

PERPETUAL TROUBLE SHOOTER'S MANUAL

Reg. U. S. Pat. Off.

VOLUME XIX



JOHN F. RIDER PUBLISHER, INC.

480 Canal Street

New York 13, N. Y.

BOOKS BY RIDER

*

THE RADIO AMATEUR'S BEAM POINTER GUIDE
INSTALLATION AND SERVICING OF LOW POWER PUBLIC ADDRESS SYSTEMS
INSIDE THE VACUUM TUBE
CATHODE-RAY TUBE AT WORK
SERVICING SUPERHETERODYNES
SERVICING RECEIVERS BY MEANS OF RESISTANCE MEASUREMENT

*

PERPETUAL TROUBLE SHOOTER'S MANUALS
VOLUMES I TO V ABRIDGED (ONE VOLUME)
VOLUME VI VOLUME X VOLUME XIII VOLUME XVI
VOLUME VII VOLUME XI VOLUME XIV VOLUME XVII
VOLUME VIII VOLUME XII VOLUME XV VOLUME XVIII
VOLUME IX VOLUME XIX

MASTER INDEX — VOLS. I-XV

AUTOMATIC RECORD CHANGERS AND RECORDERS

*

RIDER TELEVISION MANUALS
VOLUME I VOLUME II

*

RIDER PA MANUALS
VOLUME I

*

ALIGNING PHILCO RECEIVERS, VOLUMES I AND II
AUTOMATIC FREQUENCY CONTROL SYSTEMS
SERVICING BY SIGNAL TRACING
THE OSCILLATOR AT WORK
THE METER AT WORK
VACUUM TUBE VOLTMETERS

*

AN HOUR A DAY WITH RIDER
ON:
RESONANCE AND ALIGNMENT
AUTOMATIC VOLUME CONTROL
ALTERNATING CURRENTS IN RADIO RECEIVERS
D-C VOLTAGE DISTRIBUTION IN RADIO RECEIVERS

*

FM TRANSMISSION AND RECEPTION — by Rider-Uslan
UNDERSTANDING VECTORS AND PHASE — by Rider-Uslan
A-C CALCULATION CHARTS — by R. Lorenzen
RADAR — WHAT IT IS — by Rider-Rowe
UNDERSTANDING MICROWAVES — by Victor J. Young
BROADCAST OPERATOR'S HANDBOOK — by H. F. Ennes

TV PICTURE PROJECTION AND ENLARGEMENT — by ALLAN LYTEL
HIGH FREQUENCY MEASURING TECHNIQUES USING TRANSMISSION LINES
By E. N. Phillips, W. G. Sterns, N. J. Gamara

The servicing data appearing on Philco, RCA and other pages carrying individual copyright notices, are copyrighted by the respective companies and are reproduced herein with their permission.

Entire Contents Copyrighted, 1949, by John F. Rider

Printed in U. S. A.



Are you on the List for

SUCCESSFUL SERVICING

Rider's **FREE** House-organ

A publication dedicated to the technical and financial advancement of the radio servicemen.

It will keep you abreast of new developments in the electronic field, timely articles on electronic maintenance, changes in manufacturers' schematics, etc. . . . these are vital to you . . . this FREE service is yours for the asking. . . . It was good before—it will be better in the future!

**Mail This
Coupon TODAY!**

JOHN F. RIDER PUBLISHER, INC.

Att.: Successful Servicing

480 Canal Street

New York 13, N. Y.

(Please PRINT your NAME and ADDRESS)

Kindly mail your FREE house-organ
SUCCESSFUL SERVICING to:

Name

Street

City Zone State

Check the following . . .

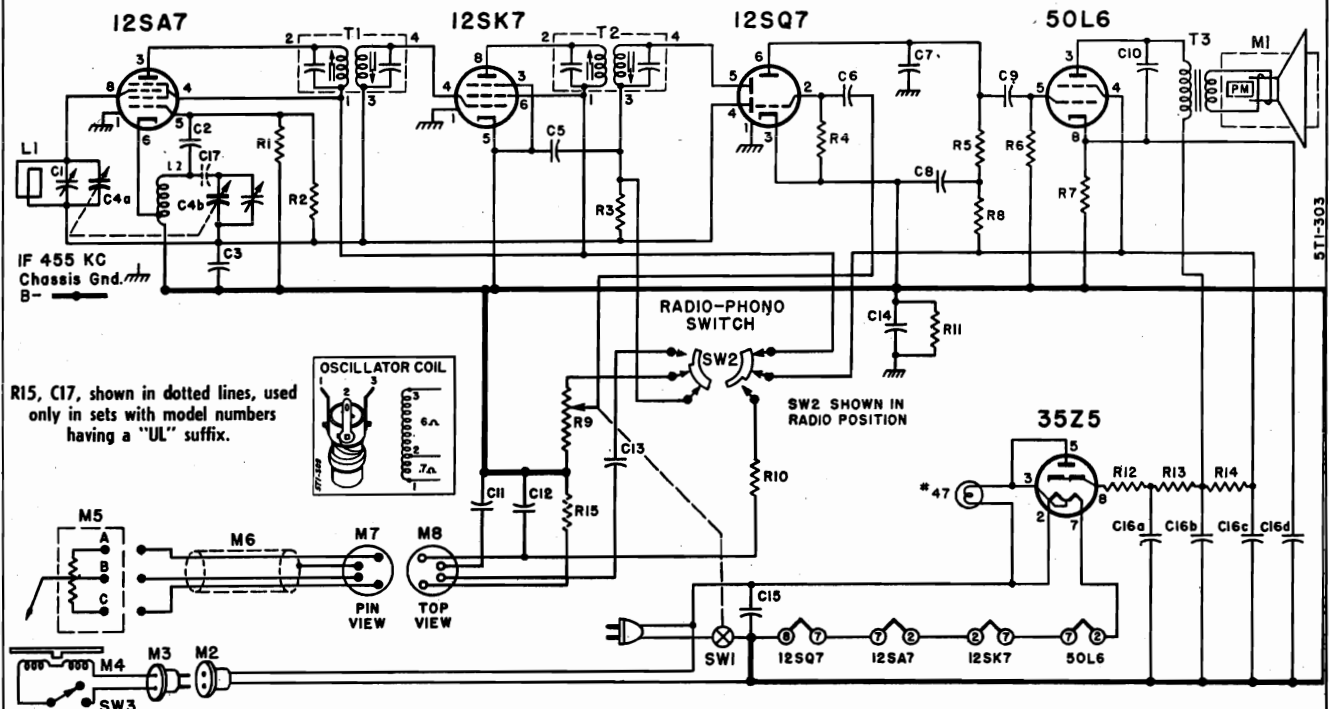
Are you a — SERVICEMAN ☐
DEALER ☐
ENGINEER ☐
HAM ☐
STUDENT ☐

FILING INSTRUCTIONS FOR BANDED PAGES

The banded pages in the front of this manual consist of 1 *(T) Triple Spread, and 73 *(D) Double Spread pages arranged alphabetically. In order to simplify your work, please file these pages as per the following instructions.

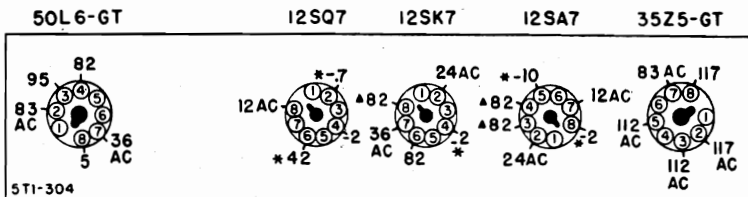
MANUFACTURER	BEGINNING WITH PAGE	ENDING WITH PAGE	FILE AFTER
ALTEC LANSING	*(D)19-1,2	19-3,4	ALLIED 19-21
BENDIX	(D)19-15,16	19-18	BENDIX 19-14
BENDIX	(D)19-27,28	19-30	BENDIX 19-26
CONCORD	(3D)19-7,8	19-18	CONCORD 19-6
CROSLEY	(2D)19-55,56	19-62	CROSLEY 19-54
ESPEY	(D)19-1,2	19-4	EMERSON 19-46
ESPEY	(2D)19-9,10	19-16	ESPEY 19-8
FARNSWORTH	(D)19-15,16	19-18	FARNSWORTH 19-14
FARNSWORTH	(D)19-25,26	19-27,28	FARNSWORTH 19-24
FARNSWORTH	(D)19-51,52	19-54	FARNSWORTH 19-50
FIRESTONE	(D)19-11,12	19-13,14	FIRESTONE 19-10
FIRESTONE	(D)19-17,18	19-20	FIRESTONE 19-16
HALLICRAFTERS	(D)19-11,12	19-14	HALLICRAFTERS 19-10
HALLICRAFTERS	(D)19-19,20	19-22	HALLICRAFTERS 19-18
HALLICRAFTERS	(D)19-35,36	19-38	HALLICRAFTERS 19-34
HALLICRAFTERS	(D)19-51,52	19-53	HALLICRAFTERS 19-50
MAGNAVOX	(D)19-1,2	19-4	LEAR 19-5
MAGNAVOX	(D)19-11,12	19-14	MAGNAVOX 19-10
MAGNAVOX	(2D)19-19,20	19-25	MAGNAVOX 19-18
MAJESTIC	(D)19-1,2	19-4	MAGNAVOX 19-25
MEISSNER	(D)19-7,8	19-9,10	MEISSNER 19-6
MOTOROLA	(D)19-65,66	19-68	MOTOROLA 19-64
MOTOROLA	(D)19-87,88	19-90	MOTOROLA 19-86
MOTOROLA	(D)19-121,122	19-124	MOTOROLA 19-120
NATIONAL CO.	(D)19-25,26	19-28	NATIONAL CO. 19-24
OLYMPIC	(D)19-9,10	19-12	OLYMPIC 19-8
OLYMPIC	(D)19-15,16	19-17	OLYMPIC 19-14
PACKARD-BELL	(D)19-15,16	19-18	PACKARD-BELL 19-14
PHILCO	(2D)19-13,14	19-19,20	PHILCO 19-12
PHILCO	(D)19-27,28	19-29,30	PHILCO 19-26
PHILCO	(D)19-67,68	19-69,70	PHILCO 19-66
PHILCO	(D)19-81,82	19-83,84	PHILCO 19-80
PHILCO	(2D)19-89,90	19-95,96	PHILCO 19-88
PHILCO	*(T)19-109,110,111	19-112,113,114	PHILCO 19-108
PHILCO	(D)19-133,134	19-135,136	PHILCO 19-132
PHILCO	(D)19-141,142	19-143,144	PHILCO 19-140
PHILCO	(D)19-149,150	19-151,152	PHILCO 19-148
PHILCO	(D)19-157,158	19-159,160	PHILCO 19-156
PHILCO	(D)19-165,166	19-167,168	PHILCO 19-164
PHILCO	(D)19-173,174	19-175,176	PHILCO 19-172
PHILCO	(D)19-181,182	19-183,184	PHILCO 19-180
PHILCO	(D)19-189,190	19-191,192	PHILCO 19-188
PHILCO	(D)19-197,198	19-199,200	PHILCO 19-196
PHILCO	(D)19-205,206	19-207,208	PHILCO 19-204
PHILCO	(D)19-213,214	19-215,216	PHILCO 19-212
PHILCO	(D)19-221,222	19-223,224	PHILCO 19-220
PILOT	(2D)19-1,2	19-8	PHILLIPS 19-2
RCA	(D)19-31,32	19-34	RCA 19-30
RCA	(D)19-57,58	19-60	RCA 19-56
RADIO WIRE	(D)19-1,2	19-4	RADIO & TEL. 19-7
REMLER	(D)19-3,4	19-6	REMLER 19-2
SCOTT	(D)19-17,18	19-19	SCOTT 19-16
SPARKS WITHINGTON	(D)19-5,6	19-8	SPARKS 19-4
SPARKS WITHINGTON	(D)19-15,16	19-18	SPARKS 19-14
STEWART WARNER	(D)19-3,4	19-5,6	STEWART WARNER 19-2
STEWART WARNER	(D)19-9,10	19-12	STEWART WARNER 19-8
STROMBERG	(D)19-1,2	19-4	STEWART WARNER 19-14
STROMBERG	(D)19-9,10	19-11,12	STROMBERG 19-8
TEMPLETONE	(D)19-7,8	19-10	TEMPLETONE 19-6
WILCOX GAY	(D)19-1,2	19-3,4	WESTINGHOUSE 19-35
ZENITH	(D)19-5,6	19-8	ZENITH 19-4
ZENITH	(D)19-17,18	19-20	ZENITH 19-16
ZENITH	(D)19-29,30	19-31,32	ZENITH 19-28
ZENITH	(D)19-39,40	19-42	ZENITH 19-38
GEN. INSTRUMENT	(D)RCD.CH.19-1,2	RCD.CH.19-3,4	G.E. RCD.CH.19-4
ZENITH	(D)RCD.CH.19-3,4	RCD.CH.19-6	ZENITH RCD.CH.19-2

ADMIRAL CORP.

MODEL 5T12,
CHASSIS 5T1

VOLTAGE DATA

- All readings made between tube socket terminals and B minus (terminal of On-Off switch).
- Switch in "Radio" position.
- Measured on 117 Volt AC line.
- Volume control minimum; dial turned to low frequency end.
- Voltages measured with Vacuum Tube Voltmeter. Readings taken with a 1000 ohm-per-volt meter will be approximately the same except for those marked with an asterisk * in the voltage chart; these readings will either be lower or practically zero.



* If taken with a 1000 ohm-per-volt meter, readings will be lower or practically zero.
 ▲ On "Phono" these voltages will be zero. All other DC readings may be slightly higher.

RESISTORS

Symbol	Description	Part No.
R1	22,000 Ohms, 1/2 Watt	60B 8-223
R2	10 Megohms, 1/2 Watt	60B 8-106
R3	1 Megohm, 1/2 Watt	60B 8-105
R4	4.7 Megohms, 1/2 Watt	60B 8-475
R5	470,000 Ohms, 1/2 Watt	60B 8-474
R6	470,000 Ohms, 1/2 Watt	60B 8-474
R7	150 Ohms, 1 Watt	60B 14-151
R8	47,000 Ohms, 1/2 Watt	60B 8-473
R9	1 Megohm Volume Control	75B 1-32
R10	22,000 Ohms, 1/2 Watt	60B 8-223
R11	150,000 Ohms, 1/2 Watt	60B 8-154
R12	33 Ohms, 1 Watt	60B 28-3
R13	220 Ohms, 1 Watt	60B 28-7
R14	1,000 Ohms, 1 Watt	60B 28-2
R15	33,000 Ohms, 1/2 Watt	60B 8-333

(R15 used only in sets with model numbers having a "UL" suffix)

CONDENSERS

C1	Trimmer, 3 to 30 mmfd.	Part of L1
C2	50 mmfd., Ceramic	65B 6-4
C3	.1 mfd., 200 Volts, Paper	64B 1-30
C4a	0 to 420 mmfd.	Gang 68B 20-1
C4b	0 to 108 mmfd.	
Note—Gang spot welded to dial drum.		
C5	250 mmfd., Ceramic	65B 6-5
C6	.01 mfd., 400 Volts, Paper	64B 1-25
C7	500 mmfd., Ceramic	65B 6-6
C8	.1 mfd., 200 Volts, Paper	64B 1-30
C9	.01 mfd., 400 Volts, Paper	64B 1-25
C10	.03 mfd., 400 Volts, Paper	64B 1-23
C11	.05 mfd., 400 Volts, Paper	64B 1-22
C12	.18 mfd., 200 Volts, Paper	64A 2-2

Symbol	Description	Part No.
C13	.001 mfd., 600 Volts, Paper	64B 1-15
C14	.18 mfd., 200 Volts, Paper	64A 2-2
C15	.05 mfd., 400 Volts, Paper	64B 1-22
C16a	30 mfd., 150 Volts	Elect. 67A 14-1
C16b	30 mfd., 150 Volts	
C16c	20 mfd., 150 Volts	
C16d	20 mfd., 25 Volts	
C17	.02 mfd., 400 Volts, Paper	64B 1-24

(Used only in sets with model numbers having a "UL" suffix)

COILS, TRANSFORMERS, ETC.

Symbol	Description	Part No.
L1	Antenna and Trimmer, Loop	69B 13
L2	Coil, Oscillator	69A 52
T1	Transformer, 1st IF	72B 50
T2	Transformer, 2nd IF	72B 51
T3	Transformer, Output	79A 11-2
M1	Speaker (5") less output Trans.	78B 39-1
M2	Socket, Phono Motor	89A 6-3
M8	Socket, Phono input	88A 8-6
SW1	Switch, On-Off	Part of R9
SW2	Switch, Radio-Phono	77A 16-4

PHONOGRAPH PARTS

Note—See Record Changer Manual (changer model number specified on label on underside of changer) for complete parts list.		
M3	Plug, AC Phono Motor	88A 8-1
M4	Motor, 60 Cycles, 115 Volts AC	407B 3-2
M5	Cartridge and Needle, Pickup	A1372-13
M6	Cable, Pickup (3 conductor)	89A 18-4
M7	Plug, Pickup Cable	88A 8-5

Symbol	Description	Part No.
SW3	Switch, Motor On-Off (See caution in changer manual)	408A 1
Centerpost (includes speed-nut)		G400B 137-1
Idle Wheel (407B 3-2 Motor)		G400A 23
Idle Wheel (407B 1-2 Motor)		G400A 57

CABINET PARTS

Cabinet, Plastic		
Bottom Less Lid (Mahog.)		34D 11-12
Lid only (Mahogany)		34D 11-13
Dial Scale, Glass		21B 35-2
Escutcheon Overlay		23C 23-3
Grille Cloth and Baffle		A1859
Knobs, Radio		
"Volume" and "Tuning"		33A 21-5
"Radio-Phono"		33A 21-9
Hinge		37A 8-1
Stay Arm and Plate		37A 9-1
Rubber Strip, Dial Scale Mtg. (8 1/2")		12A 9-3

MISCELLANEOUS

Background, Dial		22B 9-1
Bracket, Dial Light		15A 156
Carton and Fillers		44B 112
Dial Cord		50A 1-3
Pilot Light, Mazda No. 47		81A 1-8
Pilot Light Socket and Leads		82A 2-4
Pointer, Dial		25A 21
Spring, Dial Drum Tension		19B 1-3
Tuning Shaft		28A 26-3
Washer, "C" (Tuning Shaft)		4A 4-6
Washer, Felt		5A 4-11
Washer, Spring (Tuning Shaft)		4A 6-3-0

MODEL 5T12,
CHASSIS 5T1

ADMIRAL CORP.

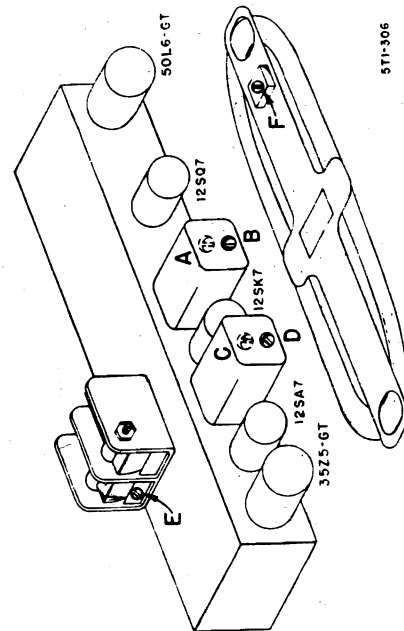
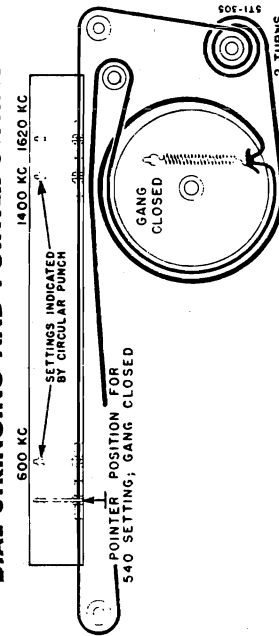
ALIGNMENT PROCEDURE

- Check pointer position. With tuning gang closed, the tip of the pointer clip should be over the 1/16" circular punch at the extreme left end of the dial background (see stringing diagram).
- Connect output meter across voice coil.
- Turn receiver volume control full on.
- Loop antenna must be connected and placed in the same relative position to the chassis as when in cabinet.
- Use an isolation transformer if available, otherwise connect a .1 mfd. condenser in series with low side of signal generator and attach to B minus of chassis.
- Use an insulated alignment screwdriver for IF adjustments.
- Use lowest output setting of signal generator capable of producing adequate output meter indication and proceed in the following sequence.
- Repeat adjustments to insure good results.

Step	Dummy Antenna in Series with Signal Generator	Connection of Signal Generator (High Side)	Signal Generator Frequency	Receiver Gang Setting	Trimmer Description	Trimmer Designation	Type of Adjustment
1	250 mmfd. condenser	Tuning condenser, antenna stator	455 KC	Gang fully open	2nd IF 1st IF	A, B C, D (see note below)	Maximum output
2	250 mmfd. condenser	Tuning condenser, antenna stator	1620 KC	Gang fully open	Oscillator	E	Maximum output
3	Loop of several turns of wire, or place generator lead close to receiver loop for adequate signal.	No physical connection (signal by radiation)	1400 KC	Tune in generator signal	Antenna	F (see note below)	Maximum output

NOTE: Antenna Trimmer "F" must be aligned after chassis and loop are mounted in cabinet. Loop trimmer adjustment is located at the rear of the cabinet.

Trimmers "A" and "C" are adjusted from underside of chassis.

TUBE AND TRIMMER LOCATION**DIAL STRINGING AND POINTER SETTING**

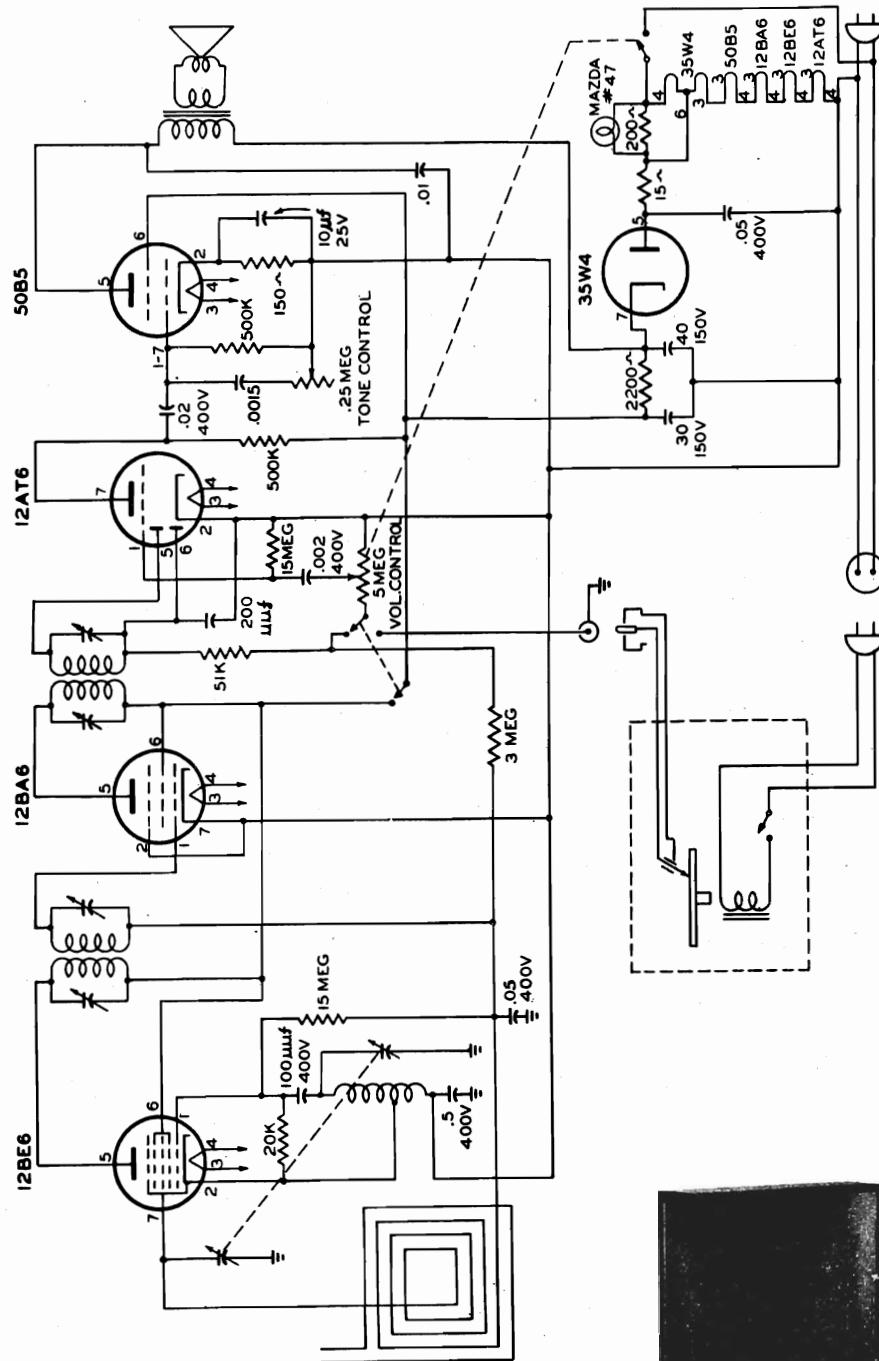
With the gang fully closed, the tip of the pointer clip should be in line with the 1/16" circular punch at the extreme left end of the dial background.

5T1-306

AIRADIO INC.

MODEL 3049

SCHEMATIC DIAGRAM



TYPE: Five tube, single band, superheterodyne with Record Changer.

FREQUENCY RANGE: 540 to 1600 kc.

INTERMEDIATE FREQUENCY: 456 kc.

POWER SUPPLY: a.c.—60 cycle.

VOLTAGE RATING: 105-125 volts.

POWER CONSUMPTION: 35 watts.

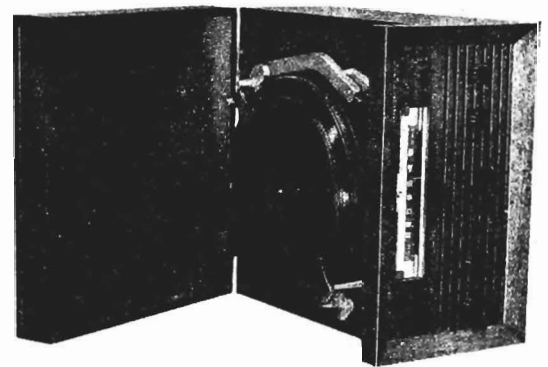
(Phonograph: 15 watts additional)

POWER OUTPUT: 1.5 watts.

TUBE COMPLEMENT:

Type	Function
12BE6	Oscillator, mixer
12BA6	I.F. Amplifier
12AT6	Detector, A.V.C. Audio Amplifier
50B5	Power output
35W4	Rectifier

Pilot Lamp: Mazda 47



MODEL 3049

AIRADIO INC.

PARTS LIST

PART No.	DESCRIPTION	PART No.	DESCRIPTION
LA-1014-32	Bulb, dial lamp, Mazda 47	AS-3362	Dial Glass (Calibrated)
AT-1018	Ant. loop	KN-1083	Knob
CI-1049	Oscillator coil	CD-1071-28	Condenser, 250 mmfd., mica
TR-1052	Transformer, 1st I.F.	CD-1071-22	Condenser, 100 mmfd., mica
TR-1051	Transformer, 2nd I.F.	CD-1227-3	Condenser, .002 mfd., 400 volt, tubular
CD-1217	Condenser, variable, two-section	CD-1227-10	Condenser, .02 mfd., 400 volt, tubular
BU-1120	Condenser drive bushing	CD-1227-13	Condenser, .05 mfd., 400 volt, tubular
CX-1025	Condenser drive bushing clip	CD-1227-19	Condenser, .5 mfd., 400 volt, tubular
SW-1060	Phono-radio switch	CD-1227-2	Condenser, .0015 mfd., 400 volt, tubular
RE-1165	Tone control potentiometer	CD-1227-8	Condenser, .01 mfd., 400 volt, tubular
RE-1164	Volume control and switch	CD-1224	Condenser, 10 mfd., 25 volt, electrolytic
SK-1011	Speaker with output transformer	CD-1226	Condenser, 30-40 mfd., 150 volt, tubular electrolytic
SO-1060	Socket (Tube)	RE-1169	Resistor, 15 ohm.
SO-1064	Socket (pilot lamp)	RE-1168-225	Resistor, 2200 ohm, 1 watt
SE-1033	Tube Shield	RE-1166-516	Resistor, 51 K ohm, $\frac{1}{2}$ watt
BE-1048	Tube Shield Base	RE-1166-159	Resistor, 15 megohm, $\frac{1}{2}$ watt
SO-1061	Phono input jack	RE-1166-308	Resistor, 3 megohm, $\frac{1}{2}$ watt
SO-1059	A.C. outlet (Phono)	RE-1166-507	Resistor, .5 megohm, $\frac{1}{2}$ watt
AS-3361	Dial drive cable assembly	RE-1166-206	Resistor, 20 K ohm, $\frac{1}{2}$ watt
IN-1024	Dial Pointer	RE-1003-154	Resistor, 150 ohm, $\frac{1}{2}$ watt

ALIGNMENT PROCEDURE

1. Turn gang condenser to full mesh position. Set dial pointer on the small dot to the left of the last calibration.

2. Connect the output meter across the voice coil.

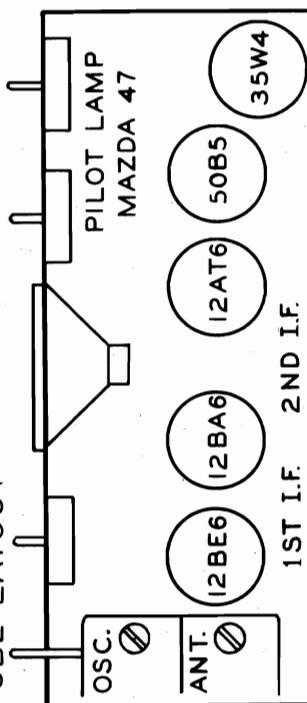
3. Connect the output of the Signal Generator to a two-turn loop of wire and place about one foot away from loop on the set.

4. Turn volume full on. Keep output of Signal Generator as low as possible and still get deflection on output meter.

ALIGNMENT CHART

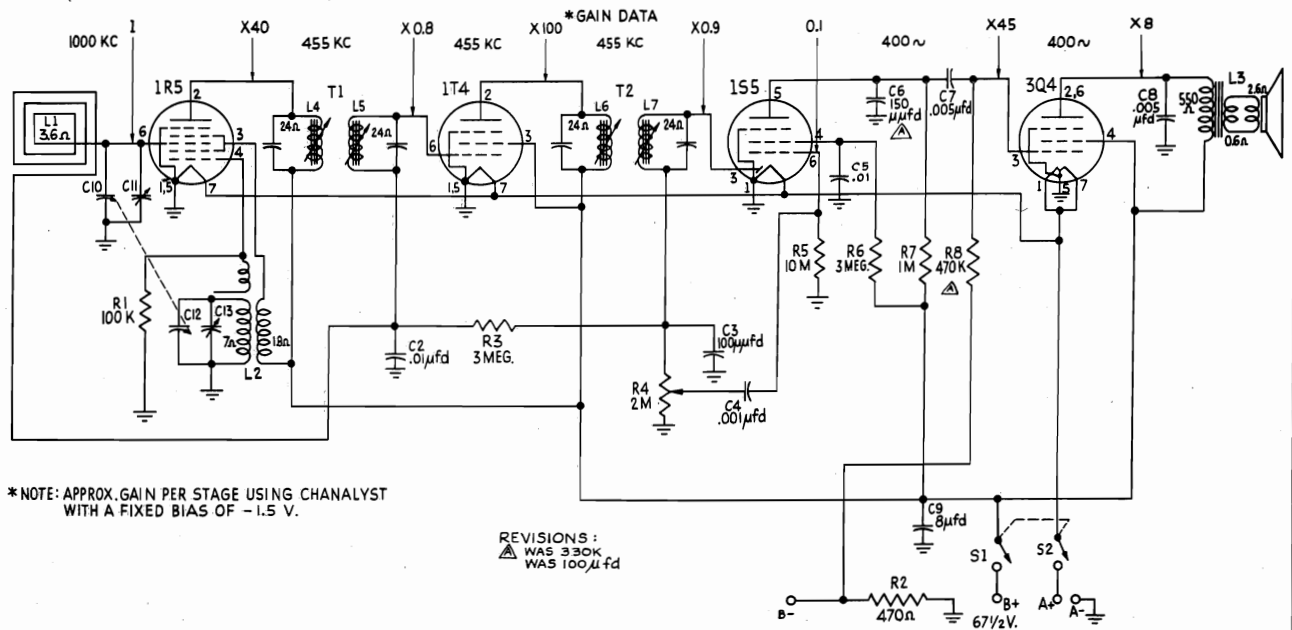
Alignment Sequence	Signal Generator	Position of Dial Pointer	Adjust for Maximum Output
1	456 kc.	Full mesh 55	2nd I.F. (2 trimmers)
2	456 kc.	Full mesh 55	1st I.F. (2 trimmers)
3	1400 kc.	1400	Oscillator Section of Gang Condenser
4	1400 kc.	1400	Antenna Section of Gang Condenser

TUBE LAYOUT



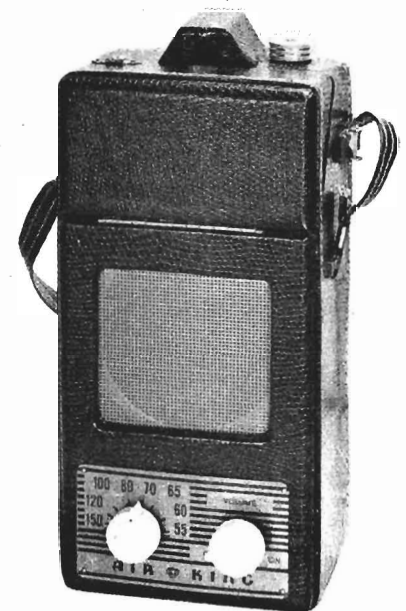
AIR KING PRODUCTS CO., INC.

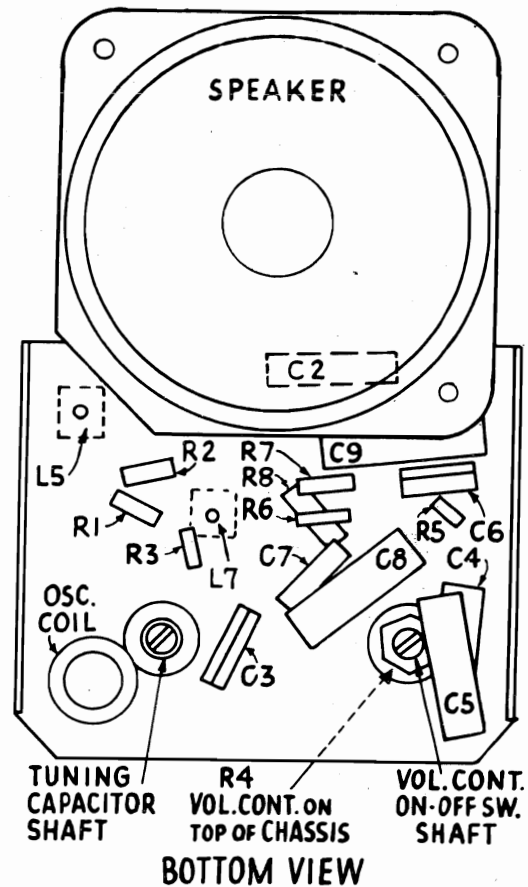
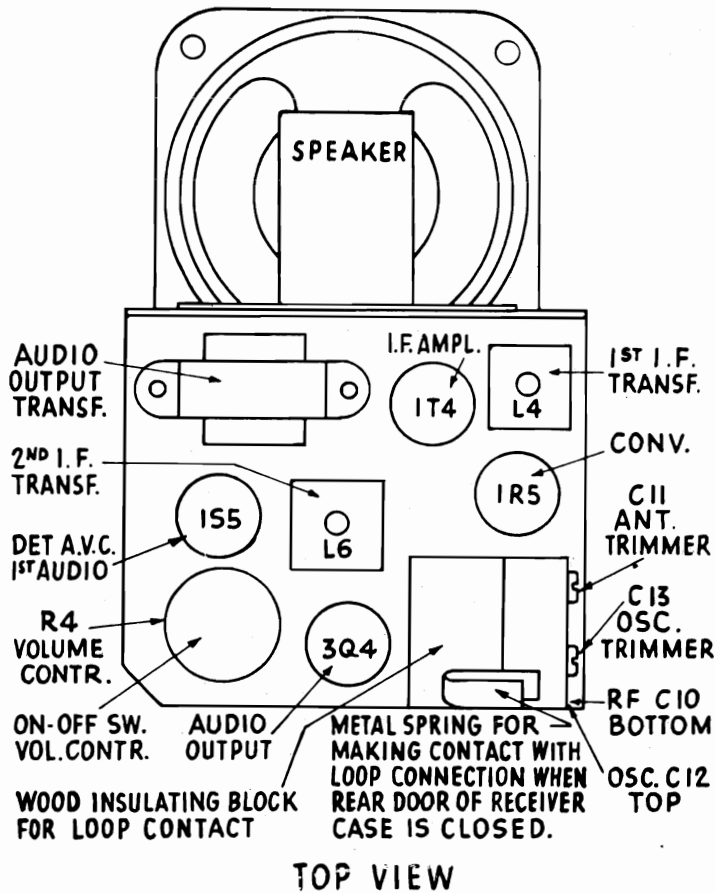
MODEL A410



TUBE	PIN	VTVM	20,000 OHM/V	1,000 OHM/V	RESISTANCE
1R5 CONVERTER	1	0	0	0	0
	2	65	65	65	OVER 500K
	3	65	65	65	OVER 500K
	4				
	550 KC	-13	-7	-2.5	100K
	1800 KC	-17	-8	-3.5	100K
	5	0	0	0	0
1T4 IF AMPL.	6	0	0	0	5MEG
	7	1.4	1.4	1.4	4.5 OHM
	1	0	0	0	0
	2	65	65	65	OVER 500K
	3	65	65	65	OVER 500K
	4	-5	-5	-5	480 OHM
	5	0	0	0	0
1S5 DET AVC	6	0	0	0	5 MEG
	7	1.4	1.4	1.4	4.5 OHM
	1	0	0	0	0
	2	--	--	--	--
	3	0	0	0	1.6 MEG
	4	15	3.5	0.2	OVER 3 MEG
	5	10	4.5	0.5	OVER 1 MEG
3Q4 AUDIO OUTPUT	6	0	0	0	10 MEG
	7	1.4	1.4	1.4	4.5 OHM
	1	1.4	1.4	1.4	4.5 OHM
	2	65	65	65	OVER 500K
	3	5	5	5	1 MEG
	4	65	65	65	OVER 500K
	5	0	0	0	0
	6	65	65	65	OVER 500K
	7	1.4	1.4	1.4	4.5 OHM

ALL VOLTAGE AND RESISTANCE MEASUREMENTS MADE WITH RESPECT TO CHASSIS
GROUND, AND WITH A SUPPLY VOLTAGE OF 67 1/2 V.D.C.





ALIGNMENT PROCEDURE

IF ALIGNMENT (REMOVE RECEIVER FROM CABINET)

CONNECT AN OUTPUT METER ACROSS THE VOICE COIL. CONNECT THE SIGNAL GENERATOR TO THE STANDARD HAZELTINE LOOP MODEL 1150 AND COUPLE IT LOOSELY TO THE RECEIVER.

SET THE SIGNAL GENERATOR TO 455KC AND FULLY MESH THE RECEIVER TUNING CAPACITOR.

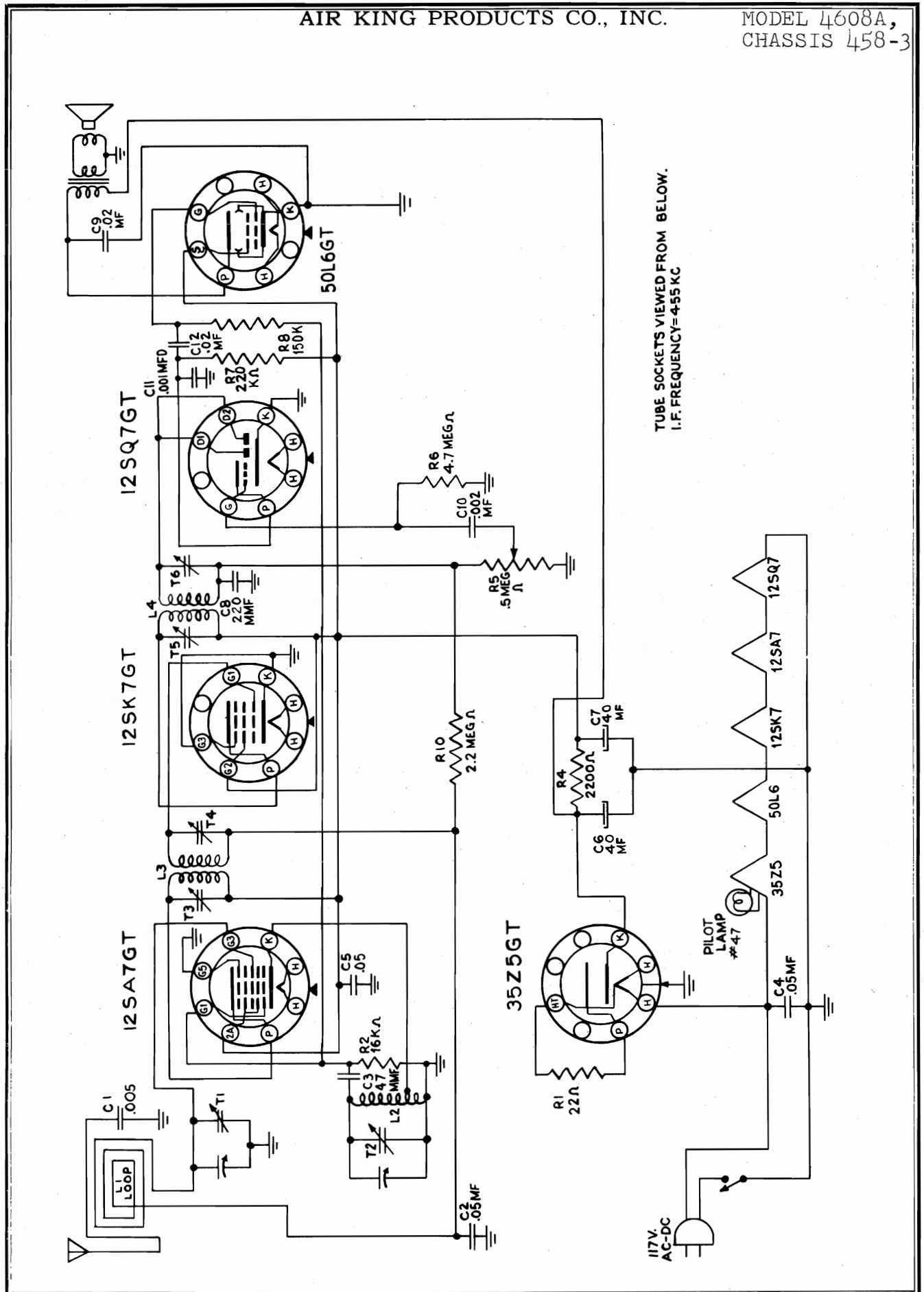
KEEP THE RECEIVER VOLUME CONTROL AT MAX. AND THE OUTPUT OF THE SIGNAL GENERATOR SUFFICIENT TO GIVE A READABLE DEFLECTION ON THE OUTPUT METER. ADJUST FOR MAX. IF TUNING SLUGS L7, L6, L5, L4.

RF OSCILLATOR ADJUSTMENT

PLACE CHASSIS IN CABINET AND SET DIAL POINTER TO 1500 KC. REMOVE KNOB AND REMOVE CHASSIS FROM CABINET. KEEPING THE SAME SETUP AS USED FOR IF ALIGNMENT, SET THE SIGNAL GENERATOR TO 1500 KC AND ADJUST OSCILLATOR TRIMMER C13 FOR MAX. OUTPUT.

SET THE SIGNAL GENERATOR AND RECEIVER TO 1300 KC AND ADJUST ANTENNA TRIMMER C11 FOR MAX. OUTPUT.

AIR KING PRODUCTS CO., INC.

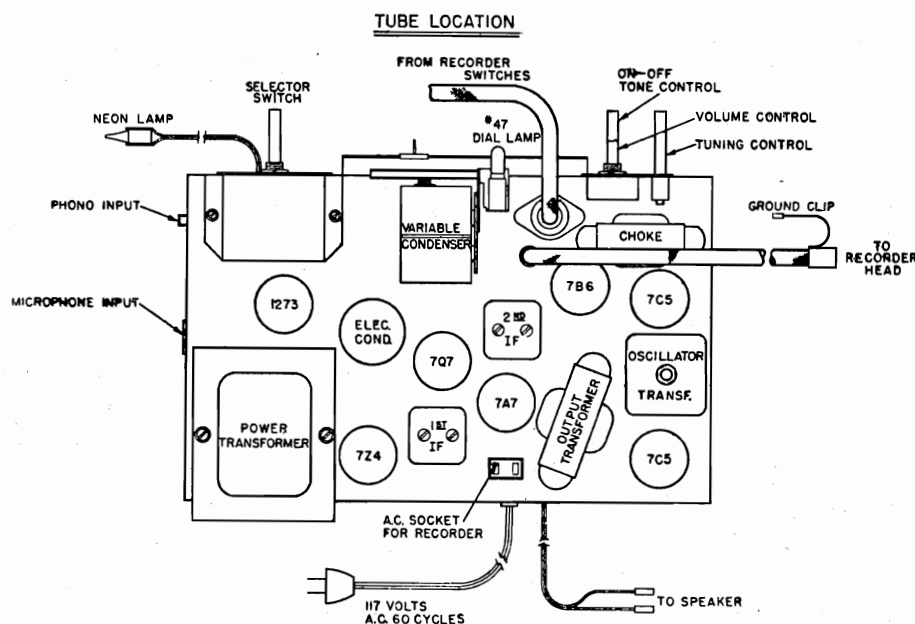
MODEL 4608A,
CHASSIS 458-3



AIR KING PRODUCTS CO., INC.

MODEL 4700,
CHASSIS 476**GENERAL DESCRIPTION**

This model is a seven-tube superheterodyne receiver with wire recorder. It covers the broadcast frequency range of 540 to 1600 kc. The antenna input and oscillator circuits are tuned by a two gang variable capacitor. A loop antenna is built into the cabinet; provision is also made for the connection of an outside antenna. The wire recorder is designed to record sound magnetically on wire. The standard spool contains enough wire for an hour of continuous recording at two feet per second. The recordings may be played back immediately after the wire has been rewound. The receiver, in addition, can be used for playing phonograph records and listening to radio programs.

**TO REMOVE THE RECORDER ASSEMBLY FROM CABINET:**

1. Remove the four Phillips Head screws (in each corner of the recorder board) taking care not to drop the flat washers and studs to the bottom of the unit.
2. Disconnect cable from recorder motor switches (see "Tube Location" Drawing for location of cable).
3. Disconnect A.C. Plug from recorder which plugs into chassis.
4. Tilt recorder assembly up from the front end, and disconnect recorder head cable, and ground connection.
5. The wire recorder assembly can now be removed.

TO REMOVE CHASSIS FROM CABINET:

1. Remove Wire Recorder assembly as covered in above paragraph.
2. Remove four knobs.
3. Remove neon bulb from lens by pulling it out through bottom of motor board.
4. Remove three screws at rear of chassis.
5. Remove the two bolts at the sides of the chassis (one is near the 7C5 output tube, and other is near the 1273 preamplifier tube).
6. The chassis can now be removed from cabinet.

MODEL 4700,
CHASSIS 476

AIR KING PRODUCTS CO., INC.

ALIGNMENT PROCEDURE

Power Supply 117 V 60 Cycle A.C. 95 Watts
 Frequency Range 540—1600 kc
 Intermediate Frequency 455 kc
 Power Output 2.25 Watts undistorted, 6 Watts maximum
 Loudspeaker 10" P.M. 3.2 or 8 ohm V.C. Impedance

Output Meter Connection Across loud speaker voice coil
 Output Meter Reading $\frac{1}{2}$ Watt
 Connection of Generator output lead See note below
 Connection of Generator ground lead B minus bus.
 Generator Modulation 30% at 400 cycles
 Position of Volume Control Fully clockwise
 Position of Tone Control Counter clockwise
 Position of Dial Pointer Variable fully closed
 Position of Functional Switch Play radio

FREQUENCY	DUMMY ANTENNA	GENERATOR CONNECTION	POSITION VARIABLE	ADJUST TRIMMER TO MAXIMUM OUTPUT IN ORDER SHOWN
455 kc	0.1 mfd	grid 7Q7	Fully closed	Tr3, Tr4, Tr5, Tr6
1500 kc	* * *	* * *	1500 kc	Tr2
1500 kc	* * *	* * *	1500 kc	Tr1
600 kc	* * *	* * *	600 kc	Check Point

* * * Run a wire from the output terminal of the signal generator near the receiver. No connection is made between the signal generator and the receiver.

The Alignment Procedure should be repeated stage by stage to insure greatest accuracy. Keep the output from signal generator at lowest value to make the A.V.C. action of the receiver ineffective.

OPERATION

The proper operation of this unit is discussed in the customers' instruction book. The most important item is the proper loading of the recording wire. It must be done properly to eliminate "wow". Make sure that the reset button is making contact if the recorder fails to operate.

ELECTRICAL ADJUSTMENTS

To check the erasing voltage of the recorder measure the voltage between pin 2 and 3 of the recorder head with a vacuum tube voltmeter. This measurement should be made with the recorder head attached to the plug of the recorder cable. The voltage at this point should be 4.0 volts minimum (as measured with a V.T.V.M.), with the shielded recorder head, and 2.7 volts minimum with the unshielded recorder head. If it is low, try replacing the 7C5 oscillator tube to increase the voltage.

If there is excessive hum when the unit is in the "Play Wire" position, the hum can be reduced by rotating the hum bucking coil (next to the power transformer) for minimum hum. If this does not entirely eliminate the hum, slide the power transformer shield slightly for minimum hum, and readjust the hum bucking coil. This should be done with the volume control on full.

MECHANICAL ADJUSTMENTS

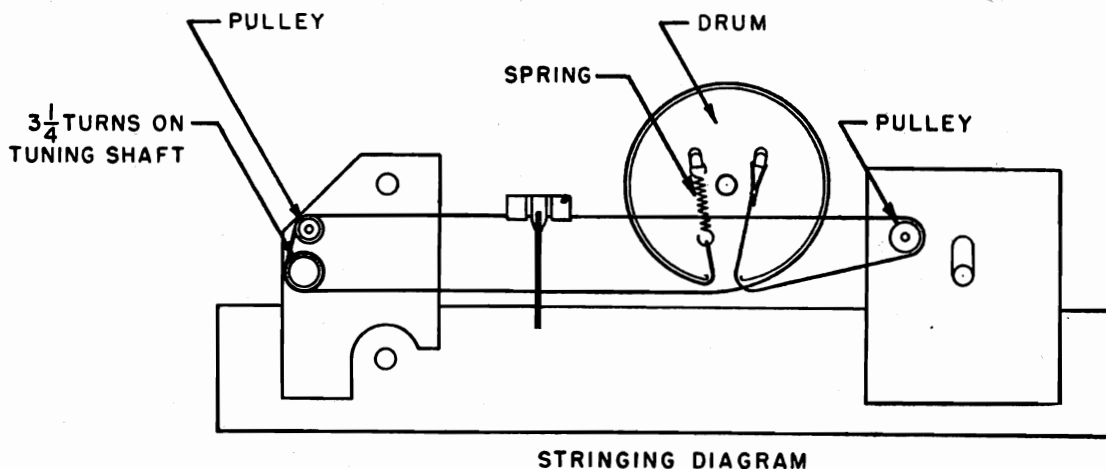
The Wire Recorder has been adjusted perfectly at the factory prior to shipment. There are very few things that can go wrong, and they are relatively simple to adjust.

The first thing to check if the recorder unit does not function properly is the centering of the motor. This is done by prying off the dust cap on the recorder board. The dust cap is the small cap which is directly to the rear of the "Reset" assembly, on the recorder board proper. Use a screwdriver, taking care not to mar the finish.

When this cap is removed, the motor spindle will be exposed. The spindle must be in the center of the opening. The centering should be checked using our centering gauge (Part #6815). If the spindle is not in the exact center, loosen the two screws holding the motor assembly, and adjust motor, with centering gauge in place, then tighten screws, and replace the dust cap.

Proper adjustment of the turntable torque is very important. To adjust the torque proceed as follows: With the power connect and wire being wound on the turntable, loosen the lock nut from the adjusting screw underneath the recorder chassis at the rear near the motor. Put your finger on the turntable to add a slight breaking action. Turn the adjusting screw clockwise until the turntable stops rotating, then turn the screw $\frac{1}{2}$ turn counterclockwise. Let the wire continue to run and then switch the lever to "rewind". If the adjustment is correct the turntable should continue to rotate in a counterclockwise direction for about $\frac{1}{2}$ turn before reversing. Tighten the lock nut taking care not to disturb the adjustment of the screw. Recheck the adjustment by going from maximum rewind to play.

If wire does not wind level, rotate the spindle until the cam under the level winding mechanism is at the position which allows the recording head to be at the bottom of its level. In this position the slot in which the wire rides should be approximately $\frac{1}{64}$ th of an inch above the motor board. If the slot is closer than this, loosen the two screws, holding the recorder head to the slide mechanism (at the bottom of unit) and place additional shims between the slide and the recorder head until the slot is $\frac{1}{64}$ th of an inch above the motor board. Place the wire on recorder and let it wind onto turntable if the wire rubs on the Reset Switch Trip Lever after about one minute of rewind. The Reset Switch Trip Lever should not depress the wire more than $\frac{1}{64}$ th of an inch when the cam is in its top position. Let the wire run for awhile and check the way the wire lays into the channel underneath the turntable. With the proper adjustment, it should wind level across the channel. If it piles up on the top of the channel, remove the turntable by loosening the set screw on the turntable spindle, remove the felt washer, and spring. The turntable can now be removed. Remove the turntable and place additional shims underneath the spindle. Replace all parts and recheck to see if the wire is being wound level. If the wire piles up on the bottom of the channel remove some of the shims.

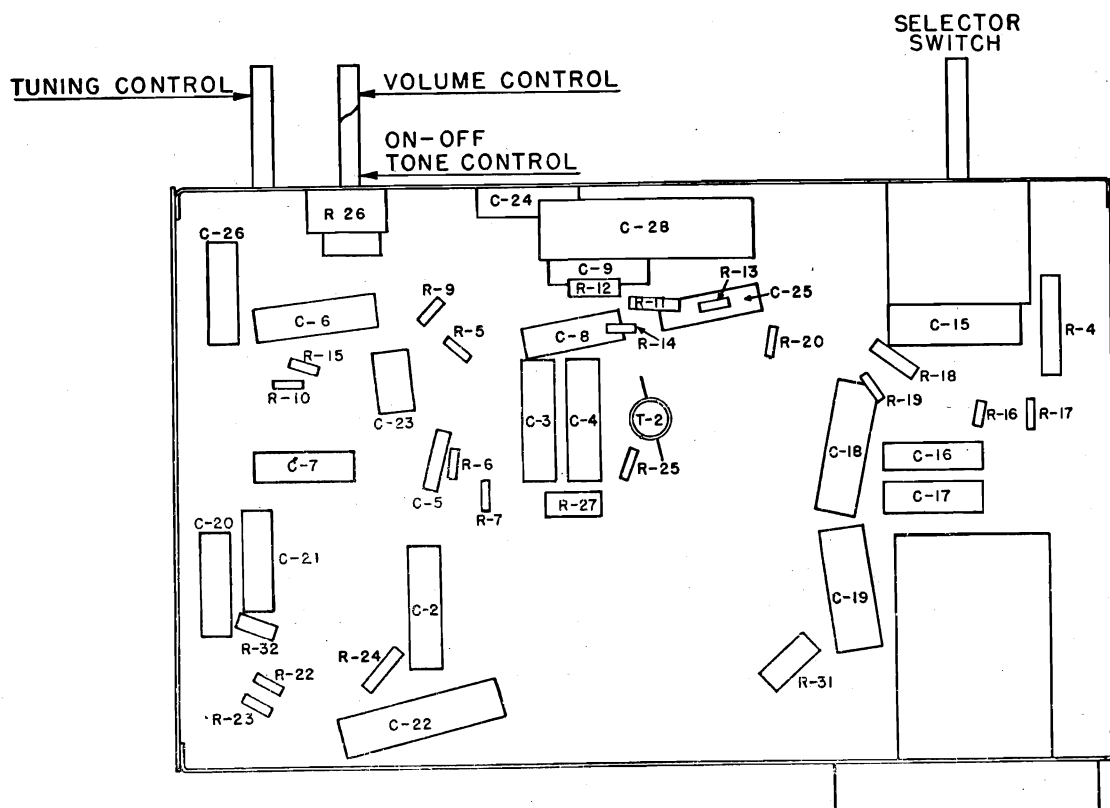


MODEL 4700,
CHASSIS 476

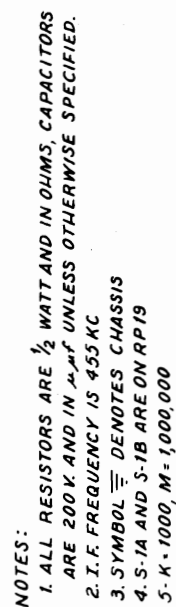
AIR KING PRODUCTS CO., INC.

PARTS LIST

SCHEMATIC LOCATION	PART NO.	DESCRIPTION	SCHEMATIC LOCATION	PART NO.	DESCRIPTION
T6	5591	Cable, Recorder head	R5		Resistor—10 meg. ohms, 1/4 W
T2	3368	Choke	R6		Resistor—680,000 ohms, 1/4 W
C1	28184	Coil, B.C. Osc.	R7, R18		Resistor—2.2 meg. ohms, 1/4 W
C3, C4, C6, C18	1695	Condenser—Variable	R9		Resistor—330,000 ohms, 1/4 W
C5		Condenser—.05 mfd., paper, 200 V	R10, R14, R19		Resistor—470,000 ohms, 1/4 W
C7, C16		Condenser—.05 mfd., paper, 400 V	R11, R29		Resistor—150,000 ohms, 1/4 W
C8, C25, C24		Condenser—100 mmfd., Mica	R12		Resistor—470,000 ohms, 1/4 W
C9, C20, C27		Condenser—.002 mfd., paper, 400 V	R13		Resistor—100,000 ohms, 1/4 W
C11, C12, C13, C14		Condenser—.001 mfd., paper, 400 V	R15		Resistor—250 ohms, 1/2 W
		Condenser—.01 mfd., paper, 400 V	R16		Resistor—4.7 meg. ohms, 1/4 W
		Condenser—25 mfd.—20 V	R17		Resistor—33,000 ohms, 1/4 W
		40 mfd.—300 V	R20		Resistor—27,000 ohms, 1/4 W
		20 mfd.—300 V	R21		Resistor—5000 ohms, 1/4 W
		20 mfd.—300 V	R22		Resistor—330 ohms, 1/4 W
C15		Condenser—.2 mfd., paper, 200 V	R23, R25		Resistor—22,000 ohms, 1/4 W
C17		Condenser—.02 mfd., paper, 400 V	R24		Resistor—150 ohms, 1/4 W
C19		Condenser—.02 mfd., oil, 400 V	R27		Resistor—15,000 ohms, 2 W
C21		Condenser—.015 mfd., paper, 600 V	R28		Resistor—270,000 ohms, 1/4 W
		(.02 mfd., if shielded recording head is used)	R31		Resistor—18 ohms, 2 W
		Condenser—.2 mfd., paper, 400 V	R32		Resistor—470 ohms, 1 W
C22		Condenser—220 mmfd., Mica	54361		Shaft Dial Drive
C23		.005 mfd., paper, 400 V	18144		Socket Dial Light
C26		Condenser—10 mfd., electrolytic 400 V	54374		Socket (for cable from recorder switch)
C28	2078	Control—Tone (with switch)	18101		Socket (Microphone)
R26	2486	Control—Volume	18104		Socket Phono
R8	54373	Cord Dial Drive	58103		Speaker—10" P.M. 3.2 ohm voice coil
	5592	Cord, Line 8 Feet Long	58108		Speaker—10" P.M. 8 ohm voice coil
	40133	Dial, Station, Lucite	18127		Speaker Socket, 2 Prong, used with Speaker 58108
	39177	Knob, Pointer	18126		Speaker Plug, 2 Prong, used with Speaker 58108
	39177	Knob, Tone-off-on	54335		Spring—Dial Cord
	39177	Knob, Tuning	3791		Switch—Master Selector
	39177	Knob, Volume control	3371		Transformer—1st I.F.
	4926	Lamp Ass'y Neon Glow	3535		Transformer—2nd I.F.
	54372	Lens Neon Light	28178		Transformer—40 KC Osc.
T1	28295	Loop Antenna	1339		Transformer—Output (used with Speaker 58103)
	6610	Microphone, Cord and Plug	1341		Transformer—Output (used with Speaker 58108)
R1	4146	Pointer, Dial	1091		Transformer—Power
R2		Resistor—2.4 ohms, 1/2 W			
R3		Resistor—1.0 ohms, 1/2 W			
R4		Resistor—1 meg. ohms, 1/4 W			
		Resistor—3.2 ohms, 1 W, Wirewound			



LOCATIONS OF PARTS UNDER CHASSIS

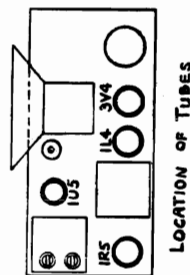


NOTES:



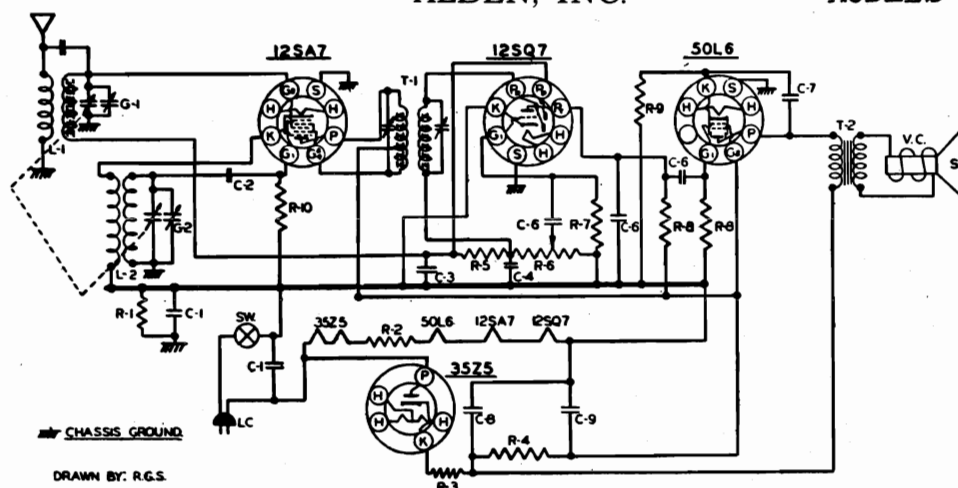
The Signal Generator may be connected through a 0.01 mf capacitor (used as dummy antenna) to the lug on RF section of the tuning capacitor. Connect ground clip of generator to the B—terminal. An output meter may be clipped directly across the voice coil lugs. Align the I.F. trimmers and iron core to 455 kc, using least possible input from Signal Generator to avoid developing A.V.C. voltage which would make the tuning adjustments broad.

Provisions are made to align the R.F. trimmers with the receiver in the metal cabinet. Remove the two plug buttons on the right side of the cabinet and connect the Signal Generator leads to two or three turns of heavy wire, forming a self-supporting loop of about 7 or 8 inches diameter, placed about a foot away from the receiver's loop antenna. Again, use the least possible input from the Signal Generator. With the tuning capacitor plates completely out of mesh, and the pointer at the extreme right end of its travel, adjust the oscillator trimmer (on front section of tuning capacitor) to 1625 kc. Readjust both Signal Generator and tuning capacitor to 1550 kc and adjust the R.F. trimmer (on rear section) for maximum response.



ALDEN, INC.

MODELS 1900, 1901



ALIGNMENT AND SERVICE DATA

Remove chassis from cabinet for alignment.

A Signal Generator is required having the following frequencies: 455 KC, 1400 KC, 1650 KC. An output meter should be connected across the speaker.

The volume control of the receiver should be turned to maximum during the I. F. and all subsequent alignment and the generator output as low as possible to prevent the A. V. C. from working and giving false readings.

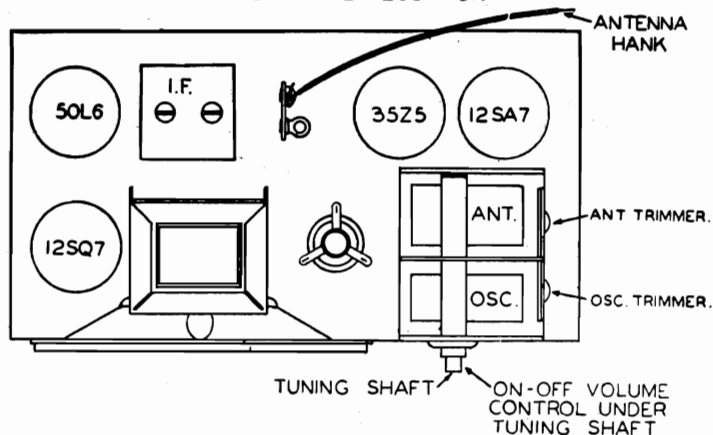
FIRST STEP: Connect the hot lead from the generator to the ANT. section of the gang condenser through a .1 MFD. condenser. The ground lead from the generator must be connected to "B" minus under the chassis. Turn the gang condenser to complete minimum capacity. Set the generator to 455 KC. Adjust the trimmers of the I. F. transformer until a maximum reading is noted on the output meter.

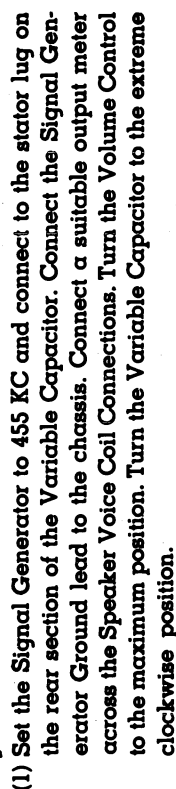
SECOND STEP: With the leads from the generator still connected in the same manner, adjust the Signal Generator to 1650 KC. Adjust the OSC. trimmer until the 1650 KC signal is tuned in. The gang condenser must be at complete minimum capacity for this adjustment.

THIRD STEP: Remove the generator hot lead and connect it to the antenna hank terminal strip through a 200 MMFD. condenser. With the receiver and generator set at 1400 KC, increase the generator output. Adjust the ANT. trimmer until a maximum signal is noted on the output meter. No further adjustment should be made as the coils and gang condenser in this receiver have been specially handled at the factory to insure proper alignment at the lower frequencies.

PART NO.	DESCRIPTION
IR-20	R-1 220M RESISTOR 1/2W. 20
IR-41	R-2 47 RESISTOR J W. 10
IR-17	R-3 33 RESISTOR 1/2W. 20
IR-25	R-4 2200 RESISTOR 1 W. 10
IR-23	R-5 3.3MEG RESISTOR 1/2W. 20
VC-9	R-6 1MEG. VOLUME CONTROL
IR-3	R-7 10MEG. RESISTOR 1/2W. 20
IR-11	R-8 470M RESISTOR 1/2W. 20
IR-14	R-9 150 RESISTOR 1/2W. 20
IR-9	R-10 22M RESISTOR 1/2W. 20
PC-5	C-1 .05MFD. CONDENSER 400V.
MC-4	C-2 .50MMFD. MICA
PC-2	C-3 .05MFD. CONDENSER 200V
MC-2	C-4 .100MMFD. MICA
MC-5	C-5 .500MMFD. MICA
PC-6	C-6 .005MFD. CONDENSER 600V
PC-7	C-7 .01 MFD. CONDENSER 400V.
EC-15	C-8 .30MFD. ELECTROLYTIC COND.
LA-3	L-1 ANT. COIL
LO-14	L-2 OSC. COIL
LI-8	T-1 I.F. TRANSFORMER
SPK-10	T-2 OUTPUT TRANSFORMER
	S 4" PM. SPEAKER
	VC. VOICE COIL
GC-7X	G-1 TUNING CONDENSER
	G-2 TUNING CONDENSER
CO-1	LC LINE CORD
TU-32	35Z5-50L6-12SA7-12SQ7

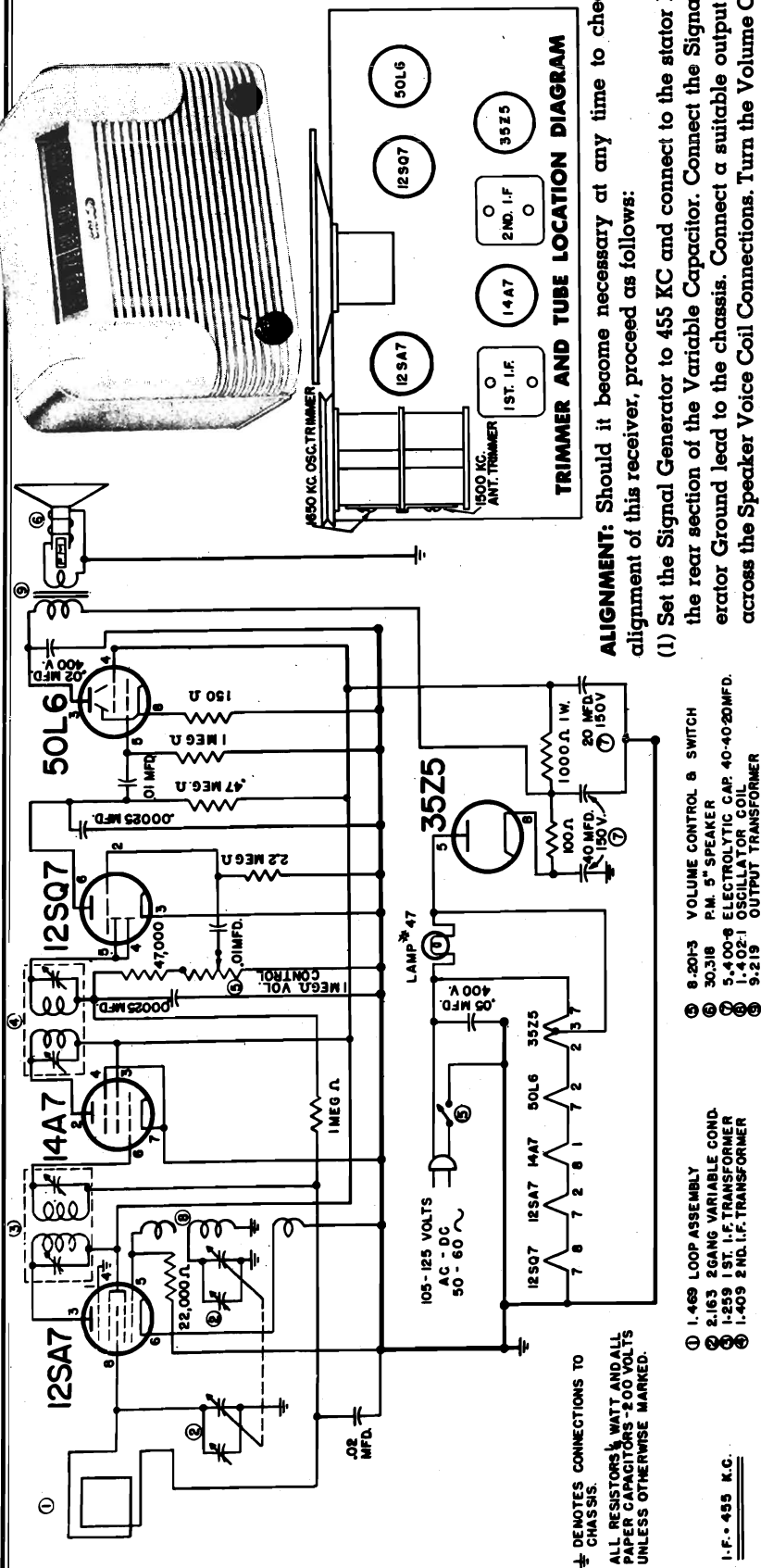
TUBE AND TRIMMER LOCATION





ALIGNMENT: Should it become necessary at any time to check the alignment of this receiver, proceed as follows:

- (1) Set the Signal Generator to 455 KC and connect to the stator lug on the rear section of the Variable Capacitor. Connect the Signal Generator Ground lead to the chassis. Connect a suitable output meter across the Speaker Voice Coil Connections. Turn the Volume Control to the maximum position. Turn the Variable Capacitor to the extreme clockwise position.
- (2) Adjust the trimmers located at the top of the first and second I. F. Transformers or the iron cores located at the top and bottom of each I. F. for maximum output as indicated on the Output Meter.
- (3) Loosely couple the Signal Generator lead to the Loop and set to 1650 KC.
- (4) With Variable Capacitor set at the extreme clockwise position, tune in the 1650 KC signal by means of the Oscillator Trimmer on the Variable Capacitor (front section).
- (5) Set the Signal Generator to 1500 KC and turn the Tuning Control so that this frequency is indicated on the dial. Adjust the Antenna Trimmer on the Variable Capacitor (rear section) for maximum output. No other adjustments are necessary.



LINE VOLTAGE: This receiver is designed for operation on 105-125 Volts, 50-60 Cycles, either Alternating or Direct Current (AC-DC).

POWER CONSUMPTION: 30 Watts.

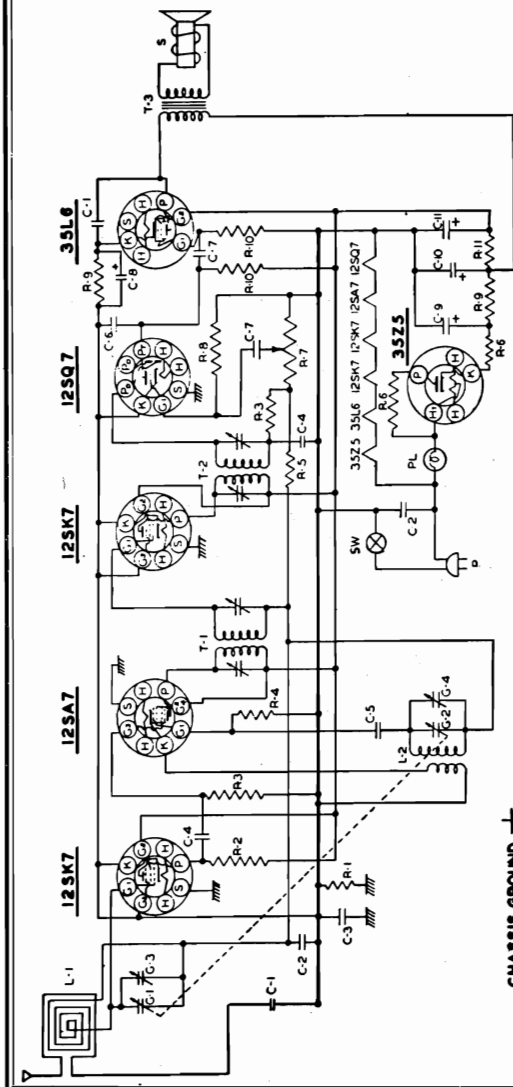
TUNING RANGE: Broadcast: 540 to 1650 Kilocycles (180 to 555 meters).

DIAL: The Dial Scale is calibrated in Kilocycles times 10 to correspond with newspaper or periodical listings.

TUBES: The tubes used, and their functions, are as follows:

12SA7 Converter
12SQ7 Detector, Avc and Audio Amp.
14A47 I.F. Amplifier
50L6 Beam Power Amplifier
35Z5 Rectifier

PART NO.	DESCRIPTION	PART NO.	DESCRIPTION
PC-7	C-1	IR-9	R-4
PC-5	C-2	IR-23	R-4
PC-6	C-3	IR-17	R-4
PC-8	C-4	VC-13	R-7
MC-2	C-5	IR-13	R-8
MC-4	C-6	IR-5	R-9
MC-5	C-6	IR-5	R-9
PC-6	C-7	IR-11	R-10
EC-2	C-8	IR-21	R-11
EC-14	C-9	GC-5	G-1
	C-10		G-2
	C-11		G-3
			G-4
IR-20	R-1		L-1
IR-22	R-2		L-2
IR-10	R-3	LL-16	
LI-6	T-1	LO-0	
LI-7	T-2		
	SW		
SPK-12	T-3		
	S		
PB-1	PL		
CO-1	P		



ALIGNMENT

Remove chassis from cabinet for alignment.

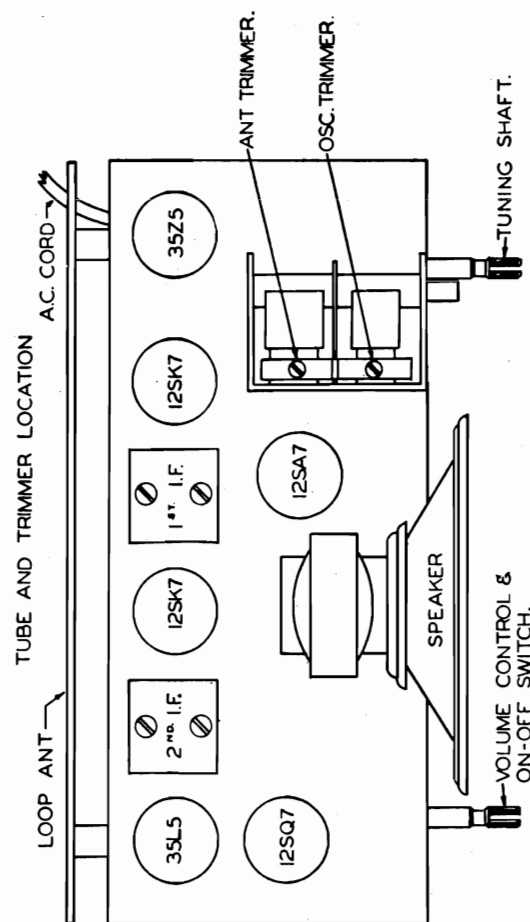
A Signal Generator is required having the following frequencies: 455 KC, 1400 KC, 1720 KC. An output meter should be connected across the speaker.

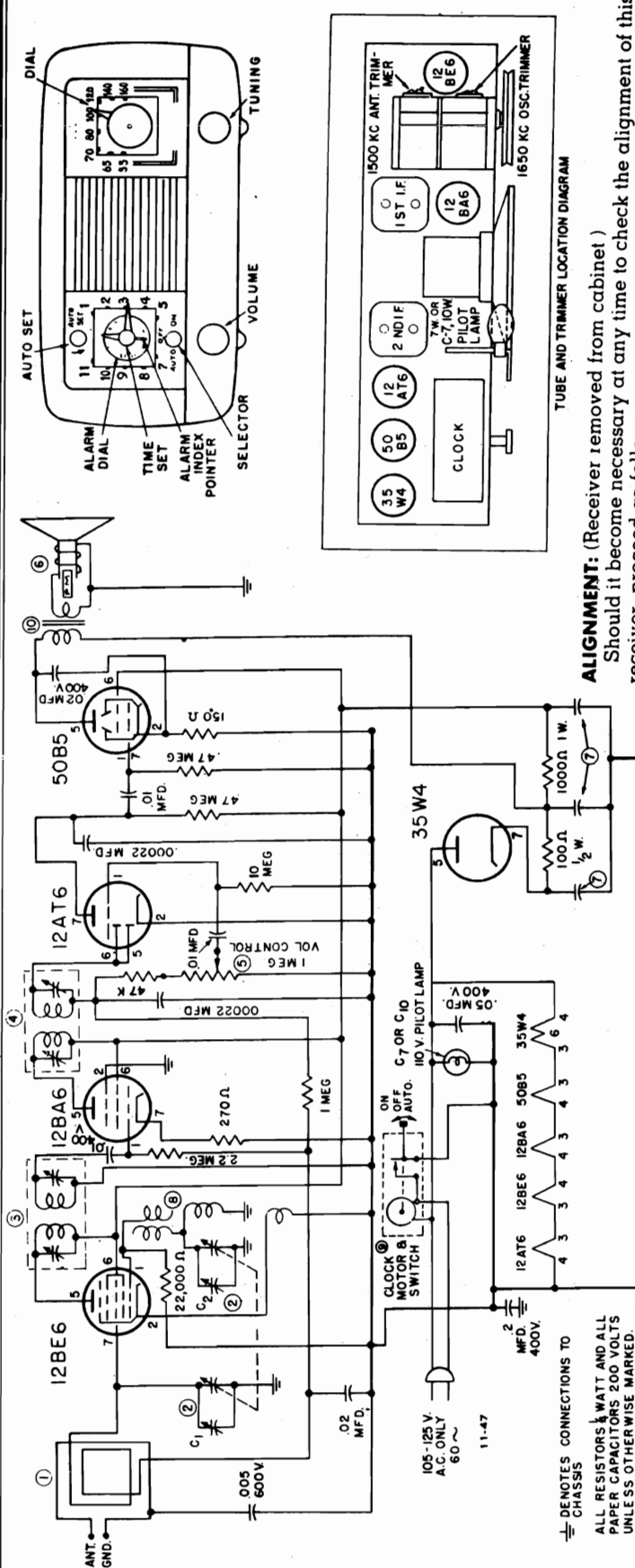
The receiver volume control should be turned to maximum during the I.F. and all subsequent alignments to keep the AVC from working and giving false readings. Keep the generator output as low as possible to prevent overloading.

FIRST STEP: Connect the hot lead from the generator to the ANT. section of the gang condenser, through a .1 MFD condenser. The ground lead from the generator must be connected to the floating ground buss under the chassis. Turn the gang condenser to complete minimum capacity. Adjust the generator to 455KC and adjust the trimmers of the 1st and 2nd I.F. transformers until a maximum reading is noted on the output meter.

SECOND STEP: With the leads from the generator still connected in the same manner, adjust the Signal Generator to 1720 KC. The OSC. trimmer is located on the front of the chassis. Adjust this trimmer until the 1720 KC signal is tuned in.

THIRD STEP: Remove the hot lead of the generator from the ANT section of the gang condenser. Connect this lead to the primary of the loop antenna through a 200 MMFD condenser. Adjust the Signal Generator to 1400 KC. Rotate the tuning control until this signal is tuned in. The ANT trimmer is located on the back of the loop antenna. Adjust this trimmer until a maximum reading is noted on the output meter. No further adjustment should be necessary, unless the set has been damaged, as the coils and condenser in this receiver have been specially handled at the factory to insure proper alignment at the lower frequencies.





ALIGNMENT: (Receiver removed from cabinet)

- (1) Set the Signal Generator to 455 KC and connect to the stator lug on the rear section of the variable capacitor. Connect the signal generator ground lead to the chassis. Connect a suitable output meter across the speaker voice coil connections. Turn the volume control to the maximum position. Turn the variable capacitor to the extreme clockwise position.
- (2) Adjust the trimmers located at the top of the first and second I.F. Transformers for maximum output as indicated on the output meter.
- (3) Loosely couple the signal generator lead to the loop and set to 1650 KC.
- (4) With the variable capacitor set at the extreme clockwise position, tune in the 1650 KC signal by means of the oscillator trimmer on the variable capacitor (front section).
- (5) Set the signal generator to 1500 KC and turn the tuning control so that this frequency is indicated on the dial. Adjust the antenna trimmer on the variable capacitor (rear section) for maximum output. No other adjustments are necessary.

TUBES: The tubes used, and their function are as follows:

12BE6 Converter

12BA6 I.F. Amplifier

12AT6 Detector AVC and Audio Amp.

50BS Beam Power Amplifier

35W4 Rectifier

LINE VOLTAGE: This clock-radio receiver is designed for operation on 105-125 volts, 60 cycles alternating current only.

POWER CONSUMPTION: 40 Watts.

TUNING RANGE: Broadcast: 540 to 1650 Kilocycles (180 to 555 Meters).

DIAL: The dial scale is calibrated in kilocycles. Example: Read 60 as 600 KC.

TO OPERATE THE RADIO: Turn the Selector knob located at the bottom of the clock face so that its index points to on. This turns on the power to the radio. Next, turn the Volume control knob at the bottom left of the cabinet about half way in the clockwise direction, or to the right. Wait a few seconds for the tubes to warm up. Turn the Tuning control knob so that the dial pointer indicates the frequency of the desired station, tuning carefully for best and clearest reception.

To turn the radio off, turn the Selector knob so that the index points to the upright or center position.

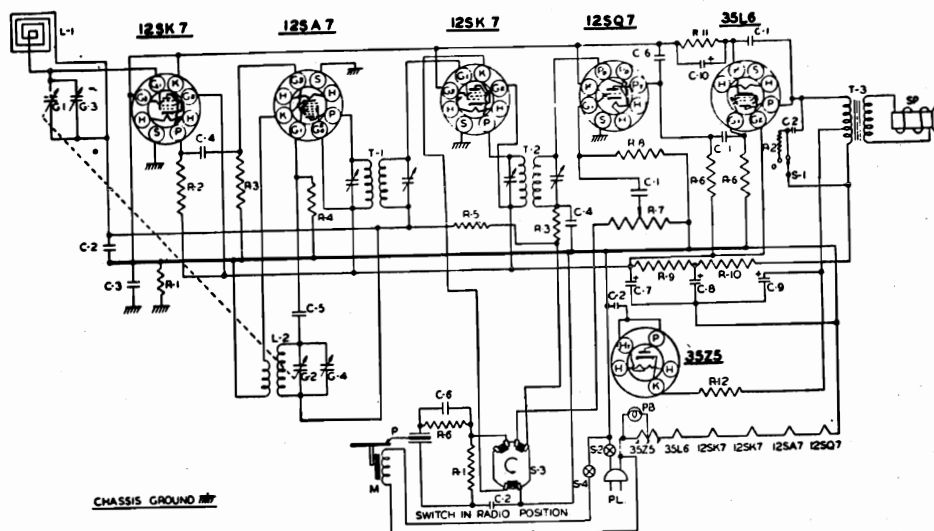
TO OPERATE YOUR "BADALARM" RADIO AS A MUSICAL ALARM: You may set your clock radio to automatically turn on a program you wish to hear during the next eleven hours. Proceed by tuning in the station which will carry the program desired. Then set the Volume control knob at the level you want, as for the regular radio operation. Turn the Auto set knob at the top of the clock face, which rotates the disc forming the alarm dial of the clock.

Stop rotation when the time you desire the radio to go on is directly under the short index pointer on the opposite end of the hour hand. Now turn the Selector knob so that the index points to Auto that is points to the left.

After setting the alarm, if you wish to return to normal radio operation, turn the Selector knob so that the index points to on. Then operate the radio as described in preceding paragraphs. Be sure to turn the Selector knob back to the Auto position if you want a program to be turned on automatically.

ALDEN, INC.

MODEL 1955



ALIGNMENT DATA

Remove the chassis from the cabinet. A Signal Generator with the following frequencies is required: 455 KC, 1400 KC and 1720 KC.

The receiver volume control should be turned to maximum during the I.F. and all subsequent alignments to keep the A.V.C. from working and giving false readings. Turn the tone control to complete left hand position. Keep the generator output as low as possible to prevent overloading.

Connect an output meter across the voice coil of the speaker.

Connect a 20,000 ohm resistor across the loop connector terminals to reflect proper loop impedance.

FIRST STEP: Connect the hot lead from the generator to the "ANT." section of the gang condenser through a .1 MFD. condenser. The ground lead must be connected to the floating ground buss under the chassis. Turn the gang condenser to complete minimum capacity. Adjust the generator to 455 KC and adjust the trimmers of the 1st and 2nd I.F. transformers until a maximum reading is noted on the output meter.

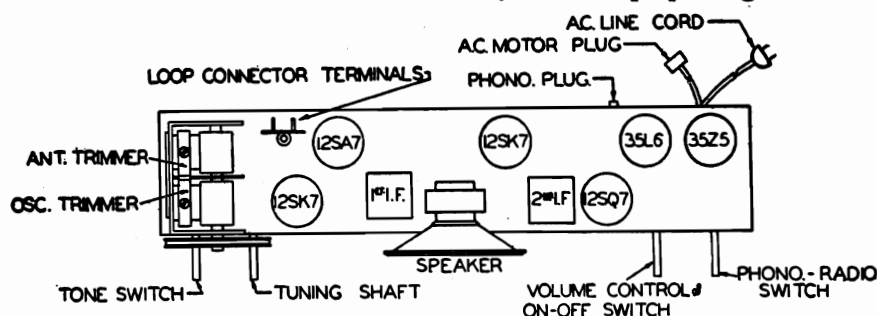
SECOND STEP: With the leads from the generator connected in the same manner as in I.F. alignment, adjust the signal generator to 1720 KC. The "O.S.C." trimmer is located on the front section of the gang condenser. Adjust this trimmer until the signal is tuned in. The gang condenser should be at complete minimum capacity for this setting.

THIRD STEP: Remove the generator leads from the chassis. Remove the 20,000 ohm resistor from the loop connector terminals. Reinstall the chassis in the cabinet, connect the loop leads, motor plug and phono pickup leads.

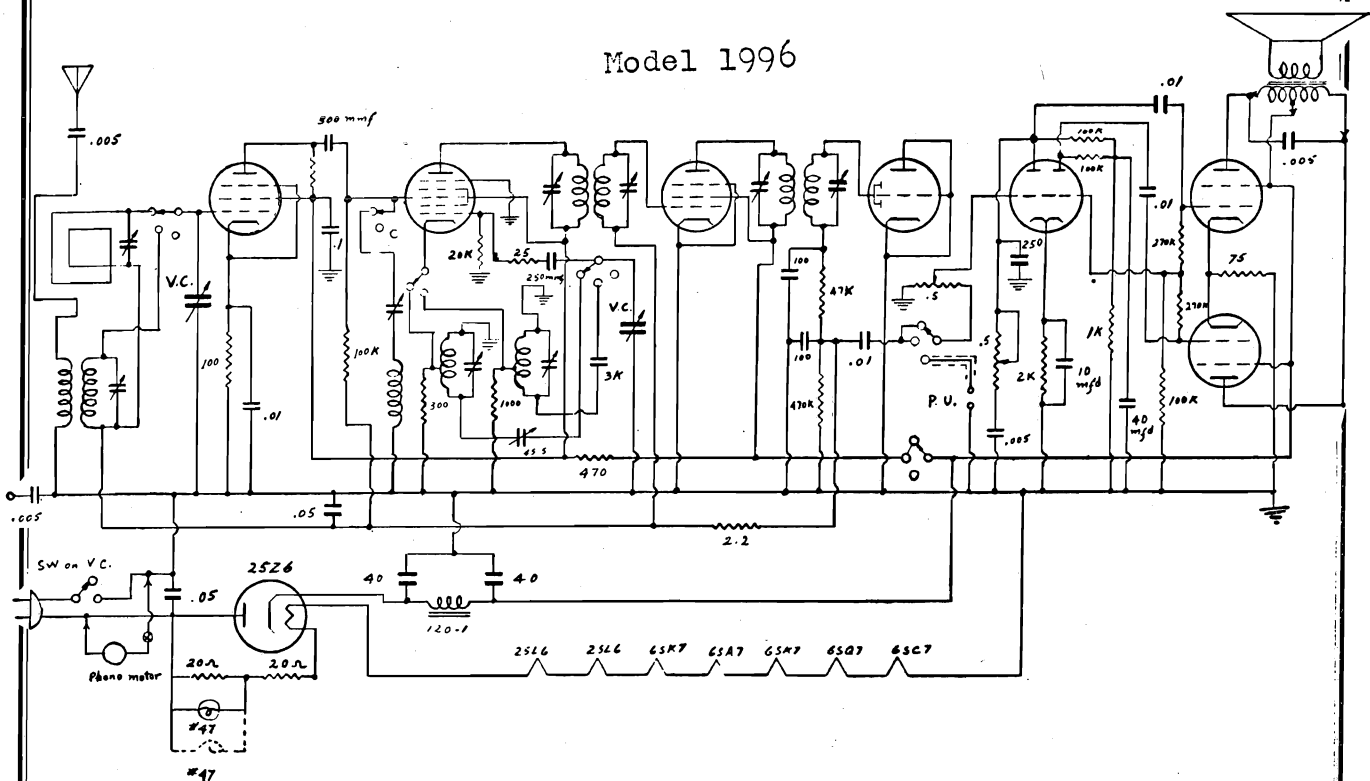
Connect the generator leads to a transmitting loop, made of a few turns of wire, and loosely couple to the receiver loop antenna which is located on the back end of the cabinet. Adjust the generator to 1400 KC. Rotate the tuning control until this signal is tuned in. The "ANT." trimmer is located on the rear section of the gang condenser. Adjust this trimmer until a maximum signal is noted on the output meter.

No further adjustment should be necessary, unless the receiver has been damaged, as the coils and tuning condenser have been specially handled at the factory to insure proper alignment at the lower frequencies.

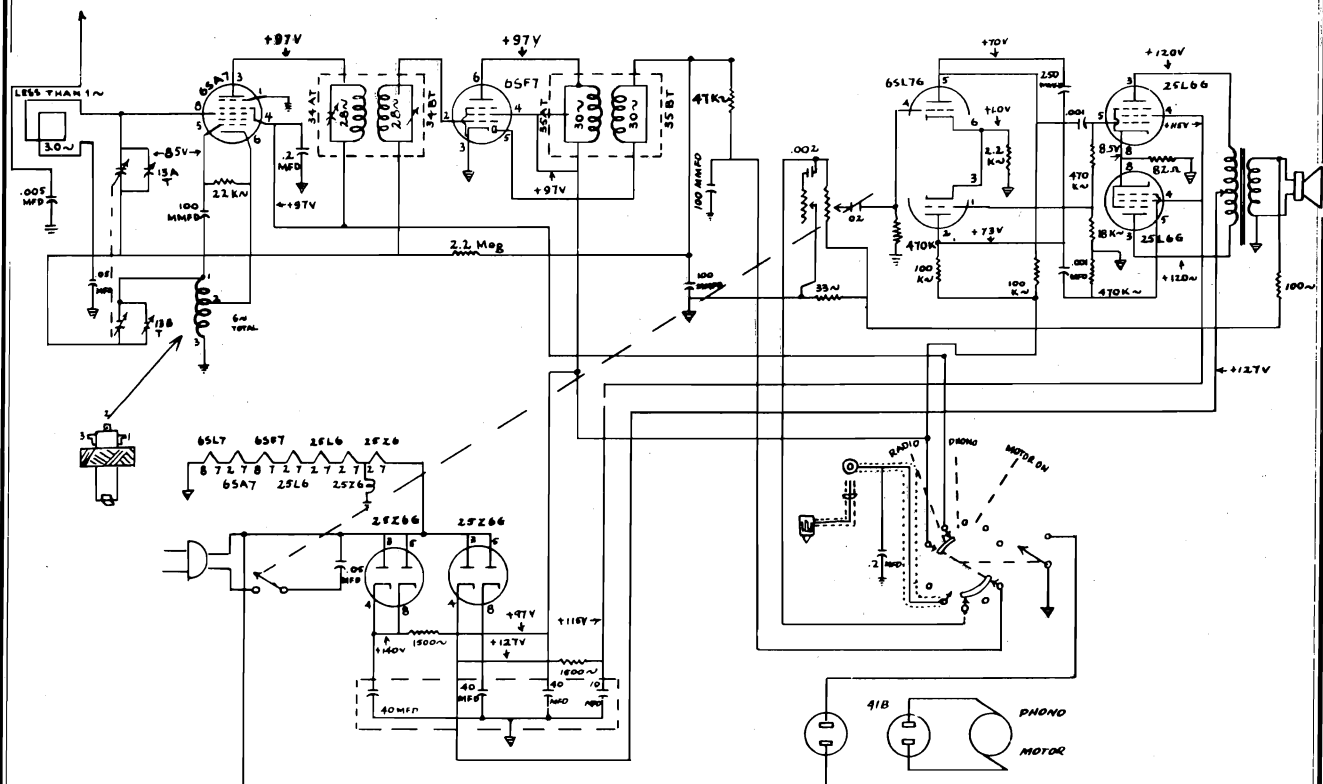
PART NO.	DESCRIPTION
PC-7	C-1 .01 MFD. CONDENSER 400 V.
PC-5	C-2 .1 MFD. CONDENSER 400 V.
PC-8	C-3 .1 MFD. CONDENSER 400 V.
MC-2	C-4 100MMFD. MICA CONDENSER
MC-4	C-5 50MMFD. MICA CONDENSER
MC-5	C-6 500MMFD. MICA CONDENSER
EC-14	C-7 20 MFD.
	C-8 40 MFD. 150WV ELECTROLYTIC
EC-2	C-9 40 MFD.
	C-10 10 MFD. 25WV ELECTROLYTIC
IR-20	R-1 220M Ω RESISTOR 1/2W 20%
IR-15	R-2 2200 Ω RESISTOR 1/2W 20%
IR-10	R-3 47M Ω RESISTOR 1/2W 20%
IR-9	R-4 22M Ω RESISTOR 1/2W 20%
IR-23	R-5 33MEG. RESISTOR 1/2W 20%
IR-11	R-6 470M Ω RESISTOR 1/2W 20%
VC-4	R-7 1MEG. VOLUME CONTROL
IR-13	R-8 2.2MEG. RESISTOR 1/2W 20%
IR-1	R-9 470 Ω RESISTOR 1/2W 20%
IR-42	R-10 1000 Ω RESISTOR 1 W 10%
IR-14	R-11 150 Ω RESISTOR 1/2W 20%
IR-17	R-12 33 Ω RESISTOR 1/2W 20%
GC-5	G-1 GANG CONDENSER
	G-2 ANT. TRIMMER
	G-3 OSC. TRIMMER
L1-6	T-1 INPUT I.F. TRANSFORMER
L1-7	T-2 OUTPUT I.F. TRANSFORMER
	T-3 OUTPUT TRANSFORMER
LL-17	L-1 LOOP ANT.
LO-15	L-2 OSC. COIL
SPK-12	SP 5" PM SPEAKER
SW-2	S-1 TONE SWITCH
	S-2 SWITCH ON VOLUME CONTROL
SW-1	S-3 PHONO. RADIO SWITCH
	S-4 SWITCH ON RECORD CHANGER
AC-M-7	M RECORD CHANGER MOTOR
AC-PU-7	P CRYSTAL PICKUP ARM. CARTRIDGE SH
	PB #47 PILOT BULB
CO-2	PL LINE CORD



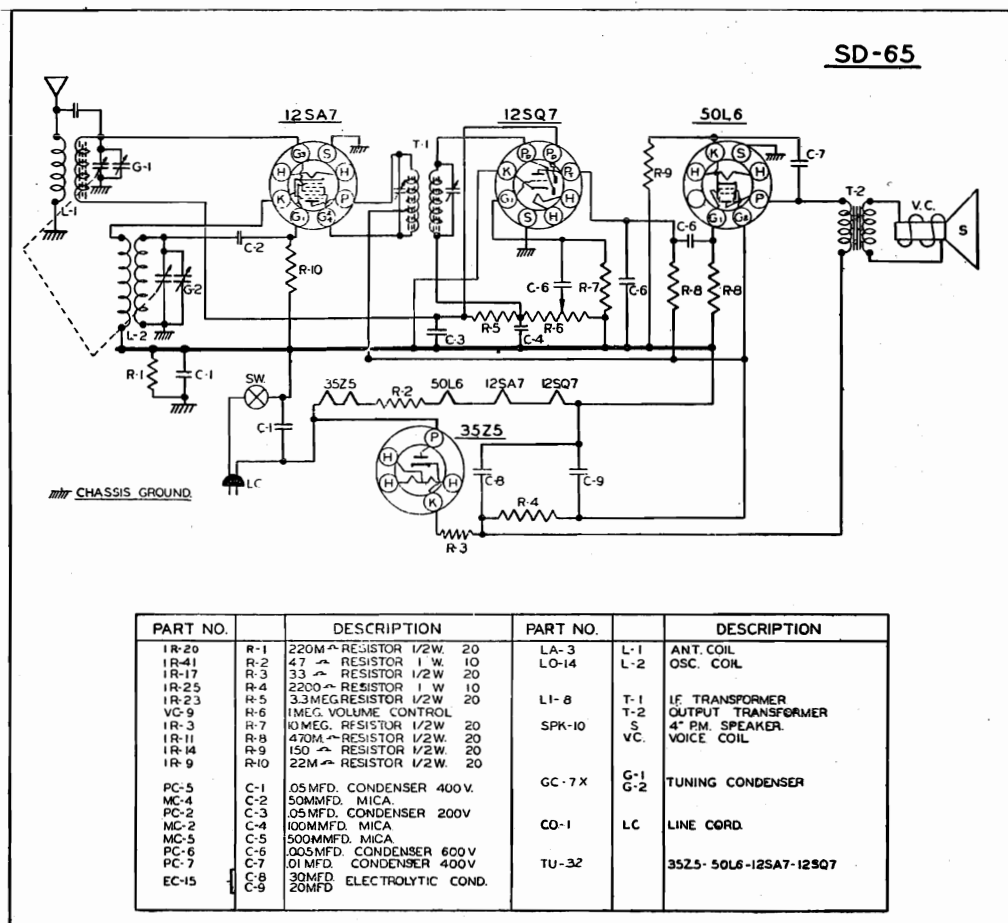
Model 1996



Model 1997



ALLIED RADIO CORP.

MODELS 4E-515,
4E-516, 4F-515, 4F-516

Operating Instructions

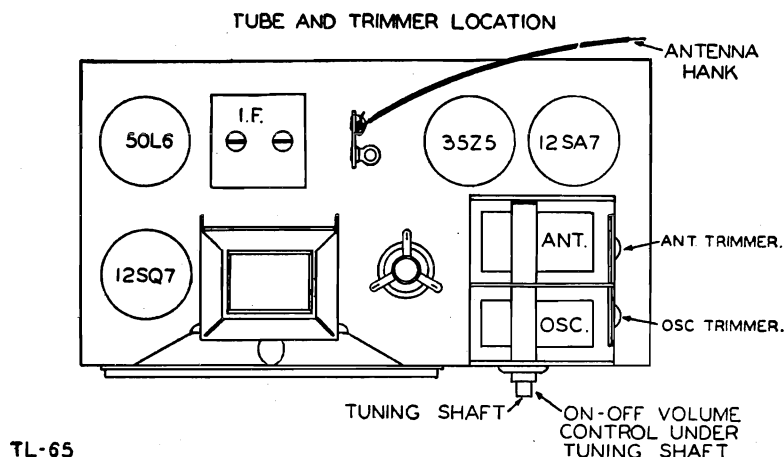
POWER SOURCES: This receiver may be operated on alternating current (AC) of 110 to 125 volts at 60 cycles or on direct current (DC) of 110 to 125 volts. When used on DC, if the tubes light up but set does not play, reverse the cord plug in the power outlet.

CAUTION: Always predetermine voltage of power sources. Never try to plug this receiver into a 220 volt line, as this will cause serious damage.

INSTALLATION: Unwind the power cord and plug into a convenient outlet. This receiver is equipped with an antenna hank, which should be uncoiled and stretched out to its full length for best reception. However, in steel constructed buildings or in distant isolated locations, better results may be obtained by connecting an outdoor antenna to the end of the antenna hank wire. The outdoor antenna should be about 50 feet long, including the lead-in wire.

MODELS 4E-515,
4E-516, 4F-515, 4F-516

ALLIED RADIO CORP.



CONTROLS: Two knobs control the operation of this receiver. The lower knob is used to turn the set off and on. It is also used to control volume. Rotate this knob to the right in a clockwise direction and a click will be heard. This turns the receiver on. Allow about thirty seconds for tubes to heat up, then continue to rotate the knob to the right to increase volume. The upper knob is the station selector. Rotate this knob to the right or left to locate your station. By mentally adding a zero to the numbers on the dial, the result will be read directly in kilocycles. To turn off, turn the lower knob to the left in a counterclockwise direction as far as it will go and a click will be heard. The power switch will then be turned off.

ALIGNMENT AND SERVICE DATA

(See Fig. No. 1 For Trimmer Location)

Remove chassis from cabinet for alignment.

A Signal Generator is required having the following frequencies: 455 KC, 1400 KC, 1650 KC. An output meter should be connected across the speaker.

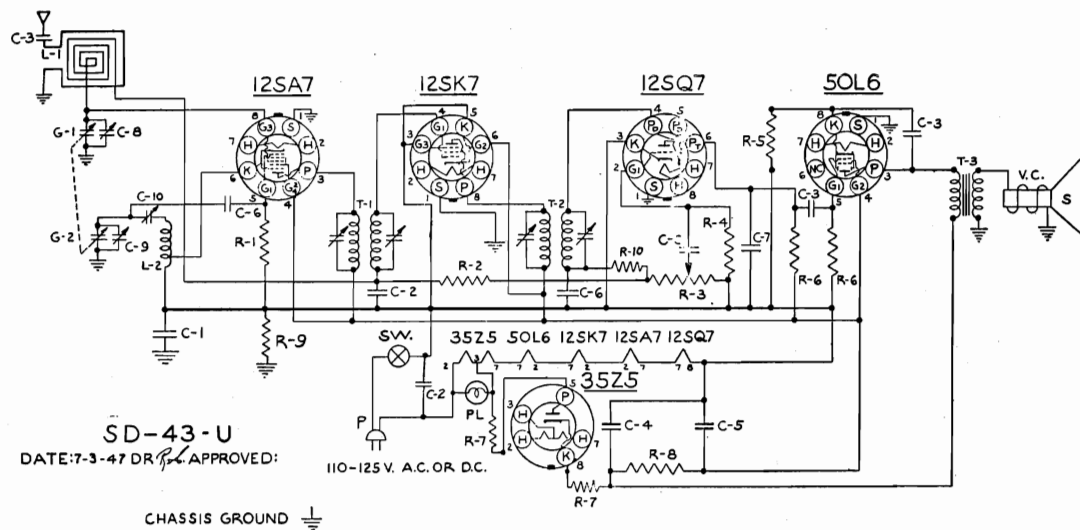
The volume control of the receiver should be turned to maximum during the I. F. and all subsequent alignment and the generator output as low as possible to prevent the A. V. C. from working and giving false readings.

FIRST STEP: Connect the hot lead from the generator to the ANT. section of the gang condenser through a .1 MFD. condenser. The ground lead from the generator must be connected to "B" minus under the chassis. Turn the gang condenser to complete minimum capacity. Set the generator to 455 KC. Adjust the trimmers of the I. F. transformer until a maximum reading is noted on the output meter.

SECOND STEP: With the leads from the generator still connected in the same manner, adjust the Signal Generator to 1650 KC. Adjust the OSC. trimmer until the 1650 KC signal is tuned in. The gang condenser must be at complete minimum capacity for this adjustment.

THIRD STEP: Remove the generator hot lead and connect it to the antenna hank terminal strip through a 200 MMFD. condenser. With the receiver and generator set at 1400 KC, increase the generator output. Adjust the ANT. trimmer until a maximum signal is noted on the output meter. No further adjustment should be made as the coils and gang condenser in this receiver have been specially handled at the factory to insure proper alignment at the lower frequencies.

ALLIED RADIO CORP. MODELS 5D-250, 5D-251, 5E-250, 5E-251



PART NO.	DESCRIPTION	PART NO.	DESCRIPTION	PART NO.	DESCRIPTION
IR-9	R-1 22,000-RESISTOR 1/2W 20%	TC-7	C-8 ANTENNA TRIMMER COND.	CO-1	P LINE CORD
IR-23	R-2 3.3 MEG. RESISTOR 1/2W 20%	TC-9	C-9 OSC. TRIMMER COND.	TU-3	12SA7 GT 12SK7 GT
VC-4	R-3 1MEG. VOL. CONTROL & SW.	TC-10	C-10 OSC. PADDING COND.		12SQ7 GT 50L6GT 35Z5GT
IR-13	R-4 22 MEG. RESISTOR 1/2W 20%	IR-20	R-9 220M-RESISTOR 1/2W 20%		
IR-14	R-5 150-RESISTOR 1/2W 20%	GC-1	G-1 GANG CONDENSER		
IR-11	R-6 470M-RESISTOR 1/2W 20%	LL-4	L-1 LOOP ANTENNA		
IR-17	R-7 33-RESISTOR 1/2W 20%	LO-7	L-2 OSC. COIL		
IR-25	R-8 22,000-RESISTOR 1/2W 10%	LI-1	T-1 INPUT I.F. TRANSFORMER		
PC-8	C-1 .1MFD. COND. 400V.	LI-2	T-2 OUTPUT I.F. TRANSFORMER		
PC-5	C-2 .05 MFD. COND. 400V.	T-3	OUTPUT SPKR. TRANSFORMER		
PC-7	C-3 .01 MFD. COND. 400V.	SPK-6	V.C. VOICE COIL		
EC-12	C-4 40 MFD. 150V. ELECTROLYTIC	S	P.M. SPEAKER		
MC-2	C-5 100MMFD. MICA COND.	PL	Nº 47 PILOT BULB		
MC-5	C-6 500MMFD. MICA COND.	SW.	AC. SW. ON VOL. CONTROL		
IR-10	R-10 47M-RESISTOR 1/2W 20%				

OPERATING INSTRUCTIONS

POWER SOURCES: This receiver may be operated on alternating current (AC) of 110 to 125 volts at 60 cycles or on direct current (DC) of 110 to 125 volts. When used on DC, if the tubes light up but set does not play, reverse the cord plug in the power outlet.

CAUTION: Always predetermine voltage of power source. Never try to plug this receiver into a 220 volt line, as this will cause serious damage.

INSTALLATION: Unwind the power cord and plug into a convenient outlet. This receiver is equipped with a sensitive loop antenna and under ordinary conditions no external antenna would be required. However, in steel constructed buildings or in distant isolated locations, the reception may be improved by using an outside antenna. This should be a single wire not more than 50 feet long and should be connected to the antenna lead that projects from the back of the receiver. No ground wire is required at any time.

MODELS 5D-250,
5D-251, 5E-250, 5E-251

ALLIED RADIO CORP.

ALIGNMENT AND SERVICE DATA

Remove chassis from cabinet for alignment.

A Signal Generator is required having the following frequencies: 455 KC, 1400 KC, 1720 KC. An output meter should be connected across the speaker.

The receiver volume control should be turned to maximum during the I.F. and all subsequent alignments to keep the AVC from working and giving false readings. Keep the generator output as low as possible to prevent overloading.

FIRST STEP: Connect the hot lead from the generator to the ANT. section of the gang condenser, through a .1 MFD condenser. The ground lead from the generator must be connected to the floating ground buss under the chassis. Turn the gang condenser to complete minimum capacity. Adjust the generator to 455KC and adjust the trimmers of the 1st and 2nd I.F. transformers until a maximum reading is noted on the output meter.

SECOND STEP: With the leads from the generator still connected in the same manner, adjust the Signal Generator to 1720 KC. The OSC. trimmer is located on the front of the chassis. Adjust this trimmer until the 1720 KC signal is tuned in.

THIRD STEP: Remove the hot lead of the generator from the ANT section of the gang condenser. Connect this lead to the primary of the loop antenna through a 200 MMFD condenser. Adjust the Signal Generator to 1400 KC. Rotate the tuning control until this signal is tuned in. The ANT trimmer is located on the top of the ANT. section of the gang condenser. Adjust this trimmer until a maximum reading is noted on the output meter. No further adjustment should be necessary, unless the set has been damaged, as the coils and condenser in this receiver have been specially handled at the factory to insure proper alignment at the lower frequencies.

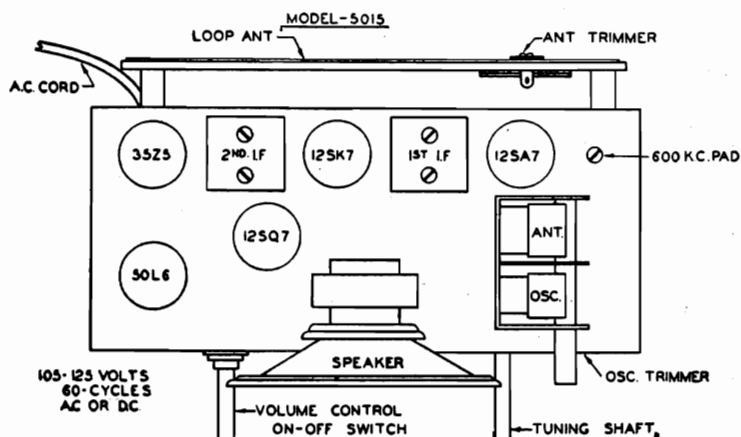


FIGURE-1

CONTROLS: Two knobs control the operation of this receiver. The left hand knob is used to turn set off and on. It is also used to control volume. Rotate knob to your right in a clockwise direction and a click will be heard. This turns receiver on. Allow about 30 seconds for tubes to heat up, then continue to rotate knob to your right to increase volume. The right hand knob is the station selector. Rotate this knob to the right or left to locate your station. By mentally adding a zero to the numbers on the dial, the result will be read directly in kilocycles. To turn set off, turn left hand knob to your left in a counter-clockwise direction as far as it will go and a click will be heard. The power switch will then be turned off.



MODELS 5F-525,
5F-526

ALLIED RADIO CORP.

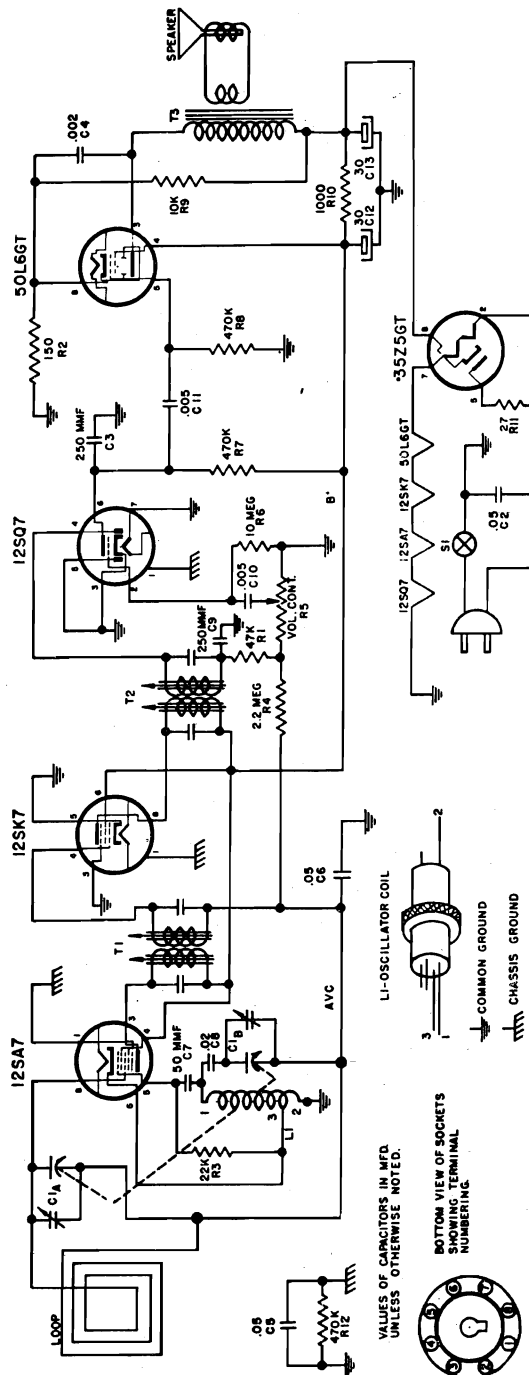
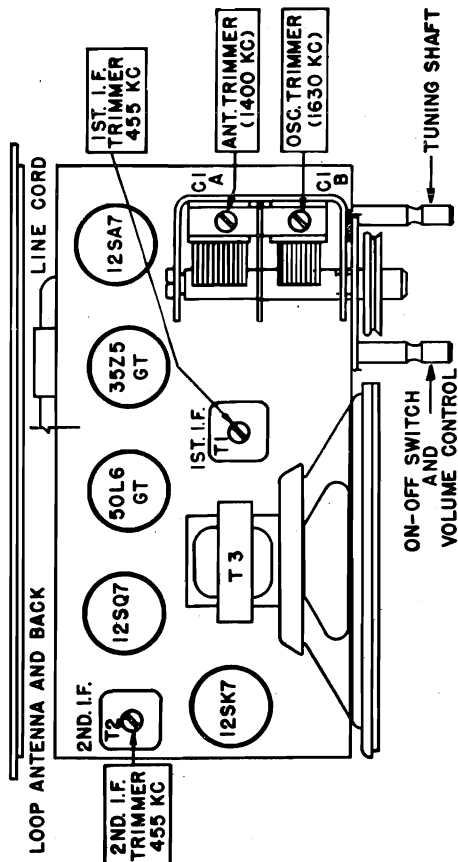
ALIGNMENT PROCEDURE

(Continued)

CAUTION: This is an A.C.-D.C. receiver and when aligning the set it is necessary to isolate the Signal Generator or the Receiver from the line by use of a transformer, or place a .2 MFD. condenser in both test leads of the Signal Generator.

Position of Variable	Generator Frequency	Dummy Ant. Mid.	Generator Connections	Trimmer Adjustment	Trimmer Function
Fully open	455 KC	.1	*12SA7 Grid (Stator of C1A)	T1	Input I.F.
Fully open	455 KC	.1	*12SA7 Grid (Stator of C1A)	T2	Output I.F.
Fully open	1630 KC	.1	*12SA7 Grid (Stator of C1A)	C1B	Oscillator
Tune in signal from generator	1400 KC		Loosely coupled to loop antenna	C1A	Antenna

*Connect ground lead of signal generator to common negative.



ALLIED RADIO CORP.

MODELS 5F-525,
5F-526

INSTALLATION

The loop antenna incorporated in the receiver is sufficient for all normal reception.

When using a DC power supply and after allowing sufficient time for the tubes to warm up the receiver does not operate, remove the line cord plug from the receptacle and reverse. Replace the plug in the reversed position and allow tubes to warm up at which time the receiver will operate.

If an excessive hum is noticed when operating from an AC power source, reverse the line cord plug to determine which position gives the best results.

NOTE: All loop antennas are somewhat directional in their characteristics.

Reception can sometimes be improved and/or local interference reduced by turning the set in a different direction.

OPERATION

To turn the receiver on, rotate the on-off switch and volume control knob (left hand control) clockwise about one-half its range. This supplies power to the receiver. Allow about thirty seconds for the tubes to warm up after which the desired station may be tuned by rotating the station selector (right hand control).

For best tone, tune the desired station with the volume control turned low. This enables you to get the exact point where the station comes in best. Then, adjust the volume to the desired level with volume control.

DESCRIPTION

This model is a 4 tube (plus rectifier) superhetrodyne radio receiver designed for use on 117 volts 60 cycle AC or 117 volts DC power supply.

The tubes used are:—

1—12SA7 Oscillator Converter	1—12SQ7 AVC Detector and 1st
1—12SK7 I.F. Amplifier	Audio
1—35Z5GT Power Rectifier	1—50L6GT Power Output

This receiver covers the frequency range from 540 kilocycles to 1630 kilocycles (KC).

ALIGNMENT PROCEDURE

The following alignment procedure is for use only by competent servicemen having the proper equipment.

The alignment should be made with volume control fully on, and the output from the signal generator as low as possible, to prevent A.V.C. action from interfering with correct alignment.

With the output meter connected across the voice coil of the speaker, the output meter reading for 50 milli-watts is .4 volts using a signal which is modulated 400 c.p.s.

Adjust all trimmers for maximum output. Repeat alignment procedure given below as a final check.

PARTS LIST

CODE	PART NO.	DESCRIPTION	CODE	PART NO.	DESCRIPTION
R7, R8, R12	A60-662	470K ohm ½ watt resistor	C1A, C1B	B19-194	Variable condenser
R9	A60-698	10K ohm 1 watt resistor	C2, C5	A16-158	.05 MFD 400 volt condenser
R10	A60-732	1000 ohm 1 watt resistor	C3, C9	A15-176	250 MMF mica condenser
R11	A60-690	27 ohm ½ watt resistor	C4	A16-155	.002 MFD 600 volt condenser
T1	A10-475	1st I.F. transformer	C6	A16-152	.05 MFD 200 volt condenser
T2	A10-479	2nd I.F. transformer	C7	A15-175	50 MMF mica condenser
L1	B10-502	Oscillator coil	C8	A16-150	.02 MFD 400 volt condenser
	A42-451	Cabinet, molded, brown	C10, C11	A16-153	.005 MFD 600 volt condenser
	D42-424	Cabinet, molded, ivory	C12, C13	B18-283	30-30 MFD 150 volt electrolytic condenser
	B67-510	Dial scale, paper	R1	A60-685	47K ohm ½ watt resistor
	A52-243	Knob, tenite, black	R2	A60-686	150 ohm ½ watt resistor
	A52-222	Knob, tenite, ivory	R3	A60-659	22K ohm ½ watt resistor
	S84-265	Loop and back	R4	A60-684	2.2 megohm ½ watt resistor
	A58-56	Pointer, "Knight"	R5	A24-174	Volume control and switch, 1 megohm
	B73-362	Speaker, 5", P.M. (includes output transformer)	R6	A60-663	10 megohm ½ watt resistor

POWER SOURCES: This receiver is designed for operation on either an external power source or on the enclosed batteries.

AC OR DC OPERATION: This receiver may be operated on 50 to 60 cycle, 110 to 125 volt AC current or 110 to 125 DC current.

CAUTION: Never plug this receiver into a 220 volt line as this will seriously damage the component parts which have been designed for 110 to 125 volt operation only.

To operate on AC or DC open the small door at the right in the back of the cabinet. Pull out the power cord and plug into a convenient outlet of the proper voltage and current. Follow instructions under "Controls."

To operate on the enclosed batteries, follow instructions under "Controls."

ANTENNA: This receiver is equipped with a sensitive loop antenna and requires no external antenna wire. However, due to the directional qualities of the loop some stations may appear to be weak in reception. This condition may be remedied by rotating or changing the position of the receiver.

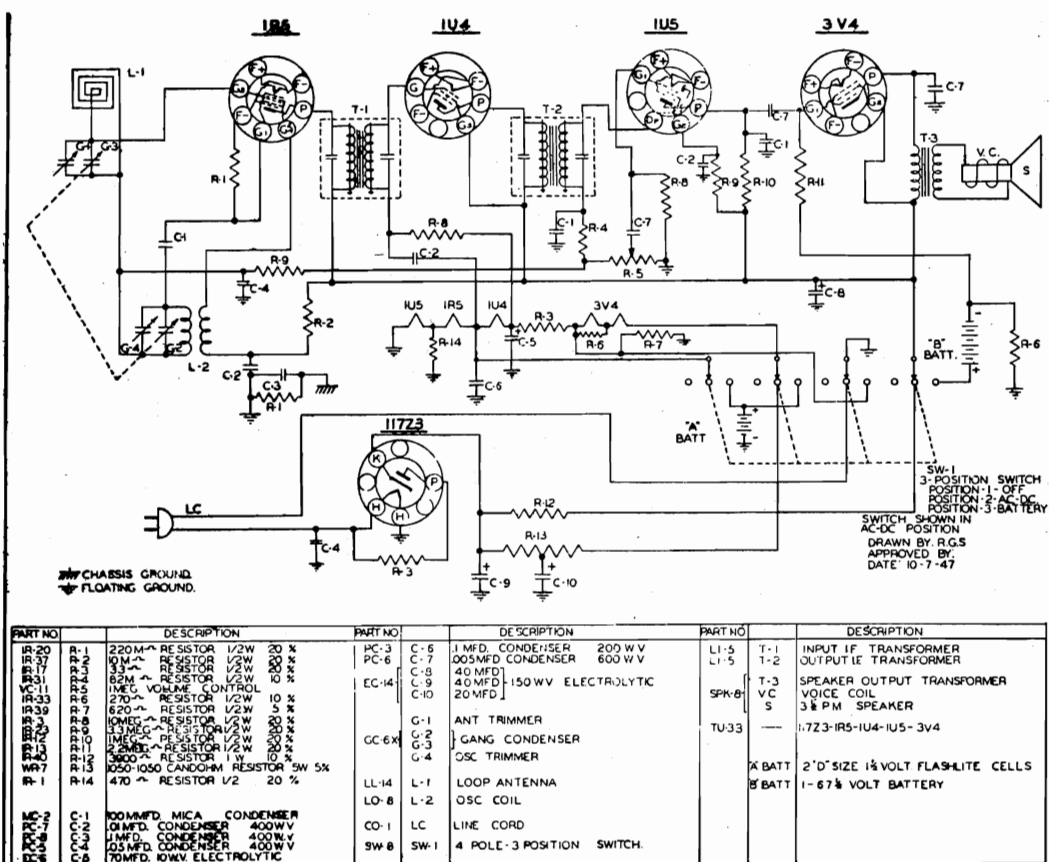
CONTROLS: This receiver has three control knobs which are located on the front panel of the cabinet.

STATION SELECTOR KNOB: The right hand knob is the station selector. Rotate this knob to the right or left to select your desired station. The dial scale is calibrated in kilocycles. By mentally adding a zero to the numbers on the scale, the result will be read directly in (KC) kilocycles. (i.e., 60 plus 0 equals 600 KC or 140 plus 0 equals 1400 KC).

POWER SELECTOR SWITCH: The left hand knob is the power selector. It has three positions which are indicated on the front panel. The extreme left position is the "OFF" position. The small dot on this knob must point to "OFF" when the receiver is not in use. The center position is "AC-DC" and is used when it is desired to operate the receiver from a power line source. The extreme right hand position is "BATT" and is used when it is desired to operate on the enclosed batteries.

AC OPERATION: When an AC power source is used, set the power selector knob to "AC-DC" after the power cord has been plugged into a convenient outlet. The receiver is now ready for operation.

DC OPERATION: If the receiver does not operate after a few seconds, reverse the power cord plug in the outlet and it will operate properly.



TUNING RANGE — 540 KC to 1650 KC

ALIGNMENT AND SERVICE DATA

(See Fig. No. 2 For Trimmer Location)

Remove chassis from cabinet for alignment.

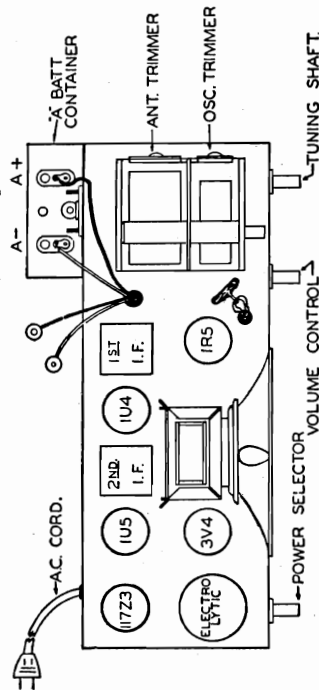
A Signal Generator is required having the following frequencies: 455 KC, 1400 KC, 1650 KC. An output meter should be connected across the speaker.

The volume control of the receiver should be turned to maximum during the I. F. and all subsequent alignment and the generator output as low as possible to prevent the A. V. C. from working and giving false readings.

FIRST STEP: Connect the hot lead from the generator to the ANT. section of the gang condenser through a .1 MFD. condenser. The ground lead from the generator must be connected to "B" minus under the chassis. Turn the gang condenser to complete minimum capacity. Set the generator to 455 KC. Adjust the movable iron cores in the IF cans. These IF adjustments are made in the top and in the bottom of the can under the chassis. Adjust the cores until a maximum reading is noted on the output meter.

SECOND STEP: With the leads from the generator still connected in the same manner, adjust the Signal Generator to 1650 KC. Adjust the OSC. trimmer until the 1650 KC signal is tuned in. The gang condenser must be at complete minimum capacity for this adjustment.

THIRD STEP: Remove the generator leads from the gang condenser and replace the chassis in the cabinet. Loosely couple the generator to the receiver loop by making a complete turn of wire over the outside of the cabinet. With the receiver and generator set at 1400 KC, increase the generator output. Adjust the ANT. trimmer through the hole which is provided in the end of the cabinet until a maximum signal is noted on the output meter. The ANT. trimmer hole in the side of the cabinet is covered by a small plug button. Replace this button after adjustment has been made. No further adjustment should be made as the coils and gang condenser in this receiver have been specially handled at the factory to insure proper alignment at the lower frequencies.



TUBE AND TRIMMER LOCATION
FIGURE-2

TL-75

BATTERY OPERATION: The power cord is not used for battery operation and may be hanked and put back in the cabinet. Set the power control knob to "BATT" and the receiver is ready for operation on the enclosed batteries.

CAUTION: When the receiver is not in use, the power selector knob must be turned to "OFF." If the knob is allowed to remain in "BATT" position, the batteries will be in use constantly. The volume control does not control the batteries and they are still in operation even though the volume control is turned all the way off.

VOLUME CONTROL: The center knob is the volume control. After the power selector knob has been properly set and the receiver is in operation, rotate the volume control knob to the right to increase volume or to the left to decrease volume.

BATTERY SUPPLIERS

The batteries for this receiver may be purchased from any reliable dealer. For proper operation this receiver requires two "A" batteries and one "B" battery.

The "A" batteries are size "D" flashlight cells and are made by all battery manufacturers.

The "B" battery is a 67½ volt battery and is made by the following manufacturers:

Eveready	67½ vlt. #467
Burgess	67½ vlt. #XX45
General	67½ vlt. #W45A
Ray-O-Vac	67½ vlt. #4367

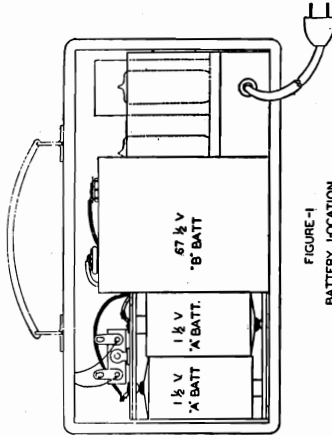


FIGURE-1
BATTERY LOCATION

BATTERY SUPPLIERS (See Fig. No. 1)

To replace the batteries in this receiver:

Remove the back.

To the left, looking into the rear of the cabinet is the "A" or flashlight battery container. To the right is the "B" or 67½ volt battery.

To replace the "A" batteries, pull the old batteries out of the container. Replace with fresh batteries, making sure the batteries are inserted according to the diagram on the inside of the container.

To replace the "B" battery, disconnect the snap fastener connectors. Replace with a fresh battery and snap the connectors into place. Replace the battery in the cabinet as shown in Fig. No. 1, making sure that the connector end faces the top of the cabinet.

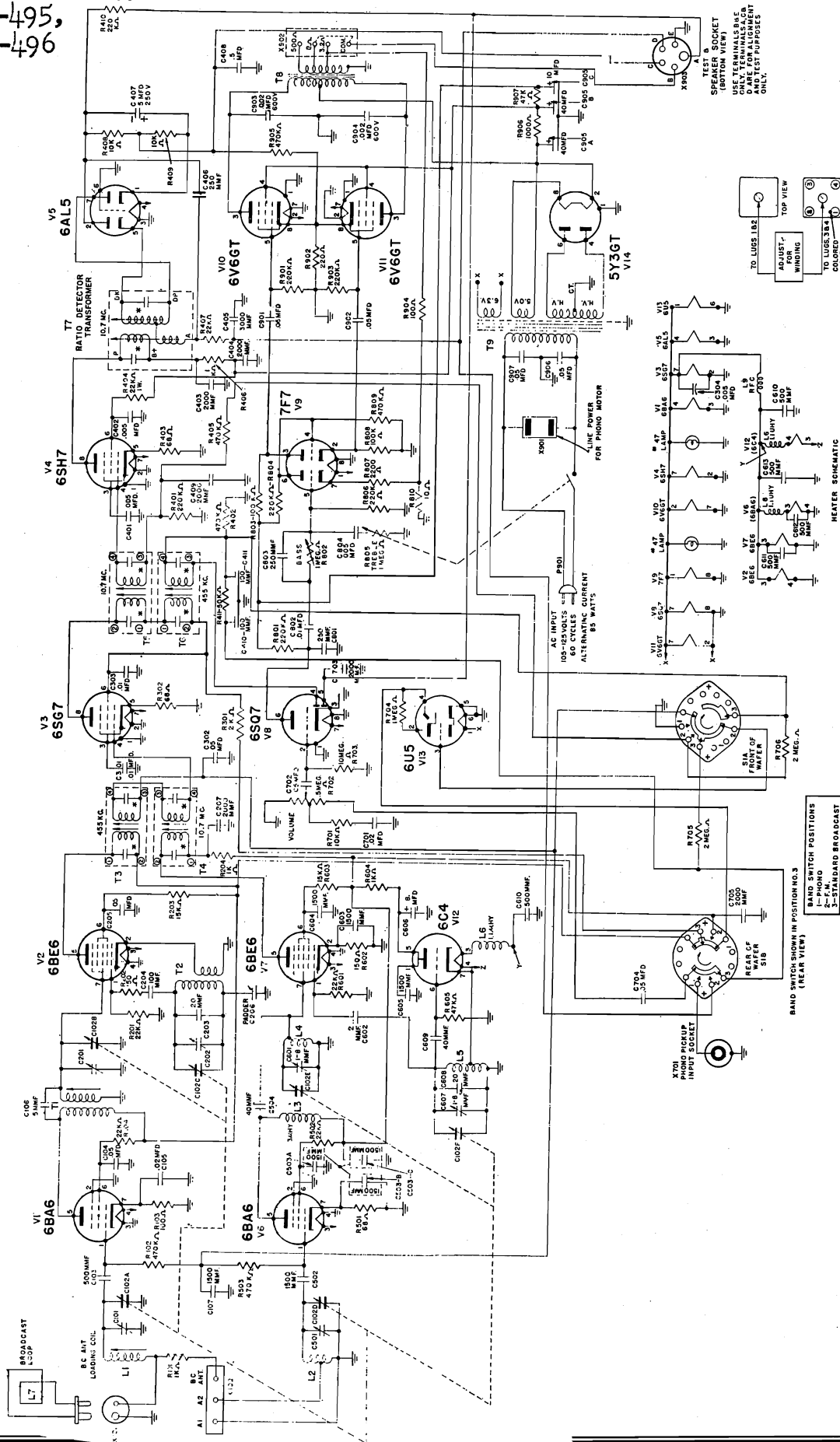
After the batteries have been installed, replace the back, making sure that the two washers in the bottom of the back fit into the slot near the bottom edge of the cabinet.

MODELS 14F-490,

14F-495,

14F-496

ALLIED RADIO CORP.



* THESE CAPACITORS ARE ENCLOSED IN EACH CAN & ARE PART OF EACH COIL.

BAND SWITCH POSITIONS
1-2-F.M.
3-STANDARD BROADCAST

BAND SWITCH SHOWN IN POSITION NO. 3
(REAR VIEW)

HEATER SCHEMATIC

TEST &
SPEAKER SOCKET
(BOTTOM VIEW)
ONLY TERMINALS 1 &
2 ARE FOR ALIGNMENT
ONLY. TEST SUPPLIES
ONLY.

ALLIED RADIO CORP.

MODELS 14F-490,
14F-495, 14F-496

This AM-FM superheterodyne radio receiver is designed to operate on 105-125 volts, 60 cycles AC.

The Tuning Ranges are:

AM 525 kc to 1720 kc

FM 88 mc to 108 mc

Tube Complement:

- 1 Type 6BA6 FM R.F. Amplifier
- 1 Type 6BA6 AM R.F. Amplifier
- 1 Type 6BE6 FM Mixer
- 1 Type 6BE6 AM Oscillator, converter
- 1 Type 6C4 FM Oscillator
- 1 Type 6SG7 I.F. Amplifier
- 1 Type 6SH7 FM Detector Driver
- 1 Type 6AL5 FM Ratio Detector
- 1 Type 6SQ7 AM Detector, A.V.C., 1st Audio Amplifier
- 1 Type 7F7 2nd Audio Amplifier and Phase Inverter
- 1 Type 6U5 Electron Ray Tuning Indicator
- 2 Type 6V6/GT Push Pull Power Amplifiers
- 1 Type 5Y3/GT Full Wave Rectifier

SERVICE NOTES:**Failure of Receiver to Operate May Be Due To:**

1. No current at power socket
2. All tubes not firmly in sockets
3. Band switch in wrong position
4. Output impedance jumper on rear of chassis not connected or missing
5. Low signal strength in the particular location.
Change position (rotate) of loop, or "folded dipole" antenna, or use an outside antenna
6. Speaker or loop antenna not plugged into sockets

ALIGNMENT PROCEDURE**Alignment Procedure for AM**

Equipment Required:

- Broadcast Band Signal Generator
- Audio Output Meter

A) 1. Set Band Switch to "AM". Advance Volume Control to maximum, set "BASS" Control at minimum, set Treble Control at maximum.

2. Connect output meter across speaker voice coil.

NOTE: During all of these tests it is necessary to reduce the signal generator output so that the receiver output level is maintained at .5 watt.

B) I. F. ALIGNMENT

1) Set signal generator to 455 kc. Connect a .05 mfd condenser in series with the "high" side of the generator output lead to pin #4 of the 6SG7 (V3) I.F. amplifier tube. Peak bottom and top cores of 2nd I.F. (T-6).

2) Connect signal generator ("high" side in series with a .05 mfd condenser) across C201 on variable condenser, peak bottom and top cores of 1st I.F. Transformer (T-3).

C) R. F. ALIGNMENT

1) Connect signal generator to the AM antenna terminal ("high" side in series with a 50 mmf condenser) and ground. Open variable condenser to minimum capacity, set signal generator to 1720 kc, adjust broadcast oscillator trimmer C202 to tune in signal.

2) Close variable condenser to maximum capacity, set signal generator to 535 kc and adjust broadcast band paddler (C206) to tune in signal.

3) Repeat step (1).

4) With variable condenser fully meshed move dial pointer to small white line slightly to left of "55" on broadcast band dial scale.

5) Set signal generator to 1500 kc. Tune in signal with Tuning Control. Peak antenna trimmer (C101) and interstage trimmer (C201).

6) Set signal generator to 600 kc, tune in signal with receiver Tuning Control, peak antenna loading coil (L1). Peak interstage transformer (T1).

7) Repeat step (5).

MODELS 14F-490,
14F-495, 14F-496

ALLIED RADIO CORP.

Alignment Procedure for FM

NOTE: Contacts A, C, and D of the speaker socket at the rear of the chassis have been provided for connection to V.T.V.M. for the alignment of the FM circuits.

Equipment Required:

High Frequency Signal Generator 87.5 mc to 108.5 mc.
Signal Generator capable of delivering .1 volt at 10.7 mc.
Audio Output Meter.
D.C. Vacuum Tube Voltmeter with zero center scale.
Tuning Wand.

A) RATIO DETECTOR ALIGNMENT

- 1) Connect V.T.V.M. across speaker socket terminals "A" and "C", (A.V.C. Voltage).
- 2) Feed 10.7 mc unmodulated R.F. signal into 6SH7 (V4) grid, pin #4, through .01 mfd condenser. This signal should be .1 volt.
- 3) Adjust primary of ratio detector transformer (T-7) for maximum indication on V.T.V.M.
- 4) Connect zero centered V.T.V.M. across speaker socket terminals "D" and "C".
- 5) Adjust secondary of ratio detector transformer (T-7) for zero indication.
- 6) Tune 10.7 mc Signal Generator higher in frequency (about 200 kc) until maximum voltage reading is obtained on V.T.V.M.

Note this voltage, then tune signal generator lower in frequency until maximum voltage of the opposite polarity is obtained. Note this voltage; then if necessary re-adjust primary of the detector (T-7) until the maximum detector voltages are about equal on either the high or low side of 10.7 mc.

B) FM 10.7 Mc I. F. ALIGNMENT

- 1) Shunt a 100 ohm carbon resistor across the primary of the detector (T-7) lugs "B+" and "P".
- 2) Connect output meter across speaker.
- 3) Set volume controls at maximum, bass at minimum.
- 4) Connect 10.7 mc signal generator (modulated 30%) to the grid (pin #4) of the 6SG7 (V-3) through a .01 mfd condenser and ground.

PARTS LIST

Schematic No.	Description
C101	Trimmer Cond. (Part of C102)
C102	Variable Cond. Gang.* B6.070.
C103	500mmf $\pm 20\%$.
C104	.05 mf 400V.
C105	.02 mf 150V.
C106	5mmf $\pm 10\%$.
C107	1500 mmf $\pm 20\%$.

- 5) Peak bottom and top cores of (T-5) 2nd I.F.
- 6) Connect 10.7 mc signal generator (modulated 30%) across the FM interstage trimmer (C601) and ground.
- 7) Peak bottom and top cores of 1st I.F. (T-4).
- 8) Remove 1000 ohm shunting resistor from (T17).

NOTE: during all of these tests it is necessary to reduce the signal generator output so that the receiver output level is maintained at .5 watts.

C) FM OSCILLATOR ALIGNMENT

- 1) Connect the high frequency signal generator across the FM antenna terminals. The ground side of the generator output cable is attached to terminal "A1", a 270 ohm carbon resistor is connected from the "high" side of the generator cable to terminal "A2".
- 2) Open variable condenser to minimum capacity; set signal generator to 108.5 mc, tune in signal with FM oscillator trimmer (C607).
- 3) Close variable condenser to maximum capacity: set signal generator to 87.5 mc. To adjust oscillator to signal it may be necessary to spread or squeeze the FM oscillator coil L5 slightly.
- 4) Repeat steps (2) and (3) if necessary.

D) FM R. F. ALIGNMENT

NOTE: When making the following tests keep the signal generator output at a level that will not cause A.V.C. voltage to rise above 1.5 volts DC.

- 1) Connect V.T.V.M. across test socket terminals "A" and "C" (A.V.C. Voltage).
- 2) FM antenna terminal connections as in "C-1".
- 3) Set signal generator to 108 mc. Tune in signal with the receiver Tuning Control. Peak FM antenna trimmer (C501), peak FM interstage trimmer (C601) for maximum voltage on V. T. V. M.
- 4) Set signal generator to 88 mc. Tune in signal with the receiver Tuning Control. Check FM antenna coil L2 and FM interstage coil L4 with a tuning wand; if any adjustment is necessary; spread or squeeze the coil turns slightly for maximum indication on V.T.V.M.
- 5) Repeat steps (3) and (4) if necessary.

C201	Trimmer Cond. (Part of C102).
C202	Trimmer Cond. (Part of C102)
C203	20 mmf $\pm 20\%$.
C204	100 mmf $\pm 20\%$.
C205	.05 mf 400V.
C206	Padder Cond. 500-1000 mmf* C13518.
C207	2000 mmf $\pm 20\%$.
C301	.01 mf 400V.
C302	.05 mmf 200V.
C303	.01 mf 400V.
C304	.005 mf 400V.

ALLIED RADIO CORP.

MODELS 14F-490,
14F-495, 14F-496

PARTS LIST

Schematic No.	Description		
C401	.005 mf 400V.	R203	15 K ohm 2W. $\pm 10\%$.
C402	.005 mf 400V.	R204	1 K ohm $\frac{1}{2}$ W. $\pm 10\%$.
C403	2000 mmf $\pm 20\%$.	R301	2 K ohm $\frac{1}{2}$ W. $\pm 10\%$.
C404	2000 mmf $\pm 20\%$.	R302	68 ohm $\frac{1}{2}$ W. $\pm 10\%$.
C405	3000 mmf $\pm 20\%$.	R401	220 K ohm $\frac{1}{4}$ W. $\pm 10\%$.
C406	250 mmf $\pm 20\%$.	R402	470 K ohm $\frac{1}{4}$ W. $\pm 10\%$.
C407	5. mf 250V.* Electrolytic Cond.*N25.206	R403	68 ohm $\frac{1}{2}$ W. $\pm 10\%$.
C408	.5 mf 200V	R404	22 K ohm 1 W. $\pm 10\%$.
C409	2000 mmf $\pm 20\%$.	R405	470 K ohm $\frac{1}{4}$ W. $\pm 10\%$.
C410	100 mmf $\pm 20\%$.	R406	1 K ohm $\frac{1}{2}$ W. $\pm 20\%$.
C411	100 mmf $\pm 20\%$.	R407	22 K ohm $\frac{1}{4}$ W. $\pm 10\%$.
C501	Trimmer Cond. (Part of C102)	R408	10 K ohm $\frac{1}{4}$ W. $\pm 5\%$.
C502	1500 mmf $\pm 20\%$.	R409	10 K ohm $\frac{1}{4}$ W. $\pm 5\%$.
C503	A, B, C, 1500 mmf each*N25.211.	R410	220 K ohm $\frac{1}{4}$ W. $\pm 10\%$.
C504	40 mmf $\pm 10\%$ NPO	R411	50 K ohm $\frac{1}{4}$ W. $\pm 20\%$.
C601	Trimmer Cond. 1-8 mmf*N20.022.	R501	68 ohm $\frac{1}{2}$ W. $\pm 10\%$.
C602	2 mmf $\pm 10\%$ NPO	R502	22 K ohm 1 W. $\pm 10\%$.
C603	1500 mmf $\pm 20\%$.	R503	470 K ohm $\frac{1}{4}$ W. $\pm 10\%$.
C604	1500 mmf $\pm 20\%$.	R601	22 K ohm $\frac{1}{4}$ W. $\pm 10\%$.
C605	1500 mmf $\pm 20\%$.	R602	150 ohm $\frac{1}{2}$ W. $\pm 10\%$.
C606	8 mf 450V	R603	15 K ohm 2W. $\pm 10\%$.
C607	Trimmer Cond. 1-8 mmf*N20.022	R604	1 K ohm $\frac{1}{2}$ W. $\pm 10\%$.
C608	20 mmf $\pm 10\%$ N130* N25.220	R605	47 Kohm $\frac{1}{4}$ W. $\pm 10\%$.
C609	40 mmf $\pm 10\%$ NPO.	R701	10 K ohm $\frac{1}{4}$ W. $\pm 20\%$.
C610	500 mmf $\pm 20\%$.	R702	.5 Meg ohm volume control*A9.127.
C611	500 mmf $\pm 20\%$.	R703	10. Meg ohm $\frac{1}{4}$ W. $\pm 20\%$.
C612	500 mmf $\pm 20\%$.	R704	1. Meg ohm $\frac{1}{4}$ W. $\pm 20\%$.
C613	500 mmf $\pm 20\%$.	R705	2. Meg ohm $\frac{1}{4}$ W. $\pm 20\%$.
C701	.02 mf 150V.	R706	2. Meg ohm $\frac{1}{4}$ W. $\pm 20\%$.
C702	.05 mf 200V.	R801	220 K ohm $\frac{1}{4}$ W. $\pm 20\%$.
C703	2,000 mmf $\pm 20\%$.	R802	1. Meg ohm potentiometer*A9.129.
C704	.05 mf 200V.	R803	100 K ohm $\frac{1}{4}$ W. $\pm 20\%$.
C705	2,000 mmf $\pm 20\%$.	R804	220 K ohm $\frac{1}{4}$ W. $\pm 220\%$.
C801	250 mmf $\pm 20\%$.	R805	1. Meg ohm potentiometer with S.P.S.T. Switch* A9.128
C802	.01 mf 400V.	R806	220 K ohm $\frac{1}{4}$ W. $\pm 20\%$.
C803	250 mmf $\pm 20\%$.	R807	2,200 ohm $\frac{1}{4}$ W. $\pm 10\%$.
C804	.005 mf 400V.	R808	100 K ohm $\frac{1}{4}$ W. $\pm 20\%$.
C901	.05 mf 400V.	R809	470 K ohm $\frac{1}{4}$ W. $\pm 20\%$.
C902	.05 mf 400V.	R810	10 ohm $\frac{1}{4}$ W. $\pm 10\%$.
C903	.002 mf 600V.	R901	220 K ohm $\frac{1}{4}$ W. $\pm 20\%$.
C904	.002 mf 600V.	R902	220 ohm 2 Watt $\pm 10\%$.
C905	A, B, C, 40 mf x 40 mf x 10 mf Electrolytic Cond. 450V,*N25.205	R903	220 K ohm $\frac{1}{4}$ W. $\pm 20\%$.
C906	.05 mf 400V. Bakelite	R904	100 ohm $\frac{1}{4}$ W. $\pm 10\%$.
C907	.05 mf 400V. Bakelite.	R905	470 K ohm $\frac{1}{4}$ W. $\pm 20\%$.
R101	1 K ohm $\frac{1}{4}$ W. $\pm 20\%$.	R906	1000 ohm 15 W. $\pm 10\%$ * N14.087.
R102	470 K ohm $\frac{1}{4}$ W. $\pm 20\%$.	R907	47 K ohm $\frac{1}{4}$ W. $\pm 20\%$.
R103	100 ohm $\frac{1}{4}$ W. $\pm 10\%$.	T1	Interstage R.F. transf., AM*B2.409.
R104	22 K ohm 1 W. $\pm 10\%$.	T2	Oscillator Coil, AM* A2.410.
R201	22 K ohm $\frac{1}{4}$ W. $\pm 10\%$.	T3	I.F. Transfer. 455KC* N2.414.
R202	150 ohm $\frac{1}{4}$ W. $\pm 10\%$.	T4	I.F. Transf. 10.7MC* N2.415.
		T5	I.F. Transf. 10.7MC* N2.415.
		T6	I.F. Transf. 455 KO* N2.414.

MODELS 14F-490,
14F-495, 14F-496

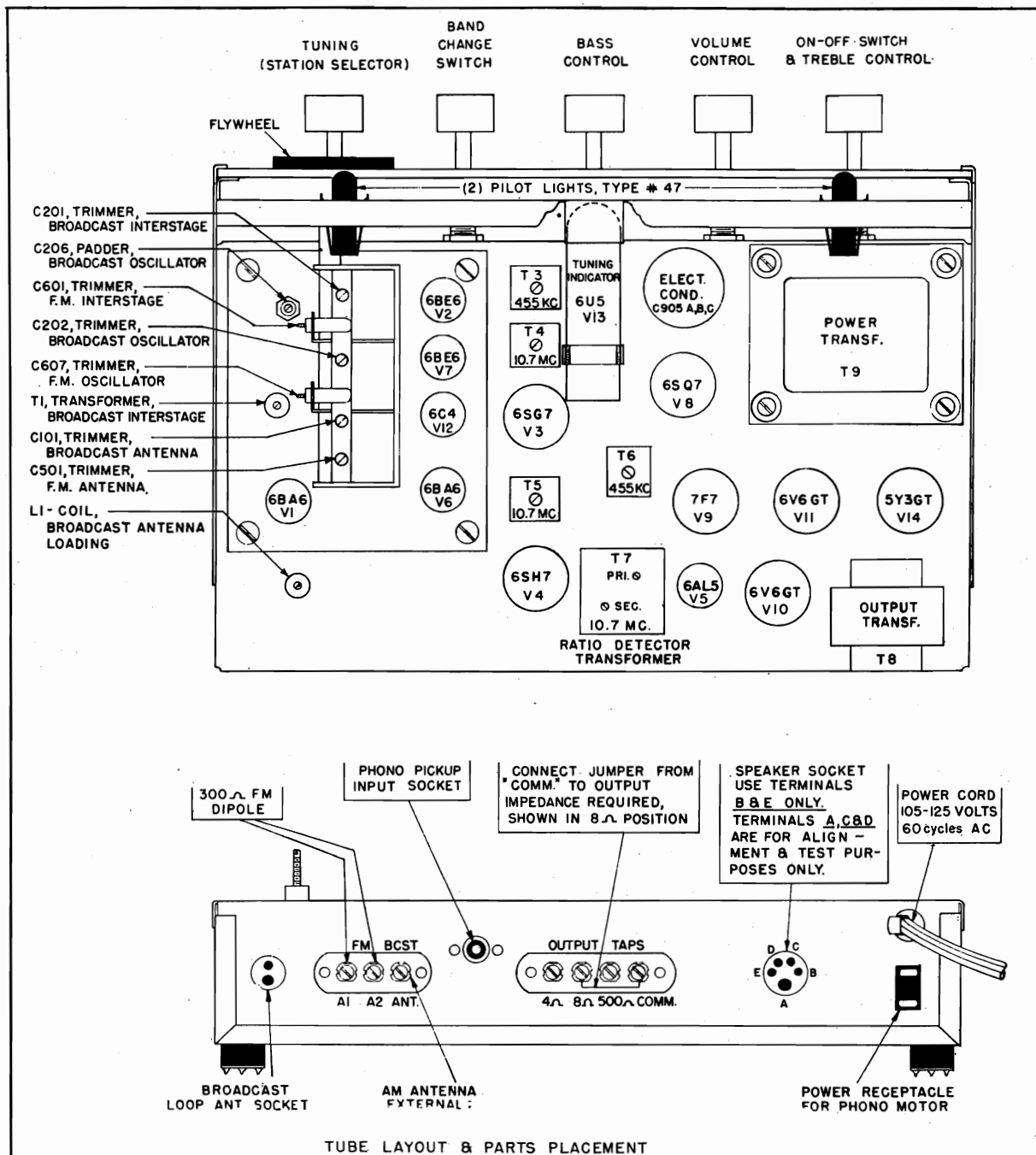
ALLIED RADIO CORP.

- T7 Ratio Det. Transf. 10.7MC* C2.278.
- T8 Outut Transf.* A15.036.
- T9 Power Transf.* B18.076.
- S1 Band Switch* A12.102.
- L1 Ant. Loading Coil, AM* B2.423.
- L2 Ant. Coil, FM* N2.411.
- L3 R.F. Choke 3uhy* A2.402.
- L4 Interstage R.F. Coil, FM* N2.412.
- L5 Oscillator Coil, FM* N2.413.
- L6 R.F. Choke 1.1uhy* N2.416.
- L7 Loop Ant. AM* C5.027.
- L8 R.F. Choke 1.1uhy* N2.416.

- L9 R.F. Choke* N2.439.
- X101 Socket, AM Loop* X13.852.
- X102 Ant. Terminal Strip* A32.329.
- X701 Socket, Phono input* N32.163.
- X901 Socket, Phono Motor* N32.072.
- X902 Output taps terminals* A32.312.
- X903 Speaker & test socket* N32.109.
- P1 Power Cord and Plug set* N10.049.

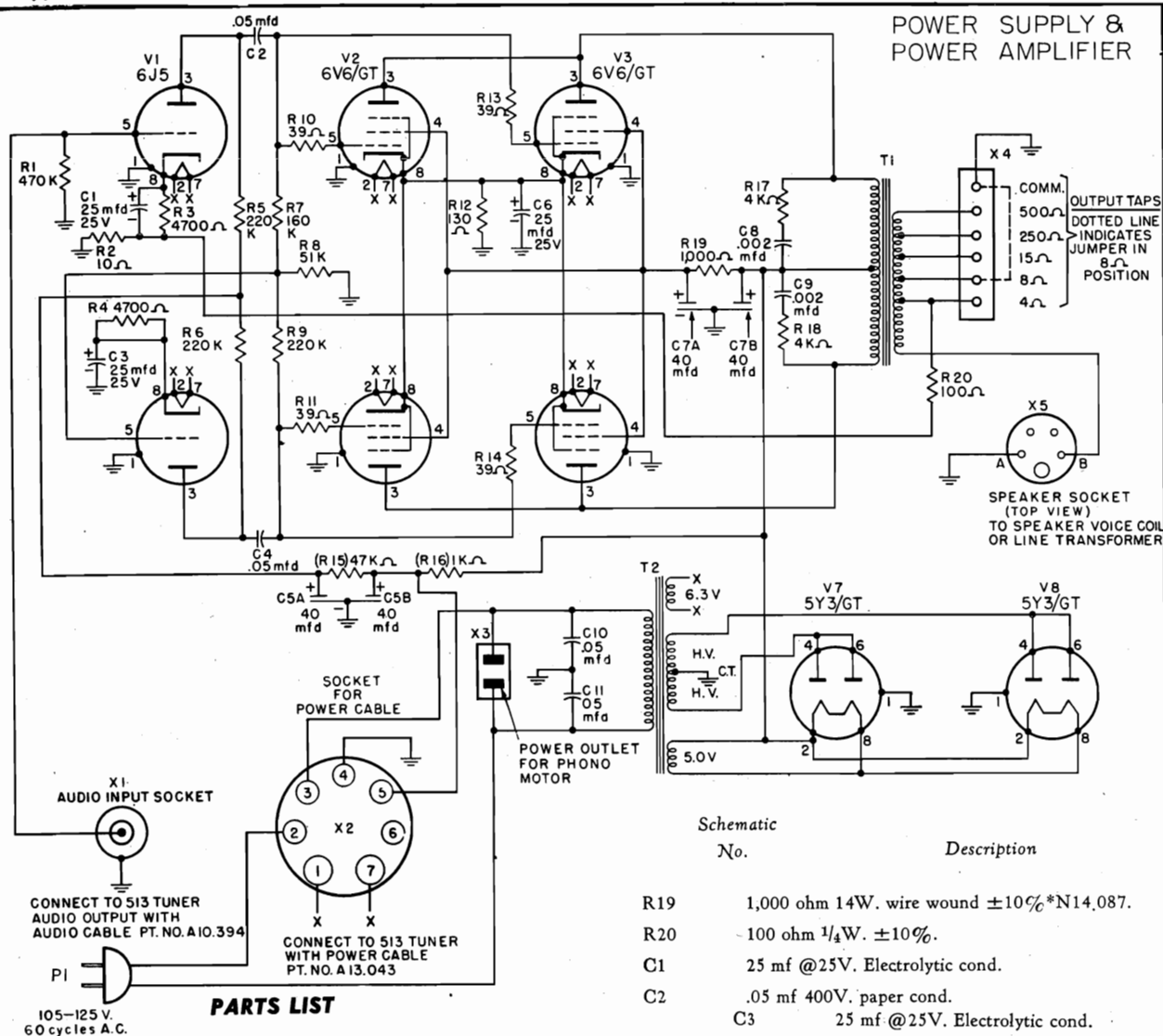
Pilot Lamps, No. 47 6-8V. Bayonet* I12301.

FM Folded dipole Ant.* A5.010.



MODELS 19F-492,
19F-497, 19F-498

ALLIED RADIO CORP.



PARTS LIST

Schematic

No.	Description
R1	470K ohm 1/4W. ±20%.
R2	10 ohm 1/4W. ±10%.
R3	4,700 ohm 1/4W. ±10%.
R4	4,700 ohm 1/4W. ±20%.
R5	220K ohm 1/4W. ±20%.
R6	220K ohm 1/4W. ±10%.
R7	160K ohm 1/4W. ±10%.
R8	51K ohm 1/4W. ±10%.
R9	220K ohm 1/4W. ±10%.
R10	39 ohm 1/4W. ±20%.
R11	39 ohm 1/4W. ±20%.
R12	130 ohm 5W. ±10% wire wound*N14.089.
R13	39 ohm 1/4W. ±20%.
R14	39 ohm 1/4W. ±20%.
R15	47K ohm 1/4W. ±20%.
R16	1K ohm 14W. wire wound ±10%*N14.087.
R17	4K ohm 10W. wire wound ±10%.
R18	4K ohm 10W. wire wound ±10%.

Schematic
No.

Description

R19	1,000 ohm 14W. wire wound ±10%*N14.087.
R20	100 ohm 1/4W. ±10%.
C1	25 mf @25V. Electrolytic cond.
C2	.05 mf 400V. paper cond.
C3	25 mf @25V. Electrolytic cond.
C4	.05 mf 400V. paper cond.
C5	A & B 40 mf x 40 mf @450V. Electrolytic cond.*C13.806.
C6	25 mf @25V. Electrolytic cond.
C7	A & B 40 mf x 40 mf @450V. Electrolytic cond.*C13.806.
C8	.002 mf 600V. paper cond.
C9	.002 mf 600V. paper cond.
C10	.05 mf 400V. Bakelite paper cond.
C11	.05 mf 400V. Bakelite paper cond.
T1	Output transformer*B15.037.
T2	Power transformer*B18.077
X1	Coaxial socket audio connector* N32.163.
X2	7 pin power cable socket* N32.294.
X3	Phono motor power receptacle* N32.072.
X4	Output taps terminal board* A32.299.
X5	Speaker socket* N32.109.
P1	Line power cord & plug set* N10.049.
P2	7 wire power cable* A13.043.
P3	Audio connector cable* A10.394.
P4	Speaker plug* N32.230.

ALLIED RADIO CORP.

MODELS 19F-492,
19F-497, 19F-498

this tuner may be used with any audio amplifier or P.A. system if it is powered by an auxiliary power supply capable of delivering 220 Volts @ 60 Ma., well filtered DC and 6.3V. @ 3.5 amps. 60 cycles AC or DC.

The Tuning Ranges are:

AM 535 kc to 1720 kc.

FM 88 mc to 108 mc.

ALIGNMENT PROCEDURE**Alignment Procedure for AM**

Equipment Required:

Broadcast Band Signal Generator

Audio Output Meter

Power Supply and Amplifier

A) 1. Set Band Switch to "AM". Advance Volume Control to maximum, set "BASS" Control at minimum, set Treble Control at maximum.

2. Connect output meter across speaker voice coil.

NOTE: During all of these tests it is necessary to reduce the signal generator output so that the receiver output level is maintained at .5 watt.

B) I.F. ALIGNMENT

1) Set signal generator to 455 kc. Connect a .05 mfd condenser in series with the "high" side of the generator output lead to pin #4 of the 6SG7 (V3) I.F. amplifier tube. Peak bottom and top cores of 2nd I.F. (T-6).

2) Connect signal generator ("high" side in series with a .05 mfd condenser) across C201 on variable condenser, peak bottom and top cores of 1st I.F. Transformer (T-3).

C) R. F. ALIGNMENT

1) Connect signal generator to the AM antenna terminal ("high" side in series with a 50 mmf condenser) and ground. Open variable condenser to minimum capacity, set signal generator to 1720 kc, adjust broadcast oscillator trimmer C202 to tune in signal.

2) Close variable condenser to maximum capacity, set signal generator to 535 kc and adjust broadcast band padder (C206) to tune in signal.

3) Repeat step (1).

4) With variable condenser fully meshed move dial pointer to small white line slightly to left of "55" on broadcast band dial scale.

5) Set signal generator to 1500 kc. Tune in signal with Tuning Control. Peak antenna trimmer (C101) and inter-stage trimmer (201).

6) Set signal generator to 600 kc, tune in signal with receiver Tuning Control, peak antenna loading coil (L1). Peak interstage transformer (T1).

7) Repeat step (5).

Tube Complement:

- 1 Type 6BA6 FM R.F. Amplifier.
- 1 Type 6BA6 AM R.F. Amplifier.
- 1 Type 6BE6 FM Mixer.
- 1 Type 6BE6 AM Oscillator, converter.
- 1 Type 6C4 FM Oscillator.
- 1 Type 6SG7 I.F. Amplifier.
- 1 Type 6SH7 FM Detector Driver.
- 1 Type 6AL5 FM Ratio Detector.
- 1 Type 6SQ7 A.V.C., 1st Audio Amplifier.
- 1 Type 6U5 Electron Ray Tuning Indicator.
- 1 Type 6J5 AM Detector.

SERVICE NOTES:**Failure of Tuner to Operate May Be Due to:**

- 1. Power Supply cable disconnected.
- 2. "Audio Connector" cable disconnected.
- 3. Band switch in wrong position.
- 4. Amplifier power off or gain set too low.
- 5. Low signal strength in the particular location.
Change position (rotate) of loop, or "folded dip ole" antenna, or use an outside antenna.
- 6. All tubes not firmly in sockets.

MODELS 19F-492,
19F-497, 19F-498

ALLIED RADIO CORP.

Alignment Procedure for FM

NOTE: Contacts A, C, and D of the test socket at the rear of the chassis have been provided for connection to V.T.V.M. for the alignment of the FM circuits.

Equipment Required:

High Frequency Signal Generator 87.5 mc to 108.5 mc.
Signal Generator capable of delivering .1 volt at 10.7 mc.
Audio Output Meter.
D.C. Vacuum Tube Voltmeter with zero center scale.
Tuning Wand.

A) RATIO DETECTOR ALIGNMENT

- 1) Connect V.T.V.M. across test socket terminals "A" and "C", (A.V.C. Voltage).
- 2) Feed 10.7 mc unmodulated R.F. signal into 6SH7 (V4) grid, pin #4, through .01 mfd condenser. This signal should be .1 volt.
- 3) Adjust primary of ratio detector transformer (T-7) for maximum indication on V.T.V.M.
- 4) Connect zero centered V.T.V.M. across test socket terminals "D" and "C".
- 5) Adjust secondary of ratio detector transformer (T-7) for zero indication.
- 6) Tune 10.7 mc Signal Generator higher in frequency (about 200 kc) until maximum voltage reading is obtained on V.T.V.M.

Note this voltage, then tune signal generator lower in frequency until maximum voltage of the opposite polarity is obtained. Note this voltage, then if necessary re-adjust primary of the detector (T-7) until the maximum detector voltages are about equal on either the high or low side of 10.7 mc.

B) FM 10.7 Mc I. F. ALIGNMENT

- 1) Shunt a 1000 ohm carbon resistor across the primary of the detector (T-7) lugs "B+" and "P".
- 2) Connect output meter across speaker.
- 3) Set volume control at maximum, bass at minimum.
- 4) Connect 10.7 mc signal generator (modulated 30%) to the grid (pin #4) of the 6SG7 (V-3) through a .01 mfd condenser and ground.
- 5) Peak bottom and top cores of (T-5) 2nd I.F.
- 6) Connect 10.7 mc signal generator (modulated 30%) across the FM interstage trimmer (C601) and ground.
- 7) Peak bottom and top cores of 1st I.F. (T-4).
- 8) Remove 1000 ohm shunting resistor from (T-7).

NOTE: During all of these tests it is necessary to reduce the signal generator output so that the receiver output level is maintained at .5 watts.

C) FM OSCILLATOR ALIGNMENT

- 1) Connect the high frequency signal generator across the FM antenna terminals. The ground side of the generator output cable is attached to terminal "A1", a 270 ohm carbon resistor is connected from the "high" side of the generator cable to terminal "A2".
- 2) Open variable condenser to minimum capacity; set signal generator to 108.5 mc, tune in signal with FM oscillator trimmer (C607).
- 3) Close variable condenser to maximum capacity; set signal generator to 87.5 mc. To adjust oscillator to signal it may be necessary to spread or squeeze the FM oscillator coil L5 slightly.
- 4) Repeat steps (2) and (3) if necessary.

D) FM R. F. ALIGNMENT

NOTE: When making the following tests keep the signal generator output at a level that will not cause A.V.C. voltage to rise above 1.5 volts DC.

- 1) Connect V.T.V.M. across test socket terminals "A" and "C". (A.V.C. Voltage).
- 2) FM antenna terminal connections as in "C-1".
- 3) Set signal generator to 108 mc. Tune in signal with the receiver Tuning Control. Peak FM antenna trimmer (C501), peak FM interstage trimmer (C601) for maximum voltage on V. T. V. M.
- 4) Set signal generator to 88 mc. Tune in signal with the receiver Tuning Control. Check FM antenna coil L2 and FM interstage coil L4 with a tuning wand; if any adjustment is necessary; spread or squeeze the coil turns slightly for maximum indication on V.T.V.M.
- 5) Repeat steps (3) and (4) if necessary.

V PARTS LIST

Schematic No.	Description
C101	Trimmer Cond. (Part of C102)
C102	Variable Cond. Gang.*B6.070.
C103	500mmf $\pm 20\%$.
C104	.05 mf 400V.
C105	.02 mf 150V.
C106	5mmf $\pm 10\%$.
C107	1500 mmf $\pm 20\%$.
C201	Trimmer Cond. (Part of C102).
C202	Trimmer Cond. (Part of C102).
C203	20 mmf $\pm 20\%$.
C204	100 mmf $\pm 20\%$.
C205	.05 mf 400V.
C206	Padder Cond. 500-1000 mmf*C13518.
C207	2000 mmf $\pm 20\%$.
C301	.01 mf 400V.

ALLIED RADIO CORP.

MODELS 19F-492,
19F-497, 19F-498

V PARTS LIST

Schematic No.	Description	Schematic No.	Description
C302	.05 mf 200V.	R301	2 K ohm $\frac{1}{2}W$. $\pm 10\%$.
C303	.01 mf 400V.	R302	68 ohm $\frac{1}{2}W$. $\pm 10\%$.
C304	.005 mf 400V.	R401	220 K ohm $\frac{1}{4}W$. $\pm 10\%$.
C401	.005 mf 400V.	R402	470 K ohm $\frac{1}{4}W$. $\pm 10\%$.
C402	.005 mf 400V.	R403	68 ohm $\frac{1}{2}W$. $\pm 10\%$.
C403	2000 mmf $\pm 20\%$.	R404	22 K ohm 1 W. $\pm 10\%$.
C404	2000 mmf $\pm 20\%$.	R405	470 K ohm $\frac{1}{4}W$. $\pm 10\%$.
C405	3000 mmf $\pm 20\%$.	R406	1 K ohm $\frac{1}{2}W$. $\pm 20\%$.
C406	250 mmf $\pm 20\%$.	R407	22 K ohm $\frac{1}{4}W$. $\pm 10\%$.
C407	5. mf 250V. Electrolytic Cond. *N25.206.	R408	10 K ohm $\frac{1}{4}W$. $\pm 5\%$.
C408	.5 mf 200V.	R409	10 K ohm $\frac{1}{4}W$. $\pm 5\%$.
C409	2000 mmf $\pm 20\%$.	R410	220 K ohm $\frac{1}{4}W$. $\pm 10\%$.
C410	100 mmf $\pm 20\%$.	R411	50 K ohm $\frac{1}{4}W$. $\pm 20\%$.
C411	100 mmf $\pm 20\%$.	R501	68 ohm $\frac{1}{2}W$. $\pm 10\%$.
C501	Trimmer Cond. (Part of C102).	R502	22 K ohm 1 W. $\pm 10\%$.
C502	1500 mmf $\pm 20\%$.	R503	470 K ohm $\frac{1}{4}W$. $\pm 10\%$.
C503	A, B, C, 1500 mmf each*N25.211.	R601	22 K ohm $\frac{1}{4}W$. $\pm 10\%$.
C504	40 mmf $\pm 10\%$ NPO.	R602	150 ohm $\frac{1}{2}W$. $\pm 10\%$.
C601	Trimmer Cond. 1-8 mmf*N20.022.	R603	15 K ohm 2W. $\pm 10\%$.
C602	2 mmf $\pm 10\%$ NPO.	R604	1 K ohm $\frac{1}{2}W$. $\pm 10\%$.
C603	1500 mmf $\pm 20\%$.	R605	47 K ohm $\frac{1}{4}W$. $\pm 10\%$.
C604	1500 mmf $\pm 20\%$.	R701	10 K ohm $\frac{1}{4}W$. $\pm 20\%$.
C605	1500 mmf $\pm 20\%$.	R702	.5 Meg ohm volume control*A9.127.
C607	Trimmer Cond. 1-8 mmf*N20.022.	R703	10. Meg ohm $\frac{1}{4}W$. $\pm 20\%$.
C608	20 mmf $\pm 10\%$ N130*N25.220.	R704	1. Meg ohm $\frac{1}{4}W$. $\pm 20\%$.
C609	40 mmf $\pm 10\%$ NPO.	R705	2. Meg ohm $\frac{1}{4}W$. $\pm 20\%$.
C610	500 mmf $\pm 20\%$.	R706	2. Meg ohm $\frac{1}{4}W$. $\pm 20\%$.
C611	500 mmf $\pm 20\%$.	R801	220 K ohm $\frac{1}{4}W$. $\pm 20\%$.
C612	500 mmf $\pm 20\%$.	R802	1. Meg ohm potentiometer*A9.129.
C613	500 mmf $\pm 20\%$.	R803	47 K ohm $\frac{1}{4}W$. $\pm 20\%$.
C614	100 mmf 400V. $\pm 20\%$.	R804	260 K ohm 1 W. $\pm 20\%$.
C701	.02 mf 150V.	R805	1. Meg ohm potentiometer with S.P.S.T. Switch* A9.128
C702	.05 mf 200V.	R806	10 K ohm 1W. $\pm 10\%$.
C703	2,000 mmf $\pm 20\%$.	R905	470 K ohm $\frac{1}{4}W$. $\pm 20\%$.
C704	.05 mf 200V.	T1	Interstage R.F. transf., AM*B2.409.
C705	2,000 mmf $\pm 20\%$.	T2	Oscillator Coil, AM*A2.410.
C801	250 mmf $\pm 20\%$.	T3	I.F. Transf. 455KC*N2.414.
C802	.01 mf 400V.	T4	I.F. Transf. 10.7MC*N2.415.
C803	250 mmf $\pm 20\%$.	T5	I.F. Transf. 10.7MC*N2.415.
C804	.005 mf 400V.	T6	I.F. Transf. 455 KC*N2.414.
C901	.05 mf 400V.	T7	Ratio Det. Transf. 10.7MC*C2.278.
C902	.05 mf 400V.	S1	Band Switch*A12.102.
C905	A & B 20 mf x 20 mf Electrolytic Cond. 450V. *N25.225.	L1	Ant. Loading Coil, AM*B2.423.
R101	1 K ohm $\frac{1}{4}W$. $\pm 20\%$.	L2	Ant. Coil, FM*N2.411.
R102	470 K ohm $\frac{1}{4}W$. $\pm 20\%$.	L3	R.F. Choke 3uhy*A2.402.
R103	100 ohm $\frac{1}{4}W$. $\pm 10\%$.	L4	Interstage R.F. Coil, FM*N2.412.
R104	22 K ohm 1 W. $\pm 10\%$.	L5	Oscillator Coil, FM*N2.413.
R201	22 K ohm $\frac{1}{4}W$. $\pm 10\%$.	L6	R.F. Choke 1.1uhy* N2.416.
R202	150 ohm $\frac{1}{4}W$. $\pm 10\%$.	L7	Loop Ant. AM* C5.027.
R203	15 K ohm 2W. $\pm 10\%$.	L8	R.F. Choke 1.1uhy* N2.416.
R204	1 K ohm $\frac{1}{2}W$. $\pm 10\%$.		

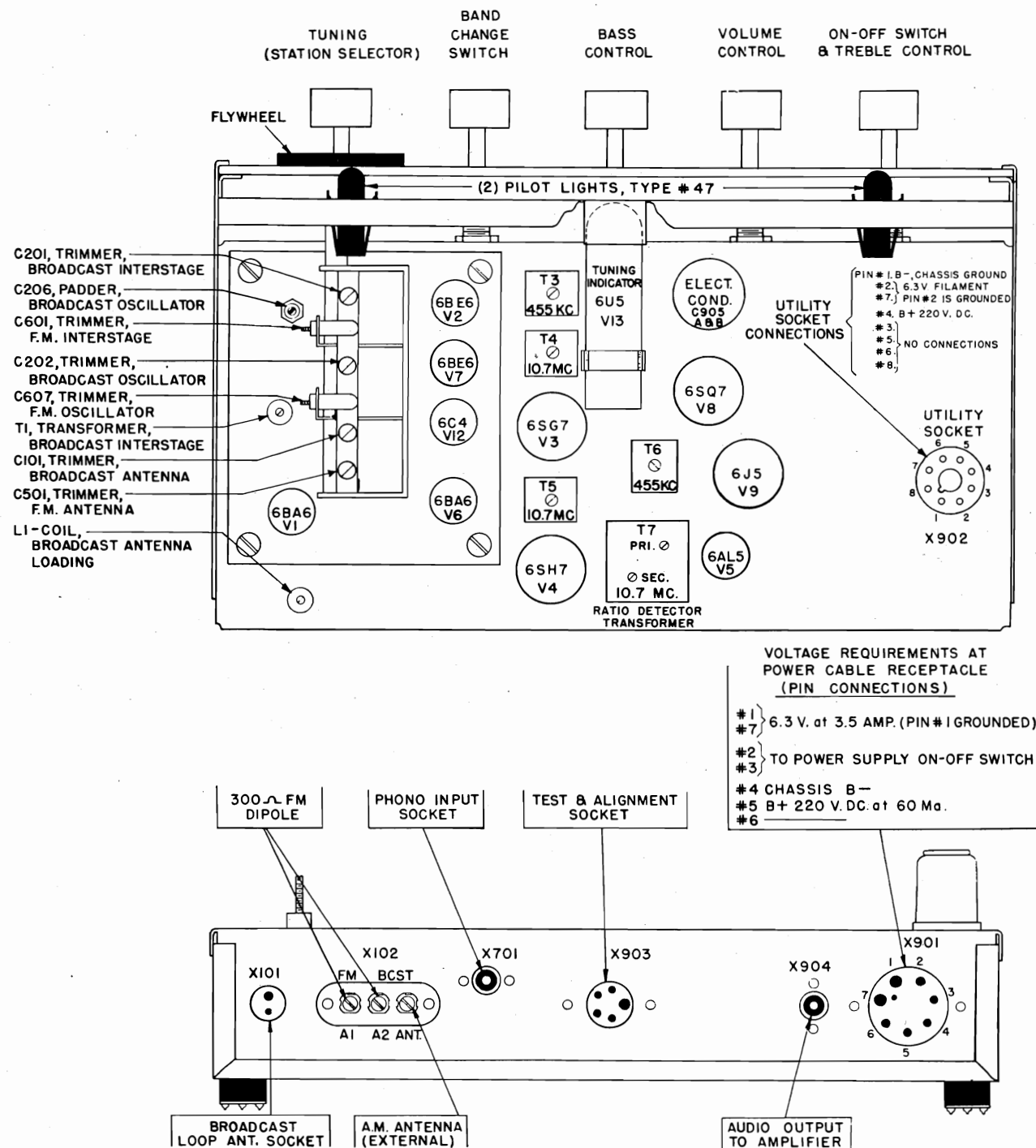
MODELS 19F-492,
19F-497, 19F-498

ALLIED RADIO CORP.

Schematic

No. Description

L9	R.F. Choke* N2.439.	X903	Test Socket* N32.109.
X101	Socket, AM Loop* X13.852.	*X904	Socket, Audio output* N32.163.
X102	Ant. Terminal Strip* A32.329.	P1	Plug, octal utility* N32.300.
X701	Socket, Phono input* N32.163.		Pilot Lamps, No. 47 6-8V. Bayonet* I12301.
X901	Plug, recessed, 7 Pin* A32.297.		FM Folded dipole Ant.* A5.010.
X902	Socket, Octal* X13821		



TUBE & PARTS LAYOUT
F.M. A.M. TUNER

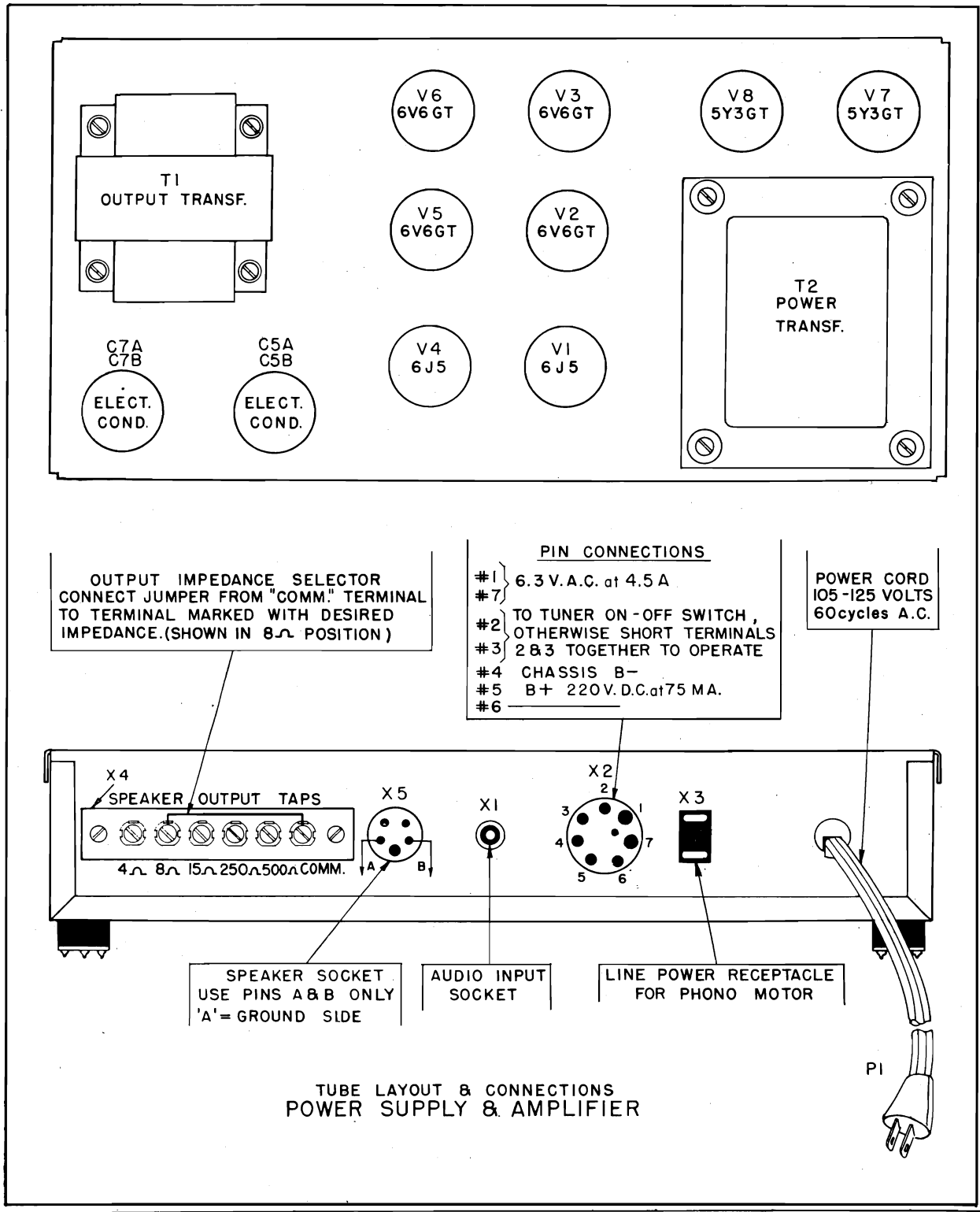
ALLIED RADIO CORP.

MODELS 19F-492,
19F-497, 19F-498**TUBE COMPLEMENT:**

- (4) 6V6/GT push-pull parallel power amplifier.
- (1) 6J5 Audio voltage amplifier.
- (1) 6J5 Audio voltage amplifier.
- (2) 5Y3/GT Rectifiers.

To be operated on 105-125 Volts 60 cycles AC

Power Consumption Approx. 150 Watts

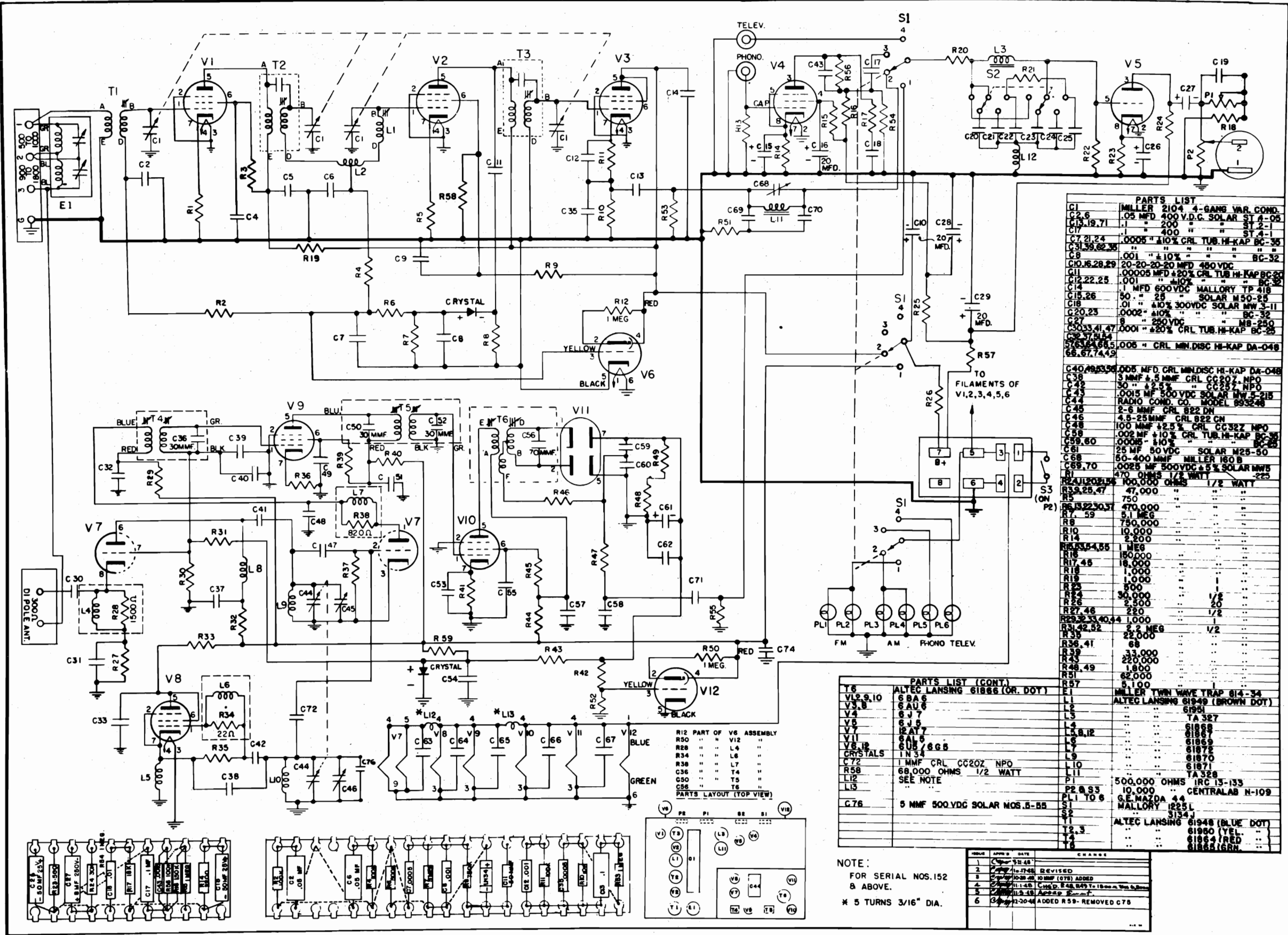


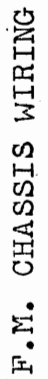
()

()

()

)





⑧ 5 MMF SOLAR MPS-5-55
(ZERO TEMP.)

77 DENOTES SOLDERED TO CHASSIS

$$* 100 \mu f \pm 2\frac{1}{2}\%$$

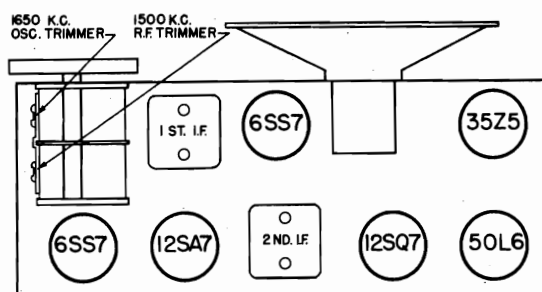
RE T4 & TS CONNECTIONS
TO BE USED ON RCARS #152
A. ROVE

A circular diagram divided into four quadrants labeled 1, 2, 3, and 4. Arrows point from the quadrants to color labels: 1 to RED, 2 to BLK., 3 to BLK., and 4 to GRN.



ALIGNMENT: Should it become necessary at any time to check the alignment of this receiver, proceed as follows:

- (1) Set the Signal Generator to 455 KC and connect to the grid of the 6SS7 R. F. Amplifier, or to the Stator Lug on the rear section of the Variable Capacitor. Connect the Signal Generator Ground Lead to a "B" point underneath the chassis. Connect a suitable output meter across the Speaker Voice Coil Connections. First turn the Volume Control to the maximum position. Turn the Variable Capacitor to the extreme clockwise position.
- (2) Adjust the trimmers located at the top of the first and second I. F. Transformers for maximum output as indicated on the Output Meter.
- (3) Loosely couple the Signal Generator lead to the Loop and set to 1650 KC.
- (4) With the Variable Capacitor set at the extreme clockwise position, tune in the 1650 KC signal by means of the Oscillator Trimmer on the Variable Capacitor (front section).
- (5) Set the Signal Generator to 1500 KC and turn the Tuning Control so that this frequency is indicated on the dial. Adjust the Antenna Trimmer on the Variable Capacitor (rear section) for maximum output. No other adjustments are necessary.



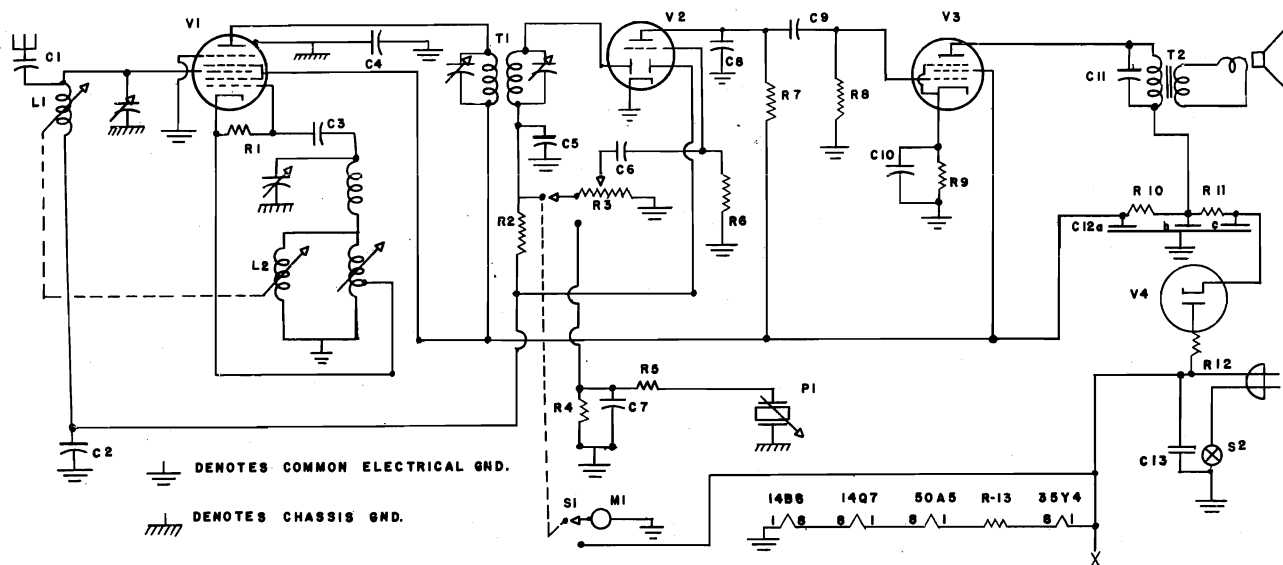
TRIMMER AND TUBE LOCATION DIAGRAM

INSTALLATION: The Model 126 is complete in every detail for efficient and immediate operation. A self-contained Loop Antenna is included, which will give excellent results in most locations. Due to the directional properties of the Loop, it may be advantageous to turn the receiver to the left or right in noisy locations for maximum signal and minimum noise. A best position for reception can always be found. In unfavorable locations where distant reception is required, a well-constructed outside antenna may be used, and connected to the green wire labeled "Ant." at the rear of the Loop. A water or gas pipe may be used as a ground and connected to the black wire labeled "Gnd." at the rear of the Loop.

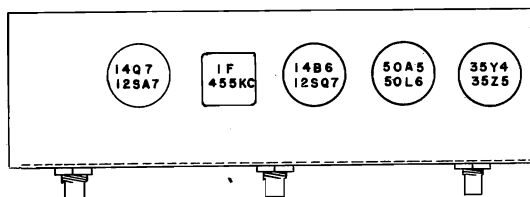
CAUTION: If this receiver is operated on D. C. (Direct Current), and you cannot obtain reception although the tubes are lighted, reverse the line cord plug to obtain the correct polarity. Objectionable hum or noise may also be eliminated on A. C. operation by reversing the line cord plug.

AUDAR INC.

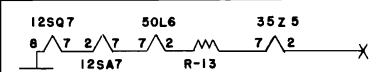
MODEL PR-6



CIRCUIT DES.	PART NO.	DESCRIPTION	CIRCUIT DES.	PART NO.	DESCRIPTION
C1-C3	CM-45-II	COND. 50MMF 500V MICA	R9	RC-151-D	RES. CARBON, 150 OHM, 1 WATT
C2-C13	CP-15-9	".05MFD. 400V. PAPER	R10	RC-102-C	" " 1000 " 1/2 WATT
C4	CP-01-9	".1 MFD " "	R11	RC-221-D	" " 220 OHM 1 WATT
C5-C8	CM-325-II	" 250MMF 500V MICA	R12	RW-330-C	" " OR WIRE 33 OHM 1/2 WATT
C6-C9	CP-11-9	".01 MFD. 400V PAPER	R13	RW-50-H	RES. WIRE 50 OHM 5 WATT
C7	CP-21-9	".001 " " "	S1		SWITCH, WAFER 2 POS.-2 POLE
C10	CE-E-1	" 10 MFD. 25V. ELECTROLYTIC	S2		SWITCH ON VOLUME CONTROL, R3
CH	CP-12-9	".02 " 400V PAPER	T1	TIF-1	TRANSFORMER, IF, 455 KC
C12a-b-c	CE-LHH-4	" a 20-b 20-c 50 150V ELECTROLYTIC	T2	TOS-20-3	TRANSFORMER, OUTPUT
L1-L2		TUNER, PERMEABILITY ASSEMBLY	V1		TUBE, 14Q7 OR 12SA7GT
M1	MP-200 MP-201	MOTOR, PHONO	V2		TUBE, 14B6 OR 12SQ7GT
P1	PC-301M	PICKUP, CRYSTAL	V3		TUBE, 50A5 OR 50L6 GT
R1	RC-103-C	RES. CARBON-10K OHM 1/2 WATT	V4		TUBE, 35Y4 OR 35Z5
R2	RC-225-C	" " 22 MEGOHM 1/2 WATT			
R3	RVC-16-S	VOLUME CONTROL, 1 MEGOHM, WITH S2			
R4-R7	RC-224-C	RES. CARBON 220K OHM 1/2 WATT			
R5	RC-205-C	" " 2 MEGOHM " "			
R6	RC-475-C	" " 4.7 MEGOHM " "			
R8	RC-474-C	" " 470K OHM " "			



FILEMENT CONNECTIONS FOR OCTAL TUBES



ALIGNMENT PROCEDURE

I.F. ALIGNMENT:

1. The following adjustments have been made at the factory and should not be changed unless necessary, and then only by an authorized service man.
2. Set the signal generator to 455 kilocycles.
3. Connect an output meter so that the output can be determined.
4. Connect the high side of the signal generator output to the antenna lead of the tuner. The ground side of the signal generator output is connected to the common electrical ground through a 0.01 mfd. condenser.
5. Turn the volume control on full and turn the dial drive shaft so that the slugs of the tuner unit are all the way out (high frequency end).
6. Adjust the two I.F. trimmers, tuning each carefully to get the maximum deflection of the output meter.
7. Repeat both adjustments since the adjustment of each I.F. trimmer may effect the other to a certain extent.

OSCILLATOR AND R.F. ALIGNMENT:

1. Connect the high side of the signal generator output to the insulation covering the antenna wire and not the wire itself.
2. Stretch antenna out to its full length.
3. Set the signal generator to 1650 kilocycles. Make sure that the slugs of the tuner are all the way out against the stop. Adjust the oscillator and antenna trimmers for maximum reading on the output meter.
4. Set the signal generator to 540 kilocycles. Turn the dial drive shaft until the slugs of the tuner are all the way in. Adjust the tracking core (screwdriver adjusted slug) to give maximum reading on the output meter.
5. Readjust as in steps 3 and 4.
6. Set signal generator to 1400 kilocycles. Turn the dial drive shaft until the 1400 kilocycle note is heard. Adjust the antenna core (core nearest the trimmers), by turning in or out with fingers, to give maximum reading on the output meter.

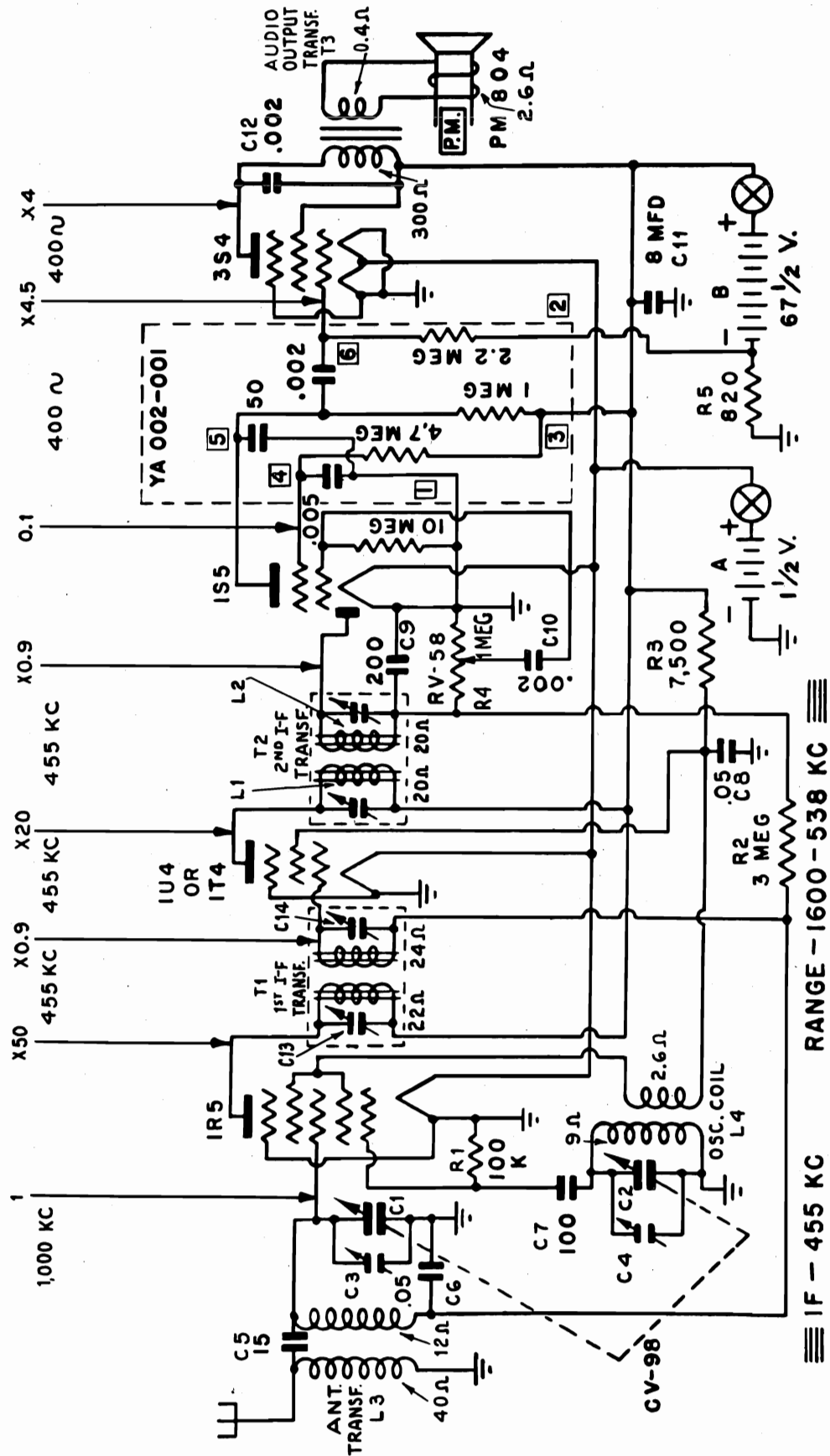
VOLTAGE TABLE

TYPE TUBE	1	2	3	4	5	6	7	8
14Q7	12.5 A.C.	92	92	-12	0	-1.05	0	25 A.C.
14B6	0	65	-7	—	-9	-1.05	0	12.5 A.C.
80A5	74 A.C.	104	92	—	—	0	6.5	25 A.C.
35Y4	117 A.C.	112.5 A.C.	112	—	—	—	125	82 A.C.
12SA7	—	12.5 A.	92	92	-12	0	25 A.C.	-1.05
12SQ7	—	-7	0	-7	-1.05	65	12.5 A.C.	0
80L6	—	74 A.C.	104	92	0	—	25 A.C.	6.5
35Z5	—	117 A.C.	—	112	112.5 A.C.	—	82 A.C.	125

NOTE: USE HIGH RESISTANCE VOLTMETER 20,000 OHMS PER VOLT D.C. AND 1,000 OHMS PER VOLT A.C. READINGS MARKED WITH AN ASTERISK OBTAINED WITH A VACUUM TUBE VOLTMETER. ALL READINGS TAKEN UNDER NO SIGNAL CONDITION.

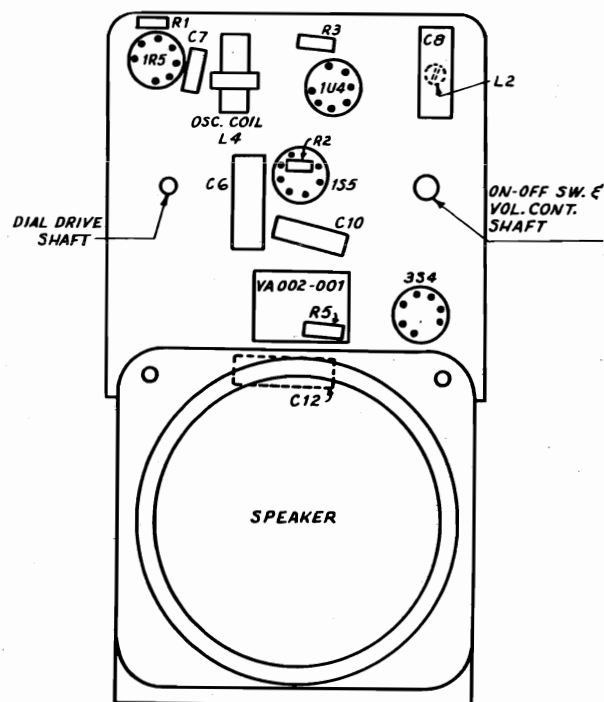
AUTOMATIC RADIO MFG. CO., INC.

MODEL B-44
Bike Radio

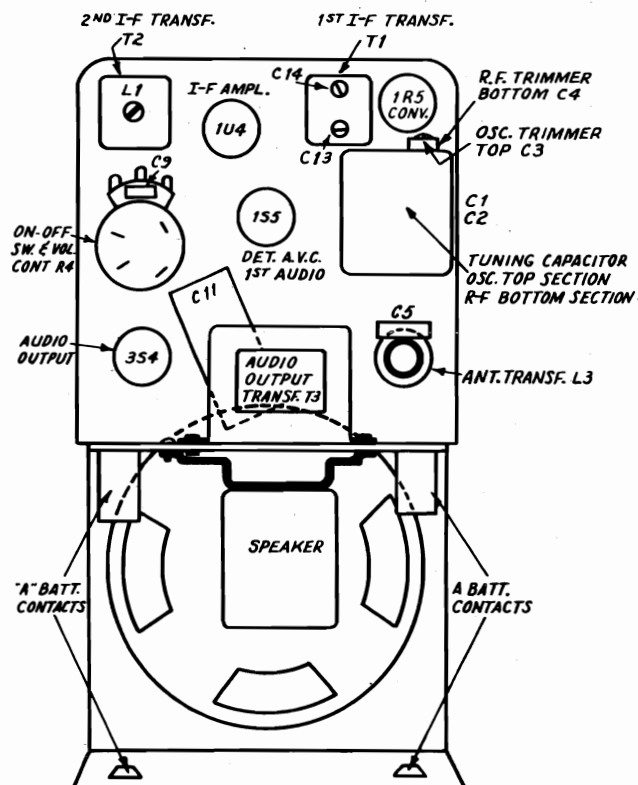


MODEL B-44
Bike Radio

AUTOMATIC RADIO MFG. CO., INC.



BOTTOM VIEW



TOP VIEW

TUBE	PIN	V.T.V.M.	20,000 Ω /v.	RESISTANCE
1R5 CONV.	1	GND.	GND.	GND.
	2	+58	+58	OVER 1 MEG.
	3	+44	+44	OVER 1 MEG.
	4	-10	-6.5	175K
	5	0	0	LESS THAN 0.1 Ω
	6	0	0	INFINITE
	7	+1.5	+1.5	5 Ω
1U4 or 1T4 I.F. AMPL.	1	GND.	GND.	GND.
	2	+58	+58	OVER 1 MEG.
	3	+44	+44	OVER 1 MEG.
	4	N.C.	N.C.	N.C.
	5	GND.	GND.	GND.
	6	0	0	4 MEG.
	7	+1.5	+1.5	5 Ω
1S5 DET. A.V.C. 1st AUDIO	1	GND.	GND.	GND.
	2	0	0	INFINITE
	3	0	0	28 Ω *
	4	+14	+10	OVER 5 MEG.
	5	+20	+16	OVER 1 MEG.
	6	0	0	10 MEG.
	7	+1.5	+1.5	5 Ω
3S4 AUDIO OUTPUT	1	GND.	GND.	GND.
	2	+56	+56	OVER 1 MEG.
	3	-7	-1	2.2 MEG.
	4	+58	+58	OVER 1 MEG.
	5	+1.5	+1.5	5 Ω
	6	+56	+56	OVER 1 MEG.
	7	GND.	GND.	GND.

Voltage and resistance measurements were made with respect to chassis ground, and with a B supply voltage of 65 V.D.C.

*With Vol. Cont. full counter clockwise the resistance is 28 Ω .

With Vol. Cont. full clockwise the resistance is 1 MEG.

ALIGNMENT PROCEDURE

Connect output meter across voice coil.

Connect the signal generator to the standard Hazeltine Loop Model 1150 and couple it loosely to the receiver loop. Set the volume control at maximum, and fully mesh the tuning capacitor.

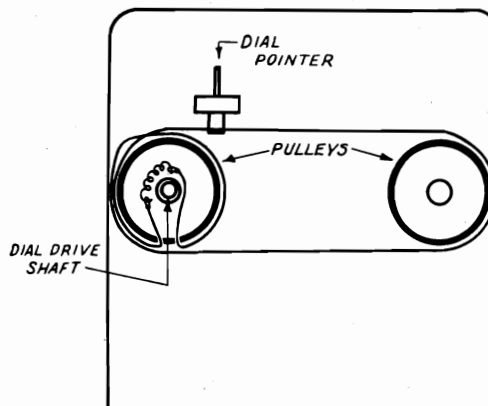
The output of the signal generator should be just sufficient to give a readable deflection on the output meter.

Set the signal generator to 455 kc and adjust i-f trimmers and slugs for maximum output in the following order: L2, L1, C14, C13. Repeat sequence if trimmers were badly maladjusted.

Set the signal generator and receiver to 1500 kc and adjust the oscillator trimmer C4 for maximum output.

Set the signal generator and receiver to 1400 kc and adjust the antenna trimmer C3 for maximum output.

Set the signal generator and receiver to 1500 kc and readjust oscillator trimmer C4 for maximum output



NOTE: TUNING CAPACITOR IN MAXIMUM CAPACITY POSITION

BENDIX RADIO DIV.

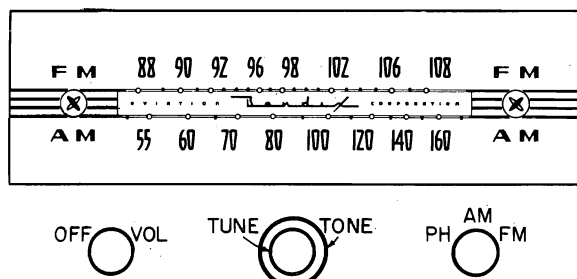
MODELS 69B8,
69M8, 69M9

Fig. 2—Control Layout

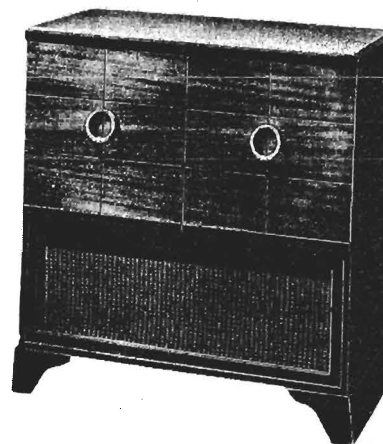


Fig. 1—Models 69M8 & 69M9—Mahogany; 69B8—Blonde

GENERAL

The Bendix Radio Models 69M8, 69B8, and 69M9 employ six tubes and a selenium rectifier to provide reception of the FM band and the AM standard broadcast band. The FM section of this receiver contains a tuned RF stage. The RF stage has its plate voltage removed when the range switch is in any but the FM position. The B+ is removed from the plates of the RF amplifier and mixer oscillator tubes when the band switch is in the PH position. Built in FM and AM antennas are mounted in the cabinet and a terminal board is provided on the rear of the cabinet for attaching external antennas. Each model contains a ten inch permanent magnet type speaker which is driven by a 50L6 audio output tube. Two multi-purpose tubes are used. One, the 19T8, combines the functions of an AM demodulator, FM detector, and first audio amplifier in one envelope. The other multi-purpose tube, the 12AT7, is a double triode and is used as a mixer-oscillator tube.

The power supply required for these models is 105-120 volts 60 cycle AC since a phono motor is included. The radio chassis itself is operative on AC or DC, but the phono motor would be damaged beyond repair if operated on DC.

SPECIFICATIONS**Power Requirements**

105-120V 60 cycle AC

Power Consumption

Radio 50W — Phono Turntable 25W

Tuning Frequency Range

AM — 540-1620KC

FM — 88-108MC

Intermediate Frequency

AM — 455KC — FM — 10.7MC

Power Output

Maximum — 2.5W

Tube Complement

3—12BA6, 12AT7, 19T8, 50L6 — Total

6 Tubes Plus Selenium Rectifier

Loudspeaker — PM 10 Inch**Record Changer**

Models 69M8 and 69B8

Automatic for Twelve 10-inch or Ten

12-inch Standard Lateral Cut or Long

Play Microgroove Records.

Model 69M9

Automatic for Twelve 10-inch or Ten

12-inch Standard Lateral Cut Records.

Overall Dimensions — All Models

Height 33 5/16"; Width 33";

Depth 15 15/16"

Shipping Weight — All Models — 75 lbs.

MODELS 69B8,
69M8, 69M9

BENDIX RADIO DIV.

PRELIMINARY ALIGNMENT PROCEDURE

The AM circuits should be aligned before the FM section because of possible interaction between the IF coils. Before attempting to align set allow receiver and test equipment to warm up for at least five minutes. Whenever possible, have a speaker connected to the output and use a 30% amplitude modulated signal in order to identify weak signals in a poorly tuned set. The antenna trimmer for AM which is attached to the loop antenna must be adjusted when the chassis is replaced in the cabinet, since the antenna loop is installed in the cabinet and cannot be removed with the chassis. It

may be necessary to adjust the FM antenna trimmer slightly when the chassis is replaced in the cabinet.

TEST EQUIPMENT REQUIRED

Signal Generator

AM 455 KC to 106 MC

FM 10.7 MC & 88-108MC.

Vacuum Tube Voltmeter

(ground or minus must be isolated from power line)

Capacitors, .01 mfd and 100 mmf

Alignment Screwdrivers

Standard Output Meter

AM ALIGNMENT

PRELIMINARY PROCEDURE: With gang condenser closed, set dial pointer to coincide with reference mark etched into dial back plate. See Fig. 5. Place band switch in AM position and use a 30% modulated signal throughout. Connect an output meter across voice coil. Adjust Antenna Trimmer C87 after chassis is installed in the cabinet. Keep input as low as possible while obtaining a stable output meter reading.

GENERATOR FREQUENCY	GENERATOR COUPLING	DUMMY ANTENNA	SPECIAL CONDITIONS	DIAL SETTING	ADJUSTMENTS	REMARKS
1.) 455 KC AM	High Side—Term. #5 gang cond. Low side—common ground	.01 mfd capacitor	Short AM Osc. Term. #1 to common ground	Gang condenser fully open	Top slug of T1, T2, T4 and bottom slug of T4	Adjust for maximum output. Repeat several times to insure maximum output
2.) 1475 KC AM	High side—Term. #3 gang cond. Low side—common ground	100 mmf capacitor	Remove short from Osc. Term. #1	1475 KC Ref. mark	C79	Rock tuning control while adjusting for maximum output
3.) 965 KC AM	"	"		965 KC Ref. mark		* Check Calibration
4.) 580 KC	"	"		580 KC Ref. mark		* Check Calibration

* If calibration does not check within tolerances denoted by etched lines on dial backplate, oscillator gang rotor plates must be bent to obtain proper calibration. This operation is very delicate and should be attempted only by properly trained personnel.

FM ANTENNA

The FM antenna used in Models 69M8, 69B8, and 69M9 will not be found in the Replacement Parts List since the service man, by following the specifications in the drawing, Fig. 3, can very easily and inexpensively make the antenna himself.

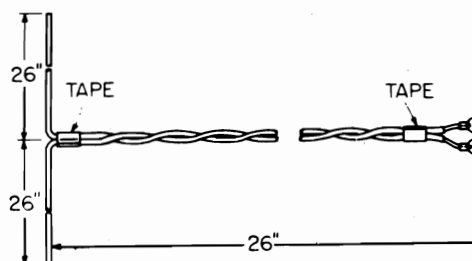


Fig. 3—FM Antenna

BENDIX RADIO DIV.

MODELS 69B8,
69M8, 69M9**FM ALIGNMENT**
CW METER METHOD

PRELIMINARY ALIGNMENT PROCEDURE: With gang condenser fully closed, adjust dial pointer to coincide with the reference mark etched into dial back plate. See Fig. 5. Place band switch in FM position. Use 30% amplitude modulated signals when possible.

GENERATOR FREQUENCY	DUMMY ANTENNA	GENERATOR COUPLING	SPECIAL CONDITIONS	DIAL SETTING	VTVM CONNECTIONS	ADJUSTMENTS	REMARKS
1.) 10.7 MC AM or CW	.01 mfd capacitor	High side—term. #3 Gang Condenser. Low side—common ground	Short FM Osc. Term. #2 of Gang Condenser to common ground	Gang Condenser fully open	+Lead to B— —Lead to Pin #2 of tube 19T8	Bottom slug of T1, T2, Bottom slug of T3	Adjust for maximum AVC reading on VTVM. Repeat adjustment several times to insure maximum reading
2.) Remove Signal Generator		Remove Signal Generator	Short FM Osc. term. #2 of gang condenser to common ground. Two 100K matched resistors in series connected between Pin #2 of tube 19T8 & B—	"	Center Tap of 100K resistors and term. #6 of switch S1C	Adjust VTVM for Zero	While connected to chassis, the VTVM is adjusted to zero by its zero centering control
3.) 10.7 MC AM or CW	.01 mfd capacitor	High side—term. #3 of Gang condenser. Low Side—Common Ground	"	"	"	Top slug of T3	Adjust top slug to produce zero reading on VTVM
4.) Repeat in Step 3.	Steps 1, 2, and 3 until Step 1 produces no change in Step 3 adjustment and bottom of T3 produces no deflection						
5.) 106 MC	FM Dummy Antenna (See Fig. 4)	FM Dummy Antenna (See Fig. 4)	Remove short from Term. #2 of gang condenser. Remove 100K Resistors	106 MC Ref. mark	+Lead to B— —Lead to Pin #2 of tube 19T8	Osc. trimmer C9, then RF, C3c & Ant., C3b	Rock tuning control when adjusting C9 for maximum AVC reading, then adjust C3c and C3b respectively for max.†
6.) 97 MC AM or CW	"	"		97 MC Ref. mark	"		* Check Calibration
7.) 90 MC AM or CW	"	"		90 MC Ref. mark	"		* Check Calibration

† Oscillator operates on high frequency side of incoming signal but it is possible to adjust to the low side. Set Signal Generator to 84.6 MC and if signal is heard readjust oscillator trimmer at signal generator frequency of 106 MC and check again at 84.6 MC. Signal should not be heard.

* If calibration is not within reasonable tolerance at these points, the inductance of the FM oscillator coil must be adjusted. If dial pointer reading is on low frequency side, inductance of oscillator coil is too low and turns of coil must be compressed slightly. If pointer reading is on high frequency side, the coil inductance is too high and coil turns must be spread slightly. Repeat steps 5, 6, and 7 until correct calibration is obtained.

To adjust RF coil, tune receiver to 90 MC and observe AVC reading. Insert into RF coil, the iron core of tuning wand (rod of insulating material one end of which contains an iron core slug and the other end contains a non-ferrous metallic slug). If reading increases, the inductance of coil is too low and, turns must be spread *slightly*. If reading decreases, insert opposite end (non-ferrous) of tuning wand into RF coil. Inductance of coil is too low if reading increases and, turns must be compressed *slightly*. Correct adjustment is obtained when insertion of either end of tuning wand causes the reading to decrease.

The antenna coil inductance is adjusted in the same manner as the RF coil.

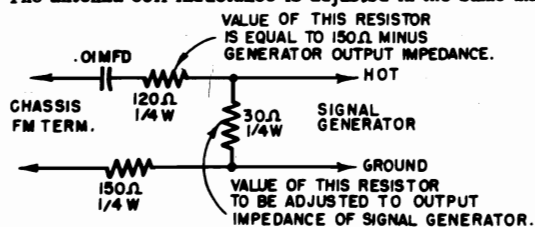


Fig. 4 - FM Dummy Antenna

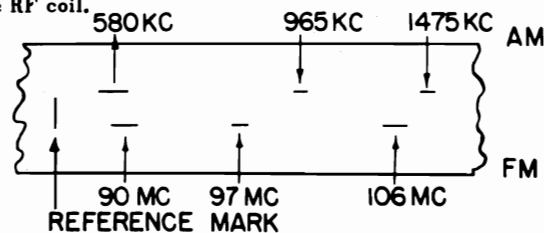


Fig. 5 - Dial Reference Points

MODELS 69B8,
69M8, 69M9

BENDIX RADIO DIV.

VISUAL ALIGNMENT

The ratio detector in the FM section of this radio receiver can be aligned by the so-called Visual Alignment method. This method can be used in conjunction with the CW method by following the procedure outlined below:

1. Perform Step 1 indicated in CW Meter Method Chart.

2. Set Signal Generator to 10.7 MC, FM, with sweep width at maximum possible (should be a minimum of 200 KC). Connect output of generator to terminal #4 of gang condenser and B-.

3. Connect vertical input of cathode ray oscilloscope to terminal #6 of switch S1C and B-, and place a 60 cycle sine wave signal to horizontal input if oscilloscope does not have an internal 60 cycle sweep.

4. Adjust signal generator frequency until "S" curve (Fig. 6) is centered on the

horizontal sweep. Curve may be reversed because of internal circuit of oscilloscope.

5. Adjust primary of T3 (top slug) and secondary (bottom slug) for maximum desired "S" curve. A VTVM can be very useful at this point if connected to pin #2 of tube 19T8 and B-. The oscilloscope will then indicate the most linear curve and the VTVM will indicate the maximum AVC voltage.

6. Adjust bottom of slugs of T1 and T2 and then repeat step 5 to insure correct alignment.

7. Continue at this point with the alignment procedure starting with step 5 as outlined in the FM-CW Meter Method.

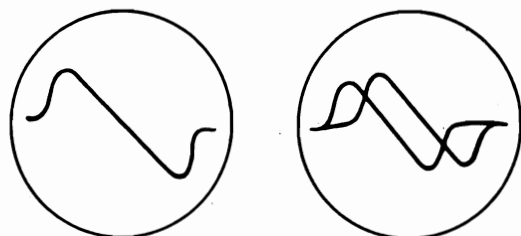


Fig. 6-S Curves

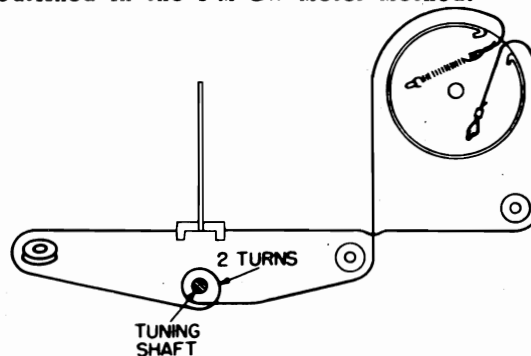


Fig. 7-Dial Stringing Diagram

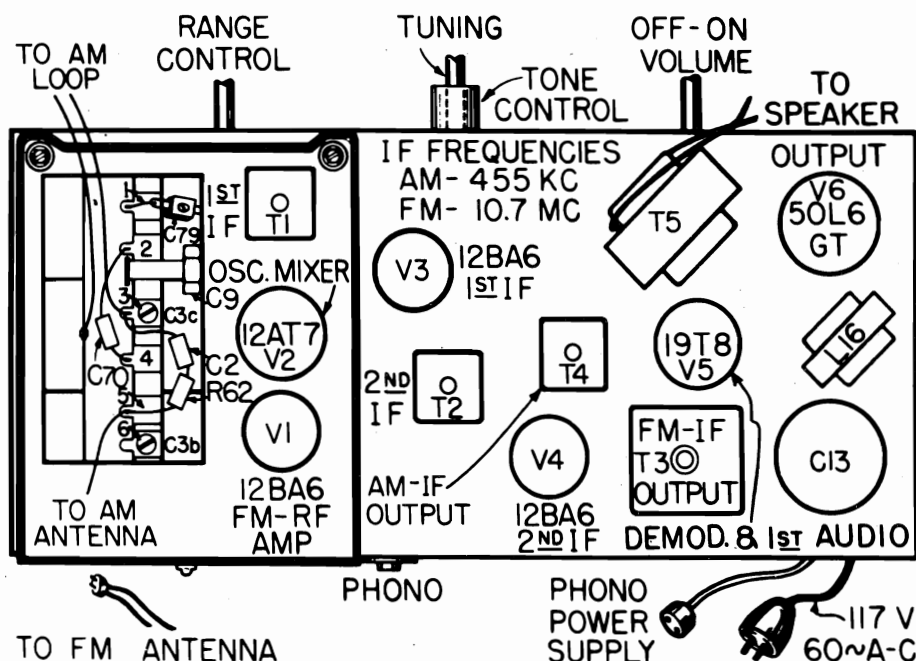


Fig. 8-Trimmer Location



MODELS 69B8,
69M8, 69M9

BENDIX RADIO DIV.

CHASSIS IDENTIFICATION

The 69M8 and 69B8 chassis are identical and they differ from the 69M9 chassis only in the type of phono input circuit used. Models 69M8 and 69B8 include a dual speed record changer which requires a different phono input circuit than the single speed record changer that is installed in Model 69M9.

Models 69M8 and 69B8 chassis can be identified by the two resistors 470K and 2.2 meg, connected to terminal 4 of switch S1C. Model 69M9 chassis has two resistors, 68K and 330 K, connected to terminal 4 of switch S1C.

CHASSIS CODES

The chassis are coded by a large block letter within a square stamped in ink on the chassis rear apron visible from the back of the cabinet. Although code A chassis normally are not marked, check any unmarked chassis against following chart to insure proper code identification. In this chart the component revisions effected by various changes are listed in the left hand column. Under the right hand columns headed A, B, C, etc., are listed the revisions as applied to each chassis code.

DESCRIPTION OF CHASSIS DIFFERENCES	CHASSIS USED WITH DUAL SPEED RECORD CHANGER				CHASSIS USED WITH SINGLE SPEED RECORD CHANGER				
	A	B	C	D	A	B	C	D	E
Value of Resistor R61 in ohms.	1000	1000	47K	47K	1000	1000	1000	47K	47K
Chassis includes Resistor R63, 150K 1/4W, connected in parallel with AM coil of IF Transformer T2.	No	No	Yes	Yes	No	No	No	Yes	Yes
Chassis includes either Capacitor C84, .05 mfd 400V, or Resistor R64, 68K 1/2W, connected to common ground (B-) and grounded at Record Changer frame.	C84	C84	C84	R64	C84	C84	C84	C84	R64
Chassis includes antenna trimmer Capacitor C3a mounted on variable capacitor.	No	Yes	No	No	No	Yes	Yes	No	No
Chassis includes antenna trimmer Capacitor C87 mounted on loop antenna.	Yes	No	Yes	Yes	Yes	No	No	Yes	Yes
Chassis includes Coil L15 wrapped on Capacitor C85, 100 mmf, connected between B+ and junction of Resistors R36 and R5.	No	Yes	No	No	No	Yes	Yes	No	No
Chassis includes Capacitor C11, .005 mfd, one lead of which is connected to common ground (B-) and the other lead of which is connected to junction of Coil L15, Capacitor C85, and B+.	No	Yes	No	No	No	Yes	Yes	No	No
Value of Resistor R8 in ohms, 1/2W.	1000	470	1000	1000	1000	470	470	1000	1000
Chassis includes Capacitor C26, .005 mfd, connected between pin #7 of tube V4 (12BA6) and common ground (B-).	No	Yes	No	No	No	Yes	Yes	No	No
Value of Resistor R9 in ohms, 1/4W.	68	33	68	68	68	33	33	68	68
Value of Capacitor C29 in mmf.	100	150	100	100	100	150	150	100	100
Chassis includes Capacitor C51, .005 mfd, connected between pin #3 of V3 (12BA6) and common ground (B-).	No	Yes	No	No	No	Yes	Yes	No	No
Chassis includes Capacitor C67, 4.7 mmf, connected between pins #1 and #7 of tube V5 (19T8).	No	Yes	No	No	No	Yes	Yes	No	No
Value of Resistor R11.	15K	22K	15K	15K	15K	22K	22K	15K	15K
Value of Capacitor C32 in mfd, 400V.	.01	.03	.01	.01	.01	.03	.03	.01	.01

BENDIX RADIO DIV.

MODELS 69B8,
69M8, 69M9

REPLACEMENT PARTS LIST

Used On Chassis Codes		Stock No.	Symbol No.	Description	Used On Chassis Codes		Stock No.	Symbol No.	Description
69M8, 69B8	69M9				69M8, 69B8	69M9			
ELECTRICAL COMPONENTS					ELECTRICAL COMPONENTS—(Continued)				
ALL	ALL	AC0C01	C33,36; R16,18	ASSY—Capacitor Resistor Coupling Plate	B ALL	B,C ALL	LF0C00 RV4S13	C85 & L15 R1; S2	ASSY—RF Choke ASSY—Potentiometer with Switch
ALL	ALL	CC9A38	C1	CAPACITOR—Ceramic 220 mmf	ALL	ALL	RC23A332M	R2	RESISTOR—Comp. 3.3K 1/2W
ALL	ALL	CC0A18	C2,69	CAPACITOR—Ceramic 4.7 mmf	ALL	ALL	RC22A473M	R3,27	RESISTOR—Comp. 47K 1/4W
ALL	ALL	CV0D01	C3b,c; C4a,b,c, d,e	CAPACITOR—Variable	ALL	ALL	RC22A105M	R4,51,52	RESISTOR—Comp. 1 meg 1/4W
ALL	ALL	CM5A46	C5	CAPACITOR—Mica .001 mfd 300V	ALL	ALL	RC23A102M	R5,36,62	RESISTOR—Comp. 1000 ohms 1/2W
ALL	ALL	CC8B30	C6	CAPACITOR—Ceramic 47 mmf $\pm 10\%$ 500V	ALL	ALL	RC22A474M	R6,39,53, 60	RESISTOR—Comp. 470K 1/4W
ALL	ALL	CT1B05	C9	CAPACITOR—Corning Glass Trimmer 1-8 mmf	ALL	ALL	RC23A101M	R7	RESISTOR—Comp. 100 ohms 1/2W
ALL	ALL	CC8B22	C10	CAPACITOR—Ceramic 10 mmf $\pm 10\%$ 500V	A,C,D	A,D,E	RC23A102M	R8	RESISTOR—Comp. 1000 ohms 1/2W
B	B,C	CC0M00	C11,26,51	CAPACITOR—Ceramic .005 mfd Min Value 500V	B	B,C	RC23A471M	R8	RESISTOR—Comp. 470 ohms 1/2W
ALL	ALL	CC0A26	C12	CAPACITOR—Ceramic 22 mmf	A,C,D	A,D,E	RC22A680M	R9	RESISTOR—Comp. 68 ohms 1/4W
ALL	ALL	CE4A03	C13	CAPACITOR—Electro- lytic 50-40-30 mfd 150V 50 mfd 25V	B	B,C	RC22A330M	R9	RESISTOR—Comp. 33 ohms 1/4W
ALL	ALL	CC0M00	C16,23,25, 31,50,52, 61,62,68, 74,78,81	CAPACITOR—Ceramic .005 mfd	ALL	ALL	RC22A333M	R10	RESISTOR—Comp. 33K 1/4W
ALL	ALL	CP4T36	C18,24,65	CAPACITOR—Paper .03 mfd 400V	A,C,D	A,D,E	RC22A153M	R11	RESISTOR—Comp. 15K 1/4W
ALL	ALL	CC9M42	C19,20,66	CAPACITOR—Ceramic 470 mmf Min Value	B	B,C	RC22A223M	R11	RESISTOR—Comp. 22K 1/4W
ALL	ALL	CC9M50	C27,42,58, 59,60,63	CAPACITOR—Ceramic .001 mfd Min Value	ALL	ALL	RC22A224M	R12,37	RESISTOR—Comp. 220K 1/4W
ALL	ALL	CE1T06	C28	CAPACITOR—Electro- lytic 5 mfd 50V	ALL	ALL	RC22A106M	R15,54,57	RESISTOR—Comp. 10 meg 1/4W
A,C,D	A,D,E	CC9A34	C29	CAPACITOR—Ceramic 100 mmf 500V	ALL	ALL	AC0C01	R16,18; C33,36	ASSY—Capacitor Resistor Coupling Plate
B	B,C	CC9A36	C29	CAPACITOR—Ceramic 150 mmf 500V	ALL	ALL	RC23A151M	R19	RESISTOR—Comp. 150 ohms 1/2W
ALL	ALL	CP6T12	C30,39	CAPACITOR—Paper .002 mfd 600V	ALL	ALL	RC22A223M	R20	RESISTOR—Comp. 22K 1/4W
A,C,D	A,D,E	CC9R80	C32	CAPACITOR—Ceramic .01 mfd 450V	ALL	ALL	RC24A471M	R21	RESISTOR—Comp. 470 ohms 1W
B	B,C	CP4T36	C32	CAPACITOR—Paper .03 mfd 400V	ALL	ALL	RC22A104M	R26,32,35	RESISTOR—Comp. 100K 1/4W
ALL	ALL	AC0C01	C33,36; R16,18	ASSY—Capacitor Resistor Coupling Plate	ALL	ALL	RW1F06	R38	RESISTOR—Flexible Wirewound 1W
ALL	ALL	CP4T34	C35	CAPACITOR—Paper .02 mfd 400V	ALL	ALL	RW2F66	R50	RESISTOR—Metalized 2.2 meg 1/3W
ALL	ALL	CP6T16	C38	CAPACITOR—Paper .004 mfd 600V	ALL	ALL	RC22A225M	R58	RESISTOR—Comp. 2.2 meg 1/4W
ALL	ALL	CC9R80	C44,45,46, 48,72,73, 75	CAPACITOR—Ceramic .01 mfd 450V	A,B	A,B,C	RC23A102M	R61	RESISTOR—Comp. 1000 ohms 1/2W
ALL	ALL	CP4T51	C47	CAPACITOR—Paper .1 mfd 400V	C,D	D,E	RC22A473M	R61	RESISTOR—Comp. 47K 1/4W
ALL	ALL	CP4T40	C55,64	CAPACITOR—Paper .05 mfd 400V	C,D	D,E	RC22A154M	R63	RESISTOR—Comp. 150K 1/4W
ALL	ALL	CC9A34	C56,77	CAPACITOR—Ceramic 100 mmf 500V	D	E	RC23A683M	R64	RESISTOR—Comp. 68K 1/2W
B	B,C	CC0A18	C67	CAPACITOR—Ceramic 4.7 mmf 500V	ALL	ALL	AL0Z15	L1	ANTENNA—Loop AM
ALL	ALL	CC0A14	C70	CAPACITOR—Ceramic 2.2 mmf	ALL	ALL	LO7B01	L2	TRANSFORMER—BC Osc.
ALL	ALL	CT1A20	C79	CAPACITOR—Trimmer 4-40 mmf	ALL	ALL	LI0F01	L3	COIL—RF Choke
ALL	ALL	LF0C00	C82 & L8; C83 & L11	ASSY—Capacitor Coil 10.7 MC	ALL	ALL	LO7F00	L4	COIL—FM Oscillator
A,B,C	A,B,C, D	CP4T40	C84	CAPACITOR—Paper .05 mfd 400V	ALL	ALL	LA0F01	L5	COIL—FM Antenna
					ALL	ALL	LF0A08	L6,7,9, 10,12	COIL—RF Filament Choke 2 mh
					ALL	ALL	LF0C00	L8 & C82; L11 & C83	ASSY—Capacitor Coil 10.7 MC
					ALL	ALL	LF0A07	L14	COIL—RF Choke 4.5 MC
					B ALL	B,C ALL	LF0C00 LF0I02	L15 & C85 L16	ASSY—RF Choke COIL—Filter Choke

MODELS 69B8,
69M8, 69M9

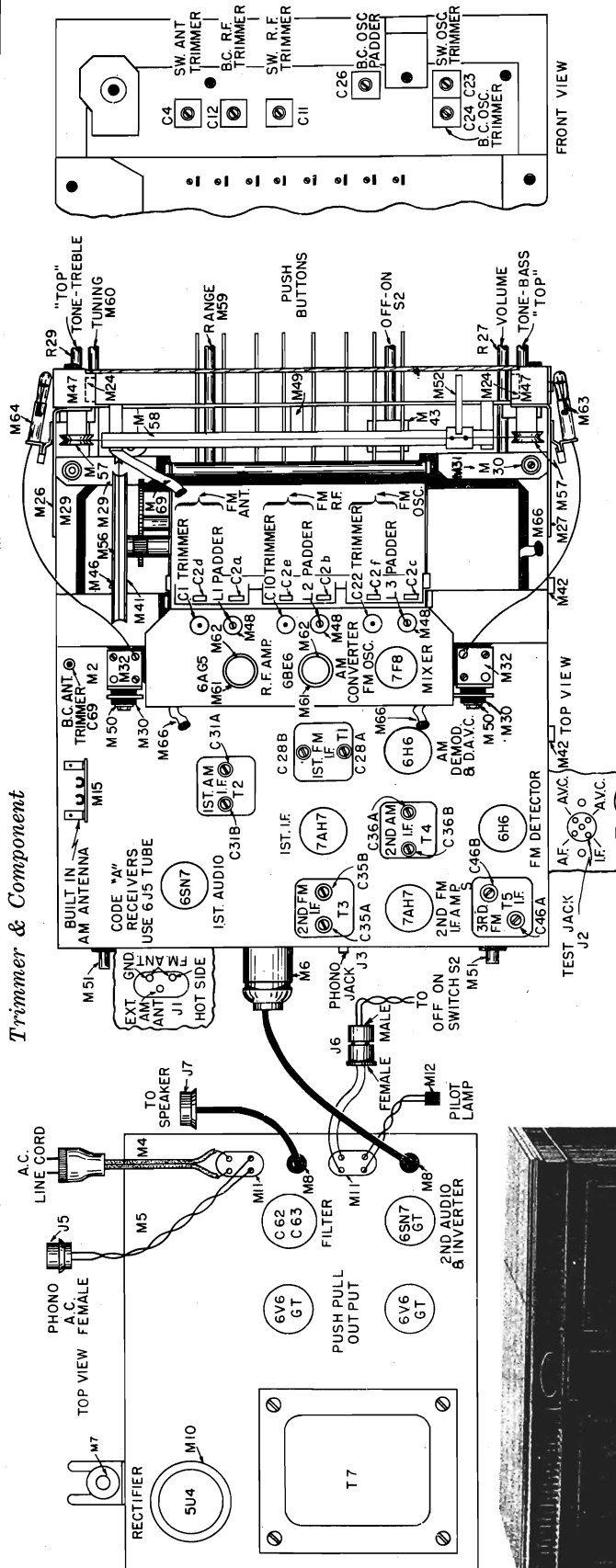
BENDIX RADIO DIV.

REPLACEMENT PARTS LIST—Continued

Used On Chassis Codes		Stock No.	Symbol No.	Description	Used On Chassis Codes		Stock No.	Symbol No.	Description
69M8, 69B8	69M9				69M8, 69B8	69M9			
ALL	ALL	TI0C12	T1	TRANSFORMER—1st IF	ALL	ALL	PI0P01		PLATE—Line Cord Insulator
ALL	ALL	TI0D20	T2	TRANSFORMER—2nd IF	ALL	ALL	SM0T10		SHIELD—Metal, Miniature Tube
ALL	ALL	TR0R00	T3	TRANSFORMER—Ratio Detector	ALL	ALL	SO7M09		SOCKET—Main Chassis 7 Prong Min. Tube
ALL	ALL	TI0D23	T4	TRANSFORMER—AM 3rd IF	ALL	ALL	SO7M10		SOCKET—Sub-Chassis 7 Prong Min. Tube
ALL	ALL	TA0O20	T5	TRANSFORMER—Audio Output	ALL	ALL	SO9M00		SOCKET—Tube 9 Prong
ALL	ALL	QR0S01		RECTIFIER—Selenium	ALL	ALL	SO0D12		SOCKET—Dial Light
ALL	ALL	SR3F00	S1	SWITCH—Rotary 3 Section 3 Position	ALL	ALL	SO8S01		SOCKET—Octal Tube
ALL	ALL	RV4S13	S2; R1	ASSY—Potentiometer With Switch	ALL	ALL	WF0I00		WASHER—Phono Input Insulating 23/64 x 15/16 x .015
ALL	ALL	SS1C02	S3	SWITCH—Slide 2 Pole 3 Position	ALL	ALL	XS0C11		STRIP—Sub-Chassis Insulating Plate
ALL	ALL	SP0R01		SPEAKER—PM 10"	ALL	ALL	XS0C13		STRIP—Sub-Chassis Ground Plate
ALL	ALL	C7		LAMP—Dial 125V	ALL	ALL	XS0C15		STRIP—Right Angle Common Ground
ALL	ALL	BT1S03		BOARD—Terminal 2 Lug 1 Mtg.	ALL	ALL	XS0C18		STRIP—Straight Common Ground
ALL	ALL	BT3S06		BOARD—Terminal 3 Lug 1 Mtg.	ALL	ALL	ZB0M03		BUTTON—Chassis Plug
ALL	ALL	BT4S06		BOARD—Terminal 4 Lug 1 Mtg.					CABINET COMPONENTS
ALL	ALL	BT6S04		BOARD—Terminal 6 Lug 2 Mtg.			BT3S09		BOARD—Terminal 3 Lug 2 Mtg.
ALL	ALL	BT8S00		BOARD—Terminal 8 Lug 2 Mtg.			BZ0B29		BACK—Cabinet Cover
ALL	ALL	CD0N01		CABLE—Dial			BZ0D45		BAFFLE—Cardboard & Cloth (Models 69M8 & 69M9)
ALL	ALL	CL2A08		CORD—AC Line			BZ0D46		BAFFLE—Cardboard & Cloth (Model 69B8)
ALL	ALL	GR0S09		GROMMET—Sub-chassis Mtg. Rear			DS0C15		DIAL—Scale
ALL	ALL	GR0S15		GROMMET—Sub-chassis Mtg. Top			ED0M06		ESCUTCHEON—Dial, Metal
ALL	ALL	HB0M74		BRACKET—Indicator Slide Rail			HC0S10		CLIP—Control Knob Retainer Ring
ALL	ALL	HB0M84		BRACKET—Dial Back Plate Mtg.			HC0S68		CLIP—Concentric Knob Retainer Ring
ALL	ALL	HB0M86		BRACKET—Sub-chassis Mtg.			HC0S69		CLIP—Dial Retainer
ALL	ALL	HB0M87		BRACKET—Dial Light Mtg.			HK0R17		KNOB—Door Pull
ALL	ALL	HC0M08		CLAMP—Tube Shield Base			HK0T00		KNOB—Tray Pull
ALL	ALL	HC0S00		CLIP—Tuning Shaft Spring			HZ0C12		CATCH—Bullet (Models 69M8 & 69M9)
ALL	ALL	HC0S60		CLIP—IF Can Spring Retainer Mtg.			HZ0C13		CATCH—Bullet (Model 69B8)
ALL	ALL	HC0S67		CLIP—Spring, Glass Trimmer			HZ0G01		GLIDE—Metal
ALL	ALL	HS0C75		SPRING—Dial Cord Drum			HZ0H04		HINGE—Door (Models 69M8 & 69M9)
ALL	ALL	HS0C88		SPRING—Coil Tension			HZ0H20		HINGE—Door (Model 69B8)
ALL	ALL	HS0F19		SLEEVE—Spacer			JP2O07		JACK—Plug 2 Contact
ALL	ALL	HS0S13		STUD—Chassis Shock-mount			KC0B16		KNOB—Control Brown (Models 69M8 & 69M9)
ALL	ALL	ID0M21		INDICATOR—Metal			KC0L03		KNOB—Control Beige (Model 69B8)
ALL	ALL	JR2O12	J1	RECEPTACLE—2 Contact			KY0B02		KNOB—Concentric Brown (Models 69M8 & 69M9)
ALL	ALL	JR2O14	J2	RECEPTACLE—Phono 2 Contact			KY0L00		KNOB—Concentric Beige (Model 69B8)
ALL	ALL	JR1S00	J3	RECEPTACLE—Phono 1 Contact			RD0F01		REFLECTOR—Dial Light
ALL	ALL	MB0B00		BEARING—Brass, Tuning Shaft			WF0F17		WASHER—Felt (Conc. Knob)
ALL	ALL	ML0C04		LEVER—Tone Control			XS0Z14		STRIP—Loop Support With Terminal Board
ALL	ALL	MP0I00		PULLEY—Idle Fiber			ZW6G05		CABINET—Mahogany (Models 69M8 & 69M9)
ALL	ALL	MS0T19		SHAFT—Tuning			ZW6G06		CABINET—Blonde Mahogany (Model 69B8)
ALL	ALL	PB0D06		PLATE—Back					
ALL	ALL	PI0C01		PLATE—Electrolytic Capacitor Mtg.					

BENDIX RADIO DIV.

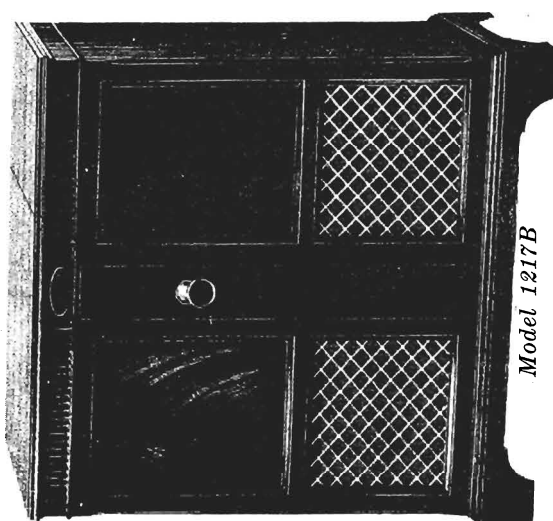
MODEL 1217B



but the built-in dipole must be disconnected when an outside antenna is used.

The 7F8 dual triode is used as an oscillator-mixer in the FM circuit and is made inoperative by removing its plate voltages when the range switch (S1) is in any but the FM position. Likewise, the 6BE6 is used as a converter for the Standard Broadcast and Shortwave Bands only, and has no plate voltage applied to it when S1 is in the FM or PH (phono) positions. One half of the 6H6 (pins 3 and 4) AM demodulator tube is used in the delayed AVC circuit for FM. The first triode section (pins 1, 2 and 3) of the 6SN7 in the radio chassis is used only when the range switch, S1, is in the FM position, but does not have the B plus removed from its plate when S1 is in any of the other three positions.

The Model 1217B radio provides reception of the Standard AM Broadcast Band, the Shortwave Band from 6 to 14 megacycles, and the FM Band from 88 to 108 megacycles. Phonograph reproduction is provided through the audio amplifier from a high impedance phono jack located on the radio chassis. A standard superheterodyne circuit is used, with one stage of tuned radio frequency on all three bands. A low impedance loop antenna installed on the back cover of the cabinet is used on both the Standard Broadcast and Shortwave Bands. A built-in dipole antenna is used on the FM Band. An outside antenna for the AM Bands may be connected to the binding screw, marked ANTENNA, on the rear of the cabinet. A 300 ohm outside FM dipole antenna may be connected to the terminals marked FM DIPOLE,

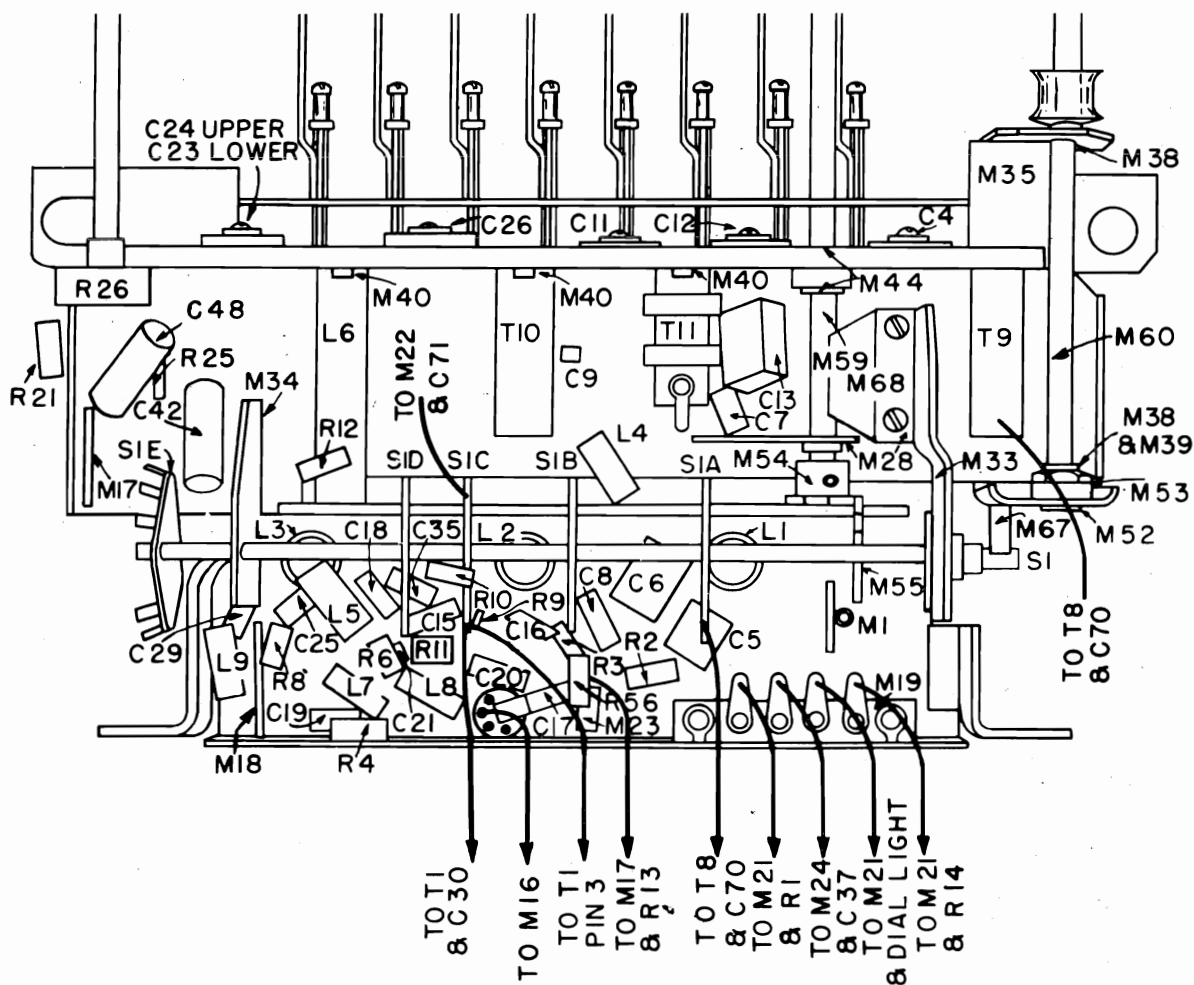


Model 1217B

Power Requirements
105 - 125 volts, 60 cycles AC

Power Consumption (including phonograph)
160 watts

Tuning Frequency Range
AM 540 - 1620 KC
SW AM 5.75 - 15.5 MC
FM 88 - 108 MC



Component Diagram—Bottom View of Tuner Chassis

CHASSIS CODE CHANGES

CODE "A" AND UNCODED CHASSIS

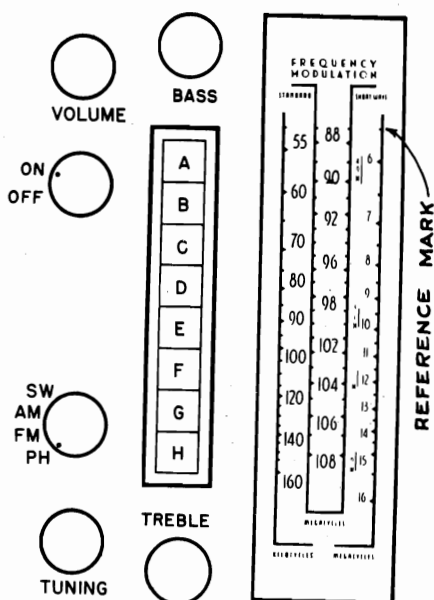
First audio amplifier was a 6J5.
FM antenna was connected to a tap on the antenna coil (L1) instead of by link.

CODE "B" CHASSIS

Some chassis used a 6J5 and some a 6SN7 as a first audio amplifier. Tone compensation network, R54 and C77, removed from phono input lead. RF choke, L9, added in plate circuit of 7F8. R38 in D.A.V.C. circuit of ratio detector changed from 8200 ohms to 10,000. FM antenna input same as in code "A" chassis. Cathode resistor, R12 and capacitor C72 in first 7AH7 removed and R15 connected directly to ground.

CODE "C" CHASSIS

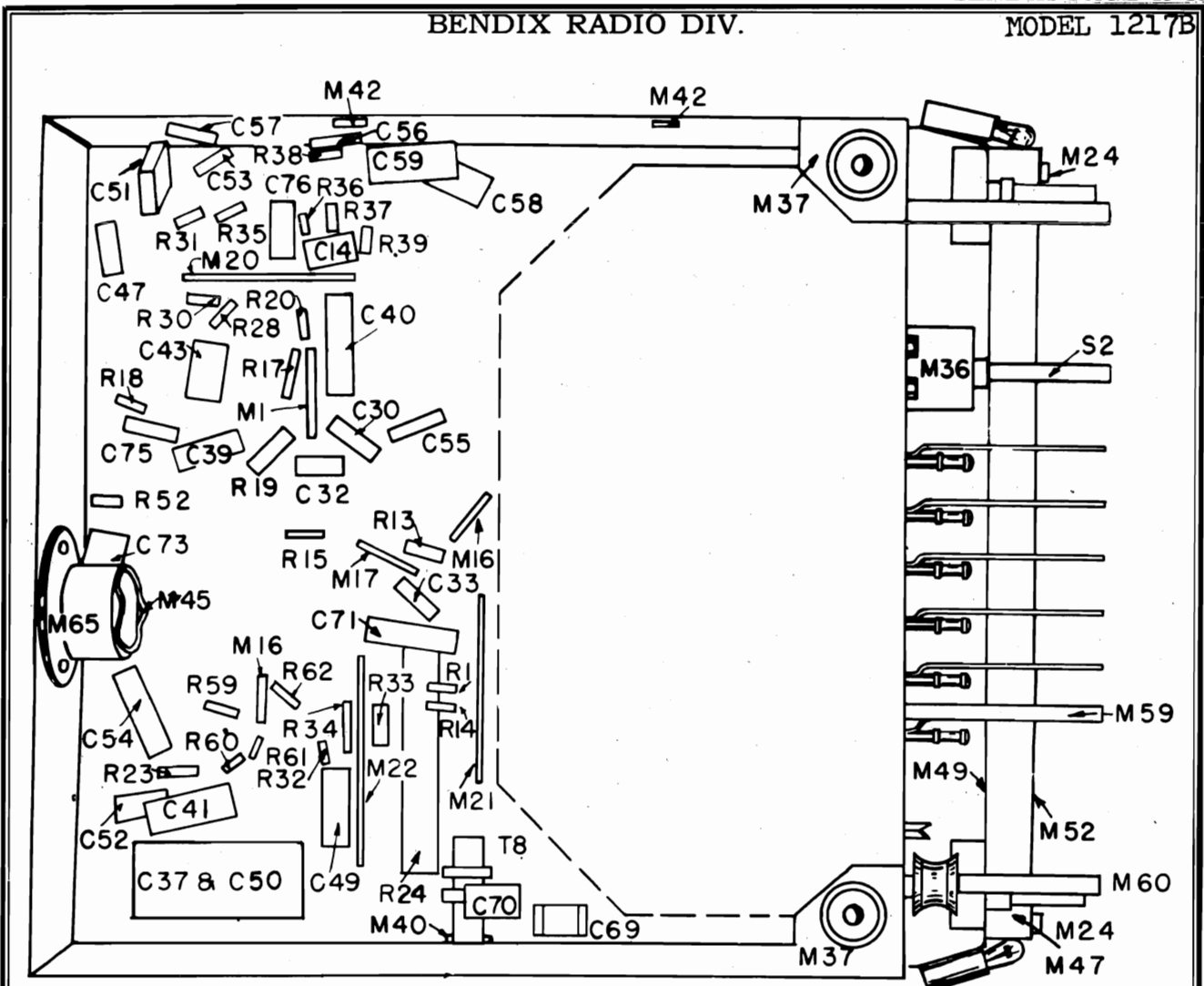
Included all previous changes.
FM antenna link coupled to antenna coil L1.



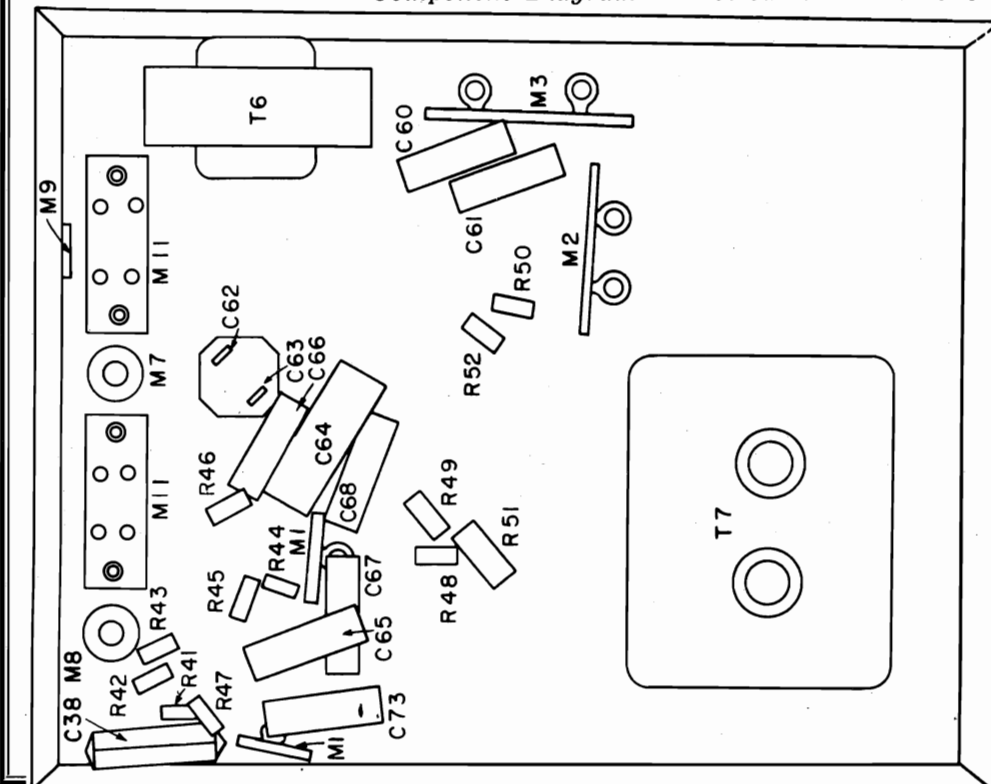
Control Layout

BENDIX RADIO DIV.

MODEL 1217B



Component Diagram — Bottom View Radio Chassis

Component Diagram
Bottom View of
Amplifier Chassis

It is not necessary to remove the two chassis from the cabinet if the FM channel only is to be aligned. An FM test socket is provided on the chassis sideplate (facing outward in normal mounting position) at which the various voltages from the ratio detector are available for either meter or oscilloscope measurements.

If the BC and SW channels are to be aligned, it is advisable to remove the radio chassis from the cabinet in order to gain access to the BC and SW AVC voltage used for output indication. It is rather difficult to align the BC and SW RF and IF sections when the volume control is full "ON" because of background noise accompanying the high gain of the audio amplifier. A DC vacuum tube voltmeter connected to the junction of R20 and C40 (lug 3 of S1-E—See Figs. 9 & 10) will provide an accurate and stable indication of RF output, at the AM demodulator, for alignment of the BC and SW bands.

Unless the various circuits of each channel are very much out of alignment, adjustments made in the SW circuits will not affect the BC circuits and adjustments made in the FM circuits will not alter either the BC or SW circuit adjustments. However, if any of these channels are badly out of alignment necessitating considerable adjustment, it is best, after these adjustments have been made, to go back and check the adjustment previously made on the other channels.

An un-modulated (CW) signal of the proper radio frequency may be used for alignment of all three channels (BC, SW, and FM), but it is convenient to use a 400 cycle AM signal during alignment and occasionally advance the volume control to be sure the correct signal is tuned in.

Before making any adjustment, allow the receiver and signal generator to warm up for at least five minutes. **IMPORTANT:** All adjustments must be made in the order in which they are given; i.e., the BC band must be aligned first, followed by the SW, and last, the FM band.

INSTRUCTIONS FOR REMOVING THE CHASSIS

If, for any reason, it is necessary to remove the radio chassis from the cabinet, proceed as per following instructions:

Remove the power cord plug from the wall receptacle, and remove all control knobs and push-buttons by simply pulling them straight up from the panel. The cabinet back cover and AM loop assembly may be detached from the chassis by pulling the loop leads out of their receptacle on the chassis, after the small wood screws holding the assembly on the cabinet have been removed. The FM antenna is disconnected from the chassis by removing the three prong plug at the rear of the chassis. All power cables and leads may be disconnected at convenient plugs and jacks in the chassis. The speaker is connected to the amplifier chassis by a 5-prong plug on the speaker.

After all connecting leads and cables have been disconnected from the chassis, remove the four hexagon-head machine screws which hold the chassis mounting rails in the cabinet. The two upper machine screws are removed from inside the record changer compartment. The two lower bolts are located below the radio chassis and removed from the chassis side of the cabinet. Note: When replacing the chassis in the cabinet, be sure dial glass is up snug against the control panel when the four mounting screws are tightened and that they are tightened securely.

PUSH-BUTTON ADJUSTMENT

The mechanical type of push-button tuning used with this receiver makes possible the selection of any one of eight pre-selected stations. Any push-button may be adjusted to select any station in the three tuning bands. However, more accurate tuning of the SW and FM stations will be obtained if the lower four buttons E, F, G and H, Figures 2 and 3, are used for stations within these bands.

1. Remove all push-buttons by pulling straight up from the panel.
2. Manually tune in the desired station.
3. Release the screw adjacent to the push-button shank and push the shank in firmly as far as it will go while holding the tuning control knob.
4. Release the shank and tighten the locking screw.
5. Rotate the tuning control to a different position and check the push-button setting by again depressing the shank previously adjusted. The tuning dial should automatically return to the stations previously tuned in. However, in some cases it may not be exactly on the peak frequency of the stations. In such cases, continue as follows:
6. Re-tune the station manually to its peak frequency, and note whether it is necessary to increase or decrease the frequency setting for optimum tuning.
7. If it is necessary to increase the dial frequency setting, then the dial should be set at an additional increase beyond the optimum point (approximately the amount of the increase) and procedures 3, 4, 5 and 6 repeated. The push-button should then tune in the station exactly on its peak frequency.
8. If it is necessary to decrease the dial frequency setting, then the dial should be set at a lower frequency from its optimum point (approximately the amount of the decrease) and the procedure in 3, 4, 5 and 6 repeated.
9. Repeat the above procedures for the remaining seven push-buttons.

After the push-buttons have been set up as previously described, the proper tab with its transparent cover should be inserted together in each push-button knob. The push-buttons should now be placed on the proper shanks.

ALIGNMENT PROCEDURE MODEL 1217B

EQUIPMENT REQUIRED

Signal Generator

AM, 455 KC to 106 MC

Vacuum Tube Voltmeter

DC up to approximately 20 volts. Ground, or minus, must be isolated from the power line.

FM Test Circuit Plug

See Fig. 4 for details.

.01 mfd. and 50 mmf. (or less) capacitor

used for connecting signal generator to receiver.

Alignment Screwdriver

Must be 100% fiber and preferably over 8" in length.

Alignment Socket Wrenches

One 1/4" hexagon - 100% fiber, 8" long.

One 3/8" hexagon - 100% fiber, 6" long.

If the 3/8" wrench has a hole through the handle of sufficient diameter to permit inserting the alignment screwdriver, the locking nuts on L1, L2 and L3 can be loosened or tightened at the same time these padders are adjusted with the screwdriver inside.

AM ALIGNMENT

Turn receiver on and allow to warm up for at least 5 minutes. (Input voltage, 117 volts 60 cycle AC). Set volume control to minimum, bass and treble controls full counterclockwise, range control to BC (third from most counterclockwise position), tuning gang fully closed. Set dial pointer to Reference Mark at low Frequency end of dial as shown on Fig. 3. If built-in AM loop antenna is disconnected, the two contacts of the AM antenna input jack located on top the chassis must be shorted together. C69 and C4 should be adjusted with loop connected.

IF CHANNEL

1. Short #5 terminal on gang (C2-F) to chassis. See Fig. 2.
2. Set signal generator to 455 KC, CW or AM, and connect to #3 gang terminal (C2-E) through a .01 mfd. capacitor. See Fig. 2.
3. Connect low range of V.T.V.M. to junction of R20 and C40 (lug 3 of switch S1-E is a convenient point—See Figs. 9 & 10), and chassis ground, and adjust signal generator attenuator to produce approximately 2 volts of AVC on the V.T.V.M.
4. Adjust C36B, C36A, C31B and C31A for maximum meter reading, keeping signal input to produce approximately 2 volts AVC. Repeat these adjustments until no further improvements can be made in any one of them. NOTE: All adjustments must be made with a completely non-metallic screwdriver.

BC OSCILLATOR ALIGNMENT

1. Remove short from #5 gang terminal.
2. Move signal input from #3 gang terminal to external AM antenna terminal (J1) and set input frequency to 1475 KC CW or AM. (V.T.V.M. remains connected as for IF alignment.)

3. Set tuning control to 1475 KC.
4. Adjust C24, (BC oscillator trimmer) for maximum meter reading.
5. Set signal generator and receiver dial pointer to 580 KC.
6. Adjust BC oscillator padder C26 for maximum meter output. Repeat steps 2 to 6 until oscillator tracks correctly. Any change in C26 will necessitate a readjustment of oscillator trimmer C24.

RF AND ANTENNA ALIGNMENT FOR BC BAND

1. Change coupling capacitor connecting signal generator to AM external antenna terminal from .01 mfd. to 50 mmf. or less. (Terminals of AM loop input jack must be shorted together if loop is disconnected.)
2. Adjust signal generator and receiver tuning control to 1475 KC.
3. Adjust BC oscillator trimmer, C24, BC RF trimmer, C12 and BC antenna trimmer, C69 for maximum output. (If AM loop is disconnected, C69 should be adjusted after chassis is installed in cabinet.)
4. Check overall tracking at 580 KC and 965 KC. Maximum output should occur within the ± 10 KC of the indicated dial pointer reading. If it falls outside these limits, the plates of the gang rotor should be bent to correct tracking, but this is a difficult operation and should be attempted only by experienced technicians.
5. Repeat steps 3 and 4 until no appreciable improvement can be obtained by additional adjustments.

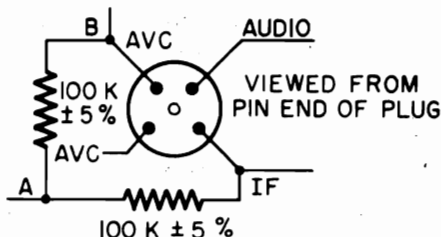
SW ALIGNMENT

1. V.T.V.M. and signal generator connected as for preceding step 5 of BC RF and antenna alignments; range switch in SW (most clockwise position).
2. Set signal generator and tuning control to 15 MC CW.
3. Adjust SW oscillator trimmer (C23), SW RF trimmer (C11), and SW antenna trimmer (C4) for maximum output. NOTE: If circuits are badly out of alignment, it may be necessary to apply the signal first to terminal #3 on gang (C2-E) until oscillator is brought close to correct alignment. The local oscillator frequency in the receiver should be adjusted to the RF *plus* the IF (not below the RF). The correct position can be determined by turning C23 all the way in (clockwise) and then out (counter-clockwise) until the second peak is reached.
4. Tune receiver and signal generator to 6 MC and check calibration and output. Maximum meter reading should be obtained with the dial pointer ± 100 KC of the 6 MC dial reference mark and an AVC output voltage not less than one-half of the AVC voltage obtained at 15 MC, providing the same voltage is applied to the antenna in both cases.

FM ALIGNMENT

FM IF CHANNEL

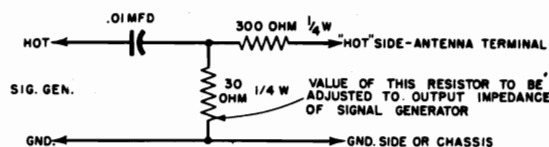
1. Set range control to FM (second from most counterclockwise position) and tuning gang to maximum capacity (closed).
2. Insert special FM test circuit plug, detailed below, in test circuit jack J2 located on left side of radio chassis. See Fig. 2.



Test Circuit Plug

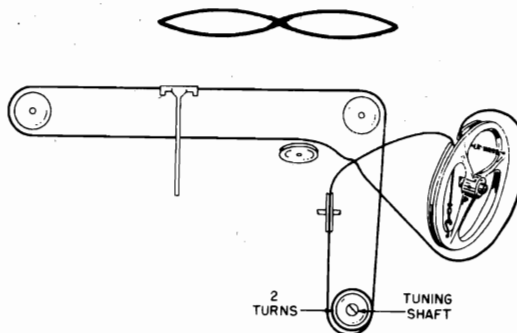
3. Connect V.T.V.M. ground or "minus" lead to point "B" and "plus" lead to IF pin on test circuit plug.
4. Connect signal generator to #4 (C2-B) gang terminal through a .01 mfd. capacitor and short #6 gang terminal (C2-C) to chassis. See Fig. 2.
5. Adjust output of signal generator to obtain 10.7 MC CW and approximately 4 volts on V.T.V.M.
6. Adjust C35B, C35A, C28B, C28A, and C46A for *maximum* meter reading, repeating all adjustments several times. NOTE: It may be necessary to apply the 10.7 MC signal to pin 6 of the 1st IF tube (7AH7) and adjust C35B, C35A, and C46A before applying the signal to #4 gang terminal and adjusting C28B and C28A.
7. Change V.T.V.M. "minus" to point "A" (center tap of two 100 K resistors) of test circuit jack and "plus" lead to audio (marked AF on chassis).
8. Turn signal generator OFF and set meter to zero when no signal is applied to IF.
9. Turn signal generator ON and adjust C46B for zero output on meter. It may be possible to obtain two or more points of adjustment at which a zero meter reading can be obtained. The correct one is the one at which the meter passes through zero most sharply with the minimum rotation of C46B.
10. Alternately adjust C46A (3rd FM IF primary) for maximum DC voltage across pins "B" and "IF" (meter connected as for previous IF alignment), and C46B (3rd FM IF secondary) for *minimum* DC voltage from point "A" to "audio." NOTE: In making this adjustment, the signal input level should be adjusted to provide approximately 6 volts DC across pins "B" and "IF" of test jack.

11. Remove short from #6 gang terminal and change signal generator input from gang to FM antenna jack on rear of radio chassis, applying signal through FM dummy antenna circuit shown in Fig. 5.



FM Dummy Antenna

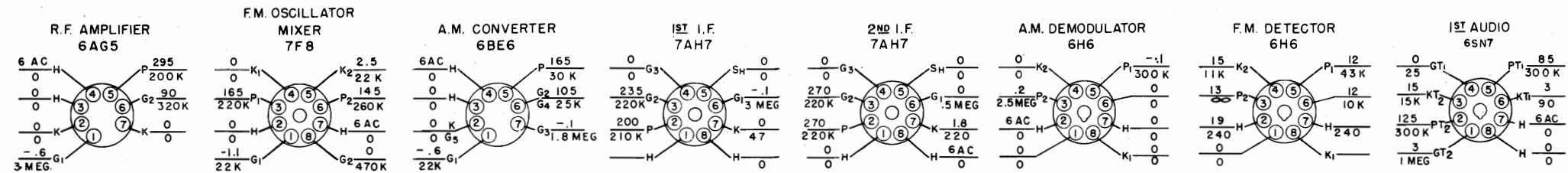
12. V.T.V.M. should be connected from point "B" to "IF" of test circuit plug.
13. Adjust signal generator and tuning control to 106 MC and output to produce approximately 8 volts on V.T.V.M.
14. Using a completely non-metallic 1/4" hexagon socket wrench, adjust FM oscillator trimmer (C22), FM RF trimmer (C10) and FM antenna trimmer (C1) for maximum output voltage read on V.T.V.M., rocking the tuning gang slightly as these adjustments are made.
15. Set signal generator and tuning control to 90 MC.
16. Adjust FM oscillator padder (L3), FM RF padder (L2) and FM antenna padder (L1) for maximum output voltage. The 3/8" locknut on these padders must be loosened before adjustments are made and tightened after adjustments are completed.
17. Repeat steps 14, 15 and 16 until maximum output voltage is obtained with the dial pointer at 90 MC and 106 MC when the signal generator is set at these respective frequencies. Any adjustments made under step 16 above must be followed by repeating the adjustments required under step 14.



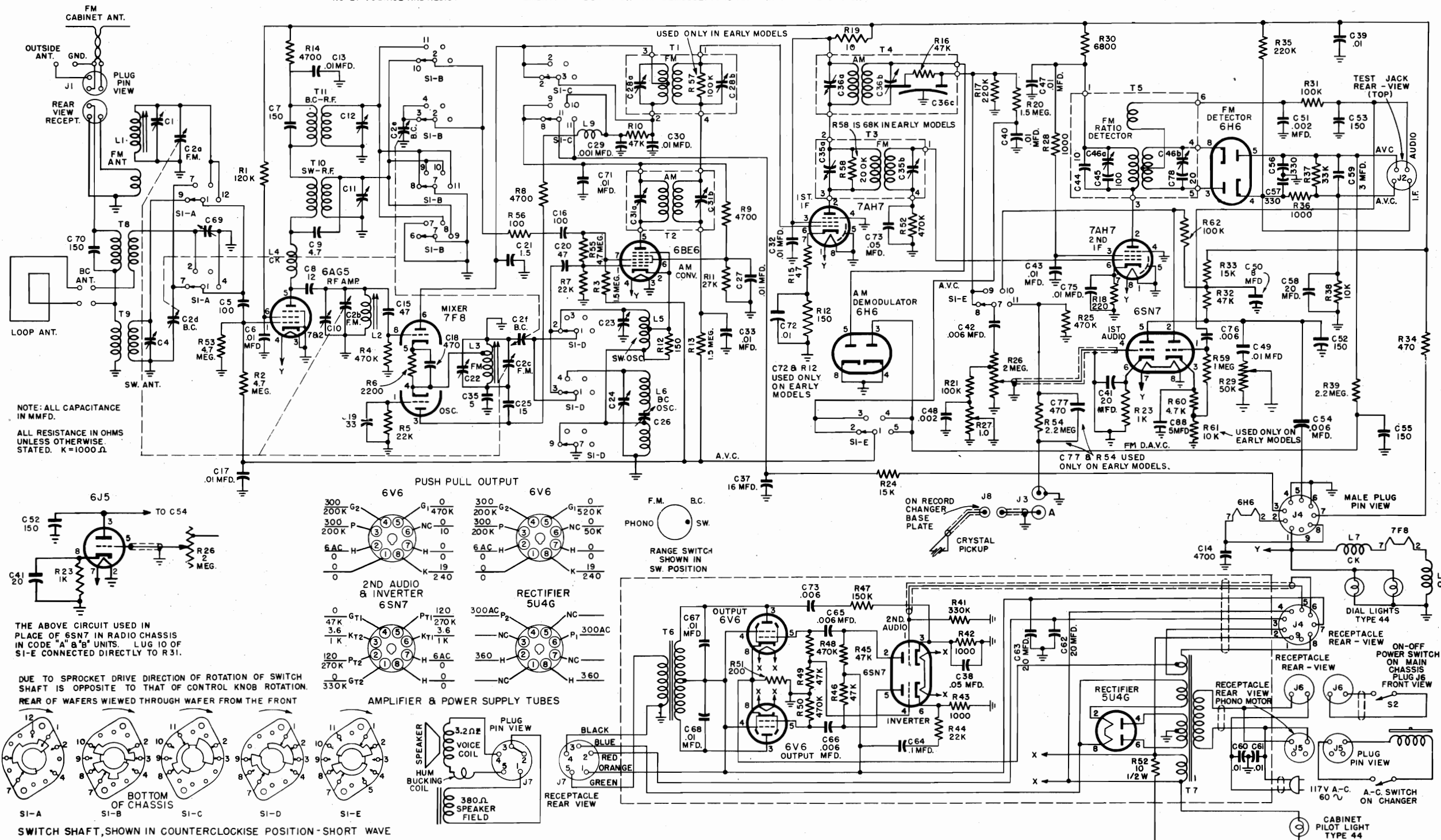
Dial Stringing Diagram

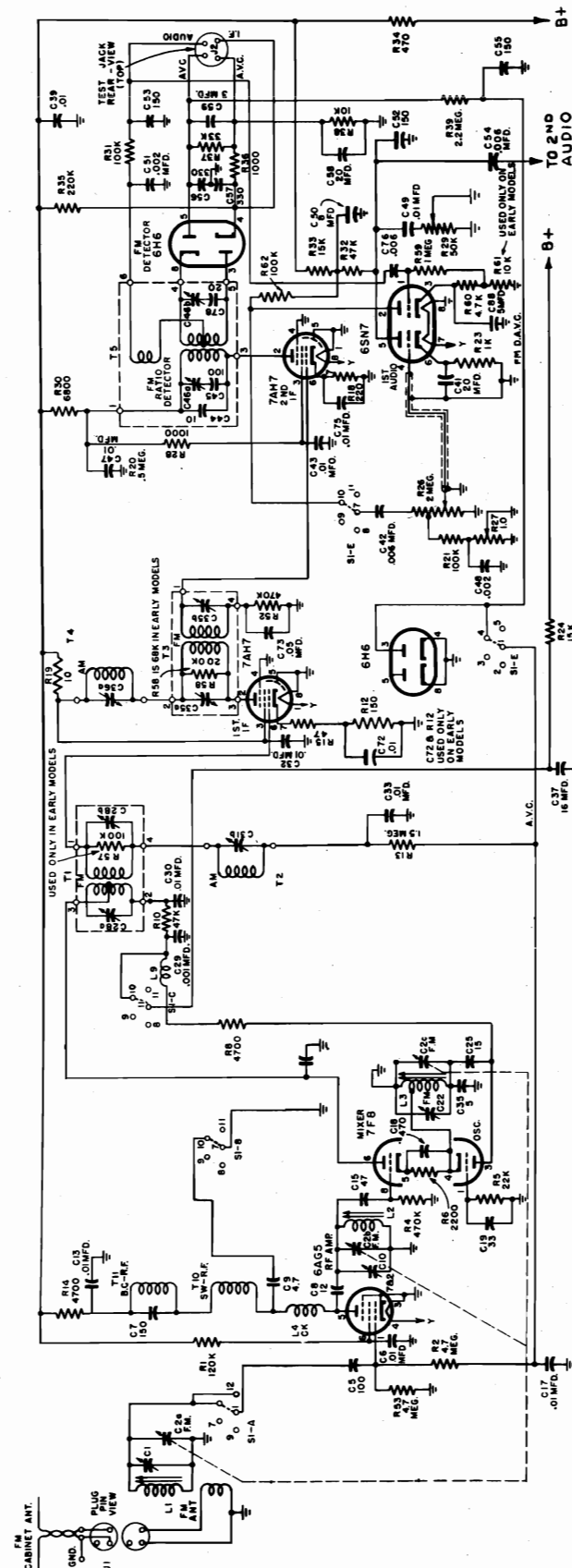
CONDITIONS OF MEASUREMENTS			
WIRE	SOCKET	VOLTAGE	TO COMMON GROUND
		RESISTANCE	
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9
10	10	10	10
11	11	11	11
12	12	12	12
13	13	13	13
14	14	14	14
15	15	15	15
16	16	16	16
17	17	17	17
18	18	18	18
19	19	19	19
20	20	20	20
21	21	21	21
22	22	22	22
23	23	23	23
24	24	24	24
25	25	25	25
26	26	26	26
27	27	27	27
28	28	28	28
29	29	29	29
30	30	30	30
31	31	31	31
32	32	32	32
33	33	33	33
34	34	34	34
35	35	35	35
36	36	36	36
37	37	37	37
38	38	38	38
39	39	39	39
40	40	40	40
41	41	41	41
42	42	42	42
43	43	43	43
44	44	44	44
45	45	45	45
46	46	46	46
47	47	47	47
48	48	48	48
49	49	49	49
50	50	50	50
51	51	51	51
52	52	52	52
53	53	53	53
54	54	54	54
55	55	55	55
56	56	56	56
57	57	57	57
58	58	58	58
59	59	59	59
60	60	60	60
61	61	61	61
62	62	62	62
63	63	63	63
64	64	64	64
65	65	65	65
66	66	66	66
67	67	67	67
68	68	68	68
69	69	69	69
70	70	70	70
71	71	71	71
72	72	72	72
73	73	73	73
74	74	74	74
75	75	75	75
76	76	76	76
77	77	77	77
78	78	78	78
79	79	79	79
80	80	80	80
81	81	81	81
82	82	82	82
83	83	83	83
84	84	84	84
85	85	85	85
86	86	86	86
87	87	87	87
88	88	88	88
89	89	89	89
90	90	90	90
91	91	91	91
92	92	92	92
93	93	93	93
94	94	94	94
95	95	95	95
96	96	96	96
97	97	97	97
98	98	98	98
99	99	99	99
100	100	100	100

LINE VOLTAGE 117 A-C ZERO SIGNAL INPUT RANGE SWITCH IN FM POSITION VOL. CONT. MIN. TONE CONTROL FULL COUNTERCLOCKWISE SOCKET VOLTAGE RESISTANCE TO COMMON GROUND D-C AT 20,000 Ω/V A-C AT 1,000 Ω/V

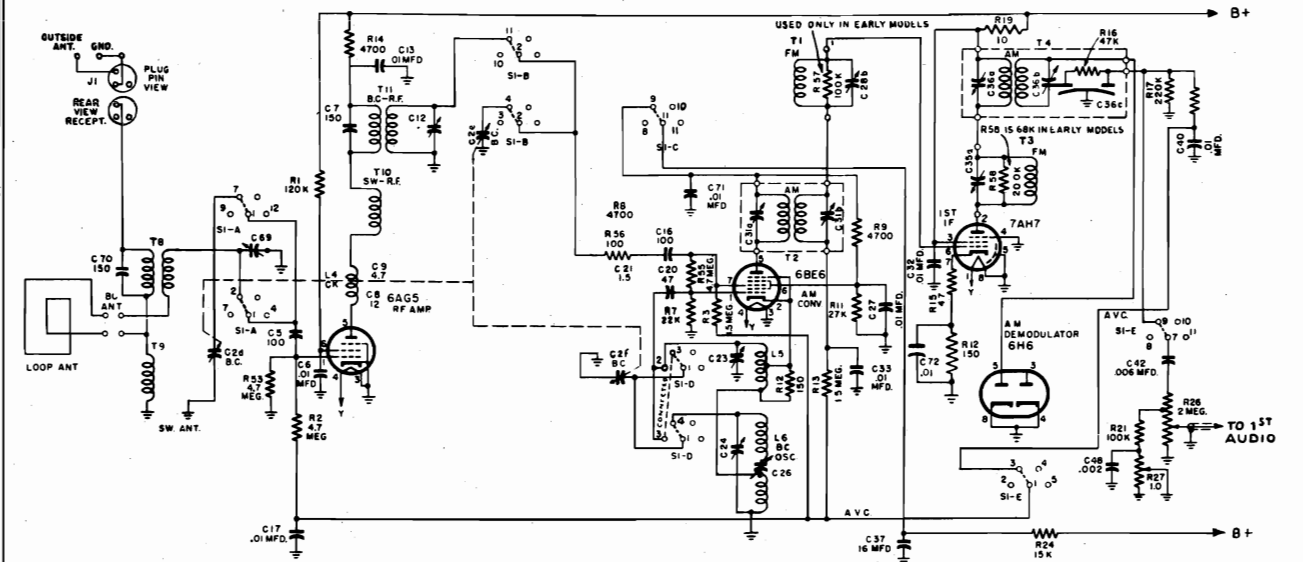


NOTE: VOLTAGE AND RESISTANCE MEASUREMENTS ON 6BE6 & 6H6 AM DEMODULATORS MADE WITH RANGE SWITCH IN AM POSITION

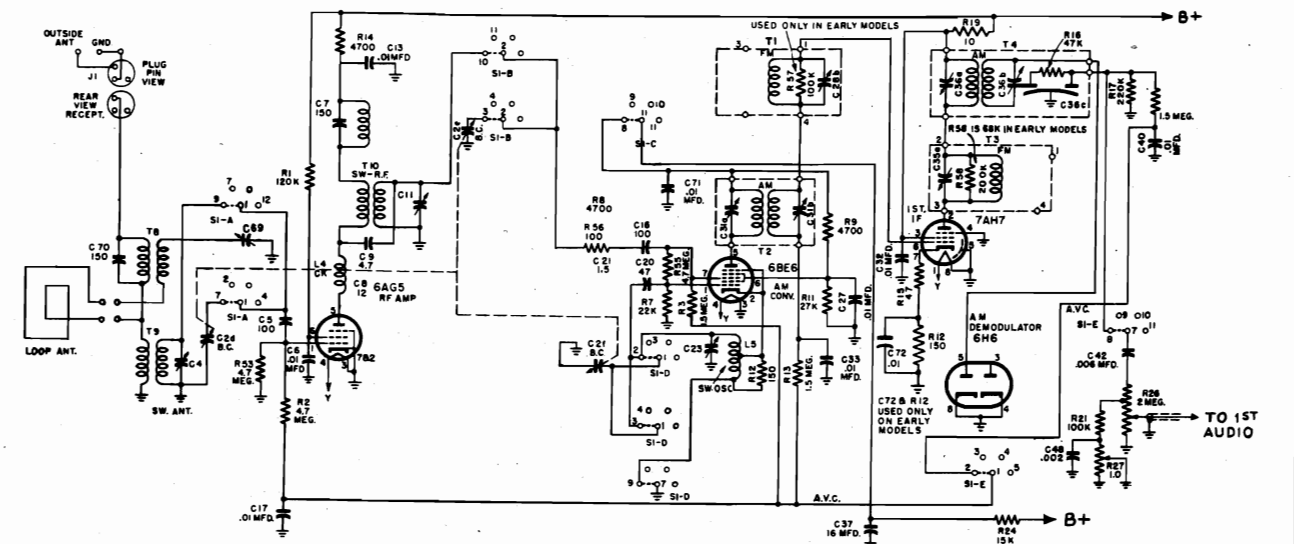




NOTE:
1ST POSITION
NOT SHOWN
BAND-SWITCH SHOWN
AT 2ND POSITION CLOCKWISE.
FM BAND
88-108 MC



BAND-SWITCH SHOWN
AT 3RD POSITION CLOCKWISE.
BROADCAST BAND
540 - 1620 KC



BAND-SWITCH SHOWN
AT 4TH POSITION CLOCKWISE.
SHORT WAVE BAND
5.75 - 15.5 MC

BENDIX RADIO DIV.

MODEL 1217B

AMPLIFIER ELECTRICAL COMPONENTS		RECEIVER ELECTRICAL COMPONENTS	
CE2A02	CAPACITOR—Electrolytic Fixed Dry. 20-20 mfd. 450V (C62 C63)	CC9A12	CAPACITOR—Ceramic Insulated 1.5 mmf. 500V (C21)
CP4M51	CAPACITOR—Paper .01 mfd. (C60 C61)	CC9A18	CAPACITOR—Ceramic Insulated 4.7 mmf. 500V (C9)
CP2T40†	CAPACITOR—Paper Tubular .05 mfd. 200V (C38)	CC0B23	CAPACITOR—Ceramic Insulated 12 mmf. 500V (C8)
CP4T20†	CAPACITOR—Paper Tubular .006 mfd. 400V (C65 C66 C79)	CC0B24	CAPACITOR—Ceramic Insulated 15 mmf. 500V (C25)
CP4T31†	CAPACITOR—Paper Tubular .01 mfd. 400V (C67 C68)	CC7B19	CAPACITOR—Ceramic Insulated 5 mmf. 500V (C35)
CP4T51†	CAPACITOR—Paper Tubular .1 mfd. 400V (C64)	CC8B28†	CAPACITOR—Ceramic Insulated 33 mmf. 500V (C19)
RC4D16	RESISTOR—Comp. 220 ohms 2W ± 20% (R51)	CC8B30†	CAPACITOR—Ceramic Insulated 47 mmf. 500V (C15 C20)
RC1G24†	RESISTOR—Comp. 1000 ohms 1/4W (R42 R13)	CE1D00†	CAPACITOR—Electrolytic Single Section 3 mfd. 50V (C58)
RC1G40†	RESISTOR—Comp. 22,000 ohms 1/4W (R14)	CE2D00	CAPACITOR—Electrolytic Dry, 2 section 8 mfd. & 16 mfd. 450V (C37 C50)
RC1G44†	RESISTOR—Comp. 47,000 ohms 1/4W (R49)	CE1T02†	CAPACITOR—Electrolytic 20 mfd. 25V (C58 C11)
RC1G58	RESISTOR—Comp. 470,000 ohms 1/4W (R48 R50)	CM5A26†	CAPACITOR—Mica 150 mmf. 500V (C7 C55 C53 C52)
RC2G44	RESISTOR—Comp. 47,000 ohms 1/2W (R15 R16)	CM5A31†	CAPACITOR—Mica 330 mmf. (C56 C57)
RC1H53	RESISTOR—Comp. 150,000 ohms 1/4W (R17)	CM5A38†	CAPACITOR—Mica 470 mmf. (C77)
RC1H56†	RESISTOR—Comp. 330,000 ohms 1/4W (R41)	CM5A40†	CAPACITOR—Mica .001 mfd. (C20)
RC2H00	RESISTOR—Comp. 10 ohms (R52)	CM5E73†	CAPACITOR—Mica 4700 mmf. 500V (C14)
TA0Q00	TRANSFORMER—Output (T6)	CM5L02	CAPACITOR—Mica (Low Loss) .002 mfd. 500V (C51)
TI0R00	TRANSFORMER—Power (T7)	CM6L22	CAPACITOR—Mica (Low Loss) 100 mmf. 500V (C16 C5)
AMPLIFIER MECHANICAL COMPONENTS		CM6L38	CAPACITOR—Mica (Low Loss) 170 mmf. 500V (C18)
BT3S03	BOARD—Terminal 3 Soldering lugs, Single Mt. (M1)	CP0M31†	CAPACITOR—Paper .01 mfd. 120V (C33 C17 C72 C75)
BT3S05	BOARD—Terminal 3 Soldering lugs, Double Mt. (M2)	CP4M31†	CAPACITOR—Paper .01 mfd. 400V (C6 C27 C32 C39 C13 C30 C47 C43)
BT4S03	BOARD—Terminal 4 Soldering lugs, Double Mt. (M3)	CP2T40†	CAPACITOR—Paper Tubular .05 mfd. 200V (C73)
CL2A08	COR—A.C. Brown (M4)	CP4T20†	CAPACITOR—Paper Tubular .006 mfd. 400V (C54 C42 C76)
CL2A10	COR—Phono Power (J5 M5)	CP4T31†	CAPACITOR—Paper Tubular .01 mfd. 400V (C71 C40)
CS0M02	COVER—Power Cable Assy. (M6)	CP4T34†	CAPACITOR—Paper Tubular .02 mfd. 400V (C49)
GR0Z13†	GROMMET—Rubber (M7)	CP6T12†	CAPACITOR—Paper .002 mfd. 600V (C48)
GR0S14†	GROMMET—Rubber Insulating (M8)	CT1A12†	CAPACITOR—Trimmer Mica (C26)
HC0C09†	CLIP—Cable (M9)	CT1A13†	CAPACITOR—Trimmer Mica 4-75 mmf. (C1 C1 C23 C24)
HC0T00†	CLAMP—Tube (M10)	CT1A14†	CAPACITOR—Trimmer Mica 1.8-40 mmf. (C12)
JK2007	RECEPTACLE—2 Contact Female (J6)	CT1A15†	CAPACITOR—Trimmer 4.0-70 mmf. (C69)
JK5001	RECEPTACLE—5 Contact Female (J7)	CT1B00	CAPACITOR—Trimmer Air concentric 3-30 mmf. (C1 C10 C22)
PI0P00†	PLATE—Line Cord Insulator (M11)	CV0E00	CAPACITOR—Variable (C2)
SF2R00†	SPEAKER—E.D. 12"	LA0F00	COIL—FM Ant. (L1)
SO0D09†	SOCKET—Pilot Light (M12)	LF0A02	CHOKE—RF (L7 L8)
SO8S01†	SOCKET—Octal Tube	LF0A03	CHOKE—RF (L4)
RECEIVER MECHANICAL COMPONENTS		LF0F00	COIL—RF FM (L2)
CC9A12	CAPACITOR—Ceramic Insulated 1.5 mmf. 500V (C21)	LO1B01	COIL—Osc. B.C. (L6)
CC9A18	CAPACITOR—Ceramic Insulated 4.7 mmf. 500V (C9)	LO1C00	COIL—Osc. S.W. (L5)
CC0B23	CAPACITOR—Ceramic Insulated 12 mmf. 500V (C8)	LO1F00	COIL—Osc. FM (L3)
CC0B24	CAPACITOR—Ceramic Insulated 15 mmf. 500V (C25)	LTOA00	COIL—Broadcast Ant. (T8)
CC7B19	CAPACITOR—Ceramic Insulated 5 mmf. 500V (C35)	RC1G08	RESISTOR—Comp. 47 ohms 1/4W (R15)
CC8B28†	CAPACITOR—Ceramic Insulated 33 mmf. 500V (C19)	RI0T00	INSERT—Brass 10/32 Tuning Core (M48)
CC8B30†	CAPACITOR—Ceramic Insulated 47 mmf. 500V (C15 C20)		
CE1D00†	CAPACITOR—Electrolytic Single Section 3 mfd. 50V (C58)		
CE2D00	CAPACITOR—Electrolytic Dry, 2 section 8 mfd. & 16 mfd. 450V (C37 C50)		
CE1T02†	CAPACITOR—Electrolytic 20 mfd. 25V (C58 C11)		
CM5A26†	CAPACITOR—Mica 150 mmf. 500V (C7 C55 C53 C52)		
CM5A31†	CAPACITOR—Mica 330 mmf. (C56 C57)		
CM5A38†	CAPACITOR—Mica 470 mmf. (C77)		
CM5A40†	CAPACITOR—Mica .001 mfd. (C20)		
CM5E73†	CAPACITOR—Mica 4700 mmf. 500V (C14)		
CM5L02	CAPACITOR—Mica (Low Loss) .002 mfd. 500V (C51)		
CM6L22	CAPACITOR—Mica (Low Loss) 100 mmf. 500V (C16 C5)		
CM6L38	CAPACITOR—Mica (Low Loss) 170 mmf. 500V (C18)		
CP0M31†	CAPACITOR—Paper .01 mfd. 120V (C33 C17 C72 C75)		
CP4M31†	CAPACITOR—Paper .01 mfd. 400V (C6 C27 C32 C39 C13 C30 C47 C43)		
CP2T40†	CAPACITOR—Paper Tubular .05 mfd. 200V (C73)		
CP4T20†	CAPACITOR—Paper Tubular .006 mfd. 400V (C54 C42 C76)		
CP4T31†	CAPACITOR—Paper Tubular .01 mfd. 400V (C71 C40)		
CP4T34†	CAPACITOR—Paper Tubular .02 mfd. 400V (C49)		
CP6T12†	CAPACITOR—Paper .002 mfd. 600V (C48)		
CT1A12†	CAPACITOR—Trimmer Mica (C26)		
CT1A13†	CAPACITOR—Trimmer Mica 4-75 mmf. (C1 C1 C23 C24)		
CT1A14†	CAPACITOR—Trimmer Mica 1.8-40 mmf. (C12)		
CT1A15†	CAPACITOR—Trimmer 4.0-70 mmf. (C69)		
CT1B00	CAPACITOR—Trimmer Air concentric 3-30 mmf. (C1 C10 C22)		
CV0E00	CAPACITOR—Variable (C2)		
LA0F00	COIL—FM Ant. (L1)		
LF0A02	CHOKE—RF (L7 L8)		
LF0A03	CHOKE—RF (L4)		
LF0F00	COIL—RF FM (L2)		
LO1B01	COIL—Osc. B.C. (L6)		
LO1C00	COIL—Osc. S.W. (L5)		
LO1F00	COIL—Osc. FM (L3)		
LTOA00	COIL—Broadcast Ant. (T8)		
RC1G08	RESISTOR—Comp. 47 ohms 1/4W (R15)		
RI0T00	INSERT—Brass 10/32 Tuning Core (M48)		
RC1G14†	RESISTOR—Comp. 150 ohms 1/4W (R12)		
RC1G24†	RESISTOR—Comp. 1000 ohms 1/4W (R36)		
RC1G35†	RESISTOR—Comp. 8200 ohms 1/4W (R38)		
RC1G40†	RESISTOR—Comp. 22,000 ohms 1/4W (R57)		
RC2G41†	RESISTOR—Comp. 27,000 ohms 1/2W (R11)		
RC2G52†	RESISTOR—Comp. 120,000 ohms 1/2W (R1)		
RC3G34†	RESISTOR—Comp. 68,000 ohms 1W (R30)		
RC1H12†	RESISTOR—Comp. 100 ohms 1/4W (R56)		
RC1H16†	RESISTOR—Comp. 220 ohms 1/4W (R18)		
RC1H24†	RESISTOR—Comp. 1000 ohms 1/4W (R23 R28)		
RC1H28†	RESISTOR—Comp. 2200 ohms 1/4W (R6)		
RC1H42†	RESISTOR—Comp. 33,000 ohms 1/4 (R37)		
RC1H44†	RESISTOR—Comp. 47,000 ohms 1/4W (R10 R32)		
RC1H51†	RESISTOR—Comp. 100,000 ohms 1/4W (R21 R31)		
RC1H54†	RESISTOR—Comp. 220,000 ohms 1/4W (R17 R35)		
RC1H58†	RESISTOR—Comp. 470,000 ohms (R25 R52 R4)		
RC1H64†	RESISTOR—Comp. 1.5 meg. 1/4W (R3 R13 R20)		
RC1H66†	RESISTOR—Comp. 2.2 meg. 1/4W (R39 R54)		
RC2H32†	RESISTOR—Comp. 4700 ohms 1/2W (R8 R9 R14)		
RC2H36	RESISTOR—Comp. 10,000 ohms 1/2W (R61)		
RC2H38	RESISTOR—Comp. 15,000 ohms 1/2W (R33)		
RC3H20	RESISTOR—Comp. 470 ohms 1W (R34)		
RC3H36†	RESISTOR—Comp. 10,000 ohms 1W (R19)		
RV0C00†	POTENTIOMETER—(Tone-Treble) (R29)		
RV4C01†	POTENTIOMETER—Volume 2 meg. (R26)		
RV4C02†	POTENTIOMETER—(Tone-Bass) 1 meg. (R27)		
RW0D38	RESISTOR—Wirewound 15,000 ohms (R24)		
TI0C07	TRANSFORMER—1st I.F. FM (T1)		
TI0D09	TRANSFORMER—I.F. Output AM (T4)		
TI0D10	TRANSFORMER—3rd I.F. FM (T5)		
TI0C10	TRANSFORMER—1st I.F. Input AM (T2)		
TI0I01	TRANSFORMER—2nd I.F. FM (T3)		
TR1C00	TRANSFORMER—S.W.R.F. Assy. (T10)		
TR1H00	TRANSFORMER—SW Ant. Assy. (T9)		
TR1L00	TRANSFORMER—B.C. Interstage (T11)		
*#44†	LAMP—Bayonet Base Dial		
*#47†	LAMP—Bayonet Base Pilot		
RECEIVER MECHANICAL COMPONENTS			
BT2R00	BOARD—Contact Loop (M15)		
BT1S00†	BOARD—Terminal 1 soldering lug Single Mt. (M16)		
BT2S00†	BOARD—Terminal 2 Soldering Lug Single Mt. (M17)		
BT2S03†	BOARD—Terminal 2 Soldering Lug Single Mt. (M18)		
BT2S06	BOARD—Terminal 2 Soldering Lug Single Mt. (M23)		
BT3S03	BOARD—Terminal 3 Soldering Lug Single Mt. (M1)		
BT4S02	BOARD—Terminal 4 Soldering Lug Double Mt. (M19)		
BT5S01	BOARD—Terminal 5 Soldering Lug Double Mt. (M20)		
BT6S01	BOARD—Terminal 6 Soldering Lug 2 mtg. lug (M21)		
BT7S00	BOARD—Terminal 7 Soldering Lug 2 mtg. lug (M22)		
CD0C20	CABLE—Dial		
DS0E01	DIAL—12 Tube AM FM Glass		
GR0I04	GROMMET—Cushion Dial Glass Rubber (M21)		
GR0S12	GROMMET—Condenser Shockmount (30)		
HB0M23	BRACKET—Assy. R.H. Back Plate Support (M26)		
HB0M24	BRACKET—Assy. L.H. Back Plate Support (M27)		
HB0M25	BRACKET—Bearing Assy. (M28)		
HB0M31	BRACKET—Condenser R.H. (M29)		
HB0M32	BRACKET—Condenser L.H. (31)		
HB0M34	BRACKET—R.F. Assy. (M32)		
HB0M36	BRACKET—Band Switch (M33)		
HB0M37	BRACKET—Rotary Switch (M34)		
HB0M38	BRACKET—Manual Tuning Control (M35)		
HB0M41	BRACKET—Power Control Mt. (M36)		
HB0M42	BRACKET—Chassis Shockmount (M37)		
HB0M43	BRACKET—Terminal Board & Trimmer Plate Assy. (inside T5 Can)		
HB0S03	BALL—Tuning Shaft Bearing 3/32 Dia. (M38)		
HB0S04	BALL—Tuning Shaft End Bearing 5/32 Dia. (M39)		
HC0C00†	CLIP—Coil Mtg. (M40)		
HC0C03†	CLAMP—Dial Cable (M41)		
HC0C08†	CLIP—Cable (M42)		
HC0L00	COVER—"S2" Switch (M43)		
HC0S28	WASHER—"C" Blued Finish (M44)		
HC0T02	CLAMP—Ring Retainer (M45)		
HC0C00	HOOK—Dial Cord (M46)		
HH0D00	HOLDER—Dial Glass (M47)		
HP0B00	PLATE—Dial Back (M49)		
HS0C57	SPRING—Dial Cord		
HS0C74	SPRING—Push Button Shaft Coil		
HS0F00	SLEEVE—2x Spacer Flared (M50)		
HS0S06	STUD—Shoulder 10 3/32 Thread (M51)		
HS0S07	SCREW—3/32 x 3 1/16 Shoulder (R.H. end of RF Tuner Assy.)		
IN0I00†	INTEGRATOR—Dial (M52)		
PI0A00†	PIN—AM Loop Antenna Connector		
PL0G00†	PLUG—Single Contact Male Phono (J3)		
PL0G05	PLUG—2 Contact Male (J6)		
JP3001	PLUG—3 Contact Male (J1)		
JR3001	RECEPTACLE—3 Contact Ant. (J1)		
JR4001	RECEPTACLE—4 Contact (J2)		
JR1S00	RECEPTACLE—Single Contact (J3)		
MB0B03	BEARING—Manual Tuning Control (M52)		
MB0S00	BUSHING—Manual Tuning Control (M53)		
MG0S00	GEAR—Segment & Hub Assy. (M54)		
MG0S01	SPROCKET—& Hub Assy. (M55)		
MP0M01	PULLEY—Drive (M56)		
MP0M02	PULLEY—Idle Dial Cord (M57)		
MR0P00	RAIL—Pointer (M58)		
MS0C01	SHAFT—Band Switch Control (M59)		
MS0T09	TUNING—Shaft (M60)		
SM0B00	SHIELD—Min. Tube Base (attached to chassis) (M61)		
SM0B01	SHIELD—Metal Braid		
SM0T03	SHIELD—Miniature Tube (M62)		
SO0D07	SOCKET—Dial Light (Lead 12 1/4" Long) (M63)		
SO0C08	SOCKET—Dial Light (Lead 8 3/4" Long) (M64)		
SO8L02	SOCKET—Locktal Tube (Ringmount)		
SO8L03	SOCKET—Locktal Tube		
SO7M05	SOCKET—Min. Tube (Zip in type)		
SO8M01	SOCKET—Power Cable (M65)		
SR4G00	SWITCH—Rotary Range (S1)		
SR2L00	SWITCH—Rotary Snap SPST (S2)		
ST0M00	TUNING—Core 10-32 Threaded, Copper Rod		
XS0C02	STRIP—Copper (M66)		
XS0C03	STRIP—Contact (Rotary Switch Shaft) (M67)		
XS0C04	STRIP—Contact (Band Switch Shaft) (M68)		
XS0C05	STRIP—Copper 3" x 5 1/16" x .004 (M69)		
BP0B01	BUTTON—Mottled Brown Push		
BR0R00	BUMPER—Swing-A-Door Cam (Rubber)		
BZ0B06	LCOP—Cabinet Back		
BZ0D09	BAFFLE—Cardboard & Cloth (T5)		
BZ0D10	BAFFLE—Cardboard & Cloth with cutout		
DZ0F13	DECAL—Tuning		
DZ0F14	DECAL—Volume		
DZ0F15	DECAL—On/Off		
DZ0F16	DECAL—AM—FM		
DZ0F17	DECAL—Treble		
DZ0F18	DECAL—Bass		
DZ0N00	DECAL—"Swing-A-Door"		
GR0S00†	GROMMET—3 x 8 x 7.8 x 1 1/2 thick Rubber Shockmount		
GR0S11	GROMMET—9 1/16 x 1 1/4 x 9 3/32 thick Split-type Shockmount		
GZ0M05	GRILLE—Metal		
HB0M27	BRACKET—2 1/4 x 1 7/16 x 1"		
HB0M30	BRACKET—13 1/2 x 6 1/2 x 1 1/2"		
HC0C07†	Record Changer Mtg.		
HC0C08†	CLIP—1 x 5 8" Cable		
HC0C09†	CLIP—"V" Shaped Runner Stop		
HC0S29	CLIP—Spring "C" Washer 5 1/16 x .039		
HC0S30	CLIP—Pushbutton Retainer Spring		
HK0R00†	RETAINER—Ring (For Control Knob)		
KN0B04	KNOB—Door Pull		
HN0R00†	BUSHING—10/32 Threaded		
HR0P01†	RIVET—1/8 x 3/16" Oval Head N.P. Tubular		
HR0P05†	RIVET—13 64 x .121" Oval Head N.P. Tubular		
HR0S07	RIVET—5 1/16 Head x 1.5 Shoulder x .330" Length (Cam Bumper)		
HS0C48†	SPRING—Helical Coil (Record Changer Shockmount)		
HS0C56†	SPRING—Helical Coil (Record Changer Shockmount)		
HS0P17†	SPACER—3/8 x 1 1/2 x 1 1/2"		
HT0F00†	TRAY—FF51 Record Changer		
HT0T00	TRACK—Record Changer		
HZ0C00†	CATCH—Bullet Door Furniture		
HZ0G01†	METAL—Glides		
HZ0H00	HINGE—Lid		
HZ0H04	HINGE—Door		
HZ0S02	SUPPORT—Lid		
J10A00	JEWEL—Pilot Light (Antenna)		
KB0B01	KNOB—Indexed Control		
KC0B06	KNOB—Control		
MC0C00	CAM—Bumper Assy.		
MC0C01	CAM—Swing-A-Door		
MR0C04	ROLLER—Swing-A-Door (Shaft and Roller)		
MS0F00	RUNNER—13 5/8 x 1 3/8" Plain		
MS0G00	RUNNER—13 5/8 x 1 3/8" Guide		
NE0M00	EMBLEM—Nameplate		
NP0S00	NEEDLE—Sapphire Phono		
PF0B00	FELT—Pads Brown		
WF0Z03†	WASHER—Felt Brown 11 3/2 x 7/8 x 1 3/2"		
XZ0R00	RAIL—Record Changer Stop		
Z10I00	DOOR—front right section (Matched Mahogany)		
Z10G00	LID—Top Permanent lid (Matched Mahogany)		
*ZW1G00	CABINET—Assy. (BW71) Period Combination (Mahogany)		
*F15†	CHANGER—Record		

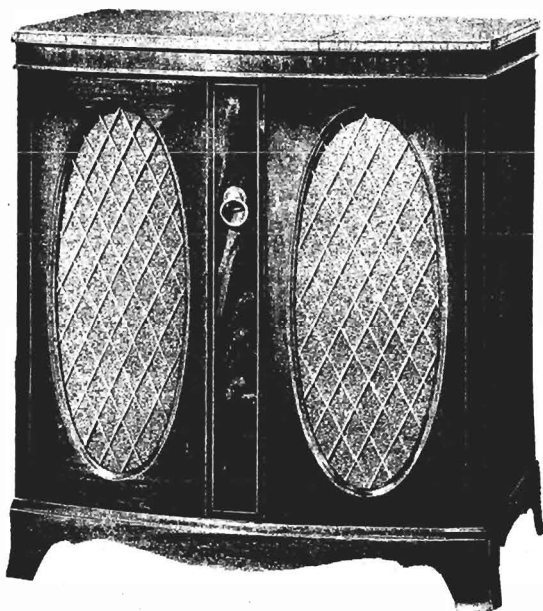


Fig. 1 Model 1217D

SPECIFICATIONS

Power Requirements

105 - 125 volts, 60 cycles AC

Power Consumption (including phonograph)
180 watts

Tuning Frequency Range

AM 540 - 1620 KC

SW AM 6 - 15.5 MC

FM 88 - 108 MC

Tube Complement

1-6AG5, 1-7F8, 1-6BE6, 2-7AH7, 2-6H6,

2-6SN7, 2-6V6GT, 1-5U4G, 1-6AQ6, 1-6BA6,
Total 14

Pushbuttons

8 mechanical type for any AM, SW, or FM station.

Loudspeaker

12-inch diameter electro-dynamic.

Record Changer

Automatic - twelve 10-inch or ten 12-inch standard records.

Maximum Power Output

12 watts.

Overall Dimensions

Height 34", width 31", depth 18 1/4".

CIRCUIT ANALYSIS

The Model 1217D radio provides radio reception of the Standard AM Broadcast Band, the Shortwave Band from 6 to 15.5 megacycles, and the FM Band from 88 to 108 megacycles. Phonograph reproduction is provided through the audio amplifier from a high impedance phono jack located on the radio chassis. A standard superheterodyne circuit is used, with one stage of tuned radio frequency on all three bands. A low impedance loop antenna installed on the back cover of the cabinet is used on both the Standard Broadcast and Shortwave Bands. A built-in dipole antenna is used on the FM Band. An outside antenna for the AM Bands may be connected to the binding screw marked ANTENNA on the rear of the cabinet. A 300 ohm outside FM dipole antenna may be connected to the terminals marked FM DIPOLE but the built-in dipole must be disconnected when an outside antenna is used.

CHASSIS CODE CHANGES

The schematic shown in Fig. 8 is for the code D radio chassis and the code C amplifier chassis. The data given below indicates the circuit changes incorporated in the different chassis as compared to this schematic.

RADIO CHASSIS

CODE C CHASSIS

First audio amplifier, 6SN7, and AM demodulator, 6H6, filaments were connected from pin #1 of J4 to ground, instead of being isolated from ground and in parallel with the FM detector 6H6 filament.

The audio output of the FM detector transformer (T5) was connected directly to pin #1 (grid) of the 6SN7 first audio amplifier. This deleted C85, 86, 87, R72, and 73. Cathode bypass capacitor, C88, was not used; cathode resistor R60 and grid resistor R59 were connected to ground through a common 10K resistor.

De-emphasis filter capacitors in the output circuit of T5, C51 and C53 were .002 mfd and 150 mmf respectively.

The Hush-O-Matic circuit shown in Fig. 9 was used in this chassis.

The 7F8 dual triode is used as an oscillator-mixer in the FM circuit and is made inoperative by removing its plate voltages when the range switch (S1) is in any but the FM position. Likewise, the 6BE6 is used as a converter for the Standard Broadcast and Shortwave Bands only, and has no plate voltage applied to it when S1 is in the FM or PH (phono) positions. One half of the 6H6 (pins 3 and 4) AM demodulator tube is used in the delayed AVC circuit for FM. The first triode section (pins 1, 2 and 3) of the 6SN7 in the radio chassis is used only when the range switch, S1, is in the FM position, but does not have the B plus removed from its plate when S1 is in any of the other three positions. The 6AQ6 and 6BA6 are used as amplifier-rectifier and control tubes for the Hush-O-Matic circuit and are inoperative on radio reception.

AMPLIFIER CHASSIS

CODE B

The hum-balancing potentiometer R76 and the voltage divider network consisting of R74 and R75 were deleted. The transformer filament winding used only for the FM detector (6H6) was center tapped and this tap connected to the cathodes of the 6V6 output tubes.

Some chassis coded B were identical to code C chassis.

ADJUSTMENT OF HUM-BALANCING POTENTIOMETER

The hum-balancing potentiometer, R76, on code C amplifier chassis should be adjusted with the range control in the FM position and the volume control at minimum. Adjust R76 to obtain minimum hum from the loudspeaker.

GENERAL

It is not necessary to remove the two chassis from the cabinet if the FM channel only is to be aligned. An FM test socket is provided on the chassis sideplate (facing outward in normal mounting position) at which the various voltages from the ratio detector are available for either meter or oscilloscope measurements.

If the BC and SW channels are to be aligned, it is advisable to remove the radio chassis from the cabinet in order to gain access to the BC and SW AVC voltage used for output indication. It is rather difficult to align the BC and SW RF and IF sections when the volume control is full "ON" because of background noise accompanying the high gain of the audio amplifier. A DC vacuum tube voltmeter connected to the junction of R20 and C40 (lug 3 of S1-E—See Figs. 7 & 13) will provide an accurate and stable indication of RF output, at the AM demodulator, for alignment of the BC and SW bands.

Unless the various circuits of each channel are very much out of alignment, adjustments made in the SW circuits will not affect the BC circuits and adjustments made in the FM circuits will not alter either the BC or SW circuit adjustments. However, if any of these channels are badly out of alignment necessitating considerable adjustment, it is best, after these adjustments have been made, to go back and check the adjustment previously made on the other channels.

An un-modulated (CW) signal of the proper radio frequency may be used for meter alignment of all three channels (BC, SW, and FM), but it is convenient to use a 400 cycle AM signal during alignment and occasionally advance the volume control to be sure the correct signal is tuned in.

Before making any adjustment, allow the receiver and signal generator to warm up for at least five minutes. **IMPORTANT:** All adjustments must be made in the order in which they are given; i.e., the BC band must be aligned first, followed by the SW, and last, the FM band.

INSTRUCTIONS FOR REMOVING THE CHASSIS

If, for any reason, it is necessary to remove the radio chassis from the cabinet, proceed as per following instructions:

Remove the power cord plug from the wall receptacle, and remove all control knobs and push-buttons by simply pulling them straight up from the panel. The cabinet back cover and AM loop assembly may be detached from the chassis by pulling the loop leads out of their receptacle on the chassis, after the small wood screws holding the assembly on the cabinet have been removed. The FM antenna is disconnected from the chassis by removing the three prong plug at the rear of the chassis. All power cables and leads may be disconnected at convenient plugs and jacks in the chassis. The speaker is connected to the amplifier chassis by a 5-prong plug on the speaker.

After all connecting leads and cables have been disconnected from the chassis, remove the four hexagon-head machine screws which hold the chassis mounting rails in the cabinet. The two upper machine screws are removed from inside the record changer compartment. The two lower bolts are located below the radio chassis and removed from the chassis side of the cabinet. Note: When replacing the chassis in the cabinet, be sure dial glass is up snug against the control panel when the four mounting screws are tightened and that they are tightened securely.

PUSH-BUTTON ADJUSTMENT

The mechanical type of push-button tuning used with this receiver makes possible the selection of any one of eight pre-selected stations. Any push-button may be adjusted to select any station in the three tuning bands. However, more accurate tuning of the SW and FM stations will be obtained if the lower four buttons E, F, G and H, Figures 2 & 3, are used for stations within these bands.

1. Remove all push-buttons by pulling straight up from the panel.
2. Manually tune in the desired station.
3. Release the screw adjacent to the push-button shank and push the shank in firmly as far as it will go while holding the tuning control knob.
4. Release the shank and tighten the locking screw.
5. Rotate the tuning control to a different position and check the push-button setting by again depressing the shank previously adjusted. The tuning dial should automatically return to the stations previously tuned in. However, in some cases it may not be exactly on the peak frequency of the stations. In such cases, continue as follows:
6. Re-tune the station manually to its peak frequency, and note whether it is necessary to increase or decrease the frequency setting for optimum tuning.
7. If it is necessary to increase the dial frequency setting, then the dial should be set at an additional increase beyond the optimum point (approximately the amount of the increase) and procedures 3, 4, 5 and 6 repeated. The push-button should then tune in the station exactly on its peak frequency.
8. If it is necessary to decrease the dial frequency setting, then the dial should be set at a lower frequency from its optimum point (approximately the amount of the decrease) and the procedure in 3, 4, 5 and 6 repeated.
9. Repeat the above procedures for the remaining seven push-buttons.

After the push-buttons have been set up as previously described, the proper tab with its transparent cover should be inserted together in each push-button knob. The push-buttons should now be placed on the proper shanks.

ALIGNMENT PROCEDURE

EQUIPMENT REQUIRED

Signal Generator

AM, 455 KC to 106 MC

FM, 10.7 MC and 88 to 108 MC.

Vacuum Tube Voltmeter

DC up to approximately 20 volts. Ground, or minus, must be isolated from the power line.

Oscilloscope

FM Test Circuit Plug

See Fig. 7 for details.

.01 mfd and 50 mmf (or less) capacitor

used for connecting signal generator to receiver.

Alignment Screwdriver

Must be 100% non-metallic and preferably over 8" in length.

Alignment Socket Wrenches—must be non-metallic.

One $\frac{1}{4}$ " hexagon, 8" long.

One $\frac{3}{8}$ " hexagon, 6" long.

If the $\frac{3}{8}$ " wrench has a hole through the handle of sufficient diameter to permit inserting the alignment screwdriver, the locking nuts on L1, L2 and L3 can be loosened or tightened at the same time these padders are adjusted with the screwdriver inside.

AM ALIGNMENT

Turn receiver and test instruments on and allow to warm up for at least 5 minutes. (Input voltage, 117 volts 60 cycles AC). Set volume control to minimum, bass and treble controls full counterclockwise, range control to BC (third from most counterclockwise position), tuning gang fully closed. Set dial pointer to Reference Mark at low frequency end of dial as shown on Fig. 6. If built-in AM loop antenna is disconnected, the two contacts of the AM antenna input jack located on top the chassis must be shorted together. C69 and C4 should be adjusted with loop connected.

IF CHANNEL

1. Short #5 terminal on gang (C2-F) to chassis. See Fig. 2.
2. Set signal generator to 455 KC, CW or AM, and connect to #3 gang terminal (C2-E) through a .01 mfd capacitor. See Fig. 2.
3. Connect low range of V.T.V.M. to junction of R20 and C40 (lug 3 of switch S1-E is a convenient point—See Figs. 8 & 13), and chassis ground, and adjust signal generator attenuator to produce approximately 2 volts of AVC on the V.T.V.M.
4. Adjust C24 (BC oscillator trimmer) for maximum meter reading, keeping signal input to produce approximately 2 volts AVC. Repeat these adjustments until no further improvements can be made in any one of them. NOTE: All adjustments must be made with a completely non-metallic screwdriver.

BC OSCILLATOR ALIGNMENT

1. Remove short from #5 gang terminal.
2. Move signal input from #3 gang terminal to external AM antenna terminal (J1) and set input frequency to 1475 KC CW or AM. (V.T.V.M. remains connected as for IF alignment.)

