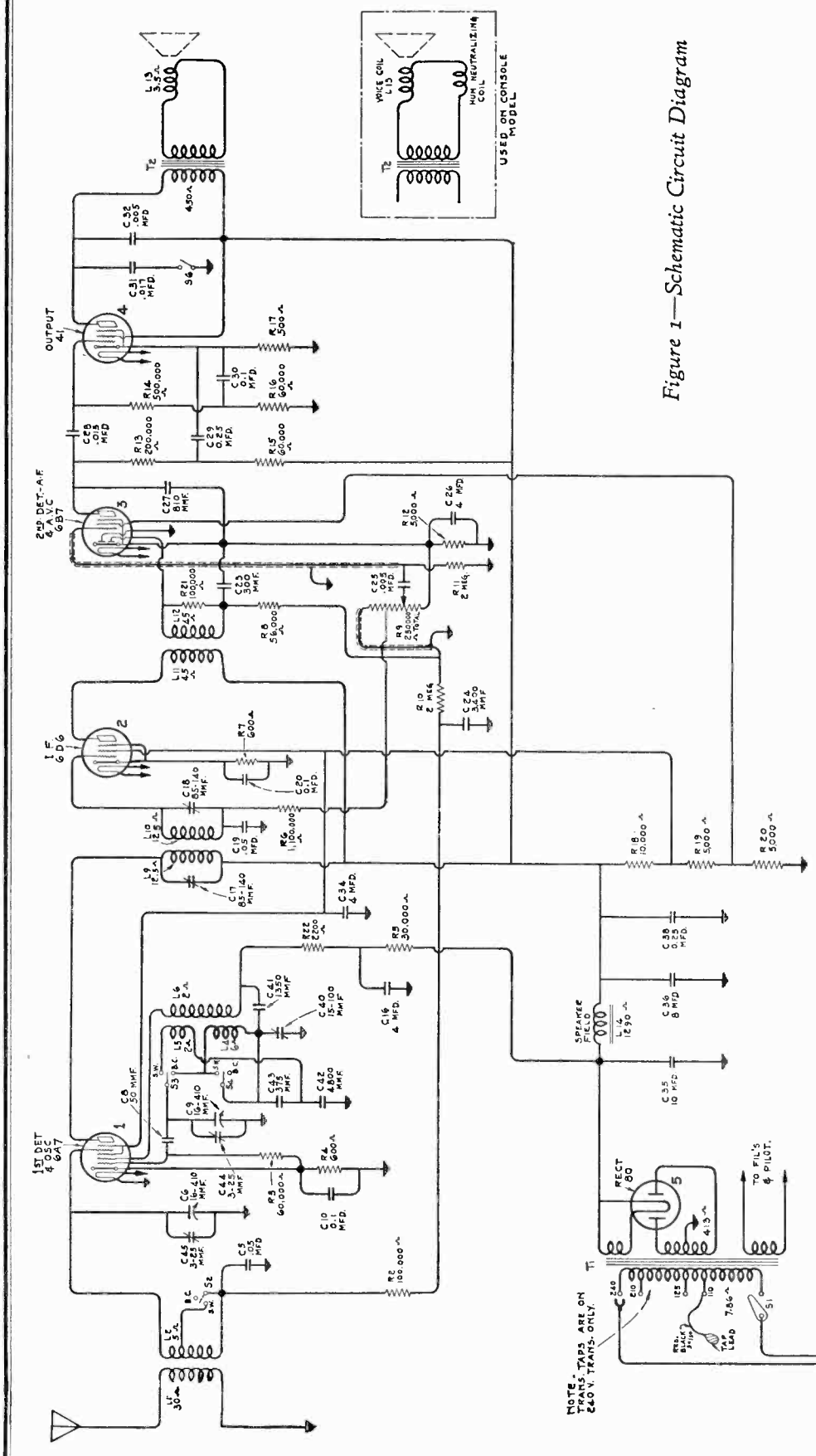


Figure 1—Schematic Circuit Diagram

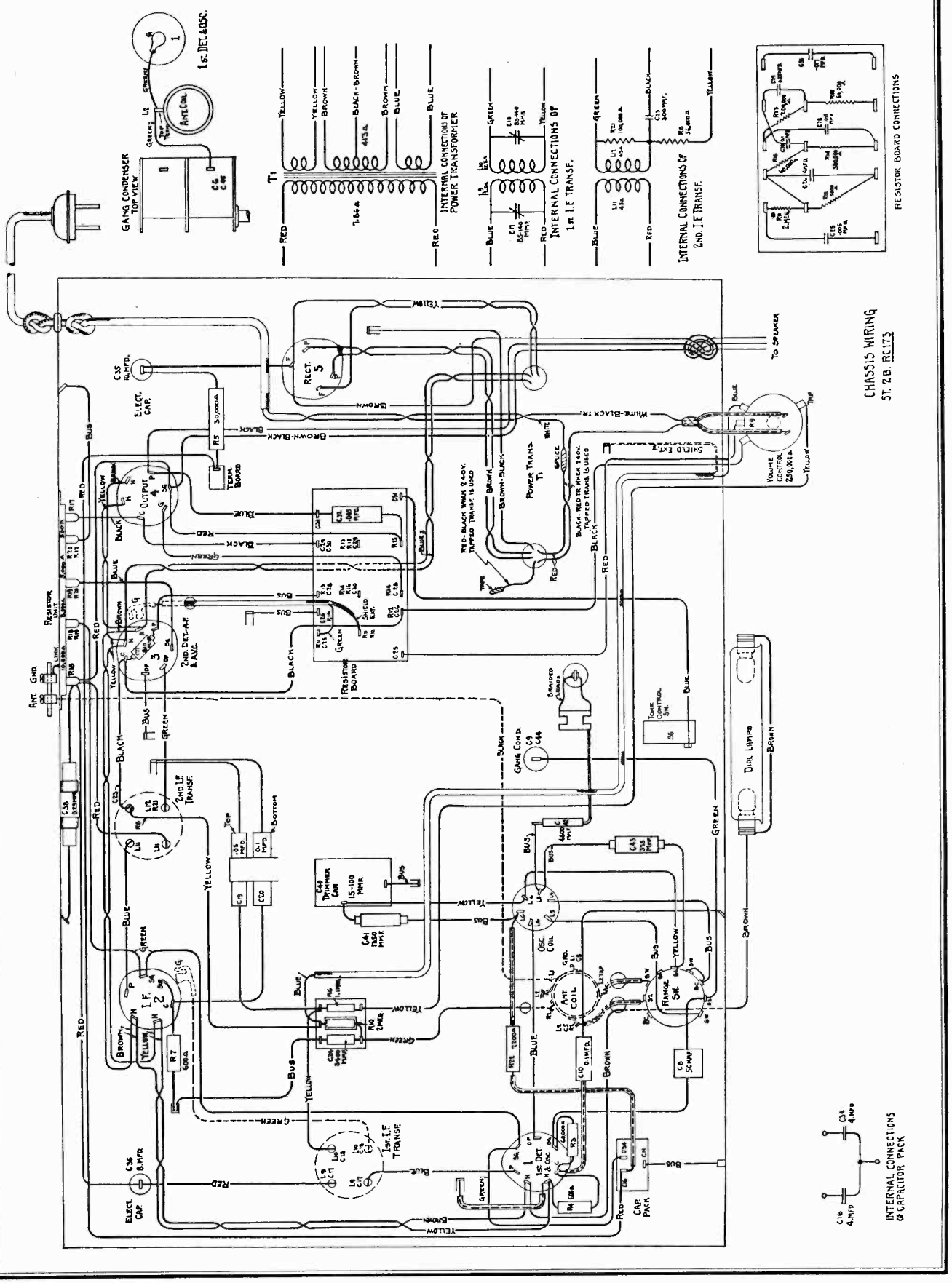
Voltage and Frequency Ratings ..... { 105–125 Volts, 50–60 Cycles / 105–125 Volts, 25–60 Cycles / 105–125/195–250 Volts, 50–60 Cycles

Power Consumption ..... 80 Watts

Tuning Frequency Ranges ..... 540 to 1720 KC. and 2250 to 6850 KC.
Alignment Frequencies ..... 460 KC. (I.F.), 1720 KC. (R.F. and Oscillator) and 600 KC. (Oscillator)
Undistorted Output ..... 1.75 Watts
Maximum Output ..... 3.5 Watts
Loudspeaker ..... Electrodynamic

MODELS 117,214
Chassis Wiring

RCA MFG. CO., INC.



(1) Line-Up Capacitor Adjustments

This receiver must be in correct electrical alignment in order to obtain maximum efficiency and best quality of performance. The circuits should be realigned after each major service or repair operation, and whenever there are positive indications that the adjustments have deviated from normal by ordinary usage. These indications will be present together and will have the nature of: low sensitivity, poor tone quality and irregular double-peaked tuning.

A definite procedure must be applied in readjusting the line up trimmers. The proper oscillator and indication equipment must also be used. Certain standard service instruments, which are useful for receiver adjustment, have been designed and made available by the manufacturer of this receiver. These are illustrated and described on page 2.

(2) I-F Tuning Adjustments

There are two i-f transformers associated in the intermediate amplifier system. The first of these transformers is tuned by accessible trimmers. The second transformer has a natural tuning inherent to its design. To obtain the correct alignment, proceed as follows:

(a) Short circuit the antenna and ground terminals and tune the receiver so that no signal is received. Set the volume control to its maximum position. Ground the receiver.

(b) Connect the output of the test oscillator between the first detector control grid and chassis ground. Attach an indicating meter, such as is illustrated on page 2, to the speaker circuit.

(c) Place the external oscillator into operation at 460 kc. Adjust the output so that a slight registration occurs on the output indicator. The output should be set at as low a value as will give a convenient indication during adjustment; this requirement is important in that the a.v.c. action is voided by such a method. Adjust the secondary and primary trimmers (C18 and C17) of the first i-f transformer for maximum receiver output.

R-F and Oscillator Adjustments

Three trimmers are provided, two for adjustment at 1720 kc. and one for oscillator line-up at 600 kc. No adjustments are required on the short-wave bands. Locations of the trimmers are shown on Figure 5. They should be adjusted in the following manner:

(a) Connect the output of the modulated Full Range Oscillator to the antenna and ground terminals of the receiver. Check the position of the dial pointer. It should set exactly on the radial line, adjacent to the dial reading of 540 when the tuning capacitor plates are at full mesh. After correcting the dial pointer, place the receiver in operation and set the selector at 1720 kc., advance the volume control to maximum and turn the range switch to its broadcast position.

(b) Adjust the frequency of the external oscillator to 1720 kc. and regulate its output until a perceptible indication appears on the output indicator. This indication should be held at a minimum during the adjustments. The trimmers C44 and C45 should then be tuned to the point giving peak receiver output.

(c) Retune the test oscillator, setting its frequency to 600 kc. Turn the receiver selector control to the point where the incoming oscillator signal is received best. *This point will not always be exactly at 600 on the dial.* Then adjust the low-frequency trimmer C40, simultaneously rocking the tuning capacitor slowly through the signal until maximum receiver output results from these combined operations. This adjustment must be made irrespective of dial calibration. It is advisable to repeat the 1720 kc. adjustment of the oscillator trimmer C44 in order to correct for any change caused by the tuning of C40.

Radiotron Socket Voltages

The various normal operating voltages are given on Figure 5. As specified, they are referred to the chassis ground. Accuracy of measurements will be a function of the internal resistance of the voltmeter used. It is advisable to employ a meter having at least 1000 ohms per volt, and for each reading use the highest range which will give an acceptably accurate reading. General deviations from the values given, due to line voltage difference, should not be taken as indicating a defective condition. The erratic departure from normal of a single value or group of values should form the basis of circuit diagnosis.

Code Interference

In certain localities near to high-powered radiotelegraph stations operating at frequencies in the vicinity of 460 kc., slight code interference may be present. This adverse condition usually occurs over the entire tuning range, the strength of the interference not being affected by changing the station selector. A shielded wave trap, such as Part No. 4539, is adaptable for suppressing interference of this type. It should be connected in series with the antenna lead at the receiver, with its *green* lead to the antenna, and its *yellow* lead to the antenna terminal. The trap must be accurately tuned to the interfering signal. The shield of the trap should be securely grounded to the receiver chassis.

REPLACEMENT PARTS

Stock No.	Description	List Price
	RECEIVER ASSEMBLIES	
4379	Board—Terminal board—Engraved "ANT–GND"	$0.20
5043	Bracket—First I.F. transformer mounting bracket	.10
4880	Bracket—Tone control switch mounting bracket	.12
4427	Bracket—Volume control mounting bracket	.18
4244	Cap—Grid contact cap—Package of 5	.20
3861	Capacitor—Adjustable capacitor (C40)	.78
4442	Capacitor—50 mmfd. (C8)	.22
4913	Capacitor—375 mmfd. (C43)	.20
5044	Capacitor—810 mmfd. (C27)	.20
4914	Capacitor—1350 mmfd. (C41)	.24
4881	Capacitor—3400 mmfd. (C24)	.20
4912	Capacitor—4800 mmfd. (C42)	.38
4793	Capacitor—0.005 mfd. (C25)	.20
4868	Capacitor—0.005 mfd. (C32)	.20
4792	Capacitor—0.015 mfd. (C28)	.22
4906	Capacitor—0.017 mfd. (C31)	.25
4836	Capacitor—0.05 mfd. (C5, C19)	.30
4791	Capacitor—0.1 mfd. (C10, C20)	.24
4841	Capacitor—0.1 mfd. (C30)	.22
3597	Capacitor—0.25 mfd. (C29, C38)	.40
3796	Capacitor—4.0 mfd. (C26)	.60
4428	Capacitor—8.0 mfd. (C36)	1.05
7790	Capacitor—10.0 mfd. (C35)	1.05
7589	Capacitor pack—Comprising two 4.0 mfd. capacitors (C16, C34)	1.64
4358	Clamp — Capacitor mounting clamp for capacitors—Stock Nos. 7790 and 4428	.15
4903	Coil—Antenna coil (L1, L2, R2, C5)	1.58
4902	Coil—Oscillator coil (L4, L5, L6)	1.22
4896	Condenser—2-gang variable tuning condenser (C6, C9, C44, C45)	3.48
4790	Volume control (R9, S1)	1.40
5045	Lead—Single conductor—Shielded lead from volume control to resistor (R10)	.20
3218	Resistor—600 ohms—Carbon type—¼ watt (R4, R7)—Package of 5	1.00
5185	Resistor — 2200 ohms — Carbon type — ½ watt (R22)—Package of 5	1.00
4436	Resistor — 5000 ohms — Carbon type — ¼ watt (R12)—Package of 10	2.00
2240	Resistor — 30,000 ohms — Carbon type — 1 watt (R5)	.22
3602	Resistor—60,000 ohms—Carbon type—¼ watt (R3, R15, R16)—Package of 5	1.00
3118	Resistor—100,000 ohms—Carbon type—¼ watt (R2)—Package of 5	1.00
3116	Resistor—200,000 ohms—Carbon type—¼ watt (R13)—Package of 5	1.00
6186	Resistor—500,000 ohms—Carbon type—¼ watt (R14)—Package of 5	1.00
4783	Resistor — 1,100,000 ohms — Carbon type — ¼ watt (R6)—Package of 5	1.00
6242	Resistor — 2 megohms — Carbon type — ¼ watt (R10, R11)—Package of 5	1.00
4721	Resistor — Tapped resistor — one 10,000 ohms, two 5,000 ohms and one 500 ohms sections (R17, R18, R19, R20)	.88
3584	Ring—Oscillator coil retaining ring—Package of 5	.40
5049	Screw—First I.F. transformer clamp screw—No. 6–32–⅛" set screw—Package of 5	.10
4908	Shield—Second I.F. transformer shield	.45
5186	Shield—First I.F. transformer shield	.28
3623	Shield—Oscillator coil shield	.30
3782	Shield—Second detector Radiotron shield	.26
3942	Shield—First Detector and output Radiotron shield	.18
7487	Shield—I.F. Radiotron shield	$0.25
3858	Socket—Dial lamp socket assembly	.26
4784	Socket—4-contact Radiotron socket	.15
4785	Socket—6-contact Radiotron socket	.15
4786	Socket—6-contact Radiotron socket	.15
4787	Socket—7-contact Radiotron socket	.15
4904	Switch—Range switch (S2, S3, S4)	.75
5052	Switch—Tone control switch (S6)	.30
4900	Transformer—First intermediate frequency transformer (L9, L10, C17, C18)	2.25
4901	Transformer—Second intermediate frequency transformer (L11, L12, R8, R21, C23)	1.50
4898	Transformer—Power transformer—105–125 volts—25–50 cycles	5.55
4897	Transformer—Power transformer—105–125 volts—50–60 cycles (T1)	3.98
4899	Transformer—Power transformer—105–125 200–240 volts—40–60 cycles	4.05
	CONDENSER DRIVE ASSEMBLIES	
5048	Dial—Station selector dial	.38
5046	Drive—Tuning condenser drive assembly—Complete	1.04
4475	Indicator—Station selector (indicator) pointer	.18
4340	Lamp—Station selector dial lamp—Package of 5	.60
3943	Screen—Translucent screen for dial light—Package of 2	.18
5047	Shaft—Condenser drive shaft	.22
3858	Socket—Station selector dial lamp socket	.26
	REPRODUCER ASSEMBLIES (CONSOLE MODEL)	
9579	Coil—Field coil (L14)	2.10
9533	Cone—Reproducer cone—Mounted and centered on metal housing (L13)	3.50
5118	Connector—3-contact male connector plug for reproducer	.25
5119	Connector—3-contact female connector plug for reproducer cable	.25
9578	Reproducer—Complete	6.58
4818	Transformer—Output transformer (T2)	2.15
	REPRODUCER ASSEMBLIES (TABLE MODEL)	
4915	Cable—3-conductor reproducer cable	.50
9587	Coil—Field coil, magnet and cone support (L14)	2.18
9588	Cone—Reproducer cone (L13)—Package of 5	3.55
5118	Connector—3-contact male connector plug for reproducer	.25
5119	Connector—3-contact female connector plug for reproducer cable	.25
9586	Reproducer—Complete	5.95
4893	Transformer—Output transformer (T2)	1.48
	MISCELLANEOUS ASSEMBLIES	
6755	Bezel—Metal bezel for station selector dial glass	.50
6707	Glass—Station selector dial glass	.20
4449	Knob—Package of 5	.60
6708	Ring—Retaining ring for dial glass—Package of 5	.44
4917	Screw—Chassis mounting screw and washer (for table model)—Package of 4	.15
5178	Screw—Chassis mounting screw assembly (for console model)—Package of 4	.15

RCA MFG. CO., INC.

MODELS 118,211
1935 Production
Parts List

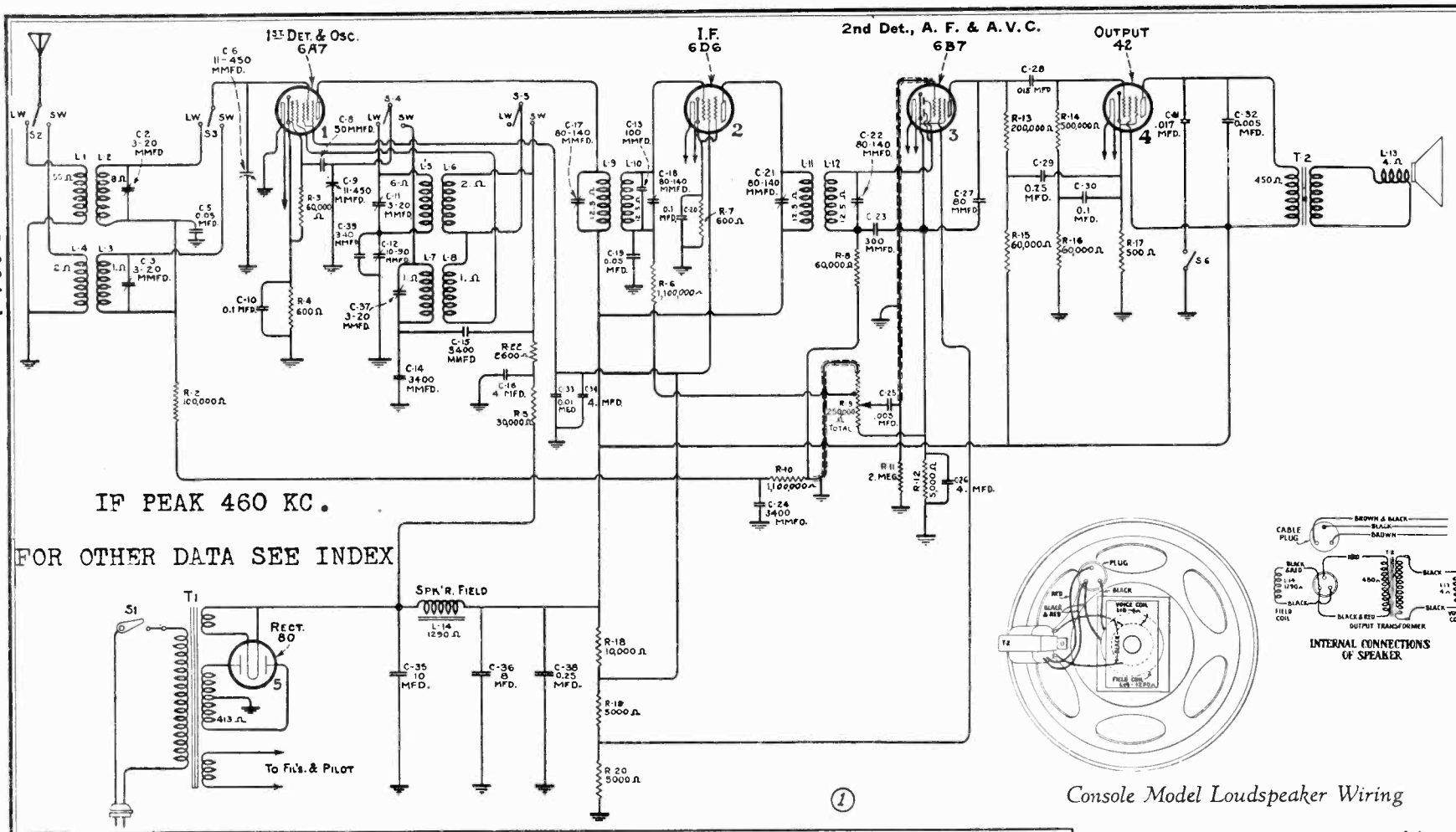
RCA MFG. CO., INC.

REPLACEMENT PARTS—Models 118 and 211 (1935 Production)

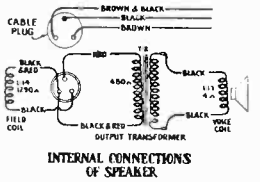
Stock No.	Description	List Price
	RECEIVER ASSEMBLIES	
4379	Board—Terminal board—Two terminals and link—Engraved "ANT-GND"	$0.20
4880	Bracket—Tone control mounting bracket	.12
4427	Bracket—Volume control mounting bracket	.18
4244	Cap—Grid contact cap	.20
3861	Capacitor — Adjustable capacitor — 10-100 mmfd. (C12)	.78
4793	Capacitor—0.005 mfd. (C25)	.20
4868	Capacitor—0.005 mfd. (C32)	.20
4883	Capacitor—0.01 mfd. (C33)	.20
4792	Capacitor—0.015 mfd. (C28)	.22
4752	Capacitor—0.017 mfd. (C31)	.26
4836	Capacitor—0.05 mfd. (C5, C19)	.30
4442	Capacitor—50 mmfd. (C8)	.22
4509	Capacitor—80 mmfd. (C27)	.15
4791	Capacitor—0.1 mfd. (C10, C20, C30)	.24
3597	Capacitor—0.25 mfd. (C29, C38)	.40
4811	Capacitor—340 mmfd. (C39)	.25
4439	Capacitor—3400 mmfd. (C14)	.35
4881	Capacitor—3400 mmfd. (C15, C24)	.20
3796	Capacitor—4.0 mfd. (C26)	.60
4428	Capacitor—8.0 mfd. (C36)	1.05
7790	Capacitor—10.0 mfd. (C35)	1.05
7589	Capacitor pack—Comprising two 4.0 mfd. capacitors (C16, C34)	1.64
4358	Clamp — Electrolytic capacitor mounting clamp	.15
5087	Coil—Antenna coil (L1, L2, L3, L4, C2, C3)	1.86
5089	Coil—Oscillator coil (L5, L6, L7, L8, C11, C37)	1.90
4504	Condenser—2-gang variable tuning condenser (C6, C9)	2.78
4788	Insulator—Radiotron socket insulator—Package of 5	.20
3708	Resistor—600 ohms—Carbon type—¼ watt (R4, R7)—Package of 5	1.00
4812	Resistor — 2600 ohms — Carbon type — ¼ watt (R22)—Package of 5	1.00
4436	Resistor — 5000 ohms — Carbon type — ¼ watt (R12)—Package of 10	2.00
2240	Resistor — 30,000 ohms — Carbon type — 1 watt (R5)	.22
3602	Resistor—60,000 ohms—Carbon type—¼ watt (R3, R8, R15, R16)—Package of 5	1.00
3118	Resistor—100,000 ohms—Carbon type—¼ watt (R2)—Package of 5	1.00
3116	Resistor—200,000 ohms—Carbon type—¼ watt (R13)—Package of 5	1.00
6186	Resistor—500,000 ohms—Carbon type—¼ watt (R14)—Package of 5	1.00
4783	Resistor—1,100,000 ohms—Carbon type—¼ watt (R6, R10)—Package of 5	1.00
6242	Resistor — 2 megohms — Carbon type — ¼ watt (R11)—Package of 5	1.00
4721	Resistor—Tapped resistor—One 10,000 ohm, two 5,000 ohm and one 500 ohm section (R17, R18, R19, R20)	.88
4521	Shield—Antenna, r-f or oscillator coil shield	.42
3942	Shield—First detector-oscillator Radiotron shield	.18
7487	Shield—I.F. Radiotron shield	.25
3782	Shield—Second detector Radiotron shield	.26
4784	Socket—4-contact Radiotron socket	.15
4785	Socket—6-contact output Radiotron socket	.15
4786	Socket—6-contact i-f Radiotron socket	.15
4787	Socket—7-contact Radiotron socket	.15
5088	Switch—Range switch (S2, S3, S4, S5, SW, LW)	1.35
5052	Switch—Tone control switch (S6)	.30
4431	Transformer—First intermediate frequency transformer (L9, L10, C13, C17, C18)	2.28
4433	Transformer—Second intermediate frequency transformer (L11, L12, C21, C22, C23, R8)	$2.15
9512	Transformer—Power transformer—105-125 volts—25-40 cycles	6.58
9513	Transformer—Power transformer—105-250 volts—40-60 cycles	4.85
9511	Transformer—Power transformer—105-125 volts—50-60 cycles	4.78
4429	Volume control (R9, S1)	1.40
	DRIVE ASSEMBLIES	
10194	Ball—Steel ball for condenser drive assembly—Package of 20	.25
4422	Clutch—Condenser drive clutch assembly complete	1.00
4474	Dial—Station selector dial (table model)	.76
4450	Dial—Station selector dial (console model)	.52
4434	Drive—Tuning condenser drive assembly	2.42
4340	Lamp—Dial lamp—Package of 5	.60
4363	Pointer—Station selector pointer (console model)	.18
4475	Pointer—Station selector pointer (table model)	.18
3943	Screen—Translucent screen for dial lamps—Package of 2	.18
3529	Socket—Dial lamp socket	.32
	REPRODUCER ASSEMBLIES (TABLE MODEL)	
4915	Cable—3-conductor reproducer cable—Complete with 3-contact female connector plug	.50
9587	Coil—Field coil magnet and cone support (L14)	2.18
9588	Cone—Reproducer cone (L13)—Package of 5	3.55
5118	Connector—3-contact male connector plug for reproducer	.25
5119	Connector—3-contact female connector plug for reproducer cable	.25
9586	Reproducer—Complete	5.95
4893	Transformer—Output transformer (T2)	1.48
	REPRODUCER ASSEMBLIES (CONSOLE MODEL)	
9590	Coil—Field coil magnet and cone support (L14)	4.20
8935	Cone—Reproducer cone (L13)—Package of 5	5.25
9589	Reproducer—Complete	8.20
4892	Transformer—Output transformer (T2)	1.30
	MISCELLANEOUS ASSEMBLIES	
6840	Escutcheon—Station selector escutcheon—Console model	.56
6706	Escutcheon—Station selector escutcheon—Table model	.42
6614	Glass—Station selector dial glass—Console model	.30
6707	Glass—Station selector dial glass—Table model	.20
4449	Knob—Station selector, range switch, tone control switch or volume control knob—Package of 5	.60
6615	Ring—Spring retaining ring for dial glass—Console model—Package of 5	.34
6708	Ring—Spring retaining ring for dial glass—Table model—Package of 5	.44
4685	Screw—Chassis mounting screw assembly—Comprising four screws, four spacers, four lockwashers, four washers and eight cushions (for console model)	.40
4446	Screw—Chassis mounting screw assembly—Comprising four screws, four spacers, four lockwashers, four washers and eight cushions (for table model)	.28

RCA MFG. CO., INC.

MODELS 118,211
1935 Production
Schematic, Voltage
Speaker Wiring



Console Model Loudspeaker Wiring



Radiotron		Cathode to Ground Volts, D. C.	Screen Grid to Ground Volts, D. C.	Plate to Ground Volts, D. C.	Plate Current, M. A.	Heater Volts, A. C.
RCA-6A7	Detector	6.0	105	265	3.5	6.3
	Oscillator		—	220	4.5	
RCA-6D6 I. F.		6.0	105	265	9.0	6.3
RCA-6B7 2nd Det.		3.0	50*	90*	0.7	6.3
RCA-42 Power		16.5	265	245	30.0	6.3
RCA-80 Rectifier		—	—	690 (Plate to Plate)	64.0	5.0

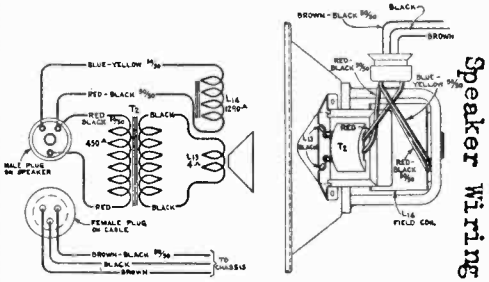
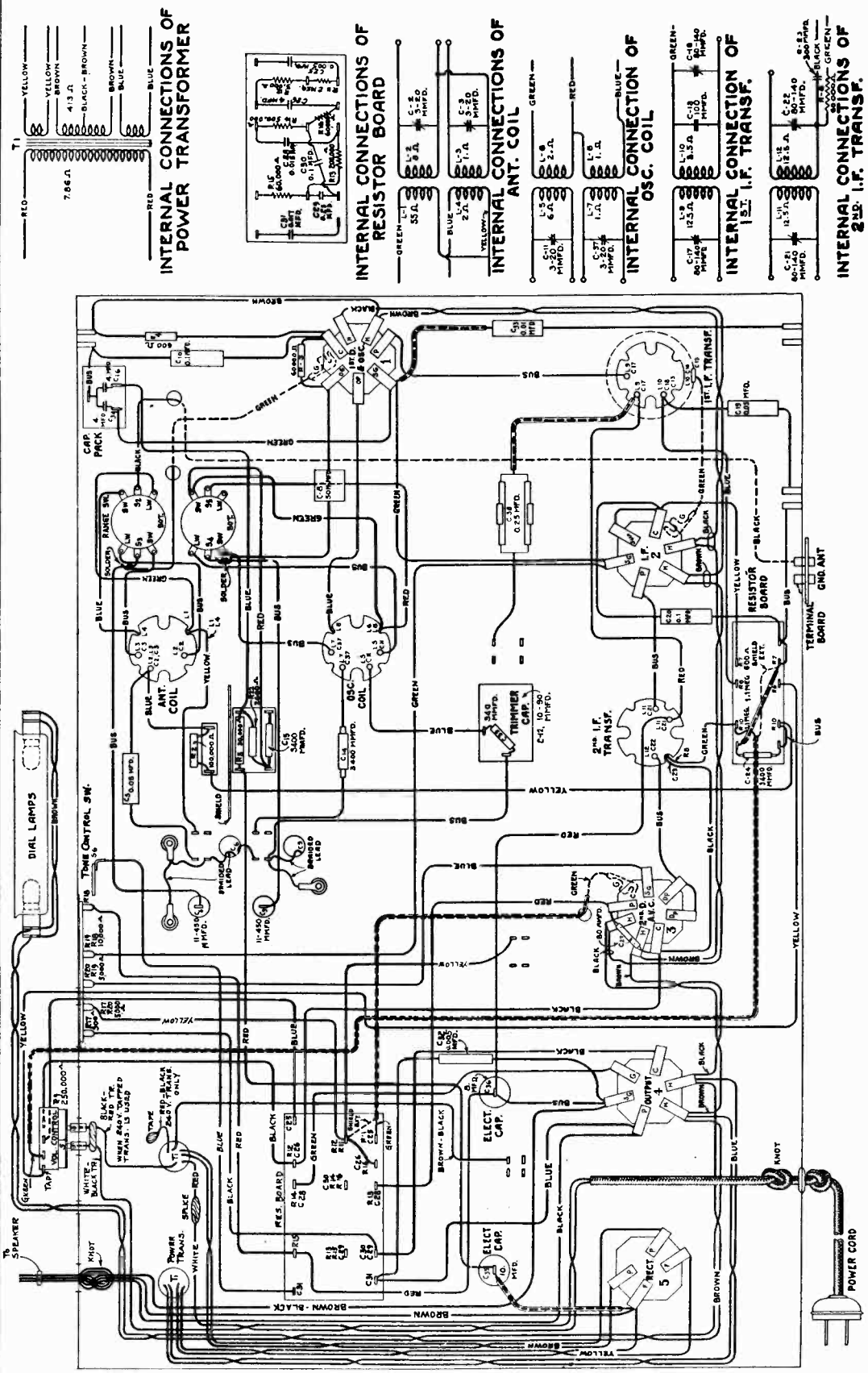


Table Model Loudspeaker Wiring

MODELS 118,211
Chassis Wiring

RCA MFG. CO., INC.

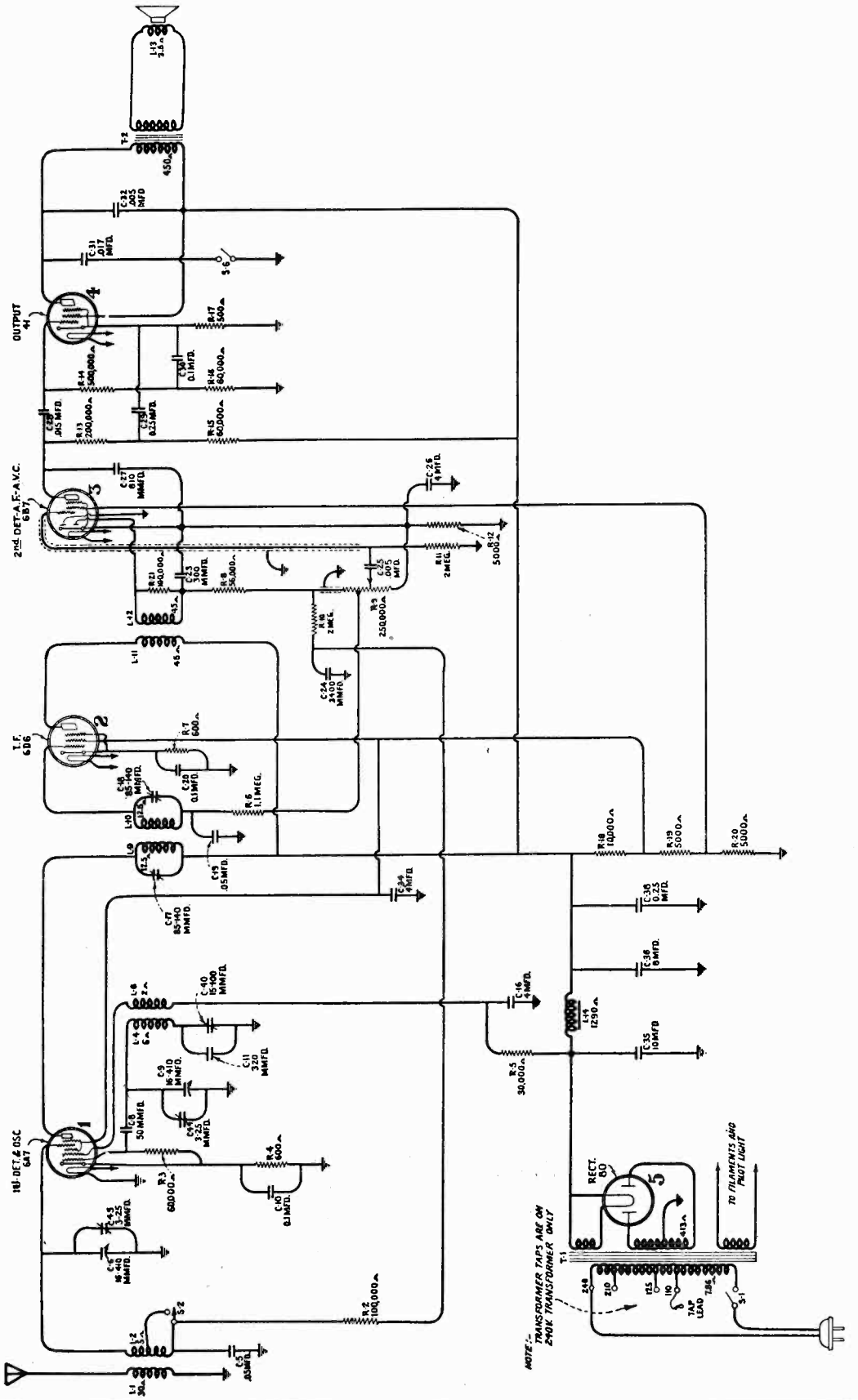


Wiring Diagram
Model 118 and Model 211 (1935 Production)

Recently manufactured receivers of Models 118 and 211 contain a number of modifications in circuit and assembly. These changes appear in the following data and on the schematic and wiring diagrams. The major items affected are the speaker cable connection, type of Radiotron in output stage, band switch and voltage divider system.

MODEL 119
Schematic

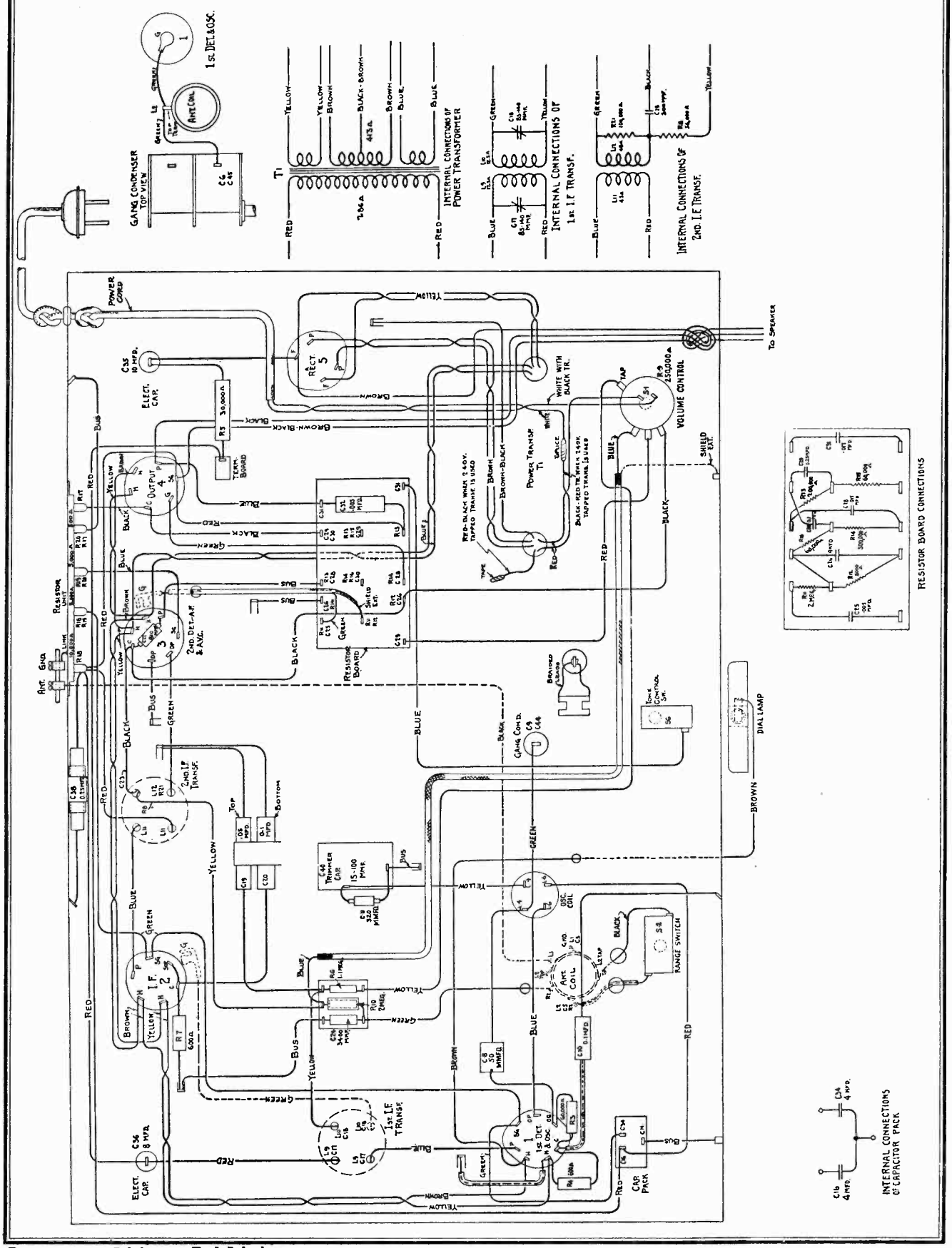
RCA MFG. CO., INC.



Tuning Frequency Ranges.....540 KC. to 1720 KC. and 1600 KC. to 3500 KC.
Alignment Frequencies.....460 KC. (I.F.), 1720 KC. (R.F. and Oscillator) 600 KC. (Oscillator)
Undistorted Output.....1.75 Watts
Maximum Output.....3.5 Watts
Loudspeaker.....6-Inch, Electro-Dynamic

MODEL 119
Chassis Wiring

RCA MFG. CO., INC.



RCA MFG. CO., INC.

MODEL 119
Trimmers, Socket Voltage, Alignment Circuit Data

In the first stage of the circuit, an RCA-6A7 pentagrid converter tube is employed as an r-f amplifier and local oscillator, the related external high-frequency circuits consisting of a tuned antenna transformer with a short-wave tap. The oscillator second harmonic is used for the short-wave position. Within the first detector tube, mixing of signal and oscillator voltages is accomplished through electron coupling, the i-f appearing in the plate circuit.

The i-f system operates at 460 kc. as the basic frequency. The presence of the natural period transformer at the i-f output should be especially noted. Its use minimizes the number of line-up adjustments.

The combined second detector—audio amplifier—a.v.c. stage, utilizes an RCA-6B7, a duplex-diode pentode Radiotron. One diode connects directly to ground, the other is used for detection. Part of the detected signal is filtered to remove the audible fluctuations and is applied to the first and second stages as a means of providing automatic volume control. The audio component of the detected signal is amplified by the RCA-6B7 and conveyed to a resistance-capacitance coupling network.

A power-amplifier pentode, RCA-41, is used in the output stage and is coupled by a transformer to the low impedance voice-coil of the speaker.

Full-wave rectification is employed in the power-supply stage. The speaker field winding serves in the filter circuit as a reactor.

(2) I-F Tuning Adjustments:

There are two i-f transformers associated in the intermediate amplifier system. The first of these transformers is tuned by accessible trimmers. The second transformer has a natural tuning inherent to its design and does not require adjustment. To obtain the correct alignment proceed as follows:

(a) Short circuit the antenna and ground terminals and tune the receiver so that no signal is received. Set the volume control to its maximum position. Ground the receiver.

(b) Connect the output of the test oscillator between the first detector control grid and chassis ground. Attach an indicating meter, such as is illustrated on page 2, to the speaker circuit.

(c) Place the external oscillator into operation at 460 kc. Adjust the output so that a slight registration occurs on the output indicator. The output should be set at as low a value as will give a convenient indication during adjustment; this requirement is important in that the a.v.c. action is voided by such a method. Adjust the secondary and primary trimmers (C18 and C17) of the first i-f transformer for maximum receiver output.

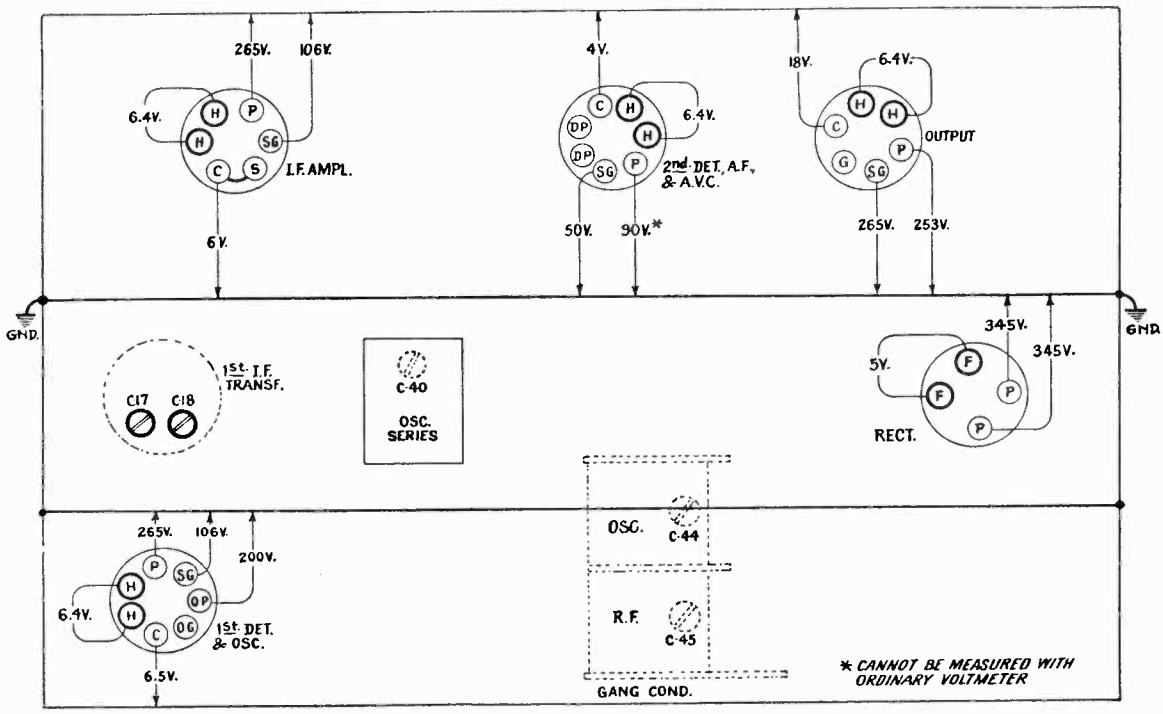


Figure 3—Trimmer Locations and Radiotron Socket Voltages (Measured at 115 volts A. C. Supply—Maximum Volume Control—No Signal)

R. F. and Oscillator Adjustments:

Three trimmers are provided, two for adjustment at 1720 kc. and one for oscillator line-up at 600 kc. No adjustments are required on the short-wave bands. Locations of the trimmers are shown on Figure 3. They should be adjusted in the following manner:

(a) Connect the output of the modulated Full Range Oscillator to the antenna and ground terminals of the receiver. Check the position of the dial pointer. It should set exactly on the radial line, adjacent to the dial reading of 540 when the tuning capacitor plates are at full mesh. After correcting the dial pointer, place the receiver in operation and set the selector at 1720 kc., advance the volume control to maximum and turn the range switch to its broadcast position.

(b) Adjust the frequency of the external oscillator to 1720 kc. and regulate its output until a perceptible indication appears on the output indicator. This indication should be held at a minimum during the adjustments. The trimmers C44 and C45 should then be tuned to the point giving peak receiver output.

(c) Re-tune the test oscillator, setting its frequency to 600 kc. Turn the receiver selector control to the point where the incoming oscillator signal is received best. *This point will not always be exactly at 600 on the dial.* Then adjust the low-frequency trimmer, C40, simultaneously rocking the tuning capacitor slowly through the signal until maximum receiver output results from these combined operations. This adjustment must be made irrespective of dial calibration. It is advisable to repeat the 1720 kc. adjustment of the oscillator trimmer C44, in order to correct for any change caused by the tuning of C40.

Radiotron Socket Voltages

The various normal operating voltages are given on Figure 3. As specified, they are referred to the chassis ground. Accuracy of measurements will be a function of the internal resistance of the voltmeter used. It is advisable to employ a meter having at least 1000 ohms per volt, and for each reading use the highest range which will give an acceptably accurate reading. General deviations from the values given, due to line voltage difference, should not be taken as indicating a defective condition. The erratic departure from normal of a single value or group of values should form the basis of circuit diagnosis.

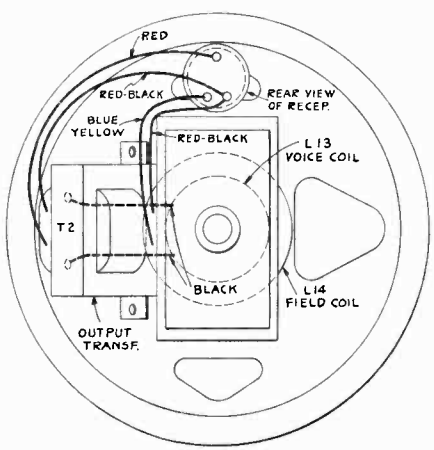
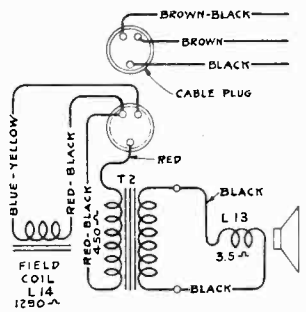


Figure 4—Loudspeaker Wiring



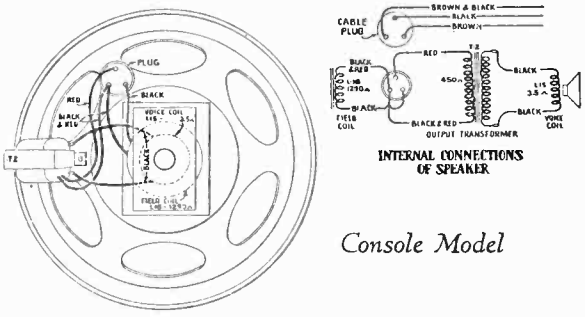
INTERNAL CONNECTIONS OF SPEAKER

REPLACEMENT PARTS

Stock No.	Description	List Price
	RECEIVER ASSEMBLIES	
4379	Board—Terminal board—Engraved "ANT-GND"	$0.20
4244	Cap—Contact cap	.20
3861	Capacitor—Adjustable capacitor (C40)	.78
5094	Capacitor—50 mmfd. (C8)	.20
5151	Capacitor—320 mmfd. (C11)	.20
5044	Capacitor—810 mmfd. (C27)	.20
4881	Capacitor—3400 mmfd. (C24)	.20
4793	Capacitor—0.005 mfd. (C25)	.20
4868	Capacitor—0.005 mfd. (C32)	.20
4792	Capacitor—0.015 mfd. (C28)	.22
4906	Capacitor—0.017 mfd. (C31)	.25
4836	Capacitor—0.05 mfd. (C5, C19)	.30
4841	Capacitor—0.1 mfd. (C10, C20, C30)	.22
3597	Capacitor—0.25 mfd. (C29, C38)	.40
3796	Capacitor—4.0 mfd. (C26)	.60
4428	Capacitor—8.0 mfd. (C36)	1.05
7790	Capacitor—10.0 mfd. (C35)	1.05
7589	Capacitor pack—Comprising two 4.0 mfd. capacitors (C16, C34)	1.64
4358	Clamp—Capacitor mounting clamp for Stock No. 4428 and No. 7790	.15
5051	Coil—Antenna coil (L1, L2, C5, R2)	1.28
5050	Coil—Oscillator coil (L4, L6)	.56
4896	Condenser—2-gang variable tuning condenser (C6, C9, C44, C45)	3.48
3708	Resistor—600 ohms—Carbon type—¼ watt (R4, R7)—Package of 5	1.00
4436	Resistor—5000 ohms—Carbon type—¼ watt (R12)—Package of 10	2.00
2240	Resistor—30,000 ohms—Carbon type—1 watt (R5)	.22
3602	Resistor—60,000 ohms—Carbon type—¼ watt (R3, R15, R16)—Package of 5	1.00
3118	Resistor—100,000 ohms—Carbon type—¼ watt (R2)—Package of 5	1.00
3116	Resistor—200,000 ohms—Carbon type—¼ watt (R13)—Package of 5	1.00
6186	Resistor—500,000 ohms—Carbon type—¼ watt (R14)—Package of 5	1.00
4783	Resistor—1,100,000 ohms—Carbon type—¼ watt (R6)—Package of 5	1.00
6242	Resistor—2 megohms—Carbon type—¼ watt (R10, R11)—Package of 5	1.00
4721	Resistor—Tapped resistor—One 500 ohm, two 5,000 ohm, and one 10,000 ohm sections (R17, R18, R19, R20)	.88
3584	Ring—Oscillator coil retaining ring	.40
3623	Shield—Oscillator coil shield	.30
3942	Shield—First Detector and output Radiotron shield	$0.18
3782	Shield—Second Detector Radiotron shield	.26
7487	Shield—I.F. Radiotron shield	.25
5186	Shield—First I.F. transformer shield	.28
4908	Shield—Second I.F. transformer shield	.45
3858	Socket—Dial lamp socket	.26
4784	Socket—4-contact Radiotron socket	.15
4785	Socket—6-contact Radiotron socket	.15
4786	Socket—6-contact Radiotron socket	.15
4787	Socket—7-contact Radiotron socket	.15
5053	Switch—Range switch (S2)	.50
4905	Switch—Tone control switch (S6)	.30
4900	Transformer—First intermediate frequency transformer (L9, L10, C17, C18)	2.25
4901	Transformer—Second intermediate frequency transformer (L11, L12, C23, R8, R21)	1.50
4898	Transformer—Power transformer—105–125 volts—25–50 cycles	5.55
4897	Transformer—Power transformer—105–125 volts—50–60 cycles (T1)	3.98
4899	Transformer—Power transformer—105–125/200–240 volts—40–60 cycles	4.05
4429	Volume control (R9, S1)	1.40
	REPRODUCER ASSEMBLIES	
4915	Cable—3 conductor reproducer cable—Complete with 3-contact female connector	.50
9587	Coil—Field coil, magnet and cone support (L14)	2.18
9588	Cone—Reproducer cone (L13)—Package of 5	3.55
5118	Connector—3-contact male connector for reproducer cable	.25
5119	Connector—3-contact female connector for reproducer cable	.25
9586	Reproducer—Complete	5.95
4893	Transformer—Output transformer (T2)	1.48
	MISCELLANEOUS ASSEMBLY	
5111	Dial—Station selector dial scale	.32
4132	Knob—Station selector knob—Package of 5	.55
4449	Knob—Volume control, range switch, or tone control knob—Package of 5	.60
4340	Lamp—Station selector dial lamp—Package of 5	.60
4909	Pointer—Station selector pointer	.15
3886	Reflector—Station selector dial reflector	.30
4917	Screw—Chassis mounting screw—Comprising one screw, and one washer—Package of 4	.15

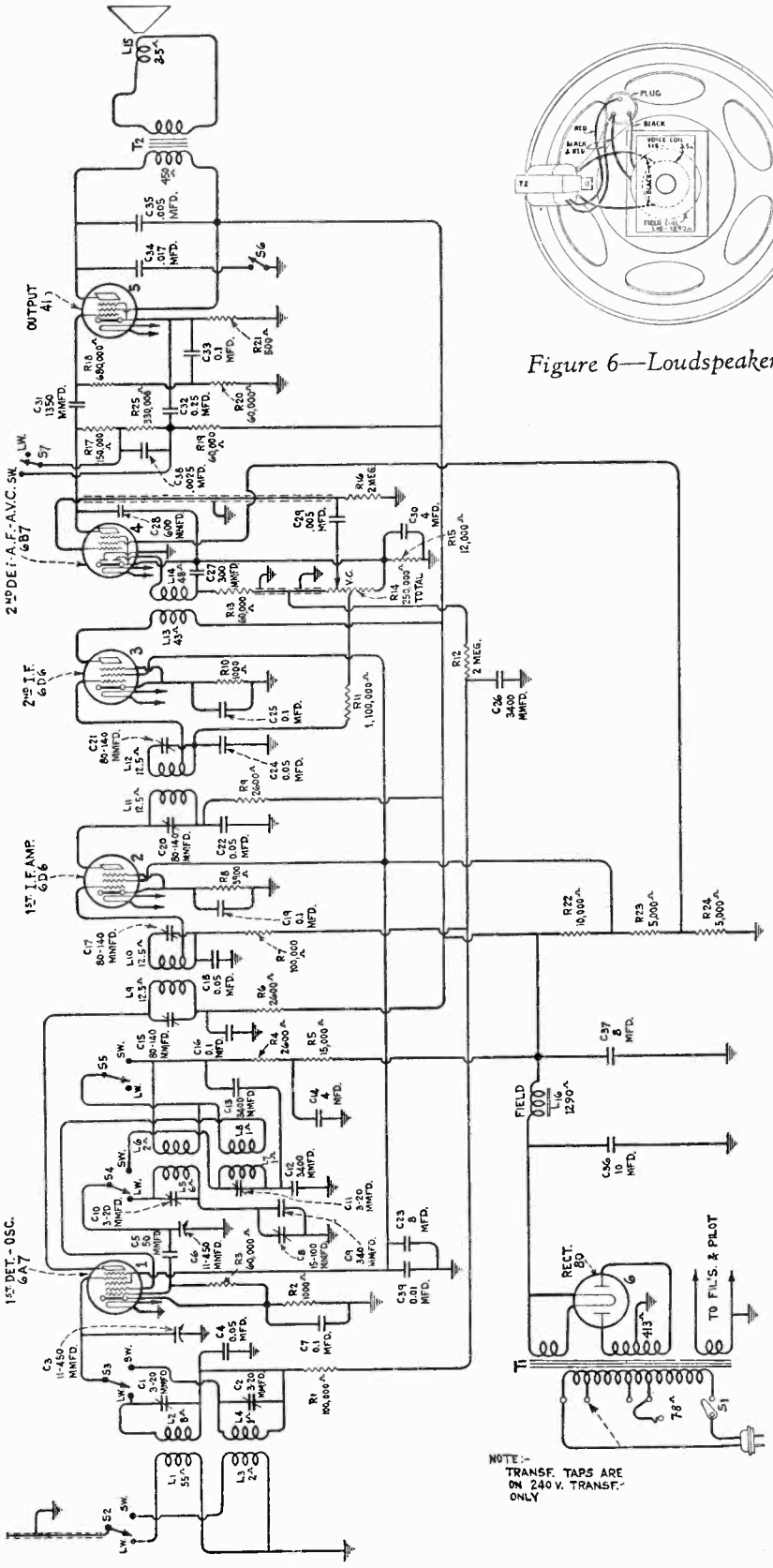
MODELS 125,225
Schematic,
Speaker Data

RCA MFG. CO., INC.



Console Model

Figure 6—Loudspeaker Wiring



Voltage and Frequency Ratings ..... { 105–125 Volts, 50–60 Cycles / 105–125 Volts, 25–60 Cycles / 105–125/200–250 Volts, 50–60 Cycles

Power Consumption ..... 85 Watts

Tuning Frequency Ranges ..... 540 KC.–1720 KC. and 5400 KC.–18,000 KC.

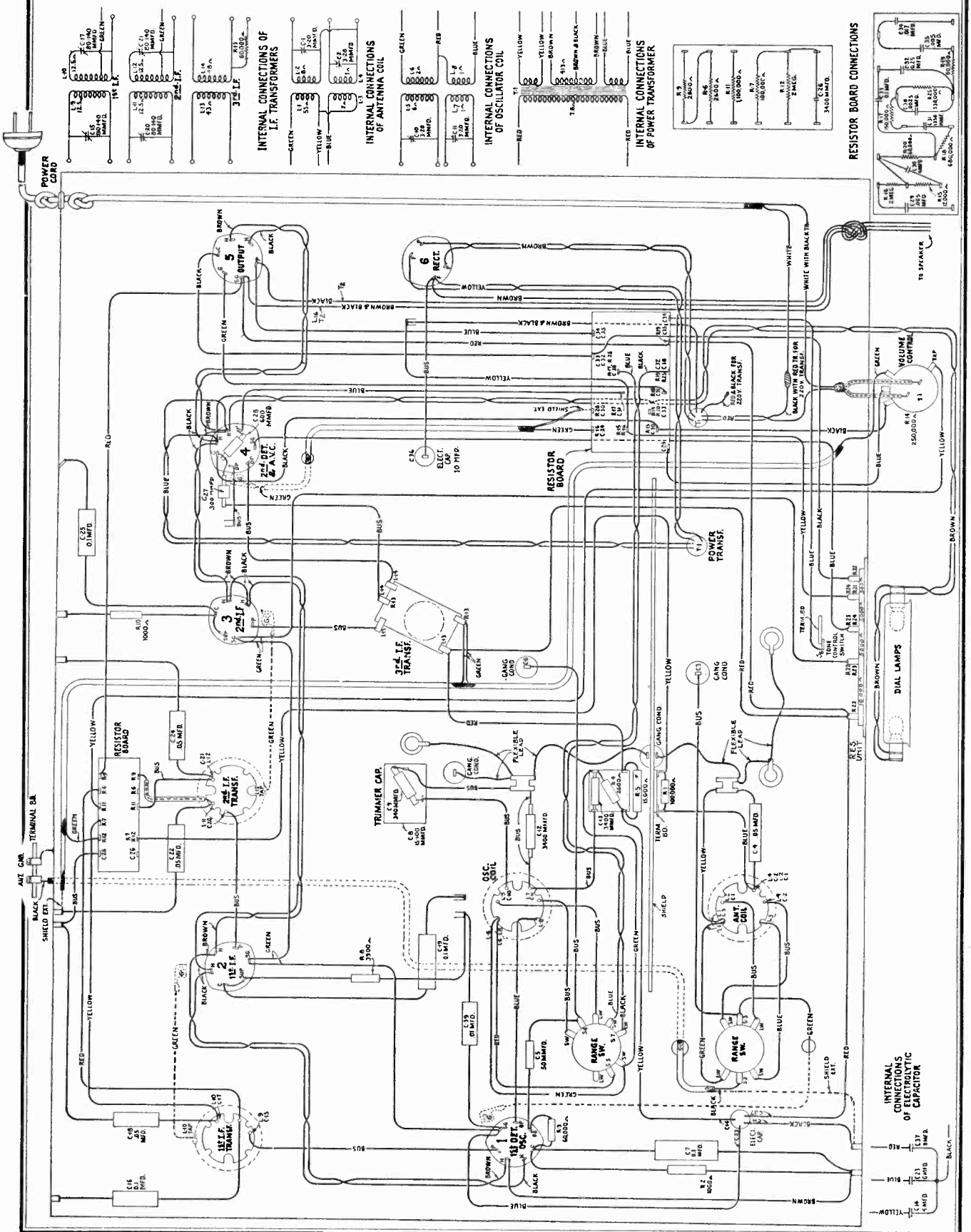
Alignment Frequencies
460 KC. (I.F.), 600 KC. (Osc.), 1720 KC. (Osc. and Det.) and 18,000 KC. (Osc. and Det.)

Undistorted Output ..... 1.75 Watts

Maximum Output ..... 3.5 Watts

MODELS 125,225
Chassis Wiring

RCA MFG. CO., INC.



(1) Line-Up Adjustments

Maximum efficiency and best quality of performance will only be obtained when the circuits are in proper alignment. "Trimmer" capacitors are provided at accessible locations on the receiver chassis for accurately realigning the circuits when they have deviated from normal. Incorrect alignment is usually evidenced by low sensitivity, poor quality and irregular double-peaked tuning.

It is important in re-adjusting the line-up trimmers to use proper oscillator and indicator apparatus. Certain standard service instruments, which are useful in making these adjustments, have been devised and made available to the service man by the manufacturer of this receiver. They are illustrated and described on page 2.

Preliminary Tests

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 circuit (r-f, oscillator or i-f) from the "Full-Range Oscillator," and inserting the "Tuning Wand" into the coils 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 as shown in Figure 1, the inductance of the coil is lowered, and therefore, the resonant frequency is increased. Placing the other end (iron filing core) into the coil raises the inductance and conversely decreases the resonant frequency. Thus it is apparent, that if the circuits are in exact resonance with the standard signal of the "Full-Range Oscillator," the insertion of either end of the wand will cause a reduction of receiver output; whereas if the circuits are not in tune or resonance with the incoming signal, one end will bring about an increase of the signal, and the other end will cause a decrease. When an increase in signal is obtained with the iron filled end of the wand, an increase of the inductance and decrease in frequency of resonance is indicated. The trimmer condenser associated with the circuit under test will therefore require adjustment so as to increase its capacitance. The reverse occurs when a gain in signal is obtained when using the brass cylinder end of the wand.

Changes Indicated By Wand

Wand	*Signal*	*Trimmer*
Brass	Decrease	None
Iron	Decrease	
Brass	Increase	Decrease
Iron	Decrease	
Brass	Decrease	Increase
Iron	Increase	

The following procedure should be applied:

I-F Tuning Adjustments

The four i-f trimmer screws shown on Figure 2 must be tuned to 460 kc., as explained below:

(a) Short circuit the antenna and ground terminals of the receiver to prevent external signal pick-up. Set the volume control to maximum and attach a good ground connection to the receiver.

(b) Feed the test oscillator output to the control grid of the first-detector. Connect an output indicator to the voice coil circuit. Regulate the oscillator output control so that a slight indication occurs on the indicating instrument.

(c) Adjust the secondary and primary trimmers of the second i-f transformer for maximum (peak) output. Then tune the first i-f transformer in a similar manner. The oscillator output should be maintained at as low a level as will give a good output indication. This will keep the signal from being affected by the a.v.c. action of the receiver. A slight improvement in line-up may be obtained by repeating the above procedure, since there is an interlocking effect between the several tuned circuits.

R-F and Oscillator Adjustments

The trimmer capacitor locations for the r-f and oscillator stages are indicated on Figure 2. Their adjustments should be performed as follows:

(a) Attach the oscillator output to the antenna-ground terminals of the receiver.

(b) Check the dial pointer and correct its position if necessary. It should be coincident with the dial marking adjacent to 540 when the gang condenser plates are in full mesh.

(c) With the external oscillator tuned to 1720 kc., and its output adjusted for the critical minimum at full volume control, set the station selector to the 1720 scale marking. Turn the range switch to its right position and adjust the trimmers C10 and C1 on Figure 2 to give maximum (peak) receiver output. Then shift the oscillator frequency to 600 kc., and tune in this signal on the receiver. Adjust the oscillator trimmer, C8, simultaneously rocking the tuning condenser slowly through the signal until the maximum output obtainable results from the two combined operations. The dial calibration should be disregarded for this adjustment. The oscillator trimmer C10 should be retuned at 1720 kc. to correct for any change caused by the 600 kc. adjustment.

(d) Turn the receiver range switch to its left (short-wave) position and set the station selector at the 18 megacycle dial marking. Tune the test oscillator to 18,000 kc. and regulate its output to produce a noticeable indication at the receiver output. Adjust C2 and C11 of the antenna and oscillator coils for maximum receiver output. There will be two positions of the trimmers which give maximum signal. On the oscillator, the position of minimum capacitance is correct; whereas the position of maximum capacitance is proper on the antenna trimmer. The latter should be made while slowly rocking the variable tuning condenser through the signal.

It is important in making the foregoing adjustments to have the receiver operating at maximum sensitivity and using as low an input as will give an accurate output indication. This procedure will obviate the broadness of tuning apparent from the effect of automatic volume control.

(2) Circuit Voltages

Refer to Figure 2. The voltages indicated at the various socket contacts are measured to the chassis.

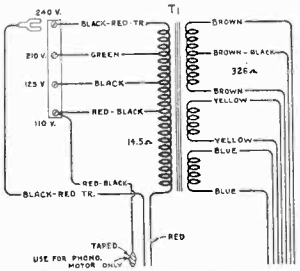


Figure 5—Universal Transformer Connections

They represent the values which apply to a receiver in normal operating condition at the specified supply voltage. At other voltages, a consistent difference will be perceptible for all readings. Such a general deviation, due to line voltage, should not be judged as a sign of defective circuit conditions, but rather the erratic measurement used as a basis for the circuit analysis.

Accuracy of the voltage measurements will be a function of the internal resistance of the voltmeter used. It is advisable to employ a meter having at least 1000 ohms per volt and for each reading use the highest range which will give an acceptably accurate reading.

(3) Code Interference

In certain localities near to high-powered radio-telegraph stations operating at frequencies in the vicinity of 460 kc., slight code-interference may be present on both bands of the receiver. This adverse condition usually occurs over the entire tuning range of each band, and is not affected by change of tuning. To overcome this interference, a shielded wave trap, such as part No. 4539, should be installed. This trap consists of a parallel resonant circuit, tuned by two trimmer capacitors. It should be connected in series with the antenna input lead at the receiver. The connections should be arranged so that a minimum of exposed (unshielded) lead is left between the trap and the band switch or the shielded input lead of the receiver. The trap is mountable by means of two holes provided in the chassis between the first i-f transformer shield and the oscillator coil shield. The can of the trap should be securely grounded. The trimmers must be accurately tuned to suppress the undesired station.

(4) 220-Volt Transformer Connections

The 220–110 volt, 50–60 cycle transformer furnished with some instruments has taps for a variety of voltages. These taps are located on the transformer assembly, and are accessible without removing the chassis from the cabinet. A schematic of the transformer with colors of its leads is shown in Figure 5.

The circuit embodied in this receiver is of the superheterodyne type. Its layout is shown schematically, in Figure 3. Two ranges of tuning are provided by two separate sets of coils. A tuned transformer is employed to couple the antenna system into the first detector tube which is an RCA-6A7. This tube also serves, by the coordinate arrangement of its elements, to generate the local oscillation required for superheterodyne operation. The local oscillation is modulated with the incoming signal by the mutual effect of the tube elements on the electron flow. The difference beat frequency of these two signals is amplified by this same tube and delivered to the i-f amplifier system. There are two Radiotron 6D6 tubes used for i-f amplification. Three transformers intercouple these tubes. The primaries and secondaries of two of these transformers are resonated to the intermediate frequency (460 kc.). The third i-f transformer has no adjustable capacitors; its natural tuning is such as to obtain the desired selectivity and efficiency. Diode detection is performed in an RCA-6B7 tube, a duplex diode pentode. The signal from the i-f system is applied to one of the diodes of the tube, where detection takes place. The remaining diode is tied solidly to ground.

A voltage having the character of an audio wave superimposed upon a constant d-c is developed by the detection process across the manual volume control resistor R14. The d-c portion of this voltage, which is dependent upon the strength of the carrier of the signal being received, is used to automatically regulate the control grid bias voltages of the first-detector and the i-f amplifier stages. Maximum control is used on the detector and first i-f, while a reduced amount of control is applied to the second i-f. A portion of the audio component of the detected voltage appearing across the manual volume control is carried through the variable arm and a blocking condenser to the control grid of the RCA-6B7, which simultaneously functions to provide audio amplification. The audio signal is conducted from the detector—a-f amplifier—a.v.c. stage to the power-output tube through a resistance-capacitance network. At this point there is provision for changing the audio response of the receiver, so that proper results will be obtained in both the long-wave and the short-wave bands. As shown on the schematic, the switch S7 operates so that for long-wave reception the resistor R25 and condenser C32 are in series with the plate resistor R17, while for short-wave reception the resistor-condenser combination is shorted out. The output tube delivers a high-level high-quality signal to the electro-dynamic loudspeaker through an efficiently designed matching transformer. A two-point tone control consisting of a small capacitor and a single pole switch is connected in the plate circuit of the RCA-41 output tube.

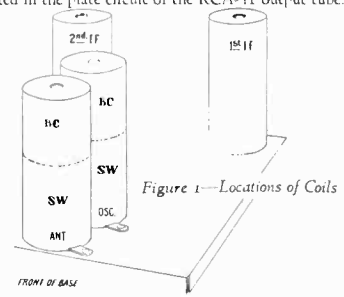


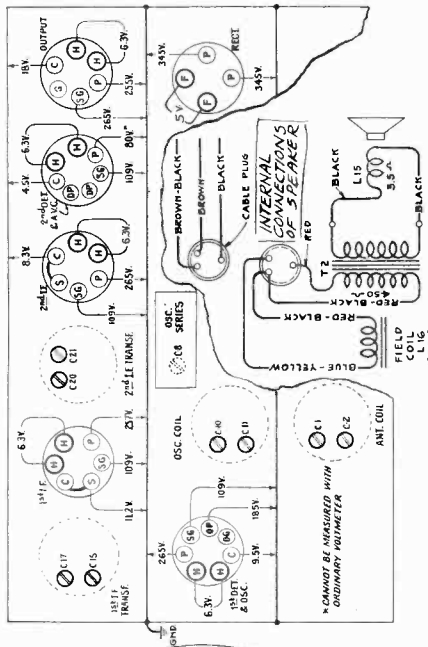
Figure 1—Locations of Coils

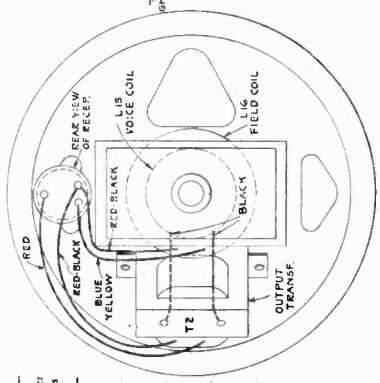
MODELS 125,225
Socket,Trimmers
Voltage,Parts
Speaker Wiring

RCA MFG. CO., INC.

Stock No.	Description	List Price
	RECEIVER ASSEMBLIES	
4880	Bracket — Tone control switch mounting bracket	$0.12
4427	Bracket—Volume control mounting bracket	.18
4358	Bracket—Electrolytic capacitor bracket for capacitor No. 7790	.15
4693	Bracket—Electrolytic capacitor bracket for capacitor No. 5101	.15
3861	Capacitor—Adjustable trimmer capacitor (C8)	.78
5094	Capacitor—50 mmfd. (C5)	.20
3981	Capacitor—300 mmfd. (C27)	.30
4811	Capacitor—340 mmfd. (C9)	.25
4210	Capacitor—600 mmfd. (C28)	.25
5115	Capacitor—1350 mmfd. (C31)	.25
4439	Capacitor—3400 mmfd. (C12)	.35
4881	Capacitor—3400 mmfd. (C13, C26)	.20
5107	Capacitor—0.0025 mfd. (C38)	.16
4793	Capacitor—0.005 mfd. (C29)	.20
4868	Capacitor—0.005 mfd. (C35)	.20
4906	Capacitor—0.017 mfd. (C34)	.25
4883	Capacitor—0.01 mfd. (C39)	.20
4836	Capacitor—0.05 mfd. (C4, C18, C24)	.30
4886	Capacitor—0.05 mfd. (C22)	.20
4841	Capacitor—0.1 mfd. (C7, C19, C25, C33)	.22
4885	Capacitor—0.1 mfd. (C16)	.28
3597	Capacitor—0.25 mfd. (C32)	.40
3796	Capacitor—4.0 mfd. (C30)	.60
7790	Capacitor—10.0 mfd. (C36)	1.05
5101	Capacitor pack—Comprising two 8. mfd. and one 4. mfd. sections (C14, C23, C37)	2.14
5087	Coil—Antenna coil (L1, L2, L3, L4, C1, C2)	1.86
5089	Coil—Oscillator coil (L5, L6, L7, L8, C10, C11)	1.90
4504	Condenser—2-gang tuning condenser (C3, C6)	2.78
5104	Lead—Shielded—Single conductor—From range switch to antenna terminal board	.30
5106	Lead—Shielded—2-conductor—From volume control to third I.F. transformer and resistor board	.40
5112	Resistor—1000 ohms—Carbon type—½ watt (R2, R10)—Package of 5	1.00
4812	Resistor—2600 ohms—Carbon type—½ watt (R4, R6, R9)—Package of 5	1.00
5113	Resistor—3900 ohms—Carbon type—½ watt (R8)—Package of 5	1.00
5109	Resistor—12,000 ohms—Carbon type—¼ watt (R15)—Package of 5	$1.00
5114	Resistor—15,000 ohms—Carbon type—1 watt (R5)	.72
3602	Resistor—60,000 ohms—Carbon type—½ watt (R3, R19, R20)—Package of 5	1.00
3118	Resistor—100,000 ohms—Carbon type—½ watt (R1, R7)—Package of 5	1.00
5027	Resistor—150,000 ohms—Carbon type—½ watt (R17)—Package of 5	1.00
5108	Resistor—330,000 ohms—Carbon type—¼ watt (R25)—Package of 5	1.00
5110	Resistor—680,000 ohms—Carbon type—½ watt (R18)—Package of 5	1.00
4783	Resistor—1,100,000 ohms—Carbon type—½ watt (R11)—Package of 5	1.00
6242	Resistor—2 megohms—Carbon type—½ watt (R12, R16)—Package of 5	1.00
4721	Resistor—Tapped—One 500, one 10,000 and two 5000 ohm sections (R21, R22, R23, R24)	.88
4521	Shield—Antenna, I.F. or oscillator coil shield	.42
3942	Shield—First detector and output Radiotron shield	.18
3782	Shield—Second detector Radiotron shield	.26
7487	Shield—I.F. Radiotron shield	.25
4784	Socket—4-contact Radiotron socket	.15
4785	Socket—6-contact Radiotron socket	.15
4786	Socket—6-contact Radiotron socket	.15
4787	Socket—7-contact Radiotron socket	.15
4379	Strip — Terminal strip — Engraved "ANT-GND"	.20
5100	Switch—Range switch (S2, S3, S4, S5, S7)	1.20
5052	Switch—Tone control switch (S6)	.30
9512	Transformer—Power transformer—105–125 volts—25–40 cycles	6.58
9513	Transformer—Power transformer—105–125/210–240 volts—40–60 cycles	4.85
9511	Transformer—Power transformer—105–125 volts—50–60 cycles (T1)	4.78
5102	Transformer—First intermediate frequency transformer (L9, L10, C15, C17)	1.98
5103	Transformer—Second intermediate frequency transformer (L11, L12, C20, C21)	1.98
5105	Transformer—Third intermediate frequency transformer (L13, L14, R13)	1.65
4429	Volume control (R14, S1)	1.40

Stock No.	Description	List Price
	CONDENSER DRIVE ASSEMBLIES	
4450	Dial—Station selector dial—Console model	$0.52
4474	Dial—Station selector dial—Table model	.76
4434	Drive—Tuning condenser drive assembly—Complete	2.42
4475	Indicator—Station selector (pointer) indicator—Table model	.18
4363	Indicator—Station selector (pointer) indicator Console model	.18
4340	Lamp—Dial lamp—Package of 5	.60
3943	Screen—Translucent screen for dial light—Package of 2	.18
3529	Socket—Dial lamp socket	.32
	REPRODUCER ASSEMBLIES TABLE MODEL	
4915	Cable—3-conductor reproducer cable	.50
9587	Coil—Field coil, magnet and cone support (L16)	2.18
9588	Cone—Reproducer cone (L15)—Package of 5	3.55
5118	Plug—3-contact plug—Male section for reproducer cable	.25
5119	Plug—3-contact plug—Female section for reproducer cable	.25
9586	Reproducer—Complete	5.95
4893	Transformer—Output transformer (T2)	1.48
	REPRODUCER ASSEMBLIES CONSOLE MODEL	
4915	Cable—3-conductor reproducer cable	.50
9590	Coil—Field coil, magnet and cone support (L16)	4.20
8935	Cone—Reproducer cone (L15)—Package of 5	$5.25
5118	Plug—3-contact plug—Male section for reproducer cable	.25
5119	Plug—3-contact plug—Female section for reproducer cable	.25
9589	Reproducer—Complete	8.20
4892	Transformer—Output transformer (T2)	1.30
	MISCELLANEOUS ASSEMBLIES	
6755	Bezel—Station selector dial escutcheon bezel—Table model	.50
6840	Bezel—Station selector dial escutcheon bezel—Console model	.56
6707	Glass—Station selector dial glass—Table model	.20
6614	Glass—Station selector dial glass—Console model	.30
4449	Knob—Station selector, volume control, band switch or tone control knob—Package of 5	.60
6708	Ring—Spring retaining ring for dial glass—Table model—Package of 5	.44
6615	Ring—Spring retaining ring for dial glass—Console model—Package of 5	.34
4446	Screw—Chassis mounting assembly—Comprising four screws, four spacers, eight cushions, four washers and four lockwashers—For table model	.28
5184	Screw—Chassis mounting assembly—Comprising one screw, one spacer, two cushions, one washer and one lockwasher—Package of 4—For console model	.28



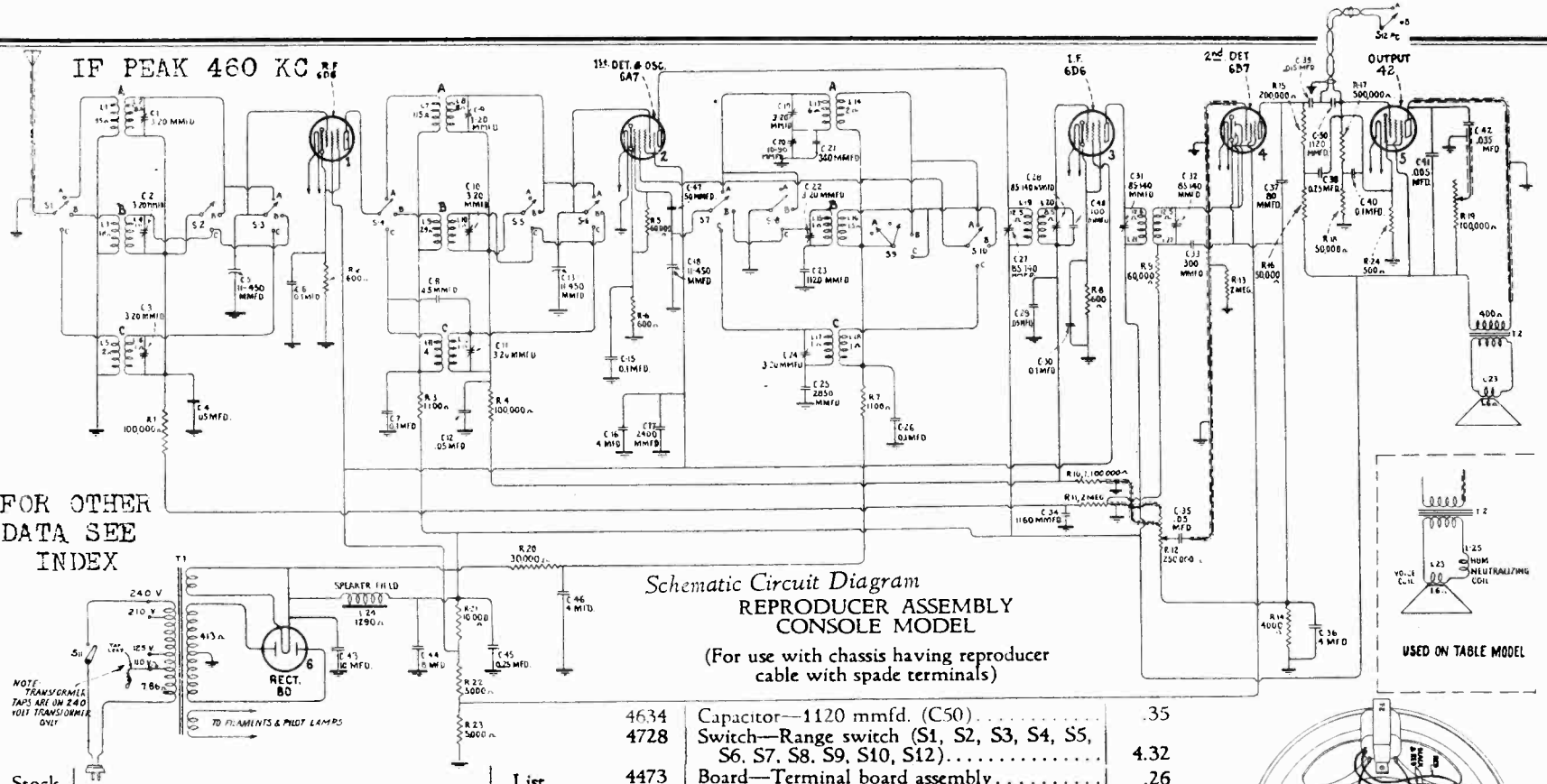


Radiotron		Plate to Ground Volts, D.C.	Screen Grid to Ground Volts, D.C.	Cathode to Ground Volts, D.C.	Plate Current	Heater Volts
RCA 6A7	Oscillator	185	—	—	4.5	—
	Detector	265	109	9.5	1.6	6.3
RCA-6D6 First I.F.		255	109	11.2	2.2	6.3
RCA-6D6 Second I.F.		265	109	8.3	6.6	6.3
RCA-6B7 Second Det.		80*	109	4.5	0.3	6.3
RCA-41 Power		255	265	18.0	30.0	6.3
RCA-80 Rectifier		345/345	—	—	68.0	5.0

*Calculated from +B.

RCA MFG. CO., INC.

MODELS 128, 226
1935 Production
Schematic, Parts
Speaker Wiring



Schematic Circuit Diagram

REPRODUCER ASSEMBLY CONSOLE MODEL

(For use with chassis having reproducer cable with spade terminals)

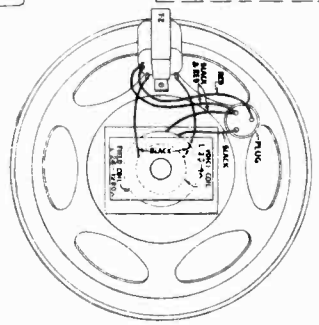
Stock No.	Description	List Price
	REPRODUCER ASSEMBLY TABLE MODEL	
4526	Cable—3-conductor—Reproducer cable with spade terminals	$0.32
5085	Cable—3-conductor reproducer cable with female connector	.45
9579	Coil—Field coil only	2.10
9533	Cone—Reproducer cone mounted and centered on housing	3.50
5118	Connector—3-contact male connector for reproducer	.25
5119	Connector—3-contact female connector for reproducer cable	.25
7818	Reproducer complete—For use with chassis having reproducer cable with spade terminals	6.58
9578	Reproducer complete—For use with chassis having cable with connector	6.58
4818	Transformer—Output transformer	2.15
4792	Capacitor—.015 mfd. (C39)	.22
4634	Capacitor—1120 mmfd. (C50)	.35
4728	Switch—Range switch (S1, S2, S3, S4, S5, S6, S7, S8, S9, S10, S12)	4.32
4473	Board—Terminal board assembly	.26
4526	Cable—3-conductor with spade terminals	.32
9460	Coil—Field coil, magnet and cone support (L24)	6.00
8935	Cone—Reproducer cone (L23)—Package of 5	5.25
9527	Reproducer—Complete	8.00
4472	Transformer—Output transformer (T2)	1.40

REPRODUCER ASSEMBLY CONSOLE MODEL

(For use with chassis having reproducer cable with connector)

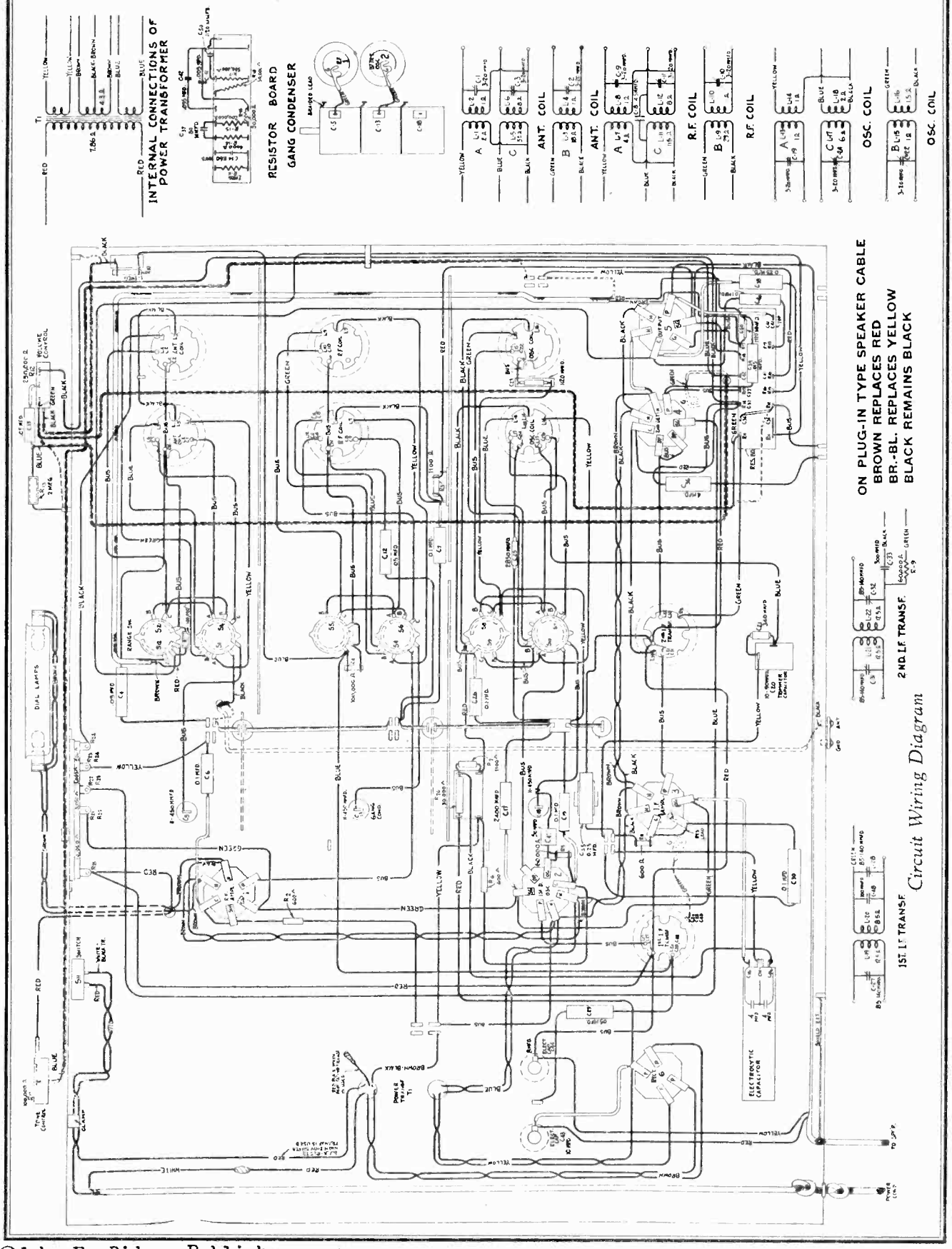
5085	Cable—3-conductor reproducer cable complete with female connector	.45
5118	Connector—3-contact male connector for reproducer	.25
5119	Connector—3-contact female connector for reproducer cable	.25
9590	Coil—Field coil, magnet and cone support (L24)	4.20
8935	Cone—Reproducer cone (L23)—Package of 5	5.25
9589	Reproducer complete	8.20
4892	Transformer—Output transformer (T2)	1.30

Console Model Loudspeaker (with cable plug)



MODELS 128,226
1935 Production
Chassis Wiring

RCA MFG. CO., INC.



RCA MFG. CO., INC.

MODELS 128E, 224E
Schematic
Transformer Data

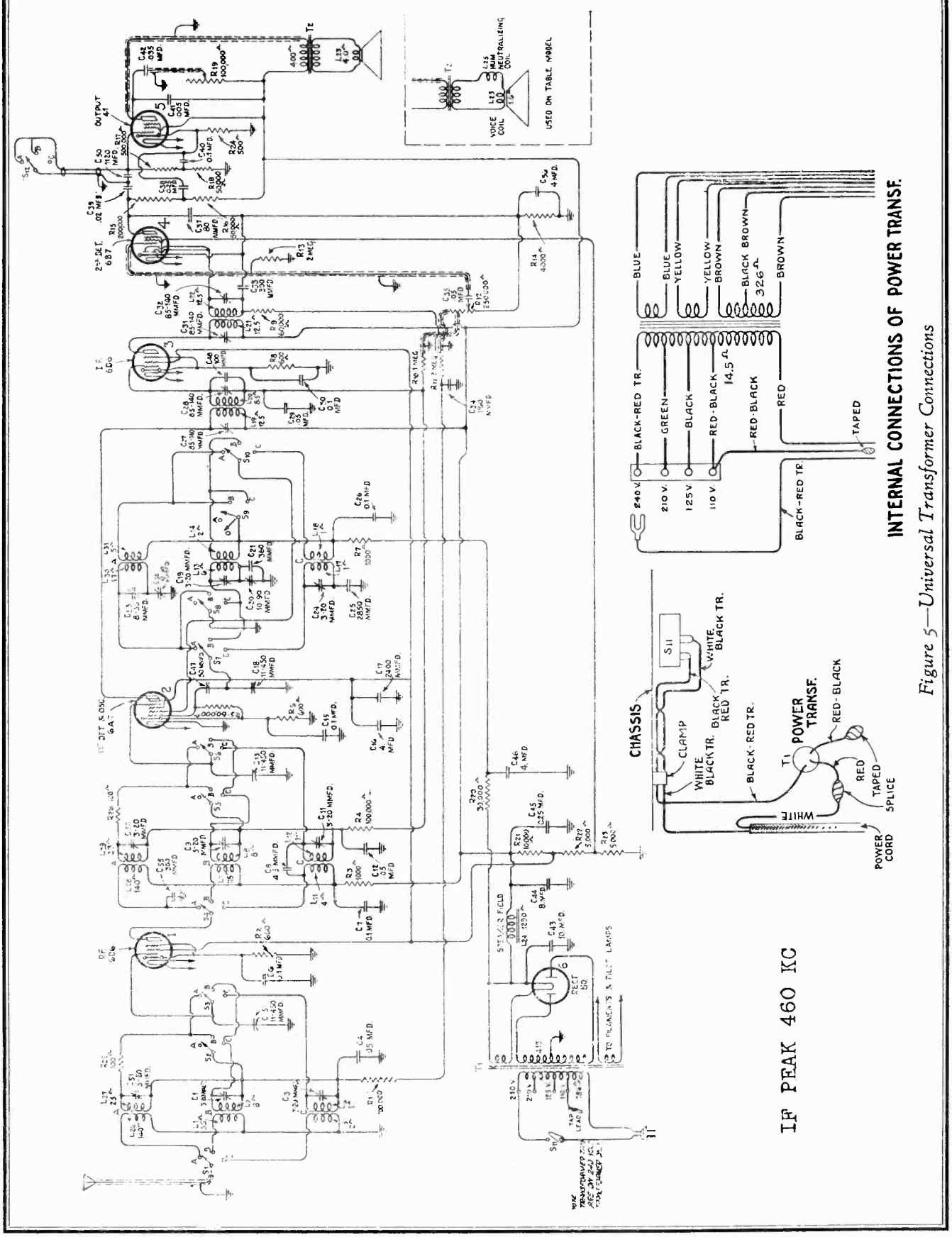


Figure 5—Universal Transformer Connections

MODELS 128E,224E
Chassis Wiring

RCA MFG. CO., INC.

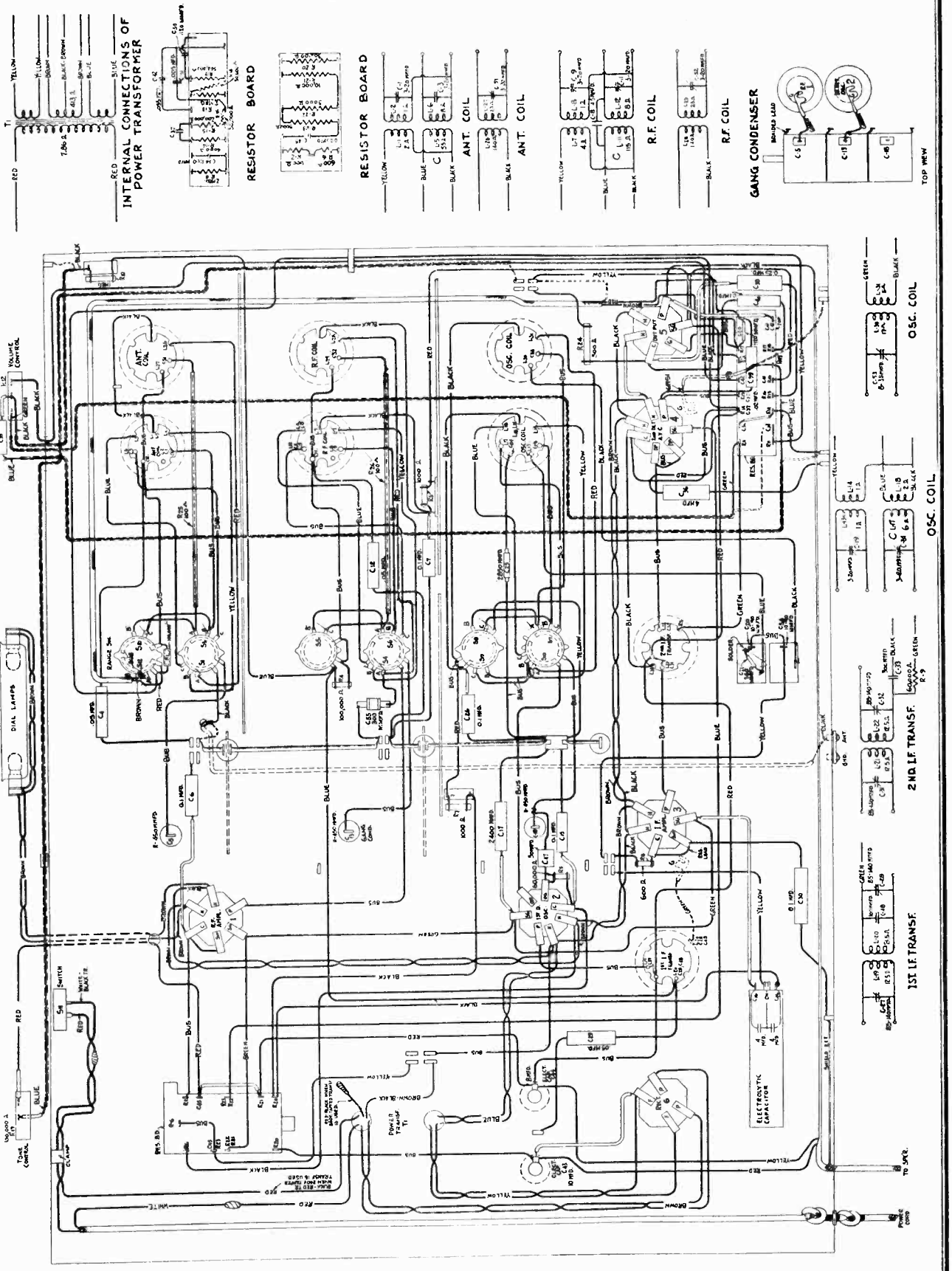
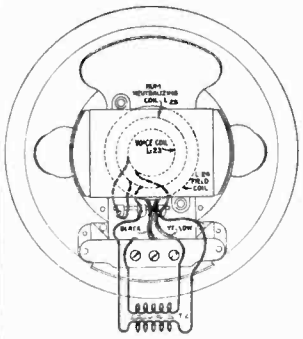


Figure 2—Chassis Wiring Diagram

MODELS 128E,224E
Trimmers, Socket
Voltage, Speakers

RCA MFG. CO., INC.



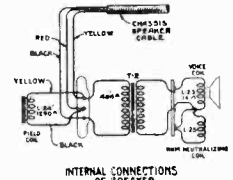
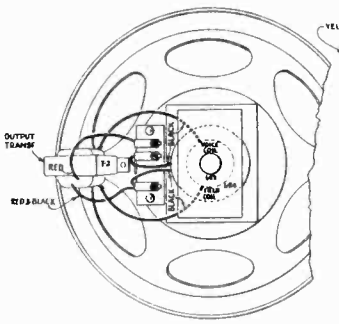


Figure 3—Table Loudspeaker Wiring



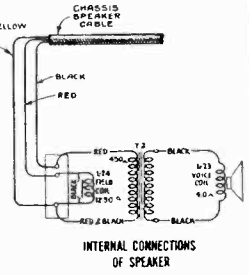


Figure 4—Console Loudspeaker Wiring

600 K.C. TRIMMER → (11)

175 K.C. TRIMMER → (12)

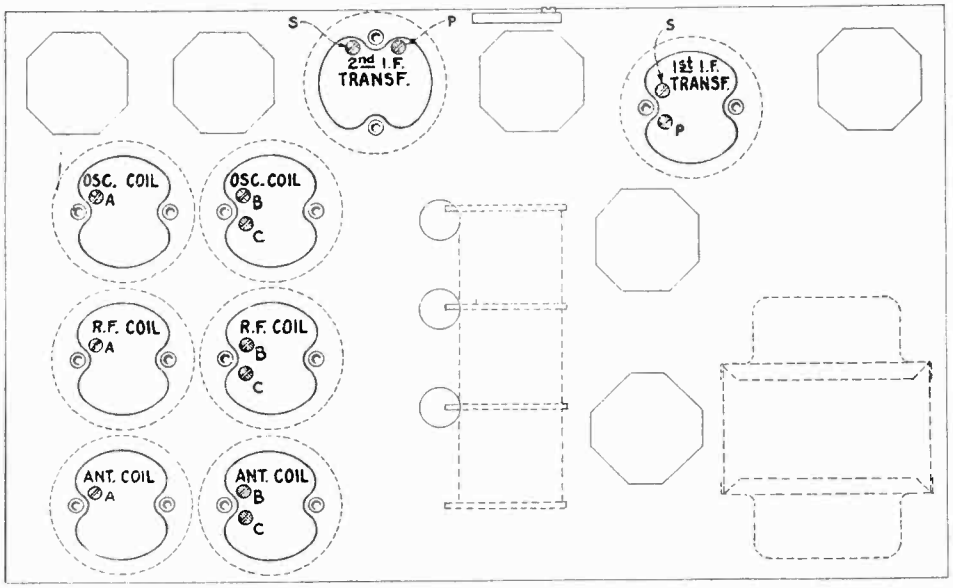
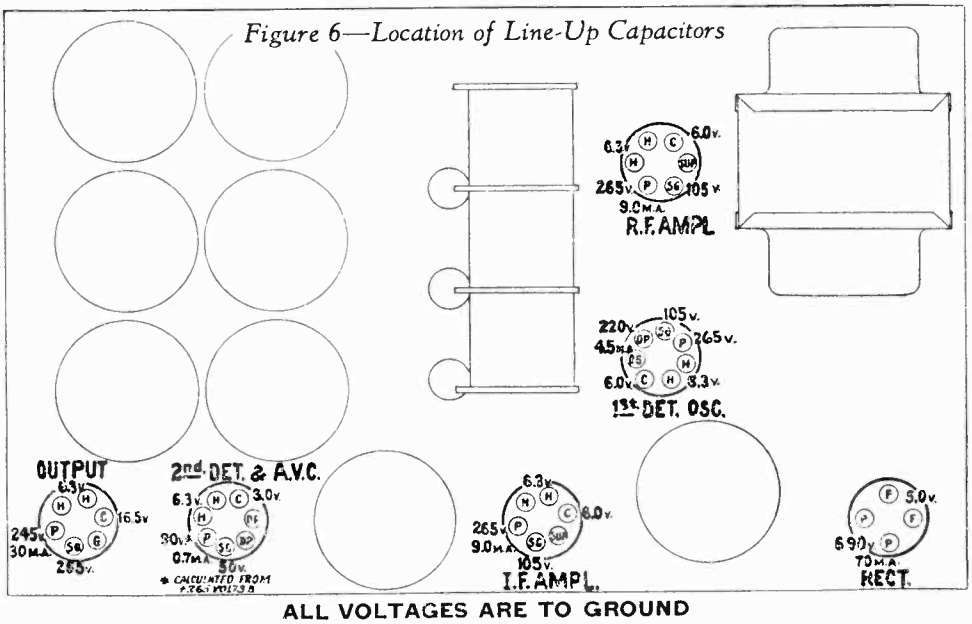


Figure 6—Location of Line-Up Capacitors



ALL VOLTAGES ARE TO GROUND

Figure 7—Tube Socket Voltages

Checking with Tuning Wand

Before making any R. F., oscillator or first detector adjustments, the accuracy of the present adjustments may be checked by means of the tuning wand (Stock No. 6679). The tuning wand consists of a bakelite rod having a brass cylinder at one end and a special finely divided iron insert at the other end. Inserting the cylinder into the center of a coil lowers its inductance, while inserting the iron end increases its inductance. From this, it is seen that unless the trimmer adjustment for a particular coil is perfect at alignment frequencies, inserting one end of the wand may increase the output of a particular signal. A perfect adjustment is evidenced by a lowering of output when either end of the wand is inserted into a coil.

The shields over the R. F. coil assembly have a hole at their top for entrance of the tuning wand. The location of the various coils inside of the shield is shown in Figure 8. An example of the proper manner of using the tuning wand would be to assume the external oscillator were set at 1720 and the signal tuned in, and the output indicator should be connected across the voice coil of the loudspeaker. Then the tuning wand would be inserted, first one end and then the other end, into the top of the three transformers at the left of the R. F. assembly, facing the front of the chassis. A perfect adjustment of the trimmer would be evidenced by a reduction in output when each end of the wand is inserted in each of the three transformers. If one end—for example, the iron end—when inserted in one coil caused an increase in output, then that circuit is low. An increase in the trimmer capacitance would be the proper remedy.

(2) I. F. TUNING CAPACITOR ADJUSTMENTS

This receiver has one I. F. stage that employs two transformers in conjunction with four adjustable capacitors. These capacitors may require adjustment, being tuned to 460 K. C.

A detailed procedure for making this adjustment follows:

(a) Connect the output of an external oscillator tuned to 460 K. C. between the first detector grid and ground. Connect the output indicator across the voice coil of the loudspeaker.

(b) Place the oscillator in operation at 460 K. C. Place the receiver in operation and adjust the station selector until a point is reached (Band B) where no signals are heard and turn the volume control to its maximum position. Reduce the oscillator input until a slight indication is obtained in the output indicator.

(c) Refer to Figure 6. Adjust each trimmer of the I. F. transformers until a maximum output is obtained. Go over the adjustments a second time.

(3) R. F., OSCILLATOR AND FIRST DETECTOR ADJUSTMENTS

Four R. F., oscillator and first detector adjustments are required in Bands "A" and "B." Three are required in Band "C."

To properly align the various bands, each band must be aligned individually in the order given. This is "A," "B" and "C." The preliminary set-up requires the external oscillator to be connected between the antenna and ground terminals of the receiver and the output indicator must be connected across the voice coil of the loudspeaker. The volume control must be at its maximum position and the input from the oscillator must be at the minimum value possible to get an output indication under these conditions. In the high frequency bands, it may be necessary to disconnect the oscillator from the receiver and place it at a distance in order to get a sufficiently low input to the receiver.

The dial pointer must be properly set before starting any actual adjustments. This is done by turning the variable capacitor until it is at its maximum capacity position. One end of the pointer should point exactly at the horizontal line at the lowest frequency end of Band "A," while the other end should point to within ⅛ inch of the horizontal line at the highest frequency end of Band "A."

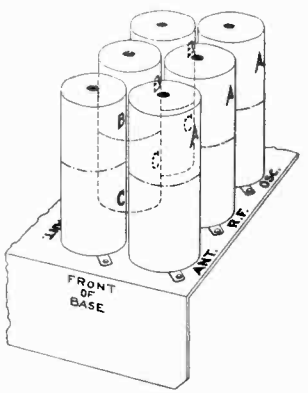


Figure 8—Location of Coils in Shields

Figure 6 shows the location of the trimmers for each band. Care must be exercised to merely adjust the trimmers of the band under test.

Band "A"

(a) Set the Band Switch at "A."

(b) Tune the external oscillator to 410 K. C., set the dial pointer at 410 K. C. and adjust the oscillator detector and R. F. trimmers for maximum output.

(c) Shift the external oscillator frequency to 175 K. C. Tune in the 175 K. C. signal irrespective of scale calibration and adjust the series trimmer, marked 175 K. C. on Figure 6, for maximum output, at the same time rocking the variable tuning capacitor. Then readjust at 410 K. C. as described in (b).

Band "B"

(a) Set the Band Switch at "B."

(b) Tune the external oscillator to 1720 K. C., set the pointer at 1720 K. C. and adjust the oscillator, detector and R. F. trimmers for maximum output.

(c) Shift the external oscillator frequency to 600 K. C. Tune in the 600 K. C. signal, irrespective of scale calibration, and adjust the series trimmers, located on rear apron of chassis, for maximum output, at the same time rocking the variable tuning capacitor. Then readjust at 1720 K. C. as described in (b).

Band "C"

(a) Set the Band Switch at "C."

(b) Tune the external oscillator to 18,000 K. C., set the pointer at 18 M. C. Adjust the oscillator trimmer for maximum output. The trimmer should be set at the first peak obtained when increasing the trimmer capacitor from minimum to maximum.

(c) Check for the image signal, which should be received at approximately 17,080 K. C. on the dial. It may be necessary to increase the external oscillator output for this check.