3. Set tuning control to 1475 KC.

4. Adjust C24 (BC oscillator trimmer) for maximum meter reading.

5. Set signal generator and receiver dial pointer to 580 KC.

6. Adjust BC oscillator padder C26 for maximum meter output. Repeat steps 2 to 5 until oscillator tracks correctly. Any change in C26 will necessitate a readjustment of oscillator trimmer C24.

RF AND ANTENNA ALIGNMENT FOR BC BAND

1. Change coupling capacitor connecting signal generator to AM external antenna terminal from .01 mfd to 50 mfd or less. (Terminals of AM loop input jack must be shorted together if loop is disconnected.)
2. Adjust signal generator and receiver tuning control to 1475 KC.
3. Adjust BC oscillator trimmer, C24, BC RF trimmer, C12, and BC antenna trimmer, C69, for maximum output. (If AM loop is disconnected, C69 should be adjusted after chassis is installed in cabinet.) Rock tuning gang slightly for maximum output as adjustments are made.
4. Check overall tracking at 580 KC and 965 KC. Maximum output should occur within the ± 10 KC of the indicated dial pointer reading. If it falls outside these limits, the plates of the gang rotor should be bent to correct tracking, but this is a difficult operation and should be attempted only by experienced technicians. Bending the plates of the gang rotor will likely cause mistracking on the shortwave band.
5. Repeat steps 3 and 4 until no appreciable improvement can be obtained by additional adjustments.

SW ALIGNMENT

1. V.T.V.M. and signal generator remain connected as for preceding step 5 of BC RF and antenna alignments; range switch in SW (most clockwise position).
2. Set signal generator and tuning control to 15 MC CW or AM.
3. Adjust SW oscillator trimmer (C23), SW RF trimmer (C11), and SW antenna trimmer (C4) for maximum output. NOTE: If circuits are badly out of alignment, it may be necessary to apply the signal first to terminal #3 on gang (C2-E) until oscillator is brought close to correct alignment. The local oscillator frequency in the receiver should be adjusted to the RF *plus* the IF (not below the RF). The correct position can be determined by turning C23 all the way in (clockwise) and then out (counterclockwise) until the second peak is reached.
4. Tune receiver and signal generator to 6 MC and check calibration and output. Maximum meter reading should be obtained with the dial pointer ± 100 KC of the 6 MC dial reference mark and an AVC output voltage not less than one-half of the AVC voltage obtained at 15 MC, providing the same voltage is applied to the antenna in both cases.

FM ALIGNMENT

CW — METER METHOD

Turn receiver and test instruments "ON" and allow to warm up for at least five minutes. (Input voltage, 117 volts 60 cycles AC.) Set volume control to minimum, bass and treble controls full counterclockwise, range control to FM position (second from most counterclockwise position), and tuning gang fully closed. Dial pointer should be over Reference Mark as directed in first paragraph of AM Alignment. Connect FM dummy antenna to FM antenna binding screws on receiver.

1. Insert special FM test circuit plug, detailed below, in test circuit jack J2 located on left side of radio chassis. See Fig. 2 & 7.
2. Connect V.T.V.M. ground or "minus" lead to point "B" and "plus" lead to IF pin on test circuit plug.
3. Connect signal generator to #4 (C2-B) gang terminal through a .01 mfd capacitor and short #6 gang terminal (C2-C) to chassis. See Fig. 2.
4. Adjust output of signal generator to obtain 10.7 MC CW and approximately 4 volts on V.T.V.M.
5. Adjust C35B, C35A, C28B, C28A, and C46A for *maximum* meter reading, repeating all adjustments several times. NOTE: It may be necessary to apply the 10.7 MC signal to pin 6 of the 1st IF tube (7AH7) and adjust C35B, C35A, and C46A before applying the signal to #4 gang terminal and adjusting C28B and C28A.
6. Change V.T.V.M. "minus" to point "A" (center tap of two 100 K resistors) of test circuit jack and "plus" lead to audio (marked AF on chassis).
7. Turn signal generator "OFF" and set meter to zero when no signal is applied to IF.
8. Turn signal generator "ON" and adjust C46B for zero output on meter. It may be possible to obtain two or more points of adjustment at which a zero meter reading can be obtained. The correct one is the one at which the meter passes through zero most sharply with the minimum rotation of C46B.
9. Alternately adjust C46A (3rd FM IF primary) for maximum DC voltage across pins "B" and "IF" (meter connected as for previous IF alignment), and C46B (3rd FM IF secondary) for *minimum* DC voltage from point "A" to "audio." NOTE: In making this adjustment, the signal input level should be adjusted to provide approximately 6 volts DC across pins "B" and "IF" of test jack.
10. Remove short from #6 gang terminal and change signal generator input from gang to FM antenna jack on rear of radio chassis, applying signal through FM dummy antenna circuit shown in Fig. 3.
11. V.T.V.M. should be connected from point "B" to "IF" of test circuit plug.
12. Adjust signal generator and tuning control to 106 MC and output to produce approximately 10 volts on V.T.V.M.
13. Using a completely non-metallic $\frac{1}{4}$ " hexagon socket wrench, adjust FM oscillator trimmer (C22), FM RF trimmer (C10) and FM antenna trimmer (C1) for maximum output voltage read on V.T.V.M., rocking the tuning gang slightly as these adjustments are made. NOTE: Be very careful when adjusting these trimmers, not to spring them and thus cause them to become shorted.
14. Set signal generator and tuning control to 90 MC.
15. Adjust FM oscillator padder (L3), FM RF padder (L2) and FM antenna padder (L1) for maximum output voltage. The $\frac{3}{8}$ " locknut on these padders must be loosened before adjustments are made and tightened after adjustments are completed.
16. Repeat steps 13, 14 and 15 until maximum output voltage is obtained with the dial pointer at 90 MC and 106 MC when the signal generator is set at these respective frequencies. Any adjustments made under step 15 above must be followed by repeating the adjustments required under step 13.

VISUAL METHOD

The antenna, RF, oscillator and first and second IF stages are aligned with a CW signal in the same manner described under the CW-meter method of alignment. The adjustment of the third IF, or ratio detector, determines to a considerable degree the fidelity and tuning characteristic of the receiver; therefore, the visual method, using an oscilloscope and FM signal, of aligning this stage may give better results than the CW - meter method. Numerous advantages can be given for either method. The best method to use depends not only on the type and quality of the test instruments available, but also on the ability and experience of the technician.

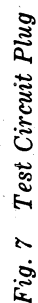
Turn receiver and test instruments "ON" and allow to warm up for at least five minutes. (Input voltage, 117 volts 60 cycles AC.) Set volume control to minimum, bass and treble controls full counterclockwise, range control to FM position (second from most counterclockwise position), and tuning gang fully closed. Dial pointer should be over Reference Mark as directed in first paragraph of AM Alignment. Connect FM dummy antenna to FM antenna binding screws on receiver.

1. Connect V.T.V.M. ground or "minus" lead to AVC pin of test circuit jack (J2) located on left side of radio chassis. (See Fig. 2).

FM ALIGNMENT**VISUAL METHOD—Cont.**

The test circuit plug used for the CW - meter method of FM alignment may be used throughout the following visual alignment procedure for providing convenient points of connections to the test circuit jack. The two 100 K resistors connected to the test circuit plug and used during the CW - meter method are not needed when the visual alignment procedure is followed, but do not affect the circuit any great amount and therefore may be disregarded.

2. Connect signal generator to #4 (C2-B) gang terminal through a .01 mfd capacitor and short #6 gang terminal (C2-C) to chassis. See Fig. 2 for gang terminal numbers.
3. Adjust output of signal generator to obtain 10.7 MC CW and approximately 6 volts on the V.T.V.M.
4. Adjust C35B, C35A, C28B, and C46A for maximum meter reading, repeating all adjustments several times.
5. Connect test equipment as shown in Fig. 4. Some oscilloscopes have phasing controls and a 60 cycle sine wave horizontal sweep provided internally. If such an oscilloscope is available, the horizontal input connection and phasing capacitor shown in Fig. 4 are not required. The vertical input to the oscilloscope is connected to the AUDIO pin on the test circuit jack and the ground of the oscilloscope connected to the receiver chassis. Connect V.T.V.M. ground or "minus" lead to point B and "plus" lead to IF pin on test circuit plug.
6. Connect signal generator to #4 (C2B) gang terminal (See Fig. 2) through a .01 mfd capacitor and short #6 gang terminal (C2C) to chassis.
7. Adjust output of signal generator to obtain 10.7 MC FM and approximately 6 volts on the V.T.V.M. The sweep width of the FM signal must be at least 200 KC plus and minus the center frequency. An "S" curve similar to Fig. 5 should now appear on the oscilloscope, but it will likely be necessary to adjust the signal generator frequency slightly in order to properly center this "S" curve on the oscilloscope screen. If a double trace appears, as shown in Fig. 5b, adjust the phasing control (may be built in the oscilloscope or the phasing capacitor shown in Fig. 4) until a single trace is obtained.
8. Adjust C46A (ratio detector primary) to obtain maximum V.T.V.M. reading and C46B (ratio detector secondary) for best symmetrical "S" curve on oscilloscope. Repeat these adjustments several times.
9. Remove short from #6 gang terminal and change signal generator input from gang to FM antenna jack on rear of radio chassis, applying signal through FM dummy antenna circuit shown in Fig. 3.
10. V.T.V.M. should be connected from point "B" to "IF" of test circuit plug.
11. Adjust signal generator and tuning control to 106 MC CW and output to produce approximately 10 volts on V.T.V.M.
12. Using a completely non-metallic $\frac{1}{4}$ " hexagon socket wrench, adjust FM oscillator trimmer (C22), FM RF trimmer (C10) and FM antenna trimmer (C1) for maximum output voltage read on V.T.V.M., rocking the tuning gang slightly as these adjustments are made. NOTE: Be very careful when adjusting these trimmers, not to spring them and thus cause them to become shorted.
13. Set signal generator and tuning control to 90 MC.
14. Adjust FM oscillator padder (L3), FM RF padder (L2) and FM antenna padder (L1) for maximum output voltage. The $\frac{3}{8}$ " locknut on these padders must be loosened before adjustments are made and tightened after adjustments are completed.
15. Repeat steps 11, 12, 13 and 14 until maximum output voltage is obtained with the dial pointer at 90 MC and 106 MC when the signal generator is set at these respective frequencies. Any adjustments made under step 14 above must be followed by repeating the adjustments required under 12.
16. It is possible to visually align the ratio detector transformer (C46A & C46B) after the oscillator, RF and antenna circuits, have been aligned. In some cases this may be desirable, especially if the output of the FM signal generator is rather low at 10.7 MC. If this method is followed, align the IF channel up through C46A (ratio detector primary) and the oscillator, RF and antenna circuits as directed above, using a CW or AM signal and the V.T.V.M. connected across the ratio detector load resistor. (Point B and IF of the test circuit jack as shown in Fig. 2). Then, with the oscilloscope and V.T.V.M. connected as directed in step 5 above and the signal generator still connected to the FM antenna input through the FM dummy antenna, apply an FM signal of any frequency between 90 and 106 MC and adjust the receiver tuning control to center the resulting "S" curve on the oscilloscope screen. The ratio detector transformer (C46A & C46B) may now be adjusted in exactly the same manner as directed in step 8, except that it may be advisable to adjust the output of the signal generator to produce approximately 10 volts on the V.T.V.M. instead of 8 volts.



6

Fig. 4 Instrument Connection Diagram

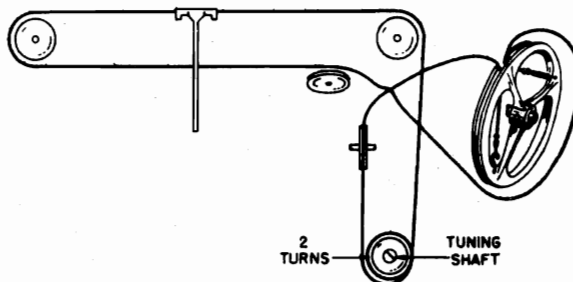
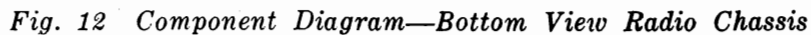


Fig. 9 Schematic Diagram—Model 1217D



CONDITIONS OF MEASUREMENTS

[illegible]

NOTE: VOLTAGE AND RESISTANCE MEASUREMENTS ON 6BE6 & 6H6 AM DEMODULATORS MADE WITH RANGE SWITCH IN AM POSITION



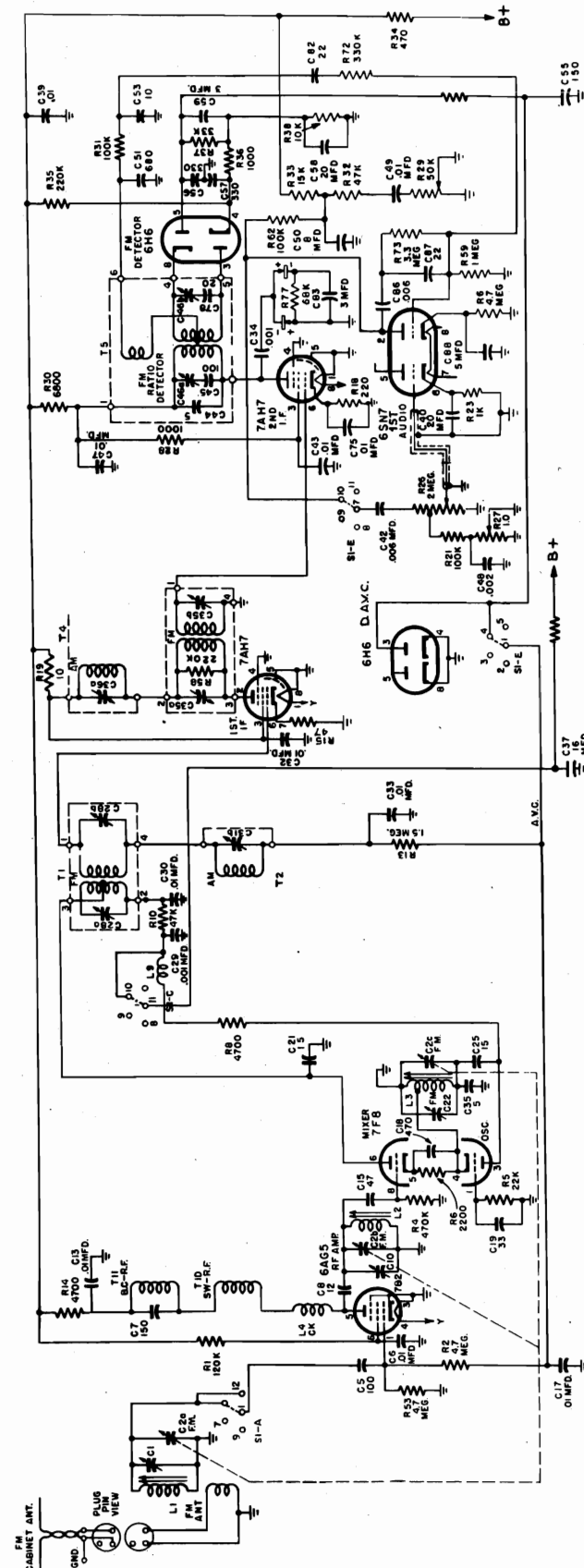
CLARI-SKEMATIX

Registered Trademark

BENDIX PAGE 19-29

BENDIX RADIO DIV.

MODEL 1217D



NOTE:
1ST POSITION (PHONO)
NOT SHOWN.
BAND-SWITCH SHOWN
AT 2ND POSITION CLOCKWISE.
F.M. BAND
88-108 MC

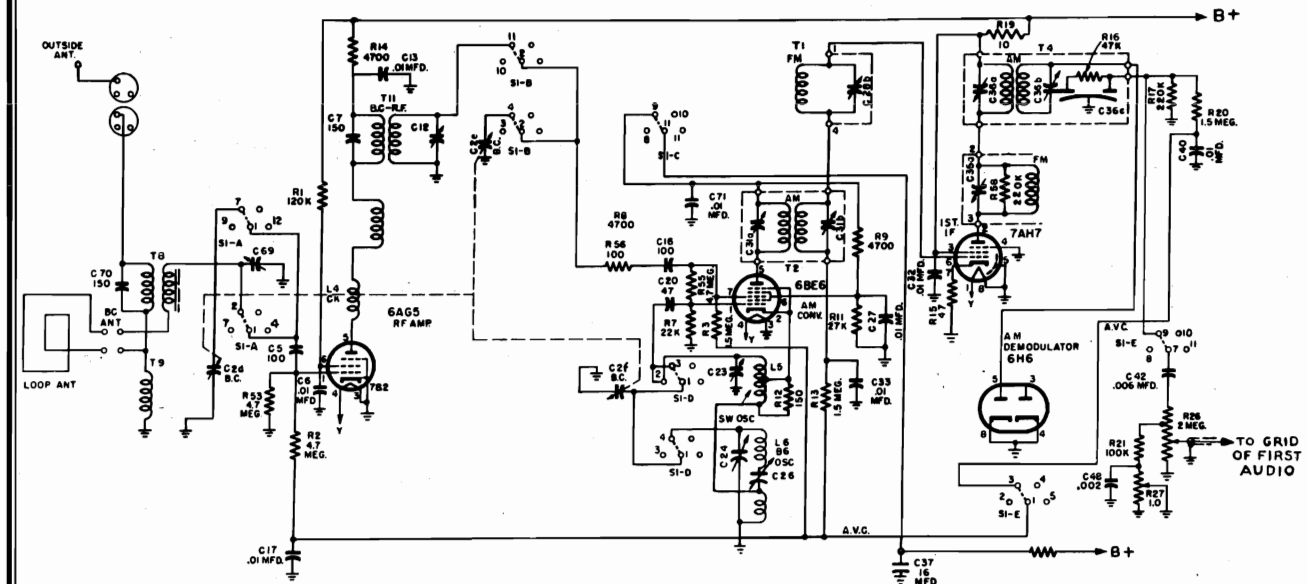
CLARI-SKEMATIX

Registered Trademark

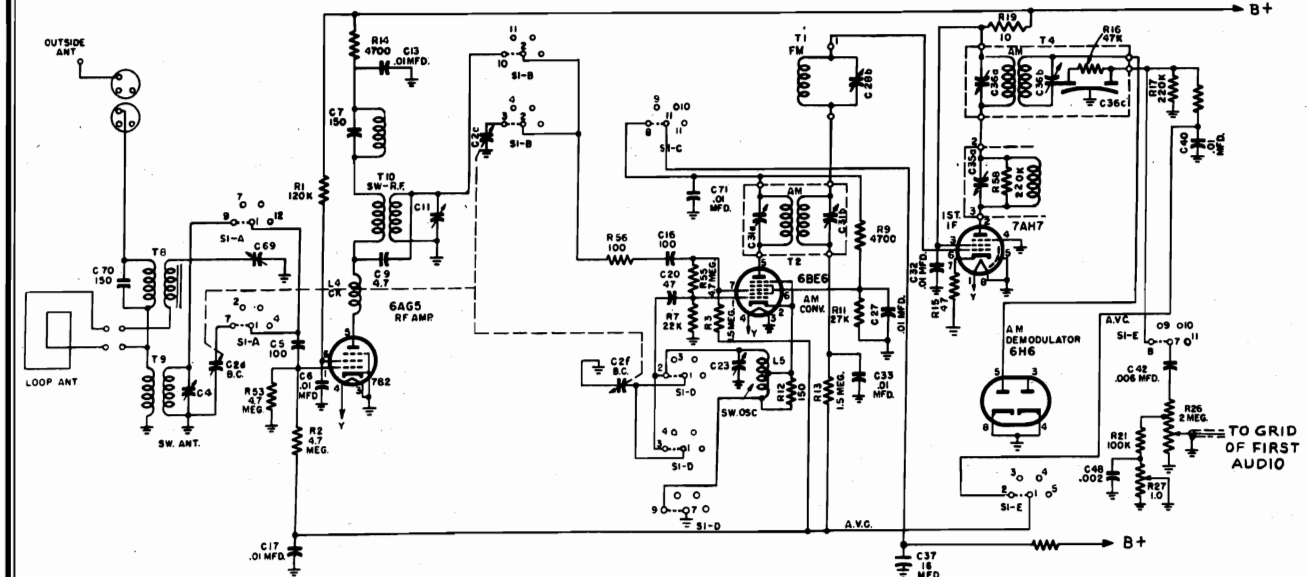
PAGE 19-30 BENDIX

MODEL 1217D

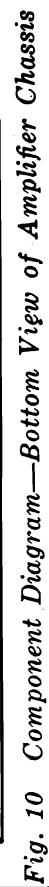
BENDIX RADIO DIV.



BAND-SWITCH SHOWN
AT 3RD POSITION CLOCKWISE.
BROADCAST BAND
540-1600 KC



BAND-SWITCH SHOWN
AT 4TH POSITION CLOCKWISE.
SHORT WAVE BAND
5.75 - 15.5 MC



MODEL 1217D

BENDIX RADIO DIV.

REPLACEMENT PARTS LIST

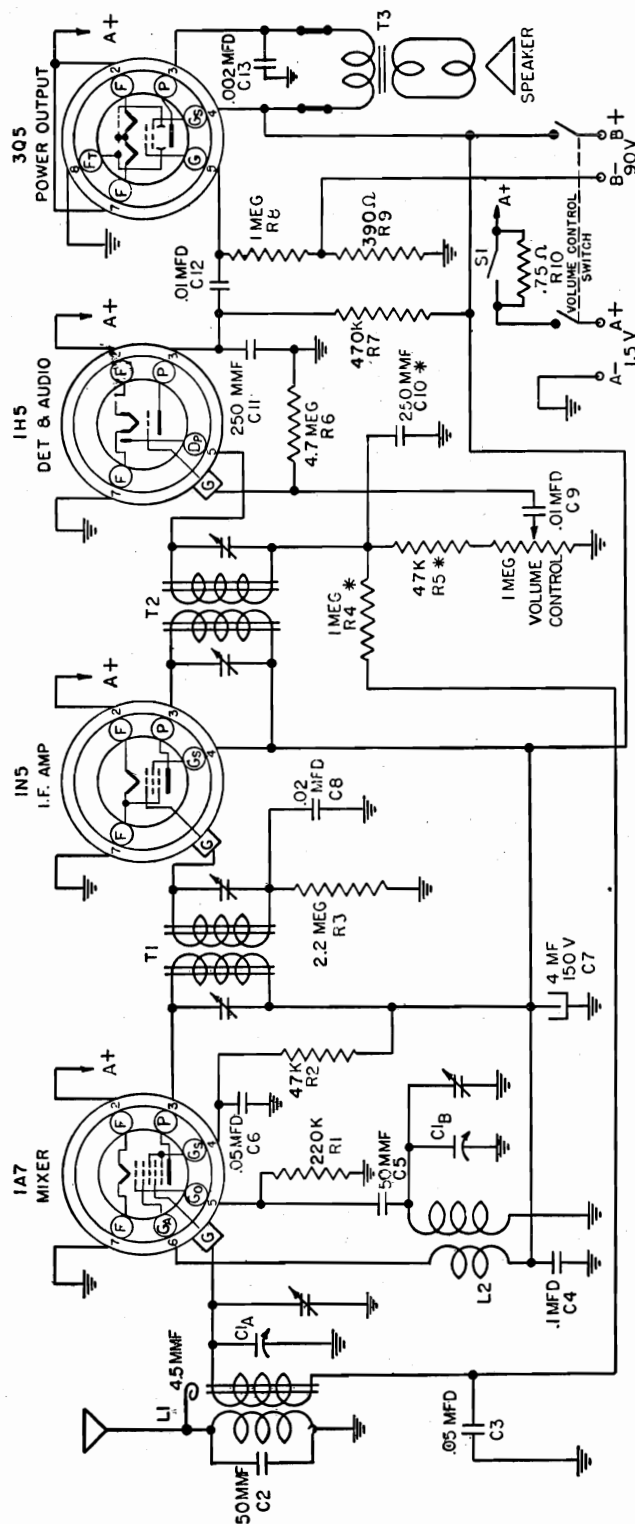
Stock Number	Symbol Number	Description	Stock Number	Symbol Number	Description
AMPLIFIER ELECTRICAL COMPONENTS					
CP2T40	(C38)	CAPACITOR—Tubular Paper .05 mfd 200V	CT1B03	(C46b)	CAPACITOR—Trimmer 5-25 mmf
CP4M51	(C60,61)	CAPACITOR—Moulded Paper .01 mfd 400V	CP4T12	(C48,77)	CAPACITOR—Paper .002 mfd 600V
CE2A02	(C62,63)	CAPACITOR—Electrolytic 20-20 mfd 450V	CP4T34	(C49)	CAPACITOR—Tubular Paper .02 mfd 400V
CP5T51	(C64)	CAPACITOR—Paper .1 mfd 600V	CM4A42	(C51)	CAPACITOR—Mica 680 mmf 300V
CP4T20	(C65,66,73)	CAPACITOR—Tubular Paper .006 mfd 400V	CM5A00	(C53)	CAPACITOR—Mica 10 mmf 500V
CP4T31	(C67,68)	CAPACITOR—Tubular Paper .01 mfd 400V	CM5A34	(C56,57)	CAPACITOR—Mica 330 mmf 500V
RC22A334M	(R41)	RESISTOR—Comp. 330K ¼W	CE1D00	(C59)	CAPACITOR—Electrolytic 3 mfd 50V
RC22A102K	(R42,43)	RESISTOR—Comp. 1,000 ohms $\pm 10\%$ ¼W	CT1A15	(C69)	CAPACITOR—Trimmer 4-70 mmf
RC22A223K	(R44)	RESISTOR—Comp. 22K $\pm 10\%$ ¼W	CC5A22	(C72)	CAPACITOR—Ceramic 10 mmf 500V
RC23A473K	(R45,46)	RESISTOR—Comp. 47K $\pm 10\%$ ½W	CC9K50	(C72,82)	CAPACITOR—Ceramic .001 mfd 300V
RC22A154M	(R47)	RESISTOR—Comp. 150K ¼W	CM7S17	(C78)	CAPACITOR—Silvered Mica 20 mmf 500V
RC22A474K	(R48,50)	RESISTOR—Comp. 470K $\pm 10\%$ ¼W	CC6A32	(C79)	CAPACITOR—Ceramic 68 mmf
RC22A473K	(R49)	RESISTOR—Comp. 47K $\pm 10\%$ ¼W	CC6A40	(C79)	CAPACITOR—Ceramic 330 mmf
RC25A221K	(R51)	RESISTOR—Comp. 220 ohms $\pm 10\%$ 2W	CP2T36	(C80)	CAPACITOR—Tubular Paper .03 mfd 200V
RC23A100M	(R52)	RESISTOR—Comp. 10 ohms ½W	CE1T05	(C83)	CAPACITOR—Electrolytic 1 mfd 100V
RC23A224M	(R74)	RESISTOR—Comp. 220K ½W	CP4T51	(C84)	CAPACITOR—Paper .1 mfd 400V
RC23A153M	(R75)	RESISTOR—Comp. 15K ½W	CP4T36	(C85)	CAPACITOR—Paper .03 mfd 400V
RV0C03	(R76)	RESISTOR—Pot. 1,000 ohms	CM5A05	(C87)	CAPACITOR—Mica 22 mmf 500V
TA0000	(T6)	TRANSFORMER—Output	CE1T03	(C88)	CAPACITOR—Electrolytic 5 mfd 25V
TP0R00	(T7)	TRANSFORMER—Power	RC23A124K	(R1)	RESISTOR—Comp. 120K $\pm 10\%$ ½W
AMPLIFIER MECHANICAL COMPONENTS					
BT3S05	(M1)	BOARD—Terminal	RC22A475M	(R2,53,55)	RESISTOR—Comp. 4.7 meg ¼W
BT4S03	(M2)	BOARD—Terminal	RC22A155M	(R3,13,20)	RESISTOR—Comp. 1.5 meg ¼W
CL2A08	(M3)	CORD—AC Brown	RC22A474M	(R4,22,25)	RESISTOR—Comp. 470K ¼W
CL2A10	(M4 & J5)	CORD—Phono Power	RC22A223K	(R5,7)	RESISTOR—Comp. 22K $\pm 10\%$ ¼W
CS0M02	(M5)	COVER—Power Cable	RC22A222M	(R6)	RESISTOR—Comp. 2.2K ¼W
GR0S13	(M6)	GROMMET—Rubber Insulating	RC23A472M	(R8,9,14,60)	RESISTOR—Comp. 4.7 ¼W
GR0S14	(M7)	GROMMET—Rubber Insulating	RC22A473M	(R10,16,32)	RESISTOR—Comp. 47K ¼W
HB0M19	(M8)	BRACKET—Shockmount Mounting	RC23A273K	(R11)	RESISTOR—Comp. 27K $\pm 10\%$ ½W
HC0C09	(M9)	CLIP—Cable	RC22A151K	(R12)	RESISTOR—Comp. 150 ohms $\pm 10\%$ ¼W
HC0T01	(M10)	CLAMP—Tube	RC22A470K	(R15)	RESISTOR—Comp. 47 ohms $\pm 10\%$ ¼W
JR2007	(J6)	RECEPTACLE—2 Contact	RC22A224M	(R17,44,68)	RESISTOR—Comp. 220K ¼W
JR5001	(J7)	RECEPTACLE—5 Contact	RC22A221M	(R18)	RESISTOR—Comp. 220 ohms ¼W
PI0P00	(M11)	PLATE—Line Cord Insulator	RC24A103M	(R19,38)	RESISTOR—Comp. 10K 1W
SO0D09	(M12)	SOCKET—Dial Light	RC22A104M	(R21,31,62,70)	RESISTOR—Comp. 100K ¼W
SO8S01		SOCKET—Octal 8 Prong Tube	RC22A102M	(R23,28)	RESISTOR—Comp. 1,000 ohms ¼W
SO8S02	(J4)	SOCKET—Octal 9 Prong Power Cable	RW0D38	(R24)	RESISTOR—Wirewound 15K $\pm 10\%$ 10W
RECEIVER ELECTRICAL COMPONENTS					
CT1B00	(C1,10,22)	CAPACITOR—Trimmer 3-30 mmf Variable Air	RV4C01	(R26)	RESISTOR—Pot. Volume 2 meg
CY0E00	(C2)	CAPACITOR—Variable (3 section AM) (3 section FM)	RV4C02	(R27)	RESISTOR—Pot. Tone Bass 1 meg
CT7B19	(C3)	CAPACITOR—Ceramic Insulated 5 mmf $\pm 10\%$ 500V	RV0C00	(R29)	RESISTOR—Pot. Tone Treble .05 meg
CT1A13	(C4,11,23,24)	CAPACITOR—Trimmer Mica 4-75 mmf	RC24A682K	(R30)	RESISTOR—Comp. 68K $\pm 10\%$ 1W
CM6L22	(C5,16)	CAPACITOR—Mica 100 mmf $\pm 10\%$ 500V (Low Loss)	RC23A153M	(R33)	RESISTOR—Comp. 15K ½W
CP4M31	(C6,13,27,30,32,39,43,47)	CAPACITOR—Paper .01 mfd 400V	RC24A471M	(R34)	RESISTOR—Comp. 470 ohms 1W
CM5A26	(C7,52,55,70)	CAPACITOR—Mica 150 mmf 500V	RC22A224K	(R35,58)	RESISTOR—Comp. 220K $\pm 10\%$ ¼W
CC0B23	(C8)	CAPACITOR—Ceramic Insulated 12 mmf $\pm 10\%$ 500V	RC22A102K	(R36)	RESISTOR—Comp. 1,000 ohms $\pm 10\%$ ¼W
CC9A18	(C9)	CAPACITOR—Ceramic Insulated 4.7 mmf 500V	RC22A333M	(R37)	RESISTOR—Comp. 33K ¼W
CT1A14	(C12)	CAPACITOR—Trimmer Mica 1.8-40 mmf	RC22A225M	(R39)	RESISTOR—Comp. 2.2 meg ¼W
CM5E73	(C14)	CAPACITOR—Mica 4,700 mmf 500V	RC22A105M	(R40,59,64,71)	RESISTOR—Comp. 1 meg ¼W
CC8B30	(C15,20)	CAPACITOR—Ceramic Insulated 47 mmf $\pm 10\%$ 500V	RC22A101M	(R56)	RESISTOR—Comp. 100 ohms ¼W
CP0M31	(C17,33,75)	CAPACITOR—Paper .01 mfd 120V	RC22A223M	(R57,63)	RESISTOR—Comp. 22K ¼W
CM6L38	(C18)	CAPACITOR—Mica 470 mmf $\pm 10\%$ 500V (Low Loss)	RC22A335M	(R65,66,67,73)	RESISTOR—Comp. 3.3 meg ¼W
CC8B28	(C19)	CAPACITOR—Ceramic Insulated 33 mmf $\pm 10\%$ 500V	RC22A473K	(R65)	RESISTOR—Comp. 47K $\pm 10\%$ ¼W
CC9A12	(C21)	CAPACITOR—Ceramic Insulated 1.5 mmf 500V	RC22A682M	(R69)	RESISTOR—Comp. 6.8K ¼W
CC0B24	(C25)	CAPACITOR—Ceramic Insulated 15 mmf $\pm 10\%$ 500V	RC22A334M	(R70,72)	RESISTOR—Comp. 330K ¼W
CT1A12	(C26)	CAPACITOR—Trimmer Mica 150-600 mmf	RC22A683K	(R77)	RESISTOR—Comp. 68K $\pm 10\%$ ¼W
CT2A09	(C28a,b,35a,b)	CAPACITOR—Trimmer 5-30 mmf, 5-30 mmf	RC22A103K		RESISTOR—Comp. 10K $\pm 10\%$ ¼W (Used only on Code C Radio Chassis)
CM5L01	(C29,34)	CAPACITOR—Mica .001 mfd 500 V (Low Loss)	LA0F00	(L1)	COIL—FM Ant.
CT2A15	(C31a,b)	CAPACITOR—Trimmer 75-145 mmf	LO0F00	(L2)	COIL—RF FM
CT2A13	(C36a,b)	CAPACITOR—Trimmer 75-145 mmf	LO1F00	(L3)	COIL—Osc. FM
CE2D00	(C37,50)	CAPACITOR—Electrolytic Dry 8-16 mfd 450V	LFOA03	(L4)	CHOKE—RF
CP4T31	(C40,71)	CAPACITOR—Tubular Paper .01 mfd 400V	LO1C00	(L5)	COIL—Osc. SW
CE1T02	(C41,58)	CAPACITOR—Electrolytic 20 mfd 25V	LO1B01	(L6)	COIL—Osc. BC
CP4T20	(C42,54,74,81,86)	CAPACITOR—Tubular Paper .006 mfd 400V	LFOA02	(L7,8)	CHOKE—RF
CM7S07	(C44)	CAPACITOR—Silvered Mica 5 mmf 500V	LFOA01	(L9)	CHOKE—RF
CM5L25	(C45)	CAPACITOR—Mica 100 mmf 500V (Low Loss)	TIOCO7	(T1)	TRANSFORMER—1st IF FM
CT1B02	(C46a)	CAPACITOR—Trimmer 3-12 mmf	TIOCI0	(T2)	TRANSFORMER—IF BC
			TIOI01	(T3)	TRANSFORMER—2nd IF FM
			TIOD09	(T4)	TRANSFORMER—IF Output
			TIOD15	(T5)	TRANSFORMER—3rd IF
			TRI000	(T8)	TRANSFORMER—Ant.
			TRI000	(T9)	TRANSFORMER—SW Ant.

BENDIX RADIO DIV.

MODEL 1217D

Stock Number	Symbol Number	Description	Stock Number	Symbol Number	Description
TR1C00	(T10)	TRANSFORMER—SW RF	SM0B03	(M60)	SHIELD—Miniature Tube Base
TR1L00	(T11)	TRANSFORMER—BC RF	SM0T01	(M61)	SHIELD—Metal Tube
SR4G00	(S1)	SWITCH—Rotary 5 Section-4 Position	SM0T03	(M62)	SHIELD—Miniature Tube
SR2L02	(S2)	SWITCH—Rotary Snap	SM0T04	(M63)	SHIELD—Miniature Tube
SR2A02	(S3)	SWITCH—Rotary Single Pole 2 Position	S00D07	(M64)	SOCKET—Dial Light (12½" lead)
#1N34	(X1,2)	CRYSTAL—Detector	S00D08	(M65)	SOCKET—Dial Light (8¼" lead)
#44		LAMP—Dial	S08L02		SOCKET—Loktal Tube Ringmount Type
			S08L03		SOCKET—Loktal Tube Rivet Mtg.
			S07M05		SOCKET—Miniature Tube (Zip In)
		RECEIVER MECHANICAL COMPONENTS	S08M01	(M66 & J4)	SOCKET—9 Contact
BT2R00	(M13)	BOARD—Loop Terminal	S08S01		SOCKET—Octal Tube
BT1S00	(M14)	BOARD—Terminal 1 Lug 1 Mtg.	ST0M00		SLUG—Tuning 10-32 Threaded Copper Rod
BT2S00	(M15)	BOARD—Terminal 2 Lug 1 Mtg.	XS0C02	(M67)	STRIP—Copper (.004 x 5/16 x 1 5/8)
BT2S03	(M16)	BOARD—Terminal 2 Lug 1 Mtg.	XS0C03	(M68)	STRIP—Contact (Rotary Switch Shaft)
BT2S06	(M17)	BOARD—Terminal 2 Lug 1 Mtg.	XS0C04	(M69)	STRIP—Copper (Band Switch Shaft)
BT3S03	(M18)	BOARD—Terminal 3 Lug 1 Mtg.	XS0C05	(M70)	STRIP—Copper (.004 x 5/16 x 3)
BT3S06	(M19)	BOARD—Terminal 3 Lug 1 Mtg.	XS0C10		SHIELD—Dial Cable
BT4S02	(M20)	BOARD—Terminal 4 Lug 2 Mtg.			CABINET COMPONENTS
BT5S01	(M21)	BOARD—Terminal 5 Lug 2 Mtg.	BP0B01		PUSHBUTTON—Mottled Brown
BT6S01	(M22)	BOARD—Terminal 6 Lug 2 Mtg.	BZ0B11		BACK—Cabinet
BT7S00	(M23)	BOARD—Terminal 7 Lug 2 Mtg.	BZ0D12		BAFFLE—Cardboard and Cloth
BT7S01	(M24)	BOARD—Terminal 7 Lug 2 Mtg.	BZ0D13		BAFFLE—Cardboard and Cloth (With Cutout)
CD0C21		CABLE—Dial 53"	BZ0D29		BAFFLE—Speaker (Wood)
DS0E01		DIAL—AM FM Glass	DZ0F13		DECAL—Tuning
GR0D04	(M25)	GROMMET—Dial Glass	DZ0F14		DECAL—Volume
GR0S00	(M26)	GROMMET—Rubber Shockmount	DZ0F15		DECAL—On-Off
GR0S06	(M27)	GROMMET—Rubber Shockmount	DZ0F16		DECAL—SW-AM-FM-PH
GR0S12	(M28)	GROMMET—Capacitor Shockmount	DZ0F17		DECAL—Treble
HB0M23	(M29)	BRACKET—R.H. Back Plate With Pulleys	DZ0F18		DECAL—Bass
HB0M24	(M30)	BRACKET—L.H. Back Plate With Pulleys	EC0M00		ESCUTCHEON—Control, Hush-O-Matic
HB0M26	(M31)	BRACKET—Bearing Mtg.	GRO511		GROMMET—Rubber, Phono Lead-In
HB0M31	(M32)	BRACKET—R.H. Capacitor Mtg.	GZ0M06		GRILLE—Metal
HB0M32	(M33)	BRACKET—L.H. Capacitor Mtg.	HC0C07		CLIP—Cable
HB0M36	(M34)	BRACKET—Band Switch	HC0S29		CLIP—"C" Washer
HB0M41	(M35)	BRACKET—Switch (S2) Mtg.	HK0R00		CLIP—Knob Retainer Spring
HB0M72	(M36)	BRACKET—Chassis Shockmount	HK0R05		KNOB—Door Pull
HB0M73	(M37)	BRACKET—Manual Tuning Control	HN6S00		NUT—Speed
HB0S03		BALL—Bearing 3/32 Dia.	HT0F02		TRAY—Record Changer
HB0S04		BALL—Bearing 5/32 Dia.	HT0T00		TRACK—Swing-A-Door
HC0C00	(M38)	CLIP—Coil Mtg.	HZ0C05		CATCH—Door Bullet
HC0C03	(M39)	CLAMP—Dial Cable	HZ0G01		GLIDE—Swing-A-Door
HC0C08	(M40)	CLIP—Cable	HZ0H04		HINGE—Door (Semi Concealed)
HC0C11		CLAMP—Cable	HZ0H05		HINGE—Lid
HC0C12		CLIP—1st IF	HZ0S02		SUPPORT—Lid (Bronze)
HC0C13		CLIP—2nd IF	J10A00		JEWEL—Amber Plastic
HC0M05	(M41)	CLAMP—Tube Shield	JP1000		PLUG—AM Ant.
HC0S28	(M42)	CLIP—"C" Washer	JP3001		PLUG—3 Contact FM Ant. Connector
HC0T00	(M43)	CLAMP—Tube Shield Ring	JP1002		PLUG—Single Contact Phono
HC0T02	(M44)	CLAMP—Ring Retainer	KB0B01		KNOB—Indexed Push-on
HH0C00	(M45)	HOOK—Dial Cord	KC0B06		KNOB—Control (Brown)
HH0D00	(M46)	RETAINER—Dial Glass	KS0B02		KNOB—Hush-O-Matic Control
HI0T00	(M47)	INSERT—Tuning Core	MC0C01		CAM—Swing-A-Door Bumper
HP0D00	(M48)	PLATE—Back	MRO0C4		ROLLER—Swing-A-Door
HROS01		RIVET—Shoulder (.171 x .083)	MRO0C5		ROLLER—Swing-A-Door Cam
HS0C57		SPRING—Dial Cord	MS0F00		RUNNER—Plain, Swing-A-Door
HS0C74		SPRING—Push Button Coil	MS0G00		GLIDE—Runner, Swing-A-Door
HS8F00	(M49)	SLEEVE—Flared, Tuning Cond.	MS0S08		SHAFT—Roller, Swing-A-Door
HS0S06	(M50)	STUD—Shoulder	NE0M00		DECAL—Bendix Emblem
HS0S12		STUD—8-32 Shoulder (R.H. End RF Chassis)	PF0B00		PADS—Felt Bumper, Lid
ID0M20	(M51)	INDICATOR—Dial	SE2R00		SPEAKER—12" E.D.
JR3001	(J1)	RECEPTACLE—3 Contact	WP0B01		WINDOW—Call Letter
JR4001	(J2)	RECEPTACLE—4 Contact	XS0Z11		STRIP—Fishpaper (.005 x ¾ x 2½)
JR1S00	(J3)	RECEPTACLE—Single Contact	XZ0M01		STRIP—Back Mtg.
JP2002	(J4)	PLUG—2 Prong	ZW1G01		CABINET
MB0B03	(M52)	BEARING—Tuning Control			
MG0S01	(M53)	SPROCKET—Hub			
MP0M01	(M54)	PULLEY—Drive			
MP0M02	(M55)	PULLEY—Dial Cord Idler			
MRO0P0	(M56)	RAIL—Pointer			
MS0C01	(M57)	SHAFT—Band Switch			
MS0T09	(M58)	SHAFT—Tuning Assy.			
SM0B00	(M59)	SHIELD—Miniature Tube Base			

Circuit components, denoted by italicized symbol numbers, used only on Code C radio chassis.



PARTS LIST

Code	Part No.	DESCRIPTION	Code	Part No.	DESCRIPTION	Code	Part No.	DESCRIPTION
C1A-C1B	B19-185	Variable Condenser	R3	A50-584	22 Megohm 1/2 watt Carbon Resistor	T2	B10-417	2nd I.F. Transformer
C2	A16-152	50 MMFD Mica Condenser (Part of L-1)	R4		1 Megohm 1/2 watt Carbon Resistor (Part of T-2)	T3	A80-226	Speaker Output Transformer
C3-C6	A16-157	.05 MFD 200 V Tubular Condenser	R5		47 K Ohm 1/2 watt Carbon Resistor (Part of T-2)		B79-348	Speaker
C4	A16-157	.1 MFD 200 V Tubular Condenser	R6		4.7 Megohm 1/2 watt Carbon Resistor		B79-345	Alternate Speaker
C5	A15-175	50 MMFD Mica Condenser	R7		470 K Ohm 1/2 watt Carbon Resistor		B67-487	Dial Scale
C6	A16-150	.02 MFD 400 V Tubular Condenser	R8		470 K Ohm 1/2 watt Carbon Resistor		A58-42	Dial Pointer
C7	A16-273	4 MFD 150 V Electrolytic Condenser	R9		1 Megohm 1/2 watt Carbon Resistor		A52-182	Knob
C8	A16-156	.01 MFD 400 V Tubular Condenser	R10		390 Ohm 1/2 watt Resistor		A83-277	Dial Scale Retainer
C9-C12		250 MMFD Mica Condenser (Part of T-2)	L1	A60-591	.75 Ohm 1 watt Resistor		D42-384	Wood Cabinet
C11	A15-176	250 MMFD Mica Condenser	L2	A10-414	Antenna Coil		A84-35	Dial Drive Shaft Assembly
C13	A16-155	.002 MFD 600 V Tubular Condenser	L3	A10-415	Oscillator Coil		A69-184	Battery Thriftmaster Switch
R1	A60-587	220 K Ohm 1/2 watt Carbon Resistor	T1	B10-416	1st I.F. Transformer		A24-165	Volume Control and Switch
R2	A60-585	47 K Ohm 1/2 watt Carbon Resistor						

DESCRIPTION

This model is a 4-Tube Superhetrodyne radio receiver designed to cover a frequency range of from 535 Kilocycles to 1725 Kilocycles (K.C.). The tubes used are—

1A7 GT—Osc. Converter
1N5 GT—I.F. Amplifier

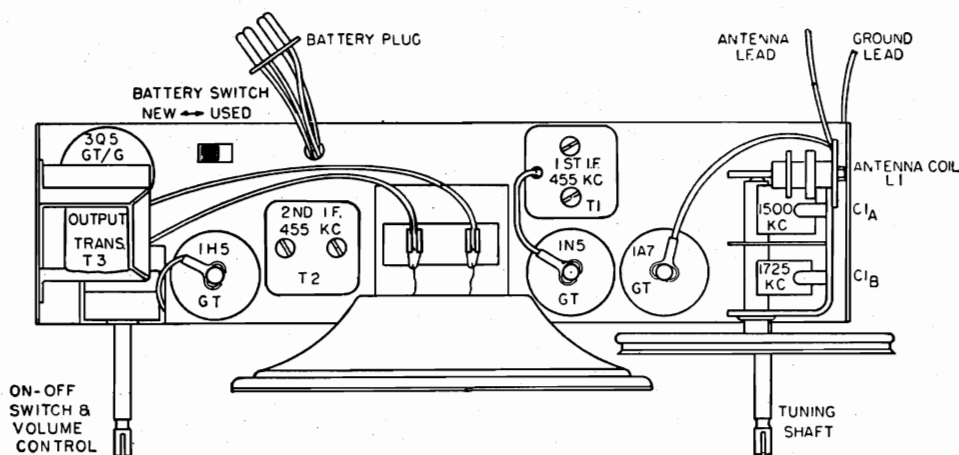
1H5 GT—AVC Det. Audio Amplifier
3Q5 GT—Power Output

INSTALLATION

This receiver has been designed to operate from a battery that has the "B" Supply (90V) and the "A" Supply (1-½ V) incorporated into a single unit.

Any one of the following batteries may be used in conjunction with this receiver and after inserting the plug from the radio into the battery it should be placed inside the cabinet in the space provided.

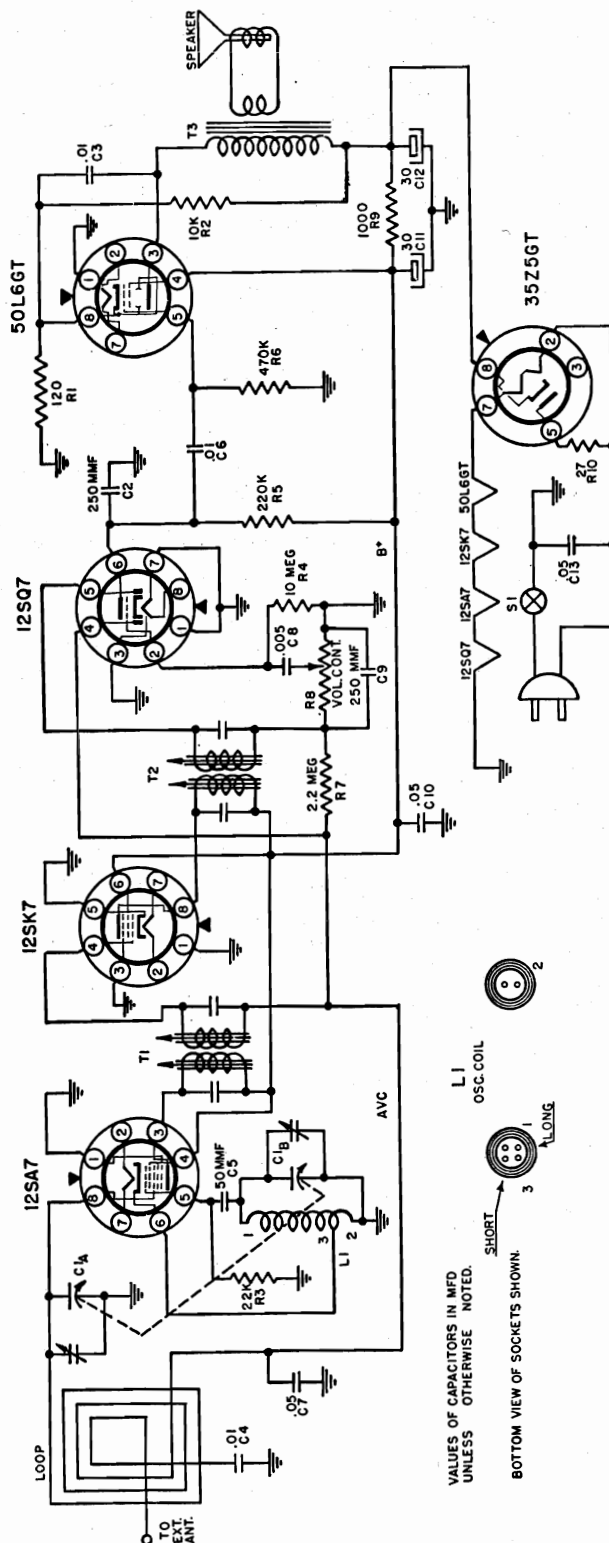
1. Ray-O-Vac Their No. "AB" 82 Power Pack
2. Burgess Their No. 17G-D60 Power Pack
3. General Their No. 60DL 11 L Power Pack
4. Everready Their No. 748 Power Pack
5. Everready Their No. 758 Power Pack

**ALIGNMENT PROCEDURE**

With an output meter connected across the voice coil of the speaker, the output meter reading for 50 milliwatts is .4 volts using a signal which is modulated 30% at 400 c.p.s. Follow through the procedure as outlined below for proper alignment.

Connect the signal generator to the grid cap of the 1A7 GT Tube through a .1 MFD. Condenser. Connect the ground lead of the generator to the chassis. Adjust the signal generator to 455 K.C. and set the variable condenser of the receiver to minimum capacity (fully opened). With the volume control full on and minimum output from the signal generator adjust the two trimmers on top of the first and second I.F. transformers for maximum output.

Now connect the signal generator to the antenna connection of the receiver through a .00025 condenser. Adjust the signal generator frequency to 1725 K. C. and set the variable condenser to minimum capacity (fully opened), and adjust the oscillator trimmer (C1B) for maximum output. Set signal generator to 1500 K. C. and tune receiver to signal. Adjust the antenna trimmer (C1A) on the variable condenser for maximum output.



PARTS LIST

CODE		PART NO.	DESCRIPTION	CODE	PART NO.	DESCRIPTION
C1A, C1B	19-173		Variable Condenser	R9	A60-732	1000 Ohm 1 watt Resistor
C2, C9	A-15176		250 MMFD. Mica Condenser	R10	A60-690	27 Ohm 1/2 watt Resistor
C3, C4, C6	A16-156		.01 MFD. 400 volt Condenser	T1	A10-478	1st I. F. Transformer
C5	A15-175		50 MMFD. Mica Condenser	T2	A10-479	2nd I. F. Transformer
C7, C10	A16-152		.05 MFD. 200 volt Condenser	T3	A80-233	Output Transformer
C8	A16-153		.005 MFD. 600 volt Condenser	L1	B10-480	Oscillator Coil
C11, C12	B18-283		30x30 MFD. 150 volt Dual Electrolytic Condenser		48-34	Dial Crystal
C13	A16-158		.05 MFD. 400 volt Condenser		58-37	Dial Pointer
R1	A60-702		120 Ohm 1/2 watt Resistor		73-316	4-inch P.M. Speaker
R2	A60-698		10K Ohm 1 watt Resistor		C83-449	Cabinet Back
R3	A60-659		22K Ohm 1/2 watt Resistor		B82-46	Loop Antenna
R4	A60-663		10 Megohm 1/2 watt Resistor		83-254	Barfie
R5	A60-667		220K Ohm 1/2 watt Resistor		A42-421	Cabinet, Molded Ivory
R6	A60-662		470K Ohm 1/2 watt Resistor		B67-505	Dial Scale
R7	A60-684		2.2 Megohm 1/2 watt Resistor		36-116	Grille Cloth
R8	24-157		Volume Control, 1 Megohm		A52-222	Knob, Ivory

MODELS MD26,
MD27

COAST TO COAST STORES

DESCRIPTION

This radio is a 5 tube (including rectifier) superheterodyne radio receiver designed for use on 117 volts 60 cycle AC or 117 volts DC power supply.

The tubes used are:—

1—12SA7 Oscillator Converter	1—12SQ7 AVC Detector and 1st
1—12SK7 I.F. Amplifier	Audio
1—35Z5GT Power Rectifier	1—50L6GT Power Output

This receiver covers the frequency range from 540 kilocycles to 1630 kilocycles (KC).

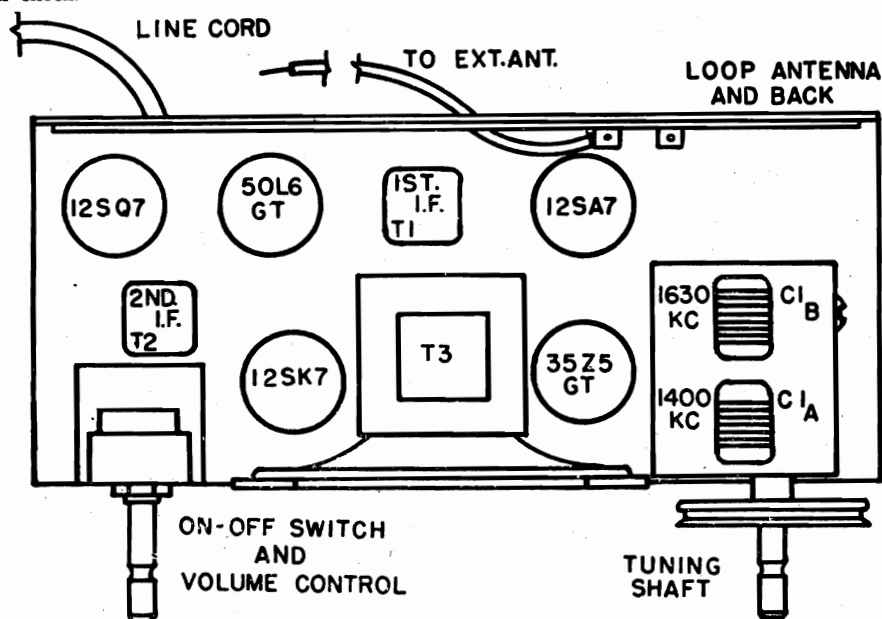
ALIGNMENT PROCEDURE

The following alignment procedure is for use only by competent servicemen having the proper equipment.

The alignment should be made with volume control fully on, and the output from the signal generator as low as possible, to prevent A.V.C. action from interfering with correct alignment.

With the output meter connected across the voice coil of the speaker, the output meter reading for 50 milli-watts is .4 volts using a signal which is modulated 400 c.p.s.

Adjust all trimmers for maximum output. Repeat alignment procedure given below as a final check.



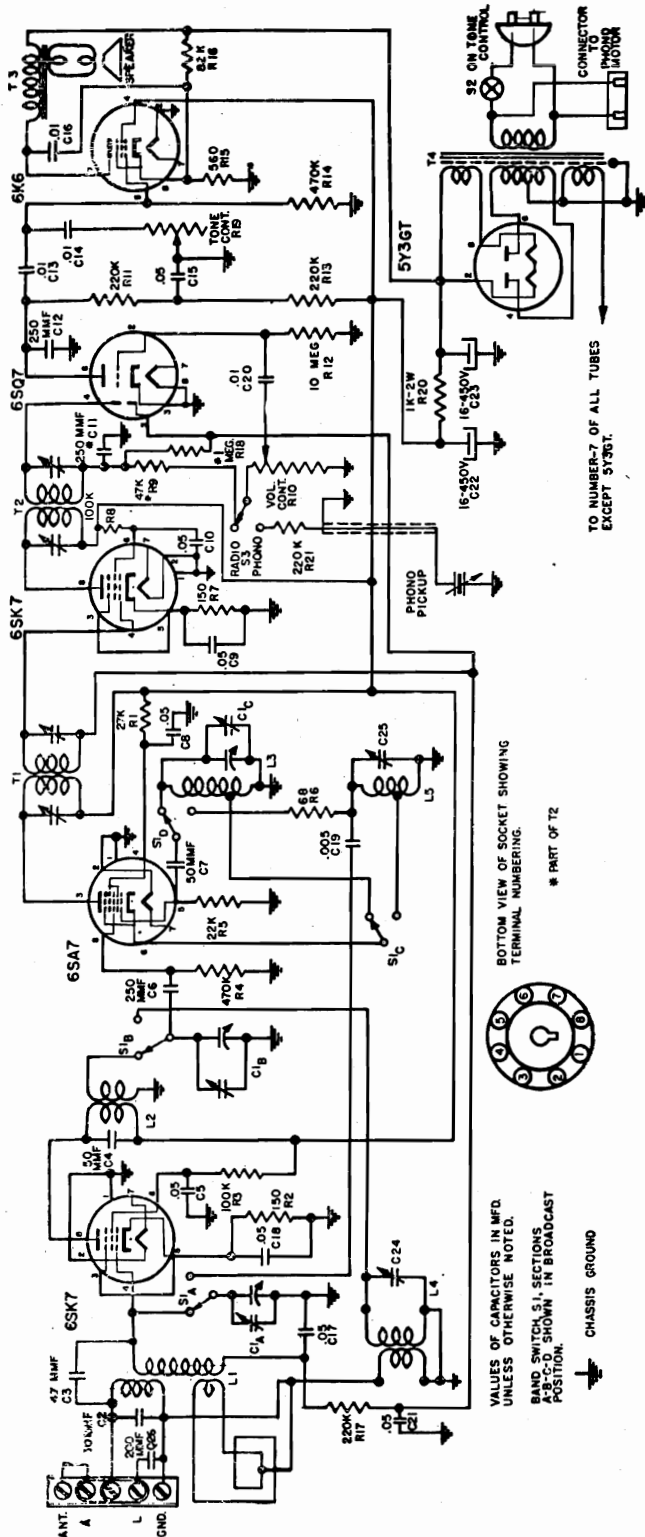
ALIGNMENT PROCEDURE

(Continued)

CAUTION: This is an A.C.-D.C. receiver and when aligning the set it is necessary to isolate the Signal Generator or the Receiver from the line by use of a transformer, or place a .2 MFD. condenser in both test leads of the Signal Generator.

Position of Variable	Generator Frequency	Dummy Ant. Mfd.	Generator Connections	Trimmer Adjustment	Trimmer Function
Fully open	455 KC	.1	*12SA7 Grid (Stator of C1A)	T1	Input I.F.
Fully open	455 KC	.1	*12SA7 Grid (Stator of C1A)	T2	Output I.F.
Fully open	1630 KC	.00025	*12SA7 Grid (Stator of C1A)	C1B	Oscillator
Tune in signal from generator	1400 KC	.00025	*Ant. lead from loop	C1A	Antenna

*Connect ground lead of signal generator to chassis.



DESCRIPTION

This Model is a 2 band six tube (including Rectifier) superheterodyne radio receiver and phonograph combination for operation on 117 volt 60 cycle AC current.

This receiver covers the standard broadcast frequency range, 535 to 1725 Kilocycles (K.C.) and the short wave frequency range from 6 to 18.2 Megacycles (M.C.).

The tubes used are:

- 6SK7—R. F. Amplifier
- 6SA7—Mixer—Osc.
- 6SK7—I. F. Amplifier

- 6SQ7—Det. AVC—Audio
- 6K6 GT—Power Output
- 5Y3 GT—Rectifier

MODELS MD42,
MD43, MD44

COAST TO COAST STORES

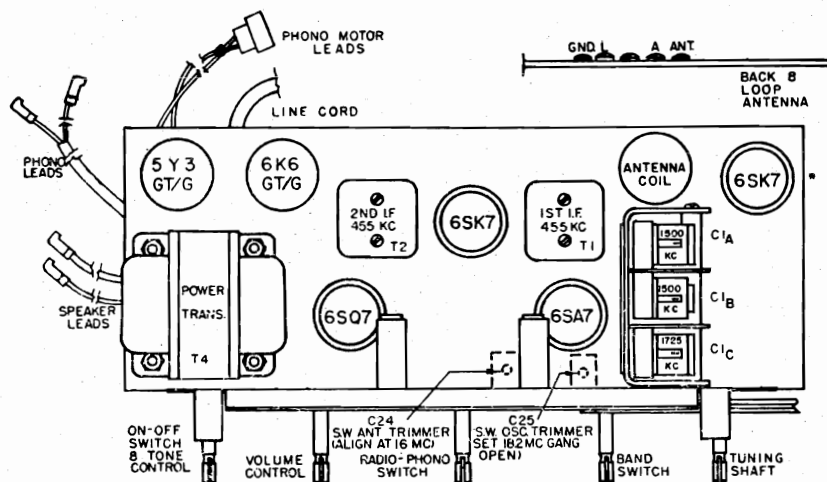


Fig. 2 Tube Positions and Alignment Points

ALIGNMENT PROCEDURE

The following alignment procedure is for use only by competent servicemen having the proper equipment.

With an output meter connected across the voice coil of the speaker, the output meter reading for $\frac{1}{2}$ watt is 1.25 volts using a signal which is modulated 400 c.p.s. Follow through the procedure as outlined below for proper alignment.

The alignment should be made with volume control fully on, and the output from the signal generator as low as possible, for accurate alignment.

Position of Variable	Band Switch Position	Generator Freq.	Dummy Ant.	Generator Connections	Trimmer Adjustment	Trimmer Function
Fully Open	BC	455 KC	.1 MFD	6SA7 Grid (Stator of C1B)	T1 T2	I. F.
Fully Open	BC	1725 KC	.00025 MFD	* Ant. Terminal on Loop	C1C	BC Osc.
Tune in signal from Generator	BC	1500 KC	.00025 MFD	* Ant. Terminal on Loop	C1B	R. F.
Tune in signal from Generator	BC	1500 KC	.00025 MFD	* Ant. Terminal on Loop	C1A	BC Ant.
Fully Open	SW	18.2 MC	400 ohms	* Ant. Terminal on Loop	C25	SW Osc.
Tune in signal from Generator	SW	16 MC	400 ohms	* Ant. Terminal on Loop	C24	SW Ant.

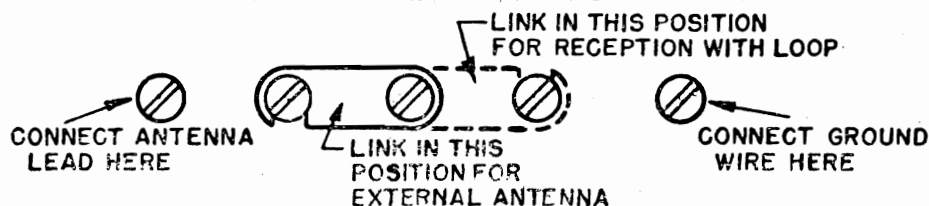
GROUND lead of generator should be attached to the chassis for all adjustments
C24 and C25 are located under the chassis

For alignment points refer to Figure 2

* Be sure coupling link is in correct position for external antenna operation. See illustration below.

Repeat above alignment procedure as a final check.

ANTENNA and GROUND CONNECTIONS

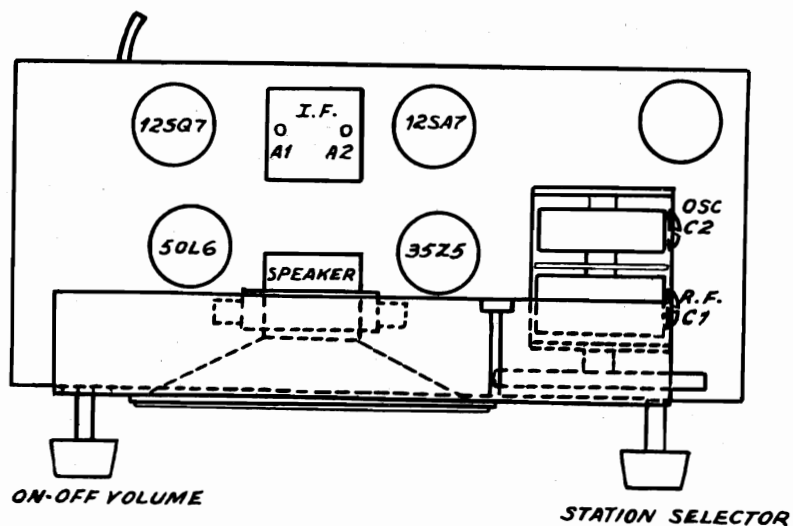


COAST TO COAST STORES

MODELS MD42,
MD43, MD44

PARTS LIST

CODE	PART NO.	DESCRIPTION
C1A, C1B, C1C	B19-186	Variable Condenser
C2, C4, C7	A15-175	50 MMFD Mica condenser
C3	A83-355	4.7 MMFD condenser
C5, C8, C10, C15	A16-158	.05 MFD 400 volt condenser
C6, C12	A15-176	250 MMFD Mica condenser
C9, C17, C18, C21	A16-152	.05 MFD 200 Volt condenser
C13, C14, C20	A16-156	.01 MFD 400 Volt condenser
C16	A16-168	.01 MFD 1000 Volt condenser
C19	A16-181	.005 MFD Mica condenser
C22	A18-279	16 MFD 450 Volt electrolytic condenser
C23	A18-274	16 MFD 450 Volt electrolytic condenser
C24	A20-143	SW Antenna trimmer
C25	A20-143	SW Oscillator trimmer
C26	A15-189	200 MMFD Mica condenser
R1	A60-692	27K ohm 1 watt resistor
R2, R7	A60-686	150 ohm 1/2 watt resistor
R3, R8	A60-671	100K ohm 1/2 watt resistor
R4, R14	A60-662	470K ohm 1/2 watt resistor
R5	A60-659	22K ohm 1/2 watt resistor
R6	A60-733	68 ohm 1/2 watt resistor
R10	A24-169	Volume control, 500,000 ohm
R11, R13, R17, R23	A60-667	220K ohm 1/2 watt resistor
R12	A60-663	10 megohm 1/2 watt resistor
R15	A60-701	560 ohm 1 watt resistor
R16	A60-700	82K ohm 1 watt resistor
R19	A26-124	Tone control, 2 megohm, with switch
R20	A60-699	1K ohm 2 watt resistor
L1	C10-459	BC Antenna coil
L2	B10-452	RF Coil
L3	B10-446	BC Oscillator coil
L4	A10-482	SW Antenna coil
L5	A10-481	SW Oscillator coil
T1	B10-412	1st IF Transformer
T2	B10-444	2nd IF Transformer
T3	A80-222	Output Transformer
T4	C80-223	Power Transformer
	A84-41	Dial drive shaft assembly
S1	A69-176	Band Switch
S3	A69-180	Switch, Phono-Radio
	A52-200	Knob, Tuning
	A52-205	Knob, Volume
	A52-233	Knob, On-Off and Tone
	A52-234	Knob, SW-BC
	A52-235	Knob, Radio-Phono
	A58-67	Dial Pointer
	C67-513	Dial scale, glass
	C83-478	Dial scale retainer
	C79-357	Speaker, 8" P.M.
	S84-183	Back and Loop Assembly
	D42-426	Cabinet



PART NO.	DESCRIPTION
IR-22	R-1 3900-Ω RESISTOR 1/2 W. 10%
IR-8	R-2 22000-Ω RESISTOR 1/2 W. 10%
IR-10	R-3 47000-Ω RESISTOR 1/2 W. 20%
IR-9	R-4 22000-Ω RESISTOR 1/2 W. 20%
IR-24	R-5 1000-Ω RESISTOR 1/2 W. 20%
IR-23	R-6 3 MEG. RESISTOR 1/2 W. 20%
IR-13	R-7 2 MEG. RESISTOR 1/2 W. 20%
IR-5	R-8 220-Ω RESISTOR 1/2 W. 10%
IR-11	R-9 470000-Ω RESISTOR 1/2 W. 20%
IR-17	R-10 39-Ω RESISTOR 1/2 W. 20%
IR-21	R-11 330-Ω RESISTOR 1/2 W. 10%
VC-3	R-12 1 MEG. VOLUME CONTROL
VC-1	R-13 25M-Ω TONE CONTROL & SW.
IR-6	R-14 470-Ω RESISTOR 1/2 W. 10%
PC-7	C-1 .01 MFD. CONDENSER 400 V.
PC-5	C-2 .05 MFD. CONDENSER 400 V.
PC-9	C-3 .25 MFD. CONDENSER 400 V.
PC-B	C-4 .1 MFD. CONDENSER 400 V.
MC-3	C-5 .00022 MFD. MICA COND. 500V.
MC-2	C-6 .0001 MFD. MICA COND. 500V.
MC-1	C-7 .00475 MFD. MICA COND. 35V.
MC-4	C-8 .00005 MFD. MICA COND. 500V.
EC-4	C-9 40 MFD.
	C-10 40 MFD. 150 V. ELECTROLYTIC
	C-11 40 MFD.
TC-7	C-12 LOOP ANTENNA TRIMMER
TC-8	C-13 S.W. ANTENNA TRIMMER
	C-14 B.C. OSC. TRIMMER
TC-1	C-15 S.W. OSC. TRIMMER
	C-16 B.C. OSC. PADDING COND.
GC-1	G-1 GANG CONDENSER
	G-2
SW-1	SW-1 BAND SWITCH
	SW-2
	SW-3
	SW-4
LI-1	A.C. SW. ON TONE CONTROL
LI-2	INPUT I.F. TRANSFORMER
	T-1
	T-2 OUTPUT S.F. TRANSFORMER
	T-3
SPK-4	V.C. VOICE COIL
	S. R.M. SPEAKER
PB-1	PL PILOT BULB #47
CO-1	P LINE CORD
LL-2	L-1 LOOP ANTENNA
LA-2	L-2 S.W. ANTENNA COIL
LO-3	L-3 B.C. OSC. COIL
LO-4	L-4 S.W. OSC. COIL
TU-4	12 SK76T 12 SA76T 12 SK76T 12 5Q76T 35L6GT 35Z56T

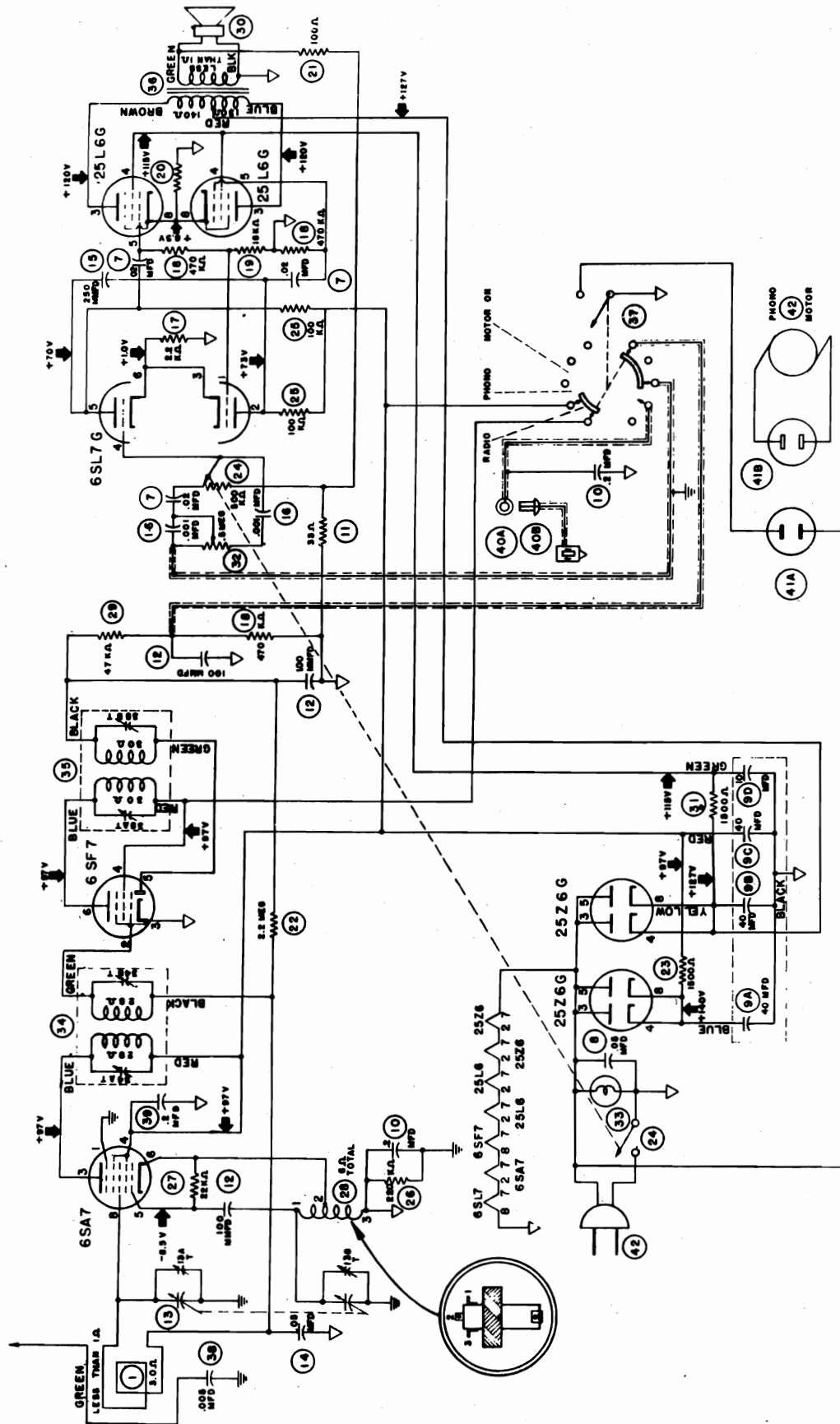
[illegible]

Registered Trademark

CONCORD RADIO CORP.

MODELS 1-702,
1-704

CONCORD RADIO CORP.



NOTE: ALL VOLTAGES MEASURED FROM B- WITH A 20,000.Ω/VOLT VOLTMETER —
LINE VOLTAGE 117 V A.C. — VOLUME CONTROL AT MAXIMUM — NO SIGNAL RECEIVED
⊞ DENOTES CHASSIS GROUND.
▽ DENOTES B- GROUND

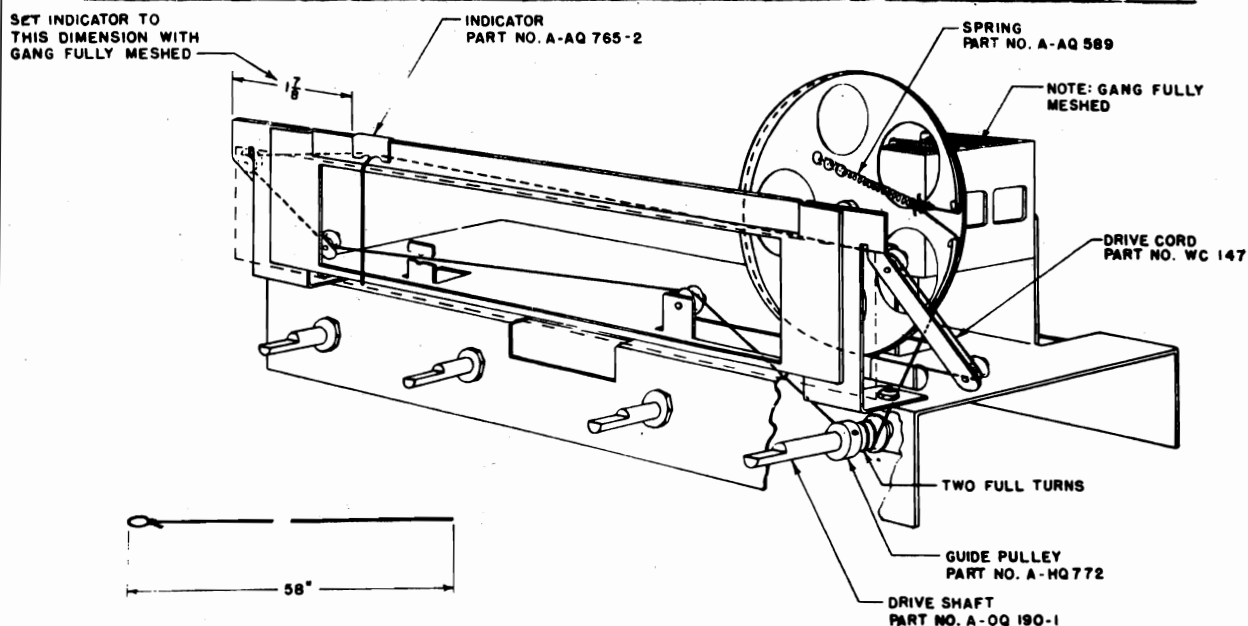
In order to make a proper alignment, the following equipment is required:

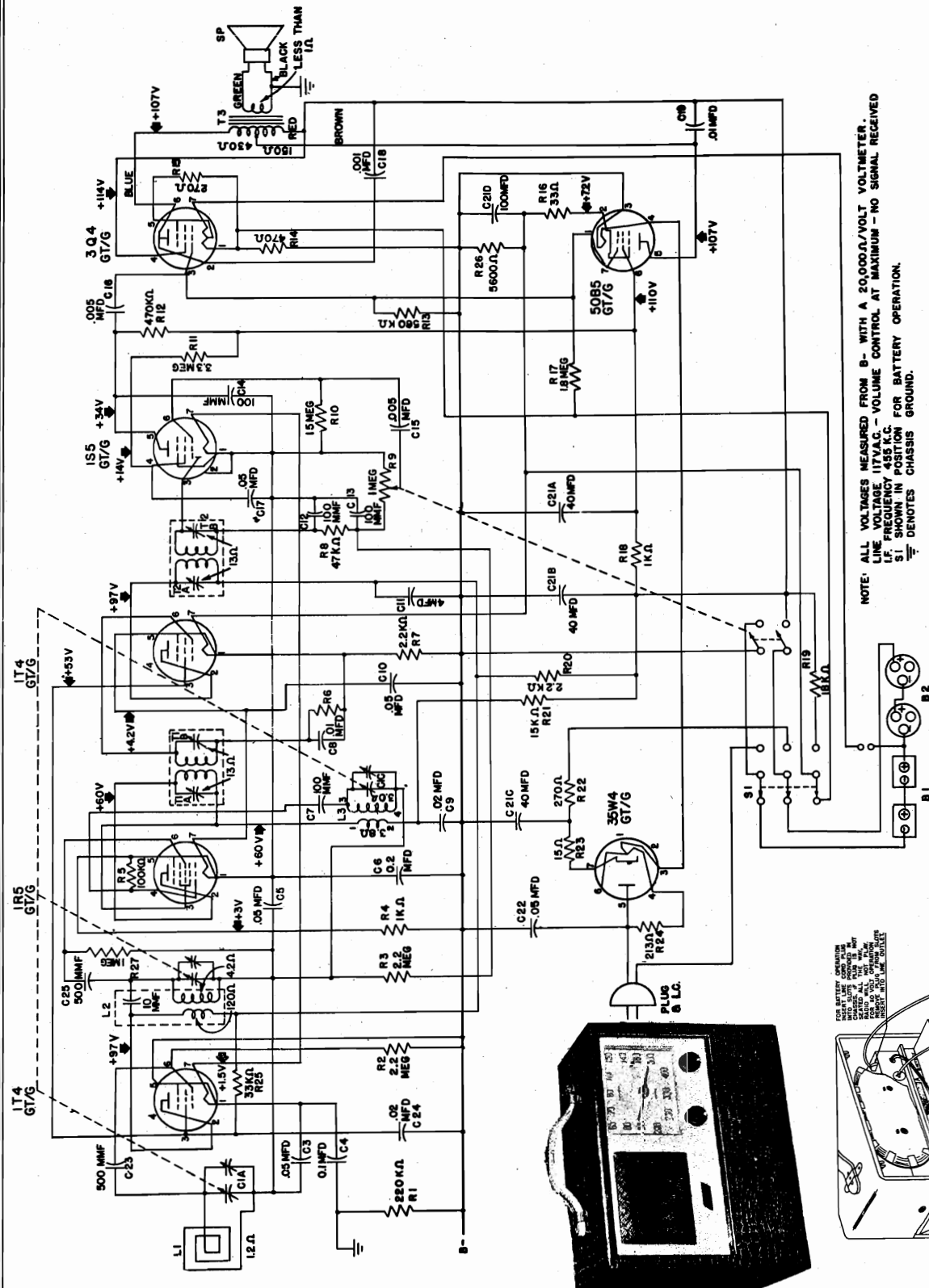
1. A signal generator capable of providing a modulated radio frequency output over the frequencies required.
2. A suitable output meter or sensitive AC voltmeter with a .1 mfd series blocking condenser.
3. A coupling loop, made of three turns of stiff hookup wire, 4 inches in diameter, mounted on a suitable block of wood or stand.
4. A non-metallic screwdriver.

With the receiver on and the volume control at maximum, connect the signal generator to the coupling loop and bring the loop close to the receiver chassis. Adjust the signal generator output to minimum necessary to give a suitable indication on the output meter, which should be connected from B minus to the plate of one output tube. CAUTION: Make sure the output meter is isolated from DC by a series blocking condenser.

I.F. FREQ. - 455 KC.

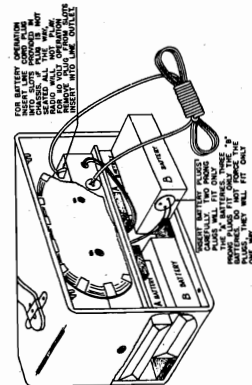
SET SIGNAL GENERATOR AT	SET GANG	LOOP DISTANCE	ADJUST TRIMMER	TUNE FOR	OPERATION
455 KC	Fully Meshed	Close	34a 34b 35a 35b	Max.	Align I.F.
1720 KC	Fully Open	Close	13b	Max.	Set Osc.
1400 KC	1400 KC	Close	13a	Max.	Align R.F.



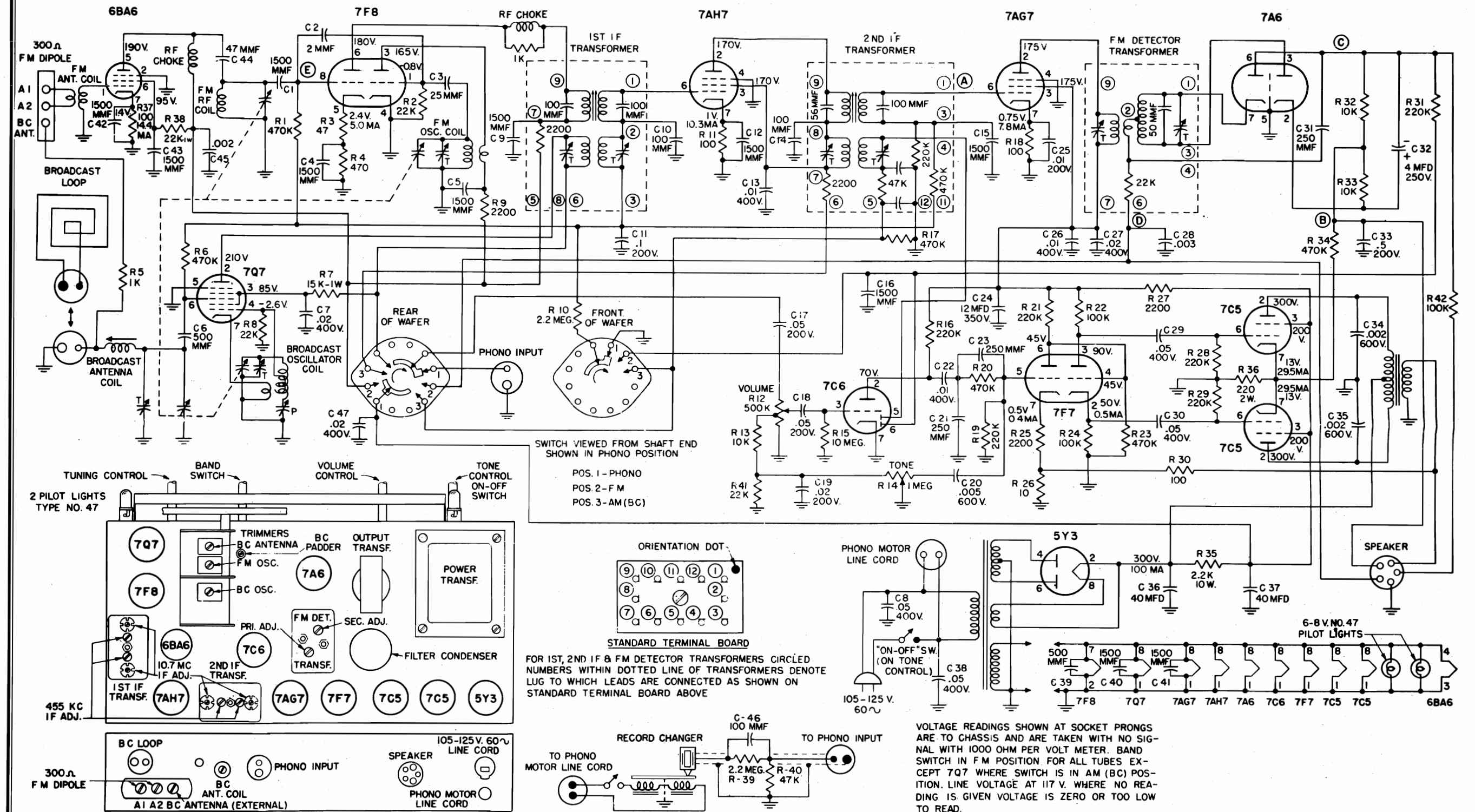


The following battery types may be used with this receiver

	"A" Battery	"B" Battery
Burgess	G3	M30
Ray-O-Vac	P 83 A.	P 7830
Eveready	746	482



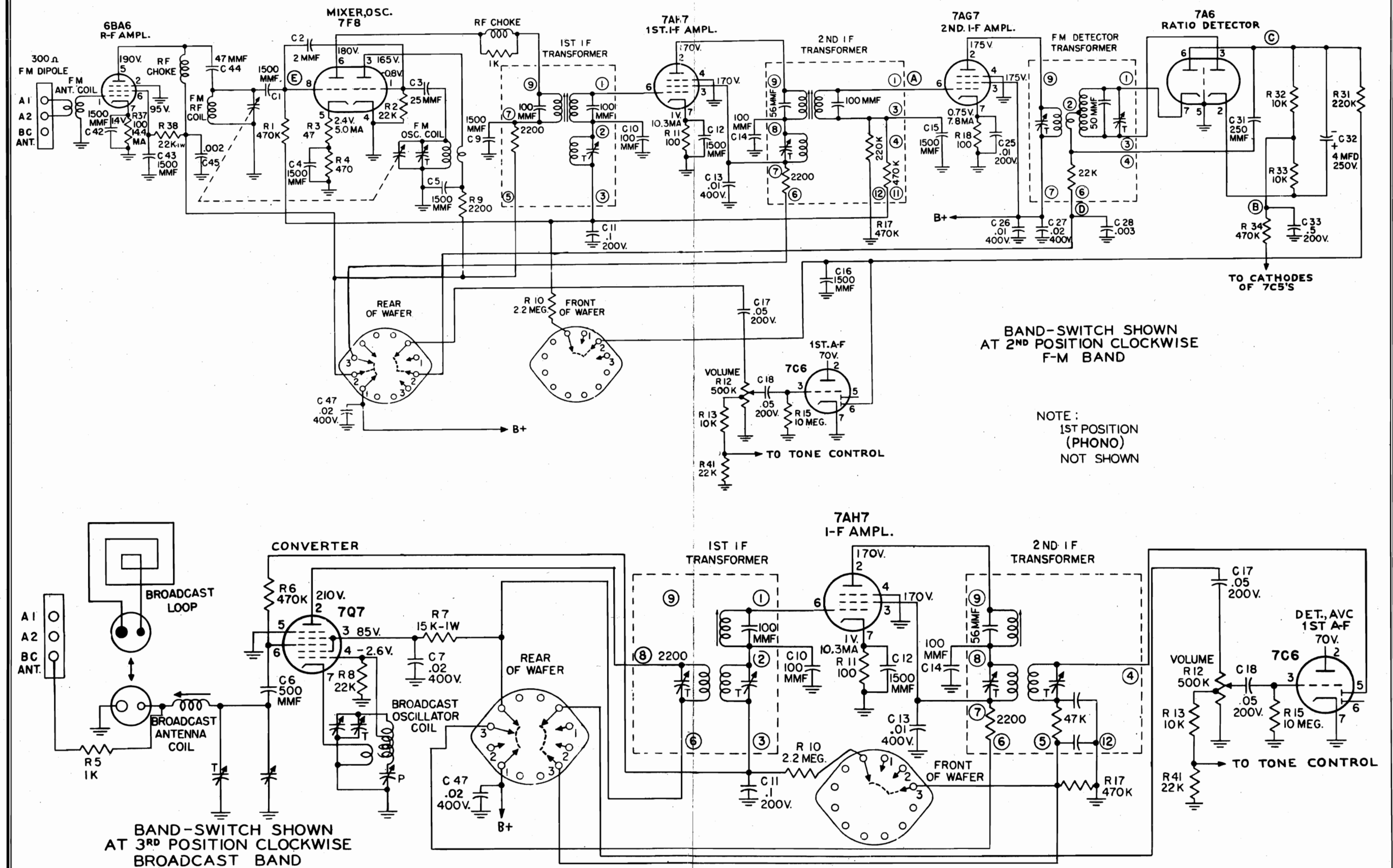
CONCORD RADIO CORP.

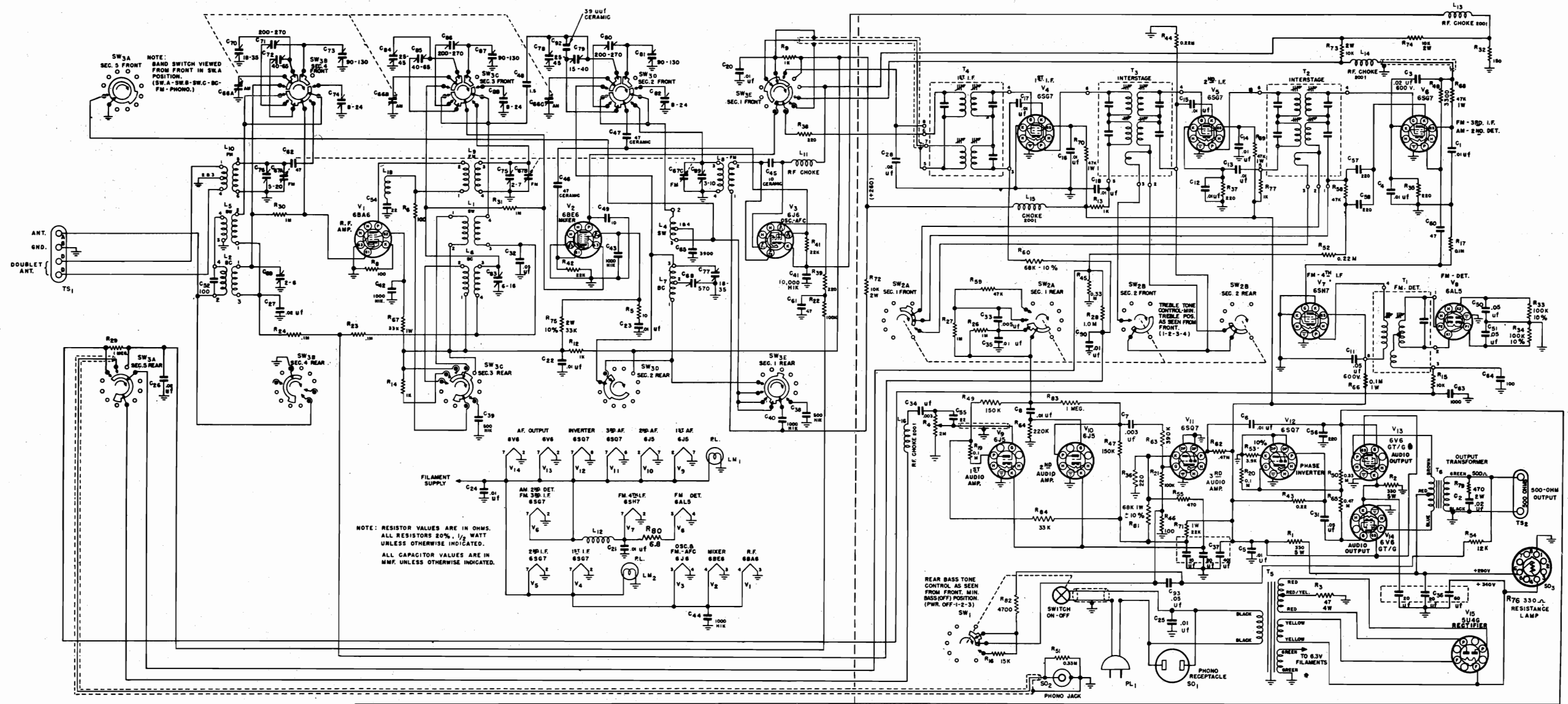


CLARI-SKEMATIX

Registered Trademark

CONCORD RADIO CORP.





Tubes Fourteen plus rectifier.
 Speaker output impedance 500 ohms.
 Antenna Provisions for external long wire antenna for AM bands and a folded dipole (300-ohm) for FM band.
 Tuning Manual and mechanical push buttons. (Five channels for AM and five channels for FM.)
 Tuning Range (BC) 540kc - 1700 kc.
 (A) 15 mc - 18 mc.
 (B) 9 mc - 12 mc.
 (C) 5.8 mc - 18 mc.
 (FM) 88 mc - 108 mc.
 I.F. (AM) 455 kc.
 I.F. (FM) 10.7 mc.
 Power Supply 105-125 V. 60 cycles A.C.
 Power Consumption 180 watts.

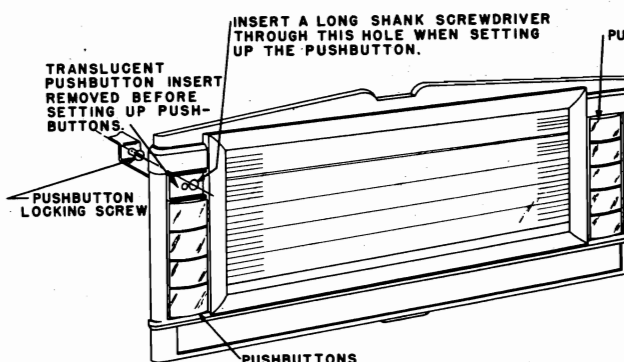


Fig. 1. View showing pushbutton setup.

BUTTON SETTING:

Note - Insulate the muting switch springs before setting the AM buttons.

1. Select any one pushbutton.
2. Pull translucent insert straight out.
3. Insert screw driver blade through large hole of pushbutton into slot of locking screw. (See Fig. 1).
4. Loosen locking screw about one-half turn. (Not more than one full turn.)
5. With pushbutton depressed, carefully tune in desired station with the manual control and tighten the locking screw.

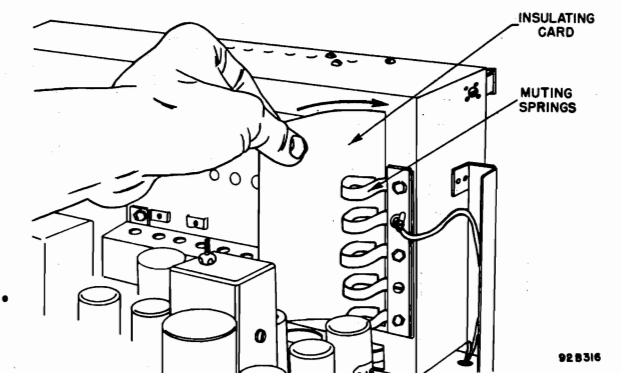
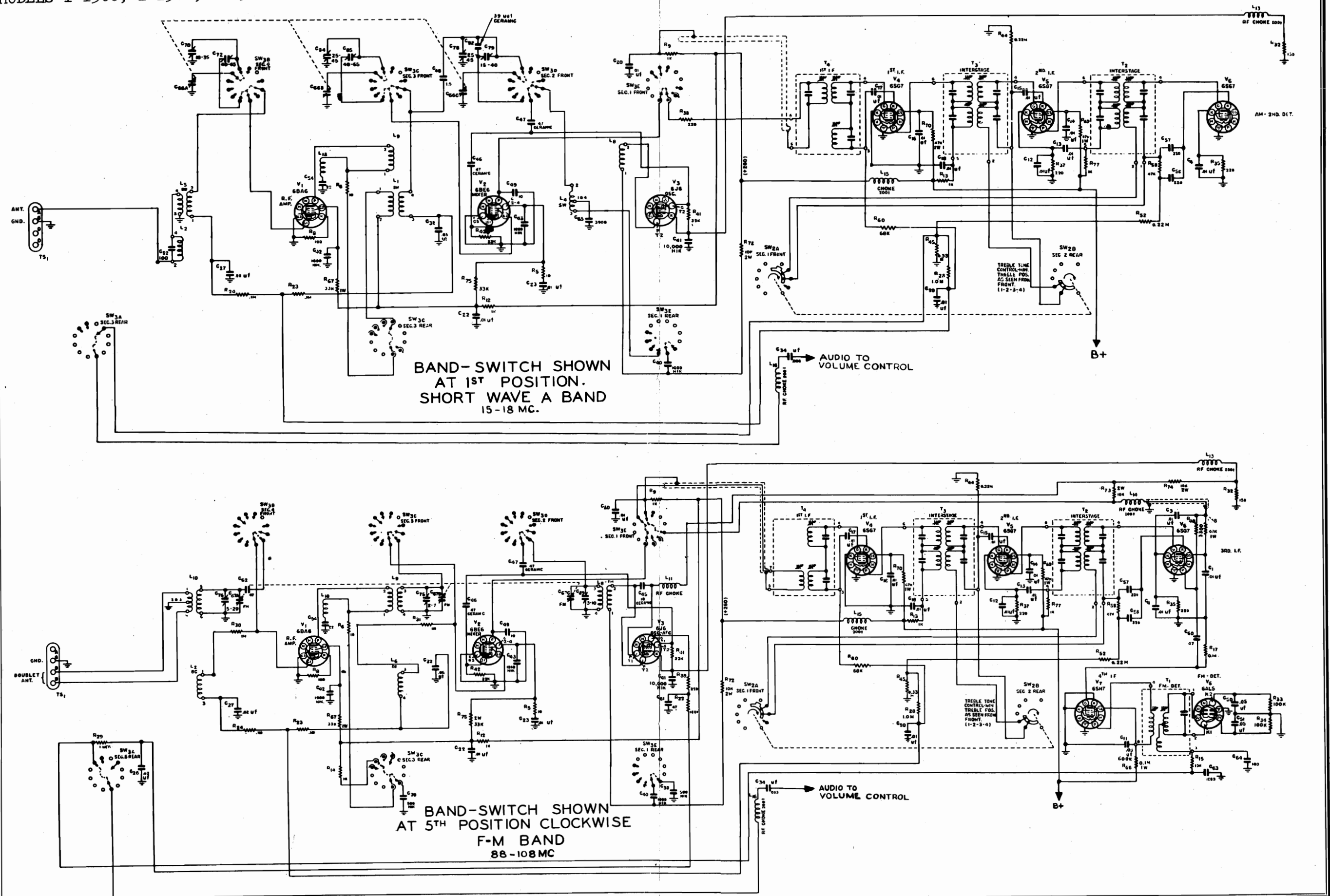


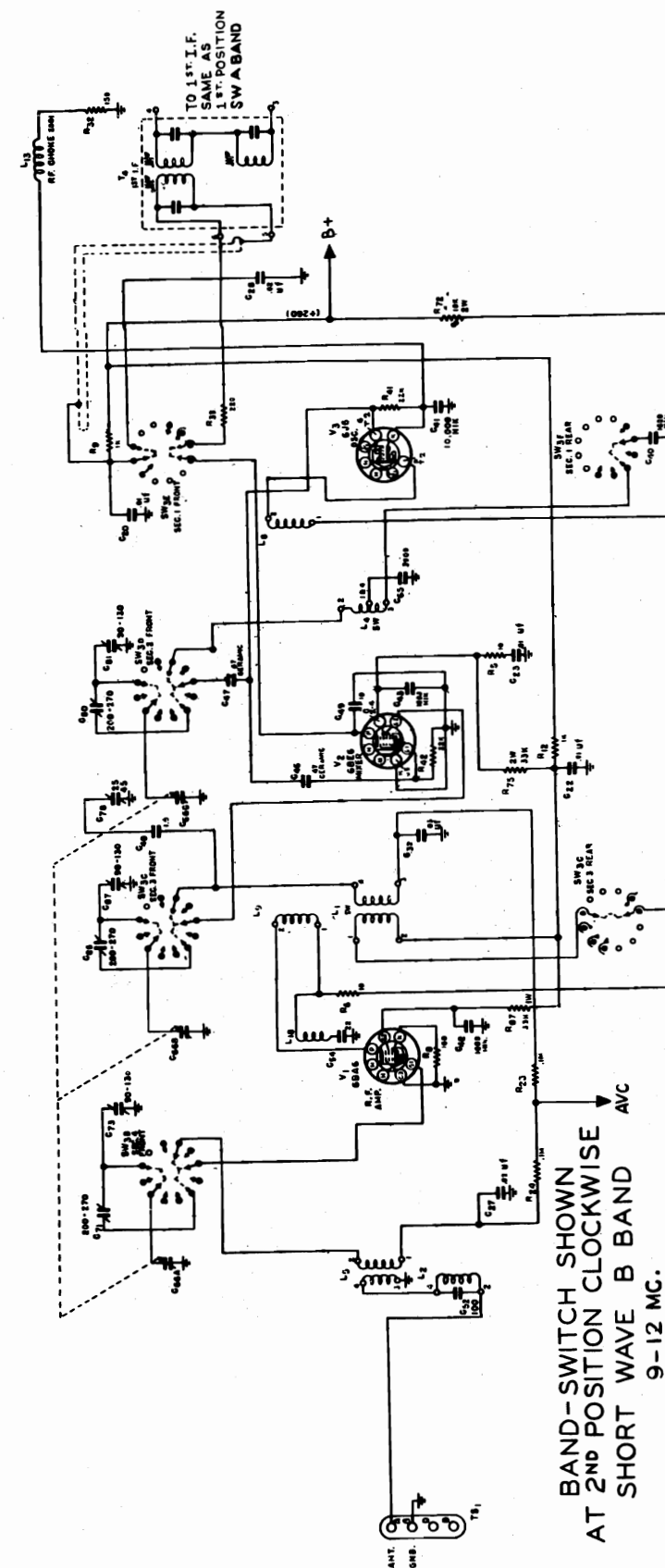
Fig. 3. Insulating the muting switch contacts

CLARI - SKEMATIX

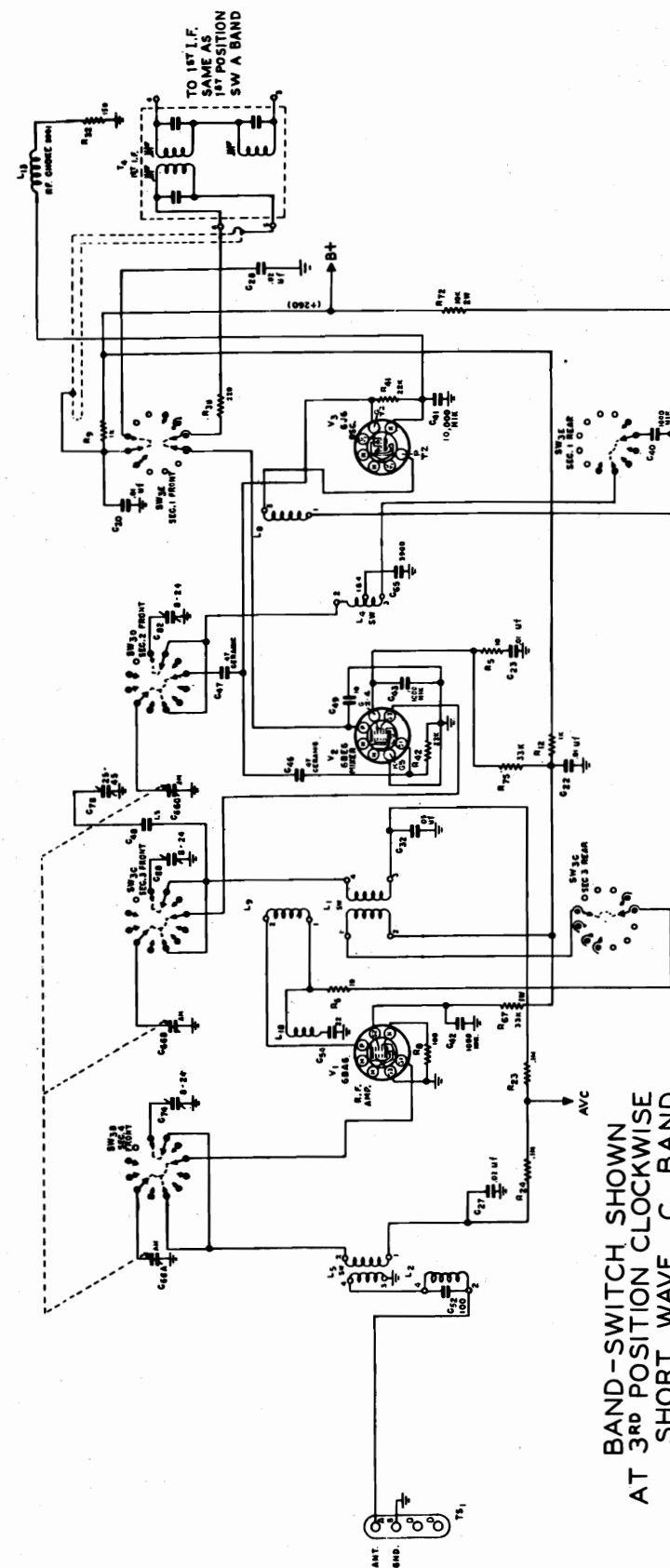
Registered Trademark

CONCORD RADIO CORP.

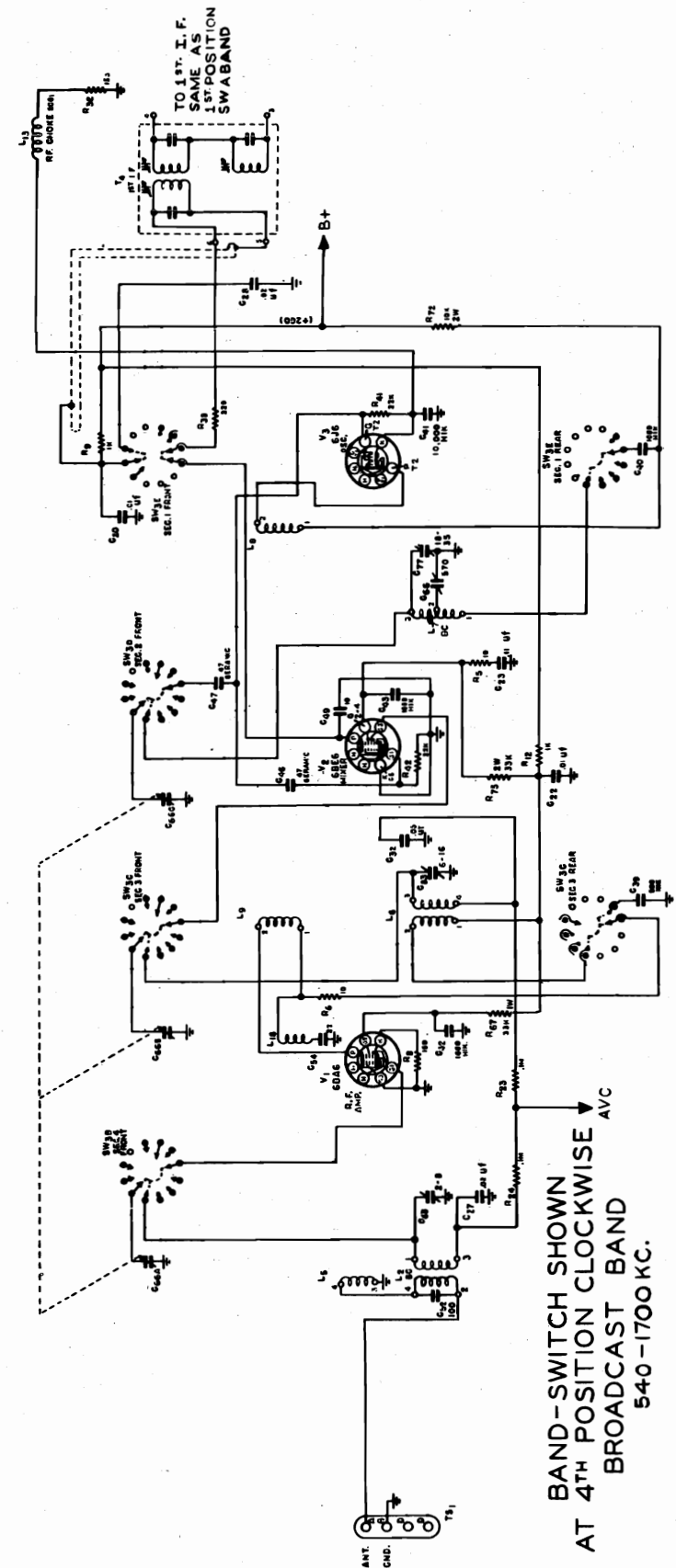




BAND-SWITCH SHOWN
AT 2ND POSITION CLOCKWISE
SHORT WAVE B BAND
9-12 MC.



AVC
BAND-SWITCH SHOWN
AT 3RD POSITION CLOCKWISE
SHORT WAVE C BAND
5.8-18 MC



BAND-SWITCH SHOWN
AT 4TH POSITION CLOCKWISE
BROADCAST BAND
540-1700 KC.

CONCORD RADIO CORP.

MODELS 1-1500,
1-1501, 1-1502

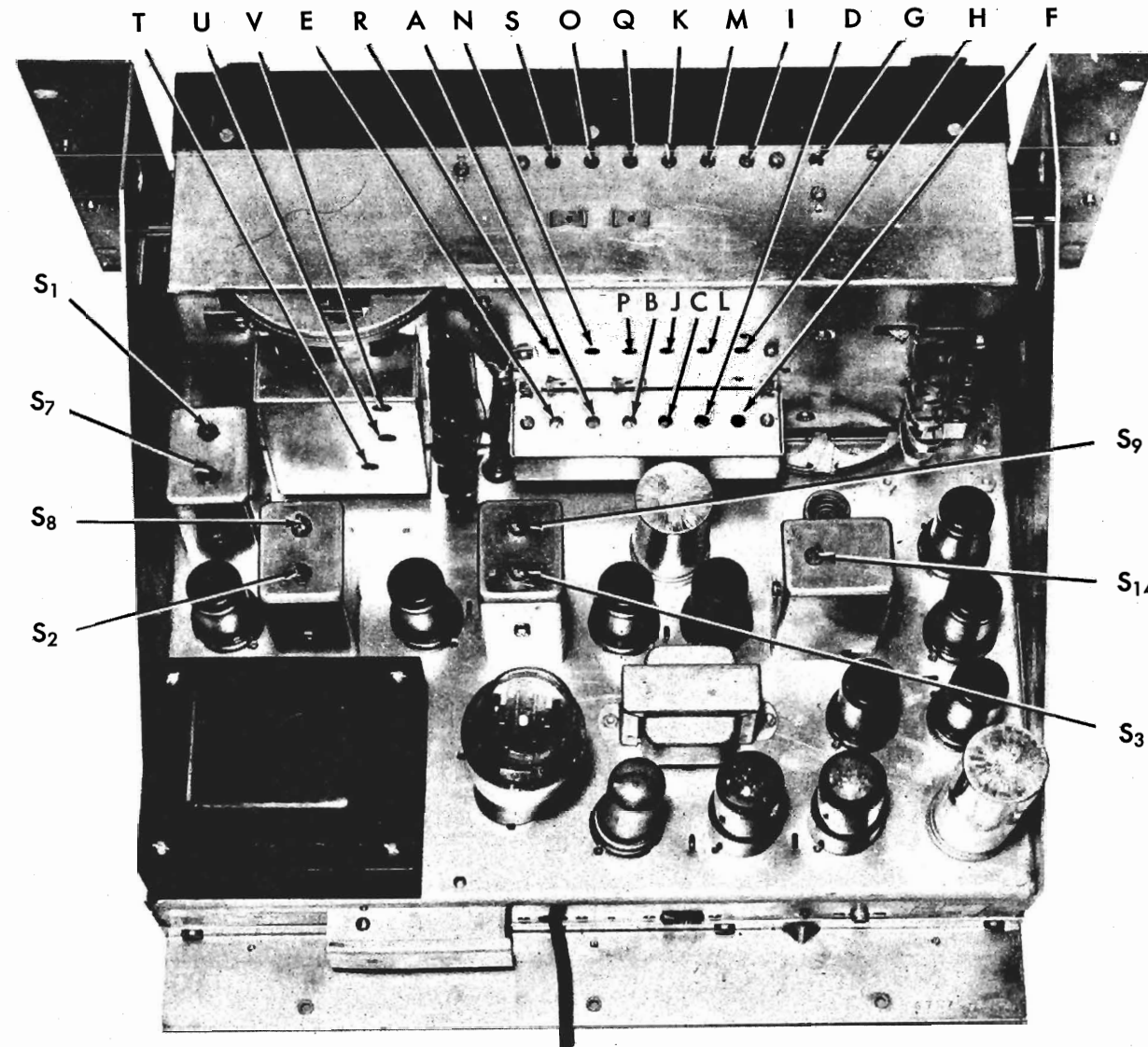
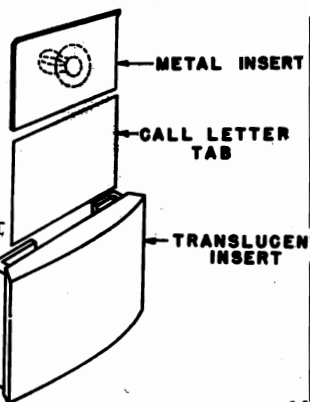


Fig. 4. Top view showing alignment points.

INSERTING CALL LETTERS INTO TRANSLUCENT INSERT ASSEMBLY:



1. Slide out metal insert from translucent insert assembly. (See Fig. 2).

2. Insert call letter tab.

3. Replace metal insert.

4. Replace translucent insert assembly into push button.

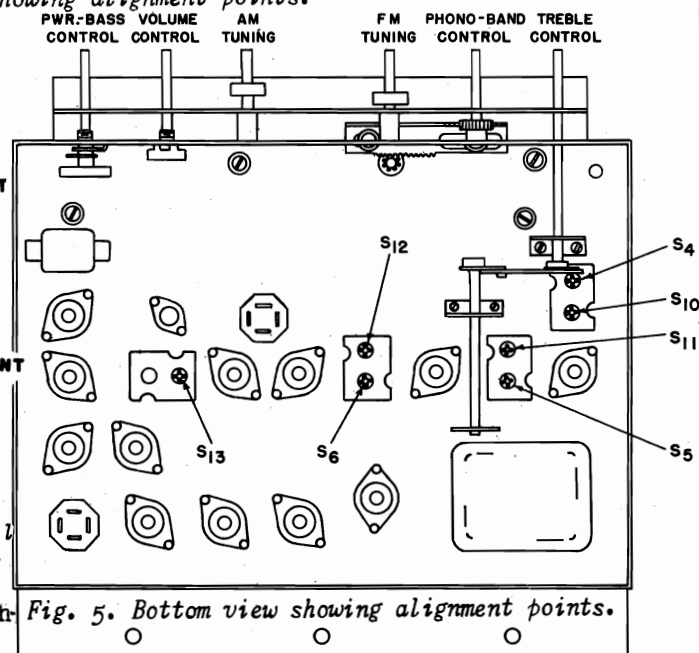


Fig. 5. Bottom view showing alignment points.

CONCORD RADIO CORP.

MODELS 1-1500,
1-1501, 1-1502

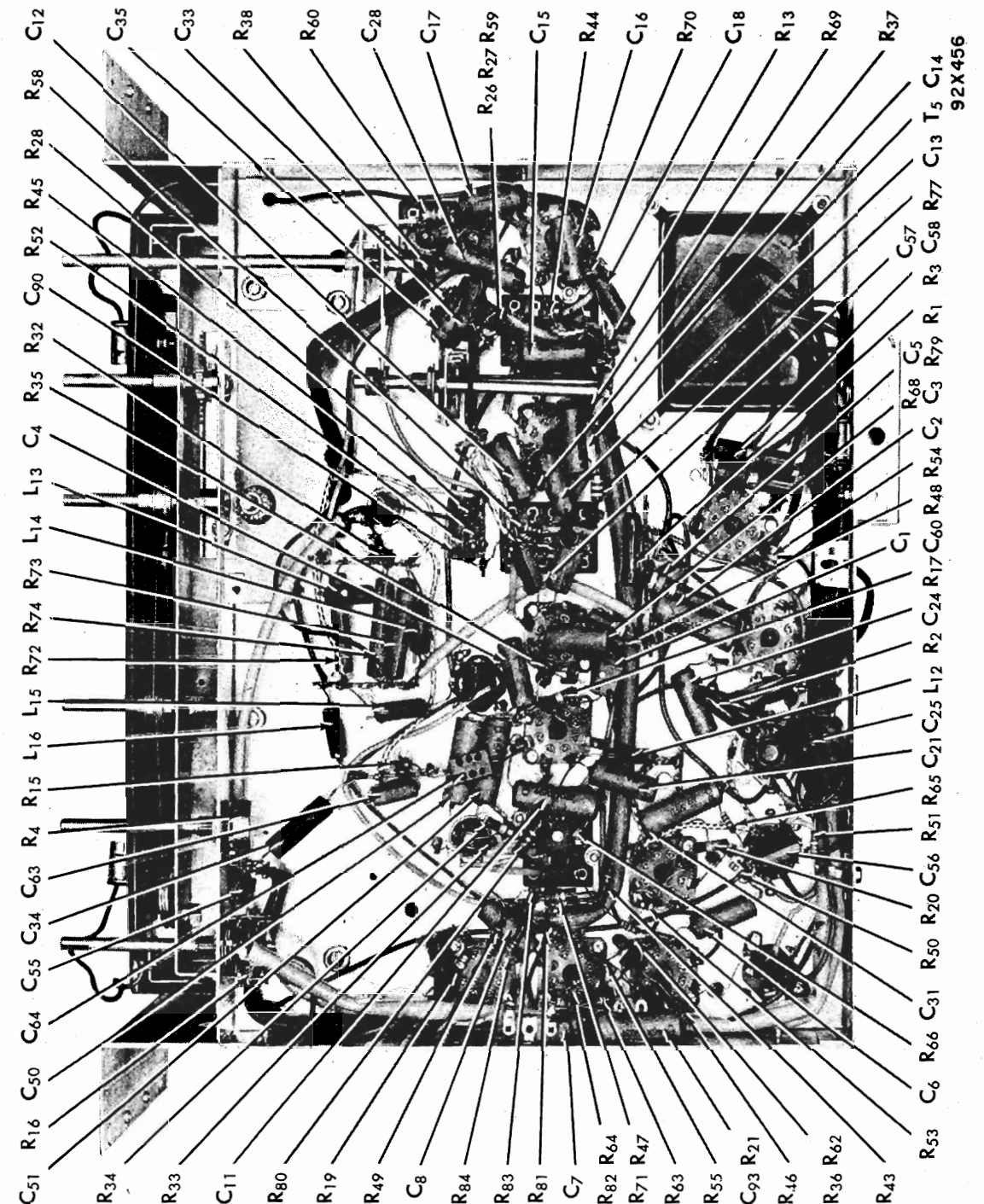


Fig. 6. Bottom view of receiver showing component location.

CONCORD RADIO CORP.

MODELS 1-1500,
1-1501, 1-1502

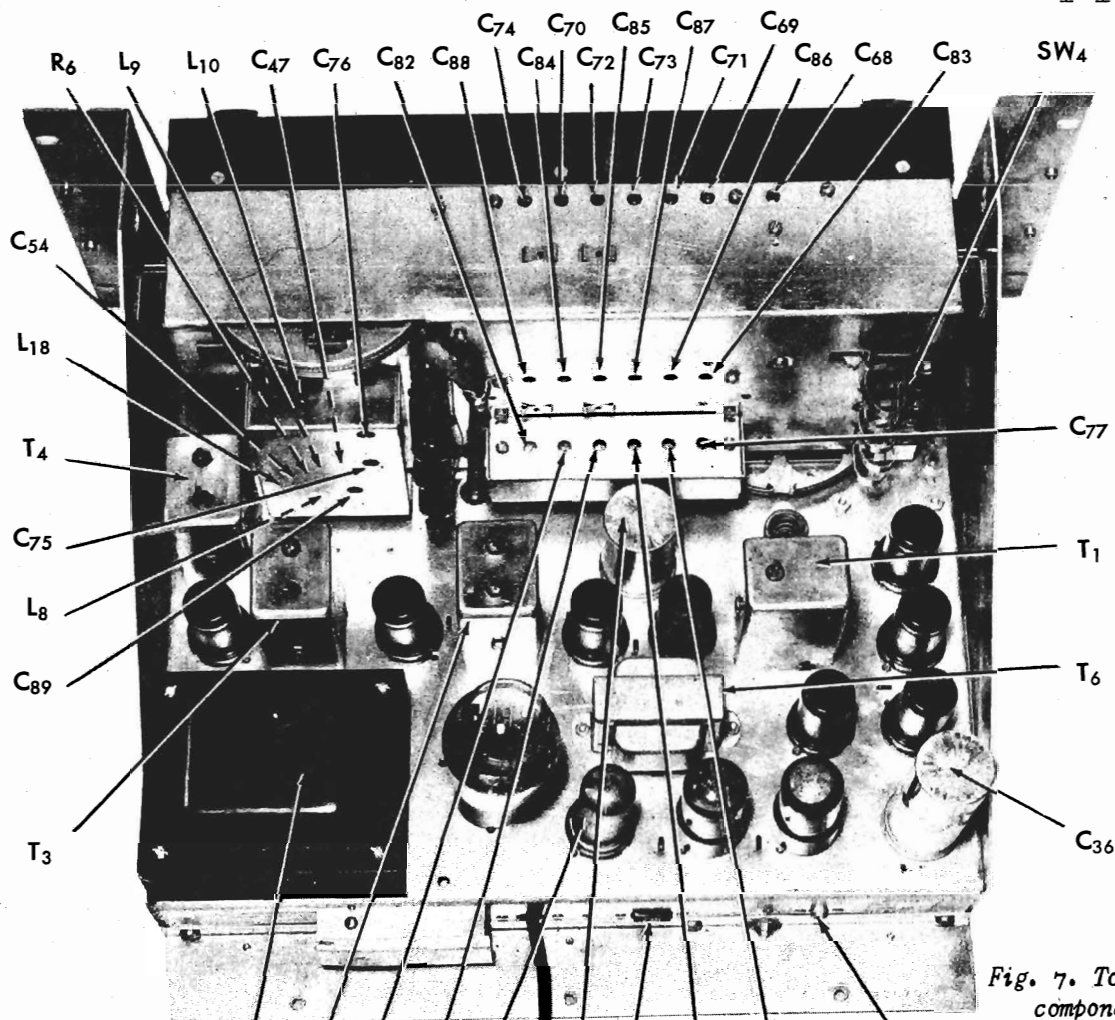


Fig. 7. Top view showing component location.

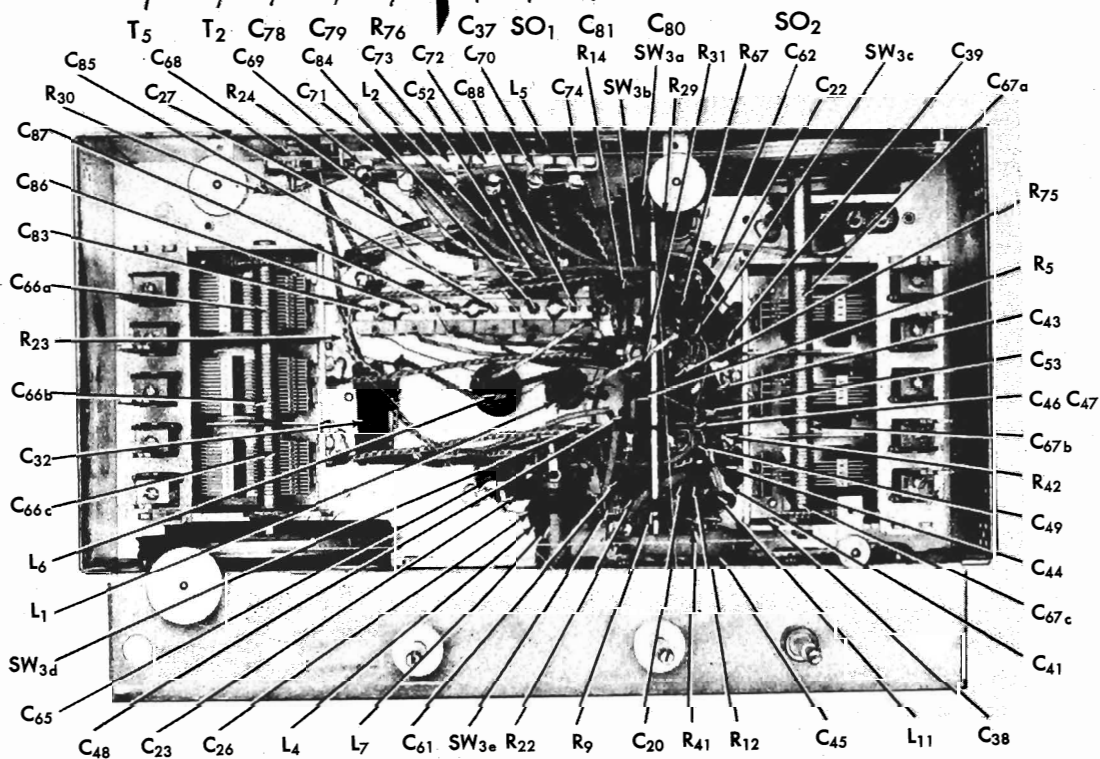


Fig. 8. Front view of R.F. chassis showing component location.

MODELS 1-1500,
1-1501, 1-1502

CONCORD RADIO CORP.

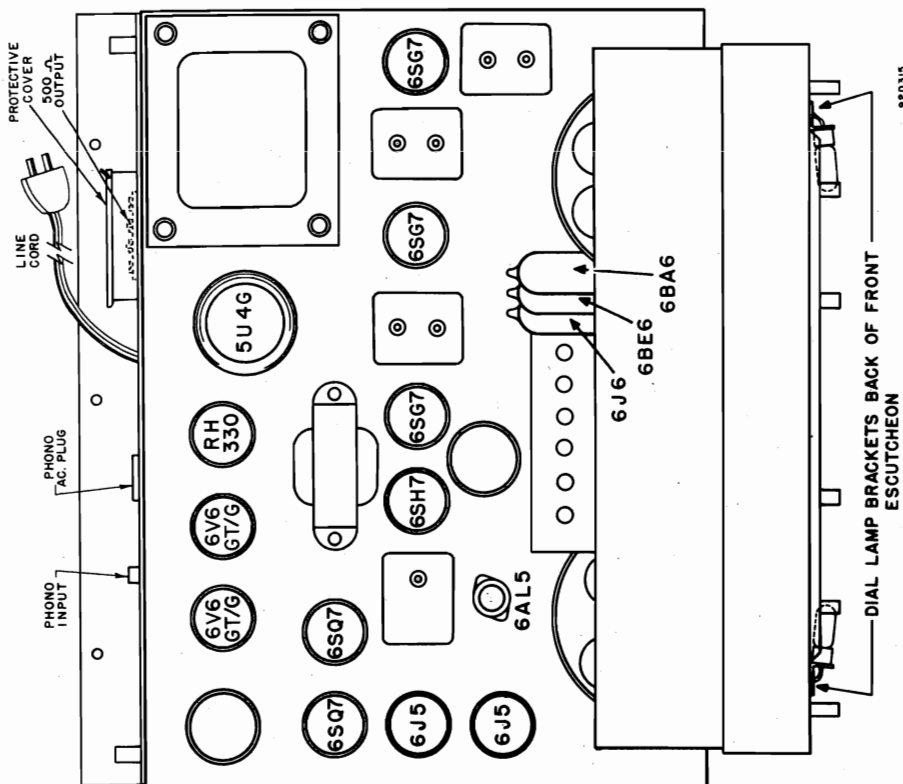


Fig. 10. Top view, location of tubes and dial lamps.

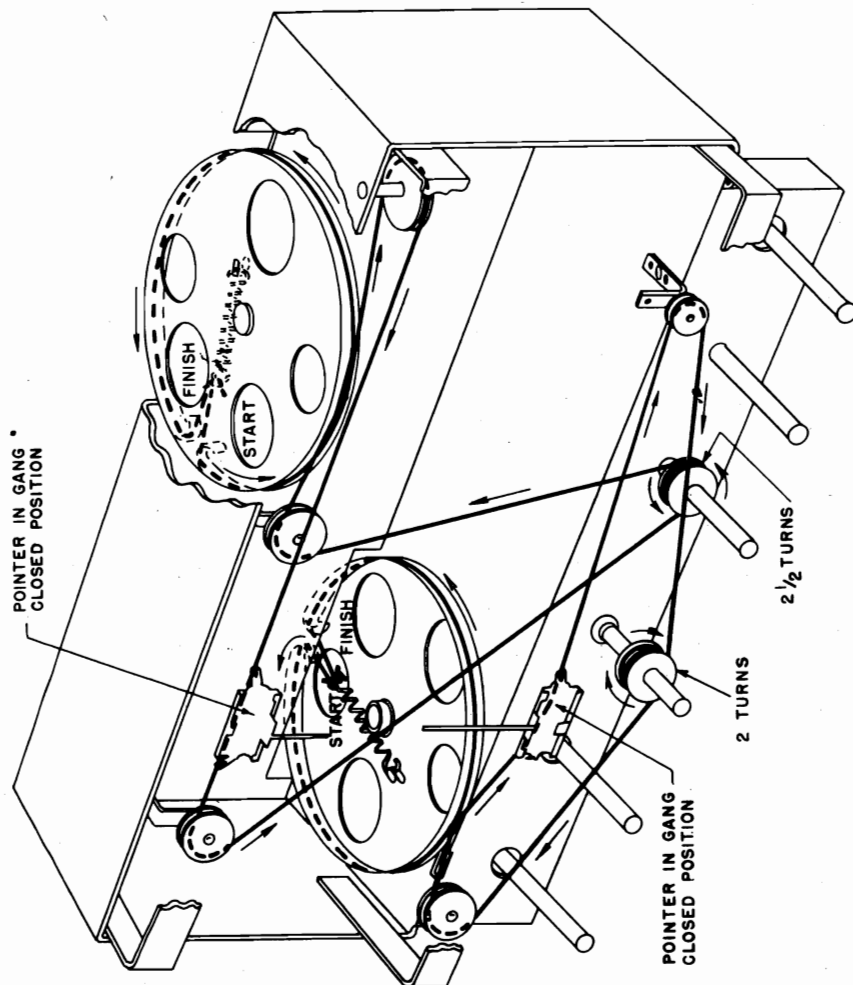


Fig. 9. Dial cable stringing procedure.

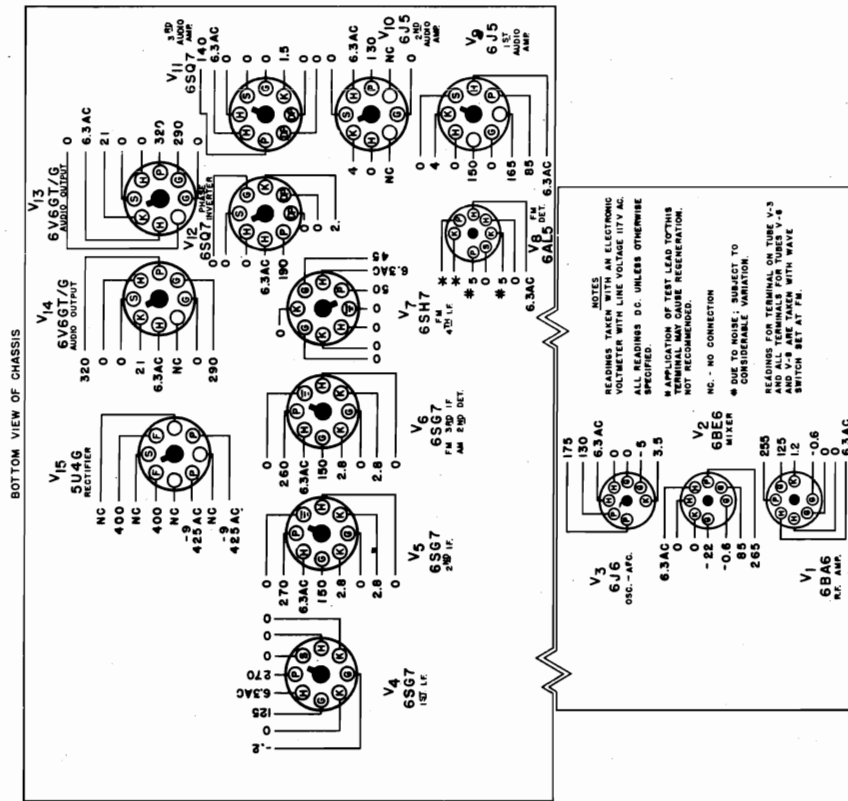


Fig. 12. Tube voltage chart.

REPLACING DIAL LAMP:

Refer to Fig. 10 for location of the two pilot lamps. To gain access to the lamps remove the four front panel screws holding the panel to the cabinet and three chassis screws located under the cabinet. and remove the knobs. Remove the four panel screws holding the panel to the chassis for release the panel exposing the pilot lamps for service. Replace pilot lamps with 8-8V, 150 ma. Mazda #47 equivalent.

ALIGNMENT PROCEDURE:

It will be necessary to remove the receiver chassis from the cabinet and remove the chassis bottom plate to gain access to some of the I. F. transformer iron core adjustments. See Fig. 5.

The receiver is equipped with AUTOMATIC FREQUENCY CONTROL. Before making adjustments for mechanical variations in the push-button mechanism. Correction factor is approximately 5 times: *Take hold* characteristics are: *Before* 100 kc and *Release* before 450 kc at a 0.2 volt input signal.

The standard RMA dummy mentioned in the alignment chart consists of a 200 mmf condenser in series with a 20 ohm r-f choke which is shunted by a 400 mmf condenser in series with a 400 ohm carbon resistor.

ALIGNMENT PROCEDURE

Step	Dummy Antenna	Signal Generator Coupling	Signal Generator Frequency	Band Switch Pos.	Radio Dial Setting	Adjust	Remarks
1	0.01 mfd cap.	To stator plates and *G* on ant. term. strip	485 kc	*BC*	1000 kc	55, 56, 57, 58, 51 & 54	Adjust for max. output. TUNE tone control set at No. 1.
2	0.01 mfd cap.	To stator plates of center section (No modulation of FM tuning cap. lation)	10.7 mc	*FM*	Mid-scale	59, 512, 13, 58, 511, 57 & 510	Adjust for max. AVC voltage as measured between pin #7 of 6AL5 and ground with a 20,000-ohm per volt meter.
3	0.01 mfd cap.	To stator plates of center section (No modulation of FM tuning cap. lation)	10.7 mc	*FM*	Mid-scale	514	Adjust for zero voltage as measured between junction of L16 and *G* on ant. term. strip with a 20,000-ohm per volt meter.
4	Std. RMA dummy.	To terminals *A* and *G* on ant. term. strip	1500 kc	*BC*	1500 kc	F*, H and I	Adjust for max. output
5	Std. RMA dummy	To terminals *A* and *G* on ant. term. strip	18 mc	*C*	18 mc	E*, R and S	Adjust for max. output.
6	Std. RMA dummy	To terminals *A* and *G* on ant. term. strip	18 mc	*A*	18 mc	A*, O and N	Adjust for max. output
7	Std. RMA dummy	To terminals *A* and *G* on ant. term. strip	15 mc	*A*	15 mc	B*, P, and Q	Adjust for max. output.
8	Two 150 ohm carbon resistors in each lead.	To terminals *A* and *G* on ant. term. strip one 150 ohm resistor in each lead.	108 mc	*FM*	108 mc	C*, J and K, D*, L, T*, U and V	Adjust for max. output.

* NOTE - Calibration adjustments.

MODELS 1-1500,
1-1501. 1-1502

CONCORD RADIO CORP.

SERVICE PARTS LIST

REF. NO.	DESCRIPTION	REF. NO.	DESCRIPTION
CAPACITORS		RESISTORS (Continued)	
C-1,4,5,6,8, 12,13,14,15,16, 17,18,20,21,22, 23,24,35,90	.01 mfd 600 V., tubular paper	R-80	6.8 ohms 1 watt, carbon
C-2,3,26,27,28	.02 mfd 600 V., tubular paper	R-81	68,000 ohms 1 watt, carbon
C-7,34	.003 mfd 600 V., tubular paper	R-82	4700 ohms $\frac{1}{2}$ watt, carbon
C-11,31,32,50, 51,93	.05 mfd 600 V., tubular paper	R-84	33,000 ohms $\frac{1}{2}$ watt, carbon
C-25	.01 mfd 600 V., molded paper	TRANSFORMERS AND COILS	
C-33	.005 mfd 600 V., tubular paper	T-1	Transformer, FM detector
C-36	60-20 mfd 450 V., 20 mfd. 30 V., electrolytic	T-2,3	Transformer, interstage I.F.
C-37	40-10 mfd 450 V., 20 mfd. 30 V., electrolytic	T-4	Transformer, 1st. I.F.
C-38,39	500 mmf 500 V., ceramic	T-5	Transformer, power
C-40,42,43,44	1000 mmf 500 V., ceramic	T-6	Transformer, audio output
C-41	10,000 mmf. 150 V., ceramic	L-1	Mixer coil for SW band
C-45	10 mmf 500 V., ceramic	L-2	Antenna coil for BC band
C-46,47	47 mmf 500 V., ceramic	L-4	Oscillator coil for SW band
C-48	1.5 mmf., 500 V., bakelite	L-5	Antenna coil for SW band
C-49	10 mmf 500 V., mica	L-6	Mixer coil for BC band
C-52,64	100 mmf 500 V., mica	L-7	Oscillator coil for BC band
C-54	22 mmf 500 V., mica.	L-8	Oscillator coil for FM band
C-55	22 mmf 500 V., mica.	L-9	Mixer coil for FM band
C-56,57,58	220 mmf 500 V., mica.	L-10	Antenna coil for FM band
C-60,61,62	47 mmf 500 V., mica	L-11	Plate choke, osc. stage
C-63	.001 mfd 500 V., mica.	L-12	Filament choke
C-65	.0039 mfd 500 V., mica.	L-13,14,15,16	R.F. choke
C-66	Tuning condenser, "AM"	L-18	R.F. choke, ant. stage plate
C-67	Tuning condenser, "FM"	SWITCHES	
C-68	570 mmf. trimmer.	SW-1	Power & Bass tone switch ass'y
C-69,70,71, 72,73,74	Trimmer assembly, ant. stage.	SW-2	Treble switch ass'y.
C-75	Trimmer, FM, mixer stage.	SW-3	Band switch
C-76	Trimmer, FM, ant. stage.	SW-4	Muting switch
C-77,78,79,80,81, 82	Trimmer assembly, osc. stage.	PLUGS AND SOCKETS	
C-83,84,85,86,87, 88	Trimmer assembly, mixer stage.	PL-1	Line cord and plug
C-89	Trimmer, FM, osc. stage	SO-1	Receptacle, phono motor
C-92	39 mmf. 500 V., ceramic	SO-2	Jack, phono pick-up
RESISTORS		SO-3	Receptacle, ballast
R-1,2	330 ohms 5 watts, WW.	TUBES, RECTIFIERS AND LAMPS	
R-3	47 ohms 4 watts, Carbon.	V-1	Type 6BA6, Antenna
R-4	2 meg-ohms, volume control	V-2	Type 6BE6, Mixer
R-5,	10 ohms $\frac{1}{2}$ watt, carbon	V-3	Type 6J6, Oscillator and A.F.C.
R-6,8	100 ohms $\frac{1}{2}$ watt, carbon	V-4,5,6	Type 6SG7, I.F. amplifier
R-9,10,12,13,14, 77	1000 ohms $\frac{1}{2}$ watt, carbon	V-7	Type 6SH7, I.F. amplifier
R-15	10,000 ohms $\frac{1}{2}$ watt, carbon	V-8	Type 6AL5, F.M. detector
R-16	15,000 ohms $\frac{1}{2}$ watt, carbon	V-9,10	Type 6J5, A.F. amplifier
R-17,19,20,21,22, 23,24	100,000 ohms $\frac{1}{2}$ watt, carbon	V-11,12	Type 6SQ7, Phase inverter
R-26,27,28,29, 30,31,83	1 meg-ohm $\frac{1}{2}$ watt, carbon	V-13,14	Type 6V6GT/G, A.F. power amplifier
R-32	150 ohms $\frac{1}{2}$ watt, carbon	V-15	Type 5U4G, Rectifier
R-33,34	100,000 ohms $\frac{1}{2}$ watt, carbon	LM-1,2	Lamp, 6-8 V., 150 MA. G.E. #47
R-35,36,37,38,39	220 ohms $\frac{1}{2}$ watt, carbon	MISCELLANEOUS COMPONENTS	
R-41,42	22,000 ohms $\frac{1}{2}$ watt, carbon	Shield base, tube (miniature tube) Shield, tube (miniature tube) Spring, tube retainer Carriage, pointer Pointer, FM Pointer, AM Spring, pointer Push-button (black) Insert, push-button, lucite Insert, push-button, metal Call letters Spring, dial Cord, dial Escutcheon Dial glass, upper Dial glass, lower Knob Terminal strip, antenna Terminal strip, speaker Shield, speaker terminal	
R-43,44,52,64	220,000 ohms $\frac{1}{2}$ watt, carbon		
R-45,50,51	330,000 ohms $\frac{1}{2}$ watt, carbon		
R-46	100 ohms $\frac{1}{2}$ watt, carbon		
R-47,49	150,000 ohms $\frac{1}{2}$ watt, carbon		
R-48	3300 ohms $\frac{1}{2}$ watt, carbon		
R-53	3900 ohms $\frac{1}{2}$ watt, carbon		
R-54	12,000 ohms $\frac{1}{2}$ watt, carbon		
R-55	470 ohms $\frac{1}{2}$ watt, carbon		
R-58,59	47,000 ohms $\frac{1}{2}$ watt, carbon.		
R-60,61	68,000 ohms $\frac{1}{2}$ watt, carbon.		
R-62,65	470,000 ohms $\frac{1}{2}$ watt, carbon		
R-63	390,000 ohms $\frac{1}{2}$ watt, carbon		
R-66	100,000 ohms 1 watt, carbon		
R-67	33,000 ohms 1 watt, carbon.		
R-68,69,70	47,000 ohms 1 watt, carbon.		
R-71	22,000 ohms 1 watt, carbon		
R-72,73,74	10,000 ohms 2 watt, carbon		
R-75	33,000 ohms 2 watts, carbon	TS-1	Terminal strip, antenna
R-76	330 ohms, plug-in ballast	TS-2	Terminal strip, speaker
R-79	470 ohms 2 watts, carbon		Shield, speaker terminal

CROSLEY DIV.
AVCO MFG. CORP.

MODEL 9-101
Revised



DESCRIPTION

TYPE: Five-tube, single-band superheterodyne.

FREQUENCY RANGE: 540 to 1600 kc.

INTERMEDIATE FREQUENCY: 455 kc.

POWER SUPPLY: Crosley "A-B" Battery Pack, CR69.

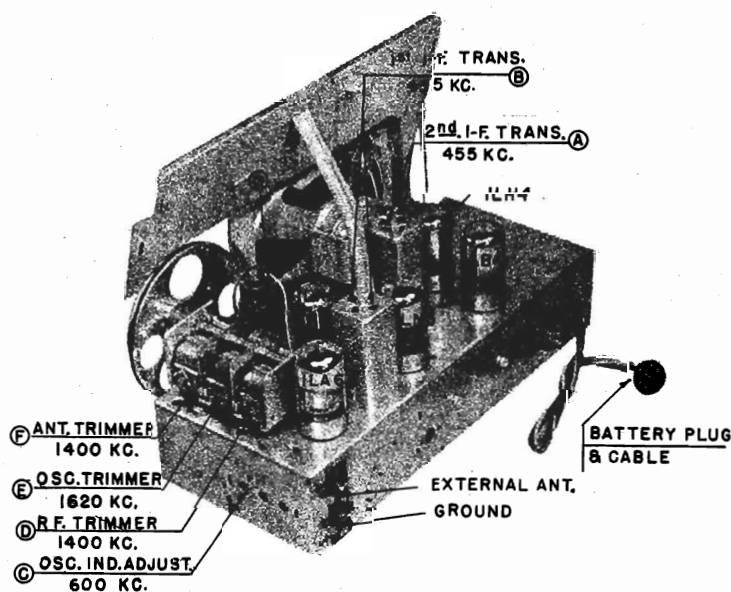
VOLTAGE RATING: 11½ v. "A"; 90 v. "B".

POWER OUTPUT: 175 mw. maximum.

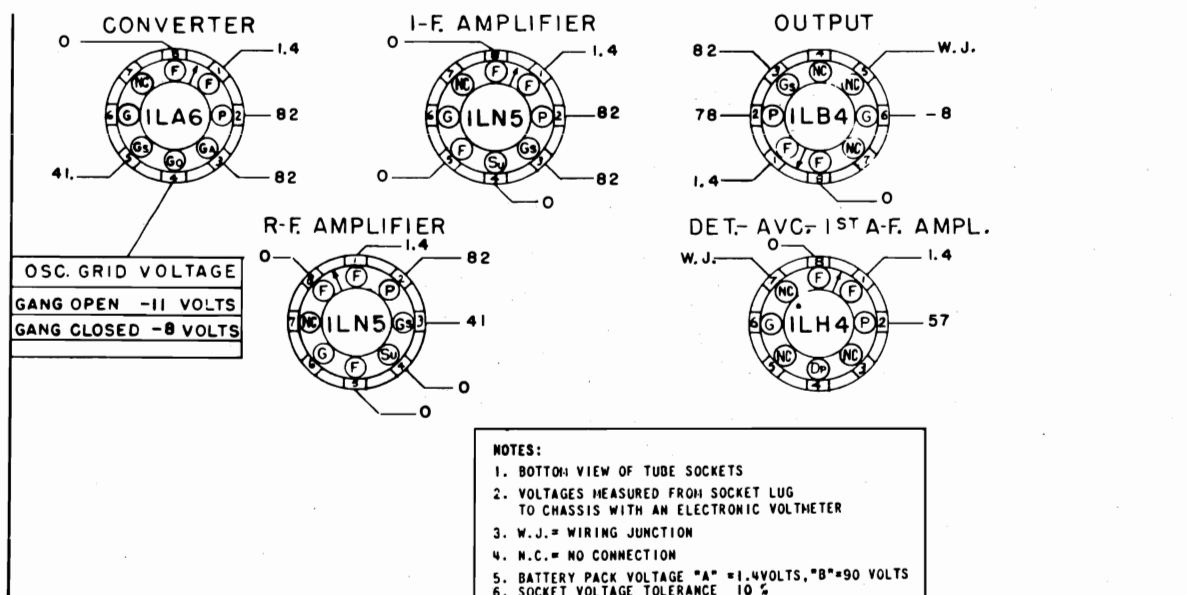
TUBE COMPLEMENT:

Type	Function
1LA6	Mixer
1LN5	I. F. Amplifier,
1LN5	R. F. Amplifier
1LH4	Detector, AVC 1st A. F. Amplifier
1LB4	A. F. Power Output

For satisfactory operation it is necessary that an antenna and ground be connected to this receiver.



CHASSIS REAR VIEW

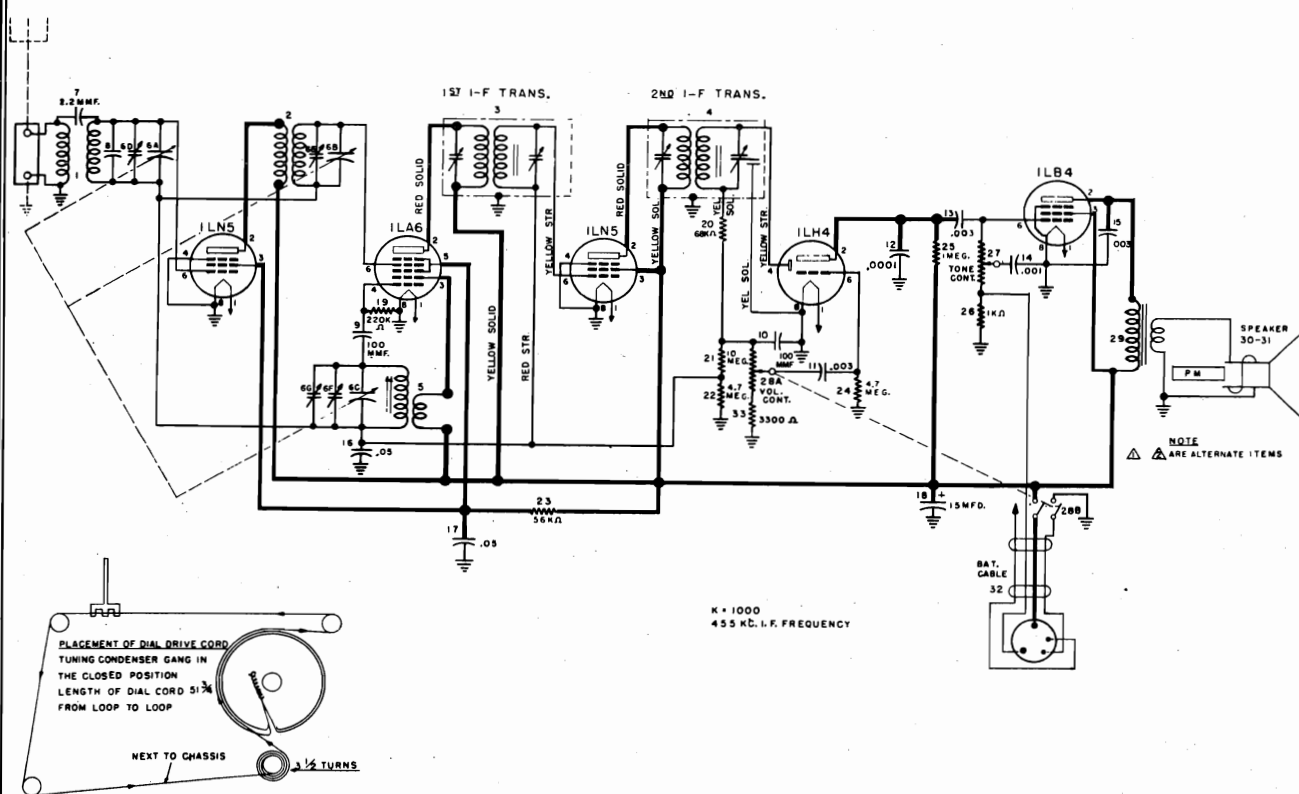
MODEL 9-101
RevisedCROSLEY DIV.
AVCO MFG. CORP.**ALIGNMENT PROCEDURE**

1. Turn the tuning condenser to the completely closed position against the stop and set the dial pointer to the reference line at the end of the dial scale.
2. Connect the output meter across the speaker voice coil.
3. The r.f. signal input from the signal generator should be fed to the receiver as indicated in the alignment chart. Connect the low side (ground) of the signal generator to the chassis.
4. Turn the tone control to its treble position.
5. Turn the volume control on full and adjust the signal generator output to produce approximately mid-scale deflection of the output meter, but maintain signal generator output as low as possible to prevent AVC action in the receiver.

ALIGNMENT CHART

Alignment adjustment locations are shown on page 1, Chassis, Rear View.

Alignment Sequence	Signal Generator Output			Position of Dial Pointer or Var. Cond.	Adjust for Maximum Output	Remarks
	Frequency in kc.	In Series With	To			
1	455	.01 mfd.	R.F. Grid	Closed	A & B	
2	600	.01 mfd.	R.F. Grid	600 kc.	C	Preset "G" to 1/4 turn from the closed position and "E" to 1/2 turn from its closed position.
3	1620	.01 mfd.	Ant.	Open	E	
4	1400	200 mmf.	Ant.	Tune to Signal	D & F	
5	600	200 mmf.	Ant.	Tune to Signal	C	Rock Gang.
6	Repeat steps 3, 4, and 5 until circuits align and dial tracks.					
7	Conclude alignment by repeating step 4.					

CROSLEY DIV.
AVCO MFG. CORP.MODEL 9-101
Revised

REPLACEMENT PARTS LIST—MODEL 9-101

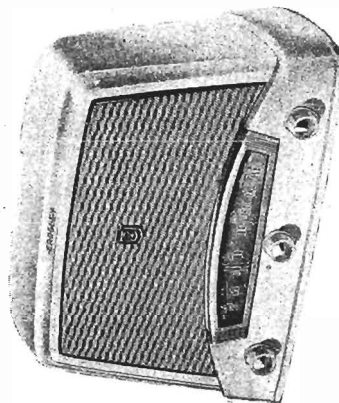
Figures in first column correspond to figures in Schematic Diagram.

Item No.	Part No.	Description	Item No.	Part No.	Description
1	AW-142997	Coil, Antenna	24	39373-102	Resistor, 4.7 megohm, 1/2 w.
2	AW-142993	Coil, R.F.	25	39373-92	Resistor, 1 megohm, 1/2 w.
3	AC-143013	Transformer, 1st I.F.	26	39373-33	Resistor, 1000 ohm, 1/2 w.
4	AC-143034	Transformer, 2nd I.F.	27	39368-11	Control, Tone (2 megohm)
5	AW-145105	Coil, Oscillator	28A	39368-14	Control, Volume (1 megohm)
6A	AC-137073-20	Condenser, Variable	28B	39369-2	Switch, Power
6B		Condenser, Variable	29	B-143018	Transformer, Output
6C		Condenser, Variable	31	143688	Speaker
6D	Part of Item 6A	Condenser, Trimmer	32	B-130493	Cable and Plug Assy., Battery
6E	Part of Item 6B	Condenser, Trimmer	33	39373-44	Resistor, 3300 ohm, 1/2 w.
6F	Part of Item 6C	Condenser, Trimmer		R-138573-5	Cabinet
6G	Part of Item 6C	Condenser, Trimmer		C-143245	Dial Glass
7	W-137398-4	Condenser, 2.2 mmf., 500 v.		W-134055	Grommet, Var. Cond. Mtg.
8	C-137727-47	Condenser, 10 mmf., 500 v., ceramic		W-143041	Grommet, Battery Cable
9	C-137727-1	Condenser, 100 mmf., 300 v., ceramic		C-39012-81	Iron Core, Osc. Coil
10	C-137727-1	Condenser, 100 mmf., 300 v., ceramic		B-138574-4	Knob
11	39001-76	Condenser, .003 mfd., 600 v., paper		W-46065	Mounting (Rubber), Speaker
12	39001-1	Condenser, .0001 mfd., 600 v., paper		W-132366-2	Nut, Locking (Osc. Iron Core)
13	39001-76	Condenser, .003 mfd., 600 v., paper		B-143115	Pointer, Dial
14	39001-7	Condenser, .001 mfd., 600 v., paper		W-137939-1	Pulley, Drive Cord Idler
15	39001-76	Condenser, .003 mfd., 600 v., paper		W-51071	Ring, Retaining (Drive Shaft)
16	39001-17	Condenser, .05 mfd., 600 v., paper		B-135075-5	Shaft, Dial Drive
17	39001-17	Condenser, .05 mfd., 600 v., paper		39441	Socket, Tube
18	39358-13	Condenser, 16 mfd., 150 v., Elect.		W-51752	Spring, Dial Drive Cord
19	39373-80	Resistor, 220,000 ohm, 1/2 w.		B-138649	Strip, Dial Glass
20	39373-71	Resistor, 68,000 ohm, 1/2 w.		W-138568	Strip, Dial Pointer
21	39373-107	Resistor, 10 megohm, 1/2 w.		AC-138443-3	Support and Pulley Assy., Dial
22	39373-102	Resistor, 4.7 megohm, 1/2 w.		W-134916	Washer, Spring (Drive Shaft)
23	39373-69	Resistor, 56,000 ohm, 1/2 w.			

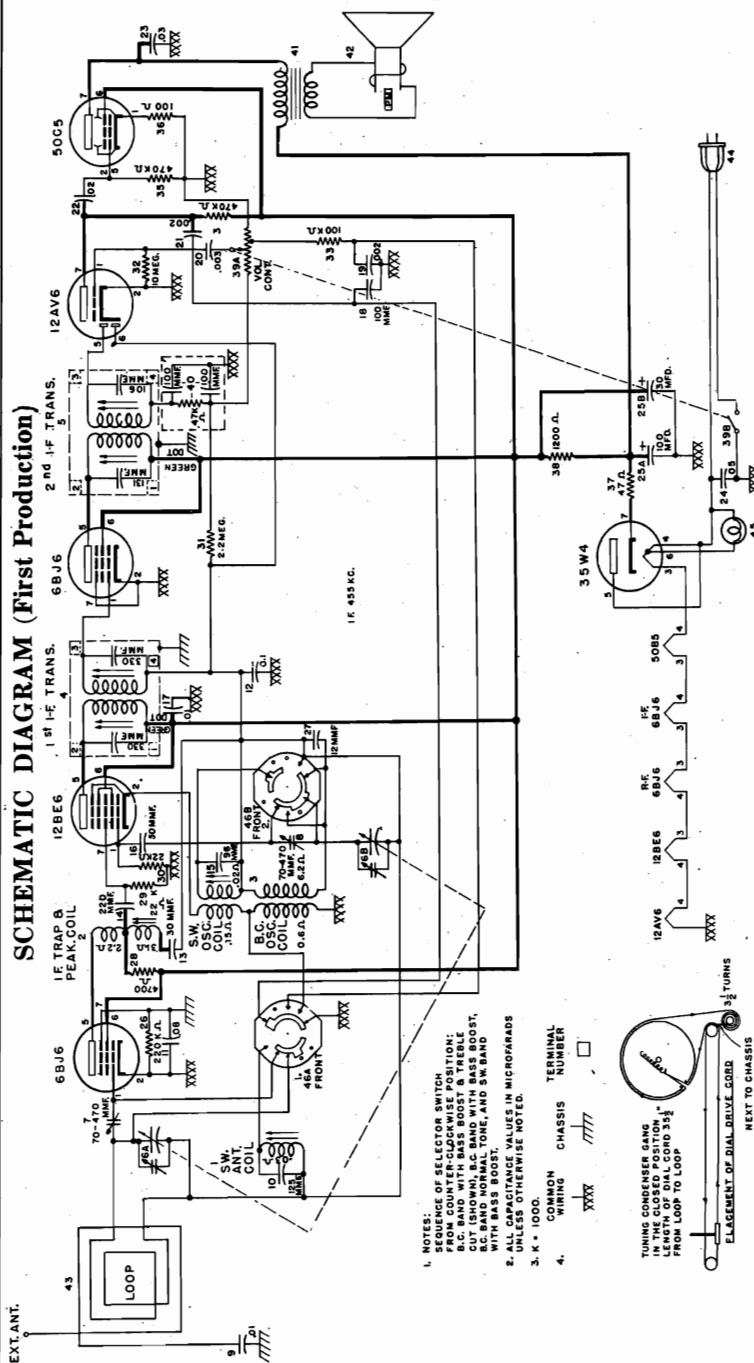
CROSLEY DIV.
AVCO MFG. CORP.



9-105



9-106W



DESCRIPTION

TUBE COMPLEMENT:

Type	Function
6BJ6	R.F. Amplifier
12BE6	Mixer
6BJ6	I.F. Amplifier
12AV6	Detector, AVC, 1st A.F. Amplifier
50C5	A.F. Power Output
35W4	Rectifier

DIAL BULB: Type 47, 6.3 volts, .15 amp.

TYPE: Six-tube, two-band, superheterodyne.

FREQUENCY RANGE: Standard Broadcast Band, 540 to 1600 kc. (Selector Switch, Counter-clockwise or Left.)

Short-wave Band: 9.4 to 11.9 mc. (Selector Switch, Clockwise or Right.)

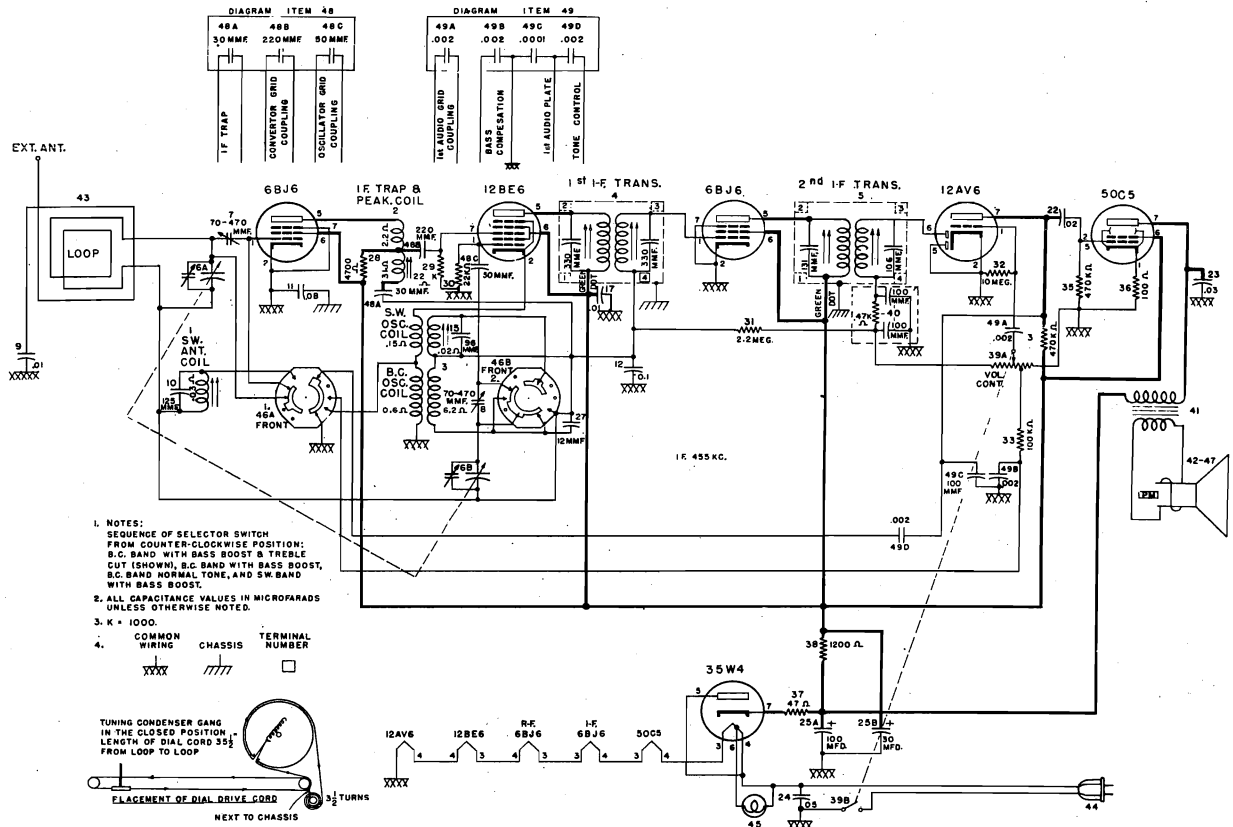
INTERMEDIATE FREQUENCY: 455 kc.

POWER SUPPLY: a.c.—d.c.

VOLTAGE RATING: 105-125 volts.

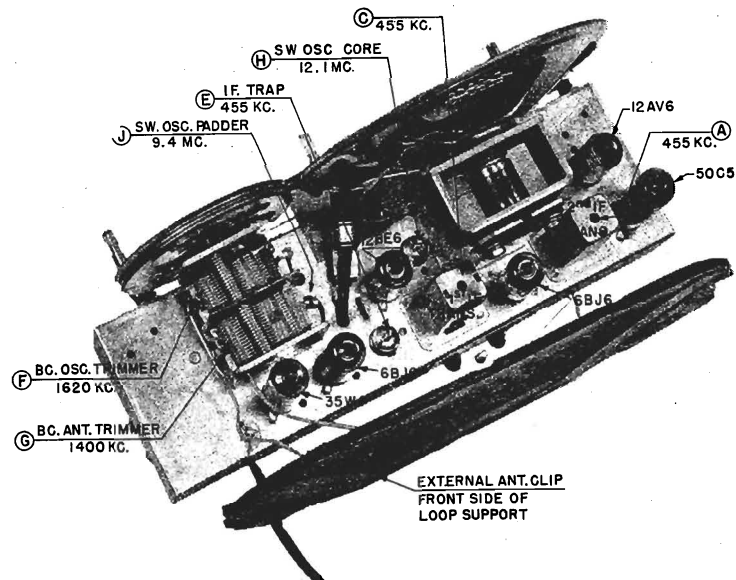
POWER CONSUMPTION: 30 watts nominal.

POWER OUTPUT: 1.5 watt maximum.

CROSLEY DIV.
AVCO MFG. CORP.MODELS 9-105,
9-106W

SCHEMATIC DIAGRAM (Second Production)

CHASSIS, TOP VIEW



MODELS 9-105,
9-106WCROSLLEY DIV.
AVCO MFG. CORP.

When using direct current it may be necessary to reverse the position of the power plug in the electric outlet for correct polarity.

Reversing the position of the power plug when alternating current is used may reduce power hum.

Under no circumstances should a ground be connected to this receiver.

ALIGNMENT PROCEDURE

1. Turn the tuning condenser to the completely closed position against the stop and set the dial pointer to the reference line at the end of the dial scale.
2. Connect the output meter across the speaker voice coil.
3. The r.f. signal input from the signal generator should be connected to the external antenna lead. Connect the signal generator ground through a 0.1 mfd. condenser to B— (pin 2 on 6BJ6 tube socket, R.F. Amplifier).
4. Turn the volume control on full and turn the tone switch to maximum treble position; then adjust the signal generator output to produce approximately mid-scale deflection of the output meter, but maintain signal generator output as low as possible to prevent AVC action in the receiver.

ALIGNMENT CHART

Alignment Adjustment Locations are shown on page 1, Chassis, Top View and on page 3, Socket Voltage Chart.

Alignment Sequence	Signal Generator Output			Position of		Adjust for Maximum Output
	Frequency	In Series with	To	Band Switch	Tuning Dial or Tuning Cond.	
*1	455 kc	200 mmf.	Ant.	BC	Open	A & B
2	455 kc	200 mmf.	Ant.	BC	Open	C & D
†3	455 kc	200 mmf.	Ant.	BC	Open	E
4	1620 kc	200 mmf.	Ant.	BC	Open 1620	F
5	1400 kc	200 mmf.	Ant.	BC	Tune in Signal	G
6	12.1 mc	400 ohm	Ant.	SW	Open	H
7	9.4 mc	400 ohm	Ant.	SW	Closed	J
Repeat adjustments 6 and 7 until circuits align.						
*8	11.8 mc	400 ohm	Ant.	SW	Tune in Signal	K
9	9.6 mc	400 ohm	Ant.	SW	Tune in Signal	L

Repeat adjustments 6 and 7 until circuits align.

NOTES:

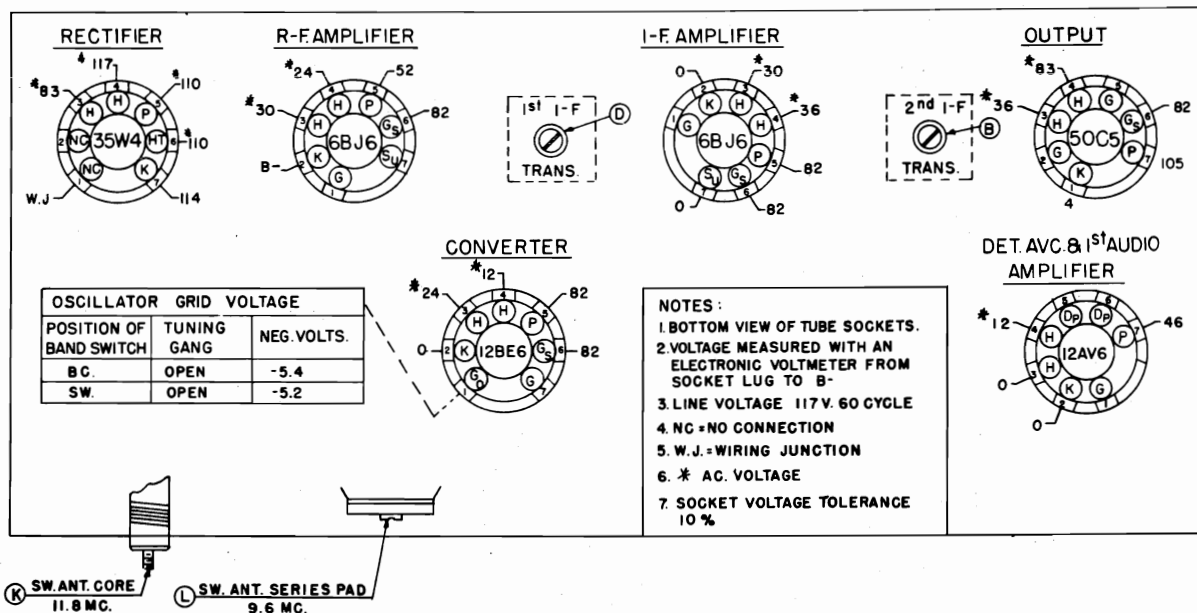
*I-F Trap Core "E" must be turned counter-clockwise, to stop, before adjusting A, B, C, and D.

†Adjust for minimum signal.—Before making alignment adjustments E through K, the chassis bottom should be in place, and the antenna loop should be moved as far from the chassis as the loop bracket will permit.

*Adjustments K and L must be made while rocking the tuning condenser.

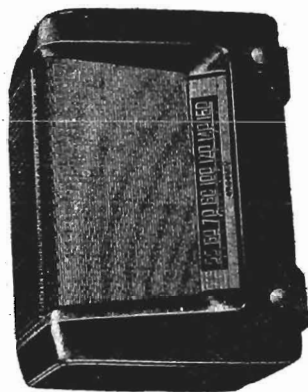
CROSLEY DIV.
AVCO MFG. CORP.MODELS 9-105,
9-106W

SOCKET VOLTAGE CHART

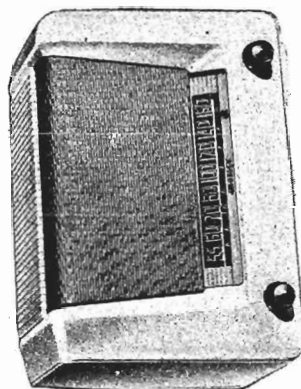


MODELS 9-113,
9-114W

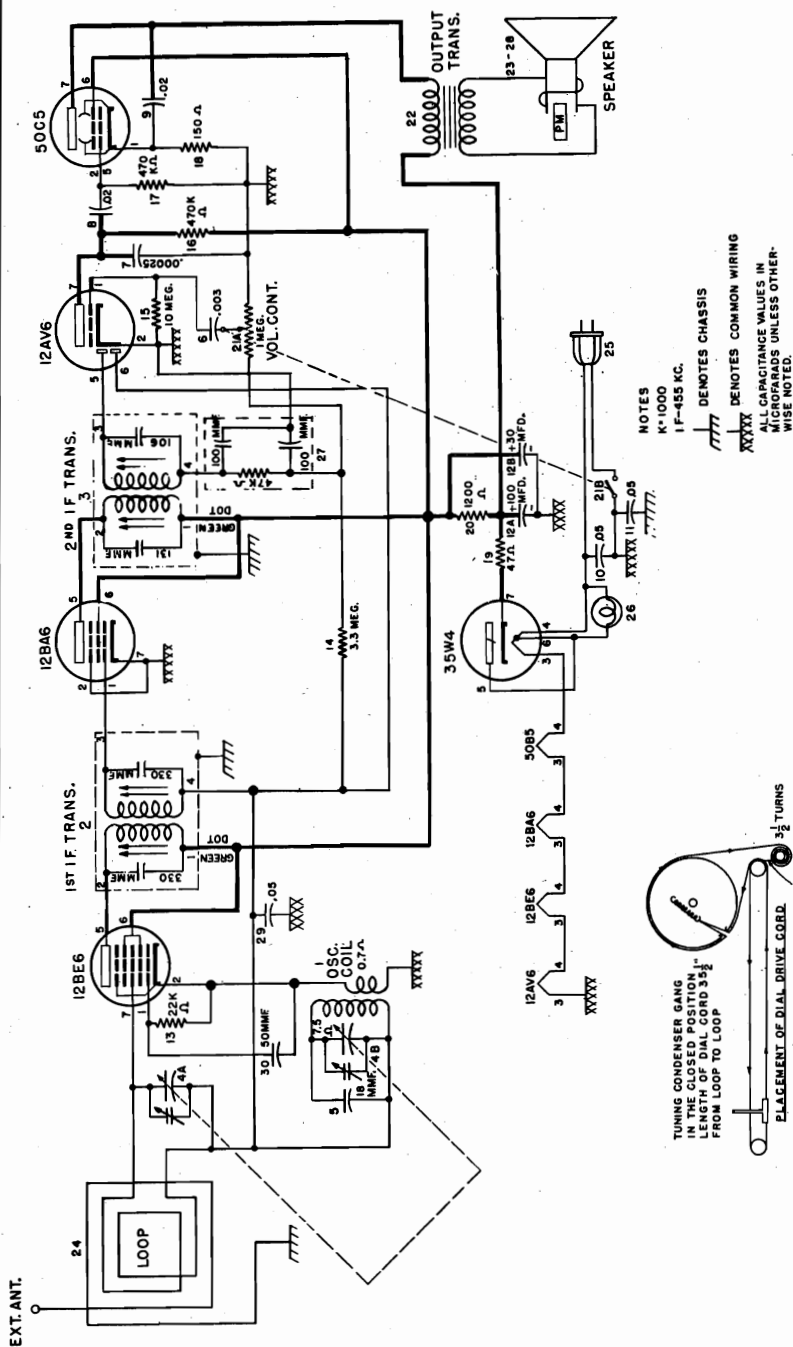
CROSLEY DIV.
AVCO MFG. CORP.



9-113



9-114W



SCHEMATIC DIAGRAM (First Production)

DESCRIPTION

TYPE: Five-tube, single band, Superheterodyne.

FREQUENCY RANGE: 540 to 1600 kc.

INTERMEDIATE FREQUENCY: 455 kc.

POWER SUPPLY: a.c.-d.c.

VOLTAGE RATING: 105-125 volts.

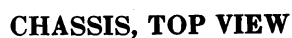
POWER CONSUMPTION: 35 watts maximum.

POWER OUTPUT: 1.3 watts maximum.

TUBE COMPLEMENT

Type	Function
12BE6	Converter
12BA6	I. F. Amplifier
12AV6	Detector, AVC, 1st A. F. Amplifier
50C5	A. F. Power Output
35W4	Rectifier

DIAL BULB: Type 47, 6.3 volts, .15 amp.



Under no circumstances should a ground be connected to this receiver.

CROSLEY DIV.
AVCO MFG. CORP.

1. Connect an output meter across the speaker voice coil.
2. The r.f. signal input from the signal generator should be connected to the high side of loop antenna. Connect the signal generator ground through a 0.1 mfd. condenser to B—(see Socket Voltage Chart).
3. Turn the volume control on full and adjust the signal generator output to produce approximately midscale deflection of the output meter, but maintain signal generator output as low as possible to prevent AVC action in the receiver.

Alignment Sequence	Signal Generator Output			Position of Tuning Cond.	Adjust for Maximum Output
	Frequency in kc.	In Series with	To		
1	455	200 mmf.	High Side of Loop	Open	A & B
2	1620	*Radiated to Loop		Open	C
3	1400	*Radiated to Loop		Tune to Signal	D

RECTIFIER

* 117
* 85
W.J.
NC
35W4
112
117
W.J.

I.F. AMPLIFIER

0
* 24
* 36
12BA6
90
90
0

CONVERTER

* 12
* 24
90
0
12BE6
5.2
0
GANG CLOSED

OUTPUT

* 85
* 36
9
10
5
0

DET. AVC. & 1st AUDIO AMPLIFIER

* 12
0
12AV6
50
0

NOTES:

1. BOTTOM VIEW OF TUBE SOCKETS.
2. VOLTAGE MEASURED WITH AN ELECTRONIC VOLTMETER FROM SOCKET LUG TO B-.
3. LINE VOLTAGE 117 V. 60 CYCLE.
4. NC=NO CONNECTION.
5. W.J.= WIRING JUNCTION.
6. * = AC VOLTAGE.
7. SOCKET VOLTAGE TOLERANCE 10%.

Item No.	Part Number	Description	Item No.	Part Number	Description
1	144325	Coil, Oscillator	24	144328	Antenna Loop and Back Assy.
2	139919-4	Transformer, 1st I. F.	25	132300-1	Cable and Plug Assy., Power
3	139919-3	Transformer, 2nd I. F.	26	W-48858	Bulb (Dial), Type 47, 6.3 v., .15 amp.
4A	137073-27	Condenser, Variable {Two	27	142951-2	Condenser—Resistor
4B		Condenser, Variable {Section	29	39001-17	Condenser, .05 mfd., 600 v., paper
5	137727-66	Condenser, 18 mmf., 500 v., ceramic	30	137727-21	Condenser, 50 mmf., 500 v., ceramic
6	39001-76	Condenser, .003 mfd., 600 v., paper	31A	144675-1	Condenser, .002 mfd., 500 v.
7	39001-73	Condenser, .00025 mfd., 600 v., paper	31B		Condenser, .00022 mfd., 500 v. } Four
8	39001-80	Condenser, .02 mfd., 600 v., paper	*31C		Condenser, .00022 mfd., 500 v. } Sect.
9	39001-80	Condenser, .02 mfd., 600 v., paper	31D		Condenser, .005 mfd., 500 v. }
10	39001-17	Condenser, .05 mfd., 600 v., paper		144176	Background Assy., Dial
11	39001-17	Condenser, .05 mfd., 600 v., paper		144112	Bracket, Dial Light
12A	143680	Condenser, 100 mfd., 150 v. {Two Sect.		144034-1	Cabinet (9-113)
12B		Condenser, 30 mfd., 150 v. {Elec. Filter		144127	Cabinet (9-114W)
13	39373-60	Resistor, 22,000 ohm, $\frac{1}{2}$ w.		144027	Dial, Glass
14	39373-100	Resistor, 3.3 megohm, $\frac{1}{2}$ w.		144110	Grille and Baffle
15	39373-107	Resistor, 10 megohm, $\frac{1}{2}$ w.		46065	Grommet, Var. Cond. Mtg.
16	39373-87	Resistor, 470,000 ohm, $\frac{1}{2}$ w.		138576-10	Knob (9-113)
17	39373-87	Resistor, 470,000 ohm, $\frac{1}{2}$ w.		138576-9	Knob (9-114W)
18	39373-16	Resistor, 150 ohm, $\frac{1}{2}$ w.		144070	Pointer, Dial
19	39373-119	Resistor, 47 ohm, 1 w.		39220-36	Screw, Chassis Mtg.
20	39373-144	Resistor, 1200 ohm, 1 w.		135075-7	Shaft, Drive
21A	39368-14	Control, Volume, 1 megohm		131346	Socket (Miniature Tube)
21B	39369-1	Switch, Power		136565-17	Socket, Dial Light
22	138131-1	Transformer, Output		51752	Spring, Dial Drive Cord
23	143694	Speaker (Less Transformer)		132124SB	Trimount Stud

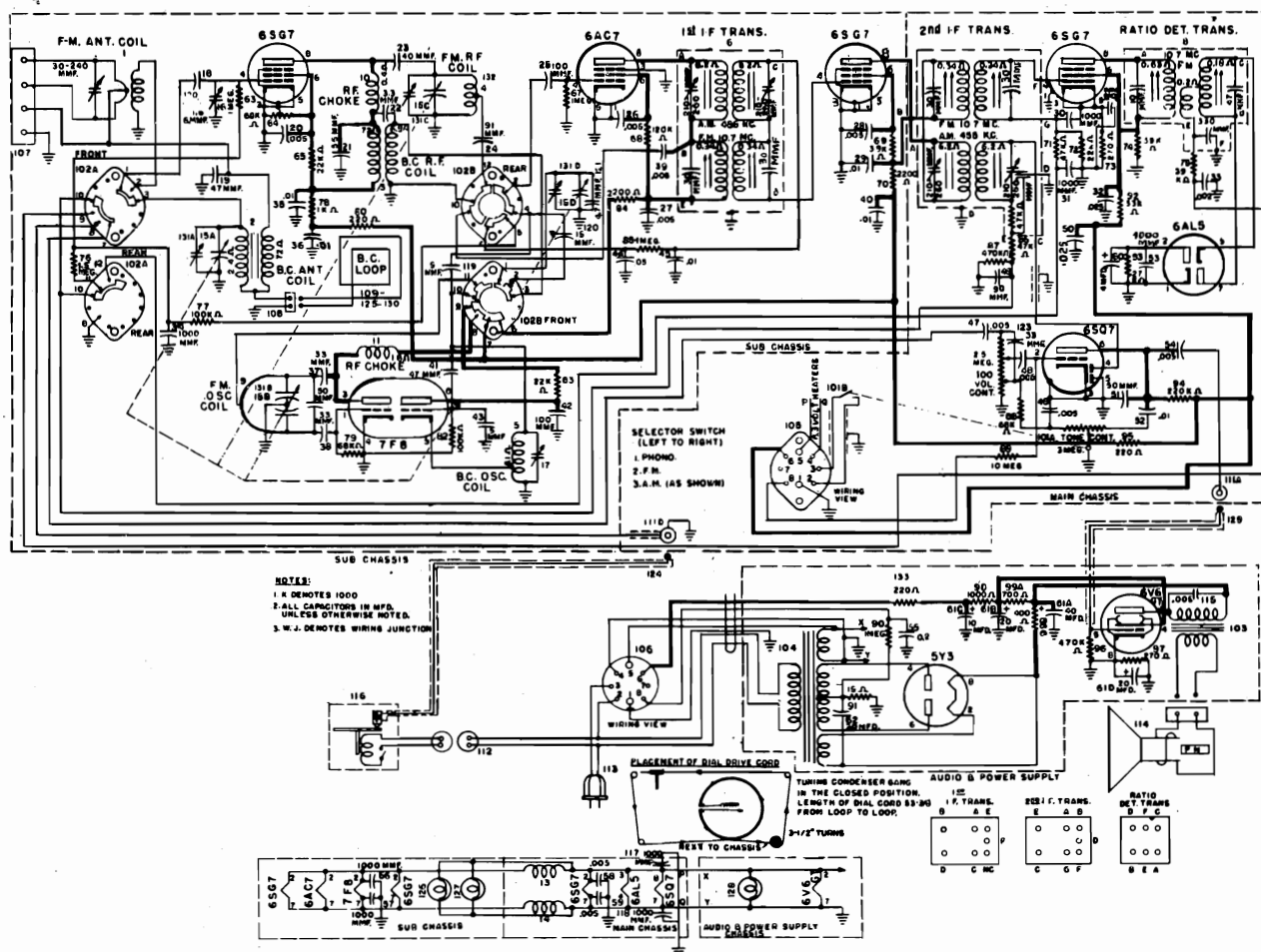
Compliments of www.nucow.com

CROSLEY DIV.
AVCO MFG. CORP.MODELS 9-204,
9-205M




9-204



9-205M



MODELS 9-204,
9-205MCROSLEY DIV.
AVCO MFG. CORP.
ALIGNMENT CHART I (SCOPE METHOD)

	Signal Generator Output		To	Range Switch	Tuning Dial or Tuning Cap	Adjust	Curve	Remarks
	Frequency	In Series With						
1	455 KC	.01 mfd.	1st IF. grid	AM	Gang open	A		Note 1
2	455 KC	.01 mfd.	Stator 21 plate sect. rear of gang	AM	Gang open	B		Note 1
3	10.7 MC	1000 mmf.	2nd IF grid	FM	Gang closed	C	Zero Volts	Note 2
4	10.7 MC	1000 mmf.	2nd IF grid	FM	Gang closed	D	Max. DC output	Note 3
5	RF sweep 10.7 marker	1000 mmf.	1st IF grid	FM	Gang closed	E & F		Align for max. output & symmetry note 4
6	RF sweep 10.7 marker	1000 mmf.	Stator 3 plate sect. rear of gang	FM	Gang closed	G & H		Align for max. output & symmetry note 5
7	FM-RF 98MC	FM dummy antenna	Dipole Ant. Term.	FM	98MC	I	Peak	Note 6
8	104MC	FM dummy antenna	Dipole Ant. Term.	FM	104MC	J	Peak	Note 7
9	92MC	FM dummy antenna	Dipole Ant. Term.	FM	92MC	Form RF Coil "K"	Peak	Note 8
10	Repeat steps 8 and 9 until no further improvement in sensitivity is noted.							
11	FM sweep Gen. 92-98-104 MC markers.	FM dummy antenna	Dipole Ant. Term.	FM	Gang closed	L & M		Note 9 or 9a
12	AM-RF Gen. 1400 KC	200 mmf.	BC Ant. Term. and ground	AM	1400 KC	N		Note 10
13	AM-RF Gen. 1400 KC	200 mmf.	BC Ant. Term. and ground	AM	1400 KC	P & Q		Note 1 & Note 10

TUBE COMPLEMENT

Type	Function		
6SG7	R. F. Amplifier	6SG7	2nd. I. F. Amplifier
6AC7	Mixer	6AL5	Discriminator
7F8	Oscillator	6SQ7	A. M. Det.—AVC 1st. A. F. Amplifier
6SG7	1st. I. F. Amplifier	6V6 (GT/G)	Output
		5Y3 GT/G	Rectifier

DIAL BULB: Type 47, 6.3 volts, .15 amp.

**CROSLEY DIV.
AVCO. MFG. CORP.
ALIGNMENT CHART II**

MODELS 9-204,
9-205M

(Using output meter and electronic voltmeter)

Alignment Sequence	Signal Gen. Output		To	Position of		Adjust	Remarks
	Frequency	In Series With		Range Switch	Tuning Dial or Tun. Cap.		
1	455 KC	.01 mfd.	1st IF grid	AM	Gang open	A	Align for peak on output meter.
2	455 KC	.01 mfd.	Stator 21 plate sect. rear of gang	AM	Gang open	B	Align for peak on output meter.
3	10.7 MC	1000 mmf	2nd IF grid	FM	Gang closed	C	Adjust for zero volts on electronic voltmeter Note 1 & 2.
4	10.7 MC	1000 mmf	2nd IF grid	FM	Gang closed	D	Adjust for max. DC. output on Elect. voltmeter Note 3.
5	10.7 MC	1000 mmf	1st IF grid	FM	Gang closed	E & F	Adjust for max. DC. output Note 4.
6	10.7 MC	1000 mmf	Stator 3 plate sect. rear of gang	FM	Gang closed	G & H	Adjust for max. DC. output Note 4.
Repeat steps 3 and 4, 5 and 6 if necessary.							
7	98 MC	FM dummy antenna	Dipole Ant. Terminals	FM	98 MC	I	Adjust for max. reading on output meter.
8	104 MC	FM dummy antenna	Dipole Ant. Terminals	FM	104 MC	J	Adjust for max. reading on output meter, rock gang if necessary while making adjustments.
9	92 MC	FM dummy antenna	Dipole Ant. Terminals	FM	92 MC	K	Adjust for max. sensitivity, the inductance of FM.RF. coil "K" by forming.
Repeat steps 8 and 9 until no further improvement in sensitivity is noted.							
10	98 MC	FM dummy antenna	Dipole Ant. Terminals	FM	98 MC	L & M	See Note 5.
11	AM-RF Gen. 1400 KC	200 mmf	BC Ant. Term.	AM	1400 KC	N	See Note 6.
12	AM-RF Gen. 1400 KC	200 mmf	BC Ant. Term. and ground	AM	1400 KC	P & Q	Note 6. Adj. for max. reading on output meter.

DESCRIPTION

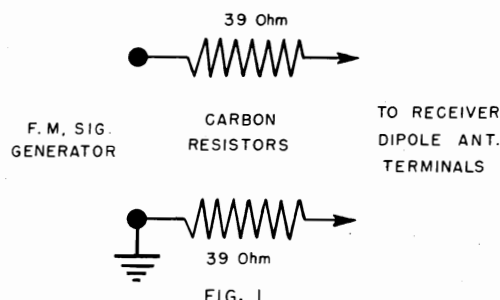
TYPE: Nine tube, two-band superheterodyne.
FREQUENCY RANGE: Standard Broadcast Band:
 540 to 1600 kc. (Selector switch at AM position).
FREQUENCY MODULATION BAND: 88 to 108 mc.
 Channels 201 to 300.
 (Selector switch at FM position).

INTERMEDIATE FREQUENCY: AM Band:
 455 kc. FM Band: 10.7 mc.
POWER SUPPLY: 60 cycle a. c.
VOLTAGE RATING: 105-125 volts.
POWER CONSUMPTION: 90 watts.
 20 watts additional for record changer.
POWER OUTPUT: 7 watts maximum.

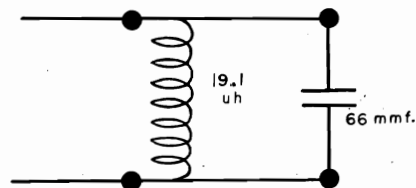
MODELS 9-204,
9-205MCROSLEY DIV.
AVCO. MFG. CORP.
ALIGNMENT CHART I NOTES (SCOPE METHOD)

1. Align for peak on output meter.

2. Connect two 100,000 ohm resistors in series and connect these resistors from the No. 2 lug of the 6AL5 to the chassis. Connect an electronic voltmeter from the center of these resistors to the shielded lead junction of the 39,000 ohm resistor (75) and the .002 mfd. condenser, (33). Adjust the ratio detector transformer secondary (C) for zero volts on the electronic voltmeter. Remove the two 100,000 ohm resistors.



3. Connect the electronic voltmeter across the 27,000 ohm load resistor (93) and adjust primary of core (D) of the ratio detector transformer (8) for maximum DC output.
4. Connect output of marker generator across sweep generator output. Connect CRO across the 22,000 ohm resistor (72) in the grid circuit of the second I.F. amplifier.



5. CRO connections same as note 4.
6. For dummy antenna see figure 1.
7. Rock gang condenser if necessary while making adjustment.
8. Tune in signal and adjust for greatest sensitivity by forming FM.—R.F. coil.
9. Connect CRO in series with 100,000 ohm resistor to grid (pin 4) of R.F. amplifier and chassis. Remove 7F8 oscillator tube. Connect output of marker generator across output of sweep generator. Adjust (L-M) until pattern and markers approximate figure in alignment chart.
- 9a. Shunt primary of FM antenna transformer with a 10 ohm carbon resistor and adjust (M) for maximum output. Remove shunt and place it across FM antenna transformer secondary and adjust (L) for maximum output. Remove shunt.
10. Connect BC. dummy loop (Fig. 2) across loop terminals on rear of chassis.

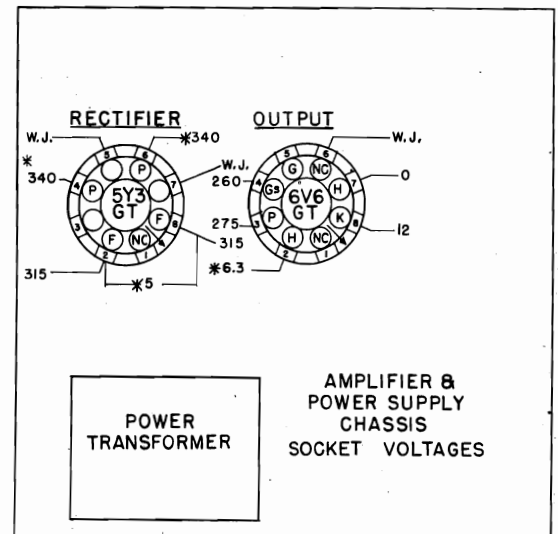
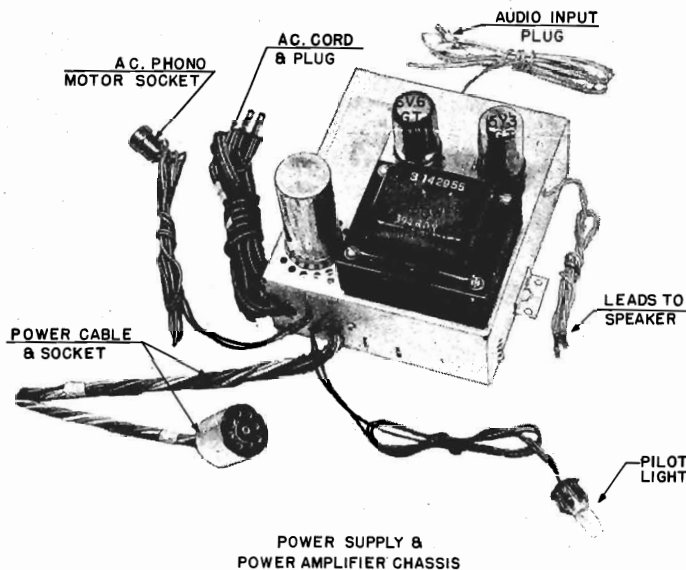
ALIGNMENT CHART II NOTES

1. Use an unmodulated signal generator, with approximately 100,000 mv. output.
2. Connect two 100,000 ohm resistors in series and connect these resistors from the No. 2 lug of the 6AL5 to the chassis. Connect an electronic voltmeter from the center of these resistors to the shielded lead junction of the 39,000 ohm resistor (75) and the .002 mfd. condenser, (33). Adjust the ratio detector transformer secondary (C) for zero volts on the electronic voltmeter. Remove the two 100,000 ohm resistors.
3. Connect the electronic voltmeter across the 27,000 ohm load resistor (93) and adjust the primary of the core (D) of the ratio detector transformer (8) for maximum DC output.
4. Limit output of signal generator so that the reading on the electronic voltmeter will not exceed 4 volts.
5. Shunt the FM antenna transformer primary with a 10 ohm carbon resistor, and adjust the FM antenna secondary trimmer (M) for maximum output meter reading. Transfer the 10 ohm shunt to the secondary of FM antenna transformer. Adjust FM antenna primary trimmer (L) for maximum output meter reading. Remove the 10 ohm shunt resistor.
6. Connect the BC dummy loop antenna across the loop terminals on the rear of the chassis (see Figure 2).

**CROSLEY DIV.
AVCO MFG. CORP.
SOCKET VOLTAGE NOTES**

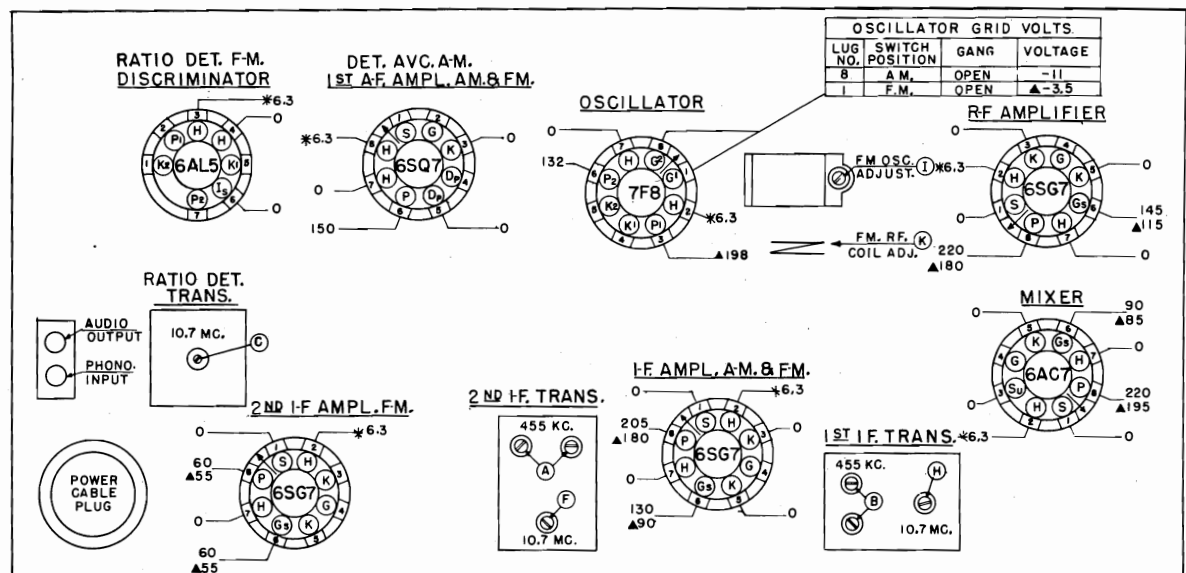
MODELS 9-204,
9-205M

1. Bottom view of Sockets.
2. Voltage measured from Socket Lug to Chassis with an Electronic Voltmeter.
3. Voltage measured with Switch in BC position except where marked with delta (Δ).
4. Δ = Selector Switch in F.M. position.
5. W.J. = Wiring Junction.
N.C. = No Connection.
* = A.C. Voltage.
6. All Voltages taken at Nominal Operating Voltage 117 V., 60 cycles.
7. Socket Voltage Tolerance $\pm 10\%$.



**TOP VIEW—MODELS 9-204, 9-205M
POWER SUPPLY AND AMPLIFIER CHASSIS,**

RECEIVER SOCKET VOLTAGE CHART



MODELS 9-204,
9-205M

CROSLEY DIV.
AVCO MFG. CORP.
ALIGNMENT PROCEDURE

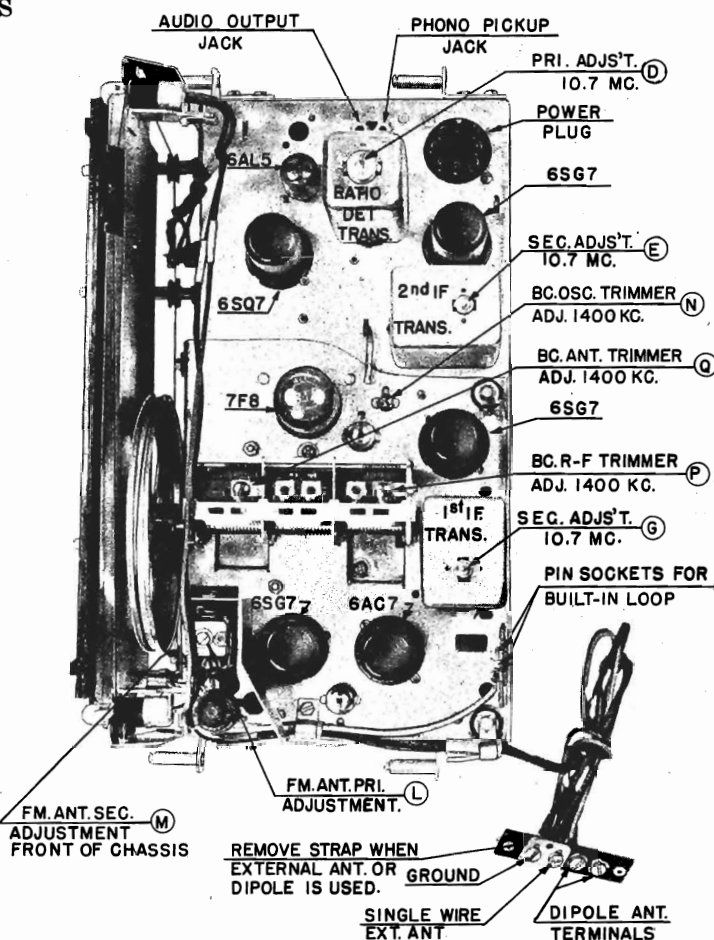
1. This receiver has been aligned at the factory for best performance, and no attempt should be made to re-align it unless the proper test equipment is available.
2. Turn the tuning condenser to full mesh, against stop, and set the dial pointer at the edge of the clear section of the dial, left of "55."
3. Connect an output meter across the voice coil of the speaker (3.2 ohms).
4. Turn the volume control knob to maximum clockwise position and adjust the signal generator output to produce a noticeable output meter reading. Keep the signal generator output as low as possible to prevent excessive AVC action in the receiver.
5. Feed an R.F. amplitude modulated signal modulated 30% at 400 cycle to the receiver as indicated in the alignment procedure chart. Connect signal generator ground terminal to the chassis of the receiver. When F.M. generator is used, a 30% modulated signal is equal to a deviation of 22.5 kc.
6. Tone control is to be set for maximum treble response.
7. When aligning the broadcast band, the build-in loop antenna or a suitable dummy antenna, consisting of a coil with 19.1 u h. inductance shunted with a 66 mmf. capacitor must be used.
8. While aligning the set, the shorting link on the antenna terminal strip should be removed. After alignment replace the link, unless an external antenna is to be used.

Cross index between frequency calibrations in megacycles
on the dial and channel numbers follow:

MEGACYCLES TO CHANNEL NUMBERS

Frequency in Megacycles	Channel No.
87.9	200
88.9	205
89.9	210
90.9	215
91.9	220
92.9	225
93.9	230
94.9	235
95.9	240
96.9	245
97.9	250
98.9	255
99.9	260
100.9	265
101.9	270
102.9	275
103.9	280
104.9	285
105.9	290
106.9	295
107.9	300

CHASSIS TOP VIEW



To find the frequency in megacycles for CHANNEL NUMBERS between those given above, add .2 megacycle for every whole number added to the CHANNEL NUMBER; for example channel 204 would be 88.7 megacycles and 251 would be 98.1 megacycles.

CROSLEY DIV.
AVCO MFG. CORP.MODELS 9-204,
9-205M

Item No.	Part Number	Description	Item No.	Part Number	Description
1	143784	Coil, Antenna (F.M.)	55	39001-87	Condenser, .25 mfd., 600 v., Paper
2	143267	Coil, Antenna Loading (B.C.)	56	137727-8	Condenser, 1000 mmf., 300 v., Ceramic
3	143402	Coil, R.F. (B.C.)	57	137727-8	Condenser, 1000 mmf., 300 v., Ceramic
4	143646	Coil, R.F. (F.M.);	58	137727-38	Condenser, .005 mfd., 500 v., Ceramic
5	143945	Coil, Osc. (B.C.)	59	137727-38	Condenser, .005 mfd., 500 v., Ceramic
6	143090	Transformer, 1st I. F.	60	142958	Condenser, 4 mfd., 50 v., Elect.
7	143105	Transformer, 2nd I. F.	61A	143089	Condenser, 40 mfd., 450 v.
8	143378	Transformer, Ratio Det.	61B		Condenser, 20 mfd., 450 v. } Four Section
9	143305	Coil Assy., Osc. (F.M.)	61C		Condenser, 10 mfd., 450 v. } Elect. Filter
10	143752	Coil, Choke	61D		Condenser, 20 mfd., 25 v.
11	143837	Coil, Choke	62	143062	Condenser, 30 mfd., 450 v., Elect.
13	143934	Coil, Coke R.F. (Heater)	63	39373-92	Resistor, 1.0 Megohm, ½ w.
14	143934	Coil, Coke R.F. (Heater)	64	39373-71	Resistor, 68,000 ohms, ½ w.
15A	142848	Condenser, Variable	65	39373-170	Resistor, 22,000 ohms, 1 w.
15B		Condenser, Variable	67	39373-92	Resistor, 1.0 Megohm, ½ w.
15C		Condenser, Variable	68	39373-75	Resistor, 120,000 ohms, ½ w.
15D		Condenser, Variable	69	39373-65	Resistor, 39,000 ohms, ½ w.
16	136327-43	Condenser, Trimmer	70	39373-40	Resistor, 2,200 ohms, ½ w.
17	143014	Condenser, Trimmer	71	39373-67	Resistor, 47,000 ohms, ½ w.
18	137727-12	Condenser, 120 mmf., 300 v., Ceramic	72	39373-60	Resistor, 22,000 ohms, ½ w.
19	137727-31	Condenser, 47 mmf., 300 v., Ceramic	73	39373-21	Resistor, 270 ohms, ½ w.
20	39001-11	Condenser, .005 mfd., 600 v., Paper	74	39373-65	Resistor, 39,000 ohms, ½ w.
21	137727-45	Condenser, 56 mmf., 500 v., Ceramic	75	39373-65	Resistor, 39,000 ohms, ½ w.
22	137398-5	Condenser, 3.3 mmf., 500 v., Ceramic	76	39373-94	Resistor, 1.5 Megohm, ½ w.
23	137727-73	Condenser, 40 mmf., 500 v., Ceramic	77	39373-74	Resistor, 100,000 ohms, ½ w.
24	137727-20	Condenser, 91 mmf., 300 v., Ceramic	78	39373-33	Resistor, 1,000 ohms, ½ w.
25	137727-25	Condenser, 100 mmf., 500 v., Ceramic	79	39373-71	Resistor, 68,000 ohms, ½ w.
26	39001-11	Condenser, .005 mfd., 600 v., Paper	80	39373-19	Resistor, 220 ohms, ½ w.
27	39001-11	Condenser, .005 mfd., 600 v., Paper	82	39373-74	Resistor, 100,000 ohms, ½ w.
28	39001-11	Condenser, .005 mfd., 600 v., Paper	83	39373-170	Resistor, 22,000 ohms, 1 w.
29	39001-13	Condenser, .01 mfd., 600 v., Paper	84	39373-40	Resistor, 2,200 ohms, ½ w.
30	137727-8	Condenser, 1000 mmf., 300 v., Paper	85	39373-92	Resistor, 1.0 Megohm, ½ w.
31	137727-8	Condenser, 1000 mmf., 300 v., Ceramic	86	39373-67	Resistor, 47,000 ohms, ½ w.
32	39001-80	Condenser, .02 mfd., 600 v., Paper	87	39373-87	Resistor, 470 000 ohms, ½ w.
33	39001-74	Condenser, .002 mfd., 600 v., Paper	88	39373-71	Resistor, 68,000 ohms, ½ w.
34	137727-8	Condenser, 1000 mmf., 3000 v., Paper	89	39373-107	Resistor, 10 0 Megohms, ½ w.
35	39001-13	Condenser, .01 mfd., 600 v., Paper	90	39373-92	Resistor, 1.0 Megohm, ½ w.
36	39001-13	Condenser, .01 mfd., 600 v., Paper	91	39373-3	Resistor, 15 ohms, ½ w.
37	137727-53	Condenser, 33 mmf., 500 v., Ceramic	92	39373-174	Resistor, 33,000 ohms, 1 w.
38	137727-53	Condenser, 33 mmf., 500 v., Ceramic	93	39373-62	Resistor, 27 000 ohms, ½ w.
39	39001-11	Condenser, .005 mfd., 600 v., Paper	94	39373-80	Resistor, 220,000 ohms, ½ w.
40	39001-13	Condenser, .01 mfd., 600 v., Paper	95	39373-19	Resistor, 220 ohms, ½ w.
41	137727-31	Condenser, 47 mfd., 300 v., Ceramic	96	39373-87	Resistor, 470,000 ohms, ½ w.
42	137727-8	Condenser, 1000 mmf., 300 v., Ceramic	97	39373-131	Resistor, 270 ohms, 1 w.
43	137727-79	Condenser, 5 mmf., 500 v., Ceramic	98	39373-253	Resistor, 1,000 ohms, 2 w.
44	39001-17	Condenser, .05 mfd., 600 v., Paper	99A	137021	Resistor, 700 ohms, (Wire Wound)
45	39001-13	Condenser, .01 mfd., 600 v., Paper	99B		Resistor, 700 ohms, (Wire Wound 4 w.) } Two Sect.
46	143686-1	Condenser, 50 mmf., 500 v., Ceramic	100	39368-19	Cont., Vol., (2.5 Meg., Tap 750 k ohms)
47	39001-11	Condenser, .005 mfd., 600 v., Paper		39370-2	Shaft, volume control (knurled)
48	39001-11	Condenser, .005 mfd., 600 v., Paper			
49	39001-11	Condenser, .005 mfd., 600 v., Paper			
50	39001-80	Condenser, .02 mfd., 600 v., Paper			
51	143686-1	Condenser, 50 mmf., 500 v., Ceramic			
52	39001-13	Condenser, .01 mfd., 600 v., Paper			
53	137727-8	Condenser, 1000 mmf., 300 v., Ceramic			
54	39001-11	Condenser, .005 mfd., 600 v., Paper			

**CROSLEY DIV.
AVCO MFG. CORP.**

CABINET PARTS

MODEL 9-204

143653	Bracket (R.H.), Radio Bin
143654	Bracket (L.H.), Radio Bin
143485	Bumper (Rubber), Door
143486	Bumper (Rubber), Radio Bin
144048	Drawer Frame Assembly
144053	Door, Center
144052	Door, (Right), Record Compartment
144054	Grille, Metal
144055	Grille, Cloth
144051	Hinge, Door
144057	Leg and Base Assembly
144049	Panels (Front), Drawer and Radio Bin
143856	Panel, Radio Dial
144050	Pull (Handle), Drawer and Radio Bin
142912	Pull, Record Compartment Door
143478	Slides (1pair), Drawer
144056	Speaker Baffle.
139319	Strike and Catch Assy., Door

CABINET PARTS

MODEL 9-205M

143859	Baffle, Speaker
143653	Bracket, R.H., Radio Bin
143654	Bracket, L.H., Radio Bin
143846	Bumper, Rubber, Radio Bin
143485	Bumper, Rubber, Door
142973	Button, Indicator
143857	Doors (matched pair), Record Compartment
143487	Doors (matched pair), Radio
143855	Frame Assy. only, Record Changer Dawer
143509	Grille Cloth
143942	Hinge, Record Compartment Door
143860	Leg and Base Assy.
143858	Panels (matched pair) Drawer and Radio Bin
143856	Panel, Radio Dial
143334	Pull, Radio Dial
143887	Pull, Radio Bin
142912	Pull, Record Storage Compartment
143478	Slide (one set), Record Changer
143913	Spring, Radio Bin
139319 S.B.	Strike and Catch Assy.



R-F AMPLIFIER
 * 6.3
 0
 195
 90
 0
 0

I-F AMPLIFIER
 * 6.3
 0
 178
 90
 0
 0

OUTPUT
 195
 235
 0
 * 6.3
 10

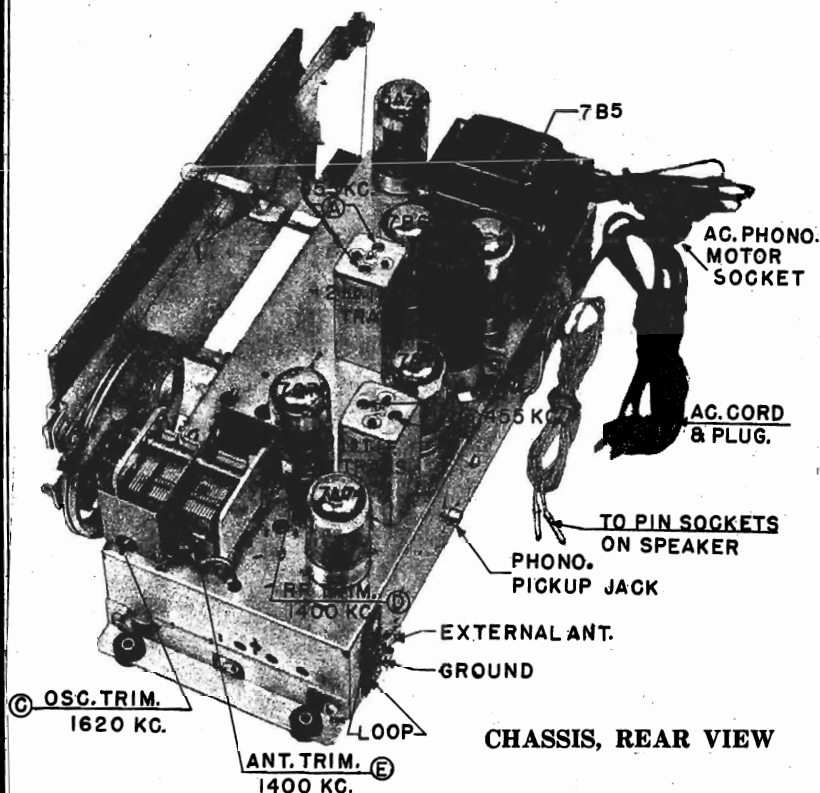
CONVERTER
 0
 * 6.3
 195
 90
 -9.5
 AT 1620 KC.
 0

DET.-AVC.-1ST. A-F. AMPL.
 * 6.3
 0
 93
 0

RECTIFIER
 * 4.5
 250
 * 275
 27

NOTES:

1. BOTTOM VIEW OF SOCKETS.
2. MEASURE VOLTAGES FROM SOCKET LUG TO -B (CHASSIS).
3. VOLTAGE MEASURED WITH AN ELECTRONIC VOLTMETER.
4. W. J. = WIRING JUNCTION.
5. N.C. = NO CONNECTION.
6. * = AC. VOLTAGE
7. LINE VOLTAGE 117 V., 60 \angle AC.
8. SOCKET VOLTAGE TOLERANCE 10%.

MODELS 9-209,
9-212MCROSLEY DIV.
AVCO MFG. CORP.

CHASSIS, REAR VIEW



Model 9-209 (Walnut)—Model 9-212M (Mahogany)

ALIGNMENT PROCEDURE

1. Turn the tuning condenser to the completely closed position against the stop and set the dial pointer to the reference line at the low frequency end of the dial scale.
2. Turn the selector switch to radio position (extreme left).
3. Connect the output meter across the speaker voice coil.
4. The r.f. signal input from the signal generator should be connected through a condenser as indicated in the alignment chart. Connect the signal generator ground to the receiver chassis.
5. Turn the volume control on full and adjust the signal generator output to produce approximately midscale deflection of the output meter, but maintain signal generator output as low as possible to prevent AVC action in the receiver.
6. Loop antenna must remain connected at all times or replaced by dummy antenna consisting of a coil with 17.6 uh inductance shunted with a 53 mmf. condenser. See Fig. 1.

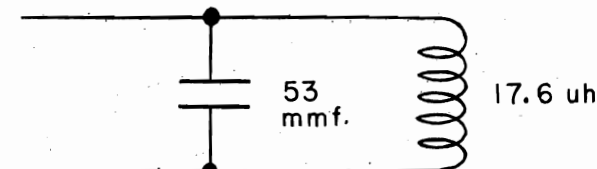


Fig. 1

Alignment Sequence	Signal Generator Output			Position of Tuning Dial or Var. Cond.	Adjust for Maximum Output
	Frequency in KC	In Series with	To		
1	455	.05 mfd.	Pin 6 7Q7	open	A & B
2	1620	15 mmf.	Top Ant. Clip	open 1620	C
3	1400	15 mmf.	Top Ant. Clip	1400	D
4	1400	15 mmf.	Top Ant. Clip	1400	E
5	1400	15 mmf.	Top Ant. Clip	1400	Rock var. cond. and repeat 3 & 4

CROSLEY DIV.
AVCO MFG. CORP.
REPLACEMENT PARTS LIST—MODELS 9-209, 9-212M

MODELS 9-209, 9-212M

Figures in first column correspond to figures in Schematic Diagram

ITEM No.	Part Number	Description	No. ITEM	Part Number	Description
1	AW-137800	Coil, R. F.	45	W-132267-1	Condenser, Trimmer
2	AW-137724	Coil, Oscillator	46	AB-138584	Terminal Board
3	AC-137933	Transformer, 1st. I. F.	47	AW-144064	Loop Antenna
4	AC-137934	Transformer, 2nd. I. F.	48A	B-137972	Condenser, Variable } Three
5	AW-139604	Coil, Antenna Loading	48B		Condenser, Variable } Section
6	W-48858	Bulb (Dial), Type 47, 6.3 v., .15 amp.	48C		Condenser, Variable } Assy.
7	C-132300-1	Cable and Plug Assy., Power	49	39001-7	Condenser, .001 mfd., 600 v., paper
8	138762-5	Speaker	51	C-137727-52	Condenser, 12 mmf., 500 v., ceramic
9	135102	Transformer, Power	52	D-144489	Record Changer
10	138131 -2	Transformer, Output	53	B-139727-6	Cable and Plus Assy., Phono Motor
11	39368-18	Control, Volume (1 meg., Tap at 300,000 ohm)	54	AW-143818	Cable & Plug Assy., (Shielded), Phono.
	39369-1	Switch, power	55	W-136998	Jack, Phono
	39370-2	Shaft, Volume Control (plug-in)	56	AW-143361	Cable and Pins, Speaker
14	39373-23	Resistor, 330 ohm, ½ w.	57	39373-67	Resistor, 47,000 ohms, ½ w.
15	39373-60	Resistor, 22,000 ohm, ½ w.	59	B-144346	Control, Tone (2 Megohm) & Radio-Phono Switch
17	39373-84	Resistor, 330,000 ohm, ½ w.			
18	39373-87	Resistor, 470,000 ohm, ½ w.		AB-143417	Background Assy., Dial
19	39373-92	Resistor, 1 megohm, ½ w.		W-139477-1	Button, Loop Ant. Mtg. (4 required)
20	39373-97	Resistor, 2.2 megohm, ½ w.		W-139477-2	Button, Loop Ant. Mtg. (1 required)
21	39373-107	Resistor, 10 megohm, ½ w.		R-144134	Cabinet (9-209)
22	39373-40	Resistor, 2200 ohm, ½ w.		R-144182	Cabinet (9-212 M)
23	39372-7	Resistor, 1500 ohm, 10 w.		W-136201	Clip, Dial Glass
24	39373-165	Resistor, 12,000 ohm, 1 w.		C-143384	Dial Glass
25	39373-62	Resistor, 27,000 ohm, ½ w.		C-144785	Escutcheon
28	39373-97	Resistor, 2.2 megohm, ½ w.		W-134055	Grommet, Var. Cond. Mtg.
29	39373-60	Resistor, 22,000 ohm, ½ w.		B-144349	Knob
32	39001-11	Condenser, .005 mfd., 600 v., paper		B-143407	Pointer, Dial
33	39001-11	Condenser, .005 mfd., 600 v., paper		W-137939-1	Pulley, Dial Drive Idler
34	39001-13	Condenser, .01 mfd., 600 v., paper		W-51071	Ring, Drive Shaft retaining
35	39001-13	Condenser, .01 mfd., 600 v., paper		W-45580	Rubber Mtg., Speaker
36	39001-17	Condenser, .05 mfd., 600 v., paper		W-144498	Screw, Escutcheon Mtg.
37	39001-17	Condenser, .05 mfd., 600 v., paper		B-135075-5	Shaft, Dial Drive
39	39001-17	Condenser, .05 mfd., 600 v., paper		39441	Socket, Tube
40	39001-73	Condenser, .00025 mfd., 600 v., paper		D-136565-16	Socket, Dial Light
41	39001-7	Condenser, .001 mfd., 600 v., paper		W-51752	Spring, Dial Drive Cord
42	39001-13	Condenser, .01 mfd., 600 v., paper		W-138568	Strip, Dial Pointer
44A	B-136596	Cond'r., 50 mfd., 300 v. } Two section		W-134916	Washer, Spring (Drive Shaft)
44B		Cond'r., 30 mfd., 300 v. } Elect. Filter			

REPLACEMENT CABINET PARTS—MODEL 9-209

144152	Baffle, Speaker	137266	Hinge, Door
143485	Bumper (Rubber), Doors	144143	Panels (Front), Drawer and Radio Door
139319-SB	Catch & Strike Assy., Doors		
B-144173	Decal	144151	Pull (Handle), Drawer and Radio Door
144150	Drawer Frame Assy.,		
144169	Grille Cloth	143478	Slides, Drawer

REPLACEMENT CABINET PARTS—MODEL 9-212M

144183	Panels (Front), Drawer and Radio Door
--------	---------------------------------------

DESCRIPTION

TYPE: Six-tube, single band, superheterodyne.

FREQUENCY RANGE: 540 to 1600 kc.

INTERMEDIATE FREQUENCY: 455 kc.

POWER SUPPLY: 60 cycle a. c. only

VOLTAGE RATING: 105-125 volts.

POWER CONSUMPTION: 50 watts nominal.

Phono 20 watts additional.

POWER OUTPUT: 2.5 watts maximum

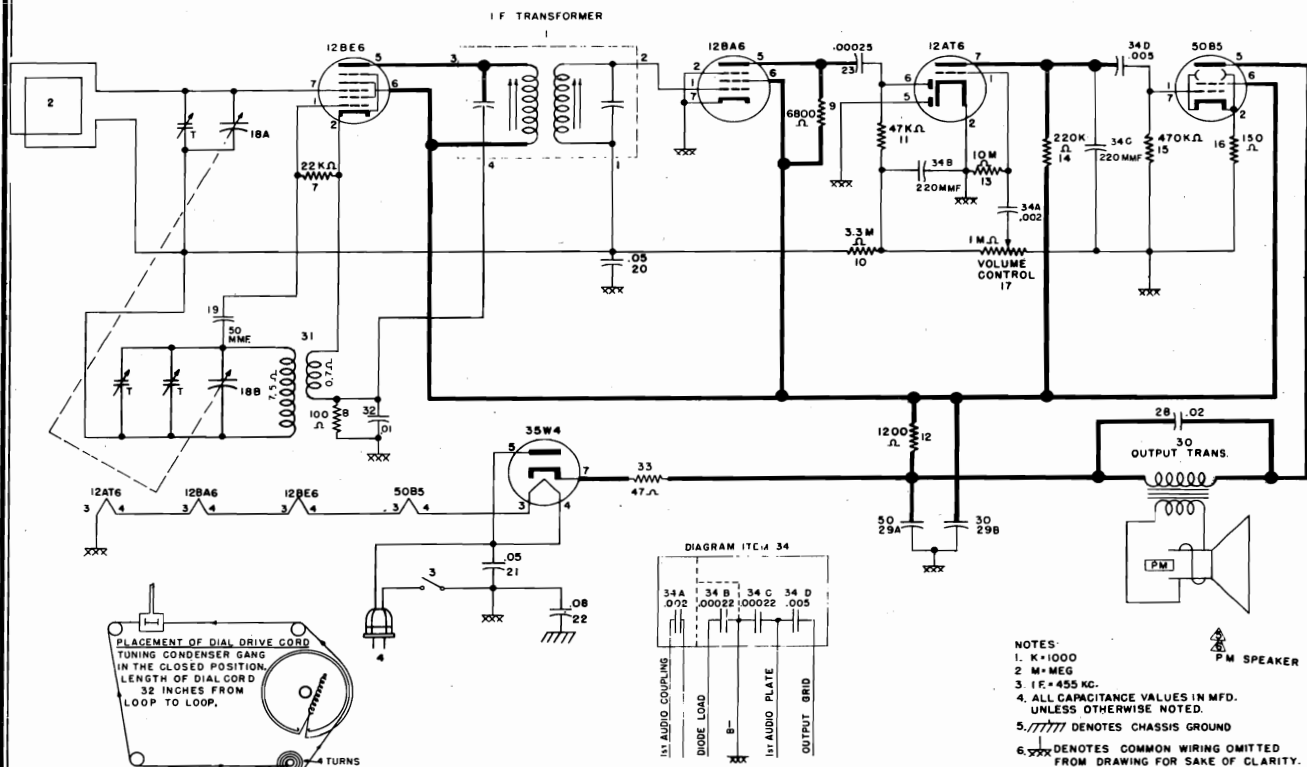
TUBE COMPLEMENT:

TYPE	FUNCTION
7A7	R. F. Amplifier
7Q7	Converter
7A7	I. F. Amplifier
7B6	Detector, AVC, 1st A. F. Amplifier
7B5	A. F. Power Output
5AZ4	Rectifier

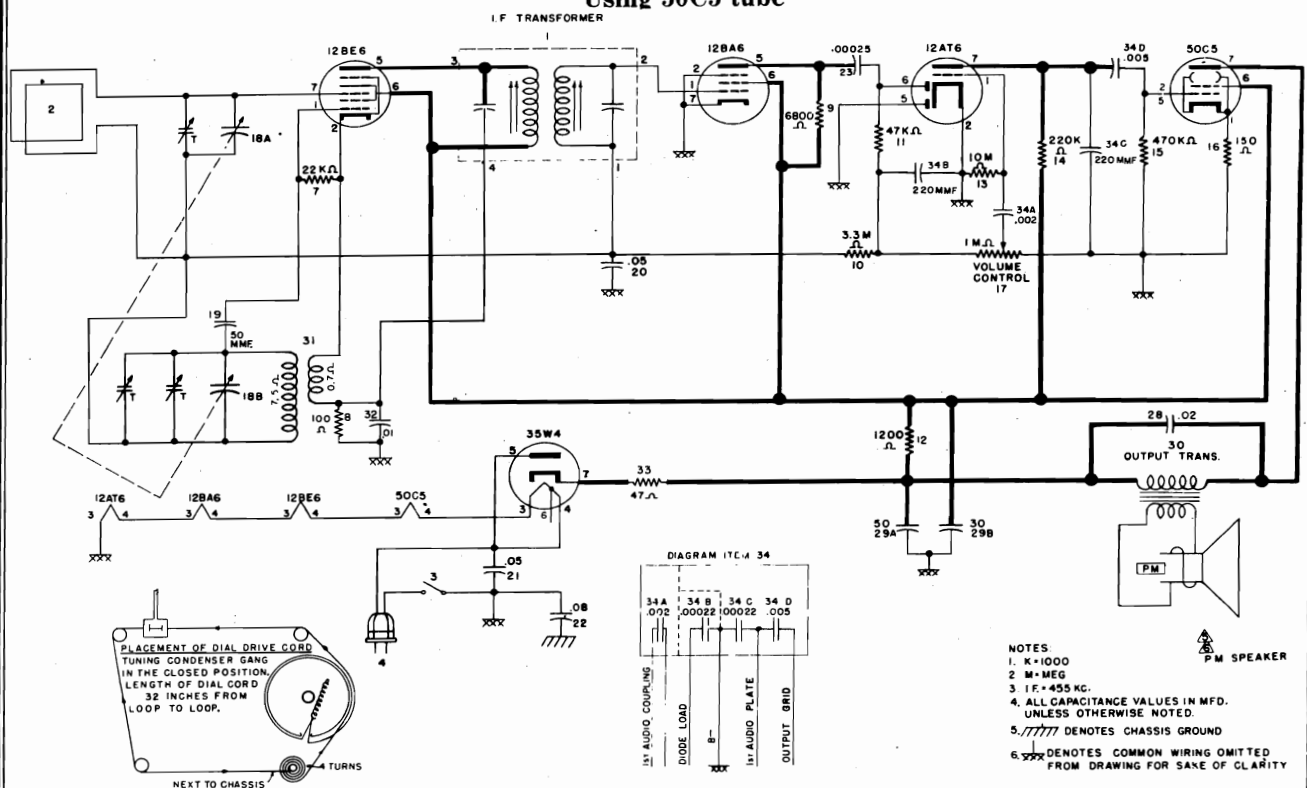
DIAL BULB: Type 47, 6.3 volts, .15 amp.

CROSLEY DIV.
AVCO MFG. CORP.

Using 50B5 tube



Using 50C5 tube

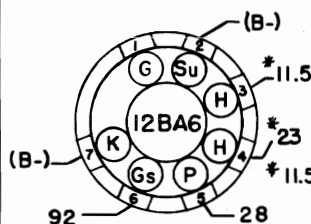
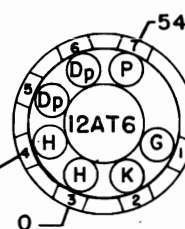


CROSLEY DIV.
AVCO MFG. CORP.MODELS 9-121,
9-122W

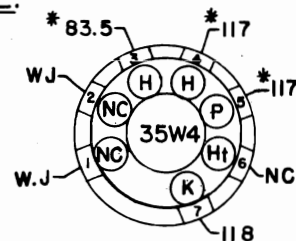
NOTES:

1. BOTTOM VIEW OF TUBE SOCKETS.
2. VOLTAGE MEASURED WITH AN ELECTRONIC VOLT-METER FROM SOCKET LUG TO B- (PIN 7 ON 12BA6)
3. LINE VOLTAGE 117V. 60 CYCLE.
4. NC=NO CONNECTION.
5. W. J.= WIRING JUNCTION.
6. * = AC VOLTAGE.
7. SOCKET VOLTAGE TOLERANCE. 10%

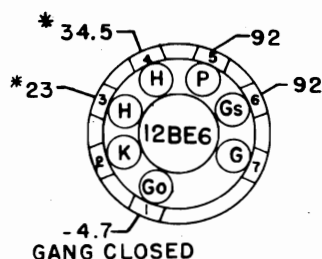
I F AMPLIFIER

DET. AVC.
1ST AUDIO AMPL.

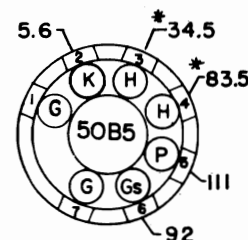
RECTIFIER



CONVERTER



OUTPUT



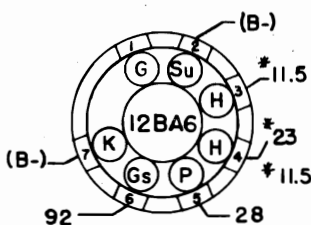
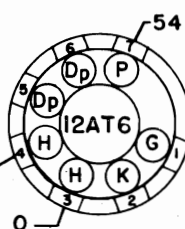
SOCKET VOLTAGE CHART

Using 50B5 tube

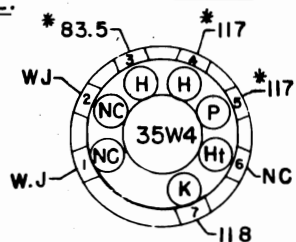
NOTES:

1. BOTTOM VIEW OF TUBE SOCKETS.
2. VOLTAGE MEASURED WITH AN ELECTRONIC VOLT-METER FROM SOCKET LUG TO B- (PIN 7 ON 12BA6)
3. LINE VOLTAGE 117V. 60 CYCLE.
4. NC=NO CONNECTION.
5. W. J.= WIRING JUNCTION.
6. * = AC VOLTAGE.
7. SOCKET VOLTAGE TOLERANCE. 10%

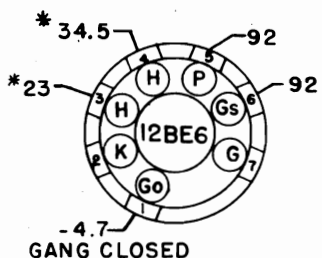
I F AMPLIFIER

DET. AVC.
1ST AUDIO AMPL.

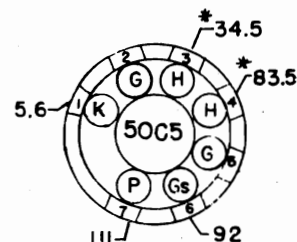
RECTIFIER



CONVERTER



OUTPUT



SOCKET VOLTAGE CHART

Using 50C5 tube

When using direct current it may be necessary to reverse the position of the power plug in the electric outlet for correct polarity.

Reversing the position of the power plug when alternating current is used may reduce power hum.

Under no circumstances should a ground be connected to this receiver.

MODELS 9-121,
9-122W

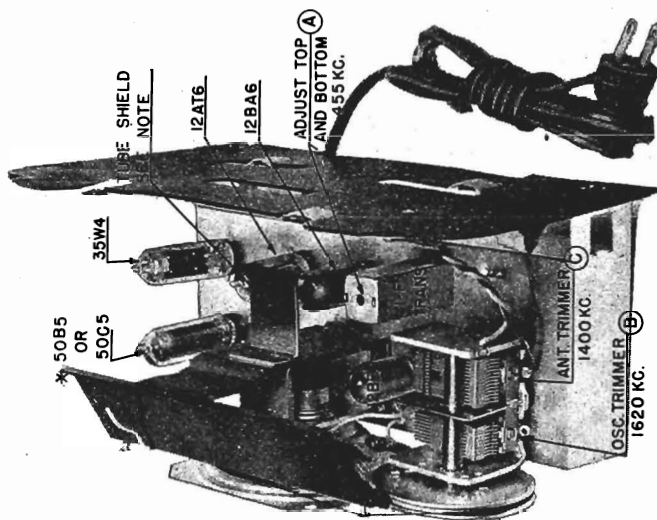
CROSLEY DIV.
AVCO MFG. CORP.

ALIGNMENT PROCEDURE

1. Turn the tuning condenser to the completely closed position against the stop and set the dial pointer to the reference line at the end of the dial scale.
2. Connect the output meter across the speaker voice coil.
3. The r. f. signal input from the signal generator should be connected to the external antenna clip. Connect the signal generator ground through a 0.1 mfd. condenser to B—(pin 7 on 12BA6 tube socket).
4. Turn the volume control on full and adjust the signal generator output to produce approximately mid-scale deflection of the output meter, but maintain signal generator output as low as possible to prevent AVC action in the receiver.

ALIGNMENT CHART

Alignment Sequence	Signal Generator Output			Position of Dial Pointer or Tuning Gang	Adjust for Maximum Output
	Frequency in kc.	In Series with	To		
1	455	.1 mfd.	To Loop	Open	A
2	1620	.1 mfd.	To Loop	1620	B
3	1400	.1 mfd.	To Loop	1400	C



* NOTE:
RECEIVERS WITH TUBE SHIELD USE 50B5 TUBE
RECEIVERS WITHOUT TUBE SHIELD USE 50C5 TUBE

CHASSIS TOP VIEW

Note:

On some receivers, the tube shield that is attached to the speaker bracket is omitted.

CROSLEY DIV.
AVCO MFG. CORP.MODELS 9-121,
9-122W

9-121



9-122W

DESCRIPTION

TYPE: Five-tube, single band, Superheterodyne.**FREQUENCY RANGE:** 540 to 1600 kc.**INTERMEDIATE FREQUENCY:** 455 kc.**POWER SUPPLY:** a.c.—d.c.**VOLTAGE RATING:** 105-125 volts.**POWER CONSUMPTION:** 35 watts.**POWER OUTPUT:** 1.5 watts maximum.

TUBE COMPLEMENT:

Type	Function
12BE6	Mixer
12BA6	I. F. Amplifier
12AT6	Detector, AVC, 1st A. F. Amplifier
50B5 or 50C5	A. F. Power Output
35W4	Rectifier

Item No.	Part No.	Description	Item No.	Part No.	Description
1	C-139919	Transformer, I.F.	30	138131-1	Transformer, Output
2	AC-144328	Loop Antenna & Back Assy.	31	AW-144325	Coil Assy., Oscillator
3	39369-1	Switch, Power	32	39001-13	Condenser, .01 mfd., 600 v., paper
4	C-142769-1	Cable & Plug Assy., Power	33	39373-119	Resistor, 47 ohm, 1 w.
5	139631	Speaker	34A	B-144675-1	Condenser, .002 mfd., 500 v.
7	39373-60	Resistor, 22,000 ohm, ½ w.	34B		Condenser, .00022 mfd., 500 v. } Four
8	39373-14	Resistor, 100 ohm, ½ w.	34C		Condenser, .00022 mfd., 500 v. } Sect.
9	39373-161	Resistor, 6,800 ohm, 1 w.	34D		Condenser, .005 mfd., 500 v.
10	39373-100	Resistor, 3.3 megohm, ½ w.		AB-143318	Background & Bracket Assy., Dial
11	39373-67	Resistor, 47,000 ohm, ½ w.		R-144015-2	Cabinet (9-121)
12	39373-144	Resistor, 1200 ohm, 1 w.		AW-143988	Cabinet (9-122W)
13	39373-107	Resistor, 10 megohm, ½ w.		W-139784	Clip, Spring (Cabinet Back)
14	39373-80	Resistor, 220,000 ohm, ½ w.		C-144175	Dial Glass
15	39373-87	Resistor, 470,000 ohm, ½ w.		B-138540-1	Knob (9-121)
16	39373-16	Resistor, 150 ohm, ½ w.		B-138540-2	Knob (9-122W)
17	39368-14	Control, Volume (1 meg.)		B-144162	Pointer, Dial
18A	AC-137073-15	Condenser, Variable } Two Section		W-51071	Ring, Retaining (Drive Shaft)
18B		Condenser, Variable }		39220-28CP	Screw, Chassis Mtg.
19	C-137727-21	Condenser, 50 mmf., 500 v. ceramic		B-135075-2	Shaft, Dial Drive
20	39001-17	Condenser, .05 mfd., 600 v., paper		W-46065	Shock Mount (Rubber), Var. Cond. Mtg.
21	39001-17	Condenser, .05 mfd., 600 v., paper		39462-1	Socket, Tube
22	39001-19	Condenser, .1 mfd., 600 v., paper		W-51752	Spring, Dial Drive Cord
23	39001-73	Condenser, .00025 mfd., 600 v., paper		B-144135	Spring, Retaining (Dial Glass)
28	39001-80	Condenser, .02 mfd., 600 v., paper		W-134916	Washer, Spring (Drive Shaft)
29A	B-136770	Condenser, 50 mfd., 150 v. } Two Section			
29B		Condenser, 30 mfd., 150 v. } Elect. Filter			

MODELS 9-209L,
9-212ML, 9-213BCROSLEY DIV.
AVCO MFG. CORP.REVISED MODELS
9-209, 9-212M

Models 9-209, 9-209L (Walnut)

Models 9-212M, 9-212ML (Mahogany)

Model 9-213B (Blond)

DESCRIPTION

TYPE: Six-tube, single band, superheterodyne.**FREQUENCY RANGE:** 540 to 1600 kc.**INTERMEDIATE FREQUENCY:** 455 kc.**POWER SUPPLY:** 60 cycle a. c. only**VOLTAGE RATING:** 105-125 volts.**POWER CONSUMPTION:** 50 watts nominal.

Phono 20 watts additional.

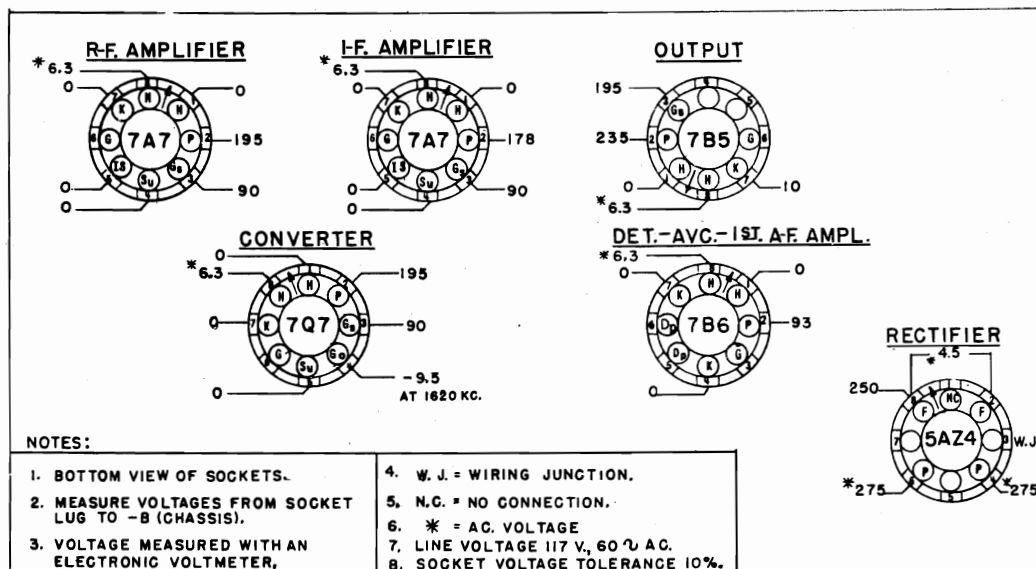
POWER OUTPUT: 2.5 watts maximum

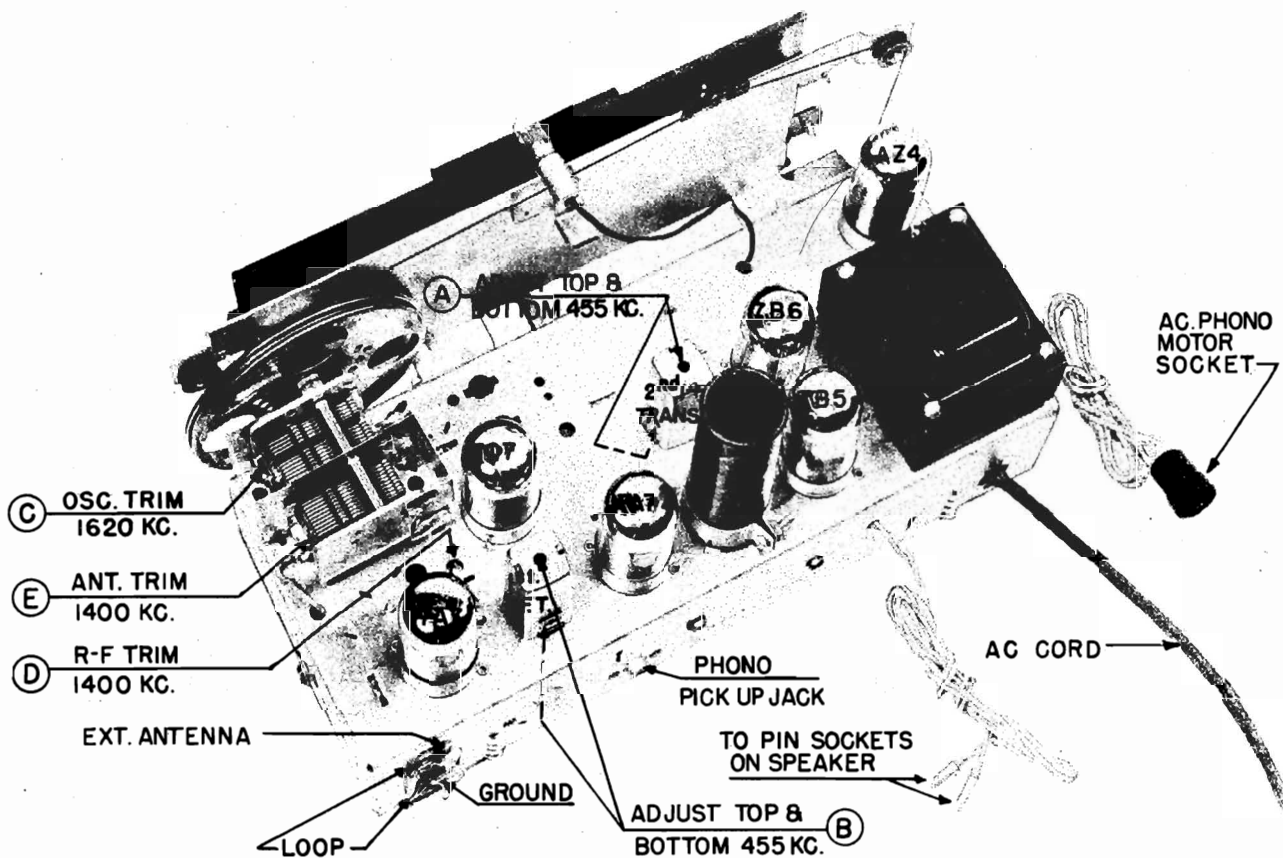
TUBE COMPLEMENT:

TYPE	FUNCTION
7A7	R. F. Amplifier
7Q7	Converter
7A7	I. F. Amplifier
7B6	Detector, AVC, 1st A. F. Amplifier
7B5	A. F. Power Output
5AZ4	Rectifier

DIAL BULB: Type 47, 6.3 volts, .15 amp.

SOCKET VOLTAGE CHART





MODELS 9-209L,
9-212ML, 9-213BCROSLEY DIV.
AVCO MFG. CORP.REVISED MODELS
9-209, 9-212M**ALIGNMENT PROCEDURE**

1. Turn the tuning condenser to the completely closed position against the stop and set the dial pointer to the reference line at the low frequency end of the dial scale.
2. Turn the selector switch to radio position (extreme left).
3. Connect the output meter across the speaker voice coil.
4. The r.f. signal input from the signal generator should be connected through a condenser as indicated in the alignment chart. Connect the signal generator ground to the receiver chassis.
5. Turn the volume control on full and adjust the signal generator output to produce approximately midscale deflection of the output meter, but maintain signal generator output as low as possible to prevent AVC action in the receiver.
6. Loop antenna must remain connected at all times or replaced by dummy antenna consisting of a coil with 17.6 uh inductance shunted with a 53 mmf. condenser. See Fig. 1.

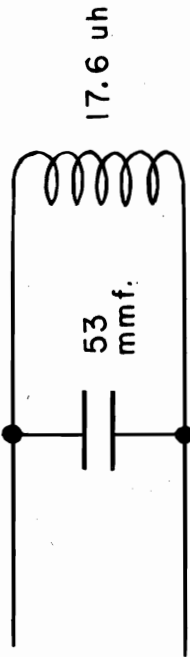


Fig. 1

ALIGNMENT CHART

Alignment adjustments are shown in "CHASSIS, REAR VIEW," page 2.

Alignment Sequence	Signal Generator Output			Position of Tuning Dial or Var. Cond.	Adjust for Maximum Output
	Frequency in KC	In Series with	To		
1	455	.05 mfd.	Pin 6 7Q7	open	A & B
2	1620	15 mmf.	Top Ant. Clip	open 1620	C
3	1400	15 mmf.	Top Ant. Clip	1400	D
4	1400	15 mmf.	Top Ant. Clip	1400	E
5	1400	15 mmf.	Top Ant. Clip	1400	Rock var. cond. and repeat 3 & 4

**CROSLEY DIV.
AVCO MFG. CORP.**

**MODELS 9-209L,
9-212ML, 9-213B
REVISED MODELS
9-209, 9-209M**

REPLACEMENT PARTS LIST

Figures in first column correspond to figures in Schematic Diagram.

Item No.	Part Number	Description	Item No.	Part Number	Description
1	AW-137800	Coil, R. F.	51	C-137727-52	Capacitor, 12 mmf., 500 v., ceramic
2	AW-137724	Coil, Oscillator	52	D-144489	Record Changer (9-209, 9-212M, 9-213B)
5	AW-139604	Coil, Antenna Loading (7.5 ohm)	52	D-145113	Record Changer (9-209L, 9-212ML)
*5	AW-145468	Coil, Antenna Loading (8.6 ohm)	53	B-139727-6	Cable and Plug Assy., Phono Motor
6	138437-1	Bulb (Dial), Type 47, 6.3 v., .15 amp.	54	AW-143496	Cable & Plug Assy., (Shielded), Phono
7	C-132300-1	Cable and Plug Assy., Power	55	W-136998	Jack, Phono
8	138762-5	Speaker	56	AW-143361	Cable and Pins, Speaker
9	135102	Transformer, Power	57	39373-67	Resistor, 47,000 ohms, $\frac{1}{2}$ w.
10	138131-2	Transformer, Output	59	B-144346	Control, Tone (2 Megohm) & Radio-Phono Switch
11	39368-18	Control, Volume (1 meg., Tap at 300,000 ohm)	64	AC-139919-3	Transformer, 1st. I. F.
	39369-1	Switch, power	65	AC-139919-3	Transformer, 2nd. I. F.
	39370-2	Shaft, Volume Control (plug-in)	66	B-142951-2	Capacitor-Resistor
14	39373-23	Resistor, 330 ohm, $\frac{1}{2}$ w.	67A	B-144675-8	Capacitor, .002 mfd., 500 v. } Four
15	39373-60	Resistor, 22,000 ohm, $\frac{1}{2}$ w.	67B		Capacitor, .005 mfd., 500 v. } Sect.
17	39373-84	Resistor, 330,000 ohm, $\frac{1}{2}$ w.	67C		Capacitor, 100 mmf., 500 v. }
18	39373-87	Resistor, 470,000 ohm, $\frac{1}{2}$ w.	67D		Capacitor, .004 mfd., 500 v. }
19	39373-92	Resistor, 1 megohm, $\frac{1}{2}$ w.		AB-143417	Background Assy., Dial
20	39373-97	Resistor, 2.2 megohm, $\frac{1}{2}$ w.		W-139477-1	Button, Loop Ant. Mtg. (4 required)
21	39373-107	Resistor, 10 megohm, $\frac{1}{2}$ w.		W-139477-2	Button, Loop Ant. Mtg. (1 required)
22	39373-40	Resistor, 2200 ohm, $\frac{1}{2}$ w.		R-144134	Cabinet (9-209, 9-209L)
23	39372-7	Resistor, 1500 ohm, 10 w.		R-144182	Cabinet (9-212M, 9-212ML)
24	39374-214	Resistor, 12,000 ohm, 1 w.		R-144806	Cabinet (9-213B)
25	39373-62	Resistor, 27,000 ohm, $\frac{1}{2}$ w.		W-136201	Clip, Dial Glass
28	39373-97	Resistor, 2.2 megohm, $\frac{1}{2}$ w.		C-143384	Dial Glass
29	39373-60	Resistor, 22,000 ohm, $\frac{1}{2}$ w.		C-144785	Escutcheon
32	39001-11	Capacitor, .005 mfd., 600 v., paper		W-134055	Grommet, Var. Capacitor Mtg.
33	39001-11	Capacitor, .005 mfd., 600 v., paper		B-144349-1	Knob (9-209, 9-212M, 9-209L, 9-212ML)
34	39001-13	Capacitor, .01 mfd., 600 v., paper		B-144349-2	Knob (9-213B)
36	39001-17	Capacitor, .05 mfd., 600 v., paper		B-143407	Pointer, Dial
37	39001-17	Capacitor, .05 mfd., 600 v., paper		W-137939-1	Pulley, Dial Drive Idler
39	39001-17	Capacitor, .05 mfd., 600 v., paper		W-51071	Ring, Drive Shaft retaining
41	39001-7	Capacitor, .001 mfd., 600 v., paper		W-45580	Rubber Mtg., Speaker
44A	B-136596	Cap., 50 mfd., 300 v. (Two Section		W-144498	Screw, Escutcheon Mtg.
44B		Cap., 30 mfd., 300 v. (Elect. Filter		B-135075-5	Shaft, Dial Drive
45	W-132267-1	Capacitor, Trimmer		39441	Socket, Tube
46	AB-138584	Terminal Board		D-136565-16	Socket, Dial Light
47	AW-144042	Loop Antenna		W-51752	Spring, Dial Drive Cord
*47	39426-2	Loop Antenna (No. 22 wire, 144" long)		W-138568	Strip, Dial Pointer
48A	B-137972	Capacitor, Variable } Three		W-134916	Washer, Spring (Drive Shaft)
48B		Capacitor, Variable } Section			
48C		Capacitor, Variable }			

REPLACEMENT CABINET PARTS

144152	Baffle, Speaker	144149	Panels (Front), Drawer and Radio Door (9-209, 9-209L)
143485	Bumper (Rubber), Door	144183	Panels (Front), Drawer and Radio Door (9-212M, 9-212ML)
139319-SB	Catch & Strike Assy., Door	144812	Panels (Front), Drawer and Radio Door (9-213B)
B-144173	Decal	144151	Pull (Handle), Drawer and Radio Door (9-209, 9-212M, 9-209L, 9-212ML)
144150	Drawer Frame Assy. (9-209, 9-209L, 9-212M, 9-212ML)	144809	Pull (Handle), Drawer and Radio Door (9-213B)
144810	Drawer Frame Assy. (9-213B)	143478	Slides, Drawer
144169	Grille Cloth (9-209, 9-209L, 9-212M, 9-212ML)		
144811	Grille Cloth (9-213B)		
145173	Hinge, Door		

*Used on sets equipped with single turn wire loop antenna (Item 47) mounted with staples.

**Used on sets equipped with loading coil AW-145468 (Item 5).

MODELS 9-214M,
9-214MLCROSLEY DIV.
AVCO MFG. CORP.**DESCRIPTION****TYPE:** Eleven tube, two-band superheterodyne.**FREQUENCY RANGE:** Standard Broadcast

Band:

540 to 1600 kc. (Selector switch at AM position).

FREQUENCY MODULATION BAND: 88 to 108 mc.

Channels 201 to 300.

(Selector switch at FM position).

INTERMEDIATE FREQUENCY: AM Band:

455 kc. FM Band: 10.7 mc.

POWER SUPPLY: 60 cycle a. c.**VOLTAGE RATING:** 105-125 volts.**POWER CONSUMPTION:** 90 watts.

20 watts additional for record changer.

POWER OUTPUT: 7 watts maximum.**TUBE COMPLEMENT**

Type	Function
6SG7	R.F. Amplifier
7F8	Oscillator
6AC7	Mixer
6SG7	I.F. Amp., A.M. & F.M.
6SG7	2nd I.F. Amp. F.M.
6AL5	Ratio Det. F.M.
6SQ7	Det.—AVC. A.M. 1st A.F. Amp., A.M. & F.M.
6SQ7	Phase Inverter
6V6GT/G (2)	Push Pull Output
5Y3GT/G	Rectifier

DIAL BULBS: Type 47, 6.3 v., .15 amp.**NOTE:**

Model 9-214M uses Model 700F automatic record changer (Part No. 144489).

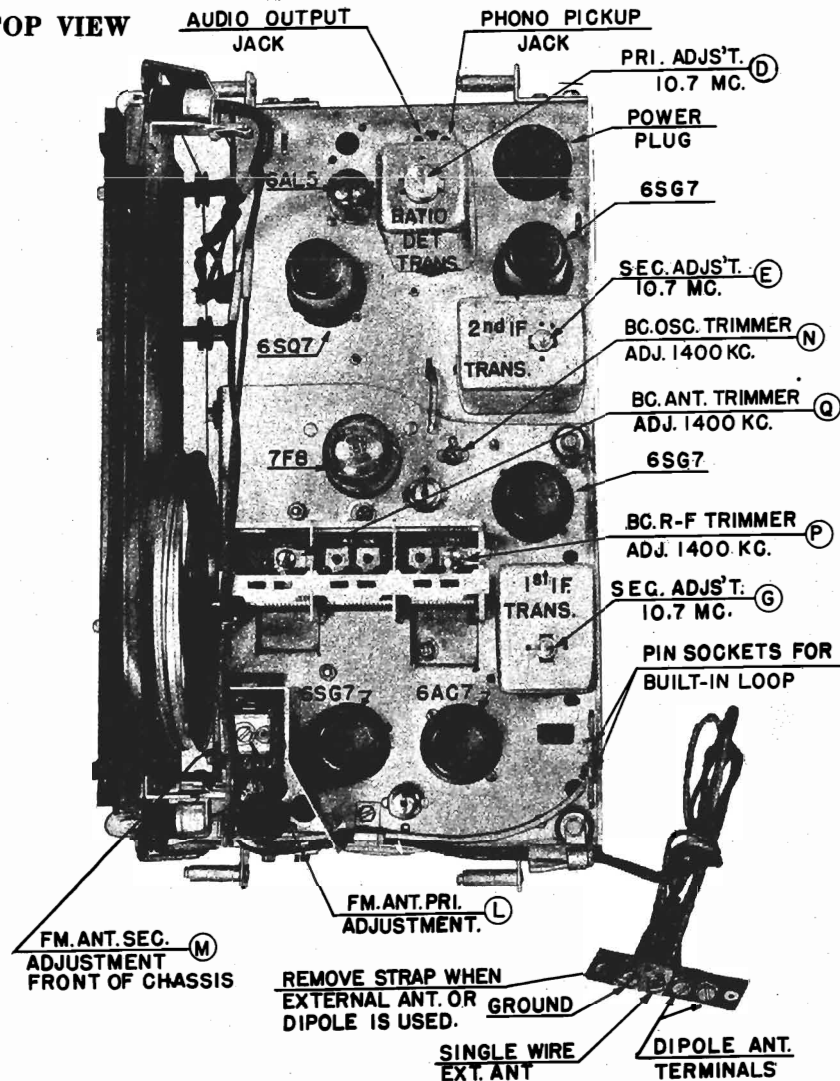
See service sheet No. 364 for service information and parts list.

Model 9-214ML uses Model 700FLP automatic record changer (Part No. 145113).

See Service Bulletin No. 375 for service information and parts list.

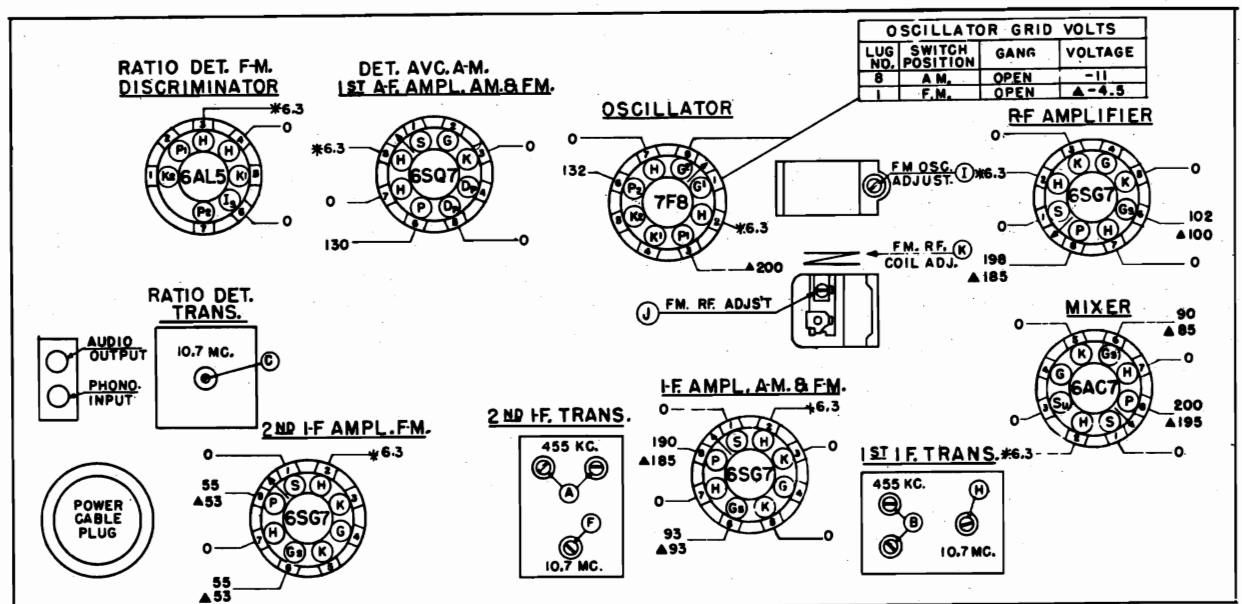
CROSLEY DIV.
AVCO MFG. CORP.MODELS 9-214M,
9-214ML

CHASSIS TOP VIEW



RECEIVER SOCKET VOLTAGE CHART

(See Socket Voltage Notes, Page 3)

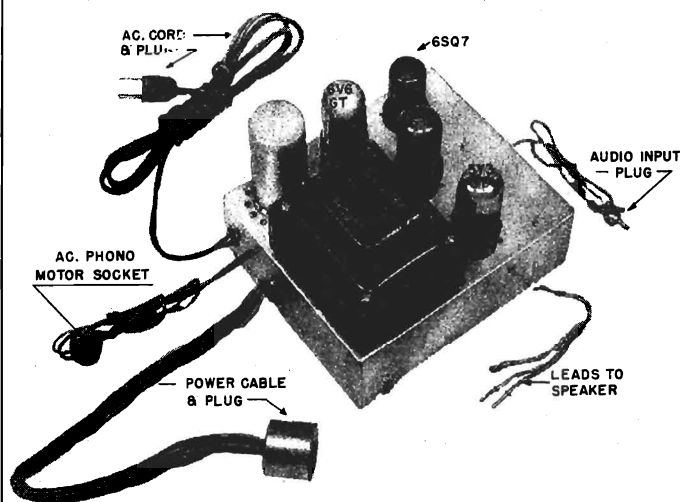


MODELS 9-214M.
9-214ML

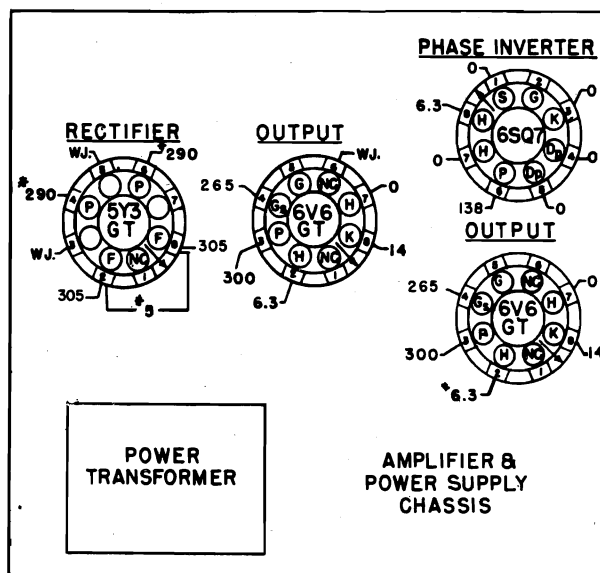
CROSLEY DIV.
AVCO MFG. CORP.

SOCKET VOLTAGE NOTES

1. Bottom view of Sockets.
2. Voltage measured from Socket Lug to Chassis with an Electronic Voltmeter.
3. Voltage measured with Switch in BC position except where marked with delta (Δ)
4. Δ = Selector Switch in F.M. position.
5. W.J.=Wiring Junction.
N.C.=No Connection.
*=A.C. Voltage.
6. All Voltages taken at Nominal Operating Voltage 117 V., 60 cycles.
7. Socket Voltage Tolerance $\pm 10\%$.



TOP VIEW—MODELS 9-214M, 9-214ML
POWER SUPPLY AND AMPLIFIER CHASSIS,



ALIGNMENT PROCEDURE




NOTE:

This receiver has been aligned at the factory for best performance, and no attempt should be made to re-align it unless the proper test equipment is available.

1. Turn the tuning condenser to full mesh, against stop, and set the dial pointer at the edge of the clear section of the dial, left of "55."
2. Connect an output meter across the voice coil of the speaker (3.2 ohms).
3. Feed an R.F. amplitude modulated signal modulated 30% at 400 cycles to the receiver as indicated in the alignment procedure chart. Connect signal generator ground terminal to the chassis of the receiver. When F.M. generator is used, a 30% modulated signal is equal to a deviation of 22.5 kc.
4. Turn the volume control knob to maximum clockwise position and adjust the signal generator output to produce a noticeable output meter reading. Keep the signal generator output as low as possible to prevent excessive AVC action in the receiver.
5. Set the tone control for maximum treble response.
6. When aligning the broadcast band, the built-in loop antenna or a suitable dummy antenna, consisting of a coil with 19.1 u h. inductance shunted with a 66 mmf. capacitor must be used.
7. While aligning the set, the shorting link on the antenna terminal strip should be removed. After alignment replace the link, unless an external antenna is to be used.

**CROSLEY DIV.
AVCO MFG. CORP.
ALIGNMENT CHART I (SCOPE METHOD)**

**MODELS 9-214M,
9-214ML**

Alignment Sequence	Signal Gen. Output		To	Position of		Adjust	Curve	Remarks
	Frequency	In Series With		Range Switch	Tuning Dial or Tun. Cap.			
1	455 KC	.01 mfd.	1st I. F. grid	AM	Gang open	A		Note 1
2	455 KC	.01 mfd.	Stator 21 plate sect. rear of gang	AM	Gang open	B		Note 1
3	10.7 MC	1000 mmf.	2nd I. F. grid	FM	Gang closed	C	Zero Volts	Note 2
4	10.7 MC	1000 mmf.	2nd I. F. grid	FM	Gang closed	D	Max. D. C. output	Note 3
5	RF sweep 10.7 marker	1000 mmf.	1st I. F. grid	FM	Gang closed	E & F		Align for max. output & symmetry Note 4
6	RF sweep 10.7 marker	1000 mmf.	Stator 3 plate sect. rear of gang	FM	Gang closed	G & H		Align for max. output & symmetry Note 5
7	FM-RF 98MC	FM dummy antenna	Dipole Ant. Term.	FM	98MC	I	Peak	Note 6
8	104MC	FM dummy antenna	Dipole Ant. Term.	FM	104MC	J	Peak	Note 7
9	92MC	FM dummy antenna	Dipole Ant. Term.	FM	92MC	Form R. F. Coil "K"	Peak	Note 8
10	Repeat steps 8 and 9 until no further improvement in sensitivity is noted.							
11	FM sweep Gen. 92-98-104 MC markers	FM dummy antenna	Dipole Ant. Term.	FM	Gang closed	L & M		Note 9 or 9a
12	AM-RF Gen. 1400 KC	200 mmf.	BC Ant. Term. and ground	AM	1400 KC	N		Note 10
13	AM-RF Gen. 1400 KC	200 mmf.	BC Ant. Term. and ground	AM	1400 KC	P & Q		Note 1 & Note 10

NOTES:

- Align for peak on output meter.
- Connect two 100,000 ohm resistors in series and connect these resistors from the No. 2 lug of the 6AL5 tube socket to the chassis. Connect an electronic voltmeter from the center of these resistors to the shielded lead junction of the 39,000 ohm resistor (75) and the .002 mfd capacitor, (33). Adjust the ratio detector transformer secondary (C) for zero volts on the electronic voltmeter. Remove the two 100,000 ohm resistors.
- Connect the electronic voltmeter across the 27,000 ohm load resistor (93) and adjust primary of core (D) of the ratio detector transformer (8) for maximum D. C. output.
- Connect output of marker generator across sweep generator output. Connect CRO across the 22,000 ohm resistor (72) in the grid circuit of the second I. F. amplifier.
- CRO connections same as note 4.
- For dummy antenna see figure 1.
- Rock gang capacitor if necessary while making adjustment.
- Tune in signal and adjust for greatest sensitivity by forming FM.—R.F. coil.
- Connect CRO in series with 100,000 ohm resistor to grid (pin 4) of R.F. amplifier and chassis. Remove 7F8 oscillator tube. Connect output of marker generator across output of sweep generator. Adjust (L-M) until pattern and markers approximate figure in alignment chart.
- Shunt primary of FM antenna transformer with a 10 ohm carbon resistor and adjust (M) for maximum output. Remove shunt and place it across FM antenna transformer secondary and adjust (L) for maximum output. Remove shunt.
- Connect BC. dummy loop (Fig. 2) across loop terminals on rear of chassis.

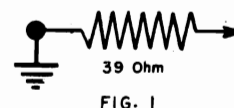
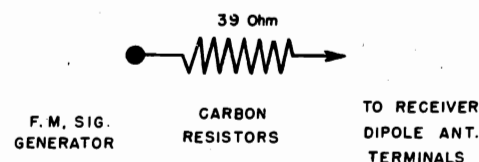


FIG. 1

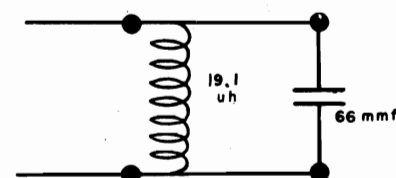


FIG. 2

MODELS 9-214M,
9-214MLCROSLEY DIV.
AVCO MFG. CORP.

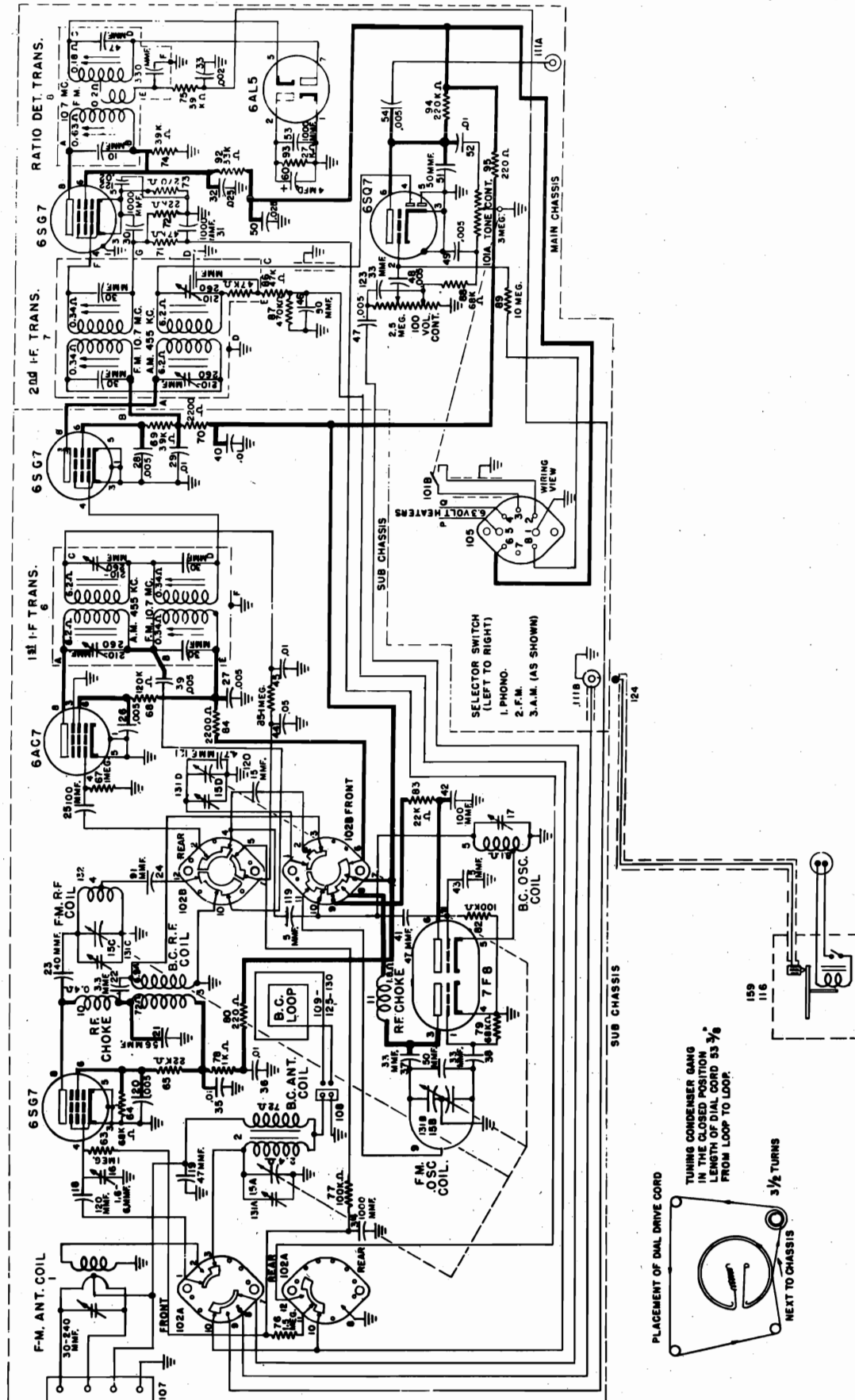
ALIGNMENT CHART II

(Using output meter and electronic voltmeter)

Alignment Sequence	Signal Gen. Output		To	Position of		Adjust	Remarks
	Frequency	In Series With		Range Switch	Tuning Dial or Tun. Cap.		
1	455 KC	.01 mfd.	1st I. F. grid	AM	Gang open	A	Align for peak on output meter.
2	455 KC	.01 mfd.	Stator 21 plate sect. rear of gang	AM	Gang open	B	Align for peak on output meter.
3	10.7 MC	1000 mmf.	2nd I. F. grid	FM	Gang closed	C	Adjust for zero volts on electronic voltmeter Note 1 & 2.
4	10.7 MC	1000 mmf.	2nd I. F. grid	FM	Gang closed	D	Adjust for max. D.C. output on Elect. voltmeter Note 3.
5	10.7 MC	1000 mmf.	1st I. F. grid	FM	Gang closed	E & F	Adjust for max. D. C. output Note 4.
6	10.7 MC	1000 mmf.	Stator 3 plate sect. rear of gang	FM	Gang closed	G & H	Adjust for max. D.C. output Note 4.
	Repeat steps 3 and 4, 5 and 6 if necessary.						
7	98 MC	FM dummy antenna	Dipole Ant. Terminals	FM	98 MC	I	Adjust for max. reading on output meter.
8	104 MC	FM dummy antenna	Dipole Ant. Terminals	FM	104 MC	J	Adjust for max. reading on output meter, rock gang if necessary while making adjustments.
9	92 MC	FM dummy antenna	Dipole Ant. Terminals	FM	92 MC	K	Adjust for max. sensitivity, the inductance of FM.RF. coil "K" by forming.
	Repeat steps 8 and 9 until no further improvement in sensitivity is noted.						
10	98 MC	FM dummy antenna	Dipole Ant. Terminals	FM	98 MC	L & M	See Note 5.
11	AM-RF Gen. 1400 KC	200 mmf.	BC Ant. Term.	AM	1400 KC	N	See Note 6.
12	AM-RF Gen. 1400 KC	200 mmf.	BC Ant. Term. and ground	AM	1400 KC	P & Q	Note 6. Adj. for max. reading on output meter.

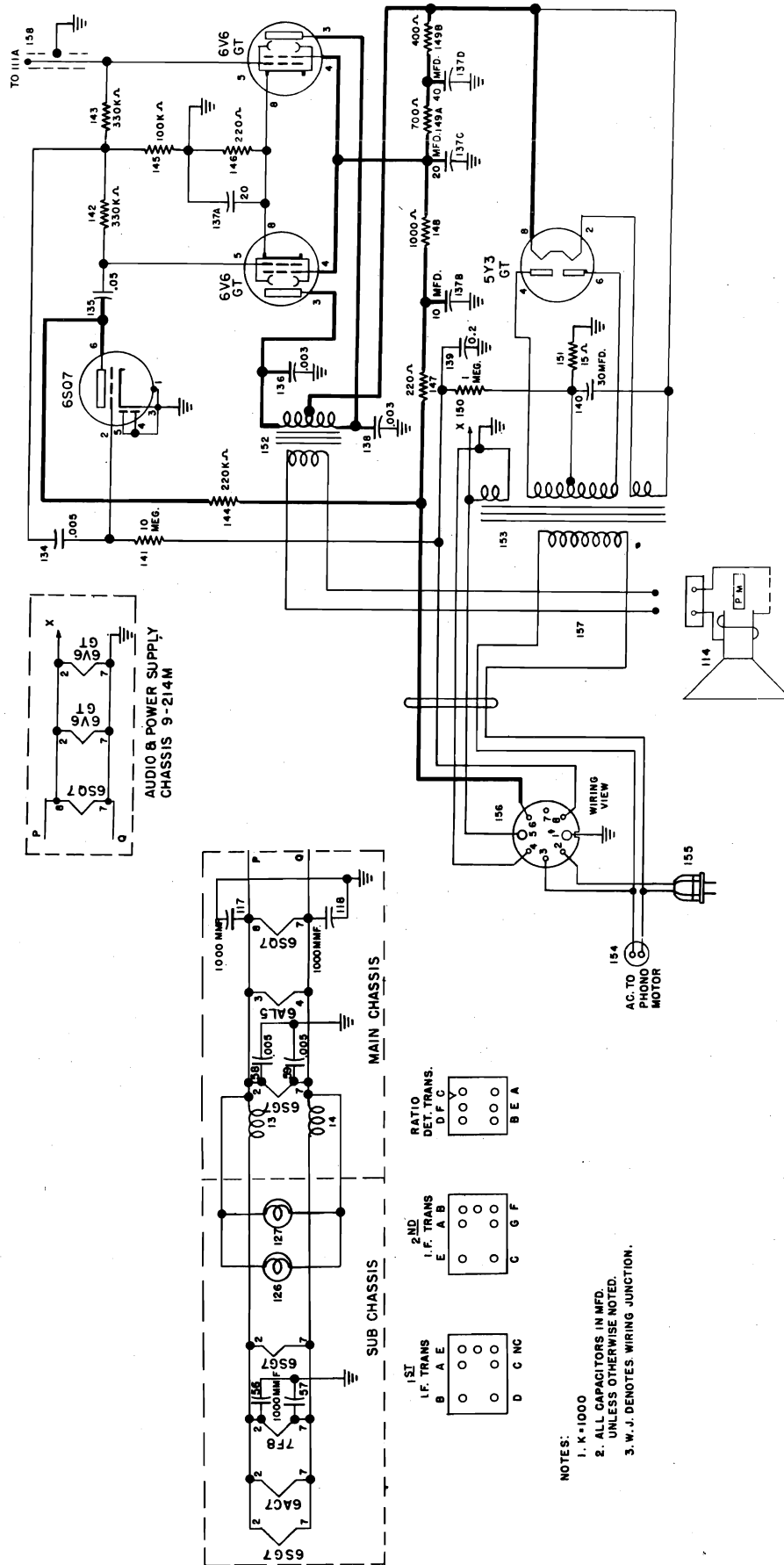
NOTES:

1. Use an unmodulated signal generator, with approximately 100,000 mv. output.
2. Connect two 100,000 ohm resistors in series and connect these resistors from the No. 2 lug of the 6AL5 to the chassis. Connect an electronic voltmeter from the center of these resistors to the shielded lead junction of the 39,000 ohm resistor (75) and the .002 mfd. capacitor, (33). Adjust the ratio detector transformer secondary (C) for zero volts on the electronic voltmeter. Remove the two 100,000 ohm resistors.
3. Connect the electronic voltmeter across the 27,000 ohm load resistor (93) and adjust the primary of the core (D) of the ratio detector transformer (8) for maximum D. C. output.
4. Limit output of signal generator so that the reading on the electronic voltmeter will not exceed 4 volts.
5. Shunt the FM antenna transformer primary with a 10 ohm carbon resistor, and adjust the FM antenna secondary trimmer (M) for maximum output meter reading. Transfer the 10 ohm shunt to the secondary of FM antenna transformer. Adjust FM antenna primary trimmer (L) for maximum output meter reading. Remove the 10 ohm shunt resistor.
6. Connect the BC dummy loop antenna across the loop terminals on the rear of the chassis (see Figure 2,

CROSLEY DIV.
AVCO MFG. CORP.MODELS 9-214M,
9-214ML

MODELS 9-214M,
9-214ML

CROSLEY DIV.
AVCO MFG. CORP.



CROSLEY DIV.
AVCO MFG. CORP.
REPLACEMENT PARTS LIST, MODELS—9-214M, 9-214ML

MODELS 9-214M,
9-214ML

Figures in first column correspond to figures in Schematic Diagram

Item No.	Part Number	Description	Item No.	Part Number	Description
1	AB-143784	Transformer, Antenna (F.M.)	83	39374-129	Resistor, 22,000 ohms, 1 w.
2	AW-143267	Coil, Antenna Loading	84	39373-40	Resistor, 2,200 ohms, $\frac{1}{2}$ w.
3	AW-143402	Transformer, R.F. (B.C.)	85	39373-92	Resistor, 1 Megohm, $\frac{1}{2}$ w.
4	AW-143646	Coil, R.F. (F.M.)	86	39373-67	Resistor, 47,000 ohms, $\frac{1}{2}$ w.
5	AW-143945	Coil, Oscillator (B.C.)	87	39373-87	Resistor, 470,000 ohms, $\frac{1}{2}$ w.
6	AC-143090	Transformer, 1st I.F.	88	39373-71	Resistor, 68,000 ohms, $\frac{1}{2}$ w.
7	AC-143105	Transformer, 2nd I.F.	89	39373-107	Resistor, 10 Megohms, $\frac{1}{2}$ w.
8	AC-143378	Transformer, Ratio Detector	92	39374-131	Resistor, 33,000 ohms, 1 w.
9	AC-143305	Coil, Oscillator (F.M.)	93	39374-42	Resistor, 27,000 ohms, $\frac{1}{2}$ w.
10	AW-143752	Choke, R.F.	94	39373-80	Resistor, 220,000 ohms, $\frac{1}{2}$ w.
11	AW-143837	Choke, R.F.	95	39373-19	Resistor, 220 ohms, $\frac{1}{2}$ w.
13	AW-143934	Choke, R.F. Heater	100	39368-19	Control, Volume (2.5 Meg., Tap 750k ohms)
14	AW-143934	Choke, R.F. Heater	39370-2		Shaft, Volume Control (knurled)
15A	C-142848	Capacitor, Variable	101A	39368-22	Control, Tone (3 megohm)
15B		Capacitor, Variable	39370-2		Shaft, Tone Control (knurled)
15C		Capacitor, Variable	101B	39369-1	Switch, Power
15D		Capacitor, Variable	102A	B-142969	Switch, Band Change } Two
16	C-136327-43	Capacitor, Trimmer	102B		Switch, Band Change } Section
17	W-143014	Capacitor, Trimmer	105	W-142918	Plug, Power
18	C-137727-12	Capacitor, 120 mmf., 300 v., Ceramic	107	AB-143775	Cable Assy., Antenna
19	C-137727-31	Capacitor, 47 mmf., 300 v., Ceramic	108	W-143404	Contact, Loop Antenna
20	39001-11	Capacitor, .005 mfd., 600 v., Paper	111A	W-143126	Socket, Two Prong
21	C-137727-45	Capacitor, 56 mmf., 500 v., Ceramic	111B		Part of 111A
22	W-137398-5	Capacitor, 3.3 mmf., 500 v.	114	138762-5	Speaker
23	C-137727-73	Capacitor, 40 mmf., 500 v., Ceramic	117	C-137727-8	Capacitor, 1000 mmf., 300 v., Ceramic
24	C-137727-20	Capacitor, 91 mmf., 300 v., Ceramic	118	C-137727-8	Capacitor, 1000 mmf., 300 v., Ceramic
25	C-137727-25	Capacitor, 100 mmf., 500 v., Ceramic	119	C-137727-79	Capacitor, 5 mmf., 500 v., Ceramic
26	39001-11	Capacitor, .005 mfd., 600 v., Paper	120	C-137727-43	Capacitor, 15 mmf., 500 v., Ceramic
27	39001-11	Capacitor, .005 mfd., 600 v., Paper	121	W-137398-6	Capacitor, 4.7 mmf., 500 v.
28	39001-11	Capacitor, .005 mfd., 600 v., Paper	122	39001-80	Capacitor, .02 mfd., 600 v., Paper
29	39001-13	Capacitor, .01 mfd., 600 v., Paper	123	B-143686-2	Capacitor, 33 mmf., 500 v.
30	C-137727-8	Capacitor, 1000 mmf., 300 v., Ceramic	126	138437-1	Bulb (Dial), Type 47, 6.3 v., .15 amp.
31	C-137727-8	Capacitor, 1000 mmf., 300 v., Ceramic	127	138437-1	Bulb (Dial), Type 47, 6.3 v., .15 amp.
32	39001-80	Capacitor, .02 mfd., 600 v., Paper	130	AW-144527	Loop Antenna
33	39001-74	Capacitor, .002 mfd., 600 v., Paper	134	39001-11	Capacitor, .005 mfd., 600 v., Paper
34	C-137727-8	Capacitor, 1000 mmf., 300 v., Ceramic	135	39001-17	Capacitor, .05 mfd., 600 v., Paper
35	39001-13	Capacitor, .01 mfd., 600 v., Paper	136	39001-76	Capacitor, .003 mfd., 600 v., Paper
36	39001-13	Capacitor, .01 mfd., 600 v., Paper	137A	B-143089	Capacitor, 20 mfd., 25 v. } Four
37	C-137727-53	Capacitor, 33 mmf., 300 v., Ceramic	137B		Capacitor, 10 mfd., 450 v. } Section
38	C-137727-53	Capacitor, 33 mmf., 300 v., Ceramic	137C		Capacitor, 20 mfd., 450 v. } Electrolytic
39	39001-11	Capacitor, .005 mfd., 600 v., Paper	137D		Capacitor, 40 mfd., 450 v.
40	39001-13	Capacitor, .01 mfd., 600 v., Paper	138	39001-76	Capacitor, .003 mfd., 600 v., Paper
41	C-137727-31	Capacitor, 47 mmf., 300 v., Ceramic	139	39001-87	Capacitor, .25 mfd., 600 v., Paper
42	C-137727-8	Capacitor, 1000 mmf., 300 v., Ceramic	140	B-143062	Capacitor, 30 mfd., 450 v., Electrolytic
43	C-137727-79	Capacitor, 5 mmf., 500 v., Ceramic	141	39373-107	Resistor, 10 Megohms, $\frac{1}{2}$ w.
44	39001-17	Capacitor, .05 mfd., 600 v., Paper	142	39374-55	Resistor, 330,000 ohms, $\frac{1}{2}$ w.
45	39001-13	Capacitor, .01 mfd., 600 v., Paper	143	39374-55	Resistor, 330,000 ohms, $\frac{1}{2}$ w.
46	B-143686-1	Capacitor, 50 mmf., 500 v., Ceramic	144	39374-53	Resistor, 220,000 ohms, $\frac{1}{2}$ w.
47	39001-11	Capacitor, .005 mfd., 600 v., Paper	145	39374-49	Resistor, 100,000 ohms, $\frac{1}{2}$ w.
48	39001-11	Capacitor, .005 mfd., 600 v., Paper	146	39374-193	Resistor, 220 ohms, 2 w.
49	39001-11	Capacitor, .005 mfd., 600 v., Paper	147	39373-19	Resistor, 220 ohms, $\frac{1}{2}$ w.
50	39001-80	Capacitor, .02 mfd., 600 v., Paper	148	39374-201	Resistor, 1000 ohms, 2 w.
51	143686-1	Capacitor, 50 mmf., 500 v., Ceramic	149A	W-137021	Resistor, 700 ohms, 4 w. } Two
52	39001-13	Capacitor, .01 mfd., 600 v., Paper	149B		Resistor, 400 ohms, 4 w. } Section
53	C-137727-8	Capacitor, 1000 mmf., 300 v., Ceramic	150	39373-92	Resistor, 1 Megohm, $\frac{1}{2}$ w.
54	39001-11	Capacitor, .005 mfd., 600 v., Paper	151	39373-3	Resistor, 15 ohms, $\frac{1}{2}$ w.
56	C-137727-8	Capacitor, 1000 mmf., 300 v., Ceramic	152	B-137001	Transformer Output
57	C-137727-8	Capacitor, 1000 mmf., 300 v., Ceramic	153	135106	Transformer, Power
58	C-137727-38	Capacitor, .005 mfd., 500 v., Ceramic	154	B-139727-6	Cable, Phone Motor
59	C-137727-38	Capacitor, .005 mfd., 500 v., Ceramic	155	C-132300-2	Cable & Plug Assy., Power (AC)
60	B-142958	Capacitor, 4 mfd., 50 v., Electrolytic	156	AB-144819	Cable & Plug Assy., Power
63	39373-92	Resistor, 1 Megohm, $\frac{1}{2}$ w.	157	AW-144823	Cable & Pins Assy., Speaker
64	39373-71	Resistor, 68,000 ohms, $\frac{1}{2}$ w.	158	AW-144818	Shielded Lead Assy., (Audio)
65	39374-129	Resistor, 22,000 ohms, 1 w.	159	D-144489	Record Changer (700F), 9-214M
67	39373-92	Resistor, 1 Megohm, $\frac{1}{2}$ w.		D-145113	Record Changer (700FLP), 9-214ML
68	39374-50	Resistor, 120,000 ohms, $\frac{1}{2}$ w.		AB-143729	Background Assy., Dial
69	39374-44	Resistor, 39,000 ohms, $\frac{1}{2}$ w.		W-139477-2	Button Loop Antenna (1 used)
70	39373-40	Resistor, 2,200 ohms, $\frac{1}{2}$ w.		W-139477-1	Button, Loop Antenna (4 used)
71	39373-67	Resistor, 47,000 ohms, $\frac{1}{2}$ w.		R-144841	Cabinet
72	39374-41	Resistor, 22,000 ohms, $\frac{1}{2}$ w.		W-136201	Clip, Dial Glass
73	39374-18	Resistor, 270 ohms, $\frac{1}{2}$ w.		W-134220	Cotter, External (Chassis Mtg.)
74	39374-44	Resistor, 39,000 ohms, $\frac{1}{2}$ w.		W-136853	Cushion (Rubber), Dial Glass
75	39374-44	Resistor, 39,000 ohms, $\frac{1}{2}$ w.		C-144768	Dial Glass
76	39373-94	Resistor, 1.5 Megohm, $\frac{1}{2}$ w.		D-144931	Escutcheon
77	39373-74	Resistor, 100,000 ohms, $\frac{1}{2}$ w.		39012-85	Iron Core, Ratio Det. Transformer
78	39373-33	Resistor, 1,000 ohms, $\frac{1}{2}$ w.		39012-84	Iron Core, 1st I.F.
79	39374-47	Resistor, 68,000 ohms, $\frac{1}{2}$ w.		39012-84	Iron Core, 2nd I.F.
80	39373-19	Resistor, 220 ohms, $\frac{1}{2}$ w.		B-138576-6	Knob (3 used)
82	39373-74	Resistor, 100,000 ohms, $\frac{1}{2}$ w.		B-143778	Knob (1 used)

MODELS 9-214M,
9-214MLCROSLLEY DIV.
AVCO MFG. CORP.

REPLACEMENT PARTS LIST, MODELS—9-214M, 9-214ML

Item No.	Part Number	Description	Item No.	Part Number	Description
	B-143769	Pointer, Dial		39232-2	Socket, Tube (6SG7, 2nd I.F. Amp., F.M.)
	AB-143453	Pulley & Hub Assy., Var. Capacitor		W-143146	Socket, Tube (6AL5, Ratio Det., F.M.)
	W-136979	Pulley, Idler (Dial Drive)		39232-10	Socket, Tube (6SQ7, Det., AVC, A.M.; 1st A.F. Amp., A.M. & F.M.)
	W-51071	Ring, Retaining (Dial Drive Shaft)		39232-6	Socket, Tube (6SQ7, Phase Inverter)
	W-211101	Ring, Tube Socket Retaining		39232-12	Socket, Tube (6V6GT, Output)
	W-136111	Rubber Mtg., Main Chassis		39232-12	Socket, Tube (6V6GT, Output)
	W-45580	Rubber Mtg., Speaker		39232-1	Socket, Tube (5Y3GT, Rectifier)
	W-143455	Shaft, Dial Drive		W-51752	Spring, Dial Drive Cord
	AW-143496	Shielded Wire Assy., Phono.		W-143913	Spring, Chassis Mtg.
	W-46055	Shock Mount, Sub Chassis Mtg.		W-144221	Spring (Hook) Chassis Mtg.
	W-139040	Shock Mount, Sub Chassis Mtg.		W-143552	Strip, Dial Pointer
	D-136565-25	Socket, Dial Light		C-135038-12	Terminal Strip (2 Lug)
	39232-10	Socket, Tube (6SG7, R.F. Amp.)		C-135038-13	Terminal Strip (3 Lug)
	39232-10	Socket, Tube (6AC7, Mixer)		C-135038-47	Terminal Strip (4 Lug)
	W-136470-2	Socket, Tube (7F8, Oscillator)		C-135038-37	Terminal Strip (1 Lug)
	39232-10	Socket, Tube (6SG7, I.F. Amp., A.M. & F.M.)		W-134916	Washer (Spring), Dial Drive Shaft

REPLACEMENT CABINET PARTS

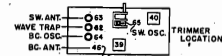
Item No.	Part Number	Description	Item No.	Part Number	Description
	144885	Baffle, Speaker		143956	Grille Cloth
	143653	Bracket (R.H.) Radio Bin		144637	Hinge, Storage Door
	143654	Bracket (L.H.) Radio Bin		144887	Knob, Storage Door
	143846	Bumper (Rubber) Radio Bin		144883	Panels (Front), Drawer & Radio Bin
	143485	Bumper (Rubber), Door & Drawer		144886	Pull (Handle), Drawer & Radio Bin
	144900	Door, Storage Compartment		143478	Slides, Drawer (1 pair)
	144884	Drawer Frame Assy.		139319SB	Strike & Catch Assy., Door

MEGACYCLES TO CHANNEL NUMBERS

Cross index between frequency calibrations in megacycles on the dial and channel numbers follow:

Frequency in Megacycles	Channel No.	Frequency in Megacycles	Channel No.
87.9	200	98.9	255
88.9	205	99.9	260
89.9	210	100.9	265
90.9	215	101.9	270
91.9	220	102.9	275
92.9	225	103.9	280
93.9	230	104.9	285
94.9	235	105.9	290
95.9	240	106.9	295
96.9	245	107.9	300
97.9	250		

To find the frequency in megacycles for CHANNEL NUMBERS between those given above, add .2 megacycle for every whole number added to the CHANNEL NUMBER; for example channel 204 would be 88.7 megacycles and 251 would be 98.1 megacycles.



MODELS 66XTW,
66XTW-10, 66XTW-20

CROSLEY DIV.
AVCO MFG. CORP.

ALIGNMENT PROCEDURE

1. Turn the tuning capacitor to the completely closed position against the stop, and set the dial pointer to the reference line at the end of the dial scale.
2. Turn the tone control to the high or treble position.
3. Connect the output meter across the speaker voice coil.
4. The r. f. signal input from the signal generator should be connected to the external antenna post. Connect the signal generator ground to the chassis.
5. Turn the volume control on full, and adjust the signal generator output to produce approximately mid-scale deflection of the output meter, but maintain signal generator output as low as possible to prevent AVC action in the receiver.
6. Loop antenna must be connected when making alignments.

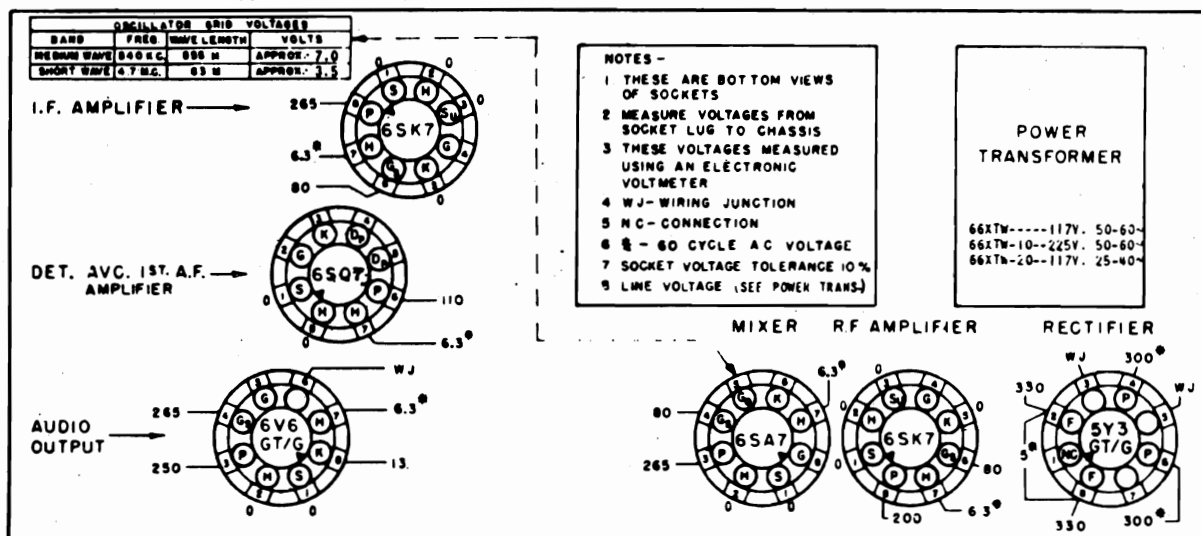
ALIGNMENT CHART

Alignment Sequence	Signal Generator Output			Position of		Adjust for Maximum Output
	Frequency in k c.	In Series with	To	Band Switch	Tuning Dial	
1	455	200 mmf.	Ant.	M	1650 KC	A & B
2	455	200 mmf.	Ant.	M	1650 KC	C*
3	15,500	400 ohms	Ant.	S	15.5 MC	D
4	15,000	400 ohms	Ant.	S	20 M	E
5	1650	200 mmf.	Ant.	M	1650 KC	F
6	1400	200 mmf.	Ant.	M	1400 KC	G
7	600	200 mmf.	Ant.	M	500 M	H
8	1400	200 mmf.	Ant.	M	1400 KC	Recheck G

*Adjust for minimum output (wavetrap). Reversing the position of the power plug may reduce power hum.

NOTE: When aligning the short-wave oscillator trimmer (D), be sure that the circuit is aligned at the correct frequency and not at the image frequency which is 910 kilocycles lower as indicated by the receiver dial. To check: Tune in the generator frequency, then increase the generator output and tune in the image frequency. The image frequency should be weaker than the fundamental and audible 910 kilocycles lower on the receiver dial. If the image cannot be tuned in, the oscillator trimmer is adjusted to the wrong peak. The correct peak is the second one heard as the trimmer adjustment screw is opened from the completely closed position.

SOCKET VOLTAGE CHART



**CROSLEY DIV.
AVCO MFG. CORP.**

MODELS 66XTW,
66XTW-10, 66XTW-20

TYPE: Six-tube, two band superheterodyne with terminals provided for record player.

FREQUENCY RANGE: Medium wave band: 540 to 1650 kc. (555 to 182 meters), Band Switch at (M). Shortwave Band: 4.7 to 15.5 mc. (63 to 19.35 meters), Band Switch at (S).

INTERMEDIATE FREQUENCY: 455 kc.

POWER SUPPLY: Models 66XTW, 66XTW-10, 50-60 cycle a. c. only. Model 66XTW-20, 25-40 cycles a. c. only.

VOLTAGE RATING: Models 66XTW, 66XTW-20, 105-130 volts. Model 66XTW-10, 210-260 volts.

POWER CONSUMPTION: 65 watts maximum.

POWER OUTPUT: 4.5 watts maximum.

TUBE COMPLEMENT

Type	Function
6SK7	R. F. Amplifier
6SA7	Mixer
6SK7	I. F. Amplifier
6SQ7	Detector, AVC, 1st A. F. Amplifier
6V6 GT/G	Power Amplifier
5Y3 GT/G	Rectifier

DIAL BULB: Type 51, 7.5 volts, 0.2 amp.

PARTS LIST—MODEL 66XTW, 66XTW-10, 66XTW-20

Figures in first column correspond to figures in Schematic Diagram.

Item No.	Part No.	Description	Item No.	Part No.	Description
1	39373-38	Resistor, 3300 ohm, $\frac{1}{2}$ w.	41	B-136132	Transformer, Power (66XTW-10)
2	39373-60	Resistor, 22,000 ohm, $\frac{1}{2}$ w.	41	B-136131	Transformer, Power (66XTW-20)
3	39373-275	Resistor, 12,000 ohm, 2 w.	42	W-43567	Bulb (dial), Type 51, 7.5 v., 0.2 amp.
4	39373-97	Resistor, 2.2 megohm, $\frac{1}{2}$ w.	43	W-43567	Bulb (dial), Type 51, 7.5 v., 0.2 amp.
5	39373-143	Resistor, 1,000 ohm, 1 w.	44	B-135651	Control, Tone (3 megohm)
6	39373-97	Resistor, 2.2 megohm, $\frac{1}{2}$ w.	*	39368-10	Control, Tone
7	39373-84	Resistor, 330,000 ohm, $\frac{1}{2}$ w.	45	B-135859	Control, Volume (1 megohm) and Switch Assy.
9	B-138131-2	Transformer, output		39368-18	Control, Volume
10	C-135933	Speaker and Transformer Assy.	*	39370-1	Shaft, Volume (Plug in)
11	39373-67	Resistor, 47,000 ohm, $\frac{1}{2}$ w.		39369-1	Switch, Power
12	39373-87	Resistor, 470,000 ohm, $\frac{1}{2}$ w.	46	W-132267-1	Condenser, Trimmer
13	39371-5	Resistor, 1,000 ohm, 10 w.	47	C-132300-2	Cable and Plug, Power
14	39373-133	Resistor, 330 ohm, 1 w.	48	W-135479	Terminal Board Assy.
15	39373-64	Resistor, 33,000 ohm, $\frac{1}{2}$ w.	49	W-135479	Terminal Board Assy.
16	39373-102	Resistor, 4.7 megohm, $\frac{1}{2}$ w.	51	W-134968-2	Socket, Speaker
17	39373-60	Resistor, 22,000 ohm, $\frac{1}{2}$ w.	52A	B-135936	Switch, Band Change} Two
18	39373-74	Resistor, 100,000 ohm, $\frac{1}{2}$ w.	52B		Switch, Band Change} Section
19	39004-9	Condenser, 220 mmf., 500 v., mica	53	AW-135907	Coil Assy., R. F.
20	39004-9	Condenser, 220 mmf., 500 v., mica	54	AW-136360	Coil Assy., Osc.
21	39001-17	Condenser, .05 mfd., 600 v., paper	55	AW-136361	Coil Assy., Ant.
22	39004-9	Condenser, 220 mmf., 500 v., mica	57	AW-135954	Coil Assy., Ant. Loading
23	39001-17	Condenser, .05 mfd., 600 v., paper	61	AC-138210	Antenna Loop and Back Assy.
24	39004-5	Condenser, 50 mmf., 500 v., mica	62	B-132386-7	Condenser Trimmer} Three
25	39001-11	Condenser, .005 mfd., 600 v., paper	63		Condenser Trimmer} Section
26	39001-13	Condenser, .01 mfd., 600 v., paper	64		Condenser Trimmer} Assy.
27	39004-9	Condenser, 220 mmf., 500 v., mica	65	Part of Item #37B	Condenser Trimmer
28	210685-188	Condenser, 5600 mmf., 500 v., mica		39388	Socket, Tube
29	210685-165	Condenser, 500 mmf., 500 v., mica		39017-3	Socket, Dial Light
30	39001-11	Condenser, .005 mfd., 600 v., paper		G-39012-8	Iron Core
32	W-30805	Condenser, .01 mfd., 400 v., paper		W-132366-2	Nut, Iron Core Locking
33	39001-11	Condenser, .005 mfd., 600 v., paper		AW-137205	Dial Face Assy.
34	39001-13	Condenser, .01 mfd., 600 v., paper		B-134571	Pointer, Dial
35	39004-5	Condenser, 50 mmf., 500 v., mica		W-134667	Clip, Dial Pointer
37A	B-136207	Condenser, Variable} Two		W-51752	Spring, Dial Drive Cord
37B		Condenser, Variable} Section		W-134917	Shaft, Drive
38A	B-135934	Condenser, 40 mfd., 360 v.w.} Four Sec.		W-51071	Ring, Retaining
38B		Condenser, 20 mfd., 275 v.w.} tion Elec.		W-134916	Washer, Spring
38C		Condenser, 20 mfd., 245 v.w.} Filter used		W-135164	Bumper
38D		Condenser, 20 mfd., 22 v.w.} on Models		W-134055	Grommet, Variable Cond. Mtg.
				AW-134737	Cabinet
38A	B-137372	Condenser, 40 mfd., 360 v.w.} Four Sec.		C-132688	Lens, Dial
38B		Condenser, 20 mfd., 275 v.w.} tion Elec.		W-134635	Knob
38C		Condenser, 20 mfd., 245 v.w.} Filter used		W-132766	Grille Cloth
38D		Condenser, 20 mfd., 22 v.w.} on Model		W-45580	Grommet
				B-134660	Gasket, Speaker
39	AW-137495	Transformer, Assy., 1st I. F.		W-132124	Stud, Trimount
40	AW-134158	Transformer Assy., 2nd I. F.		W-136584	Washer, Rubber
41	B-135937	Transformer, Power (66XTW)			

*These parts will replace the original equipment parts.

455 KC I.F.
BAND SWITCH SHOWN IN PHONO POSITION.
BAND SWITCH SEQUENCE, CLOCKWISE ROTATION, IS PHONO, BROADCAST, SHORT WAVE

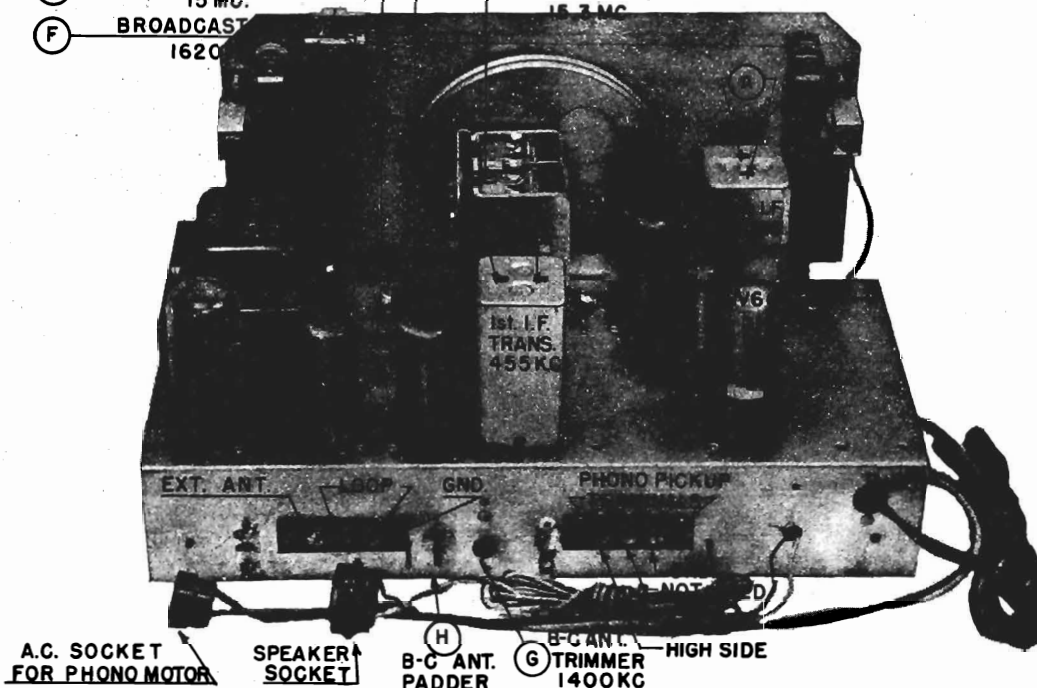
D-139401

INTERMEDIATE FREQUENCY: 455 kc
POWER SUPPLY: 60 cycle a. c. only.
VOLTAGE RATING: 105-125 volts.

POWER OUTPUT: 4.5 watts minimum.

- (C) WAVE TRAP TRIMMER
455 KC.
(E) SHORT WAVE ANT. TRIM
15 MG.
(F) BROADCAST
1620

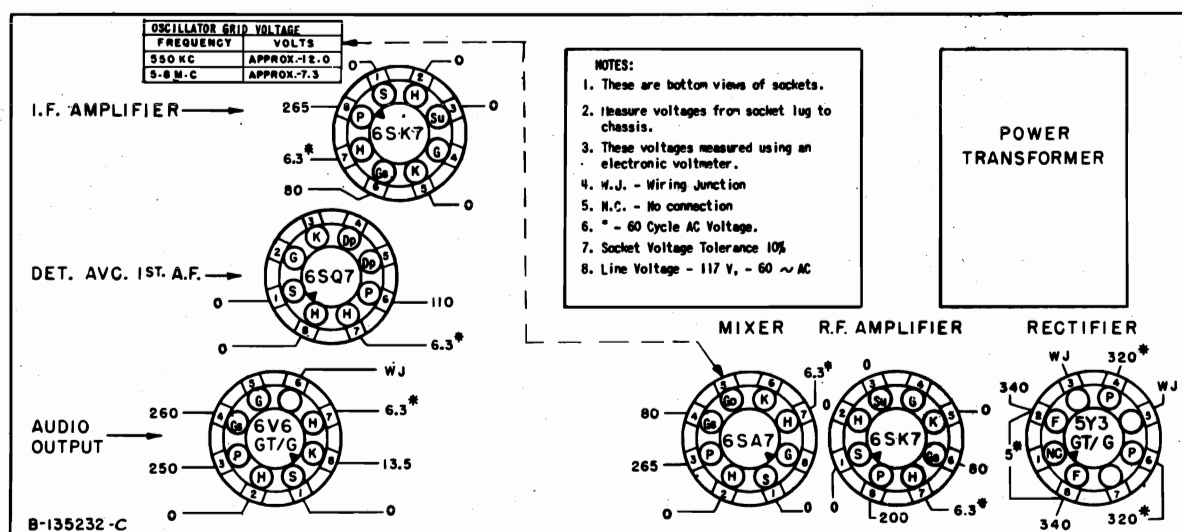
(D) SHORTWAVE
OSC. TRIMMER
15.7 MC



CHASSIS, REAR VIEW

CROSLEY DIV.
AVCO MFG. CORP.MODELS 68CP,
68CR

SOCKET VOLTAGE CHART



ALIGNMENT PROCEDURE

1. Turn the tuning condenser to the completely closed position against the stop and set the dial pointer to the notch at the right-hand end of the dial background.
2. Connect the output meter across the speaker voice coil and turn tone control to the treble position.
3. The r. f. signal input from the signal generator should be connected to the external antenna post as indicated in the alignment chart. Connect the low side (ground) of the signal generator to the chassis.
4. Turn the volume control on full and adjust the signal generator output to produce approximately mid-scale deflection of the output meter, but maintain the signal generator output as low as possible to prevent AVC action in the receiver.

NOTE: The signal web antenna must remain connected at all times. If the receiver is removed from cabinet, use a suitable dummy antenna of 4 uh.

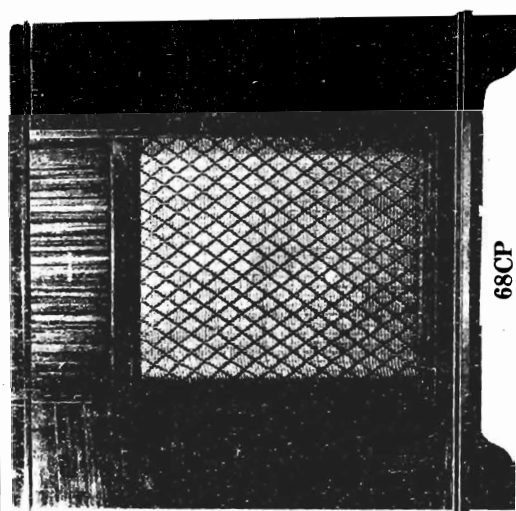
ALIGNMENT CHART

Alignment adjustment locations are shown on Chassis, Rear View

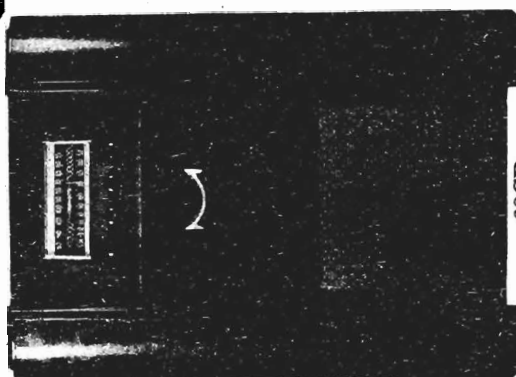
Alignment Sequence	Signal Generator Output			Position of		Adjust for Maximum Output
	Frequency	In Series With	To	Band Switch	Variable Condenser	
1	455 kc.	200 mmf.	Ant.	BC	Open	A & B
2	455 kc.	200 mmf.	Ant.	BC	Open	C*
3	15.3 mc.	400 ohms	Ant.	SW	Open	D
4	15 mc.	400 ohms	Ant.	SW	To 15 mc. Signal	E
5	1620 kc.	200 mmf.	Ant.	BC	Open	F
6	1400 kc.	200 mmf.	Ant.	BC	To 1400 kc. Signal	G
7	600 kc.	200 mmf.	Ant.	BC	To 600 kc. Signal	H
8	1400 kc.	200 mmf.	Ant.	BC	To 1400 kc. Signal	Recheck G

*Adjust for Minimum Output (Wave Trap).

NOTE: When aligning the short-wave oscillator trimmer (D), be sure that the circuit is aligned at the correct frequency and not at the image frequency which is 910 kilocycles lower as indicated by the receiver dial. To check: tune in the generator frequency, then increase the generator output and tune in the image frequency. The image frequency should be weaker than the fundamental and audible 910 kilocycles lower on the receiver dial. If the image cannot be tuned in, the oscillator trimmer is adjusted to the wrong peak. The correct peak is the second peak of the trimmer from the closed position.

MODELS 68CP,
68CRCROSLEY DIV.
AVCO MFG. CORP.

68CP



68CR

TUBE COMPLEMENT:

Type	Function
6SA7 (GT/G)	Mixer
6SK7 (GT/G)	R. F. Amplifier
6SK7 (GT/G)	I. F. Amplifier

Item No.	Part No.	Description	Item No.	Part No.	Description
1	39373-44	Resistor, 3300 ohm, 1/2 w.	46	W-132267-1	Condenser, Trimmer
2	39373-60	Resistor, 22,000 ohm, 1/2 w.	47	B-132300-1	Cable and Plug Assy., Power
3	39373-275	Resistor, 12,000 ohm, 2 w.	48	39019-3	Terminal Board Assy.
4	39373-97	Resistor, 2.2 megohm, 1/2 w.	49	39019-3	Terminal Board Assy.
5	39373-143	Resistor, 1,000 ohm, 1 w.	50	D-137057-1	Record Changer (68CP)
6	39373-97	Resistor, 2.2 megohm, 1/2 w.	52A	B-135312	Switch, Band Change } Two
7	39373-84	Resistor, 330,000 ohm, 1/2 w.	52B		Switch, Band Change } Section
10	B-138131-2	Transformer, Output	53	AW-139073	Coil Assy., R.F.
11	39373-67	Resistor, 47,000 ohm, 1/2 w.	54	AW-139079	Coil Assy., Oscillator
12	39373-87	Resistor, 470,000 ohm, 1/2 w.	55	AW-139081	Coil Assy., Antenna (SW)
13	39371-5	Resistor, 1,000 ohm, 5 w.	56	C-138762-5	Speaker (Less Transformer)
14	39373-133	Resistor, 330 ohm, 1 w.	57	AW-139074	Coil Assy., Antenna Loading
15	39373-64	Resistor, 33,000 ohm, 1/2 w.	58	B-139727-2	Cable, Phono Motor (68CP)
16	39373-102	Resistor, 4.7 megohm, 1/2 w.	60	W-139692	Loop, Antenna (Transmission Line)
17	39373-74	Resistor, 22,000 ohm, 1/2 w.	61A		Condenser, Trimmer } Three
18	39373-74	Resistor, 100,000 ohm, 1/2 w.	61B		Condenser, Trimmer } Section
19	39001-73	Condenser, .00025 mfd., 600 v., paper	61C		Condenser, Trimmer } Assy.
20	39001-73	Condenser, .00025 mfd., 600 v., paper	64	Part of Item 37B	Condenser, Trimmer
21	39001-17	Condenser, .05 mfd., 600 v., paper	65	AB-139023	Cable and Plug Assy., Speaker (68CP)
22	39001-17	Condenser, .00025 mfd., 600 v., paper	69	AB-138935	Cable, Speaker (68CR)
23	39001-17	Condenser, .05 mfd., 600 v., paper	70	D-142552	Record Changer (68CR)
24	39004-5	Condenser, 47 mfd., 500 v., mica	71	B-139727-5	Cable, Phono Motor (68CR)
25	39001-11	Condenser, .005 mfd., 600 v., paper	72	AW-142644	Shielded Cable Assy. (68CR)
26	39001-13	Condenser, .01 mfd., 600 v., paper	73	Part of Item 50	Shielded Cable Assy. (68CP)
27	39001-73	Condenser, .00025 mfd., 600 v., paper		R-139858	Cabinet (68CR)
30	39001-11	Condenser, .005 mfd., 600 v., paper		R-142615	Cabinet (68CR)
32	W-30805	Condenser, .01 mfd., 400 v., paper		W-131154-1	Coffet, External
33	39001-11	Condenser, .005 mfd., 600 v., paper		D-139376	Dial Glass
34	39001-13	Condenser, .01 mfd., 600 v., paper		C-139888	Escutcheon, Dial
35	B-137727-21	Condenser, 50 mfd., 500 v., ceramic		W-45580	Grommet, Speaker and Chassis Mtg.
36	B-137498-14	Condenser, 580 mfd., 300 v., mica		W-134055	Grommet, Variable Cond. Mtg.
37A	B-137073-3	Condenser, Variable { Two Section		G-39012-8	Iron Core
37B		Condenser, Variable { Assy.		W-135309	Knob
38A	B-137076	Condenser, 40 mfd., 450 v. { Four Sec.		AB-134935	Needle, Floating Jewel Assy.
38B		Condenser, 20 mfd., 450 v. { Elect. Filter		W-132366-2	Nut, Iron Core Locking
38C		Condenser, 20 mfd., 25 v.		C-135234	Plate, Dial Background
38D		Condenser, 20 mfd., 25 v.		W-135274	Pointer, Dial
39	AW-137495	Transformer, 1st I.F.		W-135074	Pulley, Drive Cord Idler
40	AW-139080	Transformer, 2nd I.F.		W-51071	Ring, Retaining
41	B-134625	Bulb (Dial), Type 47, 6.3 v., .15 amp.		B-135532	Shaft, Drive
42	W-48858	Bulb (Dial), Type 47, 6.3 v., .15 amp.		G-39204	Socket, Tube
43	W-48858	Bulb (Dial), Type 47, 6.3 v., .15 amp.		D-136565-3	Socket, Dial Light
44	* { 39368-22	Control, Tone (3 megohm)		W-51752	Spring, Dial Drive Cord
	* { 39370-2	Control, Volume		W-138136	Strip, Dial Pointer
	B-135313	Control, Volume (1 megohm) and Switch Assy.		AC-137885	Support, Cabinet Lid (68CP)
45	* { 39368-18	Control, Volume		C-135038-46	Terminal Strip
	* { 39370-2	Switch, Power		W-134916	Washer, Spring
	* { 39369-1	Shaft, Plug-in			

* These parts will replace the original equipment parts.

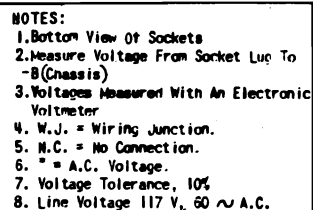
6SQ7 (GT/G) Detector, AVC, 1st A.F. Amplifier

6V6 (GT/G) A. F. Power Output

5Y3 GT/G Rectifier

DIAL BULB: Type 47, 6.3 volts, .15 amp.

TYPE: Six-tube, two-band, superheterodyne.
 FREQUENCY RANGE: Broadcast Band, 540 to 1600 kc. (Selector Switch at BC.)
 Short-wave Band, 5.8 to 15 mc. (Selector Switch at SW.)



MODELS 68TA,
68TWCROSLLEY DIV.
AVCO MFG. CORP.**ALIGNMENT PROCEDURE**

1. Turn the tuning condenser to the completely closed position against the stop and set the dial pointer to the reference line at the low frequency end of the dial scale.
2. Turn the tone control to the treble (clockwise) position.
3. Connect the output meter across the speaker voice coil.
4. The r. f. signal input from the signal generator should be connected through a condenser as indicated in the alignment chart. Connect the signal generator ground to the receiver chassis.
5. Turn the volume control on full and adjust the signal generator output to produce approximately mid-scale deflection of the output meter, but maintain signal generator output as low as possible to prevent AVC action in the receiver.
6. Loop antenna must remain connected at all times.

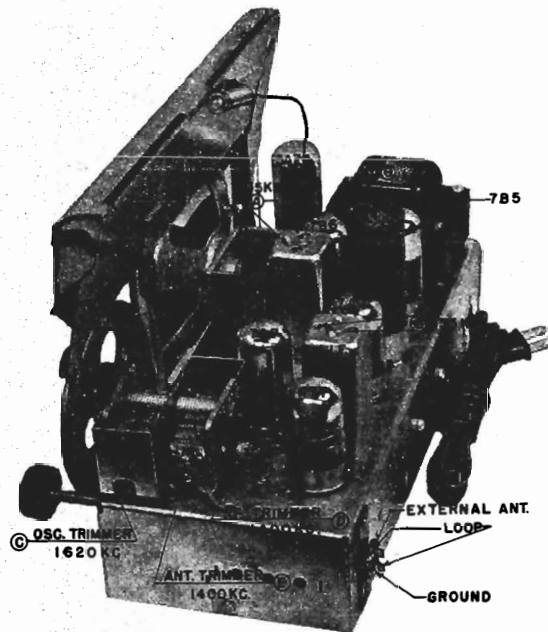
ALIGNMENT CHART

Alignment adjustments are shown in "CHASSIS, SIDE VIEW,"

Alignment Sequence	Signal Generator Output			Position of Tuning Dial or Var. Cond.	Adjust for Maximum Output
	Frequency in KC	In Series with	To		
1	455	.05 mfd.	Pin 6 7Q7	open	A & B
2	1620	4 mmf.	Top Ant. Clip	open 1620	C
3	1400	4 mmf.	Top Ant. Clip	1400	D
4	1400	4 mmf.	Top Ant. Clip	1400	E
5	1400	4mmf.	Top Ant. Clip	1400	Rock var. cond. and repeat 3 & 4

DESCRIPTION**TYPE:** Six-tube, single band, superheterodyne.**FREQUENCY RANGE:** 540 to 1600 kc.**INTERMEDIATE FREQUENCY:** 455 kc.**POWER SUPPLY:** 60 cycle a. c. only**VOLTAGE RATING:** 105-125 volts.**POWER CONSUMPTION:** 50 watts nominal.**POWER OUTPUT:** 2.5 watts maximum**TUBE COMPLEMENT:**

TYPE	FUNCTION
7A7	R. F. Amplifier
7Q7	Converter
7A7	I. F. Amplifier
7B6	Detector, AVC, 1st A. F. Amplifier
7B5	A. F. Power Output
5AZ4	Rectifier

CROSLEY DIV.
AVCO MFG. CORP.MODELS 68TA,
68TW

CHASSIS, SIDE VIEW



68 TW



REPLACEMENT PARTS LIST

Figures in first column correspond to figures in Schematic Diagram

Item No.	Part No.	Description	Item No.	Part No.	Description
1	AW-137800	Coil, R. F.	40	39001-73	Condenser, .00025 mfd., 600 v., pap.
2	AW-137724	Coil, Oscillator	41	39001-7	Condenser, .001 mfd., 600 v., paper
3	AC-137933	Transformer, 1st I. F.	42	39001-13	Condenser, .01 mfd., 600 v., paper
4	AC-137934	Transformer, 2nd I. F.	44 A	B-136596	Cond., 50 mfd., 300 v. } Two Sec.
5	AW-138546	Coil, Antenna Loading	44 B		Cond., 30 mfd., 300 v. } Elec. Filt.
6	W-48858	Bulb (Dial), Type 47, 6.3 v., .15 amp.	45	W-132267-1	Condenser, Trimmer
7	C-132300-1	Cable and Plug Assy., Power	46	AB-138584	Terminal Board
9	B-136597	Transformer, Power	47	AC-138464	Loop Antenna Assembly
10	B-136598	Transformer, Output	48 A	AC-138595-2	Condenser, Variable
11	B-136595	Control, Volume (1 meg., Tap 300K) and Switch Assy.	48 B		Condenser, Variable } Assembly
*	39368-18	Control, Volume	48 C		Condenser, Variable }
	39370-2	Shaft, Plug in	51	C-137727-52	Condenser, 12 mmf., 500 v. ceramic
	39369-1	Switch, Power	52	B-142857	Control, Tone (2 megohm)
13	C-138246	Speaker	*	39368-11	Control, Tone
14	39373-23	Resistor, 330 ohm, ½ w.	53	39373-67	Resistor, 47,000 ohm, ½ w.
15	39373-60	Resistor, 22,000 ohm, ½ w.	54	W-48858	Bulb (Dial), Type 47, 6.3 v., .15 amp.
16	39373-67	Resistor, 47,000 ohm, ½ w.		R-138573-1	Cabinet, (66TA)
17	39373-84	Resistor, 330,000 ohm, ½ w.		AW-138663	Cabinet (66TW)
18	39373-87	Resistor, 470,000 ohm, ½ w.		C-137750	Cabinet Back
19	39373-92	Resistor, 1 megohm, ½ w.		W-138490	Clip, Spring
20	39373-97	Resistor, 2.2 megohm, ½ w.		AC-138443-1A	Dial Plate and Pulley Assy.
21	39373-107	Resistor, 10 megohm, ½ w.		C-143138	Dial Glass
22	39373-40	Resistor, 2200 ohm, ½ w.		W-134055	Grommet (Var. Cond. Mtg.)
23	39372-7	Resistor, 1500 ohm, 10 w.		B-138574-5	Knob (66TA)
24	39373-165	Resistor, 12,000 ohm, 1 w.		B-138574-2	Knob (66TW)
25	39373-62	Resistor, 27,000 ohm, ½ w.		143142	Pointer, Dial
27	39373-97	Resistor, 2.2 megohm, ½ w.		W-137939-1	Pulley, Idler (Drive Cord)
28	39373-97	Resistor, 2.2 megohm, ½ w.		W-51071	Ring, Retaining (Drive Shaft)
29	39373-60	Resistor, 22,000 ohm, ½ w.		W-46065	Rubber Mtg., Speaker
32	39001-11	Condenser, .005 mfd., 600 v., paper		W-136613-3CP	Screw, Dial Glass Strip
33	39001-11	Condenser, .005 mfd., 600 v., paper		39220-36CP	Screw, Chassis Mtg.
34	39001-13	Condenser, .01 mfd., 600 v., paper		B-135075-5	Shaft, Drive
35	39001-13	Condenser, .01 mfd., 600 v., paper		39441	Socket, Tube
36	39001-17	Condenser, .05 mfd., 600 v., paper		D-136565-16	Socket, Dial Light
37	39001-17	Condenser, .05 mfd., 600 v., paper		W-138568	Strip, Dial Pointer
38	39001-7	Condenser, .001 mfd., 600 v., paper		C-139844	Strip, Dial Trim
39	39001-17	Condenser, .05 mfd., 600 v., paper		B-138649	Strip, Dial Glass
				W-132124	Trimount Stud, Cabinet Back
				W-134916	Washer, Spring (Drive Shaft)

*These parts will replace the original equipment parts.

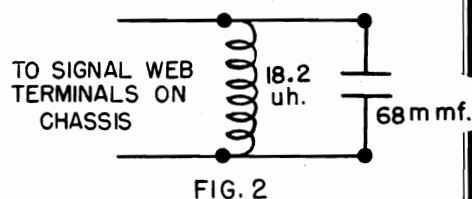
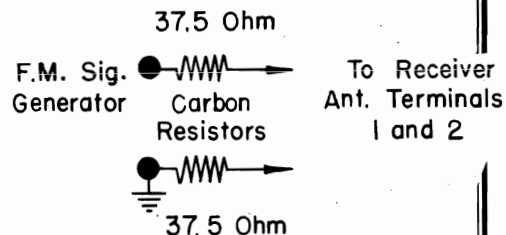
MODELS 148CP,
148CP(W), 148CQ,
148CR

CROSLEY DIV.
AVCO MFG. CORP.

ALIGNMENT PROCEDURE NOTES

1. Sweep alignment (use approximately 500 kc. to sweep).
2. Sweep Generator Output .1 to 1 Volt RMS.
3. Scope connected to center terminal on phono switch.
4. Align for maximum peak amplitude. Peak separation should be 150 to 200 kc.
5. Scope connected to center terminal of 3rd I.F. through 200,000 ohms.
6. Repeat operations 8 and 9 until no charge can be noted in sensitivity.
7. Rock gang.
8. When aligning the shortwave oscillator trimmer, make certain the circuit is aligned at the correct frequency and not at the image frequency which is 910 kilocycles lower in frequency as indicated on the receiver dial. To check, tune in signal generator frequency, then increase the generator output and tune in the image frequency which should be audible, but weaker than the fundamental frequency. If the image can not be tuned in, the oscillator trimmer is adjusted to the wrong peak. The correct peak is the second peak of the trimmer from the closed position.

CIRCUIT



MEGACYCLES TO CHANNEL NUMBERS

Cross index between frequency calibrations in megacycles on the dial and channel numbers follow:

Frequency in Megacycles	Channel No.	Frequency in Megacycles	Channel No.
87.9	200	98.9	255
88.9	205	99.9	260
89.9	210	100.9	265
90.9	215	101.9	270
91.9	220	102.9	275
92.9	225	103.9	280
93.9	230	104.9	285
94.9	235	105.9	290
95.9	240	106.9	295
96.9	245	107.9	300
97.9	250		

To find the frequency in megacycles for CHANNEL NUMBERS between those given above, add .2 megacycles for every whole number added to the CHANNEL NUMBER; for example Channel 204 would be 88.7 megacycles and 251 would be 98.1 megacycles.

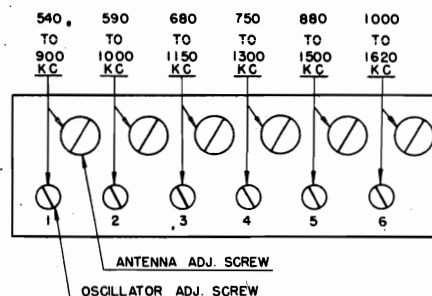
**CROSLEY DIV.
AVCO MFG. CORP.**

**MODELS 148CP,
148CP(W), 148CQ,
148CR**

PUSH BUTTON ADJUSTMENT PROCEDURE

Each of the six push buttons, for automatic tuning, has two adjusting screws by which it may be set to any nearby American broadcast station whose frequency in kilocycles is within the kilocycle range covered by that button. To gain access to these screws, carefully pull off the push button. To set No. 1 push button to a desired position, proceed as follows:

1. Turn the ANTENNA ADJ. SCREW clockwise until moderately tight, then turn the OSCILLATOR ADJ. SCREW counter-clockwise until the threaded portion extends approximately $\frac{3}{4}$ inch. Use a small screw-driver and do not exert pressure.
2. Turn the band selector switch to the "AM" position and manually tune in the station to which the push button is to be set. The frequency of the station selected must be between 540 and 900 kilocycles. Carefully adjust the tuning control to the point of clearest reception.
3. Turn the band selector switch to the "AUTO" position and slowly turn the OSCILLATOR ADJ. SCREW clockwise until the same station is heard. Adjust the screw for maximum volume.
4. Adjust the ANTENNA ADJ. SCREW for maximum volume.
5. Turn the band selector switch from "AUTO" to "AM" and back again to check if the adjustment has been correctly made. There should be no change in tone quality when switched from one to the other.
6. Place the tab with the call letters of the station, to which the push button has been set, in a celluloid "V" and slide it into the button from the side.
7. The remaining push buttons may be set in a similar manner. No adjustment of master tone control push buttons is required.



ALIGNMENT PROCEDURE

1. This receiver has been aligned at the factory for best performance, and no attempt should be made to re-align it unless the proper test equipment is available.
2. Turn the tuning condenser to full mesh, against stop, and set the dial pointer to the reference line at the end of the dial scale.
3. Release all tone control buttons to the out position.
4. Connect the output meter across the speaker voice coil (3.2 ohms).
5. Feed an R. F. amplitude modulated signal modulated 30% at 400 cycle to the receiver as indicated in the alignment procedure chart. Connect signal generator ground terminal to the chassis of the receiver. When F. M. generator is used, a 30% modulated signal is equal to a deviation of 22.5 kc.
6. Turn the volume control knob to maximum clockwise position and adjust the signal generator output to produce a noticeable output meter reading. Keep signal generator output as low as possible to prevent excessive AVC action in the receiver.
7. The low impedance "Signal Web" antenna should remain connected at all times. If the chassis is removed from cabinet, use a dummy antenna consisting of a 18.2 u.h. coil in parallel with a 68 mmf. capacitor
8. The link must be connected in external antenna position.

TUBE COMPLEMENT

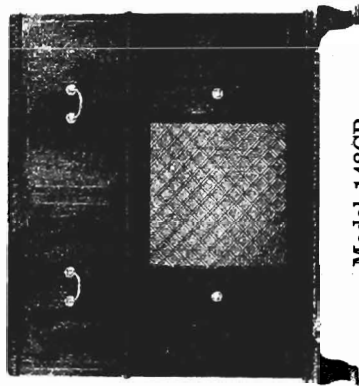
Type	Description
6SG7	R. F. Amplifier
6SA7	A. M. Converter
6AC7	F. M. Mixer
7F8	F. M. Oscillator
6SG7	1st I. F. Amplifier
6SG7	2nd I. F. Amplifier
6SH7	3rd I. F. Amplifier

6H6	Discriminator
6SQ7	A. M. Det.—AVC 1st A. F. Amplifier
6SQ7	Phase Inverter
6V6 GT/G	Output
6V6 GT/G	Output
5U4G	Rectifier
6E5	Tuning Indicator

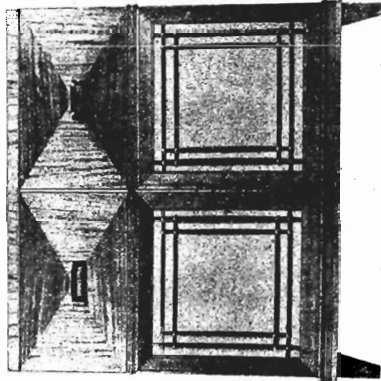
DIAL BULB: Type 51, 7.5 v., 0.2 amp.

MODELS 148CP,
148CP(W), 148CQ,
148CR

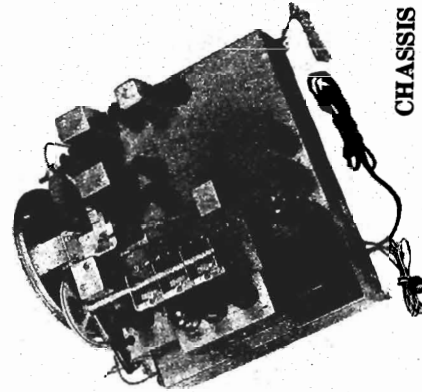
CROSLEY DIV.
AVCO MFG. CORP.



Model 148CP



Model 148CQ



CHASSIS VIEW

ALIGNMENT PROCEDURE CHART

Align- ment Sequence	Signal Generator Output			Position of		Adjust for Maximum Output	Remarks
	Frequency	In Series with	To	Band Switch	Tuning Dial		
1	455 kc.	.1 mfd.	2nd I.F. Grid	AM	Hi. Freq. stop	3rd I.F.	
2	455 kc.	.1 mfd.	1st I.F. Grid	AM	Hi. Freq. stop	2nd I.F.	
3	455 kc.	1 mfd.	19 plate section of center gang	AM	Hi. Freq. stop	1st I.F.	Retouch 3rd, 2nd, 1st I.F.
4	10.7 mc.	100 mmf.	3rd I.F. Grid	FM	Hi. Freq. stop	Discriminator	Notes 1, 2, 3, 4
5	10.7 mc.	100 mmf.	2nd I.F. Grid	FM	Hi. Freq. stop	3rd I.F.	Notes 1 and 5
6	10.7 mc.	100 mmf.	1st I.F. Grid	FM	Hi. Freq. stop	2nd I.F.	Retouch 3rd I.F.
7	10.7 mc.	100 mmf.	3 plate section of center gang	FM	Hi. Freq. stop	1st I.F.	Retouch 3rd, 2nd, 1st I.F.
8	1400 kc.	200 mmf.	Ant. 1	AM	1400 kc.	BC-Osc.-R.F. & Ant. Trim	
9	600 kc.	200 mmf.	Ant. 1	AM	600 kc.	Broadcast Osc. Padder	Notes 6 and 7
10	6.0 mc.	400 ohm	Ant. 1	Police	6.0 mc.	Police Osc., R.F. & Ant. Trimmers	
11	18 mc.	400 ohm	Ant. 1	SW	18 mc.	Sw. Osc., R.F., & Ant. Trimmers	Note 9
12	98 mc.	See Circuit Diag.	Ant. 1 & 2	FM	98 mc.	FM-Osc. Core	
13	106 mc.	See Circuit Diag.	Ant. 1 & 2	FM	106 mc.	FM R.F. & Ant. Trimmer	Note 7



RECTIFIER

OUTPUT

INPUT

WAVE "A" MEASURED GRID VOLTAGES

Wave	Type	Frequency	Volts
A.1	0.007	100 KC	-7.0
A.2	0.010	1.00 MC	-2.0
A.3	0.005	4.00 MC	-0.5
A.4	7.0	0.1 MC	-0.5

NOTES:

1. Wave are bottom view of cathode
2. Measure voltages from socket legs to chassis
3. These voltages were measured with an Electrostat Voltmeter
4. Voltages on 7.0 & 0.007 taken with same switch in F.M. position. All other voltages taken with same change switch in A.M. position
5. W.A. Wiring Junction
6. S.C. - 100 Connection
7. " = S.C. Voltages
8. Socket Voltage Tolerance, $\pm 10\%$
9. All voltages measured at normal operating voltage, 117 Volts, 60~
10. S. Grid Change switch in Phase Position

RECTIFIER

OUTPUT

INPUT

WAVE "A" MEASURED GRID VOLTAGES

Wave	Type	Frequency	Volts
A.1	0.007	100 KC	-7.0
A.2	0.010	1.00 MC	-2.0
A.3	0.005	4.00 MC	-0.5
A.4	7.0	0.1 MC	-0.5

NOTES:

1. Wave are bottom view of cathode
2. Measure voltages from socket legs to chassis
3. These voltages were measured with an Electrostat Voltmeter
4. Voltages on 7.0 & 0.007 taken with same switch in F.M. position. All other voltages taken with same change switch in A.M. position
5. W.A. Wiring Junction
6. S.C. - 100 Connection
7. " = S.C. Voltages
8. Socket Voltage Tolerance, $\pm 10\%$
9. All voltages measured at normal operating voltage, 117 Volts, 60~
10. S. Grid Change switch in Phase Position

RECTIFIER

OUTPUT

INPUT

WAVE "A" MEASURED GRID VOLTAGES

Wave	Type	Frequency	Volts
A.1	0.007	100 KC	-7.0
A.2	0.010	1.00 MC	-2.0
A.3	0.005	4.00 MC	-0.5
A.4	7.0	0.1 MC	-0.5

NOTES:

1. Wave are bottom view of cathode
2. Measure voltages from socket legs to chassis
3. These voltages were measured with an Electrostat Voltmeter
4. Voltages on 7.0 & 0.007 taken with same switch in F.M. position. All other voltages taken with same change switch in A.M. position
5. W.A. Wiring Junction
6. S.C. - 100 Connection
7. " = S.C. Voltages
8. Socket Voltage Tolerance, $\pm 10\%$
9. All voltages measured at normal operating voltage, 117 Volts, 60~
10. S. Grid Change switch in Phase Position

RECTIFIER

OUTPUT

INPUT

WAVE "A" MEASURED GRID VOLTAGES

Wave	Type	Frequency	Volts
A.1	0.007	100 KC	-7.0
A.2	0.010	1.00 MC	-2.0

MODELS 148CP
148CP(W), 148CQ,
148CR

CROSLEY DIV.
AVCO MFG. CORP.

REPLACEMENT PARTS LIST

Figures in first column correspond to figures in Schematic Diagram

Item No.	Part No.	Description	Item No.	Part No.	Description
142	G-39012-7	Iron Core (P. B. #6)	216	39204	Socket, Tube (6V6)
143	G-39012-7	Iron Core (P. B. #5)	217	39232-1	Socket, Tube (5U4G)
144	G-39012-7	Iron Core (P. B. #4)	218	C-137727-64	Condenser, 300 mmf., 500 v., ceramic
145	G-39012-7	Iron Core (P. B. #3)	219	C-137727-68	Condenser, 11.5 mmf., 500 v., ceramic
146	G-39012-7	Iron Core (P. B. #2)		AC-136187	Background Assy., Dial
147	G-39012-7	Iron Core (P. B. #1)		AW-135502	Brackets & Bushing Assy., Pointer Pulley
148	Part of Item 180	Iron Core		W-41405-1	Bushing (Headed), Chassis Mtg., or Switch Mtg.
149	B-139727-4	Cable and Plug, Power (Phono)		W-41405-9	Bushing (Headed), R.F. Unit Mtg.
150	W-139692	Loop Assy., Transmission Line		B-135719-1	Button (On-Off)
151	W-135421	Switch, Power		B-135717-1	Button (Station)
152A	C-135976	Switch, Band Change		B-135688-1	Button (Tone), Treble 1
152B		Switch, Band Change		B-135714-1	Button (Tone), Treble 2
152C		Switch, Band Change		B-135715-1	Button (Tone), Treble 3
152D		Switch, Band Change		B-135694-1	Button (Tone), Bass 1
153	B-135828	Control, Volume (2.5 megohm, Tap 750,000 ohm)		B-135699-1	Button (Tone), Bass 2
	39368-19	Control, Volume		B-135716-1	Button (Tone), Bass 3
	39370-1	Shaft, Volume (Plug-in)		B-135719-2	Button (On-Off)
154	R-139882	Record Changer ("W56," Model 148CQ)		B-135717-2	Button (Station)
154	R-143055	RECORD CHANGER (W156) 148 CP(W) CR		B-135688-2	Button (Tone), Treble 1
155	W-135741	Switch Assy., P. B. (Tone)		B-135714-2	Button (Tone), Treble 2
156	AC-136090	Transformer, Discriminator		B-135715-2	Button (Tone), Treble 3
157	AC-136073	Transformer, 1st I.F.		B-135694-2	Button (Tone), Bass 1
158	AC-136059	Transformer, 2nd I.F.		B-135699-2	Button (Tone), Bass 2
159	AC-136112	Transformer, 3rd I.F.		B-135716-2	Button (Tone), Bass 3
161	AW-134089	Coil, P.B. Oscillator, (No. 2)		W-136168	Call Letter Sheet
162	AW-134090	Coil, P.B. Oscillator, (No. 5)		W-136144	Call Letter Covers
163	AW-134091	Coil, P.B. Oscillator, (No. 6)		R-139505	Cabinet (148CP)
164	AW-134092	Coil, P.B. Oscillator, (No. 1)		R-139517	Cabinet (148CQ)
165	AW-134230	Coil, P.B. Oscillator, (No. 3)		W-135690	Clip, Escutcheon 148 CP, CQ
166	AW-134231	Coil, P.B. Oscillator, (No. 4)		W-230529	Clip, Tube
167	C-137058	Speaker (Less Transformer)		W-134595	Cord, Dial Drive
168	39001-17	Condenser, .05 mfd., 600 v., paper		D-136142	Dial Glass
169	39373-33	Resistor, 1,000 ohm, 1/2 w.		B-135970	Disc, Indicator
170	W-43567	Bulb (Dial), Type 51, 7.5 v., 0.2 amp.		D-135711-1	Escutcheon (148CP)
	138437-4	Bulb (Dial), Type 51, 7.5 v., 0.2 amp. (Carton of Ten Bulbs)		D-135711-2	Escutcheon (148CQ)
171	39001-76	Condenser, .003 mfd., 600 v., paper		AW-138590	Flywheel & Pinion Gear Assy.
172	39001-76	Condenser, .003 mfd., 600 v., paper		W-136656	Gasket, Dial Glass
173	39373-71	Resistor, 68,000 ohm, 1/2 w.		W-135581	Gasket, Dial Lens
174	39373-80	Resistor, 220,000 ohm, 1/2 w.		AW-136203	Gear & Hub Assy.
175	39373-80	Resistor, 220,000 ohm, 1/2 w.		W-45580	Grommet (Rubber)
176	W-135742	Switch, P.B. Tuning		AW-137266	Hinge Assy., Cabinet 148 CP, CQ
177	AB-137433	Coupling, F.M. Antenna		B-135981-1	Knob, Large (148CP) CP(W), CR
178	AW-136737	Coil, Antenna Secondary		W-135989-1	Knob, Small (148CP) CP(W), CR
179	AW-136411	Coil, Antenna		B-135981-2	Knob, Large (148CQ)
180	AW-136396	Coil, Antenna Loading		W-135989-2	Knob, Small (148CQ)
181	AW-136726	Choke, R.F.		C-134880	Lens, Dial
182	AW-136732	Choke, R.F. Primary		AB-136215	Link Assy., Toggle
183	AW-138245	Coil, R.F. Secondary		AB-134935	Needle, Floating Jewel Assy.
184	AW-136406	Coil, R.F. (S. W. & Police)		W-132366-2	Nut (Locking), Iron Core
185	AW-136362	Coil, R.F. (B. C.)		W-135580	Nut (Special), Escutcheon
186	AW-136392	Coil, Oscillator (S. W.)		B-135857	Pointer, Dial
187	AW-136393	Coil, Oscillator (Police)		W-139573	Pull (Handle), Cabinet—148CP
188	AW-136364	Coil, Oscillator (B. C.)		W-139574	Pull (Knob), Cabinet—148CP
189	AW-136682	Coil, and Mtg. (H. F.)		142,569	Pull (Handle), Cabinet—148CQ
190	39371-5	Resistor, 1,000 ohm, 10 w.		142568	Pull (Knob), Cabinet—148CQ
191	AW-136720	Choke, R.F. Heater		AW-136310	Pulley & Sleeve Assy.
192	Part of Item 189	Iron Core, F.M. Oscillator		W-51071	Ring (Retaining), Indicator Disc
193	39019-2	Terminal Board, Phono		W-135499	Ring (Snap), Pointer Bearing
194	W-136316	Tie Bar		W-211101	Ring (Retaining), Socket
195	39373-60	Resistor, 22,000 ohm, 1/2 w.		39311-60	Screw (#8-32x3/16 C. P. Headless Set)
196	39019-5	Terminal Board, Antenna		W-135752	Screw, Escutcheon
197	B-226638-31	Condenser, .001 mfd., 300 v., ceramic		W-136102	Screw, (#12-24 Hex. Hd. Ptd. Pilot Ma.)
198	B-226638-31	Condenser, .001 mfd., 300 v., ceramic		W-135350	Shaft, Drive
199	39373-33	Resistor, 1,000 ohm, 1/2 w.		D-136565-7	Socket, Dial Light
200	138927	Record Changer (400-12 Model 148CP)		W-132322	Spring, Chassis Mtg.
204	39232-5	Socket, Tube (6SG7)		W-136425	Spring (Comp.), Gear & Hub Assy.
205	39232-5	Socket, Tube (6AC7)		W-51752	Spring, Dial Drive Cord
206	39232-5	Socket, Tube (6SG7)		W-49829	Spring (Lock), Switch Shafts
207	39232-1	Socket, Tube (6SG7)		W-136113	Spring (Loop), Pointer
208	39232-5	Socket, Tube (6SH7)		W-136760	Spring, Grounding
209	39232-1	Socket, Tube (6H6)		W-137430	Spring, Static
210	39232-1	Socket, Tube (6SA7)		C-135693	Support, Dial Lens
211	W-136470	Socket, Tube (7F8)		AB-136283	Switch Assy. (Complete), Push Button
213	39232-1	Socket, Tube (6SQ7)		AB-136233	Toggle Assy., Double
214	39232-1	Socket, Tube (6SQ7)		W-134916	Washer (Spring), Indicator Disc
215	39204	Socket, Tube (6V6)			

*These parts will replace the original equipment parts.

**CROSLEY DIV.
AVCO MFG. CORP.**

**MODELS 148CP,
148CP(W), 148CQ,
148CR**

REPLACEMENT PARTS LIST

Figures in first column correspond to figures in Schematic Diagram

Item No.	Part No.	Description	Item No.	Part No.	Description
1	39372-10	Resistor, 6,200 ohm, 10 w.	76	39001-13	Condenser, .01 mfd., 600 v., paper
2	39373-92	Resistor, 1.0 megohm, 1/2 w.	77	B-226638-53	Condenser, 50 mmf., 500 v., ceramic
3	39373-97	Resistor, 2.2 megohm, 1/2 w.	78	39004-7	Condenser, 100 mmf., 500 v., mica
4	39373-97	Resistor, 2.2 megohm, 1/2 w.	79	B-226638-31	Condenser, .001 mfd., 300 v., ceramic
5	39373-97	Resistor, 2.2 megohm, 1/2 w.	80	B-226638-31	Condenser, .001 mfd., 300 v., ceramic
6	39373-33	Resistor, 1,000 ohm, 1/2 w.	81	B-226638-31	Condenser, .001 mfd., 300 v., ceramic
7	39373-33	Resistor, 1,000 ohm, 1/2 w.	82	Part of Item 158	Condenser, 30 mmf., 500 v., ceramic
8	39373-33	Resistor, 1,000 ohm, 1/2 w.	83	Part of Item 159	Condenser, 30 mmf., 500 v., ceramic
9	39373-33	Resistor, 1,000 ohm, 1/2 w.	84	Part of Item 159	Condenser, 30 mmf., 500 v., ceramic
10	39373-33	Resistor, 1,000 ohm, 1/2 w.	85	Part of Item 158	Condenser, 30 mmf., 500 v., ceramic
11	39373-75	Resistor, 120,000 ohm, 1/2 w.	86	W-137398-2	Condenser, 1 mmf., 500 v., silver mica
12	39373-74	Resistor, 100,000 ohm, 1/2 w.	87	G-131502-20	Condenser, 680 mmf., 400 v., silver mica
13	39373-51	Resistor, 6,800 ohm, 1/2 w.	88	G-131502-5	Condenser, 500 mmf., 400 v., silver mica
14	39373-74	Resistor, 100,000 ohm, 1/2 w.	89	G-131502-5	Condenser, 500 mmf., 400 v., silver mica
15	39373-74	Resistor, 100,000 ohm, 1/2 w.	90	Part of Item 157	Condenser, 1,000 mmf., 500 v., mica
16	39373-74	Resistor, 100,000 ohm, 1/2 w.	91	Part of Item 157	Condenser, 1,000 mmf., 500 v., mica
17	39373-71	Resistor, 68,000 ohm, 1/2 w.	92	Part of Item 158	Condenser, 1,000 mmf., 500 v., mica
18	39373-60	Resistor, 22,000 ohm, 1/2 w.	93	Part of Item 158	Condenser, 1,000 mmf., 500 v., mica
19	39373-77	Resistor, 150,000 ohm, 1/2 w.	94	Part of Item 159	Condenser, 1,000 mmf., 500 v., mica
20	39373-67	Resistor, 47,000 ohm, 1/2 w.	95	Part of Item 159	Condenser, 1,000 mmf., 500 v., mica
21	39373-107	Resistor, 10 megohm, 1/2 w.	96	Part of Item 156	Condenser, 180 mmf., 500 v., mica
22	39373-107	Resistor, 10 megohm, 1/2 w.	97	Part of Item 156	Condenser, 180 mmf., 500 v., mica
23	39373-80	Resistor, 220,000 ohm, 1/2 w.	98	Part of Item 156	Condenser, 82 mmf., 500 v., silver mica
24	39373-80	Resistor, 220,000 ohm, 1/2 w.	99	GC-210685-179	Condenser, 1,460 mmf., 500 v., mica
25	39373-80	Resistor, 220,000 ohm, 1/2 w.	100	GC-210685-178	Condenser, 4,140 mmf., 500 v., mica
26	39373-80	Resistor, 220,000 ohm, 1/2 w.	101	GC-210685-168	Condenser, 3,300 mmf., 500 v., mica
27	39373-157	Resistor, 4,700 ohm, 1 w.	102	39004-7	Condenser, 100 mmf., 500 v., mica
28	39373-155	Resistor, 3,900 ohm, 1 w.	104	B-136327-12	Condenser, Trimmer
29	39373-239	Resistor, 220 ohm, 2 w.	105	B-136327-24	Condenser, Trimmer
30	39373-94	Resistor, 1.5 megohm, 1/2 w.	106	B-136327-24	Condenser, Trimmer
31	39373-94	Resistor, 1.5 megohm, 1/2 w.	107	B-136327-25	Condenser, Trimmer
32	39373-84	Resistor, 330,000 ohm, 1/2 w.	108	B-136327-26	Condenser, Trimmer
33	39373-84	Resistor, 330,000 ohm, 1/2 w.	109	B-136327-27	Condenser, Trimmer
34	Part of Item 157	Resistor, 39,000 ohm, 1/2 w.	110	Part of Item 157	Condenser, 16 mmf., 500 v., ceramic
35	Part of Item 158	Resistor, 39,000 ohm, 1/2 w.	111	Part of Item 157	Condenser, 27 mmf., 500 v., ceramic
36	Part of Item 159	Resistor, 39,000 ohm, 1/2 w.	113	B-136327-29	Condenser, Trimmer
37	39373-51	Resistor, 6,800 ohm, 1/2 w.	114	Part of Item 189	Condenser, 50 mmf., 500 v., ceramic
38	39373-19	Resistor, 220 ohm, 1/2 w.	115	B-136327-22	Condenser, Trimmer
39	39373-170	Resistor, 22,000 ohm, 1 w.	116	B-137001	Transformer, Output
40	39373-170	Resistor, 22,000 ohm, 1 w.	117A	W-135818-2	Condenser, Trimmer
41	39373-170	Resistor, 22,000 ohm, 1 w.	117B		Condenser, Trimmer
42	39373-278	Resistor, 18,000 ohm, 2 w.	117C		Condenser, Trimmer
43	39373-87	Resistor, 470,000 ohm, 1/2 w.	117D		Condenser, Trimmer
44	39001-13	Condenser, .01 mfd., 600 v., paper	118A	W-135821	Condenser, Trimmer
45	39001-13	Condenser, .01 mfd., 600 v., paper	118B		Condenser, Trimmer
46	39001-13	Condenser, .01 mfd., 600 v., paper	118C		Condenser, Trimmer
47	39001-13	Condenser, .01 mfd., 600 v., paper	119A	W-135821	Condenser, Trimmer
48	39001-13	Condenser, .01 mfd., 600 v., paper	119B		Condenser, Trimmer
49	39001-17	Condenser, .05 mfd., 600 v., paper	119C		Condenser, Trimmer
50	39001-17	Condenser, .05 mfd., 600 v., paper	120A	C-134895	Condenser, Variable
51	39001-17	Condenser, .05 mfd., 600 v., paper	120B		Condenser, Variable
52	39001-78	Condenser, .006 mfd., 600 v., paper	120C		Condenser, Variable
53	39001-78	Condenser, .006 mfd., 600 v., paper	121	W-43567	Bulb (Dial), Type 51, 7.5 v., 0.2 amp.
54	39001-1	Condenser, .0001 mfd., 600 v., paper	122A	B-137003	Condenser, 40 mfd., 400 w.v., } Two Sec.
55	B-226638-2	Condenser, 100 mmf., 300 v., ceramic	122B		Condenser, 20 mfd., 25 w.v., } Elec. Fil.
56	39001-1	Condenser, .0001 mfd., 600 v., paper	123A	B-137002	Condenser, 50 mfd., 400 w.v., } Two Sec.
57	39001-1	Condenser, .0001 mfd., 600 v., paper	123B		Condenser, 10 mfd., 300 w.v., } Elec. Fil.
58	39001-1	Condenser, .0001 mfd., 600 v., paper	124	W-135695	Socket, Tube (6E5)
59	39001-1	Condenser, .0001 mfd., 600 v., paper	125	B-135870	Switch, Phono
60	39004-9	Condenser, 220 mmf., 500 v., mica	126	C-132300-2	Cable and Plug, Power
61	39004-9	Condenser, 220 mmf., 500 v., mica	127	B-135600	Transformer, Power
62	B-226638-54	Condenser, 75 mmf., 500 v., ceramic	128	Part of Item 156	Iron Core
63	B-226638-54	Condenser, 75 mmf., 500 v., ceramic	129	Part of Item 156	Iron Core
64	B-226638-54	Condenser, 75 mmf., 500 v., ceramic	130	Part of Item 159	Iron Core
65	39001-17	Condenser, .05 mfd., 600 v., paper	131	Part of Item 159	Iron Core
66	39001-17	Condenser, .05 mfd., 600 v., paper	132	Part of Item 158	Iron Core
67	39001-17	Condenser, .05 mfd., 600 v., paper	133	Part of Item 158	Iron Core
68	39001-17	Condenser, .05 mfd., 600 v., paper	134	Part of Item 157	Iron Core
69	39001-17	Condenser, .05 mfd., 600 v., paper	135	Part of Item 157	Iron Core
70	39001-76	Condenser, .003 mfd., 600 v., paper	136	Part of Item 159	Iron Core
71	39001-76	Condenser, .003 mfd., 600 v., paper	137	Part of Item 159	Iron Core
72	39001-76	Condenser, .003 mfd., 600 v., paper	138	Part of Item 158	Iron Core
73	39001-11	Condenser, .005 mfd., 600 v., paper	139	Part of Item 158	Iron Core
74	39001-11	Condenser, .005 mfd., 600 v., paper	140	Part of Item 157	Iron Core
75	39001-17	Condenser, .05 mfd., 600 v., paper	141	Part of Item 157	Iron Core

Four
Section
Assy.

Three
Section
Assy.

Three
Section
Assy.

Three
Section
Assy.

MODELS 148CP(W),
148CRCROSLEY DIV.
AVCO MFG. CORP.

CABINET PARTS—MODEL 148CP(W)

Figures in first column correspond to figures in Schematic Diagram

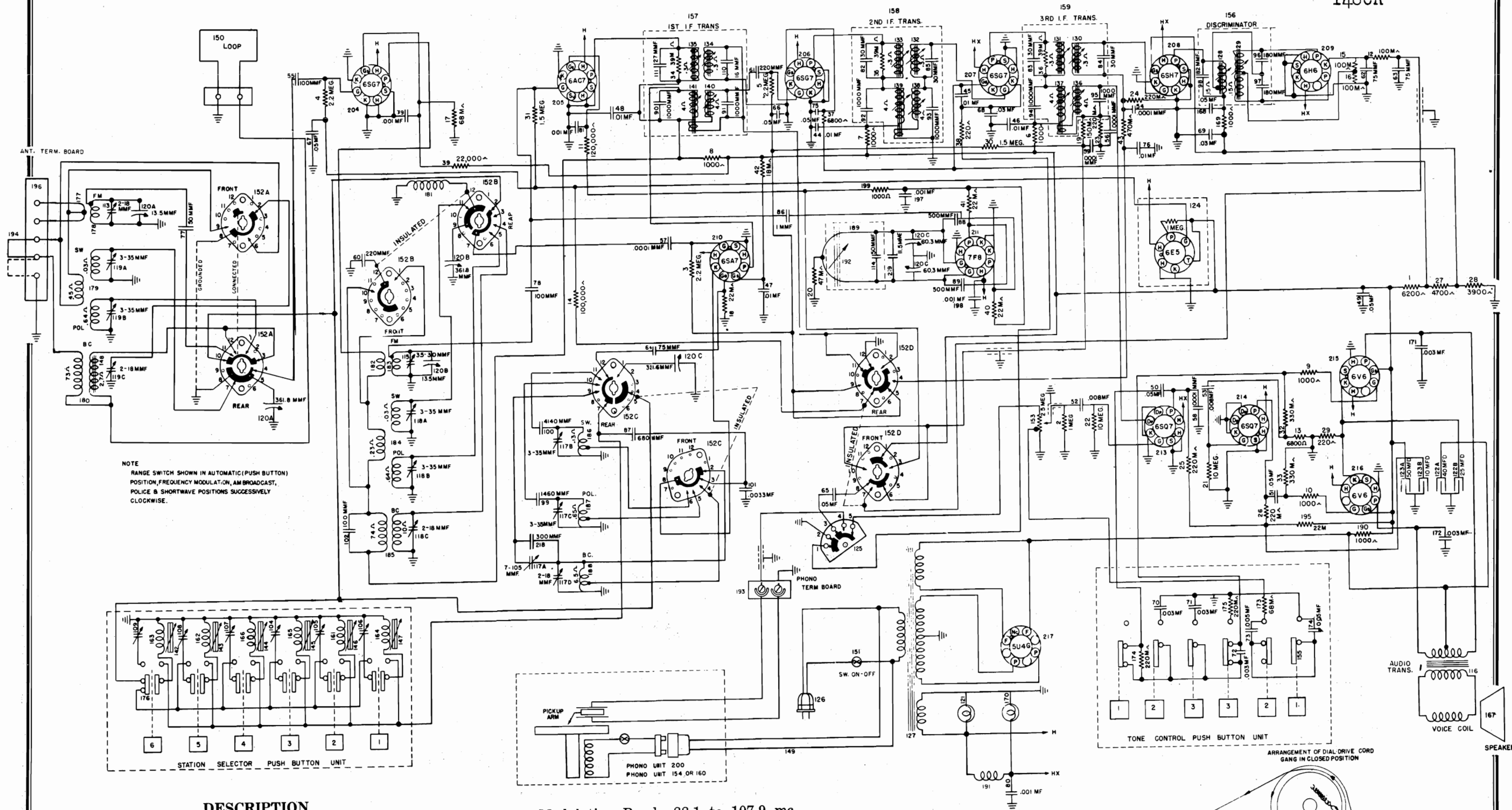
Part No.	Description	Item No.	Part No.	Description
R-143379	Cabinet, only		143608	Grille, Metal
139319	Catch & Strike Assy., Door & Drawer		143609	Grille, Cloth
W-135690	Clip, Escutcheon		137266	Hinge, Door
143221	Door, Left Record Comp. } Matched Set		143263	Leg, Cabinet
	Door, Right Record Comp. } Matched Set		C-134880	Lens, Dial
143220	Door, Radio Compartment		W-135580	Nut (Special), Escutcheon
	Panel (Front), Record } Matched Set		143631	Panel, Radio Dial
143610	Changer Drawer		W-139573	Pull (Handle), Drawer & Radio Door
	Drawer Frame Assy. only, Record		W-139574	Pull (Knob), Record Comp. Door
D-135711-1	Changer		W-135752	Screw, Escutcheon
W-135581	Escutcheon		139006	Slide, Drawer
	Gasket, Dial Lens		C-135693	Support, Dial Lens

Model 148CP(W)

CABINET PARTS—MODEL 148CR

143485	Bumper (Rubber), Door		W-135581	Gasket, Dial Lens
R-143169-1	Cabinet, only		143509	Grille, Cloth
139319-SB	Catch & Strike Assy., Door & Drawer		143620-SB	Hinge, Radio Compartment Door
143623	Door, Left Record Comp. } Matched Set		143333	Hinge, Record Compartment Door
	Door, Right Record Comp. } Matched Set		143331	Knob, Drawer & Radio Comp. Door
143625	Door, Speaker (Left)		143334	Knob, Speaker Door
	Door, Speaker (Right) } Matched Set		143629	Leg & Base Assembly
	Door, Speaker (Left Center) } Matched Set		C-134880	Lens, Dial
	Door, Speaker (Right Center) } Matched Set		W-135580	Nut (Special), Escutcheon
143621	Door, Radio Compartment		143630	Panel, Radio Dial
	Panel (Front), Record } Matched Set		142912	Pull (Key Type) Record Comp. Door
143665	Changer Drawer		139006	Slide, Drawer
	Drawer Frame Assy. only, Record		C-135693	Support, Dial Lens
D-135711-1	Changer		W-135752	Screw, Escutcheon
143619-SB	Escutcheon		143332	Support, Radio Compartment Door
	Equalizer, Speaker Door			

Model 148CR

CROSLEY DIV.
AVCO MFG. CORP.MODELS 148CP,
148CP(W), 148CQ,
148CR

DESCRIPTION

TYPE: Fourteen tube, four-band superheterodyne.**FREQUENCY RANGE:** American Broadcast Band: 535 to 1620 kc. (Selector switch at AM position).

Police Band: 2.25 to 6.7 mc. (Selector switch at POLICE position).

Short-wave Band: 6.7 to 18.5 mc. (Selector switch at SW position).

Frequency Modulation Band: 88.1 to 107.9 mc. (Selector switch at FM position).

INTERMEDIATE FREQUENCY: AM, Police and SW Bands: 455 kc. FM Band: 10.7 mc.**POWER SUPPLY:** 60 cycle a.c. only**VOLTAGE RATING:** 105-125 volts.**POWER CONSUMPTION:** 120 watts.**POWER OUTPUT:** 18 watts maximum.

RECORD CHANGERS:

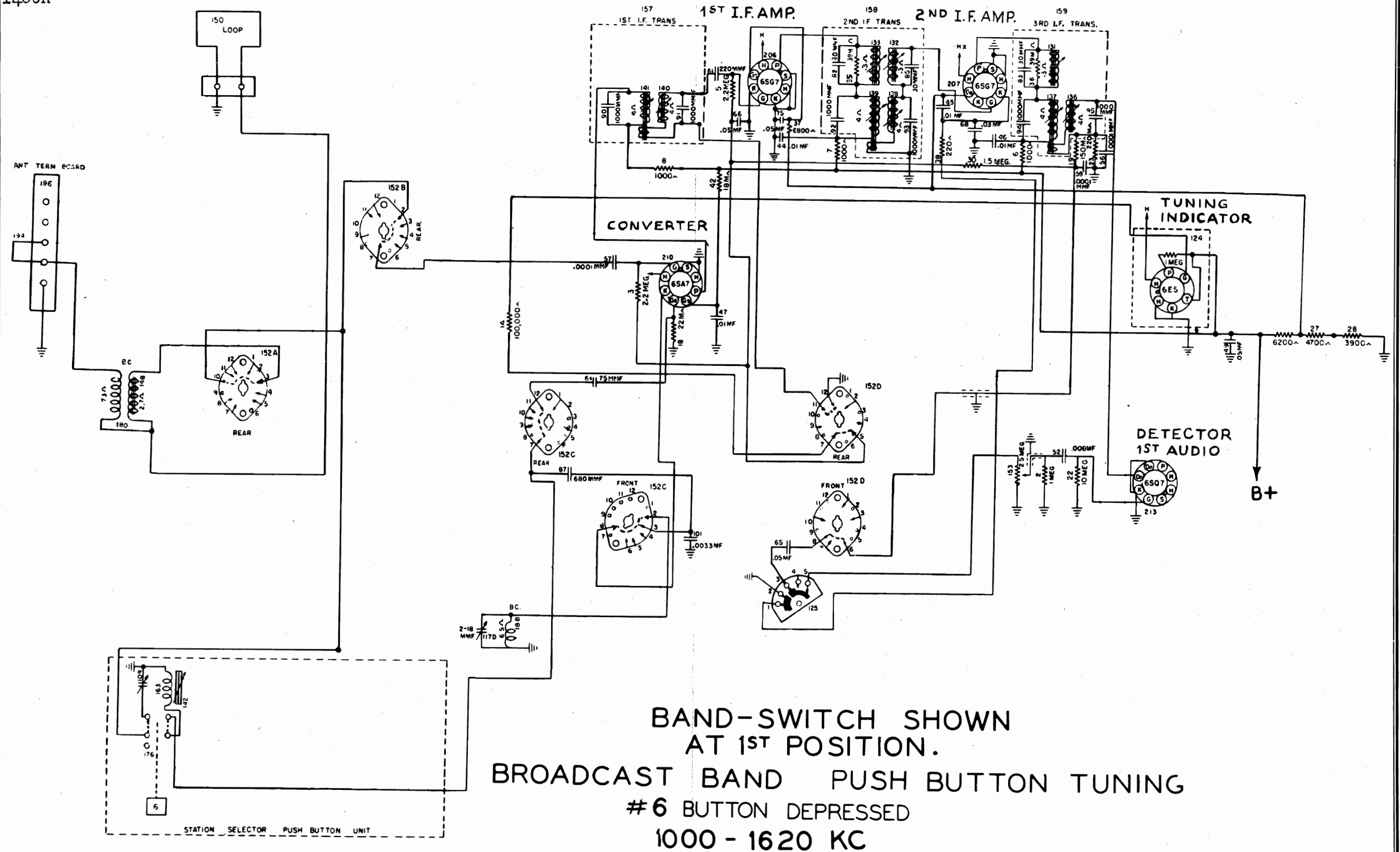
For 148CP, V-M Model 400, RCD.CH 15-1; for 148CP(W) and 148CR, Webster Model 156, RCD.CH. 19-1; for 148CQ, Webster 56, RCD.CH. 15-10.

CLARI - SKEMATIX

Registered Trademark

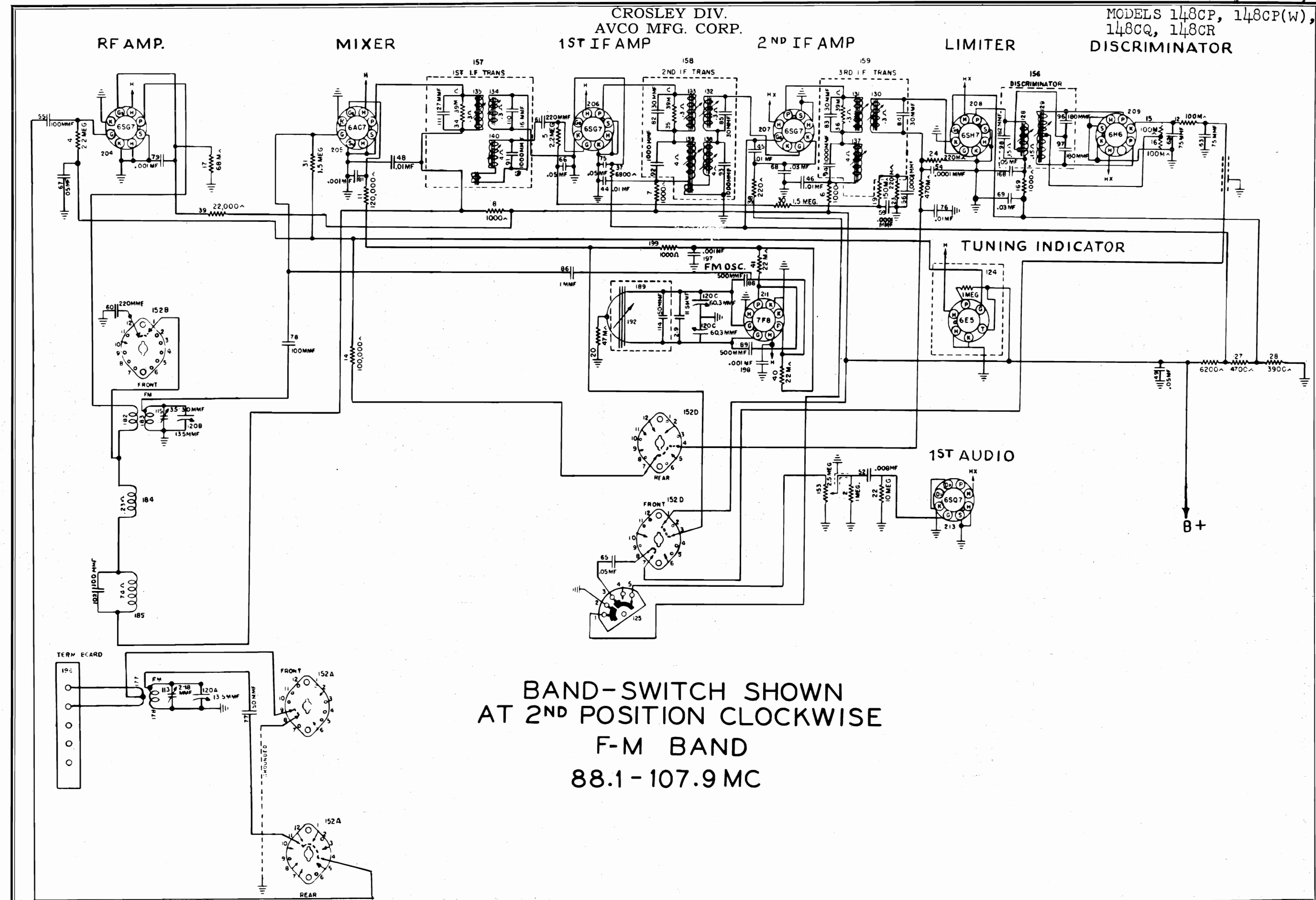
CROSLEY DIV.
AVCO MFG. CORP.

MODELS 148CP,
148CP(W), 148CQ,
148CR



CROSLEY DIV.
AVCO MFG. CORP.

MODELS 148CP, 148CP(W),
148CQ, 148CR
DISCRIMINATOR



BAND-SWITCH SHOWN
AT 2ND POSITION CLOCKWISE
F-M BAND
88.1 - 107.9 MC

Registered Trademark

CROSLEY DIV.
AVCO MFG. CORP.

MODELS 148CP,
148CP(W), 148CQ,
148CR



Registered Trademark

CROSLEY DIV.
AVCO MFG. CORP.

MODELS 148CP,
148CP(W), 148CQ,
148CR



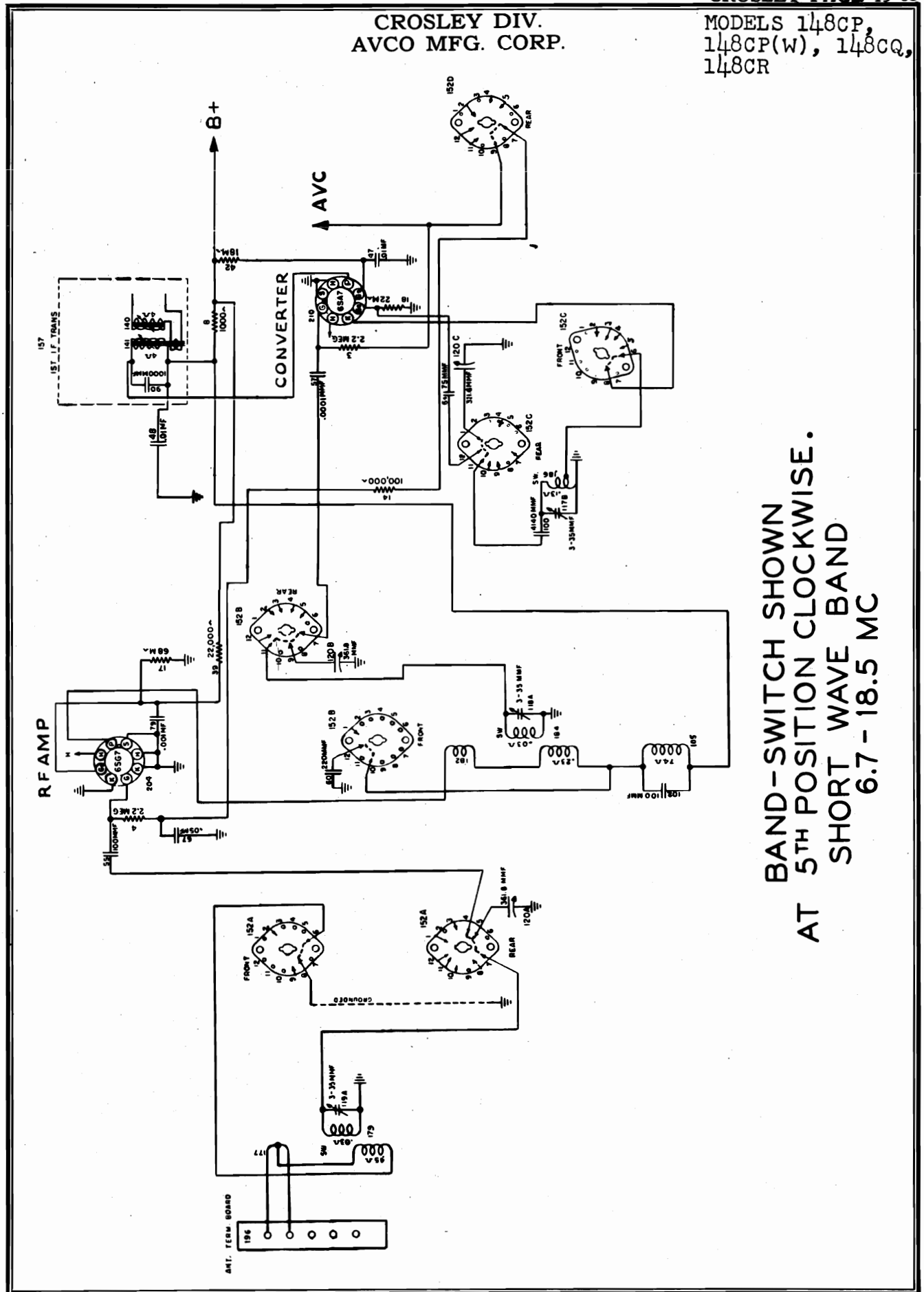
CLARI - SKEMATIX

Registered Trademark

CROSLEY PAGE 19-63

CROSLEY DIV.
AVCO MFG. CORP.

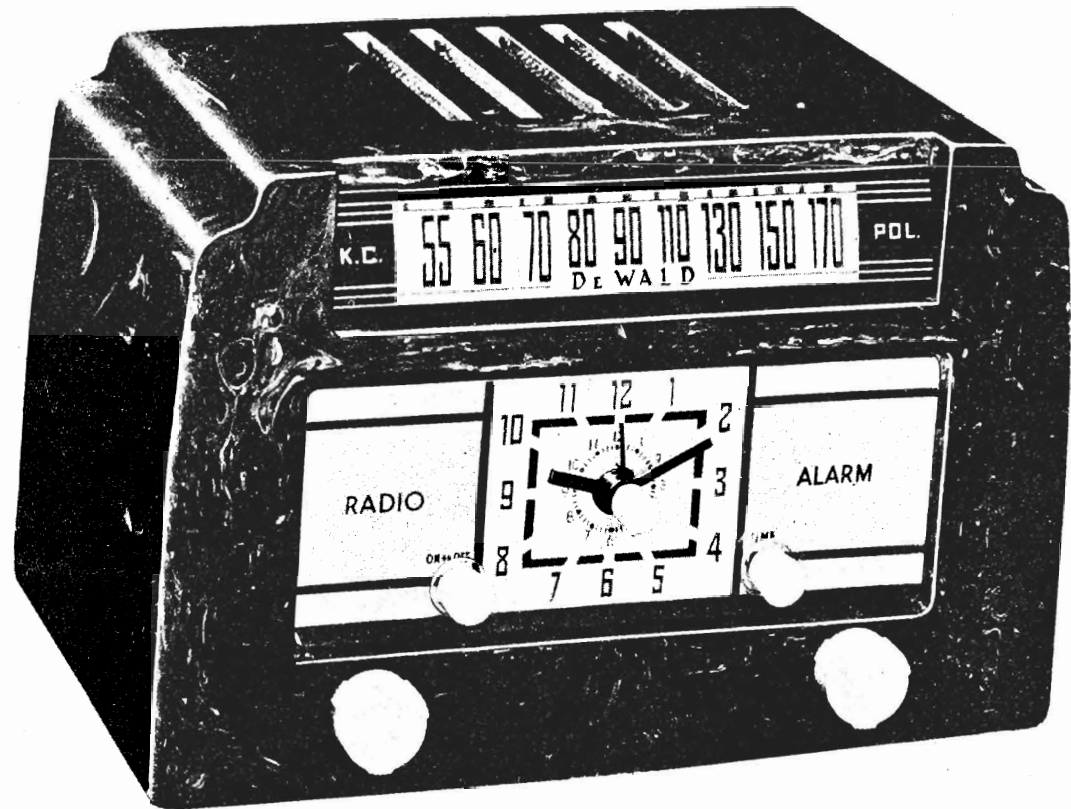
MODELS 148CP,
148CP(W), 148CQ,
148CR



BAND-SWITCH SHOWN
AT 5TH POSITION CLOCKWISE.
SHORT WAVE BAND
6.7 - 18.5 MC

DEWALD RADIO

MODEL B-512

**TO TURN RADIO ON AUTOMATICALLY:**

Tune radio to station and volume desired. With timer switch set at "ON" press in "center" knob and turn until setting hand is at desired time. This operation turns radio off, but it will automatically turn on at the time set.

TO TURN RADIO OFF AUTOMATICALLY:

While radio is playing press in "center" knob and turn until setting hand is at desired time. This setting operation turns radio off. Turn "ON-OFF", by turning knob clockwise and radio will resume playing but will automatically turn off at the time set.

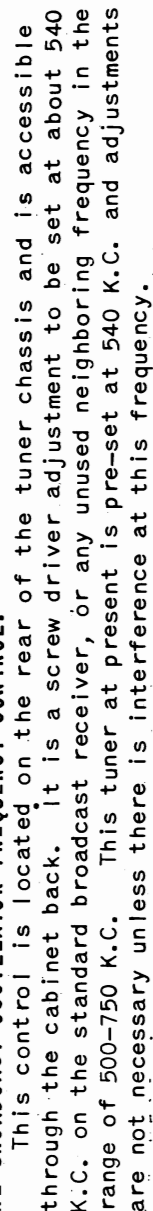
ANTENNA:

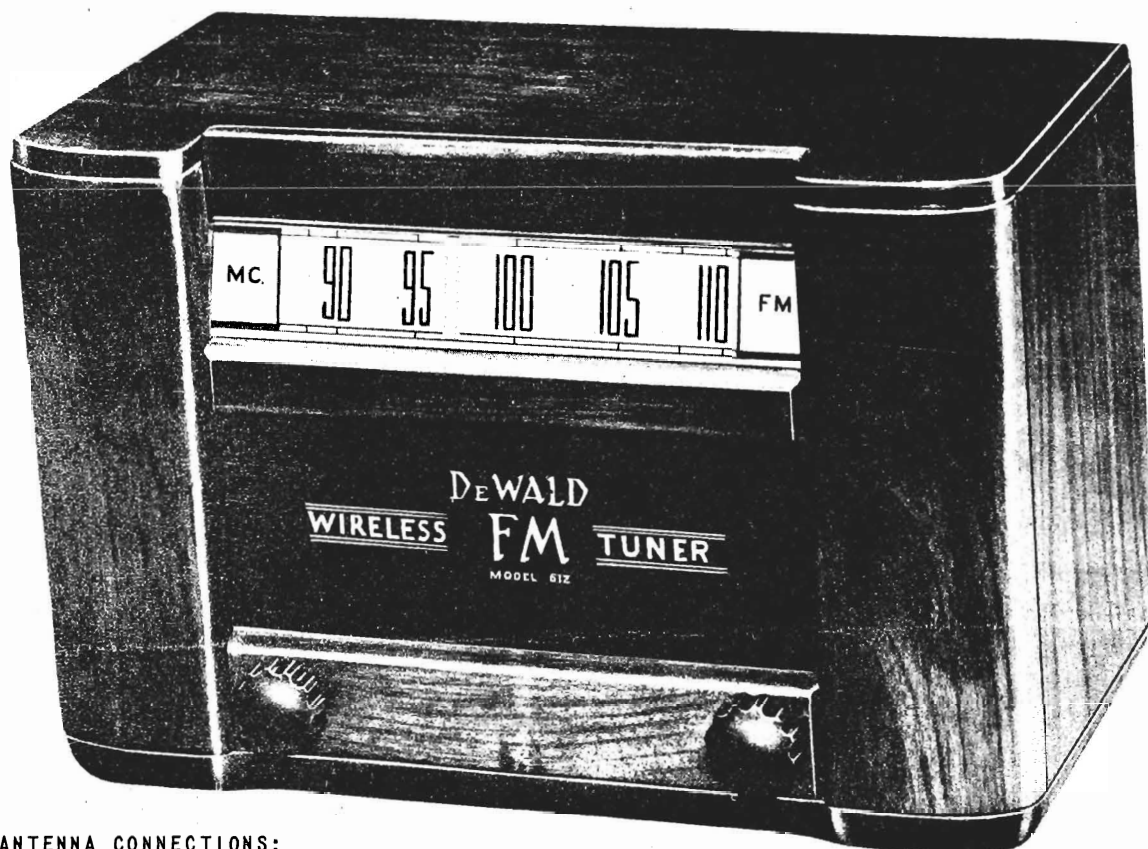
The looptenna incorporated in the DeWald Model B-512 receiver makes use of an outside antenna unnecessary in most localities. If additional pick-up is desired, weave an insulated wire through the outer holes of the cabinet back, connect one end to the outside antenna and the other end to an outside ground. See back of cabinet. The looptenna has a directional effect, it may be necessary to change the angle of the receiver for the best reception.

REPLACEMENT PARTS

1001 Antenna Loop	6000 Dial Scale
1003 Oscillator Coil	7006 Speaker
1000 1st I.F. Coil	8001 Pilot Lamp Socket
1002 2nd I.F. Coil	9000 Shaft
2000 Paper Condensers	9762 Drive Spring
2001 Mica Condensers	4000-2 Cabinet
2002 Comb. Electrolytic	8026 Clock
2003 Variable Condenser	6013 Crystal Face
3000 Resistors	#47 Pilot Lamp
3002 Volume Cont. & Sw.	8027 Clock Face
5000 Line Cord	





**ANTENNA CONNECTIONS:**

The choice of antenna to be used for the best F. M. reception depends on many factors: location, the type of building, power and distance of the F. M. station. The three main types of antennas are explained below. Test your DeWald F. M. Wireless Tuner and choose the one most practical for your use.

A. **For local high-powered F. M. stations:** The Wireless Tuner is equipped with a permanent built-in antenna that will be satisfactory for good reception of most local F. M. stations. This built-in antenna is connected internally by connecting the green wire to the red wire in the rear of the tuner. For best results when using the built-in antenna, keep the electric line cord extended to its full length.

B. **For distant F. M. stations:** An outside F. M. dipole antenna may be found to be necessary when the Wireless Tuner is operated at a great distance from the broadcasting station, or under unusual operating conditions. The outside dipole antenna (equipped with a 300 ohm flat lead-in) should be connected to the red and orange leads, at the rear of tuner, after the green wire has been disconnected from the red wire.

C. **For local weak-powered F. M. stations:** If it is not possible to erect an outside F. M. dipole antenna, an indoor type of antenna, made of 300 ohm flat lead-in wire, can be used. This indoor antenna must be installed so that its horizontal view faces the location of the desired stations.

OPERATION OF THE F. M. TUNER:

After the necessary installation has been made according to the instructions contained in the preceding paragraphs, the electric line cord of the Wireless Tuner may be plugged into an electric wall socket. Turn the ON-OFF switches of both the tuner and your radio receiver to the "ON" position. The brown wire coming out of the rear of the tuner is to be placed approximately 1 foot near the radio receiver loop or antenna lead, if radio receiver has no loop. The radio receiver is to be set at 540 Kc or any nearby clear channel, and the re-broadcast oscillator frequency control slightly adjusted until a rushing sound is heard from your radio receiver. The volume for F. M. reception is regulated by the volume control of your own radio receiver.

DEWALD RADIO

MODEL B-612

The F. M. band is ultra-high frequency. This necessitates precision tuning. Therefore, it is necessary to move the tuning knob of the Wireless Tuner very slowly when tuning in stations. Rotate the tuning knob back and forth several times over the station desired. You will note that the station is "on the button" when all side band noise disappears.

If the Wireless Tuner is connected to an AC-DC type radio receiver operated on AC, a very slight hum may occur when the radio receiver volume control is on full for reception on weak powered stations. If this hum is excessive, reverse the electric line cord plug of your radio receiver or of the Wireless Tuner, or both in the wall socket.

Alignment of the Wireless Tuner

Insulated alignment tools are necessary. The output meter should be a D. C. vacuum tube voltmeter with a range of at least 20 volts. The signal generator should cover the frequencies of 10.7, 90 and 105 M. C. Allow the Wireless Tuner to warm up for at least 5 minutes before making any adjustments. The location of the adjustment screws is indicated clearly on the license label. Follow the following sequence.

I. F. ALIGNMENT:

Connect the signal generator through a .01 mfd condenser to the grid of the 12AT7 converter tube. Connect the low side of the generator through a 1/10th mfd. condenser to tuner chassis. Adjust signal generator to 10.7 mc. Connect VTVM to junction of 100 M -Ohm diode load resistors. Adjust primary and secondary slugs or trimmers of each I. F. for maximum D. C. voltage output. Remove VTVM lead from junction point and connect lead to pin 5 of 12AL5 tube. Adjust secondary slug or trimmer of discriminator for zero D. C. voltage output, (check proper zero set of VTVM. Meter should register reverse polarity when slug or trimmer is rotated through zero output.)

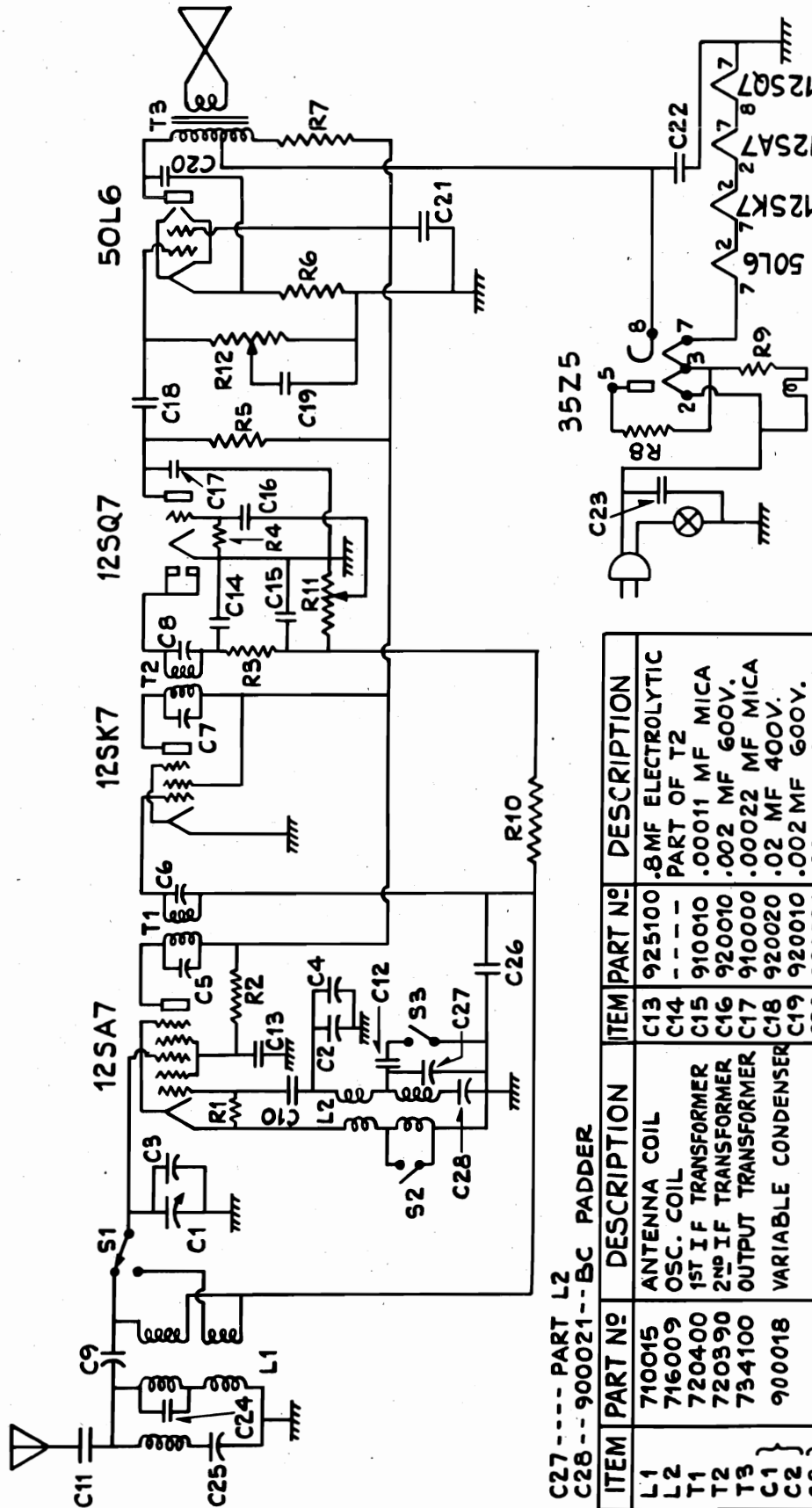
R. F. ALIGNMENT:

Remove signal generator leads from 12AT7 control grid. Connect in series with each generator lead a carbon 150 ohm resistor. Connect the high side generator lead to the red wire, in rear of tuner, and the low side generator lead to the orange wire. Adjust signal generator to 109 Mc. Open the tuner variable condenser for minimum capacity. Peak oscillator section of tuner condenser for maximum signal. Next set signal generator to 105 Mc. Tune in this signal. Adjust R.F. section of receiver variable condenser for maximum signal strength. To adjust the low frequency end, set the tuner and signal generator to 90 Mc. Peak the oscillator padder for maximum output. The variable condenser should be rocked during this operation. Keep the signal generator output as low as possible when making all of these measurements. It is extremely necessary in making the R.F. adjustments, that the fundamental oscillator signal be tuned in and not the image frequency. This can be checked by using a calibrated wavemeter.

REPLACEMENT PARTS

1038-1	I. F. Coil	3003	1/2 Watt Resistors
1038-2	Discriminator Coil	3005	4 Watt Pigtail Resistor
1040-2	R. F. Chokes	4016	Cabinet
1041	A. M. oscillator Coil	4069	Cabinet Back
1042	Filter Choke	4044-2	Knob
1043	Antenna Coil	5000	Line Cord
1044	F. M. oscillator Coil	6014	Dial Scale
2000	Paper Capacitors	8001	Pilot Lamp Socket
2005	Electrolytic	8003	Power Switch
2012	Ceramic Condensers	9762	Dial Spring
2023	Variable Condensers	2018	Electrolytic
2040	Trimmer Condensers	#47	Pilot Lamp

EMERSON RADIO AND PHONO. CORP. MODELS 512SW,
516SW, 531SW,
554, 555,
CHASSIS 120057A



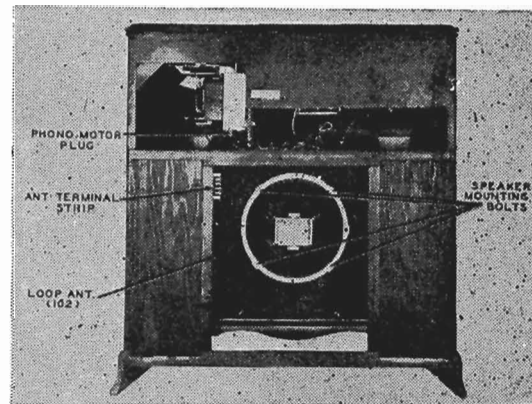
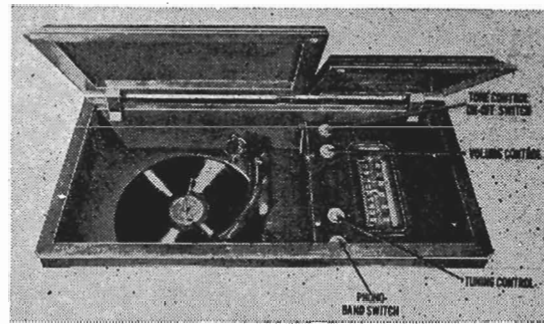
C27 ---- PART L2
C28 --- 900021--BC PADDER

ITEM	PART NO	DESCRIPTION	ITEM	PART NO	DESCRIPTION
L1	710015	ANTENNA COIL	C13	925100	.8MF ELECTROLYTIC
L2	716009	OSC. COIL	C14	---	PART OF T2
T1	720400	1ST IF TRANSFORMER	C15	910010	.00011 MF MICA
T2	720390	2ND IF TRANSFORMER	C16	920010	.002 MF 600V.
T3	734100	OUTPUT TRANSFORMER	C17	910000	.00022 MF MICA
C1	900018	VARIABLE CONDENSER	C18	920020	.02 MF 400V.
C2	---	PART OF C1 & C2	C19	920010	.002 MF 600V.
C3	---	PART OF T1	C20	920020	.02 MF 400V.
C4	---	PART OF T2	C21	925012	50-50 MF ELECTROLYTIC
C5	---	PART OF L1	C22	920030	.05 MF 400V.
C6	---	.00011 MF MICA	C23	910250	.00005 MF MICA
C7	---	.005 MF 400V.	C24	---	PART OF L1
C8	---	.0072 MF MICA	C25	---	22000 OHMS 1/2 W.
C9	---	.1 MF 200V.	R1	340810	470 OHMS 1/2 W.
C10	910010	.00011 MF MICA	R2	340410	470 OHMS 1/2 W.
C11	920230	.005 MF 400V.	R3	---	PART OF T2
C12	910011	.0072 MF MICA	R4	397000	15 MEGOHMS 1/4 W.
C26	920040	.1 MF 200V.	R5	351130	470000 OHMS 1/2 W.
			R6	340290	150 OHMS 1/2 W.

ITEM	PART NO	DESCRIPTION
R7	370490	1000 OHMS 1 W.
R8	340050	15 OHMS 1/2 W.
R9	340010	10 OHMS 1/2 W.
R10	351930	3.3 MEG
R11	390190	VOLUME CONTROL
R12	390280	TONE CONTROL
S1	---	BAND SWITCH
S2	---	---
S3	---	---

MODEL 537,
CHASSIS 120043

EMERSON RADIO AND PHONO. CORP.



DESCRIPTION

TYPE: Console AM-FM superheterodyne with automatic record changer.

FREQUENCY RANGE:

Broadcast band (AM)—530-1620 kilocycles

Frequency modulation band (FM)—87.75-108.5 megacycles

TYPE OF TUBES:

1—6AG5, r-f amplifier

1—6BE6, converter

2—6BA6, i-f amplifier

2—6AU6, limiter and AM second detector; audio amplifier

1—6AL5, FM ratio detector

2—6V6GT, power output

1—5U4G, rectifier

1—6U5/6G5, tuning eye

POWER SUPPLY: 60-cycle a.c.

VOLTAGE RATING: 105-125 volts.

POWER CONSUMPTION: 125 watts.

CURRENT DRAIN: 1.0 amp. at 117 volts a.c.

GENERAL NOTES

1. If replacements are made or the wiring disturbed in the r-f section of the circuit, the receiver should be carefully realigned.
2. The color coding of the i-f transformer leads is as follows:

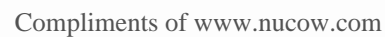
Grid—green
Grid return—black

Plate—blue
B+—red

3. A self-contained loop antenna is provided for broadcast band reception. If it is desired to improve reception of weak stations, however, an additional outdoor antenna may be used. Connect the external antenna to the *outside* terminal on the "AM" side of the terminal strip at the rear of the cabinet. Connect the ground to the adjoining terminal.
4. An internal power line antenna is provided for FM operation in relatively strong signal areas. An external dipole antenna is recommended for best FM operation. To connect dipole, remove the wire from the terminal on the "FM" side of the terminal strips and connect the two dipole leads to the two "FM" terminals. A ground connection is not required for FM operation.

DISASSEMBLY INSTRUCTIONS

1. Remove four push-on type control knobs from top of cabinet.
2. Remove phono motor plug, phono pickup plug, and two speaker plugs from chassis.
3. Remove two Phillips head screws holding antenna terminal strip to chassis.
4. Remove two nuts and washers fastening loop to cabinet.
5. Remove two Phillips head bolts in phono compartment retaining chassis to cabinet.
6. Remove two hex head bolts and washers retaining chassis to cabinet. Remove loop and chassis from rear of cabinet.
7. Remove four nuts fastening speaker to cabinet and remove speaker.



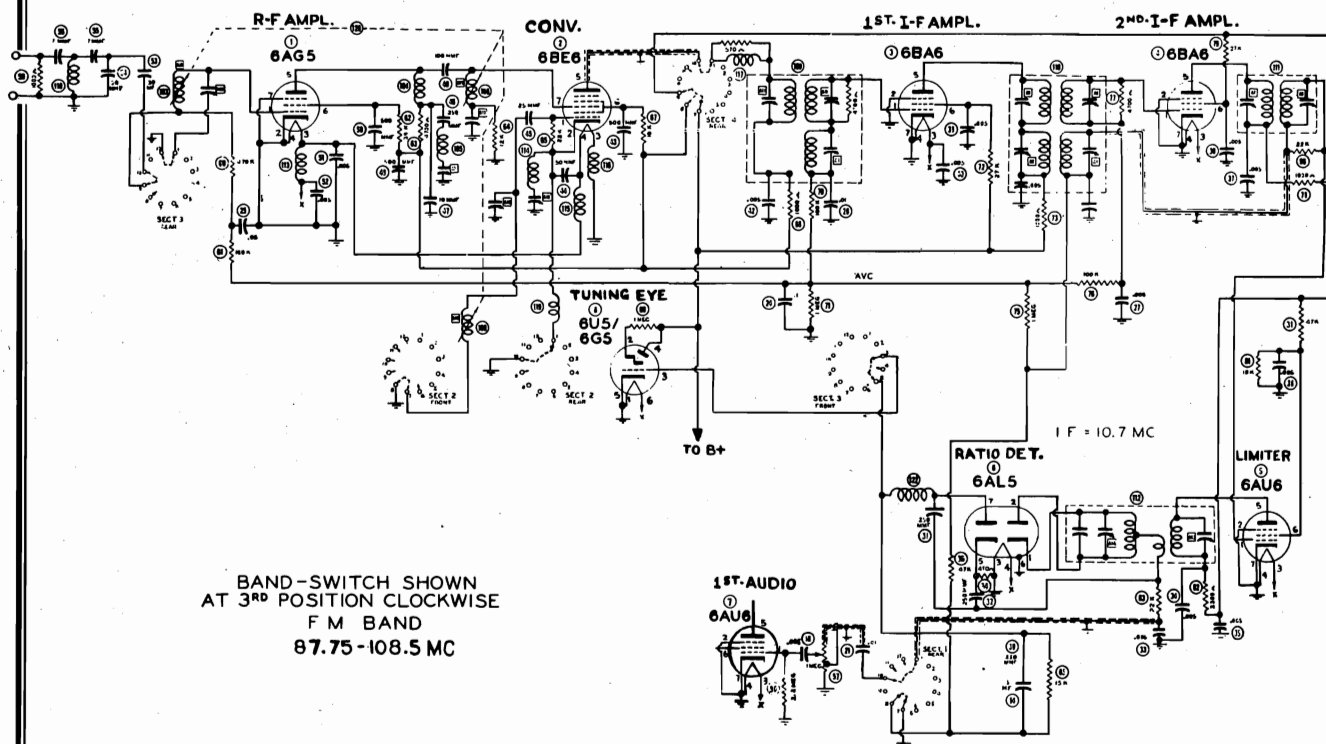
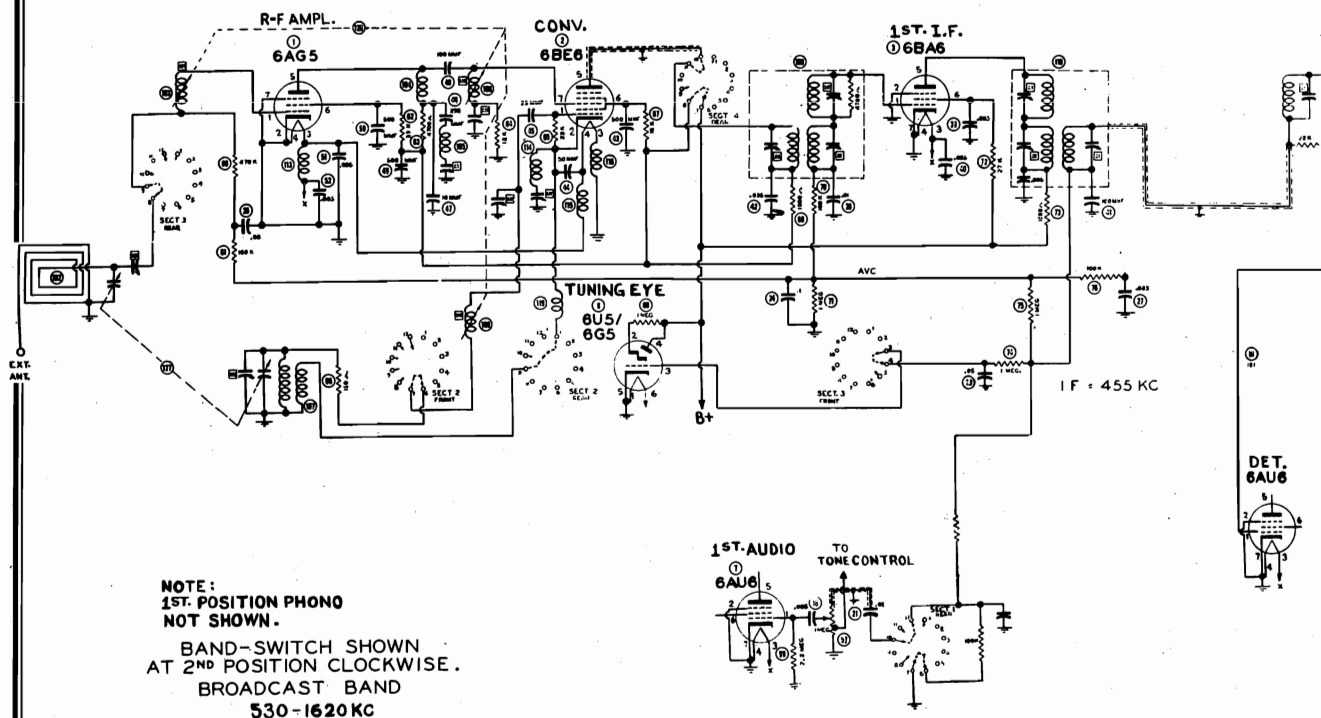
CLARI-SKEMATIX

Registered Trademark

PAGE 19-4 EMERSON

MODEL 537,
CHASSIS 120043

EMERSON RADIO AND PHONO. CORP.



EMERSON RADIO AND PHONO. CORP. MODEL 537, CHASSIS 120043

INSTRUCTIONS FOR VOLTAGE AND RESISTANCE READINGS

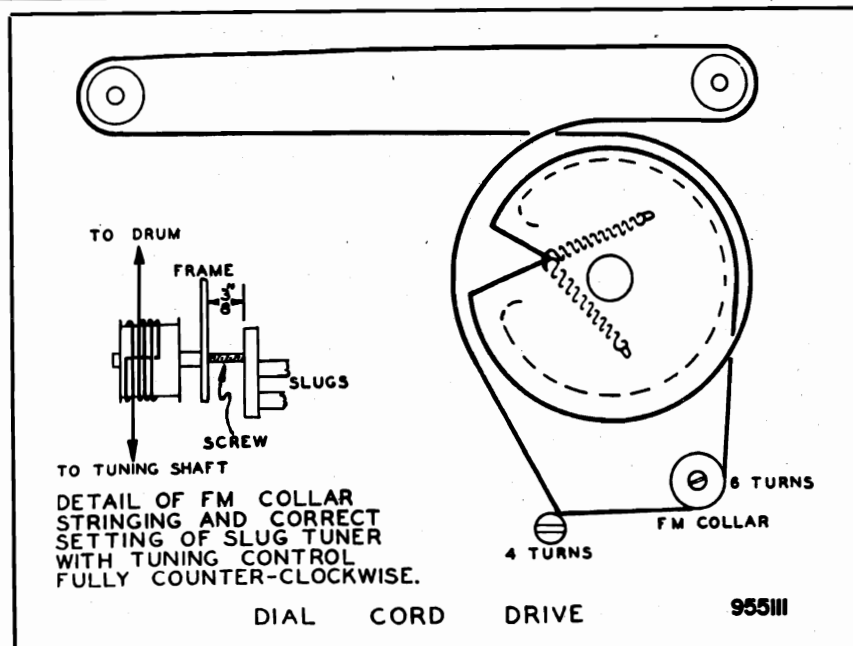
1. Voltage readings are in volts and resistance readings in ohms unless otherwise specified.
2. All readings taken in broadcast position except those for items 4, 5 and 6, which should be taken in FM position.
3. D-C voltage measurements are at 20,000 ohms per volt; a-c voltages measured at 1,000 ohms.
4. Socket connections are shown as bottom views.
5. Measured values are from socket pin to common negative.
6. Line voltage maintained at 117 volts for voltage readings.
7. Nominal tolerance on component values makes possible a variation of $\pm 15\%$ in voltage and resistance readings.
8. Volume control at maximum, no signal applied for voltage measurements.
9. Resistance readings in the B+ circuits may vary widely according to the condition of the filter capacitors.

VOLTAGE READINGS

SYMBOL	TUBE	PIN 1	PIN 2	PIN 3	-PIN 4	PIN 5	PIN 6	PIN 7	PIN 8
1	6AG5	-0.4DC	0	6.2AC	0	225DC	137DC	0	
2	6BE6	-0.3DC	0	0	6.2AC	270DC	100DC	0	
3	6BA6	-0.3DC	0	6.2AC	0	270DC	122DC	0	
4	6BA6	-0.5DC	0	6.2AC	0	260DC	110DC	0	
5	6AU6	-0.6DC	0	6.2AC	0	280DC	48DC	0	
6	6AL5	0	0	0	6.2AC	0.4DC	0	-11DC	
7	6AU6	-0.7DC	0	6.2AC	0	59DC	29DC	0	
9	6V6GT	0	0	320DC	290DC	0	59DC	6.2AC	15DC
10	6V6GT	0	0	320DC	290DC	0	0	6.2AC	15DC
11	5U4G	0	330DC	0	300AC	0	300AC	0	330DC

RESISTANCE READINGS

SYMBOL	TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8
1	6AG5	1.1 meg.	0	0.2	0	85,000	120,000	0	
2	6BE6	22,000	0.7	0.2	0.4	80,000	98,000	12,000	
3	6BA6	650,000	0	0.1	0	80,000	110,000	0	
4	6BA6	650,000	0	0.1	0	45,000	70,000	0	
5	6AU6	45,000	0	0.1	0	45,000	10,000	0	
6	6AL5	inf.	inf.	0	0.1	450	0	15,000	
7	6AU6	2.4 meg.	0	0.1	0	770,000	1.8 meg.	0	
9	6V6GT	0	0	80,000	80,000	450,000	0.3	0.1	170
10	6V6GT	0	0	80,000	80,000	0	620,000	0.1	170
11	5U4G	inf.	80,000	inf.	69	inf.	72	inf.	80,000



MODEL 537,
CHASSIS 120043

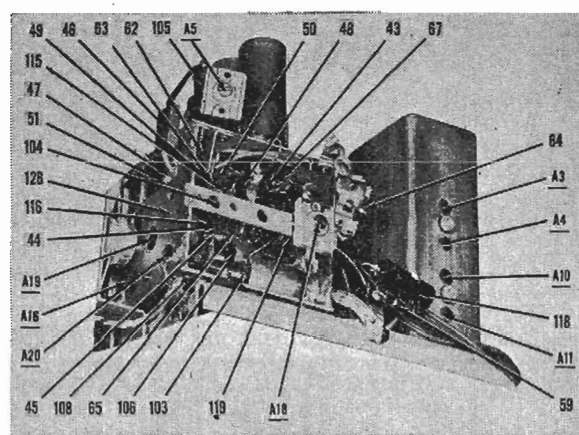
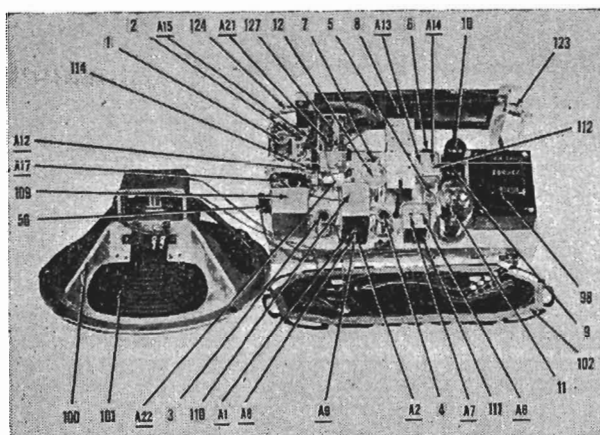
EMERSON RADIO AND PHONO. CORP.

ALIGNMENT

To set pointer turn variable condenser fully closed and set pointer to last reference mark at low frequency end of dial. To inject signal in Steps 5, 6 and 7, remove 6BE6 and connect wire to pin 1. Replace tube, making certain that wire does not short to shield base. In Step 9, connect two 100,000 ohm resistors in series from pin 7 of 6AL5 to chassis. These resistors should be equal within 5%. After Step 9, turn variable condenser fully counterclockwise and check adjustment of FM tuning unit per dial cord drawing. Loop should be maintained in same relative position to chassis as when receiver is in cabinet. Volume control should be at maximum position; output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POSITION	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1	0.1 mfd.	High side to front stator of variable condenser. Low side to chassis.	455 kc	BC (center position)	High frequency end of dial.	Across voice coil.	A1, A2 A3, A4	Adjust for maximum output.
2	0.1 mfd.	High side to front stator of variable condenser. Low side to chassis.	455 kc	BC (center position)	Low frequency end of dial.	Across voice coil.	A5	Adjust for minimum output.
3	0.05 mfd.	High side to pin 1 (grid) of 6BA6, 2nd L-F tube (4). Low side to chassis.	10.7 mc (unmodulated)	FM (fully clockwise)	High frequency end of dial.	VTVM connected from pin 7 of 6AL5 to chassis.	A6, A7	Adjust for maximum deflection.
4	0.05 mfd.	High side to pin 1 (grid) of 6BA6, 1st L-F tube (3). Low side to chassis.	10.7 mc (unmodulated)	FM (fully clockwise)	High frequency end of dial.	VTVM connected from pin 7 of 6AL5 to chassis.	A8, A9	Adjust for maximum deflection.
5	0.05 mfd.	High side to pin 1 (grid) of 6BE6. Low side to chassis.	10.6 mc unmodulated)	FM (fully clockwise)	High frequency end of dial.	VTVM connected from pin 7 of 6AL5 to chassis.	A10	Adjust for maximum deflection.
6	0.05 mfd.	High side to pin 1 (grid) of 6BE6. Low side to chassis.	10.8 mc (unmodulated)	FM (fully clockwise)	High frequency end of dial.	VTVM connected from pin 7 of 6AL5 to chassis.	A11	Adjust for maximum deflection.
7	0.05 mfd.	High side to pin 1 (grid) of 6BE6. Low side to chassis.	10.7 mc (unmodulated)	FM (fully clockwise)	High frequency end of dial.	VTVM connected from pin 7 of 6AL5 to chassis.	A12	Adjust for maximum deflection.
8	0.05 mfd.	High side to pin 1 (grid) of 6AT6, 3rd L-F tube (5). Low side to chassis.	10.7 mc (unmodulated)	FM (fully clockwise)	High frequency end of dial.	VTVM connected from pin 7 of 6AL5 to chassis.	A13	Adjust for maximum deflection.
9	0.05 mfd.	High side to pin 1 (grid) of 6AT6, 3rd L-F tube (5). Low side to chassis.	10.7 mc (unmodulated)	FM (fully clockwise)	High frequency end of dial.	VTVM connected from junction of two 100,000 ohm resistors and junction of condensers 31 and 32. (See preliminary alignment notes).	A14	Adjust for zero deflection.
10	150 ohms in series with each lead.	High side to ungrounded FM antenna terminal. Low side to chassis. (Disconnect internal antenna.)	108 mc (unmodulated)	FM (fully clockwise)	108 mc	VTVM connected from pin 7 of 6AL5 to chassis.	A15	Adjust for maximum deflection.
11	150 ohms in series with each lead.	High side to ungrounded FM antenna terminal. Low side to chassis. (Disconnect internal antenna.)	88 mc (unmodulated)	FM (fully clockwise)	88 mc	VTVM connected from pin 7 of 6AL5 to chassis.	A16	Adjust iron core (hold brass in position) for maximum deflection.
12	150 ohms in series with each lead.	High side to ungrounded FM antenna terminal. Low side to chassis. (Disconnect internal antenna.)	98 mc (unmodulated)	FM (fully clockwise)	98 mc	VTVM connected from pin 7 of 6AL5 to chassis.	A16	Adjust iron and brass cores (single screw) for maximum deflection. Repeat steps 10, 11, 12 until no further improvement can be made.
13	150 ohms in series with each lead.	High side to ungrounded FM antenna terminal. Low side to chassis. (Disconnect internal antenna.)	106 mc (unmodulated)	FM (fully clockwise)	Tune for maximum deflection.	VTVM connected from pin 7 of 6AL5 to chassis.	A17, A18	Adjust for maximum deflection.
14	150 ohms in series with each lead.	High side to ungrounded FM antenna terminal. Low side to chassis. (Disconnect internal antenna.)	90 mc (unmodulated)	FM (fully clockwise)	Tune for maximum deflection.	VTVM connected from pin 7 of 6AL5 to chassis.	A19, A20	Adjust iron core (hold brass in position) for maximum deflection.
15	150 ohms in series with each lead.	High side to ungrounded FM antenna terminal. Low side to chassis. (Disconnect internal antenna.)	100 mc (unmodulated)	FM (fully clockwise)	Tune for maximum deflection.	VTVM connected from pin 7 of 6AL5 to chassis.	A19, A20	Adjust iron and brass cores (single screw) for maximum deflection. Repeat steps 13, 14, 15 until no further improvement can be made.
16	200 mmfd.	High side to AM ungrounded lug on antenna terminal strip. Low side to chassis.	1600 kc	BC	1600 kc	Across voice coil.	A21	Adjust for maximum output.
17	200 mmfd.	High side to AM ungrounded lug on antenna terminal strip. Low side to chassis.	1400 kc	BC	Tune for maximum output.	Across voice coil.	A22	Adjust for maximum output.

EMERSON RADIO AND PHONO. CORP.

MODEL 537,
CHASSIS 120043

REPLACEMENT PARTS LIST

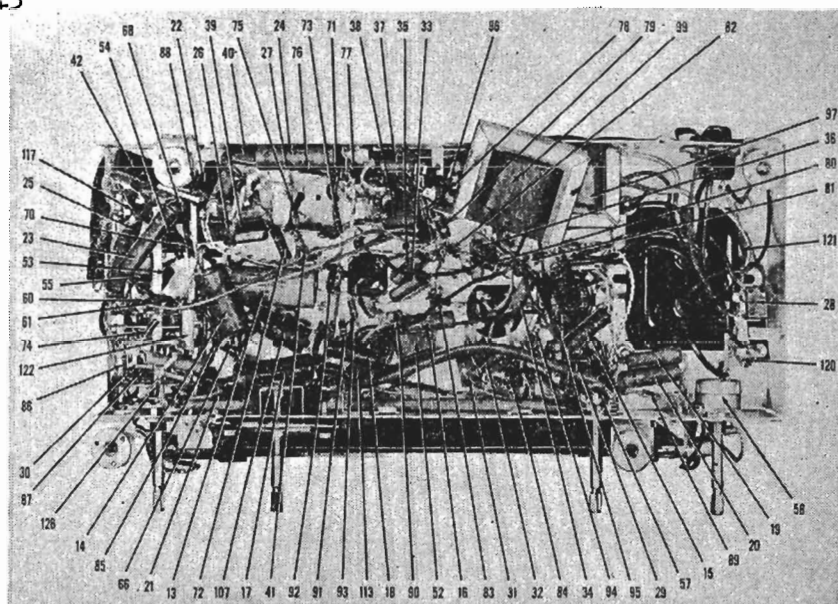
Symbol	†Part No.	DESCRIPTION	Symbol	†Part No.	DESCRIPTION
1	6AG5	Tube, r-f amplifier	37	910356	0.005 mfd., 500 volt mica condenser (2nd i-f decoupling)
2	6BE6	Tube, converter	38	910356	0.005 mfd., 500 volt mica condenser (2nd i-f screen bypass)
3	6BA6	Tube, 1st i-f amplifier	39	910356	0.005 mfd., 500 volt mica condenser (1st i-f screen bypass)
4	6BA6	Tube, 2nd i-f amplifier	40	910356	0.005 mfd., 500 volt mica condenser (1st i-f filament bypass)
5	6AU6	Tube, limiter and AM 2nd detector	41	910100	0.0001 mfd., 500 volt mica condenser (diode filter)
6	6AL5	Tube, FM ratio detector	42	910356	0.005 mfd., 500 volt mica condenser (converter plate decoupling)
7	6AU6	Tube, audio amplifier	43	915003	0.0005 mfd., 300 volt mica condenser (converter screen bypass)
8	6U5/6G5	Tube, tuning eye	44	928102	50 mmfd., 300 volt ceramic condenser (converter cathode bypass)
9	6V6GT	Tube, power output	45	928101	25 mmfd., 300 volt ceramic condenser (oscillator grid)
10	6V6GT	Tube, power output	46	910320	0.00025 mfd., 500 volt mica condenser (wave trap)
11	5U4G	Tube, rectifier	47	928002	10 mmfd., 300 volt ceramic condenser (r-f plate decoupling)
12A, B	925006	40-30 mfd., 400 volt electrolytic condenser (filter)	48	928106	0.0001 mfd., 300 volt ceramic condenser (r-f coupling)
13	925190	8 mfd., 450 volt electrolytic condenser (a-f plate decoupling)	49	915003	0.0005 mfd., 300 volt mica condenser (r-f decoupling)
14	925005	5 mfd., 50 volt electrolytic condenser (ratio detector bias)	50	915003	0.0005 mfd., 300 volt mica condenser (r-f screen bypass)
15	920180	0.005 mfd., 400 volt condenser (tone compensation)	51	910356	0.005 mfd., 300 volt mica condenser (r-f filament bypass)
16	920090	0.01 mfd., 400 volt condenser (audio coupling)	52	910356	0.005 mfd., 300 volt mica condenser (r-f filament decoupling)
17	920250	0.1 mfd., 400 volt condenser (feedback coupling)	53	928107	30 mmfd., 300 volt ceramic condenser (r-f coupling)
18	920180	0.005 mfd., 400 volt condenser (audio coupling)	54	928102	50 mmfd., 300 volt ceramic condenser (FM-r-f coupling)
19	920090	0.01 mfd., 400 volt condenser (tone compensation)	55	928105	7 mmfd., 300 volt ceramic condenser (FM-r-f coupling)
20	920090	0.01 mfd., 400 volt condenser (tone compensation)	56	928105	7 mmfd., 300 volt ceramic condenser (FM-r-f coupling)
21	920090	0.01 mfd., 400 volt condenser (audio coupling)	57	390004	Volume control, 1 meg.
22	920180	0.005 mfd., 400 volt condenser (phono coupling)	58	390081	Tone control and switch, 1 meg.
23	920060	0.05 mfd., 200 volt condenser (AM eye grid filter)	59	320490	1000 ohms, 1/4 watt resistor (FM antenna loading)
24	920040	0.1 mfd., 200 volt condenser (AVC filter)	60	321130	470,000 ohms, 1/4 watt resistor (r-f grid)
25	920060	0.05 mfd., 200 volt condenser (AVC filter)	61	320970	100,000 ohms, 1/4 watt resistor (AVC network)
26	920090	0.01 mfd., 400 volt condenser (AVC filter)	62	370872	39,000 ohms, 1 watt resistor (r-f screen dropping)
27	920180	0.005 mfd., 500 volt mica condenser (AVC filter)	63	310650	4,700 ohms, 1/4 watt resistor (r-f plate decoupling)
28	910320	0.00025 mfd., 500 volt mica condenser (FM antenna coupling)	64	310750	12,000 ohms, 1/4 watt resistor (converter grid)
29	928107	30 mmfd., 300 volt ceramic condenser (a-f plate bypass)	65	310810	22,000 ohms, 1/4 watt resistor (oscillator grid)
30	910320	0.00025 mfd., 500 volt mica condenser (diode filter)	66	320290	150 ohms, 1/4 watt resistor (parasitic suppressor)
31	910320	0.00025 mfd., 500 volt mica condenser (ratio detector load)	67	397070	18,000 ohms, 2 watt resistor (converter screen dropping)
32	910320	0.00025 mfd., 500 volt mica condenser (ratio detector load)	68	320490	1,000 ohms, 1/4 watt resistor (converter plate decoupling)
33	920180	0.005 mfd., 500 volt mica condenser (deemphasis)			
34	910356	0.005 mfd., 500 volt mica condenser (limiter plate decoupling)			
35	910356	0.005 mfd., 500 volt mica condenser (r-f bypass power supply)			
36	910356	0.005 mfd., 500 volt mica condenser (limiter screen bypass)			

* Not supplied separately.

† Specify part numbers when ordering.

MODEL 537,
CHASSIS 120043

EMERSON RADIO AND PHONO. CORP.



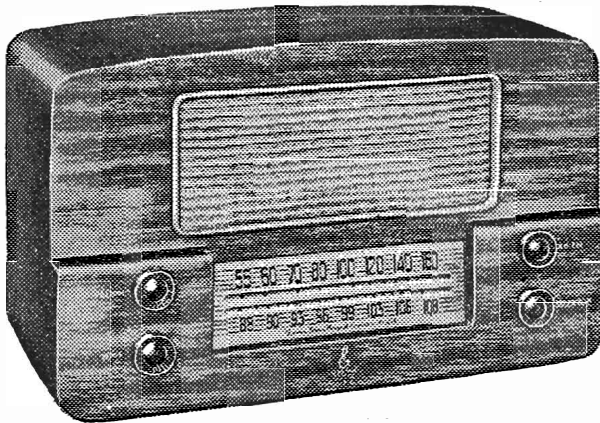
REPLACEMENT PARTS LIST (continued)

Symbol	†Part No.	DESCRIPTION	Symbol	†Part No.	DESCRIPTION
69	321210	1 meg., ¼ watt resistor (tuning eye plate load)	98	730002	Power transformer
70	320970	100,000 ohms, ¼ watt resistor (AVC network)	99	734004	Output transformer
71	311210	1 meg., ¼ watt resistor (AVC network)	100	180023	Speaker, 12 inch permanent magnet dynamic
72	370830	27,000 ohms, 1 watt resistor (1st i-f screen dropping)	*101		Speaker cone (part of 180023)
73	320490	1,000 ohms, ¼ watt resistor (1st i-f plate decoupling)	102	700003	Loop antenna
74	321210	1 meg., ¼ watt resistor (AVC network)	103	710014	FM antenna coil
75	321210	1 meg., ¼ watt resistor (AVC network)	104	705000	R-F plate choke
76	320970	100,000 ohms, ¼ watt resistor (AVC network)	105	708001	AM wave trap
77	310650	4,700 ohms, ¼ watt resistor (2nd FM i-f transformer shunt)	106	713013	FM r-f coil
78	320490	1,000 ohms, ¼ watt resistor (2nd i-f plate decoupling)	107	716113	AM oscillator coil
79	370830	27,000 ohms, 1 watt resistor (2nd i-f screen dropping)	108	716112	FM oscillator coil
80	370890	47,000 ohms, 1 watt resistor (limiter screen dropping)	109	720015	1st AM-FM i-f transformer
81	370730	10,000 ohms, 1 watt resistor (limiter screen bleeder)	110	720016	2nd AM-FM i-f transformer
82	340610	3,300 ohms, ½ watt resistor (limiter plate decoupling)	111	720014	3rd FM i-f transformer
83	350810	22,000 ohms, ½ watt resistor (de-emphasis)	112	708145	Ratio detector transformer
84	340410	470 ohms, ½ watt resistor (ratio detector bias)	113	705002	R-F choke
85	310771	15,000 ohms, ¼ watt resistor (ratio detector bias network)	114	705002	R-F choke
86	310890	47,000 ohms, ¼ watt resistor (diode filter)	115	705002	R-F choke
87	310970	100,000 ohms, ¼ watt resistor (diode load)	116	705002	R-F choke
88	321210	1 meg., ¼ watt resistor (series phono)	117	705005	Converter plate r-f choke
89	310890	47,000 ohms, ¼ watt resistor (tone compensation)	118	705003	R-F choke
90	321290	2.2 meg., ¼ watt resistor (a-f grid)	119	705007	R-F choke
91	321130	470,000 ohms, ¼ watt resistor (a-f plate load)	120	705002	R-F choke
92	321050	220,000 ohms, ¼ watt resistor (a-f plate decoupling)	121	705002	R-F choke
93	311250	1.5 meg., ¼ watt resistor (a-f screen dropping)	122	705000	R-F choke
94	321130	470,000 ohms, ¼ watt resistor (output grid)	123	807020	Dial light
95	394140	180 ohms, 2 watt resistor (output cathode)	124	807020	Dial light
96	310810	22,000 ohms, ¼ watt resistor (3rd i-f transformer shunt)	125		Crystal pickup
97	737002	Filter choke	126	510051	Band switch
			127	900007	Two-gang variable condenser
			128		FM tuning assembly
				500500	A-C receptacle
				508010	Phono receptacle
				555004	Terminal strip, speaker
				580032	Speaker pin terminal
				580033	Speaker pin terminal
				505005	A-C plug, phono motor
				505040	Connector plug, pickup
				583150	Line cord and plug
				507001	Dial light socket assembly
				585210	Tuning indicator socket and cable
				819020	Record Changer, curved spindle, brown
				819022	Record changer, straight spindle, blue
				140065	Cabinet
				620034	Knob, mahogany
				620035	Knob, mahogany, with indicator dot
				280002	Drive shaft, dial
				280505	Drive shaft, FM tuner
				520002	Dial back plate
				520003	Dial face
				525002	Pointer

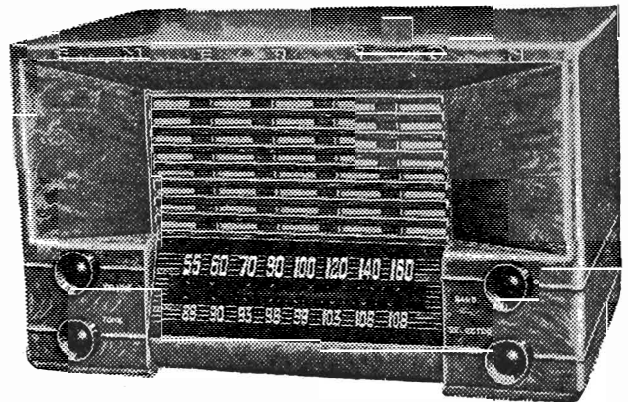
* Not supplied separately.

† Specify part numbers when ordering.

EMERSON RADIO AND PHONO. CORP. MODELS 556, 557, 565, CHASSIS 120018B



MODEL 565



MODEL 557

DESCRIPTION

TYPE: Amplitude modulation (AM) and frequency modulation (FM) superheterodyne.

FREQUENCY RANGE:

Broadcast band (AM)—540-1620 kilocycles

Frequency modulation band (FM)—88-108 megacycles

TYPE OF TUBES:

1—12BA6 FM r-f amplifier

1—12BA7 FM and AM converter

1—12BA6 FM and AM first i-f amplifier

1—12AU6 FM limiter

1—19T8 FM discriminator, AM detector, a.v.c., audio amplifier

1—35B5 Power output

1—Selenium rectifier

POWER SUPPLY: 60 cycle a.c.

VOLTAGE RATING: 105-125 volts

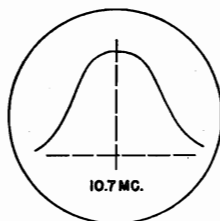
POWER CONSUMPTION: 35 watts

CURRENT DRAIN: 0.30 amps. at 117 volts a.c.

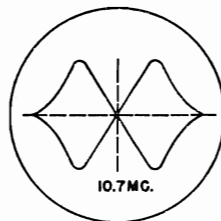
GENERAL NOTES

1. If replacements are made or the wiring disturbed in the r-f section of the circuit, the receiver should be carefully realigned.
2. A self-contained loop antenna is provided for broadcast band reception. For permanent home installation, however, if it is desired to improve reception of weak stations, an additional outdoor antenna may be used. Connect the outdoor antenna to the screw on the loop terminal strip marked "AM".
3. An internal power line antenna is provided for FM operation in relatively strong signal areas. The line cord should be completely uncoiled for effective operation of this antenna. An external dipole antenna is recommended for maximum FM operation. To connect the dipole, first remove the wire from the screw on the loop terminal strip marked "FM" and connect the dipole leads to the "FM" terminal and "G".
4. A ground connection is not required for AM and FM operation.

955171



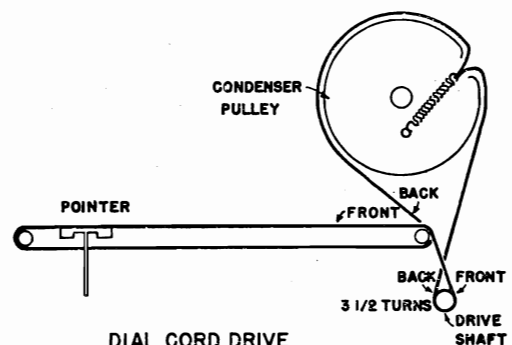
I.F. AND LIMITER



DISCRIMINATOR

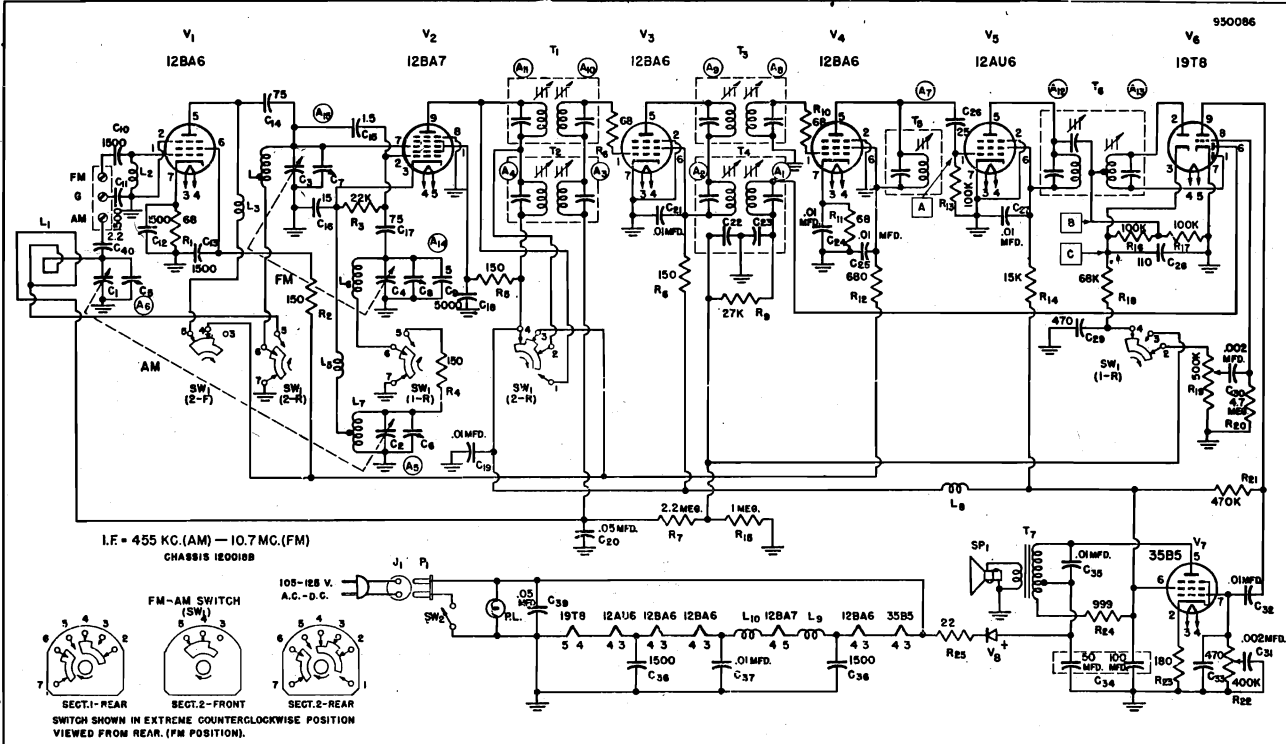
ALIGNMENT CURVES (FM)

955162



MODELS 556, 557,
565, CHASSIS 120018B

EMERSON RADIO AND PHONO. CORP.



INSTRUCTIONS FOR VOLTAGE AND RESISTANCE READINGS

1. Voltages readings are in d.c. volts and resistance readings in ohms, unless otherwise specified.
2. D.c. voltage measurements are made at 20,000 ohms-per-volt and a.c. voltages are measured at 1000 ohms-per-volt.
3. Socket connections are shown as bottom views. Values are measured from socket pin to common negative.
4. Line voltage maintained at 117 volts a.c. for voltage readings.
5. Nominal tolerance on component values makes possible a variation of $\pm 15\%$ in readings.
6. Volume control at maximum, with no sig. applied and bandswitch in broadcast position (unless otherwise noted), for voltage measurements.

VOLTAGE READINGS

SYMBOL	TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8	PIN 9
V1	12BA6	0	0	80AC	67AC	76*	78*	.8*	—	—
V2	12BA7	.100	-.5	0	67AC	55AC	0	-.5	0	95
V3	12BA6	-.2	0	55AC	43AC	93	98	0	—	—
V4	12BA6	0	0	43AC	30AC	70*	70*	.6*	—	—
V5	12AU6	-.4	0	30AC	18AC	50	50	0	—	—
V6	19T8	-.5	-.4	5.5*	18AC	0	-.8	0	-.5	33
V7	35B5	0	6	117AC	80AC	132	100	NC	—	—

NC denotes "no connection"; * for bandswitch in FM position only.

RESISTANCE READINGS

SYMBOL	TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8	PIN 9
V1	12BA6	0	0	16	12	65K*	65K*	66	—	—
V2	12BA7	65K	24K	1	56	75	0	0	0	65K
V3	12BA6	2.8 meg.	0	56	44	65K	65K	0	—	—
V4	12BA6	68	0	44	32	65K	65K	68	—	—
V5	12AU6	100K	0	32	20	65K	65K	0	—	—
V6	19T8	90K	90K	150K	20	0	1 meg.	0	4 meg.	550K
V7	35B5	400K	190	112	80	65K	65K	NC	—	—

K—Kilohms; meg.—megohms.

EMERSON RADIO AND PHONO. CORP. MODELS 556, 557, 565, CHASSIS 120018B

ALIGNMENT INSTRUCTIONS

1. To position pointer, turn variable condenser fully closed and set pointer to reference mark on dial backplate at the low frequency end of the dial.
2. Volume control should be set at maximum position. The output of the signal generator should be no higher than necessary to obtain an output reading. Attenuate the signal input as alignment proceeds. Use an insulated alignment tool for all adjustments.
3. Use isolation transformer if available; otherwise connect a .1 mfd. condenser in series with low side of signal generator to chassis.

AM ALIGNMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POSITION	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1	.1 mfd.	High side to Pin 7 (grid) of 12BA7. Low side to chassis.	455 KC.	Broadcast	Tuning condenser fully open.	Across voice coil.	A1, A2, (Trans. T4). A3, A4, (Trans. T2).	Adjust for maximum output. Reduce dummy antenna to .001 mfd. if isolation trans. is not used.
2		Loop	1600 KC.	Broadcast	Tuning condenser fully open.	Across voice coil.	A5, (Trimmer cond. C6).	Form loop of several turns of wire. Radiate signal into receiver loop. Adjust for maximum output.
3		Loop	1400 KC.	Broadcast	Tune for max. output.	Across voice coil.	A6, (Trimmer cond. C5).	Adjust for maximum output.

FM I-F and Disc. Alignment Using AM Signal Generator and VTVM

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POSITION	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
1	.01 mfd.	High side to Pin 1 (grid) of 12BA6 2nd i-f (V4). Low side to chassis.	10.7 mc. (Unmodulated)	Frequency modulation	Tuning condenser fully open.	Connect d.c. probe to point "A". Common to chassis.	A7, (Trans. T5).	Adjust for maximum output.
2	.01 mfd.	High side to Pin 1 (grid) of 12BA6 1st i-f (V3). Low side to chassis.	10.7 mc. (Unmodulated)	Frequency modulation	Tuning condenser fully open.	Connect d.c. probe to point "A". Common to chassis.	A8, A9, (Trans. T3).	Adjust for maximum output.
3	.01 mfd.	High side to Pin 2 (osc. grid) of 12BA7 conv. (V2). Low side to chassis.	10.7 mc. (Unmodulated)	Frequency modulation	Tuning condenser fully open.	Connect d.c. probe to point "A". Common to chassis.	A10, A11, (Trans. T1).	Adjust for maximum output.
4	.01 mfd.	High side to Pin 1 (grid) of 12BA6 2nd i-f (V4). Low side to chassis.	10.7 mc. (Unmodulated)	Frequency modulation	Tuning condenser fully open.	Connect d.c. probe to point "B". Common to chassis.	A12, (Trans. T6).	Adjust for maximum output.
5	.01 mfd.	"	10.7 mc. (Unmodulated)	Frequency modulation	Tuning condenser fully open.	Connect d.c. probe to point "C". Common to chassis.	A13, (Trans. T6).	Adjust for zero output. Continue with FM r-f alignment.

FM I-F AND DISC. ALIGNMENT USING SWEEP SIGNAL GENERATOR AND OSCILLOSCOPE. Use frequency modulated signal, with 60 cycle modulation and 450 kc. sweep. Use 120 cycle sawtooth sweep voltage in oscilloscope for horizontal deflection.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POSITION	RADIO DIAL SETTING	CONNECT OSCILLOSCOPE	ADJUST	REMARKS
1	.01 mfd.	High side to Pin 1 (grid) of 12BA6 1st i-f (V3). Low side to chassis.	10.7 mc. (Unmodulated).	Frequency modulation	Tuning condenser fully open.	Vertical input to Point "A". Ground to chassis.	A7, A8, A9, (Trans. T5 and T3).	Adjust for maximum output (height) and symmetry as per i-f alignment curve shown (page 3).
2	.01 mfd.	High side to Pin 2 (osc. grid) of 12BA7 conv. (V2). Low side to chassis.	10.7 mc. (Unmodulated).	Frequency modulation	Tuning condenser fully open.	Vertical input to Point "A". Ground to chassis.	A10, A11, (Trans. T1).	Adjust for maximum output (height) and symmetry as per i-f alignment curve shown (page 3).
3	.01 mfd.	High side to Pin 1 (grid) of 12BA6 2nd i-f (V4). Low side to chassis.	10.7 mc. (Unmodulated).	Frequency modulation	Tuning condenser fully open.	Vertical input to Point "C". Ground to chassis.	A12, A13, (Trans. T6).	Alternately adjust A12 for maximum amplitude and A13 for maximum straightness of cross-over lines, with cross-over occurring at center of pattern as per discriminator alignment curve (page 3). Continue with FM r-f alignment.

FM R-F ALIGNMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POSITION	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
1	150 ohm resistor in series with each gen. lead.	High side to FM ant. term. Low side to chassis.	108.0 mc. (Unmodulated).	Frequency modulation	Tuning condenser fully open (108.0 mc.)	Connect d.c. probe to point "A". Common to chassis.	A14 (Trimmer cond. C8).	Adjust for maximum output.
2	"	"	106.0 mc.	Frequency modulation	Tune for maximum output.	"	A15 (Trimmer cond. C7).	Adjust for maximum output.

MODELS 556, 557,
565, CHASSIS 120018B

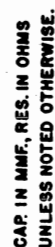
EMERSON RADIO AND PHONO. CORP.

REPLACEMENT PARTS LIST

Symbol	†Part No.	DESCRIPTION	Symbol	†Part No.	DESCRIPTION
V1	12BA6	FM r-f amplifier	R12	340450	680 ohms, 1/2 watt resistor
V2	12BA7	FM and AM converter	R13, R16, R17	340970	100 kilohms, 1/2 watt resistor
V3	12BA7	FM and AM 1st i-f amplifier	R14	350770	15 kilohms, 1/2 watt resistor
V4	12BA6	FM 2nd i-f amplifier	R15	351210	1 megohm, 1/2 watt resistor
V5	12AU6	FM limiter	R18	350930	68 kilohms, 1/2 watt resistor
V6	19T8	FM disc, AM det., a.v.c., audio amp.	R19	390057	500 kilohms, volume control
V7	35B5	Power output	R20	351370	4.7 megohms, 1/2 watt resistor
V8	817101	Selenium rectifier	R21	351130	470 kilohms, 1/2 watt resistor
C1, C2, C3, C4	900045	Two-gang, four section, variable condenser (alt. part. 900400 A).	R22	390046	400 kilohms, tone control
C5, C6, C7, C8	*	Trimmers, part of C1-C2-C3-C4	R23	370310	180 ohms, 1 watt resistor
C9	928017	5 mmf., ceramic condenser	R24	394042	999 ohms, 3 watt wire wound
C10, C11, C12, C13, C36, C38	928006	1500 mmf., ceramic condenser	R25	380090	22 ohms, 1 watt resistor
C14, C17			L1	700011	AM loop antenna (alternate part 700021) #
C15	928015	75 mmf., ceramic condenser	L2	710019	FM antenna coil
C16	915011	1.5 mmf., molded condenser	L3, L5, L9, L10	705002	FM oscillator choke
C18	928109	5000 mmf., ceramic condenser	L4	713024	FM r-f coil
C19, C21, C24, C25, C27	920092	.01 mfd., 200 volt paper condenser	L6	716013	FM oscillator coil
C20, C39	920030	.05 mfd., 400 volt paper condenser	L7	716015	AM oscillator coil
C22, C23	*	Part of T4 (2nd i-f, AM)	L8	705013	R-f choke
C26	928110	25 mmf., ceramic condenser	T1	720024	First i-f trans. (FM).
C28	910010	110 mmf., mica condenser	T2	720031	(Alt. parts 720082, 720067) #
C29, C33	910014	470 mmf., mica condenser	T3	720025	First i-f trans. (AM).
C30, C31	920515	.002 mfd., volt paper condenser	T4	720032	(Alt. parts 720084, 720075) #
C32, C35, C37	920090	.01 mfd., 400 volt paper condenser	T5	720069	Second i-f trans. (FM).
C34	925126	100-50 mfd., 150 volt elect. cond.	T6	708005	(Alt. parts 720082, 720076) #
C40	*	2.2 mmf., part of loop antenna L1	T7	734041	(Alt. parts 720083, 720077) #
R1, R6, R10, R11	340210	68 ohms, 1/2 watt resistor	SW1	510037	Disc. trans. FM.
R2, R4, R5, R8	350290	150 ohms, 1/2 watt resistor	SW2	*	Output transformer
R3	340810	22 kilohms, 1/2 watt resistor	SP1	180031P	Band switch, AM-FM
R7	351290	2.2 megohms, 1/2 watt resistor	P1	505007	Line switch, part of vol. control
R9	340830	27 kilohms, 1/2 watt resistor (may be part of T4)	J1	500005	P.m. speaker, (6" oval)

CABINET AND DIAL PARTS

†Part No.	DESCRIPTION	†Part No.	DESCRIPTION
140113	Cabinet, maroon plastic (Models 556, 557)	520071	Dial crystal
560041	Cabinet back (Models 556, 557)	410177	Dial backplate
140125	Cabinet, wood (Model 565)	280039	Dial drive shaft
560052	Cabinet back (Model 565)	530002	Dial drive cord (44")
460470	Knob, black	587070	Dial cord spring
		525017	Pointer
		410503	Speaker grille (Model 556)



MODEL 561-615,
CHASSIS 120001B

EMERSON RADIO AND PHONO. CORP.

INSTRUCTIONS FOR VOLTAGE AND RESISTANCE READINGS

1. Voltage readings are in d.c. volts and resistance readings in ohms unless otherwise specified.
2. D.c. voltage measurements are at 20,000 ohms-per-volt; a.c. voltages measured at 1,000 ohms-per-volt.
3. Socket connections are shown as bottom views.
4. Measured values are from socket pin to common negative (B—).
5. Line voltage maintained at 117 volts for voltage readings.
6. Nominal tolerance on component values makes possible a variation of $\pm 15\%$ in voltage and resistance readings.
7. Volume control at maximum with no signal applied, for voltage measurements.

VOLTAGE READINGS

SYMBOL	TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8
V1	12SG7	0	18 AC	1.2	-.5	NC	86	30 AC	82
V2	6SS7	0	12 AC	88	3	0	86	18 AC	86
V3	6SS7	0	36 AC	0	-.5	0	86	30 AC	86
V4	12AT6	-.7	0	0	12 AC	-.5	-.5	45	—
V5	50L6GT	NC	86 AC	105	86	0	NC	36 AC	5.5
V6	35Z5GT	NC	117 AC	112 AC	112	110 AC	NC	86 AC	112

RESISTANCE READINGS

SYMBOL	TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8
V1	12SG7	250 K	22	70	3.5 meg.	NC	150 K	33	150 K
V2	6SS7	250 K	15	150 K	22 K	0	150 K	22	150 K
V3	6SS7	250 K	40	0	3.5 meg.	0	150 K	33	150 K
V4	12AT6	10 meg.	0	0	16	480 K	3.5 meg.	600 K	—
V5	50L6GT	Inf.	90	150 K	150 K	420 K	Inf.	40	160
V6	35Z5GT	Inf.	120	118	150 K	160	NC	90	150 K

NC = no connection; K = kilohm; meg. = megohm; Inf. = infinity

ALIGNMENT PROCEDURE

1. To set pointer, turn variable condenser fully closed and set pointer at mark near left end of dial backplate.
2. Use isolation transformer if available. If not, connect a 0.1 mfd. condenser in series with low side of signal generator and chassis.
3. Volume control should be at maximum position; output of signal generator should be no higher than necessary to obtain an output reading.
4. Use an insulated alignment screwdriver for adjusting.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	METER OUTPUT	ADJUST	REMARKS
1	0.1 mfd.	High side to pin 4 (grid) of 12SG7 (V1). Low side to chassis.	455 kc	Variable condenser fully open.	Across voice coil.	A1, A2 (2nd i-f trans. T2) A3, A4 (1st i-f trans. T1)	Adjust for maximum output. If isolation transformer is not used, reduce dummy antenna to 0.001 mfd. to reduce hum modulation.
2	200 mmfd.	High side to external antenna lead. Low side to chassis.	1620 kc	Variable condenser fully open.	Across voice coil.	A5 (Trimmer cond. C4).	Adjust for maximum output.
3	200 mmfd.	High side to external antenna lead. Low side to chassis.	1400 kc	Tune for maximum output.	Across voice coil.	A6 (Trimmer cond. C3).	Adjust for maximum output.

EMERSON RADIO AND PHONO. CORP.

MODEL 561-615,
CHASSIS 120001B

REPLACEMENT PARTS LIST

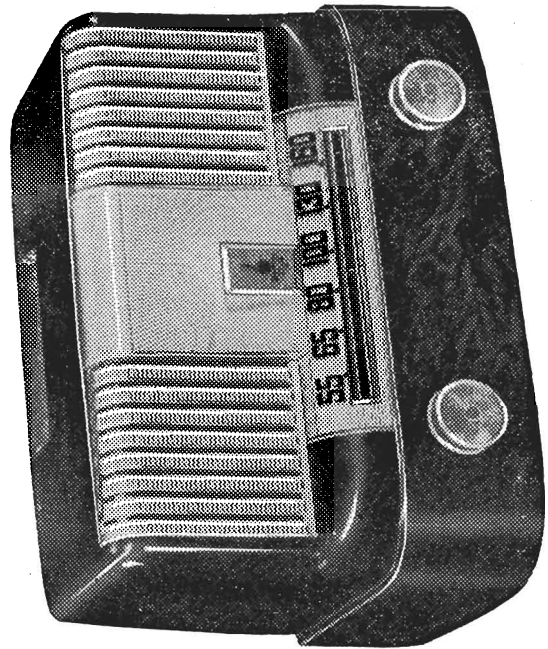
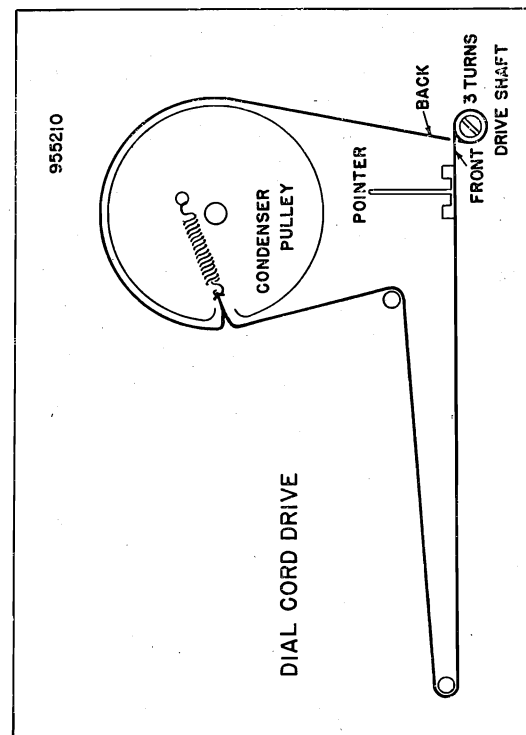
Symbol	†Patr No.	DESCRIPTION	Symbol	†Patr No.	DESCRIPTION
V1	12SG7	Converter	R2	340810	22 kilohms, ½ watt resistor
V2	6SS7	Oscillator	R3	351050	220 kilohms, ½ watt resistor
V3	6SS7	I-f amplifier	R4	340890	47 kilohms, ½ watt resistor
V4	12AT6	Detector, a.v.c., a-f amplifier	R5	351330	3.3 megohms, ½ watt resistor
V5	50L6GT	Power output	R6	390044	.5 megohms, volume control
V6	35Z5GT	Rectifier	R7	351490	15 megohms, ½ watt resistor
C1, C2	900027	Two gang var. condenser	R8, R9	351130	470 kilohms, ½ watt resistor
C3, C4	*	Trimmers, part of var. cond.	R10	340290	150 ohms, ½ watt resistor
C5	920050	.2 mfd., 400 volt paper cond.	R11	370150	39 ohms, 1 watt resistor
C6	920100	.02 mfd., 200 volt paper cond.	R12	370490	1000 ohms, 1 watt resistor
C7	920040	.1 mfd., 200 volt paper cond.	L1	700000	Loop antenna
C8	920030	.05 mfd., 400 volt paper cond.	L2	716025	Oscillator coil
C9	910010	110 mmf., mica condenser	T1	720061	First i-f transformer
C10	910000	220 mmf., mica condenser	T2	720036	Second i-f transformer
C11	920010	.002 mmf., 600 volt paper cond.	T3	734043	Output transformer
C12	920240	500 mmf., 600 volt paper cond.	SP1	180045	P.n. speaker
C13, C14	920020	.02 mfd., 400 volt paper cond.	SW1	*	Line switch, part of vol. control
C15	925112	50-50 mfd., 150 volt electrolytic condenser	P.L.	807000	Dial light, 6-8 v., .15 amp.
R1	340450	680 ohms, ½ watt resistor		583014	Line cord
				507006	Dial light socket

CABINET AND DIAL PARTS

†Part No.	DESCRIPTION
140119	Cabinet, ivory plastic
450310	Knob, ivory
460072	Speaker grille
525024	Pointer
520050	Dial backplate
280042	Dial drive shaft
530002	Dial cord (30")
587070	Dial cord spring

† Specify part numbers when ordering.

* Not supplied separately.



MODEL: 561 - 615



EMERSON RADIO AND PHONO. CORP.

MODEL 568, CHASSIS
120070A, 120070B

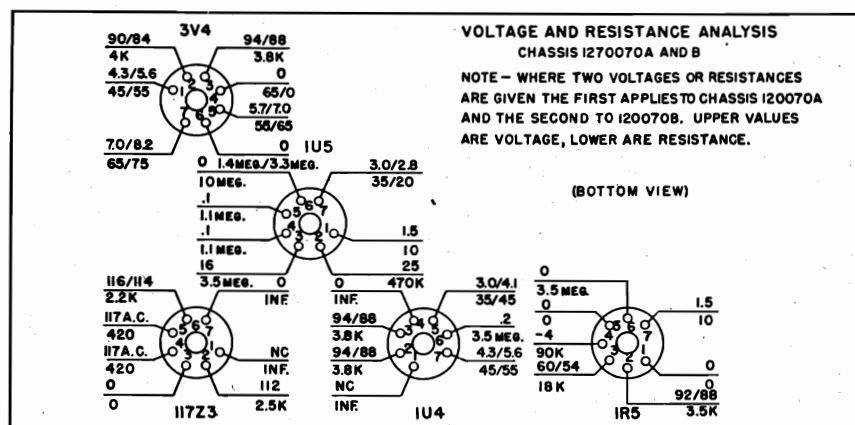
ALIGNMENT PROCEDURE

1. Use battery power when available. When a.c. power is used, connect the line cord through an isolation transformer if available. Otherwise connect a 0.1 mfd. condenser in series with the low side of the signal generator and B—.
2. Set the volume control at maximum. The output of the signal generator should be no higher than that necessary to obtain an output reading. Attenuate the signal input as alignment proceeds. Use an insulated alignment tool.
3. Maintain the loop in the same position relative to the chassis as when the receiver is in the cabinet.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1	0.1 mfd.	High side to grid (pin 6) of V1 (1R5). Low side to chassis.	455 KC.	Variable condenser fully open.	Across voice coil	A1, (2nd i-f trans), A2, A3 (1st i-f trans.)	Adjust for maximum output. If a.c. is used, without an isolation transformer, reduce dummy antenna to 200 mmf. to reduce hum modulation.
2	200 mmf.	High side to external antenna lead. Low side to chassis.	1620 KC.	Variable condenser fully open.	Across voice coil	A4 (trimmer cond. C4.)	Adjust for maximum output.
3	200 mmf.	"	1400 KC.	Tune for maximum output.	Across voice coil	A5 (trimmer cond. C2).	Adjust for maximum output.

INSTRUCTIONS FOR VOLTAGE AND RESISTANCE READINGS

1. Voltage and resistance readings are measured for 117 volt a.c. line operation. Socket connections are shown as bottom views. Measurements are taken from socket pin to chassis (chassis 120070A) or socket pin to common negative (chassis 120070B).
2. Voltages are d.c. unless otherwise indicated, measured with a 20,000 ohms-per-volt meter. A.c. voltages are measured at 1000 ohms-per-volt.
3. For voltage measurements, set volume control at maximum; no signal applied.
4. Nominal tolerance on component values makes possible a variation of $\pm 15\%$ in voltage and resistance readings.
5. On the voltage and resistance analysis diagram NC denotes no connection; K—kilohms; meg.—megohms; inf.—infinity.



DESCRIPTION

TYPE: Three way (battery, a.c., d.c.) portable superheterodyne.

FREQUENCY RANGE: 540-1620 KC.

TYPE OF TUBES:

- 1—1R5, pentagrid converter
- 1—1U4, i-f amplifier
- 1—1S5, or 1U5, detector, a.v.c., a-f amplifier
- 1—3V4, power output
- 1—117Z3 rectifier

POWER SUPPLY: Battery powerpack, or a.c., or d.c.

VOLTAGE RATING:

- Line operation—105-125 volts, a.c. or d.c.
- Battery operation—7½ volts (chassis 120070A);
9 volts (chassis 120070B) "A" supply
90 volts "B" supply

POWER CONSUMPTION: Line operation 20 watts

CURRENT CONSUMPTION:

- "A" battery—.053 amp. (chassis 120070A)
.055 amp. (chassis 120070B)
- "B" battery—.013 amp.
- 117 volts a.c.—.170 amp.



MODEL: 568

MODEL 568, CHASSIS
120070A, 120070B

EMERSON RADIO AND PHONO. CORP.

REPLACEMENT PARTS LIST

Symbol	†Part No.	DESCRIPTION	Symbol	†Part No.	DESCRIPTION
V1	1R5	Converter	R15	340470	820 ohms, $\pm 10\%$, $\frac{1}{2}$ watt resistor
V2	1U4	I-f amplifier	R16	340450	680 ohms, $\pm 10\%$, $\frac{1}{2}$ watt resistor
V3	1S5 or 1U5	Detector, a.v.c., a-f amplifier	R17	341330	3.3 megohms, $\pm 10\%$, $\frac{1}{2}$ watt resistor
V4	3V4	Power output			
V5	117Z3	Rectifier	R18	341490	15 megohms, $\pm 10\%$, $\frac{1}{2}$ watt resistor
C1, C3	900043	Two-gang variable condenser	R19	340550	1800 ohms, $\pm 10\%$, $\frac{1}{2}$ watt resistor
C2, C4	*	Trimmers, part of var. condenser	R23	370132	33 ohms, $\pm 10\%$, $\frac{1}{2}$ watt resistor
C5, C18	920060	.05 mfd., 200 volt condenser	R24	340110	27 ohms, $\pm 10\%$, $\frac{1}{2}$ watt resistor
C6, C15, C19	920539	.05 mfd., 400 volt condenser	L1	700039 Δ	Loop antenna
C7, C11	920092	.01 mfd., 400 volt condenser		700042 \square	" "
C8, C12	910000	220 mmf., mica condenser	L2	716029	Oscillator coil
C9, C20	915005	2.2 mmf., molded condenser	T1	720525	First i-f transformer (alternate parts 720051 or 720062) #
C10, C21	920515	.002 mfd., 400 volt condenser			Second i-f transformer
C13, C14	920180	.005 mfd., 400 volt condenser	T2	720066	Output transformer
C16	925059	80-40-30-100 mfd., 150-150-150-25 volt electrolytic condenser	T3	734039 Δ	" "
				734039A \square	Power changeover switch, d.p.d.t.
C17	920040	.1 mfd., 200 volt condenser	SW1	510008 Δ	" " " " t.p.d.t.
R1	351290	2.2 megohms, $\frac{1}{2}$ watt resistor		510043 \square	" " " " " " " "
R2	340770	15 kilohms, $\pm 10\%$, $\frac{1}{2}$ watt res.	SW2	*	On-off switch, part of volume control
R3	350970	100 kilohms, $\frac{1}{2}$ watt resistor		585031 Δ	Battery cable ("A" and "B")
R4, R7	351330	3.3 megohms, $\frac{1}{2}$ watt resistor		585033 \square	" " " " " " " "
R5	390063	1 megohm, volume control		583012P Δ	Line cord
R6	351450	10 megohms, $\frac{1}{2}$ watt resistor		583017P \square	" "
R8	351130	470 kilohms, $\frac{1}{2}$ watt resistor			Battery power pack unit (7 $\frac{1}{2}$ or 9 volts "A" and 90 volts "B").
R9	351250	1.5 megohms, $\frac{1}{2}$ watt resistor			Eveready No. 753 or Rayovac No. AB994.
R10	340210	68 ohms, $\pm 10\%$, $\frac{1}{2}$ watt resistor			
R11	370170	47 ohms, $\pm 10\%$, $\frac{1}{2}$ watt resistor			
R12	394041	1100-1100 ohms, $\pm 5\%$, wire-wound resistor			
R13, R14, R20, R21, R22	340530	1500 ohms, $\pm 10\%$, $\frac{1}{2}$ watt resistor			

CABINET AND DIAL PARTS

†Part No.	DESCRIPTION
140182°	Cabinet
140183S°	Cabinet back, with hinge springs
460081°	Speaker grille
520092	Dial Crystal
520085	Dial backplate
595006°	Handle, with rings
460082°	Knob
808205	Cabinet catch clip
280079	Cover catch stud
525041	Dial pointer
280070	Drive shaft
530002	Drive cord (30")
587040	Drive cord spring

† State part numbers when ordering.

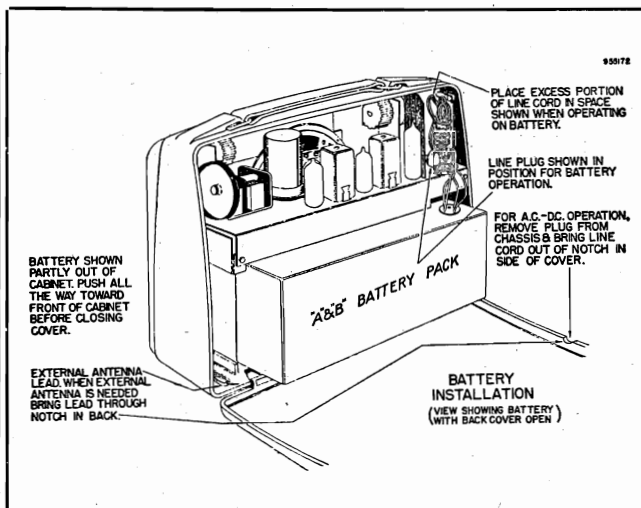
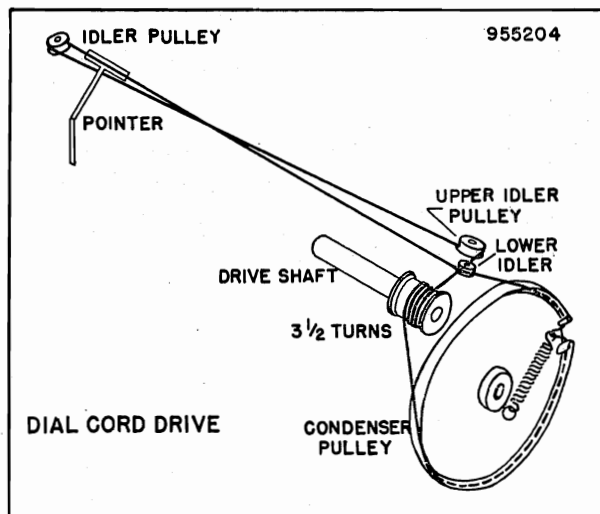
* Not supplied separately.

Replace with parts having same number as that removed.

△ Used on chassis 120070A.

☐ Used on chassis 120070B.

° Specify color when ordering.



EMERSON RADIO AND PHONO. CORP. MODELS 563, 593, 603, CHASSIS 120063B

DESCRIPTION

TYPE: Console AM-FM superheterodyne with automatic record changer.

FREQUENCY RANGE:

Broadcast band (AM)—535-1620 kilocycles

Frequency modulation band (FM)—88.0 to 108.0 megacycles

1—6AG5, r-f amplifier

1—6BE6, converter

2—6SG7, i-f amplifiers

1—6U5/6G5, tuning eye

1—5U4G, rectifier

1—6S8/GT, AM detector, FM discriminator, audio amplifier

1—6SH7, FM limiter

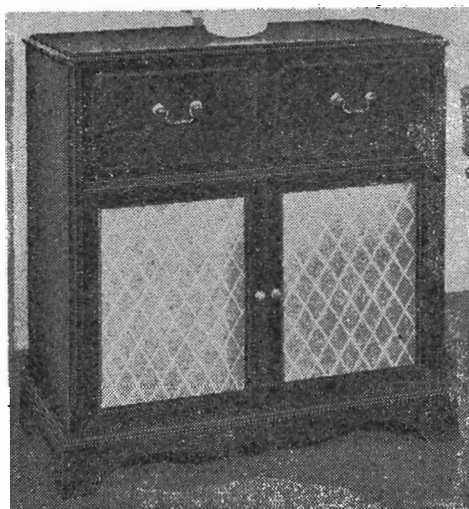
2—6V6/GT, power output

1—6SQ7, phase inverter

POWER SUPPLY: 60-cycle a.c. only

VOLTAGE RATING: 105-125 volts

POWER CONSUMPTION: 140 watts



MODEL 563



MODEL 593

GENERAL NOTES

1. If replacements are made or the wiring disturbed in the r-f section of the circuit, the receiver should be carefully realigned.
2. The color coding of the i-f transformer leads is as follows:

Grid—green

Grid return—black

Plate—blue

B+—red

3. A self-contained loop antenna is provided for broadcast band reception. If it is desired to improve reception of weak stations, however, an additional outdoor antenna may be used. Connect the external antenna to the *outside* terminal on the "AM" side of the terminal strip at the rear of the cabinet. Connect the ground to the adjoining terminal.

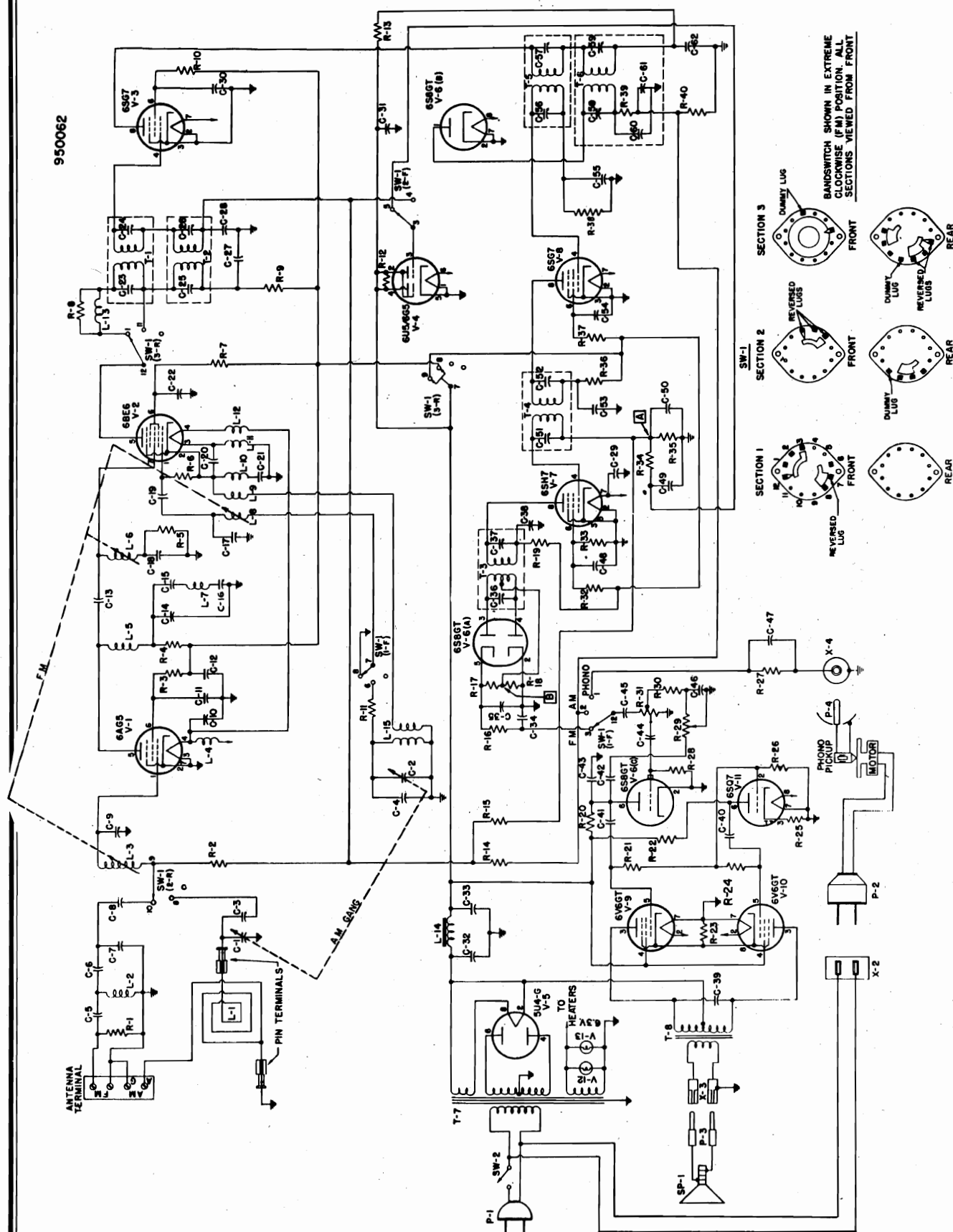
An internal power line antenna is provided for FM operation in relatively strong signal areas. An external dipole antenna is recommended for best FM operation. To connect dipole, remove the wire from the terminal on the "FM" side of the terminal strips and connect the two dipole leads to the two "FM" terminals. A ground connection is not required for FM operation.

DISASSEMBLY INSTRUCTIONS

1. Remove four push-on type control knobs from front of cabinet.
2. Remove phone motor plug, phono pickup plug, and two speaker pin-terminals from chassis.
3. Remove two Phillips head screws holding antenna terminal strip to cabinet.
4. Remove two nuts and washers fastening loop to cabinet.
5. Remove four hex-head bolts in chassis shelf retaining chassis to cabinet.
6. Remove four nuts fastening speaker to cabinet and remove speaker.

MODELS 563, 593, 603,
CHASSIS 120063B

EMERSON RADIO AND PHONO. CORP.



EMERSON RADIO AND PHONO. CORP. MODELS 563, 593, 603, CHASSIS 120063B

AM ALIGNMENT

Volume control should be at maximum position; output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screw driver for adjusting.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1	.1 mfd.	High side to Pin No. 1 of V2 6BE6. Low side to chassis.	455 kc	Center position BC.	High frequency end of dial.	Across voice coil.	C-25, C-26 C-58, C-59	Adjust all trimmers for maximum response.
2	.1 mfd.	"	455 kc	"	"	"	C-16 IF-trap trimmer	Adjust for minimum response.
3	200 mmfd.	High side to AM ungrounded lug on antenna terminal strip. Low side to chassis.	1620 kc	"	1620 kc Reference marker on dial backplate.	"	C-4	Adjust for maximum response.
4	200 mmfd.	"	1400 kc	"	Tune in 1400 kc for maximum output.	"	C-3	Adjust for maximum response.

FM IF ALIGNMENT USING FM SIGNAL GENERATOR AND VTVM Use FM Signal with 60 Cycle Modulation and 500 KC Deviation

	DUMMY ANTENNA	SIGNAL GENERATOR SIGNAL	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
1	.005 mfd.	High side to Pin No. 1 V2 6BE6. Low side to chassis.	10.7 mc freq. mod.	Fully clock-wise FM position.	High frequency end of dial.	Point "A"	C-23, C-24 C-57, C-56 C-52, C-51	Adjust all trimmers for maximum deflection while attenuating signal so as to read approximately 2 volts at Point "A" during alignment.
2	.005 mfd.	"	10.7 mc freq. mod.	"	"	Point "A"	C-21	Adjust for maximum deflection.

FM IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
1	.05 mfd.	High side to Pin No. 1 V2 6BE6. Low side to chassis.	10.7 mc unmodulated	Fully clock-wise FM pos.	High frequency end of dial.	Point "A"	C-52 C-51	Adjust for maximum deflection.
2	.05 mfd.	"	10.7 mc unmodulated	"	"	"	C-56 C-57	"
3	.05 mfd.	"	10.7 mc unmodulated	"	"	"	C-24 C-23	"
4	.05 mfd.	"	10.7 mc unmodulated	"	"	Point "B"	C-37	"
5	.05 mfd.	"	10.7 mc unmodulated	"	"	Pin No. 5 6S8-V6A	C-36	Adjust for zero minimum deflection

Vol. control in max. pos.

FM DISCRIMINATOR ALIGNMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
1	.05 mfd.	High side to Pin No. 1 of 6BE6 V2. Low side to chassis.	10.7 mc freq. mod.	Fully clock-wise Pos. FM.	High frequency end of dial.	Point "B"	C-37	Adjust for maximum deflection. Attenuate signal so that reading of approximately 2 volts indicates maximum response of discriminator alignment.
2	.05 mfd.	"	10.7 mc unmodulated	"	"	Connect scope or AC-VTVM across voice coil.	C-36	Adjust for minimum deflection. Making sure that a sharp rise can be obtained if the secondary of discriminator is aligned on either side of minimum deflection setting.

MODELS 563, 593, 603, EMERSON RADIO AND PHONO. CORP.
CHASSIS 120063B

Vol. control in max. pos. FM RF ALIGNMENT USING AM GENERATOR AND VTVM

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
1	300 ohm carbon resistor	High side to FM antenna terminal. Low side to chassis. Disconnect internal antenna.	108 mc unmodulated	Fully clockwise FM pos.	108 mc	Point "A"	C-17	Adjust for maximum deflection.
2	"	"	88 mc unmodulated	"	88 mc	"	L-8	Adjust iron core only for maximum deflection. (Hold brass in position).
3	"	"	98 mc unmodulated	"	98 mc	"	L-8	Adjust iron and brass cores together (single screw). For maximum deflection repeat steps 1, 2, 3 until no further improvement can be obtained.
4	"	"	106 mc unmodulated	"	Tune for maximum deflection.	"	C-18 C-9	Adjust for maximum deflection
5	"	"	90 mc unmodulated	"	Tune for maximum deflection.	"	L-6 L-3	Adjust iron core only. For maximum deflection (Hold brass in position).
6	"	"	100 mc unmodulated	"	Tune for maximum deflection.	"	L-6 L-3	Adjust iron and brass cores together (single screw) for maximum deflection. Repeat 1, 2, 3 until no further improvement can be made.

FM-RF ALIGNMENT USING FM GENERATOR AND OSCILLOSCOPE

Vol. control in max. pos. Use FM Signal with 500 KC Deviation

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT SCOPE	ADJUST	REMARKS
1	300 ohm carbon resistor	High side to FM antenna terminal. Low side to chassis. Disconnect internal antenna.	108 mc unmodulated	Fully clockwise FM pos.	108 mc	Point "A"	C-17	Adjust trimmer so as to center response curve on scope. Choose 108 mc peak at maximum capacity.
2	"	"	108 mc unmodulated	"	"	"	C-18 C-9	Adjust trimmers for maximum response—use maximum height of response curve as indication—See Fig. 1
3	"	"	88 mc unmodulated	"	88 mc	"	L-8	Adjust iron core only for maximum response. (Hold brass in position).
4	"	"	100 mc unmodulated	"	100 mc	"	L-8	Adjust iron and brass cores together (single screw) for maximum response—Repeat steps 1, 2, 3, 4 until no further improvement can be made.
5	"	"	88 mc unmodulated	"	88 mc	"	L-6 L-3	Adjust iron core only for maximum response. (Hold brass in position).
6	"	"	100 mc unmodulated	"	100 mc	"	L-6 L-3	Adjust iron and brass cores together (single screw) for maximum response.
7	"	"	108 mc unmodulated	"	108 mc	"	C-18 C-9	Adjust trimmers for maximum response to 108 mc signal. Repeat steps 5, 6, 7 until no further improvement can be made.

**EMERSON RADIO AND PHONO. CORP. MODELS 563, 593, 603,
CHASSIS 120063B**

INSTRUCTIONS FOR VOLTAGE AND RESISTANCE READINGS

1. Voltage readings are in volts and resistance readings in ohms unless otherwise specified.
2. D-C voltage measurements are at 20,000 ohms per volt; a-c voltages measured at 1,000 ohms.
3. Socket connections are shown as bottom views.
4. Measured values are from socket pin to common negative.
5. Line voltage maintained at 117 volts for voltage readings.
6. Nominal tolerance on component values makes possible a variation of $\pm 15\%$ in voltage and resistance readings.
7. Volume control at maximum, no signal applied for voltage measurements.
8. Resistance readings in the B+ circuits may vary widely according to the condition of the filter capacitors.

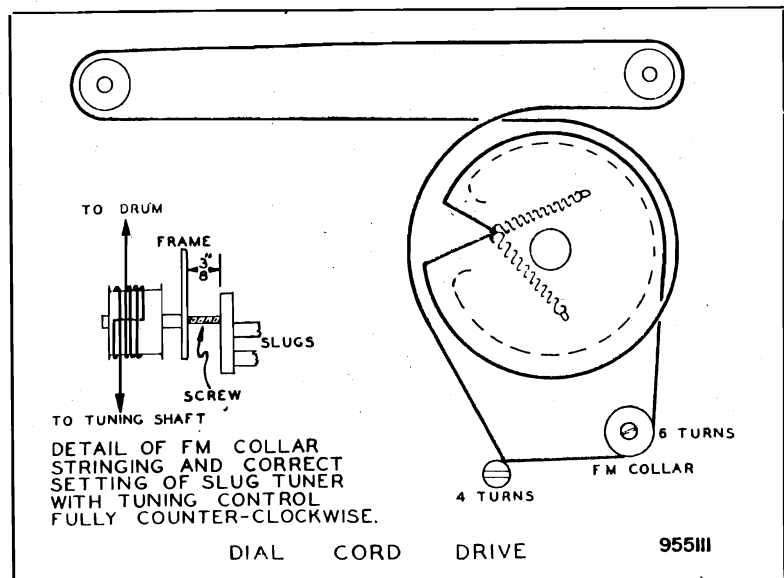
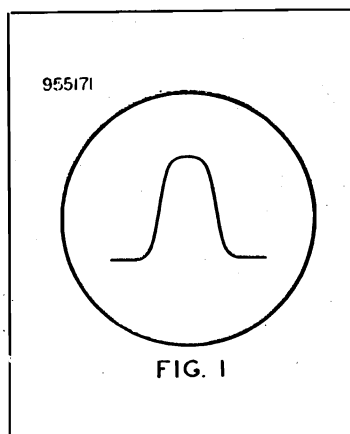
VOLTAGE READINGS

SYMBOL	TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8	CAP.
1	6AG5	-0.4 DC	0	6.2 AC	0	195 DC	137 DC	0		
2	6BE6	-0.3 DC	0	0	6.2 AC	250 DC	100 DC	0		
3	6SG7	0	0	0	-0.75 DC	0	150 DC	6.2 AC	250 DC	
5	5U4G	0	260 DC	0	260 AC	0	260 AC	0	260 DC	
*6	6S8GT	-0.5 DC	0	-1.0 DC	-0.6 DC	-0.2 DC	100 DC	0	6.2 AC	-0.75 DC
*7	6SH7	0	0	0	-0.65 DC	0	35 DC	6.2 AC	175 DC	
*8	6SG7	0	0	0	-0.75 DC	0	125 DC	6.2 AC	235 DC	
9	6V6GT	0	6.2 AC	250 DC	240 DC	0	0	0	13 DC	
10	6V6GT	0	0	250 DC	240 DC	0	0	6.2 AC	13 DC	
11	6SQ7	0	-0.25 DC	-0.5 DC	0	0	70 DC	6.2 AC	0	

RESISTANCE READINGS

SYMBOL	TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8	CAP.
1	6AG5	1 meg.	0	0	0.2	60,000	110,000	0		
2	6BE6	22,000	0.7	0.2	0.4	50,000	100,000	12,000		
3	6SG7	0	0	0	800,000	0	70,000	0	50,000	
5	5U4G	Inf.	60,000	Inf.	60	Inf.	60	Inf.	60,000	
6	6S8GT	250,000	0	100,000	100,000	200,000	100,000	0	0.2	15 meg.
7	6SH7	0	0	0	47,000	0	75,000	0.2	100,000	
*8	6SG7	0	0	0	2.2 meg.	0	80,000	0.2	50,000	
9	6V6GT	Inf.	0.2	60,000	60,000	440,000	Inf.	0	180	
10	6V6GT	Inf.	0.2	60,000	60,000	440,000	Inf.	0	180	
11	6SQ7	0	220,000	1000	Inf.	Inf.	80,000	0	0.2	

* Taken in FM Position.



MODELS 563, 593, 603, EMERSON RADIO AND PHONO. CORP. CHASSIS 120063B

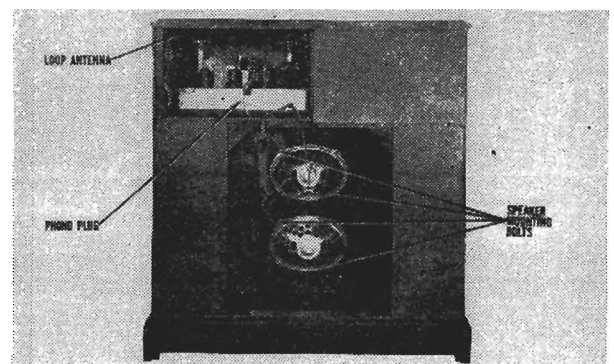
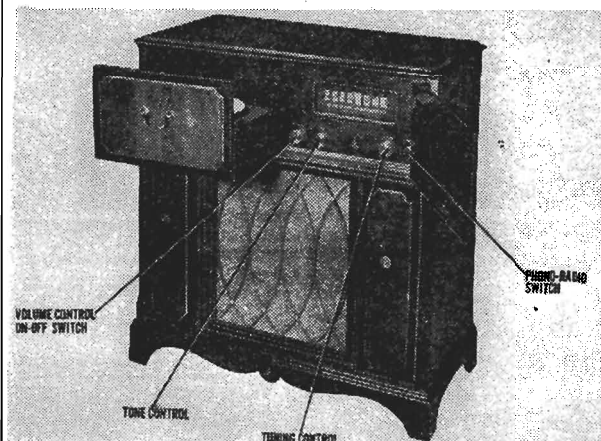
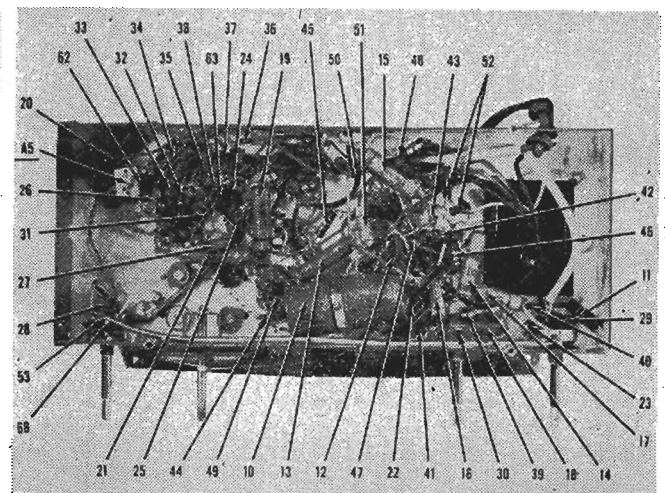
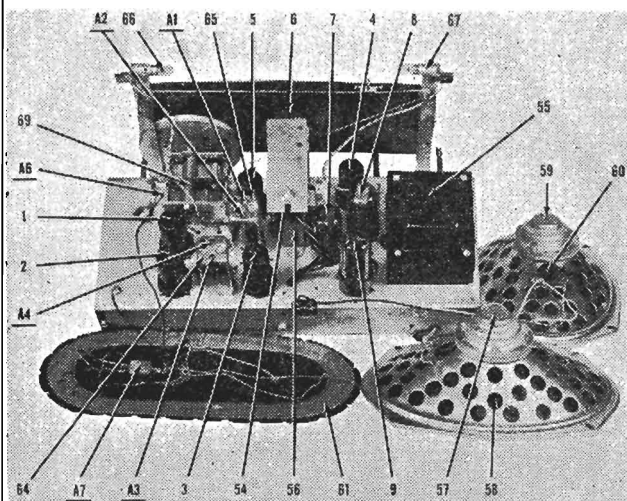
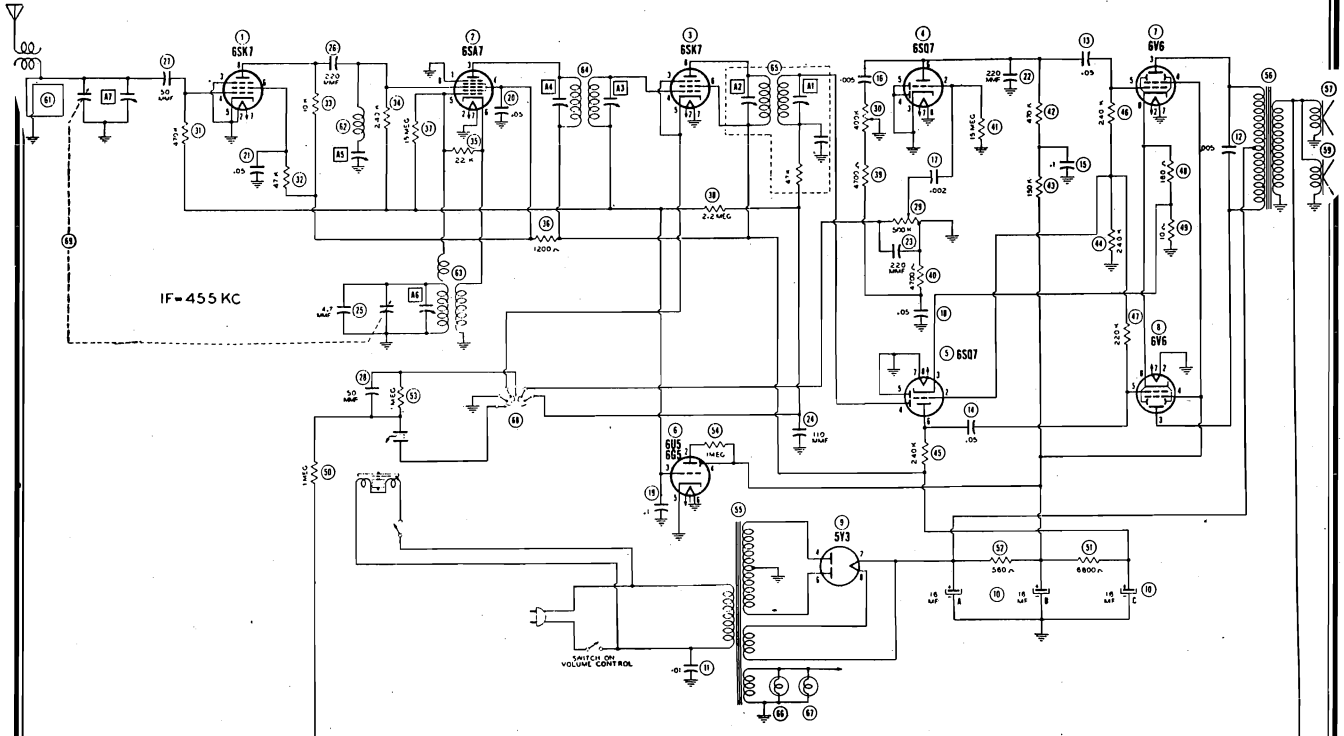
REPLACEMENT PARTS LIST

Symbol	†Part No.	DESCRIPTION	Symbol	†Part No.	DESCRIPTION
C1, C2	900007	Variable Condenser	R2, R20,	351130	470,000 ohms, ½ watt resistor
*C3, C4		Trimmers, part of variable condenser	R22		
C5, C6	928105	7 mmf., 300 volts ceramic condenser	R3	370872	39,000 ohms, 1 watt resistor
C7, C20,	928102	50 mmf., 300 volts ceramic condenser	R4	340650	4,700 ohms, ½ watt resistor
C50			R5	340750	12,000 ohms, ½ watt resistor
C8	928107	30 mmf., 300 volts ceramic condenser	R6	340810	22,000 ohms, ½ watt resistor
C9	900313	1.6-18 mmf., trimmer	R7	397070	18,000 ohms, 2 watt resistor
C10	928109	5000 mmf., ceramic condenser C.T.S.	*R8		510 ohms, resistor, part of L-13
C11, C12,	915003	500 mmf., 300 volts ceramic condenser	R10, R37	370830	27,000 ohms, 1 watt resistor
C22			R11	350290	150 ohms, ½ watt resistor
C13	928106	100 mmf., 300 volts ceramic condenser	*R12		1 meg., ½ watt resistor, part of tuning eye socket cable
C14	928002	10 mmf., 300 volts ceramic condenser	R14, R34	351210	1 meg., ¼ watt resistor
C15, C43	910320	250 mmf., 500 volts mica condenser	R15, R27, R38	351290	2.2 meg., ¼ watt resistor
*C16		Trimmer, part of L-7	R16	350930	68,000 ohms, ½ watt resistor
C17	900026	1—8 mmf., trimmer	R17, R18	340970	100,000 ohms, ½ watt resistor
C18	900314	10—60 mmf., trimmer	R19, R30, R35	340890	47,000 ohms, ½ watt resistor
C19	928101	25 mmf., 300 volts ceramic condenser	R21, R24	351050	220,000 ohms, ½ watt resistor
C21	900012	10—60 mmf., trimmer	R26, R40	394140	180 ohms, 2 watt wirewound resistor
*C23, C24		Trimmers, part of T-1	R28	397000	15 meg., ½ watt resistor
*C25, C26		Trimmers, part of T-2	R29	290081	1 meg., ½ watt tone control
C27, C29,			R31	390004	1 meg., ½ watt volume control
C31, C38,			R32	370890	47,000 ohms, 1 watt resistor
C40, C41,			R33	370730	10,000 ohms, 1 watt resistor
C44, C45,			*R39		27,000 ohms, resistor, part of T-6
C46, C53,			T1	720046	First I.F. transformer F.M.
C62			T2	720045	First I.F. transformer A.M.
C28, C49	920040	.1 mfd., 200 volts tubular paper condenser	T3	708005	Discriminator coil
C32, C33	925006	30—40 mfd., 400 volts dual electrolytic condenser	T4	720049	Third I.F. transformer F.M.
C30, C42			T5	720047	Second I.F. transformer F.M.
C48, C54	920180	.005 mfd., 400 volts tubular paper condenser	T6	720048	Second I.F. transformer A.M.
C34	920514	.001 mfd., 400 volts tubular paper condenser	T7	730011	Power transformer
C35	928013	100 mmf., 300 volts ceramic condenser	T8	734004	Output transformer
*C36, C37		Trimmers, part of T-3	SP1	180023	P.M. speaker
C39	920544	.003 mfd., 600 volts tubular paper condenser	SW1	510018	Band change switch
C47	910120	360 mmf., 400 volts mica condenser	*SW2		On-Off switch, part of R-29
*C51, C52		Trimmers, part of T-4	X2	500500	Power outlet
C55	920060	.05 mfd., 200 volts tubular paper condenser	X3	555004	Terminal strip-speaker
*C56, C57		Trimmers, part of T-5	X4	540540	Pick-up socket
*C58, C59		Trimmers, part of T-6	P1	583204	Line cord and plug
*C60, C61		110 mmf., cond., part of T-6	P2	505005	A.C. plug record changer
V12, V13	807020	Pilot light	P3	580006	Pin terminal leads—speaker
L1	700003	Antenna loop	P4	505040	Connector plug—pick-up
L2	705003	R.F. choke		507001	Dial light socket assembly
L3	710014	Antenna coil F.M.		585210	Tuning eye socket and cable
L4, L10				140144	Cabinet (model 563)
L11, L12	705002	R.F. choke		140187	Cabinet (model 593)
L5	705000	R.F. choke		140229	Cabinet (model 603)
L6	713013	R.F. coil F.M.		620034	Knob for models (603-563)
L7	708001	I.F. wave trap A.M.		620035	Knob for models (603-563)
L8	716112	Oscillator coil F.M.		620094	Knob for model (593)
L9	705007	R.F. choke		620095	Knob for model (593)
L13	705005	Converter plate R.F. choke		819022	Automatic record changer—rotating action record support, or
L14	737002	Filter choke		819039	Automatic record changer—lever action record support
L15	716113	Oscillator coil A.M.		280002	Drive shaft
R1, R9,				280505	Drive shaft for F.M. tuner
R13, R25,	350490	1000 ohms, ½ watt resistor		520002	Dial backplate
R36				520058	Dial face
				525002	Pointer

† Specify part numbers when ordering.

* Not supplied separately.

EMERSON RADIO AND PHONO. CORP. MODELS 573, 583, CHASSIS 120039B



MODELS 573, 583,
CHASSIS 120039B

EMERSON RADIO AND PHONO. CORP.

ALIGNMENT

To set pointer, turn tuning cap. fully closed and set pointer 2-3/8" from left edge of dial backplate. This is the calibration mark referred to below.

Loop should be maintained in same relative position to chassis as when receiver is in cabinet.

Volume control should be at maximum position; output signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1	.1 mfd.	High side to pin 8 (grid) of 6SA7. Low side to chassis.	455KC	Tuning cap. fully open.	Across voice coil.	A1, A2, A3, A4	Adjust for maximum output.
2	.1 mfd.	High side to ext. antenna lead. Low side to chassis.	"	Tuning cap. fully closed.	"	A5	Adjust for minimum output.
3	200 mmf.	"	1400KC	5" from calibration mark.	"	A6	Adjust for maximum output.
4	200 mmf.	"	"	Tune for maximum output.	"	A7	Adjust for maximum output.
5	200 mmf.	"	600KC	"	"		Use adjusting turn in rear of loop. Adjust for max. output.

DESCRIPTION

TYPE: Console A.C. superheterodyne phonoradio with automatic record changer.

FREQUENCY RANGE: 540-1620 K.C.

TYPE OF TUBES:

1-6SK7, r-f amplifier
1-6SA7 converter
1-6SK7, i-f amplifier
1-6SQ7, detector-a.v.c. phase inverter
1-6SQ7, a-f amplifier
1-6U5/6G5, tuning eye (omitted on Model 583)
2-6V6GT, power output
1-5Y3GT, rectifier

POWER SUPPLY: 60 cycle a.c.

VOLTAGE RATING: 105-125 volts

POWER CONSUMPTION: 110 watts

CURRENT DRAIN: .73 amp. at 117 volts a.c.

GENERAL NOTES

1. If replacements are made or the wiring disturbed in the r-f section of the circuit, the receiver should be carefully realigned.

2. The color coding of the i-f transformer leads is as follows:

Grid—green Plate—blue
Grid return—black B+—red

3. The receiver has a self-contained antenna and normally does not require additional antenna or ground connection. For permanent home installations, however, in a location far removed from broadcasting stations, an additional outside antenna may be used. The outside antenna connection should be made to the colored lead at the rear of the cabinet. Ground connection may be used. Connect ground to black lead at rear.

4. The grille-work and tuning eye are omitted on Model 583. Other change noted in parts list.

EMERSON RADIO AND PHONO CORP. MODELS 573, 583 CHASSIS 120039B

INSTRUCTIONS FOR VOLTAGE AND RESISTANCE READINGS

- 1—DC Voltage measurements are at 20,000 ohms per volt;
AC Voltages measured at 1,000 ohms per volt.
- 2—Socket connections are shown as bottom views.
- 3—Measured values are from socket pin to common negative.
- 4—Line voltage maintained at 117 volts for voltage readings.
- 5—Nominal tolerance on component values makes possible a
variance of $\pm 10\%$ in voltage and resistance readings.
- 6—Volume control at maximum, no signal applied for volt-
age measurements.

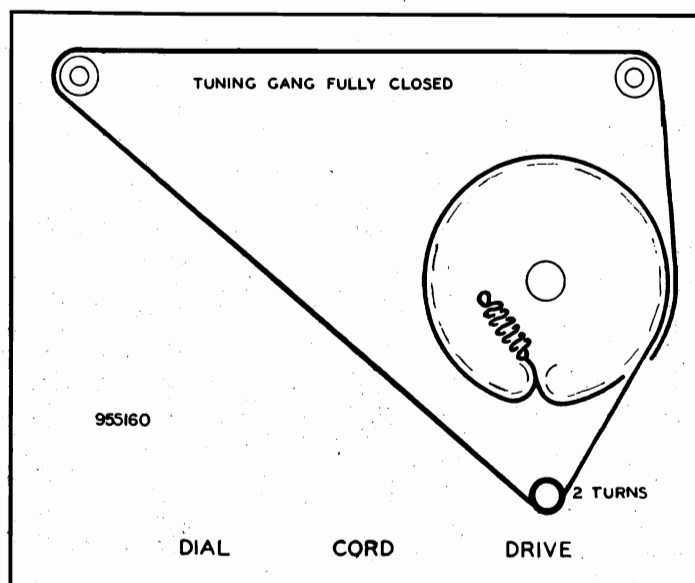
VOLTAGE READINGS

SYMBOL	TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8
1	6SK7	0	0	0	-.3V DC	0	43V DC	6.6V AC	53V DC
2	6SA7	0	6.6V AC	95V DC	80V DC	-.11V DC	0	0	-.2V DC
3	6SK7	0	6.6V AC	0	-.3V DC	0	95V DC	0	95V DC
4	6SQ7	0	-.5V DC	0	0	0	95V DC	6.6V AC	0
5	6SQ7	0	1.1V DC	.7V DC	-.1V DC	0	55V DC	0	6.6V AC
6	6U5/6G5	—	—	—	—	—	—	—	—
7	6V6GT	0	6.6V AC	280V DC	280V DC	0	90V DC	0	15V DC
8	6V6GT	0	0	295V DC	280V DC	0	-.1V DC	6.6V AC	15V DC
9	5Y3GT	0	300V DC	225V DC	300V AC	78V AC	300V AC	.7V DC	300V DC

† Taken with Vacuum Tube Voltmeter.

RESISTANCE READINGS

SYMBOL	TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8
1	6SK7	0 ohm	0 ohm	0 ohm	3.1 meg.	0 ohm	200K ohm	.1 ohm	160K ohm
2	6SA7	0 ohm	.1 ohm	150K ohm	150K ohm	22K ohm	1 ohm	0 ohm	2.9 meg.
3	6SK7	0 ohm	.1 ohm	0 ohm	2.7 meg.	0 ohm	150K ohm	0 ohm	150K ohm
4	6SQ7	0 ohm	15 meg.	0 ohm	0 ohm	0 ohm	770K ohm	.1 ohm	0 ohm
5	6SQ7	0 ohm	240K ohm	10 ohm	550K ohm	0 ohm	370K ohm	0 ohm	.1 ohm
6	6U5/6G5	—	—	—	—	—	—	—	—
7	6V6GT	0 ohm	.1 ohm	150K ohm	150K ohm	460K ohm	150K ohm	0 ohm	190 ohm
8	6V6GT	0 ohm	0 ohm	150K ohm	150K ohm	460K ohm	220K ohm	.1 ohm	190 ohm
9	5Y3GT	inf.	150K ohm	300K ohm	85 ohm	inf.	88 ohm	10 ohm	150K ohm



MODELS 573, 583,
CHASSIS 120039B

EMERSON RADIO AND PHONO. CORP.

REPLACEMENT PARTS LIST

Symbol	†Part No.	DESCRIPTION	Symbol	†Part No.	DESCRIPTION
1	6SK7	RF amplifier	37	397000	AVC network, 15 meg., ½ watt resistor
2	6SA7	Converter	38	351290	AVC network, 2.2 meg., ½ watt resistor
3	6SK7	IF amplifier	39	350650	Tone compensation, 4700 ohms, ½ watt resistor
4	6SQ7	Det.-AVC-phase inverter	40	350650	Tone compensation, 4700 ohms, ½ watt resistor
5	6SQ7	AF amplifier	41	397000	AF grid, 15 meg., ¼ watt resistor
6	6U5/6G5	Tuning eye (omitted on Model 583)	42	351130	AF plate load, 470K ohms, ½ watt resistor
7	6V6GT	Power output	43	351010	AF plate decoupling, 150K ohms, ½ watt resistor
8	6V6GT	Power output	44		Phase inverter grid, 240K ohms, ½ watt resistor
9	5Y3GT	Rectifier	45		Phase inverter plate, 240K ohms, ½ watt resistor
10A	925007	Filter (elect.), 16 mfd., 450 volt condenser	46		Output grid, 240K ohms, ½ watt resistor
B		Filter (elect.), 16 mfd., 450 volt condenser	47	351050	Output grid, 220K ohms, ½ watt resistor
C		Filter (elect.), 16 mfd., 450 volt condenser	48	394140	Output cathode, 180 ohms, 2 watt resistor
11	922020	Line filter, .01 mfd., 400 volt condenser	49	340010	Phase inverter cathode feedback, 10 ohms, ½ watt resistor
12	920230	Output plate bypass, .005 mfd., 600 volt condenser	50	351210	Phono feedback, 1 meg., ½ watt resistor
13	920030	Audio coupling, .05 mfd., 400 volt condenser	51	394002	Filter, 6800 ohms, 5 watt resistor
14	920030	Audio coupling, .05 mfd., 400 volt condenser	52	397001	Filter, 560 ohms, 2 watt resistor
15	920250	AF plate decoupling, .1 mfd., 400 volt condenser on Model 573	53	351210	Series phono, 1 meg., ½ watt resistor
15	920260	AF plate decoupling, .25 mfd., 400 volt condenser on Model 583	54	Part of 585001	Tuning eye plate load, 1 meg., ½ watt resistor
16	920230	Tone compensation, .005 mfd., 600 volt condenser	55	730017	Power transformer
17	920010	Audio coupling, .002 mfd., 600 volt condenser	56	734005	Output transformer
18	920030	Tone compensation, .05 mfd., 400 volt condenser	57	180037	6" x 9" oval speaker (PM)
19	920040	A V C filter, .1 mfd., 200 volt condenser	58		Cone (part of 180037)
20	920030	Decoupling, .05 mfd., 400 volt condenser	59	180037	6" x 9" oval speaker (PM)
21	920030	RF Screen bypass, .05 mfd., 400 volt condenser	60		Cone (part of 180037)
22	910000	AF plate bypass, 220 mmf., 500 volt condenser	61A	700024	Loop antenna
23	910000	Tone compensation, 220 mmf., 500 volt condenser	B		Antenna coupling coil (part of 700024)
24	910010	Diode RF filter, 110 mmf., 500 volt condenser	62	708060	Wave trap
25	923004	Fixed trimmer, 4.7 mmf., 300 volt condenser	63	716050	Oscillator coil
26	910000	RF coupling, 220 mmf., 500 volt condenser	64	720532	Input i-f
27	910250	RF coupling, 50 mmf., 500 volt condenser	65	720533	Output i-f
28	910250	Phono tone compensation, 50 mmf., 500 volt condenser	66	807020	Type 44 pilot lamp
29	390006	Volume control with switch, 500K ohms	67	807020	Type 44 pilot lamp
30	390007	Tone control	68	510002	Radio-phono switch
31	351130	RF grid, 470K ohms, ½ watt resistor	69	900008	2-gang variable capacitor
32	340890	RF screen 47K ohms, ½ watt resistor		520062	Dial crystal
33	340730	RF plate load, 10K ohms, ½ watt resistor		525027	Dial pointer
34		Converter grid, 240K ohms, ½ watt resistor		520130	Dial backplate
35	340810	Oscillator grid, 22K ohms, ½ watt resistor		280004	Drive shaft
36	340510	Decoupling, 1200 ohms, ½ watt resistor		587070	Drive cord spring
				460241	Knob and cover assembly
				505040	Phono pickup plug
				508010	Phono pickup socket
				585001	Tuning socket and cable
				507001	Pilot lamp socket
				583001	Line cord
				555004	Speaker terminal strip
				140141	Mahogany cabinet
				819022	Record changer, or
				819031	Record changer, or
				819039	Record changer

* Not supplied separately.

† Specify part numbers when ordering.



CURRENT DRAIN: .43 amp. at 117 volts a.c.

MODEL 576,
CHASSIS 120069A

EMERSON RADIO AND PHONO. CORP.

ALIGNMENT

To set pointer turn tuning cap. fully closed and set pointer $2\frac{1}{4}$ " from top right edge of dial backplate. This is calibration mark referred to below.

Use isolation transformer if available. If not, connect a .1 mfd. capacitor in series with low side of signal generator and B—.

Volume control should be at maximum position, output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1	.1 mfd.	High side to Pin 7 (grid) of 12BE6. Low side to B—.	455KC	Tuning cap. fully open.	Across voice coil.	A1, A2, A3, A4	Adjust for maximum output. If isolation transformer is not used, reduce dummy ant. to .001 mfd. to reduce hum modulation.
2	200 mmf.	High side to ext. ant. lead. Low side to ext. ground lead.	1600KC	$4\frac{1}{4}$ " from calibration mark.	"	A5	Adjust for maximum output.
3	200 mmf.	" "	1500KC	Tune for maximum output.	"	A6	" " " "

INSTRUCTIONS FOR VOLTAGE AND RESISTANCE READINGS

- 1—DC Voltage measurements are at 20,000 ohms per volt; AC Voltages measured at 1000 ohms per volt.
- 2—Socket connections are shown as bottom views.
- 3—Measured values are from socket pin to common negative.
- 4—Line voltage maintained at 117 volts for voltage readings.
- 5—Nominal tolerance on component values makes possible a variation of $\pm 15\%$ in voltage and resistance readings.
- 6—Volume control at maximum, no signal applied for voltage measurements.

VOLTAGE READINGS

SYMBOL	TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8
1	12BE6	-14V DC†	0	27V AC	13V AC	95V DC	95V DC	1.1V DC	
2	12BA6	-1V DC	0	27V AC	40V AC	95V DC	95V DC	.7V DC	
3	12AT6	-.7V DC	0	0	13V AC	-.6V DC	0	46V DC	
4	50B5	0	5.8V DC	85V AC	40V AC	108V DC	95V DC	0	
5	35W4	0	115V DC	85V AC	117V AC	111V AC	113V AC	115V DC	

† Taken with vacuum tube voltmeter, Radio-Phono switch in radio position.

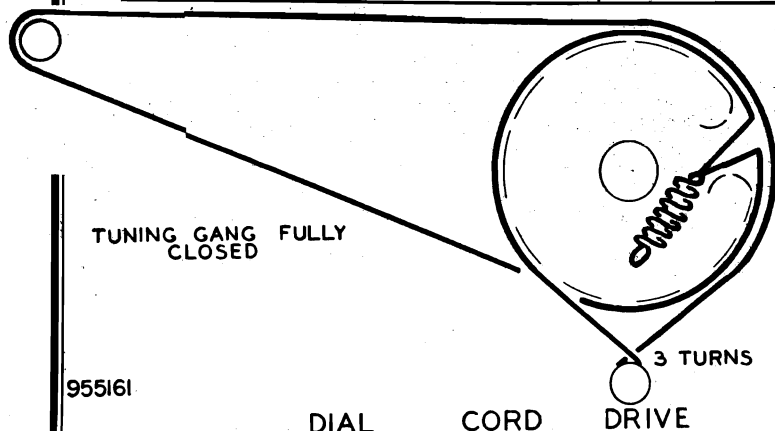
RESISTANCE READINGS

SYMBOL	TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	- PIN 7	PIN 8
1	12BE6	22K ohm	.5 ohm	24 ohm	12 ohm	200K ohm	200K ohm	3.8 meg.	
2	12BA6	3.8 meg.	0 ohm	24 ohm	37 ohm	200K ohm	200K ohm	100 ohm	
3	12AT6	15 meg.	0 ohm	0 ohm	12 ohm	540K ohm	0 ohm	670K ohm	
4	50B5	470K ohm	150 ohm	85 ohm	37 ohm	200K ohm	200K ohm	470K ohm	
5	35W4	inf.	200K ohm	85 ohm	115 ohm	150 ohm	110 ohm	200K ohm	

GENERAL NOTES

1. If replacements are made or the wiring disturbed in the ω -f section of the circuit, the receiver should be carefully realigned.
2. The color coding of the i-f transformer leads is as follows:

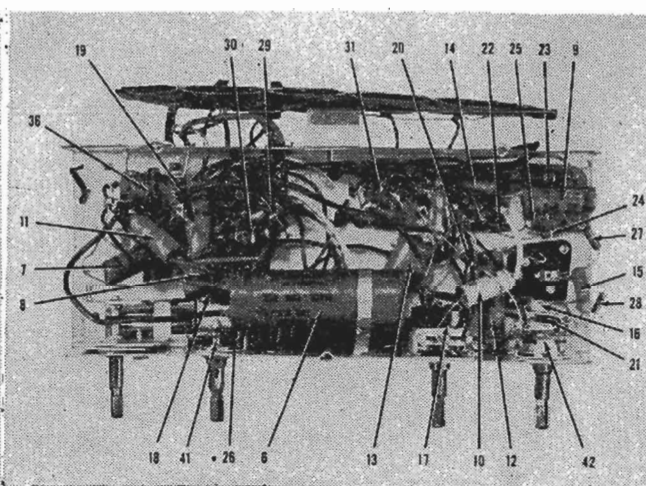
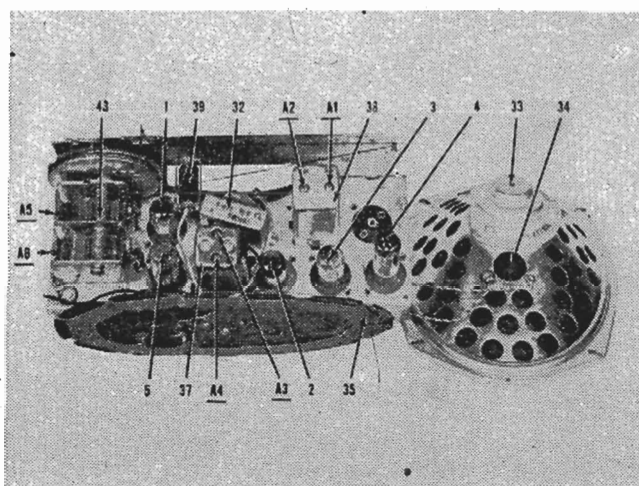
Grid—green	Plate—blue
Grid return—black	B+—red
3. The receiver has a self-contained antenna and does not require additional antenna connections. For permanent home installations, however, if it is desired to improve reception of weak stations, an additional outdoor antenna should be used. For this purpose a lead has been brought out of the rear near the line cord.



955161

EMERSON RADIO AND PHONO. CORP. MODEL 576

CHASSIS 120069A



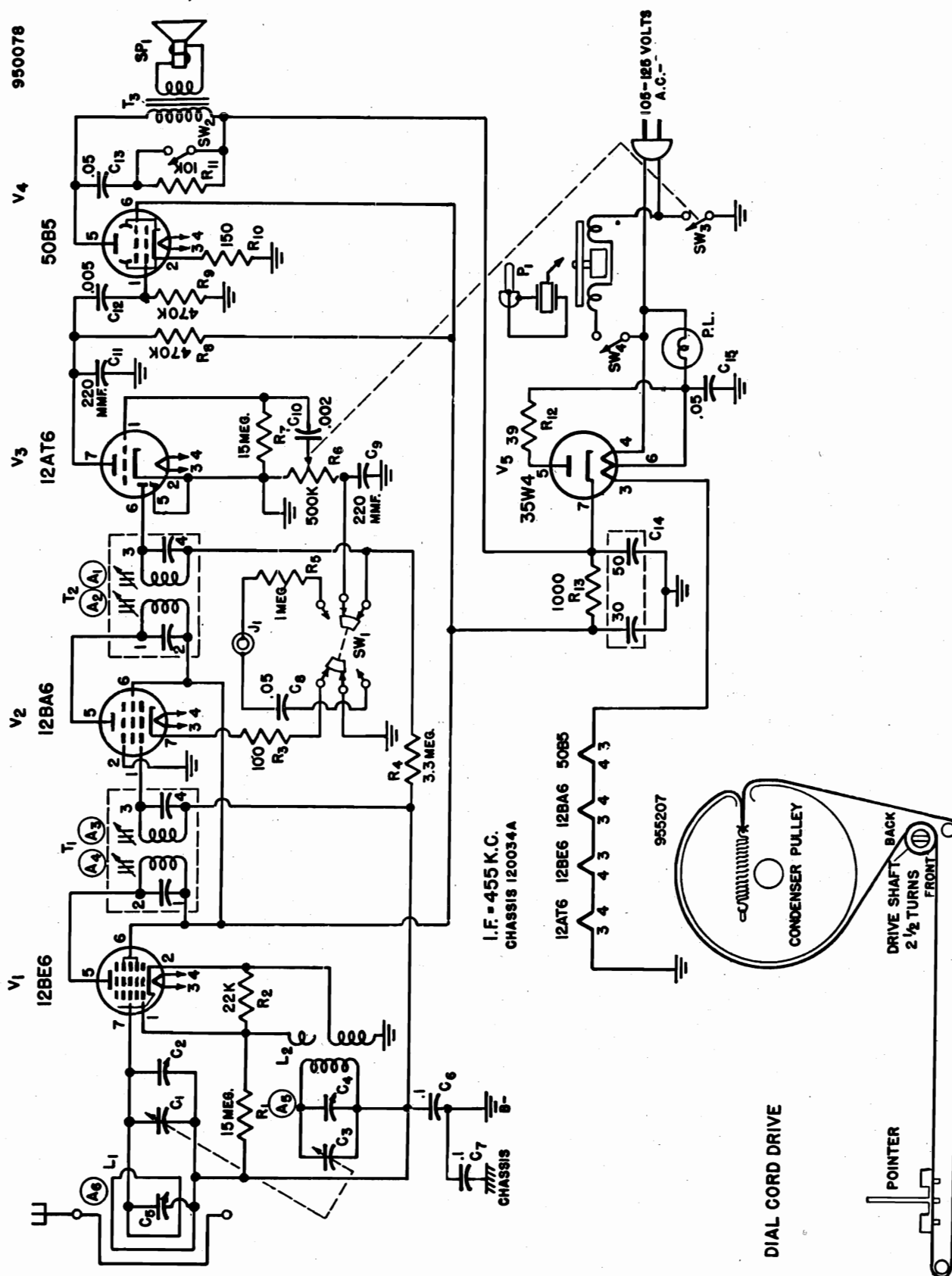
Symbol	†Part No.	DESCRIPTION	Symbol	†Part No.	DESCRIPTION
1	12BE6	Converter	25	340290	Output cathode, 150 ohms, ½ watt resistor
2	12BA6	IF amplifier	26	340650	Tone compensation, 4700 ohms, ½ watt resistor
3	12AT6	Detector - AVC - audio amplifier	27	351290	Feedback, 2.2 megohms, ½ watt resistor
4	50B5	Power output	28	351210	Phono tone compensation, 1.0 megohms, ½ watt resistor
5	35W4	Rectifier	29	370490	Filter, 1000 ohms, ½ watt resistor
6	925012	Filter (elect.), 50-50 mfd., 150 volt condenser	30	370150	Rectifier ballast, 39 ohms, ½ watt resistor
7	920030	Line filter, .05 mfd., 400 volt condenser	31	35150	Line isolation, 220K ohms, ½ watt resistor
8	920030	Tone compensation, .05 mfd., 400 volt condenser	32	734080	Output transformer
9	920020	Audio coupling, .02 mfd., 400 volt condenser	33	180037	6" x 9" oval speaker
10	920010	Audio Coupling, .002 mfd., 600 volt condenser	*34		Cone (part of 180037)
11	920040	AVC filter, .1 mfd., 200 volt condenser	35	700025	Loop antenna
12	920030	Phono isolation, .05 mfd., 400 volt condenser	36	716010	Oscillator coil
13	920050	Line isolation, .2 mfd., 200 volt condenser	37	720220	Input i-f coil
14	910000	Audio plate bypass, 220 mmf., 300 volt condenser	38	720039	Output i-f coil
15	910000	Phono tone compensation, 220 mmf., 300 volt condenser	39	807000	Type 47 pilot lamp
16	910010	Diode r-f filter, 100 mmf., 300 volt condenser	40	L-70	Phono cartridge
17	390042	Volume control with switch, 500K ohm, resistor	41	510120	Tone switch
18	340810	Oscillator grid, 22K ohms, ½ watt resistor	42	510391	Phono-radio switch
19	397000	AVC network, 15 megohms, ½ watt resistor	43	900070	2-gang variable capacitor
20	340250	IF cathode, 100 ohms, ½ watt resistor		520062	Dial glass
21	351330	AVC network, 3.3 megohms, ½ watt resistor		525028	Dial pointer
22	397000	Audio grid, 15 megohms, ½ watt resistor		520061	Dial backplate
23	351130	Audio plate load, 470K ohms, ½ watt resistor		280313	Dial drive shaft
24	351130	Output grid, 470K ohms, ½ watt resistor		587070	Drive cord spring
				520064	Escutcheon
				460470	Plastic knob
				140149	Cabinet, mahogany
				140159	Cabinet, toasted mahogany
				507060	Pilot lamp socket
				508010	Pickup socket
				505040	Pickup plug
				583016	Line cord
				819031	Record changer
				819032	Record changer

* Not supplied separately.

† Specify part numbers when ordering.

MODELS 579, 596,
CHASSIS 120034A

EMERSON RADIO AND PHONO. CORP.



EMERSON RADIO AND PHONO. CORP.

MODELS 579, 596,
CHASSIS 120034A

INSTRUCTIONS FOR VOLTAGE AND RESISTANCE READINGS

1. Voltages are d.c. volts; resistances in ohms unless otherwise indicated.
2. D.c. voltage measurements are at 20,000 ohms-per-volt; a.c. voltages are measured at 1000 ohms-per-volt.
3. Socket connections are shown as bottom viels. Values are measured from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Volume control at maximum; radio-phonograph switch in radio position; no signal applied for voltage measurements.
6. Nominal tolerance on component values makes possible a variation of $\pm 15\%$ in voltage and resistance readings.

VOLTAGE READINGS

SYMBOL	TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7
V1	12BE6	-4.5	0	25 A.C.	13 A.C.	95	96	-1
V2	12BA6	-1	0	25 A.C.	38 A.C.	95	96	.4
V3	12AT6	-5	0	0	13 A.C.	0	-3	42
V4	50B5	0	6.5	82 A.C.	38 A.C.	107	96	NC
V5	35W4	0	NC	82 A.C.	117 A.C.	110 A.C.	112 A.C.	115

RESISTANCE READINGS

SYMBOL	TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7
V1	12BE6	24 K	.5	25	13	80 K	80 K	3 meg.
V2	12BA6	3 meg.	0	25	37	80 K	80 K	100
V3	12AT6	15 meg.	0	0	13	0	600 K	700 K
V4	50B5	550 K	150	82	37	80 K	80 K	Inf.
V5	35W4	0	Inf.	82	110	145	105	80 K

NC—no connection; K—kilohm; meg.—Megohm; Inf.—infinity.

ALIGNMENT INSTRUCTIONS

1. To position pointer, turn variable condenser fully closed and set pointer to reference mark at low-frequency end of dial backplate.
2. Use isolation transformer if available. If not, connect a .1 mfd. condenser in series with low side of signal generator and B—.
3. Volume control should be at maximum position; radio-phonograph switch in radio position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated screw driver for adjusting.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1	.1 mfd.	High side to Pin 7 (grid) of 12BE6. Low side to B—.	455KC	Tuning cond. fully open.	Across voice coil.	A1, A2, A3, A4 (I-f trans. T2 and T1)	Adjust for maximum output. If isolation transformer is not used, reduce dummy ant. to .001 mfd. to reduce hum modulation.
2	200 mmf.	High side to ext. ant. lead. Low side to ext. ground	1600KC	Tuning cond. fully open.	Across voice coil.	A5 (Var. cond. trimmer C4).	Adjust for maximum output.
3		High side to ext. ant. lead. Low side to ext. ground	1400KC	Tune for maximum output.	Across voice coil.	A6 (Loop ant. trimmer C5).	Adjust for maximum output.

DESCRIPTION

TYPE: Single band superheterodyne and automatic record changer.

FREQUENCY RANGE: 540-1620 kc.

TYPE OF TUBES:

- 1—12BE6, pentagrid converter
- 1—12BA6, i-f amplifier
- 1—12AT6, detector, a.v.c., a-f amplifier
- 1—50B5, power output
- 1—35W4, rectifier

POWER SUPPLY: A.C. only, 60 cycles

VOLTAGE RATING: 105-125 volts

POWER CONSUMPTION:

Receiver—30 watts

Phono motor—20 watts

CURRENT DRAIN: 0.24 amp. (for receiver), at 117 volts a.c.

GENERAL NOTES

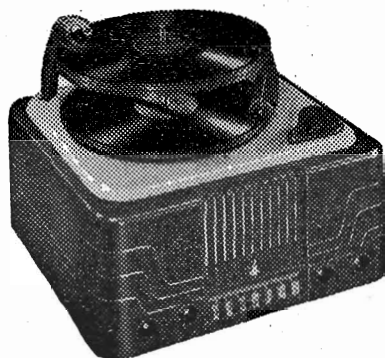
1. If replacements are made or the wiring disturbed in the r-f section of the circuit, the receiver should be carefully realigned.
2. The receiver has a self-contained antenna and does not require an additional antenna. For permanent installations, however, if it is desired to improve reception of weak stations, an additional outdoor antenna may be connected to the white lead (with colored tracer) at the rear of the cabinet. Connect a ground to the black lead, if desired.
3. The self-contained loop antenna has directional properties. It is important, therefore, once a station is tuned in, that the cabinet be rotated back and forth through a quarter-turn and left at that position where maximum volume is obtained.

DISASSEMBLY INSTRUCTIONS

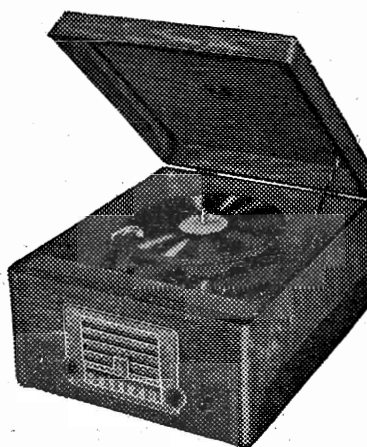
1. Remove four push-on type control knobs
2. Remove four corner cabinet supports
3. Disconnect phono-motor leads by unscrewing wirenut insulators. Remove phono pickup plug from chassis.
4. Remove remaining two screws holding chassis mounting plate to bottom of cabinet. Remove chassis from cabinet.
5. Remove two center screws holding chassis to mounting board.

MODELS 579, 596,
CHASSIS 120034A

EMERSON RADIO AND PHONO. CORP.



MODEL 579



MODEL 596

REPLACEMENT PARTS LIST

Symbol	†Part No.	DESCRIPTION	Symbol	†Part No.	DESCRIPTION
V1	12BE6	Pentagrid converter	R8, R9	351130	470 kilohms, ½ watt resistor
V2	12BA6	I-f amplifier	R10	340290	150 ohms, ½ watt resistor
V3	12AT6	Detector, a.v.c., a-f amplifier	R11	340730	10 kilohms, ½ watt resistor
V4	50B5	Power output	R12	370150	39 ohms, 1 watt resistor
V5	35W4	Rectifier	R13	370490	1000 ohms, 1 watt resistor
C1, C3	900023	Two-gang variable condenser	L1	700035	Loop antenna
C2, C4	*	Trimmer, part of var. condenser	L2	716026	Oscillator coil
C5	*	Trimmer, part of loop antenna	T1, T2	720055	First and second i-f transformers
C6, C7	920040	.1 mfd., 200 volt paper condenser	T3	734023	Output transformer
C8, C13,	920030	.05 mfd., 400 volt paper condenser	SP1	180032H	P.M. speaker
C15			SW1	510027	Radio-phono switch, d.p.d.t.
C9, C11	910000	220 mmf., mica condenser (alternate part 928104) #	SW2	510034	Tone control switch, s.p.s.t.
C10	920515	.002 mfd., 400 volt paper condenser	SW3	*	Line switch, part of volume control
C12	920180	.005 mfd., 400 volt paper condenser	SW4	*	Phono-motor switch, part of record changer
C14	925061	30-50 mfd., 150 volt elect. condenser	P1	505040	Phono pickup plug
R1, R7	351490	15 megohms, ½ watt resistor	J2	508010	Phono pickup socket
R2	340810	22 kilohms, ½ watt resistor		583021	Line cord
R3	340250	100 ohms, ½ watt resistor		819032	Record changer
R4	351330	3.3 megohms, ½ watt resistor			(alternate part 819031) #
R5	351210	1 megohm, ½ watt resistor		807000	Dial light
R6	390024	500 kilohms, volume control		507003	Dial light socket

CABINET AND DIAL PARTS

	520048	Dial backplate		140108	Cabinet, walnut plastic
	525023	Dial pointer		140196	Cabinet, walnut wood
	280035	Drive shaft		450115	Knob, black
	530002	Drive cord (26")		460076B	Speaker grille (Model 596 only)
	587040	Drive cord spring			

† Specify part numbers when ordering.

Replace with part having same number as that removed.

* Not supplied separately.

Note: C9, C10, C11, C12 may be combined in one unit, part No. 470310, on some chassis.

EMERSON RADIO AND PHONO. CORP. MODEL 586, CHASSIS
120023B, 120083B



MODEL: 586

DESCRIPTION

TYPE: Console AM-FM superheterodyne, with automatic record changer.

FREQUENCY RANGE:

Broadcast band (AM)—540-1620 kilocycles.

Frequency modulation band (FM)—88-108 megacycles.

TYPE OF TUBES:

- 1—6BA6 FM r-f amplifier (chassis 120083B only)
- 1—6SB7Y FM and AM converter
- 1—6SG7 FM and AM first i-f amplifier
- 1—6SG7 FM second i-f amplifier
- 1—6SH7 FM limiter
- 1—6S8GT FM discriminator, AM detector, a.v.c., audio amplifier
- 1—6AT6 Phase inverter
- 2—25L6GT Push-pull power output
- 1—25Z6GT Rectifier

POWER SUPPLY: 60 cycle a.c.

VOLTAGE RATING: 105-125 volts

POWER CONSUMPTION: 90 watts

CURRENT DRAIN: 0.77 amp. at 117 volts a.c.

GENERAL NOTES

1. If replacements are made or the wiring disturbed in the r-f section of the circuit, the receiver should be carefully realigned.

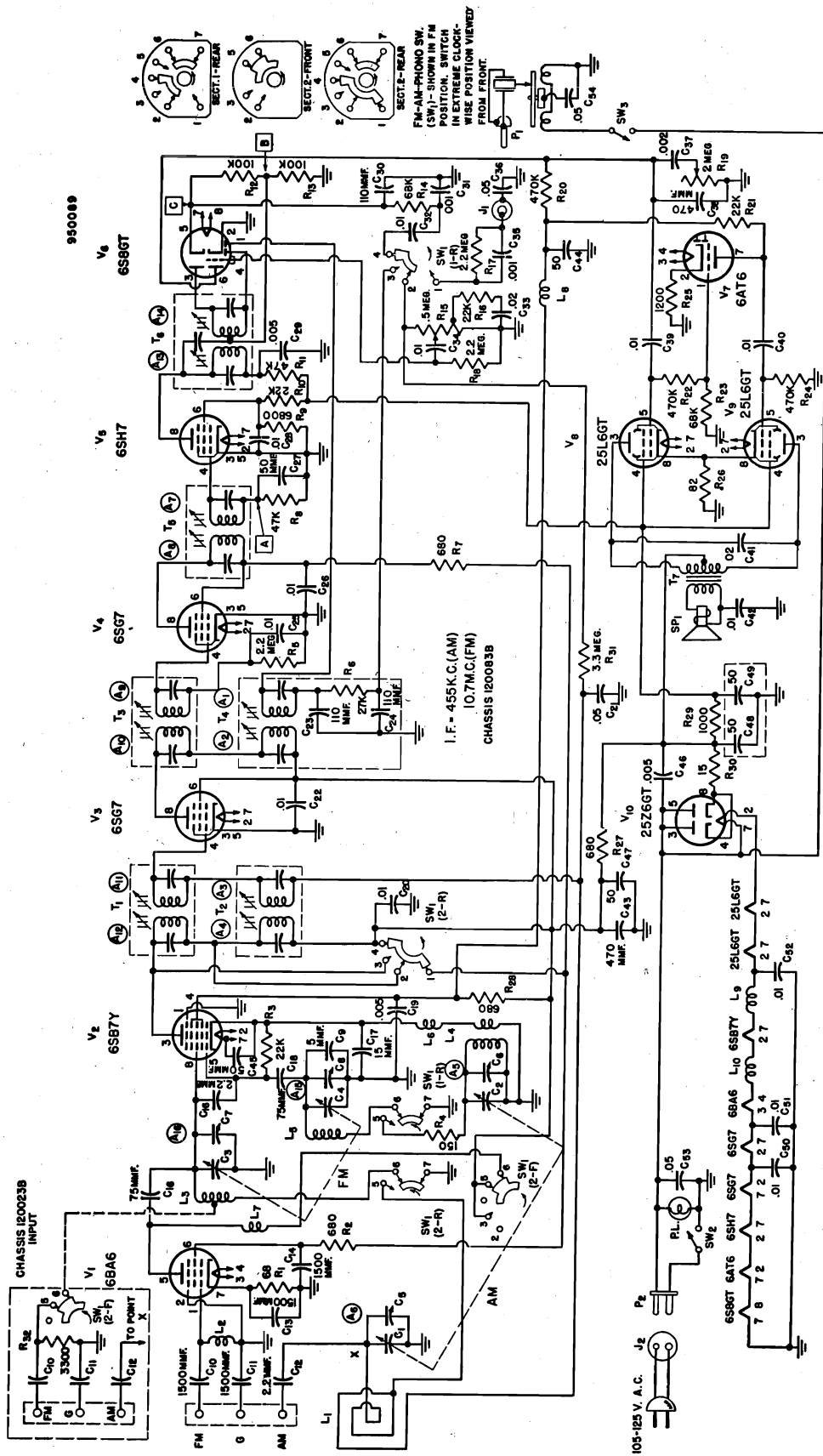
2. A self-contained loop antenna is provided for broadcast band reception. For permanent home installation, however, if it is desired to improve reception of weak stations, an additional outdoor antenna may be used. Connect the outdoor antenna to the screw on the terminal strip marked "AM".
3. An internal power line antenna is provided for FM operation in relatively strong signal areas. The line cord should be completely uncoiled for effective operation of this antenna. An external dipole antenna is recommended for maximum FM operation. To connect the dipole, first remove the chassis cover at the rear of the cabinet. Then remove the wire from the screw on the terminal strip marked "FM" and connect the dipole leads to the "FM" terminal and "G".
4. A ground connection is not required for AM or FM operation.

DISASSEMBLY INSTRUCTIONS

1. Remove four push-on type knobs at front of cabinet.
2. Remove five screws holding chassis cover in place.
3. Remove phono plug at left side of chassis. Unscrew wire nuts from phono motor leads. Disconnect speaker leads.
4. Unfasten interlock socket by removing two screws from mounting bracket.
5. Remove four chassis mounting bolts and carefully withdraw chassis.

MODEL 586, CHASSIS
120023B, 120083B

EMERSON RADIO AND PHONO. CORP.



EMERSON RADIO AND PHONO. CORP.

MODEL 586, CHASSIS
120023B, 120083B

ALIGNMENT INSTRUCTIONS

1. To position pointer, turn variable condenser fully closed and set pointer to reference mark on dial backplate at the low frequency end of the dial.
2. Volume control should be set at maximum position. The output of the signal generator should be no higher than necessary to obtain an output reading. Attenuate the signal input as alignment proceeds. Use an insulated alignment tool for all adjustments.
3. Use isolation transformer if available; otherwise connect a .1 mfd. condenser in series with low side of signal generator to chassis.

AM Alignment

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POSITION	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1	.1 mfd.	High side to Pin 8 (grid) of 6SB7Y. Low side to chassis.	455 KC.	Broadcast	Tuning condenser fully open.	Across voice coil.	A1, A2, (Trans. T4). A3, A4, (Trans. T2).	Adjust for maximum output. Reduce dummy antenna to .001 mfd. if isolation trans. is not used.
2		Loop	1600 KC.	Broadcast	Tuning condenser fully open.	Across voice coil.	A5, (Trimmer cond. C6).	Form loop of several turns of wire. Radiate signal into receiver loop. Adjust for maximum output.
3		Loop	1400 KC.	Broadcast	Tune for max. output.	Across voice coil.	A6, (Trimmer cond. C5).	Adjust for maximum output.

FM I-F and Disc. Alignment Using AM Signal Generator and VTVM

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POSITION	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
1	.01 mfd.	High side to Pin 4 (grid) of 6SG7 2nd i-f (V4). Low side to chassis.	10.7 mc. (Unmodulated)	Frequency modulation	Tuning condenser fully open.	Connect d.c. probe to point "A". Common to chassis.	A7, A8, (Trans. T5).	Adjust for maximum output.
2	.01 mfd.	High side to Pin 4 (grid) of 6SG7 1st i-f (V3). Low side to chassis.	10.7 mc. (Unmodulated)	Frequency modulation	Tuning condenser fully open.	Connect d.c. probe to point "A". Common to chassis.	A9, A10, (Trans. T3).	Adjust for maximum output.
3	.01 mfd.	High side to Pin 5 (osc. grid) of 6SB7Y conv. (V2). Low side to chassis.	10.7 mc. (Unmodulated)	Frequency modulation	Tuning condenser fully open.	Connect d.c. probe to point "A". Common to chassis.	A11, A12, (Trans. T1).	Adjust for maximum output.
4	.01 mfd.	High side to Pin 4 (grid) of 6SG7 2nd i-f (V4). Low side to chassis.	10.7 mc. (Unmodulated)	Frequency modulation	Tuning condenser fully open.	Connect d.c. probe to point "B". Common to chassis.	A13, (Trans. T6).	Adjust for maximum output.
5	.01 mfd.	"	10.7 mc. (Unmodulated)	Frequency modulation	Tuning condenser fully open.	Connect d.c. probe to point "C". Common to chassis.	A14, (Trans. T6).	Adjust for zero output. Continue with FM r-f alignment.

FM I-F and Disc. Alignment Using Sweep Signal Generator and Oscilloscope.

Use frequency modulated signal, with 60 cycle modulation and 450 kc. sweep. Use 120 cycle sawtooth sweep voltage in oscilloscope for horizontal deflection.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POSITION	RADIO DIAL SETTING	CONNECT OSCILLOSCOPE	ADJUST	REMARKS
1	.01 mfd.	High side to Pin 4 (grid) of 6SG7 1st i-f (V3). Low side to chassis.	10.7 mc. (Unmodulated).	Frequency modulation	Tuning condenser fully open.	Vertical input to Point "A". Ground to chassis.	A7, A8, (Trans. T5). A9, A10, (Trans. T3).	Adjust for maximum output (height) and symmetry as per i-f alignment curve shown (page 5).
2	.01 mfd.	High side to Pin 5 (osc. grid) of 6SB7Y conv. (V2). Low side to chassis.	10.7 mc. (Unmodulated).	Frequency modulation	Tuning condenser fully open.	Vertical input to Point "A". Ground to chassis.	A11, A12, (Trans. T1).	Adjust for maximum output (height) and symmetry as per i-f alignment curve shown (page 5).
3	.01 mfd.	High side to Pin 4 (grid) of 6SG7 2nd i-f (V4). Low side to chassis.	10.7 mc. (Unmodulated).	Frequency modulation	Tuning condenser fully open.	Vertical input to Point "C". Ground to chassis.	A13, A14, (Trans. T6).	Alternately adjust A13 for maximum amplitude and A14 for maximum straightness of cross-over lines, with cross-over occurring at center of pattern as per discriminator alignment curve (page 5). Continue with FM r-f alignment.

FM R-F Alignment

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POSITION	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
1	150 ohm resistor in series with each gen. lead.	High side to FM ant. term. Low side to chassis.	108.0 mc. (Unmodulated).	Frequency modulation	Tuning condenser fully open (108.0 mc.)	Connect d.c. probe to point "A". Common to chassis.	A15, (Trimmer cond. C8).	Adjust for maximum output.
2	"	"	106.0 mc.	Frequency modulation	Tune for maximum output.	"	A16, (Trimmer cond. C7).	Adjust for maximum output.

MODEL 586, CHASSIS
120023B, 120083B

EMERSON RADIO AND PHONO. CORP.

INSTRUCTIONS FOR VOLTAGE AND RESISTANCE READINGS

1. Voltage readings are in d.c. volts and resistance readings in ohms, unless otherwise specified.
2. D.c. voltage measurements are made at 20,000 ohms-per-volt and a.c. voltages are measured at 1000 ohms-per-volt.
3. Socket connections are shown as bottom views. Values are measured from socket pin to common negative.
4. Line voltage maintained at 117 volts a.c. for voltage readings.
5. Nominal tolerance on component values makes possible a variation of $\pm 15\%$ in readings.
6. Volume control at maximum, with no signal applied and bandswitch in broadcast position (unless otherwise noted), for voltage measurements.

VOLTAGE READINGS

SYMBOL	TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8	CAP
V1	6BA6	0	0	37AC	31AC	82*	80*	.7*	—	—
V2	6SB7Y	0	37AC	100	92	-.5	0	44AC	-.5	—
V3	6SG7	0	95	0	0	0	95	31AC	95	—
V4	6SG7	0	25AC	0	-.4	0	78*	19AC	78*	—
V5	6SH7	0	12AC	0	0	0	22	19AC	45	—
V6	6S8GT	-.5	0	0	0	5.5*	42	0	6AC	-.7
V7	6AT6	0	.8	6AC	12AC	0	0	74	—	—
V8	25L6GT	89	44AC	107	100	0	110	70AC	7.6	—
V9	25L6GT	0	70AC	107	100	0	74	95AC	7.6	—
V10	25Z6GT	107	95AC	117AC	107	117AC	83	117AC	107	—

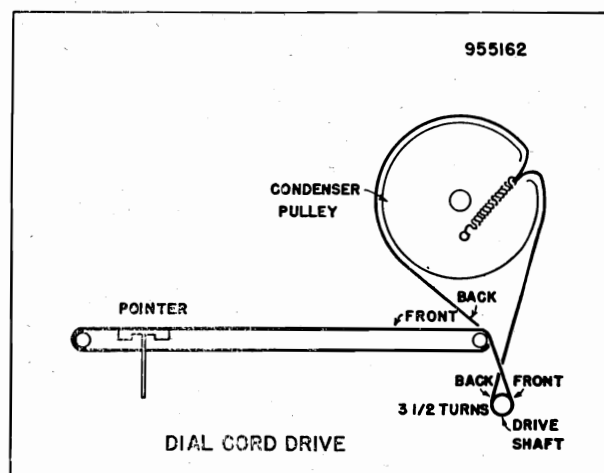
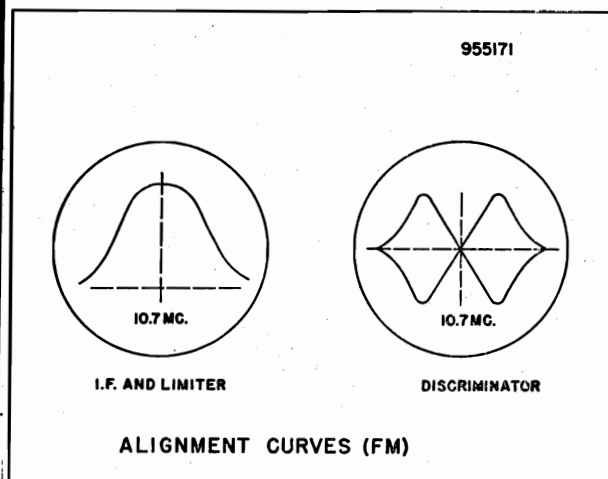
RESISTANCE READINGS

SYMBOL	TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8	CAP
V1	6BA6	0	0	26	20	30K*	30K*	68	—	—
V2	6SB7Y	0	29	30K	33K	25K	1	30	0	—
V3	6SG7	0	22	0	4 meg.	0	30K	26	30K	—
V4	6SG7	0	22	0	2 meg.	0	30K*	15	30K*	2.2 meg.
V5	6SH7	0	10	0	46K	0	8K	15	80K	—
V6	6S8GT	450K	0	100K	100K	200K	550K	0	5	—
V7	6AT6	68K	1200	5	10	Inf.	Inf.	50K	—	—
V8	25L6GT	30K	35	30K	30K	500K	30K	51	90	—
V9	25L6GT	Inf.	51	30K	30K	500K	65K	68	90	—
V10	25Z6GT	30K	68	86	30K	86	30K	86	40K	—

NC—No connection; * for bandswitch in FM position only

K—kilohms; meg.—megohms; Inf.—infinity

NOTE: Chassis 120023B does not contain the r-f amp. V1, (6BA6). Voltage and resistance measurements are substantially the same as chassis 120083B.



**EMERSON RADIO AND PHONO. CORP. MODEL 586, CHASSIS
120023B, 120083B**

REPLACEMENT PARTS LIST

Symbol	†Part No.	DESCRIPTION	Symbol	†Part No.	DESCRIPTION
V1	6BA6	FM r-f amplifier (Chassis 120083B only)	R6	340830	27 kilohms, $\pm 10\%$, $\frac{1}{2}$ watt resistor (may be part of i-f trans. T4)
V2	6SB7Y	FM and AM converter	R7	350450	680 ohms, $\frac{1}{2}$ watt resistor
V3	6SG7	FM and AM 1st i-f amplifier	R8	340890	47 kilohms, $\pm 10\%$, $\frac{1}{2}$ watt resistor
V4	6SG7	FM 2nd i-f amplifier	R9	340690	6800 ohms, $\pm 10\%$, $\frac{1}{2}$ watt resistor
V5	6SH7	FM limiter	R11	350890	47 kilohms, $\frac{1}{2}$ watt resistor
V6	6S8GT	FM disc., AM detector, a.v.c., audio amplifier	R12, R13	340970	100 kilohms, $\pm 10\%$, $\frac{1}{2}$ watt resistor
V7	6AT6	Phase inverter	R14, R23	350930	68 kilohms, $\frac{1}{2}$ watt resistor
V8	25L6GT	Power output	R15	390057	.5 megohms, tapped volume control
V9	25L6GT	Power output	R16, R21	350810	22 kilohms, $\frac{1}{2}$ watt resistor
V10	25Z6GT	Rectifier	R19	390046	2 megohms, tone control
C1, C2	900046	Two gang, four section variable condenser	R20, R22,	351130	470 kilohms, $\frac{1}{2}$ watt resistor
C3, C4	*	Trimmers, part of C1, C2, C3, C4	R24		
C5, C6, C7, C8			R25	340510	1200 ohms, $\pm 10\%$, $\frac{1}{2}$ watt resistor
C9	928023	5 mmf., ceramic condenser	R26	370230	82 ohms, $\pm 10\%$, $\frac{1}{2}$ watt resistor
C10, C11, C13, C14	928006	1500 mmf., ceramic condenser	R27	370450	680 ohms, $\pm 10\%$, 1 watt resistor
C15, C18	928015	75 mmf., ceramic condenser	R29	340490	1000 ohms, $\pm 10\%$, $\frac{1}{2}$ watt resistor
C16	915005	2.2 mmf., molded condenser	R30	380050	15 ohms, $\pm 10\%$, $\frac{1}{2}$ watt resistor
C17	928016	15 mmf., ceramic condenser	R31	351330	3.3 megohms, $\frac{1}{2}$ watt resistor
C19, C29	928109	.005 mfd., ceramic condenser	R32	350610	3300 ohms, $\frac{1}{2}$ watt resistor
C20, C22, C25, C26, C28, C32	920092	.01 mfd., 200 volt paper cond.	L1	700011	AM loop antenna
C21	920060	.05 mfd., 200 volt paper condenser	L2	710019	FM antenna coil
C23, C24	*	110 mmf., part of i-f trans. T4	L3	713008	FM r-f coil
C27	928102	50 mmf., $\pm 10\%$, ceramic condenser	L4	716015	AM oscillator coil
C30	910010	110 mmf., mica condenser	L5	716013	FM oscillator coil
C31, C35	920514	.001 mfd., 400 volt paper condenser	L6, L7	705002	FM oscillator choke
C33	920100	.02 mfd., 200 volt paper condenser	L8	—	R.f. choke, plate supply
C34, C39	920090	.01 mfd., 400 volt paper condenser	L9, L10	705011	R.f. choke, filament
C40, C42, C50, C51			T1	720024	First i-f trans. (FM) (Alt. part 720067) #
C52			T2	720031	First i-f trans. (AM) (Alt. part 720075) #
C36, C53	920030	.05 mfd., 400 volt paper condenser	T3	720025	Second i-f trans. (FM) (Alt. part 720067) #
C37	920515	.002 mfd., 400 volt paper condenser	T4	720032	Second i-f trans. (AM) (Alt. part 720076) #
C38, C43	910014	470 mmf., mica condenser	T5	720026	Third i-f trans. (FM) (Alt. part 720067) #
C41	920020	.02 mfd., 400 volt paper condenser	T6	708005	Discriminator trans. (FM) (Alt. parts 708012, 708013) #
C44, C47	925067	50-50 mfd., 150 volt elect. condenser	T7	734028	Output transformer
C45	928014	50 mmf., ceramic condenser	SW1	510038	Three position, band-phonos switch
C46	920180	.005 mfd., 400 volt paper condenser	SW2	*	Line switch, part of vol. control
C48, C49	925101	50-50 mfd., 150 elect. condenser	SW3	*	Phono switch, part of changer
C54	922101	.05 mfd., 400 volt molded condenser	SP1	180042	P.m. speaker, 12"
R1	340210	68 ohms, $\pm 10\%$, $\frac{1}{2}$ watt resistor	P1	505040	Phono pickup plug
R2, R28	340450	680 ohms, $\pm 10\%$, $\frac{1}{2}$ watt resistor	J1	508100	Phono pickup socket
R3, R10	340810	22 kilohms, $\pm 10\%$, $\frac{1}{2}$ watt resistor	P2	508008	Line cord interlock socket
R4	350290	150 ohms, $\frac{1}{2}$ watt resistor	J2	500005	Line cord connector plug
R5, R17, R18	351290	2.2 megohms, $\frac{1}{2}$ watt resistor		583202	Line cord and internal antenna
				807003	Dial light, 115 volts, 10 watts
				507008	Dial light socket

CABINET AND DIAL PARTS

Symbol	†Part No.	DESCRIPTION	Symbol	†Part No.	DESCRIPTION
	140181	Cabinet (for 819039 changer). (Alt. part 140233 for 819044 changer)		460041	Knob, black, push-on, indicator type
	560054	Cabinet back		520071	Dial crystal
	819039	Record changer (GI type 700 FS) (Alt. part 819044, Webster type 146)		410177	Dial backplate
				280039	Dial drive shaft
	460470	Knob, black push-on		530002	Dial drive cord (44")
				587070	Dial cord spring
				525017	Pointer

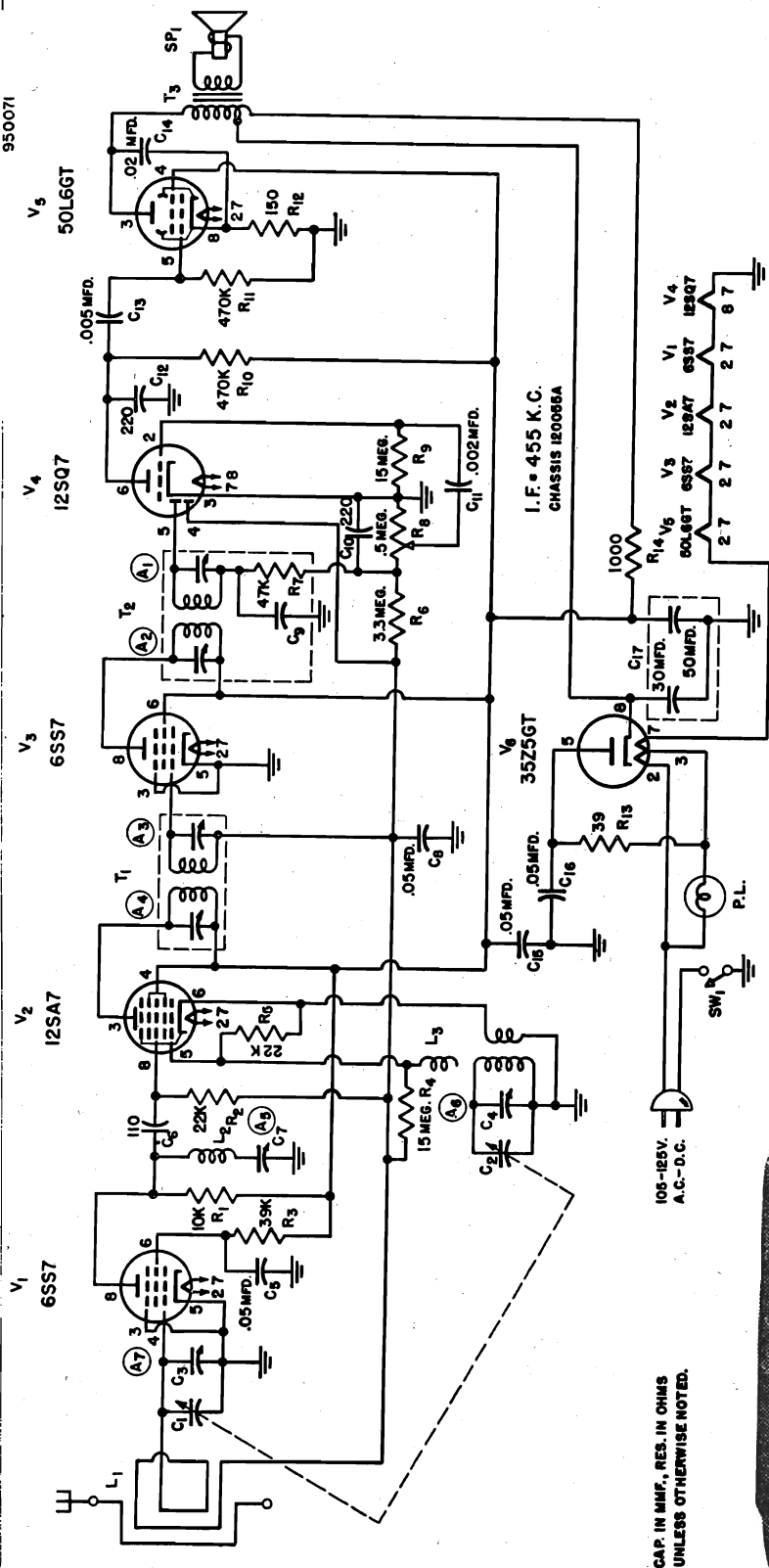
† Specify part numbers when ordering.

* Not supplied separately.

Replace with part having same number as that removed.

MODEL 591,
CHASSIS 120055A

EMERSON RADIO AND PHONO. CORP.



GENERAL NOTES

1. If replacements are made or the wiring disturbed in the r-f section of the circuit, the receiver should be carefully realigned.
2. The receiver has a self-contained antenna and does not require additional antenna connections. For permanent home installations, however, if it is desired to improve reception of weak stations, an additional outdoor antenna may be used. For this purpose a lead has been brought out of the rear near the line cord.
3. The self-contained loop antenna has directional properties. It is important, therefore, once the station is tuned in, that the cabinet be rotated on its base back and forth through a quarter of a circle (90 degrees), and left at the position where the station is received with maximum volume.
4. The color coding of the i-f transformer leads is as follows:
Plate—blue
Grid return—black
Grid—green

DESCRIPTION

TYPE: Single band (AM) superheterodyne
FREQUENCY RANGE: 540-1620 kc.

TYPES OF TUBES:

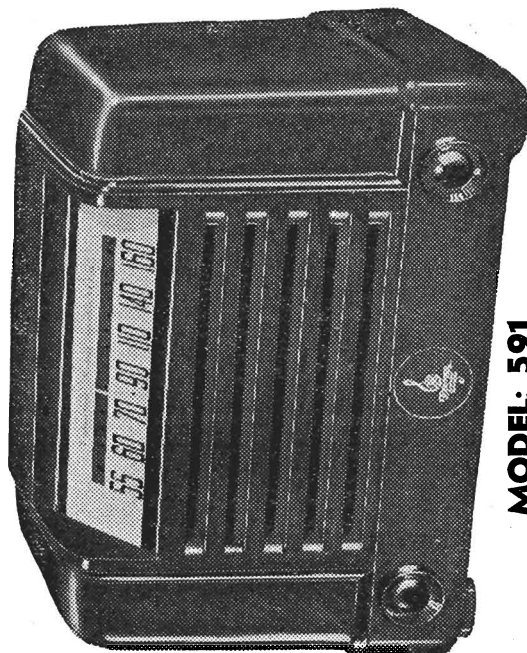
- 1—6SS7 r-f amplifier
- 1—12SA7 converter
- 1—6SS7 i-f amplifier
- 1—12SQ7 detector, a.v.c., audio amplifier
- 1—50L6GT power output
- 1—35Z5GT rectifier

POWER SUPPLY: A.c. or d.c.

VOLTAGE RATING: 105-125 volts

POWER CONSUMPTION: 30 watts

CURRENT DRAIN: 0.24 amp. at 117 volts a.c.



MODEL: 591

EMERSON RADIO AND PHONO. CORP.

MODEL 591,
CHASSIS 120055A

INSTRUCTIONS FOR VOLTAGE AND RESISTANCE READINGS

1. Voltages are in volts d.c.; resistances in ohms unless otherwise specified.
2. D.c. voltage measurements are at 20,000 ohms-per-volt; a.c. voltages measured at 1000 ohms-per-volt.
3. Socket connections are shown as bottom views.
4. Measured values are from socket pin to common negative (chassis).
5. Line voltage maintained at 117 volts for voltage readings.
6. Nominal tolerance on component values makes possible a variation of $\pm 15\%$ in voltage and resistance readings.
7. Volume control at maximum with no signal applied, for voltage measurements.

VOLTAGE READINGS

SYMBOL	TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8
V1	6SS7	0	19 AC	0	-.6	0	55	12 AC	50
V2	12SA7	0	31 AC	83	85	-.4.5	0	19 AC	-.5
V3	6SS7	0	37 AC	0	-.6	0	85	31 AC	83
V4	12SQ7	0	-.9	0	-.4	0	52	0	12 AC
V5	50L6GT	NC	87 AC	100	85	0	NC	37 AC	5.8
V6	35Z5GT	NC	117 AC	113 AC	106	112 AC	NC	87 AC	106

RESISTANCE READINGS

SYMBOL	TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8
V1	6SS7	0	26	0	2.8 meg.	0	100 K	19	60 K
V2	12SA7	0	40	45 K	45 K	25 K	0	26	2.8 meg.
V3	6SS7	0	47	0	2.8 meg.	0	45 K	40	45 K
V4	12SQ7	0	15 meg.	0	2.8 meg.	600 K	540 K	0	19
V5	50L6GT	Inf.	110	45 K	45 K	450 K	Inf.	47	150
V6	35Z5GT	Inf.	160	150	45 K	190	Inf.	110	45 K

NC = no connection; K = kilohm; meg. = megohm; Inf. = infinity

ALIGNMENT PROCEDURE

1. To set pointer, turn variable condenser fully closed and set pointer at mark near left end of dial backplate.
2. Use isolation transformer if available. If not, connect a 0.1 mfd. condenser in series with low side of signal generator and chassis.
3. Volume control should be at maximum position; output of signal generator should be no higher than necessary to obtain an output reading.
4. Use an insulated alignment screwdriver for adjusting.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1	0.1 mfd.	High side to pin 8 (grid) of 12SA7 (V2). Low side to chassis.	455 KC.	Variable condenser fully open.	Across voice coil.	A1, A2 (2nd i-f trans. T2). A3, A4 (1st i-f trans. T1).	Adjust for maximum output. If isolation transformer is not used, reduce dummy antenna to .001 mfd. to reduce hum modulation.
2	0.1 mfd.	High side to external antenna lead. Low side to chassis.	455 KC.	Variable condenser fully open.	Across voice coil.	A5 (Trimmer) cond. C7).	Adjust for minimum output.
3	200 mmf.	"	1620 KC.	Variable condenser fully open.	Across voice coil.	A6 (Trimmer) cond. C4).	Adjust for maximum output.
4	200 mmf.	"	1400 KC.	Tune for maximum output.	Across voice coil.	A7 (Trimmer) cond. C3).	Adjust for maximum output.

MODEL 591,
CHASSIS 120055A

EMERSON RADIO AND PHONO. CORP.

REPLACEMENT PARTS LIST

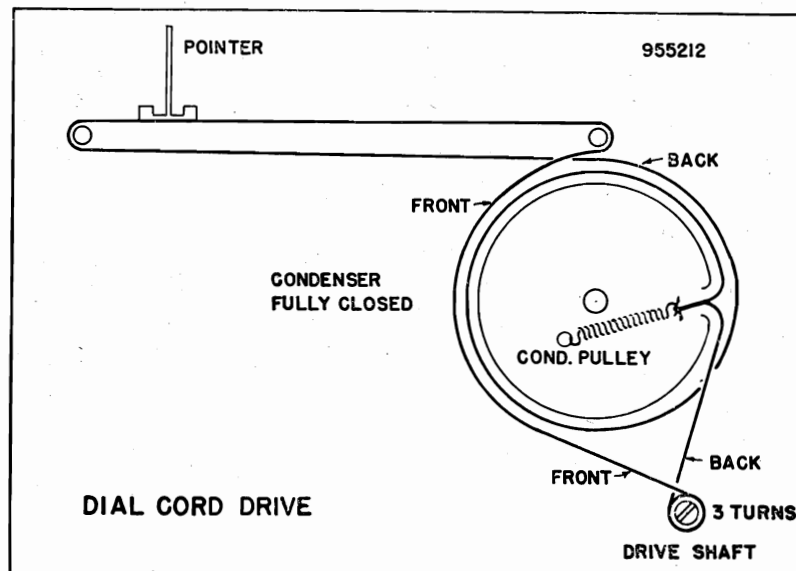
Symbol	†Part No.	DESCRIPTION	Symbol	†Part No.	DESCRIPTION
V1	6SS7	R-f amplifier	R4, R9	351490	15 megohms, ½ watt resistor
V2	12SA7	Converter	R5	*	22 kilohms, part of L3
V3	6SS7	I-f amplifier	R6	351330	3.3 megohms, ½ watt resistor
V4	12SQ7	Detector, a.v.c., audio amplifier	R7	*	47 kilohms, part of T2
V5	50LGGT	Power output	R8	390053	.5 megohms, volume control
V6	35Z5GT	Rectifier	R10, R11	351130	470 kilohms, ½ watt resistor
C1, C2	900037	Two-gang variable condenser	R12	340290	150 ohms, ½ watt resistor
C3, C4	*	Trimmers, part of var. cond.	R13	370150	39 ohms, 1 watt resistor
C5, C8	920060	.05 mfd., 200 volt paper cond.	R14	370490	1000 ohms, 1 watt resistor
C6	910010	110 mmf., mica condenser	L1	700033	Loop antenna
C7	*	Trimmer, part of wave trap L2	L2	708060	Wave trap
C9	*	Part of 2nd i-f trans. T2	L3	716024	Oscillator coil
C10, C11,	470310	220 mmf.—.002 mfd.—220 mmf.—	T1	720058	First i-f transformer
C12, C13		.005 mfd. coupling cond. assembly	T2	720390	Second i-f transformer
C14	920020	.02 mfd., 200 volt paper cond.	T3	734046	Output transformer
C15, C16	920030	.05 mfd., 400 volt paper cond.	SP1	180043	P.m. speaker, 4"
C17	925104	30-50 mfd., 150 volt elect. cond.	SW1	*	Line switch, part of vol. control
R1	340730	10 kilohms, ½ watt resistor	P.L.	807000	Dial light
R2	340810	22 kilohms, ½ watt resistor		507060	Dial light socket
R3	340870	39 kilohms ½ watt resistor		583070	Line cord

CABINET AND DIAL PARTS

†Part No.	
140210	Cabinet, walnut plastic
140213	Cabinet, ivory plastic
560190	Cabinet back
460470	Knob, black
525035	Pointer
520076	Dial glass
520078	Dial back plate
280313	Dial drive shaft
530002	Dial drive cord (39")
587070	Dial drive spring

† Specify part numbers when ordering.

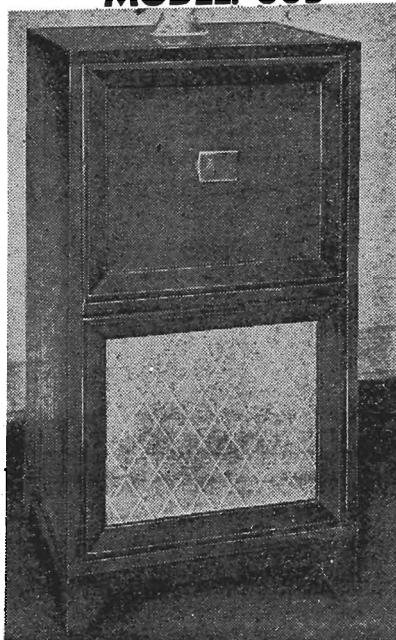
* Not supplied separately.





1. Remove four push-on type knobs at front of cabinet.
2. Remove chassis cover at rear of cabinet.
3. Disconnect speaker and phono-motor leads. Remove phono plug.
4. Remove chassis mounting bolts and carefully withdraw chassis.

MODEL: 605



TYPE: Consolette AM-FM superheterodyne, with automatic record changer.

FREQUENCY RANGE:

Broadcast band (AM)—540-1620 kilocycles.

Frequency modulation band (FM)—88.108 megacycles.

TYPE OF TUBES:

- 1—12BA6 FM r-f amplifier
- 1—12BA7 FM and AM converter
- 1—12BA6 FM and AM first i-f amplifier
- 1—12BA6 FM second i-f amplifier
- 1—12AU6 FM limiter
- 1—19T8 FM discriminator, AM detector, a.v.c., audio amplifier
- 1—35B5 Power output
- 1—Selenium rectifier

POWER SUPPLY: 60 cycle a.c.

VOLTAGE RATING: 105-125 volts

POWER CONSUMPTION: 90 watts

CURRENT DRAIN: 0.77 amp. at 117 volts a.c.

GENERAL NOTES

1. If replacements are made or the wiring disturbed in the r-f section of the circuit, the receiver should be carefully realigned.
2. A self-contained loop antenna is provided for broadcast band reception. For permanent home installation, however, if it is desired to improve reception of weak stations, an additional outdoor antenna may be used. Connect the the outdoor antenna to the screw on the loop terminal strip marked "AM".
3. An internal power line antenna is provided for FM operation in relatively strong signal areas. The line cord should be completely uncoiled for effective operation of this antenna. An external dipole antenna is recommended for maximum FM operation. To connect the dipole, first remove the wire from the screw on the loop terminal strip marked "FM" and connect the dipole leads to the "FM" terminal and "G".
4. A ground connection is not required for AM and FM operation.

MODEL 605,
CHASSIS 120076B

EMERSON RADIO AND PHONO. CORP.

INSTRUCTIONS FOR VOLTAGE AND RESISTANCE READINGS

1. Voltages readings are in d.c. volts and resistance readings in ohms, unless otherwise specified.
2. D.c. voltage measurements are made at 20,000 ohms-per-volt and a.c. voltages are measured at 1000 ohms-per-volt.
3. Socket connections are shown as bottom views. Values are measured from socket pin to common negative.
4. Line voltage maintained at 117 volts a.c. for voltage readings.
5. Nominal tolerance on component values makes possible a variation of $\pm 15\%$ in readings.
6. Volume control at maximum, with no signal applied and bandswitch in broadcast position (unless otherwise noted), for voltage measurements.

VOLTAGE READINGS

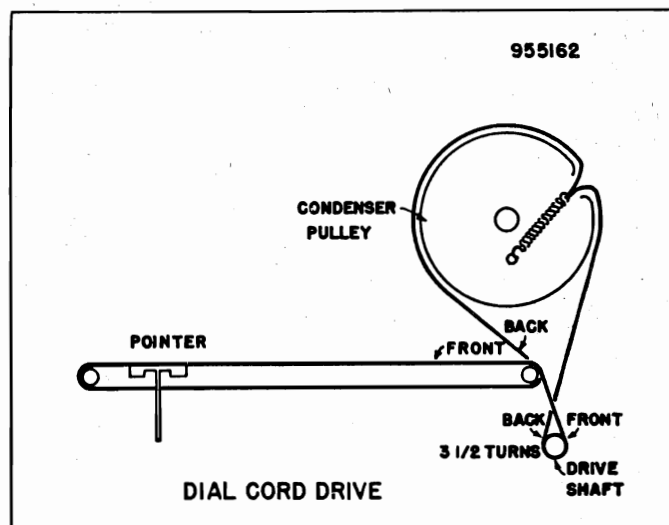
SYMBOL	TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8	PIN 9
V1	12BA6	0	0	80AC	67AC	76*	78*	.8*	—	—
V2	12BA7	100	-.5	0	67AC	55AC	0	-.5	0	95
V3	12BA6	-.2	0	55AC	43AC	93	98	0	—	—
V4	12BA6	0	0	43AC	30AC	70*	70*	.6*	—	—
V5	12AU6	-.4	0	30AC	18AC	50	50	0	—	—
V6	19T8	-.5	-.4	5.5*	18AC	0	-.8	0	-.5	33
V7	35B5	0	6	117AC	80AC	132	100	NC	—	—

NC denotes "no connection"; * for bandswitch in FM position only.

RESISTANCE READINGS

SYMBOL	TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8	PIN 9
V1	12BA6	0	0	16	12	65K*	65K*	66	—	—
V2	12BA7	65K	24K	1	56	75	0	0	0	65K
V3	12BA6	2.8 meg.	0	56	44	65K	65K	0	—	—
V4	12BA6	68	0	44	32	65K	65K	68	—	—
V5	12AU6	100K	0	32	20	65K	65K	0	—	—
V6	19T8	90K	90K	150K	20	0	1 meg.	0	4 meg.	550K
V7	35B5	400K	190	112	80	65K	65K	NC	—	—

K—Kilohms; meg.—megohms.



EMERSON RADIO AND PHONO. CORP.

MODEL 605,
CHASSIS 120076B

ALIGNMENT INSTRUCTIONS

1. To position pointer, turn variable condenser fully closed and set pointer to reference mark on dial backplate at the low frequency end of the dial.
2. Volume control should be set at maximum position. The output of the signal generator should be no higher than necessary to obtain an output reading. Attenuate the signal input as alignment proceeds. Use an insulated alignment tool for all adjustments.
3. Use isolation transformer if available; otherwise connect a .1 mfd. condenser in series with low side of signal generator to chassis.

AM ALIGNMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POSITION	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1	.1 mfd.	High side to Pin 7 (grid) of 12BA7. Low side to chassis.	455 KC.	Broadcast	Tuning condenser fully open.	Across voice coil.	A1, A2, (Trans. T4). A3, A4, (Trans. T2).	Adjust for maximum output. Reduce dummy antenna to .001 mfd. if isolation trans. is not used.
2		Loop	1600 KC.	Broadcast	Tuning condenser fully open.	Across voice coil.	A5, (Trimmer cond. C6).	Form loop of several turns of wire. Radiate signal into receiver loop. Adjust for maximum output.
3		Loop	1400 KC.	Broadcast	Tune for max. output.	Across voice coil.	A6, (Trimmer cond. C5).	Adjust for maximum output.

FM I-F and Disc. Alignment Using AM Signal Generator and VTVM

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POSITION	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
1	.01 mfd.	High side to Pin 1 (grid) of 12BA6 2nd i-f (V4). Low side to chassis.	10.7 mc. (Unmodulated)	Frequency modulation	Tuning condenser fully open.	Connect d.c. probe to point "A". Common to chassis.	A7, (Trans. T5).	Adjust for maximum output.
2	.01 mfd.	High side to Pin 1 (grid) of 12BA6 1st i-f (V3). Low side to chassis.	10.7 mc. (Unmodulated)	Frequency modulation	Tuning condenser fully open.	Connect d.c. probe to point "A". Common to chassis.	A8, A9, (Trans. T3).	Adjust for maximum output.
3	.01 mfd.	High side to Pin 2 (osc. grid) of 12BA7 conv. (V2). Low side to chassis.	10.7 mc. (Unmodulated)	Frequency modulation	Tuning condenser fully open.	Connect d.c. probe to point "A". Common to chassis.	A10, A11, (Trans. T1).	Adjust for maximum output.
4	.01 mfd.	High side to Pin 1 (grid) of 12BA6 2nd i-f (V4). Low side to chassis.	10.7 mc. (Unmodulated)	Frequency modulation	Tuning condenser fully open.	Connect d.c. probe to point "B". Common to chassis.	A12, (Trans. T6).	Adjust for maximum output.
5	.01 mfd.	"	10.7 mc. (Unmodulated)	Frequency modulation	Tuning condenser fully open.	Connect d.c. probe to point "C". Common to chassis.	A13, (Trans. T6).	Adjust for zero output. Continue with FM r-f alignment.

FM I-F AND DISC. ALIGNMENT USING SWEEP SIGNAL GENERATOR AND OSCILLOSCOPE. Use frequency modulated signal, with 60 cycle modulation and 450 kc. sweep. Use 120 cycle sawtooth sweep voltage in oscilloscope for horizontal deflection.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POSITION	RADIO DIAL SETTING	CONNECT OSCILLOSCOPE	ADJUST	REMARKS
1	.01 mfd.	High side to Pin 1 (grid) of 12BA6 1st i-f (V3). Low side to chassis.	10.7 mc. (Unmodulated).	Frequency modulation	Tuning condenser fully open.	Vertical input to Point "A". Ground to chassis.	A7, A8, A9, (Trans. T5 and T3).	Adjust for maximum output (height) and symmetry as per i-f alignment curve shown (page 3).
2	.01 mfd.	High side to Pin 2 (osc. grid) of 12BA7 conv. (V2). Low side to chassis.	10.7 mc. (Unmodulated).	Frequency modulation	Tuning condenser fully open.	Vertical input to Point "A". Ground to chassis.	A10, A11, (Trans. T1).	Adjust for maximum output (height) and symmetry as per i-f alignment curve shown (page 3).
3	.01 mfd.	High side to Pin 1 (grid) of 12BA6 2nd i-f (V4). Low side to chassis.	10.7 mc. (Unmodulated).	Frequency modulation	Tuning condenser fully open.	Vertical input to Point "C". Ground to chassis.	A12, A13, (Trans. T6).	Alternately adjust A12 for maximum amplitude and A13 for maximum straightness of cross-over lines, with cross-over occurring at center of pattern as per discriminator alignment curve (page 3). Continue with FM r-f alignment.

FM R-F ALIGNMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POSITION	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
1	150 ohm resistor in series with each gen. lead.	High side to FM ant. term. Low side to chassis.	108.0 mc. (Unmodulated).	Frequency modulation	Tuning condenser fully open (108.0 mc.)	Connect d.c. probe to point "A". Common to chassis.	A14 (Trimmer cond. C8).	Adjust for maximum output.
2	"	"	106.0 mc.	Frequency modulation	Tune for maximum output.	"	A15 (Trimmer cond. C7).	Adjust for maximum output.

MODEL 605,
CHASSIS 120076B

EMERSON RADIO AND PHONO. CORP.

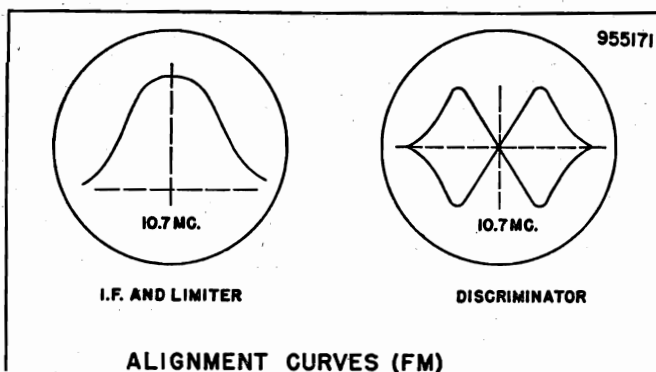
REPLACEMENT PARTS LIST

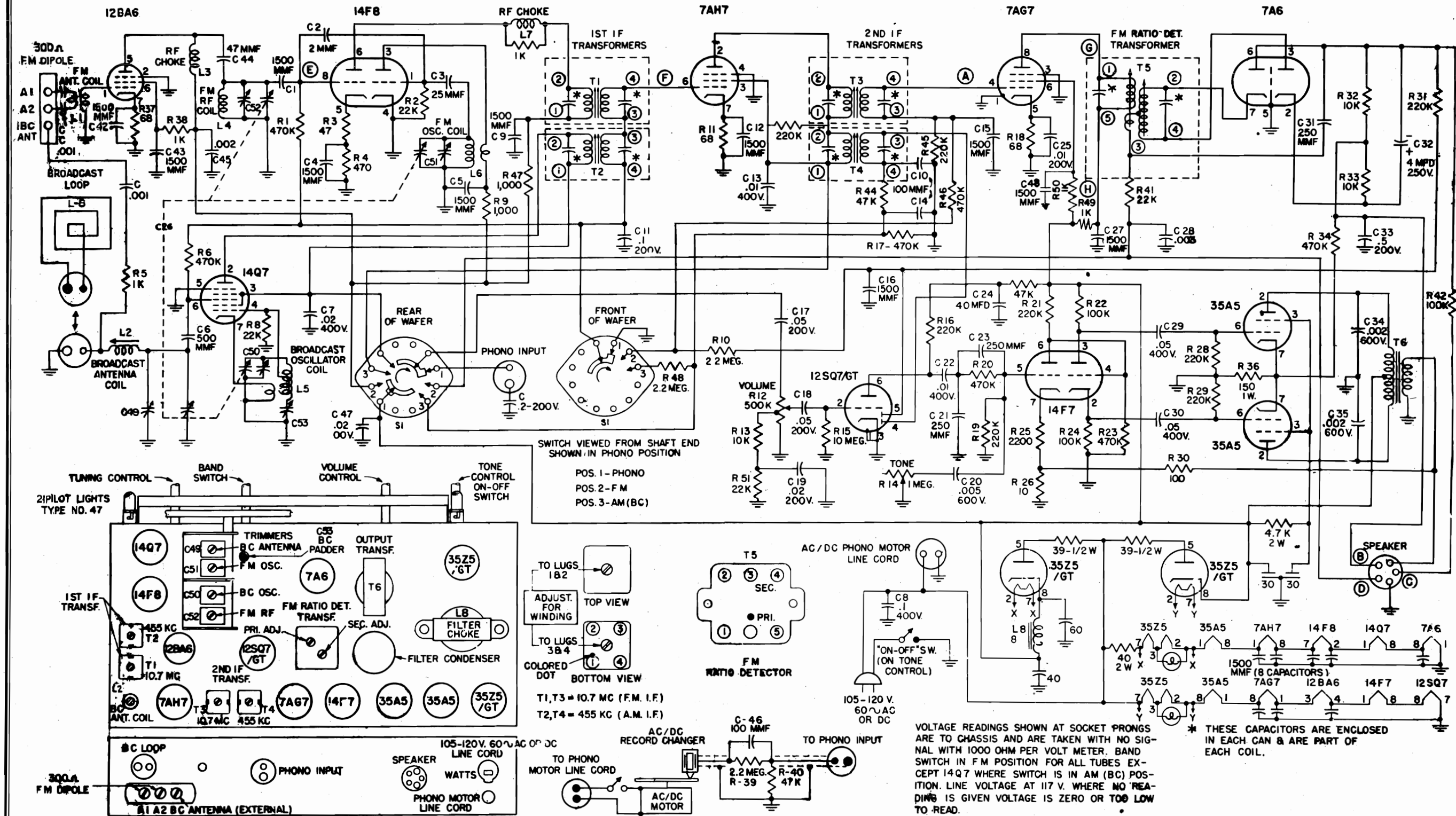
Symbol	†Part No.	DESCRIPTION	Symbol	†Part No.	DESCRIPTION
V1	12BA6	FM r-f amplifier	R12	340450	680 ohms, ½ watt resistor
V2	12BA7	FM and AM converter	R13, R16,	340970	100 kilohms, ½ watt resistor
V3	12BA6	FM and AM 1st i-f amplifier	R17		
V4	12BA6	FM 2nd i-f amplifier	R14	350770	15 kilohms, ½ watt resistor
V5	12AU6	FM limiter	R15	351210	1 megohm, ½ watt resistor
V6	19T8	FM disc., AM det., a.v.c., audio amp.	R18	350930	68 kilohms, ½ watt resistor
V7	35B5	Power output	R19	390057	500 kilohms, tapped volume control
V8	817101	Selenium rectifier	R20	351370	4.7 megohms, ½ watt resistor
C1, C2,	900045	Two-gang, four section variable	R21, R26	351130	470 kilohms, ½ watt resistor
C3, C4		condenser (alt. part 900400A)*	R22	390046	2 megohms, tone control
C5, C6,	*	Trimmers, part of C1-C2-C3-C4	R23	370310	180 ohms, 1 watt resistor
C7, C8			R24	394042	999 ohms, 3 watt wire wound res.
C9	928017	5 mmf., ceramic condenser	R25	380090	22 ohms, 1 watt resistor
C10, C11,	928006	1500 mmf., ceramic condenser	R28	350810	22 kilohms, ½ watt resistor
C12, C13,			L1	700011	AM loop antenna (alternate part of 700021) #
C36, C38			L2	710019	FM antenna coil
C14, C17	928015	75 mmf., ceramic condenser	L3, L5,	705002	FM oscillator choke
C15	915011	1.5 mmf., molded condenser	L9, L10		
C16	928016	15 mmf., ceramic condenser	L4	713024	FM r-f coil
C18	928109	5000 mmf., ceramic condenser	L6	716013	FM oscillator coil
C19, C21,	920092	.01 mfd., 200 volt paper cond.	L7	716015	AM oscillator coil
C24, C25,			L8	705013	R-f choke
C27, C40			T1	720024	First i-f trans. (FM).
C20, C39,	920030	.05 mfd., 400 volt paper cond.			(Alternate parts 720082, 720067) #
C45			T2	720031	First i-f trans. (AM).
C22, C23	*	Part of T4 (2nd i-f, AM)			(Alt. parts 720084, 720075) #
C26	928110	25 mmf., ceramic condenser	T3	720025	Second i-f trans. (FM).
C28	910010	110 mmf., mica condenser			(Alt. parts 720082, 720067) #
C29, C33	910014	470 mmf., mica condenser	T4	720032	Second i-f trans. (AM).
C30, C31	920515	.002 mfd., 400 volt paper cond.			(Alt. parts 720085, 720076) #
C32, C35,	920090	.01 mfd., 400 volt paper cond.	T5	720069	Third i-f trans. (FM).
C37					(Alt. parts 720083, 720077) #
C34	925126	100-50 mfd., 150 volt elect. cond.	T6	708005	Disc. trans. (FM). (Alt. parts 708012, 708013) #
C41	920514	.001 mfd., 400 volt paper cond.	T7	734042	Output transformer
C42	920100	.02 mfd., 200 volt paper cond.	SW1	510038	Three position band-phonos switch
C43	922101	.05 mfd., 400 volt molded paper condenser	SW2	*	Line switch, part of vol. control
			SW3	*	Phono switch, part of changer
C44	*	2.2 mmf., part of loop antenna L1	SP1	180051	P.M. speaker (12")
R1, R6,	340210	68 ohms, ½ watt resistor	P1	505040	Phono pickup plug
R10, R11			J1	508100	Phono pickup socket
R2, R4,	350290	150 ohms, ½ watt resistor	P2	505007	Line cord connector plug
R5, R8			J2	500005	Line cord interlock socket
R3	340810	22 kilohms, ½ watt resistor, ± 10%		583202	Line cord and internal ant.
R7, R27	351290	2.2 megohms, ½ watt resistor		807003	Dial light, 115 volt, 10 watt
R9	340830	27 kilohm, ½ watt resistor (may be part of 2nd i-f T4)		507008	Dial light socket

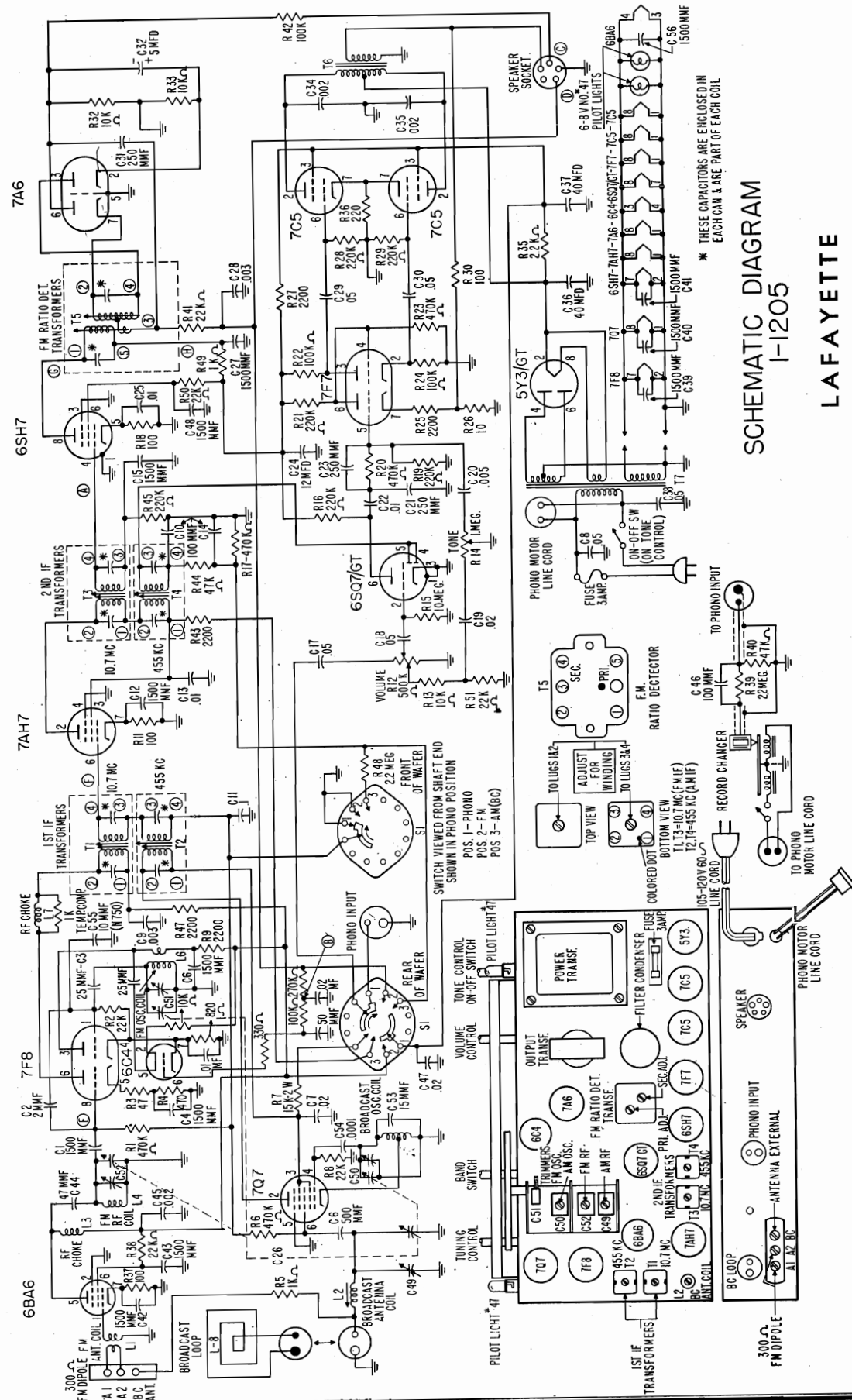
CABINET AND DIAL PARTS

	†Part No.	DESCRIPTION		†Part No.	DESCRIPTION
	140206	Cabinet (for 819039 changer). (Alt. part 140246 for 819044 changer).		460041	Knob, black indicator, push-on
	560064	Cabinet back		410177	Dial backplate
	819039	Record changer (GI type 700FS). (Alt. part 819044, Webster type 146).		520071	Dial crystal
				280039	Dial drive shaft
				530002	Dial drive cord (44")
				587070	Dial cord spring
	460470	Knob, black push-on		525017	Pointer

* Not supplied separately. † Specify part numbers when ordering. # Replace with part having same number as that removed.







SCHEMATIC DIAGRAM
I-1205

LAFAYETTE

This Receiver features the latest in A. M. - F. M., Receiver Design. Eleven (11) tubes plus a Rectifier are used in the A. M. - F. M. superheterodyne circuit. separate antennas are supplied for A. M. and F. M. An automatic frequency control tube is used to stabilize the F. M. and simplify tuning.

TUBE COMPLEMENT:

- 1 Type 6BA6 — F. M. R F. Amplifier
- 1 Type 7F8 — F. M. Converter
- 1 Type 7Q7 — A. M. Converter
- 1 Type 6C4 — Automatic Frequency Control
- 1 Type 7AH7 — I. F. Amplifier
- 1 Type 6SH7 — Detector Driver (F.M.)
- 1 Type 6SQ7 — 1st Audio Amplifier, A. M. Detector
- 1 Type 7A6 — Ratio Detector
- 1 Type 7F7 — 2nd Audio Amplifier and phase inverter
- 2 Type 7C5 — Beam power output.
- 1 Type 5Y3/GT — Rectifier.

1. OPERATING CONTROLS:

- 1) The "ON-OFF" power switch and Tone Control is the knob at the extreme left of the set. Turn this control in a clockwise direction until the switch clicks and the dial becomes illuminated. Turning this control further in the same direction will change the tone.
- 2) The Volume Control is the second knob from the left. Turning this control in a clockwise direction will increase the volume.
- 3) The Band Switch is the third knob from the left. The extreme counterclockwise position of this knob is for phonograph operation. The center position is for F.M. reception. The extreme clockwise position is for A. M. reception.
- 4) The Tuning Control is the extreme right hand knob. Turning this knob in either direction will move the dial pointer and select the stations on the A. M. or F. M. Bands.

2. ANTENNAS:

In most cases it will not be necessary to use external antennas, since the receiver is equipped with a loop antenna for AM reception and an indoor type folded dipole antenna for FM reception.

When inadequate reception is obtained from a desired station, it may be necessary to reposition the antennas to

favor that station. On AM, the loop should be turned so that the edge faces toward the station desired. On FM, the entire cabinet should be positioned so that the back is broadside to the direction from which the signals are transmitted.

For the reception of weak or distant stations, or for the operation of the receiver in unfavorable locations, provisions are made for the use of external antennas. The folded dipole should be disconnected when an external FM antenna is employed.

Do not disconnect the AM loop when an external antenna is used on standard broadcast.

3. SERVICE NOTES:

Failure of the Receiver to operate may be due to:

- 1) All tubes not firmly in sockets.
- 2) No current at power socket.
- 3) Band Switch in wrong position.
- 4) Speaker not plugged in.
- 5) Antennas not attached.
- 6) Defective fuse in Receiver.

4. ALIGNMENT PROCEDURE FOR A. M.:

Equipment Required:

- a) Broadcast Band Signal Generator.
- b) Output Meter.

1. Set band switch to AM, advance volume control to full volume setting.
2. Connect output meter across voice coil.
3. Connect the Signal Generator across the broadcast band antenna (Rear) section of the variable condenser. The "high" side of the Generator should connect to the stator section and the "ground" side to the chassis. Adjust the Signal Generator to 455 kc and with the receiver switched on, adjust the first and second I. F. transformers for peak output as shown on the output meter. The signal injected into the receiver should be as small in magnitude as possible, consistent with a useful deflection on the output meter.

4. Connect the "high" side of the Generator to the antenna terminal with a 200mmf condenser inserted in series. Connect the "ground" side of the Generator to the chassis. Tune receiver to 60 on the dial, adjust Signal Generator to 600kc. Adjust the BC antenna coil for maximum deflection on the output meter. Use a weak signal.

5. Tune receiver to 160 on the dial. Adjust Signal Generator to 1600kc. Adjust BC oscillator and BC antenna trimmers for maximum output.

6. Repeat operations 4 and 5.

5. ALIGNMENT PROCEDURE FOR F. M.:

NOTE: Points A, B, C, D, E, F, G, and H are noted on circuit diagram. Points C, and D have been brought out to the unused contacts of the speaker socket at the rear of the chassis.

Equipment Required:

- a) High frequency Signal Generator with 88-108 Mc tuning range.
- b) Signal Generator capable of delivering .1 Volt at 10.7mc.
- c) Audio output meter.
- d) D. C. vacuum tube voltmeter with zero center scale.
- e) Tuning wand.

Disable A.F.C. during alignment of F.M. circuits by short circuiting point "B" to chassis.

A. Ratio Detector Alignment:

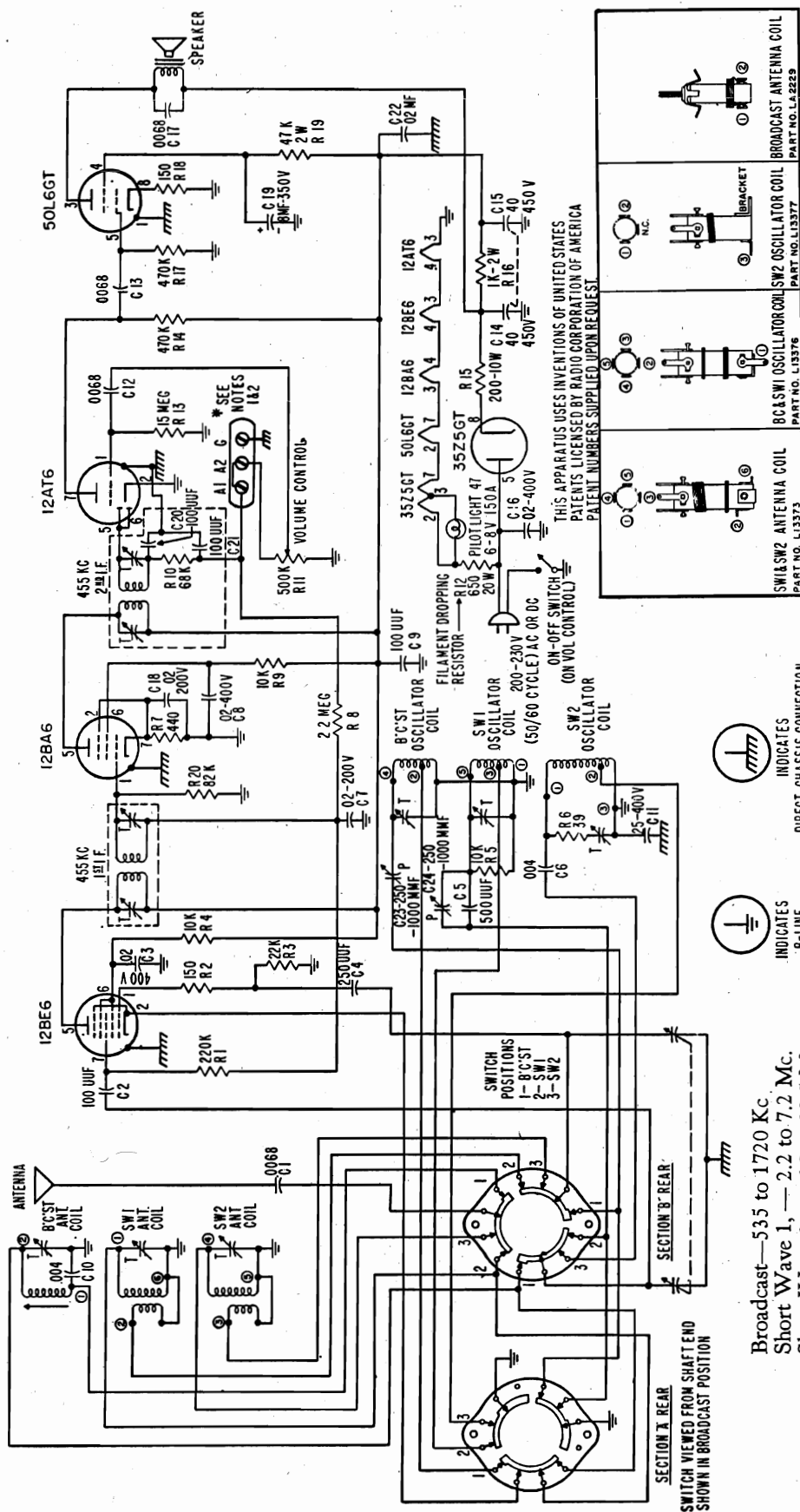
1. Connect V.T.V.M. across point "C" and ground, (Detector Voltage).
2. Feed 10.7mc unmodulated R.F. Signal into 6SH7 grid (point A) through .01 ufd. condenser. This signal should be .1 volt.
3. Adjust primary of Ratio Detector (T-5) for maximum voltage indication on V. T. V. M.
4. Connect zero centered V. T. V. M. across point "D" and ground.
5. Adjust secondary of Ratio Detector (T-5) for zero indication.
6. Tune 10.7mc Signal Generator higher in frequency (about 200kc) until maximum voltage reading is obtained on V. T. V. M.; note this voltage, then tune signal generator lower in frequency until maximum voltage of the opposite polarity is obtained. Note this voltage, then if necessary re-adjust primary of the Det. (T-5) until the voltages are about equal on either the high or low side of 10.7 mc.

B. 10.7 I. F. ALIGNMENT:

1. Shunt a 1,000-ohm carbon resistor across the primary of the detector (T-5) (Points G and H).
2. Connect output meter across speaker voice coil.
3. Volume and tone controls at maximum clockwise position.
4. Connect 10.7mc (modulated 30%) signal generator through .01ufd. condenser across point "F" and ground.
5. Adjust secondary, then primary of (T-3) for maximum audio output. (Reduce input signal to maintain output at .5-watt level.)
6. Connect 10.7mc 30% modulated signal generator across point "E" and ground.
7. Adjust secondary, then primary of (T-1) for maximum audio output. (Reduce input signal to maintain output at .5-watt level.)
8. Remove 1000-ohm shunting resistor from across primary of (T-5).

C. OSCILLATOR AND R. F. ALIGNMENT:

1. Connect V. T. V. M. across point "C" and ground, (detector voltage).
2. Connect 108mc signal generator to FM antenna terminals. If generator impedance is low, put one 150-ohm carbon resistor in series with each of the generator leads. Tune receiver dial to 108 mc.
3. Adjust FM oscillator trimmer (C-51) for maximum V. T. V. M. reading.
4. Adjust FM R.F. trimmer (C-52) for maximum V. T. V. M. reading. During alignment reduce input signal to maintain Detector voltage at 2.V.
5. Repeat steps 3 and 4.
6. Feed a 90mc signal into antenna terminals (as in C-2), tune receiver dial to signal.
7. Test R. F. coil with tuning wand and if necessary adjust spacing of FM R.F. coil (L-4) for maximum V.T. V.M. reading at 90mc. During alignment reduce input signal to maintain Detector voltage at 2.V.
8. Repeat steps 2 and 4 if necessary.
9. Remove A.F.C. shorting jumper.



SCHEMATIC DIAGRAM (figure 2)

TUBE COMPLEMENT:

- 1 type 12BE6 — Converter, Oscillator
- 1 type 12BA6 — I.F. Amplifier
- 1 type 12AT6 — Detector, A.V.C., First Audio Amplifier
- 1 type 50L6GT — Beam power output
- 1 type 35Z5GT — Rectifier

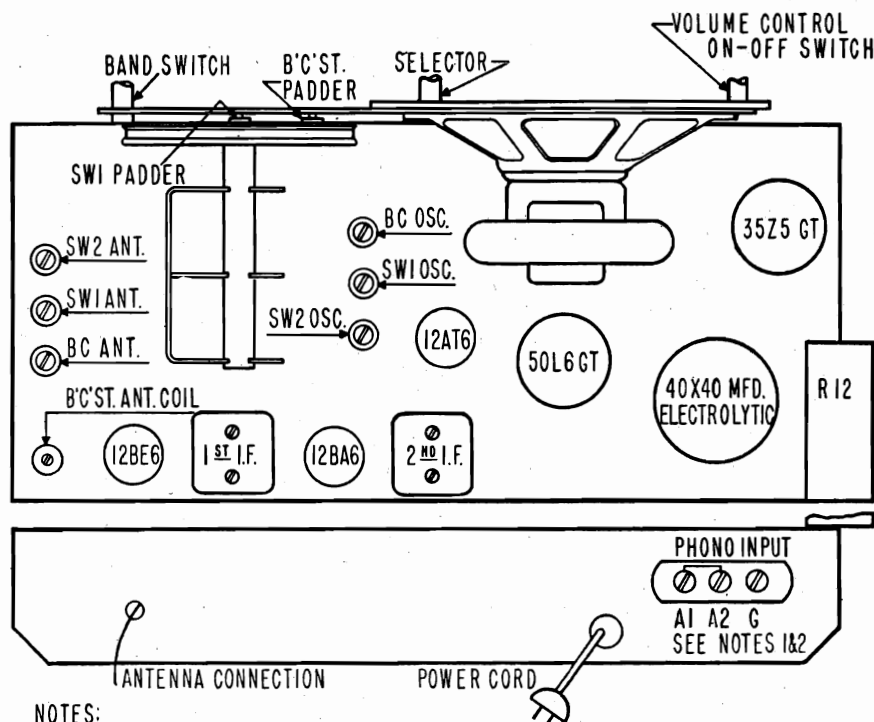
Broadcast—535 to 1720 Kc.
Short Wave 1, — 2.2 to 7.2 Mc.
Short Wave 2, — 6.9 to 23.5 Mc.

ESPEY MFG. COMPANY, INC.

MODEL 502K

FAILURE OF THE RADIO RECEIVER TO OPERATE MAY BE DUE TO:

1. No current at power socket.
2. Tubes not firmly in sockets.
3. Antenna not connected.
4. Defective tube.
5. Band Switch in wrong position.
6. "Phono" terminal jumper missing or or incorrectly connected.

**NOTES:**

- 1- FOR RADIO OPERATION CONNECT JUMPER FROM TERMINAL A1 TO TERMINAL A2.
- 2- FOR PHONO OPERATION REMOVE A1 TO A2 JUMPER, CONNECT PICKUP ACROSS TERMINAL A2 & G.

Figure 1 Tube and Trimmer Locations Radio Receiver Model 502K

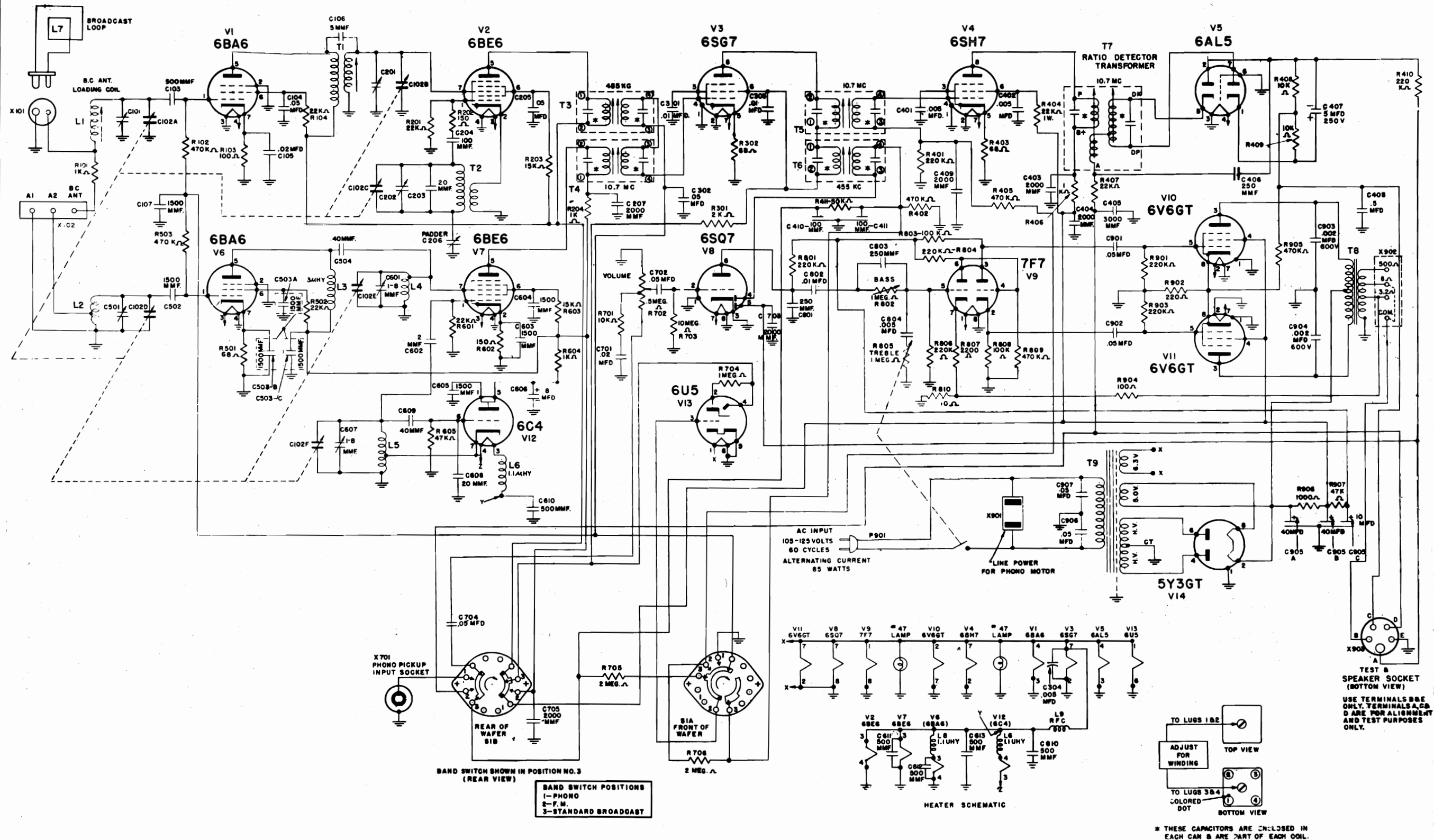
ALIGNMENT PROCEDURE:

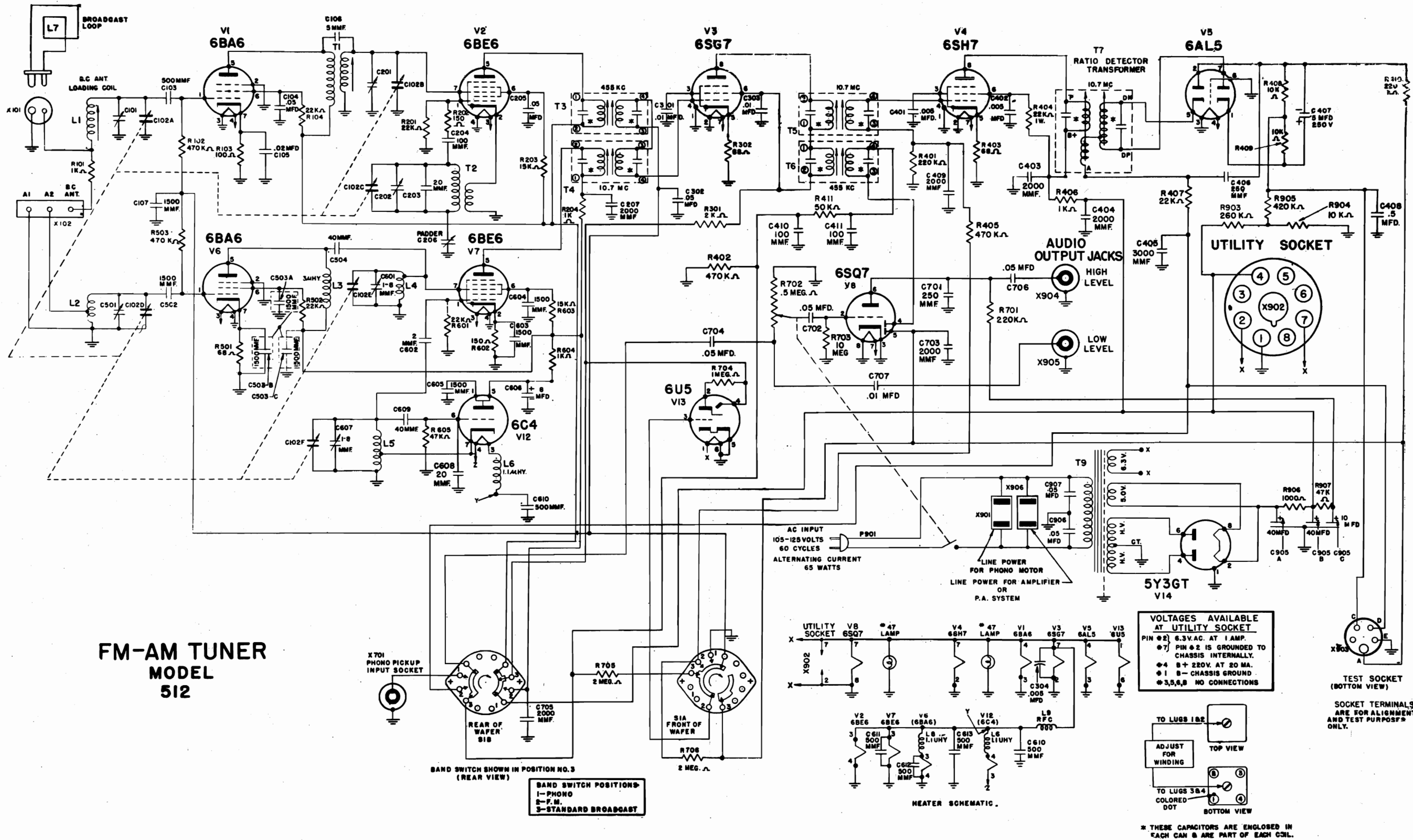
Steps	Connect Output of Generator to	Tune Generator to	Band Switch to	Tune Radio to	Adjust the following for maximum peak output
1.	Tuning condenser stator (RF) in series with .05 mfd.	455 kc	Bcst	Quiet point on high frequency end of dial.	2nd and 1st transformers.
2.	Ant in series with 200 mmf.	1500 kc	Bcst	1500 kc on dial.	BC Osc. Trimmer
3.	Same as above	1500 kc	Bcst	Sig. (1500 kc).	BC Ant. Trimmer
4.	Same as above	600 kc	Bcst	600 kc on dial.	BC Osc. padder. Ant. Coil core.
5.	Same as above	1500 kc	Bcst	1500 kc on dial.	BC Osc. trimmer. BC Ant. trimmer.
6.	Ant. in series with 400 ohm Carbon resistor	6Mc	SW1	6Mc on dial.	SW1 Osc. trimmer**
7.	Same as above	6Mc	SW1	6Mc	SW1 Ant. trimmer.
8.	Same as above	2.5Mc	SW1	2.5Mc	SW1 Ant. trimmer. Rock in SW1 Osc. padder.
9.	Same as above	6Mc	SW1	6Mc (sig.)	SW1 Ant. trimmer. SW1 Osc. trimmer.
10.	Same as above	21Mc	SW2	21Mc	SW2 Osc. trimmer.** SW2 Ant. trimmer.
11.	Same as above	21Mc	SW2	Sig. (21 Mc).	SW2 Ant. trimmer.

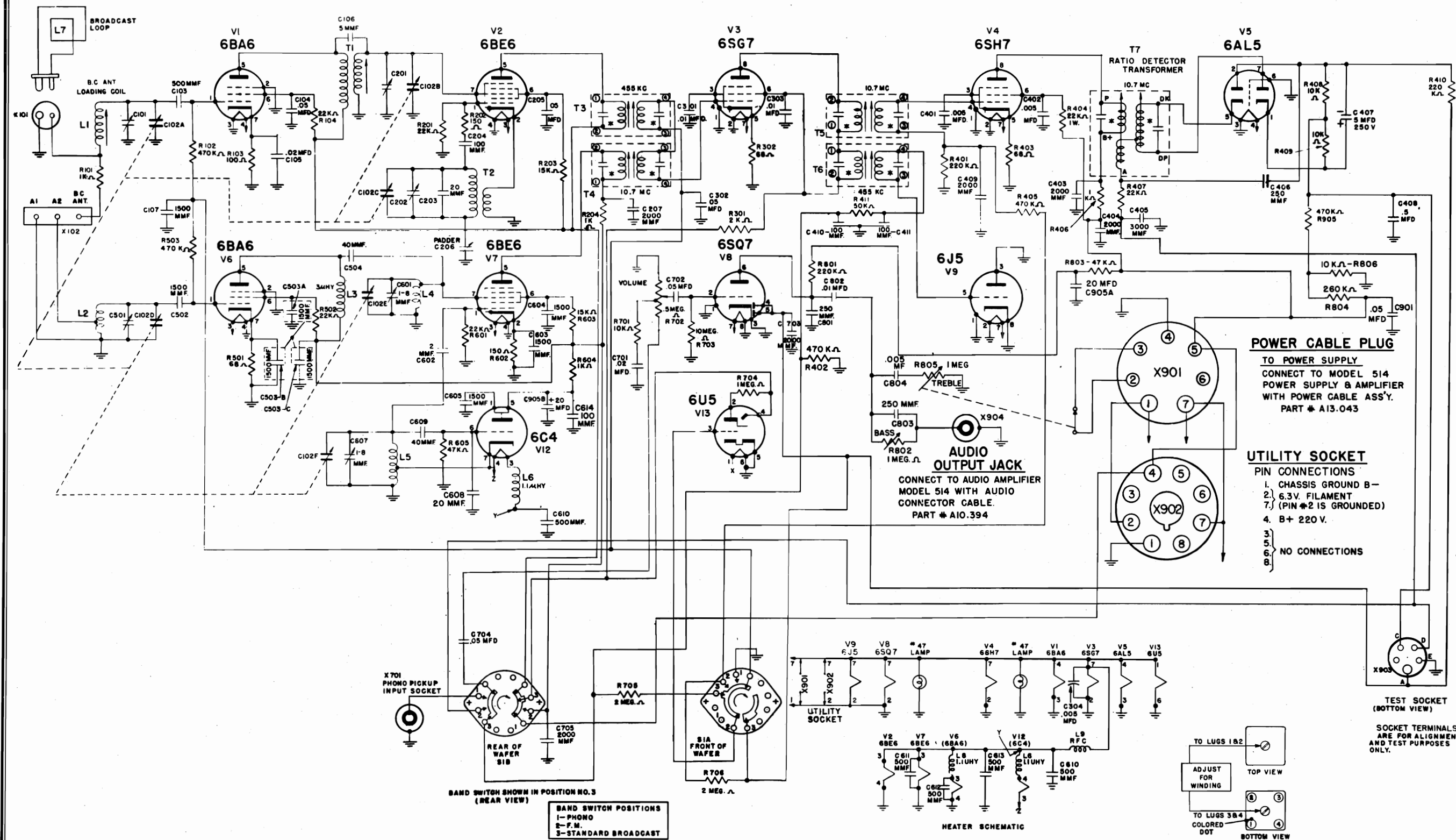
*Before alignment set dial pointer on dial point marker with condenser plate fully meshed.

**Caution adjust to peak closest to minimum trimmer capacity.









POWER CABLE PLUG

TO POWER SUPPLY
CONNECT TO MODEL 514
POWER SUPPLY & AMPLIFIER
WITH POWER CABLE ASS'Y.
PART # A13.043

UTILITY SOCKET

PIN CONNECTIONS
1. CHASSIS GROUND B-
2. 6.3V. FILAMENT
7. (PIN #2 IS GROUNDED)
4. B+ 220 V.
3.
5.
6.
8. NO CONNECTIONS

AUDIO OUTPUT JACK

CONNECT TO AUDIO AMPLIFIER
MODEL 514 WITH AUDIO
CONNECTOR CABLE.
PART # A10.394

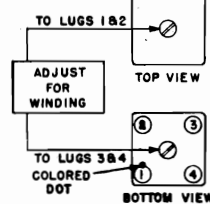
TEST SOCKET
(BOTTOM VIEW)

SOCKET TERMINALS
ARE FOR ALIGNMENT
AND TEST PURPOSES
ONLY.

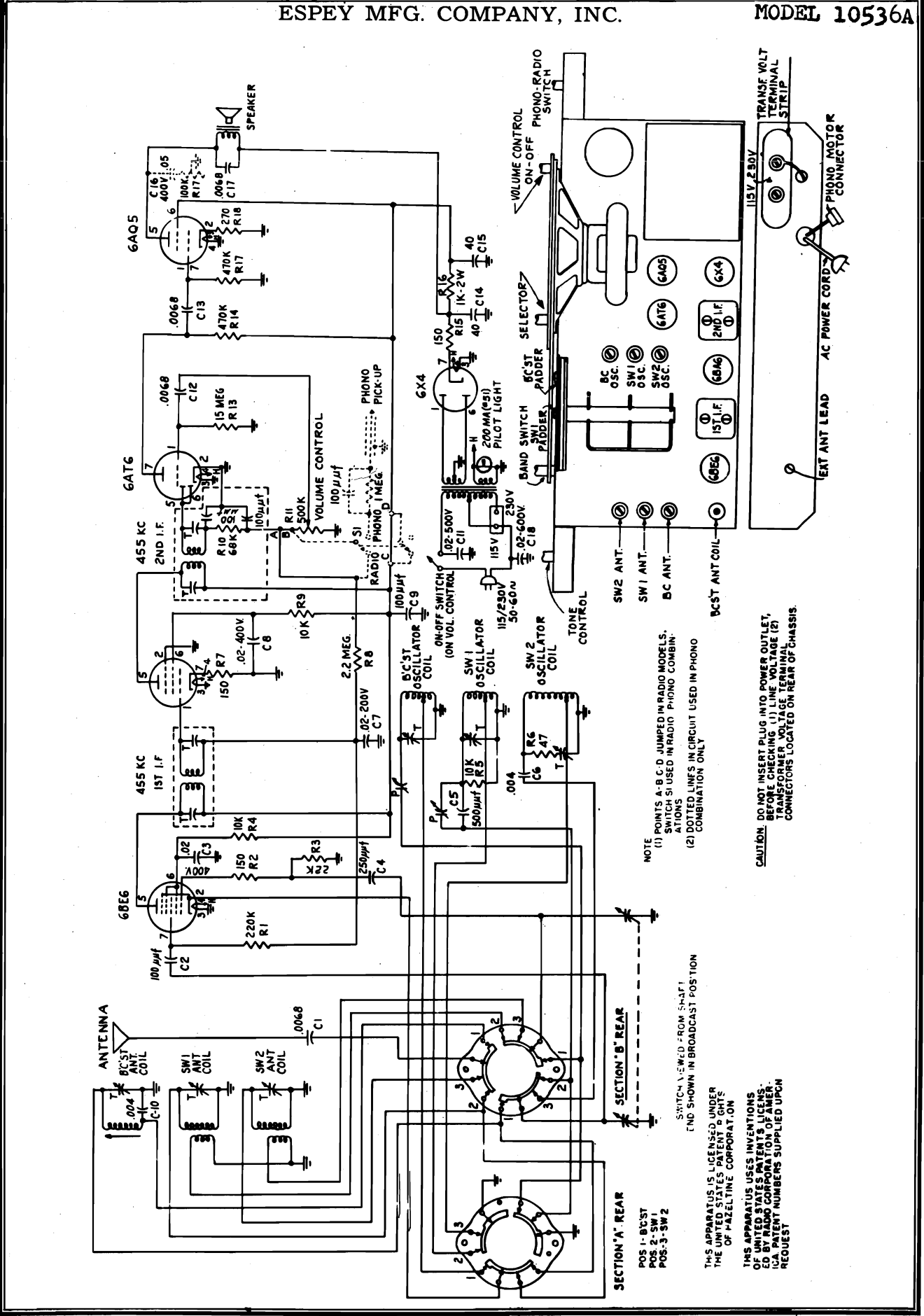
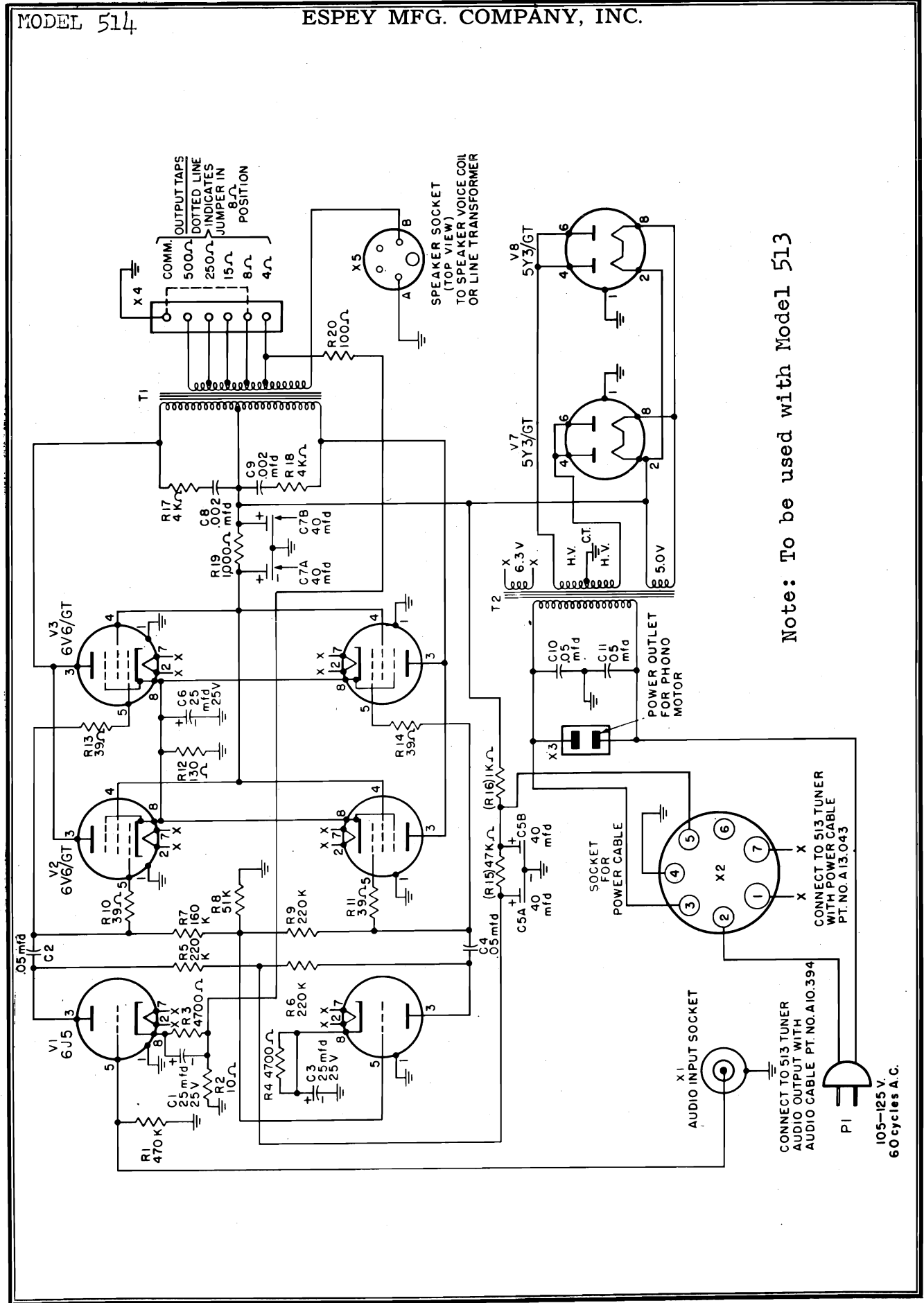
BAND SWITCH SHOWN IN POSITION NO.3
(REAR VIEW)

BAND SWITCH POSITIONS
1- PHONO
2- F.M.
3- STANDARD BROADCAST

HEATER SCHEMATIC

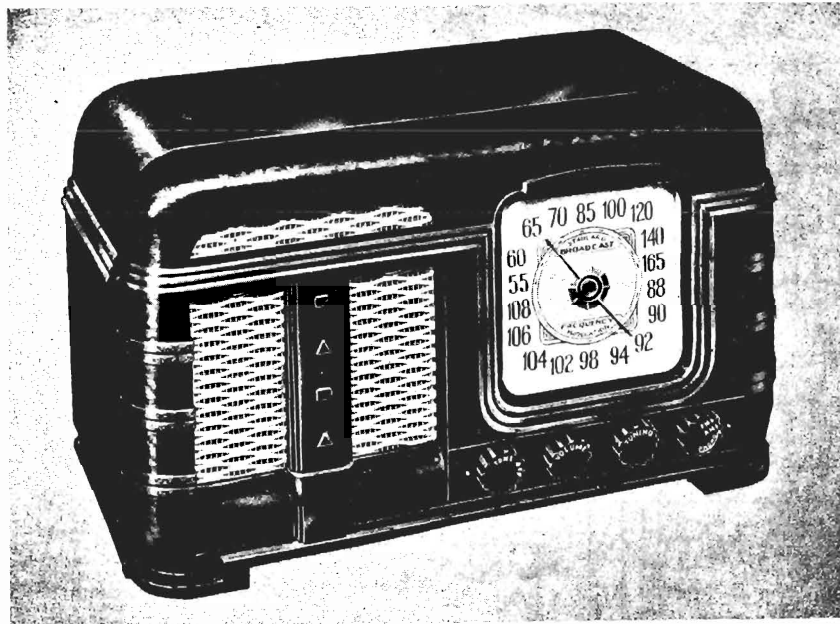
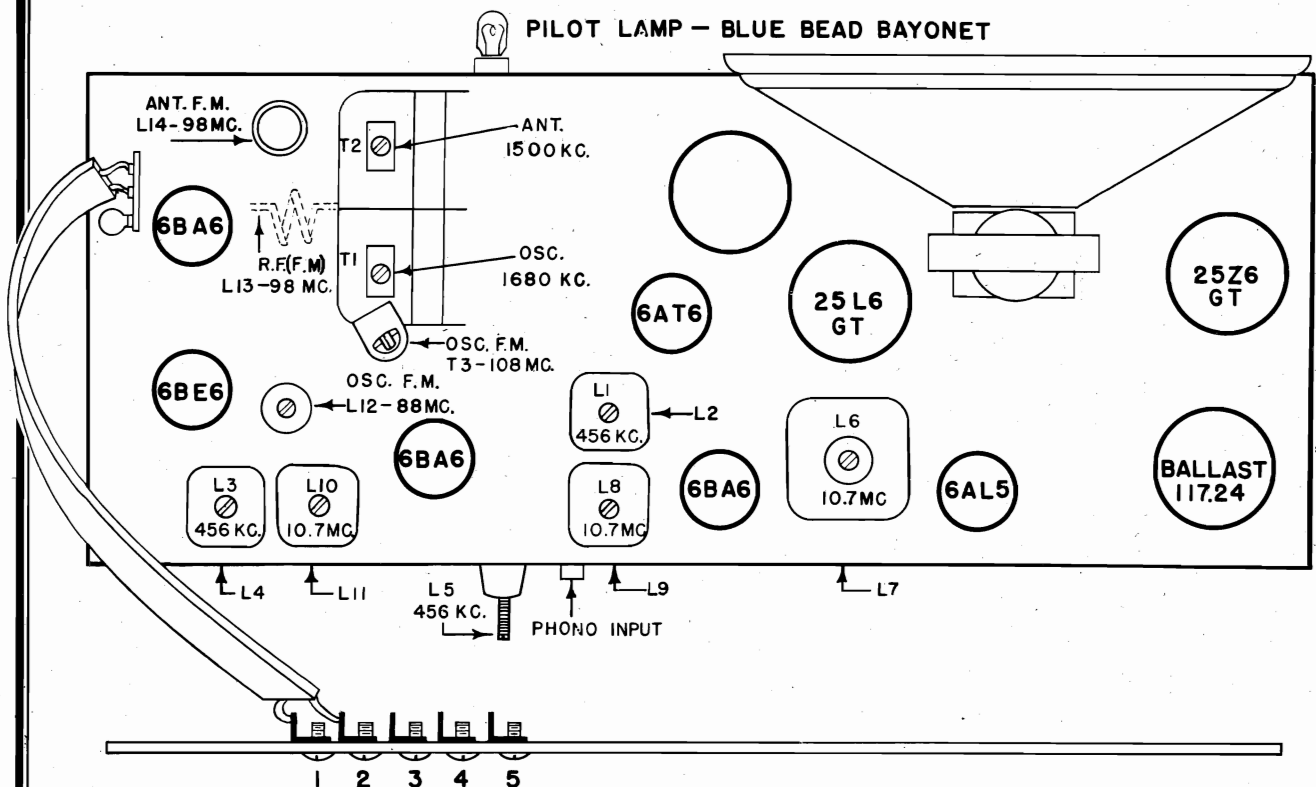


* THESE CAPACITORS ARE ENCLOSED IN
EACH CAN & ARE PART OF EACH COIL.



FADA RADIO & ELECTRIC CO., INC.

MODEL 790

TUBE LAYOUT

TUNING RANGE
 B.C. - 530 KC. - 1680 KC.
 F.M. - 87 MC. - 109 MC.

1 & 2 - EXT. F.M. ANT.
 LINK 2 TO 3 FOR INT. F.M. ANT.
 4 EXT. B.C. ANT.
 5 GROUND.

FADA RADIO & ELECTRIC CO., INC.

MODEL 790

ALIGNMENT PROCEDURE

No attempt should be made to realign the various circuits until all other causes have been checked, unless the condition is so obvious as to indicate that realignment is necessary. Then proceed as follows:

A.M.:

- Band switch in A.M. position
- Volume Control and Tone Control in maximum clockwise position.
- Low range A.C. meter connected across voice coil to indicate output.
- Keep signal generator attenuated so as to maintain $\frac{1}{2}$ scale reading on output meter.
- Make certain that the dial pointer is exactly horizontal when variable condenser is fully meshed.

Receiver Dial at	Signal Generator Frequency	Dummy Antenna	Connect Signal Generator To:	Refer to Chassis Layout for Location of component to be adjusted
1. Variable Cond. fully open.	456 KC	.1 MF	Control Grid 6BE6 tube, pin #7.	Adjust L1, L2, L3 and L4 for maximum output.
2. Variable Cond. fully open.	456 KC	.1 MF	Top of first section of variable condenser (stator of the A.M.-R.F. section.)	Adjust L5 for minimum output.
3. Variable Cond. fully open.	1680 KC	200 MMF	Terminal #4 on back of loop.	Adjust T1 for maximum output.
4. 1500 KC	1500 KC	200 MMF	Terminal #4 on back of loop.	Adjust T2 for maximum output.
5. 600 KC	600 KC	200 MMF	Terminal #4 on back of loop.	Check tracking and bend slotted end plate (first section) of variable if necessary.

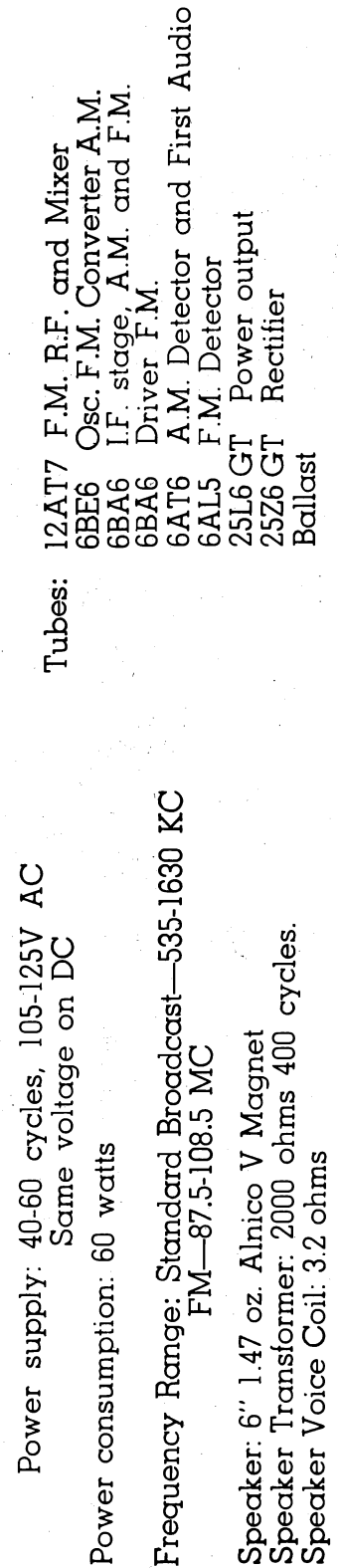
F.M.:

- Band switch F.M. position. Allow at least 10 minutes "warming up" period.
- Use a standard V.T.V.M. with zero center setting.
- Use an A.M. signal generator with no modulation, taking harmonics if fundamentals are not available.
- Keep signal generator attenuated so as to maintain approximately a 3 volt reading.
- Make certain that the dial pointer is exactly horizontal when variable condenser is fully meshed.

Receiver Dial at:	Signal Generator Frequency	Signal Generator Connected to:	V.T.V.M. Connected to:	Refer to Chassis Layout for Location of Components to be adjusted
1. 98 MC	10.7 MC	Control grid Pin #1 6BA6 (2nd. I.F.) Socket Series with .01 Condenser.	Across the two 100,000 ohm resistors marked X.	Adjust L6 and L7 for maximum output.
2. 98 MC	10.7 MC	Control grid Pin #7 6BE6 Socket Series with .01 condenser.	"	Shunt L9 with a 680 ohm carbon resistor and adjust L8 for maximum output.
3. 98 MC	10.7 MC	"	"	Shunt L8 with a 680 ohm carbon resistor and adjust L9 for maximum output.
4. 98 MC	10.7 MC	"	"	Adjust L10, L11 and L6 for maximum output.
5. 98 MC	10.7 MC	"	Ground lead of V.T.V.M. to point A on schematic and probe to point B.	Adjust L7 for zero output. (Check zero setting of V.T.V.M.) Meter should register reverse when slug is rotated through zero output.
6. 108 MC	108 MC	Terminals 1 & 2 in series with 2 130 ohm. carbon resistors.	Same as step #1.	Adjust T3 for maximum output. Starting with the trimmer at minimum capacity use the first peak.
7. 88 MC	88 MC	"	"	Adjust L12 for maximum output.
8.	Repeat steps 6 & 7 until L12 requires no further adjustment.			
9. 98 MC	98 MC	Same as step #6	Same as step #1.	Adjust L13 and L14 for maximum output.

Caution: If any adjustments are made in the A.M.-I.F.'s after the F. M. I.F.'s have been aligned, it would be necessary to readjust the F.M. I.F.'s.

Part No.	Description	Part No.	Description
12.26	Tubular Condenser .005 mfd—200 W.V.	32.40	Carbon Resistors 200 ohms 2 Watts $\pm 10\%$
12.6	Tubular Condenser .01 mfd—400 W.V.	32.115	Carbon Resistors 660 ohms 2 Watts $\pm 10\%$
12.8	Tubular Condenser .02 mfd—400 W.V.	32.2	Carbon Resistors 100 ohms $\frac{1}{2}$ Watt $\pm 10\%$
12.1	Tubular Condenser .002 mfd—200 W.V.	37.116	Coil Ratio Detector
12.11	Tubular Condenser .05 mfd—200 W.V.	37.112	Coil Fm I.F. 1st.
12.12	Tubular Condenser .05 mfd—400 W.V.	37.132	Coil FM I.F. 2nd.
17.47	Ceramic Condenser 100 mfd $\pm 10\%$ Insul.	37.138	Coil BC I.F. 1st.
17.49	Ceramic Condenser 50 mmfd $\pm 10\%$	37.139	Coil BC I.F. 2nd.
17.48	Ceramic Condenser 250 mmfd $\pm 10\%$	37.137	Coil BC Osci.
17.33	Ceramic Condenser 10 mmfd $\pm 20\%$	37.135	Coil FM Osci.
17.44	Ceramic Condenser 5000 mmfd gmV	37.133	Coil FM R.F.
17.46	Ceramic Condenser .01 mfd gmV	37.117	Coil FM Ant.
17.57	Ceramic Condenser 270 mmfd $\pm 10\%$	37.136	BC Loop
17.53	Ceramic or Mica 82 mmfd $\pm 5\%$	37.66	Wave Trap
17.45	Ceramic 1500 mmfd $\pm 20\%$	37.134	R.F. Choke
22.29	Electrolytic 5 mfd 25 W.V. Alu. can.	47.15	Switch
22.31	Electrolytic 25 mfd 25 W.V. Alu. can.	52.30	Volume Control
22.36	Electrolytic 30-40-40 150 W.V. Alu. can.	57.5	Tone Control (with switch)
27.29	Variable Condenser (with drum)	77.128	Crystal
32.1	Carbon Resistors 68 ohm $\frac{1}{2}$ Watt $\pm 10\%$	77.126	Dial (Pointer)
32.4	Carbon Resistors 150 ohm $\frac{1}{2}$ Watt $\pm 10\%$	77.127	Dial (Scale)
32.3	Carbon Resistors 130 ohm $\frac{1}{2}$ Watt $\pm 10\%$	77.124	Dial (Vernier Drive)
32.30	Carbon Resistors 470 ohm $\frac{1}{2}$ Watt $\pm 10\%$	97.141	Grille Silk
32.8	Carbon Resistors 1000 ohm $\frac{1}{2}$ Watt $\pm 10\%$	97.130	Back
32.9	Carbon Resistors 4700 ohm $\frac{1}{2}$ Watt $\pm 10\%$	97.131W	Cabinet (Walnut)
32.85	Carbon Resistors 27,000 ohm $\frac{1}{2}$ Watt $\pm 10\%$	97.131V	Cabinet (Ivory)
32.12	Carbon Resistors 15,000 ohm $\frac{1}{2}$ Watt $\pm 10\%$	97.142	Metal Grille (Speaker)
32.13	Carbon Resistors 22,000 ohm $\frac{1}{2}$ Watt $\pm 10\%$	97.138	Baffle (Speaker)
32.18	Carbon Resistors 220,000 ohm $\frac{1}{2}$ Watt $\pm 20\%$	107.24	Speaker with Transformer & Bracket 6" P.M.
32.19	Carbon Resistors 330,000 ohm $\frac{1}{2}$ Watt $\pm 20\%$	117.24	Ballast Tube
32.20	Carbon Resistors 470,000 ohm $\frac{1}{2}$ Watt $\pm 20\%$	132.7	Ceramic Trimmer 5-20 mmf N 500
32.23	Carbon Resistors 1 megohm $\frac{1}{2}$ Watt $\pm 20\%$	142.45V	Knob Band Selector (Ivory)
32.99	Carbon Resistors 10 megohm $\frac{1}{2}$ Watt $\pm 20\%$	142.45W	Knob Band Selector (Walnut)
		142.46V	Knob Tuning (Ivory)
		142.46W	Knob Tuning (Walnut)
		142.47W	Knob Volume (Walnut)
		142.47V	Knob Volume (Ivory)
		142.48W	Knob Tone AC-On-Off (Walnut)
		142.48V	Knob Tone AC-On-Off (Ivory)



MODEL 790
Series B etc.