(d) Reduce the capacity of the detector trimmer, while rocking the tuning capacitor, until the signal disappears. The first detector circuit is then aligned with the oscillator circuit and the RCA-6A7 tube is blocked. Then increase the capacity of the detector trimmer, while rocking the tuning capacitor, until the signal is peaked for maximum output.

(e) The antenna trimmer should now be peaked for maximum output. It is not necessary to rock the main tuning capacitor while making this adjustment.

(4) POWER TRANSFORMER CONNECTIONS

The 220-volt power transformer furnished with some instruments includes taps for operating on 110-volt lines. Figure 5 shows the schematic circuit of the transformer and the proper voltage to be applied to the various taps. The taps are located on the power transformer assembly and are accessible without removing the chassis from the cabinet.

(5) VOLTAGE READINGS

The following voltages are those at the various tube sockets while the receiver is in operating condition. No allowance has been made for currents drawn by the meter, and if low-resistance meters are used, such allowances must be made:

RADIOTRON SOCKET VOLTAGES

115-Volt A. C. Line—No Signal—Volume Control Maximum

Radiotron-Number		Cathode to Ground, Volts, D. C.	Screen Grid to Ground, Volts, D. C.	Plate to Ground, Volts, D. C.	Plate Current, M. A.	Heater Volts, A. C.
RCA-6D6—R. F.		6.0	105	265	9.0	6.3
RCA-6A7	Det.	6.0	105	265	3.5	6.3
	Osc.	—	—	220	4.5	
RCA-6D6—I. F.		6.0	105	265	9.0	6.3
RCA-6B7—2nd Detector		3.0	50	90*	0.7	6.3
RCA-41—Power		16.5	265	245	30.0	6.3
RCA-80—Rectifier		—	—	690 (RMS)	70.0	5.0

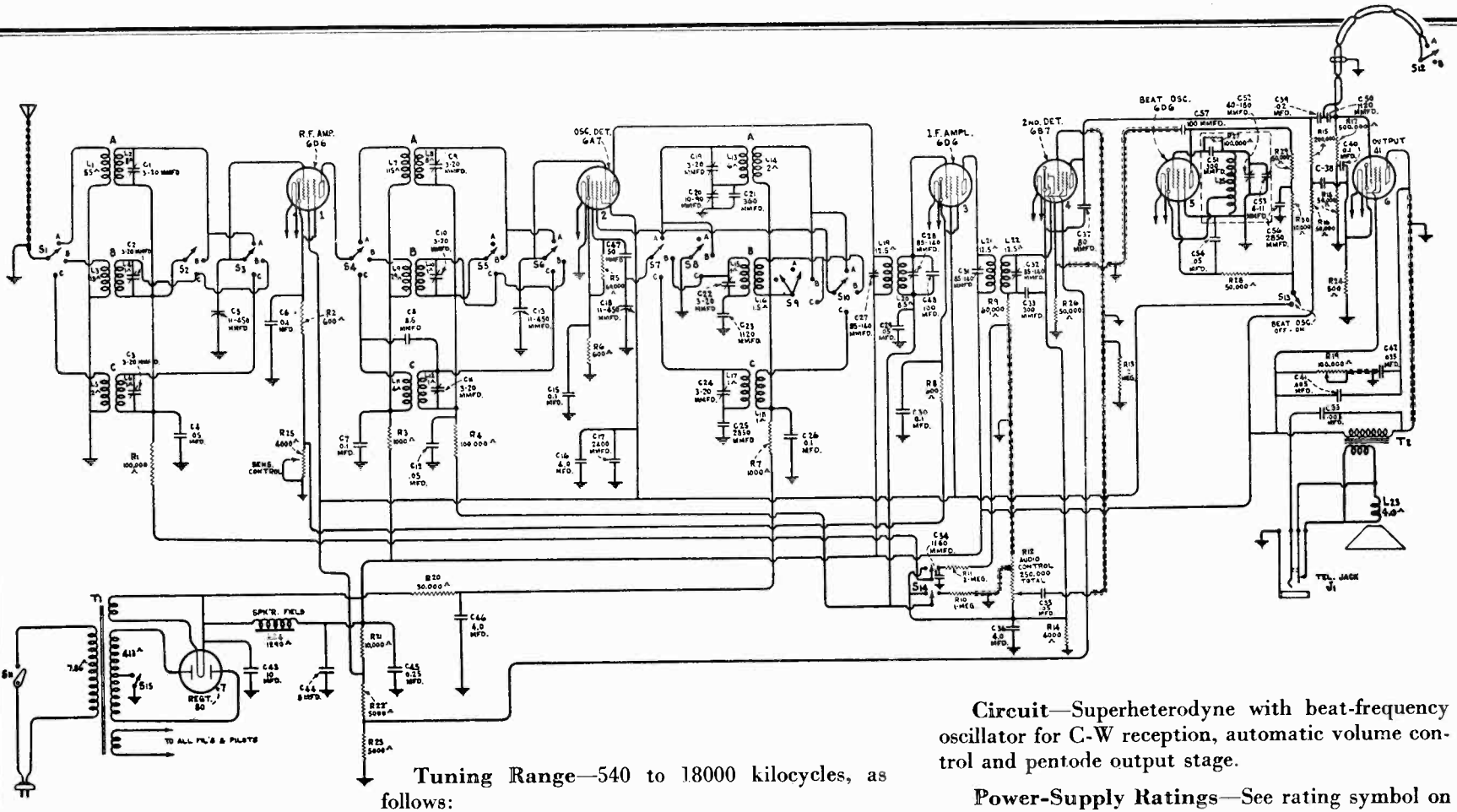
*Voltage calculated from 265 V. + B.

REPLACEMENT PARTS

Stock No.	Description	List Price
	RECEIVER ASSEMBLIES	
4427	Bracket—Volume control or tone control mounting bracket	$0.18
2747	Cap—Contact cap—Package of 5	.50
3861	Capacitor—Adjustable trimmer capacitor (C20)	.78
4442	Capacitor—50 mmfd. (C47)	.22
4662	Capacitor—80 mmfd. (C37)	.28
4413	Capacitor—360 mmfd. (C21)	.22
4634	Capacitor—1120 mmfd. (C50)	.35
4515	Capacitor—1160 mmfd. (C34)	.22
4670	Capacitor—2250 mmfd. (C14)	.30
4523	Capacitor—2400 mmfd. (C17)	.26
4524	Capacitor—2850 mmfd. (C25)	.35
4435	Capacitor—0.02 mfd. (C39)	.25
4518	Capacitor—0.05 mfd. (C35)	.52
4417	Capacitor—0.05 mfd. (C4, C12, C29)	.25
3877	Capacitor—0.1 mfd. (C40)	.32
4415	Capacitor—0.1 mfd. (C6, C15, C30)	.30
4645	Capacitor—0.1 mfd. (C7, C26)	.25
3597	Capacitor—0.25 mfd. (C38, C45)	.40
4525	Capacitor—4.0 mfd. (C36)	.70
4428	Capacitor—8.0 mfd. (C44)	1.05
7790	Capacitor—10.0 mfd. (C43)	1.05
4692	Capacitor pack—Comprising one 0.035 mfd. and one 0.005 mfd. capacitors (C41, C42)	.30
7589	Capacitor pack—Comprising two 4.0 mfd. capacitors (C16, C46)	1.64
4358	Clamp—Electrolytic capacitor mounting clamp	.15
4734	Coil—Antenna coil "A" (L26, L27, C51)	3.05
7803	Coil—Antenna coil "B & C" (L1, L2, L5, L6, C1, C3)	1.82
4751	Coil—Detector coil "A" (L28, L29, C52)	2.38
7805	Coil—Detector coil "B & C" (L7, L8, L11, L12, C8, C9, C11)	2.15
7807	Coil—Oscillator coil "B & C" (L13, L14, L17, L18, C19, C24)	1.62
4733	Coil—Oscillator coil "A" (L30, L31, C53)	3.05
7801	Condenser—3-gang variable tuning condenser (C5, C13, C18)	4.42
4340	Lamp—Dial lamp—Package of 5	.60
3632	Resistor—500 ohms—Carbon type—1 watt (R24)—Package of 5	1.10
3218	Resistor—600 ohms—Carbon type—¼ watt (R2, R6, R8)—Package of 5	$1.00
4370	Resistor—1000 ohms—Carbon type—¼ watt (R3, R7)—Package of 10	2.00
3997	Resistor—4000 ohms—Carbon type—¼ watt (R14)—Package of 5	1.00
6318	Resistor—10,000 ohms (R21)	.80
3114	Resistor—50,000 ohms—Carbon type—¼ watt (R16, R18)—Package of 5	1.00
3602	Resistor—60,000 ohms—Carbon type—¼ watt (R5)—Package of 5	1.00
3118	Resistor—100,000 ohms—Carbon type—¼ watt (R1, R4)—Package of 5	1.00
3116	Resistor—200,000 ohms—Carbon type—¼ watt (R15)—Package of 5	1.00
6186	Resistor—500,000 ohms—Carbon type—¼ watt (R17)—Package of 5	1.00
3033	Resistor—1 megohm—Carbon type—¼ watt (R10)—Package of 5	1.00
6242	Resistor—2 megohms—Carbon type—¼ watt (R11, R13)—Package of 5	1.00
3413	Resistor—5000 ohms—Carbon type—½ watt (R22, R23)—Package of 5	1.00
4513	Resistor—30,000 ohms—Carbon type—3 watts (R20)	.25
4521	Shield—Antenna R. F. or oscillator coil shield	.42
4145	Shield—First detector or output Radiotron shield	.30
4103	Shield—I. F. amplifier Radiotron shield	.20
6955	Shield—R. F. amplifier Radiotron shield	.25
3782	Shield—Second detector Radiotron shield	.26
3529	Socket—Dial lamp socket	.32
3859	Socket—4-contact Radiotron socket	.30
6676	Socket—6-contact output Radiotron socket	.40
7485	Socket—6-contact Radiotron socket	.40
3572	Socket—7-contact Radiotron socket	.38
4379	Strip—Antenna terminal engraved "ANT–GND"	.20
4684	Switch—Operating switch (S11)	.45
4728	Switch—Range switch (S1, S2, S3, S4, S5, S6, S7, S8, S9, S10)	4.32
4517	Tone control (R19)	.90
4431	Transformer—First intermediate frequency transformer (L19, L20, C27, C28, C48)	2.28
4433	Transformer—Second intermediate frequency transformer (L21, L22, C31, C32, C33, R9)	2.15
9511	Transformer—Power transformer—105–125 volts—50–60 cycles (T1)	$4.78
9512	Transformer—Power transformer—105–125 volts—25–40 cycles	6.58
9513	Transformer—Power transformer—105–250 volts—40–60 cycles	4.85
4519	Volume control (R12)	1.25
	DRIVE ASSEMBLIES	
4362	Arm—Band indicator operating arm	.28
10194	Ball—Steel ball for condenser drive assembly—Package of 20	.25
4422	Clutch—Clutch drive assembly for variable condenser drive	.88
4510	Drive—Tuning condenser drive assembly	2.42
4361	Indicator—Band indicator (celluloid)	.12
4732	Scale—Station selector dial scale	.40
3943	Screen—Dial light screen (celluloid)—Package of 2	.18
3993	Screw—Number 6–32–5/32 square head set screws for band indicator operating arm—Package of 10	.25
4669	Screw—Number 8–32–5/32 set screw for variable condenser drive assembly—Package of 10	.25
4377	Spring—Band indicator and arm tension spring—Package of 5	.25
4378	Stud—Band indicator operating arm stud—Package of 5	.25
	REPRODUCER ASSEMBLY TABLE MODEL	
4526	Cable—3-conductor—Reproducer cable	$0.32
7818	Reproducer complete	6.58
	REPRODUCER ASSEMBLY CONSOLE MODEL	
4473	Board—Terminal board assembly	.26
9460	Coil—Field coil, magnet and cone support (L24)	6.00
8935	Cone—Reproducer cone (L23)—Package of 5	5.25
9527	Reproducer—Complete	8.00
4472	Transformer—Output transformer (T2)	1.40
	MISCELLANEOUS ASSEMBLY	
4677	Bezel—Station selector dial (escutcheon) bezel	.56
6614	Glass—Station selector dial glass	.30
4520	Indicator—Station selector indicator pointer	.18
4449	Knob—Station selector, volume control, tone control, range switch or operating switch knob—Package of 5	.60
4678	Ring—Dial glass retaining ring—Package of 5	.34
4527	Screw—Chassis mounting screw assembly comprising 4 spacers, 4 screws, 4 lock-washers, 4 washers, 8 cushions—For table model	.40
4685	Screw—Chassis mounting screw assembly—Comprising 4 spacers, 4 screws, 4 lock-washers, 4 washers and 8 cushions—For console model	.40
4632	Screw—Number 8–32–7/16 headless set screw for knobs—Package of 10	.25

REPLACEMENT PARTS

Stock No.	DESCRIPTION	List Price
	RECEIVER ASSEMBLIES	
4427	Bracket—Volume control or tone control mounting bracket	$0.18
2717	Cap—Contact cap—Package of 5	.50
3861	Capacitor—Adjustable trimmer capacitor (C20)	.78
4412	Capacitor—50 mmfd. (C47)	.22
4662	Capacitor—80 mmfd. (C37)	.24
4413	Capacitor—360 mmfd. (C21)	.22
4412	Capacitor—1120 mmfd. (C23)	.25
4515	Capacitor—1160 mmfd. (C34)	.22
4523	Capacitor—2400 mmfd. (C17)	.26
4524	Capacitor—2850 mmfd. (C25)	.35
4824	Capacitor—.005 mfd. (C55)	.55
4435	Capacitor—.02 mfd. (C39)	.25
4518	Capacitor—.05 mfd. (C35)	.52
4417	Capacitor—.05 mfd. (C4, C12, C29)	.25
3877	Capacitor—.1 mfd. (C10)	.32
4415	Capacitor—.1 mfd. (C6, C15, C30)	.30
4645	Capacitor—.1 mfd. (C7, C26)	.25
3597	Capacitor—.25 mfd. (C45)	.40
4525	Capacitor—4.0 mfd. (C36)	.70
4428	Capacitor—8 mfd. (C44)	1.05
7790	Capacitor—10 mfd. (C43)	1.05
4692	Capacitor pack—Comprising one 0.035 mfd. and one 0.005 mfd. capacitors (C41, C42)	.30
7589	Capacitor pack—Comprising two 4.0 mfd. capacitors (C16, C46)	1.64
4458	Clamp—Electrolytic capacitor mounting clamp	.15
4516	Coil—Antenna coil "B" (L3, L4, C2)	1.65
7803	Coil—Antenna coil "A-C" (L1, L2, L5, L6, C1, C3)	1.82
4514	Coil—Detector coil "B" (L9, L10, C10)	1.65
7805	Coil—Detector coil "A-C" (L7, L8, L11, L12, C8, C9, C11)	2.15
7807	Coil—Oscillator coil "A-C" (L13, L14, L17, L18, C19, C24)	1.62
4511	Coil—Oscillator coil "B" (L15, L16, C22)	1.52
7801	Condenser—3-gang variable tuning condenser (C5, C13, C18)	4.42
4340	Lamp—Dial lamp—Package of 5	.60
3632	Resistor—500 ohms—Carbon type—1 watt (R24)—Package of 5	1.10
3218	Resistor—600 ohms—Carbon type—¼ watt (R2, R6, R8)—Package of 5	$1.00
4370	Resistor—1000 ohms—Carbon type—¼ watt (R3, R7)—Package of 10	2.00
3997	Resistor—4000 ohms—Carbon type—¼ watt (R14)—Package of 5	1.00
3114	Resistor—50,000 ohms—Carbon type—¼ watt (R16, R18)—Package of 5	1.00
3602	Resistor—60,000 ohms—Carbon type—¼ watt (R5)—Package of 5	1.00
3118	Resistor—100,000 ohms—Carbon type—¼ watt (R1, R4)—Package of 5	1.00
3116	Resistor—200,000 ohms—Carbon type—¼ watt (R15)—Package of 5	1.00
6186	Resistor—500,000 ohms—Carbon type—¼ watt (R17)—Package of 5	1.00
3033	Resistor—1 megohm—Carbon type—¼ watt (R10)—Package of 5	1.00
6242	Resistor—2 megohms—Carbon type—¼ watt (R11, R13)—Package of 5	1.00
4513	Resistor—30,000 ohms—Carbon type—3 watt (R20)	.25
4521	Shield—Antenna R. F. or oscillator coil shield	.42
4145	Shield—First detector or output Radiotron shield	.30
4103	Shield—I. F. amplifier Radiotron shield	.20
6955	Shield—R. F. amplifier Radiotron shield	.25
3782	Shield—Second detector Radiotron shield	.26
3529	Socket—Dial lamp socket	.32
3859	Socket—4-contact Radiotron socket	.30
6676	Socket—6-contact output Radiotron socket	.40
7485	Socket—6-contact Radiotron socket	.40
3572	Socket—7-contact Radiotron socket	.38
4379	Strip—Antenna terminal engraved "ANT-GND"	.20
4684	Switch—Oscillator switch (S13)	.45
4512	Switch—Range switch (S1, S2, S3, S4, S5, S6, S7, S8, S9, S10)	3.42
4517	Tone control (R19)	.90
4431	Transformer—First intermediate frequency transformer (L19, L20, C27, C28, C48)	2.28
4433	Transformer—Second intermediate frequency transformer (L21, L22, C31, C32, C33, R9)	2.15
4721	Resistor—Tapped resistor—One 10,000 ohm, two 5000 ohm and one 500 ohm section (R21, R22, R23, R24)	.88
9511	Transformer—Power transformer 105–125 volts, 50–60 cycles (T1)	4.78
9512	Transformer—Power transformer 105–125 volts, 25–40 cycles	$6.58
9513	Transformer—Power transformer—105–250 volts—40–60 cycles	4.85
4519	Volume control (R12)	1.25
	DRIVE ASSEMBLIES	
4362	Arm—Band indicator operating arm	.28
10194	Ball—Steel ball for variable condenser drive assembly—Package of 20	.25
4422	Clutch—Tuning condenser drive clutch assembly—Comprising drive shaft, balls, ring, spring and washers assembled	.88
4724	Dial—Station selector dial	.40
7799	Drive—Variable tuning condenser drive assembly complete	2.45
4364	Gear—Spring gear assembly complete with hub pinion, gear cover and spring	.96
4361	Indicator—Band indicator—Celluloid	.12
4520	Pointer—Station selector main pointer—Large	.18
4725	Pointer—Station selector vernier pointer—Small	.22
3993	Screw—No. 6-32 ⅜" square head set screw for variable condenser drive assembly—Package of 10	.25
4377	Spring—Band indicator and arm tension spring—Package of 5	.25
4360	Stem—Pointer stem assembly	.35
4378	Stud—Band indicator operating arm stud—Package of 5	.25
	OSCILLATOR ASSEMBLIES	
2747	Cap—Contact cap—Package of 5	.50
3640	Capacitor—.05 mfd. (C54)	.25
3794	Capacitor—100 mmfd. (C57)	.30
4524	Capacitor—2850 mmfd. (C56)	$0.35
4755	Coil—Beat coil—Oscillator assembly—Complete (R27, C51, C52, C53, L25)	7.28
3381	Resistor—10,000 ohms—Carbon type—¼ watt (R30)—Package of 5	1.00
3114	Resistor—50,000 ohms—Carbon type—¼ watt (R26, R28, R29)—Package of 5	1.00
6955	Shield—Oscillator Radiotron shield	.25
7485	Socket—6-contact Radiotron socket	.40
	REPRODUCER ASSEMBLY	
4448	Board—Terminal board assembly	.25
9531	Coil—Field coil, magnet and cone support (L24)	2.75
9492	Cone—Reproducer cone (L23)—Package of 5	3.70
9514	Reproducer—Complete	6.00
4505	Transformer—Output transformer (T2)	1.55
4447	Shield—Terminal board shield	.18
	MISCELLANEOUS ASSEMBLY	
4757	Bezel—Station selector dial (escutcheon) bezel	.82
6614	Glass—Station selector dial glass	.30
4823	Knob—Station selector knob—Package of 5	.75
4132	Knob—Volume control, tone control, sensitivity control, oscillator switch, range switch or AVC switch knob—Package of 5	.55
6615	Ring—Dial glass retaining ring—Package of 5	.34
4613	Screw—Number 8-32-7/16" headless set screw for knobs—Package of 10	.25
4726	Rheostat—Sensitivity control rheostat (R25, S11)	1.42
4756	Jack—Phone jack (J1)	1.44
4758	Switch—Standby switch (S15)	.95
4727	Switch—AVC control switch (S14)	1.44



IF PEAK 460 KC.

Tuning Range—540 to 18000 kilocycles, as follows:

Band	Limits (kc.)	Services
A	540–1720	Standard Broadcast–Police Calls
B	1720–5400	Amateur–Police Calls–Aviation
C	5400–18000	Amateur–S-W Broadcast–Aviation

Intermediate Frequency—460 kilocycles.

Power Output—1.9 watts (undistorted); 3.5 watts (maximum).

Loudspeaker—Electrodynamic (voice-coil impedance 4 ohms).

Circuit—Superheterodyne with beat-frequency oscillator for C-W reception, automatic volume control and pentode output stage.

Power-Supply Ratings—See rating symbol on chassis.

Symbol	Voltage	Frequency (cycles)
A	105–125	50–60
B	105–125	25–60
C	100–130/195–250	50–60

As shipped from factory, instruments rated "C" are connected for 225–250 volts unless prominently specified otherwise on chassis. Any of these, however, can be converted for operation at 100–117, 117–130 or 195–225 volts when required. (See A-C Line Voltages in Part II.)

Power Consumption—85 watts.

MODEL ACR-136
Chassis Wiring

RCA MFG. CO., INC.

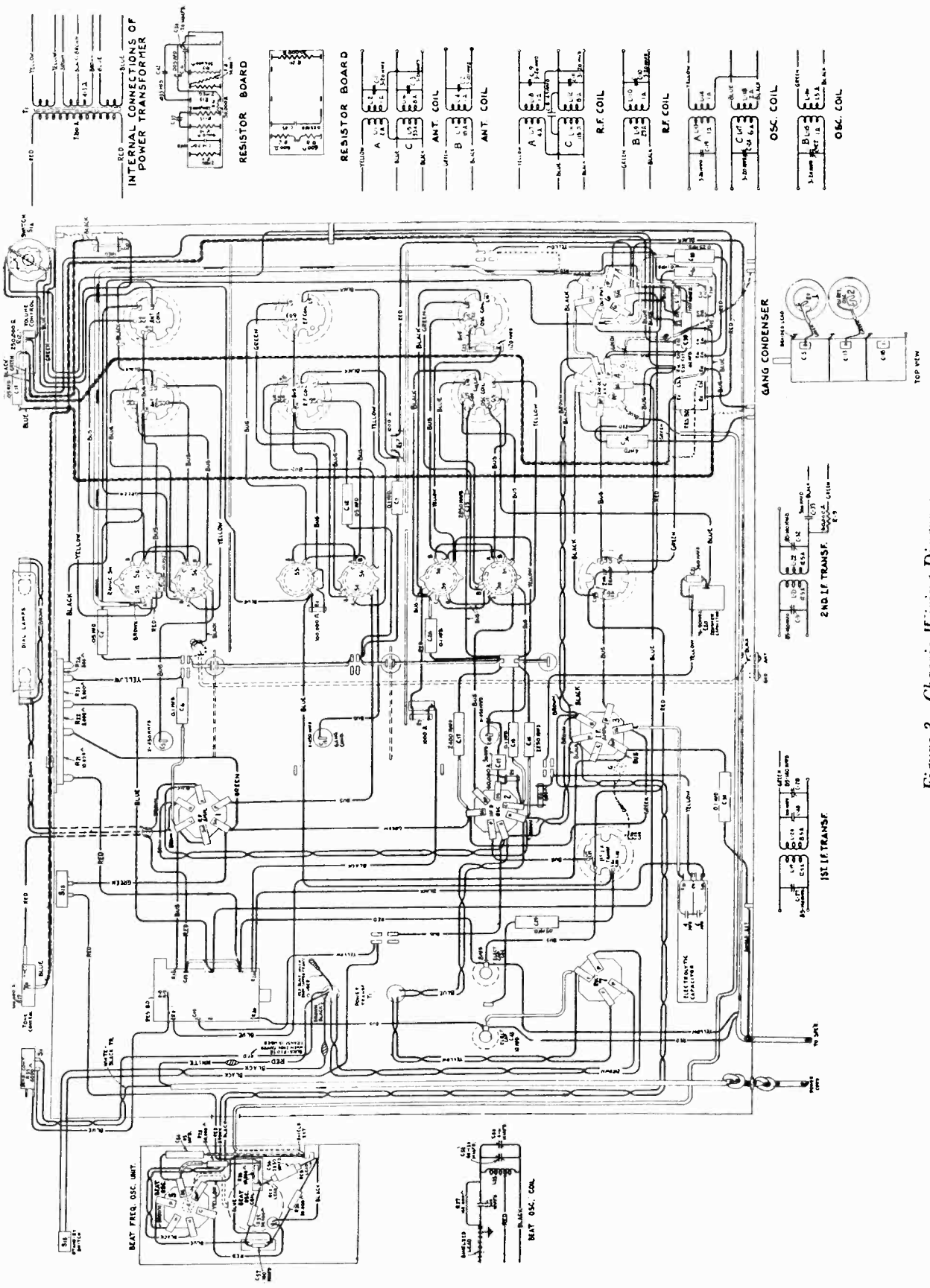


Figure 3—Chassis Wiring Diagram

Alignment Procedure

This receiver, of course, was aligned at the factory, but should be checked regularly (preferably once every six months) to insure best possible results. Adjustments when necessary can be performed easily since all trimmer capacitors are accessible through openings in the external case as shown in Figure 6. If desired, however, the chassis can be withdrawn upon removal of the front panel and four mounting screws.

Equipment

Good equipment is prerequisite to satisfactory alignment. A modulated r-f oscillator having an adequate frequency range such as No. 9050, an output meter or simply an output indicator such as No. 4317, and a non-metallic screwdriver such as No. 4160 are three very necessary items. The process can be greatly facilitated through use of tuning wand No. 6079. The parts to which these numbers apply were designed by the manufacturer of this receiver for use by its authorized servicemen. Such parts, however, can be purchased by radio amateurs or engineers through the regular commercial channels. Brief descriptions and net prices of those items are shown on page 15.

I-F Alignment

Both the primary and the secondary circuits of the two coupling transformers for the i-f stage are tuned. Thus, four trimmers may require adjustment to the nominal intermediate frequency—460 kilocycles. To effect these adjustments, refer to Figure 6 and proceed as follows:

1. Connect a modulated oscillator so that its output is impressed between the grid of the first detector and ground.

2. Connect an output indicator across the voice coil of the loudspeaker or an output meter across the secondary of the output transformer with the loudspeaker voice coil open-circuited.

3. Remove the antenna lead-in connection from the rear (ANT-GND) terminal board. Apply power to receiver, turn volume and sensitivity controls fully clockwise (for maximum output) and set tuning control to any point in band A where no signal is received.

4. Place the oscillator in operation at 460 kilocycles and adjust its output control to a position just sufficient to actuate the output meter or indicator.

5. Adjust each of the four trimmer capacitors in turn for maximum output, reducing the input from the oscillator in order to maintain a suitable reading at all times. It will be advisable to go over these adjustments again to make certain that each circuit is exactly peaked rather than merely approximately correct. When an i-f alignment has been made, always follow with the r-f adjustments, as an interlocking effect is usually incurred.

R-F Alignment

The r-f amplifier, oscillator and first detector stages include a total of four trimmers in band A and totals of three trimmers each in bands B and C. These bands should be aligned individually and in alphabetical sequence. Care must be used to avoid disturbing the adjustments of trimmers not involved in the band under test. Nominal line-up frequencies for band A are 600 and 1720 kilocycles, while bands B and C are aligned at 5160 and 18000 kilocycles, respectively. For these adjustments, refer to Figure 6 and proceed as follows:

1. Check setting of dial pointer and adjust if necessary. With tuning capacitor plates fully meshed, one end of the pointer should point exactly toward

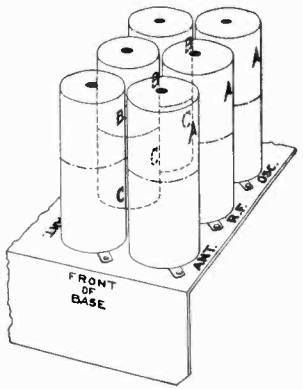


Figure 7—Locations of R-F Coils

the horizontal line at the low-frequency end of band A while the other end should point to within 1/64-inch of the horizontal line at the high-frequency end of that band.

2. Connect a modulated oscillator to the antenna (ANT) and ground (GND) terminals of the receiver.

3. Connect an output indicator across the voice coil of the loudspeaker or an output meter across the secondary of the output transformer with the loudspeaker voice coil open-circuited.

4. Apply power to receiver and turn volume and sensitivity controls fully clockwise (for maximum output).

5. Set range switch at "A":

(a) Adjust oscillator series capacitor (accessible from rear of case) to approximately the center of its range.

(b) Place test oscillator in operation at 1720 kilocycles, set dial pointer at 1720 kilocycles and adjust the three trimmers designated by the letter "A" (Figure 6) for maximum output.

(c) Shift test oscillator frequency to 600 kilocycles and tune receiver to this signal irrespective of the actual dial reading, then adjust the oscillator series trimmer (accessible through opening in rear of case) for maximum output while rocking the tuning capacitor.

(d) Re-adjust at 1720 kilocycles as described in (b).

6. Set range switch at "B":

(a) Tighten the r-f amplifier and first detector trimmers to afford approximately three-quarters of their maximum capacitance—that is, screwed inward three-quarters of the total travel.

(b) Shift test oscillator frequency to 5160 kilocycles, set dial pointer at 5160 kilocycles and adjust oscillator trimmer for maximum output. Set the trimmer at the first peak obtained while increasing the capacitance from "minimum" position.

(c) Check for the image signal at approximately 4240 kilocycles on dial (increasing the test oscillator output if necessary) in order to make certain that the oscillator trimmer is adjusted correctly in accordance with paragraph (b).

(d) Reset dial to 5160 kilocycles and reduce the capacitance of the first detector trimmer until signal disappears. (At this setting, the detector is tuned to the same frequency as the oscillator and the RCA-6A7 tube is blocked.) Now, increase the trimmer capacitance while rocking the tuning capacitor until maximum output is attained.

(e) Adjust the r-f amplifier trimmer for maximum output. It is not necessary to rock the tuning capacitor during this adjustment.

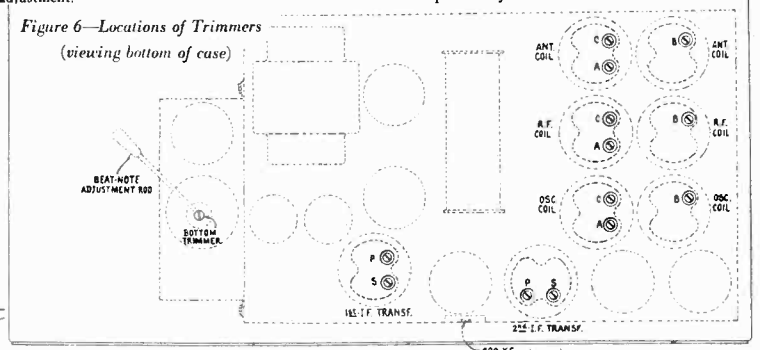
7. Set range switch at "C":

(a) Follow the same procedure as for band B (6) except use a test frequency of 18000 kilocycles and check for the image signal at 17,080 kilocycles.

During these adjustments, always leave the *sensitivity* and *volume* controls of the receiver at "maximum." To maintain a suitable output, reduce the test-oscillator input as necessary. In the high-frequency bands, it may be found necessary to disconnect the test oscillator and place it at an appreciable distance from the receiver.

Tuning Wand—This tool permits checking the accuracy of r-f alignment without disturbing any of the trimmer adjustment screws. It consists of a bakelite rod with a brass cylinder at one end and iron laminations at the other end. An opening is provided in the top surface of each shield in the r-f assembly (see Figure 7) for inserting the wand. Obviously, the inductance of any coil will be lowered when the brass end is inserted and will be raised upon insertion of the iron end. The trimmer setting is correct when the output at alignment frequencies is decreased alike by each end of the wand. If either end causes an increase in output, it is evident that the associated trimmer requires adjustment.

Figure 6—Locations of Trimmers (viewing bottom of case)



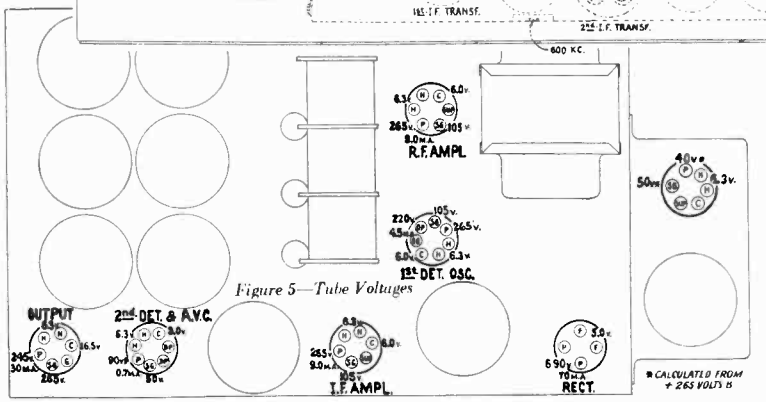


Figure 5—Tube Voltages

Circuit Description

Before attempting to align or otherwise adjust this receiver, it is advisable to form a general knowledge of the circuit arrangement. A schematic diagram of the complete circuit is shown in Figure 1 (frontispiece). Figure 2 illustrates the arrangement of wiring which interconnects the radio chassis, loudspeaker and front-panel controls while the wiring layout of the radio chassis independently is detailed in Figure 3.

A signal upon entering the receiver passes through a shielded lead to the antenna coupling transformer, the secondary of which is tuned by one section of the three-gang variable capacitor, and is thence impressed upon the grid of the r-f amplifier—a stage of pre-selection used primarily for reducing image-frequency interference to a negligible value. The output of this stage is transformer coupled to the grid circuit of the first detector which also is tuned to the signal frequency by the second unit of the gang capacitor.

As in all superheterodynes, the first detector is actually a mixer stage, combining the incoming r-f carrier with an unmodulated sinusoidal voltage produced by a local oscillator. The oscillator plate circuit, being tuned by the third section of the gang capacitor, maintains a constant frequency difference from the transmitted signal throughout the entire tuning range. Thus, a difference or *beat* frequency is developed when any signal is received which is the same at each position of exact resonance. In this receiver, the functions of the first detector and oscillator are performed by a single tube.

It should be noted at this point that the three tuning ranges are obtained through a coil-selector system in conjunction with the one three-gang variable capacitor. Three sets of coils, each set consisting of three coils, are employed and with each shift of the range switch, a different and complete coil set is substituted. In addition to selecting the desired coil set, other contacts are provided on the range switch to short-circuit the coil set for band A when operating in band B and the coil set for band B together with the oscillator coil for band A when operating in band C. This practice prevents the occurrence of "dead spots" in bands B and C because of absorption effects in coil sets A and B which (when untuned) have natural periods within the range of the next higher-frequency band.

The beat frequency set up in the first detector carries the same modulation as the original r-f signal and is commonly termed the *intermediate* frequency. Since this intermediate frequency is constant for all r-f carriers, the next (i-f amplifier) stage utilizes fixed tuning. Its grid circuit is coupled to the first detector through a transformer, both windings of which are tuned to the intermediate frequency (460 kilocycles) by means of independent adjustable capacitors. A similarly-tuned transformer is used to couple the output of this amplifier to the second detector, making a total of four capacitors for adjustment during alignment.

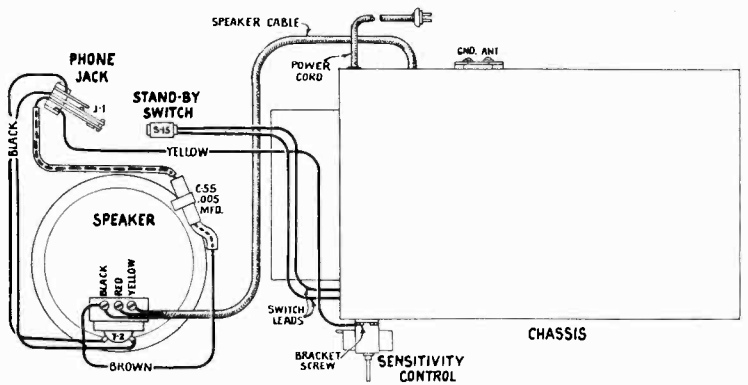


Figure 2—Assembly Wiring Diagram

The i-f signal generated by the beat oscillator for c-w reception also is applied to the input of the second detector. As mentioned in the foregoing section, the variable capacitor operated by the horizontal rod inside the case is actually a *vernier* control which permits adjustment of the oscillator output frequency over a very limited range on either side of the receiver intermediate frequency. The latter is connected in parallel with the main tuning capacitor for the oscillator stage—also a variable air-dielectric unit accessible for adjustment by means of a screwdriver through an opening in bottom of case. Both capacitors together with the oscillator tuning coil are contained inside a single shield.

In addition to detection, the succeeding stage also performs functions of automatic volume control and audio-frequency amplification. Diode detection is employed to avoid distortion and provide automatic volume control. The i-f signal is applied between the cathode and diode plate elements of the tube and the volume control, which is in series with this circuit, assumes a negative d-c potential of an amplitude that varies directly in accordance with the strength of the original r-f carrier. By returning this potential or portions thereof to the grids of the r-f amplifier, first detector and i-f amplifier, these tubes are biased in varying degree to compensate for fluctuations in field strength (fading) and for extreme changes of r-f input when tuning. The switch in this circuit permits elimination of the automatic volume control feature by removing all variable bias from the aforementioned tubes.

The audio-frequency component of the rectified signal is capacitance-coupled from the arm of the volume control to the grid of the pentode section wherein amplification occurs. Resistance coupling is used between this amplifier section and the power output stage which also is connected as a pentode for high-power sensitivity. The plate circuit of the output stage is matched to the cone coil of the electrodynamic loudspeaker through a step-down (output) transformer.

A tone control circuit consisting of a variable resistor and a fixed capacitor in series is connected across the primary of the output transformer. The sensitivity control is a variable resistor common to the cathode circuits of the r-f and i-f amplifiers for alteration of self-bias produced by the combined plate currents for those tubes.

All power voltages are obtained from a full-wave rectifier and filter system connected to the a-c line. The loudspeaker field coil is excited from this system and serves therein as a filter reactor.

A-C Line Voltages

As noted under Electrical Specifications in Part I, this receiver is manufactured in three a-c line ratings designated as A, B and C, respectively. The first two models (A and B) cover a single-voltage range (105 to 125 volts), whereas the third or "C" model is operable in either of four ranges (100 to 117, 117 to 130, 195 to 225 and 225 to 250), three taps being provided on the primary of the power transformer. Internal connections of the transformer are shown in Figure 4. All taps are brought out to a terminal board on the top of the transformer and may be interchanged without removing the chassis from its case.

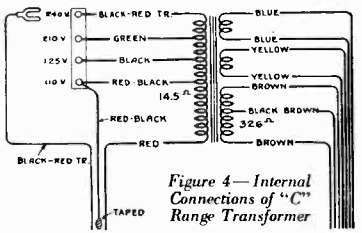


Figure 4—Internal Connections of "C" Range Transformer

Tube Voltages

The following voltages are normal at the tube sockets when the receiver is operating at 115 volts a-c line, with no incoming r-f signal, with the volume and sensitivity controls at "maximum" (both turned fully clockwise), and with the automatic volume control switch turned to the "on" position. Such voltages, of course, were measured with high-resistance meters. If low-resistance meters are used in checking, therefore, allowances must be made for meter-current drain. See Figure 5.

Radiotron Type Number	Cathode to Ground (Volts)	Screen Grid to Ground (Volts)	Plate to Ground (Volts)	Plate Current (M. A.)	Heater Volts
RCA-6D6 (R-F Amplifier)	6.0	105	265	9.0	6.3
RCA-6A7 (1st Detector)	6.0	105	265	3.5	6.3
RCA-6A7 (Oscillator)	—	—	220	4.5	6.3
RCA-6D6 (I-F Amplifier)	6.0	105	265	9.0	6.3
RCA-6D6 (Beat Oscillator)	—	50*	40*	—	6.3
RCA-6B7 (2nd Detector)	3.0	50	90*	0.7	6.3
RCA-41 (Output)	16.5	265	245	30.0	6.3
RCA-80 (Rectifier)	—	—	690 (r-m-s) Plate to Plate	70.0 Total	5.0

* Difficult to measure—Calculated from 265 Volts (+B).

RCA MFG. CO., INC.

MODELS 143,242,243
1935 Production
Schematic, Speakers

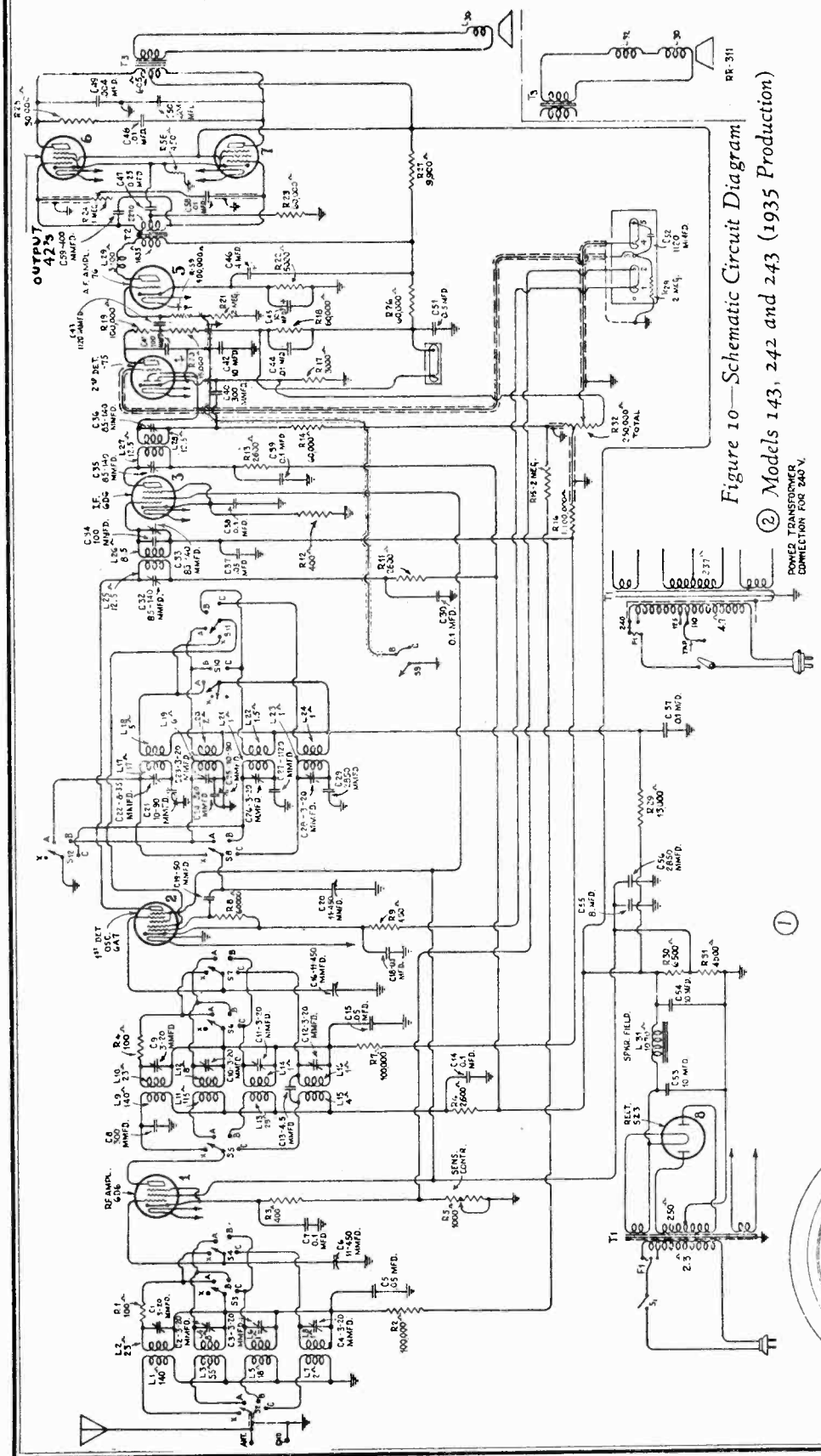


Figure 10—Schematic Circuit Diagram
② *Models 143, 242 and 243 (1935 Production)*

Figure 6—Console Loudspeaker Wiring—With Cable Plug

Figure 7—Table Loudspeaker Wiring—With Cable Plug

MODELS 143,242,243
1935 Production
Chassis Wiring

RCA MFG. CO., INC.

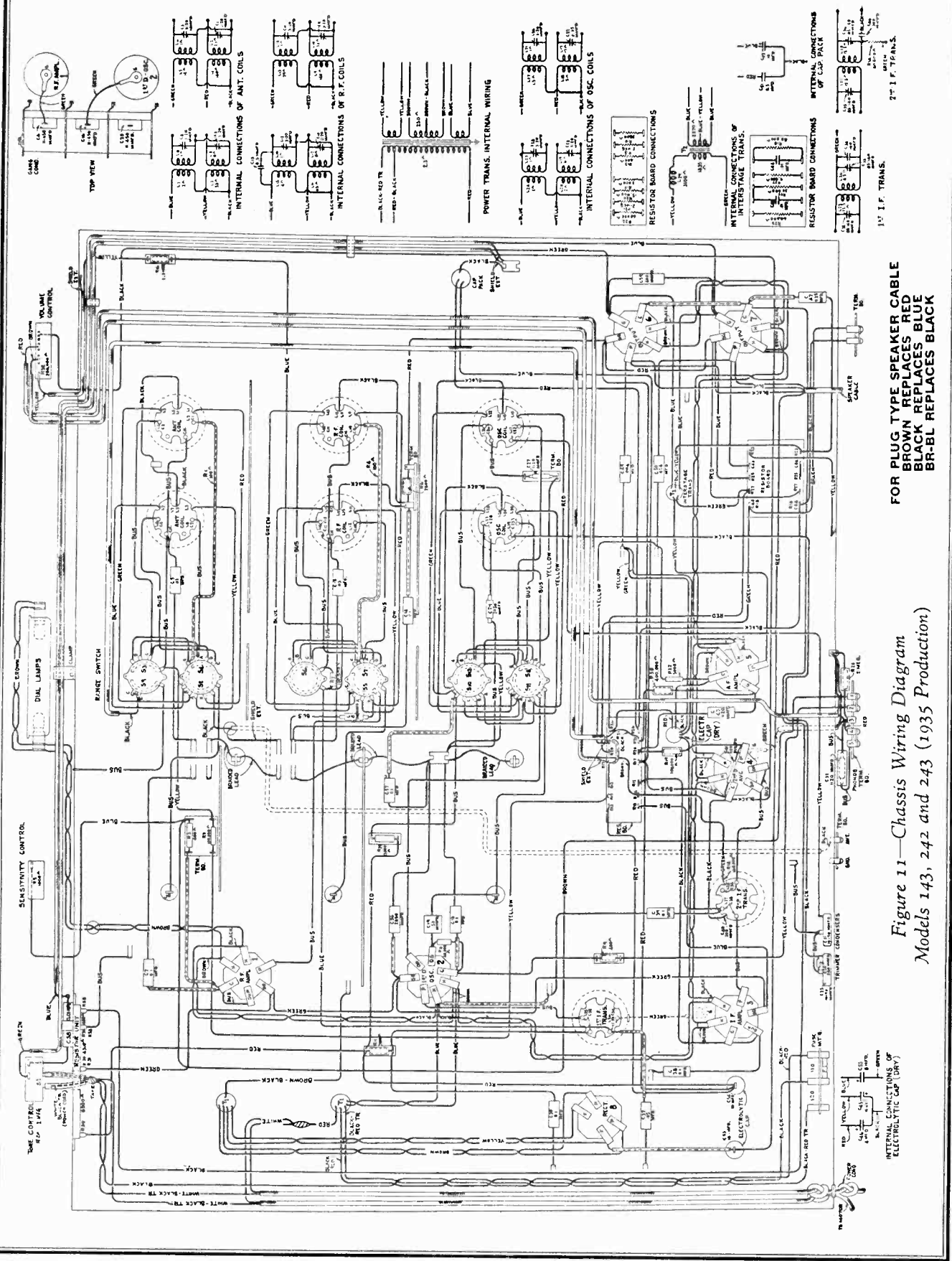


Figure 11—Chassis Wiring Diagram
Models 143, 242 and 243 (1935 Production)

REPLACEMENT PARTS—Models 143, 242 and 243 (1935 Production)

Stock No.	Description	List Price
	RECEIVER ASSEMBLIES	
4632	Board—Terminal board—Two terminals and link—For changing fidelity	$0.25
4379	Board—Antenna terminal board	.20
4427	Bracket—Volume control, tone control or noise suppressor mounting bracket	.18
4244	Cap—Contact cap—Package of 5	.20
3861	Capacitor — Oscillator trimmer capacitor (C21, C25)	.78
4633	Capacitor—50 mmfd. (C19)	.25
4635	Capacitor—100 mmfd. (C41)	.25
4248	Capacitor—300 mmfd. (C8)	.22
4811	Capacitor—340 mmfd. (C24)	.25
4183	Capacitor—400 mmfd. (C59)	.26
4412	Capacitor—1120 mmfd. (C27)	.25
4409	Capacitor—1120 mmfd. (C43)	.35
4634	Capacitor—1120 mmfd. (C52)	.35
4524	Capacitor—2850 mmfd. (C29)	.35
4615	Capacitor—2850 mmfd. (C56)	.34
4628	Capacitor—0.004 mfd. (C49, C50)	.28
3787	Capacitor—0.01 mfd. (C48)	30
4212	Capacitor—0.01 mfd. (C44)	.30
4624	Capacitor—0.01 mfd. (C58)	.54
4836	Capacitor—0.05 mfd. (C5, C15, C37)	.30
4791	Capacitor—0.1 mfd. (C7, C18, C38)	.24
4885	Capacitor—0.1 mfd. (C14, C30, C39, C57)	.28
4840	Capacitor—0.25 mfd. (C47)	.30
7790	Capacitor—10 mfd. (C53, C54)	1.05
4619	Capacitor pack—Comprising one 0.5 mfd., one 10 mfd. capacitor (C42, C51)	1.44
4626	Capacitor pack—Comprising one 4 mfd., one 10 mfd. and one 8 mfd. capacitor (C45, C46, C55)	2.82
4358	Clamp—Electrolytic capacitor clamp—For capacitor Stock No. 7790	.15
4693	Clamp—Electrolytic capacitor clamp—For capacitor Stock No. 4626	.15
7810	Coil—Antenna coil "Band B-X" (L1, L2, L5, L6, C1, C3)	2.10
7803	Coil—Antenna coil "Band A-C" (L3, L4, L7, L8, C2, C4)	1.82
7808	Coil—Detector coil "Band X-B" (L9, L10, L13, L14, C9, C11)	2.05
7805	Coil—Detector coil "Band A-C" (L11, L12, L15, L16, C10, C12, C13)	2.15
7807	Coil—Oscillator coil "Band A-C" (L19, L20, L23, L24, C23, C28)	1.62
7809	Coil—Oscillator coil "Band X-B" (L17, L18, L21, L22, C22, C26)	$1.70
4806	Condenser—3-gang variable tuning condenser (C6, C16, C20)	5.64
4371	Cover—Fuse mount cover	.15
4631	Cover—Terminal strip cover	.15
10907	Fuse—3-ampere—Package of 5	.40
3376	Mount — Fuse mount — 105–125-volt instrument	.40
4604	Mount—Fuse mount for 200–250-volt instrument	.35
4625	Resistor—Wire wound resistor—Comprising one 6500-ohm–4500-ohm and 450 section (R30, R31, R58)	.70
3704	Resistor—400 ohms—Carbon type—¼ watt (R3, R9, R12)—Package of 5	1.00
4812	Resistor — 2600 ohms — Carbon type — ¼ watt (R6, R11, R13)—Package of 5	1.00
4242	Resistor — 3000 ohms — Carbon type — ¼ watt (R17)—Package of 5	1.00
2871	Resistor — 5000 ohms — Carbon type — ¼ watt (R22)—Package of 5	1.00
3998	Resistor—15,000 ohms—Carbon type—¼ watt (R20)—Package of 5	1.00
3602	Resistor—60,000 ohms—Carbon type—¼ watt (R8, R18, R23, R26)—Package of 5	1.00
3118	Resistor—100,000 ohms—Carbon type—¼ watt (R2, R7, R19)—Package of 5	1.00
3619	Resistor—400,000 ohms—Carbon type—¼ watt (R59)—Package of 5	1.00
4783	Resistor—1,100,000 ohms—Carbon type—¼ watt (R16)—Package of 5	1.00
6242	Resistor — 2 megohms — Carbon type — ¼ watt (R15, R21, R28)—Package of 5	1.00
3078	Resistor—10,000 ohms—Carbon type—½ watt (R27)—Package of 5	1.00
4623	Resistor—13,000 ohms—Carbon type—½ watt (R29)—Package of 10	2.00
2240	Resistor—30,000 ohms—Carbon type—1 watt (R25)	.22
4418	Resistor—100 ohms—Flexible type (R1, R4)—Package of 10	1.50
4618	Rheostat—Sensitivity control (R5)	1.25
4742	Shield—Antenna, detector or oscillator coil shield	.40
4627	Shield—First detector—Oscillator Radiotron shield	.36
6956	Shield—First detector—Oscillator Radiotron shield top	.15
4452	Shield—Second detector—"A.V.C." Radiotron shield	.35
4629	Shield—Second detector—"A.V.C." Radiotron shield top	.15
3950	Shield—I. F. amplifier Radiotron shield	$0.26
4521	Shield—I. F. amplifier shield	.42
4663	Shield—Oscillator coil wiring shield—Shields oscillator coil wiring from R. F. coil—Complete with terminal board, clamp and resistor	.32
4664	Shield—Oscillator wiring shield—Shields oscillator coil wiring from R. F. coil—Complete with terminal strip and resistor	.36
4630	Shield—R. F. amplifier—Radiotron shield	.36
4665	Shield—R. F. coil wiring shield with two resistors and terminal board	.50
3529	Socket—Dial lamp socket	.32
4784	Socket—4-contact Radiotron socket	.15
4814	Socket—5-contact Radiotron socket	.15
4786	Socket—6-contact Radiotron socket	.15
4787	Socket—7-contact Radiotron socket	.15
4617	Switch—Range switch (S2, S3, S4, S5, S6, S7, S8, S9, S10, S11, S12)	3.32
4813	Tone control (R24, S1)	1.42
4431	Transformer—First intermediate frequency transformer (L25, L26, C32, C33, C34)	2.28
9505	Transformer—Power transformer—105–125 volts—50–60 cycles (T1)	6.35
9506	Transformer—Power transformer—105–125 volts—25–40 cycles	8.90
9507	Transformer—Power transformer—105–250 volts—40–60 cycles	6.40
4433	Transformer—Second intermediate frequency transformer (L27, L28, C35, C36, C40, R14)	2.15
4620	Transformer and reactor—Interstage transformer and reactor (T2, L29)	2.98
4309	Volume control (R32)	1.45
	DRIVE ASSEMBLIES	
4362	Arm—Band indicator operating arm	.28
10194	Ball—Steel ball for variable condenser drive assembly—Package of 20	.25
4422	Clutch—Tuning condenser drive clutch assembly—Comprising drive shaft, balls, ring, spring and washers assembled	1.00
7799	Drive—Variable tuning condenser drive complete	2.45
4827	Gear—Spring gear assembly complete with hub, pinion, gear, cover and spring	1.25
4704	Indicator—Band indicator—Celluloid	.12
4367	Indicator—Station selector vernier pointer—Small	.15
4520	Indicator—Station selector main pointer—Large	.18
3943	Screen—Translucent screen for dial light—Package of 2	.18
3993	Screw—No. 6–32–5/32" square head set screw for band indicator operating arm or condenser drive—Package of 10	.25
4377	Spring — Band indicator and arm tension spring—Package of 5	$0.25
4722	Pinion — Vernier pointer pinion — Station selector pointer stem	.18
4378	Stud—Band indicator operating arm stud—Package of 5	.25
	REPRODUCER ASSEMBLY (TABLE MODEL)	
5038	Cable—4-conductor—Reproducer cable with female connector plug	.60
9534	Coil—Field coil (L31)	1.90
9533	Cone—Cone mounted and centered on housing (L30)	3.50
5039	Connector—4-prong male connector for reproducer cable	.25
5040	Connector—4-contact female connector for reproducer cable	.25
9593	Reproducer complete	7.50
9535	Transformer—Output transformer (T3)	1.50
	REPRODUCER ASSEMBLY (CONSOLE MODEL)	
5038	Cable—4-conductor—Reproducer cable with female connector plug	.60
9591	Coil—Field coil magnet and cone support (L31)	4.00
8969	Cone—Reproducer cone (L30)—Package of 5	6.35
5039	Connector—4-prong male connector for reproducer cable	.25
5040	Connector—4-contact female connector for reproducer cable	.25
9592	Reproducer complete	8.00
5041	Transformer—Output transformer (T3)	1.40
	MISCELLANEOUS PARTS	
4677	Bezel—Metal bezel (escutcheon) for station selector dial*	.56
4621	Dial—Station selector dial	.65
4895	Escutcheon—Station selector escutcheon and celluloid crystal*	.55
6614	Glass—Station selector dial glass*	.30
4449	Knob—Station selector, volume control, tone control, noise suppressor rheostat on range switch knob—Package of 5	.60
4340	Lamp—Dial lamp—Package of 5	.60
4678	Ring—Retaining ring for dial glass—Package of 5*	.35
4446	Screw assembly—Chassis mounting screw assembly—Comprising four screws, four lockwashers, four washers, four spacers and eight cushions—For table model	.28
4613	Screw—No. 8–32–7/16" headless set screw for knobs—Package of 10	.25

* Used on some models

S. O. 765208 11M

SERVICE DATA

(1) Line-Up Capacitor Adjustments

To properly align this receiver, it is essential that a modulated R. F. oscillator of suitable frequency range such as Stock No. 9050, an output indicator, Stock No. 4317, and an alignment tool, Stock No. 4160, be available. Figure 4 shows the location of the various line-up capacitors.

I. F. Tuning Adjustments

The I. F. amplifier comprises two stages which have three transformers. The third transformer is untuned so that only a total of four tuned circuits are used. Refer to Figure 4 and proceed as follows:

(a) Short-circuit the antenna and ground terminals and tune the receiver so that no signal is heard. Set the volume control at maximum and connect a ground to the ground terminal.

(b) Connect the test oscillator output between the first detector control grid and chassis ground. Connect the output indicator across the voice coil of the loudspeaker and adjust the oscillator output so that, with the receiver volume control at maximum, a slight glow is obtained in the output indicator.

(c) Adjust the secondary and primary of the first and then the second I. F. transformers until a maximum deflection is obtained. The third transformer is untuned and does not require adjusting. Keep the oscillator output at a low value so that only a slight glow is obtained in the output indicator at all times. Go over these adjustments a second time, as there is a slight interlocking of adjustments. This completes the I. F. alignment.

R. F. and Oscillator Adjustments

The important points to remember are the need for using the minimum oscillator output to obtain an indication in the output device with the volume control at its maximum position and the manner of obtaining the proper high-frequency oscillator and detector adjustments.

The R. F. line-up capacitors are located at the bottom of the coil assemblies instead of their usual position on the gang capacitor. They are all accessible from the bottom of the chassis except the 600 K. C. series capacitor, which is accessible from the top of the chassis. Proceed as follows:

(a) Connect the output of the oscillator to the antenna and ground terminals of the receiver. Check the position of the dial pointer when the tuning capacitor plates are fully meshed. It should be coincident with the radial line adjacent to the dial reading of 540

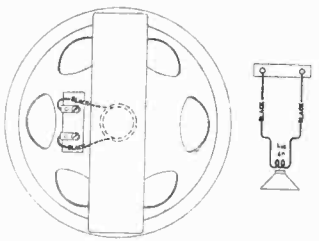


Figure 3—Loudspeaker Wiring

(b) Then set the Test Oscillator at 1720 K. C., the dial pointer at 1720, and adjust the oscillator output so that a slight glow will be obtained in the output indicator when the volume control is at its maximum position. Adjust the two trimmers under the two R. F. coils, see Figure 4, until a maximum output is obtained. Then shift the Test Oscillator frequency to 600 K. C. The trimmer capacitor, accessible from the top of the chassis, should now be adjusted for maximum output while rocking the main tuning capacitor back and forth through the signal. Then repeat the 1720 K. C. adjustment.

(2) Voltage and Current Measurements

Voltage and current values listed in the following table and indicated at the Radiotron socket contacts on Figure 4 form a reference basis for test of the receiver. It is to be noted that all voltages are given with respect to chassis-ground, excepting those appearing across the filaments (F-F). The values shown are obtainable when the receiver is in normal operating condition. They do not take into account inaccuracies caused by current consumed in the voltmeter used for the tests; the lower the voltmeter resistance, the lower the degree of accuracy. Allowances must therefore be made, dependent upon the type of test instrument used, for the loading effect of the voltmeter on the circuit

REPLACEMENT PARTS

Stock No.	Description	List Price
	RECEIVER ASSEMBLIES	
2747	Cap—Contact cap—Package of 5	$0.50
4498	Capacitor—8 mfd. (C18)	1.25
4442	Capacitor—50 mmfd. (C10)	.22
3981	Capacitor—300 mmfd. (C25)	.30
4413	Capacitor—360 mmfd. (C16)	.22
2749	Capacitor—2400 mmfd. (C26)	.35
4801	Capacitor—2400 mmfd. (C31, C32)	.50
4529	Capacitor—2650 mmfd. (C33)	.32
4858	Capacitor—0.01 mfd. (C29)	.25
4518	Capacitor—0.05 mfd. (C27)	.52
4836	Capacitor—0.05 mfd. (C5, C19, C23, C24)	.30
4906	Capacitor—0.017 mfd. (C30)	.25
4791	Capacitor—0.1 mfd. (C8, C28)	.24
4840	Capacitor—0.25 mfd. (C7)	.30
3861	Capacitor — Adjustable trimmer capacitor (C17)	.78
4796	Coil—Antenna coil (L4, L5, R1, C4)	2.30
4800	Coil—Oscillator coil (L8, L9, C35)	1.90
4504	Condenser—2-gang variable tuning condenser (C6, C9)	2.78
4370	Resistor—1,000 ohms—Carbon type—½ watt—Package of 10 (R5)	2.00
3602	Resistor—60,000 ohms—Carbon type—¼ watt (R2, R7)—Package of 5	1.00
3118	Resistor—100,000 ohms—Carbon type—¼ watt (R1, R4, R6)—Package of 5	1.00
3744	Resistor—250,000 ohms—Carbon type—¼ watt (R11, R12)—Package of 5	1.00
6186	Resistor—500,000 ohms—Carbon type—¼ watt (R13)—Package of 5	1.00
6242	Resistor — 2 megohms — Carbon type — ¼ watt (R8, R10)—Package of 5	1.00
4521	Shield—Antenna, oscillator or I. F. transformer shield	.42
7487	Shield—Second detector Radiotron shield—"AVC"	.25
3942	Shield—First detector and oscillator Radiotron shield	.18
3056	Shield—First I. F., second I. F., first audio Radiotron shield—Package of 2	.40
4794	Socket—4-contact Radiotron socket	.15
4784	Socket—4-contact audio amplifier—Radiotron socket	.15
4786	Socket—6-contact detector-oscillator Radiotron socket	.15
4785	Socket—6-contact output Radiotron socket	.15
4799	Switch—Tone control switch (S3)	.62
4431	Transformer—First intermediate transformer (L10, L11, C13, C14, C15)	2.28
7840	Transformer — Second intermediate transformer (L12, L13, C20, C21, C22)	2.35
4538	Transformer—Third intermediate frequency transformer (L14, L15)	$2.15
4533	Transformer pack—Audio transformer pack—Comprising driver and output transformer (T1, T2)	3.98
4535	Volume control (R9)	1.40
	REPRODUCER ASSEMBLIES	
4541	Cable—2-conductor reproducer cable	.38
9432	Cone—Reproducer cone (L16)	1.88
7820	Magnet—Cone housing and magnet assembly	8.98
7819	Reproducer complete	12.18
4234	Rivet—Cone mounting rivet—Package of 100	.66
	DRIVE ASSEMBLY	
4996	Dial—Station selector dial	.75
4798	Drive—Variable tuning condenser drive assembly complete	1.50
4363	Pointer—Station selector pointer	.18
4669	Screw—No. 8–32–5/32 square head set screw for condenser drive—Package of 10	.25
4997	Shaft—Condenser drive shaft	.28
	MISCELLANEOUS ASSEMBLIES	
4895	Bezel—Metal bezel (escutcheon) and crystal for station selector drive	.55
4289	Body—Fuse connector body—Package of 10	.35
7867	Cable—8-conductor battery cable complete	.78
4288	Cap—Fuse connector cap—Package of 10	.36
6516	Connector—Fuse connector complete	.16
4286	Ferrule—Fuse connector ferrule and bushing—Package of 10	.38
3748	Fuse—0.5 ampere—Package of 5	.40
4290	Insulator—Fuse connector insulator—Package of 10	.35
4449	Knob—Station selector, volume control, tone or battery switch knob—Package of 5	.60
4644	Resistor—0.38 ohms—Flexible type—Filament series (R15)—Package of 5	.80
4638	Screw—Chassis mounting screw assembly—Comprising eight cushions, four screws, four washers, four lockwashers and four spacers	.52
3238	Screw—6–40–1⅛" knurled head—Set screw for operating switch knob No. 3088—Package of 10	.25
4613	Screw—8–32–7/16" headless set screw for station selector volume control, tone control or range switch knob—Package of 10	.25
4284	Spring—Fuse connector spring—Package of 10	.30
4797	Switch—Operating switch	1.50
4285	Washer—Fuse connector insulating washer—Package of 10	.22

RCA MFG. CO., INC.

MODEL 236-B
Schematic, Voltage
Trimmers, Socket

Figure 1—Schematic Circuit Diagram

Total "A" Battery Current.....0.68 Ampere
Maximum "B" Battery Current .....21 M. A.
Tuning Range.....540 K. C.-1720 K. C.
Maximum Undistorted Output .....1.2 Watts
Maximum Output.....2.2 Watts
Line-up Frequencies 460 K. C., 600 K. C. and 1720 K. C.

Figure 2—Line-Up Capacitor Locations and Voltage Values at Socket Contacts

MODEL 236-B
Chassis Wiring

RCA MFG. CO., INC.

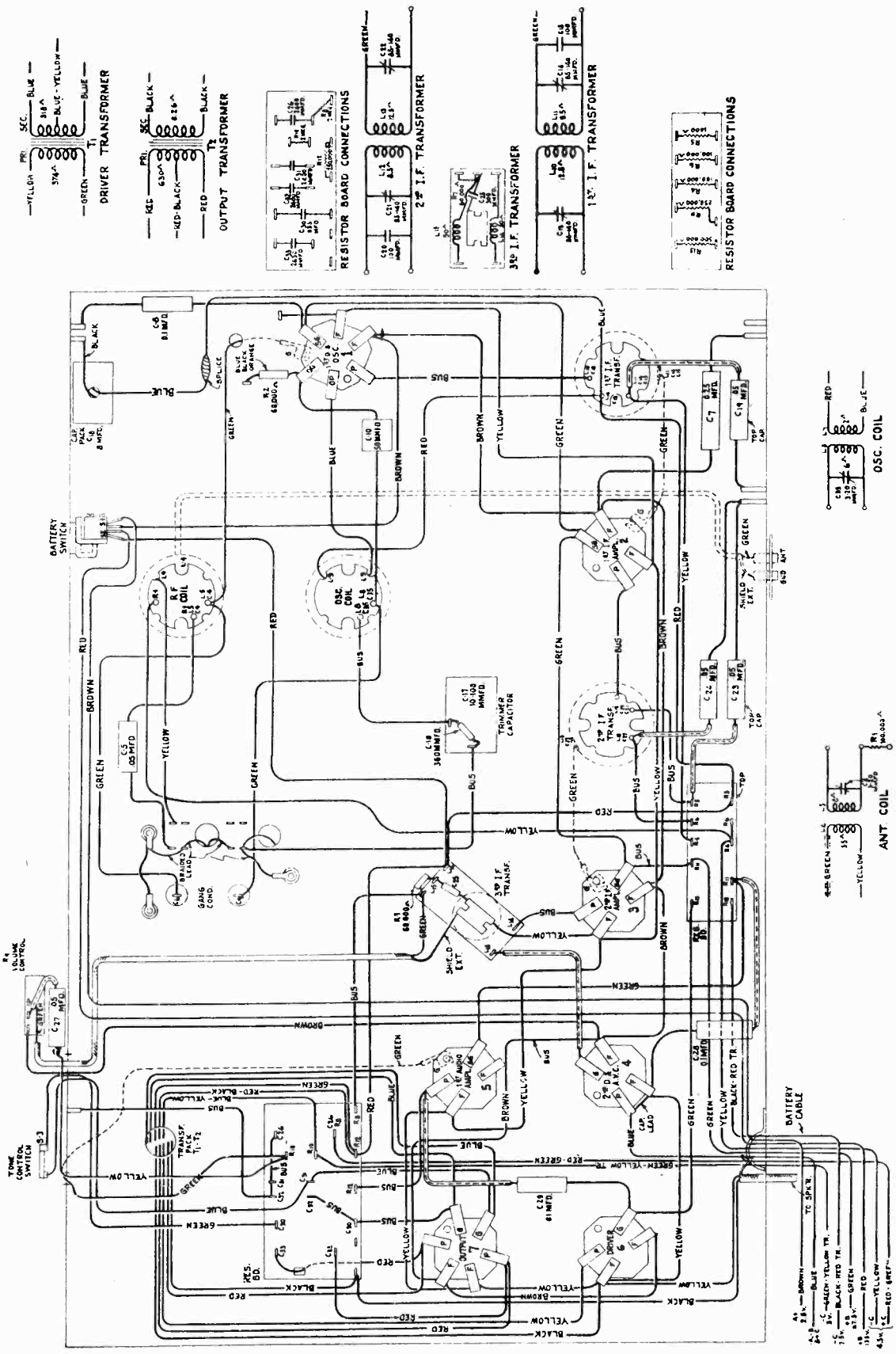
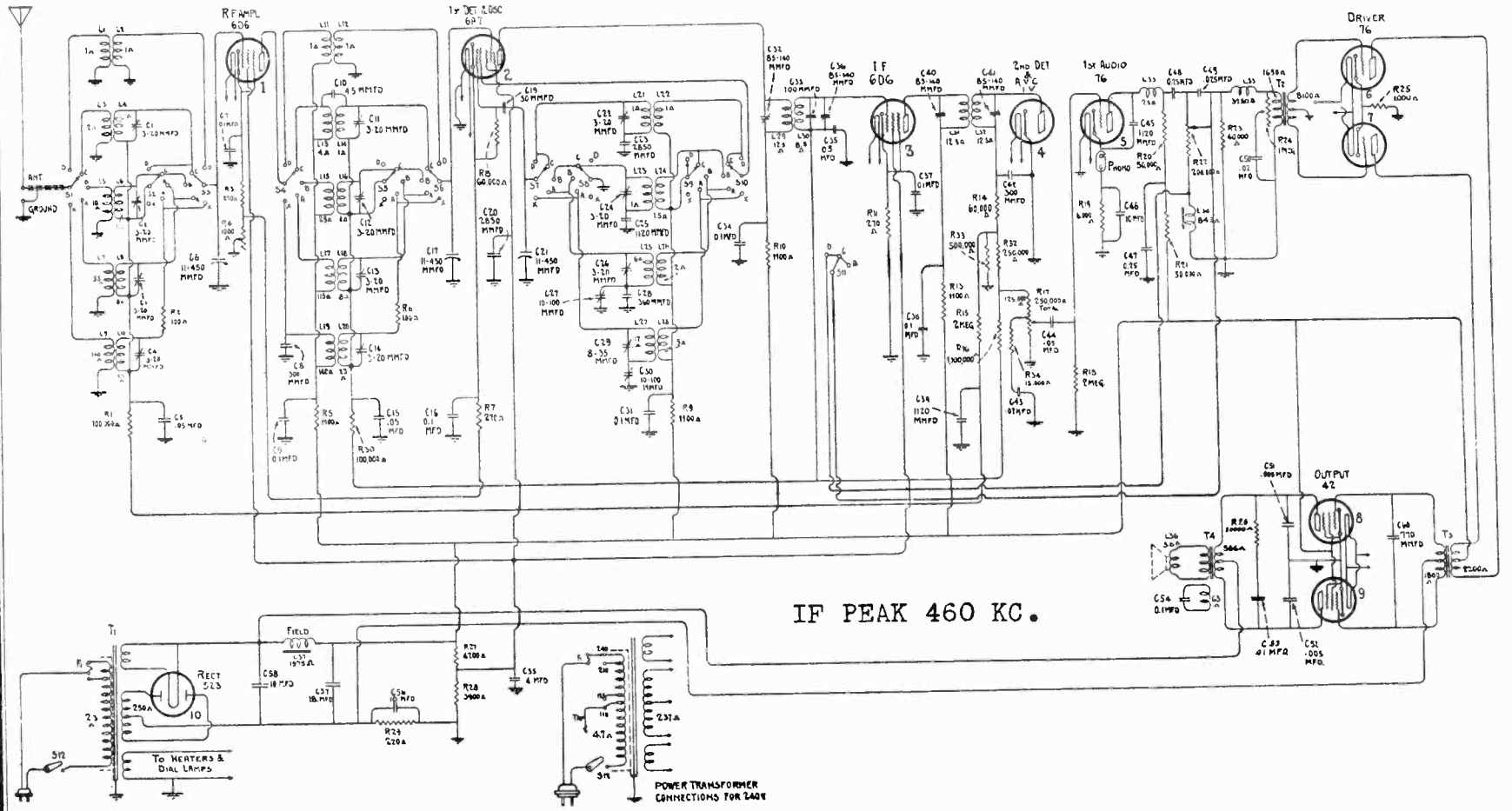


Figure 2—Chassis Wiring Diagram

SUPPLEMENT
to
RCA VICTOR MODEL 262 SERVICE NOTES

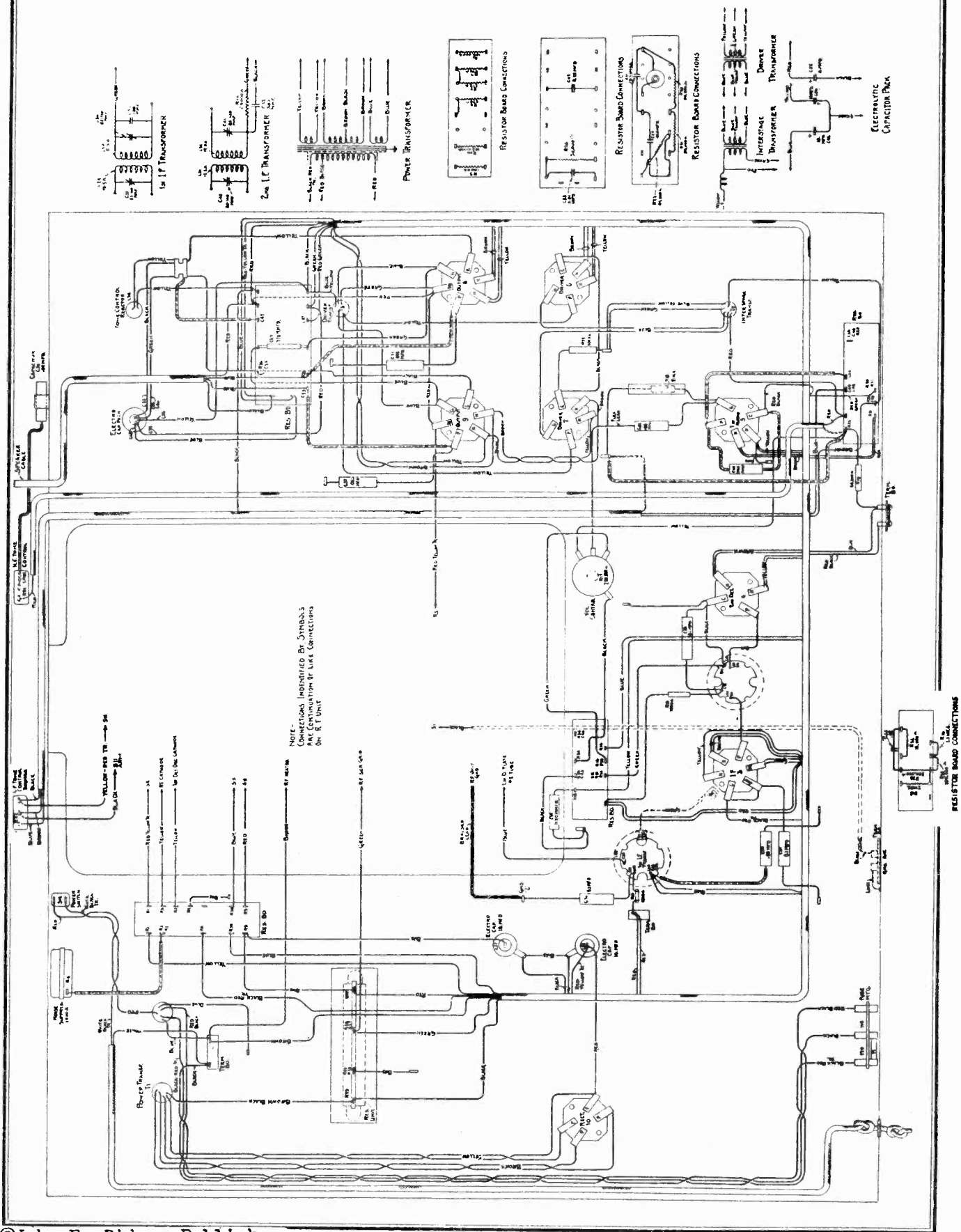
Late production of the RCA Victor Model 262 uses Radiotron RCA-1-V as the second detector instead of Radiotron RCA-76. The changes in the schematic and chassis wiring diagrams are shown on this and the reverse page.



Schematic Circuit Diagram

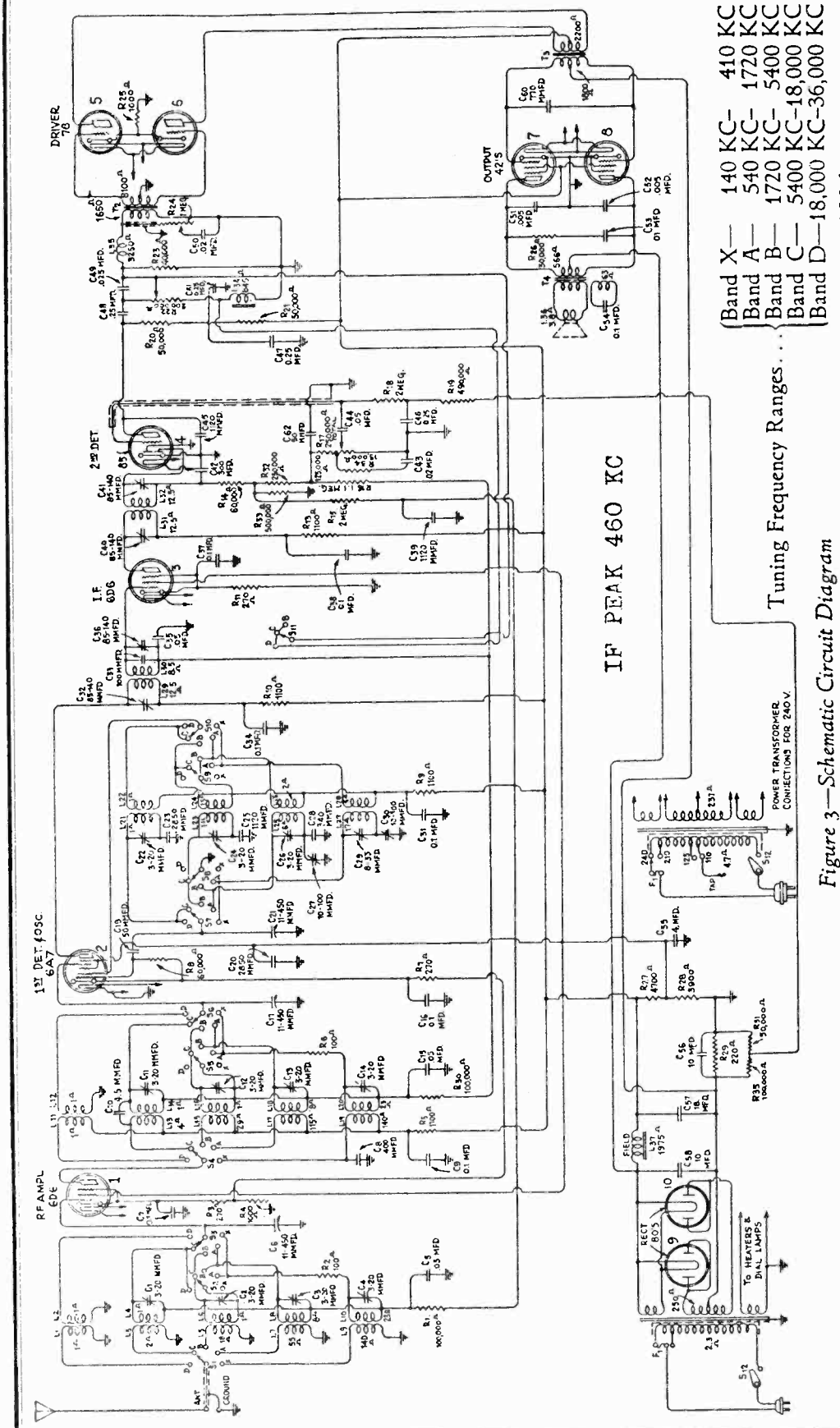
MODEL 262
Late Production
Chassis Wiring

RCA MFG. CO., INC.



RCA MFG. CO., INC.

MODELS 262,263
1935 Production
Schematic



Band X— 140 KC– 410 KC
Band A— 540 KC– 1720 KC
Band B— 1720 KC– 5400 KC
Band C— 5400 KC–18,000 KC
Band D—18,000 KC–36,000 KC

Tuning Frequency Ranges . . .

Figure 3—Schematic Circuit Diagram

Voltage Ratings . . . . . 105–125 Volts
Frequency Ratings . . . . . 25–60 Cycles and 50–60 Cycles
Power Consumption . . . . . 130 Watts at 125 Volts, 50 Cycles; 130 Watts at 125 Volts, 25 Cycles
Number and Type of Radiotrons
2 RCA-6D6, 1 RCA-6A7, 2 RCA-76, 1 RCA-85, 2 RCA-42, 2 RCA-80—Total, 10

Line-up Frequencies . . . . . 175 KC, 410 KC, 460 KC, 600 KC, 1720 KC, 5160 KC, and 18,000 KC
Maximum Undistorted Output . . . . . 7 Watts
Maximum Output . . . . . 14 Watts

MODELS 262,263
1935 Production
R-F. Unit Wiring Diagram
Speaker Data

RCA MFG. CO., INC.

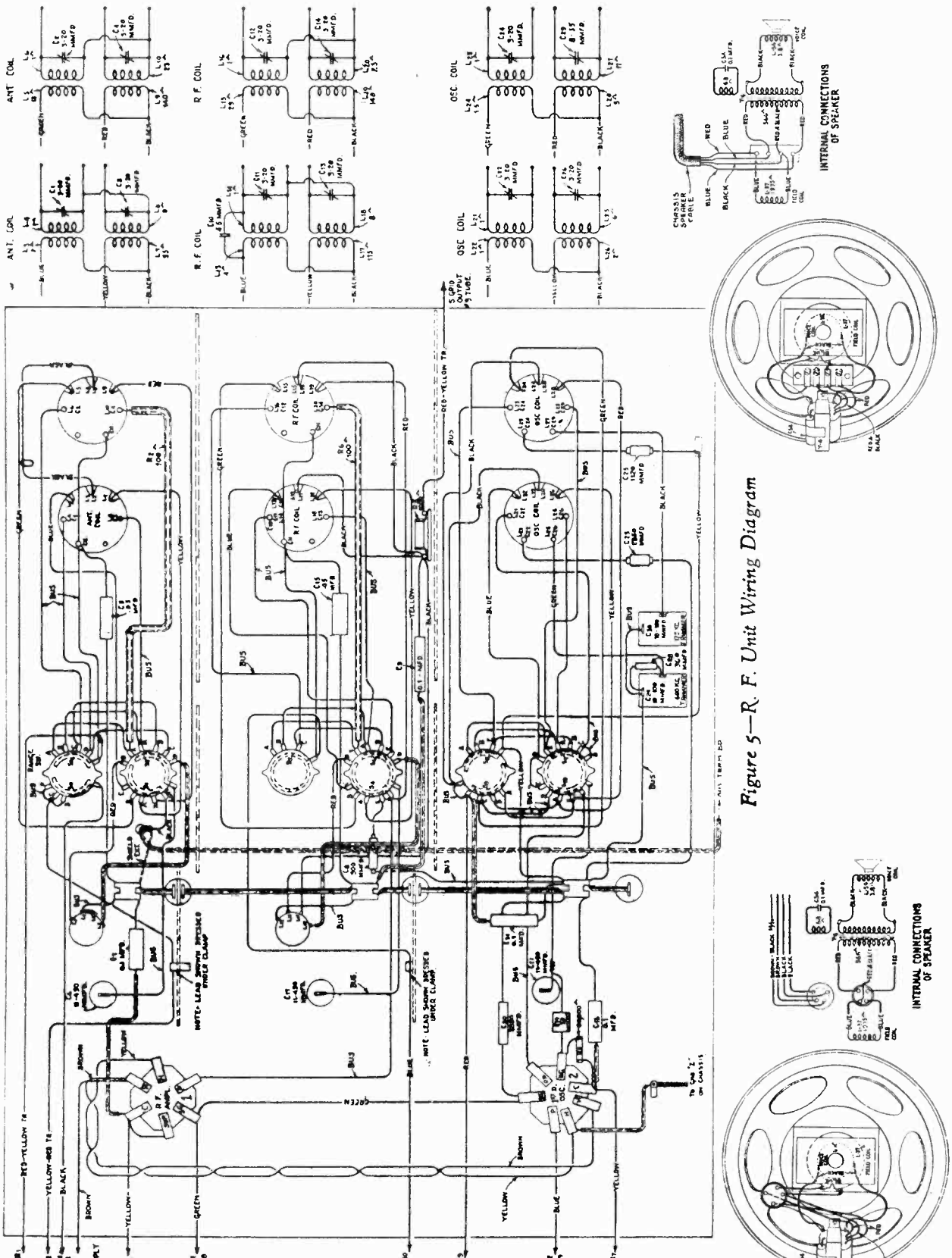


Figure 5—R. F. Unit Wiring Diagram

Figure 1—Loudspeaker Wiring—Without Plug

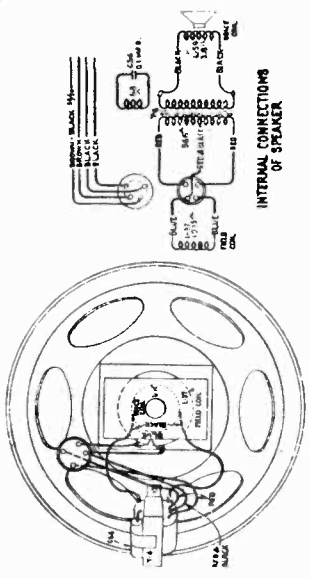
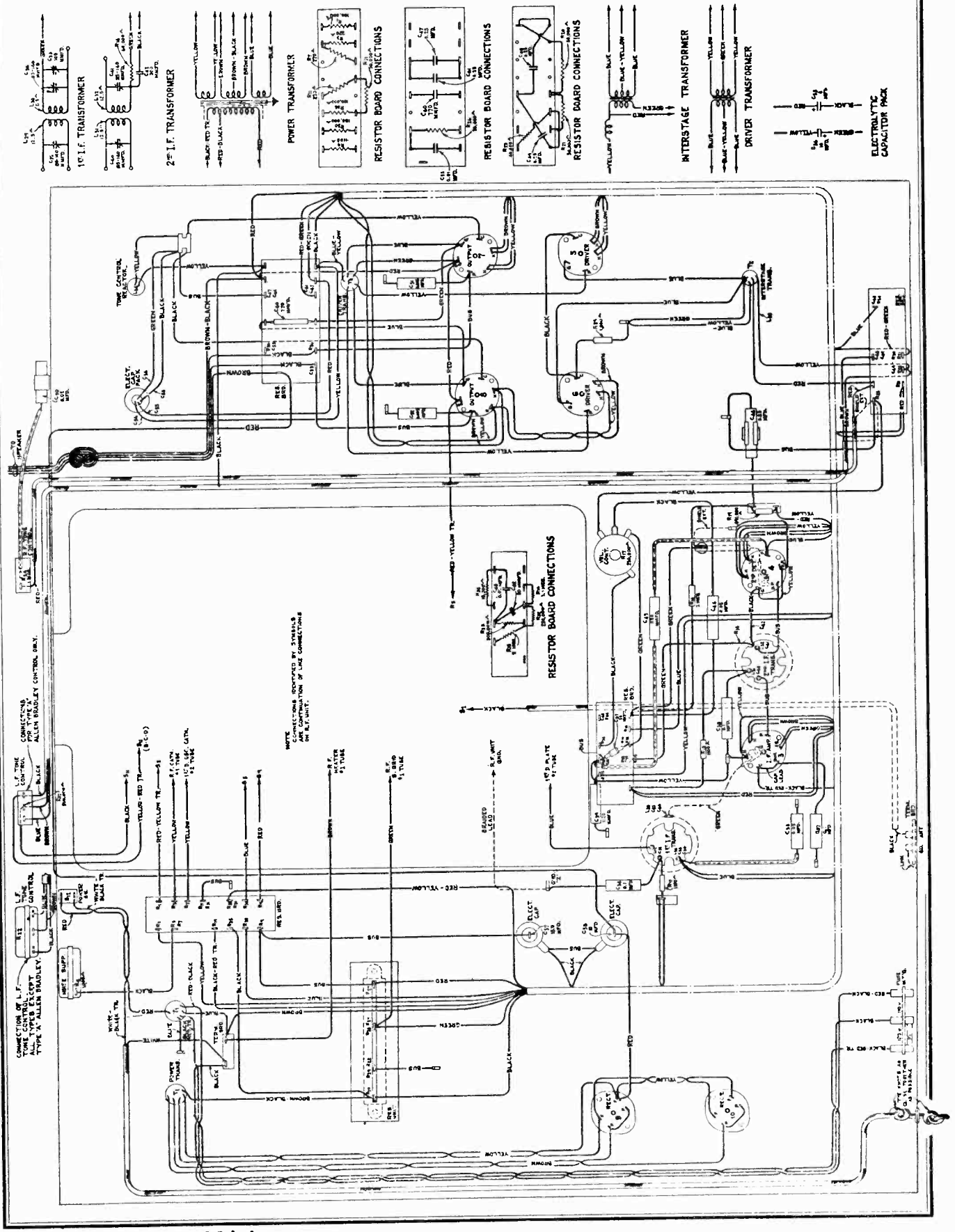


Figure 2—Loudspeaker Wiring for Plug-In Type

RCA MFG. CO., INC.

MODELS 262,263
1935 Production
Chassis Wiring



MODELS 262,263
1935 Production
Socket,Voltage

RCA MFG. CO., INC.

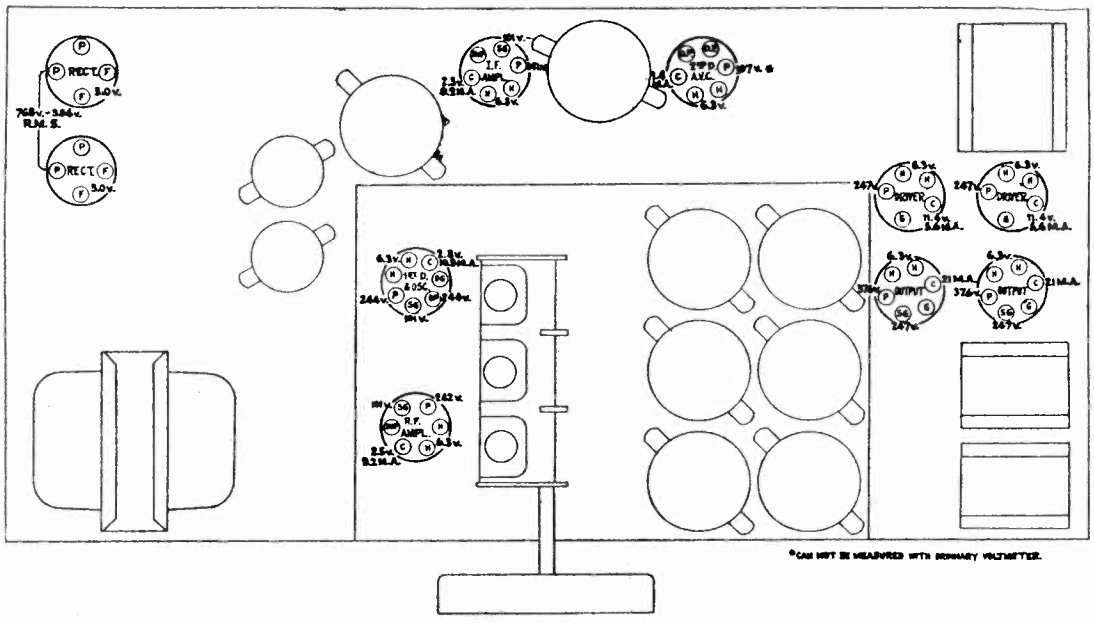


Figure 8—Radiotron Socket Voltages

RADIOTRON SOCKET VOLTAGES

120-Volt A. C. Input—Volume and Sensitivity Controls Maximum—Band Switch at "A"—No Signal

Radiotron Type and Purpose		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.
RCA-6D6—R. F.		2.5	101	242	9.2	6.3
RCA-6A7	Detector	2.8	101	244	10.9	6.3
	Oscillator	—	—	244		
RCA-6D6—I. F.		2.5	101	242	9.2	6.3
RCA-85—2nd Det. AVC		0	—	107*	1.4	6.3
RCA-76—Driver		11.4	—	247	5.6	6.3
RCA-76—Driver		11.4	—	247	5.6	6.3
RCA-42—Power		0	247	376	21.0	6.3
RCA-42—Power		0	247	376	21.0	6.3
RCA-80—Rectifier		—	—	768/384 R. M. S.	56.0	5.0
RCA-80—Rectifier		—	—		56.0	5.0

*Cannot be measured with ordinary voltmeter.

SERVICE DATA

(1) LINE-UP PROCEDURE

The line-up procedure for these receivers is somewhat involved and it is important that these instructions be carefully followed when making adjustments. Properly aligned, they have outstanding performance, otherwise, poor reception may be experienced.

Equipment

To align this receiver, proper test equipment must be used. This consists of a modulated R. F. oscillator having proper frequency range, an output indicator, an alignment tool and a tuning wand. These parts have been developed by the manufacturer of this receiver for use by service men to duplicate the original factory adjustments.

Checking with Tuning Wand

Before making any R. F., oscillator or first detector adjustments, the accuracy of the present adjustments may be checked by means of the tuning wand (Stock No. 6679). The tuning wand consists of a bakelite rod having a brass cylinder at one end and a special finely divided iron insert at the other end. Inserting the cylinder into the center of a coil lowers its inductance, while inserting the iron end increases its inductance. From this, it is seen that unless the trimmer adjustment for a particular coil is correctly adjusted, inserting one end of the wand may increase the output of a particular signal. A perfect adjustment is evidenced by a lowering of output when either end of the wand is inserted into a coil.

The shields over the R. F. coil assembly have a hole at their top for entrance of the tuning wand. The location of the various coils inside of the shield is shown in Figure 6. An example of the proper manner of using the tuning wand would be to assume the external oscillator were set at 1720 KC and the signal tuned in. The output indicator should be connected across the voice coil of the loudspeaker. Then insert the tuning wand, first one end and then the other end, into the top of the three transformers at the left of the R. F. assembly, facing the front of the chassis. A perfect adjustment of the trimmer would be evidenced by a reduction in output when either end of the wand is inserted in each of the three transformers. If one end—for example, the iron end—when inserted in one coil caused an increase in output, then that circuit is out of alignment. An increase in the trimmer capacitance would be the proper remedy.

(2) I. F. TUNING CAPACITOR ADJUSTMENTS

There is one I. F. stage, with two I. F. transformers in the receiver. A total of four adjustable capacitors are used, two on each transformer. The transformers are both peaked at 460 KC.

A detailed procedure for making this adjustment follows:

(a) Connect the output of an external oscillator tuned to 460 KC between the first detector grid and ground. Connect the output indicator across the voice coil of the loudspeaker.

(b) Place the oscillator in operation at 460 KC. Place the receiver in operation and adjust the station selector until a point is reached (Band A) where no signals are heard and turn the volume control to its maximum position. Reduce the oscillator input until a slight indication is obtained in the output indicator.

(c) Refer to Figure 7. Adjust each trimmer of the I. F. transformers until a maximum output is obtained. Go over the adjustments a second time.

This completes the I. F. adjustments. However, it is good practice to follow the I. F. adjustments with the R. F. and oscillator adjustments due to interlocking which always occurs.

(3) R. F. OSCILLATOR AND FIRST DETECTOR ADJUSTMENTS

Four R. F., oscillator and first detector adjustments are required in Bands "A" and "X." Three are required in Bands "B" and "C." None are required in Band "D."

To properly align the various bands, each band must be aligned individually. The preliminary set-up requires the external oscillator to be connected between the antenna and ground terminals of the receiver and the output indicator across the voice coil of the loudspeaker. The volume control must be at its maximum position and the input from the oscillator must be at the minimum value possible to get an output indication under these conditions. In the high-frequency bands, it may be necessary to disconnect the oscillator from the receiver and place it at a distance in order to get a sufficiently low input to the receiver.

The dial pointer must be properly set before starting any actual adjustments. This is done by turning the variable capacitor until it is at its maximum capacity position. One end of the pointer should be toward the horizontal line at the lowest frequency end of Band "A," while the other end should point to within 1/64 inch of the horizontal line at the highest frequency end of band "A."

Figure 7 shows the location of the trimmers for each band. Care must be exercised to only adjust the trimmers in the band under test.

Band "X"

(a) Set the band switch at "X."

(b) Tune the external oscillator to 410 KC, set the pointer at 410 KC and adjust the oscillator, detector and R. F. trimmers for maximum output.

(c) Shift the external oscillator to 175 KC. Tune in the 175 KC signal irrespective of scale calibration and adjust the series trimmer marked 175 KC on Figure 7, for maximum output, at the same time rocking the variable tuning capacitor. Then readjust at 410 KC as described in (a).

Band "A"

(a) Set the band switch at "A."

(b) Tune the external oscillator to 1720 KC, set the pointer at 1720 KC and adjust the oscillator, detector and R. F. trimmers for maximum output.

(c) Shift the external oscillator to 600 KC. Tune in the 600 KC signal irrespective of scale calibration and adjust the series trimmer, marked 600 KC on Figure 7, for maximum output, at the same time rocking the variable tuning capacitor. Then readjust at 1720 KC as described in (a).

Band "B"

(a) Set the band switch at "B."

(b) Tune the external oscillator to 5160 KC, and set the pointer at 5160 KC. Adjust the oscillator trimmer for maximum output. The trimmer should be set at the first peak obtained when increasing the trimmer capacitor from minimum to maximum.

(c) Check for the image signal, which will be received at approximately 4240 on the dial if the oscillator trimmer has been set correctly in accordance with paragraph (b).
It will probably be necessary to increase the external oscillator output for this check.

(d) Reset the dial to 5160 KC and peak the antenna and detector trimmers for maximum output.

Band "C"

(a) Set the band switch at "C."

(b) Tune the external oscillator to 18,000 KC, and set the pointer at 18 M. C. Adjust the oscillator trimmer for maximum output. The trimmer should be set at the first peak obtained when increasing the trimmer capacity from minimum to maximum.

(c) Check for the image signal, which should be received at approximately 17,080 on the dial. It may be necessary to increase the external oscillator output for this check.

(d) Reduce the capacity of the detector trimmer, while rocking the tuning capacitor, until the signal disappears. The first detector circuit is then aligned with the oscillator circuit and the RCA-6A7 tube is blocked. Then increase the capacity of the detector trimmer, while rocking the tuning capacitor, until the signal is peaked for maximum output.

(e) The antenna trimmer should now be peaked for maximum output. It is not necessary to rock the main tuning capacitor while making this adjustment.

Band "D"

No adjustments are required for Band "D."

(4) MAGNETIC PICKUP CONNECTIONS

A convenient point for attachment of a phonograph turntable exists at the RCA-85 second detector stage, where such an input may be connected between the control grid cap and ground. A switching arrangement should be provided for disconnecting or shorting the antenna input to prevent the reception of radio signals when the record adjunct is being used. It will be necessary to provide an external volume control for the phonograph. The wiring should be well shielded to prevent "hum" pickup.

(5) ADJUSTMENT OF DIAL VERNIER MECHANISM

A small vernier indicator is provided for giving a simple means of band spread. Under normal conditions, adjustment of this mechanism will not be required. However, in event the initial adjustment is not satisfactory or adjustment is required because of replacement, the following procedure should be used:

(a) Remove the chassis from the cabinet to a place convenient for work.

(b) Check the tension on the vernier hand by pushing it in a counter-clockwise direction. There should be tension against such a push. If this tension does not exist, the action of the hand may be erratic and possibly fail to return to the same position for a particular station.

(c) Pull off the long hand with a pair of long-nose pliers.

(d) Straighten the lugs that hold the dial in place. Then remove the dial "vernier" hand and stem gear together.

(e) Then remove the "vernier" hand from the stem gear.

(f) Turn the dial to each extreme and to its center position and check the backlash of the back gear (closest to reflector). There should be definite backlash in each direction at each of these three positions.

(g) If this backlash is not obtained, it will be necessary to re-adjust the position of the gears. Loosen the lock-screw located above the central set of gears and move the adjoining gear assembly in or out of mesh as required.

(h) After making sure there is backlash at the three check points mentioned, turn the outside gear in a clockwise direction 1½ turns

MODELS 262,263
1935 Production
Trimmers, Data

RCA MFG. CO., INC.

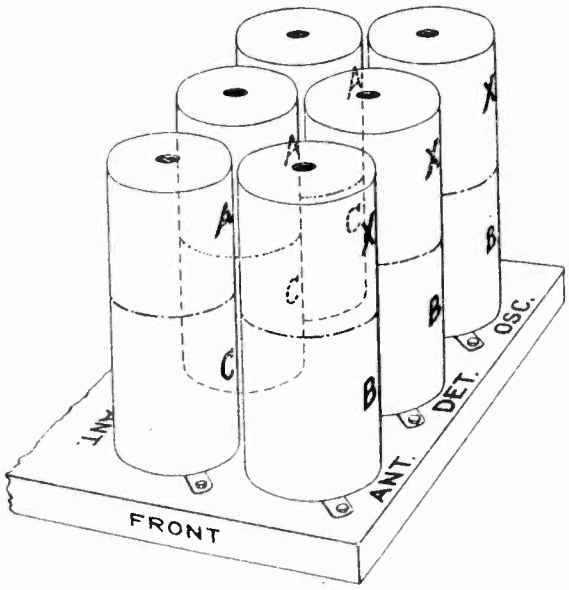


Figure 6—Location of Coils in Shields

Hold it at this position and replace the stem gear.

(i) Turn the dial throughout its range. If the gears become noisy, move the gear further toward the reflector edges described in (g).

(j) Replace the dial scale, making sure the hole clears the spindle.

(k) Replace the vernier hand. It should point at zero when the tuning capacitor is fully meshed.

(l) Replace the large hand. One end of the pointer should point exactly at the horizontal line at the lowest frequency end of Band "A" when the tuning capacitor is fully meshed.

The above covers the proper manner of making adjustments, assuming all parts are in normal condition. Of course, if any part is defective, it must be replaced. The spring gear may be checked by turning it until the spring is tight and unwinding it slowly. It should unwind 4¼ turns.

(6) HUM INDUCTION

In chasses of early manufacture (models with a type-76 or 1-v second detector), a slight "buzz" or "hum" will often be encountered. In order to reduce this interference the following steps should be taken:

(1) Remove the connections of the *red with yellow tracer* lead from the 10 mfd. electrolytic capacitor (C-56) and from the lug on the resistor board where it terminates. In place of this conductor, install a new one that will be outside of the chassis cable, carried along the front side of the chassis, similar to the *red* lead connecting the corresponding points on the wiring diagram of Figure 4.

(2) Connect the grounding lead from the second detector cathode to a ground point nearer the detector socket.

(3) The secondary leads of the interstage transformer connecting to the driver stage, should be kept away from the heater prongs and heater wiring. It is desirable to shorten these leads as much as possible.

(4) It is important that the heater leads of the audio stages of the receiver be carefully twisted.

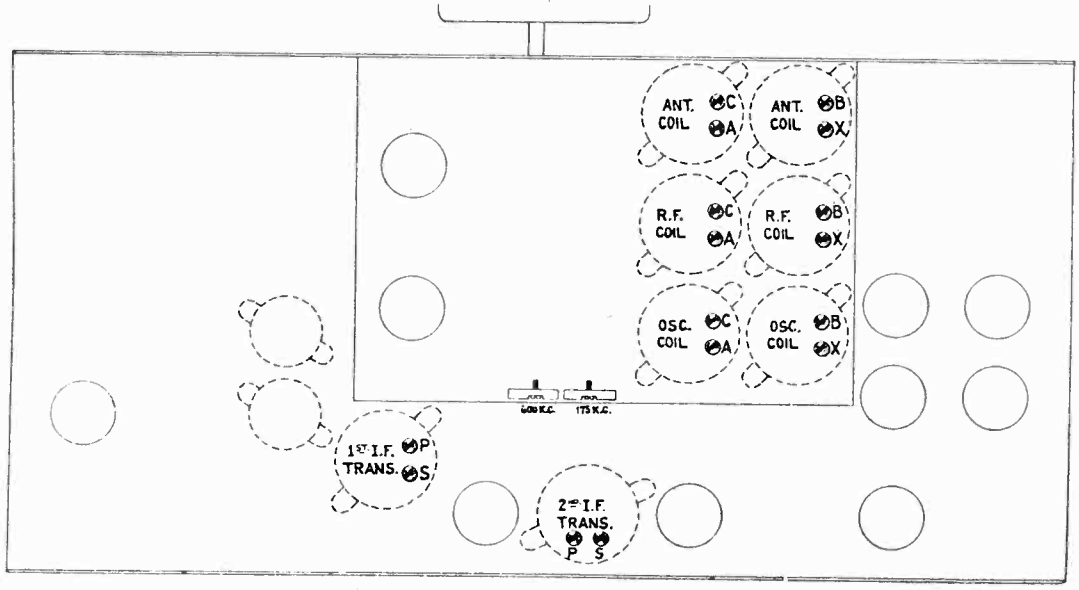


Figure 7—Location of Trimmer Capacitors

RCA MFG. CO., INC.