FADA RADIO & ELECTRIC CO., INC.

ALIGNMENT PROCEDURE

No attempt should be made to realign the various circuits until all other causes have been checked, unless the condition is so obvious as to indicate that realignment is necessary. Then proceed as follows:

A.M.:

Band switch in A.M. position
Volume Control and Tone Control in maximum clockwise position.
Low range A.C. meter connected across voice coil to indicate output.
Keep signal generator attenuated so as to maintain $\frac{1}{2}$ scale reading on output meter.
Make certain that the dial pointer is exactly horizontal when variable condenser is fully meshed.

Receiver Dial at	Signal Generator Frequency	Dummy Antenna	Connect Signal Generator To:	Refer to Chassis Layout for Location of component to be adjusted
1. Variable Cond. fully open.	456 KC	.1 MF	Control Grid 6BE6 tube, pin #7.	Adjust L1, L2, L3 and L4 for maximum output.
2. Variable Cond. fully open.	1630 KC	200 MMF	Terminal #4 on back of loop.	Adjust T1 for maximum output.
3. 1500 KC	1500 KC	200 MMF	Terminal #4 on back of loop.	Adjust T2 for maximum output.
4. 600 KC	600 KC	200 MMF	Terminal #4 on back of loop.	Check tracking and bend slotted end plate (last section) of variable if necessary.

F.M.:

Band switch F.M. position. Allow at least 10 minutes "warming up" period.
Use a standard V.T.V.M. with zero center setting.
Use an A.M. signal generator with no modulation, taking harmonics if fundamentals are not available.
Keep signal generator attenuated so as to maintain approximately a 3 volt reading.
Make certain that the dial pointer is exactly horizontal when variable condenser is fully meshed.

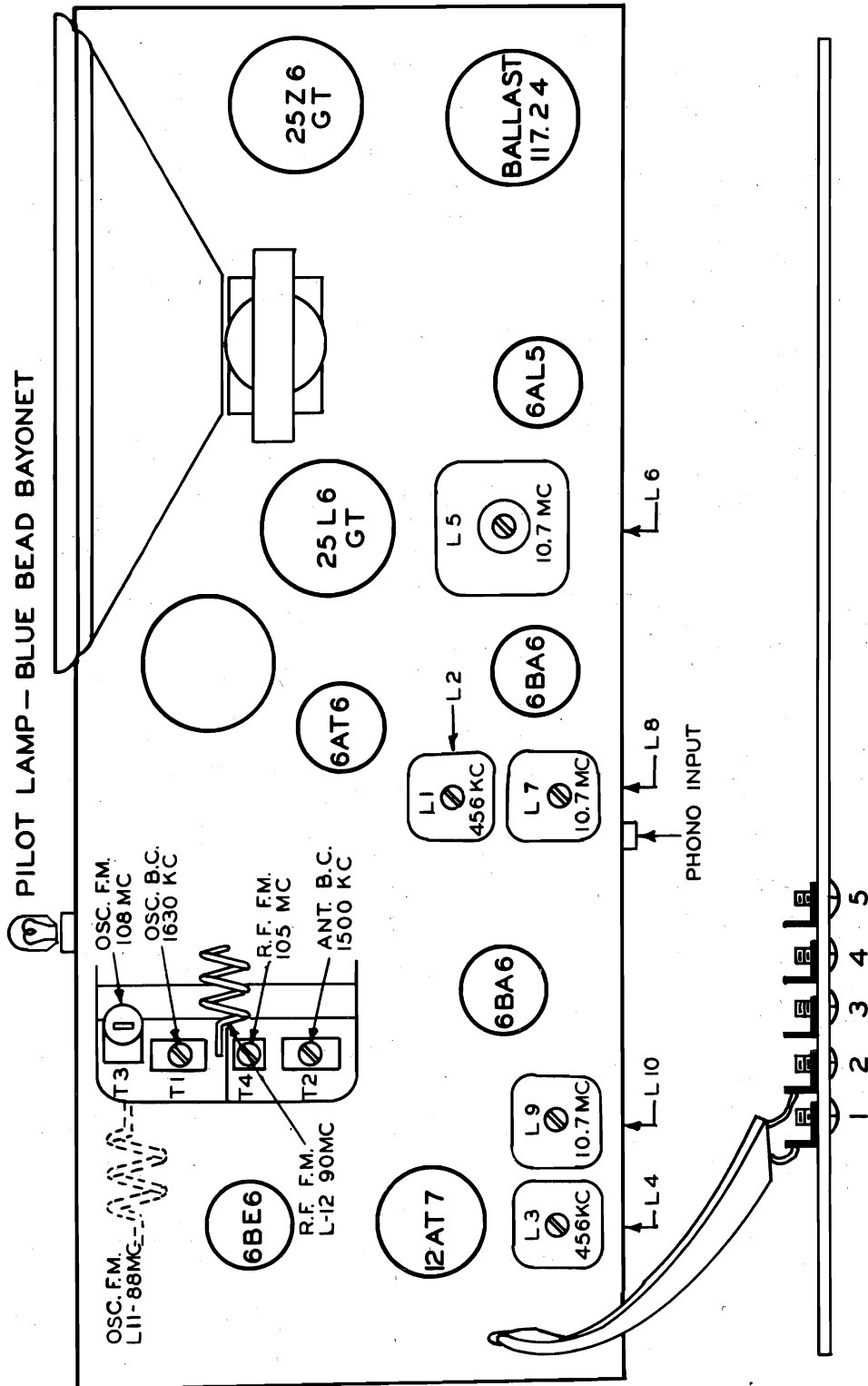
Receiver Dial at:	Signal Generator Frequency	Signal Generator Connected to:	V.T.V.M. Connected to:	Refer to Chassis Layout for Location of Components to be adjusted
1. 98 MC	10.7 MC	Control grid Pin #1 6BA6 (2nd. I.F.) Socket Series with .01 Condenser.	Across the two 100,000 ohm resistors marked X.	Adjust L5 and L6 for maximum output.
2. 98 MC	10.7 MC	Junction of L12 and T4 in Series with .01 condenser.	"	Shunt L8 with a 680 ohm carbon resistor and adjust L7 for maximum output.
3. 98 MC	10.7 MC	"	"	Shunt L7 with a 680 ohm carbon resistor and adjust L8 for maximum output.
4. 98 MC	10.7 MC	"	"	Adjust L9, L10 and L5 for maximum output.
5. 98 MC	10.7 MC	"	Ground lead of V.T.V.M. to point A on schematic and probe to point B.	Adjust L6 for zero output. (Check zero setting of V.T.V.M.) Meter should register reverse when slug is rotated through zero output.
6. 108 MC	108 MC	Ground to terminal 1 and hot side to terminal 2 in series with a 270 ohm carbon resistor.	Same as step #1.	Adjust T3 for maximum output. Starting with the trimmer at minimum capacity use the first peak.
7. 88 MC	88 MC	"	"	Adjust L11 for maximum output.
8.	Repeat steps 6 & 7 until L11 requires no further adjustment.			
9. 105 MC	105 MC	Same as step #6	Same as step #1.	Adjust T4 for maximum output.
10. 90 MC	90 MC	Same as step #6	Same as step #1	Adjust L12 for maximum output.
11.	Repeat steps 9 & 10 until T4 requires no further adjustment.			

Caution: If any adjustments are made in the A.M.-I.F.'s after the F. M. I.F.'s have been aligned, it would be necessary to readjust the F.M. I.F.'s.

FADA RADIO & ELECTRIC CO., INC.

MODEL 790
Series B etc.

TUBE LAYOUT



1 & 2 - EXT. FM. ANT.
LINK 2 TO 3 FOR INT. FM. ANT.
4 EXT. B.C. ANT.
5 GROUND.

TUNING RANGE
B.C. - 534 KC. - 1630 KC.
F.M. - 87.6 MC. - 108.4 MC.

MODEL 790
Series B etc.

FADA RADIO & ELECTRIC CO., INC.

PARTS LIST

Part No.	Description	Part No.	Description
12.1	Tubular Condenser .002 200 W.V.	32.19	Carbon Res. 330,000 ohm ½ W. ±20% Carbon
12.19	Tubular Condenser .005 400 W.V.	32.20	Carbon Res. 470,000 ohm ½ W. ±20% Carbon
12.6	Tubular Condenser .01 400 W.V.	32.23	Carbon Res. 1 megohm ½ W. ±20% Carbon
12.11	Tubular Condenser .05 200 W.V.	32.24	Carbon Res. 2.2 megohm ½ W. ±20% Carbon
12.12	Tubular Condenser .05 400 W.V.	32.99	Carbon Res. 10 megohm ½ W. ±20% Carbon
12.56	Tubular Condenser .005 200 W.V. ±10%	32.41	Carbon Res. 1000 ohm 1 W. ±10% Carbon
17.59	Ceramic Cond. 2 mmf ±.5 mmf Insul.	32.40	Carbon Res. 200 ohm 2 W. ±10% Carbon
17.78	Ceramic Cond. 2 mmf ±.5 mmf Insul. M750	32.115	Carbon Res. 660 ohm 2 W. ±10% Carbon
17.79	Ceramic Cond. 5 mmf ±.5 mmf Insul.	32.154	Carbon Res. 1500 ohm 2 W. ±20% Carbon
17.61	Ceramic Cond. 30 mmf ±10% Insul.	32.2	Carbon Res. 100 ohm ½ W. ±10% Carbon
17.47	Ceramic Cond. 100 mmf ±10% "	37.116	Coil Ratio Det.
17.21	Ceramic Cond. 100 mmf ±20% "	37.112	Coil F.M. 1st. I.F.
17.81	Ceramic Cond. 250 mmf ±20% "	37.132	Coil F.M. 2nd I.F.
17.57	Ceramic Cond. 270 mmf ±10% "	37.138	Coil B.C. 1st. & 2nd I.F.
17.62	Ceramic Cond. 500 mmf. ±20% "	37.194	Coil B.C. Oscl.
17.45	Ceramic Cond. 1500 mmf ±20% "	37.195	Coil F.M. Oscl. (Made at Fada)
17.44	Ceramic Cond. 5000 mmf gmV "	37.196	Coil F.M. R.F. (Made at Fada)
17.80	Ceramic Cond. 10,000 mmf gmV "	37.193	Coil B.C. Loop
17.46	Ceramic Cond. 10,000 mmf gmV "	77.128	Crystal
17.28	Ceramic Cond. 10 mmf ±20% "	77.125	Dial Plate
22.36	Electrolytic 30-40-40 150 W.V. Alum. Can	77.126	Dial Pointer
22.52	Electrolytic 30 mf 150 W.V. Alum. Tube	77.152	Dial Scale
22.31	Electrolytic 25 mf 25 W.V. Alum. Tube	77.5	Dial Cord
22.53	Electrolytic 4 mf 50 W.V. Alum. Tube	77.4	Dial Spring
27.37	Variable Cond. With drum	77.124	Vernier Drive
32.109	Carbon Res. 22 ohm ½ W. ±10% Carbon	97.138	Baffle Speaker
32.1	Carbon Res. 68 ohms ½ W. ±10% Carbon	97.141	Grille Silk
32.3	Carbon Res. 130 ohms ½ W. ±10% Carbon	97.130	Back
32.4	Carbon Res. 150 ohm ½ W. ±10% Carbon	97.131W	Cabinet (Walnut)
32.5	Carbon Res. 220 ohm ½ W. ±10% Carbon	97.131V	Cabinet (Ivory)
32.30	Carbon Res. 470 ohm ½ W. ±10% Carbon	97.142	Metal Grille
32.153	Carbon Res. 820 ohm ½ W. ±20% Carbon	107.24	Speaker with Trans. & Bracket 6" PM
32.8	Carbon Res. 1000 ohm ½ W. ±10% Carbon	117.24	Ballast Tube
32.12	Carbon Res. 15000 ohm ½ W. ±10% Carbon	132.9	Ceramic Trimmer 3-12 mmf NPO
32.85	Carbon Res. 27000 ohm ½ W. ±10% Carbon	142.45V	Knob Band Selector (Ivory)
32.13	Carbon Res. 22000 ohm ½ W. ±10% Carbon	142.45W	Knob Band Selector (Walnut)
32.18	Carbon Res. 220,000 ohm ½ W. ±20% Carbon	142.46V	Knob Tuning (Ivory)
		142.46W	Knob Tuning (Walnut)
		142.47W	Knob Volume (Walnut)
		142.47V	Knob Volume (Ivory)
		142.48W	Knob Tone AC-On-Off (Walnut)
		142.48V	Knob Tone AC-On-Off (Ivory)



MODEL 795
F.M. Tuner

FADA RADIO & ELECTRIC CO., INC.

ALIGNMENT PROCEDURE

No attempt should be made to realign the various circuits until all other causes have been checked, unless the condition is so obvious as to indicate that realignment is necessary. Then proceed as follows:

Remove chassis from cabinet, turn on tuner and allow at least 10 minutes "warming up" period.

Use a standard V.T.V.M. with zero center setting.

Use an A.M. signal generator with no modulation, taking harmonics if fundamentals are not available.

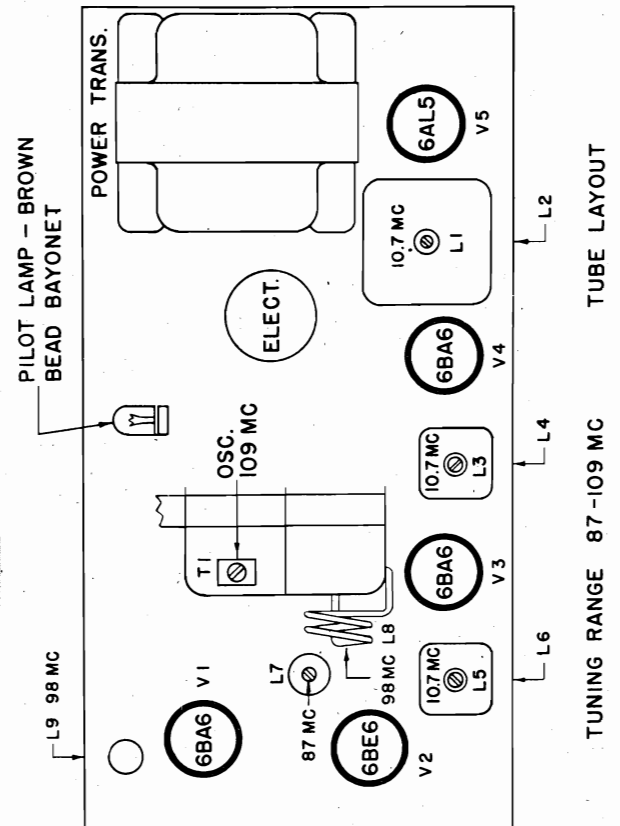
Keep signal generator attenuated so as to maintain a 3 V reading.

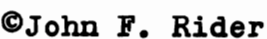
Receiver Dial at:	Signal Generator Frequency	Signal Generator Connected to:	V.T. V.M. Connected to:	Refer to chassis Layout for location of trimmers.
1. 98 MC	10.7MC	Control Grid Pin #1 6BA6 (2nd I.F.) Socket Series with .01 cond.	Across the (2) 22000 ohm Resistors Pin #2 6AL5, Marked X.	Adjust L1, L2 for Maximum Output.
2. 98 MC	10.7MC	Control Grid Pin #7 6BE6 Socket Series with .01 Cond.	"	Shunt L4 with a 680 ohm ½ W carbon & adjust L3 for maximum output.
3. 98 MC	10.7MC	"	"	Shunt L3 with a 680 ohm ½ W carbon & adjust L4 for maximum output.
4. 98 MC	10.7MC	"	"	Adjust L5, L6 & L1 for maximum output.
5. 98 MC	10.7MC	"	Ground lead of V.T. V.M. to point A on schematic, and probe to point B.	Adjust L2 for zero output. (Check zero setting of V.T. V.M.) Meter should register reverse when slug is rotated through zero output.
6. Variable Condenser Fully open.	109MC	Terminals 1 & 2 in series with (2) 130 ohm carbon ½ W resistors.	Same as Step #1	Adjust T1 for maximum output "Top" peak on trimmer.
7. Variable Condenser Fully closed.	87 MC	"	"	Adjust L7 for maximum output.
8	Repeat steps 6 & 7 until L7 requires no further adjustment.			
9 98 MC	98 MC	Same as step #6	Same as Step #1	Adjust L8 & L9 for maximum output.

FADA RADIO & ELECTRIC CO., INC.

MODEL 795
F.M. Tuner

Part No.	Description
12.43	Tubular Condenser .01 mf 200 V
12.8	Tubular Condenser .02 mf 400 V
12.22	Tubular Condenser .01 mf 400 V
12.31	Tubular Condenser .02 mf 200 V
17.9	Mica Condenser 270 mmf $\pm 10\%$
17.49	Ceramic Condenser 50 mmf $\pm 10\%$
17.45	Ceramic Condenser 1500 mmf $\pm 20\%$
17.44	Ceramic Condenser 5000 mmf Gmv. Disk type
17.53	Mica Condenser 82 mmf $\pm 5\%$
17.47	Ceramic Condenser 100 mmf
17.54	Ceramic Condenser 8.2 mmf $\pm 10\%$ N 1800
22.30	Electrolytic Condenser 4 mf 50 WV
22.32	Electrolytic Condenser 30-40-20 mf 150 WV
27.27	Variable Condenser w/Drum
37.116	Coil Ratio Detector
37.112	Coil 1st. I.F. Transformer
37.132	Coil 2nd. I.F. Transformer
37.127	Coil Oscillator
37.128	Coil R. F.
37.117	Coil Antenna
37.129	Coil R. F. Choke
42.20	Power Transformer
47.14	Switch
77.16	Dial Pointer
77.123	Dial Scale
97.118	Cabinet Back
97.125W	Cabinet Walnut
97.125V	Cabinet Ivory
112.6	Selenium Rectifier
142.4W	Knob Walnut
142.4V	Knob Ivory





ALIGNMENT PROCEDURE

No attempt should be made to realign the various circuits until all other causes have been checked, unless the condition is so obvious as to indicate that realignment is necessary. Then proceed as follows:

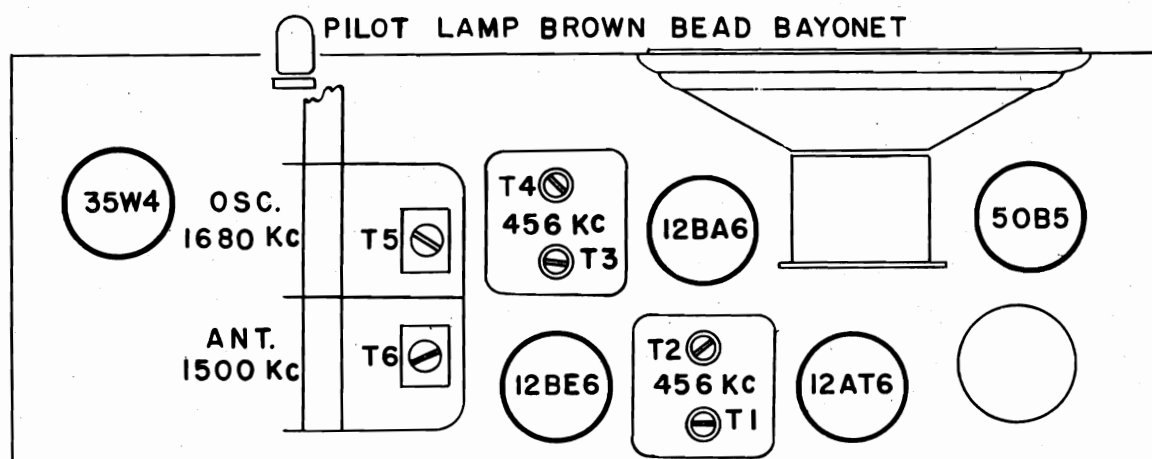
Volume Control full on.

Low range A.C. meter connected across voice coil to indicate output.

Keep signal generator attenuated so as to maintain $\frac{1}{2}$ scale reading on output meter.

Make certain that dial pointer is exactly horizontal when variable condenser is fully meshed.

Receiver Dial at:	Signal Generator	Dummy Antenna	Connect Signal Generator to:	Refer to Chassis Layout for Location of Trimmers
1 Full Open	Exactly 456 KC	.1 MF	Control Grid 12BE6 Tube (Top) Rear Section Variable Condenser	Adjust for Minimum Output T5 Note: On later production this trimmer is eliminated.
2 Full Open	Exactly 1680 KC		Radiating Loop ($\frac{1}{2}$ meter) 20" from Receiver	Adjust for Maximum Output T6
3 Approx. 1500 KC	Approx. 1500 KC		Radiating Loop ($\frac{1}{2}$ meter) 20" from Receiver	Adjust for Maximum Output T7
4 Approx. 600 KC	Approx. 600 KC		Radiating Loop ($\frac{1}{2}$ meter) 20" from Receiver	Check tracking and bend slotted end plate (rear section) of variable if necessary.
5				

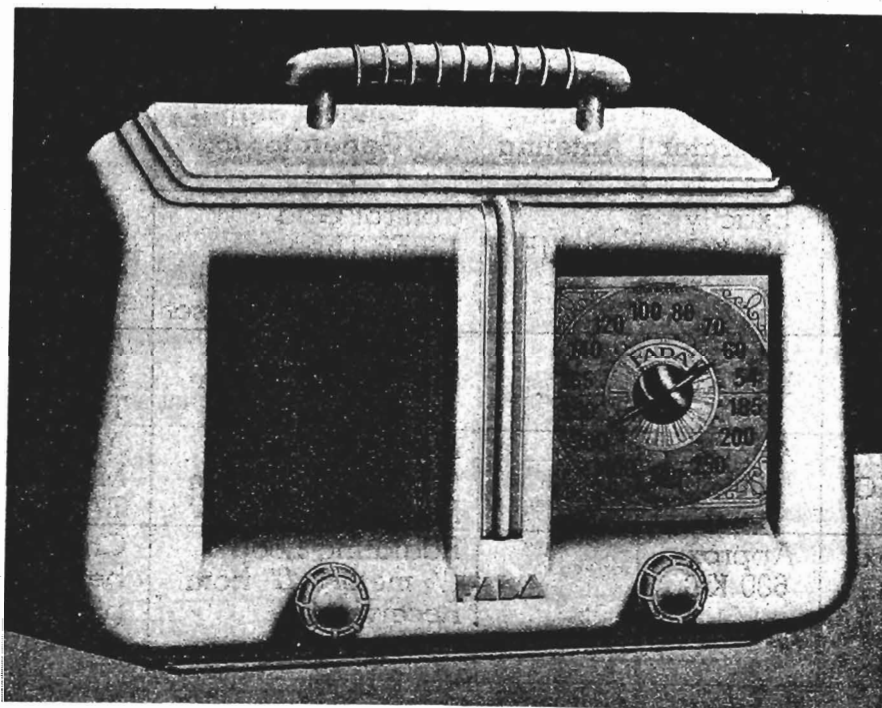


TUNING RANGE 530-1680 Kc

1005
TUBE LAYOUT

MODEL 1005

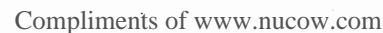
FADA RADIO & ELECTRIC CO., INC.



Part No.	Description
12.4	Tubular Condenser .005 mf 600 V
12.6	Tubular Condenser .01 mf 400 V
12.9	Tubular Condenser .03 mf 400 V
12.11	Tubular Condenser .05 mf 200 V
12.12	Tubular Condenser .05 mf 400 V
17.21	Mica Condenser 100 mmf $\pm 10\%$
17.22	Mica Condenser 220 mmf $\pm 10\%$
22.19	3 Section Electrolytic Condenser 30-40-20 mf 150 W.V.
27.20	Variable Condenser
37.57	Oscillator Coil
37.54	Loop Antenna & Back
37.61	Input I.F. Transformer complete
37.22	Output I.F. Transformer complete
52.1	Volume Control w/switch
72.1	Power Cord (Approved)
77.78	Dial Pointer
77.92	Dial Scale (Calibrated)
97.71	Cabinet — state color
142.25	Cabinet Knobs — state color
97.80	Cabinet Handle — state color
107.19T	4" P.M. Speaker with Transformer
107.19	4" P.M. Speaker less Transformer
42.2	Speaker Transformer for Above
117.1	30 ohm 1 W. Resistor

Tubes:

Osc. Converter	12BE6	Power Output	50B5
I.F. Amplifier	12BA6	Rectifier	35W4
Det. Avc. A.F.	12AT6		

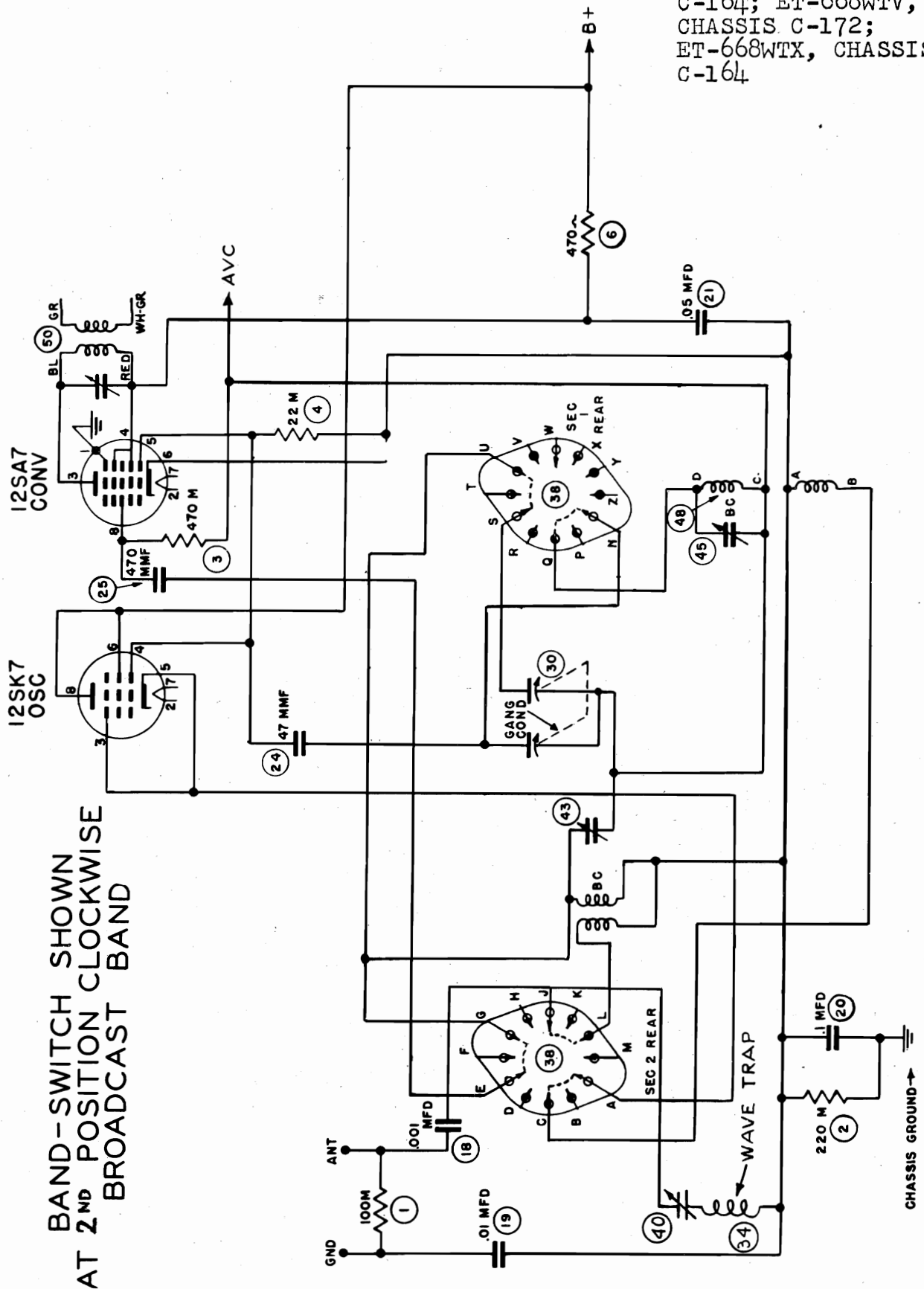


Registered Trademark

MODELS ET-667BRV, FARNSWORTH TELEV. & RADIO CORP.
CHASSIS C-172;
ET-667BRX, CHASSIS
C-164; ET-668WTV,
CHASSIS C-172;
ET-668WTX, CHASSIS
C-164



FARNSWORTH TELEV. & RADIO CORP. MODELS ET-667BRV,
CHASSIS C-172;
ET-667BRX, CHASSIS
C-164; ET-668WTV,
CHASSIS C-172;
ET-668WTX, CHASSIS
C-164

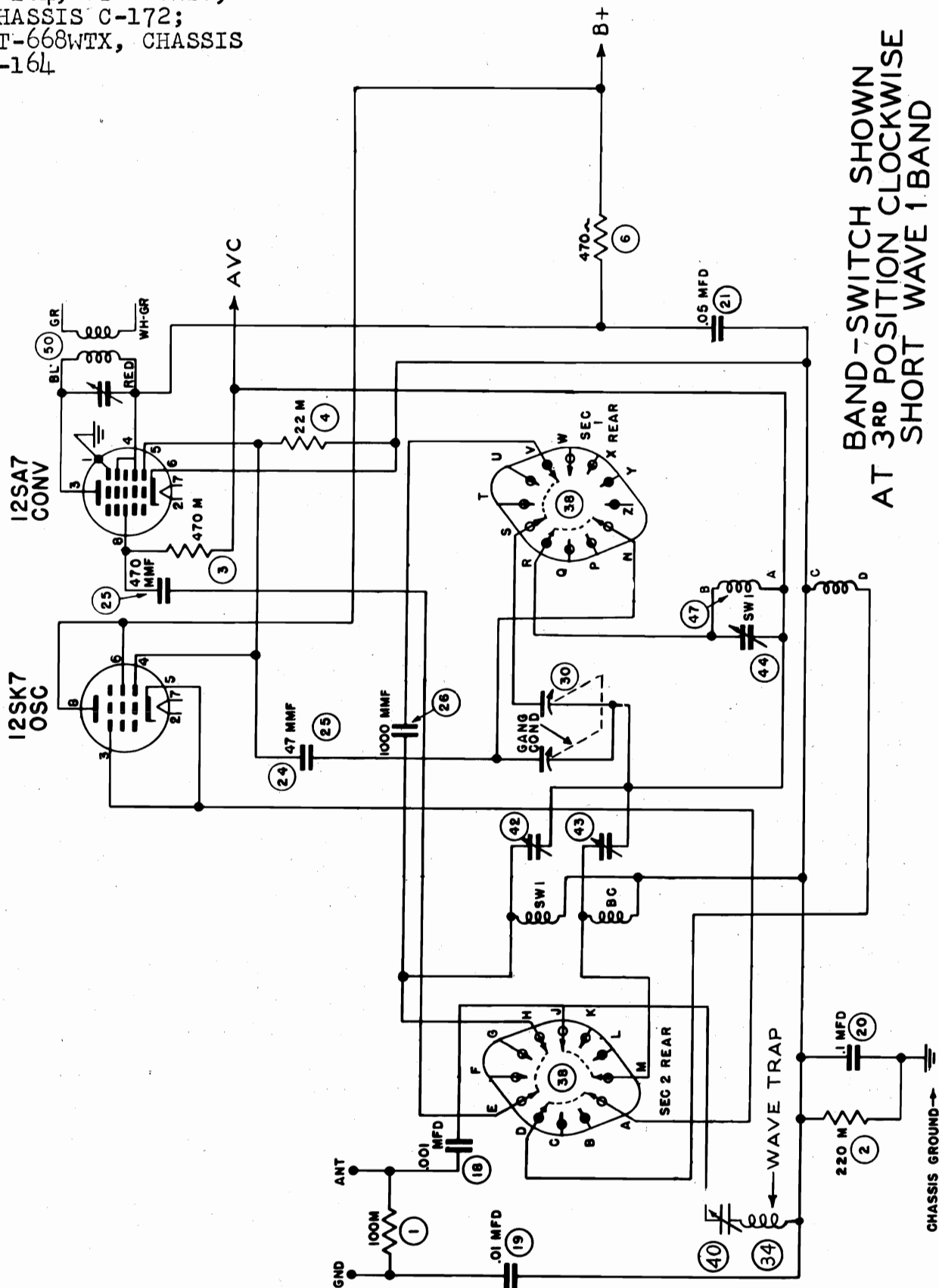


CLARI - SKEMATIX

Registered Trademark

PAGE 19-4 FARNSWORTH

MODELS ET-667BRV, FARNSWORTH TELEV. & RADIO CORP.
CHASSIS C-172;
ET-667BRX, CHASSIS
C-164; ET-668WTV,
CHASSIS C-172;
ET-668WTX, CHASSIS
C-164



BAND-SWITCH SHOWN
AT 3RD POSITION CLOCKWISE
SHORT WAVE 1 BAND

MODELS ET-668WTV,
CHASSIS C-172;
ET-668WTX, CHASSIS
C-164

FARNSWORTH TELEV. & RADIO CORP.

MODELS ET-667BRV,
CHASSIS C-172;
ET-667BRX, CHASSIS
C-164

EQUIPMENT AND PROCEDURE FOR ALIGNMENT

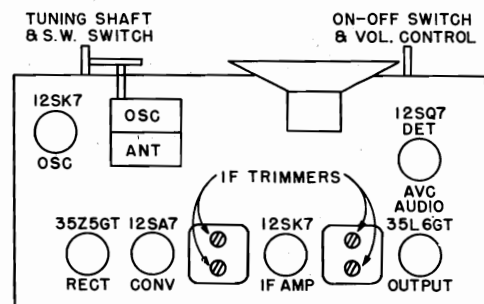
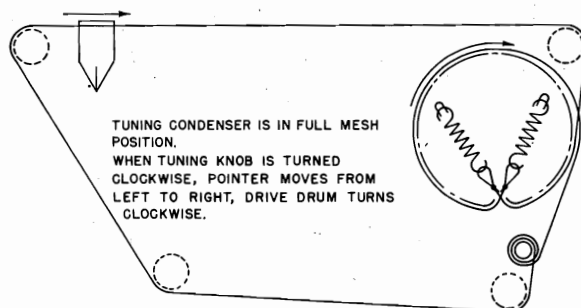
An output meter and a signal generator are required for proper alignment of these sets. The signal generator should be calibrated at the following points: 455 Kc., 600 Kc., 1000 Kc., 1500 Kc., 3.5 Mc., 8 Mc., 9 Mc. and 20 Mc. All adjustments should be made with the volume control set for maximum, keeping the signal generator output as low as possible to prevent AVC action and incorrect settings.

Connect the low side of the signal generator to the ground terminal on the chassis through a .1 Mfd. condenser. Connect the high side of generator to antenna terminal through dummy load of 200 MMF for broadcast band and a dummy load of 400 ohms for shortwave.

STEPS	DUMMY ANTENNA	SET GENERATOR AT	SET GANG AT	ADJUST	LOCATED	TO OBTAIN
1	SET VOLUME CONTROL AT MAXIMUM				Top of I.F. Trans.	Maximum Output
2	Broadcast 200 MMF	455 Kc.	Minimum	2nd. I.F. Trimmers		
3				1st. I.F. Trimmers		
4			1000 Kc.	Wave Trap Trimmer	See Illustration on page one	Minimum Output
5		1500 Kc.	1500 Kc.	B.C. Osc. Trimmer		
6		1500 Kc.	1500 Kc.	B.C. RF Trimmer		
7		CHECK POINTER CALIBRATION AT 1000 Kc. & 600 Kc.				See Illustration on page one	MAXIMUM OUTPUT
8	S.W. 1 400 ohms	8 Mc.	8 Mc.	S.W. 1 Osc. Trimmer *		
9		8 Mc.	8 Mc.	S.W. 1 RF Trimmer **		
10		CHECK 3.5 Mc.				
11	S.W. 2 400 ohms	20 Mc.	20 Mc.	S.W. 2 Osc. Trimmer *		
12		20 Mc.	20 Mc.	S.W. 2 RF Trimmer **		
13		CHECK 9 Mc.				

*When aligning the Shortwave oscillators use the peak found farthest out from maximum capacity on the oscillator trimmers.

**Use the peak nearest maximum capacity on the R.F. trimmers.



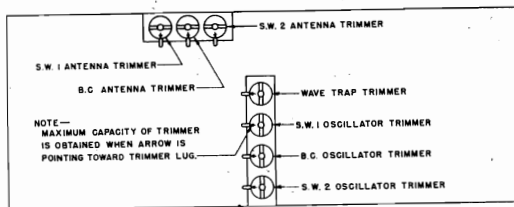
MODELS ET-667BRV,
CHASSIS C-172;
ET-667BRX, CHASSIS
C-164

FARNSWORTH TELEV. & RADIO CORP.

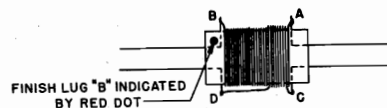
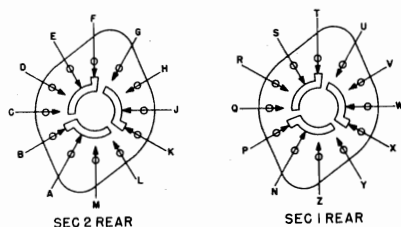
MODELS ET-668WTV,
CHASSIS C-172;
ET-668WTX, CHASSIS
C-164

Ref. No.	Part No.	DESCRIPTION
1	77214	100M ohms
2	77216	220M ohms
3	77217	470M ohms
4	77266	22M ohms
5	77259	150 ohms
6	77261	470 ohms
7	77417	100 ohms, 4 watt, wire wound
8	77344	666 ohms, 25 watt, wire wound
9	77258	100 ohms
10	77270	2.2 megohms
11	77304	1000 ohms, 2 watt
12	77273	6.8 megohms
14	77332	1500 ohms, 3 watt
15	77208	47 ohms
18	25360	.001 mfd. molded oil paper capacitor 600 V.
19	25365	.01 mfd. molded oil paper capacitor 600 V.
20	25361	.1 mfd. molded oil paper capacitor 400 V.
21	25362	.05 mfd. Molded oil paper capacitor 200 V.
22	25363	.02 mfd. molded oil paper capacitor 800 V.
24	25193	47 mmf. Mica capacitor
25	25284	470 mmf. Mica capacitor
26	25053	1000 mmf. Mica capacitor
27	25187	240 mmf. Mica capacitor
29	25283	Electrolytic Capacitor 40-20 mfd. 300 V., 30 mfd., 250 V.
30	26227	2 Gang Tuning Capacitor
31	78118	Volume Control
34	38650	Wave Trap Coil
36	27118	Line Cord
38	90198	Band Switch
39	38651	Antenna Coil
40	26229	Wave Trap Trimmer
41	26228	SW2 Antenna Trimmer
42	26228	SW1 Antenna Trimmer
43	26228	BC Antenna Trimmer
44	26228	SW1 Oscillator Trimmer
45	26228	BC Oscillator Trimmer
46	26238	SW2 Oscillator Trimmer
47	38648	SW1 Oscillator Coil
48	38647	BC Oscillator Coil
49	38649	SW2 Oscillator Coil
50	38536	1st. I.F. Transformer
51	38537	2nd I.F. Transformer
52	94179	Output Transformer
54	81146	Speaker
56	42186	Dial Lamp 150 Ma.
	80033	Antenna and Ground Terminal Strip
	31339	Dial Scale
	60431	Dial Background
	11329	Dial Pointer
	41106	Drive Cord (36" long approx.) and Springs
	56994	Drive Drum
	80167	Molded octal tube socket
	07412	Back cover Ass'y. ET-667 BRX and ET-668 WTX
	13541	Back cover Ass'y. ET-667 BRV and ET-668 WTV
	09277	Knob and Set screw
	54091	Band Switch Lever
	05098	Baffle Assembly ET-667 BRV and ET-667 BRX
	05099	Baffle Assembly ET-668 WTX and ET-668 WTX
	H-263	Cabinet for ET-667 BRX and ET-667 BRV
	H-264	Cabinet for ET-668 WTV and ET-668 WTX

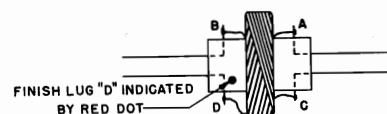
BOTTOM VIEW OF CHASSIS



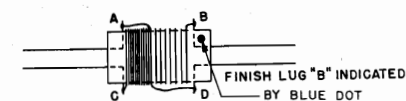
BAND SWITCH



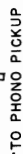
SHORT WAVE 1 OSCILLATOR COIL



BROADCAST OSCILLATOR COIL



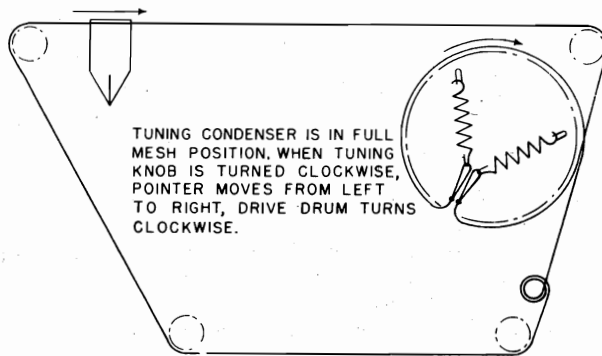
SHORT WAVE 2 OSCILLATOR COIL



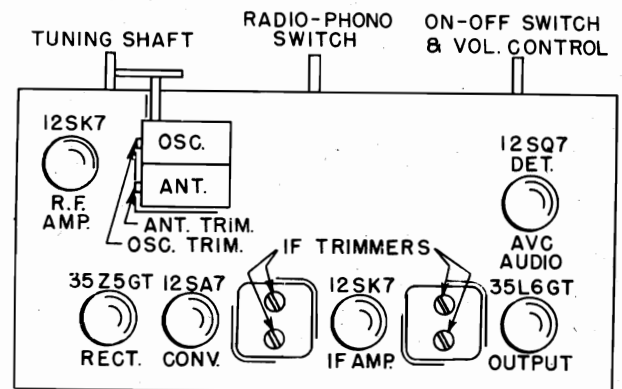
FARNSWORTH TELEV. & RADIO CORP.

MODEL K-262P

DIAL STRINGING



CHASSIS LAYOUT



Ref. No.	Part No.	DESCRIPTION
1	77185	150 ohm resistor.....
2	77170	470 ohm resistor.....
3	77168	4700 ohm resistor.....
4	77246	15K ohm resistor.....
5	77169	22K ohm resistor.....
6	77178	220K ohm resistor.....
7	77173	470K ohm resistor.....
8	77171	2.2 Megohm resistor.....
9	77223	3.3 Megohm resistor.....
10	47177	6.8 Megohm resistor.....
11	25182	.1 mfd. tubular cap., 200 volts.....
12	25494	.08 mfd. tubular cap., 200 volts.....
13	25181	.05 mfd. tubular cap., 200 volts.....
14	25195	.02 mfd. tubular cap., 600 volts.....
15	25186	.01 mfd. tubular cap., 400 volts.....
16	25193	47 mmfd. mica capacitor.....
17	25188	100 mmfd. mica capacitor.....
18	25187	240 mmfd. mica capacitor.....
19	25022	Electrolytic Cond. 30 mfd. & 20 mfd., 150 volt.....
20	11448	Tuning Capacitor Assembly.....
21	38484	Wavetrap Coil Ass'y.....
22	38706	Oscillator Coil Ass'y.....
23	94267	Filter Choke.....
24	38322	1st I.F. Transformer.....
25	38324	2nd I.F. Transformer.....
26	78048	500M Volume Control.....
27	94091	Output Transformer.....
28	81188	Speaker.....
29	27050	Line Cord.....
30	22198	Phone Accord.....
31	22169	Pickup Cable.....
32	90273	Band Switch.....
33	38984	Loop Antenna Ass'y.....
34	42186	Pilot Lamp Mazda 47.....
	22199	Speaker Cable.....
	07692	Pointer Slide Ass'y.....
	59183	Dial Pointer.....
	05047	Drive Cord Ass'y.....
	92192	Drive Cord.....
	31265	Dial Scale.....
	18058	Dial Background Ass'y.....
	59476	Knob.....
	H-313-1	Cabinet and Packing—Mahogany.....
	H-313-2	Cabinet and Packing—Walnut.....
	H-313-3	Cabinet and Packing—Maple.....

All Resistors are 1/2 watt, 20% Tolerance

MODELS 19N₄, 24N₄, FARNSWORTH TELEV. & RADIO CORP. MODELS 29P₄, 30P₄,
26N₄, 31N₄, 114N₄, 31P₄, 116P₄, 118P₄,
116N₄, 21P₄, 24P₄.

Model	Cabinet	Record Changer
118P ₄	Georgian	41E-MP
116P ₄	Sheraton	41E-MP
31P ₄	Hepplewhite	P-71
30P ₄	French Provincial	P-71
29P ₄	Early American	P-71
24P ₄	Hepplewhite	P-71
21P ₄	Chippendale	P-71
116N ₄		Capehart 41E
114N ₄	Early Georgian	41E
31N ₄	Sheraton	Panamuse P-63
26N ₄	Modern	P-63
24N ₄	Hepplewhite	P-63
19N ₄	Hepplewhite	P-63

"Whistles" and Heterodynes

Check IF rejection ratio by application of signal generator at the intermediate frequency to the antenna terminals.

A defective wave trap will cause heterodynes.

Low Volume

If low volume of N₄ combinations is experienced, we suggest the following:

1. Test tubes.
2. Check alignment of the receiver.

RECEIVER SPECIFICATIONS**SECTION 1****RECEIVER FREQUENCIES**

AM Broadcast Band.....	540 to 1600 Kc.	IF (AM Band).....	455 Kc.
FM Band.....	87.5 to 108.5 Mc.	IF (FM Band).....	10.7 Mc.

TUBE COMPLEMENT

Application	Type	Type	Application
FM RF Ampl.....	6AG5	6H6.....	FM Detector, AVC
FM Converter-Osc.....	6SB7Y	6SC7*.....	Phono Pre-Amplifier
AM RF Converter-Osc.....	6SA7	6SL7.....	Audio Ampl., Phase Inverter
AM RF Ampl. FM 1st IF Ampl.....	6SG7	6V6.....	Power Output
AM IF Ampl., AM Det., FM 2nd IF Ampl.....	6SF7	5Y3GT.....	Rectifier

*The N₄ Uses a 6J7 as Phono Pre-Amplifier.

POWER AND VOLTAGE REQUIREMENTS

185 Watts at 117 Volts.....	60 Cycles	105 to 125 Volts.....	AC
-----------------------------	-----------	-----------------------	----

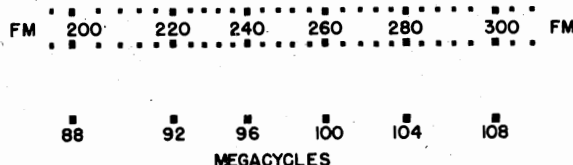
DIAL SCALE

The AM Band conventionally calibrated in Kilocycles

FM Band is marked with the new Channel Numbers

The conversion of FM Dial Scale readings to frequency may be made from the following analysis:

The FM band extends from 88 to 108 mc., each station channel 200 kc., in width, Channel 201, that lowest in frequency, has center frequency at 88.1 mc. Each succeeding channel is successively 200 kc., higher, so channel 202 is centered at 88.3 (200 kc. higher) channel 203 is centered at 88.5 mc., etc.

**ANTENNAS**

P₄ & N₄ series instruments both incorporate two internal antennas; a loop antenna used in broadcast band reception and a folded-dipole antenna used for FM reception.

These internal antennas are intended for use only in the presence of adequate field strength, as in large metropolitan areas where local stations supply the majority of desired programs. Neither a loop nor a dipole element which is within the confines of the cabinet can be considered as efficient

signal pickup devices and, should field strength requirements be not fulfilled, it will be necessary, for satisfactory reception, to install an efficient outside antenna.

Both the loop and the dipole (internal or external) antennas exhibit certain characteristics of directivity, with which the experienced serviceman is familiar, which should be borne in mind when locating the receiver (or external antenna) in the home.

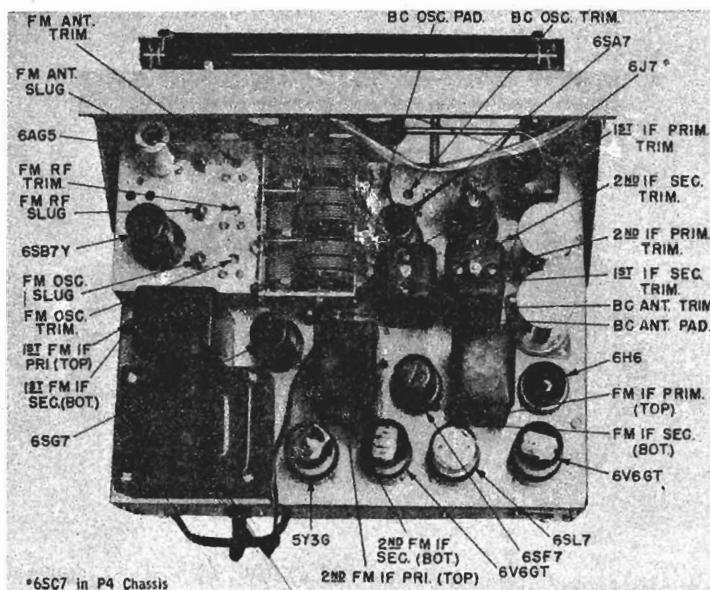
MODIFICATION KIT NO. 41140

The N4 tuner modification kit no. 41140 was issued for the purpose of revising the Phono Pre-Amplifier circuit of the tuner, in the field. This was so that P-71 record changers, using the variable reluctance pickup could be incorporated in N4 instruments already in the field. The kit is also applicable to N4 tuners that are used with the 41E record changers. A kit was also issued for the purpose of revising 41E changers to equal the new 41E-MP, by addition of the variable reluctance pickup, the Noise Eliminator and various other modernizations.

The N4 tuner which has been modified, following the instructions accompanying kit no. 41140, is the electrical equivalent of the P4 tuner

If the N4 tuner is of early production (C-175) then the circuit is different

N4 tuners that have not been modified by modification kit no. 41140 will have the Phono Pre-Amplifier circuit

**ALIGNMENT OF THE RECEIVER**

Two methods of alignment of P4 & N4 receivers are presented. Service shops possessing a suitable sweep generator and oscilloscope will effect a considerable saving of time by using the first method.

The alternate method using an amplitude modulated signal generator is preferred by some servicemen. This method requires careful attention to details to attain accurate alignment.

GENERAL INSTRUCTIONS**1. Adjustment of Dial Pointer****ALIGNMENT OF FM BAND**

1. Equipment required will be an oscilloscope, a frequency modulated signal generator covering the range 87.5 mc to 108.5 mc on fundamentals, a sweep generator producing a signal of 10.7 mc and sweeping at least 150 kc each side of 10.7 mc, and an output meter.

2. The vertical or "Y" axis terminals of the oscilloscope should be connected between pin 3 of the 6H6 discriminator and ground. The sweep voltage of the sweep generator should be fed to the horizontal or "X" axis terminals of the oscilloscope. The 10.7 mc output of the sweep generator should be fed into the grid of the 6SF7 tube through a condenser of approximately 3300 mmfd.

3. Remove the negative lead of the 4 mfd. electrolytic from pin #3 of 6H6 socket. Remove 6SL7 tube from socket. Turn the set on and turn both the tone control and the volume control all the way to the right. Detune the secondary of the third FM IF transformer by turning the bottom slug screw out as far as possible. Adjust the primary top slug screw, until pattern (A) appears on the oscilloscope. Adjust the secondary, bottom slug screw, until pattern "B" is obtained on the oscilloscope and until both sides of this pattern are symmetrical.

4. Remove the 10.7 mc output of the sweep

generator from the grid of the 6SF7 tube and connect to the grid of the 6SG7. Align the second FM IF transformer as in paragraph "3."

2. Test Signal Conditions

All alignment shall be done with only sufficient signal amplitude to provide satisfactory signal to noise ratio, and acceptable pattern size on oscilloscope or readable output on output meter. The use of excessively strong signal is almost certain to produce misalignment.

5. Connect the 10.7 mc output of the sweep generator to the signal grid of the 6SB7Y, (pin 8) detune secondary of the first FM IF transformer and tune primary as before for pattern (A). Tune secondary for pattern "C" and make both sides of pattern as symmetrical as possible. This completes alignment of the FM IF transformers.

6. Reconnect the negative lead of the 4 mfd. electrolytic to pin #3 of the 6H6 socket and move the oscilloscope leads to the middle terminal on third FM IF (to which tertiary winding connects) and ground. With the sweep generator connected to the 6SB7Y signal grid as before, the discriminator pattern (D) should appear on the oscilloscope if the IF alignment instructions have been followed carefully. Remove the oscilloscope and sweep generator leads and reinstall 6SL7 tube in socket. Never adjust AM IF transformers without rechecking FM IF alignment.

7. Connect the 87.5 to 108.5 mc signal generator to the antenna socket of the receiver through a 300 ohm resistor. The generator should be frequency modulated at some frequency in the audible range. Connect output meter across secondary of

MODELS N4, P4,
Series, Capehart

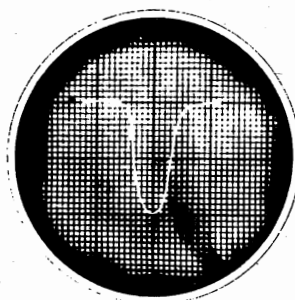
FARNSWORTH TELEV. & RADIO CORP.

output transformer. Tune receiver to channel 300 FM dial. With signal generator set at 107.9 mc adjust oscillator trimmer condenser, third from front, for maximum reading on output meter. Set signal generator to 87.9 mc and tune receiver to channel 200 on FM dial. Adjust oscillator coil screw, third from front, (see chassis layout) for maximum reading on output meter. Recheck oscillator setting for channel 300.

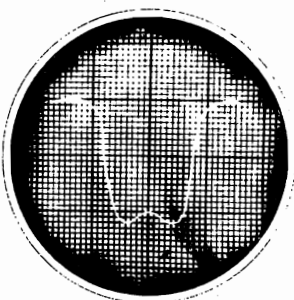
8. Tune signal generator and receiver to 105 mc (channel 285 approx.). Adjust converter signal

grid trimmer condenser, second from front, for maximum reading on output meter. Tune signal generator and receiver to 92 mc, (channel 220 approx.) and adjust converter coil screw, (second from front), to maximum reading on output meter. Recheck converter trimmer setting at 105 mc (channel 285 approx.).

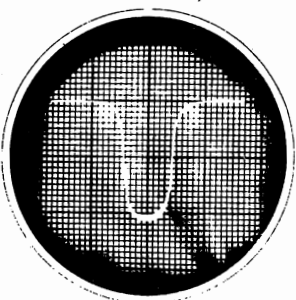
9. Repeat operations of paragraph (7) for antenna trimmer condenser and coil. This completes FM RF alignment.



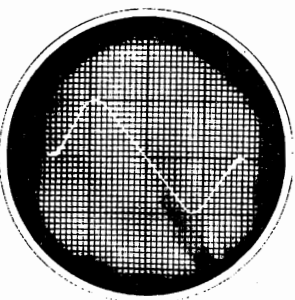
A



B



C



D

ALTERNATE FM ALIGNMENT PROCEDURE

Necessary Equipment:

Signal generator.

Vacuum tube voltmeter or DC voltmeter 20,000 ohms per volt.

FM IF ALIGNMENT

Adjust dial pointer as outlined in section VII. Connect voltohmmyst from ground to pin #3 of 6H6. Connect generator tuned to 10.7 mc to pin #4 on 6SG7. Turn secondary slug of third FM IF (closest to chassis) out as far as it will turn. Tune primary of third IF for maximum negative voltage. Tune primary and secondary of the second FM IF for maximum output. Move generator to pin #8 of 6SB7Y and tune primary and secondary of first FM IF for maximum output. Next tune secondary of third FM IF to balance to zero volts, using high resistance voltmeter connected to middle terminal of FM IF transformer (tertiary winding).

FM RF ALIGNMENT

With high resistance voltmeter connected between ground and pin #3 on 6H6 socket, connect generator between ground and small pin of dipole antenna socket. Use very short leads on generator and a 300 ohm resistor as a dummy antenna. Set generator to 108.5 mc and gang to minimum and adjust oscillator trimmer for maximum voltage. Go back and check low frequency end. Next set generator at 92 mc, tune in signal on receiver, approximately 220 on dial. Adjust converter and antenna slug for maximum voltage output. Set generator at 105 mfd. Tune in signal on receiver, approximately 280 on dial. Tune converter and antenna trimmer for maximum voltage output. Check adjustment of antenna and converter slugs at 92 mc.

ALIGNMENT INSTRUCTIONS FOR AM BAND

An output meter and a signal generator calibrated at 455 Kc., 600 Kc., 1500 Kc. and 1600 Kc., are required to properly align these receivers on AM band. Keep the output of the signal generator as low as possible to prevent AVC action and false settings. Connect the high side of the generator to the blue wire found at rear of set and low side to the white wire.

STEPS	DUMMY ANTENNA	SET GENERATOR AT	SET GANG AT	ADJUST	LOCATED	OBTAIN MAXIMUM OUTPUT
1	SET VOLUME AND TONE CONTROLS AT MAXIMUM					
2	.1 Mfd. to converter RF grid	455 Kc.	Minimum	2nd IF Trimmers*	Top of IF Transformers	
3				1st IF Trimmers**		
4	200 MMF.	1600 Kc.	1600 Kc.	B.C. Osc. Trimmer	See Trimmer Layout	
5		1500 Kc.	1500 Kc.	B.C. RF Trimmer**	See Under Chassis	
6		1500 Kc.	1500 Kc.	B.C. Ant. Trimmer	On Loop	
7		600 Kc.	600 Kc. Rock Gang	600 Kc. Padder	See Trimmer Layout	
8		600 Kc.	600 Kc.	Peak loading coil slug	See Trimmer Layout	
9	Recheck 1500 Kc.					

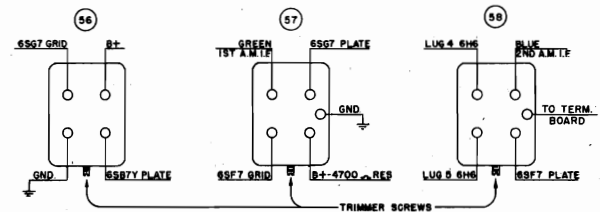
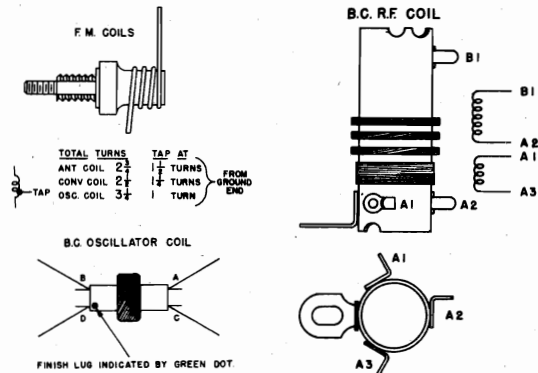
* Recheck after FM alignment.

** Not used on early production.

FARNSWORTH TELEV. & RADIO CORP.

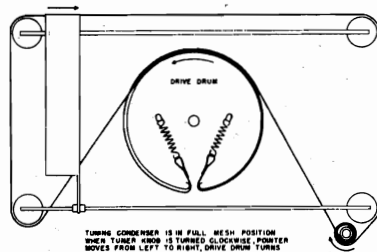
MODELS N₄, P₄,
Series, Capehart

RECEIVER RF-IF COILS



Letters on terminals of coils correspond to similarly lettered terminals on the coils shown in the circuit diagram.

MAINTENANCE OF THE TUNER



1. Adjustments of Dial Pointer

a. Tune receiver to extreme low frequency end of dial and set pointer to index at the last calibration mark of either scale.

b. Carefully determine that the gang condenser plates are completely meshed with the pointer in this position.

Warning: This adjustment is extremely important if subsequent alignment is to provide accurate calibration.

NOTE: The pointer remains dark when the band switch is in the phonograph position.

c. Tune the dial across the entire range and observe that the pointer line is a single sharply defined line of uniform brilliance. If this is not obtained, it indicates that mechanical adjustment of the spacing of the light-box from the dial glass is necessary.

2. "Sticking" Light-Boxes

The traveling light-box may be sticking, causing dial slippage. This may be due to (a) lubricant on rods, (b) bent rods, (c) rough rods, (d) misalignment of rods.

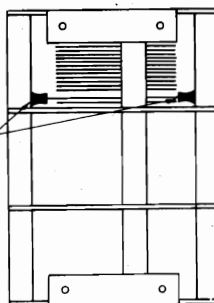
(a) The rods must be free of all lubricants. Lubrication, momentarily helpful, causes gum to form at the light-box mounting, resulting in "sticking." Clean well with carbon tetrachloride.

(b) Bent rods must be accurately straightened or replaced.

(c) Rough portions of the rod surface should be cleaned with crocus cloth until perfectly smooth.

3. Dial Glass Plate

Paint scratched. This is due to the light-box as-



sembly contacting the painted surface. Adjust the horizontal positioning of the light-box for optical focus of the projected line of light, so that (1) focus is maintained throughout the entire path of travel, (2) front of light-box assembly does not at any point touch the scale. The clamps which hold the glass rod in place may be clipped back if necessary.

Touch-up paint may be obtained at automobile service stations.

4. Control Knobs—Eccentric—Loose—How to Remove

A. Knobs eccentric (wobbly motion) or loose. This may be caused by pinching together the two halves of the split-shaft end. One-half section becomes bent toward the axis of the shaft to a greater degree than does the other. Re-form the split portions of the shaft so that they are symmetrical with respect to the axis of the shaft.

B. To remove control knobs.

Loop a heavy cord behind the knob, bringing out the two ends at opposite sides of the knob. Pull both ends firmly. If the cord (both ends) is brought out on one side only, there will be a tendency to cause the difficulty of 4A, above.

5. Microphonics and Feedback

A. Microphonic tubes.

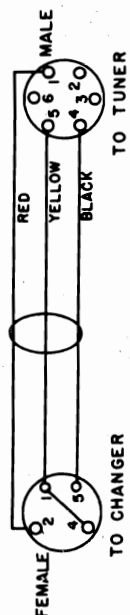
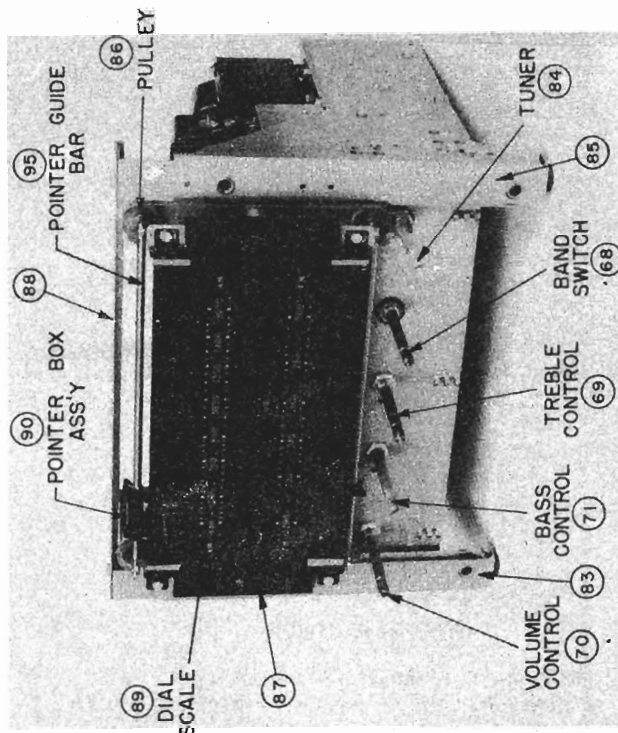
B. Check the variable condenser stator plates to ascertain whether they are loose. If so, apply a laquer cement to the clamp which holds the stator plates to the insulating material.

C. "Twin lead" to antenna binding posts may be stapled to cabinet in taut condition, whereby feedback is introduced mechanically. Re-staple the twin lead, leaving somewhat free and loose.

D. On FM, microphonics and howl may be caused by the lead from stator plate to sub-chassis assembly being taut. Re-solder with less tension in the flat ribbon lead.

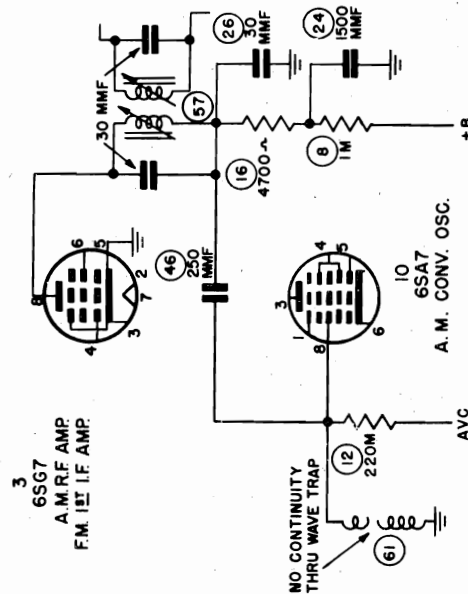
NOTE: Oscillator trimmer may have to be readjusted.

E. If howl on the FM position persists, the following may alleviate the condition: Sponge rubber bits added as shown in sketch. Rubbers must be trimmed so that they will not touch rotor plates when the condenser is fully-meshed. Observe dial calibration for any change resulting from increased capacity.



CIRCUIT DIAGRAM MODIFICATIONS

Record Changer AC Cable, Part No. 22184



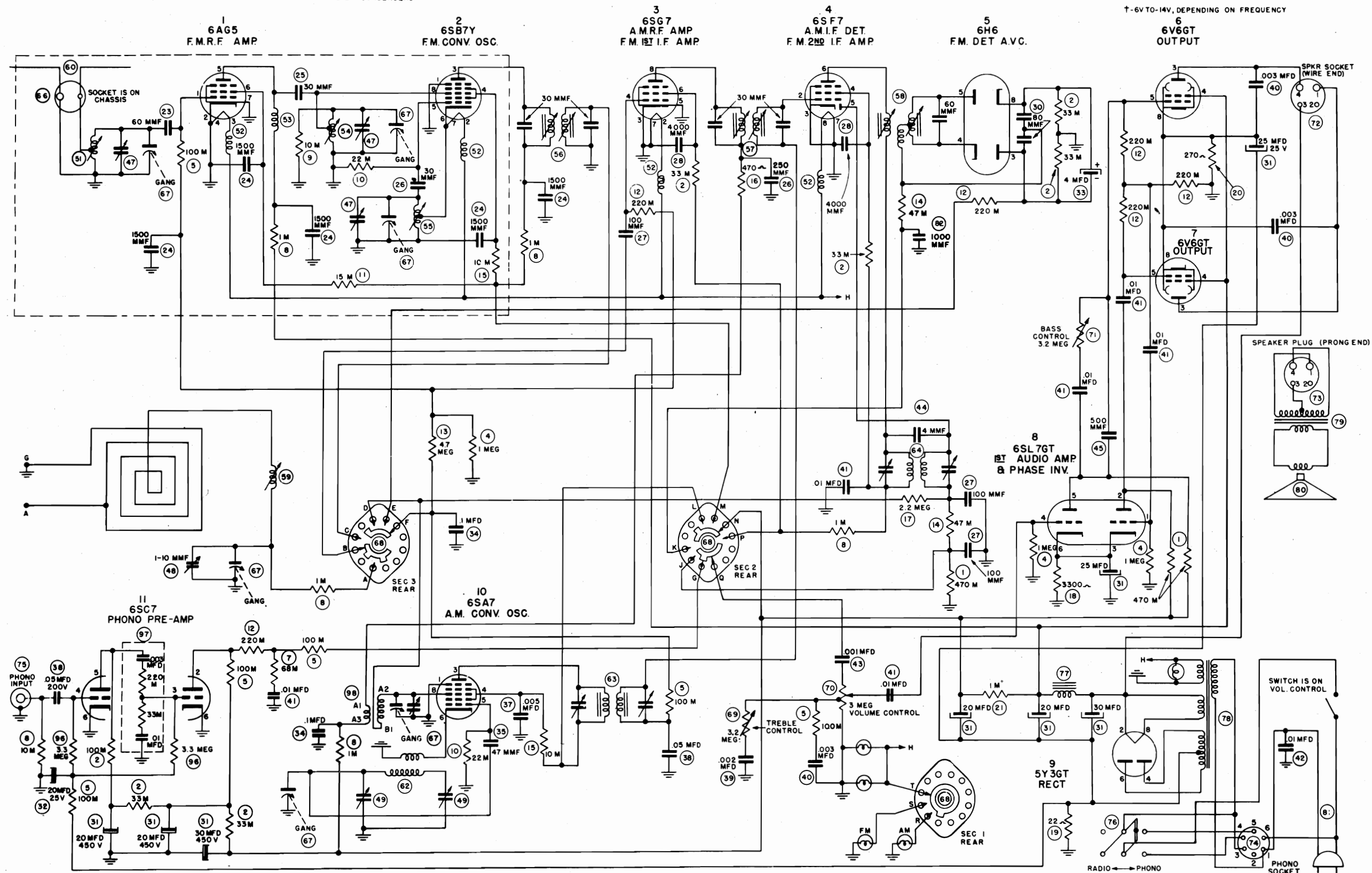
Early production N4 tuners used a two gang broadcast tuning capacitor and wave trap connected as indicated in the RF portion of the schematic reproduced above:

FARNSWORTH TELEV. & RADIO CORP.

MODELS N4, P4,
Series, Capehart

VOLTAGE 1 RESISTANCE			VOLTAGE 2 RESISTANCE			VOLTAGE 3 RESISTANCE			VOLTAGE 4 RESISTANCE			VOLTAGE 5 RESISTANCE			VOLTAGE 6 RESISTANCE			VOLTAGE 7 RESISTANCE			VOLTAGE 8 RESISTANCE			VOLTAGE 9 RESISTANCE			VOLTAGE 10 RESISTANCE			VOLTAGE 11 RESISTANCE		
10	10	1 MEG	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10		
20	20	2.3 AC	20	20	3.1	20	20	3.1	20	20	3.1	20	20	3.1	20	20	3.1	20	20	3.1	20	20	3.1	20	20	3.1	20	20	3.1	20	20	
30	30	3.1	30	30	3.1	30	30	3.1	30	30	3.1	30	30	3.1	30	30	3.1	30	30	3.1	30	30	3.1	30	30	3.1	30	30	3.1	30	30	
40	40	3.1	40	40	3.1	40	40	3.1	40	40	3.1	40	40	3.1	40	40	3.1	40	40	3.1	40	40	3.1	40	40	3.1	40	40	3.1	40	40	
50	50	3.1	50	50	3.1	50	50	3.1	50	50	3.1	50	50	3.1	50	50	3.1	50	50	3.1	50	50	3.1	50	50	3.1	50	50	3.1	50	50	
60	60	3.1	60	60	3.1	60	60	3.1	60	60	3.1	60	60	3.1	60	60	3.1	60	60	3.1	60	60	3.1	60	60	3.1	60	60	3.1	60	60	
70	70	3.1	70	70	3.1	70	70	3.1	70	70	3.1	70	70	3.1	70	70	3.1	70	70	3.1	70	70	3.1	70	70	3.1	70	70	3.1	70	70	
80	80	3.1	80	80	3.1	80	80	3.1	80	80	3.1	80	80	3.1	80	80	3.1	80	80	3.1	80	80	3.1	80	80	3.1	80	80	3.1	80	80	

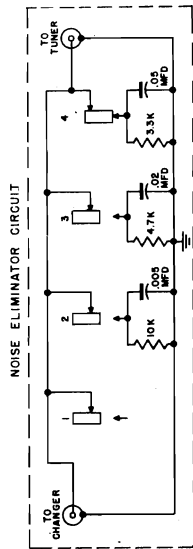
* 1 MEG OR MORE, DEPENDING UPON THE CONDITION OF THE FILTER CONDENSERS



SPECIAL INFORMATION
P-4 SERIES

THE NOISE ELIMINATOR
P4 series instruments are divided into two groups, the instruments using the 41E-MP record changer (100P4 series) and those using the P-71 drop type record changer. The N4 series is also divided in a like manner.

The 41E-MP automatic record changer, used in the 100P4 series instruments, uses the new "Magnetic True Timbre" pickup, which is of the variable reluctance type. The Noise Eliminator used with these instruments is contained in a metal control box which is mounted on the inner wall of the record changer compartment. A schematic diagram of the noise eliminator circuit, as used in the 100P4 series is shown below:



On P4 series instruments using the P-71 record changer the noise eliminator circuit and selector switch are included on the changer itself.

RECORD CHANGER AC CABLES

100P4 and 100N4 series instruments use the Record Changer AC Cable, part no. 22182. This cable is a multi-purpose cable, in that it not only supplies A.C. power to the 41E-MP record changer, but also supplies 110 volts to the record changer compartment light and in addition serves to connect the Reject Button to the record changer.

P4 instruments using the P-71 record changer and N4 instruments using the P-63 changer, both use the Record Changer AC Cable, part no. 22184. This cable serves merely as a power carrier to the record changer.

Schematic diagrams of both cables are shown

PARTS LIST

Ref. No.	Description	Ref. No.	Description
1 77217	470M ohm Resistor	61 38484	Wave Trap Coil (Used with Two Gang Chassis)
2 77267	33M ohm Resistor	62 38694	Broadcast Osc. Coil Assy.
3 77351	1.5 Meg ohm Resistor	63 38822	1st AM Intermediate Freq. Trans.
4 77218	1 Meg ohm Resistor	64 38823	2nd AM Intermediate Freq. Trans.
5 77214	100M ohm Resistor	65 80361	Female Input Socket for FM Dipole
6 77305	68M ohm Resistor	66 26275	Three Gang Tuning Condenser for C-226 N-4 Chassis and C-235 P-4 Chassis
7 77262	1000 ohm Resistor	67 26237	Two Gang Tuning Condenser for C-175 N-4 Chassis
8 77212	10M ohm Resistor	68 90223	Band Switch
9 77265	22M ohm Resistor	69 78123	Treble Tone Control
10 77265	15M ohm Resistor	70 78101	Master Volume Control & Switch
11 77216	200M ohm Resistor	71 78148	Base Tone Control
12 77212	4.7 Meg ohm Resistor	72 80244	Five Prong Speaker Connecting Socket (Female)
13 77213	47M ohm Resistor	73 80284	Five Prong Male Speaker Plug and Cap
14 77013	10M ohm 2 Watt Carbon Resistor	74 80368	Six Prong Female Socket for Phono AC Cable
15 77211	4700 ohm 2 Watt Carbon Resistor (used on 2 gang chassis)	75 80030	Phono Signal Input Socket (Female)
16 77210	2.2 Meg ohm Resistor	76 90219	Phono AC Switch
17 77210	3300 ohm Resistor	77 94226	Filter Choke
18 77360	22 ohm Resistor	78 94225	Power Transformer
19 77180	270 ohm 2 Watt Carbon Resistor	79 94260	Output Trans. for 8115 Speaker on P4 & N4 series
20 77440	1000 ohm 5 Watt Wire Wound Resistor	80 81155	Speaker & Output Trans. Assy.
21 77261	470 ohm Resistor	81 27118	AC Line Cord
22 77261	470 ohm Resistor	82 25053	1000 mmf Capacitor
23 25333	60 mmf Ceramic Capacitor N-470	83 07524	Left Hand Dial Support Brkt. and Pulley Assy.
24 25273	1500 mmf (350V-20%+50%) (Hi-"K") Ceramic Capacitor	84 15174	Tuning Drive Shaft & Pulley Assy.
25 25332	30 mmf Ceramic Capacitor +5% N-150	85 07525	Right Hand Dial Support Brkt. and Pulley Assy.
26 25329	30 mmf Ceramic Capacitor +5% N-750	86 59279	Fibre Dial Cord Pulley
27 25188	100 mmf Molded Mica Capacitor	87 04070	Mount. Clamp for Dial Glass Scale
28 25271	4000 mmf Molded Mica Capacitor	88 04098	Top Dial Support Angle Brkt.
29 25205	2000 mmf Molded Mica Capacitor	89 13807	Dial Glass Scale Assy.
30 25406	80 mmf Ceramic Capacitor	90 13631	Dial Pointer Box Assy.
31 25214	Filter Condenser (30 Mfd., 20 Mfd., at 25V)	91 62115	Rubber Grommet (on bottom of dial Support)
32 25269	50 Mfd., 25 Volt Electrolytic Condenser	92 55261	Tuning Fly Wheel
33 25270	4 Mfd., 100 Volt Electrolytic Condenser	93 07410	Brg. Assy. for Lower Pointer Guide
34 25215	1 Mfd., 600 Volt Tubular Condenser	94 58552	Mount. Brkt. for Phono AC Switch
35 25193	47 mmf Molded Mica Capacitor	95 55259	Guide Rod (upper & lower) for Pntr. Box Assy.
36 25183	.005 Mfd., 600 Volt Tubular Condenser	96 77207	3.3 Meg. Ohm Resistor
37 25196	.05 Mfd., 600 Volt Tubular Condenser	97 13889	Pre-Amp. Equalizer Assy.
38 25185	.002 Mfd., 600 Volt Tubular Condenser		
39 25184	.003 Mfd., 600 Volt Tubular Condenser		
40 25184	.01 Mfd., 600 Volt Tubular Condenser		
41 25194	.01 Mfd., 600 Volt Tubular Condenser (Metal en-cased)		
42 25209	.01 Mfd., 25 Mfd., at 25V)		
43 25197	.001 Mfd., 600 Volt Condenser		
44 25327	4 mmf. Ceramic Capacitor		
45 25189	500 mmf Mica Capacitor		
46 25187	250 mmf Mica Capacitor (2 gang chassis)		
47 26231	5-20 mmf Ceramic Trimmer Capacitor		
48 26023	1-10 mmf Trimmer Condenser (Broadcast Antenna)		
49 26240	Dual Trimmer Condenser Strip		
50 26036	Trimmer Condenser for Broadcast Converter Coil		
51 38690	FM Antenna Coil		
52 38661	RF Choke		
53 38913	Broadcast Converter Coil		
54 38691	FM Converter Coil		
55 38692	FM Osc. Coil		
56 38824	1st FM Intermediate Freq. Trans.		
57 38825	2nd FM Intermediate Freq. Trans.		
58 38826	3rd FM Intermediate Freq. Trans.		
59 38805	Loop Loading Coil Assy.		
60 11325	FM Antenna & Plug Assy. (Mounted on Cabinet)		

MISCELLANEOUS PARTS LIST

Part No.	Description
07529	Dial cord and spring assy.
11382	AC phono cable & plug assy. (for two gang N4 chassis, C-175)
17019	Tuning drive drum
22183	AC phono cable and plug assy. for C-226, N4 Chassis and C-235, P4 Chassis
25187	Molded mica cap. 240 mmf +10%
25270	Tubular Elec. cap. 4 mfd. 100V

25325	Ceramic cap. 60 mmf. +5%
36927	Snap washer (for tuning drive shaft)
36936	Flange sleeve to mount tuning cond.
42185	Pilot light
54144	Bakelite mtg. wafer for filtr. cond.
54161	Ceramic spacer for mtg. trm. cond.
54193	Glass rod pointer for stat. pointer box
55260	Mtg. stud for fibre dial cord pulley
56183	Tuning shaft bearing
56518	Rear mtg. brkt. for tuning condenser
56528	Front mtg. brkt. for 2 gang tun. cond.
58302	Capacitor clip
58335	Min. tube shield
58446	Clamp to hold dial string to pntn. box
58524	Mtg. clip for glass rod sta. pointer
58880	Front mtg. brkt. for 3 gang cond
59391	Plastic prism for sta. pntn. box
60315	N4 chassis bottom cover
62099	Rubber mtg. grommet for tuning cond.
64351	Spring only for dial cord
64382	Compression spring for pntn. guide bar
80139	Molded octal socket
80319	Miniature tube socket
80344	Pilot light socket and lead
2000-007	#2-.56x5/16" R.H.M.S. (to mount plastic prism in pointer box)
2000-071	#3-.48x1" lg. R.H.M.S. (adj. screw for pointer guide bar)
11325	Dipole antenna assy. (mounted on cab.)
13581	Speaker network term. board assy. (100 series P4 & N4)
22152	Pickup cable (100N4 & 100P4 series)
22156	Pickup cable (for P4 & N4)
22182	Record changer AC cable (100N4 & 100 P4 series)
22184	Record changer AC cable (P4 & N4 series)
31419	Escutcheon for Pan. N4 series
31429	Escutcheon for 100N4 & P4 series
36478	#3-.48 x 1/2" lg. Phillips F.H.M.S. to mount escutcheon mtg. plate
41130	Mounting screw kit for dial escutch. mtg. plate
58461	Escutcheon mtg. plate (metal)
58546	Tuning and volume knob
59373	Tone control knob
80284	5 prong male speaker plug with cap
80362	2 prong male plug for FM dipole ant.
80366	3 prong female connector on phono AC cable (100N4 & 100P4 series)
80368	6 prong female plug and cap for phono AC cable (100N4 & 100P4 series)
80373	Male connector plug for reject switch cable (100N4 & 100 P4 series)
80422	Ant. and ground terminal strip
80463	6 prong male plug and cap for phono AC cable (100N4 & 100P4 series)
81155	Speaker and output trans. assy. (12")
81183	Cone and voice coil assy. (12")
81184	Treble speaker only (100N4 & 100P4)
90194	Reject switch (100N4 & 100P4)

FARNSWORTH TELEV. & RADIO CORP.

MODELS 35P7, 32P9,
33P9, 34P10

SECTION I

RECEIVER FREQUENCIES

Broadcast Band	540 to 1620 KC
Frequency Modulation Band	87.5 to 108.5 MC
Intermediate Frequency—AM Band	455 KC
FM Band	10.7 MC

TUBE COMPLEMENT

P7		P9 & P10	
Type	Application	Type	Application
6AG5	AM-FM, RF Amplifier	6AG5	AM-FM, RF Amplifier
12AT7	FM Oscillator-Mixer	12AT7	FM Oscillator-Mixer
6BE6	AM Converter-Osc.	6BE6	AM Converter-Osc.
6SK7	1st IF Amplifier, FM-AM	6SK7	1st IF Amplifier, FM-AM
6SK7	2nd IF Amplifier, FM-AM	6SK7	2nd IF Amplifier, FM-AM
6SK7	3rd IF Amplifier, FM	6SK7	3rd IF Amplifier, FM
6T8	FM-AM Detector, AVC and 1st Audio Amp.	6T8	FM-AM Detector, AVC and 1st Audio Amp.
6SQ7	Phase Inv. and Gas Gate	6V6GT	Power Amplifier
6V6GT (2)	Push Pull Power Amps.	5Y3G/GT	Full Wave Rectifier
5Y3G/GT	Full Wave Rectifier	6SC7*	Phono. Pre-Amplifier
6SC7*	Phono. Pre-Amplifier		

* Used only in P7 and P9 instruments.

Total Number Of Tubes

P7—12 tubes P9—10 tubes P10—9 tubes

AMPLIFIER SPEAKER SYSTEM

P7		P9 & P10	
12 watts	Power Output	8 watts	Power Output
4 ohms	Voice Coil Impedance	4 ohms	Voice Coil Impedance
12" PM	Type Speaker	12" PM	Type Speaker
40 to 12,000 c. p. s.	Frequency Response	50 to 10,000 c. p. s.	Frequency Response

AUTOMATIC RECORD CHANGER

P7		P9 & P10	
P-71	Type	P-72 (P9)—P-73 (P10)	Type
78 RPM	Speed	78 RPM	Speed

POWER AND VOLTAGE REQUIREMENTS

Power Consumption—105 watts at 117 volts. Voltage—105 to 125 volts at 60 cycles per second.

ANTENNAS--INTERNAL AND EXTERNAL

SECTION III

Two antennas are provided within the cabinet—a Capehart Low Impedance Loop and a Folded Dipole, constructed of 300 ohm "twin lead."

The loop antenna provides signal pickup for broadcast-band AM reception. This antenna is a directional device (its radiation pattern would show greatest signal pickup directly in front and in back of the loop, with very little if any pickup from its sides). Therefore, the reception of a desired weak signal may be improved by swinging the loop to a new position. The loop is fastened to the inner cabinet wall by means of two hinges which permit it to be adjusted. The built-in loop normally provides satisfactory reception, however in locations remote from broadcasting stations or where poor receiving conditions exists, an outdoor antenna will improve reception.

By shorting terminals 3 and 4 on the antenna terminal strip on the rear of the chassis, the outdoor FM dipole (if used) can be utilized as an outdoor antenna for AM reception. However, if a separate AM outdoor antenna is to be used the lead-in from the antenna should be connected to terminal 4 on the antenna terminal strip, on the rear of the chassis.

The half-wave folded dipole within the cabinet is for FM reception, connection being made by a section of 300 ohm transmission line. It should be borne in mind that the dipole is also a directional device. Should the reception of a desired FM station be inadequate after installation in the home, it may be possible to correct the condition by relocating the receiver in the room.

Internal antennas are intended for use only in the presence of adequate field strength, as

MODELS P7, P9, P10, FARNSWORTH TELEV. & RADIO CORP. Series, Capehart

in large metropolitan areas where local stations supply the majority of desired programs. Neither a loop nor a dipole element which is confined within a cabinet can be considered as efficient signal pickup devices, therefore if field strength requirements are not met, it will be necessary for satisfactory reception, to install an efficient outside antenna.

When an outside dipole is used, disconnect the transmission line to the internal dipole from the Fahenstock clips on the rear of the cabinet

and connect the transmission line from the outside dipole to these clips.

The same chassis as used in the P7 instruments is also used as an AM-FM chassis in Capehart Television-Radio-Phono Combinations. In this case an outside television antenna will be connected to the clips at the rear of the cabinet and it will be necessary to connect the antenna terminals on the video chassis to terminals 1 and 2 on the receiver antenna terminal strip.

MAINTENANCE OF THE RECEIVER

SECTION IV

1. Adjustment of Dial Pointer

a. Tune receiver to extreme low frequency end of dial and set pointer to index at the last calibration mark of either scale.

b. Carefully determine that the gang condenser plates are completely meshed with the pointer in this position.

Warning: This adjustment is extremely important if subsequent alignment is to provide accurate calibration.

2. Dial Slippage

a. The dial pointer may be sticking, causing dial slippage. This may be due to (a) lubricant on rod, (b) bent rod, (c) rough rod.

(a) The rod must be free of all lubricants. Lubrication, momentarily helpful, causes gum to form at the pointer mounting, resulting in "sticking." Clean well with carbon tetrachloride.

(b) Bent rods must be accurately straightened or replaced.

(c) Rough portions of the rod surface should be cleaned with crocus cloth until perfectly smooth.

3. Replacing Miniature Tubes

Inadvertently inserting miniature tubes in their sockets incorrectly will result in damage to the tube pins. Therefore extreme care should be taken to see that the tube pins are properly aligned with the tube socket before applying pressure to insert the tube. As an aid to the serviceman we have placed an indicating mark on the miniature tube sockets to show the correct position for the center of the separation space between the first and last pins on the tube.

In this manner it is possible to line-up the tube with the socket before exerting pressure.

4 Control Knobs—Eccentric—Loose—How to Remove

a. Knobs eccentric (wobbly motion) or loose.

This may be caused by pinching together the two halves of the split-shaft end. One-half section becomes bent toward the axis of the shaft to a greater degree than does the other. Re-form the split portions of the shaft so that they are symmetrical with respect to the axis of the shaft.

b. To remove control knobs.

Loop a heavy cord behind the knob, bringing out the two ends at opposite sides of the knob. Pull both ends firmly. If the cord (both ends) is brought out on one side only, there will be a tendency to cause the difficulty of 4a, above.

5. Microphonics and Feedback

a. Microphonic tubes.

b. Check the variable condenser stator plates to ascertain whether they are loose. If so, apply a laquer cement to the clamp which holds the stator plates to the insulating material.

c. "Twin lead" to antenna binding posts may be stapled to cabinet in taut condition, whereby feedback is introduced mechanically. Re-staple the twin lead, leaving somewhat free and loose.

d. On FM, microphonics and howl may be caused by the lead from stator plate to sub-chassis assembly being taut. Re-solder with less tension in the flat ribbon lead.

NOTE: Oscillator trimmer may have to be readjusted.

REMOVING CHASSIS FROM CABINET

Following is the suggested procedure to be employed in removing the receiver and pre-amplifier chassis from the cabinet for service purposes.

Model 35P7

1. Remove the knobs.

2. Disconnect the A.C. cable and phono input cable from the record changer. To do this simply remove the two palnuts in the front of the record changer slide drawer and lift the drawer up just enough to reach in and remove the plugs from the power socket and the phono output jack on the changer. It will be necessary to unfasten the cables from the changer slide where they are held in place. Upon reassem-

bly the instrument, be certain that these cables are again fastened so that they will not become entangled in the changer mechanism.

3. Remove the Phono Pre-amplifier chassis by removing the three mounting screws which fasten it to the cabinet wall.

4. Remove the pre-amp output cable from the phono input jack on the receiver chassis and disconnect the pre-amp power cable.

5. Disconnect the speaker cable and antenna leads.

6. Remove the two mounting bolts in rear of the receiver chassis and slide the chassis out on the chassis mounting board. The mounting board will have to be removed to get at the underside of the chassis.

Models 32P9 and 33P9

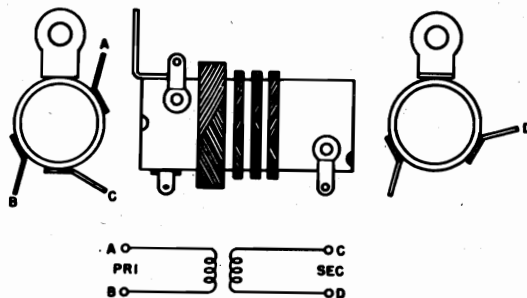
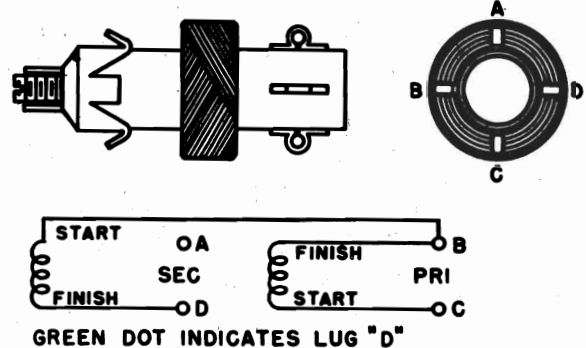
1. Remove the knobs.
2. Disconnect the a.c. cable and phono input cable from the record changer. The underside of the changer is easily accessible from the rear of the cabinet. Both cables are fastened to the inner wall of the cabinet by means of insulated staples, it will be necessary to remove these staples. Upon reassembling the instrument, be certain that these cables are again fastened as they were.
3. Remove the phono preamplifier chassis by removing the three mounting screws which fasten it to the cabinet wall.
4. Remove the pre-amp output cable from the phono input jack on the receiver chassis and disconnect the pre-amp power cable.
5. Disconnect the speaker cable and antenna leads.
6. Remove the molding from around the glass escutcheon and remove the escutcheon.
7. Remove the chassis mounting bolts. (The chassis is mounted on the wall of the cabinet. The bolts, which are accessible from the record

storage compartment, are concealed by plug buttons.) The two top bolts are to be removed first, then loosen the bottom bolt slightly. Grasp the chassis from the top, preferably by placing the fingers under the dial background panel, remove the final mounting bolt with the other hand and then lower the chassis to the bottom of the cabinet.

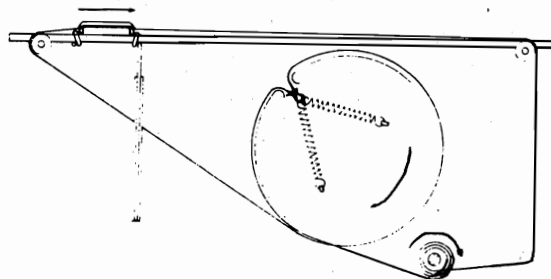
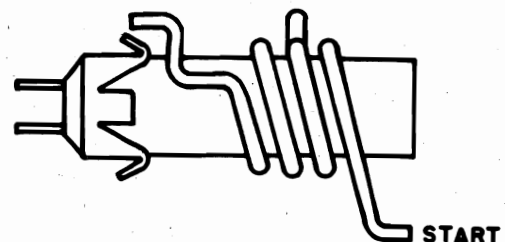
Model 34P10

1. Use the same procedure as described for models 32P9 and 33P9 with exception of steps 3 and 4. (The 34P10 does not use the phono preamplifier.)

NOTE: It is not necessary to remove the chassis from the cabinet to replace tubes or dial lights or to remove tubes for testing in any of these models. All tubes are accessible from the rear of the cabinet in the 35P7. In the other models there is a removable panel in the partition separating the receiver and record changer compartments. Tubes that are not accessible from the rear of the cabinet are accessible through the opening provided by this panel.

PARTS IDENTIFICATION**SECTION V****RF. OSCILLATOR AND MIXER COILS****AM Conv. Coil****AM OSC. Coils**

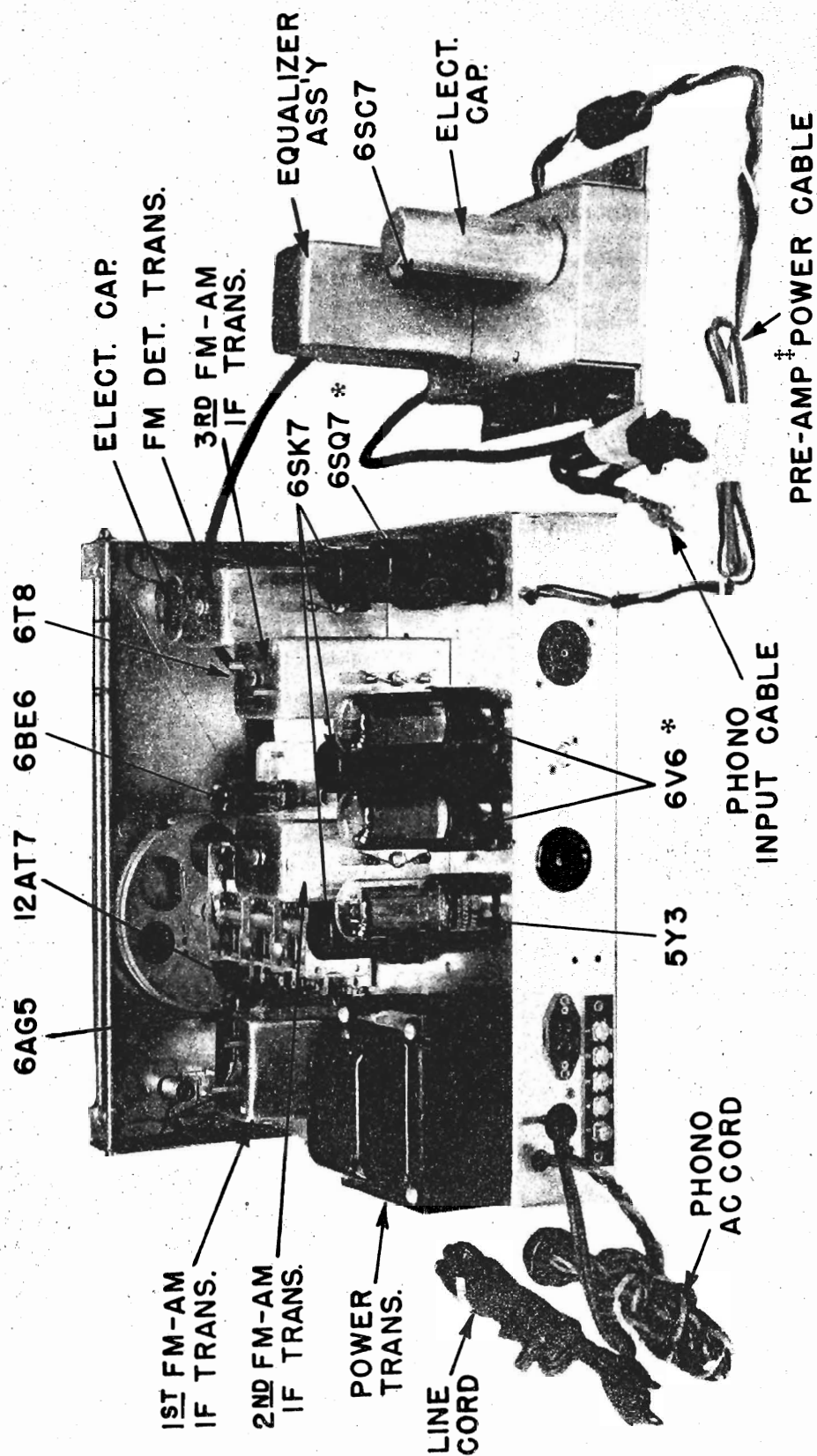
TUNING CONDENSER IN FULL MESH POSITION TURN KNOB CLOCKWISE AND DIAL NEEDLE MOVES IN DIRECTION OF ARROW AND DRUM MOVES CLOCKWISE.

**Dial Stringing**

TOTAL TURNS	TAP AT
MIXER COIL — $3\frac{1}{4}$	$\frac{1}{2}$ TURN
OSC. COIL — $3\frac{1}{4}$	$1\frac{1}{8}$ & $2\frac{1}{8}$ TURNS

FM Coils

MODELS P7, P9, P10, FARNSWORTH TELEV. & RADIO CORP.
Series, Capehart



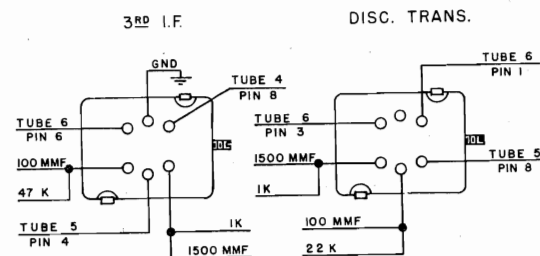
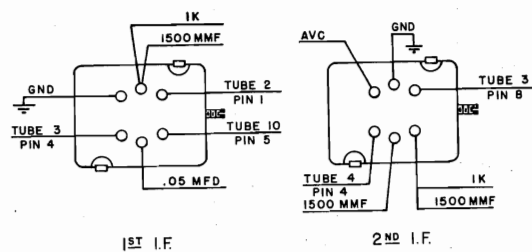
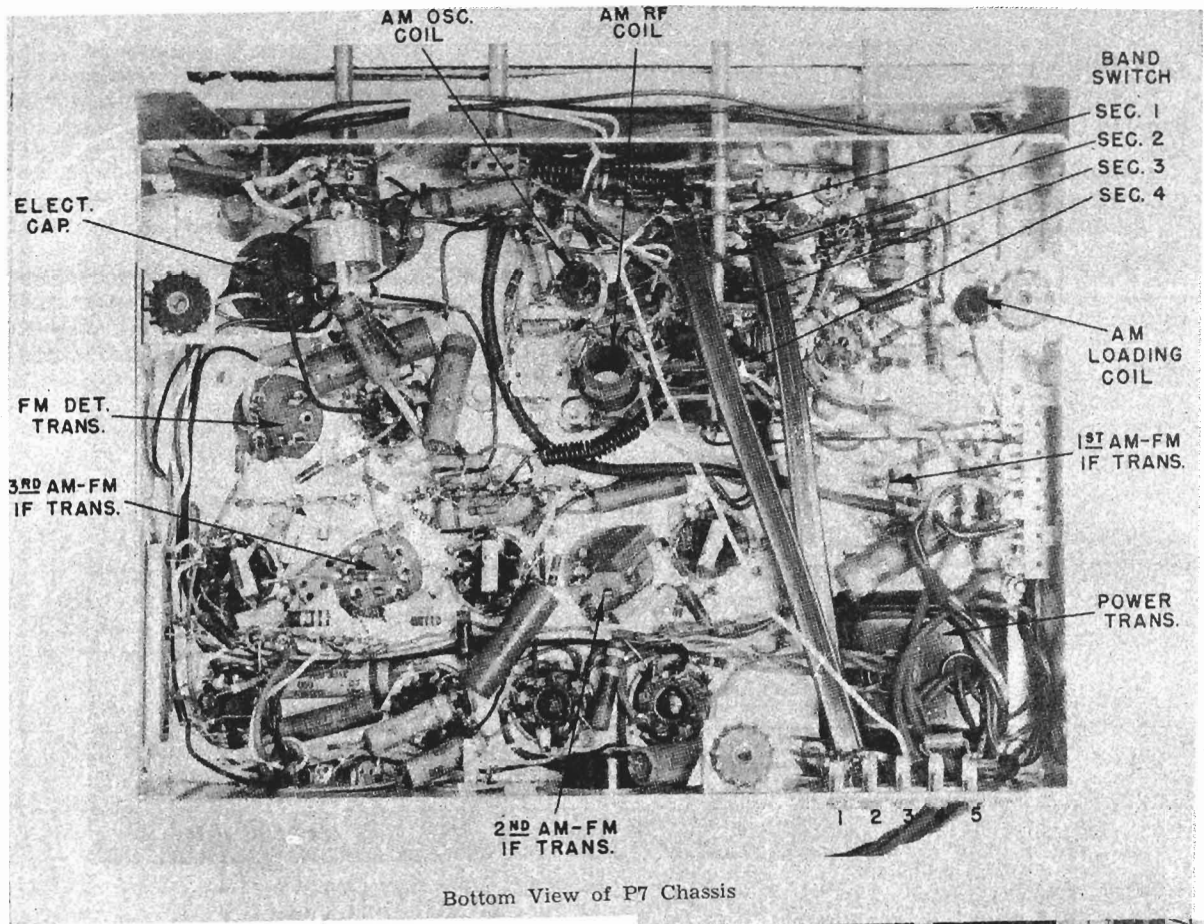
P7 CHASSIS

* P9 & P10 chassis have only (1) 6V6 and no 6SQ7.

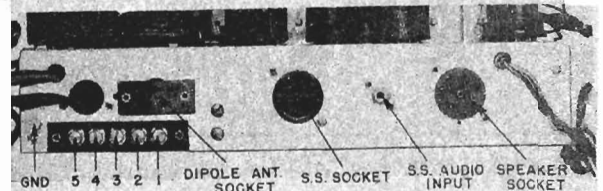
‡ P10 does not use Pre Amplifier

FARNSWORTH TELEV. & RADIO CORP.

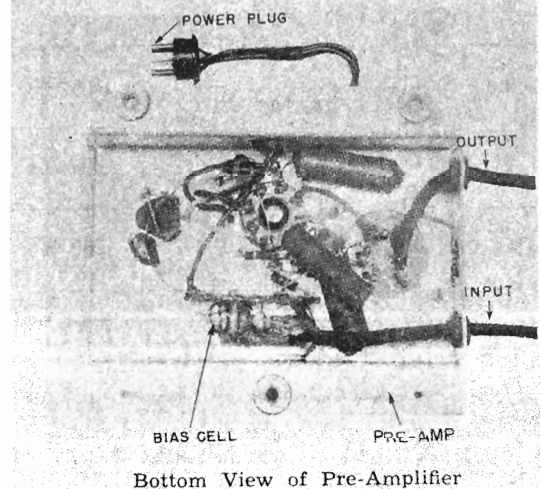
MODELS P7, P9, P10,
Series, Capehart



Bottom View of I.F. Cans



Rear View of Chassis



Bottom View of Pre-Amplifier

ALIGNMENT OF AM BAND**SECTION VI****EQUIPMENT REQUIRED**

A calibrated RF Signal Generator having fundamental frequencies of from 455 KC to 1620 KC.

A Voltohmmyst. or some such high resistance type AC voltmeter.

An insulated screwdriver.

GENERAL INSTRUCTIONS

For IF alignment the signal generator is to be connected through a .1 mfd. capacitor to the grid (pin 7) of the 6BE6 AM converter tube.

For RF alignment the signal generator is to be connected through a .1 mfd. capacitor to the RF section of the gang tuning capacitor.

For adjustment of the wavetrap the 455 KC signal should be connected to terminal 4 on the Antenna Terminal Strip on the rear of the chassis. The wavetrap is mounted on the loop antenna.

The AC voltmeter can be connected either across the voice coil of the loud speaker or if the meter range is high enough, from plate to plate of the output tubes, using a .1 mfd. capacitor for isolation.

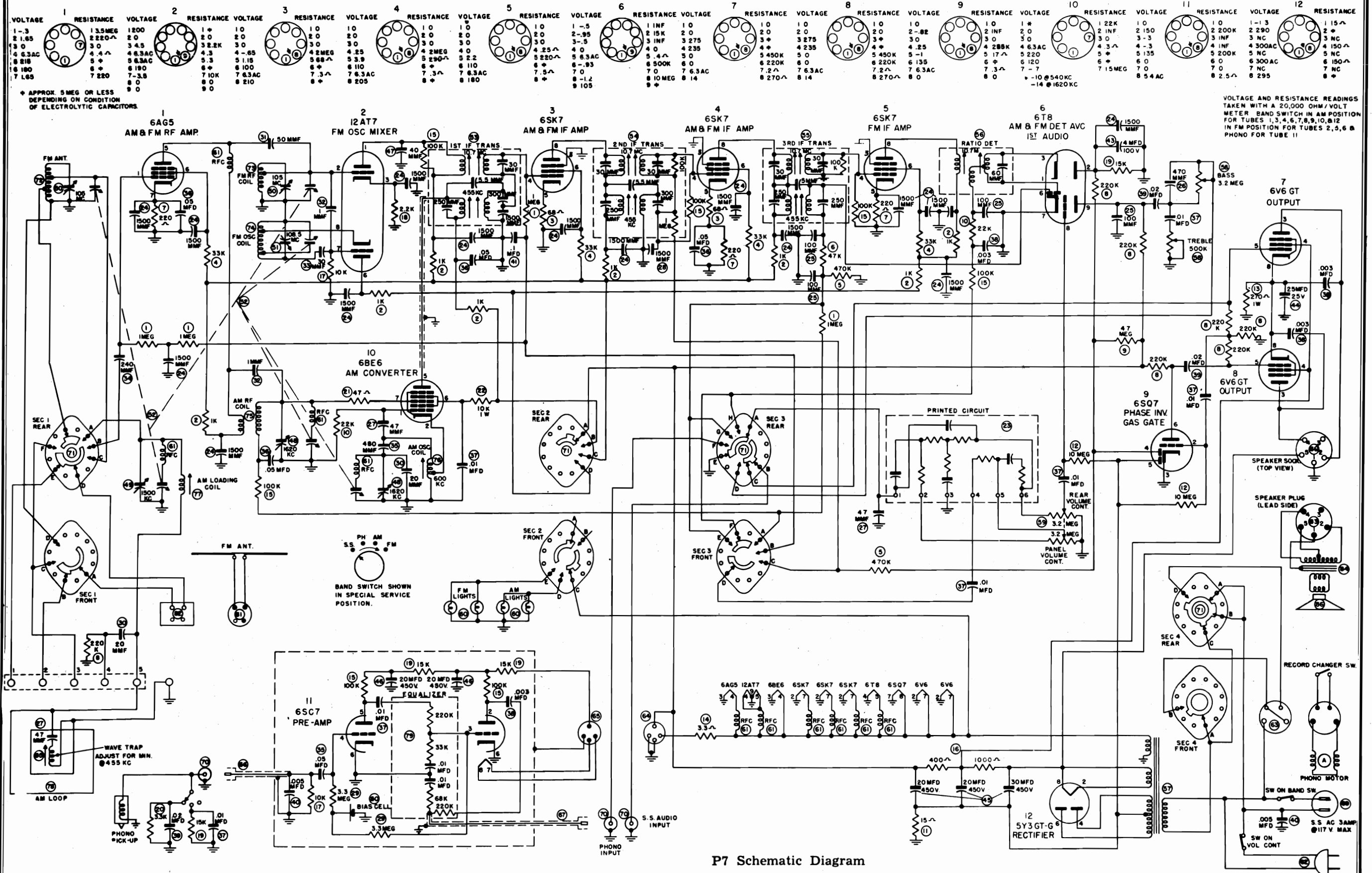
TABULATION FOR AM ALIGNMENT

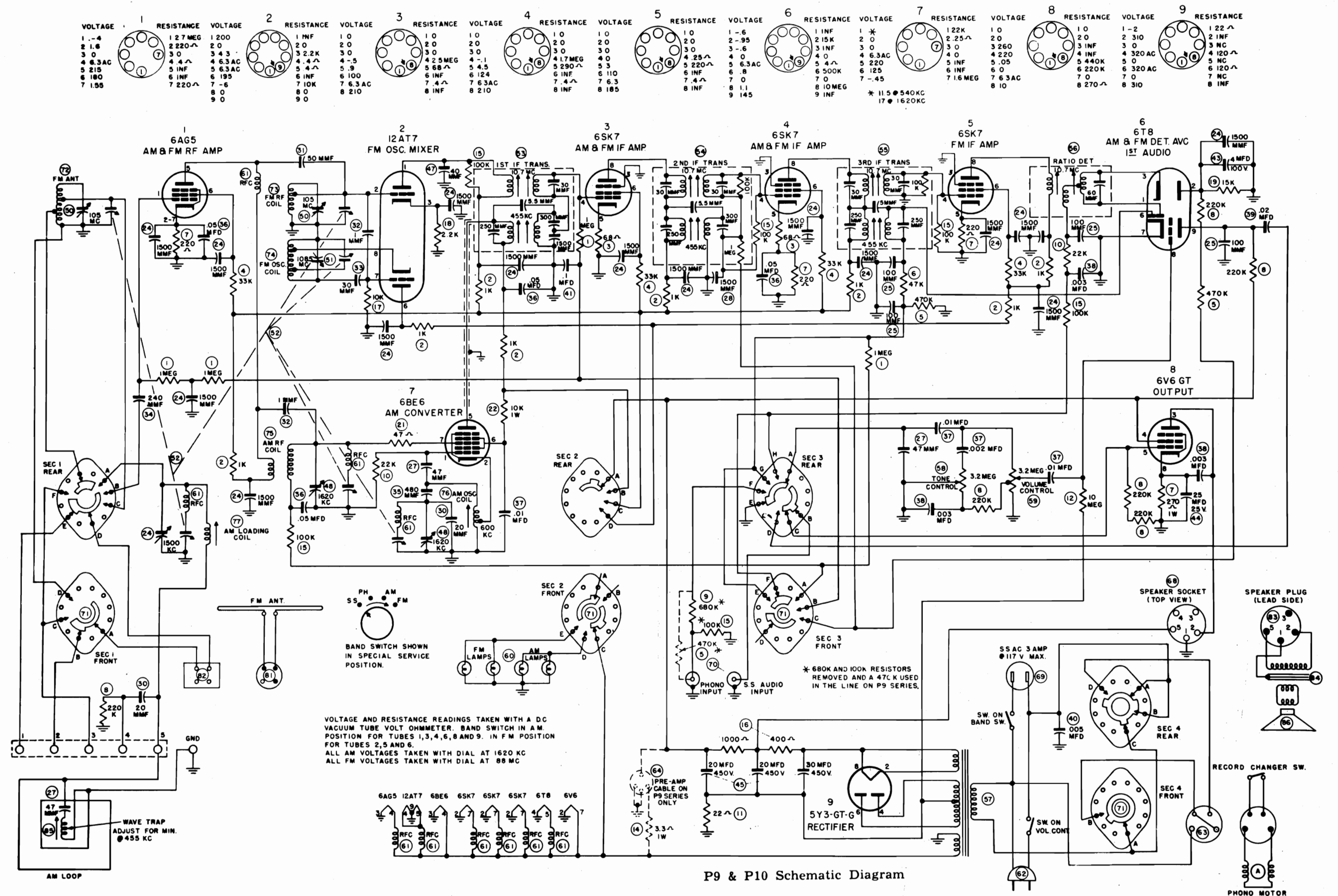
See page 11 for Trimmer locations

STEPS	CONNECT GENERATOR	SET GENERATOR AT	SET GANG AT	ADJUST	TO OBTAIN
1	Set Bandswitch in AM position				
2	Set Tone and Volume Controls at Maximum				
3	Through .1 Mfd.	Grid Conv. tube	455 Kc	Quiet Point	3rd I.F. A.M. Slugs
4					2nd I.F. A.M. Slugs
5					1st I.F. A.M. Slugs
6	Through .1 Mfd.	RF Section of GANG	1620 Kc	1620 Kc	A.M. Osc. Trimmer
7					A.M. R.F. Trimmer
8			1500 Kc	1500 Kc	A.M. Ant. Trimmer
9			600 Kc	600 Kc	A.M. Ant. Padder
10			600 Kc	600 Kc	A.M. Osc. Padder*
11	Check dial calibration at several frequencies. If not reasonably correct, adjust oscillator padder. See Note †				
12	Terminal 4 Ant. Term. Strip	455 Kc	Quiet Point	Wave Trap on Loop	MINIMUM OUTPUT

* This adjustment should be made while gang is rocked.

† After any adjustment of oscillator padder, repeat steps 4 to 8 inclusive.

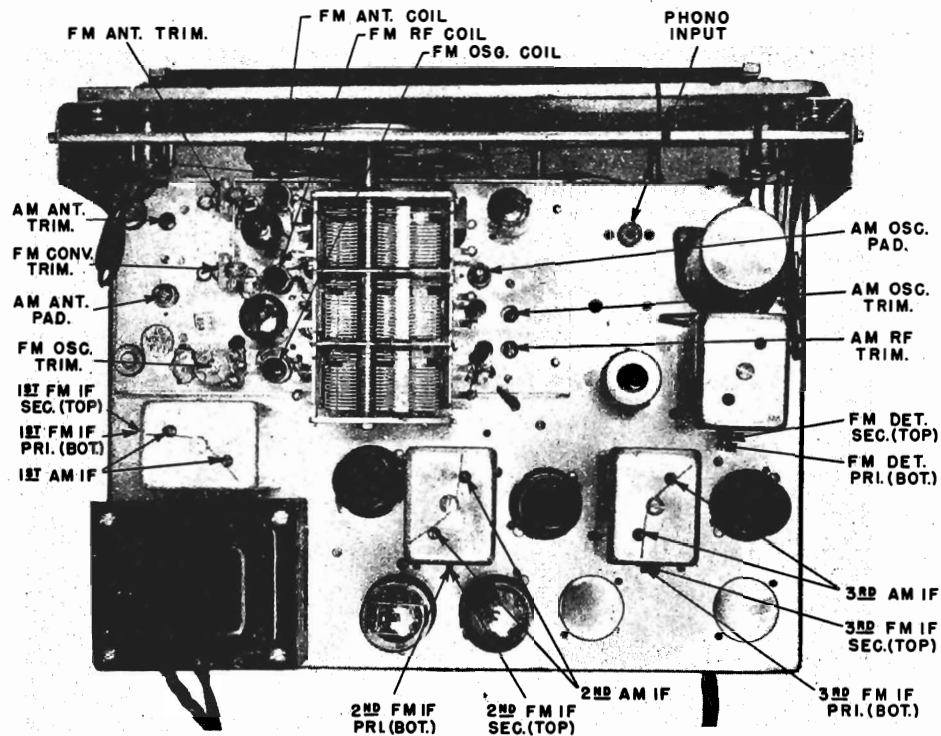




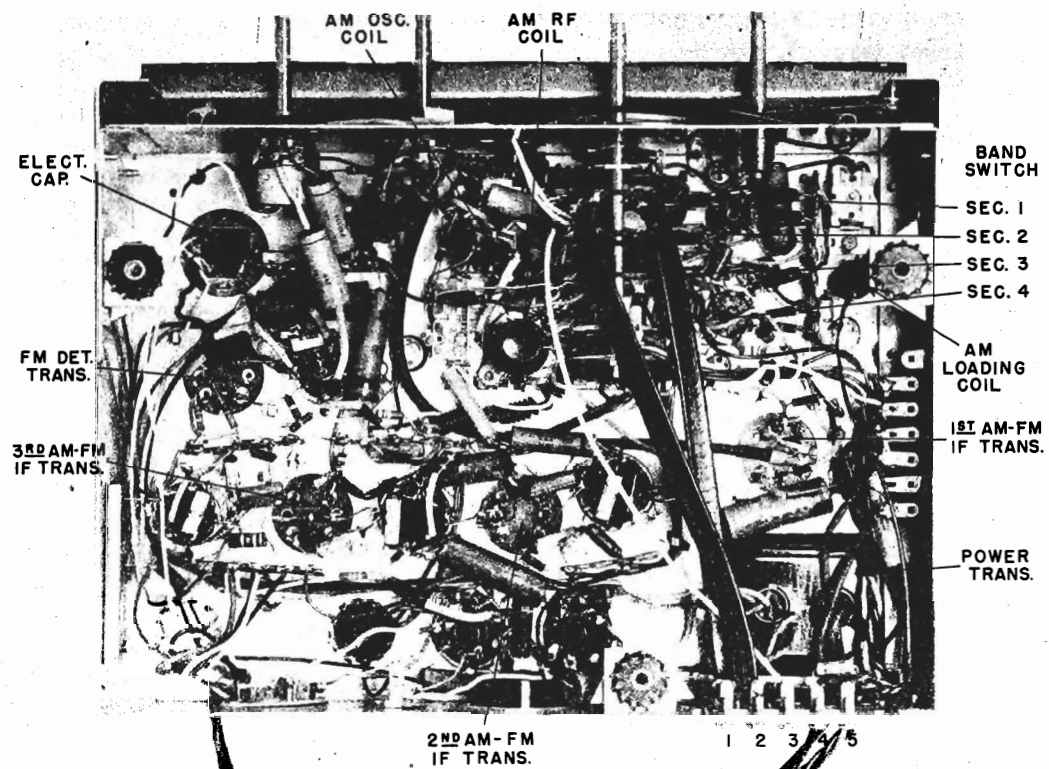
P9 & P10 Schematic Diagram

LOCATION OF TRIMMERS

SECTION VIII



Top View of P9, P10 Chassis



Bottom View of P9, P10 Chassis

MODELS P7, P9, P10, FARNSWORTH TELEV. & RADIO CORP.
Series, Capehart

FM ALIGNMENT

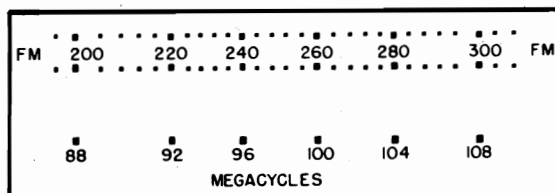
SECTION IX

This section presents information on two methods of alignment of Capehart receivers. Those service shops possessing a suitable Sweep Generator and Oscillograph will effect considerable saving of time, as well as assuring more precise alignment, by using the first method, the sweep generator method. This is the method used in factory alignment.

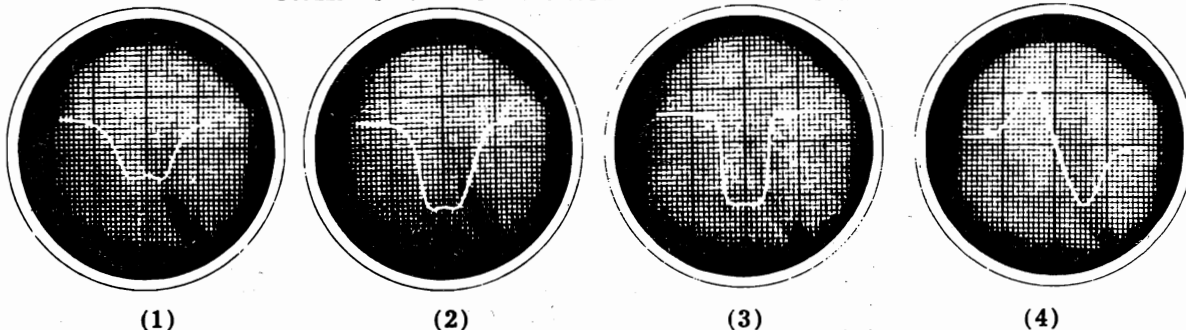
An alternative method, using an amplitude-modulated signal generator, is presented in the second portion of this section, which covers alignment of FM, IF and RF stages.

The conversion of FM dial scale readings to channel numbers can be made, with the help of the charts shown here, from the following analysis:

The FM band extends from 88 to 108 mc., each station channel 200 kc. in width. Channel 201, that lowest in frequency, has center frequency at 88.1 mc. Each succeeding channel is successively 200 kc. higher, so channel 202 is centered at 88.3 (200 kc. higher), channel 203 is centered at 88.5 mc., 206 at 89.1 mc., etc.



SWEEP GENERATOR METHOD OF FM IF ALIGNMENT



These curves were obtained under ideal conditions and show curves to be expected. They should be duplicated as nearly as possible.

1. Equipment required: Oscilloscope, 10.7 MC Sweep Generator, Volt ohmyst and RF Signal Generator.

2. Make connection from vertical deflection amplifier of oscilloscope to pin No. 2 of 6T8 discriminator tube. Make certain that the 4MFD electrolytic condenser is disconnected from this same circuit. It is necessary that the lead to the oscilloscope be shielded, of low total capacity and connection to the receiver isolated by means of a 47K resistor.

3. Connect Sweep Generator to last FM IF grid (pin 4 6SK7) through a .001 MFD coupling capacitor.

4. Connect a 350 mmf. capacitor across the discriminator secondary. Back out discriminator secondary slug (top slug) as far as it will turn. Align primary (bottom slug) to obtain a somewhat broad but single peaked curve. Then remove the 350 mmf. capacitor and tune the secondary to obtain a curve similar to figure 1. This does not constitute a final alignment of the discriminator, but is a convenient expedient to assist in IF alignment.

5. Shift connection of sweep signal generator to the grid of the second FM IF tube.

NOTE: As alignment moves from stage to stage, reduce input instead of reducing oscilloscope gain.

6. Align the third FM IF transformer by

first turning the secondary slug all the way out, adjust the primary and then the secondary for a symmetrical flat top pattern, as in Fig. 2.

7. Align second IF transformer in same manner as described in Section 6. Note that the width of the nose of the curve is the same as before, but the sides have become steeper as in Fig. 3.

8. Connect the signal generator to the grid of the mixer tube, in series with a 10,000 resistor and a .001 MFD capacitor or loosely couple by stray capacitance of an insulated wire.

9. Align first FM IF Transformer in the same manner as in Section 6. Note that the sides of the curve have further steepened, but that the nose of the curve has retained approximately the same width as in Fig. 3.

10. Connect 4 MFD electrolytic capacitor, that was previously disconnected.

11. Connect oscilloscope to audio output terminal of the discriminator transformer.

12. With sweep signal input to converter grid, align discriminator transformer for conventional discriminator pattern, as in Fig. 4.

15. Connect the signal generator to the mixer tube grid. With an unmodulated signal at 10.7 MC adjust the input to 190 microvolts. Connect a volt ohmyst to the AVC line. Rock the signal generator until the peak is obtained on the volt ohmyst. With a 190 microvolt input this peak should read -1 volt.

SIGNAL GENERATOR METHOD**GENERAL INSTRUCTIONS**

a. Tune receiver to extreme low frequency end of dial and set pointer to index at the last calibration mark.

b. Carefully determine that the gang condenser plates are completely meshed with the pointer in this position.

WARNING: This adjustment is extremely important if subsequent alignment is to provide accurate calibration.

c. With the pointer at the extreme low end of the range, rotate band switch through all po-

sitions and note that the pointer line is accurately indexed on both the AM and FM bands.

Unless otherwise indicated, the receiver controls shall be set as follows during all alignment operations:

a. Set treble tone control to maximum treble position.

b. Set bass tone control to maximum bass position.

c. Set volume control to maximum.

FM IF ALIGNMENT

1. Connect a voltohmmyst or high resistance voltmeter on AVC line (negative lead to pin 2 of 6T8 and positive lead to chassis) through a .001 capacitor. Connect on AM signal generator, set at 10.7 MC, to the grid of the last FM IF amplifier. Connect output meter on voice coil of speaker.

2. Turn the secondary slug of the FM detector transformer (top slug) out as far as it will turn. Then, tune the primary (bottom slug) for maximum output (negative voltage) on the voltmeter.

3. Connect generator to grid of second FM IF amplifier (6SK7).

4. Detune the secondary of the 3rd IF transformer by turning out as far as possible.

5. Tune the primary of the 3rd IF transformer for maximum voltage, next tune the secondary for maximum voltage.

NOTE: In each step do not use an input greater than necessary to give three volts AVC.

6. Connect signal generator to grid of first IF amplifier (6SK7).

7. Detune the secondary of the 2nd IF amplifier by turning out as far as possible.

8. Tune the primary of the 2nd IF for maximum voltage, next tune the secondary for maximum voltage.

9. Connect the signal generator to the FM mixer grid (12AT7).

10. Tune the 1st IF transformer as in steps 7 and 8.

11. With the generator still connected to the FM mixer grid and modulated with 400 cycles, about 200 microvolts input, adjust the FM detector secondary slug for minimum output voltage on the output meter which is connected across the voice coil.

FM RF ALIGNMENT

1. Equipment required:

a. RF Signal Generator. Range 88 to 108 MC.

b. Output Meter.

c. Insulated Screw Driver.

2. Connect RF signal generator in series with 330 ohm carbon resistor to "high" side of FM antenna socket. Connect output meter across voice coil of speaker.

3. Set tuning control for pointer to calibrate at 108.

4. Apply 108 MC Signal.

5. Set converter and antenna trimmers at minimum capacity.

6. Adjust oscillator trimmer by tuning from maximum capacity to first signal that is heard, and peak for maximum output.

7. Adjust antenna and converter trimmers for maximum output.

8. Set tuning controls so dial pointer calibrates at 88 MC.

9. Apply 88 MC signal.

10. Adjust oscillator, converter, and antenna slugs to maximum output.

11. Repeat operations 3 to 10 inclusive.

NOTE: The degree of adjustment required in the tuning of the oscillator slug will determine the number of times operations 3 to 10 must be repeated until no further gain in sensitivity is obtained.

12. Carefully tune across the entire FM band for the observance of the dead or weak spots that may be a resultant of improper alignment or defective components. This can be determined by carefully noting the degree of receiver noise, that is, high noise generally is accompanied by good sensitivity.

MODELS

FARNSWORTH TELEV. & RADIO CORP.

P7, P9, P10,
Series, Capehart

P7 INSTRUMENTS

Ref. No.	Part No.	Description	Ref. No.	Part No.	Description
1	77181	Ins. Carbon Res. 1 Meg. -----	73	38959	FM Mixer Coil Ass'y. -----
2	77233	Ins. Carbon Res. 1K -----	74	38960	FM Osc. Coil Ass'y. -----
3	77245	Ins. Carbon Res. 68 -----	75	38961	AM Conv. Coil Ass'y. -----
4	77183	Ins. Carbon Res. 33K -----	76	38962	AM Osc. Coil Ass'y. -----
5	77173	Ins. Carbon Res. 470K -----	77	38963	AM Loading Coil Ass'y. -----
6	77172	Ins. Carbon Res. 47K -----	78	13893	Low Impedance Loop Antenna Assembly -----
7	77186	Ins. Carbon Res. 220 -----	79	13869	Equalizer Ass'y. (Pre-Amp Chassis) -----
8	77178	Ins. Carbon Res. 220K -----	80	95005	Bias Cell (Pre-Amp Chassis) -----
9	77187	Ins. Carbon Res. 4.7 Meg. -----	81	05150	Dipole Lead and Plug Assembly -----
10	77169	Ins. Carbon Res. 22K -----	82	80439	3 prong socket (FM dipole) -----
11	77491	Ins. Carbon Res. 15 ohms -----	83	80469	Speaker Plug (part of #13897) -----
12	77182	Ins. Carbon Res. 10 Meg. -----	84	94239	Output Transformer -----
13	77174	Ins. Carbon Res. 270 1W -----	85	38996	Wave Trap Coil -----
14	77492	Ins. Carbon Res. 3.3 ohms 1W -----	86	13897	12" PM Speaker & Output Trans- former -----
15	77167	Ins. Carbon Res. 100K -----	87	38898	Osc. Series choke -----
16	77463	Molded Res. 1000 ohms, 400 ohms -----	31446	Dial Escutcheon (35P7) -----	
17	77180	Ins. Carbon Res. 10K -----	05144	Dial Drive Cord Ass'y. -----	
18	77184	Ins. Carbon Res. 2.2K -----	31439	AM Dial Glass -----	
19	77246	Ins. Carbon Res. 15K -----	31440	FM Dial Glass -----	
20	77240	Ins. Carbon Res. 3.3K -----	59492	Volume Knob -----	
21	77219	Ins. Carbon Res. 47 ohms -----	59495	Tuning Knob -----	
22	77022	Ins. Carbon Res. 10K 1W -----	59498	Band Switch Knob -----	
23	77462	Printed Circuit -----	59496	Bass Tone Knob -----	
24	25273	Ceramic Cap. 1500 mmf. -----	59497	Treble Tone Knob -----	
25	25188	Ceramic Cap. 100 mmf. -----	60428	Washer -----	
26	25285	Ceramic Cap. 470 mmf. -----	05151	Dipole Antenna Ass'y. -----	
27	25193	Ceramic Cap. 47 mmf. -----	15214	Drive Shaft Assembly -----	
28	25299	Mica Cap. 1500 mmf. -----	80456	Miniature Tube Socket -----	
29	77223	Ins. Carbon Res. 3.3 Meg. -----	80479	Miniature 9-pin Tube Socket -----	
30	25492	Ceramic Cap. 20 Mmf. -----	17213	Dial Back Plate Ass'y. -----	
31	25493	Ceramic Cap. 50 Mmf. -----	55385	Drive Shaft Bearing -----	
32	25497	Ceramic Cap. 1 Mmf. -----	62032	Rubber Grommet (R. F. Chassis) -----	
33	25329	Ceramic Cap. 30 Mmf. (N750) -----	80139	Molded Octal Socket -----	
34	25427	Ceramic Cap. 240 Mmf. -----	80239	Molded Octal Socket -----	
35	25504	Silver Mica Cap. 480 Mmf. $\pm 3\%$ -----	58939	9-pin Min. Tube Shieldbase -----	
36	25196	Tub. Paper Cap. .05-600V. -----	58940-2	Tube Shield (9-pin Min) -----	
37	25186	Tub. Paper Cap. .01-400V. -----	80494	Bias Cell Mounting (Pre-Amp Chassis) -----	
38	25184	Tub. Paper Cap. .003-600V. -----	80491	9-pin Min. Mica Tube Socket (12AT7) -----	
39	25195	Tub. Paper Cap. .02-600V. -----	62172	Rubber Grommet -----	
40	25031	Tub. Paper Cap. .005-600V. -----	62189	Rubber Bushing -----	
41	25182	Tub. Paper Cap. .1-200V. -----	36260-003	Phil Rd. Hd. Wood Screw, #6 x $\frac{5}{8}$ " (Pre-Amp. Mtg.) -----	
42	25194	Tub. Paper Cap. .01-600V. -----	80348	Pilot Lamp Soc. & Cord -----	
43	25270	Elect. Cap. 4 Mfd. 100V -----	80522	Pilot Lamp Soc. & Cord -----	
44	25158	Elect. Cap. 25 Mf.-25V -----	07674	Chassis End Brkt. Ass'y. (R.H.) -----	
45	25424	Elect. Cap. 30, 20, 20 Mf.-450V. -----	07673	Chassis End Brkt. Ass'y. (L.H.) -----	
46	25463	Elect. Cap. 20, 20, Mf.-450V. -----	05154	Light Shield -----	
47	25507	Ceramic Cap. 40 Mmf. (N-750) -----	04133	Dial Pointer Ass'y. -----	
48	26278	AM Conv. Osc. Trim. Strip -----	55383	Pointer Rod -----	
49	26279	AM Ant. Trimmer -----	62099	Rubber Grommet -----	
50	26280	FM Mixer-Ant. Trim. Strip -----	H-321	Cabinet (35P7) -----	
51	26231	FM Osc. Trimmer -----	2000-323 003	#10/32 x $1\frac{1}{8}$ " Rd. Hd. Mach. screw (Chassis Mtg.) -----	
52	17210	Gang Capacitor & Drive Drum Assembly -----	2000-321 003	#10/32 x 1" Rd. Hd. Mach. screw (Chassis Mtg. Board) -----	
53	38957	1st IF Trans. -----	2015-005 003	#8/32 Steel Hex nut (Speaker Mtg.) -----	
54	38950	2nd IF Trans. -----	09374	Mtg. Spring Assy. (P-71 Changer)	
55	38951	3rd IF Trans. -----	37066-072	#10/32 Acorn Palnut (Changer Mtg.) -----	
56	38952	Discriminator Trans. -----	13890	Air Compression Stay Arm (35P7)	
57	94262	Power Trans. -----	64481	Spring -----	
58	78159	Tone Control -----	37662	Cup Hook -----	
59	78158	Volume Control -----	36490	Spring Washer -----	
60	42185	Dial Light Mazda #44 -----	74611	Operating Instructions (35P7) -----	
61	38884	RF Choke (heater) -----			
62	27118	Line Cord -----			
63	22193	Phono AC Cord & Socket -----			
64	22173	Pre-Amp Power Cable (Fem.) -----			
65	22171	Pre-Amp Power Cable (Male) (Pre-Amp Chassis) -----			
66	22169	Pickup Cable (Pre-Amp Chassis) -----			
67	22170	Output Cable (Pre-Amp Chassis) -----			
68	80244	5 Prong Speaker Socket -----			
69	80497	(SS) Power Adapter Socket -----			
70	80030	Phono Socket -----			
71	90269	Band Switch -----			
72	38958	FM Ant. Coil Ass'y. -----			

All resistors are $\frac{1}{2}$ watt unless otherwise specified

FARNSWORTH TELEV. & RADIO CORP. MODELS P7, P9, P10, Series, Capehart

P9 & P10 INSTRUMENTS

Ref. No.	Part No.	Description	Ref. No.	Part No.	Description
1	77181	Ins. Carbon Res. 1 Meg.	73	38959	FM Mixer Coil Ass'y.
2	77233	Ins. Carbon Res. 1K	74	38960	FM Osc. Coil Ass'y.
3	77245	Ins. Carbon Res. 68	75	38961	AM Conv. Coil Ass'y.
4	77183	Ins. Carbon Res. 33K	76	38962	AM Osc. Coil Ass'y.
5	77173	Ins. Carbon Res. 470K	77	38963	AM Loading Coil Ass'y.
6	77172	Ins. Carbon Res. 47K	78	13893	Low Impedance Loop Antenna Assembly
7	77186	Ins. Carbon Res. 220	79	13869	Equalizer Ass'y. (Pre-Amp Chassis)
8	77178	Ins. Carbon Res. 220K	80	95005	Bias Cell (Pre-Amp Chassis)
9	77508	Ins. Carbon Res. 680K (P10 only)	81	05150	Dipole Lead and Plug Assembly
10	77169	Ins. Carbon Res. 22K	82	80439	3 prong socket (FM dipole)
11	77236	Ins. Carbon Res. 22	83	80469	Speaker Plug (part of #13897)
12	77182	Ins. Carbon Res. 10 Meg.	84	94235	Output Transformer
13	77174	Ins. Carbon Res. 270 1W	85	38996	Wave Trap Coil
14	77492	Ins. Carbon Res. 3.3 ohms 1W	86	13892	12" PM Speaker & Output Transformer
15	77167	Ins. Carbon Res. 100K	87	38898	Osc. Series choke
16	77463	Molded Res. 1000 ohms, 400 ohms.	31460		Dial Escutcheon (32P9)
17	77180	Ins. Carbon Res. 10K	05144		Dial Drive Cord Ass'y.
18	77184	Ins. Carbon Res. 2.2K	31437		AM Dial Glass
19	77246	Ins. Carbon Res. 15K	31438		FM Dial Glass
21	77219	Ins. Carbon Res. 47 ohms	59495		Tuning Knob
22	77022	Ins. Carbon Res. 10K 1W	59508		Band Switch Knob
24	25273	Ceramic Cap. 1500 mmf.	59509		Bass Tone Knob
25	25188	Ceramic Cap. 100 mmf.	31459		Dial Escutcheon (33P9 & 34P10)
27	25193	Ceramic Cap. 47 mmf.	60428		Washer
28	25299	Mica Cap. 1500 mmf.	05151		Dipole Antenna Ass'y.
29	77223	Ins. Carbon Res. 3.3 Meg. (Pre-Amp Chassis)	15214		Drive Shaft Assembly
30	25492	Ceramic Cap. 20 Mmf.	80456		Miniature Tube Socket
31	25493	Ceramic Cap. 50 Mmf.	80479		Miniature 9-pin Tube Socket
32	25497	Ceramic Cap. 1 Mmf.	17213		Dial Back Plate Ass'y.
33	25329	Ceramic Cap. 30 Mmf. (N750)	37609		Plug Button 1" dia.
34	25427	Ceramic Cap. 240 Mmf.	55385		Drive Shaft Bearing
35	25504	Silver Mica Cap. 480 Mmf. $\pm 3\%$	62032		Rubber Grommet (R. F. Chassis)
36	25196	Tub. Paper Cap. .05-600V.	80139		Molded Octal Socket
37	25185	Tub. Paper Cap. .002-600V.	80239		Molded Octal Socket
38	25184	Tub. Paper Cap. .003-600V.	58939		9-pin Min. Tube Shieldbase
39	25195	Tub. Paper Cap. .02-600V.	58940-2		Tube Shield (9-pin Min)
40	25031	Tub. Paper Cap. .005-600V.	80494		Bias Cell Mounting (Pre-Amp Chassis)
41	25182	Tub. Paper Cap. 1-200V.	80491		9-pin Min. Mica Tube Socket (12AT7)
42	25194	Tub. Paper Cap. .01-600V.	62172		Rubber Grommet
43	25270	Elect. Cap. 4 Mfd. 100V	62189		Rubber Bushing
44	25158	Elect. Cap. 25 Mf.-25V	36260-CC3		Phil Rd. Hd. Wood Screw, #6 x $\frac{5}{8}$ " (Pre-Amp. Mtg.)
45	25424	Elect. Cap. 30, 20, 20 Mf.-450V.	80348		Pilot Lamp Soc. & Cord
46	25463	Elect. Cap. 20, 20, Mf.-450V. (Pre-Amp Chassis)	80522		Pilot Lamp Soc. & Cord
47	25507	Ceramic Cap. 40 Mmf. (N-750)	07674		Chassis End Brkt. Ass'y. (R.H.)
48	26278	AM Conv. Osc. Trim. Strip	07673		Chassis End Brkt. Ass'y. (L.H.)
49	26279	AM Ant. Trimmer	05154		Light Shield
50	26280	FM Mixer-Ant. Trim. Strip	04133		Dial Pointer Ass'y.
51	26231	FM Osc. Trimmer	55383		Pointer Rod
52	17210	Gang Capacitor & Drive Drum Assembly	62099		Rubber Grommet
53	38957	1st IF Trans.	H-318		Cabinet ((33P9)
54	38950	2nd IF Trans.	H-319		Cabinet (34P10)
55	38951	3rd IF Trans.	H-320		Cabinet (32P9)
56	38952	Discriminator Trans.	2000-325	071	#10/32 x 1 $\frac{1}{4}$ Rd. Hd. Mach. screw (Chassis Mtg.)
57	94262	Power Trans.	2000-321	003	#10/32 x 1" Rd. Hd. Mach. screw (Chassis Mtg. Board)
58	78153	Tone Control	2015-005	003	#8/32 Steel Hex nut (Speaker Mtg.)
59	78155	Volume Control	09373		Mtg. Spring Assy. (P72 & P73 Changers)
60	42185	Dial Light Mazda #44	37066-072		#10/32 Acorn Palnut (Changer Mtg.)
61	38884	RF Choke (heater)	74605		Operating Instructions (32P9 & 33P9)
62	27118	Line Cord	74608		Operating Instructions (34P10)
63	22193	Phono AC Cord & Socket			
64	22173	Pre-Amp Power Cable (Fem.) (P9 only)			
65	22171	Pre-Amp Power Cable (Male) (Pre-Amp Chassis)			
66	22169	Pickup Cable (Pre-Amp Chassis)			
67	22170	Output Cable (Pre-Amp Chassis)			
68	80244	5 Prong Speaker Socket			
69	80497	(SS) Power Adapter Socket			
70	80030	Phono Socket			
71	90269	Band Switch			
72	38958	FM Ant. Coil Ass'y.			

All resistors are $\frac{1}{2}$ watt unless otherwise specified.

ELECTRICAL AND MECHANICAL SPECIFICATIONS

Four Band	Broadcast - 540 to 1600 K.C.	Band Spread - 25 and 31 Meters
Receiver	Short Wave - 5.4 to 18 M.C.	F.M. - 41.9 to 51 M.C.
Type Receiver Circuit.	Superheterodyne	
Intermediate Frequency - AM Band.	455 K.C.	
Intermediate Frequency - FM Band.	4.3 M.C.	
Tubes in Receiver - 13	Total 31	

Total 31

1 6AB7 R.F. Amplifier (A.M. & F.M.)	1 6H6 Discriminator F.M.
1 6SA7 Converter (A.M. & F.M.)	1 6SN7 Silencer F.M.
1 6J5 Oscillator (A.M. & F.M.)	1 6Q7 2nd Det. A.M. & 1st Audio (A.M. & F.M.)
1 6SG7 1st I.F. Amplifier (A.M. & F.M.)	1 6AF6G Tuning Eye (A.M. & F.M.)
1 6SG7 2nd I.F. Amplifier (F.M.)	2 6R7 Voltage Amplifiers
1 6SJ7 Limiter (F.M.)	2 6C8G Duo Drivers
1 6SN7 Eye Amplifier (A.M. & F.M.)	8 6V6G Power Output Tubes
1 6SJ7 A.V.C. Amplifier (A.M.)	6 5Y3G Rectifier Tubes
1 6B8 2nd I.F. and A.V.C. (A.M.)	

Power output tubes each amplifier - four 6V6G - Push - Pull - Parallel -	20 Watts
Total Power Output - Audio Amplifier System	40 Watts

1 - 12" Treble Electrodynamic - 450 ohm field - 8 ohm voice coil at 400 cycles
1 - 14" Bass Electrodynamic - 450 ohm field - 8 ohm voice coil at 400 cycles

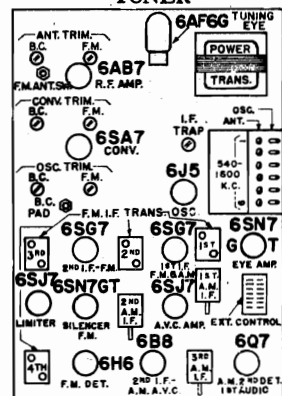
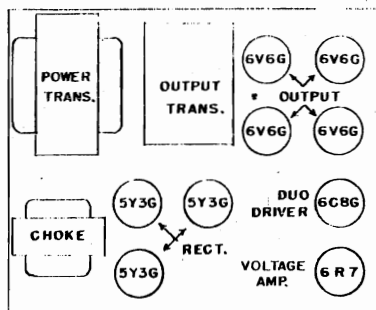
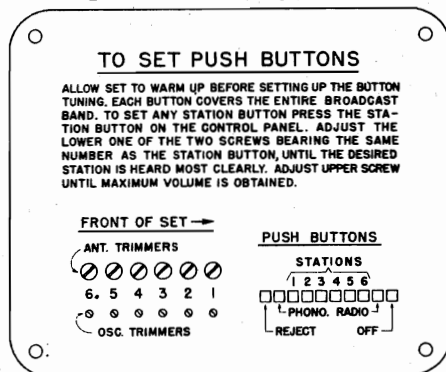
Type - Capehart 16-E	Fully Automatic
Record Capacity	16 to 18 records either 10" or 12"
Turntable Speed	78 R.P.M.
Drive	78 Motor - Thru gear reduction unit
Pickup - Light Weight - Crystal Unit,	1-1/4 oz. Needle Pressure
True Tangent Tone Arm	Electric Play Control Unit

Power Watts. . . . 400	At	117 Volts	60 Cycles
Voltage - 105 - 125 AC		Frequency -	Either 50 or 60 Cycles
400-M Models not adaptable for 25 cycle operation			

TUBE LOCATIONS

A-10 AMPLIFIER

TUNER



FARNSWORTH TELEV. & RADIO CORP. MODEL 400M Series, Capehart

GENERAL DESCRIPTION

SECTION 2

It has been our aim in this Service Brochure to include all of the necessary information to guide an experienced service man in locating and correcting all types of service difficulties that may be encountered during normal operation of the instrument. No attempt has been made to include an elementary discussion of the basic fundamentals or principles of operation of the component parts since it is assumed that no attempt will be made to service a Capehart DeLuxe Instrument unless the service man has sufficient technical training or experience to be familiar with the practice and theory involved in fundamental radio circuits and automatic record changing mechanisms.

In the design of the 400 M series Capehart DeLuxe Instruments we have endeavored to not only retain all of the desirable features incorporated in the "K" series, but to improve upon the performance of every unit in keeping with Capehart tradition. When considered as a whole each 400 M series Instrument represents a group of interconnected components of sound design offering the best in radio and record reproduction as we know it today.

The features retained in the tuner are the motor driven selector switch to permit extended and remote control; separate Bass, Master and Treble volume controls, the latter being used in conjunction with a high fidelity switch; and the "FM" band for the reception of frequency modulated signals. For record reproduction we have retained the famous Capehart 16-E Record Changer, which is the only fully automatic, continuous playing record changer on the market today, plus the play control feature which permits playing a pre-determined number of selections and then automatically shuts the instrument off.

Again triple unit construction is employed, i.e., separate chassis for the tuner and each amplifier, resulting in improved circuit stability and performance, together with dual speakers for perfect Bass and Treble response. Authentic cabinet styling is a characteristic of all fine Capeharts. Each cabinet bears the stamp of approval of the Walnut and Mahogany Institutes.

The new improvements incorporated in the "M" series DeLuxe Capeharts are the electrically operated play control; improved broadcast and shortwave reception, due to improvements in tubes and circuits; superior "FM" performance, which includes an exclusive Capehart squelch circuit

to prevent inter-station noise; band spread tuning on the important 25 and 31 meter bands for added ease of tuning, and improved performance in the motor driven selector switch which has been accomplished by modifications in design.

A brief review of features incorporated in the various units of this instrument will be of considerable assistance in following the circuit diagram and in analyzing circuit difficulties when present. In the event trouble is experienced with an instrument it is important to first localize the condition in a particular unit before an attempt at correction is made. For example, do not "pull a speaker" as has been done, when the pickup crystal is really at fault, and when switching from phono to radio would have disclosed the fact that the reproduction was only bad on record reproduction.

SECTION 3 THE RADIO TUNER

The radio tuner is an assembly complete in itself except for the plate voltage supply which is obtained from the amplifiers. The filament or heater transformer for tubes in the tuner, however, is mounted on the tuner chassis. Electrically, the tuner is of sound design utilizing the the highest quality of parts available and incorporates many modern improvements.

Features which contribute to its performance are as follows:

A. Provision for doublet or regular antenna system with a switch provided to rearrange the input circuit for maximum efficiency with either type system.

B. Tuned "RF" stage on all bands in manual tuning position, and use is made of a high gain 1853/6AB7 tube in this circuit.

C. Separate oscillator and mixer greatly improving stability and conversion gain.

D. Two "IF" stages using permeability tuned iron core "IF" transformers for increased over-all gain and selectivity.

E. Separate "IF" channel for "FM" using air core air tuned "IF" transformers for minimum drift and maximum gain.

F. In the "FM" position a second 6SC7 high gain pentode replaces a 6B8 tube used in the "AM" position, the change being automatically handled by the band switch.

G. Amplified "AVC" which tends to reduce fading and allows substantially constant output with wide variations in signal input.

MODEL 400M

FARNSWORTH TELEV. & RADIO CORP.

Series,
Capehart

II. Tuning eye amplifier which assures sufficient deflection of the tuning eye for correct tuning even on weak signals.

I. An exclusive Capehart "FM" squelch circuit for the elimination of noise when tuning from station to station in the "FM" band. This arrangement makes use of a 6SN7GT tube, one section being used as an oscillator operating on approximately 200 KC. and used as a source of voltage for control of the bias on the first audio stage. The other section of the 6SN7GT is used as a grid controlled rectifier for the rectification and control of the squelch voltage applied to the first audio grid.

J. Improved system of push button tuning permitting the setting of any push button to any desired frequency within the broadcast band.

K. Motor driven selector switch allows selection of stations or other services at instrument or for Extended or Remote Control.

L. The incorporation of this switch and a 15 prong socket in the tuner chassis makes possible either remote or extended control of the complete instrument when the necessary extended or remote units are added. The remote and extended control feature of the 400 M instrument greatly increases its flexibility and operating convenience and opens added sales opportunities for the dealer who has not taken advantage of this feature previously.

M. Bass and Treble volume controls allow individual adjustment of the high or low frequency response.

SECTION 4 AUDIO AMPLIFIERS

The first audio stage is located in the tuner chassis. The output of this tube after passing through the Bass and Treble networks is fed into two separate 20 watt audio power amplifiers, the inputs of which are effectively in parallel. The audio power amplifiers make use of the most modern tubes and circuits. Inverse feedback is incorporated effectively lowering the plate impedance of the push-pull parallel connected output tubes and contributes to over-all noise and hum reduction. All of the tubes and components in the audio system are operated conservatively as evidenced by the use of three 5Y3G rectifiers in each amplifier. The operation of the push-pull parallel connected output tubes at conservative voltage rather than using only two such tubes in each output stage

operating at higher potentials results in longer tube life.

SECTION 5 SPEAKERS

Two heavy duty electrodynamic speakers are incorporated in each 400 M series instrument. Adequate field excitation is provided and the construction of the speaker is such that the 14" speaker responds to the lower frequencies and the 12" speaker favors the highs. Careful consideration has been given to baffle and cabinet design for high fidelity reproduction.

SECTION 6 CAPEHART 16-E RECORD CHANGER

This record changer is fully automatic, is continuous in operation, has a maximum capacity of 20 records, either 10" or 12" or intermixed, and will play either one or both sides of a record as desired. Because of variations in records (thickness and warpage) we recommend that 16 to 18 records generally be loaded in the record magazine.

An outstanding feature of the 16-E Changer is the "True Tangent Tone Arm" which maintains the needle or stylus at the correct tangent with respect to the record groove throughout the playing of the record.

Another important feature not found in other automatic record changers is the heavy duty drive motor and gear reduction unit. This gear reduction unit controls the speed or R.P.M. of the turntable which for perfect reproduction of records must be constant and even. This motor and gear reduction unit in addition to the use of a heavy cast turntable compares with the precision type of equipment generally found in broadcast stations.

SECTION 7 EXTENDED AND REMOTE CONTROL

The Capehart 400 M Series DeLuxe Instruments are designed to permit either Extended or Remote Control. Extended or Remote Control equipment may be added so that Radio or Record reproduction identical to that reproduced at the instrument may be controlled or distributed to any number of rooms around the house or grounds.

FARNSWORTH TELEV. & RADIO CORP. MODEL 400M Series, Capehart

PART 2 OPERATION AND MAINTENANCE RADIO TUNER

SECTION 8 SETTING INSTRUMENT UP FOR OPERATION

The importance of care in checking every part of the equipment in setting up an instrument for operation cannot be over emphasized. This applies when the instrument is being set up on the sales floor for sales demonstration purposes, as well as when delivered to the customer's home. It is obvious that an instrument not properly set up in the dealer's store may fail to perform to its best advantage when demonstrated. An improperly installed instrument in the customer's home means extra service calls, customer dissatisfaction and excessive service costs.

Following is a suggested Inspection Routine, covering "30" important items to check when installing a DeLuxe Capehart Instrument. We request that you at least cover all of these, and if you are thorough in your work, you undoubtedly will add to this list. We would also advise that a check of these "30" items will often be found to quickly isolate service difficulties when trouble is encountered.

SUGGESTED INSPECTION ROUTINE FOR THE INSTALLATION OF CAPEHART DELUXE 400 SERIES INSTRUMENTS

1. Unpacking...Remove the instrument from its shipping case carefully
2. Inspect condition of Cabinet. NOTE: Packing case should be checked carefully. If panel broken, look for concealed damage -- if cabinet damaged due to rough handling in transit concealed damage claim should be filed with "carrier."
3. Remove packing material around the record changer and shipping bolts which hold the changer in place during transit. Put plug buttons in changer base. Remove back covering tuner and amplifier compartments.
4. Insert tubes in proper position in the amplifier, by referring to tube complement label. Put "Eye Tuning" tube in position, making certain not to place tube too far forward as it is likely to press dial scale out of shape.
5. Put in Gear Reduction Unit "Bottle of Oil" supplied with instrument...Be sure to replace oil plug.
6. Important -- Make sure record changer is free floating on mounting rubbers and that all four support rubbers are in proper position. Changer unit position should be shifted slightly until there is no tendency to touch against any part of changer mounting frame.
7. Level Cabinet by adjustable glides. This is important for proper automatic phonograph operation.

8. Check adjustment of clutch tension and clutch shaft assembly connecting gear box to record changer, making certain that it is straight and in line...A tendency to MOTOR RUMBLE or HUM may be prevalent otherwise, and this may also cause uneven turntable speed.

9. Make sure Reverse Arm and Fork Assembly is in correct position by moving this through its normal reverse motion.

10. Make sure Automatic Trip Switch under turntable is in proper position. This means end of lever arm or quadrant should be in the center of the trip switch contacts.

11. Make sure Tone Arm Stop Lever, Part Number 64197, is adjusted properly.

12. Insert New Needle or desired type of permanent point stylus in Pickup.

13. Attach "Control Knobs" to Tuner, putting felts between the knobs and the Escutcheon.

14. Check Line Voltage and Frequency to determine if same agrees with electrical specifications plate on rear of the instrument. Plug instrument into proper source of power supply.

15. Read carefully Operating Instructions accompanying instrument, then...Turn Instrument On.

16. Place a blank phonograph record on turntable. Set all controls, Volume, Bass and Treble in wide open position for acoustic feedback test. RCA Record, Number 49196 is good for this purpose. This test will locate excessive noise or rumble. Shifting the changer into a "free floating position" while this record is playing should clear up any rumble which may be present. If this does not quiet operation, again check for proper positioning of drive shaft between gear box and record changer, try shifting motor and gear box "mounting board" assembly.

17. Properly load 16 or 18 assorted 10" and 12" records in record magazine. Warped or damaged records should not be used. Make sure all record edges are free of "flash"...Records with excessive "flash" and rough edges should be smoothed down with fine sand paper.

18. Put automatic "On-Off" switch in "On Position." Instruments are all shipped with this switch in "Automatic 'OFF' Position."

19. Put selector arm lever in "REPEAT" position. Play one record.
Put selector arm lever in "ONE SIDE" position. Play one record.
Put selector arm lever in "BOTH SIDES" position. Play one record.

The above tests check for proper action of the "Selector Arm Lever." At the same time that the

MODEL 400M Series, FARNSWORTH TELEV. & RADIO CORP. Capehart

above tests are being made, a visual check for "Feed In" or "Indexing" of the pickup, Trip Action and setting down of records from magazine to turntable can be made.

20. Check Play Control action for indexing and shutting instrument off.

21. Operate Volume, Bass and Treble Controls to observe proper action.

22. Check next for maximum and minimum hum by lifting Pickup off record. When this has been done rotate Volume Control wide open. If excessive hum is present, reverse power line cord or attach good ground connection to instrument. Hum should be negligible except possibly with the volume control in "wide open" position which is seldom if ever necessary during normal operation of the instrument.

23. Check for Quality Reproduction. To do this, use a good record, the quality of and type of reproduction with which you are familiar. Check reproduction of the record at both High and Low Volume Levels.

24. Attach proper "Antenna System." A fine instrument deserves a good antenna. Check reception and calibration of radio tuner on all

bands. If a new antenna is required, install a Capehart Stock Number 41-80, or Stock Number 41-79 Dipole especially efficient for reception of "FM" signals.

25. Check action of "Electric Eye" tube, and position, so tuning segments are horizontal.

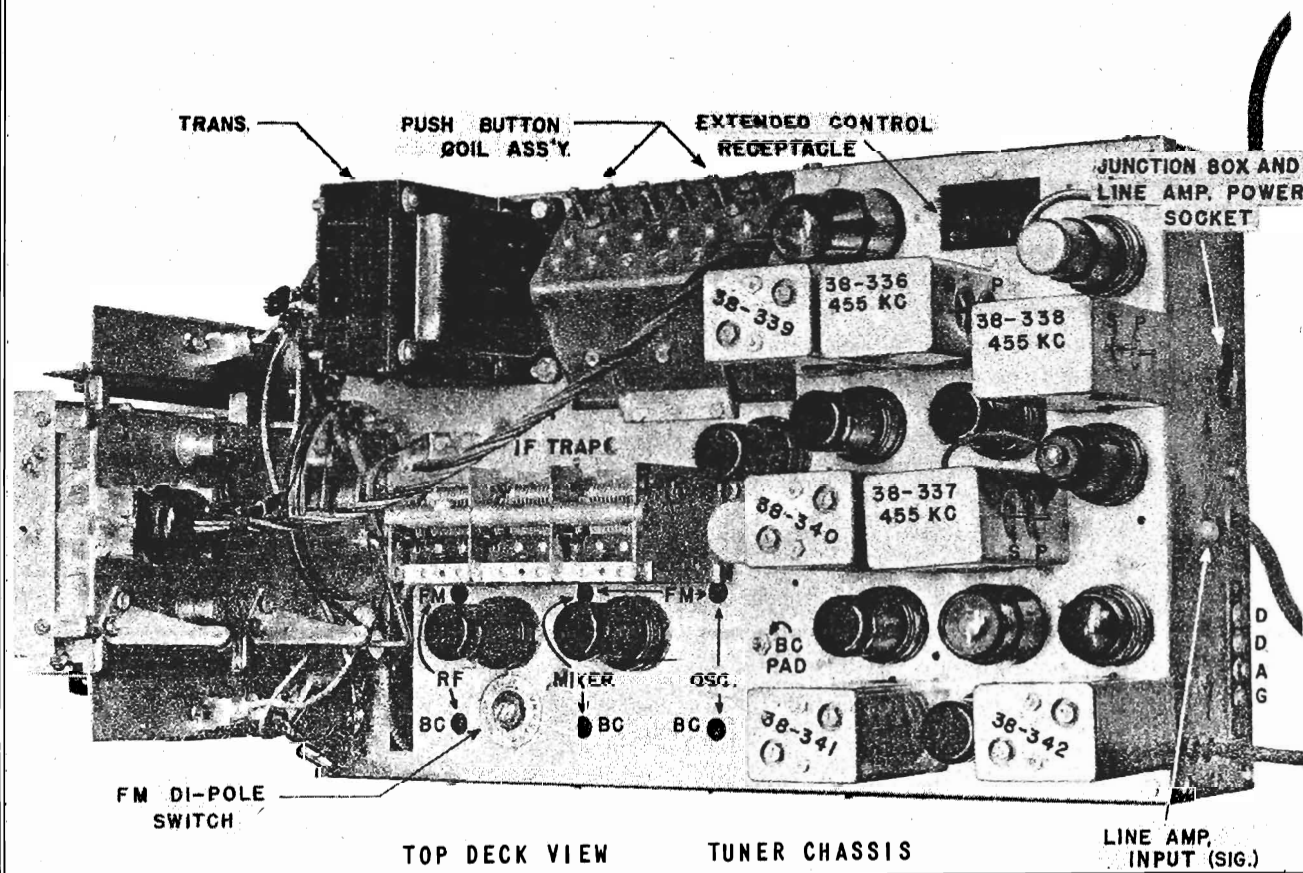
26. Tap tubes in tuner gently to locate any excessively microphonic tubes.

27. By the time the foregoing tests have been conducted, the instrument will have been in operation for 35 or 40 minutes and should be sufficiently warmed up so that the "Push Buttons" may be set without subsequent drift. Set up "Push Buttons" according to instructions accompanying instrument.

28. Attach proper Station Tabs.

29. Replace "back" of cabinet. Carefully clean up cabinet to remove all finger marks. For this purpose a piece of cheese cloth folded into a pad and moistened with water and a few drops of vinegar is very good. The use of furniture polish on Capehart cabinets is not recommended.

30. Instruct customer on all phases of operation of the machine. Personally place in the customer's hands the operation manual which accompanies the instrument.

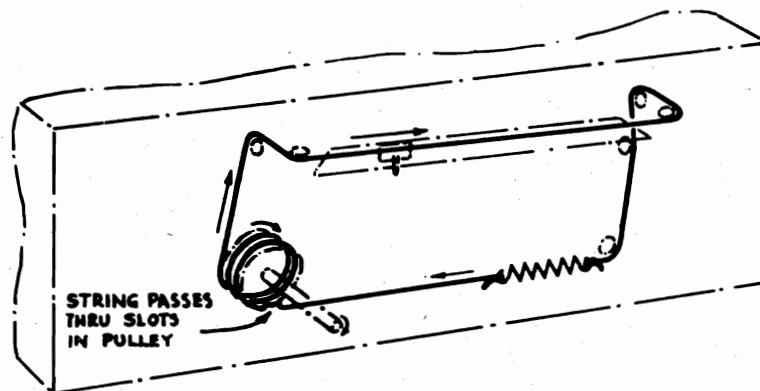


FARNSWORTH TELEV. & RADIO CORP. MODEL 400M Series,
Capehart

SECTION 9 DRIVE CORD ASSEMBLIES

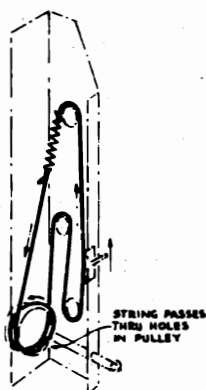
Quite often in handling a radio chassis the "drive cord" may slip off the controls or pulleys on which it rides. So many different types of mechanical drive methods have been devised depending on the tuner construction or the mechanical

genius who designed them that it is impossible for a service man to quickly figure out just how they should be restrung. In this connection we are sure that stringing diagrams below will be found most welcome.



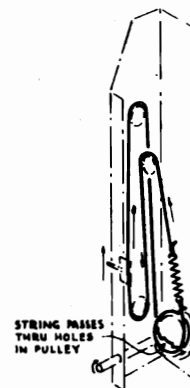
VOLUME CONTROL

Turning knob in clockwise direction causes pointer to move to right.



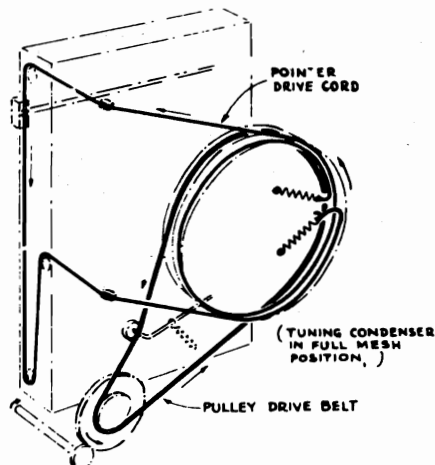
BASS TONE CONTROL

Shaft geared to tone control, turning knob in clockwise direction causes pointer to move upward.



TREBLE TONE CONTROL

Shaft geared to tone control, turning knob in clockwise direction causes pointer to move upward.



METHOD OF DIAL STRINGING

Turning tuning knob counter-clockwise moves pointer from top to bottom, drive drum turns clockwise, viewed from shaft end.

MODEL 400M Series, FARNSWORTH TELEV. & RADIO CORP.

Capehart

SECTION 10

ALIGNMENT OF AM BANDS

EQUIPMENT NECESSARY

A calibrated signal generator having fundamental frequencies from 455 Kc. to 20 Mc. In addition to the signal generator a crystal calibrator is a great convenience.

An indicating device for showing correct alignment, this may be a high resistance A.C. calibrator, a vacuum tube voltmeter, a high resistance D.C. voltmeter (20,000 ohms per volt minimum) or a Cathode Ray oscilloscope.

The A.C. voltmeter can be used either across the voice coil of one of the loud speakers or if the meter range is high enough from plate to plate in the output stage (don't forget a condenser (0.1 Mfd.)) to keep the D.C. out of the meter.

Either the vacuum tube voltmeter or high resistance D.C. voltmeter may be used to read the AVC voltage. This may be connected to pin #4 of the 6AB7 while aligning the I.F. and to pin #4 of the 6B8 while aligning the R.F. Converter and Oscillator.

The use of a Rider Volt Ohmst connected

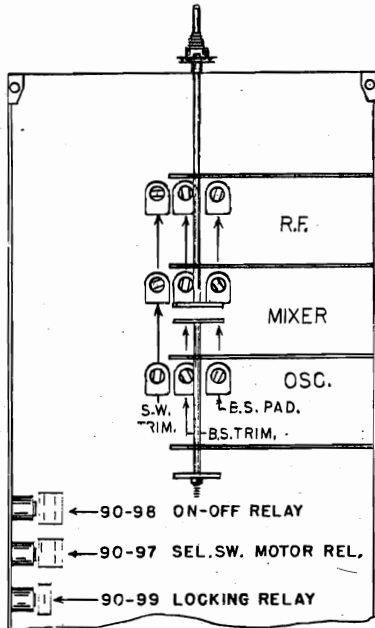
from ground to the AVC Bus is the preferred method as the high input impedance of the meter does not appreciably affect the alignment. And its high sensitivity allows the use of low input voltages.

Special care must be employed when aligning the short wave spread band, for the adjustment of the shunt trimmer affects the adjustment of the series pad. At the high frequency end of the band it is possible to peak the oscillator trimmer and the pad at the low frequency end at the image so in the alignment instructions we have indicated the fundamental frequency and the correct oscillator setting for the image so by resetting the signal generator it is possible to see if the alignment is correctly made. In each case the image is found at a frequency 910 Kc. higher than the fundamental that is if the set is aligned at 12 Mc. when the oscillator using high output is tuned to 12.91 Mc., the signal will be heard if the right peak has been used. This also applies to the short wave band.

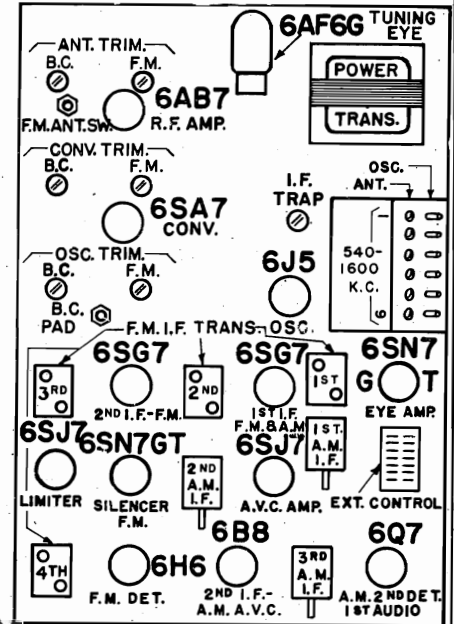
TABULATION FOR ALIGNMENT

STEPS	IN SERIES WITH ANT	SET GENERATOR AT	SET GANG AT	ADJUST AND SEE FIG.	TO OBTAIN
1	250 MMF	455 KC	Quiet Point	3rd IF Trimmers	MAXIMUM OUTPUT
2				2nd IF Trimmers	
3				1st IF Trimmers	
4		1500 KC	1500 KC	B C Osc Trimmer	
5				B C Ant Trimmer	
6				B C R F Trimmer	
7				600 KC Pad	
8		455 KC	Press Any Push Button	IF Trap	Min Output
9	400 Ω	15 MC	15 MC Image At 15.91 MC	S W Osc Trimmer.	MAXIMUM OUTPUT
10				S W Ant Trimmer	
11				S W R F Trimmer	
12	Check At		6 Mc		
13	400 Ω	12 MC	12 MC Image At 12.91 MC	B S Osc Trimmer	
14				B S Ant Trimmer	
15				B S R F Trimmer	
16	400 Ω	9.5 MC	9.5 MC Image At 10.41 MC	B S Osc Pad	
17				B S Ant Pad	
18				B S R F Pad	
19	Recheck Steps 13 to 18 Inclusive				

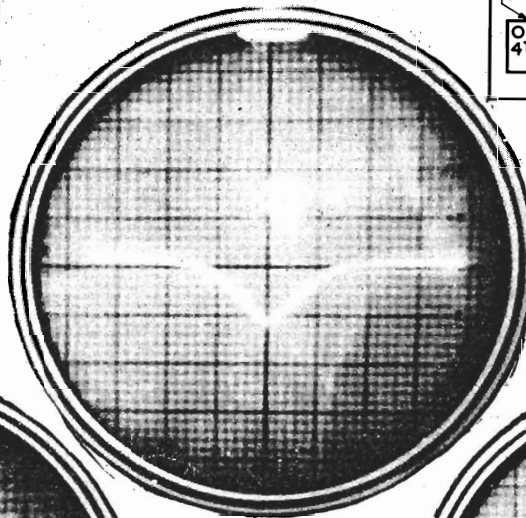
FARNSWORTH TELEV. & RADIO CORP. MODEL 400M Series, Capehart



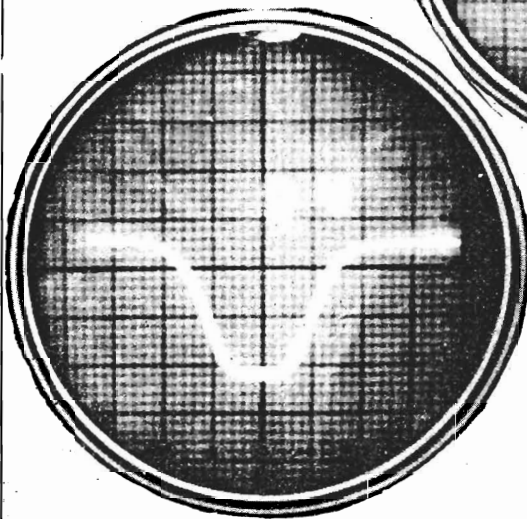
BOTTOM VIEW 400M



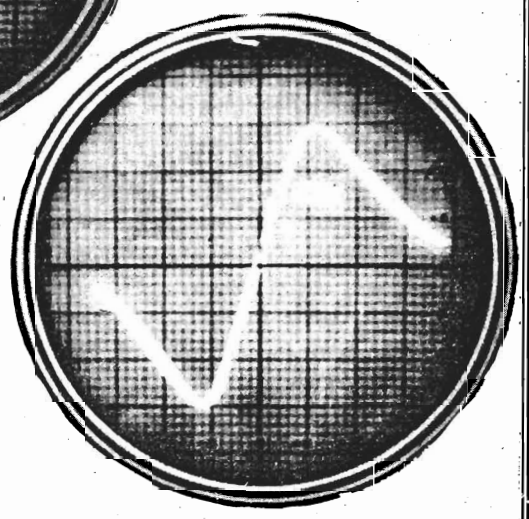
TUBE LOCATION LABEL



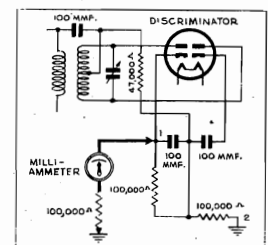
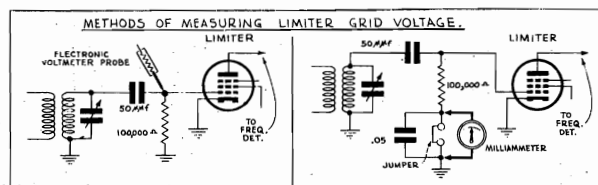
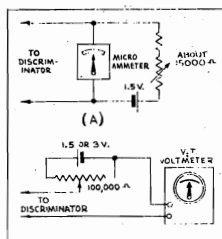
I.F. BEFORE ALIGNMENT FM



I.F. AFTER ALIGNMENT FM



ALIGNMENT OF THE DISCRIMINATOR



MODEL 400M Series, FARNSWORTH TELEV. & RADIO CORP.
Capehart

ALIGNMENT OF FM BAND

SECTION 11

Following are described two (2) methods for the Alignment of the F.M. Band.

Method 1 will require the use of a Cathode Ray Oscilloscope, a sweep frequency generator providing a fundamental frequency at 4.3 Mc and a deviation of at least 150 Kc and also a signal generator with a fundamental high frequency range of 42-50 Mc.

As an indicating device, a meter with at least 10 Meg. ohm internal resistance can be used or as a second choice - a low range micro-ammeter with a 1 Meg. ohm resistor in series.

Method 2 will require the same equipment with the exception of the Oscilloscope and the 4.3 Mc sweep generator.

ALIGNMENT BY METHOD 1

Connect the vertical deflection input of the oscilloscope with a 1 Meg. ohm resistor in series to the grid of the limiter tube. Care must be exercised to maintain the connection of the resistor to the grid of the limiter tube as short as possible to avoid regeneration. The ground terminal of the oscilloscope must be connected to the chassis.

Limiter Alignment - Connect the ground terminal of the 4.3 Mc. I.F. sweep generator to the chassis. Connect the output of the signal generator to the grid of the second I.F. tube with a .1 Mfd. paper condenser in series, adjust the deviation control of the generator for a usable picture on the oscilloscope screen, with the input control of the oscilloscope set at maximum gain. Detune the secondary trimmer of the limiter transformer, adjust the primary trimmer until you obtain a pattern as shown in Figure 1 of the oscilloscope photos. Then adjust the secondary trimmer until you obtain a pattern as shown in Figure 2. The pattern should be kept centered on the oscilloscope screen.

Align 2nd I.F. - Move the signal generator to the grid of the 1st I.F. tube and repeat the same procedure as described for the limiter stage.

Align 1st I.F. - Move the signal generator to the grid of the Mixer tube and repeat the limiter stage procedure.

Align Discriminator - Connect the oscilloscope to the Cathode of the 6H6 F.M. detector which is not grounded. Connect the signal generator to the secondary of the limiter transformer as indicated by A in Figure 6. Adjust the secondary trimmer of the discriminator transformer with an insulated screw driver, for pattern as in Figure 2, then adjust the primary trimmer to obtain symmetrical and linear trace and centering of the picture on the oscilloscope screen. It will be necessary to go over the primary and secondary trimmer several times to adjust the stage accurately.

R.F. Alignment F.M. Band - Connect the high frequency generator to the regular antenna terminal with a 400 ohm carbon resistor in series. Make certain the F.M. antenna Selector Switch is in regular position.

Set the signal generator at 50 Mc and adjust the Oscillator trimmer for correct dial calibration at this frequency. Connect high resistance Voltmeter to point A, Figure 4 and then adjust the signal generator to 49.5 Mc adjust the mixer and the R.F. Trimmers for maximum deflection of the meter.

Another indicating device for the R.F. alignment - connect a 0-1 millimeter between point A and ground or a low range micro-ammeter with a 1 Meg. ohm resistor in series between C and ground. Tune for maximum deflection of the meter.

Lacking the above meters, the R.F. and Mixer alignment may be trimmed for minimum noise on signal. To avoid false peak when aligning the Mixer and the R.F. Trimmers the gang condenser must be rocked through the signal.

ALIGNMENT BY METHOD 2

Limiter Alignment - Connect one of the indicating meters as shown in Figure 4 or Figure 5.

Feed a 4.3 Mc signal through .1 Mfd. paper condenser to the grid of the second I.F. tube. Place a 1000 ohm carbon resistor across the secondary of the limiter transformer then tune the primary for maximum meter deflection. Remove the 1000 ohm carbon resistor from the secondary and place it across the primary and tune the secondary for maximum meter deflection.

FARNSWORTH TELEV. & RADIO CORP.

MODEL 400M
Series,
Capehart

SECTION 11

ALIGNMENT OF FM BAND

To check how accurate this stage has been aligned tune the signal generator 75 Kc each side of 4.3 Mc. Only a slight loss in maximum meter deflection should be noted.

Align 2nd I.F.F.M. - Move the signal generator to the grid of the 1st I.F. tube and repeat the same procedure described above for the limiter stage.

Align 1st I.F.F.M. - Move the signal generator to the grid of the mixer tube and repeat alignment procedure as described above for the limiter stage.

Discriminator Alignment - Connect a meter to Point A as shown in accompanying illustrations to the ungrounded Cathode.

Feed a 4.3 Mc signal to the grid of the second I.F. tube.

With an insulated screw driver turn the secondary trimmer screw for maximum and minimum capacity. You will note that there are two points where you have maximum meter deflection. Tune to the point between the maximum meter deflections where the meter will read as near zero as possible.

Tune the signal about 150 Kc each side of 4.3 Mc. You will note that the meter deflection rises about equal distance each side of 4.3 Mc. Tune the primary trimmer until you have maximum meter deflection an equal distance each side of 4.3 Mc.

Note: The meter will have to be reversed when reading the other side of the signal.

SECTION 13

CABINET PARTS LIST & PRICES

Stock No.	Description
31-95	Capehart Decal
31-96	DeLuxe Decal
59-58	Dial Escutcheon
59-71	Dial Escutcheon (Bl.)
59-62	Push Button Knob
59-74	Push Button Knob (Bl.)
6058	Tuning Knob
77-176	Tuning Knob (Bl.)
6060	Bass or Treble Knob
67-177	Bass or Treble Knob (Bl.)
67-178	Band Switch Knob

Another indicating device for the R.F. alignment - connect a 0-1 millimeter between point A and ground or a low range micro-ammeter with a 1 Meg. ohm resistor in series between C and ground. Tune for maximum deflection of the meter.

Lacking the above meters, the R.F. and Mixer alignment may be trimmed for minimum noise on signal. To avoid false peak when aligning the Mixer and the R.F. trimmers the gang condenser must be rocked through the signal.

Note: If a high frequency signal generator is not available a standard signal generator which will give good harmonic output between 42 - 50 Mc can be used.

Two methods using a micro-ammeter or a V.T. voltmeter may be used for the alignment of the discriminator are shown in the accompanying illustrations.

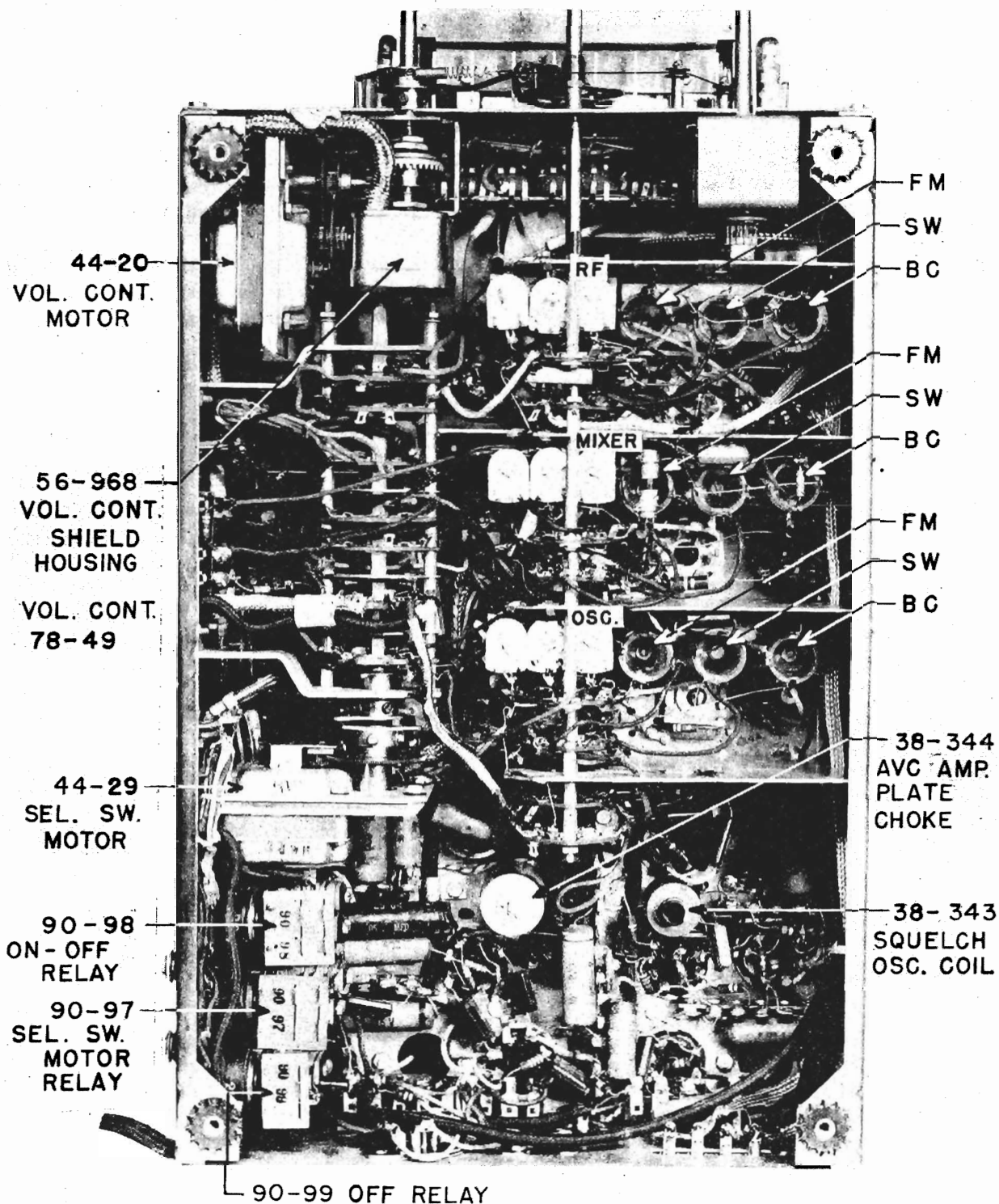
It will be necessary to go over the primary and secondary trimmers several times to accurately align this stage.

R.F. Alignment F.M. Band - Connect the high frequency generator to the regular antenna terminal with a 400 ohm carbon resistor in series. Make certain the F.M. antenna Selector Switch is in regular position.

Set the signal generator at 50 Mc and adjust the Oscillator trimmer for correct dial calibration at this frequency. Connect high resistance Voltmeter to point A, Figure 4 and then adjust the signal generator to 49.5 Mc adjust the mixer and the R.F. trimmer for maximum deflection of the meter.

Stock No.	Description
67-179	Band Switch Knob (Bl.)
61163	Compartment Lamp
31-93	Push Button Trimmer Cover
13-368	Play Control & Cab Light (Comp)
36-468	Escutcheon Screws (Pkg. 10)
56-538	Soss Hinge for 506, 410, 411
13-219	Basic Glide ea.
36-383	16-F Mtg. Bolts ea.
5092	16-F Mtg. Rubbers ea.
50117	16-F Main Frame Pads
36-597	16-E Plug Buttons

MODEL 400M Series, FARNSWORTH TELEV. & RADIO CORP
Capehart



BOTTOM VIEW

TUNER CHASSIS

FARNSWORTH TELEV. & RADIO CORP. MODEL 400M Series, Capehart

SECTION 14

RADIO TUNER PARTS LIST

Reference No.	Part No.	Description	Reference No.	Part No.	Description
0	773-40	1500 Ohms	68	90-89	No. 1, 3 and 5 Band Switch Wafers
1	773-36	220 Ohms	69	90-90	No. 2 and 8 Band-Switch Wafers
2	773-55	2.2 Megohms	70	90-91	No. 4 Band Switch Wafer
3	773-49	100 M Ohms	71	90-92	No. 6 Band Switch Wafer
4	773-46	22 M Ohms	72	90-93	No. 7 Band Switch Wafer
5	773-41	2200 Ohms	73	90-100	No. 1 Selector Switch Wafer
6	773-38	470 Ohms	74	90-101	No. 2 Selector Switch Wafer
7	773-80	150 M Ohms	75	90-102	No. 3 Selector Switch Wafer
8	773-78	47 M Ohms	76	90-103	No. 4 and 5 Selector Switch Wafers
9	773-39	1 M Ohms	77	90-104	No. 6 Selector Switch Wafer
10	77-98	6800 Ohms	78	90-105	No. 7 Selector Switch Wafer
11	773-42	3300 Ohms	79	90-96	Ant. Selector Switch
12	773-54	1 Megohm	80	90-88	Push Button Switch
13	773-47	33 M Ohms	81	94-90	18 V. and 6.3 V Trans- former
14	773-43	4700 Ohms	82	44-20	Volume Motor
15	773-51	220 M Ohms	83	44-29	Selector Switch Motor
16	77-95	6.8 Ohms	84	90-97	Selector Switch Motor Relay
17	78-49	3 Meg. Vol. Control	85	90-98	On-Off Relay
18	78-36	4 Meg. Treble Control	86	90-99	Off Relay
19	78-35	3 Meg. Bass Control	87	80-84	Ant. Strip
20	26-138	3 Gang Condenser	88	38-359	FM RF Plate Choke
21	26-151	PC and FM Ant. and Mixer Trim.	89	22-116	No. 1 Input Sig. Cable
22	26-147	PC and FM Osc. Trimmers	90	22-117	No. 2 Input Sig. Cable
23	26-140	Short Wave Ceramic Trim.	91	22-15	Plug and Cable to Junction Box
24	26-141	BS Padder Ceramic Condenser	92	22-118	Power Plug and Cable to Amps.
25	26-142	BS Trimmer Ceramic Condenser	93	80-132	Remote Line Amp. Power Socket and Cable
26	263-1	PC Osc. Padder Condenser	94	80-170	15 Prong Socket
27	26-33	Wave Trap Trimmer	95	80-30	Input Socket to Remote Line Amp
28	26-66	Push Button Ant. Trim. Strip	96	22-124	Phono Input Strip and Cable
29	25-136	80 MMF Silver Mica Cond.	80-82		Octal Ceramic Socket
30	253-1	100 MMF Cond.	80-175		Octal Ceramic Socket for Osc. only
31	25-141	500 MMF Cond.	80-81		Octal Socket
32	25-140	15 MMF Cond.	31-181		Dial Scale
33	25-166	10 MMF Cond.	36-541		Dial Scale Fasteners (In lots of 10)
34	258-2	350 MMF Silver Mica Cond.	31-97		Dial Glass Window
35	253-5	50 MMF Cond.	56-453		Tone Control Pointers
36	25-52	200 MMF Silver Mica Cond.	56-598		Volume Control Pointer
37	25-68	300 MMF Cond.	56-462		Dial Pointer
38	25-53	1000 MMF Cond.	07-136		Bass Control Drive Cord Assembly
39	25-69	250 MMF Cond.	07-137		Treble Control Drive Cord Assembly
40	25-141	5000 MMF Cond.	07-134		Volume Control Drive Cord Assembly
41	25-134	.05 MF 600 V.	07-135		Tuning Drive Cord Assembly
42	256-1	.05 MF 200 V.	92-82		Endless Belt for Gang Drive
43	255-1	.01 MF 600 V.	59-77		Small Pulley for Tone and Volume Control
44	256-2	.1 MF 200 V.	13-175		Split Gear Assembly
45	25-97	.01 MF 200 V.	22-115		Tuning Eye Cable and Socket Assembly
46	25-142	10 MF 25 V.	56-883		Coupling Arm on Selector Switch
47	25-50	Dual 10 MF 450 V.	421-2		Pilot Lamp
48	38-226	P C Ant Coil	71-522		Operating Instruction Book
49	38-361	FM Ant. Coil			
50	38-360	SW Ant. Coil			
51	38-356	BC Mixer Coil			
52	38-358	FM Mixer Coil			
53	38-357	SW Mixer Coil			
54	38-353	PC Osc. Coil			
55	38-355	FM Osc. Coil			
56	38-354	SW Osc. Coil			
57	38-343	Squelch Osc. Coil			
58	38-352	Osc. Push Button Coil Assembly			
59	38-351	Wave Trap Coil			
60	38-344	A V C Amp. Plate Coil			
61	38-339	1st I F AM Transformer			
62	38-340	2nd I F AM Transformer			
63	38-341	3rd I F AM Transformer			
64	38-342	4th I F AM Transformer			
65	38-336	1st I F AM Transformer			
66	38-337	2nd I F AM Transformer			
67	38-338	3rd I F AM Transformer			

Reference	Part		Reference	Part	
No.	No.	Description	No.	No.	Description
1	773-53	470 M Ohms $\frac{1}{2}$ Watt	16	25-38	50 Mfd. 25 V.
2	773-39	1000 Ohms $\frac{1}{2}$ Watt	17	25-138	15 Mfd. 475 V.
3	77-32	10 M Ohms $\frac{1}{2}$ Watt	18	25-139	30 Mfd. 475 V.
4	773-41	2200 Ohms $\frac{1}{2}$ Watt	19	35-146	30 Mfd. 450 V.
5	773-72	3300 Ohms $\frac{1}{2}$ Watt	20	24-42	25 Mfd. 400 V.
6	773-81	220 M Ohms $\frac{1}{2}$ Watt	21	94-85	Phase Conector Reactor
7	773-51	220 Ohms $\frac{1}{2}$ Watt	22	77-102	Voltage Divider
8	77-71	110 Ohms 10 Watt	23	94-61	Power Trans.
9	25-54	.25 Mfd. 600 V.	24	94-32	Output Trans.
10	254-8	.05 Mfd. 600 V.	25	805-1	Input Jack
11	256-2	.1 Mfd. 200 V.	26	80-57	Speaker Socket
12	25-46	.003 Mfd. 1000 V.	27	80-50	Tuner Voltage Socket
13	257-2	.01 Mfd. 600 Line Buffer	28	94-65	Choke
14	253-3	500 M.M.F. Mica		27-118	A.C. Line Cord
15	25-52	20 Mfd. 25 V.		13-204	Shorting Plug

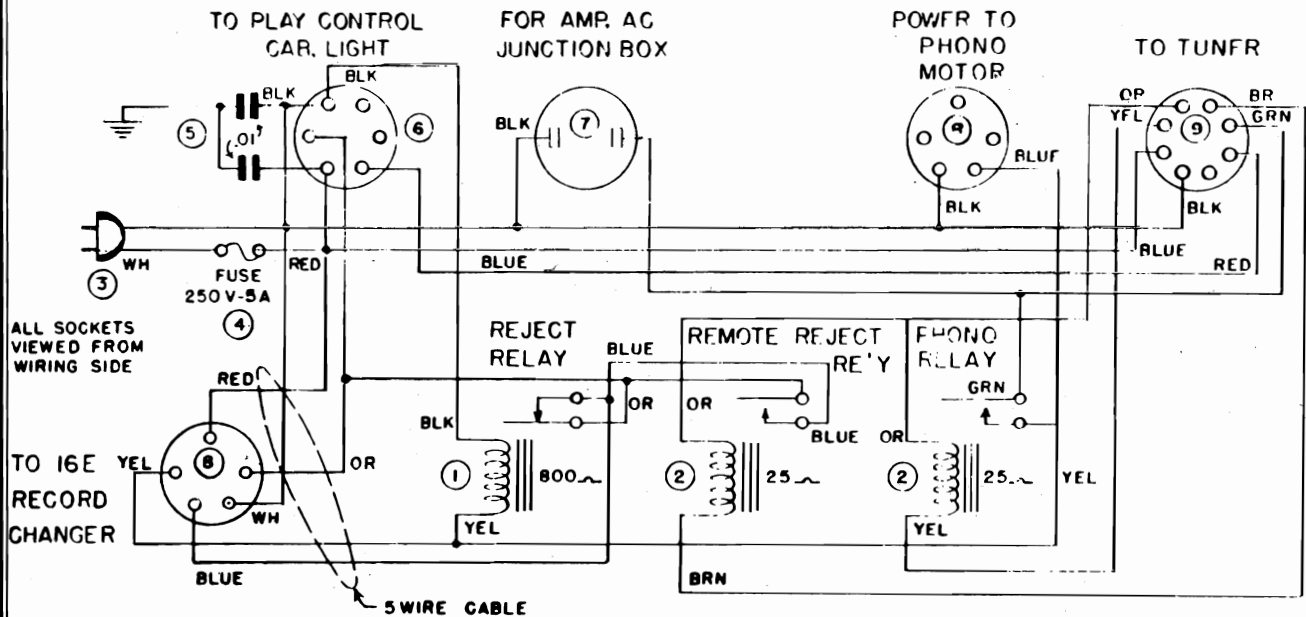
Stock No.	Description	Stock No.	Description
81-72	Treble Speaker 12"	81-101	Cone & Voice Coil for 81-72 Speaker
81-73	Bass Speaker 14"	81-113	Cone & Voice Coil for 81-73 Speaker
81-114	Field Coil for 81-72 Speaker		
38-287	Field Coil for 81-73 Speaker		

Compliments of www.nucow.com

FARNSWORTH TELEV. & RADIO CORP. MODEL 400M Series, Capehart

SECTION 18

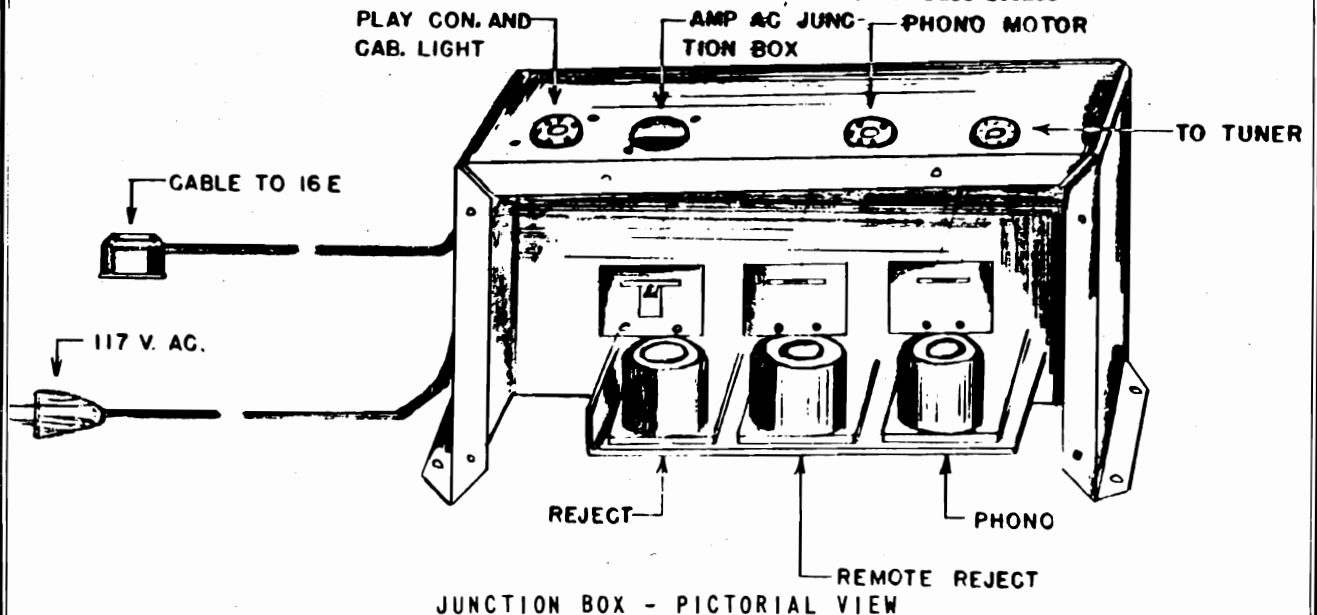
JUNCTION BOX CIRCUIT WIRING DIAGRAM

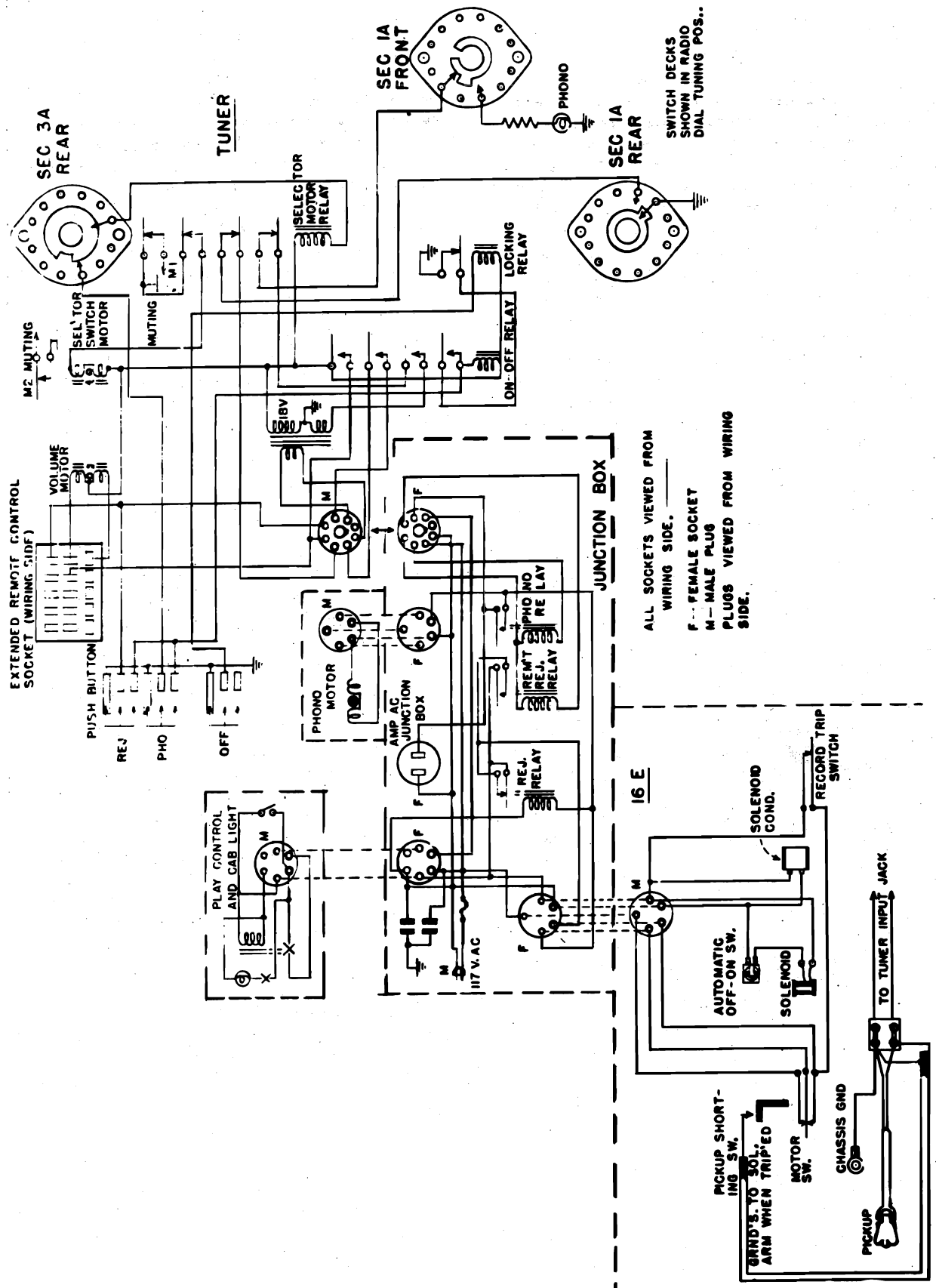


SECTION 19

JUNCTION BOX SERVICE PARTS

Reference No.	Stock No.	Description	Reference No.	Stock No.	Description
1	90-109	Reject Relay 50-60 Cycle	6	80-61	6 Prong Socket
2	90-110	Motor Relay 50-60 Cycle	7	80-69	2 Pole AC Socket
3	27-134	AC Line Cord	8	80-57	5 Prong Socket
4	48-6	Fuse 250 V 5 A	9	80-71	Octal Socket (8 Prong)
5	2512-1	.01 Mfd. 600 V. Condenser		22-9	Cable and Socket Assy.
				80-68	Fuse Socket



FARNSWORTH TELEV. & RADIO CORP. MODEL 400M Series,
Capehart

COMPLETE RECORD REPRODUCING CONTROL CIRCUIT DIAGRAM

SECTION 21

MODEL 400M Series, FARNSWORTH TELEV. & RADIO CORP.
CapehartSECTION 22 MOTOR DRIVE - GEAR REDUCTION UNIT
- DRIVE SHAFT ALIGNMENT

A silent and smooth operating drive motor, and gear reduction unit properly coupled to the record changer is of utmost importance for perfect reproduction of records. Unless these parts are all functioning properly there is a possibility that waver, or wows may be noticed in the sound reproduction from records. It is also possible that objectionable hum or rumble may be discernable during low passages in records or the change cycle. If such conditions are apparent we suggest a careful check and adjustment in accordance with the procedures which follow.

After freeing the record changer by removing the four hold down bolts used in shipment, make certain that the record changer is floating freely on its rubber mounting supports and that it does not touch the record changer mounting shelf at any point. There should be a feeling of entirely free floating motion when the changer is shaken slightly. If such is the case, it is a good indication of full free floating action. By making sure that

the record changer is "free floating" the possibility of acoustic feedback, hum or rumble is eliminated.

Because of the importance for positioning the record changer into a free floating position it is always advisable to check the alignment relation of the record changer drive shaft with respect to the gear reduction unit and

between this unit and the drive motor. Unless the correct alignment relationship is maintained excessive hum or rumble may be present as well as the possibility of uneven turntable speed causing waver or wows in the record reproduction.

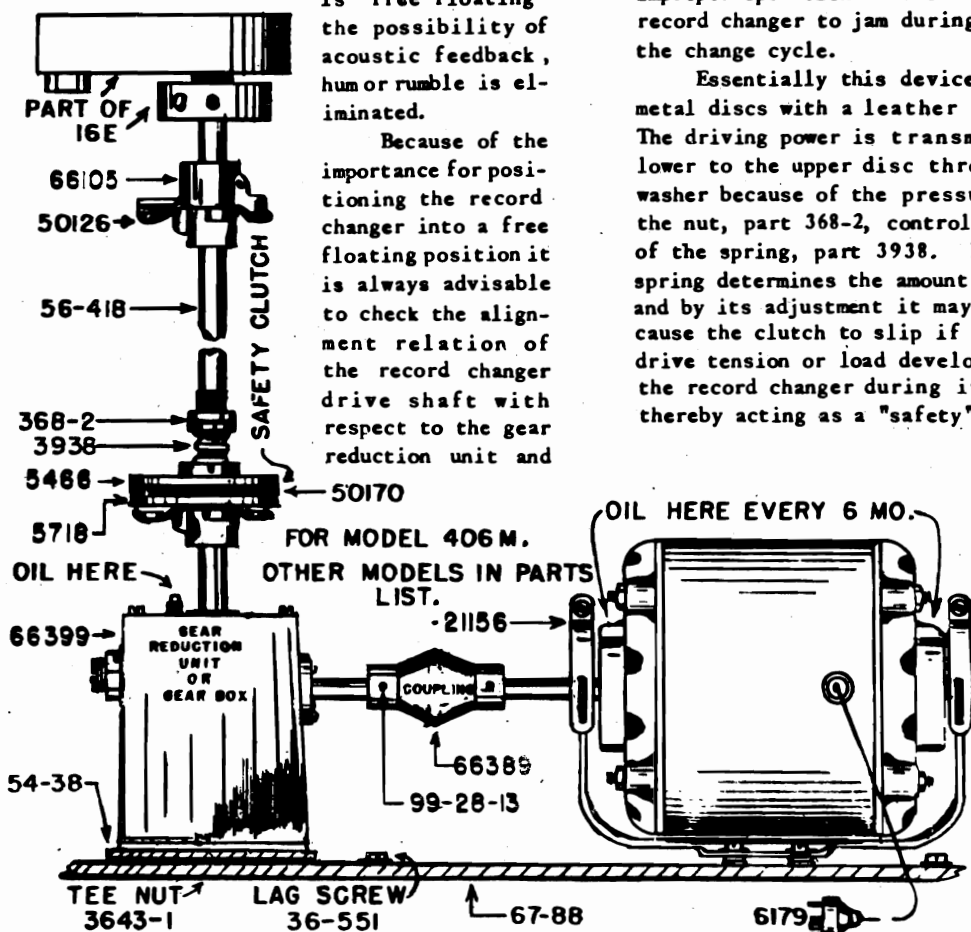
If the above conditions are apparent with record changer in free floating position, try shifting the gear reduction and motor assembly slightly until a position is found where the difficulty is eliminated or negligible.

NOTE: Drive motors and gear reduction units are "run-in" and aligned on the mounting board at the factory, and will seldom, if ever, require adjustment in the field unless they have been tampered with or in the event the motor has shifted due to rough handling in transit. If hum or rumble persists after trying previous suggestions, loosen the motor and shift slightly locking same back in place when minimum hum position is located.

SECTION 23 SAFETY CLUTCH -
PURPOSE AND ADJUSTMENT

The purpose of this feature is to uncouple the record changer from the gear reduction unit in the event a faulty record or improper operation of the machine causes the record changer to jam during some portion of the change cycle.

Essentially this device consists of two metal discs with a leather washer between. The driving power is transmitted from the lower to the upper disc through the leather washer because of the pressure developed by the nut, part 368-2, controlling the pressure of the spring, part 3938. Pressure of the spring determines the amount of back pressure and by its adjustment it may be set so as to cause the clutch to slip if more than normal drive tension or load develops somewhere in the record changer during its change cycle, thereby acting as a "safety" feature.





SECTION 25 PLAY CONTROL - INSTALLATION - ADJUSTMENTS & MAINTENANCE

1. The following parts comprise a complete play control installation. Play control with cables, plug and switch, compartment light, mounting bracket, two bracket mounting screws, two switch mounting bolts, and four wood screws. Check packing material so no parts are overlooked.

2. The mounting bracket should be installed on the record changer first. See illustration 3.

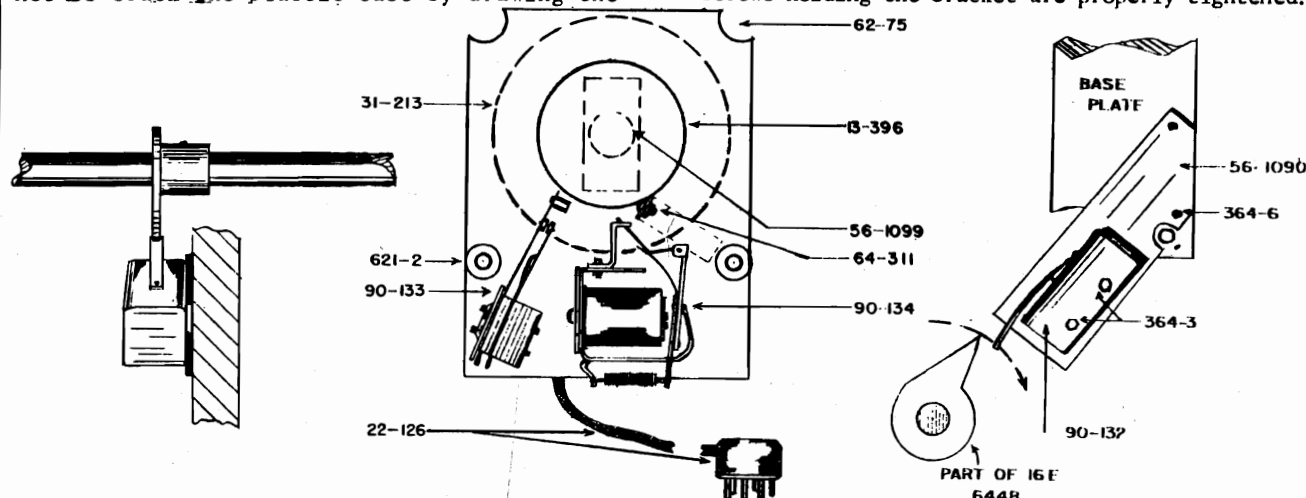
3. The bracket is mounted on the boss which supports the clutch fork shaft and the reverse cam shaft, on the side of the boss away from the main cam, so the clutch fork shaft sets in the cutout. Pass the two screws that fit the tapped holes in the switch bracket through the old play control bracket holes when mounting the bracket.

4. Remove the plug button from the partition between radio and changer, put the six prong plug, the switch and the cables through the holes in the partition. Fasten the play control on the partition by means of the wood screws being careful not to crack the plastic case by drawing the

screws too tight or driving the screws in crooked. Also be sure the record tray clears the play control housing before driving any screws.

5. Fasten the switch to the bracket by means of the two bolts. See illustration. This puts the switch in such a position that the throw out cam can actuate the switch. Of course, the switch goes on the bracket with the leads at the bottom and pointing toward the left (when looking in the back of the cabinet), this brings the spring finger in line with the throw out cam.

6. Remove play control shorting plug (six prong) from junction box and plug in cable from play control. Set play control at any number except zero (off) and run changer through several cycles, if the switch is too close to the throw out cam the relay in the play control will buzz, if not close enough the action will be erratic. Be sure the bolts holding the switch and the screws holding the bracket are properly tightened.



SECTION 26

400M SERIES PLAY CONTROL PARTS LIST

Stock No.	Description	Stock No.	Description
13-396	Ratchet Ass'y	64-311	Dog Spring
22-126	Cable and Plug	90-125	Light Switch
31-213	Dial Scale	92-140	Back Cushion
56-1099	Shaft	61163	Light Bulb
56-1100	Steel Ball Bearing	90-133	Relay (Complete)
59-142	Control Knob	90-134	Switch
59-143	Housing	621-2	Rubber Grommet
62-75	Rubber Grommet	13-368	Play Control & Cabinet Assembly (Complete)

SECTION 20. OPERATION AND MAINTENANCE 16-E RECORD CHANGER

The "On-Off" relay is used to turn on the 117 volts for the entire set. Due to the fact 117 volts are always on the transformer in the set, the 6.3 volts for the heaters is supplied through one set of contacts on the relay. Another set of contacts supplies the audio amplifiers and another set in conjunction with the selector switch energizes the Reject Relay located in the Junction Box.

This latter relay closes the AC circuit to the Phono motor and the "Phono Relay" also in the Junction Box. Due to the fact the "Phono Relay" contacts are closed until it is energized the AC is also applied to the Clutch Solenoid in the 16-E Changer causing the clutch to be engaged. Thus whenever the "Phono" button is pushed the 16-E goes into

cycle to permit the tubes to reach operating temperature before a record is played.

In the 16-E Changer the Clutch Solenoid is energized by the above starting cycle, pressing the Reject Button or by the Automatic Trip Switch. As soon as the change cycle starts the Solenoid Motor Switch opens the Solenoid circuit and shunts the reject relay to keep the motor running until the change cycle is completed even if the "Off" button is pushed.

The Automatic Trip Switch, located under the turntable is actuated by the tone arm moving the trip lever when the needle enters the trip or change groove.

The "Automatic On-Off" switch is used to open the Clutch Solenoid circuit when it is desirable to play records manually.

SECTION 23 SAFETY CLUTCH - PURPOSE AND ADJUSTMENT

The proper method of checking the adjustment of the safety clutch follows. With the record changer in cycle and the record magazine fully loaded apply a slight downward pressure on the bottom of the record magazine, while the magazine is tilting backward. When such pressure is applied it should cause the safety clutch to slip and the turntable should stop revolving. In the event the action of the safety clutch is not as described loosen nut, part 368-2, thereby releasing pressure on spring, 3938, this will permit safety clutch to unload sooner. After this adjustment is made the changer should be put through a number of cycles to make certain that the clutch does not slip at any point in the normal change cycle as this would cause the changer to stall.

The action of this safety clutch should always be checked when the instrument is per-

manently set up in the customer's home since it acts as a safety device to prevent record breakage or damage to changer in the event of a jam because of reasons previously mentioned. CAUTION: The leather clutch facing should be kept free of oil or grease.

GEAR REDUCTION UNIT

At least once a year the gear reduction unit should be removed, the oil drained, gear box flushed and refilled with 1/2 ounce, No. 10 S.A.E. oil. Stock No. 1315-1.

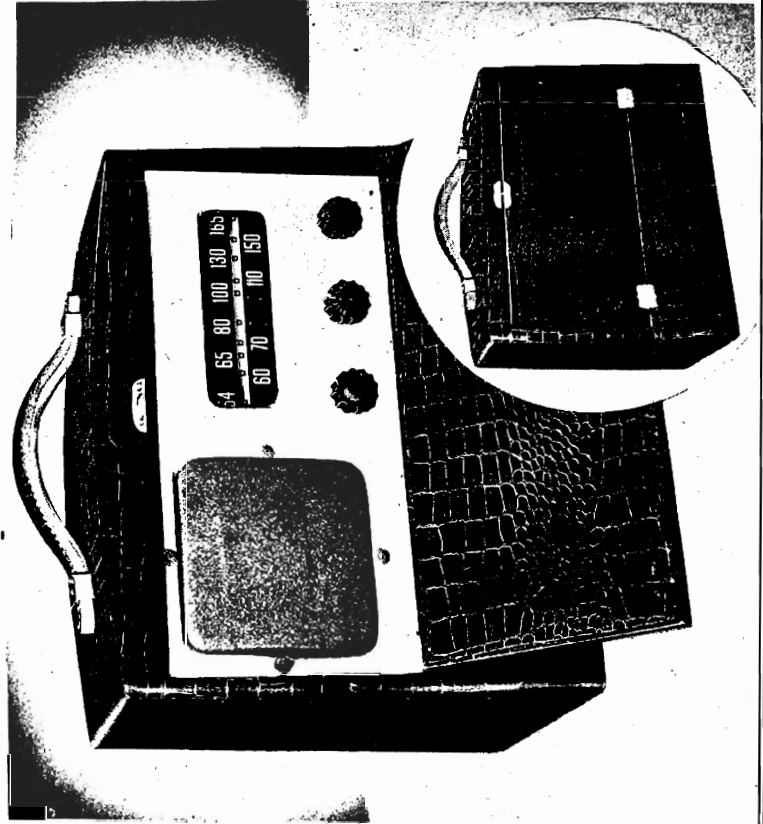
LUBRICATION

At least every six months a few drops of oil should be applied to the drive motor oil cups. See illustration. For this purpose use the special electrical motor oil which is carried by most all oil companies for electric fans, sewing machine motors, etc.

SECTION 24

MOTOR DRIVE ASSEMBLY PARTS

Stock Number	Description	Stock Number	Description
13-151	406M Frict. Drive Ass'y.	66105	Flexible Coupl. Set Screw 99-28-13
56-418	406M Shaft	50126	Leather Disc
5466	406M Upper Frict. Drive Disc.	21156	Motor 60 Cycle
5718	405M Lower Frict. Drive Disc.	21157	Motor 50 Cycle
50170	406M Drive Facint (Leather)	66399	Gear Box 60 Cycle
36-501	"C" for Friction Drive	66435	Gear Box 50 Cycle
41-89	"C" Washer Pkg. 12	1315-1	Reduct Unit Oil SAE 10, 1/2 oz.
99-34-7	406M Cotter Pin	6019	1/4" Allen Wrench
3938	406M Spring	67-88	Mtg. Board
368-2	406M 3/8 x 32" Hex Nut	54-38	Reduction Unit Shim
13-151	410 M Frict. Drive Ass'y.	62-46	Motor Grommet
56-119	Shaft for Friction Drive	36-258	Spacers
13-148	411M Friction Drive Ass'y.	36-136	#10 Plain Washer
56-415	411M Shaft for Friction Drive	36-550	#10/32xx 3/4" Slotted ISMS
13-150	412M Friction Drive Ass'y	3611-4	#10 S.P. Lock Washer
56-417	412M Shaft for Friction Drive	3643-1	#10/32 Tee Nut
66389	Motor Couplings (rubber)	6179	5 Tring Motor Plug
99-28-13	1/4 x 20 x 4" Allen Set Screw	36-551	Lag Screw



ALL VOLTAGES MEASURED TO CHASSIS
VOLTAGE READINGS TAKEN WITH
20,000 OHMS PER VOLT METER
117 VOLT 60 CYCLE LINE.
TUNING RANGE 538-1650 KC

Diagram showing three vertical lines representing wires, connected by a horizontal line. The text "CONNECTED WIRES" is written vertically along the right side of the diagram.

ALIGNMENT PROCEDURE

No attempt should be made to realign the various circuits until all other causes have been checked, unless the condition is so obvious as to indicate that realignment is necessary. Then proceed as follows:

Volume Control full on.
Low range A.C. meter connected across voice coil to indicate output.

Keep signal generator attenuated so as to maintain 1/2 scale reading on output meter.

Make certain that dial pointer is exactly on index line (top left side of dial plate) when variable condenser is fully meshed.

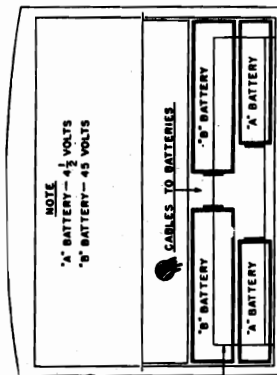
REMOVE CHASSIS BOTTOM PLATE

RECEIVER DIAL A.F.	SIGNAL GENERATOR	DUMMY ANTENNA	CONNECT SIGNAL GENERATOR TO:	REFER TO CHASSIS LAYOUT FOR LOCATION OF TRIMMERS
1 Fully closed	Exactly 456 KC	.1 MF	Common Ground and Control Grid 1R5 top front section var. cond.	Adjust for maximum output T1, T2, T3, and T4.
2 Fully closed	Approx. 538 KC	.1 MF	Control Grid 1T4 top rear section var. condenser	Adjust for maximum output T8
3 Fully open	Exactly 1650 KC	.1 MF	Control Grid 1T4 top rear section var. cond.	Adjust for maximum output T5

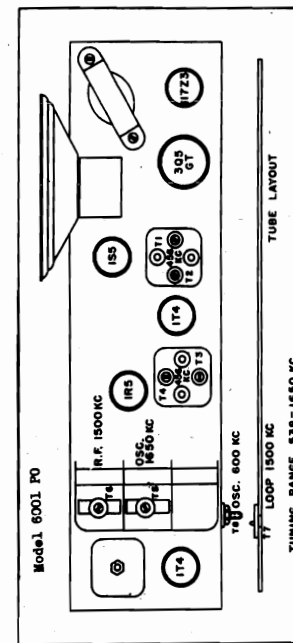
REPEAT OPERATIONS 2 and 3.

4 Approx. 1500 KC	Approx. 1500 KC	.1 MF	Control Grid 1T4 same as No. 3	Adjust for maximum output T6
5 Approx. 1500 KC	Approx. 1500 KC	.1 MF	Radiating Loop 20" from Receiver	Adjust T7 for maximum output
6 Approx. 600 KC	Approx. 600 KC		Radiating Loop 20" from Receiver	Adjust T8 for maximum while rocking variable condenser

The next two operations are performed with the bottom plate on and the chassis in the cabinet — with lid closed



Battery Block Battery Layout



TUBE LAYOUT

TUNING RANGE 538-1650 KC

Power Supply: 105-125V., 40-60 cycles AC
Same Voltage DC, 15 Watts Power Consumption

Battery Operation: 9 V.A. — 90 V.B.

Frequency Range: 1650 - 540 KC

I.F. Circuits: 456 KC

Tubes: 1T4 R.F. Amplifier 1R5 Det. Arc. A.F.

1T5 Osc. Converter 3Q5 Power Output

1T6 I.F. Amplifier 1T7 Rectifier

Speaker: 5" P.M. 1.47 oh. Alnico V Magnet

Speaker Transformer: 8500 ohms - 400 cycles

Speaker Voice Coil: 3.2 ohms

Part No.

12.2 Tubular Condenser .002 mf 500 V
12.5 Tubular Condenser .01 mf 200 V
12.11 Tubular Condenser .05 mf 200 V
12.12 Tubular Condenser .05 mf 400 V
12.14 Tubular Condenser .1 mf 200 V
12.17 Tubular Condenser .25 mf 400 V
12.26 Tubular Condenser .005 mf 400 V
12.27 Tubular Condenser .15 mf 200 V
17.20 Mica Condenser 50 mmf $\pm 10\%$
17.22 Mica Condenser 220 mmf $\pm 10\%$
17.21 Mica Condenser 100 mmf $\pm 10\%$
22.9 Electrolytic Condenser 150-150mf — 15 W.V.
22.11 Electrolytic Condenser 40-30-20 mf — 150 W.V.
27.10 3 Section Variable Condenser 397 mmf

Loop Antenna w Trimmer

37.27 Input I.F. Transformer

37.33 Diode I.F. Transformer

37.35 Oscillator Coil

37.30 R. F. Coil

52.9 Volume Control

47.5 Battery Electric Changeover Switch

77.54 Dial Pointer

77.50 Dial Scale (Calibrated)

97.92 Cabinet

42.3 Output Transformer

107.6 5" P. M. Speaker

117.9 1850 ohm 10-W W.W. Resistor

132.1 Padder Condenser

142.30 Tuning Knob

142.23 Volume Knob

142.28 Battery-Off-Electric Knob

The following apply to Model P22 only.

97.51 Cabinet

117.1 30 ohm 1 W — W.W. Resistor

142.12 Tuning Knob (wood)

142.13 Volume Knob (wood)

142.14 Battery-Off-Electric Knob (wood)



CIRCUIT DESCRIPTION

The chassis utilized in these modern Firestone radio receivers incorporates a basic superheterodyne type of circuit that is designed to provide reception from standard broadcast stations in the frequency range of 540 to 1600 KC as well as reception from the new frequency modulation stations that are located in the 88 to 108 MC band. Many of the stages of the complete circuit will be readily recognized as necessary elements of a typical superheterodyne system, however, the detection method that is used for frequency modulation reception embodies an entirely new principle that will be fully explained in this pamphlet. All sections of the circuit have been developed in accordance with the most modern radio engineering technique and some of the more prominent features are described in the following paragraphs.

Built-in antennas are provided for reception of AM as well as FM stations. In locations where signal strength is adequate, these built-in antennas will give satisfactory performance but where FM signals are weak, it is desirable to obtain greater signal pick-up by installing an outdoor antenna such as:

**FIRESTONE
FOLDED DIPOLE
FM ANTENNA
STOCK NO. 4-D-126**

The built-in antenna used for AM reception is a high impedance loop that is mounted on rear edge of cabinet. A specially arranged and accurately cut length of "ribbon-type" high frequency transmission line serves to form the built-in folded dipole antenna for FM reception.

Tuning of the radio frequency circuits of the receiver is accomplished by a sturdily constructed permeability ("slug") tuner. This tuning system provides a means of minimizing the effects of "microphonism" that are inherent in other tuning devices. A high degree of accuracy in calibration and alignment of tuned circuits is also obtained with the permeability tuning system.

An R. F. amplifier stage is utilized to give maximum sensitivity and selectivity as well as high image rejection on FM and manual tuning AM reception.

Both transformer coupled I.F. stages are used for FM and one stage is used for AM. The first and second I.F. transformers have two sets of windings; one set is tuned to 455 KC for AM operation and the other is tuned to 10.7 MC for FM operation. Switching of the windings, to alleviate undesired beat frequencies, is necessary only in the first I.F. transformer.

Detection of amplitude modulated 455 KC signals is accomplished by the 6SQ7 diode rectification circuit and the resulting audio signal is passed to a conventional 6SJ7 audio amplifier stage.

Frequency modulation detection is obtained by an entirely new circuit that is known as the "RATIO DISCRIMINATOR." This FM detector circuit has the unusual ability to reject noise or other brief variations in the amplitude of the signal. The relative insensitivity of the Ratio Discriminator to signal amplitude variation makes it possible to eliminate the use of a "limiter" stage that ordinarily precedes the discriminator in other types of FM detector systems. It will therefore be noted that this receiver utilizes a normal I.F. amplifier stage instead of a low gain limiter stage preceding the FM discriminator. The theory of operation of the Ratio Discriminator is given in a subsequent section.

Two stages of voltage amplification (6SQ7 and 6SJ7) are provided for the audio frequency output from the FM discriminator circuit. The final audio power amplifier stage incorporates a 6V6GT tube in a special inverse feedback arrangement which reduces distortion and contributes to exceptionally good tone quality.

When the receiver is used for phonograph operation, audio voltage and power amplification is accomplished by the 6SJ7 and 6V6GT audio stages. Gain of this system is intentionally limited so that the output tube will not be driven into the high distortion region. This design permits the volume control to be advanced to its maximum position before reaching an audio level where distortion would otherwise cause unintelligible blasting—hence the maximum volume control position approximates the highest sound level that would be obtainable with an acceptable percentage of distortion.

THE RATIO DISCRIMINATOR

(Theory of Operation)

With the introduction of frequency modulated radio transmission it was necessary to devise a means of "detecting" or extracting the audio frequency intelligence from a carrier wave after it was appropriately amplified at the receiver. Since the frequency modulation process involves variation of a given carrier frequency for as much as 75 KC in either direction, it is apparent that the intelligence (or modulating signal) can best be extracted from the wave by a circuit that is capable of "discriminating" or recognizing the frequency of the carrier at any instant. Thus, the receiver circuit which converts FM carrier frequency variations into a corresponding voltage variation has become known as a discriminator.

When considering the function of a discriminator it is important to keep in mind that the output voltage amplitude is determined by the extent of the carrier frequency deviation from its center frequency; **the greater the deviation, the greater the amplitude of the discriminator output voltage—this determines volume of the resultant audible signal.**

The rate at which the FM carrier frequency is being deviated above and below its center value determines the rate at which the discriminator output voltage will vary and therefore it will be seen that **this rate of variation of output voltage corresponds to the audio frequency of the intelligence that was to be extracted from the carrier wave**; rapid variation of carrier frequency causes the discriminator to produce high audio frequencies and vice versa.

Unfortunately the conventional type of discriminator circuit is also sensitive to amplitude variations in the carrier wave and it must be preceded by a limiter stage that is capable of delivering a constant amplitude FM carrier wave to the discriminator. If the limiter stage were omitted, noise signals, which cause a variation in signal amplitude, would pass through the discriminator and would be audible in the output system.

With the advent of the "RATIO" Discriminator, an FM detector circuit was devised which was found to be relatively insensitive to amplitude variation of the incoming signal and therefore the use of a limiter stage could be dispensed with. After careful consideration of the performance of the Ratio Discriminator, Firestone engineers selected it as the means of FM detection in this receiver.

The outstanding difference between the "Ratio" Discriminator and other discriminators is as its name implies—the output voltage is dependent upon the **ratio** of two voltages rather than upon a comparison of these voltages on the basis of magnitude alone. Full significance of this feature will become apparent after studying the following description of the Ratio Discriminator circuit.

Operation of the Ratio Discriminator can best be understood by starting with a simple 3 wire D.C. circuit as an analogy and building up the discriminator circuit in easily comprehended sections. A typical 3 wire D.C. circuit is therefore shown in Fig. 1 and the following performance characteristics should be particularly noted.

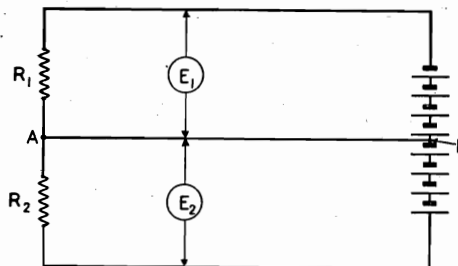


Fig. 1

When resistors R_1 and R_2 are equal, the circuit is said to be balanced and no current will flow in the center conductor A-B providing point B is a center tap on the battery supply voltage. In addition the voltage drop E_1 across resistor R_1 equal to voltage drop E_2 across resistor R_2 . If we now introduce batteries of equal voltage in the R_1 and R_2 sec-

tions of the circuit as shown in Fig. 2, the system will remain balanced and although the current changes, there will be no change in the reading of voltmeters E_1 and E_2 . It should be noted that the introduction of the batteries (with polarity as indicated), has caused a reduction in current. This current reduction results in a lower voltage drop across both load resistors but the sum of the drop across either resistor plus the battery voltage V must be equal to one-half of the supply voltage which is E_1 or E_2 .

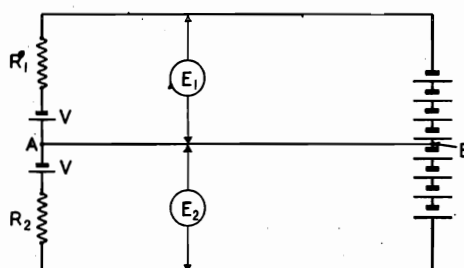


Fig. 2

This principle is made use of in the Ratio Discriminator so as to make it relatively insensitive to variation in amplitude of the incoming signal. By substituting the center tapped secondary winding of an I.F. transformer as shown in Fig. 3 for the two batteries labelled V in Fig. 2 it will be seen that a comparable condition is produced as equal voltages are induced in both halves of the secondary winding. Diode rectifier tubes are substituted for resistor R_1 and R_2 since we are now dealing with A.C. induced voltages that must be rectified. Do not overlook the fact that the plate resistance of the diodes creates a voltage drop and is analogous in that respect to the action of R_1 and R_2 .

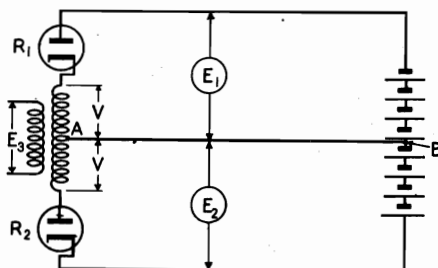


Fig. 3

Observe that irrespective of the magnitude of incoming signal voltage E_s , the voltage V induced in each half of the secondary winding will be equal since it is center-tapped. It has been previously shown that as long as equal voltages V are added to each load section of the 3 wire system, there would be no change in the reading of meters E_1 and E_2 and thus these voltages remain the same irrespective of the variation in the input signal voltage E_s . The ratio of the voltages E_1/E_2 also may be said to remain constant with variation in magnitude of incoming signal.

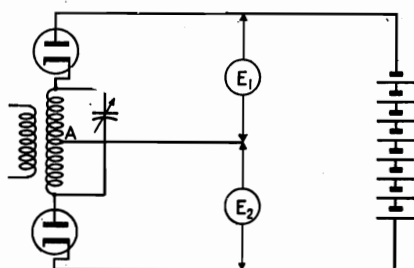


Fig. 4

Fig. 4 shows a slight rearrangement of the same circuit that was illustrated in Fig. 3 with the exception that the I.F. transformer has a condenser across the secondary in order to resonate it to the desired frequency. In addition, the conductor between points A and B has been eliminated since current will not flow thru it as long as the system is balanced. Center tap A on transformer secondary is still retained.

The foregoing circuit has been shown to be insensitive to variations in amplitude of the incoming signal and if it can now be arranged so that it will be capable of "discriminating" between variations in the frequency of the incoming signal, it will prove to be an ideal FM detector. Frequency discrimination can be accomplished by introducing some voltage from the primary of the I.F. transformer in series with the resonant voltage of the secondary so that the vector sum of these two voltages will effectively determine the instantaneous voltage between points A and E as well as between A and F. (These are the voltages that are measured by meters E_1 and E_2). The circuit of Fig. 5 shows how a portion of the primary voltage of the I.F. transformer is introduced into the secondary circuit by means of a tertiary winding on the transformer.

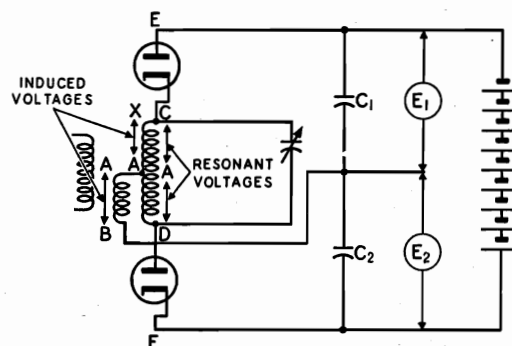


Fig. 5

Condensers C_1 and C_2 have low reactance at the I.F. frequency, however, their reactance is appreciable at audio frequencies and therefore the voltage drop across these condensers will readily follow circuit voltage variations that occur at an audio rate.

If an examination is now made of the conditions that would prevail under each of the following circumstances, it will be possible to determine whether the voltages E_1 and E_2 can be made to vary in accordance with the variation of carrier frequency since that action would follow the intelligence that is contained in the FM signal.

1. Ratio of voltage E_1 to E_2 when frequency of incoming signal is exactly equal to the I.F.
2. Ratio of voltage E_1 to E_2 when frequency of incoming signal is above I.F.
3. Ratio of voltage E_1 to E_2 when frequency of incoming signal is below I.F.

CONDITION #1: INCOMING SIGNAL EQUAL TO I.F.: When this condition prevails, the vector diagram shown in Fig. 6 illustrates how the voltage across tertiary winding AB is added vectorially to the resonant secondary voltage across AC or across AD to produce a resultant voltage that determines the voltage indicated by meters E_1 and E_2 .

AX and AB represent the voltages that are coupled into the secondary and tertiary windings of the I.F. transformer. When the secondary is tuned to resonance, the voltage AC (across one-half the resonant circuit) will be 90 degrees ahead of induced voltage AX as well as induced voltage AB. It should be remembered that the phase difference between applied voltage (or induced voltage as in this case) and the voltage developed across an inductance in an A.C. circuit will vary with frequency and only at the resonant frequency will the phase difference be equal to 90 degrees.

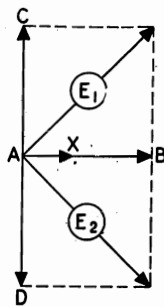


Fig. 6

By again examining the circuit shown in Fig. 5 it may now be appreciated that the voltages read on meters E_1 and E_2 will be respectively proportional to the vector resultant voltages E_1 and E_2 illustrated in Fig. 6 (these resultants represent the vector sum of voltage AB and AC or the vector sum of AB and AD). Since the resultant voltages E_1 and E_2 are equal in magnitude, the voltage from point A to E will equal the voltage from point A to F and hence meters E_1 and E_2 will have identical readings.

CONDITION #2; INCOMING SIGNAL ABOVE I.F.: When this condition prevails, the vector diagram shown in Fig. 7 illustrates the phase relation of the induced voltage in the tertiary winding and the resonant voltage in the tuned secondary. Note that the resonant secondary voltage AC does not lead the voltage AB by 90 degrees as was the case when the incoming signal was exactly equal to the I.F.

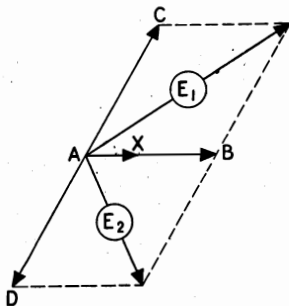


Fig. 7

Vector addition of voltages AB plus AC and AB plus AD produces the respective resultants E_1 and E_2 . Since E_1 is obviously larger than E_2 , the voltage that appears across the A to E portion of the circuit will be greater than the voltage that appears across the A to F portion. Hence, the reading of meter E_1 is larger than that of meter E_2 and the ratio of E_1/E_2 is greater than unity.

CONDITION #3; INCOMING SIGNAL BELOW I.F.: When this condition prevails, the vector diagram shown in Fig. 8 illustrates the phase relation of induced voltage in the tertiary winding and the resonant voltage in the tuned secondary. Note that the resonant secondary voltage AC leads the voltage AB by more than 90 degrees and that the vector resultant E_1 is now smaller than the resultant E_2 . In this case the voltage that appears across the A to E portion of the circuit will be smaller than the voltage from A to F. Hence, the reading of meter E_1 is smaller than that of meter E_2 and the ratio of E_1/E_2 is less than unity.

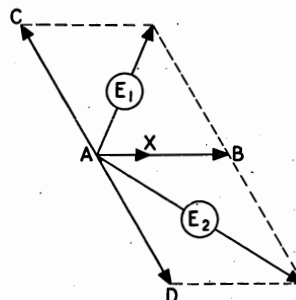


Fig. 8

The manner in which a Ratio Discriminator extracts the intelligence from a frequency modulated carrier by means of a variation in the ratio between two voltages should now be apparent from the foregoing discussion and Fig. 9 illustrates the complete discriminator circuit as used in this receiver.

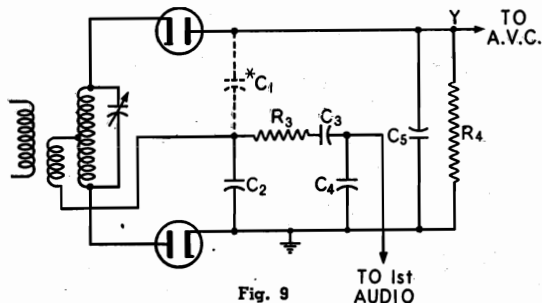


Fig. 9

*Capacitor C_1 is represented in the actual circuit by distributed capacitance of associated wiring.

Elimination of the battery that was shown in previous illustrations is accomplished by using a long time constant resistor:capacitor combination consisting of R_4 and C_5 . Since the two diodes in the discriminator circuit are in series, they will conduct on the same half cycle, and the rectified current thru R_4 will charge capacitor C_5 so that the point labelled Y becomes negative. The time constant of R_4-C_5 is about 0.1 second so that the negative potential at point Y will remain constant at even the lowest audio frequencies.

A rapid increase in carrier voltage cannot momentarily increase the voltage across R_4-C_5 due to the large time constant; similarly, a sudden reduction in carrier voltage will not be accompanied by a change in voltage across R_4-C_5 . Thus, the voltage across this R-C combination stabilizes the Ratio Discriminator against amplitude modulation. In addition it should be noted that the same voltage serves as an excellent A.V.C. voltage and is used for that purpose in this receiver.

The "threshold" effect that is noticeable in other types of FM limiter-discriminator combinations is absent in the ratio type discriminator and there is no specific minimum carrier level that must be applied (as in the case of a limiter stage) to prevent noise from reaching the audio system.

Since the higher audio frequencies are intentionally emphasized in the frequency modulation transmission process, de-emphasis is used at the receiver in order to provide normal tone rendition and to reduce high frequency noises. De-emphasis is accomplished by resistor R_3 and capacitors C_3 and C_4 in the discriminator circuit shown in Fig. 9.

BROADCAST BAND — "AM" — ALIGNMENT PROCEDURE

1. Disconnect leads from FM antenna terminal strip (labelled "A-G-A") at back of chassis; also disconnect speaker plug, AM loop antenna plug and phono plugs. Remove chassis from cabinet.
2. It will be necessary to perform this alignment procedure with the chassis placed relatively close to the cabinet in order to avoid removing the AM loop antenna that is attached to cabinet frame.
3. After conveniently locating chassis with respect to the cabinet, reconnect AM loop antenna plug, speaker plug and brown lead of "External Antenna" coupling turn to blue lead at back of receiver.
4. Connect an output meter across speaker voice coil or from plate of 6V6GT tube to chassis through a 0.1 Mfd. condenser.
5. Connect ground lead of signal generator to receiver chassis.
6. Set volume control to the maximum volume position and use a weak signal from the signal generator.
7. If alignment of both AM and FM channels is required, it is necessary to align the AM channel first; then align FM channel as instructed in preceding section.
8. R.F. leads from slug tuner assembly should be dressed away from wave trap coil and close to chassis.
9. After alignment procedure is completed and chassis has been reinstalled in cabinet, arrange leads to loop antenna so that they are separated from each other as much as possible—avoid twisting or taping these leads together.

DUMMY ANT. IN SERIES WITH SIGNAL GENERATOR	CONNECT HIGH SIDE OF SIGNAL GENERATOR TO	SIGNAL GENERATOR FREQUENCY	FM-AM PHONO SWITCH POSITION	RECEIVER DIAL SETTING	TRIMMER OR SLUG NUMBER	TRIMMER DESCRIPTION	TYPE OF ADJUSTMENT
0.1 MFD. Condenser	Terminal K on tuner unit (see Fig. 11).	455 KC	"AM" Center Position	Any position where it does not affect the signal.	1-2 3-4	2nd I.F. 1st I.F.	Adjust for maximum output. Then repeat adjustment.
0.1 MFD. Condenser	Terminal K on tuner unit (see Fig. 11).	455 KC	"AM" Center Position	Any position where it does not affect the signal.	5	Wave Trap	Adjust for minimum output.
If positions of movable slugs in the slug tuner assembly have been disturbed (examine cement seal near top of threaded stem on each slug) or if a coil or slug has just been replaced in the tuner assembly, omit the next 5 instructions in this chart and start with the procedure entitled "Slug Tuner Adjustment Procedure—AM Section." Where the tuner assembly has not been disturbed, ignore this instruction and proceed with the next step.							
500 MMFD. Mica Condenser	External Antenna clip at back of Cabinet.	535 KC	"AM" Center Position	Set Slug tuner assembly to fully closed position. Disregard position of dial pointer.	6	Oscillator Trimmer	Adjust for maximum output.
500 MMFD. Mica Condenser	External Antenna clip at back of Cabinet.	1000 KC	"AM" Center Position	Tune to 1000 KC generator signal and check position of dial pointer. If it is set incorrectly, release clip on pointer and reposition to 1000 KC calibration mark. Note that the 1000 KC mark is located under the last "0" in the numeral "100." Exercise care to set pointer accurately.			
500 MMFD. Mica Condenser	External Antenna clip at back of Cabinet.	1500 KC	"AM" Center Position	Tune to 1500 KC generator signal.	7	Antenna Trimmer	Note the difference between the dial pointer setting and the 1500 KC mark on the scale—do not disturb pointer position even if pointer does not coincide with 1500 KC mark. If the difference does not exceed 20 KC, adjust trimmer No. 7 for maximum output and proceed with next two instructions in this chart. Where the calibration error exceeds 20 KC it is advisable to omit the next two instructions in this chart and adjust the slug tuner as described in the following section.
500 MMFD. Mica Condenser	External Antenna clip at back of Cabinet.	600 KC	"AM" Center Position	Tune to 600 KC generator signal.	8	Antenna Padder	Adjust for maximum output. Try to increase output by detuning padder and retuning receiver dial until maximum output is obtained.

Repeat adjustment of trimmers 7 and 8 until one no longer detunes the other. This completes the AM band alignment procedure. The following procedure should only be used where the conditions described under the heading are encountered.

MODEL 4-A-60

THE FIRESTONE TIRE & RUBBER CO.

"AM" ALIGNMENT PROCEDURE CONTINUED**SLUG TUNER ADJUSTMENT PROCEDURE — AM SECTION**

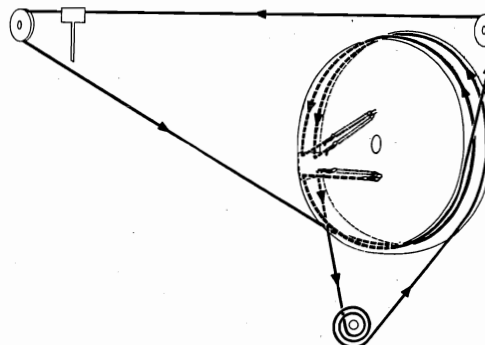
This procedure is to be used only where the positions of slugs in the slug tuner have been disturbed or in event of a coil or slug replacement, or where a serious calibration or tracking error is noted after attempting to align the receiver as described in the preceding section.

DUMMY ANT. IN SERIES WITH SIGNAL GENERATOR	CONNECT HIGH SIDE OF SIGNAL GENERATOR TO	SIGNAL GENERATOR FREQUENCY	FM-AM PHONO SWITCH POSITION	RECEIVER DIAL SETTING	TRIMMER OR SLUG NUMBER	TRIMMER DESCRIPTION	TYPE OF ADJUSTMENT
500 MMFD. Mica Condenser	External Antenna clip at back of Cabinet.	535 KC	"AM" Center Position	Set Slug tuner assembly to fully closed position. Disregard position of dial pointer.	9	Oscillator Tuning Slug	The object of this adjustment is to set slug #9 to a position where the oscillator coil reaches maximum inductance at 535 KC. That is accomplished by first backing off trimmer condenser #6 until its plates are well spaced (lowest capacity); then rotate slug #9 and note whether a peak can be obtained on the output meter. If a peak cannot be reached, turn trimmer condenser #6 to a slightly higher capacity setting and repeat adjustment of slug #9 for peak output. When adjusting this slug, always approach the peak output setting by rotating the slug so that it is moving down in to the coil form. The correct setting of slug #9 is determined when a definite peak can be reached with trimmer #6 at the lowest capacity position that permits the coil and condenser to resonate at 535 KC.
500 MMFD. Mica Condenser	External Antenna clip at back of Cabinet.	1500 KC	"AM" Center Position	Set Accurately to 1500 KC mark on scale.	6	Oscillator Trimmer	Adjust for maximum output.
500 MMFD. Mica Condenser	External Antenna clip at back of Cabinet.	535 KC	"AM" Center Position	Set Slug tuner assembly to fully closed position.	10	Oscillator Padder Slug	Adjust to receive 535 KC signal and for maximum output.
Repeat adjustment of oscillator trimmer #6 at 1500 KC and oscillator padder slug at 535 KC until both points are correctly calibrated with the dial scale.							
500 MMFD. Mica Condenser	External Antenna clip at back of Cabinet.	1500 KC	"AM" Center Position	Tune to 1500 KC generator signal.	7	Antenna Trimmer	Adjust for maximum output.
500 MMFD. Mica Condenser	External Antenna clip at back of Cabinet.	1000 KC	"AM" Center Position	Tune to 1000 KC generator signal.	11	Antenna Tuning Slug	Adjust for maximum output.
500 MMFD. Mica Condenser	External Antenna clip at back of Cabinet.	600 KC	"AM" Center Position	Tune to 600 KC generator signal.	8	Antenna Padder	Adjust for maximum output. Try to increase output by detuning padder and retuning receiver dial until maximum output is obtained.
Repeat the three preceding adjustments until no further improvement can be made in output at 1500 KC, 1000 KC and 600 KC. Apply a coating of speaker cement at top of each tuning slug stem to prevent movement.							

DIAL AND POINTER DRIVE CORD ARRANGEMENT

To string dial cord, turn the main drive drum to maximum counter-clockwise position and use following parts:

- 114955—Clip on end of cord
- 117057—Cord (7 feet)
- 119087—Ring for dial cord
- 113177—Tension Spring



FREQUENCY MODULATION — "FM" — ALIGNMENT PROCEDURE

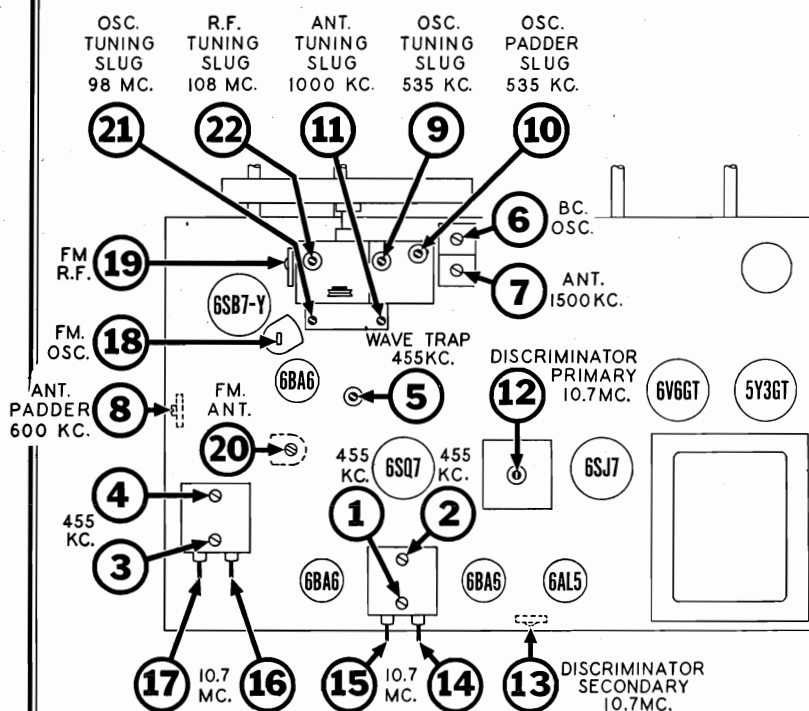
INSTRUMENTS: Alignment of the FM circuits in this receiver may be accomplished with either a conventional AM type signal generator or an FM signal generator. The output indicator should be an oscilloscope or a vacuum tube voltmeter.

Although it is preferable to use an FM generator and an oscilloscope, reasonably accurate alignment is obtainable when using a conventional AM generator and vacuum tube voltmeter providing proper care is exercised in adjusting the discriminator circuit trimmer condenser.

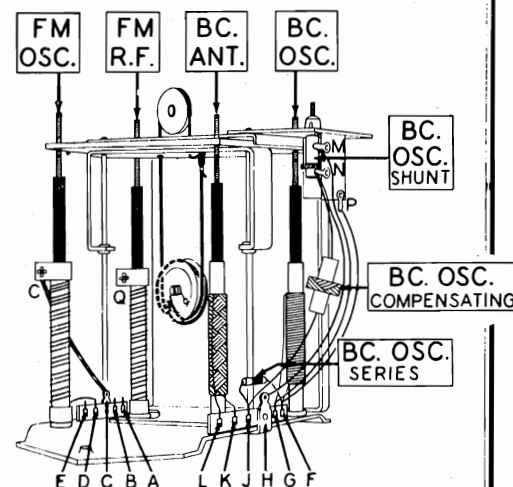
IMPORTANT: If an AM signal generator is used, it should be capable of producing fundamental frequencies of 10.7 MC and 88 to 108 MC—avoid using an AM generator which produces signals in the 88 to 108 MC range by using harmonics higher than the second. Generators which are dependent upon third, fourth or fifth harmonics for output frequencies of 88 to 108 MC will generally produce undesirable spurious beat signals with the local oscillator in the receiver and alignment will be exceedingly difficult.

The following procedure is adaptable for use with either an AM or FM generator and oscilloscope or vacuum tube voltmeter—merely follow the instructions which are applicable to the instruments that are used.

1. If alignment of both AM and FM channels is required it is necessary to align the AM channel first, then align the FM channel as instructed in adjacent chart (AM alignment procedure is given on page 9). Do not attempt to reposition pointer by releasing it from clip on dial cord this is done only during AM alignment.
2. Disconnect leads from FM antenna terminal strip (labelled "A-G-A") at back of chassis; also disconnect all other plugs on rear of chassis and remove chassis from cabinet. It is not necessary to remove the built in antennas.
3. Remove speaker from cabinet and reconnect plug to receiver chassis.
4. A specific setting of the receiver volume control is not required, however, it will be found convenient to leave it in the maximum volume position so that alignment signals will be audible even though the output indication is obtained by a V-T voltmeter or 'scope connected to points in the discriminator circuit.
5. FM circuit leads should be dressed as short and straight as possible, particularly those in the oscillator circuit. I.F. plate and grid leads should also be kept short and straight.
6. Alignment of receiver circuits may now be accomplished by using the procedure in the adjoining chart.



TRIMMER LOCATION CHART



SLUG TUNER ASSEMBLY

STAGE GAIN MEASUREMENT PROCEDURE

REQUIRED INSTRUMENTS: The amount of amplification or "gain" of each of the stages of this receiver should be measured with an A. C. Vacuum Tube Voltmeter of the high frequency type (uniform response up to 100 MC). A conventional "AM" type signal generator may be used but it must be capable of producing **fundamental frequencies of 600 KC. and 98 MC—avoid using a generator that produces the 98 MC. signal by means of harmonics.**

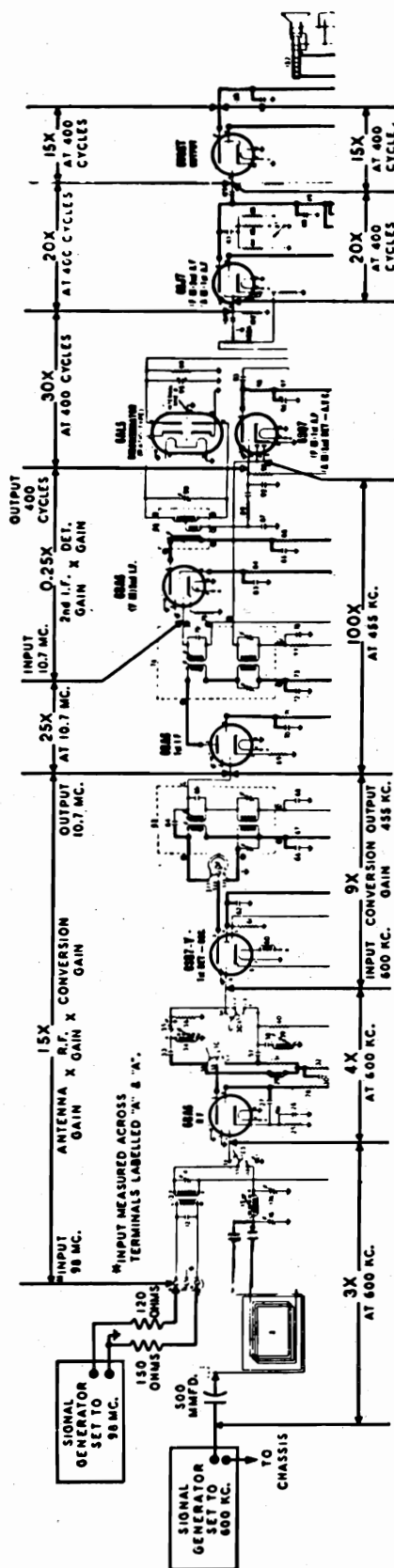
PROCEDURE: It is exceedingly important to adhere to the procedure outlined below since the accuracy of these measurements will be affected to a considerable extent by the failure to establish proper operating conditions.

1. Be sure that R.F., I.F. and Discriminator stages are carefully and accurately aligned by utilizing the alignment procedure given in this manual.
2. Connect Signal Generator as shown below. Note that generator connections differ for "AM" and "FM" measurements.
3. For "AM" measurements, set signal generator to 600 KC. and then carefully tune radio receiver to this signal by using an output meter to indicate peak output. If a local station interferes, set generator to a nearby frequency and re-tune the receiver.
4. For "FM" measurements, set signal generator to 98 MC. and then carefully tune radio receiver to this signal by using a D. C. Vacuum Tube Voltmeter as an output indicator—meter must be

connected between pin #7 of 6AL5 tube and chassis. If a local station interferes, set generator to a nearby frequency and re-tune the receiver.

5. The values of stage gain which are given here were measured with a fixed bias of 3 volts on the control grids of all R.F. and I.F. tubes which are connected to the A.V.C. circuit. Therefore, these values are not intended to indicate the full capability of a stage but they will serve as a convenient basis for determining proper operation. In order to duplicate the fixed bias voltage, connect the negative terminal of a 3 volt battery to A.V.C. at terminal 7 of the 1st I.F. transformer and connect the positive battery lead to the receiver chassis.

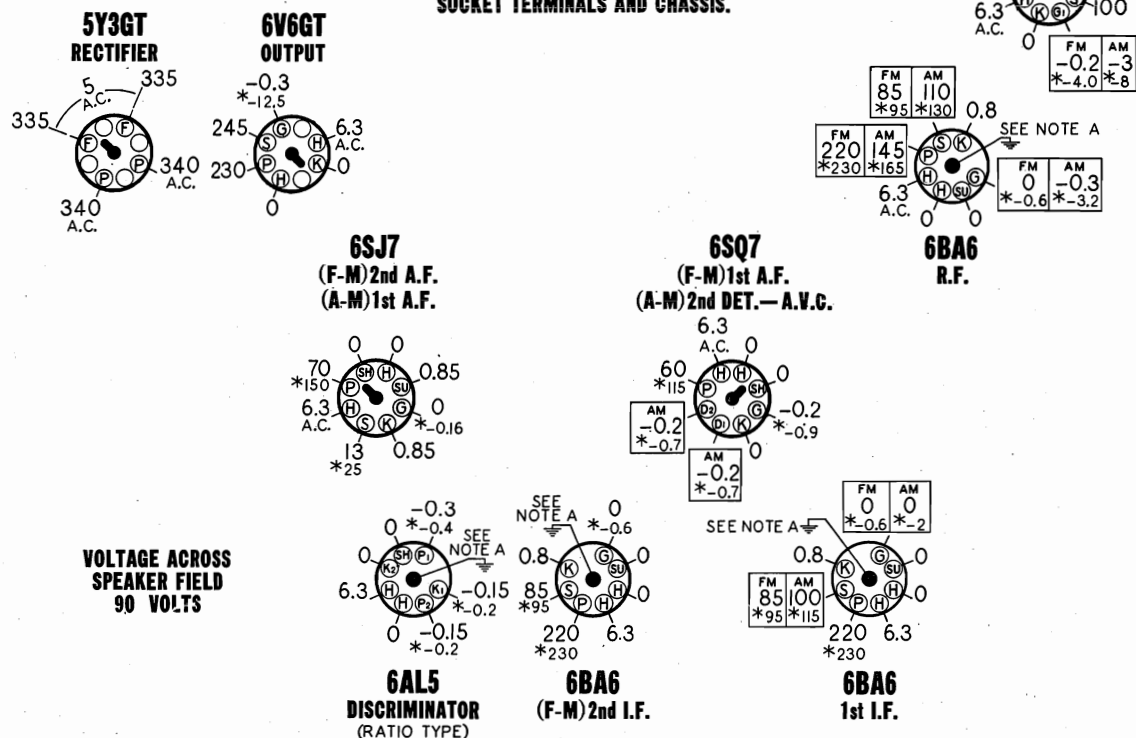
6. R.F. and I.F. circuits are slightly de-tuned when contact is made with an instrument probe and this action, which is indicated by a change in the output meter reading, may seriously affect the gain measurement. Therefore, it is important to adjust the associated circuit trimmer for a maximum output meter reading and to set the input signal level to a convenient reference point on the gain measuring instrument while the probe is making contact. After removing the probe it is again necessary to adjust the trimmer so as to obtain the same output meter reading and thereby assure that the signal voltage at the specified point has not changed as a result of circuit-de-tuning.



DIFFERENCES in tube characteristics, tolerance of parts, adjustment of tuned circuits and variations in line voltage will influence stage gain. These factors should be given due attention in event the gain of a stage varies extensively from the values shown above.

BOTTOM VIEW OF CHASSIS

117 VOLT 60 CYCLE A.C.
POWER SUPPLY USED
FOR THESE MEASUREMENTS.
ALL VOLTAGES MEASURED BETWEEN
SOCKET TERMINALS AND CHASSIS.

**REAR OF CHASSIS**

NOTE A: Grounding of center stud on tube socket is necessary to reduce capacity coupling between other pins. Oscillation may result if this ground is omitted.

SOCKET VOLTAGES

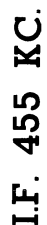
Measured with voltmeter having sensitivity of 1000 ohms per volt except where indicated by (*). The (*) symbol designates a vacuum tube voltmeter measurement.

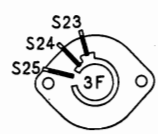
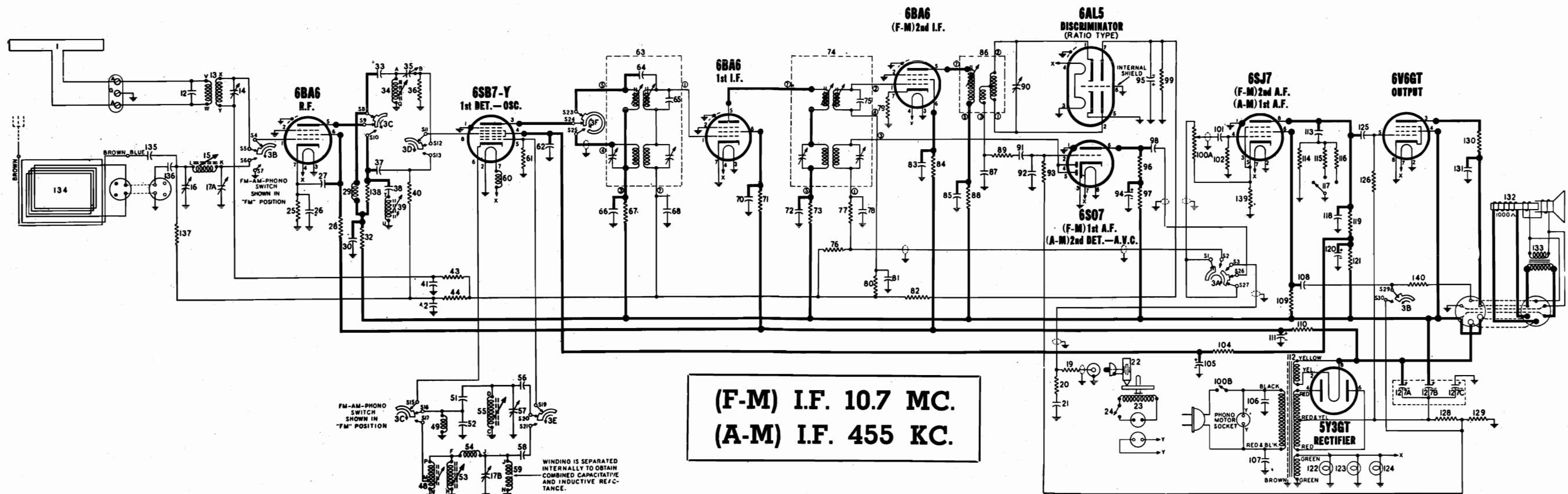
ALL MEASUREMENTS MADE WITH FM-AM-PHONO SWITCH IN "FM" POSITION UNLESS OTHERWISE INDICATED
DIAL TUNED TO 108MC. FOR "FM" MEASUREMENTS
DIAL TUNED TO 540KC. FOR "AM" MEASUREMENTS
VOLUME CONTROL SET TO MINIMUM WITH NO SIGNAL
TONE SWITCH IN SPEECH POSITION



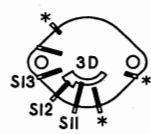
REAR VIEW OF RECEIVER

THE FIRESTONE TIRE & RUBBER CO.

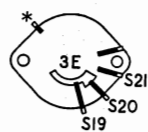




SECTION 1
FRONT VIEW



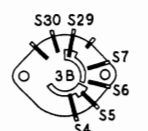
SECTION 1
REAR VIEW



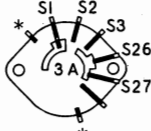
SECTION 2
FRONT VIEW



SECTION 2
REAR VIEW



SECTION 3
FRONT VIEW

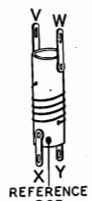


SECTION 3
REAR VIEW

*Not used; may serve as wiring junction point.

BAND SWITCH
504593

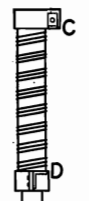
Lettered terminals in illustrations correspond to similarly lettered terminals on the circuit diagram.



FM ANT.
COIL
504692



FM H.F.
COIL
505159



FM OSC.
COIL
505159

SLUGS FOR
MANUAL
TUNING COILS

FM R.F. } 505160
FM OSC. }

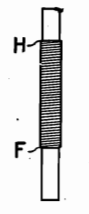
BC. ANT. } 505152
BC. OSC. }



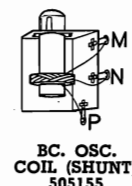
BC. ANT.
COIL
505151



WAVE TRAP
COIL
504670



BC. OSC.
COIL
505153



BC. OSC.
COIL (SHUNT)
505155



W-504138
RECORD CHANGER

FREQUENCY RANGES:

Standard } 540-1600 KC.
Broadcast }
FM — 88-108 MC.

POWER OUTPUT:

Undistorted — 3.5 watts
Maximum — 6.0 watts

MANUAL TUNING DEVICE:

Permeability tuned coils; shock resistant mounting.

BUILT-IN ANTENNA:

AM — High efficiency loop.
FM — "Ribbon Type" folded dipole.

POWER SUPPLY:

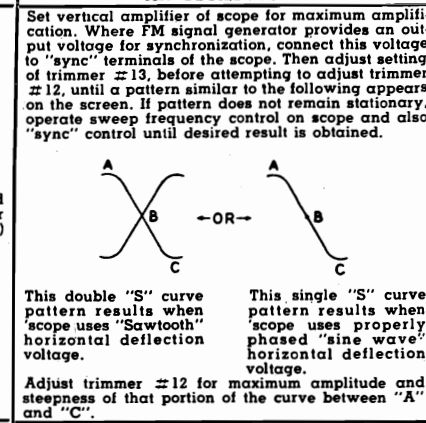
117 volts
60 cycles A.C.
85 watts (radio)
20 watts (phono)

SPEAKER:

10 inch Electro-Dynamic Voice
coil impedance — 3.5 ohms

"FM" ALIGNMENT PROCEDURE CONTINUED
INSTRUCTIONS GIVEN ON PRECEDING PAGE MUST BE FOLLOWED BEFORE USING THIS CHART

SIGNAL GENERATOR CONNECTIONS			OSCILLOSCOPE OR V-T VOLT METER CONNECTIONS		RECEIVER			TYPE OF ADJUSTMENT AND OUTPUT INDICATION	
CONNECT HIGH SIDE OF SIGNAL GENERATOR TO	CONNECT GROUND LEAD OF SIGNAL GENERATOR TO	FREQUENCY & TYPE OF MODULATION	IF AN OSCILLOSCOPE IS USED, CONNECT IT AS FOLLOWS:	IF A V-T VOLT METER IS USED, CONNECT IT AS FOLLOWS:	FM-AM-PHONO SWITCH POSITION	DIAL SETTING	TRIMMER OR SLUG NUMBER	TRIMMER DESCRIPTION	ADJUSTMENT AND OUTPUT INDICATION WHEN USING A V-T VOLT METER
Pin #1 of 6BA6 (FM) 2nd I.F. use a .01 MFD. condenser in series with generator lead.	Receiver chassis in vicinity of 6BA6 (FM) 2nd I.F. tube.	10.7 MC AM signal may be 400 cycle modulated or FM signal should preferably be modulated ± 300 KC.	Connect vertical amplifier "high" lead in series with an 0.1 MFD. condenser to pin #6 of 6SQ7 tube. Connect scope ground lead to receiver chassis.	Connect common (or ground) terminal of meter to receiver chassis. D.C. probe lead of meter is then connected to pin #7 of the 6AL5 tube.	FM Maximum clockwise position	Any position where it does not affect the signal.	12	Discriminator Primary	Set meter to a low D.C. voltage range and adjust trimmer #12 for maximum meter reading. (This voltage will be negative.)
Same as above	Same as above	Same as above	Same as above	Before connecting V-T voltmeter, it is necessary to connect two 68,000 ohm resistors (resistance of both units must compare within 1%) in series from pin #7 of the 6AL5 tube to the chassis. Then connect common (or ground) terminal of V-T voltmeter to the junction of these two resistors. D.C. probe lead of meter is now connected to junction of resistor #89 (3300 ohms) and condenser #91 (0.1 MFD.) which are in the discriminator output circuit.	Same as above	Same as above	13	Discriminator Secondary Use an insulated phasing tool to adjust this trimmer.	Set meter for operation on its lowest D.C. voltage range. Note that as trimmer #13 is rotated a point will be found where voltmeter will swing rather sharply from a positive to a negative reading or vice versa. Correct setting of trimmer #13 is obtained when meter reads zero as trimmer is moved through this point. The adjustment is somewhat critical and considerable care must be exercised to set the trimmer for a zero meter indication.
Recheck the two preceding adjustments to be sure that both trimmers are set as accurately as possible to obtain the specified output indication on vacuum tube voltmeter or oscilloscope. Then disconnect and remove the two 68,000 ohm resistors that were used for the vacuum tube voltmeter connection in the 2nd step.									
Pin #1 of 6BA6 (FM) 1st I.F. tube; use a .01 MFD. condenser in series with generator lead.	Receiver chassis in vicinity of 6BA6 (FM) 1st I.F. tube.	Same as above	Same as above	Connect common (or ground) terminal of meter to receiver chassis. D.C. probe lead of meter is then connected to Pin #7 of the 6AL5 tube.	Same as above	Same as above	14 and 15	2nd I.F.	Adjust trimmers #14 and #15 for maximum meter reading.
Terminal "B" on slug tuner unit (see Fig. 11); use a .01 MFD. condenser in series with generator lead.	Receiver chassis in vicinity of slug tuner unit.	Same as above	Same as above	Same as above	Same as above	Same as above	16 and 17	1st I.F.	Adjust trimmers #16 and #17 for maximum meter reading.
If positions of movable slugs in the slug tuner assembly have been disturbed (examine cement seal near top of threaded stem on each slug) or if a coil or slug has just been replaced in the tuner assembly, omit the next 4 instructions in this chart and start with the procedure entitled "Slug Tuner Adjustment Procedure—FM Section." Where the tuner assembly has not been disturbed, ignore this instruction and proceed with the next step.									
Generator output leads must be connected to the two terminals labelled "A" on the "A-G-A" terminal strip at back of chassis. Connect "high" lead to one "A" terminal in series with a 120 ohm resistor and connect generator ground lead to the other "A" terminal in series with a 150 ohm resistor.		98 MC AM signal may be 400 cycle modulated or FM signal should preferably be modulated ± 300 KC.	Same as above	Same as above	FM Maximum clockwise position	98 MC	18	Oscillator Trimmer	Set trimmer #18 to receive 98 MC. signal and adjust for maximum meter reading.
Same as above	Same as above	Same as above	Same as above	Same as above	Same as above	98 MC	19 16 and 17	R.F. Trimmer 1st I.F.	Adjust trimmer #19 for maximum meter reading. Recheck adjustment of these trimmers for maximum meter reading.
Same as above	Same as above	90 MC AM signal may be 400 cycle modulated or FM signal should preferably be modulated ± 300 KC.	Same as above	Same as above	Same as above	Tune to 90 MC. generator signal.	20	Antenna Trimmer	Adjust trimmer #20 for maximum meter reading.
Check calibration and tracking of receiver with input signals of 98 and 108 MC. If difference between dial pointer setting and 98 or 108 MC. calibration mark does not exceed ± 0.4 MC. and R.F. circuit is tracking properly, then alignment may be considered satisfactory and no further adjustment is necessary. Where calibration error is greater than ± 0.4 MC. it is advisable to adjust the slug tuner as described in the following section.									
SLUG TUNER ADJUSTMENT PROCEDURE — FM SECTION									
This procedure is to be used only where the positions of slugs in slug tuner have been disturbed or in event of a coil or slug replacement, or where a serious calibration or tracking error is noted after attempting to align the receiver as described in the preceding section.									
Same as above	Same as above	98 MC AM signal may be 400 cycle modulated or FM signal should preferably be modulated ± 300 KC.	Same as above	Same as above	Same as above	By means of tuning control knob, set dial pointer to 98 MC. mark on dial.	18 19 20	Oscillator Trimmer R.F. Trimmer Antenna Trimmer	Set trimmer #18 to receive 98 MC. signal. Adjust trimmers #19 and #20 for maximum meter reading.
Same as above	Same as above	98 MC	Same as above	Same as above	Same as above	By means of tuning control knob, set dial pointer to 98 MC. mark on dial.	21	Oscillator tuning slug	Set slug #21 to receive 98 MC. signal and adjust for maximum meter reading.
Same as above	Same as above	108 MC	Same as above	Same as above	Same as above	By means of tuning control knob, set dial pointer to 108 MC. mark on dial.	22	R.F. tuning slug	Note heavy braided lead connection to osc. coil; adjust position of this braid until 108 MC. signal is received and meter reading is maximum. Coat braid with speaker cement after correct position is located. Adjust slug #22 for maximum meter reading.
Repeat the three preceding adjustments until satisfactory calibration and tracking is obtained at 98 MC., 98 MC., and 108 MC. Apply a coating of speaker cement at top of each tuning slug stem to prevent movement.									



THE FIRESTONE TIRE & RUBBER CO.

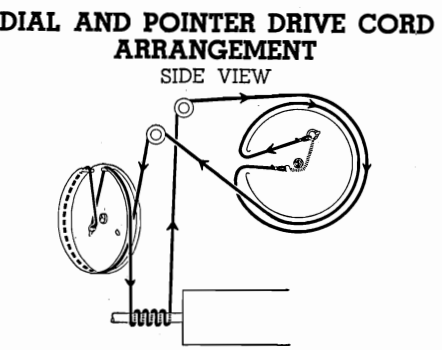
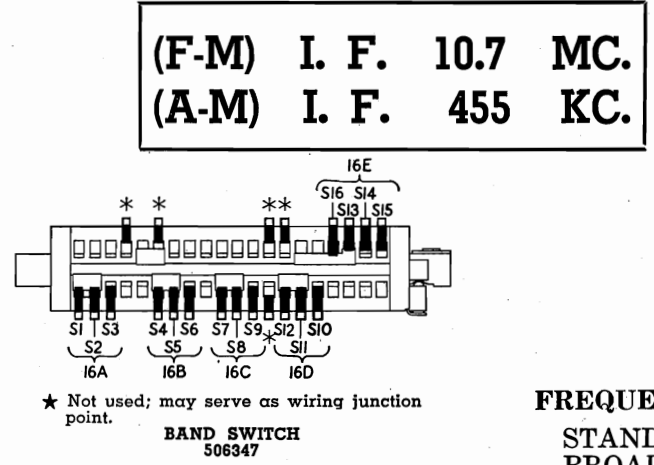
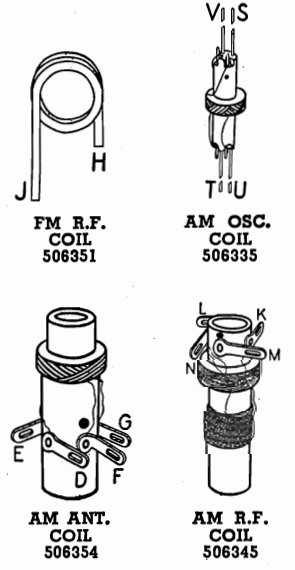
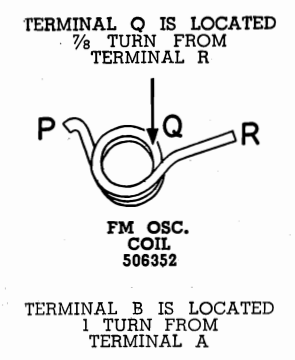
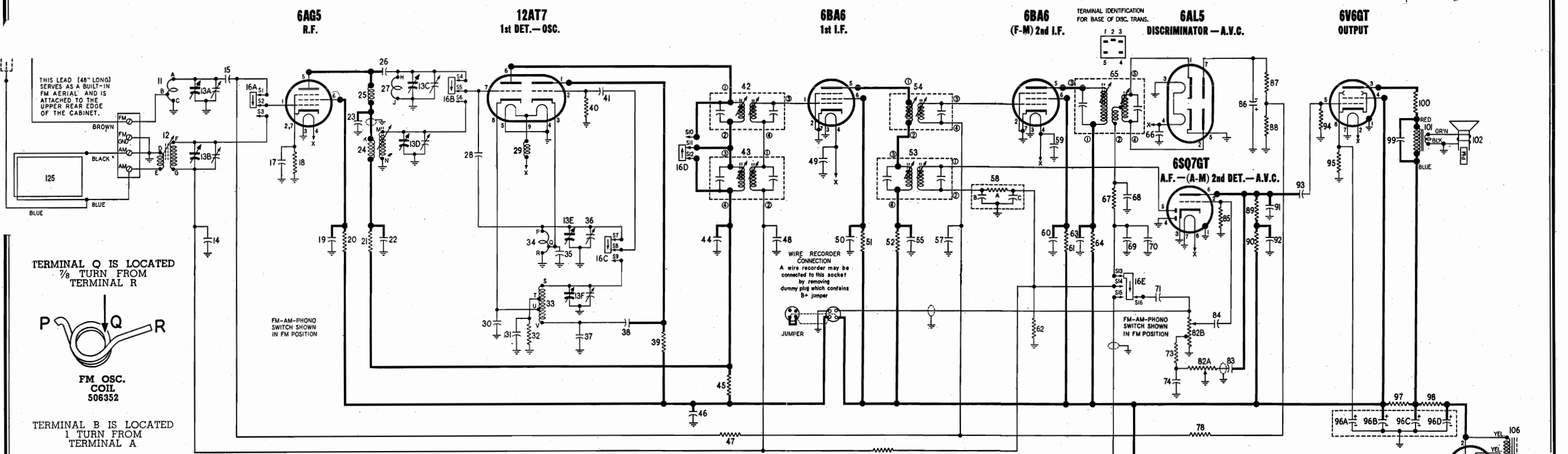
MODEL 4-A-60

DIA-GRAM NO.	PART NO.	DESCRIPTION	DIA-GRAM NO.	PART NO.	DESCRIPTION
CONDENSERS					
12	504723	Condenser mica 30 Mmfd. 500 volt	130	502454	Resistor wire wound 47 Ohms 1 watt
14	504663	Condenser trimmer 5-20 Mmfd.	137	502267	Resistor carbon 680,000 Ohms 1/4 watt
16	504956	Condenser trimmer 390-550 Mmfd.	138	502406	Resistor carbon 1,500 Ohms 1/4 watt
17-A, B	504712	Condenser trimmer assembly A - 50 to 120 Mmfd. B 220 to 340 Mmfd.	139	502478	Resistor carbon 1,000 Ohms 1/4 watt
21	502261	Condenser .01 Mfd. 600 volt	140	502126	Resistor carbon 470 Ohms 1/4 watt
26	504447	Condenser .05 Mfd. 150 volt	COILS & TRANSFORMERS		
27	504724	Condenser mica 1000 Mmfd. 500 volt	1	504895	Antenna FM ("Twin Lead" Assembly)
30	502261	Condenser .01 Mfd. 600 volt	13	504692	Coil FM antenna
33	502929	Condenser mica 47 Mmfd. 500 volt	15	505151	Coil - BC. antenna (less slug)
35	502757	Condenser trimmer; 6.5 to 35 Mmfd.	505152		Tuning slug for BC. ant. coil (may have end colored yellow, green, blue or violet)
37	502931	Condenser mica 100 Mmfd. 500 volt	29	504675	Coil - R.F. choke
38	504659	Condenser ceramic 39 Mmfd. 500 volt	34	505159	Coil FM R.F. (less slug)
41	504725	Condenser .02 Mfd. 200 volt	505160		Tuning slug for FM R.F. coils (may have end colored black, grey, red or orange)
42	502153	Condenser .05 Mfd. 200 volt	39	504670	Coil wave trap (455 Kc.)
51	504905	Condenser ceramic 5 Mmfd. 500 volt	504671		Slug core for wave trap
52	502929	Condenser mica 47 Mmfd. 500 volt	48	505155	Coil - BC. oscillator; shunt (less slug)
56	504733	Condenser ceramic 15 Mmfd. 500 volt	505156		Slug core for BC. osc. shunt coil (505155)
57	502757	Condenser trimmer; 6.5 to 35 Mmfd.	49	504675	Coil R.F. choke (FM)
58	502929	Condenser mica 47 Mmfd. 500 volt	53	505153	Coil BC. oscillator (less slug)
62	502261	Condenser .01 Mfd. 600 volt	505152		Tuning slug for BC. osc. coil (may have end colored yellow, green, blue or violet)
64	504983	Condenser ceramic 1.0 Mmfd. 500 volt	54	505157	Coil - BC. oscillator; series
65	504982	Condenser ceramic 39 Mmfd. 500 volt	55	505159	Coil - FM oscillator (less slug)
66	502261	Condenser .01 Mfd. 600 volt	505160		Tuning slug for FM osc. coil (may have end colored black, grey, red or orange)
68	502153	Condenser .05 Mfd. 200 volt	59	505158	Coil - BC. oscillator; compensating
70	502261	Condenser .01 Mfd. 600 volt	60	504675	Coil - R.F. choke (FM)
72	502261	Condenser .01 Mfd. 600 volt	63	504645	Transformer - 1st I.F.
75	504982	Condenser ceramic 39 Mmfd. 500 volt	74	504646	Transformer - 2nd I.F.
78	502931	Condenser mica 100 Mmfd. 500 volt	86	504690	Transformer - discriminator
81	504727	Condenser mica 500 Mmfd. 500 volt	112	504643	Transformer - power
83	502261	Condenser .01 Mfd. 600 volt	502994		Transformer output for M-502302 speaker
85	502261	Condenser .01 Mfd. 600 volt	505029		Transformer output for E-502302 speaker
87	502202	Condenser ceramic 150 Mmfd. 500 volt	505394		Transformer output for O-502302 speaker
90	504662	Condenser trimmer 35-55 Mmfd.	134	505668	Loop antenna for AM
92	502261	Condenser .01 Mfd. 600 volt	OTHER ELECTRICAL PARTS		
91	504725	Condenser .02 Mfd. 200 volt (used only in chassis stamped with letter "S")	3-A to F	504593	Switch FM-AM-Phono
92	502157	Condenser .05 Mfd. 400 volt	22	502461	Crystal cartridge (Astatic L-71)
94	504719	Condenser electrolytic 4 Mfd. 450 volt	23	504201	Motor - for type "W"-504138 Record Changer 115 volt 60 cycle
95	504937	Condenser electrolytic 5 Mfd. 50 volt	24	504203	Switch - "ON-OFF" for type "W"-504138 Record Changer
98	502261	Condenser .01 Mfd. 600 volt	117	504592	Switch - tone
101	502150	Condenser .004 Mfd. 600 volt	122, 123, 124	110629	Lamp - dial (Mazda #44) 6.3V 0.25 Amps.
105	505150	Condenser electrolytic 16 Mfd. 400 volt	132	502302	Speaker electro-dynamic (10 in.)
106, 107	502804	Condenser .01 Mfd. 400 volt	MISCELLANEOUS PARTS		
108	502405	Condenser .25 Mfd. 400 volt	506099		Background for Dial
111	505150	Condenser electrolytic 16 Mfd. 400 volt	116467		Base for mtg. electrolytic condenser
113	502261	Condenser .01 Mfd. 600 volt	117131		Bulls Eye for indicator light
118	502271	Condenser mica 260 Mmfd. 500 volt	506100		Cabinet (mahogany)
120	504719	Condenser electrolytic 4 Mfd. 450 volt	119989		Clamp for dial glass
125	502152	Condenser .02 Mfd. 400 volt	114955		Clip - retainer on end of dial cord
127-A,B,C	161193	Condenser electrolytic A 20 Mfd. 450 volt B 15 Mfd. 450 volt C 10 Mfd. 25 volt	504691		Clip coil mtg.; wave trap
131	502479	Condenser .006 Mfd. 600 volt	505368		Clip - for tube shield
135	502931	Condenser mica 100 Mmfd. 500 volt	117057		Cord - dial drive (7 ft. required) per ft.
136	502261	Condenser .01 Mfd. 600 volt	506147		Dial Scale
RESISTORS			505417		Door - radio compartment; upper right (mahogany)
19	502132	Resistor carbon 100,000 Ohms 1/4 watt	505420		Door - record storage compartment; lower right (mahogany)
20	502408	Resistor carbon 68,000 Ohms 1/4 watt	505426		Drawer - record changer compartment
25	502794	Resistor carbon 68 Ohms 1/4 watt	506101		Escutcheon - Firestone
28	502466	Resistor carbon 33,000 Ohms 1/4 watt	505433		Handle - for upper door or drawer
32	502128	Resistor carbon 2,200 Ohms 1/4 watt	505432		Hinges - for all doors (supplied in pairs)
36	502130	Resistor carbon 22,000 Ohms 1/4 watt	504835		Knob - volume or tuning
40	502130	Resistor carbon 22,000 Ohms 1/4 watt	504837		Knob - tone or band
43	504907	Resistor carbon 560,000 Ohms 1/4 watt	505431		Knob - for record storage compartment doors
44	502134	Resistor carbon 470,000 Ohms 1/4 watt	502460		Needle - phonograph
61	502130	Resistor carbon 22,000 Ohms 1/4 watt	504711		Perm. tuning mechanism (less coils)
67	502128	Resistor carbon 2,200 Ohms 1/4 watt	500966		Plug - phono, pick-up cable
71	502466	Resistor carbon 33,000 Ohms 1/4 watt	501031		Plug - phono, motor cable
73	502128	Resistor carbon 2,200 Ohms 1/4 watt	504097		Plug - speaker
76	502267	Resistor carbon 680,000 Ohms 1/4 watt	504838		Pointer
77	502131	Resistor carbon 47,000 Ohms 1/4 watt	505430		Rail for drawer (supplied in sets)
79	502794	Resistor carbon 68 Ohms 1/4 watt	504138		Record Changer
80	502133	Resistor carbon 220,000 Ohms 1/4 watt	119087		Ring for dial cord
82	502135	Resistor carbon 2.2 Meg. 1/4 watt	17843		Rubber grommets for mtg. FM coils
84	502466	Resistor carbon 33,000 Ohms 1/4 watt	85078		Rubber grommets for mtg. BC. coils
88	502128	Resistor carbon 2,200 Ohms 1/4 watt	113463		Rubber pad for mtg. chassis
89	502514	Resistor carbon 3,300 Ohms 1/4 watt	116584		Rubber spacer for mtg. dial scale
93	502136	Resistor carbon 10 Meg. 1/4 watt			
96	502132	Resistor carbon 100,000 Ohms 1/4 watt			
97	502892	Resistor carbon 330,000 Ohms 1/4 watt			
99	502130	Resistor carbon 22,000 Ohms 1/4 watt			
100-A, B	502148	Volume control 500,000 Ohms (with switch)			
102	502468	Resistor carbon 4.7 Meg. 1/4 watt			
104	504731	Resistor carbon 12,000 Ohms 2 watt			
109	502135	Resistor carbon 2.2 Meg. 1/4 watt			
110	504731	Resistor carbon 12,000 Ohms 2 watt			
114	502468	Resistor carbon 4.7 Meg. 1/4 watt			
115	502131	Resistor carbon 47,000 Ohms 1/4 watt			
116	502291	Resistor carbon 4,700 Ohms 1/4 watt			
119	502133	Resistor carbon 220,000 Ohms 1/4 watt			
121	502478	Resistor carbon 1,000 Ohms 1/4 watt			
126	502134	Resistor carbon 470,000 Ohms 1/4 watt			
128	504729	Resistor carbon 130 Ohms 2 watt			
129	504728	Resistor carbon 11 Ohms 1/2 watt			



THE FIRESTONE TIRE & RUBBER CO.

MODELS 4-A-64,
4-A-65



To string dial cord, set gang condenser to fully open position and use the following parts:
114955 Clip on end of cord
117057 Cord (3 feet)
119087 Ring for dial cord
505161 Tension spring

(F-M) I. F. 10.7 MC.
(A-M) I. F. 455 KC.

FREQUENCY RANGES:
STANDARD } —540-1700 KC.
BROADCAST }
FM — 88-108 MC.

MANUAL TUNING DEVICE:
3 section gang condenser;
shock resistant mounting.

SPECIFICATIONS

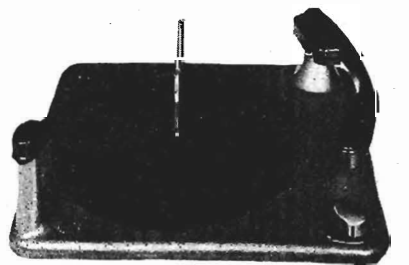
POWER SUPPLY:
117 volts
60 cycles A.C.
85 watts (radio)
30 watts (phono)

SPEAKER:
10 inch P-M Dynamic
Voice coil impedance—3.2 ohms

BUILT-IN AERIALS:
AM — High efficiency loop.
FM — Single ended half-wave aerial.

POWER OUTPUT:
Undistorted — 2.8 watts
Maximum — 5.4 watts

Lettered terminals in illustrations correspond to similarly lettered terminals on the circuit diagram.



VM-506569
RECORD CHANGER

STAGE GAIN MEASUREMENT PROCEDURE

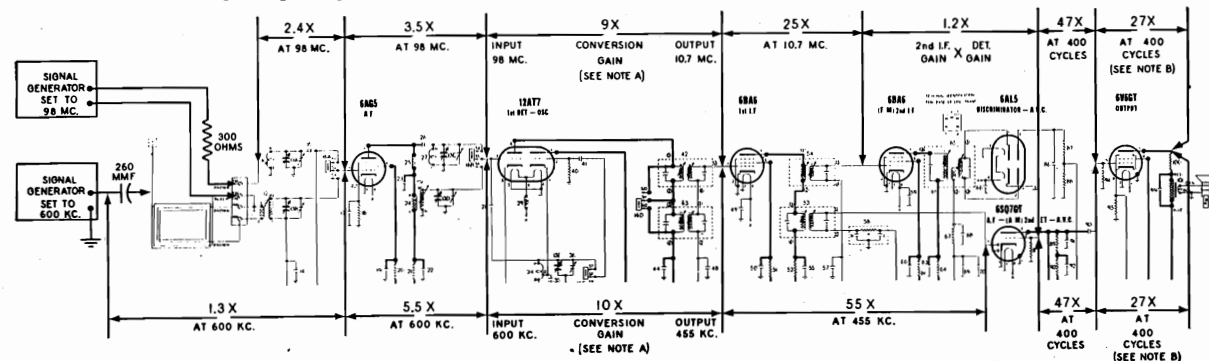
REQUIRED INSTRUMENTS: The amount of amplification or "gain" of most of the stages of this receiver can be measured with an A.C. Vacuum Tube Voltmeter of the high frequency type. An AM (600 KC.) as well as an FM (98 MC.) signal source is required. For gain measurements in the FM antenna-FM converter-FM 1st I.F. stages, a microvolt calibrated FM signal generator should preferably be used.

PROCEDURE: It is exceedingly important to adhere to the procedure outlined below since the accuracy of these measurements will be affected to a considerable extent by the failure to establish proper operating conditions.

1. Be sure that R.F., I.F. and Discriminator stages are carefully and accurately aligned by utilizing the alignment procedure given in this manual.
2. Connect Signal Generator as shown below. Note that generator connections differ for "AM" and "FM" measurements.
3. For "AM" measurements, set signal generator to 600 KC. (400 cycle modulation) and then carefully tune radio receiver to this signal by using an output meter to indicate peak output. If a local station interferes, set generator to a nearby frequency and re-tune the receiver.
4. For "FM" measurements, set signal generator to 98 MC. (400 cycle modulation with 22½ KC. deviation) and then carefully tune radio receiver to this signal by using a D.C. Vacuum Tube Volt-

meter as an output indicator meter must be connected between pin No. 7 of 6AL5 tube and chassis. If a local station interferes, set generator to a nearby frequency and re-tune the receiver.

5. The values of stage gain which are given here were measured with a fixed bias of -3 volts on the control grids of all R.F. and I.F. tubes which are connected to the A.V.C. system. Therefore, these values are not intended to indicate the full capability of a stage but they will serve as a convenient basis for determining proper operation. In order to duplicate the fixed bias voltage, connect the negative terminal of a 3 volt battery to both A.V.C. supply lines by effecting a common connection to terminal 4 of 2nd FM-I.F. transformer and terminal 2 of 1st AM-I.F. transformer. Then connect the positive battery lead to the receiver chassis.
6. R.F. and I.F. circuits are slightly de-tuned when contact is made with an instrument probe and this action, which is indicated by a change in the output meter reading, may seriously affect the gain measurement. Therefore, it is important to adjust the associated circuit trimmer for a maximum output meter reading and to set the input signal level to a convenient reference point on the gain measuring instrument while the probe is making contact. After removing the probe it is again necessary to adjust the trimmer so as to obtain the same output meter reading and thereby assure that the signal voltage at the specified point has not changed as a result of circuit de-tuning.

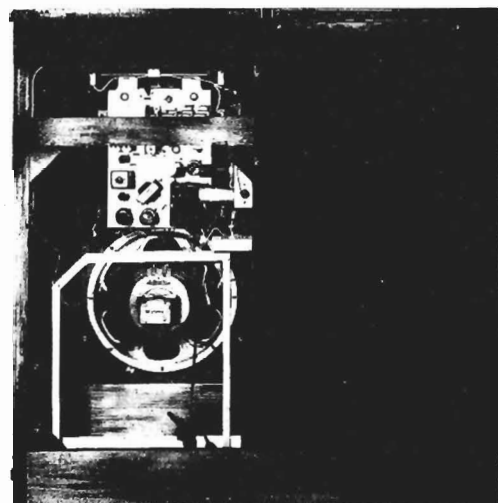


NOTE A: Short oscillator grid (pin 2 of 12AT7) to ground when measuring input voltage at signal grid (pin 7) of 12AT7 tube.

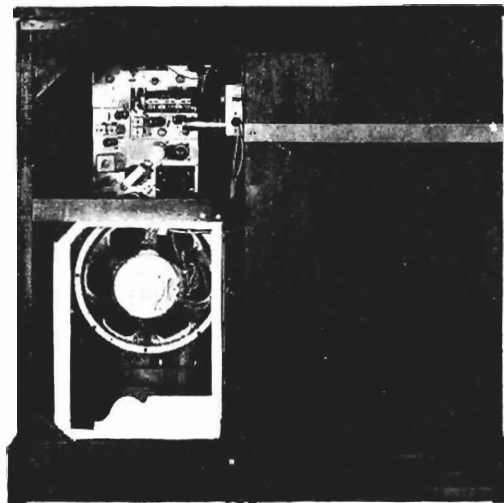
NOTE B: Measured with input voltage of 0.3.

NOTE C: Measured with input voltage of 0.05.

DIFFERENCES in tube characteristics, tolerance of parts, adjustment of tuned circuits and variations in line voltage will influence stage gain. These factors should be given due attention in event the gain of a stage varies extensively from the values shown.



Rear View
Model 4-A-64



Rear View
Model 4-A-65

BROADCAST BAND - "AM" - ALIGNMENT PROCEDURE

1. Disconnect leads from FM-AM aerial terminal strip (labeled FM-FM-AM-AM) at back of chassis; also disconnect speaker leads and phono plugs. Remove chassis and speaker. If desired, allow speaker to remain in cabinet and connect to receiver by extension leads.
2. Stand chassis on one edge so that all trimmers are accessible.
3. Built-in loop aerial leads do not have to be connected to terminal strip on rear of chassis while I. F. stages are being aligned. Before starting alignment of Ant., R.F., and Osc. stages, the loop aerial must be reconnected to chassis—do not attempt to use extension leads, remove loop aerial from cabinet to facilitate connection to chassis. Loop can be taken out of cabinet by merely lifting so as to release pivot dowel

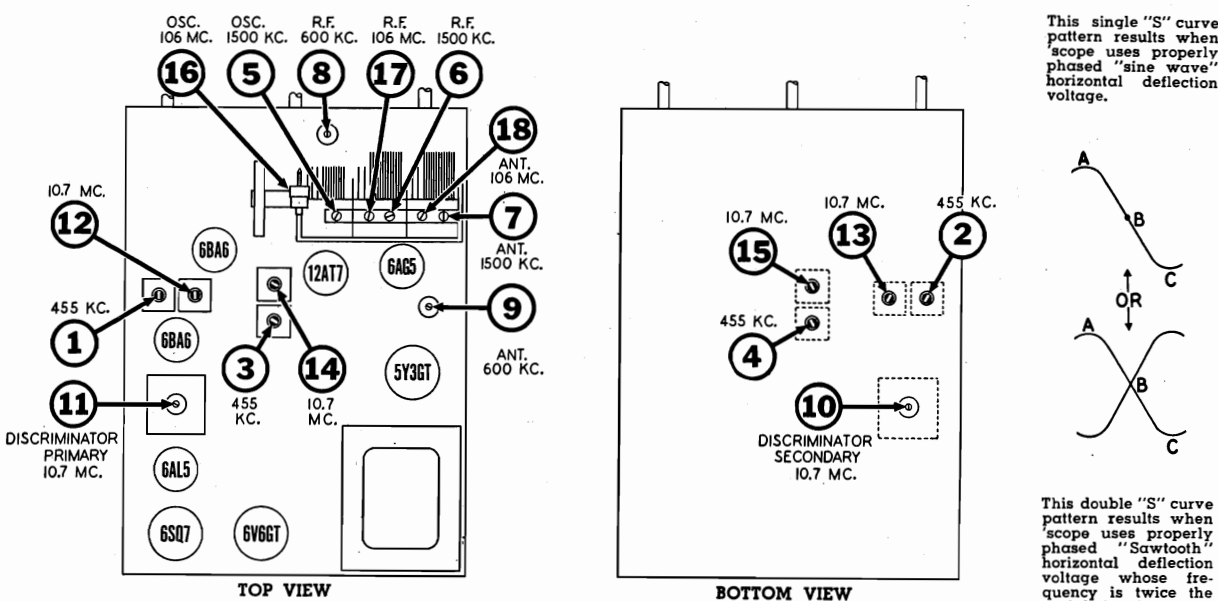
at bottom of frame; then remove screw which holds external aerial clip on top support block so as to release connecting lead.

4. With the gang condenser fully meshed, dial pointer should be in the position indicated by the last division below 55 on the dial. If it is set incorrectly, hold tuning shaft steady and reposition pointer.
5. Connect an output meter across speaker voice coil, or from plate of 6V6GT tube to chassis through a 0.1 Mfd. condenser.
6. Connect ground lead of signal generator to the receiver chassis.
7. Set volume control at maximum volume position and use a weak signal from the signal generator.

DUMMY ANT. IN SERIES WITH SIGNAL GENERATOR	CONNECT HIGH SIDE OF SIGNAL GENERATOR TO	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POSITION	RECEIVER DIAL SETTING	TRIMMER OR SLUG NUMBER	TRIMMER DESCRIPTION	TYPE OF ADJUSTMENT
1 MFD. Condenser	Lug on trimmer No. 6 at top of gang (see figure below for location of trimmer).	455 KC	AM Broadcast (Middle)	Any point where it does not affect the signal.	1-2	2nd I.F.	Adjust for maximum output. Then repeat adjustment.
260 MMFD. Mica Condenser	External Aerial Clip	1500 KC	AM Broadcast (Middle)	1500 KC	3-4	1st I.F.	
260 MMFD. Mica Condenser	External Aerial Clip	1500 KC	AM Broadcast (Middle)	1500 KC	5	Broadcast Oscillator	Adjust for maximum output.
260 MMFD. Mica Condenser	External Aerial Clip	1500 KC	AM Broadcast (Middle)	Tune to 1500 Kc. generator signal.	6	Broadcast R.F.	Adjust for maximum output.
260 MMFD. Mica Condenser	External Aerial Clip	1500 KC	AM Broadcast (Middle)	Tune to 1500 Kc. generator signal.	7	Broadcast Antenna	Adjust for maximum output.
260 MMFD. Mica Condenser	External Aerial Clip	600 KC	AM Broadcast (Middle)	Tune to 600 Kc. generator signal.	8	Adjustable core of Broadcast R.F. Coil.	Adjust for maximum output.
260 MMFD. Mica Condenser	External Aerial Clip	600 KC	AM Broadcast (Middle)	Tune to 600 Kc. generator signal.	9	Adjustable core of Broadcast Antenna Coil.	Adjust for maximum output.

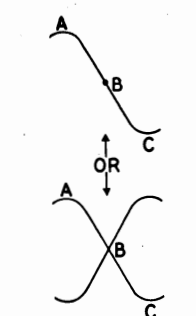
Repeat adjustment of trimmers 6 & 7 and slugs 8 & 9 until one no longer detunes the other.

NOTE: It is preferable to check the alignment of the I.F. stages in the FM channel after completing AM alignment.

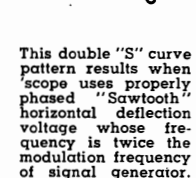


TRIMMER LOCATION CHART

This single "S" curve pattern results when scope uses properly phased "sine wave" horizontal deflection voltage.



This double "S" curve pattern results when scope uses properly phased "Sawtooth" horizontal deflection voltage whose frequency is twice the modulation frequency of signal generator.



THE FIRESTONE TIRE & RUBBER CO.

MODELS 4-A-64,
4-A-65

INSTRUMENTS: Alignment of the FM circuits in this receiver can be most conveniently accomplished with an FM signal generator. When using this type generator, the output indicator must be an oscilloscope.

1. If alignment of both AM and FM channels is required it is necessary to align the AM channel first, then align the FM channel as instructed in chart below (AM alignment procedure is given on page 8).
2. Disconnect leads from FM-AM aerial terminal strip (labelled FM-FM-AM-AM) at back of chassis; also disconnect speaker leads and phono plugs. Remove chassis and speaker. (If desired, allow speaker to remain in cabinet and connect to receiver by extension leads.)
3. With the gang condenser fully meshed, dial pointer should be in the position indicated by the last division below 88 on the dial.

If it is set incorrectly, hold tuning shaft steady and reposition pointer.

4. A specific setting of the receiver volume control is not required, however, it will be found convenient to leave it in the maximum volume position so that alignment signals will be audible even though the output indication is obtained by an oscilloscope connected to points in the discriminator circuit.
5. Dress FM circuit leads as short and straight as possible, particularly those in the oscillator circuit. I.F. plate and grid leads should also be kept short and straight.
6. Set band switch to the FM (extreme counter-clockwise) position.
7. Set tone control to fully counter-clockwise position.

SIGNAL GENERATOR CONNECTIONS	FREQUENCY & TYPE OF MODULATION	OSCILLOSCOPE CONNECTIONS	RECEIVER DIAL SETTING	TRIMMER OR SLUG NUMBER	TRIMMER DESCRIPTION	TYPE OF ADJUSTMENT AND OUTPUT INDICATION
Connect high side in series with an .01 Mfd condenser to lug on trimmer No. 17 at top of gang (see illustration on page 8 for location of trimmer). Connect ground lead to receiver chassis in vicinity of 12A7 tube.	10.7 MC FM signal should preferably be modulated ± 400 KC.	Connect vertical amplifier "high" lead to junction of resistor No. 67 (18000 ohms) and condenser No. 70 (.003 Mfd.) which are in discriminator output circuit. Connect scope ground lead to receiver chassis. Set vertical amplifier of scope for maximum amplification. Where FM signal generator provides an output voltage for synchronization, connect this voltage to "sync" terminals of the scope.	Any position where it does not affect the signal.	10	Discriminator Secondary	Before attempting to adjust trimmer No. 10, set trimmers No. 11, 12, 13, 14 and No. 15 for approximately maximum sound output from the speaker (output meter not required). This is done to obtain sufficient signal for an oscilloscope pattern of desirable amplitude when making the following discriminator trimmer adjustment. Adjust setting of trimmer No. 10 until a pattern similar to that shown in Fig. 2 appears on the screen. If pattern does not remain stationary operate sweep frequency control on scope and also "sync" control until desired result is obtained. Correct setting of trimmer No. 10 is obtained when crossover point "B" (Fig. 2) is centrally located in both the horizontal and vertical directions; in addition that portion of the curve between "A" and "C" should be as linear (straight) as possible.
Same as above	Same as above	Same as above	Same as above	11	Discriminator Primary	Adjust these trimmers for maximum amplitude and steepness of that portion of the pattern between "A" and "C" (see Fig. 2).
				12 and 13	2nd I.F.	
				14 and 15	1st I.F.	
Recheck adjustments of trimmers No. 10 and No. 11 to be sure that both are set as accurately as possible to obtain correct cross-over point or symmetry of pattern.						
Connect generator "high" side in series with a 300 ohm carbon resistor to end terminal marked "FM" on strip at back of chassis. Generator ground lead must connect to next terminal marked "GND".	106 MC FM signal should preferably be modulated ± 400 KC.	Same as above	106 MC	16	Oscillator Trimmer	Adjust trimmer No. 16 to obtain the symmetrical pattern shown in Fig. 2. Correct setting of trimmer No. 16 is obtained when cross-over point in pattern is centrally located. IMPORTANT: It will be noted that there are two different settings of trimmer No. 16 at which the desired 'scope pattern can be obtained—always select the trimmer setting which is nearest to the low capacity end of its range.
Same as above	Same as above	Same as above	Tune to 106 MC. generator signal.	17	R.F. Trimmer	Adjust trimmer No. 17 for maximum amplitude of pattern.
				18	Antenna Trimmer	Adjust trimmer No. 18 for maximum amplitude of pattern.
				14 and 15	1st I.F.	Recheck adjustment of these trimmers for maximum amplitude of pattern.

Check calibration and tracking of receiver with input signals of 90 and 98 MC. If difference between dial pointer setting and 90 or 98 MC. calibration mark does not exceed ± 0.3 MC. and antenna and R.F. circuits are tracking properly, then alignment may be considered satisfactory and no further adjustment is necessary.

Where the calibration error is greater than ± 0.3 MC. it is advisable to make the following adjustments:

1. If pointer falls above the 90 MC. calibration point, it will be necessary to slightly spread the windings of the FM oscillator coil. Then repeat the two preceding adjustments of trimmers 16, 17 and 18 at 106 MC. Should it be found impossible to obtain the 106 MC. signal at the proper point on the dial by adjustment

of the trimmers it will then be necessary to adjust the spacing of the gang condenser plates.

2. If pointer falls below the 90 MC. calibration point, it will be necessary to push the windings together on the FM oscillator coil. Then repeat the two preceding adjustments of trimmers 16, 17 and 18 at 106 MC. Should it be found impossible to obtain the 106 MC. signal at the proper point on the dial by adjustment of the trimmers it will then be necessary to adjust the spacing of the gang condenser plates.
3. Correction for mistracking of antenna and R.F. may be accomplished by adjusting coil turns and gang plate spacing in the same manner.

MODELS 4-A-64,
4-A-65

THE FIRESTONE TIRE & RUBBER CO.

FREQUENCY MODULATION—"FM"—ALIGNMENT PROCEDURE (USING A VACUUM TUBE VOLTMETER AND AM SIGNAL GENERATOR)

INSTRUMENTS: Although it is preferable to use an FM generator and an oscilloscope, reasonably accurate alignment is obtainable when using a conventional AM generator and vacuum tube voltmeter providing proper care is exercised in adjusting the discriminator circuit trimmer.

IMPORTANT: When using an AM signal generator, it should be capable of producing fundamental frequencies of 10.7 MC and 88 to 108 MC — avoid using an AM generator which produces signals in the 88 to 108 MC range by using harmonics higher than the second. Generators which are dependent upon third, fourth or fifth harmonics for output frequencies of 88 to 108 MC will generally produce undesirable spurious beat signals with the local oscillator in the receiver and alignment will be exceedingly difficult.

1. If alignment of both AM and FM channels is required it is necessary to align the AM channel first, then align the FM channel as instructed in chart below (AM alignment procedure is given on the preceding page).

2. Disconnect leads from FM-AM aerial terminal strip (labelled FM-FM-AM-AM) at back of chassis; also disconnect speaker leads and phono plugs. Remove chassis and speaker. If desired, allow speaker to remain in cabinet and connect to receiver by extension leads.
3. With the gang condenser fully meshed, dial pointer should be in the position indicated by the last division below 88 on the dial. If it is set incorrectly, hold tuning shaft steady and reposition pointer.
4. A specific setting of the receiver volume control is not required. However, it will be found convenient to leave it in the maximum volume position so that alignment signals will be audible even though the output indication is obtained by a V-T voltmeter connected to points in the discriminator circuit.
5. Dress FM circuit leads as short and straight as possible, particularly those in the oscillator circuit. I.F. plate and grid leads should also be kept short and straight.
6. Set band switch to the FM (extreme counter-clockwise) position.

SIGNAL GENERATOR CONNECTIONS	FREQUENCY & TYPE OF MODULATION	VACUUM TUBE VOLTMETER CONNECTIONS	RECEIVER DIAL SETTING	TRIMMER OR SLUG NUMBER	TRIMMER DESCRIPTION	TYPE OF ADJUSTMENT AND OUTPUT INDICATION
Connect high side in series with an .01 Mfd condenser to lug on trimmer No. 17 at top of gang (see illustration on page 8 for location of trimmer). Connect ground lead to receiver chassis in vicinity of 12AT7 tube.	10.7 MC AM signal may be 400 cycle modulated.	Connect common (or ground) terminal of meter to receiver chassis. D.C. probe lead of meter is then connected to pin No. 7 of the 6AL5 tube.	Any position where it does not affect the signal.	11	Discriminator Primary	Adjust these trimmers for maximum meter reading—the output voltage will be of negative polarity.
				12 and 13	2nd I.F.	
				14 and 15	1st I.F.	
Same as above	Same as above	Connect common (or ground) terminal of V-T voltmeter to the junction of resistors 87 and 88 in the discriminator circuit. D.C. probe lead of meter is then connected to junction of resistor No. 87 (18,000 ohms) and condenser No. 70 (.003 MFD.) which are in the discriminator output circuit. Set meter for operation on its lowest D.C. voltage range.	Same as above	10	Discriminator Secondary	Note that as trimmer No. 10 is rotated a point will be found where voltmeter will swing from a positive to a negative reading or vice versa. Correct setting of trimmer No. 10 is obtained when meter reads zero as trimmer is moved through this point. The adjustment is somewhat critical and considerable care must be exercised to set the trimmer for a zero meter indication.

Recheck adjustment of trimmers No. 10 and No. 11 to be sure that both are set as accurately as possible to obtain the specified output indication.

Connect generator "high" side in series with a 300 ohm carbon resistor to end terminal marked "FM" on strip at back of chassis. Generator ground lead must connect to next terminal marked "GND".	106 MC AM signal may be 400 cycle modulated.	Connect common (or ground) terminal of meter to receiver chassis. D.C. probe lead of meter is then connected to Pin No. 7 of the 6AL5 tube.	106 MC	16	Oscillator Trimmer	Set trimmer No. 16 to receive 106 MC. signal as indicated by maximum meter reading. IMPORTANT: It will be noted that there are two different settings of trimmer No. 16 at which the 106 MC. signal will be received—always select the trimmer setting which is nearest to the low capacity end of its range.
Same as above	Same as above	Same as above	Tune to 106 MC. generator signal.	17	R.F. Trimmer	Adjust trimmer No. 17 for maximum meter reading.
				18	Antenna Trimmer	Adjust trimmer No. 18 for maximum meter reading.
				14 and 15	1st I.F.	Recheck adjustment of these trimmers for maximum meter reading.

Check calibration and tracking of receiver with input signals of 90 and 98 MC. If difference between dial pointer setting and 90 or 98 MC. calibration mark does not exceed ± 0.3 MC. and antenna and R.F. circuits are tracking properly, then alignment may be considered satisfactory and no further adjustment is necessary. Where the calibration error is greater than ± 0.3 MC. it is advisable to make the following adjustments:

1. If pointer falls above the 90 MC. calibration point, it will be necessary to slightly spread the windings of the FM oscillator coil. Then repeat the two preceding adjustments of trimmers 16, 17 and 18 at 106 MC. Should it be found impossible to obtain the 106 MC. signal at the proper point on the dial by adjust-

ment of the trimmers it will then be necessary to adjust the spacing of the gang condenser plates.

2. If pointer falls below the 90 MC. calibration point, it will be necessary to push the windings together on the FM oscillator coil. Then repeat the two preceding adjustments of trimmers 16, 17 and 18 at 106 MC. Should it be found impossible to obtain the 106 MC. signal at the proper point on the dial by adjustment of the trimmers it will then be necessary to adjust the spacing of the gang condenser plates.
3. Correction for mistracking of antenna and R.F. may be accomplished by adjusting coil turns and gang plate spacing in the same manner as outlined above for the oscillator stage.

THE FIRESTONE TIRE & RUBBER CO.