MODELS 262, 263

1935 Production

Parts List

REPLACEMENT PARTS

Stock No.	Description	List Price
	RECEIVER ASSEMBLIES	
4372	Bracket—Bass tone control mounting bracket	$0.20
4683	Bracket — Treble tone control mounting bracket	.25
4406	Bracket—Volume control mounting bracket	.25
4416	Capacitor—50 mmfd. (C62)—Package of 5	1.25
3794	Capacitor—100 mmfd.—Located on first I.F. transformer (C33)	.30
3981	Capacitor—300 mmfd.—Located on second I. F. transformer (C42)	.30
4668	Capacitor—770 mmfd. (C60)	.30
4409	Capacitor—1120 mmfd. (C39, C45)	.35
4838	Capacitor—0.005 mfd. (C51, C52)	.20
3787	Capacitor—0.01 mfd. (C53)	.30
3639	Capacitor—0.02 mfd. (C43)	.25
4652	Capacitor—0.02 mfd. (C50)	.60
4836	Capacitor—0.05 mfd. (C35)	.30
4694	Capacitor—0.05 mfd. (C44)	.30
3765	Capacitor—0.025 mfd. (C49)	.34
4835	Capacitor—0.1 mfd. (C38)	.28
4841	Capacitor—0.1 mfd. (C34, C37)	.22
3597	Capacitor—0.25 mfd. (C46, C47, C61)	.40
3702	Capacitor—0.25 mfd. (C48)	.42
7790	Capacitor—10. mfd. (C58)	1.05
7788	Capacitor—18 mfd. (C57)	1.10
483*	Capacitor pack—Comprising one 10. mfd. and one 4. mfd. capacitor (C55, C56)	2.40
4420	Clamp—Antenna lead clamp and screw—Package of 10	.40
4358	Clamp—Mounting clamp for capacitor—Stock No. 7788 or No. 7790	.15
7806	Coil—First audio plate choke (L33)	.30
4371	Cover—Fuse mount cover	.15
10907	Fuse—3 amperes—Package of 5	.40
3376	Mount—Fuse mount—105-125 volt operation	.40
4604	Mount—Fuse mount for 200-250 volt operation	.35
7784	Reactor—Tone control reactor (L34)	1.30
6135	Resistor—270 ohms—Carbon type—¼ watt (R3, R7, R11)—Package of 5	1.00
4687	Resistor—1000 ohms—Carbon type—½ watt (R25)—Package of 10	2.00
4834	Resistor—1100 ohms—Carbon type—¼ watt (R9, R10, R13)—Package of 5	1.00
4833	Resistor—490,000 ohms—Carbon type—¼ watt (R19)—Package of 5	1.00
3998	Resistor—15,000 ohms—Carbon type—¼ watt (R34)—Package of 5	1.00
6143	Resistor—40,000 ohms—Carbon type—¼ watt (R23)—Package of 5	1.00
3114	Resistor—50,000 ohms—Carbon type—¼ watt (R31)—Package of 5	1.00
3602	Resistor—60,000 ohms—Carbon type—¼ watt (R14)—Package of 5	1.00
3118	Resistor—100,000 ohms—Carbon type—¼ watt (R1, R30, R35)—Package of 5	1.00
3744	Resistor—250,000 ohms—Carbon type—¼ watt (R32)—Package of 5	$1.00
6186	Resistor—500,000 ohms—Carbon type—½ watt (R33)—Package of 5	1.00
4783	Resistor—1,100,000 ohms—Carbon type—¼ watt (R16)—Package of 5	1.00
6242	Resistor — 2 megohms — Carbon type — ¼ watt (R15, R18)—Package of 5	1.00
3594	Resistor—50,000 ohms—Carbon type—½ watt (R20, R21)—Package of 5	1.00
2240	Resistor — 30,000 ohms — Carbon type — 1 watt (R26)	.22
4649	Resistor—Flat type—Total resistance 8820 ohms—Divided as follows: one 220 ohms, one 3,900 ohms and one 4,700 ohms section (R27, R28, R29)	1.05
7804	Rheostat—Sensitivity control rheostat (R4)	1.30
4656	Screw—Volume control mounting assembly—Comprising one bushing, one washer, one shakeproof washer and one nut	.18
4452	Shield—Second detector A.V.C. Radiotron shield	.35
3683	Shield—Second detector—A.V.C. Radiotron shield top	.20
4453	Shield—I. F. Radiotron shield	.32
4742	Shield—Intermediate frequency transformer shield	.40
4784	Socket—4-contact rectifier Radiotron socket	.15
4814	Socket—5-contact driver Radiotron socket	.15
4786	Socket—6-contact I. F. amplifier—Second detector—"A.V.C." or output Radiotron socket	.15
4686	Strip—"ANT-GND" terminal strip—Two terminals and link	.20
7796	Switch—Operating switch (S12)	.62
4829	Tone control—Bass tone control (R22)	1.00
4830	Tone control—Treble tone control (R24)	1.00
7841	Transformer—Audio transformer pack comprising interstage transformer and reactor (T2, L35)	4.05
4431	Transformer—First intermediate frequency transformer (L29, L30, C32, C33, C36)	2.28
4433	Transformer—Second intermediate frequency transformer (L31, L32, C40, C41, C42)	2.15
7832	Transformer—Driver transformer (T3)	2.85
9505	Transformer—Power transformer—105-125 volts—50-60 cycles (T1)	6.35
9506	Transformer—Power transformer—105-125 volts—25-40 cycles	8.90
9507	Transformer—Power transformer—105-250 volts—40-60 cycles	6.40
4832	Volume control (R17)	1.25
	R. F. UNIT ASSEMBLIES	
4244	Cap—Contact cap—Package of 5	.20
4646	Capacitor—4.5 mmfd. (C10)	.20
4633	Capacitor—50 mmfd. (C19)	.25
4842	Capacitor—400 mmfd. (C8)	.24
4811	Capacitor—340 mmfd. (C28)	.25
4412	Capacitor—1,120 mmfd. (C25)	$0.25
4524	Capacitor—2,850 mmfd. (C23)	.35
4615	Capacitor—2,850 mmfd. (C20)	.34
4836	Capacitor—0.05 mfd. (C5, C15)	.30
4841	Capacitor—0.1 mfd. (C7, C16)	.22
4835	Capacitor—0.1 mfd. (C9, C31)	.28
3861	Capacitor—Adjustable capacitor (C27, C30)	.78
4420	Clamp—Antenna lead clamp and screw—Package of 10	.40
4410	Coil—Antenna coil—Band "D" (L1, L2)	.70
7803	Coil—Antenna coil—Band B-C (L3, L4, L7, L8, C1, C3)	1.82
7810	Coil—Antenna coil—Band X-B (L5, L6, L9, L10, C2, C4)	2.10
7805	Coil—Detector coil—Band A-C (L13, L14, L17, L18, C11, C13)	2.15
7808	Coil—Detector coil—Band X-B (L15, L16, L19, L20, C12, C14)	2.05
4421	Coil—Detector coil—Band D (L11, L12)	.70
7807	Coil—Oscillator coil—Band A-C (L21, L22, L25, L26, C22, C26)	1.62
7809	Coil—Oscillator coil—Band X-B (L23, L24, L27, L28, C24, C29)	1.70
4806	Condenser—3-gang variable tuning condenser (C6, C17, C21)	5.64
4340	Lamp—Dial lamp—Package of 5	.60
4834	Resistor — 1100 ohms — Carbon type — ¼ watt (R5)—Package of 5	1.00
3602	Resistor—60,000 ohms—Carbon type—¼ watt (R8)—Package of 5	1.00
4418	Resistor—100 ohms—Flexible type (R2, R6)—Package of 10	1.50
4656	Screw—Chassis mounting screw assembly—Comprising one bushing, one washer, one shakeproof washer, and one nut (four sets required to mount chassis)	.18
4742	Shield—Antenna, detector or oscillator coil shield	.40
3682	Shield—First detector-oscillator Radiotron shield	.22
3683	Shield—Radiotron shield top	.20
4235	Shield—R. F. amplifier Radiotron shield	.24
3529	Socket—Dial lamp socket	.32
4786	Socket—6-contact R. F. amplifier Radiotron socket	.15
4787	Socket — 7-contact first detector-oscillator Radiotron socket	.15
7836	Switch—Range switch (S1, S2, S3, S4, S5, S6, S7, S8, S9, S10, S11)	3.05
	DRIVE ASSEMBLIES	
4362	Arm—Band indicator operating arm	.28
10194	Ball—Steel ball for variable condenser drive assembly—Package of 20	.25
4422	Clutch—Tuning condenser drive clutch assembly—Comprising drive shafts, balls, ring, spring and washers—Assembled	.88
4455	Dial—Station selector dial	.60
7799	Drive—Variable tuning condenser drive assembly complete	$2.45
4827	Gear—Spring gear assembly complete with hub, pinion, gear cover and spring	1.25
4704	Indicator—Band indicator—Celluloid lettered—D. C. B. A. X.	.12
4360	Pinion—Vernier pointer pinion	.35
4363	Pointer—Station selector main (large) pointer	.18
4367	Pointer—Station selector vernier (small) pointer	.15
3943	Screen—Celluloid screen for dial light—Package of 2	.18
3993	Screw—No. 6-32-5/32" square head set screw for band indicator operating arm or variable condenser drive—Package of 10	.25
4377	Spring—Band indicator and arm tension spring—Package of 5	.25
4378	Stud—Band indicator operating arm stud—Package of 5	.25
	CABLE ASSEMBLIES	
5084	Cable—Main cable	1.35
5083	Cable—4-conductor—Reproducer cable	.60
4655	Cable—Shielded cable—From low-frequency tone control to resistor boards	.58
5039	Plug—4-contact male plug for reproducer cable	.25
5040	Plug—4-contact female plug for reproducer cable	.25
	REPRODUCER ASSEMBLY	
4645	Capacitor—0.1 mfd.—Located on output transformers (C54)	.25
9583	Coil—Field coil, magnet and cone support (L37)	5.20
8969	Cone—Reproducer cone (L36)—Package of 5	6.35
9582	Reproducer—Reproducer complete	9.00
6999	Screen—Dust (cloth) screen—Package of 6	.12
5080	Transformer—Output transformer and capacitor (T4, C54)	1.60
	MISCELLANEOUS PARTS	
4677	Bezel—Metal bezel (escutcheon) for station selector dial glass*	.56
4895	Escutcheon—Station selector escutcheon and crystal*	.55
6614	Glass—Station dial glass*	.30
3829	Knob—Bass or treble tone control, volume or sensitivity control range switch or operating switch knob—Package of 5	1.10
4657	Knob—Knob station selector knob—Package of 5	.65
4678	Ring—Retaining ring for dial glass—Package of 5*	.34
4119	Screw—8-32-¼" headless set screw for knob—Stock No. 4657—Package of 20	.38
4393	Screw—8-32-5/16" headless set screw for knob—Stock No. 3829—Package of 10	.25

*Used in some models.

REPLACEMENT PARTS

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

Stock No.	Description	List Price
	RECEIVER ASSEMBLIES	
4427	Bracket—Volume control or tone control mounting bracket	$0.18
4729	Cable—2-conductor shielded—From range switch to resistor board	.20
2747	Cap—Contact cap—Package of 5	.50
3851	Capacitor — Adjustable trimmer capacitor (C20)	.78
4442	Capacitor—50 mmfd. (C47)	.22
4662	Capacitor—80 mmfd. (C37)	.24
4413	Capacitor—360 mmfd. (C21)	.22
4412	Capacitor—1120 mmfd. (C23)	.25
4634	Capacitor—1120 mmfd. (C50)	.35
4515	Capacitor—1160 mmfd. (C34)	.22
4670	Capacitor—2250 (C14)	.30
4523	Capacitor—2400 mmfd. (C17)	.26
4524	Capacitor—2850 mmfd. (C25)	.35
4435	Capacitor—.02 mfd. (C39)	.25
4518	Capacitor—.05 mfd. (C35)	.52
4417	Capacitor—.05 mfd. (C4, C12, C29)	.25
3877	Capacitor—.1 mfd. (C40)	.32
4415	Capacitor—.1 mfd. (C6, C15, C30)	.30
4645	Capacitor—.1 mfd. (C7, C26)	.25
3597	Capacitor—.25 mfd. (C38, C45)	.40
4525	Capacitor—4.0 mfd. (C36)	.70
4428	Capacitor—8 mfd. (C44)	1.05
7790	Capacitor—10 mfd. (C43)	1.05
4692	Capacitor pack—Comprising one 0.035 mfd. and one 0.005 mfd. capacitors (C41, C42)	.30
7589	Capacitor Pack—Comprising two 4. mfd. capacitors (C16, C46)	1.64
4358	Clamp—Electrolytic capacitor mounting clamp	.15
4516	Coil—Antenna coil "PB" (L3, L4, C2)	1.65
7803	Coil—Antenna coil "B & SW" (L1, L2, L5, L6, C1, C3)	1.82
4514	Coil—Detector Coil "PB" (L9, L10, C10)	1.65
7805	Coil—Detector coil "B & SW" (L7, L8, L11, L12, C8, C9, C11)	2.15
7807	Coil—Oscillator coil "B & SW" (L13, L14, L17, L18, C19, C24)	1.62
4511	Coil—Oscillator coil "PB" (L15, L16, C22	1.52
7801	Condenser—3-gang variable tuning condenser (C5, C13, C18)	4.42
4340	Lamp—Dial lamp—Package of 5	.60
3632	Resistor—500 ohms—Carbon type—1 watt (R24)—Package of 5	1.10
3218	Resistor—600 ohms—Carbon type—½ watt (R2, R6, R8)—Package of 5	1.00
4370	Resistor—1000 ohms—Carbon type—¼ watt (R3, R7)—Package of 10	2.00
3997	Resistor—4000 ohms—Carbon type—¼ watt (R14)—Package of 5	1.00
6318	Resistor—10,000 ohms (R21)	.80
3114	Resistor—50,000 ohms—Carbon type—¼ watt (R16, R18)—Package of 5	1.00
3602	Resistor—60,000 ohms—Carbon type—¼ watt (R5)—Package of 5	1.00
3118	Resistor—100,000 ohms—Carbon type—¼ watt (R1, R4)—Package of 5	1.00
3116	Resistor—200,000 ohms—Carbon type—¼ watt (R15)—Package of 5	1.00
6186	Resistor—500,000 ohms—Carbon type—¼ watt (R17)—Package of 5	$1.00
3033	Resistor—1 megohm—Carbon type—½ watt (R10)—Package of 5	1.00
6242	Resistor — 2 megohms — Carbon type — ¼ watt (R11, R13)—Package of 5	1.00
3413	Resistor—5000 ohms—Carbon type—½ watt (R22, R23)—Package of 5	1.00
4513	Resistor — 30,000 ohms — Carbon type — 3 watt (R20)	.25
4521	Shield—Antenna R. F. or oscillator coil shield	.42
3942	Shield—First detector or output Radiotron shield	.18
7487	Shield—I. F. amplifier Radiotron shield	.25
4705	Shield—R. F amplifier Radiotron shield	.30
3782	Shield—Second detector Radiotron shield	.26
3529	Socket—Dial lamp socket	.32
3859	Socket—4-contact Radiotron socket	.30
6676	Socket—6-contact output Radiotron socket	.40
7485	Socket—6-contact Radiotron socket	.40
3572	Socket—7-contact Radiotron socket	.38
4379	Strip—Antenna terminal engraved "ANT-GND"	.20
4684	Switch—Operating switch (S11)	.45
4728	Switch—Range switch (S1, S2, S3, S4, S5, S6, S7, S8, S9, S10)	4.32
4517	Tone control (R19)	.90
4431	Transformer — First intermediate frequency transformer (L19, L20, C27, C28, C48)	2.28
4433	Transformer—Second intermediate frequency transformer (L21, L22, C31, C32, C33, R9)	2.15
9511	Transformer—Power transformer 105–125 volts, 50–60 cycles (T1)	4.78
9512	Transformer—Power transformer 105–125 volts, 25–40 cycles	6.58
9513	Transformer—Power transformer—105–250 volts—40–60 cycles	4.85
4519	Volume control (R12)	1.25
	DRIVE ASSEMBLIES	
4362	Arm—Band indicator operating arm	.28
10194	Ball—Steel ball for condenser drive assembly—Package of 20	.25
4422	Clutch—Clutch drive assembly for variable condenser drive	.88
4661	Dial—Station selector dial	.62
4510	Drive—Tuning condenser drive assembly	2.42
4704	Indicator—Band indicator (celluloid)	.12
4520	Indicator—Station selector indicator pointer	.18
3943	Screen—Dial light screen (celluloid)—Package of 2	.18
3993	Screw—Number 6-32–5/32 square head set screws for band indicator operating arm—Package of 10	.25
4669	Screw—Number 8-32–5/32 set screw for variable condenser drive assembly—Package of 10	.25
4377	Spring—Band indicator and arm tension spring—Package of 5	.25
4378	Stud—Band indicator operating arm stud—Package of 5	.25

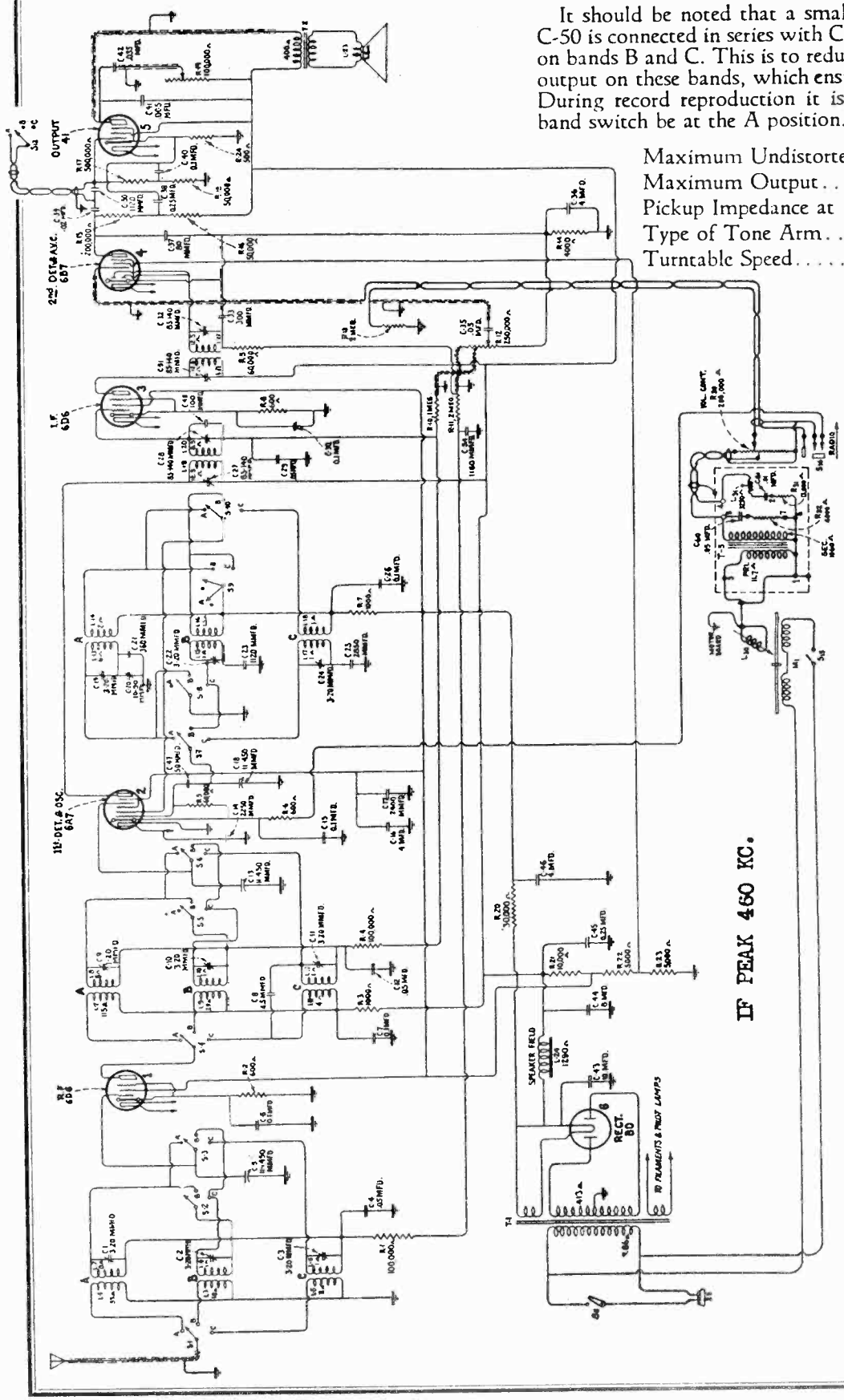
Stock No.	Description	List Price
	MOTOR ASSEMBLIES	
4577	Connector—Male section two-prong motor connector plug	$0.30
8989	Motor—105–125 volts—60 cycle motor complete	18.52
8990	Motor—105–125 volts—50 cycle motor complete	18.52
8991	Motor—105–125 volts—40 cycle motor complete	23.36
8992	Motor—105–125 volts—25 cycle motor complete	23.36
8993	Rotor and shaft—For 105–125 volt—60 cycle motor	7.00
8995	Rotor and shaft—For 105–125 volt—50 cycle motor	7.00
8999	Rotor and shaft—For 105–125 volt—25 cycle motor	8.00
8994	Spindle—Turntable spindle with fibre gear for 60 cycle motor	4.75
8996	Spindle—Turntable spindle with fibre gear for 50 cycle motor	4.75
9001	Spindle—Turntable spindle with fibre gear for 25 cycle motor	5.50
3817	Stud—Motor mounting stud—Package of 3	.18
3398	Motor mounting—Spring and washer assembly—Comprising 2 cup washers, 4 springs and 1 "C" washer	.48
	PICKUP AND ARM ASSEMBLIES	
7842	Arm—Pickup arm complete, less escutcheon and pickup	4.75
3417	Armature—Pickup armature	.72
6346	Back—Pickup housing back	.45
3385	Coil—Pickup coil (L30)	.50
3386	Cover—Pickup cover	.56
3521	Cover—Magnetic pickup back cover	.18
3418	Cushions—Pickup rubber cushions—Comprising one damper and two spacer cushions and one damper bushing—5 sets	1.10
3516	Damper assembly—Comprising one upper and one lower damper, one upper bushing and one lower bearing—Located in bottom of pickup base	.14
3390	Escutcheon—Pickup arm escutcheon complete with mounting rivets	.46
6335	Pickup—Pickup unit complete	4.00
3389	Rod—Automatic brake trip rod with lock nut—Package of 5	.40
3387	Screw assembly—Pickup mounting screw assembly comprising one screw, one nut and one washer—10 sets	.40
3388	Screw—Pickup needle holding screw—Package of 10	.60
3419	Screw—Pickup cover mounting screw—Package of 10	.40
	REPRODUCER ASSEMBLY	
4473	Board—Terminal board assembly	.26
9460	Coil—Field coil, magnet and cone support (L24)	6.00
8935	Cone—Reproducer cone (L23)—Package of 5	5.25
9527	Reproducer—Complete	8.00
4472	Transformer—Output transformer (T2)	1.40
	SWITCH ASSEMBLIES	
3994	Cover—Motor switch cover	$0.26
10184	Plate—Automatic brake latch plate—Package of 5	.40
10174	Springs—Automatic brake springs—Package of 4	.50
6896	Switch—Eccentric automatic switch complete	2.50
3322	Switch—Motor switch (S15)	.75
	TURNTABLE ASSEMBLIES	
7084	Cover—Turntable cover	.40
7838	Turntable complete	2.15
	MISCELLANEOUS ASSEMBLIES	
3166	Bolt—Reproducer mounting assembly—Comprising 2 bolts, 2 nuts, 2 lockwashers and 1 plate	.50
4677	Bezel—Station selector (escutcheon) bezel	.56
3430	Box—Needle box with lid—Package of 2	.90
4696	Cable—2-conductor motor cable with section of connector plug—From receiver chassis to motor cord connector	.95
4695	Cable—3-conductor shielded cable with grid and female section of connector—From receiver chassis to volume control cable connector	1.05
7843	Cable—5-conductor shielded with male section of connector plug—From phonograph volume control to input transformer	.98
4153	Connector—Female section (4-contact) of connector for cable Stock No. 4695	.48
4573	Connector—Female section (2-contact) of connector plug for cable Stock No. 4696	.30
6614	Glass—Station selector dial glass	.30
3829	Knob—Phonograph volume control knob—Package of 5	1.10
4449	Knob—Station selector volume control, range switch or operating switch knob—Package of 5	.60
6123	Plug—Male section (4-prong) of phonograph volume control and input transformer cable plug	.30
3396	Receptacle—Needle receptacle	.52
4678	Ring—Dial retaining ring—Package of 5	.34
4393	Screw—8–32–5/16" headless set screw for knob No. 3829—Package of 10	.52
4698	Screw—Chassis mounting screw assembly—Comprising 1 screw, 1 lockwasher, 1 washer, 2 cushions and 1 spacer	.45
3391	Suspension spring and washer assembly—For motor board—Comprising 1 bolt, 1 top spring, 1 bottom spring, 2 cup washers, 1 "C" washer and 1 nut	.50
7844	Transformer—Phonograph input transformer pack comprising one transformer, one reactor, one 4000 ohm and one 13,000 ohm resistor, one .01 mfd. and one .05 mfd. capacitor (T5, L31, R31, R32, C60, C61)	5.38
6766	Volume control—Phonograph volume control (R30, S16)	2.28

MODEL 322 Duo
Schematic

RCA MFG. CO., INC.

It should be noted that a small coupling capacitor C-50 is connected in series with C-39 during operation on bands B and C. This is to reduce the low frequency output on these bands, which ensures better operation. During record reproduction it is important that the band switch be at the A position.

Maximum Undistorted Output..1.9 Watts
Maximum Output.....3.5 Watts
Pickup Impedance at 1000 Cycles..7 Ohms
Type of Tone Arm.....Inertia
Turntable Speed..... 78 R. P. M. Only



ELECTRICAL SPECIFICATIONS

Voltage Rating.....105–125 Volts and 105–130/200–250 Volts (Double Range Transformer)
Frequency Rating.....25, 30, 40, 50 and 60 Cycles
Power Consumption.....130 Watts (60 Cycles)
Type and Number of Radiotrons.....2 RCA-6D6, 1 RCA-6A7, 1 RCA-6B7, 1 RCA-41, 1 RCA-80—Total, 6
Tuning Frequency Range.....{Band A— 540 K. C.– 1720 K. C.
{Band B—1720 K. C.– 5400 K. C.
{Band C—5400 K. C.–18000 K. C.
Line-up Frequencies.....460 K. C., 600 K. C., 1720 K. C., 5160 K. C., 18000 K. C.

MODEL 322 Duo
Chassis Wiring

RCA MFG. CO., INC.

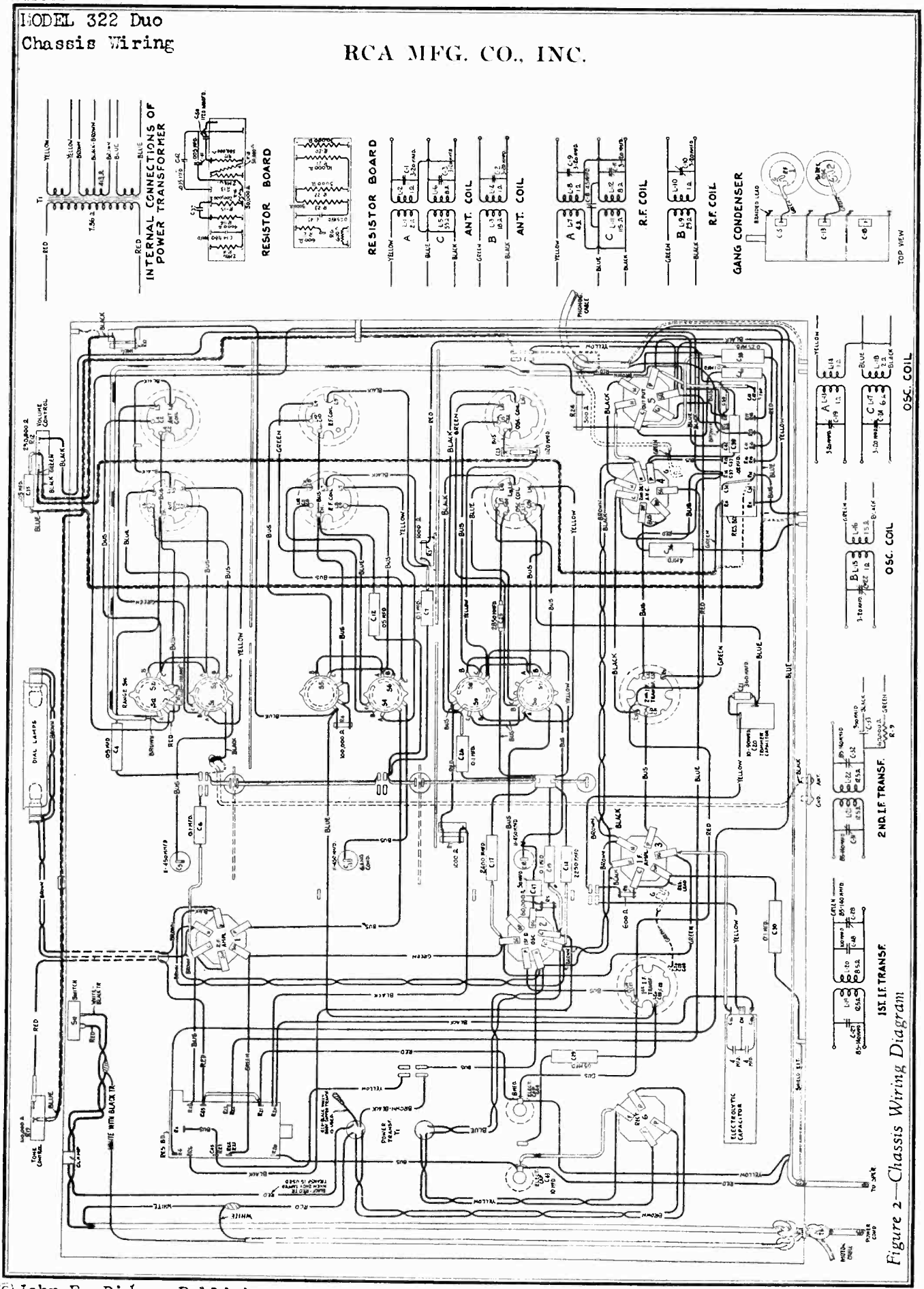


Figure 2—Chassis Wiring Diagram

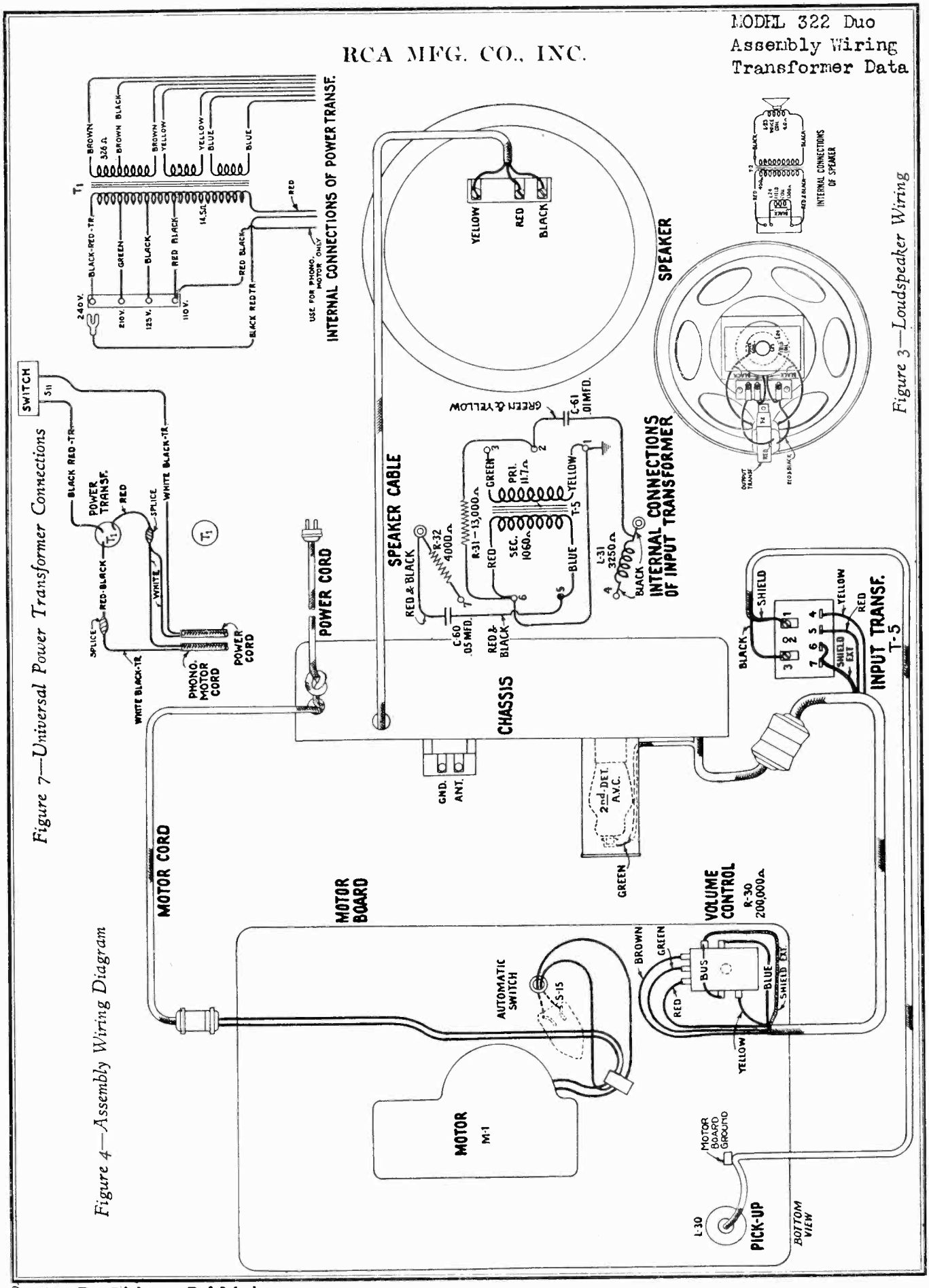


Figure 3—Loudspeaker Wiring

Figure 4—Assembly Wiring Diagram

Figure 7—Universal Power Transformer Connections

The shields over the R. F. coil assembly have a hole at their top for entrance of the tuning wand. The location of the various coils inside of the shield is shown in Figure 5. An example of the proper manner of using the tuning wand would be to assume the external oscillator were set at 1720 and the signal tuned in, and the output indicator should be connected across the voice coil of the loudspeaker. Then the tuning wand would be inserted, first one end and then the other end, into the top of the three transformers at the left of the R. F. assembly, facing the front of the chassis. A perfect adjustment of the trimmer would be evidenced by a reduction in output when each end of the wand is inserted in each of the three transformers. If one end—for example, the iron end—when inserted in one coil caused an increase in output, then that circuit is low. An increase in the trimmer capacitance would be the proper remedy.

(2) I. F. TUNING CAPACITOR ADJUSTMENTS

This receiver has one I. F. stage, which uses two transformers. The transformers are all peaked at 460 K. C.

A detailed procedure for making this adjustment follows:

(a) Connect the output of an external oscillator tuned to 460 K. C. between the first detector grid and ground. Connect the output indicator across the voice coil of the loudspeaker.

(b) Place the oscillator in operation at 460 K. C. Place the receiver in operation and adjust the station selector until a point is reached (band A) where no signals are heard and turn the volume control to its maximum position. Reduce the oscillator input until a slight indication is obtained in the output indicator.

(c) Refer to Figure 6. Adjust each trimmer of the I. F. transformers until a maximum output is obtained. Go over the adjustments a second time.

This completes the I. F. adjustments. However, it is good practice to follow the I. F. adjustments with the R. F. and oscillator adjustments due to interlocking which always occurs.

(3) R. F. OSCILLATOR AND FIRST DETECTOR ADJUSTMENTS

Four R. F., oscillator and first detector adjustments are required in band "A." Three are required in bands "B" and "C."

To properly align the various bands, each band must be aligned individually. The preliminary set-up requires the external oscillator to be connected between the antenna and ground terminals of the receiver and the output indicator must be connected across the voice coil of the loudspeaker. The volume control must be at its maximum position and the input from the oscillator must be at the minimum value possible to get an output indication under these conditions. In the high-frequency bands, it may be necessary to disconnect the oscillator from the receiver and place it at a distance in order to get a sufficiently low input to the receiver.

The dial pointer must be properly set before starting any actual adjustments. This is done by turning the variable capacitor until it is at its maximum capacity position. One end of the pointer should point exactly at the horizontal line at the lowest frequency end of band "A," while the other end should point to within ¼ inch of the horizontal line at the highest frequency end of band "A."

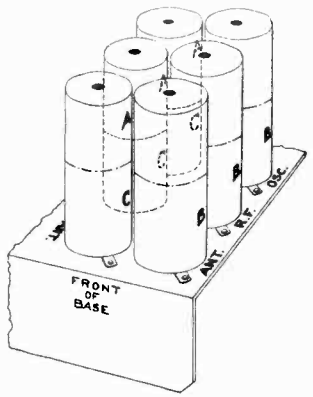


Figure 5—Location of Coils in Shields

Figure 6 shows the location of the trimmers for each band. Care must be exercised to merely adjust the trimmers in the band under test.

Band "A"

(a) Set the Band Switch at "A."

(b) Tune the external oscillator to 1,720 K. C., set the pointer at 1,720 K. C. and adjust the oscillator, detector and R. F. trimmers for maximum output.

(c) Shift the external oscillator frequency to 600 K. C. Tune in the 600 K. C. signal, irrespective of scale calibration, and adjust the series trimmers, located on rear apron of chassis, for maximum output, at the same time rocking the variable tuning capacitor. Then readjust at 1,720 K. C. as described in (b).

Band "B"

(a) Set the Band Switch at "B."

(b) Tune the external oscillator to 5,160 K. C., and set the pointer at 5,160 K. C. Adjust the oscillator trimmer for maximum output. The trimmer should be set at the first peak obtained when increasing the trimmer capacitor from minimum to maximum.

(c) Check for the image signal, which should be received at approximately 4,240 K. C. on the dial. It will be necessary to increase the external oscillator output for this check.

(d) The antenna and detector trimmer should now be peaked for maximum output. It is not necessary to rock the main tuning capacitor while making this adjustment.

Band "C"

(a) Set the Band Switch at "C."

(b) Tune the external oscillator to 18,000 K. C., set the pointer at 18 M. C. Adjust the oscillator trimmer for maximum output. The trimmer should be set at the first peak obtained when increasing the trimmer capacitor from minimum to maximum.

(c) Check for the image signal, which should be received at approximately 17,080 on the dial. It may be necessary to increase the external oscillator output for this check.

(d) Reduce the capacity of the detector trimmer, while rocking the tuning capacitor, until the signal disappears. The first detector circuit is then aligned with the oscillator circuit and the RCA-6A7 tube is blocked. Then increase the capacity of the detector trimmer, while rocking the tuning capacitor, until the signal is peaked for maximum output.

(e) The antenna trimmer should now be peaked for maximum output. It is not necessary to rock the main tuning capacitor while making this adjustment.

(4) POWER TRANSFORMER CONNECTIONS

The 220-volt power transformer furnished with some instruments includes taps for operating on 110-volt lines. Figure 6 shows the schematic circuit of the transformer and the proper voltage to be applied to the various taps. The taps are located on the power transformer assembly and are accessible without removing the chassis from the cabinet.

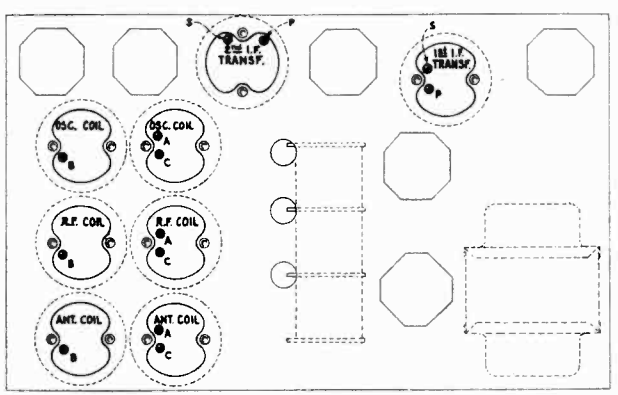
(5) VOLTAGE READINGS

The following voltages are those at the various tube sockets while the receiver is in operating condition. No allowance has been made for currents drawn by the meter, and if low-resistance meters are used, such allowances must be made. Figure 8 shows the actual voltage at each socket contact.

(6) SERVICE DATA ON MAGNETIC PICKUP

The Magnetic Pickup used in this combination instrument is of a new design with an improved frequency range. While in physical appearance it is similar to that of the older type, details of construction are considerably different. It consists essentially of a chromium steel magnet, two thin pole pieces, a mechanism support and bracket, a coil, and an armature that is damped by means of an anchored damping block.

The use of the anchored damping block eliminates any bad peaks in the frequency range. The frequency-response characteristic is substantially flat from 50 to 5,000 cycles.



Figure—6 Location of Line-up Capacitors

In assembling, it may be desirable to check the armature air gap by means of a small Feeler Gauge. This air gap should be .009" on each side of the

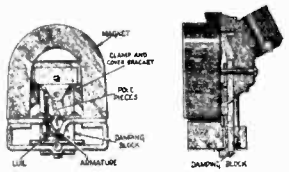


Figure 9—Details of Magnetic Pickup

armature. However, a little practice with the needle in place will quickly disclose whether or not the armature is centered.

(7) REPLACING MAGNET COIL, PIVOT RUBBERS, ARMATURE OR DAMPING BLOCK

In order to replace a defective coil or the hardened pivot rubbers (see Figure 9), it is necessary to proceed as follows:

(a) Remove the pickup cover by removing the center holding screw and needle screw.

(b) Remove the pickup magnet and the magnet clamp by pulling them forward.

(c) Unsolder the coil leads and remove the mechanism assembly from the back plate by releasing the two mounting screws and the damping block clamping screw.

(d) Remove screws A and B, Figure 10, and then remove the mechanism assembly from the pole pieces.

(e) The coil or the front pivot rubber may now be removed and replaced. If it is desired to replace the rear pivot rubber, then the end of the armature soldered to the mechanism support must be unsoldered and the damping block removed. The rear pivot rubber now may be replaced. After putting the pivot rubbers in place a new damping block should be fastened to the armature as outlined in instructions on replacing the damping block.

(f) The mechanism should now be reassembled, except for the magnet, which must be magnetized. After being magnetized, the mechanism—with the pole pieces upward—should be placed so that the magnet may be slid from the magnetizer onto the pole pieces without breaking physical contact. After placing the pole pieces on the magnet, the entire assembly should be remagnetized thoroughly, being careful not to change the polarity obtained by the initial magnetization.

(g) After assembling to the mechanism, the entire assembly should be fastened to the back plate by means of the screws provided, making sure the damping block is securely clamped. At the same time, the metal dust cover must be placed in position.

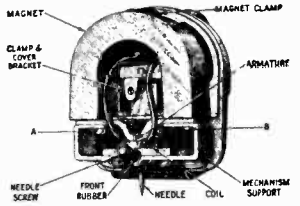


Figure 10—Pickup Nomenclature

(h) After remagnetizing, it is necessary to correctly center the armature. This may be done quite accurately by feeling its play after the needle is inserted. A little practice will quickly show which way an adjustment is necessary to have the armature centered properly. The adjustment is made by loosening screws A and B (Figure 10), and sliding the mechanism slightly in relation to the pole pieces.

(i) The cover may be now replaced over the entire assembly, and the pickup returned to the tone arm.

(8) REPLACING THE DAMPING BLOCK

If it is desired to replace the damping block, it may be done in the following manner:

(a) Disassemble the pickup as described under the preceding section.

(b) Remove the armature entirely by unsoldering it at its joint with the mechanism support.

(c) Remove the damping block from the armature and clean the bushing for holding the damping block with emery paper.

(d) Insert the armature through the new block so that it occupies the same position as that of the old. Also ascertain that the block is in correct vertical alignment with the armature. It will be noted that the hole in the damping block is somewhat smaller than the diameter of the armature. This is done so that a snug fit will be obtained.

(e) After properly locating the damping block, a soldering iron should be applied to the armature so that the block will melt slightly at its point of contact with the armature. A special tip, constructed as shown in Figure 11, will prove desirable for fusing the block in place. The iron should be applied long enough to slightly melt the block and cause a small bulge on both sides, but should not be applied long enough to cause any bubbling. The pickup should then be reassembled as described in the preceding section.

Only rosin core solder should be used for soldering the coil leads in the pickup. Also rosin core solder should be satisfactory for resoldering the end of the spring in the hole in the mechanism, since both these parts have been previously tinned. In case the parts are not well tinned, it will be necessary to scrape the end of the spring and the hole in the mechanism until bright. These parts may now be tinned by using as a flux a water solution of zinc chloride (commonly called acid flux). After tinning, dip the parts in water to wash off the acid flux and thereby prevent serious subsequent corrosion. After making sure that the pivot rubbers and damping block are properly in place,

Figure 11—Special Soldering-Iron Tip

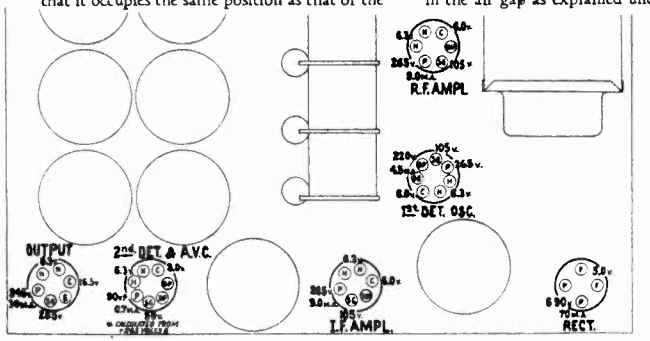
as described under (e) above, the armature may now be soldered in place in the mechanism by using rosin core solder, since the parts are now tinned. Care must be exercised to get the needle hole perfectly square with respect to the mechanism, or otherwise it will be difficult if not impossible to center the armature in the air gap as explained under (h), section (7).

RADIOTRON SOCKET VOLTAGES

115-Volt A. C. Line—No Signal—Volume Control Maximum

Radiotron Number		Cathode to Ground, Volts, D. C.	Screen Grid to Ground, Volts, D. C.	Plate to Ground, Volts, D. C.	Plate Current, M. A.	Heater Volts, A. C.
RCA-6D6—R. F.		6.0	105	265	9.0	6.3
RCA-6A7	Det.	6.0	105	265	3.5	6.3
	Osc.	—	—	220	4.5	
RCA-6D6—I. F.		6.0	105	265	9.0	6.3
RCA-6B7—2nd Detector		3.0	50	90*	0.7	6.3
RCA-41—Power		16.5	265	245	30.0	6.3
RCA-80—Rectifier		—	—	690 (RMS—P to P)	70.0	5.0

* Voltage calculated from 265 v. + B.



ALL D. C. VOLTAGES ARE TO GROUND

Figure 8

Tube Socket Voltages

REPLACEMENT PARTS

Stock No	Description	List Price
	RECEIVER ASSEMBLIES	
4427	Bracket—Volume control or tone control mounting bracket	$0.18
4729	Cable—2-conductor shielded—From range switch to resistor board	.20
2747	Cap—Contact cap—Package of 5	.50
3861	Capacitor — Adjustable trimmer capacitor (C20)	.78
4442	Capacitor—50 mmfd. (C47)	.22
4662	Capacitor—80 mmfd. (C37)	.24
4413	Capacitor—360 mmfd. (C21)	.22
4634	Capacitor—1120 mmfd. (C50)	.35
4515	Capacitor—1160 mmfd. (C34)	.22
4670	Capacitor—2250 (C14)	.30
4523	Capacitor—2400 mmfd. (C17)	.26
4524	Capacitor—2850 mmfd. (C25)	.35
4435	Capacitor—.02 mfd. (C39)	.25
4518	Capacitor—.05 mfd. (C35)	.52
4417	Capacitor—.05 mfd. (C4, C12, C29)	.25
3877	Capacitor—.1 mfd. (C40)	.32
4415	Capacitor—.1 mfd. (C6, C15, C30)	.30
4545	Capacitor—.1 mfd. (C7, C26)	.25
3597	Capacitor—.25 mfd. (C38, C45)	.40
4525	Capacitor—4.0 mfd. (C36)	.70
4428	Capacitor—8 mfd. (C44)	1.05
7790	Capacitor—10 mfd. (C43)	1.05
4692	Capacitor pack—Comprising one 0.035 mfd. and one 0.005 mfd. capacitors (C41, C42)	.30
7589	Capacitor pack—Comprising two 4. mfd. capacitors (C16, C46)	1.64
4358	Clamp—Electrolytic capacitor mounting clamp	.15
4734	Coil—Antenna coil "A" (L26, L27, C51)	3.05
7803	Coil—Antenna coil "B & SW" (L1, L2, L5, L6, C1, C3)	1.82
4751	Coil—Detector coil "A" (L28, L29, C52)	2.38
7805	Coil—Detector coil "B & SW" (L7, L8, L11, L12, C8, C9, C11)	2.15
7807	Coil—Oscillator coil "B & SW" (L13, L14, L17, L18, C19, C24)	1.62
4733	Coil—Oscillator coil "A" (L30, L31, C53)	3.05
7801	Condenser—3-gang variable tuning condenser (C5, C13, C18)	4.42
4340	Lamp—Dial lamp—Package of 5	.60
3632	Resistor—500 ohms—Carbon type—1 watt (R24)—Package of 5	1.10
3218	Resistor—600 ohms—Carbon type—½ watt (R2, R6, R8)—Package of 5	1.00
4370	Resistor—1000 ohms—Carbon type—½ watt (R3, R7)—Package of 10	2.00
3997	Resistor—4000 ohms—Carbon type—¼ watt (R14)—Package of 5	1.00
6318	Resistor—10,000 ohms (R21)	.80
3114	Resistor—50,000 ohms—Carbon type—¼ watt (R16, R18)—Package of 5	1.00
3602	Resistor—60,000 ohms—Carbon type—¼ watt (R5)—Package of 5	1.00
3118	Resistor—100,000 ohms—Carbon type—¼ watt (R1, R4)—Package of 5	1.00
3116	Resistor—200,000 ohms—Carbon type—¼ watt (R15)—Package of 5	1.00
6186	Resistor—500,000 ohms—Carbon type—¼ watt (R17)—Package of 5	$1.00
3033	Resistor—1 megohm—Carbon type—¼ watt (R10)—Package of 5	1.00
6242	Resistor — 2 megohms — Carbon type — ¼ watt (R11, R13)—Package of 5	1.00
3413	Resistor—5000 ohms—Carbon type—½ watt (R22, R23)—Package of 5	1.00
4513	Resistor — 30,000 ohms — Carbon type — 3 watt (R20)	.25
4521	Shield—Antenna R. F. or oscillator coil shield	.42
3942	Shield—First detector or output Radiotron shield	.18
7487	Shield—I. F. amplifier Radiotron shield	.25
4705	Shield—R. F. amplifier Radiotron shield	.30
3782	Shield—Second detector Radiotron shield	.26
3529	Socket—Dial lamp socket	.32
3859	Socket—4-contact Radiotron socket	.30
6676	Socket—6-contact output Radiotron socket	.40
7485	Socket—6-contact Radiotron socket	.40
3572	Socket—7-contact Radiotron socket	.38
4379	Strip—Antenna terminal engraved "ANT-GND"	.20
4684	Switch—Operating switch (S11)	.45
4728	Switch—Range switch (S1, S2, S3, S4, S5, S6, S7, S8, S9, S10)	4.32
4517	Tone control (R19)	.90
4431	Transformer — First intermediate frequency transformer (L19, L20, C27, C28, C48)	2.28
4433	Transformer—Second intermediate frequency transformer (L21, L22, C31, C32, C33, R9)	2.15
9511	Transformer—Power transformer 105–125 volts, 50–60 cycles (T1)	4.78
9512	Transformer—Power transformer 105–125 volts, 25–40 cycles	6.58
9513	Transformer—Power transformer—105–250 volts—40–60 cycles	4.85
4519	Volume control (R12)	1.25
	DRIVE ASSEMBLIES	
4362	Arm—Band indicator operating arm	.28
10194	Ball—Steel ball for condenser drive assembly—Package of 20	.25
4422	Clutch—Clutch drive assembly for variable condenser drive	.88
4732	Dial—Station selector dial	.40
4510	Drive—Tuning condenser drive assembly	2.42
4704	Indicator—Band indicator (celluloid)	.12
4520	Indicator—Station selector indicator pointer	.18
3943	Screen—Dial light screen (celluloid)—Package of 2	.18
3993	Screw—Number 6–32–5/32" square head set screws for band indicator operating arm—Package of 10	.25
4669	Screw—Number 8–32–5/32" set screw for variable condenser drive assembly—Package of 10	.25
4377	Spring—Band indicator and arm tension spring—Package of 5	.25
4378	Stud—Band indicator operating arm stud—Package of 5	.25
	MOTOR ASSEMBLIES	
4577	Connector—Male section two-prong motor connector plug	$0.30
8989	Motor—105–125 volts—60 cycle motor complete	18.52
8990	Motor—105–125 volts—50 cycle motor complete	18.52
8991	Motor—105–125 volts—40 cycle motor complete	23.36
8992	Motor—105–125 volts—25 cycle motor complete	23.36
8993	Rotor and shaft—For 105–125 volt—60 cycle motor	7.00
8995	Rotor and shaft—For 105–125 volt—50 cycle motor	7.00
8999	Rotor and shaft—For 105–125 volt—25 cycle motor	8.00
8994	Spindle—Turntable spindle with fibre gear for 60 cycle motor	4.75
8996	Spindle—Turntable spindle with fibre gear for 50 cycle motor	4.75
9001	Spindle—Turntable spindle with fibre gear for 25 cycle motor	5.50
3817	Stud—Motor mounting stud—Package of 3	.18
3398	Motor mounting—Spring and washer assembly—Comprising 2 cup washers, 4 springs and 1 "C" washer	.48
	PICKUP AND ARM ASSEMBLIES	
7842	Arm—Pickup arm complete, less escutcheon and pickup	4.75
3417	Armature—Pickup armature	.72
6346	Back—Pickup housing back	.45
3385	Coil—Pickup coil (L30)	.50
3386	Cover—Pickup cover	.56
3521	Cover—Magnetic pickup back cover	.18
3418	Cushions—Pickup rubber cushions—Comprising one damper and two spacer cushions and one damper bushing—5 sets	1.10
3516	Damper assembly—Comprising one upper and one lower damper, one upper bushing and one lower bearing—Located in bottom of pickup base	.14
3390	Escutcheon—Pickup arm escutcheon complete with mounting rivets	.46
6335	Pickup—Pickup unit complete	4.00
3389	Rod—Automatic brake trip rod with lock nut—Package of 5	.40
3387	Screw assembly—Pickup mounting screw assembly comprising one screw, one nut and one washer—10 sets	.40
3388	Screw—Pickup needle holding screw—Package of 10	.60
3419	Screw—Pickup cover mounting screw—Package of 10	.40
	REPRODUCER ASSEMBLY	
4473	Board—Terminal board assembly	.26
9460	Coil—Field coil, magnet and cone support (L24)	6.00
8935	Cone—Reproducer cone (L23)—Package of 5	5.25
9527	Reproducer—Complete	8.00
4472	Transformer—Output transformer (T2)	1.40
	SWITCH ASSEMBLIES	
3994	Cover—Motor switch cover	$0.26
10184	Plate—Automatic brake latch plate—Package of 5	.40
10174	Springs—Automatic brake springs—Package of 4	.50
6896	Switch—Eccentric automatic switch complete	2.50
3322	Switch—Motor switch (S15)	.75
	TURNTABLE ASSEMBLIES	
7084	Cover—Turntable cover	.40
7838	Turntable complete	2.15
	MISCELLANEOUS ASSEMBLIES	
3166	Bolt — Reproducer mounting assembly — Comprising 2 bolts, 2 nuts, 2 lockwashers and 1 plate	.50
7837	Bezel—Station selector (escutcheon) bezel	.82
3430	Box—Needle box with lid—Package of 2	.90
4696	Cable—2-conductor motor cable with section of connector plug—From receiver chassis to motor cord connector	.95
4695	Cable—3-conductor shielded cable with grid and female section of connector—From receiver chassis to volume control cable connector	1.05
7843	Cable—5-conductor shielded with male section of connector plug—From phonograph volume control to input transformer	.98
4153	Connector—Female section (4-contact) of connector for cable Stock No. 4695	.48
4573	Connector—Female section (2-contact) of connector plug for cable Stock No. 4696	.30
6614	Glass—Station selector dial glass	.30
3829	Knob—Phonograph volume control knob—Package of 5	1.10
4449	Knob—Station selector volume control, range switch or operating switch knob—Package of 5	.60
6123	Plug—Male section (4-prong) of phonograph volume control and input transformer cable plug	.30
3396	Receptacle—Needle receptacle	.52
4678	Ring—Dial retaining ring—Package of 5	.34
4393	Screw—8–32–5/16" headless set screw for knob No. 3829—Package of 10	.25
4698	Screw—Chassis mounting screw assembly—Comprising 1 screw, 1 lockwasher, 1 washer, 2 cushions and 1 spacer	.45
3391	Suspension spring and washer assembly—For motor board—Comprising 1 bolt, 1 top spring, 1 bottom spring, 2 cup washers, 1 "C" washer and 1 nut	.50
7844	Transformer—Phonograph input transformer pack comprising one transformer, one reactor, one 15,000 ohm and one 13,000 ohm resistor, one .01 mfd. and one .05 mfd. capacitor (T5, L31, R31, R32, C60, C61)	5.38
6766	Volume control—Phonograph volume control (R30, S16)	2.28

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MODEL 322-E Duo
Schematic
Speaker Data

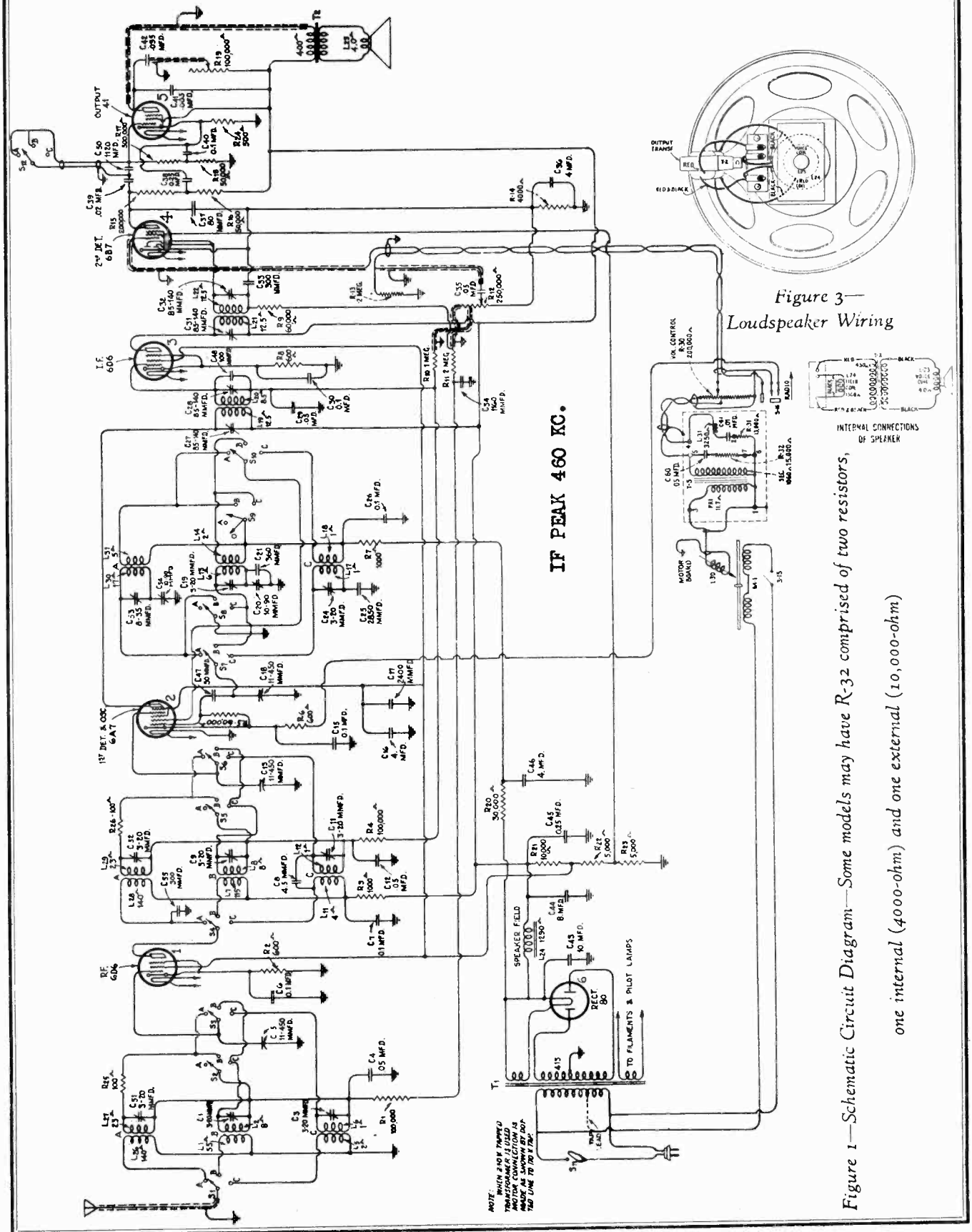
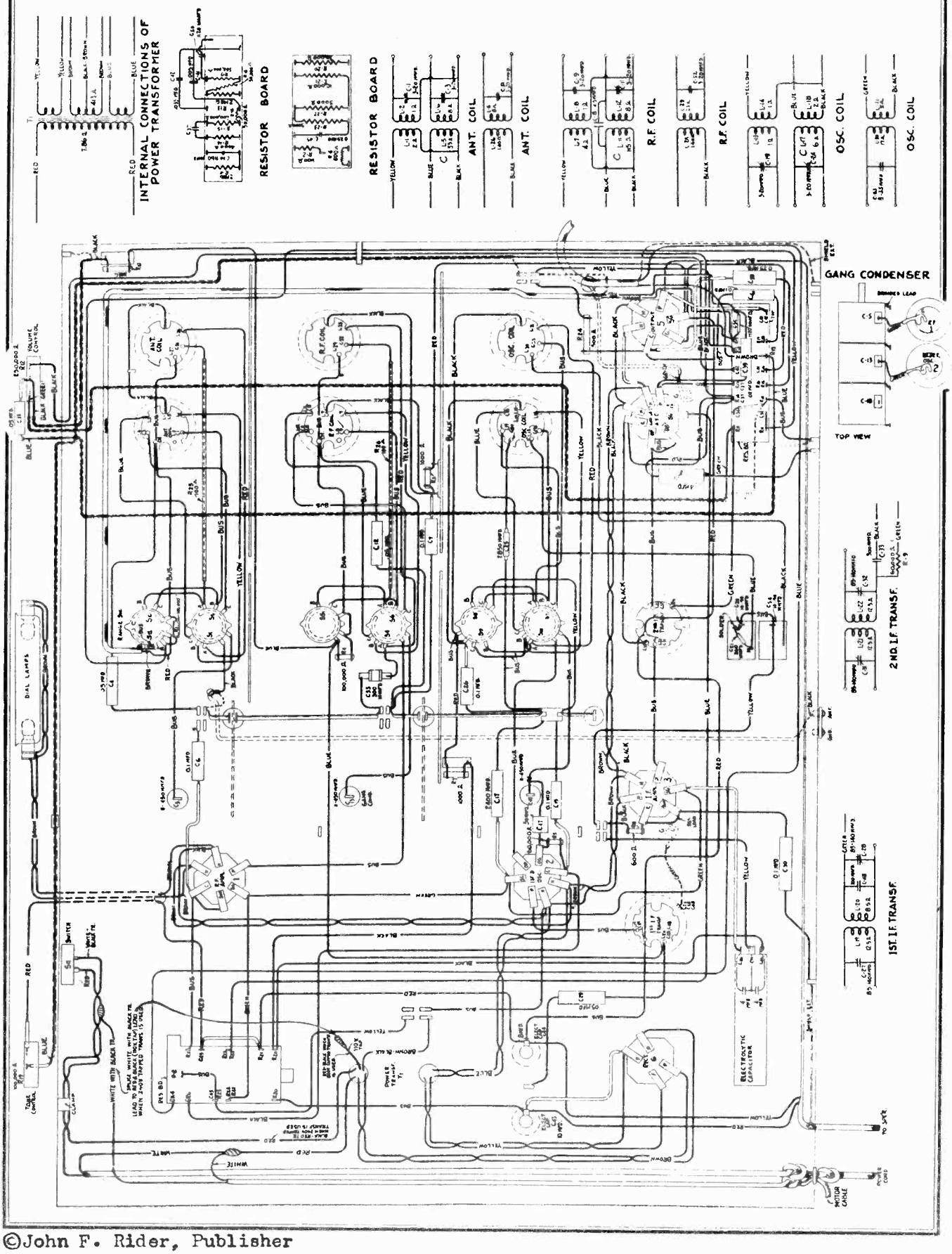


Figure 3—Loudspeaker Wiring

Figure 1—Schematic Circuit Diagram—Some models may have R-32 comprised of two resistors, one internal (4000-ohm) and one external (10,000-ohm)

MODEL 322-E Duo
Chassis Wiring

RCA MFG. CO., INC.



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MODEL 322-E Duo
Assembly Wiring
Transformer Data

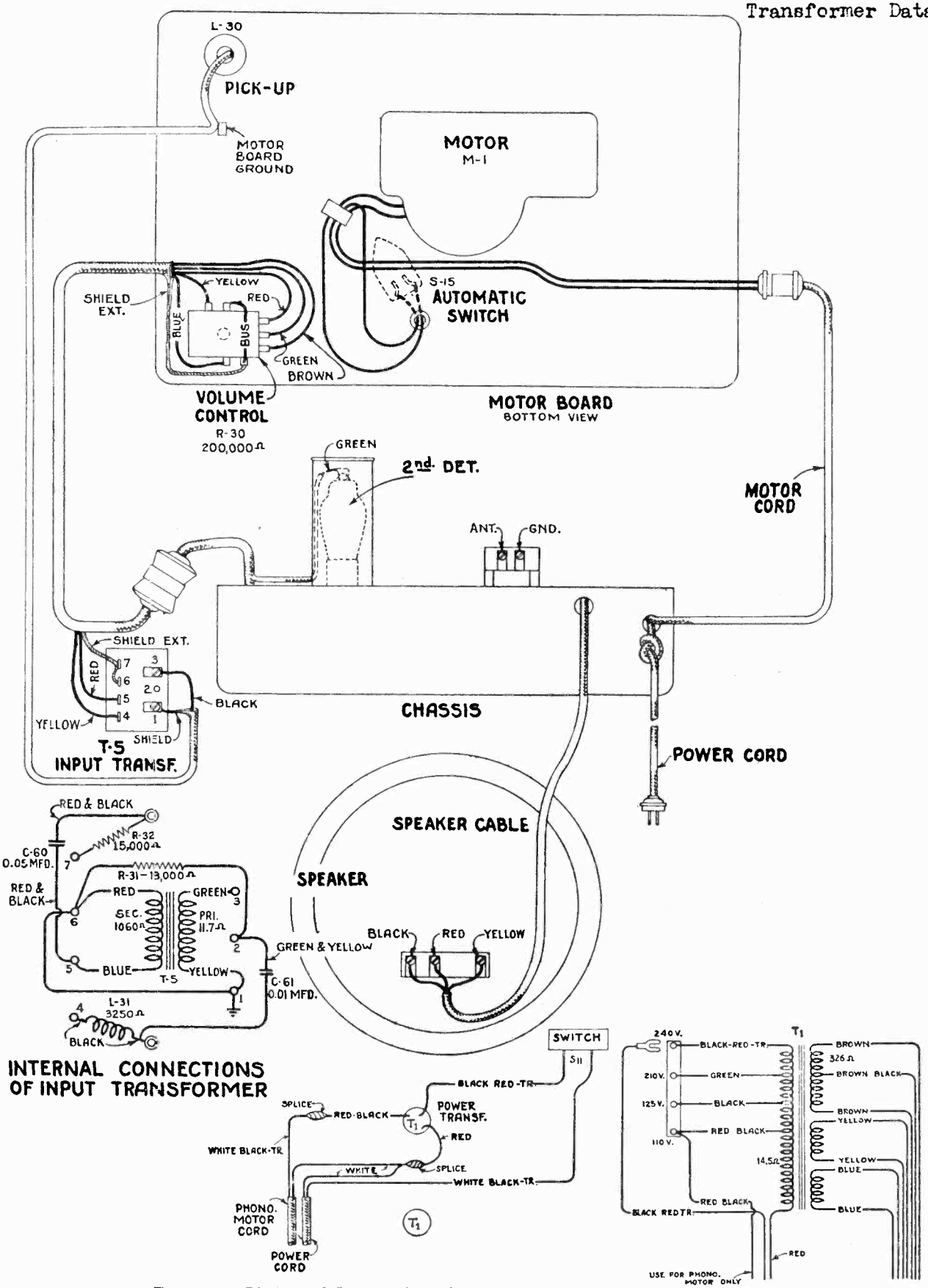


Figure 7—Universal Power Transformer Connections

The shields over the R. F. coil assembly have a hole at their top for entrance of the tuning wand. The location of the various coils inside of the shield is shown in Figure 5. An example of the proper manner of using the tuning wand would be to assume the external oscillator were set at 1720 and the signal tuned in, and the output indicator should be connected across the voice coil of the loudspeaker. Then the tuning wand would be inserted, first one end and then the other end, into the top of the three transformers at the left of the R. F. assembly, facing the front of the chassis. A perfect adjustment of the trimmer would be evidenced by a reduction in output when each end of the wand is inserted in each of the three transformers. If one end—for example, the iron end—when inserted in one coil caused an increase in output, then that circuit is low. An increase in the trimmer capacitance would be the proper remedy.

(2) I. F. TUNING CAPACITOR ADJUSTMENTS

This receiver has one I. F. stage, which uses two transformers. The transformers are all peaked at 460 K. C.

A detailed procedure for making this adjustment follows:

(a) Connect the output of an external oscillator tuned to 460 K. C. between the first detector grid and ground. Connect the output indicator across the voice coil of the loudspeaker.

(b) Place the oscillator in operation at 460 K. C. Place the receiver in operation and adjust the station selector until a point is reached (band B) where no signals are heard and turn the volume control to its maximum position. Reduce the oscillator input until a slight indication is obtained in the output indicator.

(c) Refer to Figure 6. Adjust each trimmer of the I. F. transformers until a maximum output is obtained. Go over the adjustments a second time.

This completes the I. F. adjustments. However, it is good practice to follow the I. F. adjustments with the R. F. and oscillator adjustments due to interlocking which always occurs.

(3) R. F. OSCILLATOR AND FIRST DETECTOR ADJUSTMENTS

Four R. F., oscillator and first detector adjustments are required in bands "A and B." Three are required in band "C."

To properly align the various bands, each band must be aligned individually. The preliminary set-up requires the external oscillator to be connected between the antenna and ground terminals of the receiver and the output indicator must be connected across the voice coil of the loudspeaker. The volume control must be at its maximum position and the input from the oscillator must be at the minimum value possible to get an output indication under these conditions. In the high-frequency band, it may be necessary to disconnect the oscillator from the receiver and place it at a distance in order to get a sufficiently low input to the receiver.

The dial pointer must be properly set before starting any actual adjustments. This is done by turning the variable capacitor until it is at its maximum capacity position. One end of the pointer should point exactly at the horizontal line at the lowest frequency end of band "B," while the other end should point to within 1/64 inch of the horizontal line at the highest frequency end of band "B."

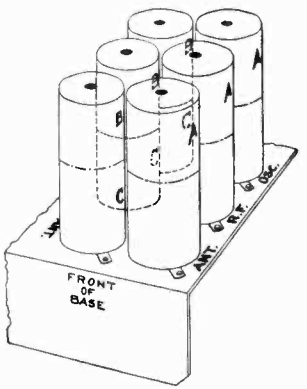


Figure 5—Location of Coils in Shields

Figure 6 shows the location of the trimmers for each band. Care must be exercised to merely adjust the trimmers in the band under test.

Band "A"

(a) Set the Band Switch at "A."

(b) Tune the external oscillator to 410 K. C., set the dial pointer at 410 K. C. and adjust the oscillator, detector and R. F. trimmers for maximum output.

(c) Shift the external oscillator frequency to 175 K. C. Tune in the 175 K. C. signal irrespective of scale calibration and adjust the series trimmer, marked 175 K. C. on Figure 6, for maximum output, at the same time rocking the variable tuning capacitor. Then readjust at 410 K. C. as described in (b).

Band "B"

(a) Set the Band Switch at "A."

(b) Tune the external oscillator to 1,720 K. C., set the pointer at 1,720 K. C. and adjust the oscillator, detector and R. F. trimmers for maximum output.

(c) Shift the external oscillator frequency to 600 K. C. Tune in the 600 K. C. signal, irrespective of scale calibration, and adjust the series trimmers, located on rear apron of chassis, for maximum output, at the same time rocking the variable tuning capacitor. Then readjust at 1,720 K. C. as described in (b).

Band "C"

(a) Set the Band Switch at "C."

(b) Tune the external oscillator to 18,000 K. C., and set the pointer at 18 M. C. Adjust the oscillator trimmer for maximum output. The trimmer should be set at the first peak obtained when increasing the trimmer capacitor from minimum to maximum.

(c) Check for the image signal, which should be received at approximately 17,080 on the dial. It may be necessary to increase the external oscillator output for this check.

(d) Reduce the capacity of the detector trimmer, while rocking the tuning capacitor, until the signal disappears. The first detector circuit is then aligned with the oscillator circuit and the RCA-6A7 tube is blocked. Then increase the capacity of the detector trimmer, while rocking the tuning capacitor, until the signal is peaked for maximum output.

(e) The antenna trimmer should now be peaked for maximum output. It is not necessary to rock the main tuning capacitor while making this adjustment.

(4) POWER TRANSFORMER CONNECTIONS

The 220-volt power transformer furnished with some instruments includes taps for operating on 110-volt lines. Figure 6 shows the schematic circuit of the transformer and the proper voltage to be applied to the various taps. The taps are located on the power transformer assembly and are accessible without removing the chassis from the cabinet.

(5) VOLTAGE READINGS

The voltages on page 10 are those at the various tube sockets while the receiver is in operating condition. No allowance has been made for currents drawn by the meter, and if low-resistance meters are used, such allowances must be made. Figure 8 shows the actual voltage at each socket contact.

(6) SERVICE DATA ON MAGNETIC PICKUP

The Magnetic Pickup used in this combination instrument is of a new design with an improved frequency range. While in physical appearance it is similar to that of the older type, details of construction are considerably different. It consists essentially of a chromium steel magnet, two thin pole pieces, a mechanism support and bracket, a coil, and an armature that is damped by means of an anchored damping block.

The use of the anchored damping block eliminates any bad peaks in the frequency range. The frequency-response characteristic is substantially flat from 50 to 5,000 cycles.

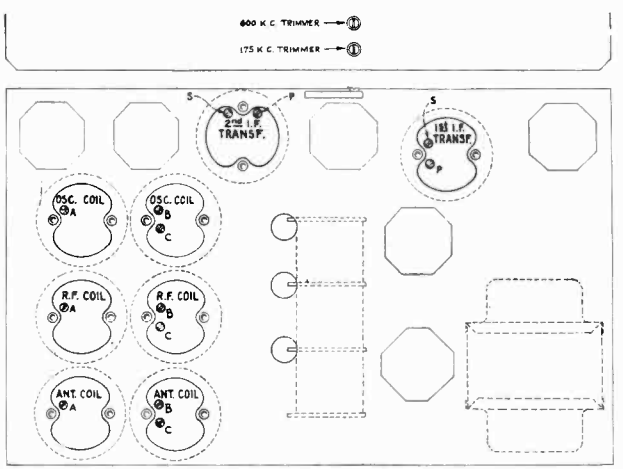


Figure 6—Location of Line-up Capacitors

In assembling, it may be desirable to check the armature air gap by means of a small Feeler Gauge. This air gap should be .009" on each side of the armature. However, a little practice with the needle in place will quickly disclose whether or not the armature is centered.

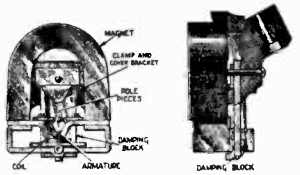


Figure 9—Details of Magnetic Pickup

(7) REPLACING MAGNET COIL, PIVOT RUBBERS, ARMATURE OR DAMPING BLOCK

In order to replace a defective coil or the hardened pivot rubbers (see Figure 9), it is necessary to proceed as follows:

(a) Remove the pickup cover by removing the center holding screw and needle screw.

(b) Remove the pickup magnet and the magnet clamp by pulling them forward.

(c) Unsolder the coil leads and remove the mechanism assembly from the back plate by releasing the two mounting screws and the damping block clamping screw.

(d) Remove screws A and B, Figure 10, and then remove the mechanism assembly from the pole pieces.

(e) The coil or the front pivot rubber may now be removed and replaced. If it is desired to replace the rear pivot rubber, then the end of the armature soldered to the mechanism support must be unsoldered and the damping block removed. The rear pivot rubber now may be replaced. After putting the pivot rubbers in place a new damping block should be fastened to the armature as outlined in instructions on replacing the damping block.

(f) The mechanism should now be reassembled, except for the magnet, which must be magnetized. After being magnetized, the mechanism—with the pole pieces upward—should be placed so that the magnet may be slid from the magnetizer onto the pole pieces without breaking physical contact. After placing the pole pieces on the magnet, the entire assembly should be remagnetized thoroughly, being careful not to change the polarity obtained by the initial magnetization.

(g) After assembling to the mechanism, the entire assembly should be fastened to the back plate by means of the screws provided, making sure the damping block is securely clamped. At the same time, the metal dust cover must be placed in position.

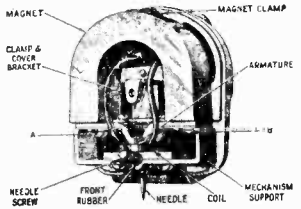


Figure 10—Pickup Nomenclature

(h) After remagnetizing, it is necessary to correctly center the armature. This may be done quite accurately by feeling its play after the needle is inserted. A little practice will quickly show which way an adjustment is necessary to have the armature centered properly. The adjustment is made by loosening screws A and B (Figure 10), and sliding the mechanism slightly in relation to the pole pieces.

(i) The cover may be now replaced over the entire assembly, and the pickup returned to the tone arm.

If it is desired to replace the damping block, it may be done in the following manner:

(a) Disassemble the pickup as described under the preceding section.

(b) Remove the armature entirely by unsoldering it at its joint with the mechanism support.

(c) Remove the damping block from the armature and clean the bushing for holding the damping block with emery paper.

(d) Insert the armature through the new block so that it occupies the same position as that of the old. Also ascertain that the block is in correct vertical alignment with the armature. It will be noted that the hole in the damping block is somewhat smaller than the diameter of the armature. This is done so that a snug fit will be obtained.

Figure 11—Special Soldering-Iron Tip

(e) After properly locating the damping block, a soldering iron should be applied to the armature so that the block will melt slightly at its point of contact with the armature. A special tip, constructed as shown in Figure 11, will prove desirable for fusing the block in place. The iron should be applied long enough to slightly melt the block and cause a small bulge on both sides, but should not be applied long enough to cause any bubbling. The pickup should then be reassembled as described in the preceding section.

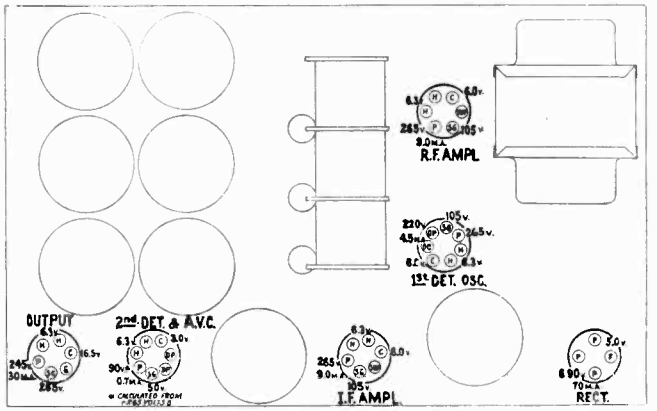


Figure 8—Tube Socket Voltages

RADIOTRON SOCKET VOLTAGES

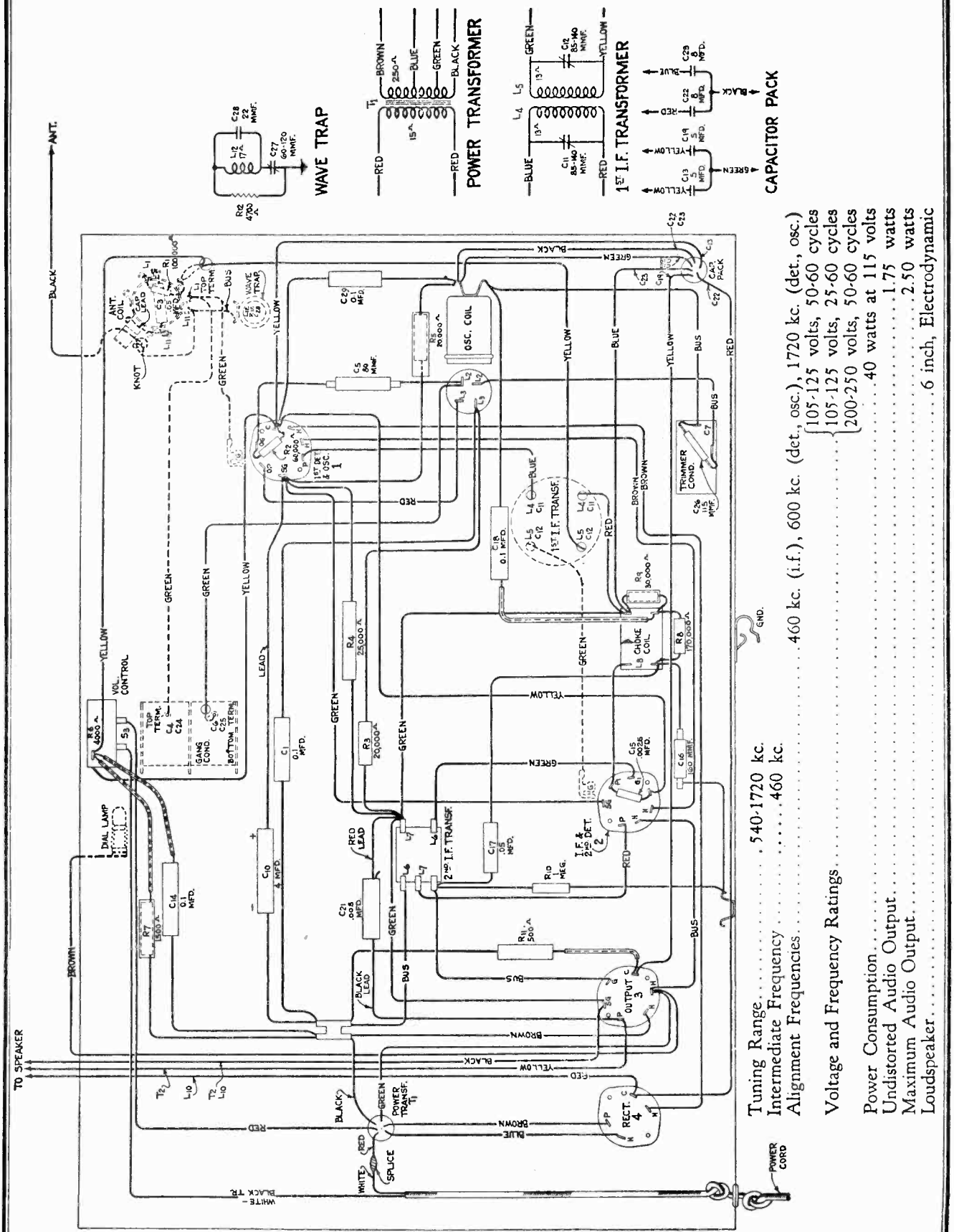
115 Volt A. C. Line—No Signal—Volume Control Maximum

Radiotron Number		Cathode to Ground, Volts, D. C.	Screen Grid to Ground, Volts, D. C.	Plate to Ground, Volts, D. C.	Plate Current, M. A.	Heater Volts, A. C.
RCA-6D6—R. F.		6.0	105	265	9.0	6.3
RCA-6A7	Det.	6.0	105	265	3.5	6.3
	Osc.	—	—	220	4.5	
RCA-6D6—I. F		6.0	105	265	9.0	6.3
RCA-6B7—2nd Detector		3.0	50	90*	0.7	6.3
RCA-41—Power		16.5	265	245	30.0	6.3
RCA-80—Rectifier		—	—	690 (RMS—P to P)	70.0	5.0

*Voltage calculated from 265 v. + B.

MODELS T4-8, T4-9
Chassis Wiring

RCA MFG. CO., INC.



Tuning Range	540-1720 kc.
Intermediate Frequency	460 kc.
Alignment Frequencies	460 kc. (i.f.), 600 kc. (det., osc.), 1720 kc. (det., osc.)
Voltage and Frequency Ratings	105-125 volts, 50-60 cycles 105-125 volts, 25-60 cycles 200-250 volts, 50-60 cycles
Power Consumption	40 watts at 115 volts
Undistorted Audio Output	1.75 watts
Maximum Audio Output	2.50 watts
Loudspeaker	6 inch, Electrodynamic

RCA MFG. CO., INC.

MODELS T4-8, T4-9
Schematic, Socket
Interference Note

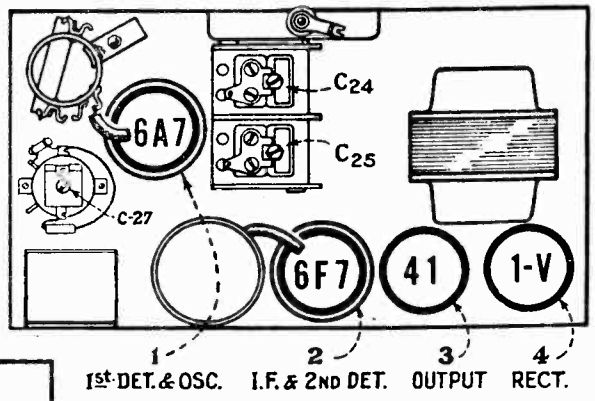


Figure 5—Radiotron Locations

Code Interference

In some localities near to high-powered, radio-telegraph communication stations, slight interference may be encountered. This trouble may be remedied by adjustment of the 460 kc. wave trap provided in the antenna circuit. Adjust the wave trap trimmer C-27 to produce a minimum of interference.

IF PEAK 460 KC

MODELS T4-8, T4-9
Alignment, Trimmers
Voltage

RCA MFG. CO., INC.

Alignment Procedure

Five aligning trimmers are provided, the physical locations of which are indicated on Figure 3. These trimmers are accurately adjusted during manufacturing tests and should remain in proper alignment indefinitely unless affected by abnormal conditions of temperature or humidity, or unless they have been altered for service purposes. Loss of sensitivity, improper tone quality and poor selectivity usually indicate necessity for re-alignment.

The correct performance of the receiver can only be obtained when the aligning has been done with adequate and reliable apparatus. Such test apparatus as may be required for this operation should be in the hands of a skilled service engineer. The manufacturer of this receiver has available for sale through its distributors and dealers, a complete assortment of service test equipment. The instruments needed for alignment operations are illustrated and described on a separate page of this booklet.

An oscillator or signal generator is required as a source of the standard alignment frequencies recommended under Electrical Specifications. Visual indication of receiver output during the adjustments is very advantageous and may be accomplished by use of a Cathode Ray Oscillograph such as the RCA Victor Stock No. 9545. The method of alignment is explained in the instruction booklet for this instrument. Where an oscillograph is not available, an RCA Victor Neon Type Output Indicator may be used with good results. It should be connected to the voice coil circuit of the loudspeaker so as to be actuated by the audio signal voltage.

The following method of procedure should be followed in adjusting the various trimmer capacitors:—

(1) **Intermediate Frequency Amplifier**—The first i-f transformer has two trimmers identified as C-11 and C-12 on the diagram, Figure 3. Each must be tuned to *460 kc.* by feeding a signal of this frequency from the Full Range Oscillator into the RCA-6A7 control grid and chassis-ground and adjusting both trimmers to the point giving maximum output. The oscillator output and the receiver volume control should be regulated so as to produce a sensitive indication on the receiver output indicator. If interference is noticed from strong local stations during these adjustments, the station selector should be tuned to a point at which they will be subdued.

(2) **Detector and Oscillator**—A total of three adjustments are necessary on the detector and oscillator coil systems. Two of these are to be made at *1720 kc.* and the other at *600 kc.* The *1720 kc.* trimmers are mounted on the variable tuning condenser and are accessible from the top of the chassis. The *600 kc.* trimmer, which is associated with the oscillator system, is located on the rear apron of the chassis as shown by Figure 3. To align these

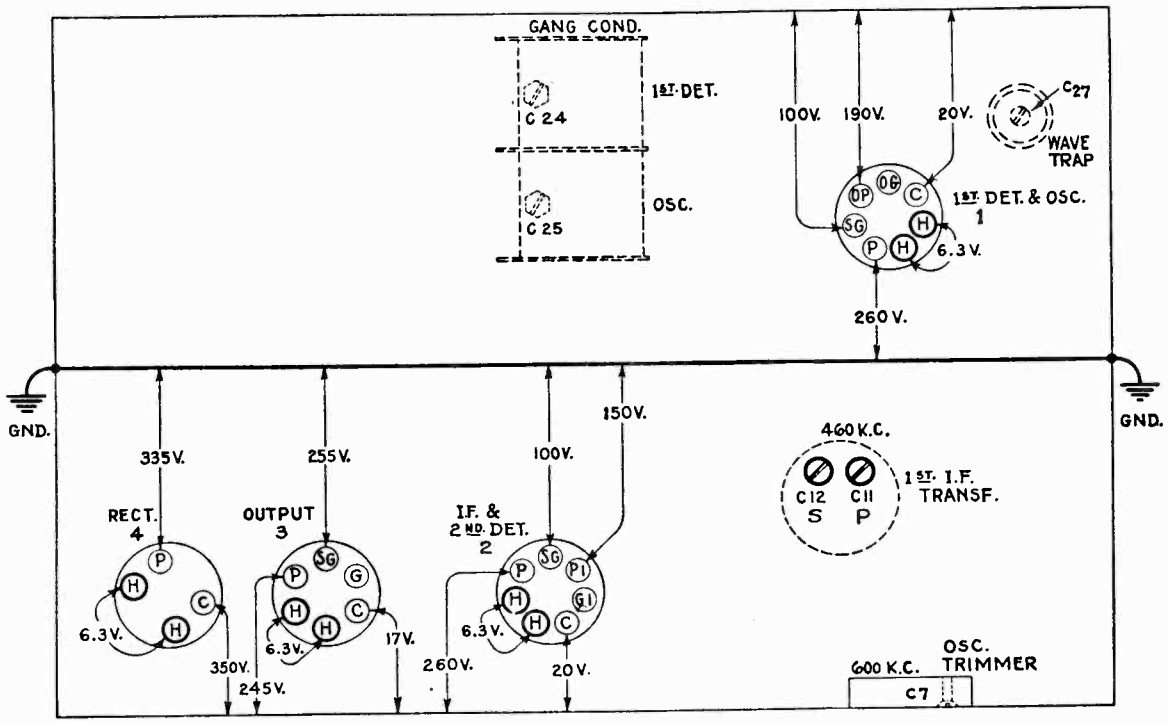


Figure 3—Trimmer Locations and Radiotron Socket Voltages to Chassis
Measured at 120 volts A-C Supply—No Signal — Volume Control Maximum

RCA MFG. CO., INC.

various trimmers, after correcting the i-f alignment, proceed in the following manner. Supply a *1720 kc.* signal from the standard oscillator to the receiver imput (ant-gnd) terminals and accurately set the station selector to the *1720 kc.* dial marking. (If for any reason, the dial pointer has slipped or been misplaced on the tuning shaft, it should be checked for proper calibration at full mesh of the variable condenser. With the station selector set to *1400 kc.* adjust the trimmers C-25 and C-24 so that each produces maximum (peak) receiver output. Then shift the test oscillator frequency to *600 kc.* and tune this standard signal on the receiver, disregarding the dial reading at which it is received. Adjust the *600 kc.* oscillator trimmer C-7, simultaneously rocking the variable gang condenser backward and forward through the signal so

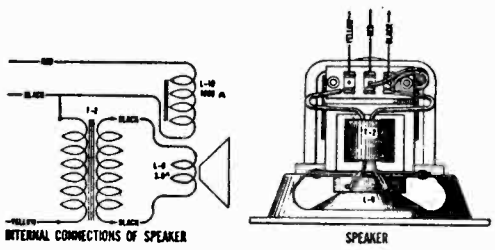


Figure 4—Loudspeaker Wiring

that maximum receiver output results from the combined operations. The point at which maximum output is obtained will not always be exactly at *600 kc.* on the dial. The error should be disregarded. It is advisable to repeat the adjustments of C-24 and C-25 as explained above to correct for any reflective changes brought about by the adjustment of C-7.

REPLACEMENT PARTS

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

Stock No.	Description	List Price
	RECEIVER ASSEMBLIES	
4244	Cap—Grid contact cap—Package of 5	$0.20
4000	Capacitor—Adjustable capacitor (C7)	.78
3459	Capacitor—80 mmfd. (C5)	.44
11302	Capacitor—115 mmfd. (C26)	.15
3865	Capacitor—160 mmfd. (C16)	.30
5107	Capacitor—0.0025 mfd. (C15)	.16
6787	Capacitor—0.005 mfd. (C21)	.30
4836	Capacitor—0.05 mfd. (C3)	.30
4886	Capacitor—0.05 mfd. (C17)	.20
4835	Capacitor—0.1 mfd. (C1)	.28
4885	Capacitor—0.1 mfd. (C14, C18)	.28
4841	Capacitor—0.1 mfd. (C29)	.22
6832	Capacitor—4.0 mfd. (C10)	.85
6661	Capacitor pack—Comprising two 5.0 mfd. and two 8.0 mfd. capacitors (C13, C19, C22, C23)	2.70
5051	Coil—Antenna coil (L1, L11, C3, R1)	1.28
3857	Coil—Choke coil (L8)	.90
5050	Coil—Oscillator coil (L2, L3)	.56
6660	Condenser—Two-gang variable tuning condenser (C4, C6, C24, C25)	2.78
6667	Volume control (R6, S3)	1.58
11301	Dial—Station selector dial	.40
4340	Lamp—Dial lamp—Package of 5	.60
3632	Resistor—500 ohms—Carbon type—1 watt (R11)—Package of 5	1.10
3047	Resistor—1500 ohms—Carbon type—½ watt (R7)—Package of 5	1.00
6114	Resistor—20,000 ohms—Carbon type—1 watt (R3, R5)—Package of 5	1.10
3889	Resistor—25,000 ohms—Carbon type—3 watt (R4)	.25
3077	Resistor—30,000 ohms—Carbon type—½ watt (R9)—Package of 5	1.00
3602	Resistor—60,000 ohms—Carbon type—¼ watt (R2)—Package of 5	$1.00
3118	Resistor—100,000 ohms—Carbon type—¼ watt (R1)—Package of 5	1.00
3869	Resistor—170,000 ohms—Carbon type—½ watt (R8)—Package of 5	1.00
3076	Resistor—1 megohm—Carbon type—½ watt (R10)—Package of 5	1.00
3584	Ring—Oscillator coil shield ring—Package of 5	.40
6665	Shield—Oscillator coil shield and bracket assembly	.34
3942	Shield—I. F. and second detector Radiotron shield	.18
8098	Socket—Dial lamp socket	.10
11187	Transformer—First intermediate frequency transformer (L4, L5, C11, C12)	1.72
6663	Transformer—Second intermediate frequency transformer (L6, L7)	1.06
9465	Transformer—Power transformer—105-125 volts—25-50 cycles	4.38
9464	Transformer—Power transformer—105-125 volts—50-60 cycles (T1)	3.20
9466	Transformer—Power transformer—200-250 volts—50-60 cycles	3.28
11224	Trap—Wave trap (R12, L12, C27, C28)	.90
	REPRODUCER ASSEMBLIES	
9548	Coil assembly—Comprising field coil, magnet and cone support (L10)	$3.08
9588	Cone—Reproducer cone—(L9)—Package of 5	3.55
9547	Reproducer—Complete	5.45
4447	Shield—Terminal board shield for reproducer	.18
4803	Transformer—Output transformer (T2)	1.45

MODEL T4-10
Socket, Alignment
Parts List, Data

RCA MFG. CO., INC.

SERVICE DATA

Two trimmer capacitors are mounted on the variable tuning condenser for alignment purposes. Their exact locations and identifications are given by Figure 3. It will be necessary to re-adjust these capacitors only when they have become altered from their original alignment by reason of change of parts for service purposes, effects of extreme climate, or possibly because of tampering. Poor all-round performance is the general indication of improper alignment.

To re-align the receiver, proceed as follows:—

(1) Place the receiver in operation with a standard signal generator (RCA Victor Stock No. 9595) connected to its antenna terminal. Correct the "zero" setting of the tuning knob so that it reads "0" when turned to its extreme left or full mesh of the variable condenser.

(2) Set the trimmer screws so that they are approximately equal at their medium capacity. This may be done by turning each the same number of turns from their maximum positions.

(3) Tune the external test oscillator to 1700 kc. and rotate the station selector until it is received. Adjust the output of the oscillator and volume control of the receiver to give the desired output level. It is advisable to use an output indicator attached to the speaker circuit. An RCA Stock No. 4317 Output Indicator is especially suitable.

(4) Adjust the two trimmers C-3 and C-14, at the same time observing the output indicator, until the maximum (peak) receiver output is obtained.

Radiotron Socket Voltages

The voltages indicated from the socket contacts to the chassis on Figure 3 will serve to assist in analyzing defective circuit conditions when existent. Each value specified should hold within ± 20% when the receiver is normally operative at the rated voltage. Variations in excess of this limit will usually be indicative of a faulty part. If all readings are incorrect, trouble should be investigated in the rectifier system. Defects occurring at other points in the circuits will affect a single or group of measurements related to that section.

Readings given are actual operating values and do not take into account measurement inaccurracies due to internal voltmeter resistance. A meter having a resistance of at least 1000 ohms per volt should be used. The amount of circuit resistance which shunts the meter will determine the accuracy obtained, the error increasing as the former becomes comparable to or less than the latter.

Antenna-Ground

The circuit of the receiver is arranged in such manner that the chassis is at negative high voltage. The usual ground connection is therefore omitted and the chassis mounted so that it is insulated. The r-f circuit to ground is by way of the negative d-c lead or neutral a-c lead.

Interference present on the power supply line may occasionally attain a bothersome level in the receiver. When being operated on a.c., some reduction of this noise may be brought about by reversal of the power plug. For more serious interference, either from an a-c or d-c line, an external ground should be made to the receiver chassis through a small series condenser (.001 mfd, 200 volts). The length of the grounding lead should be kept to an absolute minimum.

Power Cord

The resistance element of the power lead will produce a noticeable amount of heat while the receiver is in operation. This heating should not be regarded as abnormal. No changes should be made in the length of the cord. In case of failure, it should be replaced in its entirety by a standard part.

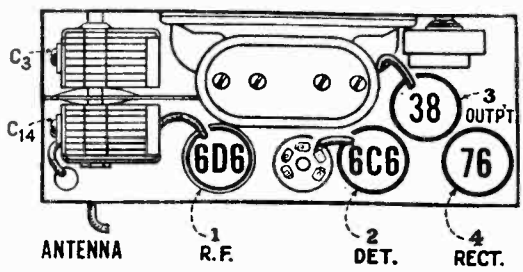


Figure 4- Tube Location Layout

Stock No.	Description	List Price
	RECEIVER ASSEMBLIES	
4244	Cap—Grid contact cap—Package of 5	$0.20
11135	Capacitor—265 mmfd. (C8)	.15
5107	Capacitor—.0025 mfd. (C9)	.16
5005	Capacitor—.0035 mfd. (C11)	.16
4858	Capacitor—.01 mfd. (C1)	.25
4836	Capacitor—.05 mfd. (C4)	.30
4841	Capacitor—.1 mfd. (C7)	.22
11268	Capacitor pack—Comprising two 4.0 mfd. capacitors (C12, C13)	.80
7956	Capacitor pack—Comprising two 5.0 mfd. capacitors (C6, C10)	.80
6821	Coil—Detector coil (L4, L5, L6)	.96
11261	Coil—RF coil (L1, L2, L3)	1.00
11260	Condenser—Two-gang variable tuning condenser (C2, C3, C5, C14)	1.75
11263	Volume control (R1, S1)	.88
11267	Cord—Power cord—315 ohms (R8)	1.00
3537	Reactor—Filter reactor (L8)	1.10
4408	Resistor—1500 ohm—Carbon type—¼ watt (R7)—Package of 10	2.00
3998	Resistor—15,000 ohm—Carbon type—¼ watt (R3)—Package of 5	$1.00
5108	Resistor—330,000 ohm—Carbon type—¼ watt (R2)—Package of 5	1.00
11172	Resistor—470,000 ohm—Carbon type—¼ watt (R5)—Package of 5	1.00
3033	Resistor—1 megohm—Carbon type—¼ watt (R6)—Package of 5	1.00
11151	Resistor—2.2 megohm—Carbon type—¼ watt (R4)—Package of 5	1.00
5129	Ring—Radiotron shield ring—Package of 5	.10
11265	Shield—Radiotron shield	.15
	REPRODUCER ASSEMBLIES	
9471	Cone—Reproducer cone—Package of 5	3.50
7713	Mechanism—Reproducer mechanism—Complete	3.72
9470	Reproducer—Complete (L7)	4.62
7712	Support—Cone support	.50

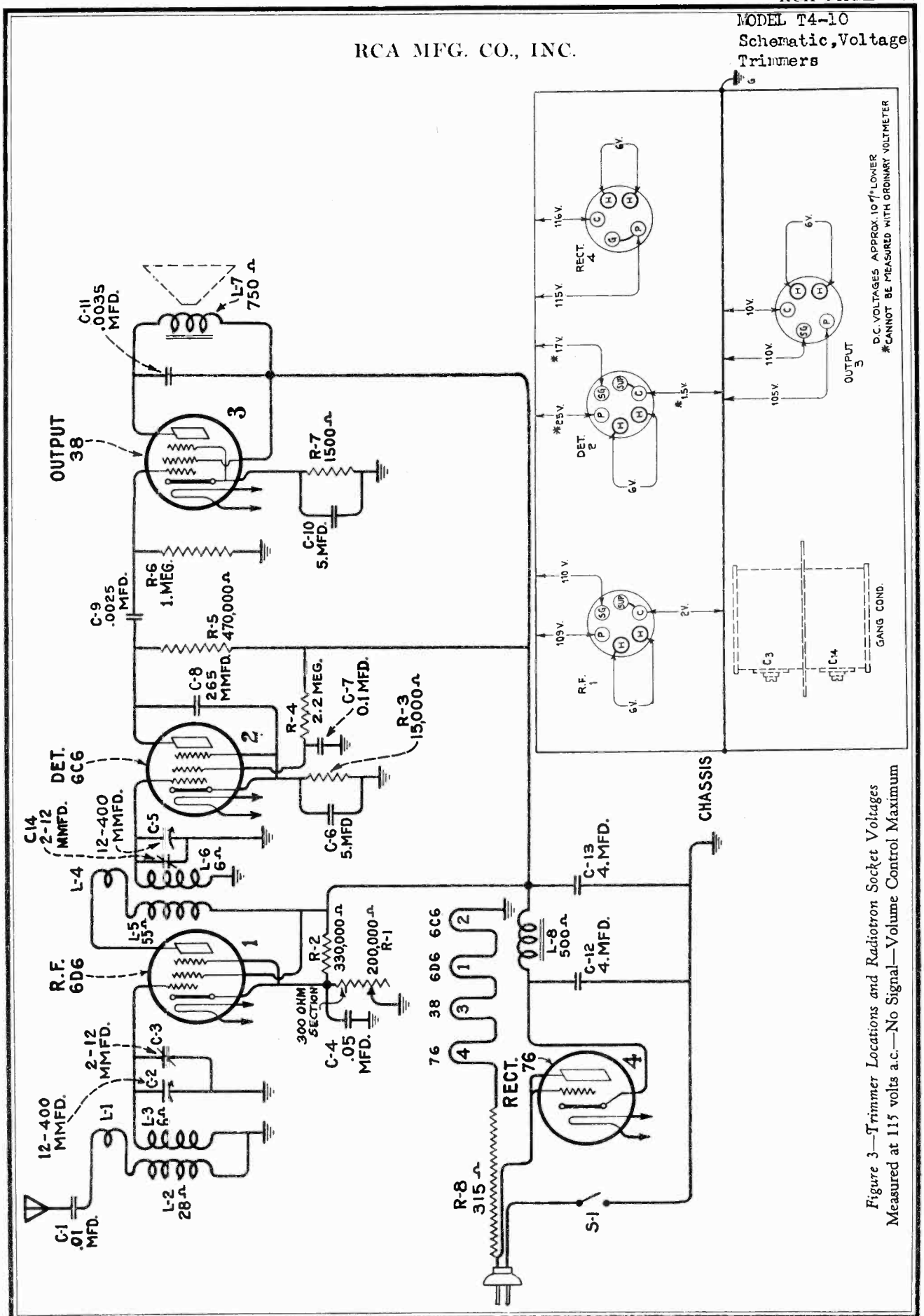
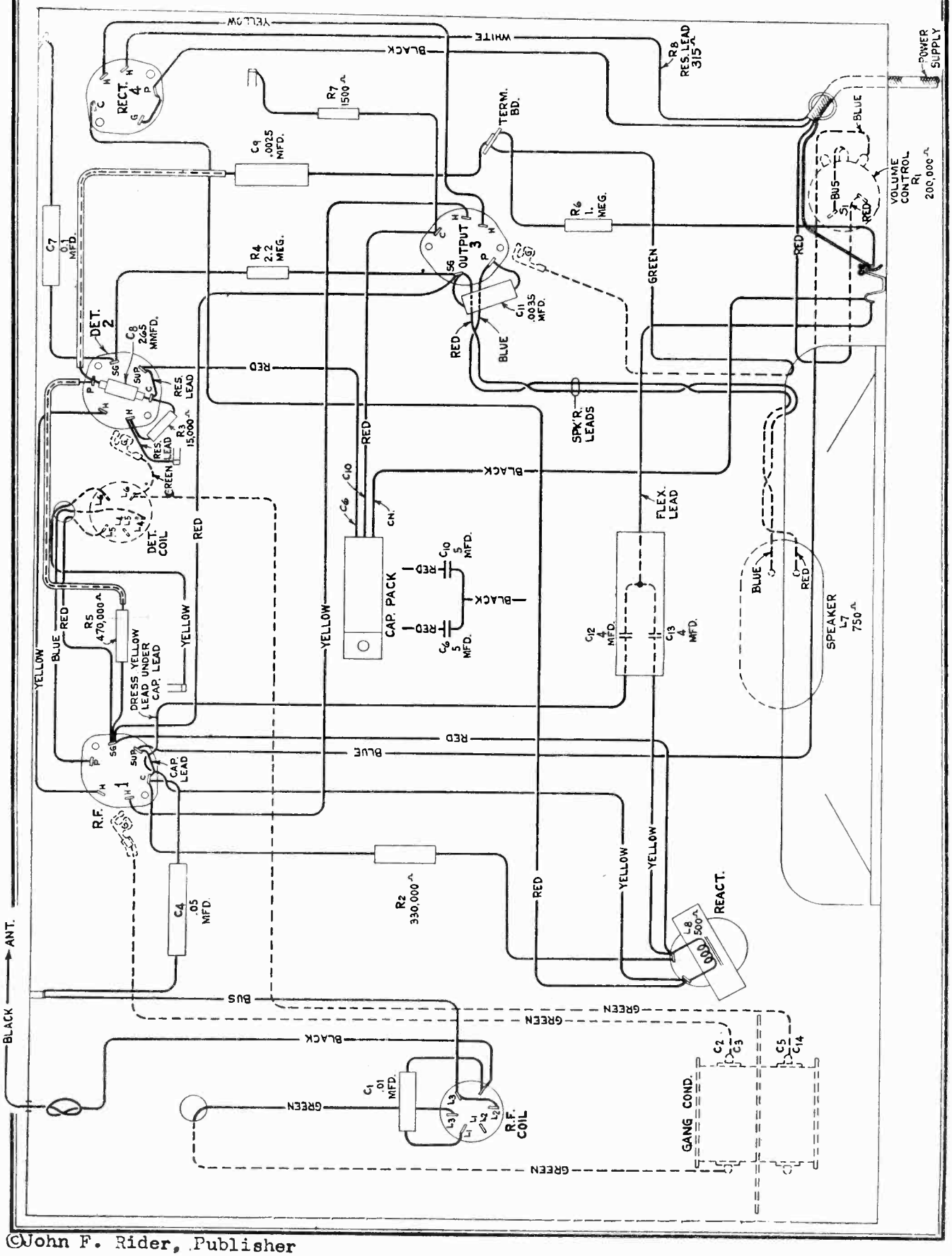


Figure 3—Trimmer Locations and Radiotron Socket Voltages Measured at 115 volts a.c.—No Signal—Volume Control Maximum

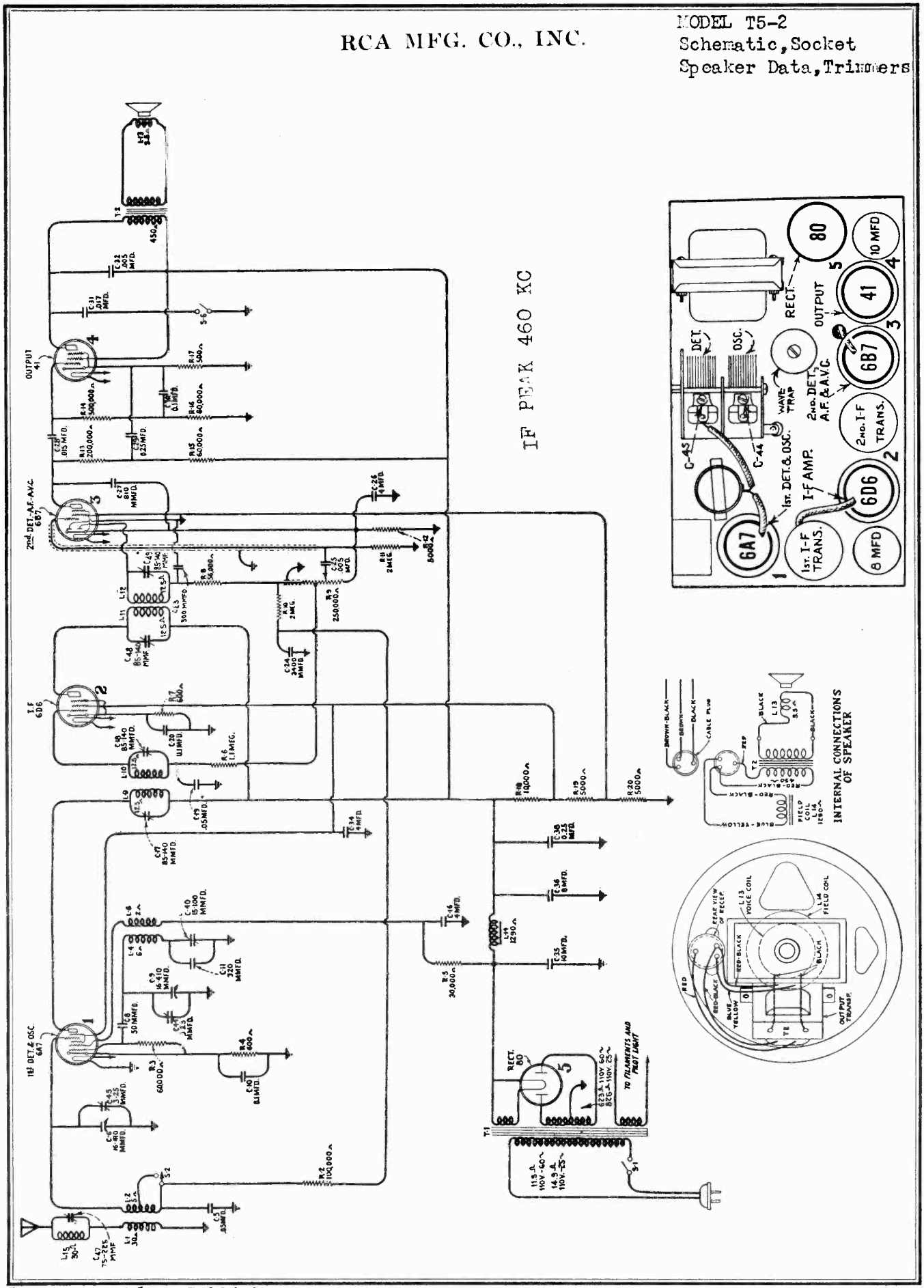
MODEL T4-10
Chassis Wiring

RCA MFG. CO., INC.



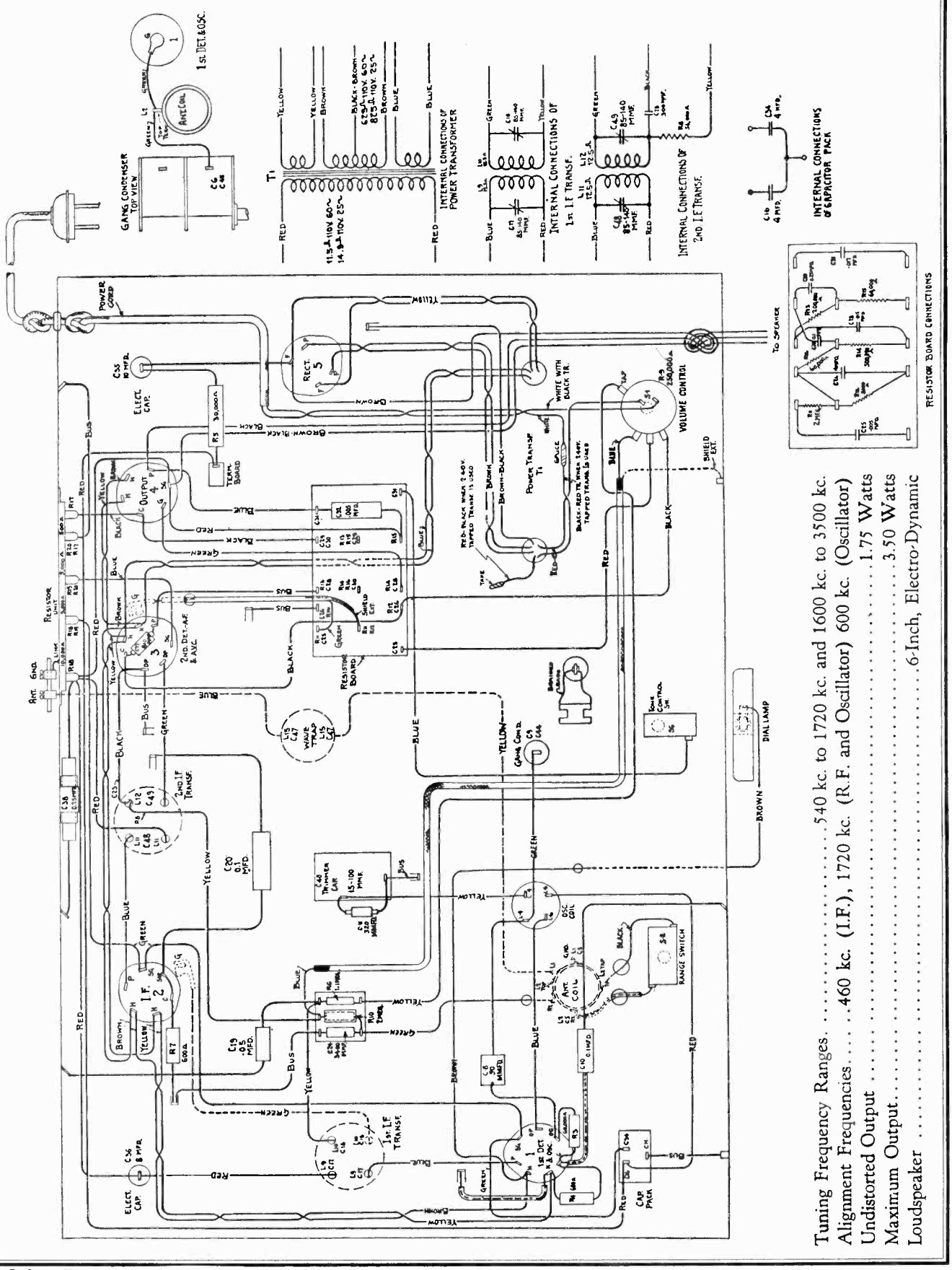
RCA MFG. CO., INC.

MODEL T5-2
Schematic, Socket
Speaker Data, Trimmers



MODEL T5-2
Chassis Wiring

RCA MFG. CO., INC.



Tuning Frequency Ranges. . . . . 540 kc. to 1720 kc. and 1600 kc. to 3500 kc.
Alignment Frequencies. . . . . 460 kc. (I.F.), 1720 kc. (R.F. and Oscillator) 600 kc. (Oscillator)
Undistorted Output . . . . . 1.75 Watts
Maximum Output. . . . . 3.50 Watts
Loudspeaker . . . . . 6-Inch, Electro-Dynamic

RCA MFG. CO., INC.

MODEL T5-2
Alignment
Trimmers, Voltage

SERVICE DATA

ALIGNMENT PROCEDURE

This receiver must be in correct electrical alignment in order to obtain maximum efficiency and best quality of performance. The circuits should be realigned after each major service or repair operation, and whenever there are positive indications that the adjustments have deviated from normal by ordinary usage. These indications will be present together and will have the nature of: low sensitivity, poor tone quality and irregular double-peaked tuning.

I-F Tuning Adjustments

There are two i-f transformers associated in the intermediate amplifier system. They are both tuned by accessible trimmers. To obtain the correct alignment proceed as follows:

(a) Short circuit the antenna and ground terminals and tune the receiver so that no signal is received. Set the volume control to its maximum position. Ground the receiver.

(b) Connect the output of the test oscillator between the first detector control grid and chassis ground. Attach an indicating meter, such as is illustrated, to the speaker circuit.

(c) Place the external oscillator into operation at 460 kc. Adjust the output so that a slight registration occurs on the output indicator. The output should be set at as low a value as will give a convenient indication during adjustment; this requirement is important in that the a.v.c. action is voided by such a method. Adjust the trimmers, C-49, C-48, C-18 and C-17 in order, for maximum receiver output.

R-F and Oscillator Adjustments

Three trimmers are provided, two for adjustment at 1720 kc. and one for oscillator line-up at 600 kc. No adjustments are required on the medium wave band. Locations of the trimmers are shown on Figure 3. They should be adjusted in the following manner:

(a) Connect the output of the modulated Full Range Oscillator to the antenna and ground terminals of the receiver. Check the position of the dial pointer. It should set exactly on the radial line, adjacent to the dial reading of 540 when the tuning capacitor plates are at full mesh. After correcting the dial pointer, place the receiver in operation and set the selector at 1720 kc., advance the volume control to maximum and turn the range switch to its broadcast position.

(b) Adjust the frequency of the external oscillator to 1720 kc. and regulate its output until a perceptible indication appears on the output indicator. This indication should be held at a minimum during the adjustments. The trimmers C44 and C45 should then be tuned to the point giving peak receiver output.

(c) Re-tune the test oscillator, setting its frequency

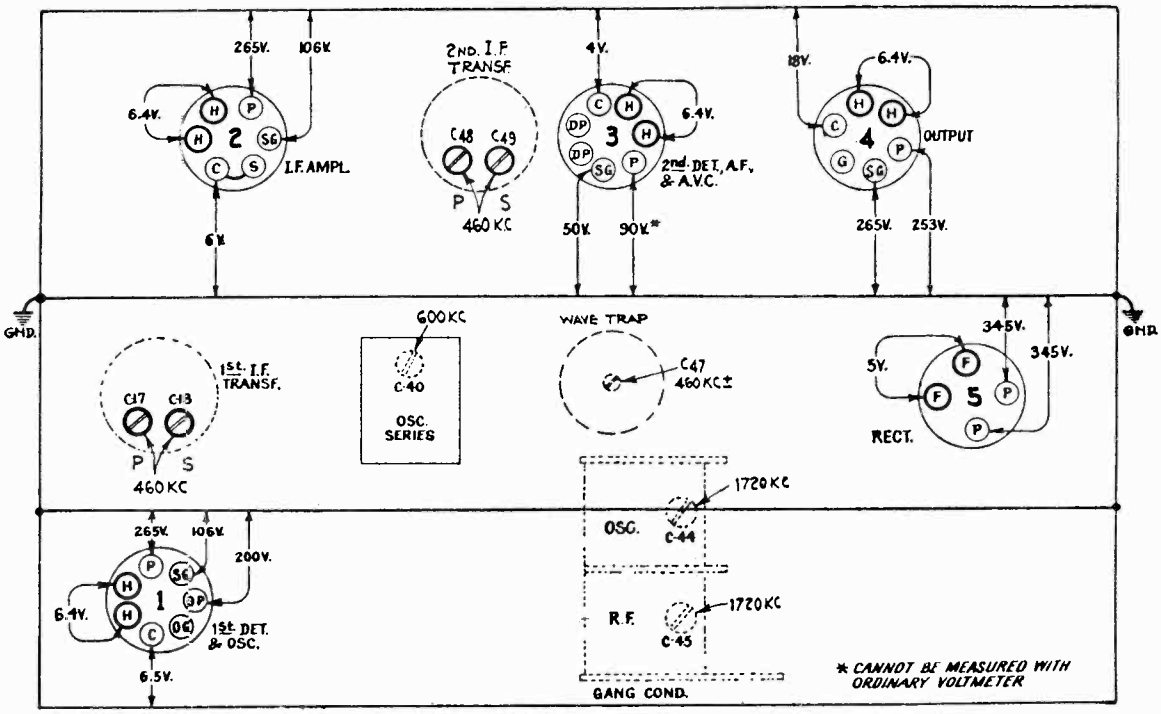


Figure 3—Trimmer Locations and Radiotron Socket Voltages (Measured at 115 volts A. C. Supply—Maximum Volume Control—No Signal)

to 600 kc. Turn the receiver selector control to the point where the incoming oscillator signal is received best. *This point will not always be exactly at 600 on the dial.* Then adjust the low-frequency trimmer, C40, simultaneously rocking the tuning capacitor slowly through the signal until maximum receiver output results from these combined operations. This adjustment must be made irrespective of dial calibration. It is advisable to repeat the 1720 kc. adjustment of the oscillator trimmer C44, in order to correct for any change caused by the tuning of C40.

Wave Trap Adjustment

With receiver in operation using its normal antenna, tune the station selector to the point at which the intermediate-wave interference is most intense. Then adjust the wave-trap trimmer to the point which cause maximum suppression of the interference.

RADIOTRON SOCKET VOLTAGES

The various normal operating voltages are given on Figure 3. As specified, they are referred to the chassis ground. Accuracy of measurements will be a function of the internal resistance of the voltmeter used. It is advisable to employ a meter having at least 1000 ohms per volt, and for each reading use the highest range which will give an acceptably accurate reading. General deviations from the values given, due to line voltage difference, should not be taken as indicating a defective condition. The erratic departure from normal of a single value or group of values should form the basis of circuit diagnosis.

T 5-2 REPLACEMENT PARTS

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

Stock No.	Description	List Price
	RECEIVER ASSEMBLIES	
4244	Cap—Contact cap—Package of 5	$0.20
3861	Capacitor—Adjustable capacitor (C40)	.78
5094	Capacitor—50 MMfd. (C8)	.20
5151	Capacitor—320 MMfd. (C11)	.20
4297	Capacitor—400 MMfd. (C27)	.30
4881	Capacitor—3400 MMfd. (C24)	.20
4868	Capacitor—0.005 Mfd. (C25, C32)	.20
11315	Capacitor—0.015 Mfd. (C28)	.20
4906	Capacitor—0.017 Mfd. (C31)	.25
4836	Capacitor—0.05 Mfd. (C5, C19)	.30
4841	Capacitor—0.1 Mfd. (C10, C20, C30)	.22
3597	Capacitor—0.25 Mfd. (C29, C38)	.40
3796	Capacitor—4.0 Mfd. (C26)	.60
4428	Capacitor—8.0 Mfd. (C36)	1.05
7790	Capacitor—10.0 Mfd. (C35)	1.05
7589	Capacitor Pack—Comprising two 4.0 Mfd. capacitors (C16, C34)	1.64
4358	Clamp—Capacitor mounting clamp for Stock No. 4428 and No. 7790	.15
5051	Coil—Antenna coil (L1, L2, C5, R2)	1.28
5050	Coil—Oscillator coil (L4, L6)	.56
11475	Condenser—2-gang variable tuning condenser (C6, C9, C44, C45)	3.25
11476	Drive—Variable condenser drive	.65
3708	Resistor—600 Ohm—Carbon type—1/4 watt (R4, R7)—Package of 5	1.00
4436	Resistor—5000 Ohm—Carbon type—1/4 watt (R12)—Package of 10	2.00
2240	Resistor—30,000 Ohm—Carbon type—1 watt (R5)	.22
3602	Resistor—60,000 Ohm—Carbon type—1/4 watt (R3, R15, R16)—Package of 5	1.00
3118	Resistor—100,000 Ohm—Carbon type—1/4 watt (R2)—Package of 5	1.00
3116	Resistor—200,000 Ohm—Carbon type—1/4 watt (R13)—Package of 5	1.00
6186	Resistor—500,000 Ohm—Carbon type—1/4 watt (R14)—Package of 5	1.00
4783	Resistor—1,100,000 Ohm—Carbon type—1/4 watt (R6)—Package of 5	1.00
6242	Resistor—2 Megohm—Carbon type—1/4 watt (R10, R11)—Package of 5	1.00
4721	Resistor—Tapped resistor—One 500 Ohm, two 5,000 Ohm, and one 10,000 Ohm sections (R17, R18, R19, R20)	.88
3584	Ring—Oscillator coil retaining ring—Package of 5	$0.40
3623	Shield—Oscillator coil shield	.30
3942	Shield—First detector and output Radiotron shield	.18
3782	Shield—Second detector Radiotron shield	.26
7487	Shield—I.F. Radiotron shield	.25
5186	Shield—I.F. Transformer shield	.28
3858	Socket—Dial lamp socket	.26
4784	Socket—4-contact Radiotron socket	.15
4785	Socket—6-contact output Radiotron socket	.15
4786	Socket—6-contact Radiotron socket	.15
4787	Socket—7-contact Radiotron socket	.15
5053	Switch—Range switch (S2)	.50
4905	Switch—Tone control switch (S6)	.30
4900	Transformer—First intermediate frequency transformer—(L9, L10, C17, C18)	2.25
11477	Transformer—Second intermediate frequency transformer (L11, L12, C23, C48, C49, R8)	2.02
4898	Transformer—Power transformer—105-125 volts—25-60 cycles	5.55
4897	Transformer—Power transformer—105-125 volts—50-60 cycles (T1)	3.98
4899	Transformer—Power transformer—105-125/200-240 volts—40-60 cycles	4.05
11479	Trap—Wave trap (L15, C47)	1.02
4429	Volume Control—(R9, S1)	1.40
	REPRODUCER ASSEMBLIES	
9587	Coil—Field coil, magnet and cone support (L14)	2.18
9588	Cone—Reproducer cone (L13)—Package of 5	3.55
5118	Connector—3-contact male connector for reproducer cable	.25
5119	Connector—3-contact female connector for reproducer cable	.25
9586	Reproducer—Complete	5.95
4893	Transformer—Output transformer (T2)	1.48
	MISCELLANEOUS ASSEMBLIES	
5111	Dial—Station selector dial scale	.32
11478	Indicator—Station selector indicator pointer	.12
4340	Lamp—Station selector dial lamp—Package of 5	.60

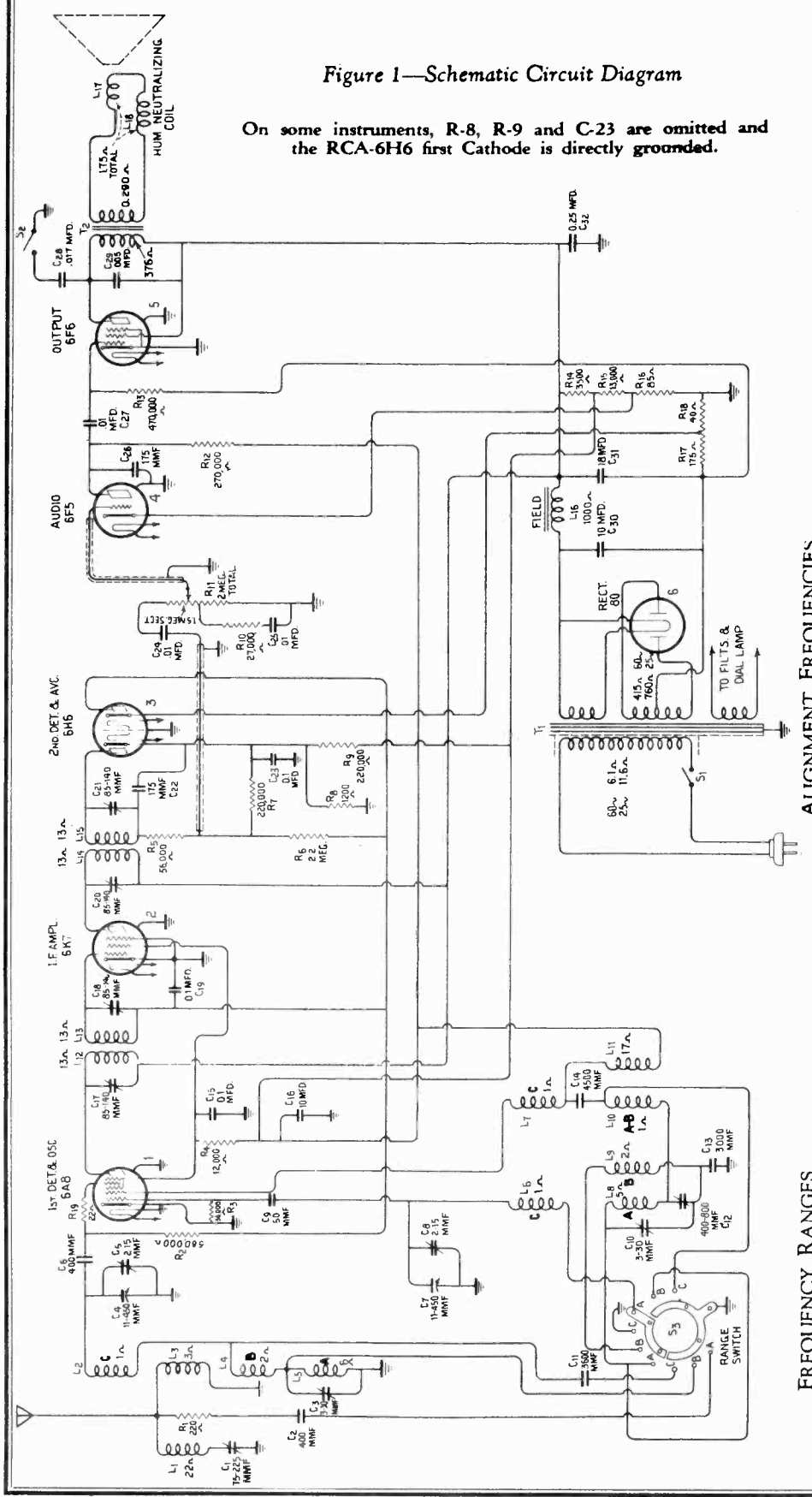
MODELS T6-1, C6-2
Schematic

RCA MFG. CO., INC.

Figure 1—Schematic Circuit Diagram

On some instruments, R-8, R-9 and C-23 are omitted and the RCA-6H6 first Cathode is directly grounded.

IF PEAK 460 KC



Alignment Frequencies

Band A	600 kc. (osc.), 1400 kc. (osc., ant.)
Band B	None required
Band C	18000 kc. (osc., ant.)

Frequency Ranges

Band A	540— 1625 kc.
Band B	1625— 5700 kc.
Band C	5700—18000 kc.

Intermediate Frequency ..... 460 kc.

Power Supply Ratings

Rating A	105—125 volts, 50—60 cycles, 85 watts
Rating B	105—125 volts, 25—60 cycles, 90 watts
Rating C	100—130/140—160/195—250 volts, 40—60 cycles, 85 watts

Power Output

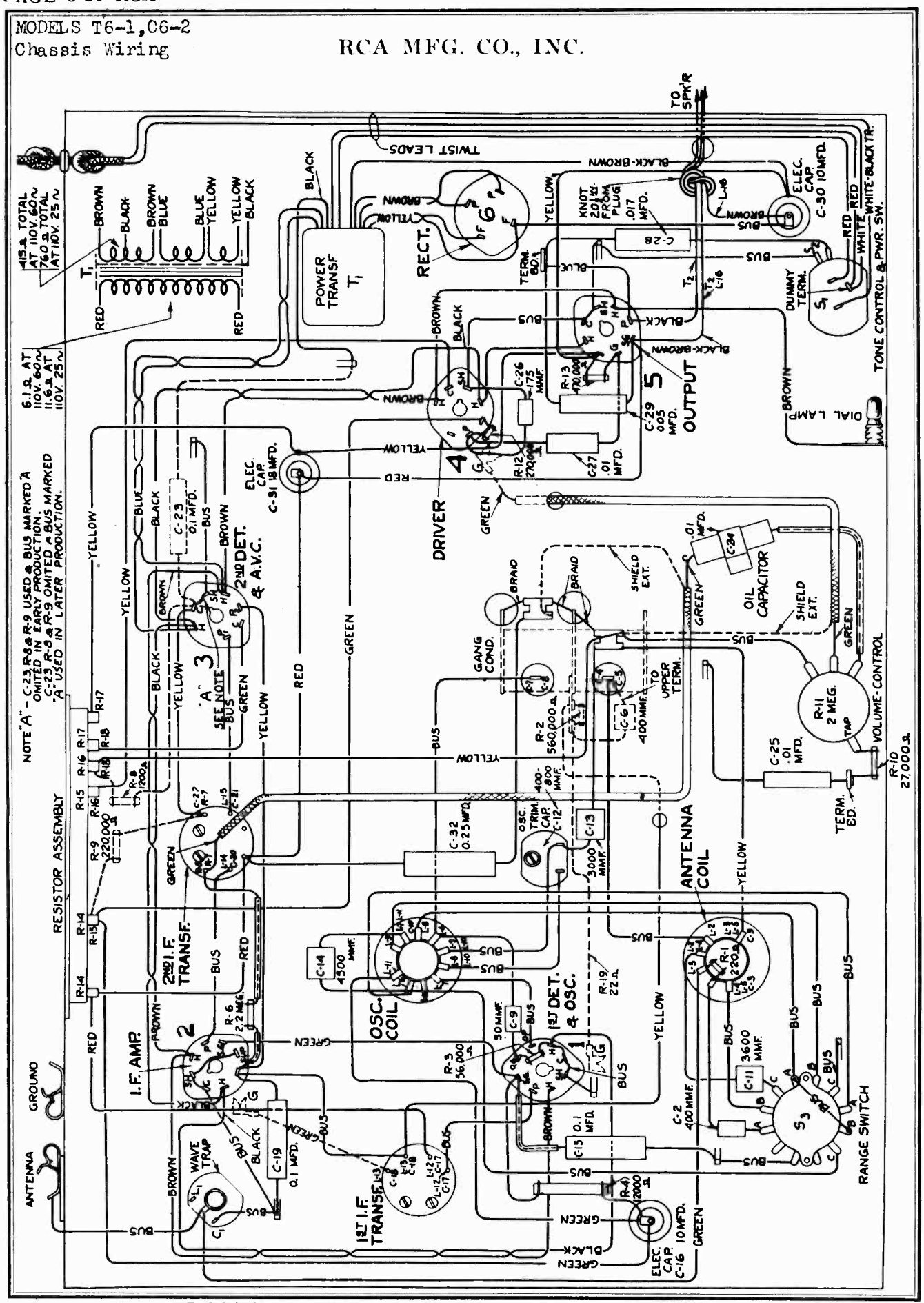
Undistorted	2.0 watts
Maximum	4.5 watts

Loudspeaker

Type	Electrodynamic
Voice Coil Impedance	2.25 ohms—400 cycles

MODELS T6-1, C6-2
Chassis Wiring

RCA MFG. CO., INC.



Circuit Arrangement

The conventional Superheterodyne type of circuit, consisting of a combined first detector-oscillator stage, a single i-f stage, a diode detector-automatic volume control stage, an audio voltage amplifier stage, an audio power output stage and a high voltage rectifier power supply stage is used.

Tuned Circuits

The antenna coil system consists of a single primary and three series connected secondary windings to provide the three ranges of tuning. The oscillator coil system is similarly wound on a single form. A range selector switch (S-3) is used for connecting the various sections of these two coil systems into the circuit to provide operation on the band desired. The coils are tuned by a variable two-section gang condenser having trimmer capacitors in shunt with each section. There are additional trimmer capacitors across the section of each coil used for Band "A." A series trimmer is also associated with the Band "A" oscillator coil.

The intermediate frequency amplifier system consists of an RCA-6K7 in a transformer-coupled circuit. This stage operates at a basic frequency of 460 kc. Each winding of both i-f transformers (input and output) is tuned by an adjustable trimmer.

Detector and A.V.C.

The modulated signal as obtained from the output of the i-f stage is detected by an RCA-6H6 double diode tube. The audio frequency secured by this process is transferred to the a-f system for amplification and final reproduction. The d-c voltage which results from detection of the signal is used for automatic volume control. This voltage, which develops across resistor R-7, is applied as automatic control grid bias to the first detector and i-f tubes through a suitable resistance filter circuit. The second (auxiliary) diode of the RCA-6H6 is used to supply residual bias for the controlled tubes under conditions of little or no signal. This diode, under such conditions, draws current which flows through resistors R-6, R-7 and R-8, thereby maintaining the desired minimum operating bias on such tubes. On application of signal energy above a certain level, however, the auxiliary bias diode ceases to draw current and the a.v.c. diode takes over the biasing function. The cathode and anode of the signal-a.v.c. diode have positive potential in respect to chassis-ground and cathodes of the a.v.c. controlled tubes when no signal is being received. (The cathode of the second detector diode is being grounded on later production to simplify manufacture and to minimize the number of component parts required. Two resistors, R-9 and R-8, and one condenser, C-23, of the first production models have accordingly been eliminated as is noted on the schematic and chassis wiring diagrams.)

Audio System

The manual volume control consists of an acoustically tapered potentiometer in the audio circuit between the output of the detector diode and the input grid of the audio voltage amplifier tube. This control has a tone compensating filter connected to it so that the correct aural balance will be obtained at different volume settings.

Resistance-capacitance coupling is used between the first audio stage and the power output stage. The output of the power amplifier is transformer-coupled into the dynamic loudspeaker. High frequency tone control is effected by a capacitor across the plate circuit of the output tube. This capacitor may be cut in or out of the circuit as desired by means of a switch (S-2).

Rectifier

The power required for operation of this receiver is supplied through transformer T-1. This transformer has an efficient static shield between its primary and secondary windings. This shield prevents interference which is on the power supply circuit from entering the receiver and conversely reduces the tendency of the receiver to re-radiate into the power circuit. An RCA-80 furnishes the high voltage necessary for plate, screen, cathode and grid potentials through a brute-force filter. The field winding of the loudspeaker is used as a reactor in this filter circuit from which it simultaneously receives its magnetizing current. The heaters of all Radiotrons are supplied from a low voltage (6.3 volt) winding on the power transformer. One side of this winding is at ground potential.

SERVICE DATA

The various diagrams of this bulletin contain such information as will be needed to isolate causes for defective operation when such a condition develops. Ratings of the resistors, capacitors, coils, etc., are indicated adjacent to the symbols signifying these parts on the diagrams. Identification titles, such as R-3, L-2, C-1, etc., are provided for reference between the diagrams and the replacement parts list. Locating of the parts in the schematic circuit is facilitated by the fact that the numerical titles increase from left to right on the diagram. The coils, reactors, and transformer windings are rated in terms of their d-c resistances only, and when the resistance is less than one ohm, no rating is given.

Alignment Procedure

Precise alignment is vital to the proper functioning of this receiver. There are four trimming adjustments provided in the i-f system, three in the oscillator coil system and two in the antenna coil system. Each of these trimmers have been accurately adjusted during manufacture and should remain properly aligned unless affected by abnormal conditions of climate or have been altered for service purposes. Incorrect alignment is usually evidenced by loss of sensitivity, improper tone quality and poor selectivity. These indications will generally be present together.

The correct performance of the receiver can only be obtained when the alignment is performed with adequate and reliable test apparatus. The manufacturer of this instrument has a complete assortment of such service equipment available. This equipment may be purchased from authorized distributors and dealers.

An oscillator (signal generator) is required as a source of the specified alignment frequencies. Visual-indication of receiver output during the adjustment is necessary to enable the serviceman to obtain an accuracy of alignment which is not possible by listening to the signal. The RCA Victor Stock No. 9595 Full Range Oscillator and the RCA Victor Stock No. 4317 Neon Output Indicator are especially suitable and fulfill the above requirements.

The following procedure should be followed in adjusting the various trimmer capacitors.

I-F Trimmer Adjustments

The four trimmers of the two i-f transformers are located as shown by Figure 4. Each must be aligned to a basic frequency of **460 kc.** To do this, attach the Output Indicator across the voice coil circuit or across the output transformer primary. Connect the output of the test oscillator between the control grid of the RCA-6A8 first detector tube and chassis-ground. Tune the oscillator to 460 kc. Advance the receiver volume control to its full-on position and adjust the receiver tuning control to a point within its range where no interference is encountered either from local broadcast stations or the heterodyne oscillator. Increase the output of the test oscillator until a slight indication is apparent on the output indicator. Then adjust the two trimmers of the second i-f transformer to produce maximum (peak) indicated receiver output. Then, adjust the two trimmers of the first i-f transformer for maximum (peak) receiver output as shown by the indicating device. During these adjustments, regulate the test oscillator output so that the indication is always as low as possible. By doing so, broadness of tuning due to a.v.c. action will be avoided. It is advisable to repeat the adjustment of all i-f trimmers a second time to assure that the interaction between them has not disturbed the original adjustment.

R-F Trimmer Adjustments

The two trimmers which are at all times directly in shunt with the variable tuning condenser necessitate that the high-frequency range (Band C) be aligned first. The range selector switch should, therefore, be turned to its Band C position for the first adjustment. The Output Indicator should be left connected to the output system. Attach the output terminals of the test oscillator to the antenna and ground terminals of the receiver input.

Calibrate the dial by rotating the tuning control until the variable condenser plates are in their full mesh (maximum capacity) position and adjusting the dial pointer so that its end points to the *horizontal* graduation (530 kc.) at the low frequency end of the Band A scale.

Proceed further as follows:

(a) Adjust the test oscillator to **18,000 kc.** and set the receiver tuning control to a dial reading of **18,000 kc.**

(b) Regulate the output of the test oscillator until a slight indication is perceptible at the receiver output. Then adjust the trimmer on the oscillator section of the variable condenser to the point at which it produces maximum indicated receiver output. Two points may be found, each of which produces such a maximum. The one of *maximum trimmer capacitance* is correct and should be used. (The oscillator will be 460 kc. below the signal frequency at this adjustment point.)

(c) Adjust the trimmer of the antenna section of the variable condenser, simultaneously rocking the receiver tuning control backward and forward through the **18,000 kc.** input signal, until maximum receiver output results from these combined operations. Rocking of the variable condenser will prevent inaccurate adjustment which would otherwise be caused by the inter-action between the heterodyne oscillator circuit and the antenna tuned circuit.

(d) Change the receiver range selector to its Band A position and set the receiver tuning control to a dial reading of **1400 kc.** Tune the test oscillator to this same frequency and regulate its output to produce a slight indication on the receiver output indicating device.

(e) Adjust the high frequency trimmers of the Band A oscillator and antenna coils, C-10 and C-3 respectively, to the points at which each produces maximum indicated receiver output.

(f) Shift the test oscillator frequency to **600 kc.** and tune the receiver to pick up this signal, disregarding the dial reading at which it is best received.

(g) Tune the low frequency trimmer, C-12, of the oscillator Band A coil, simultaneously rocking the tuning control of the receiver backward and forward through the signal, until maximum indicated receiver output results from these combined operations. The adjustment of C-10 and C-3 should be corrected at **1400 kc.** to compensate for any changes caused by the adjustment of the low frequency oscillator coil trimmer.

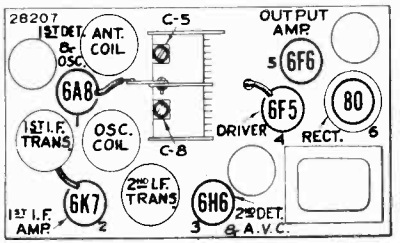


Figure 3—Radiotron and Coil Locations

Stock No.	Description	List Price
	RECEIVER ASSEMBLIES	
5237	Bushing—Variable tuning condenser mounting bushing—Package of 3	$0.43
11465	Capacitor—Adjustable capacitor—(C12)	.48
11289	Capacitor—50 MMfd.—(C9)	.26
11623	Capacitor—175 MMfd.—(C26)	.18
11290	Capacitor—400 MMfd.—(C2, C6)	.25
11622	Capacitor—3000 MMfd.—(C13)	.36
11621	Capacitor—3600 MMfd.—(C11)	.38
11287	Capacitor—4500 MMfd.—(C14)	.30
4868	Capacitor—.005 Mfd.—(C29)	.20
11395	Capacitor—.01 Mfd.—(C24)	.18
4838	Capacitor—.01 Mfd.—(C25, C27)	.25
4906	Capacitor—.017 Mfd.—(C28)	.25
4841	Capacitor—0.1 Mfd.—(C19, C23)*	.22
11414	Capacitor—0.1 Mfd.—(C15)	.20
5170	Capacitor—0.25 Mfd.—(C32)	.25
11387	Capacitor—10 Mfd.—(C16)	.86
11240	Capacitor—10 Mfd.—(C30)	1.08
5212	Capacitor—18 Mfd.—(C31)	1.16
11617	Coil—Antenna coil—(L2, L3, L4, L5, C3R1)	1.68
11618	Coil—Oscillator coil—(L6, L7, L8, L9, L10, L11, C10)	2.22
11612	Condenser—Two-gang variable tuning condenser—(C4, C5, C7, C8)	3.80
11615	Dial—Station selector dial	.60
11613	Drive—Variable tuning condenser drive	1.00
11376	Escutcheon—Station selector escutcheon and crystal	.70
11619	Foot—Chassis mounting foot and bracket assembly—Package of 2	.65
11396	Indicator—Station selector indicator pointer	.25
5226	Lamp—Dial lamp—Package of 5	.70
11466	Resistor—Voltage divider resistor—comprising one 3500 ohm, one 13000 ohm, one 85 ohm, one 40 ohm, and one 175 ohm sections—(R14, R15, R16, R17, R18)	.95
11624	Resistor—22 Ohms—Flexible type—complete with contact cap—(R19)	.22
11620	Resistor—220 Ohms—Carbon type—1/10 watt—(R1)—Package of 5	.75
11283	Resistor—1200 Ohms—Carbon type—1/4 watt—(R8)*—Package of 5	1.00
11231	Bolt—Yoke and core assembly bolt and nut	.16
8060	Bracket—Output transformer mounting bracket	.14
11257	Clamp—Cone center suspension clamping nut and screw assembly—Package of 5	.25
11470	Coil—Field coil—(L16)	2.16
11469	Coil—Neutralizing coil—(L18)	.20
11258	Cone—Reproducer cone—(L17)—Package of 5	3.85
5118	Connector—Three contact male connector for reproducer	.25
5119	Connector—Three contact female connector for reproducer cable	.25
9622	Reproducer—Complete	7.16
11253	Transformer—Output transformer—(T2)	1.56
11230	Washer—Binders board "C" washer—used to hold field coil assembly—Package of 5	.18
	REPRODUCER ASSEMBLIES Table Model	
11232	Board—Terminal board assembly	.18
3066	Resistor—12,000 Ohms—Carbon type—1 watt—(R4)—Package of 5	1.10
11400	Resistor—27,000 Ohms—Carbon type—1/4 watt—(R10)—Package of 5	1.00
5029	Resistor—56,000 Ohms—Carbon type—1/4 watt—(R3)—Package of 5	1.00
5158	Resistor—220,000 Ohms—Carbon type—1/4 watt—(R9)*—Package of 5	1.00
11453	Resistor—270,000 Ohms—Carbon type—1/10 watt—(R12)—Package of 5	.75
11452	Resistor—470,000 Ohms—Carbon type—1/10 watt—(R13)—Package of 5	.75
11397	Resistor—560,000 Ohms—Carbon type—1/10 watt—(R2)—Package of 5	.75
11626	Resistor—2.2 Megohms—Carbon type—1/4 watt—(R6)—Package of 5	1.00
11603	Shield—Antenna or oscillator coil shield	.26
11390	Shield—Intermediate frequency transformer shield	.25
11383	Shield—Rectifier Radiotron shield	.20
11614	Spring—Coil spring for large gears on variable tuning condenser—Package of 10	.70
11616	Switch—Range switch—(S3)	1.00
11460	Switch—Tone control and power switch—(S1, S2)	.95
5238	Terminal—Antenna terminal board, with clip	.14
11388	Transformer—First intermediate frequency transformer—(L12, L13, C17, C18)	1.90
11389	Transformer—Second intermediate frequency transformer—(L14, L15, C20, C21, C22, R5, R7)	3.02
11458	Transformer—Power transformer—105-125 volts—50-60 cycles—(T1)	4.85
11585	Transformer—Power transformer—105-125 volts—25-50 cycles	7.00
11584	Transformer—Power transformer—100-130, 140-160, 195-250 volts—40-60 cycles	5.05
11391	Trap—Wave trap—(L1, C1)	1.22
11237	Volume Control—(R11)	1.20
	REPRODUCER ASSEMBLIES Console Model	
11232	Board—Terminal board assembly	.18
11231	Bolt—Yoke and core assembly bolt and nut	.16
8060	Bracket—Output transformer mounting bracket	.14
11257	Clamp—Cone center suspension clamping nut and screw assembly—Package of 5	.25
11470	Coil—Field coil—(L16)	2.16
11469	Coil—Neutralizing coil—(L18)	.20
11235	Cone—Reproducer cone—(L17)—Package of 5	3.50
5118	Connector—Three contact male connector for reproducer	.25
5119	Connector—Three contact female connector for reproducer cable	.25
9621	Reproducer—Complete	6.85
11253	Transformer—Output transformer—(T2)	1.56
11230	Washer—Binders board "C" washer—used to hold field coil assembly—Package of 5	.18

Universal Transformer

The special transformer used on some receivers of this type is adaptable to several ranges of voltage as given under Rating C of Electrical Specifications. Its schematic and wiring are shown by Figure 6. Terminals are provided at the top of the transformer case for changing the primary connections to suit the voltage available. Note that a 110-volt tap is brought out separately for supplying a phonograph motor.

Wave-Trap Adjustment

With the receiver in operation using its normal antenna, tune station selector to the point at which the intermediate frequency interference is most intense. Then adjust the wave trap trimmer to the point which causes maximum suppression of the interference.

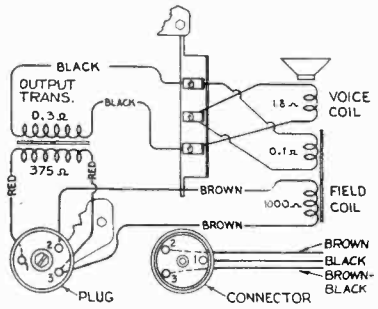


Figure 5—Loudspeaker Wiring

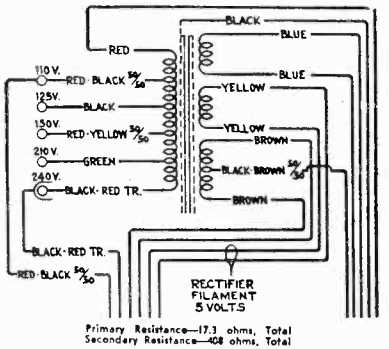


Figure 6—Universal Transformer

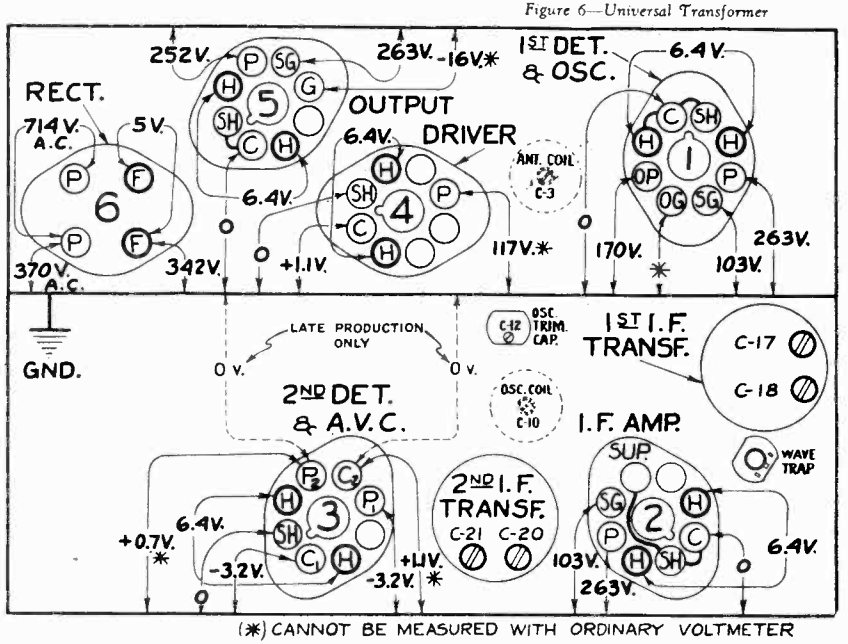


Figure 4—Radiotron Socket Voltages
Measured at 115 volts, 60 cycle supply—No signal being received

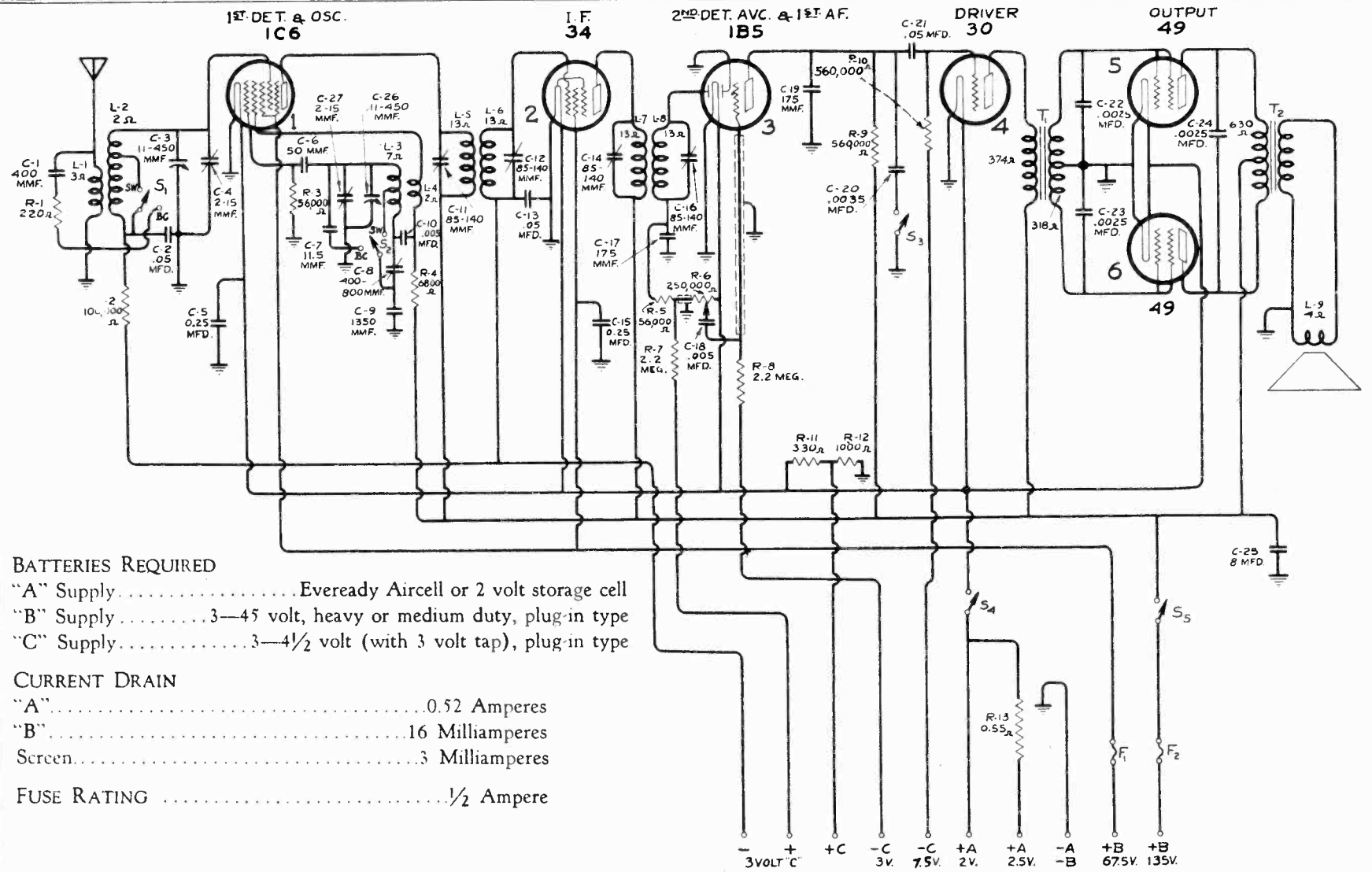
— NOTES —

(1) Beat notes or heterodyning (whistles) may be encountered in some instances on these receivers due to excessive antenna capacitance. This condition may be corrected by reducing the size of the antenna or by inserting a 150 mmfd. capacitor in series with the antenna lead. This may be accomplished in the receiver by removing the bus lead which connects from the antenna terminal to the wave trap inductance L-1 and inserting the condenser between these points.

RCA MFG. CO., INC.

MODELS BT6-3, BC6-4, BT6-10

Schematic



BATTERIES REQUIRED

"A" Supply.....Eveready Aircell or 2 volt storage cell
"B" Supply.....3—45 volt, heavy or medium duty, plug-in type
"C" Supply.....3—4½ volt (with 3 volt tap), plug-in type

CURRENT DRAIN

"A".....0.52 Amperes
"B".....16 Milliamperes
Screen.....3 Milliamperes

FUSE RATING.....½ Ampere

FREQUENCY RANGES

Broadcast.....540-1850 kc.
Shortwave.....1850-6900 kc.

ALIGNMENT FREQUENCIES

Broadcast.....600 kc. (osc.), 1720 kc. (osc., ant.)
Shortwave.....None required

Intermediate Frequency.....460 kc.

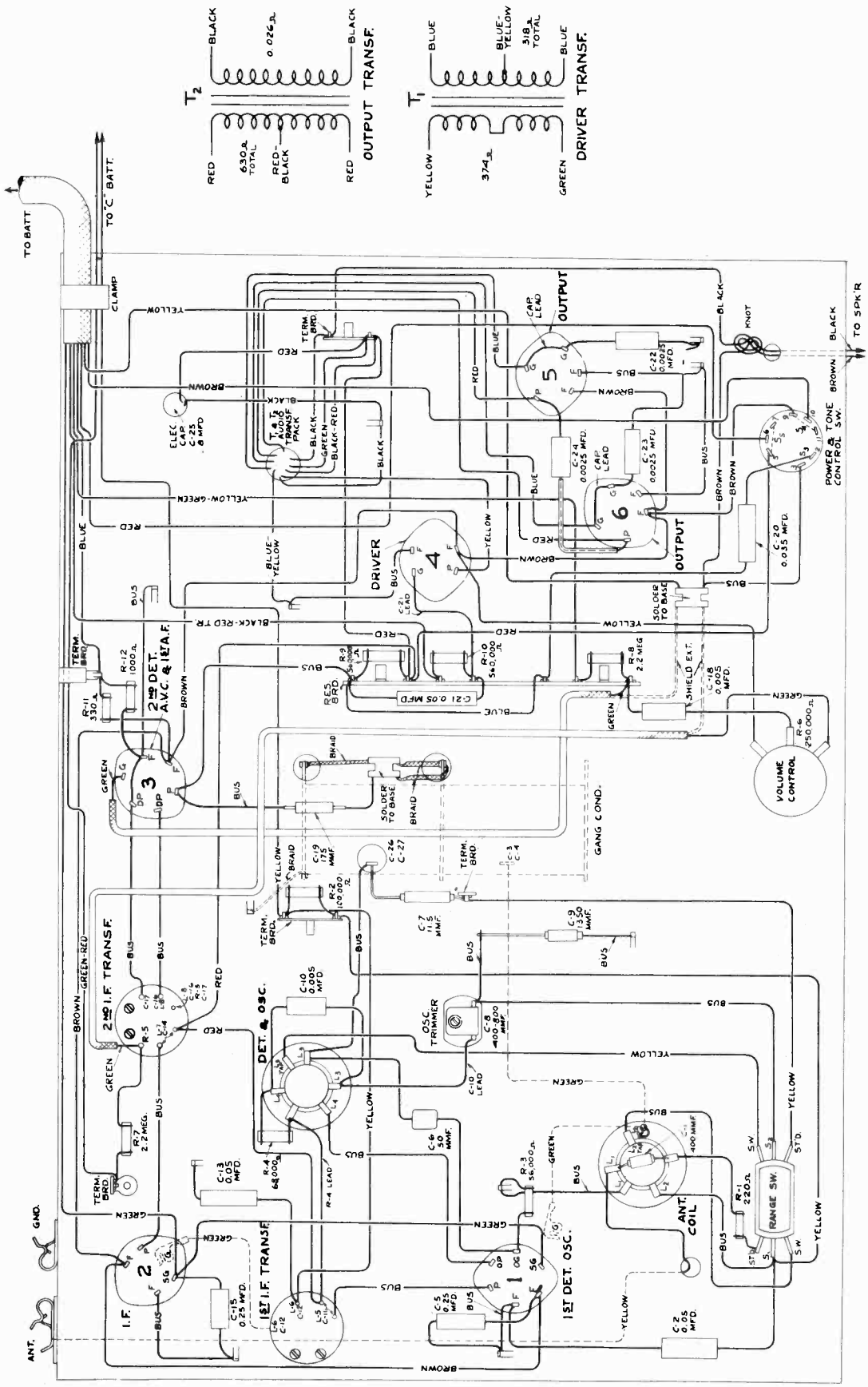
POWER OUTPUT

Undistorted.....1.2 Watts
Maximum.....2.2 Watts

October 1935

MODELS BT6-3,BC6-4,BT6-10
Chassis Wiring

RCA MFG. CO., INC.



Circuit Arrangement

The conventional Superheterodyne circuit is used. The first stage combines the local oscillator and first detector functions in one tube, an RCA-1C6. Coils of the detector input and oscillator are tuned by a two-section variable condenser and are aligned by a total of three adjustable trimmers. Each coil is tapped so that a portion of it may be shorted by the band switch in order to extend the tuning range to the higher frequencies. The oscillator operates at a fundamental frequency which is at all times above the incoming signal by 460 kc.

An RCA-34 is employed as i-f amplifier. Its input and output are coupled by transformers to the first detector and second detector, respectively. Each transformer has both its secondary and primary windings tuned to 460 kc. by adjustable trimmer capacitors.

The modulated signal as obtained from the output of the i-f system is detected by a diode of the RCA-1B5. Audio developed by such detection in the diode load resistor, R-6, is selected by the variable arm of the volume control (R-6) and passed on to the a-f system for amplification and final reproduction. The d.c. which occurs in resistor R-6, due to signal detection, is used for automatic volume control by varying the control grid bias on the first detector and i-f tubes.

Resistance-capacitance coupling is used between the RCA-1B5 and the RCA-30 driver tube. A high-frequency tone control, consisting of a switch in series with a condenser, is shunted across the plate circuit of the RCA-1B5. In the closed position of the switch, the high a-f frequencies are reduced.

The power output stage is arranged for Class "B" operation. The high level of power afforded, is fed to the permanent magnet, dynamic speaker through a step-down transformer.

Battery "On-off" control is by means of a double pole switch, one side of which is in the +A lead; the other side being in the 135 volt, +B lead. Two +A leads are provided in order to permit operation from either a standard 2 volt storage cell or an "Eveready 2.5 volt Aircell". A resistor (R-13) is in series with the +A, 2.5 volt lead to drop the voltage to the proper value. Fuse protection is incorporated in the screen and plate supply leads from the "B" batteries.

SERVICE DATA

Alignment Procedure

There are a total of seven trimmer adjustments provided. Four of these are located in the i-f system and the remainder are associated with the antenna and oscillator coils. They are precisely adjusted at the factory to give the correct performance. Their settings should remain intact indefinitely when the receiver is used under ordinary conditions, however, necessity for readjustment may occasionally occur from continued extremes of climate, tampering, purported alteration for service purposes, or after repairs have been made to the r-f or i-f tuned circuits. Improper alignment usually causes the receiver to be insensitive, non-selective, and sub-normal in respect to tone quality. Such indications will usually exist simultaneously.

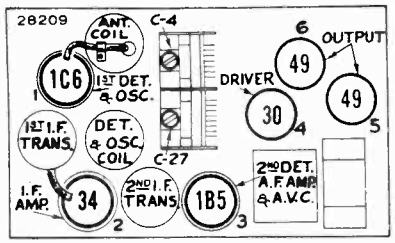


Figure 3—Radiotron and Coil Locations

In re-adjusting the trimmers to their normal settings, it is quite important to apply a definite procedure and to use adequate and reliable test equipment. A standard test oscillator such as the RCA Stock No. 9595, will be required as a source of signal at the specified alignment frequencies. Means for indication of the receiver output during alignment is also necessary to accurately show when the correct point of adjustment is reached. This indication should be by means of an instrument such as the RCA Stock No. 4317 Neon Glow Indicator. Proceed with the alignment as follows:

Place the receiver in operation where it will be easily accessible. Attach the Output Indicator across the loudspeaker voice coil circuit, or across the output transformer primary. Advance the receiver volume control to its maximum position, letting it remain in such position for *all* adjustments. For each trimming operation, regulate the test oscillator output control so that the signal level is as low as possible and still observable at the receiver output. Use of such a small signal will obviate broadness of tuning which would otherwise result from A. V. C. action on a stronger one.

I-F Adjustments

(a) Connect the output of the test oscillator between the control grid cap of the i-f tube (RCA-34) and chassis-ground. Adjust the frequency of the oscillator to 460 kc. Tune the receiver to a point where no interference is received from the heterodyne oscillator or local station.

(b) Adjust the trimmers, C-16 and C-14, of the second i-f transformer so that each produces maximum (peak) receiver output as shown by the indicating device.

(c) Remove the oscillator from the i-f tube input and connect it between the control grid cap of the first detector tube (RCA-1C6) and chassis-ground. Allow its tuning to remain at 460 kc. Tune the receiver to avoid interference as in (a).

(d) Adjust the trimmers, C-12 and C-11, of the first i-f transformer for maximum (peak) receiver output. This completes the i-f transformer adjustments.

R-F Adjustments

(a) Check the calibration of the dial scale by rotating the tuning control until the variable condenser plates are in full mesh. (Maximum capacity). This will carry the dial pointer to its minimum frequency position. Then adjust the dial pointer until it points to the horizontal line at the low frequency end of the broadcast band scale.

(b) Connect the output of test oscillator to the antenna-ground terminals of the receiver. Adjust the receiver range switch to its "Broadcast" position. Tune the oscillator to 1720 kc. Allow the output indicator to remain attached to the receiver output.

(c) Tune the receiver so that the dial reading is 1720 kc. Then adjust the oscillator and antenna coil trimmers, C-27 and C-4 respectively, tuning each to the point producing maximum indicated receiver output.

(d) Shift the oscillator frequency to 600 kc. and tune the receiver to pick up this signal, disregarding the dial reading at which it is best received. The oscillator series trimmer, C-8, should then be adjusted, simultaneously rocking the receiver tuning backward and forward through the signal until maximum receiver output results from the combined operations. The adjustment of C-27 should be repeated as in (c) to correct for any change in its alignment due to the adjustment of C-8.

Radiotron Socket Voltages

Voltage values indicated at the Radiotron socket contacts on Figure 4 form a reference basis for test of the receiver. It is to be noted that all voltages are given in respect to chassis-ground excepting those appearing across the heaters (H-H). The values shown are obtainable when the receiver is in normal operating condition. They do not take into account inaccuracies caused by current consumed in the voltmeter used for the tests. The lower the meter resistance, the lower will be the degree of accuracy. Allowances must therefore be made, dependent upon the type of test instrument used, for the loading effect of the voltmeter on the circuit.

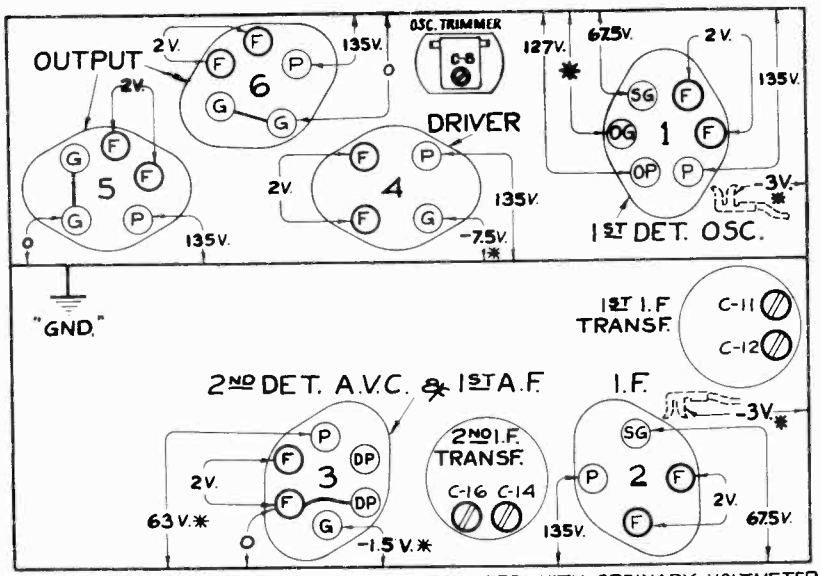


Figure 4—Radiotron Socket Voltages and Trimmer Locations
Measured at Normal Battery Voltages No Signal Being Received

MODELS BT6-3, BC6-4, BT6-10
Battery Connections
Parts List

RCA MFG. CO., INC.

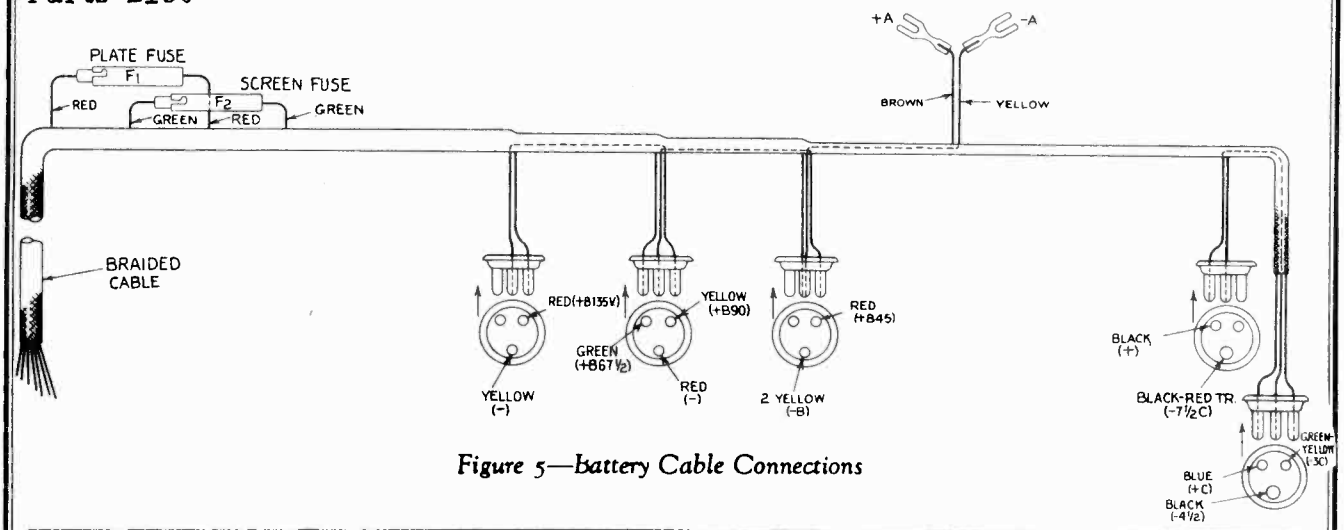


Figure 5—Battery Cable Connections

Stock No.	Description	List Price
	RECEIVER ASSEMBLIES	
11465	Capacitor—Adjustable capacitor—(C-8)	$0.48
11450	Capacitor—11.5 MMfd.—(C7)	.14
11289	Capacitor—50 MMfd.—(C6)	.26
5116	Capacitor—175 MMfd.—(C19)	.18
11171	Capacitor—400 MMfd.—(C1)	.22
11597	Capacitor—1350 MMfd.—(C9)	.22
5107	Capacitor—.0025 Mfd.—(C22, C23, C24)	.16
5005	Capacitor—.0035 Mfd.—(C20)	.16
4868	Capacitor—.005 Mfd.—(C10, C18)	.20
4836	Capacitor—.05 Mfd.—(C2, C13, C21)	.30
4840	Capacitor—0.25 Mfd.—(C5, C15)	.30
11595	Capacitor—8 Mfd.—(C25)	1.04
11590	Coil—Antenna coil—(L1, L2)	1.70
11463	Coil—Oscillator coil—(L3, L4)	1.65
11457	Condenser—Two gang variable tuning condenser—(C3, C4, C26, C27)	3.46
11467	Indicator—Station selector indicator pointer	.10
11174	Resistor—220 Ohms—Carbon type—¼ watt—(R1)—Package of 5	1.00
11296	Resistor—330 Ohms—Carbon type—¼ watt—(R11)—Package of 5	1.00
5112	Resistor—1000 Ohms—Carbon type—¼ watt—(R12)—Package of 5	1.00
11454	Resistor—6800 Ohms—Carbon type—¼ watt—(R4)—Package of 5	1.00
5029	Resistor—56,000 Ohms—Carbon type—¼ watt—(R3)—Package of 5	1.00
3118	Resistor—100,000 Ohms—Carbon type—¼ watt—(R2)—Package of 5	1.00
5035	Resistor—560,000 Ohms—Carbon type—¼ watt—(R9, R10)—Package of 5	1.00
11626	Resistor—2.2 Megohms—Carbon type—¼ watt—(R7, R8)—Package of 5	1.00
11464	Shield—Antenna or oscillator coil shield	.25
3682	Shield—First or Second detector Radiotron shield	.22
3056	Shield—Intermediate frequency Radiotron shield—Package of 2	.40
11390	Shield—Intermediate frequency transformer shield	.25
11461	Switch—Range switch—(S1, S2)	.56
11588	Switch—Tone control and power switch—(S3, S4, S5)	.90
5238	Terminal—Antenna terminal board with clip, insulation strip and rivets	.14
11594	Transformer—Audio driver and output transformer pack—(T1, T2)	4.10
11592	Transformer—First intermediate frequency transformer—(L5, L6, C11, C12)	2.55
11593	Transformer—Second intermediate frequency transformer—(L7, L8, C14, C16, C17, R5)	2.75
11589	Volume Control—(R6)	.85
	MISCELLANEOUS ASSEMBLIES	
4289	Body—Fuse connector body—Package of 10	.35
4288	Cap—Fuse connector cap—Package of 10	.36
6516	Connector—Fuse connector—complete	.16
11340	Connector—Three contact male connector with three small prongs—for "B" battery connections	.24
11341	Connector—Three contact male connector with two small and one large prong—for "C" battery connection	.24
11627	Dial—Station selector dial	.32
4286	Ferrule—Fuse connector—ferrule and bushing—Package of 10	.38
3748	Fuse—½ Ampere fuse—(F1, F2)—Package of 5	.40
4290	Insulator—Fuse connector insulator—Package of 10	.35
11587	Resistor—0.55 Ohms—Flexible type, complete with terminal (R13)	.24
4284	Spring—Fuse connector spring—Package of 10	.30
4285	Washer—Fuse connector insulating washer—Package of 10	.22
	REPRODUCER ASSEMBLIES (Table Models BT 6-3, BT 6-10)	
9539	Cone—Reproducer cone—(L9)—Package of 5	4.30
9540	Magnet Assembly—Comprising cone bracket, core, and magnet	5.72
9538	Reproducer—Complete	7.65
	REPRODUCER ASSEMBLIES (Console Model BC 6-4)	
9432	Cone—Reproducer cone—complete with voice coil—(L9)	1.88
7820	Magnet—Cone housing and magnet assembly	8.98
7819	Reproducer—Complete	12.18

RCA MFG. CO., INC.

MODEL T6-9
Schematic
Socket

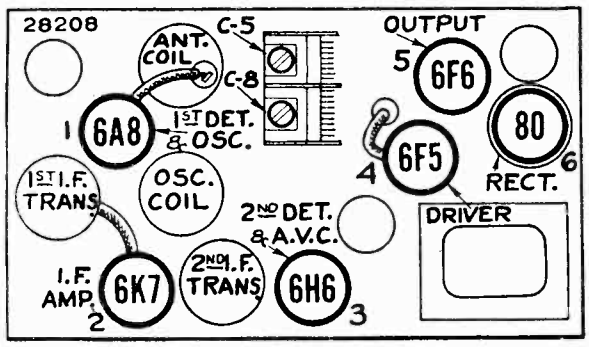
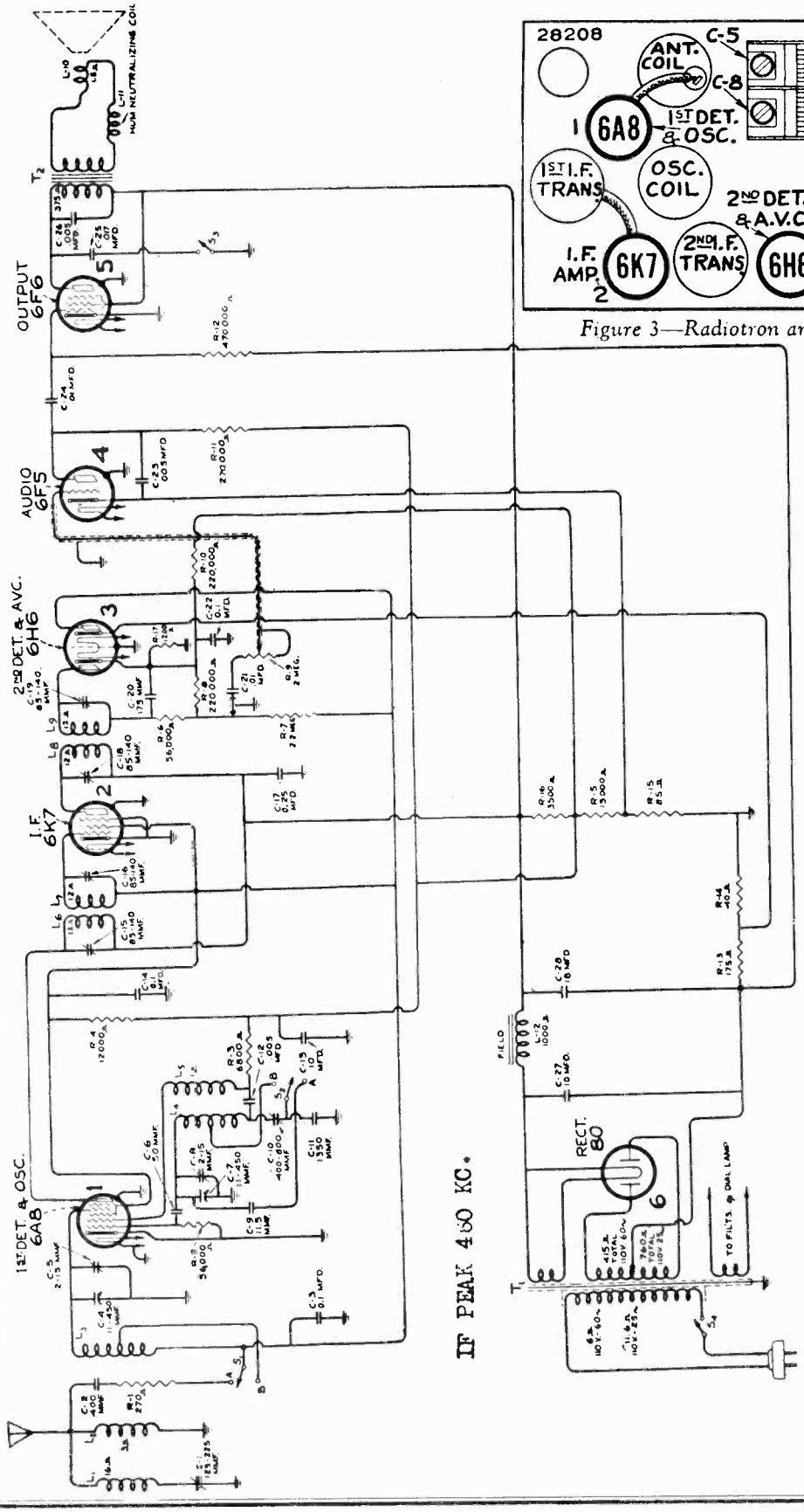


Figure 3—Radiotron and Coil Locations



Power Consumption .90 watts

Power Output

Undistorted .....2.0 watts
Maximum .....4.5 watts

Frequency Ranges

Broadcast Band (A) ..540-1850 kc.
Shortwave Band (B) .1850-6900 kc.

Intermediate Frequency.....460 kc.

Loudspeaker

Type .....8 inch, Electrodynamic
Voice Coil Impedance 2.25 ohms at 400 cycles

Alignment Frequencies

Broadcast Band (A) .....600 kc. and 1720 kc.
Shortwave Band (B) No Adjustments Required

Voltage and Frequency

Rating A ..... 105-125 volts, 50-60 cycles
Rating B ..... 105-125 volts, 25-60 cycles
Rating C 100-130/140-160/195-250 volts, 40-60 cycles

MODEL T6-9
Chassis Wiring

RCA MFG. CO., INC.

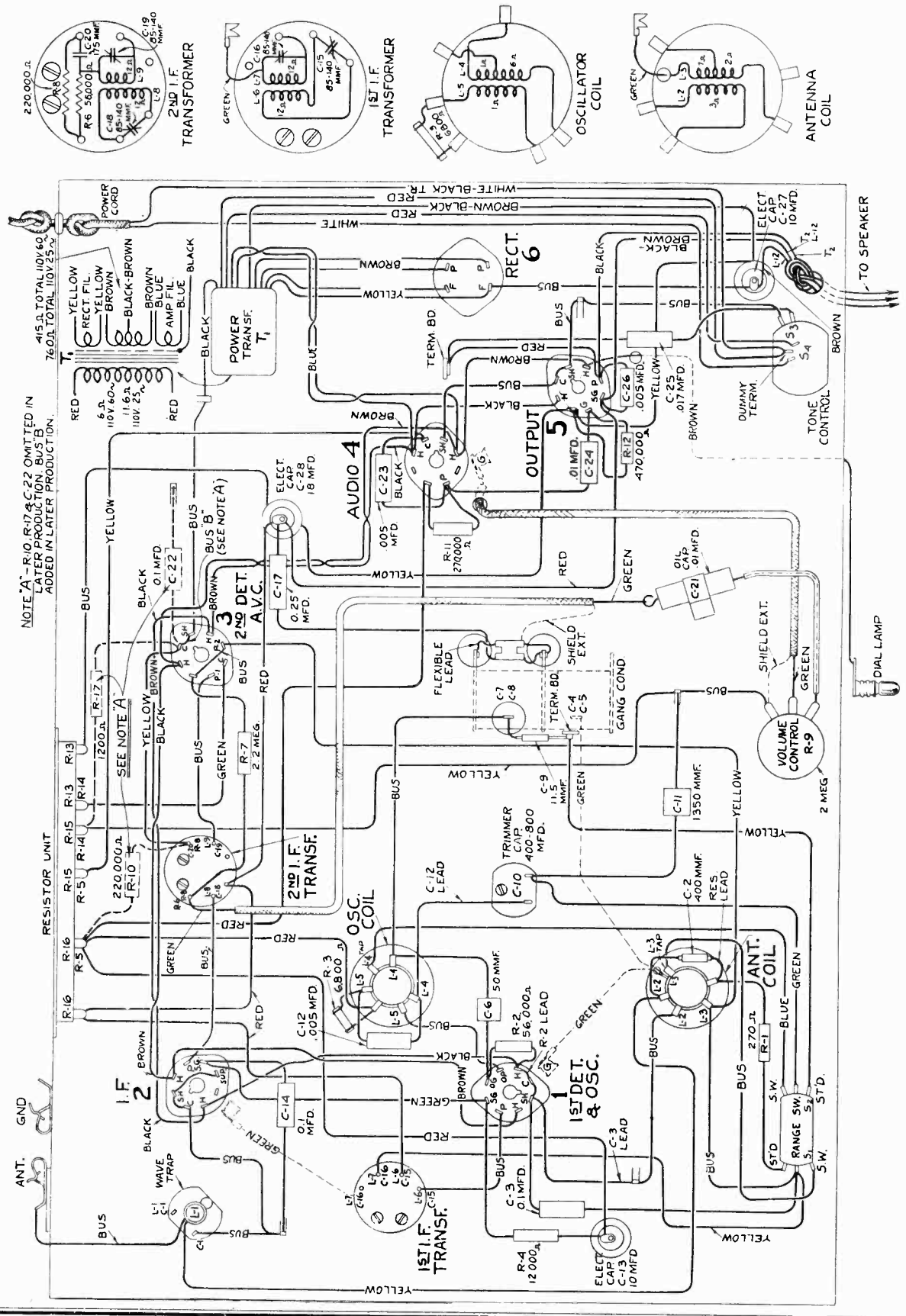


Figure 2—Chassis Wiring Diagram

RCA MFG. CO., INC.

The first detector and oscillator functions are accomplished in a single tube, an RCA-6A8. The input of this tube is coupled to the antenna through a tuned transformer. A shunt (series tuned) wave-trap is connected across the primary of this transformer to prevent signals of intermediate frequency (460 kc) from being introduced into the first stage as interference. The two-section gang condenser which tunes the antenna transformer secondary and the heterodyne oscillator coil has adjustable trimmers for use in obtaining exact alignment. Each of these coils is tapped so that the range switch increases the range of tuning by decreasing the amount of inductance.

The intermediate frequency stage is coupled to the RCA-6A8 and to the RCA-6H6 second detector by means of tuned transformers. These transformers are adjusted to resonance at 460 kc. by means of trimmers.

The modulated signal as obtained from the output of the i-f system is detected by the RCA-6H6 double diode tube. Audio frequency secured by this process is passed on to the a-f system for amplification and final reproduction. The d-c voltage, which results from detection of the signal, is used for automatic volume control. This voltage, which develops across resistor R-8, is applied as automatic control grid bias to the first detector and i-f tubes through a suitable resistance filter. The second diode of the RCA-6H6 is used to supply residual bias for the controlled tubes under conditions of little or no signal. This auxiliary diode, under such conditions, draws current which flows through resistors R-7, R-8 and R-10, thereby maintaining the desired minimum operating bias on such tubes. On application of signal energy above a certain level, however, the auxiliary bias diode ceases to draw current and the a.v.c. diode takes over the biasing function. The cathode and anode of the signal-a.v.c. diode have positive potential in respect to chassis-ground and cathodes of the a.v.c.-controlled tubes when no signal is being received.

Manual volume control is by means of an acoustically tapered potentiometer connected as a variable coupling element between the output of the second detector and the first audio control grid. After amplification by the RCA-6F5, the audio signal is transmitted by resistance-capacitance coupling to the input of the RCA-6F6 power output stage which in turn is transformer-coupled to the dynamic speaker. High-frequency tone control is provided by means of a shunt capacitor across the plate circuit of the output tube, which may be cut in or out of the circuit with a control switch (S3).

The power supply system consists of a RCA-80 rectifier tube which is supplied from an efficiently designed power transformer and which works into a suitable filter. The various potentials required for the plate, screen, control grid, and cathode circuits are obtained from the output of the filter on a resistance-divider system. The electrodynamic loudspeaker field coil is used as a filter reactor.

The various diagrams of this booklet contain such information as will be needed to isolate causes for defective operation when 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 R-3, L-2, C-1, etc., are provided for reference between the illustrations and the Replacement Parts List. The coils, reactors, and transformer windings are rated in terms of their d-c resistances only, and when the resistance is less than one ohm, no rating is given.

Alignment Procedure

There are three alignment trimmers provided in the antenna transformer and oscillator coil tuned circuits and four are used in the i-f system. All of these have been accurately adjusted during manufacture and should remain properly aligned unless affected by abnormal conditions of climate or have been altered for service purposes. Loss of sensitivity, improper tone quality and poor selectivity are the usual indications of improper alignment.

The correct performance of this receiver can only be obtained when the aligning has been done with adequate and reliable apparatus. The manufacturer of this receiver has available for sale through its distributors and dealers, a complete assortment of such service equipment as may be needed for the alignment operation. These instruments are illustrated and described on a separate page of this book.

An oscillator (signal generator), such as the RCA Stock No. 9595, is required as a source of the specified alignment frequencies. Visual indication of receiver output during the adjustment is necessary and should be accomplished by the use of an indicator such as the RCA Victor Stock No. 4317 Neon Output Indicator.

The following method of procedure should be followed in adjusting the various trimmer capacitors:

I-F Trimmer Adjustment

The four trimmers of the two i-f transformers are located as shown by Figure 4. Each trimmer must be aligned to a basic frequency of **460 kc.** To do this, attach the output indicator across the voice coil or across the output transformer primary. Connect the output of the test oscillator between the control grid of the RCA-6A8 and chassis-ground. Tune the oscillator to **460 kc.** Advance the receiver volume control to its full-on position and adjust the receiver tuning control to a point within its range where no interference is encountered either from local broadcast stations or from the heterodyne oscillator. Increase the output of the test oscillator until a slight indication is present on the output indicator. Then, adjust the two trimmers of the second i-f transformer to produce maximum (peak) indicated receiver output. Then, adjust the two trimmers of the first i-f transformer for maximum (peak) receiver output as shown by the indicating device. During these adjustments, regulate the test oscillator output so that the indication is always as low as possible. By doing so, broadness of tuning due to a.v.c. will be avoided. It is advisable to repeat the adjustment of all i-f trimmers to assure that the interaction between them has not disturbed the original adjustment.

taneously rocking the tuning control backward and forward through the signal until maximum receiver output results from these combined operations. The adjustment at **1720 kc.** should then be repeated to correct for any change which may have been caused by the oscillator series trimmer adjustment.

R-F Trimmer Adjustment

Calibrate the tuning dial by setting pointer to horizontal line at low frequency end of broadcast band scale while variable condenser is at maximum capacity.

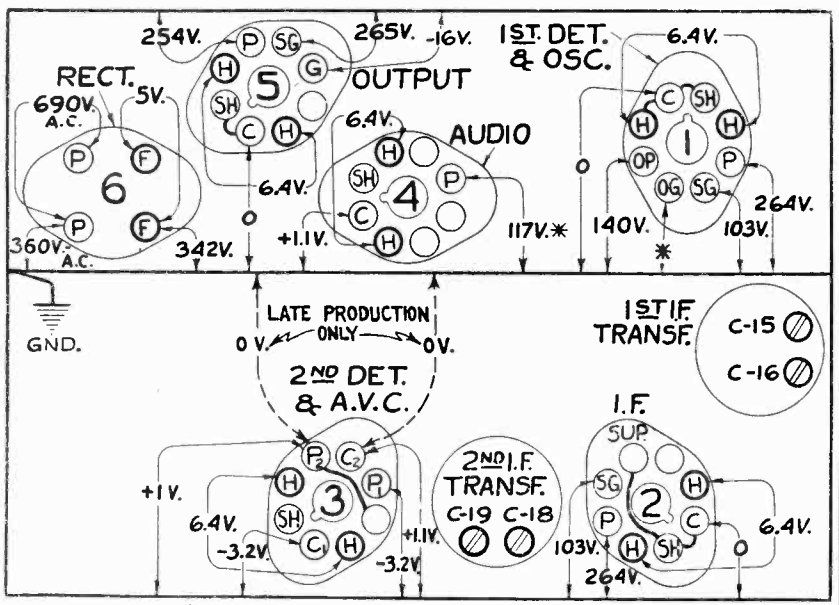
The output indicator should be left connected to the output system. Attach the output of the test oscillator between the antenna and ground terminals of the receiver input. Adjust the oscillator to **1720 kc.** and set the receiver tuning control to a dial reading of **1720 kc.** Leave the volume control of the receiver at its maximum position. Make sure that the range selector is at its broadcast position. Regulate the output of the test oscillator until a slight indication is perceptible at the receiver output. Then adjust the two trimmers of the oscillator and antenna transformer coils (mounted on the variable condenser) so that each produces maximum (peak) receiver output. After this maximum has been accurately obtained, shift the test oscillator to 600 kc. Tune the receiver to pick up this signal, disregarding the dial reading at which it is best received. Then adjust the receiver oscillator series trimmer, simul-

Radiotron Socket Voltages

Voltage values indicated at the Radiotron socket contacts on Figure 4 form a reference basis for test of the receiver. It is to be noted that all voltages are given with respect to chassis-ground, excepting those appearing across the heaters (H-H). The values shown are obtainable when the receiver is in normal operating condition with all tubes intact. They do not take into account inaccuracy caused by the resistance of the voltmeter used for the tests, the lower the voltmeter resistance, the lower the degree of accuracy. Allowance must, therefore, be made, dependent upon the type of test instrument used, for the loading effect of the voltmeter on the circuit.

Wave-Trap Adjustment

With the receiver in operation using its normal antenna, tune station selector to the point at which the intermediate frequency interference is most intense. Then adjust the wave trap trimmer to the point which causes maximum suppression of the interference.



(*) CANNOT BE MEASURED WITH ORDINARY VOLTMETER

Figure 4—Radiotron Socket Voltages

Measured at 115 volts, 60 cycle supply—No signal being received

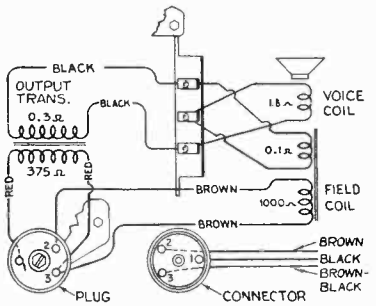


Figure 5—Loudspeaker Wiring

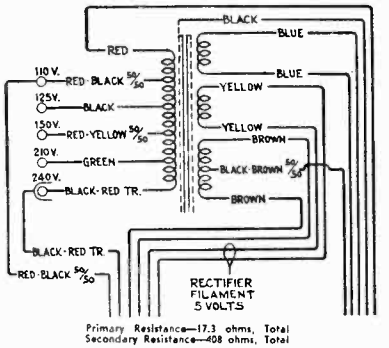


Figure 6—Universal Transformer

T6-9 REPLACEMENT PARTS

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

Stock No.	Description	List Price
	RECEIVER ASSEMBLIES	
11468	Bracket—Dial mounting bracket	$0.14
11465	Capacitor—Adjustable capacitor—(C10)	.48
11450	Capacitor—11.5 Mmfd. (C9)	.14
11289	Capacitor—50 Mmfd. (C6)	.26
4297	Capacitor—400 Mmfd. (C2)	.30
11449	Capacitor—1350 Mmfd. (C11)	.26
4868	Capacitor—0.005 Mfd. (C12, C23, C26)	.20
4858	Capacitor—0.01 Mfd. (C24)	.25
4624	Capacitor—0.01 Mfd. (C21)	.54
11451	Capacitor—0.017 Mfd. (C25)	.18
11414	Capacitor—0.1 Mfd. (C14)	.20
4841	Capacitor—0.1 Mfd. (C3, C22*)	.22
5170	Capacitor—0.25 Mfd. (C17)	.25
11387	Capacitor—10 Mfd. (C13)	.86
11240	Capacitor—10 Mfd. (C27)	1.08
5212	Capacitor—18 Mfd. (C28)	1.16
11462	Coil—Antenna coil (L2, L3)	1.85
11463	Coil—Oscillator coil (L4, L5)	1.65
11457	Condenser—Two-gang variable tuning condenser—complete with mounting bushing assembly (C4, C5, C7, C8)	3.46
11583	Dial—Dial scale	.40
11467	Indicator—Station selector indicator pointer	.10
5226	Lamp—Dial lamp—Package of 5	.70
11466	Resistor—Voltage divider resistor—comprising one 3,500 ohm, one 13,000 ohm, one 85 ohm, one 40 ohm and one 175 ohm sections (R5, R13, R14, R15, R16)	.95
6135	Resistor—270 Ohms—Carbon type—½ watt (R1)—Package of 5	1.00
11283	Resistor—1200 Ohms—Carbon type—½ watt (R17*)—Package of 5	1.00
11454	Resistor—6800 Ohms—Carbon type—½ watt (R3)—Package of 5	1.00
3066	Resistor—12,000 Ohms—Carbon type—1 watt (R4)—Package of 5	1.10
5029	Resistor—56,000 Ohms—Carbon type—½ watt (R2)—Package of 5	1.00
11453	Resistor—270,000 Ohms—Carbon type—1/10 watt (R11)—Package of 5	.75
11452	Resistor—470,000 Ohms—Carbon type—1/10 watt (R12)—Package of 5	.75
5158	Resistor—220,000 Ohms—Carbon type—½ watt (R10*)—Package of 5	1.00
11626	Resistor—2.2 Megohms—Carbon type—½ watt (R7)—Package of 5	1.00
11464	Shield—Antenna or oscillator coil shield	.25
11390	Shield—Intermediate frequency transformer shield	.25
11383	Shield—Radiotron shield	.20
11461	Switch—Range switch (S1, S2)	.56
5238	Terminal—Antenna terminal board assembly—with clip, insulation strip and rivets	.14
11460	Tone Control—Tone control and power switch (S3, S4)	.95
11388	Transformer—First intermediate frequency transformer (L6, L7, C15, C16)	1.90
11389	Transformer—Second intermediate frequency transformer (L8, L9, C18, C19, C20, R6, R8)	3.02
11458	Transformer—Power transformer—105-125 volts—50-60 cycles (T1)	4.85
11585	Transformer—Power transformer—105-125 volts—25-50 cycles	7.00
11584	Transformer—Power transformer—100-130/140-160/195-250 volts—40-60 cycles	5.05
11391	Trap—Wave trap (L1, C1)	1.22
11459	Volume Control (R9)	.85
	REPRODUCER ASSEMBLIES	
11232	Board—Terminal board assembly with two lead wire clips	.18
11231	Bolt—Yoke and core assembly bolt and nut	.16
8060	Bracket—Output transformer mounting bracket	.14
11257	Clamp—Cone center suspension clamping nut and screw assembly—Package of 5	.25
11470	Coil—Field coil (L12)	2.16
11469	Coil—Neutralizing coil (L11)	.20
11235	Cone—Reproducer cone (L10)—Package of 5	3.50
5118	Connector—Three-contact male connector for reproducer	.25
5119	Connector—Three-contact female connector for reproducer cable	.25
9621	Reproducer—Complete	6.85
11253	Transformer—Output transformer (T2)	1.56
11230	Washer—Binders board "C" washer—Used to hold field coil assembly—Package of 5	.18

* C-22, R-10 and R-17 used in some models

RCA MFG. CO., INC.

MODELS BT7-8, BC7-9
Schematic, Socket, Trimmers, Data

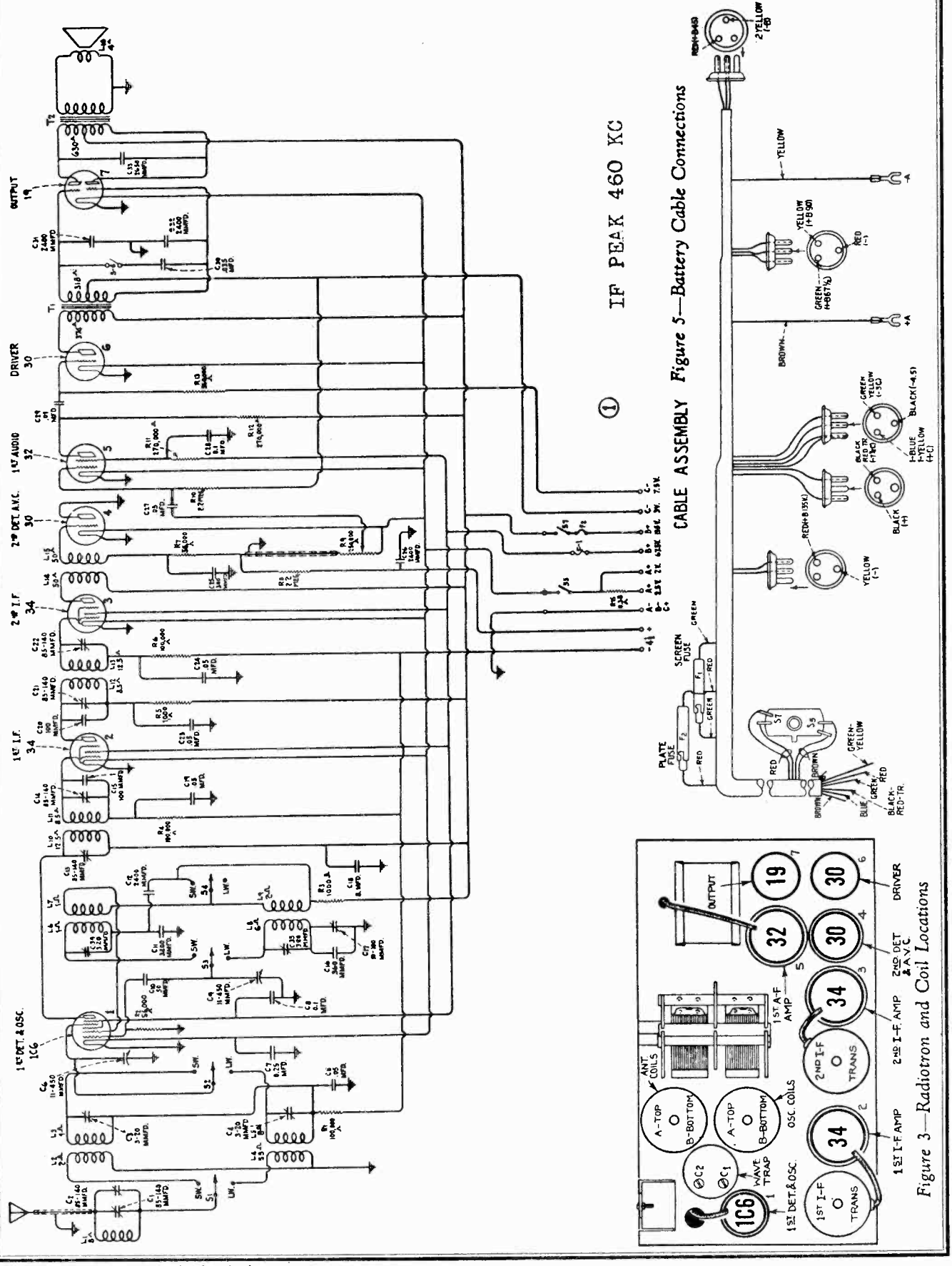


Figure 5—Battery Cable Connections

Figure 3—Radiotron and Coil Locations

MODELS BT7-8, BC7-9
Chassis Wiring

RCA MFG. CO., INC.

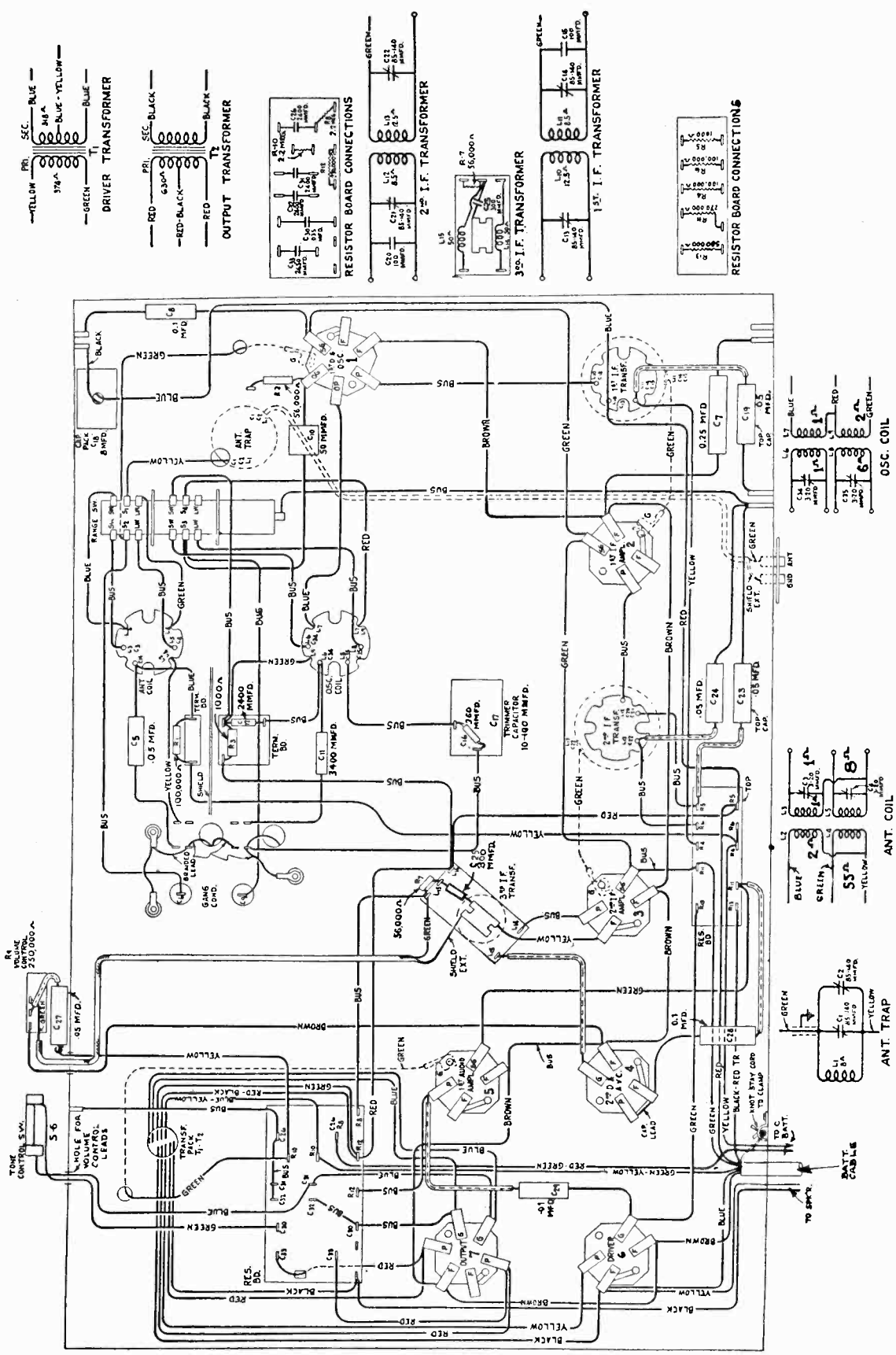


Figure 2—Chassis Wiring Diagram

BT 7-8 and BC 7-9
REPLACEMENT PARTS

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

Stock No.	Description	List Price
	RECEIVER ASSEMBLIES	
4427	Bracket—Volume control or tone control mounting bracket	$0.18
4244	Cap—Grid contact cap—Package of 5	.20
3861	Capacitor—Adjustable capacitor (C17)	.78
11289	Capacitor—50 MMfd. (C10)	.26
3794	Capacitor—100 MMfd. (C15, C20)	.30
3981	Capacitor—300 MMfd. (C25)	.30
4413	Capacitor—360 MMfd. (C16)	.22
4801	Capacitor—2400 MMfd. (C12, C31, C32)	.50
2749	Capacitor—2400 MMfd. (C26)	.35
4529	Capacitor—2650 MMfd. (C33)	.32
4439	Capacitor—3400 MMfd. (C11)	.35
5196	Capacitor—0.035 Mfd. (C30)	.18
4883	Capacitor—0.01 Mfd. (C29)	.20
4518	Capacitor—0.05 Mfd. (C27)	.52
4836	Capacitor—0.05 Mfd. (C5, C19, C23, C24)	.30
4841	Capacitor—0.1 Mfd. (C8, C28)	.22
4840	Capacitor—0.25 Mfd. (C7)	.30
11344	Capacitor—8 Mfd. (C18)	0.00
4430	Coil—Antenna coil (L2, L3, L4, L5, C3, C4)	1.92
4432	Coil—Oscillator coil (L6, L7, L8, L9, C34, C35)	1.65
4539	Coil and shield assembly—Antenna trap circuit	2.05
4504	Condenser—Two-gang variable tuning condenser (C6, C9)	2.78
11338	Volume control—(R9)	1.00
5112	Resistor—1000 Ohms—Carbon type—¼ Watt—(R5)—Package of 5	1.00
5029	Resistor—56,000 Ohms—Carbon type—¼ Watt—(R2, R7)—Package of 5	1.00
3118	Resistor—100,000 Ohms—Carbon type—¼ Watt—(R1, R4, R6)—Package of 5	1.00
11323	Resistor—270,000 Ohms—Carbon type—¼ Watt—(R11, R12)—Package of 5	1.00
5035	Resistor—560,000 Ohms—Carbon type—¼ Watt—(R13)—Package of 5	1.00
11151	Resistor—2.2 Megohms—Carbon type—¼ Watt—(R8, R10)—Package of 5	1.00
4521	Shield—Antenna, oscillator, or intermediate frequency coil shield	.42
3942	Shield—First detector, oscillator Radiotron shield	.18
7487	Shield—Second detector Radiotron shield	.25
3056	Shield—First or second intermediate frequency, or first audio Radiotron shield—Package of 2	.40
4532	Socket—4-contact first audio Radiotron socket	.28
6980	Socket—4-contact intermediate frequency, second detector or driver Radiotron socket	.20
4232	Socket—6-contact first detector, oscillator Radiotron socket	.35
4531	Socket—6-contact output Radiotron socket	.30
5053	Switch—Tone control switch (S6)	.50
11339	Switch—Operating switch—less knob (stock #3088) and escutcheon (stock #6176)—(S5, S7)	.80
4437	Switch—Range switch (S1, S2, S3, S4)	2.35
4733	Transformer—Audio transformer pack comprising driver and output transformer (T1, T2)	3.98
4431	Transformer—First intermediate frequency transformer—(L10, L11, C13, C14, C15)	2.28
7840	Transformer—Second intermediate frequency transformer (L12, L13, C20, C21, C22)	$2.35
4538	Transformer—Third intermediate frequency transformer (L14, L15, R7, C45)	2.15
	DRIVE ASSEMBLIES	
10194	Ball—Steel ball—Package of 20	.50
4422	Clutch—Tuning condenser drive clutch assembly—comprising shaft, balls, ring, spring and washers—assembled	1.00
11342	Dial—Station selector dial	.72
4586	Drive—Variable tuning condenser drive assembly—complete	2.42
4520	Indicator—Station selector indicator pointer	.18
4669	Screw—No. 8-32 5/32" set screw for variable condenser drive assembly—Package of 10	.25
	REPRODUCER ASSEMBLIES (TABLE MODEL—BT 7-8)	
9539	Cone—Reproducer cone—Package of 5—(L16)	4.30
9540	Magnet assembly—Comprising cone bracket, core, and magnet	5.72
9538	Reproducer—Complete—(L16)	7.65
	REPRODUCER ASSEMBLIES (CONSOLE MODEL—BC 7-9)	
9432	Cone—Reproducer cone—complete with voice coil (L16)	1.88
7820	Magnet—Cone housing and magnet assembly	8.98
7819	Reproducer—Complete—(L16)	12.18
	MISCELLANEOUS ASSEMBLIES	
11343	Cable—Main battery cable complete with three stock #11340 connectors, two stock #11341, connectors, two stock #6516 fuse connectors, two stock #3748 fuses—except, less one stock #11339 switch	3.55
6516	Connector—Fuse connector	.16
11340	Connector—3-contact male connector with three small prongs—for "B" battery connections	.24
11341	Connector—3-contact male connector with two small and one large prong for "C" battery connections	.24
11337	Escutcheon—Station selector escutcheon	.70
6176	Escutcheon—Off-on operating switch escutcheon—Package of 5	.50
3748	Fuse—½ ampere F1—Package of 5	.40
6614	Glass—Station selector dial glass	.30
3088	Knob—Operating switch knob and screw—Package of 5	.50
4449	Knob—Station selector, volume control, tone or range switch knob—Package of 5	.60
4644	Resistor—38 Ohms—Flexible type—Filament series resistor—(R15)—Package of 5	.80
4678	Ring—Dial glass retaining ring—Package of 5	.34
3238	Screw—No. 6-40 17/32" Knurled head screw for knob, stock 3088—Package of 10	.25
4945	Screw—Chassis mounting screw assembly—Console Model	.50
4446	Screw—Chassis mounting screw assembly—Table Model	.28
4613	Screw—No. 8-32 7/16" headless set screw for station selector volume control, tone control switch, or range switch knob—Package of 10	.25

Total "A" Battery Current	0.68 Ampere
Maximum "B" Battery Current	.21 M. A.
Tuning Ranges	540-1720 kc. and 5400-18000 kc.
Maximum Undistorted Output	1.2 Watts
Maximum Output	2.2 Watts
Line-up Frequencies	460 kc., 600 kc., 1720 kc., and 18000 kc.

DESCRIPTION OF ELECTRICAL CIRCUIT

The circuit is of the superheterodyne type and consists of a combined oscillator-detector stage, two i-f amplifying stages, a combined, second detector and automatic volume control, a two-stage audio amplifier and a Class "B" output stage. A two-pole operating switch opens the "+A" and "+B" battery leads when the switch is turned to the "off" position.

The signal enters the receiver through a shielded antenna lead and is applied through the antenna transformer to the grid circuit of the first detector which also serves as the local oscillator for producing a signal, 460 kc. higher in frequency than the incoming signal. The combined signals after passing through the first detector produce the i-f signal.

The volume control selects the desired amount of audio signal from the drop across R-9 and applies it to the grid circuit of the first audio stage, RCA-32.

The output of the first audio stage is resistance coupled to the grid circuit of the RCA-30 driver stage, which is transformer coupled to the Class "B" output stage. The output stage utilizes the twin amplifier Radiotron RCA-19, which has two separate sets of elements and eliminates the necessity of having two separate tubes for a Class "B" output stage. The plate circuit of this tube is transformer coupled to the cone coil of the permanent magnet, dynamic loudspeaker.

Plate, grid and filament voltages are supplied by individual batteries. Two +A leads are provided, one permitting operation on a 2-volt storage cell and the other used for operation on a 2.5-volt "Eveready Air Cell."

The i-f amplifier uses two RCA-34 Radiotrons in conjunction with three transformers. Two of the transformers are tuned very accurately to the i-f frequency (460 kc.) by means of suitable trimmer capacitors. The third transformer is untuned and couples the output of the second stage to the input of the second detector, an RCA-30, the plate of which is grounded.

Automatic volume control action is obtained from the voltage drop of a portion of the rectified signal across resistor R-9. The voltage drop constitutes the automatic bias voltage for the first detector and i-f stages and thereby gives the automatic volume control action of the receiver.

SERVICE DATA

ALIGNMENT PROCEDURE

To properly align this receiver, it is essential that a modulated R. F. oscillator of suitable frequency range such as Stock No. 9595, an output indicator, Stock No. 4317, and an alignment tool, Stock No. 4160, be available. Figure 4 shows the location of the various line-up capacitors.

I-F Tuning Adjustments

The i-f amplifier comprises two stages including three transformers. The third transformer is untuned so that only a total of four circuits are to be adjusted. Refer to Figure 4 and proceed as follows:

(a) Short-circuit the antenna and ground terminals and tune the receiver so that no signal is heard. Set the volume control at maximum and connect a ground to the ground terminal.

(b) Connect the test oscillator output between the first detector control grid and chassis ground. Connect the output indicator across the voice coil of the loudspeaker and adjust the oscillator output so that, with the receiver volume control at maximum, a slight glow is obtained in the output indicator.

(c) Adjust the secondary and primary of the second and then the first i-f transformers until a maximum deflection is obtained. The third transformer is untuned and does not require adjusting. Keep the oscillator output at a low value so that only a slight glow is obtained in the output indicator at all times. Go over these adjustments a second time, as there is a slight interlocking of adjustments. This completes the i-f alignment.

(d) Connect Test Oscillator to antenna-ground terminals. Adjust wave trap trimmer, C-1, to give minimum receiver output.

R-F and Oscillator Adjustments

The important points to remember are the need for using the minimum oscillator output to obtain an indi-

cation in the output device with the volume control at its maximum position and the manner of obtaining the proper high-frequency oscillator and detector adjustments.

The r-f line-up capacitors are located at the bottom of the coil assemblies instead of their usual position on the gang capacitor. They are all accessible from the bottom of the chassis except the 600 kc. series capacitor, which is accessible from the top of the chassis. Proceed as follows:

(a) Connect the output of the oscillator to the antenna and ground terminals of the receiver. Check the position of the dial pointer when the tuning capacitor plates are fully meshed. It should be coincident with the radial line adjacent to the dial reading of 540.

(b) Then set the receiver band switch to its broadcast position, the Test Oscillator at 1720 kc., and the dial pointer at 1720. Adjust the oscillator output so that a slight glow will be obtained in the output indicator when the volume control is at its maximum position. Adjust the two trimmers, C-35 and C-4, under the two r-f coils, see Figure 4, until a maximum output is obtained. Then shift the Test Oscillator frequency to 600 kc. The trimmer capacitor, C-17, accessible from the top of the chassis, should now be adjusted for maximum output while rocking the main tuning capacitor back and forth through the signal. Then repeat the 1720 kc. adjustment.

(c) Change the receiver range switch to its high frequency (short wave) position and tune the Station Selector to a dial reading of 18,000 kc. Adjust the Test Oscillator to this same frequency and regulate its output to give a slight indication on the output meter. Then adjust trimmer C-34 to the point giving maximum receiver output. Two points may be found on the trimmer, C-34, which give this maximum. The one of least capacitance is correct and should be used. To assure that this point has been used, tune the receiver to a dial setting of 17,080 kc. and increase the output of the Test Oscillator. The "image" of the 18,000 kc. signal will be received, if the adjustment of C-34 has been properly made. *No adjustments are to be made during the "image" check.*

Return the receiver tuning to 18,000 kc., readjust C-34 if necessary, and then tune the antenna trimmer, C-3, simultaneously rocking the tuning control backward and forward through the signal, until maximum output is obtained. Two positions of the trimmer may be found which give this condition—the one of maximum capacitance is correct.

Radiotron Socket Voltages

Voltage and current values indicated at the Radiotron socket contacts on Figure 4 form a reference basis for test of the receiver. It is to be noted that all voltages are given with respect to chassis-ground, excepting those appearing across the filaments (F-F). The values shown are obtainable when the receiver is in normal operating condition. They do not take into account inaccuracies caused by current consumed in the voltmeter used for the tests; the lower the voltmeter resistance, the lower the degree of accuracy.