MODELS 4-A-64,
4-A-65

DIA. GRAM NO.	PART NO.	DESCRIPTION
117057		Card-dial drive (3 ft. required).....per ft.
506368		C-Washer-tuning and band switch shaft
506369		Dial scale-glass
506747		Door for Record Storage compartment;
506693		Stock No. 4-A-64 (less hardware)
506642		Door Pull for Record Storage compartment;
506749		Door Pull for Record Storage compartment;
506694		Door Pull for Record Storage compartment;
506696		Drawer for Record Storage;
506763		Escutcheon
506748		Hinge-lid; Stock No. 4-A-64
506695		Hinge-door; Stock No. 4-A-64
506692		Hinge-lid; Stock No. 4-A-65
506362		Knob-VOLUME
506363		Knob-TONE
506364		Knob-TUNING
506744		Lid for Record Storage compartment;
506690		Lid for Record Storage compartment;
506745		Lid Support for Stock No. 4-A-64
506795		Plug for phone pick-up cable
501031		Plug for phone input to receiver
506852		Plug for phone power cable
506751		Plug (contains jumper)-wire-recorder socket
506370		Pointer
506897		Rail for Record Changer Drawer; Stock
119087		Ring for dial cord
38501		Rubber bushing for band switch
160496		Rubber pad for mounting chassis
170167		Scraper for mtg. dial scale
503588		Shaft and drum assembly-dial
503757		Shaft and link easy-band switch
506349		Shaft-tuning
506344		Slug core for antenna coil (AM)
506470		Socket-phonograph pick-up plug
160039		Socket-phonograph input to receiver
506307		Socket and phone motor cable
506826		Socket-Pre-amp power cable
506750		Socket and Cable assembly-wire recorder
506372		Socket-dial lamp; pair (with leads)
504595		Socket-indicator lamp at base of cabinet
504597		Socket-miniature
506331		Socket-nova base
116690		Socket-octal base
160392		Socket-octal (rectifier)
505161		Spring-dial cord tension
505924		Terminal strip (FM-FM-AM-AM)
506689		Tilt Door assembly-Stock No. 4-A-64

DIA. GRAM NO.	PART NO.	DESCRIPTION
85	510098	Resistor-carbon 15 Meg. 1/4 watt
87, 88	510053	Resistor-carbon 8200 Ohms 1/4 watt ± 10%
89	510093	Resistor-carbon 2.2 Meg. 1/4 watt
90	510079	Resistor-carbon 220,000 Ohms 1/4 watt
94	510085	Resistor-carbon 470,000 Ohms 1/4 watt
95	510128	Resistor-carbon 330 Ohms 1/2 watt
97, 98	510709	Resistor-wire wound 600 Ohms 5 watt
108	510132	Resistor-carbon 47 Ohms 1/4 watt
111	510132	Resistor-carbon 800 Ohms 1/2 watt
112	510170	Resistor-carbon 68,000 Ohms 1/2 watt
112	510179	Resistor-carbon 220,000 Ohms 1/2 watt
113	510163	Resistor-carbon 270,000 Ohms 1/2 watt
114	510163	Resistor-carbon 270,000 Ohms 1/2 watt ± 10%
116	510194	Resistor-carbon 3.3 Meg. 1/2 watt
118	510194	Resistor-carbon 3.3 Meg. 1/2 watt
119	510194	Resistor-carbon 220,000 Ohms 1/2 watt
120	510164	Resistor-carbon 33,000 Ohms 1/2 watt
121	510170	Resistor-carbon 68,000 Ohms 1/2 watt

COILS AND TRANSFORMERS

11	506353	Coil-Antenna (FM)
12	506354	Coil-Antenna (AM)
24	506349	Slug core for AM antenna coil
25	506344	Coil-R. F. (AM)
26	506347	Coil-R. F. choke (FM)
27	506351	Coil-R. F. (FM)
33	506325	Coil-R. F. choke (FM)
34	506352	Coil-Osc. (FM)
42	506800	Transformer-1st I. F. (FM)
43	506333	Transformer-1st I. F. (AM)
53	505797	Transformer-2nd I. F. (AM)
54	505905	Transformer-2nd I. F. (FM)
65	506332	Transformer-discriminator
101	505912	Transformer-output
106	506709	Transformer-power
125	506670	Loop Aerial

OTHER ELECTRICAL PARTS

16-A to E	506347	Switch-FM-AM-Phono
58-A, B, C	506338	Diode filter unit
79	506707	Resistor-carbon 47,000 Ohms 1/5 watt
80	506789	C-C Pick-up Cartridge (includes tone arm)
		Motor for type "VM"-506569 Record
		Changer 115 volt 60 cycle
		Motor for type "VM"-506569 Record
		Changer 115 volt 50 cycle
81	505269	Switch-"ON-OFF" for type "VM"-506569
102	506667	Record Changer
103 to 105	118921	Speaker-P.M. (12 inch)
123	118921	Lamp-dial (Mazda No. 47) 6-8 V. 150 Ma.
124	506685	Record Changer compartment
		Socket and Switch for light in Changer
		Record Changer

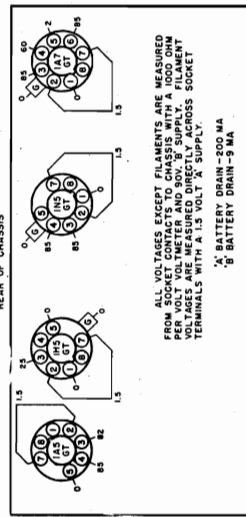
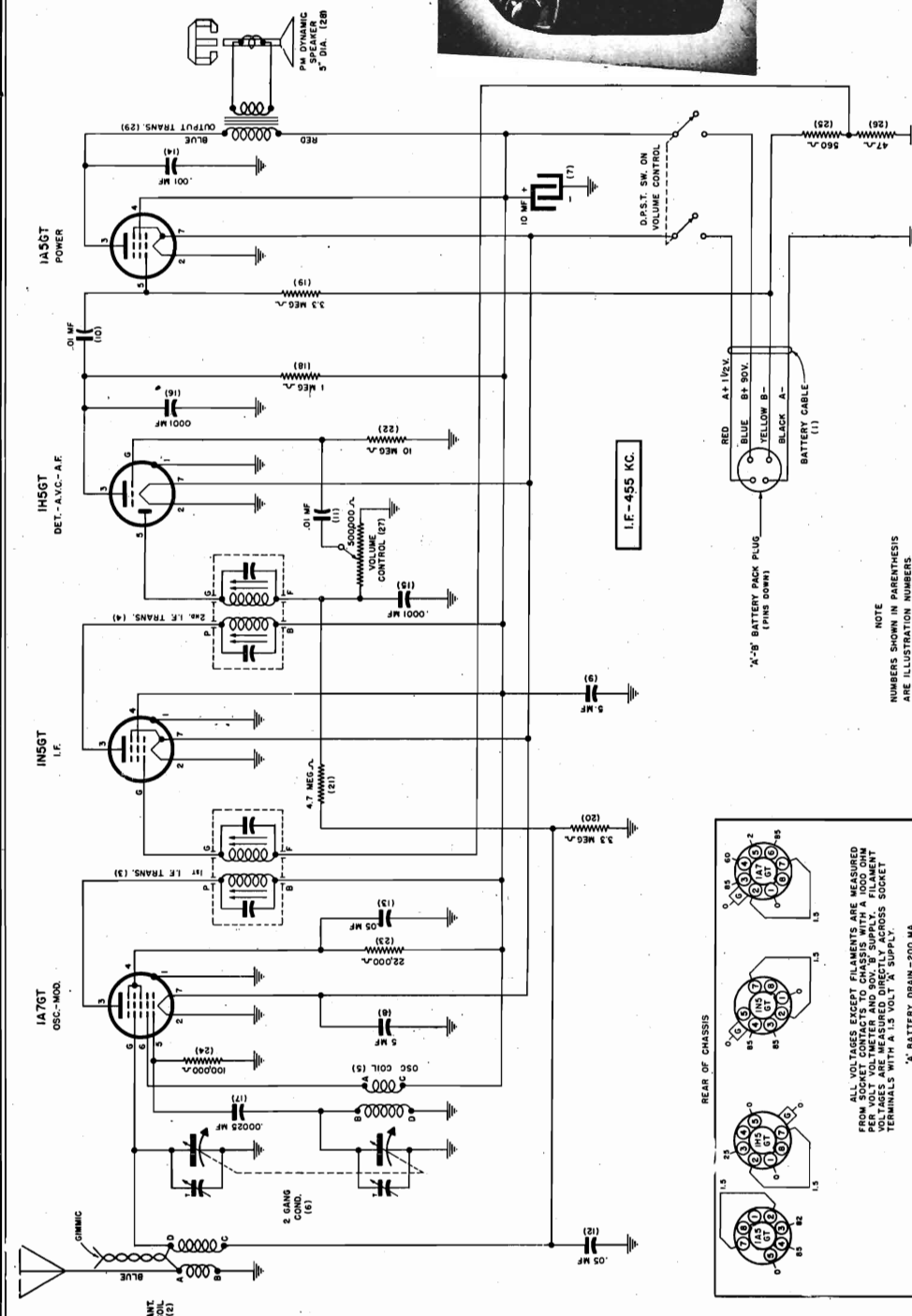
MISCELLANEOUS PARTS

506369		Background for dial
160026		Base for mtg. elect. cond. (pre-amp.)
401270		Base for mtg. electrolytic condenser
506371		Bull's eye for indicator light
506883		Cabinet-Stock No. 4-A-64
506920		Cabinet-Stock No. 4-A-65
506343		Clamp-dial gages
506343		Clamp-mtg. for R. F. and Ant. coil (AM)
505101		Clip-I. F. transformer and of dial cord
114955		Clip-retainer on
160326		Clip-retains dial background
160832		Clip-retains escutcheon

DIA. GRAM NO.	PART NO.	DESCRIPTION
13-A to F	506348	Condenser-variable gang (with drum)
14	510058	Condenser-.05 Mfd. 200 volt
15	510058	Condenser-.05 Mfd. 500 volt
17	504974	Condenser-ceramic 47 Mfd. 500 volt
19	505873	Condenser-ceramic .005 Mfd. 450 volt
22	505873	Condenser-ceramic .005 Mfd. 450 volt
23	504974	Condenser-ceramic 47 Mfd. 500 volt
26	504905	Condenser-ceramic 5 Mfd. 500 volt ± 10%
28	504983	Condenser-ceramic 1.0 Mfd. 500 volt
30	506341	Condenser-ceramic 330 Mfd. 500 volt
31	512009	Condenser-.01 Mfd. 200 volt
35	512429	Condenser-trimmer: 3 to 30 Mfd.
36	506346	Condenser-ceramic .005 Mfd. 500 volt
37	506544	Condenser-ceramic .005 Mfd. 450 volt
38	505873	Condenser-ceramic .005 Mfd. 450 volt
41	513409	Condenser-ceramic 39 Mfd. 500 volt ± 5%
44	505873	Condenser-ceramic .005 Mfd. 450 volt
46	505873	Condenser-ceramic .005 Mfd. 450 volt
48, 49, 50	505873	Condenser-ceramic .005 Mfd. 450 volt
55	505873	Condenser-ceramic .005 Mfd. 450 volt
57	505873	Condenser-ceramic .005 Mfd. 450 volt
58-B, C	506338	Condenser-ceramic 100 Mfd. 400 volt
		(part of diode filter unit)
59, 60	505873	Condenser-ceramic .005 Mfd. 450 volt
63	505873	Condenser-ceramic .005 Mfd. 450 volt
66	505873	Condenser-ceramic .005 Mfd. 450 volt
69	506341	Condenser-ceramic 330 Mfd. 500 volt
70	512004	Condenser-.03 Mfd. 600 volt
71	512006	Condenser-.005 Mfd. 600 volt
74	512006	Condenser-.005 Mfd. 600 volt
76	512006	Condenser-.005 Mfd. 600 volt
83, 84	512006	Condenser-.005 Mfd. 600 volt
86	504937	Condenser-electrolytic 5 Mfd. 500 volt
91	506340	Condenser-ceramic 100 Mfd. 500 volt
92	512034	Condenser-.02 Mfd. 400 volt
93	512016	Condenser-.01 Mfd. 400 volt
96-A to D	505908	Condenser-electrolytic
		A-20 Mfd. 25 volt
		B-10 Mfd. 450 volt
		C-30 Mfd. 450 volt
		D-40 Mfd. 450 volt
99	512006	Condenser-.005 Mfd. 600 volt
107	512256	Condenser-.01 Mfd. 600 volt
109	512026	Condenser-.05 Mfd. 200 volt
110 A, B	506527	Condenser-electrolytic
		A - 15 Mfd. 400 volt
		B - 15 Mfd. 400 volt
115	512010	Condenser-.01 Mfd. 400 volt
117	512028	Condenser-.05 Mfd. 400 volt
122	512016	Condenser-.02 Mfd. 400 volt

RESISTORS

18	510017	Resistor-carbon 82 Ohms 1/4 watt ± 10%
20	510164	Resistor-carbon 33,000 Ohms 1/2 watt
21	510137	Resistor-carbon 1000 Ohms 1/2 watt
32	510041	Resistor-carbon 1800 Ohms 1/2 watt
39	510137	Resistor-carbon 1000 Ohms 1/2 watt
40	510055	Resistor-carbon 10,000 Ohms 1/4 watt
45	510137	Resistor-carbon 10,000 Ohms 1/4 watt
47	510067	Resistor-carbon 47,000 Ohms 1/4 watt
51	510165	Resistor-carbon 39,000 Ohms 1/2 watt
52	510137	Resistor-carbon 22 Meg. 1/4 watt
56	510033	Resistor-carbon 22 Meg. 1/4 watt
58-A	506368	Resistor-carbon 47,000 Ohms 1/5 watt
		(part of diode filter unit)
61	510165	Resistor-carbon 39,000 Ohms 1/2 watt
62	510033	Resistor-carbon 22 Meg. 1/4 watt
64	510137	Resistor-carbon 1000 Ohms 1/2 watt
67	510055	Resistor-carbon 18,000 Ohms 1/4 watt
73	510070	Resistor-carbon 68,000 Ohms 1/4 watt
75	510070	Resistor-carbon 68,000 Ohms 1/4 watt
77	510079	Resistor-carbon 220,000 Ohms 1/4 watt
78	510093	Resistor-carbon 2.2 Meg. 1/4 watt
82-A, B, C	505911	Volume and tone control (with switch)
		A-2 Megohms
		B-2 Megohms
		C-"ON-OFF" switch



VOLTAGE TABLE
(BOTTOM VIEW OF CHASSIS)

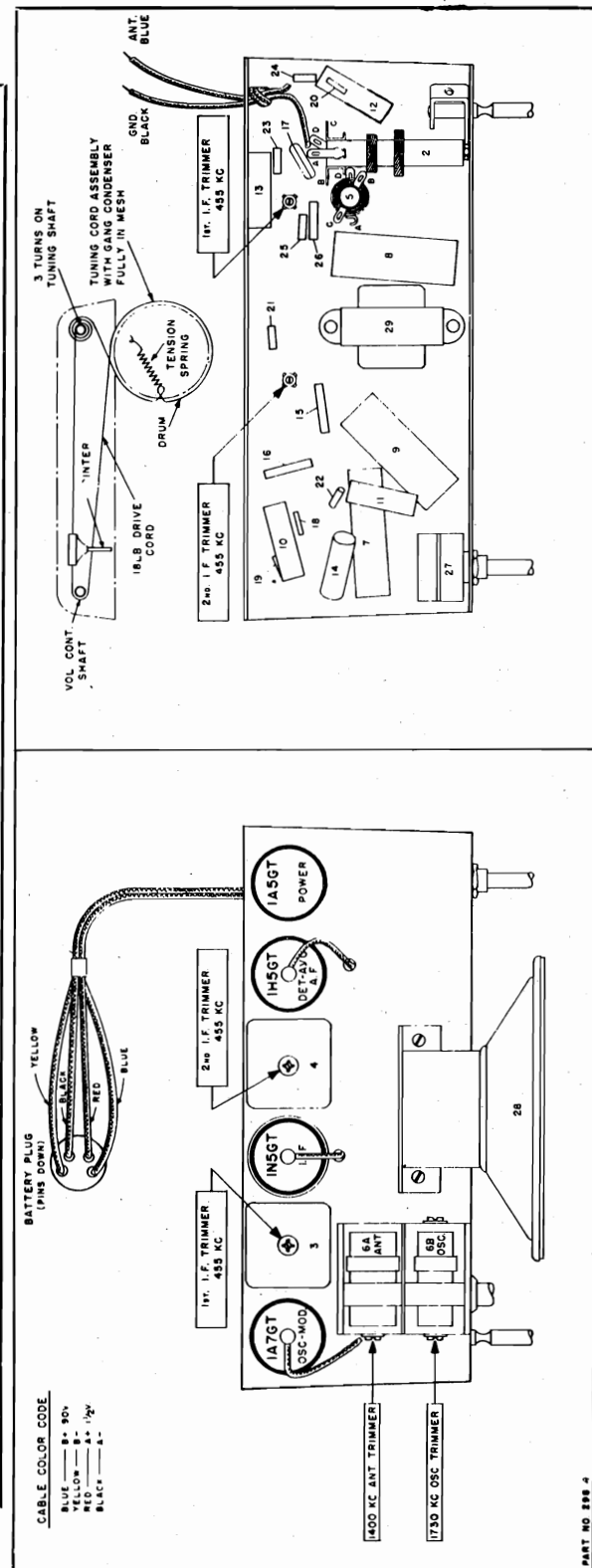
LOUD SPEAKER	5 Inch P.M.	POWER SUPPLY	Battery Operated
VOICE COIL IMPEDANCE	3.2 OHM at 400 Cycles	BATTERY SPECIFICATIONS	1000 hour Firestone Battery
POWER OUTPUT	Undistorted - 100 Milliwatts Maximum - 200 Milliwatts	TUNING RANGE	Stock No. 4-D-1 528 to 1730 KC
TUBE COMPLEMENT	1A7GT Oscillator Modulator, 1H5GT IF, 1H5GT Det. AVC, 1A5GT Power Output.	INTERMEDIATE FREQUENCY	455 KC

ALIGNMENT PROCEDURE

Be sure to follow procedure carefully and in the order given—otherwise the receiver will be insensitive and the dial calibration incorrect. For alignment procedure read tabulations from left to right. Make the adjustment marked (1) first, (2) next, etc. Before starting alignment:

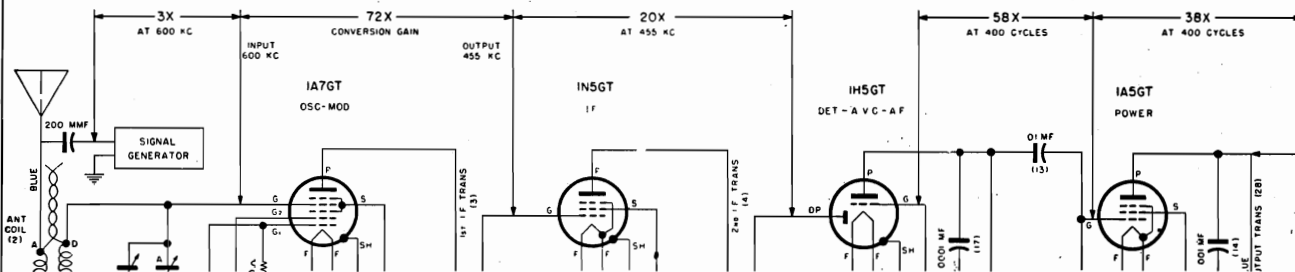
- (a) Check tuning dial adjustment by tuning gang condenser until plates touch maximum capacity stop (completely in mesh) at which point the dial needle must be exactly even with the last line at the low frequency end of the dial calibration. If dial needle does not point exactly to last line move to correct position.
- (b) Use an accurately calibrated test oscillator with some type of output measuring device.

Steps	Set receiver dial to:	TEST OSCILLATOR			Refer to parts layout diagram for location of trimmers mentioned below:
		Adjust test oscillator frequency to:	Use dummy antenna in series with output of test oscillator consisting of:	Attach output of test oscillator to:	
1	I.F. Any point where no interference signal is received	455 K. C.	.02 MFD. condenser	High side to grid terminal of 1A7GT tube DO NOT REMOVE CAP. Low side to receiver black ground lead.	Adjust each of the second I.F. transformer trimmers for maximum output—then adjust each of the first I.F. trimmers for maximum output.
2	Exactly 1730 K. C.	Exactly 1730 K. C.	.00025 MFD. condenser	Receiver blue antenna lead Receiver black ground lead	Adjust 1730 K. C. oscillator trimmer for maximum output.
3	Exactly 1400 K. C.	Exactly 1400 K. C.	.00025 MFD. condenser	Receiver blue antenna lead Receiver black ground lead	While rocking gang condenser adjust 1400 K. C. antenna trimmer for maximum output.



Be sure R.F. and I.F. stages are accurately aligned before measuring gain. R.F. gains can be measured with a "channel" type instrument containing a tuned and calibrated R.F. amplifier. A vacuum tube voltmeter may be used for audio gain measurements. Observe following precautions.

1. For all gain measurements connect signal generator as shown. Use 600 KC. signal with 400 cycle modulation (use nearby frequency if local station interferes.)
2. Be sure radio is carefully tuned to generator signal (use weak signal for sharp tuning.)
3. When using a "channel" type instrument carefully tune it for maximum output at desired frequency before making measurements.



Differences in tube characteristics, tolerance of parts, adjustment of tuned circuits, and variations of line voltage will influence stage gains. Accuracy of measurements is dependent upon careful tuning of receiver to generator signal and experience in using your test equipment. These factors may create considerable variation in gain measurements.

PARTS LIST

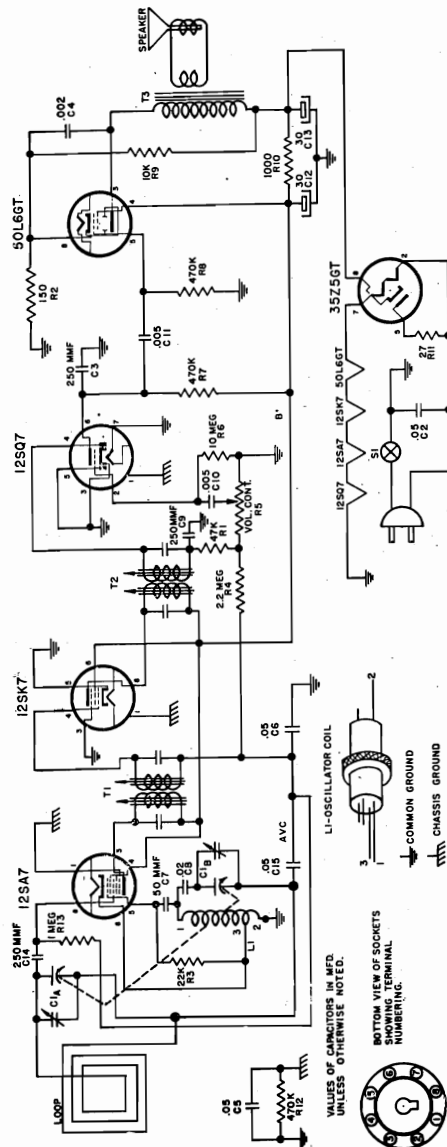
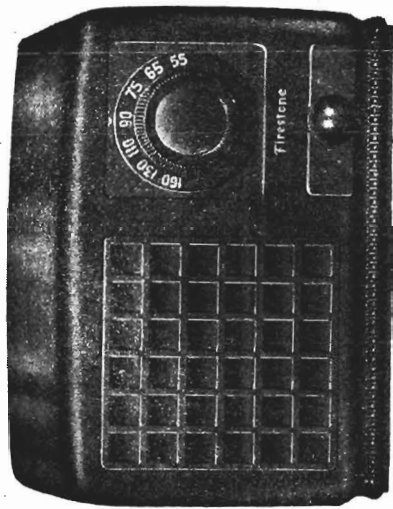
Illus. No.	Part No.	Part Name	Description	Illus. No.	Part No.	Part Name	Description
1	20E94-2	Cable	Battery with 4 Prong Plug	13	23E216	Condenser	Tubular, .05 Mfd. 200 V.
2	20E32	Coil	Antenna	14	23E204	Condenser	Tubular, .001 Mfd. 200 V.
3	20E261	Coil	1st I.F. Transformer	15	23E11	Condenser	Fixed Ceramic, .0001 Mfd. 500 V.
	or			16	23E11	Condenser	Fixed Ceramic, .0001 Mfd. 500 V.
4	20E307	Coil	1st I.F. Transformer	17	23E42	Condenser	Mica, .00025 Mfd. 500 V.
	20E261-3	Coil	2nd I.F. Transformer	18	27E105	Resistor	Carbon, 1 Megohm, 1/3 Watt
	or			19	27E335	Resistor	Carbon, 3.3 Megohm, 1/3 Watt
	20E307-3	Coil	2nd I.F. Transformer	20	27E335	Resistor	Carbon, 3.3 Megohm, 1/3 Watt
5	20E77	Coil	Oscillator	21	27E475	Resistor	Carbon, 4.7 Megohm, 1/3 Watt
6	24E2	Condenser	Tuning, 2 Gang	22	27E106	Resistor	Carbon, 10 Megohm, 1/3 Watt
7	25E9	Condenser	Tubular, Dry Elect. 10 Mfd. 100 V.	23	27E223	Resistor	Carbon, 22,000 Ohm, 1/3 Watt
8	23E224	Condenser	Tubular, .5 Mfd. 200 V.	24	27E104	Resistor	Carbon, 100,000 Ohm, 1/3 Watt
9	23E224	Condenser	Tubular, .5 Mfd. 200 V.	25	27E561	Resistor	Carbon, 560 Ohm, 1/3 Watt
10	23E151	Condenser	Tubular, .01 Mfd. 120 V.	26	27E470	Resistor	Carbon, 47 Ohm, 1/3 Watt
11	23E151	Condenser	Tubular, .01 Mfd. 120 V.	27	28E11	Vol. Control	With D.P.S.T. Switch, 500,000 Ohm.
12	23E216	Condenser	Tubular, .05 Mfd. 200 V.	28	1E9	Speaker	5" P.M.
				29	22E25	Transformer	Output

MISCELLANEOUS PARTS

Part No.	Part Name	Description	Part No.	Part Name	Description
7E76-4	Cabinet	Walnut Cabinet	36E40	Dial Scale	Calibrated Scale
7E83	Cabinet Back	Back for Cabinet	35E8	Dial Pointer	Dial Needle
20E253-11	Dial Cord	Drive Cord Assembly	35E15	Dial Indicator	"ON-OFF" Indicator
6SE2	Dial Cord Spring	Dial Cord Tension Spring	37E27-41	Knob	Walnut Knob
20E270-3	Dial Shaft Assembly	Drive Shaft Assembly	17E3-4	Plug	4 Prong Battery Plug
			46E14	Throw-Arm	Operates "ON-OFF" Indicator

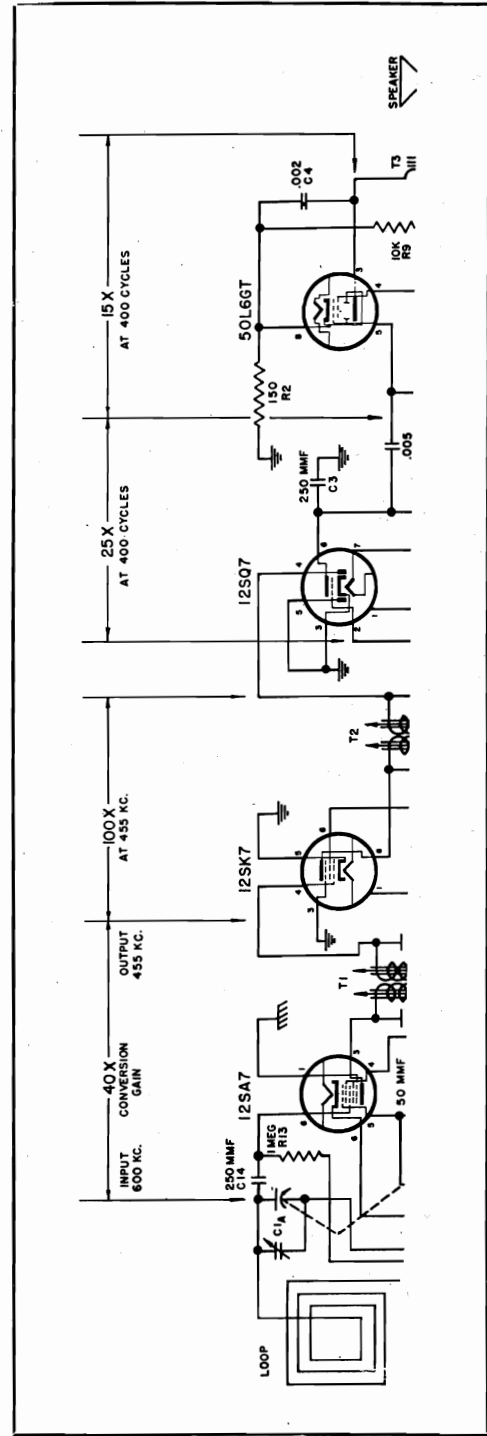
MOUNTING HARDWARE

Part No.	Part Name	Description	Part No.	Part Name	Description
12E6-F10	Washer	Metal Washer used with 82E36 Screw for Mtg. Back	12E52	Washer	Fibre Washer for Mounting Dial Scale
		—Lower Right & Left Corners	12E104	Washer	Spring Washer for Mounting Dial Scale
82E36	Screw	6—20x5/16 Rd. Rec. Hd. Shakeproof Type No. 25 used with 12E6 Washer	13E103-2	Washer	Speed Clip Washer for Mtg. Dial Scale
82E3	Screw	4—24x1/4 Rd. Rec. Hd. Shakeproof Type No. 25 For Mtg. Dial Scale	82E55	Screw	8—18x1/2 Rd. Rec. Hd. Shakeproof Type No. 25 Chassis Mounting Screw
10E43	Stud	Trimount Stud to Mount Cabinet Back	12E114	Washer	Special Washer Used with 82E55 Chassis Mounting Screw



Before proceeding with stage measurements be sure the receiver is properly aligned. R.F. gains can be measured by a "channel" type instrument containing a tuned and calibrated R.F. amplifier. A vacuum tube voltmeter may be used for audio gain measurements. Observe the following precautions:

1. For all gain measurements connect the "high" side of a signal generator to the grid of the tuning condenser, C1A, through a .00025 mica condenser. The ground side of the signal generator should be connected to common negative. Use a 600 KC signal with 400 cycle modulation (use nearby frequency if local station interferes).
2. Be sure radio is carefully tuned to generator signal (use weak signal for sharp tuning.)
3. When using a "channel" type instrument carefully tune it for maximum output at desired frequency before making measurements.



ALIGNMENT PROCEDURE

The alignment should be made with volume control fully on, and the output from the signal generator as low as possible, to prevent A.V.C. action from interfering with correct alignment.

For alignment procedure read tabulations from left to right, and make the adjustment marked (1) first, (2) next, (3) third. When making alignment:

- (a) Use an accurately calibrated test oscillator with some type of output measuring device.
- (b) PLACE LOOP ANTENNA IN THE SAME POSITION IT WILL BE IN WHEN THE SET IS IN THE CABINET.

TEST OSCILLATOR				
Steps	Set receiver dial to:	Adjust test oscillator frequency to:	Use dummy antenna in series with output of test oscillator consisting of:	Attach output of test oscillator to:
1	Minimum capacity (fully open)	455 K.C.	.1 MFD. condenser	High side to grid of tuning condenser, C1A. Low side to common negative. (through .25 MFD. Cond.)
2	Minimum capacity (fully open)	Exactly 1630 K.C.	.00025 MFD. condenser	High side to grid of tuning condenser, C1A. Low side to common negative.
3	Approx. 1400 K.C.	Approx. 1400 K.C.	.00025 MFD. condenser	Loosely coupled to loop.
				Refer to parts layout diagram for location of trimmers mentioned below:
				Adjust each trimmer on the second I. F. transformer for maximum output—then adjust each trimmer on the first I. F. transformer for maximum output.
				Adjust 1630 K.C. oscillator trimmer for maximum output.
				While rocking gang condenser adjust 1400 K.C. antenna trimmer for maximum output.

SPECIFICATIONS

Tube Complement

12SA7	— Oscillator Converter
12SK7	— I. F. Amplifier
12SQ7	— AVC, Detector, 1st Audio
50L6GT	— Power Output
35Z5GT	— Rectifier

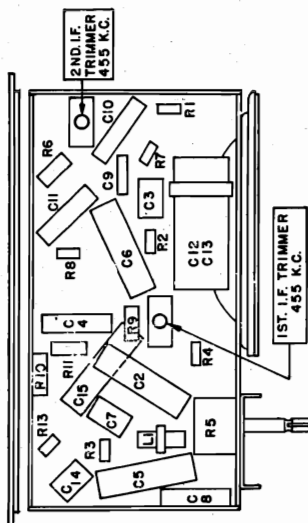
Power Supply
105-125 volts, 50-60 cycles, AC or DC
Tuning Range
540 to 1630 KC

I. F. Frequency
455 KC

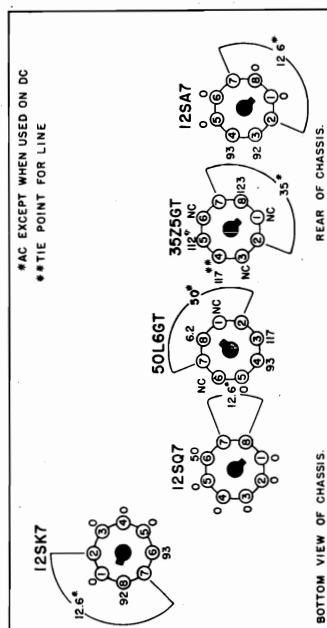
Loud Speaker
.5 inch P. M.

Voice Coil Impedance
3.2 ohms at 400 cycles

Power Output
Maximum 1.65 watts



VOLTAGE TABLE
(BOTTOM OF CHASSIS)



REAR OF CHASSIS

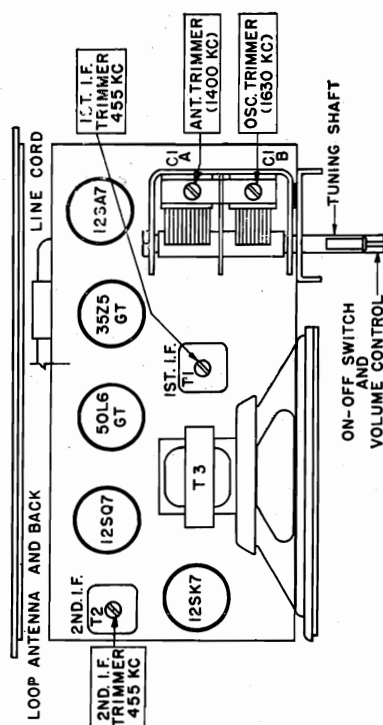
All voltages except heaters are measured from socket contacts to "common negative." Heater voltages are measured across socket contacts. All voltages measured with a 20,000 ohms per volt meter.

*AC except when used on DC.

Code No.	Part No.	Description
R6	A60-663	10 megohm 1/2 watt resistor
R7, R8, R12	A60-662	470K ohm 1/2 watt resistor
R9	A60-698	10K ohm 1 watt resistor
R10	A60-732	1000 ohm 1 watt resistor
R11	A60-690	27 ohm 1/2 watt resistor
R13	A60-668	1 megohm 1/2 watt resistor
T1, T2	A10-479	1st and 2nd I. F. Transformer
T3		Output transformer (part of speaker)
L1	B10-502	Oscillator coil

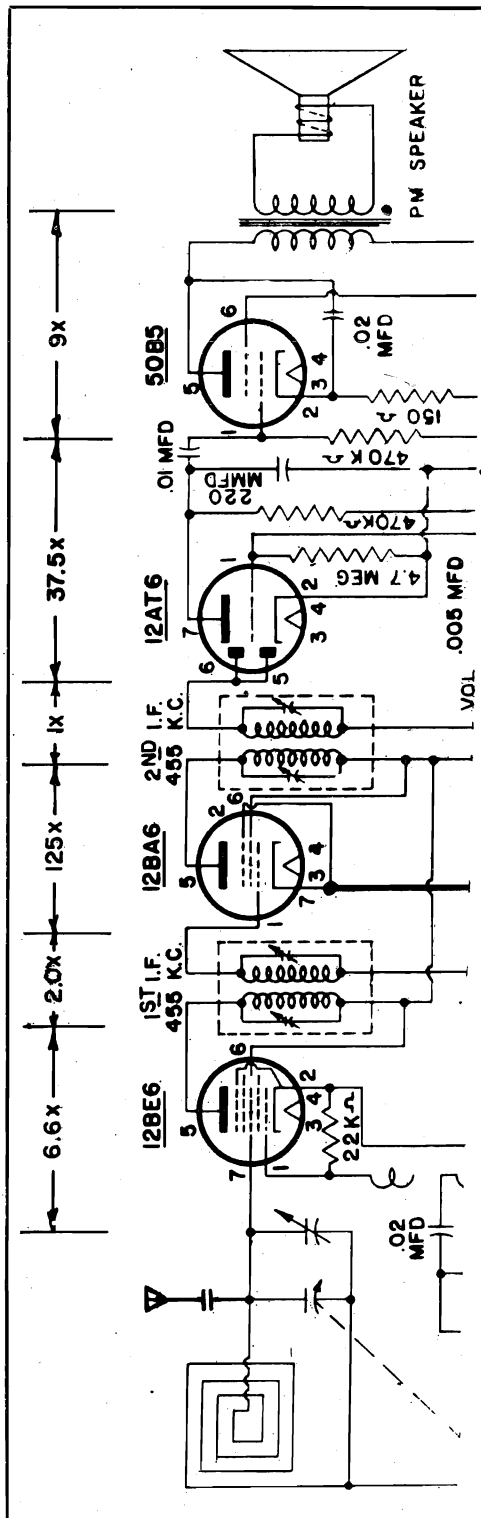
MISCELLANEOUS PARTS

C42-449	Cabinet, molded
C52-274	Knob, tuning, calibrated
A52-275	Knob, volume control
A23-151	Line cord
S882-56	Loop antenna, with cabinet back
B79-363	Speaker, 5" P.M. (includes output transformer)



Code No.	Part No.	Description
C1A, C1B	B19-199	Variable condenser
C2, C5	A16-158	.05 MFD 400 volt condenser
C3, C9, C14	A15-176	250 MMF mica condenser
C4	A16-155	.002 MFD 600 volt condenser
C6, C15	A16-152	.05 MFD 200 volt condenser
C7	A15-175	50 MMF mica condenser
C8	A16-150	.02 MFD 400 volt condenser
C10, C11	A16-153	.005 MFD 600 volt condenser
C12, C13	B18-283	30 x 30 MFD 150 volt electrolytic condenser
R1	A60-685	47K ohm 1/2 watt resistor
R2	A60-686	150 ohm 1/2 watt resistor
R3	A60-659	22K ohm 1/2 watt resistor
R4	A60-684	2.2 megohm 1/2 watt resistor
R5	A24-174	Volume control and switch, 1 megohm

3. When using a "channel" type instrument, carefully tune it for maximum output at desired frequency before making measurements.

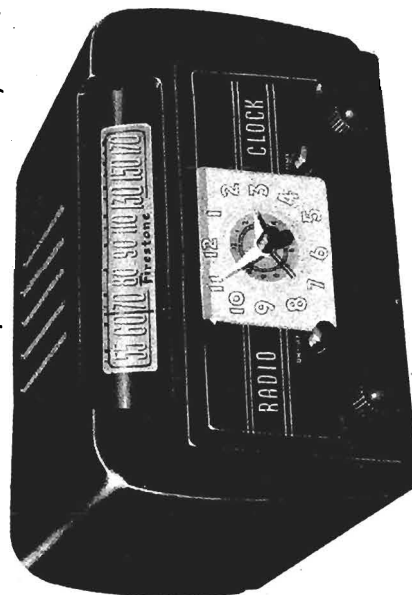


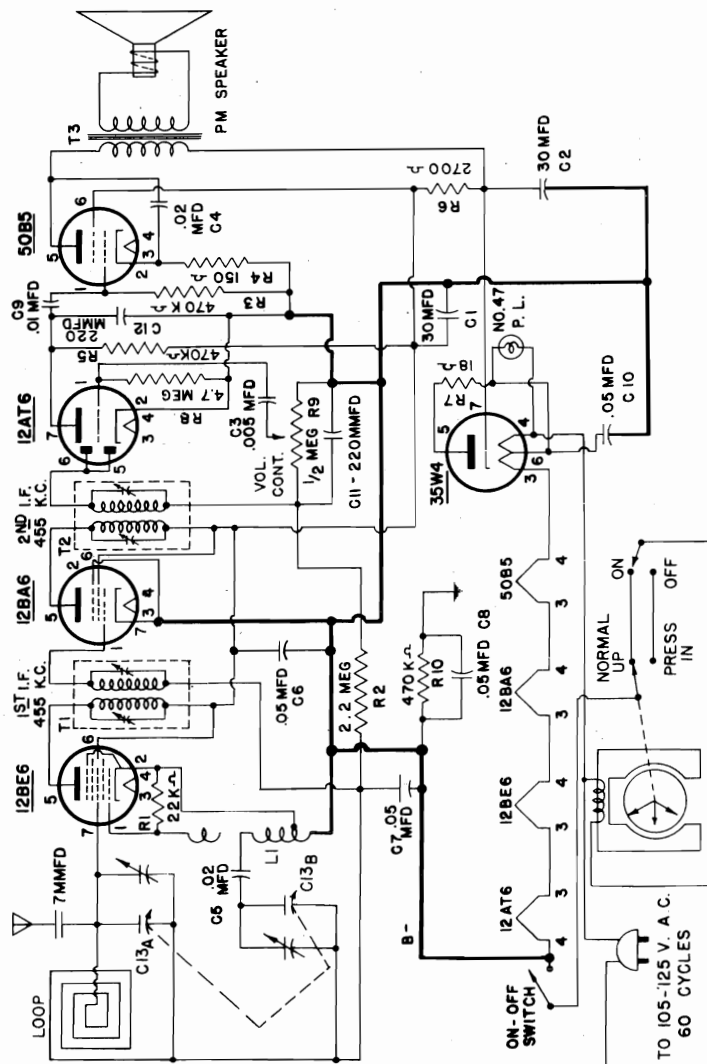
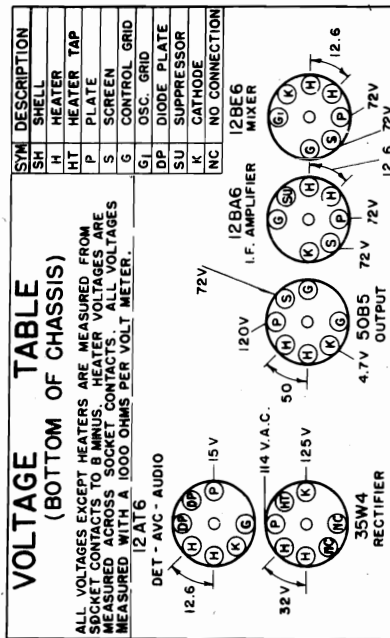
Stage gain measurements can be influenced by the normal manufacturers tolerances allowed in parts, differences in individual tube characteristics, the adjustment of the tuned circuits and variations in line voltage. Careful tuning of the receiver as well as experience in using your test equipment will determine the accuracy of the measurements taken. Due to all of these factors, the stage gains shown in the above diagram are approximate values rather than absolute as it is possible to introduce many variations in these measurements.

Power Output
Maximum 1.25 watts

Power Supply
105-125 Volt, 60 Cycle. A.C. only

Tuning Range
535 to 1700 KC





Tube Complement

12BE6	— Oscillator Converter
12BA6	— I. F. Amplifier
12AT6	— AVC, Detector, 1st Audio
50B5	— Power Output
35W4	— Rectifier

Code No.	Description	Part No.	Code No.	Description	Part No.
C1, C2	30 x 30 MFD 150 volt electrolytic condenser.	2033-2	T1	1st I.F. transformer	1046-3
C3	.005 MFD 400 volt condenser.	2000-5	T2	2nd I.F. transformer	1046-4
C4, C5	.02 MFD 400 volt condenser	2000-2	T3	Output transformer	1048
C6, C7, C10	.05 MFD 400 volt condenser	2000-4	L1	Oscillator coil	1049
C8	.05 MFD 600 volt condenser	2000-25		Loop antenna	1073
C9	.01 MFD 400 volt condenser	2000-1		Speaker, 4 inch P.M.	7009
C11, C12	220 MMFD ceramicon condenser	2012-1		Line Cord	5008
C13A, C13B	Variable condenser	2003 C		Clock	8026-2
R1	22K ohm 1/2 watt resistor	3003-16		Clock face	6017 B
R2	2.2 Megohm 1/2 watt resistor	3003-14		Clock Crystal	6013C
R3, R5, R10	470K ohm 1/2 watt resistor	3003-13		Dial pointer	9113
R4	150 ohm 1/2 watt resistor	3003-11		Dial scale (glass)	6016
R6	2700 ohm 2 watt resistor	3004-3		Pilot lamp socket	8001
R7	18 ohm 1/2 watt resistor	3003-12		#47 Pilot lamp	
R8	4.7 Megohm 1/2 watt resistor	3003-15		Cabinet, molded, mahogany	4077A
R9	1/2 Megohm volume control and switch	3013-3		Cabinet back	4079
	Dial Cord, 40" long			Knob, mahogany	4080-3
				Clock knob, mahogany	4066-2

MODEL 4-A-69,
THE SUNRISE

THE FIRESTONE TIRE & RUBBER CO.

ALIGNMENT PROCEDURE

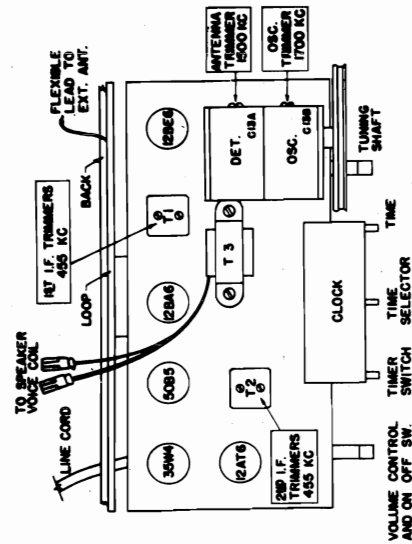
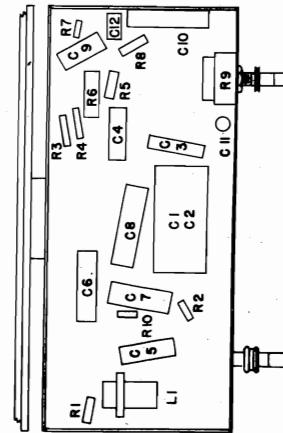
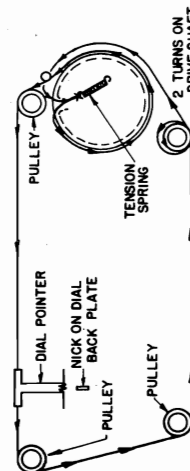
The alignment should be made with volume control fully on, and the output from the signal generator as low as possible, to prevent A.V.C. action from interfering with correct alignment.

For alignment procedure read tabulations from left to right, and make the adjustment marked (1) first, (2) next, (3) third. Before starting alignment:

- (a) Check tuning dial adjustment by tuning gang condenser until plates touch maximum capacity stop (completely in mesh) at which point the dial pointer must be exactly even with the last mark at the low frequency end of the dial calibration. If dial pointer is incorrectly set, release pointer clip on dial cord and reposition pointer.
- (b) Use an accurately calibrated test oscillator with some type of output measuring device.
- (c) PLACE LOOP ANTENNA IN THE SAME POSITION IT WILL BE IN WHEN THE SET IS IN THE CABINET.

Steps	Set receiver dial to:	TEST OSCILLATOR			Refer to parts layout diagram for location of trimmers mentioned below:
		Adjust test oscillator frequency to:	Use dummy antenna in series with output of test oscillator consisting of:	Attach output of test oscillator to:	
1	Minimum capacity (fully open)	455 K.C.	.1 MFD. condenser	High side to grid of tuning condenser. Low side to B-buss (through .25 MFD. Cond.)	Adjust each trimmer on the second I. F. transformer for maximum output—then adjust each trimmer on the first I. F. transformer for maximum output.
2	Minimum capacity (fully open)	Exactly 1700 K.C.	NONE	High side to receiver antenna lead. Low side to chassis. (Through .25 Mfd. Cond.)	Adjust 1700 K.C. oscillator trimmer for maximum output.
3	Approx. 1500 K.C.	Approx. 1500 K.C.	NONE	High side to receiver antenna lead. Low side to chassis. (Through .25 Mfd. Cond.)	While rocking gang condenser adjust 1500 K.C. antenna trimmer for maximum output.

GANG CONDENSER SHOWN FULLY IN MESH





MODEL 4-B-31,
THE ROMAER

THE FIRESTONE TIRE & RUBBER CO.

Voice Coil Impedance
3.2 ohms at 400 cycles

Power Output
1.2 watts, undistorted
2.5 watts, maximum

Sensitivity
10 microvolts average
for 1 watt output

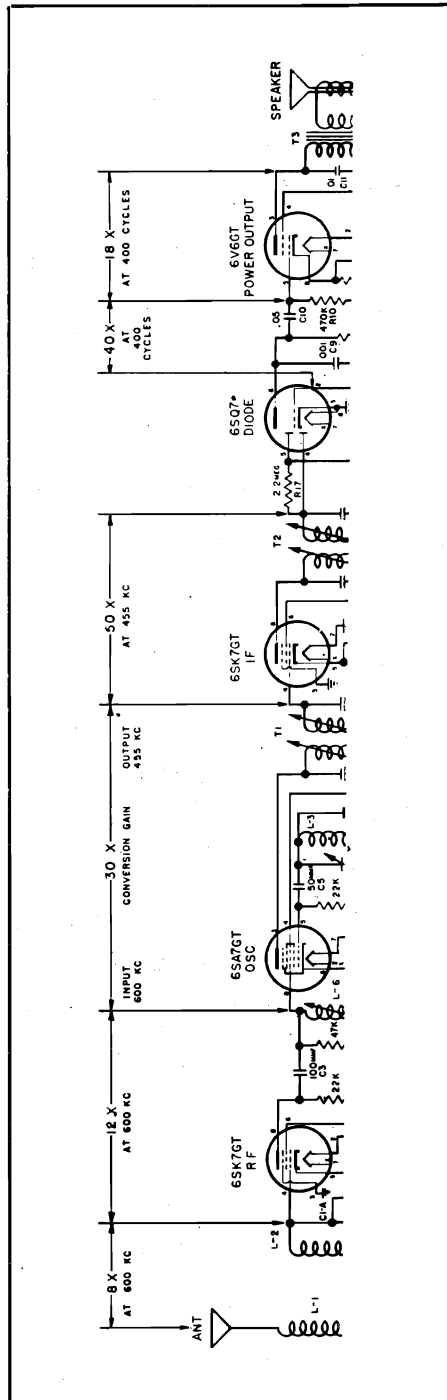
Selectivity
50 KC broad at 1000
times signal, at
1000 KC

Power Supply
6.3 volts DC
4.8 amp. average

Tuning Range
540 to 1600 KC
I.F. Frequency
455 KC
Loud Speaker
4" P.M.

Before proceeding with stage measurements be sure the receiver is properly aligned. R.F. gains can be measured by a "channel" type instrument containing a tuned and calibrated R.F. amplifier. A vacuum tube voltmeter may be used for audio gain measurements. Observe the following precautions:

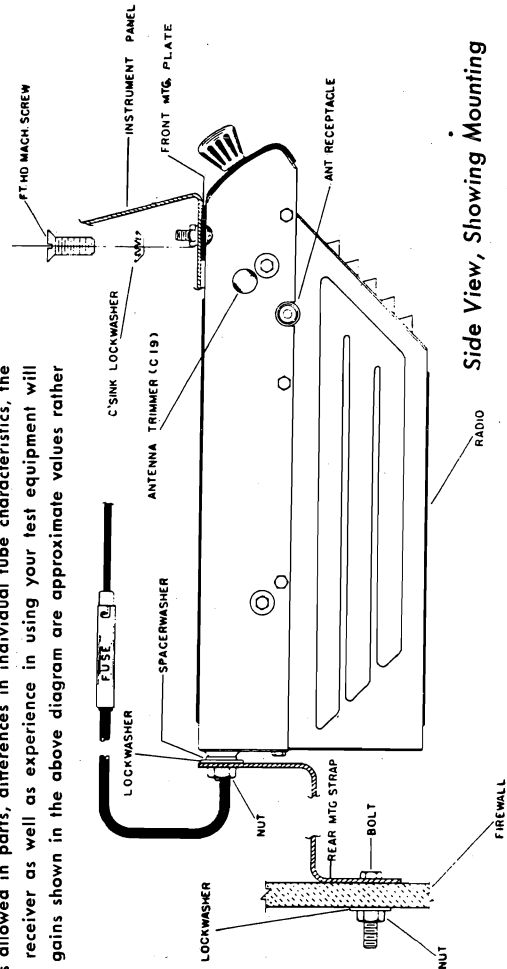
1. For all gain measurements connect the "high" side of a signal generator to the antenna lead through a .00025 mica condenser. The ground side of the signal generator should be connected to the chassis. Use a 600 KC signal with 400 cycle modulation (use nearby frequency if local station interferes).
2. Be sure radio is carefully tuned to generator signal (use weak signal for sharp tuning.)
3. When using a "channel" type instrument carefully tune it for maximum output at desired frequency before making measurements.



Stage gain measurements can be influenced by the normal manufacturers tolerances allowed in parts, differences in individual tube characteristics, the adjustment of the tuned circuits and variations in input voltage. Careful tuning of the receiver as well as experience in using your test equipment will determine the accuracy of the measurements taken. Due to all of these factors, the stage gains shown in the above diagram are approximate values rather than absolute as it is possible to introduce many variations in these measurements.

Tube Complement

- 1—6SK7GT R.F. Amplifier
- 1—6SA7GT Converter
- 1—6SK7GT I.F. Amplifier
- 1—6SQ7 Det., AVC, Audio
- 1—6V6GT Power output
- 1—6X5GT Rectifier



Side View, Showing Mounting

THE FIRESTONE TIRE & RUBBER CO. MODEL 4-B-31, THE ROAMER

ALIGNMENT PROCEDURE

Volume control—Maximum, all adjustments.

No signal applied to antenna.

Power input—6.3 volts

Connect dummy antenna in series with output lead of signal generator.

Connect output meter across voice coil.

Connect ground lead of signal generator to chassis.

Repeat alignment procedure as a final check.

The following equipment is necessary for proper alignment:

Signal generator that will provide the test frequencies as listed.

Non-metallic screwdriver.

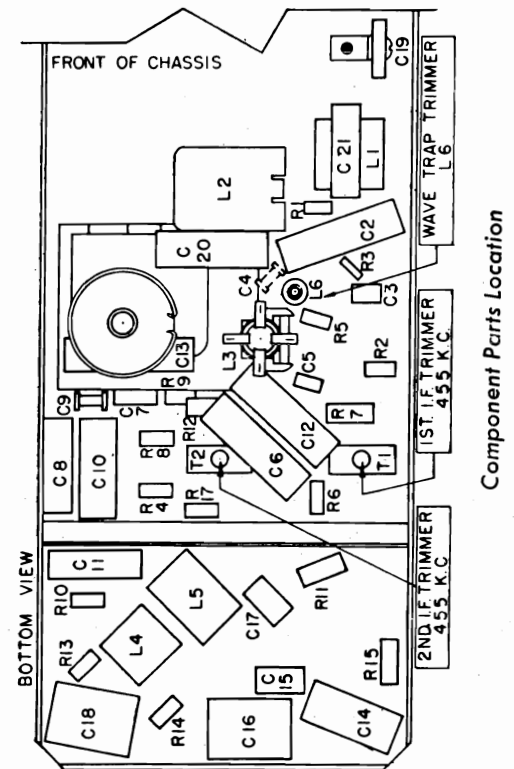
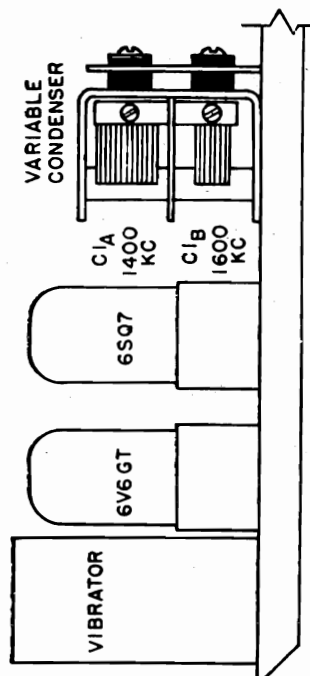
Output meter.

Dummy antennas—.1 MFD., .00025 MFD.

For alignment points refer to Figures 4, 5 and 8.

Dial Setting	Generator Frequency	Dummy Ant.	Generator Connections	Trimmer Reference	Trimmer Adjustment	Trimmer Function
Fully Open	455 KC	.1 MFD.	6SA7 Grid	T2	Maximum	Output I.F.
Fully Open	455 KC	.1 MFD.	6SA7 Grid	T1	Maximum	Input I.F.
Fully Open	455 KC	.00025 MFD.	Ant. lead	L6	Minimum	Wave trap
Fully Open	1600 KC	.00025 MFD.	Ant. lead	C1B	Maximum	Oscillator
Tune in signal from generator	1400 KC	.00025 MFD.	Ant. lead	C1A	Maximum	Antenna

NOTE: The antenna paddler condenser, C19, (see Fig. 1) should be adjusted after the radio is installed in the car. Tune the receiver to a weak station at about 1100 KC and adjust this trimmer for maximum volume.



Component Parts Location

MODEL 4-B-31,
THE ROAMER

THE FIRESTONE TIRE & RUBBER CO.

SERVICE NOTES

Voltages taken from the different points of the circuit to the chassis are measured with volume control in maximum position, all tubes in their sockets, no signal applied, and with a volt meter having a resistance of 20,000 ohms per volt. These voltages are clearly shown on the voltage chart, (Fig. 7).

All voltages should be measured with an input voltage of 6.3 volts DC.

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

ALIGNING INSTRUCTION

Never attempt any adjustments on this receiver unless it becomes necessary to replace a coil or transformer, or the adjustments have been tampered with in the field. Always make certain that other circuit components, such as tubes, condensers, resistors, etc., are normal before proceeding with realignment.

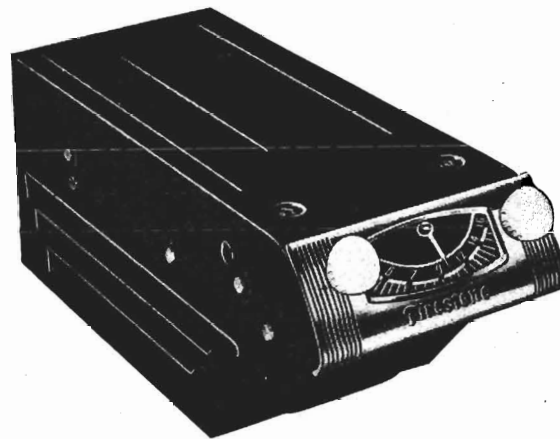
If realignment is necessary follow the instructions given under the heading "ALIGNMENT PROCEDURE". After realignment has been completed repeat the procedure as a final check.

DIAL POINTER ADJUSTMENT

If it should become necessary to readjust the dial pointer for correct calibration, this may be easily done without removing the radio from the car by proceeding as follows:

- A. Turn tuning knob to the right (clockwise) as far as it will go.
- B. Remove snap button located on the right side of the case (viewed from the front), in the extreme upper front corner.
- C. Insert screwdriver through hole in case and move dial pointer directly over white dot at high end of dial (1600KC).
- D. Tune receiver to station of known frequency in the center of the dial and readjust pointer for more accurate indication, if necessary.
- E. Replace snap button into hole in case.

CAUTION: Be careful not to scratch or damage dial scale or dial pointer when making this adjustment.

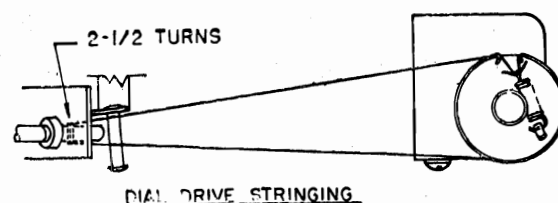
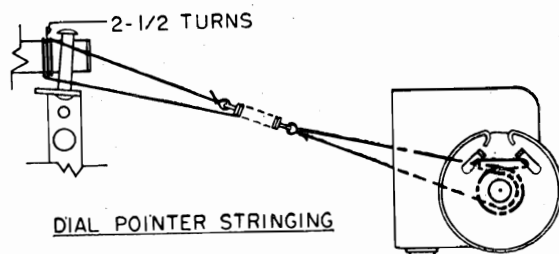
**INSTRUCTIONS FOR REMOVING CHASSIS FROM THE CASE**

The bottom cover (the one with the speaker louvers) can be removed to permit servicing of major components, such as tubes and vibrator, by removing the eight (8) screws holding it to the top cover. There are three (3) screws on each side, one (1) in the rear, and one (1) in the front.

CAUTION: Before attempting to remove the top cover, to service condensers, resistors, etc., the screw connecting the spark plate to the "A" terminal (inside case) must be removed. This is a round head screw, and is located on the rear of the case, close to the mounting stud bolt. It is recessed in a 1/2 inch hole in the case itself, thereby permitting contact with the spark plate.

After removing the spark plate screw, remove the two knobs by pulling forward and remove the eight (8) screws securing the cover to the chassis. Lift the chassis at the rear, at the same time moving it away from the front of the case so that the volume and tuning shafts will clear the holes in the cover.

NOTE: When reinstalling the chassis into the case, be sure the screw connecting the spark plate to the "A" terminal (inside case) is tightened very securely, otherwise the receiver will not operate properly.



THE FIRESTONE TIRE & RUBBER CO. MODEL 4-B-31, The Roamer

CONDENSERS

Schematic Diagram Reference	Part No.	Description
C1A, C1B	B19-196	Variable Condenser
C2, C6, C12	A16-187	.1 MFD. 400 Volt Condenser
C3	A15-196	100 MMFD Ceramic Condenser
C4	A15-202	20 MMFD Ceramic Condenser
C5	A15-204	50 MMFD Ceramic Condenser
C7, C15, C17	A15-176	250 MMFD Mica Condenser
C8	A16-190	.005 MFD. 600 Volt Condenser
C9	A16-195	.001 MFD. Ceramic Condenser
C10	A16-193	.05 MFD. 600 Volt Condenser
C11, C21	A16-192	.01 MFD. 400 Volt Condenser
C13	A16-188	.2 MFD. 400 Volt Condenser
C14	A16-185	.005 MFD. 1600 Volt Oil Filled Condenser
C16, C18	A16-184	.5 MFD. 100 Volt Condenser
C19	A20-145	Trimmer Condenser
C20	A16-189	.05 MFD. 400 Volt Condenser
C22	A18-289	20 MFD 25 Volt Electrolytic Condenser
C23		30 MFD 350 Volt Electrolytic Condenser
C24		20 MFD. 350 Volt Electrolytic Condenser

RESISTORS

R1	A60-722	470 Ohm 1/2 Watt 20% Resistor
R13, R14	A60-752	100 Ohm 1/2 Watt 10% Resistor
R2, R5	A60-744	22K Ohm 1/2 Watt 10% Resistor
R3	A60-685	47K Ohm 1/2 Watt 20% Resistor
R4, R17	A60-726	2.2 Megohm 1/2 Watt 20% Resistor
R6	A60-753	220 Ohm 1/2 Watt 10% Resistor
R7	A60-716	15K Ohm 1 Watt 10% Resistor
R8	A60-728	10 Megohm 1/2 Watt 20% Resistor
R9	A60-667	220K Ohm 1/2 Watt 20% Resistor
R10	A60-731	470K Ohm 1/2 Watt 20% Resistor
R11	A60-754	270 Ohm 1 Watt 10% Resistor
R12	A60-698	10K Ohm 1 Watt 10% Resistor
R15	A60-694	470 Ohm 1 Watt 10% Resistor
R16	A24-177	Volume Control, 500,000 Ohms, with Switch

COILS

L1	A10-513	Antenna Loading Coil
L2	B10-511	Antenna Coil
L3	A10-512	Oscillator Coil
L4	A33-229	Choke, "A" Line
L5	A33-228	Choke, Vibrator Hash
L6	A10-510	I.F. Trap Coil
T1	A10-508	1st I.F. Transformer
T2	A10-509	2nd I.F. Transformer

TRANSFORMERS

T3	B80-242	Output Transformer (Part of Speaker)
T4	B80-243	Power Transformer

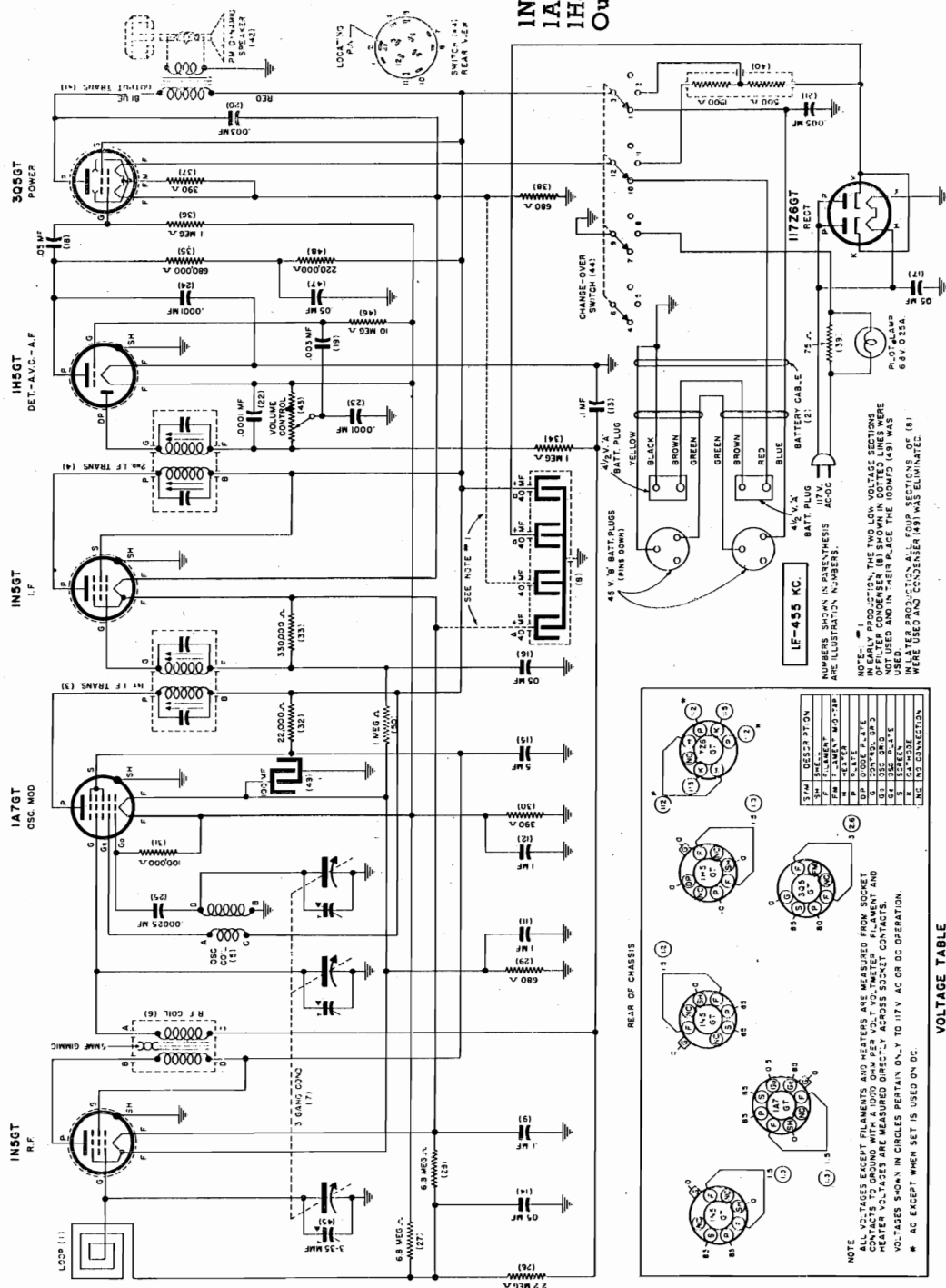
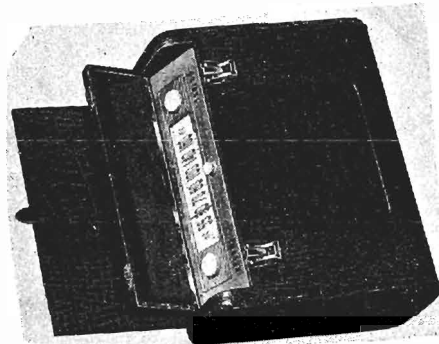
DIAL PARTS

A11-303	Bracket, Dial Scale
A11-304	Bracket, String Guide
A72-29	Bushing, Tuning Shaft Bearing
A70-130	Clip, Spring, for Tuning Shaft
B48-44	Dial Crystal
C40-144	Dial Escutcheon
A58-55	Dial Pointer
B67-526	Dial Scale
A52-270	Knob
A89-10	Pilot Light, Type 47
A71-39	Pilot Light Shield
A65-37	Rivet, Shoulder, for String Guide Bracket
A75-68	Shaft, Tuning
A75-67	Shaft, for Dial Pointer
A70-132	Spring, for Pilot Light Socket
A70-133	Spring, String Tension, Pointer Drive and Tuning

MISCELLANEOUS

A83-421	Clip, I.F. Transformer Mounting
A83-517	Clip, Oscillator Coil Mounting
A43-10	Fuse, 15 Amp.
A28-101	Gasket for Speaker
A47-112	Grommet, Rubber (for Mounting Speaker and Variable Condenser)
B31-134	Mounting Strap, Rear
A31-140	Mounting Plate, Front
S84-192	Mounting Parts Kit
A87-38	Receptacle, Antenna Cable
B79-362	Speaker, 4" P.M. (includes Output Transformer)
S84-232	Suppression Kit Assembly
A34-105	Vibrator
A83-519	Wiper, Grounding, for Case Covers

1N5GT R.F., 1N5GT I.F.,
1A7GT Oscillator Modulator,
1H5GT Det., AVC, 3Q5GT Power
Output, 11Z6GT Rectifier.



5 Inch P. M.

3.2 Ohms at 400 Cycles

Undistorted — .25 Watts
Maximum — .4 Watts

LOUD SPEAKER

VOICE COIL IMPEDANCE

POWER OUTPUT

110-120 Volt AC-DC & Battery

Two 4½ Volt "A" Firestone Type 4-D-86

Two 45 Volt "B" Firestone Type 4-D-85

1620 to 530 K. C.

455 K. C.

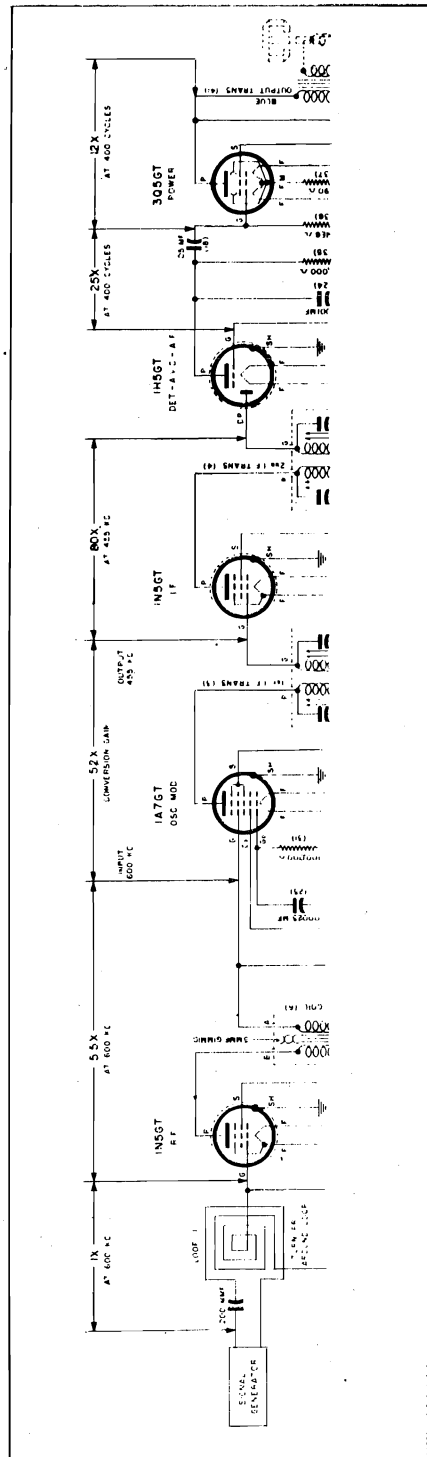
POWER SUPPLY BATTERIES

TUNING RANGE

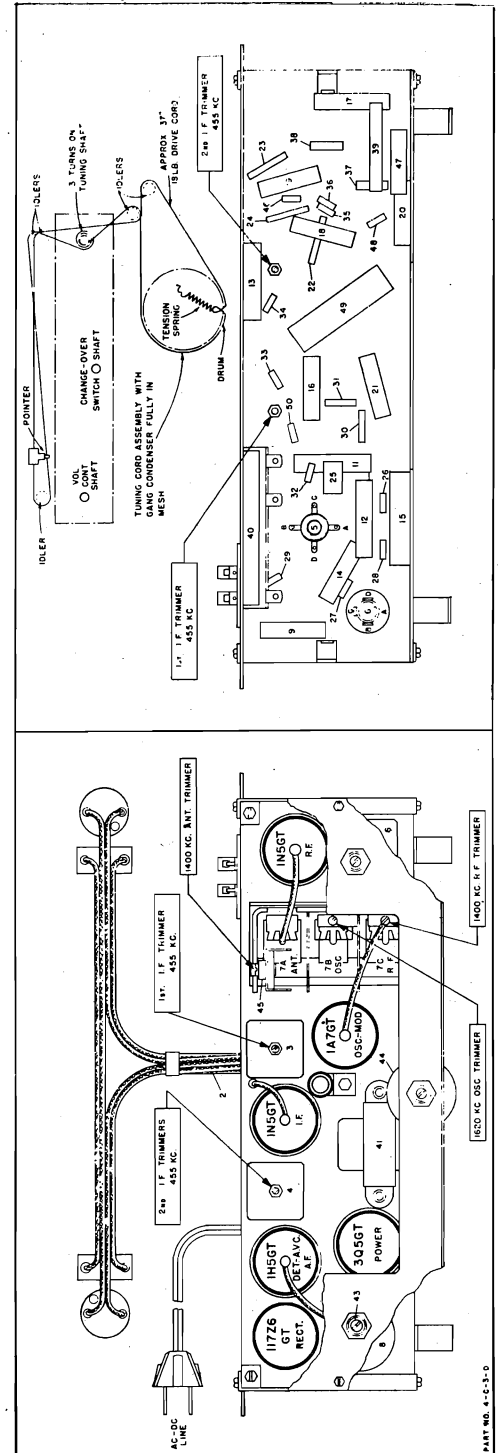
INTERMEDIATE FREQ

Be sure R.F. and I.F. stages are accurately aligned before measuring gain. R.F. gains can be measured with a "channel" type instrument containing a tuned and calibrated R.F. amplifier. A vacuum tube voltmeter may be used for audio gain measurements. Observe following precautions:

1. For all gain measurements connect signal generator as shown. Use 600 KC. signal with 400 cycle modulation (use weak signal for sharp tuning.)
2. Be sure radio is carefully tuned to generator signal (use weak signal for sharp tuning.)
3. When using a "channel" type instrument carefully tune it for maximum output at desired frequency before making measurements.



Differences in tube characteristics, tolerance of parts, adjustment of tuned circuits, and variations of line voltage will influence stage gain. Accuracy of measurements is dependent upon careful tuning of receiver to generator signal and experience in using your test equipment. These factors may create considerable variation in gain measurements.



MODEL 4-C-3

THE FIRESTONE TIRE & RUBBER CO.

ALIGNMENT PROCEDURE

Be sure to follow procedure carefully and in the order given—otherwise the receiver will be insensitive and the dial calibration incorrect. For alignment procedure read tabulations from left to right. Make the adjustment marked (1) first, (2) next, (3) third, etc.

Before starting alignment:

- Check tuning dial adjustment by tuning gang condenser until plates touch maximum capacity stop (completely in mesh) at which point the dial needle must be exactly even with the last line at the low frequency end of the dial calibration. If dial needle does not point exactly to last line, move to correct position.
- Use an accurately calibrated test oscillator with some type of output measuring device.
- WHEN ADJUSTING 1620 KC OSCILLATOR TRIMMER AND 1400 KC R. F. TRIMMER**, remove chassis from cabinet and disconnect the white-green and white-black loop connection wires from the two Fahenstock clips mounted on rear of chassis. Attach a 1 megohm resistor across these Fahenstock clips and feed output of test oscillator across the 1 megohm resistor.
- THE 1400 KC LOOP ANTENNA TRIMMER** is accessible from the rear of the chassis when the inner back is removed. It should be adjusted only after all other adjustments have been made and with the set mounted in the cabinet, and the loop in an upright position. When aligning the 1400 KC Antenna Trimmer, couple test oscillator to receiver loop by: (1) make loop consisting of five to ten turns of No. 20 to No. 30 size wire, wound on a 2" or 3" form; (2) connect this loop across output of test oscillator; (3) place test oscillator loop near radio loop. **BE SURE THAT NEITHER LOOP MOVES WHILE ALIGNING.**

Steps	Set receiver dial to:	TEST OSCILLATOR			Refer to parts layout diagram for location of trimmers mentioned below:
		Adjust test oscillator frequency to:	Use dummy antenna in series with output of test oscillator consisting of:	Attach output of test oscillator to	
1	Any point where no interfering signal is received	Exactly 455 K. C.	0.2 Mfd. Condenser	High side to grid of 1A7GT tube, Low side to chassis (if non-Underwriter Approved) or Common Negative (if Underwriter Approved).	Adjust each of the 2nd I.F. transformer trimmer adjustment screws for maximum output, then adjust each of the 1st I.F. transformer trimmer adjustment screws for maximum output.
2	Rotate gang condenser to minimum capacity	Exactly 1620 K. C.	See paragraph (C) above	See paragraph (C) above	Adjust 1620 Osc. Trimmer for maximum 1620 K. C. signal.
3	Rotate gang condenser to 1400 K.C.	Exactly 1400 K. C.			Adjust 1400 K.C. R.F. Trimmer for maximum output.
4	Approximately 1400 K. C.	Approx. 1400 K. C.	See paragraph (D) above	See paragraph (D) above	Adjust 1400 K.C. antenna trimmer for maximum output.

PARTS LIST

III. No.	Part No.	Part Name	Description	III. No.	Part No.	Part Name	Description
1	20E120-1	Antenna	Cabinet Door Assembly Complete with Hinges & Door Stop	24	23E39	Condenser	Mica, .0001 Mfd.
2	20E118	Cable	Battery Cable with "A" & "B" Plugs	25	23E42	Condenser	Mica, .00025 Mfd.
3	20E53	Coil	1st I.F. Transformer	26	27E225	Resistor	Carbon, 2.2 Megohm, 1/3 W.
4	20E54	Coil	2nd I.F. Transformer	27	27E685	Resistor	Carbon, 6.8 Megohm, 1/3 W.
*5	20E237	Coil	Oscillator (use with 24E7A Cond.)	28	27E685	Resistor	Carbon, 6.8 Megohm, 1/3 W.
OR				29	27E681	Resistor	Carbon, 680 Ohm, 1/3 W.
*5	20E248	Coil	Oscillator (use with 24E7B Cond.)	30	27E391	Resistor	Carbon, 390 Ohm, 1/3 W.
6	20E48	Coil	R. F.	31	27E104	Resistor	Carbon, 100,000 Ohm, 1/3 W.
*7	24E7A	Condenser	Tuning, 3 Gang (use with 20E237 Osc. Coil)	32	27E223	Resistor	Carbon, 22,000 Ohm, 1/3 W.
OR				33	27E334	Resistor	Carbon, 330,000 Ohm, 1/3 W.
*7	24E7B	Condenser	Tuning, 3 Gang (use with 20E248 Osc. Coil)	34	27E105	Resistor	Carbon, 1 Megohm, 1/3 W.
8	25E11	Condenser	Tubular, Dry Elect. 40-40 Mfd. 25 V.	35	27E684	Resistor	Carbon, 680,000 Ohm, 1/3 W.
9	23E218	Condenser	Tubular, .1 Mfd. 200 V.	36	27E105	Resistor	Carbon, 1 Megohm, 1/3 W.
10	23E218	Condenser	Tubular, .1 Mfd. 200 V.	37	27E391	Resistor	Carbon, 390 Ohm, 1/3 W.
11	23E218	Condenser	Tubular, .1 Mfd. 200 V.	38	27E681	Resistor	Carbon, 680 Ohm, 1/3 W.
12	23E218	Condenser	Tubular, .1 Mfd. 200 V.	39	27E1001	Resistor	Flexible Wire Wound, 75 Ohm, 2 W.
13	23E218	Condenser	Tubular, .1 Mfd. 200 V.	40	27E1000	Resistor	Wire Wound 500 & 1900 Ohms
14	23E216	Condenser	Tubular, .05 Mfd. 200 V.	41	22E15	Transformer	Output
15	23E224	Condenser	Tubular, .5 Mfd. 200 V.	42	1E18	Speaker	5" P.M. Dynamic
16	23E216	Condenser	Tubular, .05 Mfd. 200 V.	43	28E13	Volume Control	500,000 Ohms
17	23E416	Condenser	Tubular, .05 Mfd. 400 V.	44	29E10	Switch	4 Pole 3 Pos.
18	23E216	Condenser	Tubular, .05 Mfd. 200 V.	45	24E21	Condenser	Trimmer 3-35 Mmf.
19	23E406	Condenser	Tubular, .003 Mfd. 400 V.	46	27E106	Resistor	Carbon, 10 Megohm, 1/3 W.
20	23E406	Condenser	Tubular, .003 Mfd. 400 V.	47	23E216	Condenser	Tubular, .05 Mfd. 200 V.
21	23E408	Condenser	Tubular, .005 Mfd. 400 V.	48	27E224	Resistor	Carbon, 220,000 Ohm, 1/3 W.
22	23E39	Condenser	Mica, .0001 Mfd.	**49	25E19	Condenser	Tubular, Dry Elect. 100 Mfd. 25 V.
23	23E39	Condenser	Mica, .0001 Mfd.	50	27E105	Resistor	Carbon, 1 Megohm, 1/3 W.

MISCELLANEOUS PARTS

Part No.	Part Name	Description	Part No.	Part Name	Description
17E3-2	"A" Battery Plug	2 Prong "A" Battery Plug	10E43	Dial Scale Fastener	Trimount Stud for fastening Scale
17E3-5	"B" Battery Plug	3 Prong "B" Battery Plug	35E20-1	Dial Pointer	Dial Indicator
7E63	Cabinet	Cabinet less Loop Door & Inner Barrier	65E2	Dial Spring	Tension Spring for Drive Cord
41E1	Cord	6 Ft. Rubber Line Cord	37E1-1	Knob	1-1/8" Dia. for Tuning & Volume Control
20E121	Door Stop Assembly	Stop for Door & Loop Assembly	37E2-1	Knob	3/4" Dia. for Changeover Switch
5E17	Dial Plate Assembly	Dial Back Plate Assembly less Dial Scale	55E18	Hinge	Hinge for Cabinet Door & Loop Assembly
5E16	Dial Front Plate	Metal Control Plate for Cabinet, less Crystal	17E17	Pilot Lamp Socket Assembly	Pilot Lamp Socket Assembly less Lamp
9E6	Dial Crystal	Crystal for Front Plate	40E2	Pilot Lamp	6-8 volt .250 amp. Type
36E22	Dial Scale	Calibrated Scale	69E72F47	Rivet	No. 44 Lamp
4E1	Dial Cord	18 lb. Dial Drive Cord	69E92F47	Rivet	For Hinge
68E10	Dial Shaft	Complete Shaft Assembly			For Door Stop

**NOTE No. 1: In early production, the two low voltage sections of filter condenser, Illus. No. 8, Part 25E11, shown in dotted lines on circuit diagram, were not used and in their place the 100 Mfd., Illus. No. 49, Part 25E19 was used.

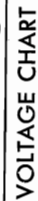
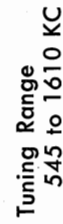
In later production all four sections of Illus. No. 8, Part 25E11, were used and condenser, Illus. No. 49, Part 25E19, was eliminated.

*NOTE No. 2: CHASSIS MARKED WITH LETTER "A" adjacent to serial number use Part 24E7A Gang Condenser and Part 20E237 Oscillator Coil.

CHASSIS MARKED WITH LETTER "B" adjacent to serial number use Part 24E7B Gang Condenser and Part 20E248 Oscillator Coil.

THESE GANG CONDENSERS AND OSCILLATOR COILS ARE NOT INTERCHANGEABLE.

DO NOT use Part 24E7A Gang Condenser with Part 20E248 Osc. Coil, or Part 24E7B Gang Condenser with Part 20E237 Osc. Coil.



Voltages shown outside the circles are obtained when the set is operated on batteries. New batteries in good condition should be used for these measurements.



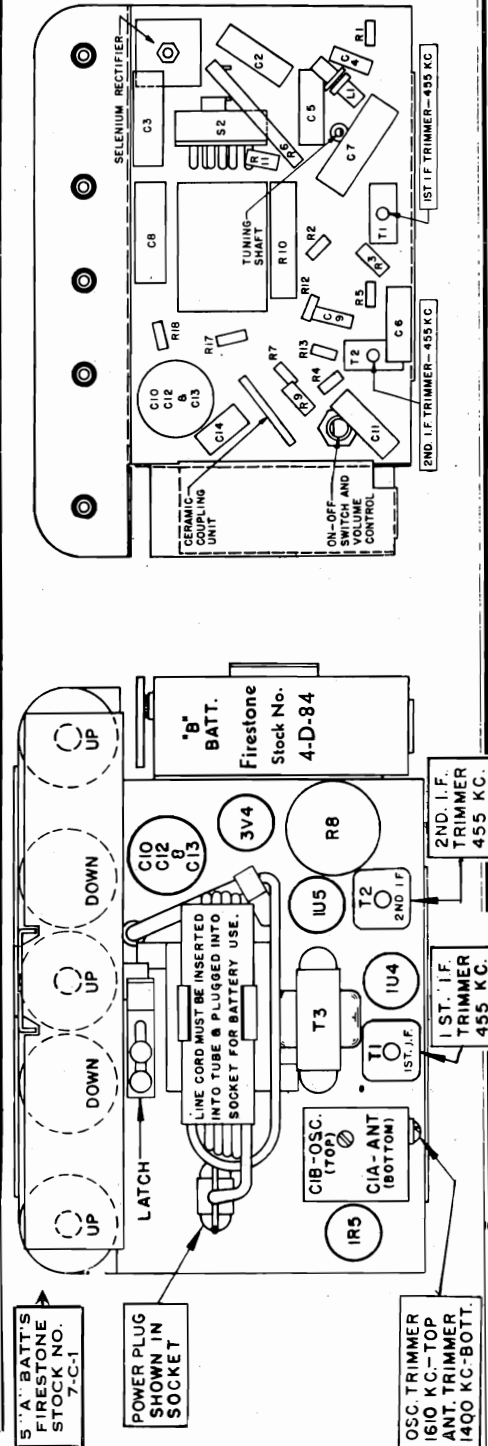
ALIGNMENT PROCEDURE

The alignment should be made with volume control fully on, and the output from the signal generator as low as possible, to prevent A.V.C. action from interfering with correct alignment.

For alignment procedure read tabulations from left to right, and make the adjustment marked (1) first, (2) next, (3) third. Before starting alignment:

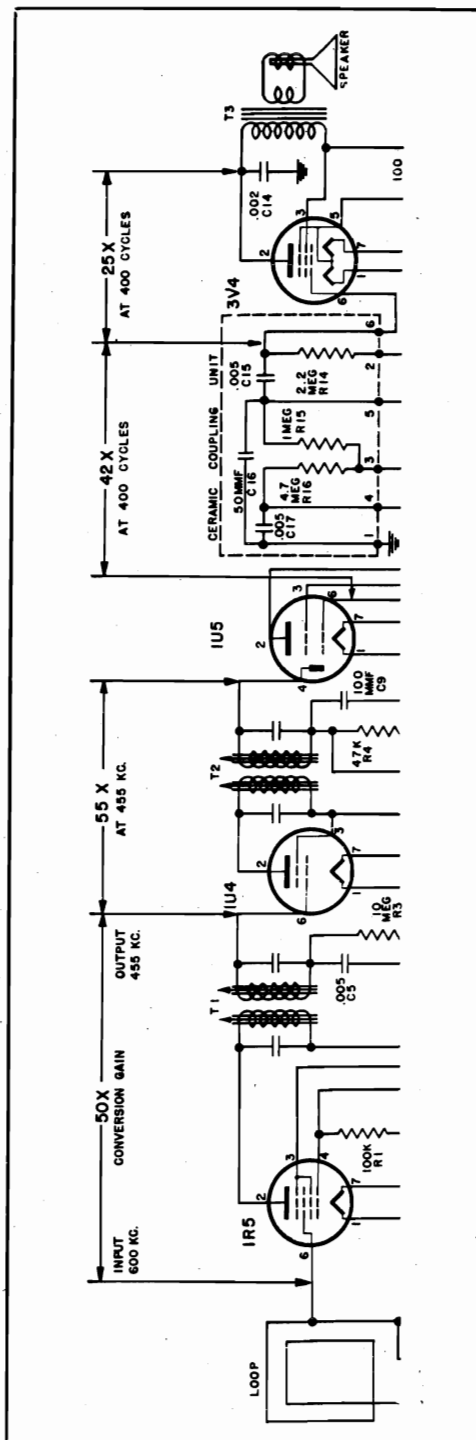
- (a) Check calibrated dial knob to see that it is positioned correctly. Turn Variable Condenser to its maximum capacity, plates completely in mesh. Adjust the knob so that the right hand edge of the small 5 in the 55 calibration number is in line with the indicator (dot) on the cabinet.
- (b) Use an accurately calibrated test oscillator with some type of output measuring device.

Steps	TEST OSCILLATOR			Refer to parts layout diagram for location of trimmers mentioned below:
	Set receiver dial to:	Adjust test oscillator frequency to:	Use dummy antenna in series with output of test oscillator consisting of:	Attach output of test oscillator to:
1	Minimum capacity (fully open)	455 K.C.	.1 MFD. condenser	High side to grid of 1R5 tube. Low side to common negative. (through .25 MFD. Cond.)
2	Minimum capacity (fully open)	Exactly 1610 K.C.	.1 MFD. condenser	High side to grid of 1R5 tube. Low side to common negative.
3	Approx. 1400 K.C.	Approx. 1400 K.C.		Loosely coupled to Loop Antenna
				Adjust 1610 K.C. oscillator trimmer for maximum output.
				Adjust 1400 K.C. antenna trimmer for maximum output.



Before proceeding with stage measurements be sure the receiver is properly aligned. R.F. gains can be measured by a "channel" type instrument containing a tuned and calibrated R.F. amplifier. A vacuum tube voltmeter may be used for audio gain measurements. Observe the following precautions:

1. For gain measurements connect the high side of the signal generator through a .1 MFD condenser to the appropriate point as indicated on the diagram below. The ground of the signal generator should be connected to common negative. The RF and IF measurements are made using 30% 400 cycle modulation.
2. Be sure radio is carefully tuned to generator signal (use weak signal for sharp tuning).
3. When using a "channel" type instrument carefully tune it for maximum output at desired frequency before making measurements.



Stage gain measurements can be influenced by the normal manufacturers tolerances allowed in parts, differences in individual tube characteristics, the adjustment of the tuned circuits and variations in line voltage. Careful tuning of the receiver as well as experience in using your test equipment will determine the accuracy of the measurements taken. Due to all of these factors, the stage gains shown in the above diagram are approximate values rather than absolute as it is possible to introduce many variations in these measurements.

Code No.	Part No.	Description
C1A, C1B	B19-197	Variable condenser
C2, C6	A16-152	.05 MFD 200 volt condenser
C3	A16-158	.05 MFD 400 volt condenser
C4	A15-175	50 MMF mica condenser
C5, C11	A16-153	.005 MFD 600 volt condenser
C7	A16-157	.1 MFD 200 volt condenser
C8	A16-189	.05 MFD 400 volt condenser
C9	A15-188	100 MMF mica condenser
C10	A18-290	40 MFD 150 volt electrolytic cond.
C12		30 MFD 150 volt electrolytic cond.
C13		100 MFD 10 volt electrolytic cond.
C14	A16-182	.002 MFD 200 volt condenser
C15	*A17-100	.005 MMF
C16		.005 MFD
C17		50 MMF
R1	A60-671	100K ohm 1/2 watt 20% resistor
R2	A60-680	1500 ohm 1/2 watt 10% resistor
R3, R9	A60-663	10 megohm 1/2 watt 20% resistor
R4		47K ohm 1/2 watt 20% resistor
R5	A60-685	2.2 megohm 1/2 watt 20% resistor
R6	A60-684	2.2 megohm 1/2 watt 20% resistor
R7	A60-725	160 ohm 5 watt 10% resistor
R8	A60-722	470 ohm 1/2 watt 10% resistor
R10	A24-178	Volume control, with switch
R11	A60-757	2000 ohm 10 watt 10% resistor
R12	A60-724	3300 ohm 1 watt 10% resistor
R13	A60-655	390 ohm 1/2 watt 10% resistor
R14	A60-756	1200 ohm 1/2 watt 10% resistor
R15	*A17-100	2.2 megohm
R16		1 megohm
R17		4.7 megohm
L1	A10-514	Oscillator coil
T1, T2	C10-475	1st and 2nd I.F. transformer
T3	B80-245	Output transformer
S2	A69-182	Switch, AC-DC, battery

*NOTE: C15, C16, C17, R14, R15, R16 are contained in the Ceramic Coupling Unit Part No. A17-100



To turn the receiver on, rotate the volume control and switch knob (left hand knob) to the right about half its range. After allowing about 30 seconds for the tubes to warm up, the desired station may be tuned by rotating the tuning control (right hand knob) to the desired frequency. The dial scale is calibrated in kilocycles minus the final two zeros. After the station has been properly tuned, the volume may be adjusted by means of the volume control knob. To increase the volume, turn the control to the right; to decrease the volume, turn it to the left. Turning this control to the left as far as it will go, turns the radio off.

Fig. 2 Side View, Showing Mounting

Labels in the diagram include: FUSE, LOCKWASHER, SPACERWASHER, ANTENNA TRIMMER, C'SINK LOCKWASHER, INSTRUMENT PANEL, FRONT MTG. STRAP, ANT. RECEPTACLE, RADIO, REAR MTG. STRAP, BOLT, NUT, and FIRFWALL. A PT. NO. MACH. SCREW is also indicated at the top right corner.

Power Supply	6.3 volts DC
Current	4.8 amp. average
Frequency Range	540 to 1600 KC
I. F. Frequency	455 KC
Speaker	4" P. M.
Power Output	1.2 watts, undistorted 2.5 watts, maximum
Sensitivity	10 microvolts average for 1 watt output
Selectivity	20 KC broad at 1000 times signal, at 1000 KC

1—6SK7GT—R. F. Amplifier.
1—6SA7GT—Converter.
1—6SK7GT—I.F. Amplifier.
1—6SQ7—Detector—AVC—1st audio.
1—6V6GT—Power output.
1—6X5GT—Rectifier.

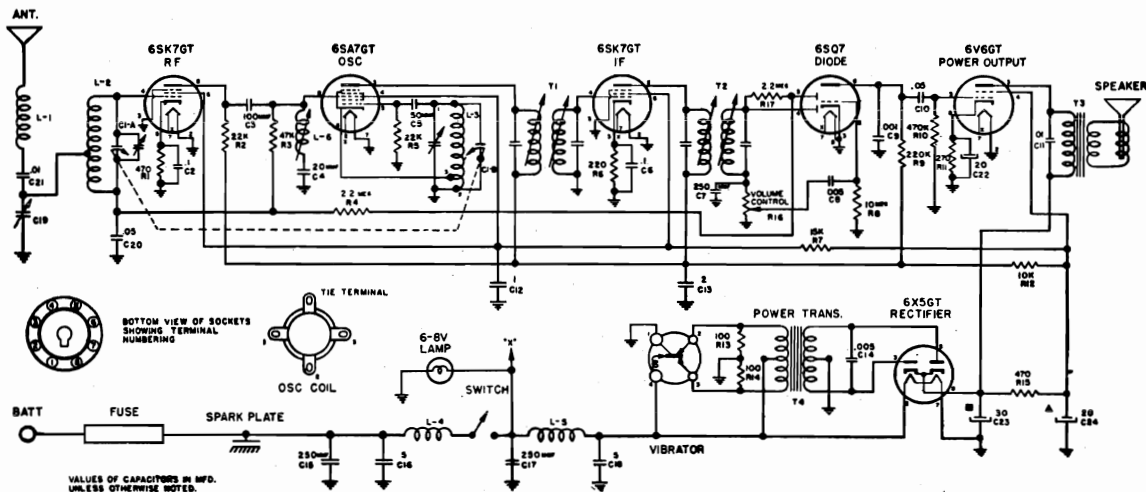


Fig. 3 Schematic Diagram

ALIGNMENT PROCEDURE

Volume control—Maximum, all adjustments.

No signal applied to antenna.

Power input—6.3 volts.

Connect dummy antenna in series with output lead of signal generator.

Connect output meter across volce coil.

Connect ground lead of signal generator to chassis.

Repeat alignment procedure as a final check.

The following equipment is necessary for proper alignment:

Signal generator that will provide the test frequencies as listed.

Non-metallic screwdriver.

Output meter.

Dummy antennas—.1 MFD., .00025 MFD.

For alignment points refer to Figures 4 and 5.

Dial Setting	Generator Frequency	Dummy Ant.	Generator Connections	Trimmer Reference	Trimmer Adjustment	Trimmer Function
Fully Open	455 KC	.1 MFD.	6SA7 Grid	T2	Maximum	Output I.F.
Fully Open	455 KC	.1 MFD.	6SA7 Grid	T1	Maximum	Input I.F.
Fully Open	455 KC	.00025 MFD.	Ant. lead	L6	Minimum	Wave trap
Fully Open	1600 KC	.00025 MFD.	Ant. lead	C1B	Maximum	Oscillator
Tune in signal from generator	1400 KC	.00025 MFD.	Ant. lead	C1A	Maximum	Antenna

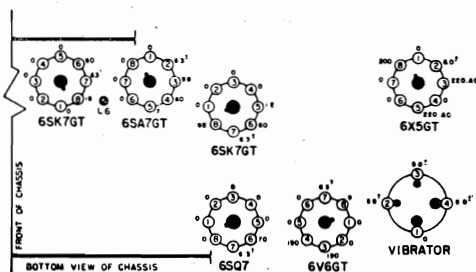


Fig. 4 Socket Voltages

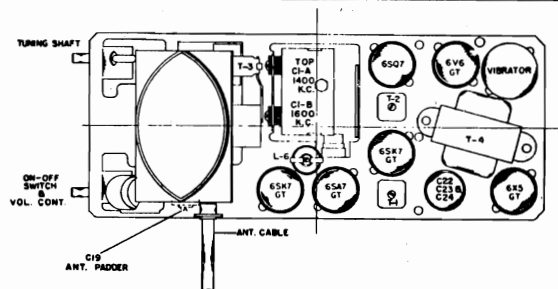


Fig. 5 Tube and Trimmer Locations

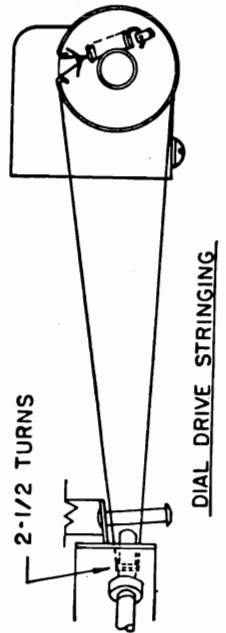
INSTRUCTIONS FOR REMOVING CHASSIS FROM THE CASE

The bottom cover (the one with the speaker louvers) can be removed to permit servicing of major components, such as tubes and vibrator, by removing the eight (8) screws holding it to the top cover. There are three (3) screws on each side, one (1) in the rear, and one (1) in the front.

CAUTION: Before attempting to remove the top cover, to service condensers, resistors, etc., the screw connecting the spark plate to the "A" terminal (inside case) must be removed. This is a round head screw, and is located on the rear of the case, close to the mounting stud bolt. It is recessed in a $\frac{1}{2}$ inch hole in the case itself, thereby permitting contact with the spark plate.

After removing the spark plate screw, remove the two knobs by pulling forward and remove the eight (8) screws securing the cover to the chassis. Lift the chassis at the rear, at the same time moving it away from the front of the case so that the volume and tuning shafts will clear the holes in the cover.

NOTE: When reinstalling the chassis into the case, be sure the screw connecting the spark plate to the "A" terminal (inside case) is tightened very securely, otherwise the receiver will not operate properly.



SERVICE NOTES

Voltages taken from the different points of the circuit to the chassis are measured with volume control in maximum position, all tubes in their sockets, no signal applied, and with a volt meter having a resistance of 20,000 ohms per volt. These voltages are clearly shown on the voltage chart, (Fig. 4).

All voltages should be measured with an input voltage of 6.3 volts DC.

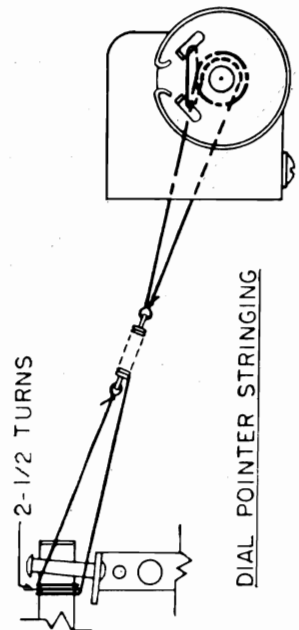
FINAL ADJUSTMENTS

The input circuit has been especially designed to be used with a low capacity antenna, of the fish pole or whip type.

To adjust the antenna trimmer condenser, carefully tune the receiver to a weak station at approximately 600 kilocycles (K.C.). Remove the snap button covering the antenna trimmer (See Figure 2) and adjust the trimmer for maximum volume. A small screw driver will be needed for this purpose.

ALIGNING INSTRUCTION

Never attempt any adjustments on this receiver unless it becomes necessary to replace a coil or transformer, or the adjustments have been tampered with in the field. Always make certain that other circuit components, such as tubes, condensers, resistors, etc., are normal before proceeding with realignment.



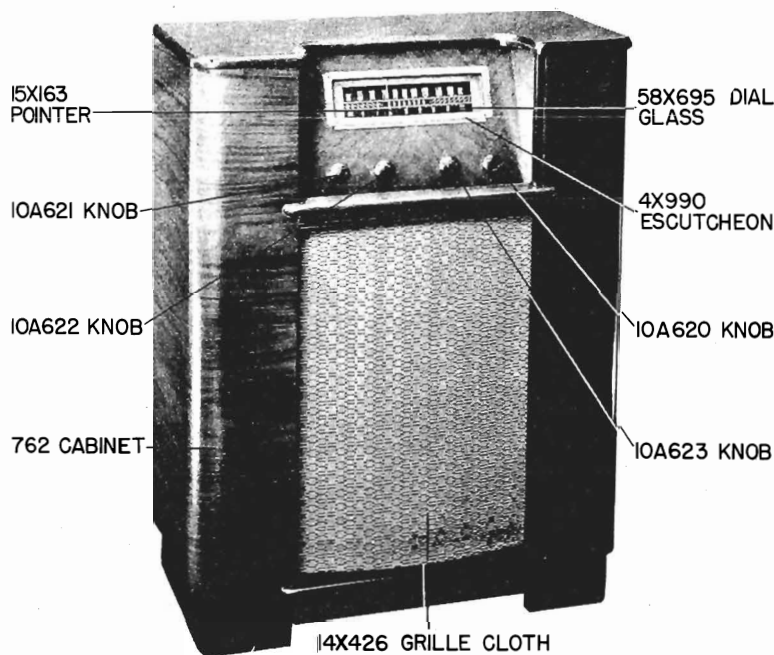
MODEL 43-5006,

GAMBLE-SKOGMO, INC.

SYMBOL	PART NO.	DESCRIPTION	VALUE	TOL	RATING
CONDENSERS					
C1A, C1B	B19-196	Variable condenser			400 volt
C2, C6, C12	A16-187	Condenser	.1 MFD		
C3	A15-196	Ceramic condenser	100 MMFD		
C4	A15-202	Ceramic condenser	20 MMFD		
C5	A15-204	Ceramic condenser	50 MMFD		
C7, C15, C17	A15-176	Mica condenser	250 MMFD		
C8	A16-190	Condenser	.005 MFD		600 volt
C9	A16-195	Ceramic condenser	.001 MFD		
C10	A16-193	Condenser	.05 MFD		600 volt
C11, C21	A16-192	Condenser	.01 MFD		400 volt
C13	A16-188	Condenser	.2 MFD		400 volt
C14	A16-185	Oil filled condenser	.005 MFD		1600 volt
C16, C18	A16-184	Condenser	.5 MFD		100 volt
C19	A20-145	Trimmer condenser			
C20	A16-189	Condenser	.05 MFD		400 volt
C22		Electrolytic condenser	20 MFD		25 volt
C23		Electrolytic condenser	30 MFD		350 volt
C24	A18-289	Electrolytic condenser	20 MFD		350 volt
RESISTORS					
R1	A60-722	Resistor	470 ohm	20%	1/2 watt
R13, R14	A60-752	Resistor	100 ohm	10%	1/2 watt
R2, R5	A60-744	Resistor	22K ohm	10%	1/2 watt
R3	A60-685	Resistor	47K ohm	20%	1/2 watt
R4, R17	A60-726	Resistor	2.2 megohm	20%	1/2 watt
R6	A60-753	Resistor	220 ohm	10%	1/2 watt
R7	A60-716	Resistor	15K ohm	10%	1 watt
R8	A60-728	Resistor	10 megohm	20%	1/2 watt
R9	A60-667	Resistor	220K ohm	20%	1/2 watt
R10	A60-731	Resistor	470K ohm	20%	1/2 watt
R11	A60-754	Resistor	270 ohm	10%	1 watt
R12	A60-698	Resistor	10K ohm	10%	1 watt
R15	A60-694	Resistor	470 ohm	10%	1 watt
R16	A24-177	Volume Control, w/switch	500,000 ohm		
COILS AND TRANSFORMERS					
L1	A10-513	Antenna loading coil			
L2	B10-511	Antenna coil			
L3	A10-512	Oscillator coil			
L4	A33-229	Choke, "A" line			
L5	A33-228	Choke, vibrator hash			
L6	A10-510	I.F. trap coil			
T1	A10-508	1st I.F. transformer			
T2	A10-509	2nd I.F. transformer			
T3	B80-242	Output transformer (part of speaker)			
T4	B80-243	Power transformer			
CABINET, DIAL, AND TUNING PARTS					
	A11-303	Bracket, dial scale			
	A11-304	Bracket, string guide			
	A72-29	Bushing, tuning shaft bearing			
	A70-130	Clip, spring, for tuning shaft			
	D40-141	Dial escutcheon			
	A58-55	Dial pointer			
	B67-522	Dial scale			
	A28-101	Gasket for speaker			
	A52-257	Knob			
	A89-10	Pilot light, type G.E. No. 422			
	A65-37	Rivet, shoulder, for string guide bracket			
	A75-68	Shaft, tuning			
	A75-67	Shaft, for dial pointer			
	A70-132	Spring, for pilot light socket			
	A70-133	Spring, string tension, pointer drive, and tuning			
MISCELLANEOUS					
	A83-421	Clip, I.F. transformer mounting			
	A83-517	Clip, oscillator coil mounting			
	A43-10	Fuse, 15 Amp.			
	A47-112	Grommet, rubber (for mounting speaker and variable condenser)			
	B31-134	Mounting strap, rear			
	A31-139	Mounting plate, front			
	S84-192	Mounting parts kit			
	A87-38	Receptacle, antenna cable			
	B79-362	Speaker, 4" P.M. (includes output transformer)			
	S84-193	Suppression kit assembly			
	A34-105	Vibrator			
	A83-519	Wiper, grounding, for case covers			

GAMBLE-SKOGMO, INC.

MODEL 43-6927



ALIGNMENT PROCEDURE

Volume Control—Maximum all adjustments.

Connect radio chassis to ground post of signal generator with a short heavy lead.

Allow chassis and signal generator to "heat up" for several minutes.

The following equipment is required for aligning:

An All Wave Signal Generator which will provide an accurately calibrated signal at the test frequencies as listed.

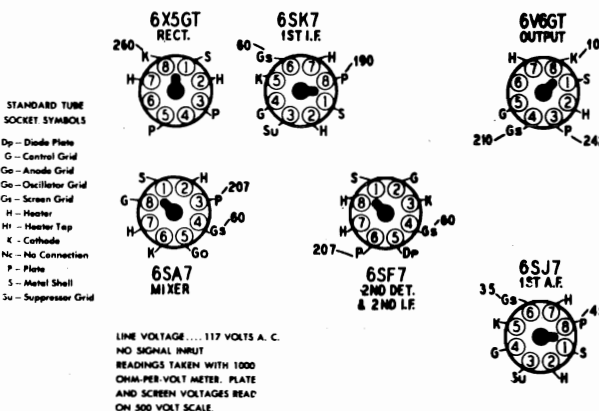
Output Indicating Meter—Non-metallic screwdriver.

Dummy Antennas—.1 mf., 50 mmf., and 400 ohms.

	SIGNAL GENERATOR FREQUENCY SETTING	CONNECTION AT RADIO	DUMMY ANTENNA	BAND SWITCH SETTING	CONDENSER SETTING	ADJUST TRIMMERS TO MAXIMUM
I. F.	455 Kc.	Grid of 6SA7 Pin 8	.1 mf.	B Range	Turn Rotor to Full Open	2nd I.F. (Pri.) and (Sec.) 1st I.F. (Pri.) and (Sec.)
RANGE B	1,620 Kc.	Antenna Lead	50 mmf.	B Range	Turn Rotor to Full Open	Oscillator Range B
	1,400 Kc.	Antenna Lead	50 mmf.	B Range	Tune Rotor to Max. Output Set Pointer to 1,400 Kc. (See Note A)	Antenna Range B
	600 Kc.	Antenna Lead	50 mmf.	B Range	Tune Rotor to Max. Output	Oscillator (600 Kc. Padder) Rock Rotor See Note B
	Repeat above steps at 1,620 and 600 Kc. until readjusting the oscillator. Range B Trimmer causes no further improvement of output.					
RANGE D	18.3 Mc.	Antenna Lead	400 ohm	D Range	Turn Rotor to Full Open	Oscillator Range D
	16 Mc.	Antenna Lead	400 ohm	D Range	Tune Rotor to Max. Output	Antenna Range D Rock Rotor—See Note B
LOOP RANGE B	Reassemble chassis in cabinet.					
	1,400 Kc.	Antenna Lead	50 mmf.	B Range	Tune Rotor to Max. Output	Antenna Range B

NOTE A—Set pointer at the 1,400 KC. mark on the dial scale. Attach pointer to drive cord.

NOTE B—Turn Rotor back and forth and adjust the trimmer until the peak of greatest intensity is obtained.



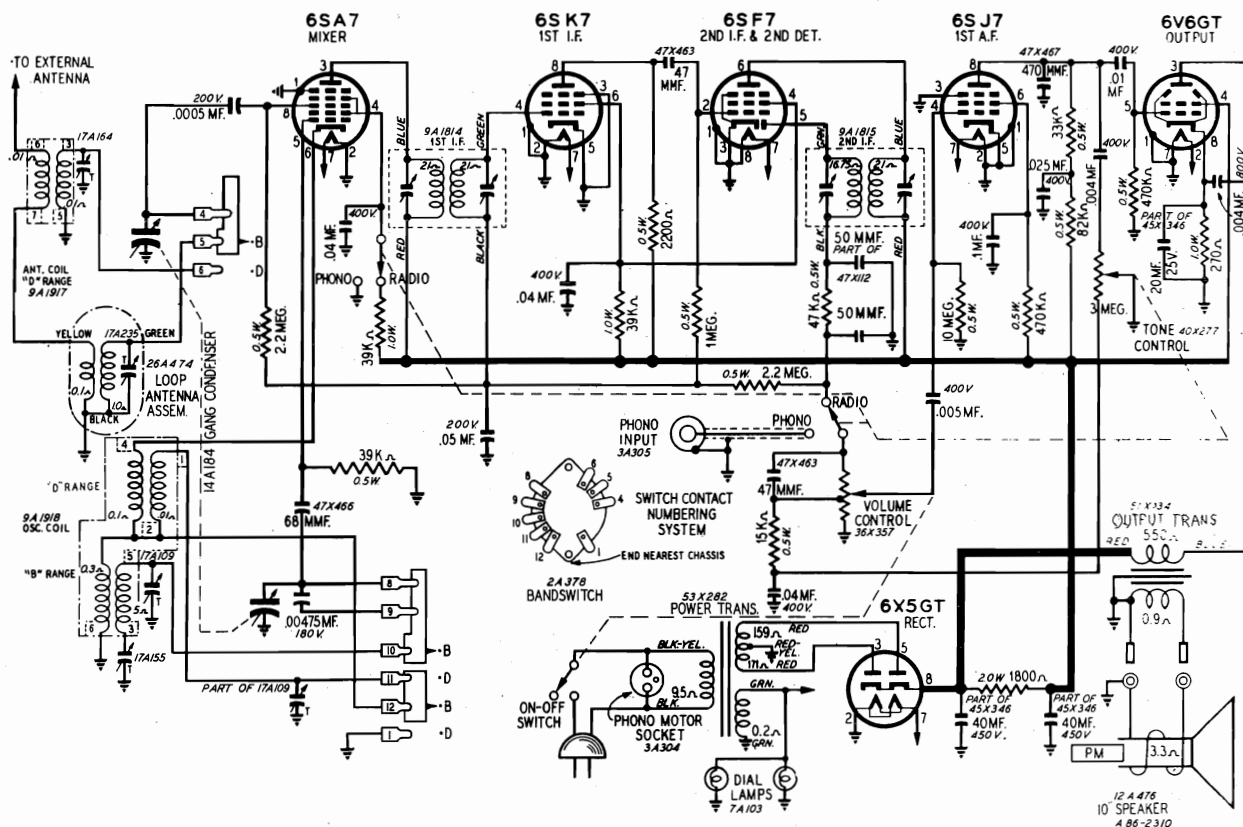
MODEL 43-6927

GAMBLE-SKOGMO, INC.

SPECIFICATIONS

6 Tube Superheterodyne, Including Rectifier Tube
 Speaker.....10" PM Dynamic
 Intermediate Frequency.....455 KC
 Selectivity.....40 KC Broad at 1000 Times Signal
 Sensitivity (For 0.5 Watt Output, with External Ant.
 B Range.....9 Microvolts Average
 D Range.....20 Microvolts Average

Power Supply.....105-125 Volts, 50 Cycles
 Power Consumption.....(at 117 Volts AC) 45 Watts
 Power Output...4 Watts Max. 2.3 Watts, 10% Harmonics
 Tuning Frequency Range
 B Range.....540-1600 Kilocycles
 D Range.....5.75 - 18.3 Megacycles



The Circuit and tube complement of the receiver are as follows:

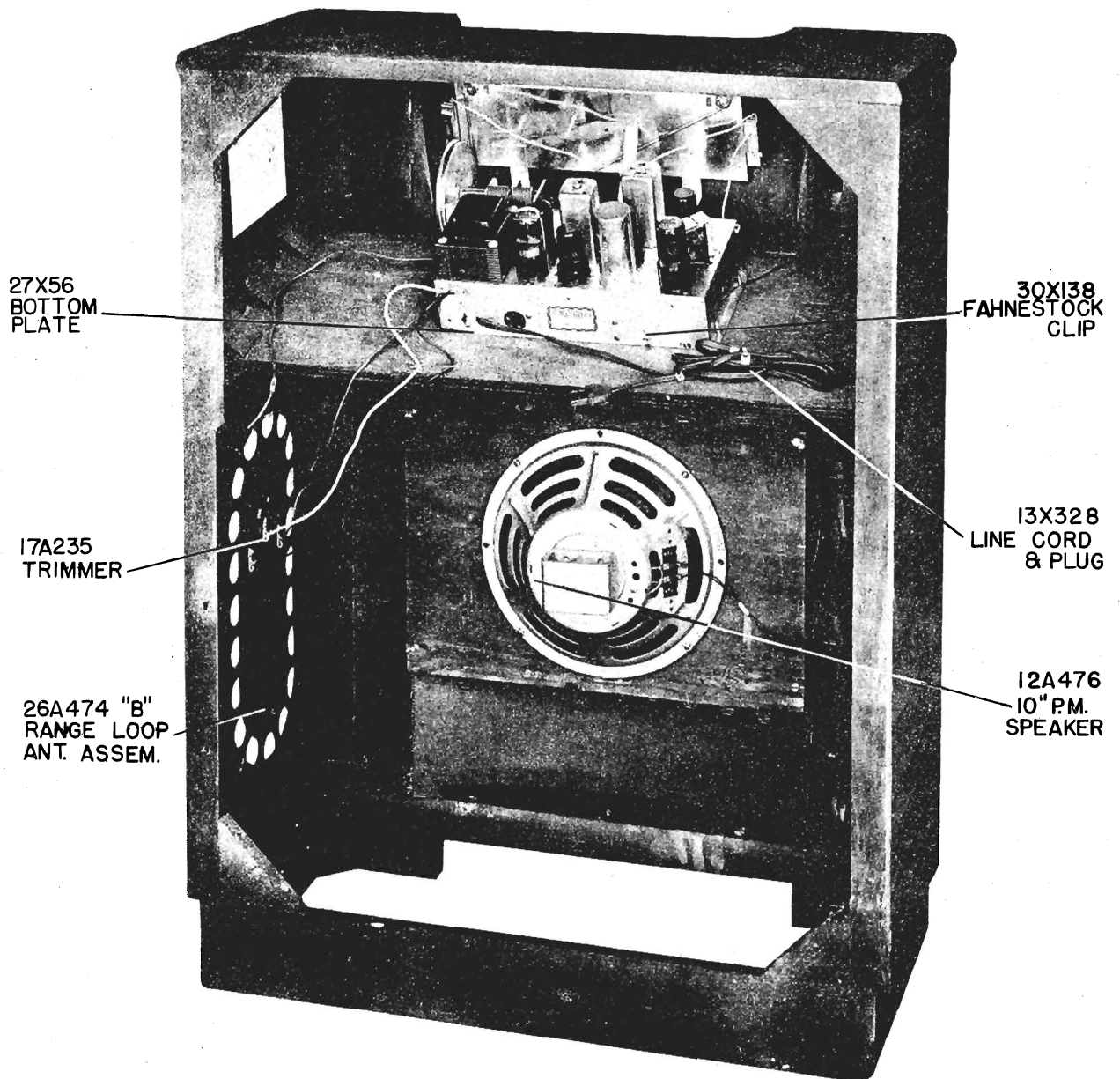
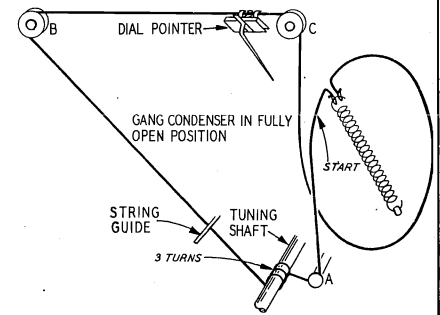
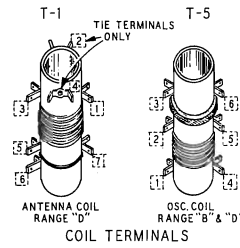
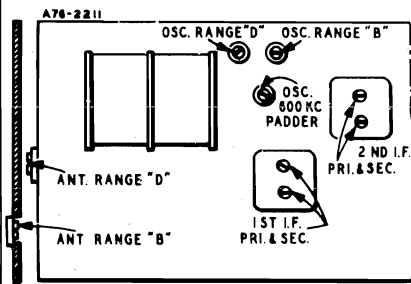
- 1 - 6SA7 1st Detector and Oscillator
- 1 - 6SK7 1st I-F Amplifier
- 1 - 6SF7 2nd I-F Amplifier and 2nd Detector
- 1 - 6SJ7 1st Audio Amplifier
- 1 - 6V6GT Power Output
- 1 - 6X5GT Rectifier

2 - No. 47 dial lamps are used for dial illumination.

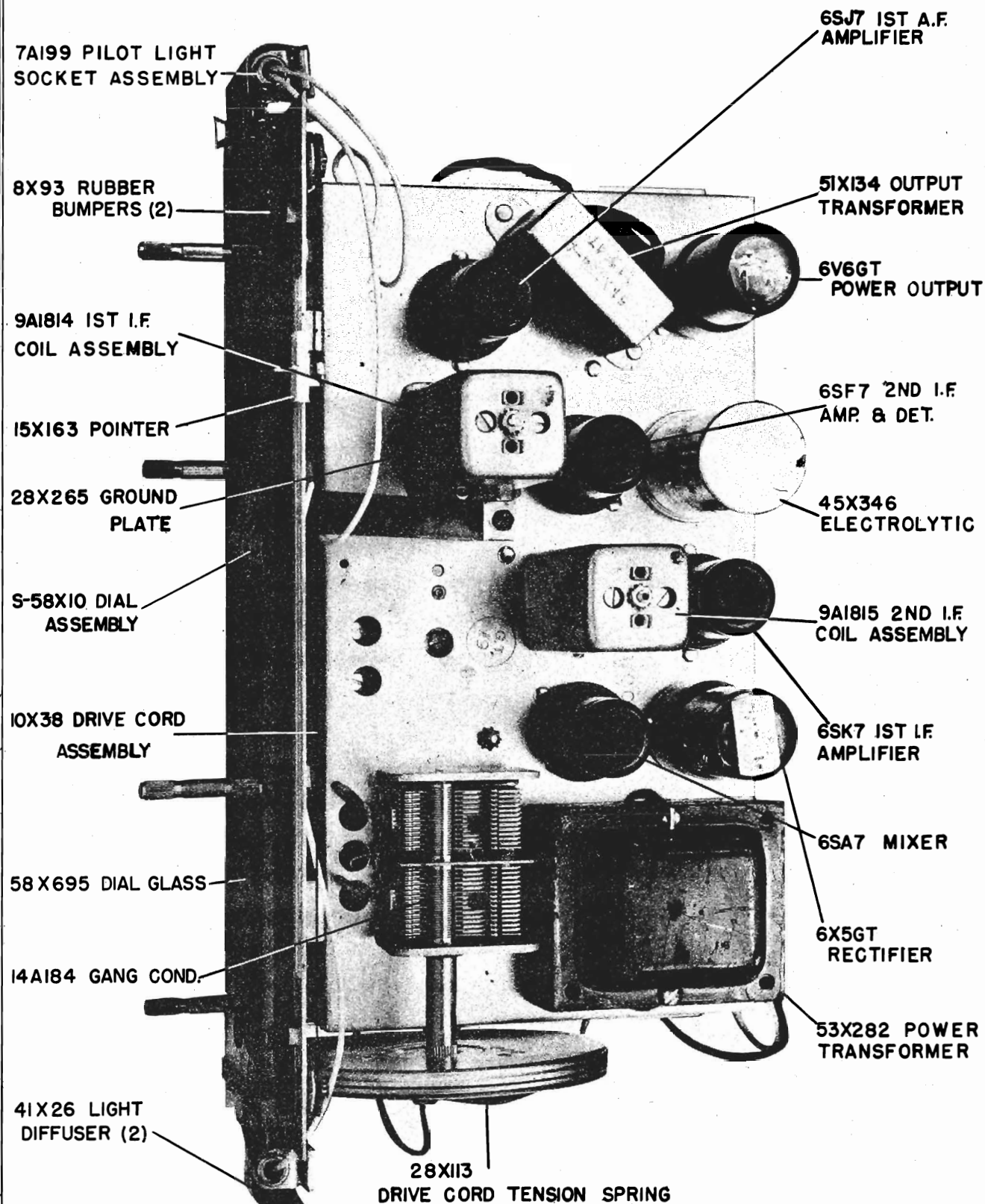
A jack is provided at the rear of the chassis for record player or other special service connections. This jack is switched in and out of the audio circuit with a switch controlled by the tone control knob. This switch also shorts out the R-F signal when it is turned to the phono position.

GAMBLE-SKOGMO, INC.

MODEL 43-6927



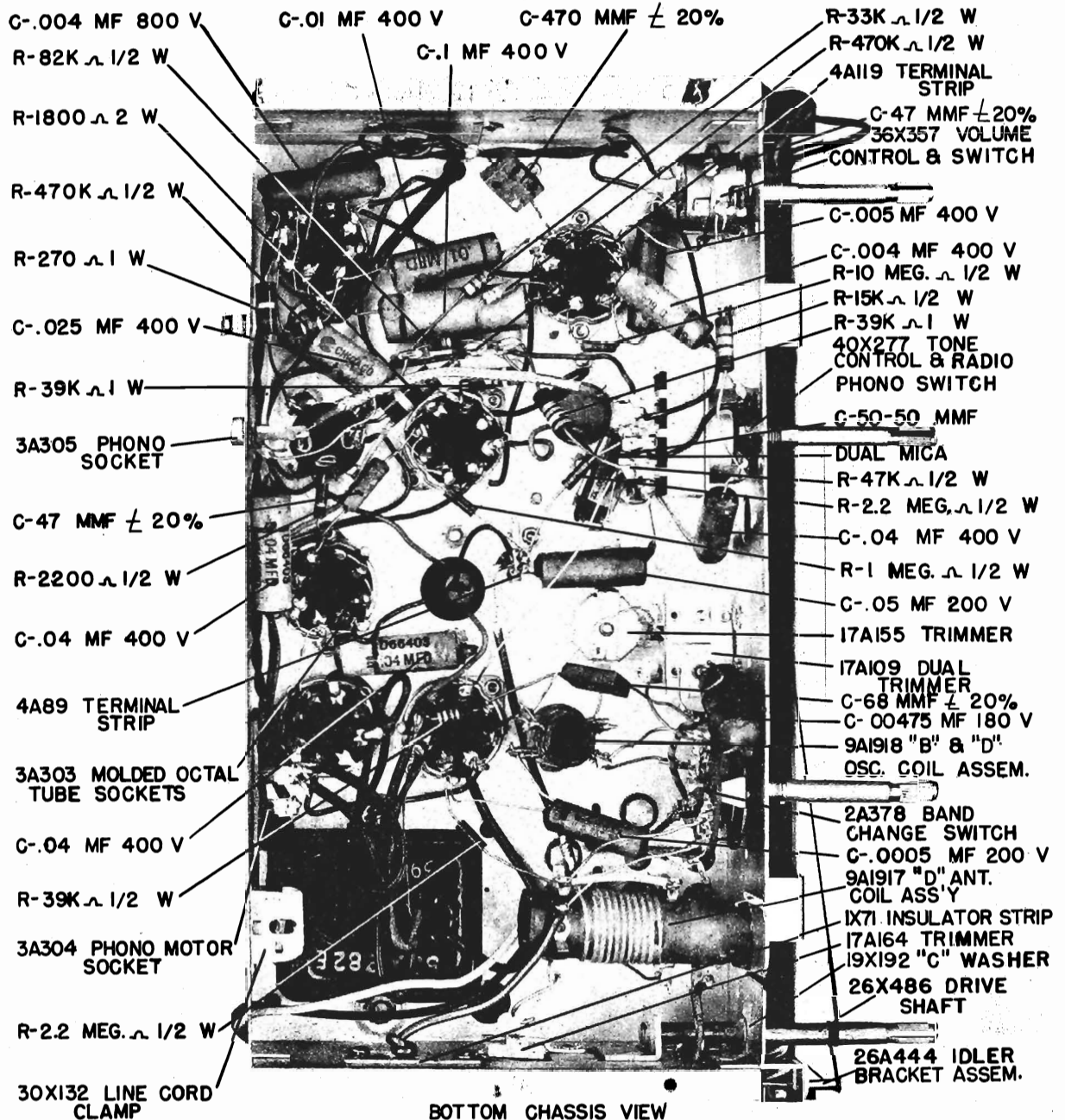
REAR CABINET VIEW



TOP CHASSIS VIEW

GAMBLE-SKOGMO, INC.

MODEL 43-6927



BOTTOM CHASSIS VIEW

Part No.	Description	Quantity
2A378	Band Change Switch	
3A303	Molded Octal Tube Socket	6
3A304	Phono Motor Socket	
3A304	Phono Socket	
4A89	Terminal Strip	
4A119	Terminal Strip	
7A103	#47 Pilot Light	2
7A199	Pilot Light Socket Assembly	
9A1814	1st I-F Coil Assembly	
9A1815	2nd I-F Coil Assembly	
9A1917	"D" Antenna Coil Assembly	
9A1918	"B" and "D" Oscillator Coil Assembly	
10A620	Knob (Tuning)	
10A621	Knob (Volume)	
10A622	Knob (Tone R.P.)	
10A623	Knob (SW-BC)	
12A476	Speaker, 10" P.M.	
14A184	Gang Condenser	
17A109	Trimmer Condenser, Dual, 2.5-55 mmf	
17A155	Trimmer Condenser, 350-430 mmf	
17A164	Trimmer Condenser, 5-50 mmf	

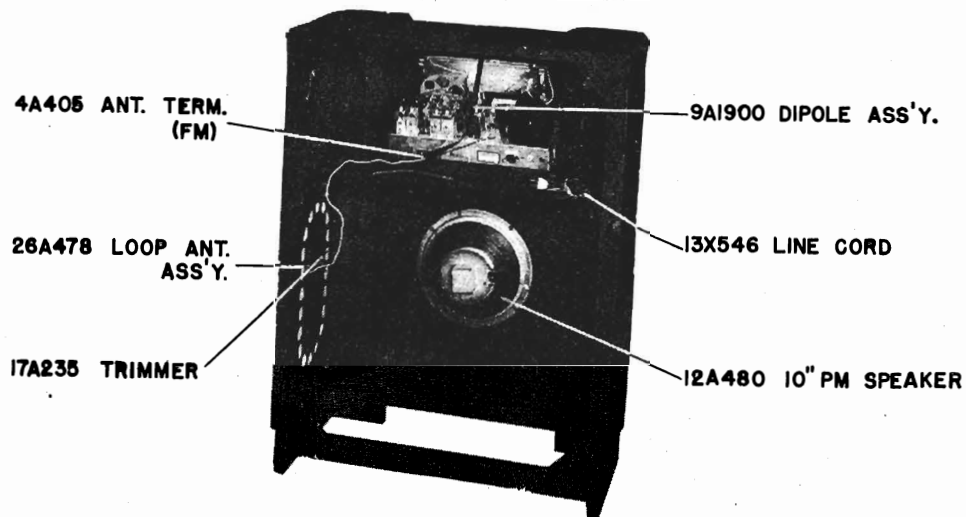
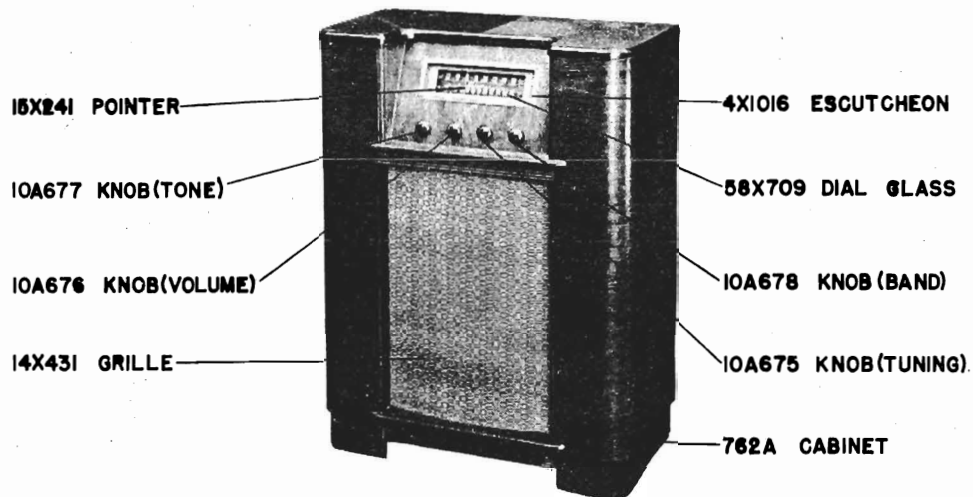
MODEL 43-6927

GAMBLE-SKOGMO, INC.

26A444	Idler Bracket consisting of:	
	25X1488 Idler Bracket	
26A474	20X1450 Rivet	
	"B" Range Loop Antenna Assembly consisting of:	
	9A1919 "B" Range Loop Antenna	
	17A235 Trimmer Condenser	
558X10	#1701 Tubular Rivet 3/16"	
	Dial Assembly consisting of:	
	7X42 Cardboard Spacer	2
	S25X6 Dial Bracket & String Guide Assembly	
	58X695 Dial Glass	
	41X26 Light Diffuser	2
	20X268 Rivet	4
1X71	Insulator Strip	
2X310	Felt Washer	
4X990	Escutcheon	
6X21	Rubber Grommet	3
7X42	Cardboard Spacer	2
8X93	Rubber Bumpers	2
10X38	Drive Cord Assembly	
13X328	Line Cord and Plug Assembly	
15X163	Pointer	
19X8	Flat Washer (Mtg. chassis to cabinet)	4
19X25	Flat Washer	
19X45	#8 Washer (Mtg. power transformer)	2
19X192	"C" Washer (Mtg. drive shaft)	2
20X329	Condenser Cushion Stud	3
20X1449	#6-32 x 1/2 Washer Hd. Machine Screw	
20X1491	Eyelet	
26X486	Drive Shaft	
27X56	Bottom Plate	
28X113	Drive Cord Tension Spring	
28X208	Coil Mounting Spring	
28X265	Ground Plate	
30X128	Solder Lug	
30X132	Line Cord Clamp	
30X138	Fahnestock Clip (External ground)	
30X522	Terminal	
30X523	Terminal	
36X357	Volume Control and Switch	
40X277	Tone Control and Radio Phono Switch	
41X26	Light Diffuser	2
45X346	3 Section Electrolytic Condenser	
	40 mf, 450V - 40 mf, 450V - 20 mf, 25 V.	
46X289	Capacitor Tubular, .00475-180V	
47X112	50-50 mmf, Dual Mica Condenser	
47X463	Capacitor, Molded Mica, 47 mmf ± 20%	2
47X466	Capacitor, Molded, 68 mmf	
47X467	Capacitor, Molded, 470 mmf ± 20%	
51X134	Output Transformer	
53X282	Power Transformer (60 cycles)	
58X695	Dial Glass	
B66501	Capacitor, Tubular - .0005 mf - 200 V.	
B66503	Capacitor, Tubular - .05 mf 200 V. 25%	
B84153	Resistor, Carbon - 15,000 Ohms 1/2 W	
B84222	Resistor, Carbon - 2200 Ohms 1/2 W	
B84333	Resistor, Carbon - 33,000 ohms 1/2 W	
B84393	Resistor, Carbon - 39,000 ohms 1/2 W	
B84823	Resistor, Carbon - 82,000 ohms 1/2 W	
B85105	Resistor, Carbon - 1 Megohm 1/2 W	
B85106	Resistor, Carbon - 10 Megohm 1/2 W	
B85225	Resistor, Carbon - 2.2 Megohm 1/2 W	
B85473	Resistor, Carbon - 47,000 ohms 1/2 W	2
B85474	Resistor, Carbon - 470,000 ohms 1/2 W	2
C84271	Resistor, Carbon - 270 ohms 1 W	2
C84393	Resistor, Carbon - 39,000 ohms 1 W	2
C64253	Capacitor, Tubular - .025 mf 400 V	
D64403	Capacitor, Tubular - .04 mf 400 V	
D66103	Capacitor, Tubular - .01 mf 400 V	
D66402	Capacitor, Tubular - .004 mf 400 V	
D66403	Capacitor, Tubular - .04 mf 400 V	
D66502	Capacitor, Tubular - .005 mf 400 V	2
D67104	Capacitor, Tubular - .10 mf 400 V	
D84182	Resistor, Carbon - 1800 ohms 210 W	
H66402	Capacitor, Tubular - .004 mf 800 V	
	8-32 Hex Nut, Cad. Pl. Mounting Power Transformer	2
	#8 Lockwasher, E. T. Shakeproof	2
	#6 x 1/4 Slotted Hex Hd. P-K Type "Z" Screw	6
	(Mounting Idler Bracket, Dial Bracket and Bottom Plate)	
	#6 Lockwasher Mounting Oscillator and I-F Coils	5
	#6-32 Hex Nut	5
	3/8" Nut, Type 9N1 (Mtg. Tone Control, Band Switch and	3
	Volume Control)	
	#2 x 3/8" French Oval Hd. Wood Screw, Statuary Bronze	4
	(Mounting Escutcheon)	
	10 x 1/2" Slotted Hex Hd. P-K Type "Z" Screw (Mounting	4
	Chassis to Cabinet)	
	#10 x 3/4" Washer Hd. Wood Screw (Mtg. Speaker	4
	#16 x 5/8" Flat Hd. Blue Finish Nail (Loop to Cabinet)	4
	#1701 5/32" Tubular Rivet (Mounting Parts)	8

GAMBLE-SKOGMO, INC.

MODEL 43-6951



REAR CABINET VIEW

SPECIFICATIONS

7 Tube Superheterodyne.....Including Rectifier Tube	FM Sensitivity.....(For 0.5 Watt Output) 200 mv avg
Power Consumption.....(at 117 Volts AC)...60 Watts	Intermediate Frequency.....AM-455KC; FM-10.7 MC
Selectivity.....AM-50KC Broad at 1000 Times Signal	Tuning Range.....AM-540-1600 KC; FM-88-108 MC
I.F. FM-200KC Broad at 2 Times Down	Speaker.....10" P.M. Dynamic
I.F. FM-800KC Broad at 200 Times Down	Power Output.....4.5 W Max.; 2.5 W 10% Harmonics
AM Sensitivity...(For 0.5 Watt Output, with external Antenna) 20 mv avg	Power Supply.....105-125 Volts, AC 50-60 cycles

REMOVAL OF CHASSIS FROM CABINET

Before the chassis can be removed from the cabinet, it will be necessary to pull off the 4 control knobs, remove the three chassis mounting bolts and disconnect the leads from the chassis to the loop antenna, dipole terminals and speaker.

ALIGNMENT PROCEDURE

AM STAGES

Volume Control Maximum all adjustments.

Connect Radio Chassis to Ground Post of Signal Generator with a Short Heavy Lead.

Allow Chassis and Signal Generator to "Heat Up" for Several Minutes.

The following is required for aligning.

An All Wave Signal Generator Which Will Provide an Accurately Calibrated Signal at the Test Frequencies as Listed.

Output Indicating Meter, Non-Metallic Screwdriver
Dummy Antennas - .1 mf, and 50 mmf.

MODEL 43-6951

GAMBLE-SKOGMO, INC.

FREQUENCY SETTING	SIGNAL GENERATOR CONNECTION AT RADIO	GROUND CONNECTION	DUMMY ANTENNA	GANG CONDENSER SETTING	ADJUST TUNING SLUGS (I-F ONLY) GRIMMERS (OSC. & ANT.)
455 KC	Control Grid 1st 6BA6 Pin No. 1	Chassis Base	.1 mf	Turn Rotor to Full Open	2nd I.F. Pri. & Sec.
455 KC	Control Grid 6BE6 Pin No. 7 1st Det.	Chassis Base	.1 mf	Turn Rotor to Full Open	1st I.F. Pri. & Sec.
1620 KC	Control Grid 6BE6 Pin No. 7	Chassis Base	.1 mf	Turn Rotor to Full Open	Oscillator Trimmer (AM)
1400 KC	External Antenna Lead	Chassis Base	50 mmf	Turn Pointer to 1400 KC See Note A	Antenna Trimmer (AM)

NOTE A - If the pointer is not at 1400 KC on the dial, reset pointer to the 1400 KC mark on the dial scale.

FM STAGES

Allow chassis and signal generator to warm up for several minutes. The following equipment is required for aligning:

An accurately calibrated signal generator providing unmodulated signals at the test frequencies listed below.

Non-metallic screwdriver.

Dummy Antennas and I-F Loading Resistor- .01 mf 300 ohms and 100 K ohms.

Zero center scale DC vacuum voltmeter having a range of approximately 3 volts.

(If a zero center scale meter is not available, a standard scale vacuum tube voltmeter may be used by reversing the meter connections for

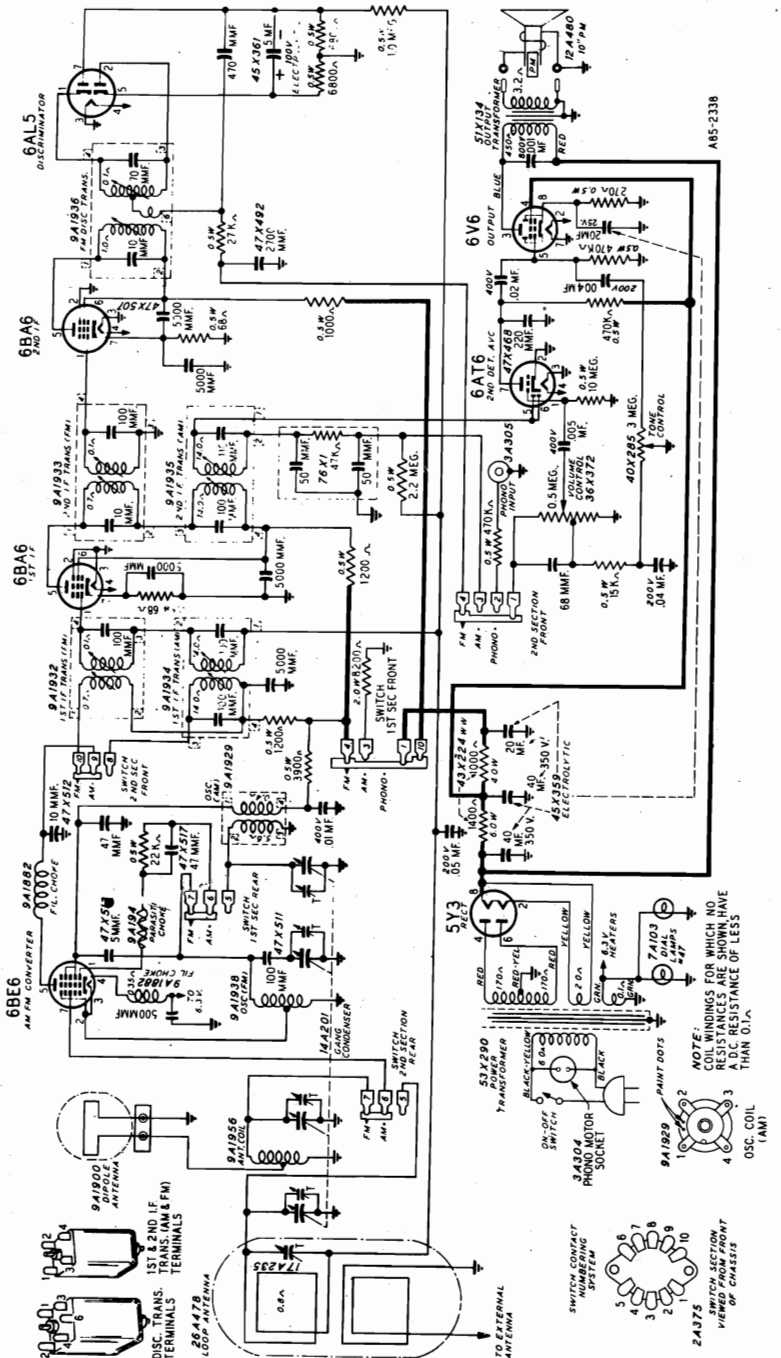
SIGNAL GENERATOR

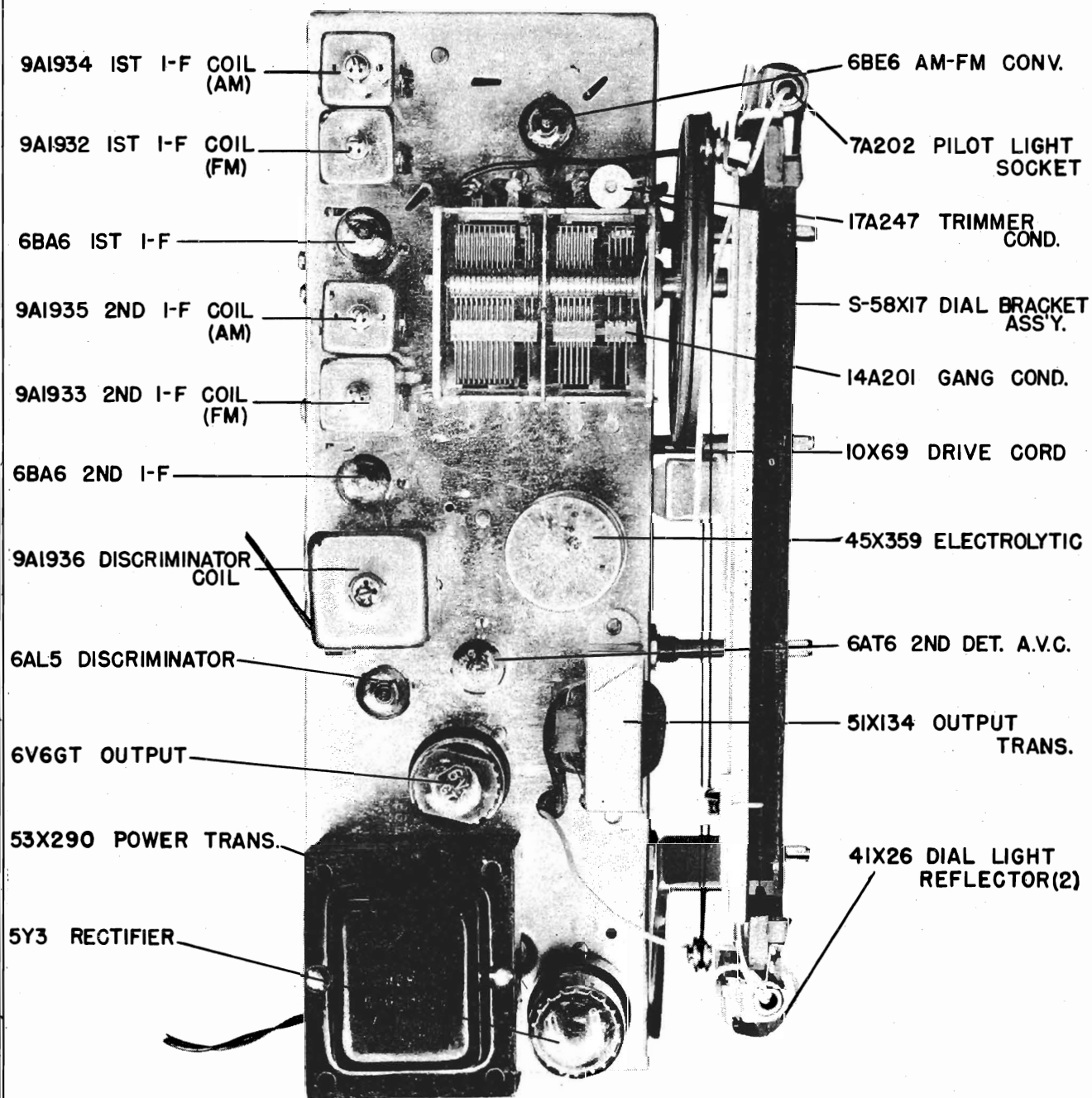
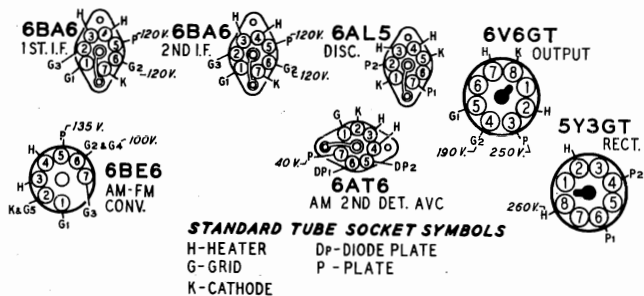
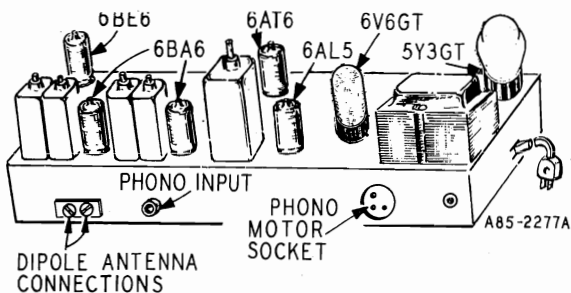
Discriminator	FREQUENCY SETTING	CONNECTION AT RADIO	DUMMY ANTENNA	BAND SWITCH SETTING	CONDENSER SETTING	ADJUSTMENT FOR MAX. METER DEFLECTION
	10.7 MC	6BA6 2nd I-F Pin 1 & Chassis	.01 mf	FM	Rotor to Full Open	Disc. Pri. Note A
	10.7 MC	6BA6 2nd I-F Pin 1 & Chassis	.01 mf	FM	Rotor to Full Open	Disc. Sec. Note B
	10.7 MC	6BA6 2nd I-F Pin 1 & Chassis	.01 mf	FM	Rotor to Full Open	Disc. Pri. Note A
	10.7 MC	6BA6 2nd I-F Pin 1 & Chassis	.01 mf	FM	Rotor to Full Open	Disc. Sec. Note B
I-F	10.7 MC	6BA6 1st IF Pin 1 & Chassis	.01 mf	FM	Rotor to Full Open	2nd I-F Pri. 2nd I-F Sec. Note C
	10.7 MC	Unsolder lead from Pin 7 to band switch. Insert 100K ohm resistor between Pin 7 & Ground and feed signal into Pin 7 of 6BE6	.01 mf	FM	Rotor to Full Open	1st I-F Pri. 1st I-F Sec. Note C

RECHECK I-F ADJUSTMENTS IN ORDER GIVEN

Ant. & Osc.	108.5	Disconnect dipole and connect generator to dipole terminals with resistor in series.	300ohms	FM	Rotor to Full Open	Osc. Trimmer (FM)
	Note D					
	104.5	Same as above	300ohms	FM	Tune rotor for max. AVC voltage	Ant. Trimmer (FM)

RECHECK ANTENNA & OSC. ADJUSTMENTS IN ORDER GIVEN

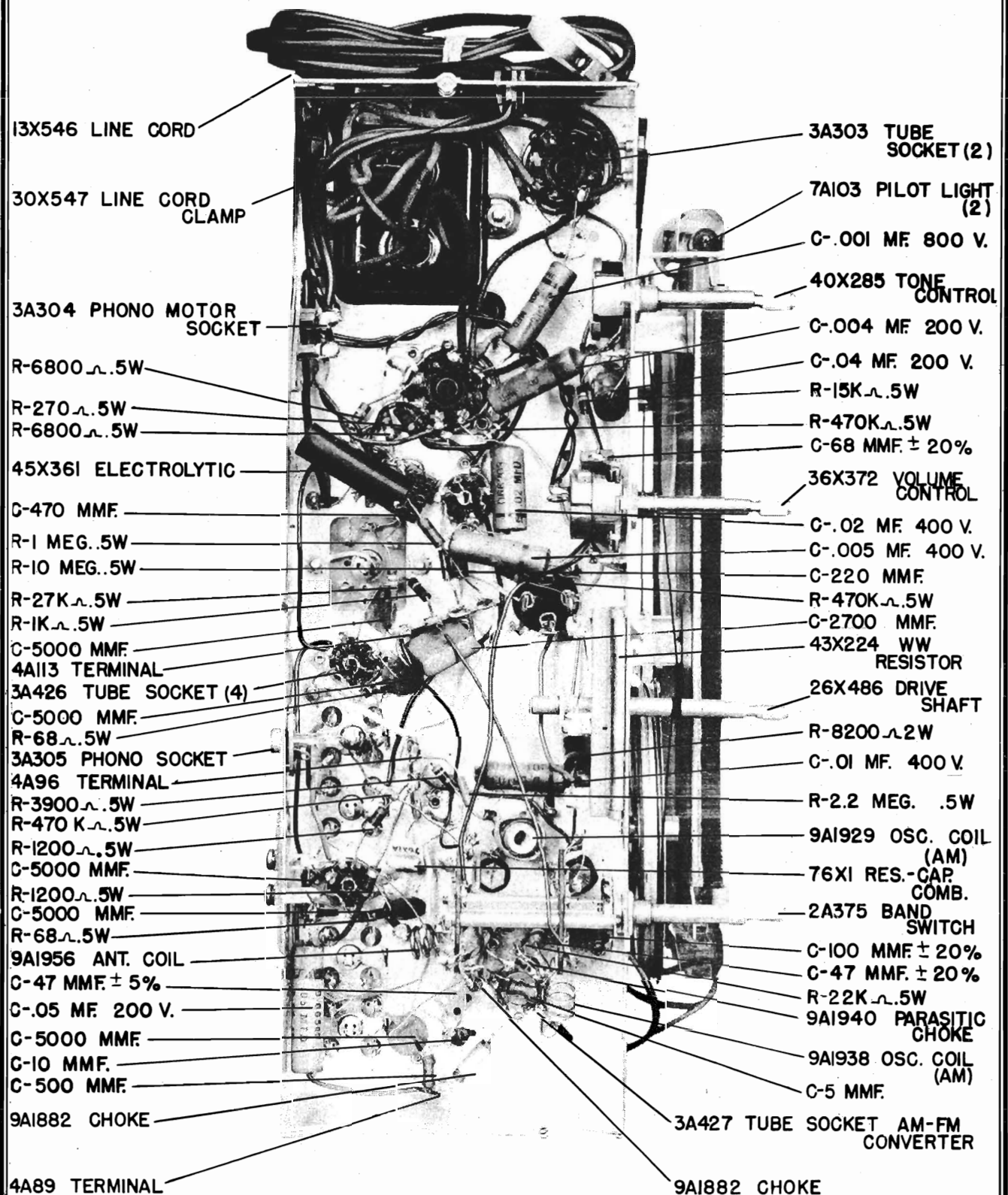




TOP CHASSIS VIEW

GAMBLE-SKOGMO, INC.

MODEL 43-6951



BOTTOM CHASSIS VIEW

PREFIX "C" INDICATES CONDENSER
 PREFIX "R" INDICATES RESISTOR

MODEL 43-6951

GAMBLE-SKOGMO, INC.

Part No. Description

2A375 Band Change Switch
 3A303 Molded Octal Tube Socket (2)
 3A304 Phono Motor Socket
 3A305 Phono Socket (Single Pin)
 3A426 Tube Socket (miniature) (4)
 3A427 Tube Socket (Miniature for AM-FM Converter)
 4A89 Terminal Strip
 4A96 Terminal Strip
 4A113 Terminal Strip
 4A405 Antenna Terminal Strip
 7A103 #47 Pilot Light (2)
 7A202 Pilot Light Socket Assembly
 9A1882 Filament Choke (2)
 9A1900 Di-Pole Antenna Assembly
 9A1929 Oscillator Coil Assembly (AM)
 9A1932 1st I.F. Coil Assembly (FM)
 9A1933 2nd I.F. Coil Assembly (FM)
 9A1934 1st I.F. Coil Assembly (AM)
 9A1935 2nd I.F. Coil Assembly (AM)
 9A1936 Discriminator Coil Assembly
 9A1938 Oscillator Coil Assembly (FM)
 9A1940 Parasitic Choke
 9A1956 Antenna Coil Assembly
 10A675 Knob (Tuning)
 10A676 Knob (Off-On Volume)
 10A677 Knob (Tone)
 10A678 Knob (Ph-BC-FM)
 12A480 10" P.M. Speaker
 14A201 Gang Condenser & Pulley
 17A247 Trimmer Condenser 3-12 mmf
 26A478 "B" Range Loop Antenna Ass'y consists of:
 9A1939 "B" Range Loop Antenna
 17A235 Trimmer Condenser
 1701 3/16" Tunular Rivet
 S-58X17 Dial Bracket Assembly consisting of:
 7X42 Cardboard Spacer (2)
 8X185 Rubber Bands (2)
 20X268 Rivets (6)
 24X446 Idler Pulley (2)
 25X1569 Dial Bracket
 41X26 Dial Light Reflector (2)
 58X709 Dial Glass
 4X1016 Escutcheon
 6X21 Rubber Grommet (4)
 10X69 Drive Cord Assembly
 13X546 Line Cord and Plug Assembly
 15X241 Pointer
 19X107 Flat Washer (Mtg. Speaker) (4)
 19X145 #8 Flat Washer (Mtg. 53X290) (2)
 19X179 Flat Washer (Mtg. Set to Cabinet) (3)
 19X192 "C" Washer (drive shaft) (2)

Part No. Description

20X329 Condenser Cushion Stud (3)
 22X462 Chassis Base (with bracket)
 26X486 Drive Shaft
 25X1488 Idler Bracket
 28X113 Drive Cord Tension Spring
 28X208 Coil Mounting Spring
 30X547 Line Cord Clamp
 36X372 Volume Control & Switch
 40X285 Tone Control
 41X26 Dial Light Reflector (2)
 43X224 W. W. Resistor, 1000 ohms 4W-1400 ohms 6W
 45X359 4 Section Electrolytic, 40 mf, 350V-40 mf, 350V, 20 mf, 350V-20 mf, 25V
 45X361 Dry Electrolytic, 5 mf, 100V
 47X463 Capacitor, Ceramic; 47 mmf 20%
 47X468 Capacitor, Ceramic; 220 mmf 20%
 47X471 Capacitor, Molded Mica; 68 mmf 20%
 47X492 Capacitor, Molded Mica; 2700 mmf 10%
 47X507 Capacitor, Silvered Mica; 5000 mmf
 47X508 Capacitor, Ceramic; 500 mmf 20%
 47X510 Capacitor, Silvered Mica; 470 mmf 5%
 47X511 Capacitor, Ceramic; 100 mmf 5%
 47X512 Capacitor, Ceramic; 10 mmf 5%
 47X513 Capacitor, Ceramic; 5.0 mmf 5%
 47X517 Capacitor, Ceramic; 47 mmf 10%
 47X518 Capacitor, Ceramic; 100 mmf 20%
 51X134 Output Transformer
 53X290 Power Transformer
 57X709 Dial Glass
 76X1 Resistor Capacitor Combination
 B66402 Capacitor Tubular .004 mf 200V 25%
 B66403 Capacitor Tubular .04 mf 200V 25%
 B66503 Capacitor Tubular .05 mf 200V 25%
 B83392 Resistor, Carbon; 3900 ohms $\frac{1}{2}$ W
 B83680 Resistor, Carbon; 68 ohms $\frac{1}{2}$ W
 B84102 Resistor, Carbon; 1000 ohms $\frac{1}{2}$ W
 B84122 Resistor, Carbon; 1200 ohms $\frac{1}{2}$ W (2)
 B84153 Resistor, Carbon; 15 K ohms $\frac{1}{2}$ W
 B84223 Resistor, Carbon; 22 K ohms $\frac{1}{2}$ W
 B84271 Resistor, Carbon; 270 ohms $\frac{1}{2}$ W
 B84273 Resistor, Carbon; 27 K ohms $\frac{1}{2}$ W
 B84682 Resistor, Carbon; 6800 ohms $\frac{1}{2}$ W (2)
 B85105 Resistor, Carbon; 1 megohm $\frac{1}{2}$ W
 B85106 Resistor, Carbon; 10 megohms $\frac{1}{2}$ W
 B85225 Resistor, Carbon; 2.2 megohms $\frac{1}{2}$ W
 B85474 Resistor, Carbon; 470 K ohms $\frac{1}{2}$ W (3)
 D66103 Capacitor, Tubular; .01 mf 400V 25%
 D66203 Capacitor, Tubular; .02 mf 400V 25%
 D66502 Capacitor, Tubular; .005 mf 400V 25%
 D84822 Resistor, Carbon; 8200 ohms 2.0 W
 H66102 Capacitor, Tubular; .001 mf 800V 25%

FM ALIGNMENT NOTES

Note A - The zero center scale DC vacuum tube voltmeter is to be connected between chassis ground and the A.V.C. line at the 27 K. ohm resistor and its junction with terminal strip. A signal of .1 volt must be fed into the receiver for this adjustment. Note output voltage on the zero center DC vacuum tube voltmeter.

Note B - Disconnect zero center DC vacuum tube voltmeter from A.V.C. and connect it to the audio takeoff point at the 1 megohm resistor and its junction with

the terminal strip. Adjust for zero voltage indication.

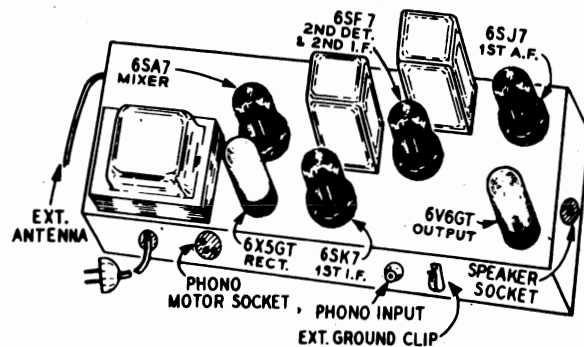
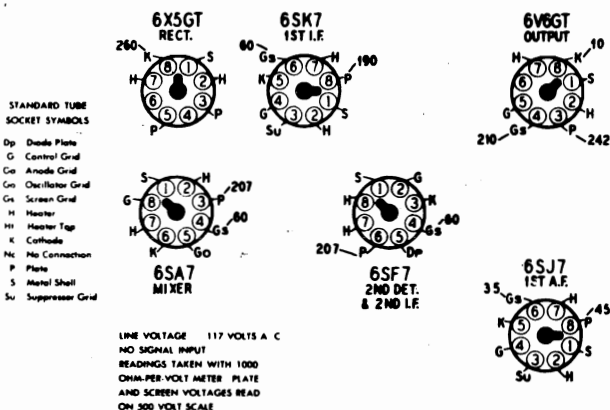
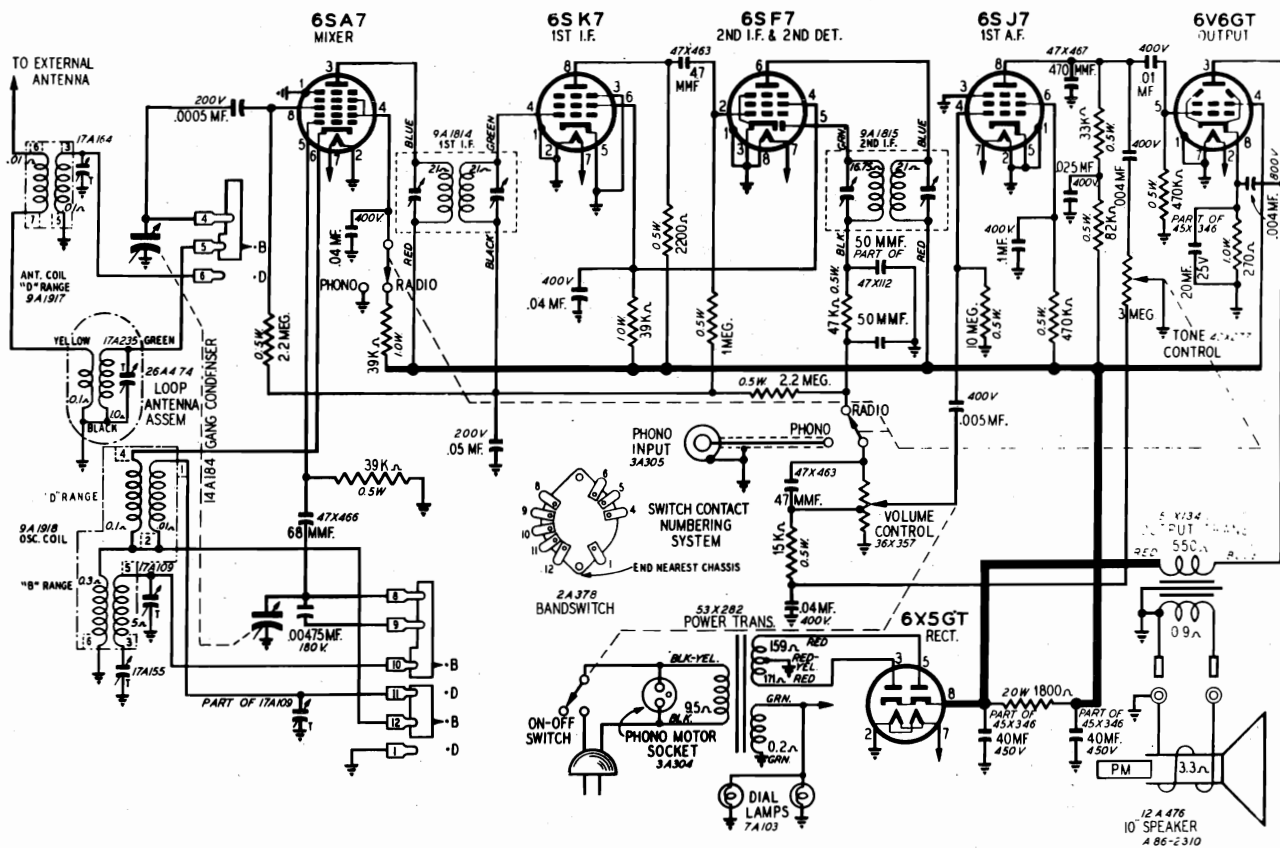
Note C - Connect zero center DC vacuum tube voltmeter as in Note A. Adjust input to give same output on the zero center DC vacuum tube voltmeter as in Note A.

Note D - Remove the 100 K ohm load resistor and solder the lead from pin 7 of 6BE6 tube to the band switch before attempting to check the antenna and oscillator adjustments.

MODELS 43-7603,
43-7604

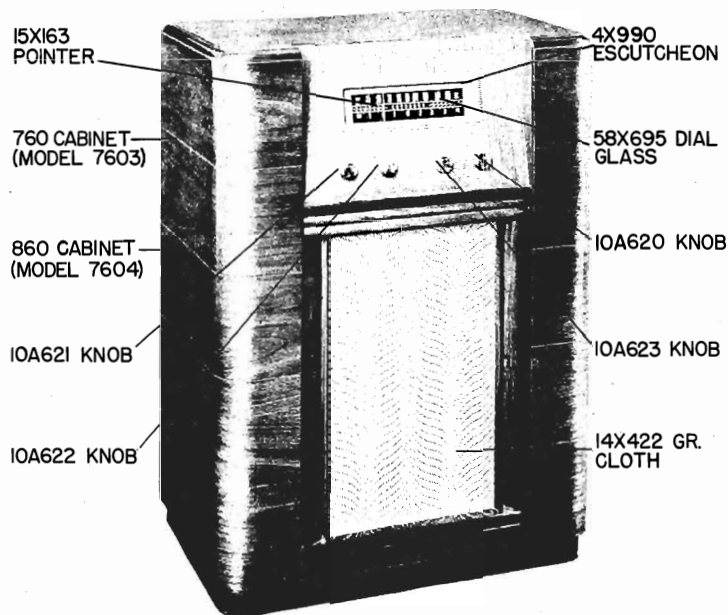
SPECIFICATIONS

6 Tube Superheterodyne, including Rectifier Tube	Power Supply	102-125 Volts, 60 cycle
Speaker.....10" PM Dynamic	Power Consumption (at 117 Volts AC)	45 Watts (normal)
Intermediate Frequency.....455 KC		65 Watts (phono)
Selectivity.....40 KC Broad at 1000 Times Signal	Power Output	4 Watts Maximum 2.3 Watt
Sensitivity (For 0.5 Watt Output, with External Antenna)		10% Harmonics
B Range	Tuning Frequency Range	B Range
D Range		D Range
	Record Changer	Plays ten 12" or twelve 10"



MODELS 43-7603,
43-7604

GAMBLE-SKOGMO, INC.



The automatic record changer is connected to the rear of the chassis through jacks marked "Phono" and "Phono Motor". The "Phono" jack is switched in or out of the audio circuit by a switch controlled by the tone control knob. This switch also shorts out the r-f signal when it is turned to the phono position.

ALIGNMENT PROCEDURE

Volume Control—Maximum all adjustments.

Connect radio chassis to ground post of signal generator with a short heavy lead.

Allow chassis and signal generator to "heat up" for several minutes.

The following equipment is required for aligning:

An All Wave Signal Generator which will provide an accurately calibrated signal at the test frequencies as listed.

Output Indicating Meter—Non-metallic screwdriver.

Dummy Antennas—.1 mf., 50 mmf., and 400 ohms.

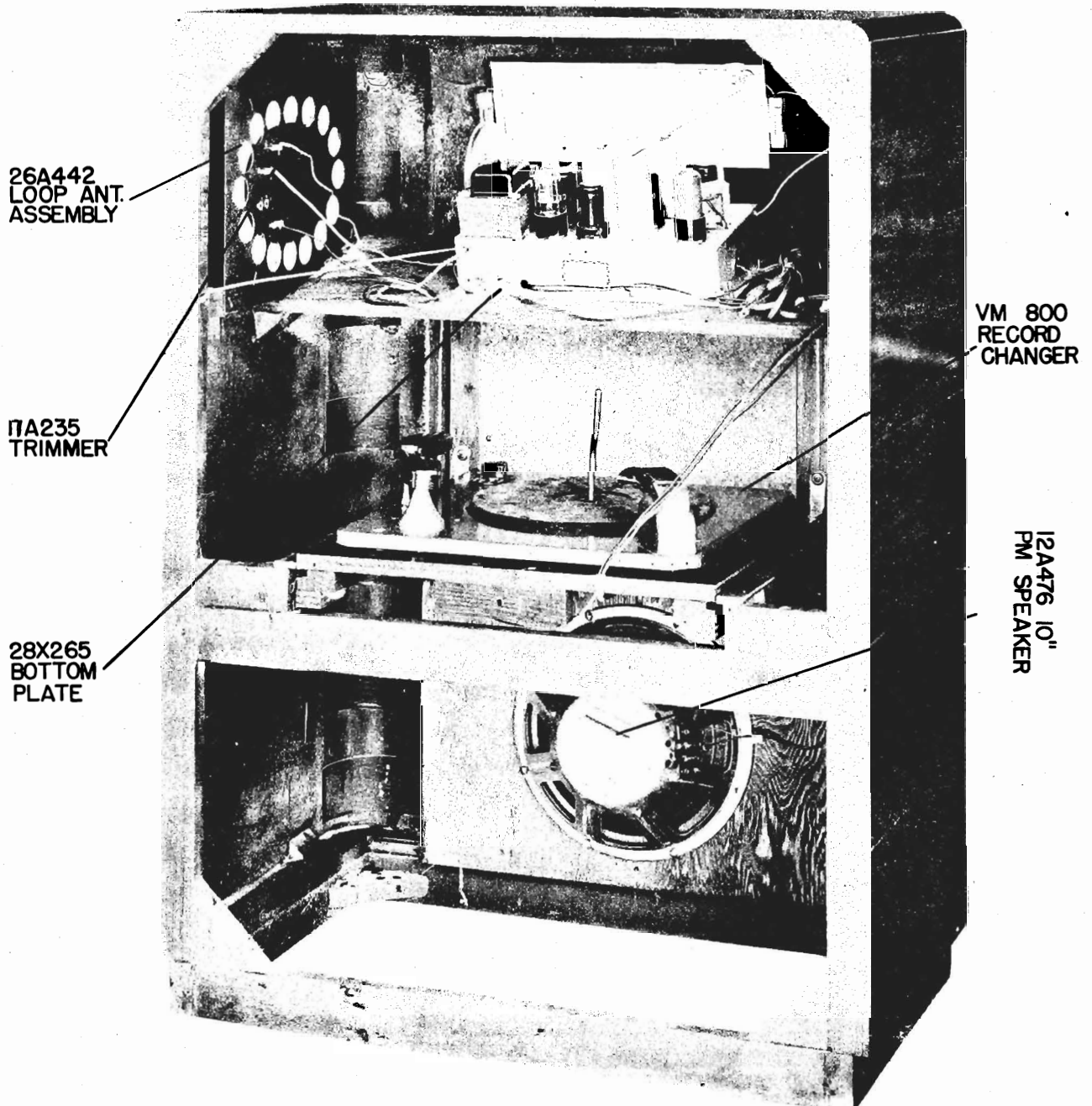
	SIGNAL GENERATOR FREQUENCY SETTING	CONNECTION AT RADIO	DUMMY ANTENNA	BAND SWITCH SETTING	CONDENSER SETTING	ADJUST TRIMMERS TO MAXIMUM
I. F.	455 Kc.	Grid of 6SA7 Pin 8	.1 mf.	B Range	Turn Rotor to Full Open	2nd I.F. (Pri.) and (Sec.) 1st I.F. (Pri.) and (Sec.)
RANGE B	1,620 Kc.	Antenna Lead	50 mmf.	B Range	Turn Rotor to Full Open	Oscillator Range B
	1,400 Kc.	Antenna Lead	50 mmf.	B Range	Tune Rotor to Max. Output Set Pointer to 1,400 Kc. (See Note A)	Antenna Range B
	600 Kc.	Antenna Lead	50 mmf.	B Range	Tune Rotor to Max. Output	Oscillator (600 Kc. Padder) Rock Rotor See Note B
	Repeat above steps at 1,620 and 600 Kc. until readjusting the oscillator. Range B Trimmer causes no further improvement of output.					
RANGE D	16.3 Mc.	Antenna Lead	400 ohm	D Range	Turn Rotor to Full Open	Oscillator Range D
	16 Mc.	Antenna Lead	400 ohm	D Range	Tune Rotor to Max. Output	Antenna Range D Rock Rotor—See Note B
LOOP RANGE B	1,400 Kc.	Reassemble chassis in cabinet. Antenna Lead	50 mmf.	B Range	Tune Rotor to Max. Output	Antenna Range B

NOTE A—Set pointer at the 1,400 KC. mark on the dial scale. Attach pointer to drive cord.

NOTE B—Turn Rotor back and forth and adjust the trimmer until the peak of greatest intensity is obtained.

The circuit and tube complement of the receiver are as follows:

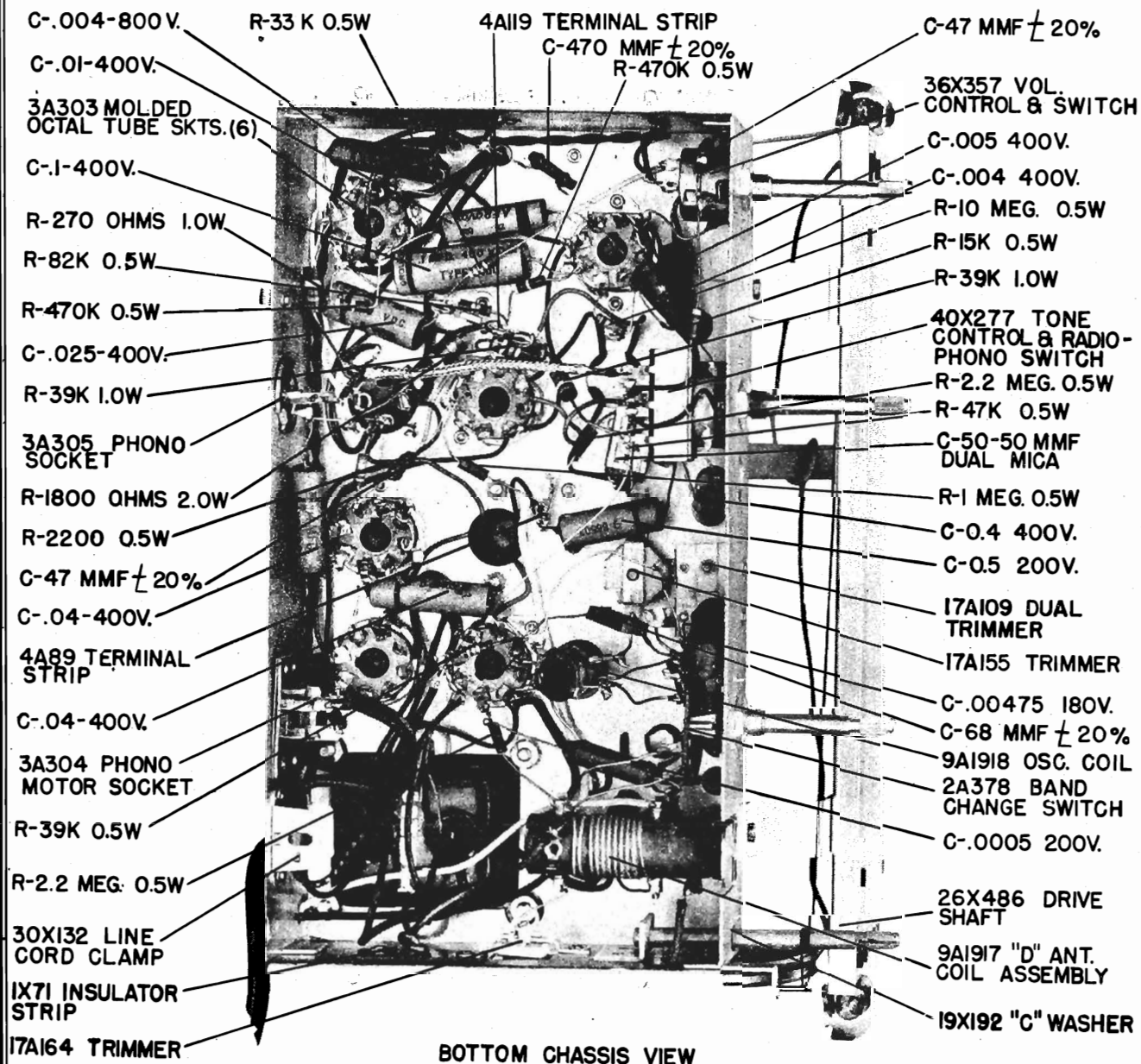
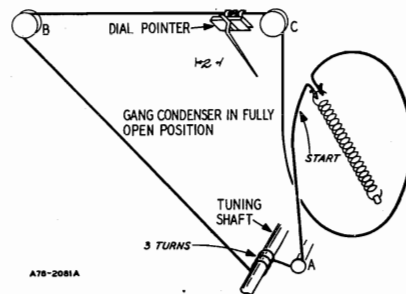
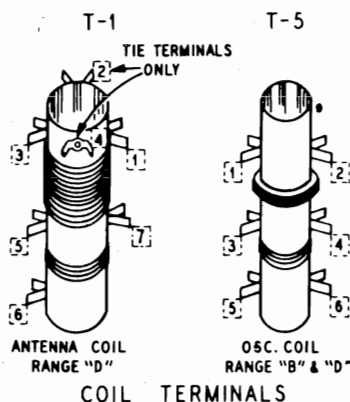
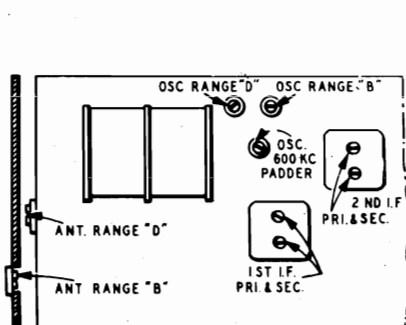
- 1 - 6SA7 1st Detector and Oscillator
- 1 - 6SK7 1st I-F Amplifier
- 1 - 6SF7 2nd I-F Amplifier and 2nd Detector
- 1 - 6SJ7 1st Audio Amplifier
- 1 - 6V6GT Power Output
- 1 - 6X5GT Rectifier
- 2 - No. 47 lamps are used for dial illumination.



REAR CABINET VIEW

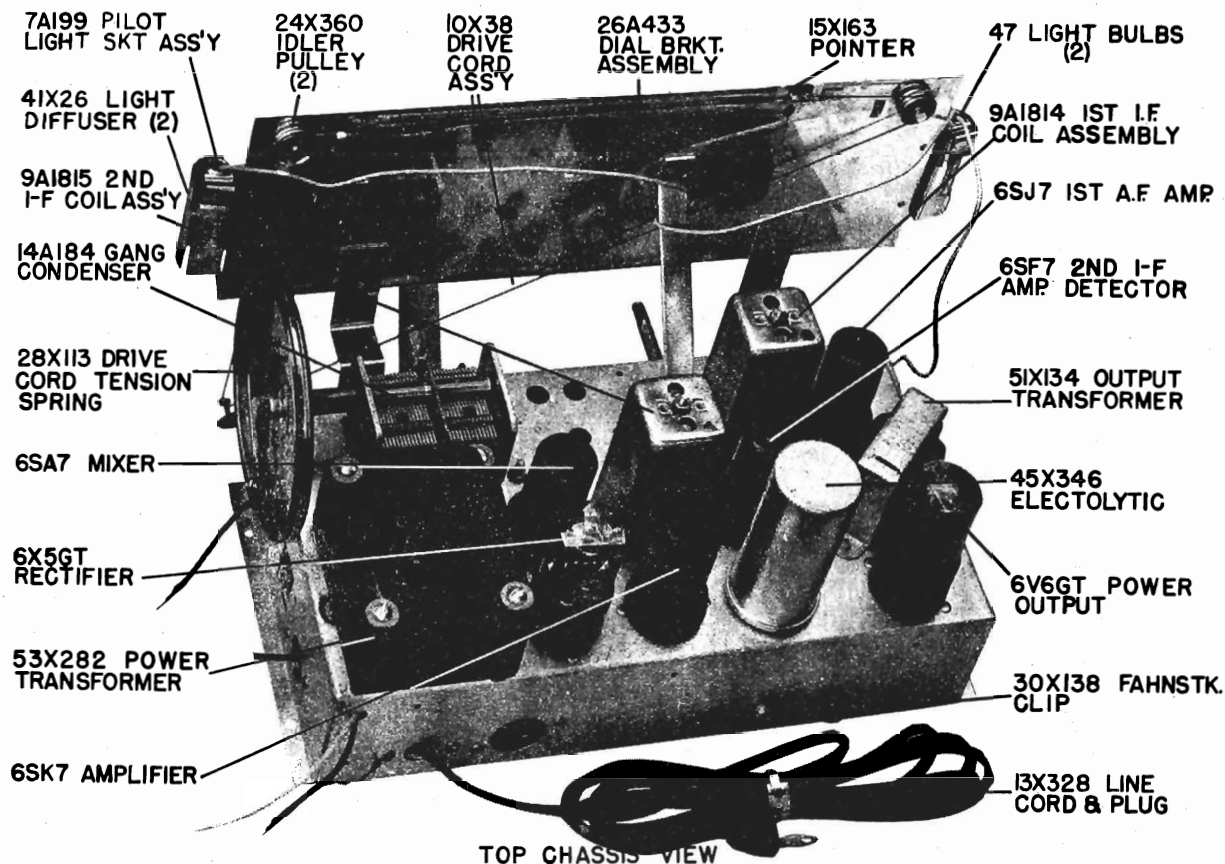
MODELS 43-7603,
43-7604

GAMBLE-SKOGMO, INC.



BOTTOM CHASSIS VIEW

GAMBLE-SKOGMO, INC.

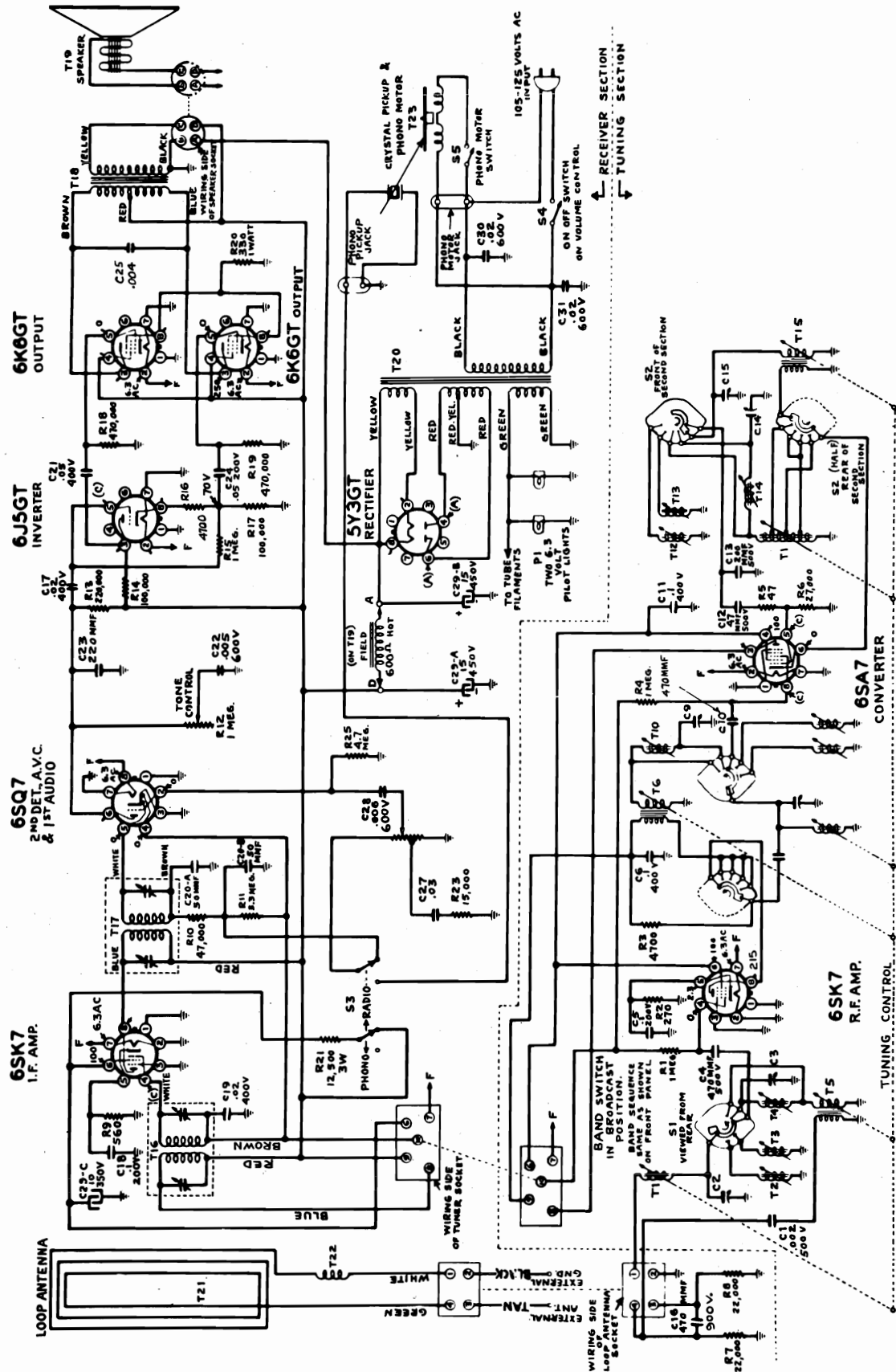
MODELS 43-7603,
43-7604

Part No.	Description	Quantity
2A378	Band Change Switch	
3A303	Molded Octal Tube Socket	6
3A304	Phono Motor Socket	
3A305	Single Pin Jack	
4A89	Terminal Strip	
4A119	Terminal Strip	
7A103	#47 Pilot Light	2
7A199	Pilot Light Socket Assembly	
9A1814	1st I-F Coil Assembly	
9A1815	2nd I-F Coil Assembly	
9A1917	"D" Antenna Coil Assembly	
9A1918	"B" & "D" Oscillator Coil Assembly	
10A620	Knob (Tuning)	
10A621	Knob (Volume)	
10A622	Knob (Tone, R.P.)	
10A623	Knob (SW-BC)	
12A476	Speaker, 10" P.M.	
14A184	Gang Condenser	
17A109	Trimmer Condenser (dual) 2.5-35 mmf	
17A155	Trimmer Condenser, 350-430 mmf	
17A164	Trimmer Condenser, 5-50 mmf	
26A442	"B" Range Loop Antenna Ass'y consisting of: 9A1821 "B" Range Loop Antenna 17A235 Trimmer Condenser #1701 Tubular Rivet 3/16"	
26A443	Dial Bracket Assembly 7X42 Cardboard Spacer 58X615 Dial Background 25X1495 Dial Bracket 24X360 Idler Pulley 41X26 Light Diffuser 20X268 Rivet	2 2 2 6
26A444	Idler Bracket Assembly consisting of: 25X1488 Idler Bracket 20X1450 Rivet	
1X71	Insulator Strip	
2X310	Felt Washer (mtg. 28X113)	
4X990	Escutcheon	

MODELS 43-7603,
43-7604

GAMBLE-SKOGMO, INC.

Part No.	Description	Quantity
6X21	Rubber Grommet	3
8X93	Rubber Bumpers	2
10X38	Drive Cord Assembly	
13X328	Line Cord and Plug	
15X163	Pointer	4
19X8	Flat Washer (Mtg. chassis to cabinet)	2
19X45	#1 Flat Washer (Mtg. power transformer)	2
19X192	"C" Washer (Mtg. drive shaft)	2
20X329	Condenser Cushion Stud	3
20X1449	6-32 x 1/2" Washer Hd. Machine Screw	
20X1491	Eyelet	
26X486	Drive Shaft	
27X56	Bottom Plate	
25X1488	Idler Bracket	
28X113	Drive Cord Tension Spring	
28X208	Coil Mounting Spring	
28X265	Ground Plate	
30X132	Line Cord Clamp	
30X138	Fahnestock Clip (External Ground)	
30X522	Terminal (connecting 27X56 to chassis)	
30X523	Terminal (connected to 27X56)	
36X357	Volume Control and Switch	
40X277	Tone Control & Radio-Ohono Switch	2
41X26	Light Diffuser	
45X346	3 Section Electrolytic Condenser 40mf, 450V. - 40mf, 450V. - 20mf, 25V.	
46X289	Capacitor, Tubular - .00475 mf, 180 V.	
47X112	Capacitor, Dual Mica - 50-50 mmf. ± 20%	2
47X463	Capacitor, Molder Mica - 47 mmf. ± 20%	
47X466	Capacitor, Molder - 68 mmf. ± 10%	
47X467	Capacitor, Molded Mica - mmf. ± 20%	
51X134	Output Transformer	
53X282	Power Transformer (60 cycles)	
57X184	Locking Plate	
58X615	Dial Background	
58X695	Dial Glass	
B66501	Capacitor, Tubular - .0005 mf 200V. ± 20%	
B66503	Capacitor, Tubular - .05 mf 200V. ± 25%	
B84153	Resistor, Carbon - 15,000 ohms .5W	
B84222	Resistor, Carbon - 2200 ohms .5W	
B84333	Resistor, Carbon - 33,000 ohms .5W	
B84393	Resistor, Carbon - 39,000 ohms .5W	
B84824	Resistor, Carbon - 82,000 ohms .5W	
B85105	Resistor, Carbon - 1 megohm .5W	
B85106	Resistor, Carbon - 10 megohms .5W	
B85225	Resistor, Carbon - 2.2 megohms .5W	2
B85473	Resistor, Carbon - 47,000 ohms .5W	
B85474	Resistor, Carbon - 470,000 ohms .5W	2
C84271	Resistor, Carbon - 270 ohms 1.0W	
C84393	Resistor, Carbon - 39,000 ohms 1.0W	2
D64253	Capacitor, Tubular - .025 mf 400V. ± 10%	
D64403	Capacitor, Tubular - .04 mf 400V. ± 10%	
D66103	Capacitor, Tubular - .01 mf 400V. ± 25%	
D66402	Capacitor, Tubular - .004 mf 400V. ± 25%	
D66403	Capacitor, Tubular - .04 mf 400V. ± 25%	2
D66502	Capacitor, Tubular - .005 mf 400V.	
D67104	Capacitor, Tubular - .10 mf 400V. -10% ± 30%	
D84182	Resistor, Carbon - 1800 ohms 2.0W	
H66402	Capacitor, Tubular - .004 mf 800V. ± 25%	
	#1701 3/16" Tubular Rivet (mtg. parts)	2
	#1701 5/32" Tubular Rivet (mtg. parts)	20
	#1701 1/8" Tubular Rivet (mtg. parts)	
	3/8" Palnut (Mtg. tone control, band switch, Type 9N1 and volume control)	3
	#8 Lockwasher E. T. } } Mtg. Power Transformer	2
	#8 - 32 Hex Nut	2
	#6 x 1/4" Slotted Hex. Hd. P.K Type "X" Screw (Mtg. idler bracket, dial bracket, and bottom plate & S-27X1)	6
	#2 x 3/8" French Oval Hd. Wood Screw Statuary Bronze (mtg. escutcheon)	4
	#6 (1106) Lockwasher, E.T. Shakeproof, Cad. Pl.	6
	#10 x 1/2" Slotted Hex. Hd. P-K Type "Z" Screw (mtg. chassis to cabinet)	4
	#10 x 3/4" Washer Hd. Wood Screw Steel (mtg. speaker)	4
	#16 x 5/8" Flat Hd. Blue Finished Nail (mtg. loop to cabinet)	
	#10 x 5/8" Washer Hd. Wood Screw, Steel (Mtg. 57X184)	
28A139	Record Changer VM #800	
	#1114 1/4" Lockwasher, E. T. Shakeproof (Mtg. 57X184)	
	1/4-20 x 1 1/4 R.H.M.S. Steel, Cad. Pl. (Mtg. 58X184)	
	#6-32 Hex Nut Cad. Pl.	5
	#6 Split Lockwasher (Mtg. 1X71)	2

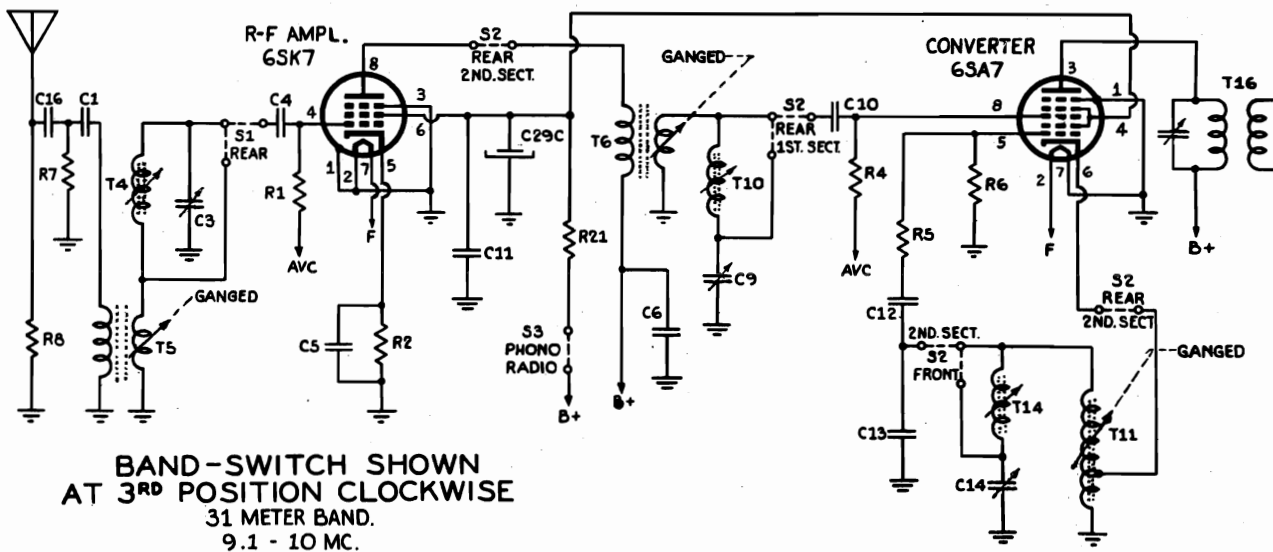
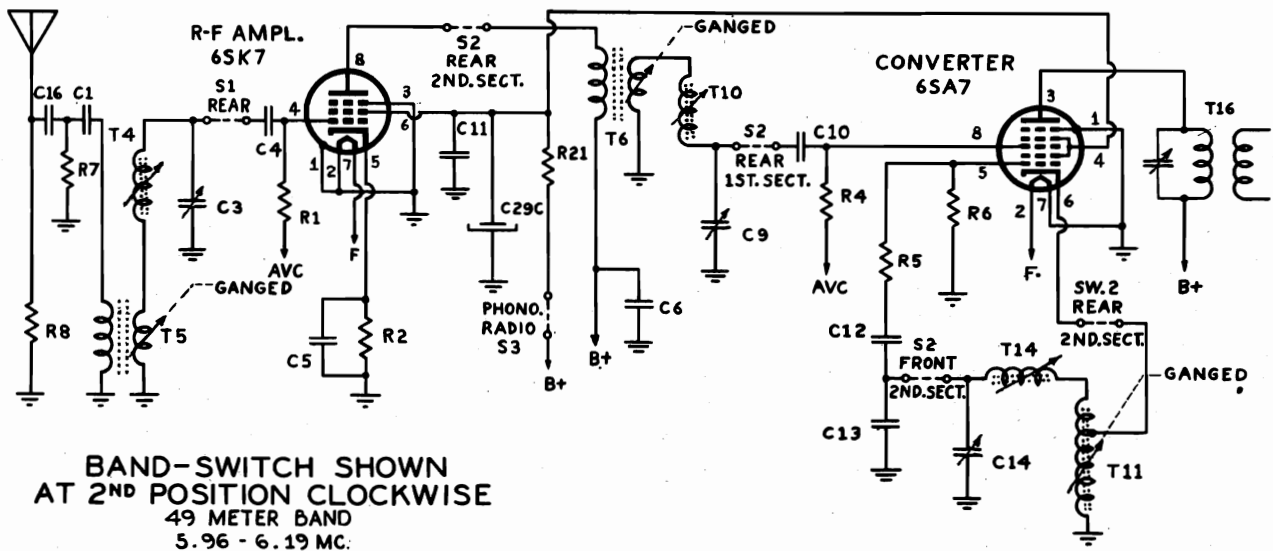
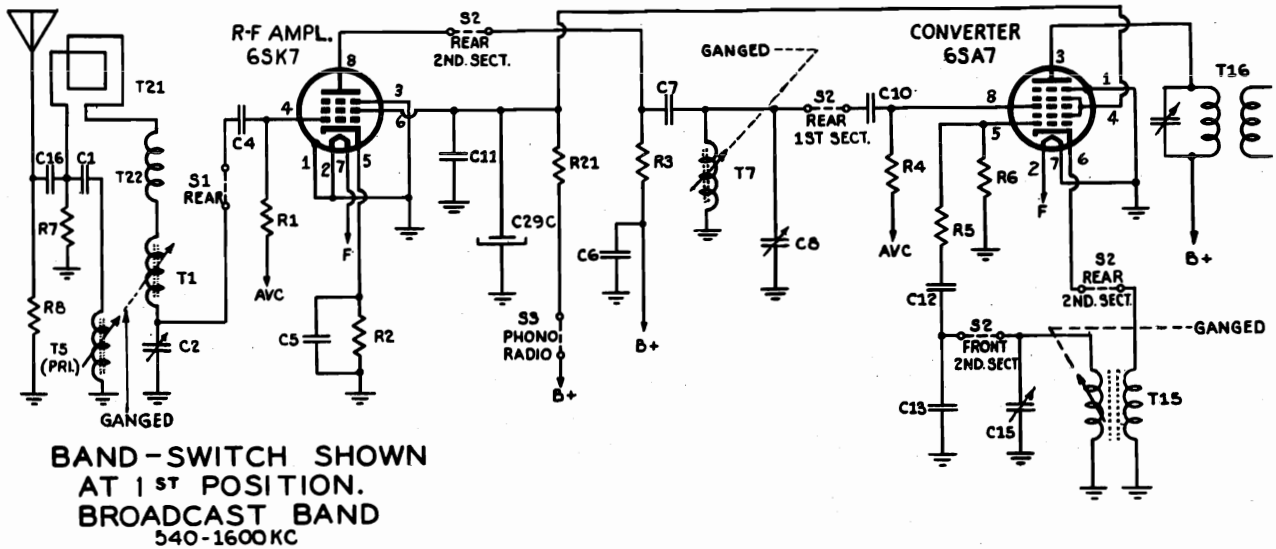


CLARI-SKEMATIX

Registered Trademark

MODELS 43-7651,
43-7652

GAMBLE-SKOGMO, INC.



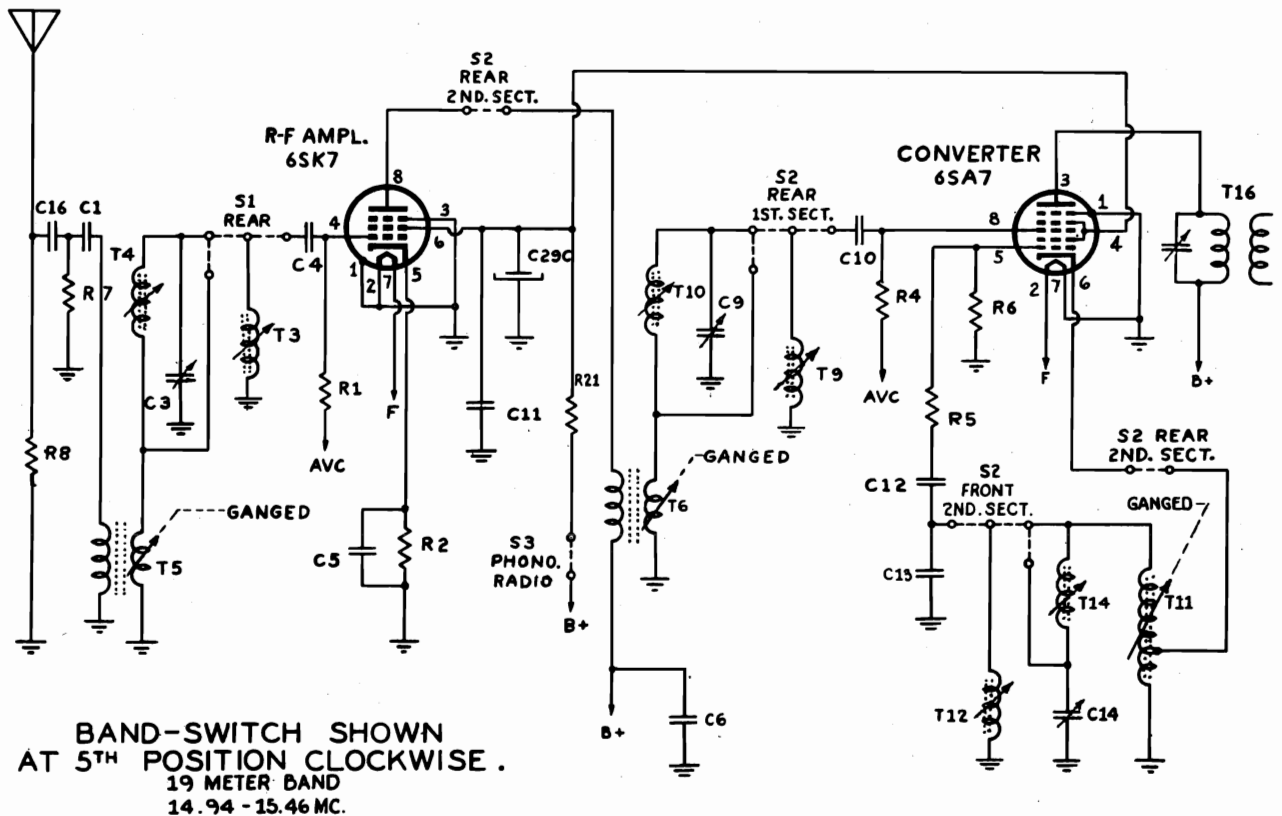
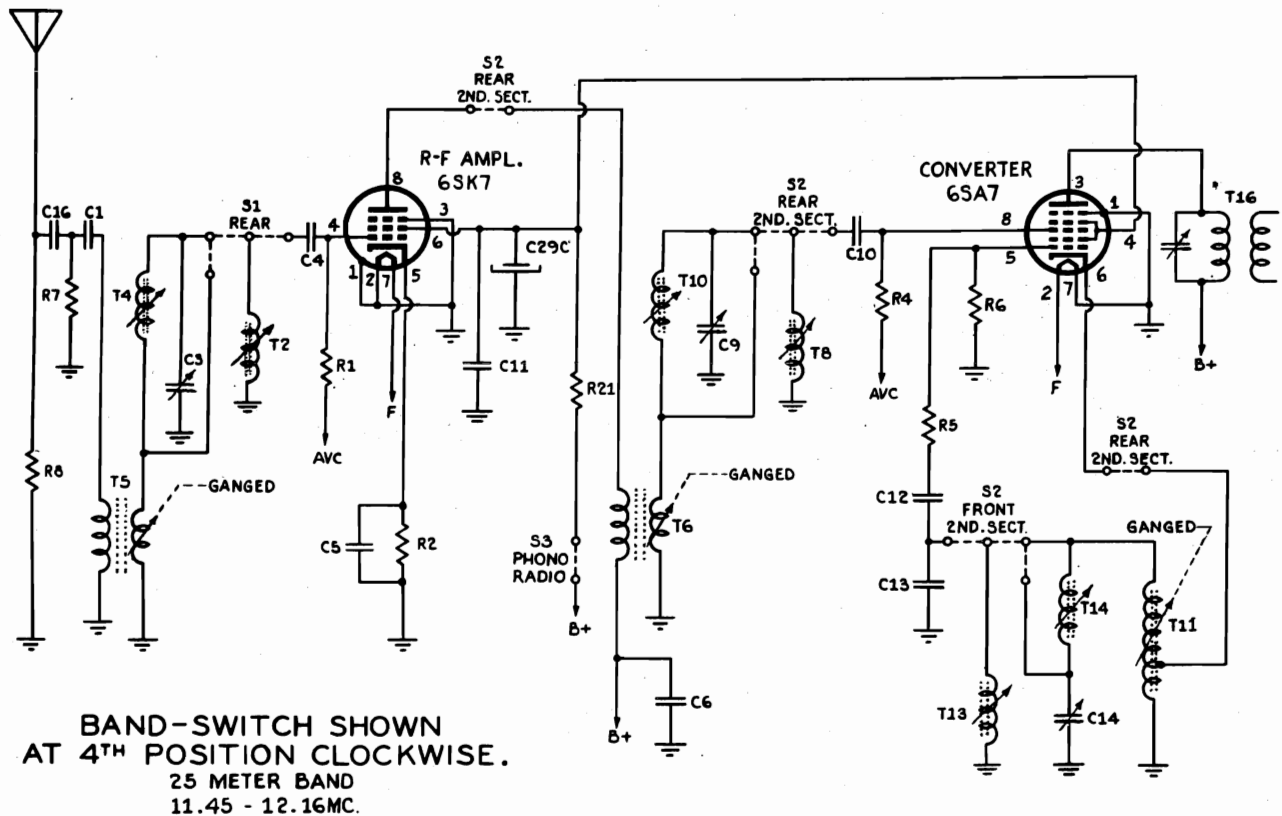
CLARI-SKEMATIX

Registered Trademark

GAMBLE-SKOGMO, INC.

GAMBLE PAGE 19-25

MODELS 43-7651,
43-7652



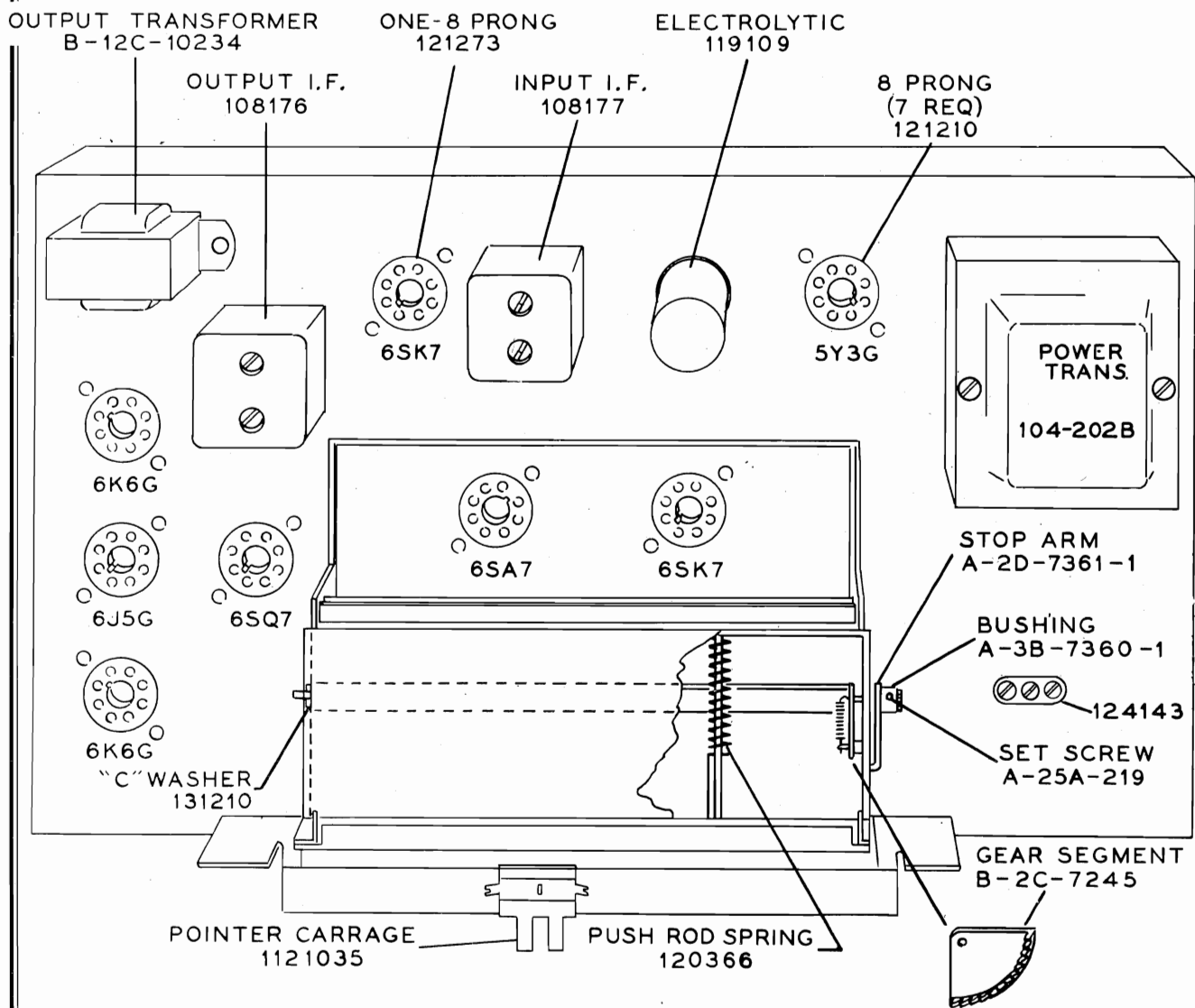
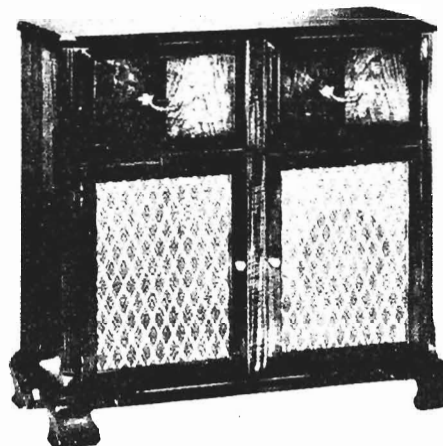
MODELS 43-7651,
43-7652

GAMBLE-SKOGMO, INC.

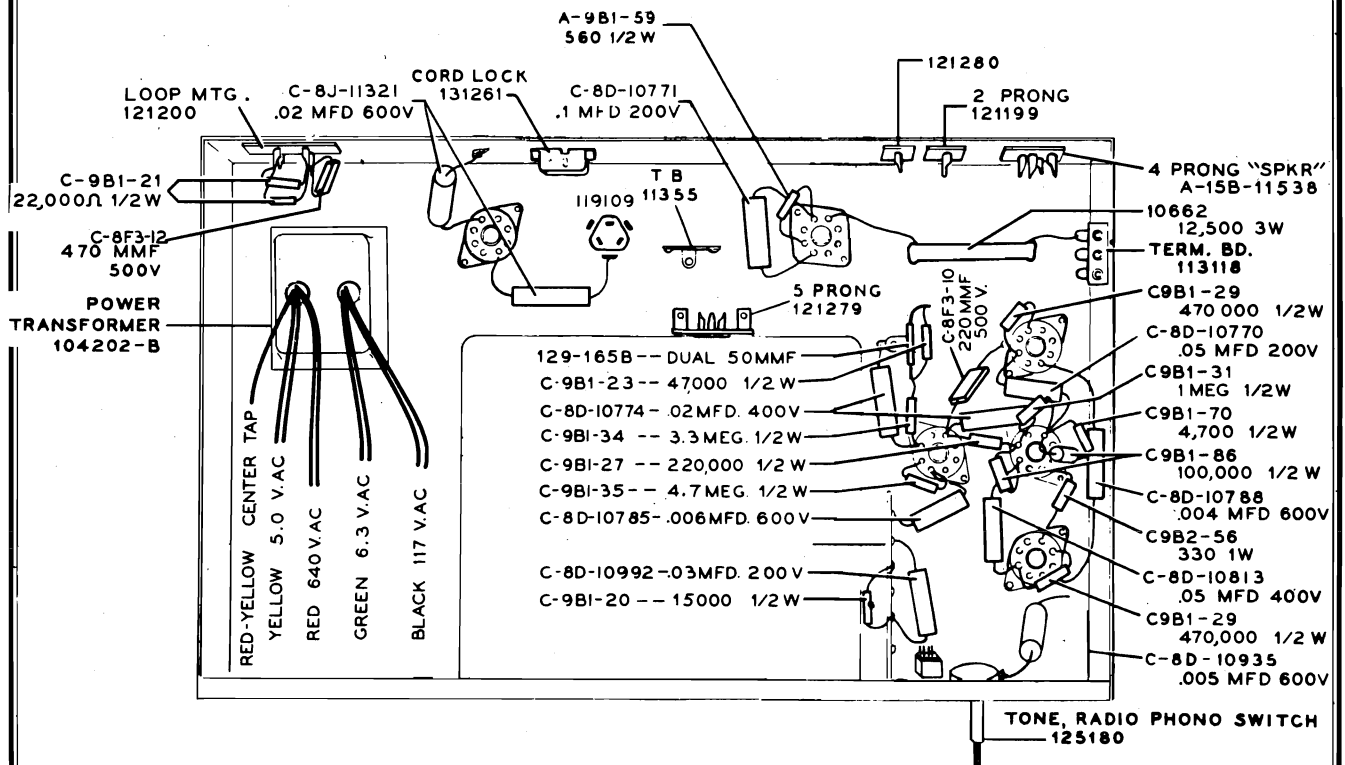
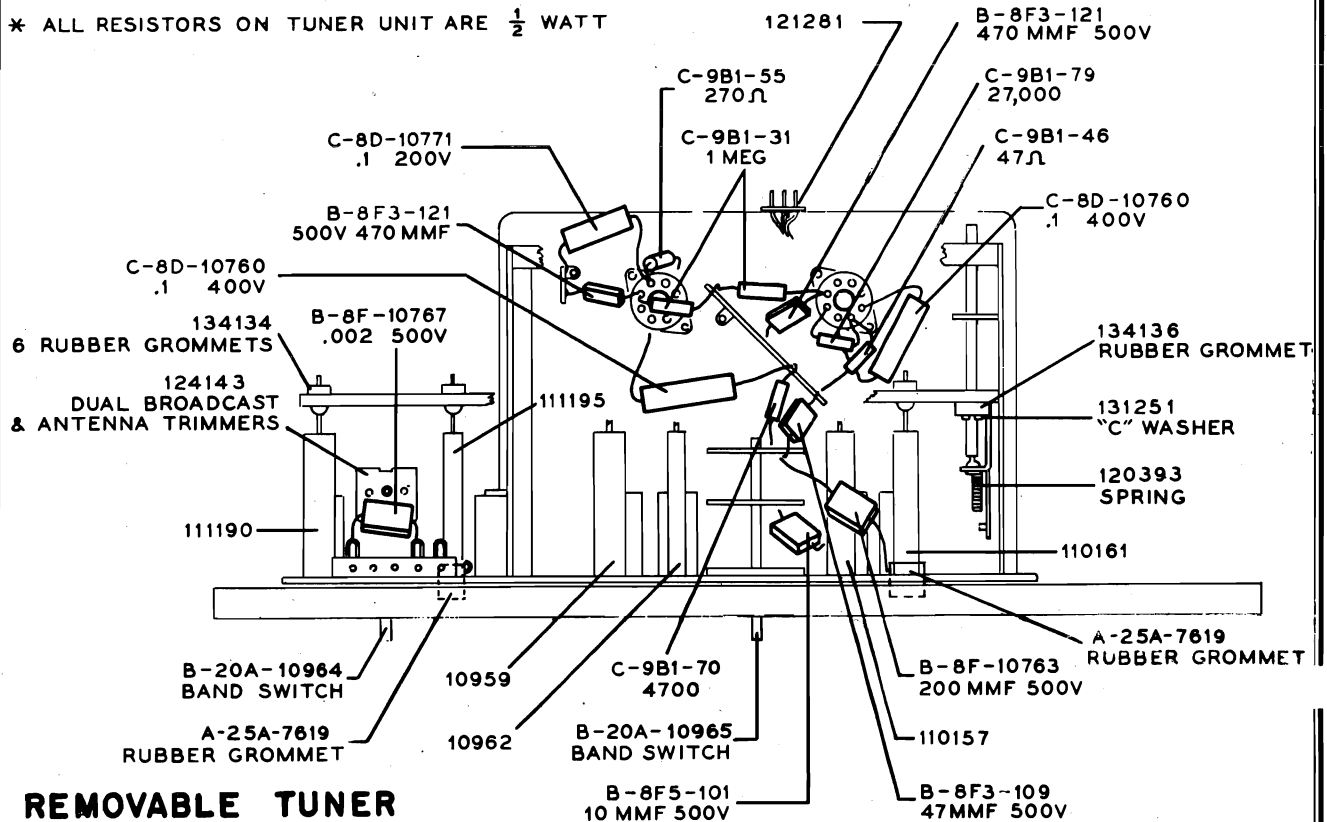
MODEL 43-7651



MODEL 43-7652



* ALL RESISTORS ON TUNER UNIT ARE $\frac{1}{2}$ WATT



MODELS 43-7651,
43-7652

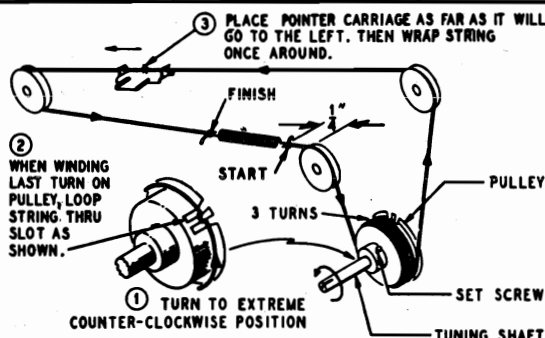
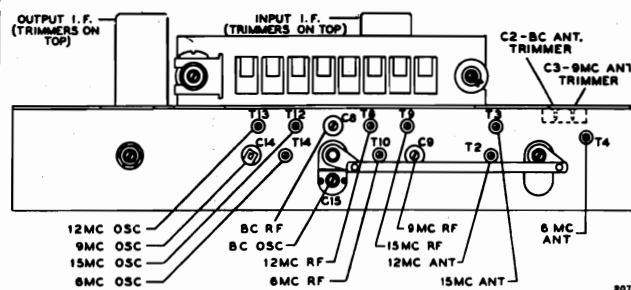
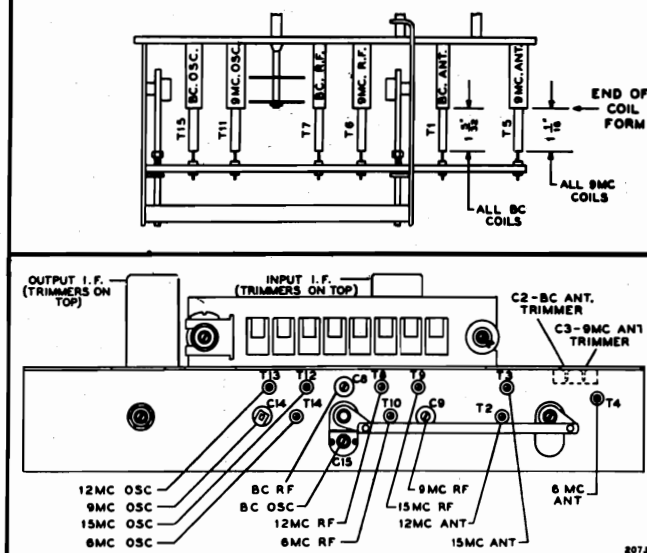
GAMBLE-SKOGMO, INC.

**REMOVAL OF CHASSIS
FROM CABINET**

Before removing chassis, take off escutcheon and pull pointer from pointer carriage.

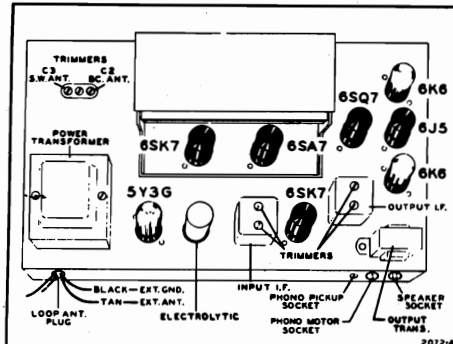
SPECIFICATIONS

8 Tube Superheterodyne, including rectifier tube
 Power Output..... 7.5 w. max., 5.5 w. undistorted
 Selectivity..... 35 kc. broad at 1,000 times signal at 1,000 kc.
 Intermediate Frequency..... 455 kc.
 Speaker..... 10 inch electrodynamic. Voice coil impedance 3.2 ohms
 Sensitivity..... 4 mv. avg. for 1/2 w. output
 Power Supply..... 105-125 v. A.C. 60 cycles 95 w. (118 w. with phono motor operating)
 Tuning..... All bands permeability-tuned
 Frequency Ranges..... Broadcast band 540-1,600 kc.
 49-meter band 5.96-6.19 mc.
 31-meter band 9.1-10 mc.
 25-meter band 11.45-12.16 mc.
 19-meter band 14.94-15.46 mc.
 Antenna..... Built-in; provisions also for external antenna and ground.

Coils and Trimmers

- WHEN FINISHED WITH STRINGING, SPRING MUST BE $\frac{1}{4}$ " FROM IDLER AS SHOWN. TO DO THIS:
- LOOSEN SET SCREW ON PULLEY.
 - HOLD TUNING SHAFT FIRM IN POSITION INDICATED AND TURN PULLEY BY HAND UNTIL SPRING IS $\frac{1}{4}$ " AWAY FROM IDLER.
 - TIGHTEN SET SCREW. NOW SPRING SHOULD TRAVEL BACK AND FORTH WITHOUT TOUCHING THE IDLERS.
 - REPLACE CHASSIS IN CABINET. REPLACE POINTER ON CARRIAGE. TUNE IN STATION OF KNOWN FREQUENCY. HOLD TUNING SHAFT FIRM AND SLIDE POINTER TO CORRECT POSITION ALONG DIAL.
 - GLUE POINTER TO STRING.

2074

Replacement of Drive Cord

2072-6

ALIGNMENT PROCEDURE CHASSIS VIEW

Mechanical Adjustment—The core tuning bar (see illustration of iron cores) and dial pointer must be adjusted mechanically before any electrical alignment is attempted. Rotate the manual tuning control until the core bar is farthest from the coils. For proper adjustment the bar should be approximately 1/32 of an inch from the two rod guide angles.

With the core bar in this position, adjust the dial pointer to coincide with 1,600 kc. on the dial scale.

Rotate each of the three broadcast coils (see illustration) until the end of the coil is 1-5/32 inches from the end of the coil form. Rotate the three 9-mc. coils until this dimension is 1-1/16 inches from these coils. After these adjustments have been made, the unit can be aligned electrically.

Electrical Adjustment—To align the set make the following preliminary adjustments: Set the tone pushbutton for treble tone; set the volume control at maximum; connect the ground post of the signal generator to the radio chassis; connect the output meter across a 3.2 ohm output load; and allow the receiver and signal generator to warm up for several minutes.

Align the set according to the sequence given in the chart. The indicated dummy antenna is to be connected in series between the signal generator output lead and the receiver. Adjust the set for maximum output; reduce the input as needed to keep the output near 1.3 volts.

Locations of all the trimmers and coils are shown in the illustrations. After adjustment, seal the coil cores with collodion or a similar substance (do not use cement).

BAND SWITCH SETTING	Frequency	SIGNAL GENERATOR Coupling Capacitor	Connection to Radio	Dial POINTER SETTING	ADJUST TO MAXIMUM OUTPUT (in order shown)
Broadcast (for I.F.)	455 kc.	.1 mf.	Grid (pin 8) of converter (6SAT)	1,600 kc.	Trimmers on output and input I.F. cans
Broadcast	1,600 kc.	200 mmf.	Antenna lead	1,600 kc.	BC Osc. trimmer C15 BC R.F. trimmer C8 BC Ant. trimmer C2
	1,400 kc.	200 mmf.	Antenna lead	1,400 kc.	Rotate cores of BC R.F. coil T7 and BC Ant. coil T1
31 Meter	9.6 mc.	400 ohms	Antenna lead	9.6 mc.	9 mc. Osc. trimmer C14 9 mc. R.F. trimmer C94 9 mc. Ant. trimmer C3
49 Meter	6.1 mc.	400 ohms	Antenna lead	6.1 mc.	6 mc. Osc. coil T14 6 mc. R.F. coil T10 6 mc. Ant. coil T4
25 Meter	11.8 mc.	400 ohms	Antenna lead	11.8 mc.	12 mc. Osc. coil T13 12 mc. R.F. coil T8 12 mc. Ant. coil T2
19 Meter	15.2 mc.	400 ohms	Antenna lead	15.2 mc.	15 mc. Osc. coil T12 15 mc. R.F. coil T9 15 mc. Ant. coil T3

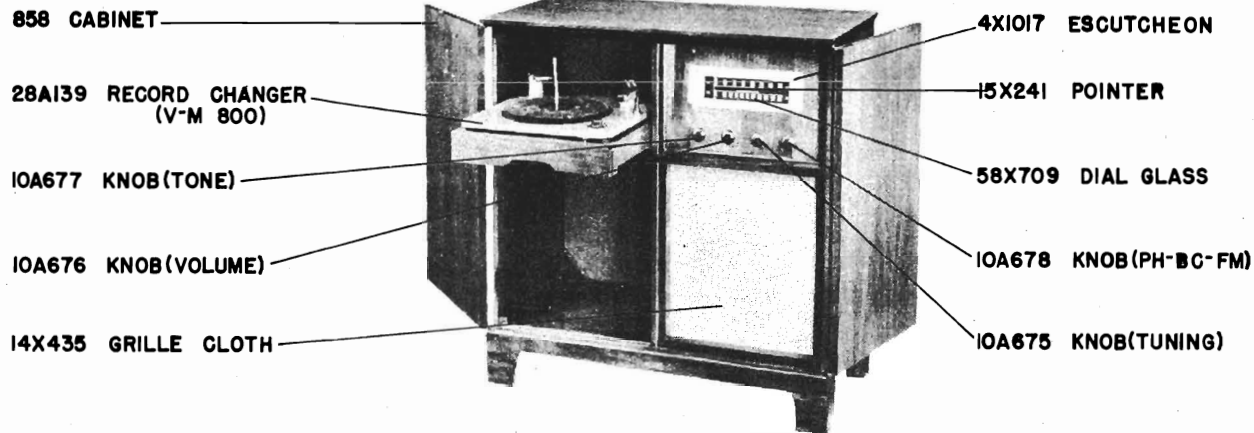
GAMBLE-SKOGMO, INC.

MODELS 43-7651,
43-7652

Ref. No.	Part No.	Description	Ref. No.	Part No.	Description
MAIN CHASSIS					
CAPACITORS*					
C16	C-8F3-12	470 mmf, 20%, mica	T17	108176	Output IF coil complete in can (Range of trimmers: 80-140 mmf)
C17, C19	C-8D-10774	.02 mf, 400 volts, 20%	T18	B-12C-10234	Output transformer
C18	C-8D-10771	.1 mf, 200 volts, +20%—10%	T20	104202B	Power transformer
C20-A	129165B	Dual, 50 mmf each section, mica,	SOCKETS		
C20-B		20%	121200		Socket, 4-terminal, for loop antenna
C21	C-8D-10813	.05 mf, 400 volts, 20%	121279		Socket, 5-terminal, for tuner
C22	C-8D-10935	.005 mf, 600 volts, +40%—15%	A-15B-11538		Socket, 4-terminal, for speaker
C23	C-8F3-10	220 mmf, 20%, mica	121280		Socket, 1-terminal, for phono pick-up
C24	C-8D-10770	.05 mf, 200 volts, 20%	121199		Socket, 2-terminal, for phono motor
C25	C-8D-10788	.004 mf, 600 volts, 20%	121210		Socket, octal, molded (all tubes except 6SK7, 1F amp.)
C27	C-8D-10992	.03 mf, 200 volts, 20%	121273		Socket, octal, laminated (for 6SK7, 1F amplifier)
C28	C-8D-10785	.006 mf, 600 volts, 20%	B-47A-10808		Socket assembly for dial light
C29-A, -B, -C	119109	Electrolytic, 15 mf x 450 volts, 15 mf x 450 volts, 10 mf x 350 volts	MISCELLANEOUS		
C30, C31	C-8J-11321	.02 mf, 600 volts, 20%	T19	B-18B-10617	Speaker, 10-inch, electrodynamic
RESISTORS*				A-19A-11539	Plug on speaker leads
R7, R8	C-9B1-21	22,000 ohms, 1/2 watt, 20%	T21	A-14MA-11066-3	Loop antenna (ribbon only)
R9	C-9B1-59	560 ohms, 1/2 watt, 10%	T22	A-16A-11113	Choke on loop terminal board
R10	C-9B1-23	47,000 ohms, 1/2 watt, 20%		A-19A-11322	Plug on loop antenna leads
R11	C-9B1-34	3.3 megohms, 1/2 watt, 20%		107401	Phono motor cable assembly
R12, S3	125180	Tone control (1 megohm) and radio-phono switch		10724	Connector, for phono pickup leads
R13	C-9B1-27	220,000 ohms, 1/2 watt, 20%		B-6D-10984	Dial scale
R14, R17	C-9B1-86	100,000 ohms, 1/2 watt, 10%		10794	Dial light, 6-8 volts, type T-44 (2 used)
R15	C-9B1-31	1 megohm, 1/2 watt, 20%		B-2G-10588-1	Dial pointer
R16	C-9B1-70	4700 ohms, 1/2 watt, 10%		A-2J-11041	Pointer spring
R18, R19	C-9B1-29	470,000 ohms, 1/2 watt, 20%		1121035	Pointer carriage
R20	C-9B2-56	330 ohms, 1 watt, 10%		B-53A-10989	String for dial pointer
R21	10662	12,500 ohms, 3 watts, 10%		120377	Spring for dial pointer string
R23	C-9B1-20	15,000 ohms, 1/2 watt, 20%		107266	Line cord and plug (9 feet)
R24, S4	A-10A-10586	Volume control (500,000 ohms) and on-off switch		112985-14	Escutcheon (for walnut cabinet)
R25	C-9B1-35	4.7 megohms, 1/2 watt, 20%		112985-41	Escutcheon (for mahogany cabinet)
COILS AND TRANSFORMERS				A-5B-10893-14	Knob, band switch or radio-phonotone (for walnut cabinet)
T16	108177	Input IF coil complete in can (Range of trimmers: 110-210 mmf)		A-5B-10893-41	Knob, band switch or radio-phonotone (for mahogany cabinet)
REMOVABLE TUNER ASSEMBLY				128523-14	Knob, tuning or volume (for walnut cabinet)
CAPACITORS				128523-41	Knob, tuning or volume (for mahogany cabinet)
C1	B-8F-10767	.002 mf, 500 volts, 10%, mica		A-2L-11293	Bandswitch link
C2, C3	124143	Dual, broadcast (67-123 mmf) and 9 mc (95-175 mmf) ant. trimmers		112961	Station call letters
C4, C10	B-8F3-121	470 mmf, 500 volts, 10%, mica	T6	10959	9-mc RF coil
C5	C-8D-10771	.1 mf, 200 volts, +20%—10%	T7	10962	Broadcast RF coil
C6, C11	C-8D-10760	.1 mf, 400 volts, +20%—10%	T8	10960	12-mc RF coil
C7	B-8F5-101	10 mmf, 500 volts, 10%, silver mica	T9	10961	15-mc RF coil
C8	A-8G-7205	Broadcast RF trimmer (120-220 mmf)	T10	10958	6-mc RF coil
C9	A-8G-7206	9 mc RF trimmer (60-110 mmf)	T11	110157	9-mc oscillator coil
C12	B-8F3-109	47 mmf, 500 volts, 10%, mica	T12	110159	15-mc oscillator coil
C13	B-8F-10763	200 mmf, 500 volts, 3%, silver mica	T13	110158	12-mc oscillator coil
C14	124145	9 mc oscillator trimmer (7-35 mmf)	T14	110156	6-mc oscillator coil
C15	124144	Broadcast oscillator trimmer (15-27 mmf)	T15	110161	Broadcast oscillator coil
RESISTORS			MISCELLANEOUS		
R1, R4	C-9B1-31	1 megohm, 1/2 watt, 20%	S1	B-20A-10964	Band switch, antenna
R2	C-9B1-55	270 ohms, 1/2 watt, 10%	S2	B-20A-10965	Band switch, oscillator and RF
R3	C-9B1-70	4700 ohms, 1/2 watt, 10%		121210	Socket, molded, for 6SA7
R5	C-9B1-46	47 ohms, 1/2 watt, 10%		121171	Socket, laminated, for 6SK7GT
R6	C-9B1-79	27,000 ohms, 1/2 watt, 10%		117907	Tuning shaft
COILS (complete with cores)				117798	Pinion gear on tuning shaft
T1	111195	Broadcast antenna coil		120393	Spring, intermediate link, under ends of treadle bar
T2	111191	12-mc antenna coil		131251	Washer, "C," on slug tuning bar
T3	111192	15-mc antenna coil		B-2C-7245	Gear segment
T4	111189	6-mc antenna coil		A-2J-7439	Spring clip, for coils
T5	111190	9-mc antenna coil		131316B	Washer "C," for 9-mc coils
				134134	Grommet for core mounting (all broadcast and 9-mc coils)
				134126	Grommet for coil mounting (broadcast RF and antenna coils)
				134125	Grommet for coil mounting (broadcast oscillator coil)
				A-25A-7619	Grommet for all 9-mc coils
				B-202-10475	Pushrod assembly
				120366	Spring, pushrod return
				121281	Plug, 5-prong
				128759-14	Pushbutton, walnut
				128759-41	Pushbutton, mahogany
				131210	Washer, "C," on end plate

MODEL 43-7851

GAMBLE-SKOGMO, INC.



SPECIFICATIONS

7 Tube Superheterodyne.....Including Rectifier Tube FM Sensitivity.....(For 0.5 Watt Output) 200 mv avg
 Power Consumption(at 117 Volts AC) 60 Watts (normal) Intermediate Frequency.....AM-455KC: FM-10.7 MC
 80 Watts (phono operating) Tuning Range.....AM-540-1600 KC, FM-88-108 MC
 Selectivity.....AM-50KC Broad at 1000 Times Signal Speaker.....10" P.M. Dynamic
 I.F. FM-200KC Broad at 2 Times DownPower Output.....4.5 W Max.: 2.5 W 10% Harmonics
 I.F. FM-800KC Broad at 200 Times DownPower Supply.....105-125 Volts AC 60 cycles only
 AM Sensitivity...(For 0.5 Watt Output, with external Record Changer.....Plays ten 12" or twelve 10"
 Antenna) 20 mv avg

REMOVAL OF CHASSIS FROM CABINET

Before the chassis can be removed from the cabinet, it will be necessary to pull off the 4 control knobs, remove the three chassis mounting bolts and disconnect the leads from the chassis to the loop antenna, record changer and speaker.

ALIGNMENT PROCEDURE

AM STAGES

Volume Control Maximum all adjustments.

Connect Radio Chassis to Ground Post of Signal Generator with a Short Heavy Lead.

Allow Chassis and Signal Generator to "Heat Up" for Several Minutes.

The following is required for aligning.

An All Wave Signal Generator Which Will Provide an Accurately Calibrated Signal at the Test Frequencies as Listed.

Output Indicating Meter, Non-Metallic Screwdriver
 Dummy Antennas - .1 mf, and 50 mmf.

GAMBLE-SKOGMO, INC.

MODEL 43-7851

FREQUENCY SETTING	SIGNAL GENERATOR CONNECTION AT RADIO	GROUND CONNECTION	DUMMY ANTENNA	GANG CONDENSER SETTING	ADJUST TUNING SLUGS (I-F ONLY) GRIMMERS (OSC. & ANT.)
455 KC	Control Grid 1st 6BA6 Pin No. 1	Chassis Base	.1 mf	Turn Rotor to Full Open	2nd I.F. Pri. & Sec.
455 KC	Control Grid 6BE6 Pin No. 7 1st Det.	Chassis Base -	.1 mf	Turn Rotor to Full Open	1st I.F. Pri. & Sec.
1620 KC	Control Grid 6BE6 Pin No. 7	Chassis Base	.1 mf	Turn Rotor to Full Open	Oscillator Trimmer (AM)
1400 KC	External Antenna Lead	Chassis Base	50 mmf	Turn Pointer to 1400 KC See Note A	Antenna Trimmer (AM)

NOTE A - If the pointer is not at 1400 KC on the dial, reset pointer to the 1400 KC mark on the dial scale.

FM STAGES

Allow chassis and signal generator to warm up for several minutes. The following equipment is required for aligning:

An accurately calibrated signal generator providing unmodulated signals at the test frequencies listed below.

Non-metallic screwdriver

Dummy Antennas and I-F Loading Resistor- .01 mf 300 ohms and 100 K ohms.

Zero center scale DC vacuum voltmeter having a range of approximately 3 volts.

(If a zero center scale meter is not available, a standard scale vacuum tube voltmeter may be used by reversing the meter connections for

SIGNAL GENERATOR

	FREQUENCY SETTING	CONNECTION AT RADIO	DUMMY ANTENNA	BAND SWITCH SETTING	CONDENSER SETTING	ADJUSTMENT FOR MAX. METER DEFLECTION
Discriminator	10.7 MC	6BA6 2nd I-F Pin 1 & Chassis	.01 mf	FM	Rotor to Full Open	Disc. Pri. Note A
	10.7 MC	6BA6 2nd I-F Pin 1 & Chassis	.01 mf	FM	Rotor to Full Open	Disc. Sec. Note B
	10.7 MC	6BA6 2nd I-F Pin 1 & Chassis	.01 mf	FM	Rotor to Full Open	Disc. Pri. Note A
	10.7 MC	6BA6 2nd I-F Pin 1 & Chassis	.01 mf	FM	Rotor to Full Open	Disc. Sec. Note B
	I-F 10.7 MC	6BA6 1st IF Pin 1 & Chassis	.01 mf	FM	Rotor to Full Open	2nd I-F Pri. 2nd I-F Sec. Note C
	10.7 MC	Unsolder lead from Pin 7 to band switch. Insert 100K ohm resistor between Pin 7 & Ground and feed signal into Pin 7 of 6BE6	.01 mf	FM	Rotor to Full Open	1st I-F Pri. 1st I-F Sec. Note C

RECHECK I-F ADJUSTMENTS IN ORDER GIVEN

Ant. & Osc.	108.5	Disconnect built-in line antenna and connect generator to dipole terminals with resistor in series	300ohms	FM	Rotor to Full Open	Osc. Trimmer (FM)
Note D						
	104.5	Same as above	300ohms	FM	Tune rotor for max. AVC voltage	Ant. Trimmer (FM)

RECHECK ANTENNA & OSC. ADJUSTMENTS IN ORDER GIVEN



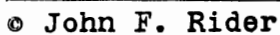
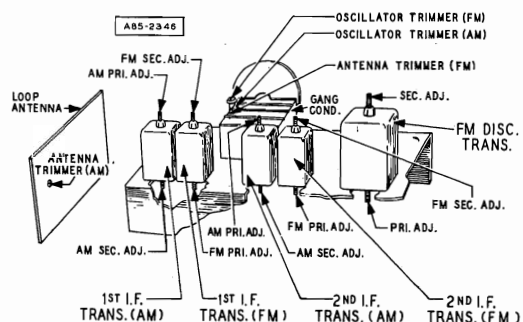
- 75X12 CABINET BACK

17A235 TRIMMER

—12A480 10" PM SPEAKER

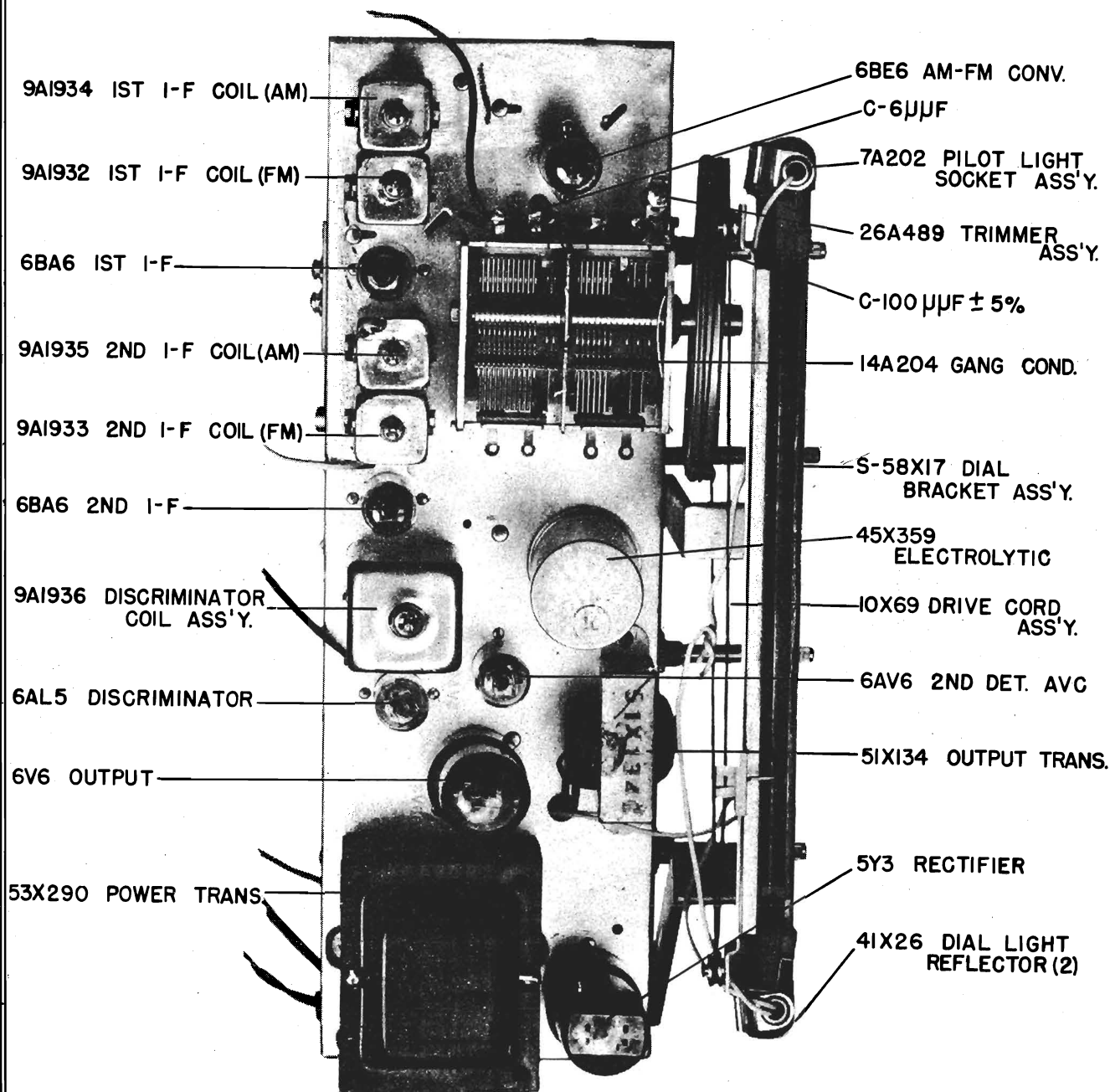
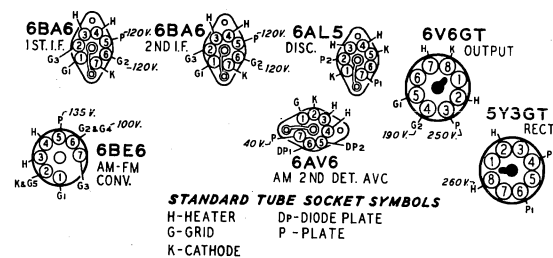
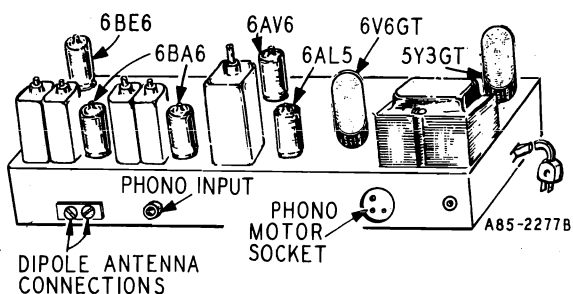
26A478 "B" RANGE LOOP
ASS'Y.

REAR CABINET VIEW



GAMBLE-SKOGMO, INC.

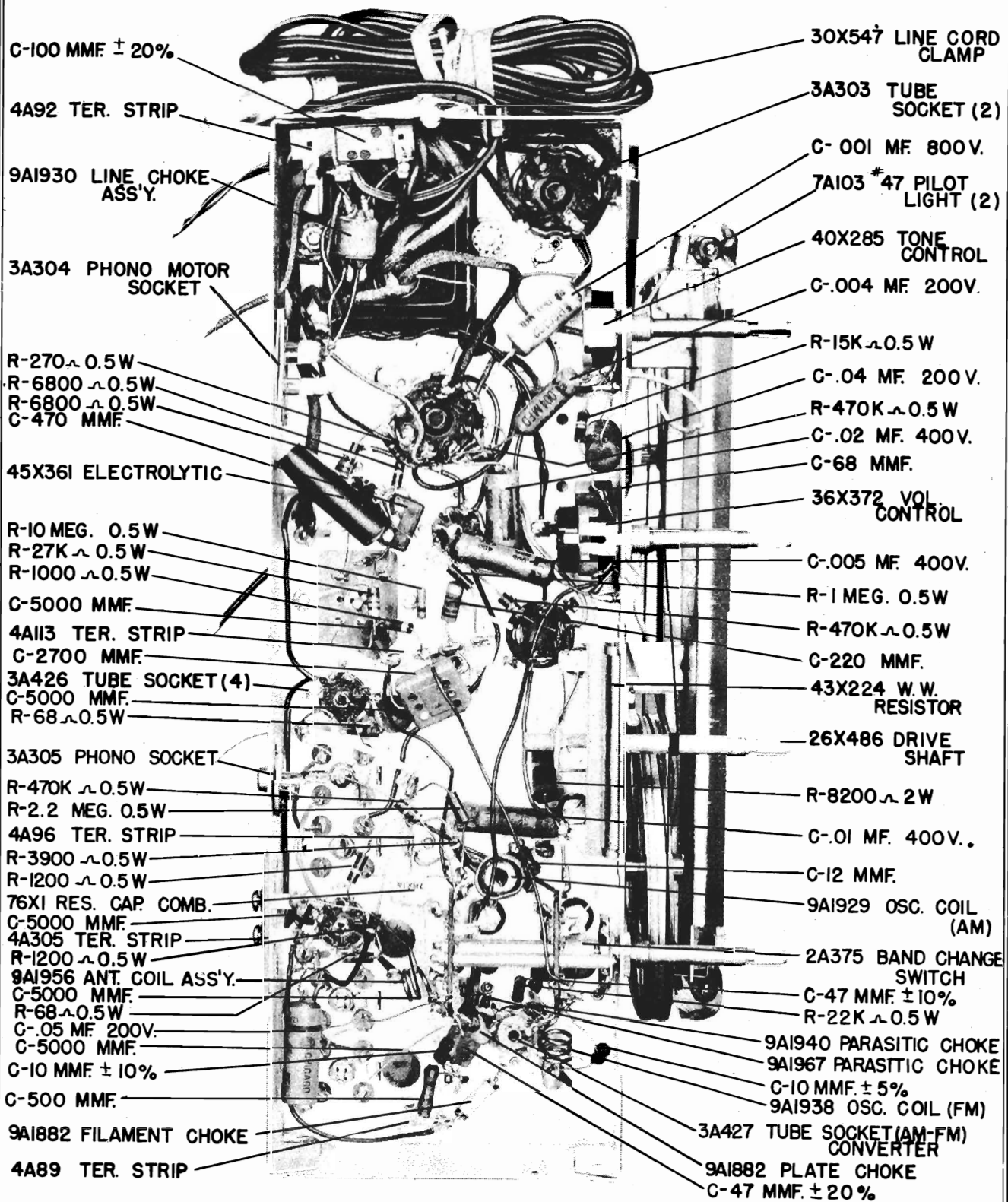
MODEL 43-7851



TOP CHASSIS VIEW

MODEL 43-7851

GAMBLE-SKOGMO, INC.



BOTTOM CHASSIS VIEW

PREFIX "C" INDICATES CONDENSER
 PREFIX "R" INDICATES RESISTOR

GAMBLE-SKOGMO, INC.

MODEL 43-7851

Part No.	Description	Part No.	Description
2A375	Band Change Switch	19X192	"C" Washer (Drive Shaft) (2)
3A303	Molded Octal Tube Socket (2)	19X434	#8 Flat Washer (Mtg. 53X290) (2)
3A304	Phono Motor Socket	20X260	Condenser Cushion Stud (3)
3A305	Phono Socket (Single Pin)	22X472	Chassis Base (with bracket)
3A426	Tube Socket (miniature) (4)	26X486	Drive Shaft
3A427	Tube Socket (miniature for AM-FM converter)	25X1488	Idler Bracket
4A89	Terminal Strip	28X113	Drive Cord Tension Spring
4A92	Terminal Strip	30X547	Line Cord Clamp
4A96	Terminal Strip	36X372	Volume Control & Switch
4A113	Terminal Strip	40X285	Tone Control
4A405	Antenna Terminal Strip	41X26	Dial Light Reflector (2)
7A103	Pilot Light #47 (2)	43X224	W.W. Resistor, 1000 ohms 4 W-1400 ohms 6 W
7A202	Pilot Light Socket Assembly	45X359	4 Section Electrolytic, 40 mf, 350 V - 40 mf 350 V - 20 mf, 350 V - 20 mf, 25 V
9A1882	Choke Assembly (2)		Dry Electrolytic, 5 mf, 100 V
9A1929	Oscillator Coil Assembly (AM)	45X361	Capacitor, Ceramic; 47 mmf 20%
9A1930	Line Choke Assembly	47X463	Capacitor, Ceramic; 220 mmf 20%
9A1932	1st I.F. Coil Assembly (FM)	47X468	Capacitor, Molded Mica; 68 mmf 20%
9A1933	2nd I.F. Coil Assembly (FM)	47X471	Capacitor, Molded Mica; 100 mmf 20%
9A1934	1st I.F. Coil Assembly (AM)	47X476	Capacitor, Molded Mica; 2700 mmf 10%
9A1935	2nd I.F. Coil Assembly (AM)	47X492	Capacitor, Silvered Mica; 5000 mmf (5)
9A1936	Discriminator Coil Assembly	47X507	Capacitor, Ceramic; 500 mmf 20%
9A1938	Oscillator Coil Assembly (FM)	47X508	Capacitor, Silvered Mica; 470 mmf 5%
9A1940	Parasitic Choke	47X510	Capacitor, Ceramic; 100 mmf 5%
9A1956	Antenna Coil Assembly	47X512	Capacitor, Ceramic; 10 mmf 5%
9A1967	Parasitic Choke Assembly	47X517	Capacitor, Ceramic; 47 mmf 10%
10A675	Knob (Tuning)	47X521	Capacitor, Ceramic; 6 mmf 10%
10A676	Knob (Off-On Volume)	47X522	Capacitor, Ceramic; 12 mmf 10%
10A677	Knob (Tone)	47X523	Capacitor, Ceramic; 10 mmf 10%
10A678	Knob (Ph-BC-FM)		Output Transformer
12A480	10" P.M. Speaker	51X134	Power Transformer
14A204	Gang Condenser & Pulley	53X290	Dial Glass
28A139	Record Changer V.M. #800	58X709	Cabinet Back
26A478	"B" Range Loop Antenna Assembly made up of: 9A1939 "B" Range Loop Antenna	75X12	Resistor Capacitor Combination
	17A235 Trimmer Condenser	76X1	Capacitor Tubular .004 mf 200 V 25%
	1701 3/16" Tubular Rivet	B66402	Capacitor Tubular .04 mf 200 V 25%
26A489	Trimmer Assembly consisting of: 17A257 Tubular Trimmer Slug	B66403	Capacitor Tubular .05 mf 200 V 25%
	17A258 Tubular Trimmer Sleeve	B66503	Capacitor Tubular .05 mf 200 V 25%
S-58X17	Dial Bracket Assembly consisting of: 7X42 Cardboard Spacer	B83392	Resistor, Carbon; 3900 ohms .5 W
	8X185 Rubber Bands	B83680	Resistor, Carbon; 68 ohms .5 W (2)
	20X268 Rivets	B84102	Resistor, Carbon; 1000 ohms .5 W
	24X446 Idler Pulley	B84122	Resistor, Carbon; 1200 ohms .5 W (2)
	25X1569 Dial Bracket	B84153	Resistor, Carbon; 15 K ohms .5 W
	41X26 Dial Light Reflector	B84223	Resistor, Carbon; 22 K ohms .5 W
	58X709 Dial Glass	B84271	Resistor, Carbon; 270 ohms .5 W
	AS. Req. Brown Lacquer Enamel	B84273	Resistor, Carbon; 27 K ohms .5 W
4X1017	Escutcheon	B84682	Resistor, Carbon; 6800 ohms .5 W (2)
5X21	Rubber Grommet (4)	B85105	Resistor, Carbon; 1 megohm .5 W
10X69	Drive Cord Assembly	B85106	Resistor, Carbon; 10 megohms .5 W
13X546	Line Cord & Plug Assembly	B85225	Resistor, Carbon; 2.2 megohms .5 W
14X435	Grille Cloth	B85474	Resistor, Carbon; 470 K ohms .5 W (3)
15X241	Pointer	D66103	Capacitor, Tubular; .01 mf 400 V 25%
19X179	Flat Washer (Mtg. Set to Cabinet) (3)	D66203	Capacitor, Tubular; .02 mf 400 V 25%
		D66502	Capacitor, Tubular; .005 mf 400 V 25%
		D84822	Resistor, Carbon; 8200 ohms 2.0 W
		H66102	Capacitor, Tubular; .001 mf 800 V 25%

FM ALIGNMENT NOTES

Note A - The zero center scale DC vacuum tube voltmeter is to be connected between chassis ground and the A.V.C. line at the 27 K. ohm resistor and its junction with terminal strip. A signal of .1 volt must be fed into the receiver for this adjustment. Note output voltage on the zero center DC vacuum tube voltmeter.

Note B - Disconnect zero center DC vacuum tube voltmeter from A.V.C. and connect it to the audio takeoff point at the 1 megohm resistor and its junction with

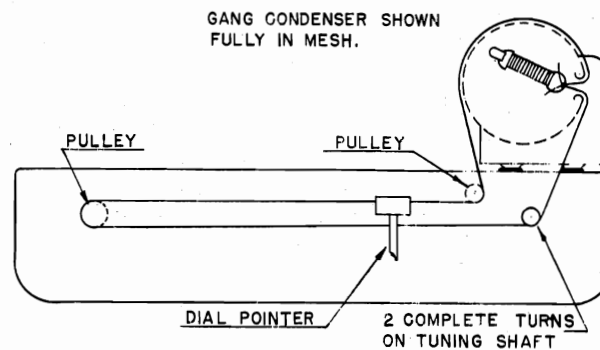
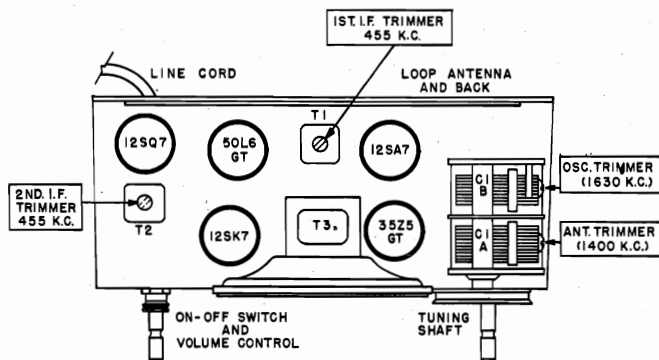
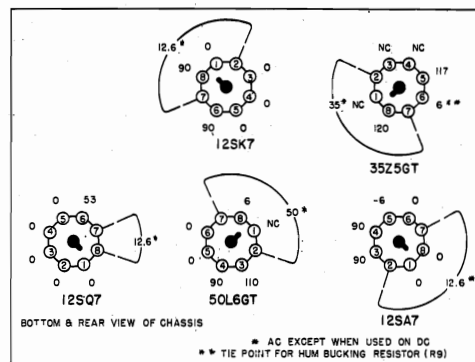
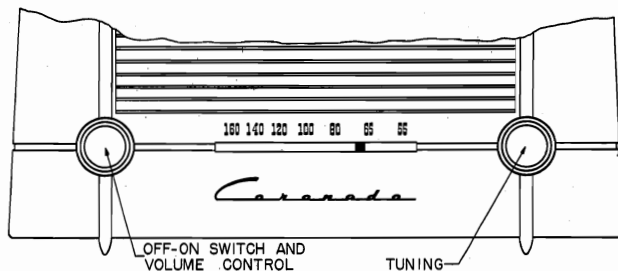
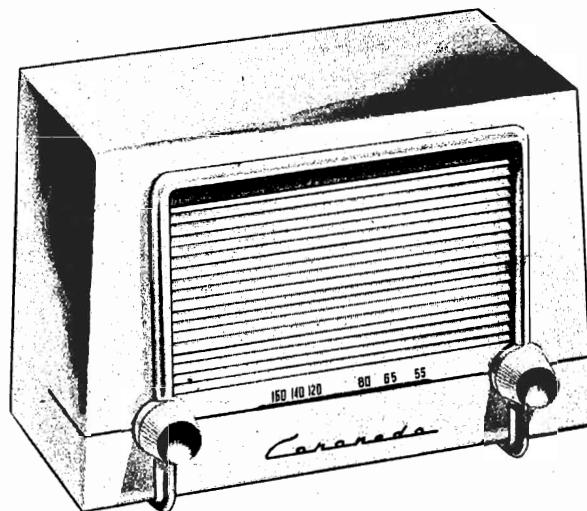
the terminal strip. Adjust for zero voltage indication.

Note C - Connect zero center DC vacuum tube voltmeter as in Note A. Adjust input to give same output on the zero center DC vacuum tube voltmeter as in Note A.

Note D - Remove the 100 K ohm load resistor and solder the lead from pin 7 of 6BE6 tube to the band switch before attempting to check the antenna and oscillator adjustments.

MODELS 43-8129A,
43-8130A, 43-8130B,
43-8131A, 43-8131B

GAMBLE-SKOGMO, INC.



SPECIFICATIONS

Power Supply	117 volts 60 cycle AC, 117 volts DC, 29 watts
Frequency Range	535 KC to 1630 KC
Intermediate Frequency	455 KC
Antenna	Built-in Loop
Tuning	Variable Capacity
Speaker	4", P.M., voice coil impedance 3.2 ohms
Power Output	0.75 watt undistorted, 1.8 watts maximum
Sensitivity	500 uv/m average for 50 milliwatts output
Selectivity	65 KC broad at 1000 times, signal at 1000 KC

Tubes used are as follows:

12SA7 Oscillator-Converter
12SQ7 AVC, Detector and Audio
12SK7 I.F. Amplifier

50L6GT Power Output
35Z5GT Power Rectifier

GAMBLE-SKOGMO, INC.

MODELS 43-8129A,
43-8130A, 43-8130B,
43-8131A, 43-8131B

ALIGNMENT PROCEDURE

The following procedure is for use only by competent servicemen having the proper equipment. The alignment should be made with volume control fully on, and the output from the Signal Generator as low as possible, to prevent AVC action from interfering with proper alignment.

With the output meter connected across the voice coil of the speaker, the output meter reading for 50 milliwatts is 0.4 volts, using a signal which is modulated 400 c.p.s.

Adjust all trimmers for maximum output. Repeat the alignment procedure given below as a final check.

CAUTION: This is an AC/DC receiver and when aligning the set it is necessary to isolate the Signal Generator or the Receiver from the line by use of a transformer, or to place a .2 MFD condenser in each test lead of the Signal Generator.

SIGNAL GENERATOR	POSITION	ADJUST FOR
Dummy	OF	MAXIMUM
Antenna	VARIABLE	OUTPUT
Frequency	Fully	T1 & T2
455 KC	Open	
1630 KC	Fully	C1B
	Open	Oscillator
1400 KC	Tune in	C1A
	Coupled	Antenna
	To Loop	

Connect low side of Signal Generator to common negative.

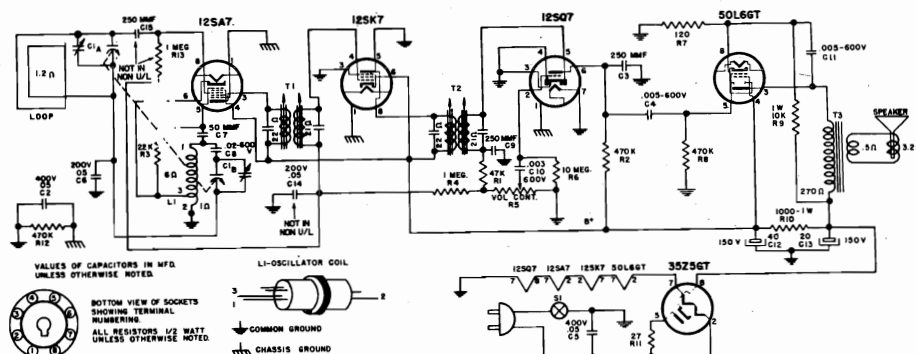
SYMBOL	PART NO.	DESCRIPTION	VALUE	TOL.	RATING
CONDENSERS					
C1A, C1B	B19-198	Condenser, 2 gang	.05 MFD	20%	400 volts
C2, C5	A16-158	Condenser, paper	250 MMF	20%	500 volts
C3, C9, C15	A15-176	Condenser, mica	.005 MFD	20%	600 volts
C4, C10, C11	A16-153	Condenser, paper	.05 MFD	20%	200 volts
C6, C14	A16-152	Condenser, paper	50 MMF	20%	500 volts
C7	A15-175	Condenser, mica	.02 MFD	20%	600 volts
C8	A16-151	Condenser, paper	40 MFD		150 volts
C12	A18-280	Electrolytic	20 MFD		150 volts
C13	A18-272	Electrolytic			
RESISTORS					
R1	A60-685	Resistor	47K ohm	20%	1/2 watt
R2, R8, R12	A60-662	Resistor	470K ohm	20%	1/2 watt
R3	A60-659	Resistor	22K ohm	20%	1/2 watt
R4, R13	A60-668	Resistor	1 megohm	20%	1/2 watt
R5	A24-180	Volume-control and switch	1 megohm	20%	1/2 watt
R6	A60-663	Resistor	10 megohm	20%	1/2 watt
R7	A60-702	Resistor	120 ohms	10%	1/2 watt
R9	A60-698	Resistor	10K ohm	10%	1 watt
R10	A60-732	Resistor	1000 ohms	10%	1 watt
R11	A60-690	Resistor	27 ohms	10%	1/2 watt
COILS AND TRANSFORMERS					
T1, T2	A10-479	Input and output I.F. transformers			
L1	B10-480	Oscillator coil			

CABINET, DIAL AND TUNING PARTS

PART NO.	DESCRIPTION
A42-453	Cabinet, polystyrene, brown
D42-450	Cabinet, polystyrene, white
A42-452	Cabinet, polystyrene, black
A52-282	Knob, tenite, brown
B52-281	Knob, tenite, white
A51-105	Dial cord
A58-73	Pointer, slide type
A70-122	Spring, dial cord tension

MISCELLANEOUS

PART NO.	DESCRIPTION
A11-187	Clamp, line cord
A23-151	Line cord
A83-421	Clip, I.F. trans. mounting
B79-369	Speaker, 4", P.M. w/output trans.
C21-139	Cover, chassis bottom
SD84-275	Loop and back (for U/L models)
SD84-305	Loop and back (for non U/L models)
68-11	Tube socket



ALIGNMENT PROCEDURE

Volume control—Maximum: all adjustments.

Connect ground lead of signal generator to common "B."

Connect dummy antenna in series with output lead of signal generator.

Connect output meter across voice coil of speaker.

For alignment points refer to Figure No. 2.

The following equipment is necessary for proper alignment:

Signal generator that will provide the test frequencies as listed, 30% modulated, 400 c.p.s.

Output meter.

Non-metallic screwdriver.

Dummy antennas—.1 mfd.,

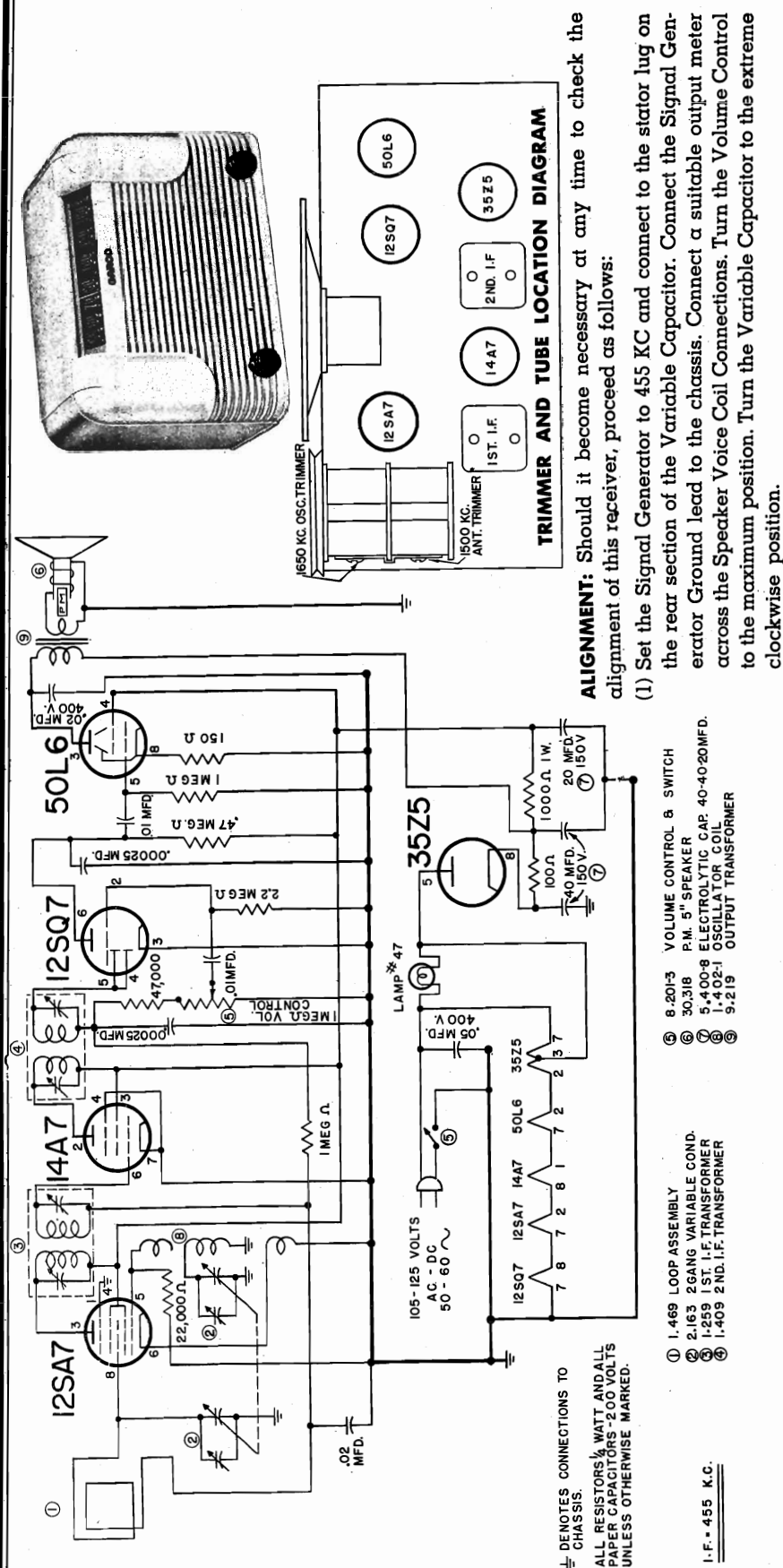
Position of Variable	Generator Frequency	Dummy Ant. Mfd.	Generator Connections	Trimmer Adjustment	Trimmer Function
Fully open	455 KC	.1	*1R5 Grid (Stator of C1A)	T2	Output I.F.
Fully open	455 KC	.1	*1R5 Grid (Stator of C1A)	T1	Input I.F.
Fully open	1600 KC	.1	*1R5 Grid (Stator of C1A)	C1B	Oscillator
Tune in signal from generator	1400 KC	—	Loosely coupled to loop	C1A	Antenna
**Tune in signal from generator	600 KC	—	Loosely coupled to loop	L1	600 KC Padder

*Connect ground lead of signal generator to chassis.

**When making this adjustment the variable should be rocked back and forth.

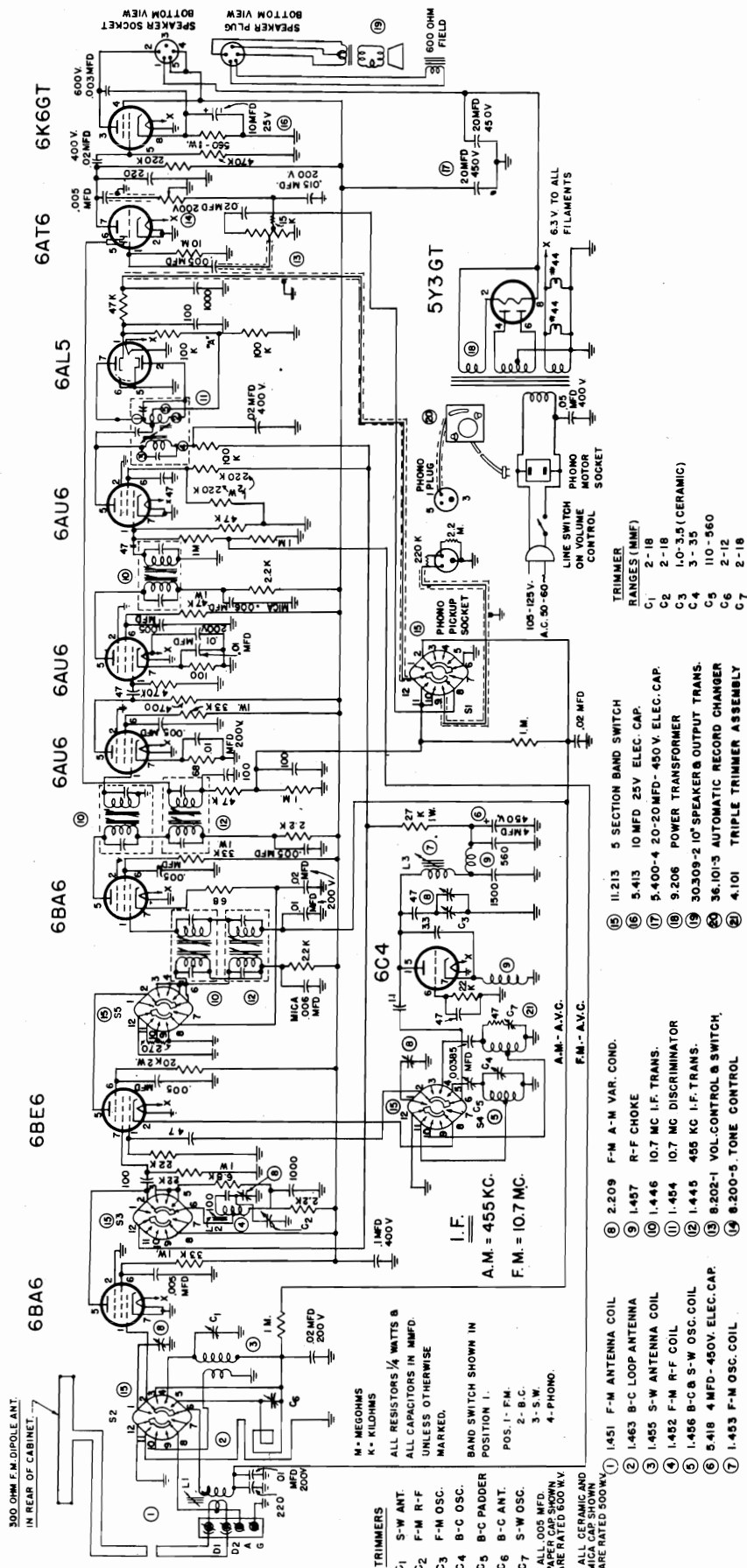
SYMBOL	PART NO.	DESCRIPTION	VALUE	RATING
CONDENSERS				
C2, C4, C5, C22	A15-190	Mica condenser	100 MMF	
C1A, C1B	B19-190	Variable condenser		
C3, C7, C8	A16-181	Condenser	.005 MFD	150 volts
C10, C12, C13				
C6	A15-191	Mica condenser	50 MMF	
C11, C17, C21	A16-172	Condenser	.05 MFD	400 volts
C14, C19		Electrolytic condenser	20 MFD	150 volts
C18	A18-282	Electrolytic condenser	40 MFD	150 volts
C20		Electrolytic condenser	100 MFD	25 volts
C15	A16-171	Condenser	.05 MFD	200 volts
C9	A16-182	Condenser	.002 MFD	200 volts
RESISTORS				
R1, R5, R7, R9	A60-726	Resistor	2.2 megohm	1/2 watt
R2	A60-727	Resistor	100K ohm	1/2 watt
R3, R11	A60-728	Resistor	10 megohm	1/2 watt
R4	A60-730	Resistor	47K ohm	1/2 watt
R6	A60-731	Resistor	470K ohm	1/2 watt
R8, R12	A60-729	Resistor	1500 ohm	1/2 watt
R10	A24-172	Volume Control	1 megohm	
R13	A60-723	Resistor	270 ohm	1/2 watt
R14	A60-722	Resistor	470 ohm	1/2 watt
R15	A60-725	Resistor	160 ohm	3 watt
R16, R17	A60-713	Resistor (1000 ohms ea. sec.)	2000 ohm	10 watt
R18	A60-724	Resistor	3300 ohm	1 watt
COILS AND TRANSFORMERS				
T1, T2	C10-475	1st and 2nd I.F. Transformer		
T3	A80-231	Output transformer		
L1	B10-477	Oscillator coil		
MISCELLANEOUS				
	S84-112	Cover assembly for "A" batteries		
	S84-214	Front cover ass'y. for case, with loop		
	S84-217	Rear cover assembly for case		
	S84-111	Hub and Pointer assembly		
	A52-227	Knob, On-Off switch		
	A52-229	Knob, tuning		
	A52-232	Knob, volume control		
	A83-561	Selenium Rectifier		
	B79-353	Speaker, P.M.		
	A69-174	Switch, AC-DC Battery		
	A69-175	Switch, On-Off		
	A75-34	Terminal for "B" battery		
	B23-156	Line cord		
	D21-108	End Cap, for handle		
	A83-494	Handle		

GAROD RADIO CORP.

MODEL 5A4,
THE THRIFTEE

MODEL 11FMP

GAROD RADIO CORP.



TUNING RANGE:

Broadcast Band: 540 to 1650 Kilocycles
(180 to 555 Meters)
Short Wave Band: 5.3 to 18.5 Megacycles
(16 to 56 Meters)
F-M Band:
87.5 to 108.5 Megacycles
(2.7 to 3.4 Meters)

DIAL SCALES: The Dial Scale is calibrated in Kilocycles for the Broadcast Band, and in Megacycles for the Short Wave and F-M Bands, corresponding with newspaper or periodical listings.

LINE VOLTAGE: This receiver is designed for operation on 105-125 Volts; 60 Cycles, Alternating Current (AC) only.

POWER CONSUMPTION INCLUDING RECORD

CHANGER: 100 Watts.

MODEL 11FMP

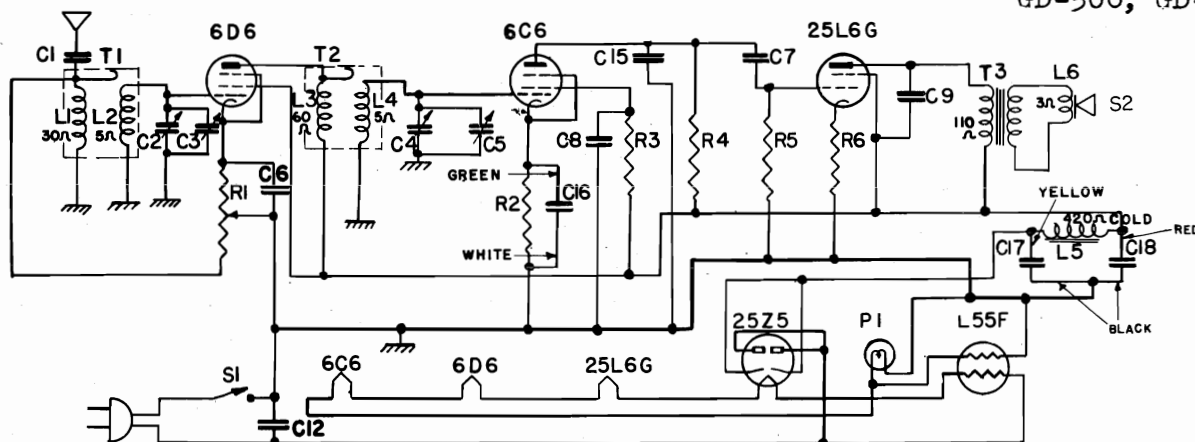
GAROD RADIO CORP.

ALIGNMENT CHART

(Follow Sequence as Indicated)

CIRCUIT ALIGNED	STEP	RCVR. DIAL POINTER	SIGNAL GENERATOR		METER	METER CONNECTIONS	TRIMMER OR CORE ADJ.	PROCEDURE
			FREQUENCY	CONNECTIONS				
B.C. I.F.	1	1650 KC. B.C. Band	455 KC. 30% Mod.	Through .1 MFD CAP. TO GRID of 6BE6.	A.C. Output Meter	Across voice coil	Cores on top and bottom of 1st and 2nd I.F. trans.	Adjust for maxi- mum output
F-M I.F.	2	108.5 MC. F-M Band	10.7 MC. unmod.	Through .01 MFD. Cap. to grid of 6BE6.	D.C. VTVM	From Pin 1 limiter grid and ground	Top and bottom cores of 1st, 2nd and 3rd I.F. Trans. F-M	Same as step 1
F-M I.F.	3							Repeat step 2
F-M Disc.	4	108.5 MC. F-M Band	10.7 MC. unmod.	Same as step 2	D.C. VTVM	From junction of 100K disc. load resistor point "A" and ground	Bottom core of 10.7 MC Disc. Trans.	Same as step 1
F-M Disc.	5	108.5 MC. F-M Band	10.7 MC. unmod.	Same as step 2	D.C. VTVM	From Pin 1 6AL5 and ground	Top core of 10.7 Mc Disc. Trans.	Adjust for zero between positive and negative meter reading
F-M Osc. (high Freq. end)	6	108.5 MC. F-M Band	108.5 MC. unmod.	Through balanced 300 ohm dummy ant. to D1, D2 and ground terminals	D.C. VTVM	From Pin 1 limiter grid and ground	C3	Same as step 1
F-M Osc. (low freq. end)	7	87.5 MC. Band 1	87.5 MC. unmod.	Same as #6	D.C. VTVM	Same as #6	Oscillator coil core L3	Same as step 1
F-M Osc.	8	REPEAT STEPS 6 AND 7 AS NECESSARY						
F-M R.F. Circuit	9	105 MC. Band 1	105 MC. unmod.	Same as #6	D.C. VTVM	Same as #6	C2	Same as step 1
F-M ANT. Circuit	10	90 MC. Band 1	90 MC. unmod.	Same as #6	D.C. VTVM	Same as #6	R.F. coil core L2	Same as step 1
	11	REPEAT STEPS 9 AND 10 AS NECESSARY						
	12	95 MC. Band 1	95 MC. unmod.	Same as #6	VTVM D.C.	Same as #6	Antenna coil core L1	Same as step 1
B.C. Osc.	13	1650 KC. Band 2	1650 KC. 30% mod.	Through loop, or coupled to re- ceiver loop by a 2 or 3 turn loop.	Output meter	Across voice coil	C4	Same as step 1
B.C. Osc.	14	540 KC. Band 2	540 KC. 30% mod.	Same as #13	Output meter	Across voice coil	C5	Same as step 1
	15	REPEAT STEP #13						
	16	1500 KC. Band 2	1500 KC. 30% mod.	Same as #13	Output meter	Across voice coil	C6	Same as step 1
B.C.R.F.	17	600 KC. Band 2	600 KC. 30% mod.	Same as #13	Output meter	Across voice coil	C5	Adjust for maxi- mum output while rocking gang
	18	REPEAT STEP 16						
S.W. Osc.	19	18.5 MC. Band 3	18.5 MC. 30% mod.	Through 400 ohm resistor to ant. and gnd. terminals.	Output meter	Across voice coil	C7	Adjust all the way open, then carefully turn in until output is maximum
S.W. R.F.	20	16.0 MC. Band 3	16.0 MC. 30% mod.	Same as #19	Output meter	Across voice coil	C1	Adjust for maxi- mum output while rocking gang

GENERAL ELECTRIC CO.

MODELS GD-50,
GD-506, GD-550

540-1800 kc.

Symbol	Description	Symbol	Description	Symbol	Description
C-1	Capacitor—.01 Mfd. (GD-41)	C-12	Capacitor—Paper .05 Mfd.	R-5	Resistor—1 Megohm
C-2	Capacitor—Variable	C-15	Capacitor—Mica 100 Mmf.	R-6	Resistor—150 Ohms
C-3	Capacitor—Trimmer on gang	C-16	Capacitor—Elect. 5 Mfd. 25 V.	T-1	Antenna Transformer
C-4	Capacitor—Variable	C-17	Capacitor—Elect. 16 Mfd. 150 V.	T-2	R.F. Transformer
C-5	Capacitor—Trimmer on gang	C-18	Capacitor—Elect. 10 Mfd. 150 V.	T-3	Output Transformer (on speaker)
C-6	Capacitor—Paper .05 Mfd.	R-1	Resistor—25,000 Ohms Volume Control	S-1	Power Switch (Comb. with R-1)
C-7	Capacitor—Paper .01 Mfd.	R-2	Resistor—35,000 Ohms	S-2	Loud-speaker—3-inch
C-8	Capacitor—Paper .01 Mfd.	R-3	Resistor—3 Megohms		
C-9	Capacitor—Paper .02 Mfd.	R-4	Resistor—1 Megohm		

ALIGNMENT

Connect the high side of the signal generator through a 250-mmf. condenser to the antenna lead. The low side of the signal generator output should be connected to the receiver chassis through a .05-mfd. condenser. Connect a suitable output meter across the voice coil leads; then proceed as follows:

1. With gang condenser plates completely closed, the dial pointer should coincide with the horizontal dial line.
2. Tune receiver to the 1500-kc. point on the dial; then align trimmers (C-3 and C-5) on the gang condenser at 1500 kc. for a maximum output meter reading.

Precaution—One side of the power supply is connected to the chassis—do not connect chassis to any external ground.

Electrical Specifications

Power Supply (Volts)	Frequency (Cycles on AC)	Power Consumption (Watts)
105-125 AC or DC	40-100	48

Electrical Power Output

Undistorted.....	1.0 watt
Maximum.....	2.0 watt

Tubes

RF Amplifier.....	GE-6D6
Detector.....	GE-6C6
Power Output.....	GE-25L6G
Rectifier.....	GE-25Z5
Ballast Tube Resistor.....	L55F
Dial Lamp.....	Mazda No. 44

SOCKET VOLTAGES

Tube No.	Plate to -B Volts DC		Screen to -B Volts DC		Cathode to -B Volts DC		Cathode Current M.A. DC		Heater Volts	
	AC	DC	AC	DC	AC	DC	AC	DC	AC	DC
6D6	113	90	113	90	9.0	7.4	0.7	0.6	6.35	6.06
6C6	20 *	16.4 *	45	37	3.1	2.5	0.1	0.08	6.35	6.06
25L6G	108	88	113	90	7.6	6.2	40.5	33.1	25.0	23.5
25Z5	.....	.....			133	108	43.0	35.0	26.0	24.0

Line voltage 115 AC or DC—No signal input—1000 ohms per volt meter.

Dial pointer at 540 kc. Volume control at minimum.

* Measured on 250-volt scale.

GENERAL INFORMATION

INTRODUCTION

Model XFM-1, Frequency Modulation Translator, is used in conjunction with any radio receiver designed for quality phono operation.

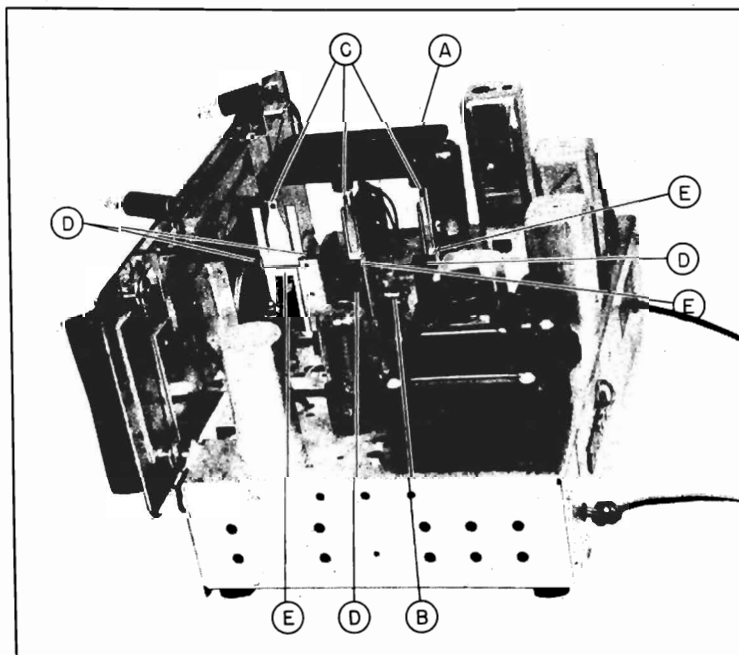
Tuning is accomplished by an "elevator" which consists of a rigid plastic horizontal plate (Figure 1-A) raised and lowered by means of a windlass (Figure 1-B) controlled by the tuning knob at the panel. From this plate are suspended three tuning "vanes" (Figure 1-C) which tune three low-inductance circuits. They are called "guillotine" tuners because of their appearance.

Nominal Voltage:	110	Range in Volts:	103-117
	125		117-133
	150		140-160
	200		185-213
	225		213-234
	245		234-260
Frequency.....			50-60 cycles
Wattage.....			.65

88 mc to 108 mc
Antenna Input
FM—300-ohm input for folded dipole.

(V1) R-F Amplifier.....	Type 6AG5
(V2) Oscillator.....	Type 6AK5
(V3) Converter.....	Type 6AK5
(V4) 1st I-F Amplifier.....	Type 6SG7
(V5) 2nd I-F Amplifier.....	Type 6SV7
(V6) Limiter.....	Type 6SH7
(V7) Discriminator and Audio Amplifier.....	Type 6AQ7GT
(V8) Rectifier.....	Type 5Y3GT/G
Dial Lamp (2).....	Mazda No. 44

The "guillotine" tuners are designed for the ultra-high frequency of the FM band where special technique is needed to attain high gain and circuit stability. The efficiency of a tuned circuit with a fixed capacity decreases with the inductance so that for high frequencies demanding very low inductance the circuit will be very inefficient. The stray capacities of every wiring assembly represent shunt capacities which offer only a low resistance at high frequencies. This resistance damps the tuned circuit, causing an appreciable drop in the gain. It is, therefore, imperative to reduce the length of any connecting wire as much as possible. Another disadvantage of standard tuning arrangements at these frequencies is that common coupling is obtained through the shaft of a ganged tuning capacitor unless insulated single sections are used (cumbersome and costly). Common coupling of this type tends to cause oscillation or general instability and preclude high gain per stage. The guillotines make possible short leads, completely isolated sections, stable tuning,



© John F. Rider

GENERAL ELECTRIC CO.

MODEL XFM-1

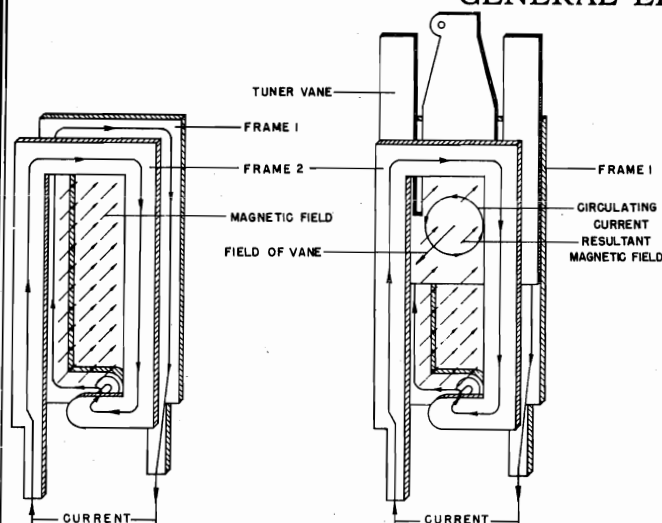


Fig. 2. Principle of Guillotine Tuner

high Q circuits, low shunt capacity, and location of each tuner in the best physical and electrical position in the assembly. Furthermore, since the shunt capacity is small and the inductance is consequently at its highest corresponding value, the additional unavoidable inductance introduced with wiring, band switch, etc., produces a minimum of circuit losses and unbalance.

GUILLOTINE TUNER

The guillotine tuner consists of two identical silver-plated brass frames (Figure 1-E) which form a two-turn square coil when connected at their open ends (Figure 2). They are mounted rigidly between two plastic posts (Figure 1-D). The magnetic field of this two-turn inductance is varied by the insertion of a brass blade between the frames (Figure 2). This solid vane slides up and down between the two turns guided in grooves in the plastic posts so that it passes between the two frames of the coil with a constant clearance. The posts are so moulded and the coil so constructed that the whole assembly is held rigidly at a predetermined spacing. The tuning vane is raised and lowered by the tuning elevator (Figure 1-B). When the elevator is all the way up (set tuned to the lowest frequency), the vane is completely above the coil which then acts as a simple two-turn coil. As the set is tuned towards the high frequencies, the vane moves downwards into the magnetic field of the coil unit, finally it is all the way in. The direction of the field is given by the arrows in Figure 2-A. It should be kept in mind that the inductance of the coil is proportional to the intensity of the linked field. If the vane is inserted between the two frames, the magnetic field (which is fluctuating at a rate determined by the FM frequency) induces in it a circulating current whose direction is such that the field produced by it is directed opposite to the original field (arrow in the opposite direction, Figure 2-B). The result is a decrease of field intensity, and subsequently a lower inductance of the coil. A sliding movement of a metal vane accomplishes, therefore, a change of the inductance of the coil.

The vane reduces this inductance through two principles. First, it acts as a shorted turn and thus reduces inductance directly; second—it provides a barrier between the two turns of the coil which reduces the mutual coupling and this, also, the inductance. It is desirable that the increase of the inductance is uniform with the movement of the vanes. To obtain the desired tuning curve, slots are cut in the blade the form of which once calculated can be kept within the required limits throughout production. The entire unit can be mechanically assembled and does not need any adjustment to insure proper tracking. Since the moving vane is ungrounded, there are no sliding contacts to produce noise while tuning in stations.

The tuners described above are identified as T1, T2, and T3 on the schematic diagram, Figure 5.

STAGE GAIN AND VOLTAGE CHECKS

Stage gain measurements by vacuum tube voltmeter or similar measuring devices may be used to check circuit performance and isolate trouble. The gain values listed may have tolerances of 20%. Readings taken with low signal so that AVC is not effective.

(1) R-F AND I-F STAGE GAINS

Signal applied through 300-ohm resistor, including signal generator impedance (remove 6AG5):

Dipole terminals to grid of R-F amplifier 6AG5.....2 at 98 mc

This check with oscillator tube 6AK5 removed:

Grid of R-F amplifier tube 6AG5 to grid converter tube 6AK5.....9 at 98 mc

These checks with oscillator tube 6AK5 removed:

Grid of converter tube 6AK5 to grid of 6SG7...38 at 10.7 mc

Grid of 6SG7 to grid of 6SV7.....37 at 10.7 mc

(Adjust grid trimmers with VTVM in place.)

(2) OSCILLATOR GRID BIAS

D-C voltage developed across R5.....10 volts at 98 mc

(3) SOCKET PIN VOLTAGES

Figure 6 shows typical tube pin voltages. All readings should be made from the pins to ground unless otherwise stated.

REPLACEMENT OF DRIVE CORDS**DIAL STRINGING**

Push the tuning elevator all the way down and string the dial as shown in Figure 3. This illustration shows the stringing as viewed from behind the dial scale, as you would see it when working on it. The number and arrows indicate the progression of the dial cord from start to finish. The procedure will be easier if pulley C is by-passed until the rest of the work is finished. After which, the cord can be pulled tight over that pulley. During the procedure, locate the two brass eyelets so that they fall between pulleys A and B. When finished, crimp the eyelets on the cord in the proper position to act as minimum and maximum stops for the tuning mechanism and clip the pointer on the cable halfway between the eyelets.

Separate detail drawing is given to show the method of attaching the ends of the cord. When stringing the mechanism, load the spring by pulling the hook over the projection at the other end of the spring, string the dial and, as a final step, release the hook so that it pulls up the slack in the dial cord.

ELEVATOR STRINGING

The step-by-step procedure for stringing the elevator windlass is shown in Figure 4. (The view is from the rear of the mechanism.) This is done with the elevator up. Start by inserting the metallic cord in the slot as shown in 1. Then loop the left-hand free end over (2) and solder it to the lug provided at the bottom of the vertical shaft (3). The other free end is then given two turns around the pulley, first on one side of the first half-turn (4-5) and then on the other side (6-7). In making the two loops, the free end of the cord passes on *this* side of the end which is already secured. Similarly, in view 2, the end of which is to be secured to the bottom of the shaft, passes on *this* side of the right-hand free end of the cord. Observe these relationships. Finally, after completing the seven steps shown, pull the upper end of the cord through the hole in the top of the elevator mechanism and solder it to the spring provided.

CONCLUDING COMMENTS

After replacing the dial cord, it may be found that some correction in relative positioning is needed. This can be done by loosening the setscrews in the large drive pulley directly behind the dial scale and repositioning it on the shaft. The object, of course, is to permit the tuning control to drive the elevator through its full tuning range. Slight errors in final settings are not serious since leeway is provided in the location of the dial pointer itself.

ALIGNMENT**EQUIPMENT REQUIRED**

1. Test Oscillator with tone modulation. (See Table.)
2. D-C Voltmeter or Microammeter. (See notes 2 and 3.)
3. A-C Voltmeter, 2 volts. (See note 6.)
4. Insulated hex wrench, $\frac{1}{4}$ ". (See steps 1, 7.)
5. .01 MF Paper Capacitor. (See Steps 1 to 5.)

Important detailed instructions and references in connection with the Alignment Table which follows are keyed in by means of column 7, headed "See Note." The notes are included in numerical order after the table. They are important—refer to them carefully.

MODEL XFM-1

GENERAL ELECTRIC CO.

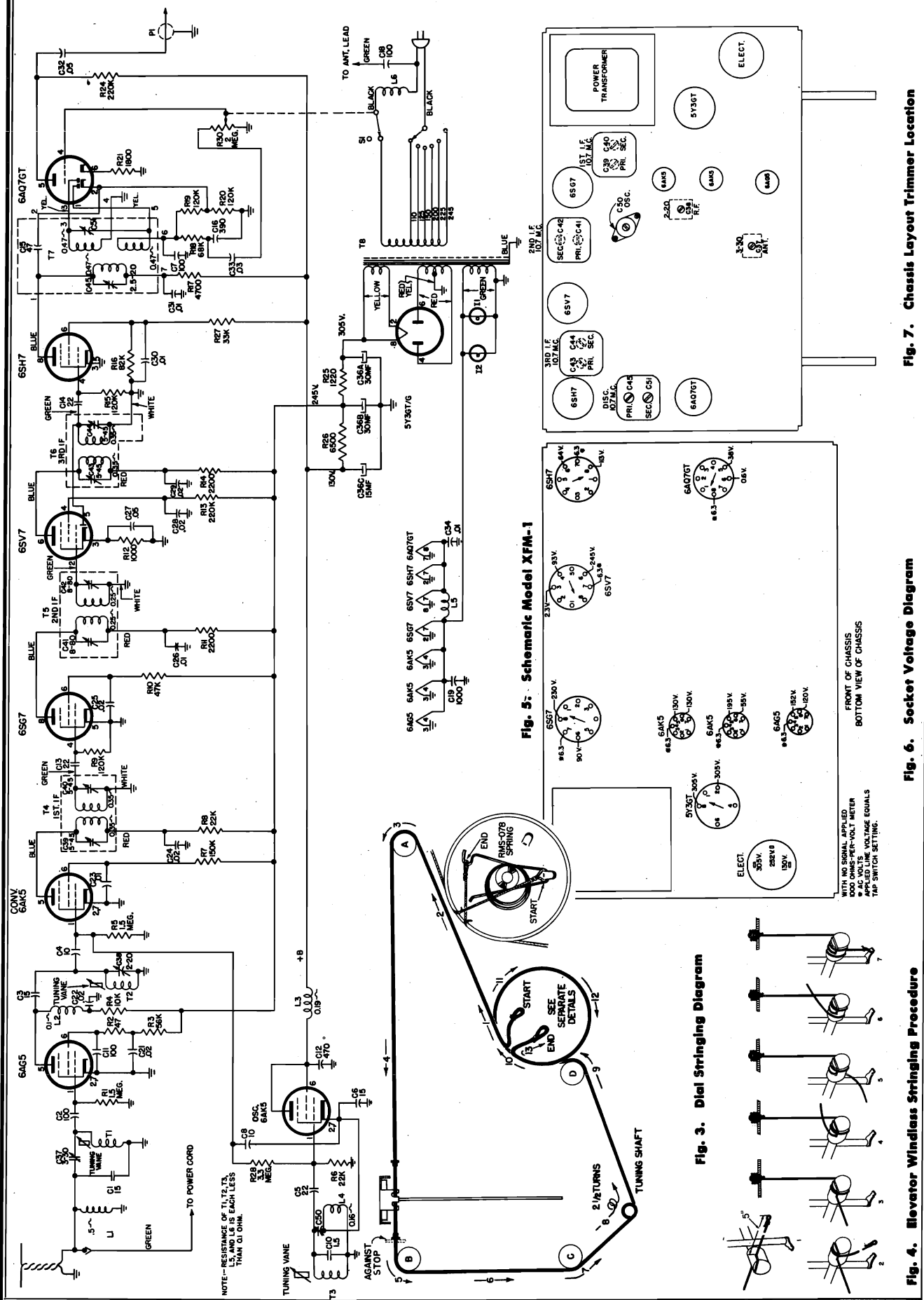


Fig. 7. Chassis Layout Trimmer Location

Fig. 6. Socket Voltage Diagram

Fig. 4. Elevator Windless Stringing Procedure

GENERAL ELECTRIC CO.

MODEL XFM-1

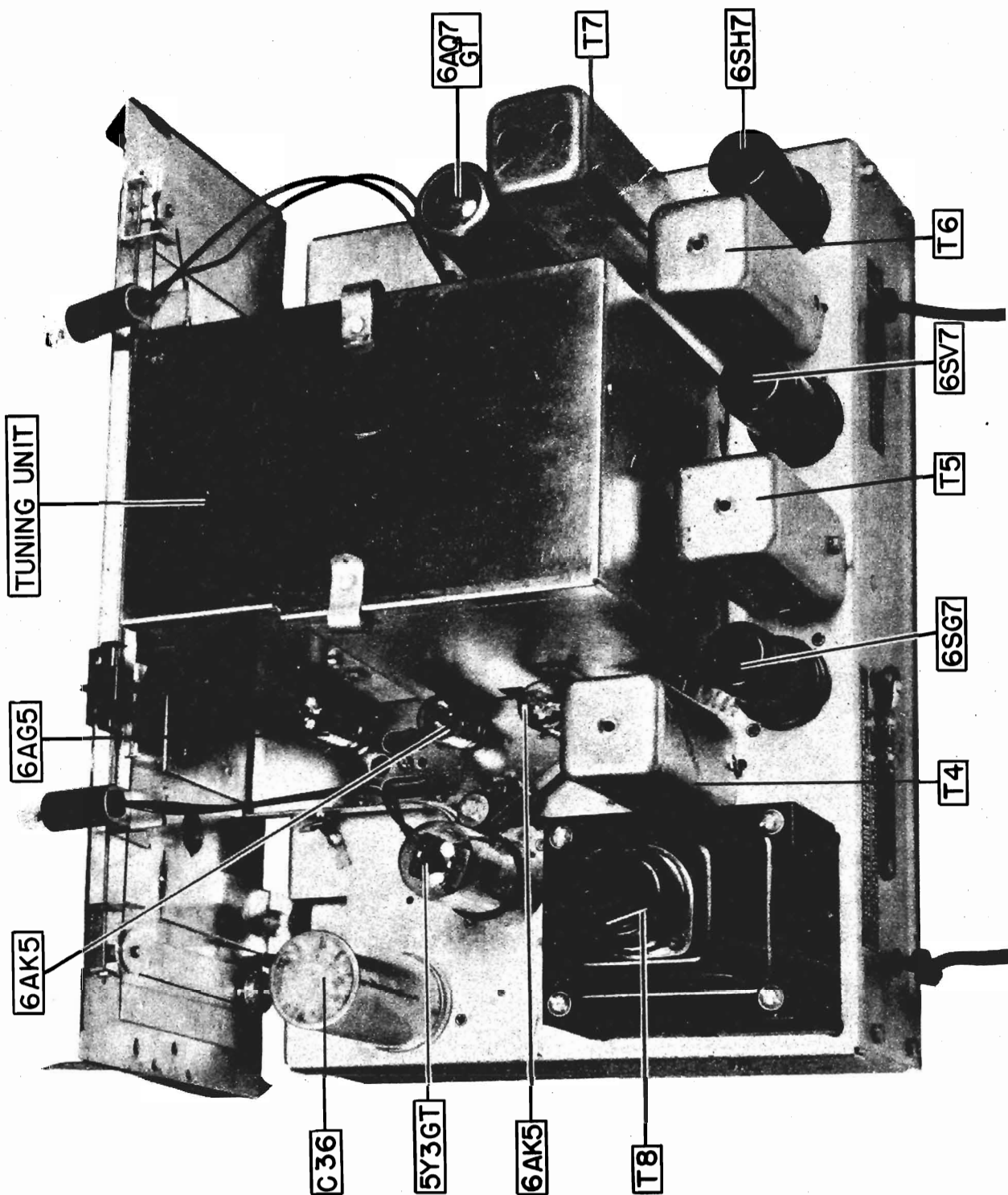


Fig. 8. Top View



GENERAL ELECTRIC CO.

MODEL XFM-1

ALIGNMENT TABLE

Step	Signal Generator Frequency	Dial Setting	Adjust	Remarks
------	----------------------------	--------------	--------	---------

I-F ALIGNMENT

1	10.7 mc 6SH7 grid thru .01 mf.	....	C51 for zero**	1, 2 Adjust C51 for zero meter reading. Apply 1 volt signal input.
2	See last column thru .01 mf.	....	Signal Generator	1, 2 Detune signal generator to point of max. meter reading.
3	As in Step 2 thru .01 mf.	....	Peak C45	1, 2
4	10.7 mc 6SV7 grid thru .01 mf.	....	Peak C43 and C44	1, 3 6AQ7GT tube removed from its socket.
5	10.7 mc 6SG7 grid thru .01 mf.	....	Peak C41 and C42	1, 3 6AQ7GT tube removed from its socket.
6	10.7 mc Conv. grid directly	....	Peak C39 and C40	1, 3, 4 6AQ7GT tube removed from its socket.

R-F ALIGNMENT

7	88 mc Dipole terminals	88 mc—6, 8 to 6.9 in.*	Peak C50	1, 3, 5 Set dial accurately—then adjust C50.
8	98 mc Dipole terminals	For max. output	Peak C38	1, 3, 6 Tune dial for max. min. output, then peak C38 while rocking dial.
9	98 mc Dipole terminals	Do not change	Peak C37	1, 3

*Important! See Note 7.

**Use insulated hex wrench, 1/4".

NOTES IN CONNECTION WITH ALIGNMENT TABLE

- Use unmodulated signal.
- Connect 20,000-ohm/volt meter from junction of R18 and R16 to chassis. Use ten-volt scale (Steps 1-3).
- Connect 20,000-ohm/volt meter from grid 4 of 6SH7 to chassis with a 200,000-ohm resistor in series. The resistor must be connected directly to the grid so that capacity load-

ing will be negligible and so that the meter is isolated from the i-f signal voltage. Keep signal generator output down so that the meter indicates not more than one volt at the grid (5 microamperes through 200,000 ohms). (Alignment Steps 4 to 6.)

- Connect signal generator directly to the converter grid at RAB-063 some convenient point. The generator lead must be shielded up to this connection so that no more than 1/16 inch of exposed lead exists. Ground the shield solidly by clamping it firmly to the chassis or a shield as close to the connection as possible. (Step 6.)
- Two oscillator settings will give response. The higher frequency response point is the correct one, the other is the image. If in doubt, start with the trimmer screw loosened completely and adjust for the first response.
- "Rocking" consists of adjusting the indicated adjuster while turning the dial a small amount back-and-forth through peak output. The object is to find the maximum peak. Rocking is necessary and is permissible only when interlocking circuits are being adjusted.
- Index pointer as follows: Turn pointer to right-hand limit of travel. Mark the dial backplate at a reference edge of the pointer slider. Then set pointer by turning dial knob until the indicated dimension exists between the reference edge and the mark.

Cat. No. Symbol Description

UNIVERSAL REPLACEMENT PARTS

UCC-040	C23, 26, 30, 31, 34	Capacitor—.01 Mfd.; 600V.; Paper
UCC-041	C21, 22, 24, 25, 28, 29	Capacitor—.02 Mfd.; 600V.; Paper
UCC-042	C33	Capacitor—.03 Mfd.; 600V.; Paper
UCC-045	C27, 32	Capacitor—.05 Mfd.; 600V.; Paper
UCU-512	C14	Capacitor—22 MMF; Mica
UCU-520	C15	Capacitor—47 MMF; Mica
UCU-528	C11, 18	Capacitor—100 MMF; Mica
UCU-1042	C16	Capacitor—390 MMF; Mica
UCU-1312	C13	Capacitor—22 MMF; Mica
UCU-1344	C12	Capacitor—470 MMF; Mica
UCW-1028	C2, 7	Capacitor—100 MMF; Ceramic
UTC-001		Cement—Speaker Cone Replacement
UJB-014	R30	Terminal—Terminal Board
URC-034		Volume Control—2 Meg. Potentiometer Tapped at 1 Meg.
URD-017	R2	Resistor—47 Ohm; 1/4W.; Carbon
URD-049	R12	Resistor—1000 Ohm; 1/4W.; Carbon
URD-055	R21	Resistor—1800 Ohm; 1/4W.; Carbon
URD-057	R11, 14	Resistor—2200 Ohm; 1/4W.; Carbon
URD-065	R17	Resistor—4700 Ohm; 1/4W.; Carbon
URD-081	R6, 8	Resistor—22,000 Ohm; 1/4W.; Carbon
URD-085	R27	Resistor—33,000 Ohm; 1/4W.; Carbon
URD-091	R3	Resistor—56,000 Ohm; 1/4W.; Carbon
URD-093	R18	Resistor—68,000 Ohm; 1/4W.; Carbon
URD-095	R16	Resistor—82,000 Ohm; 1/4W.; Carbon
URD-099	R9, 15, 19, 20	Resistor—120,000 Ohm; 1/4W.; Carbon
URD-101	R7	Resistor—150,000 Ohm; 1/4W.; Carbon
URD-105	R13, 24	Resistor—220,000 Ohm; 1/4W.; Carbon
URD-125	R1, 5	Resistor—1.5 Meg.; 1/4W.; Carbon
URD-133	R28	Resistor—3.3 Meg.; 1/4W.; Carbon

Resistor—10,000 Ohm; 1/4W.; Carbon
Resistor—47,000 Ohm; 1/4W.; Carbon
Switch—A-C Switch for Volume Control

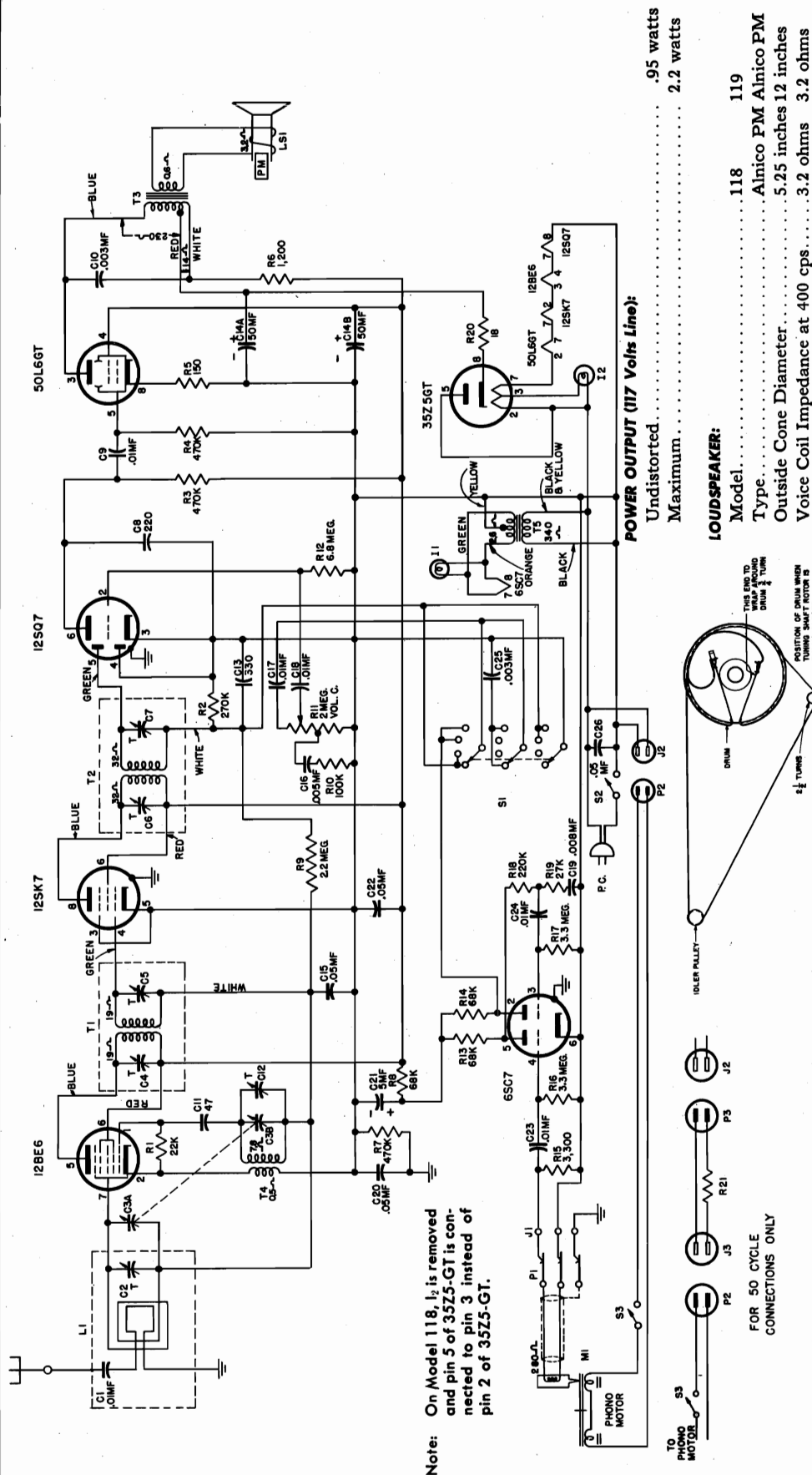
R4
R10
S1

SPECIALIZED REPLACEMENT PARTS

C36A, B, C	Back—Cabinet Back Bracket—Bracket and Roller Fork for Elevator Shaft Capacitor—30 Mf.; 400V.; 30 Mf.; 400V.; 15 Mf.; 400V.; Dry Electrolytic Capacitor—100 MMF; Mica Capacitor—15 MMF; Ceramic Capacitor—15 MMF; Ceramic Capacitor—22 MMF; Ceramic Capacitor—100 MMF; Ceramic Capacitor—Air Trimmer; 3-30 MMF Capacitor—Trimmer Strip; 3-30 MMF; Mica Capacitor—Trimmer Strip; 2-20 MMF; Mica Cord—Hoist Cord 6 1/4" Long Cord—Dial Cord 10 Yd. Roll Knob—Black Plain Knob Pointer—Pointer Assembly Scale—Tuning Dial Scale Spring Clip—Holds Coil Assembly Grommet—For Tuning Unit Link—Hoist Link Holding End of Hoist Cord Ring—Retaining Ring for Flywheel Coil Link—Rectangular Coil Link for Coils T1 and T2 Coil Link—Rectangular Coil Link for Coil T3 Post—Insulated/Posts for Assembly FM Coils
C19	Plug—Output Plug
C4, 8	Socket—Tube Socket for V5, V6, and V7
C1, 5, 6	Socket—Tube Socket for V4 and V8
C10	Socket—Tube Socket for V1, V2, and V3
C5	Socket—Pilot Light Socket and Leads
C37	Choke—Antenna Choke Core
C38	Choke—Antenna Coil and RF Coil
	Choke—Oscillator Cathode Choke
	Choke—RF Plate Choke Coil
	Coil—Oscillator Coil
	Choke—Filament Choke Coil
	Choke—Power Line Choke
	Choke—Oscillator Plate Choke Coil
	Vane—Tuner Vane for FM Coils T1 and T2
	Vane—Tuner Vane for FM Coil T3
	Roller—Hoist Shaft Roller
	Spring—Flat Hoist Pulley Shaft Spring
	Spring—Hoist Pulley Shaft Spring
	Spring—Hoist Cord Tension Spring
	Spring—Guide Wire in Elevator Plate Shaft—Tuning Shaft
	Pulley—Small Idle Pulley
	Pulley—Drive Pulley
	Flywheel—Flywheel with Setscrew
	Pulley—Hoist Pulley and Shaft
	Plate and Shaft—Elevator Top Plate and Vertical Shaft
R25, 26	Resistor—1220 and 6500 Ohms, Wire Wound
T7	Transformer—Discriminator
T4	Transformer—1st I.F. Transformer
T5	Transformer—2nd I.F. Transformer
T6	Transformer—3rd I.F. Transformer
T8	Transformer—Power Transformer
	Wire—Guide Wire on Tuning Unit

MODELS 118,
119M, 119W

GENERAL ELECTRIC CO.



POWER OUTPUT (117 Volts Line):

Undistorted..... .95 watts
Maximum..... 2.2 watts

LOUDSPEAKER:

Model..... 118 119
Type..... Alnico PM Alnico PM
Outside Cone Diameter..... 5.25 inches 12 inches
Voice Coil Impedance at 400 cps..... 3.2 ohms 3.2 ohms

PHONOGRAPH PICK-UP:

Type..... Variable Reluctance
D-C Resistance..... 280 ohms

TUBE COMPLEMENT:

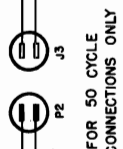
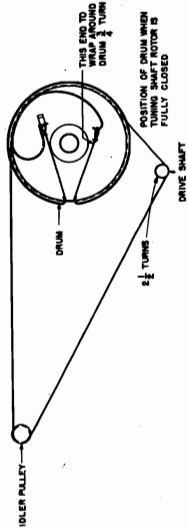
Converter-Oscillator..... Type 12BE6
I-F Amplifier..... Type 12SK7
Detector and Audio Amplifier..... Type 50L6GT
Output..... Type 50L6
Phono Preamplifier..... Type 6SC7
Rectifier..... Type 35Z5
Pilot Lamps..... Mazda No. 47

OPERATING FREQUENCIES:

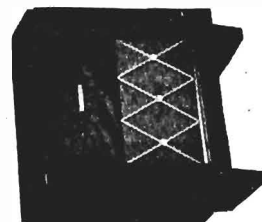
Broadcast Band..... 540-1600 kc
I-F Amplifier..... 455 kc

ELECTRICAL (INPUT):

	A5	A6
Voltage (A-C only).....	105-125	105-125
Frequency.....	50 cps	60 cps
Wattage (on Radio).....	35	35
Wattage (on Phono).....	70	55



FOR 50 CYCLE
CONNECTIONS ONLY



119M and 119W

GENERAL ELECTRIC CO.

MODELS 118,
119M, 119W

STAGE GAIN AND VOLTAGE CHECKS

Stage gain measurements may be made with a vacuum tube voltmeter to check circuit performance and to locate stages which are not operating properly. The gain values listed may have a tolerance of 20 per cent. Readings should be taken with the AVC shorted to B minus.

1. R-F STAGE GAINS.

Antenna to 12BE6 Grid 3.5 at 1000 kc
12BE6 Grid to 12SK7 Grid 50. at 455 kc

2. AUDIO GAIN.

The power output across the speaker voice coil should be approximately $\frac{1}{2}$ watt with .95 volts at 400 cps applied between the high side of the volume control (R11) and ground.

3. OSCILLATOR GRID BIAS.

The d-c voltage developed across the oscillator grid leak resistor (R1) averages 4.5 volts at 1000 kc.

4. SOCKET PIN VOLTAGES.

Figure 4 shows typical tube pin voltages. All readings should be made from the pins to B minus unless otherwise indicated.

ELECTRICAL CIRCUIT ALIGNMENT

EQUIPMENT REQUIRED:

1. Test oscillator with audio tone modulation.
2. A-C output meter, $1\frac{1}{2}$ volts full scale.
3. Insulated screwdriver.

ALIGNMENT PROCEDURE:

The Alignment Procedure is given in table form. All i-f alignments may be made with the chassis removed from the cabinet. However, the r-f alignments should be made with the chassis and loop mounted in the cabinet, as the relative position of the loop antenna with respect to the chassis materially affects the alignment.

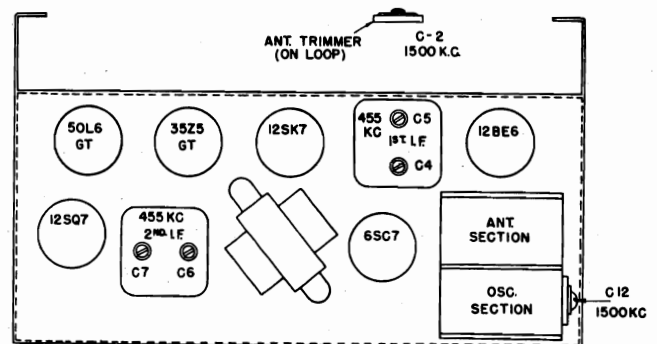
The oscillator trimmer is accessible by tilting the chassis slightly in the cabinet. The antenna trimmer is on the loop and is accessible from the rear of the cabinet. The locations of these trimmers are shown in Figure 3.

The output meter should be connected across the loudspeaker voice coil terminals. The low side of the test oscillator should be connected to B minus; the high side should be connected as indicated in the Alignment Chart. During the entire alignment procedure, the radio volume control should be in its maximum position. The test oscillator output signal should be attenuated so that the output meter reading never exceeds $1\frac{1}{4}$ volts.

ALIGNMENT CHART

Step	Connect Test-Oscillator To:	Test Oscillator Setting	Dial Setting	Adjust Trimmers For Max. Output
1	12SK7 grid (Pin 4) in series with .05 mf.	455 kc	—	C6 and C7
2	12BE6 grid (Pin 7) in series with .05 mf.	455 kc	—	C4 and C5 Readjust C6 and C7
3	Blue wire on loop in series with 200 mmf. and 470 ohms.	1500 kc	1500 kc	C12 (Osc.); C2 (Ant.)*

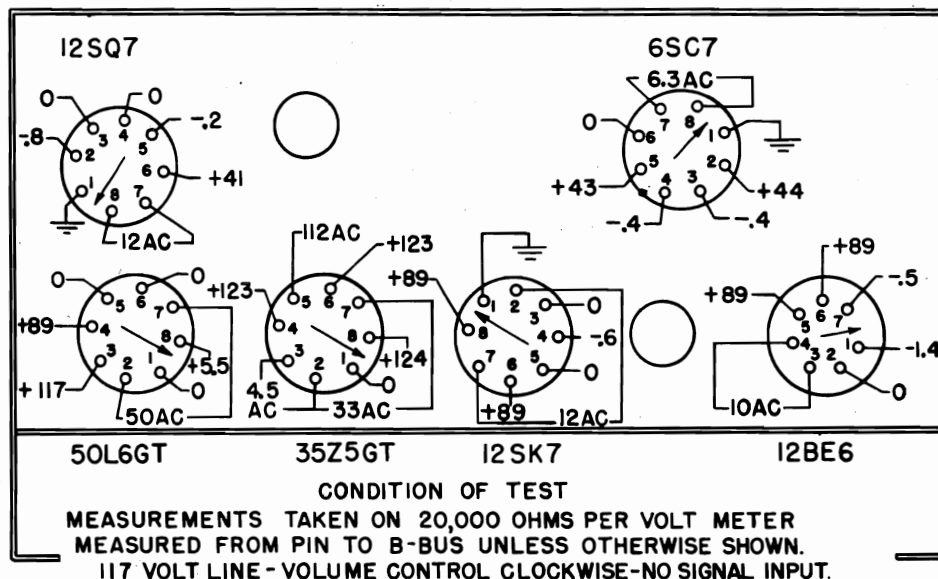
* Rock gang condenser when making alignment.