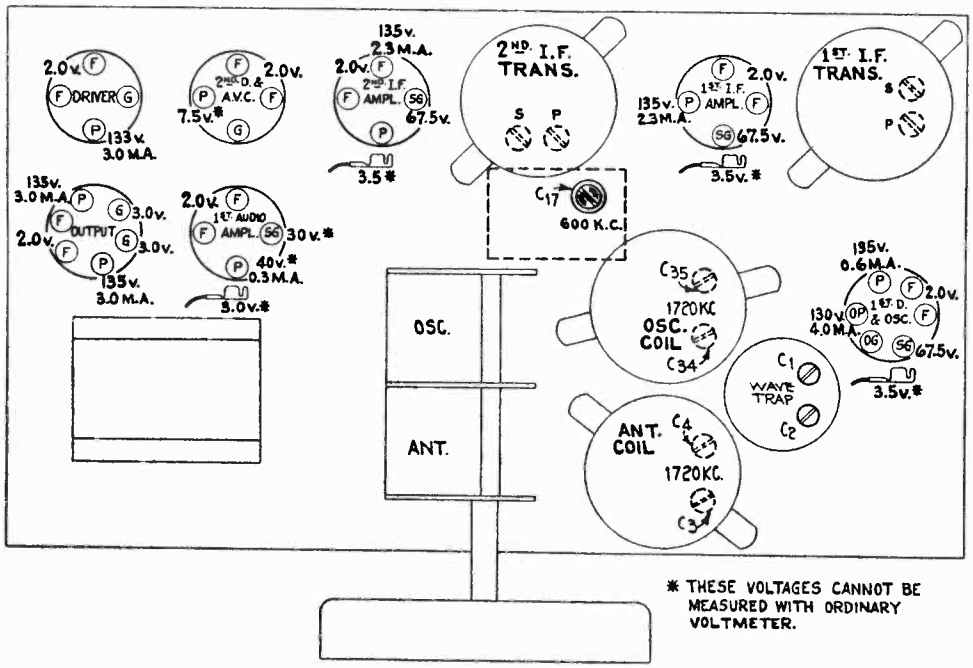
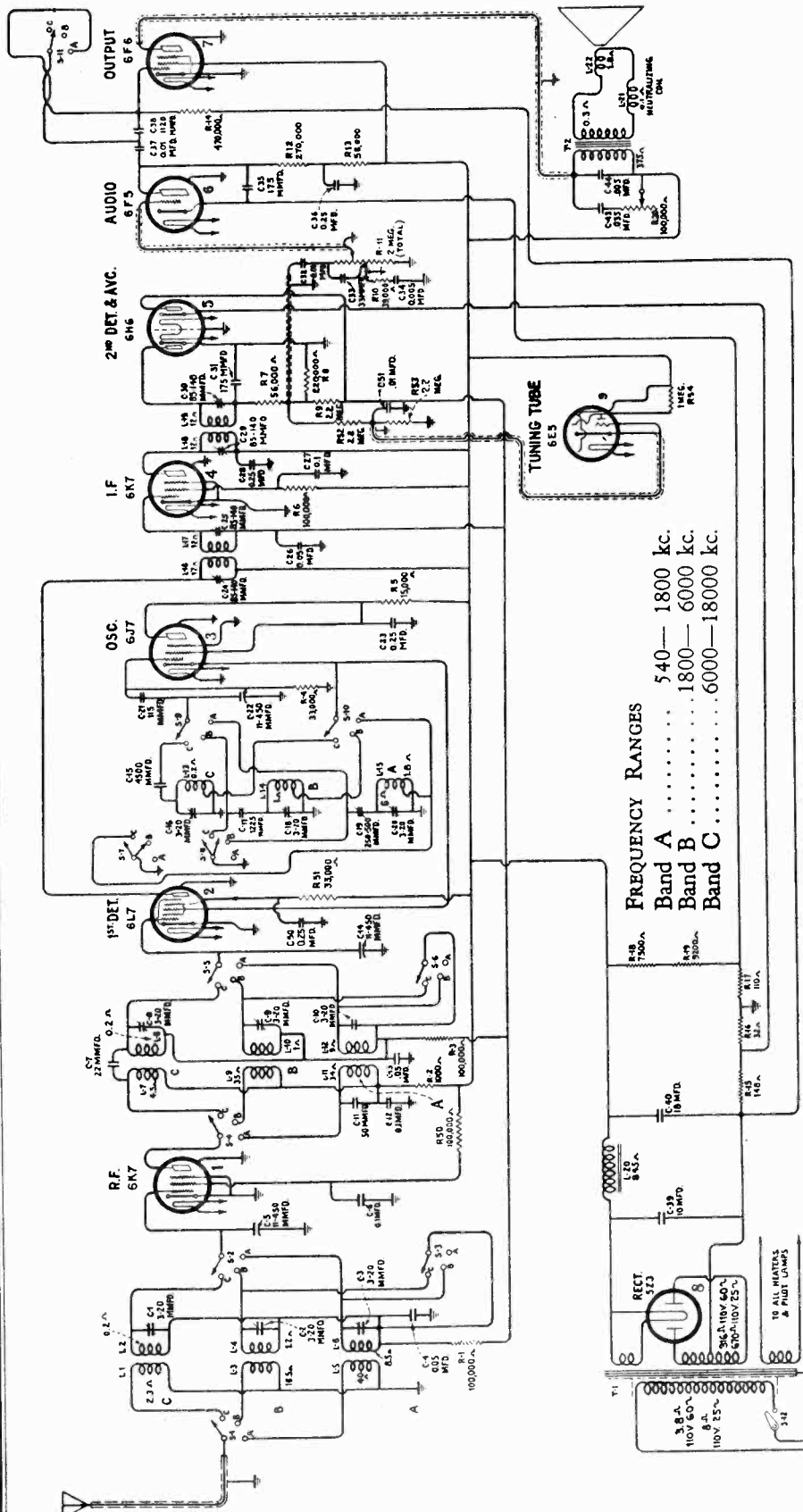


Figure 4—Line-Up Capacitor Locations and Voltage Values at Socket Contacts

Volume Control at Maximum—No Signal—135 Volt "B" Battery—
4.5 and 7.5-Volt Bias Batteries

MODEL C9-4
Schematic
Speaker Data

RCA MFG. CO., INC.



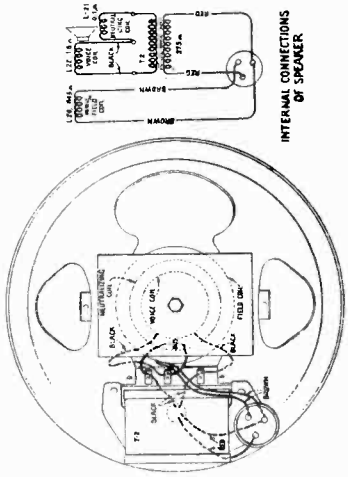


Figure 3—Loudspeaker Wiring

Power Consumption.....105 watts

Undistorted Output.....2 watts

Maximum Output.....4½ watts
Loudspeaker.....12 inch, Electrodynamic
Voice Coil Impedance.....2¼ ohms at 400 cycles

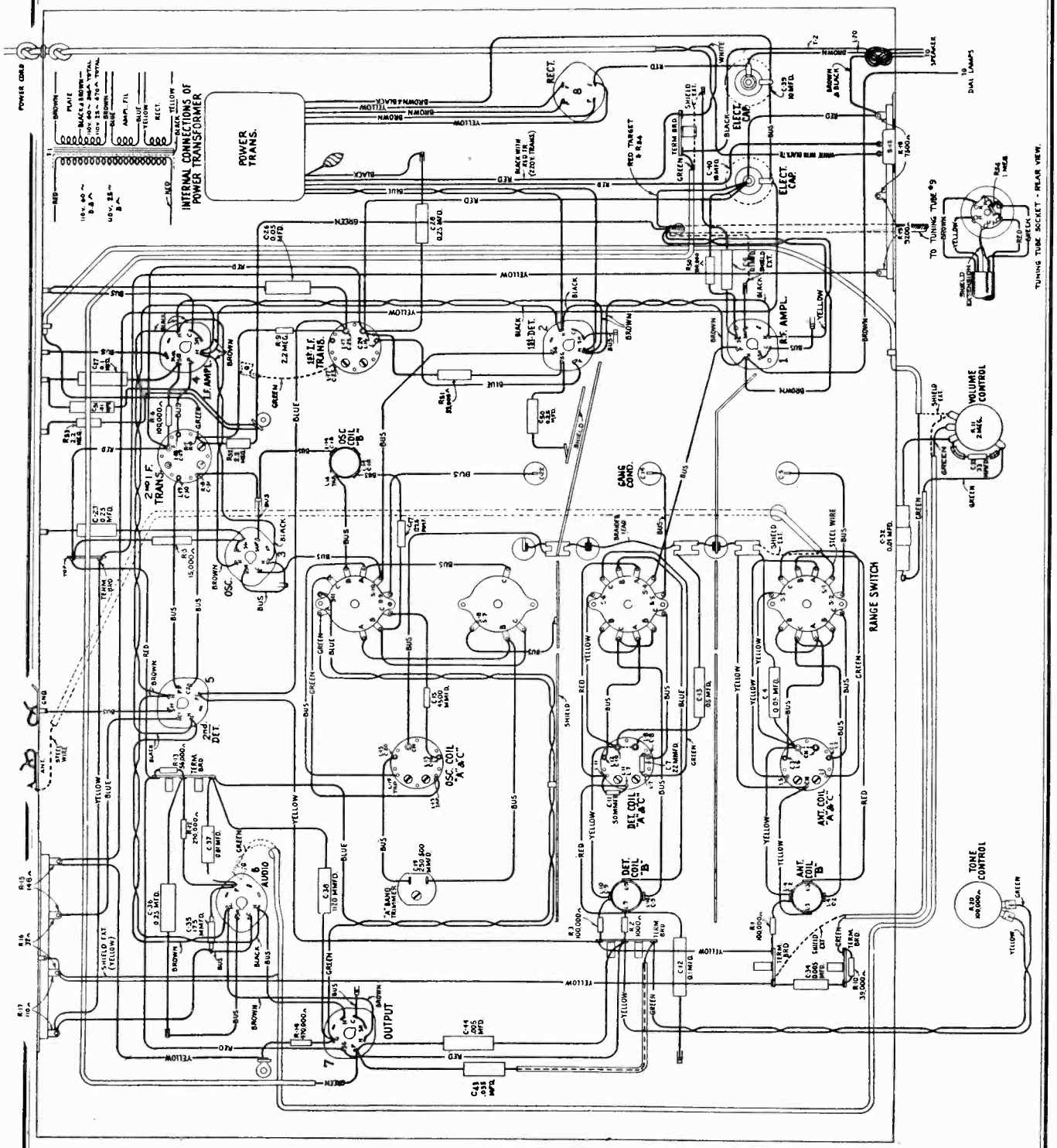
Intermediate Frequency.....460 kc.

ALIGNMENT FREQUENCIES

Band A.....600 kc. (osc), 1720 kc. (osc, ant, det)
Band B.....6132 kc. (osc, ant, det)
Band C.....18000 kc. (osc, ant, det)

MODEL C9-4
Chassis Wiring

RCA MFG. CO., INC.



RCA MFG. CO., INC.

MODEL C9-4
Trimmers, Socket
Alignment Connections

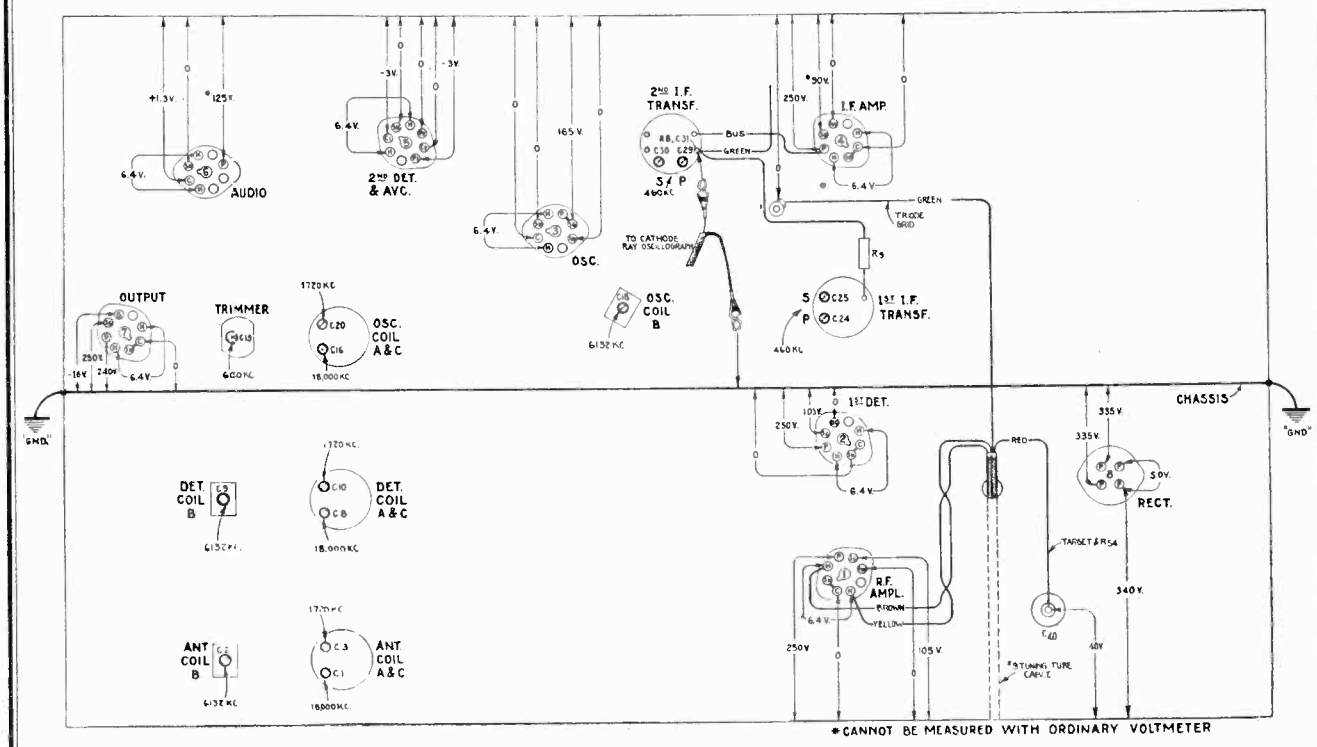


Figure 6—Trimmer Locations and Radiotron Socket Voltages
Measured at 115 volts A.C.—No Signal—Volume Control Maximum

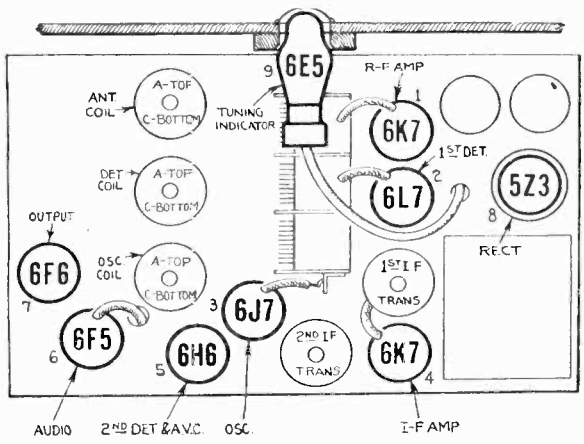


Figure 4—Coil and Radiotron Locations

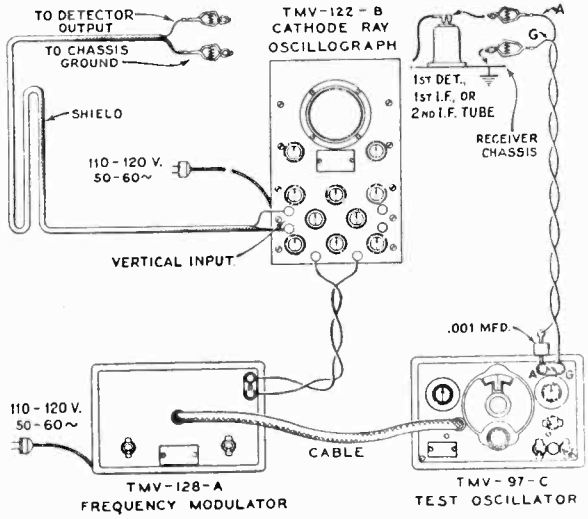


Figure 5—Alignment Apparatus Connections

SERVICE DATA

The various diagrams of this booklet contain such information as will be needed for servicing the receiver. The ratings of all resistors, capacitors, coils, etc., are indicated adjacent to the symbols signifying these parts on the diagrams. The coils, reactors and transformer windings are rated in terms of their d-c resistances only and where the value is less than one ohm, no rating is given. Identification titles such as R-3, L-2, C-1, etc., are provided for reference between the illustrations and replacement parts list.

Alignment Procedure

There are a total of fourteen adjustments necessary for obtaining proper alignment when such a process becomes necessary. Four of these are involved with the i-f system and the remainder are associated with the antenna, first detector and oscillator coils.

Correct performance of the receiver can only be obtained when the trimmer adjustments have been made by a skilled service man with the use of adequate and reliable test equipment. Such apparatus as may be required for this particular instrument is illustrated and described on a separate page of this booklet.

Two methods of alignment are applicable. One utilizes a Cathode-Ray Oscillograph as a means of output indication and the other follows former procedure where a glow type indicator or meter is used. The oscillographic method is much to be preferred, since greater accuracy is possible from the type of indication afforded. There are no approximations necessary as with the meter or aural method, but each adjustment can be made with excellent precision. Both methods are hereinafter outlined so that alignment operations may be made according to the equipment available.

It is wise to determine the necessity for alignment as well as the direction of misalignment before making adjustments. The RCA Tuning Wand is an instrument designed particularly for such a purpose.

The Tuning Wand consists of a bakelite rod having a small brass cylinder at one end and a core of finely divided iron at the other. It may be inserted into a tuned coil while a signal of the normal resonant frequency is being supplied to such coil to obtain an indication of the tuning. Holes are provided at the top of the r-f shield cans for entrance of the Wand. The presence of either end of the Wand will cause a change in tuning which will be indicated at the receiver output as an increase or decrease in signal level. If there is a decrease of output when either end is inserted, the tuning is correct and will require no adjustment. However, should there be an increase of output due to the iron core and decrease with the brass cylinder, an increase in inductance or capacitance is indicated as necessary to bring the circuit into line. The trimmer involved should therefore be increased accordingly. If the brass cylinder end causes an increase in output while the iron end causes a decrease, reduction of inductance will be necessary to place the circuit in alignment. This is equivalent to decreasing the trimmer concerned. The following tabulation gives the various changes and the adjustments required:—

WAND	SIGNAL	TRIMMER
{Brass	Decrease}	
{Iron	Decrease}	None
{Brass	Increase}	
{Iron	Decrease}	Decrease
{Brass	Decrease}	
{Iron	Increase}	Increase

(I) CATHODE-RAY ALIGNMENT

Equipment

A standard source of the specified alignment frequencies is required. Such a source should consist of an RCA Full Range Oscillator, Stock No. 9595. Output indication should be by means of an RCA Stock No. 9545 Cathode-Ray Oscillograph. An RCA Stock No. 9558 Frequency Modulator will be needed to sweep the generated signal and synchronize it with the Oscillograph in order to make possible the visual representation of the resonant characteristic of the circuit being tuned on the cathode-ray fluorescent screen.

I-F Trimmer Adjustments

The four trimmers of the two i-f transformers are located as shown by Figure 6. Each must be aligned to a basic frequency of 460 kc. The last transformer must be aligned firstly and the first transformer aligned secondly. For such a process, it is necessary to feed the output of the Full Range Oscillator to the stages in their order of alignment, adjusting the trimmers of each transformer and observing the effect at the second detector output on the Cathode-Ray Oscillograph. The proper point of connection of the Oscillograph is with its vertical "high" input terminal attached to the juncture of R-7, R-8 and R-9 as illustrated in Figure 6, and with the "0" or ground terminal to the chassis. The "Ext. Sync." terminals of the Oscillograph should be connected to the Frequency Modulator as shown by Figure 5. A .001 mfd. capacitor installed in series with the Oscillator "Ant." lead will prevent the voltages of the stage under alignment from becoming upset. The vertical "A" amplifier should be "On" for the ensuing adjustments and the gain control kept at its maximum position. For each adjustment, the Oscillator output need be regulated so that the image obtained on the Oscillograph screen will be of sufficient size as to be accurately observable. Proceed further as follows:—

(a) Place the receiver, Oscillograph and test Oscillator in operation. Set the receiver range switch to Band "A" and tune the station selector to a point where no interference will be picked up, shorting the antenna and ground terminals if necessary. Set the Oscillograph horizontal "B" amplifier to "Timing" and control its gain so that the luminescent spot sweeps a straight line trace completely across the screen. Place the timing control to "Int." Adjust the intensity and focusing controls of the Oscillograph to produce the correct size and strength of the spot.

(b) Attach the output of the test Oscillator between the control grid cap of the RCA-6K7 i-f tube and chassis ground as shown typically by Figure 5. Tune the Oscillator to 460 kc. and set its modulation switch to "On". Regulate its output until the signal produces a wave pattern on the Oscillograph screen, adjusting the Oscillograph controls to give the desired number of cycles. Cause the image to stand still on the screen by manipulation of the frequency and synchronizing controls. Then carefully tune the two trimmers C-29 and C-30 of the second i-f transformer to produce maximum amplitude (vertical deflection) of the oscillographic image. Under this condition the transformer will be sharply resonated to 460 kc.

(c) The Frequency Modulator should then be placed in operation and interconnected with the Full Range Oscillator by means of the special shielded patch cord. Figure 5 shows the proper arrangement. Set the Frequency Modulator sweep range switch to its "Lo" position and turn the Oscillator modulation switch to "Off". Change the timing control of the Oscillograph to "Ext." and place the range switch to its No. 2 position. Then carefully shift the tuning of the Oscillator so as to increase its frequency, until two distinct and similar waves appear on the Oscillograph screen and become exactly coincident at their highest points. These curves will be found to occur at an Oscillator setting of *approximately* 540 kc. They will be identical in shape but appearing in reversed positions. Adjust the frequency control of the Oscillograph in order to cause the waves to conform with the above requirements and to make them remain motionless on the screen. This will require a setting of approximately ½ clockwise rotation of the frequency control. The trimmers C-29 and C-30 should then be re-adjusted so that the two curves move together and become exactly coincident throughout their lengths, maintaining the maximum amplitude at which this condition can be brought about.

(d) Leaving the equipment connected and adjusted as in (c), change the Oscillator output to the control grid cap of the RCA-6L7 first detector tube. Then adjust the first i-f transformer trimmers C-24 and C-25 so that the forward and reverse waves appearing on the Oscillograph coincide throughout their lengths and have maximum amplitude. The shape of the composite wave obtained from this operation is a true representation of the overall tuning characteristic of the i-f system. Each trimmer of the entire group should then be checked to assure that it is in correct alignment as indicated by the degree of coincidence and relative amplitude of the image on the Oscillograph screen.

R-F Trimmer Adjustments

Locations of the various antenna, detector and oscillator coil trimmers are shown by Figure 6. The test Oscillator should be removed from connection with the i-f system and its output connected to the antenna-ground terminals of the receiver. No changes are to be made in the connections of the Oscillograph at the second detector. During the following adjustments, the Oscillator output should be regulated as often as is necessary to keep the oscillographic image as low as is practically observable. Adherence to such a procedure will obviate the broadness of tuning that would result from a.v.c. action on a stronger signal. Proceed with the adjustments as follows:—

Calibration

Set the receiver range switch to Band A and rotate the station selector until the tuning condenser plates are in full mesh (maximum capacitance). Then move the main dial pointer until it points exactly to the horizontal line at the low frequency end of the Band A scale.

Band A

(a) With the receiver range switch in its Band A position, tune the station selector until the dial pointer is at a reading of 1720 kc. Adjust the test Oscillator to 1720 kc. (modulation "On" and Frequency Modulator disconnected) and increase its output to produce a registration on the Oscillograph. Carefully align the oscillator, detector and antenna trimmers C-20, C-10 and C-3 respectively, so that each brings about maximum amplitude of output as shown by the wave on the Oscillograph. It will be necessary to have the timing control of the Oscillograph on "Int." for this operation. After each trimmer has been peaked, the Oscillograph timing control should be set to "Ext." and the Frequency Modulator placed into operation with its connections to the Oscillator and Oscillograph made in accordance with Figure 5. Turn the modulation switch of the Oscillator to "Off" and retune the Oscillator (increase frequency) until the forward and reverse waves show on the Oscillograph and become coincident at their highest points. Adjust the trimmers C-20, C-10 and C-3 again, getting each to the point which produces the best coincidence and maximum amplitude of tbe wave images.

(b) Remove the Frequency Modulator cable from the Oscillator and shift the signal frequency to 600 kc. Place the modulation switch to "On". Tune the receiver to pick up this signal, disregarding the dial reading at which it is best received. Then insert the Frequency Modulator plug and retune the Oscillator (modulation "Off") until the two similar forward and reverse waves appear on the screen. For this adjustment, it is advisable to shift the Oscillator to its 200—400 kc. range and use the third harmonic of the generated signal in order to obtain the desired range of sweep. The oscillator series trimmer C-19 should then be adjusted to produce maximum amplitude of the images. No rocking will be necessary on the station selector inasmuch as the signal frequency is being "wobbled" by the Frequency Modulator to produce the same effect.
After completing this adjustment the trimmer C-20 should be re-aligned as in (a) to correct for any change brought about by the adjustment of C-19.

Band B

(a) Advance the receiver range switch to its Band B position and tune the station selector to a dial reading of 6132 kc. Set the test Oscillator to this same frequency (modulation "On" and Frequency Modulator disconnected) and increase its output until a suitable indication is apparent on the Oscillograph. The Oscillograph should be adjusted for "Int." timing. Then adjust the oscillator trimmer C-18 to the point at which maximum amplitude of the image is obtained. Two points will be found for this trimmer which give such a maximum. The one of least capacitance is correct and should be used. This can be checked by tuning the "image" signal, which will be received at 5212 kc. on the dial if the adjustment of C-18 has

been properly made. An increase in test Oscillator output may be necessary for this test, however, its *frequency should not be changed from* 6132 kc. *nor any trimmer adjustments made on the receiver.*

(b) Return the station selector to the 6132 kc. reading and align the detector, and antenna coil trimmers, C-9 and C-2 respectively, for maximum (peak) output as shown by the Oscillograph. No further adjustments are to be made on this band.

Band C

(a) Turn the range switch of the receiver to its Band C position and tune the station selector until the dial pointer reads 18,000 kc. Set the test Oscillator to the same frequency (modulation "On" and Frequency Modulator disconnected) and regulate its output to the level required for convenient observation. Adjust the trimmer C-16 to the point producing maximum output as indicated on the Oscillograph. Check for the presence of the proper "image" signal by tuning the receiver to 17,080 kc. The 18,000 kc. signal of the Oscillator will be received at this point if the adjustment of C-16 has been properly made using the position of least capacitance which gives maximum receiver output. It may be necessary to increase the output of the Oscillator in order to get an indication of the "image". *No adjustments should be made during this check.*

(b) Return the receiver tuning to 18,000 kc., realign C-16 if necessary, and then adjust the detector and antenna trimmers, C-8 and C-1, for maximum signal output as evidenced by the oscillographic image. No further adjustments are to be made on this band.

(2) ALIGNMENT WITH OUTPUT METER

To align the receiver by means of an output indicator other than a Cathode-Ray Oscillograph will require the use of a standard test Oscillator such as that recommended above for the source of signals and means of indication for the output. The RCA Neon Output Indicator, Stock No. 4317 will be found very satisfactory for such use. It should be connected across the voice coil circuit of the loudspeaker or across the output transformer primary.

I-F Alignment

Connect the test Oscillator to the control grid cap of the i-f tube. Advance the volume control of the receiver to its full-on position. Tune the test Oscillator accurately to 460 kc. and align the trimmers C-29 and C-30 to give maximum receiver output. Regulate the Oscillator output during this adjustment so that the output indication is as small as can be conveniently observed. After completing the adjustments of these trimmers, re-connect the Oscillator so that it will feed into the control grid circuit of the RCA-6L7 first detector. Then tune the first i-f transformer trimmers C-24 and C-25 for maximum receiver output.

R-F Alignment

After completing the i-f adjustments, it is advisable to correct the line-up of the circuits ahead of the first detector. The test Oscillator should be connected to the antenna-ground terminals of the receiver and the manual volume control kept at its maximum position. For each adjustment the Oscillator output should be maintained as low as possible in order to avoid broadness of tuning which would result from a.v.c. action on a stronger signal. **Band A** should be aligned by supplying a 1720 kc. signal to the receiver, tuning the station selector to a dial reading of 1720 and adjusting the trimmers C-20, C-10 and C-3 to produce maximum receiver output. The Oscillator should then be shifted to 600 kc. and the receiver tuned to resonate this signal, disregarding the reading at which it is best received. Trimmer C-19 must then be adjusted, simultaneously while rocking the station selector backward and forward through the signal until the maximum output results from the combined operations. C-20 should be rechecked to assure that its adjustment has not changed because of the trimming of C-19. **Band B**

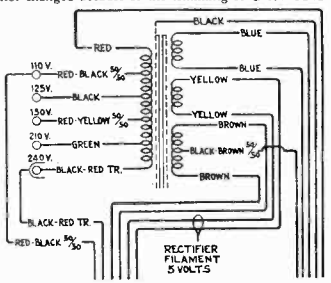


Figure 7—Universal Power Transformer Connections
Pri. Res.—10.3 Ohms, Total
Sec. Res.—383 Ohms, Total

must be aligned at 6132 kc. by tuning the test Oscillator to such a frequency and turning the station selector to the same dial reading. Tune the trimmer C-18 to produce maximum receiver output, using the setting of least capacitance which causes same. The presence of the proper "image" may be checked by tuning the receiver to 5212 kc. at which point the 6132 kc. signal will be heard if the trimmer C-18 has been properly set to the position of least capacitance for maximum (peak) output. It may be necessary to increase the Oscillator output for this check. *No adjustments are to be made.* Return the station selector to the 6132 kc. dial marking and trim capacitors C-9 and C-2 for maximum receiver output. No other adjustments are necessary on Band B. Change the receiver so that it is operative and the dial reads 18,000 kc. on the "C" Band. Tune the test Oscillator to this same frequency. Then adjust the oscillator trimmer C-16 to produce maximum (peak) output. Two positions of this trimmer will be found which conform with this requirement. The one of least capacitance is correct. Check for the presence of "image" response at 17,080 kc. by shifting the receiver tuning. If it is received at such a point, the trimmer C-16 has been correctly adjusted to the right peak. *No adjustments are to be made during this check.* Tune the receiver back to the 18,000 kc. dial marking, re-adjust C-16 if necessary, and then tune the detector and antenna capacitors C-1 and C-8 for maximum receiver output. No further adjustments are necessary.

Radiotron Socket Voltages

The voltage values indicated from the Radiotron socket contacts to chassis on Figure 6 will serve to assist in the location of causes for faulty operation. Each value as specified should hold within ± 20% when the receiver is normally operative at its rated supply voltage. Variations in excess of this limit will usually be indicative of trouble in the basic circuits. The voltages given are actual operating values and do not allow for inaccuracies which may be caused by the loading effect of a voltmeter's internal resistance. This resistance should be duly considered for all readings unless measurement will determine the accuracy to be obtained, the error increasing as the meter resistance becomes comparable to or less than the circuit resistance. For the majority of readings, a meter having an internal resistance of 1000 ohms per volt will be satisfactory when the range used for each reading is chosen as high as possible consistent with good readability.

Universal Transformer

The transformer used on some models of these receivers is adaptable to several ranges of voltage as given under rating C of Electrical Specifications. Its schematic and wiring are shown by Figure 7. Terminals are provided at the top of the transformer case for changing the primary connections to suit the voltage being used.

REPLACEMENT PARTS

Stock No.	Description	List Price
	RECEIVER ASSEMBLIES	
4427	Bracket—Volume control or high frequency tone control mounting bracket	$0.18
5237	Bushing—Variable tuning condenser mounting bushing assembly—Package of 3	.43
11350	Cap—Contact cap—Package of 5	.20
11223	Capacitor—Adjustable capacitor (C19)	.46
11292	Capacitor—22 MMfd. (C7)	.24
11321	Capacitor—33 MMfd. (C33)	.26
11289	Capacitor—50 MMfd. (C11)	.26
11291	Capacitor—115 MMfd. (C21)	.24
5116	Capacitor—175 MMfd. (C35)	.18
4409	Capacitor—1120 MMfd. (C38)	.35
11288	Capacitor—1225 MMfd. (C17)	.30
11287	Capacitor—4500 MMfd. (C15)	.30
4868	Capacitor—0.005 Mfd. (C34, C44)	.20
4624	Capacitor—0.01 Mfd. (C32)	.54
4858	Capacitor—0.01 Mfd. (C37, C51)	.25
5196	Capacitor—0.035 Mfd. (C43)	.18
4836	Capacitor—0.05 Mfd. (C4, C13, C26)	.30
4885	Capacitor—0.1 Mfd. (C6, C12, C27)	.28
5170	Capacitor—0.25 Mfd. (C23, C28, C36, C50)	.25
11240	Capacitor—10 Mfd. (C39)	1.08
5212	Capacitor—18 Mfd. (C40)	1.16
11272	Clamp—Antenna cable clamp—Located near antenna terminal	.10
5215	Coil—Antenna coil (A and C Bands)—(L1, L2, L5, L6, C1, C3)	$2.32
5245	Coil—Antenna coil (B Band)—(L3, L4, C2)	1.58
5216	Coil—Detector coil (A and C Bands)—(L7, L8, L11, L12, C8, C10)	2.34
5246	Coil—Detector coil (B Band)—(L9, L10, C9)	1.62
5217	Coil—Oscillator coil (A and C Bands)—(L13, L15, C16, C20)	2.20
5247	Coil—Oscillator coil (B Band)—(L14, C18)	1.44
11214	Condenser—3-Gang variable tuning condenser (C7, C14, C22)	4.20
11238	Tone Control—High frequency tone control (R20)	.96
11237	Volume Control—(R11)	1.20
4340	Lamp—Dial lamp—Package of 5	.60
8041	Plate—R.F. or I.F. coil shield locking plate—Package of 2	.12
11244	Resistor—Voltage divider resistor, comprising one 7500 ohm and one 9200 ohm section—(R18, R19)	1.08
11329	Resistor—Voltage divider resistor, comprising one 148 ohm, one 32 ohm and one 85 ohm section—(R15, R16, R17)	.52
5112	Resistor—1000 Ohm—Carbon Type—¼ Watt—(R2)—Package of 5	1.00
5114	Resistor—15,000 Ohm—Carbon Type—1 Watt—(R5)	$0.22
11300	Resistor—33,000 Ohm—Carbon Type—⅒ Watt—(R4)—Package of 5	.75
5033	Resistor—33,000 Ohm—Carbon Type—1 Watt—(R51)—Package of 5	1.10
11322	Resistor—39,000 Ohm—Carbon Type—¼ Watt—(R10)—Package of 5	1.00
5029	Resistor—56,000 Ohm—Carbon Type—¼ Watt—(R13)—Package of 5	1.00
3118	Resistor—100,000 Ohm—Carbon Type—¼ Watt—(R1, R3, R6, R50)—Package of 5	1.00
4669	Screw—No. 8-32-5/32" set screw for variable condenser drive assembly—Package of 10	$0.25
4377	Spring—Band indicator operating arm spring—Package of 5	.25
4378	Stud—Band indicator operating arm stud and nut assembly—Package of 5	.25
	MISCELLANEOUS ASSEMBLIES	
11191	Bracket—Tuning Lamp mounting bracket—Less Clamp 11192	.12
11331	Cable—Tuning Lamp Cable—Complete with socket	1.28
11192	Clamp—Tuning Lamp Mounting Clamp—Less Bracket 11191	.12
11276	Escutcheon—Tuning Lamp Escutcheon	.40
	Escutcheon—Station selector escutcheon	.70
11337	Glass—Station selector dial glass	.30
6614	Knob—Station selector knob—Package of 5	.75
11346		
11347	Knob—Volume control, tone control, range switch or power switch knob—Package of 5	.75
11246	Foot—Chassis mounting foot and bracket assembly—Package of 2	.76
11382	Resistor—1 Megohm—Carbon Type—⅒ Watt—(R14)—Package of 5	.75
4678	Ring—Spring retaining ring for dial glass—Package of 5	.34
5210	Screw—Chassis mounting screw assembly—Package of 4	.16
11348	Screw—No. 8-32-7/16" headless cupped point set screw for knob, stock #11346—Package of 10	.32
11381	Socket—Tuning Lamp Socket and Cover	.45
11349	Spring—Retaining spring for knob, stock #11347—Package of 5	.15
	REPRODUCER ASSEMBLIES	
11232	Board—Terminal board assembly with two lead wire clips	.18
11231	Bolt—Yoke and core assembly bolt and nut	.16
8060	Bracket—Output transformer mounting bracket	.14
11257	Clamp—Cone center suspension clamping nut and screw assembly—Package of 5	.25
11254	Coil—Field coil—L20	2.00
11233	Coil—Hum neutralizing coil—L21	.30
11258	Cone—Reproducer cone—L22—Package of 5	3.85
5118	Connector—3-contact male connector for reproducer	.25
5119	Connector—3-contact female connector plug for reproducer cable	.25
9619	Reproducer—Complete	6.05
11253	Transformer—Output transformer—T2	1.56
11230	Washer—"Binders board" "C" washer used to hold field coil assembly	.18
11323	Resistor—270,000 Ohm—Carbon Type—¼ Watt—(R12)—Package of 5	1.00
11172	Resistor—470,000 Ohm—Carbon Type—¼ Watt—(R14)—Package of 5	1.00
11151	Resistor—2.2 Megohms—Carbon Type—¼ Watt—(R9, R52, R53)—Package of 5	1.00
11273	Shield—Rectifier Radiotron shield	.25
11222	Socket—Dial lamp socket	.18
4794	Socket—4-contact rectifier Radiotron socket	.15
11313	Socket—5-contact Radiotron socket	.18
11198	Socket—7-contact Radiotron socket	.15
11236	Switch—Band switch (S1, S2, S3, S4, S5, S6, S7, S8, S9, S10, S11)	2.44
11133	Switch—Power switch—(S12)	.62
5238	Terminal—Antenna terminal clip assembly	.14
11216	Transformer—First intermediate frequency transformer (L16, L17, C24, C25)	2.19
11239	Transformer—Second intermediate frequency transformer—(L18, L19, C29, C30, C31, R7, R8)	2.72
11330	Transformer—Power transformer—105-125 volts—50-60 cycles (T1)	5.52
11242	Transformer—Power transformer—105-125 volts—25-60 cycles	6.52
11243	Transformer—Power transformer—100-130, 140-160, 195-250 volts—40-60 cycles	4.64
	DRIVE ASSEMBLIES	
4362	Arm—Band indicator operating arm	.28
10194	Ball—Steel ball—Package of 20	.25
4422	Clutch—Tuning condenser drive clutch assembly—comprising drive shaft, balls, ring, spring and washers—assembled	1.00
11328	Dial—Dial scale	.68
11252	Drive—Variable tuning condenser drive assembly	1.88
4520	Indicator—Station selector indicator pointer	.18
11226	Indicator—Band indicator pointer assembly comprising indicator pointer, arm, link and stud	.20
3993	Screw—No. 6-32-5/32" square head set screw for band indicator operating arm—Package of 10	.25

RCA MFG. CO., INC.

MODEL T10-1
Trimmers, Socket

RCA MFG. CO., INC.

Voltage, Speaker Data
Transformer Data

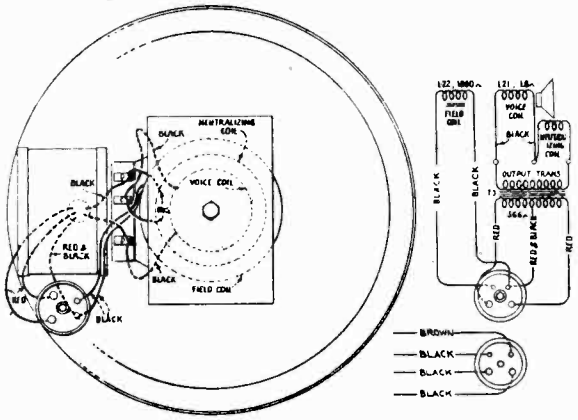


Figure 3—Loudspeaker Wiring

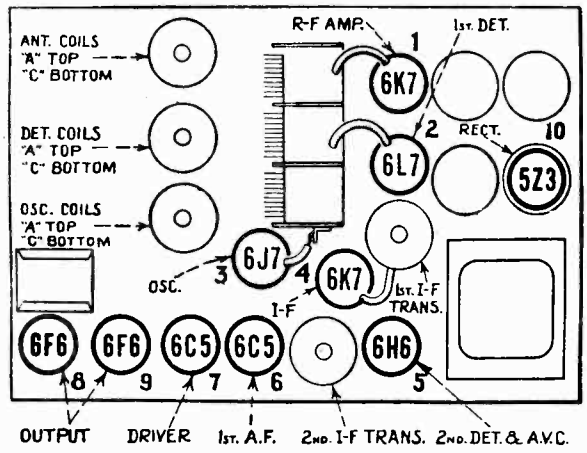


Figure 4—Coil and Radiotron Locations

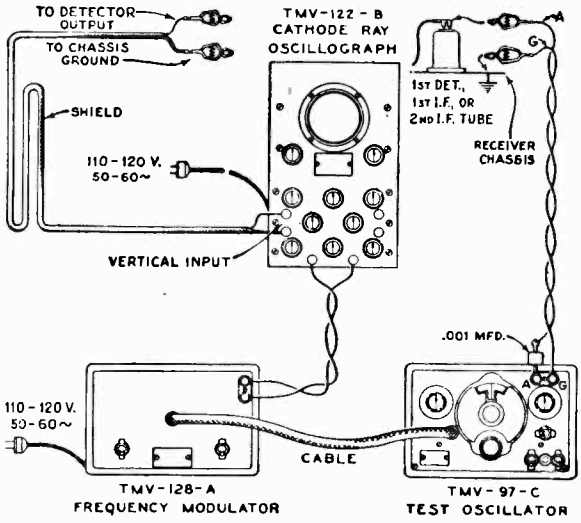


Figure 5—Alignment Apparatus Connections

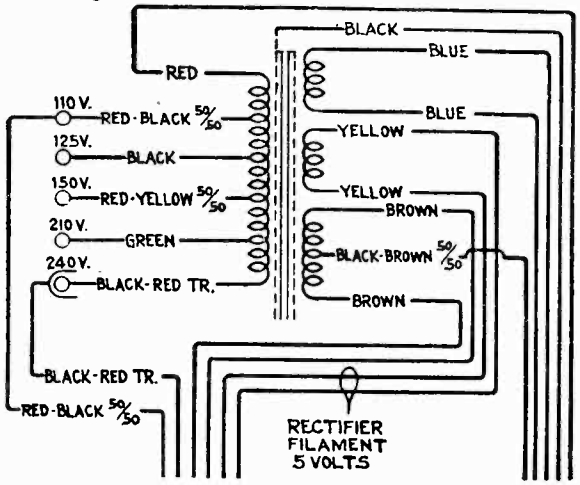


Figure 7—Universal Power Transformer Connections

Pri. Res.—7.42 ohms, total
Sec. Res.—274 ohms, total

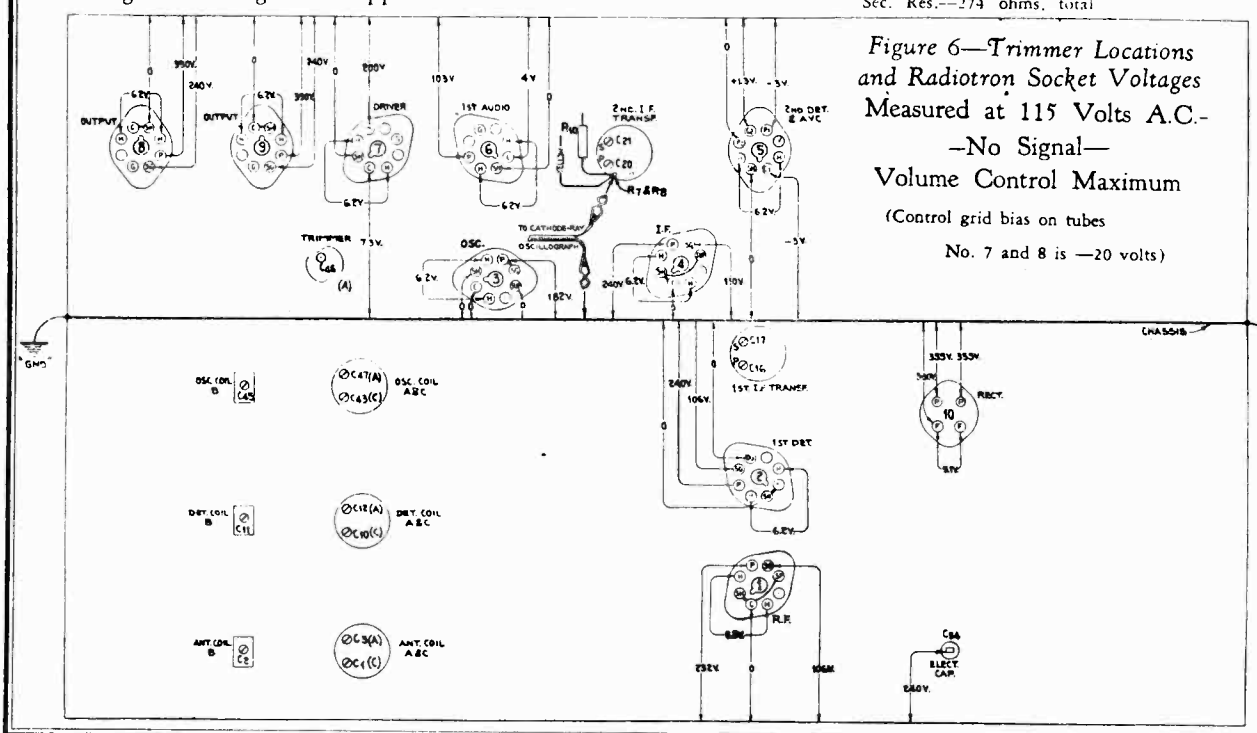
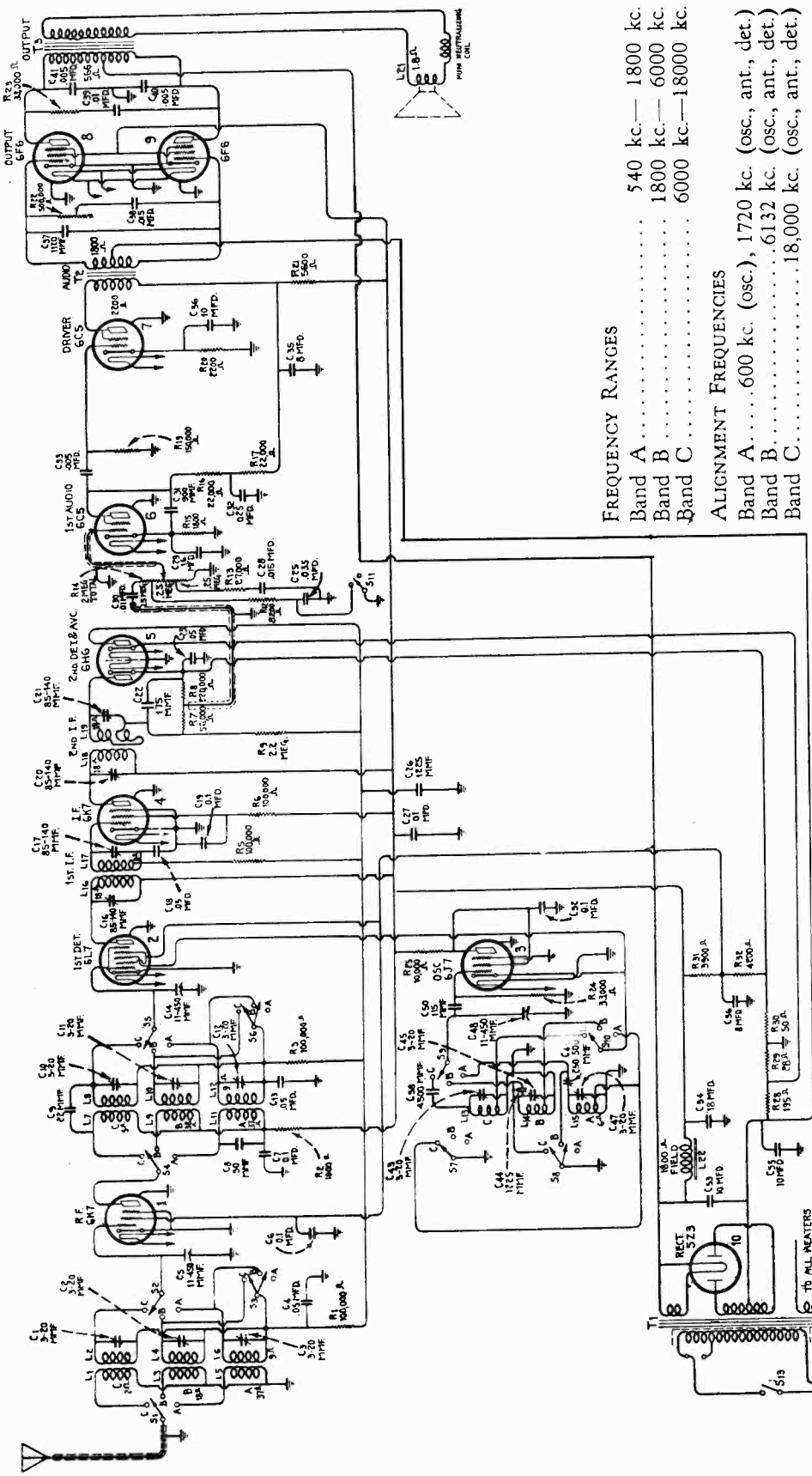


Figure 6—Trimmer Locations and Radiotron Socket Voltages Measured at 115 Volts A.C.—No Signal—Volume Control Maximum

(Control grid bias on tubes No. 7 and 8 is —20 volts)

MODEL T10-1
Schematic

RCA MFG. CO., INC.



FREQUENCY RANGES

Band A	540 kc.— 1800 kc.
Band B	1800 kc.— 6000 kc.
Band C	6000 kc.—18000 kc.

ALIGNMENT FREQUENCIES

Band A	600 kc. (osc.), 1720 kc. (osc., ant., det.)
Band B	6132 kc. (osc., ant., det.)
Band C	18,000 kc. (osc., ant., det.)

POWER RATINGS

Rating A	105—125 volts, 50—60 cycles
Rating B	105—125 volts, 25—60 cycles
Rating C	100—130/140—160/195—250 volts, 40—60 cycles
Power Consumption	135 watts

MISCELLANEOUS

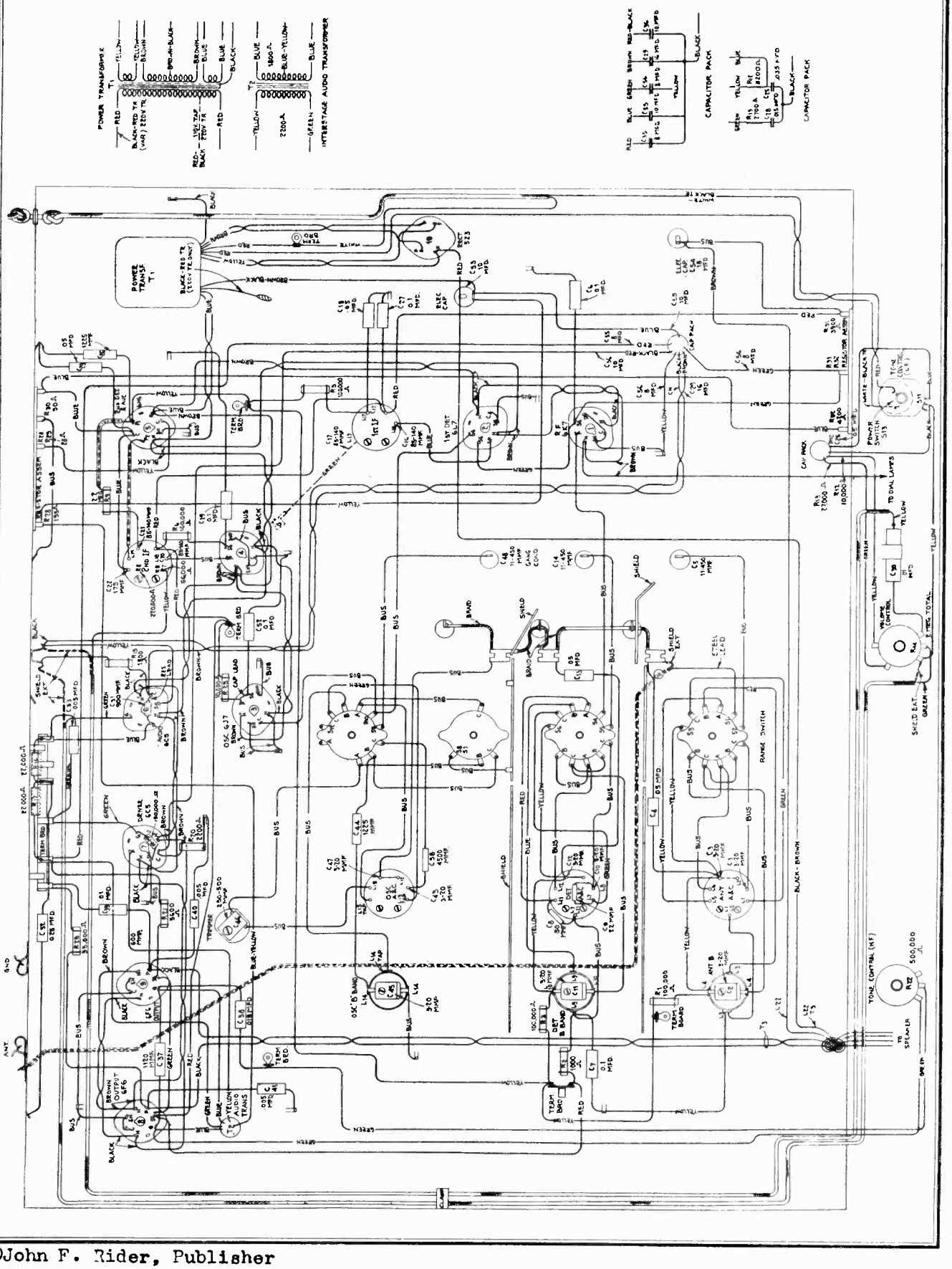
Undistorted Output	8.5 watts
Maximum Output	11.5 watts
Loudspeaker	Electrodynamic—8 inch
Voice Coil Impedance	2.25 ohms at 400 cycles
Intermediate Frequency	**460 kc.**

POWER TRANSFORMER

Pri. Res.	Sec. Res.
3.8 ohms	335 ohms (60 cycle)
5.4 ohms	470 ohms (25 cycle)

MODEL T10-1
Chassis Wiring

RCA MFG. CO., INC.



MODEL T10-1
Alignment
Parts List

RCA MFG. CO., INC.

REPLACEMENT PARTS

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

Stock No.	Description	List Price
	RECEIVER ASSEMBLIES	
4427	Bracket—High or low frequency tone control or volume control mounting bracket.	$0.18
5237	Bushing—Variable condenser mounting bushing assembly—Package of 3	.43
11223	Capacitor—Adjustable capacitor—(C46)	.46
11292	Capacitor—22 MMfd.—(C9)	.24
11289	Capacitor—50 MMfd.—(C8)	.26
11291	Capacitor—115 MMfd.—(C50)	.24
3784	Capacitor—900 MMfd.—(C31)	.30
4409	Capacitor—1120 MMfd.—(C37)	.35
11288	Capacitor—1225 MMfd.—(C44)	.30
11316	Capacitor—1225 MMfd.—(C26)	.40
11287	Capacitor—4500 MMfd.—(C58)	.30
4907	Capacitor—0.005 Mfd.—(C40, C41)	.38
4868	Capacitor—0.005 Mfd.—(C33)	.20
4624	Capacitor—0.01 Mfd.—(C30)	.54
4937	Capacitor—0.01 Mfd.—(C39)	.25
5215	Coil—Antenna coil—A and C Bands—(L1, L2, L5, L6, C1, C3)	2.32
5245	Coil—Antenna coil—B band—(L3, L4, C2)	1.58
5216	Coil—Detector coil—A and C bands—(L7, L8, L11, L12, C10, C12)	2.34
5246	Coil—Detector coil—B band—(L9, L10, C11)	1.62
5217	Coil—Oscillator coil—A and C bands—(L13, L15, C43, C47)	2.20
5247	Coil—Oscillator coil—B band—(L14, C45)	1.44
11277	Compensating Pack—Comprising one 0.015 Mfd., one 0.035 Mfd. capacitor, one 27,000 ohm and one 8200 ohm resistor—(C25, C28, R12, R13)	.92
11214	Condenser—Three gang variable tuning condenser—(C5, C14, C48)	4.20
11205	Volume Control—(R14)	1.30
11219	Tone Control—High frequency tone control—(R22)	.90
8041	Plate—I. F. or R. F. coil shield locking plate with screw—Package of 2	.12
11220	Resistor—Voltage divider resistor—comprising one 3900 ohm and one 4200 ohm section—(R31, R32)	.84
11221	Resistor—Voltage divider resistor—comprising one 50 ohm, one 28 ohm and one 195 ohm section—(R28, R29, R30)	.48
5112	Resistor—1000 Ohm—Carbon type—¼ Watt—(R2)—Package of 5	1.00
3706	Resistor—1800 Ohm—Carbon type—¼ Watt—(R15)—Package of 5	1.00
5159	Resistor—2200 Ohm—Carbon type—¼ Watt—(R20)—Package of 5	1.00
5175	Resistor—5600 Ohm—Carbon type—½ Watt—(R21)—Package of 5	1.00
2731	Resistor—10,000 Ohm—Carbon type—1 Watt—(R25)—Package of 5	1.10
11305	Resistor—22,000 Ohm—Carbon type—¼ Watt—(R16, R17)—Package of 5	1.00
11300	Resistor—33,000 Ohm—Carbon type—1/10 Watt—(R24)—Package of 5	.75
5033	Resistor—33,000 Ohm—Carbon type—1 Watt—(R23)—Package of 5	1.10
3118	Resistor—100,000 Ohm—Carbon type—¼ Watt—(R1, R3, R5, R6)—Package of 5	1.00
5027	Resistor—150,000 Ohm—Carbon type—¼ Watt—(R19)—Package of 5	1.00
11151	Resistor—2.2 Megohms—Carbon type—¼ Watt—(R9)—Package of 5	1.00
5249	Shield—R. F. coil shield	.20
11273	Shield—Radiotron shield	.25
5250	Shield—I. F. Transformer shield	.22
11222	Socket—Dial lamp socket	.18
4794	Socket—4-contact Radiotron socket	.15
11197	Socket—6-contact Radiotron socket	.14
11198	Socket—7-contact Radiotron socket	.15
5224	Switch—Low frequency tone control switch and power switch—(S11, S13)	1.00
11236	Switch—Range switch (S1, S2, S3, S4, S5, S6, S7, S8, S9, S10)	2.44
5238	Terminal—Antenna terminal assembly	.14
11218	Transformer—Audio driver transformer—(T2)	2.58
11216	Transformer—First intermediate frequency transformer—(L16, L17, C16, C17)	2.15
11217	Transformer—Second intermediate frequency transformer—(L18, L19, C20, C21, C22, R7, R8)	3.10
11213	Transformer—Power transformer—105-125-150-210-250 volts—40-60 cycles	5.10
11212	Transformer—Power transformer—105-125 volts—25-60 cycles	7.18
11315	Capacitor—0.015 Mfd.—(C38)	.20
4836	Capacitor—0.05 Mfd.—(C4, C13, C18, C23)	.30
4885	Capacitor—0.1 Mfd.—(C7, C19, C27, C52)	.28
4841	Capacitor—0.1 Mfd.—(C6)	.22
5170	Capacitor—0.25 Mfd.—(C32)	.25
11203	Capacitor—10 Mfd.—(C53)	1.18
5212	Capacitor—18 Mfd.—(C54)	1.16
11215	Capacitor Pack—Comprising one 16 Mfd., two 10 Mfd., and two 8 Mfd capacitors—(C29, C35, C36, C55, C56)	3.85
11201	Clamp—Cable clamp—located near variable tuning condenser—Package of 5	.20
11272	Clamp—Cable clamp—located above antenna terminal	.10
4693	Clamp—Electrolytic capacitor clamp—for stock #11215	.15
11211	Transformer—Power transformer—105-125 volts—50-60 cycles	4.88
	DRIVE ASSEMBLIES	
4362	Arm—Band indicator operating arm	$0.28
10194	Ball—Steel ball—Package of 20	.25
4422	Clutch—Tuning condenser drive clutch assembly—comprising drive shaft, balls, ring, spring and washers assembled	1.00
11375	Dial—Station selector dial scale	.68
11227	Drive—Variable tuning condenser drive complete—less dial scale	2.08
11228	Gear—Vernier pointer drive gear	.42
4827	Gear—Spring gear assembly	1.25
11303	Indicator	.22
11226	Indicator—Band indicator pointer assembly—comprising indicator, arm, link and stud	.20
4475	Indicator—Station selector indicator	.18
4340	Lamp—Dial lamp—Package of 5	.60
3993	Screw—No. 6-32-5/32" set screw—for band indicator operating arm—Package of 10	.25
4669	Screw—No. 8-32-5/32" Square head set screw—for tuning condenser shaft—Package of 10	.25
4377	Spring—Band indicator operating arm spring—Package of 5	.25
4378	Stud—Band indicator operating arm stud assembly—Package of 5	.25
	MISCELLANEOUS ASSEMBLIES	
11337	Escutcheon—Station selector escutcheon	.70
6614	Glass—Station selector dial glass	.30
11346	Knob—Station selector knob—Package of 5	.75
11347	Knob—Volume control, range switch, tone control or power switch knob—Package of 5	.75
4678	Ring—Spring retaining ring for station selector dial glass—Package of 5	.34
11210	Screw—Chassis mounting screw assembly—Package of 4	.28
11348	Screw—No. 8-32-7/16" Headless, cupped point, set screw for knob, Stock #11346—Package of 10	.32
11349	Spring—Retaining spring for knob, stock #11347—Package of 5	.15
	REPRODUCER ASSEMBLIES	
11232	Board—Terminal board with two lead wire clips	.18
11231	Bolt—Yoke and core assembly bolt and nut	.16
8060	Bracket—Mounting bracket for output transformer and connector	.14
11304	Cable—Reproducer cable—complete with female connector	.80
11234	Coil—Field Coil—(L22)	2.15
11233	Coil—Neutralizing coil	.30
11235	Cone—Reproducer cone (L21)—Package of 5	3.50
5040	Connector—4-prong female connector socket for reproducer cable	.25
5039	Connector—4-prong male connector plug for reproducer	.25
11257	Clamp—Cone center suspension clamping nut and screw assembly—Package of 5	.25
9617	Reproducer—Complete	6.60
11229	Transformer—Output transformer—(T3)	1.66
11230	Washer—Binders board "C" washer—used to hold field coil securely—Package of 5	.18

SERVICE DATA

The various diagrams of this booklet contain such information as will be needed to isolate causes for defective operation when 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 R-3, L-2, C-1, etc., are provided for reference between the illustrations and the Replacement Parts List. The coils, reactors, and transformer windings are rated in terms of their d-c resistances only and where the resistance is less than one ohm, no rating is given.

Alignment Procedure

Ten alignment trimmers are provided in the r-f, first detector and oscillator tuning system and four are used in the i-f system. All of these are accurately adjusted during manufacture and should remain in proper alignment unless affected by abnormal conditions of climate or have been altered by other means. Loss of sensitivity, improper tone quality and poor selectivity are the usual indications of improper alignment.

Correct performance of the receiver can only be obtained when the trimmer adjustments have been made by a skilled service man with the use of adequate and reliable test equipment. Such apparatus as may be required for alignment of this particular instrument is illustrated and described on a separate page of this booklet.

Two methods of alignment are applicable. One utilizes a Cathode-Ray Oscillograph as a means of output indication and the other follows former procedure where a glow type indicator or meter is used. The oscillographic method is much to be preferred, since greater accuracy is possible from the type of indication afforded. There are no approximations necessary as with the meter or aural method, but each adjustment can be made with definite precision. Both methods are hereinafter outlined so that alignment operations may be made according to the equipment available.

It is wise to determine the necessity for alignment as well as the direction of misalignment before making adjustments. The RCA Tuning Wand is an instrument designed particularly for such a purpose.

CATHODE-RAY ALIGNMENT

Equipment

A standard source of alignment frequencies is required. Such a source should consist of an RCA Full Range Oscillator, Stock No. 9595. Output indication should be by means of an RCA Stock No. 9545 Cathode-Ray Oscillograph. An RCA Stock No. 9558 Frequency Modulator will be needed to sweep the generated signal and synchronize it with the Oscillograph in order to obtain visual representation of the resonant characteristic of the circuit being tuned on the cathode-ray fluorescent screen.

I-F Trimmer Adjustments

The four trimmers of the two i-f transformers are located as shown by Figure 6. Each must be aligned to a basic frequency of **460 kc.** The last transformer must be aligned firstly and the first transformer aligned secondly. For such a process, it is necessary to feed the output of the Full Range Oscillator to the stages in their order of alignment, adjusting the trimmers of each transformer and observing the effect at the second detector output on the Cathode-Ray Oscillograph. The proper point of connection of the Oscillograph is with its vertical "high" input terminal attached to the juncture of R-7 and R-8, as illustrated in Figure 6, and with the "0" or ground terminal to the chassis. The "Ext. Sync." terminals of the Oscillograph should be connected to the Frequency Modulator as shown by Figure 5. A .001 mfd. capacitor installed in series with the Oscillator "Ant." lead will prevent the voltages of the stage under alignment from becoming upset. The vertical "A" amplifier should be "On" for the ensuing adjustments and its gain control kept at maximum. For each adjustment, the Oscillator output must be regulated so that the image obtained on the Oscillograph screen will be of the minimum size convenient for accurate observation. Proceed further as follows:—

(a) Place the receiver, Oscillograph and test Oscillator in operation. Set the receiver range switch to Band "A" and tune the station selector to a point where no interference will be encountered from signal pickup or from the RCA-6J7 oscillator, removing the tube if necessary. Set the Oscillograph horizontal "B" amplifier to "Timing" and control its gain so that the luminescent spot sweeps a straight line trace completely across the screen. Place the timing control to "Int." Adjust the intensity and focusing controls of the Oscillograph to produce the correct size and strength of spot.

(b) Attach the output of the test Oscillator between the control grid cap of the RCA-6K7 i-f tube and chassis ground as shown typically by Figure 5. Tune the Oscillator to **460 kc.** and set its modulation switch to "On." Regulate its output until the signal produces a wave pattern on the Oscillograph screen, adjusting the Oscillograph controls to give a shape which is convenient for peak indications. Cause the image to stand still on the screen by manipulation of the frequency and synchronizing controls. Then carefully tune the two trimmers C-20 and C-21 of the second i-f transformer to produce maximum amplitude (vertical deflection) of the oscillographic image. Under this condition the transformer will be sharply resonated to 460 kc.

(c) The Frequency Modulator should then be placed in operation and interconnected with the Full Range Oscillator by means of the special shielded patch cord. Figure 5 shows the proper arrangement. Set the Frequency Modulator sweep range switch to its "Lo" position and turn the Oscillator modulation switch to "Off." Change the timing control of the Oscillograph to "Ext." and place the range switch to its No. 2 position. Then carefully shift the tuning of the Oscillator so as to increase its frequency, until two distinct and similar waves appear on the Oscillograph screen and become exactly coincident at their highest points. This condition will be found to occur at an Oscillator setting of *approximately* 540 kc. The curves will be identical in shape but appearing in reversed positions. Adjust the frequency control of the Oscillograph in order to cause the waves to conform with the above requirement and to make them remain motionless on the screen. This will require a setting of approximately ½ clockwise rotation of the frequency control. The trimmers C-20 and C-21 should then be re-adjusted so that the two curves move together and become exactly coincident throughout their lengths, maintaining the maximum amplitude at which this condition can be brought about.

(d) Leaving the equipment connected and adjusted as in (c), change the Oscillator output to the control grid cap of the RCA-6L7 first detector tube. Then adjust the first i-f transformer trimmers C-16 and C-17 so that the forward and reverse waves appearing on the Oscillograph coincide throughout their lengths and have maximum amplitude. The shape of the composite wave obtained from this operation is a true representation of the overall tuning characteristic of the i-f system.

R-F Trimmer Adjustments

Locations of the various antenna, detector and oscillator coil trimmers are shown by Figure 6. The test Oscillator should be removed from connection with the i-f system and its output connected to the antenna-ground terminals of the receiver. No changes are to be made in the connections of the Oscillograph at the second detector. During the following adjustments, the Oscillator output should be regulated as often as is necessary to keep the oscillographic image as low as is practically observable. Adherence to this procedure will obviate the broadness of tuning that would result from a.v.c. action on a stronger signal. Proceed with the adjustments as follows:—

Calibration

Set the receiver range switch to Band A and rotate the station selector until the tuning condenser plates are in full mesh (maximum capacitance). Then move the main dial pointer until it points exactly to the horizontal line at the low frequency end of the Band A scale. Correct the setting of the vernier second hand pointer to read zero.

Band A

(a) With the receiver range switch in its Band A position, tune the station selector until the dial pointer is at a reading of **1720 kc.** Adjust the test Oscillator to **1720 kc.** (modulation "On" and Frequency Modulator disconnected) and increase its output to produce a registration on the Oscillograph. Carefully align the oscillator, detector and antenna trimmers, C-47, C-12 and C-3 respectively, so that each brings about maximum amplitude of output as shown by the wave on the Oscillograph. It will be necessary to have the timing control of the Oscillograph on "Int." for this operation. After each trimmer has been peaked, the Oscillograph timing control should be set to "Ext." and the Frequency Modulator placed into operation with its connections to the Oscillator and Oscillograph made in accordance with Figure 5. Turn the modulation switch of the Oscillator to "Off" and retune the Oscillator (increase frequency) until the forward and reverse waves show on the Oscillograph and become coincident at their highest points. Adjust the trimmers C-47, C-12 and C-3 again, setting each to the point which produces the best coincidence and maximum amplitude of the wave images.

(b) Remove the Frequency Modulator cable from the Oscillator and shift the signal frequency to **600 kc.** Place the modulation switch to "On". Tune the receiver to pick up this signal, disregarding the dial reading at which it is best received. Then insert the Frequency Modulator plug and retune the Oscillator (modulation "Off") until the two similar forward and reverse waves appear on the screen. For this adjustment, it is advisable to shift the Oscillator to its 200-400 kc. range using the third harmonic of the generated signal in order to obtain the desired range of sweep. The oscillator series trimmer, C-46, should then be adjusted to produce maximum amplitude of the images. No rocking will be necessary on the station selector inasmuch as the signal frequency is being "wobbled" by the Frequency Modulator to produce the same effect. After completing this adjustment, the trimmer C-47 should be re-aligned as in (a) to correct for any change brought about by the adjustment of C-46.

Band B

(a) Advance the receiver range switch to its Band B position and tune the station selector to a dial reading of **6132 kc.** Set the test Oscillator to this same frequency (modulation "On" and Frequency Modulator disconnected) and increase its output until a suitable indication is apparent on the Oscillograph. The Oscillograph should be adjusted for "Int." timing. Then adjust the oscillator trimmer, C-45, to the point at which maximum amplitude of the image is obtained. Two positions will be found for this trimmer which gives such a maximum. The one of least capacitance is correct and should be used. This can be checked by tuning the "image" signal, which will be received at **5212 kc.** on the dial if the adjustment of C-45 has been properly made. An increase in test Oscillator output may be necessary for this test. *Its frequency should not be changed from* **6132 kc.** *nor any trimmer adjustments made on the receiver.*

(b) Return the station selector to the **6132 kc.** reading and align the detector, and antenna coil trimmers, C-11 and C-2 respectively, for maximum (peak) output as shown by the Oscillograph. No further adjustments are to be made on this band.

Band C

(a) Turn the range switch of the receiver to its Band C position and tune the station selector until the dial pointer reads **18,000 kc.** Set the test Oscillator to the same frequency (modulation "On" and Frequency Modulator (disconnected) and regulate its output to the level required for convenient observation. Adjust the trimmer C-43 to the point producing maximum output as indicated on the Oscillograph. Check for the presence of the proper "image" signal by tuning the receiver to **17,080 kc.** The **18,000 kc.** signal of the Oscillator will be received at this point if the adjustment of C-43 has been properly made by using the position of least capacitance which gives maximum receiver output. It may be necessary to increase the output of the Oscillator in order to get an indication of the "image". *No adjustments should be made during this check.*

(b) Return the receiver tuning to **18,000 kc.**, realign C-43 if necessary, and then adjust the detector and antenna trimmers, C-10 and C-1, for maximum signal output as evidenced by the oscillographic image. No further adjustments are to be made on this band.

ALIGNMENT WITH OUTPUT METER

To align the receiver by means of an output indicator other than a Cathode-Ray Oscillograph will require the use of a standard test Oscillator, such as that recommended above, for the source of signals and means of indication for the output. The RCA Neon Output Indicator, Stock No. 4317, will be found very satisfactory for such use. It should be connected across the voice coil circuit of the loudspeaker or across the output transformer primary.

I-F Alignment

Connect the test Oscillator to the control grid cap of the i-f tube. Advance the volume control of the receiver to its full-on position. Tune the test Oscillator accurately to **460 kc.** and align the trimmers C-20 and C-21 to give maximum receiver output. Regulate the Oscillator output during this adjustment so that the output indication is as small as can be conveniently observed. After completing the adjustments of these trimmers, re-connect the Oscillator so that it will feed into the control grid circuit of the RCA-6L7 first detector. Then tune the first i-f transformer trimmers C-16 and C-17 for maximum receiver output.

R-F Alignment

After completing the i-f adjustments, it is advisable to correct the line-up of the circuits ahead of the first detector. The test Oscillator should be connected to the antenna-ground terminals of the receiver and the manual volume control turned to its maximum position. For each adjustment, the Oscillator output should be maintained as low as possible in order to avoid broadness of tuning which would result from a.v.c. action on a stronger signal.

Band A—This band should be aligned by supplying a **1720 kc.** signal to the receiver, tuning the station selector to a dial reading of 1720 and adjusting the trimmers C-47, C-12 and C-3 to produce maximum receiver output. The Oscillator should then be shifted to **600 kc.** and the receiver tuned to resonate this signal, disregarding the reading at which it is best received. Trimmer C-46 must then be adjusted, simultaneously while rocking the station selector backward and forward through the signal until the maximum output results from the combined operations. C-47 should be rechecked to assure that its adjustment has not changed because of the trimming of C-46.

Band B—This band must be aligned at **6132 kc.** by tuning the test Oscillator to such a frequency and turning the station selector to the **6132 kc.** dial reading. Then tune the trimmer C-45 to produce maximum receiver output, using the setting of least capacitance which causes same. The presence of the proper "image" may be checked by tuning the receiver to **5212 kc.** at which point the **6132 kc.** signal will be heard if the trimmer C-45 has been properly set to the position of least capacitance for maximum (peak) output. It may be necessary to increase the Oscillator output for this check. *No adjustments are to be made.* Return the station selector to the **6132 kc.** dial marking and trim capacitors C-11 and C-2 for maximum receiver output. No other adjustments are necessary on Band B.

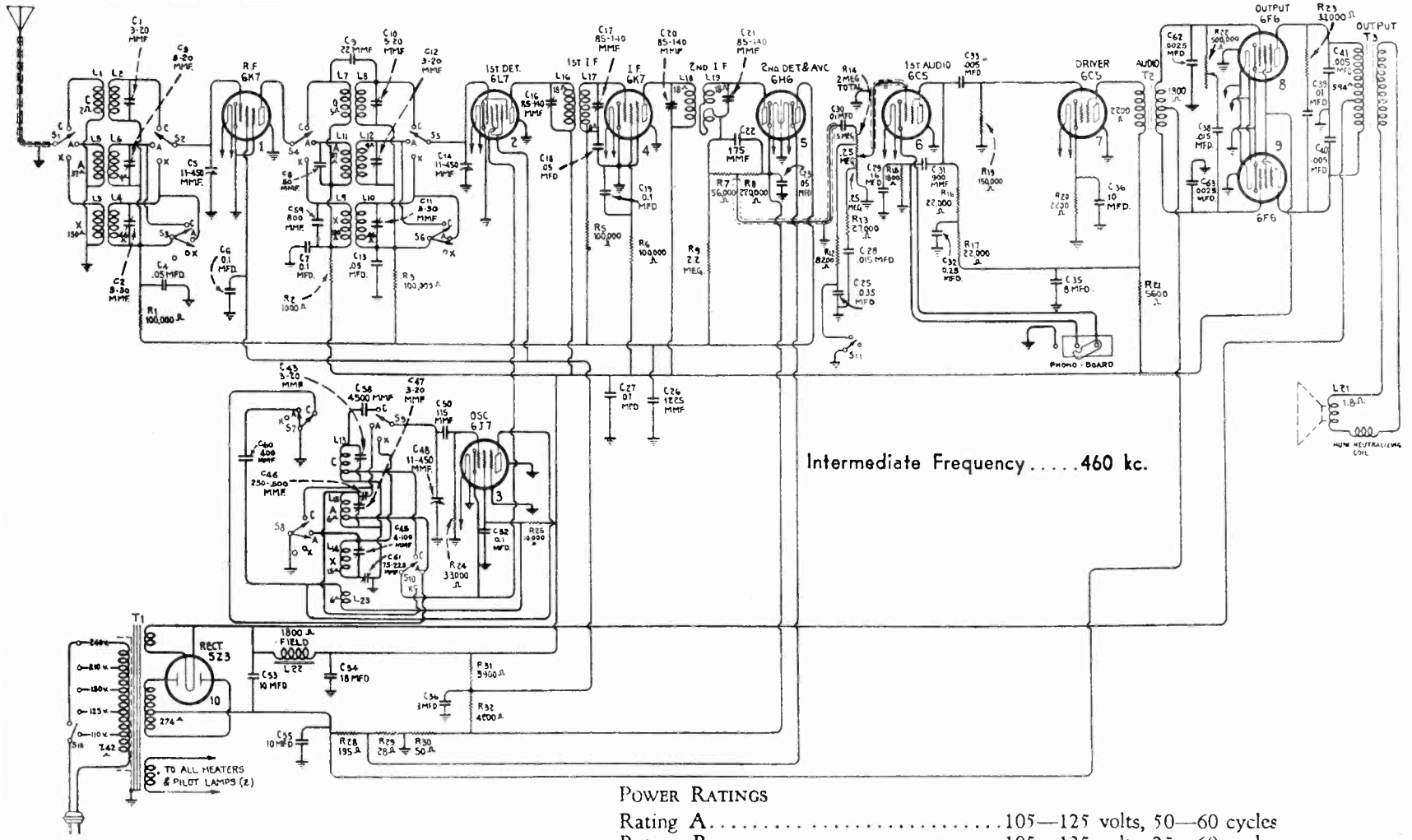
Band C—Change the receiver so that it is operative and the dial reads **18,000 kc.** on the "C" Band. Tune the test Oscillator to this same frequency. Then adjust the oscillator trimmer C-43 to produce maximum (peak) output. Two positions of this trimmer will be found which conform with this requirement. The one of least capacitance is correct. Check for the presence of "image" response at **17,080 kc.** by shifting the receiver tuning. If it is received at such a point, the trimmer C-43 has been correctly adjusted to the right peak. *No adjustments are to be made during this check.* Tune the receiver back to the **18,000 kc.** dial marking, readjust C-43 if necessary, and then tune the detector and antenna capacitors C-10 and C-1 for maximum receiver output. No further adjustments are necessary.

Radiotron Socket Voltages

The voltage values indicated from the Radiotron socket contacts to chassis on Figure 6 will serve to assist in the location of causes for faulty operation. Each value as specified should hold within ± 20% when the receiver is normally operative at its rated supply voltage. Variations in excess of this limit will usually be indicative of trouble in the basic circuits. The voltages given are actual operating values and do not allow for inaccuracies which may be caused by the loading effect of a voltmeter's internal resistance. This resistance should be duly considered for all readings. The amount of circuit resistance shunting the meter during measurement will determine the accuracy to be obtained, the error increasing as the meter resistance becomes comparable to or less than the circuit resistance. For the majority of readings, a meter having an internal resistance of 1000 ohms per volt will be satisfactory when the range used for each reading is chosen as high as possible consistent with good readability.

Universal Transformer

The transformer used on some models of this receiver is adaptable to several ranges of voltage as given under Rating C of Electrical Specifications. Its schematic and wiring are shown by Figure 7. Terminals are provided at the top of the transformer case for changing the primary connections to suit the voltage being used. Note that a 110 volt tap is brought out separately for supplying a phonograph motor.



Frequency Ranges

Band X	140 kc.— 410 kc.
Band A	540 kc.— 1800 kc.
Band C	5700 kc.—18000 kc.

Alignment Frequencies

Band X	150 kc. (osc.), 400 kc. (osc., ant., det.)
Band A	600 kc. (osc.), 1720 kc. (osc., ant., det.)
Band C	18000 kc. (osc., ant., det.)

Power Ratings

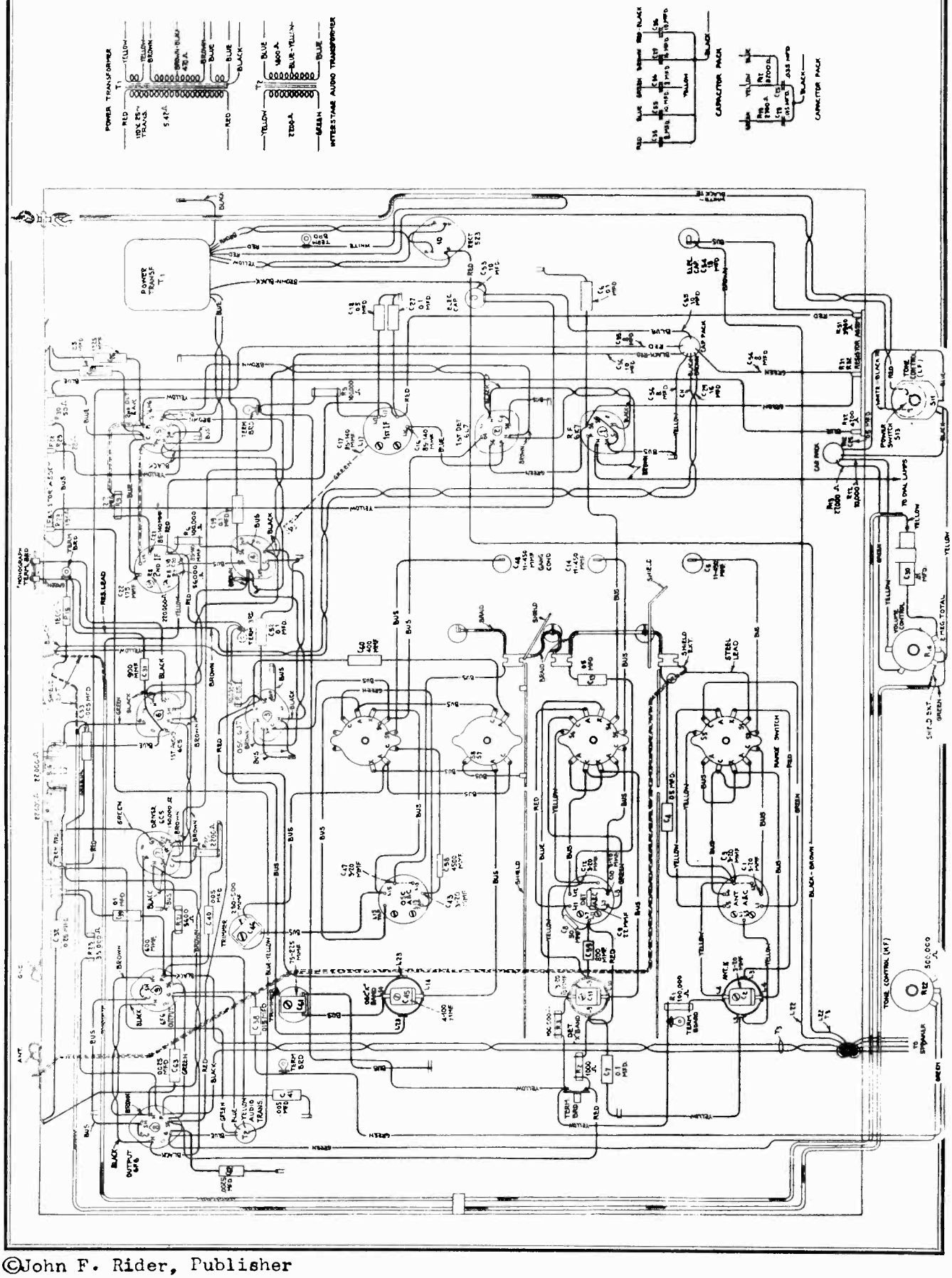
Rating A	105—125 volts, 50—60 cycles
Rating B	105—125 volts, 25—60 cycles
Rating C	100—130/140—160/195—250 volts, 40—60 cycles
Power Consumption	135 watts

Miscellaneous

Undistorted Output	8.5 watts
Maximum Output	11.5 watts
Loudspeaker	Electrodynamic—8 inch
Voice Coil Impedance	2.25 ohms at 400 cycles

MODEL T10-3
Chassis Wiring

RCA MFG. CO., INC.



RCA MFG. CO., INC.

MODEL T10-3
Socket, Trimmers
Speaker Data, Voltage

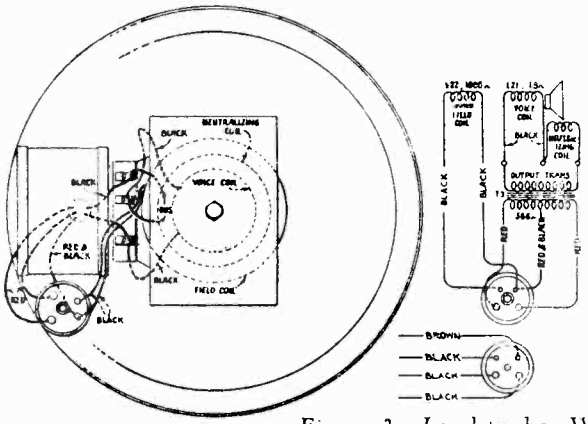


Figure 3—Loudspeaker Wiring

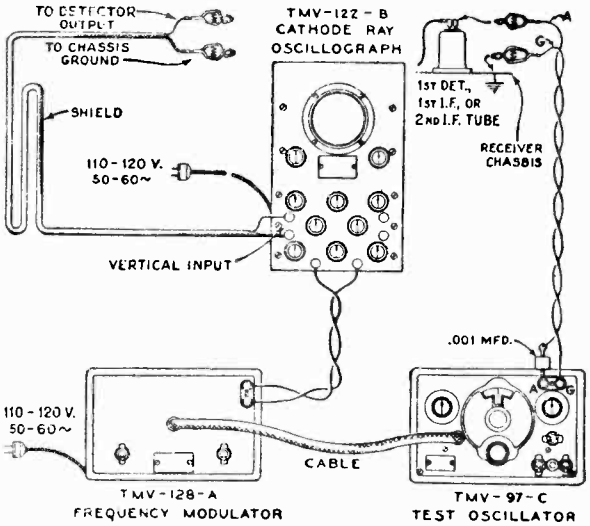


Figure 5—Alignment Apparatus Connections

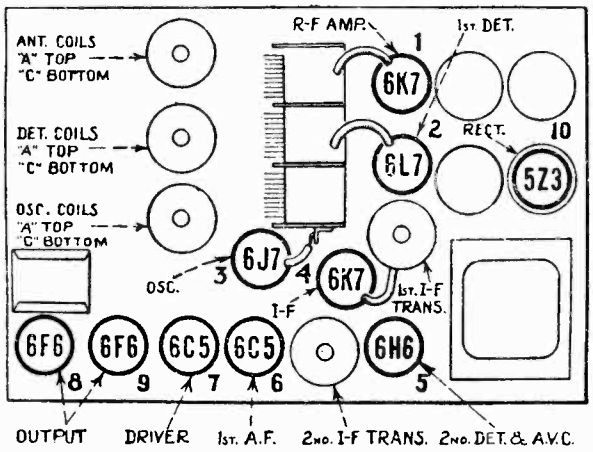


Figure 4—Coil and Radiotron Locations

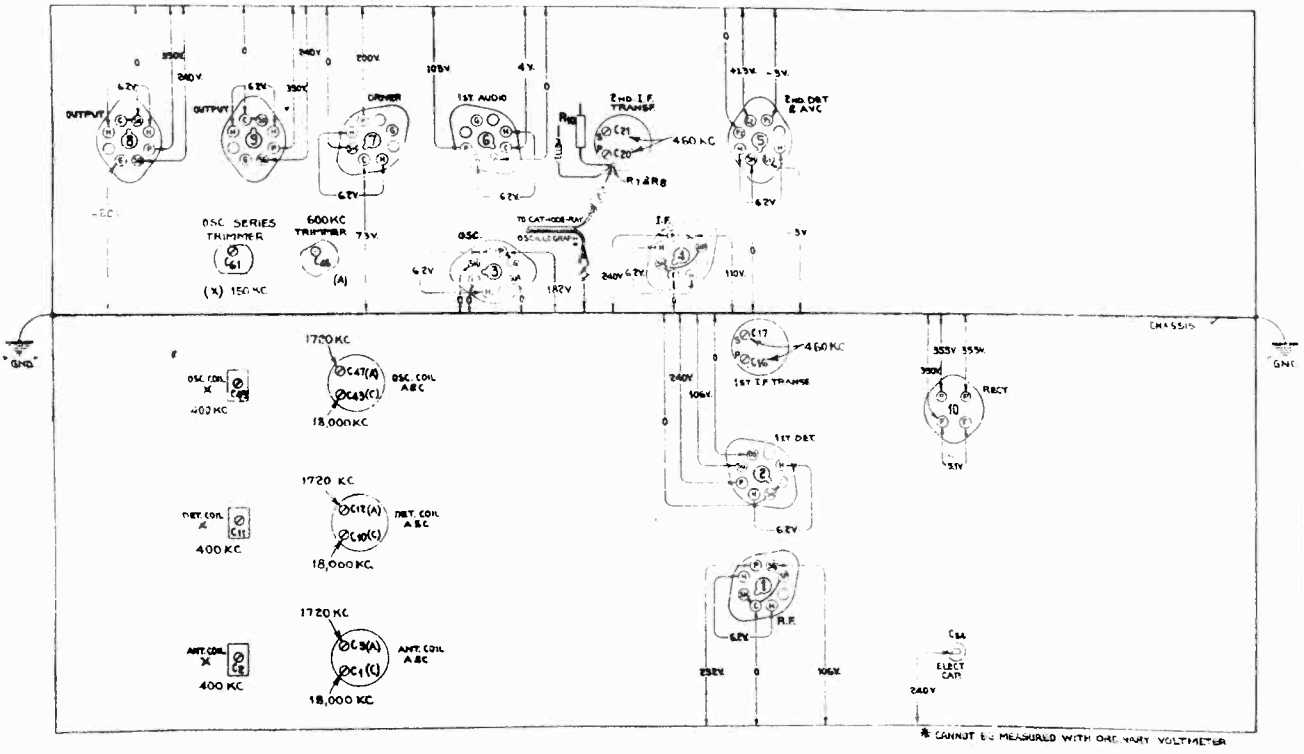


Figure 6—Trimmer Locations and Radiotron Socket Voltages
Measured at 115 Volts A.C.—No Signal—Volume Control Maximum

CIRCUIT ARRANGEMENT

The Superheterodyne principle of operation forms the basis of the circuit design. A single, tuned r-f stage is used ahead of the first detector. The functions of oscillator and detector are performed by two separate tubes. One i-f stage is employed and designed to operate at 460 kc. The combined second detector and a.v.c. stage uses an RCA-6H6 double diode. The audio system consists of two single amplifier stages working in cascade with a push-pull power output stage. The loudspeaker is an electrodynamic type, receiving its field supply from the rectifier and filter system and simultaneously acting as a filter reactor. Full wave rectification is performed in the RCA-5Z3 tube. The outstanding features of electrical design are concerned with the following:—

Tuned Circuits

A total of seven circuits are tuned to provide gain and selectivity to the incoming signal. The variable gang condenser resonates the antenna transformer secondary, the detector transformer secondary and the oscillator coil. Alignment trimmers are included for each of these same circuits. Additional trimmers are used on the i-f transformers, tuning both the secondaries and primaries to 460 kc. There are separate groups of antenna, detector and oscillator coils for each of the tuning ranges. They are placed into operation by means of a rugged rotary switch.

First Detector

This stage has unusually good high frequency mixing efficiency. The tube used, an RCA-6L7, is a new hexode type. The signal is supplied to the first control grid and the oscillator is fed in on a second control grid, a screen grid separating the two. The arrangement of the grids prevents degenerative difficulties, particularly at the higher frequencies. The second grid is direct-connected to the cathode of the oscillator tube and has no d-c bias.

Oscillator

The oscillator circuit is worthy of careful study inasmuch as it is different from the type ordinarily employed. It has self-stabilizing properties which are very advantageous for short wave operation. The generated frequency remains substantially constant when the circuit is affected by variation of line voltage and other similar influences. Output also remains uniform over the individual tuning ranges. The switching of the tuning coils is arranged so as to short those not in use in order to prevent absorption or any reactive effects in the particular band being tuned.

Detector and A.V.C.

The modulated signal as obtained from the output of the i-f system is detected by an RCA-6H6 double diode tube. The audio frequency secured by this process is passed on to the a-f system for amplification and final reproduction. The d-c voltage which results from detection of the signal, is used for automatic volume control. This voltage, which develops across resistors R-7 and R-8, is applied as automatic control grid bias to the r-f, first detector and i-f tubes through suitable resistance-capacitance filter circuits. The second diode of the RCA-6H6 is used to supply residual bias for these controlled tubes under conditions of little or no signal. This diode, under such conditions, draws current, which flows through resistors R-7, R-8 and R-9, thereby maintaining the desired minimum operating bias on such tubes. On application of signal energy above a certain level, however, the auxiliary bias diode ceases to draw current and the a.v.c. diode takes over the biasing function. The cathode and anode of the signal-a.v.c. diode have positive potential in respect to chassis-ground and cathodes of the a.v.c. controlled tubes when no signal is being received.

Audio System

Manual volume control of the detected signal is effected by an acoustically tapered potentiometer in the grid circuit of the first a-f stage. This control has tone compensating filters connected to two points thereon. These filters effect the correct aural balance at different volume settings. A music-speech switch (low frequency tone control) is associated with one of the compensation filters. The purpose of this control is to make speech reproduction more intelligible and to reduce hum obtained from stray modulation on a carrier. The driver stage of the audio system uses an RCA-6C5 which is resistance coupled to the first a-f tube and transformer coupled into the push-pull power output stage. High-frequency tone control is obtained by use of a condenser and variable resistor in series across the grids of the output tubes. The field coil serves as a reactor in the high voltage filter circuit.

Rectifier

The a-c voltage supplied by the power line is stepped up by the transformer T-1 and applied to the 5Z3 full wave rectifier for production of high voltage d.c. to be used for plate and bias supply. Simultaneously, a step down takes place in the same transformer to provide the low voltage necessary for heaters. The current obtained from the rectifier is thoroughly filtered by large capacitors and the field coil reactance.

SERVICE DATA

Alignment Procedure

Ten alignment trimmers are provided in the r-f, first detector and oscillator tuning system and four are used in the i-f system. All of these are accurately adjusted during manufacture and should remain in proper alignment unless affected by abnormal conditions of climate or have been altered by other means. Loss of sensitivity, improper tone quality and poor selectivity are the usual indications of improper alignment.

Correct performance of the receiver can only be obtained when the trimmer adjustments have been made by a skilled service man with the use of adequate and reliable test equipment. Such apparatus as may be required for alignment of this particular instrument is illustrated and described on a separate page of this booklet.

Two methods of alignment are applicable. One utilizes a Cathode-Ray Oscillograph as a means of output indication and the other follows former procedure where a glow type indicator or meter is used. The oscillographic method is much to be preferred, since greater accuracy is possible from the type of indication afforded. There are no approximations necessary as with the meter or aural method, but each adjustment can be made with definite precision. Both methods are hereinafter outlined so that alignment operations may be made according to the equipment available.

It is wise to determine the necessity for alignment as well as the direction of misalignment before making adjustments. The RCA Tuning Wand is an instrument designed particularly for such a purpose.

The Tuning Wand consists of a bakelite rod having a small brass cylinder at one end and a core of finely divided iron at the other. It may be inserted into a tuned coil while a signal of the normal resonant frequency is being supplied to such coil to obtain an indication of the tuning. Holes are provided at the top of the r-f shield cans for entrance of the Wand. The presence of either end of the Wand will cause a change in tuning which will be indicated at the receiver output as an increase or decrease in signal level. If there is a decrease of output when either end is inserted, the tuning is correct and will require no adjustment. However should there be an increase of output due to the iron core and decrease with the brass cylinder, an increase in inductance or capacitance is indicated as necessary to bring the circuit into line. The trimmer involved should therefore be increased accordingly. If the brass cylinder end causes an increase in output while the iron end causes a decrease, reduction of inductance will be necessary to place the circuit in alignment. This is equivalent to decreasing the trimmer concerned. The following tabulation gives the various changes and the adjustments required —

WAND	SIGNAL	TRIMMER
Brass	Decrease	None
Iron	Decrease	
Brass	Increase	Decrease
Iron	Decrease	
Brass	Decrease	Increase
Iron	Increase	

CATHODE-RAY ALIGNMENT

Equipment

A standard source of alignment frequencies is required. Such a source should consist of an RCA Full Range Oscillator, Stock No. 9595. Output indication should be by means of an RCA Stock No. 9545 Cathode-Ray Oscillograph. An RCA Stock No. 9558 Frequency Modulator will be needed to sweep the generated signal and synchronize it with the Oscillograph in order to obtain visual representation of the resonant characteristic of the circuit being tuned on the cathode-ray fluorescent screen.

I-F Trimmer Adjustments

The four trimmers of the two i-f transformers are located as shown by Figure 6. Each must be aligned to a basic frequency of 460 kc. The last transformer must be aligned firstly and the first transformer aligned secondly. For such a process, it is necessary to feed the output of the Full Range Oscillator to the stages in their order of alignment, adjusting the trimmers of each transformer and observing the effect at the second detector output on the Cathode-Ray Oscillograph. The proper point of connection of the Oscillograph is with its vertical "high" input terminal attached to the juncture of R-7 and R-8, as illustrated in Figure 6, and with the "0" or ground terminal to the chassis. The "Ext. Sync." terminals of the Oscillograph should be connected to the Frequency Modulator as shown by Figure 5. A .001 mfd. capacitor installed in series with the Oscillator "Ant." lead will prevent the voltages of the stage under alignment from becoming upset. The vertical "A" amplifier should be "On" for the ensuing adjustments and its gain control kept at maximum. For each adjustment, the Oscillator output must be regulated so that the image obtained on the Oscillograph screen will be of the minimum size convenient for accurate observation. Proceed further as follows:—

(a) Place the receiver, Oscillograph and test Oscillator in operation. Set the receiver range switch to Band "A" and tune the station selector to a point where no interference will be encountered from signal pickup or from the RCA-6J7 oscillator, removing the tube if necessary. Set the Oscillograph horizontal "B" amplifier to "Timing" and control its gain so that the luminescent spot sweeps a straight line trace completely across the screen. Place the timing control to "Int." Adjust the intensity and focusing controls of the Oscillograph to produce the correct size and strength of spot.

(b) Attach the output of the test Oscillator between the control grid cap of the RCA-6K7 i-f tube and chassis ground as shown typically by Figure 5. Tune the Oscillator to 460 kc. and set its modulation switch to "On." Regulate its output until the signal produces a wave pattern on the Oscillograph screen, adjusting the Oscillograph controls to give a shape which is convenient for peak indications. Cause the image to stand still on the screen by manipulation of the frequency and synchronizing controls. Then carefully tune the two trimmers C-20 and C-21 of the second i-f transformer to produce maximum amplitude (vertical deflection) of the oscillographic image. Under this condition the transformer will be sharply resonated to 460 kc.

(c) The Frequency Modulator should then be placed in operation and interconnected with the Full Range Oscillator by means of the special shielded patch cord. Figure 5 shows the proper arrangement. Set the Frequency Modulator sweep range switch to its "Lo" position and turn the Oscillator modulation switch to "Off." Change the timing control of the Oscillograph to "Ext." and place the range switch to its No. 2 position. Then carefully shift the tuning of the Oscillator so as to increase its frequency, until two distinct and similar waves appear on the Oscillograph screen and become exactly coincident at their highest points. This condition will be found to occur at an Oscillator setting of *approximately 540 kc.* The curves will be identical in shape but appearing in reversed positions. Adjust the frequency control of the Oscillograph in order to cause the waves to conform with the above requirement and to make them remain motionless on the screen. This will require a setting of approximately ½ clockwise rotation of the frequency control. The trimmers C-20 and C-21 should then be re-adjusted so that the two curves move together and become exactly coincident throughout their lengths, maintaining the maximum amplitude at which this condition can be brought about.

(d) Leaving the equipment connected and adjusted as in (c), change the Oscillator output to the control grid cap of the RCA-6L7 first detector

tube. Then adjust the first i-f transformer trimmers C-16 and C-17 so that the forward and reverse waves appearing on the Oscillograph coincide throughout their lengths and have maximum amplitude. The shape of the composite wave obtained from this operation is a true representation of the overall tuning characteristic of the i-f system.

R-F Trimmer Adjustments

Locations of the various antenna, detector and oscillator coil trimmers are shown by Figure 6. The test Oscillator should be removed from connection with the i-f system and its output connected to the antenna-ground terminals of the receiver. No changes are to be made in the connections of the Oscillograph at the second detector. During the following adjustments, the Oscillator output should be regulated as often as is necessary to keep the oscillographic image as low as is practically observable. Adherence to this procedure will obviate the broadness of tuning that would result from a.v.c. action on a stronger signal. Proceed with the adjustments as follows:—

Calibration

Set the receiver range switch to Band A and rotate the station selector until the tuning condenser plates are in full mesh (maximum capacitance). Then move the main dial pointer until it points exactly to the horizontal line at the low frequency end of the Band A scale. Correct the setting of the vernier second hand pointer to read zero.

Band A

(a) With the receiver range switch in its Band A position, tune the station selector until the dial pointer is at a reading of **1720 kc.** Adjust the test Oscillator to **1720 kc.** (modulation "On" and Frequency Modulator disconnected) and increase its output to produce a registration on the Oscillograph. Carefully align the oscillator, detector and antenna trimmers, C-47, C-12 and C-3 respectively, so that each brings about maximum amplitude of output as shown by the wave on the Oscillograph. It will be necessary to have the timing control of the Oscillograph on "Int." for this operation. After each trimmer has been peaked, the Oscillograph timing control should be set to "Ext." and the Frequency Modulator placed into operation with its connections to the Oscillator and Oscillograph made in accordance with Figure 5. Turn the modulation switch of the Oscillator to "Off" and retune the Oscillator (increase frequency) until the forward and reverse waves show on the Oscillograph and become coincident at their highest points. Adjust the trimmers C-47, C-12 and C-3 again, setting each to the point which produces the best coincidence and maximum amplitude of the wave images.

(b) Remove the Frequency Modulator cable from the Oscillator and shift the signal frequency to **600 kc.** Place the modulation switch to "On". Tune the receiver to pick up this signal, disregarding the dial reading at which it is best received. Then insert the Frequency Modulator plug and retune the Oscillator (modulation "Off") until the two similar forward and reverse waves appear on the screen. For this adjustment, it is advisable to shift the Oscillator to its 200-400 kc. range using the third harmonic of the generated signal in order to obtain the desired range of sweep. The oscillator series trimmer, C-46, should then be adjusted to produce maximum amplitude of the images. No rocking will be necessary on the station selector inasmuch as the signal frequency is being "wobbled" by the Frequency Modulator to produce the same effect. After completing this adjustment, the trimmer C-47 should be re-aligned as in (a) to correct for any change brought about by the adjustment of C-46.

Band X

(a) Disconnect the Frequency Modulator and tune the test Oscillator (Modulation "On") to **400 kc.** Place the receiver range switch to its Band X position and tune the station selector to 400 kc. Turn Oscillograph timing control to "Int." Then align trimmers C-45, C-11 and C-2 for maximum indication at the Oscillograph. Place the Frequency Modulator in operation and attach it to the test Oscillator. Change the Oscillograph timing to "Ext." Increase Oscillator frequency (Modulation "Off") until the forward and reverse waves appear and become coincident at their highest point, approximately at 462 kc. These images may be made to remain stationary by manipulation of the Oscillograph range switch (No. 2 position) and frequency control (mid-position). Readjust trimmers C-45, C-11 and C-2 to give maximum amplitude and complete coincidence of the waves.

(b) Change the test Oscillator to **150 kc.** (Frequency Modulator disconnected). Tune this signal on the receiver, disregarding the dial reading at which it is best received. Then interconnect the Frequency Modulator and Oscillator. Retune the latter to the point at which the two similar waves appear on the screen. Adjust trimmer C-61 for maximum amplitude of the waves. Rocking of the tuning condenser will not be necessary for this operation as such is duplicated by the Frequency Modulator. Re-align C-45 as in (a) to correct for any error caused by the adjustment of C-61.

Band C

(a) Turn the range switch of the receiver to its Band C position and tune the station selector until the dial pointer reads **18,000 kc.** Set the test Oscillator to the same frequency (modulation "On" and Frequency Modulator disconnected) and regulate its output to the level required for convenient observation. Adjust the trimmer C-43 to the point producing maximum output as indicated on the Oscillograph. Check for the presence of the proper "image" signal by tuning the receiver to **17,080 kc.** The **18,000 kc.** signal of the Oscillator will be received at this point if the adjustment of C-43 has been properly made by using the position of least capacitance which gives maximum receiver output. It may be necessary to increase the output of the Oscillator in order to get an indication of the "image". *No adjustments should be made during this check.*

(b) Return the receiver tuning to **18,000 kc.**, re-align C-43 if necessary, and then adjust the detector and antenna trimmers, C-10 and C-1, for maximum signal output as evidenced by the oscillographic image. No further adjustments are to be made on this band.

ALIGNMENT WITH OUTPUT METER

To align the receiver by means of an output indicator other than a Cathode-Ray Oscillograph will require the use of a standard test Oscillator, such as that recommended above, for the source of signals and

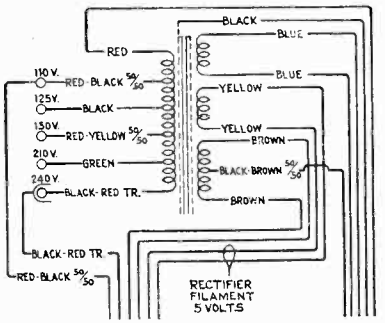


Figure 7—Universal Power Transformer Connections

Pri. Res.—7.42 ohms, total
Sec. Res.—274 ohms, total

means of indication for the output. The RCA Neon Output Indicator, Stock No. 4317, will be found very satisfactory for such use. It should be connected across the voice coil circuit of the loudspeaker or across the output transformer primary.

I-F Alignment

Connect the test Oscillator to the control grid cap of the i-f tube. Advance the volume control of the receiver to its full-on position. Tune the test Oscillator accurately to **460 kc.** and align the trimmers C-20 and C-21 to give maximum receiver output. Regulate the Oscillator output during this adjustment so that the output indication is as small as can be conveniently observed. After completing the adjustments of these trimmers, re-connect the Oscillator so that it will feed into the control grid circuit of the RCA-6L7 first detector. Then tune the first i-f transformer trimmers C-16 and C-17 for maximum receiver output

R-F Alignment

After completing the i-f adjustments, it is advisable to correct the line-up of the circuits ahead of the first detector. The test Oscillator should be connected to the antenna-ground terminals of the receiver and the manual volume control turned to its maximum position. For each adjustment, the Oscillator output should be maintained as low as possible in order to avoid broadness of tuning which would result from a.v.c. action on a stronger signal.

Band A—This band should be aligned by supplying a **1720 kc.** signal to the receiver, tuning the station selector to a dial reading of **1720** and adjusting the trimmers C-47, C-12 and C-3 to produce maximum receiver output. The Oscillator should then be shifted to **600 kc.** and the receiver tuned to resonate this signal, disregarding the reading at which it is best received. Trimmer C-46 must then be adjusted, simultaneously while rocking the station selector backward and forward through the signal until the maximum output results from the combined operations. C-47 should be rechecked to assure that its adjustment has not changed because of the trimming of C-46.

Band X—This band must be aligned at **400 kc.** and **150 kc.** Tune the test Oscillator to **400 kc.** and turn the receiver dial to the same reading. Adjust trimmers C-45, C-11 and C-2 for maximum (peak) receiver output. Then shift the Oscillator to **150 kc.** and tune the receiver to pick up this signal, disregarding the dial reading at which it is best received. Adjust trimmer C-61, simultaneously rocking the tuning condenser backward and forward through the signal, until maximum receiver output results from the combined operations. Repeat the alignment of C-45 as above to correct for any change which may have been caused by the adjustment of C-61.

Band C—Change the receiver so that it is operative and the dial reads **18,000 kc.** on the "C" Band. Tune the test Oscillator to this same frequency. Then adjust the oscillator trimmer C-43 to produce maximum (peak) output. Two positions of this trimmer will be found which conform with this requirement. The one of least capacitance is correct. Check for the presence of "image" response at **17,080 kc.** by shifting the receiver tuning. If it is received at such a point, the trimmer C-43 has been correctly adjusted to the right peak. *No adjustments are to be made during this check.* Tune the receiver back to the **18,000 kc.** dial marking, readjust C-43 if necessary, and then tune the detector and antenna capacitors C-10 and C-1 for maximum receiver output. No further adjustments are necessary.

Universal Transformer

The transformer used on some models of this receiver is adaptable to several ranges of voltage as given under Rating C of Electrical Specifications. Its schematic and wiring are shown by Figure 7. Terminals are provided at the top of the transformer case for changing the primary connections to suit the voltage being used. Note that a 110 volt tap is brought out separately for supplying a phonograph motor.

MODEL T10-3
Parts List

RCA MFG. CO., INC.