Tube and Trimmer Location

Socket Voltage Diagram

BOTTOM VIEW OF CHASSIS



REPLACEMENT PARTS LIST—MODELS 118, 119W AND 119M

Cat. No.	Symbol	Description	Cat. No.	Symbol	Description
UNIVERSAL REPLACEMENT PARTS					
UCC-008	C23	CAPACITOR—.01 mf., 200 v., paper	RCE-056	C21	CAPACITOR—5 mf., 150 v., electrolytic
UCC-025	C17	CAPACITOR—.01 mf., 400 v., paper	RCN-014	C26	CAPACITOR—Phenolic capacitor for Model 118
UCC-028	C15, C20, C22	CAPACITOR—.05 mf., 400 v., paper	RCT-026	C3A, C3B	CAPACITOR—Tuning capacitor
UCC-040	C1	CAPACITOR—.01 mf., 600 v., paper	RCY-005	C2	CAPACITOR—Trimmer for Model 118
UCC-045	C26	CAPACITOR—.05 mf., 600 v., paper, Model 119	RDC-032	C2	CAPACITOR—Trimmer for Model 119
UCC-623	C25	CAPACITOR—.003 mf., 400 v., paper	RDK-036		CORD—Dial cord (10 yds. min.)
UCU-020	C11	CAPACITOR—47 mmf., mica	RDK-039		KNOB—Plain
UCU-036	C18	CAPACITOR—220 mmf., mica	RDS-055		KNOB—With arrow
UCU-040	C3	CAPACITOR—330 mmf., mica	RDX-033		SCALE—Dial scale
UOP-557	C8	SPEAKER—Model 118. Same as S525D-7	RHC-008		POINTER—Dial scale pointer assembly
UOP-1247		SPEAKER—Model 119. Same as S1200D-7	RHG-015		CLIP—For mounting filter capacitor
UOX-005		SPEAKER REPAIR KIT—For Model 119			GROMMET—Rubber grommet for mounting tuning capacitor
UOX-008		SPEAKER REPAIR KIT—For Model 118	RHJ-005		SPACER—For mounting tuning capacitor
URD-029	R5	RESISTOR—150 ohms, $\frac{1}{2}$ w., carbon	RHM-014		RING—Tuner shaft retaining ring
URD-061	R15	RESISTOR—3300 ohms, $\frac{1}{2}$ w., carbon	RHM-016		STUD—For dial idler pulley
URD-081	R19	RESISTOR—22,000 ohms, $\frac{1}{2}$ w., carbon	RHM-037		CLIP—Oscillator coil clip
URD-083	R9	RESISTOR—27,000 ohms, $\frac{1}{2}$ w., carbon	RHR-003		CLIP—For mounting dial scale
URD-093	R8, R13, R14	RESISTOR—68,000 ohms, $\frac{1}{2}$ w., carbon	RHS-004		STUD—For mounting set screw
URD-097	R10	RESISTOR—100,000 ohms, $\frac{1}{2}$ w., carbon	RJP-003	P3	SPACER—Between loop and cabinet
URD-105	R18	RESISTOR—220,000 ohms, $\frac{1}{2}$ w., carbon	RJS-003		PLUG—Phono power plug
URD-107	R2	RESISTOR—270,000 ohms, $\frac{1}{2}$ w., carbon	RJS-027		SOCKET—Octal tube socket
URD-113	R3, R4, R7	RESISTOR—470,000 ohms, $\frac{1}{2}$ w., carbon	RJS-031		SOCKET—For dial light
URD-129	R9	RESISTOR—2.2 meg., $\frac{1}{2}$ w., carbon	RJS-033		SOCKET—Tube socket for 6SC7
URD-133	R16, R17	RESISTOR—3.3 meg., $\frac{1}{2}$ w., carbon	RJS-049	J2, J3	SOCKET—Bezel pilot light socket
URF-051	R6	RESISTOR—1200 ohms, 2 w., carbon	RJS-092		SOCKET—Phono power
			RJS-097		SOCKET—Miniature for 12BE6
			RLC-001	J1	SOCKET—Phonet
			RLI-026	T4	COIL—Oscillator coil
			RLI-028	L1	LOOP ASSEMBLY—Model 119
			RMM-034	L1	LOOP ASSEMBLY—Model 118
			RMM-054		HOOD—Hood for dial light
			RMS-118		SUPPORT—Lid support
			RMU-036		SPRING—Dial cord tension spring
			RMW-037		SHAFT—Tuning shaft
			RRC-060	R11	PULLEY—Dial cord idler pulley
			RRW-005	R21	VOLUME CONTROL—2 meg.
					RESISTOR—70 ohms, wirewound, for 50-cycle operation of phono motor
			RRW-008	R20	RESISTOR—18 ohms, 1 w., wirewound
			RSW-043	S1	SWITCH—Radio phono switch
			RTF-001	T5	TRANSFORMER—Filament transformer for 6SC7
					TRANSFORMER—1st I.F. transformer
			RTL-050	T1	TRANSFORMER—2nd I.F. transformer
			RTL-051	T2	TRANSFORMER—Output transformer
			RTO-038	T3	
			RWL-009		CORD—Power cord
SPECIALIZED REPLACEMENT PARTS					
RAC-050		LID—For Model 119 walnut			
RAC-051		LID—For Model 119 mahogany			
RAL-001		BEZEL—For pilot light			
RAM-002		BASE—2 for Model 119 walnut			
RAM-003		BASE—2 for Model 119 mahogany			
RAV-044		CABINET—Walnut Model 119W			
RAV-045		CABINET—Mahogany Model 119M			
RAY-054		CABINET—Model 118			
RCC-040	C9	CAPACITOR—.01 mf., 600 v., paper			
RCC-074	C10	CAPACITOR—.003 mf., 600 v., paper			
RCC-082	C18	CAPACITOR—.01 mf., 200 v., paper			
RCC-084	C19	CAPACITOR—.008 mf., 400 v., paper			
RCC-085	C16	CAPACITOR—.005 mf., 200 v., paper			
RCE-050	C14A, C14B	CAPACITOR—50-50 mfd., electrolytic, 150 v.			

Cat. No.	Symbol	Description
UNIVERSAL REPLACEMENT PARTS		
UCC-623	C13	CAPACITOR—003 mf., 600 v., paper
UCC-625	C12*	CAPACITOR—.005 mf., 600 v., paper
UCC-631	C7	CAPACITOR—.02 mf., 600 v.
UCC-633	C14	CAPACITOR—.03 mf., 600 v., paper
UCC-635	C3, 8, 9	CAPACITOR—.05 mf., 600 v., paper
UCE-067	C10	CAPACITOR—100 mf., 6 v., electrolytic
UOP-488	LS1	LOUDSPEAKER—4-in. permanent magnet
URD-009	R1	RESISTOR—22 ohms, $\frac{1}{2}$ w., carbon
URD-041	R6	RESISTOR—470 ohms, $\frac{1}{2}$ w., carbon
URD-053	R4, 5	RESISTOR—1500 ohms, $\frac{1}{2}$ w., carbon
URD-067	R11	RESISTOR—5600 ohms, $\frac{1}{2}$ w., carbon
URD-073	R10	RESISTOR—10,000 ohms, $\frac{1}{2}$ w., carbon
URD-085	R8	RESISTOR—33,000 ohms, $\frac{1}{2}$ w., carbon
URD-097	R9	RESISTOR—100,000 ohms, $\frac{1}{2}$ w., carbon
URD-113	R7, 15	RESISTOR—470,000 ohms, $\frac{1}{2}$ w., carbon
URD-129	R12, 16, 18	RESISTOR—2.2 meg., $\frac{1}{2}$ w., carbon
URD-133	R14, 19	RESISTOR—3.3 meg., $\frac{1}{2}$ w., carbon
URD-137	R17	RESISTOR—7 meg., $\frac{1}{2}$ w., carbon
URE-059	R2	RESISTOR—2700 ohms, 1 w., carbon
SPECIALIZED REPLACEMENT PARTS		
RAB-076		CABINET BACK—Plastic cabinet back (maroon)
RAB-080		CABINET BACK—Plastic (mahogany and gray)
RAS-001		STRAP—Battery strap
RAU-038		CABINET—Plastic cabinet (maroon)
RAU-041		CABINET—Plastic cabinet (mahogany)
RAU-042		CABINET—Plastic cabinet (gray)
RCE-069	C2A, B, C	CAPACITOR—200 mf., 25 v., electrolytic; 50-50 mfd., 150 v., electrolytic
RCT-032	C1	CAPACITOR—Tuning capacitor
RCW-177	C21	CAPACITOR—330 mmf., ceramic
RCW-1073	C6	CAPACITOR—47 mmf., ceramic

Cat. No.	Symbol	Description
SPECIALIZED REPLACEMENT PARTS (CONT'D)		
RCW-1074	C5	CAPACITOR—100 mmf., ceramic
RCW-3013	C11A,B,C,D	CAPACITOR—.002-220-220-.005, c-ramic
RDC-032		DIAL CORD—Roll of 25 yards
RDK-136		KNOB—Maroon knob
RDK-148		KNOB—Mahogany knob
RDP-040		POINTER—Dial pointer
RDS-072		SCALE—Dial scale
RER-001	SR	SELENIUM RECTIFIER
RHB-004		BUTTON—Monogram button
RHC-015		CLIP—Clip for oscillator coil
RHE-016		HAIRPIN COTTER
RHG-018		GROMMET—Grommet for tuning condenser
RHI-005		HINGE—Hinge for back
RHJ-005		SPACER—For tuning condenser
RHM-052		CLIP—For loop antenna
RHM-053		BOSS CAP FOR HANDLE
RHR-005		RIVET—Tubular rivet for door hinge
RHS-010		SHIELD—Tube shield
RHX-013		HANDLE—Handle assembly
RJP-025		PLUG—Battery plug
RJS-024		MOUNTING PLATE—For electrolytic capacitor
RJS-068		SOCKET—Tube socket
RJS-100		COIL—Oscillator coil
RLC-068	L2	LOOP—Loop antenna
RLI-029	L1	CLIP—"C" clip
RMS-039		SPRING—Dial spring
RMS-118		SPRING CATCH
RMS-154		PULLEY—Idler pulley
RMW-009		VOLUME CONTROL—Volume control and switch
RRC-083	R13, S1, AB	RESISTOR—2300 ohms, 10 w.
RRW-027	R3	SWITCH—Power switch
RSW-058	S2A, B	TRANSFORMER—1st I-F transformer
RTL-052	T1	TRANSFORMER—2nd I-F transformer
RTL-079	T2	TRANSFORMER—Output transformer
RTO-050	T3	CORD—Power cord
RWL-005		CONNECTING PIN FOR LOOP ANTENNA
SJS-068		

©John F. Rider



GENERAL INFORMATION

The Model 150 portable radio is a five-tube superheterodyne broadcast receiver with a range of 540 to 1600 kc. The power source may be either 105 to 125 volts, 50 to 60 cycles, or direct current when a power outlet is available. The receiver will also operate from its battery source, thus making it independent of external electric power providing excellent operation in any location where external power is not available.

BATTERY—AC or DC Operation.

The left knob turns on the battery provided that the power plug is well inserted into the socket in the chassis.

For AC or DC supply (105-125 volts, 50 to 60 cycle operation) the same knob switches on the power when the power plug is pulled out of its socket in the chassis and inserted into the house outlet.

ELECTRICAL CIRCUIT ALIGNMENT

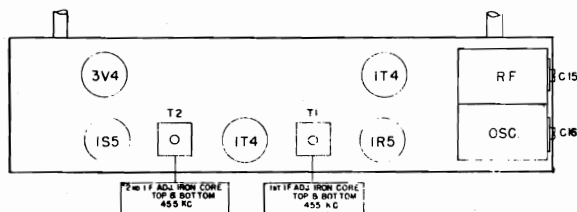
R-F 1500 KC
I-F 455 KC

EQUIPMENT REQUIRED

1. Test Oscillator with Tone Modulation.
2. AC Output Meter.
3. .05 mf. Paper Capacitor.
4. Insulated Screwdriver.

PROCEDURE—GENERAL

The Alignment Chart gives the alignment procedure with correct sequence of trimmer adjustments. The chassis must be removed from the cabinet during i-f alignment.

**Tube and Trimmer Location****ALIGNMENT CHART**

Step	Test-Osc. Connected to:	Test-Osc. Setting	Pointer Setting	Adjust for Max. Output
1	1T4 I-F grid in series with .05 mfd.	455 KC	550 KC	Iron cores of I-F Transformer T2.
2	1R5 converter grid in series with .05 mfd.	455 KC	550 KC	Iron cores of I-F Transformer T1.
3	Repeat Steps 1 and 2.			
4	Inductively coupled	1500 KC	1500 KC	C15* C16

* Chassis in cabinet and cabinet back (with loop) closed; remove plug button to adjust C15.

STAGE GAIN AND VOLTAGE CHECKS

Stage gain by vacuum tube voltmeter or similar measuring device may be used to check circuit performances and isolate trouble. The gain values listed may have tolerances of 20 per cent. Readings should be taken with low signal input so that the AVC is not effective.

(1) R-F STAGE GAINS

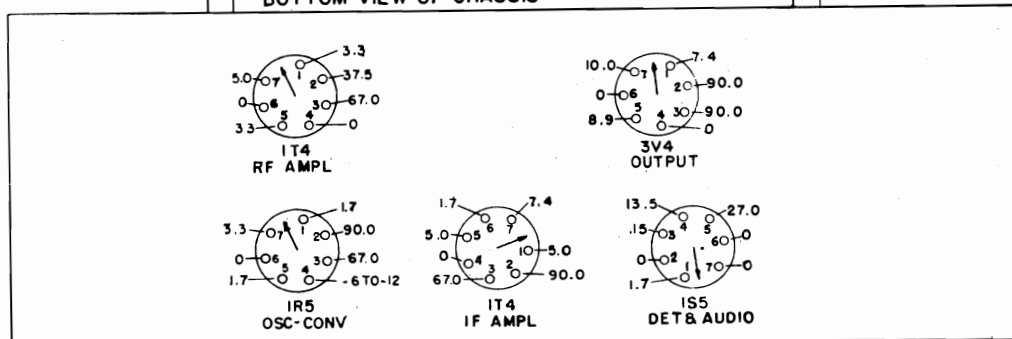
1T4 R-F Grid (Pin 6) to 1R5 Grid (Pin 6) ... 2.5 @ 1000 KC
1R5 Grid (Pin 6) to 1T4 Grid (Pin 6)30 @ 1000 KC
1T4 Grid (Pin 6) to 1S5 Diode Plate (Pin 3)50 @ 455 KC

(2) AUDIO GAIN

.020 volt at 400 cycles across volume control (R13) with control set at maximum will give approximately .05 watts output across speaker voice coil.

(3) DC voltage developed across oscillator grid resistor (R9) averages — 8 volts at 1000 kc with respect to B minus.**(4) SOCKET PIN VOLTAGES**

Figure 3 shows voltages from all tube pins to B—. Voltage readings much lower than those specified may help localize defective components or tubes.

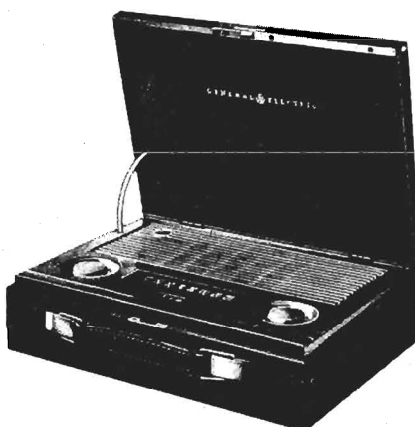
BOTTOM VIEW OF CHASSIS

DC VOLTAGES TO GROUND UNLESS OTHERWISE SPECIFIED
ALL RATINGS ARE AC OPERATION MEASURED WITH REFERENCE TO B—
RATINGS FOR BATTERY ARE SIMILAR TO AC RATINGS
VOLTAGE IS MEASURED WITH 20,000 OHMS PER VOLT METER

Socket Voltages

GENERAL ELECTRIC CO.

MODEL 145



SPECIFICATIONS

CABINET:

Height.....	7 $\frac{5}{8}$ inches
Width.....	10 $\frac{5}{8}$ inches
Depth.....	2 $\frac{3}{4}$ inches

POWER SUPPLY:

(AC-DC Operation)

Voltage.....	105-120 volts
Frequency on A-C.....	50- 60 cycles
Power Consumption.....	10 watts

(Battery Operation)

- 2— 1 $\frac{1}{2}$ volt "A" Batteries, Eveready No. 950 or equivalent.
 1—67 $\frac{1}{2}$ volt "B" Battery, Eveready No. 467 or equivalent.

OPERATING FREQUENCIES:

Broadcast Band.....	540-1600 KC
I-F Amplifier.....	455 KC

POWER OUTPUT:

Undistorted.....	.06 watts
Maximum.....	.12 watts

LOUDSPEAKER:

Type.....	Alnico 5 permanent magnet
Size.....	4 inches
Voice Coil Impedance at 400 Cycles.....	3.2 ohms

TUBE COMPLEMENT:

Oscillator-Converter.....	1R5
I-F Amplifier.....	1T4
Detector Audio Amplifier.....	1S5
Power Output.....	3V4

GENERAL INFORMATION

The Model 145 is a portable superheterodyne receiver designed to operate on the broadcast band range of 540 to 1600 kilocycles. This receiver may be operated from a 105 to 120 volt d-c or 50-60 cycle a-c power source, or it may be operated from its own self-contained batteries by switching to the "Bat." position.

A selector switch (S2) on the front panel is used to switch the radio to battery operation or AC-DC operation. The switch on the volume control will turn on and off either battery or AC-DC power depending on the position of switch S2.

ELECTRICAL CIRCUIT ALIGNMENT

EQUIPMENT REQUIRED:

1. Test Oscillator with Tone Modulation.
2. A-C Output Meter.
3. .05 mfd. Capacitor.
4. Insulated Screwdriver.

PROCEDURE:

1. The alignment procedure is given in table form. All i-f adjustments may be made with the chassis removed from the cabinet. The locations of the i-f and r-f adjustments are shown in Figure 1.

2. The output meter should be connected across the voice coil terminals of the speaker. The low side of the test oscillator should be connected to B minus. The high side of the test oscillator should be connected as indicated in the alignment chart.

PRECAUTION: If the signal generator is A-C operated, use an isolating transformer between the power supply and the radio receiver power input. The use of an isolating capacitor is not recommended, as A-C through the capacitor will introduce hum modulation and/or create the possibility of a burned out signal generator attenuator.

3. During the entire alignment procedure the volume control should be rotated fully clockwise in its maximum position. The test oscillator should be attenuated so that the output meter doesn't exceed .4 volt.

4. For alignment of the oscillator and r-f trimmer, the input signal should be inductively coupled to the radio loop antenna by connecting a 4-turn, 6-inch diameter loop of bell wire across the signal generator output terminals, and locate the loop about one foot from the radio loop for alignment. To prevent possible errors in peak readings, the position of the loop with respect to the radio loop should not be changed during any one set of adjustments. The chassis should be installed in the cabinet when the r-f adjustment (step 4) is made.

ALIGNMENT CHART

Step	Connect Test Oscillator To:	Test Oscillator Setting	Dial Setting	Adjust for Maximum Output
1	1T4 grid (Pin 6) in series with .05 mfd. cap.	455 KC	550 KC	2nd i-f transformer (T2) primary and secondary cores.
2	1R5 grid (Pin 6) in series with .05 mfd. cap.	455 KC	550 KC	1st i-f transformer (T1) primary and secondary cores.
3	Inductively coupled (see Note 4)	1620 KC	Gang condenser completely open.	C2B for maximum.
4	Inductively coupled (see Note 4)	1500 KC	For max. signal. Set dial pointer at 1500 KC mark on dial scale.	C1B for maximum.

STAGE GAINS AND VOLTAGE CHECKS

Stage gain by vacuum tube voltmeter or similar device may be used to check circuit performance and to isolate trouble. The gain values listed may have tolerances of 20 per cent. Readings should be taken with low signal input so that AVC is not effective.

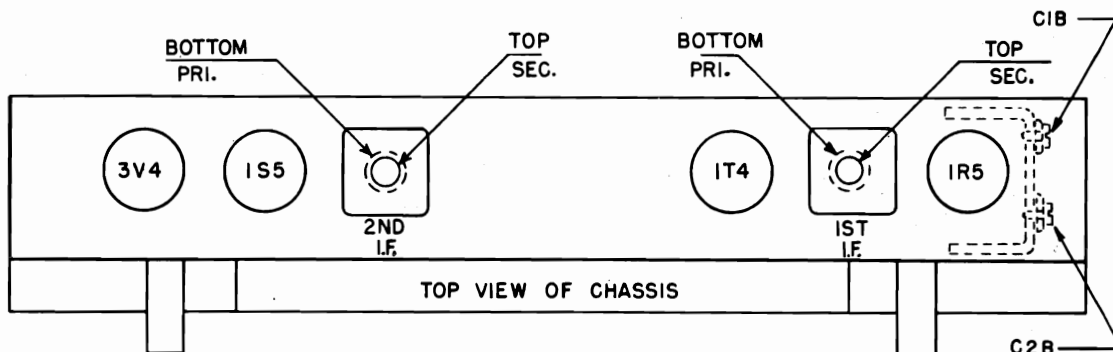


Fig. 1. Tube and Trimmer Location

1. R-F STAGE GAINS.

1R5 Grid (Pin 6) to 1T4 Grid (Pin 6) 27 at 1000 KC

1R5 Grid (Pin 6) to 1T4 Grid (Pin 6) 33 at 455 KC

1T4 Grid (Pin 6) to 1S5 Diode Plate (Pin 3) . . . 60 at 455 KC

2. AUDIO GAIN.

.05 volt at 400 cycles across the volume control (R6) with volume control set fully clockwise will give approximately .05 watt output or .4 volts across the speaker voice coil.

3. D-c voltage developed across oscillator grid resistor R1 averages 18 volts at 1000 kc.

4. SOCKET PIN VOLTAGES.

Figure 4 shows voltages from all tube pins to B—. Voltage readings much lower than those specified may help localize defective components or tubes.

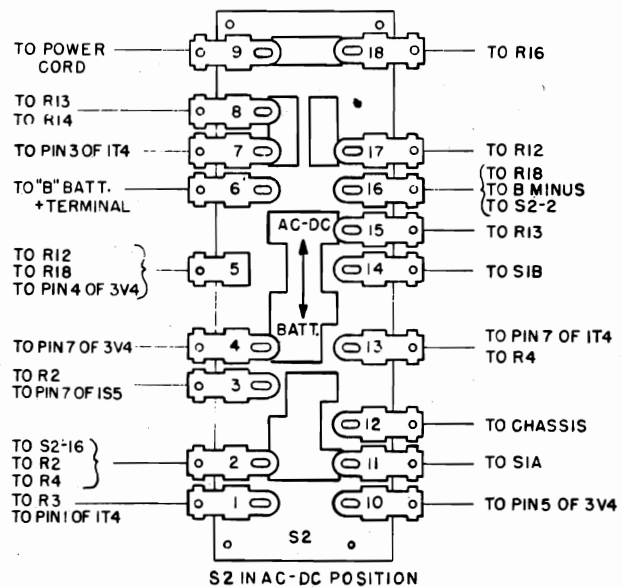


Fig. 2. Switch Connections

GENERAL ELECTRIC CO.

MODEL 145

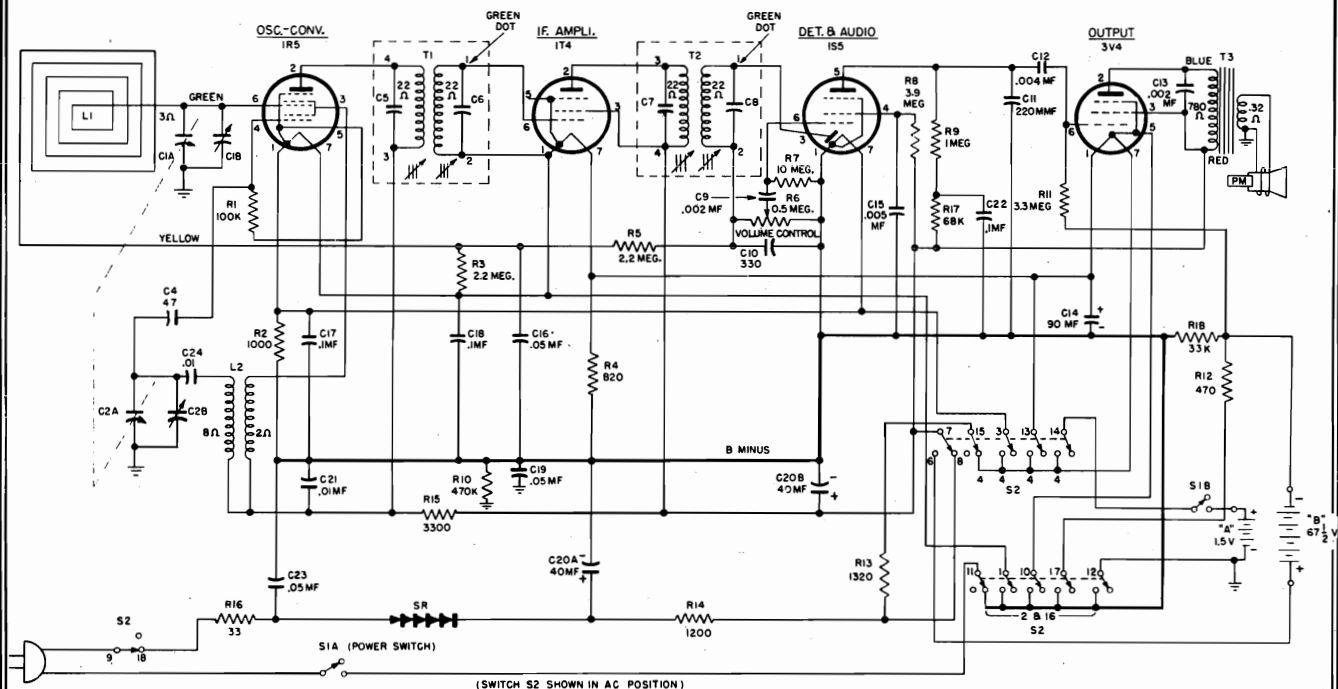
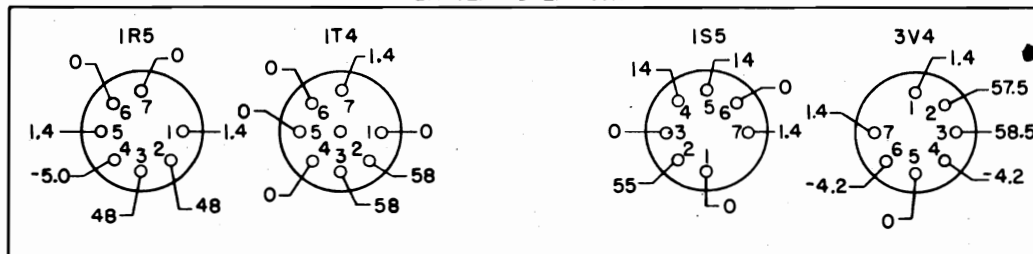


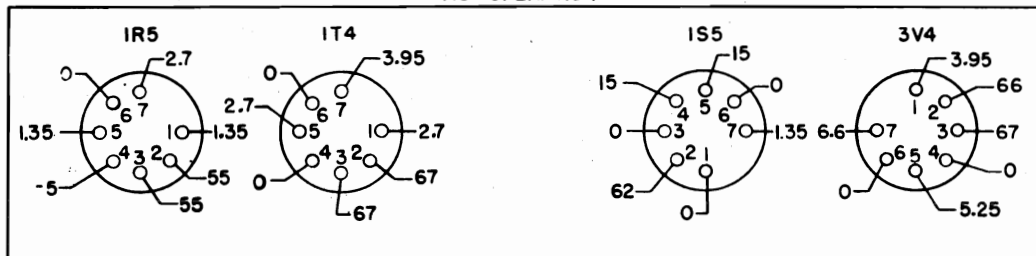
Fig. 3. Schematic Diagram, Model 145

BATTERY OPERATION



BOTTOM VIEW OF CHASSIS

AC - OPERATION



VOLTAGE ON INPUT SECTION OF ELECTROLYTIC 135 VOLTS

Fig. 4. Socket Voltage Diagram

MODEL 145

GENERAL ELECTRIC CO.

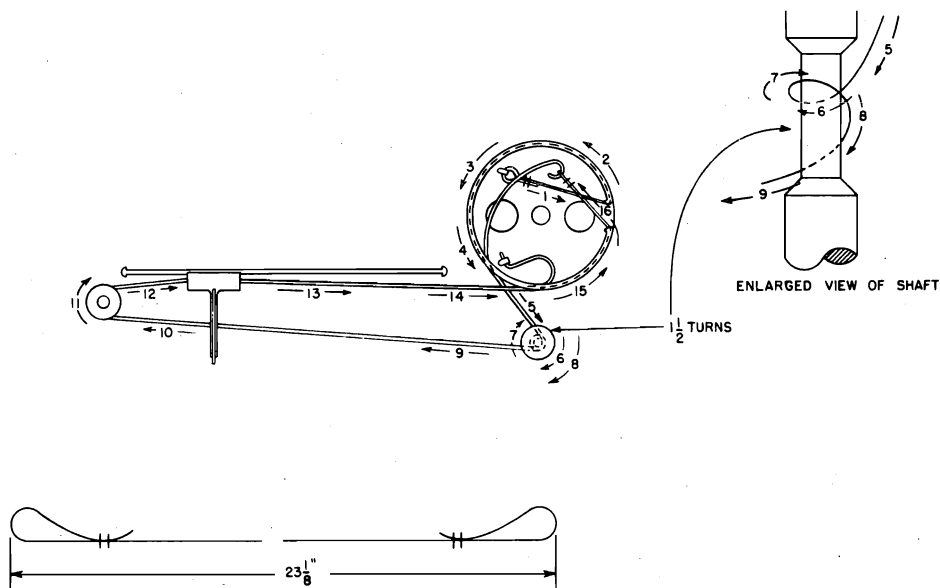


Fig. 5. Dial Stringing Diagram

MODEL 145—REPLACEMENT PARTS LIST

Cat. No.	Symbol	Description	Cat. No.	Symbol	Description
UNIVERSAL REPLACEMENT PARTS			SPECIALIZED REPLACEMENT PARTS (Cont.)		
UCC-028	C23	CAPACITOR—.05 mfd., 400 v.	RDK-149		KNOB and Clip
UCU-020	C4	CAPACITOR—47 mmf. $\pm 20\%$, mica	RDP-044		POINTER—Dial pointer assembly
UOP-489		SPEAKER	RDS-080		SCALE—Dial scale
URD-041	R12	RESISTOR—470 ohms, $\frac{1}{2}$ w., carbon	REC-001		CONNECTOR—For "B" battery
URD-047	R4	RESISTOR—820 ohms, $\frac{1}{2}$ w., carbon	REC-004		CONTACT—For "A" battery
URD-049	R2	RESISTOR—1000 ohms, $\frac{1}{2}$ w., carbon	REX-005		RECTIFIER—Selenium
URD-061	R15	RESISTOR—3300 ohms, $\frac{1}{2}$ w., carbon	RHI-007		HINGE—Front cover hinge
URD-081	R18	RESISTOR—33,000 ohms, $\frac{1}{2}$ w., carbon	RHI-008		HINGE—Back cover hinge
URD-093	R17	RESISTOR—68,000 ohms, $\frac{1}{2}$ w., carbon	RHJ-009		SPACER—For switch S2 (four req.)
URD-097	R1	RESISTOR—100,000 ohms, $\frac{1}{2}$ w., carbon	RHM-055		SPEED NUT— $\frac{1}{8}$ "
URD-113	R10	RESISTOR—470,000 ohms, $\frac{1}{2}$ w., carbon	RHR-002		RIVET—.121" dia. x $\frac{1}{8}$ " long
URD-121	R9	RESISTOR—1 meg., $\frac{1}{2}$ w., carbon	RHR-006		RIVET—.121" dia. x $\frac{1}{8}$ " long for mounting RDE-035
URD-129	R3, 5	RESISTOR—2.2 meg., $\frac{1}{2}$ w., carbon	RHS-015		SCREW—Self-tapping screw for mounting loop assembly door
URD-133	R11	RESISTOR—3.3 meg., $\frac{1}{2}$ w., carbon	RHS-022		SCREW—Self-tapping for mounting the brass latch plate
URD-135	R8	RESISTOR—3.9 meg., $\frac{1}{2}$ w., carbon	RHS-023		SCREW—Self-tapping for mounting hinges
URD-145	R7	RESISTOR—10.0 meg., $\frac{1}{2}$ w., carbon	RHY-008		HANDLE
			RII-019		INSULATOR—For "A" battery contact
			RII-020		BARRIER—Shield around "A" battery
			RJS-100		SOCKET—For 1R5, 1S5, and 3V4 tube
			RJS-125		SOCKET—For 1T4 tube
			RLC-080	L2	COIL—Oscillator coil
			RLL-037	L1	LOOP
			RMC-028		KNOB—Catch knob
			RMC-029		LATCH PLATE—On front cover, fastened by screws RHS-022
					CATCH—Front cover catch
					CATCH COVER—Front cover, fastened with screws RHS-022
					LATCH PLATE—On back cover, fastened with screws RHS-022
					LATCH—Back cover latch
					NAMEPLATE AND CATCH
					CLIP—For "A" battery
					BARRIER
					SPRING—Dial cord tension spring
					PULLEY— $\frac{1}{4}$ -in. pulley for dial cord
					VOLUME CONTROL AND SWITCH
					RESISTOR—33 ohms, 3 w., w.w.
					RESISTOR—1320 ohms, w.w.
					RESISTOR—1200 ohms, w.w.
					SWITCH—AC-DC Batt. switch
					TRANSFORMER—1st and 2nd I-F transformer
					TRANSFORMER—Output
					CORD—Power cord

SPECIFICATIONS

CABINET:	Plastic
Height.....	10 $\frac{1}{8}$ in.
Length.....	12 $\frac{1}{4}$ in.
Width.....	5 $\frac{3}{4}$ in.
Weight.....	17 pounds

ELECTRICAL RATING:**Charging from A-C Line:**

Voltage.....	105-125 volts
Frequency.....	50/60 cps
Wattage.....	10 watts

Operating from Internal Battery.

Voltage.....	2.1 volts
Current.....	1.7 amp
Wattage.....	3.6 watts
Hours of Operation without Charging Battery.....	Approx. 12-15 hours

BATTERY REQUIREMENT:

Willard 2.0 volt No. 25-2 rechargeable battery or equivalent

OPERATING FREQUENCIES:

Broadcast Band.....	540-1600 KC
I-F Amplifier.....	455 KC
Power Output (at 2.1 Battery Voltage).....	
Undistorted.....	170 milliwatts
Maximum.....	210 milliwatts

LOUDSPEAKER:

Type.....	Alnico PM
Outside Cone Diameter.....	5 $\frac{1}{4}$ in.
Voice Coil Impedance (400 CPS).....	3.2 ohms

TUBE COMPLEMENT:

R.F. Amplifier.....	Type 1U4
Oscillator-Converter.....	Type 1R5
I-F Amplifier.....	Type 1U4
Detector—1st Audio.....	Type 1S5
Audio Output.....	Type 3V4

GENERAL INFORMATION

The Model 160 Portable Radio is a five-tube superheterodyne broadcast receiver which operates from a built-in rechargeable battery or from 105-125 volts, 50 or 60 cps with a battery in place.

The following paragraphs describe special tests for checking the power supply and the battery of the receiver, and explain some of the special constructional features which will be encountered while servicing the receiver.

1. POWER SUPPLY

All power necessary for the operation of the receiver is supplied by the 2-volt rechargeable battery mounted within the radio. Power to the 1.4 volt tube filaments is supplied by the battery through suitable voltage dropping resistors. The high voltage for the screens and plates of the tubes is furnished by a synchronous vibrator used in conjunction with a step-up power transformer and its associated filter circuit. The synchronous vibrator operates directly from the battery.

The receiver power is obtained from the battery at all times in the manner just described, whether the power cord is connected

to a power source or not. When the power cord is connected to a receptacle supplying from 105 to 125 volts, 50 or 60 cps, a-c and the power selector is in either the CHARGE or ON position, the power supplied from the line will be used to charge the battery. The CHARGE position on the three-position power selector switch allows the battery to be charged from the house current when the receiver is not operating. The ON position of the switch permits the radio to be operated with the battery floating on the charger. Under this condition the battery filters the charger's output, maintains the voltage at its proper value and acquires a slow charge, if the voltage is adequate.

The battery charging unit consists of a step-down transformer which converts the line voltage of 117 volts to approximately 5.8 volts center-tapped, and a full wave copper-oxide rectifier which supplies the battery with the d-c charging current.

A charging cable is available which provides an easy means of charging the radio battery from an automobile or a 6-volt storage battery. The cable plug is inserted over the pins provided, see Figure 3, and the plug and socket on the other end of the cable are connected to a 6-volt supply. Complete installation instructions are provided with each cable.

2. CHARGER CHARACTERISTICS

Testing the Operation of the Rectifier Unit—A $\frac{1}{4}$ ampere fuse is used in series with the primary of the charger transformer. If the battery does not show any signs of becoming charged after a reasonable length of time, check the fuse. If it is necessary to replace the fuse, use a $\frac{1}{4}$ -ampere (G.E. No. 2548 or REF-001) fuse.

If one or more of the copper-oxide discs of the rectifier unit are defective, the charger will not operate properly. To test the rectifier unit operation, remove the battery from the unit and reconnect it in series with a d-c ammeter capable of reading at least two amperes. Plug the power cord into a 105-125 volts, 50 or 60 cps, a-c supply, and turn the power selector switch to the CHARGE position. With the a-c line voltage at 117 volts, the average charging current should read about 1.8 amperes at 2.1 volts battery voltage. Care must be exercised in making this test as the charging circuit is of extremely low resistance. Very heavy leads must be used, and the use of an ammeter having only 0.05 ohms resistance will introduce considerable error. If the line voltage is greater than 117 volts, or the battery voltage is lower than 2.1 volts, the charging current will be greater. If the current is much less than 1.8 amperes at the rated line voltage of 117 volts, one or more of the copper-oxide discs may be defective.

Testing the Individual Rectifier Disc—Two rectifier assemblies are used in the receiver, each assembly consisting of two rectifier discs held together by an eyelet. A cross section of a rectifier as-

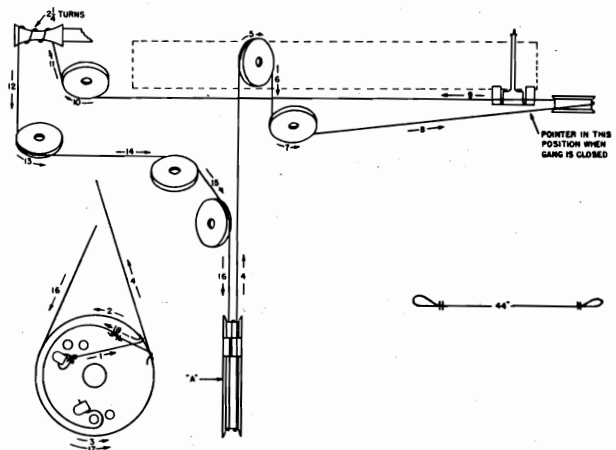


Fig. 1. Dial Stringing Diagram

MODEL 160

GENERAL ELECTRIC CO.

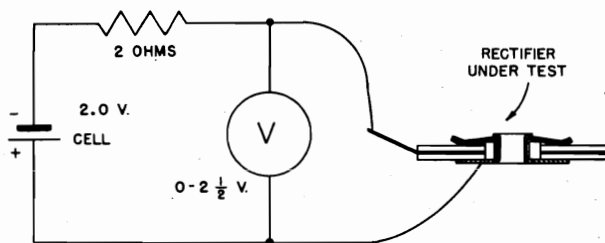


Fig. 2. Rectifier Test Circuit

assembly is shown in Figure 2. The center plate of the assembly is positive and is provided with a soldering tab. A copper-oxide rectifier disc is located on each side of the center plate. The rectifier disc conducts when the proper polarity potential is applied to the copper-oxide surface. The copper oxide is a dark coating which has been plated with nickel to afford a good surface contact to the copper oxide. If either or both of the rectifier discs in an assembly become defective, the entire assembly should be replaced.

To check the rectifier assembly, the following tests are recommended. In the conducting direction, the rectifier assembly should pass 0.5 ampere or more when $\frac{1}{2}$ volt is impressed across it. If a d-c ammeter is not available for measuring currents as high as 0.65 ampere, the circuit shown in Figure 2 can be used for this check. The 2.0-ohm resistor should be fairly accurate. The voltage across the rectifier assembly should read 0.7 volt or less; if this voltage exceeds 0.7 volt, the assembly is defective and should be replaced.

The reverse current flow is as important as the above test and is made as follows: Reverse the battery polarity in the test circuit described for current check, disconnect the voltmeter, and place a milliammeter that will read 10 ma. in series with a lead to one of the battery terminals. A suitable meter fuse should be used in series with the milliammeter to prevent damage to the meter in case the assembly under test is shorted. The reversed current should not exceed 10 ma. If this current is considerably above this value, the rectifier assembly should be discarded.

If a milliammeter is not available, a rough check may be made by measuring the resistance of the assembly in the non-conducting direction on the low resistance range of an ohmmeter. The resistance should measure at least 300 ohms.

3. REPLACEMENT OF VIBRATORS

After many hours of service, the reception might become very noisy or fail due to a faulty vibrator. The type used in this receiver is REU-001.

In order to gain access to the vibrator, proceed as follows:

1. Pull out the pins on the handle of the cabinet (Figure 3).
2. Unscrew the five hex screws which hold the chassis in cabinet (one screw at the bottom of cabinet).

3. Slide the chassis out of the cabinet, being careful not to strain the loop leads.

4. Unscrew the three screws at the bottom and one on the top of the power unit.

5. Lift up the outer shield and then replacement of the vibrator is as easy as changing a normal radio tube.

BATTERY INFORMATION

The receiver uses a 2-volt Willard Radio Battery No. 25-2 or equivalent. It has a 25 ampere-hour capacity and should be cared for in the same manner as any storage battery.

CHARGE INDICATORS

The degree of charge of the battery can be determined by raising the back cover of the radio and referring to the charge ball indicators visible through the hole in the metal battery case.

If the battery is fully charged, two indicator balls will be visible at the surface of the liquid in the battery. When the battery discharges, these ball indicators will sink and disappear in the following order:

1. Green indicator sinks when approximately 20 per cent of battery capacity has been discharged.

2. The red ball sinks when battery is 80 per cent discharged. On charge, the balls rise or float in the reverse order and the charge may be stopped when both balls appear in the opening.

TO CHARGE BATTERY

The battery is charged by merely plugging the receiver power cord in the rated ac power outlet and turning the selector switch to CHARGE. Frequent check should be taken of the charge indicator and when both indicator balls are visible, the battery is adequately charged. Charging the battery after both indicator balls are visible will not harm the battery except it will evaporate the water faster. A completely discharged battery will be restored, usually within 20 to 30 hours.

When operating the receiver from the a-c house current, the battery floats or is being charged at a slow rate. Thus if you wish to operate the receiver even with a fully discharged battery, plug in the power cord in the ac receptacle and turn the power selector switch to the ON position. Prolonged operation in this manner usually will cause the battery potential to stabilize at some voltage determined by the line voltage and the characteristics of the charging circuit components. The degree of charge obtainable with this method of operation likewise is dependent on the line voltage and the characteristics of the charging circuit components.

BATTERY OPERATING INSTRUCTIONS.

1. Add distilled or tap water in the filler cap at sufficiently frequent intervals to keep liquid level at indicator mark as viewed through opening in battery case. Do not overfill as this impairs the nonspill feature. Distilled water is to be preferred, as it does not contain any chemical compound which can contaminate the battery.

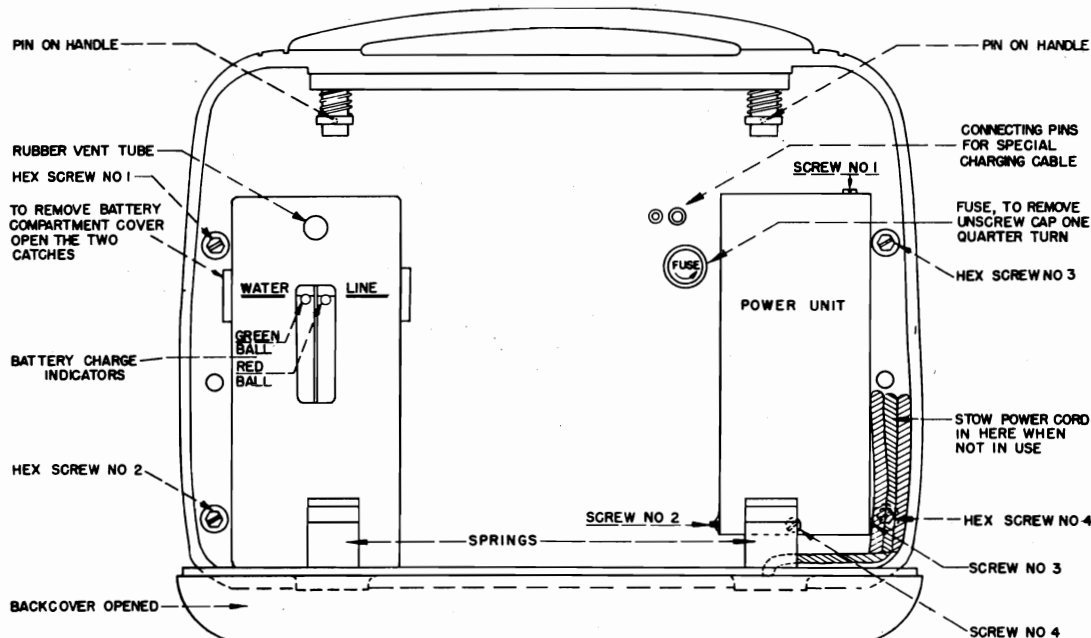


Fig. 3. Rear Compartment Assembly

GENERAL ELECTRIC CO.

MODEL 160

2. A fully charged battery will operate the radio in the ON position without being connected to an a-c outlet for about 12 to 15 hours before recharging is required. Whenever possible, it is best not to allow the battery to become discharged to the extent that both indicators disappear. However, if both indicators have sunk, the battery should be recharged immediately or within 24 hours.

3. A battery will continually discharge at a slow rate even when not in use. For this reason, monthly checks should be made of the charge condition and the battery placed on charge when necessary. This will prevent damage to the battery, such as freezing during cold weather.

BATTERY INSTALLATION

The following instructions should be carefully followed in installing a battery, or replacing an old one:

1. Remove battery from packing carton.
2. If needed, add water to bring liquid level to indicator mark on battery container. Do not overfill.
3. Raise back cover on radio, remove battery case cover. The latter is removed by lifting two catches.
4. Unplug old battery if present, and replace with new battery.
5. Place battery on charge, if necessary, as described in a previous paragraph, until both indicators are showing in the opening in the case cover.

ELECTRICAL CIRCUIT ALIGNMENT**EQUIPMENT REQUIRED**

1. Signal generator with audio tone modulation.
2. A-C output meter, 1 or $\frac{1}{2}$ volts full scale, 1000 ohms/volt.
3. Insulated screwdriver.
4. .05 mf. capacitor.
5. Antenna loop.
6. Shorted one turn loop (for "wandering").
7. Powdered iron cores.

ALIGNMENT PROCEDURE

1. **General**—The alignment procedure is given in table form for convenience. Reference is made to Figure 5 for the trimmer locations. The low side of the signal generator should be connected to the chassis of the receiver for i-f alignment; the high side should be connected as indicated in the Alignment Chart. A meter or some other suitable indicating device must be connected to the output of the receiver.

When aligning the receiver, the volume control on the receiver should be turned to its maximum position. The output signal of the signal generator should be kept as low as possible at all times, the reading of a meter connected across the voice coil leads of the receiver should be kept below $\frac{1}{2}$ volt by changing the signal generator output. If the signal level is too high, the AVC becomes effective and alignment errors might result.

The following paragraphs give greater details regarding the connections of the output meter and the signal generator to the receiver during alignment.

2. **Connecting the Output Meter**—In aligning the receiver some means for indicating differences in the output voltage will be required. A rectifier type a-c meter of 1 or $1\frac{1}{2}$ volts full scale deflection is connected across the speaker voice coil terminals. For alignment of the i-f amplifier, the chassis and the back cover have to be removed from the cabinet (see paragraph 3 of General Information).

In order to be able to tune the i-f amplifier with ease, it is advisable to unsolder the two leads connecting the loop antenna, and solder them together avoiding any undesirable shorting to ground. Now remove the four self-tapping screws holding the speaker mounting plate and slide it out to gain access to the inside of the chassis. Due to the fact that the rectifier discs are mounted

on this mounting plate, it is necessary to ground this plate temporarily to the chassis by means of a metal strip or wire to avoid excessive hum.

For the r-f alignment, the chassis can be left in the cabinet and the output meter connected between the auxiliary green voice coil lead provided and chassis.

3. **Connecting the Signal Generator**—After aligning the i-f transformer T3, the output of the signal generator should be coupled through a .05 mf. capacitor to the grid of the 1R5 oscillator-converter tube. This may be accomplished easily by connecting the capacitor to the stator of C2-B, the middle section of the tuning gang, as this stator is connected directly to the converter grid. The low side of the signal generator output should be connected to the chassis ground to complete the circuit.

For aligning the oscillator and r-f coils, the r-f signal should be inductively coupled by connecting a three- or four-turn, 6-inch diameter loop of bell wire across the signal generator output terminals and then locating the loop about one foot from the radio cover. To prevent possible error in peak readings, the position of the loop with respect to the receiver should not be changed during any one set of adjustments. The adjustment of the iron cores must be made with the cover opened, and during the reading of the output meter the loop must be in normal position (the cover of the receiver must be closed).

For the oscillator adjustment, it is advisable to use the method of "wandering" the radio loop antenna. "Wandering" is the procedure where more or less gain will be indicated by an increase or decrease in output meter readings when a shorted one-turn loop (approximately 10 in. by 5 in.) is coupled to the radio antenna loop. If a gain is indicated, we have to increase the inductance by screwing in the iron core of the oscillator coil T6. In a similar manner, a field of powdered iron cores may be coupled to the loop. In this case a gain would indicate that the oscillator inductance must be decreased. When no gain is apparent with either the shorted turn wand or the iron field wand, the adjustment of the oscillator iron core is peaked.

After the alignment of the oscillator, the r-f transformer T1 should be aligned as follows:

1. The signal is fed over the loop coupled to the radio antenna loop with cover closed. Note the output meter reading.
2. Open the back cover and turn the tuning slug of T1 approximately $\frac{1}{2}$ turn clockwise.
3. Close the back cover and note the new output meter reading. If it has increased, continue to turn the core in the same direction; if it has decreased, reverse the direction. Repeat this procedure until a definite maximum reading is obtained.

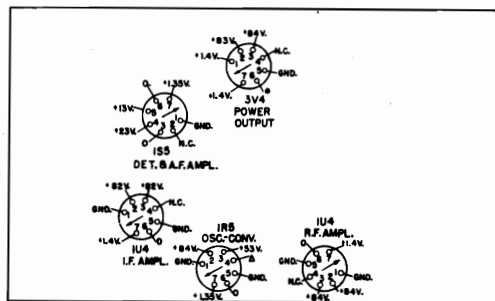
ALIGNMENT CHART

Step	Test-Oscillator Connected to:	Test-Oscillator Setting	Pointer Setting	Adjust for Maximum Output
1	1U4 (i-f amplifier) grid (Pin 6) in series with 0.5 mf capacitor.	455 KC	1600 KC (gang condenser open)	Iron cores of i-f transformer T3
2	1R5 converter grid (Pin 6) in series with .05 mf capacitor.	455 KC	1600 KC (gang condenser open)	Iron cores of i-f transformer T2
3	1R5 converter grid (Pin 6) in series with .05 mf capacitor.	455 KC	1600 KC (gang condenser open)	Repeak T3 and T2
4	Inductively coupled to loop antenna.	580 KC	580 KC	Iron core of T6*
5	Inductively coupled to loop antenna.	580 KC	580 KC	Iron core of T1**
6	Inductively coupled to loop antenna.	1500 KC	1500 KC	C3B, C2B, and C1B***
7	Repeat Steps 4, 5, and 6 until both peaks reach maximum.			

*Use "Wandering" method described in text.

**See text for details.

***Chassis in cabinet and cabinet back (with loop) closed; remove plug buttons to adjust trimmers.



CONDITIONS OF TEST:
ALL MEASUREMENTS D-C.
MEASUREMENTS MADE TO GROUND.
MEASUREMENTS MADE WITH 50,000 OHM/VOLTMETER
BATTERY VOLTAGE - 2.1 VOLTS.

N.C. - NOT CONNECTED TO TUNE.
* - 4.5 V., IF MEASURED WITH V.T.V.A.
* - READING AFFECTED BY INSTRUMENTS.

Fig. 4. Socket Voltage Diagram

MODEL 160

GENERAL ELECTRIC CO.

STAGE GAINS AND VOLTAGE CHECKS

Stage gain measurements may be made with a vacuum tube voltmeter to check circuit performance and to locate stages which are not operating properly. The gain values listed may have tolerance of 20%.

1. R-F STAGE GAINS.

- R-F Amplifier Grid (1U4 Pin 6) to Oscillator-Converter Grid (1R5 Pin 6).....13 at 1000 KC
 Oscillator-Converter Grid (1R5 Pin 6) to I-F Amplifier Grid (1U4, Pin 6).....26 at 1000 KC
 Oscillator-Converter Grid (1R5, Pin 6) to I-F Amplifier Grid (1U4, Pin 6).....31 at 455 KC

2. AUDIO GAIN

The power output across the speaker voice coil should be approximately 50 milliwatts with a 400 cps signal of .03 volt applied across the volume control.

3. OSCILLATOR GRID BIAS

The d-c voltage developed across the oscillator grid leak (Resistor R2) averages 13 volts at 1000 KC.

4. SOCKET PIN VOLTAGE

Fig. 4 shows typical tube pin voltages. All readings should be made from the pins to ground unless otherwise indicated.

5. HUM LEVEL

Across the primary of the output transformer
 T4 measured in series with 1 mf paper capacitor in series with the meter.....3 volts
 (With the line cord plugged in; with battery operation alone, the voltage thus measured will be negligible.)

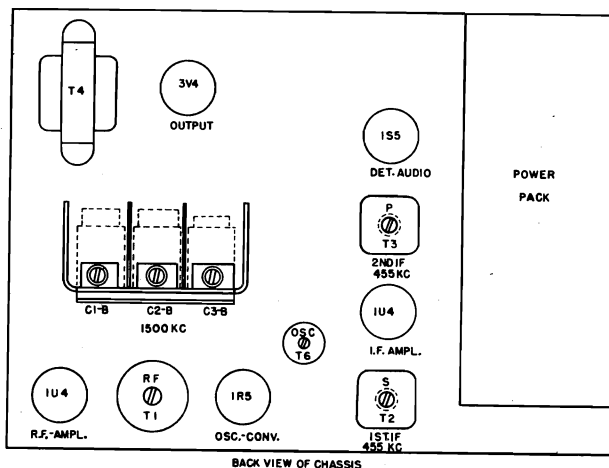


Fig. 5. Tube and Trimmer Location

MODEL 160—REPLACEMENT PARTS LIST

CAT. NO.	SYMBOL	DESCRIPTION	CAT. NO.	SYMBOL	DESCRIPTION
UNIVERSAL REPLACEMENT PARTS			SPECIALIZED REPLACEMENT PARTS		
UCC-625	C9, 17	CAPACITOR—.005 mf., 400 v., paper	RHG-019		GROMMET—For battery box
UCC-630	C6, 12, 13	CAPACITOR—.01 mf., 600 v., paper	RHI-006		HINGE—Door hinge
UCC-631	C11, 16	CAPACITOR—.02 mf., 400 v., paper	RHQ-002		VENT TUBE—For battery
UCC-635	C4, 15, 23	CAPACITOR—.05 mf., 400 v., paper	RHS-010		TUBE SHIELD—For 1S5 tube
UCU-028	C7, 8, 10	CAPACITOR—100 mmf., mica	RHS-018		SHIELD—Spiral shield
UOP-611		SPEAKER—PM speaker	RHY-007		HANDLE—Cabinet handle
URD-049	R16	RESISTOR—1000 ohms, ½ w., carbon	RJP-014		PLUG—Battery plug
URD-057	R15	RESISTOR—2200 ohms, ½ w., carbon	RJP-026		PLUG BUTTON
URD-073	R13, 14	RESISTOR—10,000 ohms, ½ w., carbon	RJS-091		SOCKET—Tube socket shock mounting
URD-077	R2	RESISTOR—15,000 ohms, ½ w., carbon	RJS-105		SOCKET—Tube socket
URD-097	R1	RESISTOR—100,000 ohms, ½ w., carbon	RJS-121		SOCKET—Vibrator socket
URD-121	R9, 12	RESISTOR—1 meg., ½ w., carbon	RJW-002		HOLDER—Fuse holder
URD-129	R6	RESISTOR—2.2 meg., ½ w., carbon	RLB-028	T1	TRANSFORMER—R-F transformer
URD-133	R10	RESISTOR—3.3 meg., ½ w., carbon	RLC-078	T6	TRANSFORMER—Oscillator transformer
URD-137	R8	RESISTOR—4.7 meg., ½ w., carbon	RLF-014	L3	CHOKE—B + filter choke
URE-059	R11	RESISTOR—2,700 ohms, ½ w., carbon	RLF-015	L4	CHOKE—A + filter choke
			RLI-026	L2	CHOKE—Hash filter choke
			RLL-032	L1	LOOP—Antenna loop
			RMA-006		ARM—Switch arm
			RMC-022		CATCH—Catch for cabinet door
			RMC-023		CATCH—Battery box catch
			RMC-025		CLAMP—Clamp for bias cell
			RML-019		LINK—Link for lever
			RML-020		LEVER—Lever for switch control shaft
			RML-021		LEVER—Lever for volume control
			RMM-082		RUBBER CUSHION—For battery box cover
			RMP-017		PIN—Handle retaining pin
			RMS-120		SPRING—Drive cord spring
			RMS-156		SPRING—For handle
			RMU-044		SHAFT—Shaft for switch
			RMU-045		SHAFT—Tuning shaft
			RMW-027		PULLEY
			RMW-077		WINDLASS
			RRC-092		VOLUME CONTROL—.5 meg.
			RRW-018	R7	RESISTOR—7.5 ohms, wirewound
			RSW-060	R3, 4, 5	SWITCH—Power switch
			RTL-052	T2	TRANSFORMER—1st I-F transformer
			RTL-054	T3	TRANSFORMER—2nd I-F transformer
			RTO-003	T5	TRANSFORMER—Charging transformer
			RTO-055	T4	TRANSFORMER—Output transformer
			RTV-003	T7	TRANSFORMER—Vibrator transformer
			RWL-009		POWER CORD
RAC-053		COVER—Battery box cover			
RAD-033		DOOR—Cabinet door			
RAG-017		GRILLE—Loudspeaker grille			
RAU-040		CABINET—Maroon			
RBC-001	B2	CELL—Bias cell			
RCC-068	C20, 21	CAPACITOR—.05 mf., 120 v., paper			
RCC-090	C22	CAPACITOR—.003 mf., 1500 v., paper			
RCE-007	C14A, B, C	CAPACITOR—Electrolytic			
RCT-034		CAPACITOR—Tuning capacitor			
RCW-1060	C19	CAPACITOR—10 mmf., ceramic			
RCW-1075	C5	CAPACITOR—4 mmf., ceramic			
RDC-032		DRIVE CORD—25 yards			
RDK-142		KNOB—Tuning knob			
RDK-143		KNOB—Knob volume and switch			
RDP-041		ASSEMBLY—Slider and pointer assembly			
RDS-075		SCALE—Dial scale			
REF-001	F1	FUSE—½ ampere			
REV-001	V1	VIBRATOR—Vibrator unit			
REX-001		RECTIFIER—Disc rectifier			
RHC-013		HAIRPIN COTTER			
RHE-006		EYELET—For handle			
RHG-018		GROMMET—Rubber grommet			

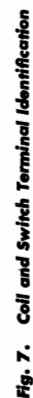
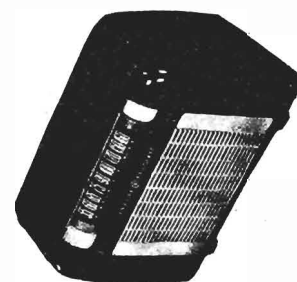


Fig. 7. Coll and Switch Terminal Identification



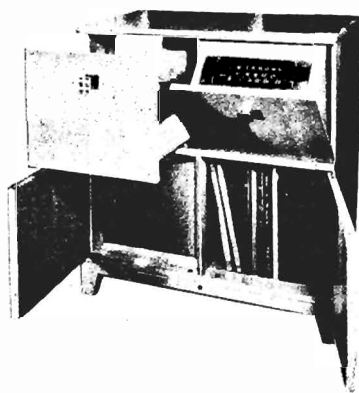
MODELS 324,
328

GENERAL ELECTRIC CO.

MODEL 324



MODEL 328



SPECIFICATIONS

CABINET

Model.....	324	328
Material.....	Wood	Wood
Color.....	Mahogany	Blonde
Height.....	32½ in.	32½ in.
Width.....	31⅝ in.	31⅝ in.
Depth.....	16⅞ in.	16⅞ in.

ELECTRICAL

Voltage.....	105-125
Frequency.....	.60 c.p.s
Wattage (Radio).....	65 watts
Wattage (Phono).....	80 watts

OPERATING FREQUENCIES

AM.....	540-1620 kc
FM.....	88-108 mc

INTERMEDIATE FREQUENCIES

AM.....	455 kc
FM.....	10.7 mc

POWER OUTPUT

Undistorted.....	3.0 watts
Maximum.....	5.0 watts

LOUDSPEAKER

Type.....	Alnico permanent magnet
Outside Diameter of Cone.....	12 inches
Voice Coil Impedance at 400 Cycles.....	3.2 ohms

TUBE COMPLEMENT

(V1) Converter.....	6BE6
(V2) R-F and 1st FM-IF Amplifier.....	6BA6
(V3) Second FM and 1st AM-IF Amplifier.....	6BA6
(V4) FM Limiter.....	6AU6
(V5) AM Detector, FM Discriminator, and Audio Amplifier.....	6T8
(V6) Power Output.....	6V6
(V7) Rectifier.....	5Y3GT
(V8) Phono Preamplifier.....	6SC7

PHONOGRAPH PICK-UP

Type.....	Variable reluctance
D-c Resistance.....	250 ohms

ANTENNA

AM.....	Built-in loop or outside antenna
FM.....	Power cord antenna, or 300 ohm FM dipole antenna

GENERAL

Models 324 and 328 are alike except for cabinet. For service information on the record changer, refer to General Electric publication ER-S-P6.

These models are designed to operate either from built-in antennas or from an external AM antenna or FM dipole antenna. On AM it is merely necessary to connect an external antenna to the terminal screw marked "Antenna." On FM, to operate the receiver from the built-in power line antenna, it is necessary to connect the green wire coming out of the rear of the chassis, to the left-hand terminal screw of the antenna terminal strip. For operation from a 300-ohm FM dipole (G.E. Cat. No. UKA-006 or UKR-006), remove this green wire from the terminal and connect the 300-ohm transmission line (G.E. Cat. No. UWT-002) to the terminals marked "DIPOLE."

On AM operation, the set operates as a five-tube set with the signal being fed directly into the converter grid.

On FM, the set uses a reflex circuit, the Armstrong type discriminator, and a special limiter circuit.

In the reflex circuit, V2 (6BA6) acts both as an r-f amplifier and as the 1st i-f amplifier. The r-f signal is fed into the grid of V2 through the secondary of T1. It is amplified by V2 and tuned at the converter grid by L4, C1B, and trimmer C6. In the converter, the r-f is changed to 10.7 mc i-f, and fed into the primary of T1 and again inserted into the grid of V2, which now acts as an i-f amplifier. The i-f signal is fed from the plate of V2 through choke L9 into the second i-f transformer.

L1 and C3 form a 10.7 mc wave trap to eliminate any i-f signal from the antenna circuit to prevent interference. C4 and L2 are designed to peak at 98 mc with strays to increase the FM r-f sensitivity. At the FM r-f frequencies, the capacitor C46 offers little series impedance to the r-f signal. L9 and C7 form a high-pass filter to pass the FM r-f signal into the converter grid and to shunt the FM i-f frequency into the primary of the second FM i-f transformer.

It should be noted that the FM oscillator coil L8 is a section of 300-ohm line shorted at one end to form a one-turn loop. C11 and C10 are tapped in at each side of the shorted end.

L13 and C27 in the cathode circuit of the limiter tube are series tuned to 10.7 mc. This effectively grounds the cathode for IF. The presence of R21, however, provides a highly degenerative condition for any amplitude modulation applied to the limiter grid. The cathode bias developed by R21 is approximately 85 volts, which makes it necessary to insert onto the grid of V4 from B+80 volts through R38.

In late models of 324 and 328, the variable reluctance pick-up with replaceable stylus was used. When this pick-up was used, the resistor R49 was changed to 15,000 ohms, ½ watt from 6800 ohms, ½ watt.

STAGE GAIN AND VOLTAGE CHECKS

Stage gain measurements by a vacuum tube voltmeter or similar measuring device may be used to check circuit performance and isolate trouble. The gain values listed may have tolerances of ±20 per cent. Readings should be taken with low signal voltage so that AVC is not effective.

I. R-F AND I-F STAGE GAINS

Signal applied through IRE dummy antenna:

Antenna Post to V2 Grid.....	.4 at 1000 kc
V2 Grid to V3 Grid.....	.60 at 455 kc
Dipole Terminals to V2 Grid.....	1.3 at 98 mc
V2 to V1 Grid.....	.5 at 98 mc
V1 to V2 Grid.....	2.6 at 10.7 mc
V2 to V3 Grid.....	.18 at 10.7 mc
V3 to V4 Grid.....	.54 at 10.7 mc

GENERAL ELECTRIC CO.

MODELS 324,
328**2. AUDIO GAIN**

0.05 volts at 400 cps across volume control with volume control set at maximum will give approximately $\frac{1}{2}$ watt output across the speaker voice coil.

3. OSCILLATOR GRID BIAS

D-c voltage developed across R3:

6.5 volts at 1000 kc. (Use 220 K resistor to isolate V.T.V.M.)

4.5 volts at 98 mc. (Use 220 K resistor to isolate V.T.V. M.)

4. SOCKET PIN VOLTAGES

Fig. 3 shows typical tube pin voltages. All readings should be made from the pins to ground, unless otherwise indicated.

5. HUM MEASUREMENT

Hum measured across the voice coil of the speaker with volume control at minimum and Band switch on AM should not exceed 7 millivolts.

On FM, ground limiter grid and measure hum across voice coil with volume control at maximum. Hum should not exceed 15 millivolts.

ALIGNMENT

Two methods of alignment are given: (1) The regular meter alignment as previously used; and (2) Visual alignment, which allows for more precision in aligning the i-f transformers and particularly the discriminator alignment where it is necessary that the negative and positive half cycles of the output wave have equal amplitude and symmetry.

EQUIPMENT REQUIRED FOR METER ALIGNMENT

1. Test oscillator with tone modulation.
2. 20,000 ohm-per-volt voltmeter or microammeter.
3. A-c voltmeter, 2 volts.
4. .01 mfd., paper capacitor.
5. 200,000-ohm resistor, $\frac{1}{2}$ watt.

NOTES IN CONNECTION WITH METER ALIGNMENT CHART

1. Use unmodulated signal.
2. Connect 20,000 ohm-per-volt meter from junction of R26 and R48 to chassis. Use 10-volt scale. Steps 4 and 5.
3. Connect 20,000 ohm-per-volt meter from junction of C40 and R38 to cathode of limiter (Pin 7 of V4) in series with a 200,000-ohm resistor. The resistor must be connected directly to the cathode pin to minimize capacity loading and to isolate the i-f signal from the meter. Keep signal generator down so that meter indicates not more than 1 volt (5 microamps through 200,000 ohms).
4. Use 400-cycle modulation.
5. Connect a standard output meter across speaker voice coil. Turn volume control full on. Keep signal generator output down so that output meter indicates not more than $\frac{1}{2}$ watt output during alignment.
6. For alignment of the AM oscillator and R-F trimmer, the signal should be inductively coupled to the loop antenna by connecting a four-turn, six-inch diameter loop of bell wire across the signal generator terminals, and then locate the loop about one foot from the radio loop antenna. To prevent possible errors in peak readings, the position of the loop in respect to the radio loop should not be changed during any one set of adjustments.
7. To align the first FM i-f transformer T1, it is necessary to disconnect the copper strap from the band switch to Pin 7 of V1 (6BE6) by unsoldering the strap from the tube pin connection. Resolder the strap after T1 is aligned.
8. When tuning the secondary of T6 three minimum points will be obtained. The center one is the correct setting. As the transformer is tuned either side of 10.7 mc, the meter reading should increase.
9. Termination impedance of signal generator should be 300 ohms.
10. When detuning the signal generator in Step (4), two maximum meter readings will be obtained, one on each side of 10.7 mc. The primary of T6 should be aligned to maximum when the signal generator is tuned to the smaller of these two peaks.

METER ALIGNMENT CHART

Step No.	Signal Generator Frequency	Signal Input Point	Band Switch	Dial Setting	Adjust	See Note
AM-IF ALIGNMENT						
1	455 KC	6BE6 grid (Pin 7 of V1) through .01 mfd.	AM	550 KC	Primary and secondary cores of T5 for maximum	4, 5
2	455 KC	6BE6 grid (Pin 7 of V1) through .01 mfd.	AM	550 KC	Primary and secondary cores of T2 for maximum	4, 5
FM DISCRIMINATOR AND I-F ALIGNMENT						
3	10.7 MC	6BA6 grid (Pin 1 of V3)	FM	.....	T6 secondary core for minimum	4, 5, 8
4	See Note 10	6BA6 grid (Pin 1 of V3)	FM	.....	Detune signal generator to point of maximum meter reading	1, 2, 10
5	See Note 10	6BA6 grid (Pin 1 of V3)	FM	.....	T6 primary for maximum	1, 2
6	Repeat Step 3.					
7	10.7 MC	6BA6 grid (Pin 1 of V3)	FM	.....	Primary and secondary cores of T4 for maximum	1, 3
8	10.7 MC	6BA6 grid (Pin 1 of V2)	FM	.....	Primary and secondary cores of T3 for maximum	1, 3
9	10.7 MC	6BE6 grid (Pin 7 of V1)	FM	.....	Primary and secondary cores of T1 for maximum	1, 3, 7
AM-RF ALIGNMENT						
10	1620 KC	Inductively coupled	-AM	C1 completely open	Adjust C9 for maximum	4, 5, 6
11	1500 KC	Inductively coupled	AM	For maximum output	Adjust C5 for maximum while rocking generator. Set pointer to 1500 KC or 161 mark on scale on backplate.	4, 5, 6

MODELS 324,
328

GENERAL ELECTRIC CO.

FM-RF ALIGNMENT

12	108 MC	Dipole terminals	FM	C1 completely open	Adjust C12 for maximum	1, 3, 9
13	108 MC	Dipole terminals	FM	For maximum output	Adjust C6 for maximum while rocking generator	1, 3, 9
14	10.7 MC	Dipole terminals	FM	.....	Adjust C3 for minimum.	1, 3

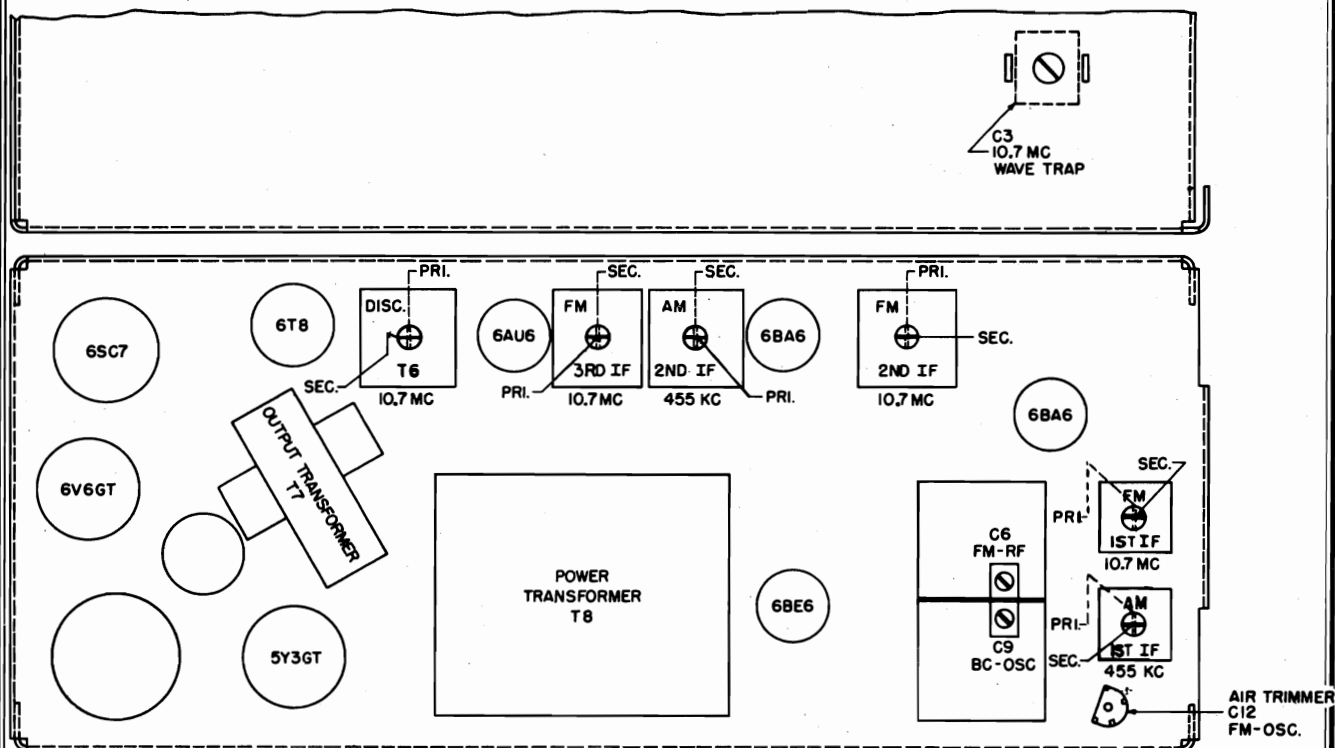


Fig. 1 Tube and Trimmer Location

EQUIPMENT REQUIRED FOR VISUAL ALIGNMENT:

1. General Electric YGS-3 AM and FM signal generator, or equivalent.
2. General Electric CRO-5A oscilloscope, or equivalent.
3. 200,000 ohm, $\frac{1}{2}$ watt resistor.
4. 20,000 ohm-per-volt meter.
5. .01 mfd. paper capacitor.
6. 8 to 10 mfd. Pyranol capacitor.

NOTES IN CONNECTION WITH METER ALIGNMENT CHART

1. Connect vertical plates of scope to the limiter cathode (Pins 2 or 7 of V4) through a 200,000-ohm resistor and chassis. Connect an 8 to 10 mfd. pyranol capacitor between junction of C40 and R38 and ground.
2. Connect vertical plates of scope at junction of R18 and C28 and chassis.
3. Use a 60-cycle, amplitude-modulated signal.
4. In some cases tuning of the converter grid will cause "pulling" of the oscillator and will change the oscillator frequency. After centering the response curve, if peaking of C5 or

C6 causes the curve to move off the scope screen, it is necessary to recalibrate the oscillator as in Steps 10 and 12.

5. The termination impedance of the signal generator 300 ohms to properly match the input impedance of this receiver.

6. To align the 1st i-f transformer T1, it is necessary to disconnect the copper strap from Pin 7 of V1 (6BE6) by unsoldering it. Resolder after alignment.

7. For alignment of the AM oscillator and r-f trimmers, the signal should be inductively coupled to the loop antenna by connecting a four-turn six-inch diameter loop of bell wire across the signal generator terminals, and then locate this loop about one foot from the radio loop antenna. To prevent possible errors in peak readings, the position of the loop with respect to the radio loop should not be changed during any one set of adjustments.

8. When using a sweep signal, it is necessary to apply the same sweep voltage to the horizontal plates of the scope as is used to sweep the r-f frequency. It may be necessary to use an RC phase shift network. This may be done by putting a .005 mfd. capacitor across the horizontal plate terminals of the scope and a $\frac{1}{2}$ -megohm potentiometer in series with the high side of the horizontal sweep voltage line. The potentiometer should be adjusted for a single trace.

GENERAL ELECTRIC CO.

MODELS 324, 328

VISUAL ALIGNMENT CHART

Step No.	Signal Generator Frequency	Signal Input Point	Band Switch	Dial Setting	Adjust	See Note
AM-IF VISUAL ALIGNMENT						
1	455 KC ±20 KC at 60-cycle sweep rate	6BE6 grid (Pin 7 of V1) through .01 mfd.	AM	.....	Two slugs of T5 for maximum amplitude and symmetry.	2
2	455 KC ±20 KC at 60-cycle sweep rate	6BE6 grid (Pin 7 of V1) through .01 mfd.	AM	.....	Two slugs of T2 for maximum amplitude and symmetry.	2
FM-IF AND DISCRIMINATOR VISUAL ALIGNMENT						
3	10.7 MC ±300 KC at 60-cycle rate	6BA6 grid (Pin 1 of V2)	FM	.....	Two slugs of T4 for maximum amplitude of wave and symmetry.	1
4	10.7 MC ±300 KC at 60-cycle rate	6BA6 grid (Pin 1 of V2)	FM	.....	Two slugs of T3 for maximum amplitude symmetry of wave.	1
5	10.7 MC ±300 KC at 60-cycle rate	6BE6 grid (Pin 7 of V1). (See Note 7.)	FM	.....	Tuning slugs of T1 for maximum amplitude and symmetry of wave.	1, 6
6	10.7 MC ±300 KC at 60-cycle rate	6BA6 grid (Pin 1 of V3)	FM	.....	Primary of T6 for maximum amplitude.	2
7	10.7 MC ±300 KC at 60-cycle rate	6BA6 grid (Pin 1 of V3)	FM	.....	Secondary of T6 for vertical symmetry with respect to the midpoint horizontal trace.	2
8	10.7 MC ±300 KC at 60-cycle sweep rate	6BA6 grid (Pin 1 of V3)	FM	.....	Primary of T6 for straightest line between positive and negative peaks.	2
9	Recheck Step 7					
AM-RF VISUAL ALIGNMENT						
10	1620 KC	Inductively coupled	AM	C1 completely open	C9 for steepest slope of straight-line trace on scope.	2, 3, 7
11	1500 KC ±20 KC at 60 cps sweep rate	Inductively coupled	AM	For maximum output	C5 for maximum amplitude. Set pointer to 1500 KC or 161 mark on scale on backplate.	2, 3, 7
FM-RF VISUAL ALIGNMENT						
12	108 MC	Dipole terminals	FM	C1 completely open	C12 for steepest slope of straight line trace on scope.	1, 3, 5
13	98 MC ±300 KC at 60 cps sweep rate	Dipole terminals	FM	For maximum output	C6 for maximum amplitude and minimum distortion.	1, 5
14	10.7 MC ±300 KC at 60 cps rate	Dipole terminals	FM	.....	C3 for minimum amplitude.	1, 5

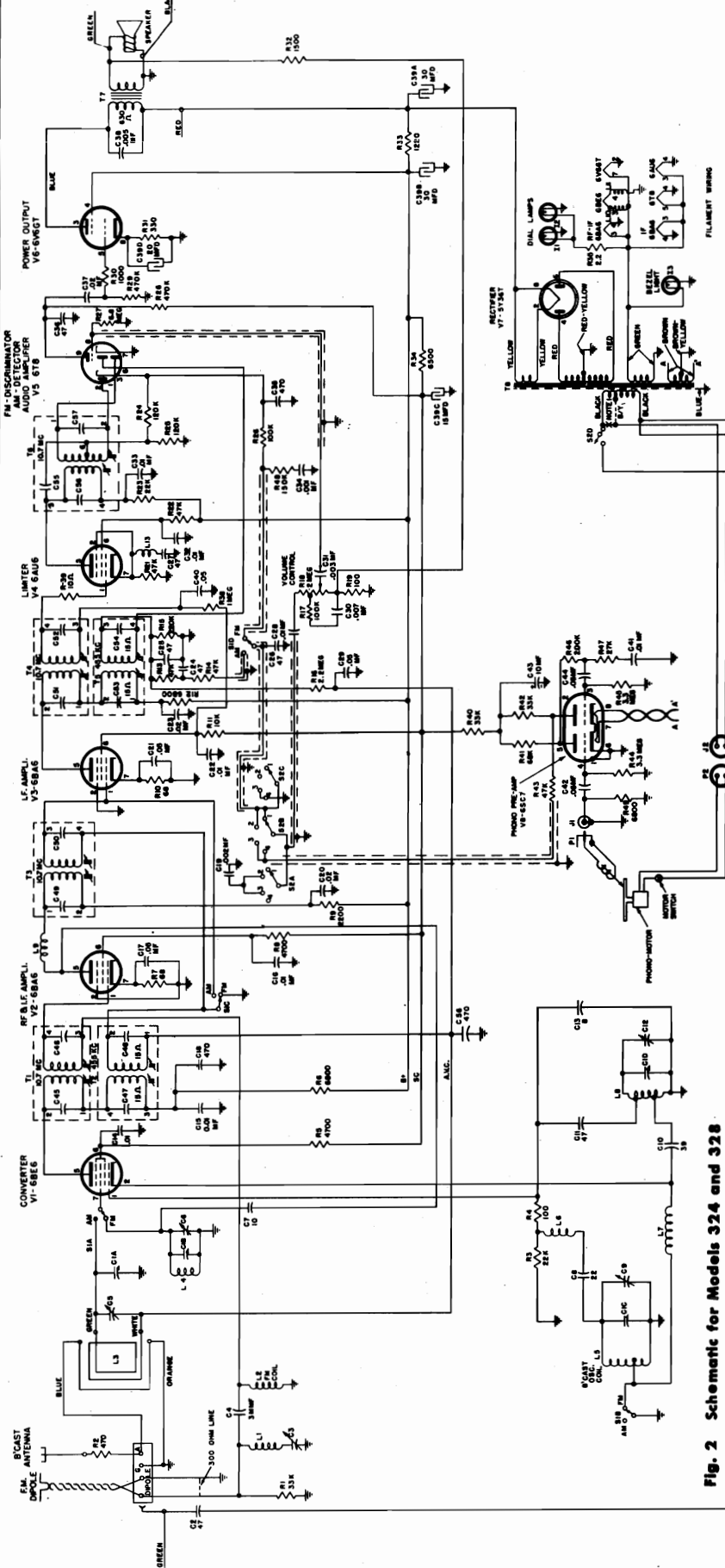


Fig. 2 Schematic for Models 324 and 328

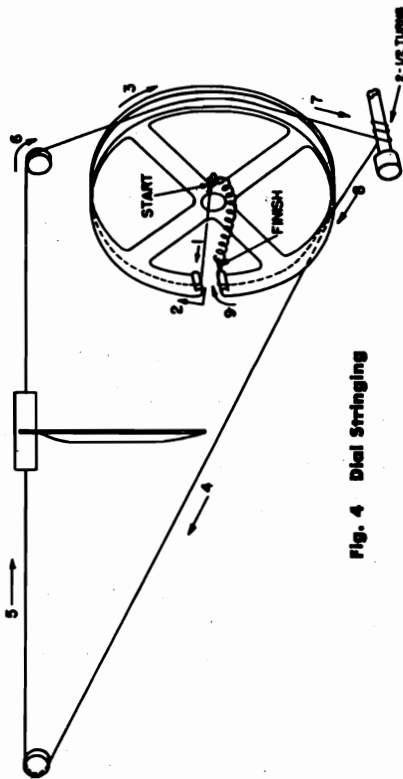


Fig. 4 Dial Stringing

GENERAL ELECTRIC CO.

MODELS 324, 328

Cat. No.	Symbol	Description	Cat. No.	Symbol	Description
UNIVERSAL REPLACEMENT PARTS			SPECIALIZED REPLACEMENT PARTS (Cont'd)		
UCC-620	C34	CAPACITOR—.001 mfd., 600 v., paper..	RCW-1053	C8	CAPACITOR—22 mmf., $\pm 20\%$, max. neg., ceramic
UCC-621	C19	CAPACITOR—.002 mfd., 600 v., paper..	RCW-1057	C10	CAPACITOR—39 mmf., $\pm 10\%$, max. neg., ceramic
UCC-623	C31	CAPACITOR—.003 mfd., 600 v., paper..	RCW-1060	C7	CAPACITOR—10 mmf., $\pm 20\%$, zero coef., ceramic
UCC-630	C14, 15, 16, 22, 28, 32, 33, 41	CAPACITOR—.01 mfd., 600 v., paper..	RCW-1066	C4	CAPACITOR—3 mmf., $\pm 10\%$, zero coef., ceramic
UCC-631	C20, 23, 37	CAPACITOR—.02 mfd., 600 v., paper..	RCW-2010	C27	CAPACITOR—47 mmf., $\pm 5\%$, zero coef., ceramic
UCC-635	C40, 44, 17, 21, 29, 42	CAPACITOR—.05 mfd., 600 v., paper..	RCW-2033	C13	CAPACITOR—8 mmf., $\pm 10\%$, max. neg., ceramic
UCC-1625	C38	CAPACITOR—.005 mfd., 1600 v., paper	RCY-020	C3	CAPACITOR—Trimmer, 36-146 mmf.
UCU-020	C2, 24, 25, 26, 36	CAPACITOR—47 mmf., $\pm 20\%$, mica..	RCY-034	C5	CAPACITOR—Trimmer, 2-20 mmf.
UCU-044	C35	CAPACITOR—470 mmf., $\pm 20\%$, mica..	RCY-038	C12	CAPACITOR—Air trimmer, 1 to 8 mmfd.
UOP-1247		SPEAKER—12-inch PM, same as S1200D7	RDC-033		CORD—Dial drive cord (25 yds.)
URD-001	R39	RESISTOR—10 ohms, $\frac{1}{2}$ w., carbon	RDE-032		ESCUTCHEON
URD-021	R7, 10	RESISTOR—68 ohms, $\frac{1}{2}$ w., carbon	RDK-037		KNOB—Plain (for Model 328)
URD-025	R4, 19	RESISTOR—100 ohms, $\frac{1}{2}$ w., carbon	RDK-040		KNOB—With arrow (for Model 328)
URD-041	R2	RESISTOR—470 ohms, $\frac{1}{2}$ w., carbon	RDK-137		KNOB—With arrow (for Model 324)
URD-049	R32	RESISTOR—1000 ohms, $\frac{1}{2}$ w., carbon	RDK-138		KNOB—Plain (for Model 324)
URD-053	R30	RESISTOR—1500 ohms, $\frac{1}{2}$ w., carbon	RDS-074		SCALE—Dial scale
URD-057	R9	RESISTOR—2200 ohms, $\frac{1}{2}$ w., carbon	RDX-035		POINTER—Dial pointer assembly
URD-065	R5, 8	RESISTOR—4700 ohms, $\frac{1}{2}$ w., carbon	RHC-017		CLIP—To hold coil
URD-069	R6, 12, 43, 49	RESISTOR—6800 ohms, $\frac{1}{2}$ w., carbon	RHG-010		GROMMET—Rubber mounting grommet for preamplifier tube
URD-073	R11	RESISTOR—10,000 ohms, $\frac{1}{2}$ w., carbon	RHG-015		GROMMET—For mounting tuning capacitor
URD-081	R3, 23	RESISTOR—22,000 ohms, $\frac{1}{2}$ w., carbon	RHJ-006		SPACER—For mounting tuner condenser
URD-085	R1, 40, 42	RESISTOR—33,000 ohms, $\frac{1}{2}$ w., carbon	RJP-010	J1	JACK—Phono jack
URD-089	R13, 14, 21, 22	RESISTOR—47,000 ohms, $\frac{1}{2}$ w., carbon	RJS-003		SOCKET—Tube socket for V6 and V7
URD-093	R41	RESISTOR—68,000 ohms, $\frac{1}{2}$ w., carbon	RJS-049	J2	SOCKET—Phono power female socket
URD-097	R17, 26	RESISTOR—100,000 ohms, $\frac{1}{2}$ w., carbon	RJS-085		SOCKET—Tube socket for V8
URD-099	R24, 25	RESISTOR—120,000 ohms, $\frac{1}{2}$ w., carbon	RJS-105		SOCKET—Tube socket for V1, V2, V3, V4
URD-101	R48	RESISTOR—150,000 ohms, $\frac{1}{2}$ w., carbon	RJS-118		SOCKET—Tube socket for V5
URD-105	R15	RESISTOR—220,000 ohms, $\frac{1}{2}$ w., carbon	RLA-012	L6	COIL—FM oscillator grid choke
URD-113	R28, 29	RESISTOR—470,000 ohms, $\frac{1}{2}$ w., carbon	RLB-027	L4	COIL—FM r-f coil
URD-121	R38	RESISTOR—1 meg., $\frac{1}{2}$ w., carbon	RLC-066	L5	COIL—B-C oscillator coil
URD-129	R16	RESISTOR—2.2 meg., $\frac{1}{2}$ w., carbon	RLC-067	L8	COIL—FM oscillator coil
URD-133	R44, 45	RESISTOR—3.3 meg., $\frac{1}{2}$ w., carbon	RLI-005	L1, 10, 11	COIL—Choke coil
URD-141	R27	RESISTOR—6.8 meg., $\frac{1}{2}$ w., carbon	RLI-044	L12	COIL—FM power line choke coil
URD-1104	R46	RESISTOR—200,000 ohms, 5%, $\frac{1}{2}$ w., carbon	RLI-056	L2	COIL—FM antenna choke coil
URE-037	R31	RESISTOR—330 ohms, 1 w., carbon	RLI-057	L7, 9	COIL—FM choke coil
URE-083	R47	RESISTOR—27,000 ohms, 1 w., carbon	RLI-058	L13	COIL—FM limiter choke
SPECIALIZED REPLACEMENT PARTS			RLI-030	L3	LOOP—Broadcast loop
RAL-001		BEZEL—Pilot light bezel	RMS-155		SPRING—For Receiver chassis bin.
RAV-058		CABINET—For Model 324	RMS-044		SPRING—Dial cord tension
RAV-060		CABINET—For Model 328	RRC-074		VOLUME CONTROL
RCC-001	C30	CAPACITOR—.007 mfd., 600 v.	RRN-006	R35	RESISTOR—2.2 ohms, $\pm 10\%$, $\frac{1}{2}$ w., carbon
RCE-029	C39A, B, 39C, D	CAPACITOR—Electrolytic capacitor 15 mfd., 400 v.; 20 mfd., 25 v.; 30 mfd., 400 v.; 30 mfd., 400 v.	RRT-003	R33, 34	RESISTOR—6500 and 1220 ohms, $\pm 10\%$, w.w.
RCE-042	C43	CAPACITOR—10 mfd., 250 v., electrolytic capacitor	RSW-048	S2A, B, 2C, D	SWITCH—Tone control and power switch
RCT-033	C1A, B, 1C, D	CAPACITOR—Tuning capacitor and drum assembly	RSW-059	S1A, B, 1C, D	SWITCH—Band change switch
RCW-176	C18, 58	CAPACITOR—470 mmf., $\pm 20\%$, Hi k, ceramic	RTD-006	T6	TRANSFORMER—Discriminator transformer
RCW-1043	C11	CAPACITOR—47 mmf., $\pm 20\%$, max. neg., ceramic	RTL-054	T5	TRANSFORMER—2nd AM i-f transformer
			RTL-078	T2	TRANSFORMER—1st AM i-f transformer
			RTL-080	T1, 3, 4	TRANSFORMER—1st, 2nd, 3rd FM i-f transformer
			RTO-051	T7	TRANSFORMER—Output transformer
			RTP-061	T8	TRANSFORMER—Power transformer (60 cy.)

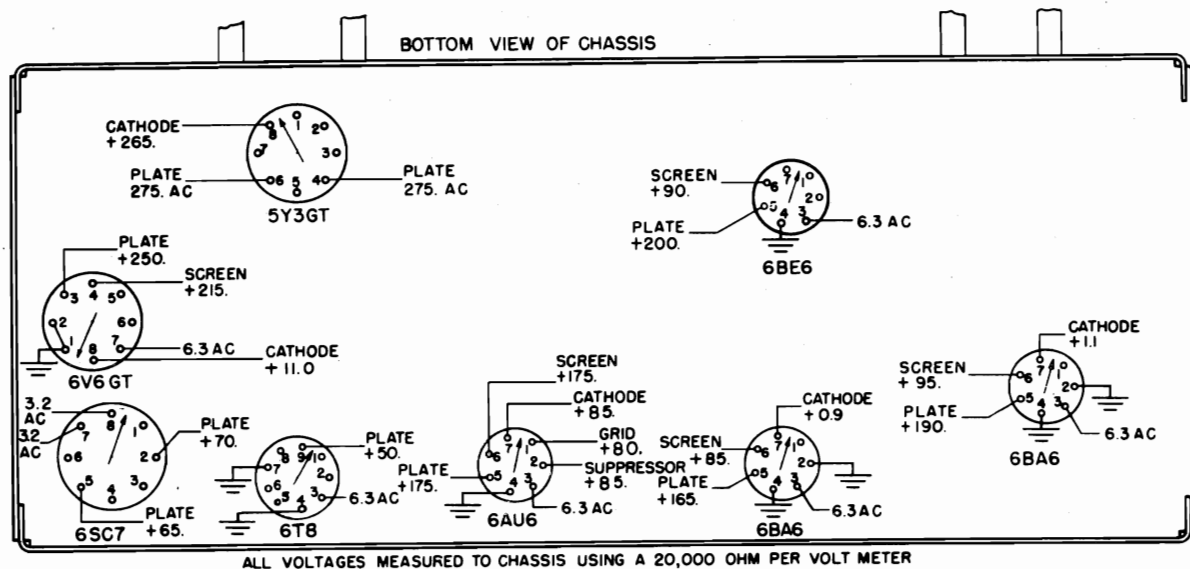
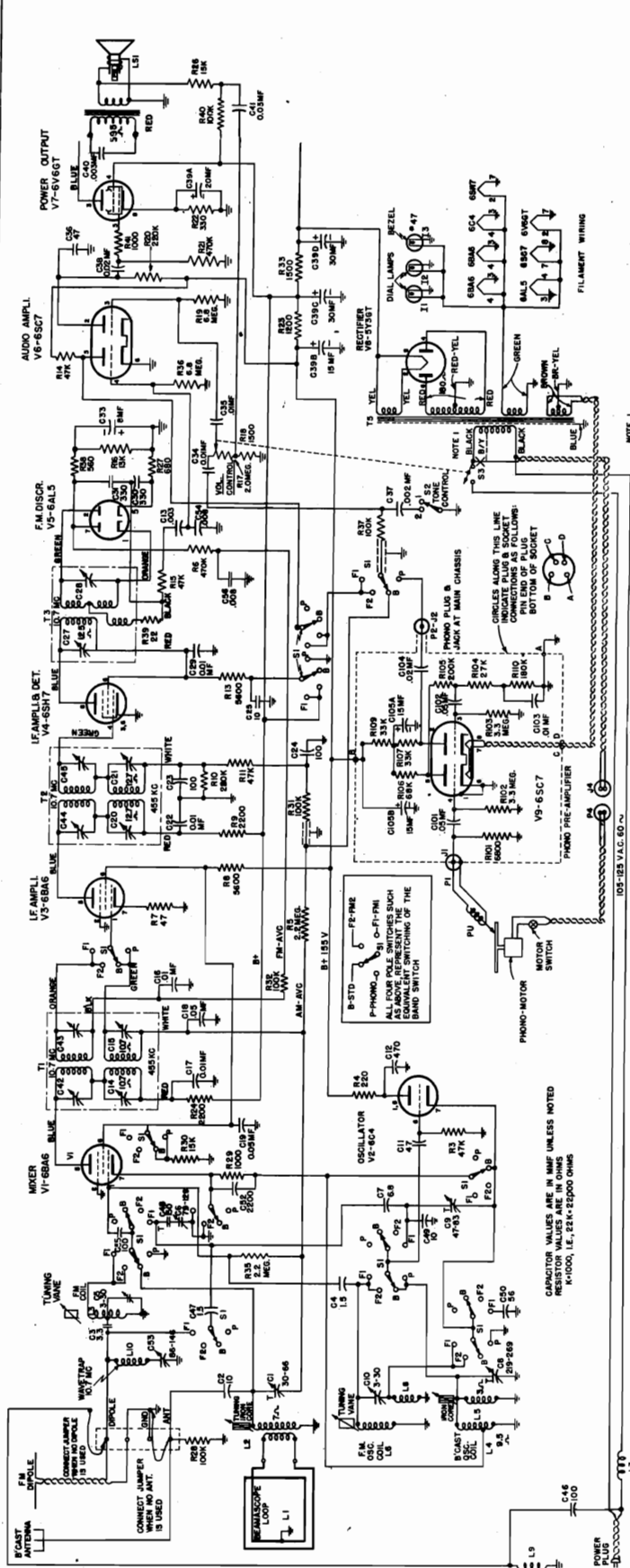


Fig. 3 Socket Voltage Diagram



NOTE 1
FOR SOCKET OPERATION, BREAK PHONO POWER
LEAD AND RECONNECT IT TO BLACK-YELLOW
TAP LEAD ON T5.

ELECTRICAL RATING:

Rating	A5	A6
Voltage	105-125	105-125
Frequency	50	60
Wattage	85	85

OPERATING FREQUENCIES

Standard Band	540 to 1600 kc
Frequency Modulation 1	42 to 49 mc
Frequency Modulation 2	83 to 108 mc

POWER OUTPUT (117 Volts Line):

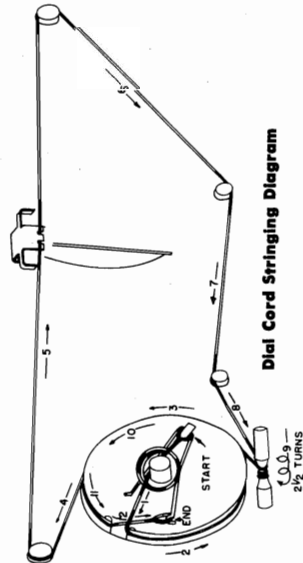
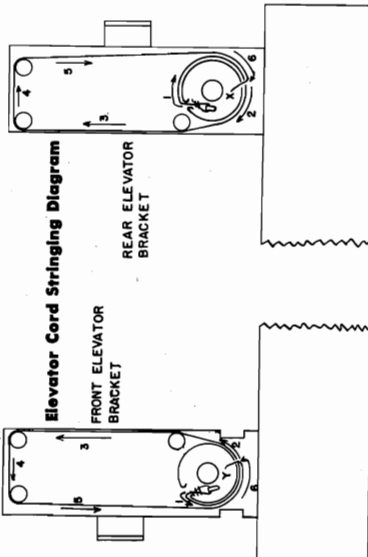
Undistorted	3 watts
Maximum	5 watts

PHONOGRAPH PICK-UP:

Type	Variable reluctance
D-C Resistance	250 ohms

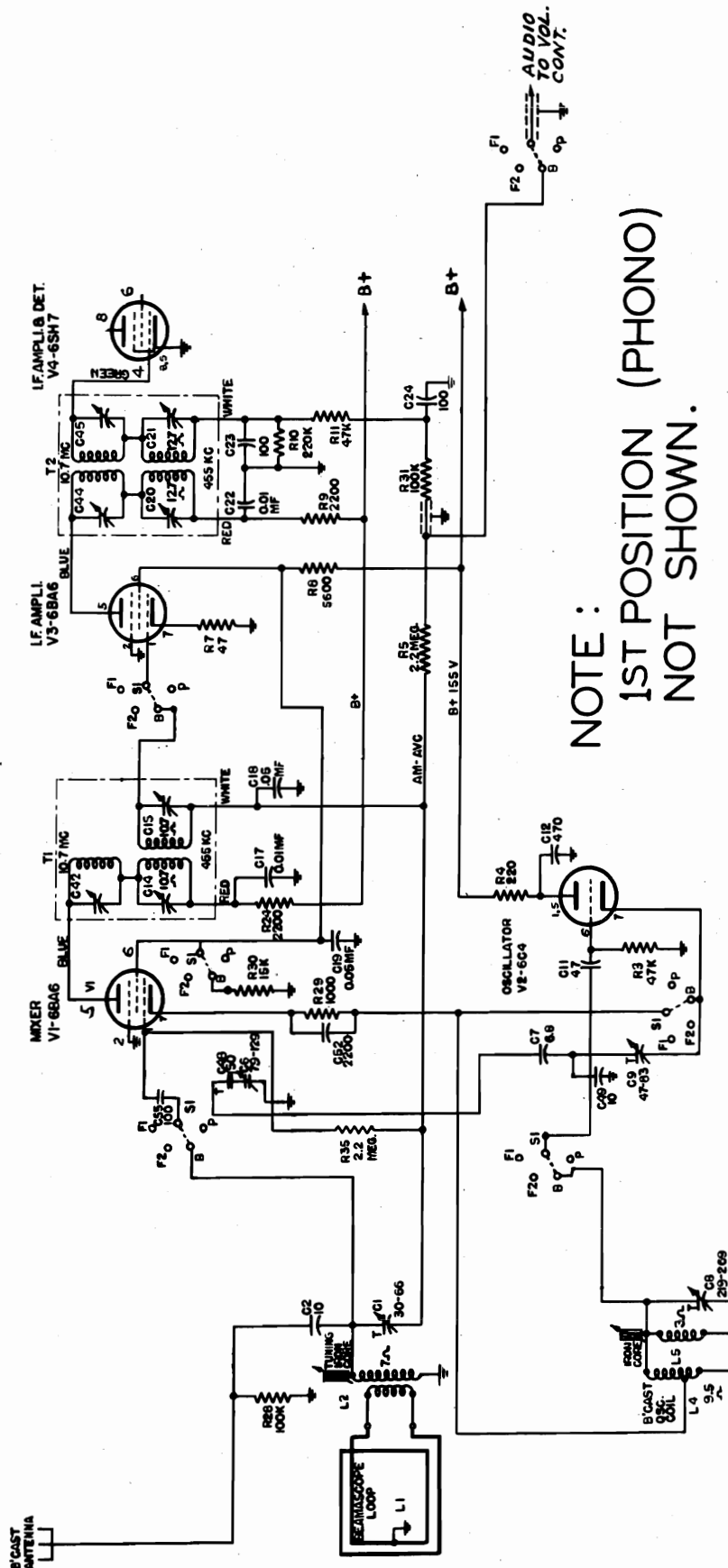
LOUD-SPEAKER:

Type	Alnico P.M.
Size	12 inches
Voice coil impedance at 400 C.P.S.	3.2 ohms



TUBE COMPLEMENT:

(V1) Converter	6BA6
(V2) Oscillator	6C4
(V3) 1st I-F Amplifier	6BA6
(V4) 2nd I-F and AM Detector	6SH7
(V5) FM Ratio Detector	6AL5
(V6) Audio Amplifier	6SC7
(V7) Power Output	6V6GT
(V8) Rectifier	5Y3GT
(V9) Phono Pre-amplifier	6SC7
I1, I2, I3 Pilot Lights	Mazda No. 47



NOTE :
1ST POSITION (PHONO)
NOT SHOWN.

BAND-SWITCH SHOWN
AT 2ND POSITION
BROADCAST BAND
540-1600 KC

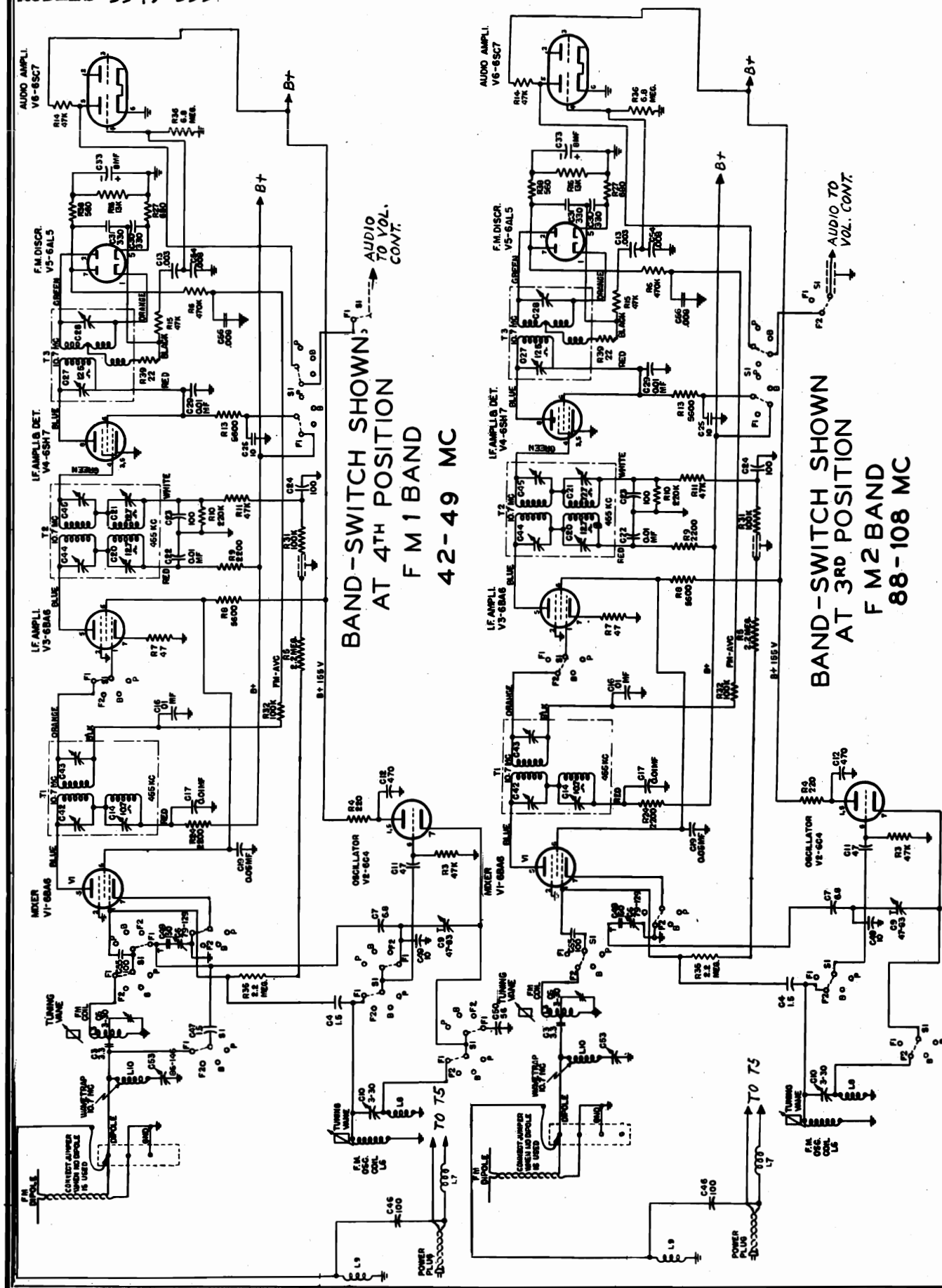
CLARI-SKEMATIX

Registered Trademark

PAGE 19-30 GE

MODELS 354, 355

GENERAL ELECTRIC CO.



THE TUNING SYSTEM:

Variable inductance tuning is employed instead of using a conventional tuning capacitor. It provides a high efficiency FM circuit in the 88-108 megacycle range which would not be possible with the more conventional methods of tuning. Other advantages are also gained but the one mentioned above is the most important.

Tuning is accomplished by an "elevator" which consists of two rigid metal elevator support bars raised and lowered by means of a windlass controlled by the tuning knob at the panel. From these elevator bars are suspended two powdered iron cores which tune the broadcast converter and oscillator coils; and two tuning "vanes" which tune two low-inductance circuits. These latter circuits are employed in both FM bands. They are called "guillotine" tuners because of their appearance.

FACTS ABOUT "GUILLOTINE TUNING":

The "guillotine" tuners are designed primarily for the 88-108 megacycle FM band where special technique is needed to realize high gain and circuit stability. Ordinary coils, tuned by a variable capacitor are inefficient at these frequencies, first because of the low inductances required to reach these frequencies when a variable tuning capacitor is used and, second, because shunt capacity reduces the gain of the amplifier circuit; shunt capacity must be kept very low. Another disadvantage of standard tuning arrangements at these frequencies is that common coupling is obtained through the shaft of a ganged tuning capacitor unless insulated single sections are used which are cumbersome and costly. Common coupling of this type tends to cause oscillations or general instability and precludes high gain per stage. The guillotines make possible short leads, completely isolated sections, stable tuning high Q circuits, low shunt capacity, and location of each tuner in the best physical and electrical position in the assembly. Furthermore, since the shunt capacity is small and the inductance is consequently at its highest corresponding value, the additional unavoidable inductance introduced in the wiring, bandswitch, etc., produces a minimum of circuit losses and unbalance.

The guillotine tuner consists of a heavy, silver-plated, two-turned square coil, rigidly supported between two plastic posts. A flat, solid vane slides up and down between the two turns. It is guided in grooves in the plastic posts so that it passes between the two sections of the coil without touching them. The posts are so moulded and the coil so constructed that the whole assembly is held rigidly at a predetermined spacing. The tuning vane is raised and lowered by the tuning elevator. When the elevator is all the way up (set tuned to the lowest frequency), the vane is completely above the coil which then acts as a simple, two-turn coil. As the set is tuned toward the higher frequencies, the vane moves downward into the field of the coil until, finally, it is all the way in.

The vane reduces the inductance of the coil through two principles. First, it acts as a shorted turn, and thus reduces inductance directly; second, it provides a barrier between the two turns of the coil which reduces the mutual coupling and thus reduces the inductance.

The tuners described above are L3 and L6.

FM BANDS:

Guillotine tuners L3 and L6 are used as the tuned circuits for the converter and local oscillator respectively, in both FM bands. In the higher frequency band, the tuner is used with only a small shunt trimmer for adjusting distributed capacity. In the lower band, a higher value shunt trimmer is used to reduce the frequency. The layout of the band switch tuners and tube sockets is arranged to give the shortest possible leads when the FM bands are in use. The lead lengths in the other band are not nearly so critical.

STANDARD BROADCAST BAND:

This receiver employs a converter and an oscillator which are tuned by iron slugs suspended from the tuning elevator. These tuners are L2 and L5 respectively.

I-F AMPLIFIER:

The i-f amplifier consists of a composite 455 kc and 10.7 mc circuit. The electrical changes required to transfer AM and FM service are made by the band switch. When the switch is in either the FM-1 or FM-2 position, the amplifier operates at 10.7 megacycles and delivers the i-f signal into an FM discriminator circuit. When the switch is in the broadcast position, the amplifier operates at 455 kc. Screen and plate voltage is removed from the 6SH7 amplifier and the tube acts as an AM diode detector. Thus, the AM audio signal appears across R10 while the FM audio signal appears across C54. A section of the band switch switches the audio input circuit from one to the other.

RATIO DETECTOR:

In the ratio detector as used in this set the a-c voltages as applied to the diodes of a ratio detector are the same as the a-c voltages applied to the diodes in a conventional discriminator circuit. The method of obtaining audio from the FM carrier distinguishes the ratio detector from the conventional discriminator.

At resonant frequency the d-c voltage to which C31 and C30 are charged are equal and additive. When the frequency of the FM carrier goes above the center frequency the d-c voltage to which C30 is charged increases and the d-c voltage to which C31 is charged decreases proportional to the increase in frequency. The sum of the voltage of C30 and C31, however, remains the same. When the frequency goes below the center frequency the ratio of the charge on C30 and C31 reverses. The d-c charge of C30 decreases below its charge at center frequency and the d-c charge of C31 increases above its charge at center frequency. The increase and decrease of d-c charge is proportional to the change in frequency while the sum of the two remains constant at all times. The audio is tapped off between C30 and C31 to ground. The d-c voltage across C30 has been shown to vary proportionately to the change in frequency applied to the diodes of the detector tube 6AL5.

The ratio detector is also different from the discriminator in that it needs no limiter stage before it. The large condenser C33—8 mfd. combined with the resistor R16, has a long time constant and serves to limit any sudden change in d-c charge across C30 and C31, which might result from noise impulses.

REPLACEMENT OF DRIVE CORDS**DIAL STRINGING**

The dial pointer should be strung as shown in Figure 1.

The tuning elevators should be strung, as shown in Figure 2, with the dial pointer at the extreme right of the dial. The front drum and stringing procedure is shown viewed from the rear of the chassis and the rear drum and stringing procedure is shown viewed from the front of the chassis. Ends X and Y at the conclusion of step 6, in stringing the front and rear elevators, should be connected at opposite ends of spring RMS-004 (not shown) after making one-half turn each around the shaft in opposite directions.

To position the elevator bar for the FM tuner, turn the dial pointer to the extreme right. Loop the elevator strings through the two notches at the end of the elevator bars and

adjust the elevator bar above the FM coils to be 2 5/8 inches from the top of the chassis to the top of the elevator bar and cement to the cord with Glyptal. With the guillotine tuning vanes at the bottom, the adjusting screws set at their mid-points on the elevator bar and with spring and guide wires in place, solder guide wire to tuning vane.

To position the elevator bar for the AM slug tuner, turn the dial pointer to the extreme left and set the elevator bar 2 3/4 inches from the top of the chassis to top of the elevator bar. Loop the elevator cord through the notches at the ends of the bar and cement to cord with Glyptal. Then turn the dial pointer to extreme right and with the adjusting screws at their midpoints on the elevator bar, position the tuning slugs in the antenna and oscillator coils 3 9/16 inches from the top of the chassis to the top of the slug and solder the guide wire to the top of the adjusting screw.

STAGE GAINS AND VOLTAGE CHECKS

Stage gain measurements by vacuum tube voltmeter or similar measuring devices may be used to check circuit performance and isolate trouble. The gain values listed may have tolerances of 20%. Readings should be taken at low signal input so that AVC is not effective.

1. R-F AND I-F STAGE GAINS.

Signal applied through IRE dummy antenna:

Antenna Post to V1 Grid.....3 at 1000 KC

These checks with oscillator tube V2 removed:

V1 Grid to V3 Grid.....78 at 455 KC

V1 Grid to V3 Grid.....38 at 10.7 MC

V3 Grid to V4 Grid.....22.5 at 10.7 MC

2. AUDIO GAIN.

.01 volts at pin 4 of V6 with volume control full clockwise will give approximately 1/2 watt output across the speaker voice coil.

3. OSCILLATOR GRID BIAS.

D-c voltage developed across R.3

11.5 Volts at 1000 KC

3.0 Volts at 45 MC

3.9 Volts at 98 MC

4. SOCKET PIN VOLTAGES.

Figure 4 shows typical tube pin voltages. All readings should be made from the pins to ground unless otherwise indicated.

MODELS 354, 355

GENERAL ELECTRIC CO.

EQUIPMENT FOR VISUAL ALIGNMENT:

1. General Electric YGS-3 AM and FM signal generator or equivalent.
2. General Electric CRO5A oscilloscope or equivalent.
3. 330,000-ohm resistor, $\frac{1}{2}$ watt.
4. .01 mf. capacitor.
5. 20,000 ohms-per-volt meter.

NOTES IN CONNECTION WITH VISUAL ALIGNMENT TABLE:

1. Connect scope to pin 4 of V4 (6SH7) through resistor 330,000 ohms.
2. The over-all i-f curve on FM with sufficient signal input should have fairly steep skirts, a relatively flat top and symmetry of form.
3. The output curve when aligning the discriminator transformer should have symmetry and the curve should extend an equal distance above and below the horizontal reference axis.
4. Connect scope to V6 (6SC7) pin 4 through 330,000 ohms.

VISUAL ALIGNMENT CHART

STEP	SIGNAL GENERATOR FREQUENCY	SIGNAL INPUT POINT	BAND SWITCH SETTING	DIAL SETTING	ADJUST	SEE NOTE	REMARKS
------	----------------------------	--------------------	---------------------	--------------	--------	----------	---------

I-F VISUAL ALIGNMENT (AM)

1	455 kc \pm 20 kc at 60-cycle sweep	6BA6 (V3) grid thru .01 mfd.	STD	.....	Adjust C20 and C21 for maximum amplitude and symmetry of curve.	1	
2	455 kc \pm 20 kc at 60-cycle sweep	6BA6 (V1) grid thru .01 mfd.	STD	.....	Adjust C14 and C15 for maximum amplitude and symmetry of curve.	1	

I-F VISUAL ALIGNMENT (FM)

3	10.7 mc \pm 300 kc at 60-cycle sweep	6BA6 (V3) grid thru .01 mfd.	FM2	.....	Adjust C44 and C45 for maximum amplitude and symmetry.	1	
4	10.7 mc \pm 300 kc at 60-cycle sweep	6BA6 (V1) grid thru .01 mfd.	FM2	.....	Adjust C42 and C43 for maximum amplitude of wave and symmetry of curve.	1, 2	

VISUAL ALIGNMENT OF RATIO DETECTOR

5	10.7 mc \pm 300 kc at 60-cycle sweep	6SH7 (V4) pin 4 (grid)	FM2	.....	Adjust C27 to maximum amplitude.	4	
6	10.7 mc \pm 300 kc at 60-cycle sweep	Same as Step 5	FM2	.....	Adjust C28 for symmetry of curve on scope*	3, 4	*Negative and positive half cycles of curve should have equal amplitude.
7	10.7 mc \pm 300 kc at 60-cycle sweep	6BA6 (V1) grid thru .01 mfd.	FM2	.....	Adjust C44, C45, C42, and C43 for maximum amplitude	1, 2	
8	10.7 mc \pm 300 kc at 60-cycle sweep	6BA6 (V1) grid thru .01 mfd.	FM2	.....	Readjust C27 and C28 as in steps 5 and 6	4	

GENERAL ELECTRIC CO.

MODELS 354, 355

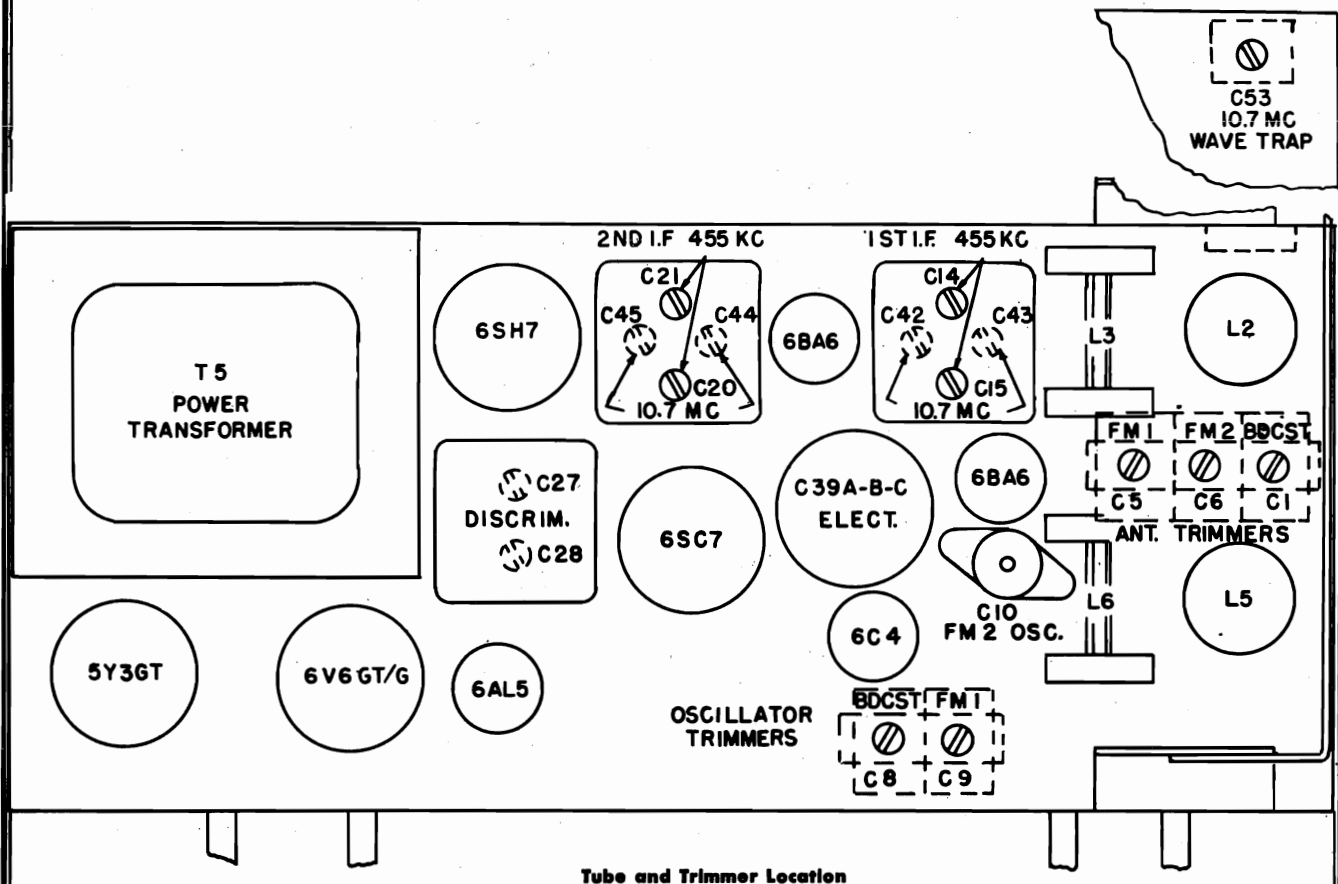
METER ALIGNMENT CHART

STEP	SIGNAL GENERATOR FREQUENCY	SIGNAL INPUT POINT	BAND SWITCH	DIAL SETTING	ADJUST	SEE NOTE	REMARKS
I-F ALIGNMENT (A-M)							
1	455 kc	6BA6 (V3) grid thru .01 mfd.	STD	.....	C20 and C21 for maximum	4, 5	
2	455 kc	6BA6 (V1) grid thru .01 mfd.	STD	.....	C14 and C15 for maximum	4, 5	
I-F ALIGNMENT (F-M)							
3	10.7 mc	6SH7 grid thru .01 mfd.	FM2	.....	C27 for maximum	1, 2	Sufficient i-f input to give approx. 0.8 volt across C33.
4	10.7 mc	6SH7 grid thru .01 mfd.	FM2	.....	Peak C28 for minimum audio output	4, 5	Use insulated screwdriver for alignment.
5	10.7 mc	6BA6 (V3) grid thru .01 mfd.	FM2	.....	C44 and C45 for maximum	1, 2	
6	10.7 mc	6BA6 (V1) grid thru .01 mfd.	FM2	.....	C42 and C43 for maximum. Retrim C27, C44 and C45 for maximum.	1, 2	
R-F ALIGNMENT—FM2 BAND							
7	Align dial pointer with dots at extreme right of scale when tuning knob is turned full clockwise.						
8	98 mc	Dipole terminal	FM2	98 mc	Adjust C10 for maximum	1, 2	
9	98 mc	Dipole terminal	FM2	98 mc	Adjust C5 for maximum*	1, 2	*Rock tuning knob during alignment.
R-F ALIGNMENT—FM1 BAND							
10	46 mc	Dipole terminal	FM1	46 mc	Adjust C9 for maximum	1, 2	
11	46 mc	Dipole terminal	FM1	46 mc	Adjust C6 for maximum*	1, 2	*Rock tuning knob during alignment.
R-F ALIGNMENT—BROADCAST							
12	1620 kc	Antenna Post**	STD	Note 6	Adjust C8 and C1 for maximum	4, 5, 6	**Remove green lead from Ant. term. board. Beam-a-scope loop L1 must be connected to chassis.
13	1000 kc	Antenna Post	STD	1000 kc	Adjust iron core in L5 for maximum	4, 5	
14	1000 kc	Antenna Post	STD	1000 kc	Adjust iron core in L2 for maximum	4, 5	
15	Recheck step 12						

ALIGNMENT NOTES

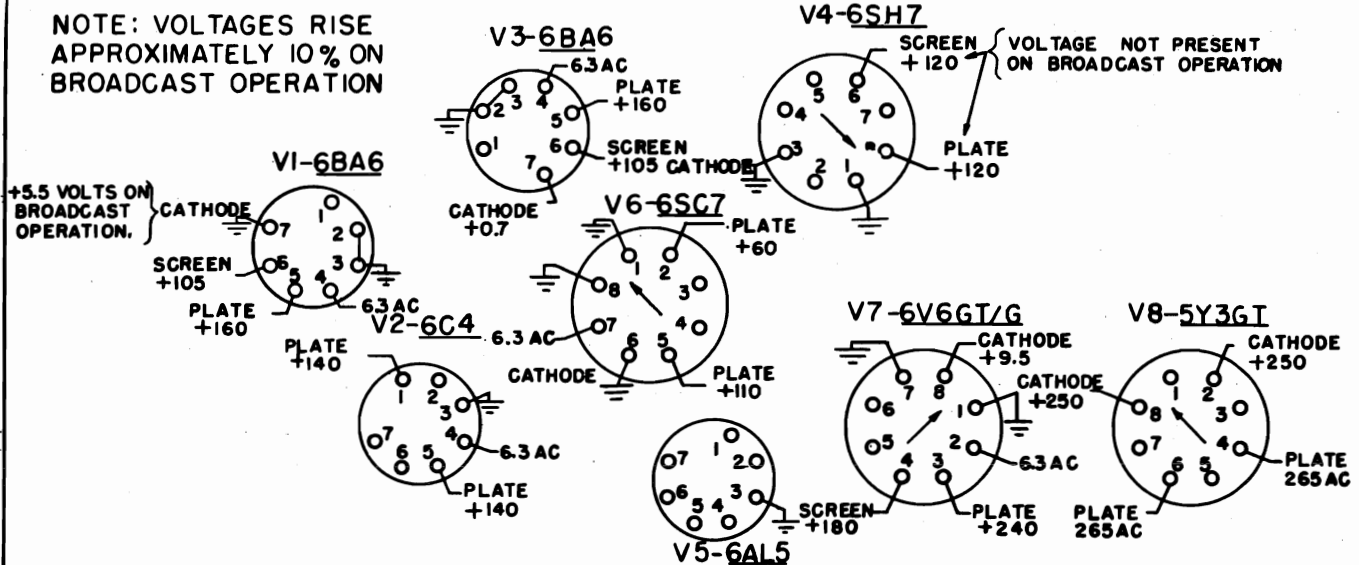
1. Use *unmodulated* signal.
2. Connect 20,000 ohms-per-volt meter across C33.
3. Connect 20,000 ohms-per-volt meter from junction of R15 and C13 to chassis.
4. Use 400-cycle modulation.

5. Connect a standard output meter across the speaker voice coil. Turn volume control fully on. Keep signal generator output down so that the meter indicates not more than 1/2-watt output during alignment.
6. Turn the tuning knob clockwise until the dial pointer is at extreme right of dial scale.



Tube and Trimmer Location

BOTTOM VIEW OF CHASSIS



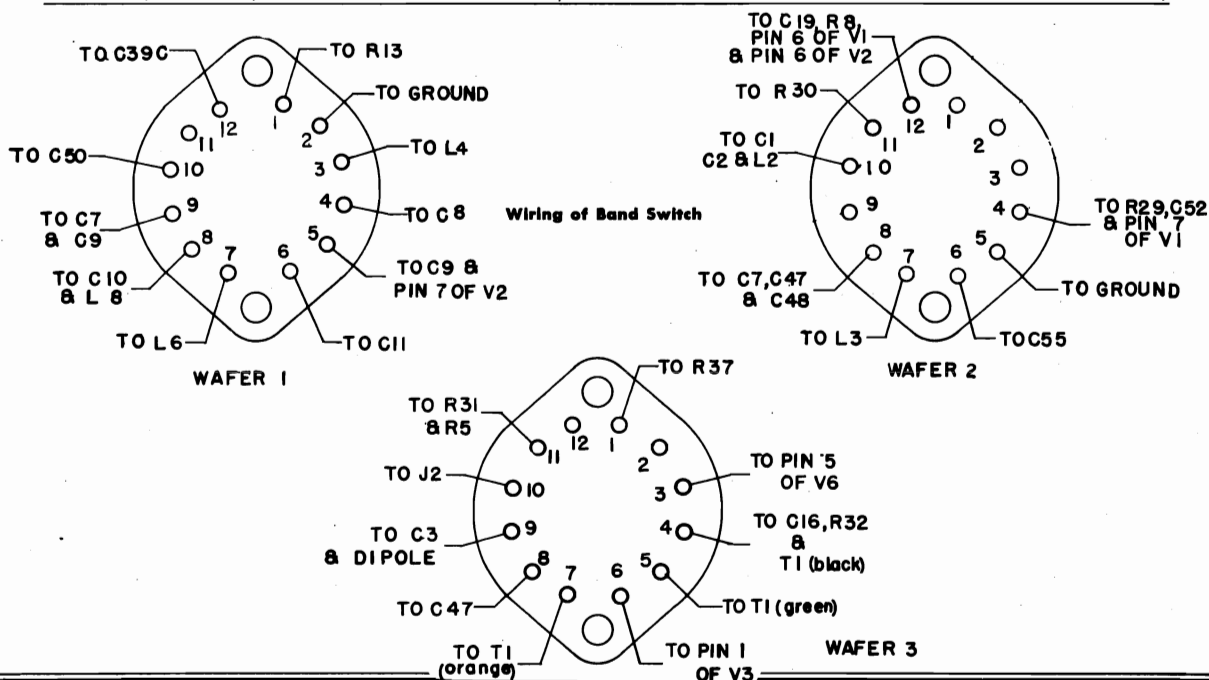
ALL VOLTAGES MEASURED TO CHASSIS USING A 20,000 OHM PER VOLT METER

Socket Voltage Diagram

GENERAL ELECTRIC CO.

MODELS 354, 355

Cat. No.	Symbol	Description	Cat. No.	Symbol	Description
UNIVERSAL REPLACEMENT PARTS			SPECIALIZED REPLACEMENT PARTS (Cont'd)		
UCC-011	C41	CAPACITOR—.05 mf., paper 200 v.	RCW-1028	C55	CAPACITOR—100 mmf., ceramic
UCC-020	C13	CAPACITOR—.003 mf., paper 400 v.	RCY-017	C10	CAPACITOR—Air trimmer
UCC-024	C54, 56	CAPACITOR—.008 mf., paper 400 v.	RCY-018	C1, 5, 6	CAPACITOR—Trimmer, 3-30 mmf., 30-60 mmf., 79-129 mmf.
UCC-028	C18	CAPACITOR—.05 mf., paper 400 v.	RCY-019	C8, 9	CAPACITOR—Trimmer, 219-269 mmf., 47-83 mmf.
UCC-036	C37	CAPACITOR—.002 mf., paper 600 v.	RCY-020	C53	CAPACITOR—Trimmer, 86-146 mmf.
UCC-040	C16, 17, 22, 34, 35	CAPACITOR—.01 mf., paper 600 v.	RDC-032		CORD—Elevator drive cord, NF28
UCC-041	C38	CAPACITOR—.02 mf., paper 600 v.	RDC-033		CORD—Dial drive cord, NF40
UCC-045	C19	CAPACITOR—.05 mf., paper 600 v.	RDE-022		ESCUTCHEON—Dial scale
UCN-504	C3	CAPACITOR—3.3 mmf., ceramic	RDK-061		KNOB—Inner knob (black)
UCN-1506	C7	CAPACITOR—6.8 mmf., ceramic	RDK-110		KNOB—Outer knob (black)
UCU-004	C2	CAPACITOR—10 mmf., mica	RDP-020		POINTER—Dial scale pointer assembly
UCU-020	C23, 24, 46	CAPACITOR—100 mmf., mica	RDS-033		SCALE—Dial scale
UCU-044	C12	CAPACITOR—470 mmf., mica	RDX-026		PLATE—Backplate assembly
UCU-060	C52	CAPACITOR—2200 mmf., mica	RHC-010		CLIP—Insulator spring clip
UCU-1032	C48	CAPACITOR—150 mmf., mica	RHM-016		CLIP—Oscillator coil clip
UCU-1040	C30, 31	CAPACITOR—330 mmf., mica	RHM-026	L3	COIL—Antenna tuner coil (two-turn frame)
UCW-1022	C50	CAPACITOR—56 mmf., ceramic	RHM-027	L6	COIL—Oscillator tuner coil (two-turn frame)
UOP-1206		SPEAKER—12-inch speaker	RHW-010		WASHER—(Two required on guide wire of tuner vane)
URD-017	R7	RESISTOR—47 ohms, $\frac{1}{2}$ w., carbon	RII-001		INSULATOR—(Insulator for Mounting L3 and L6, 4 per set)
URD-033	R4	RESISTOR—200 ohms, $\frac{1}{2}$ w., carbon	RJP-004	P1	PLUG—Phono plug
URD-049	R29, 41	RESISTOR—1000 ohms, $\frac{1}{2}$ w., carbon	RJP-010	J2	JACK—Phono jack
URD-053	R18	RESISTOR—1500 ohms, $\frac{1}{2}$ w., carbon	RJS-003		SOCKET—Tube socket (Octal)
URD-057	R9, 24	RESISTOR—2200 ohms, $\frac{1}{2}$ w., carbon	RJS-011	J5	SOCKET—Pilot lamp socket for Bezel
URD-077	R26	RESISTOR—15,000 ohms, $\frac{1}{2}$ w., carbon	RJS-014		SOCKET—Preamplifier
URD-089	R3, 11, 14, 15	RESISTOR—47,000 ohms, $\frac{1}{2}$ w., carbon	RJS-044	J4	SOCKET—Miniature for V1, V3, and V5
URD-097	R40, 28, 31, 32, 37	RESISTOR—100,000 ohms, $\frac{1}{2}$ w., carbon	RJS-049		SOCKET—Phono-power
URD-105	R10, 20	RESISTOR—220,000 ohms, $\frac{1}{2}$ w., carbon	RJS-055		SOCKET—Miniature for V2
URD-113	R6, 21	RESISTOR—470,000 ohms, $\frac{1}{2}$ w., carbon	RJS-056		SOCKET—Dial light
URD-133	R5, 35	RESISTOR—2.2 meg., $\frac{1}{2}$ w., carbon	RLA-013	L2	COIL—B-C antenna
URD-141	R19, 36	RESISTOR—6.8 meg., $\frac{1}{2}$ w., carbon	RLC-022	L4	PADDER—B-C oscillator
URD-1043	R38	RESISTOR—56 ohms, $\frac{1}{2}$ w., carbon	RLC-023	L5	COIL—B-C oscillator
URD-1045	R27	RESISTOR—680 ohms, $\frac{1}{2}$ w., carbon	RLI-004	L7	CHOKE—Power line choke
URD-1076	R16	RESISTOR—13,000 ohms, $\frac{1}{2}$ w., carbon	RLI-005	L8, L9, L10	CHOKE—Oscillator and FM antenna
URE-037	R22	RESISTOR—330 ohms, 1 w., carbon	RLL-013		LOOP—Assembly
URF-051	R23	RESISTOR—1200 ohms, 2 w., carbon	RMM-050		VANE—Antenna tuner vane for coil L3
URF-067	R8, 13	RESISTOR—5600 ohms, 2 w., carbon	RMM-051		VANE—Oscillator tuner vane for coil L6
URF-077	R30	RESISTOR—15,000 ohms, 2 w., carbon	RMM-052		GUIDE WIRE—Connects vanes to elevator bar
SPECIALIZED REPLACEMENT PARTS			RMS-043		ADJUSTING SCREW—On elevator bar
RAA-006		ARM—Band switch	RMS-115		SPRING—Spring on tuning vane guide wires
RAA-007		ARM—Tone switch	RPX-010		PICKUP—Variable reluctance
RAB-038		BACK—Cabinet	RRC-033	R17, S3	VOLUME—Control, 2 meg. and switch
RAL-001		BEZEL—on cabinet front	RSW-024	S1	SWITCH—Band
RAV-031		CABINET—Model 355	RSW-025	S2	SWITCH—Tone control
RAV-034		CABINET—Model 354	RTD-004	T3	TRANSFORMER—Discriminator
RCC-014	C40	CAPACITOR—.005 mfd., paper	RTL-031	T1	TRANSFORMER—1st I-F transformer
RCC-040	C29	CAPACITOR—.01 mfd., oil	RTL-032	T2	TRANSFORMER—2nd I-F transformer
RCE-038	C33	CAPACITOR—.8 mfd., 25 v., electrolytic	RTP-028	T5	TRANSFORMER—Power transformer (60 cycles)
RCE-039	C39A, C39B, C39C, D	CAPACITOR—20 mfd., 25 v.	RTP-033	T5	TRANSFORMER—Power transformer (50 cycles)
RCW-001	C11	CAPACITOR—15 mfd., 300 v.	RWL-004		CORD—Power cord
RCW-013	C49	CAPACITOR—30 mfd., 350 v.			
RCW-017	C4, 47	CAPACITOR—ceramic			
		CAPACITOR—10 mmf., ceramic			
		CAPACITOR—1.5 mmf., ceramic			



MODELS 376,
377, 378

GENERAL ELECTRIC CO.

ELECTRICAL RATING (INPUT):

Voltage.....	105-125 volts
Frequency.....	50 cycles, 60 cycles
Wattage (Radio).....	75 watts
Wattage (Phono).....	105 watts

OPERATING FREQUENCIES:

Standard Band.....	540 to 1600 KC
FM Band.....	88 to 108 MC

POWER OUTPUT:

Undistorted.....	3 watts
Maximum.....	5.5 watts

LOUDSPEAKER:

Type.....	Alnico PM
Size.....	12 inches
Voice Coil Impedance.....	3.2 ohms

INTERMEDIATE FREQUENCY:

Standard Band.....	455 KC
FM Band.....	10.7 MC

ANTENNA INPUT:

Standard Band.....	Conventional antenna
FM Band.....	300-ohm input for folded dipole

PHONOGRAPH PICK-UP:

Type.....	Variable reluctance
D-C Resistance.....	250 ohms

TUBE COMPLEMENT:

(V1) R-F Amplifier.....	6AG5
(V2) Converter.....	6BE6
(V3) 1st I-F Amplifier.....	6BA6
(V4) 2nd I-F Amplifier.....	6AU6
(V5) FM Limiter.....	6AU6
(V6) FM Discriminator, AM Detector, and Audio Amplifier.....	6S8GT
(V7) Power Output.....	6V6GT
(V8) Rectifier.....	5Y3GT
(V9) Phono-preamplifier.....	6SC7
(I1, I2) Dial Lamps.....	Mazda No. 47
(I3) Bezel Lamp.....	Mazda No. 47

STAGE GAIN AND VOLTAGE CHECKS:

Stage gain measurements by vacuum tube voltmeter or similar measuring devices may be used to check circuit performance and isolate trouble. The gain values listed may have tolerances of $\pm 20\%$. Readings should be taken with low signal voltage so that AVC is not effective.

1. R-F AND I-F STAGE GAINS.

Signal applied through IRE dummy antenna:

Antenna Post to V1 Grid.....	3.0 at 1000 kc
Dipole Terminals to V1 Grid.....	0.7 at 98 mc
V1 Grid to V2 Grid.....	8.5 at 1000 kc
V1 Grid to V2 Grid.....	10 at 98 mc
V2 Grid to V3 Grid.....	22 at 455 kc
V2 Grid to V3 Grid.....	3.0 at 10.7 mc
V3 Grid to V4 Grid.....	2.0 at 455 kc
V3 Grid to V4 Grid.....	57 at 10.7 mc
V4 Grid to V5 Grid.....	40 at 10.7 mc

2. AUDIO GAIN.

.07 volts at 400 cps across volume control with control set at maximum will give approximately $\frac{1}{2}$ watt output across the speaker voice coil.

3. OSCILLATOR GRID BIAS.

D-c Voltage Developed Across R5:	
8.5 volts at 1000 kc.	
3.5 volts at 98 mc.	

4. SOCKET PIN VOLTAGES.

Figure 3 shows typical tube pin voltages. All readings should be made from the pins to chassis unless otherwise indicated.

ALIGNMENT

Two methods of alignment, (1) the regular meter alignment method as previously used on AM sets, and (2) the visual alignment which allows for much more precision in aligning the i-f transformers and, particularly the discriminator where you can check the output wave shape for distortion, oscillations, and to see that the negative and positive half cycles of the wave have equal amplitude and are symmetrical.

EQUIPMENT REQUIRED FOR METER ALIGNMENT:

1. Test Oscillator with tone modulation.
2. D-C Voltmeter or Microammeter.
3. A-C Voltmeter, 2 volts.
4. .01 mf. paper capacitor.
5. $\frac{1}{2}$ watt resistor of required resistance (note 9).
6. 200 mmf. mica capacitor.

EQUIPMENT REQUIRED FOR VISUAL ALIGNMENT:

1. General Electric YGS-3 AM and FM signal generator, or equivalent.
2. General Electric CRO-5A oscilloscope, or equivalent.
3. 330,000 ohm resistor, $\frac{1}{2}$ watt.
4. 20,000 ohm per volt meter.

NOTES IN CONNECTION WITH METER ALIGNMENT:

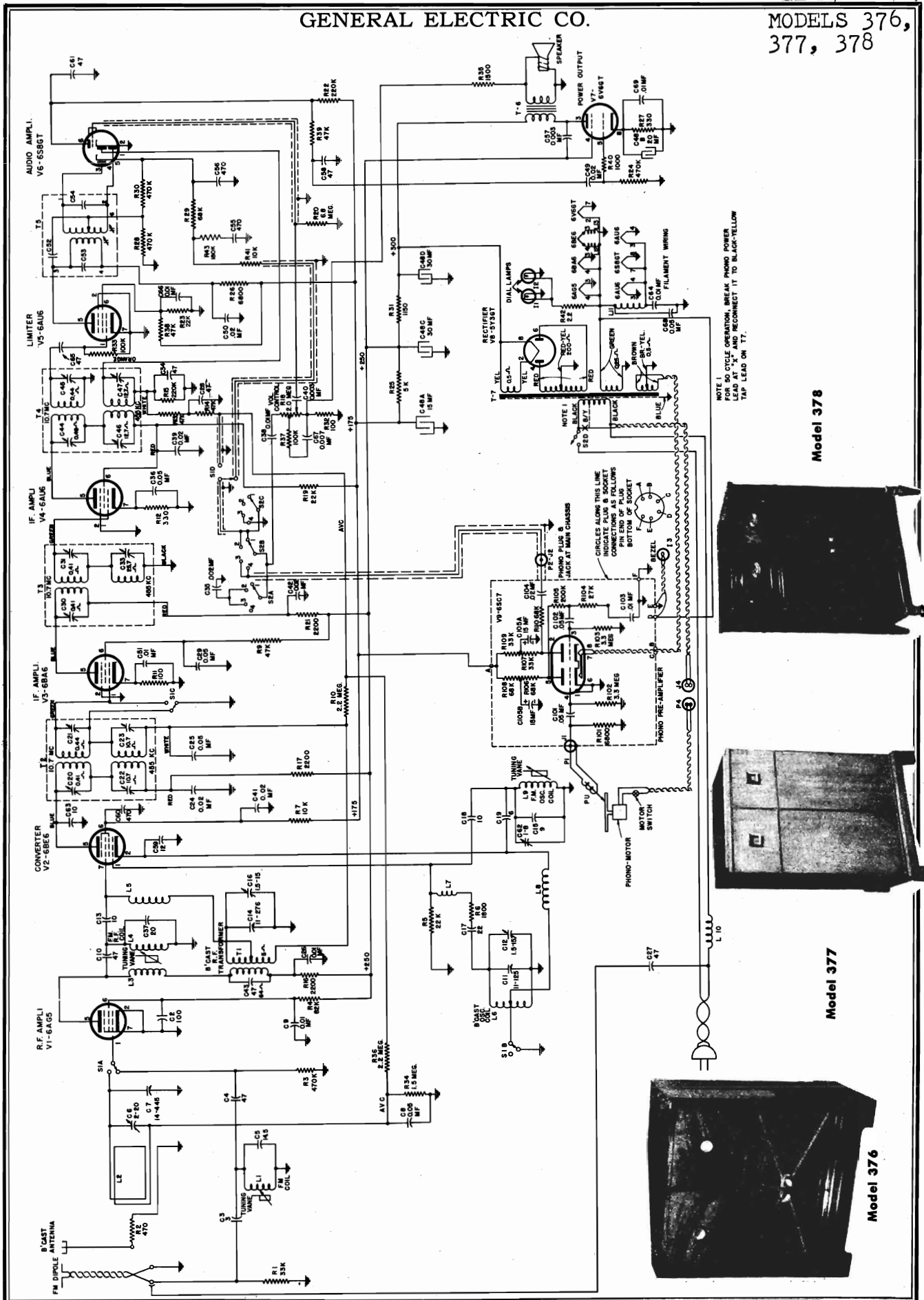
- (1) Use unmodulated signal.
- (2) Connect 20,000 ohm-per-volt meter from junction of R29 and R41.
- (3) Connect 20,000 ohm-per-volt meter from grid pin 1 of (V5) 6AU6 limiter to chassis with a 200,000-ohm resistor in series. The resistor must be connected directly to the grid to minimize capacity loading and to isolate the meter from the i-f voltage. Keep signal generator output down so that meter indicates not more than one volt at the grid (5 microamperes through 200,000 ohms) (Alignment Steps 7 through 13).
- (4) Use 400-cycle modulation (Steps 1, 2, 3, 15, 16, 17, and 18).
- (5) Connect a standard output-meter across speaker voice coil. Turn volume control full on. Keep signal generator output down so that meter indicates not more than $\frac{1}{2}$ watt output (1.26 volts) during alignment. (Steps 1, 2, 3, 15, 16, 17 and 18.)
- (6) Two oscillator settings will give response. The higher frequency response is the correct one; the other is the image response. If in doubt, start with the trimmer screw loosened completely and adjust for the first response.
- (7) For alignment of the standard band oscillator and r-f trimmers, the input signal should be inductively coupled to the radio loop antenna by connecting a 4-turn, 6-inch diameter loop of bell wire across the signal generator terminals, and then locate the loop about one foot from the radio loop antenna to prevent possible errors in peak readings. The position of the loop in respect to the radio loop antenna should not be changed during any one set of adjustments. Steps 15, 16, 17 and 18.
- (8) The lead from the signal generator must be kept as short as possible and it must be kept away from later stages to prevent regeneration. The signal may also be fed in to the tube pin connection from the top of the chassis to prevent regeneration.
- (9) A dummy antenna is a resistor in series with the hot lead of the signal generator. The resistance of the resistor plus the termination impedance of the signal generator should equal 300 ohms.
- (10) If a dial scale is not available, index the dial pointer as follows: Turn the pointer to the left-hand limit of travel and mark the dial plate at a reference edge of the pointer slide. Then set the pointer by turning the dial knob until the indicated dimension exists between the reference edge and the mark.

NOTES IN CONNECTION WITH VISUAL ALIGNMENT TABLE:

- (1) Use FM signal modulated at 60 cps ± 300 kc.
- (2) Connect vertical plates of scope to the limiter grid (pin 1 of V5) (6AU6) through 200,000 ohm resistor.
- (3) Connect vertical plates of scope to the junction of R29 and R41 (FM audio) through 200,000 ohms.
- (4) Connect vertical plates of scope at junction of R13 and C28 (AM audio output) through 200,000 ohms.
- (5) Use FM signal modulated at 60 cps ± 20 kc.
- (6) Use a 60 cycle amplitude modulated signal.
- (7) If a dial scale is not available, index the dial pointer as follows: Turn the pointer to the left-hand limit of travel and mark the dial plate at a reference edge of the pointer slide. Then set the pointer by turning dial knob until the indicated dimension exists between the reference edge and the mark.
- (8) Two oscillator settings will give a response. The higher frequency response is the correct one, the other response is the image. If in doubt, start with the trimmer screw loosened completely and adjust for the first response.
- (9) In some cases tuning of the converter grid will cause "pulling" of oscillator which will change the oscillator frequency. After centering the response curve on the scope, if peaking of L4 causes the response curve to move off of the screen it is necessary to realign the oscillator for calibration.
- (10) A dummy antenna is a resistor in series with the hot lead of the signal generator. The resistance of the resistor plus the termination impedance of the signal generator should equal 300 ohms.
- (11) Leads from the signal generator must be kept as short as possible and away from later stages to prevent regeneration. The signal may also be fed to the tube pin connection from the top of the chassis to prevent regeneration.

GENERAL ELECTRIC CO.

MODELS 376,
377, 378



Model 378

Model 377

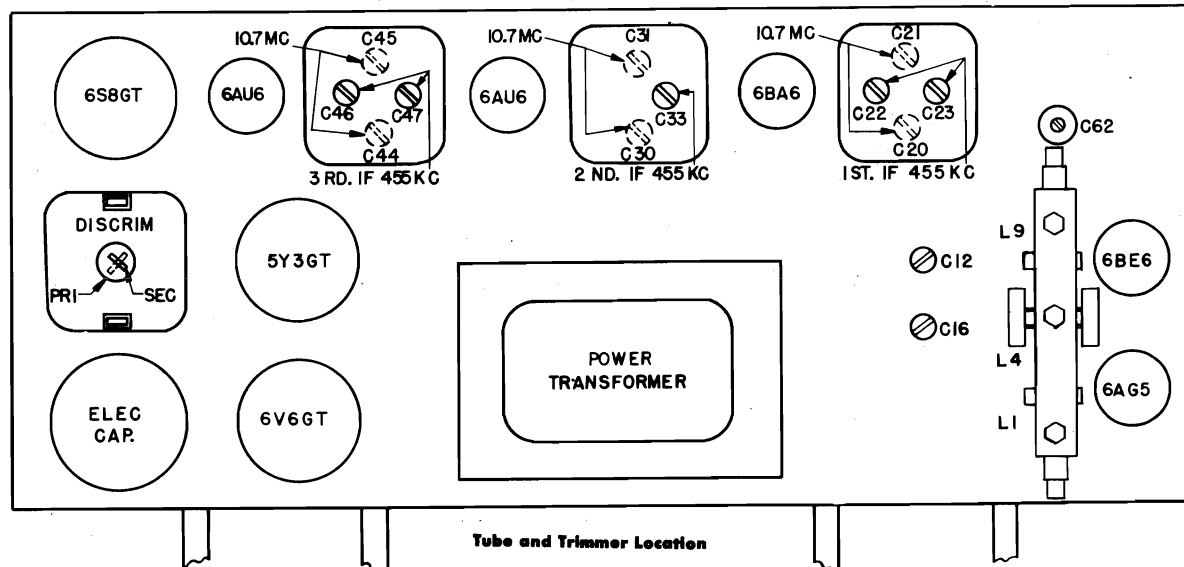
Model 376

MODELS 376,
377, 378

GENERAL ELECTRIC CO.

ALIGNMENT CHART

STEP	SIGNAL GEN-ERATOR FRE-QUENCY	SIGNAL INPUT POINT	BAND SWITCH	DIAL SETTING	ADJUST	SEE NOTE	REMARKS
AM I-F METER ALIGNMENT							
1	455 kc	Conv. grid directly thru .01 mfd	STD	....	Peak C47 and C46	4, 5	Adjust for max.
2	455 kc	Conv. grid directly thru .01 mfd	STD	....	Peak C33	4, 5	Adjust for max.
3	455 kc	Conv. grid directly thru .01 mfd	STD	....	Peak C23 and C22	4, 5	Adjust for max.
FM DISCRIMINATOR AND I-F METER ALIGNMENT							
4	10.7 mc	Pin 1 of V5 (6AU6) thru .01 mf	FM	....	Discrim. Secondary for zero meter	1, 2	Apply 1 volt signal input.
5	Detune signal generator	Pin 1 of V5 (6AU6) thru .01 mf	FM	....	*Signal Generator	1, 2	*Detune signal generator to point of maximum meter reading.
6	As in Step 5	Pin 1 of V5 (6AU6) thru .01 mf	FM	....	Peak discr. primary	1, 2	Adjust for max.
7	10.7 mc	Pin 1 of V4 (6AU6) thru .01 mf	FM	....	Peak C45 and C44	1, 3	Adjust for max.
8	10.7 mc	Pin 1 of V3 (6BA6) thru .01 mf	FM	....	C31 and C30	1, 3	Adjust for max.
9	10.7 mc	Pin 7 of V2 (6BE6) thru .01 mf	FM	....	C21 and C20	1, 3, 8	Adjust for max.
FM R-F METER ALIGNMENT							
10	98 mc	Dipole terminals thru dummy antenna	FM	98 mc or 3 $\frac{1}{4}$ inches	Peak C62	1, 3, 6, 9, 10	
11	98 mc	Dipole terminals thru dummy antenna	FM	For max. output	Peak L4 vane	1, 3, 9	
12	Repeat steps 10 and 11 until no further improvement in sensitivity.						
13	98 mc	Dipole terminals thru dummy antenna	FM	98 mc	Peak L1 vane	1, 3, 9	
14	Repeat steps 10, 11, and 12.						
AM R-F METER ALIGNMENT							
15	1500 kc	Inductively coupled	STD	1500 kc or 5 inches	Peak C12	4, 5, 7, 10	
16	1500 kc	Inductively coupled	STD	For max. output	Peak C16	4, 5, 7	
17 Repeat steps 15 and 16 until no further improvement in sensitivity.							
18	1500 kc	Inductively coupled	STD	Do not change from Step 16	Peak C6	4, 5, 7	



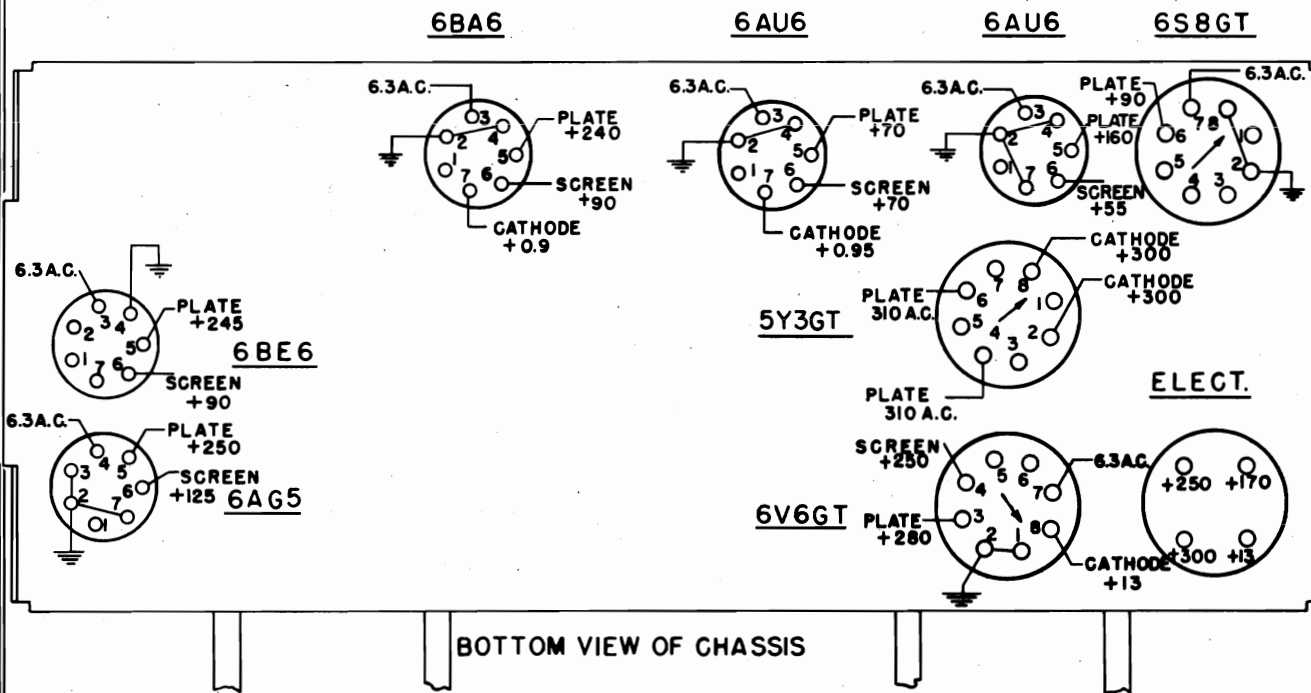
GENERAL ELECTRIC CO.

MODELS 376,
377, 378

STEP	SIGNAL GEN- ERATOR FRE- QUENCY	SIGNAL INPUT POINT	BAND SWITCH	DIAL SETTING	ADJUST	SEE NOTE	REMARKS
AM I-F VISUAL ALIGNMENT							
1	455 kc ± 20 kc at 60-cycle sweep	Conv. grid directly pin 7 V2 (6BE6) thru .01 mf	AM	....	C47 and C46*	4, 5	*Adjust for max. amplitude and min. distortion of curve on scope screen.
2	Same as Step 1	Same as Step 1	AM	.....	C33	4, 5	Same as Step 1.
3	Same as Step 1 and 2	Same as Step 1 and 2	AM	....	C23 and C22	4, 5	Same as Steps 1 and 2.
FM I-F VISUAL ALIGNMENT							
4	10.7 mc ±.3 mc at 60- cycle sweep	Conv. grid directly pin 7 V2 (6BE6) thru .01 mf	FM	....	C45 and C44	1, 2, 11	Adjust for max. amplitude and min. distortion.
5	Same as Step 4	Same as Step 4	FM	....	C31 and C30	1, 2, 11	Same as Step 4.
6	Same as Steps 4 and 5	Same as Steps 4 and 5	FM	....	C21 and C20	1, 2, 11	Same as Steps 4 and 5.
DISCRIMINATOR VISUAL ALIGNMENT							
7	10.7 mc ±.3 mc at 60- cycle rate	Conv. grid directly pin 7 V2 (6BE6) thru .01 mf	FM	....	Primary of T5 discrim. trans- former	1, 3, 11	Adjust primary for max. amplitude.
8	Same as Step 7	Same as Step 7	FM	....	Secondary of T5	1, 3, 11	Adjust secondary for vertical symmetry with respect to mid- point horizontal traces.
9	Same as Step 7	Same as Step 7	FM	....	Primary of T5	1, 3, 11	Adjust for straightest possible slope of straight line trace.
FM R-F VISUAL ALIGNMENT							
10	98 mc Note 6	Dipole terminals thru dummy antenna	FM	98 mc or 3 $\frac{1}{8}$ in.	Adjust C62*	2, 6, 7, 8, 10	*Set dial pointer accurately, then adjust for steepest slope of straight line trace on scope.
11	98 mc Note 1	Dipole terminals thru dummy antenna	FM	98 mc	Peak L4 vane	1, 2, 9, 10	Center response curve on scope, then peak for max. amplitude.
12	98 mc Note 1	Dipole terminals thru dummy antenna	FM	98 mc	Peak L1 tuning vane	1, 2, 10	Peak for max. amplitude.
AM R-F VISUAL ALIGNMENT							
13	1500 kc Note 6	Antenna thru 200 mmf	STD	1500 kc or 5 in.	Adjust C12	4, 6, 7	Adjust C12 for steepest slope of straight line trace on scope.
14	1500 kc Note 5	Antenna thru 200 mmf	STD	1500 kc	Adjust C16	4, 5, 7, 9	Adjust C16 for max. ampli- tude.
15	1500 kc Note 5	Antenna thru 200 mmf	STD	1500 kc	Adjust C6	4, 5, 7	Adjust C6 for max. ampli- tude.

MODELS 376,
377, 378

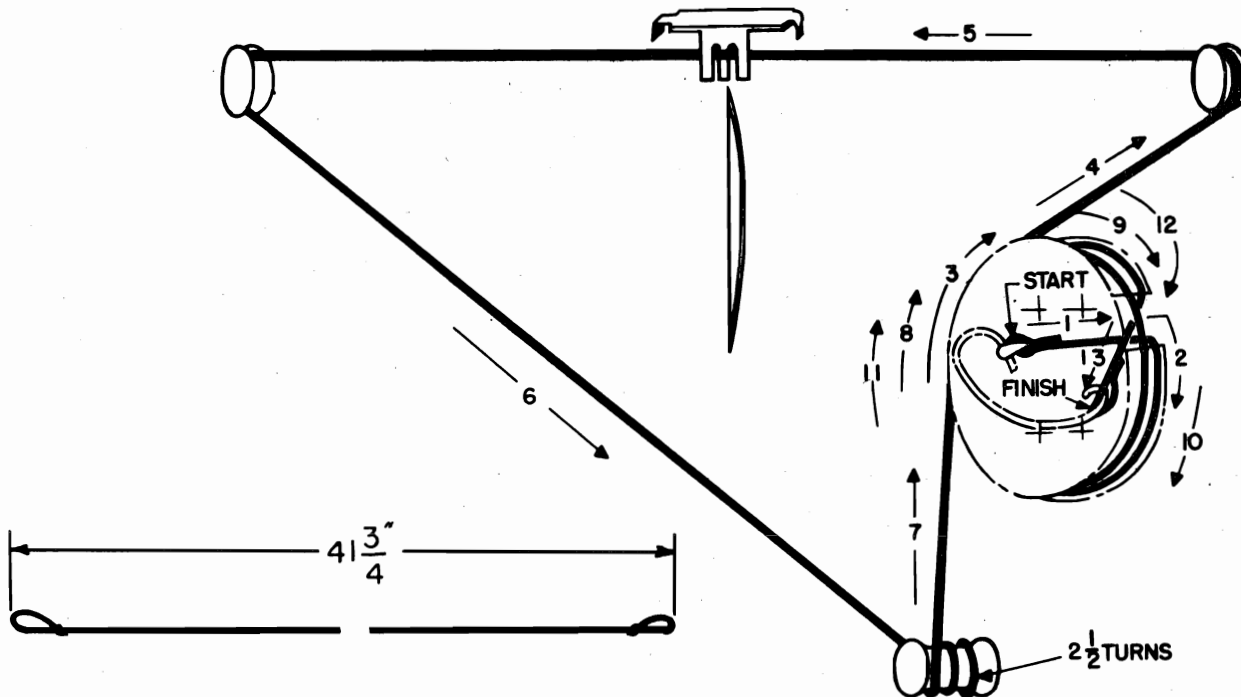
GENERAL ELECTRIC CO.



ALL VOLTAGES ARE + DC UNLESS OTHERWISE SPECIFIED

ALL VOLTAGES MEASURED TO CHASSIS USING A 20,000 OHM PER VOLT METER

Socket Voltage Diagram



Dial String Diagram

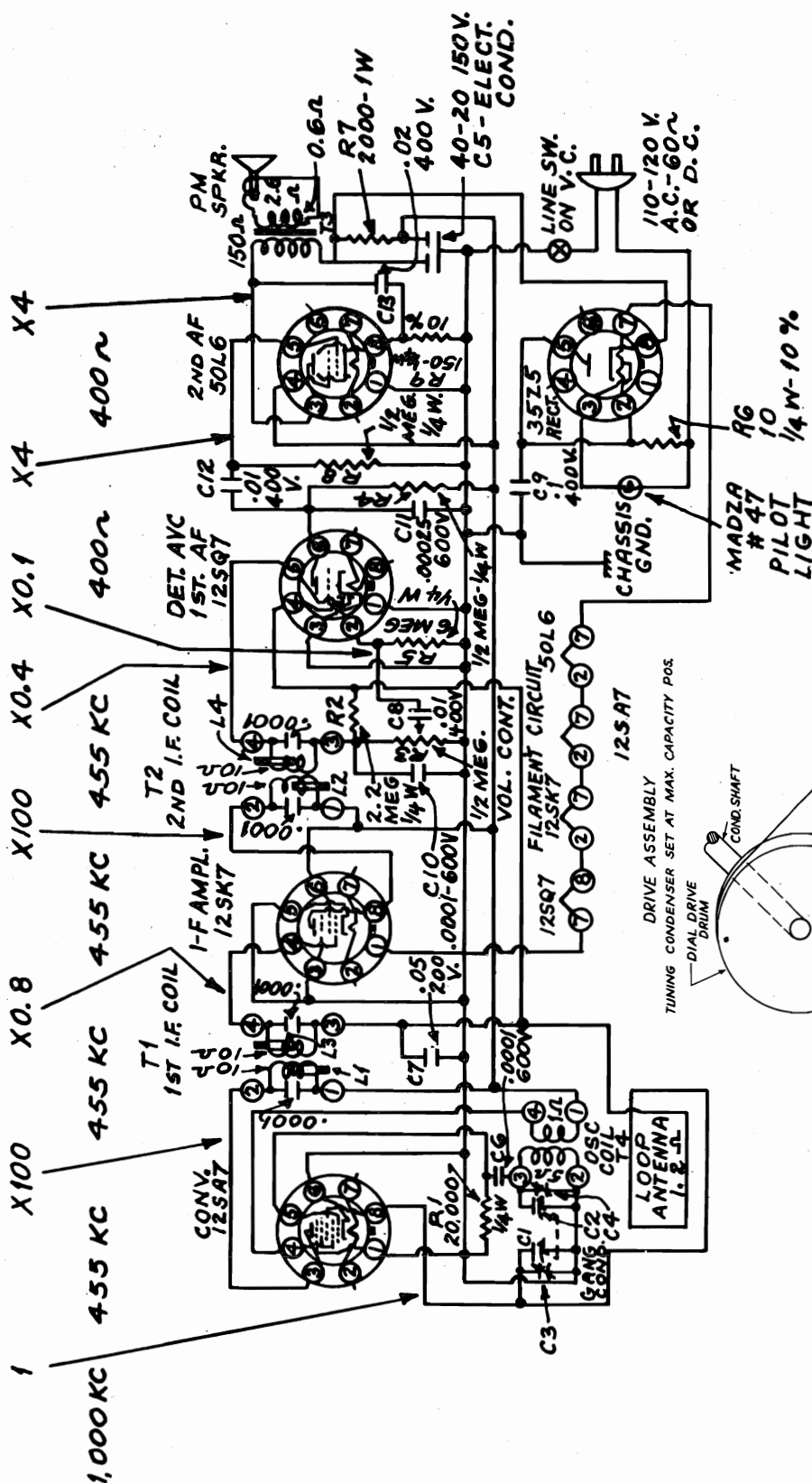
GENERAL ELECTRIC CO.

MODELS 376,
377, 378

MODELS 376, 377, 378 REPLACEMENT PARTS LIST

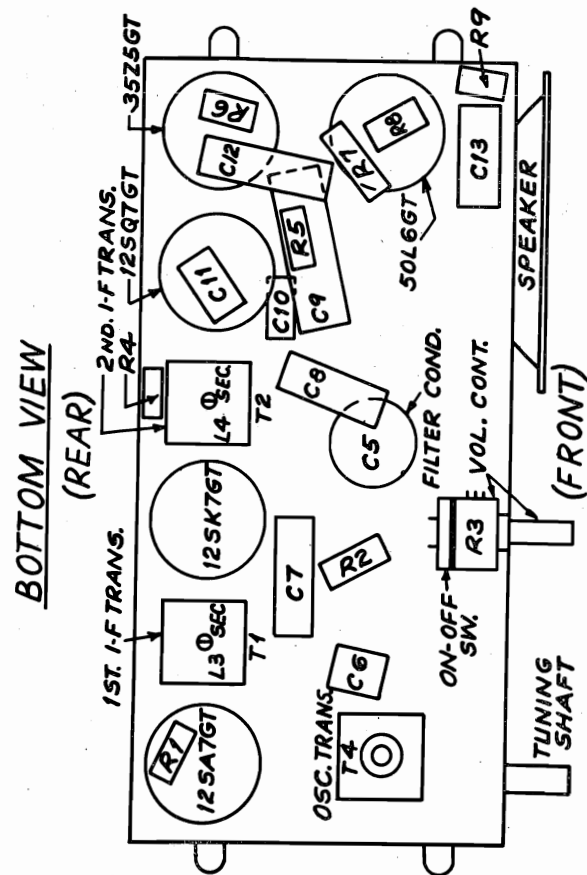
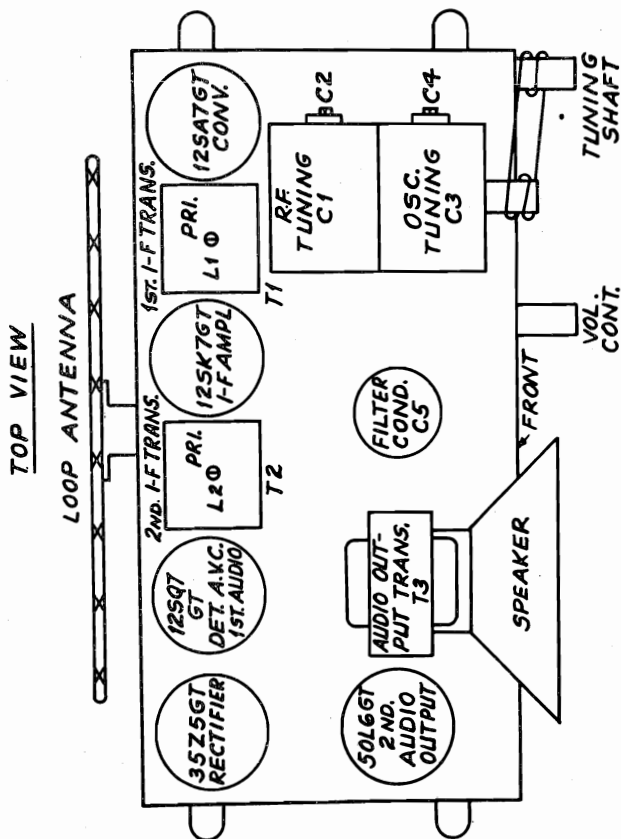
Cat. No.	Symbol	Description	Cat. No.	Symbol	Description
UNIVERSAL REPLACEMENT PARTS			SPECIALIZED REPLACEMENT PARTS (Cont'd)		
UCC-621	C35	CAPACITOR—.002 mf., 600 v., paper	RCW-1048	C3	CAPACITOR—3 mmf., ceramic
UCC-623	C40	CAPACITOR—.003 mf., 600 v., paper	RCW-1049	C5	CAPACITOR—14.5 mmf., ceramic
UCC-630	C38, 51, 69, 64, 66, 9, 26, 103	CAPACITOR—.01 mf., 600 v., paper	RCW-1050	C19	CAPACITOR—6 mmf., ceramic
UCC-631	C24, 41, 42, 49, 50, 39, 104	CAPACITOR—.02 mf., 600 v., paper	RCW-1051	C15	CAPACITOR—9 mmf., ceramic
UCC-635	C29, 101, 102, 8, 25, 68	CAPACITOR—.05 mf., 600 v., paper	RCW-1052	C4, 10	CAPACITOR—47 mmf., ceramic
UCU-020	C27, 28, 34, 58	CAPACITOR—47 mmf., mica	RCW-1053	C17	CAPACITOR—22 mmf., ceramic
UCU-028	C2	CAPACITOR—100 mmf., mica	RCY-037	C6	CAPACITOR—Trimmer, 2-20 mmf.
UCU-044	C56, 55	CAPACITOR—470 mmf., mica	RCY-038	C62	CAPACITOR—Trimmer, 1-8 mmf.
UCU-520	C61	CAPACITOR—47 mmf., mica	RDC-033		CORD—Dial drive cord, 10 yard length
UCU-1034	C55	CAPACITOR—180 mmf., mica	RDD-009		DRUM
UCW-044	C60	CAPACITOR—470 mmf., ceramic	RDE-005		ESCUTCHEON
UCW-1020	C43	CAPACITOR—47 mmf., ceramic	RDK-030		KNOB—With Arrow
UCW-2004	C18	CAPACITOR—10 mmf., ceramic	RDK-031		KNOB—Plain
UCW-2006	C59	CAPACITOR—12 mmf., ceramic	RDK-079		KNOB—Plain, for Model 377
UCW-2011	C37	CAPACITOR—20 mmf., ceramic	RDK-116		KNOB—With Arrow, for Model 377
UOP-1206		SPEAKER—12-inch PM speaker same as S1200D-7	RDM-007		BUSHING—For tuning shaft
UOX-005		SPEAKER REPAIR KIT—Cone, voice coil and spider assembly, dust cap and gasket	RDS-058		SCALE—Dial scale
URD-009	R5, 19, 23	RESISTOR—22,000 ohms, ½ w., carbon	RDX-035		POINTER—Dial pointer assembly
URD-013	R1, 107, 109	RESISTOR—33,000 ohms, ½ w., carbon	RHG-010		GROMMET—Rubber grommet for mounting tube socket on preamplifier
URD-017	R9, 13, 14, 38, 39	RESISTOR—47,000 ohms, ½ w., carbon	RHJ-006		SPACER—For mounting tuner assembly
URD-021	R11	RESISTOR—68 ohms, ½ w., carbon	RHM-038	L1, 4, 9	COIL—For guillotine tuner, 2 required per coil
URD-025	R32	RESISTOR—100 ohms, ½ w., carbon	RHM-039		CLIP (For pilot lights)
URD-033	R12	RESISTOR—220 ohms, ½ w., carbon	RHX-011		GROMMET (Tuner mounting grommet)
URD-041	R2	RESISTOR—470 ohms, ½ w., carbon	RII-010		INSULATOR—Mounting insulator for guillotine tuner
URD-049	R40	RESISTOR—1000 ohms, ½ w., carbon	RJJ-004	J3	SOCKET—Preamplifier power socket
URD-053	R35	RESISTOR—1500 ohms, ½ w., carbon	RJP-003	P1	PLUG—Phono motor power
URD-055	R6	RESISTOR—1800 ohms, ½ w., carbon	RJP-004	P2	PLUG—Pick-up output plug
URD-057	R16, 17, 21	RESISTOR—2200 ohms, ½ w., carbon		P3, 4	PLUG—Preamplifier output plug
URD-069	R26, 101	RESISTOR—6800 ohms, ½ w., carbon	RJP-010	J2	PLUG—Preamplifier power plug
URD-073	R7, 41	RESISTOR—10,000 ohms, ½ w., carbon	RJP-018	J1	SOCKET—Preamplifier output socket
URD-083	R104	RESISTOR—27,000 ohms, ½ w., carbon	RJS-003		SOCKET—Phono input to preamplifier
URD-093	R29, 106, 108, 110	RESISTOR—68,000 ohms, ½ w., carbon	RJS-049	J4	SOCKET—Tube socket for V6
URD-095	R4	RESISTOR—82,000 ohms, ½ w., carbon	RJS-085		SOCKET—Phono power socket
URD-097	R33, 37	RESISTOR—100,000 ohms, ½ w., carbon	RJS-106		SOCKET—Octal socket for preamplifier
URD-103	R43	RESISTOR—180,000 ohms, ½ w., carbon	RLA-012	L3, 5, 7	SOCKET—Pilot light
URD-105	R15, 22	RESISTOR—220,000 ohms, ½ w., carbon	RLB-024	T1	COIL—FM choke coil
URD-113	R3, 24, 28, 30	RESISTOR—470,000 ohms, ½ w., carbon	RLC-060	L6	TRANSFORMER—Broadcast R-F
URD-125	R34	RESISTOR—1.5 meg., ½ w., carbon	RLF-007	L11, 8	COIL—B-C oscillator coil
URD-129	R10, 36	RESISTOR—2.2 meg., ½ w., carbon	RLI-005	L12, 13	COIL—FM oscillator choke and filament choke coil
URD-133	R102, 103	RESISTOR—3.3 meg., ½ w., carbon	RLI-044	L10	COIL—Filament choke
URD-141	R20	RESISTOR—6.8 meg., ½ w., carbon	RLL-027	L2	COIL—FM power line choke coil
URD-1104	R105	RESISTOR—200,000 ohms, ½ w., carbon	RMM-006		LOOP—Broadcast loop
URE-037	R27	RESISTOR—330 ohms, 1 w., carbon	RMM-055		SHIELD—Pilot light
SPECIALIZED REPLACEMENT PARTS			RMS-044		HOOD—Lamp hood
RAL-001		BEZEL—Pilot light	RMS-130		SPRING—Vane holder spring
RAV-047		CABINET—For Model 376	RMS-125		SPRING—Dial cord tension spring
RAV-048		CABINET—For Model 377	RMS-126		SPRING—Lever plate spring
RAV-049		CABINET—For Model 378	RMW-042		SPRING—Vane holder
RCC-001	C67	CAPACITOR—.007 mf., 200 v., paper	RMX-108	L1, 4	PULLEY—Dial cord idler
RCC-014	C57	CAPACITOR—.003 mf., 1000 v., paper	RMX-109		TUNER VANE AND GUIDE WIRE ASSEMBLY
RCC-086	C36	CAPACITOR—.05 mf., paper	RMX-110	L9	TUNING SHAFT ASSEMBLY
RCE-029	C48A, B, C, D	CAPACITOR—Electrolytic	RRC-074	R18	VOLUME CONTROL
RCE-030	C103A, B	CAPACITOR—Electrolytic for preamp	RRN-006	R42	RESISTOR—2.2 ohms, ½ w.
RCT-028	C7, 11, 14	CAPACITOR—Tuning	RSW-010	R25, 31	RESISTOR—5000 ohms, wirewound
RCW-020	C13, 63	CAPACITOR—10 mmf., ceramic	RSW-047	S1	SWITCH—Bandchange switch
			RSW-048	S2	SWITCH—Radio, phono and tone control
			RTD-006	T5	TRANSFORMER—Discriminator transformer
			RTL-062	T2	TRANSFORMER—1st I-F transformer
			RTL-063	T3	TRANSFORMER—2nd I-F transformer
			RTL-064	T4	TRANSFORMER—3rd I-F transformer
			RTO-040	T6	TRANSFORMER—Output transformer
			RTP-058	T7	TRANSFORMER—Power transformer (60 cycles)
			RTP-059	T7	TRANSFORMER—Power transformer (50 cycles)
			RWL-004		CORD—Power cord

NOTE: APPROX. GAIN PER STAGE USING CHANALYST & WITH A FIXED BIAS OF -3 V.



MODEL 5A5

GENERAL TELEV. AND RADIO CORP.



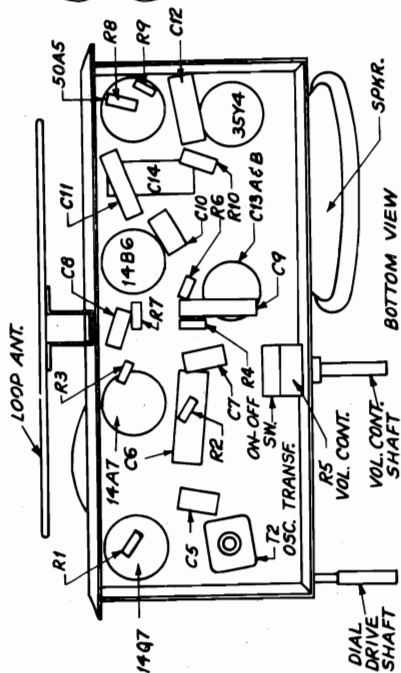
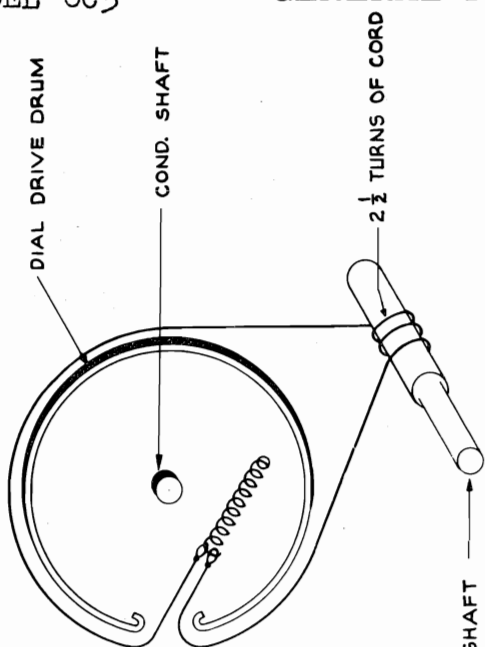
Tube	Pin	D-C Voltage VTVM	20000 ohms/ volt	1000 ohms/ volt	Resistance
12SA7	1	0	0	0	0
	2	+80	+80	+80	250
	3	+80	+80	+80	over 500K
	4	-6	-5.6	-2.6	over 500K
	5	0	0	0	19 K
	6	0	0	0	0
	7	-1	-0.4	-0.4	5 Megs.
12SK7	1	0	0	0	0
	2	0	0	0	150
	3	0	0	0	0
	4	-1	-0.4	-0.4	5 Megs.
	5	+80	+80	+78	over 500K
	6	0	0	0	200
	7	+80	+80	+78	over 500K
12SQ7	1	0	0	0	0
	2	-1.2	-0.8	-0.5	10 Megs.
	3	0	0	0	0
	4	-1	-0.45	-0.4	5 Megs.
	5	-0.7	-0.5	-0.2	500 K
	6	+54	+48	+42	over 500K
	7	0	0	0	150
50L6	1	0	0	0	0
	2	+125	+120	+120	400
	3	+80	+80	+80	over 500K
	4	0	0	0	over 500K
	5	0	0	0	450 K
	6	0	0	0	Infinite
	7	+5.2	+5	+5	900
35Z5	1	0	0	0	1400
	2	0	0	0	Infinite
	3	0	0	0	1200
	4	0	0	0	1200
	5	0	0	0	Infinite
	6	0	0	0	1200
	7	0	0	0	1200
	8	+130	+125	+125	900



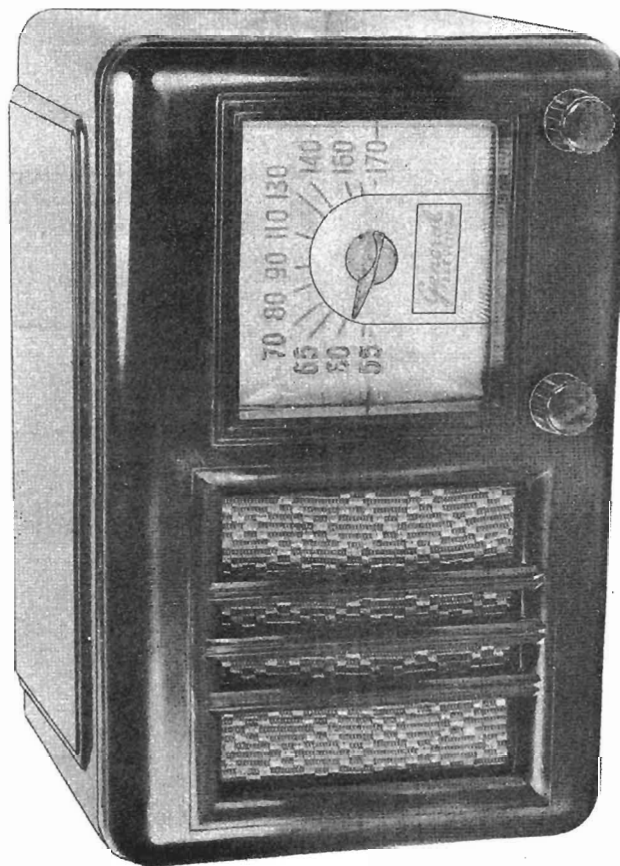
MODEL 6C5

GENERAL TELEV. AND RADIO CORP.

DIAL DRIVE ASSEMBLY



NOTE: TUNING COND. IN MAX. CAPACITY POSITION



TUBE	PIN	VOLTM	1,000 OHM/V	RESISTANCE
14A7 converter	1	A.C.	A.C.	35 ohm
	2	80	80	over 500K
	3	80	80	over 500K
	4	-5	-4	6.8K
	5	GND. 0	GND.	2.5 meg.
	6	-1	-0.3	1.4 ohm
	7	0	0	1.4 ohm
	8	A.C.	A.C.	50 ohm
14B6 1st AF AMPL.	1	A.C.	A.C.	18 ohm
	2	24	22	over 500K
	3	80	80	over 500K
	4	GND.	GND.	500K
	5	GND.	GND.	2.5 meg.
	6	-1	-0.3	35 ohm
	7	GND.	GND.	35 ohm
	8	A.C.	A.C.	35 ohm
50A5 audio output	1	GND.	GND.	500K
	2	46	12	over 500K
	3	-1	-0.3	10 meg's
	4	-1	-0.3	500K
	5	-1	-0.3	500K
	6	GND.	GND.	18 ohm
	7	A.C.	A.C.	100 ohm
	8	A.C.	A.C.	over 500K
35Y4 rectifier	1	A.C.	A.C.	135 ohm
	2	120	120	over 500K
	3	80	80	over 500K
	4	-0.5	0	1.2 meg
	5	5	5	150 ohm
	6	A.C.	A.C.	40 ohm
	7	A.C.	A.C.	135 ohm
	8	A.C.	A.C.	135 ohm

ALL VOLTAGE AND RESISTANCE MEASUREMENTS MADE WITH RESPECT TO CHASSIS GROUND. AND WITH A LINE VOLTAGE OF 116 V.A.C.

ALIGNMENT PROCEDURE.

Connect output meter across voice coil.

Connect the signal generator to the standard Baseline Loop Model 1150 and couple it loosely to the receiver loop. Set the volume control at maximum, and fully mesh the tuning capacitor.

The output of the signal generator should be just sufficient to give a readable deflection on the output meter.

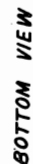
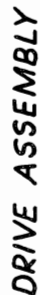
Set the signal generator to 450 kc and adjust i-f alugs for maximum output in the following order: L2, L1. Repeat sequence if trimmers were badly maladjusted.

Set the signal generator and receiver to 1600 kc and adjust the oscillator trimmer C2 for maximum output.

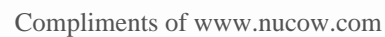
Set the signal generator and receiver to 1400 kc and adjust the antenna trimmer C4 for maximum output.

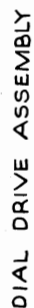
Set the signal generator and receiver to 1600 kc and readjust oscillator trimmer C2 for maximum output.



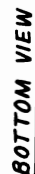


Tube	Pin	V _{TH}	D-C Voltage 20000 ohms/ volt	1000 ohms/ volt	Resistance
11A6	1	+1.5	+1.4	+1.4	4
	2	+90	+90	+88	Infinite
	3	+90	+90	+88	Infinite
	4	-3.4	-0.5	0	600,000
	5	+3.4	+33	+26	Infinite
	6	-0.3	-0.1	0	7,000,000
	7	0	0	0	Infinite
	8	0	0	0	0
11A5	1	+1.5	+1.4	+1.4	4
	2	+90	+90	+88	Infinite
	3	+90	+90	+88	Infinite
	4	0	0	0	0
	5	0	0	0	Infinite
	6	-0.3	-0.1	0	Infinite
	7	-0.3	-0.1	0	7,000,000
	8	0	0	0	0
11D5	1	+1.5	+1.4	+1.4	4
	2	+26	+20	+20	Infinite
	3	+21	+16	+10	Infinite
	4	-0.4	-0.2	0	2,000,000
	5	0	0	0	Infinite
	6	-0.2	0	0	7,500,000
	7	-0.2	0	0	7,700,000
	8	0	0	0	0
31P4	1	+1.5	+1.4	+1.4	4
	2	+86	+86	+84	Infinite
	3	+90	+90	+83	Infinite
	4	0	0	0	0
	5	-5.4	-5	-5	450
	6	-5	-1	0	1,700,000
	7	0	0	0	0
	8	+1.5	+1.4	+1.4	4

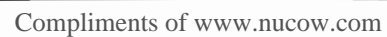


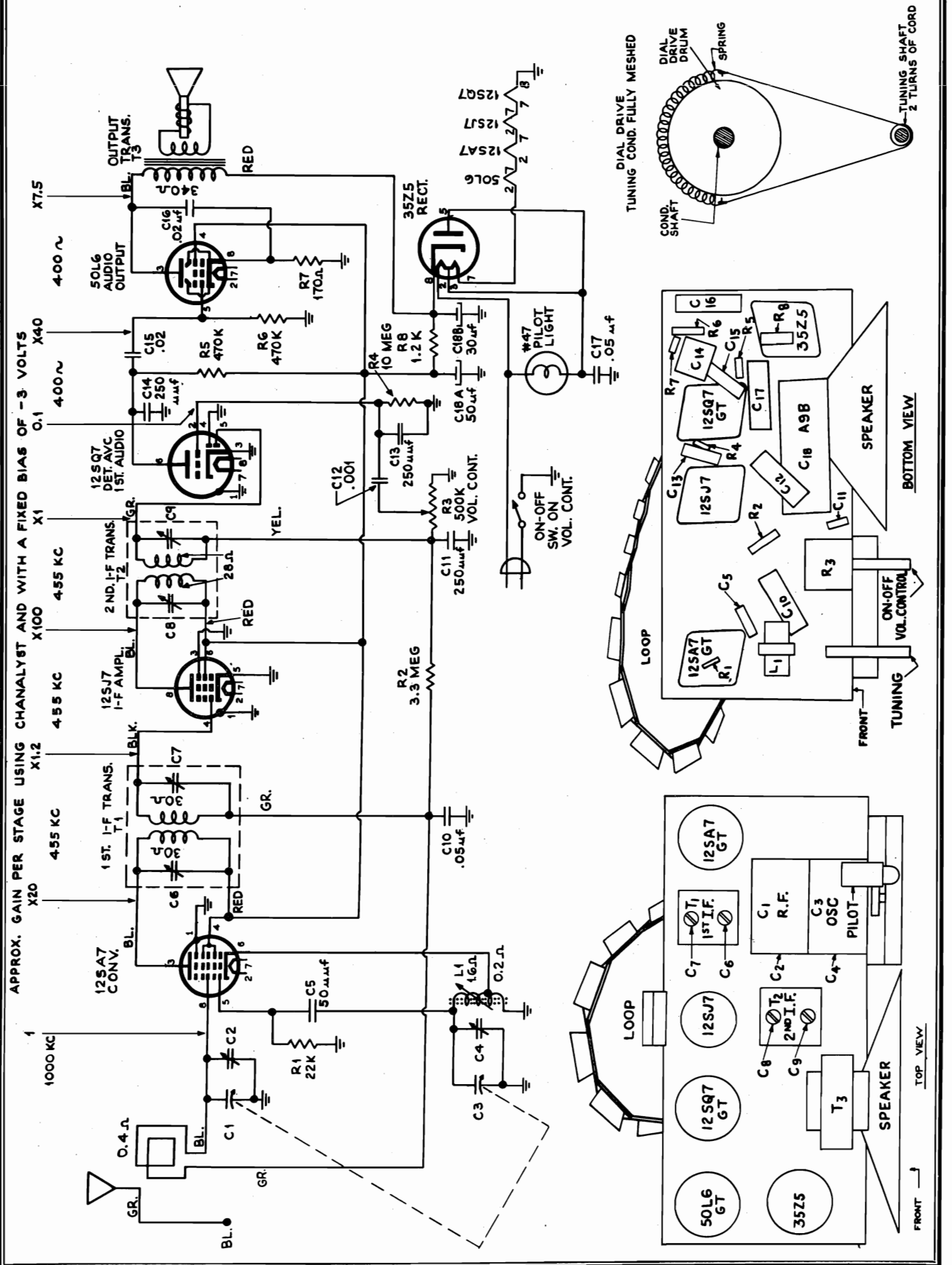


NOTE: TUNING COND. IN MAX. CAPACITY POSITION



Tube	Pin	D-C Voltage VTVM	20000 ohms/ volt	1000 ohms/ volt	Resistance
12SA7	1	0	0	0	0
	2	0	0	0	24
	3	+80	+80	+78	Infinite
	4	+80	+80	+78	Infinite
	5	-10	-9.5	-4.8	20,000
	6	0	0	0	1
	7	0	0	0	40
	8	-1.5	-0.8	-0.2	1,200,000
12SK7	1	0	0	0	0
	2	0	0	0	12
	3	0	0	0	0
	4	-1.5	-0.6	-0.2	1,200,000
	5	0	0	0	0
	6	+80	+80	+78	Infinite
	7	0	0	0	26
	8	+80	+80	+78	Infinite
12SQ7	1	0	0	0	0
	2	-0.5	-0.4	-0.2	6,000,000
	3	0	0	0	0
	4	-0.5	-0.4	-0.2	400,000
	5	-0.5	-0.4	-0.2	400,000
	6	+46	+42	+40	Infinite
	7	0	0	0	14
	8	0	0	0	0
50L6	1	0	0	0	0
	2	0	0	0	40
	3	+120	+120	+120	Infinite
	4	+80	+80	+78	Infinite
	5	0	0	0	400,000
	6	0	0	0	Infinite
	7	0	0	0	90
	8	+4.5	+4.5	+4.5	150
35Z5	1	0	0	0	Infinite
	2	0	0	0	120
	3	0	0	0	120
	4	0	0	0	Infinite
	5	0	0	0	120
	6	0	0	0	120
	7	0	0	0	90
	8	+120	+120	+120	Infinite







ALIGNMENT PROCEDURE

Connect output meter across the voice coil.

Connect the signal generator to the standard Hazeltime Loop Model 1150 and couple it loosely to the receiver loop. Set the volume control at maximum, and fully mesh the tuning capacitor.

The output of the signal generator should be just sufficient to give a readable deflection on the output meter.

Set the signal generator to 455 kc and adjust i-f trimmers for maximum output in the following order: C9, C8, C7, C6. Repeat sequence if trimmers were badly maladjusted.

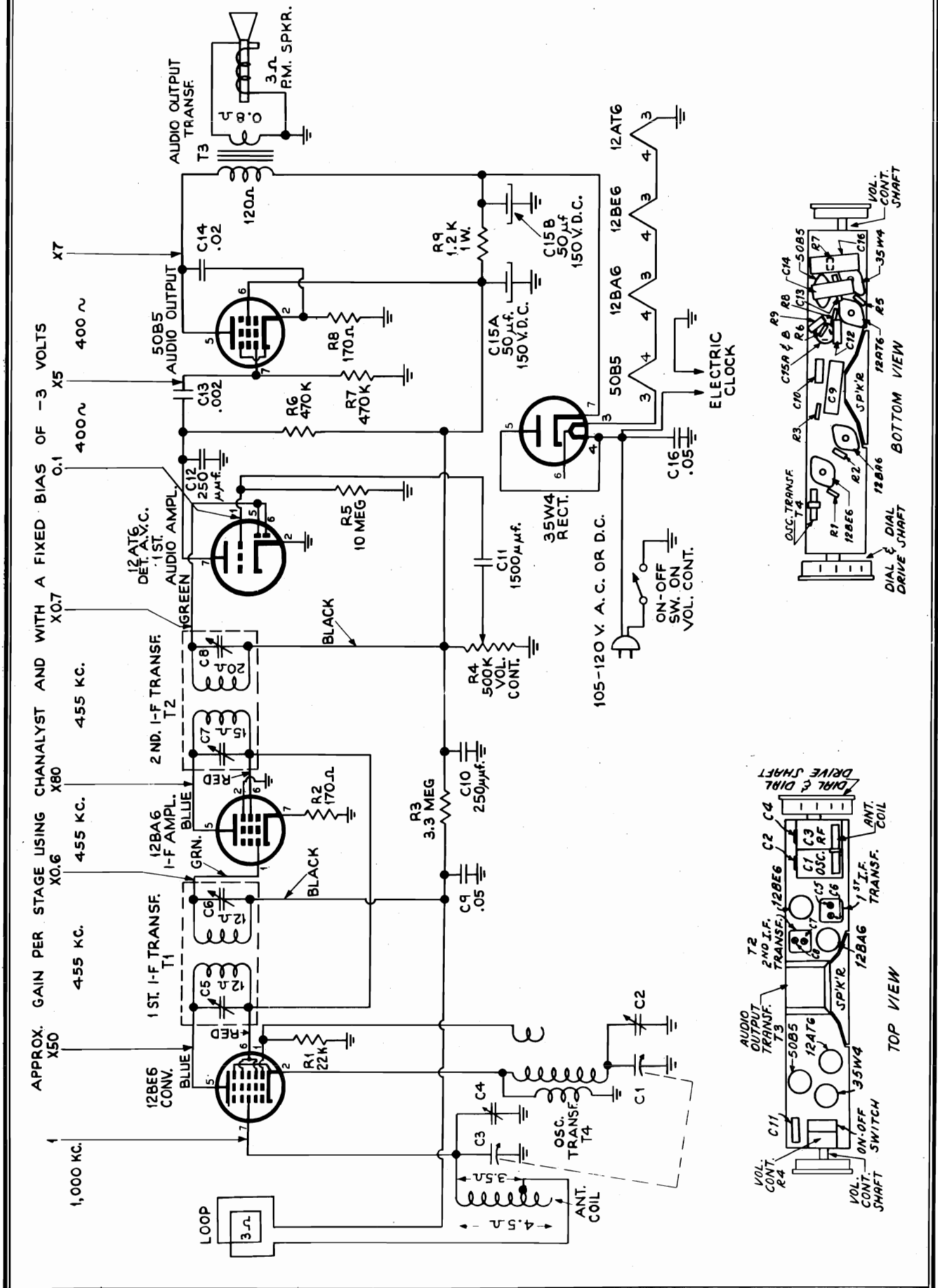
Set the signal generator and receiver to 1550 kc and adjust the oscillator trimmer C4 for maximum output.

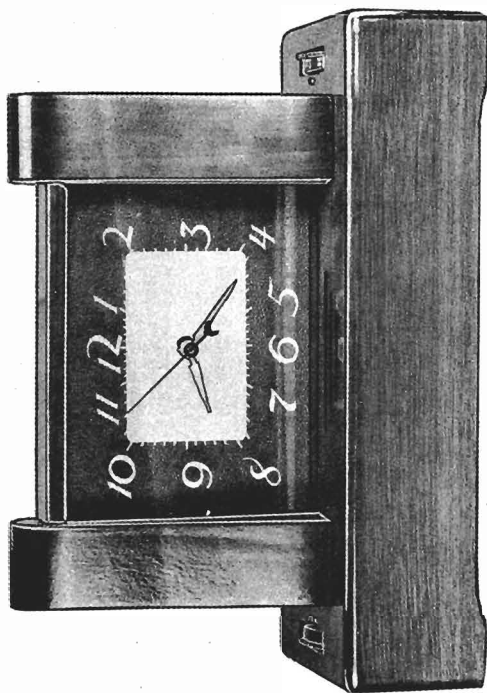
Set the signal generator and receiver to 1400 kc and adjust the antenna trimmer C2 for maximum output.

Set the signal generator and receiver to 600 kc and adjust the oscillator padder L1 for maximum output while rocking the tuning capacitor.

Set the signal generator and receiver to 1550 kc and readjust oscillator trimmer C4 for maximum output.

TUBE	PIN	VTVM	20,000Ω/V	1,000Ω/V	RESISTANCE
12SA7 CONV.	1	0	0	0	0
	2	AC	AC	AC	34Ω
	3	82V	82V	82V	2.0 Meg
	4	82V	82V	82V	2.0 Meg
	5	-8.6V	-7.4	-4.0	22K
500 KC 1600 KC	6	-9.8V	-9.2	-5.4	22K
	7	0	0	0	0.2Ω
	8	AC	AC	AC	22Ω
		-1.1V	-0.24V	-0.05	5 Meg
12SJ7 IF AMPL.	1	0	0	0	0
	2	AC	AC	AC	22Ω
	3	0	0	0	0
	4	-1.1V	-0.24V	-0.08	5 Meg
	5	0	0	0	0
	6	82V	82V	82V	2.0 Meg
	7	AC	AC	AC	12Ω
	8	82V	82V	82V	2.0 Meg
12SQ7 DET. AVC 1st AUDIO	1	0	0	0	0
	2	-1.44	-0.72	-0.25	10 Meg
	3	0	0	0	0
	4	0	0	0	500K
	5	-0.8V	-0.44	-0.06V	2 Meg
	6	54V	50V	14V	10Ω
	7	AC	AC	AC	0
	8	0	0	0	0
50L6 AUDIO OUTPUT	1	--	--	--	---
	2	AC	AC	AC	75Ω
	3	92V	92V	92V	2 Meg
	4	82V	82V	82V	2 Meg
	5	0	0	0	500K
	6	--	--	--	---
	7	AC	AC	AC	30Ω
	8	0	0	0	0





ALIGNMENT PROCEDURE

Connect output meter across voice coil.

Connect the signal generator to the standard Hazeltine Loop Model 1150 and couple it loosely to the receiver loop. Set the volume control at maximum, and fully mesh the tuning capacitor.

The output of the signal generator should be just sufficient to give a readable deflection on the output meter.

Set the signal generator to 455 kc and adjust i-f trimmers for maximum output in the following order: C8, C7, C6, C5. Repeat sequence if trimmers were badly maladjusted.

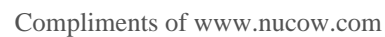
Set the signal generator and receiver to 1600 kc and adjust the oscillator trimmer C2 for maximum output.

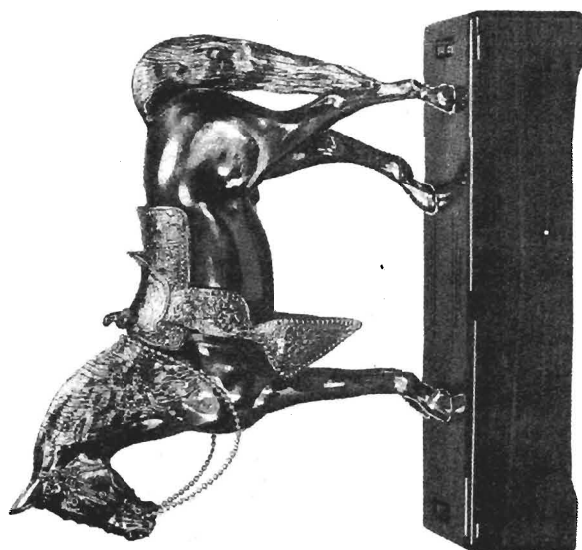
Set the signal generator and receiver to 1400 kc and adjust the antenna trimmer C4 for maximum output.

Set the signal generator and receiver to 1600 kc and readjust oscillator trimmer C2 for maximum output.

TUBE	PIN	VOLTS	1,000 OHM/V	RESISTANCE
12BE6 conv.	1	-8	-4	22K
	2	0	0	0.6 ohm
	3	A.C.	A.C.	15 ohm
	4	A.C.	A.C.	30 ohm
	5	95	95	over 500K
	6	95	95	over 500K
	7	-0.8	0	2.5 megs
12BA6 1-F. AMPL.	1	-0.8	0	2 megs
	2	GND.	GND.	GND.
	3	A.C.	A.C.	30 ohm
	4	A.C.	A.C.	40 ohm
	5	95	95	over 500K
	6	9	95	over 500K
	7	1.6	1.6	170 ohm
12AT6 DET. A.V.C. 1st audio AMPL.	1	-1.3	-0.5	10 meg's
	2	GND.	GND.	GND.
	3	GND.	GND.	GND.
	4	A.C.	A.C.	15 ohm
	5	-0.9	-0.3	600K
	6	-0.9	-0.3	600K
	7	45	18	over 500K
50B5 audio output	1	6.5	6.5	470K
	2	A.C.	A.C.	170 ohm
	3	A.C.	A.C.	100 ohm
	4	A.C.	A.C.	40 ohm
	5	125	125	over 500K
	6	95	95	over 500K
	7	0	0	470K
35W4 rect.	1	6.5 tie point	6.5 tie point	170 ohm
	2	—	—	—
	3	A.C.	A.C.	100 ohm
	4	A.C.	A.C.	135 ohm
	5	A.C.	A.C.	135 ohm
	6	A.C.	A.C.	130 ohm
	7	130	130	over 500K

ALL VOLTAGE AND RESISTANCE MEASUREMENTS MADE WITH RESPECT TO CHASSIS GROUND.
AND WITH A LINE VOLTAGE OF 116 V.A.C.





TUBE	PIN	V _{TA}	1,000 OHM/V	RESISTANCE
12BE6 conv.	1	-8	-4	22K
	2	0	0	0.6 ohm
	3	A.C.	A.C.	15 ohm
	4	A.C.	A.C.	30 ohm
	5	95	95	over 500K
	6	95	95	over 500K
	7	-0.6	0	2.5 meg's
12BA6 1-F AMPL.	1	-0.6	0	2 meg's
	2	GND.	GND.	GND.
	3	A.C.	A.C.	30 ohm
	4	A.C.	A.C.	40 ohm
	5	95	95	over 500K
	6	95	95	over 500K
	7	1.6	1.6	170 ohm
12AT6 DET. A.V.C. 1st audio AMPL.	1	-1	-0.3	10 meg's
	2	GND.	GND.	GND.
	3	GND.	GND.	GND.
	4	A.C.	A.C.	15 ohm
	5	-0.7	-0.2	600K
	6	-0.7	-0.2	600K
	7	45	18	over 500K
50B5 audio output	1	6.5	6.5	470K
	2	A.C.	A.C.	170 ohm
	3	A.C.	A.C.	100 ohm
	4	A.C.	A.C.	40 ohm
	5	125	125	over 500K
	6	95	95	over 500K
	7	0	0	470K
35W4 rect.	1	6.5 tie point	6.5 tie point	170 ohm
	2	A.C.	A.C.	100 ohm
	3	A.C.	A.C.	135 ohm
	4	A.C.	A.C.	135 ohm
	5	A.C.	A.C.	130 ohm
	6	A.C.—	A.C.—	over 500K
	7	130	130	

ALIGNMENT PROCEDURE

Connect output meter across voice coil.

Connect the signal generator to the standard Hazeltine Loop model 1150 and couple it loosely to the receiver loop. Set the volume control at maximum, and fully mesh the tuning capacitor.

The output of the signal generator should be just sufficient to give a readable deflection on the output meter.

Set the signal generator to 450 kc and adjust i-f trimmers for maximum output in the following order: C10, C9, C8, C7. Repeat sequence if trimmers were badly maladjusted.

Set the signal generator and receiver to 1600 kc and adjust the oscillator trimmer C2 for maximum output.

Set the signal generator and receiver to 1400 kc and adjust the antenna trimmer C4 for maximum output.

Set the signal generator and receiver to 1600 kc and readjust oscillator trimmer C2 for maximum output.

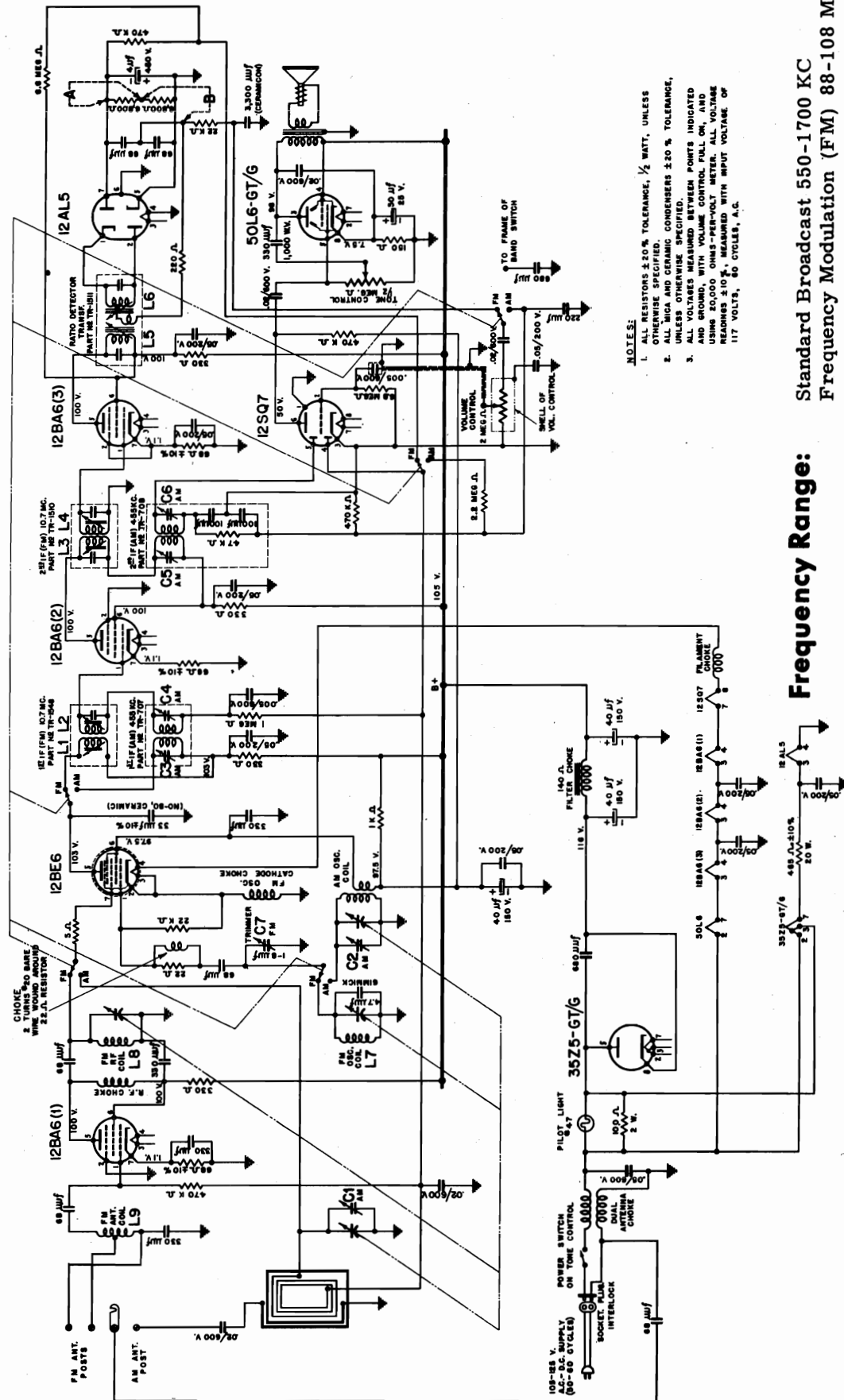
ALL VOLTAGE AND RESISTANCE MEASUREMENTS MADE WITH RESPECT TO CHASSIS GROUND, FOR TRIMMER C2 FOR MAXIMUM OUTPUT.

AND WITH A LINE VOLTAGE OF 116 V.A.C.

THE B. F. GOODRICH COMPANY

MODEL 11-701

CIRCUIT DIAGRAM

**Frequency Range:**Standard Broadcast 550-1700 KC
Frequency Modulation (FM) 88-108 MC**Power Requirement:** 105-125 volts ac 50-60 cycles
or 105-125 volts dc**Power Consumption:** 50 watts

MODEL 11-701

THE B. F. GOODRICH COMPANY

REPLACEMENT PARTS LIST

Condensers

CCA332M	3300 mmfd $\pm 20\%$ ceramicon
CCAL300K	30 mmfd $\pm 10\%$ ceramicon
CO-111	40+40/150 W.V. and 50/25 W.V. electrolytic
CO-1056	4 mmfd/450 W.V. electrolytic
CO-1083	4.7 mfd $\pm 20\%$ condenser
CO-1248	40 mfd/150 W.V. electrolytic
CT-1036-1	1-8 mmfd trimmer
CV-1461	2 gang A.M.-F.M. variable condenser
RCM20A221M	220 mmfd $\pm 20\%$ mica
RCM20A331M	330 mmfd $\pm 20\%$ mica
RCM20A680M	68 mmfd $\pm 20\%$ mica
RCM30A681M	680 mmfd $\pm 20\%$ mica
RCM40A331M	330 mmfd $\pm 20\%$ mica
RCPI0W2503A	.05/200 W.V. paper tubular
RCPI0W6203A	.02/600 W.V. paper tubular
RCPI0W6502A	.005/600 W.V. paper tubular
RCPI0W6503A	.05/600 W.V. paper tubular

Resistors

RE-1464	465 ohms $\pm 10\%$ 20 watt
REB100M	10 ohms $\pm 20\%$ 1/2 watt
REB102M	two used in parallel
REB105M	1000 ohms $\pm 20\%$ 1/2 watt
REB151K	1 megohm $\pm 20\%$ 1/2 watt
REB220M	150 ohms $\pm 10\%$ 1/2 watt
	22 ohms $\pm 20\%$ 1/2 watt
	wind two turns of #20 bare wire over resistor
REB221M	220 ohms $\pm 20\%$ 1/2 watt
REB223M	22,000 ohms $\pm 20\%$ 1/2 watt
REB225M	2.2 megohm $\pm 20\%$ 1/2 watt
REB331M	330 ohms $\pm 20\%$ 1/2 watt
REB474M	470,000 ohms $\pm 20\%$ 1/2 watt
REB680K	68 ohms $\pm 10\%$ 1/2 watt
REB682M	6800 ohms $\pm 20\%$ 1/2 watt
REB685M	6.8 megohm $\pm 20\%$ 1/2 watt
RED101M	100 ohms $\pm 20\%$ 2 watt

Transformers and Coils

CK-114	85 mils-140 ohm choke
CK-1058	filament choke
CK-1109	dual antenna choke
CK-1127	r-f choke
CK-1452	f-m oscillator cathode choke
CL-1457	f-m antenna coil
CL-1458	f-m oscillator coil
CL-1459	f-m r-f coil
CL-1466	a-m oscillator coil
TR-707	455 kc input I.F. transformer
TR-708	455 kc output I.F. transformer
TR-904	output transformer
TR-1510	10.7 mc f-m output I.F. transformer
TR-1511	ratio detector transformer
TR-1548	10.7 mc f-m input I.F. transformer

Miscellaneous

BU-187	#47 pilot light bulb
CA-154-1W	walnut bakelite cabinet
CA-154-1V	ivory bakelite cabinet
DL-1444	dial scale
KN-671	walnut knob marked "Volume"
KN-672	walnut knob marked "Off-On-Tone"
KN-673	walnut knob marked "Tuning"
KN-1117	walnut knob marked "AM-FM"
KN-675	ivory knob marked "Volume"
KN-676	ivory knob marked "Off-On-Tone"
KN-677	ivory knob marked "Tuning"
KN-1118	ivory knob marked "AM-FM"
LP-1463	loop
PO-334	dial pointer
PT-105	2 megohm volume control
PT-106	1/2 megohm tone control
SD-855	miniature tube shield
SK-792	6" PM speaker
SO-313	insulated pilot light socket assembly
SP-218	pointer drive spring
ST-1450	masonite back
ST-1465	light diffuser
SW-1435	band switch
WA-302	C washer for drive shaft

SERVICE AND ALIGNMENT INSTRUCTIONS

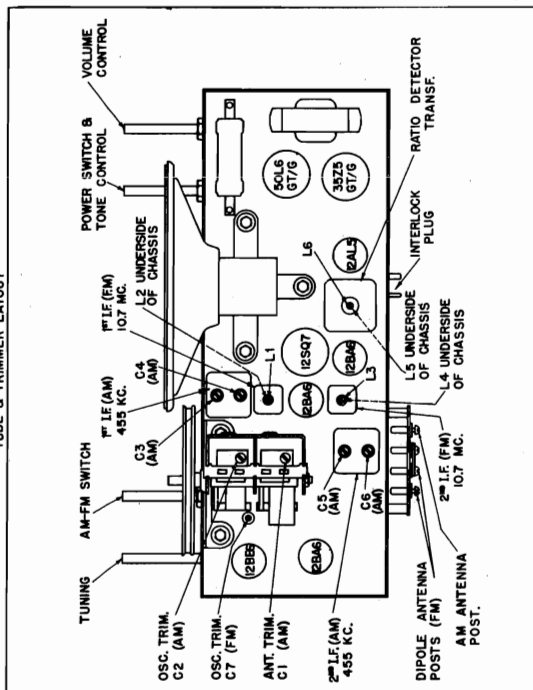
CAUTION: The chassis of this receiver is directly connected to one side of the line. When servicing this receiver do not place chassis on a grounded metallic bench.

ALIGNMENT:

Equipment Required: Vacuum tube voltmeter; modulated A-M and F-M signal generator; output meter radiation loop; one .1/400 WV condenser; one 300 ohm resistor; one insulated screw driver.

To insure proper alignment on A-M, the use of a radiation loop is recommended. To radiate a signal connect a loop of about 6" to 8" diameter one turn of #14 or #12 wire across the output of the signal generator and place this loop parallel to the loop of the receiver to be aligned at a distance of 8" or 10".

TUBE & TRIMMER LAYOUT



FOR COMPLETE ALIGNMENT INSTRUCTIONS ON AM AND FM BANDS SEE ALIGNMENT CHART.

To facilitate alignment of the receiver when removed from cabinet, calibration points are provided on the light diffuser plate, which is mounted to the chassis.

CAUTION: The diffuser plate is assembled to the chassis with two P.K. screws. The one at the left is fastened down tight. The one at the right should be backed off about two turns from the tight position in order to permit free expansion of the plate and thereby avoid warpage which may interfere with proper movement of the pointer.

Before aligning close the variable condenser fully counter-clockwise (plates fully closed) and check that pointer coincides with the reference dot (extreme left dot) on diffuser plate.

ALIGNMENT PROCEDURE CHART

STEP	SET BAND SWITCH ON SIGNAL GENERATOR TO -	CONNECT HIGH SIDE OF SIGNAL GENERATOR TO -	SET SIGNAL GENERATOR TO	TURN POINTER TO -	READ OUTPUT ON -	ADJUST THE FOLLOWING - KEEP SIGNAL FROM SIGNAL GENERATOR AS LOW AS POSSIBLE
BEFORE ALIGNING CLOSE VARIABLE CONDENSER FULLY COUNTERCLOCKWISE (PLATES FULLY CLOSED) AND ADJUST POINTER TO COINCIDE WITH THE REFERENCE DOT (EXTREME LEFT DOT) ON CALIBRATION STRIP.						
1	FM	PIN NO. 1 OF 12BA 6 (3) TUBE FOR 1 VOLT SIGNAL	10.7 MC UNMODULATED SIGNAL	EXTREME RIGHT HAND POSITION (CONDENSER FULLY OPEN).	VACUUM TUBE VOLTMETER ACROSS 8800 OHM RESISTOR (SHOWN AS "A" ON CIRCUIT DIAGRAM)	(RATIO DETECTOR PRIMARY) L5, FOR MAXIMUM READING (SLUG ON UNDER-SIDE OF CHASSIS).
2	FM				VACUUM TUBE VOLTMETER ACROSS "B" ON CIRCUIT DIAGRAM.	L6 (RATIO DETECTOR SECONDARY) FOR ZERO READING (SLUG ON TOP OF CHASSIS).
3	FM	PIN NO. 7 OF 12BE6 TUBE IN SERIES WITH A.1/400 VOLT COND.			VACUUM TUBE VOLTMETER ACROSS 8800 OHM RESISTOR AS SHOWN AS "A" ON CIRCUIT DIAGRAM.	L4 (UNDER-SIDE OF CHASSIS) L3 (TOP OF CHASSIS) 2ND I.F. TRANSFORMER FOR MAXIMUM READING.
4	FM					L2 (UNDER-SIDE OF CHASSIS) L1 (TOP OF CHASSIS) 1ST I.F. TRANSFORMER FOR MAXIMUM READING.
5	AM	R.F. SECTION OF VARIABLE CONDENSER OR PIN NO. 7 OF 12BE6 TUBE IN SERIES WITH A.1/400 VOLT COND.	455 KC		OUTPUT METER ACROSS SPEAKER-VOICE-COIL	C5 AND C6 (2ND I.F. TRANSFORMER) FOR MAXIMUM READING
6	AM					C3 AND C4 (1ST I.F. TRANSFORMER) FOR MAXIMUM READING
REPEAT STEPS 3 AND 4						
8	FM	CONNECT FM SIGNAL GENERATOR TO DIPOLE TERMINAL POST USING A 300 OHM RESISTOR IN SERIES WITH THE HIGH SIDE LEAD. USE A 30% MODULATED FM SIGNAL	88 MC	98 MC ON CALIBRATION STRIP	OUTPUT METER ACROSS SPEAKER-VOICE-COIL	OSCILLATOR COIL #17 UNDER-SIDE OF CHASSIS ADJUST BY COMPRESSING OR EXPANDING COIL SLIGHTLY FOR MAXIMUM OUTPUT INCLUDING WITH 98 MC ON CALIBRATION STRIP
9	FM		108 MC	108 MC ON CALIBRATION STRIP		C7 (OSCILLATOR TRIMMER) FOR MAXIMUM OUTPUT
10	FM		REPEAT STEPS 8 AND 9 UNTIL OSCILLATOR RANGE IS 98 MC ON CALIBRATION STRIP			
11	FM		98 MC	RESONANCE APPROXIMATELY 98 MC ON CALIBRATION STRIP	OUTPUT METER ACROSS	#18 AND #19 UNDER-SIDE OF CHASSIS ADJUST BY COMPRESSING OR EXPANDING COIL SLIGHTLY FOR MAXIMUM OUTPUT
12	AM	USE RADIATED SIGNAL CONNECT BOTH SIDES OF SIGNAL GENERATOR TO RADIATION LOOP	1700 KC	EXTREME RIGHT HAND POSITION, CONDENSER FULLY OPEN		C2 (OSCILLATOR TRIMMER) FOR MAXIMUM OUTPUT
13	AM		1500 KC	RESONANCE APPROXIMATELY 1500 KC ON CALIBRATION STRIP	SPEAKER-VOICE-COIL	C1 (R.F. TRIMMER) FOR MAXIMUM OUTPUT
14	AM		600 KC	RESONANCE APPROXIMATELY 600 KC ON CALIBRATION STRIP		CHECK THAT 600 KC RESONANCE CORRESPONDS WITH 600 KC POINT ON CALIBRATION STRIP

* THESE ADJUSTMENTS ARE PERMANENTLY SET AT THE FACTORY AND NORMALLY DO NOT REQUIRE RE-ADJUSTMENT UNLESS THEY ARE DISPLACED OR REPLACED IN SERVICING

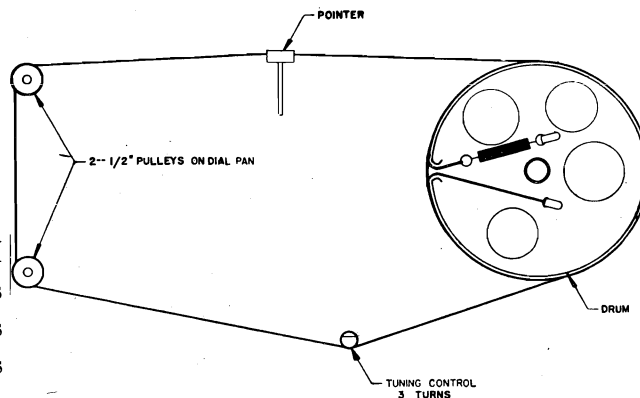
MODELS 93-104,
93-105, 93-106

THE B. F. GOODRICH COMPANY

ELECTRICAL AND MECHANICAL DATA

Frequency Range (AM) 535 KC to 1620 KC
 Intermediate (FM) 87.25 MC to 108.75 MC
 Frequency (AM) 455 KC (FM) 10.7 MC
 Power Supply 117 volts AC, 60 cycles

Speaker 10-inch PM
 V.C. Impedance 3.2 ohms at 400 cycles
 Power Output (Undistorted) 3.5 watts
 Power Output (Maximum) 5 watts

**TUBE COMPLEMENT****DIAL STRINGING**

1	6BA6	RF Amplifier	1	6AT6	AM Detector—AVC—1st Audio (AM-FM)
1	6BE6	Oscillator-Converter	1	6H6	FM Detector
1	6BA6	1st IF Amplifier	1	6V6GT	Power Output
1	6BA6	2nd IF Amplifier	1	5Y3GT	Rectifier

SOCKET VOLTAGES

TUBE	POSITION	1	2	3	4	5	6	7	8
6BA6	RF Amplifier	—2	0	0	6.3 AC	130	90	.75	.....
6BE6	Oscillator-Converter	—2.5	0	6.3 AC	0	140	95	0	.....
6BA6	1st IF. Amplifier	—5	0	6.3 AC	0	120	90	.75	.....
6BA6	2nd IF. Amplifier	0	0	0	6.3 AC	90	90	.75	.....
6AT6	AM Detector—AVC— 1st Audio (AM-FM)	—3	0	0	6.3 AC	—3	0	55	.....
6H6	FM Detector	0	0	8	8	8	8	6.3 AC	8
6V6GT	Power Output	0	0	210	175	0	8	6.3 AC	0
5Y3GT	Rectifier	0	5V AC	NC	235	NC	235 AC	NC	225

To Pin 8

NOTE: All DC voltages measured with RCA Voltomyst from B—
 to socket contact indicated. All voltages are positive DC
 unless otherwise marked.
 Volume control full on. Zero signal input.

Tone control in clockwise position.
 Band switch in "AM" position.
 Line voltage 117 volts, 60 cycle AC.

Reference Notes to Alignment Chart

Note 1—Either spread or compress the R.F. section
 gang plates for maximum output.

Note 2—The FM section of this receiver operates
 with delayed A.V.C. This delay must be re-
 moved for the alignment procedure, this is ac-
 complished by shorting pin No. 6 on the 6V6.
 The A.V.C. point is on terminal board at end of

2.2 meg. resistor coming from pin 1 of 6BA6
 1st I.F. amplifier. Audio point is on high end of
 volume control.

Note 3—The F.M. R.F. and osc. coils are air coils
 constructed of stiff wire. To adjust these coils
 for band coverage and tracking, move turns of
 coil together or apart as required.

The performance of the ratio detector stage may be checked by closely following the procedure and diagram given below.

The schematic diagram illustrates a vacuum tube radio receiver circuit. The circuit is powered by a 100,000 μV 10.7 MC. CW signal source. The signal path starts with a 6BA6 pentode (first stage) and a 6H6 pentode (second stage). The 6BA6 is connected to a 6H6 via a transformer (T4). The 6H6 is connected to a 6AT6 diode for AVC. The circuit includes a variable tuning indicator (V.T. V.M. NO. 2) and a volume control (V.T. V.M. NO. 1). The circuit is grounded to chassis.

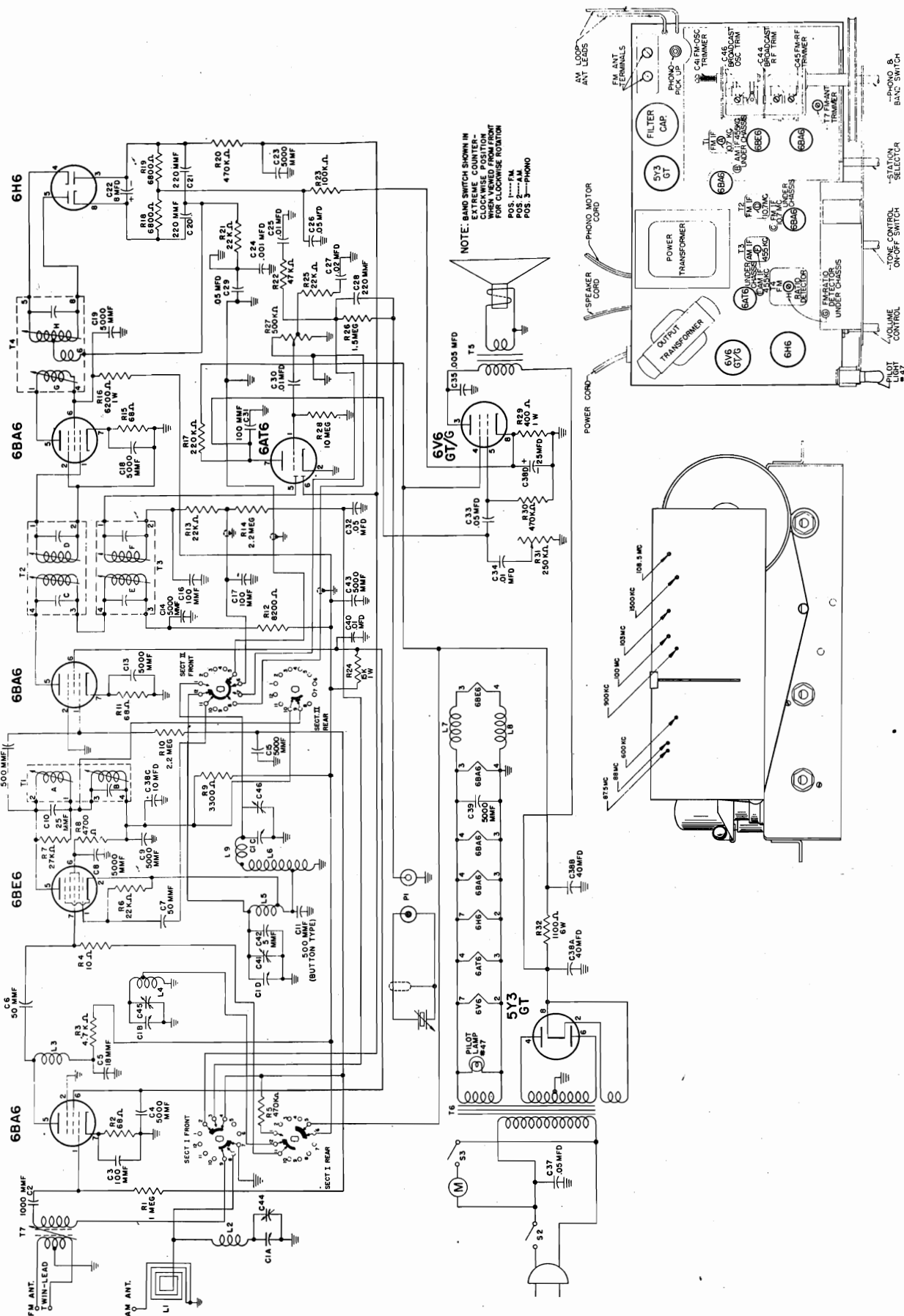
Key components and their values:

- Resistors:** R15 (68), R16 (6200), R18 (6800), R19 (6800), R20 (470K), R21 (22K), R22 (220), R23 (100K), R27 (variable).
- Capacitors:** C18 (5000), C19 (5000), C20 (220), C21 (220), C22 (8+), C23 (5000), C24 (.001), C26 (.05), C29 (.05).
- Transformer (T4):** 1, 4, 5, 6, 8.
- Vacuum Tubes:** 6BA6, 6H6, 6AT6.
- Other Components:** Jumper, V.T. V.M. NO. 2, V.T. V.M. NO. 1, OP VOL. CONTROL, AV.C. PIN 6 6AT6, PIN 8 6V6.

7. The difference between the generator frequencies noted in STEPS 5 and 6 is the "Static Band Width" of the Ratio Detector transformer. This should be approximately 285 kc.

MODELS 93-104,
93-105, 93-106

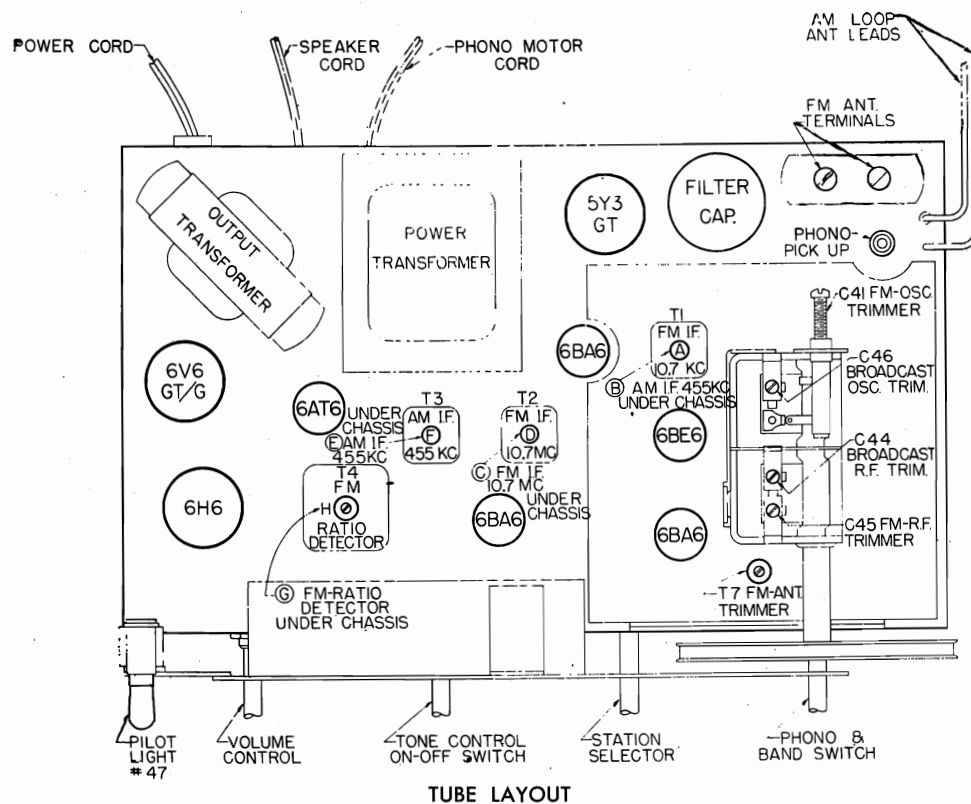
THE B. F. GOODRICH COMPANY



TRIMMER LOCATION

CALIBRATION POINTS

THE B. F. GOODRICH COMPANY

MODELS 93-104,
93-105, 93-106

GENERAL—Operate this receiver on 117 volt, 60 cycle alternating current (AC). Do not connect this equipment to any other source.

ANTENNA—A built-in loop and folded dipole antennae are provided for reception of AM and FM stations, which eliminate the need for external antennae in the average installation.

If this receiver is installed where AM reception is poor, attach an external antenna to the lead at the back of the built-in loop antenna.

To connect an external FM antenna, first remove the two dipole wires from the "FM" terminals on the top of the radio chassis. Connect the two wires from the external FM antenna to the terminals marked "FM" as shown in above illustration.

GROUND—A ground connection is not required for installation of this receiver.



MODELS 93-104,
93-105, 93-106

THE B. F. GOODRICH COMPANY

ALIGNMENT CHART

Step No.	Band Switch Position	Signal Generator	Connection at Receiver	Dummy Antenna	Dial Setting	Adjust Trimmer	Remarks
1	AM	Mod. 455 kc.	6BE6 Conv. Grid Pin 7	0.1 Mfd.	Mid Band	B, E, F	Adjust for Maximum Output
2	AM	1500	Receiver Loop	Radiating Loop	1500	C-46 BC osc. Trim	Adjust for Maximum Output
3	AM	1500 kc.	Receiver Loop	Radiating Loop	1500	C-44 BC RF Trim	Adjust for Maximum Output
4	AM	1000 kc.	Receiver Loop	Radiating Loop	1000	See Note 1	See Note 1.
5	AM	600 kc.	Receiver Loop	Radiating Loop	600	See Note 1	See Note 1
6	FM	10.7 mc. CW	FM Antenna Terminals	0.1 Mfd.	Mid Band	A, C, D, G See Note 2	Adjust for Maximum AVC using VTVM at Terminal Board.
7	FM	10.7 mc. CW	FM Antenna Terminals	0.1 Mfd.	Mid Band	H See Note 2	Adjust for Zero Audio Volts using VTVM. No. 2
8	FM	108.5 mc. FM	FM Antenna Terminals	300 ohms Carbon Res.	HF end	C-41 FM osc. Trim	Adjust for Maximum Output.
9	FM	87.5 mc. FM	FM Antenna Terminals	300 ohms Carbon Res.	LF end	Adjust FM osc. coil See Note 3	Adjust for Maximum Output.
10	FM	103 mc. FM	FM Antenna Terminals	300 ohms Carbon Res.	103 mc.	C-45 FM RF Trim	Adjust for Maximum Output.
11	FM	100 mc. FM	FM Antenna Terminals	300 ohms Carbon Res.	100 mc.	T7 FM Ant. Trim	Adjust for Maximum Output.
12	FM	88 mc. FM	FM Antenna Terminals	300 ohms Carbon Res.	88 mc.	Adjust FM RF Coil See Note 3	Adjust for Maximum Output.

Before starting alignment, pointer must be set to 87.5 MC. mark with gang fully closed.

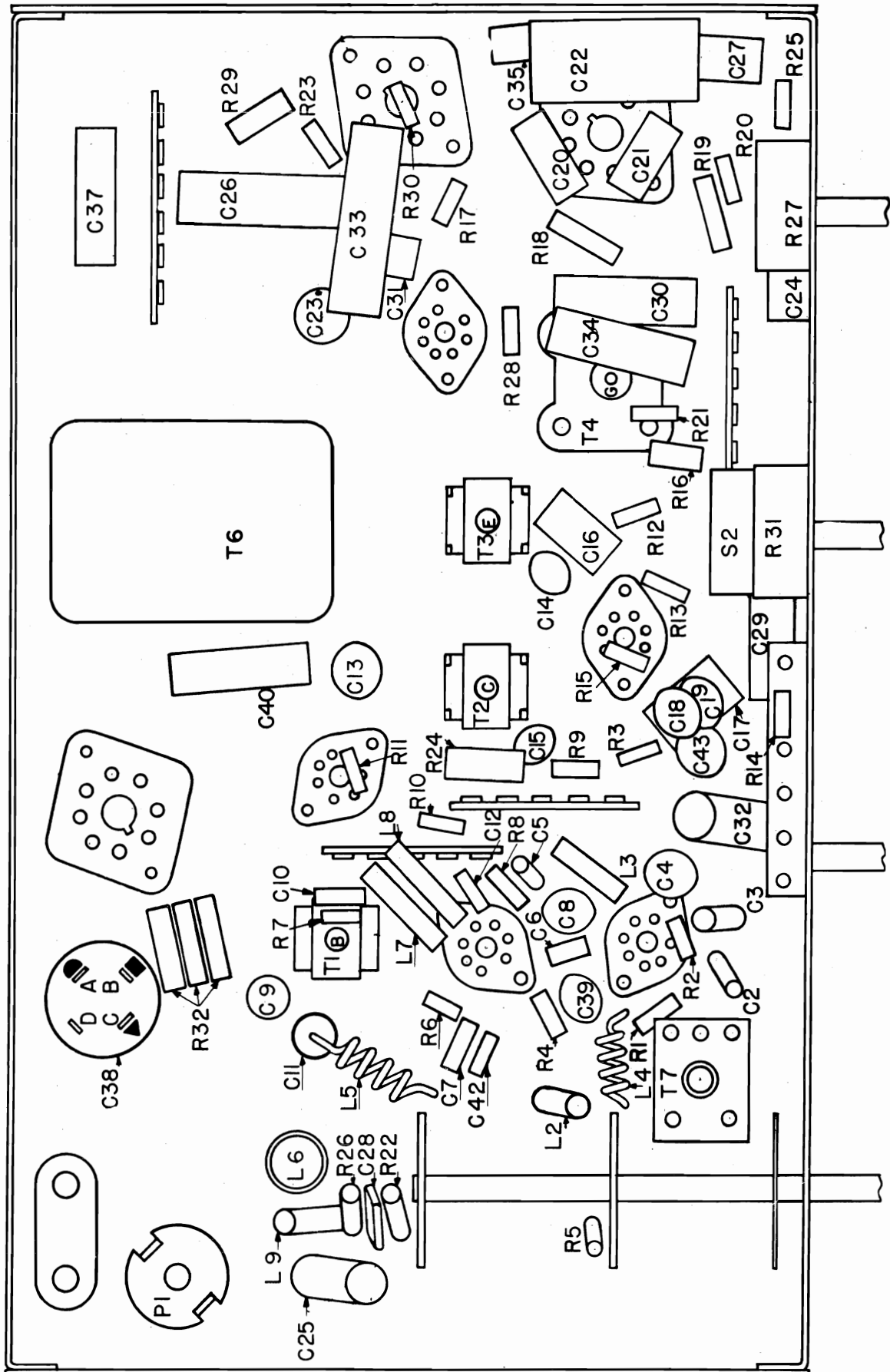
ALIGNMENT PROCEDURE

The following equipment is necessary to properly align this receiver:

1. AM signal generator with frequency coverage from 4. 455 kc. to 1700 kc.
2. FM or CW signal generator covering the FM band from 87.25 mc. to 108.75 mc. and the 10.7 mc. frequency for FM IF alignment.
3. Vacuum Tube Voltmeter (VTVM).
4. Output meter—to match 4 ohms, 5 watts maximum.
5. Insulated alignment screwdriver.
6. Dummy antenna—0.1 mfd. capacitor, 300 ohm carbon resistor and inductive loop (fashioned from several turns of wire).

NOTE: Oscilloscope equipment not required if aligned according to the following procedure:

THE B. F. GOODRICH COMPANY

MODELS 93-104,
93-105, 93-106

BOTTOM VIEW — PARTS LAYOUT

MODELS 93-104,
93-105, 93-106

THE B. F. GOODRICH COMPANY

SERVICE PARTS LIST

Symbol	Part No.	Description	Symbol	Part No.	Description
		Cabinet, Mahogany		39184-1	Knob, Mahogany
		Cabinet, Blonde			(selector)
		Cabinet, Walnut		39183-1	Knob, Mahogany
CI	1698	Capacitor, variable			(volume, tone, tuning)
C5		Capacitor, ceramic		39183-2	Knob, Walnut
		18 mmf G.P.			(volume, tone, tuning)
C10		Capacitor, ceramic		39184-2	Knob, Walnut (selector) ..
		25 mmf G.P.		39184-3	Knob, White (selector)
C6, C7		Capacitor, ceramic		39183-3	Knob, White
		50 mmf G.P.			(volume, tone, tuning)
C3		Capacitor, ceramic	L1	28243	Loop, antenna
		100 mmf G.P.		41111	Pointer, dial
C2		Capacitor, ceramic	R1		Resistor 1 meg ohm $\frac{1}{4}$ w.
		1000 mmf G.P.	R5, R20,		Resistor
C4, C8, C9		Capacitor, ceramic	R30		470,000 ohms $\frac{1}{4}$ w.
C13, C14, C15,		5000 mmf G.P.	R6, R13,		Resistor
C18, C19, C23,			R21, R25		22,000 ohms $\frac{1}{4}$ w. 10%
C39, C43			R7		Resistor
C12		Capacitor, ceramic			27,000 ohms $\frac{1}{4}$ w. 10%
		500 mmf G.P.	R10, R14		Resistor 2.2 meg ohms $\frac{1}{4}$ w.
C42		Capacitor, ceramic	R4		Resistor 10 ohms $\frac{1}{4}$ w. 10%
		5mmf (—750 P.M.)	R2, R11,		Resistor 68 ohms $\frac{1}{4}$ w.
			R15		
C20, C21,		Capacitor, Mica 220 mmf	R18, R19		Resistor
C28					6800 ohms $\frac{1}{4}$ w. 10% ..
C16, C17,		Capacitor, Mica 100 mmf..	R3, R8		Resistor 4700 ohms $\frac{1}{4}$ w.
C31			R28		Resistor 10 meg ohms $\frac{1}{4}$ w.
C29, C26,		Capacitor, Paper	R29		Resistor
C33, C32		.05 MFD 400 V.			390 ohms 1 w. 10%
C40, C30,		Capacitor, paper	R17		Resistor
C34, C25		.01 MFD 400 v.			220,000 ohms $\frac{1}{4}$ w.
C35		Capacitor, paper	R12		Resistor 8200 ohms $\frac{1}{2}$ w..
		.005 mfd 400 v.	R24		Resistor 15,000 ohms 1 w.
C22		Capacitor, electrolytic	R23		Resistor 100,000 ohms $\frac{1}{4}$ w.
		8 mfd 50 v.	R32		Resistor 1100 ohms 7 w.
C38a, 20120		Capacitor, electrolytic 10,			10%
C38b, C38c, C38d		40, 40 mfd 300 v. 25 mfd	R22		Resistor 47,000 ohms $\frac{1}{4}$ w.
		25 v.	R26		Resistor 1.5 meg ohms $\frac{1}{4}$ w.
C11	1985	Capacitor, mica 500 mmf	R16		Resistor 6800 ohms 1 w....
C24		Capacitor, paper	R9		Resistor 3300 ohms $\frac{1}{4}$ w.
		.001 mfd 400 v.		54523	Shaft, dial drive
C27		Capacitor, paper		18149	Socket, dial light
		.02 mfd 400 v.		18150	Socket, miniature
C37		Capacitor, oil			Socket, octal
		.05 mfd 400 v.	P1	18104	Socket, Phono
L2, L9, 28229		Choke, filament		58112	Speaker, 10" P.M.
L7, L8				54335	Spring, dial cable
L3	28242	Choke, plate	S1	3797	Switch, band
L6	28244	Coil, B.C. Osc.	T1	3382	Transformer,
L5	28221	Coil, F.M. Osc.			A.M., F.M. I.F.
L4	28222	Coil, F.M. R.F.	T2	3381	Transformer, F.M. I.F.
R-27	2494	Control, volume $\frac{1}{2}$ meg	T3	3383	Transformer, A.M. I.F.
R-31	2522	Control, tone,	T7	28239	Transformer, antenna
		w/switch .25 meg	T4	3539	Transformer,
					Discriminator
	5592	Cord, power	T5	1349	Transformer, output
	4278	Dial crystal	T6	1092	Transformer, power
	54503	Holder, dial crystal	C41		Trimmer, F.M.

THE B. F. GOODRICH COMPANY

MODELS 93-107,
93-108

TUBE LOCATION

ANTENNA—A built-in loop and folded dipole antennas are provided for reception of AM and FM stations, which eliminate the need for external antennas in the average installation.

If this receiver is installed where reception is poor, separate antennas may be desirable for AM and/or FM reception. For AM reception, a single wire antenna 25 to 100 feet long can be attached to the external antenna clip located near the center of the AM antenna loop fastened to the center panel of the radio compartment. For FM reception, an external dipole antenna can be connected to the right-hand pair of antenna terminals located on the back of the radio chassis (after removing the leads from the cabinet dipole antenna).

GROUND—A ground connection is not required for installation of this receiver.

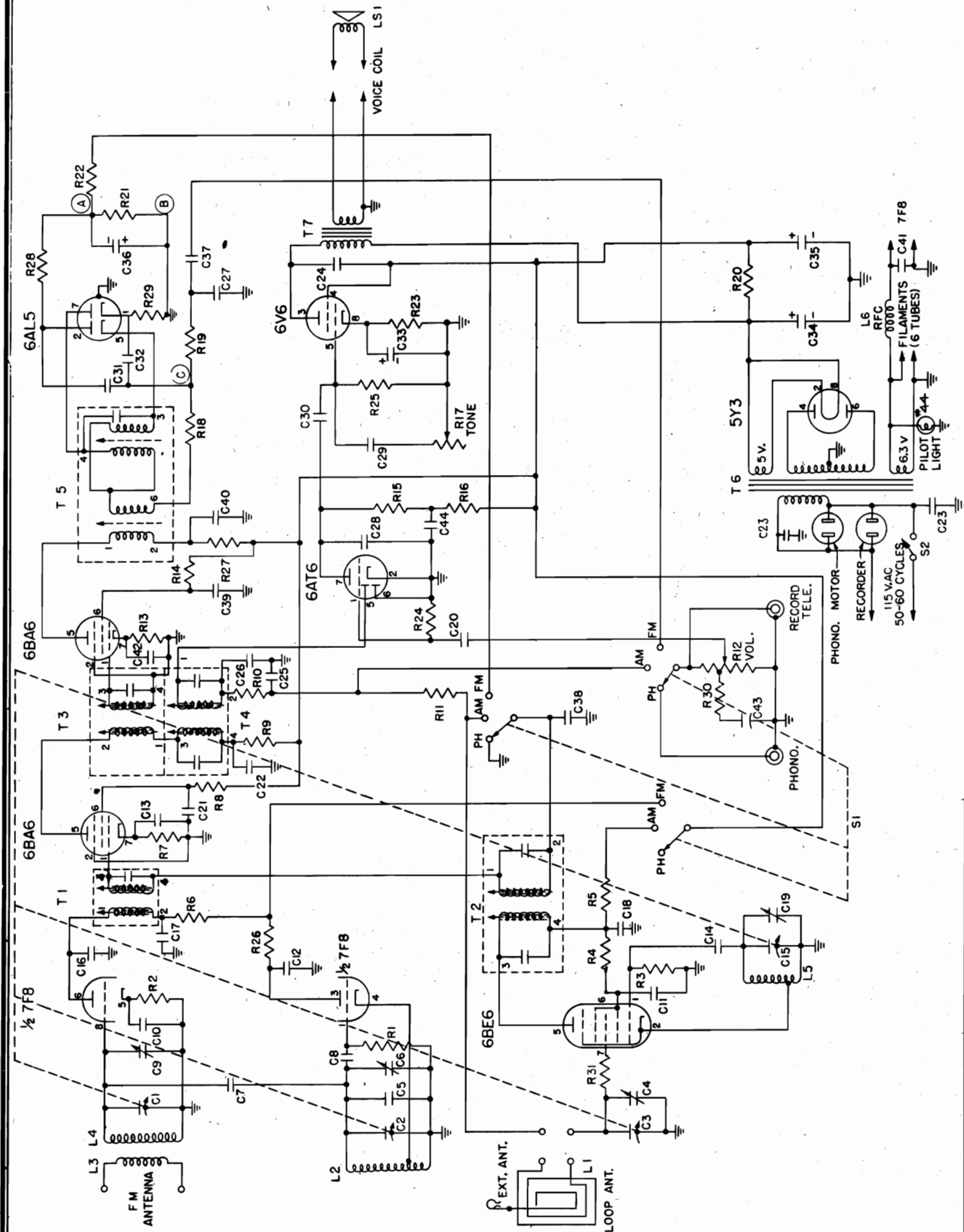
INSTALLATION

GENERAL—Operate this receiver on 117 volt, moved from the set. See that the record changer 60 cycle alternating current (AC) only. is floating freely on its mountings.

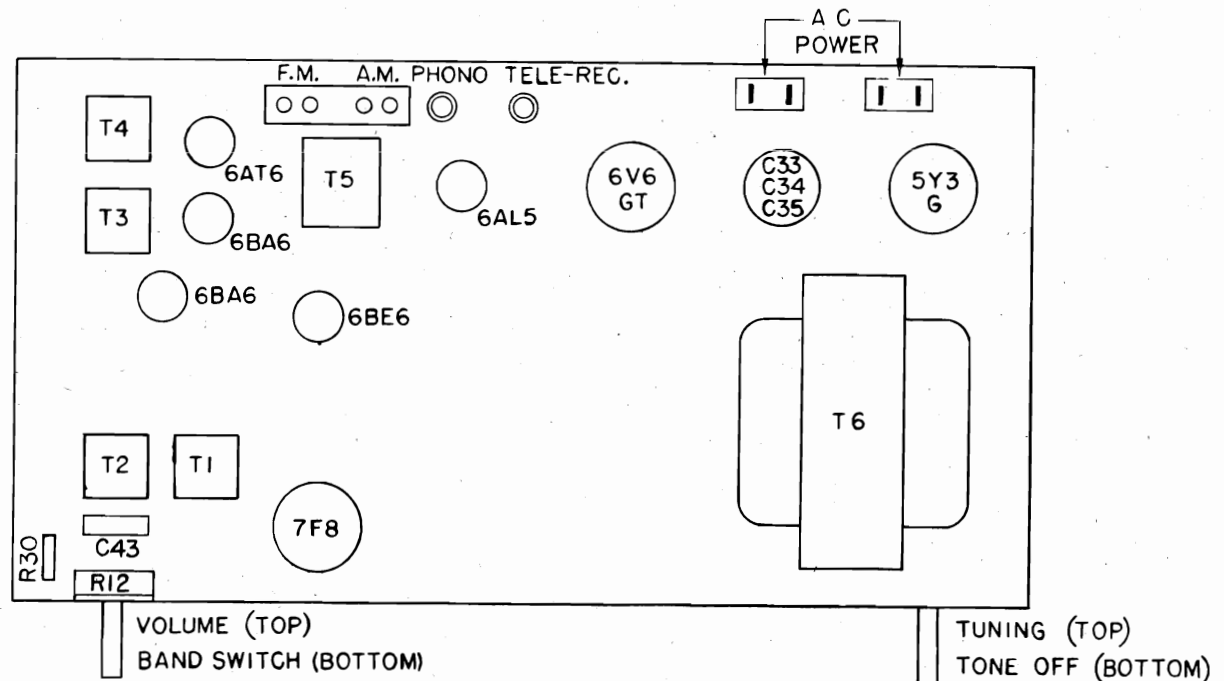
Before connecting the plug to an electrical outlet, be sure that all tubes are firmly seated in their sockets as shown in the tube layout illustration.

MODELS 93-107,
93-108

THE B. F. GOODRICH COMPANY



THE B. F. GOODRICH COMPANY

MODELS 93-107,
93-108

TOP VIEW OF CHASSIS

ELECTRICAL AND MECHANICAL DATA

Frequency Range (AM) 535 KC to 1650 KC	Speaker .....10-inch PM
Intermediate (FM) 88 MC to 108 MC	V.C. Impedance .....3.2 ohms at 400 cycles
Frequency .....(AM) 455 KC, (FM) 10.7 MC	Power output (Undistorted) .....3.5 watts
Power Supply 117 volts*AC, 60 cycles	Power output (Maximum) .....5 watts

TUBE COMPLEMENT

1	7F8	FM Oscillator—Converter	1	6AL5	FM Detector
1	6BE6	AM Oscillator—Converter	1	6AT6	AM Detector—AVC
1	6BA6	AM-FM 1st IF Amplifier			1st Audio (AM-FM)
1	6BA6	FM 2nd IF Amplifier	1	6V6GT	Power Output
			1	5Y3GT	Rectifier

SOCKET VOLTAGES

Tube	Position	1	2	3	4	5	6	7	8	Band Switch
7F8	FM Osc.—Conv.	—2*	0	230	0	4	240	6.3 AC	0	FM
6BE6	AM Osc.—Conv.	—12*	0	0	6.3 AC	230	120	0	—	AM
6BA6	FM-AM IF	—0.8*	0	0	6.3 AC	230	95	1	—	FM
6BA6	FM 2nd IF	0	0	0	6.3 AC	230	85	1	—	FM, AM
6AT6	AM Det.- 1st AF	—1.5*	0	0	6.3 AC	—2.7*	0	100	—	AM
6AL5	FM Disc.	0	—1*	0	6.3 AC	—0.5*	NC	—0.5*	—	FM
6V6GT	AF Output	0	0	280	250	0	NC	6.3 AC	14	FM, AM
5Y3GT	Rect.	—	5V AC to pin 8	NC	260 AC	NC	260 AC	NC	300	FM, AM

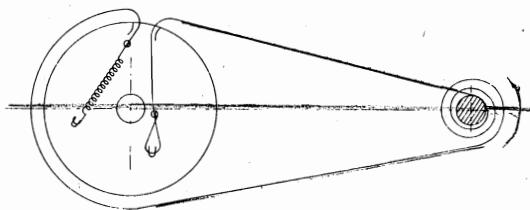
All voltages measured to chassis unless otherwise noted.
DC voltages measured with 20,000 ohm/volt meter.
All voltages DC unless otherwise noted.

All measurements made with no signal input to receiver.
* Must be measured with VTVM with 100,000 ohm composition resistor in series with probe.

CHASSIS REMOVAL—Remove the receiver power cord from the electrical outlet before starting to remove the chassis.

1. Close the tuning condenser by setting to the low end of the band.
2. Remove the four knobs by pulling.
3. Disconnect loop and dipole leads from their respective chassis terminals.
4. Pull the phono-motor plug from the chassis socket.
5. Pull out the phono-pickup plug.
6. Unsolder the speaker leads at the speaker.
7. Remove the four long chassis bolts and slide the chassis out.

NOTE: When reinstalling the chassis, hold the wooden chassis blocks against the chassis and slide the chassis and blocks into the cabinet. The tuning condenser should also be kept closed when handling the chassis.

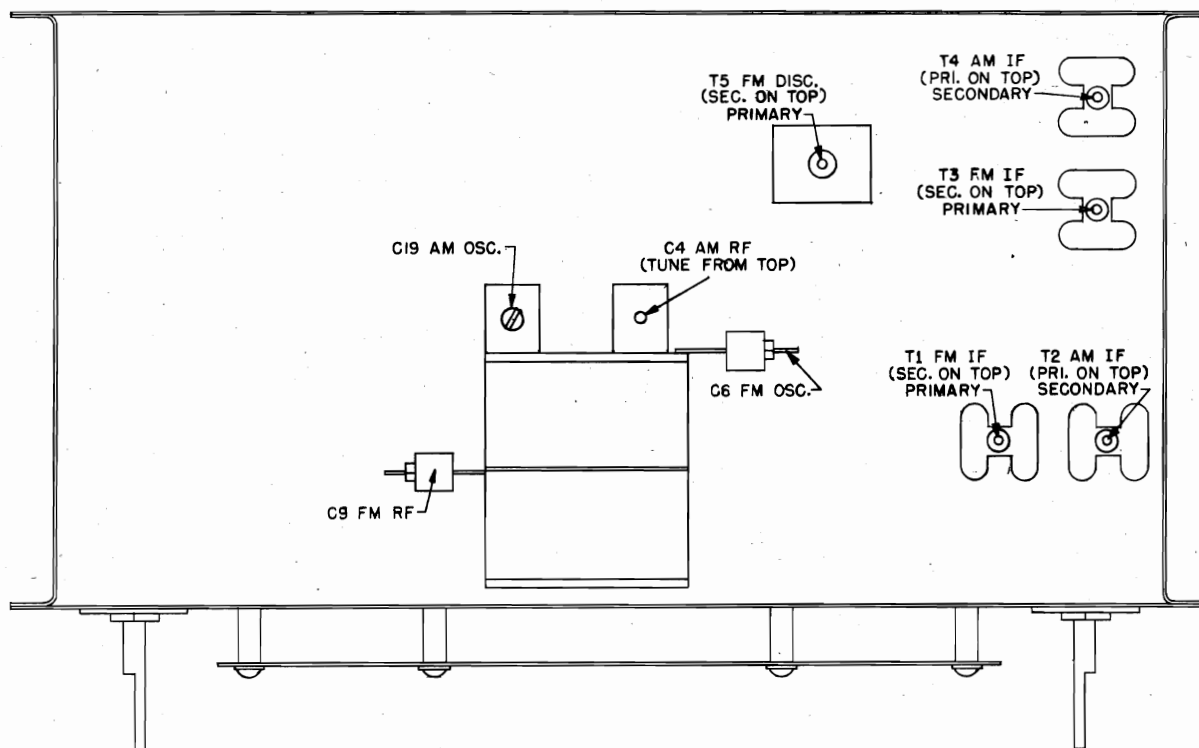


DIAL STRINGING

ALIGNMENT PROCEDURE

The following equipment is necessary to properly align this receiver.

1. AM signal generator, 455 kc to 1650 kc.
2. FM or CW signal generator covering the FM band from 88 mc. to 108 mc. and 10.7 mc. for FM IF.
3. Vacuum Tube Voltmeter (VTVM).
4. Output meter.
5. Insulated alignment screwdriver.
6. Dummy antennas—0.1 mfd. capacitor and two 150 ohm composition resistors.
7. Two 100,000 ohm $\pm 10\%$ composition resistors for ratio detector alignment.



TRIMMER LOCATION—BOTTOM VIEW

THE B. F. GOODRICH COMPANY

MODELS 93-107,
93-108

Notes on Alignment

- 1—Before beginning alignment, the pointer must be set at the highest mark on the dial with the tuning condenser fully open.
- 2—The AM section should be completely aligned before beginning the FM alignment.
- 3—The set should be allowed to warm up 15 minutes before aligning.
- 4—An output meter should be connected across the speaker voice coil for AM alignment. Keep the volume control at maximum on AM and use as low a signal input as possible for AM and FM.
- 5—For AM and FM tracking, bend plates of the variable (RF Section) as required.
- 6—In FM alignment, care must be taken to set the receiver oscillator frequency 10.7 MC above the incoming signal frequency.
- 7—The dummy antenna for FM alignment is two 150 ohm composition resistors; one in series with each generator lead.

RATIO DETECTOR ALIGNMENT

(T1 and T3 should be tuned before tuning T5.)

TUNING T5 PRIMARY

Locate the ratio detector test points A, B, and C on the schematic diagram. Solder two 100,000 ohm composition resistors in series from point "A" to chassis. Connect a VTVM from point "A" to chassis and feed 10.7 MC CW into the FM antenna terminals. Adjust T5 primary (bottom slug) for maximum reading, setting the generator output to give about one volt meter reading. (An insulated aligning tool should be used for this adjustment.)

TUNING T5 SECONDARY

Connect the VTVM probe to point "C" and the VTVM common or ground lead to the junction

of the two 100,000 ohm resistors. Tune T5 secondary until the meter reading reverses polarity. Set the slug at this zero point.

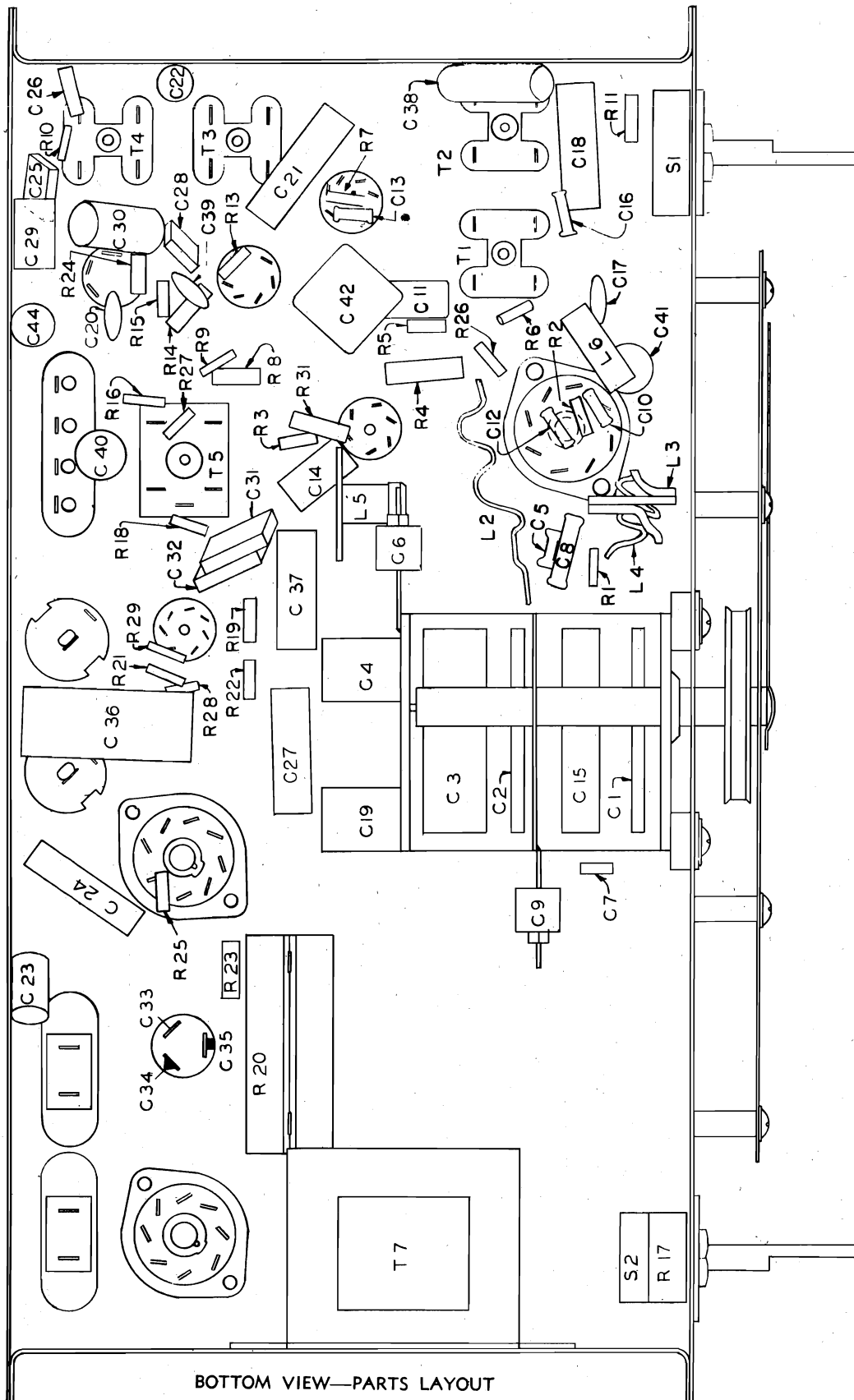
CHECKING BAND WIDTH

Connect the signal generator to the grid of the 2nd FM IF tube. Set the generator to 100,000 microvolts at 10.7 MC CW. Shift the generator frequency above and below 10.7 MC and record the frequencies at which the maximum positive and negative meter readings are obtained. The difference between these two readings is the bandwidth of the ratio detector and should be 250 to 300 KC.

Remove the two 100,000 ohm resistors before beginning the FM RF alignment.

ALIGNMENT CHART

STEP NO.	BAND SWITCH POSITION	SIGNAL GENERATOR	CONNECTION TO RECEIVER	DUMMY ANTENNA	DIAL SETTING	ADJUST	REMARKS
1	AM	455 KC Mod.	6BE6 Conv. Grid Pin 7	0.1 mfd	1600 KC	T2 Pri., Sec., T4 Pri., Sec.	Adjust for Max. output
2	AM	1600 KC Mod.	Ext. Antenna Clip	0.1 mfd	1600 KC	C19 BC Osc. Trimmer	Adjust for Max. output
3	AM	1400 KC Mod.	Ext. Antenna Clip	0.1 mfd	1400 KC	C4 BC RF Trimmer	Adjust for Max. output
4	AM	600 KC Mod.	Ext. Antenna Clip	0.1 mfd	600 KC	See Note 5	See Note 5
5	FM	10.7 MC CW	FM Ant. Terminals	0.1 mfd	107 MC	T1 Pri. & Sec., T3 Pri. & Sec.; T5 Pri. only	Tune for Max. reading, VTVM from point A to chassis. See Ratio Detector Alignment.
6	FM	10.7 MC CW	FM Ant. Terminals	0.1 mfd	107 MC	T5 Sec.	Tune for Zero reading, VTVM from resistor junction to point C. See Ratio Detector Alignment
7	FM	107 MC CW	FM Ant. Terminals	300 ohms See Note 7	107 MC	C6 FM Osc. Trimmer	Adjust for Max. with VTVM from point A to chassis. See Note 6.
8	FM	107 MC CW	FM Ant. Terminals	300 ohms	107 MC	C9 FM RF Trimmer	Adjust for Max. with VTVM from Point A to chassis.
9	FM	98 MC CW	FM Ant. Terminals	300 ohms	98 MC	See Note 5	Adjust for Max. with VTVM from Point A to chassis.
10	FM	88 MC CW	FM Ant. Terminals	300 ohms	88 MC	See Note 5	Adjust for Max. with VTVM from Point A to chassis.



BOTTOM VIEW—PARTS LAYOUT

THE B. F. GOODRICH COMPANY

MODELS 93-107,
93-108

SERVICE PARTS LIST

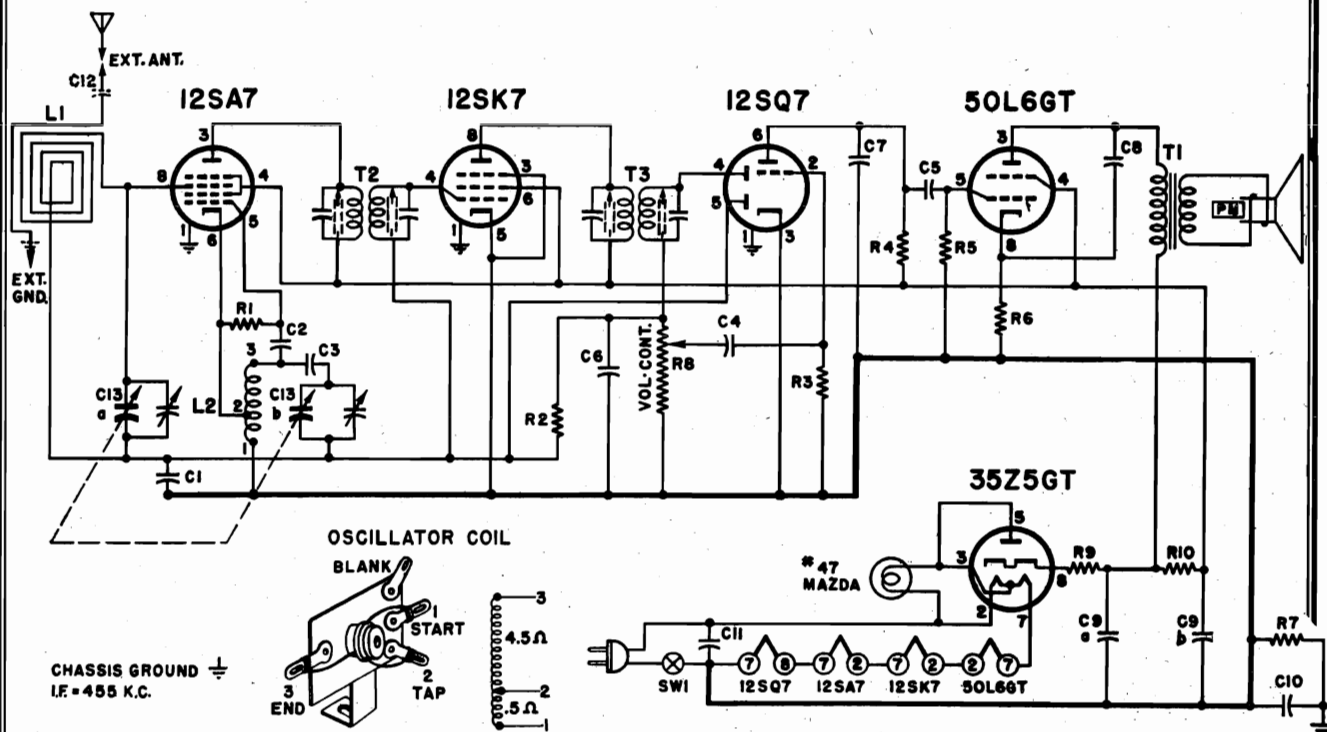
Symbol	Description	Part Number	Symbol	Description	Part Number
C1, C2, C3, C15	Capacitor, 4 Section Variable	4410	R12	Resistor, .5 MEG. Tapped Potentiometer (Vol.)	4814
C4, C19	Capacitor, Trimmer (A.M. Section)	4313	R15, R16, R22	Resistor, .22 MEG. $\pm 20\%$ Composition $\frac{1}{2}$ WATT	4500
C6, C9	Capacitor, Trimmer (F.M. Section)	4318	R17	Resistor, .5 MEG. Potentiometer w/switch (Tone)	4812
C5	Capacitor, 5 MMF. $\pm 10\%$ N750 Ceramic	4028	R18	Resistor, 120 OHM $\pm 10\%$ Composition $\frac{1}{2}$ WATT	4546
C7	Capacitor, 1.5 MMF. $\pm 10\%$ Mica	4024	R20	Resistor, 1500 OHM $\pm 5\%$ w.w. $6\frac{1}{2}$ WATT	4701
C8	Capacitor, 22 MMF. $\pm 10\%$ N150 Ceramic	4021	R21	Resistor, 15,000 OHM $\pm 20\%$ Composition $\frac{1}{2}$ WATT	4521
C10, C12, C13, C42	Capacitor, 1000 MMF. Ceramic Hi-K	4025	R23	Resistor, 400 OHM $\pm 10\%$ Composition 1 WATT	4587
C11, C18, C21, C22, C23	Capacitor, .01 MFD. 400V Paper	4112	R24	Resistor, 4.7 MEG. $\pm 20\%$ $\frac{1}{2}$ WATT	4544
C14, C26	Capacitor, 100 MMF. $\pm 20\%$ Mica	4000	R25	Resistor, .47 MEG. $\pm 20\%$ $\frac{1}{2}$ WATT	4506
C16	Capacitor, 10 MMF. $\pm 10\%$ Ceramic	4027	R28, R29	Resistor, 560 OHM $\pm 10\%$ $\frac{1}{2}$ WATT	4507
C17, C20, C39, C40, C41	Capacitor, 5000 MMF. Ceramic Hi-K	4029	R30	Resistor, 6800 OHM $\pm 10\%$ $\frac{1}{2}$ WATT	4557
C25	Capacitor, 470 MMF. $\pm 20\%$ Mica	4003	L1	Loop Antenna (A.M.)	5279
C27, C24	Capacitor, .002 MFD. 600V. Paper	4118	L2	Oscillator Coil (F.M.)	5247
C28, C31, C32	Capacitor, 270 MMF. $\pm 20\%$ Mica	4001	L3	Antenna Primary (F.M.)	5258
C29	Capacitor, .005 MFD. 600V. Paper	4102	L4	Antenna Secondary (F.M.)	5248
C30, C44	Capacitor, .05 MFD. 400V. Paper	4101	L5	Oscillator Coil (A.M.)	5282
C33	Capacitor, 20 MFD. 25V. Electrolytic	4200	L6	Filament Choke	5266
C34, C35	Capacitor, 20 MFD. 450V. Electrolytic	4200	LS1	Loudspeaker 10" (P.M.)	9054
C36	Capacitor, 5 MFD. 50V. Electrolytic	4209	T1	1st F.M. I.F. Transformer	5284
C37, C43	Capacitor, .02 MFD. 400V. Paper	4106	T2	1st A.F. I.F. Transformer	5286
C38	Capacitor, .05 MFD. 200V. Paper	4100	T3	2nd F.M. I.F. Transformer	5285
R1, R3	Resistor, 22,000 OHM $\pm 20\%$ Composition $\frac{1}{2}$ WATT	4501	T4	2nd A.F. I.F. Transformer	5287
R2	Resistor, 1200 OHM $\pm 10\%$ Composition $\frac{1}{2}$ WATT	4553	T5	Discriminator Ratio Detector	5288
R4	Resistor, 15,000 OHM $\pm 20\%$ Composition 1 WATT	4539	T6	Power Transformer	5012
R5, R6, R9, R26, R27	Resistor, 1500 OHM $\pm 20\%$ Composition $\frac{1}{2}$ WATT	4534	T7	Output Transformer	5122
R7, R13	Resistor, 68 OHM $\pm 20\%$ Composition $\frac{1}{2}$ WATT	4524	S2	On-Off Switch (Part of R17)	
R8, R14	Resistor, 33,000 OHM $\pm 20\%$ Composition 1 WATT	4556	S1	Band Switch	6002
R10, R19	Resistor, 47,000 OHM $\pm 20\%$ Composition $\frac{1}{2}$ WATT	4504		Cabinet, Blonde	7529
R11	Resistor, 2.2 MEG. $\pm 20\%$ Composition $\frac{1}{2}$ WATT	4502		Cabinet, Mahogany	7529
				Dial	2217B
				Escutcheon (with crystal attached)	8084
				Knob, Blonde	3585B
				Knob, Mahogany	3585M
				Plug, Phono	6203
				Pointer, dial	518
				Socket, octal	6105
				Socket, miniature	6118
				Socket, octal	6103
				Socket, phono	6121
				Socket, pilot lamp	6110
				Socket, AC power	6108
				Spring, dial cable	9507
				Strip, antenna terminal	424

NOTE: In some cases the following substitutions have been made:
C24 is two .001 MFD. 600V in parallel.
C27 is two .001 MFD. 600V in parallel.

C42 is 1050 MMF. $\pm 5\%$ Mica.
R8 and R14 are each 47,000 ohm $\pm 20\%$ 1 Watt.
R23 is two 820 ohm $\pm 10\%$ $\frac{1}{2}$ Watt in parallel.

MODELS 92503,
92504

THE B. F. GOODRICH COMPANY



REPLACEMENT PARTS

RESISTORS

Symbol	Part No.
R1... 22,000 Ohms, 1/2 Watt...	60B 8-223
R2... 1 Megohm, 1/2 Watt...	60B 8-105
R3... 47 Megohms, 1/2 Watt...	60B 8-475
R4... 220,000 Ohms, 1/2 Watt...	60B 8-224
R5... 470,000 Ohms, 1/2 Watt...	60B 8-474
R6... 150 Ohms, 1/2 Watt...	60B 8-151
R7... 150,000 Ohms, 1/2 Watt...	60B 8-154
R8... 1 Megohm, Volume Control and Switch SW1...	75B 1-6
R9... 33 Ohms, 1 Watt...	60B 28-3
R10... 1,000 Ohms, 1 Watt...	60B 28-2

CONDENSERS

Symbol	Part No.
C1... .1 mfd., 200 Volts, Paper...	64B 1-30
C2... 50 mmfd., Mica...	65B 7-11
C3... .02 mfd., 400 Volts, Paper...	64B 1-24
C4... .01 mfd., 400 Volts, Paper...	64B 1-25
C5... .01 mfd., 400 Volts, Paper...	64B 1-25
C6... 250 mmfd., Mica...	65B 7-22
C7... 500 mmfd., Mica...	65B 7-27

C8... .02 mfd., 400 Volts, Paper...	64B 1-24
C9a... 50 mfd., 150 Volts, Elect.	67A 10
C9b... 30 mfd., 150 Volts, Elect.	67A 10
C10... .18 mfd., 200 Volts, Paper...	64A 2-2
C11... .05 mfd., 400 Volts, Paper...	64B 1-22
C12... .005 mfd., 600 Volts, Paper...	64B 1-12
(Used in early production only)	
C13a. 0 to 420 mmfd., R.F. Section	
C13b. 0 to 108 mmfd., Osc. Section	
	Gang ...68A 18

COILS & TRANSFORMERS

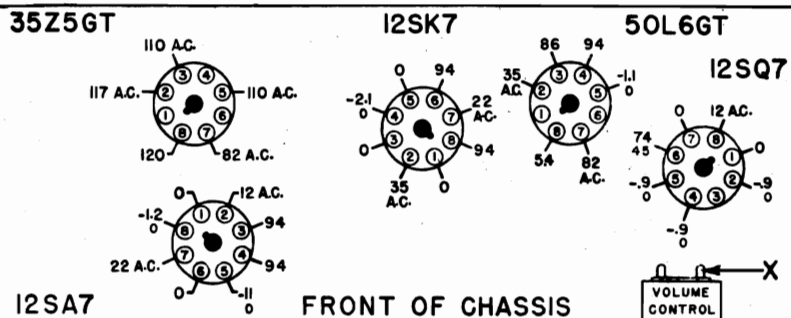
L1... Loop Antenna	69C 44
L2... Oscillator Coil	69A 43
T1... Transformer, Output	98A 4
T2... Transformer, 1st I.F.	72B 50
T3... Transformer, 2nd I.F.	72B 51

MISCELLANEOUS

Description	Part No.
Background, Dial	X22C 3-1

Bracket, Loop Retainer	15A 14
Cabinet, Ivory (Model 92503)	34D 5-1
Cabinet, Mahogany (Model 92504)	34D 5-2
Clip, Dial Glass Mounting	18A 2
Cord, Dial (62")	50A 1-3
Cover, Back and Loop Antenna	69C 44
Dial Scale, Glass	21B 8-2
Drum and Hub Assembly, Dial	A1012
Knob, Ivory (Model 92503)	33A 7-1
Knob, Mahogany (Model 92504)	33A 7-2
Pilot Light No 47	81A 1-8
Pilot Light Socket and Leads	82A 2-4
Pointer, Metal Dial	25A 4-1
Pulley, Fibre Dial	17A 1-3
Shaft, Tuning	28A 1-1
Socket, Laminated Octal Tube	87A 10-2
Speaker (5" PM) and Output Trans.	78B 4-4
Spring, Dial Cord Tension	19B 1-7
Washer, Fibre Flat	5A 1-6
Washer, Fibre Offset	5A 2-5
Washer, C.	4A 4-8
Washer, Spring	4A 6-3-0

VOLTAGE DATA



Bottom View of Chassis, Showing Voltages

- Readings made between point indicated and Volume Control Lug (Point "X" on drawing).
 - Measured on a 117 Volt A.C. line.
 - Dial turned to low frequency end, no signal.
 - Measured with vacuum tube voltmeter.
- A second voltage reading is shown made with a 1000 ohm - per-volt meter when use of this instrument would result in appreciably lower readings.

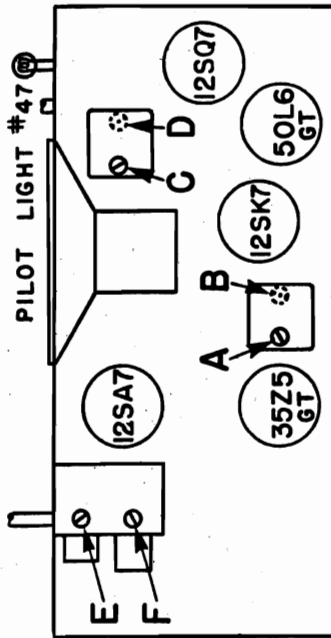
THE B. F. GOODRICH COMPANY

MODELS 92503,
92504

ALIGNMENT PROCEDURE

- Check setting of Pointer Extremes and note correct 600 K.C. and 1400 K.C. positions on Dial Background. (See Dial Diagram.)
- Connect the signal generator ground lead through a .1 mfd. condenser to B—(point "X" on voltage chart).
- Connect Output Meter across Voice Coil of Speaker.
- Turn Receiver Volume Control full on.
- Use lowest Output setting of Signal Generator capable of producing adequate Output Meter indication and then proceed as outlined in chart below.
- Repeat adjustments to insure good results.

TOP VIEW TUBE AND TRIMMER LOCATION



BACK OF CHASSIS

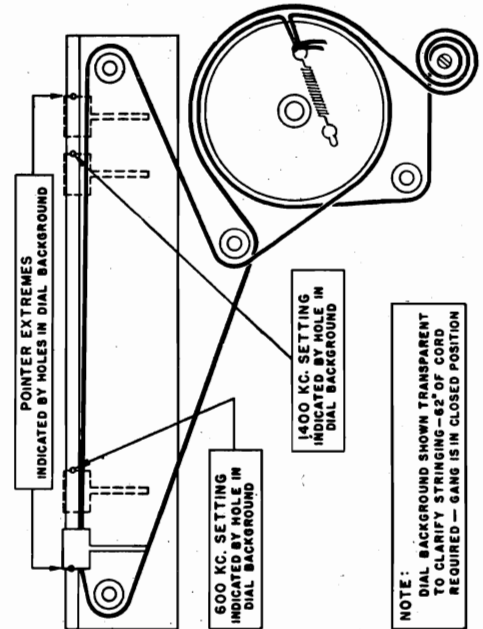
Connect Signal Generator to—	Dummy Antenna Between Radio and Generator	Set Generator Frequency to—	Set Receiver Dial Frequency to—	Adjust Following Trimmers	Type of Adjustment
Tuning Condenser Antenna Stator	250 mmfd. Condenser	455 KC.	High frequency end of Dial	C—D 2nd I. F. A—B 1st I. F. (See note below)	Adjust to maximum Output
Tuning Condenser Antenna Stator	250 mmfd. Condenser	1630 KC.	High frequency end of Dial	E—Oscillator	Adjust to maximum Output
Loop radiator (or place pickup lead from generator close to loop of set to obtain adequate signal).	No actual connection between set and generator.	1400 KC.	Tune in generator signal	F—Antenna	Adjust to maximum Output

NOTE: The B and D adjustments are made from the underside of the chassis.

POWER SUPPLY

This receiver is designed to operate from any AC (Alternating Current) power supply main of 110-120 volts, 50-60 cycles or DC (Direct Current) power supply main of 110-120 volts. If the receiver fails to operate on DC (Direct Current), reverse the power line plug.

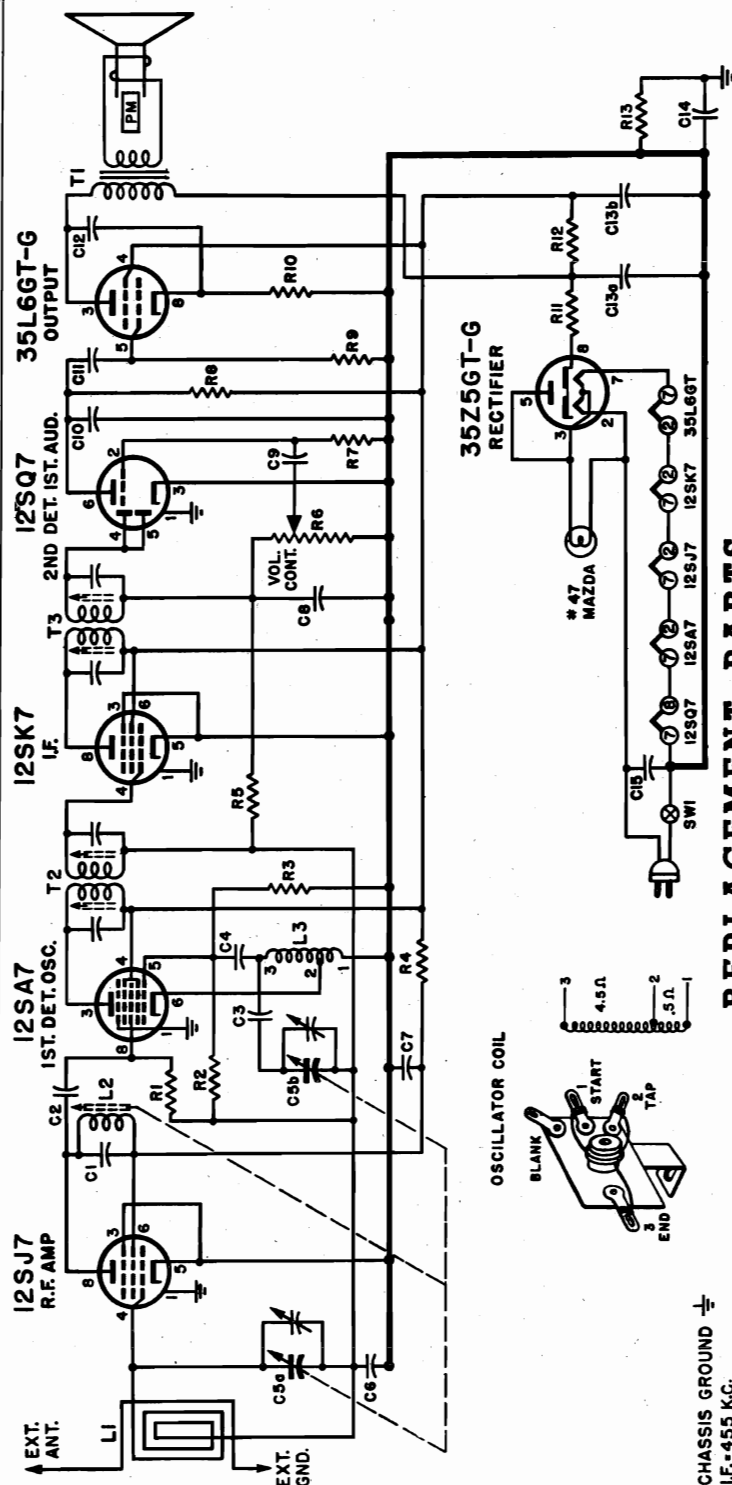
On AC only the line plug should be tried both ways and left in the position that gives minimum hum.



DIAL STRINGING AND POINTER SETTINGS

MODELS 92505,
92506

THE B. F. GOODRICH COMPANY



REPLACEMENT PARTS

Buttons, Snap (for R.F. Coil).....	13A 1-2-2
Cabinet, Ivory (Model 92505).....	34D 8-1
Cabinet, Mahogany (Model 92506).....	34D 8-2
Clip, Dial Glass.....	18A 2
Cord, Dial.....	50A 1-3
Cover, Back (Incl. Loop Antenna).....	69C 44
Dial Scale, Glass.....	21B 10-2
Drum and Cam Assembly.....	A1049
Knob, Mahogany (Model 92505).....	33A 7-2
Knob, Ivory (Model 92506).....	33A 7-1
Lever Arm Assembly (R.F.).....	A1050
Pilot Light No. 47.....	81A 1-8
Pilot Light Socket and Leads.....	82A 2-3
Pointer.....	25A 13-1
Pulley, Fibre: 1/2x1/2" OD.....	17A 1-3
Screw, Set: 8/32x1/2" (Dial Drum).....	18A 1-3
Shaft, Tuning.....	28A 1-1
Slug, R.F. Iron Core (with wire).....	71B 1-2
Socket, Octal Tube.....	87A 10-2
Specter (5" PM) and Transformer.....	78B 4-4
Spring, Tension (Dial).....	19B 1-3
Spring, Lever Arm (R.F.).....	19A 4
Spacer, T (R.F.).....	29A 2-3-21
Stud, Cug Adj. (R.F.).....	27A 4
Washer, C (Tuning Shaft).....	4A 4-6
Washer, Spring (Tuning Shaft).....	4A 6-3-0

C6.....	1 mfd., 200 Volts, Paper.....	64B 1-30
C7.....	.05 mfd., 400 Volts, Paper.....	64B 1-22
C8.....	.250 mfd., Mica.....	65B 7-22
C9.....	.01 mfd., 400 Volts, Paper.....	64B 1-25
C10.....	500 mfd., Mica.....	65B 7-27
C11.....	.01 mfd., 400 Volts, Paper.....	64B 1-25
C12.....	.02 mfd., 400 Volts, Paper.....	64B 1-24
C13a.....	50 mfd., 150 Volts, Elect.....	67A 10
C13b.....	30 mfd., 150 Volts, Paper.....	64A 2-2
C14.....	.18 mfd., 200 Volts, Paper.....	64B 1-22
C15.....	.05 mfd., 400 Volts, Paper.....	64B 1-22

COILS & TRANSFORMERS

L1.....	Loop Antenna.....	69C 44
L2.....	R.F. Coil and Mounting.....	A1052
L3.....	Oscillator Coil.....	69A 43
T1.....	Transformer, Output.....	98A 4
T2.....	Transformer, 1st I.F.....	72B 50
T3.....	Transformer, 2nd I.F.....	72B 51

MISCELLANEOUS

Description	Part No.
Background, Dial.....	X22C3-1
Bracket Plate, Loop Retainer.....	15A 14

RESISTORS

Symbol		Part No.
R1.....	10,000 Ohms, 1/2 Watt.	60B 8-103
R2.....	10 Megohms, 1/2 Watt.	60B 8-106
R3.....	22,000 Ohms, 1/2 Watt.	60B 8-223
R4.....	100 Ohms, 1/2 Watt.	60B 8-101
R5.....	1 Megohm, 1/2 Watt.	60B 8-105
R6.....	1/2 Megohm, Volume Control & Switch	75B 1-6
R7.....	4.7 Megohms, 1/2 Watt.	60B 8-475
R8.....	270,000 Ohms, 1/2 Watt.	60B 8-274
R9.....	470,000 Ohms, 1/2 Watt.	60B 8-474
R10.....	150 Ohms, 1/2 Watt.	60B 8-151
R11.....	33 Ohms, 1 Watt.	60B 28-3
R12.....	1,000 Ohms, 1 Watt.	60B 28-2
R13.....	150,000 Ohms, 1/2 Watt.	60B 8-154

CONDENSERS

Symbol	Part No.
C1..... 785 mmfd., ±5%, Silver Mica.....	65B 1-8
C2..... 250 mmfd., Mica.....	65B 7-22
C3..... .02 mfd., 400 Volts, Paper.....	64B 1-24
C4..... .50 mmfd., Mica.....	65B 7-11
C5a..... 0 to 420 mmfd.	} Gang..... 68A 18
C5b..... 0 to 108 mmfd.	

THE B. F. GOODRICH COMPANY

MODELS 92505,
92506

TOP VIEW

TUBE & TRIMMER LOCATION

ALIGNMENT PROCEDURE

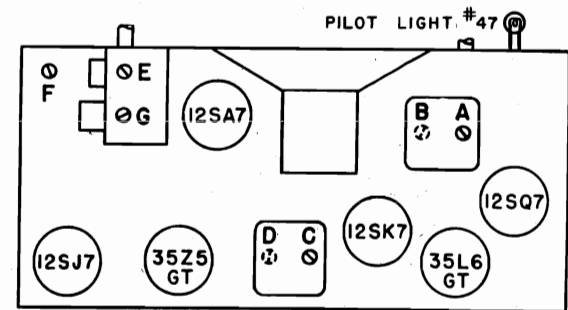
Check setting of Pointer Extremes and note correct 600 K.C. and 1400 K.C. positions on Dial Background. (See Dial Diagram.)

Connect Output Meter across Voice Coil of Speaker.

Turn Receiver Volume Control full on.

Use lowest Output setting of Signal Generator capable of producing adequate Output Meter indication and then proceed as outlined in chart below.

Repeat adjustments to insure good results.

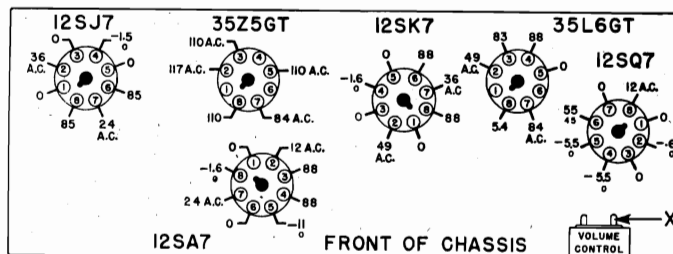


Connect Signal Generator To—	Dummy Antenna Between Radio and Generator	Set Generator Frequency To—	Set Receiver Dial Frequency To—	Adjust Following Trimmers	Type of Adjustment
12SA7 Control Grid	250 mmfd. Mica Condenser	455 KC.	High frequency end of Dial	A and B—2nd I. F. C and D—1st I. F. (See Note 1 below)	Adjust to maximum Output
External Antenna Wire on Loop	250 mmfd. Mica Condenser	1630 KC.	High frequency end of Dial	E—Osc.	Adjust to maximum Output
External Antenna Wire on Loop	250 mmfd. Mica Condenser	1400 KC.	Tune in Generator signal	F—R. F. (Iron Core)	See Note 2 Below
Loop radiator (or place lead from generator close to loop of set to obtain adequate signal).	No actual connection between set and generator.	1400 KC.	Tune in Generator signal	G—Ant.	Adjust to maximum Output

NOTE 1: The B and D adjustments are made from the underside of the chassis.

NOTE 2: Adjustment F is the threaded stud at the top end of the slug wire. Screw stud up or down in the bakelite for maximum output. Alignment is correct if the output is reduced when the position of the lever arm is changed slightly in either direction (up or down).

VOLTAGE DATA



Bottom View of Chassis, Showing Voltages

- Readings made between point indicated and Volume Control Lug (Point "X" on drawing).
- Measured on a 117 Volt A.C. line.
- Dial turned to low frequency end, no signal.
- Measured with Vacuum Tube voltmeter.
- A second voltage reading is shown made with a 1000 ohm-per-volt meter when use of this instrument would result in appreciably lower readings.

DIAL DRUM POSITION

If the dial drum position is disturbed, it should be carefully re-positioned to insure correct tuning of the permeability tuned coil. With the gang fully meshed, the drum will be properly positioned if the center of the condenser shaft and the dial cable hole on the drum are in a straight line parallel to the chassis base. Note that the dial cable hole should be on the right side (looking at front) of the chassis.

R.F. SLUG POSITION

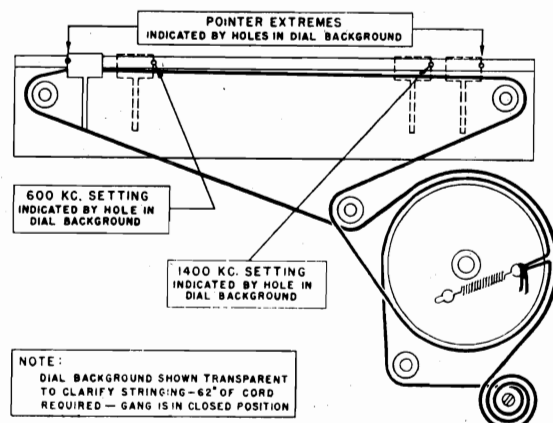
If the tuned coil slug needs replacing or re-positioning, first see that the dial drum is in its proper position. Then with the gang condenser fully meshed and the threaded stud half-way through the bakelite, note that the top of the slug is flush with the top of coil form. Then re-align.

POWER SUPPLY

This receiver is designed to operate from any AC (Alternating Current) power supply main of 110-120 volts, 50-60 cycles or DC (Direct Current) power supply main of 110-120 volts. If the receiver fails to operate on DC (Direct Current), reverse the power line plug.

On AC only the line plug should be tried both ways and left in the position that gives minimum hum.

DIAL STRINGING AND POINTER SETTINGS



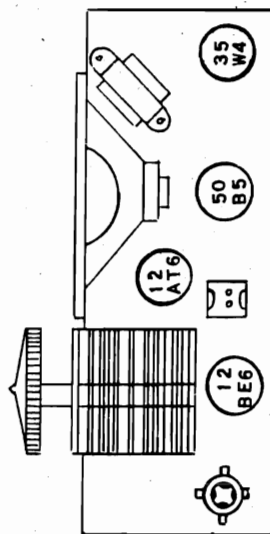
MODELS 92514,
92515, CHASSIS AG

THE B. F. GOODRICH COMPANY

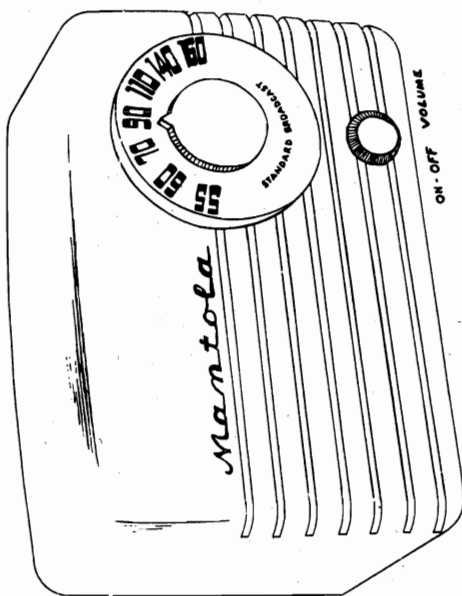
POWER SUPPLY

This receiver is designed to operate on either an A.C. or D.C. power supply. The following operation ratings should be observed:

Voltages 105-125 Volts, A.C. or D.C.
Frequency 50 to 60 cycles on A.C.



Remove back to replace tubes

**ALIGNMENT PROCEDURE**

- Output meter across 3.5 ohm output load.
- Volume control at maximum for all adjustments.
- Align for maximum output. Reduce input as needed to keep output near 0.4 volts.

SIGNAL GENERATOR			SETTING TUNER	ADJUST TRIMMERS TO MAXIMUM OUTPUT (in order shown)
Frequency	Coupling Factor	Connection to Receiver Ground Connection		
455 kc	.1 mfd	12BE6 Grid B—	Rotor full open (Plates out of mesh)	Input and output trimmers on IF cans
1620 kc	.1 mfd	12BE6 Grid B—	Rotor full open (Plates out of mesh)	Oscillator trimmer T2
1400 kc	75 mmf	Hank B—	1400 kc	Antenna trimmer T1

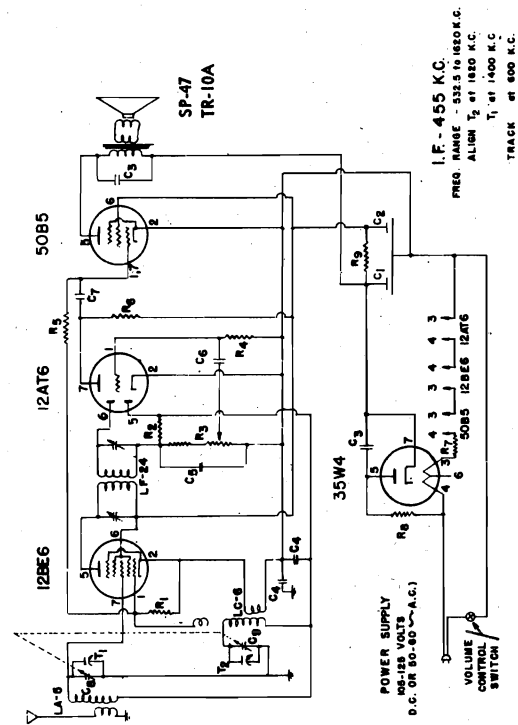
THE B. F. GOODRICH COMPANY

MODELS 92514,
92515, CHASSIS AG**REPLACEMENT PARTS LIST**

Ref. No.	Part No.	Description
CAPACITORS		
C1, C2	CE-15	2 x 40 mfd 150V. Elect.
C3	CP203-1	.02 mfd 400V paper cond.
C4	CP503-4	.05 mfd 200V paper cond.
C5	CM151-1	.00015 mfd 500V paper cond.
C6	CP202-2	.002 mfd 400V paper cond.
C7	CP502-3	.005 mfd 200V paper cond.
C8, C9	CV-14	Variable Condenser (2 gang)
RESISTORS		
R1	RC183-2	18,000 ohms $\frac{1}{2}$ W 10%
R2	RC475-1	4.7 megohms $\frac{1}{2}$ W 20%
R3	VC-11	2 meg. vol. cont., 100 K Stop
R4	RC106-1	10 megohms $\frac{1}{2}$ W 20%
R5	RC334-1	330,000 ohms $\frac{1}{2}$ W 20%
R6	RC224-1	220,000 ohms $\frac{1}{2}$ W 20%
R7	RW390-5	39 ohms 1W 10%
R8	RC180-1	18 ohms $\frac{1}{2}$ W 20%
R9	RC222-5	2200 ohms 1W 10%
COILS & TRANSFORMERS		
	LA-5	Antenna Coil
	LC-6	Oscillator Coil
	LF-24	I.F. Transformer
	TR-10A	Output Transformer
MISCELLANEOUS		
	CB-116	Cabinet (specify Ivory or Mahogany)
	KN-20-2	Knob
	KN-25-2	Pointer Knob
	SP-47	4" PM Speaker

ELECTRICAL SPECIFICATIONS

Power Supply	105-125 Volts D.C. or 50-60 Cycles A.C. 30 Watts
Frequency Range	532.5 to 1620 kc.
Intermediate Freq.	455 kc.
Tuning	Two gang capacitor
Speaker	4 inch PM 3.5 ohm voice coil impedance
Power Output	1 watt undistorted 1.5 watt maximum
Sensitivity	800 Microvolts at 50 milli-watts Output
Selectivity	120 kc broad at 1000 times signal at 1000 kc.



CHASSIS SERIES "AG"

MODELS 92516,
92517

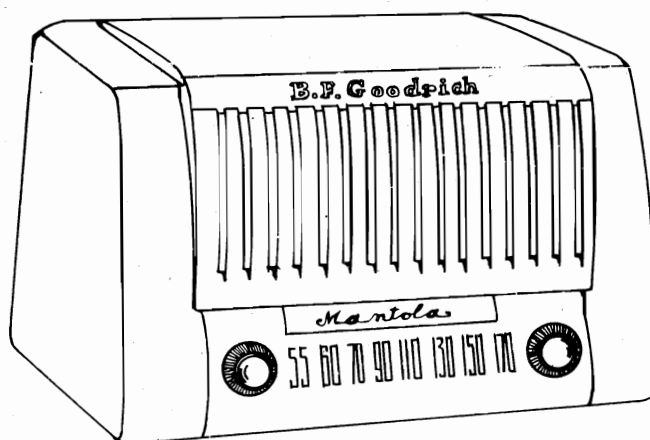
THE B. F. GOODRICH COMPANY

POWER SUPPLY

This receiver is designed to operate on either an A.C. or D.C. power supply. The following operation ratings should be observed:

Voltages.....105 - 125 Volts, A.C. or D.C.

Frequency.....50 to 60 cycles on A.C.



VOLUME CONTROL
AND
ON-OFF SWITCH

DIAL TUNING
KNOB

ALIGNMENT PROCEDURE

- Output meter across 3.5 ohm output load.
- Volume control at maximum for all adjustments.
- Align for maximum output. Reduce input as needed to keep output near 0.4 volts.

SIGNAL GENERATOR				SETTING TUNER	ADJUST TRIMMERS TO MAXIMUM OUTPUT (in order shown)
Frequency	Coupling Factor	Connection to Receiver	Ground Connection		
455 kc	.1 mfd	12BE6 Grid	B—	Rotor full open (Plates out of mesh)	Input and output trimmers on IF cans
1700 kc	.1 mfd	12BE6 Grid	B—	Rotor full open (Plates out of mesh)	Oscillator trimmer T2
1500 kc		Radiating Loop		1500 kc	Antenna trimmer T1

MODEL 92752,
CHASSIS W

THE B. F. GOODRICH COMPANY

TUBES

Be sure each of the tubes is in place and inserted firmly in its socket.

The tube location of each tube is shown on the card attached to the back of the cabinet. Your receiver is equipped and tested at the factory with the tubes that are shipped with it.

POWER SUPPLY

This receiver is designed to operate on either an A.C. or D.C. power supply. The following operation ratings should be observed:

Voltages.....105 - 125 Volts, A.C. or D.C.

Frequency.....50 to 60 cycles on A.C.

If in doubt as to the voltage and frequency supplied to your home, telephone your local Power Company.

When operating on a D.C. source, it is necessary to insert the power plug with the proper polarity. If the set fails to function after an interval sufficient for the tubes to reach their operating temperature, reverse the power plug in the outlet.

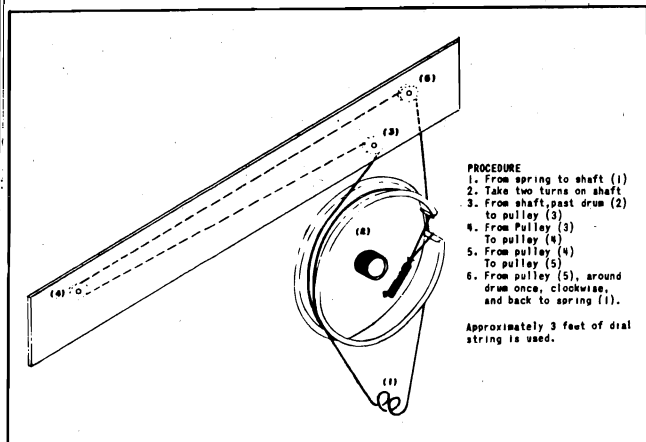
The battery supply to be used with this receiver is as follows:

"A" supply 71½ volts.
Use five type "D" flashlight cells.

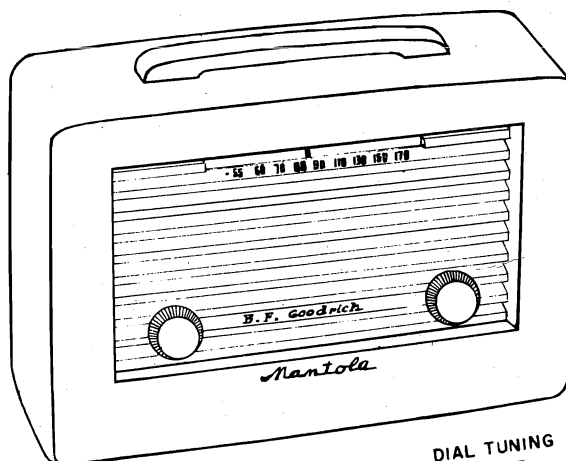
"B" supply 67½ volts.
Use B.F. Goodrich No. R35, Ray-O-Vac No. 4367 or equivalent.

ANTENNA SYSTEM

This receiver is equipped with a loop antenna system, which obviates the necessity of using an antenna connection for receiving most local and some distant stations.



Replacement of Drive Cord



VOLUME CONTROL
AND
ON-OFF SWITCH

DIAL TUNING
KNOB

When tuning Broadcast Stations, it may be found advisable to rotate the radio about its position of rest until the most distant station regularly enjoyed is heard the clearest. In some vicinities where there is a localized noise interference prevalent, it is best to rotate the radio cabinet to a position which gives a minimum of noise.

OPERATION

TO OPERATE ON AC OR DC

Switch to electric on the slide switch located at the back of the set.

Plug the line cord into the nearest convenient wall outlet through the opening provided in the back.

TO OPERATE ON BATTERIES

To operate on batteries switch to batteries on the slide switch and store the line cord in the space provided.

THE B. F. GOODRICH COMPANY

MODEL 92752,
CHASSIS W**VOLUME CONTROL and POWER SWITCH**

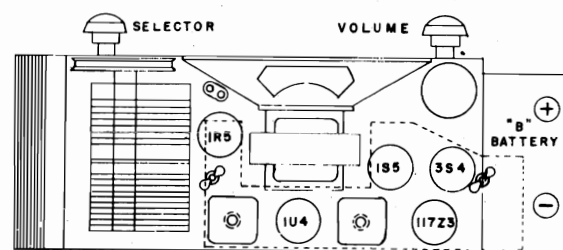
The volume control and power switch are operated by a common control knob at the left of the cabinet. When the control is in extreme counter-clockwise position, the receiver power is off. From this position a slight clockwise rotation will turn the power on and by further clockwise rotation, volume may be increased until the full output of the receiver is obtained. To conserve batteries and tubes, be sure that the receiver is turned off when it is not in use.

TUNING CONTROL

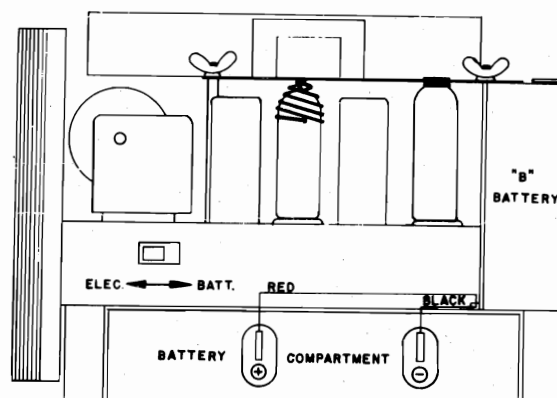
The knob at the right is the tuning control. Stations are tuned manually by turning this tuning control. The dial calibration numbers are in tenths of the actual kilocycle readings. To convert these calibrations to kilocycles, as is shown in most radio log books, add a "0" to the end of each number. After the desired station is heard, adjust this knob to the point of maximum volume and most realistic reproduction. This position of exact tune is very important as it is only when the receiver is in this position that the full, rich tone is available. The volume control may now be set to give the desired volume.

MAINTENANCE**CAUTION**

Always remove the power cord from its receptacle before starting to replace tubes or batteries.



TO REPLACE TUBES, UNSCREW WING NUTS, AND REMOVE TUBE SPRING PLATE



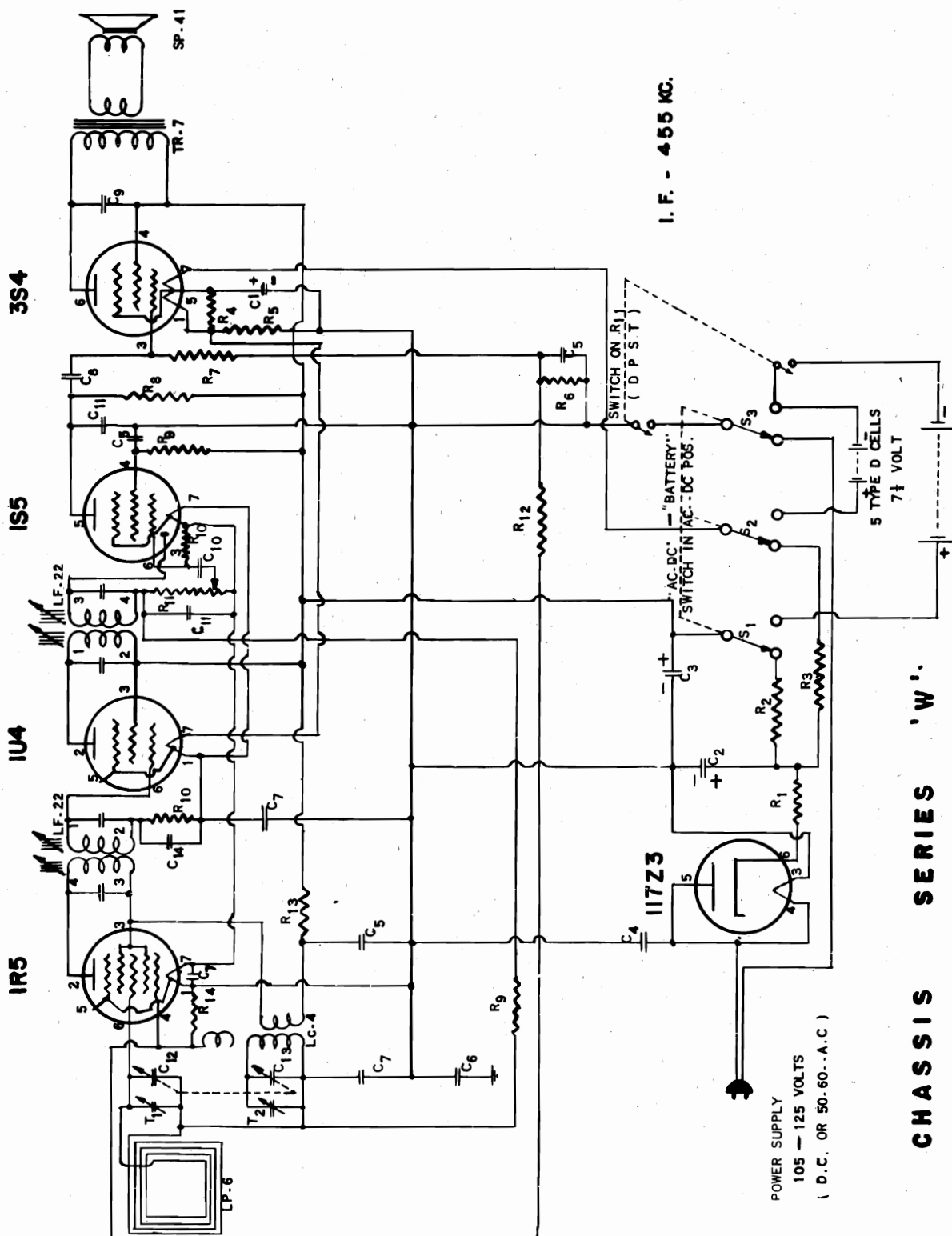
Do not allow cells which have become too weak to operate the set properly to remain in the set for any length of time.

REPLACEMENT OF TUBES

To replace tubes, remove the two wing nuts which hold the tube spring plate and lift off the plate. Replace the plate and wing nuts after removal of old tubes.

ELECTRICAL SPECIFICATIONS

Power Supply	105-125 volts DC or 50-60 cycles AC 15 watts
Batteries	A—7½ volts. 50 ma. B—67½ volts. 8 ma. average.
Frequency Range	530 to 1700 kc.
Intermediate Freq.	455 kc.
Tuning	Two-gang capacitor
Antenna	Built-in loop
Speaker	4 inch PM; voice coil Impedance 3.5 ohms.
Power Output	80 milliwatts undistorted 140 milliwatts maximum
Sensitivity	500 microvolts per meter for 50 milliwatt output
Selectivity	55 kc broad at 1000 times signal at 1000 kc.



B. F. GOODRICH No. R35. RAY-O-VAC No. 4367
67½ VOLT OR EQUIVALENT

THE B. F. GOODRICH COMPANY

MODEL 92752,
CHASSIS W**ALIGNMENT PROCEDURE**

- Output meter across 3.5 ohm output load.
- Volume control at maximum for all adjustments.

- Align for maximum output. Reduce input as needed to keep output near 0.4 volts.

SIGNAL GENERATOR				SETTING TUNER	ADJUST TRIMMERS TO MAXIMUM OUTPUT (in order shown)
Frequency	Coupling Factor	Connection to Receiver	Ground Connection		
455 kc	.1 mfd	1R5 Grid	B—	Rotor full open (Plates out of mesh)	Input and output trimmers on IF cans
1700 kc	.1 mfd	1R5 Grid	B—	Rotor full open (Plates out of mesh)	Oscillator trimmer T2
1500 kc		Radiating Loop		1500 kc*	Antenna trimmer T1

* Five markings on the dial bracket represent respectively 530 kc., 600 kc., 1000 kc., 1500 kc., and 1700 kc., reading from left to right. These points are to be used for the alignment of the receiver.

REPLACEMENT PARTS LIST

When ordering parts, specify part number, and model number.

Ref. No. Part No. Description

CAPACITORS

C1, {	CE-12	{ 125 mfd, 10 volt }	{ Electrolytic
C2, C3, }			
C4	CP-503-1	.05 mfd, 400 volt, paper	
C5	CP-103-2	.01 mfd, 150 volt, paper	
C6	CP-104-2	.1 mfd, 200 volt, paper	
C7	CP-503-2	.05 mfd, 150 volt, paper	
C8	CP-202-3	.002 mfd, 200 volt, paper	
C9	CP-502-2	.005 mfd, 400 volt, paper	
C10	CP-102-3	.001 mfd, 200 volt, paper	
C11	CM-101-1	.0001 mfd, 300 volt, mica	
C12, C13	CV-10	Variable condenser, 2 gang	
C14	CP-103-4	.01 mfd, 100 volt, paper	

RESISTORS

R1	RC-180-1	18 ohms,	1/2 watt 20%
R2	RC-682-5	6800 ohms,	1 watt 10%
R3	RP-2	2650 ohms,	10 watt 5%
R4	RC-471-1	470 ohms,	1/2 watt 20%
R5	RC-821-2	820 ohms,	1/2 watt 10%
R6	RC-274-2	270,000 ohms,	1/2 watt 10%
R7	RC-225-1	2.2 megohms,	1/2 watt 20%
R8	RC-105-1	1 megohm,	1/2 watt 20%
R9	RC-335-1	3.3 megohms,	1/2 watt 20%
R10	RC-106-1	10 megohms,	1/2 watt 20%
R11	VC-6	1 meg. vol. control with switch	
R12	RC-105-2	1 megohm,	1/2 watt 10%
R13	RC-153-1	15,000 ohms,	1/2 watt 20%
R14	RC-104-2	100,000 ohms,	1/2 watt 10%

Ref. No. Part No. Description

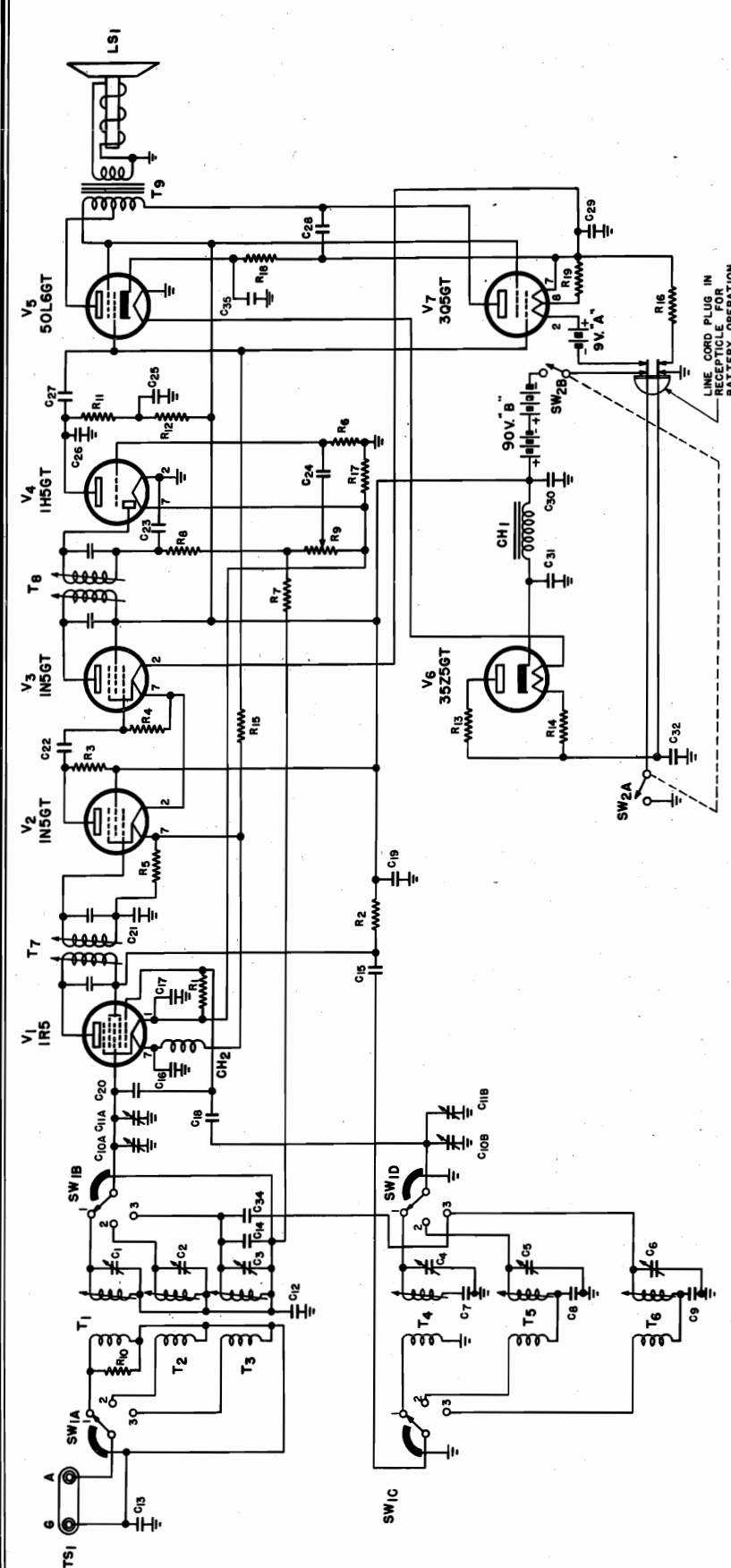
COILS AND TRANSFORMERS

LC-4	Oscillator coil
LF-22	IF transformer
LP- 6	Loop antenna
TR- 7	Output transformer

MISCELLANEOUS

S1, S2, S3	SW-10	Three Pole Single Throw Switch
	SP-41	4 inch P.M. speaker
	PN-6	Pointer
	CR-2	Drive cord
	SG-1	Spring for drive cord
	KN-20-6	Knob
	BK-20	Cabinet back (with hardware)
	CB-117	Assembled cabinet (without back and handle)
	HA-2	Handle for cabinet (with springs and pins)
	AS-1	Assembled battery box

THE HALLICRAFTERS CO.

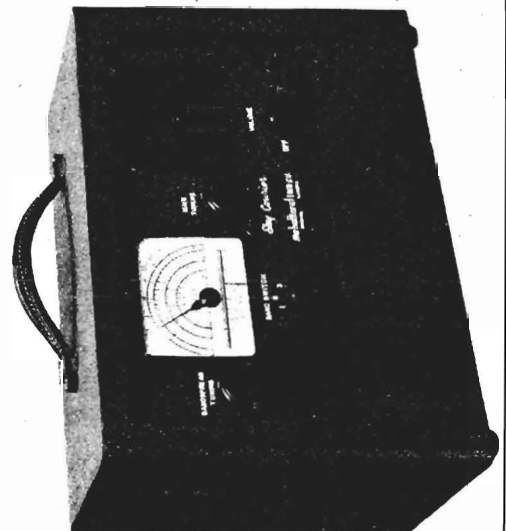
MODEL RE-1,
Sky Courier

Note: When operating from a 110/125 volt direct current source, it may be necessary to turn the line plug around in the wall socket before the set will operate.

CAUTION: Remove run-down batteries from their compartment to avoid corrosion resulting from the deteriorating cells.

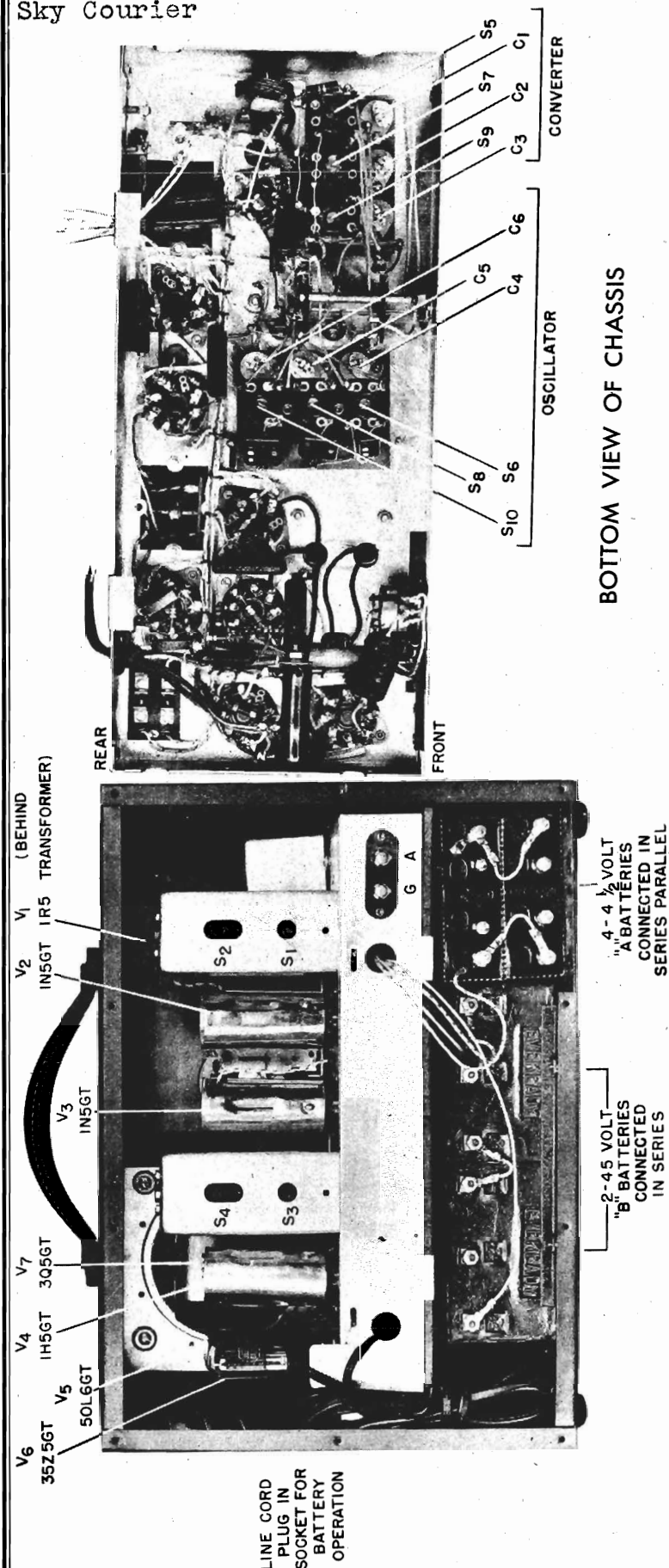
BATTERY REPLACEMENT

Replace "B" batteries with Burgess #5308 or equivalent.
Replace "A" batteries with four Burgess #2370 Standard Terminal Type or two Burgess G3 Plug Type or equivalent.



MODEL RE-1,
Sky Courier

THE HALLICRAFTERS CO.



BOTTOM VIEW OF CHASSIS

ALIGNMENT AND SERVICE

REAR VIEW—COVER REMOVED

EQUIPMENT REQUIRED -

- (1) Signal generator covering 455 KC. to 20 MC. and equipped to provide a 400 cycle modulated signal.
- (2) Non-metallic screw driver.
- (3) Output meter.
- (4) 0.1 mfd. condenser.
- (5) 100 mmfd. condenser.
- (6) 25 ohm non-inductive resistor.
- (7) 400 ohm non-inductive resistor.

THE HALLICRAFTERS CO.

MODEL RE-1,
Sky Courier

I-F ALIGNMENT -

- (1) Connect the "hot" lead of the signal generator to the stator of the front section of the gang condenser through the 0.1 mfd. condenser. Connect the ground lead of the generator to the ground terminal on the antenna terminal strip.

CAUTION - Do not ground the chassis of the receiver directly, make all ground connections to the G terminal of the terminal strip.

- (2) Connect the output meter across the speaker terminals.
- (3) Turn on the receiver and set the VOLUME control at maximum volume.
- (4) Set the BAND SWITCH at BAND 2. and set the MAIN TUNING dial at approx. 7 MC.
- (5) Set the signal generator at 455 KC. and turn on the 400 cycle modulation.
- (6) Adjust i-f transformer slugs S_1 , S_2 , S_3 and S_4 for maximum output. Refer to the rear view of the receiver for location of the slug adjustments.

R-F ALIGNMENT -

- (1) Connect the "hot" lead of the signal generator to the antenna terminal through the dummy antenna specified in the chart. Leave the ground lead of the generator connected to the ground terminal of the antenna terminal strip.
- (2) Leave the output meter connected as for i-f alignment.
- (3) Set the VOLUME control for maximum volume.
- (4) Set the BAND SWITCH, MAIN TUNING dial, signal generator, trimmer condenser, and slug adjustments as follows:

SET BAND SWITCH	USE DUMMY ANT.	SET RECEIVER & SIGNAL GENERATOR	SET TRIMMER FOR MAX. OUTPUT	SET SLUG FOR MAX. OUTPUT
1	100 mmfd. condenser and 25 ohm resistor	1500 KC.	C_1 and C_4	-
1		600 KC.	-	S_5 and S_6
2		7 MC.	C_2 and C_5	-
2		3 MC.	-	S_7 and S_8
3	400 ohm resistor	18 MC.	C_3 and C_6	-
3		9 MC.	-	S_9 and S_{10}

NOTE: Refer to rear and bottom views of the receiver for location of adjustment screws.

MODEL RE-1,
Sky Courier

THE HALLICRAFTERS CO.

LIST OF REPLACEABLE PARTS (Cont'd.)

REF. SYMBOL	NAME OF PART AND DESCRIPTION	FUNCTION	MFG. CODE	COUNTRY PART NO.
C ₈	CAPACITOR, fixed, 1500 mfd., $\pm 10\%$, 500 V. D-C working, mica dielectric, humidity resistant	Padder for transformer T ₅	ASA	CM20E152K
C ₉	CAPACITOR, fixed, 3900 mfd., $\pm 10\%$, 500 V. D-C working, mica dielectric, humidity resistant	Padder for transformer T ₆	ASA	CM20E392K
C _{10A}	CAPACITOR, 2 sections, gaged, section #1 (C _{10A}) min. cap. 39.7 mfd., max. cap. 333.4 mfd., air dielectric, section #2 (C _{10B}) min. cap. 33.9 mfd., max. cap. 333.3 mfd., air dielectric; bandspread (C _{10A} and C _{10B}) consists of a single rotor plate for each section; three 6-32 NC-249/32" spade bolts mount assembly (2 on front frame 7/8" apart, 1 centered on rear frame 2-1/8" from front frame); a stamped sheet metal pulley 2-1/8" O.D. is fixed to the main gmg and bandspread gmg shafts.	Transformers T ₁ , T ₂ , T ₃ main tuning Transformers T ₄ , T ₅ , T ₆ main tuning Transformers T ₁ , T ₂ , T ₃ bandspread tuning Transformers T ₄ , T ₅ , T ₆ bandspread tuning	OM Special	48C125
C ₁₂	CAPACITOR, fixed, .005 mfd., $\pm 10 \times 40\%$, 600 V. D-C working, paper dielectric, molded case, Same as C ₁₉	A-V-C by-pass	MIC type 346	46ME203J
C ₁₃	CAPACITOR, fixed, .01 mfd., $\pm 10 \times 40\%$, 600 V. D-C working, paper dielectric, molded case. Same as C ₁₂	D-C voltage block between chassis and ground	MIC type 342	46ME103J
C ₁₄	CAPACITOR, fixed, 20 mfd., $\pm 20\%$, 500 V. D-C working, ceramic dielectric, 0.00075 mfd./mfd./degree Cent. temp. coeff.	Trimmer for transformer T ₃ secondary	ASA	JC220JN200E
C ₁₅	CAPACITOR, fixed, .005 mfd., $\pm 20\% \times 60\%$, 400 V. D-C working, paper dielectric, molded case. Same as C ₁₂	Coupling between oscillator inductance and plate circuit of tube V ₁	ASA	CM548602
C ₁₆	CAPACITOR, fixed, .25 mfd., $\pm 10 \times 40\%$, 200 V. D-C working, paper dielectric, molded case	Filament by-pass for tube V ₁	MIC type 342	46ME254J
C ₁₇	CAPACITOR, fixed, .1 mfd., $\pm 10 \times 40\%$, 400 V. D-C working, paper dielectric, molded case. Same as C ₁₅	Filament by-pass for tube V ₁	MIC type 342	46ME104J
C ₁₈	CAPACITOR, fixed, 47 mfd., $\pm 20\%$, 500 V. D-C working, mica dielectric, humidity resistant	Coupling between oscillator inductance and oscillator grid circuit of tube V ₁	ASA	CM20A470M
C ₁₉	CAPACITOR, same as C ₁₂	Plate circuit by-pass	SC Special	49A001
C ₂₀	CAPACITOR, fixed, 2.5 mfd., $\pm 20\%$, 500 V. D-C working, bakelite dielectric, molded body. Same as C ₁₄	Coupling between oscillator and converter	MIC type 342	46ME203J
C ₂₁	CAPACITOR, fixed, .02 mfd., $\pm 10 \times 40\%$, 200 V. D-C working, paper dielectric, molded case	Grid return by-pass for tube V ₂	ASA	CM20A221M
C ₂₂	CAPACITOR, fixed, 220 mfd., $\pm 20\%$, 500 V. D-C working, mica dielectric, humidity resistant. Same as C ₁₆	Coupling between tubes V ₂ and V ₃	ASA	CM20A101M
C ₂₃	CAPACITOR, fixed, 100 mfd., $\pm 20\%$, 500 V. D-C working, mica dielectric, humidity resistant	Diode load r-f by-pass for tube V ₄	ASA	CM20A101M
C ₂₄	CAPACITOR, same as C ₁₅	A-P coupling between detector circuit and let audio amplifier section of tube V ₄	ASA	CM20A101M
C ₂₅	CAPACITOR, same as C ₁₇	Plate circuit decoupling for tube V ₄		

LIST OF REPLACEABLE PARTS.

REF. SYMBOL	NAME OF PART AND DESCRIPTION	FUNCTION	MFG. CODE	COUNTRY PART NO.
R ₁	RESISTOR, 100,000 ohms $\pm 20\%$, $\frac{1}{2}$ watt, carbon, insulated, humidity resistant. Same as R ₁₂	Oscillator grid return for tube V ₁	ASA	RC10A1004M
R ₂	RESISTOR, 4,700 ohms $\pm 10\%$, $\frac{1}{2}$ watt, carbon, insulated, humidity resistant	Decoupling for tube V ₁	ASA	RC10A472K
R ₃	RESISTOR, 22,000 ohms $\pm 20\%$, $\frac{1}{2}$ watt, carbon, insulated, humidity resistant	Plate load for tube V ₂	ASA	RC10A222M
R ₄	RESISTOR, 470,000 ohms $\pm 10\%$, $\frac{1}{2}$ watt, carbon, insulated, humidity resistant. Same as R ₁₁ , R ₁₅	Grid return for tube V ₃	ASA	RC10A474K
R ₅	RESISTOR, 2 megohms $\pm 20\%$, $\frac{1}{2}$ watt, carbon, insulated, humidity resistant.	Grid return for tube V ₂	ASA	RC10A202M
R ₆	RESISTOR, 10 megohms $\pm 20\%$, $\frac{1}{2}$ watt, carbon, insulated, humidity resistant.	Grid return for tube V ₄	ASA	RC10A102M
R ₇	RESISTOR, 3.3 megohms $\pm 20\%$, $\frac{1}{2}$ watt, carbon, insulated, humidity resistant.	A-V-C decoupling	ASA	RC10A332M
R ₈	RESISTOR, 47,000 ohms $\pm 20\%$, $\frac{1}{2}$ watt, carbon, insulated, humidity resistant.	Diode load for tube V ₄	ASA	RC10A472M
R ₉	RESISTOR, variable, 500,000 ohms $\pm 20\%$, bushing 3/8-32 $\times \frac{1}{2}$ long, shaft 5/8" long $\times \frac{1}{2}$ dia., includes DFR toggle action switch on rear of control	VOLUME control	CT type 125	25A090
R ₁₀	RESISTOR, 10,000 ohms $\pm 20\%$, $\frac{1}{2}$ watt, carbon, insulated, humidity resistant	Primary loading for transformer T ₁	ASA	RC10A102K
R ₁₁	RESISTOR, same as R ₄	Plate load for tube V ₄		
R ₁₂	RESISTOR, same as R ₁	Decoupling for tube V ₄		
R ₁₃	RESISTOR, two sections, section #1 (R ₁₃) 80 ohms $\pm 5\%$, 2.5 watts, wire wound; section #2 (R ₁₄) 220 ohms $\pm 5\%$, 6.5 watts, wire wound; 3 solder lug terminals	Surge voltage stabilizing for tube V ₆ Filament voltage dropping for tubes V ₅ and V ₆	U type I-1300	24AB34
R ₁₅	RESISTOR, same as R ₄	Grid return for tubes V ₅ and V ₆	ASA	RC10A224K
R ₁₆	RESISTOR, 680 ohms $\pm 10\%$, $\frac{1}{2}$ watt, carbon, insulated, humidity resistant	Filament voltage divider for battery operation	ASA	RC10A682K
R ₁₇	RESISTOR, 270 ohms $\pm 10\%$, $\frac{1}{2}$ watt, carbon, insulated, humidity resistant	Shunt for filament of tube V ₄	ASA	RC10A271K
R ₁₈	RESISTOR, 47 ohms $\pm 10\%$, $\frac{1}{2}$ watt, carbon, insulated, humidity resistant	Cathode bias for tube V ₅	ASA	RC10A472K
R ₁₉	RESISTOR, 330 ohms $\pm 10\%$, $\frac{1}{2}$ watt, carbon, insulated, humidity resistant	Shunt for filament of tube V ₇	ASA	RC10A331K
C ₁	CAPACITOR, adjustable, min. cap. 4 mfd., max. cap. 20 mfd., ceramic dielectric, solder lug terminals and wdg.; same as C ₂ , C ₃ , C ₄ , C ₅ , C ₆	Trimmer for transformer T ₁	CEL type 680	44A118
C ₂	CAPACITOR, same as C ₁	Trimmer for transformer T ₂		
C ₃	CAPACITOR, same as C ₁	Trimmer for transformer T ₃		
C ₄	CAPACITOR, same as C ₁	Trimmer for transformer T ₄		
C ₅	CAPACITOR, same as C ₁	Trimmer for transformer T ₅		
C ₆	CAPACITOR, same as C ₁	Trimmer for transformer T ₆		
C ₇	CAPACITOR, fixed 390 mfd., $\pm 10\%$, 500 V. D-C working, mica dielectric, humidity resistant	Padder transformer T ₄	ASA	CM20D391J

THE HALLICRAFTERS CO.

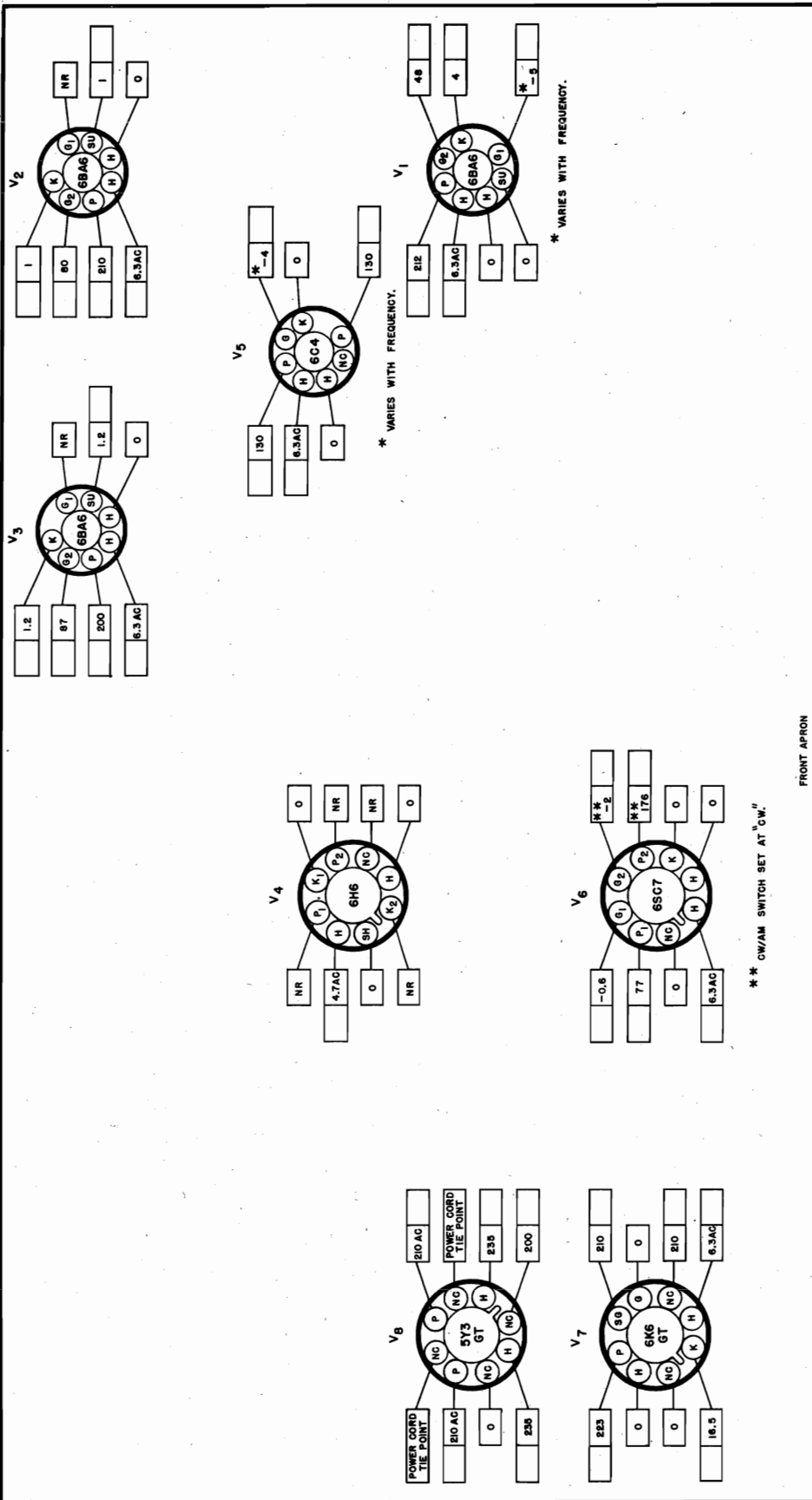
MODEL RE-1,
Sky Courier

LIST OF REPLACEABLE PARTS - (Cont'd.)

REF. SYMBOL	NAME OF PART AND DESCRIPTION	FUNCTION	CONTR. S. PART NO.	MFG. CODE	CONTR. S. PART NO.
C26	CAPACITOR, same as C22	Plate circuit r-f by-pass for tube V ₄	ASA	45A72	55A062
C27	CAPACITOR, fixed, .004 mfd., 20 + 50%, 600 V. D-C working, paper dielectric, humidity resistant. Same as C28	Coupling between tube V ₄ and V ₅	IC type P-1	45A72	55A062
C28	CAPACITOR, same as C27	Plate circuit equalizer for tubes V ₅ and V ₇	IC type P-1	45A72	55A062
C29	CAPACITOR, 3 section unit, 4 prong plug-in type electrolytic; section #1 (C ₂₉) 40 mfd., 10 + 50%; 150 V. D-C working; section #2 (C ₂₉) 40 mfd., 10 + 50%, 150 V. D-C working; section #3 (C ₂₉) 100 mfd., 10 + 50%, 50 V. D-C working, terminal #1 common to all sections	Filament circuit by-pass for battery operation	IC type P-1	45A72	55A062
C30	CAPACITOR, same as C29	Output filter capacitor for A-C/D-C operation	IC type P-1	45A72	55A062
C31	CAPACITOR, same as C29	Input filter capacitor for A-C/D-C operation	IC type P-1	45A72	55A062
C32	CAPACITOR, same as C13	Line filter for A-C/D-C operation	IC type P-1	45A72	55A062
C33	Not used.				
C34	CAPACITOR, same as C20	Coupling between transformers T ₃ and T ₆ on band #3	IC type P-1	45A72	55A062
T1	TRANSFORMER, R-F, 3 unit assembly; unit #1 (T ₁) 550-1600 KC., universal windings primary and secondary, Hallowax #2012 impregnation, variable iron core adjustment; unit #2 (T ₁) 2.8 - 7.8 MC., universal winding primary, single layer winding secondary, Hallowax #2012 impregnation, variable iron core adjustment; unit #3 (T ₁) 7.0 - 19.0 MC., single layer windings primary and secondary, Hallowax #2012 impregnation, variable iron core adjustment; assembly mounted on a bakelite board 3" long x 1-3/4" wide x 1/16" thick with 2 mtg. holes 1" apart centered on the board; coils wound on bakelite form 1" long x 3/8" O.D.	Coupling between antennas and tube V ₁ on band #1	GU type 30-5225-2	51C661	51C661
T2		Coupling between antennas and tube V ₁ on band #2	GU type 30-5225-2	51C661	51C661
T3		Coupling between antennas and tube V ₁ on band #3	GU type 30-5225-2	51C661	51C661
T4	TRANSFORMER, R-F, 3 unit assembly; unit #1 (T ₄) 550-1600 KC., universal windings primary and secondary, Hallowax #2012 impregnation, variable iron core adjustment unit #2 (T ₄) 2.8 - 7.8 MC., single layer windings, Hallowax #2012 impregnation, variable iron core adjustment; unit #3 (T ₄) 7.0 - 19.0 MC., single layer interwoven primary and secondary, Hallowax #2012 impregnation, variable iron core adjustment; assembly mounted on a XP bakelite board 3" long x 2-3/8" wide x 1-1/16" thick with 2 mtg. holes 1" apart centered on the board; coils wound on bakelite form 1" long x 3/8" O.D.	Oscillator inductances for band #1	GU type 30-5225-2	51C660	51C660
T5		Oscillator inductances for band #2	GU type 30-5225-2	51C660	51C660
T6		Oscillator inductances for band #3	GU type 30-5225-2	51C660	51C660
T7	TRANSFORMER, I-F, 455 KC., fixed trimmer capacitors, variable iron core tuning, shielded assembly	Coupling between tubes V ₁ and V ₂	GU type 30-5225-2	50B152	50B152
T8	TRANSFORMER, I-F, 455 KC., fixed trimmer capacitors, variable iron core tuning, shielded assembly	Coupling between tubes V ₃ and V ₄	GU type 30-5225-2	50B153	50B153
T9	TRANSFORMER, A-F, primary to match a 8000 ohm 300T tube plate load, tapped to match a 2500 ohm 50L6GT tube plate load; secondary to match 2.3 ohm voice coil; metal case covered with corite wax except on mounting surface; two single hole mtg. feet with 1-3/4" mtg. centers.	Coupling between tube V ₅ or V ₇ and speaker	F Special	55A064	55A064

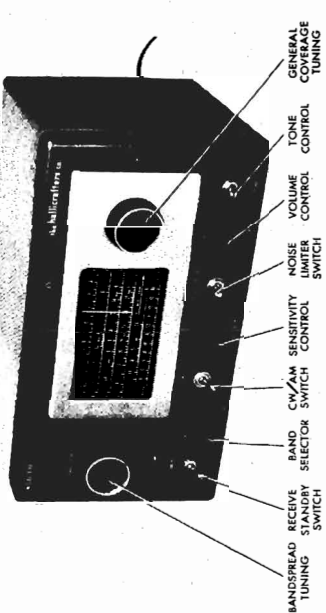
LIST OF REPLACEABLE PARTS - (Cont'd.)

REF. SYMBOL	NAME OF PART AND DESCRIPTION	FUNCTION	CONTR. S. PART NO.	MFG. CODE	CONTR. S. PART NO.
CH1	CHOKE, filter, 2250 turns of #35 wire wound on a 3/4" x 1/2" metal core, rated at 50 milliwatts, entire unit dipped in black corite wax except for mtg. surface; two single hole mtg. feet with 2-1/16" mtg. centers.	Plate voltage inductance for A-C/D-C line operation	55A062	Special	55A062
CH2	CHOKE, R-F, 37 turns of #22 SCS universal winding, air core, inductance 46 microhenries	R-F filter for filament of tube V ₁	55A062	GU type 30-5225-2	55A062
SW1A	SWITCH, 2 section, 3 positions, bakelite wafers, mounted by a 3/8-32 bushing 1/4" long, shaft 7/8" long	Converter stage transformer	55A062	OM Special	55A062
SW1B		Primary selector	55A062	OM Special	55A062
SW1C		Secondary selector	55A062	OM Special	55A062
SW1D		Oscillator stage transformer	55A062	OM Special	55A062
SW1E		Primary selector	55A062	OM Special	55A062
SW1F		Secondary selector	55A062	OM Special	55A062
TS1	SWITCH, DPST, located on the rear or rear of chassis	A-C/D-C line switch	55A062	OM Special	55A062
LS1	TERMINAL STRIP, two terminals brass solder lugs with 6-32 x 3/8" binding head and metal screws, mounted with centers 2 1/4" apart on a XP brown bakelite strip 2 1/4" long x 1 1/16" wide x 1/16" thick 2 mtg. holes with centers 1-11/16" apart, marked "A" and "C"	Battery power supply switch	55A062	OM Special	55A062
LS1	SPEAKER, 5 inch semi moisture proof cone; 4.25 ounce field P.M.; 3.8 ohm voice coil; 8" long insulated leads soldered to speaker terminals at one end and a cinch plug (type #2724) at other end; includes a special mtg. plate 4-5/8" x 1-1/4" with three 7/16" dia. mtg. holes; mtg. centers 4" x 5-1/16" x 4-1/2"	Antenna and ground connections	55A062	CN type 1720	55A062
V1	TUBE, pentagrid converter, type 1B5	Loudspeaker	55A062	CHI type X-1241	55A062
V2	TUBE, r-f amplifier pentode, type 1B6GT/G	Oscillator and converter	55A062	RCA	55A062
V3	TUBE, same as V2	1st I-F amplifier	55A062	RCA	55A062
V4	TUBE, diode high-mu triode, type 1B6GT/G	2nd I-F amplifier	55A062	RCA	55A062
V5	TUBE, beam power amplifier, type 50L6GT	Detector and 1st audio amplifier	55A062	RCA	55A062
V6	TUBE, half-wave high-vacuum rectifier, type 50Z6GT/G	Audio power amplifier for A-C/D-C operation	55A062	RCA	55A062
V7	TUBE, beam power amplifier, type 50Z6GT/G	Rectifier for A-C/D-C operation	55A062	RCA	55A062



NOTES-

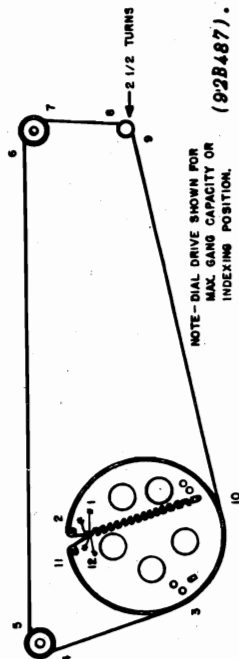
1. SOCKET VIEWS ARE BOTTOM VIEWS.
2. ALL VOLTAGES ARE MEASURED BETWEEN TUBE SOCKET TERMINALS AND CHASSIS WITH ZERO SIGNAL INPUT.
3. LINE VOLTAGE - 117 V. AC. (60 CYCLES).
4. ALL VOLTAGES SHOWN ARE DC, UNLESS OTHERWISE SPECIFIED.
5. DC VOLTAGES SHOWN WERE MEASURED WITH AN ELECTRONIC VOLTMETER.
6. READINGS TAKEN WITH STANDBY/RECEIVE SWITCH SET AT "RECEIVE"; CW/AM SWITCH SET AT "AM"; NOISE LIMITER SWITCH ON.
7. "NC" - NO CONNECTION. (VOLTAGE SHOWN FOR THIS TERMINAL ONLY WHEN TERMINAL IS USED AS A TIE LUG).
8. "NR" - NOT READABLE. (READING GENERALLY MEANINGLESS).
9. ☐ SPACE PROVIDED FOR SERVICE METER READINGS.



RESTRINGING DIAL CORD

To restring the general coverage dial cord, cut a 48-inch length of 30 lb. test dial cord and tie one end to the tension spring of the general coverage tuning capacitor drive pulley at position "1" on the diagram. Follow the sequence "1" through "12" and at position "12" stretch the tension spring and tie the cord securely.

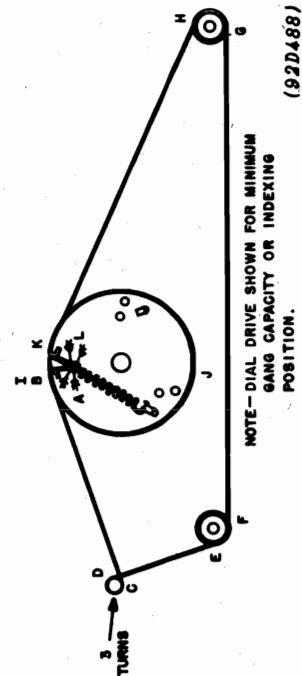
Set the general coverage tuning condenser at maximum capacity and attach and set the pointer in line with the left hand index marker.



Dial cable stringing procedure, general coverage dial.

To restring the band spread dial cord, cut a 36-inch length of 30 lb. test dial cord and follow the procedure as above, starting at position "A" ending at "L".

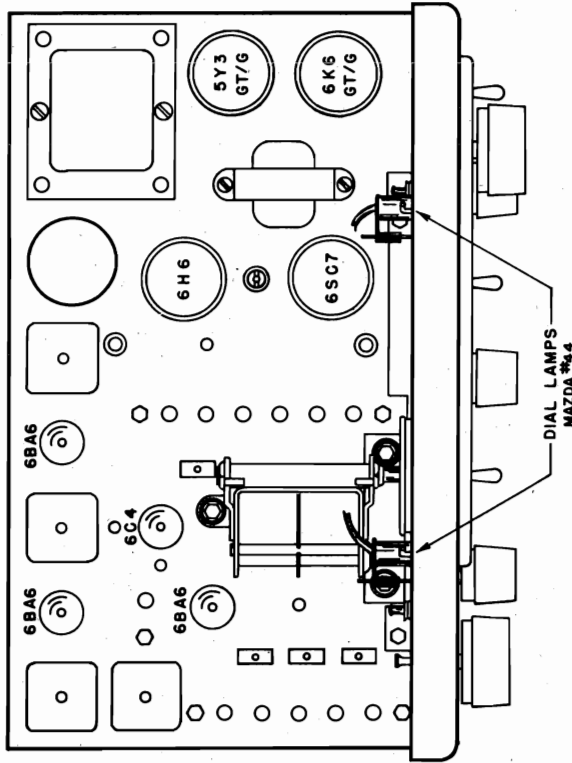
Set the bandspread condenser at minimum capacity and attach and set the pointer at "100" on the logging scale.



Dial cable stringing procedure, band spread dial.

REPLACING LAMPS

Refer to Fig. for the location of the two dial lamps used in the receiver. To gain access to defective lamps, reach in through cabinet cover and unclip the dial lamp sockets. The sockets may then be brought out into the open to change the defective lamp. Replace lamps with 6-8 V. Mazda #44, (Blue bead) lamps or equivalent.



Top view, location of tubes and dial lamps.

ALIGNMENT PROCEDURE

Set the following controls before alignment.

STANBY/RECEIVE	Set at RECEIVE
CW/AM	Set at AM (see step 2)
SENSITIVITY	Set at maximum
NOISE LIMITER	Set at OFF
VOLUME	Set at maximum
TONE switch.	Set at HIGH
BANDSPREAD	Set at 100
SPEAKER/PHONES switch	Set at SPEAKER

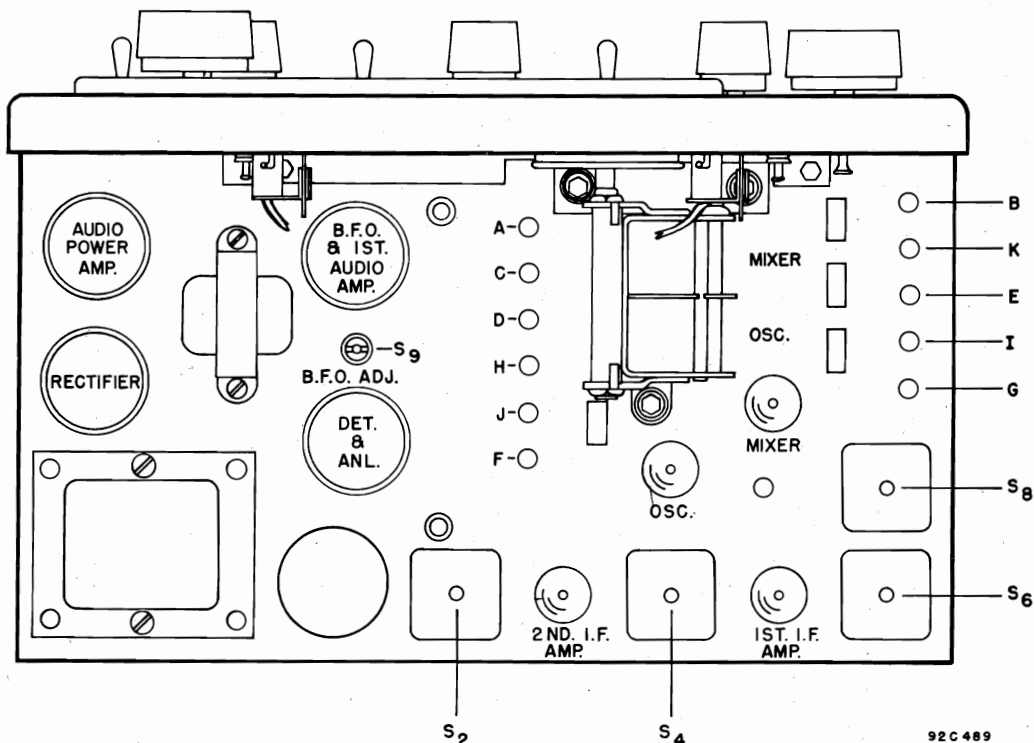
Remove the receiver chassis from the cabinet to make alignment adjustments. The chassis is held in the cabinet by three screws along both the bottom edge of the front panel and the rear of the cabinet, and two screws on either side of the front panel.

Before starting the alignment procedure, index the general coverage dial pointer on the low frequency end of the range and index the bandspread dial pointer at 100. The general coverage condenser should index at maximum capacity and the bandspread condenser should index at minimum capacity.

ALIGNMENT CHART

Step	Dummy Antenna	Signal Generator Coupling	Signal Generator Frequency	Band Selector Setting	Receiver Dial Setting	Adjust	Remarks
1	0.1 mfd. capacitor	High side to front stator section of tuning cap. Low side to chassis.	2.075 mc	A	Tuning cap. fully open	S1,S2,S3,S4,S5, S6,S7,S8	Adjust for maximum audio output at speaker voice coil. Use just enough signal generator output to obtain a 50 mw audio level.
2	See step 1.	See step 1.	2.075 mc	A	See step 1.	S9	With the CW/AM switch set at CW, adjust S-9 for zero beat.
3	300 ohm carbon resistor	High side to "A1" on antenna strip. Jumper connected between "A2" and "G"	1500 kc 600 kc	A	1500 kc 600 kc	*A,B *F	Adjust for maximum output as in step 1.
4	See step 3.	See step 3.	6 mc	B	6 mc	*D,E	Adjust for maximum output as in step 1.
5	See step 3.	See step 3.	15 mc	C	15 mc	*F,G	Adjust for maximum output as in step 1.
6	See step 3.	See step 3.	30 mc	D	30 mc	*H,I	Adjust for maximum output as in step 1.
7	See step 3.	See step 3.	52 mc	E	52 mc	*J,K	Adjust for maximum output as in step 1.

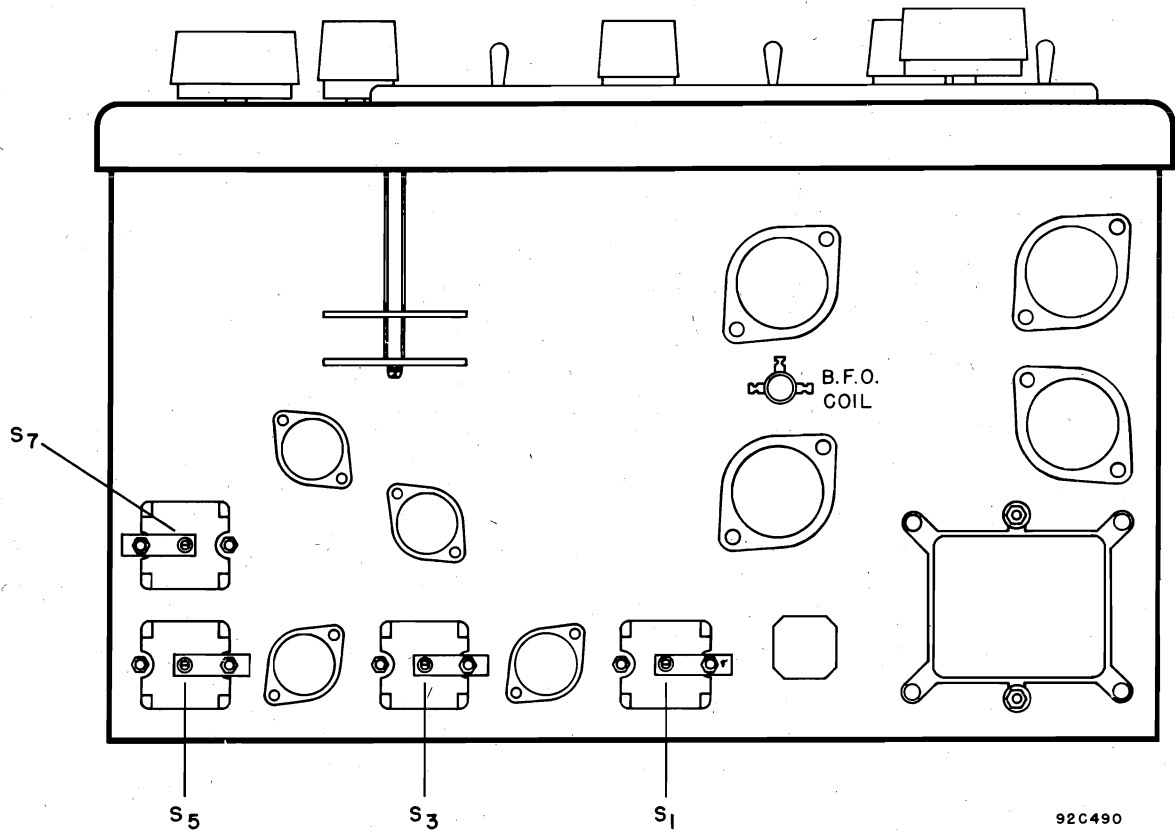
*Note - Calibration adjustments.



Alignment points, top view.

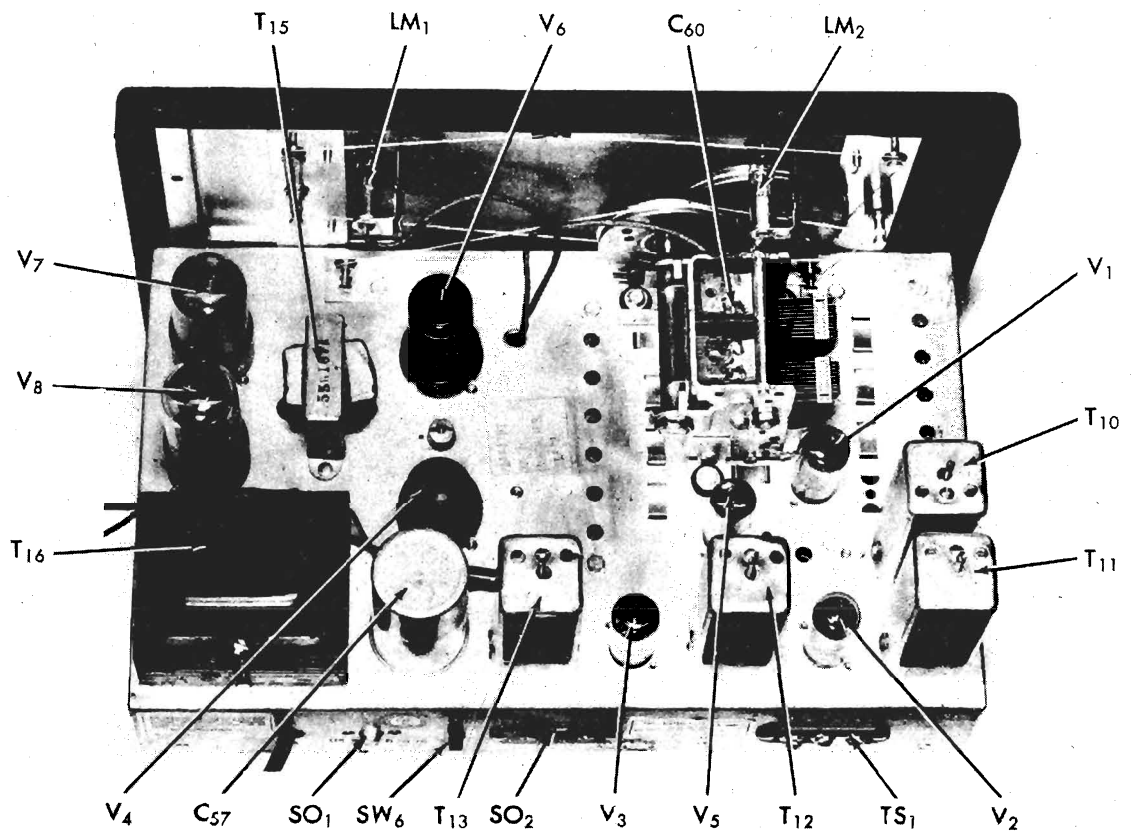
THE HALLICRAFTERS CO.

MODEL S-53



92C490

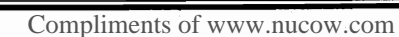
Alignment points, bottom view.



Component location, top view.

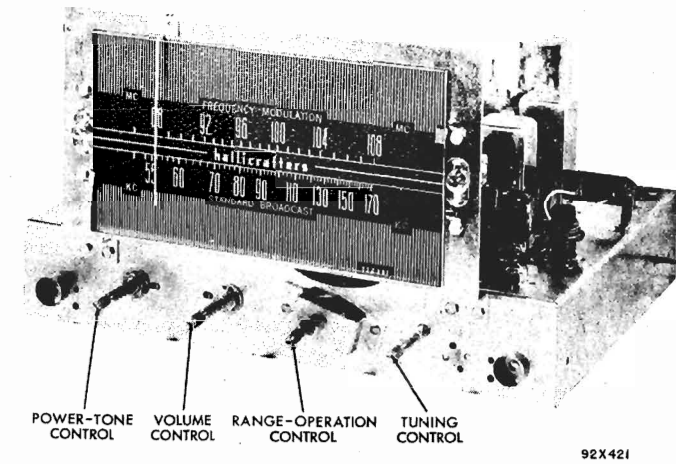


THE HALLICRAFTERS CO.



SERVICE PARTS LIST

Ref. No.	Description	Hallcrafters Part Number	Ref. No.	Description	Hallcrafters Part Number
CONDENSERS			TRANSFORMERS AND COILS (Cont.)		
C-1,4,58	.005 mfd. 450 V., ceramic	47A168	T-6	Transformer, oscillator stage, band B	51B1032
C-5,39,49	.05 mfd. 400 V., tubular	46AW503J	T-7	Transformer, oscillator stage, band C	51B1033
C-6,7,9,10,11	Trimmer assembly, 5 section antenna stage	44B355	T-8	Transformer, oscillator stage, band D	51B1034
C-8,42	220 mmf. 500 V., mica	CM20A221K	T-9	Transformer, oscillator stage, band E	51B1035
C-12	Trimmer adjustable, wave trap	44A356	T-10,11,12,13	Transformer, IF amp. and detector stages	50B369
C-13,14,15	4.7 mmf. 500 V., bakelite	47A160-6	T-14	Transformer, BFO	54B038
C-16,59	2.2 mmf. 500 V., bakelite	47A160-4	T-15	Transformer, audio output	55B107
C-17,40,44	100 mmf. 500 V., ceramic	47A086	T-16	Transformer, power	52C164
C-18,19,22,24,25,26	Trimmer assembly, 6 sections, oscillator stage	44B354	L-1	Coil, low pass filter	53A135
C-20	4700 mmf. 500 V., mica	CM35A472K	L-2	Coil, wave trap, antenna section	51B1036
C-21	1,000 mmf. 2% 500 V., silver mica	CM20C102G	SWITCHES		
C-23	500 mmf. 2% 500 V., silver mica	CM20C501G	SW-1	Band switch assembly	60B323
C-27	.1 mfd. 200 V., tubular	46AU104J	SW-2	Switch, toggle, DPST, CW/AM control	60A285
C-28,36,54	.02 mfd. 600 V., tubular	46AY203J	SW-3,5,7	Switch, toggle, SPST, STANBY/REC., NOISE LIMITER & TONE control	60A138
C-29,32,35,37,43,50,52,53,56	.01 mfd. 600 V., tubular	46AZ103J	SW-4	Switch, part of SENSITIVITY control, R-6	60A243
C-41	.01 mfd. 400 V., molded paper	46AB103J	SW-6	Switch, slide, SPDT, SPEAKER/PHONE control	60A243
C-45	470 mmf. 500 V., mica	CM20A471J	SW-8	Switch, part of VOLUME control R-31	
C-46,47	50 mmf. 500 V., ceramic	47A091	PLUGS AND SOCKETS		
C-51	.003 mfd. 600 V., tubular	46AZ302J	PL-1	Line cord and plug	87A078
C-55	10 mmf. 500 V., mica	CC20UK100K	SO-1	Receptacle, phono motor	36A029
C-57	50-10-10 mfd. 350-100-25V., electrolytic	45B122	SO-2	Receptacle, headphone jack	88A071
C-59	Tuning condenser, 2 section	48C198		Socket, octal (tube)	6A269
				Socket, miniature (tube)	6A297
				Socket, dial light	86B063
RESISTORS			TUBES, RECTIFIERS AND LAMPS		
R-1,24	1.8 megohms $\frac{1}{2}$ watt, carbon	RC20AE185M	V-1,2,3	6BA6, mixer, 1st & 2nd IF amplifier	90X6BA6
R-2	2200 ohms $\frac{1}{2}$ watt, carbon	RC20AE222M	V-4	6H6, detector & ANL	90X6H6
R-3,15	27 ohms $\frac{1}{2}$ watt, carbon	RC20AE270M	V-5	6C4, oscillator	90X6C4
R-4,27	330,000 ohms $\frac{1}{2}$ watt, carbon	RC20AE334K	V-6	6SC7, audio amplifier & BFO	90X6SC7
R-5,35	680 ohms $\frac{1}{2}$ watt, carbon	RC20AE681K	V-7	6K6GT, power amplifier	90X6K6GT
R-6	10,000 ohms, variable, SENSITIVITY control	25B603	V-8	5Y3GT, rectifier	90X5Y3GT
R-7,17	100 ohms $\frac{1}{2}$ watt, carbon	RC20AE101K	LM-1,2	Lamp, 6-8 V., 250 ma., Mazda #44	39A003
R-8,16,34	1000 ohms $\frac{1}{2}$ watt, carbon	RC20AE102M	MISCELLANEOUS		
R-9,30,32,36	470,000 ohms $\frac{1}{2}$ watt, carbon	RC20AE474M	TS-1	Terminal strip, antenna	88A032
R-10,12	4700 ohms $\frac{1}{2}$ watt, carbon	RC20AE472K		Lock, line cord	76A299
R-11	10,000 ohms $\frac{1}{2}$ watt, carbon	RC20AE103K		Clip, coil mtg.	76A325
R-13,23	22,000 ohms $\frac{1}{2}$ watt, carbon	RC20AE223M		Shaft, tuning drive	74A248
R-14	10,000 ohms 1 watt, carbon	RC30AE103K		"C" washer (tuning drive shaft)	4A139
R-18	22,000 ohms 1 watt, carbon	RC30AE223M		Spring, dial cord	75A012
R-19	120 ohms $\frac{1}{2}$ watt, carbon	RC20AE121M		Dial cord	38A019
R-20	220,000 ohms $\frac{1}{2}$ watt, carbon	RC20AE224K		Plate, dial	63C333
R-21	15 megohms $\frac{1}{2}$ watt, carbon	RC20AE156K		Pointer, general coverage dial	82A149
R-22,26	47,000 ohms $\frac{1}{2}$ watt, carbon	RC20AE473M		Pointer, band spread dial	82A148
R-25	100,000 ohms $\frac{1}{2}$ watt, carbon	RC20AE104K		Dial glass (calibrated)	22C204
R-28	1 megohm $\frac{1}{2}$ watt, carbon	RC20AE105M		Gasket, dial glass	12A042
R-29	2.7 megohms $\frac{1}{2}$ watt, carbon	RC20AE275M		Clip, dial glass mtg.	76A390
R-31	2 megohms, variable, VOLUME control	25B602		Pad, dial clip	16A126
R-33	15 ohms $\frac{1}{2}$ watt, carbon	RC20AE150M		Pad, felt (round disc)	14A166
R-37	680 ohms 2 watts, carbon	RC40AE681M		Pad, sponge rubber	16A047-1
R-38	1000 ohms 1 watt, carbon	RC30AE102M		Mounting feet, rubber	16A007
R-39	6.8 ohms 1 watt, carbon	RC30AE068K		Speaker, P.M.	85C030
TRANSFORMERS AND COILS				Knob, BAND SELECTOR, SENSITIVITY, and VOLUME controls	15A049
T-1	Transformer, antenna stage, band A	51B1028		Knob, BAND SPREAD and general coverage controls	15A047
T-2	Transformer, antenna stage, band B	51B1027			
T-3	Transformer, antenna stage, bands C & D	51B1026			
T-4	Transformer, antenna stage, band E	51B1030			
T-5	Transformer, oscillator stage, band A	51B1031			



92X421

RESTRINGING DIAL CORD

Restring the dial drive with 30 lb test dial cord. Tie one end to the tension spring and follow the sequence outlined in Fig. 1. Stretch the tension spring and tie the end of the cord securely to the spring as shown.

Set the tuning condenser at maximum capacity (closed), attach the pointer to the string and line it up with the left hand index mark on the dial scale.

REPLACING LAMPS

Refer to Fig. 7 for the location of two dial lamps used in the receiver. To gain access to defective lamps, reach in through the cabinet cover and unclip the dial lamp socket by compressing the side springs. The socket may then be brought out into the open to change the defective lamp. Replace all lamps with 6-8 V. Mazda #44 (Blue bead) lamps or equivalent.

ALIGNMENT PROCEDURE

The receiver is equipped with AUTOMATIC FREQUENCY CONTROL on the FM band to compensate for oscillator drift and improve the tuning function on the FM band. The correction factor is approximately 5 times: AFC takes hold 250 kc before the station frequency is reached and releases before tuning 500 kc beyond the station frequency when receiving a 1000 micro-volt signal.

The standard RMA dummy specified in the alignment chart consist of a 200 mmf condenser in series with a 20 uh r-f choke which is shunted by a 400 mmf condenser in series with a 400 ohm carbon resistor.

When making the alignment adjustments set the tone control at NORMAL and the volume control at maximum volume. Use just enough signal generator output to obtain the results indicated on the chart.

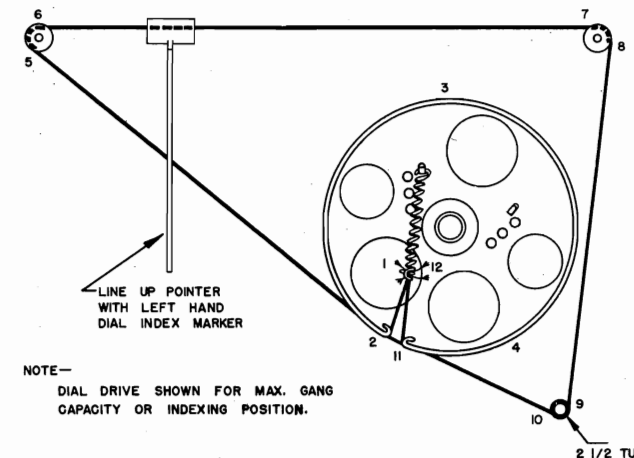


Fig. 1. Dial cable stringing procedure. (92B382.)

THE HALLICRAFTERS CO.

MODELS S-55, S-56

ALIGNMENT CHART:

Step	Dummy Antenna	Signal Generator Coupling	Signal Generator Frequency	Band Switch Pos.	Radio Dial Setting	Adjust	Remarks
1	0.01 mfd. cap.	To high cap. stator of center section.	455 kc	"BC"	1000 kc	A,B,C, D,E	Adjust for max. audio output. Keep audio output below 500 MW to avoid AVC action.
2	0.01 mfd. cap. in series with a 4700 ohm carbon resistor.	To low cap. stator of center section.	10.7 mc	"FM"	90 mc	F,G,H, I,J,K	Adjust for max. voltage as measured between pin #3 of 6H6 and ground with an electronic volt meter. Adjust signal generator output for approx. 2 volts DC at this point.
3	0.01 mfd. cap.	See step 2.	10.7 mc	"FM"	90 mc	L	Adjust for zero voltage as measured between the junction of R27 and R28 and ground with an electronic volt meter.
4	Std RMA dummy	To terminals "A" and "G" on terminal strip TS-2.	1500 kc	"BC"	1500 kc	*M,N,O	Adjust for max. output as in step 1.
5	Two 150 ohm carbon resistors	To terminals "D-D" on terminal strip TS-1.	105 mc	"FM"	105 mc	*P,Q	Adjust for max. voltage as measured across R24 with an electronic volt meter. Adjust signal generator output for approx. 1 volt DC at this point.

*Note - Calibration adjustments.

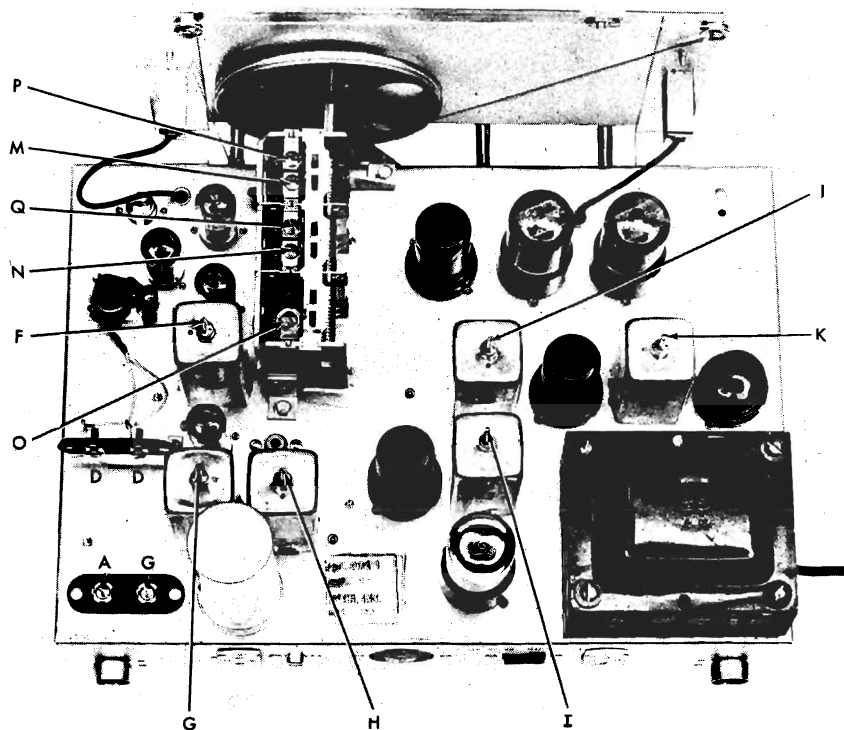


Fig. 2. Alignment adjustments, top view.

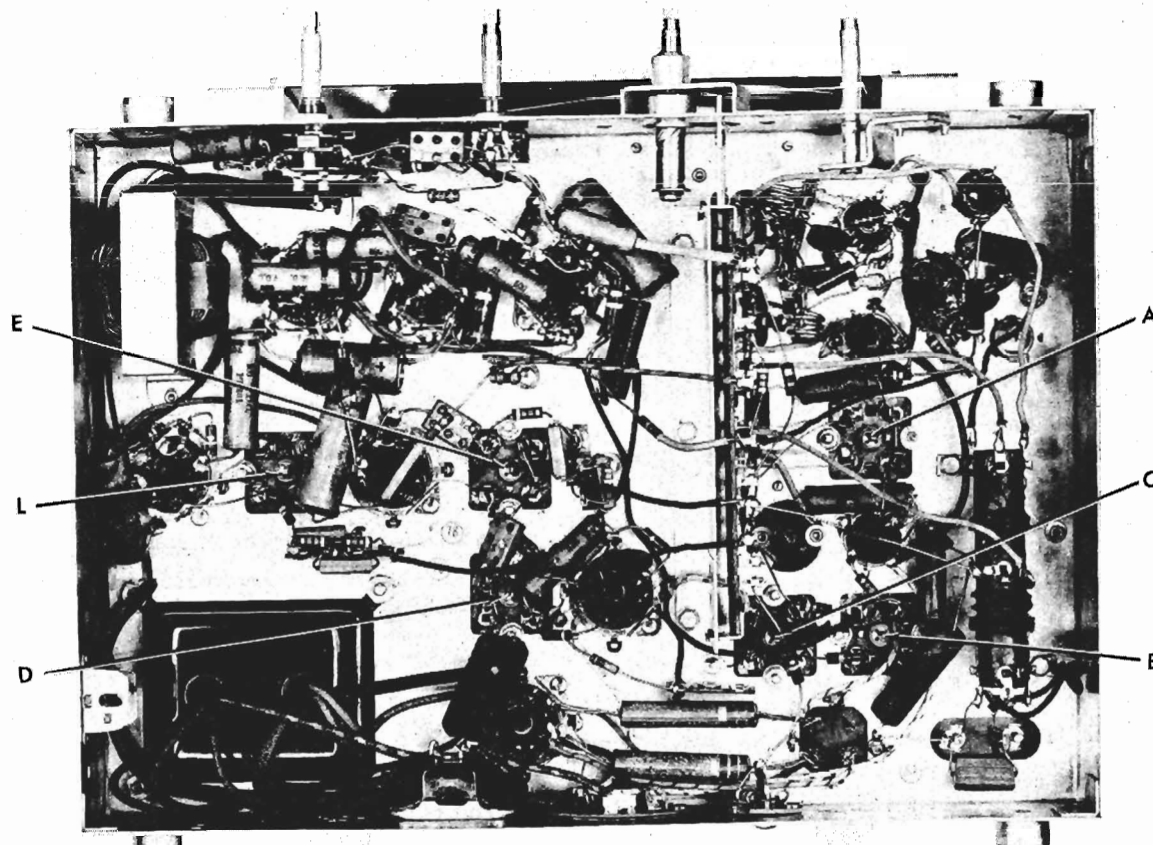


Fig. 3. Alignment adjustments, bottom view.

(92X410)

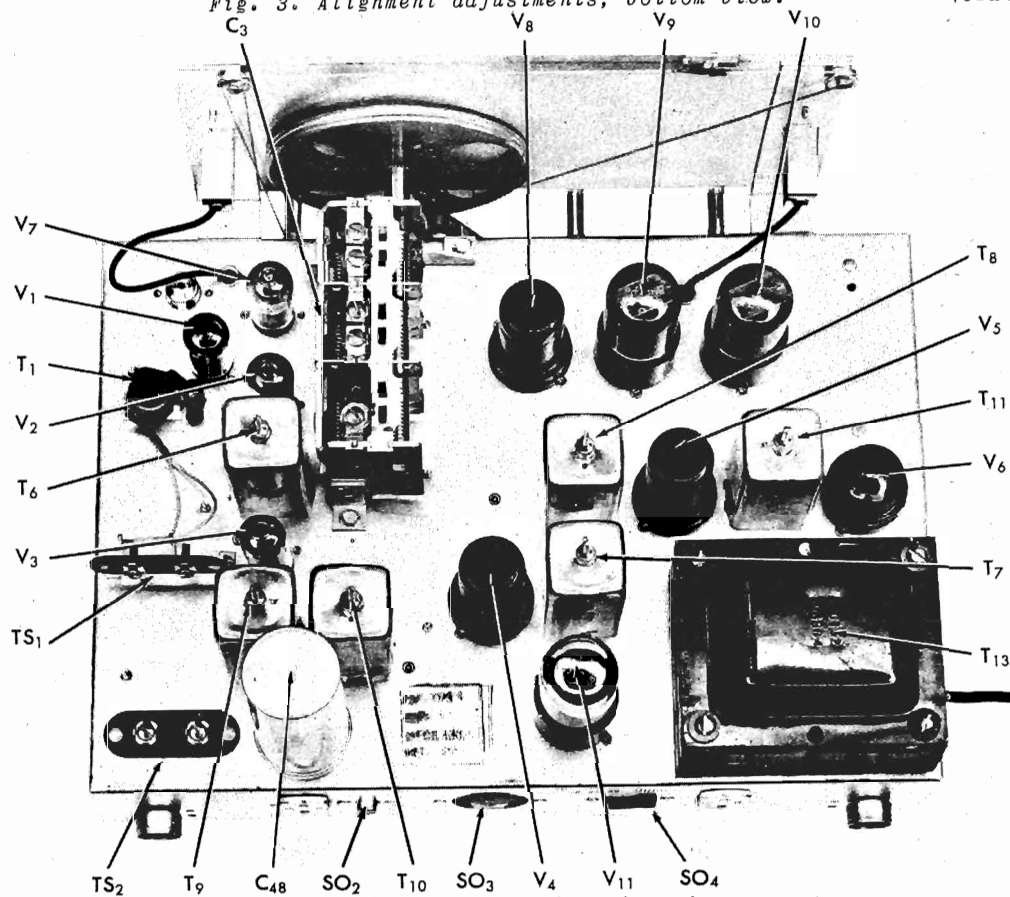
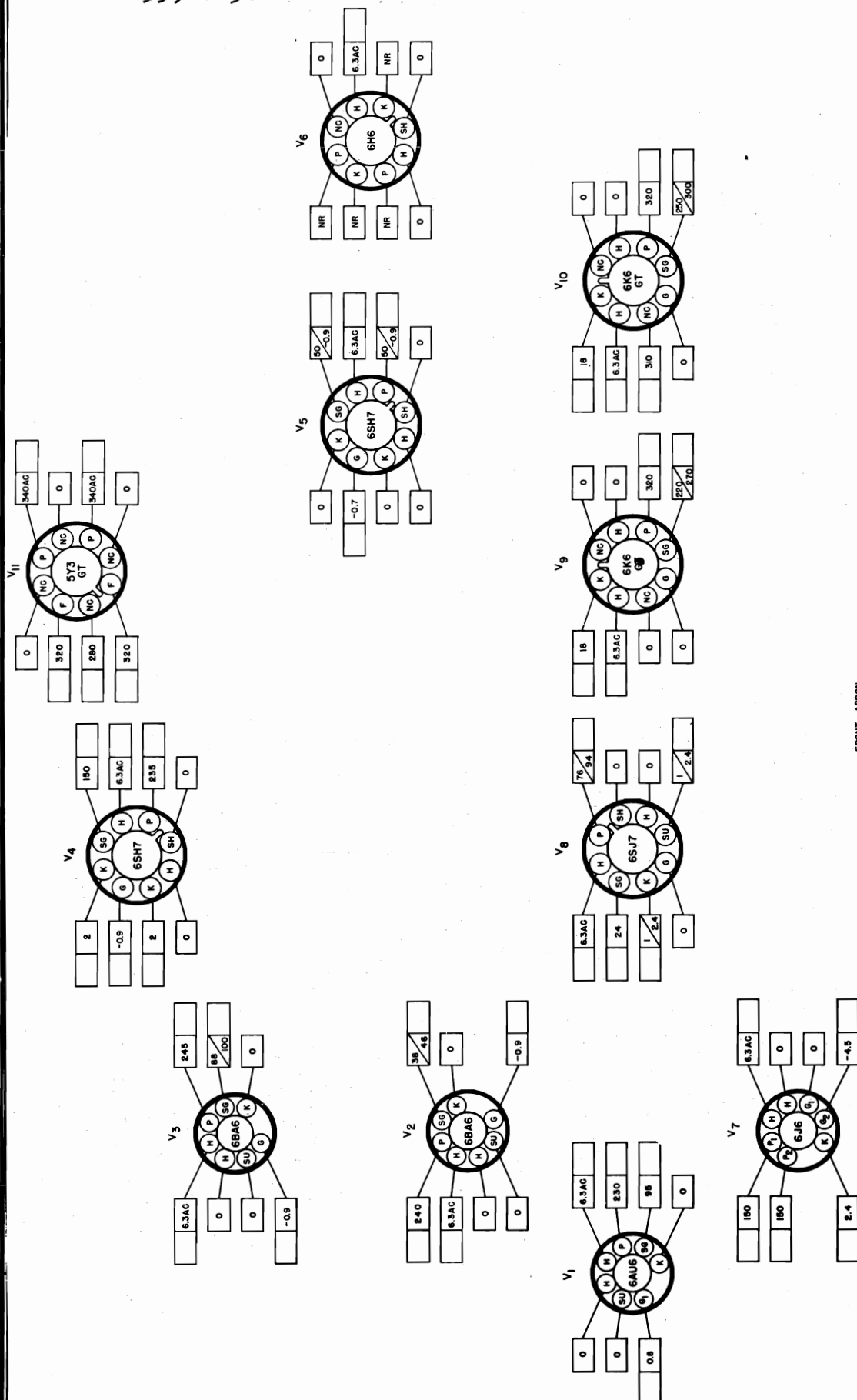


Fig. 4. Component location, top view.





NOTES

1. SOCKET VIEWS ARE BOTTOM VIEWS.
2. ALL VOLTAGES MEASURED BETWEEN TUBE SOCKET TERMINALS AND CHASSIS.
3. ALL VOLTAGES SHOWN WERE MEASURED WITH A 20,000 OHM/VOLTMETER AND AT ZERO SIGNAL.
4. ALL VOLTAGES SHOWN WERE MEASURED WITH A 20,000 OHM/VOLTMETER AND AT ZERO SIGNAL.
5. ALL VOLTAGES ARE DC UNLESS OTHERWISE SPECIFIED.
6. NO SIGNAL.
7. THE BLANK SPACES ARE PROVIDED FOR THE SERVICEMAN.
8. FILL IN THE ACTUAL READING AS TAKEN WITH YOUR OWN EQUIPMENT.
9. A NORMAL OPERATING READING SHOULD BE USED FOR AM RECEPTION TWO READINGS ABOVE THE READING SHOWN.
10. WHEN SHOWN UPPER LEFT SHOWS FM READINGS—LOWER RIGHT SHOWS AM READINGS.
11. "NR" = NOT READABLE.

Fig. 6. Tube socket voltage chart.

THE HALLICRAFTERS CO.

MODELS S-55, S-56

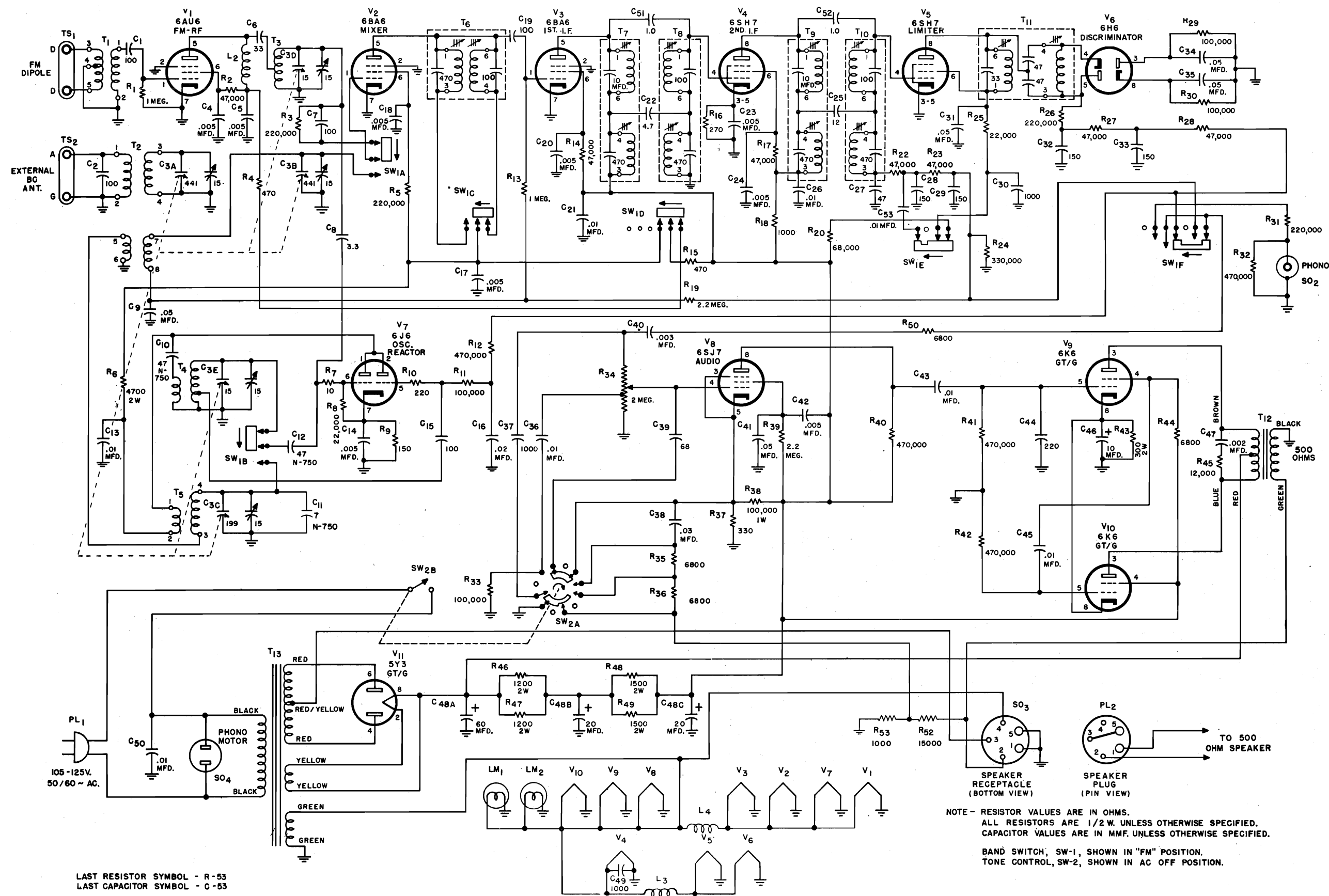


Fig. 8. Schematic diagram.

SERVICE PARTS LIST

Ref. No.	Description	Hallcrafters Part Number
CONDENSERS		
C-1,7,15,19	100 mmf. 500 V., ceramic	47B20101M5
C-2	100 mmf. 500 V., mica	CM20A101M
C-3	Tuning condenser, 5 sections	48C196
C-4,5,14,17,18,20,23,24	.005 mfd. 450 V., ceramic	47A168
C-6	3.3 mmf. 500 V., ceramic	CC20UK330K
C-8	3.3 mmf. 500 V., bakelite	47A160-5
C-9,34,35	.05 mfd. 200 V., tubular paper	46AU503J
C-10,12	47 mmf. 500 V., ceramic	CC20UK470M
C-11	7 mmf. 500 V., ceramic	CC20UJ070K
C-13,21,26,36,43,45	.01 mfd. 600 V., tubular paper	46AZ103F
C-16	.02 mfd. 200 V., tubular paper	46AU203J
C-22	4.7 mmf. 500 V., bakelite	47A160-6
C-25	12 mmf. 500 V., mica	CM20A120K
C-27	47mmf. 500 V., mica	CM20A470M
C-28,29,32,33	150 mmf. 500 V., mica	CM20A151M
C-30,37,49	1000 mmf. 500 V., ceramic	47B20102M5
C-31,41	.05 mfd. 600 V., tubular paper	46AY503J
C-38	.03 mfd. 200 V., tubular paper	46AU303J
C-39	68 mmf. 500 V., mica	CM20A680M
C-40	.003 mfd. 600 V., tubular paper	46AZ302J
C-42	.005 mfd. 600 V., tubular paper	46AZ502J
C-44	220 mmf. 500 V., mica	CM20A221M
C-46	10 mfd. 25 V., electrolytic	45A121
C-47	.002 mfd. 600 V., tubular paper	46AZ202J
C-48	60-20-20 mfd. 450 V., electrolytic	45B113
C-50	.01 mfd. 600 V., molded paper	46AG103J
C-51,52	1 mmf. 500 V., bakelite	47A160-2
C-53	.01 mfd. 600 V., tubular paper	46AY103J
RESISTORS		
R-1,13	1 megohm $\frac{1}{2}$ watt, carbon	RC20AE105M
R-2,14,17,22,23,27,28	47,000 ohms $\frac{1}{2}$ watt, carbon	RC20AE473M
R-3,5,26,31	220,000 ohms $\frac{1}{2}$ watt, carbon	RC20AE224M
R-4,15	470 ohms $\frac{1}{2}$ watt, carbon	RC20AE471M
R-6	4700 ohms 2 watts, carbon	RC40AE472M
R-7	10 ohms $\frac{1}{2}$ watt, carbon	RC20AE100M
R-8,25	22,000 ohms $\frac{1}{2}$ watt, carbon	RC20AE223M
R-9	150 ohms $\frac{1}{2}$ watt, carbon	RC20AE151M
R-10	220 ohms $\frac{1}{2}$ watt, carbon	RC20AE221M
R-11,33	100,000 ohms $\frac{1}{2}$ watt, carbon	RC20AE104M
R-12,32,40,	470,000 ohms $\frac{1}{2}$ watt, carbon	RC20AE474M

41,42	RC20AE271K
R-16	270 ohms $\frac{1}{2}$ watt, carbon
R-18,53	1000 ohms $\frac{1}{2}$ watt, carbon
R-19,39	2.2 megohms $\frac{1}{2}$ watt, carbon
R-20	68,000 ohms $\frac{1}{2}$ watt, carbon
R-24	330,000 ohms $\frac{1}{2}$ watt, carbon
R-29,30	100,000 ohms $\frac{1}{2}$ watt, carbon
R-34	Volume control, 2 megohms (tapped)
R-35,36	6800 ohms $\frac{1}{2}$ watt, carbon
44,50	RC20AE682M
R-37	330 ohms $\frac{1}{2}$ watt, carbon
R-38	100,000 ohms 1 watt, carbon
R-43	300 ohms 2 watt, carbon
R-45	12,000 ohms $\frac{1}{2}$ watt, carbon
R-46,47	1200 ohms 2 watt, carbon
R-48,49	1500 ohms 2 watt, carbon

TRANSFORMERS AND COILS

T-1	Transformer, FM, antenna stage	51B1021
T-2	Transformer, BC, mixer stage	51B1059
T-3	Transformer, FM, mixer stage	51B1022
T-4	Transformer, FM, osc. stage	51B1073
T-5	Transformer, BC, osc. stage	51B1020
T-6	Transformer, 1st I.F.	50B469
T-7,9	Transformer, 2nd I.F. and AM Detector & FM limiter	50B407
T-8,10	Transformer, 2nd I.F. and AM Detector & FM limiter	50B408
T-11	Transformer, FM, detector stage	50B410
T-12	Transformer, audio output	55B109
T-13	Transformer, power	52C152
L-2	Plate choke for tube V1	53B124
L-3	Filament choke for tubes V5 & 6	53B123
L-4	Filament choke for tubes V1,2,3, & 7	53A136

THE HALLICRAFTERS CO.

MODELS S-55, S-56

SWITCHES

SW-1	Band switch assembly	60B318
SW-2	Switch, tone control	60B319

PLUGS AND SOCKETS

PL-1	Line cord and plug	87A078
SO-2	Receptacle, television, phono	36A029
SO-3	Receptacle, speaker	6A277
SO-4	Receptacle, phono motor	10A015
	Socket, octal (tube)	6A296
	Socket, miniature (tube)	6A297
	Socket & bracket, dial light	86A062

TUBES, RECTIFIERS AND LAMPS

V-1	6AU6 antenna	90X6AU6
V-2,3	6BA6 mixer, 1st I.F.	90X6BA6
V-4,5	6SH7 2nd I.F., limiter	90X6SH7
V-6	6H6 discriminator	90X6H6
V-7	6J6 osc. & AFC	90X6J6
V-8	6SJ7 audio amp.	90X6SJ7
V-9,10	6K6GT power amp.	90X6K6GT
V-11	5Y3GT rectifier	90X5Y3GT
LM-1,2	Lamp, 8-8 V., 250 Ma., Mazda #44	39A003

MISCELLANEOUS

Shaft, tuning	74A247
Pulley, idler	28A052-6
Switch, cam	77A261
Drive pin	74A246
Collar	77A267
Bushing	77A266
Bracket, dial plate mtg.	67A793
Dial plate	63B332
Dial background (paper)	32A446
Dial glass (calibrated)	22C201
Clip (for dial glass 22C201)	76A390
Rubber spacer, for dial clip	16A126
Pointer	82A147
Dial cord	38A019
Spring, dial cord	75A012
Dial glass (clear)	22B205
Clip (for dial glass 22B205)	76A331
Escutcheon (Model S-55)	7C067-1
Escutcheon (Model S-56)	7C067
Knob, tone and range controls (Model S-55)	15B077-4
Knob, tone and range controls (Model S-56)	15B068-3

SWITCHES

TS-1	Knob, tuning and volume controls (Model S-55)	15B068-4
TS-2	Knob, tuning and volume controls (Model S-56)	15B077-3
	Terminal strip, antenna (Marked D-D)	87A379
	Terminal strip, antenna (Marked A-G)	88A327
	Line cord lock	76A299
	Mounting foot, rubber	16A007

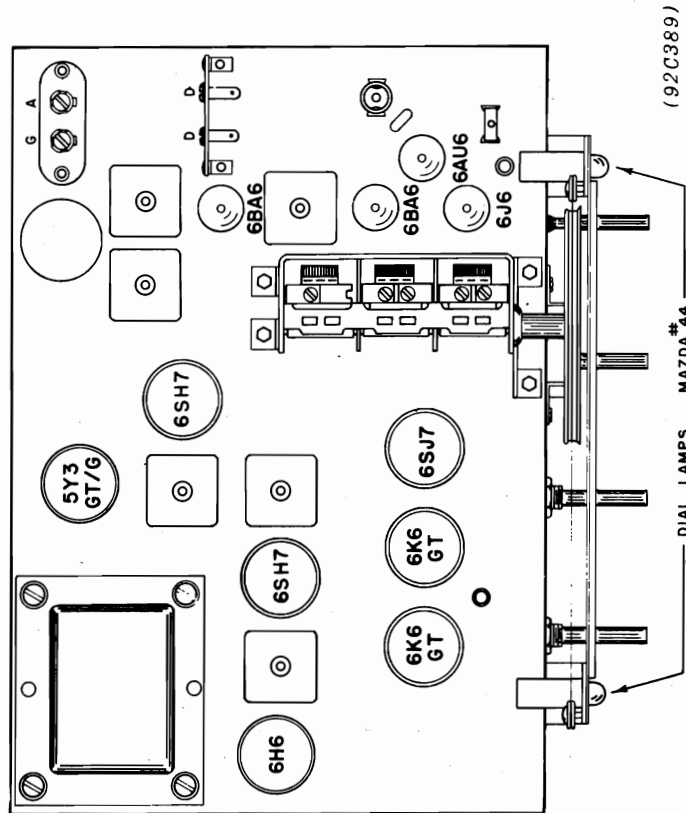


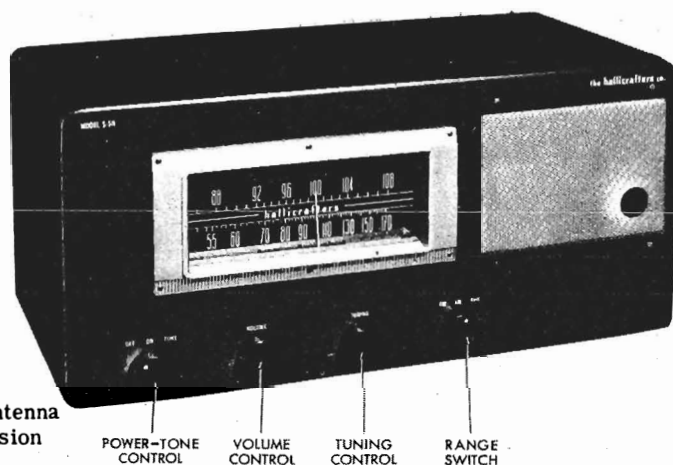
Fig. 7. Top view, location of tubes and dial lamps.

THE HALLICRAFTERS CO.

MODELS S-55, S-56

GENERAL

Tubes	Six plus rectifier
Speaker.	5-inch PM
Voice Coil Impedance.	3.2 ohms
Antenna.	Provisions for external antenna with 300-ohm transmission line
Phono Input	High Impedance
Tuning	Manual
Frequency Range.	Broadcast 540 kc - 1600 kc Frequency Modulation 88 mc - 108 mc
Intermediate Frequency.	455 kc/10.7 mc
Power Supply	105-125 V., DC or 60 cycles AC
Power Consumption	28 Watts



ALIGNMENT PROCEDURE

Generator connection	See chart
Generator ground	See chart.
Output meter connection	Across voice call
Electronic voltmeter	See chart connection
Volumn control position	Maximum
Tone control position	Optional

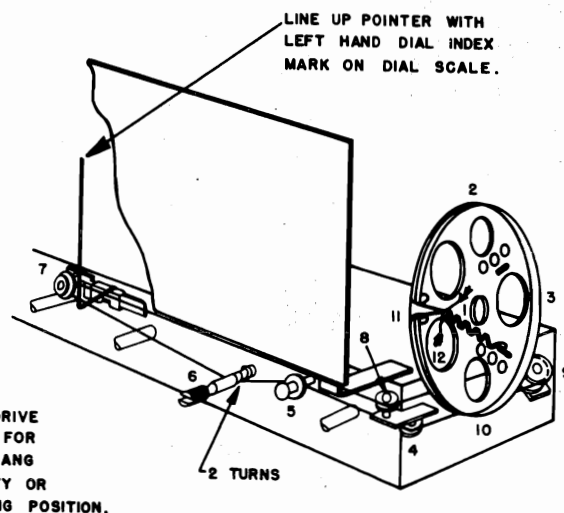
The standard RMA dummy specified in the alignment chart consist of a 200 mmf condenser in series with a 20 uh r-f choke which is shunted by a 400 mmf condenser in series with a 400 ohm carbon resistor.

REPLACING LAMPS

Refer to Fig. 4. for the location of the dial lamps used in receiver. To gain access to the defective lamp, reach in through the cabinet cover and unclip the dial lamp socket by compressing the side springs. The socket may then be brought out into the open to change the defective lamp. Replace defective lamps with 6-8 V. Mazda #47 (Brown bead) lamps or equivalent.

RESTRINGING DIAL CORD

To restring the dial cable, the chassis must be removed from the cabinet. Pull the four control knobs from their shafts, remove the three chassis screws at the bottom of the cabinet and lift the chassis from the cabinet through the top cover. Restringing the dial drive with a 48-inch length of 20 lb. test dial cord following the stringing sequence shown in Fig. 1. With the tuning condenser set at maximum capacity (closed) attach the dial pointer to the drive string and line it up with the left hand index mark on the dial scale.

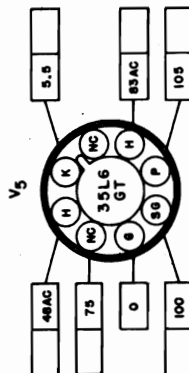
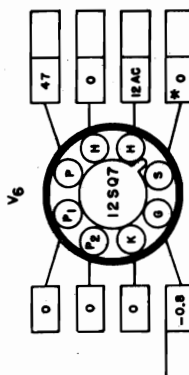
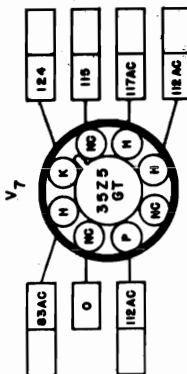
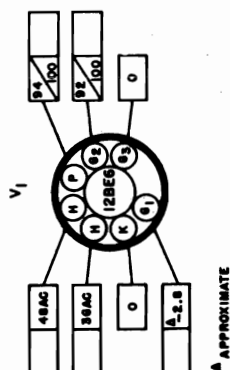
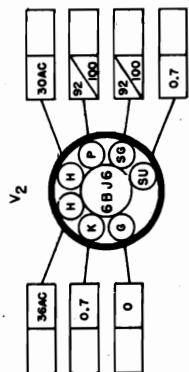
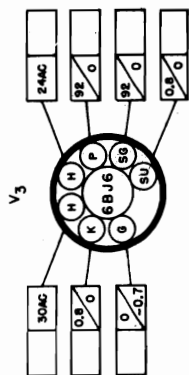
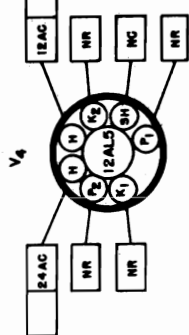


92B513

Fig. 1. Dial cable stringing procedure (92B513)

MODEL S-58

THE HALLICRAFTERS CO.



FRONT APRON
BOTTOM VIEW OF CHASSIS

* CAUTION - SEE NOTE 8

NOTES -

1. SOCKET VIEWS ARE BOTTOM VIEWS.
2. ALL VOLTAGES ARE MEASURED BETWEEN TUBE SOCKET TERMINALS AND ELECTRICAL GROUND BUSS (NOT CHASSIS) WITH ZERO SIGNAL INPUT. WHERE TWO READINGS ARE SHOWN THE FIRST IS FOR FM THE SECOND FOR BC.
3. LINE VOLTAGE - 117V. AC. AC VOLTAGES SHOWN WILL BE DC WHEN OPERATING FROM A DC LINE.
4. ALL VOLTAGES SHOWN ARE DC UNLESS OTHERWISE SPECIFIED.
5. DC VOLTAGES SHOWN WERE MEASURED WITH AN ELECTRONIC VOLTMETER.
6. "NC" - NO CONNECTION. (VOLTAGES SHOWN FOR THIS TERMINAL ONLY WHEN TERMINAL IS USED AS A TIE LUG).
7. "NR" - NOT READABLE. (READING GENERALLY MEANINGLESS).
8. [] SPACE PROVIDED FOR SERVICE METER READINGS.
9. ALL READINGS TAKEN WITH LINE PLUG POLARIZED SO THAT GROUND BUSS AND CHASSIS ARE AT THE SAME POTENTIAL WITH CHASSIS GROUNDED.

Fig. 5. Tube socket voltage chart.

ALIGNMENT CHART

Dummy Antenna	Signal Generator Coupling	Signal Generator Frequency	Radio Range Switch Position	Radio Dial Setting	Adjust	Remarks
1. .01 mfd. cap.	High side to stator plates of high cap. mixer section. Generator ground to chassis.	455 kc	AM	1000 kc	A,B,C,D	Adjust for max. audio output at voice coil. Keep audio output below 50 mw to avoid AVC action.
2. .01 mfd. cap.	High side to stator plates of low cap. mixer section. Generator ground to chassis.	10.7 mc (No modulation)	FM	100 mc	E,F,G,H	Adjust for max. DC voltage between pin #7 of the 12 AL5 and ground buss. Connect a 500,000 ohm resistor in series with voltmeter probe. Use just enough signal generator output to obtain approx. 2 volts at the electronic voltmeter.
3. After completing the adjustments required by step 2. detune the signal generator on each side of 10.7 mc and note the generator dial or frequency reading for one half of the DC voltage measured by the electronic voltmeter. Use just enough signal generator output to obtain a maximum of 2 volts at the center frequency of the IF channel. Set the signal generator frequency at the midpoint of the two readings obtained above and align the FM detector transformer as follows:						
4. Without changing the setup, adjust the primary of the FM detector transformer (I) for maximum DC voltage. Disconnect the electronic voltmeter probe and reconnect it at the junction of R-13 and 14 using the 500,000-ohm resistor as before for isolation. Adjust the secondary of the FM detector (J) for the null or zero DC voltage. This completes the IF amplifier adjustment.						
5. Std. RMA dummy	To terminals "D-D" on rear chassis apron. Connect RMA dummy to unby-passed terminal.	1500 kc	AM	1500 kc	*K,L	Adjust for max. audio output as in step 1.
		600 kc	AM	600 kc	*M	
6. 300-ohm carbon resistor	To terminals "D-D" on rear chassis apron. Connect resistor to high side or unbypassed terminal.	108 mc	FM	108 mc	*N,O	Adjust for max. DC voltage as in step 2.

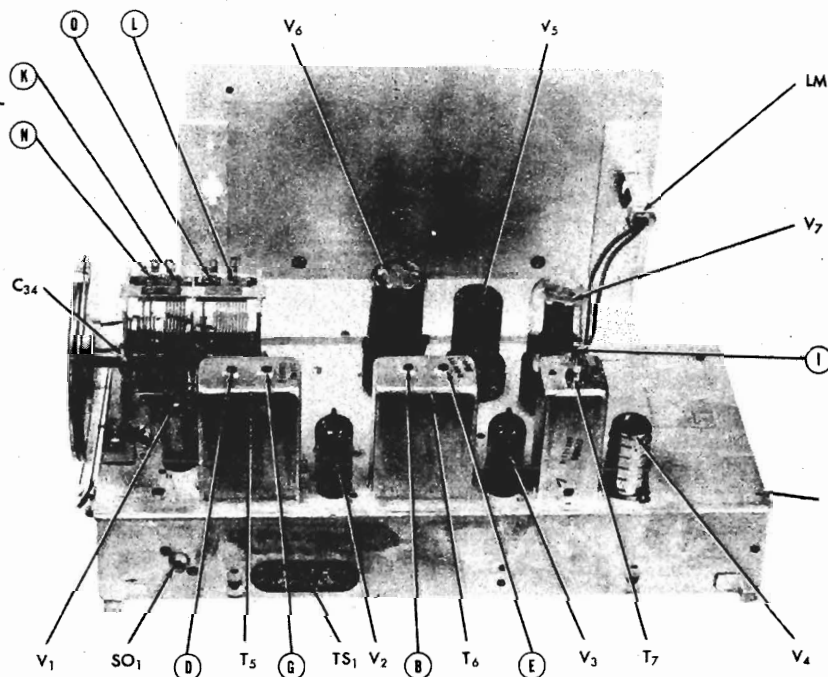
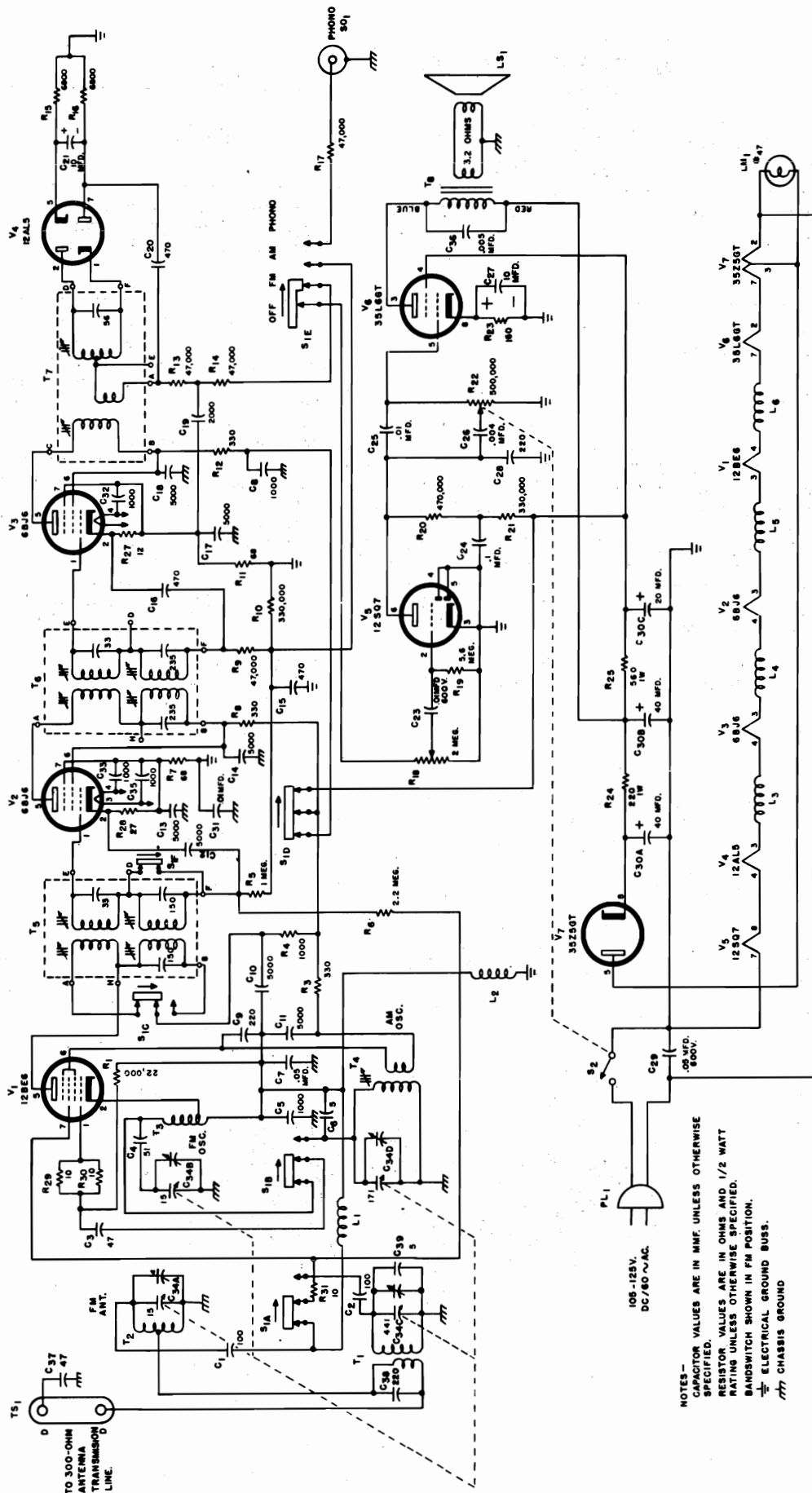


Fig. 2. Top view, alignment, adjustments and component location

MODEL S-58

THE HALLICRAFTERS CO.



89D285-0

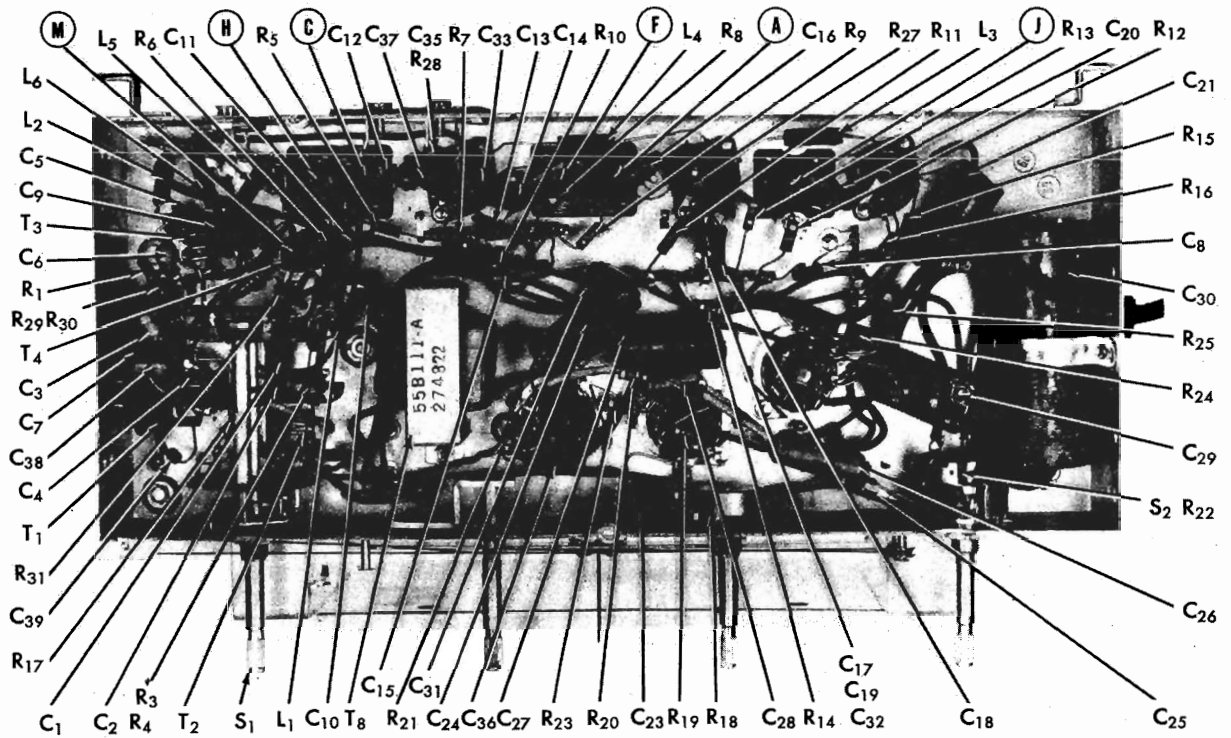
Fig. 6. Schematic diagram.

NOTES—
CAPACITOR VALUES ARE IN MMF. UNLESS OTHERWISE SPECIFIED.
RESISTOR VALUES ARE IN OHMS AND 1/2 WATT RATING UNLESS OTHERWISE SPECIFIED.
BANDSWITCH SHOWN IN FM POSITION.
ELECTRICAL GROUND BUSH.
CHASSIS GROUND

LAST C SYMBOL—C-39
LAST R SYMBOL—R-31

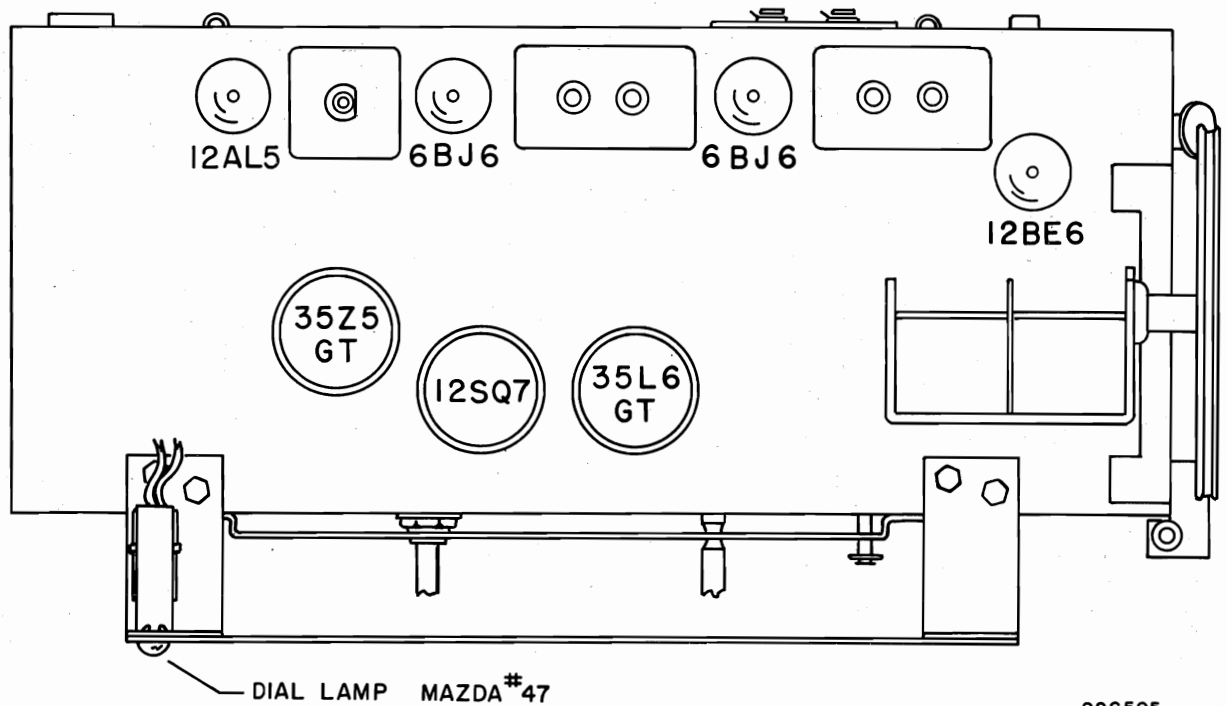
THE HALLICRAFTERS CO.

MODEL S-58



92X512

Fig. 3. Bottom view, alignment adjustments and component location



92C505

Fig. 4. Top view, location of tubes and dial lamps.

© John F. Rider

THE HALLICRAFTERS CO.

MODEL S-59

GENERAL

Tubes Seven plus rectifier

Output Impedance. 500 ohms

Antenna Built-in loop type antenna.
Provisions for external antenna

Phono Input High impedance

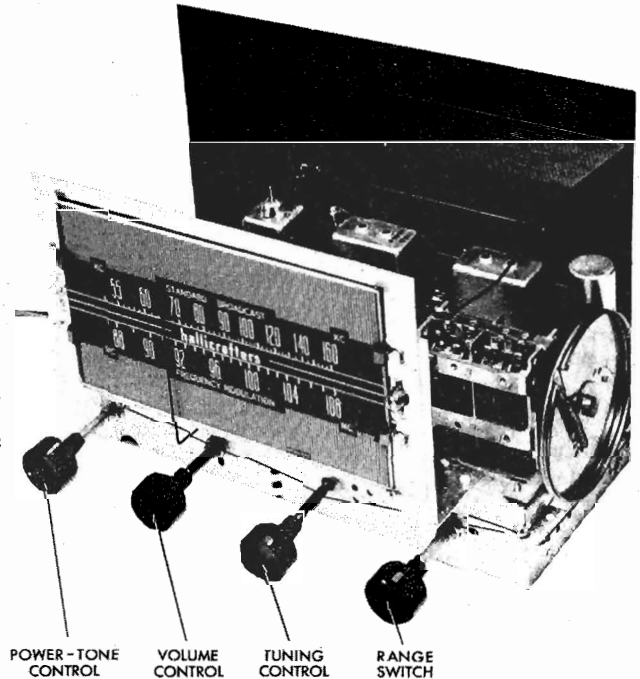
Tuning Manual

Frequency Range. Broadcast 540 kc - 1600 kc
Frequency Modulation 88 mc - 108 mc

Intermediate Frequency. 455 kc/10.7 mc

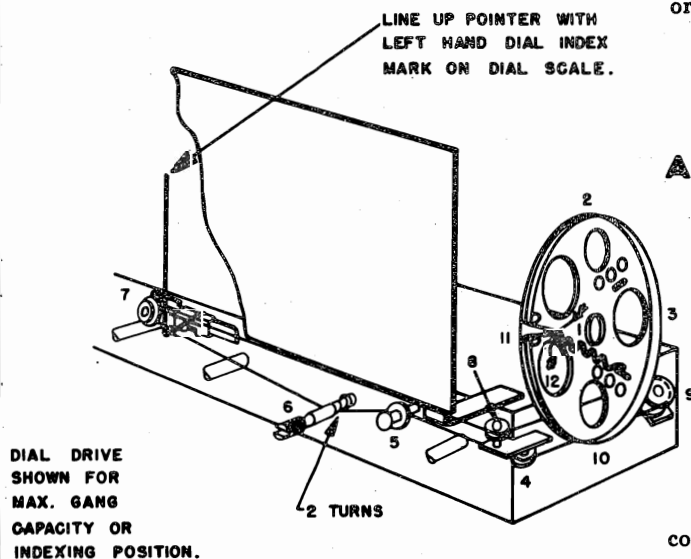
Power Supply 105 - 125 V. 60 cycles AC

Power Consumption. 60 watts

**RESTRINGING DIAL CORD**

Restring the dial drive with a 48-inch length of 20 lb. test dial cord. Tie one end to the tension spring and follow the stringing sequence outlined in Fig. 1. Stretch the tension spring and tie the end of the cord securely to the spring as shown.

Set the tuning condenser at maximum capacity (closed), attach the dial pointer to the drive string and line it up with the left hand index mark on the dial scale.

**REPLACING LAMPS**

Refer to Fig. 4 for the location of the two dial lamps used in the receiver. To gain access to defective lamps, unclip the dial lamp socket by compressing the side springs. Replace defective lamps with 6-8 V. Mazda #44 (Blue bead) lamps or equivalent.

ALIGNMENT

Generator connection See chart

Generator ground To chassis

Output meter connection Across voice coil

Electronic voltmeter connection See chart

Volume control position Maximum

Tone control position Optional

The standard RMA dummy specified in the alignment chart consists of a 200 mmf condenser in series with a 20 uh r-f choke which is shunted by a 400 mmf condenser in series with a 400 ohm carbon resistor.

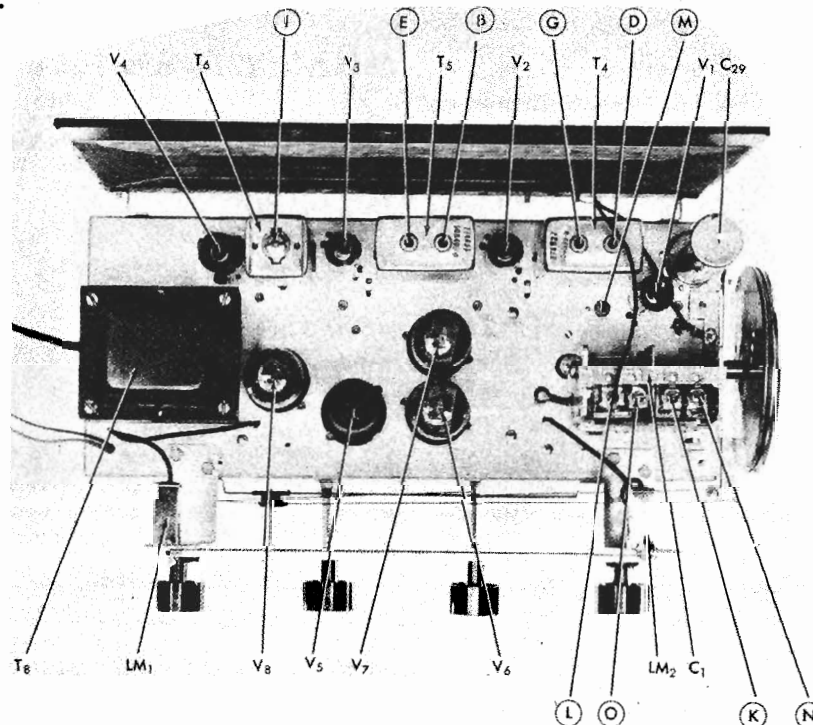
MODEL S-59

THE HALLICRAFTERS CO.

ALIGNMENT CHART

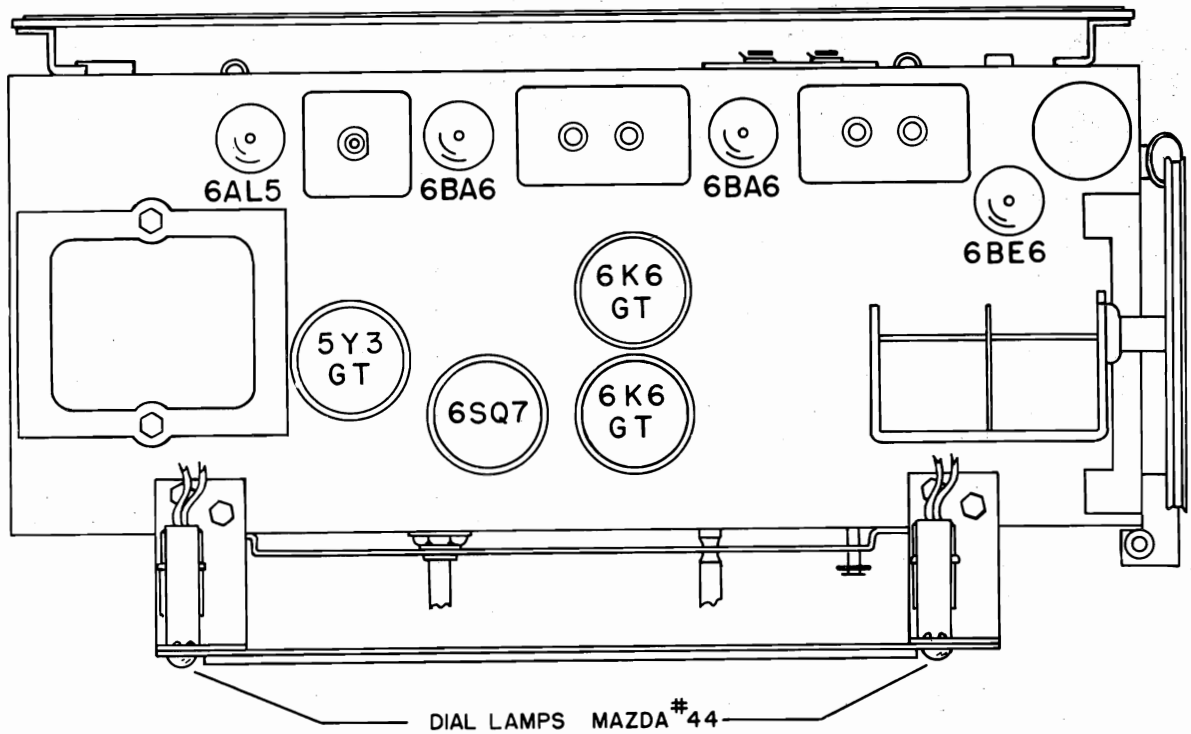
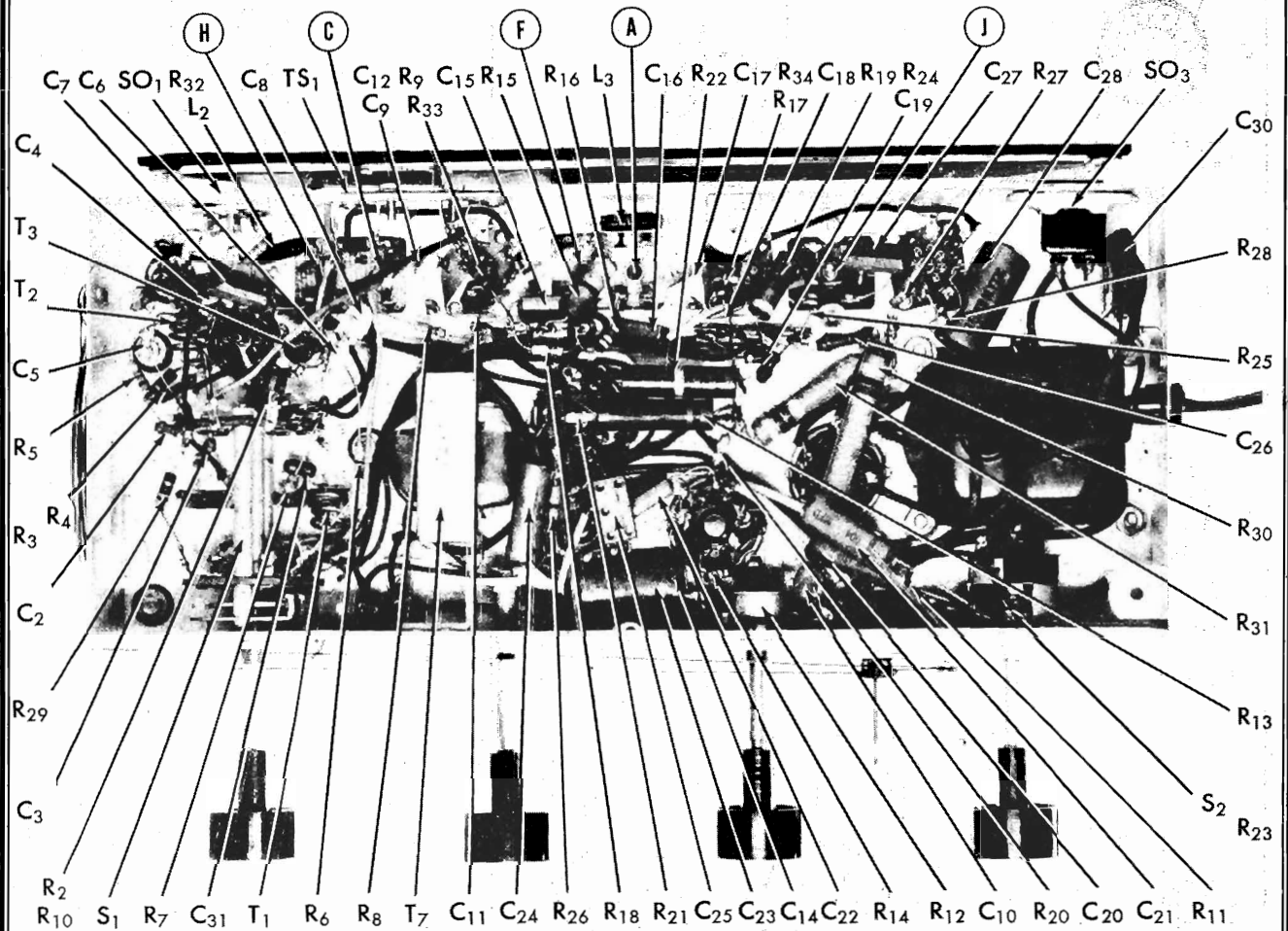
Dummy Antenna	Signal Generator Coupling	Signal Generator Frequency	Radio Range Switch Position	Radio Dial Setting	Adjust	Remarks
1. .01 mfd. cap.	To stator plates of high cap. mixer section	455 kc	2	1000 kc	A,B,C,D	Adjust for max. audio output at voice coil. Keep audio output below 50 mw to avoid AVC action.
2. .01 mfd. cap.	To stator plates of low cap. mixer section	10.7 mc (No modulation)	1	100 mc	E,F,G,H	Adjust for max. DC voltage between pin #7 of the 6AL5 and chassis. Connect a 500,000 ohm resistor in series with voltmeter probe. Use just enough signal generator output to obtain approx. 2 volts at the electronic voltmeter.
3. After completing the adjustments required by step 2, detune the signal generator on each side of 10.7 mc and note the generator dial or frequency reading for one half of the DC voltage measured by the electronic voltmeter. Use just enough signal generator output to obtain a maximum of 2 volts at the center frequency of the IF channel. Set the signal generator frequency at the midpoint of the two readings obtained above and align the FM detector transformer as follows:						
4. Without changing the setup, adjust the primary of the FM detector transformer (I) for maximum DC voltage. Disconnect the electronic voltmeter probe and reconnect it to the junction of R24 and R25 using the 500,000-ohm resistor as before for isolation. Adjust the secondary of the FM detector (J) for the null or zero DC voltage. This completes the IF amplifier adjustment.						
5. Std. RMA dummy	To BC antenna terminal on back of loop.	1500 kc	2	1500 kc	*K,L	Adjust for max. audio output as in step 1.
		600 kc	2	600 kc	*M	
6. 300-ohm carbon resistor	To terminals "D-D" on rear chassis apron. Connect resistor to high side or ungrounded terminal	108 mc	1	108 mc	*N,O	Adjust for max. DC voltage as in step 2.

*Calibration adjustment.



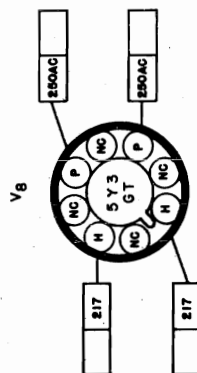
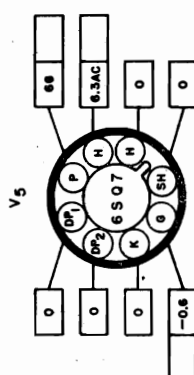
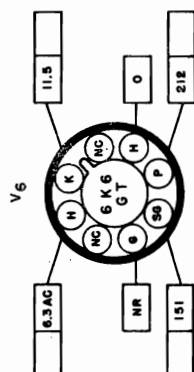
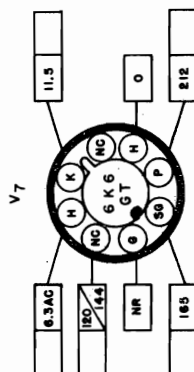
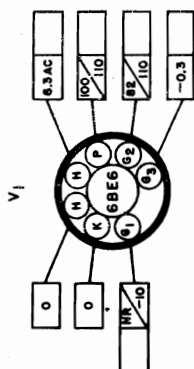
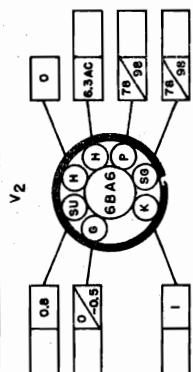
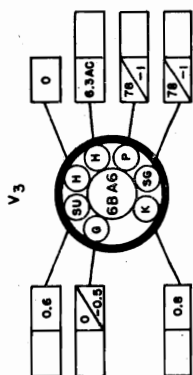
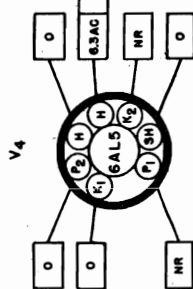
THE HALLICRAFTERS CO.

MODEL S-59



MODEL S-59

THE HALLICRAFTERS CO.



FRONT APRON
BOTTOM VIEW OF CHASSIS

NOTES—

1. SOCKET VIEWS ARE BOTTOM VIEWS.
2. ALL VOLTAGES MEASURED BETWEEN TUBE SOCKET TERMINALS AND CHASSIS.
3. LINE VOLTAGE — 117V. AC.
4. ALL VOLTAGES SHOWN WERE MEASURED WITH AN ELECTRONIC VOLTMETER AND AT ZERO SIGNAL.
5. ALL VOLTAGES ARE DC UNLESS OTHERWISE SPECIFIED.
6. WHERE TUBE SOCKET VOLTAGES CHANGE FROM FM TO AM RECEPTION TWO READINGS ARE SHOWN, UPPER LEFT SHOWS FM READINGS — LOWER RIGHT SHOWS AM READINGS.
7. "NC"—NO CONNECTION. READING SHOWN ONLY WHEN TERMINAL IS USED AS A TIE LUG.
8. "NR"—NOT READABLE OR READING GENERALLY MEANINGLESS.
9. THE BLANK SPACES ARE PROVIDED FOR THE SERVICE METER READING. FILL IN THE ACTUAL READING AS TAKEN WITH YOUR OWN TEST EQUIPMENT USING A NORMAL OPERATING RADIO FOR THESE MEASUREMENTS.
10. TUBES V-1, 2 AND 3 ARE DISABLED DURING PHONO OPERATION.

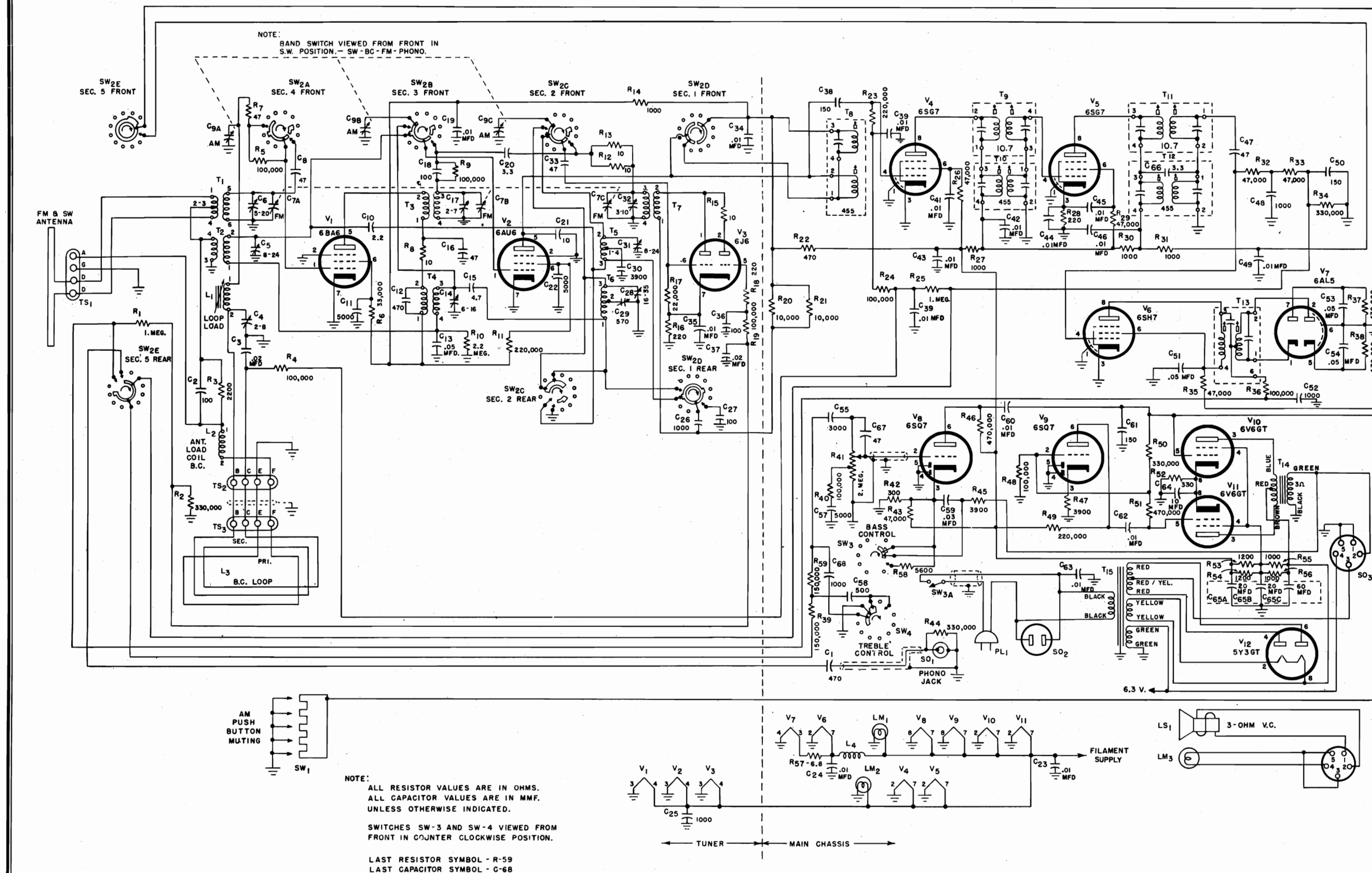
LAST CAPACITOR	SYMBOL	C - 31
LAST RESISTOR	SYMBOL	R - 34

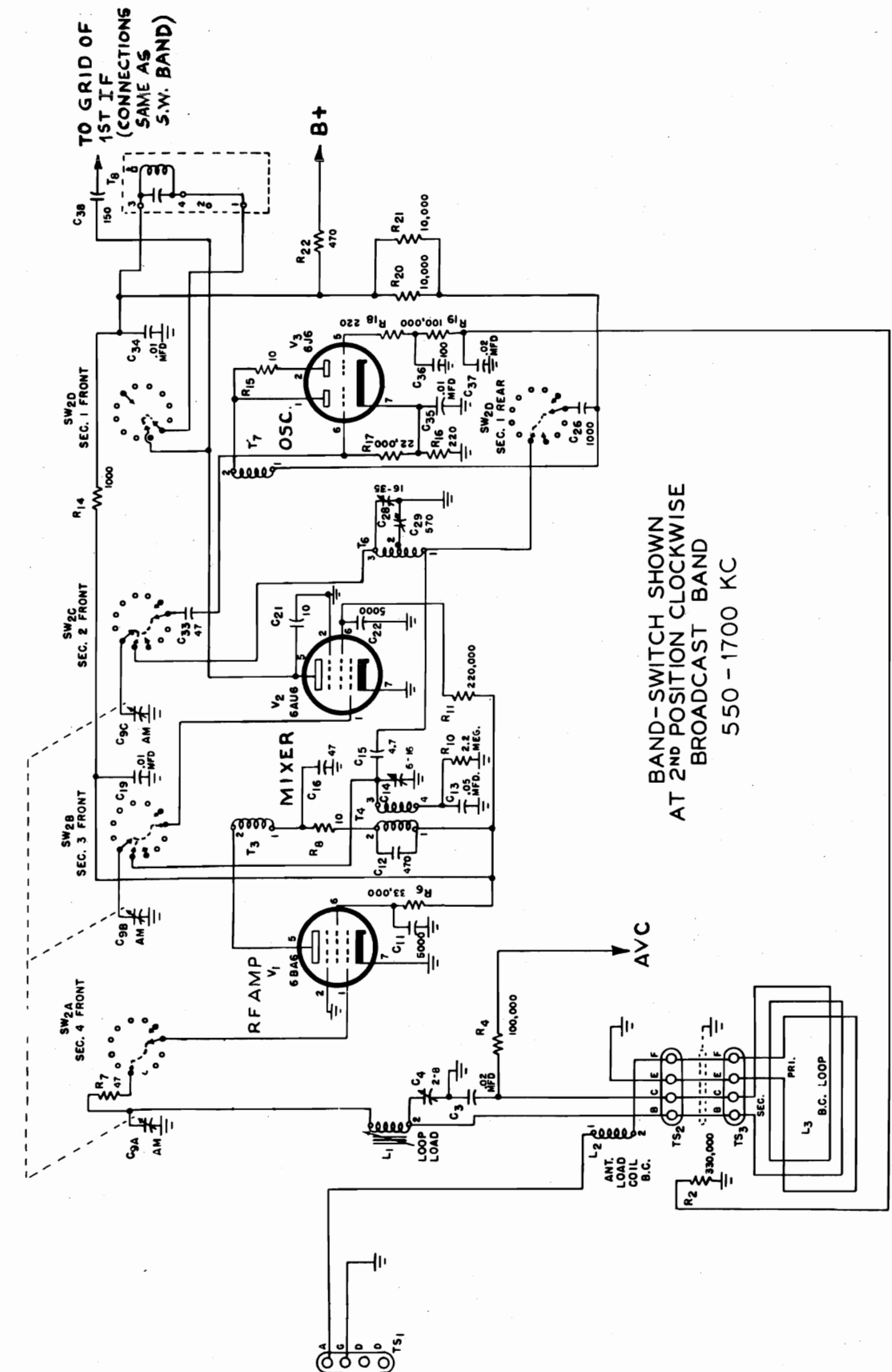
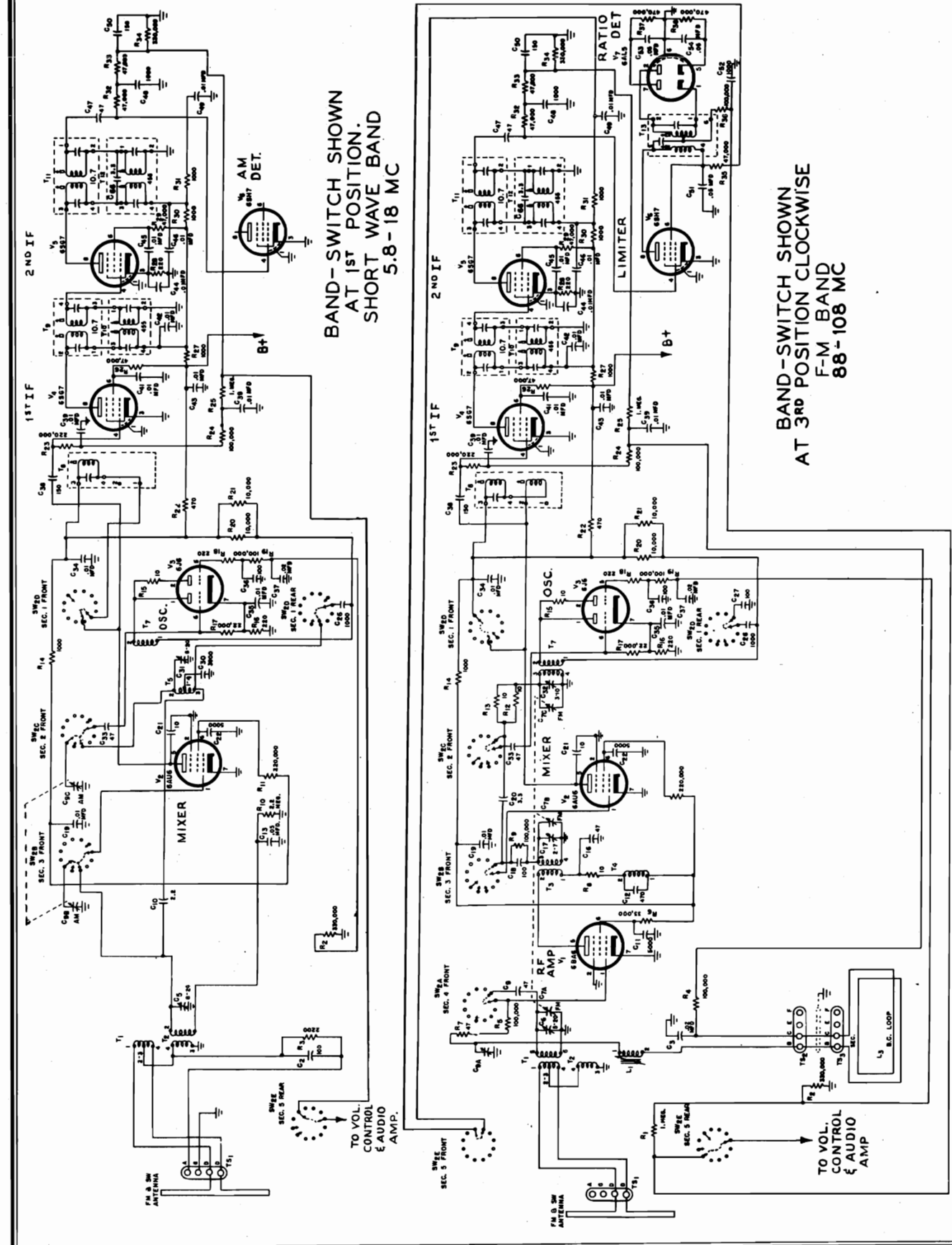
MODEL S-59

THE HALLICRAFTERS CO.

Ref. No.	Description	Hallcrafters Part Number	Ref. No.	Description	Hallcrafters Part Number
CONDENSERS			TRANSFORMERS AND COILS (Cont.)		
C-1	Capacitor, main tuning	48C203	T-8	Transformer, power	52C166
C-2	47 mmf. 500 V., ceramic	CC21UK470K	L-1	Loop antenna	57C123
C-3	51 mmf. 500 V., ceramic	CC21UK510J	L-2,3	Coil, R.F. choke	53A136
C-4,19	1000 mmf. 500 V., ceramic	47B20A102N5			
C-5	10 mmf. 500 V., ceramic	CC21UK100K			
C-6,8,9,11, 12,17,18	.005 mfd. 500 V., ceramic	47A168			
C-7,22	220 mmf. 500 V., mica	CM20A221M	S-1	Switch assembly, band selector	60B328
C-10,20,24	.01 mfd. 600 V., tubular	46A147	S-2	Switch, power (part of tone control R-23)	
C-14,26	2,000 mmf. 500 V., ceramic	47B20A202M5			
C-15,16	150 mmf. 500 V., mica	CM20A151M			
C-21	.004 mfd. 600 V., tubular	46AZ402J			
C-23,28	10 mfd. 25 V., electrolytic	45A121			
C-25,27	470 mmf. 500 V., mica	CM20A471M			
C-29	30-10-10 mfd. 350 V., electrolytic	45B131	PL-1	Line cord and plug	87B1669
C-30	.01 mfd. 600 V., molded paper	46A147	SO-1	Receptacle, phono	36A029
C-31	100 mmf. 2% 500 V., ceramic	47B20A101M5	SO-2	Speaker connector	10A287
			SO-3	Socket, A.C. receptacle	10A015
				Socket, octal (tube)	6A296
				Socket, miniature (tube)	6A308
				Socket, dial light	86A062-1
RESISTORS			PLUGS AND SOCKETS		
R-2,3,4	10 ohms 1/2 watt, carbon	RC20AE100K			
R-5	22,000 ohms 1/2 watt, carbon	RC20AE223K			
R-6,26,27, 28	6800 ohms 1/2 watt, carbon	RC20AE682K			
R-7	15,000 ohms 1/2 watt, carbon	RC20AE153M			
R-8	1 megohm 1/2 watt, carbon	RC20AE105M			
R-9,17	68 ohms 1/2 watt, carbon	RC20AE680K			
R-10	2.2 megohms 1/2 watt, carbon	RC20AE225M			
R-11,16,24, 25,29	47,000 ohms 1/2 watt, carbon	RC20AE473K			
R-12	Resistor variable, volume control	25B624	V-1	Type 6BE6, mixer/osc.	90X6BE6
R-13	1500 ohms 2 watts, carbon	RC40AE152M	V-2	Type 6BA6, 1st I.F. amp.	90X6BA6
R-14	5.6 megohms 1/2 watt, carbon	RC20AE565M	V-3	Type 6BA6, 2nd I.F. amp. (FM) & detector (AM)	90X6BA6
R-15,19	4700 ohms 1 watt, carbon	RC30AE472M	V-4	Type 6AL5, detector (FM)	90X6AL5
R-18	330,000 ohms 1/2 watt, carbon	RC20AE334M	V-5	Type 6SQ7, audio amp.	90X6SQ7
R-20,21,32	470,000 ohms 1/2 watt, carbon	RC20AE474M	V-6,7	Type 6K6 GT, audio power amp.	90X6K6GT
R-22	330 ohms 2 watts, carbon	RC40AE331K	V-8	Type 5Y3GT, rectifier	90X5Y3GT
R-23	Resistor, variable, tone control	25B758	LM-1,2	Lamp, 6-8 V., Mazda #44 (Blue bead)	39A003
R-30,31	820 ohms 2 watts, carbon	RC40AE821K			
R-33	27 ohms 1/2 watt, carbon	RC20AE270K			
R-34	12 ohms 1/2 watt, carbon	RC20AE120K			
TRANSFORMERS AND COILS			MISCELLANEOUS		
T-1	Transformer, FM mixer stage	51A1060	TS-1	Terminal Strip, antenna	89A379
T-2	Transformer, FM osc. stage	51A1062		Lock, line cord	76A397
T-3	Transformer, AM osc. stage	51B1063		Shaft, tuning	74A251
T-4	Transformer, 1st I.F. stage	50B399		Retainer, spring	75A062
T-5	Transformer, 2nd I.F. stage	50B400		Rail, pointer	67B820
T-6	Transformer, ratio detector	50B401		Pointer	82B152
T-7	Transformer, audio output	55B112-1		Bracket, dial plate mtg.	67A834
				Dial plate	63B332
				Dial background (Black)	32A446
				Dial scale (glass)	22C212
				Clip, dial scale	76A390
				Spacer, rubber	16A126
				Escutcheon	7DO67
				Shield, miniature (tube)	69A232
				Dial, glass (clear)	22B205
				Clip, dial glass	76A331
				Spring, dial drive	75B012
				Knob, tuning and volume controls	15B067-2
				Knob, tone and range controls	15B143

THE HALLICRAFTERS CO.

MODELS 400, 406,
409, 410, 411, 412



THE HALLICRAFTERS CO.

MODELS 400, 406,
409, 410, 411, 412

REPLACING DIAL AND PILOT LAMPS

Refer to Fig. 11 for location of the two dial lamps used in the receiver. To gain access to them, remove the dial escutcheon. The pilot lamp at the base of the cabinet is removed by slipping the socket assembly straight back a short distance releasing it from its mounting tongue. The defective lamp may now be brought out in the open for replacement. Replace all lamps with 6-8 volt Mazda #44 or equivalent.

ALIGNMENT PROCEDURE

Removal of the receiver chassis from the cabinet requires the use of other calibration means than the dial glass. Calibration strips mounted on the pointer rails are provided for alignment purposes.

To use these calibration strips, it is necessary to remove the dial plate (brown metal cover) in the following manner.

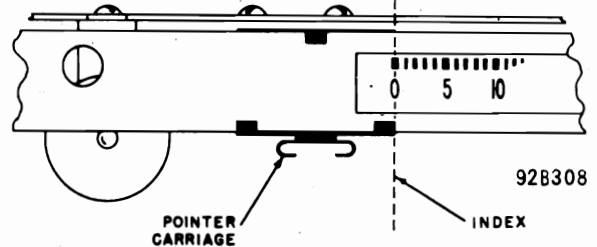
1. Remove dial pointers - Pull them straight out of their spring clips.
2. Remove the two dial lamp sockets.
3. Remove dial plate fastened to the chassis with seven sheet metal screws.

With the variable condensers fully mashed, the right hand side of the pointer carriage will be

indexed to zero on the calibration strips. Refer to Fig. 4.

The receiver is equipped with AUTOMATIC FREQUENCY CONTROL on the FM band to compensate for mechanical variations in the push-button mechanism. The correction factor is approximately 5 times: AFC takes hold 100 kc before the station frequency is reached and released before tuning 450kc passed the station frequency when receiving a 0.1 volt signal.

The standard RMA dummy specified in the alignment chart consists of a 200 mmf condenser in series with a 20 uh r-f choke which is shunted by a 400 mmf condenser in series with a 400 ohm carbon resistor.



Calibration strip detail.

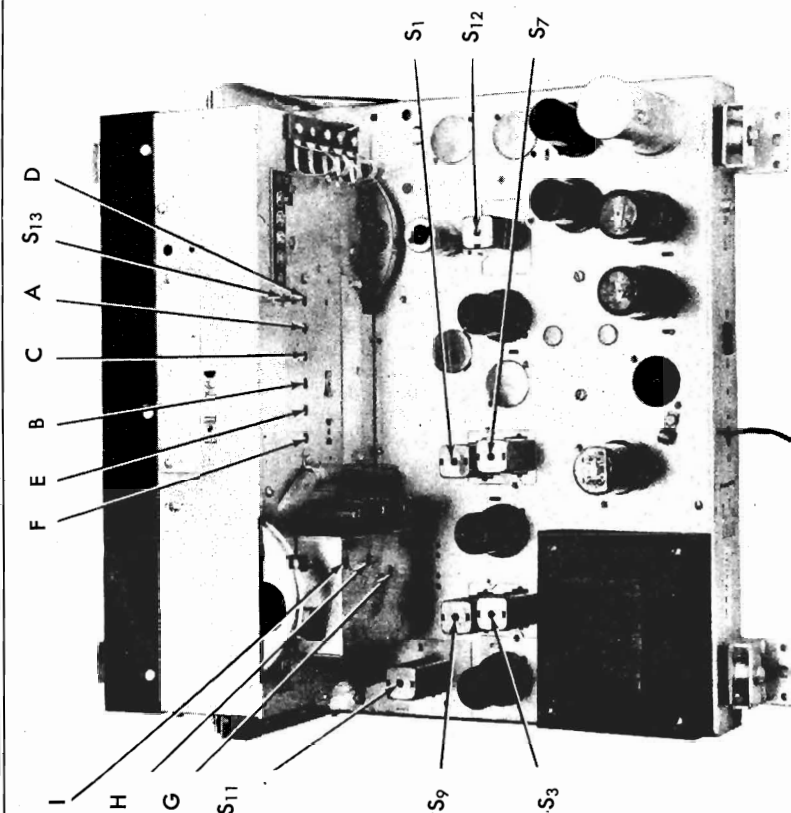
ALIGNMENT CHART

Step	Dummy Antenna	Signal Generator Coupling	Signal Generator Frequency	Band Switch Pos.	Radio Dial Setting	Cal. No.	Adjust	Remarks
1	0.01 mfd cap.	To stator plates of center section of AM tuning cap.	455 kc	"BC"	1000 kc	55	S1, S2, S3, S4, & S5	Adjust for max. output.
2	0.01 mfd cap.	To stator plates of center section of FM tuning cap	10.7 mc (No modulation)	"FM"	Mid-scale	55	S6, S7, S8, S9, S10, & S11	Adjust for max. AVC voltage as measured between pin #7 of 6AL5 and ground with a 20,000-ohm per volt meter.
3	0.01 mfd cap.	To stator plates of center section of FM tuning cap.	10.7 mc (No modulation)	"FM"	Mid-scale	55	S12	Adjust for zero voltage as measured between the junction of C55 and C68 ground with a 20,000-ohm per volt meter.
4	Std. RMA dummy.	To terminals "A" and "G" on ant. term. strip	1500 kc 600 kc	"BC" "BC"	1500 kc 600 kc	82 15.5	A*, B, & C D* & S13	Adjust for max. output
5	Std. RMA	To terminals "A" and "G" on ant. term. strip.	16 mc	"SW"	16 mc	84	E* & F	Adjust for max. output.
6	Two 150 ohm carbon resistors	To "D" terminals on ant. term. strip;	108 mc	"FM"	108 mc	83.5	G*, H & I	Adjust for max. limiter grid voltage as measured between the junction of R33 and R34 and ground with a 20,000-ohm per volt meter

* NOTE - Calibration adjustments.

MODELS 400, 406,
409, 410, 411, 412

THE HALLICRAFTERS CO.



Top view showing alignment points.

GENERAL

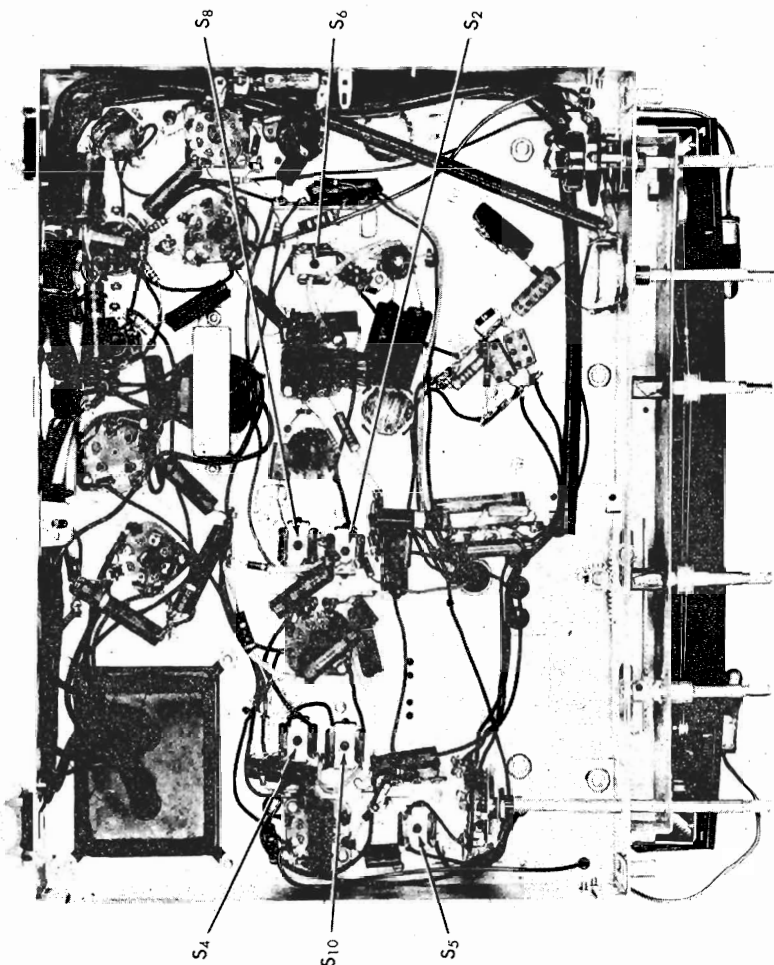
Tubes.....Eleven plus rectifier

Speaker.....12-inch PM

Voice Coil Impedance...3.2 ohms

Antenna.....Built-in loop, "AM"
Built-in dipole, "FM"
and shortwave. Pro-
visions for external
antennas.

Tuning.....Manual and mechan-
ical push-buttons;
five P.B. for "AM",
five P.B. for "FM".



Bottom view showing alignment points.

Tuning Range.....Band -
BC 550 kc - 1700 kc.
SW 5.8 mc - 18 mc.
FM 88 mc - 108 mc.

Intermediate Frequency...455 kc/10.7 mc.

Power Supply.....105-125 V. 60
cycles AC.

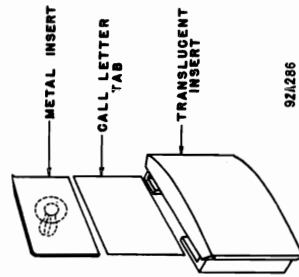
Power Consumption.....120 Watts (140 watts
with changer).

THE HALLICRAFTERS CO.

MODELS 400, 406,
409, 410, 411, 412

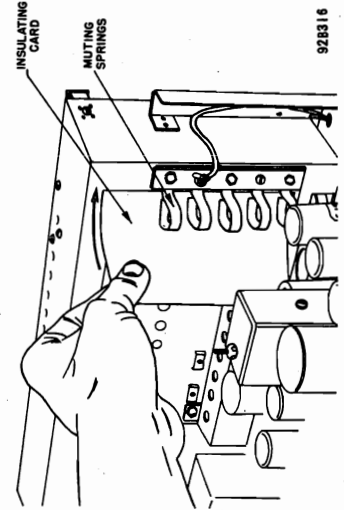
3. Insert screw driver blade through large hole of pushbutton into slot of locking screw
4. Loosen locking screw about one-half turn (Not more than one full turn.)
5. With pushbutton depressed, carefully tune in desired station with the manual control and tighten the locking screw.
6. Replace the translucent insert with the proper station call letters inserted.

INSERTING CALL LETTERS

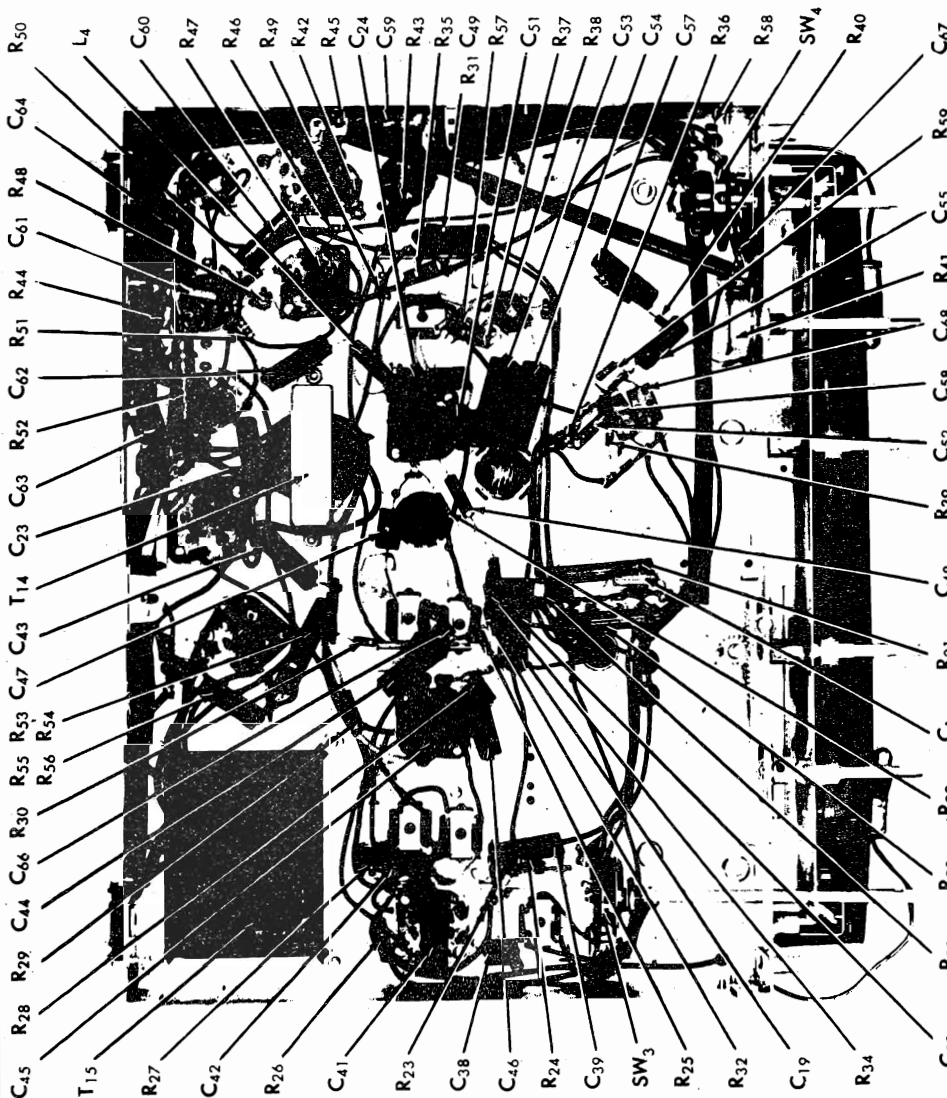


1. Slide out metal insert from translucent insert assembly. (See Fig. 2.)
2. Insert desired call letter tab.
3. Replace metal insert behind call letter tab.
4. Replace translucent insert assembly into pushbutton mechanism.

Fig. 2. View showing call letter installation.



Insulating the muting switch contacts.



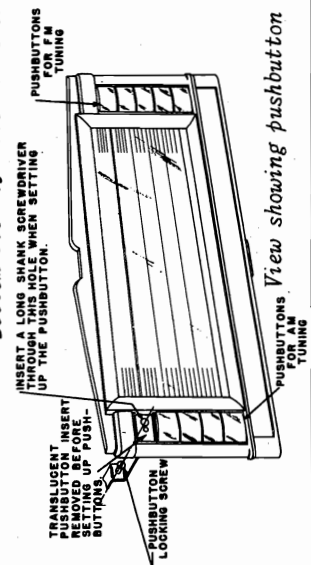
Bottom view of receiver showing component location.

BUTTON SETTING

Insulate the muting switch contacts before setting the left hand group of AM push buttons.

1. Select any one pushbutton.

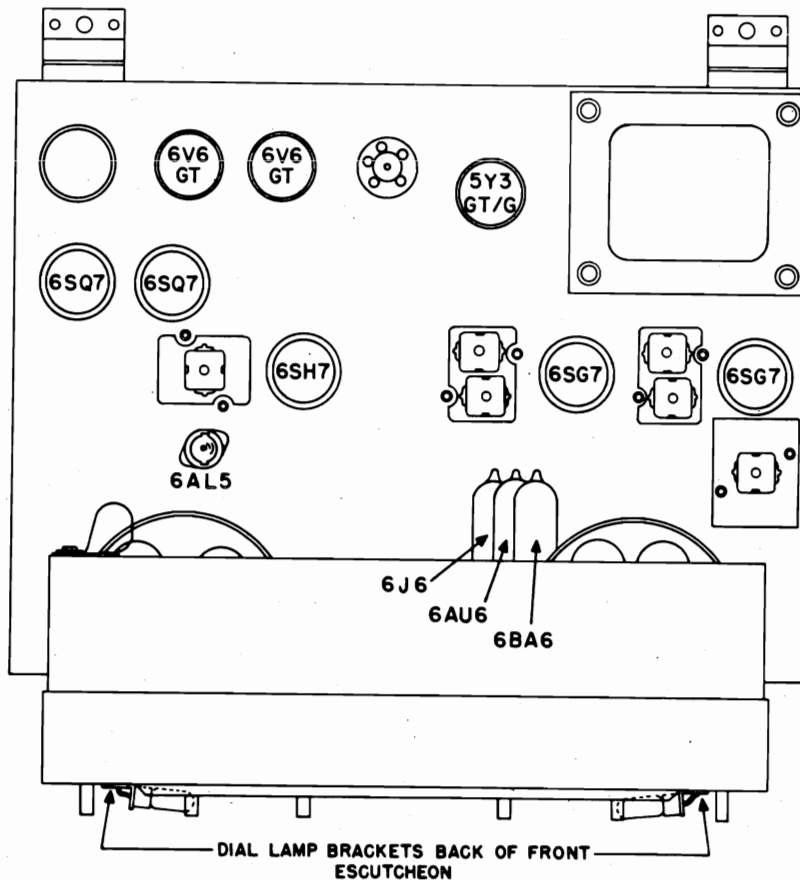
2. Pull translucent insert straight out.



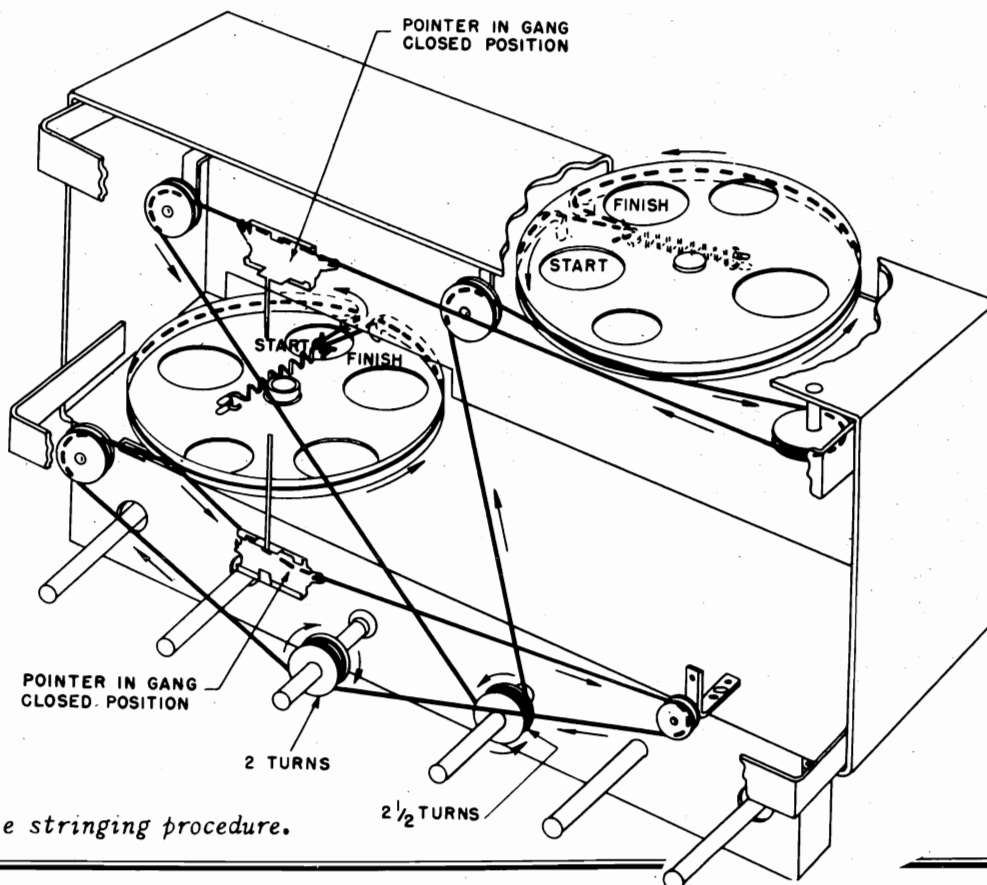
View showing pushbutton setup.

MODELS 400, 406,
409, 410, 411, 412

THE HALLICRAFTERS CO.



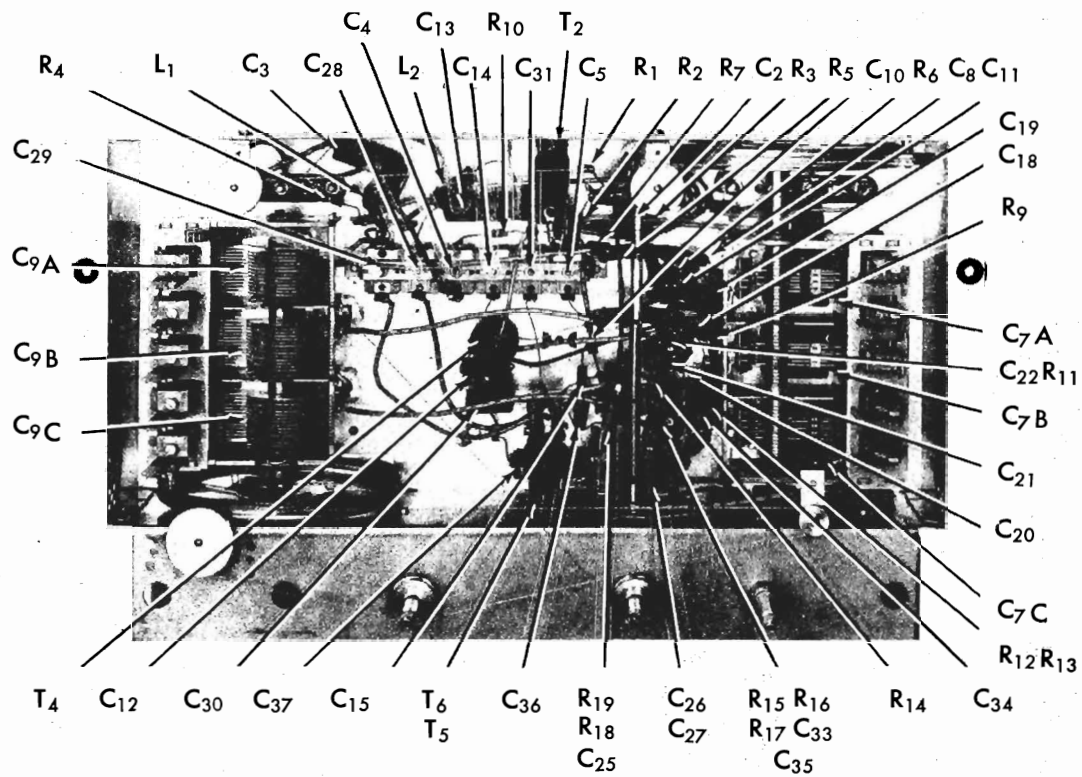
Top view showing location of tubes and dial lamps.



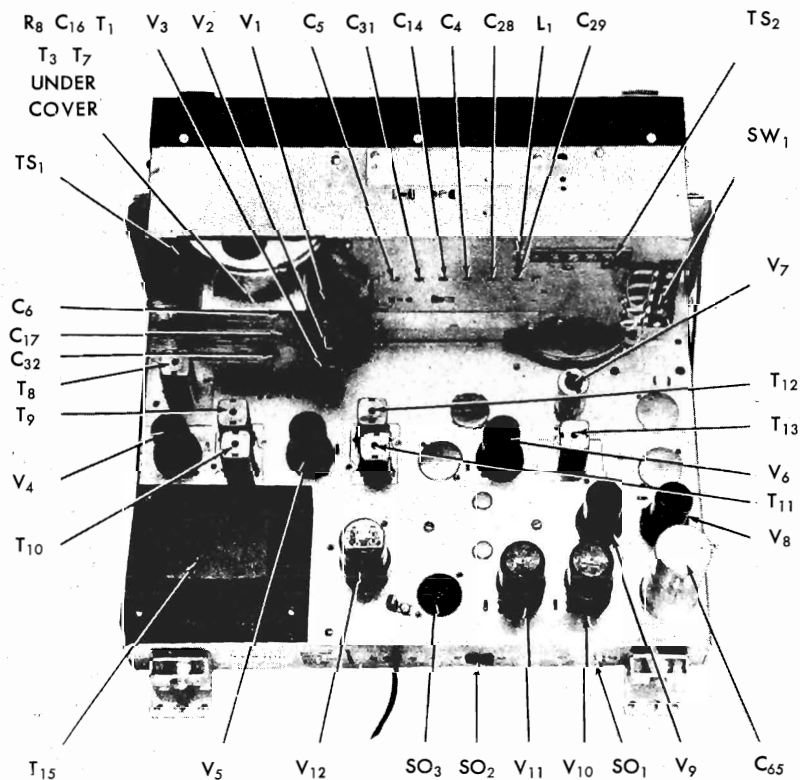
Dial cable stringing procedure.

THE HALLICRAFTERS CO.

MODELS 400, 406,
409, 410, 411, 412



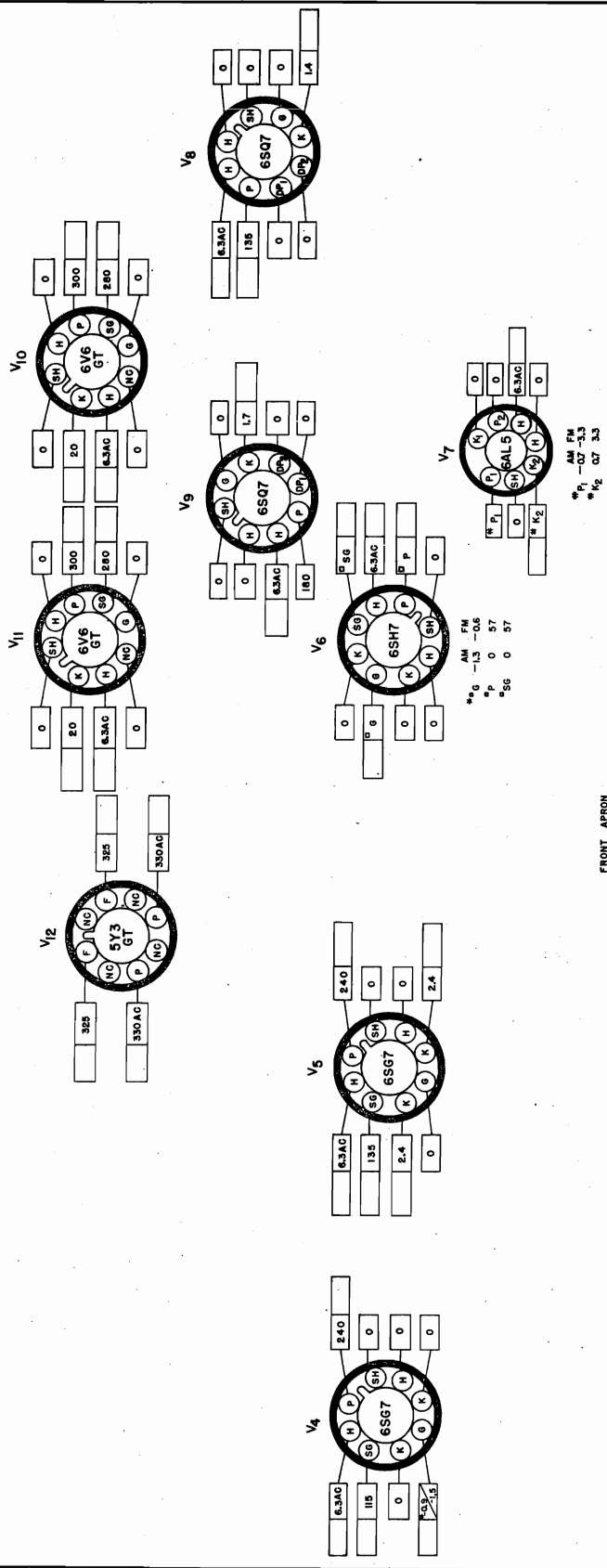
Front view of R.F. chassis showing component location.



Top view showing component location.

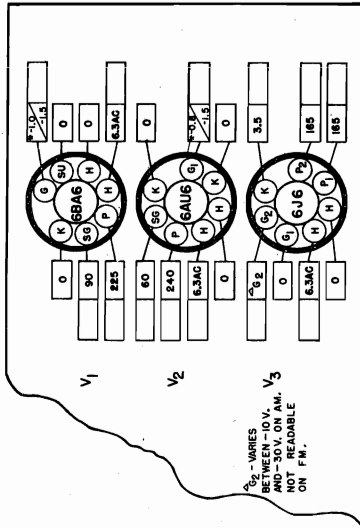
MODELS 400, 406,
409, 410, 411, 412

THE HALLICRAFTERS CO.



FRONT APRON

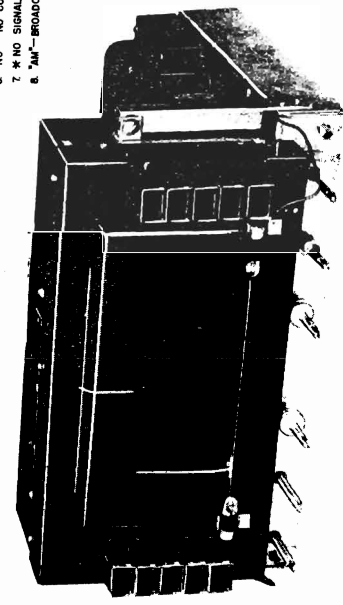
BOTTOM VIEW OF CHASSIS



FRONT VIEW OF RF DECK

- NOTES—
1. SOCKET VIEWS ARE BOTTOM VIEWS.
 2. ALL VOLTAGES MEASURED BETWEEN TUBE SOCKET TERMINALS AND CHASSIS.
 3. LINE VOLTAGE — 117 V. AC.
 4. ALL VOLTAGES SHOWN ARE DC UNLESS OTHERWISE SPECIFIED.
 5. VOLTAGES SHOWN WERE MEASURED WITH A 20,000 OHM/VOLT METER.
 6. "NC"—NO CONNECTION.
 7. *NO SIGNAL READINGS.
 8. "AM"—BROADCAST & SHORTWAVE BANDS, "FM"—FREQUENCY MODULATION BAND.

Tube socket voltage chart.



THE HALLICRAFTERS CO.

MODELS 400, 406,
409, 410, 411, 412

SERVICE PARTS LIST

Ref. No.	Description	Hallcrafters Part No.
CONDENSERS		
C-1	470 mmf. 500 V., mica	CM20A471M
C-2,36	100 mmf. 500 V., mica	CM20A101M
C-3,37	.02 mfd. 600 V., tubular paper	46AY203F
C-4,5,14,28,29; 31	Trimmer assembly	44B348
C-6	Trimmer, FM, ant. stage	44A194
C-7	Tuning condenser, FM	48C175
C-8,33	47 mmf. 500 V., ceramic	47A150
C-9	Tuning condenser, AM	49C176
C-10	2.2 mmf., ceramic	47A160-4
C-11,22	5000 mmf. 500 V., ceramic	47A168
C-12	470 mmf. 500 V., mica	CM20A471K
C-13,51,53,54	.05 mfd. 600 V., tubular paper	46AY503F
C-15	4.7 mmf., ceramic	47A160-6
C-16,47, 67	47 mmf. 500 V., mica	CM20A470M
C-17	Trimmer, FM, mixer stage	44A192
C-18,27	100 mmf. 500 V., ceramic	47A045
C-19,23,24,34, 39,40,41,42,43, 44,45,46,49,60, 62	.01 mfd. 600 V., tubular paper	46A2103F
C-20,66	3.3 mmf., ceramic	47A160-5
C-21	10 mmf. 500 V., ceramic	47A149
C-25,26,48,52	1000 mmf. 500 V., ceramic	47A148
C-30	3900 mmf. 500 V., mica	CM35A392J
C-32	Trimmer, FM, osc. stage	44A218
C-35	.008 mfd. 150 V., ceramic	47B32802N1
C-38,50, 61	150 mmf. 500 V., mica	CM20A151M
C-55	.003 mfd. 600 V., tubular paper	46A2302J
C-57	.005 mfd. 600 V., tubular paper	46A2502J
C-58	500 mmf. 350 V., ceramic	47A147
C-59	.03 mfd. 200 V., tubular paper	46AU303J
C-63	.01 mfd. 600 V., molded paper	46AG103J
C-64	10 mfd. 25 V., electrolytic	45A121
C-65	60-20 mfd. 450 V., 20 mfd. 400 V., electrolytic	45B113
C-68	1000 mmf. 500V., mica	CM20A102M
RESISTORS		
R-1,25	1 megohm $\frac{1}{2}$ watt, carbon	RC20AE105M
R-2,34,44	330,000 ohms $\frac{1}{2}$ watt, carbon	RC20AE334M
R-3	2200 ohms $\frac{1}{2}$ watt, carbon	RC20AE222M
R-4,5,9,19,24, 36,40	100,000 ohms $\frac{1}{2}$ watt, carbon	RC20AE104M
R-6	33,000 ohms 1 watt, carbon	RC30AE333M
R-7	47 ohms $\frac{1}{2}$ watt, carbon	RC20AE470M
R-8,12,13,15	10 ohms $\frac{1}{2}$ watt, carbon	RC20AE100M
R-10	2.2 megohms $\frac{1}{2}$ watt, carbon	RC20AE225M
R-11,23,49	220,000 ohms $\frac{1}{2}$ watt, carbon	RC20AE224M
R-14,27,30,31	1000 ohms $\frac{1}{2}$ watt, carbon	RC20AE102M
R-16,18,28	220 ohms $\frac{1}{2}$ watt, carbon	RC20AE221M
R-17	22,000 ohms $\frac{1}{2}$ watt, carbon	RC20AE223M
R-20,21	10,000 ohms 2 watts, carbon	RC40AE103M
R-22	470 ohms 1 watt, carbon	RC30AE471M
R-26,29,35	47,000 ohms 1 watt, carbon	RC30AE473M
R-32,33	47,000 ohms $\frac{1}{2}$ watt, carbon	RC20AE473M
R-37,38,51	470,000 ohms $\frac{1}{2}$ watt, carbon	RC20AE474K
R-39,59	150,000 ohms $\frac{1}{2}$ watt, carbon	RC20AE154M
R-41	Resistor, variable, 2 megohms (tapped)	25B622
R-42	300 ohms $\frac{1}{2}$ watt, carbon	RC20AE301J
R-43	47,000 ohms 2 watts, carbon	RC40AE473K
R-45,47	3900 ohms $\frac{1}{2}$ watt, carbon	RC20AE392K
R-46	470,000 ohms $\frac{1}{2}$ watt, carbon	RC20AE474M
R-48	100,000 ohms $\frac{1}{2}$ watt, carbon	RC20AE104K
R-50	330,000 ohms $\frac{1}{2}$ watt, carbon	RC20AE334K
R-52	330 ohms 2 watts, carbon	RC40AE331M
R-53,54	1200 ohms 2 watts, WW	24BV122E
R-55,56	1000 ohms 2 watts, WW	24BV102E
R-57	6.8 ohms 1 watt, carbon	RC30AE068K
R-58	5600 ohms $\frac{1}{2}$ watt, carbon	RC20AE562K
TRANSFORMERS AND COILS		
T-1	Transformer, FM, antenna stage	51B916
T-2	Transformer, SW, antenna stage	51B993
T-3	Transformer, FM, mixer stage	51B915
T-4	Transformer, BC, mixer stage	51B910
T-5	Transformer, SW, osc. stage	51B908
T-6	Transformer, BC, osc. stage	51B911
T-7	Transformer, FM, osc. stage	51B914
T-8	Transformer, 1st I.F.	50C298
T-9,11	Transformer, FM, interstage I.F.	50C237
T-10	Transformer, AM, interstage I.F.	50C236
T-12	Transformer, AM, detector stage I.F.	50C235
T-13	Transformer, FM, detector stage I.F.	50C263

SERVICE PARTS LIST

Ref. No.	Description.	Hallcrafters Part No.
TRANSFORMERS AND COILS (Continued)		
T-14	Transformer, audio output	55B105
T-15	Transformer, power	52C153
L-1	Coil, loop loading	51B902
L-2	Coil, antenna loading	51B994
L-3	Loop antenna (Models 400,406,409)	57C114
L-3	Loop antenna (Models 410,411,412)	57C116
L-4	Coil, R.F. choke	53B009
SWITCHES		
SW-1	Switch, muting	18A092
SW-2	Band switch assembly	60C308
SW-3	Switch, power and bass tone cont.	60B265
SW-4	Switch, treble tone control	60B325
PLUGS AND SOCKETS		
PL-1	Line cord and plug	87B1625
SO-1	Receptacle, phono pickup	36A034
SO-2	Receptacle, phono motor	10A015
SO-3	Socket, speaker (5 pin)	6A277
-	Socket, octal (tube)	6A190
-	Socket, octal (6V6GT tubes)	6A296
-	Socket, miniature (tube)	6A276
-	Socket & bracket, dial light, L.H.	86A046
-	Socket & bracket, dial light, R.H.	86A047
-	Socket, cabinet pilot light	86B050-2
TUBES, RECTIFIERS AND LAMPS		
V-1	Type 6BA6, antenna	90X6BA6
V-2	Type 6AU6, mixer	90X6AU6
V-3	Type 6J6, osc.	90X6J6
V-4,5	Type 6SG7, 1st & 2nd I.F.	90X6SG7
V-6	Type 6SH7, FM limiter, AM detector	90X6SH7
V-7	Type 6AL5, FM detector	90X6AL5
V-8,9	Type 6SQ7, audio amp.	90X6SQ7
V-10,11	Type 6V6GT/G, power amp.	90X6V6GT/G
V-12	Type 5Y3GT, rectifier	90X5Y3GT
LM-1,2,3	Lamp, 6-8 V., 250 MA., G.E. #44	39A003
MISCELLANEOUS		
	Shield, tube base (miniature tube)	69A169
	Shield, tube (miniature tube)	69A104
	Spring, tube retainer	75A076
	Shield, dial light	86A037
	Shield, pilot light	69A197
	Shield, FM coil section	69C172
	Carriage, pointer	67B645
	Pointer, FM	82A145
	Pointer, AM	82A146
	Spring, pointer	75A132
	Push-button (brown)	17B028
	Insert, push-button, lucite	17A027
	Insert, push-button, metal	17A029
	Call letters	17A025
	Spring, dial drive	75A006
	Cord, dial drive	38A017
	Plate, dial drive cover	83A300
	Escutcheon (Models 409,410)	70C39
	Escutcheon (Models 400,406,411,412)	70D39-2
	Dial glass, upper	22D195
	Dial glass, lower	22B207
	Clips, dial glass	76A331
	Knob, power switch & tone control (Models 400,406,411,412)	15B986-1
	Knob, power switch & tone control (Models 409,410)	15B096
	Knob, tuning & volume controls (Models 400,406,411,412)	15B095-2
	Knob, tuning & volume controls (Models 409,410)	15B093
	Knob, & pin ass'y bandswitch (Models 400,406,411,412)	15A136
	Knob & pin ass'y, bandswitch (Models 409,410)	15A129
TS-1	Terminal strip, antenna	88A277
TS-2	Terminal strip, loop	88A278
	Transmission line, loop	87A1615-1
	FM folded doublet	57C108-1
	Jewel, pilot lamp	86A057
	Bracket, pilot lamp	67A765
LS-1	Speaker assembly	85C069
	Record changer	115C017

MODEL 414

THE HALLICRAFTERS CO.

GENERAL

Tubes Ten plus rectifier

Speaker 12 inch PM

Voice Coil Impedance . . . 6 ohms

Antenna Built in loop, "BC"
Built in dipole, "FM"
Provisions for external
antennas

Tuning Manual

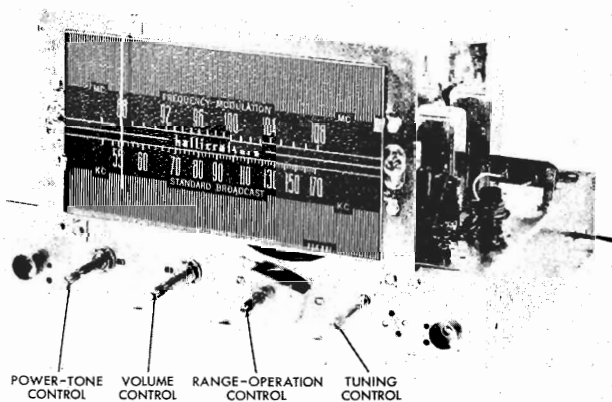
Tuning Range Broadcast 540 kc - 1750 kc
Frequency
Modulation 88 mc - 108 mc

Intermediate Frequency . . 455 kc/21.75 mc.

Power Supply 105-125 V. 50/60 cycles AC

Power Consumption 90 Watts (110 watts with
changer)

When making the alignment adjustments set the tone control at NORMAL and the volume control at maximum volume. Use just enough signal generator output to obtain the results indicated on the chart.



92X421

RESTRINGING DIAL CORD

Restring the dial drive with 30 lb test dial cord. Tie one end to the tension spring and follow the sequence outlined in Fig. 1. Stretch the tension spring and tie the end of the cord securely to the spring as shown.

Set the tuning condenser at maximum capacity (closed), attach the pointer to the string and line it up with the left hand index mark on the dial scale.

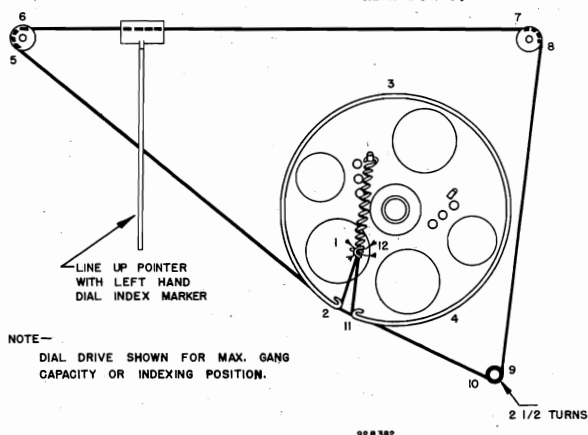


Fig. 1. Dial cable stringing procedure.

ALIGNMENT PROCEDURE

The receiver is equipped with AUTOMATIC FREQUENCY CONTROL on the FM band to compensate for oscillator drift and improve the tuning function on the FM band. The correction factor is approximately 5 times: AFC takes hold 250 kc before the station frequency is reached and releases before tuning 500 kc beyond the station frequency when receiving a 1000 micro-volt signal.

The standard RMA dummy specified in the alignment chart consist of a 200 mmf condenser in series with a 20 uh r-f choke which is shunted by a 400 mmf condenser in series with a 400 ohm carbon resistor.

REPLACING LAMPS

Refer to Fig. 7 for the location of two dial lamps used in the receiver. To gain access to defective lamps, reach in through the rear of the cabinet and unclip the dial lamp socket by compressing the side springs. The socket may then be brought out into the open to change the defective lamp. The lamp in the record changer compartment may be reached directly through the compartment door. Replace all lamps with 6-8 V. Mazda #44 (Blue bead) lamps or equivalent.

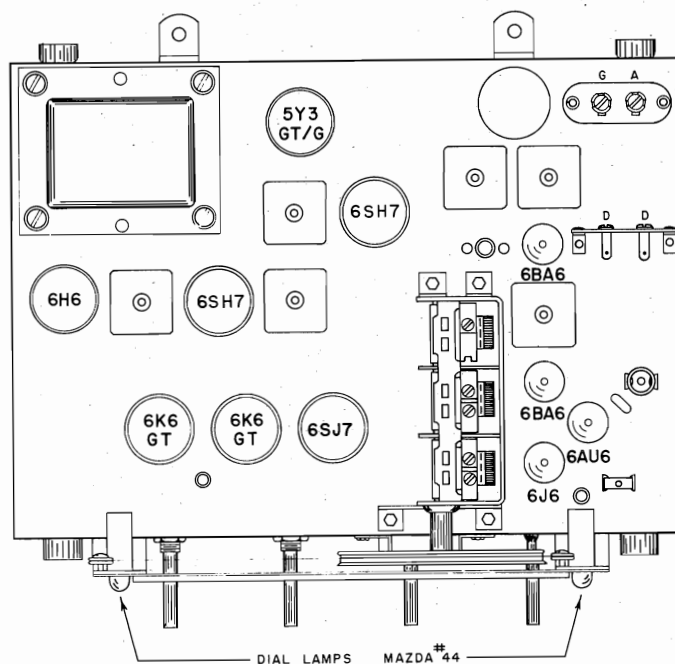


Fig. 7. Top view, location of tubes and dial lamps.

THE HALLICRAFTERS CO.

MODEL 414

ALIGNMENT CHART

Step	Dummy Antenna	Signal Generator Coupling	Signal Generator Frequency	Band Switch Pos.	Radio Dial Setting	Adjust	Remarks
1	0.01 mfd. cap.	To high cap. stator of center section.	455 kc	"BC"	1000 kc	A,B,C, D,E	Adjust for max. output.
2	0.01 mfd. cap. in series with a 4700 ohm carbon resistor.	To low cap. stator of center section.	21.75 mc	"FM"	90 mc	F,G,H, I,J,K	Adjust for max. voltage as measured between pin #3 of 6H6 and ground with an electronic volt meter.
3	0.01 mfd. cap.	See step 2.	21.75 mc	"FM"	90 mc	L	Adjust for zero voltage as measured between the junction of R27 and R28 and ground with an electronic volt meter.
4	Std RMA dummy	To terminals "A" and "G" on terminal strip TS-2.	1500 kc	"BC"	1500 kc	*M,N,O	Adjust for max. output
5	Two 150 ohm carbon resistors	To terminals "D-D" on terminal strip TS-1.	105 mc	"FM"	105 mc	*P,Q	Adjust for max. voltage as measured across R24 with an electronic volt meter.

*Note - Calibration adjustments.

**Note - The intermediate frequency for the FM channel in this receiver is 21.75 megacycles. This is a value which has been standardized by the Radio Manufacturers Association for the television sound channel. A "TLV" position on the band switch and a suitable connector (on the chassis near the tuning condenser) have been provided so that this receiver can be used with a relatively inexpensive video unit for high-quality television reception.

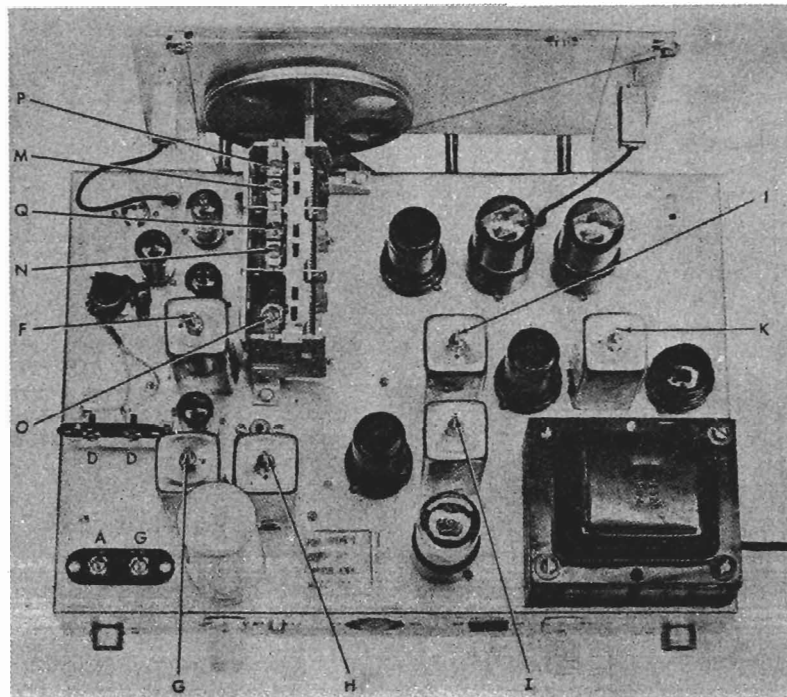


Fig. 2. Alignment adjustments, top view.

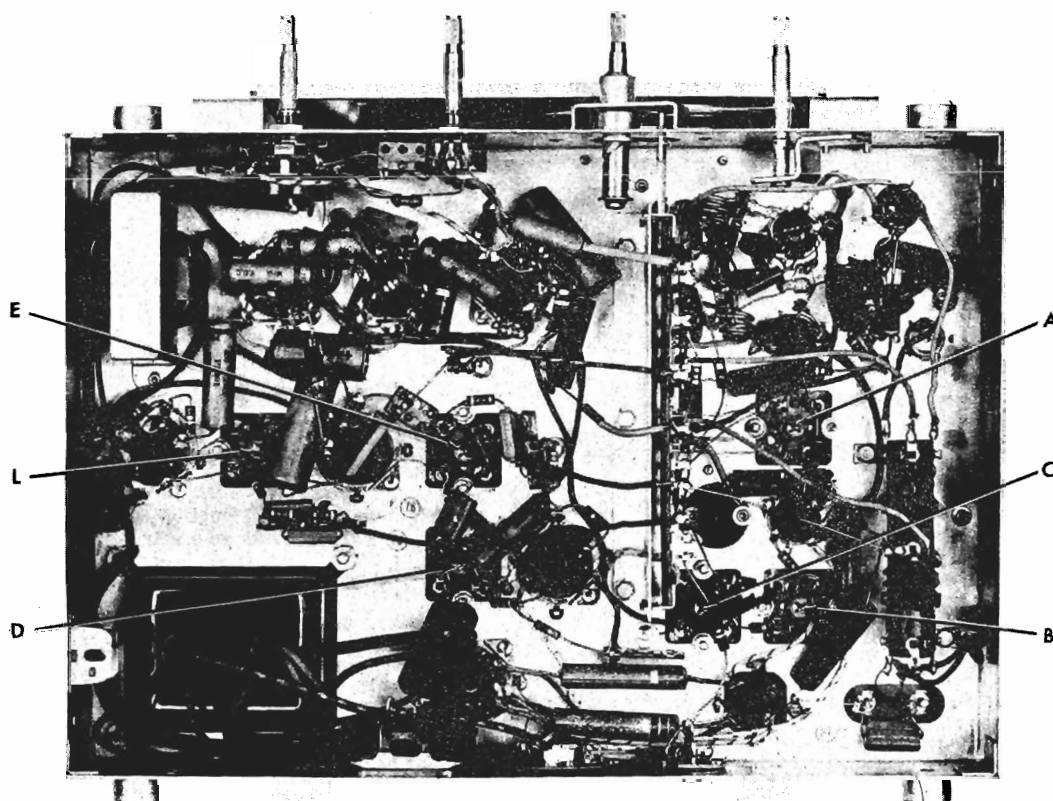


Fig. 3. Alignment adjustments, bottom view.

(92X410)

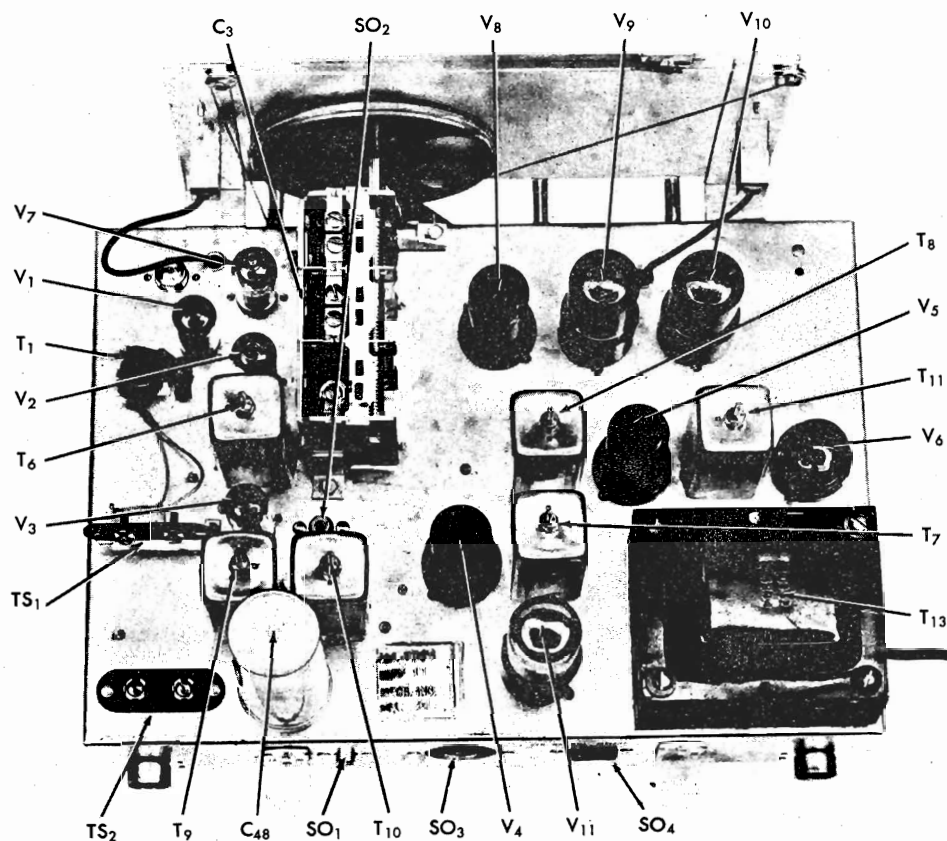


Fig. 4. Component location, top view.

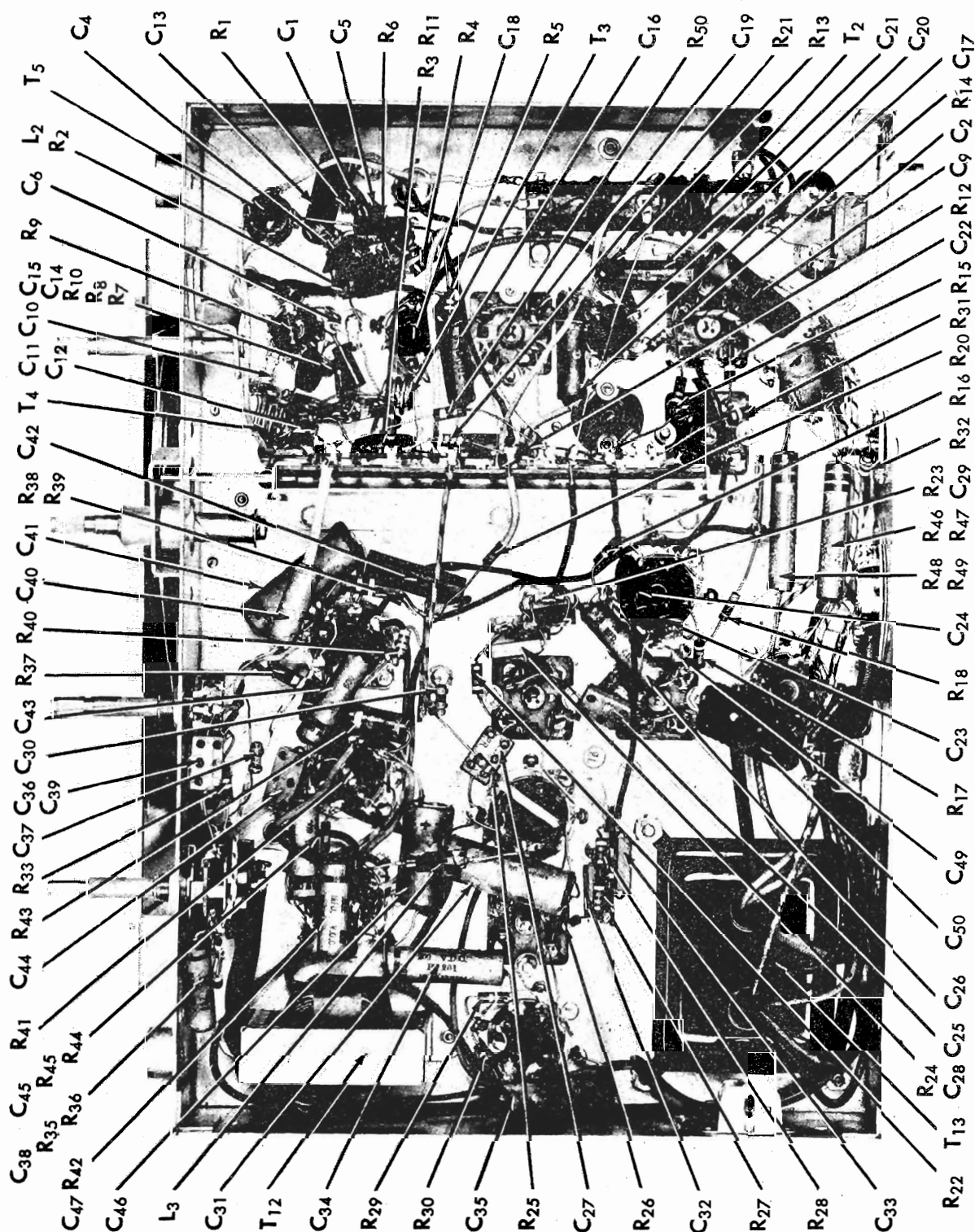


Fig. 5. Component location, bottom view. (92X423)

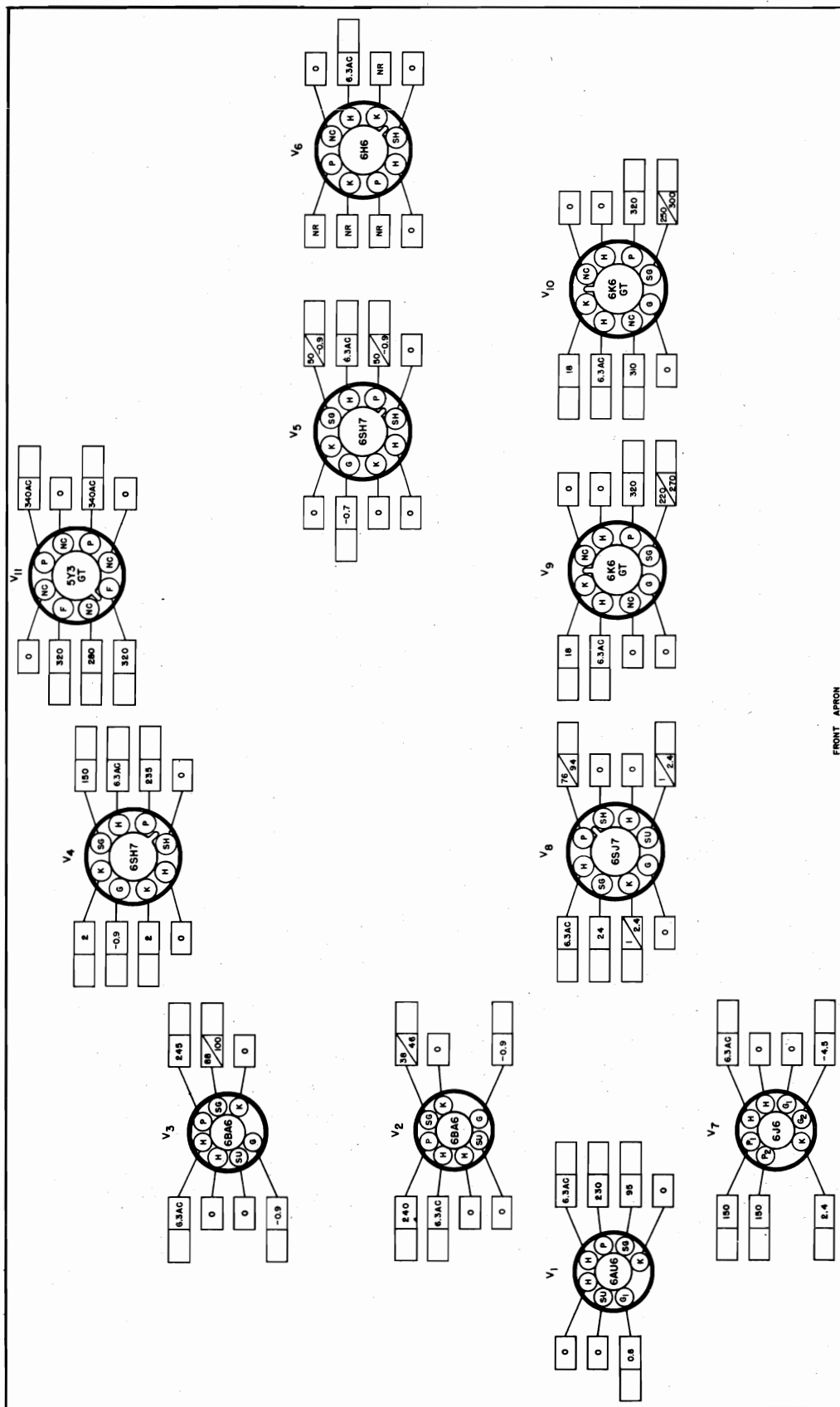


Fig. 6. Tube socket voltage chart.

THE HALLICRAFTERS CO.

MODEL 414

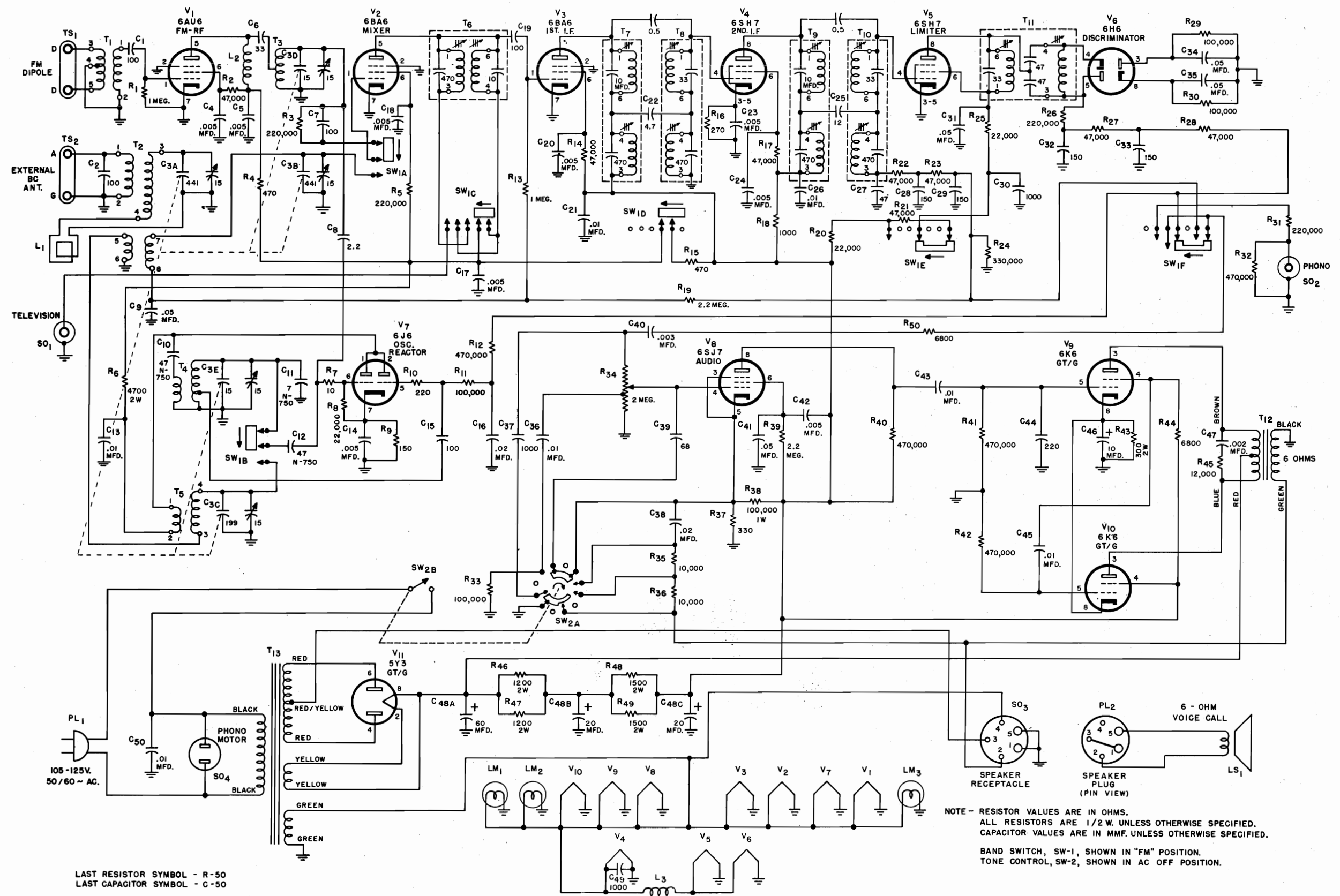


Fig. 8. Schematic diagram.

(89D272)

THE HALLICRAFTERS CO.

MODEL 414

SERVICE PARTS LIST

Ref. No.	Description	Hallcrafters Part Number
CONDENSERS		
C-1,7,15,19	100 mmf. 500 V., ceramic	47B20101M5
C-2	100 mmf. 500 V., mica	CM20A101M
C-3	Tuning condenser, 5 sections	48C196
C-4,5,14,17,18,20,23,24	.005 mfd. 450 V., ceramic	47A168
C-6	33 mmf. 500 V., ceramic	CC20UK330K
C-8	3.3 mmf. 500 V., bakelite	47A160-5
C-9,34,35	.05 mfd. 200 V., tubular paper	46AU503J
C-10,12	47 mmf. 500 V., ceramic	CC20UK470M
C-11	7 mmf. 500 V., ceramic	CC20UJ070K
C-13,21,26,36,43,45	.01 mfd. 600 V., tubular paper	46AZ103F
C-16,38	.02 mfd. 200 V., tubular paper	46AU203J
C-22	4.7 mmf. 500 V., bakelite	47A160-6
C-25	12 mmf. 500 V., mica	CM20A120K
C-28,29,32,33	150 mmf. 500 V., mica	CM20A151M
C-30,37,49	1000 mmf. 500 V., ceramic	47B20102M5
C-31,41	.05 mfd. 600 V., tubular paper	46AY503J
C-39	68 mmf. 500 V., mica	CM20A680M
C-40	.003 mfd. 600 V., tubular paper	46AZ302J
C-42	.005 mfd. 600 V., tubular paper	46AZ502J
C-44	220 mmf. 500 V., mica	CM20A221M
C-46	10 mfd. 25 V., electrolytic	45A121
C-47	.002 mfd. 600 V., tubular paper	46AZ202J
C-48	60-20-20 mfd. 450 V., electrolytic	45B113
C-50	.01 mfd. 600 V., molded paper	46AG103J

RESISTORS

R-1,13	1 megohm $\frac{1}{2}$ watt, carbon	RC20AE105M
R-2,14,17,21,22,23,27,28	47,000 ohms $\frac{1}{2}$ watt, carbon	RC20AE473M
R-3,5,26,31	220,000 ohms $\frac{1}{2}$ watt, carbon	RC20AE224M
R-4,15	470 ohms $\frac{1}{2}$ watt, carbon	RC20AE471M
R-6	4700 ohms 2 watts, carbon	RC40AE472M
R-7	10 ohms $\frac{1}{2}$ watt, carbon	RC20AE100M
R-8,20,25	22,000 ohms $\frac{1}{2}$ watt, carbon	RC20AE223M
R-9	150 ohms $\frac{1}{2}$ watt, carbon	RC20AE151M
R-10	220 ohms $\frac{1}{2}$ watt, carbon	RC20AE221M
R-11,33	100,000 ohms $\frac{1}{2}$ watt, carbon	RC20AE104M
R-12,32,40,41,42	470,000 ohms $\frac{1}{2}$ watt, carbon	RC20AE474M
R-16	270 ohms $\frac{1}{2}$ watt, carbon	RC20AE271K
R-18	1000 ohms $\frac{1}{2}$ watt, carbon	RC20AE102M
R-19,39	2.2 megohms $\frac{1}{2}$ watt, carbon	RC20AF225M
R-24	330,000 ohms $\frac{1}{2}$ watt, carbon	RC20AF334M
R-29,30	100,000 ohms $\frac{1}{2}$ watt, carbon	RC20AE104K
R-34	Volume control, 2 megohms (tapped)	25B623
R-35,36	10,000 ohms $\frac{1}{2}$ watt, carbon	RC20AF103M
R-37	330 ohms $\frac{1}{2}$ watt, carbon	RC20AE331K
R-38	100,000 ohms 1 watt, carbon	RC30AE104K
R-43	300 ohms 2 watt, carbon	RC40AE301J
R-44,50	6800 ohms $\frac{1}{2}$ watt, carbon	RC20AE682M
R-45	12,000 ohms $\frac{1}{2}$ watt, carbon	RC20AE123K
R-46,47	1200 ohms 2 watt, carbon	RC40AE122K
R-48,49	1500 ohms 2 watt, carbon	RC40AE152K

TRANSFORMERS AND COILS

T-1	Transformer, FM, antenna stage	51B1021
T-2	Transformer, BC, mixer stage	51B1019
T-3	Transformer, FM, mixer stage	51B1023
T-4	Transformer, FM, osc. stage	51B1023
T-5	Transformer, BC, osc. stage	51B1020
T-6	Transformer, 1st I.F.	50B367
T-7,9	Transformer, 2nd I.F. and AM Detector & FM limiter	50B370

SERVICE PARTS LIST (Cont.)

Ref. No.	Description	Hallcrafters Part Number
TRANSFORMERS AND COILS (Cont.)		
T-8,10	Transformer, 2nd I.F. and AM Detector & FM limiter	50B366
T-11	Transformer, FM, detector stage	50B368
T-12	Transformer, audio output	55B105-1
T-13	Transformer, power	52C152
L-1	Loop antenna	57C118
L-2	Plate choke for tube V1	53B124
L-3	Filament choke for tubes V5 & V6	53B123

SWITCHES:

SW-1	Band switch assembly	60B318
SW-2	Switch, tone control	60B319

PLUGS AND SOCKETS:

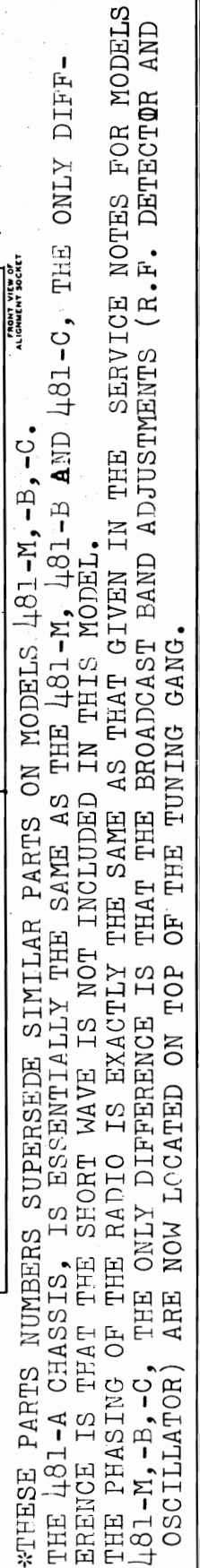
PL-1	Line cord and plug	87A078
SO-1,2	Receptacle, television, phono	36A029
SO-3	Receptacle, speaker	6A277
SO-4	Receptacle, phono motor	10A015
	Socket, octal (tube)	6A296
	Socket, miniature (tube)	6A297
	Socket & bracket, dial light	86A062
	Socket, pilot light	86B065

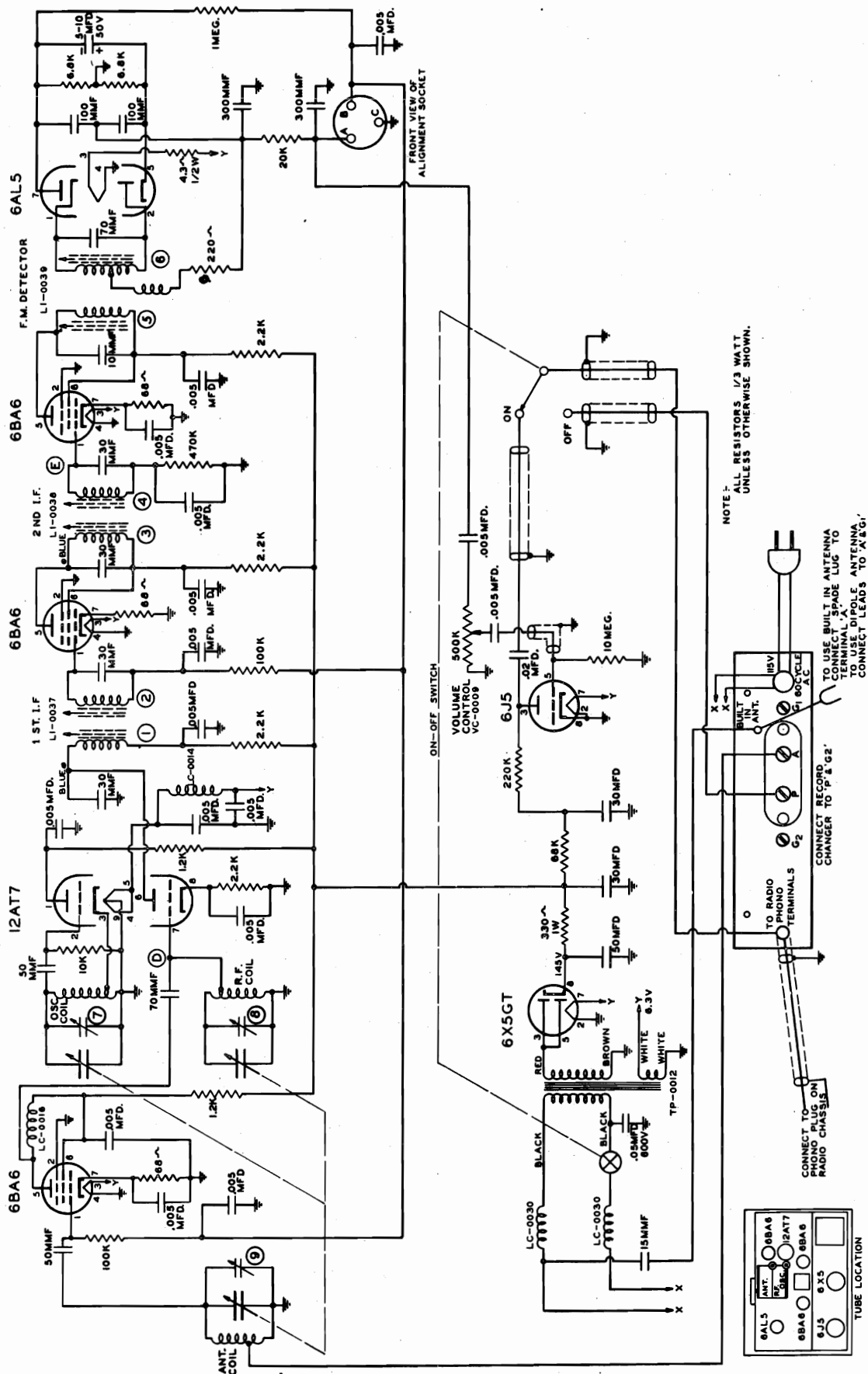
TUBES RECTIFIERS AND LAMPS

V-1	6AU6 antenna	90X6AU6
V-2,3	6BA6 mixer, 1st I.F.	90X6BA6
V-4,5	6SH7 2nd I.F., limiter	90X6SH7
V-6	6H6 discriminator	90X6H6
V-7	6J6 osc. & AFC	90X6J6
V-8	6SJ7 audio amp.	90X6SJ7
V-9,10	6K6GT power amp.	90X6K6GT
V-11	5Y3GT rectifier	90X5Y3GT/C
LM-1,2,3	Lamp, 6-8 V., 250 Ma., Mazda #44	39A003

MISCELLANEOUS

	Shaft, tuning	74A247
	Pulley, idler	28A052-6
	Switch, cam	77A261
	Drive pin	74A246
	Collar	77A267
	Bushing	77A266
	Bracket, dial plate mtg.	67A793
	Dial plate	63B332
	Dial background (paper)	32B433
	Dial glass (calibrated)	22C201
	Clip (for dial glass 22C201)	76A390
	Rubber spacer, for dial clip	16A126
	Pointer	82A147
	Dial cord	38A019
	Spring, dial cord	75A012
	Dial glass (clear)	22B205
	Clip (for dial glass 22B205)	76A331
	Escutcheon	7D067
	Knob, tone and range controls	15B077-3
	Knob, tuning and volume controls	15B068-3
LS-1	Speaker assembly	85C072
TS-1	Terminal strip, antenna (Marked D-D)	87A379
TS-2	Terminal strip, antenna (Marked A-G)	88A327
	Dipole assembly	57C108-1
	Line cord lock	76A299
	Grommet, chassis mtg.	16A124
	Shield, pilot light	86A037
	Record changer	115C019



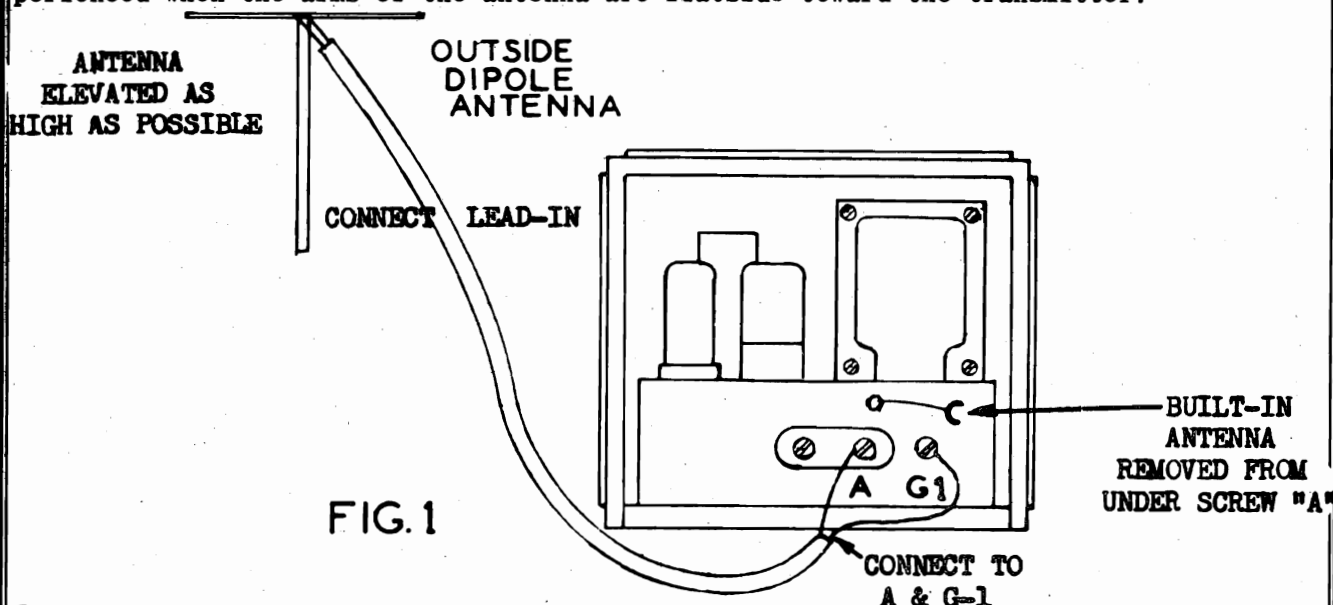


HOWARD RADIO COMPANY

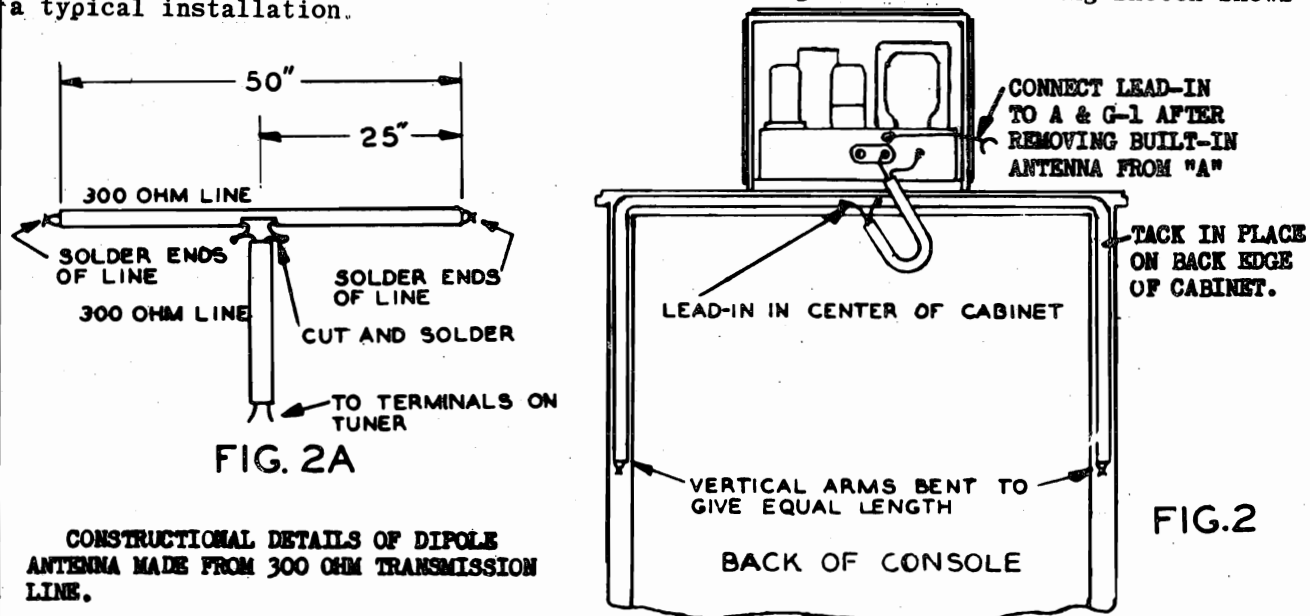
MODELS 482, 482A

ANTENNA REQUIREMENTS: Although the Howard Model "482" Tuner is the most sensitive built today, the successful operation of your FM Tuner depends on the signal strength of the transmitter and the efficiency of the antenna connected to the Tuner. In localities a number of miles from the sending station, it is advisable that a good antenna be used. It must be remembered that a great many things influence FM reception: elevation, high buildings or hills will intercept the waves and reduce signal strength. Each installation presents a different problem however, in most cases the built-in antenna will provide sufficient signal strength to operate the Tuner. Below are listed the different types of antennas which may be used with the "482" Tuner and a diagram to show how they are connected. The various antennas will be listed according to their efficiency.

1. **DIPOLE ANTENNA:-** Mounted as high as possible and away from all obstructions. Connect as shown in Fig. 1 using 300 ohm twin lead-in wire. Maximum pickup will be experienced when the arms of the antenna are flatside toward the transmitter.



2. **INSIDE DIPOLE ANTENNA:-** This type of antenna is made of 300 Ohm Transmission Line (See Fig. 2-A) and may be mounted on the back of the average console radio. Connections to the "482" Tuner are the same as shown in Fig. 2. The following sketch shows a typical installation.



This type of antenna while economical and easy to install gives excellent results. The arms may also be stretched out and placed under a rug if the cabinet is too small to attach to the back.

MODELS 482, 482A

HOWARD RADIO COMPANY

3. **BUILT-IN ANTENNA:-** The antenna built into the "482" Tuner is quite efficient in most localities within the primary coverage area of the transmitter. For best results the line cord should be stretched out straight and away from metal objects. The Tuner is shipped with the built-in antenna attached as shown in Fig. 3.

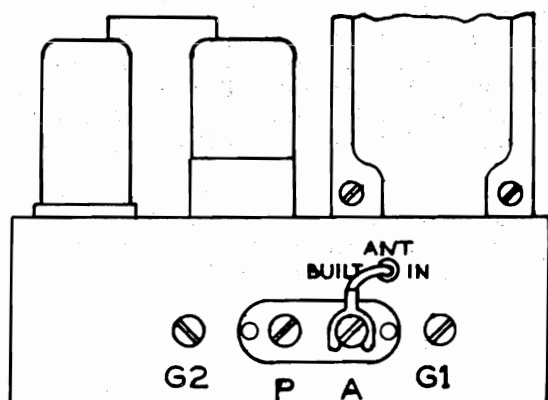
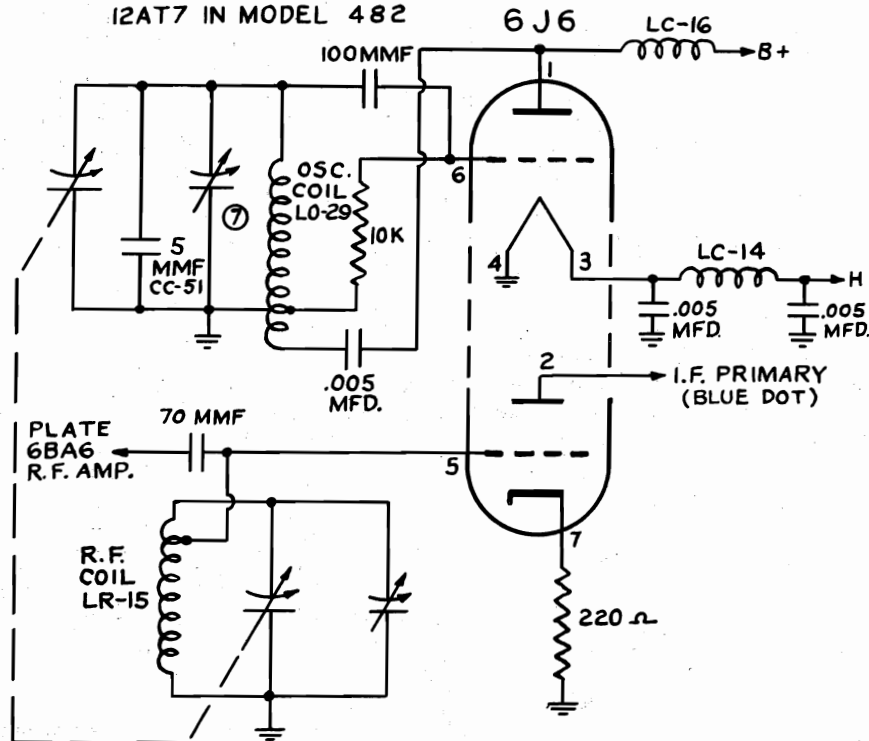


FIG. 3

CONNECTIONS TO RADIO RECEIVER

THE 6J6 IN MODEL 482-A REPLACES THE
12AT7 IN MODEL 482



GENERAL:- Most receivers have connections in the rear of the chassis for a phonograph. The type of connection varies with different manufacturers, but it usually is in the form of a terminal strip marked PHONO and consists of two screws or a socket. In the following paragraphs each type of connection will be shown with the "482" Tuner connected in the proper manner. It will be necessary for you to determine which of the two screws or which terminal of the plug is "live". By "live" we mean which is the audio connection and which is the ground connection; no voltage capable of giving a shock will be encountered. To determine which is the "live" terminal, turn the radio on with the selector switch in the PHONO position and volume up; touch the two screws or the plug connections one at a time, the one which produces a loud hum in the speaker is the "live" terminal.

1. **RADIO HAVING NO PHONO CONNECTION:-** In this case it is advisable to call a competent serviceman to make the installation as the "482" Tuner will have to be connected internally to your receiver.

2. RADIO WITH TWO SCREW TERMINALS (OR CLIPS)

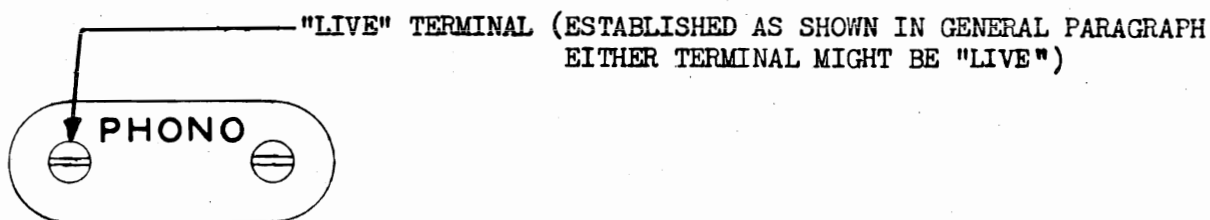
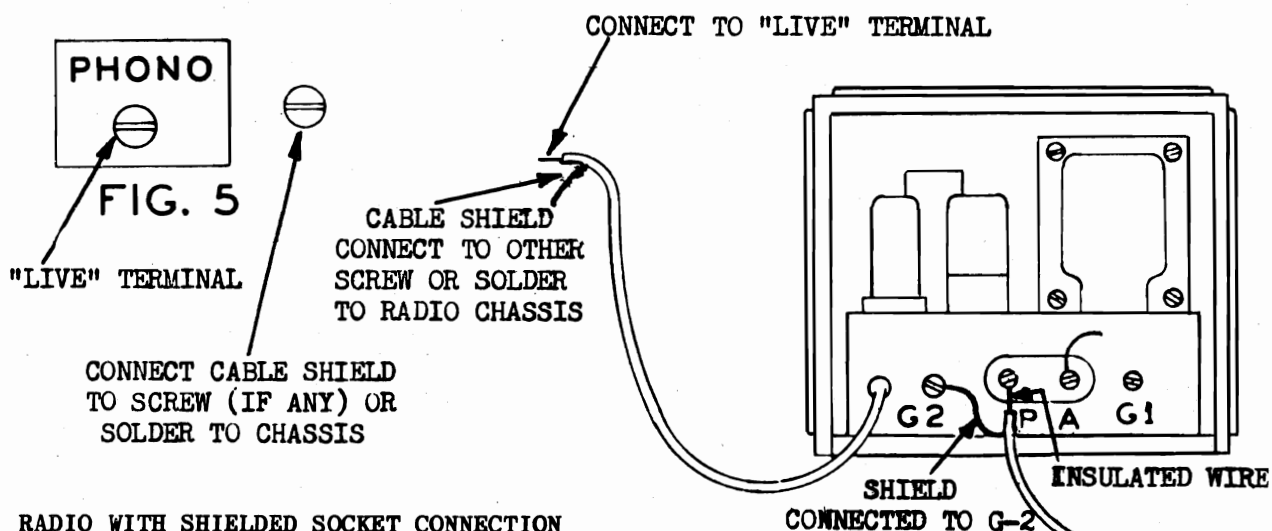
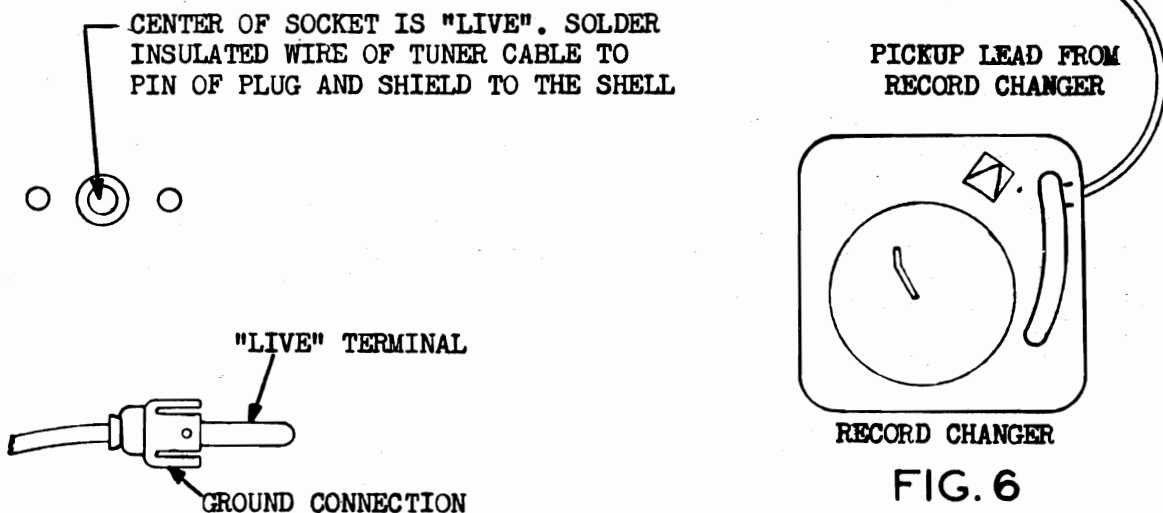


FIG. 4

3. RADIO WITH ONE SCREW TERMINAL (OR CLIPS)



4. RADIO WITH SHIELDED SOCKET CONNECTION



UNSOLDER PLUG AND CONNECT
TO "P" & G-2 AS SHOWN.

MODELS 482, 482A

HOWARD RADIO COMPANY

NOTE:

It is impossible to show all the means used to connect a record player to a radio, but by remembering to find the "live" connection going to the record player and attaching the Tuner insulated lead to this point and the cable shield to the chassis, then your Tuner will be connected properly. Then connect the lead from your record changer that went to the "live" terminal to "P" on your Tuner chassis and the other lead or shield to G-2 then your record player will play normally when the center switch on the "482" Tuner is turned to the left or OFF position.

The "482" Tuner is designed for AC operation only and should never be connected to a DC supply. It operates best with a receiver designed for AC operation as a slight hum may be noticed on high volume if the Tuner is connected to an AC-DC receiver. This may be eliminated by reversing the power cord plug in its socket on either the radio or the Tuner, or both.

TO OPERATE:

Plug power cord into 115 volt, 60 cycle, A.C. power outlet. Turn radio on, place radio in phono position, and turn radio volume control approximately half on. Turn FM Tuner to ON position, use volume control on Tuner to adjust volume level and carefully tune in FM Stations.

PARTS LIST

CONTROLS		DIAL AND CONTROL ACCESSORIES	
VC-0009	Volume Control	DG-0021	Dial Scale
SW-0025	Switch (On-Off) (AM-FM)	DC-0001	Dial Cord 28" long
CONDENSERS		HD-0003	Pointer - Dial
CV-0018	Tuning Gang and Drive Hub	SL-0006	Dial Light Socket Assy.
CE-0007	Capacitor - Electrolytic 50x30x30 MFD 150 volts	LS-0001	Lamp Type #47
CE-0028	Capacitor - Electrolytic 10 MFD 50 volts	SP-0010	Spring-Dial 12 oz. Load Spr. Stl.
CT-0005	Trimmer - Cap. 2.5-30MMF	SM-0188	Shaft-tuning 2-9/64" long
CC-0005	Capacitor - Ceramic 30MMFD 500 V. D.C.	KNOBS	
CC-0014	Capacitor - Ceramic 50MMFD 500 V. D.C.	KB-0022-1	Knob - Moulded 3/4" Dia. Walnut
CC-0050	Capacitor - Ceramic 68-72MMFD 500 V. D.C.	KB-0022-2	Knob - Moulded 3/4" Dia. Onyx
CC-0016	Capacitor - Ceramic 100MMFD 500 V. D.C.	KB-0023-1	Knob - Moulded 1-1/32" Dia. Walnut
CC-0020	Capacitor - Ceramic 10MMFD 500 V. D.C.	KB-0023-2	Knob - Moulded 1-1/32" Dia. Onyx
CC-0022	Capacitor - Ceramic 70MMFD 500 V. D.C.	TRANSFORMER	
CC-0028	Capacitor - Ceramic 300MMFD 500 V. D.C.	TP-0012	Power Transformer (60 Cycle, 110 V.)
CC-0034	Capacitor - Ceramic 5000MMFD 500 V. D.C.	TUBES	
CC-0049	Capacitor - Ceramic 15MMFD 500 V. D.C.	TU -	6AL5
COILS		TU -	6BA6 (3 used)
LA-0017	Antenna Coil	TU -	6J5
LC-0014	Choke Coil - Filament	TU -	6X5GT
LC-0016	F.M.-R.F. Choke Coil	TU -	12AT7
LC-0030	Line Antenna Choke Coil	SOCKETS	
LI-0037	1st I.F. Transformer	SO-0007	Socket - Octal - 8 Prong
LI-0038	2nd I.F. Transformer	SO-0019	Socket - Miniature - 7 Pin
LI-0039	Discriminator Transformer	SO-0022	Socket - Miniature - 9 Pin
LO-0028	Oscillator Coil	SO-0029	Socket - Miniature - 7 Pin
LR-0015	R.F. Coil	SO-0030	Socket - - 3 Pin
		TB-0018	Antenna Terminal Strip
		LINE CORD	
		CA-0038	A.C. Line Cord 6 ft. W/Plastic Plug
		CABINETS	
		CW-0012-1	Wood Cabinet (Mahogany)
		CW-0012-2	Wood Cabinet (Blonde)
		DG-0020	Cabinet Dial Escutcheon

ALIGNMENT NOTES

Volume control should be turned on full before aligning radio.
Tuning gang should be in a closed condition unless otherwise stated in the following data. Pointer on last line below 88 MC.
Use an F.M. Signal Generator.

HOWARD RADIO COMPANY

MODELS 482, 482A

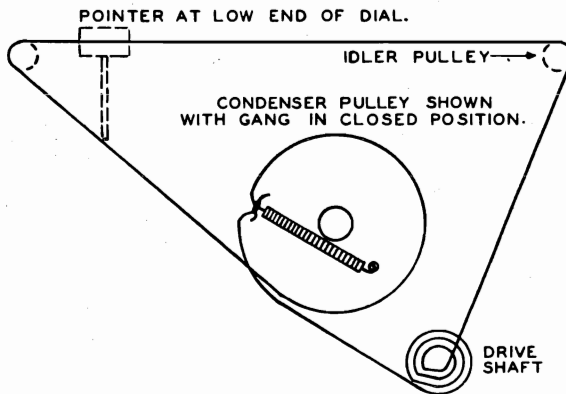
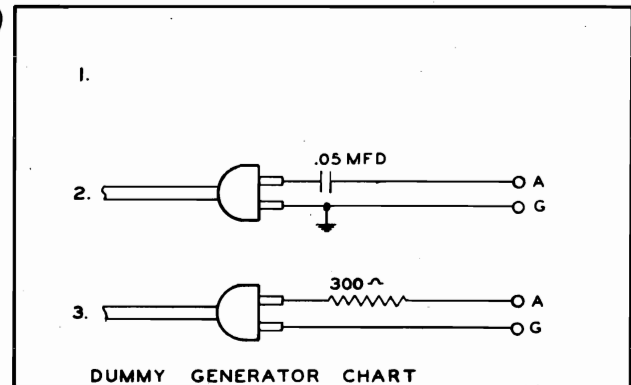


DIAGRAM SHOWING DIAL STRINGING
FOR MODEL 482



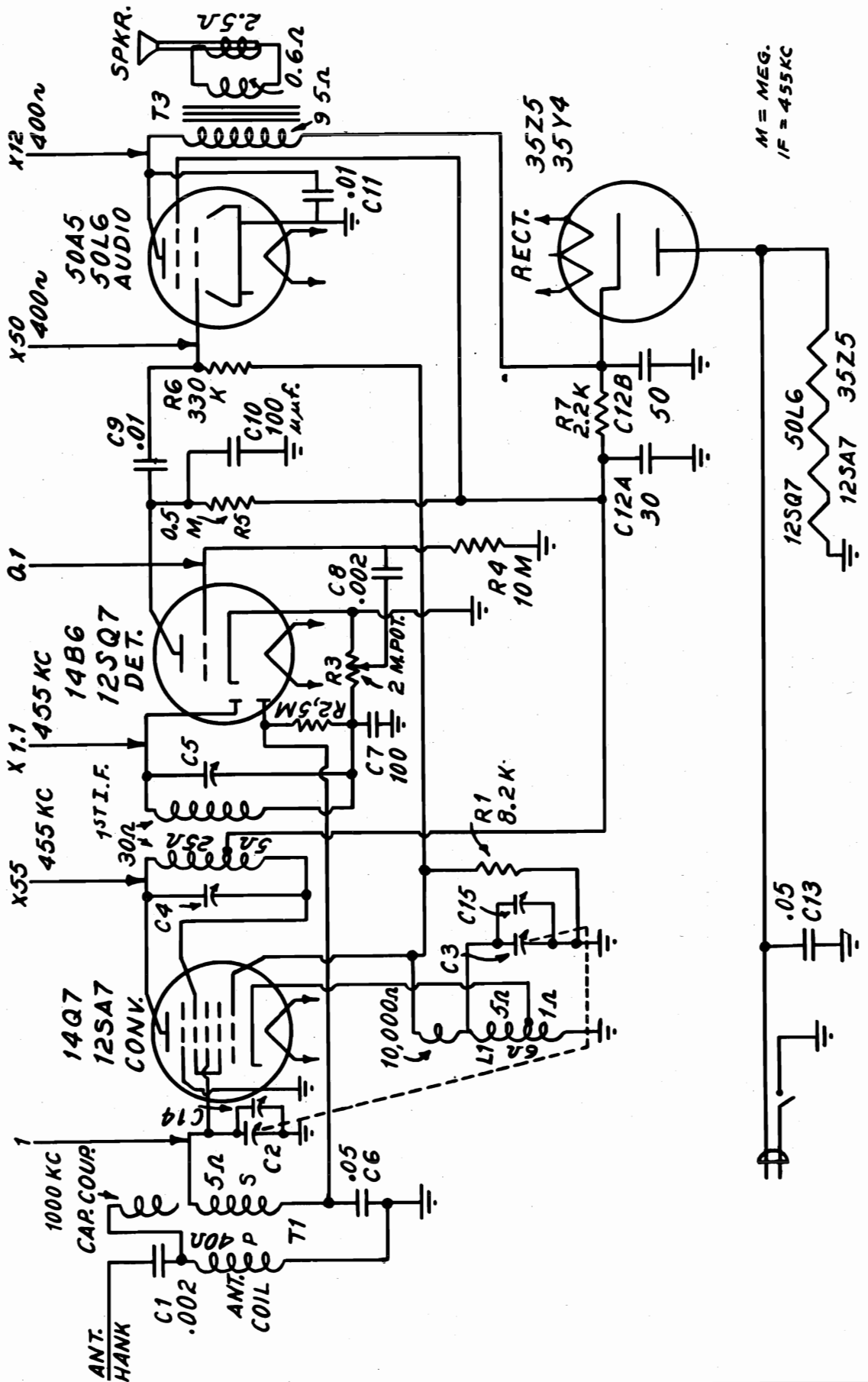
ALIGNMENT CHART USING MODULATED GENERATOR

SEE DUMMY GEN. CHART	SIG. GEN. CONNECTION	GEN. FREQ.	BAND SW. POSITION	DIAL SETTING	ORDER OF SLUG AND TRIMMER ADJUSTMENTS	TRIMMER OR SLUG FUNCTION	SEE NOTES BELOW
2	Point B on Circuit Diagram	10.7 MC.	FM	Gang Closed	⑥	F.M. Det. Adj.	A & B
2	Point B on Circuit Diagram	10.7 MC.	FM	Gang Closed	⑤ Adjust to zero Voltage	F.M. Det. Adj.	C
2	Point D on Circuit Diagram	10.7 MC.	FM	Gang Closed	①②③④	F.M. - I.F.	D
3	Ant. and Grd. Back of Chassis	105 MC.	FM	105 MC.	⑦⑧⑨	Osc. and R.F.-F.M.	E F & G
3	Ant. and Gnd. Back of Chassis	90 MC.	FM	90 MC.		F.M. - R.F. Ind. Adj.	H & I

- A. Signal generator modulation off and turned up to about 100,000 microvolts.
- B. Connect electronic volt meter (equivalent to voltohmmist) at point "B" of alignment socket as shown on the wiring diagram and turn slug (6) on trimmer location chart to extreme counter-clockwise position. Turn clockwise to 1st peak and adjust to maximum.
- C. Turn slug (5) to extreme counter-clockwise position. Connect electronic voltmeter to Point A of alignment socket and turn slug (5) until voltmeter is to zero voltage. Repeat adjustments given in Notes B & C until no further improvement can be made.
- D. Connect voltmeter to Point B and generator at Point D. Adjust (1) (2) (3) (4), then retrim (6). Move voltmeter to Point A and recheck zero voltage (retrim if necessary). These adjustments should be made with input signal necessary to produce approximately .7 volts at Point B.
- E. Remove built-in antenna from the connection A on back of chassis.
- F. Change generator dummy as shown on dummy antenna chart, Picture 3, and modulation on, and fasten generator to A & G-1.
- G. Turn the first Detector or R.F. Trimmer (8) well to the left - almost open - so you will not have a locking condition and be able to locate the signal at 105 M.C. when turning Trimmer (7).
- H. Should 90 M.C. signal not fall in at 90 M.C. on the dial, adjust F.M. oscillator coil to correct calibration. It is only necessary to press together or open the spacing on one turn of the coil to do so.
- I. After adjusting oscillator coil for the correct calibration at 90 M.C., check the detector and antenna coil for proper tracking with the oscillator. If they do not track it will be necessary to adjust the detector and antenna coils for perfect tracking.
- J. Repeat adjustments (7) (8) (9) until no further improvement can be made.

M = MEG.
IF = 455 KC

APPROXIMATE GAIN PER STAGE USING CHANNELYST
AND WITH A FIXED BIAS OF -3 VOLTS.



MODEL 300

JEWEL RADIO CORP.

ALIGNMENT PROCEDURE

Connect output meter across the voice coil.

Couple the signal generator to the hank antenna through a 100 μ f capacitor. Set the volume control at maximum, and fully mesh the tuning capacitor.

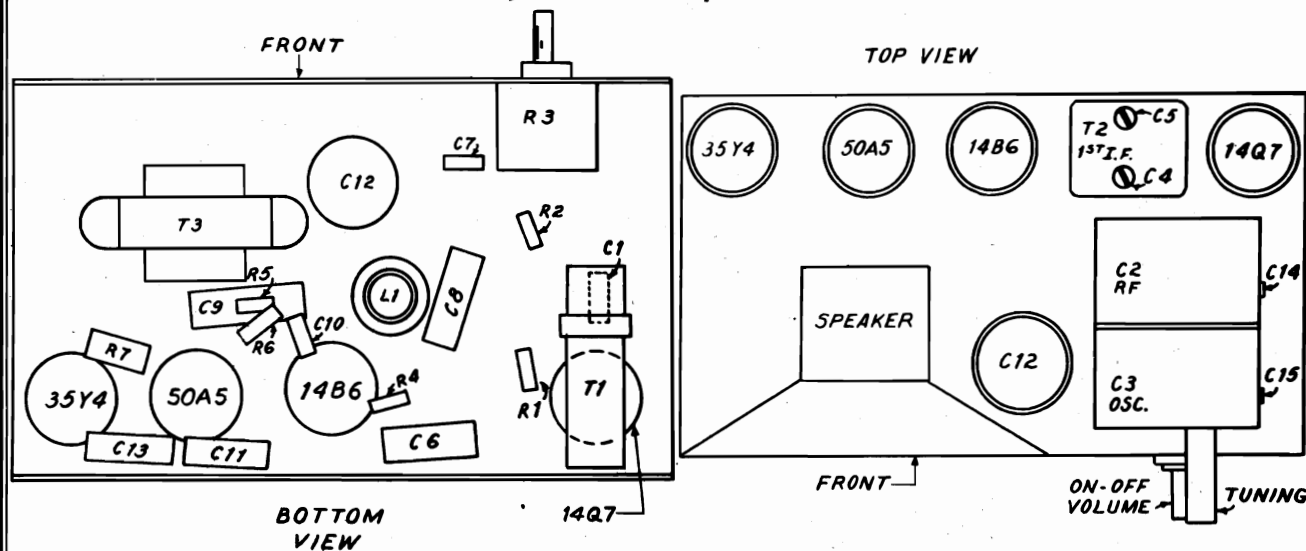
The output of the signal generator should be just sufficient to give a readable deflection on the output meter.

Set the signal generator to 455 kc and adjust i-f trimmers for maximum output in the following order: C5, C4. Repeat sequence if trimmers were badly maladjusted.

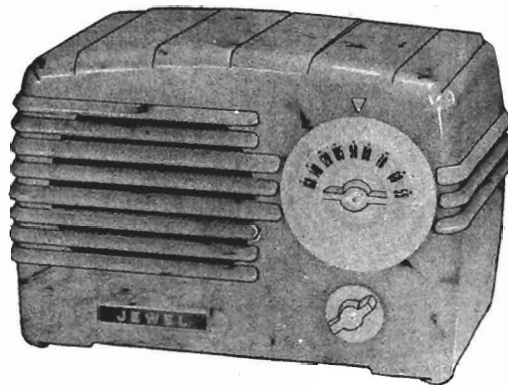
Set the signal generator and receiver to 1400 kc and adjust the oscillator trimmer C15 for maximum output

Set the signal generator and receiver to 1600 kc and adjust the antenna trimmer C14 for maximum output.

Set the signal generator and receiver to 1400 kc and readjust oscillator trimmer C15 for maximum output.



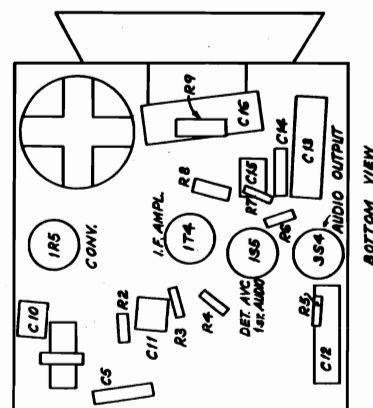
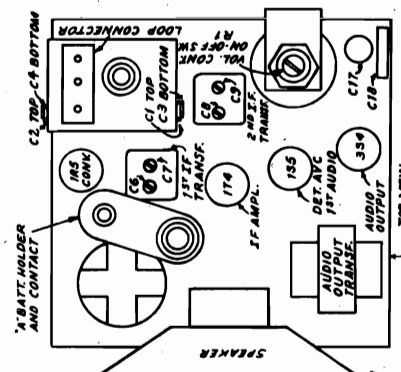
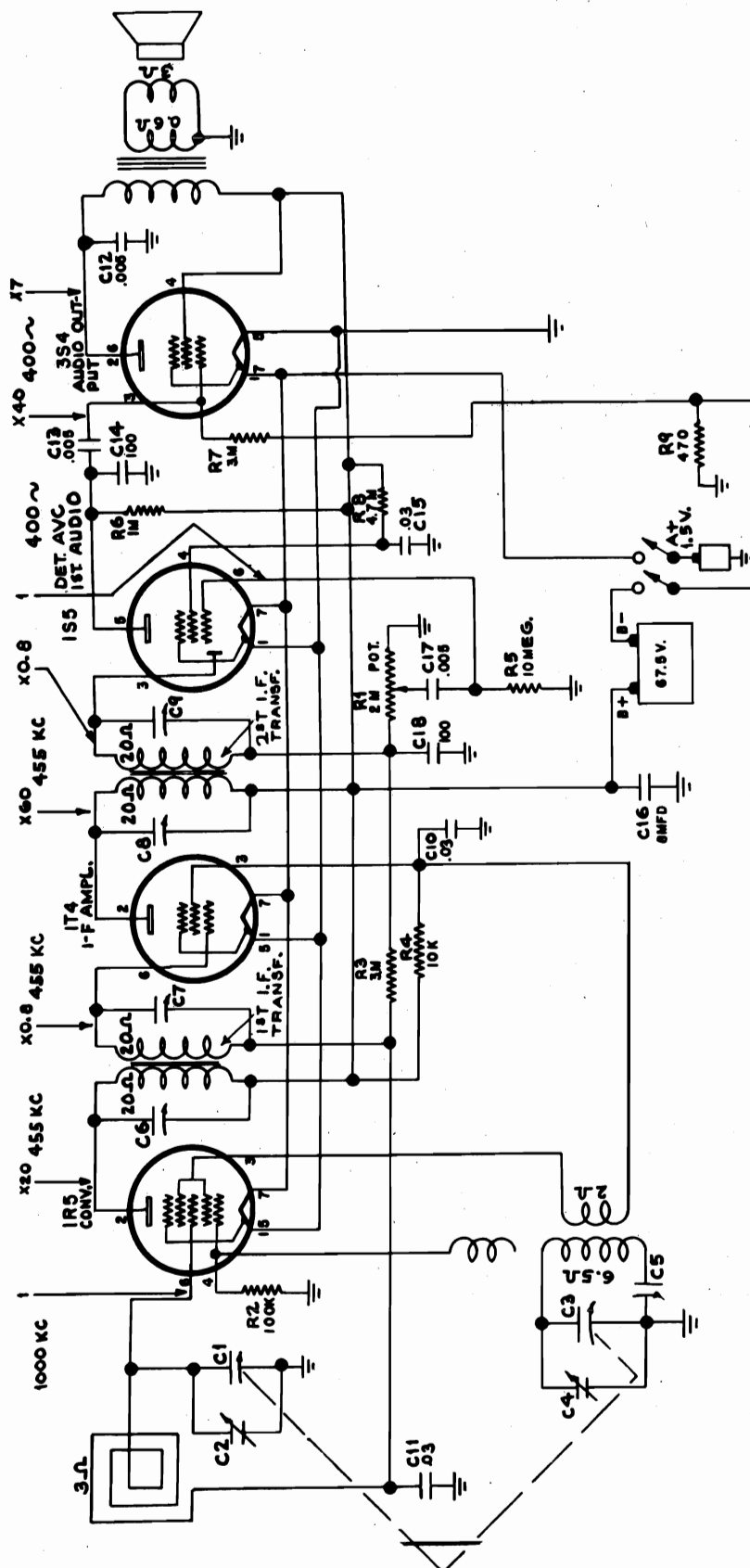
TUBE	PIN	VTVM	20,000 Ω /V	1,000 Ω /V	RESISTANCE
14Q7 CONV.	1	AC	AC	AC	18 Ω
	2	+90	+97	+90	over 10 meg
	3	+90	+97	+90	over 10 meg
	4	-6.8	-6.8	-3.8	11K
	5	0	0	0	0
	6	-.95	-.58	-.1	4.5K
	7	0	0	0	1
	8	AC	AC	AC	26 Ω
14B6 DET	1	AC	AC	AC	0
	2	+52	+51	+16	over 10 meg
	3	-.9	-.6	-.4	10 meg
	4	--	--	--	--
	5	-1.5	-.8	-.4	1.5 meg
	6	-.95	-.8	-.4	4.5K
	7	0	0	0	0
	8	AC	AC	AC	20 Ω
50A5 AUD OUT	1	AC	AC	AC	75 Ω
	2	+125	+120	+120	over 10 meg
	3	+90	+98	+92	over 10 meg
	4	--	--	--	--
	5	--	--	--	--
	6	-19	-5	-2	400K
	7	0	0	0	0
	8	AC	AC	AC	25 Ω
35Y4	1	-5.5	0	0	100 Ω
	2	-5.5	0	0	100 Ω
	3	--	--	--	--
	4	--	--	--	--
	5	--	--	--	--
	6	--	--	--	--
	7	+130	+130	+130	over 10 meg
	8	-3	0	0	over 10 meg



JEWEL RADIO CORP.

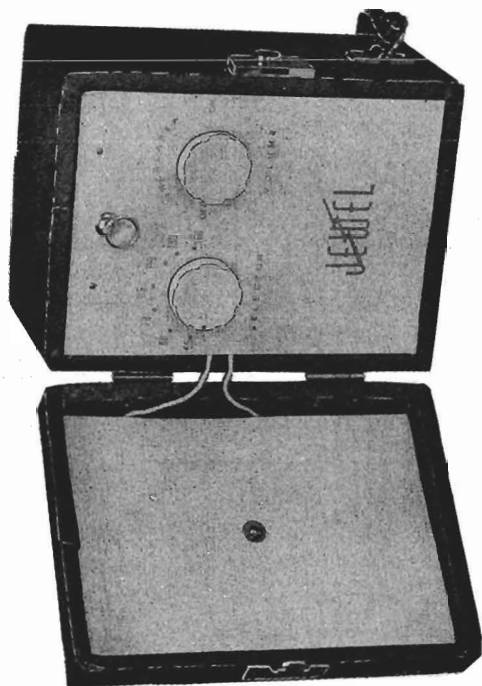
MODEL 304,
Pixie

APPROX. GAIN PER STAGE USING CHANNELYST AND WITH A FIXED BIAS OF -3 VOLTS



MODEL 304,
Pixie

JEWEL RADIO CORP.



TUBE	PIN	V _{TM}	20,000/V	1,000/V	RESISTANCE
1B5 conv.	1	0	0	0	0
	2	62	62	62	over 500K
	3	50	50	44	over 500K
	4	-1.2	-0.2	0	100K
	5	-3	-1.4	-0.2	0
	6	0	0	0	4 megs.
	7	-0.3	0	0	0.2 ohm
		1.4	1.4	1.4	
1B4 1-F. AMPL.	1	0	0	0	0
	2	62	62	62	over 500K
	3	50	50	44	over 500K
	4	-0.3	0	0	4.5 megs.
	5	0	0	0	0
	6	-0.3	0	0	4.5 megs.
	7	1.4	1.4	1.4	0.2 ohm
1B5 DET. A.V.C. 1st audio	1	0	0	0	0
	2	-0.4	-0.2	0	1.8 megs.
	3	14	12	2	over 5 megs.
	4	24	20	4	over 1 meg.
	5	-0.3	0	0	10 megs.
	6	1.4	1.4	1.4	0.2 ohm
	7				
3B4 audio output	1	1.4	1.4	1.4	0.2 megs.
	2	60	60	60	over 500K
	3	-4.5	-0.5	0	3 megs.
	4	62	62	62	over 500K
	5	0	0	0	0
	6	60	60	60	over 500K
	7	1.4	1.4	1.4	0.2 ohm

ALL VOLTAGE AND RESISTANCE MEASUREMENTS MADE WITH RESPECT TO CHASSIS GROUND.
AND WITH A SUPPLY VOLTAGE OF 67 1/2 DC

ALIGNMENT PROCEDURE

Connect output meter across voice coil.

Connect the signal generator to the standard Hazeltine Loop Model 1150 and couple it loosely to the receiver loop. Set the volume control at maximum, and fully mesh the tuning capacitor.

The output of the signal generator should be just sufficient to give a readable deflection on the output meter.

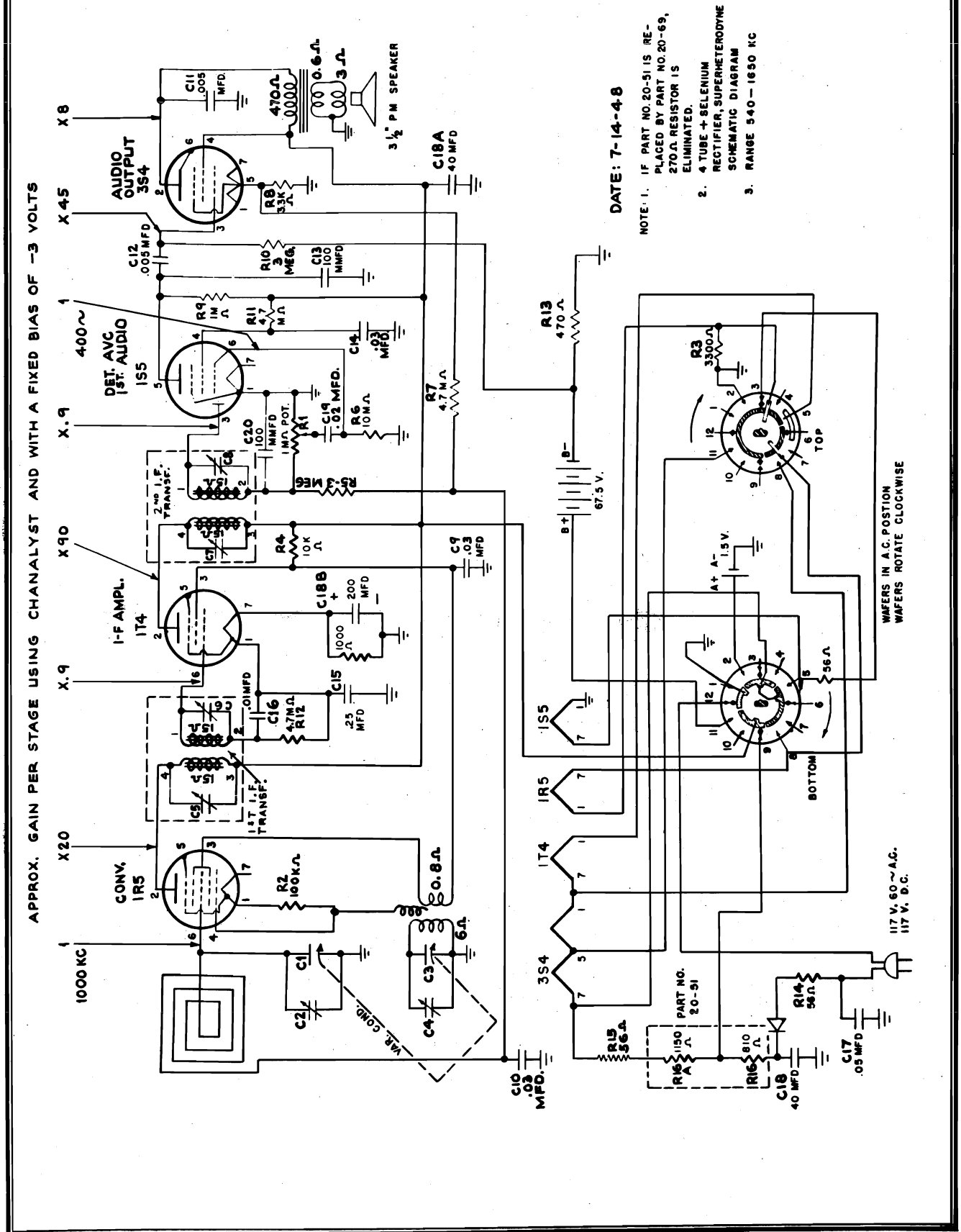
Set the signal generator to 455 kc and adjust i-f trimmers for maximum output in the following order: C3, C8, C7, C6. Repeat sequence if trimmers were badly maladjusted.

Set the signal generator and receiver to 1620 kc and adjust the oscillator trimmer C4 for maximum output.

Set the signal generator and receiver to 1500 kc and adjust the antenna trimmer C2 for maximum output.

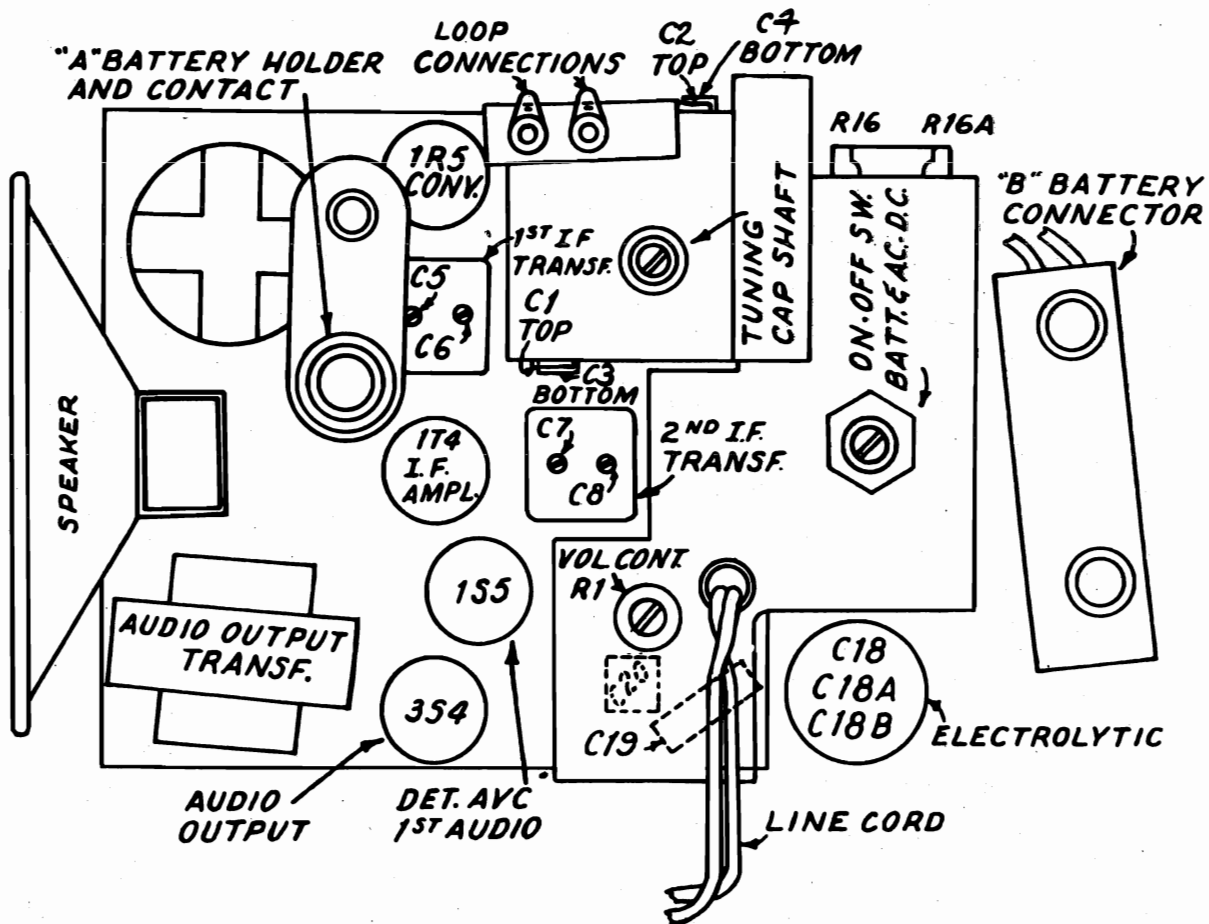
Set the signal generator and receiver to 1620 kc and readjust oscillator trimmer C4 for maximum output.

JEWEL RADIO CORP.

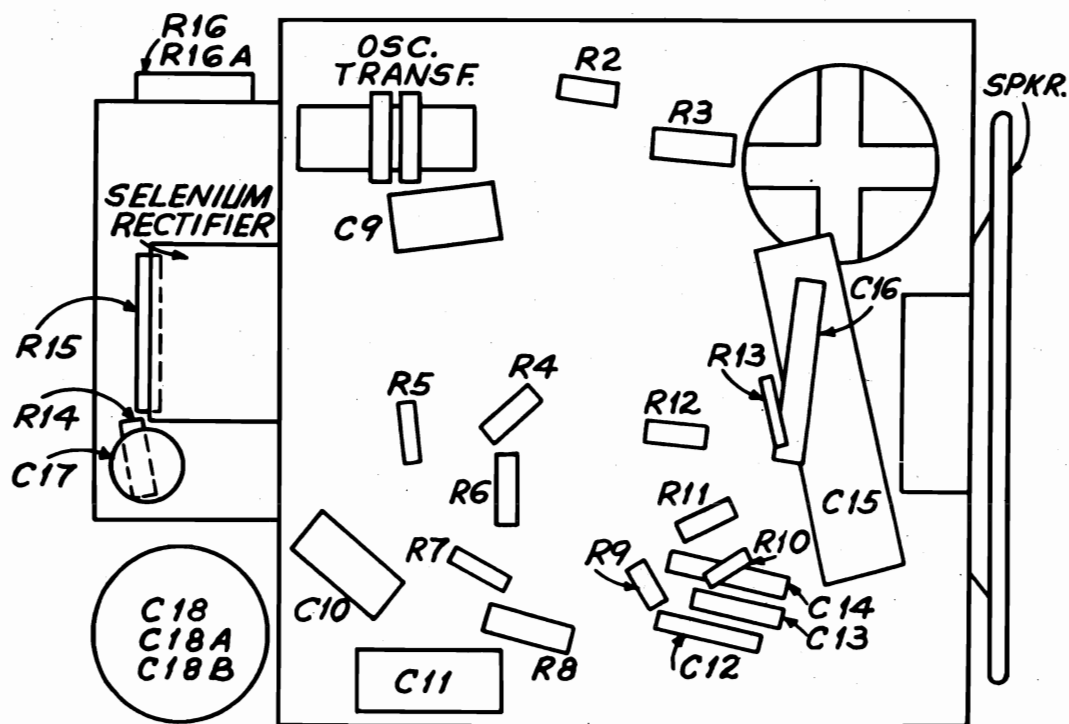
MODEL 801,
Trixie

MODEL 801,
Trixie

JEWEL RADIO CORP.

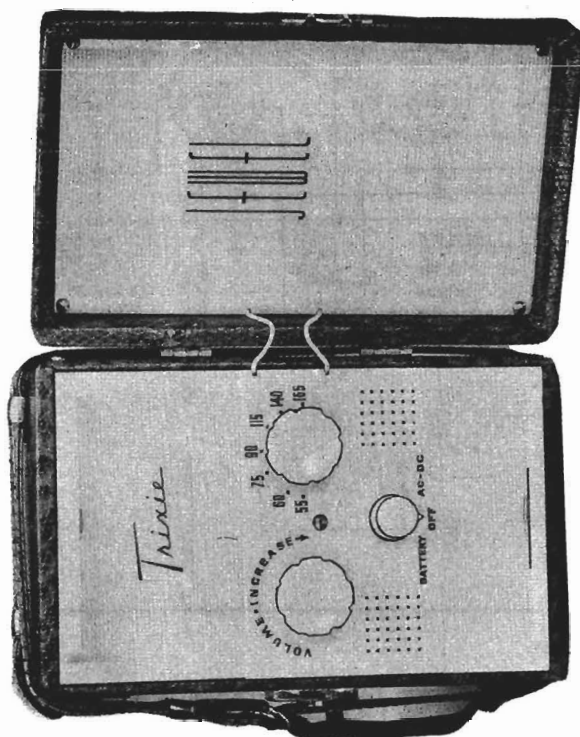


TOP VIEW



BOTTOM VIEW

JEWEL RADIO CORP.

MODEL 801,
Trixie

ALIGNMENT PROCEDURE

Connect output meter across voice coil.

Connect the signal generator to the standard Haseltine Loop Model 1150 and couple it loosely to the receiver loop. Set the volume control at maximum, and fully mesh the tuning capacitor.

The output of the signal generator should be just sufficient to give a readable deflection on the output meter.

Set the signal generator to 455 kc and adjust i-f trimmers for maximum output in the following order: C8, C7, C6, C5. Repeat sequence if trimmers were badly maladjusted.

Set the signal generator and receiver to 1600 kc and adjust the oscillator trimmer C4 for maximum output.

Set the signal generator and receiver to 1400 kc and adjust the antenna trimmer C2 for maximum output.

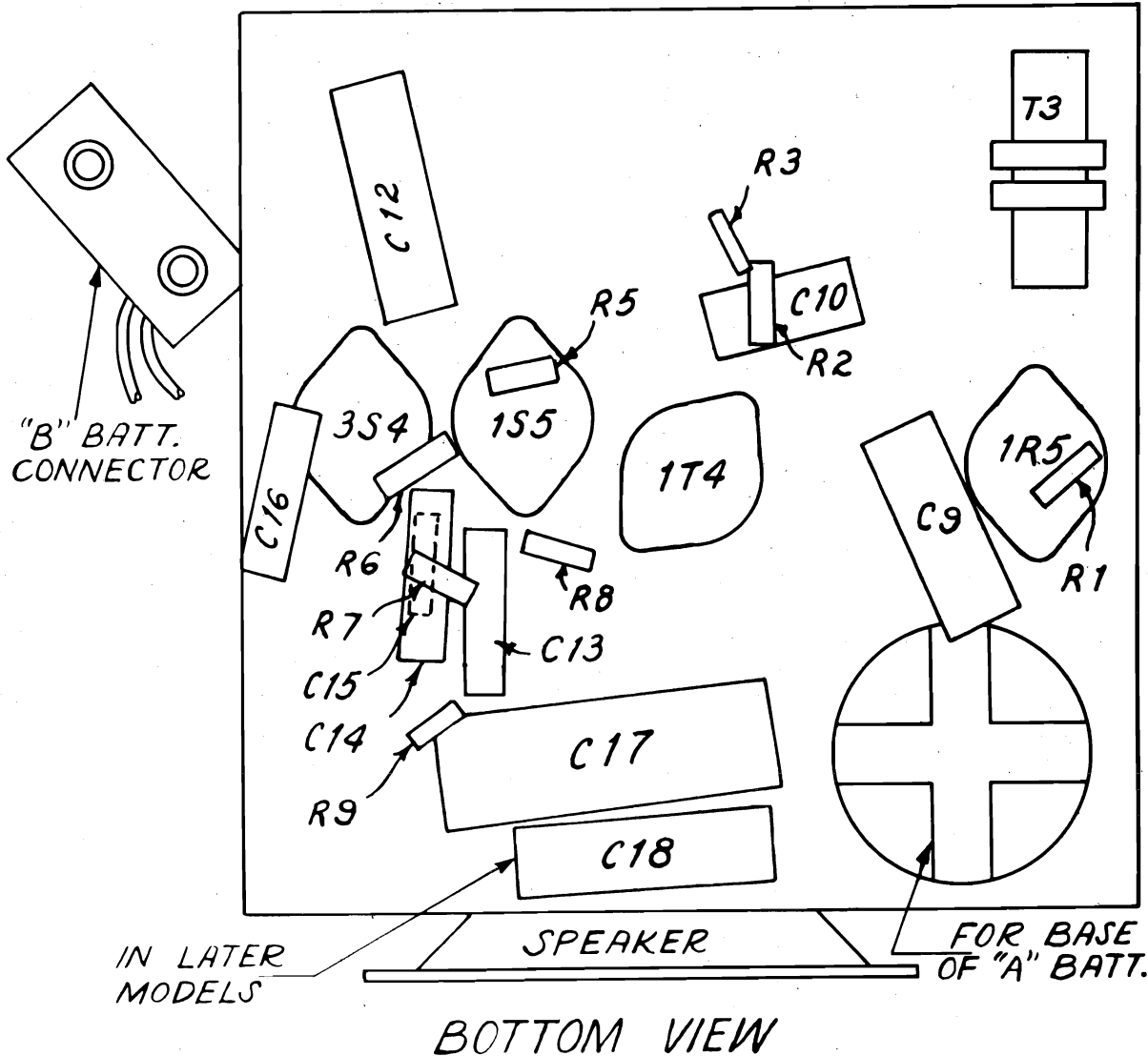
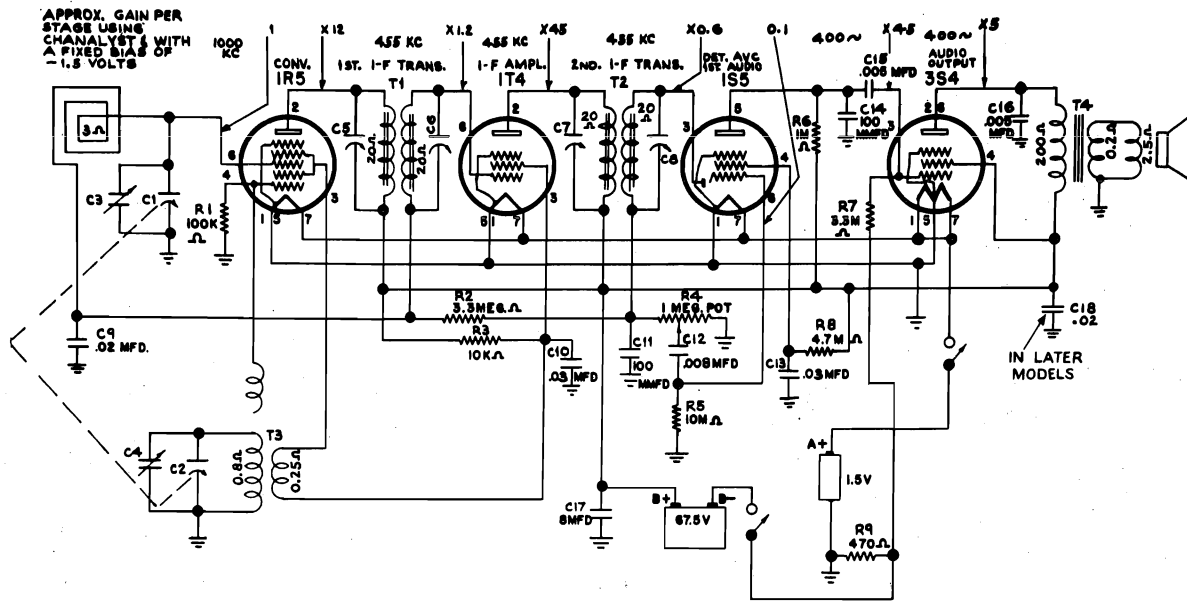
Set the signal generator and receiver to 1600 kc and readjust oscillator trimmer C4 for maximum output.

TUBE	PIN	V ₁ V ₂ M	20,000/V	1,000/V	RESISTANCE
1R5 conv.	1	4	4	4	3.4K
	2	76	76	76	over 50K
	3	50	50	48	over 50K
	4	-7	-2.3	0	115K
		-10	-2.4	0	
550 KC	5	4	4	4	3.4K
1600 KC	6	3	0.2	0	2.3 megs.
	7	5.2	5.2	5.2	3.4K
1R4 1-F AMPL.	1	5.2	5.2	5.2	750 ohm
	2	76	76	76	over 50K
	3	50	50	48	over 50K
	4				
	5	5.2	5.2	5.2	750 ohm
	6	3.5	-0.2	0	4.8 megs.
	7	6.4	6.4	6.4	740 ohm
1R5 DET. A.V.C. 1st audio	1	0	0	0	0
	2	-	-	-	-
	3	0	0	0	1 meg.
	4	17	14	2	5.4 megs.
	5	21	18	6	1 meg.
	6	0.1	0	0	10 megs.
	7	1.2	1.2	1.2	12 ohm
3R4 audio output	1	6.5	6.5	6.5	740 ohm
	2	73	73	73	over 50K
	3	0.1	0	0	3 megs.
	4	76	76	76	over 50K
	5	7.8	7.8	7.8	750 ohm
	6	73	73	73	over 50K
	7	9	9	9	760 ohm

ALL VOLTAGE AND RESISTANCE MEASUREMENTS MADE WITH RESPECT TO CHASSIS GROUND.
And WITH A LINE VOLTAGE OF 116 V.A.C.

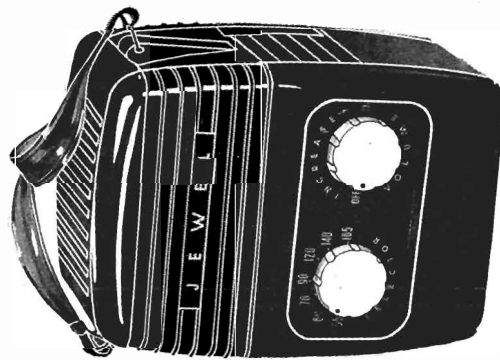
MODEL 814

JEWEL RADIO CORP.

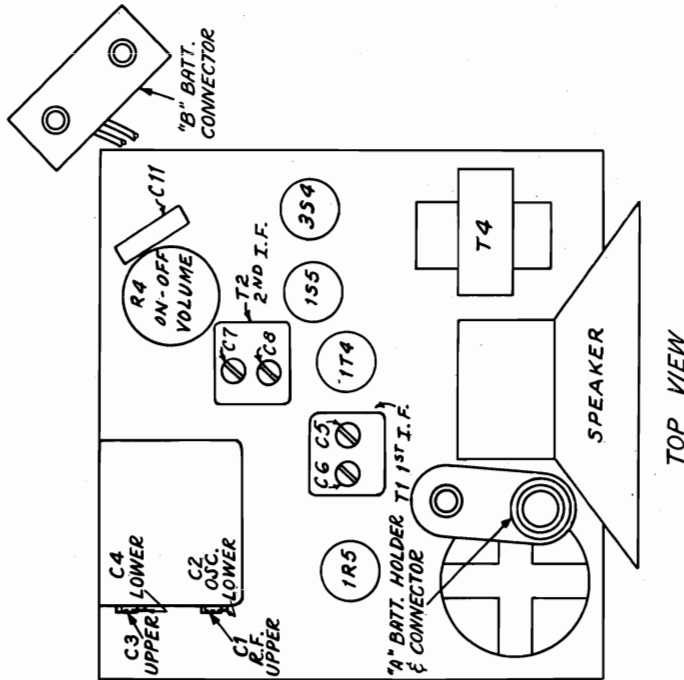


JEWEL RADIO CORP.

MODEL 814



TUBE	PIN	V _{TM}	20,000Ω/V	1,000Ω/V	RESISTANCE
1R5 CONV.	1	0	0	0	0
	2	63	63	60	10 meg.
	3	40	40	37	10 meg.
1600kc	4	-12.5	-7	-6	120 K
550 kc	5	-10	-6	-5	120 K
	6	0	0	0	0
	7	-0.4	0	0	4.7 meg
		1.5	1.4	1.3	4.5Ω
1R4 IF AMP	1	0	0	0	0
	2	61	61	59	10 meg
	3	39	39	36	10 meg
	4	-0.5	-0.1	0	4.7 meg
	5	0	0	0	0
	6	-0.5	-0.1	0	4.7 meg
	7	1.3	1.3	1.3	4.7 meg
1S5 DET 1st AUD	1	0	0	0	0
	2	NC	0	0	---
	3	-0.5	-0.3	0	1 meg
	4	16.5	13	2	over 10 meg
	5	19	15	4	over 10 meg
	6	-0.15	0	0	10 meg
	7	1.3	1.2	1.2	4.7Ω
3S4 AUD OUT	1	1.3	1.2	1.2	4.6Ω
	2	58	58	56	over 10 meg.
	3	-4.3	-3	0	3.3 meg
	4	60	60	58	10 meg
	5	0	0	0	0
	6	58	58	56	over 10 meg
	7	1.3	1.2	1.2	4.6Ω



ALIGNMENT PROCEDURE

Connect output meter to voice coil.

Connect the signal generator to the standard Hazeltine Loop Model 1150 and couple it loosely to the receiver loop. Set the volume control at maximum, and fully mesh the tuning capacitor.

The output of the signal generator should be just sufficient to give a readable deflection on the output meter.

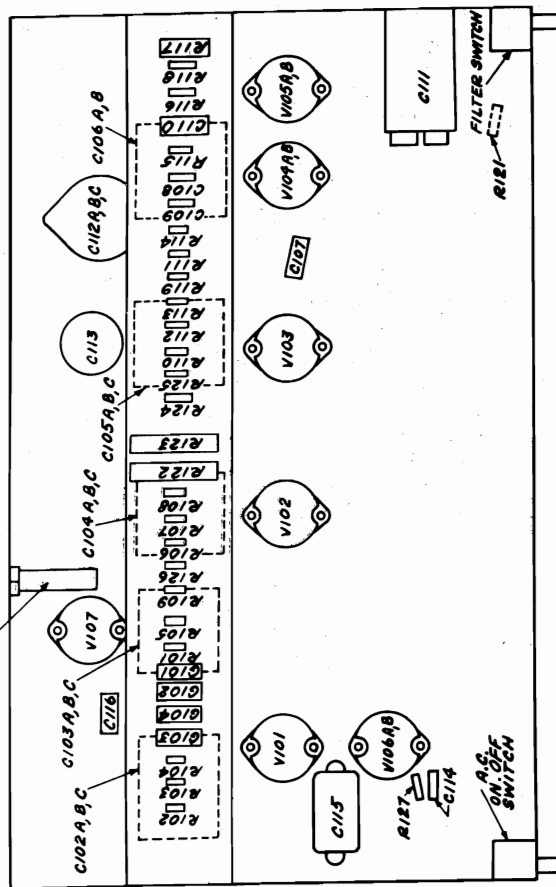
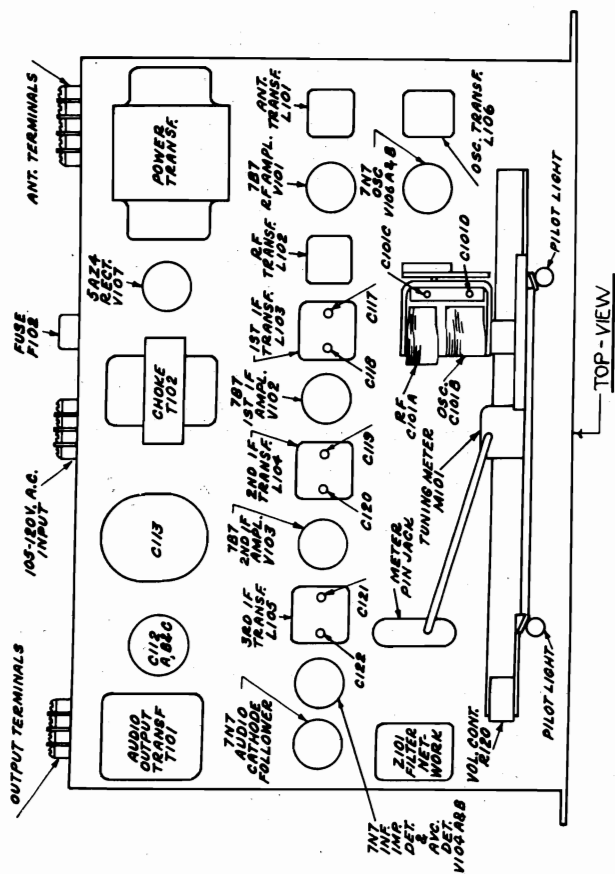
Set the signal generator to 455 kc and adjust i-f trimmers for maximum output in the following order: C8, C17, C6, C5. Repeat sequence if trimmers were badly maladjusted.

Set the signal generator and receiver to 1400 kc and adjust the oscillator trimmer C4 for maximum output.

Set the signal generator and receiver to 1620 kc and adjust the antenna trimmer C3 for maximum output.

Set the signal generator and receiver to 1400 kc and readjust oscillator trimmer C4 for maximum output.





NOTE
DIAL DRIVE SHOWN
WITH TUNING
CAPACITOR IN
MAXIMUM CAPACITY
POSITION.

DIAL DRIVE DRUM

DIAL
DRIVE

1 3/4 TURNS.

PULLEY

PULLEY

THE KAPPLER CO.

MODEL 102T

Alignment Procedure - I.F. Alignment

TUBE	PIN	VTVM	1,000/V	RESISTANCE
7B7 R.F. ampl.	1	6.3 A.C.	6.3 A.C.	less than 0.1 ohm
	2	280	280	40K
	3	80	75	30K
	4	1	1	150 ohm
	5	GND.	GND.	GND.
	6	-2.5	-0.3	600K
	7	1	1	150 ohm
	8	GND.	GND.	GND.
7B7 OSC.	1	6.3 A.C.	6.3 A.C.	less than 0.1 ohm
	2	0	0	0.5 ohm
	3	80	75	25K
	4	-10	-2	47K
	5	-10	-2	47K
	6	80	75	25K
	7	0	0	0.5 ohm
	8	GND.	GND.	GND.
conv. bridge modulator G101	cathode	0.3	0.3	60 ohm Rx10 scale
	plate	0	0	0.5 ohm Rx1 scale
	G102	GND.	GND.	GND.
	plate	0.3	0.3	60 ohm Rx10 scale
G103	cathode	0.3	0.3	60 ohm Rx10 scale
	plate	0	0	0.5 ohm Rx1 scale
	G104	0	0	GND.
	plate	0.3	0.3	60 ohm Rx10 scale
7B7 1st IF ampl.	1	6.3 A.C.	6.3 A.C.	less than 0.1 ohm
	2	280	280	40K
	3	80	75	30K
	4	1	1	150 ohm
	5	GND.	GND.	GND.
	6	-2	-0.4	600K
	7	1	1	150 ohm
	8	GND.	GND.	GND.
7B7 2nd IF ampl.	1	6.3 A.C.	6.3 A.C.	less than 0.1 ohm
	2	280	280	40K
	3	80	75	30K
	4	1	1	150 ohm
	5	GND.	GND.	GND.
	6	-1.5	0	600K
	7	1	1	150 ohm
	8	GND.	GND.	GND.
7B7 infinite impedance detector. AVC detector	1	6.3 A.C.	6.3 A.C.	less than 0.1 ohm
	2	18	18	100K
	3	280	280	50K
	4	0	0	2k ohm
	5	-4	-0.5	900K
	6	-4	-0.5	900K
	7	GND.	GND.	GND.
	8	GND.	GND.	GND.
7B7 audio cathode follower	1	6.3 A.C.	6.3 A.C.	less than 0.1 ohm
	2	120	120	34K
	3	290	290	40K
	4	45	0	2 megs.
	5	45	0	2 megs.
	6	290	290	40K
	7	120	120	34K
	8	GND.	GND.	GND.
5A2A rectifier	1	110 V.A.C.	110 V.A.C.	infinite
	2	tie point	tie point	40K
	3	300	300	40K
	4	290	290	40K
	5	tie point	tie point	100 ohm
	6	350 A.C.	350 A.C.	100 ohm
	7	GND.	GND.	GND.
	8	5 V.A.C.	5 V.A.C.	40K

It is recommended that Visual Alignment be used for the I.F.

The bandpass width of the 456-KC I.F.'s is 20 KC, so a 40-KC swept signal with a center frequency of 456-KC is used to align the I.F.'s.

Connect the Oscilloscope to pin 2 of V104A (7B7) and connect the signal generator to pin 6 of V103 (7B7). Keep the output of the signal generator as low as possible.

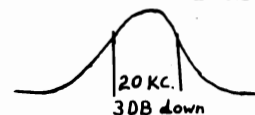
If the output impedance of the signal generator is high, it will be necessary to detune the secondary of L104 with C120.

Align L105 with C122 and C121, for a flat top to the I-F response curve, while trying to obtain maximum output.

Move the signal generator to pin 6 of V102 (7B7) and align L104 with C120 and C119 using the same procedure as used for L105.

Move the signal generator to pin 6 of V101 (7B7) and align L103 with C118 and C117 using the same procedure as used in aligning L105 and L104.

The I.F. response curve should be similar to the curve shown below.



Oscillator Alignment

The tuning meter on the front panel of the tuner may be used as an indicator when aligning the R-F and Oscillator section.

Connect the signal generator to the antenna terminal through a 0.01 MF capacitor.

Set the signal generator and tuner to 1300 KC. Output of the signal generator should be such that a reading of approximately 6 on the tuning meter is obtained.

Adjust C101D for maximum output.

Set the signal generator and tuner to 700KC and adjust L106 for maximum output. This procedure should be repeated for accurate calibration.

R-F Alignment

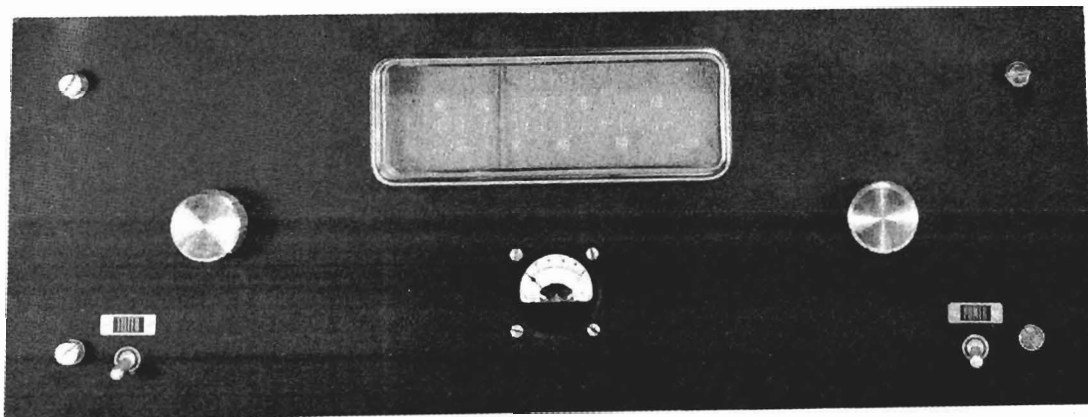
Set the signal generator and tuner to 1300 KC and adjust C101C for maximum output.

Set the signal generator and receiver to 700 KC and adjust L101 for maximum output.

When the tuner is tuned across the signal a succession of 2 peaks should appear on the tuning meter. Both peaks should have equal amplitude, and the dip in the middle should be equal to approximately 1 division on the meter scale. The maximum reading on the tuning meter should be at least 5 when adjusting C101C and L101 for this indication.

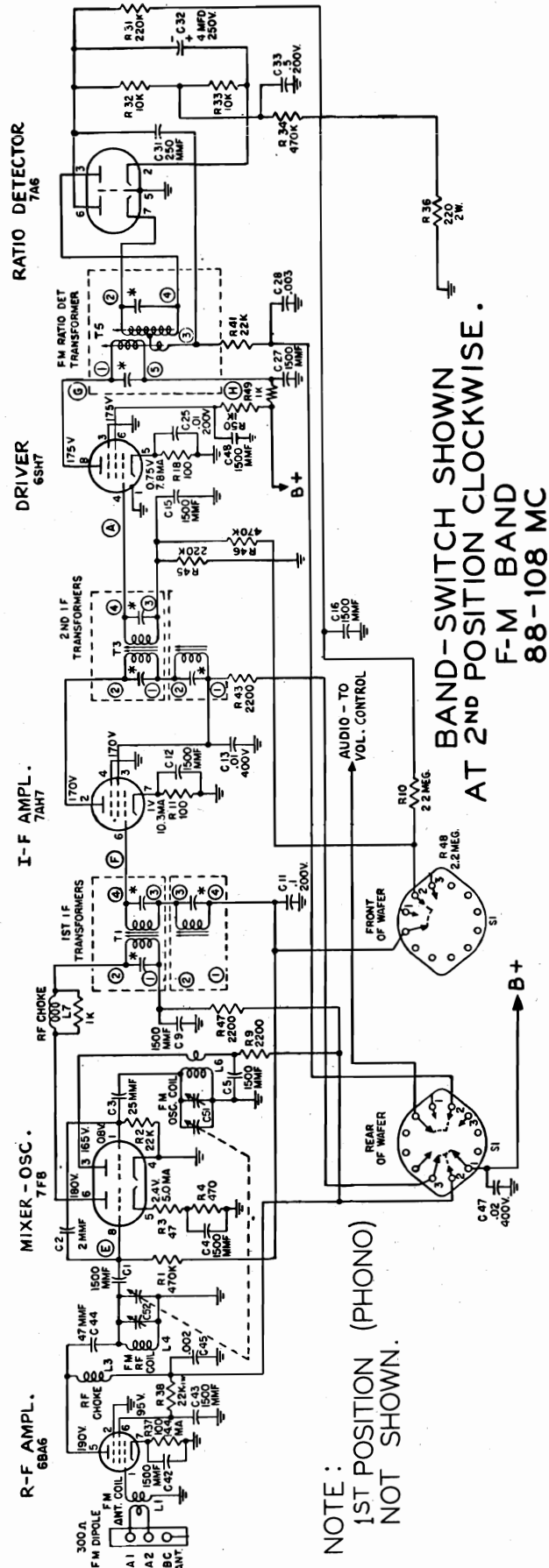
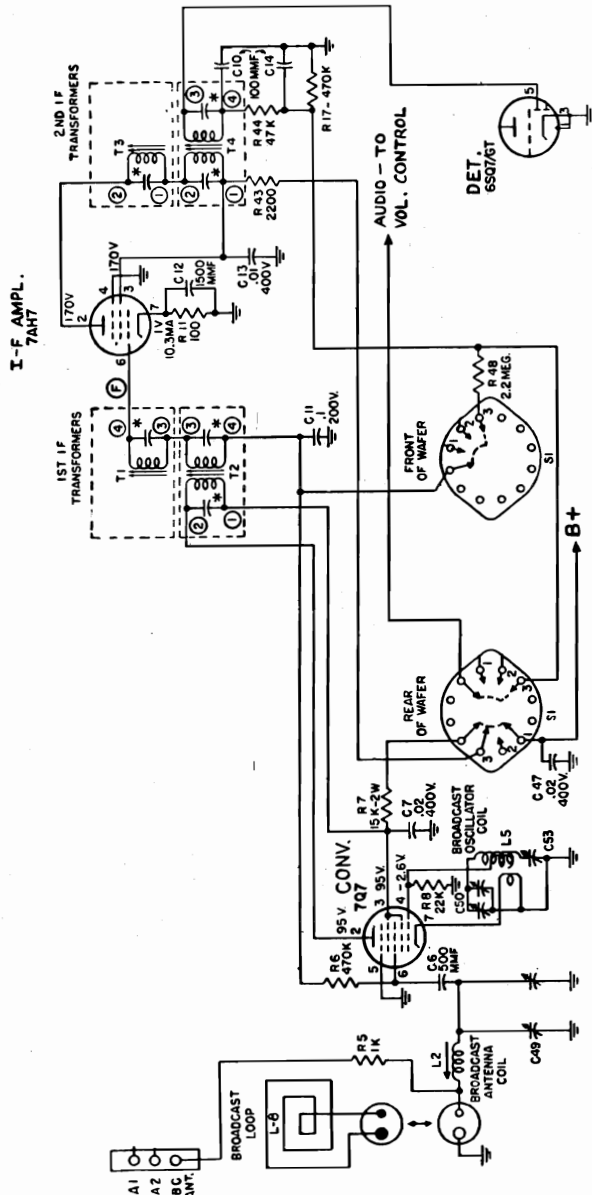
This adjustment may have to be repeated before the R-F alignment is satisfactory.

If there are strong stations at approximately 700 KC and 1300 KC, these may be used instead of the signal generator.

ALL VOLTAGE AND RESISTANCE MEASUREMENTS MADE WITH RESPECT TO CHASSIS GROUND.
AND WITH A LINE VOLTAGE OF 116 V.A.C.

[illegible]

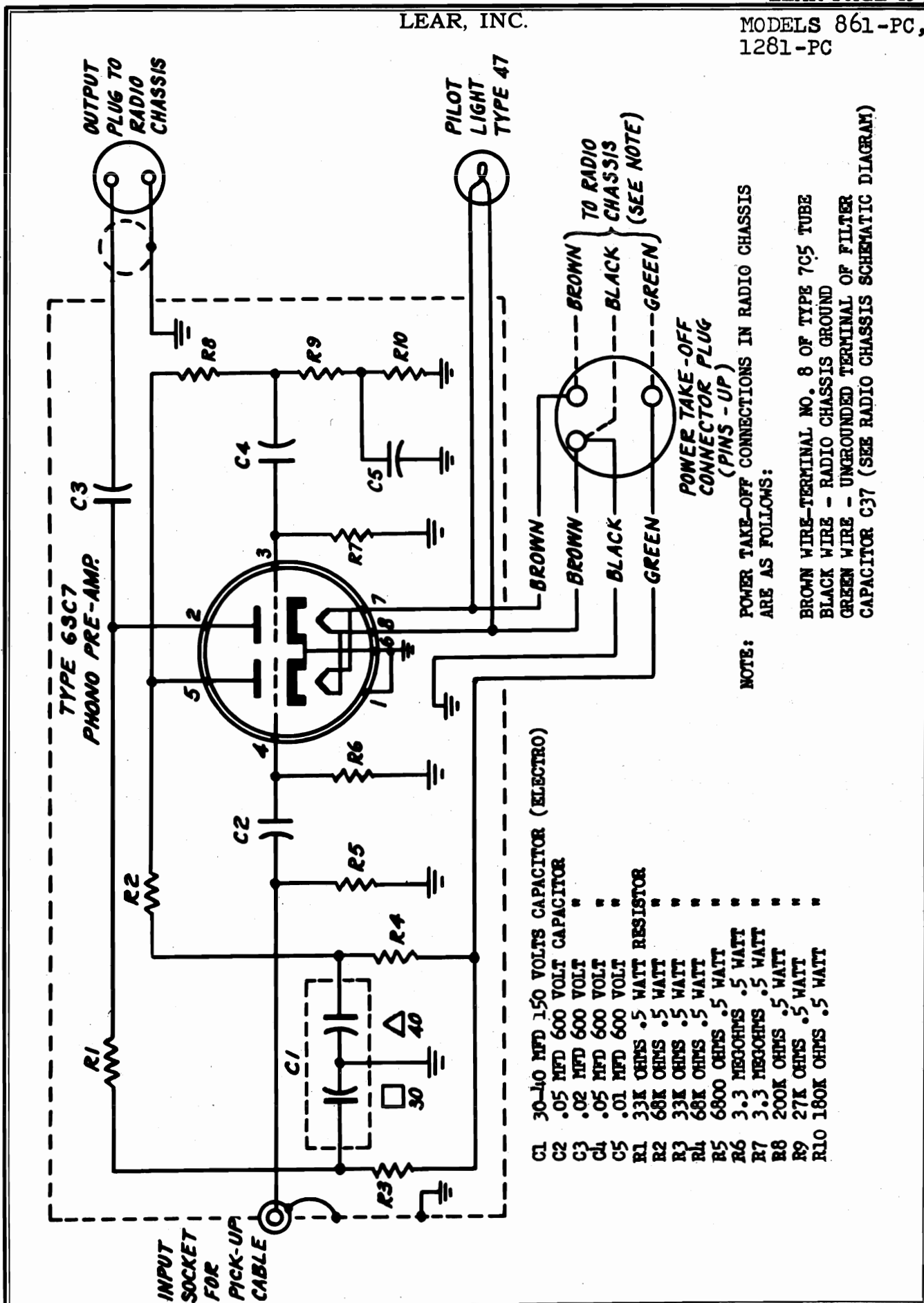
BAND-SWITCH SHOWN
AT 3RD POSITION CLOCKWISE
BROADCAST BAND
540-1700 KC



NOTE:
1ST POSITION (PHONO)
NOT SHOWN.

LEAR, INC.

MODELS 861-PC,
1281-PC



MODELS 861-PC,
1281-PC

LEAR, INC.

ALIGNMENT PROCEDURE FOR A.M.:

Equipment Required:

- a) Broadcast Band Signal Generator.
- b) Output Meter.

1. Set band switch to AM. Advance volume control to full volume setting.
2. Connect output meter across voice coil.
3. Connect the Signal Generator across the broadcast band antenna section of the variable condenser. The "high" side of the Generator should connect to the stator section and the "ground" side to the frame or chassis. Adjust the Signal Generator to 455 kc and with the receiver switched on, adjust the first and second I.F. transformers for peak output as shown on the output meter. The signal injected into the receiver should be as small in magnitude, as possible, consistent with a useful deflection on the output meter.
4. Connect the "high" side of the Generator to the antenna terminal with a 200 mmf condenser inserted in series. Connect the "ground" side of the Generator to the chassis. Tune receiver to 60 on the dial, adjust Signal Generator to 600 kc. Adjust the BC padder and the BC antenna coil for maximum deflection on the output meter. Use a weak signal.
5. Tune receiver to 160 on the dial. Adjust Signal Generator to 1600 kc. Adjust BC oscillator and BC antenna trimmers for maximum output.
6. Repeat operations 4 and 5.

ALIGNMENT PROCEDURE FOR F.M.:

Note: Points A, B, C, D, E, F, G, and H are noted on circuit diagram.

Points B, C, and D have been brought out to the unused contacts of the speaker socket at the rear of the chassis.

Equipment Required:

- a) High frequency Signal Generator with 88-108 Mc tuning range.
- b) Signal Generator capable of delivering .1 V at 10.7 mc.
- c) Audio output meter.
- d) D.C. vacuum tube voltmeter with zero center scale.

a. Ratio Detector Alignment:

1. Connect V.T.V.M. across points "B" and "C" (A.V.C. Voltage).
2. Feed 10.7 mc unmodulated R.F. signal into 6SH7 grid (point A) through .01 μ fd. condenser. This signal should be .1 volt.
3. Adjust primary of Ratio Detector (T-5) for maximum voltage indication on V.T.V.M.
4. Connect zero centered V.T.V.M. across points "B" and "D".
5. Adjust secondary of Ratio Detector (T-5) for zero indication.

6. Tune 10.7 mc Signal Generator higher in frequency (about 200 kc) until maximum voltage reading is obtained on V.T.V.M.; note this voltage, then tune signal generator lower in frequency until maximum voltage of the opposite polarity is obtained. Note this voltage, then if necessary re-adjust primary of the Det. (T-5) until the detector voltages are about equal on either the high or low side of 10.7 mc.

b. 10.7 I.F. Alignment:

1. Shunt a 1,000-ohm carbon resistor across the primary of the detector (T-5) (Points G and H).
2. Connect output meter across speaker voice coil.
3. Volume and tone controls at maximum clockwise position.
4. Connect 10.7 mc (modulated 30% signal generator through .01 μ fd. condenser across point "F" and ground.
5. Adjust secondary, then primary of (T-3) for maximum audio output. (Reduce input signal to maintain output at .5-watt level.)
6. Connect 10.7 mc 30% modulated signal generator across point "E" and ground.
7. Adjust secondary, then primary of (T-1) for maximum audio output. (Reduce input signal to maintain output at .5-watt level.)
8. Remove 1000-ohm shunting resistor from across primary of (T-5).

c. Oscillator and R.F. Alignment:

1. Connect V.T.V.M. across "B" and "C" (A.V.C. voltage).
2. Connect 108 mc signal generator to FM antenna terminals. If generator impedance is low, put one 150-ohm carbon resistor in series with each of the generator leads. Tune receiver dial to 108 mc.
3. Adjust FM oscillator trimmer (C-51) for maximum V.T.V.M. reading.
4. Adjust FM R.F. trimmer (C-52) for maximum V.T.V.M. reading. During alignment reduce input signal to maintain A.V.C. voltage at 2 V.
5. Repeat steps 3 and 4.
6. Feed a 90 mc signal into antenna terminals (as in C-2), tune receiver dial to signal.
7. Adjust spacing of FM R.F. coil (L-4) for maximum V.T.V.M. reading at 90 mc. During alignment reduce input signal to maintain A.V.C. voltage at 2 V.
8. Repeat steps 2 and 4 if necessary.

LEAR, INC.

MODELS 861-PC,
1281-PC**Tube Complement:**

- 1 Type 6BA6—FM RF Amplifier.
- 1 Type 7F8—FM Mixer, oscillator.
- 1 Type 7AH7—1st IF Amplifier.
- 1 Type 6SH7—FM Detector Driver.
- 1 Type 7A6—FM Detector.
- 1 Type 6SQ7/GT—AM Det., A.V.C. and 1st Audio Amplifier.
- 1 Type 7F7—2nd Audio, Phase Inverter.
- 2 Type 7C5—Push-pull Power Amplifiers.
- 1 Type 5Y3—Rectifier.
- 1 Type 7Q7—AM Mixer Oscillator.

A.M. — 540 Kc. to 1700 Kc.
F.M. — 88 Mc. to 108 Mc.

Power:

This receiver operates on 105-125 volts, 60 cycle, AC. Do not plug this radio receiver into a direct current socket. Power consumption is 80 watts.

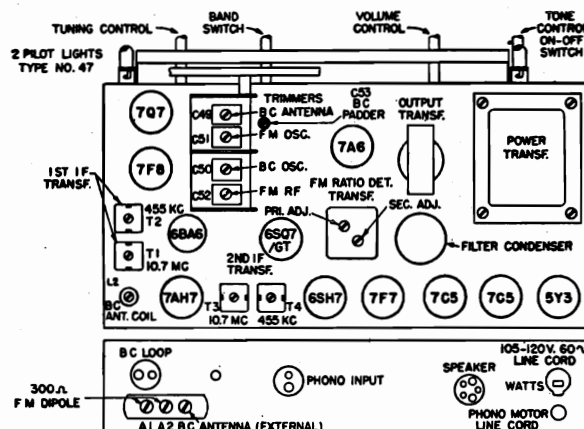


Figure 1. Tube and Trimmer Locations.

PARTS LIST:

- | | | |
|----------------------------------|---|---|
| C 1—1,500 mmfd., ± 300 mmfd. | C44—47 mmfd., 10% | R28—220K Ω , $\frac{1}{4}$ W., 20% |
| C 2—2 mmfd., 20% | C45—.002 mfd., 400 V. | R29—220K Ω , $\frac{1}{4}$ W., 20% |
| C 3—25 mmfd., 10% | C46—100 mmfd., 20% | R30—100 Ω , $\frac{1}{4}$ W., 20% |
| C 4—1,500 mmfd., ± 300 mmfd. | C47—.02 mfd., 400 V. | R31—220K Ω , $\frac{1}{4}$ W., 20% |
| C 5—1,500 mmfd., ± 300 mmfd. | C48—1,500 mmfd., ± 300 mmfd. | R32—10K Ω , $\frac{1}{4}$ W., 20% |
| C 6—500 mmfd., 20% | C49—Trimmer, compression, | R33—10K Ω , $\frac{1}{4}$ W., 20% |
| C 7—.02 mfd., 400 V. | 3-35 mmfd. | R34—470K Ω , $\frac{1}{4}$ W., 20% |
| C 8—.05 mfd., 400 V. | C50—Trimmer, compression, | R35—2,200 Ω , 10W., wirewound, 10% |
| C 9—1,500 mmfd., ± 300 mmfd. | 3-35 mmfd. | R36—220 Ω , 2W., 20% |
| C10—100 mmfd., 20% | C51—Trimmer, ceramic, 1.5-7 mmfd. | R37—100 Ω , $\frac{1}{4}$ W., 20% |
| C11—.1 mfd., 200 V. | C52—Trimmer, compression, | R38—22K Ω , 1W., 20% |
| C12—1,500 mmfd., ± 300 mmfd. | 1.6-18 mmfd. | R39—2.2 Meg. Ω , $\frac{1}{4}$ W., 20% |
| C13—.01 mfd., 400 V. | C53—Padder condenser, | R40—47K Ω , $\frac{1}{4}$ W., 20% |
| C14—100 mmfd., 20% | 275-1,000 mmfd. | R41—22K Ω , $\frac{1}{4}$ W., 20% |
| C15—1,500 mmfd., ± 300 mmfd. | R 1—470K Ω , $\frac{1}{4}$ W., 20% | R42—100K Ω , $\frac{1}{4}$ W., 20% |
| C16—1,500 mmfd., ± 300 mmfd. | R 2—22K Ω , $\frac{1}{4}$ W., 20% | R43—2,200 Ω , $\frac{1}{4}$ W., 20% |
| C17—.05 mfd., 200 V. | R 3—47 Ω , $\frac{1}{4}$ W., 20% | R44—47K Ω , $\frac{1}{4}$ W., 20% |
| C18—.05 mfd., 200 V. | R 4—470 Ω , $\frac{1}{4}$ W., 20% | R45—220K Ω , $\frac{1}{4}$ W., 20% |
| C19—.02 mfd., 200 V. | R 5—1K Ω , $\frac{1}{4}$ W., 20% | R46—470K Ω , $\frac{1}{4}$ W., 20% |
| C20—.005 mfd., 600 V. | R 6—470K Ω , $\frac{1}{4}$ W., 20% | R47—2,200 Ω , $\frac{1}{4}$ W., 20% |
| C21—250 mmfd., 20% | R 7—15K Ω , 2W., 20% | R48—2.2 Meg. Ω , $\frac{1}{4}$ W., 20% |
| C22—.01 mfd., 400 V. | R 8—22K Ω , $\frac{1}{4}$ W., 20% | R49—1K Ω , $\frac{1}{4}$ W., 20% |
| C23—250 mmfd., 20% | R 9—2,200 Ω , $\frac{1}{4}$ W., 20% | R50—1K Ω , $\frac{1}{4}$ W., 20% |
| C24—12 mfd., 350 V. | R10—2.2 Meg. Ω , $\frac{1}{4}$ W., 20% | T 1—FM I.F. Trans., 10.7 Mc. *ZB-2.276 |
| C25—.01 mfd., 200 V. | R11—100 Ω , $\frac{1}{4}$ W., 20% | T 2—AM I.F. Trans., 455 Kc. *ZB-2.275 |
| C26—Var. cond. (AM-FM) *C-6.0 12 | R12—.5 Meg. Ω Volume Control | T 3—FM I.F. Trans., 10.7 Mc. *ZB-2.276 |
| C27—1,500 mmfd., ± 300 mmfd. | (Audio Taper) tapped at | T 4—AM I.F. Trans., 455 Kc. *ZB-2.275 |
| C28—.003 mfd., 20% | 50K Ω *RA-9.069 | T 5—FM Ratio Detector Trans- |
| C29—.05 mfd., 400 V. | R13—10K Ω , $\frac{1}{4}$ W., 20% | former, 10.7 Mc. *ZC-2.278 |
| C30—.05 mfd., 400 V. | R14—1 Meg. Ω Tone Control, with | T 6—Output Trans. *ZB-15.019 |
| C31—250 mmfd., 20% | power switch *RA-9.070 | T 7—Power Trans. *TA-18.053 |
| C32—4 mfd., 250 V. | R15—10 Meg. Ω , $\frac{1}{4}$ W., 20% | S 1—Band Switch *SA-12.060 |
| C33—.5 mfd., 200 V. | R16—220K Ω , $\frac{1}{4}$ W., 20% | L 1—FM Antenna Coil *LA-2.241 |
| C34—.002 mfd., 600 V. | R17—470K Ω , $\frac{1}{4}$ W., 20% | L 2—Antenna Coil, Broadcast *LA-2.273 |
| C35—.002 mfd., 600 V. | R18—100 Ω , $\frac{1}{4}$ W., 20% | L 3—R.F. Plate Choke *LA-2.279 |
| C36 & C37—40 mfd. x 40 mfd., | R19—220K Ω , $\frac{1}{4}$ W., 20% | L 4—R.F. Coil, FM *LA-2.243 |
| electrolytic, 400 V. | R20—470K Ω , $\frac{1}{4}$ W., 20% | L 5—Oscillator Coil, Broadcast *LA-2.221 |
| C38—.05 mfd., 400 V. | R21—220K Ω , $\frac{1}{4}$ W., 20% | L 6—Oscillator Coil, FM *LA-2.222 |
| C39—1,500 mmfd., ± 300 mmfd. | R22—100K Ω , $\frac{1}{4}$ W., 20% | L 7—R.F. Choke, Conv. Plate *LA-2.242 |
| C40—1,500 mmfd., ± 300 mmfd. | R23—470K Ω , $\frac{1}{4}$ W., 20% | L 8—Loop, Broadcast *LC-5.018 |
| C41—1,500 mmfd., ± 300 mmfd. | R24—100K Ω , $\frac{1}{4}$ W., 20% | Antenna, FM, Folded Dipole |
| C42—1,500 mmfd., ± 300 mmfd. | R25—2,200 Ω , $\frac{1}{4}$ W., 20% | (300 Ω) *LA-5.010 |
| C43—1,500 mmfd., ± 300 mmfd. | R26—10 Ω , $\frac{1}{4}$ W., 20% | Pilot Lamp, No. 47, 6-8 V. |
| | R27—2,200 Ω , $\frac{1}{4}$ W., 20% | |

Part No. NG-500 Rev. 11-12-47

* Mfg. Part No.

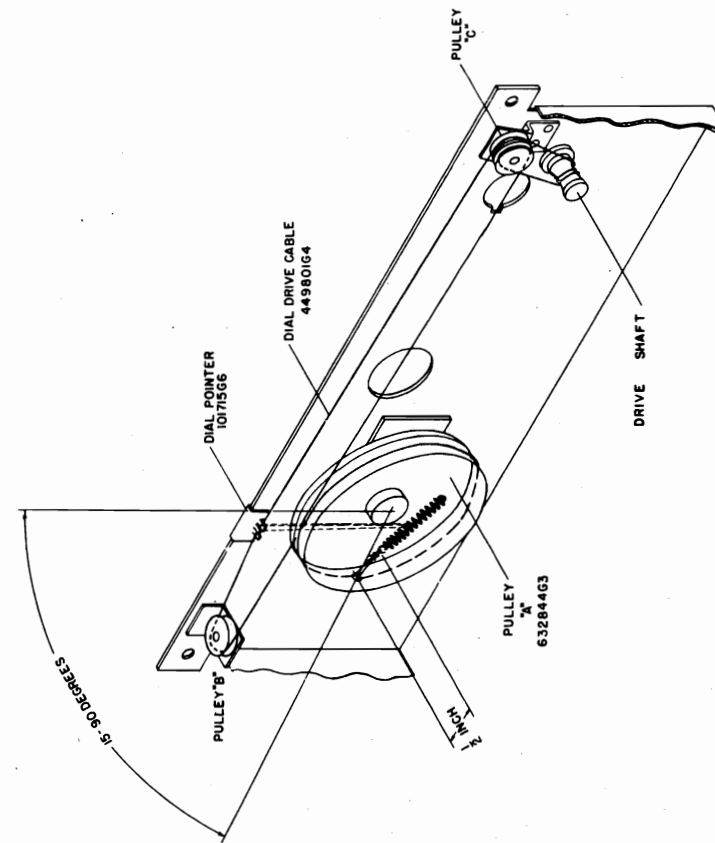
DIAL CORD REPLACEMENT

A single cable transmits motion from the dial tuning knob to rotate the condenser gang and to move the dial pointer. A 30-inch length of string is required to restring this assembly. After the broken cable is removed, turn pulley "A" (see Figure 1) until the condenser gang plates are completely meshed. In this condition, the small hole in the rim of pulley "A" should be within the limits of 15 to 90 degrees to the left of being vertical as shown in Figure 1. If this hole is at a different position from the condition specified, loosen the two screws in the coupling to the condenser gang and turn pulley "A" while holding the condenser plates meshed. Tighten the two set screws after the adjustment has been made.