	RECEIVER ASSEMBLIES	
4427	Bracket—High or low frequency tone control or volume control mounting bracket.	$0.18
5237	Bushing—Variable condenser mounting bushing assembly—Package of 3	.43
11223	Capacitor—Adjustable capacitor (C46)	.46
5241	Capacitor—Adjustable capacitor (C61)	.40
11292	Capacitor—22 MMfd. (C9)	.24
11289	Capacitor—50 MMfd. (C8)	.26
11291	Capacitor—115 MMfd. (C50)	.24
11290	Capacitor—400 MMfd. (C60)	.25
11269	Capacitor—800 MMfd. (C59)	.30
3784	Capacitor—900 MMfd. (C31)	.30
11316	Capacitor—1225 MMfd. (C26)	.40
11287	Capacitor—4500 MMfd. (C58)	.30
5107	Capacitor—.0025 Mfd. (C62, C63)	.16
4907	Capacitor—0.005 Mfd. (C40, C41)	.38
4868	Capacitor—0.005 Mfd. (C33)	.20
4624	Capacitor—0.01 Mfd. (C30)	.54
4937	Capacitor—0.01 Mfd. (C39)	.25
11315	Capacitor—0.015 Mfd. (C38)	.20
4836	Capacitor—0.05 Mfd. (C4, C13, C18, C23)	.30
11327	Coil—Oscillator coil—X band—(L14, L23, C45)	$1.44
11277	Compensating Pack—Comprising one 0.015 Mfd., one 0.035 Mfd. capacitor, one 27,000 ohm and one 8200 ohm resistor—(C25, C28, R12, R13)	.92
11214	Condenser—Three gang variable tuning condenser—(C5, C14, C48)	4.20
11205	Volume Control—(R14)	1.30
11219	Tone Control—High frequency tone control—(R22)	.90
8041	Plate—I. F. or R. F. coil shield locking plate with screw—Package of 2	.12
11220	Resistor—Voltage divider resistor—comprising one 3900 ohm and one 4200 ohm section—(R31, R32)	.84
11221	Resistor—Voltage divider resistor—comprising one 50 ohm, one 28 ohm and one 195 ohm section—(R28, R29, R30)	.48
5112	Resistor—1000 Ohm—Carbon type—¼ Watt—(R2)—Package of 5	1.00
3706	Resistor—1800 Ohm—Carbon type—¼ Watt—(R15)—Package of 5	1.00
5159	Resistor—2200 Ohm—Carbon type—¼ Watt—(R20)—Package of 5	1.00
5175	Resistor—5600 Ohm—Carbon type—½ Watt—(R21)—Package of 5	1.00
2731	Resistor—10,000 Ohm—Carbon type—1 Watt—(R25)—Package of 5	1.10
11305	Resistor—22,000 Ohm—Carbon type—¼ Watt—(R16, R17)—Package of 5	1.00
11300	Resistor—33,000 Ohm—Carbon type—1/10 Watt—(R24)—Package of 5	.75
5033	Resistor—33,000 Ohm—Carbon type—1 Watt—(R23)—Package of 5	1.10
3118	Resistor—100,000 Ohm—Carbon type—¼ Watt—(R1, R3, R5, R6)—Package of 5	1.00
5027	Resistor—150,000 Ohm—Carbon type—¼ Watt—(R19)—Package of 5	1.00
11151	Resistor—2.2 Megohms—Carbon type—¼ Watt—(R9)—Package of 5	1.00
5249	Shield—R. F. coil shield	.20
11273	Shield—Radiotron shield	.25
5250	Shield—I. F. Transformer shield	.22
11222	Socket—Dial lamp socket	.18
4794	Socket—4-contact Radiotron socket	.15
11197	Socket—6-contact Radiotron socket	.14
11198	Socket—7-contact Radiotron socket	.15
5224	Switch—Low frequency tone control switch and power switch—(S11, S13)	1.00
11236	Switch—Range switch (S1, S2, S3, S4, S5, S6, S7, S8, S9, S10)	2.44
5238	Terminal—Antenna terminal assembly	.14
11218	Transformer—Audio driver transformer—(T2)	2.58
11216	Transformer—First intermediate frequency transformer—(L16, L17, C16, C17)	2.15
11217	Transformer—Second intermediate frequency transformer—(L18, L19, C20, C21, C22, R7, R8)	3.10
11213	Transformer—Power transformer—105-125-150-210-250 volts—40-60 cycles	5.10
11212	Transformer—Power transformer—105-125 volts—25-60 cycles	7.18
	DRIVE ASSEMBLIES	
4362	Arm—Band indicator operating arm	.28
4885	Capacitor—0.1 Mfd. (C7, C19, C27, C52)	$0.28
4841	Capacitor—0.1 Mfd. (C6)	.22
5170	Capacitor—0.25 Mfd. (C32)	.25
11203	Capacitor—10 Mfd. (C53)	1.18
5212	Capacitor—18 Mfd. (C54)	1.16
11215	Capacitor pack—Comprising one 16 Mfd., two 10 Mfd., and two 8 Mfd. capacitors (C29, C35, C36, C55, C56)	3.85
11201	Clamp—Cable clamp—located near variable tuning condenser—Package of 5	.20
11272	Clamp—Cable clamp—located above antenna terminal	.10
4693	Clamp—Electrolytic capacitor clamp—for stock #11215	.15
5215	Coil—Antenna coil—A and C bands (L1, L2, L5, L6, C1, C3)	2.32
11325	Coil—Antenna coil—X band (L3, L4, C2)	1.56
5216	Coil—Detector coil—A and C bands (L7, L8, L11, L12, C10, C12)	2.34
11326	Coil—Detector coil—X band (L9, L10, C11)	1.60
5217	Coil—Oscillator coil—A and C bands (L13, L15, C43, C47)	2.20
10194	Ball—Steel ball—Package of 20	$0.25
4422	Clutch—Tuning condenser drive clutch assembly—comprising drive shaft, balls, ring, spring and washers assembled	1.00
11333	Dial—Station selector dial scale	.60
11227	Drive—Variable tuning condenser drive complete—less dial scale	2.08
11228	Gear—Vernier pointer drive gear	.42
4827	Gear—Spring gear assembly	1.25
11303	Indicator	.22
11226	Indicator—Band indicator pointer assembly—comprising indicator, arm, link and stud	.20
4475	Indicator—Station selector indicator	.18
4340	Lamp—Dial lamp—Package of 5	.60
3993	Screw—No. 6-32-5/32" set screw—for band indicator operating arm—Package of 10	.25
4669	Screw—No. 8-32-5/32" Square head set screw—for tuning condenser shaft—Package of 10	.25
4377	Spring—Band indicator operating arm spring—Package of 5	.25
4378	Stud—Band indicator operating arm stud assembly—Package of 5	.25
	MISCELLANEOUS ASSEMBLIES	
11337	Escutcheon—Station selector escutcheon	.70
6614	Glass—Station selector dial glass	.30
11346	Knob—Station selector knob—Package of 5	.75
11347	Knob—Volume control, range switch, tone control or power switch knob—Package of 5	.75
4678	Ring—Spring retaining ring for station selector dial glass—Package of 5	.34
11210	Screw—Chassis mounting screw assembly—Package of 4	.28
11348	Screw—No. 8-32-7/16" Headless, cupped point, set screw for knob, Stock #11346—Package of 10	.32
11349	Spring—Retaining spring for knob, stock #11347—Package of 5	15
	REPRODUCER ASSEMBLIES	
11232	Board—Terminal board with two lead wire clips	.18
11231	Bolt—Yoke and core assembly bolt and nut	.16
8060	Bracket—Mounting bracket for output transformer and connector	.14
11304	Cable—Reproducer cable—complete with female connector	.80
11234	Coil—Field Coil—(L22)	2.15
11233	Coil—Neutralizing coil	.30
11235	Cone—Reproducer cone (L21)—Package of 5	3.50
5040	Connector—4-prong female connector socket for reproducer cable	.25
5039	Connector—4-prong male connector plug for reproducer	.25
11257	Clamp—Cone center suspension clamping nut and screw assembly—Package of 5	.25
9617	Reproducer—Complete	6.60
11229	Transformer—Output transformer—(T3)	1.66
11230	Washer—Binders board "C" washer—used to hold field coil securely—Package of 5	.18

MODEL C11-1
Schematic

RCA MFG. CO., INC.

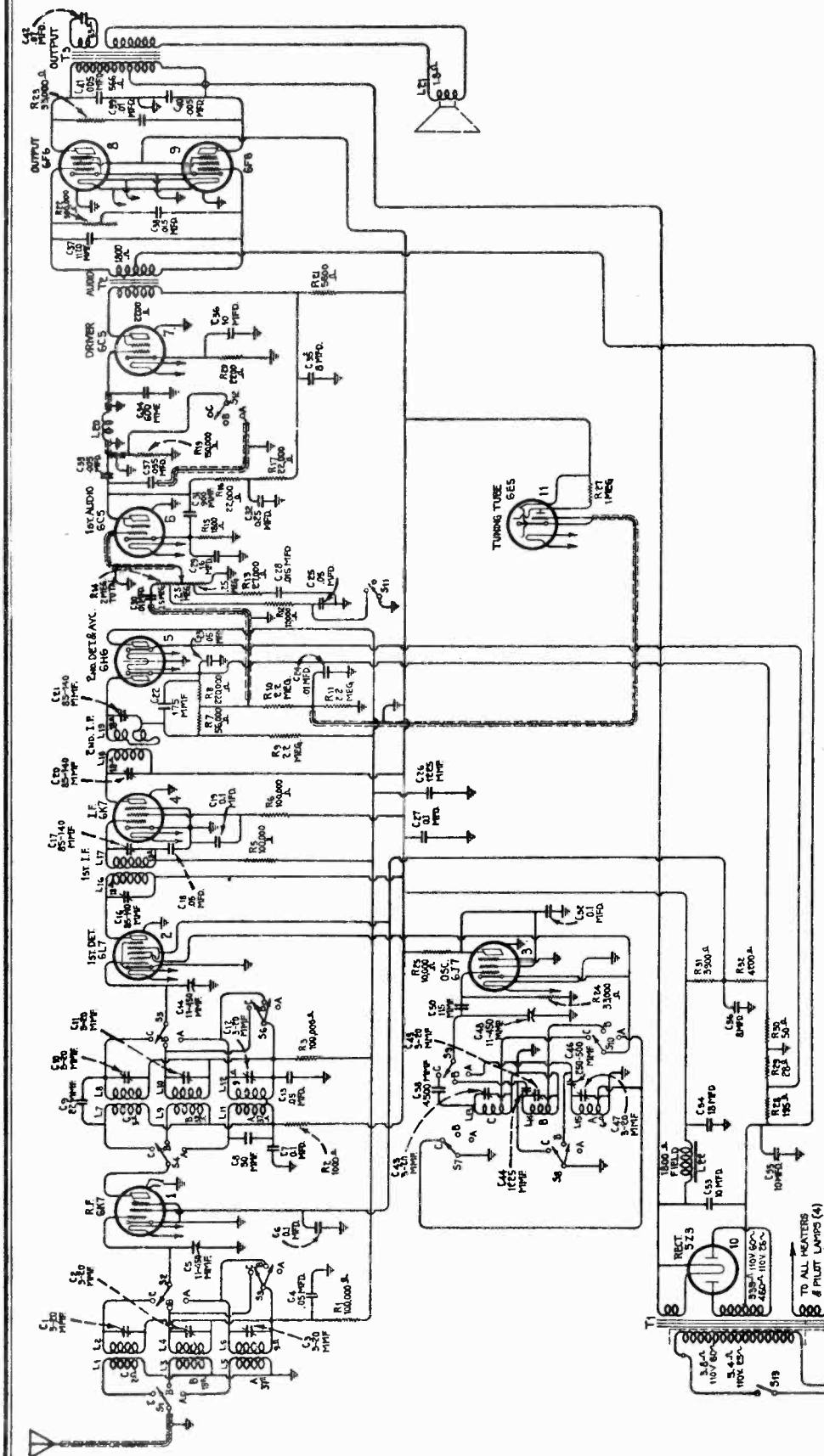


Figure 1—Schematic Circuit Diagram

(On some instruments—C-33 is .035 mfd. and C-37 is removed.)

Power Ratings

Rating A.....105—125 volts, 50—60 cycles
Rating B.....105—125 volts, 25—60 cycles
Rating C.....100—130/140—160/195—250 volts, 40—60 cycles
Power Consumption.....135 watts

Miscellaneous

Undistorted Output.....8.5 watts
Maximum Output.....11.5 watts

Loudspeaker.....Electrodynamic—12 inch
Voice Coil Impedance.....7.5 ohms at 400 cycles

Frequency Ranges

Band A.....540 kc.— 1800 kc.
Band B.....1800 kc.— 6000 kc.
Band C.....6000 kc.—18000 kc.

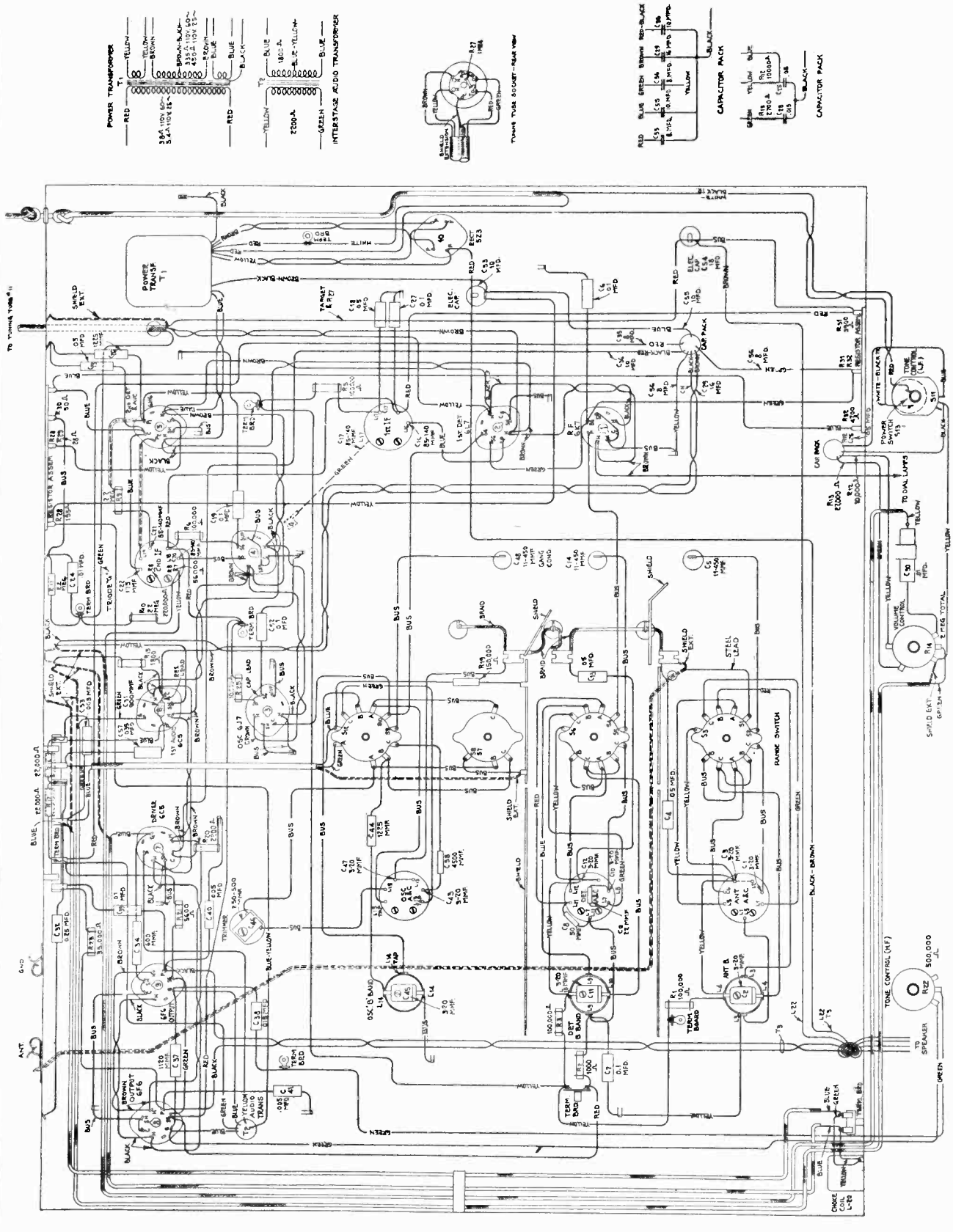
Alignment Frequencies

Band A.....600 kc. (osc.), 1720 kc. (osc., ant., det.)
Band B.....6132 kc. (osc., ant., det.)
Band C.....18000 kc. (osc., ant., det.)

Intermediate Frequency.....460 kc.

MODEL C11-1
Chassis Wiring

RCA MFG. CO., INC.



RCA MFG. CO., INC.

MODEL C11-1
Trimmers, Voltage
Speaker Data
Alignment Connections

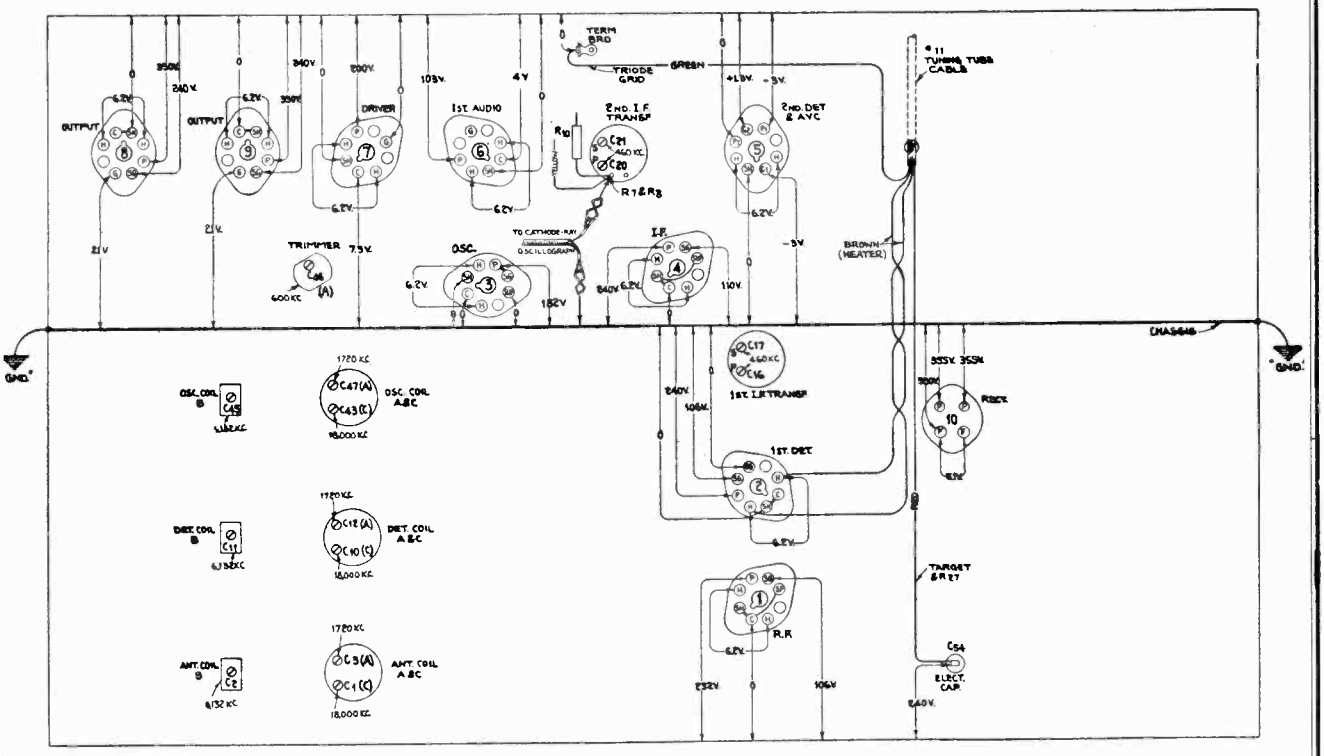


Figure 6—Trimmer Locations and Radiotron Socket Voltages
Measured at 115 Volts A.C.—No Signal—Volume Control Maximum

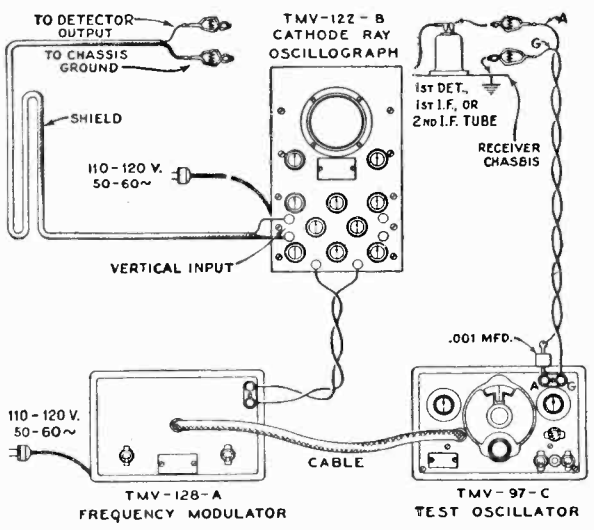


Figure 5—Alignment Apparatus Connections

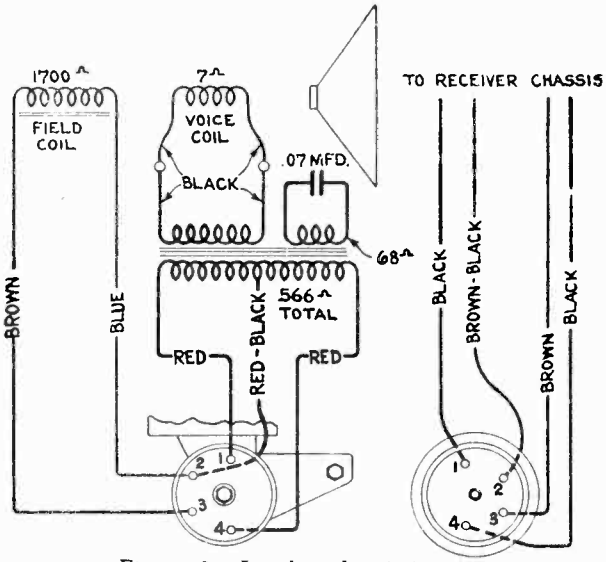


Figure 3—Loudspeaker Wiring

Tuning Condenser

The variable tuning condenser is supported by a new design of shock-proof mount which has been developed by our engineers to prevent chassis vibration from producing audio frequency howl.

Loudspeaker

A super-sensitive 12 inch electrodynamic speaker is employed. It is correctly adapted to the cabinet design to assure the best possible acoustic performance. Electrical connection is made from the speaker to the chassis through a plug and connector attachment, permitting easy removal for servicing.

Dial Drive

The dial drive and station indicator system are of new and unique design. Five individual dial scales, each with full 180 degree band spread, are provided, one for use on each band. The scales are eccentrically arranged on a rotary disc and adapted to operate in connection with the band change switch so that as the switch is shifted to a certain band, the corresponding dial scale rotates into position. For other positions of the band switch, a similar scale selection takes place, there being only one scale visible at a time. The driving mechanism for the dial and condenser has tuning ratios of 10 to 1 and 50 to 1. Control may be interchanged between these two ratios by push-in operation of a positive action clutch which is actuated by the tuning knob. From the clutch and ratio controlling mechanism, the drive system interlinks with the tuning condenser, main dial pointer and vernier dial pointer through means of fibre and brass gears. The ratio of vernier rotation to the main pointer is 20 to 1. An intermediate gear is used in the system to reduce gear back-lash. This gear is suspended in position with two tension springs which maintain the proper mesh at all times. A flexible coupling disc is used between the drive and the condenser shaft.

CIRCUIT ARRANGEMENT

The Superheterodyne principle of operation forms the basis of the circuit design. A single, tuned r-f stage is used ahead of the first detector. The functions of oscillator and detector are performed by two separate tubes. One i-f stage is employed and designed to operate at 460 kc. The combined second detector and a.v.c. stage uses an RCA-6H6 double diode. The audio system consists of two single amplifier stages working in cascade with a push-pull power output stage. The loudspeaker is an electrodynamic type, receiving its field supply from the rectifier and filter system and simultaneously acting as a filter reactor. Full wave rectification is performed in the RCA-5Z3 tube. The outstanding features of electrical design are concerned with the following:—

Tuned Circuits

A total of seven circuits are tuned to provide gain and selectivity to the incoming signal. The variable gang condenser resonates the antenna transformer secondary, the detector transformer secondary and the oscillator coil. Alignment trimmers are included for each of these same circuits. Additional trimmers are used on the i-f transformers, tuning both the secondaries and primaries to 460 kc. There are separate groups of antenna, detector and oscillator coils for each of the tuning ranges. They are placed into operation by means of a rugged rotary switch.

First Detector

This stage has unusually good high frequency mixing efficiency. The tube used, an RCA-6L7, is a new hexode type. The signal is supplied to the first control grid and the oscillator is fed in on a second control grid, a screen grid separating the two. The arrangement of the grids prevents degenerative difficulties, particularly at the higher frequencies. The second grid is direct-connected to the cathode of the oscillator tube and has no d-c bias.

Oscillator

The oscillator circuit is worthy of careful study inasmuch as it is different from the type ordinarily employed. It has self-stabilizing properties which are very advantageous for short wave operation. The generated frequency remains substantially constant, the circuit being unaffected by variation of line voltage and other similar influences. Output also remains uniform over the individual tuning ranges. The switching of the tuning coils is arranged so as to short those not in use in order to prevent absorption or any reactive effects in the particular band being tuned.

Detector and A.V.C.

The modulated signal as obtained from the output of the i-f system is detected by an RCA-6H6 double diode tube. The audio frequency secured by this process is passed on to the a-f system for amplification and final reproduction. The d-c voltage which results from detection of the signal, is used for automatic volume control. This voltage, which develops across resistors R-7 and R-8, is applied as automatic control grid bias to the r-f, first detector and i-f tubes through suitable resistance-capacitance filter circuits. The second diode of the RCA-6H6 is used to supply residual bias for these controlled tubes under conditions of little or no signal. This diode, under such conditions, draws current, which flows through resistors R-7, R-8 and R-9, thereby maintaining the desired minimum operating bias on such tubes. On application of signal energy above a certain level, however, the auxiliary bias diode ceases to draw current and the a.v.c. diode takes over the biasing function. The cathode and anode of the signal-a.v.c diode have positive potential in respect to chassis-ground and cathodes of the a.v.c. controlled tubes when no signal is being received.

Audio System

Manual volume control of the detected signal is effected by an acoustically tapered potentiometer in the grid circuit of the first a-f stage. This control has tone compensating filters connected to two points thereon. These filters effect the correct aural balance at different volume settings. A music-speech switch (low frequency tone control) is associated with one of the compensation filters. The purpose of this control is to make speech reproduction more intelligible and to reduce hum obtained from stray modulation on a carrier. The driver stage of the audio system uses an RCA-6C5 which is resistance coupled to the first a-f tube and transformer coupled into the push-pull power output stage.

Tuning Indicator

A cathode-ray tube is used as a means of visually indicating when the receiver is accurately tuned to the incoming signal. This tube is of new design and comprises an amplifier section and a cathode-ray section built in the same glass envelope. The cathode-ray section consists of a conically shaped luminescent screen, upon which a pattern is formed by an effect of the detected signal after said effect has been amplified by the amplifier section which is fed from the detector diode circuit. The size of the pattern is determined by the strength of the signal voltage, so that any change of tuning may be readily observed in order to facilitate tuning to exact resonance.

SERVICE DATA

The various diagrams of this booklet contain such information as will be needed to isolate causes for defective operation when 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 R-3, L-2, C-1, etc., are provided for reference between the illustrations and the Replacement Parts List. The coils, reactors, and transformer windings are rated in terms of their d-c resistances only and where the resistance is less than one ohm, no rating is given.

Alignment Procedure

Ten alignment trimmers are provided in the r-f, first detector and oscillator tuning system and four are used in the i-f system. All of these are accurately adjusted during manufacture and should remain in proper alignment unless affected by abnormal conditions of climate or have been altered by other means. Loss of sensitivity, improper tone quality and poor selectivity are the usual indications of improper alignment.

Correct performance of the receiver can only be obtained when the trimmer adjustments have been made by a skilled service man with the use of adequate and reliable test equipment. Such apparatus as may be required for alignment of this particular instrument is illustrated and described on a separate page of this booklet.

Two methods of alignment are applicable. One utilizes a Cathode-Ray Oscillograph as a means of output indication and the other follows former procedure where a glow type indicator or meter is used. The oscillographic method is much to be preferred, since greater accuracy is possible from the type of indication afforded. There are no approximations necessary as with the meter or aural method, but each adjustment can be made with definite precision. Both methods are hereinafter outlined so that alignment operations may be made according to the equipment available.

It is wise to determine the necessity for alignment as well as the direction of misalignment before making adjustments. The RCA Tuning Wand is an instrument designed particularly for such a purpose.

The Tuning Wand consists of a bakelite rod having a small brass cylinder at one end and a core of finely divided iron at the other. It may be inserted into a tuned coil while a signal of the normal resonant frequency is being supplied to such coil to obtain an indication of the tuning. Holes are provided at the top of the r-f shield cans for entrance of the Wand. The presence of either end of the Wand will cause a change in tuning which will be indicated at the receiver output as an increase or decrease in signal level. If there is a decrease of output when either end is inserted, the tuning is correct and will require no adjustment. However should there be an increase of output due to the iron core and decrease with the brass cylinder, an increase in inductance or capacitance is indicated as necessary to bring the circuit into line. The trimmer involved should therefore be increased accordingly. If the brass cylinder end causes an increase in output while the iron end causes a decrease, reduction of inductance will be necessary to place the circuit in alignment. This is equivalent to decreasing the trimmer concerned. The following tabulation gives the various changes and the adjustments required:—

WAND	SIGNAL	TRIMMER
Brass	Decrease	None
Iron	Decrease	
Brass	Increase	Decrease
Iron	Decrease	
Brass	Decrease	Increase
Iron	Increase	

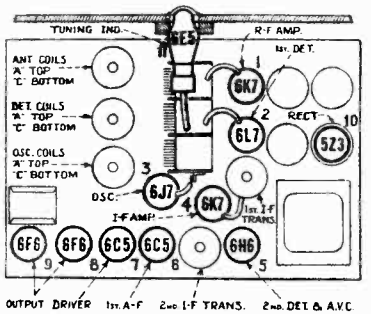


Figure 4—Coil and Radiotron Locations

CATHODE-RAY ALIGNMENT

Equipment

A standard source of alignment frequencies is required. Such a source should consist of an RCA Full Range Oscillator, Stock No. 9595. Output indication should be by means of an RCA Stock No. 9545 Cathode-Ray Oscillograph. An RCA Stock No 9558 Frequency Modulator will be needed to sweep the generated signal and synchronize it with the Oscillograph in order to obtain visual representation of the resonant characteristic of the circuit being tuned on the cathode-ray fluorescent screen.

I-F Trimmer Adjustments

The four trimmers of the two i-f transformers are located as shown by Figure 6. Each must be aligned to a basic frequency of 460 kc. The last transformer must be aligned firstly and the first transformer aligned secondly. For such a process, it is necessary to feed the output of the Full Range Oscillator to the stages in their order of alignment, adjusting the trimmers of each transformer and observing the effect at the second detector output on the Cathode-Ray Oscillograph. The proper point of connection of the Oscillograph is with its vertical "high" input terminal attached to the juncture of R-7 and R-8, as illustrated in Figure 6, and with the "0" or ground terminal to the chassis. The "Ext. Sync." terminals of the Oscillograph should be connected to the Frequency Modulator as shown by Figure 5. A .001 mfd. capacitor installed in series with the Oscillator "Ant." lead will prevent the voltages of the stage under alignment from becoming upset. The vertical "A" amplifier should be "On" for the ensuing adjustments and its gain control kept at maximum. For each adjustment, the Oscillator output must be regulated so that the image obtained on the Oscillograph screen will be of the minimum size convenient for accurate observation. Proceed further as follows:—

(a) Place the receiver, Oscillograph and test Oscillator in operation. Set the receiver range switch to Band "A" and tune the station selector to a point where no interference will be encountered from signal pickup or from the RCA-6J7 oscillator, removing the tube if necessary. Set the Oscillograph horizontal "B" amplifier to "Timing" and control its gain so that the luminescent spot sweeps a straight line trace completely across the screen. Place the tuning control to "Int." Adjust the intensity and focusing controls of the Oscillograph to produce the correct size and strength of spot.

(b) Attach the output of the test Oscillator between the control grid cap of the RCA-6K7 i-f tube and chassis ground as shown typically by Figure 5. Tune the Oscillator to **460 kc.** and set its modulation switch to "On." Regulate its output until the signal produces a wave pattern, on the Oscillograph screen, adjusting the Oscillograph controls to give a shape which is convenient for peak indications. Cause the image to stand still on the screen by manipulation of the frequency and synchronizing controls. Then carefully tune the two trimmers C-20 and C-21 of the second i-f transformer to produce maximum amplitude (vertical deflection) of the oscillographic image. Under this condition the transformer will be sharply resonated to 460 kc.

(c) The Frequency Modulator should then be placed in operation and interconnected with the Full Range Oscillator by means of the special shielded patch cord. Figure 5 shows the proper arrangement. Set the Frequency Modulator sweep range switch to its "Lo" position and turn the Oscillator modulation switch to "Off." Change the timing control of the Oscillograph to "Ext." and place the range switch to its No. 2 position. Then carefully shift the tuning of the Oscillator so as to increase its frequency, until two distinct and similar waves appear on the Oscillograph screen and become exactly coincident at their highest points. This condition will be found to occur at an Oscillator setting of *approximately* **540** *kc.* The curves will be identical in shape but appearing in reversed positions. Adjust the frequency control of the Oscillograph in order to cause the waves to conform with the above requirement and to make them remain motionless on the screen. This will require a setting of approximately ½ clockwise rotation of the frequency control. The trimmers C-20 and C-21 should then be re-adjusted so that the two curves move together and become exactly coincident throughout their lengths, maintaining the maximum amplitude at which this condition can be brought about.

(d) Leaving the equipment connected and adjusted as in (c), change the Oscillator output to the control grid cap of the RCA-6L7 first detector tube. Then adjust the first i-f transformer trimmers C-16 and C-17 so that the forward and reverse waves appearing on the Oscillograph coincide throughout their lengths and have maximum amplitude. The shape of the composite wave obtained from this operation is a true representation of the overall tuning characteristic of the i-f system

R-F Trimmer Adjustments

Locations of the various antenna, detector and oscillator coil trimmers are shown by Figure 6. The test Oscillator should be removed from connection with the i-f system and its output connected to the antenna-ground terminals of the receiver. No changes are to be made in the connections of the Oscillograph at the second detector. During the following adjustments, the Oscillator output should be regulated as often as is necessary to keep the oscillographic image as low as is practically observable. Adherence to this procedure will obviate the broadness of tuning that would result from a.v.c. action on a stronger signal. Proceed with the adjustments as follows:—

Calibration

Set the receiver range switch to Band A and rotate the station selector until the tuning condenser plates are in full mesh (maximum capacitance). Then move the main dial pointer until it points exactly to the horizontal line at the low frequency end of the Band A scale. Correct the setting of the vernier second hand pointer to read zero.

Band A

(a) With the receiver range switch in its Band A position, tune the station selector until the dial pointer is at a reading of **1720 kc.** Adjust the test Oscillator to **1720 kc.** (modulation "On" and Frequency Modulator disconnected) and increase its output to produce a registration on the Oscillograph. Carefully align the oscillator, detector and antenna trimmers, C-47, C-12 and C-3 respectively, so that each brings about maximum amplitude of output as shown by the wave on the Oscillograph. It will be necessary to have the timing control of the Oscillograph on "Int." for this operation. After each trimmer has been peaked, the Oscillograph timing control should be set to "Ext." and the Frequency Modulator placed into operation with its connections to the Oscillator and Oscillograph made in accordance with Figure 5. Turn the modulation switch of the Oscillator to "Off" and retune the Oscillator (increase frequency) until the forward and reverse waves show on the Oscillograph and become coincident at their highest points. Adjust the trimmers C-47, C-12 and C-3 again, setting each to the point which produces the best coincidence and maximum amplitude of the wave images.

(b) Remove the Frequency Modulator cable from the Oscillator and shift the signal frequency to **600 kc.** Place the modulation switch to "On". Tune the receiver to pick up this signal, disregarding the dial reading at which it is best received. Then insert the Frequency Modulator plug and retune the Oscillator (modulation "Off") until the two similar forward and reverse waves appear on the screen. For this adjustment, it is advisable to shift the Oscillator to its 200-400 kc. range using the third harmonic of the generated signal in order to obtain the desired range of sweep. The oscillator series trimmer, C-46, should then be adjusted to produce maximum amplitude of the images. No rocking will be necessary on the station selector inasmuch as the signal frequency is being "wobbled" by the Frequency Modulator to produce the same effect. After completing this adjustment, the trimmer C-47 should be re-aligned as in (a) to correct for any change brought about by the adjustment of C-46.

Band B

(a) Advance the receiver range switch to its Band B position and tune the station selector to a dial reading of **6132 kc.** Set the test Oscillator to this same frequency (modulation "On" and Frequency Modulator disconnected) and increase its output until a suitable indication is apparent on the Oscillograph. The Oscillograph should be adjusted for "Int." timing. Then adjust the oscillator trimmer, C-45, to the point at which maximum amplitude of the image is obtained. Two positions will be found for this trimmer which gives such a maximum. The one of least capacitance is correct and should be used. This can be checked by tuning the "image" signal, which will be received at **5212 kc.** on the dial if the adjustment of C-45 has been properly made. An increase in test Oscillator output may be necessary for this test. *Its frequency should not be changed from* **6132 kc.** *nor any trimmer adjustments made on the receiver.*

(b) Return the station selector to the **6132 kc.** reading and align the detector, and antenna coil trimmers, C-11 and C-2 respectively, for maximum (peak) output as shown by the Oscillograph. No further adjustments are to be made on this band.

Band C

(a) Turn the range switch of the receiver to its Band C position and tune the station selector until the dial pointer reads **18,000 kc.** Set the test Oscillator to the same frequency (modulation "On" and Frequency Modulator disconnected) and regulate its output to the level required for convenient observation. Adjust the trimmer C-43 to the point producing maximum output as indicated on the Oscillograph. Check for the presence of the proper "image" signal by tuning the receiver to **17,080 kc.** The **18,000 kc.** signal of the Oscillator will be received at this point if the adjustment of C-43 has been properly made by using the position of least capacitance which gives maximum receiver output. It may be necessary to increase the output of the Oscillator in order to get an indication of the "image". *No adjustments should be made during this check.*

(b) Return the receiver tuning to **18,000 kc.**, realign C-43 if necessary, and then adjust the detector and antenna trimmers, C-10 and C-1, for maximum signal output as evidenced by the oscillographic image. No further adjustments are to be made on this band.

ALIGNMENT WITH OUTPUT METER

To align the receiver by means of an output indicator other than a Cathode-Ray Oscillograph will require the use of a standard test Oscillator, such as that recommended above, for the source of signals and

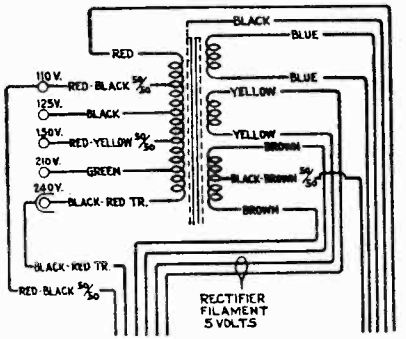


Figure 7—Universal Power Transformer Connections

Pri. Res.—7.42 ohms, total
Sec. Res.—274 ohms, total

means of indication for the output. The RCA Neon Output Indicator, Stock No. 4317, will be found very satisfactory for such use. It should be connected across the voice coil circuit of the loudspeaker or across the output transformer primary.

I-F Alignment

Connect the test Oscillator to the control grid cap of the i-f tube. Advance the volume control of the receiver to its full-on position. Tune the test Oscillator accurately to **460 kc.** and align the trimmers C-20 and C-21 to give maximum receiver output. Regulate the Oscillator output during this adjustment so that the output indication is as small as can be conveniently observed. After completing the adjustments of these trimmers, re-connect the Oscillator so that it will feed into the control grid circuit of the RCA-6L7 first detector. Then tune the first i-f transformer trimmers C-16 and C-17 for maximum receiver output.

R-F Alignment

After completing the i-f adjustments, it is advisable to correct the line-up of the circuits ahead of the first detector. The test Oscillator should be connected to the antenna-ground terminals of the receiver and the manual volume control turned to its maximum position. For each adjustment, the Oscillator output should be maintained as low as possible in order to avoid broadness of tuning which would result from a.v.c. action on a stronger signal.

Band A—This band should be aligned by supplying a **1720 kc.** signal to the receiver, tuning the station selector to a dial reading of **1720** and adjusting the trimmers C-47, C-12 and C-3 to produce maximum

receiver output. The Oscillator should then be shifted to **600 kc.** and the receiver tuned to resonate this signal, disregarding the reading at which it is best received. Trimmer C-46 must then be adjusted, simultaneously while rocking the station selector backward and forward through the signal until the maximum output results from the combined operations. C-47 should be rechecked to assure that its adjustment has not changed because of the trimming of C-46.

Band B—This band must be aligned at **6132 kc.** by tuning the test Oscillator to such a frequency and turning the station selector to the **6132 kc.** dial reading. Then tune the trimmer C-45 to produce maximum receiver output, using the setting of least capacitance which causes same. The presence of the proper "image" may be checked by tuning the receiver to **5212 kc.** at which point the **6132 kc.** signal will be heard if the trimmer C-45 has been properly set to the position of least capacitance for maximum (peak) output. It may be necessary to increase the Oscillator output for this check. *No adjustments are to be made.* Return the station selector to the **6132 kc.** dial marking and trim capacitors C-11 and C-2 for maximum receiver output. No other adjustments are necessary on Band B.

Band C—Change the receiver so that it is operative and the dial reads **18,000 kc.** on the "C" Band. Tune the test Oscillator to this same frequency. Then adjust the oscillator trimmer C-43 to produce maximum (peak) output. Two positions of this trimmer will be found which conform with this requirement. The one of least capacitance is correct. Check for the presence of "image" response at **17,080 kc.** by shifting the receiver tuning. If it is received at such a point, the trimmer C-43 has been correctly adjusted to the right peak. *No adjustments are to be made during this check.* Tune the receiver back to the **18,000 kc.** dial marking, readjust C-43 if necessary, and then tune the detector and antenna capacitors C-10 and C-1 for maximum receiver output. No further adjustments are necessary.

Radiotron Socket Voltages

The voltage values indicated from the Radiotron socket contacts to chassis on Figure 6 will serve to assist in the location of causes for faulty operation. Each value as specified, should hold within + 20% when the receiver is normally operative at its rated supply voltage. Variations in excess of this limit will usually be indicative of trouble in the basic circuits. The voltages given are actual operating values and do not allow for inaccuracies which may be caused by the loading effect of a voltmeter's internal resistance. This resistance should be duly considered for all readings. The amount of circuit resistance shunting the meter during measurement will determine the accuracy to be obtained, the error increasing as the meter resistance becomes comparable to or less than the circuit resistance. For the majority of readings, a meter having an internal resistance of 1000 ohms per volt will be satisfactory when the range used for each reading is chosen as high as possible consistent with good readability.

Universal Transformer

The transformer used on some models of this receiver is adaptable to several ranges of voltage as given under Rating C of Electrical Specifications. Its schematic and wiring are shown by Figure 7. Terminals are provided at the top of the transformer case for changing the primary connections to suit the voltage being used. Note that a 110 volt tap is brought out separately for supplying a phonograph motor.

REPLACEMENT PARTS

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

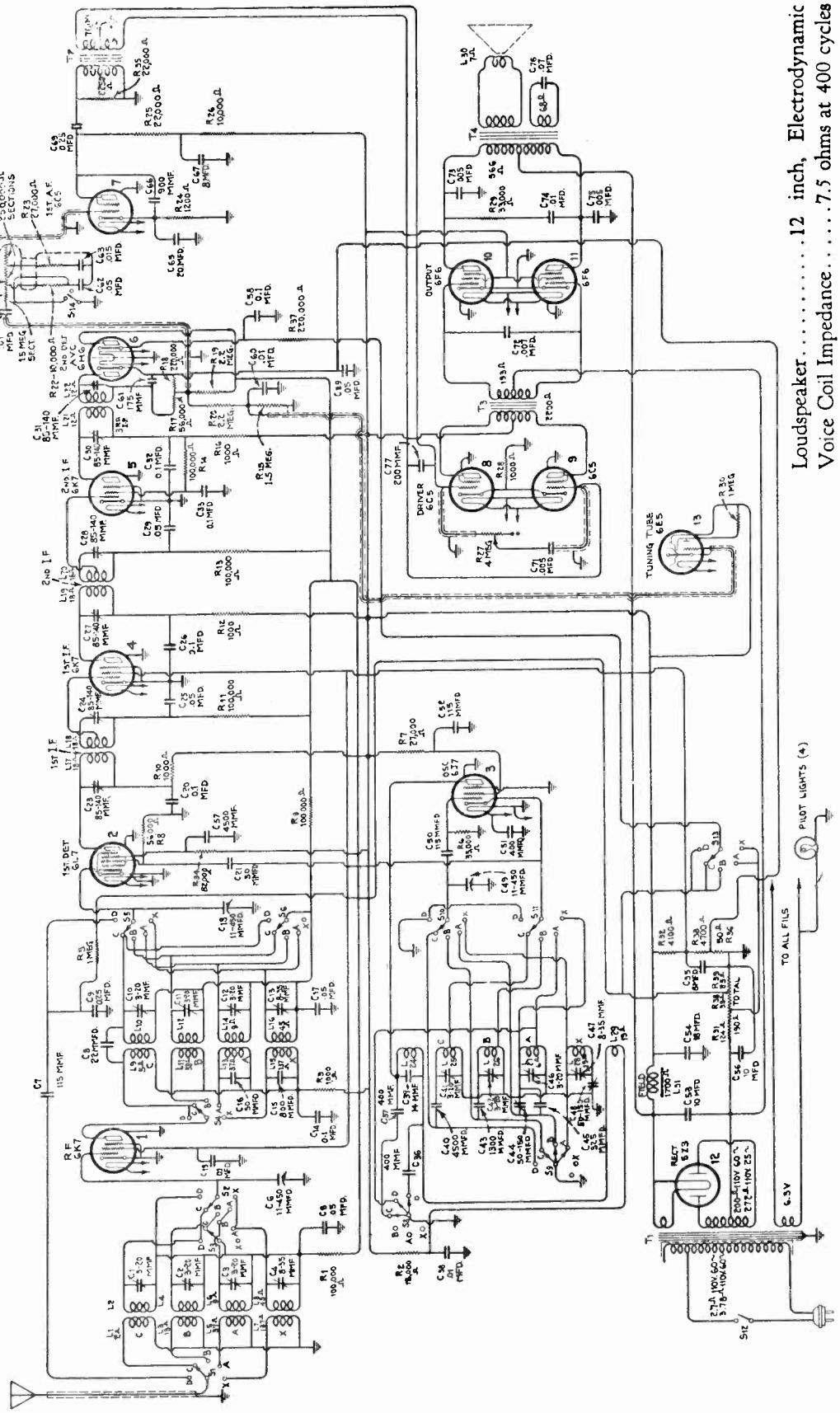
Stock No.	Description	List Price
	RECEIVER ASSEMBLIES	
4427	Bracket—High or low frequency tone control or volume control mounting bracket	$0.18
5237	Bushing—Variable condenser mounting bushing assembly—Package of 3	.43
11223	Capacitor—Adjustable capacitor (C46)	.46
11292	Capacitor—22 MMfd. (C9)	.24
11289	Capacitor—50 MMfd. (C8)	.26
11291	Capacitor—115 MMfd. (C50)	.24
11317	Capacitor—600 MMfd. (C34)	.30
3784	Capacitor—900 MMfd. (C31)	.30
4409	Capacitor—1120 MMfd (C37)	.35
11288	Capacitor—1225 MMfd (C44)	.30
11316	Capacitor—1225 MMfd (C26)	.40
11287	Capacitor—4500 MMfd (C58)	.30
4907	Capacitor—0.005 Mfd. (C40, C41)	.38
4868	Capacitor—0.005 Mfd. (C33)	.20
4858	Capacitor—0.01 Mfd. (C24)	.25
4624	Capacitor—0.01 Mfd. (C30)	.54
4937	Capacitor—0.01 Mfd. (C39)	.25
11315	Capacitor—0.015 Mfd. (C38)	.20
5196	Capacitor—0.035 Mfd. (C57)	.18
4836	Capacitor—0.05 Mfd. (C4, C13, C18, C23)	.30
4885	Capacitor—0.1 Mfd. (C7, C19, C27, C52)	.28
4841	Capacitor—0.1 Mfd. (C6)	.22
5170	Capacitor—0.25 Mfd. (C32)	$0.25
11203	Capacitor—10 Mfd. (C53)	1.18
5212	Capacitor—18 Mfd. (C54)	1.16
11215	Capacitor pack—Comprising one 16 Mfd., two 10 Mfd., and two 8 Mfd. capacitors (C29, C35, C36, C55, C56)	3.85
11318	Capacitor pack—Comprising one .015 Mfd., one .05 Mfd., one 10,000 Ohm resistor and one 27,000 Ohm resistor (C25, C28, R12, R13)	1.30
11201	Clamp—Cable clamp—located near variable tuning condenser—Package of 5	.20
11272	Clamp—Cable clamp—located above antenna terminal	.10
4693	Clamp—Electrolytic capacitor clamp—for stock #11215	.15
5215	Coil—Antenna coil—A and C bands (L1, L2, L5, L6, C1, C3)	2.32
5245	Coil—Antenna coil—B band (L3, L4, C2)	1.58
11320	Coil—Choke coil (L20)	1.00
5216	Coil—Detector coil—A and C bands (L7, L8, L11, L12, C10, C12)	2.34
5246	Coil—Detector coil—B band (L9, L10, C11)	1.62
5217	Coil—Oscillator coil—A and C bands (L13, L15, C43, C47)	2.20

REPLACEMENT PARTS (Continued)

Stock No.	Description	List Price
5247	Coil—Oscillator coil—B band (L14, C45)	$1.44
5214	Condenser—Three gang variable tuning condenser—(C5, C14, C48)	4.42
11205	Volume control (R14)	1.30
11219	Tone Control—High frequency tone control (R22)	.90
5226	Lamp—Pilot lamp—Package of 5	.70
8041	Plate—I.F. or R.F. coil shield locking plate with screw—Package of 2	.12
11220	Resistor—Voltage divider resistor—comprising one 3900 Ohm and one 4200 Ohm section (R31, R32)	.84
11221	Resistor—Voltage divider resistor—comprising one 50 Ohm, one 28 Ohm and one 195 Ohm section (R28, R29, R30)	.48
5112	Resistor—1000 Ohm—Carbon type—¼ watt—(R2)—Package of 5	1.00
3706	Resistor—1800 Ohm—Carbon type—¼ watt—(R15)—Package of 5	1.00
5159	Resistor—2200 Ohm—Carbon type—¼ watt—(R20)—Package of 5	1.00
5175	Resistor—5600 Ohm—Carbon type—½ watt—(R21)—Package of 5	1.00
2731	Resistor—10,000 Ohm—Carbon type—1 watt—(R25)—Package of 5	1.10
11305	Resistor—22,000 Ohm—Carbon type—¼ watt—(R16, R17)—Package of 5	1.00
11300	Resistor—33,000 Ohm—Carbon type—⅒ watt—(R24)—Package of 5	.75
5033	Resistor—33,000 Ohm—Carbon type—1 watt—(R23)—Package of 5	1.10
3118	Resistor—100,000 Ohm—Carbon type—¼ watt—(R1, R3, R5, R6)—Package of 5	1.00
5027	Resistor—150,000 Ohm—Carbon type—¼ watt—(R19)—Package of 5	1.00
11151	Resistor—2.2 Megohm—Carbon type—¼ watt—R9, R10, R11)—Package of 5	1.00
11250	Shield—Choke coil shield	.20
5249	Shield—R.F. coil shield	.20
11273	Shield—Radiotron shield	.25
5250	Shield—I.F. Transformer shield	.22
11222	Socket—Dial lamp socket	.18
4794	Socket—4-contact Radiotron socket	.15
11197	Socket—6-contact Radiotron socket	.14
11198	Socket—7-contact Radiotron socket	.15
5224	Switch—Low frequency tone control with power switch—(S11, S13)	1.00
11236	Switch—Range switch (S1, S2, S3, S4, S5, S6, S7, S8, S9, S10, S12)	2.44
5238	Terminal—Antenna terminal assembly	.14
11218	Transformer—Audio driver transformer (T2)	2.58
11216	Transformer—First intermediate frequency transformer (L16, L17, C16, C17)	2.15
11217	Transformer—Second intermediate frequency transformer (L18, L19, C20, C21, C22, R7, R8)	3.10
11213	Transformer—Power Transformer—105/125/150/210/250 volts—40-60 cycles	5.10
11212	Transformer—Power transformer—105-125 volts—25-50 cycles	7.18
11211	Transformer—Power transformer (T1)—105-125 volts—50-60 cycles	4.88
	DRIVE ASSEMBLIES	
5243	Arm—Band indicator operating arm	.42
10194	Ball—Steel ball for drive assembly—Package of 20	.25
8054	Cam—Five position cam for station selector drive assembly	.28
4422	Clutch—Tuning condenser drive clutch assembly—comprising shaft, balls, ring, spring and washers assembled	1.00
8048	Coupling—Flexible coupling for variable capacitor—(includes indicator shaft)	$0.70
11334	Dial—Dial scale with mounting rivets	.75
8045	Disc—Drive disc and gear assembly	.46
11631	Drive—Tuning condenser drive assembly complete	6.35
8044	Escutcheon—Dial escutcheon with vernier scale	1.08
8046	Gear—Indicator shaft drive gear and vernier idler with one spring	.72
8050	Gear—Gear sector and band indicator operating link—(link connects to arm on band switch)	.15
8053	Indicator—Station selector indicator pointer	.12
8051	Link—Complete with roller and spring	.30
8049	Pinion—Vernier pointer drive pinion and shaft	.55
4669	Screw—No. 8-32 5/32" square head set screw—for variable condenser drive assembly—Package of 10	.25
8047	Spring—Coil spring for indicator shaft drive gear and vernier idler (Stock #8046)	.12
8052	Spring—Coil spring for link—Package of 5	.32
8042	Stud—Band indicator operating arm stud—Package of 5	.25
	REPRODUCER ASSEMBLIES	
8059	Board—Reproducer terminal board—(2 terminals)	.14
8060	Bracket—Output transformer mounting bracket	.14
11304	Cable—Reproducer cable—complete with connector	.80
8058	Clamp—Cone rim clamp—Package of 4	.44
11189	Coil—Field coil, magnet and cone housing (L22)	10.60
8056	Cone—Reproducer cone (L21)	1.58
5039	Connector—4-prong male connector plug for reproducer	.25
5040	Connector—4-contact female connector socket for reproducer cable	.25
9620	Reproducer—Complete	16.32
8057	Transformer—Output transformer—(T3, C42)	3.22
	MISCELLANEOUS ASSEMBLIES	
5211	Bolt—Speaker mounting bolt assembly—Package of 2	.24
11191	Bracket—Radiotron tuning lamp mounting bracket—less clamp (Stock #11192)	.12
11319	Cable—Radiotron tuning lamp cable and plug—approximately 25" long	1.38
11192	Clamp—Radiotron tuning lamp mounting clamp—less bracket (Stock #11191)	.12
11276	Escutcheon—Radiotron tuning lamp escutcheon	.40
11379	Escutcheon—Station selector escutcheon and crystal	1.08
11346	Knob—Station selector knob—Package of 5	.75
11347	Knob—Volume control, tone control, power switch or range switch knob—Package of 5	.75
11382	Resistor—1 Megohm—Carbon type—⅒ watt (R27)—Package of 5	.75
5210	Screw—Chassis mounting screw assembly—Package of 4	.16
11348	Screw—No. 8-32 7/16" Headless cupped point set screw for knob (Stock #11346)—Package of 10	.32
11193	Shield—Reproducer cover (shield)	.82
11381	Socket—Tuning lamp socket and cover	.45
11349	Spring—Retaining spring for knob (Stock #11347)—Package of 5	.15

RCA MFG. CO., INC.

MODEL C13-2
Schematic



Loudspeaker.....12 inch, Electrodynamic
Voice Coil Impedance.....7.5 ohms at 400 cycles
Intermediate Frequency.....460 kc.
Power Consumption.....140 watts
Undistorted Output.....10 watts
Maximum Output.....15 watts

Figure 1—Schematic Circuit Diagram

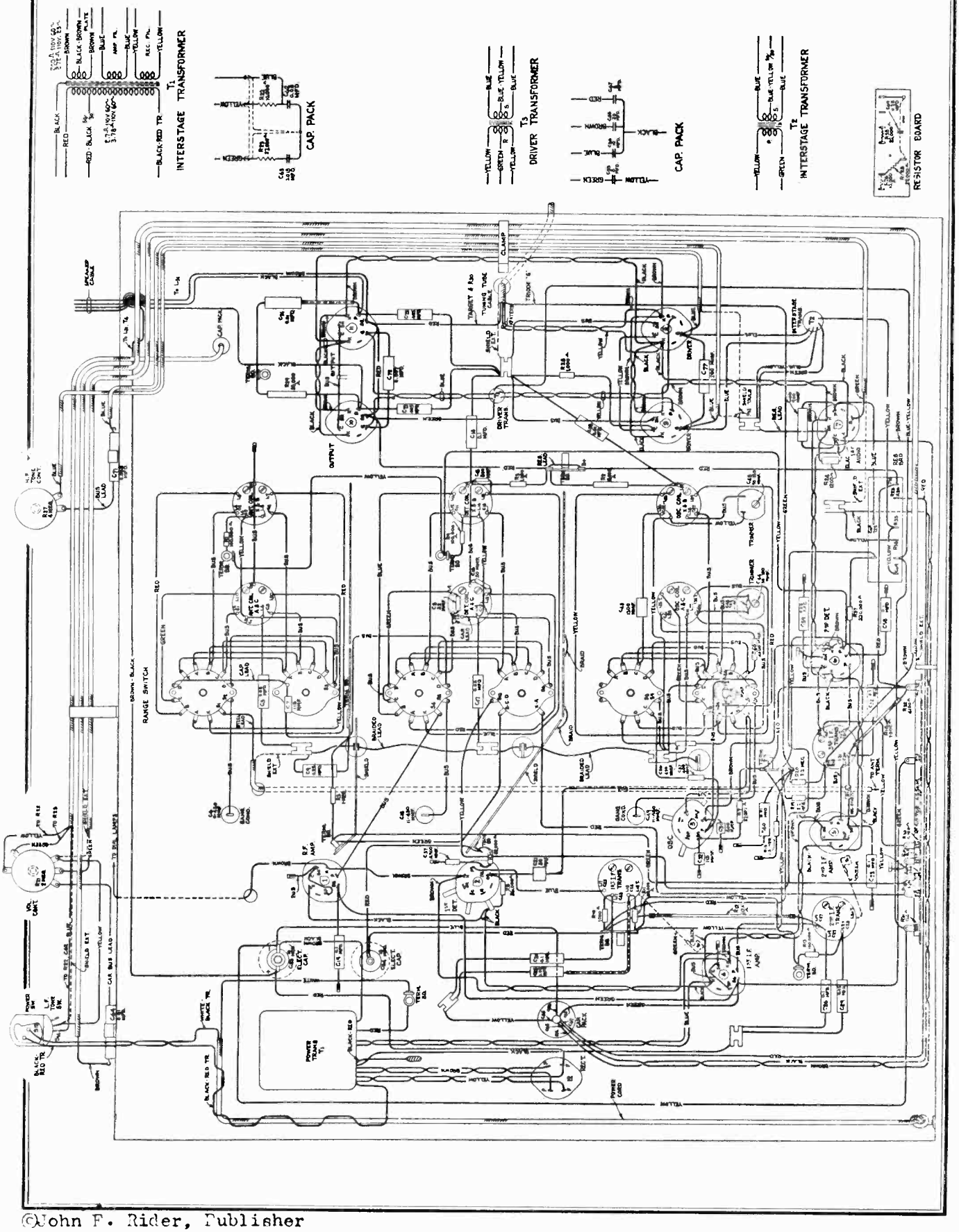
FREQUENCY RANGES

ALIGNMENT FREQUENCIES

Band X	140— 410 kc.	Band X.....150 kc. (osc.), 400 kc. (osc., det., ant.)
Band A	540— 1,800 kc.	Band A.....600 kc. (osc.), 1,720 kc. (osc., det., ant.)
Band B	1,800— 6,000 kc.	Band B.....6,132 kc. (osc., det., ant.)
Band C	6,000—18,000 kc.	Band C.....18,000 kc. (osc., det., ant.)
Band D	18,000—60,000 kc.	Band D.....No adjustments required

MODEL C13-2
Chassis Wiring

RCA MFG. CO., INC.



MODEL C13-2
Trimmers, Voltage
Circuit Data

RCA MFG. CO., INC.

Figure 7—Trimmer Locations and Radiotron Socket Voltages

Measured at 120 volts A.C.—No Signal—All Tubes Intact—Volume Control Maximum—Band Switch on "A"

* Measured on 250 Volt Range of 1000 Ohm Per Volt Meter

GENERAL FEATURES

Metal Tubes

This receiver uses the new metal tubes which are much smaller in size than the corresponding glass types. The high frequency efficiency of these metal tubes is greater because of the shorter lengths of leads, lesser interelectrode capacitance and the more complete shielding of the metallic envelopes. Their rugged construction prevents breakage and reduces microphonic tendencies. The bases and sockets of all types have a standardized arrangement of connecting prongs.

Receiver Chassis

Service convenience has been a controlling factor in the layout of the chassis parts and wiring. The assembly of these various elements is such that the number of conductors is minimized with all important connections being readily accessible. Further accessibility to all parts of the chassis is due to the open construction of the base and mounting supports. Trimmer adjustments are easily reached from the underside of the chassis. The r-f, detector and oscillator coils are identified by markings on their bases, which for example read "A-O" to indicate the Band A, "antenna" and "oscillator" coils.

Figure 3—Loudspeaker Schematic and Wiring

Dial Drive

The dial drive and station indicator system are of new and unique design. Five indivdual dial scales, each with full 180 degree hand spread, are provided, one for use on each band. The scales are eccentrically arranged on a rotary disc and adapted to operate in connection with the hand change switch so that as the switch is shifted to a certain band, the corresponding dial scale rotates into position. For other positions of the hand switch, a similar scale selection takes place, there being only one scale visible at a time. The driving mechanism for the dial and condenser has tuning ratios of 10 to 1 and 50 to 1. Control may be interchanged between these two ratios by push-in operation of a positive action clutch which is actuated by the tuning knob. From the clutch and ratio controlling mechanism, the drive system interlinks with the tuning condenser, main dial pointer and vernier dial pointer through means of fibre and brass gears. The ratio of vernier rotation to the main pointer is 20 to 1. An intermediate gear is used in the system to reduce gear back-lash. This gear is suspended in position with two tension springs which maintain the proper mesh at all times. A flexible coupling disc is used between the drive and the condenser shaft permitting the dial drive mechanism to be rigidly mounted to the chassis base.

Tuning Condenser

The variable tuning condenser is supported by a new design of shock-proof mount which has been developed by our engineers to minimize audio-frequency "howl" produced by chassis vibration.

Power Transformer

The transformer is assembled flat against the chassis base which acts as a radiating fin to disseminate the heat developed in the windings. An improved electrostatic shield is used between the primary and secondary windings to reduce ac line disturbances and to prevent the receiver from radiating into the line.

Loudspeaker

A super-sensitive 12 inch electrodynamic speaker is employed. It is correctly adapted to the cabinet design to assure the best possible acoustic performance. Electrical connection is made from the speaker to the chassis through a plug and connector attachment, permitting easy removal for servicing.

ELECTRICAL CIRCUIT

The circuit is based upon the Superheterodyne principle. The radio frequency and audio frequency amplification are balanced in such manner that the maximum of performance is obtained. The following general items cover the circuit arrangement and notable features involved:—

Tuned Circuits

Six adjustable tuned circuits are used in the i-f system, each resonating at 460 kc. A three section variable condenser tunes the secondary of the antenna transformer, the secondary of the detector input transformer and the oscillator coil on all bands with the exception of D, which has only its detector and oscillator tuned. Each tuning range has its own group of r-f and oscillator coils, they being selected as desired by operation of the band-change switch. Trimmer condensers are provided on all of the tuned circuits for use in obtaining precise alignment.

Band D Tuning

Special notice should be taken of the manner of tuning this band. The r-f stage is unused when the range switch is turned to its Band D position and the signal is fed from the antenna directly to the first detector input circuit. The inductance of this circuit consists of a short length of bus wire to which the antenna lead is tapped at a definite predetermined point. The

total length of this inductive wire from the stator of the tuning capacitor to ground represents the secondary of a high frequency autotransformer, while the inductive section included between the antenna lead tap and ground forms the primary. Alteration of the dimensions and position of this wiring will change the tuning and alignment of the circuit, resulting in total

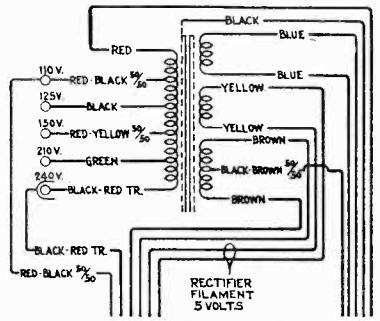


Figure 4—Universal Transformer Schematic and Wiring

Pri. Res.—4.89 Ohms, Total
Sec. Res.—165 Ohms, Total

lack of operation or seriously poor operation. *It is therefore necessary when servicing to avoid changes in the wiring which includes Band D detector and oscillator r-f circuits unless the arrangement is restored to its exact original condition.* Similar caution should be observed when exchanging by-pass condensers in these same circuits, since their values, physical positions, length of leads, quality of dielectric etc. are critical and variations will definitely affect operation of the receiver. The small heater by-pass condensers and ground terminals installed at the tube sockets are very important in this respect.

Oscillator Stage

The heterodyne oscillator circuit used in this receiver is an improved type, having exceptional frequency stability and uniformity of output over its various tuning ranges. It operates on fundamental frequencies which are fed to the first detector hexode tube (RCA-6L7) on an auxiliary mixing grid. The oscillator generates a signal which is at all times above the frequency of the incoming signal by 460 kc. As shown by the schematic diagram, the cathode of the oscillator tube is above ground potential for r.f., while the plate is effectively at ground potential. This particular arrangement, together with the plate and screen series resistors, makes the circuit independent of supply voltage variations in regard to stability and uniformity of output. Separate coils are used for each of the tuning ranges. The switching of the different bands is such as to short circuit certain unused coils which would absorb energy from the circuits used.

Intermediate Amplifier

Two stages of i-f amplification comprising three tuned transformers and two RCA-6K7 tubes are arranged in cascade to operate at 460 kc. The transformers have their primaries as well as secondaries tuned by adjustable trimmer capacitors. These trimmers are designed to resist moisture, temperature and other detrimental factors which may affect their adjustments. Litz wire is used for the windings of the third transformer in order to provide the proper efficiency in driving the diode second detector.

Detection and A. V. C.

The modulated signal as obtained from the output of the i-f system is detected by an RCA-6H6 double diode tube. The audio frequency secured by this process is passed on to the a-f system for amplification and final reproduction. The d-c voltage which results from detection of the signal is used for automatic volume control. This voltage, which develops across resistor R-18, is applied as automatic control grid bias to the r-f, first detector and i-f tubes through suitable resistance-capacitance filter circuits. The second diode of the RCA-6H6 is used to supply residual bias for these controlled tubes under conditions of little or no signal. This diode, under such conditions, draws current, which flows through R-18, R-19, and R-37, thereby maintaining the desired minimum operating bias on such tubes. On application of signal energy above a certain level, however, the auxiliary bias diode ceases to draw current and the a.v.c. diode takes over the biasing function. The cathode and the anode of the signal-a.v.c. diode have positive potential in respect to chassis-ground and cathodes of the a.v.c. controlled tubes when no signal is being received.

Audio System

Several stages of audio amplification provide excellent fidelity and wide range of volume both for short wave as well as on the standard and long wave bands. The high gain of the system has necessitated thorough shielding and careful manufacture. All wiring, transformers, etc., should always be placed as originally installed if it has been necessary to remove such for service purposes. Hum difficulties are likely to occur if this caution is not observed. Manual volume control is by means of an acoustically tapered potentiometer which conveys the audio output of the second detector to the first a-f amplifier stage. This control has tone compensation produced by filters connected to two points thereon. This gives the correct aural balance at different volume settings. A music-speech switch is provided in one of the volume control filter circuits for use in obtaining good speech intelligibility. On the speech position, the low frequency tones are reduced. A push-pull driver stage is used between the first a.f. and the Class AB output amplifier. A continuously variable high frequency tone control is shunted across the grids of the driver tubes. A sharp, high audio frequency cut-off is obtained by a tertiary winding on the audio output transformer and by the correct design of the driver and interstage transformers. This cut-off feature results in quieter operation by the reduction of high frequency noise, especially on weaker stations

Rectifier and Filter

An RCA-5Z3 full-wave rectifier tube is employed in the high voltage supply system. The loudspeaker field coil serves as a filter reactor in conjunction with high capacity, electrolytic condensers. Fixed bias voltages are made available at the filter output on a divider system, which is likewise well filtered with large capacitors.

Tuning Indicator

A cathode-ray tube is used as a means of visually indicating when the receiver is accurately tuned to the incoming signal. This tube is of new design and comprises an amplifier section and a cathode-ray section built in the same glass envelope. The cathode-ray section consists of a conically shaped luminescent screen, upon which a pattern is formed by an effect of the detected signal after said effect has been amplified by the amplifier section which is fed from the detector diode circuit. The size of the pattern is determined by the strength of the signal voltage, so that any change of tuning may be readily observed in order to facilitate tuning to exact resonance.

SERVICE DATA

The various diagrams of this booklet contain such information as will be needed to isolate causes for defective operation. In general, the ratings of the resistors, capacitors, coils, etc. are indicated adjacent to the symbols signifying these parts. Identification titles such as R-3, L-2, C-1, etc., are provided for reference between the illustrations and Replacement Parts List. The coils, reactors and transformer windings are rated in terms of their d-c resistances. Where the value is not given, the resistance is less than one ohm.

Alignment Procedure

The extensive frequency range of this receiver necessitates a more or less involved method of alignment. However, if the following directions are carefully applied, the normal performance of the instrument will be obtained.

Circuits aligned by use of Cathode-Ray equipment will be as near to perfection as possible, hence this method is to be preferred in all cases. Alignment by other methods is oftentimes an approximation unless extreme care is taken and a good deal of time expended. The oscillographic method is particularly advantageous for trimming the i-f tuned circuits to obtain

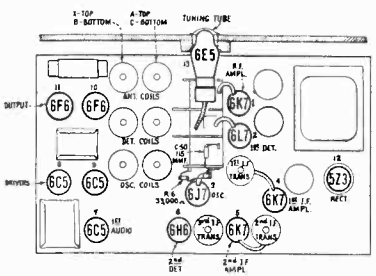


Figure 5—Radiotron and Coil Locations

the utmost in tone quality and at the same time the maximum of selectivity. Procedure to be followed when using a Cathode-Ray Oscillograph is therefore given in detail. Should this type of equipment be unavailable, a substitute indicator may be used, the procedure necessary being covered on page 12.

Equipment

The instruments required for placing this receiver in proper alignment should consist of an RCA Cathode-Ray Oscillograph, an RCA Full Range Oscillator, an RCA Frequency Modulator, a Tuning Wand and a non-metallic screw driver. These devices are illustrated and described on a separate page of this book. The Cathode-Ray Oscillograph is to be used as an output indicator to show precisely when the circuits are correctly aligned. The Full Range Oscillator is required as the source of standard alignment signals at the various frequencies. Visual alignment is made possible through use of the Frequency Modulator, which in conjunction with the Oscillograph and Oscillator, causes the characteristic wave shape of the circuit under test to be formed on the Oscillograph screen. The necessity for alignment and direction of required change may be tested with a Tuning Wand. It's use is as follows:—

The Tuning Wand, which consists of a bakelite rod having a small brass cylinder installed at one end, and a core of finely divided iron at the other, may be inserted into a tuned coil to obtain an indication of the tuning. With a signal being supplied to the receiver at the alignment frequency of the circuit concerned, each end of the Wand should be placed through the center of the coil. Holes are provided in the r-f coil shields for this test. A change in tuning will be produced by the presence of the brass cylinder or iron core and consequent change of receiver output occurs. If there is a decrease of output when either of the two ends are inserted, the tuning is correct and will require no adjustment. However, should there be an increase of output due to the iron core and decrease with the brass cylinder, an increase in inductance or capacitance is indicated as necessary to bring the circuit into line. The trimmer involved should therefore be increased accordingly. If the brass cylinder end causes an increase in output, while the iron end causes a decrease, reduction of inductance will be necessary to bring the circuit into alignment. This will be equivalent to decreasing the trimmer concerned.

End of Wand Used	Change of Signal Output	Change Req'd in Trimmer Capacity
Brass	Decrease	None
Iron	Decrease	
Brass	Increase	Decrease
Iron	Decrease	
Brass	Decrease	Increase
Iron	Increase	

I-F TRIMMER ADJUSTMENT

Six trimmers are associated with the three i-f transformers. Their locations on the chassis are shown by Figure 7. Each must be aligned to a basic frequency of 460 kc. The last i-f transformer should be adjusted first, the one preceding it second and the operation carried through successive stages until the first transformer has been aligned. For such a process, it is necessary to feed the output of the Full Range Oscillator to the stages in their order of alignment, adjusting the trimmers of each and observing the effect at the second detector output on the Cathode-Ray Oscillograph. The most convenient point for connection of the Oscillograph is at the detector diode load circuit, with the vertical "Hi" terminal attached to the juncture of R-17, R-18 and R-19, and the "Gnd" to the chassis The "Ext. Sync." terminals of the Oscillograph should be connected to the Frequency Modulator as illustrated in Figure 6. A .001 mfd. capacitor installed in series with the Oscillator "Ant." output lead will prevent the voltage constants of the stage being aligned from becoming upset. Proceed further as follows:—

(a) Place the receiver, Oscillograph and test Oscillator in operation. Set the receiver volume control to maximum and the range switch to Band "A". Tune the station selector to a point where no interference is caused by local stations or the local oscillator, removing the 6J7 tube if necessary. Turn the Oscillograph vertical "A" amplifier to "On" and advance the vertical gain control to its maximum position. Set the horizontal "B" amplifier to "Timing" and control its gain so that the luminescent spot sweeps a trace completely across the screen. Have the timing control adjusted to "Int."

(b) Attach the output of the test Oscillator to the control grid cap of the second i-f tube (RCA-6K7) and chassis ground. Tune the Oscillator

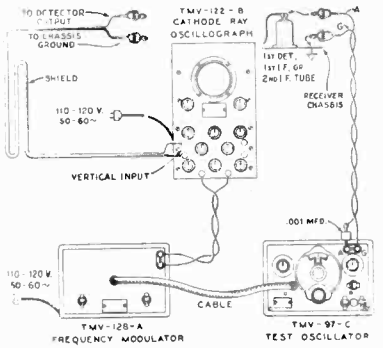


Figure 6—Alignment Apparatus Connections

to 460 kc. having its modulation switch turned to "On". Regulate the output control until the signal produces a wave pattern on the Oscillograph screen, adjusting the Oscillograph frequency and range controls to give several complete cycles, the amplitude of which will afford an accurate peak indication. Cause the image formed to stand still on the screen by manipulation of the "Sync." control. Use as low a signal output from the Oscillator as can be accurately observed at the Oscillograph. Then tune the two trimmers. C-30 and C-31 of the third i-f transformer to produce maximum amplitude (vertical deflection) of the oscillographic image. Under this condition, the transformer will be sharply resonated to 460 kc.

(c) The Frequency Modulator should then be placed in operation and interconnected with the Full Range Oscillator by means of the shielded patch cord provided. Figure 6 shows the proper arrangement. Set the Frequency Modulator sweep range switch to its "Lo" position and turn the Oscillator modulation switch to "Off". Change the timing (Sync.) control of the Oscillograph to "Ext." and place the range switch to its No. 2 position. Then shift the tuning of the Oscillator so as to increase its frequency, until two distinct and similar waves appear on the Oscillograph screen and become coincident at their highest points. These curves will be found to occur at an Oscillator setting of *approximately* 540 kc. They will be identical in shape but appearing in reversed positions. Adjust the frequency control of the Oscillograph in order to cause the waves to conform with these requirements and to make them remain motionless on the screen. This will require a setting of approximately ½ clockwise rotation of the frequency control. The trimmers C-30 and C-31 should then be re-adjusted so that the two curves move together and become exactly coincident throughout their lengths, maintaining the maximum amplitude at which this condition can be brought about.

(d) Leaving the equipment connected and adjusted as above, change the Oscillator output to the control grid cap of the first i-f tube (RCA-6K7). Adjust the two trimmers C-27 and C-28 of the second i-f transformer until the forward and reverse waves appearing on the Oscillograph coincide throughout their lengths and have maximum amplitude.

(e) Change the test Oscillator output to the control grid of the first detector tube (RCA-6L7) without disturbing the connections and adjustments of the other apparatus. Then align the trimmers C-23 and C-24 of the first i-f transformer to produce waves of maximum coincidence and maximum amplitude. The shape of the composite wave obtained from this operation is a true representation of the over-all tuning characteristic of the i-f system.

ANTENNA, DETECTOR AND OSCILLATOR

For Bands A and X, adjustments must be made at the high and low frequency ends of the range. On Bands B and C, alignment is required only at the high frequency end. Band D is permanently adjusted during manufacture, hence no alignment will be necessary in this range. Locations of the various antenna, detector and oscillator trimmers are shown on Figure 7. The test Oscillator should be removed from connection with the i-f system and its output attached to the antenna-ground terminals of the receiver. No changes are to be made in the attachment of the Oscillograph at the second detector. During the adjustments, the Oscillator output should be regulated as often as is necessary to keep the oscillographic image as low as is practically observable. Such procedure will obviate apparent broadness of tuning which would result from a.v.c. action on a stronger signal. The sequence of alignment should be Band A, Band X, Band B and Band C. Proceed with the adjustments as follows:—

Calibration

Set the receiver range switch to Band A and rotate the station selector until the tuning capacitor plates are in full mesh (maximum capacity). Then move the main dial pointer until it points exactly to the horizontal line at the low frequency end of the Band A scale. Correct the setting of the vernier second hand pointer to read zero.

Band A

(a) With the receiver range switch on its Band A position, tune the station selector until the dial pointer is at a reading of 1720 kc. Adjust the Oscillator to 1720 kc. (modulation "On" and Frequency Modulator disconnected) and increase its output to produce a registration on the Oscillograph. Carefully align the oscillator, detector and antenna trimmers, C-46, C-12 and C-3 respectively, so that each brings about maximum amplitude of output as shown by the wave on the Oscillograph. It will be necessary to have the timing control of the Oscillograph on "Int." for this operation. Then shift the timing control to "Ext." and place the Frequency Modulator into operation with its connections to the Oscillator and Oscillograph as shown on Figure 6. Retune the test Oscillator (increase frequency) until the forward and reverse waves show on the Oscillograph and become coincident at their highest points. Adjust the trimmers C-46, C-12 and C-3 again, setting each to the point which produces the best coincidence and maximum amplitude of the images.

(b) Remove the Frequency Modulator cable from the Oscillator and shift the signal frequency to 600 kc. Tune the receiver to pick up this signal, disregarding the dial reading at which it is best received. Then insert the Frequency Modulator plug and retune the Oscillator until the similar forward and reverse waves appear on the screen. It is advisable to shift the Oscillator to its 200—400 kc. range and use the third harmonic of the generated signal in order to obtain the desired range of sweep for this adjustment. The trimmer C-44 should then be adjusted until a point is reached where the waves have the greatest amplitude. It will be unnecessary to rock the tuning condenser for this operation inasmuch as the Frequency Modulator is automatically producing the same effect. After completing this adjustment, the trimmer C-46 should be realigned as in (a) to correct for any change in the oscillator high frequency tuning which has been caused by the adjustment of C-44.

Band X

(a) Disconnect the Frequency Modulator and tune the test Oscillator to a frequency of 400 kc. (Modulation "On"). Place the receiver range switch in its Band X position and turn the station selector until the dial pointer reads 400 kc. Adjust the Oscillograph timing control to "Int." Then align each of the trimmers C-47, C-13 and C-4 to the point producing maximum output at the Oscillograph. Place the Frequency Modulator in operation and attach it to the Oscillator in the normal manner. Change the Oscillograph timing to "Ext." Increase the frequency of the Oscillator (modulation "Off") until the two waves appear and become coincident at their highest points, *approximately at 462 kc.*. They may be made to remain stationary on the screen by manipulation of the Oscillograph range switch and frequency control. Readjust the three trimmers C-47, C-13 and C-4 to give maximum amplitude and complete coincidence of the waves.

(b) Change the test Oscillator so that it delivers a signal of 150 kc. with the Frequency Modulator disconnected. Tune this signal on the receiver which has previously been set to Band X, disregarding the dial reading at which the signal is best received. Then interconnect the Frequency Modulator with the Oscillator and retune the latter to the point at which the two similar waves appear on the screen. Adjust the trimmer C-48, for maximum amplitude of the wave images. Rocking of the tuning condenser will not be necessary as the Frequency Modulator duplicates such an operation. Repeat the alignment of C-47 as outlined in (a) to correct for any reflective error brought about by the adjustment of C-48.

Band B

(a) Advance the receiver range switch to its Band B position and tune the station selector to a dial reading of 6132 kc. Set the test Oscillator to this same frequency (Modulation "On" and Frequency Modulator disconnected) and increase its output until a suitable indication is apparent on the Oscillograph. Then adjust the trimmer C-42 to the point producing the maximum amplitude of the image. Two positions will be found on this trimmer which causes maximum amplitude. The one of least capacitance is correct and should be used. Check for the "image" signal, which will be received at 5212 kc. on the dial if the adjustment of C-42 has been properly made. An increase in Oscillator output may be necessary for this test, however *its frequency should not be changed nor any trimmer adjustments made on the receiver.*

(b) Return the station selector to the **6132 kc.** reading and align the detector and antenna trimmers C-11 and C-2 respectively, for maximum (peak) output as shown by the Oscillograph. No further adjustments are to be made on Band B.

Band C

(a) Turn the range switch of the receiver to its Band C position and tune the station selector until the dial pointer reads **18,000 kc.** Set the test Oscillator to this same frequency (Modulation "On" and Frequency Modulator disconnected), regulating its output to the level required for convenient observation. Adjust the trimmer C-41 to the point producing maximum output as indicated on the Oscillograph. Check for the presence of "image" signal by tuning the receiver to **17,080 kc.** The **18,000 kc.** signal of the Oscillator will be received at this point if the adjustment of C-41 has been properly made, using the position of minimum capacitance giving maximum receiver output. It may be necessary to increase the output of the Oscillator in order to get an indication of the "image". *No adjustments should be made during this check.*

(b) Return the receiver tuning to **18,000 kc.**, realign C-41 if necessary, and then adjust the detector and antenna trimmers C-10 and C-1 for maximum signal output as evidenced by the oscillographic image. No further adjustments are to be made on Band C.

Band D

No adjustments are required on this band.

Output Meter Alignment

To align the receiver by other methods than that explained above will require the use of a standard test oscillator, such as the Stock No. 9595, and a suitable output indicator, such as the Stock No. 4317. The indicator should be connected either to the voice coil circuit or across the output transformer primary. For each adjustment, the volume control should be maintained at maximum and the Oscillator output regulated until the indication is barely perceptible. The smaller the amount of glow, the more accurate will be the indication. The signal level will also be below the range of the receiver a.v.c., preventing broadness of tuning.

I-F Adjustments—Connect the output of the test Oscillator from the RCA-6L7 first detector control grid to chassis-ground and adjust its frequency to **460 kc.** Tune the receiver to Band "A", setting the station selector at a point where no interference is received from local stations or the local oscillator. Then tune the i-f trimmers C-31, C-30, C-28, C-27, C-24 and C-23 in order, each for maximum indicated receiver output.

R-F Adjustments—Connect the Oscillator output to the antenna-ground terminals of the receiver. Keep the output indicator attached to the receiver output as above. For each adjustment, use the minimum signal which will give a perceptible indication on glow indicator.

Band A

(a) Set the range switch of the receiver to its Band A position and tune the selector to a dial reading of **1720 kc.** Tune the Oscillator to this same frequency and adjust trimmers C-46, C-12 and C-3 to produce maximum indicated receiver output.

(b) Shift the Oscillator to **600 kc.** and tune the receiver to pick up this signal, disregarding the dial reading at which it is best received. Then adjust trimmer C-44, simultaneously rocking the tuning control backward and forward through the signal, until maximum output is obtained from the combined operations. Repeat the alignment of C-46 as in (a) to correct for any change caused by adjustment of C-44.

Band X

(a) Change the range switch to its Band "X" position. Tune the receiver to read **400 kc.** and set the Oscillator to produce this same frequency. Adjust trimmers C-47, C-13 and C-4 to produce maximum receiver output.

(b) Shift the Oscillator frequency to **150 kc.** and tune the receiver to pick up this signal, disregarding the dial reading at which it is best received. Then tune the oscillator series trimmer C-48, simultaneously rocking the tuning control (receiver) backward and forward through the signal, until maximum output results from the combined operations. Repeat the alignment of C-47 as in (a) to correct for any change caused by the adjustment of C-48.

Band B

Place the receiver range switch in its Band "B" position and tune the station selector to a dial reading of **6132 kc.** Set the frequency of the Oscillator to **6132 kc.**

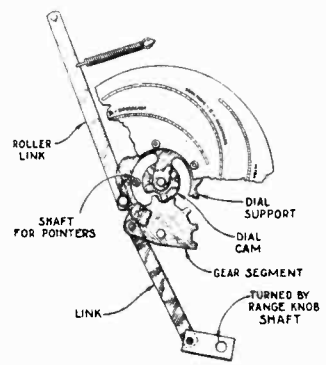


Figure 8—Selector Dial Change Mechanism

Then adjust trimmer C-26 to give maximum receiver output. Two positions may be found which fulfill this condition. The one of least capacitance is correct. To assure that the right peak has been used; tune the receiver to **5212 kc.** and increase the Oscillator output. The "image" of **6132 kc.** will be received at this point if C-26 has been adjusted to the proper point of maximum output. *No trimmer adjustments are to be made during this check.* Return the receiver tuning to **6132 kc.**, readjust C-26 if necessary, and then tune the detector and antenna coil trimmers, C-11 and C-2 to produce maximum (peak) receiver output as indicated on the glow meter.

Band C

Turn the receiver range switch to its Band "C" position and set the tuning control to a dial reading of **18,000 kc.** Tune the Oscillator to this same frequency. Adjust the oscillator parallel trimmer C-41 to produce maximum receiver output. Two positions of the trimmer will be found which fulfill such a condition. The one of least capacitance is correct. To assure that the right position has been used, check for the "image" of the **18,000 kc.** signal which will be received at **17,080 kc.** on the dial if C-41 is correctly adjusted. An increase in Oscillator output may be necessary. *No trimmer adjustments should be made during this check.* Return the receiver tuning to **18,000 kc.**, readjust C-41 if necessary, and then tune the detector and antenna trimmers C-10 and C-1 to give maximum receiver output.

Dial Adjustment

Figure 8 illustrates the relations of the various parts of the dial mechanism when it is in its A–Broadcast position and the range switch is likewise turned to its Band A setting. In re-assembling the dial after repair, see that the gears are meshed in accordance with the diagram, at the same time noting that the lever which is attached to the range switch shaft is in the position as shown.

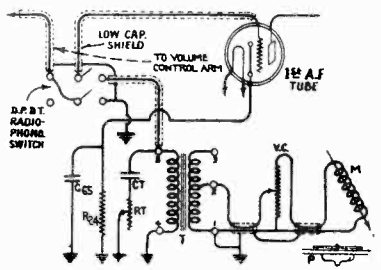


Figure 9—General Phonograph Connections

INSTALLATION

Change the receiver circuits and add phonograph connections to conform with the above schematic. Thoroughly shield leads where indicated, keeping them clear of a-c circuits and transformers. Place transformer T so as to obtain minimum lengths of secondary leads and mount it in the position which does not cause hum.

PARTS REQUIRED

M—Magnetic Pickup —Low Impedance
VC—Volume Control —100 ohms
T—Phono Input Transformer—Stock No. 7445
P—Phono Turntable Mechanism
CT—Condenser—.05 mfd.
RT—Variable Resistor —0 to 10,000 ohms

Phonograph Attachment

The audio system of this receiver may be adapted for use in the reproduction of phonograph records by proper connection and arrangement of an external turntable and its associated accessories. The relatively high amplification due to the number of a-f stages employed, necessitates that great care be taken when the circuits are changed for phonograph input. It is recommended that the turntable used be fed directly to the grid circuit of the first audio stage, with suitable switching installed for changing between radio and phonograph operation. Diagrams covering suggested methods of phonograph attachment are given in Figures 9 and 10 with installation details. Hum may possibly be encountered from lack of shielding and improper placement and shielding of the input transformer if these items are not taken care of during re-arrangement of the circuits. All wiring should be installed in a substantial and permanent manner.

Radiotron Socket Voltages

The voltage values indicated from the Radiotron socket contacts to ground on Figure 7 will serve to assist in locating causes for faulty operation when existent. Each value as specified should hold within ± 20% when the receiver is normally operative at the rated supply voltage. Variations in excess of this limit will usually be indicative of trouble in the basic circuits. The voltages given on the diagram are actual operating values and do not allow for inaccuracies which may be caused by the loading effect of a voltmeter's internal resistance. This resistance should be duly considered for all readings. The amount of circuit resistance shunting the meter during measurement will determine the accuracy to be obtained, the error increasing as the meter resistance is comparable to or less than the circuit resistance. For the majority of readings, a meter having an internal resistance of 1000 ohms per volt will be satisfactory when the range used for each check is chosen as high as possible consistent with good readability.

Universal Transformer

The wiring of the special transformer used in some models of this receiver is given by Figure 4. This transformer is adaptable to several ranges of voltage, hence, in cases of receiver inoperation, the connections should be checked to assure that they are correct for the voltage being used.

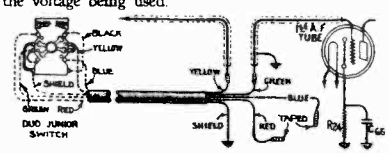


Figure 10—Duo Junior Connections

INSTALLATION

Arrange connections from Duo Junior output cable to receiver so that completed wiring is in accordance with schematic above. Add two jumpers shown by heavy full lines to Duo Junior Radio-Phono switch. Keep all leads as short as possible and well shielded where indicated.

PARTS REQUIRED

Model R-93—Duo Junior Phonograph

REPLACEMENT PARTS

Stock No.	Description	List Price
	RECEIVER ASSEMBLIES	
4427	Bracket—Low frequency tone control switch, volume control or high frequency tone control mounting bracket	$0.18
5237	Bushing—Variable capacitor mounting assembly—Package of 3	.43
11255	Cable—Radiotron tuning lamp cable complete with socket	1.20
5241	Capacitor—Adjustable capacitor—(C44, C48)	.40
11286	Capacitor—14 Mmfd. (C39)	.24
11292	Capacitor—22 Mmfd. (C8)	.24
11289	Capacitor—50 Mmfd. (C16,C21)	.26
11291	Capacitor—115 Mmfd. (C7, C50, C52)	.24
11295	Capacitor—200 Mmfd. (C77)	.30
11294	Capacitor—325 Mmfd. (C45)	.32
11290	Capacitor—400 Mmfd. (C36, C37, C51)	.25
11269	Capacitor—800 Mmfd. (C15)	.30
11293	Capacitor—900 Mmfd. (C66)	.40
11335	Capacitor—1300 Mmfd. (C43)	.30
11287	Capacitor—4500 Mmfd. (C40, C57)	.30
4838	Capacitor—.005 Mfd. (C73, C75)	.20
5242	Capacitor—.005 Mfd. High frequency tone control capacitor (C71)	.52
5148	Capacitor—.007 Mfd. (C72)	.20
4624	Capacitor—.01 Mfd. (C64)	.54
4883	Capacitor—.01 Mfd. (C38, C60)	.20
4937	Capacitor—.01 Mfd. (C74)	.25
4836	Capacitor—.05 Mfd. (C5, C17, C25, C29, C59)	.30
4841	Capacitor—.1 Mfd. (C19, C58)	.22
4885	Capacitor—.1 Mfd. (C14, C20, C26, C32, C33)	.28
4840	Capacitor—.25 Mfd. (C9)	.30
3597	Capacitor—.25 Mfd. (C69)	.40
11203	Capacitor—10 Mfd. (C53)	1.18
5212	Capacitor—18 Mfd. (C54)	1.16
11204	Capacitor Pack—Comprising one 10 Mfd., one 20 Mfd., and two 8 Mfd. capacitors C55, C56, C65, C67)	3.44
11208	Capacitor Pack—Comprising one .015 Mfd. and one .05 Mfd. capacitor and one 27,000 ohm and one 10,000 ohm resistors C62, C63, R22, R23)	1.32
11272	Clamp—Cable clamp—Located on top surface of chassis near variable tuning condenser	.10
4693	Clamp—Electrolytic capacitor mounting clamp—for Stock No. 11204	.15
5215	Coil—Antenna coil—A and C Bands—(L1, L2, L5, L6, C1, C3)	2.32
5218	Coil—Antenna coil—X and B Bands—(L3, L4, L7, L8, C2, C4)	2.58
5216	Coil—Detector coil—A and C Bands—L9, L10, L13, L14, C10, C12)	2.34
5219	Coil—Detector coil—X and B Bands—(L11, L12, L15, L16, C11, C13)	2.58
5217	Coil—Oscillator coil—A and C Bands—(L25, L27, C41, C46)	2.20
5220	Coil—Oscillator coil—X and B Bands—(L26, L28, L29, C42, C47)	2.24
5221	Coil—Oscillator coil—D Band—(L24)	.64
5214	Condenser—3 gang variable tuning condenser—(C6, C18, C49)	4.42
5226	Lamp—Pilot lamp—Package of 5	.70
8041	Plate—I.F. or R.F. coil shield locking plate—Package of 2	.12
5112	Resistor—1000 ohms—Carbon type—¼ watt (R3, R10, R28)—Package of 5	1.00
11285	Resistor—1000 ohms—Flexible type—(R12, R16)—Package of 5	1.00
11283	Resistor—1200 ohms—Carbon type—¼ watt—(R24)—Package of 5	$1.00
3381	Resistor—10,000 ohms—Carbon type—¼ watt (R26)—Package of 5	1.00
5114	Resistor—15,000 ohms—Carbon type—1 watt (R2)	.22
8070	Resistor—22,000 ohms—Carbon type—½ watt (R25)—Package of 5	1.00
11305	Resistor—22,000 ohms—Carbon type—¼ watt (R35)—Package of 5	1.00
8065	Resistor—27,000 ohms—Carbon type—½ watt (R7)—Package of 5	1.00
5033	Resistor—33,000 ohms—Carbon type—1 watt (R29)—Package of 5	1.10
11300	Resistor—33,000 ohms—Carbon type—1/10 watt (R6)—Package of 5	.75
11282	Resistor—56,000 ohms—Carbon type—1/10 watt (R8)—Package of 5	.75
8064	Resistor—82,000 ohms—Carbon type—½ watt (R34)—Package of 5	1.00
3118	Resistor—100,000 ohms—Carbon type—¼ watt (R11, R13, R14)—Package of 5	1.00
11281	Resistor—100,000 ohms—Carbon type—1/10 watt (R1, R9)—Package of 5	.75
5158	Resistor—220,000 ohms—Carbon type—¼ watt (R37)—Package of 5	1.00
3033	Resistor—1 megohm—Carbon type—¼ watt (R5)—Package of 5	1.00
4241	Resistor—1.5 Megohms—Carbon type—¼ watt (R15)—Package of 5	1.00
11151	Resistor—2.2 megohm—Carbon type—¼ watt (R19, R20)—Package of 5	1.00
11209	Resistor—Voltage divider resistor—Comprising one 4100 ohm, one 4700 ohm, one 50 ohm, two 33 ohm and one 124 ohm sections—(R31, R32, R33, R36, R38, R39)	1.16
5249	Shield—Antenna, Dectector or Oscillator coil shield	.20
5250	Shield—Intermediate frequency transformer shield	.22
11273	Shield—Rectifier Radiotron shield	.25
4794	Socket—4 contact rectifier Radiotron socket	.15
11197	Socket—6 contact Radiotron socket—For first audio or driver radiotrons—(6C5)	.14
11198	Socket—7 contact Radiotron socket—For 6K7, 6H6, or 6F6 radiotrons	.15
11278	Socket—7 contact oscillator Radiotron (6J7) socket	.20
11279	Socket—7 contact First Detector Radiotron (6L7) socket	.20
11199	Socket—Dial lamp socket	.14
5224	Switch—Low frequency tone control switch and power switch (S12, S14)	1.00
5225	Switch—Range switch—(S1, S2, S3, S4, S5, S6, S8, S9, S10, S11, S13)	3.75
5238	Terminal—Antenna terminal board and clip with insulating strip and rivets	.14
5222	Tone Control—High frequency tone control—(R27)	1.04
5232	Transformer—Audio driver transformer—(T3)	2.50
5228	Transformer—First Intermediate frequency transformer—(L17, L18, C23, C24)	1.80
5234	Transformer—Interstage Audio transformer—(T2)	3.40
8061	Transformer—Power transformer—105-125 volts 50/60 cycles—(T1)	6.75
8062	Transformer—Power transformer—105/125 volts 25/50 cycles	9.84
11194	Transformer—Power transformer—105/125/150/210/250 volts 40/60 cycles	7.08
11206	Transformer—Second Intermediate frequency transformer—(L19, L20, C27, C28)	1.82
5230	Transformer—Third Intermediate frequency transformer—(L21, L22, C30, C31, C61, R17, R18)	2.76
11205	Volume Control—Complete (R21)	1.30
	DRIVE ASSEMBLIES	
5243	Arm—Band indicator operating arm	.42
10194	Ball—Steel ball for drive assembly—Package of 20	.25
8054	Cam—Five position cam—For station selector drive assembly	.28
4422	Clutch—Tuning condenser drive clutch assembly—Comprising drive shaft, balls, ring, spring and washers assembled	1.00
8048	Coupling—Flexible coupling for variable capacitors—Includes indicator shaft	.70
11336	Dial—Dial scale with mounting rivets	.60
8045	Disc—Drive disc and gear assembly	.46
11380	Drive—Tuning condenser drive assembly complete	6.35
8044	Escutcheon—Dial escutcheon and vernier label	1.08
8050	Gear—Gear sector and band indicator operating link—(Link connects to arm on band switch)	.15
8046	Gear—Indicator shaft drive gear and vernier idler with one spring	.72
8053	Indicator—Station selector pointer	.12
8051	Link—Complete with roller and spring	.30
8049	Pinion—Vernier pointer drive pinion and shaft	.55
4669	Screw—8-32x5/32" Square head set screw for drive assembly—Package of 10	.25
8047	Spring—Coil spring for indicator shaft drive gear and vernier idler (Stock No. 8046)	.12
8052	Spring—Coil spring for link—Package of 5	.32
8042	Stud—Band indicator operating arm stud—Package of 5	.25
	MISCELLANEOUS ASSEMBLIES	
5211	Bolt—Reproducer mounting bolt assembly—Package of 2	.24
11191	Bracket—Radiotron tuning lamp mounting bracket—Less clamp	.12
11192	Clamp—Radotron tuning lamp mounting clamp—Less bracket	.12
11193	Cover—Reproducer cover	.82
11276	Escutcheon—Radiotron tuning lamp escutcheon	.40
11379	Escutcheon—Station selector escutcheon and crystal	1.08
11346	Knob—Station selector knob—Package of 5	.75
11347	Knob—Volume control, tone control range switch or power switch knob—Package of 5	.75
11382	Resistor—1 megohm—Carbon type—1/10 watt—Used in tuning tube socket—Package of 5 (R30)	.75
5210	Screw—Chassis mounting screw assembly—Package of 4	.16
11348	Screw—8-32x7/16" Headless cupped point set screw for knob No. 11346—Package of 10	.32
11381	Socket—Radiotron tuning tube socket and cover	.45
11349	Spring—Retaining spring for knob (Stock No. 11347)—Package of 5	.15
	REPRODUCER ASSEMBLIES	
8059	Board—Terminal board (2 terminals)	.14
8060	Bracket—Output transformer mounting bracket	.14
11200	Cable—Reproducer cable	.50
8058	Clamp—Cone rim clamp—Package of 4	.44
11189	Coil—Field coil—magnet and cone housing (L31)	10.60
8056	Cone—Reproducer cone (L30)	1.58
5039	Connector—4 contact male connector for reproducer	.25
5040	Connector—4 contact female connector for reproducer cable	.25
9620	Reproducer—Complete	16.32
8057	Transformer—Output transformer (T4, C76)	3.22

RCA MFG. CO., INC.

MODEL C15-3
REPLACEMENT PARTS

Stock No.	Description	List Price
	RECEIVER ASSEMBLIES	
4427	Bracket—Low frequency tone control switch, volume control or high frequency tone control mounting bracket	$0.18
5237	Bushing—Variable capacitor mounting bushing assembly—Package of 3	.43
11255	Cable—Radiotron tuning lamp cable complete with socket	1.20
5241	Capacitor—Adjustable capacitor—C23, C27	.40
11286	Capacitor—14 Mmfd. capacitor—C19	.24
11292	Capacitor—22 Mmfd. capacitor—C11	.24
11289	Capacitor—50 Mmfd. capacitor—C8, C30	.26
11291	Capacitor—115 Mmfd. capacitor—C62, C65	.24
11295	Capacitor—200 Mmfd. capacitor—C55	.30
11294	Capacitor—325 Mmfd. capacitor—C24	.32
11290	Capacitor—400 Mmfd. capacitor—C9, C18, C20, C49, C64	.25
11299	Capacitor—600 Mmfd. capacitor—C48	.26
3784	Capacitor—900 Mmfd. capacitor—C69	.30
11335	Capacitor—1300 Mmfd. capacitor—C22	.30
11287	Capacitor—4500 Mmfd. capacitor—C21, C77	.30
4838	Capacitor—.005 Mfd. capacitor—C58, C59	.20
5242	Capacitor—.005 Mfd. High frequency tone control capacitor—C56	.52
5148	Capacitor—.007 Mfd. capacitor—C57	.20
4937	Capacitor—.01 Mfd. capacitor—C60	.25
4858	Capacitor—.01 Mfd. capacitor—C17, C47, C68	.25
4836	Capacitor—.05 Mfd. capacitor—C5, C16, C35, C40, C70	.30
4835	Capacitor—.1 Mfd. capacitor—C31	.28
4841	Capacitor—.1 Mfd. capacitor—C7, C28, C36, C41, C67	.22
4885	Capacitor—.1 Mfd. capacitor—C10, C34, C39, C42, C43	.28
3597	Capacitor—.25 Mfd. capacitor—C51	.40
11203	Capacitor—10 Mfd. capacitor—C71	1.18
5212	Capacitor—18 Mfd. capacitor—C72	1.16
5213	Capacitor Pack—Comprising one 4 Mfd., one 10 Mfd. and one 8 Mfd. capacitors—C50, C73, C74	2.94
5236	Capacitor Pack—Comprising two .5 Mfd., capacitors, one 680 ohm resistor and one 820 ohm resistor—C53, C54, R23, R27	1.36
4693	Clamp—Electrolytic capacitor mounting clamp (For stock No. 5213)	.15
5215	Coil—Antenna coil—A and C Bands—L1, L2, L5, L6 ,C1, C3	2.32
5218	Coil—Antenna coil—X and B Bands—L3, L4, L7, L8, C2, C4	2.58
5216	Coil—Detector coil—A and C Bands—L9, L10, L13, L14, C12, C14	2.34
5219	Coil—Detector coil—X and B Bands—L11, L12, L15, L16, C13, C15	2.58
5217	Coil—Oscillator coil—A and C Bands—L18, L20, C25, C75	2.20
5220	Coil—Oscillator coil—X and B Bands—L19, L22, C26, C76	$2.24
5221	Coil—Oscillator coil—D Band—L17	.64
5214	Condenser—3 gang variable tuning condenser—C6, C29, C63	4.42
5240	Cover—Fuse cover plate	.24
11202	Foot—Chassis mounting foot and bracket assembly—Package of 2	.78
10907	Fuse—3 ampere fuse—F1—Package of 5	.40
5226	Lamp—Dial lamp—Package of 5	.70
5239	Mounting—Fuse mounting for 110 volt instrument	.36
5244	Mounting—Fuse mounting for 220 volt instrument	.32
8041	Plate—I.F. or R.F. coil shield locking plate—Package of 2	.12
5233	Reactor—Coupling reactor—L29	2.32
11296	Resistor—330 ohms—Carbon type—¼ watt (R2, R12)—Package of 5	1.00
11285	Resistor—1000 ohms—Flexible type resistor (R13, R17, R36)—Package of 5	1.00
5112	Resistor—1000 ohms—Carbon type—¼ watt (R4, R10, R15, R29)—Package of 5	1.00
11283	Resistor—1200 ohms—Carbon type—¼ watt (R3)—Package of 5	1.00
4408	Resistor—1500 ohms—Carbon type—¼ watt (R8)—Package of 10	2.00
5159	Resistor—2200 ohms—Carbon type—¼ watt (R35)—Package of 5	1.00
11298	Resistor—5600 ohms—Carbon type—1 watt (R21)	.22
8043	Resistor—10,000 ohms—Carbon type—2 watts (R22)	.25
3998	Resistor—15,000 ohms—Carbon type—¼ watt (R30)—Package of 5	1.00
5114	Resistor—15,000 ohms—Carbon type—1 watt (R5)	.22
8061	Resistor—27,000 ohms—Carbon type—½ watt (R33)—Package of 5	1.00
11300	Resistor—33,000 ohms—Carbon type—1/10 watt (R32)—Package of 5	.75
5033	Resistor—33,000 ohms—Carbon type—1 watt (R31)—Package of 5	1.10
11282	Resistor—56,000 ohms—Carbon type—1/10 watt (R9)—Package of 5	.75
8064	Resistor—82,000 ohms—Carbon type—½ watt (R43)—Package of 5	1.00
5145	Resistor—100,000 ohms—Carbon type—¼ watt (R16)—Package of 5	1.00
5027	Resistor—150,000 ohms—Carbon type—¼ watt (R37)—Package of 5	1.00
11297	Resistor—330,000 ohms—Carbon type—1/10 watt (R1, R6)—Package of 5	.75
5108	Resistor—330,000 ohms—Carbon type—¼ watt (R11, R14, R38)—Package of 5	1.00
3033	Resistor—1 Megohm—Carbon type—¼ watt (R7)—Package of 5	1.00
11151	Resistor—2.2 Megohm—Carbon type—¼ watt (R20)—Package of 5	1.00
5235	Resistor—Voltage divider resistor—3 sections—4100 ohms, 4750 ohms and 190 ohms (R40, R41, R42)	$1.15
5249	Shield—Antenna, detector or oscillator coil shield	.20
5250	Shield—Intermediate frequency transformer shield	.22
11273	Shield—Radiotron shield	.25
4794	Socket—4 contact Radiotron socket—For Radiotron 5Z3	.15
11197	Socket—6 contact Radiotron socket—For Radiotron 6C5	.14
11198	Socket—7 contact Radiotron socket—For Radiotron 6K7, 6H6 (2nd Detector only) or 6F6	.15
11278	Socket—7 contact Radiotron socket—For Radiotron 6J7 (oscillator)	.20
11280	Socket—7 contact Radiotron socket—For Radiotron 6L7 (First detector)	.14
11196	Socket—8 contact Radiotron socket—For Radiotron 6H6 (as AVC only)	.15
11199	Socket—Dial lamp socket	.14
5224	Switch—Low frequency tone control and power switch—S13, S14	1.00
5225	Switch—Range switch—S1, S2, S3, S4, S5, S6, S7, S8 ,S9, S10, S11	3.75
5238	Terminal—Antenna terminal board with clip, insulating strip and rivets	.14
5222	Tone Control—High frequency tone control (R28)	1.04
5232	Transformer—Audio driver transformer—(T3)	2.50
5228	Transformer—First intermediate frequency transformer (L23, L24, C32, C33)	1.80
5231	Transformer—Fourth intermediate frequency transformer (L31, L32)	1.50
5234	Transformer—Interstage transformer (T2)	3.40
8061	Transformer—Power transformer 105-125 volts 50/60 cycles (T1)	6.75
8062	Transformer—Power transformer 105-125 volts 25-50 cycles	9.84
11194	Transformer—Power transformer 105/125/150/210/250 volts—40-60 cycles	7.08
5229	Transformer—Second intermediate frequency transformer (L25, L26, C37, C38, C66, R34)	2.42
5230	Transformer—Third intermediate frequency transformer (L27, L28, C44, C45, C46, R18, R19)	2.76
5223	Volume Control—(R24, R25, R26)	1.22
	DRIVE ASSEMBLIES	
5243	Arm—Band indicator operating arm	.42
10194	Ball—Steel ball for drive assembly—Package of 20	.25
8054	Cam—Five position cam for station selector drive assembly	.28
4422	Clutch—Tuning condenser drive clutch assembly comprising shaft, balls, ring, spring and washers assembled	1.00
8048	Coupling—Flexible coupling for variable capacitor (includes indicator shaft)	.70
11336	Dial—Dial scale with mounting rivets	.60
8045	Disc—Drive disc and gear assembly	.46
11380	Drive—Tuning condenser drive assembly complete	$6.35
8044	Escutcheon—Dial escutcheon with vernier scale	1.08
8046	Gear—Indicator shaft drive gear and vernier idler with one spring	.72
8050	Gear—Gear sector and band indicator operating link (link connects to arm on band switch)	.15
8053	Indicator—Station selector indicator pointer	.12
8051	Link—Complete with roller and spring	.30
8049	Pinion—Vernier pointer drive pinion and shaft	.55
4669	Screw—Square head No. 8-32x5/32 set screw—Package of 10	.25
8047	Spring—Coil spring for indicator shaft drive gear and vernier idler (Stock No. 8046)	.12
8052	Spring—Coil spring for link—Package of 5	.32
8042	Stud—Band indicator operating arm stud—Package of 5	.25
	LOUDSPEAKER ASSEMBLY	
8059	Board—Reproducer terminal board (2 terminals)	.14
8060	Bracket—Output transformer mounting bracket	.14
11200	Cable—Reproducer cable—Complete with connector	.50
8058	Clamp—Cone rim clamp—Package of 4	.44
11189	Coil—Field coil, magnet and cone housing (L33)	10.60
8056	Cone—Reproducer cone (L30)	1.58
5039	Connector—4 prong male connector plug for reproducer	.25
5040	Connector—4 contact female connector socket for reproducer cable	.25
9620	Reproducer—Complete	16.32
8057	Transformer—Output transformer (T4, C61)	3.22
	MISCELLANEOUS ASSEMBLY	
5211	Bolt—Speaker mounting bolt assembly—Package of 2	.24
11191	Bracket—Radiotron tuning lamp mounting bracket—less clamp (Stock No. 11192)	.12
11192	Clamp—Radiotron tuning lamp mounting clamp—less bracket (Stock No. 11191)	.12
11193	Cover—Reproducer cover	.82
11276	Escutcheon—Tuning lamp escutcheon	.40
11379	Escutcheon—Station selector escutcheon and crystal	1.08
11346	Knob—Station selector knob—Package of 5	.75
11347	Knob—Volume control, tone control, power switch or range switch knob—Package of 5	.75
11382	Resistor—1 Megohm—Carbon type—1/10 watt (R39)—Package of 5	.75
11348	Screw—8-32-7/16" headless set screw for knob (Stock No. 11346)—Package of 10	.32
5210	Screw—Chassis mounting screw assembly—Package of 4	.16
11381	Socket—Tuning tube socket and cover	.45
11349	Spring—Retaining spring for knob (Stock No. 11347)—Package of 5	.15

MODEL C15-3
Schematic

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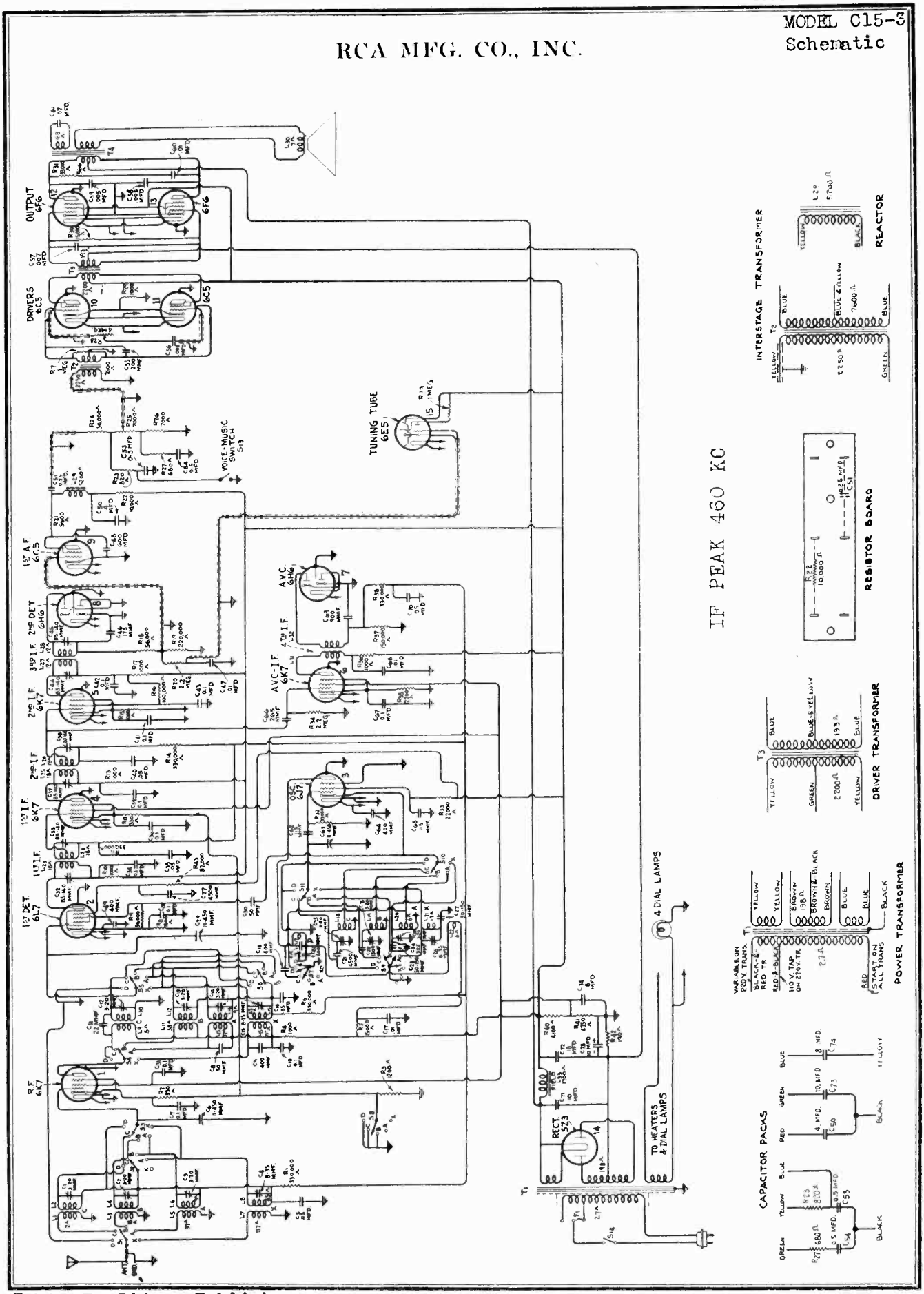
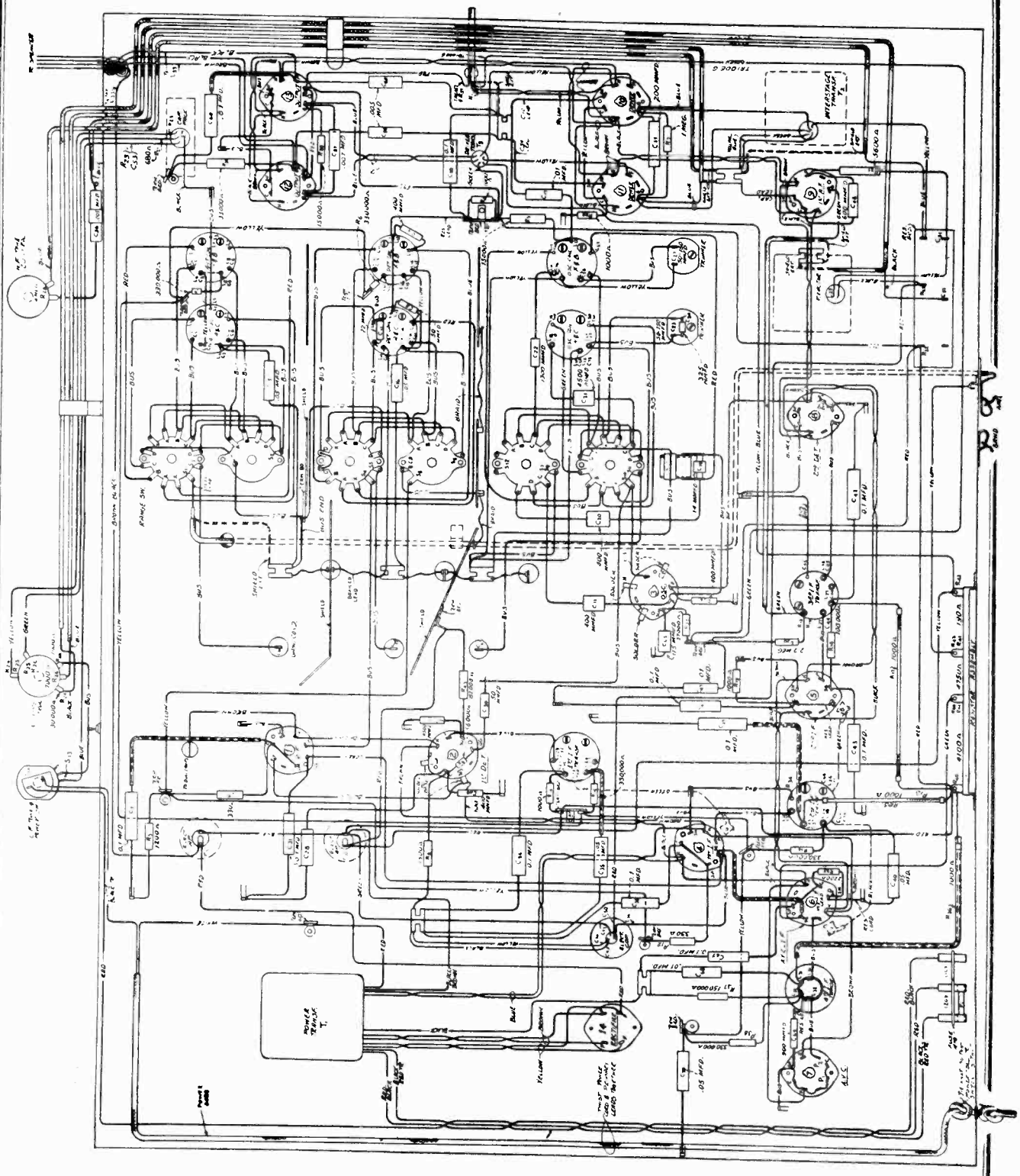


MODEL C15-3
Chassis Wiring

RCA MFG. CO., INC.



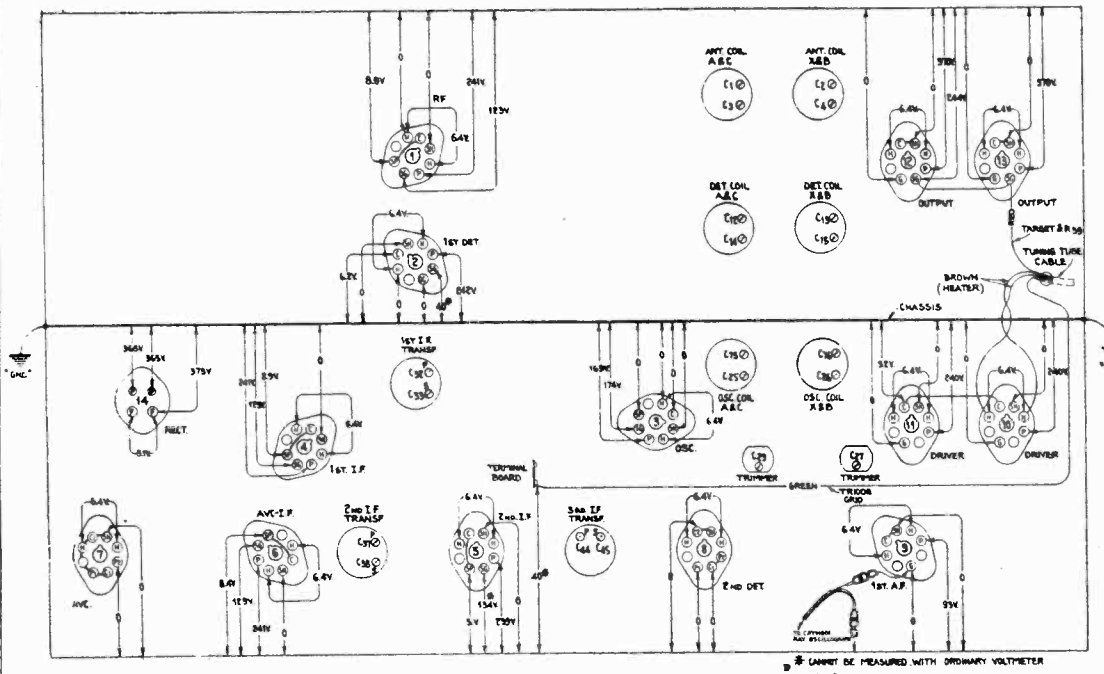


Figure 8—Trimmer Locations and Radiotron Socket Voltages

Measured at 120 volts A.C.—No Signal—All Tubes Intact—Volume Control Maximum—Band Switch on "A"

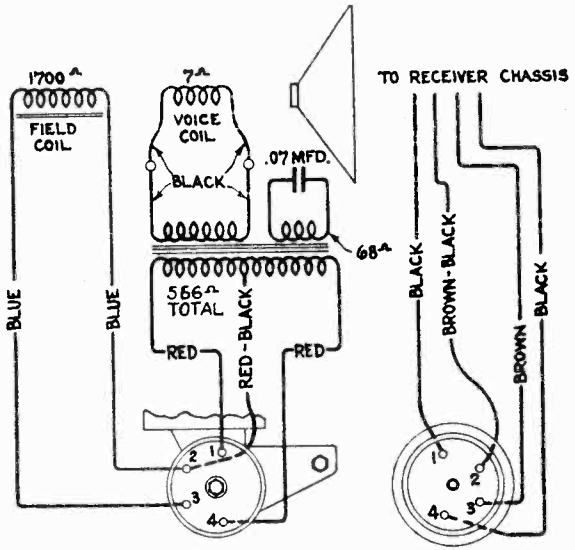


Figure 3—Loudspeaker Schematic and Wiring

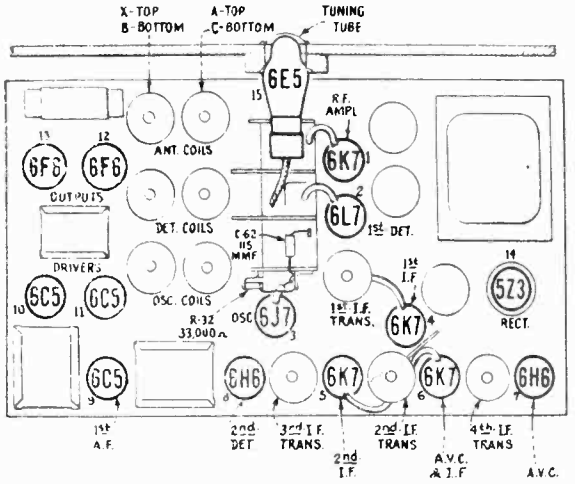


Figure 5—Radiotron and Coil Locations

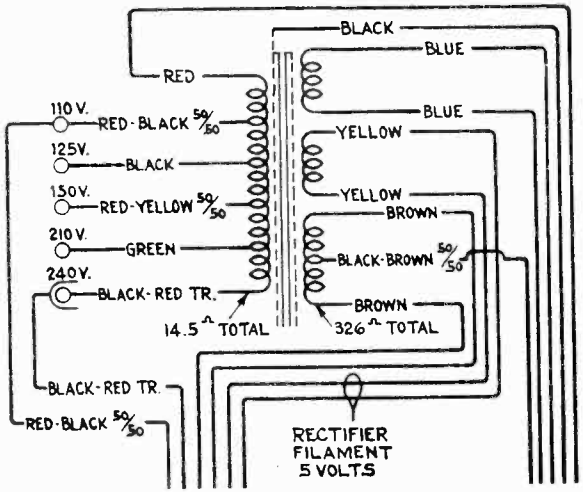


Figure 4—Universal Transformer Schematic and Wiring

Band D Tuning

Special notice should be taken of the manner of tuning this band. The r-f stage is unused when the range switch is turned to its Band D position and the signal is fed from the antenna directly to the first detector input circuit. The inductance of this circuit consists of a short length of bus wire to which the antenna lead is tapped at a definite predetermined point. The total length of this inductive wire from the stator of the tuning capacitor to ground represents the secondary of a high frequency autotransformer, while the inductive section included between the antenna lead tap and ground forms the primary. Alteration of the dimensions and position of this wiring will change the tuning and alignment of the circuit, resulting in total lack of operation or seriously poor operation. *It is therefore necessary when servicing to avoid changes in the wiring which includes Band D detector and oscillator r-f circuits unless the arrangement is restored to its exact original condition.* Similar caution should be observed when exchanging by-pass condensers in these same circuits, since their values, physical positions, length of leads, quality of dielectric etc. are critical and variations will definitely affect operation of the receiver. The small heater by-pass condensers and ground terminals installed at the tube sockets are very important in this respect.

Oscillator Stage

The heterodyne oscillator circuit used in this receiver is an improved type, having exceptional frequency stability and uniformity of output over its various tuning ranges. It operates on fundamental frequencies which are fed to the first detector hexode tube (RCA-6L7) on an auxiliary mixing grid. The oscillator generates a signal which is at all times above the frequency of the incoming signal by 460 kc. As shown by the schematic diagram, the cathode of the oscillator tube is above ground potential for r.f., while the plate is effectively at ground potential. This particular arrangement, together with the plate and screen series resistors, makes the circuit independent of supply voltage variations in regard to stability and uniformity of output. Separate coils are used for each of the tuning ranges. The switching of the different bands is such as to short circuit certain unused coils which would absorb energy from the circuits used.

Intermediate Amplifier

Two stages of i-f amplification comprising three tuned transformers and two RCA-6K7 tubes are arranged in cascade to operate at 460 kc. The transformers have their primaries as well as secondaries tuned by adjustable trimmer capacitors. These trimmers are designed to resist moisture, temperature and other detrimental factors which may affect their adjustments. Litz wire is used for the windings of the third transformer in order to provide the proper efficiency in driving the diode second detector.

Second Detector

Signal detection is brought about by the rectifying action of the RCA-6H6 double diode tube. Audio signal obtained from the voltage drop across resistor R-19 in the diode circuit, is transmitted to the first audio stage by direct coupling. The direct signal component across resistor R-19 is used for bias for the RCA-6C5 first audio tube.

Automatic Volume Control

The a.v.c. operates as a parallel system, being fed from the first i-f output through an auxiliary amplifier tube, an RCA-6K7. This stage has an untuned input and broadly resonated output, as accomplished in the natural period fourth i-f transformer. A double diode RCA-6H6 receives the signal at i-f frequency from the No. 6 stage and rectifies it in order to obtain the d-c component required for a.v.c. This component, which develops across resistor R-37, is applied to the control grids of the r-f, first detector and i-f tubes through resistor-condenser filter systems. The value of the bias obtained by this process varies with the intensity of the received signal and in turn governs the amplification of the receiver, thereby automatically regulating the output to the same level when there are fading tendencies and similarly when tuning from station to station.

Audio System

Several stages of audio amplification provide excellent fidelity and wide range of volume both for short wave as well as on the standard and long wave bands. The high gain of the system has necessitated thorough shielding and careful manufacture. All wiring, transformers, etc., should always be placed as originally installed if it has been necessary to remove such for service purposes. Hum difficulties are likely to occur if this caution is not observed. Manual volume control is by means of an acoustically tapered potentiometer which conveys the audio output of the first a-f stage to the interstage coupling transformer. This control has tone compensation produced by filters connected to two points thereon. This gives the correct aural balance at different volume settings. A music-speech switch is provided in one of the volume control filter circuits for use in obtaining good speech intelligibility. On the speech position, the low frequency tones are reduced. A push-pull driver stage is used between the first a.f. and the Class AB output amplifier. A continuously variable high frequency tone control is shunted across the grids of the driver tubes. A sharp, high audio frequency cut-off is obtained by a tertiary winding on the audio output transformer and by the correct design of the driver and interstage transformers. This cut-off feature results in quieter operation by the reduction of high frequency noise, especially on weaker stations.

Rectifier and Filter

An RCA-5Z3 full-wave rectifier tube is employed in the high voltage supply system. The loudspeaker field coil serves as a filter reactor in conjunction with high capacity, electrolytic condensers. Fixed bias voltages are made available at the filter output on a divider system, which is likewise well filtered with large capacitors.

Tuning Indicator

A cathode-ray tube is used as a means of visually indicating when the receiver is accurately tuned to the incoming signal. This tube is of new design and comprises an amplifier section and a cathode-ray section built in the same glass envelope. The cathode-ray section consists of a conically shaped luminescent screen, upon which a pattern is formed by an effect of the detected signal after said effect has been amplified by the amplifier section which is fed from the detector diode circuit. The size of the pattern is determined by the strength of the signal voltage, so that any change of tuning may be readily observed in order to facilitate tuning to exact resonance.

Alignment Procedure

The extensive frequency range of this receiver necessitates a more or less involved method of alignment. However, if the following directions are carefully applied, the normal performance of the instrument will be obtained.

Circuits aligned by use of Cathode-Ray equipment will be as near to perfection as possible, hence this method is to be preferred in all cases. Alignment by other methods is oftentimes an approximation unless extreme care is taken and a good deal of time expended. The oscillographic method is particularly advantageous for trimming the i-f tuned circuits to obtain the utmost in tone quality and at the same time the maximum of selectivity. Procedure to be followed when using a Cathode-Ray Oscillograph is therefore given in detail. Should this type of equipment be unavailable, a substitute indicator may be used, the procedure being the same but without the sweeping operations.

Equipment

The instruments required for placing this receiver in proper alignment should consist of an RCA Cathode-Ray Oscillograph, an RCA Full Range Oscillator, an RCA Frequency Modulator, a Tuning Wand and an Alignment Tool. All of these devices are illustrated and described on a separate page of this booklet. The Cathode-Ray Oscillograph is to be used as an output indicator to precisely show when the circuits are correctly aligned. The Full Range Oscillator is required as the source of standard alignment signals at the various frequencies. Visual alignment is made possible through use of the Frequency Modulator, which in conjunction with the Oscillograph and Oscillator, causes the characteristic wave shape of the circuit under test to be formed on the Oscillograph screen. Adjustments must be made with an insulated screwdriver, the Alignment Tool fitting such a requirement. The necessity for alignment and direction of required change may be tested with the Tuning Wand. Its use is as follows:—

The Tuning Wand, which consists of a bakelite rod having a small brass cylinder installed at one end and a core of finely divided iron at the other, may be inserted into a tuned coil to obtain an indication of the tuning. With a signal being supplied to the receiver at the particular frequency of the circuit concerned, each end of the Wand should be placed through the center of the coil. Holes are provided in the coil shields for this test. A change in tuning will be produced by the presence of the brass cylinder or iron core and consequent change of receiver output occurs. If there is a decrease of output when either of the two ends are inserted, the tuning is correct and will require no adjustment. However, should there be an increase of output due to the iron core and decrease with the brass cylinder, an increase in inductance or capacitance is indicated as necessary to bring the circuit into line. The trimmer involved should therefore be increased accordingly. If the brass cylinder end causes an increase in output, while the iron end causes a decrease, reduction of inductance will be necessary to bring the circuit into alignment. This will be equivalent to decreasing the trimmer concerned.

Changes Indicated by Tuning Wand

Wand	Signal	Trimmer
Brass	Decrease	None
Iron	Decrease	
Brass	Increase	Decrease
Iron	Decrease	
Brass	Decrease	Increase
Iron	Increase	

I-F TRIMMER ADJUSTMENT

Six trimmers are associated with the three i-f transformers. Their locations on the chassis are shown by Figure 8. Each must be aligned to a basic frequency of **460 kc.** The last i-f transformer should be adjusted first, the one preceding it second and the operation carried through successive stages until the first transformer has been aligned. For such a process, it is necessary to feed the output of the Full Range Oscillator to the stages in their order of alignment, adjusting the trimmers of each and observing the effect at the second detector output on the Cathode-Ray Oscillograph. The most convenient point for connection of the Oscillograph is at the control grid of the RCA-6C5 first audio tube, with the vertical "Hi" input terminal attached to the grid connection and the "Gnd" to the chassis. The "Ext. Sync." terminals of the Oscillograph should be connected to the Frequency Modulator as illustrated in Figure 7. A .001 mfd. capacitor installed in series with the Oscillator "Ant." output lead will prevent the voltage constants of the stage being aligned from becoming upset. Proceed further as follows:—

(a) Place the receiver, Oscillograph and test Oscillator in operation. Set the receiver volume control to maximum and the range switch to Band "A". Tune the station selector to a point where no interference is caused by local stations or the local oscillator, removing the 6J7 tube if necessary. Turn the Oscillograph vertical "A" amplifier to "On" and advance the vertical gain control to its maximum position. Set the horizontal "B" amplifier to "Timing" and control its gain so that the luminescent spot sweeps a trace completely across the screen. Have the timing control adjusted to "Int."

(b) Attach the output of the test Oscillator to the control grid cap of the second i-f tube (RCA-6K7) and chassis ground. Tune the Oscillator

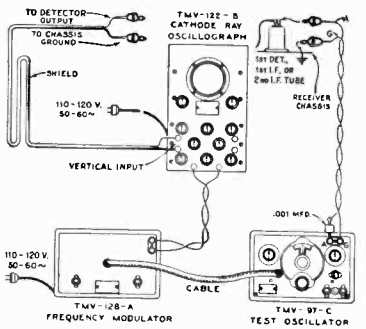


Figure 7—Alignment Apparatus Connections

to **460 kc.** having its modulation switch turned to "On". Regulate the output control until the signal produces a wave pattern on the Oscillograph screen, adjusting the Oscillograph frequency and range controls to give the desired number of cycles. Cause the image formed to stand still on the screen by manipulation of the "Sync." control. Use as low a signal

RCA MFG. CO., INC.

MODEL C15-3
Alignment, Part 2
Cathode-Ray Oscillograph Images for Alignment

output from the Oscillator as can be accurately observed at the Oscillograph. Then tune the two trimmers C-44 and C-45 of the third i-f transformer to produce maximum amplitude (vertical deflection) of the oscillographic image. Under this condition, the transformer will be sharply resonated to 460 kc.

(c) The Frequency Modulator should then be placed in operation and interconnected with the Full Range Oscillator by means of the shielded patch cord provided. Figure 7 shows the proper arrangement. Set the Frequency Modulator sweep range switch to its "Lo" position and turn the Oscillator modulation switch to "Off". Change the timing (Sync.) control of the Oscillograph to "Ext." and place the range switch to its No. 2 position. Then shift the tuning of the Oscillator so as to increase its frequency, until two distinct and similar waves appear on the Oscillograph screen and become coincident at their highest points. These curves will be found to occur at an Oscillator setting of approximately 540 kc. They will be identical in shape but appearing in reversed positions. Adjust the frequency control of the Oscillograph in order to cause the waves to conform with these requirements and to make them remain motionless on the screen. This will require a setting of approximately ½ clockwise rotation of the frequency control. The trimmers C-44 and C-45 should then be readjusted so that the two curves move together and become exactly coincident throughout their lengths, maintaining the maximum amplitude at which this condition can be brought about.

(d) Leaving the equipment connected and adjusted as above, change the Oscillator output to the control grid cap of the first i-f tube (RCA-6K7). Adjust the two trimmers C-37 and C-38 of the second i-f transformer until the forward and reverse waves appearing on the Oscillograph coincide throughout their lengths and have maximum amplitude.

(e) Change the test Oscillator output to the control grid of the first detector tube (RCA-6L7) without disturbing the connections and adjustments of the other apparatus. Then align the trimmers C-32 and C-33 of the first i-f transformer to produce waves of maximum coincidence and maximum amplitude. The shape of the composite wave obtained from this operation is a true representation of the overall tuning characteristic of the i-f system.

ANTENNA, DETECTOR AND OSCILLATOR

For Bands A and X, adjustments must be made at the high and low frequency ends of the range. On Bands B and C, alignment is required only at the high frequency end. Band D is permanently adjusted during manufacture, hence no alignment will be necessary in this range. Locations of the various antenna, detector and oscillator trimmers are shown on Figure 8. The test Oscillator should be removed from connection with the i-f system and its output attached to the antenna ground terminals of the receiver. No changes are to be made in the attachment of the Oscillograph at the second detector. During the adjustments, the Oscillator output should be regulated as often as is necessary to keep the oscillographic image as low as is practically observable. Such procedure will obviate apparent broadness of tuning which would result from avc action on a stronger signal. The sequence of alignment should be Band A, Band X, Band B and Band C. Proceed with the adjustments as follows:—

Calibration

Set the receiver range switch to Band A and rotate the station selector until the tuning capacitor plates are in full mesh (maximum capacity). Then move the main dial pointer until it points exactly to the horizontal line at the low frequency end of the dial A scale. Correct the setting of the vernier second hand pointer to read zero.

Band A

(a) With the receiver range switch on its Band A position, tune the station selector until the dial pointer is at a reading of 1720 kc. Adjust the Oscillator to 1720 kc. (modulation "On" and Frequency Modulator disconnected) and increase its output to produce a registration on the Oscillograph. Carefully align the oscillator, detector and antenna trimmers, C-25, C-14 and C-3 respectively, so that each brings about maximum amplitude of output as shown by the wave on the Oscillograph. It will be necessary to have the timing control of the Oscillograph on "Int." for this operation. Then shift the tuning control to "Ext." and place the Frequency Modulator into operation with its connections to the Oscillator and Oscillograph as shown on Figure 7. Retune the test Oscillator (increase frequency) until the forward and reverse waves show on the Oscillograph and become coincident at their highest points. Adjust the trimmers C-25, C-14 and C-3 again, setting each to the point which produces the best coincidence and maximum amplitude of the images.

(b) Remove the Frequency Modulator cable from the Oscillator and shift the signal frequency to 600 kc. Tune the receiver to pick up this signal, disregarding the dial reading at which it is best received. Then insert the Frequency Modulator plug and retune the Oscillator until the two similar forward and reverse waves appear on the screen. It is advisable to shift the Oscillator to its 200—400 kc. range and use the third harmonic of the generated signal in order to obtain the desired range of sweep for this adjustment. The trimmer C-23 should then be adjusted until a point is reached where the waves have the greatest amplitude. It will be unnecessary to rock the tuning condenser for this operation inasmuch as the Frequency Modulator is automatically producing the same effect. After completing this adjustment, the trimmer C-25 should be realigned as in (a) to correct for any change in the oscillator high frequency tuning which has been caused by the adjustment of C-23.

Band X

(a) Disconnect the Frequency Modulator and tune the test Oscillator to a frequency of 400 kc. (Modulation "On") Place the receiver range switch in its Band X position and turn the station selector until the dial pointer reads 400 kc. Adjust the Oscillograph timing control to "Int." Then align each of the trimmers C-26, C-15 and C-4 to the point producing maximum output at the Oscillograph. Place the Frequency Modulator in operation and attach it to the Oscillator in the normal manner. Change the Oscillograph timing to "Ext." Increase the frequency of the Oscillator (modulation "Off") until the two waves appear and become coincident at their highest points, approximately at 462 kc. They may be made to remain stationary on the screen by manipulation of the Oscillograph range switch and frequency control. Readjust the three trimmers C-26, C-15 and C-4 to give maximum amplitude and complete coincidence of the waves.

(b) Change the test Oscillator so that it delivers a signal of 150 kc. with the Frequency Modulator disconnected. Tune this signal on the receiver which has previously been set to Band X, disregarding the dial reading at which the signal is best received. Then interconnect the Frequency Modulator with the Oscillator and retune the latter to the point at which the two similar waves appear on the screen. Adjust the trimmer C-27, for maximum amplitude of the wave images. Rocking of the tuning condenser will not be necessary as the Frequency Modulator duplicates such an operation. Repeat the alignment of C-26 as outlined in (a) to correct for any reflective error brought about by the adjustment of C-27.

Band B

(a) Advance the receiver range switch to its Band B position and tune the station selector to a dial reading of 6132 kc. Set the test Oscillator to this same frequency (Modulation "ON" and Frequency Modulator disconnected) and increase its output until a suitable indication is apparent on the Oscillograph. Then adjust the trimmer C-76 to the point producing the maximum amplitude of the image. Two positions will be found on this trimmer which causes maximum amplitude. The one of least capacitance is correct and should be used. Check for the "image" signal, which will be received at 5212 kc. on the dial if the adjustment of C-76 has been properly made. An increase in Oscillator output may be necessary for this test, however its frequency should not be changed nor any trimmer adjustments made on the receiver.

(b) Return the station selector to the 6132 kc. reading and align the detector and antenna trimmers C-13 and C-2 respectively, for maximum (peak) output as shown by the Oscillograph. No further adjustments are to be made on Band B.

Figure 6—Cathode Ray Images for I.F. System

Band C

(a) Turn the range switch of the receiver to its Band C position and tune the station selector until the dial pointer reads 18,000 kc. Set the test Oscillator to this same frequency (Modulation "On" and Frequency Modulator disconnected), regulating its output to the level required for convenient observation. Adjust the trimmer C-75 to the point producing maximum output as indicated on the Oscillograph. Check for the presence of "image" signal by tuning the receiver to 17,080 kc. The 18,000 kc. signal of the Oscillator will be received at this point if the adjustment of C-75 has been properly made, using the position of minimum capacitance giving maximum receiver output. It may be necessary to increase the output of the Oscillator in order to get an indication of the "image". *No adjustments should be made during this check.*

(b) Return the receiver tuning to 18,000 kc., realign C-75 if necessary, and then adjust the detector and antenna trimmers C-12 and C-1 for maximum signal output as evidenced by the oscillographic image. No further adjustments are to be made on Band C.

Band D

No adjustments are required on this band.

To align the receiver by other means than those explained in the above procedure will require the use of an output indicator and a suitable test oscillator. The output device should be connected at the receiver output, either to the voice coil circuit or to the output transformer primary. Successive points of connection of the test Oscillator will be identical to those specified for Cathode-Ray alignment, the same test frequencies being used in each case. The process of sweeping the frequency of the test Oscillator with the Frequency Modulator will of course be omitted, instead, the trimmers throughout the system should be adjusted to produce maximum indication at the output. It will be essential to rock the tuning condenser for the low frequency adjustments of Bands X and A, but to cause maximum output rather than the type of indication afforded by the Oscillograph. The receiver volume control must be kept at its maximum setting and for each test, the Oscillator output regulated to maintain an indication which will be as small as possible. Under this condition, the receiver will be operating at maximum gain, but receiving only a weak signal of insufficient strength to cause appreciable a.v.c. action. This requirement is of importance in either method of procedure, since the a.v.c. will have a definite effect on the indication if a more intense input is used.

Dial Drive

The dial drive and station indicator system are of new and unique design. Five individual dial scales, each with full 180 degree band spread, are provided, one for use on each band. The scales are eccentrically arranged on a rotary disc and adapted to operate in connection with the band change switch so that as the switch is shifted to a certain band, the corresponding dial scale rotates into position. For other positions of the band switch, a similar scale selection takes place, there being only one scale visible at a time. The driving mechanism for the dial and condenser has tuning ratios of 10 to 1 and 50 to 1. Control may be interchanged between these two ratios by push-in operation of a positive action clutch which is actuated by the tuning knob. From the clutch and ratio controlling mechanism, the drive system interlinks with the tuning condenser, main dial pointer and vernier dial pointer through means of fibre and brass gears. The ratio of vernier rotation to the main pointer is 20 to 1. An intermediate gear is used in the system to reduce gear back-lash. This gear is suspended in position with two tension springs which maintain the proper mesh at all times. A flexible coupling disc is used between the drive and the condenser shaft.

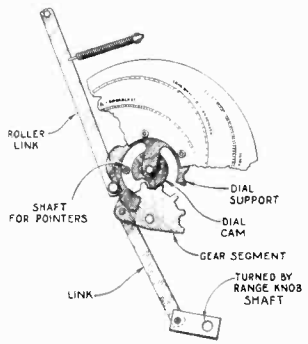


Figure 9—Selector Dial Change Mechanism

Dial Adjustment

Figure 9 illustrates the relations of the various parts of the dial mechanism when it is in its A—Broadcast position and the range switch is likewise turned to its Band A setting. In re-assembling the dial after repair, see that the gears are meshed in accordance with the diagram, at the same time noting that the lever which is attached to the range switch shaft is in the position as shown.

Phonograph Attachment

The audio system of this receiver may be adapted for use in the reproduction of phonograph records by proper connection and arrangement of an external turntable and its associated accessories. The relatively high amplification due to the number of a-f stages employed, necessitates that great care be taken when the circuits are changed for phonograph input. It is recommended that the turntable used be fed directly to the grid circuit of the first audio stage, with suitable switching installed for changing between radio and phonograph operation. Bias of the stage must be maintained by addition of a resistor, to be shorted out for the radio position of the switch. This resistor should be by-passed by a condenser of appropriate rating. Diagrams covering suggested methods of phonograph attachment are given in Figures 10 and 11 with installation details. Hum may possibly be encountered from lack of shielding and improper placement and shielding of the input transformer if these items are not taken care of during re-arrangement of the circuits. All wiring should be installed in a substantial and permanent manner.

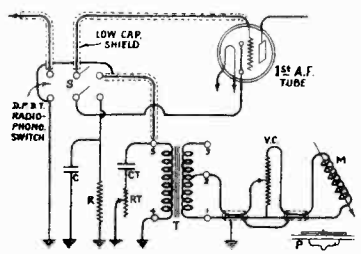


Figure 10—General Phonograph Connections

INSTALLATION

Change the receiver circuits and add phonograph connections to conform with the above schematic. Resistor R and capacitor C must be used to provide the proper bias. Thoroughly shield leads where indicated, keeping them clear of a-c circuits and transformers. Place transformer T so as to obtain minimum lengths of secondary leads and mount it in the position which does not cause hum.

PARTS REQUIRED

M—Magnetic Pickup —Low Impedance
VC—Volume Control —100 ohms
R—Biasing Resistor— 2500 ohms
C—By-pass Condenser —10 mfd.
T—Phono Input Transformer—Stock No. 7445
P—Phono Turntable Mechanism
C_1—Condenser—.05 mfd.
R_1—Variable Resistor —0 to 10,000 ohms

Radiotron Socket Voltages

The voltage values indicated from the Radiotron socket contacts to ground on Figure 8 will serve to assist in locating causes for faulty operation when existent. Each value as specified should hold within + 20% when the receiver is normally operative at the rated supply voltage. Variations in excess of this limit will usually be indicative of trouble in the basic circuits. The voltages given on the diagram are actual operating values and do not allow for inaccuracies which may be caused by the loading effect of a voltmeter's internal resistance. This resistance should be duly considered for all readings. The amount of circuit resistance shunting the meter during measurement will determine the accuracy to be obtained, the error increasing as the meter resistance is comparable to or less than the circuit resistance. For the majority of readings, a meter having an internal resistance of 1000 ohms per volt will be satisfactory when the range used for each check is chosen as high as possible consistent with good readability.

Universal Transformer

The wiring of the special transformer used in some models of this receiver is given by Figure 4. This transformer is adaptable to several ranges of voltage, hence, in cases of receiver inoperation, the connections should be checked to assure that they are correct for the voltage being used.

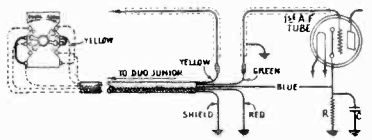


Figure 11—Duo Junior Connections

INSTALLATION

Arrange connections from Duo Junior output cable to receiver so that completed wiring is in accordance with schematic above. Add two jumpers shown by heavy full lines to Duo Junior Radio-Phono switch. Resistor R and capacitor C must be added to receiver circuit to maintain bias. Keep all leads as short as possible and well shielded where indicated.

PARTS REQUIRED

Model R-93—Duo Junior Phonograph
R—Biasing Resistor— 2500 ohms
C—By-pass Condenser —10 mfd.

FREQUENCY RANGES

Band X	140—	410 kc.
Band A	540—	1,800 kc.
Band B	1,800—	6,000 kc.
Band C	6,000—	18,000 kc.
Band D	18,000—	60,000 kc.

ALIGNMENT FREQUENCIES

Band X	150 kc. and 400 kc.
Band A	600 kc. and 1720 kc.
Band B	6132 kc.
Band C	18000 kc.
Band D	*none required*

MISCELLANEOUS

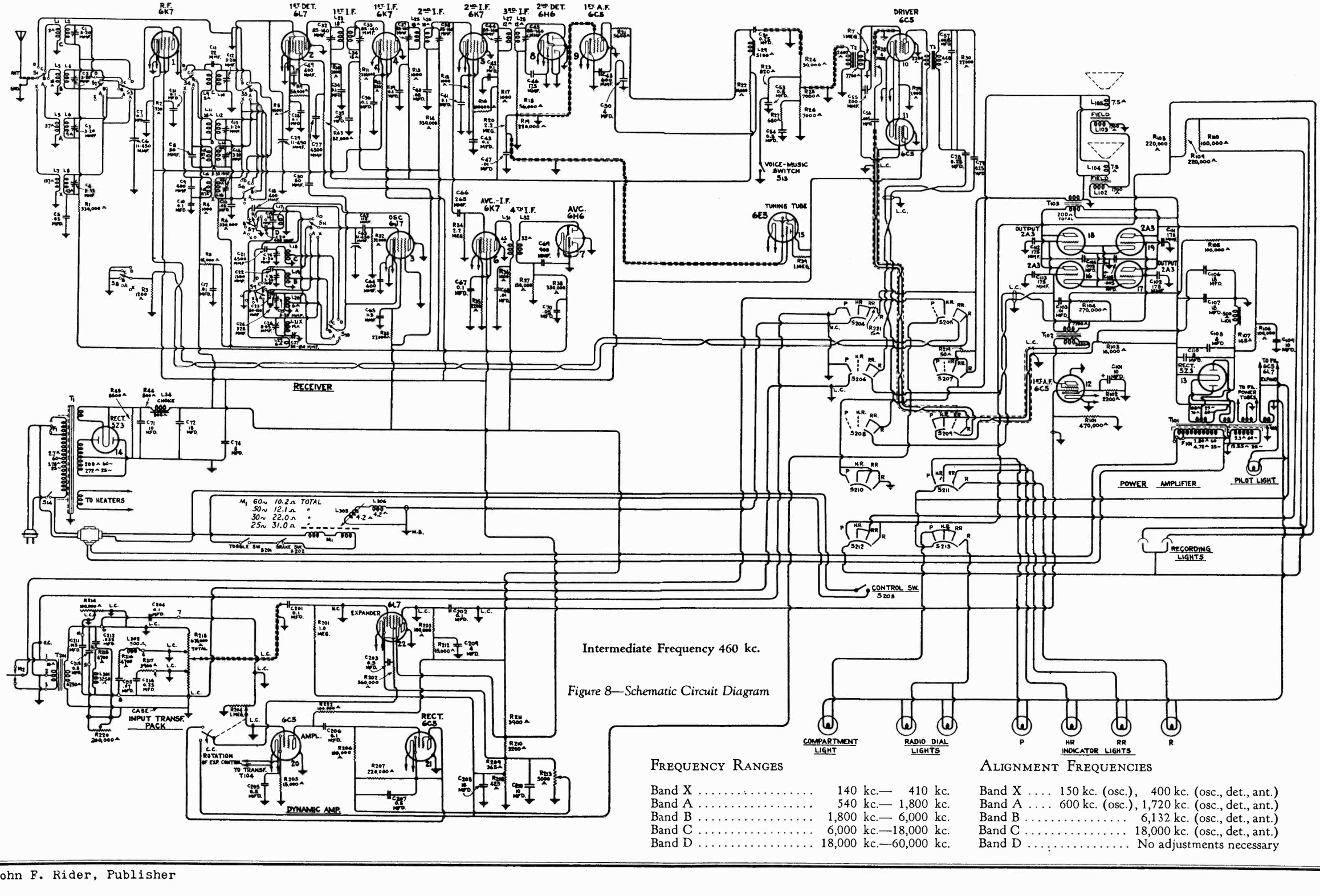
Power Consumption	145 watts
Undistorted Output	10 watts
Maximum Output	15 watts
Loudspeaker	12 inch, Electrodynamic
Voice Coil Impedance	7.5 ohms at 400 cycles
Intermediate Frequency	460 kc.

VOLTAGE AND FREQUENCY

Rating A	105—125 volts, 50—60 cycles
Rating B	105—125 volts, 25—60 cycles
Rating C	100—130/140—160/195—250 volts, 40—60 cycles

MODEL D22-1
Schematic

RCA MFG. CO., INC.



Intermediate Frequency 460 kc.

Figure 8—Schematic Circuit Diagram

Frequency Ranges

Band X	140 kc.— 410 kc.
Band A	540 kc.— 1,800 kc.
Band B	1,800 kc.— 6,000 kc.
Band C	6,000 kc.—18,000 kc.
Band D	18,000 kc.—60,000 kc.

Alignment Frequencies

Band X	150 kc. (osc.), 400 kc. (osc., det., ant.)
Band A	600 kc. (osc.), 1,720 kc. (osc., det., ant.)
Band B	6,132 kc. (osc., det., ant.)
Band C	18,000 kc. (osc., det., ant.)
Band D	No adjustments necessary

MODEL D22-1
Power Amplifier
Chassis Wiring

RCA MFG. CO., INC.

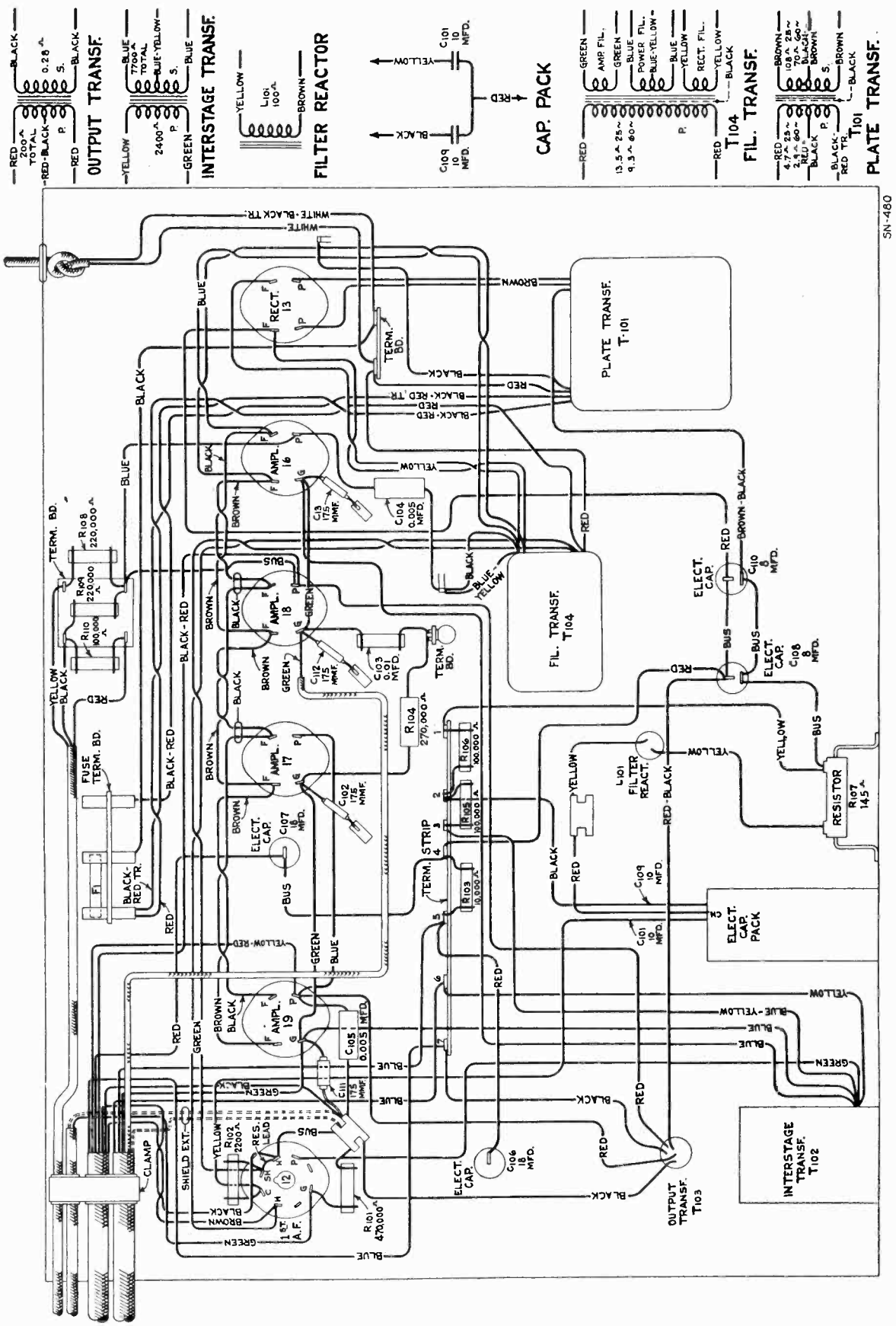


Figure 10—Power Amplifier Wiring

RCA MFG. CO., INC.

MODEL D22-1
Chassis Wiring

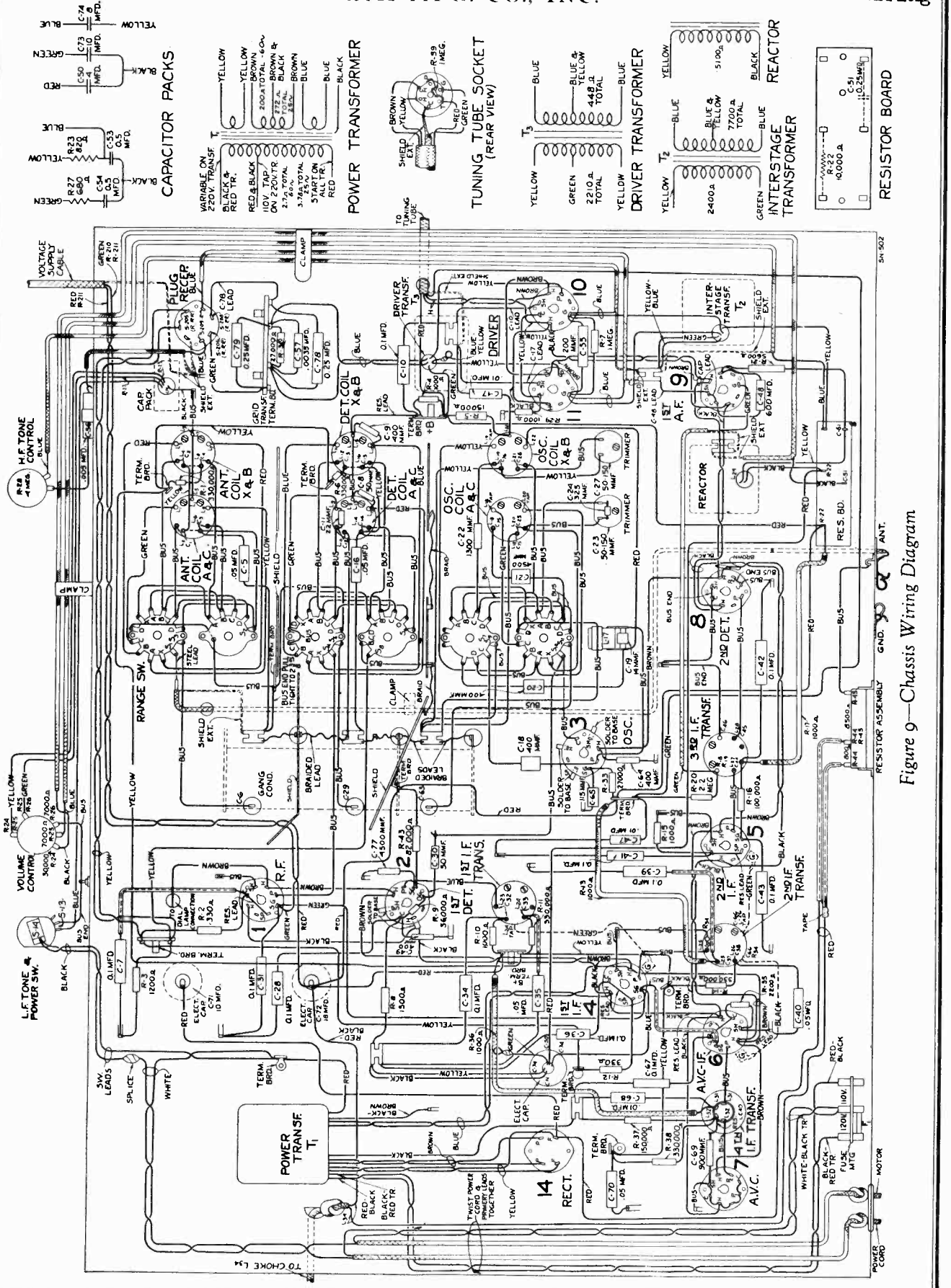
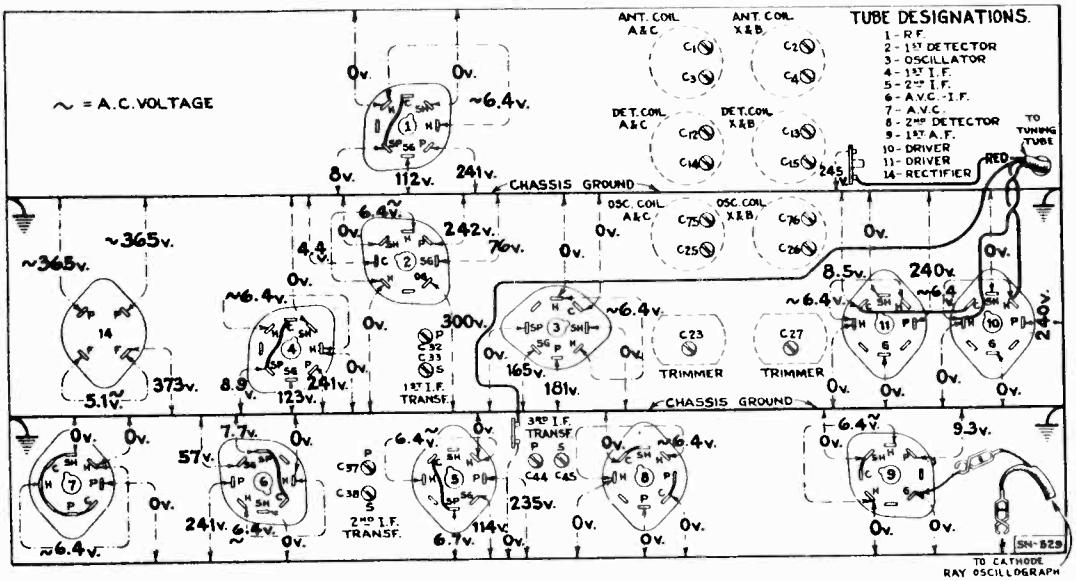


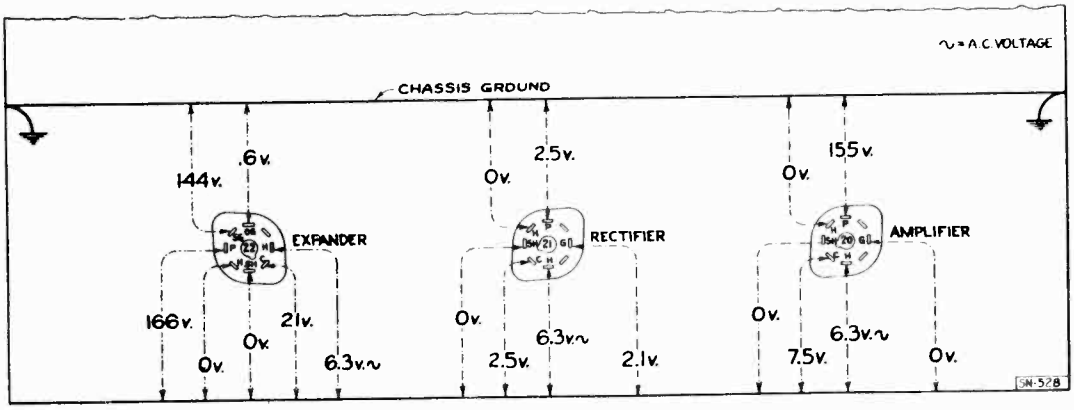
Figure 9—Chassis Wiring Diagram

MODEL D22-1
Voltage, Socket

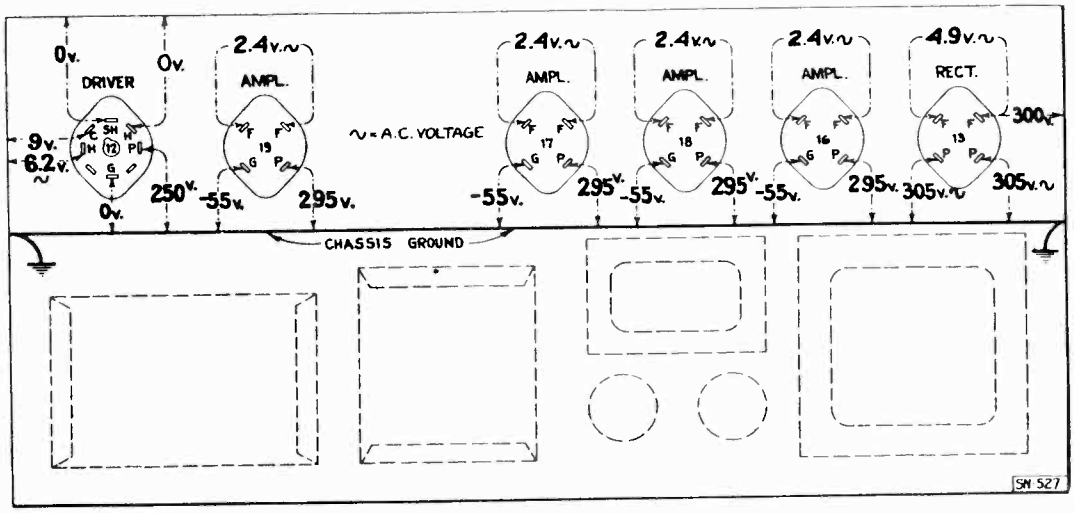
RCA MFG. CO., INC.



Receiver Chassis



Dynamic Amplifier



Power Amplifier

Figure 4—Radiotron Socket Voltages
Measured at 115 volts, 60 cycle supply—No signal being received

MODEL D22-1
Dynamic Amplifier Wiring
Pickup Details, Transformer
Dial Mechanism Details

RCA MFG. CO., INC.

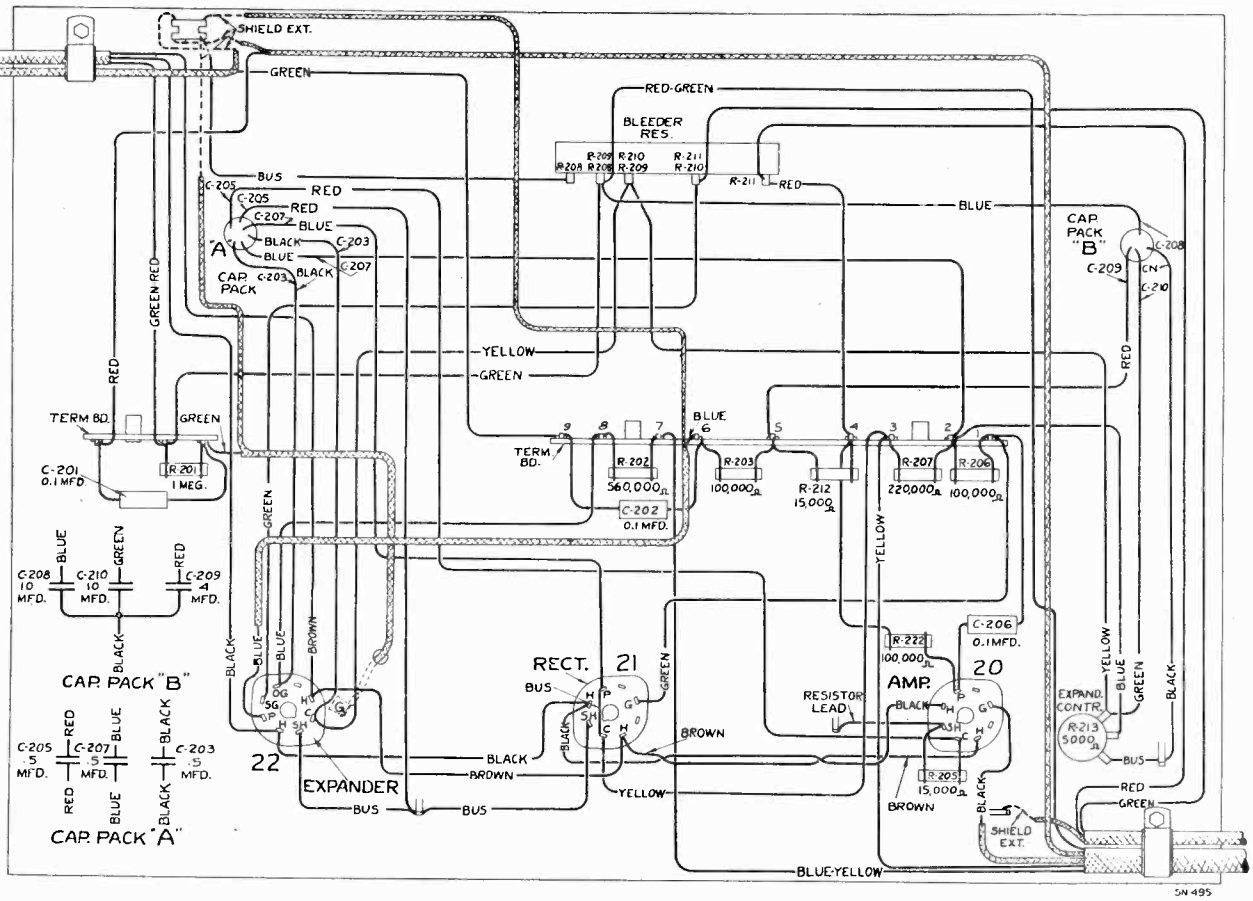


Figure 12—Dynamic Amplifier Wiring

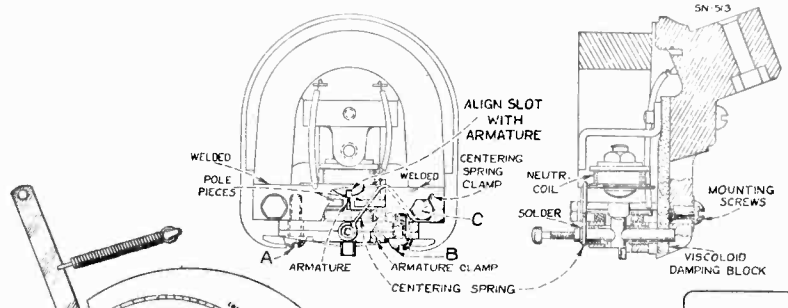


Figure 16—Details of Pickup

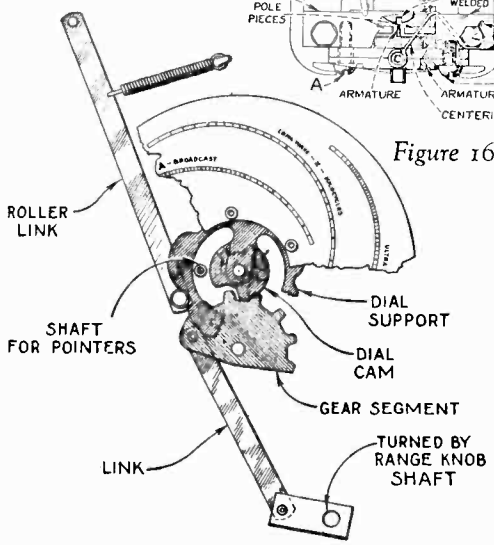


Figure 6—Selector Dial Change Mechanism

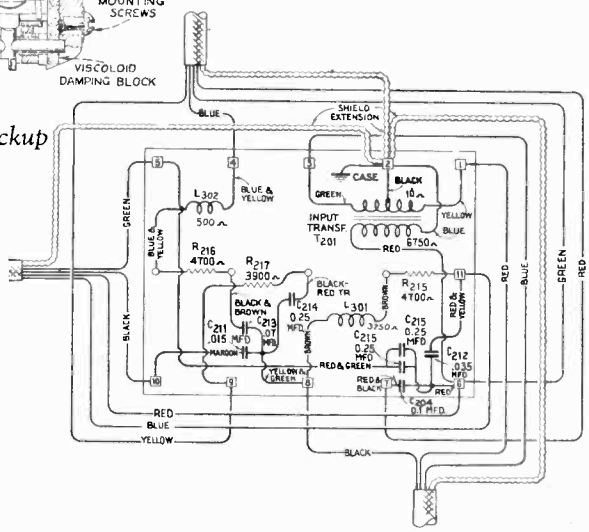


Figure 7—Input Transformer Wiring

General Description

The RCA Victor Model D 22-1 is an instrument of de luxe quality and performance. It consists of a thirteen-tube, five-band radio receiver; a six-tube, high-level power output amplifier; and a three-tube dynamic amplifier. An automatic phonograph is part of the assembly. Home recording facilities are provided so that recordings may be made direct of a radio program, or, by means of a microphone included with the equipment, of any desired speech or music. The high level of sound energy obtainable from the output of the instrument is capably handled by two of the new Super-Sensitive, twelve-inch, dynamic loudspeakers. The important features which make this instrument outstanding are as follows:—

Dynamic Amplifier

Limitations imposed by present methods of disc recording necessitate a constricted range of sound intensity which may be recorded. The *minimum* intensity of sound which may be recorded is determined by unavoidable record surface-noise which masks the recorded sound when such sound approaches down towards the intensity of the noise. The *maximum* sound intensity which may be recorded is determined by the thickness of the record groove-wall into which the record cutting stylus makes an impression of the original sound. The depth of cutting is, therefore, regulated so that the stylus will not break over into the adjacent groove. It is because of these upper and lower limits that the sound reproduction cannot be identical to the original sound which is produced in the recording studio. To keep the recorded sound within the limiting intensities, the recording control engineer regulates the recording amplifiers accordingly.

The dynamic amplifier of this reproducing instrument is designed to compensate for the recording limitations of intensity range. It serves to restore the original intensity relations of the recorded sound by varying the amplification of the reproducing amplifier in direct accordance with the average intensity value of the sound. Thus, when there is a prevailing rise in the intensity of the recorded sound, the dynamic amplifier increases in gain accordingly, and conversely when there is a prevailing tendency toward a decrease of the recorded sound, the dynamic amplifier decreases in gain. The functions of the dynamic amplifier are particularly advantageous in the reproduction of symphonic and certain other types of music where very great ranges of sound intensity are encountered. The dynamic amplifier causes the very loud or fortissimo and the very soft or pianissimo passages to be reproduced in their natural relations, although they may have been somewhat modified in the actual recording.

Power Amplifier

In order that the dynamic amplifier may bring about its designed purpose, the amplifier and reproducing system into which it works must have an undistorted range of amplification consistent with the degree of volume expansion provided in the dynamic amplifier. The power amplifier is, therefore, designed to have a maximum output of 25 watts. This unusually high level is obtainable from four RCA-2A3 Radiotrons which are arranged in a parallel push-pull Class "A" system. The two twelve-inch loudspeakers faithfully reproduce the amplified sound at all intensities from the minimum to the maximum.

Automatic Record Changer

An improved automatic mechanism is used in this model. It is of the record ejector type, having a record capacity of seven for the ten-inch type, and a capacity of eight for the twelve-inch type. The turntable speed is fixed at 78 r.p.m. by the design of the drive motor and the intermediate gear mechanism. *This speed is invariable and does not vary as long as the supply line frequency remains constant.* The instrument may be purchased with any one of five ratings as specified under Electrical Specifications. *It is very important that a machine of any particular rating be operated at the frequency for which it is designed and rated.* Attempts to operate at other frequencies will result in improper reproduction from the phonograph system. The ejecting mechanism is arranged so that it will trip on various types of records. This is obtained by having a trip mechanism which is actuated by the rate of needle acceleration toward the center of the record.

Magic Brain

The radio receiver includes the "Magic Brain" unit for maximum all-around efficiency. This unit is a scientifically correct co-ordination of all the parts for the r-f, oscillator, and first detector functions of a Superheterodyne Receiver. Such design of the important head end, or "Magic Brain" unit, gives greater efficiency in the short-wave ranges as all lead lengths are kept as short as possible, and all sockets and other parts are located for best possible operation.

Magic Eye

A cathode-ray tube whose fluorescent screen has the appearance of a human eye, is used for visually indicating when the receiver is accurately tuned to the incoming signal. This tube is of new design. It contains two groups of elements; one group operates as an amplifier and the other group operates as a cathode-ray tube.

The cathode-ray section consists of a conically shaped luminescent screen, a cathode, and a control electrode. The detected signal from the receiver is applied through the amplifier section of the tuning tube to the control electrode of the cathode-ray section. This control electrode, in turn, affects the electron stream emitted by the cathode in such a manner as to cause a triangular shadow on the luminescent screen. The size of the shadow caused by the control electrode is determined by the strength of the incoming signal, so that a change-of-tuning is readily exhibited on the cathode-ray screen, and therefore tuning to exact resonance can be definitely obtained.

RCA All-Metal Tubes

The new metal tubes are used in the radio receiver unit, in the dynamic amplifier unit, and in one stage of the power amplifier unit. These tubes make possible a greater range of stable amplification not previously attainable with corresponding glass types. Their metal envelopes form a perfect electrostatic and electromagnetic shield, precluding the former necessity for elaborate shielding by means of cans. The metal tubes are especially adaptable to the modern, extended-range receivers because of their efficient shielding and their favorable internal characteristics.

Selector Dial

The dial drive and station indicator system are of unique design. There are five individual dial scales, each with full 180 degree band spread, one for use on each of the five tuning bands. These scales are eccentrically arranged on a rotary disc which operates in conjunction with the range-selector switch, so that as the switch is shifted to a particular band, the corresponding dial scale rotates into position, leaving the remaining four scales concealed. The driving mechanism for the dial pointer and the variable gang-condenser has tuning ratios of 10 to 1 and 50 to 1. Control may be interchanged between these two ratios by a push-pull operation of a positive-action clutch which is actuated by the tuning control knob. A vernier dial with an auxiliary pointer (band-spreader) is provided for the accurate tuning required for short-wave reception. The vernier pointer is geared to the main dial-shaft through a mechanism which causes it to rotate twenty times to a single rotation of the main dial-pointer. The dial-drive mechanism connects to the variable gang-condenser by means of a flexible coupling. This coupling arrangement together with the new shock-proof condenser mounting makes possible the rigid attachment of the drive mechanism to the receiver-chassis base without causing serious microphonic coupling between the base and the tuning condenser.

Electrical Circuits

The circuits of this instrument are arranged so that for the radio function, the incoming signal is amplified and detected in the normal process and is then transmitted to the power output amplifier through a driver stage which is part of the radio chassis. The phonograph function is accomplished through a system which includes the dynamic amplifier, a separate driver stage, and the same power amplifier as used for radio. These circuits are controlled by means of a ganged rotary-switch which is attached to the motor board in the record-playing compartment. An indicating system of pilot lamps behind engraved windows, readily displays to the operator the position of the change-over switch. It is to be noted that the dynamic amplifier works only in conjunction with the phonograph function. A control is included so that "dynamic amplification" may be eliminated if desired by the listener. The following features of electrical design are of particular importance:

Dynamic Amplifier

The purpose of this unit has been previously described. Electrically, it consists of an RCA-6L7 operating as an audio expander, an RCA-6C5 operating as an audio amplifier which, in turn, feeds another RCA-6C5 operating as an audio rectifier. The audio signal obtained from the magnetic pick-up is boosted by the input transformer and then fed to the paralleled inputs of the RCA-6L7 expander and the RCA-6C5 audio amplifier. Compensation filters are associated with the input-transformer circuit to correct the frequency response of the reproducing system so as to compensate for the recording characteristic. The signal from the input transformer is supplied to the first control-grid of the RCA-6L7 through the manual volume-control potentiometer (R-218), and is simultaneously applied through the expander control (R-204) to the control-grid of the first RCA-6C5. The signal applied to this latter tube is first amplified and then fed to the RCA-6C5 audio-rectifier stage. This latter stage rectifies the audio signal by operating as a diode. Its output is of the nature of a pulsating direct current, the amount varying in direct relation with the average value of intensity of the audio signal. The pulsating voltage due to rectification in the RCA-6C5 appears across resistor (R-207) and is applied through a delay filter (R-202 and C-203), to an auxiliary control-grid of the RCA-6L7. The value of the bias on this auxiliary control-grid determines the amplification of the RCA-6L7 expander stage. The gain of the dynamic amplifier is, therefore, automatically regulated by the average intensity of the audio signal.

Power Amplifier

The power amplifier unit contains four RCA-2A3 Radiotrons and a single RCA-5Z3 rectifier Radiotron. The amplifier tubes are arranged in parallel push-pull and are operated with fixed bias. Their grids are coupled to the radio chassis directly through a coupling transformer (T-3). The same grids are coupled to the phonograph driver-stage (RCA-6C5) through another transformer (T-102). There are two power transformers in the power-supply system; one supplying the high voltage necessary for the plate circuits, and the other supplying the heater voltages for the tubes of the power amplifier and dynamic amplifier. The home-recording level-indicator lamps are supplied from the plate circuit of the power-amplifier stage. The high level of audio energy from the output stage is delivered to the two heavy-duty, super-sensitive, electrodynamic loudspeakers through a step-down matching transformer. Suitable switching is incorporated in the voice-coil circuit for connecting in the pickup as a cutting-head for home recording.

Automatic Signal Stabilizer

The heterodyne oscillator circuit used in the radio receiver is an improved type having exceptional frequency stability and uniformity of output over its various tuning ranges. It operates on fundamental frequencies and the output is fed to the first-detector hexode tube (RCA-6L7) on an auxiliary mixing grid. The oscillator signal is at all times above the frequency

of the incoming signal by 460 kc. As shown by the schematic diagram, the cathode of the oscillator tube is above ground potential for r.f. while the plate is effectively at ground potential. This particular arrangement, together with the plate and screen series resistors, makes the circuit independent of supply voltage variations in regard to stability and uniformity of output. Separate oscillator coils are used for each of the tuning ranges. The switching between the ranges is such as to short-circuit certain unused coils which would absorb energy from the operative coils because of their natural tuning in the band being used.

Automatic Sensitivity Booster

The sensitivity on the short-wave bands, B, C, and D is higher than that of bands A and X. This difference is necessary because of the weaker signal strength normally encountered in the short-wave bands as compared to those of the longer-wave bands. Change in sensitivity from band to band is accomplished by variations of the fixed d-c bias on the r-f and i-f tubes. This change is automatically made by the range switch when it is rotated.

Automatic Volume Control

The a.v.c. operates as a parallel system, being fed from the i-f output through an auxiliary amplifier tube, an RCA-6K7. This stage has an untuned input and broadly resonated output, accomplished by the natural-period fourth i-f transformer. A double-diode RCA-6H6 operates as the a.v.c.-detector. It receives the incoming signal at 460 kc. from the a.v.c. i-f stage and rectifies it. This causes a signal d-c component to appear across the diode load resistor (R-37). This d-c component is applied to the control-grid of the r-f, first detector, and i-f tubes through resistor-condenser filters. The value of the bias obtained by this process is in accordance with the intensity of the received signal and governs the amplification of the r-f, first detector, and i-f stages, thereby maintaining the same level of input to the second-detector stage whenever there are fading tendencies, and similarly when tuning from station to station. For a given percentage of modulation, therefore, and within the range of the automatic-volume-control system, a constant output level will be obtained at the output of the receiver.

Band D Tuning

Special notice should be taken of the manner of tuning the ultra-high-frequency band of this receiver. The r-f stage is unused when the range switch is turned to its Band D position and the signal is fed directly from the antenna to the first-detector grid circuit. The inductance of the circuit consists of a short length of bus wire to which the antenna lead is attached at a definite predetermined point. The total length of this inductive wire, from the stator of the tuning capacitor to ground, represents the secondary of a high-frequency autotransformer, while the inductive section included between the antenna lead-tap and ground forms the primary. Alteration of the dimensions and position of this wiring will change the tuning and alignment of the circuit, resulting in poor operation or complete failure of operation. *It is therefore necessary when servicing to avoid any changes in the wiring which includes Band D detector and oscillator r-f circuits. If unavoidable, the arrangement must be restored to its exact original condition.* Similar caution should be observed when exchanging by-pass condensers in these same circuits, since their values, physical position, length of leads, quality of dielectric, etc., are critical, and variation will definitely affect operation of the receiver. The small heater by-pass condensers and ground terminals at the tube socket are very important in this respect.

Power Supply

The voltages for the radio receiver and plate voltage for the dynamic amplifier are supplied separately from

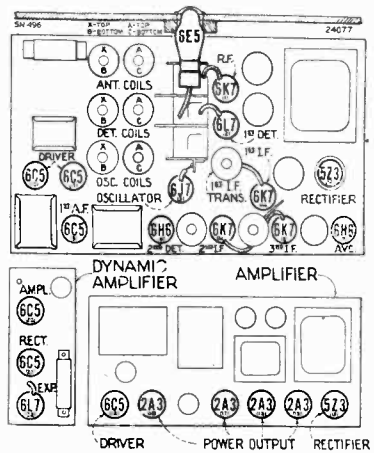


Figure 1—Radiotron and Coil Locations

a power transformer and an RCA-5Z3 rectifier stage. The voltages for the power amplifier and the filament voltages for the dynamic amplifier are supplied from two power transformers and a single RCA-5Z3 rectifier tube.

An efficient electro-static shield is placed in each of the power-supply transformers to isolate the primary and secondary for radio frequency. This isolation prevents r-f disturbances which are on the supply line from entering the receiver circuit and causing interference, and at the same time eliminates the tendency of the receiver to re-radiate into the line.

Compensated Volume Controls

Manual volume control of the radio is by means of an acoustically tapered potentiometer which conveys the audio output of the first a-f stage to the interstage coupling transformer. This control has tone compensation produced by filters connected to two points thereon. These filters give the correct aural balance at different volume settings. A music-speech control is provided in one of the volume control filter circuits for use in obtaining good speech intelligibility. On the speech position, the low-frequency tones are reduced. The phonograph volume control is likewise compensated at two points. A high-frequency tone control is connected from grid to grid of the RCA-6C5 driver tubes of the radio chassis to enable reduction of static and incidental noises which interfere with reception. Two tone controls are used in the phonograph system, one of which (left-hand in record compartment when facing cabinet) reduces low-frequency response (*maximum lows — counter-clockwise,*) and the other (right-hand) reduces high-frequency response (*maximum highs — clockwise*). Each is continuously variable and may be adjusted by the listener to produce the balance of tone which is most pleasing.

SERVICE DATA

The various diagrams of this booklet contain such information as will be needed to isolate causes for defective operation when such develops. The values of the various resistors, capacitors, coils, etc., are indicated adjacent to the symbols signifying these parts on the diagrams. Identification titles such as R-3, L-2, C-1, etc., are provided for reference between the illustrations and the Replacement Parts List. These identifications are in a sequence which begins at the left of the diagram (antenna) and they increase numerically from left to right as a signal would proceed through the circuit, thus facilitating location of such parts on the schematic diagram. The coils, reactors, and transformer windings are rated in terms of their d-c resistance only. Resistances of less than 1 ohm are generally omitted.

Alignment Procedure

Fourteen alignment trimmers are provided in the r-f, first detector, and oscillator tuning system and six are used in the i-f system. All of these are accurately adjusted during manufacture and should remain in proper alignment unless affected by abnormal conditions of climate or have been altered by other means. Loss of sensitivity, improper tone quality and poor selectivity are the usual indications of improper alignment.

Correct performance of the receiver can only be obtained when the trimmer adjustments have been made by a skilled service man with the use of adequate and reliable test equipment. Such apparatus as may be required for alignment of this particular instrument is illustrated and described on a separate page of this booklet.

The extensive frequency range of this receiver necessitates a more or less involved method of alignment. However, if the following directions are carefully applied, normal performance of the instrument will be obtained.

Two methods of alignment are applicable. One utilizes a cathode-ray oscillograph as a means of output indication and the other follows former procedure where a glow-type indicator, or meter, is used. The oscillographic method is much to be preferred, since greater accuracy is possible from the type of indication afforded. There are no approximations necessary as with the meter or aural methods, but each adjustment can be made with definite precision. Both methods are hereinafter outlined so that the alignment operations may be made in accordance with the equipment available.

It is wise to determine the necessity for alignment, as well as the direction of mis-alignment before making adjustments. The RCA Tuning Wand is an instrument designed particularly for such a purpose.

Its use is outlined as follows:—

The Tuning Wand consists of a bakelite rod having a small brass cylinder at one end and a core of finely divided iron at the other. It may be inserted into a tuned coil while a signal of the normal resonant frequency is being supplied to such a coil in order to obtain an indication of the accuracy of the tuning. Holes are provided at the top of r-f shield-cans for entrance of the Wand. The presence of either end of the Wand will cause a change in tuning which will be indicated at the receiver output as an increase or decrease in signal level. If there is a decrease of output when either end is inserted, the tuning is correct and will require no adjustment. However, should there be an increase of output due to the iron core and a decrease with the brass cylinder, an increase in inductance or capacitance is indicated as necessary to bring the circuit into alignment. The trimmer involved should, therefore, be increased in capacitance. If the brass-cylinder end causes an increase in output while the iron end causes a decrease, reduction of inductance or capacity will be necessary to place the circuit in alignment. Therefore, the associated trimmer should be decreased in capacitance. The following tabulation gives the various changes and the adjustments required:

Wand	*Signal*	*Trimmer*
Brass	Decrease	None
Iron	Decrease	
Brass	Increase	Decrease
Iron	Decrease	
Brass	Decrease	Increase
Iron	Increase	

CATHODE-RAY ALIGNMENT

Equipment

A standard source of alignment frequencies is required. Such a source should consist of an RCA Full-Range Oscillator, Stock No. 9595. Output indication should be by means of an RCA Cathode-Ray Oscillograph, Stock No. 9545. An RCA Frequency Modulator, Stock No. 9558, will be needed to sweep the generated signal and synchronize it with the Oscillograph in order to obtain visual representation of the resonant characteristic of the circuit being tuned on the cathode-ray fluorescent screen.

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Alignment, Part 2
Cathode-Ray Oscillograph
Alignment Images

I-F Trimmer Adjustments

Six trimmers are associated with the three i-f transformers. Their locations on the chassis are shown by Figure 4. Each must be aligned to a basic frequency of 460 kc. The last i-f transformer should be adjusted first, the one preceding it second and the operation carried through successive stages until the first transformer has been aligned. For such a process, it is necessary to feed the output of the Full-Range Oscillator to the stages in their order of alignment, adjusting the trimmers of each and observing the effect at the second-detector output on the Cathode-Ray Oscillograph. The most convenient point for connection of the Oscillograph is at the control-grid of the RCA-6C5 first audio tube, with the vertical "Hi" input terminal attached to the grid connection and the "Gnd" to the chassis. The "Ext. Sync." terminals of the Oscillograph should be connected to the Frequency Modulator as illustrated in Figure 2. A .001 mfd. capacitor installed in series with the Oscillator "Ant." output lead will prevent the voltage constants of the stage being aligned, from becoming upset.

Figure 2—Alignment Apparatus Connections

The vertical "A" amplifier should be "On" for the ensuing adjustments and its gain control kept at maximum. For each adjustment, the Oscillator output must be regulated so that the image obtained on the Oscillograph screen will be of the minimum size convenient for accurate observation. Proceed further as follows:—

(a) Place the Receiver Oscillograph, and Test Oscillator in operation. Set the receiver **Range** switch to Band "A" and tune the station selector to a point where no interference will be encountered from signal pickup or from the RCA-6J7 oscillator, removing the tube if necessary. Set the Oscillograph horizontal "B" amplifier to "Timing" and control its gain so that the luminescent spot sweeps a straight line trace completely across the screen. Place the timing control to "Int." Adjust the intensity and focusing controls of the Oscillograph to produce the correct size and strength of spot.

(b) Attach the output of the test Oscillator between the control-grid cap of the second i-f tube (RCA-6K7) and chassis ground as shown typically by Figure 2. Tune the Oscillator to **460 kc.** and set its modulation switch to "On." Regulate its output until the signal produces a wave pattern on the Oscillograph screen, adjusting the Oscillograph controls to give a shape which is convenient for peak indications. Cause the image to stand still on the screen by manipulation of the frequency and synchronizing controls. Then carefully tune the two trimmers C-44 and C-45 of the third i-f transformer to produce maximum amplitude (vertical deflection) of the oscillographic image. Under this condition the transformer will be sharply resonated to 460 kc.

(c) The Frequency Modulator should then be placed in operation and interconnected with the Full-Range Oscillator by means of the special shielded patch cord. Figure 2 shows the proper arrangement. Set the Frequency Modulator sweep-range switch to its "Lo" position and turn the Oscillator modulation switch to "Off." Change the timing control of the Oscillograph to "Ext." and place the range switch to its No. 2 position. Then carefully shift the tuning of the Oscillator so as to increase its frequency, until two distinct and similar waves appear on the Oscillograph screen and become exactly coincident at their highest points. This condition will be found to occur at an Oscillator setting of *approximately* 540 kc. The curves will be identical in shape but appearing in reversed positions. Adjust the frequency control of the Oscillograph in order to cause the waves to conform with the above requirement and to make them remain motionless on the screen. This will require a setting of approximately ½ clockwise rotation of the frequency control. The trimmers C-44 and C-45 should then be re-adjusted so that the two curves move together and become exactly coincident throughout their lengths, maintaining the maximum amplitude at which this condition can be brought about.

(d) Leaving the equipment connected and adjusted as above, change the Oscillator output to the control-grid cap of the first i-f tube (RCA-6K7). Adjust the two trimmers C-37 and C-38 of the second i-f transformer until the forward and reverse waves appearing on the Oscillograph coincide throughout their lengths and have maximum amplitude.

(e) Change the test Oscillator output to the control-grid of the first detector tube (RCA-6J7) without disturbing the connections and adjustments of the other apparatus. Then align the trimmers C-32 and C-33 of the first i-f transformer to produce waves of maximum coincidence and maximum amplitude. The shape of the composite wave obtained from this operation is a true representation of the overall tuning characteristic of the i-f system.

Figure 3—Cathode-Ray Images for I-F System

R-F Trimmer Adjustments

For Bands A and X, adjustments must be made at the high and low frequency ends of the range. On Bands B and C, alignment is required only at the high frequency end. Band D is permanently adjusted during manufacture, hence no alignment will be necessary in this range. Locations of the various antenna, detector, and oscillator trimmers are shown on Figure 4. The test Oscillator should be removed from connection with the i-f system and its output attached to the antenna ground terminals of the receiver. No changes are to be made in the attachment of the Oscillograph at the second detector. During the adjustments, the Oscillator output should be regulated as often as is necessary to keep the oscillographic image as low as is practically observable. Adherence to this procedure will obviate apparent broadness of tuning which would result from a.v.c. action on a stronger signal. The sequence of alignment should be Band A, Band X, Band B, and Band C. Proceed with the adjustments as follows:—

Calibration

Set the receiver range switch to Band A and rotate the station selector until the tuning condenser plates are in full mesh (maximum capacitance). Then move the main dial pointer until it points exactly to the horizontal line at the low frequency end of the Band A scale. Correct the setting of the vernier second hand pointer to read zero.

BAND A

(a) With the receiver range switch in its Band A position, tune the station selector until the dial pointer is at a reading of **1720 kc.** Adjust the test Oscillator to **1720 kc.** (modulation "On" and Frequency Modulator disconnected) and increase its output to produce a registration on the Oscillograph. Carefully align the oscillator, detector, and antenna trimmers, C-25, C-14, and C-3 respectively, so that each brings about maximum amplitude of output as shown by the wave on the Oscillograph. It will be necessary to have the timing control of the Oscillograph on "Int." for this operation. After each trimmer has been peaked, the Oscillograph timing control should be set to "Ext." and the Frequency Modulator placed into operation with its connections to the Oscillator and Oscillograph made in accordance with Figure 2. Turn the modulation switch of the Oscillator to "Off" and retune the Oscillator (increase frequency) until the forward and reverse waves show on the Oscillograph and become coincident at their highest points. Adjust the trimmers C-25, C-14, and C-3 again, setting each to the point which produces the best coincidence and maximum amplitude of the wave images.

(b) Remove the Frequency Modulator cable from the Oscillator and shift the signal frequency to **600 kc.** Place the modulation switch to "On". Tune the receiver to pick up this signal, disregarding the dial reading at which it is best received. Then insert the Frequency Modulator plug and retune the Oscillator (modulation "Off") until the two similar forward and reverse waves appear on the screen. For this adjustment, it is advisable to shift the Oscillator to its 200-400 kc. range using the third harmonic of the generated signal in order to obtain the desired range of sweep. The oscillator series trimmer, C-23, should then be adjusted to produce maximum amplitude of the images. No rocking will be necessary on the station selector inasmuch as the signal frequency is being "wobbled" by the Frequency Modulator to produce the same effect. After completing this adjustment, the trimmer C-25 should be re-aligned as in (a) to correct for any change brought about by the adjustment of C-23.

BAND X

(a) Disconnect the Frequency Modulator and tune the test Oscillator to a frequency of **400 kc.** (Modulation "On"). Place the receiver range switch in its Band X position and turn the station selector until the dial pointer reads **400 kc.** Adjust the Oscillograph timing control to "Int." Then align each of the trimmers C-26, C-15, and C-4 to the point producing maximum output at the Oscillograph. Place the Frequency Modulator in operation and attach it to the Oscillator in the normal manner. Change the Oscillograph timing to "Ext." Increase the frequency of the Oscillator (modulation "Off") until the two waves appear and become coincident at their highest points, *approximately at 462 kc.* They may be made to remain stationary on the screen by manipulation of the Oscillograph range switch and frequency control. Readjust the three trimmers C-26, C-15, and C-4 to give maximum amplitude and complete coincidence of the waves.

(b) Change the test Oscillator so that it delivers a signal of **150 kc.** with the Frequency Modulator disconnected. Tune this signal on the receiver which has previously been set to Band X, disregarding the dial reading at which the signal is best received. Then interconnect the Frequency Modulator with the Oscillator and retune the latter to the point at which the two similar waves appear on the screen. Adjust trimmer C-27, for maximum amplitude of the wave images. Rocking of the tuning condenser will not be necessary as the Frequency Modulator duplicates such an operation. Repeat the alignment of C-26 as outlined in (a) to correct for any reflective error brought about by the adjustment of C-27.

BAND B

(a) Advance the receiver range switch to its Band B position and tune the station selector to a dial reading of **6132 kc.** Set the test Oscillator to **6132 kc.** (modulation "On" and Frequency Modulator disconnected) and increase its output until a suitable indication is apparent on the Oscillograph. The Oscillograph should be adjusted for "Int." timing. Then adjust the oscillator trimmer, C-76, to the point at which maximum amplitude of the image is obtained. Two positions will be found for this trimmer which gives such a maximum. The one of least capacitance is correct and should be used. This can be checked by tuning the "image" signal, which will be received at **5212 kc.** on the dial if the adjustment of C-76 has been properly made. An increase in the test Oscillator output may be necessary for this test. *Its frequency should not be changed from* **6132 kc.** *nor any trimmer adjustments made on the receiver.*

(b) Return the station selector to the **6132 kc.** reading and align the detector, and antenna coil trimmers, C-13 and C-2 respectively, for maximum (peak) output as shown by the Oscillograph. No further adjustments are to be made on this band.

BAND C

(a) Turn the range switch of the receiver to its Band C position and tune the station selector until the dial pointer reads **18,000 kc.** Set the test Oscillator to **18,000 kc.** (Modulation "On" and Frequency Modulator disconnected), regulating its output to the level required for convenient observation. Adjust trimmer C-75 to the point producing maximum output as indicated on the Oscillograph. Check for the presence of "image" signals by tuning the receiver to **17,080 kc.** The **18,000 kc.** signal of the Oscillator will be received at this point if the adjustment of C-75 has been properly made, using the position of minimum capacitance giving maximum receiver output. It may be necessary to increase the output of the Oscillator in order to get an indication of the "image". *No adjustments should be made during this check.*

(b) Return the receiver tuning to **18,000 kc.**, realign C-75 if necessary, and then adjust the detector and antenna trimmers C-12, and C-1 for maximum signal output as evidenced by the oscillographic image. No further adjustments are to be made on Band C.

BAND D

No adjustments are required on this band.

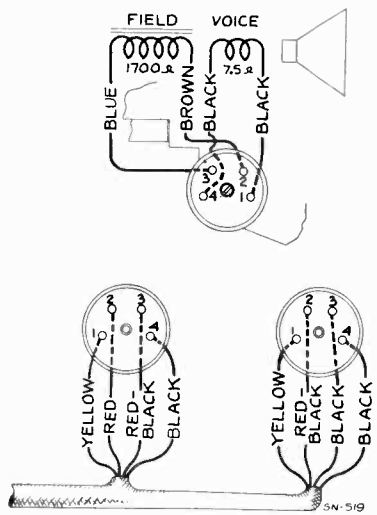

Figure 5—Loudspeaker Wiring

OUTPUT METER ALIGNMENT

To align the receiver by other methods than that explained above will require the use of a standard test oscillator, such as the Stock No. 9595, and a suitable output indicator, such as the Stock No. 4317. The indicator should be connected either to the voice coil circuit or across the output transformer primary. For each adjustment, the volume control should be maintained at maximum and the Oscillator output regulated until the indication is barely perceptible. The smaller the amount of glow, the more accurate will be the indication. The signal level will also be below the range of the receiver a.v.c., preventing broadness of tuning.

I-F Adjustments—Connect the output of the test Oscillator from the RCA-6L7 first detector control-grid to chassis-ground and adjust its frequency to **460 kc.** Tune the receiver to Band "A", setting the station selector at a point where no interference is received from local stations or the local oscillator. Then tune the i-f trimmers C-45, C-44, C-38, C-37, C-33, and C-32 in order, each for maximum indicated receiver output.

R-F Adjustments—Connect the Oscillator output to the antenna-ground terminals of the receiver. Keep the output indicator attached to the receiver output as above. For each adjustment, use the minimum signal which will give a perceptible indication on the glow indicator.

BAND A

(a) Set the range switch of the receiver to its Band A position and tune the selector to a dial reading of **1720 kc.** Tune the Oscillator to this same frequency and adjust trimmers C-25, C-14, and C-3 to produce maximum indicated receiver output.

(b) Shift the Oscillator to **600 kc.** and tune the receiver to pick up this signal, disregarding the dial reading at which it is best received. Then adjust trimmer C-23, simultaneously rocking the tuning control backward and forward through the signal, until maximum output is obtained from the combined operations. Repeat the alignment of C-25 as in (a) to correct for any change caused by adjustment of C-23.

BAND X

(a) Change the range switch to its Band "X" position. Tune the receiver to read **400 kc.** and set the Oscillator to produce this same frequency. Adjust trimmers C-26, C-15, and C-4 to produce maximum receiver output.

(b) Shift the Oscillator frequency to **150 kc.** and tune the receiver to pick up this signal, disregarding the dial reading at which it is best received. Then tune the oscillator series trimmer, C-27, simultaneously rocking the tuning control (receiver) backward and forward through the signal, until maximum output results from the combined operations. Repeat the alignment of C-26 as in (a) to correct for any change caused by the adjustment of C-27.

BAND B

Place the receiver range switch in its Band "B" position and tune the station selector to a dial reading of **6132 kc.** Set the frequency of the Oscillator to **6132 kc.** Then adjust trimmer C-76 to give maximum receiver output. Two positions may be found which fulfill this condition. The one of least capacitance is correct. To assure that the right peak has been used, tune the *receiver* to **5212 kc.** and increase the Oscillator output. The "image" of **6132 kc.** will be received at this point if C-76 has been adjusted to the proper point of maximum output. *No trimmer adjustments are to be made during this check.* Return the receiver tuning to **6132 kc.**, readjust C-76 if necessary, and then tune the detector and antenna coil trimmers, C-13 and C-2 to produce maximum (peak) receiver output as indicated on the glow meter.

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MODEL D22-1
Alignment, Part 4
Automatic Record Changer Notes

Figure 15—Automatic Record Changer Adjustments

BAND C

Turn the receiver range switch to its Band "C" position and set the tuning control to a dial reading of 18,000 kc. Tune the Oscillator to this same frequency. Adjust the oscillator parallel trimmer C-75 to produce maximum receiver output. Two positions of the trimmer will be found which fulfill such a condition. The one of least capacitance is correct. To assure that the right position has been used, check for the "image" of the 18,000 kc. signal which will be received at 17,080 kc. on the dial if C-75 is correctly adjusted. An increase in Oscillator output may be necessary. *No trimmer adjustments should be made during this check.* Return the receiver tuning to 18,000 kc., readjust C-75 if necessary, and then tune the detector and antenna trimmers, C-12 and C-1 to give maximum receiver output.

Dial Adjustment

Figure 6 illustrates the relations of the various parts of the dial mechanism when it is in its A—Broadcast position and the range switch is likewise turned to it. Band A setting. In re-assembling the dial after repairs, see that the gears are meshed in accordance with the diagram, at the same time noting that the lever which is attached to the range-switch shaft is in the position as shown.

Radiotron Socket Voltages

The voltage values indicated from the Radiotron socket contacts to ground and appearing across the heaters (H-H) on Figure 4 will serve to assist in locating causes for faulty operation when existent. Each value as specified should hold within ± 20% when the receiver is normally operative at the rated supply voltage. Variations in excess of this limit will usually be indicative of trouble in the basic circuits.

The voltages given on this diagram are actual measured voltages, and are the results obtained after the loading of the circuit, by the voltmeter, has taken place.

To fulfill the conditions under which these d-c voltages were measured it requires a 1,000-ohm-per-volt voltmeter having ranges of 30, 300, and 600 volts.

For all d-c voltages under 30, measure on the 30-volt scale; all d-c voltages between 30 and 300, measure on the 300-volt scale and all d-c voltages between 300 and 600, measure on the 600-volt scale.

For meters of the 1,000-ohm-per-volt type, but ranges other than above, use the nearest ranges to those specified. If the range is higher the voltage may be higher, and if the range is lower the voltage may be lower; either condition depending on the percentage of circuit current drawn by the meter.

Dynamic Amplifier

It is essential that the correct voltages and currents exist at the RCA-6L7 audio expander stage in order that the expanding function may take place in the proper manner. A screw-driver adjustment (see Figure 14) is accordingly provided for regulating the fixed bias of the RCA-6L7 auxiliary grid so that the plate current may be adjusted to the correct value under a no-signal condition. This current should be adjusted to a value of 0.10—0.13 ma. with no signal input to the dynamic amplifier and with a normal voltage of 275 volts appearing across the resistance-divider system (R-211, R-210, R-209, and R-208).

A substitute method for adjusting the RCA-6L7 no-signal characteristic is by means of a voltmeter having an internal resistance of 600,000 ohms (600 volt range, 1,000-ohms-per-volt). This voltmeter should be used to set the plate (of the RCA-6L7) to chassis voltage. The plate voltage as indicated by the specified meter should be adjusted to exactly 195 volts, with a power line supply-voltage of 115 volts.

An indication of the operation of the dynamic amplifier may be obtained by playing a record which has predominating loudness. Such a record is Victor Red Seal Record No. 8651, "Die Fledermaus".—Overture. The plate current during the playing of such a record should increase from the static value of 0.10-0.13 ma. to a minimum of 0.55 ma.

Variations of the Radiotron (RCA-6L7) in the audio expander stage may affect operation of the circuit. Several tubes of such type should therefore be tried when correct performance is not obtainable from a single tube. The various voltages of the dynamic amplifier under a no-signal condition are indicated in Figure 4. It is very important that these voltages be as near to the specified values as possible.

If excessive hum is encountered, it is recommended that a different RCA-6L7 be tried in the expander unit. If this does not reduce the hum to a low enough value try reversing the power-line supply cord plug and/or the power amplifier supply plug to obtain a condition of minimum hum. The continuity of ground connections between chassis, expander unit, and power amplifier should be of very low resistance to maintain minimum hum.

Automatic Record Ejector

The record changing mechanism is designed to be simple and foolproof. Under normal operating conditions, service difficulties should be negligible. Occasionally, however, certain adjustments may be required. These adjustments are illustrated and explained in Figure 15.

It is important when servicing the automatic mechanism, to have it placed on a level support. It is also important to refrain from forcing the mechanism if there is a tendency to bind or jam, since bent levers and possibly broken parts may result.

The tip of the record ejector is adjustable in relation to the turntable spindle, the two being exactly coaxial when properly adjusted. To align the tip, remove the rubber silencer of the ejector assembly, loosen ejector tip retaining nut and slide the tip assembly to the position where it is in true-line with the axis of the turntable spindle. This adjustment may be simplified by placing several records on the turntable, depressing the spindle through the top record hole and lining up the ejector tip in the spindle hole of the record.

To insure that the ejector tip rotates freely, apply a slight amount of oil to the shank of the tip at the point where it is in contact with the ball bearing.

Magnetic Pickup

The pickup used in the phonograph unit is of an improved design, having several variations from the usual type of pickup. The magnetic assembly is one rigid piece. The horseshoe magnet is solidly welded to the pole pieces and is irremovable. There is a centering spring attached to the armature to maintain proper adjustment and provides a damping effect on the move-

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Assembly Wiring
Cable Connectors

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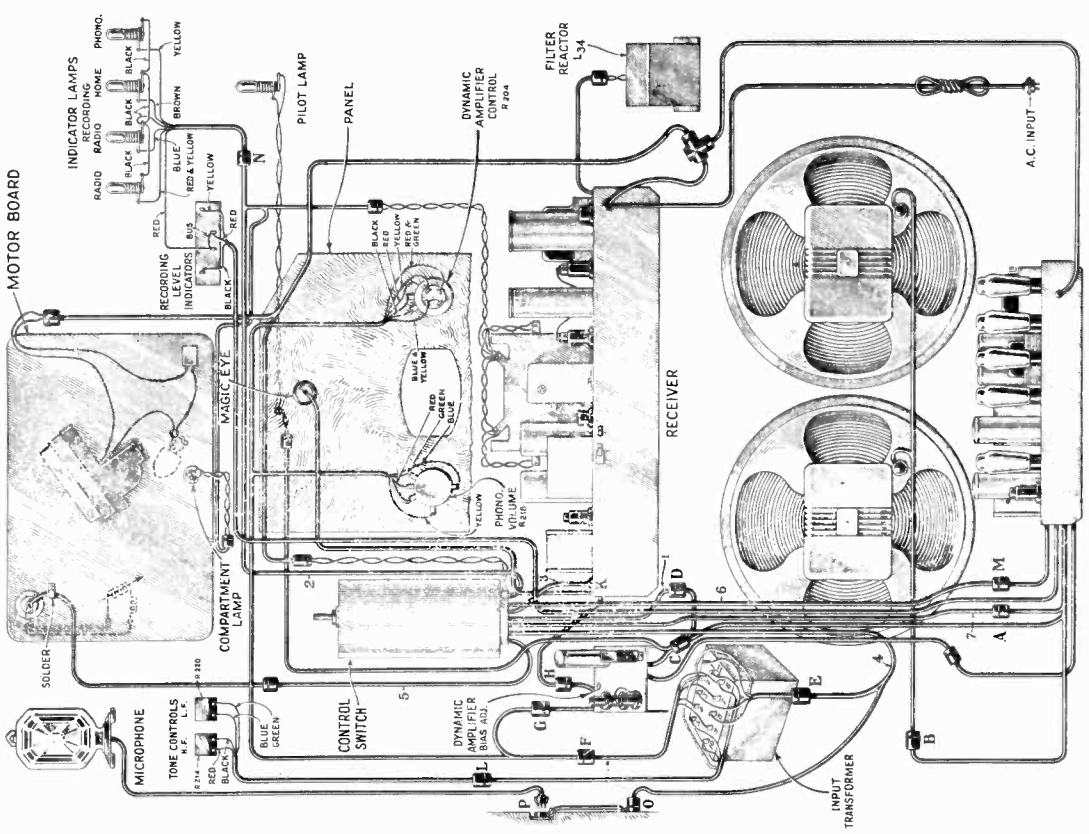


Figure 14—Assembly Wiring

ment of the armature. A neutralizing coil is mounted in the magnet assembly in such manner that it balances out hum induced by stray magnetic fields but does not affect the audio signal. The frequency response is uniform over a wide range.

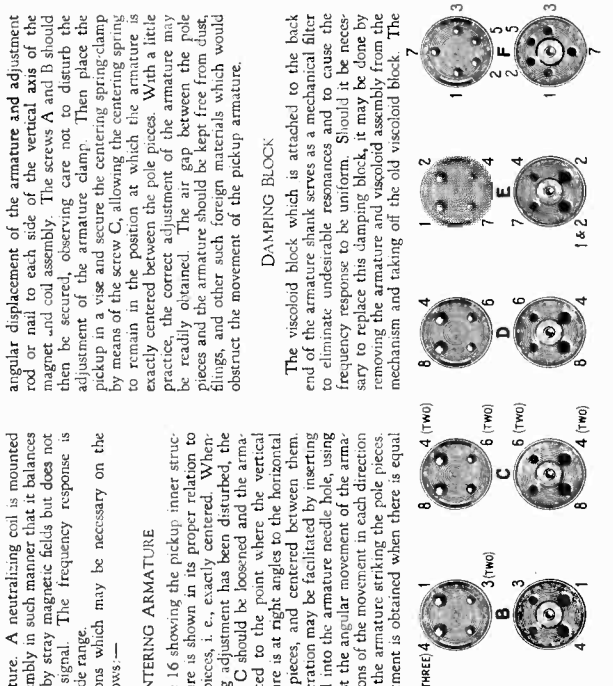
Service operations which may be necessary on the pickup are as follows:—

CENTERING ARMATURE

Refer to Figure 16 showing the pickup inner structure. The armature is shown in its proper relation to the magnet pole pieces, i. e., exactly centered. Whenever this centering adjustment has been disturbed, the screws A, B, and C should be loosened and the armature clamp adjusted to the point where the vertical axis of the armature is at right angles to the horizontal axis of the pole pieces, and centered between them. This centering operation may be facilitated by inserting a small rod or nail into the armature needle hole, using it as a lever to test the angular movement of the armature. The limitations of the movement in each direction will be caused by the armature striking the pole pieces. The proper adjustment is obtained when there is equal angular displacement of the armature and adjustment rod or nail to each side of the vertical axis of the magnet and coil assembly. The screws A and B should then be secured, observing care not to disturb the adjustment of the armature clamp. Then place the pickup in a vise and secure the centering spring-clamp by means of the screw C, allowing the centering spring to remain in the position at which the armature is exactly centered between the pole pieces. With a little practice, the correct adjustment of the armature may be readily obtained. The air gap between the pole pieces and the armature should be kept free from dust, filings, and other such foreign materials which would obstruct the movement of the pickup armature.

DAMPING BLOCK

The viscoloid block which is attached to the back end of the armature shank serves as a mechanical filter to eliminate undesirable resonances and to cause the frequency response to be uniform. Should it be necessary to replace this damping block, it may be done by removing the armature and viscoloid assembly from the mechanism and taking off the old viscoloid block. The



COLOR CODING of CABLE CONNECTORS

1 RED
2 BLUE
3 YELLOW
4 BLACK
5 GREEN
6 BROWN
7 SHIELD
8 RED & GREEN
9 RED & BLACK
10 RED & YELLOW
11 YELLOW & BLUE
12 BROWN WITH RED TR.

SN 526

Figure 13—Socket and Plug Details of Assembly Wiring
(Refer to Figure 14)

RCA MFG. CO., INC.

MODEL D22-1
Phonograph Data, Part 2
Change-Over Switch Wiring
Parts List

surface of the armature which is in contact with the viscoloid should be thoroughly cleaned with fine emery cloth and then inserted into the new block so that it occupies the same position as it did originally. Make certain that the block is in correct vertical alignment with the armature. The hole in the new viscoloid block is somewhat smaller than the diameter of the armature in order to permit a snug fit. With the viscoloid aligned on the armature, heat should be applied to the armature (viscoloid side) so that the viscoloid block will fuse at the point of contact and become rigidly attached to the armature. A special-tip soldering iron constructed as shown in Figure 17 will be found very useful in performing this operation. The iron should be applied only long enough to slightly melt the block and cause a small bulge on both sides. The pickup should then be carefully re-assembled and the armature centered as previously explained.

Replacing Coils

Whenever there is defective operation due to open or shorted pickup coils, these coils should both be replaced. The method of replacement will be obvious upon inspection of the pickup assembly and by study of the cut-a-way illustrations. It is important to readjust the armature as previously explained after reassembly of the mechanism. It is also necessary to have the hum and signal coils mounted in proper relation to each other in order that there may be the intended neutralization between them. Make certain that the slot in the center screw of the neutralizing coil is aligned directly over the armature tip, as illustrated. Only rosin core solder should be used for soldering the coil leads in the pickup. This same type of solder should be used when necessary for soldering the centering spring to the armature.

Magnetizing

Loss of magnetization will not usually occur when the pickup has received normal care, due to the fact that the magnet and pole pieces are one unit and the magnetic circuit remains closed at all times. When the pickup has been mishandled, subjected to a strong a-c field, jolted, or dropped, there may be an appreciable loss of magnetic strength, in which case it will be necessary to re-magnetize the entire structure. This should

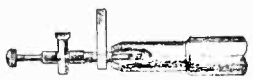


Figure 17—Special Soldering-Iron Tip

be done by placing the pickup assembly on the poles of a standard pickup magnetizer and charging the pickup in accordance with the instructions accompanying the magnetizer. It is preferable to check the polarity of the pickup magnet and to re-magnetize it so that the same polarity is maintained.

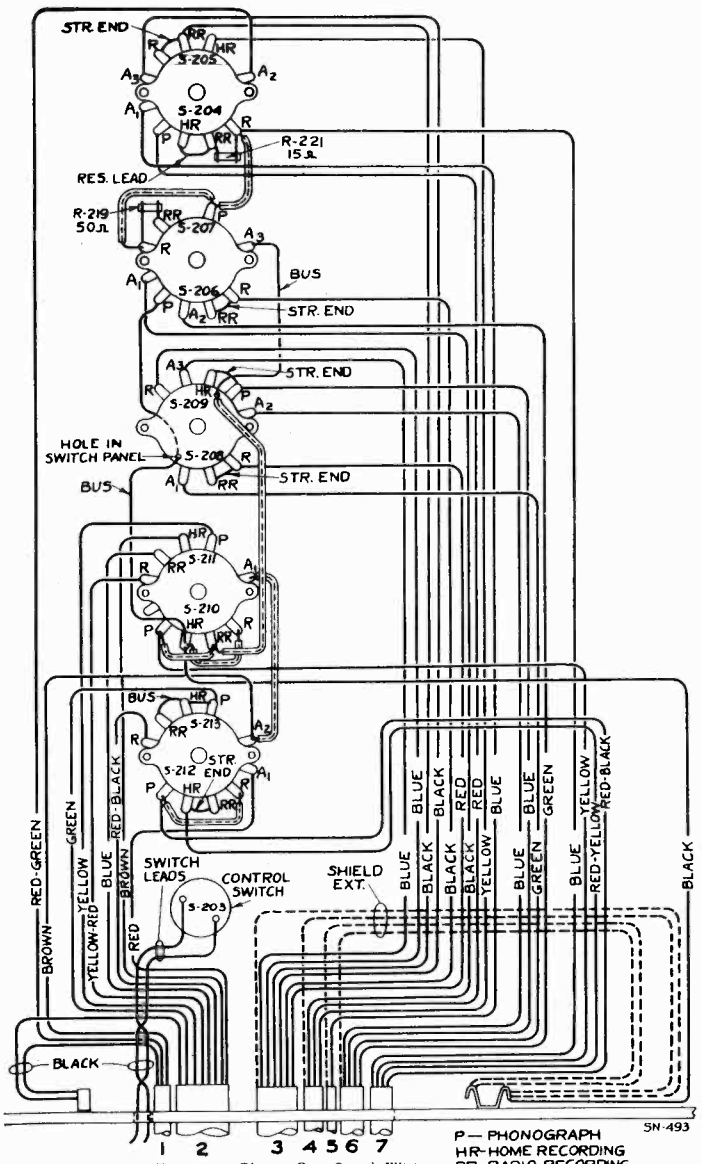


Figure 11—Change-Over Switch Wiring

Power Supply Ratings

Rating A-6 . . . . 105-125 Volts, 60 Cycles, 400 Watts
Rating A-5 . . . . 105-125 Volts, 50 Cycles, 405 Watts
Rating B-4 . . . . 105-125 Volts, 40 Cycles, 410 Watts
Rating B-3 . . . . 105-125 Volts, 30 Cycles, 405 Watts
Rating B-2 . . . . 105-125 Volts, 25 Cycles, 410 Watts

Power Output Ratings

Undistorted . . . . . 20 Watts
Maximum . . . . . 25 Watts

Loudspeakers (2)

Type . . . . . 12-inch Electrodynamic
Voice Coil Impedance . . . . . 7.5 Ohms at 400 Cycles
Field Coil Rating . . . . . 1,700 Ohms—90 M.A.

Phonograph

Type . . . . . Automatic Record Ejector
Record Capacity . . . . . Eight 10-inch or Seven 12-inch
Turntable Speed . . . . . 78 R.P.M.
Type of Pickup . . Improved Low-Impedance Magnetic
Pickup Impedance . . . . . 18 Ohms at 1,000 Cycles

REPLACEMENT PARTS

Stock No.	Description	List Price
	RECEIVER ASSEMBLIES	
5243	Arm—Band indicator operating arm with stud, set screws, nut, and washer	$0.42
4427	Bracket—High frequency tone control, low frequency tone or power switch or volume control mounting bracket	.18
11591	Button—Plug button	.10
11489	Cable—Two conductor cable with three way connector plug—Stock No. 11490	.66
11487	Cable—Two conductor shielded cable with female section of two contact connector plug—Stock No. 11488—To choke—(L34)	.42
11486	Cable—Two conductor shielded voltage supply cable with female section of four contact connector plug—Stock No. 4153—To (1) Terminal board and R19, (1) Terminal board, R3 and S8 shield to S205—Expander unit	1.08
11255	Cable—Four conductor tuning tube cable with connector socket—Stock No. 11381	1.20
5241	Capacitor—Adjustable capacitor—(C23, C27)	.40
5242	Capacitor—High frequency tone capacitor—.005 Mfd.—(C56)	.52
11286	Capacitor—14 MMfd.—(C19)	.24
11292	Capacitor—22 MMfd.—(C11)	.24
11289	Capacitor—90 MMfd.—(C8, C30)	.26
11291	Capacitor—115 MMfd.—(C62 C65)	.24
11295	Capacitor—200 MMfd.—(C55)	.30
11294	Capacitor—325 MMfd.—(C24)	.32
11290	Capacitor—400 MMfd.—(C9, C18, C20, C49, C64)	.25
11299	Capacitor—600 MMfd.—(C48)	.26
3784	Capacitor—900 MMfd.—(C69)	.30
11335	Capacitor—1300 MMfd.—(C22)	.30
11287	Capacitor—4500 MMfd.—(C21, C77)	.30
5005	Capacitor—0.0035 Mfd.—(C57)	.16
4858	Capacitor—0.01 Mfd.—(C17, C47, C68)	.25
4836	Capacitor—0.05 Mfd.—(C5, C16, C35, C40, C70)	.30
11414	Capacitor—0.1 Mfd.—(C31)	.20
4885	Capacitor—0.1 Mfd.—(C10, C34, C39, C42, C43)	.28
4841	Capacitor—0.1 Mfd.—(C7, C28, C36, C41, C67)	.22
5170	Capacitor—0.25 Mfd.—(C78, C79)	.25
3597	Capacitor—0.25 Mfd.—(C51)	.40
11203	Capacitor—.10 Mfd.—(C71)	1.18
5212	Capacitor—18 Mfd.—(C72)	1.16
5213	Capacitor Pack—Comprising one 4. Mfd., one 8. Mfd., and one 10. Mfd. capacitors—(C50, C73, C74)	2.94

REPLACEMENT PARTS—Continued

Stock No.	Description	List Price
	RECEIVER ASSEMBLIES—Continued	
5236	Capacitor Pack—Comprising two 0.5 Mfd. capacitors, one 680 ohm resistor and one 820 ohm resistor—(C53, C54, R23, R27)	1.36
5215	Coil—Antenna coil for "A" and "C" band—(L1, L2, L5, L6, C1, C3)	2.32
5218	Coil—Antenna coil for "X" and "B" band—(L3, L4, L7, L8, C2, C4)	2.58
5216	Coil—Detector coil for "A" and "C" band—(L9, L10, L13, L14, C12, C14)	2.34
5219	Coil—Detector coil for "X" and "B" band—(L11, L12, L15, L16, C13, C15)	2.58
5217	Coil—Oscillator coil for "A" and "C" band—(L18, L20, C25, C75)	2.20
5221	Coil—Oscillator coil—"D" band—Located on Range Switch	.64
5220	Coil—Oscillator coil for "X" and "B" band—(L19, L21, L22, C26, C76)	2.24
5214	Condenser—Three gang variable tuning condenser—(C6, C29, C63)	4.42
5222	Control—Tone control—High frequency tone control—(R28)	1.04
5223	Control—Volume control—(R24, R25, R26)	1.22
5240	Cover—Fuse cover	.24
11202	Foot—Chassis mounting (bracket) foot—Package of 2	.78
10907	Fuse—Three ampere fuse—(F1)—Package of 5	.40
5226	Lamp—Dial lamp—Package of 5	.70
5239	Mounting—Fuse mounting	.36
4153	Plug—Female section four-contact connector plug—used on cables—Stock Nos. 11486, 11503, 11569	.48
11490	Plug—Three-way plug for cable—Stock No. 11489	.26
5233	Reactor—Coupling reactor—(L29)	2.32
11488	Receptacle—Two-contact female section of connector—used with cables.—Stock Nos. 11487, 11502, 11513, 11567, 11571	.14
11718	Resistor—Wire wound resistor—800-8500 Ohms—(R44, R45)	1.08
11296	Resistor—330 Ohms—Carbon type—½ watt—(R2, R12)—Package of 5	1.00
11285	Resistor—1000 ohms—Flexible type resistor—(R13, R17, R36)—Package of 5	1.00
5112	Resistor—1000 ohms—Carbon type—½ watt—(R4, R10, R15, R29)—Package of 5	1.00
11283	Resistor—1200 Ohms—Carbon type—½ watt—(R3, R31)—Package of 5	1.00
4408	Resistor—1500 Ohms—Carbon type—½ watt—(R8)—Package of 10	2.00
5159	Resistor—2200 Ohms—Carbon type—½ watt—(R35)—Package of 5	1.00
11298	Resistor—5600 Ohms—Carbon type—1 watt—(R21)	.22
8043	Resistor—10,000 Ohms—Carbon type—2 watts—(R22)	.25
5114	Resistor—15,000 Ohms—Carbon type—1 watt—(R5)	.22
11400	Resistor—27,000 Ohms—Carbon type—½ watt—(R30)—Package of 5	1.00
8065	Resistor—27,000 Ohms—Carbon type—½ watt—(R33)—Package of 5	1.00
11300	Resistor—33,000 Ohms—Carbon type—½ watt—(R32)—Package of 5	.75
11282	Resistor—56,000 Ohms—Carbon type—½ watt—(R9)—Package of 5	.75
8064	Resistor—82,000 Ohms—Carbon type—½ watt—(R43)—Package of 5	1.00
3118	Resistor—100,000 Ohms—Carbon type—¼ watt—(R16)—Package of 5	1.00
5027	Resistor—150,000 Ohms—Carbon type—¼ watt—(R37)—Package of 5	1.00
5108	Resistor—330,000 Ohms—Carbon type—¼ watt—(R11, R14, R38)—Package of 5	1.00
11297	Resistor—330,000 Ohms—Carbon type—½ watt—(R1, R6)—Package of 5	.75
3033	Resistor—1 Megohm—Carbon type—¼ watt—(R7)—Package of 5	1.00
11382	Resistor—1 Megohm—Carbon type—½ watt—(R39)—Located in tuning tube cable—Package of 5	.75
11626	Resistor—2.2 Megohm—Carbon type—¼ watt—(R20)—Package of 5	1.00
4669	Screw—No. 8—32—$\frac{1}{2}$" Set screw for indicator operating arm—Package of 10	.25
5249	Shield—Metal shield case for antenna, detector, or oscillator coils	.20
11273	Shield—Radiotron shield	.25
11381	Socket—Tuning tube cable connector socket	.45
11598	Socket—Dial lamp socket	.14
4794	Socket—Four-contact socket for 5Z3 Radiotron—(No. 14)	.15
11197	Socket—Six-contact socket for 6C5 Radiotrons—(Nos. 9, 10, 11)	.14
11278	Socket—Seven-contact socket for 6J7 Radiotron—(No. 3)	.20
4787	Socket—Seven-contact socket for Cable Stock—(No. 11568)	.15
11198	Socket—Seven-contact socket for 6K7, 6H6, Radiotrons—(Nos. 2, 4, 5, 6 and 8)	.15
11280	Socket—Seven-contact socket for 6L7 Radiotron—(No. 2)	.14
5225	Switch—Range switch—(S1, S2, S3, S4, S5, S6, S7, S8, S9, S10, S11)	3.75
11507	Switch—Low frequency tone or power switch—(S13, S14)	.92
11508	Transformer—Driver transformer—T3	2.75
5234	Transformer—Interstage transformer—T2	3.40
5228	Transformer—First intermediate frequency transformer—(L23, L24, C32, C33)	1.80
5229	Transformer—Second intermediate frequency transformer—(L25, L26, C37, C38, C66, R34)	2.42
5230	Transformer—Third intermediate frequency transformer—(L27, L28, C44, C45, C46, R18, R19)	2.76
5231	Transformer—Fourth intermediate frequency transformer—(L31, L32)	1.50
8062	Transformer—Power transformer—105-125 volts—25-50 cycles	9.84
8061	Transformer—Power transformer—105-125 volts—50-60 cycles—(T1)	6.75
	CONDENSER DRIVE ASSEMBLIES	
5243	Arm—Band indicator operating arm	.42
10194	Ball—Steel ball for drive assembly—Package of 20	.25
8054	Cam—Five-position cam for station selector drive assembly	.28
4422	Clutch—Tuning condenser drive clutch assembly—comprising shaft, balls, ring, spring and washers assembled	1.00
8048	Coupling—Flexible coupling for variable capacitor—includes indicator shaft	.70
11336	Dial—Dial scale with mounting rivets	.60
8045	Disc—Drive disc and Micarta gear assembly	.46
11380	Drive—Tuning condenser drive assembly—complete	6.35
8044	Escutcheon—Dial escutcheon with vernier scale	1.08
8046	Gear—Indicator shaft, Micarta drive gear and Brass vernier idler with one spring	.72
8050	Gear—Gear sector and band indicator operating link—(link connects to arm on band switch)	.15
8053	Indicator—Station selector vernier indicator pointer	.12
8051	Link—Complete—with roller and spring	.30
8049	Pinion—Vernier pointer drive pinion and shaft	.55
4669	Screw—No. 8—32—$\frac{1}{2}$" Square head set screw—Package of 10	.25
8047	Spring—Coil spring for indicator shaft drive gear and vernier idler—(Stock No. 8046)	.12
8052	Spring—Coil spring for link—Package of 5	.32
8042	Stud—Band indicator operating arm stud—Package of 5	.25

Stock No.	Description	List Price
	AMPLIFIER ASSEMBLIES	
11502	Cable—Single conductor shielded cable with female section of connector—Stock No. 11488)—Connects to Grid of first audio socket in amplifier—to expander unit—(C202)	.74
11501	Cable—Three conductor cable—Connects from R108, R109 and R110 in amplifier—to Neon indicator lamp	.64
11504	Cable—Four conductor shielded cable with five contact female connector plug—Stock No. 11506—connects to Amplifier "G," sockets No. 18 and No. 19—(T102, C106)—Terminals	.20
11503	Cable—Eight conductor cable with four female sections of connectors—(Stock No. 4153)—From (C107)—Amplifier Plate—(C111)—and "H" of first "AF" in Amplifier—to expander, control switch and reproducers	3.70
11500	Capacitor—175 MMfd.—(C102, C111, C112, C113)	.18
4838	Capacitor—0.005 Mfd.—(C104, C105)	.20
4858	Capacitor—0.01 Mfd.—(C103)	.25
11497	Capacitor—8 Mfd.—(C108, C110)	1.04
11496	Capacitor—18 Mfd.—(C106, C107)	1.15
11498	Capacitor Pack—Comprising two 10 Mfd. capacitors—(C101, C109)	1.00
4358	Clamp—Capacitor clamp for capacitor—(Stock No. 11498)	.15
11488	Connector—Female section—two contact connector—used on cables—(Stock Nos. 11502, 11513, 11487, 11567 and 11571)	.14
4153	Connector—Female section—four contact connector—used on cables—Stock Nos. 11503, 11486, 11569	.48
5240	Cover—Fuse cover	.24
10907	Fuse—Three ampere fuse—Package of 5—(F1)	.40
5239	Mounting—Fuse mounting	.36
11493	Reactor—Power filter reactor—(L101)	3.70
11506	Receptacle—Female section—five prong plug—used on cable—Stock Nos. 11504, 11517, 11518	.65
11499	Resistor—Wire wound—145 ohms—(R107)	.74
5159	Resistor—2200 Ohms—Carbon type—¼ watt—Package of 5—(R102)	1.00
3078	Resistor—10,000 Ohms—Carbon type—½ watt—(R103)—Package of 5	1.00
3118	Resistor—100,000 Ohms—Carbon type—¼ watt—(R106, R105, R110)—Package of 5	1.00
5158	Resistor—220,000 Ohms—Carbon type—¼ watt—(R108, R109)—Package of 5	1.00
11323	Resistor—270,000 Ohms—Carbon type—¼ watt—(R104)—Package of 5	1.00
11172	Resistor—470,000 Ohms—Carbon type—¼ watt—(R101)—Package of 5	1.00
4794	Socket—Four contact socket—for 2A3 and 5Z3 Radiotrons	.15
11198	Socket—Seven contact socket—for 6C5 Radiotron	.15
11492	Transformer—Filament transformer—105-125 volts—50-60 cycle—(T104)	6.10
11879	Transformer—Filament transformer—105-125 volts—25-50 cycle—(T104)	3.50
11878	Transformer—Plate transformer—105-125 volts—25-50 cycle—(T101)	5.55
11495	Transformer—Interstage transformer—(T102)	3.16
11494	Transformer—Output transformer—(T103)	5.65
11491	Transformer—Plate transformer—105-125 volts—50-60 cycle—(T101)	6.00
	EXPANDER ASSEMBLIES	
11514	Cable—Single conductor shielded cable—with male section of two-prong plug—Stock No. 4674—From (C202) and ground terminal	1.00
11516	Cable—Two conductor shielded cable—with male section of four-prong plug—Stock No. 6123—To (R211) and capacitor pack—(C208, C209 and C210)	.68
11513	Cable—Three conductor cable—with one male section of connector and one female section of connector—Stock Nos. 6123, 11488—To (R208) and "H-H"—Socket No. 22	1.06
11515	Cable—Five conductor shielded cable—with male section six-prong connector—Stock No. 4574—To (R202), (R207), "G Amplifier 20," (C201), (R206) and ground terminal	1.50
11350	Cap—Grid control contact cap—Package of 5	.20
11414	Capacitor—0.1 Mfd.—(C202, C206)	.20
4841	Capacitor—0.1 Mfd.—(C201)	.22
11509	Capacitor Pack—Comprising three 0.5 Mfd. capacitors—(C203, C205, C207)	1.75
11608	Capacitor Pack—Comprising two 10 Mfd. and one 4 Mfd. capacitors—(C208, C209, C210)	1.98
4358	Clamp—Capacitor clamp	.15
11488	Connector—Two contact female section of connectors—used with cables—Stock Nos. 11513, 11502, 11567, 11487, 11571	.14
11512	Control—Expander bias control—(R213)	.78
11511	Foot—Chassis mounting (bracket) foot	.50
4674	Plug—Male section two prong connector—used with cables—Stock Nos. 11514, 11524	.25
6123	Plug—Male section four prong plug—used with cables—Stock Nos. 11513, 11516, 11526, 11525, 11572	.30
4574	Plug—Six prong male section of connector plug—used with cables—Stock Nos. 11515, 11522	.48
5158	Resistor—220,000 Ohms—Carbon type—¼ watt—(R207)—Package of 5	1.00
3998	Resistor—15,000 Ohms—Carbon type—¼ watt—(R205, R212)—Package of 5	1.00
3118	Resistor—100,000 Ohms—¼ watt—Carbon type—(R203, R206)—Package of 5	1.00
3252	Resistor—100,000 Ohms—Carbon type—½ watt—(R213)—Package of 5	1.00
5035	Resistor—560,000 Ohms—Carbon type—¼ watt—(R202)—Package of 5	1.00
3033	Resistor—1 Megohm—Carbon type—¼ watt—(R201)—Package of 5	1.00
11510	Resistor—Wire wound—425, 365, 3200 and 3900 Ohms—(R208, R209, R210, R211)	.74
11197	Socket—Six-contact socket for 6C5 Radiotron	.14
11198	Socket—Seven-contact socket for 6L7 Radiotron	.15
	MISCELLANEOUS CABLE AND PLUGS	
11524	Cable—Two-conductor cable with two-prong male section of connector plug—Stock No. 4674—From pilot lamp to cable—Stock 11567	.36
11526	Cable—Three-conductor shielded cable with four-prong male section of connector plug Stock No. 6123 and three terminals—connects from input transformer terminals Nos. 1, 3 and 8 to cable—Stock No. 11527	1.02
11527	Cable—Three-conductor cable with one four-contact microphone socket and one three-prong male section of connector plugs—Stock Nos. 4592, 5118	.50
11523	Cable—Three-conductor cable with two female two-contact and one male section of connector plugs—Stock Nos. 2308, 4573—From power cable, Stock No. 11489 to motor leads, and leads from control switch S203	2.22
11517	Cable—Four-conductor shielded cable with female section of connector plug—Stock No. 11506—Connects from tone controls, R214 and R220, to input transformer cable—Stock No. 11521	2.15
11518	Cable—Four-conductor shielded cable with female section of connector plug—Stock No. 11506—From input transformer terminals, Nos. 2, 5, 6 and 10, to cable—Stock No. 11519	1.92
11521	Cable—Four-conductor shielded cable with five-prong male section of connector—Stock No. 11520—From input transformer terminals Nos. 4, 5, 7 and 9 to cable—Stock No. 11517	1.12

REPLACEMENT PARTS—Continued

Stock No.	Description	List Price
	MISCELLANEOUS CABLE AND PLUGS—Continued	
11522	Cable—Six-conductor cable, with Connector Stock No. 4574, from Radio-Phonograph, Home and Radio Recording indicator lamps, to cable—Stock No. 11567 from control switch	1.18
11525	Cable—Seven-conductor cable with one four-contact male and two four-contact female sections of connectors—Stock Nos. 5040, 6123—connects from Reproducers to cable—Stock No. 11503 amplifier	1.98
11519	Cable—Nine-conductor shielded cable with one six-contact female and one five-prong male section of connector plugs—Stock Nos. 4151, 11520—From expander control (R204) and phonograph volume control (R218) to expander and input transformer cable—Stock No. 11518	4.50
4577	Plug—Two-prong male section of motor connection plug—Connects to cable—Stock No. 11523	.30
4674	Plug—Two-contact male section of connector plug for cable—Stock Nos. 11524, 11514	.25
2308	Plug—Two-contact male section of connector plug for cable—Stock No. 11523	.55
5118	Plug—Three-prong male section of connector plug for cable—Stock No. 11527	.25
6123	Plug—Four-prong male section of connector for cable—Stock No. 11525 and Stock Nos. 11526, 11516, 11513, 11572	.30
11520	Plug—Five-prong male section of connector plug for cable—Stock No. 11519 and Stock Nos. 11521, 11630	.34
4574	Plug—Six-contact male section of connector for cable—Stock Nos. 11522, 11515	.48
4573	Receptacle—Two-contact female section of connector plug for cable—Stock No. 11523	.30
5040	Receptacle—Four-contact female section of connector for cable—Stock No. 11525	.25
11506	Receptacle—Five-contact female section of connector for cable—Stock No. 11517 and Stock Nos. 11518, 11504	.65
4151	Receptacle—Six-contact female section of connector for cable—Stock Nos. 11519, 11567	.60
4593	Socket—Four-contact microphone socket for cable—Stock No. 11527	.42
	EJECT ARM ASSEMBLIES	
11541	Arm—Eject arm—complete	.82
11533	Ball—$\frac{1}{8}$" diameter steel ball—Package of 10	.20
10129	Ball—$\frac{1}{4}$" diameter steel ball—Package of 20	.25
11529	Bearing—Ejector tip bearing and nut	.32
11538	Bracket—Eject arm bracket	1.72
11537	Collar—Eject arm shaft collar and set screw	.24
11540	Cover—Eject arm cover	1.52
11536	Cushion—Counter balance roller cushion—Located inside of eject arm	.14
4055	Post—Vertical adjustment post—Located on eject arm bracket	.30
3729	Roller—Eject arm counter balance roller—Located inside of eject arm	.45
4580	Screw—No. 6—32—$\frac{1}{8}$" Square head set screw for eject arm collar—Package of 10	.25
11534	Screw—No. 8—36—$\frac{3}{32}$" Special screw for eject arm tip center adjustment—Package of 10	.14
11535	Shaft and Collar—Eject arm vertical action shaft and collar assembly	.15
11528	Silencer—Ejector tip silencer	.14
4067	Spring—Eject arm bracket spring—Package of 10	.30
11531	Spring—Ejector tip spring—Package of 10	.42
11530	Tip—Ejector tip with tip center, adjusting screw and cap	.32
11539	Yoke—Eject arm yoke assembly	.94
	PICKUP AND ARM ASSEMBLIES	
11482	Arm—Pickup arm complete—less pickup mounting screw, escutcheon and pickup unit	4.80
11543	Armature—Pickup armature	.72
11548	Back—Pickup back	.52
4064	Cable—Pickup arm operating cable—Package of 5	1.00
11544	Coil—Pickup coil—(L305)	.80
11532	Coil—Pickup hum bucking coil—(L306)	.60
4674	Connector—Two-prong male section of pickup cable connector plug—Stock Nos. 11514, 11524	.25
11545	Cover—Pickup front cover	.22
11546	Cover—Pickup back cover with mounting screws	.14
3717	Damper—Pickup damper—Package of 5	.65
11481	Pickup—Pickup unit complete	4.80
11549	Screw—Pickup front cover screw—Package of 10	.42
3387	Screw, nut and washer for mounting pickup to arm—Package of 10	.40
11547	Screw—Pickup needle screw—Package of 10	.42
11550	Weight—Home recording weight	1.50
	MOTOR BOARD ASSEMBLIES	
11553	Escutcheon—Index escutcheon engraved Manual—12–10	.44
3764	Nut—Cap nut for motor board suspension assembly—Package of 4	.40
3672	Pin—Manual index pin	.42
11551	Rest—Pickup rest	.14
3654	Roller—Pickup arm cable guide roller—comprising bracket roller and guide pin	.34
3763	Suspension Spring—Suspension spring, washer and bolt assembly, for motor board—comprising one bolt, two cup washers, two springs, two "C" washers and one cap nut	.42
4671	Switch—Operating switch—toggle type—(S201)	.72
11542	Cover—Turntable cover	.88
11599	Turntable—complete	2.90
	MOTOR ASSEMBLIES	
9479	Motor—105–125 volts—25 cycles—(M1)	36.48
9478	Motor—105–125 volts—50 cycles—(M1)	25.88
9477	Motor—105–125 volts—60 cycles—(M1)	25.88
4562	Suspension Spring—Motor mounting spring, washer, and stud assembly—comprising six springs, six cup washers, three spring washers and three studs	.58
	AUTOMATIC SWITCH ASSEMBLIES	
3994	Cover—Motor switch cover	.26
10184	Plate—Automatic brake latch plate—Package of 5	.40
10174	Springs—Automatic brake springs—Package of 2	.50
6805	Switch Assembly—Automatic switch complete	1.90
3322	Switch—Motor switch—(S202)	.75
	OPERATING MECHANISM	
6502	Cam—Cam and gear assembly	1.18
6808	Clutch—Trip lever friction clutch	.30
11558	Cover—Metal cover for trip lever and friction finger assembly	.36
6809	Finger—Manual index lever finger assembly	.25
3670	Finger—Friction finger assembly	.32
11554	Lever—Manual index lever—less pin	.62
11556	Lever—Main lever and link assembly	2.10
11557	Lever—Main spring lever	.42
3677	Lever—Pickup arm cable lever assembly—comprising lever with cable screw, spring and nut	.40
11555	Lever—Trip lever and friction clutch assembly	.94
6503	Pawl—Trip pawl assembly	.40
4124	Plate—Eject arm actuating plate assembly	.50
4563	Screw—Cable lever screw and nut—Package of 10	.60

Stock No.	Description	List Price
	OPERATING MECHANISM—Continued	
4564	Screw—Manual index lever finger set screw—Package of 10	.20
4059	Screw—Trip lever clutch tension adjustment screw—Package of 10	.22
4566	Screw—Special screw used to fasten main lever and link assembly bushing—Package of 10	.30
11559	Spacer—Pickup arm mounting spacer	.28
4127	Spring—Actuating spring—Package of 10	.24
3666	Spring—Cable lever tension spring—Package of 10	.44
4565	Spring—Manual index lever finger tension spring—Package of 10	.30
4061	Spring—Main spring lever, tension spring—Package of 10	.38
2893	Spring—Trip lever latch plate tension spring—Package of 10	.30
2917	Washer—Spring washer "U" type—Package of 10	.25
	MICROPHONE ASSEMBLIES	
7534	Cable—Microphone cable	.70
11561	Cover—Microphone cover—Package of 2	.32
11560	Frame—Microphone frame	1.00
7533	Mechanism—Microphone mechanism	6.80
11480	Microphone—complete—(M2)	7.05
11562	Plug—Microphone plug	.25
4158	Socket—Microphone socket	.40
	RECORDING SWITCH ASSEMBLIES	
11571	Cable—Single conductor shielded cable with one female section of connector—Stock No. 11488—To S204, shield grounded to terminal lug—To cable from pickup arm assembly—Stock No. 11482	.64
11566	Cable—Three-conductor cable with male section of four-prong plug—Stock No. 11570—To S213, S205 and terminal lug—and cable—Stock No. 11503	.72
11572	Cable—Four-conductor cable with male section of four-prong plug—Stock No. 6123—To (1) S204, (1) S210, (2) S212 and cable—Stock No. 11503	.88
11569	Cable—Four-conductor shielded cable with one female section of four-contact plug—Stock No. 4153—and one female section of three-contact plug—Stock No. 5119—To (1) S204, (1) S205, (1) S206, (2) three-contact receptacle, shield grounded to terminal lug—and cable—Stock Nos. 11526 and 11527	2.45
11630	Cable—Four-conductor shielded cable with one five-prong male section of plug—Stock No. 11520—To (1) S206, (1) S208, (2) S209—shield grounded to terminal and cable—Stock No. 11504	1.18
11568	Cable—Six-conductor shielded cable—with male section of seven-prong connector plug—Stock No. 4602—To (2) S205, (1) S206, (1) S208, (2) S209 and shield grounded to terminal—Receptacle—Stock No. 4787 on receiver chassis	1.40
11567	Cable—Ten-conductor cable with two-contact female section of plug—Stock No. 11488—and one female section of six-contact plug—Stock No. 4151—To (1) S212, (2) S213, (4) S211 and (1) to terminal lug and cable—Stock No. 11522	.26
11347	Knob—Control switch knob—Package of 5	.75
4577	Plug—Two-prong male section of connector plug—Part of connector cord from S203	.30
6123	Plug—Four-contact male section of connector plug—used with cables—Stock Nos. 11572, 11516, 11513, 11526, 11525	.30
11570	Plug—Male section of four-prong connector plug for cable—Stock No. 11566	.32
11520	Plug—Five-prong male section of connector plug for cable—Stock Nos. 11519, 11521, 11630	.34
4602	Plug—Seven-prong male section of connector plug—used with cable—Stock No. 11568	.56
11488	Receptacle—Two-contact female section of connector plug—used with cables—Stock Nos. 11567, 11571, 11487, 11502, 11513	.14
5119	Receptacle—Female section—three-contact plug receptacle for cable—Stock No. 11569	.25
4153	Receptacle—Female section—four-contact plug receptacle for cable—Stock No. 11569	.48
4151	Receptacle—Six-contact female section of connector plug used with cables—Stock Nos. 11519, 11567	.60
11564	Resistor—47 Ohms—Carbon type—$\frac{1}{10}$ watt—Package of 5—(R219)	.75
11565	Resistor—15 Ohms—Carbon type—$\frac{1}{4}$ watt—(R221)—Package of 5	1.00
11563	Switch—Phonograph, Radio, Home Recording and Phonograph recording switch—complete—(S203, S204, S205, S206, S207, S208, S209, S210, S211, S212, S213)	4.80
	INDICATOR ASSEMBLIES	
11522	Cable—Six-conductor indicator assembly cable with male section of six-prong connector plug—Stock No. 4574	1.18
4340	Lamp—Indicator lamp—Package of 5	.60
4574	Plug—Six-prong male section of connector plug—for use with cables—Stock Nos. 11515, 11522	.48
11719	Screen—Indicator lamp screen—Package of 5	.34
11573	Socket—Indicator lamp socket	.28
	RECORDING INDICATOR ASSEMBLIES	
11574	Escutcheon—Recording indicator escutcheon	.32
4161	Lamp—Neon lamp	.56
4164	Screen—Indicator lamp screen	.18
11575	Screw—Screen escutcheon and terminal board mounting screw assembly—comprising two screws, two spacers, two nuts and two lockwashers	.12
	REPRODUCER ASSEMBLIES	
11577	Coil—Field coil magnet and cone support—(L102, L103)	12.00
11576	Cone—Reproducer cone—(L104, L105)—Package of 5	6.85
5039	Plug—Male section of four-prong plug	.25
9629	Reproducer—Complete	14.55
	MISCELLANEOUS ASSEMBLIES	
11881	Base—Phonograph compartment lamp base	.55
4391	Box—Needle box	.70
11606	Cap—Pilot lamp cap—Package of 5	.22
11884	Control—Expander control—(R204)	1.16
11580	Cover—Pilot lamp cover	.12
11379	Escutcheon—Station selector escutcheon and crystal	1.08
11347	Knob—Phonograph or Radio high or low frequency tone control, Radio volume control, Range switch, Selector switch knob—Package of 5	.75
11582	Knob—Expander control or Phonograph volume control knob—Package of 5	.50
11346	Knob—Station selector knob—Package of 5	.75
11605	Pad—Home recording pad	.45
11578	Reactor—Filter reactor—(L34)	3.70
11607	Receptacle—Receptacle for new needles	.38
11711	Shade—Phonograph compartment lamp shade	.16
11579	Tone Control—Phonograph low frequency tone control	.98
11581	Tone Control—Phonograph high frequency tone control	.98
11883	Transformer—Microphone and pickup input transformer pack—(R215, R216, R217, C204, C211, C212, C213, C214, C215, L301, L302, T201)	10.45
11877	Volume Control—Phonograph volume control—(R28)	1.42

MODEL RK-24
Schematic,Parts
Chassis Wiring
Assembly

RCA MFG. CO., INC.

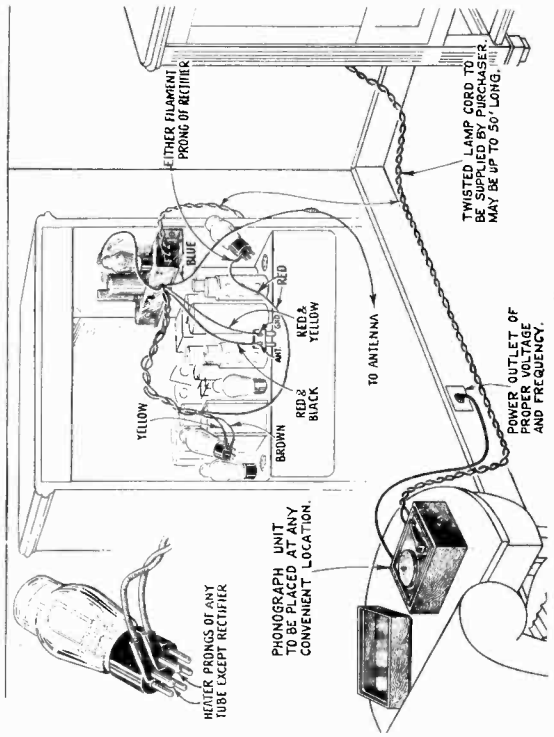


Figure 1—Typical Connections of RK-24 Phonograph Oscillator to Model R-93 Record Player

ELECTRICAL SPECIFICATIONS

Type of Oscillator Circuit	Modified Hartley
Type of Modulation	Pentode Control Grid
Type of Radiotrons	RCA-2A7 or RCA-6A7
Heater Current	0.3 or 1.0 (Depending on Tube Used)
Heater Voltage	2.5 or 6.3 Volts (Depending on Tube Used)
Plate Voltage	150 Volts to 400 Volts
Plate Current	2.0 M. A. at 250 Volts
Input Pickup Impedance	2450 Ohms at 1000 Cycles
Output Impedance	30 Ohms
Tuning Frequency Range	1400 K. C. to 1700 K. C.

The RCA Victor RK-24 Phonograph Oscillator is a modulated R. F. oscillator designed for use in conjunction with the RCA Victor Record Player Model R-93. The purpose of the RK-24 Oscillator is to facilitate and ensure the proper connection and operation of the R-93 when connected to a radio receiver of any type and manufacture.

The Oscillator uses Radiotron RCA-2A7 or RCA-6A7, depending on the heater voltage of the receiver with which it is to be used. This Radiotron is of the dual purpose variety and functions both as an oscillator and a modulator. The modulation is of the pentode control grid type and results in excellent quality throughout the audio range of the pickup.

A typical connection of the RK-24 in conjunction with the R-93 Record Player is shown in Figure 1.

Figure 2 shows the schematic circuit diagram, while Figure 3 shows the chassis wiring diagram.

Stock No.	Description	List Price
4749	Board—Terminal board assembly	$0.48
4013	Capacitor—200 mmfd. (C3)	.30
4027	Capacitor—800 mmfd. (C1)	.44
4745	Capacitor pack—Comprising two 4.0 mfd capacitors (C4, C5)	1.28
4748	Clamp—Electrolytic capacitor clamp	.15
4747	Coil—Oscillator coil and shield assembly (L1, L2, C2)	2.18
9554	Oscillator—Complete	7.75
3400	Resistor—30 ohms—Carbon type—½ watt (R6)—Package of 5	$1.00
6143	Resistor—40,000 ohms—Carbon type—½ watt (R2, R3)—Package of 5	1.00
3464	Resistor—70,000 ohms—Carbon type—½ watt (R4)—Package of 5	1.00
3058	Resistor—100,000 ohms—Carbon type (R5)—Package of 5	1.10
6300	Socket—4 contact Radiotron socket	.35
4750	Switch—Operating switch	.94
4746	Transformer—Output transformer (L3, L4)	.48

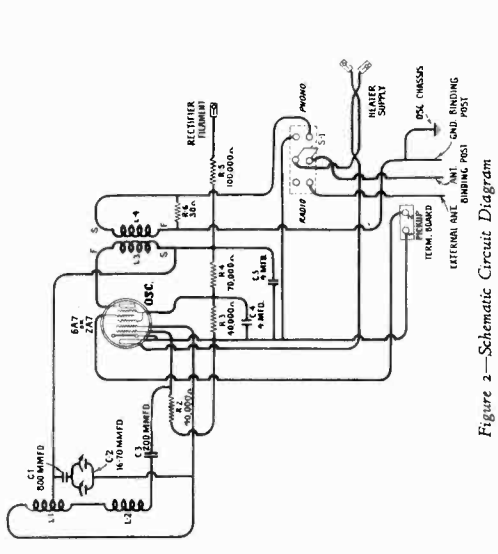


Figure 2—Schematic Circuit Diagram

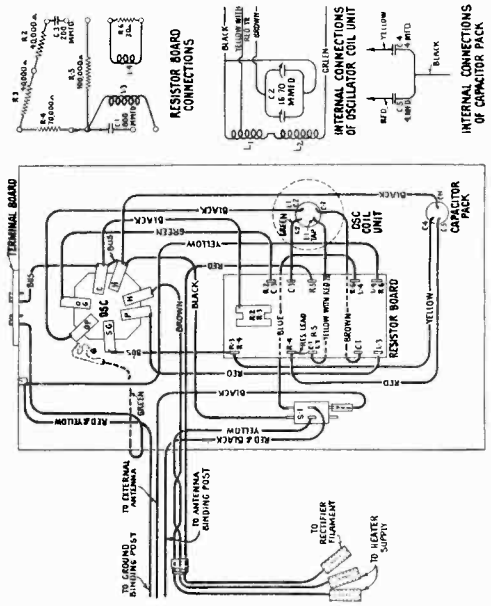


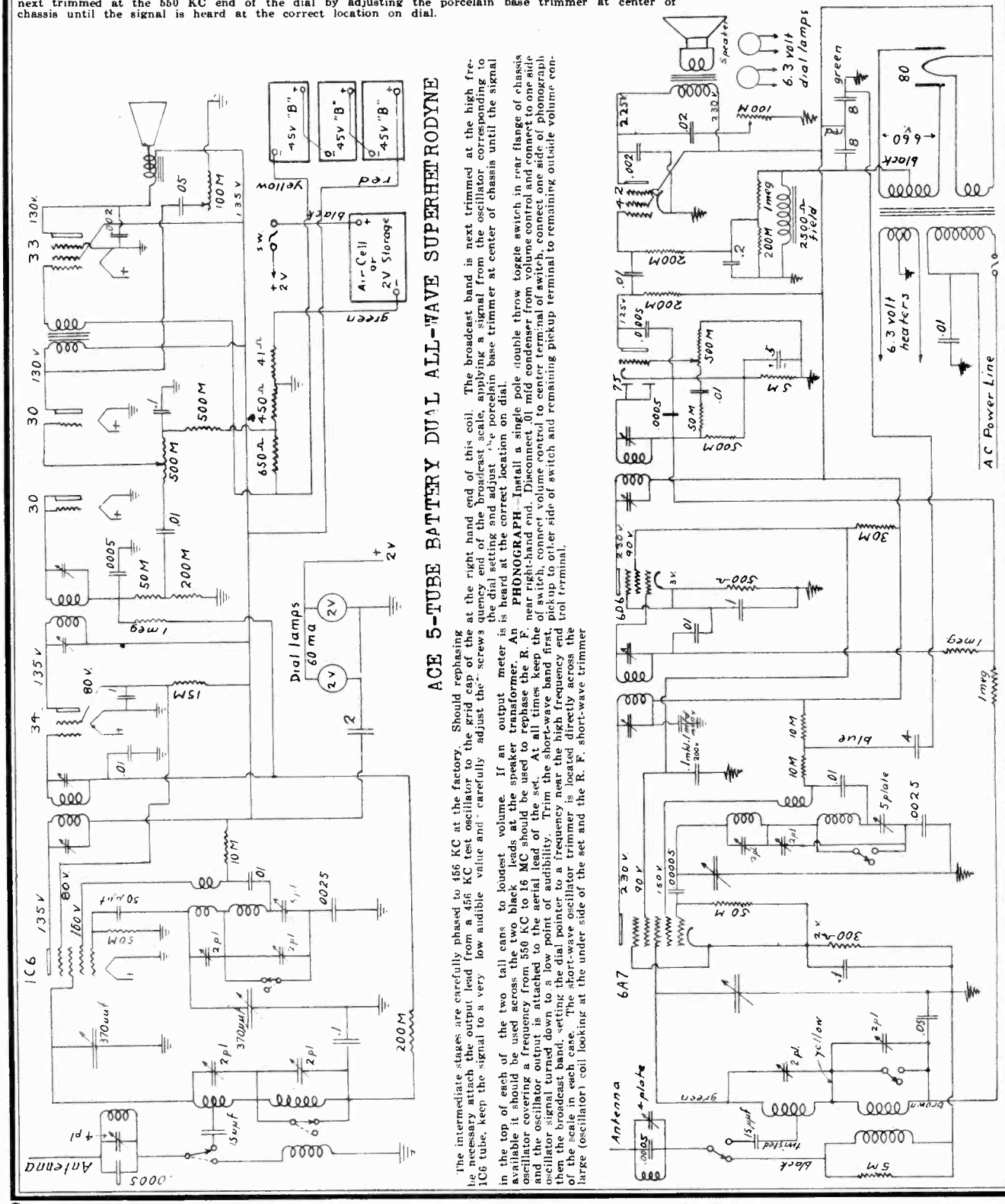
Figure 3—Chassis Wiring

MODEL 5-Tube Dual Battery A-W. Superhet.
MODEL 5-Tube Dual A-C. A-W. Super.
Schematics, Alignment

RADIO CIRCULAR CO.

ACE 5-TUBE DUAL ALL-WAVE SUPERHETRODYNE

The intermediate stages are carefully phased to 456 KC at the factory. Should rephasing be necessary, attach the output lead from a 456 KC test oscillator to the grid cap of he 6A7 tube, keep the signal to a very low audible value and carefully adjust the two trimmer screws in the top of each of the two tall cans to loudest volume. If an output meter is available it should be used across the two black leads at the speaker transformer. An oscillator covering a frequency from 550 KC to 16 MC should be used to rephase the R. F. The test oscillator output is attached to the aerial lead of the set. At all times keep the oscillator signal turned down to a low point of audibility. Trim the short-wave band first, then the broadcast band, setting the dial pointer to a frequency near the high frequency end of the scale in each case. The short-wave oscillator trimmer is located directly across the large (oscillator) coil looking at the under side of the set, and the R. F. short-wave trimmer at the right hand end of this coil. The broadcast band is next trimmed at the high frequency end of the broadcast scale, applying a signal from the oscillator corresponding to the dial setting and adjust the oscillator trimmer connected between the end of the oscillator coil and the porcelain base trimmer. Next trim the Broadcast R. F. by the trimmer connecting to the band switch. The broadcast band is next trimmed at the 550 KC end of the dial by adjusting the porcelain base trimmer at center of chassis until the signal is heard at the correct location on dial.



The intermediate stages are carefully phased to 456 KC at the factory. Should rephasing be necessary attach the output lead from a 456 KC test oscillator to the grid cap of the 1C6 tube, keep the signal to a very low audible value and carefully adjust the two screws in the top of each of the two tall cans to loudest volume. If an output meter is available it should be used across the two black leads at the speaker transformer. An oscillator covering a frequency from 550 KC to 16 MC should be used to rephase the R. F. and the oscillator output is attached to the aerial lead of the set. At all times keep the oscillator signal turned down to a low point of audibility. Trim the short-wave band first, then the broadcast band, setting the dial pointer to a frequency near the high frequency end of the scale in each case. The short-wave oscillator trimmer is located directly across the large (oscillator) coil looking at the under side of the set and the R. F. short-wave trimmer at the right hand end of this coil. The broadcast band is next trimmed at the high frequency end of the broadcast scale, applying a signal from the oscillator corresponding to the dial setting and adjust the porcelain base trimmer at center of chassis until the signal is heard at the correct location on dial.

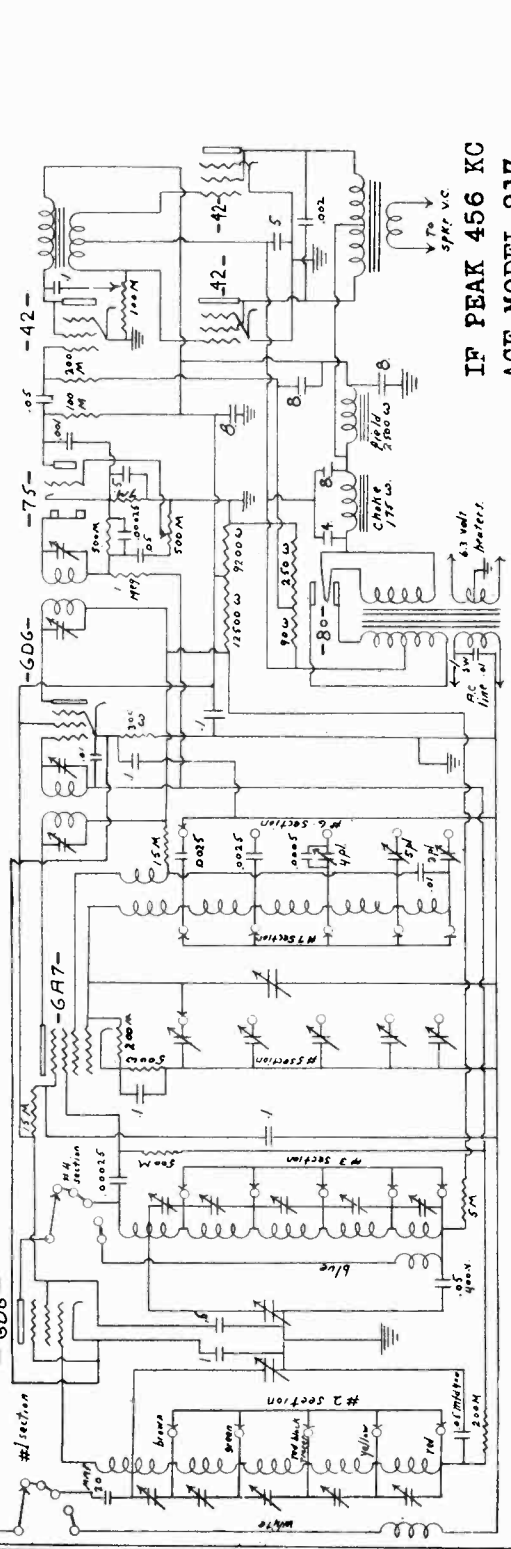
PHONOGRAPH—Install a single pole double throw toggle switch in rear flange of chassis near right-hand end. Disconnect .01 mfd condenser from volume control and connect to one side of switch, connect volume control to center terminal of switch, connect one side of phonograph pickup to other side of switch and remaining pickup terminal to remaining outside volume control terminal.

MODEL 5-Tube AC-DC Dual
A-W. Superheterodyne
MODEL 817
Schematics, Alignment

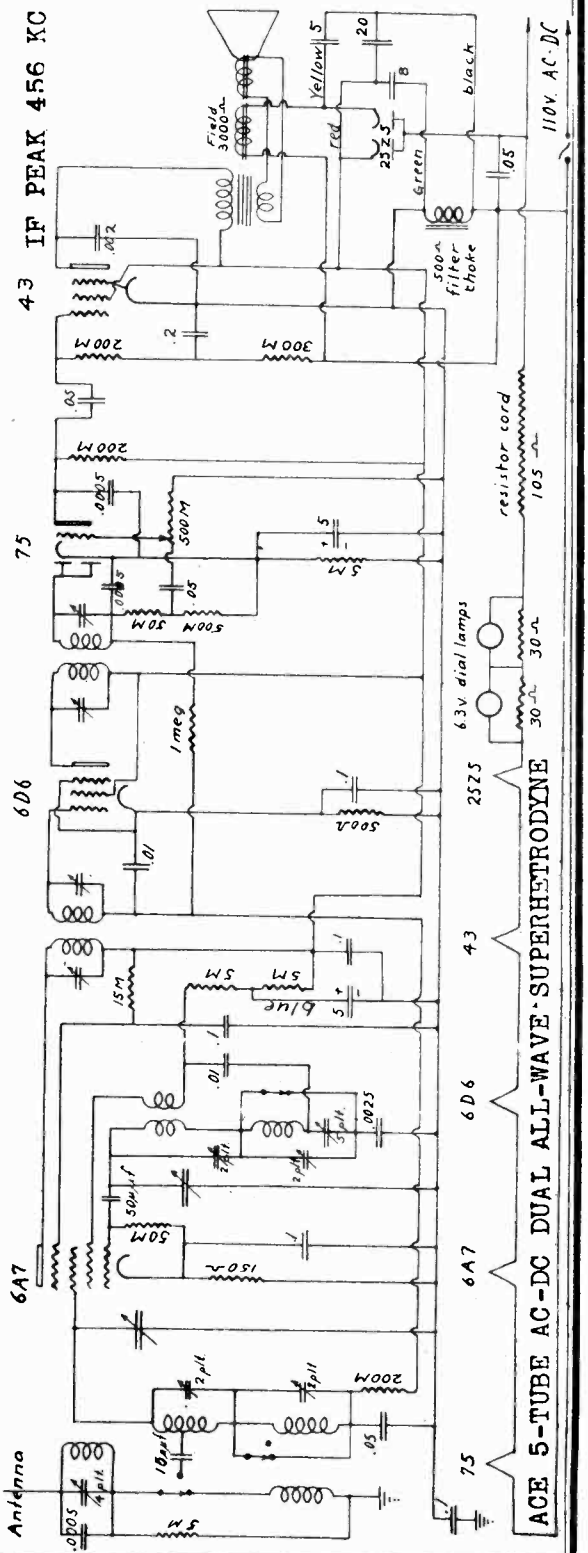
RADIO CIRCULAR CO.

Short-wave oscillator trimmer attaches between the two ends of the oscillator coil located at the right. Broadcast oscillator trimmer is the lower section of the dual trimmer at the end of the chassis. Short-wave R. F. trimmer is at the lower end of the oscillator coil and the broadcast R. F. trimmer is to the left of this same coil.

PHONOGRAPH—Install a single pole double-throw toggle switch in rear of chassis nearest the 75 tube. Disconnect the .01 mfd. condenser from volume control and attach to one side of toggle switch, connect middle terminal of switch to terminal of volume control just disconnected, connect one side of phonograph pickup to remaining terminal of switch and other side to "B" minus.

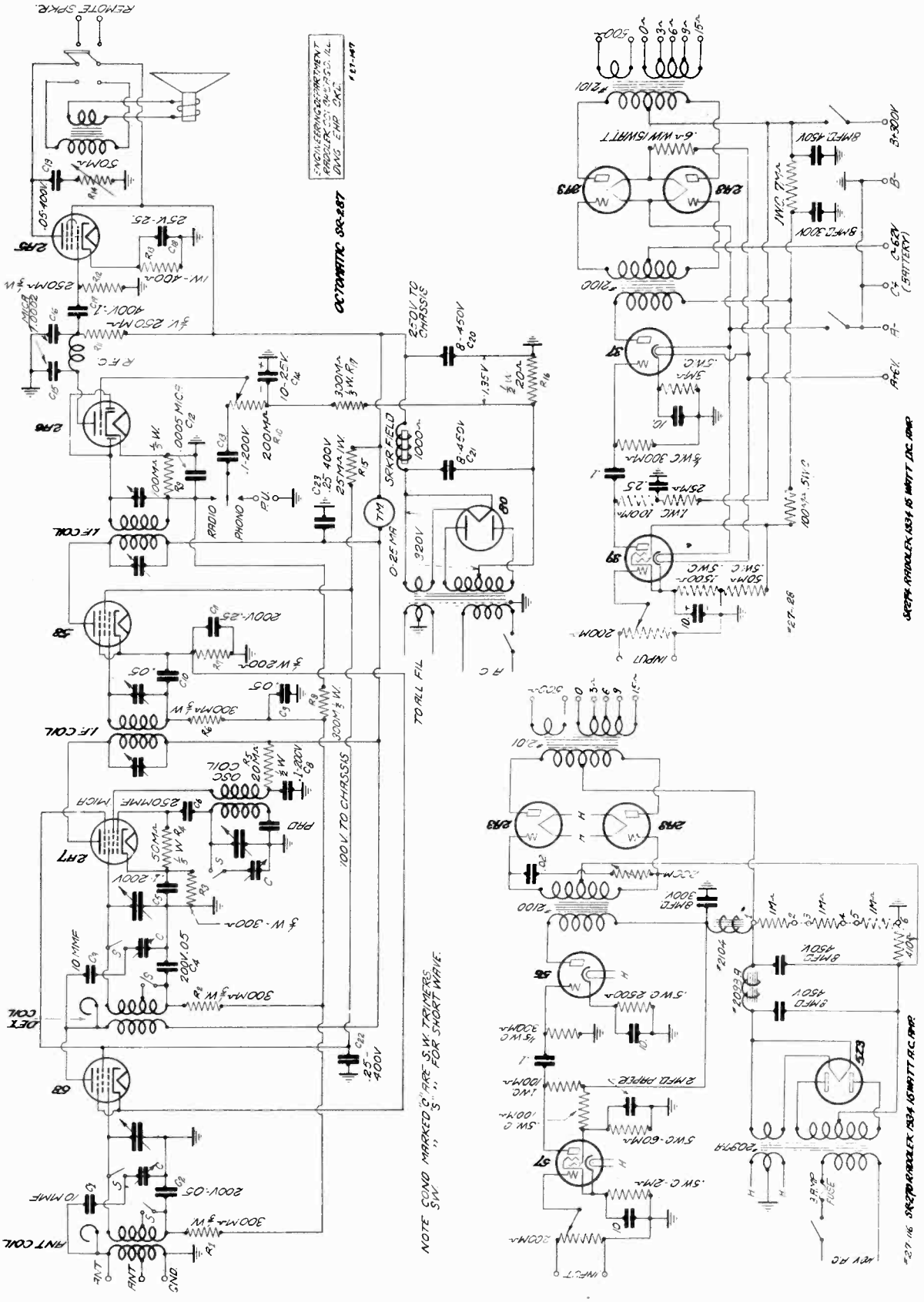


An all-wave oscillator having a range from 150 KC to 20 MC will be necessary to rephase the frequency bands. The oscillator output is attached to the aerial lead of the set and oscillator output kept always at a low audible level. The R. F. coil trimmers are reached through a series of five (5) holes in the side of the R. F. shield cans and correspond to frequency band Nos. 1, 2, 3, 4, and 5, from top down. The oscillator parallel trimmers are seen on the under side of the set when the front of it is raised and are located along side the band switch, No. 1 being the one nearest the back of chassis and No. 5 nearest the front. The dual porcelain trimmers at back of chassis are series padders, the left hand for band No. 2 and the right hand one for band No. 1. The series padder for band No. 3 is the single trimmer at the center of the chassis. Each band is trimmed first at the minimum end of its range, band No. 5 being first, No. 4 second, then No. 3, etc. Bands 3, 2, and 1 are also tracked near their maximum ranges, or with the tuning condenser turned well in, by adjusting that series padder belonging to the particular band being used, location of which is given above.



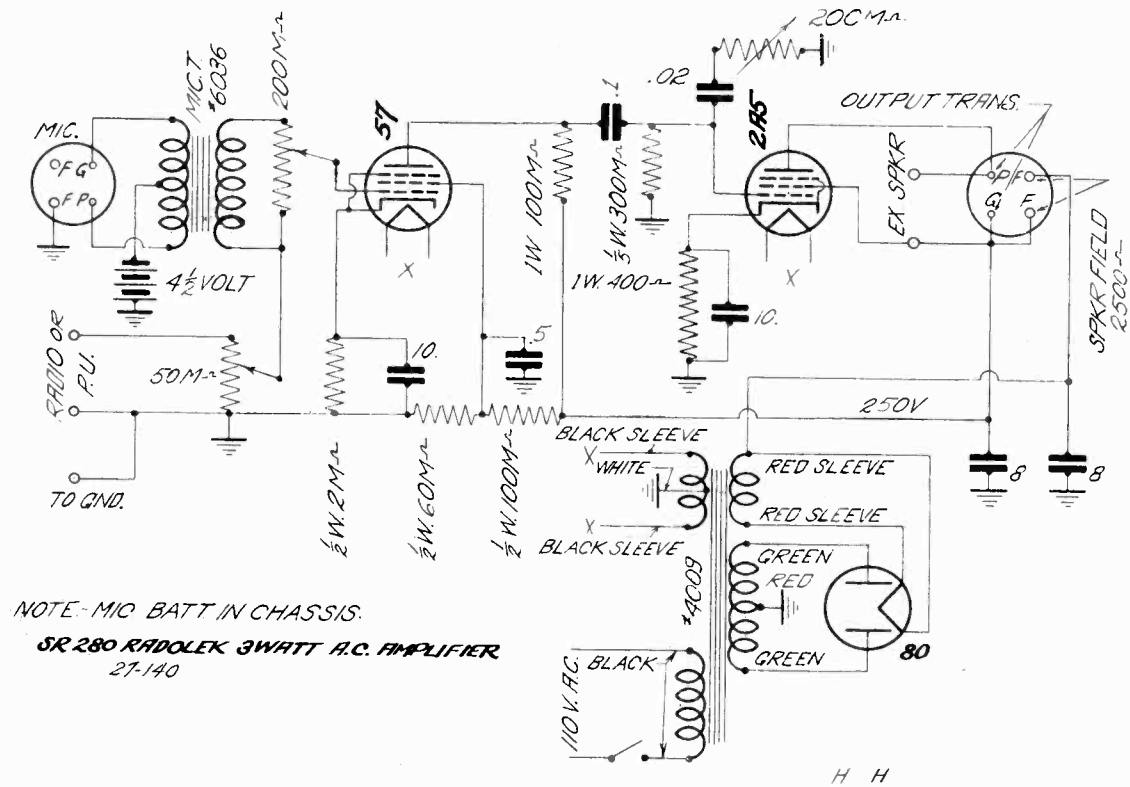
RADOLEK CO.

MODEL Octomatic
MODEL 15-Watt A-C.Amplifier
MODEL 15-Watt D-C.Amplifier
Schematics



MODEL 3-Watt A-C. Amplifier
MODEL 30-Watt A-C. Amplifier
Schematics

RADOLEK CO.

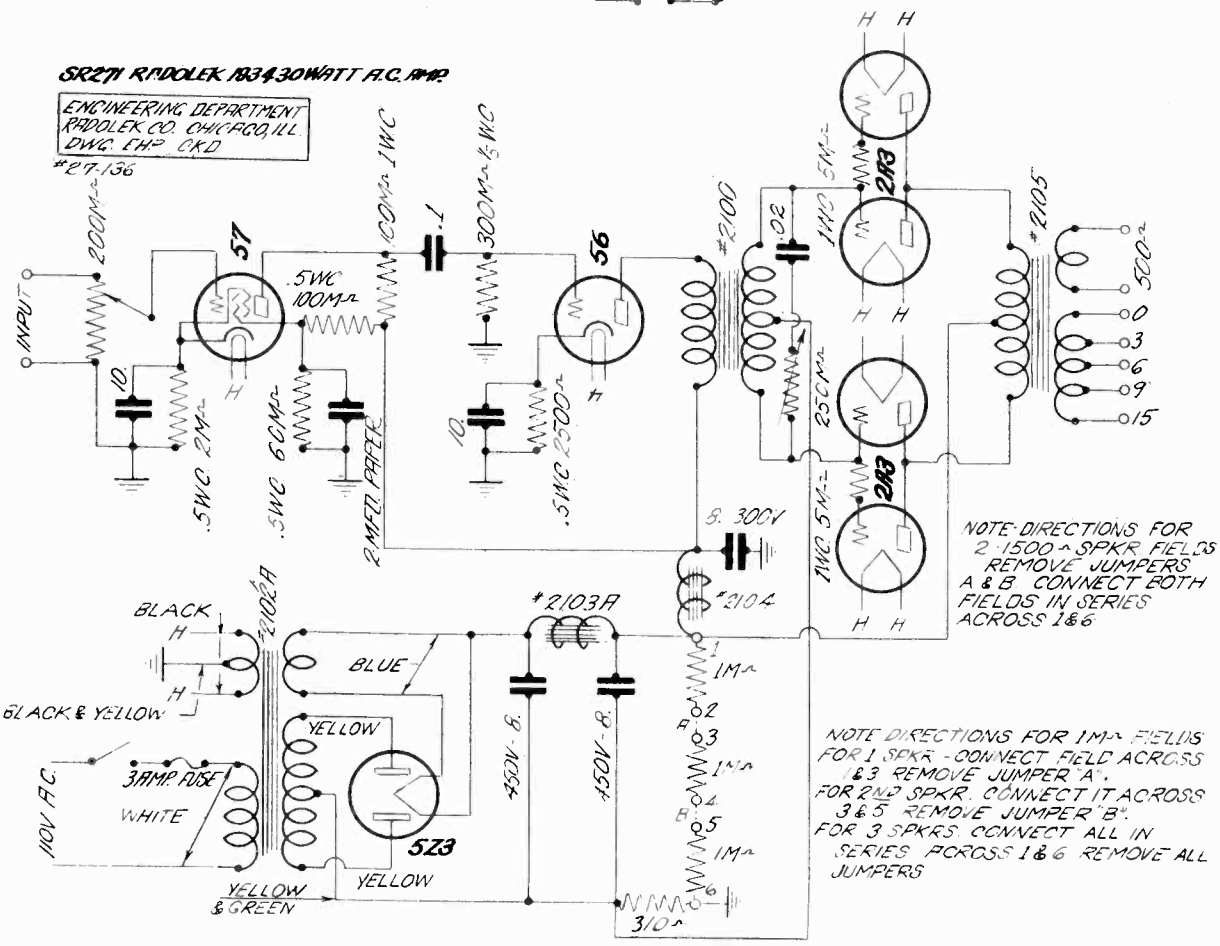


NOTE - MIC BATT IN CHASSIS.

SR 280 RADOLEK 3 WATT A.C. AMPLIFIER
27-140

SR271 RADOLEK 1934 30 WATT A.C. AMP.

ENGINEERING DEPARTMENT
RADOLEK CO. CHICAGO, ILL.
DWG. CH= CK'D
#27-136



NOTE: DIRECTIONS FOR 2 - 1500Ω SPKR. FIELDS
REMOVE JUMPERS
A & B. CONNECT BOTH
FIELDS IN SERIES
ACROSS 1 & 6

NOTE DIRECTIONS FOR 1MΩ FIELDS
FOR 1 SPKR - CONNECT FIELD ACROSS
1 & 3 REMOVE JUMPER 'A'.
FOR 2ND SPKR. CONNECT IT ACROSS
3 & 5 REMOVE JUMPER 'B'.
FOR 3 SPKRS. CONNECT ALL IN
SERIES ACROSS 1 & 6 REMOVE ALL
JUMPERS

REMLER COMPANY, LTD.

MODEL 26
Above Serial 54760
Schematic, Voltage
Alignment

MODEL 26

GENERAL DESCRIPTION:

This five tube superheterodyne is of the universal type and is equipped with a six inch full dynamic speaker and two wave ranges.

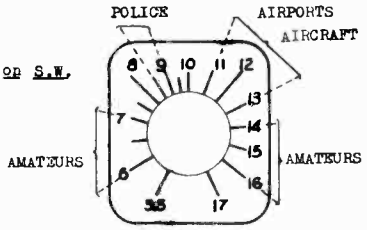
INSTALLATION:

The receiver is designed for operation from a power supply of 110 to 125 volts A.C. or D.C. A resistor voltage reducer may be secured for operation from 220 volt sources. The antenna supplied with the receiver should be extended to its full length and connected to the black wire extending from the back of the cabinet. This indoor antenna may be concealed under a rug or along a molding. An outdoor antenna up to one hundred feet in length may be used where the indoor type is not satisfactory.

OPERATION:

The knob at the left controls the volume and operates the ON and OFF switch at the extreme left position. The knob on the right is the station selector. The dial is calibrated in hundreds of kilocycles. The lower frequency police band may be tuned in near 17 on the dial with the wave range switch on the back of the cabinet in the L.W., or broadcast, position. When this switch is placed on the S.W. position, a range of from 1700 to 4100 kilocycles is covered by the selector knob. The location of the principal short wave bands are noted in the figure following.

<u>Short-wave bands with switch on S.W.</u>



SERVICE DATA:

The plate supply is rectified directly from the power source and the filaments of the tubes are connected in series and through a series resistor to this source. The chassis is directly connected to the power line, and contact between chassis and ground should be avoided.

To take the chassis out of the cabinet - first, remove the knobs, then the back, and finally the hold down screw in the base of the cabinet. To replace tubes it is only necessary to remove the back. The back may be plugged on the chassis after removal from the cabinet for testing and aligning.

The antenna and mixer coils are in the aluminum shield at the back of the variable condenser. The mixer coil is trimmed by the back section trimmer. The oscillator coil is within the chassis and is trimmed by the front section trimmer on the variable condenser. The first I.F. transformer is mounted with the oscillator coil and is trimmed by the condensers accessible from the back of the chassis. The second I.F. transformer is also located within the chassis and may be trimmed by the condensers mounted thereon. The intermediate frequency used is 450 kilocycles.

TUBES:

6A7 Converter (mixer oscillator)
78 I. F. amplifier
77 Detector
43 Power amplifier
25Z5 Rectifier
Dial light 6-8 volt.

VOLTAGE READINGS: (When operated on A.C.)

Line	-	120 volts
Filaments:		
43 and 25Z5		24 "
6A7, 78, 77 each		6 "
Across series resistor		54 "

(Filament voltages may vary with tubes)

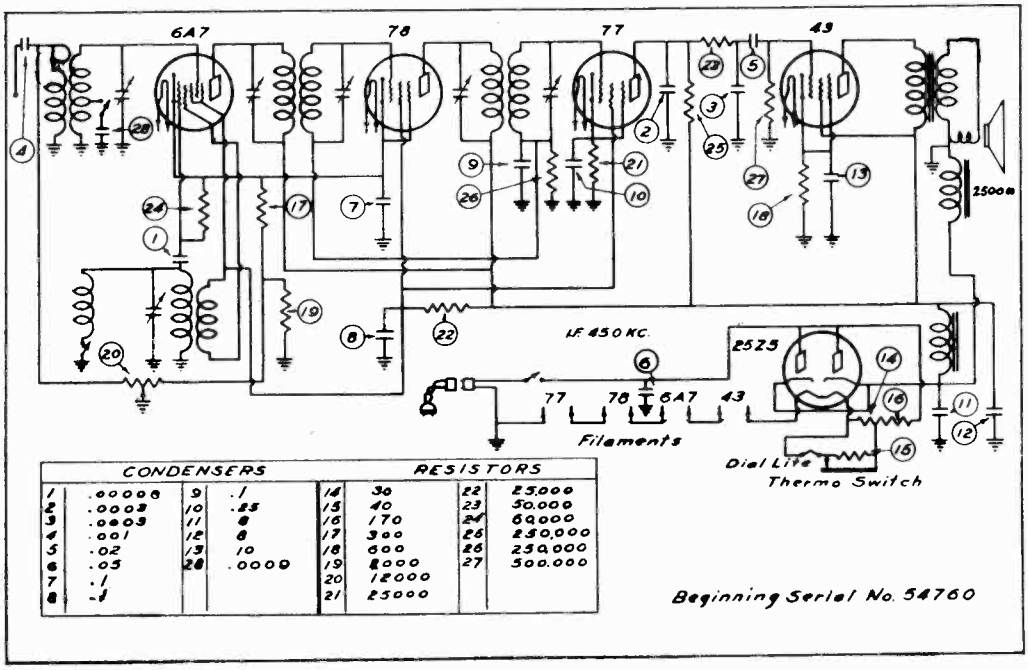
D.C. VOLTAGES - On full volume - No signal

From Chassis to:

25Z5 Rectifier tube	cathode	105	volts
43 Power "	plate	83	"
43 " "	screen grid	92	"
43 " "	cathode	12	"
6A7 Mixer Osc. "	plate	92	"
6A7 " " "	screen grid	35	"
6A7 " " "	cathode	3	"
6A7 " " "	osc. plate	35	"
78 I.F. "	plate	92	"
78 I.F. "	screen grid	35	"
78 I.F. "	cathode	2	"
* 77 Detector "	plate	36	"
77 " "	screen grid	35	"
77 " "	cathode	2	"

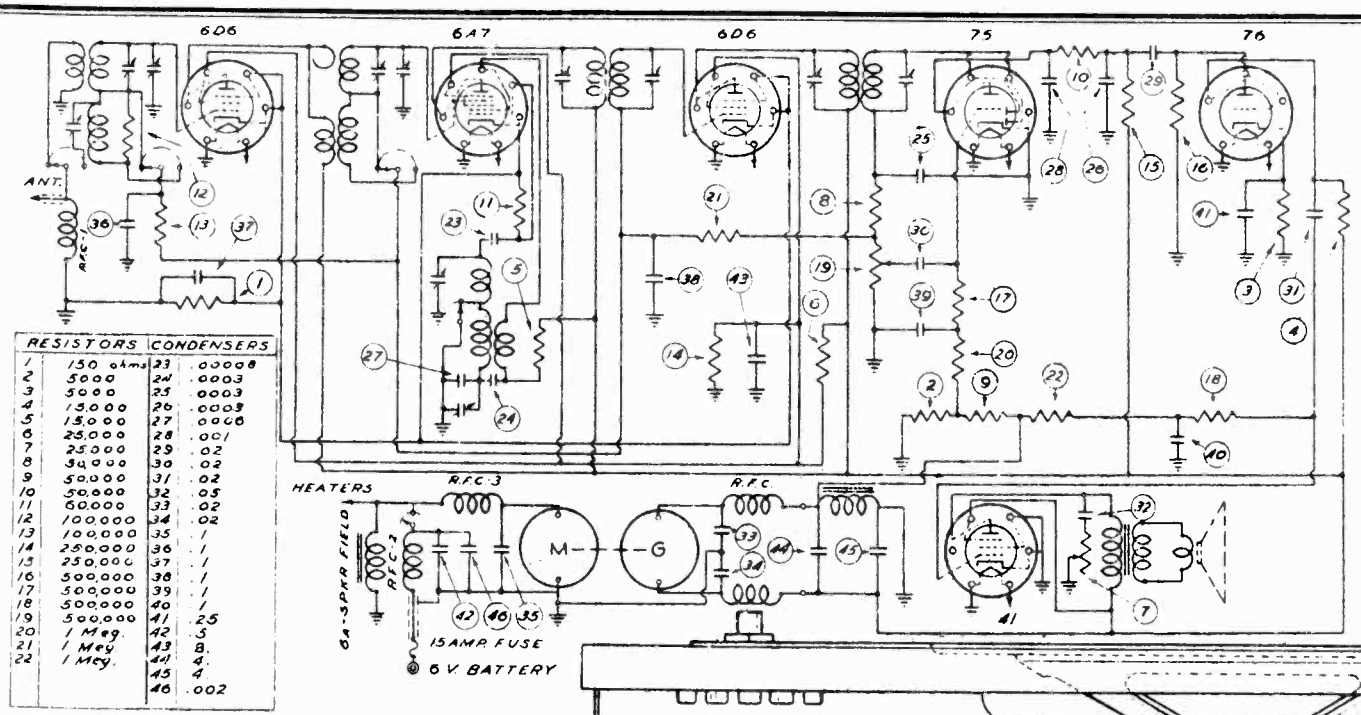
* Due to small current, meter readings will be inaccurate on detector tube plate.

D.C. voltage readings when connected to a D.C. source of 120 volts will be slightly less than those above.



CONDENSERS				RESISTORS			
1	.00006	9	.1	14	30	22	25,000
2	.0003	10	.25	15	40	23	50,000
3	.0003	11	8	16	170	24	60,000
4	.001	12	8	17	300	25	250,000
5	.02	13	10	18	600	26	250,000
6	.05	28	.0006	19	8000	27	500,000
7	.1			20	12000		
8	.1			21	25000		

Beginning Serial No. 54760



RESISTORS		CONDENSERS	
1	150 ohms	23	.00008
2	5000	24	.0003
3	5000	25	.0003
4	15,000	26	.0003
5	15,000	27	.0006
6	25,000	28	.001
7	25,000	29	.02
8	34,000	30	.02
9	50,000	31	.02
10	50,000	32	.05
11	60,000	33	.02
12	100,000	34	.02
13	100,000	35	.1
14	250,000	36	.1
15	250,000	37	.1
16	500,000	38	.1
17	500,000	39	.1
18	500,000	40	.1
19	500,000	41	.25
20	1 Meg.	42	.5
21	1 Meg	43	8.
22	1 Meg.	44	4.
		45	4
		46	.002

REMLER

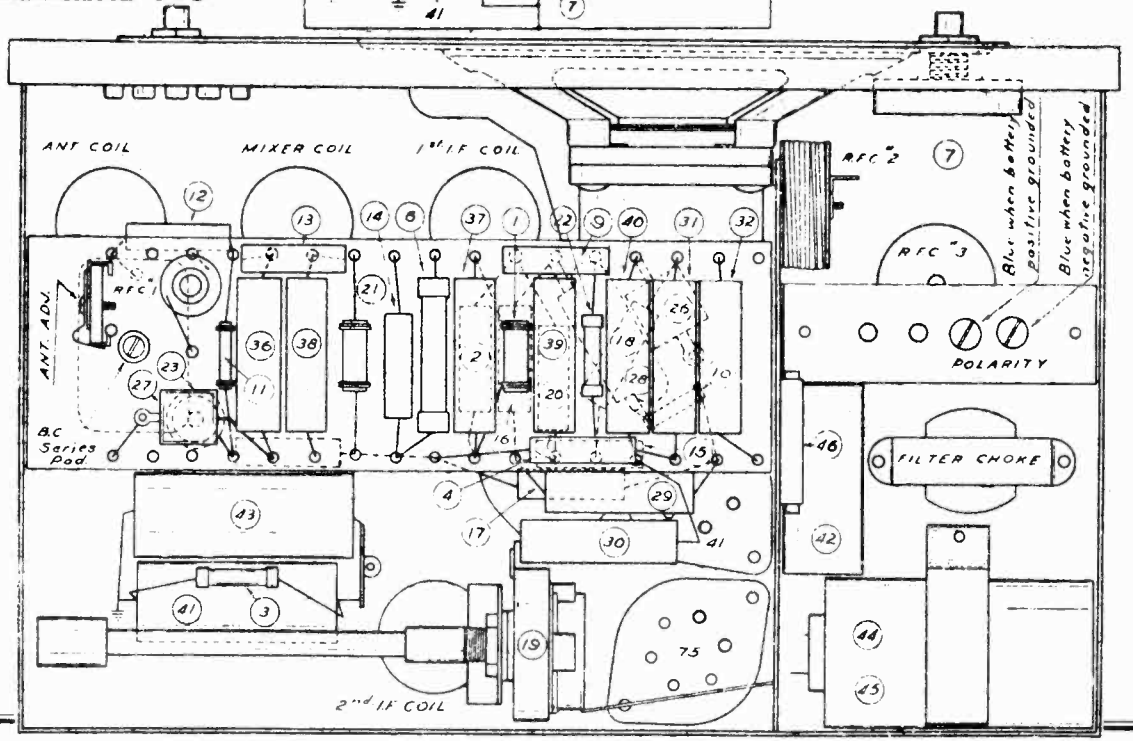
MODEL 36 AUTO RADIO

IF PEAK 250 KC.

REMLER COMPANY, LTD.

VOLTAGE TO CHASSIS-NO SIGNAL

Plate supply from dynamotor	215 v.
6D6-RF Plate	215
6D6-RF Screen	80
6D6-RF Cathode	3
6A7-Mixer Plate	215
6A7-Mixer Screen	80
6A7-Mixer Cathode	3
6A7-Oscillator Plate	150
6D6-IF Plate	215
6D6-IF Screen	80
6D6-IF Cathode	3
75 -Det.AVC Plate	85
75 -Det.AVC Grid	1.5
76 -AF Plate	155
76 -AF Cathode	9
41 -Power Plate	195
41 -Screen 215v. Grid	15



REMLER COMPANY, LTD.

MODEL 40
Above Serial 53410
Schematic, Voltage
Alignment

MODEL 40

GENERAL DESCRIPTION:

This radio receiver employs the superheterodyne circuit and utilizes four tubes, two of which are of the double purpose type. It is equipped with a six inch full dynamic speaker and two wave ranges.

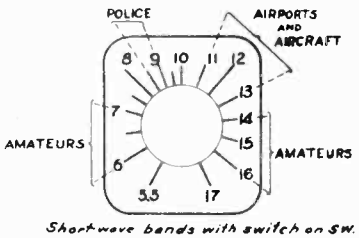
INSTALLATION:

The receiver is designed for operation from an alternating current (A.C.) power supply of 110 to 125 volts, 50 or 60 cycles.

Flexible leads for connecting antenna and ground extend from the back of the cabinet. A good ground connection to the black lead is essential for best performance. This lead should be as short as possible and preferably attached to a water pipe. Two antenna connections are provided. The antenna supplied with the receiver should be connected to the red lead and extended to its full length. It may be concealed under a rug or along a molding. An outdoor antenna up to 100 feet in length may be used when the indoor type is not satisfactory. In rural locations, where a longer antenna may be used, connection to the green wire is recommended.

OPERATION:

The knob at the left controls the volume and operates the ON and OFF switch at the extreme left position. The knob on the right is the station selector. The dial is calibrated in hundreds of kilocycles. The lower frequency police band may be tuned in near 17 on the dial with the wave range switch on the back of the cabinet in the L.W., or broadcast, position. When this switch is placed on the S.W. position, a range of from 1700 to 4100 kilocycles is covered by the selector knob. The location of the principal short wave bands are noted in the figure following.



Short wave bands with switch on SW.

SERVICE DATA:

The antenna and mixer coils are in the aluminum shield at the back of the variable condenser. The mixer coil is trimmed by the back section trimmer. The oscillator coil is within the chassis and is trimmed by the front section trimmer on the variable condenser. The first I.F. transformer is mounted with the oscillator coil and is trimmed by the condensers accessible from the back of the chassis. The second I.F. transformer is also located within the chassis and may be trimmed by the condensers mounted thereon. The intermediate frequency used is 450 kilocycles.

Tubes:

6A7	Converter (mixer-oscillator)
6F7	I.F. Amplifier and detector
41	Power amplifier
84	Full wave rectifier

A. C. VOLTAGES:

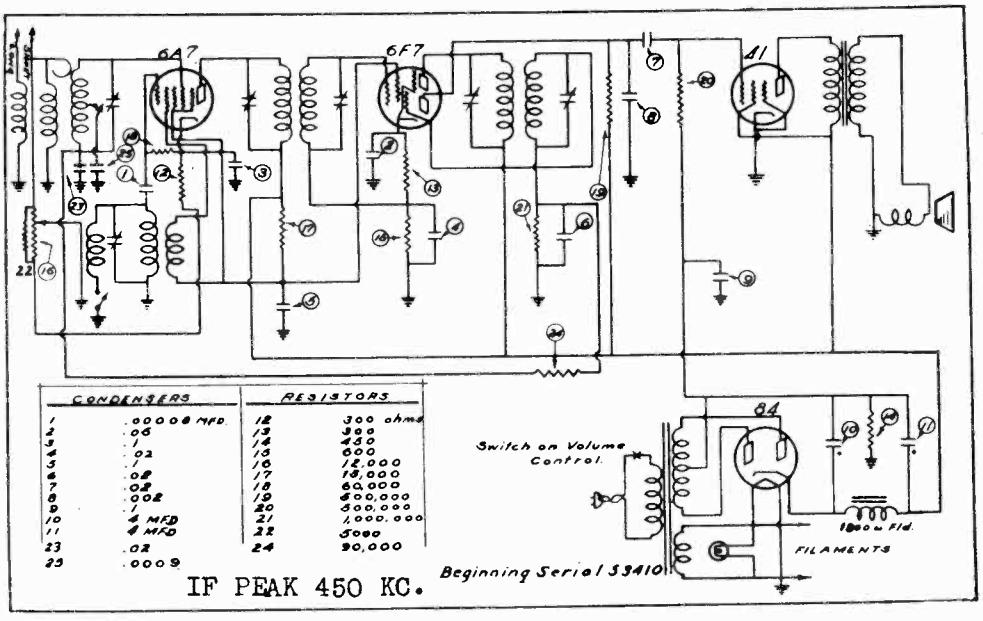
Line	-	120 volts
Filaments		6.3 "

D. C. VOLTAGES:

From ground to:

#84 Rectifier cathode	-	330 volts
#41 Plate		240 "
#41 Screen grid		250 "
#41 Grid		20 "
#6F7 Triode plate		100 "
#6F7 Pentode plate		250 "
#6F7 Screen grid		100 "
#6F7 Cathode		8 "
#6F7 Pentode grid		5 "
#6A7 Plate		250 "
#6A7 Screen grid		100 "
#6A7 Oscillator plate		100 "
#6A7 Cathode		3½ - 23 volts

Due to current taken by voltmeter used, readings of detector plate and grid voltages may be slightly less than values shown above.



IF PEAK 450 KC.

MODEL 42
Above Serial 53968
Schematic, Voltage
Alignment

REMLER COMPANY, LTD.

MODEL 42

This is a six tube superheterodyne receiver with automatic volume control, tone compensator and police call switch. It is designed to operate from a 110 to 125 volt, 50 or 60 cycle, alternating current power supply.

INSTALLATION:

An antenna of from twenty-five to a hundred feet in length should be connected to the blue wire extending from the back of the set. The antenna and lead-in wire should be kept clear of all metal objects such as pipes and wires, and be run in as straight a line as possible. An indoor antenna may be used to receive local stations or where the receiver is used in an isolated wooden building.

A good ground is essential for clearest reception. Connect the black wire at the back of the set to a water or steam pipe. The pipe should first be scraped clean before attaching the ground wire.

CONTROLS:

The knob on the left is the volume control and also operates the ON and OFF switch in the extreme left position.

The selector knob is at the right. The dial is calibrated in hundreds of kilocycles and covers a range of from 540 to 1720 K. C. The lower frequency police band is tuned from 16 to 17 on the dial. Police calls from stations on the higher frequency band may be received by shifting the police call switch on the back of the receiver to the right and tuning from 15 to 17 on the dial. Police radio stations operate intermittently to suit their particular needs and do not operate continuously as do the broadcast stations.

A tone control switch is located on the back of the receiver. When shifted to the right the higher audio frequencies are suppressed and static and interfering noises are reduced.

OPERATION:

With the line plug connected, turn the volume control to the right. The dial lights should light up brightly. Allow about one half minute for the tubes to warm up and slowly turn the selector knob until the desired program is heard. If too loud reduce the volume by turning the volume control to the left. For best quality the selector knob should be adjusted to the center of the range on the dial within which the station is heard and the volume adjusted with the volume control only.

SERVICE DATA:

The following tubes are used in this receiver:

6D6 - R. F. amplifier
6A7 - Converter (mixer-oscillator)
6D6 - I. F. amplifier
75 - Diode detector and audio amplifier
42 - Output amplifier
80 - Rectifier
Dial lights 6 - 8 volts.

SERVICE DATA - Cont'd.

The antenna and R. F. coils are in the shielding can nearest the front of the chassis and the mixer coil is in the shield within the chassis. The first I.F. transformer and oscillator are mounted in the shield between the 6A7 and 6D6 tubes; while the second I. F. transformer is located on the under side of the chassis. The oscillator trimmer condenser is nearest the back of the variable condenser and the mixer and R. F. trimmers are next in order toward the front of the chassis.

Trimmers for the I. F. transformers are adjustable through holes in the shield can, and on the I. F. transformer within the chassis. The intermediate frequency is 450 K.C. Use a weak signal or oscillator input when adjusting the trimmers. In removing the chassis from the cabinet pry off the knobs with a wooden screw driver with a piece of cardboard against the cabinet and pull off the pointer from the condenser shaft.

Voltage readings for service work follow:

A. C. VOLTAGES:

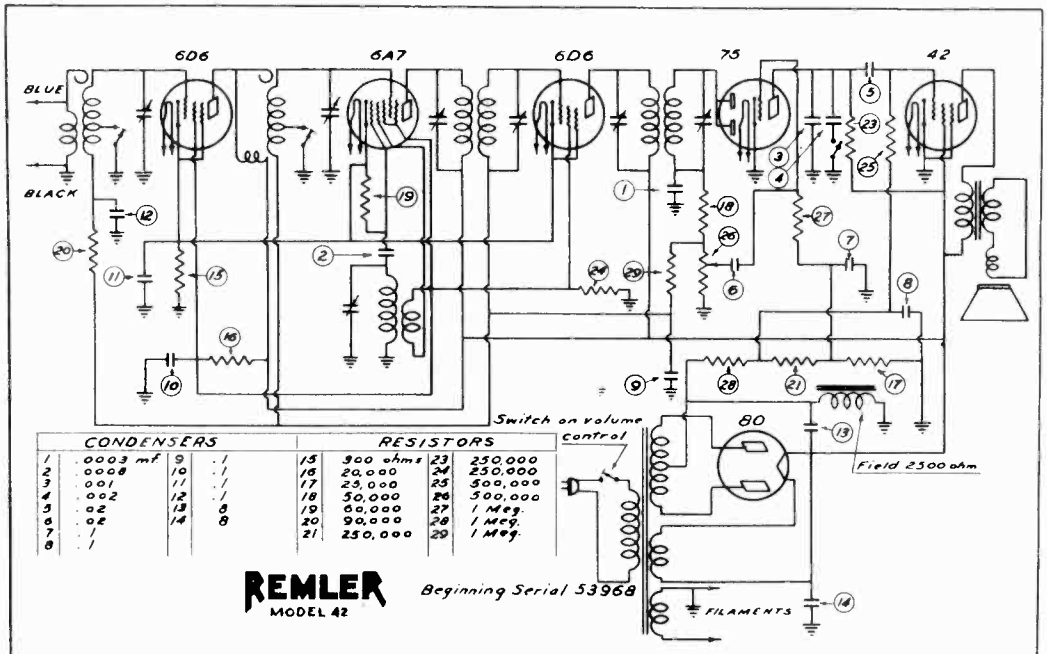
Line	120 volts
Filaments 6A7, 6D6's, 75 and 42	6.3 "
Filaments 80	5.2 "

D. C. VOLTAGES: (no signal)

From ground to:

80 Rectifier filament	270 volts
42 Plate	260 "
42 Screen grid	270 "
42 Grid	18 "
75 Plate	140 "
75 Grid	3 "
6D6 I. F. plate	270 "
6D6 I. F. screen grid	110 "
6D6 I. F. Cathode	5 "
6A7 Plate (mixer)	270 "
6A7 Screen grid	110 "
6A7 Cathode	5 "
6A7 Plate (oscillator)	110 "
6D6 R. F. plate	270 "
6D6 R. F. screen grid	110 "
6D6 R. F. cathode	5 "
Speaker field	120 "

Due to current taken by voltmeter used, readings of 75 and 42 grid voltages will be less than those above.



IF PEAK 450 KC.

REMLER COMPANY, LTD.

MODEL 53
Above Serial 54862
Schematic, Voltage
Alignment

GENERAL DESCRIPTION:

This radio receiver employs the superheterodyne circuit and utilizes five tubes, two of which are of the double purpose type. It is equipped with a six inch full dynamic speaker and receives all police calls.

INSTALLATION:

The receiver is designed for operation from an alternating current (A.C.) power supply of 110 to 125 volts, 50 or 60 cycles.

Flexible leads for connecting antenna and ground extend from the back of the cabinet. A good ground connection to the black lead is essential for best performance. This lead should be as short as possible and preferably attached to a water pipe. Under ordinary conditions an outdoor antenna of approximately 100 feet in length should be connected to the blue wire. Where the receiver is installed near broadcast stations, a shorter antenna may be used to improve selectivity. An antenna longer than 100 feet may be used in rural locations.

OPERATION:

The lower knob controls the volume and operates the ON and OFF switch at the extreme left position. The dial is calibrated in hundreds of kilocycles, that is - a station transmitting on 700 kilocycles is tuned in at 7 on the dial.

The lower frequency police band may be tuned in near 17 on the dial while police calls from stations on the higher frequency band are tuned in from 15 to 16. These stations are on the air intermittently to suit their particular needs and are not operated continuously as are the broadcast stations.

SERVICE DATA:

The antenna and mixer coils are located in the protecting shield on the top of the chassis. The mixer coil is trimmed by the trimmer condenser nearest the back of the variable condenser. The oscillator coil is within the chassis and is trimmed by the front trimmer on the variable condenser.

The I. F. transformers have untuned secondaries and are located within the chassis. The trimmers for the primary windings are attached to the transformers. The intermediate frequency used is 450 K.C.

TUBES:

6A7	Converter (mixer-oscillator)
6D6	I.F. amplifier
53	Diode detector and audio amplifier
42	Power amplifier
80	Full wave rectifier
	Dial light 3.8 volt

A. C. VOLTAGES:

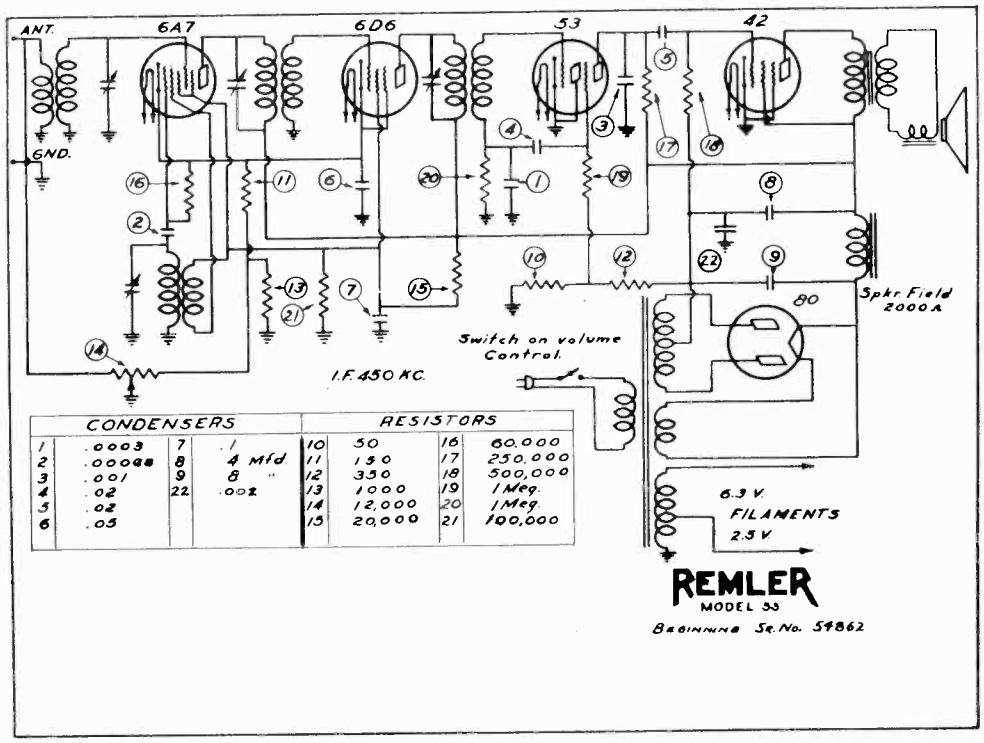
Line		120 volts
Filaments -	#80	5 "
	#53 and dial light	2.4 "
	#42, 6A7 and 6D6	6.2 "

D. C. VOLTAGES: Full volume, no signal

From ground to:

80	Rectifier filament	325 volts
42	Plate	215 "
42	Screen grid	220 "
42	Cathode	0 "
42	Grid	18 "
53	Second section plate	100 "
53	Second section grid	2.5 "
53	Cathode	0 "
6D6	Plate	220 "
6D6	Screen grid	105 "
6D6	Cathode	3 "
6A7	Pentode plate	220 "
6A7	Screen grid	105 "
6A7	Oscillator plate	105 "
6A7	Cathode	3 "

Due to current taken by the voltmeter used, readings of the 42 grid and 53 plate voltages will be less than values shown above.



CONDENSERS				RESISTORS			
1	.0003	7	.1	10	50	16	60,000
2	.00008	8	4 Mfd	11	150	17	250,000
3	.001	9	8 "	12	350	18	500,000
4	.02	22	.002	13	1000	19	1 Meg.
5	.02			14	12,000	20	1 Meg.
6	.05			15	20,000	21	100,000

MODEL 53-C
Above Serial 56208
Schematic, Voltage
Alignment

REMLER COMPANY, LTD.

GENERAL DESCRIPTION:

This radio receiver employs the superheterodyne circuit and utilizes five tubes, one of which is of the double purpose type. It is equipped with a six inch full dynamic speaker and receives all police calls.

INSTALLATION:

The receiver is designed for operation from an alternating current (A.C.) power supply of 110 to 125 volts, 50 or 60 cycles.

Flexible leads for connecting antenna and ground extend from the back of the cabinet. A good ground connection to the black lead is essential for best performance. This lead should be as short as possible and preferably attached to a water pipe. Under ordinary conditions an outdoor antenna of approximately 100 feet in length should be connected to the blue wire. Where the receiver is installed near broadcast stations, a shorter antenna may be used to improve selectivity. An antenna longer than 100 feet may be used in rural locations.

OPERATION:

The knob on the left controls the volume and operates the ON and OFF switch at the extreme left position. The dial is calibrated in tens of kilocycles, that is, a station on 700 KC is tuned in at 70 on the dial. The lower frequency police band may be tuned in near 170 on the dial, while police calls from stations on the higher frequency band are tuned in between 150 and 160. These stations are on the air to suit their particular needs and are not operated continously as are the broadcast stations. The knob on the right operates the tone control.

SERVICE DATA:

The antenna and mixer coils are located in the protecting shield on the top of the chassis. The mixer coil is trimmed by the trimmer condenser nearest the back of the variable condenser. The oscillator coil is within the chassis and is trimmed by the front trimmer on the variable condenser.

The I. F. Transformers are located within the chassis and may be trimmed by the adjusting screws on the rear of the chassis.
The intermediate frequency is 450 KC

TUBES:

6A7	Converter (mixer-oscillator)
6D6	I. F. Amplifier
76	Detector
42	Power amplifier
80	Full wave rectifier
	Dial light 6.8 volt

A. C. VOLTAGES:

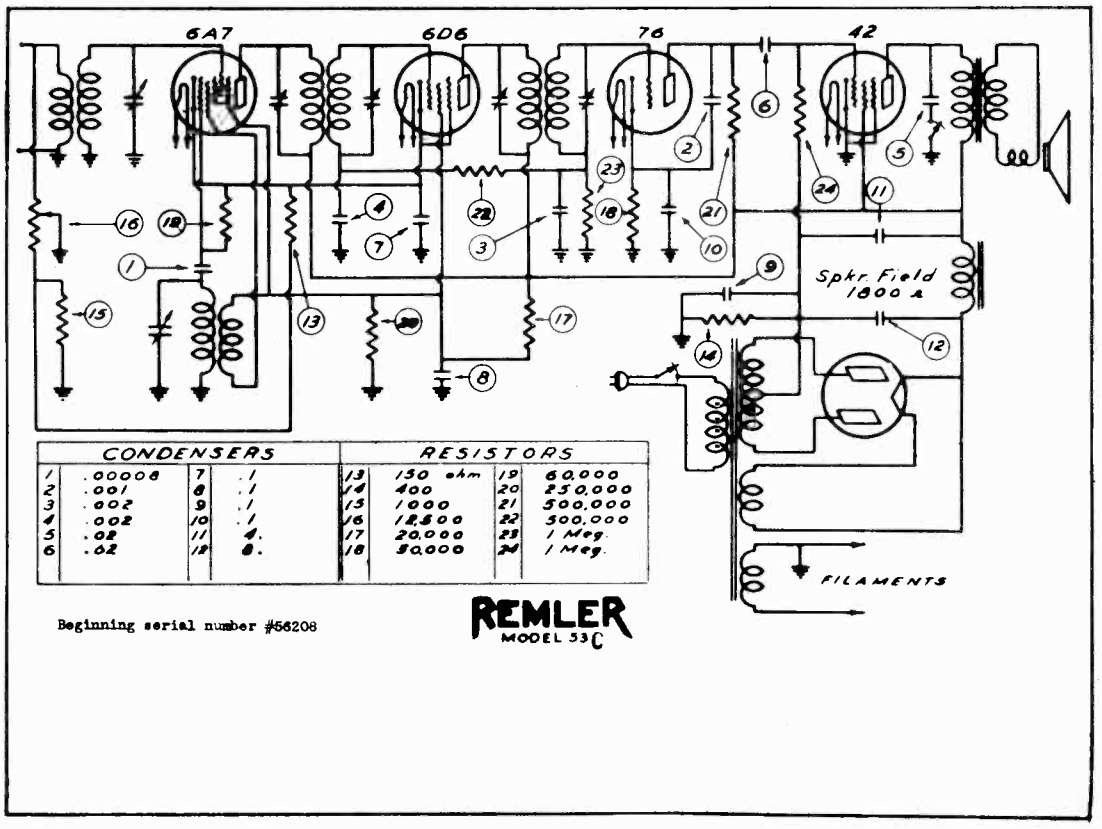
Line		120 volts
Filaments -	#80	5.0 "
	#42, 6A7, 76, 6D6 and dial light	6.3 "

D. C. VOLTAGES: Full volume, no signal

From ground to:

80 Rectifier filament	310 volts
42 Plate	205 "
42 Screen grid	215 "
42 Cathode	0 "
42 Grid	19.5 "
76 Plate	70 "
76 Cathode	8 "
6D6 Plate	215 "
6D6 Screen grid	90 "
6D6 Cathode	2.5 "
6A7 Pentode Plate	215 "
6A7 Screen grid	90 "
6A7 Oscillator plate	90 "
6A7 Cathode	2.5 "

Due to current taken by the voltmeter used, reading of the 42 grid and 76 plate voltages will be less than values shown above.



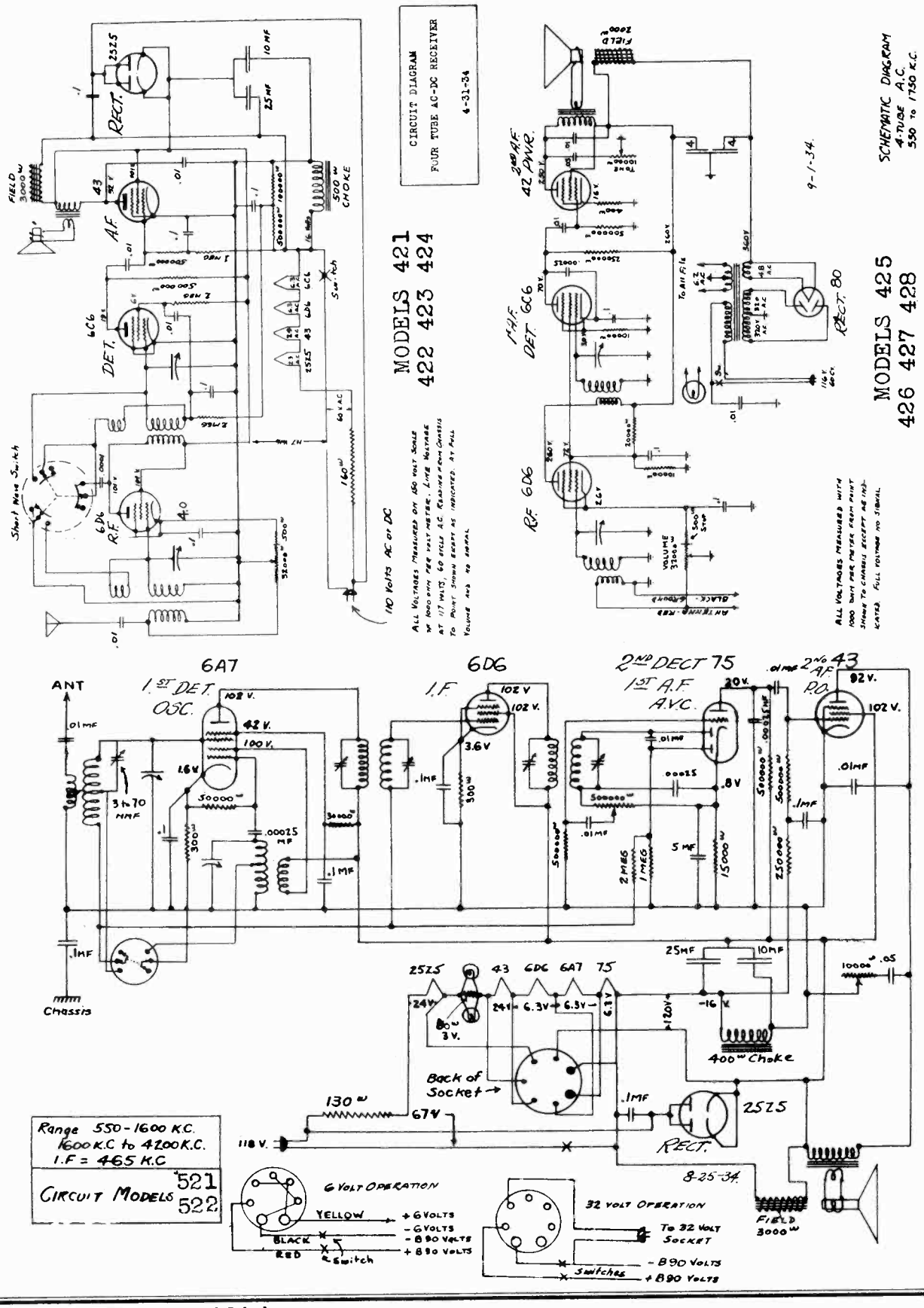
CONDENSERS				RESISTORS			
1	.00008	7	.1	13	150 ohm	19	60,000
2	.001	8	.1	14	400	20	250,000
3	.002	9	.1	15	1000	21	500,000
4	.002	10	.1	16	12,500	22	500,000
5	.05	11	4.	17	20,000	23	1 Meg.
6	.02	12	8.	18	30,000	24	1 Meg.

Beginning serial number #56208

REMLER
MODEL 53C

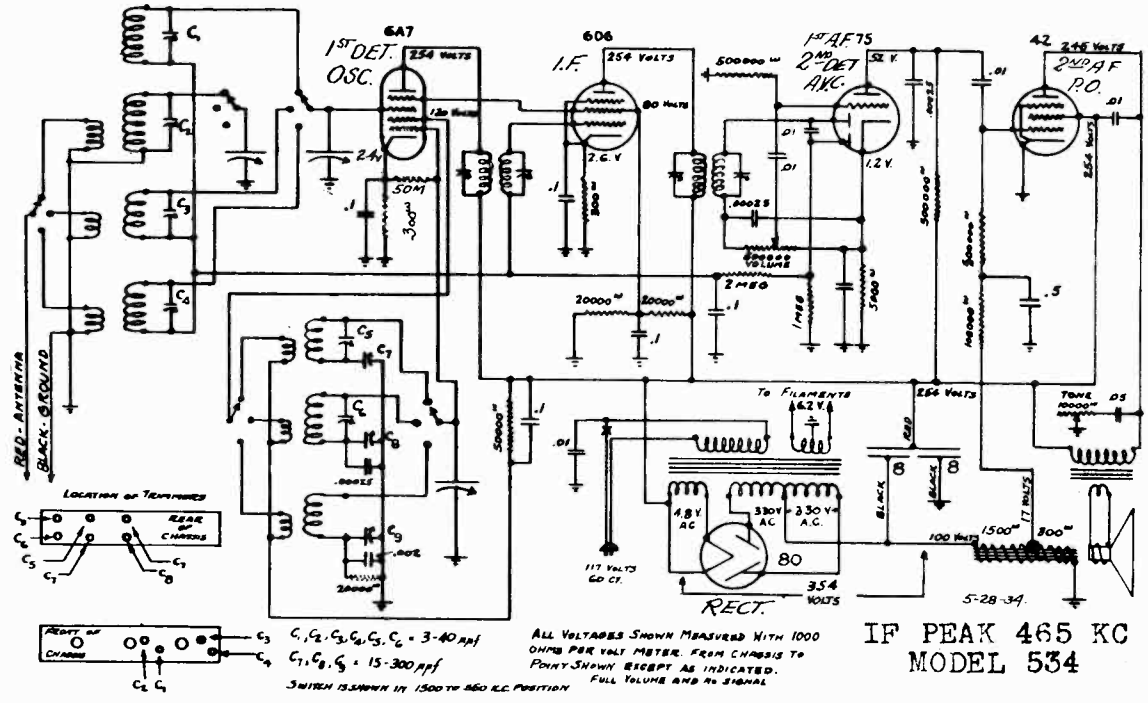
MODELS 421,422,423,424
MODELS 425,426,427,428
MODELS 521,522
Schematics,Voltage

RK RADIO LABORATORIES, INC.

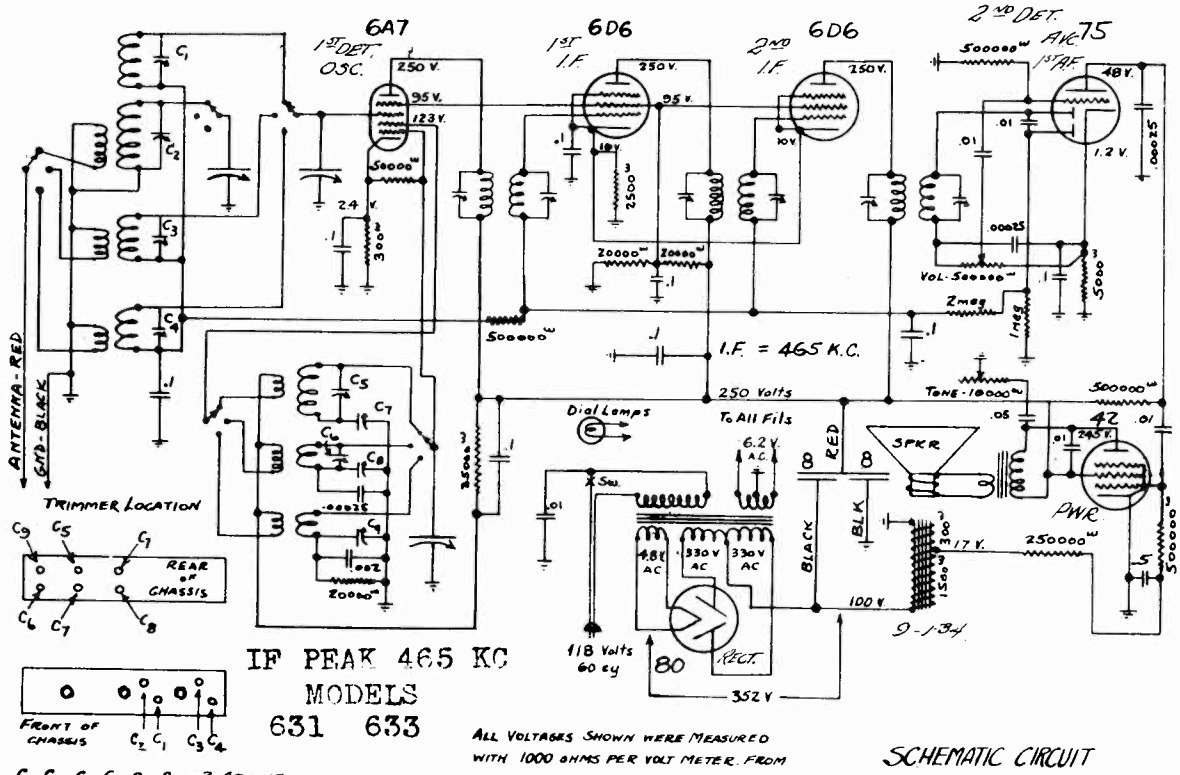


MODEL 534
MODELS 631,633
Schematics,Voltage

RK RADIO LABORATORIES, INC.



IF PEAK 465 KC
MODEL 534



IF PEAK 465 KC
MODELS
631 633

SCHEMATIC CIRCUIT
6-TUBE 3-BAND CHASSIS