Lace one end of the new length of cable through the hole in pulley "A" and temporarily fasten it to the hook to which the spring is normally fastened. Make a complete turn around pulley "A" in a counter-clockwise direction, lace it around pulley "B", then across the rear of the dial scale and over the top of the front groove in pulley "C". Proceed down around the tuning shaft for 2½ turns in a clockwise direction and wrapping the cable over pulley "D" from front to back. Continue up over the rear groove of pulley "C" in a clockwise direction for one turn and extend the cable to the left so that the loose end is to the rear of the section of cable that it crosses. The loose end of the cable should now be wound over the top of pulley "A" so that it is nearest the dial frame and into the hole in the pulley groove. Remove the other end of the cable from the hook and while holding both ends taut, insert one end of the spring on the hook in pulley "A". Lace the two free ends of the cable through the opposite end of the spring and

pull the cable until the spring is stretched to within ½-inch of the rim on the pulley. Tie a double knot so that the knot is around one coil of the spring, while maintaining tension on the cable.

Turn the tuning control shaft until the condenser gang is completely meshed and slide the dial pointer on its track until it is in line with the last calibration mark at the low frequency end of the dial. Press the crimping lugs on the dial pointer together over the cable. After checking to see that the condenser gang is still completely meshed and the dial pointer is in the position specified previously, apply a few drops of cement to the cable where it is crimped by the pointer. This completes the operation.



ALIGNMENT PROCEDURE

The alignment of this F-M tuner is made in three major steps namely, I-F alignment, Discriminator alignment and R-F alignment. An F-M generator is not required in aligning this F-M tuner. Any accurately calibrated signal generator covering a range in the vicinity of 10.7 megacycles may be used in aligning the I-F and the Discriminator stages. For R-F alignment, the generator must cover the tuning range of the tuner or approximately 87 to 110 megacycles. If such a signal generator is not available, this alignment may be made by using an F-M radio station as a frequency standard.

I-F ALIGNMENT

1. Connect the "high" side of the signal generator to Grid 3 (pin #8) of the 6SB7Y converter tube and the "low" side of the generator to the radio chassis.
2. If a vacuum tube voltmeter is available, connect it across the 220,000 ohm resistor in the grid circuit of the 6SH7 limiter tube at points designated "A" and "X" on the schematic diagram (Figure 2) to measure the limiter grid bias voltage. Set the signal generator to exactly 10.7 megacycles and adjust the third, the second and the first i-f transformer trimmers in that order for maximum reading on the meter. A reading of 2 to 8 volts should be considered normal.
3. If a vacuum tube voltmeter is not available, connect a 0-50 or 0-200 microammeter in series with the "ground" end of the 220,000 ohm resistor in the grid circuit of the 6SH7 limiter tube at point "X" on the schematic diagram. Set the signal generator to exactly 10.7 megacycles and adjust the third, the second and the first i-f transformer trimmers in that order for maximum meter readings. A normal reading will be in the range of 10 to 35 microamperes. At the completion of these adjustments, remove the microammeter and ground the 220,000 ohm resistor to the point where it was originally connected.

DISCRIMINATOR ALIGNMENT

The accurate alignment of the discriminator transformer cannot be overemphasized. Incorrect alignment will result in badly distorted reception. The following steps should be followed in the order given:

1. A DC vacuum tube voltmeter is connected to the output circuit by connecting it from ground to point "B" on the schematic diagram. This measures the detector output voltage. Adjust the signal generator frequency to exactly 10.775 megacycles and adjust both trimmers on the discriminator transformer for maximum reading. If the indicated voltage is less than 3 volts readjust the output of the generator until the meter indicates 3 volts or more. Now adjust the signal generator frequency to 10.7 megacycles and turn the trimmer screw on the top of the discriminator

until the voltage is zero. This is an extremely important adjustment. Reset the generator frequency to 10.775 and record the meter reading.

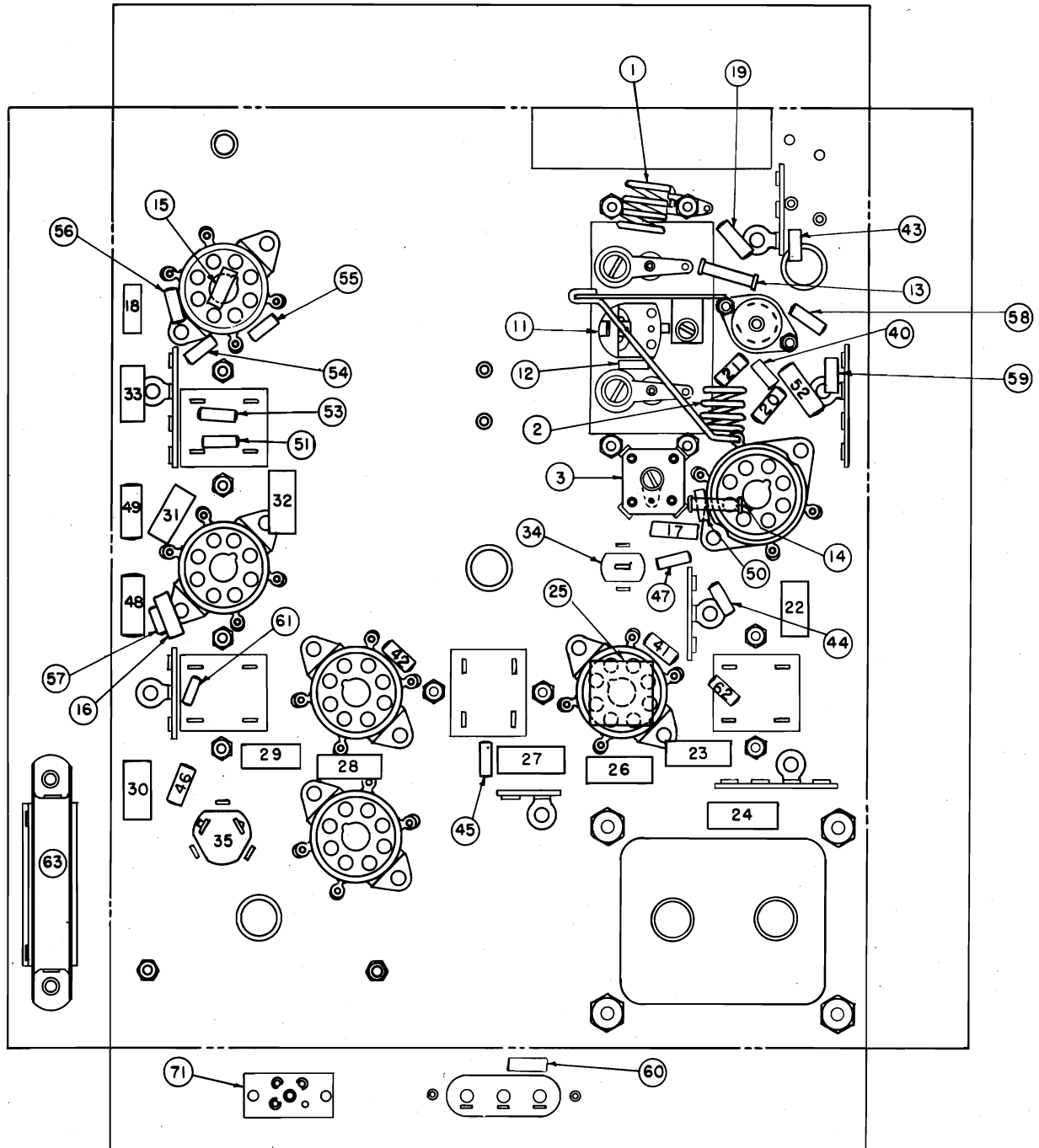
2. Reverse the meter connections and set the signal generator frequency to 10.625 megacycles. The meter reading now obtained must be within 10% of the reading recorded in the previous operation—if it is not, the discriminator alignment was not done accurately and must be repeated.

3. The discriminator may also be aligned using a 0-50 or 0-200 microammeter if a vacuum tube voltmeter is not available. In this case, the detector output current is measured. Connect the microammeter to the same points specified in paragraph 1 and proceed in the manner outlined in paragraphs 1 and 2 of this section. In the operation described in paragraph 1, the meter reading should be at least 20 microamperes when the trimmers are peaked at 10.775 megacycles; if not, the generator should be adjusted until that value is obtained.

R-F ALIGNMENT

1. Check that the dial pointer is in line with the last mark at the low frequency end of the dial calibration when the condenser gang is fully meshed. If it is not, slide the pointer on its string to the correct position, and crimp the lugs (on the rear of the pointer) tightly around the string and apply a drop of cement to hold the pointer in adjustment.
2. Connect the vacuum tube voltmeter to points "A" and "X" on the schematic diagram or connect a 0-50 or 0-200 microammeter in series with the "ground" end of the 220,000 ohm resistor in the grid circuit of the 6SH7 limiter tube at point "X" on the schematic diagram.
3. An extremely accurate signal generator is a necessity in making the following adjustments and it should be connected to the antenna post through a 300 ohm resistor. If such a generator is not available, connect an F-M antenna to the antenna terminal (A) and use an F-M transmitter for a frequency standard. It is preferable that this station be located in the high frequency end of the band—102 to 108 megacycles.

4. Set the signal generator (if one is used) and the F-M tuner to exactly 108 megacycles—if an F-M station is used as a frequency standard accurately set the tuner to the frequency of the F-M station and adjust the oscillator trimmer for a maximum reading on the meter. Then adjust the antenna trimmer and the r-f trimmer for a maximum meter indication. If too much signal is fed to the tuner, it might appear at several settings of the tuning dial and confuse the adjustment. When the adjustments are completed, the second harmonic of the oscillator frequency will be 10.7 megacycles lower than the signal frequency.



Special Service Information

The following information is provided for the service man who has a vacuum tube voltmeter or a similar measuring instrument available.

STAGE GAINS*

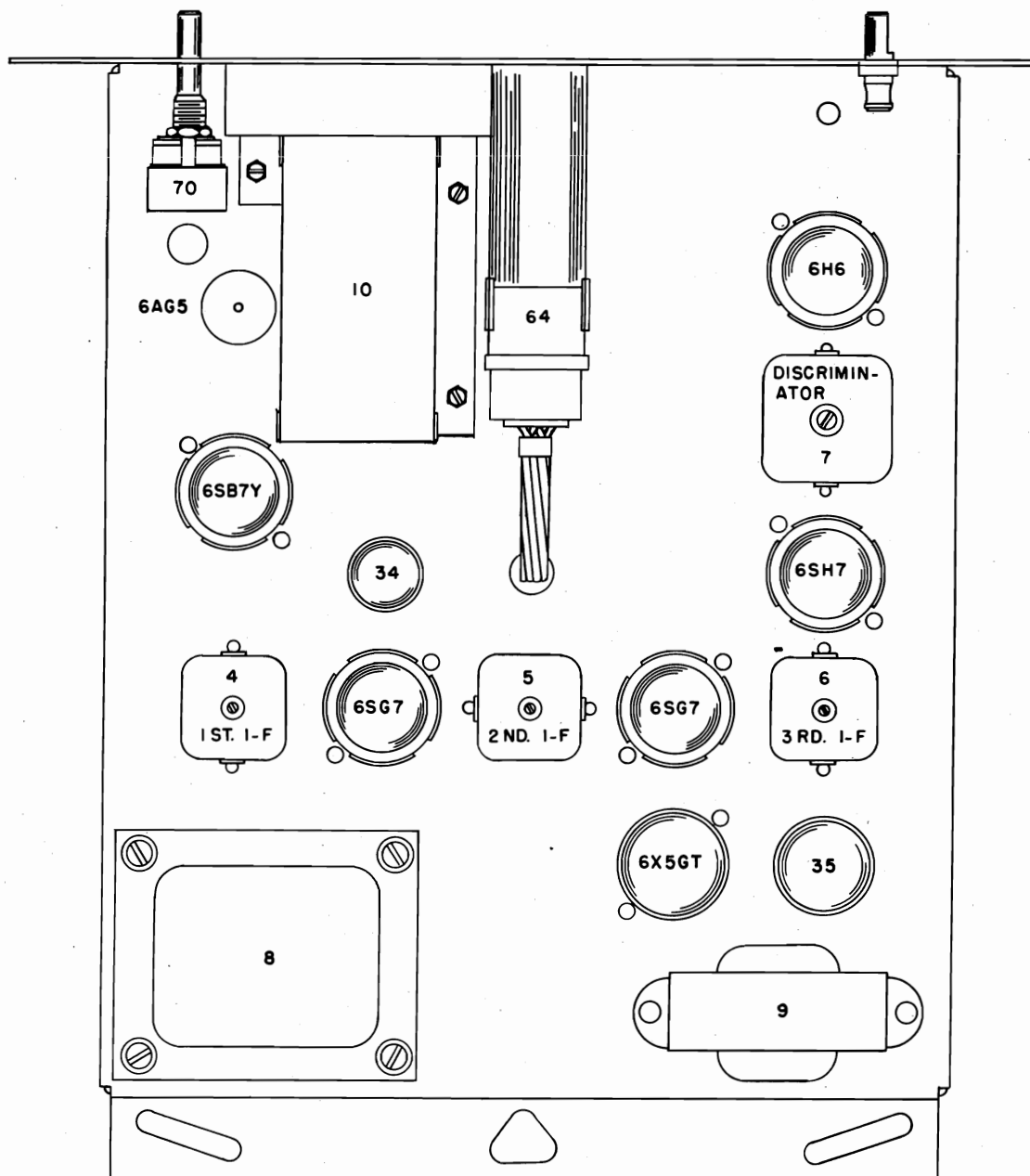
Antenna Post to R-F Grid through 300-ohm resistor at:	
98 mc.	1.1
R-F to Converter Grid at:	
98 mc.	13.8
R-F on Converter Grid to 1st I-F Grid at:	
98 mc.	5.0

I-F on 1st I-F Grid to 2nd I-F Grid at:	
10.7 mc.	35
2nd I-F Grid to Limiter Grid at:	
10.7 mc.	33

OSCILLATOR GRID VOLTAGE

The DC voltage developed across Oscillator Grid resistor (37) at:	
98 mc.	7.0

*Variations of $\pm 20\%$ are permissible. All readings made with sufficient signal to provide 15 millivolts output at 400 cycles with 22.5 kc. modulation.



Power supply.....117 volts 50/60 cycles AC

Power consumption.....46 watts

Intermediate frequency.....10.7 mc.

Tuning frequency range:.....87.1-108.9 mc.

Tubes:

R-F Amplifier6AG5

Converter6SB7Y

First I-F Amplifier.....6SG7

Second I-F Amplifier.....6SG7

Limiter6SH7

Detector6H6

Rectifier6X5GT/G

Tuning Indicator6U5

Dial LampMazda No. 51

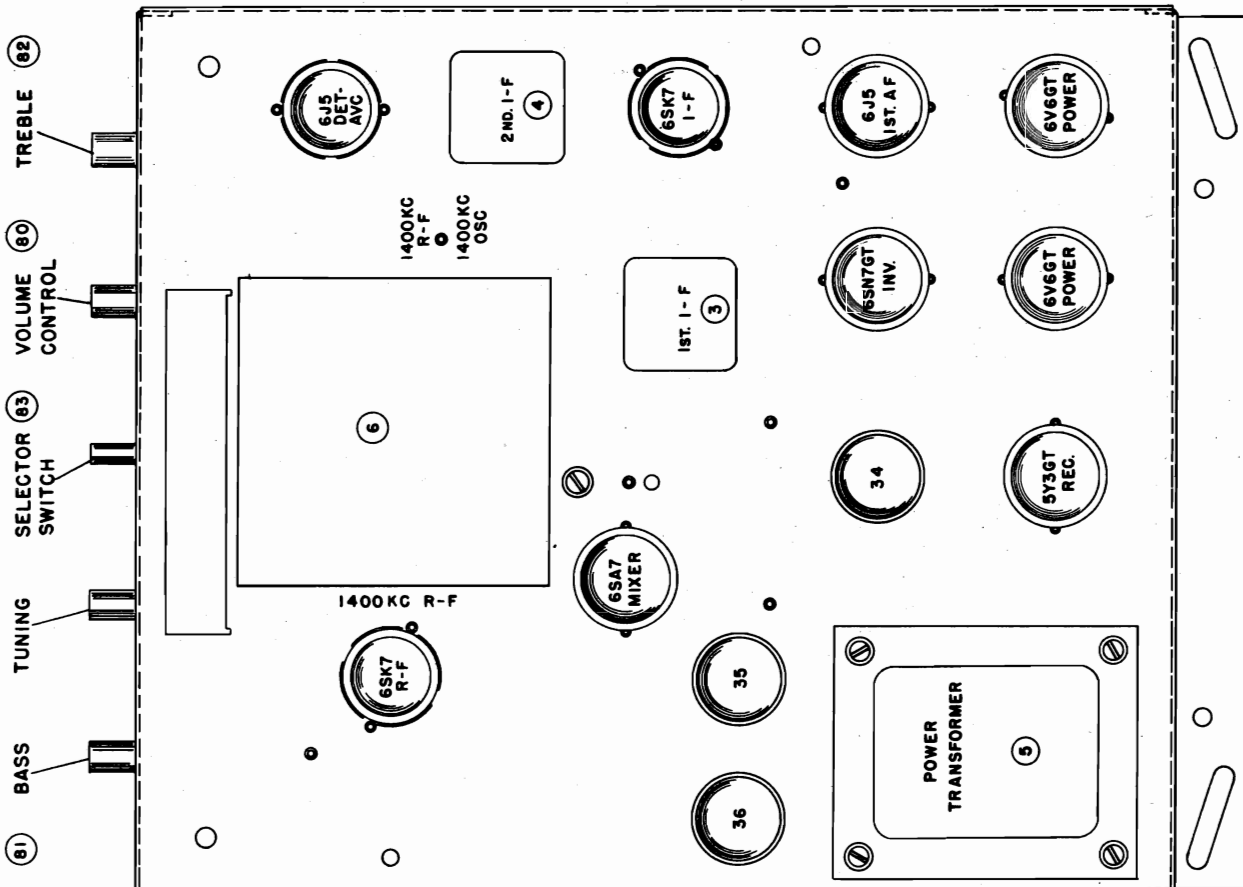
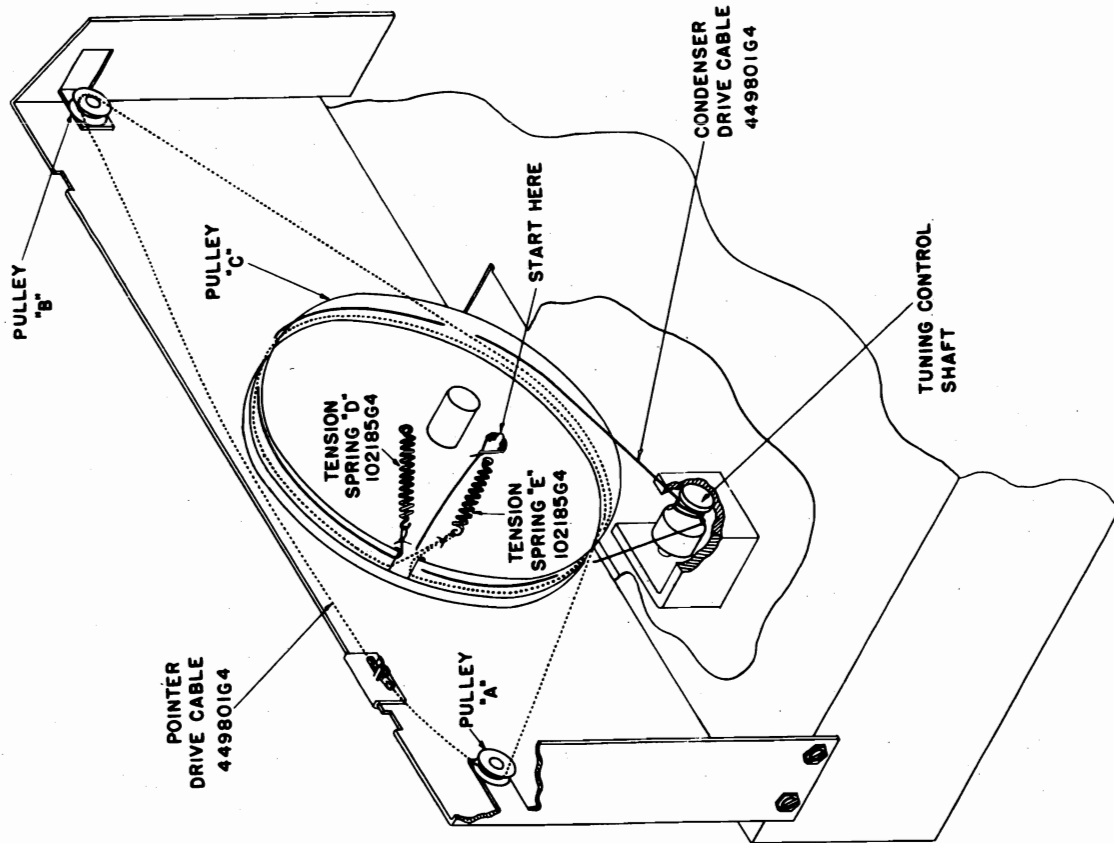
THE MAGNAVOX CO.

MODEL CR-206

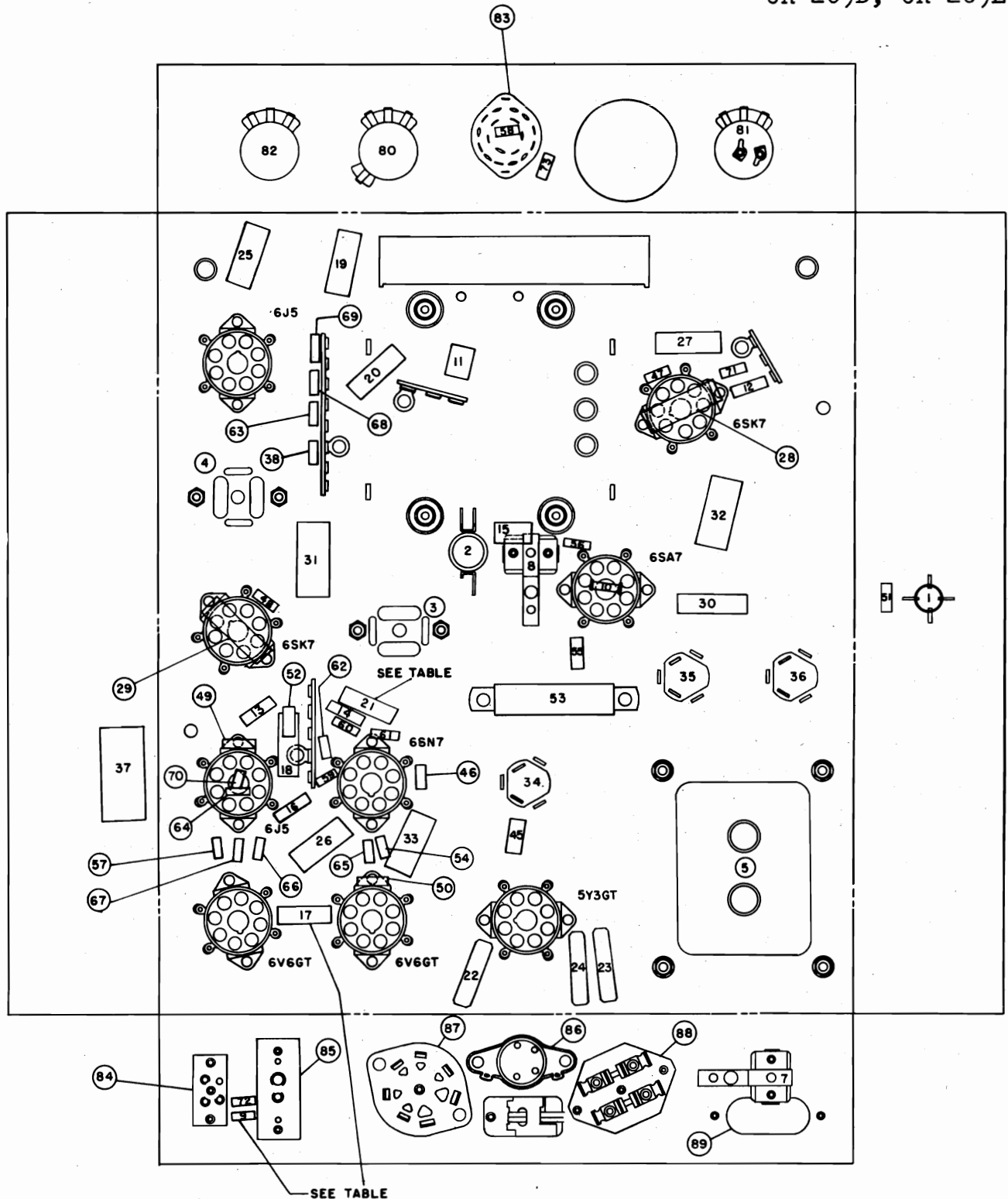
REFERENCE NO.	DESCRIPTION	MAGNAVOX PART NO.
1	Coil assembly, antenna	360311G2
2	Coil assembly, r-f.	360312G2
3	Coil assembly, oscillator	360263G2
4	Transformer, 1st i-f.	360304G1
5	Transformer, 2nd i-f.	360304G1
6	Transformer, 3rd i-f.	360304G1
7	Transformer, discriminator	360305G1
8	Transformer, power	300030G1
9	Choke, filter	350032G1
10	Capacitor, variable, three-gang tuning	260059G1
11	Capacitor, trimmer	260067G1
12	Capacitor, ceramic, 10 mmf.	250088G8
13	Capacitor, ceramic, 35 mmf.	250088G26
14	Capacitor, ceramic, 35 mmf.	250088G26
15	Capacitor, mica, 47 mmf.	250159G96
16	Capacitor, mica, 47 mmf.	250159G96
17	Capacitor, mica, 470 mmf.	250159G102
18	Capacitor, mica, 470 mmf, $\pm 10\%$	250159G90
19	Capacitor, ceramic, 500 mmf.	250088G31
20	Capacitor, ceramic, 500 mmf.	250088G31
21	Capacitor, ceramic, 500 mmf.	250088G31
22	Capacitor, paper, .01 mfd, 600 V	250129G2
23	Capacitor, paper, .01 mfd, 600 V	250129G2
24	Capacitor, paper, .01 mfd, 600 V	250129G2
25	Capacitor, paper, .01 mfd, 600 V	250129G2
26	Capacitor, paper, .01 mfd, 600 V	250129G2
27	Capacitor, paper, .01 mfd, 600 V	250129G2
28	Capacitor, paper, .01 mfd, 600 V	250129G2
29	Capacitor, paper, .01 mfd, 600 V	250129G2
30	Capacitor, paper, .01 mfd, 600 V	250129G2
31	Capacitor, paper, .01 mfd, 600 V	250129G2
32	Capacitor, paper, .01 mfd, 600 V	250129G2
33	Capacitor, paper, .05 mfd, 600 V	250129G5
34	Capacitor, electrolytic, 10 mfd, 450 V	270026G3
35	Capacitor, electrolytic, 30-10 mfd, 475 V	270023G2
40	Resistor, composition, 10 ohms, $\frac{1}{2}$ W	230084G1
41	Resistor, composition, 100 ohms, $\frac{1}{2}$ W	230084G7
42	Resistor, composition, 100 ohms, $\frac{1}{2}$ W	230084G7
43	Resistor, composition, 220 ohms, $\frac{1}{2}$ W	230084G9
44	Resistor, composition, 1000 ohms, $\frac{1}{2}$ W	230084G13
45	Resistor, composition, 1000 ohms, $\frac{1}{2}$ W	230084G13
46	Resistor, composition, 1000 ohms, $\frac{1}{2}$ W	230084G13
47	Resistor, composition, 3300 ohms, $\frac{1}{2}$ W	230084G16
48	Resistor, composition, 4700 ohms, $\pm 5\%$ 2 W	230061G175
49	Resistor, composition, 6800 ohms, $\pm 5\%$ 2 W	230061G179
50	Resistor, composition, 22,000 ohms, $\frac{1}{2}$ W	230084G21
51	Resistor, composition, 27,000 ohms, $\pm 10\%$ $\frac{1}{2}$ W	230084G79
52	Resistor, composition, 33,000 ohms, $\pm 10\%$ 1 W	230085G80
53	Resistor, composition, 39,000 ohms, $\pm 10\%$ $\frac{1}{2}$ W	230084G81
54	Resistor, composition, 100,000 ohms, $\pm 10\%$ $\frac{1}{2}$ W	230084G86
55	Resistor, composition, 150,000 ohms, $\pm 10\%$ $\frac{1}{2}$ W	230084G88
56	Resistor, composition, 150,000 ohms, $\pm 10\%$ $\frac{1}{2}$ W	230084G88
57	Resistor, composition, 220,000 ohms, $\frac{1}{2}$ W	230084G27
58	Resistor, composition, 220,000 ohms, $\frac{1}{2}$ W	230084G27
59	Resistor, composition, 470,000 ohms, $\frac{1}{2}$ W	230084G29
60	Resistor, composition, 1 megohm, $\frac{1}{2}$ W	230084G31
61	Resistor, composition, 1 megohm, $\frac{1}{2}$ W	230084G31
62	Resistor, composition, 1.5 megohm, $\frac{1}{2}$ W	230084G32
63	Resistor, wire wound, 5000 ohms, 5 W	240035G4
64	Resistor, composition, 470,000 ohms, $\frac{1}{2}$ W. (in tuning eye socket)	230084G29
70	Switch, rotary power	160174G1
71	Socket, output	180060G1

MODELS CR-209A,
CR-209B, CR-209C,
CR-209D, CR-209E

THE MAGNAVOX CO.



THE MAGNAVOX CO.

MODELS CR-209A,
CR-209B, CR-209C,
CR-209D, CR-209E

ITEM NO.	ELECTRICAL VALUES		
	CR209A	CR209B	CR209C
9	8 MMF	33 MMF	33 MMF
17	.002 MFD	.0015 MFD	.0015 MFD
21	.01 MFD	.01 MFD	.002 MFD

MODELS CR-209A,
CR-209B, CR-209C,
CR-209D, CR-209E

THE MAGNAVOX CO.

ALIGNMENT PROCEDURE

The alignment of this receiver requires the use of an accurately calibrated r-f signal generator and an output meter. All trimmer condenser locations are shown on the chassis layout diagram, Figure 3. The radio volume control should be turned to maximum and the signal generator output kept as low as possible during alignment to prevent the AVC from operating and giving false readings.

I-F ALIGNMENT

1. Connect the output of the signal generator to the control grid (pin No. 8) of the 6SA7 tube through a .00025 mfd. capacitor. The ground on the signal generator should be connected to the radio chassis ground.
2. Turn the condenser gang until it is completely meshed, (low-frequency end of dial calibration) and set the input selector switch to RAD.
3. Adjust the signal generator to EXACTLY 455 kc. and peak the second i-f transformer and the first i-f transformer trimmers in that order.

BROADCAST BAND ALIGNMENT

1. Remove the signal generator lead from the 6SA7 grid and connect it to the control grid (pin 4) on 6SK7 RF tube.
2. Check the tuning dial pointer adjustment. When the plates of the tuning condenser are completely meshed, the dial pointer must be in line with the last calibration mark at the low frequency end of the dial. If it is not, slide the pointer on its string to the correct position. Be sure to crimp the lugs (on the rear of the pointer) tightly around the string to hold the pointer in adjustment.
3. Set the signal generator and the radio receiver to 1400 kc., adjust the 1400 kc. oscillator trimmer and the 1400 kc. r-f trimmer for maximum output.

4. Adjust the signal generator and the radio receiver to 600 kc. While rocking the gang condenser a few degrees to the right and to the left, adjust the 600 kc. oscillator padder for maximum indication on the output meter. If considerable adjustment was necessary, recheck the 1400 kc. trimmer setting.
5. Form three turns of wire into a loop, connect this loop to the signal generator and loosely couple it to the cabinet antenna.
6. With the signal generator and dial at 1400 kc., adjust the loop antenna trimmer for maximum output.

SPECIAL SERVICE INFORMATION

The following information is provided for the service man who has a vacuum tube voltmeter or a similar measuring instrument available.

STAGE GAINS*

R-F Grid to Converter Grid at:	
600 kc.....	4.7
R-F on Converter to I-F Grid at:	
600 kc.....	62.5
I-F on Converter Grid to I-F Grid at:	
455 kc. (gang closed).....	80.0
I-F Grid to Detector Plate at:	
455 kc.....	72

OSCILLATOR OUTPUT VOLTAGE

The DC voltage developed across the Oscillator Grid Resistor at:

600 kc.....	8.8 V.
or 0.4-ma. through 22,000 ohm Oscillator Grid Resistor (56).	

AUDIO GAIN

Voltage required across the Volume Control to produce .05 watt speaker output** at 400 cycles is .011 volt with Input Selector Switch in RAD setting.

*Variations of $\pm 20\%$ are permissible. All readings made with sufficient input signal to provide .05 watt speaker output.

** .05 watt speaker output at 400 cycles is equivalent to a reading of 0.4 volts as measured by a high resistance AC voltmeter across the voice coil of speaker.

Tubes:

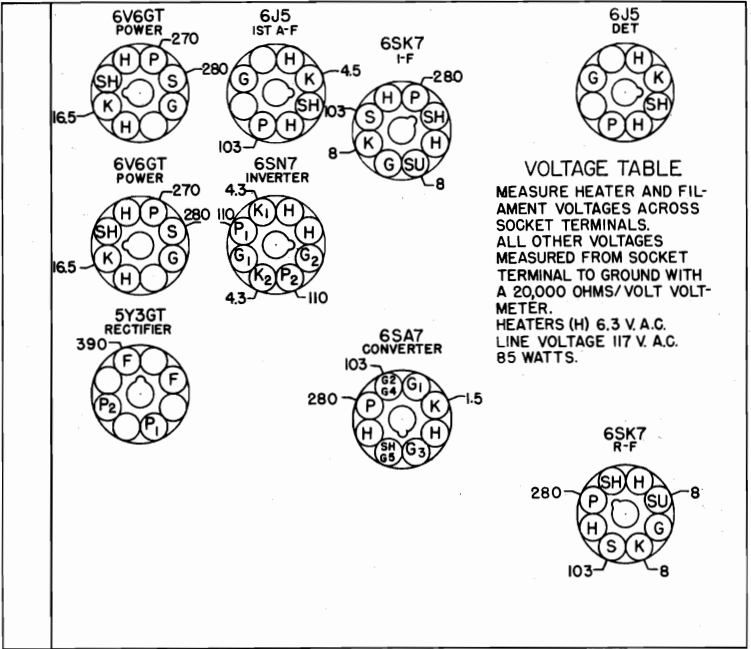
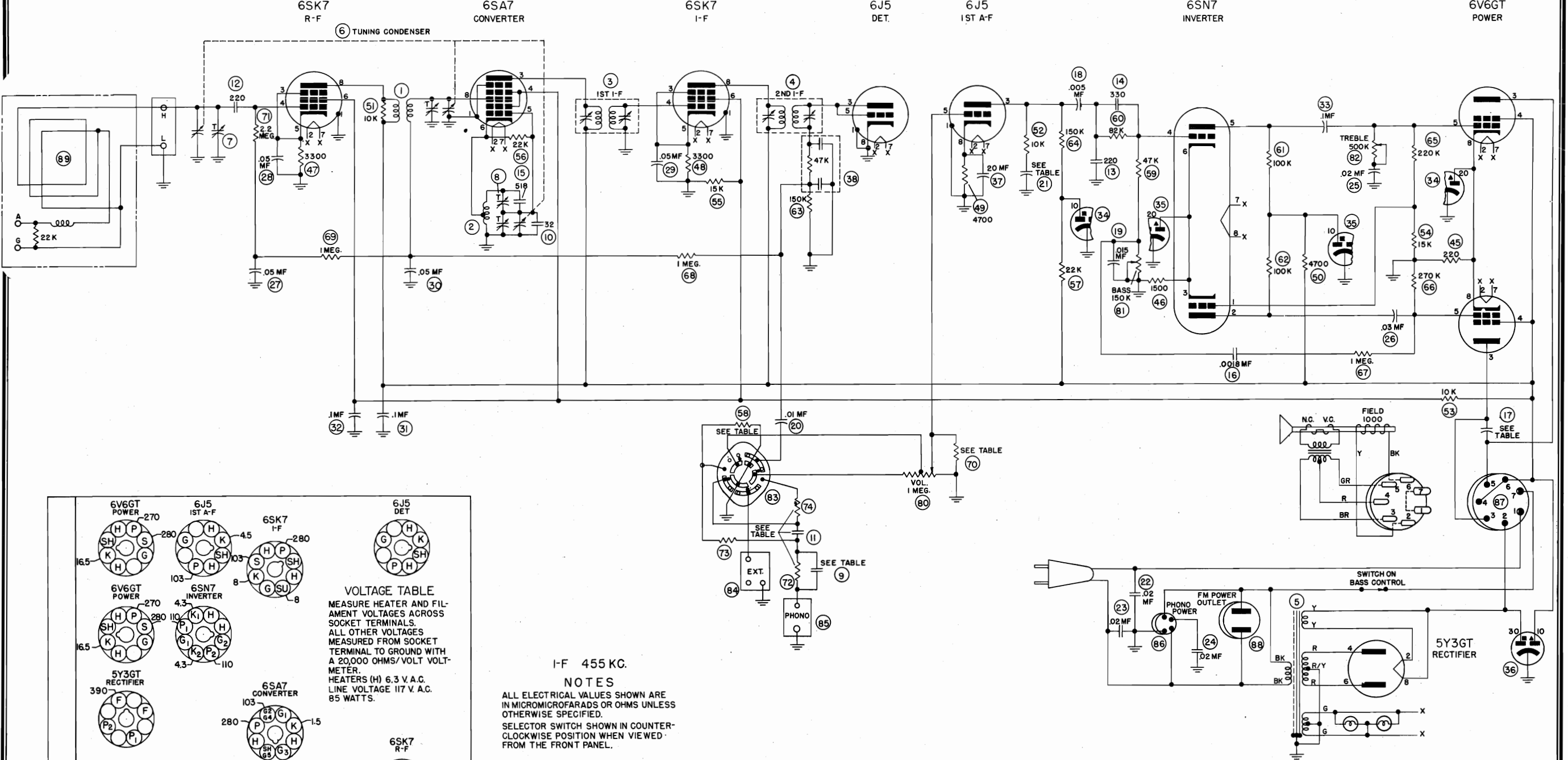
R-F Amplifier.....	6SK7
Converter.....	6SA7
I-F Amplifier.....	6SK7
Detector and AVC.....	6J5
First Audio.....	6J5
Inverter.....	6SN7GT
Power output (push-pull stage).....	(2) 6V6GT
Rectifier.....	5Y3GT
Dial lamps.....	Mazda No. 44

Speakers:

Field coil resistance.....	1000 ohms
Voice coil impedance (400 cycles).....	3.0 ohms
Output transformer.....	8,000/3 ohms

THE MAGNAVOX CO.

MODELS CR-209A, CR-209B, CR-209C, CR-209D, CR-209E



VOLTAGE TABLE.
MEASURE HEATER AND FILAMENT VOLTAGES ACROSS SOCKET TERMINALS.
ALL OTHER VOLTAGES MEASURED FROM SOCKET TERMINAL TO GROUND WITH A 20,000 OHMS/VOLT VOLT-METER.
HEATERS (H) 6.3 V.A.C. LINE VOLTAGE 117 V.A.C. 85 WATTS.

I-F 455 KC.
NOTES
ALL ELECTRICAL VALUES SHOWN ARE IN MICROMICROFARADS OR OHMS UNLESS OTHERWISE SPECIFIED.
SELECTOR SWITCH SHOWN IN COUNTER-CLOCKWISE POSITION WHEN VIEWED FROM THE FRONT PANEL.

ITEM NO.	CR209A	CR209B	CR209C	CR209D	CR209E
74	OMIT	OMIT	OMIT	330K	470K
73	4.7 MEG.	4.7 MEG.	4.7 MEG.	1 MEG.	1 MEG.
72	3.9 MEG.	3.9 MEG.	3.9 MEG.	820K	820K
70	1.5 MEG.	1.5 MEG.	1.5 MEG.	OMIT	OMIT
58	33K	33K	33K	OMIT	OMIT
11	150	150	150	470	470
21	.01 MF	.01 MF	.002 MF	.01 MF	.002 MF
17	.002 MF	.0015 MF	.0015 MF	.0015 MF	.0015 MF
9	8	33	33	100	100

SPECIFICATIONS

Power supply.....117 volts 50/60 cycles AC
Power consumption.....85 watts
Power output.....10 watts
Intermediate frequency.....455 kc.
Tuning frequency range.....534-1620 kc.

THE MAGNAVOX CO.

MODELS CR-209A,
CR-209B, CR-209C,
CR-209D, CR-209E

DIAL CORD REPLACEMENT

Two separate drive cables are used in the CR-209 dial assembly. One cable is used to transmit the motion from the tuning knob to the large pulley that is coupled to the condenser gang; the other cable actuates the dial pointer whenever the large pulley on the condenser gang is rotated. Separate instructions for replacing either of these cables is given in the following paragraphs.

CONDENSER DRIVE CABLE REPLACEMENT

Remove dial assembly after taking out two screws on each side of chassis. Slide a short length (approximately 1/2 inch) of sleeving over one end of a length of dial cable, form a small loop and tie a knot in the manner shown on Figure 1. Tie spring to opposite end of cable making length including spring 20 3/4 inches. Hook loop over the metal hook in pulley "C" and lace the cable through the pulley slot and around the pulley in a counterclockwise direction when viewed from the rear of the chassis keeping the cable to the rear of the pulley groove. Lace the cable around the smaller diameter portion of the tuning control shaft wrapping 2 1/2 turns from front to back then around the opposite side of pulley "C" into the pulley through the slot. Hook the end of tension spring "D" in the hole provided in pulley "C"; completing this operation.

DIAL POINTER DRIVE CABLE REPLACEMENT

Remove dial assembly after taking out two screws on each side of chassis. Slip a one-half inch length

of sleeving into a 42-inch length of dial cable. Tie the two ends to the loop end of the cable spring "E" securely so that the cable doubled measures 20 3/4 inches end to end including spring.

Place spring hook in bottom hole and draw cable through slot of pulley "C". Loop one end of cable around pulley "C" in a clockwise direction in front of condenser drive cable (viewing chassis from front) then loop the remaining end around pulley in a counterclockwise direction. Secure both ends of cable to chassis at edge of pulley slot with scotch tape, keeping piece of sleeving on remaining loop of cable.

Replace dial assembly and loop cable over pulley "A". While holding cable taut remove scotch tape and loop cable over pulley "B".

Turn the tuning control shaft until the condenser gang is completely meshed and slide the dial pointer on its track until it is in line with the last calibration mark at the low frequency end of the dial. The short piece of sleeving installed prior to the stringing operation should be slid to the rear of the dial pointer and the crimping lug on the pointer pressed over the sleeving. After checking to make certain that the condenser gang is completely meshed and the dial pointer is in the position specified previously, apply a few drops of cement to each end of the sleeving to which the dial pointer is fastened. This completes the operation.

PARTS LIST

REFERENCE NO.	DESCRIPTION	MAGNAVOX PART NO.
1	Coil assembly, r-f.....	360280G1
2	Coil assembly, oscillator.....	360281G1
3	Transformer, first i-f.....	363700G2
4	Transformer, second i-f.....	363700G3
5	Transformer, power.....	300036G1
6	Capacitor, variable, three-gang tuning.....	260097G1
7	Capacitor, trimmer.....	250046G1
8	Capacitor, trimmer.....	250046G1
9	Capacitor, ceramic dielectric, 8 mmf. (CR 209A Only).....	250164G1
	Capacitor, ceramic dielectric, 33 mmf. (CR 209B, C Only).....	250164G4
10	Capacitor, ceramic, 32 mmf. ± 5%.....	250088G42
11	Capacitor, mica, 150 mmf. ± 10%.....	250159G84
12	Capacitor, mica, 220 mmf.....	250159G100
13	Capacitor, mica, 220 mmf.....	250159G100
14	Capacitor, mica, 330 mmf. ± 10%.....	250159G88
15	Capacitor, silver mica, 518 mmf. ± 1%.....	250085G35
16	Capacitor, mica, 1800 mmf. ± 10%.....	250160G67
17	Capacitor, paper, .002 mfd. 600 V. (CR 209A Only).....	250152G44
	Capacitor, paper, .0015 mfd. 600 V. ± 10% (CR 209B, C Only).....	250169G1
18	Capacitor, paper, .005 mfd. 600 V.....	250152G41
19	Capacitor, paper, .015 mfd. 200 V. ± 10%.....	250152G70
20	Capacitor, paper, .01 mfd. 200 V.....	250152G18
21	Capacitor, paper, .01 mfd. 400 V. (CR 290A,B, Only).....	250152G27
	Capacitor, paper, .002 mfd. 600 V. ± 10% (CR 209C Only).....	250169G2

THE MAGNAVOX CO.

MODELS CR-209A,
CR-209B, CR-209C,
CR-209D, CR-209E

REFERENCE NO.	DESCRIPTION	MAGNAVOX PART NO.
22	Capacitor, molded paper, .02 mfd. 600 V.....	250129G3
23	Capacitor, molded paper, .02 mfd. 600 V.....	250129G3
24	Capacitor, molded paper, .02 mfd. 600 V.....	250129G3
25	Capacitor, paper, .02 mfd. 200 V.....	250152G17
26	Capacitor, paper, .03 mfd. 400 V.....	250152G25
27	Capacitor, paper, .05 mfd. 200 V.....	250152G15
28	Capacitor, paper, .05 mfd. 200 V.....	250152G15
29	Capacitor, paper, .05 mfd. 200 V.....	250152G15
30	Capacitor, paper, .05 mfd. 200 V.....	250152G15
31	Capacitor, paper, .1 mfd. 400 V.....	250152G22
32	Capacitor, paper, .1 mfd. 400 V.....	250152G22
33	Capacitor, paper, .1 mfd. 400 V.....	250152G22
34	Capacitor, electrolytic, 10 mfd. 450 V., 20 mfd. 25 V.....	270023G6
35	Capacitor, electrolytic, 10 mfd. 450 V., 20 mfd. 25 V.....	270023G6
36	Capacitor, electrolytic, 10-30 mfd. 475 V.....	270023G2
37	Capacitor, electrolytic, 20 mfd. 25 V.....	270027G2
38	Capacitor-resistor filter.....	250170G1
45	Resistor, composition, 220 ohm, 2 W. ± 10%.....	230064G54
46	Resistor, composition, 1500 ohm, 1/2 W.....	230084G14
47	Resistor, composition, 3300 ohm, 1/2 W.....	230084G16
48	Resistor, composition, 3300 ohm, 1/2 W.....	230084G16
49	Resistor, composition, 4700 ohm, 1/2 W.....	230084G17
50	Resistor, composition, 4700 ohm, 1/2 W.....	230084G17
51	Resistor, composition, 10K ohm, 1/2 W.....	230084G19
52	Resistor, composition, 10K ohm, 1 W.....	230085G19
53	Resistor, composition, 10K ohm, 3 W.....	240035G2
54	Resistor, composition, 15K ohms, 1/2 W. ± 5%.....	230084G187
55	Resistor, composition, 15K ohm, 2 W.....	230086G20
56	Resistor, composition, 22K ohm, 1/2 W.....	230084G21
57	Resistor, composition, 22K ohm, 1/2 W.....	230084G21
58	Resistor, composition, 33K ohm, 1/2 W.....	230084G22
59	Resistor, composition, 47K ohm, 1/2 W.....	230084G23
60	Resistor, composition, 82K ohm, 1/2 W. ± 10%.....	230084G85
61	Resistor, composition, 100K ohm, 1/2 W.....	230084G25
62	Resistor, composition, 100K ohm, 1/2 W.....	230084G25
63	Resistor, composition, 150K ohm, 1/2 W.....	230084G26
64	Resistor, composition, 150K ohm, 1/2 W.....	230084G26
65	Resistor, composition, 220K ohm, 1/2 W. ± 5%.....	230084G215
66	Resistor, composition, 270K ohm, 1/2 W. ± 10%.....	230084G91
67	Resistor, composition, 1 megohm, 1/2 W. ± 10%.....	230084G98
68	Resistor, composition, 1 megohm, 1/2 W.....	230084G31
69	Resistor, composition, 1 megohm, 1/2 W.....	230084G31
70	Resistor, composition, 1.5 megohm, 1/2 W.....	230084G32
71	Resistor, composition, 2.2 megohm, 1/2 W.....	230084G33
72	Resistor, composition, 3.9 megohm, 1/2 W. ± 10%.....	230084G105
73	Resistor, composition, 4.7 megohm, 1/2 W. ± 10%.....	230084G106
80	Control, volume.....	220074G1
81	Control, bass.....	220073G5
82	Control, treble.....	220072G8
83	Switch, selector.....	160175G1
84	Socket, fm input.....	180060G1
85	Socket, phonograph input.....	189741G1
86	Socket, phonograph motor.....	180501G5
87	Socket, speaker.....	180504G16
88	Socket, AC.....	180428G1
89	Antenna loop assembly.....	360336G1
	Dial glass.....	150292G2

THE MAGNAVOX CO.

MODELS CR-209A,
CR-209B, CR-209C,
CR-209D, CR-209E

SUPPLEMENT TO PARTS LIST

REFERENCE NO.	CR 209A	MAGNAVOX PART NO.
9	Capacitor, Ceramic Dielectric, 8 mmf.	250164G1
11	Capacitor, Mica, 150 mmf., $\pm 10\%$	250159G84
17	Capacitor, Paper, .002 mfd., 600 V.	250152G44
21	Capacitor, Paper, .01 mfd., 400 V.	250152G27
58	Resistor, Composition, 33K ohms, $\frac{1}{2}$ W.	230084G22
70	Resistor, Composition, 1.5 megohm, $\frac{1}{2}$ W.	230084G32
72	Resistor, Composition, 3.9 megohm, $\frac{1}{2}$ W., $\pm 10\%$	230084G105
73	Resistor, Composition, 4.7 megohm, $\frac{1}{2}$ W., $\pm 10\%$	230084G106
74	Omitted	
CR 209B		
9	Capacitor, Ceramic, Dielectric, 33 mmf.	250164G4
17	Capacitor, Paper, .0015 mfd., 600 V., $\pm 10\%$	250169G1
CR 209C		
9	Capacitor, Ceramic Dielectric, 33 mmf.	250164G4
21	Capacitor, Paper, .002 mfd., 600 V., $\pm 10\%$	250169G2
CR 209D		
9	Capacitor, Mica, 100 mmf., $\pm 10\%$	250159G82
11	Capacitor, Mica, 470 mmf., $\pm 10\%$	250159G90
17	Capacitor, Paper, .0015 mfd., 600 V., $\pm 10\%$	250169G1
58	Omitted	
70	Omitted	
72	Resistor, Composition, 820K ohms, $\frac{1}{2}$ W., $\pm 10\%$	230084G97
73	Resistor, Composition, 1 megohm, $\frac{1}{2}$ W., $\pm 10\%$	230084G98
74	Resistor, Composition, 30K ohms, $\frac{1}{2}$ W., $\pm 10\%$	230084G92
CR 209E		
9	Capacitor, Mica, 100 mmf., $\pm 10\%$	250159G82
11	Capacitor, Mica, 470 mmf., $\pm 10\%$	250159G90
17	Capacitor, Paper, .0015 mfd., 600 V., $\pm 10\%$	250169G1
21	Capacitor, Paper, .002 mfd., 600 V., $\pm 10\%$	250169G2
58	Omitted	
70	Omitted	
72	Resistor, Composition, 820K ohms, $\frac{1}{2}$ W., $\pm 10\%$	230084G97
73	Resistor, Composition, 1 megohm, $\frac{1}{2}$ W., $\pm 10\%$	230084G98
74	Resistor, Composition, 470K ohms, $\frac{1}{2}$ W., $\pm 10\%$	230084G94

MODELS CR-210A,
CR-210B, CR-210C

THE MAGNAVOX CO.

ALIGNMENT PROCEDURE

The alignment of this receiver requires the use of an accurately calibrated r-f signal generator and an output meter. All trimmer condenser locations are shown on the chassis layout diagram, Figure 3. The radio volume control should be turned to maximum and the signal generator output kept as low as possible during alignment to prevent the AVC from operating and giving false readings.

All alignment adjustments except antenna trimmer adjustment can be made with the loop antenna leads disconnected. When checking overall operation with the signal generator, the generator can be connected across the loop antenna terminals on the rear of the chassis. It is not necessary to remove the loop antenna from the cabinet for alignment of this receiver.

I-F ALIGNMENT

1. Connect the output of the signal generator to the control grid (pin No. 8) of the 6SA7 tube through a .00025 mfd. capacitor. The ground on the signal generator should be connected to the radio chassis ground.
2. Turn the condenser gang until it is completely meshed, (low-frequency end of dial calibration) and set the input selector switch to RAD.
3. Adjust the signal generator to EXACTLY 455 kc. and peak the second i-f transformer and the first i-f transformer trimmers in that order.

BROADCAST BAND ALIGNMENT

1. Remove the signal generator lead from the 6SA7 grid and connect it across H and L on terminal strip on the rear of the chassis. The high side of the signal generator should be connected to H and the signal generator ground to L.
2. Check the tuning dial pointer adjustment. When the plates of the tuning condenser are completely meshed, the dial pointer must be in line with the last calibration mark at the low frequency end of the dial. If it is not, slide the pointer on its string to the correct position. Be sure to crimp the lugs (on the rear of the pointer) tightly around the string to hold the pointer in adjustment.

3. Set the signal generator and the radio receiver to 1400 kc., adjust the 1400 kc. oscillator trimmer and the 1400 kc. r-f trimmer for maximum output.
4. Set the signal generator and radio receiver to 600 kc. Adjust the oscillator and r-f coil slugs for maximum output. If considerable adjustment was necessary re-check the 1400 kc. trimmer settings.
5. Replace chassis in cabinet and connect loop antenna leads to proper terminals on the rear of the chassis.
6. Form three turns of wire into a loop, connect this loop to the signal generator and loosely couple it to the receiver loop antenna.
7. With the signal generator and dial at 1400 kc., adjust the loop antenna trimmer for maximum output.

SPECIAL SERVICE INFORMATION

The following information is provided for the service man who has a vacuum tube voltmeter or a similar measuring instrument available.

STAGE GAINS*

R-F Grid to Converter Grid at:	
600 kc.....	10
R-F on Converter to I-F Grid at:	
600 kc.....	53
I-F on Converter Grid to I-F Grid at:	
455 kc. (gang closed).....	61
I-F Grid to Detector Plate at:	
455 kc.....	46

OSCILLATOR OUTPUT VOLTAGE

The DC voltage developed across the Oscillator Grid Resistor at:

600 kc.....	8.3 V.
or 0.38 ma. through 22,000 ohm Oscillator Grid Resistor (46).	

AUDIO GAIN

Voltage required across the Volume Control to produce 0.5 watt speaker output** at 400 cycles is .062 volt with Input Selector Switch in RAD setting.

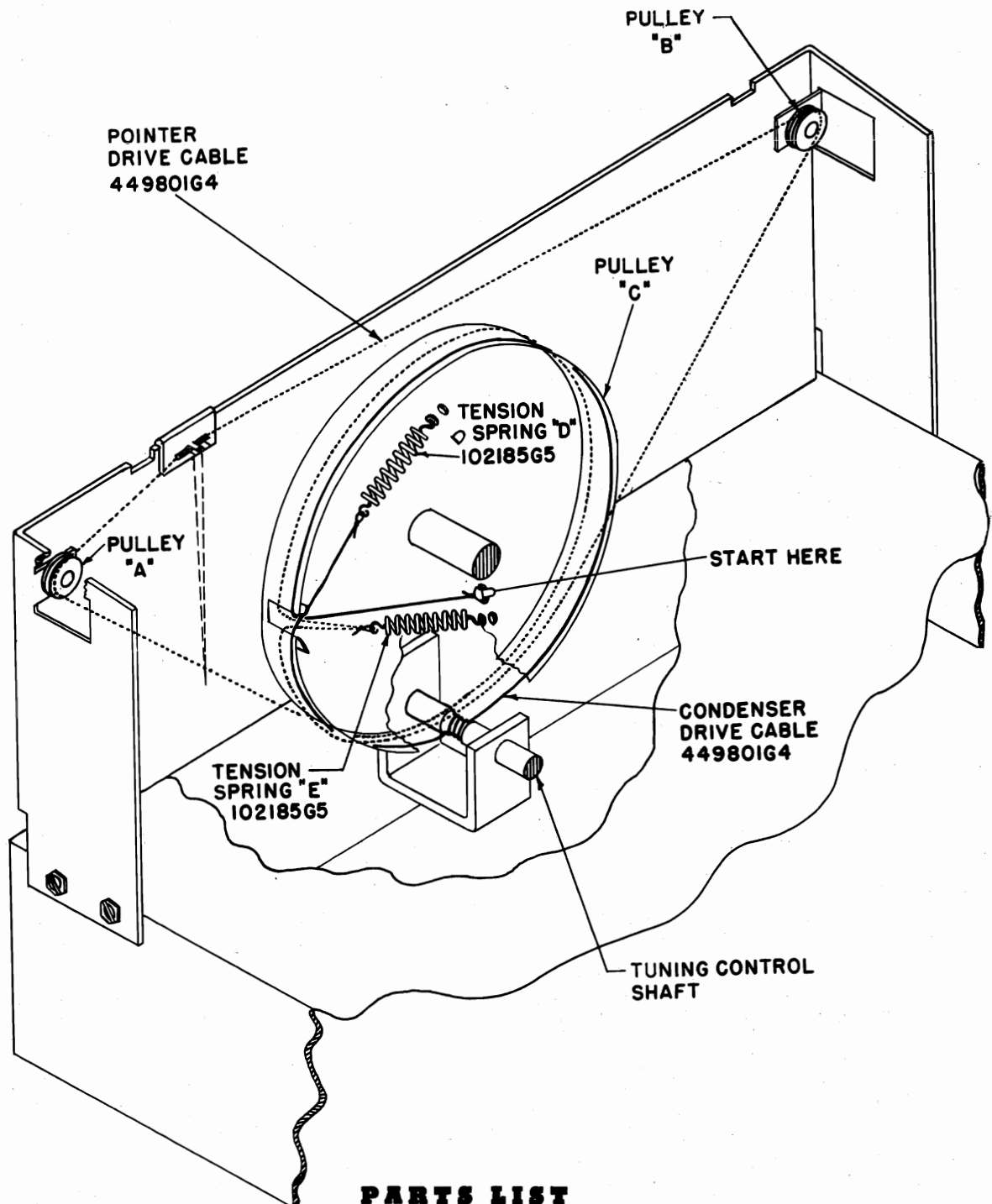
*Variations of $\pm 20\%$ are permissible. All readings made with sufficient input signal to provide 0.5 watt speaker output.

**0.5 watt speaker output at 400 cycles is equivalent to a reading of 1.22 volts as measured by a high resistance AC voltmeter across the voice coil of speaker.

SPECIFICATIONS

Power supply.....	117 volts 50/60 cycles AC
Power consumption.....	70 watts
Power output.....	6 watts
Intermediate frequency.....	455 kc.
Tuning frequency range.....	540-1620 kc.
Speaker:	
Field coil resistance.....	1500 ohms
Voice coil impedance (400 cycles).....	3.0 ohms
Output transformer.....	6,500/3 ohms

THE MAGNAVOX CO.

MODELS CR-210A,
CR-210B, CR-210C**PARTS LIST**

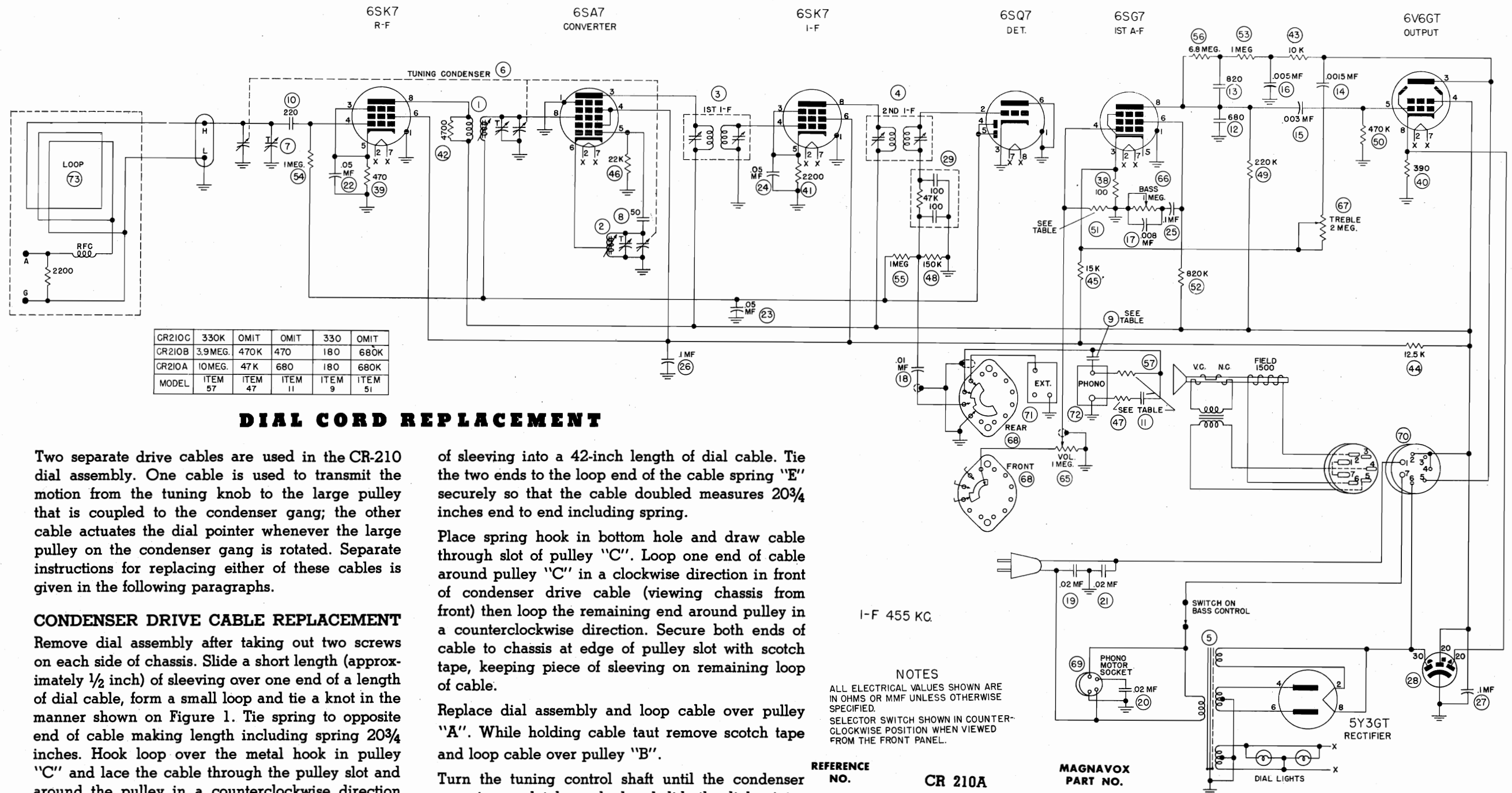
REFERENCE NO.	DESCRIPTION	MAGNAVOX PART NO.
1	Coil, r-f.....	360329G1
2	Coil, oscillator.....	360335G1
3	Transformer, first i-f.....	363700G4
4	Transformer, second i-f.....	363700G5
5	Transformer, power.....	300044G1
6	Capacitor, variable, three-gang tuning.....	260099G1
7	Capacitor, trimmer.....	250046G2
8	Capacitor, ceramic, 50 mmf. $\pm 10\%$	250088G39
9	Capacitor, mica, 180 mmf. $\pm 10\%$	250159G85
10	Capacitor, mica, 220 mmf.	250159G100

MODELS CR-210A,
CR-210B, CR-210C

THE MAGNAVOX CO.

REFERENCE NO.	DESCRIPTION	MAGNAVOX PART NO.
11	Capacitor, mica, 680 mmf. (CR 210A Only)	250159G136
	Capacitor, mica, 470 mmf. (CR 210B Only)	250159G102
12	Capacitor, mica, 680 mmf.	250159G136
13	Capacitor, mica, 820 mmf. $\pm 10\%$	250159G132
14	Capacitor, paper, .0015 mfd. $\pm 10\%$, 600 V.	250169G1
15	Capacitor, paper, .003 mfd. 600 V.	250152G43
16	Capacitor, paper, .005 mfd. 600 V.	250152G41
17	Capacitor, paper, .008 mfd. 400 V.	250152G28
18	Capacitor, paper, .01 mfd. 200 V.	250152G18
19	Capacitor, paper, .02 mfd. 600 V.	250129G3
20	Capacitor, paper, .02 mfd. 600 V.	250129G3
21	Capacitor, paper, .02 mfd. 600 V.	250129G3
22	Capacitor, paper, .05 mfd. 200 V.	250152G15
23	Capacitor, paper, .05 mfd. 200 V.	250152G15
24	Capacitor, paper, .05 mfd. 200 V.	250152G15
25	Capacitor, paper, .1 mfd. 400 V.	250152G19
26	Capacitor, paper, .1 mfd. 400 V.	250152G19
27	Capacitor, paper, .1 mfd. 400 V.	250152G19
28	Capacitor, electrolytic, 30 mfd. 475 V., 20 mfd. 475 V., 20 mfd. 25 V.	270021G6
29	Capacitor-resistor filter	250170G1
38	Resistor, composition, 100 ohm, $\frac{1}{2}$ W.	230084G7
39	Resistor, composition, 470 ohm, $\frac{1}{2}$ W.	230084G11
40	Resistor, composition, 390 ohm, 1 W.	230085G57
41	Resistor, composition, 2200 ohm, $\frac{1}{2}$ W.	230084G15
42	Resistor, composition, 4700 ohm, $\frac{1}{2}$ W.	230084G17
43	Resistor, composition, 10,000 ohm, 1 W.	230085G19
44	Resistor, composition, 12,500 ohm, 10 W. $\pm 5\%$	240021G14
45	Resistor, composition, 15,000 ohm, 2 W. $\pm 10\%$	230086G76
46	Resistor, composition, 22,000 ohm, $\frac{1}{2}$ W.	230084G21
47	Resistor, composition, 47,000 ohm, $\frac{1}{2}$ W. (CR 210A Only)	230084G23
	Resistor, composition, 470,000 ohm, $\frac{1}{2}$ W. (CR 210B Only)	230084G29
48	Resistor, composition, 150,000 ohm, $\frac{1}{2}$ W.	230084G26
49	Resistor, composition, 220,000 ohm, $\frac{1}{2}$ W.	230084G27
50	Resistor, composition, 470,000 ohm, $\frac{1}{2}$ W.	230084G29
51	Resistor, composition, 680,000 ohm, $\frac{1}{2}$ W.	230084G30
52	Resistor, composition, 820,000 ohm, $\frac{1}{2}$ W. $\pm 10\%$	230084G97
53	Resistor, composition, 1 megohm, $\frac{1}{2}$ W. $\pm 10\%$	230084G98
54	Resistor, composition, 1 megohm, $\frac{1}{2}$ W.	230084G31
55	Resistor, composition, 1 megohm, $\frac{1}{2}$ W.	230084G31
56	Resistor, composition, 6.8 megohm, $\frac{1}{2}$ W.	230084G36
57	Resistor, composition, 10 megohm, $\frac{1}{2}$ W. (CR 210A Only)	230084G37
	Resistor, composition, 3.9 megohm, $\pm 10\%$, $\frac{1}{2}$ W. (CR 210B Only)	230084G105
65	Control, volume, 1 megohm	220072G15
66	Control, bass, with AC switch, 1 megohm	220073G12
67	Control, treble, 2 megohm	220072G16
68	Switch, selector	160191G1
69	Socket, phono motor	180501G5
70	Socket, speaker	180504G16
71	Socket, FM	180060G1
72	Socket, phono input	189741G1
73	Antenna loop assembly	*
	Dial glass	150317G1

*The part number of the loop antenna assembly changes with different cabinets. It is therefore important that you specify the STYLE NUMBER of the instrument when ordering a replacement loop antenna assembly.



DIAL CORD REPLACEMENT

Two separate drive cables are used in the CR-210 dial assembly. One cable is used to transmit the motion from the tuning knob to the large pulley that is coupled to the condenser gang; the other cable actuates the dial pointer whenever the large pulley on the condenser gang is rotated. Separate instructions for replacing either of these cables is given in the following paragraphs.

CONDENSER DRIVE CABLE REPLACEMENT

Remove dial assembly after taking out two screws on each side of chassis. Slide a short length (approximately 1/2 inch) of sleeving over one end of a length of dial cable, form a small loop and tie a knot in the manner shown on Figure 1. Tie spring to opposite end of cable making length including spring 20 3/4 inches. Hook loop over the metal hook in pulley "C" and lace the cable through the pulley slot and around the pulley in a counterclockwise direction when viewed from the rear of the chassis keeping the cable to the rear of the pulley groove. Lace the cable around the smaller diameter portion of the tuning control shaft wrapping 2 1/2 turns from front to back then around the opposite side of pulley "C" into the pulley through the slot. Hook the end of tension spring "D" in the hole provided in pulley "C"; completing this operation.

DIAL POINTER DRIVE CABLE REPLACEMENT

Remove dial assembly after taking out two screws on each side of chassis. Slip a one-half inch length

of sleeving into a 42-inch length of dial cable. Tie the two ends to the loop end of the cable spring "E" securely so that the cable doubled measures 20 3/4 inches end to end including spring.

Place spring hook in bottom hole and draw cable through slot of pulley "C". Loop one end of cable around pulley "C" in a clockwise direction in front of condenser drive cable (viewing chassis from front) then loop the remaining end around pulley in a counterclockwise direction. Secure both ends of cable to chassis at edge of pulley slot with scotch tape, keeping piece of sleeving on remaining loop of cable.

Replace dial assembly and loop cable over pulley "A". While holding cable taut remove scotch tape and loop cable over pulley "B".

Turn the tuning control shaft until the condenser gang is completely meshed and slide the dial pointer on its track until it is in line with the last calibration mark at the low frequency end of the dial. The short piece of sleeving installed prior to the stringing operation should be slid to the rear of the dial pointer and the crimping lug on the pointer pressed over the sleeving. After checking to make certain that the condenser gang is completely meshed and the dial pointer is in the position specified previously, apply a few drops of cement to each end of the sleeving to which the dial pointer is fastened. This completes the operation.

NOTES
ALL ELECTRICAL VALUES SHOWN ARE IN OHMS OR MMF UNLESS OTHERWISE SPECIFIED.
SELECTOR SWITCH SHOWN IN COUNTER-CLOCKWISE POSITION WHEN VIEWED FROM THE FRONT PANEL.

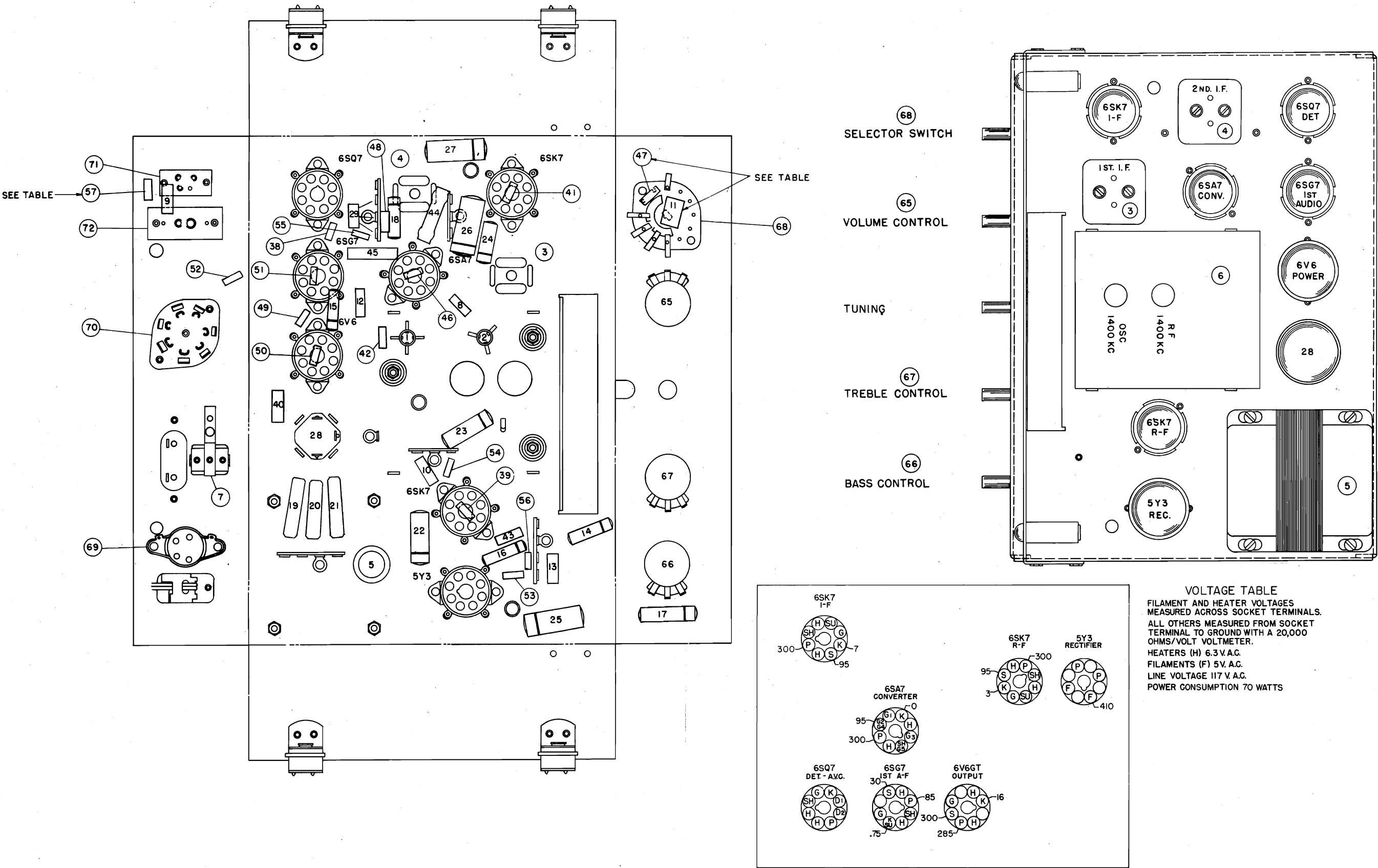
REFERENCE NO.	CR 210A	MAGNAVOX PART NO.
9	Capacitor, Mica, 180 mmf., ±10%	250159G85
11	Capacitor, Mica, 680 mmf.	250159G136
47	Resistor, Composition, 47K ohms, 1/2 W.	230084G23
51	Resistor, Composition, 680K ohms, 1/2 W.	230084G30
57	Resistor, Composition, 10 megohm, 1/2 W.	230084G37

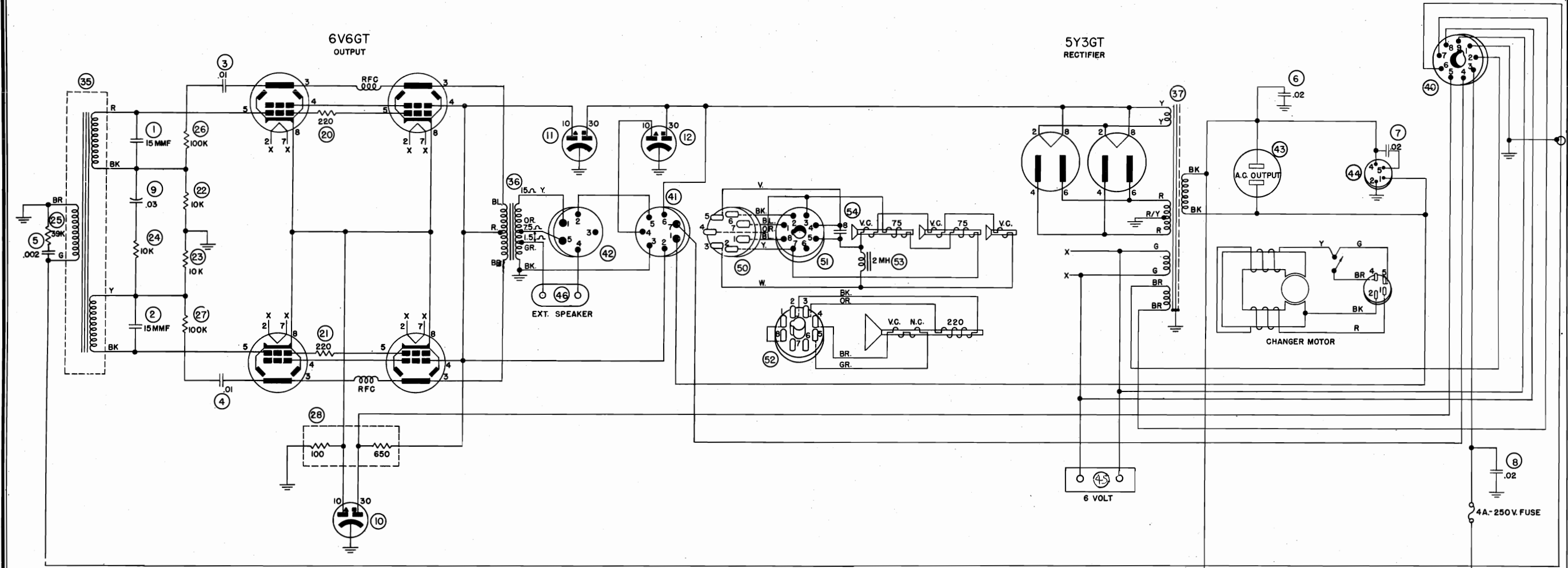
REFERENCE NO.	CR 210B
11	Capacitor, Mica, 470 mmf.
47	Resistor, Composition, 470K ohms, 1/2 W.
57	Resistor, Composition, 39 megohm, ±10%, 1/2 W.

REFERENCE NO.	CR 210C
9	Capacitor, Mica, 330 mmf., ±10%
11	Omitted
38	Resistor, Composition, 100 ohms, 1/2 W., ±5%
47	Omitted
51	Omitted
57	Resistor, Composition, 330K ohms, 1/2 W., ±10%

MODELS CR-210A,
CR-210B, CR-210C

THE MAGNAVOX CO.





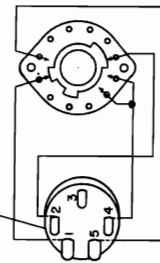
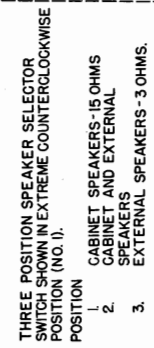
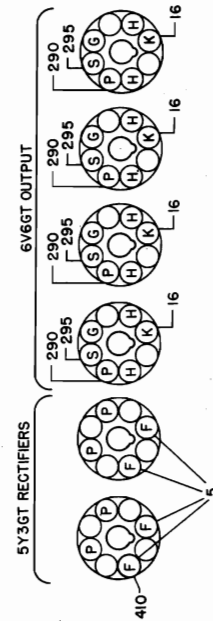
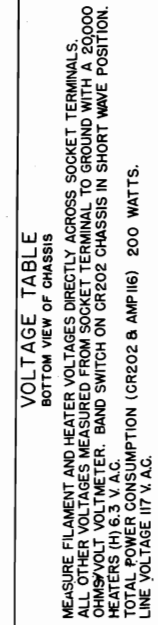
REFERENCE NO	DESCRIPTION	MAGNAVOX PART NO.
1	Capacitor, molded mica, 15 mmf, 500 V	250159G93
2	Capacitor, molded mica, 15 mmf, 500 V	250159G93
3	Capacitor, paper, .01 mfd, 600 V	250129G2
4	Capacitor, paper, .01 mfd, 600 V	250129G2
5	Capacitor, paper, .002 mfd, $\pm 10\%$, 600 V	250169G2
6	Capacitor, paper, .02 mfd, 600 V	250129G3
7	Capacitor, paper, .02 mfd, 600 V	250129G3
8	Capacitor, paper, .02 mfd, 600 V	250129G3
9	Capacitor, tubular, .03 mfd, 400 V	250152G25
10	Capacitor, electrolytic, 30-10 mfd, 475 V	270023G2
11	Capacitor, electrolytic, 30-10 mfd, 475 V	270023G2
12	Capacitor, electrolytic, 30-10 mfd, 475 V	270023G2
20	Resistor, composition, 220 ohm, $\frac{1}{2}$ W	230084G9
21	Resistor, composition, 220 ohm, $\frac{1}{2}$ W	230084G9
22	Resistor, composition, 10,000 ohm, $\frac{1}{2}$ W	230084G19
23	Resistor, composition, 10,000 ohm, $\frac{1}{2}$ W	230084G19
24	Resistor, composition, 10,000 ohm, $\pm 10\%$, $\frac{1}{2}$ W	230084G74
25	Resistor, composition, 39,000 ohm, $\pm 10\%$, $\frac{1}{2}$ W	230084G81
26	Resistor, composition, 100,000 ohm, 1 W	230085G25
27	Resistor, composition, 100,000 ohm, 1 W	230085G25
28	Resistor, wire wound, 100-650 ohm, 7 W	240040G1
35	Transformer, input	320021G2

36	Transformer, output	330030G1
37	Transformer, power	300037G1
40	Cable & Plug assembly	460634G1
41	Socket, speaker connection	180504G16
42	Socket, speaker switch	180504G6
43	Socket, AC power connection	180428G1
44	Socket, phonograph motor connection	180501G5
45	Socket, 6 volt outlet	189788G2
46	Terminal Board-external speaker connection	209601G2
50	Plug, speaker	180503G4
51	Socket, tweeter	180403G2
52	Plug, bass speaker	180503G5
53	Choke Assembly	350042G2
54	Capacitor, paper, 8 mfd, 100 V	250167G1

SPECIFICATIONS

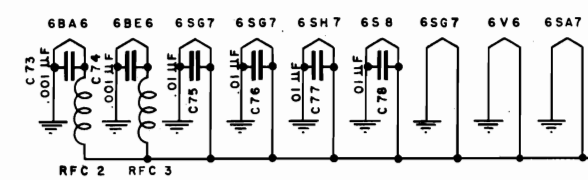
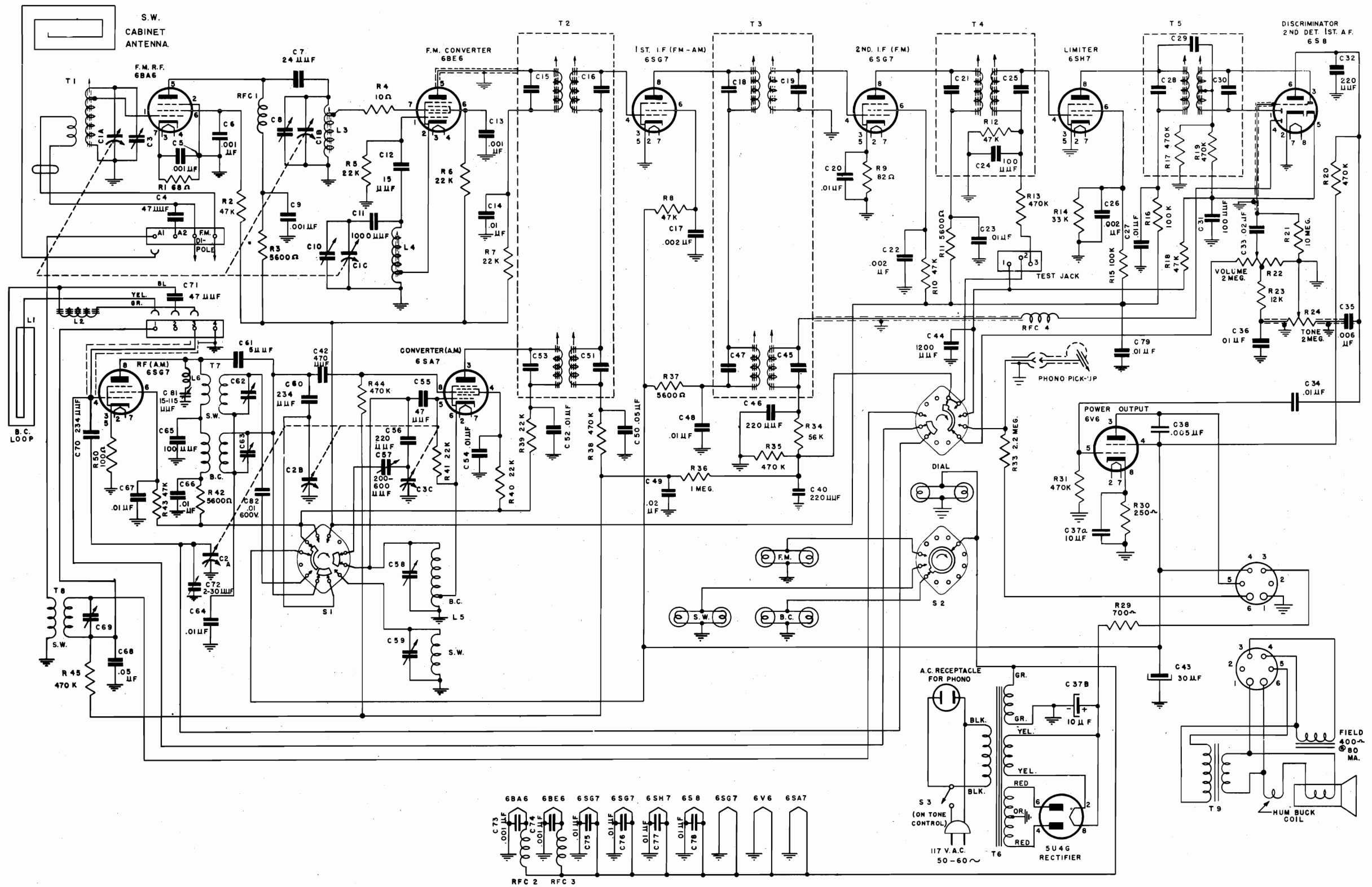
Power supply	117 volts 50/60 cycles AC
Power consumption	*200 watts
Power output	45 watts
Output impedance	15/7.5/1.5 ohms
Tubes:	
Power output (push-pull parallel stage)	(4) 6L6G
Rectifiers	(2) 5U4G

Speakers:	No. 583113 (Bass)	No. 580005 (Tweeter)	(2) No. 583112 (Tweeter)
Field coil resistance	225 ohms	PM	75 ohms
Voice coil resistance	12 ohms	3.2 ohms	± 3.2 ohms
*Power consumption is for amplifier and CR-213 radio chassis. †Voice coil resistance of one speaker.			



MAJESTIC RADIO & TELEV. CORP.

MODELS 10B27E,
10FM782



ALIGNMENT

OPERATION	CONNECT OSCILLATOR TO	DUMMY ANTENNA	INPUT SIGNAL FREQUENCY	BAND	SET DIAL AT	TRIMMERS	PURPOSE
1	Conv. Grid	.01mfd	455 KC	BC	600 KC	T2,T3 Bottom	Align I.F.'s
2	ONE TURN LOOP MADE WITH GENERATOR LEADS		455 KC	BC	600KCC	C81	I.F. trap adjustment for minimum I.F. signal
3			1500 KC	BC	1500 KC	C58	Set BC osc. to scale at 1500 KC
4			1500 KC	BC	1500 KC	C63,C72	Align BC RF. and Loop
5			600 KC	BC	600 KC	C57	Rock Gang to track BC padder
6	Al-Grid.	400ohn	15 MC	SW	15 MC	C59	Scale osc. at 15 MC
7	Al-Grid.	400ohn	15 MC	SW	15 MC	C62,C69	Align SW RF and Ant.
8	6SG7 2nd I.F. Grid	.01mfd.	10.7 MC	FM	88 MC	T4 top	Align for max. voltage at test jack pin 3 Rock gen. over 10.7 MC to check for symmetrical I.F. response.
9	6SG7 1st. I.F. Grid	.01mfd.	10.7 MC	FM	88 MC	T3 top	Align for max. voltage at test jack pin 3 Rock gen. over 10.7 MC to check for symmetrical I.F. response.
10	Converter	.01mfd.	10.7 MC	FM	88 MC	T2 top	Align for max. voltage at text jack pin 3 Rock gen. over 10.7 MC to check for symmetrical I.F. response. Re-check peaking of T4, and T3.
11	Converter grid 6BE6	.01mfd.	10.7 MC	FM	88 MC	T5 primary	Align for max. voltage across discriminator load (un-used Lug bottom of T5 to ground)
12	Converter grid 6BE6	.01mfd.	10.7 MC	FM	88 MC	T5 secondary	Align for zero voltage across full discriminator load (Test jack pin 1 to ground)
13	FM ant. term.	direct	108 MC	FM	108 MC	C10	Scale OSC at 108 MC (max. voltage Test jack pin 3.
14	FM ant. term.	direct	108 MC	FM	108 MC	C8,C3	Align FM RF and Ant. (max. voltage Test jack pin 3.
15	FM ant. term.	direct	88 MC	FM	88 MC	L4	Scale osc. at 88 MC.
16	FM ant. term.	direct	88 MC	FM	88 MC	L3,T1	Align RF and Ant. at 88 MC repeat steps 13, 14, 15, 16 as necessary.

NOTE: 1. A much more satisfactory IF and discriminator alignment may be obtained by using a 10.7 MC signal generator frequency modulated at an audio frequency and swept approximately 600 KC (±300 KC). An oscilloscope should be connected to Test jack pin 3 and all IF screws adjusted for a symmetrical pattern of highest amplitude. See Fig. 1. For discriminator alignment, connect scope to Test jack pin 1 and adjust T5 for highest symmetrical pattern. See Fig. 2.

NOTE: 2. In all FM alignment calling for a voltage measurement at Test jack pin 3 (limiter grid resistor) keep signal generator output to such a value as will result in approximately 2 volts measured with a vacuum Tube voltmeter such as the Voltchmyst, Vomax or equiv.

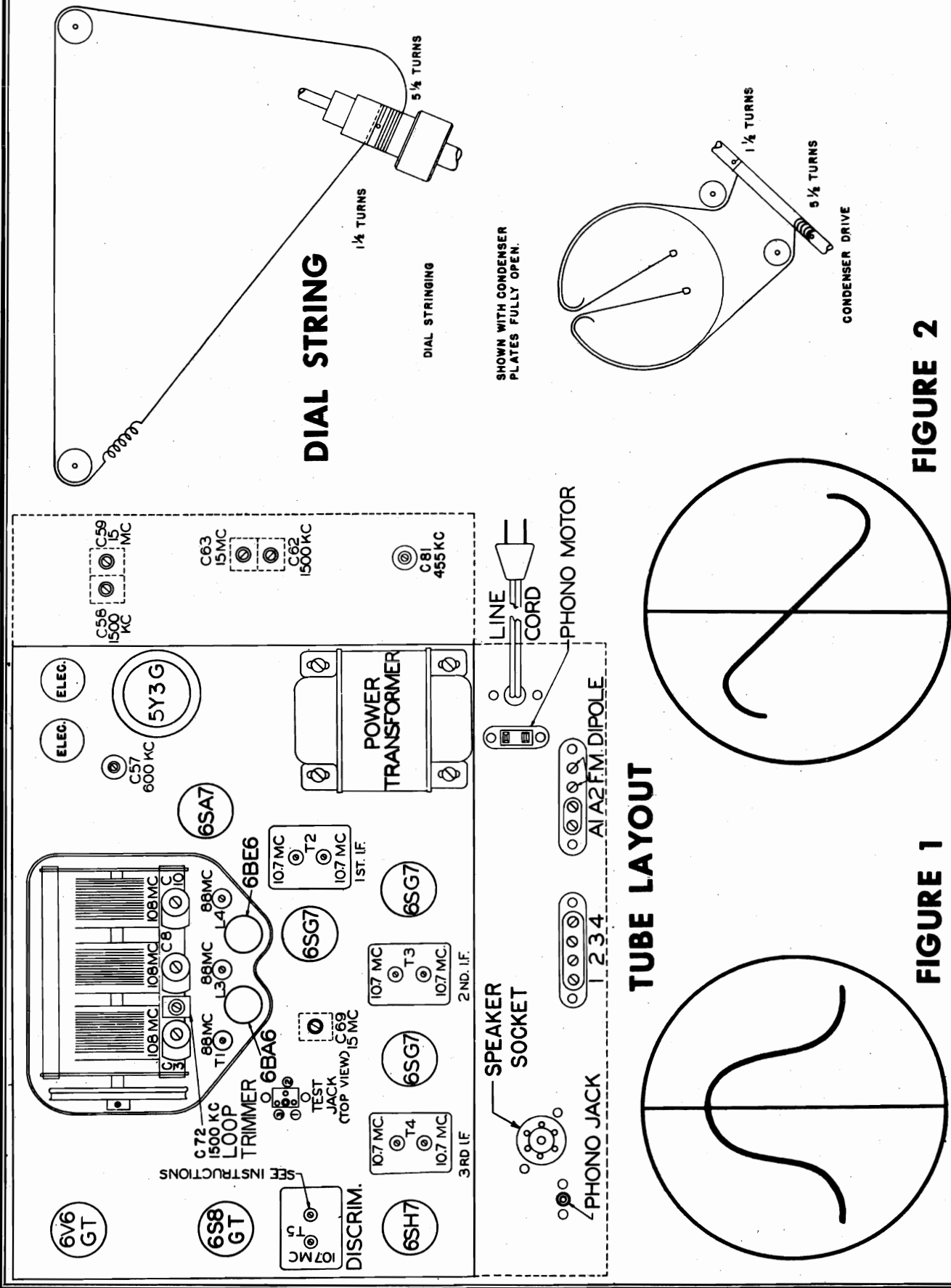


FIGURE 1

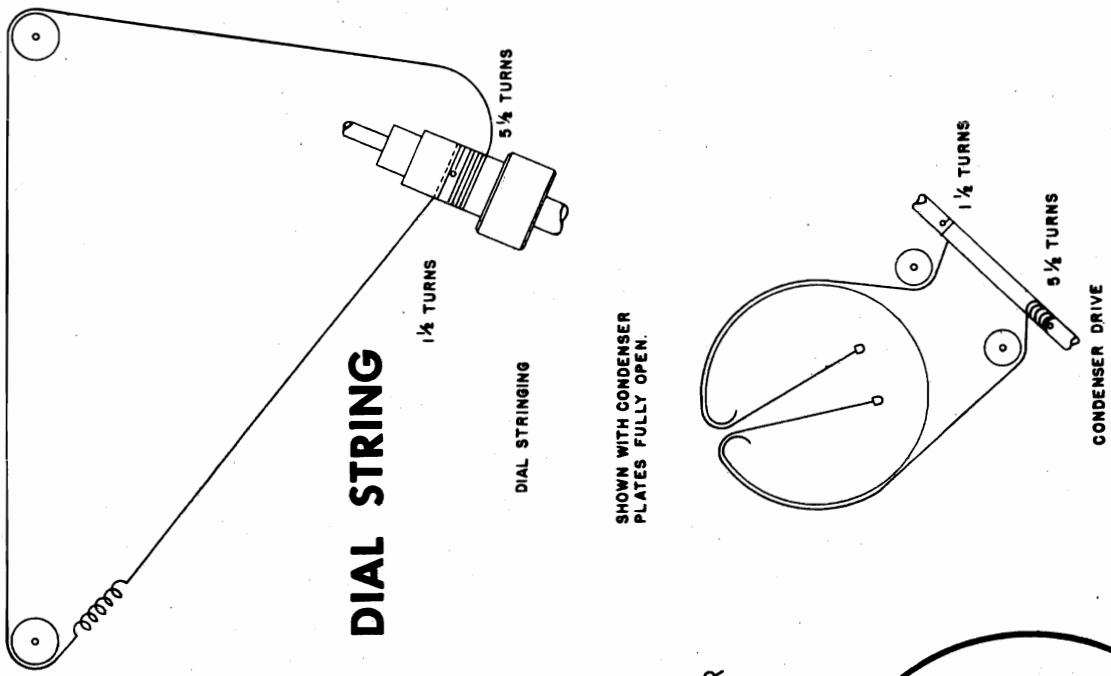


FIGURE 2

MAJESTIC RADIO & TELEV. CORP.

MODELS 10B27E,
10FM782

VOLTAGE CHART

Measurements made at 117 volts line; volume control at minimum; zero signal input. Measurements made to chassis ground with vacuum tube voltmeter.

TUBE	ELEMENT	PIN NO.	VOLTAGE
6BA6 R.F. AMP. (F.M.)	plate	5	175
	screen grid	6	83
	cathode	7	.95
	control grid	1	0
6BE6 CONVERTER (F.M.)	plate	5	180
	screen grid	6	97
	cathode	2	0
	control grid	7	0
	osc. injector grid	1	* 3.2 to 3.5
6SG7 R.F. AMP. (A.M.)	plate	8	240
	screen grid	6	195
	cathode	5 & 3	.7
	control grid	4	-.7
6SA7 CONVERTER (A.M.)	plate	3	215
	screen grid	4	90
	cathode	6	0
	control grid	8	-1.0
	osc. injector grid	5	* -13 to +3.6
6SG7 1st I.F. AMP.	plate	8	215
	screen grid	6	130
	cathode	5 & 3	0
	control grid	4	-1.3
6SG7 2nd I.F. AMP.	plate	8	190
	screen grid	6	105
	cathode	5 & 3	1.2
	control grid	4	0
6SH7 LIMITER	plate	8	27
	screen grid	6	40
	cathode	5 & 3	0
	control grid	4	0
6S8 DISC. *-AM DET. 1st I.F. AMP.	plate	6	84
	cathode	2	0
	control grid	top cap	-0.8
5Y3/5U4	plate	4	350-A.C.
	plate	6	350-A.C.
	filament	8/2	325-350 D.C.
6V6 POWER OUTPUT	plate	3	230
	screen grid	4	270
	cathode	8	13
	control grid	5	0

* The Following chart is reference oscillator grid;
Oscillator voltage varies with frequency.

Band sw.	Tube	Frequency	Voltage
A.M.	6SA7	600 KC	-11
		1000 KC	-12.5
		1500 KC	-13
S.W.	6SA7	10 MC	4.2
		15 MC	3.6
F.M.	6BE6	88 MC	3.2
		103 MC	3.4
		108 MC	3.5

PARTS LIST

ITEM NO.	PART NO.	DESCRIPTION
C1a, b, c.	7-17	Ganged Tuning Condenser A.M. & F.M.
C2a, b, C3c.	8-38	Trimmer 3-13 mmf (Gang trimmers).
C3, C8, C10.	6-159	47 mmf., 500 V ceramic 20% Condenser.
C4, C55, C71	6-230	.001 mfd 400 V ceramic 10% Condenser.
C5, C6, C9, C13, C73, C74.	6-143	24 mmf 500 V ceramic 10% Condenser.
C7	021-15	1000 mmf 500 V mica 5% Condenser.
C11	6-199	15 mmf 500 V ceramic 5% Condenser.
C12		
C14, C20, C23, C27, C34,	017-5	.01 mfd 600 V paper Condenser
C36, C48, C52, C54, C64,	.....	Part of T2, 1st I.F. transformer.
C66, C67, C79, C82.	6-231	.002 mfd 400 V ceramic 10% Condenser
C15, C16, C51, C53.	.....	Part of T3, 2nd I.F. transformer.
C17, C22, C26	.....	Part of T4, 3rd I.F. transformer.
C18, C19, C45, C47.	.....	Part of T5, Discriminator transformer.
C21, C24, C25	.....
C28, C29, C30	020-39	100 mmf 500 V mica 20% Condenser.
C31	020-53	220 mmf 500 V mica 20% Condenser.
C32, C40, C46	016-6	.02 mfd 400 V paper Condenser
C33, C49	5-69	.006 mfd 600 V paper Condenser.
C35	19-34	10-10 mfd 450 V electrolytic Condenser.
C37a, b	017-4	.005 mfd 600 V paper Condenser.
C38		

MODELS 10B27E,
10FM782

MAJESTIC RADIO & TELEV. CORP.

PARTS LIST--Continued

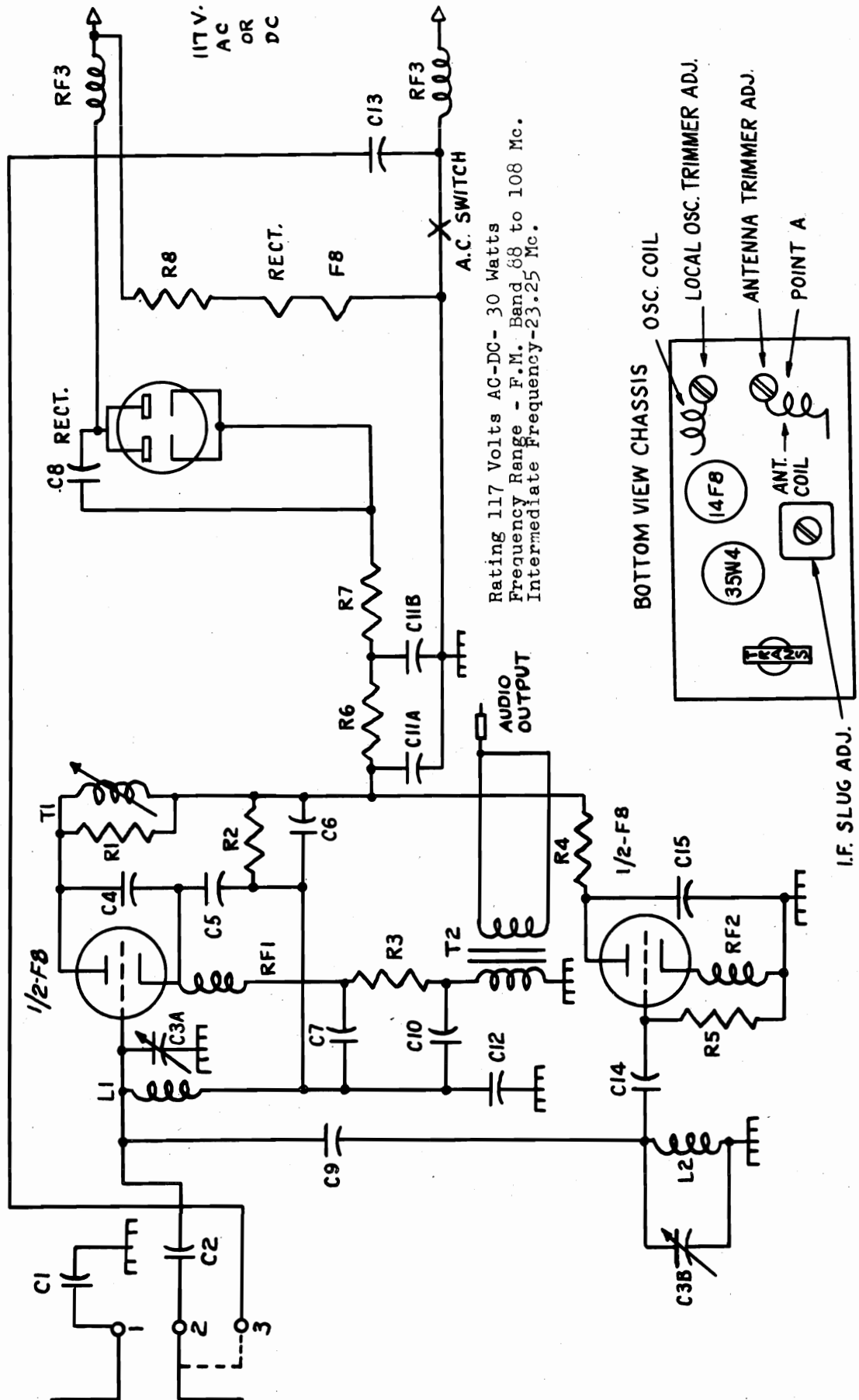
ITEM NO.	PART NO.	DESCRIPTION
C42	020-67	470 mmf 500 V mica 20% Condenser.
C43	19-35	30 mfd 450 V electrolytic Condenser
C44	021-20	1200 mmf 500 V mica Condenser
C50, C68	016-8	.05 mfd 500 V paper Condenser
C56	6-207	220 mmf 500 V ceramic condenser
C57	8-65	200-600 mmf padder condenser.
C58, C59	.....	Part of L5 coil assembly.
C60, C70	6-208	234 mmf 500 V mica condenser.
C61, C62, C63, C65	.....	Part of T7 coil assembly.
C69	.....	Part of T8 coil assembly.
C71	.....	Part of L1 coil assembly (47 mmf.).
C72	8-35	24-30 mmf ceramic trimmer
C75, C76, C77, C78	021-74	.01 mfd 500 V mica 20% condenser.
C81	8-63	15-115 mmf trimmer (wave trap).
L1	20-27	Broadcast loop assembly (less cover #20-28)
L2	.....	Loading coil (part of 20-27 loop)
L3	3-184	F.M. B.F. coil.
L4	3-189	F.M. oscillator coil.
L5	3-171	A.M. oscillator coil.
L6	S-1468	Wave trap coil.
R1	02-37	68 ohms $\frac{1}{2}$ watt 10% resistor
R2	03-157	47,000 ohms 1 watt 20% resistor
R3, R11, R37, R42	03-118	5600 ohms 1 watt 10% resistor
R4	01-2	10 ohms $\frac{1}{2}$ watt 10% resistor
R5, R41	9-222	22,000 ohms $\frac{1}{2}$ watt 20% resistor (01-143).
R6, R40	04-143	22,000 ohms $\frac{1}{2}$ watt 20% resistor
R7, R39	02-143	22,000 ohms $\frac{1}{2}$ watt 20% resistor
R8, R10, R43	02-156	47,000 ohms $\frac{1}{2}$ watt 10% resistor
R9	02-41	82 ohms $\frac{1}{2}$ watt 10% resistor
R12	.....	Part of T4 assembly (47,000 ohms $\frac{1}{2}$ w 10%)
R13, R20, R31, R35, R38,	02-199	470,000 ohms $\frac{1}{2}$ watt 20% resistor.
R44, R45	02-149	33,000 ohms $\frac{1}{2}$ watt 10% resistor
R14	02-170	100,000 ohms $\frac{1}{2}$ watt 10% resistor.
R15, R16	.....	Part of T5 assembly (470,000 ohms $\frac{1}{2}$ w 10%).
R17, R19	02-157	47,000 ohms $\frac{1}{2}$ watt 20% resistor
R18	02-255	10 megohm $\frac{1}{2}$ watt 20% resistor
R21	13-25	Volume control, 2 megohm with tap
R22	02-132	12,000 ohm $\frac{1}{2}$ watt 10% resistor.
R23	14-7	Tone control 2 megohm, with switch.
R24	02-213	1 megohm $\frac{1}{2}$ watt 20% resistor.
R26	** 9-342	700 ohms 10 watts 10% resistor.
R29	9-290	250 ohm 5 watt 10% wire wound resistor.
R30	02-226	2.2 megohm $\frac{1}{2}$ watt 10% resistor.
R33	01-160	56,000 ohm $\frac{1}{2}$ watt 10% resistor.
R34	02-44	100 ohm $\frac{1}{2}$ watt 10% resistor
R50	.....	.....
RFC-1	3-187	6BA6 plate choke.
RFC-2, RFC-3	3-188	Filament choke.
RFC-4	3-104	Diode plate choke
S1	11-58	Band switch (R.F.).
S2	11-59	Band switch (pilot lites & audio).
S3	.....	Part of Tone control assembly, A.C. switch.
T1	3-183	F.M. antenna transformer.
T2	3-173	1st I.F. transformer.
T3	3-174	2nd I.F. transformer.
T4	3-175	3rd I.F. transformer.
T5	3-176	Discriminator transformer
T6	2-9	Power transformer
T7	3-186	B.C.-S.W. R.F. transformer.
T8	3-185	S.W. antenna transformer.
T9	52-58	Output transformer (part of speaker ass'y).
	15-81	Tube socket (octal)
	15-87	Phono pick-up socket.
	15-135	Phone A.C. receptacle socket.
	26-2	Dial lite (#47 brown bead).
	26-7	Dial lite (#44 blue bead).
	16-34	Tube shield, for 6BA6 & 6BE6 tubes.
	S-1570	Dial pointer & carriage assembly.
	135-30-2	Dial pointer, lower carriage only.
	129-56	Dial cord tension spring.
	S-1329	Dial cord, 62 inches long (#134-7).
	S-1328	Dial cord (for condenser gang).
	117-63	Dial scale F.M.
	117-90	Dial scale B.C.
	117-91	Dial scale S.W.
	**22-58	Speaker, 12" complete with output transformer
	115-45-2	Cabinet, combination console.
	122-44	Dial escutcheon grill
	122-20	Escutcheon glass (large).
	21-32	Record changer, Oak
	117-50	Dial masking plate.
	128-85	Knob, (band switch)
	129-46	Spring, insert for above knob
	128-37	Knob, (tone-tuning-volume).
	S-1330 or	.....
	S-1863	R.F. shelf & tuning condenser ass'y

** Speakers marked with a BLUE X have a change of wiring:
ref; speaker plug and chassis socket, pin #2 interchanged with pin #5. Change refers to LATE
RUN SETS ONLY.

** R29 (700 ohm) Resistor is omitted in chassis using speaker #22-58.
Sets using 10" speakers — schematic circuit remains the same.
(TUBES 5Y3GT & 504G ARE INTERCHANGEABLE)

JOHN MECK IND., INC.

MODEL F.M.
Converter



MODEL F.M.
Converter

JOHN MECK IND., INC.

The super-regenerative circuit is inherently self-regulating; that is, it acts as if it had good automatic volume control. This super-regenerative circuit has the added feature of an automatic regeneration control, applied to the quench-oscillator Capacitor C-7 and the Resistor R-3, in the cathode controls the quench wave shape, selectivity, and is the quench pulse width control. While the Resistor R-2 and the Capacitor C-6 in the plate circuit regulate the average grid current regeneration rate and so controls the regeneration automatically.

The Converter contains a built-in antenna system which is internally connected to Terminal #3. To use the built-in antenna, connect together Terminals #2 and #3, with a short length of wire. In locations unfavorable to F.M. Reception, improved results will be obtained by using an inside or outside dipole antenna. This antenna must be carefully installed and connected to Terminals #1 and #2.

ALIGNMENT CHART

Use A.M. or F.M. Signal Generator

Alignment made with output meter a cross voice coil of speaker to which the converter is connected.

CIRCUIT ALIGNED	DIAL POINTER	SIGNAL GENERATOR 30% Modulation Freq. Connection	TRIMMER OR SLUG ADJUST- MENT	PROCEDURE
I.F.	108 Mc.	23.25 Mc. through .01 Capacitor to Point A or Pin #1 or F8 Tube	Bottom slug I.F. Can	Adjust for maximum output.
R.F.	105 Mc.	105 Mc. through 300 ohms to Terminal #1 and Terminal #2	Local Osc. Trimmer	Adjust for maximum output.
R.F.	105 Mc.	105 Mc. through 300 ohms to Terminal #1 and Terminal #2	Antenna Trimmer	Adjust for maximum output while rocking variable condenser

ALIGNMENT OF F.M. STATION:

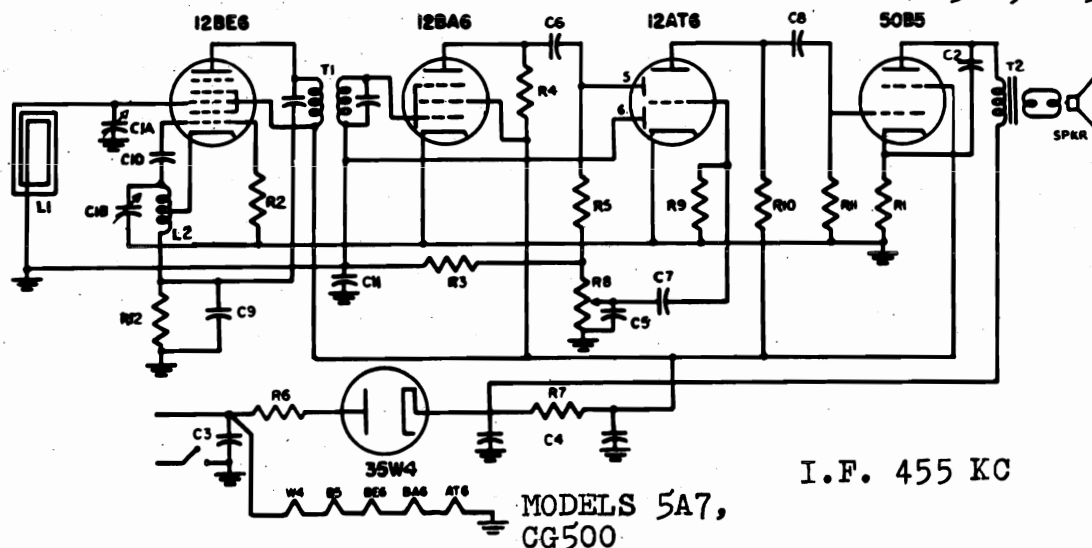
If you do not have the equipment to make the necessary alignments adjustments, the R.F. section may be easily aligned on a local station. With the proper antenna attached, tune in an F.M. station, preferably between 97 and 108 Mc. Note any difference in calibration and correct accordingly with the local oscillator trimmer. Then adjust the antenna trimmer for maximum output while rocking the variable condenser.

INSTRUCTIONSAlignment NotesGENERAL DESCRIPTION:

In addition to functioning as a converter-oscillator in a super-heterodyne circuit, one section comprising of pins 1 - 3 - 4 of the #14F8 double triode, as used in the MECK F.M. Converter, is functioning as super-regenerative detector and I.F. amplifier. Since the super-regenerative amplification is at the intermediate frequency, relatively little energy is radiated from the antenna. Pins 5 - 6 - 8 is the triode section of the #14F8 that is used as a local oscillator for normal superheterodyne action. Detection of the frequency modulation is accomplished by the signal being normally resident on the side of the selectivity curve. This is the reason it is necessary to slightly mistune the received signal for best F.M. reception.

CIRCUIT SYMBOL	PART NUMBER	DESCRIPTION
C1, C12, C13, C15	CC-15501	Condenser, Ceramic, 500 Mmf.
C2, C9	CC-1520	Condenser, Ceramic 2 Mmf.
C3A, C3B	CV-10014	F.M. Variable
C4, C5	CC-15300	Condenser, Ceramic, 30 Mmf.
C6	CP-12502	Condenser, Paper .005 Mf.
C7	CP-12522	Condenser, Paper, .0025 Mf.
C8	CP-12103	Condenser, Paper, .01 Mf.
C10	CL-10011	Condenser Elect. 8 Mfd.
C11A, C11B	CL-10007	Condenser, Elect., 30/50 Mfd.
C14	CC-15200	Condenser, Ceramic, 20 Mmf.
R1	RC-26802	Resistor, Carbon 68,000 ohm 1/3 Watt
R2	RC-21503	Resistor, Carbon, 150,000 ohm, 1/3 Watt
R3	RC-21501	Resistor, Carbon, 1,500 ohm 1/3 Watt
R4	RC-21000	Resistor, Carbon, 100 ohm 1/3 Watt
R5	RC-22202	Resistor, Carbon, 22,000 ohm 1/3 Watt
R6	RC-22001	Resistor, Carbon, 2,000 ohm 1/3 Watt
R7	RC-21001	Resistor, Carbon, 1,000 ohm 1/3 Watt
R8	WP-10003	Line Cord Resistor
L1	TRF-10009	F.M. Antenna Coil
L2	TRC-10010	F.M. Osc. Coil
RF1	TSP-10016	Choke (Inside I.F. Can) & (T1)
RF2	LG-10002	12 Uh. Choke
RF3	LG-10001	Line Cord Inductor
T2	TO-10009	Audio Transformer

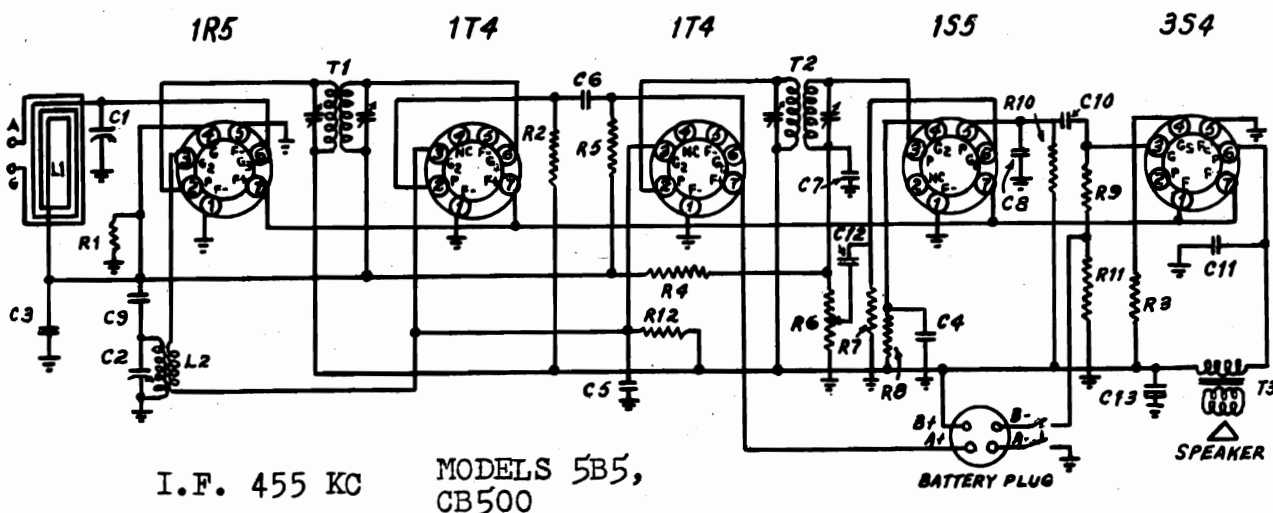
JOHN MECK IND., INC.

MODELS 5A7, 5B5,
CB500, CG500

I.F. 455 KC

MODELS 5A7,
CG500

Part No.	Circuit Symbol	Description	Part No.	Circuit Symbol	Description
CV-10008	C1	Variable condenser for Model 5A7	RCP-30220	R6	Resistor carbon 22 ohm 1/2 watt
CPP-14208	C2	Condenser paper tub .02 mfd-400V	RCP-41001	R7	Resistor carbon 1000 ohm 1 watt
CPP-14508	C3	Condenser paper tub .05 mfd-400V	VCP-10105	R8	Volume control 1 megohm and switch
CLP-10007	C4	Condenser electrolytic 50-30 mfd-150V	VCP-12105	R8	Volume control for Model 5A7- 1 megohm
CHP-15251	C5, C6	Condenser mica 250 mmf-500V	RCP-31005	R9	Resistor carbon 10 megohm 1/2 watt
CPP-12103	C7, C8	Condenser paper tub .01 mfd-200V	RCP-32203	R10	Resistor carbon 220,000 ohm 1/2 watt
CPP-11103	C9	Condenser paper tub .01 mfd-150V	RCP-34703	R11	Resistor carbon 470,000 ohm 1/2 watt
CHP-15500	C10	Condenser mica 50 mmf-500V	ALP-10013	L1	Loop antenna
CPP-12203	C11	Condenser paper .02 mfd-200V	TRCP-10000-D	L2	Oscillator coil
RCP-31500	R1, R12	Resistor carbon 150 ohm 1/2 watt	TSP-10002	T1	I.F. Transformer
RCP-31002	R2	Resistor carbon 10,000 ohm 1/2 watt	TOP-10000	T2	Output transformer
RCP-32204	R3	Resistor carbon 2.2 megohm 1/2 watt	SRP-10005	SPKR	Speaker P.M. 3" round for Model 5A7
RCP-36801	R4	Resistor carbon 6800 ohm 1/2 watt			
RCP-31008	R5	Resistor carbon 100,000 ohm 1/2 watt			



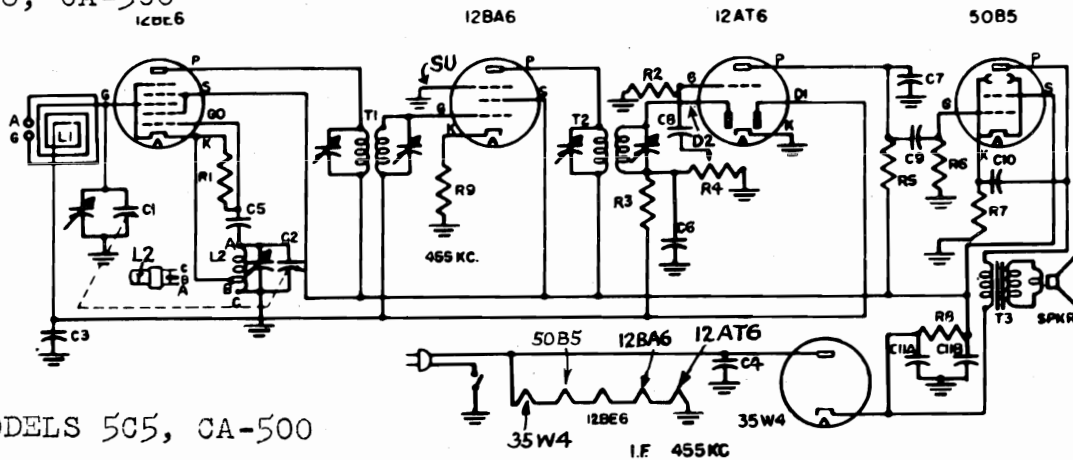
I.F. 455 KC

MODELS 5B5,
CB500

Circuit Symbol	Part Number	Description	Circuit Symbol	Part Number	Description
C1, C2	CV-10002-E	Condenser-Variable with pulley	R9, R9	RC-33884	Resistor-Carbon, 3 Meg ohms 1/2 watt
C3, C4, C5	CP-14503	Condenser-Paper, 0.05 mfd. 400 volt	R10	RC-21004	Resistor-Carbon, 1 Meg ohm 1/2 watt
C6, C7	CM-19251	Condenser-Mica, 250 mmfd. 500 volt	R11	RC-34000	Resistor-Carbon, 400 ohms 1/2 watt
C8, C9	CM-16000	Condenser-Mica, 50 mmfd. 500 volt	R12	RC-21002	Resistor-Carbon, 10,000 ohms 1/2 watt
C10, C11, C12	CP-14103	Condenser-Paper, 0.01 mfd. 400 volt	L1	AL-10004	Antenna-Loop
C13	CL-10006	Condenser-Electr. 12 to 20 mfd. 150 volt	L2	TRE-10001	Coil-Oscillator
R1	RC-01000	Resistor-Carbon, 100,000 ohms 1/2 watt	T1	TS-10000	Transformer-1st I.F.
R2, R3	RC-30004	Resistor-Carbon, 5,000 ohms 1/2 watt	T2	TS-10001	Transformer-2nd I.F.
R4, R5	RC-33884	Resistor-Carbon, 3 Meg ohms 1/2 watt	T3	TS-10002	Transformer-Output
R6	VC-20405	Control-Volume, 1 Meg ohm with d.p.s.t. switch	SPKR	SR-10002	Speaker-P.M. 8" round low output transformer
R7	RC-01005	Resistor-Carbon, 10 Meg ohms 1/2 watt			

JOHN MECK IND., INC.

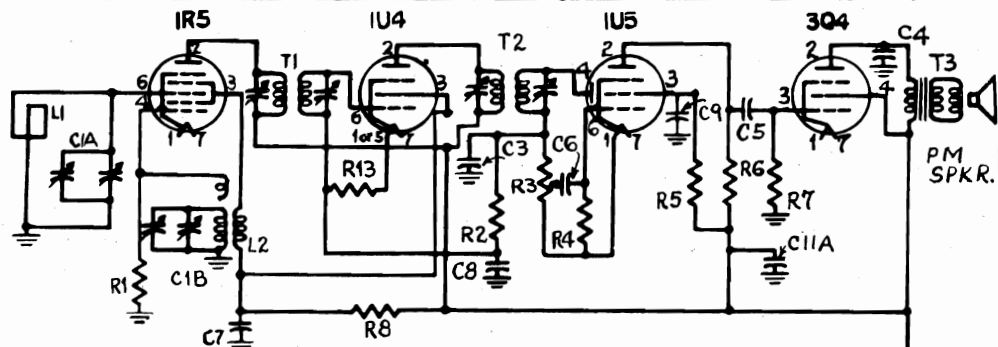
MODELS 505,
5D7-W18, CA-500



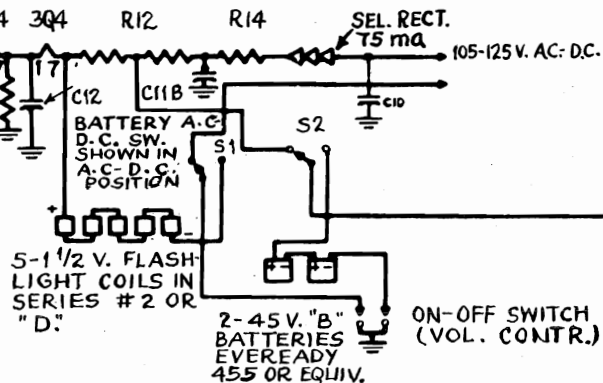
MODELS 505, CA-500

PART NO.	CIRC. SYM.	DESCRIPTION	PART NO.	CIRC. SYM.	DESCRIPTION
CV-10002-E	C1,C2	Condenser - Variable Tuning with Drum	RC-32503	R5	Resistor-Carbon 250,000 Ohms 1/2 watt
CP-14503	C3,C4	Condenser - .05 Mfd. 400 Volt	RC-35003	R6	Resistor-Carbon 500,000 Ohms 1/2 watt
CM-15500	C5	Condenser - .00005 Mfd. Mica	RC-31500	R7	Resistor-Carbon 150 Ohms 1/2 watt
CM-15251	C6,C7	Condenser - .00025 Mfd. Mica	RC-32000	R8	Resistor-Carbon 200 Ohms 1/2 watt
CP-14103	C8,C9	Condenser - .01 Mfd. 400 Volt	RC-31500	R9	Resistor-Carbon 150 Ohms 1/2 watt
CP-14503	C10	Condenser - .05 Mfd. 400 Volt	AL-10004	L1	Loop Antenna
CL-10001	C11A,C11B	Condenser - 20/20 Mfd. 150 Volt Elect.	TRC-10000-D	L2	Coil Oscillator
RC-32002	R1	Resistor-Carbon 20,000 ohms 1/2 watt	TS-10000	T1	Transformer 1st. I.F.
RC-31005	R2	Resistor-Carbon 10 Meg. 1/2 watt	TS-10001	T2	Transformer 2nd. I.F.
RC-32004	R3	Resistor-Carbon 2 Meg. 1/2 watt	TO-10000	T3	Transformer-Output for speaker
VC-10105	R4	Volume Control - 1 Meg. (with switch)	SR-10000	SPKR	Speaker, 4" P.M.

MODEL 5D7-W18



Circuit Sym	Part No.	Description
R1	RC-11003	RESISTOR CARBON 100,000 OHM 1/4 W
R2,7,13	RC-32204	" 2.2 MEG. 1/4 W
R3	VC-21105	VOLUME CONTROL & SWITCH 1 MEG. D.P.S.Y.
R4	RC-11005	RESISTOR CARBON 10 MEG. 1/4 W
R5	RC-13304	" 3.3 MEG. 1/4 W
R6	RC-11004	" 1 MEG. 1/4 W
R8	RC-11002	" 10,000 OHM 1/4 W
R9	RC-14700	" 470 OHM 1/4 W
R12	RX-10004	" V.W. 700-1800 10 W
R14	RC-30220	" CARBON 22 OHM 1/2 W
C1	CV-10008	CONDENSER VARIABLE
C3	CM-15251	" MICA 250 MFP 500 V
C4	CP-14502	" PAPER .005 MP 400 V
C5	CP-12502	" .005 MP 200 V
C7,9	CP-12103	" .01 MP 200 V
C8	CP-12203	" .02 MP 200 V
C10	CP-14503	" .05 MP 400 V
C11	CL-10010	" ELECT. A-90 B-20 150 V
C12	CL-10009	" 100 MP 25 V
L1	AL-10015	LOOP ANTENNA
L2	TRC-10015	OSCILLATOR COIL
S1,2	VS-10005	SWITCH AC-DC BATTERY
T1	TS-10018A	I.F. TRANSFORMER INPUT
T2	TS-10019A	I.F. TRANSFORMER OUTPUT
T3	TO-10007	OUTPUT TRANSFORMER
SPKR.	SR-10000	SPEAKER 4" PM - ROUND
C6	CP-12202	CONDENSER PAPER .002 MP 200 V



105 to 125 VOLTS A.C. (50 to 60 CYCLES) OR D.C.

Power Consumption 15 Watts

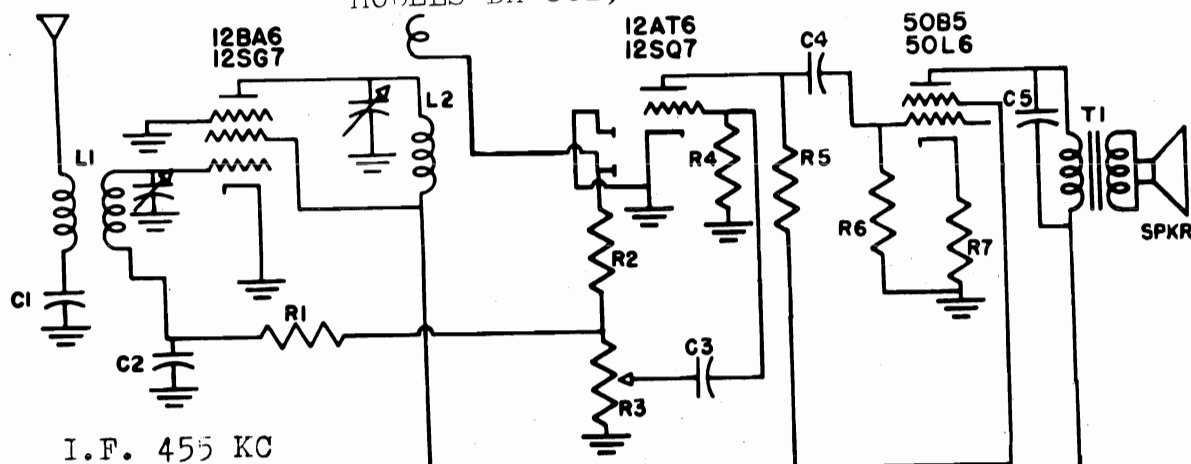
I.F. 455 KC

JOHN MECK IND., INC.

MODELS DA-601, DB-602

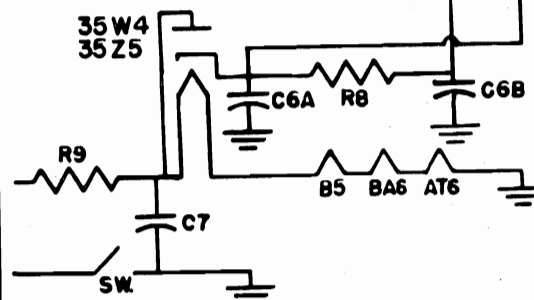
MODELS DA-601, DB-602

MODEL 6B8

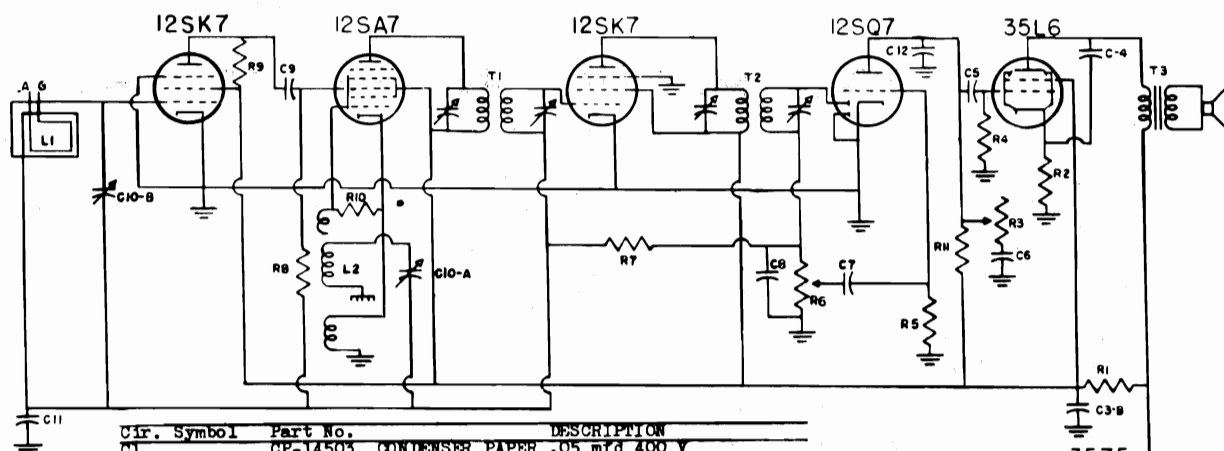


I.F. 455 KC

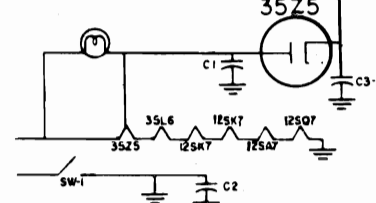
Ckt. Sym.	Part No.	DESCRIPTION
CL3,4,5	CP-12103	Condenser paper tubular .01mfd 200 V.
C2,7	CP-12203	" " .02mfd 200 V.
C6A,C6B	CL-10017	Electrolytic 30/20 MFD
R1	RC-22204	Resistor carbon 2.2 meg ohm 1/3 W.
R2	RC-21003	" " 100,000 ohm 1/3 W.
R3	VC-12106	Volume control STSP 1 meg ohm
R4	RC-21005	Resistor carbon 10 meg ohm 1/3 W.
R5,6	RC-24703	" " 470,000 ohm 1/3 W.
R7	RC-21500	" " 150 ohm 1/3 W.
R8	RC-21001	" " 1000 ohm 1/3 W.
R9	RC-40220	" " 22 ohm 1 W.
L1	TRF10010-B	Antenna Coil
L2	TRF10011-B	Interstage coil 15uuf capacity turn
T1	TO-10000	Output transformer
SPKR.	SR-10005	Round 3" speaker



MODEL 6B8

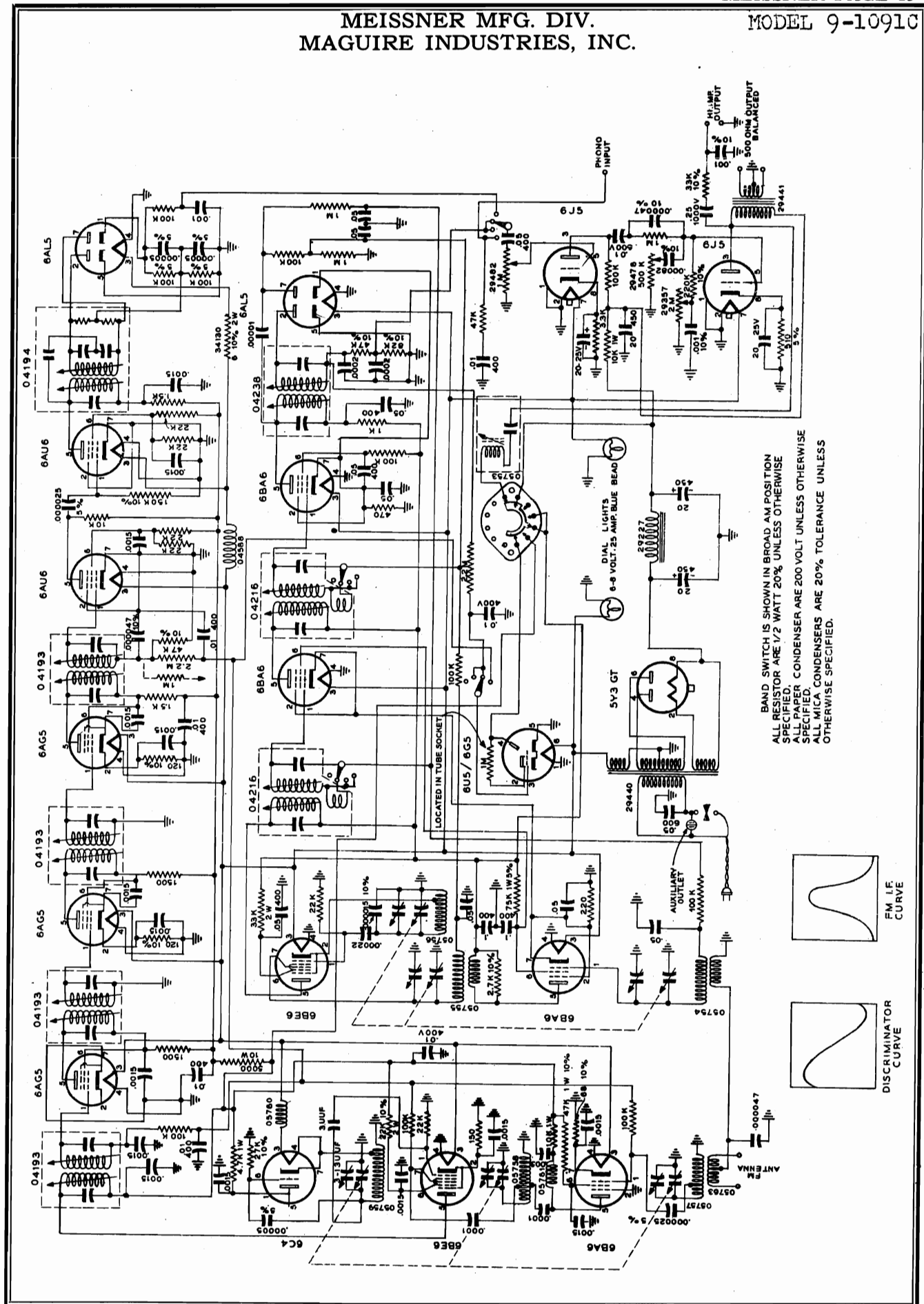


Cir. Symbol	Part No.	DESCRIPTION
C1	CP-14503	CONDENSER PAPER .05 mfd 400 V
C2	CP-14156	" " .15 mfd 400 V
C3	CL-10021	" " ELECTR. A-50 mfd B-30 mfd 150 V
C4	CP-14203	" " PAPER .05 mfd 400 V
C5	CP-12502	" " .005 mfd 200 V
C6	CP-12302	" " .003 mfd 200 V
C7	CP-12202	" " .002 mfd 200 V
C8,C12	CM-15221	" " MICA 220 mmf 500 V
C9	CM-15101	" " " 100 mmf 500 V
C10 A-B	CV-10009	" " VARIABLE
C11	CP-12104	" " PAPER .1 mfd 200 V
L1	AL-10021	ANTENNA LOOP
L2	TRC-10013	OSCILLATOR COIL
R1	RC-51001	RESISTOR CARBON 1000 OHM 2 WATT
R2	RC-31500	" " 150 OHM 1/2 WATT
R3	VC-13105	1 MEG TONE CONTROL
R4	RC-15003	RESISTOR CARBON 500,000 OHM 1/4 WATT
R5	RC-11005	" " 10 MEG OHM 1/4 WATT
R6	VC-11105	1 MEG VOLUME CONTROL WITH SWITCH
R7	RC-12204	RESISTOR CARBON 2.2 MEG OHM 1/4 WATT
R8	RC-11003	" " 100,000 OHM 1/4 WATT
R9	RC-14701	" " 4700 OHM 1/4 WATT
R10	RC-12202	" " 22,000 OHM 1/4 WATT
R11	RC-12203	" " 220,000 OHM 1/4 WATT
T1	TSP-10020	INPUT I.E. TRANSFORMER
T2	TSP-10021	OUTPUT I.E. TRANSFORMER
T3	TO-10011	OUTPUT TRANSFORMER



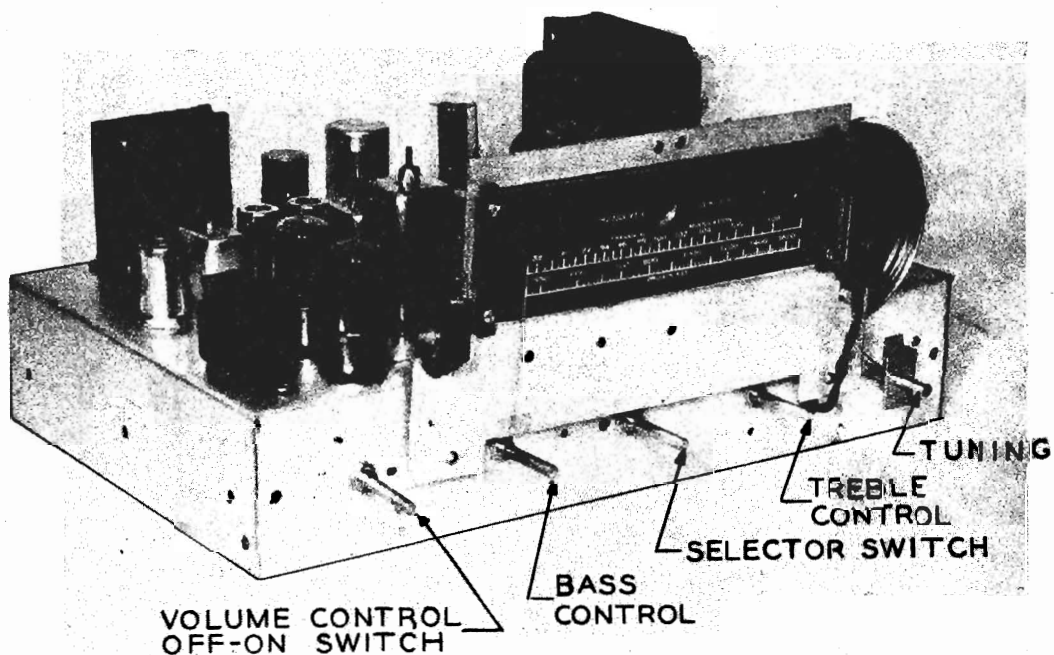
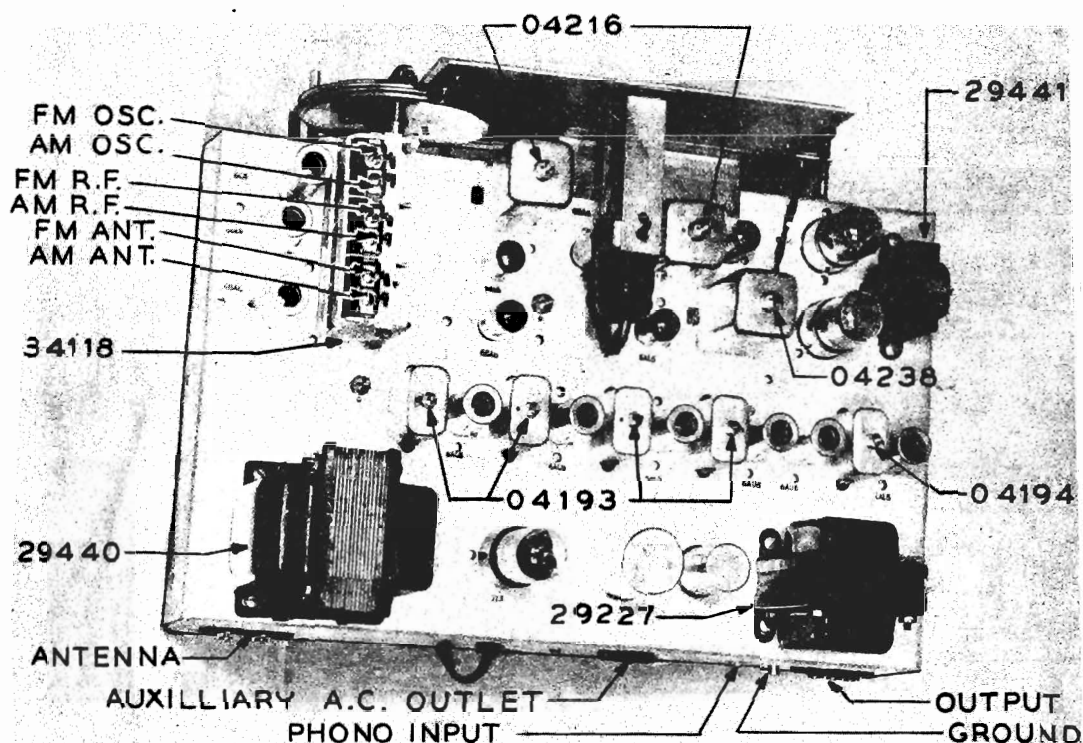
⊖ B-
CHASSIS
GND

I.F. 455 KC



MODEL 9-1091C

MEISSNER MFG. DIV.
MAGUIRE INDUSTRIES, INC.



Power Supply 105-125 volts, 50-60 cycles.
CAUTION, DO NOT ATTEMPT TO OPERATE ON OTHER SUPPLY.
Power Consumption 75 watts.

Type of Circuit - Superheterodyne.

Intermediate Frequencies AM 455 kc.
FM 10.7 mc.

Output impedance - 500 ohm balanced and high impedance unbalanced.

Antenna impedance

Broadcast - Standard

F M - - - 300 ohms.

MEISSNER MFG. DIV.
MAGUIRE INDUSTRIES, INC.

MODEL 9-1091C

Alignment AM

The AM alignment may be carried out with an AM signal generator and an output meter. Connect a 500 ohm resistor across the 500 ohm output terminals of the Tuner. The output meter may be connected from the high impedance output terminal to chassis.

For IF alignment introduce a 455 kc. 30% modulated signal into the signal grid of the 6BE6 (Pin #7) through a .1 ufd. coupling condenser. The output of the signal generator should at all times be kept as low as will give a satisfactory reading on the output meter. With the selector switch in the sharp position, adjust the top and bottom adjustments of IF transformers 04216, 04216, and 04238 for maximum output. Now move the selector switch to the broad position and check the symmetry of the IF response curve by swinging the signal generator frequency. The response in the broad position should be double peaked, the dip between the peaks falling at 455 kc. The peaks should be equally spaced on either side of 455 kc. and should be of approximately the same amplitude. The gain in the broad position will be less than the gain in the sharp position. If the above conditions do not exist, then a careful recheck of alignment in the sharp position should be carried out.

For RF alignment introduce a 30% modulated signal through a 200 uuf. dummy antenna to one of the FM antenna terminals. First check dial pointer position by turning the gang condenser to full mesh and setting the pointer to the last reference mark at the low end of the dial scale. With signal generator and Tuner set to 1400 kc., adjust the oscillator trimmer for maximum output, then adjust RF and antenna trimmers for maximum output.

Alignment FM

For FM alignment a frequency modulated generator (60 to 400 cycle modulation, 400 kc. sweep) and an oscilloscope are required. Connect the modulation source on the signal generator into the horizontal amplifier of the oscilloscope. It may be necessary to connect a phase shifting network in this line between the signal generator modulating source and the oscilloscope horizontal amplifier in order to get the correct pattern on the oscilloscope. Connect the Tuner output to the vertical amplifier input of the oscilloscope.

Introduce a 10.7 mc. (400 kc. sweep) signal into the grid of the first 6AU6 limiter tube (Pin #1) through a .01 ufd. condenser. Make the ground connection of the generator to the center post of the 6AU6 socket with as short a lead as

possible. Remove the last 6AG5 IF amplifier tube to avoid the possibility of stray signals coming through the IF system and confusing the discriminator alignment procedure. Adjust the signal generator sweep and signal amplitude, and the oscilloscope for a pattern like the discriminator pattern shown in Fig. 3. Adjust the top adjustment on the 04194 discriminator coil for maximum vertical amplitude on the oscilloscope pattern and adjust the bottom adjustment on this coil for best symmetry of the pattern about the center. Repeat these two adjustments until no further improvement can be made. This completes the adjustment of the discriminator coil. Replace IF tube.

For alignment of the IF amplifier the same oscilloscope set-up is retained except the input to the vertical amplifier. Feed the input to the vertical amplifier with audio taken from the first limiter grid return. This point is identified as point X on the circuit diagram of Fig. 3. Connection should be made to this point through a 1 megohm isolating resistor as shown by dotted line in Fig. 3.

Introduce a 10.7 mc. (400 kc. sweep) signal into the signal grid of the 6BE6 (Pin #7) through a .01 ufd. condenser. Make the ground connection of the signal generator to the center post of the 6BE6 socket with as short a lead as possible. Adjust signal generator and oscilloscope to obtain a pattern like the IF pattern shown in Fig. 3. Adjust top and bottom adjustments on the four 04193 IF coils for maximum amplitude and symmetry of the pattern, keeping the signal level from the generator as low as possible throughout the adjustment. If the pattern tends to become double peaked or badly unsymmetrical during adjustment the trouble is probably due to incorrect placement of some of the connecting leads in the test set-up. Corrections should be made to eliminate the trouble and the adjustments repeated.

For the high frequency adjustments the same oscilloscope set-up may be retained. In connecting the signal generator to the antenna terminals the signal generator is not connected to chassis as in the previous connections. Connect two 150 ohm resistors to the two antenna terminals on the tuner. Connect the other ends of these two resistors to the two generator output terminals. If the setting of the dial pointer has been previously checked during AM alignment it is not necessary to recheck it at this point. Set the signal generator and the Tuner to 106 mc. and adjust the oscillator trimmer (identified in Fig. 1) to bring the pattern to center on the oscilloscope. In case this is possible with two different positions of the oscillator trimmer, use the position of least capacity. Adjust the RF and Antenna trimmers (identified in Fig. 1) for the greatest amplitude of the pattern keeping the generator output as low as possible during the process of adjustment.

**MEISSNER MFG. DIV.
MAGUIRE INDUSTRIES, INC.**

MODEL 9-1091C

Voltage Readings

DC taken with 20,000 ohm per volt meter.

AC taken with 1,000 ohm per volt meter.

No signal - AM sharp position except * taken in FM position.

Line voltage 117.

<u>Tube</u>	<u>Pin 1</u>	<u>Pin 2</u>	<u>Pin 3</u>	<u>Pin 4</u>	<u>Pin 5</u>	<u>Pin 6</u>	<u>Pin 7</u>	<u>Pin 8</u>
*6BA6	Slight negative DC	0	6.3 AC	0	170 DC	87 DC	0.8 DC	-----
*6BE6	Slight negative DC	1.4 DC	6.3 AC	0	240 DC	87 DC	Slight negative DC	-----
*6C4	170 DC	0	6.3 AC	0	170 DC	Slight negative DC	0	-----
*6AG5	Slight negative DC	0	6.3 AC	0	83 DC	85 DC	0	-----
*6AG5	0	0.7 DC	6.3 AC	0	83 DC	85 DC	0.7 DC	-----
*6AG5	0	0.7 DC	6.3 AC	0	83 DC	85 DC	0.7 DC	-----
*6AU6	Slight negative DC	0	6.3 AC	0	84 DC	44 DC	0	-----
*6AU6	Slight negative DC	0	6.3 AC	0	93 DC	42 DC	0	-----
*6AL5	** -1.3 DC	** -0.7 DC	4.5 AC	0	0	0	** -7.5 DC	-----
6BA6	0	2.2 DC	6.3 AC	0	280 DC	82 DC	2.2 DC	-----
6BE6	-5 DC	0	6.3 AC	0	280 DC	73 DC	0	-----
6BA6	0	2.2 DC	6.3 AC	0	280 DC	82 DC	2.2 DC	-----
6BA6	0	2.8 DC	6.3 AC	0	278 DC	95 DC	2.8 DC	-----
6AL5	2.8 DC	Slight negative DC	6.3 AC	0	0	0	0	-----
6J5	0	0	95 DC	0	0	0	6.3 AC	4.0 DC
6J5	0	0	186 DC	280 DC	0	0	6.3 AC	4.6 DC
6U5/6G5	Green	-----	Yellow	Red	Brown	Blue	-----	-----
	0		0	280 DC	0	6.3 AC		
5Y3	0	284 DC	0	260 AC	0	260 AC	280 DC	284 DC

NOTE: Normal tolerance on components makes possible a variation of $\pm 20\%$ in all DC voltage readings.

** Subject to wide variation.

Sensitivity - less than 10 microvolts.

Audio fidelity

Flat within ± 2 db. from 30 to 15000 cycles.

Band width at 1000 kc.

Sharp 7 kc.

Broad 14 kc.

Output

High impedance 11 volts maximum for 2-1/2% distortion.

500 ohm 2 volts maximum for 2-1/2% distortion.

Distortion

Tone control action

2-1/2% at full rated output Bass boost at 40 cycles - 12 db.

Less at lower levels Treble suppression at 8000 cycles - 12 db.

Hum

Maximum - 0.5 micro watts.

MODEL 9-1091C

MEISSNER MFG. DIV.
MAGUIRE INDUSTRIES, INC.DC Resistance Readings

Band Switch in BC sharp position.

Measured from specified tube pin to chassis.

Tuner turned off.

*Resistance readings in the B $\frac{1}{2}$ circuits may vary widely depending on the condition of the filter condensers and the polarity of the ohmmeter.

**With bass control set clockwise.

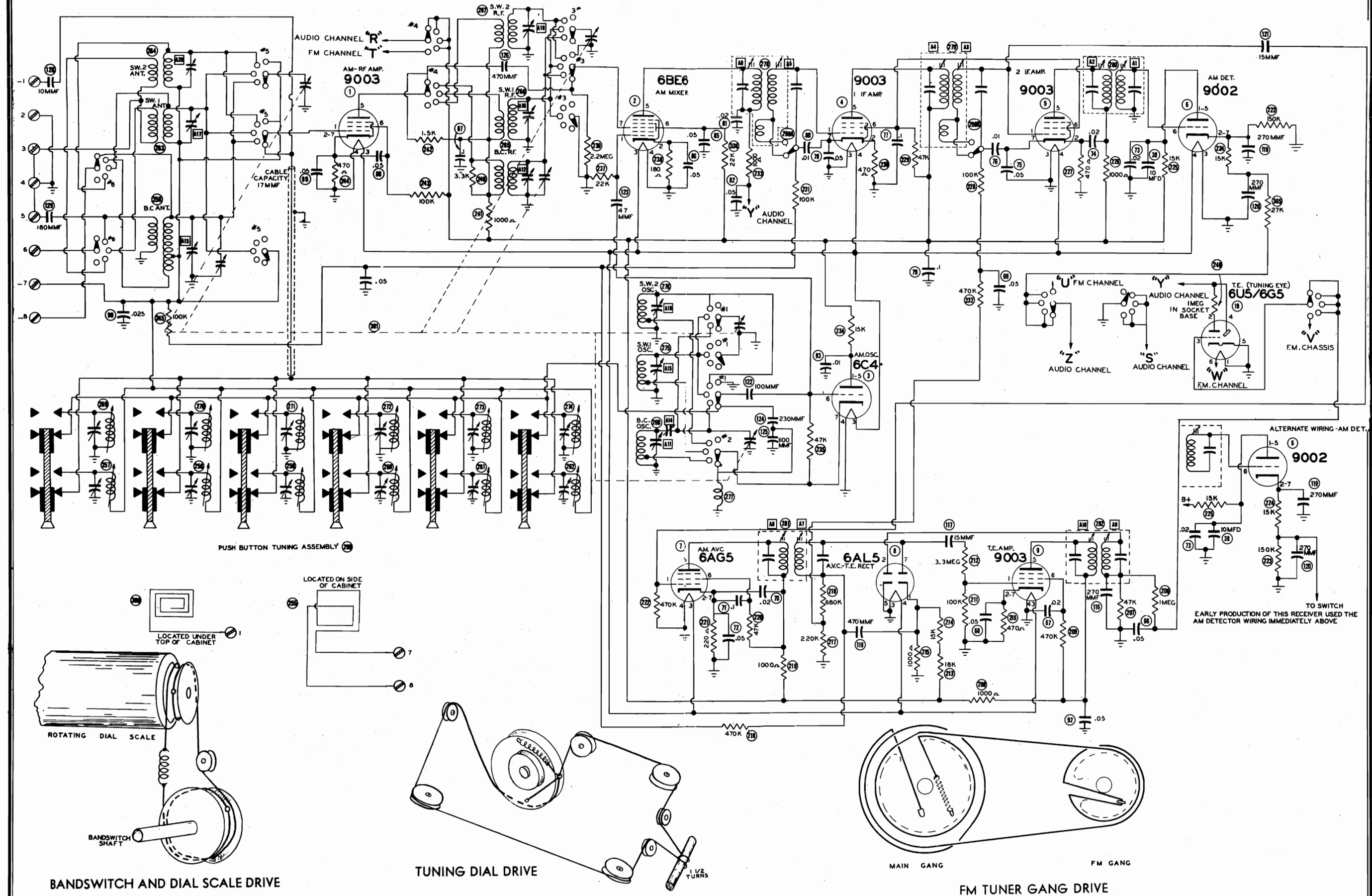
<u>Tube</u>	<u>Pin 1</u>	<u>Pin 2</u>	<u>Pin 3</u>	<u>Pin 4</u>	<u>Pin 5</u>	<u>Pin 6</u>	<u>Pin 7</u>	<u>Pin 8</u>
Values below given in ohms								
6BA6	2.35M	0	0	0	37K	74K	68	-----
6BE6	22K	150	0	0	27K	49K	2.35M	-----
6C4	32K	Inf.	Less than 1	0	32K	15K	0	-----
6AG5	2.35M	0	0	0	23k	23K	0	-----
6AG5	Less than 1	120	0	0	23K	23K	120	-----
6AG5	Less than 1	120	0	0	23K	23K	120	-----
6AU6	47K	0	0	0	32K	15K	0	-----
6AU6	150k	0	Less than 1	0	23K	15K	0	-----
6AL5	200K	150K	2.5	0	0	Inf.	150K	-----
6BA6	2.2M	220	0	0	*500K	*500K	220	-----
6BE6	22K	Less than 1	0	0	*500K	*500K	1.1M	-----
6BA6	2.1M	220	0	0	*500K	*500K	220	-----
6BA6	1M	470	0	0	*500K	*500K	470	-----
6AL5	470	130K	0	0	0	Inf.	1.1M	-----
6J5	0	0	*500K	Inf.	0 to 200	Inf.	0	3.3K
6J5	0	0	*500K	*500K	**220K	0	0	510
6U5/6G5	Green	-----	Yellow	Red	Brown	Blue	-----	-----
	0		2.3M	*500K	0	0		
5Y3	Inf.	*500K	Inf.	95	Inf.	95	*500K	*500K

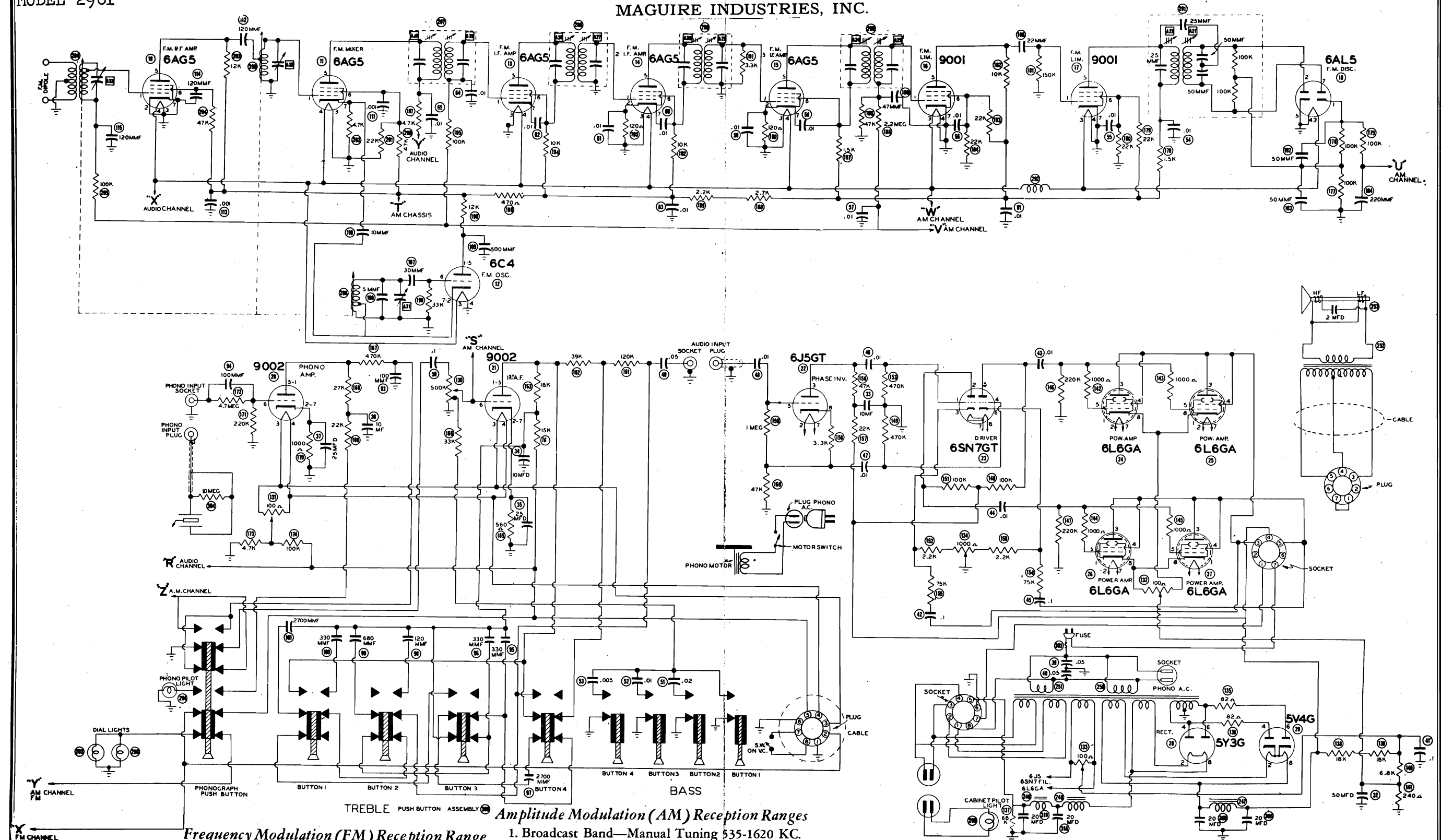
Power Amplifier

If this Meissner tuner is to be used with a power amplifier, a power amplifier should be chosen which will give full power output when driven with the maximum output of the Tuner (see "Nominal Performance" ratings). It is not essential that the power amplifier have exactly the right gain, but if best results are to be obtained the gain of the power amplifier should not greatly exceed the requirement. If, for instance, the power amplifier has an input jack for a phonograph pickup, then the Tuner might be fed into this jack through a voltage divider made from a 30,000 ohm potentiometer. This potentiometer should be adjusted to a level where full rated output (11 volts) from the Tuner will just produce full power output from the power amplifier. It is not recommended that the Tuner be fed into the Microphone input jack of a power amplifier.

MEISSNER MFG. DIV.
MAGUIRE INDUSTRIES, INC.

MODEL 2961





Frequency Modulation (FM) Reception Range
88-108 MC

Intermediate Frequency (IF) Amplifier Characteristics

AM Channel-Peaking Frequency 455 KC
Bandwidth (Normal) 19 KC
Bandwidth (Sharp) 7.3 KC
FM Channel-Peaking Frequency 10.7 MC
Bandwidth 150 KC

Amplitude Modulation (AM) Reception Ranges

1. Broadcast Band—Manual Tuning 535-1620 KC.
2. Broadcast Band—Automatic Tuning. Selection of six desired stations. Each push-button setting is conveniently adjustable to any point within the 535-1620 KC range from the front panel (see Front Cabinet View and Push-Button Alignment procedure). Individual calibration scales are provided for identification of button settings.
3. Shortwave Band No. 1 9.2 MC-12.2 MC
4. Shortwave Band No. 2 14.4 MC-18.4 MC

Audio Amplifier Frequency Range
60-20,000 cycles \pm .75 db.

Power Output Rating
Distortion below 4%.....20 watts

Loudspeaker—Jensen HNP-50 (Special)
Voice Coil Impedance.....16 ohms
Permanent Magnet, Horn type coaxial, 15" diameter

Power Supply
Primary Power Source, 105-125 Volts AC @ 50-60 cycles
Current Consumption, Approximately 200 Watts

Registered Trademark

MEISSNER MFG. DIV.
MAGUIRE INDUSTRIES, INC.

900Z
A-M-RF AMPL.

6BE6
A-M MIXER

6C4
A-M OSC.

306

128

299

257

245

90

242

88

244

87

241

126

239

237

238

85

86

236

81

233

82

300

123

83

234

277

125

124

235

B+

AVC

#4

#5

#3

#1

#2

A6

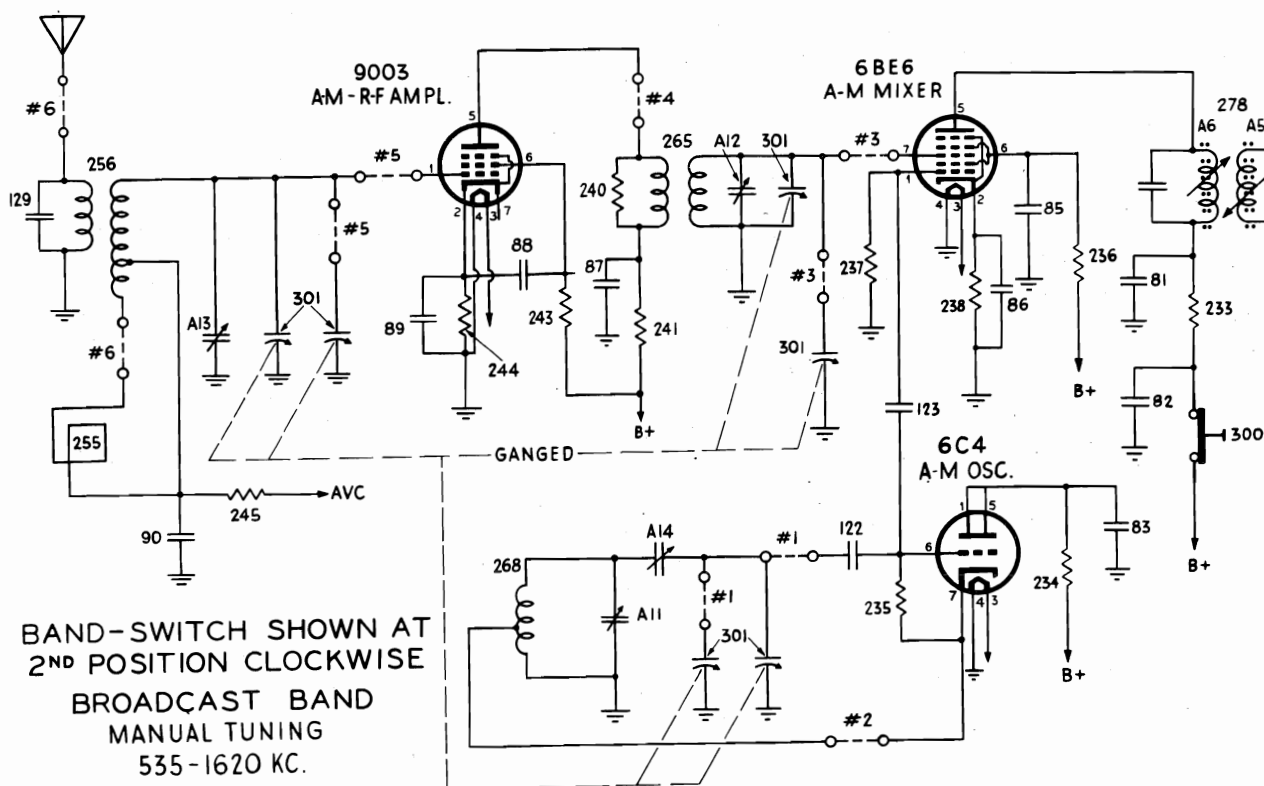
A5

278

269

BAND-SWITCH SHOWN AT
AT 1ST POSITION.
BROADCAST BAND
PUSH BUTTON TUNING
535-1620 KC.

BAND-SWITCH SHOWN AT
AT 1ST POSITION.
BROADCAST BAND
PUSH BUTTON TUNING
535-1620 KC.



BAND-SWITCH SHOWN AT
2ND POSITION CLOCKWISE
BROADCAST BAND
MANUAL TUNING
535-1620 KC.

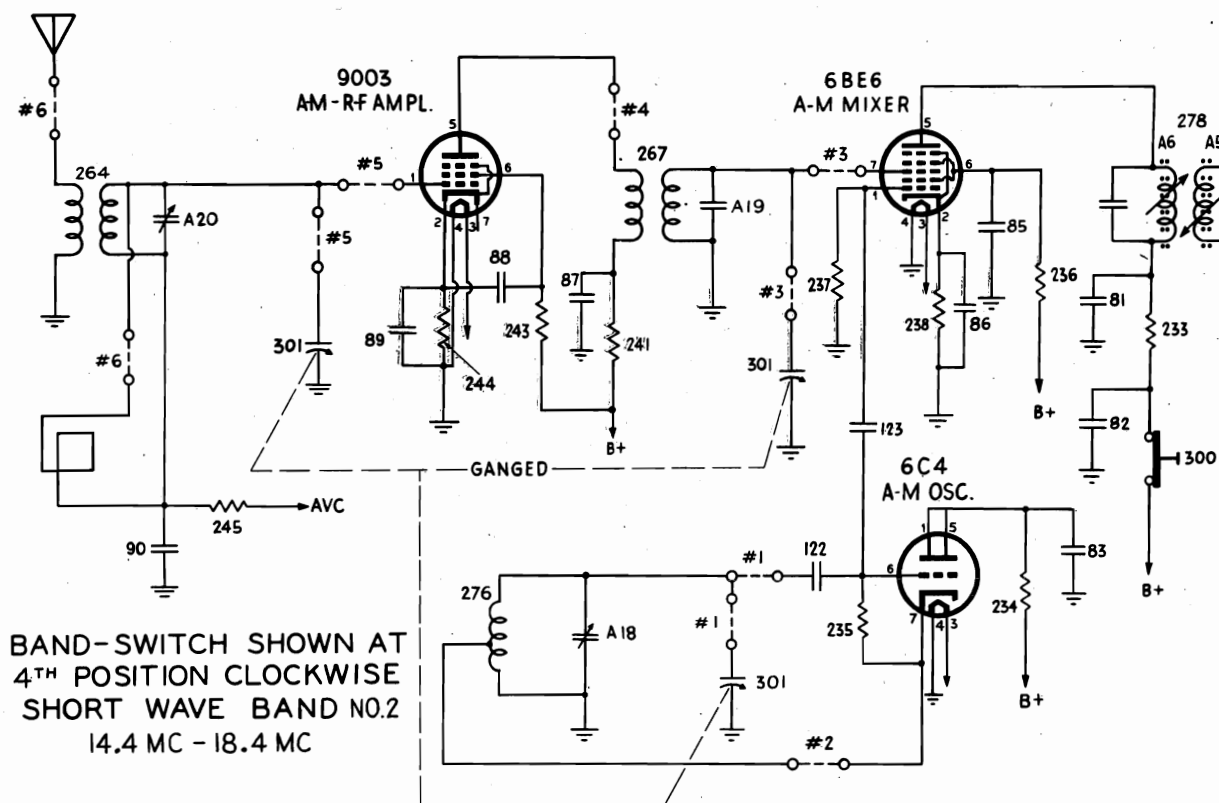
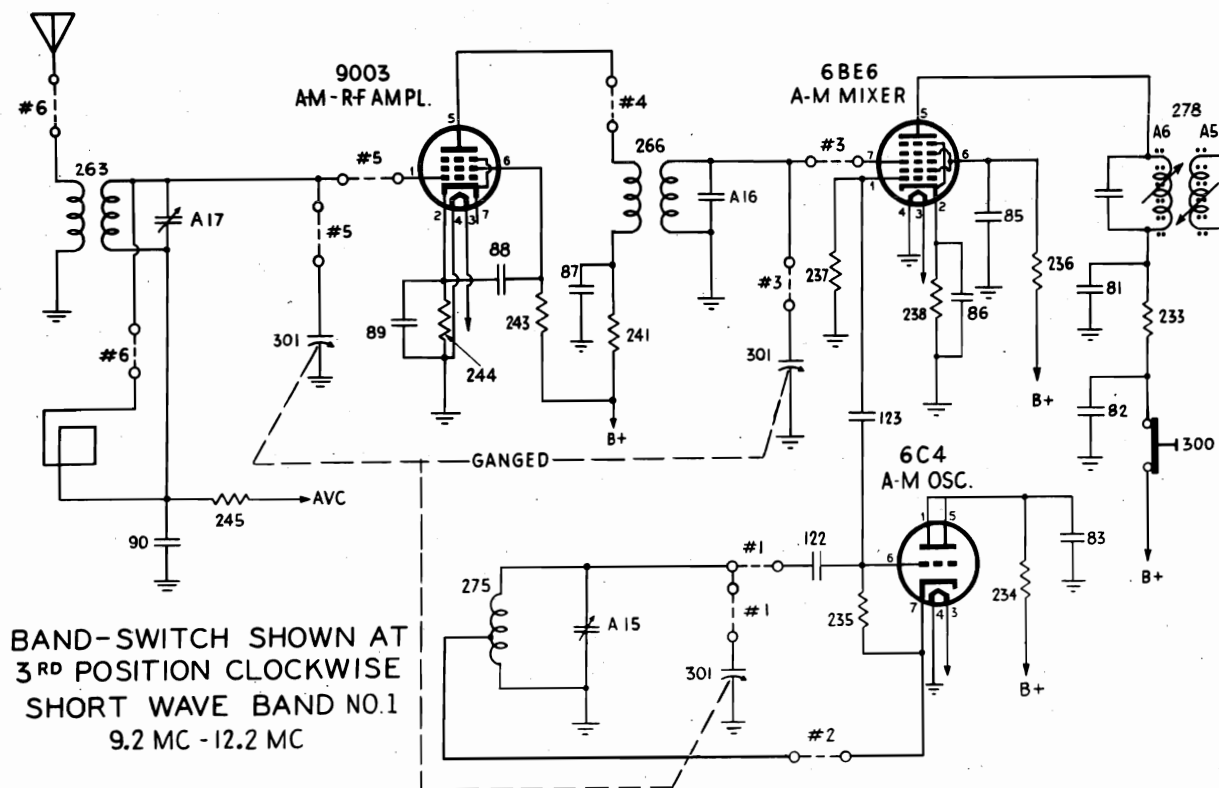
CLARI-SKEMATIX

Registered Trademark

PAGE 19-12 MEISSNER

MODEL 2961

MEISSNER MFG. DIV.
MAGUIRE INDUSTRIES, INC.



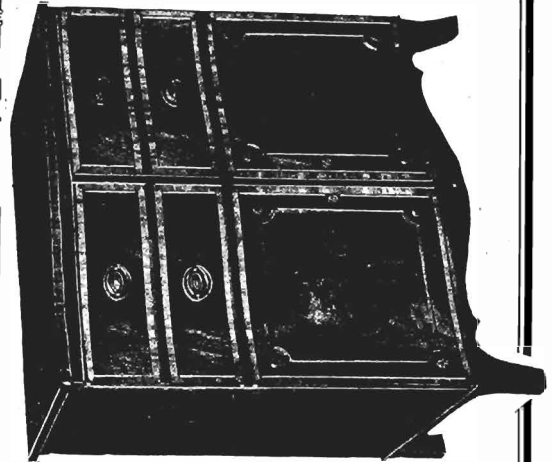
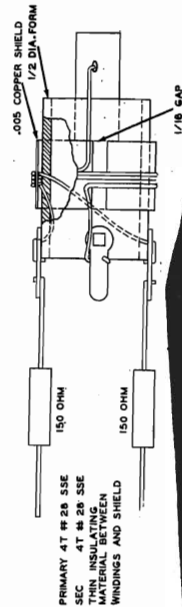
MEISSNER MFG. DIV.
MAGUIRE INDUSTRIES, INC.

MODEL 2961

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
"	Remove FM mixer tube (11). Remove 9001 second limiter tube (17) from socket. Adjust for maximum amplitude, symmetry and coincidence of pattern on scope. Care should be taken not to disturb the mixer plate lead after IF alignment is completed as it will detune the 1st IF primary.	"	"	"	"	A23, A24	
300Ω (See pre-struct instructions)	To FM dipole terminals.	107.9MC	FM	300	To low side of secondary limiter transformer and chassis.	A31	Replace osc. tube. Adjust for maximum amplitude, symmetry and coincidence of pattern on scope.
"	"	"	"	"	"	A22, A23	Adjust for maximum amplitude. Replace 2nd limiter tube.
200Ω	High side to terminal #6 on ant. terminal strip. Low side to chassis.	1400KC	Push-button (Depress push button from left).	Set left knob to 1400KC.	Across voice coil	B1	Adjust for maximum output.
200Ω	"	"	"	"	"	B2	"

Follow same procedure for aligning remaining pushbutton channels. Adjust B3, B5, B7, B9 and B11 to tune in generator signal and B4, B6, B8, B10 and B12 for maximum output. Make sure the button is depressed that corresponds to the channel being aligned.

DETAILS OF QUARTZ ANTENNA AND PI COUPLING TRANSFORMER TO GIVE BALANCED OUTPUT



ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT							
To set pointer, turn tuning capacitor fully closed and set pointer at the last reference mark at the left end of the broadcast band dial. Keep output of signal generator no higher than is necessary to obtain output indication. When aligning FM RF section use dummy antenna and coupling transformer constructed as shown in sketch. Use insulated alignment screwdriver for adjusting.							
DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
.1 MFD.	High side to Pin #1 (grid) of 1st IF tube. (2) Low side to Pin 3 of same tube.	455KC (Freq. Mod. 20KC sweep)	BC	High freq. end. of dial	Pin #7 (cathode) or (6) & chassis.	A1, A2	Adjust for maximum amplitude, symmetry and coincidence of pattern on scope.
.1 MFD.	High side to Pin #1 (grid) of 1st IF tube (4). Low side to Pin 3 of same tube.	"	"	"	"	A3, A4	Adjust for maximum amplitude, symmetry and coincidence of pattern on scope. Turn selectivity switch to broad. Pattern should set at 455KC. Return selectivity switch to normal.
.1 MFD.	High side to Pin #7 (grid) of mixer tube (2). Low side to ground lug near socket of same tube.	"	"	"	"	A5, A6	"
.1 MFD.	High side to Pin #1 (grid) of AVC Amp. (7). Low side to ground lug near socket of same tube.	"	"	"	Low side of secondary of AVC IF (281) and chassis.	A7, A8	"
.1 MFD.	"	"	"	"	Low side of secondary of Tuning Eye IF (282) & chassis.	A9, A10	"
200Ω	High side to ant. terminal strip. Low side to chassis.	1500KC	BC	1500KC	Rock variable and adjust for maximum output. Repeat last three steps until no further improvement can be made.	A11	Adjust for maximum output.
200Ω	"	600KC	"	Tune for maximum output.	Rock variable and adjust for maximum output.	A12, A13	"
400Ω	"	12.0MC	SW 1	12.0MC	Rock variable and adjust for maximum output.	A14	"
400Ω	"	18.0MC	SW 2	18.0MC	Rock variable and adjust for maximum output.	A15, A16, A17, A18, A19	"
.005 mica.	High side to Pin #1 (grid) of 1st modulated side to ground lug near socket of same tube.	10.7MC (freq. modulated 200KC deviation)	FM	High freq. end of dial.	To Pin #6 (grid) of audio amp. (21) and chassis.	A21	Adjust so that peaks of curves are symmetrical about the vertical axis and cross over at the horizontal axis.
"	High side to Pin #1 (grid) of 2nd IF (14). Low side to ground lug near same tube.	"	"	"	To low side of secondary of 1st limiter transformer and chassis.	A22	Adjust for maximum amplitude of peaks.
"	High side to Pin #1 (grid) of 2nd IF (14). Low side to ground lug near same tube.	"	"	"	To low side of secondary of 1st limiter transformer and chassis.	A23, A24	Remove 9001 second limiter tube. Adjust for maximum amplitude, symmetry and coincidence of pattern on scope.
"	High side to Pin #1 (grid) of 1st IF (13). Low side to ground lug near same tube.	"	"	"	"	A25, A26	"
"	High side to Pin #1 (grid) of 1st IF (13). Low side to ground lug near same tube.	"	"	"	"	A27, A28	"

MODEL 2961

MEISSNER MFG. DIV.
MAGUIRE INDUSTRIES, INC.

RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8
1	9003	1.4 MEG	475 Ω	2 Ω	0 Ω	17 K Ω	105 K Ω	475 Ω	
2	6BE6	17 K Ω	170 Ω	2 Ω	0 Ω	17 K Ω	39 K Ω	5 Ω	
3	6C4	29 K Ω	17 K Ω	2 Ω	0 Ω	29 K Ω	47 K Ω	7 Ω	
4	9003	1.4 MEG	475 Ω	0 Ω	2 Ω	17 K Ω	65 K Ω	475 Ω	
5	9003	760 K Ω	500 K Ω	0 Ω	2 Ω	17 K Ω	65 K Ω	500 Ω	
6	9002	29 K Ω	167 K Ω	0 Ω	2 Ω	29 K Ω	6 Ω	167 K Ω	
7	6AG5	470 K Ω	190 Ω	2 Ω	0 Ω	17 K Ω	61 K Ω	190 Ω	
8	6AL5	1000 Ω	43 K Ω	0 Ω	2 Ω	0 Ω	3 MEG	860 K Ω	
9	9003	94 K Ω	500 Ω	2 Ω	0 Ω	17 K Ω	490 K Ω	500 Ω	
10	6AG5	1.9 MEG	0 Ω	0 Ω	2 Ω	23 K Ω	57 K Ω	0 Ω	
11	6AG5	0 Ω	4 K Ω	0 Ω	2 Ω	57 K Ω	17 K Ω	4 K Ω	
12	6C4	25 K Ω	INF.	2 Ω	0 Ω	25 K Ω	32 K Ω	0 Ω	
13	6AG5	1.9 MEG	0 Ω	2 Ω	0 Ω	20 K Ω	25 K Ω	0 Ω	
14	6AG5	7 Ω	115 Ω	2 Ω	0 Ω	20 K Ω	20 K Ω	115 Ω	
15	6AG5	7 Ω	115 Ω	2 Ω	0 Ω	13 K Ω	13 K Ω	115 Ω	
16	9001	42 K Ω	0 Ω	2 Ω	0 Ω	22 K Ω	15 K Ω	0 Ω	
17	9001	146 K Ω	0 Ω	2 Ω	0 Ω	13 K Ω	13 K Ω	0 Ω	
18	6AL5	190 K Ω	145 K Ω	2 Ω	0 Ω	0 Ω	INF.	145 K Ω	
19	6U5/6G5	0 Ω	1 MEG	950 K Ω	18 K Ω	0 Ω	1 Ω		
20	9002	62 K Ω	1000 Ω	4.2 K Ω	4.2 K Ω	62 K Ω	205 K Ω	1000 Ω	
21	9002	46 K Ω	600 Ω	4.2 K Ω	4.2 K Ω	46 K Ω	500 K Ω	600 Ω	
22	6J5GT	0 Ω	6.5 K Ω	112 K Ω	65 K Ω	1.2 MEG	48 K Ω	6.5 K Ω	50 K Ω
23	6SN7GT	430 K Ω	140 K Ω	2.6 K Ω	470 K Ω	138 K Ω	2.5 K Ω	6.5 K Ω	6.5 K Ω
24	6L6GA	0 Ω	6.5 K Ω	39 K Ω	39 K Ω	215 K Ω	215 K Ω	6.5 K Ω	280 Ω
25	6L6GA	0 Ω	6.5 K Ω	39 K Ω	39 K Ω	215 K Ω	215 K Ω	6.5 K Ω	280 Ω
26	6L6GA	0 Ω	6.5 K Ω	39 K Ω	39 K Ω	215 K Ω	215 K Ω	6.5 K Ω	280 Ω
27	6L6GA	0 Ω	6.5 K Ω	39 K Ω	39 K Ω	215 K Ω	215 K Ω	6.5 K Ω	280 Ω
28	5Y3G	INF.	17 K Ω	INF.	72 Ω	INF.	64 Ω	INF.	17 K Ω
29	5V4G	INF.	39 K Ω	INF.	145 Ω	INF.	138 Ω	INF.	39 K Ω

VOLTAGE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8
1	9003	0V.	3.2V _{DC}	6.3V _{AC}	0V.	256V _{DC}	83V _{DC}	3.2V _{DC}	
2	6BE6	2.2V _{DC}	2V _{DC}	6.3V _{AC}	0V.	265V _{DC}	108V _{DC}	0V.	
3	6C4	157V _{DC}	270V _{DC}	6.3V _{AC}	0V.	157V _{DC}	0V.	0V.	
4	9003	0V.	3.5V _{DC}	0V.	6.3V _{AC}	270V _{DC}	95V _{DC}	3.5V _{DC}	
5	9003	0V.	3.1V _{DC}	0V.	6.3V _{AC}	262V _{DC}	97.5V _{DC}	3.1V _{DC}	
6	9002	270V _{DC}	1.5V _{DC}	0V.	6.3V _{AC}	265V _{DC}	0V.	1.5V _{DC}	
7	6AG5	0V.	1.9V _{DC}	6.3V _{AC}	0V.	262V _{DC}	148V _{DC}	1.9V _{DC}	
8	6AL5	8.3V _{DC}	3.3V _{DC}	0V.	6.3V _{AC}	0V.	0V.	0V.	
9	9003	0V.	1.3V _{DC}	6.3V _{AC}	0V.	265V _{DC}	31V _{DC}	1.3V _{DC}	
10	6AG5	3.3V _{DC}	0V.	0V.	6.3V _{AC}	143V _{DC}	132V _{DC}	0V.	
11	6AG5	0V.	2.2V _{DC}	0V.	6.3V _{AC}	250V _{DC}	68V _{DC}	2.2V _{DC}	
12	6C4	150V _{DC}	0V.	6.3V _{AC}	0V.	150V _{DC}	4V _{DC}	0V.	
13	6AG5	2.25V _{DC}	0V.	6.3V _{AC}	0V.	123V _{DC}	123V _{DC}	0V.	
14	6AG5	0V.	1.3V _{DC}	6.3V _{AC}	0V.	146V _{DC}	146V _{DC}	1.3V _{DC}	
15	6AG5	0V.	1.1V _{DC}	6.3V _{AC}	0V.	118V _{DC}	118V _{DC}	1.1V _{DC}	
16	9001	2.25V _{DC}	0V.	6.3V _{AC}	0V.	122V _{DC}	57V _{DC}	0V.	
17	9001	2.4V _{DC}	0V.	6.3V _{AC}	0V.	145V _{DC}	57V _{DC}	0V.	
18	6AL5	1V _{DC}	1V _{DC}	6.3V _{AC}	0V.	0V.	0V.	10V _{DC}	
19	6U5/6G5	0V.	2.2V _{DC}	2.2V _{DC}	265V _{DC}	0V.	6.3V _{AC}		
20	9002	124V _{DC}	3.4V _{DC}	12V _{DC}	12V _{DC}	124V _{DC}	0V.	3.4V _{DC}	
21	9002	123V _{DC}	2.5V _{DC}	12V _{DC}	12V _{DC}	123V _{DC}	0V.	2.5V _{DC}	
22	6J5GT	0V.	96V _{DC}	250V _{DC}	340V _{DC}	4V _{DC}	98V _{DC}	96V _{DC}	105V _{DC}
23	5Y3	0V.	165V _{DC}	6.5V _{DC}	0V.	155V _{DC}	5.8V _{DC}	95V _{DC}	96V _{DC}
24	6L6GA	0V.	96V _{DC}	395V _{DC}	395V _{DC}	0V.	0V.	97V _{DC}	40.5V _{DC}
25	6L6GA	0V.	96V _{DC}	395V _{DC}	395V _{DC}	0V.	0V.	97V _{DC}	40.5V _{DC}
26	6L6GA	0V.	96V _{DC}	395V _{DC}	395V _{DC}	0V.	0V.	97V _{DC}	40.5V _{DC}
27	6L6GA	0V.	96V _{DC}	395V _{DC}	395V _{DC}	0V.	0V.	97V _{DC}	40.5V _{DC}
28	5Y3GT	0V.	292V _{DC}	0V.	365V _{AC}	0V.	370V _{AC}	0V.	290V _{DC}
29	5V4G	0V.	410V _{DC}	0V.	350V _{AC}	0V.	350V _{AC}	0V.	410V _{DC}

1—DC Voltage measurements are at 20,000 ohms per volt; AC Voltages measured at 1,000 ohms per volt.

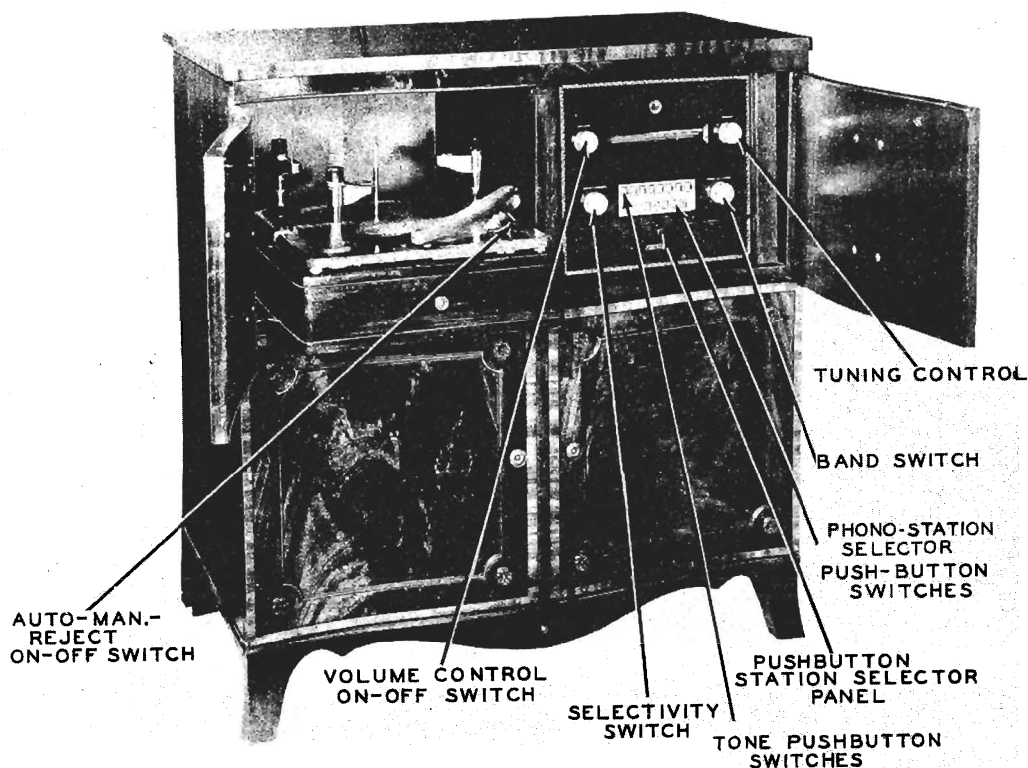
2—Socket connections are shown as bottom views.

3—Measured values are from socket pin to common negative.

4—Line Voltage maintained at 117 volts for voltage readings.

5—Nominal tolerance on component values makes possible a variation of $\pm 10\%$ in voltage and resistance readings.

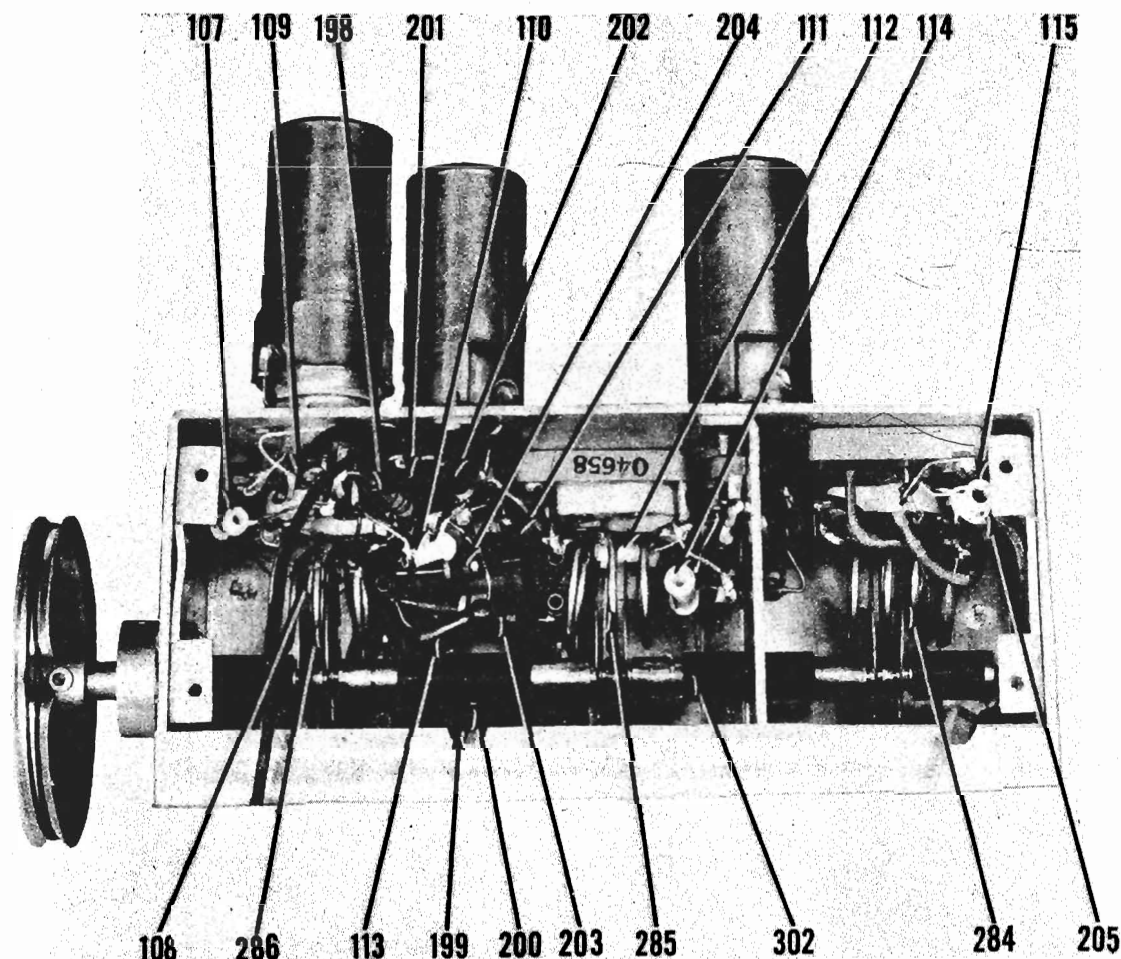
6—Volume control at maximum, no signal applied for voltage measurements.



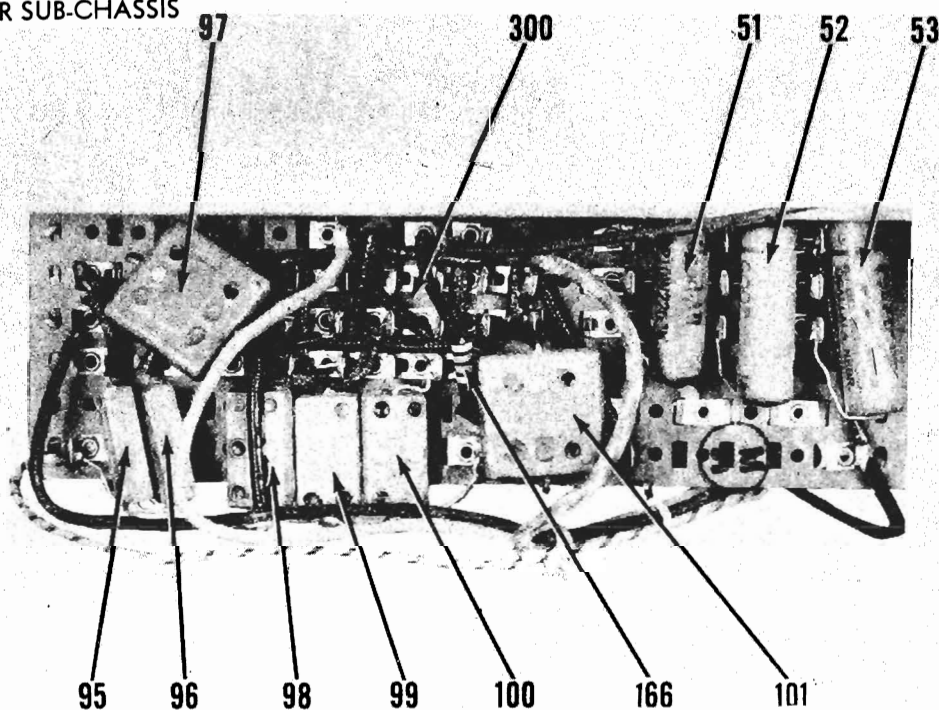
FRONT CABINET VIEW

MEISSNER MFG. DIV.
MAGUIRE INDUSTRIES, INC.

MODEL 2961



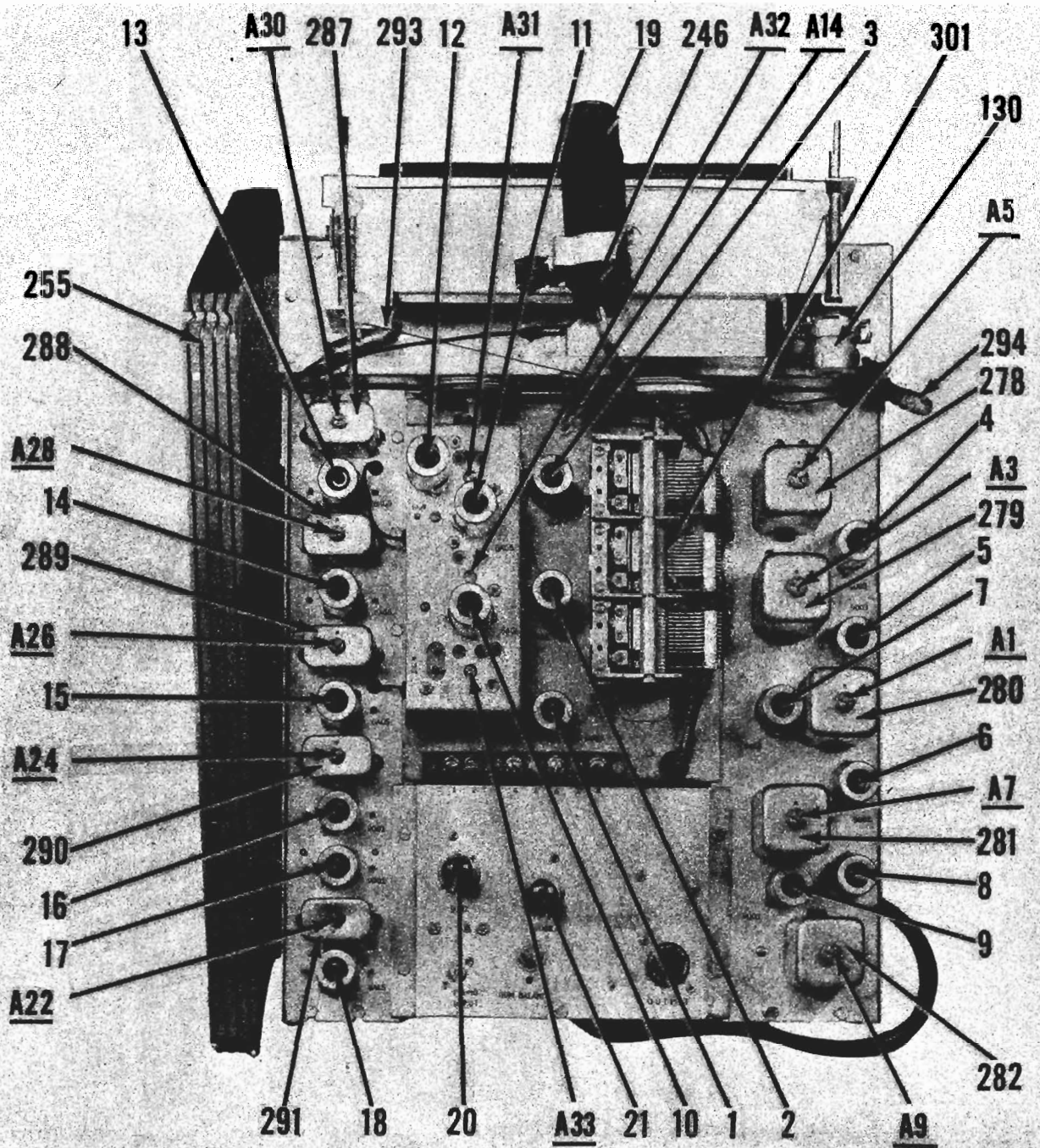
FM TUNER SUB-CHASSIS



TONE CONTROL SWITCH ASSEMBLY

MODEL 2961

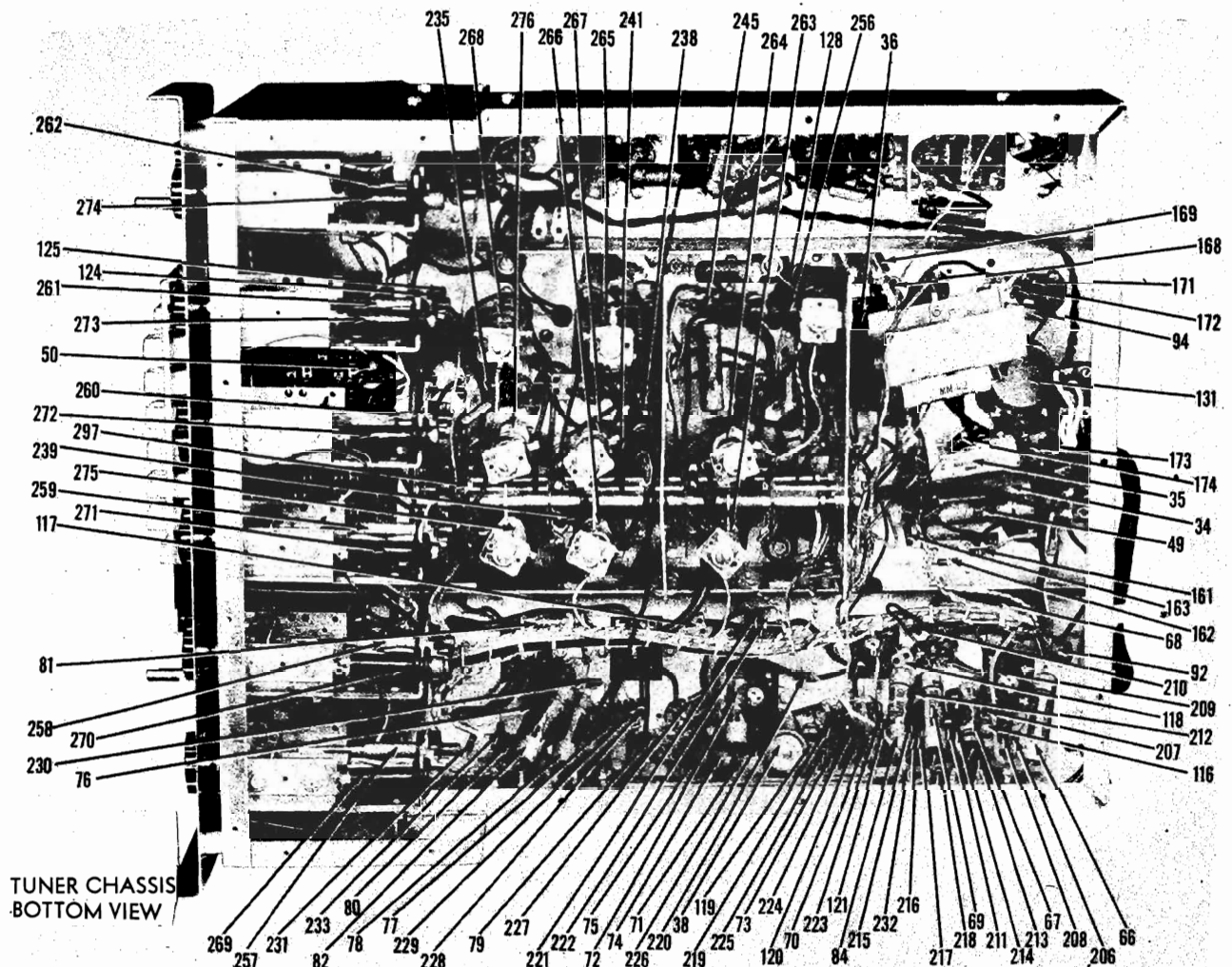
MEISSNER MFG. DIV.
MAGUIRE INDUSTRIES, INC.



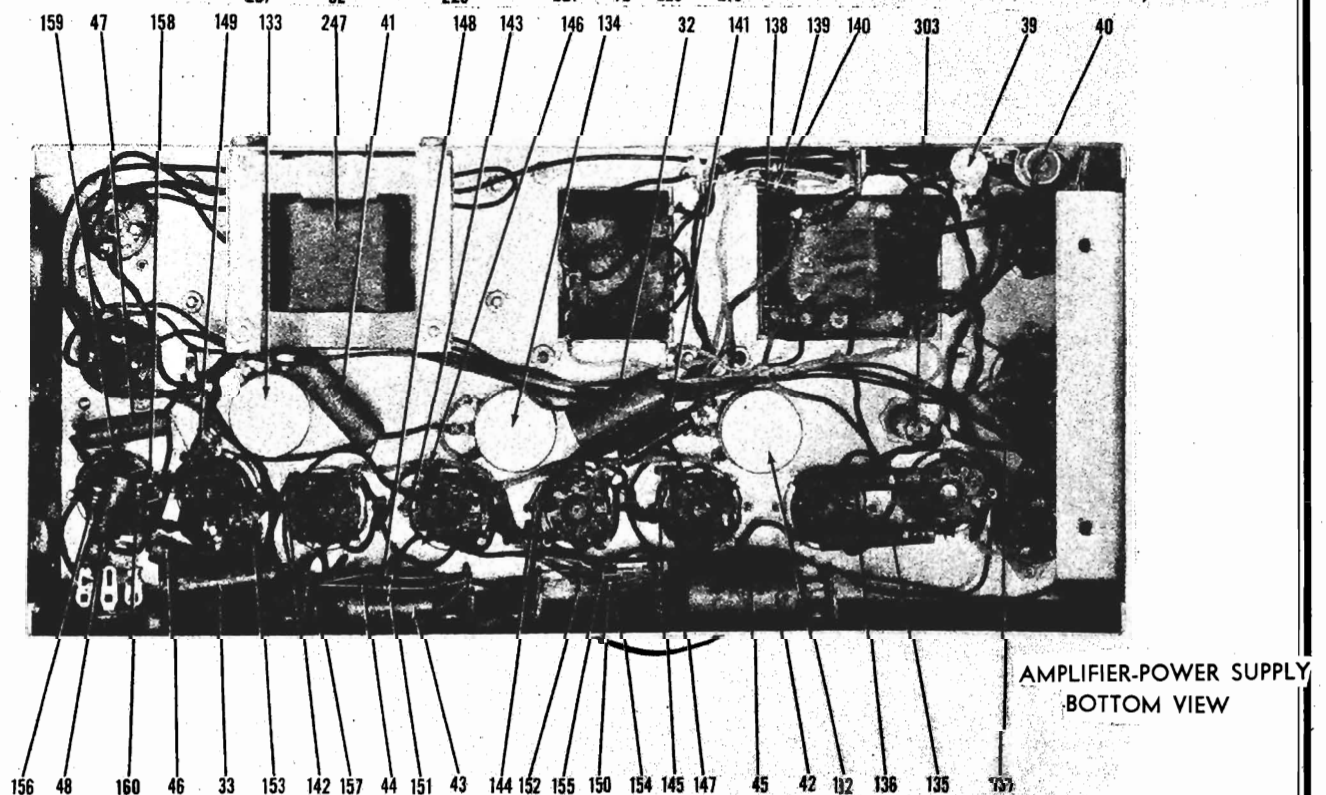
TUNER CHASSIS—TOP VIEW

MEISSNER MFG. DIV.
MAGUIRE INDUSTRIES, INC.

MODEL 2961



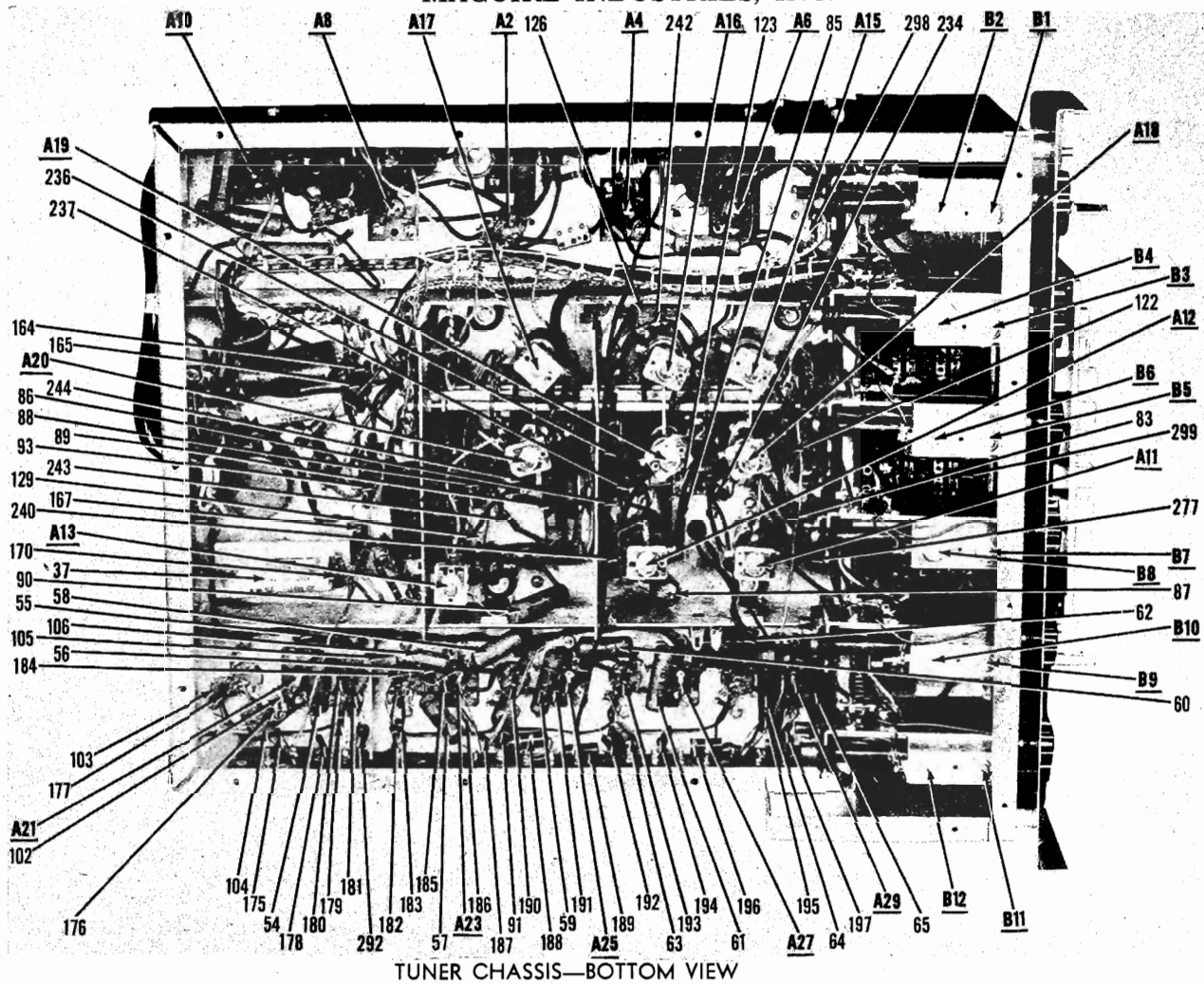
TUNER CHASSIS
BOTTOM VIEW



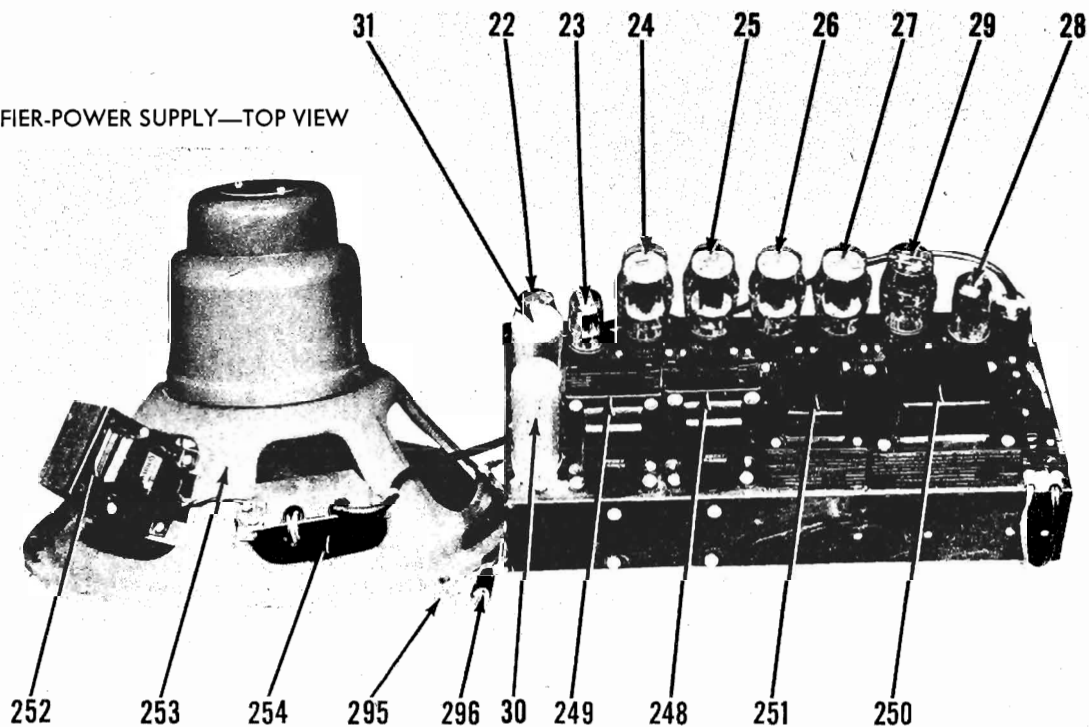
AMPLIFIER-POWER SUPPLY
BOTTOM VIEW

MODEL 2961

MEISSNER MFG. DIV.
MAGUIRE INDUSTRIES, INC.



AMPLIFIER-POWER SUPPLY—TOP VIEW



MEISSNER MFG. DIV.
MAGUIRE INDUSTRIES, INC.

MODEL 2961

Item No.	Part No.	Description	Item No.	Part No.	Description	Item No.	Part No.	Description
1	9003	AM RF Amplifier	57	28119	.01 Mfd. @ 400 v. AVC Filter	93	CM20A101K	100 MMF. @ 500 v. Tone Compensation
2	6BEG	AM Mixer	58	28119	.01 Mfd. @ 400 v. 3rd FM IF Screen Bypass	94	CM20A101K	100 MMF. @ 500 v. Phono Coupling
3	6C4	AM Osc.	59	28119	.01 Mfd. @ 400 v. 3rd FM IF Cathode	95	CM20A331K	330 MMF. @ 500 v. Tone Compensation
4	9003	AM 1st IF Amplifier	60	28119	Bypass	96	CM20A331K	330 MMF. @ 500 v. Tone Compensation
5	9003	AM 2nd IF Amplifier	61	28119	Bypass	97	CM30A272K	2700 MMF. @ 500 v. Tone Compensation
6	9002	AM Detector	62	28119	Bypass	98	CM20A121K	120 MMF. @ 500 v. Tone Compensation
7	6AG5	AM AVC Amplifier	63	28119	.01 Mfd. @ 400 v. 1st FM IF Screen Bypass	99	CM25A681K	680 MMF. @ 500 v. Tone Compensation
8	6AL5	AM Tuning eye-AVC Rectifier	64	28119	Supply	100	CM20A331K	330 MMF. @ 500 v. Tone Compensation
9	9003	AM Tuning eye Amplifier	65	28119	.01 Mfd. @ 400 v. AVC Filter	101	CM30A272K	2700 MMF. @ 500 v. Tone Compensation
10	6AG5	FM RF Amplifier	66	28103	.05 Mfd. @ 400 v. Tuning Eye Grid Filter	102	27166	50 MMF. @ 300 v. (Ceramic) Discriminator Filter
11	6AG5	FM Mixer	67	28117	.02 Mfd. @ 400 v. T.E. Amp. Screen Bypass	103	27166	50 MMF. @ 300 v. (Ceramic) Discriminator Filter
12	6C4	FM Osc.	68	28103	.05 Mfd. @ 400 v. T.E. Amp. Cathode	104	CM20A221M	220 M.M.F. @ 500 v. De-emphasis
13	6AG5	FM 1st IF Amplifier	69	28103	Bypass	105	CM20A220M	22 MMF. @ 500 v. Limiter Coupling
14	6AG5	FM 2nd IF Amplifier	70	28117	.02 Mfd. @ 400 v. AVC Amp. Plate Decoupling	106	CM20B470K	47 MMF. @ 500 v. 1st Limiter Grid Filter
15	6AG5	FM 3rd IF Amplifier	71	28113	.1 Mfd. @ 400 v. AVC Amp. Screen Bypass	107	28127	30 MMF. @ 300 v. (Ceramic) FM Osc. Grid
16	9001	FM 1st Limiter	72	28103	.05 Mfd. @ 400 v. AVC Amp. Cathode	108	28160	5 MMF. @ 300 v. (Ceramic) Fixed Trimmer
17	9001	FM 2nd Limiter	73	28117	Bypass	109	28124	120 MMF. @ 300 v. (Ceramic) FM RF Screen Bypass
18	6AL5	Discriminator	74	28117	.02 Mfd. @ 400 v. Detector Plate Bypass	110	28140	10 MMF. @ 300 v. (Ceramic) Osc. Coupling
19	6U5/6G5	Tuning Eye	75	28103	.05 Mfd. @ 400 v. 2nd AM IF Cathode	111	28125	1000 MMF. @ 500 v. (Ceramic) FM Mixer Screen Bypass
20	9002	Phono Amplifier	76	28109	.01 Mfd. @ 400 v. 2nd AM IF Grid Filter	112	28126	120 MMF. @ 300 v. (Ceramic) RF Coupling
21	9002	1st Audio Amplifier	77	28113	.1 Mfd. @ 400 v. Screen Bypass	113	28125	1000 MMF. @ 500 v. (Ceramic) FM RF Plate Decoupling
22	615GT	Phase Inverter	78	28103	.05 Mfd. @ 400 v. 1st AM IF Cathode	114	28120	500 MMF. @ 300 v. (Ceramic) FM Osc. Plate Bypass
23	6SN7GT	Driver	79	28113	Bypass	115	28126	120 MMF. @ 300 v. (Ceramic) FM RF Grid Filter
24	6L6GA	Power Output	80	28119	.01 Mfd. @ 400 v. RF Bypass Power Supply	116	CM20A271K	270 MMF. @ 500 v. (Ceramic) T.E. Diode Filter
25	6L6GA	Power Output	81	28117	.02 Mfd. @ 400 v. 1st AM IF Grid Filter	117	CM20A150M	15 MMF. @ 500 v. (Ceramic) T.E. Amp. Coupling
26	6L6GA	Power Output	82	28103	.05 Mfd. @ 400 v. RF Bypass Power Supply	118	CM20A471M	470 MMF. @ 500 v. (Ceramic) AVC Diode Filter
27	6L6GA	Power Output	83	28119	.01 Mfd. @ 400 v. AM Osc. Plate Bypass	119	CM20A271K	270 MMF. @ 500 v. (Ceramic) IF Filter
28	5Y3G	Rectifier	84	28103	.05 Mfd. @ 400 v. AVC Filter	120	CM20A271K	270 MMF. @ 500 v. (Ceramic) IF Filter
29	5V4G	Rectifier	85	28103	.05 Mfd. @ 400 v. AM Mixer Screen Bypass	121	CM20A150M	15MMF. @ 500 v. (Ceramic) AM—AVC Coupling
30	20171	20-20 Mfd. @ 450 v. Filter Capacitor	86	28103	.05 Mfd. @ 400 v. AM Mixer Cathode	122	CM20A101M	100 MMF. @ 500 v. (Ceramic) Osc. Grid Capacitor
31	20171	20-20 Mfd. @ 450 v. Filter Capacitor	87	28113	.1 Mfd. @ 400 v. AM RF Plate Decoupling	123	CM20A470M	47 MMF. @ 500 v. (Ceramic) Osc. Coupling
32	28106	50 Mfd. @ 50 v. Cathode Bypass	88	28103	.05 Mfd. @ 400 v. AM RF Screen Bypass	124	CM20A231J	230 MMF. @ 500 v. (Ceramic) Fixed Trimmer
33	28109	10 Mfd. @ 450 v. Phase Inverter Decoupling	89	28103	.05 Mfd. @ 400 v. AM RF Cathode Bypass	125	CM20A112M	1100 MMF. @ 300 v. (Ceramic) Osc. Cathode Bypass
34	28109	10 Mfd. @ 450 v. 1st Audio Plate Decoupling	90	28132	.025 Mfd. @ 400 v. AVC Filter	126	CM20A471M	470 MMF. @ 500 v. (Ceramic) RF Coupling
35	28105	25 Mfd. @ 25 v. 1st Audio Cathode Bypass	91	28119	.01 Mfd. @ 400 v. RF Bypass Power Supply			
36	28109	10 Mfd. @ 450 v. Phono Amp. Plate Decoupling	92	28103	.05 Mfd. @ 400 v. T.E. Amp. Plate Decoupling			
37	28105	25 Mfd. @ 25 v. Phono Amp. Cathode Bypass						
38	28109	10 Mfd. @ 450 v. AM Detector Plate Bypass						
39	28172	.05 Mfd. @ 600 v. Line Bypass						
40	28172	.05 Mfd. @ 600 v. Line Bypass						
41	28113	.1 Mfd. @ 600 v. Filament Bypass						
42	28112	.1 Mfd. @ 600 v. Tone Compensation						
43	28101	.01 Mfd. @ 600 v. Audio Coupling						
44	28101	.01 Mfd. @ 600 v. Audio Coupling						
45	28112	.1 Mfd. @ 600 v. Tone Compensation						
46	28101	.01 Mfd. @ 600 v. Audio Coupling						
47	28101	.01 Mfd. @ 600 v. Audio Coupling						
48	28119	.05 Mfd. @ 400 v. Audio Coupling						
49	28103	.05 Mfd. @ 400 v. Audio Coupling						
50	28112	.1 Mfd. @ 600 v. Audio Coupling						
51	28130	.02 Mfd. @ 200 v. Tone Compensation						
52	28129	.01 Mfd. @ 200 v. Tone Compensation						
53	28102	.1 Mfd. @ 600 v. Tone Compensation						
54	28119	.01 Mfd. @ 400 v. 2nd Limiter Plate Decoupling						
55	28119	.01 Mfd. @ 400 v. 2nd Limiter Screen Bypass						
56	28119	.01 Mfd. @ 400 v. 1st Limiter Screen Bypass						

MODEL 2961

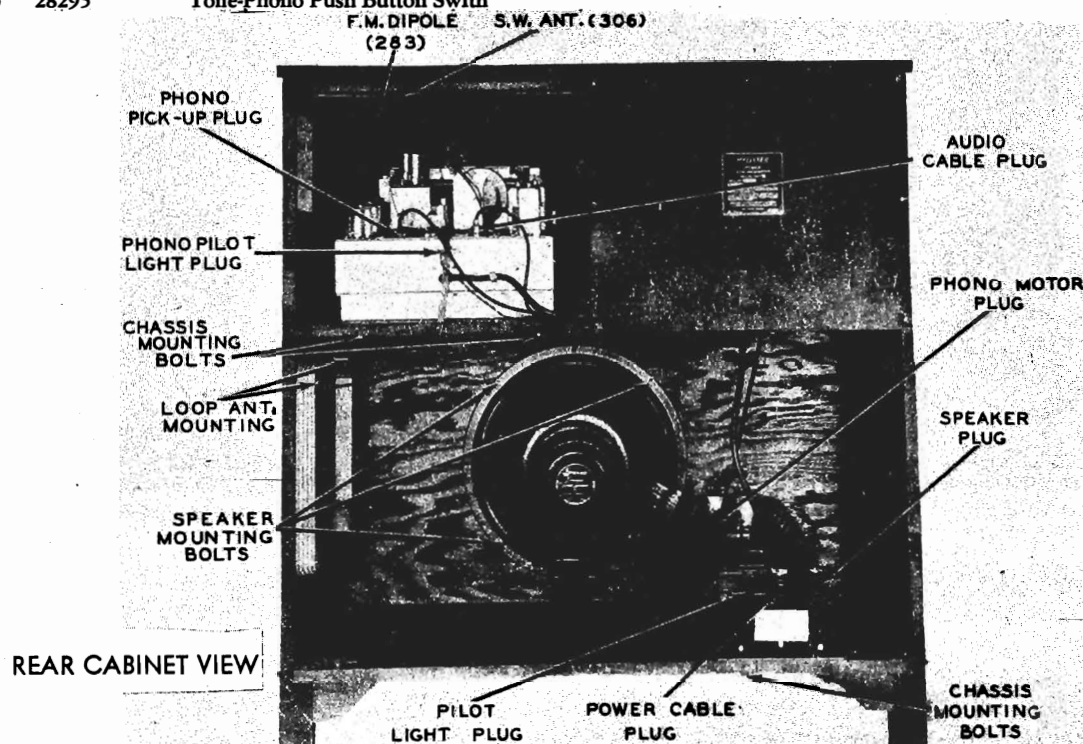
MEISSNER MFG. DIV.
MAGUIRE INDUSTRIES, INC.

Item No.	Part No.	Description	Item No.	Part No.	Description	Item No.	Part No.	Description
128	CM20A100M	10 MMF @ 500 v. (Ceramic) Ant. Coupling	169	RC20AE223M	22K ohm 1/2 w. Phono Amp. Plate Decoupling	214	RC20AE153K	15K ohm 2 w. Delayed AVC Bleeder Network
129	CM20A181K	180 MMF. @ 500 v. (Ceramic) Ant. Coupling	170	RC20AE102M	100K ohm 1/2 w. Phono Amp. Cathode	215	RC20AE102M	1000 ohm 1/2 w. Delayed AVC Bleeder Network
130	29232	500 K ohm 1 w. (Ceramic) Volume Control and Switch	171	RC20AE475K	4.7 Meg. 1/2 w. Tone Compensation	216	RC20AE684K	680K ohm 1/2 w. IF Filter
131	29260	100 ohm 2 w. (Ceramic) Hum Balance Control	172	RC20AE475M	470K ohm 1/2 w. Bleeder	217	RC20AE224M	220K ohm 1/2 w. AVC Diode Load
132	29260	100 ohm 2 w. (Ceramic) Bias Balance Control	173	RC20AE102M	100K ohm 1 w. Bleeder	218	RC20AE474M	470K ohm 1/2 w. AVC Network
133	29260	100 ohm 2 w. (Ceramic) Hum Balance Control	174	RC20AE104M	100K ohm 1/2 w. De-emphasis Network	219	RC20AE102M	1000 ohm 1/2 w. AVC Amp. Plate Decoupling
134	29259	100 ohm 2 w. (Ceramic) Hum Balance Control	175	RC20AE104J	100K ohm 1/2 w. Discriminator Diode Load	220	RC20AE473J	47K ohm 1/2 w. AVC Amp. Screen Dropping
135	28123	82 ohm 2 w. (Ceramic) Feed-back Balance Control	176	RC20AE104J	100K ohm 1/2 w. Discriminator Diode Load	221	RC20AE221M	220 ohm 1/2 w. AVC Amp. Cathode
136	28123	82 ohm 2 w. (Ceramic) Rectifier Ballast	177	RC20AE152M	1500 ohm 1/2 w. 2nd Limiter Plate Decoupling	222	RC20AE474M	470K ohm 1/2 w. AVC Amp. Grid
137	RC40AE68M	68K ohm 2 w. (Ceramic) Rectifier Ballast	178	RC20AE223M	22K ohm 1/2 w. 2nd Limiter Screen Dropping	223	RC20AE154M	150K ohm 1/2 w. AM Detector Cathode
138	RC30AE183K	18K ohm 1 w. (Ceramic) Bleeder	179	RC20AE223M	22K ohm 1/2 w. 2nd Limiter Screen Dropping	224	RC40AE153M	15K ohm 1/2 w. IF Filter
139	RC30AE183K	18K ohm 1 w. (Ceramic) Bleeder	180	RC20AE223M	22K ohm 1/2 w. 2nd Limiter Screen Dropping	225	RC40AE153M	15K ohm 1/2 w. AM Detector Plate Load
140	RC30AE68K	6800 ohm 1 w. (Ceramic) Bleeder	181	RC20AE154K	150K ohm 1/2 w. 2nd Limiter Grid	226	RC20AE102M	1000 ohm 1/2 w. 2nd AM IF Plate Decoupling
141	27195	240 ohm 5 w. (Ceramic) Output Cathode	182	RC20AE103M	10K ohm 1/2 w. 1st Limiter Plate Load	227	RC20AE471M	470 ohm 1/2 w. 2nd AM IF Cathode
142	RC20AE102M	1000 ohm 1/2 w. (Ceramic) Parasitic Suppressor	183	RC20AE223M	22K ohm 1/2 w. 1st Limiter Screen Dropping	228	RC20AE104M	100K ohm 1/2 w. AVC Network
143	RC20AE102M	1000 ohm 1/2 w. (Ceramic) Parasitic Suppressor	184	RC20AE223M	22K ohm 1/2 w. 1st Limiter Screen Dropping	229	RC30AE473K	47K ohm 1 w. AM IF Screen Dropping
144	RC20AE102M	1000 ohm 1/2 w. (Ceramic) Parasitic Suppressor	185	RC20AE473M	47K ohm 1/2 w. 1st Limiter Screen Dropping	230	RC20AE471M	470 ohm 1/2 w. 1st AM IF Cathode
145	RC20AE102M	1000 ohm 1/2 w. (Ceramic) Parasitic Suppressor	186	RC20AE225M	2.2 Meg. 1/2 w. A V C Network	231	RC20AE104M	100K ohm 1/2 w. AVC Network
146	RC20AE224J	220K ohm 1/2 w. (Ceramic) Output Grid	187	RC20AE152M	1500 ohm 1/2 w. 3rd FM IF Plate Decoupling	232	RC20AE474M	470K ohm 1/2 w. AVC Network
147	RC20AE224J	220K ohm 1/2 w. (Ceramic) Output Grid	188	RC40AE222K	2700 ohm 2 w. Voltage Dropping	233	RC20AE102M	1000 ohm 1/2 w. AM Mixer Plate Decoupling
148	RC20AE104J	100K ohm 1/2 w. (Ceramic) 1st Driver Plate Load	189	RC40AE222K	2200 ohm 2 w. Voltage Dropping	234	PC30AE153M	15K ohm 1 w. AM Osc. Plate Load
149	RC20AE474M	470K ohm 1/2 w. (Ceramic) 1st Driver Grid	190	RC20AE121K	120 ohm 1/2 w. 3rd FM IF Cathode	235	RC20AE473M	47K ohm 1/2 w. AM Osc. Grid
150	RC20AE222K	2200 ohm 1/2 w. (Ceramic) 1st Driver Cathode	191	RC20AE332M	3300 ohm 1/2 w. 3rd FM IF Grid	236	RC40AE223K	22K ohm 2 w. AM Mixer Screen Dropping
151	RC20AE104J	100 K ohm 1/2 w. (Ceramic) 2nd Driver Plate Load	192	RC20AE103M	10K ohm 1 w. 2nd FM IF Plate Decoupling	237	RC20AE223K	22K ohm 1/2 w. AM Mixer Injector Grid
152	RC20AE222K	2200 ohm 1/2 w. (Ceramic) 2nd Driver Cathode	193	RC20AE121K	120 ohm 1/2 w. 2nd FM IF Cathode	238	RC20AE181K	180 ohm 1/2 w. AM Mixer Cathode
153	RC20AE474M	470K ohm 1/2 w. (Ceramic) 2nd Driver Grid	194	RC20AE103M	10K ohm 1 w. 1st FM IF Plate Decoupling	239	RC20AE225M	2.2 Meg. 1/2 w. AM Mixer Signal Grid
154	RC20AE753J	75K ohm 1/2 w. (Ceramic) Feed-back	195	RC20AE104M	100K ohm 1/2 w. AVC Network	240	RC20AE332K	3300 ohm 1/2 w. BCRF Coil Shunt
155	RC20AE753J	75K ohm 1/2 w. (Ceramic) Feed-back	196	RC40AE471K	470 ohm 2 w. Decoupling	241	RC20AE102M	1000 ohm 1/2 w. AM RF Plate Decoupling
156	RC20AE473J	47K ohm 1/2 w. (Ceramic) Phase Inverter Plate Load	197	RC20AE473K	47K ohm 1/2 w. FM Mixer Plate Decoupling	242	RC20AE152M	1500 ohm 1/2 w. AM RF Plate Load (Push Button)
157	RC20AE223M	22K ohm 1/2 w. (Ceramic) Phase Inverter Plate Decoupling	198	RC20AE333K	33K ohm 1/2 w. FM Oscillator Grid	243	RC20AE104M	100K ohm 1/2 w. AM RF Screen Dropping
158	RC20AE333K	3300 ohm 1/2 w. Phase Inverter Cathode	199	RC40AE123K	12K ohm 2 w. FM Oscillator Plate Load	244	RC20AE471M	470 ohm 1/2 w. AMRF Cathode
159	RC20AE473J	47K ohm 1/2 w. Phase Inverter Grid	200	RC20AE473K	47K ohm 1/2 w. FM Mixer Screen Dropping	245	RC20AE104M	100K ohm 1/2 w. AVC Network
160	RC20AE473J	47K ohm 1/2 w. Phase Inverter Cathode	201	RC20AE223M	22K ohm 1/2 w. FM Mixer Screen Dropping	246	RC20AE103M	1 Meg. 1/2 w. Tuning Eye Plate Load
161	RC20AE124K	120K ohm 1/2 w. Tone Compensation	202	RC20AE472M	4700 ohm 1/2 w. FM Mixer Cathode	247	29224	4.5 Henries 75 ohm D.C. Resis. Filter Choke
162	RC20AE393K	39K ohm 1/2 w. Tone Compensation	203	RC40AE473K	47K ohm 1/2 w. FM RF Screen Dropping	248	29227	9 Henries 170 ohm D.C. Resis. Filter Choke
163	RC20AE183K	18K ohm 1/2 w. Audio Amp. Plate Load	204	RC20AE473K	47K ohm 1/2 w. FM RF Screen Dropping	249	29227	9 Henries 170 ohm D.C. Resis. Filter Choke
164	RC20AE153M	15K ohm 1/2 w. Audio Amp. Plate Decoupling	205	RC20AE104M	100K ohm 1/2 w. AVC Network	250	29225	(Power Xfmr.) 117 VAC @ 1.16 A-760 VCT @ 210A-4.9 VAC @ 1.8A-4.9 VAC @ 2.0A
165	RC20AE561K	560 ohm 1/2 w. Audio Amp. Cathode	206	RC20AE103M	1 Meg. 1/2 w. Tuning Eye Grid Filter	251	29226	(Filament Xfmr.) 117 VAC @ .64A-6.6 VAC @ .3A-6.4 VAC @ 4.3A-6.4 AC @ 4.5A
166	RC20AE333K	33K ohm 1/2 w. Tone Compensation	207	RC20AE473K	47K ohm 1/2 w. Tuning Eye Diode Load	252	29290	(Output Xfmr.) Pri. -3500 ohm CT., Secondary -22 ohm
167	RC20AE474K	470K ohm 1/2 w. Tone Compensation	208	RC20AE102M	1000 ohm 1/2 w. Tuning Eye Amp. Plate Decoupling	253	29220-2	(DC Resist. Pri. -110 ohm CT., Secondary 9 ohm)
168	28137	27K ohm 1/2 w. Phono Amp. Plate Load	209	RC20AE474M	470K ohm 1/2 w. Tuning Eye Amp. Screen Dropping	254	None	Speaker 15" P.M. 16 ohm Voice Coil Impedance
			210	RC20AE471M	470 ohm 1/2 w. Tuning Eye Amp. Cathode			Speaker Cone — Cone Diam. 14 1/4" — Voice Coil Diam. 2 1/2"
			211	RC20AE104M	100K ohm 1/2 w. Tuning Eye Amp. Grid			
			212	RC20AE333M	3.3 Meg. 1/2 w. Tuning Eye Amp. Grid			
			213	RC20AE183K	18 K ohm 2 w. Delayed AVC Bleeder Network			

**MEISSNER MFG. DIV.
MAGUIRE INDUSTRIES, INC.**

MODEL 2961

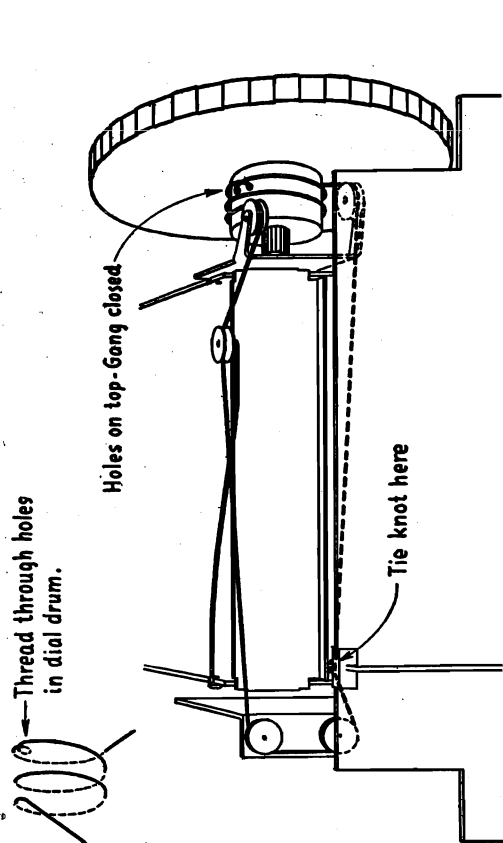
Item No.	Part No.	Description	No. Item	Part No.	Description
255	04751	Loop Antenna	301	27168	Tuning Capacitor
256	04607	B.C. Antenna Coil	302	04638	FM Tuner Shaft and Vanes
257	04672	Push-Button Antenna Coil	303	29276	Fuse
258	04672	Push-Button Antenna Coil	304	RC20AE105M	1 Meg. 1/2 Watt Tone Compensation
259	04672	Push-Button Antenna Coil	305	RC20AE273K	27 K ohm AM Det. Series Audio 1/2 Watt
260	04672	Push-Button Antenna Coil			
261	04672	Push-Button Antenna Coil	306		SW Antenna Hank
262	04672	Push-Button Antenna Coil		24294	Fuse Holder
263	04610	S.W. Ant. Coil Band 1		04724	Input Cable Assembly (Consists of plug 29292A, shell 29292B, and 72" of single conductor shielded cable 228-50)
264	04613	S.W. Ant. Coil Band 2			
265	04608	B. C. RF Coil			
266	04611	S.W. RF Coil Band 1		04728	8-Conductor Cable Assembly (Consists of plug 29202A and 42" of 8-Conductor Cable 22857)
267	04614	S.W. RF Coil Band 2			
268	04609	B. C. Osc. Coil			
269	04673	Push-Button Osc. Coil	A13	17057	Trimmer Capacitor
270	04673	Push-Button Osc. Coil	A14	17066	Padder Capacitor (6 plate)
271	04673	Push-Button Osc. Coil		29255	Tuning Eye Socket and Cable
272	04673	Push-Button Osc. Coil	A32	17062	Trimmer Capacitor (FM RF)
273	04673	Push-Button Osc. Coil	A33	17062	Trimmer Capacitor (FM Ant.)
274	04673	Push-Button Osc. Coil	A31	17060	Trimmer Capacitor (FM Osc.)
275	04612	S.W. Osc. Coil Band 1		04598	FM Drive Pulley Assembly
276	04615	S.W. Osc. Coil Band 2		04674	Pulley and Bracket Assembly (Band Selector Drive Cord)
277	04650	Osc. Cathode Coil			
278	04216	AM Input IF		29274	Dial Light Socket
279	04216	AM Interstage IF		29221	Dial Light Socket
280	04238	AM Output IF		12491	24-inch Cable and Shield (shield outside)
281	04238	AVC IF			
282	04421	Tuning Eye IF		04515	Complete assembly—single permeability tuner
283	04878	FM Antenna			
284	04590	FM Antenna Coil		22850	12-inch shielded lead-insulated cover. This lead connects between the push-button switch and the band selector switch. It is a part of the tuned circuit and exact replacement must be employed.
285	04590	FM RF Coil			
286	04590	FM Osc. Coil			
287	04193	FM Input IF			
288	04193	FM Interstage IF			
289	04193	FM Output IF			
290	04193	Limiter Transformer		04332	Cover Plate
291	04194	Discriminator Transformer		19665	Pulley, dial drive, small hole
292	04588	Filament RF Choke		04592	Pulley, dial drive, large hole
293	29262	Dial Light Type 44		04507	Dial Scale
294	29262	Dial Light Type 44		04556	Dial Backing
295	29262	Dial Light Type 44		19795	Dial Light Shield
296	29262	Dial Light Type 44		04329-B	Push-Button Knobs (Ivory)
297	04179	Band Switch		04559-B	Push-Button escutcheon (Ivory)
298	28299	Selectivity Switch		04353-A	Pointer Knobs, Push-Button Setup
299	28294	Station Selector Push Button Assembly		29278	Push-Button Call Letters (set)
300	28295	Tone-Phono Push Button Switch			



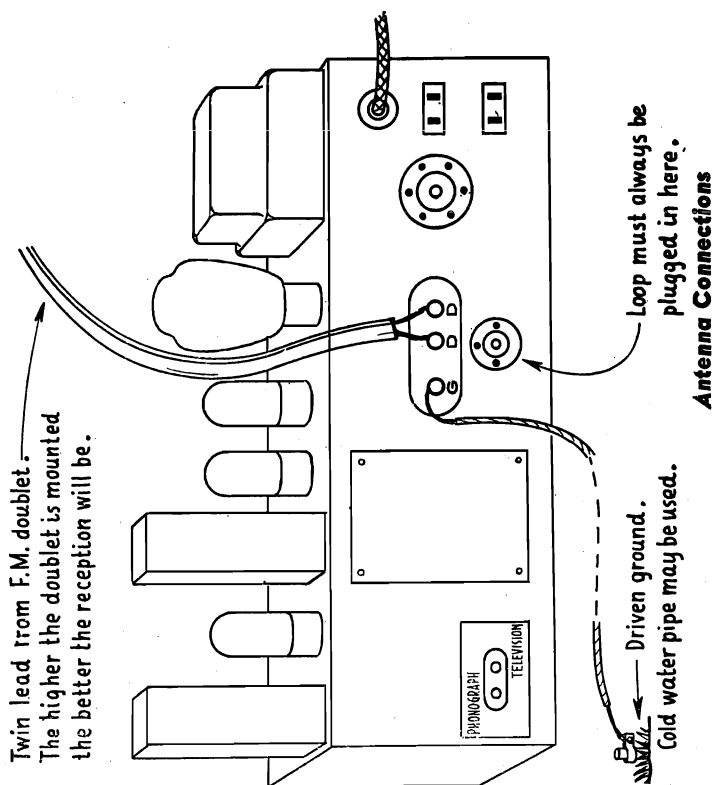


MODELS RB-12, SC-12,
922, CHASSIS LC-12

MIDWEST RADIO CORP.



Series 12 Dial Stringing



ALIGNMENT — Refer to the alignment chart for step by step procedure. It is preferable to align the FM IF stages with an AM or CW Signal. It should be noted that all adjustments are made for peak avc reading except the secondary of the third transformer. At this point, if you use an AM signal, it may be tuned for minimum audio signal; or the discriminator voltage may be used, reading it with a VTVM, and the secondary may be adjusted to the zero voltage. There may be some discrepancy between these methods, and if it is not excessive, is of no importance.

The FM RF alignment should be made using an FM signal and either avc or audio for peaking. In doing this alignment, or when feeding the IF signal into the FM mixer grid, care must be taken not to move the wiring. If the wiring is displaced so as to affect the inductance of the RF circuits it is difficult to re-establish the RF-Oscillator tracking.

The AM, RF and IF alignment should be done with a VTVM across the avc. The recommended signal value is one which will generate 10 volts of avc. When aligning the "AM" band the loop must be plugged in and you need not adjust the RF padder core. The RF padder is very broad and can be aligned only if the converter grid lead is connected to an RF type VTVM as indicator; this will usually involve a signal level greater than is normally available.

ALIGNMENT CHART

Coupling	Signal	Band Switch	Dial	Adjustment
To 7Q7 converter grid through .05 mfd. capacitor.	456 KC AM	AM	1000 KC	Peak 1st, 2nd and 3rd IF trimmers on top of IF cans.
To "A" on antenna ground terminal strip through 200 mfd. and 400 ohms in series.	1600 KC AM	AM	1600 KC	Peak RF, converter and oscillator trimmers marked "B".
	550 KC AM	AM	550 KC	Peak converter and oscillator padder cores marked "B". Loop must be plugged in. Do not adjust RF.
To 6BE6 mixer grid direct.	10.7 MC AM or CW*	FM	100 MC	Peak core adjustments for avc (around 3 volts) at 1st, 2nd and primary of 3rd IF. Adjust secondary of 3rd IF for audio null from 30% amplitude modulated 10.7 MC IF signal.
To "A" and "A" on doublet terminal strip through a pair 150 ohm resistors.	105 MC FM	FM	105 MC	Peak RF mixer and oscillator trimmers for avc or audio.

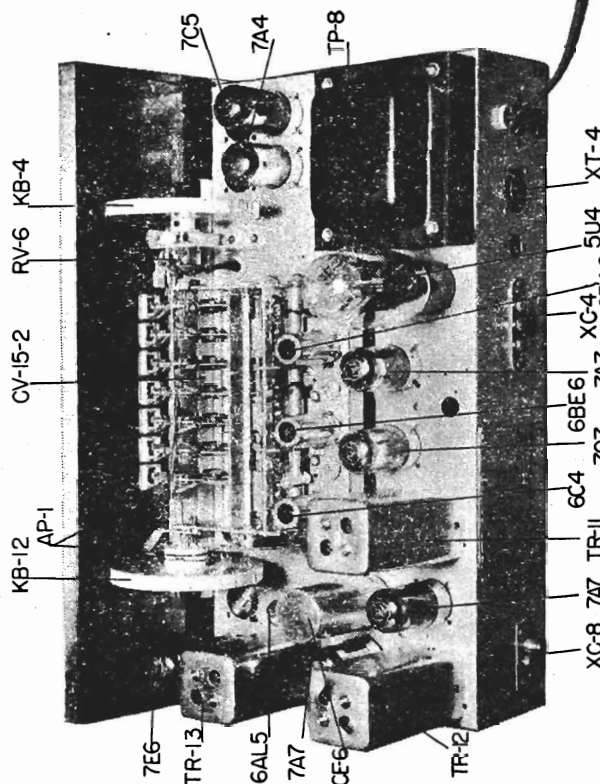
*Read text for use of CW for FM-IF alignment.

DIAL STRINGING — Use a light weight flexible dial cord when replacing worn or broken cord such as Beven-Wilcox FSN-25-12.

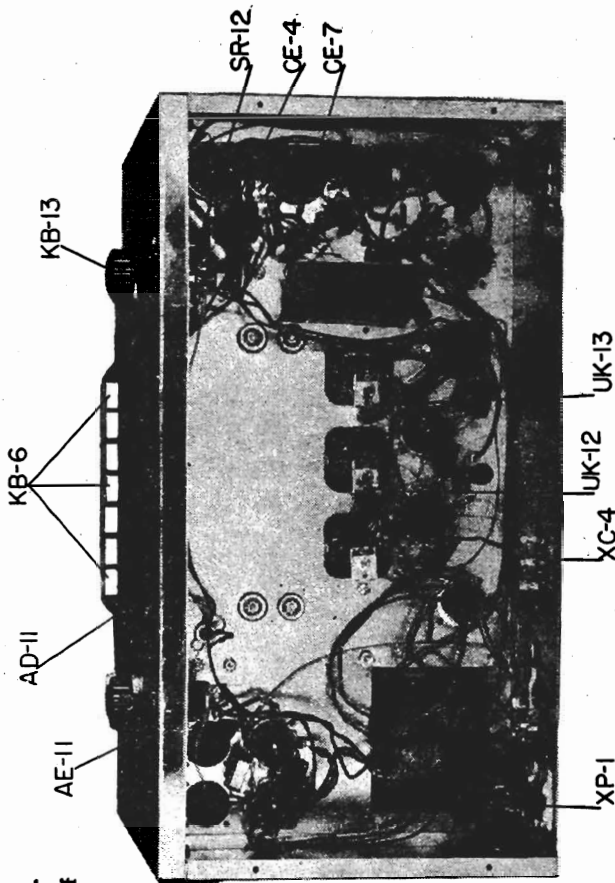
MIDWEST RADIO CORP.

MODELS RB-12, SC-12,
Q22, CHASSIS LC-12

Note: Order resistors and condensers by value, tolerance and wattage or voltage.
Note: When ordering include serial number of chassis, since Midwest records of changes in parts specifications are kept by that number.



Top View of Series 12 Chassis



Bottom View of Series 12 Chassis

To set the push buttons this exact procedure should be followed. A small screw driver will be needed.

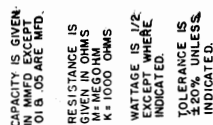
1. Turn on the receiver and allow at least three minutes to warm up.
2. Remove the push button by pulling straight out. A hooked instrument will assist in removing the end buttons.
3. Loosen the LOCK SCREW at least one half turn.
4. Using the screw driver with the blade in the screw slot, push the mechanism in firmly. Hold in during step 5. The mechanism may bind at first. Use sufficient force to break loose so that the push button and tuning control are independent.
5. Tune the pointer past the desired station then back to the desired station and make the tuning adjustment as carefully as you know how.
6. Tighten the LOCK SCREW.
7. Check the setting of this push button by tuning away from the station manually, then pushing in firmly. Pushing the button must return the pointer to the position it had when the LOCK SCREW was tightened. If the station is not now tuned in perfectly repeat the steps 2 to 6 carefully.
8. Adjust each of the seven buttons, or as many as you wish to set, exactly as outlined above.

Any button can be set for any pointer position, however, you may find it more desirable to select the button nearest the pointer position so that each successive adjustment moves the pointer in the same direction. That is, the "M" button will be set for a station at the left of the dial, the "W" button will set for a station near the center, etc.

PARTS LIST

Part	Description
AD-11	Glass Dial
AE-11	Escutcheon
AP-1	Wood Pulley
AP-21	Pointer
AS-1	Wood Pulley Stud
CE-6	Filter Condenser 40-40
CE-4	Cathode Bypass 40 mfd. 25v
CE-7	Electrolytic 8 mfd. 150v
*CV-15-2	Tuning Gang
EG-5	Speaker Grommet
ES-12	Miniature Tube Shield
HE-7	Speaker Mtg. Eyelet
IL-1	Panel Lamp 6-8v
KB-4	Volume Knob
KB-12	Tuning Knob
KB-13	Tone & Band Knob
KB-6	Push Buttons, Set of 7
OG-1	Miter Gear, Pair
PC-3	Loop Plug
PC-5	Phono & Television Plug
RV-5	Tone Control
RV-6	Volume Control
SP-5	Speaker
SR-12	Band Switch
TP-8	Power Transformer
*TR-11	1st IF Transformer
*TR-12	2nd IF Transformer
*TR-13	3rd IF Transformer
*UK-12	Mixer Coil Assembly
*UK-13	Oscillator Coil Assembly

PAGE 19-4 MIDWEST	
MODELS RB-16, SC-16, 916, CHASSIS LB-16	MIDWEST RADIO CORP.



MIDWEST RADIO CORP.

MODELS RB-16, SC-16,
916, CHASSIS LB-16

ALIGNMENT — Refer to the alignment chart for step by step procedure. It is preferable to align the FM IF stages with an AM or CW Signal. It should be noted that all adjustments are made for peak avc reading except the secondary of the third transformer. At this point, if you use an AM signal, it may be tuned for minimum audio signal; or the discriminator voltage may be used, reading it with a VTVM, and the secondary may be adjusted to the zero voltage. There may be some discrepancy between these methods, and if it is not excessive, is of no importance.

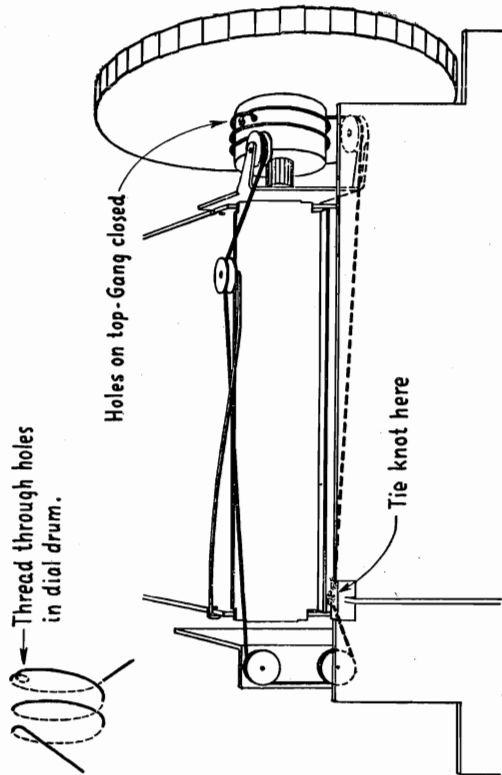
The FM RF alignment should be made using an FM signal and either avc or audio for peaking. In doing this alignment, or when feeding the IF signal into the FM mixer grid, care must be taken not to move the wiring. If the wiring is displaced so as to affect the inductance of the RF circuits it is difficult to re-establish the RF-Oscillator tracking.

The AM, RF and IF alignment should be done with a VTVM across the avc. The recommended signal value is one which will generate 10 volts of avc. When aligning the "B" band the loop must be plugged in and you need not adjust the RF padder core. The RF padder is very broad and can be aligned only if the converter grid lead is connected to an RF type VTVM as indicator; this will usually involve a signal level greater than is normally available.

ALIGNMENT CHART

Coupling	Signal	Band Switch	Dial	Adjustment
To 7Q7 converter grid through .05 mfd. capacitor.	456 KC AM	B	1000 KC	Peak 1st, 2nd and 3rd IF trimmers on top of IF cans.
To "D" on antenna ground terminal strip through 200 mfd. and 400 ohms in series.	1600 KC AM	B	1600 KC	Peak RF, converter and oscillator trimmers marked "B".
	550 KC AM	B	550 KC	Peak converter and oscillator padder cores marked "B". Loop must be plugged in. Do not adjust RF.
	4.7 MC AM	C	4.7 MC	Peak "C" trimmers.
	1.6 MC AM	C	1.6 MC	Peak "C" cores.
	10 MC AM	D	10 MC	Peak "D" trimmer
	5 MC AM	D	5 MC	Peak "D" cores.
	22 MC AM	E	22 MC	Peak "E" trimmer.
	11.5 MC AM	E	11.5 MC	Peak "E" cores.
To 6BE6 mixer grid direct.	10.7 MC AM or CW	A	100 MC	Peak core adjustments for avc (around 3 volts) at 1st, 2nd and primary of 3rd IF. Adjust secondary of 3rd IF for audio null from 30% amplitude modulated 10.7 MC IF signal.
To "D" and "D" on doublet terminal strip above "A-G" strip through a pair 150 ohm resistors.	105 MC FM	A	105 MC	Peak RF mixer and oscillator trimmers for avc or audio.

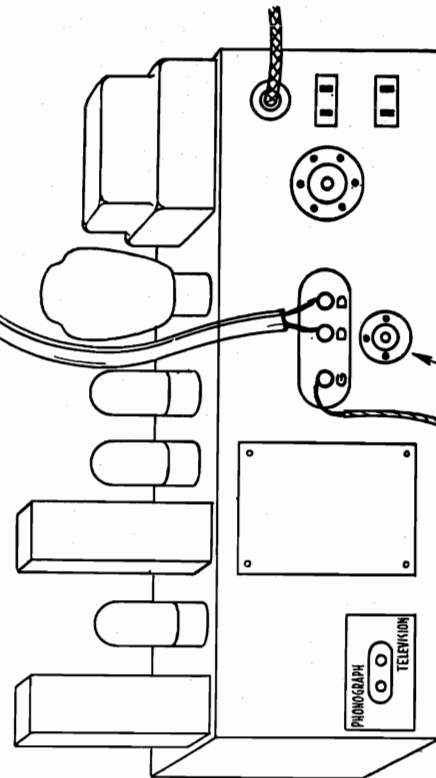
Read text for use of CW for FM-IF alignment.



Dial Stringing

DIAL STRINGING — Use a light weight flexible dial cord when replacing worn or broken cord such as Beven-Wilcox FSN-25-12.

Twin lead from F.M. doublet.
The higher the doublet is mounted the better the reception will be.

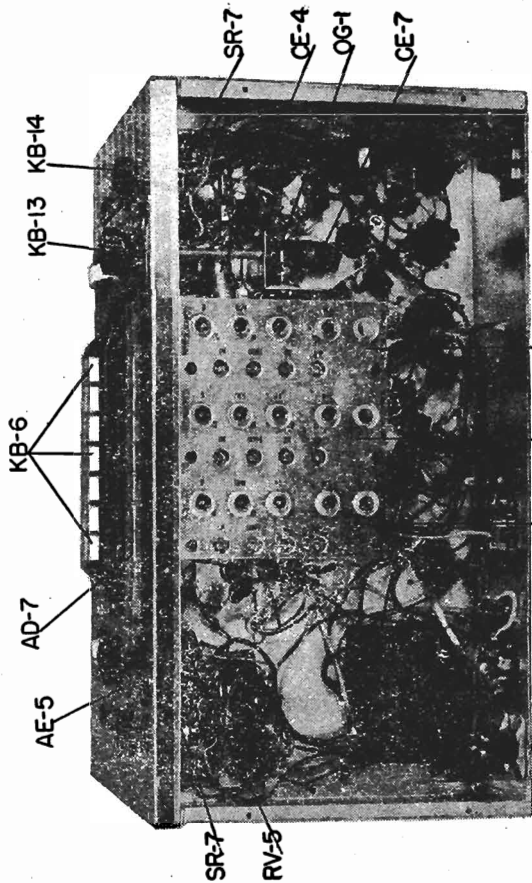


Antenna Connections
Loop must always be plugged in here.

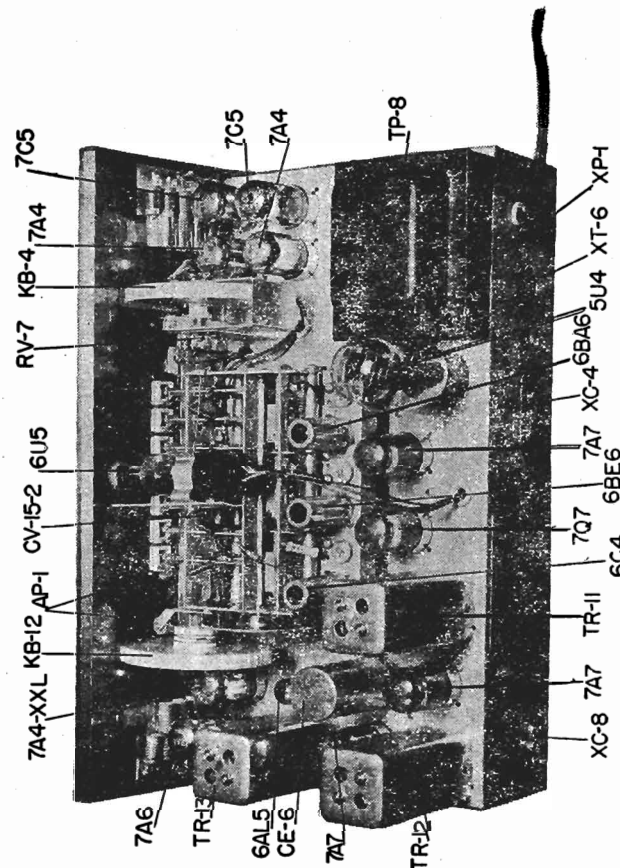
Driven ground.
Cold water pipe may be used.

MODELS RB-16, SC-16,
916, CHASSIS LB-16

MIDWEST RADIO CORP.



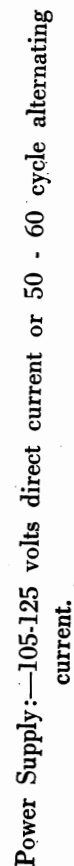
Bottom View of Series 16 Chassis



Top View of Series 16 Chassis

Part	Description	Part	Description
AD-6	Short Wave Dial	EG-5	Speaker Grommet
AD-7	Glass Dial	ES-12	Miniature Tube Shield
AD-9	Tone Disc Assembly	HE-7	Speaker Mtg. Eyelet
AD-10	Selector Disc Assembly	HL-1	Panel Lamp 6-8v
AE-5	Escutcheon	KB-4	Volume Knob
AP-1	Wood Pulley	KB-12	Tuning Knob
AP-21	Pointer	KB-13	Tone & Band Knob
AS-1	Wood Pulley Stud	KB-14	Tone & Selector Knob, Small
CE-6	Filter Condenser 40-40	KB-6	Push Buttons, Set of 7
CE-4	Cathode Bypass 40 mfd. 25v	OG-1	Miter Gear, Pair
CE-7	Electrolytic 8 mfd. 150v	PC-3	Loop Plug
CV-15-2	Tuning Gang	PC-5	Phono & Television Plug
RV-5	Tone Control		
RV-7	Volume Control		
SP-2	Speaker		
TP-8	Power Transformer		
TR-11	1st IF Transformer		
TR-12	2nd IF Transformer		
TR-13	3rd IF Transformer		
UK-8	R.F. Coil plate		
UK-9	Mixer coil plate		
UK-10	Oscillator coil plate		

REPLACEMENT PARTS — Certain parts are available on an exchange basis; these are shown on the parts list with an "x".



MODEL W-725

MINERVA CORP. OF AMERICA

ANTENNA

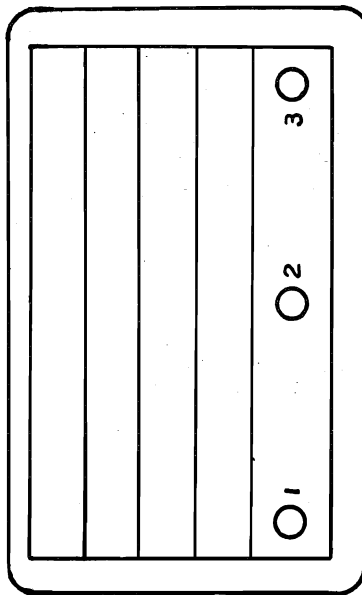
This receiver contains a built-in loop Antenna of excellent design and will give good results even in localities where broadcast signals are weak. It may be necessary, however, to turn the set toward the direction of the desired signal to provide maximum loop pick-up. For best reception of distant stations an external Antenna should be used. A screw connector is provided on the cabinet back for easy connection to an outdoor Antenna. An external Antenna is required for shortwave reception. Where space prohibits an outdoor installation, 10 feet of insulated wire stretched out on the floor will usually give adequate results.

INITIAL ADJUSTMENT

Plug line cord connector into 115 volt current supply outlet. Turn Power Switch (see drawing below) clockwise until a click is heard. Wait one minute for tubes to heat and advance control until a response is heard. If the set does not operate or if a loud hum is heard, remove plug, rotate $\frac{1}{2}$ turn and replace in socket.

CONTROLS

The position and function of the three controls are shown in diagram below:



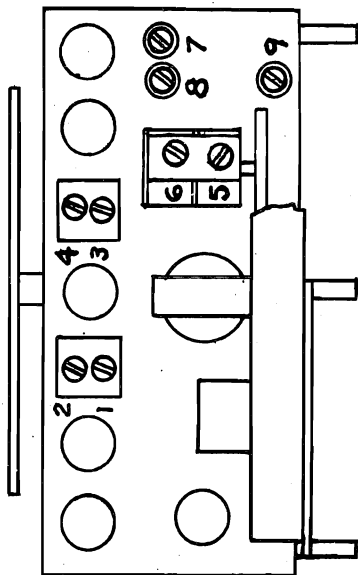
No. 1—Power Switch and Volume Control

No. 2—Tuning Control

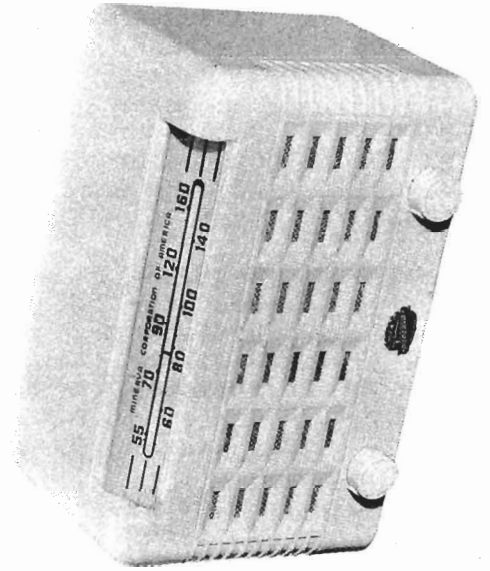
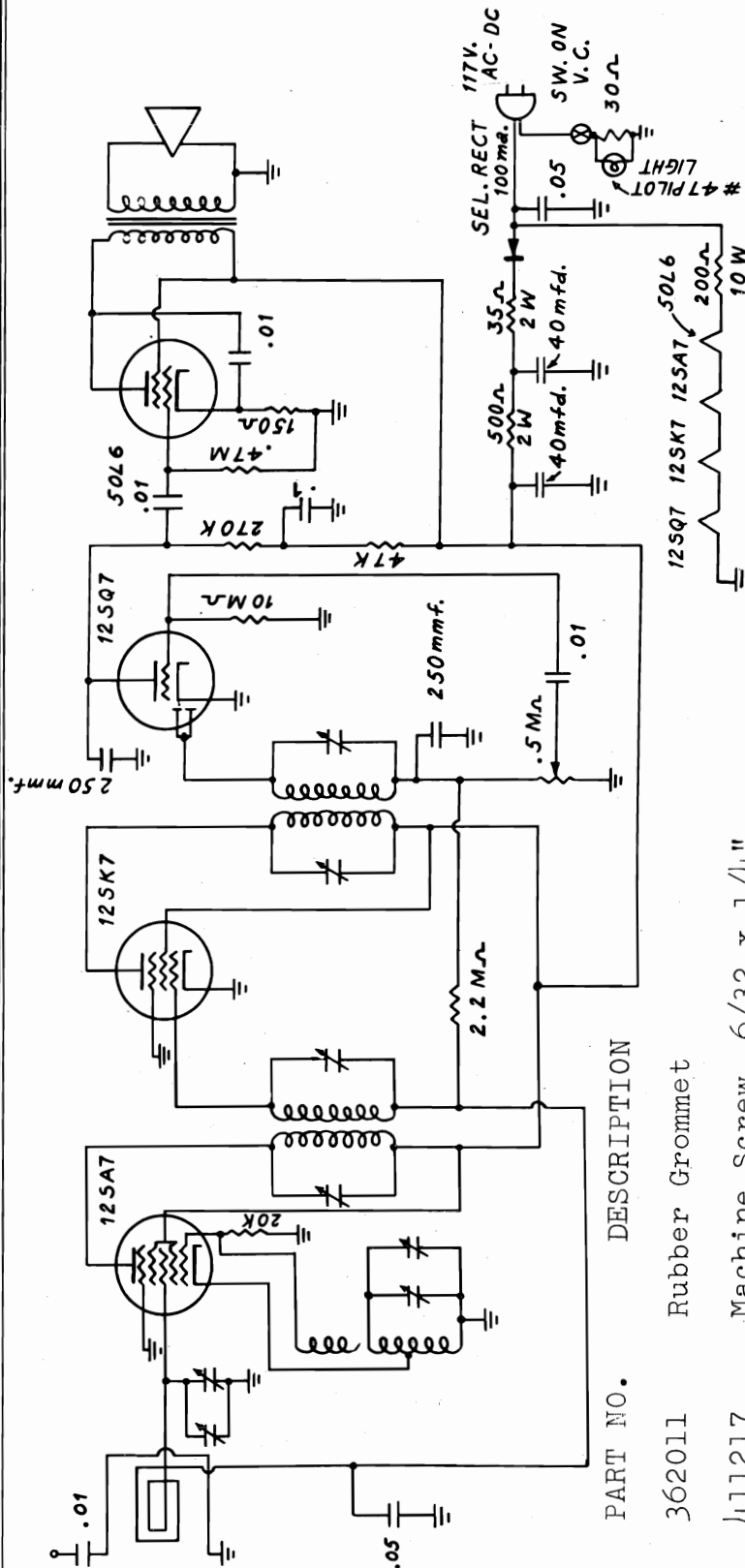
No. 3—Band Switch, counter clockwise for broadcast — clockwise for Short-wave.

ALIGNMENT NOTES

The screws for adjusting the IF and RF Amplifiers, together with the frequencies at which adjustment is to be made, are shown in diagrams below.



Generator Connection	Dummy Antenna	Band SW Position	Freq.	Adjust. Trimmers
Stator rear section gang open	.1 mfd Condenser	B. C.	455 KC	1, 2, 3, 4
Antenna Post	400 ohm Resistor	S. W.	18 MC	5, 6
Antenna Post	200 MMF Condenser	B. C.	1400 KC	7, 8
Antenna Post	200 MMF Condenser	B. C.	600 KC	9 (rock gang)
Antenna Post	200 MMF Condenser	B. C.	1400 KC	7, 8



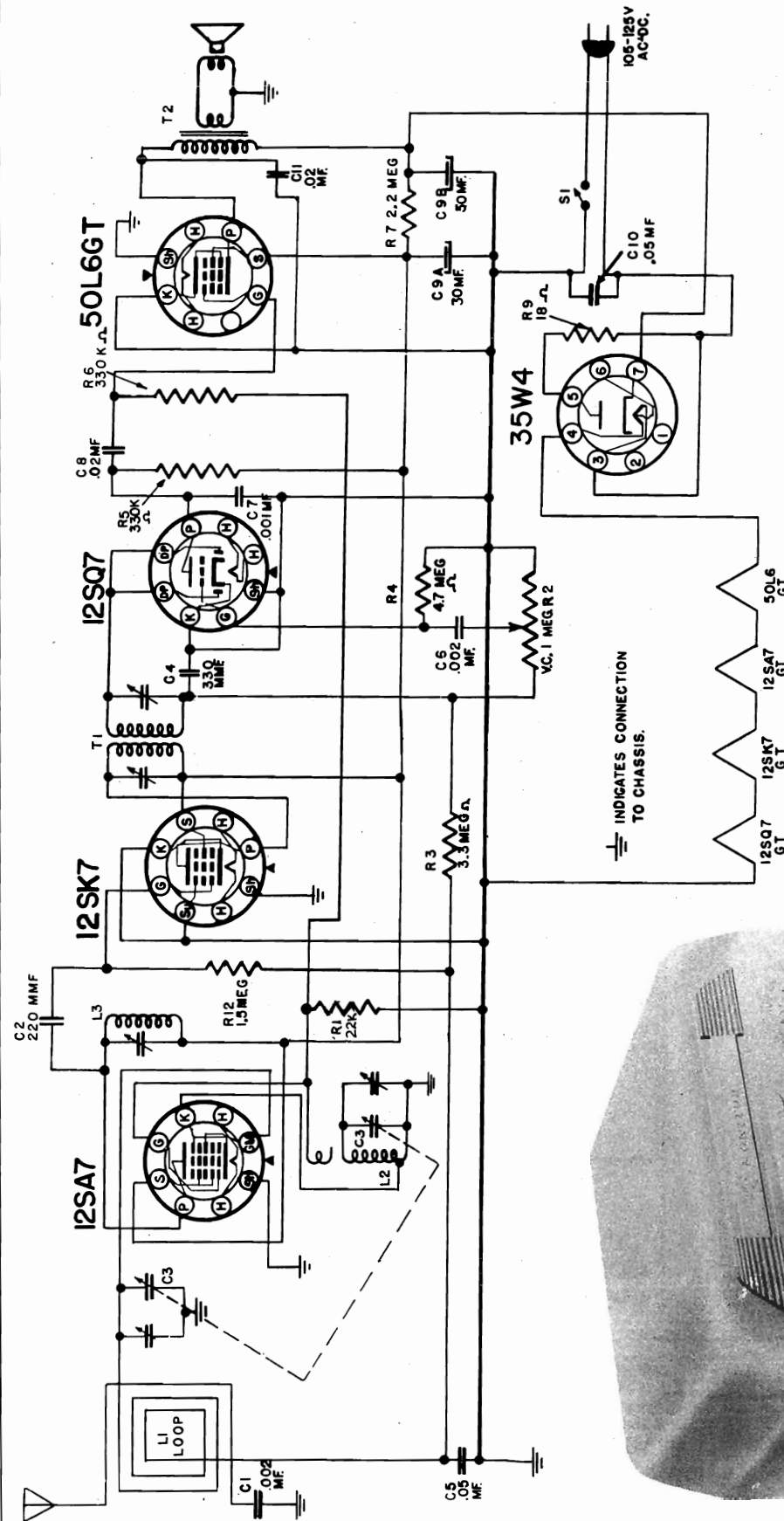
PART NO. DESCRIPTION

362011	Rubber Grommet
411217	Machine Screw, 6/32 x 1/4"
411237	Binding Head
431042	Machine Screw, 6/32 x 1 1/4"
431150	Binding Head
431614	Self-tapping Screw, #6 x 1/2"
	Phillips Round Head
	Self-tapping Screw, #6 x 1/4"
	Phillips Round Head
	Self-tapping Screw, #6 x 1/4"
	Hex Head
461007	Hex Nut, 3/8" x 32 x 1/2"
461009	Hex Nut, 6/32 x 1/4"
491002	#6 I.T. Lockwasher, Shakeproof
491048	3/8" I.T. Lockwasher, Shakeproof

MODELS 410, 411

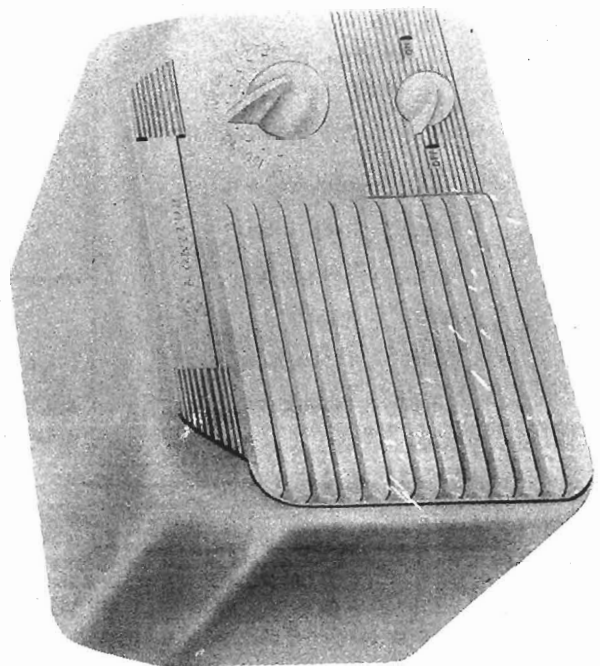
MINERVA CORP. OF AMERICA

PART NO.	DESCRIPTION	
185005	5" PM Speaker w/Transformer	
190004	Condenser, .05 Mfd 400V	190004
190005	Condenser, .1 Mfd 200V	
190010	Condenser, .01 Mfd 400V	
212035	Condenser, Mica, 250 mmf	
230008	Condenser, Electrolytic, 2 x 40 Mfd 150V	
235003	Condenser, Variable, w/pulley	
247001	Antenna Loop	
248008	Oscillator Coil	
262106	Resistor 10 megohm 1/4 Watt	Watt
262203	Resistor 20K ohm 1/4 Watt	
262225	Resistor 2.2 megohm 1/4 Watt	
262334	Resistor 330K ohm 1/4 Watt	
262473	Resistor 47K ohm 1/4 Watt	
262474	Resistor 470K ohm 1/4 Watt	
282151	Resistor 150 ohm 1 Watt	
292350	Resistor 35 ohm 2 Watt	
292501	Resistor 500 ohm 2 Watt	
300015	Potentiometer w/switch 1 9/16"	
303031	Resistor 200 ohm 10 Watt	
305002	IF Transformer, input	
305003	IF Transformer, output	
312003	Tube, type 12SA7	
312005	Tube, type 12SK7	
312009	Tube, type 12SQ7	
312118	Tube, type 50L6	
317004	Octal Socket	
328002	#6 I.T. Soldering Lug	
328008	Terminal Strip, Single Tie	
328028	Terminal Strip, 6-Tie, 3rd from left gnd.	
337107	3/16" Spaghetti.	
333007	AC Line Cord	
336001	Dial Cord	
344002	Idler Pulley	Idler
346007	Dial Pointer	
348001	Dial Cord Spring	
350018	Loop Mounting Bracket	
350019	Condenser Mounting Bracket	
350030	Speaker Mounting Bracket	
350038	Dial Face Holder	
350039	Dial Face Holder Bracket	
350040	Dial Light Bracket	
350096	Chassis	
357010	Dial Drive Shaft Assembly, 1 9/16"	
511011	#6 Flat Washer, 5/8" OD x 1/32"	
531033	Standard Rivet, 9/64"	
551009	Shoulder Rivet, 29/64"	
600008	Spacer Sleeve, 7/32"	
730001	Selenium Rectifier, 100 ma.	
292350	Resistor, 35 ohm, 2 W	
316011	Pilot Lamp, #47	
319001	Pilot Lamp Assembly	



TECHNICAL DATA

Tuning range	520 to 1590 kc
Intermediate frequency	455 kc
Power consumption	30 watts
Selectivity	1. A.C.A.—3 to 1. 2. A.C.A.—12.5 to 1
Sensitivity (for 0.5 watt output)	600 microvolts average
Power output (in voice coil) :	
Undistorted	0.8 watts
Maximum	2.5 watts



MODEL M-500

MONITOR EQUIPMENT CORP.

ALIGNMENT PROCEDURE

(Refer to Chassis View)

- Output meter across 3.2-ohm output load.
- Volume control at maximum.
- Connect ground post of signal generator to chassis.
- Align for maximum output. Reduce input as needed to keep output near 0.4 volts.

SIGNAL GENERATOR

TUNER
SETTINGADJUST FOR
MAXIMUM OUTPUT
(in order shown)

Frequency	Dummy Antenna	Connection to Radio	Tuner Setting	Adjust for Maximum Output (in order shown)
455 kc	0.1 mf	Stator of antenna section of gang	Any	Trimmers on I.F. can
1590 kc	50 mmfd	Primary of antenna coil	Rotor full open (plates out of mesh)	Oscillator trimmer
1590 kc	50 mmfd	Primary of antenna coil	Rotor full open (plates out of mesh)	Antenna trimmer

REPLACEMENT PARTS LIST

Ref. No.	Part No.	Description	Ref. No.	Part No.	Description
----------	----------	-------------	----------	----------	-------------

Capacitors

C1, C6		Paper, .002 mfd 400 volts
C8-C11		Paper, .02 mfd 400 volts
C5		Paper, .05 mfd 200 volts
C7		Paper, .001 mfd 500 volts
C4		Ceramic 330 mmfd 500 volts
C3	1675	Variable Air—2 gang
C9	2073	Electrolytic, 50-30 mfd 150 volts
C10		Paper, .05 mfd 400 volts

Coils and Transformers

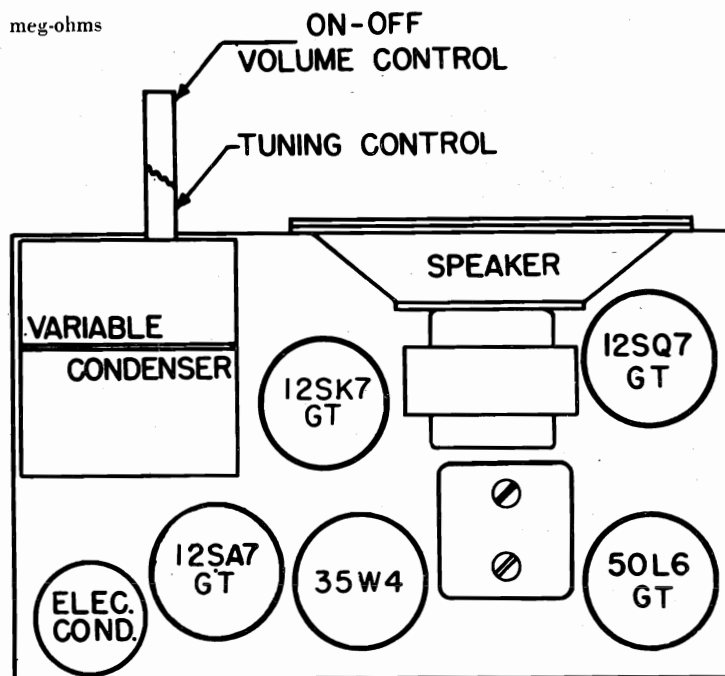
L2	28210	Oscillator coil
L3	3535	I.F. transformer
L5	1770	I.F. transformer
L4	1300	Output transformer
L1	62192	Loop

Resistors

R2	2483	Control, volume with switch, 2 meg-ohms
R1	22K	19,000 ohms, 1/4 watt
R3		3.3 meg ohms, 1/4 watt
R4, R10		4.7 meg ohms, 1/4 watt
R5		220,000 ohms, 1/4 watt
R6		330,000 ohms, 1/4 watt
R7		2200 ohms, 2 watts
R9		18 ohms, 1/2 watt
R11		100,000 ohms, 1/4 watt

Miscellaneous

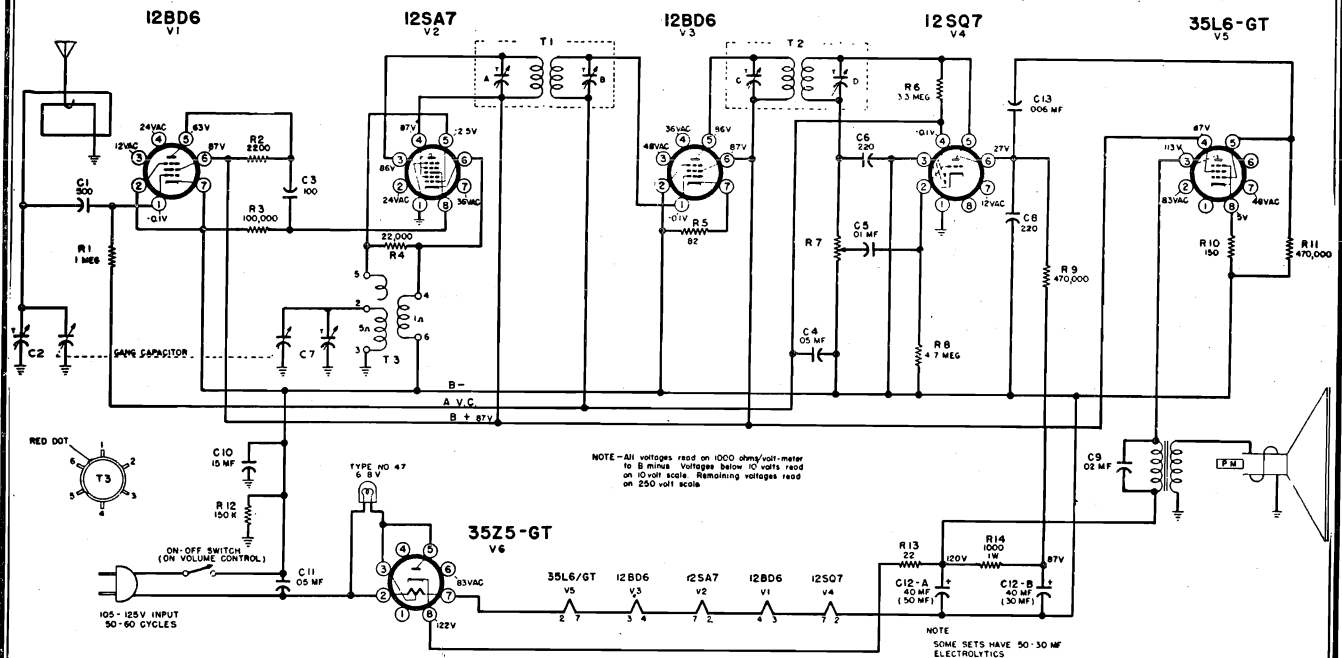
		Cord, line 6 ft.
39160		Knob, tuning
39161		Knob, volume
5877		Speaker
54314		Tuning knob washer
18110		Sockets, wafer octal



* The values of the resistors and mica capacitors listed above are based on RMA standards. Due to conditions beyond our control some receivers have been shipped with components of pre-standardized values. This receiver will operate equally well with components of either group. An illustration of the differences in both resistors and capacitors follows:

Pre-standardized value—50,000 ohms, 1/3 watt, 10%
RMA value—47,000 ohms, 1/2 watt, 10%
Pre-standardized value—200 mmf, 500 volts, 20%
RMA value—220 mmf, 500 volts, 20%

MONTGOMERY WARD

MODELS 84BR-1517A,
84BR-1518A

NOTE: On some sets slug tuned I.F.'s are used instead of trimmer tuned I.F.'s. 108-140Q and 108-145H are trimmer tuned. B-13A-12023-1 and B-13B-12022-1 are slug tuned. The slug tuned

I.F.'s are tuned from the top and bottom (secondary on top, primary on bottom).

When trimmer tuned I.F.'s are used, R5 is 270 ohms.

GENERAL DESCRIPTION

This receiver is a single-band, AC-DC set which uses 5 tubes plus a rectifier. The antenna input and oscillator circuits are tuned by a two-gang capacitor. A loop antenna is built into the cabinet; provision is made also for the connection of an external antenna. AVC voltage is applied to the grids of the R.F.-Amplifier, and IF-amplifier tubes.

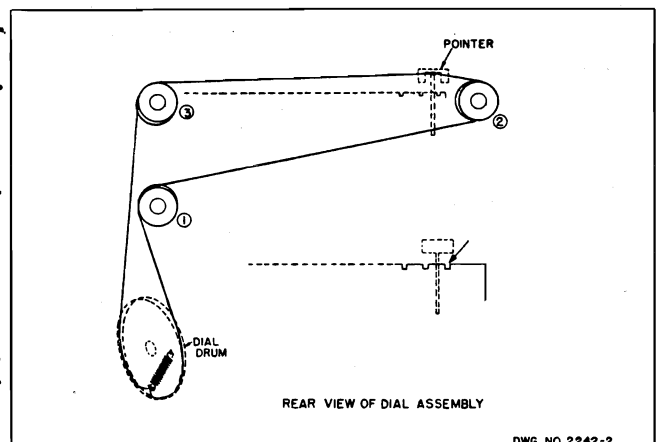
ELECTRICAL SPECIFICATIONS

Power Supply.....105 to 125 volts, DC or 50-60 cycle AC, 35 watts.
Frequency Range.....530 to 1650 kc.
Intermediate Freq.....455 kc.
Selectivity.....At 1000 kc, 55 kc at 1000 x signal.
Sensitivity.....40 microvolts average for .05 watt output.
Power Output......0.8 watts undistorted, 1 watt maximum.
Loud Speaker.....5" P.M., v.c. impedance 3.2 ohms.
Tube Complement.....12BD6, R. F. stage.
12SA7, converter.
12BD6, I. F. amplifier.
12SQ7, detector, AVC, audio amplifier.
35L6GT, output amplifier.
35Z5GT, rectifier.

REPLACING DIAL POINTER DRIVE CORD—

1. Rotate tuning knob to extreme clockwise position. This closes the tuning condenser. Knob should remain in this position until installation of cord is completed.

2. Tie cord to loop in spring in drum. Pass around drum in direction shown.
3. Pass over idler pulley number 1, then around idler pulley number 2 as shown.
4. Pass cord over idler pulley number 3, then down around drum as shown. Tie to loop in spring in such a manner that the spring is partly stretched.
5. Place pointer on top edge of dial plate. Guide cord through the three fingers on the back of the pointer.
6. Make sure the tuning knob is in the extreme clockwise position. Slide the dial pointer along the edge of the dial plate until the left edge of the pointer coincides with the right hand notch on the gold background plate, when viewed from the front.
7. Push the cord firmly into the three fingers and clamp them tightly together.



DWG. NO 2242-2

MODELS 84BR-1517A,
84BR-1518A

MONTGOMERY WARD

SETTING THE PUSHBUTTONS—The pushbuttons may be used, after proper adjustment, for the automatic tuning of any six stations which you select. They can be set up in any order.

1. Turn on the radio. Allow it to warm up for at least one minute.
2. Push out the call letters of the six stations from the call-letter sheets supplied with this manual.
3. Insert one call-letter tab in the rectangular opening in each of the pushbuttons, in any sequence. Press an acetate tab (supplied in small envelope) into each of the pushbuttons.
4. With the screwdriver supplied, check to see that the locking screw in the center of the tuning knob (see illustration) is loose. If it is not, turn it several turns to the left (counterclockwise).
5. Press the first pushbutton down *all the way*. With one hand hold the button down *firmly* and with the other carefully tune in the desired station. Release the pushbutton.
6. Follow this procedure for each of the five other buttons, adjusting each one for a different station.
7. Rotate the tuning knob on the side of the cabinet as far to the right as it will go. Tighten the locking screw in the center of the knob. **IT IS IMPORTANT THAT THIS SCREW BE TIGHTENED VERY FIRMLY.**
8. The pushbuttons are now properly set for automatic tuning. Any of the six stations may now be tuned in simply by pressing the proper button down as far as it will go. If it is desired to reset any of the buttons for a new station, loosen the locking screw in the center of the tuning knob, set the pushbutton as described above, and re-tighten the locking screw.

ALIGNMENT PROCEDURE AND RECEIVER STAGE SENSITIVITIES

The signal source must be an accurately calibrated signal generator capable of supplying R. F. signals modulated 30% with a 400-cycle audio signal. A 400-cycle source is necessary for the audio measurement.

The table below lists the sensitivity at various points. All measurements are based on an output of 50-milliwatts. This may be measured by disconnecting the speaker voice coil and substituting a 3.2-ohm, 5-watt resistor across the secondary winding of the output transformer. A reading of .4 volts AC across this resistor will be equivalent to a 50-milliwatt output with the speaker connected. Variations of plus or minus 25% are usually permissible. Volume control at maximum for all adjustments.

SIGNAL GENERATOR				TUNER SETTING	ADJUST FOR MAXIMUM OUTPUT	INPUT FOR 50-MILLIWATT OUTPUT
Frequency	Coupling Capacitor	Connection to Radio	Ground Connection			
455 kc.	.1 mf.	Pin No. 8 of 12SA7	12SQ7 Pin 3	Rotor full open	Trimmers on output and input I.F. cans	100 microvolts
1650 kc.	.1 mf.	Pin No. 8 of 12SA7	12SQ7 Pin 3	Rotor full open	Oscillator trimmer C7 (on bottom)	_____
1400 kc.	none	See note A	none	Set dial at 1400	Antenna trimmer C2 (on bottom)	_____
1400 kc.	.1 mf.	External antenna clip	12SQ7 Pin 3	1400 kc.	_____	13 microvolts
400 cycles	.1 mf.	12SQ7, Pin 2	12SQ7 Pin 3	_____	_____	.05 volts

Note A: Lay output lead of generator in back of loop antenna.

Turn up generator output. Loop antenna will pick up energy.

MONTGOMERY WARD

MODELS 84BR-1517A,
84BR-1518A

REPLACEMENT PARTS LIST

Use Only Genuine Factory Replacement Parts

Ref. No.	Part No.	Description
CONDENSERS		
C12A, C12B	A-8C-15030 or A-8C-15262	Filter cond., 40 mfd. x 40 mfd. x 150 volts Filter cond. 50 mfd. x 30 mfd. x 150 volts
C4	C-8D-10770	.05 x 200 volts, tubular
C9	C-8D-10774	.02 x 400 volts tubular
C5	C-8D-11738	.01 x 200 volts, tubular
C11	C-8D-10813	.05 x 400 volts, tubular
C10	C-8D-10953	.15 x 400 volts, tubular
C13	C-8D-10785	.006 x 600 volts, tubular
C6, C8	C-8G-11733	220 mmf., ceramic
C1	C-8G-11822	500 mmf., ceramic
C3	C-8G-11734	100 mmf., ceramic

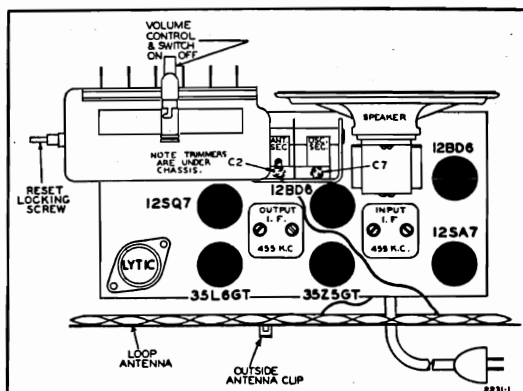
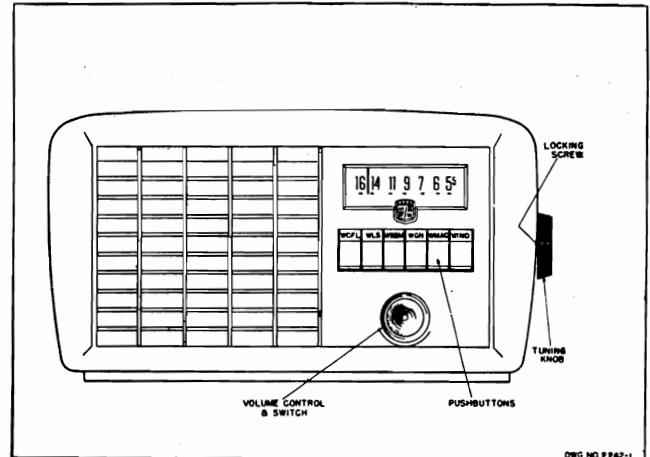
RESISTORS		
R14	C-9B2-62	1000 ohms, 1 watt, 10%
R9, R11	C-9B1-94	470K ohms, 1/2 watt, 20%
R8	C-9B1-35	4.7 megohms, 1/2 watt, 20%
R6	C-9B1-34	3.3 megohms, 1/2 watt, 20%
R4	C-9B1-78	2.2K ohms, 1/2 watt, 20%
R13	C-9B1-42	22 ohms, 1/2 watt, 10%
R3	C-9B1-25	100K ohms, 1/2 watt, 20%
R2	C-9B1-66	2200 ohms, 1/2 watt, 10%
R12	C-9B1-26	150K ohms, 1/2 watt, 20%
R1	C-9B1-31	1 megohm, 1/2 watt, 20%
R10	C-9B1-52	150 ohms, 1/2 watt, 10%
R5	C-9B1-49 or C-9B1-55	82 ohms, 1/2 watt, 10% 270 ohms, 1/2 watt, 10%

COILS		
	C-13E-16257	Loop antenna assembly, complete on back
T3	B-13D-15277	Oscillator coil
T1	108140Q or B-13A-12023-1	Input I.F. coil in can, 455 Kc.
T2	108145H or B-13B-12022-1	Output I.F. coil in can, 455 Kc.

SOCKETS		
	A-15C-16110	7-prong, tube socket
	121171	8-prong socket, laminated
	121216 or B-15B-10076	Socket base, bakelite
	A-47A-15451	Pilot light socket assembly

Ref. No.	Part No.	Description
SPEAKER		
	114197	5-inch P.M. speaker
	B-12C-15278	Output transformer for speaker
DIAL AND TUNER PARTS		
	115448	End plate (right hand bracket)
	115448C	End plate (left hand bracket)
	115146	Cams
	115143	Key washer (12 used on cam shaft)
	115143C	Key washer (one used)
	117528	Brass spacer (one used on cam-shaft)
	117602	Brass spacer (four used on cam-shaft)
	131181	Spring washer for locking collar
	117604	Locking collar
	117600	Lever shaft
	115361	Lever with roller
	120283	Return spring for levers
	A-2G-15449	Pointer
	A-55A-10989	Dial cord, 24 inches used
	C-2C-15428	Dial plate assembly
	A-200-15463	Drum pulley
	A-3H-10299	Idler pulley
	120285	Drum spring
	B-2M-10383	Cinch button
	C-6D-15422	Dial scale
	B-2M-15200	Cinch button for dial scale
	A-2C-15450	Background plate

MISCELLANEOUS		
	10798	Line cord and plug
R7	101218 or A-10A-10626	Volume control and switch, 1 meg.
CI-A, CI-B	B-8A-10211	2-gang variable condenser
	107249	Pilot light bulb, type T-47
	134123	Rubber bumper (bottom of cabinet)
	13141	Cinch buttons, to cover trimmer holes in cabinet
	B-5B-14298-8	Pushbutton (6 used), Ivory
	A-23L-11900	Station call letters, set
	A-6C-14299	Acetate tabs for call letters
	5C-14286-9	Cabinet, bakelite, ivory color
	B-5B-15085-8	Knob, volume, ivory color
	A-5B-10994-9	Knob, tuning, ivory color
	A-3F-10995	Locking screw for tuning knob
	120388	Locking spring for tuning knob
	A-2H-10996	Reset key
	5C-14286-36	Cabinet, walnut
	A-2H-10715	Tube shield

CHASSIS VIEW, SHOWING TUBE LOCATIONS
(See note on I.F.'s.)



Intermediate Freq.....	455 kc.
Selectivity.....	At 1000 kc. 50 kc. at 1000 x signal.
Sensitivity.....	10 microvolts average for .05 watts output.
Power Output.....	0.75 watts undistorted, 1.0 watts maximum.
Loud Speaker.....	4" x 6" oval, P.M., v.c. impedance 3.2 ohms.
Tube Complement.....	12BE6, converter 12BA6, I.F. amplifier. 12AT6, detector, AVC, audio amplifier
	50B5, output amplifier
	35W4, rectifier
	Pilot life, 6-8 volts, T-47.

ELECTRICAL SPECIFICATIONS

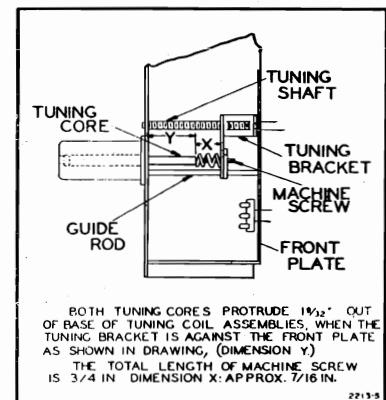
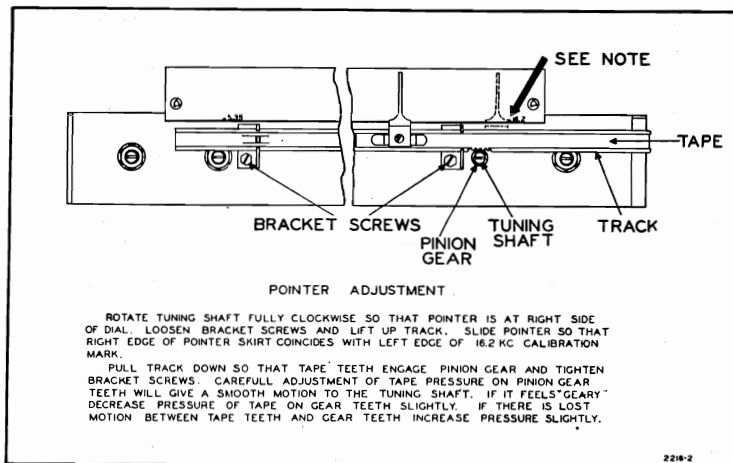
Power Supply..... 105 to 125 volts; 60 cycles AC,
60 watts.

Frequency Range..... 535 to 1620 kc.

This radio-phonograph is a permeability-tuned, AC set using 4 miniature tubes plus a rectifier. A loop antenna is built into the back of the cabinet. A clip is provided for connection of an external antenna. Simple AVC voltage is applied to the converter and IF-amplifier tubes. The filament string is across the AC line.

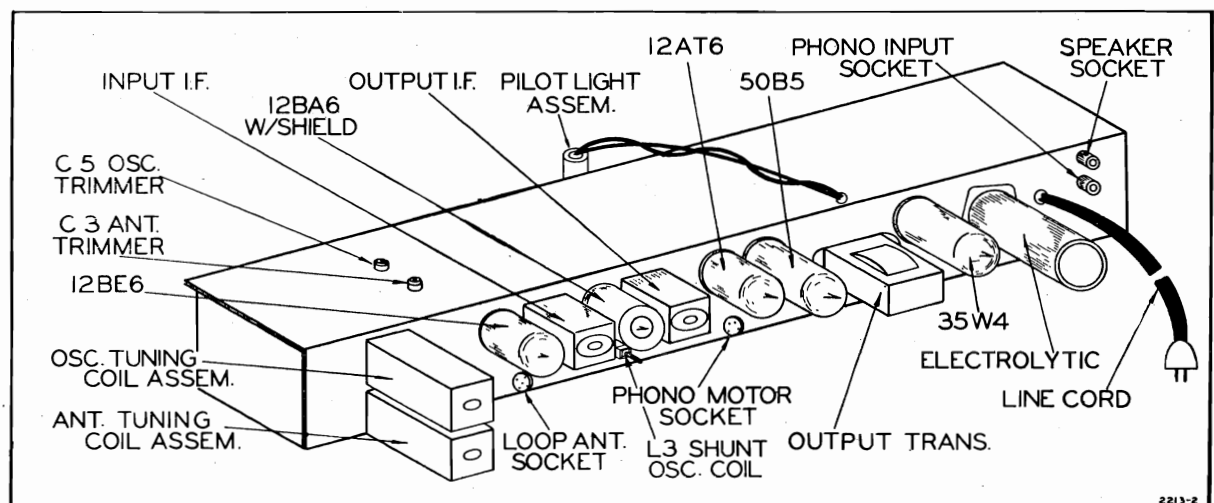
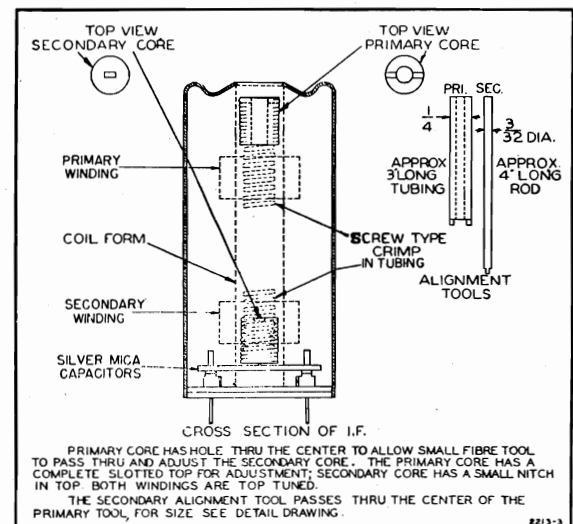
MONTGOMERY WARD

MODEL 84BR-2003C



NOTE: On some sets, pairs of punch marks on the inside of the tape guide are used as calibration markers. They are in the same relative position as the frequencies shown above. The end of the tape is then used as the indicator line.

CAUTION: The I.F. transformer construction is such that two resonance peaks occur for each winding, one peak when the slug is above its coil and another peak when the slug is below its coil. Be sure the upper cores are above the top coils and the lower cores are below the bottom coils (see coil drawing).



NOTE: On some sets, the loop antenna socket is eliminated and leads are brought out thru the hole.

MODEL 84BR-2003C

MONTGOMERY WARD

ALIGNMENT PROCEDURE AND RECEIVER STAGE SENSITIVITIES

The signal source must be an accurately calibrated signal generator capable of supplying R. F. signals modulated 30% with a 400-cycle audio signal. A 400-cycle source is necessary for the audio measurement.

The table below lists the sensitivity at various points. All measurements are based on an output of 50-milliwatts. This may be measured by disconnecting the

speaker voice coil and substituting a 3.2-ohm, 5-watt resistor across the secondary winding of the output transformer. A reading of .4 volts AC across this resistor will be equivalent to a 50-milliwatt output with the speaker connected. Variations of plus or minus 25% are usually permissible. Volume control at maximum for all adjustments. Tone control at maximum treble.

SIGNAL GENERATOR				TUNER SETTING	ADJUST FOR MAXIMUM OUTPUT	INPUT FOR 50-MILLIWATT OUTPUT
Frequency	Coupling Capacitor	Connection to Radio	Ground Connection			
455 kc.	.1 mf	12BE6, Pin 7	12AT6, Pin 2	Iron cores all the way out	Trimmers on output and input I.F. cans	28 microvolts
1620 kc.	.1 mf	12BE6, Pin 7	12AT6, Pin 2	Iron cores all the way out	Oscillator trimmer C5	—
535 kc.	200 mmf	External antenna clip	12AT6, Pin 2	Iron cores all the way in	Shunt osc. coil L3	11 microvolts
1620 kc.	200 mmf	External antenna clip	12AT6, Pin 2	1620 kc.	Antenna trimmer C3*	8 microvolts
1400 kc.	200 mmf	External antenna clip	12AT6, Pin 2	1400 kc.	Adjust position of ant. core (see coil illustration view)	8 microvolts
400 cycles	.1 mf	12AT6, Pin 1	12AT6, Pin 2	—	—	.03 volts

*After the antenna coil has been tracked at 1400 kc, it is necessary to check the antenna trimmer C3 again at 1620 kc. If no appreciable change in trimmer adjustment is necessary, the coil is in track. If the trimmer

requires considerable change, the position of the antenna core at 1400 kc must be readjusted. These two adjustments should be made several times, until no trimmer adjustment is required at 1620 kc.

Ref. No.	Part No.	Description	Qty. Used In Set
----------	----------	-------------	------------------

CONDENSERS

C20A, B, C	A-8C-10077 or A-8C-10937	40 mf; 20 mf; 20 mf; 150 volts Electrolytic filter condenser	1
C3, 5	A-2M-12618	Trimmer plate	2
C3, 5	A-6M-12616	Insulator for trimmer—mica	2
C3	A-2M-14054	Trimmer plate	1
C3	A-6M-14203	Insulator for trimmer (laminated)	1
C10	C-8D-10771	.1 mf x 200 volts, 20%	1
C14, 18, 21	C-8D-10761	.01 mf x 400 volts, 20%	3
C11	C-8D-10813	.05 mf x 400 volts, 20%	1
C6	C-8D-10770	.05 mf x 200 volts, 20%	1
C7	C-8D-11251	.09 mf x 400 volts, 10%	1
C17	C-8D-12243	.006 mf x 600 volts, 10%	1
C19	A-8C-11678	Electrolytic condenser, 25 mf x 25 volts	1
C15, C16	C-8F3-10	220 mmf x 500 volts, 20%, mica	2
C22	C-8F3-124	820 mmf x 300 volts, 10%, mica	1
C4	C-8G-12198	47 mmf, 10%, ceramic	1

RESISTORS

R7, S1	A-10A-12654	Volume (1 megohm) control and switch	1
R10	A-11B-12659	Tone control, 1 megohm	1
R3	C-9B1-91	270K ohms, 1/2 watt, 10%	1
R4	C-9B1-47	56 ohms, 1/2 watt, 10%	1
R14	C-9B1-43	27 ohms, 1/2 watt, 10%	1
R5	C-9B2-44	33 ohms, 1 watt, 10%	1
R11	C-9B1-86	100K ohms, 1/2 watt, 10%	1
R13	C-9B1-52	150 ohms, 1/2 watt, 10%	1
R15	C-9B2-54	220 ohms, 1 watt, 10%	1
R16	C-9B2-63	1200 ohms, 1 watt, 10%	1
R2	C-9B1-78	22K ohms, 1/2 watt, 10%	1
R17	C-9B1-62	1000 ohms, 1/2 watt, 10%	1
R6, R12	C-9B1-95	560K ohms, 1/2 watt, 10%	2
R8	C-9B1-34	3.3 megohms, 1/2 watt, 20%	1
R9	C-9B1-36	6.8 megohms, 1/2 watt, 20%	1

COILS AND TRANSFORMERS

T1, C8, 9	B-13A-13071	Input I.F. coil	1
T2, C12, 13	B-13B-13072	Output I.F. coil	1

Ref. No.	Part No.	Description	Qty. Used In Set
----------	----------	-------------	------------------

L4	C-13E-15103	Loop antenna assembly	1
L3	B-13D-12371	Osc. shunt coil assembly	1
L2	A-23D-12667	Osc. tuning coil	1
L1	A-13E-12668	Antenna tuning coil	1
T3	B-12C-12356	Output transformer for speaker	1

SPEAKER

T4	B-18A-12839-1	4" x 6", P.M. speaker, less output transformer	1
----	---------------	--	---

PHONO PARTS

D-21H-13293	Record changer	1
P30	Crystal cartridge, with phono needle	1
	Phono needle, see manual 62P-5050	

DIAL AND TUNING PARTS

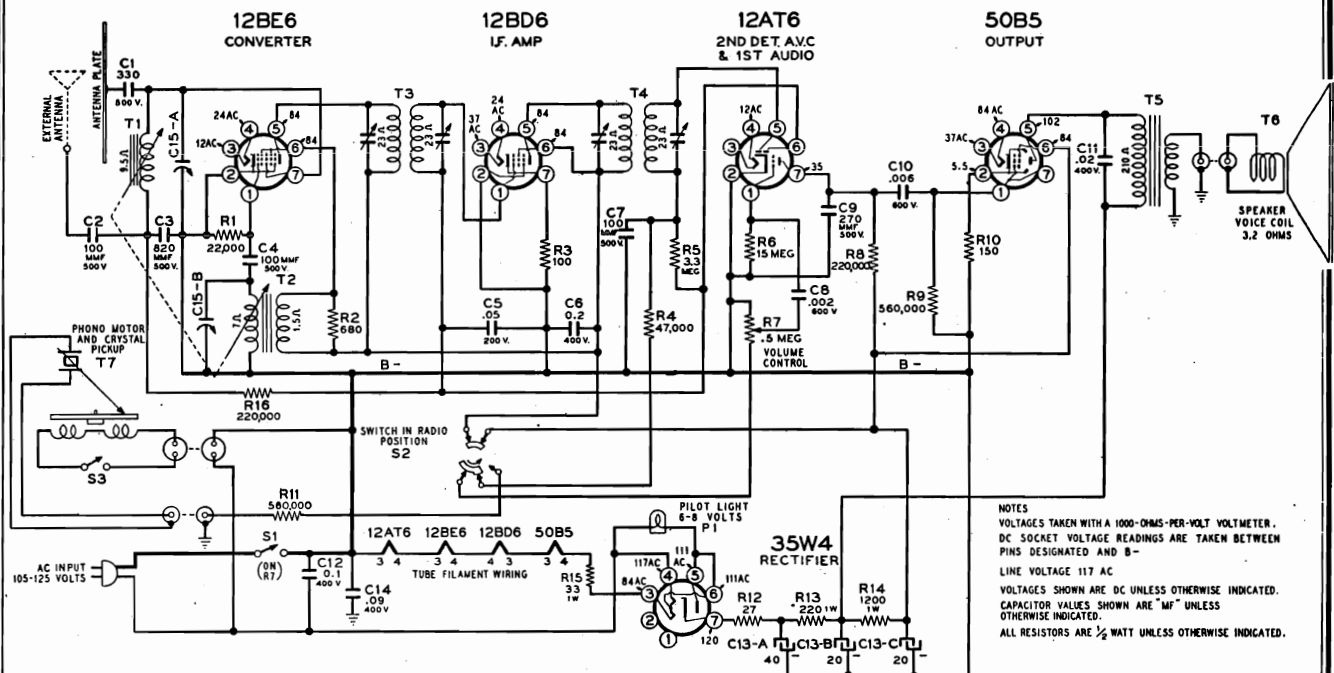
C-6D-15153	Dial scale	1
B-5B-13390-58	Knob	4
A-2G-13281	Pointer	1
32F4-10830	Screw, 4-40 x 1/8", to fasten pointer	1
B-2J-13282	Rack tape, with teeth	1
A-200-13288	Tuning shaft assembly	1
A-6B-13277	Diffuser	1
or		
B-6B-14151	Diffuser	1
B-2M-7758	Snap-pin rivets to fasten diffuser	2
A-47A-13360	Pilot lite and bracket assembly	1
A-46A-10793	Pilot lite bulb, 6-8 volt, type T-47	1

MISCELLANEOUS

A-15C-10717	Miniature 7 prong tube socket	5
B-15B-10076	Mounting plate for lytic	1
A-19B-12644	Phono motor socket	1
A-19B-12645	Loop antenna socket	1
A-19B-11044	Pick-up socket	1
A-23A-10344	Line cord lock	1
A-19B-12170	Speaker socket	1
A-20A-12653	Radio-phonos switch	1

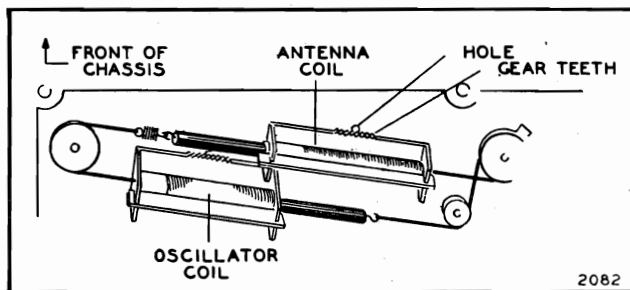
MONTGOMERY WARD

MODEL 84BR-2005A



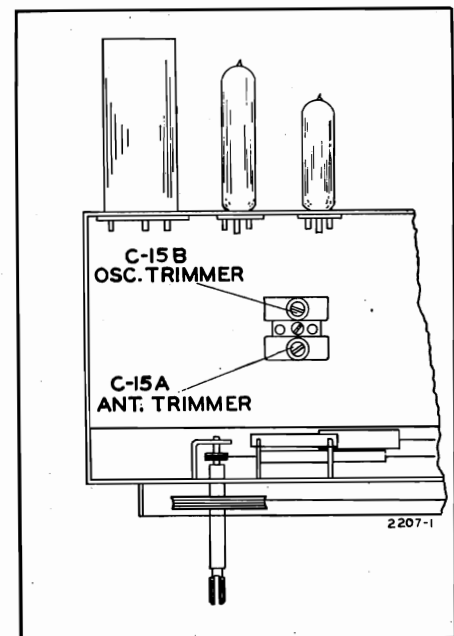
ELECTRICAL SPECIFICATIONS

- Power Supply..... 105-125 volts, 60 cycles AC, 55 watts.
- Frequency Range..... 535-1720 kc.
- Intermediate Freq..... 455 kc.
- Antenna..... Built-in plate; provisions also for external antenna connection.
- Tuning..... Permeability.
- Speaker..... 4 x 6-inch, P.M., voice coil impedance 3.2 ohms.
- Power Output..... 0.75 watt undistorted.
1.1 watts maximum.
- Sensitivity..... 34 microvolts average for 50-milli-watts output.
- Selectivity..... 55 kc. broad at 1000 times signal at 1000 kc.

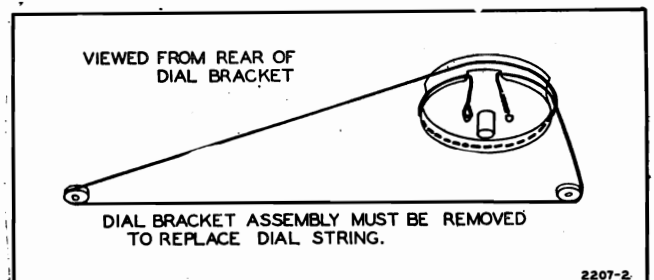


VIEW OF COIL ASSEMBLY

The antenna coil assembly is movable left to right. When making the adjustment as required in the alignment procedure, move the coil assembly very slowly, either by hand or by pivoting one edge of a screwdriver blade in the hole and engaging the blade in the gear teeth of the coil form.



TRIMMER VIEW



DIAL STRINGING VIEW

MODEL 84BR-2005A

MONTGOMERY WARD

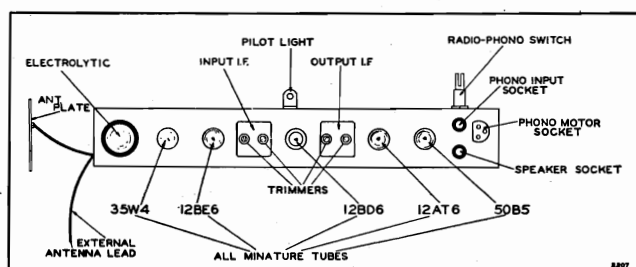
ALIGNMENT PROCEDURE

(Refer to Chassis and Coil Views)

- Output meter across 3.2-ohm resistive output load.
- Align for maximum output. Reduce input as needed to keep output near 0.4 volts which is equal to 50 milliwatts.
- Volume control at maximum for all adjustments.
- Connect ground post of signal generator to B— of radio.

SIGNAL GENERATOR			TUNER SETTING	ADJUST FOR MAXIMUM OUTPUT (in order shown)	INPUT FOR 50-MILLIWATT OUTPUT
Frequency	Dummy Antenna	Connection to Radio			
455 kc.	.1 mf.	Grid (pin 7) of 12BE6	Iron cores all the way out	Trimmers on output and input I.F. cans	90 microvolts
1720 kc.	.1 mf.	Grid (pin 7) of 12BE6	Iron cores all the way out	Oscillator trimmer C-15B	—
1720 kc.	200 mmf	Antenna lead	Iron cores all the way out	Antenna trimmer C-15A	34 microvolts
1400 kc.	200 mmf	Antenna lead	Turn dial to 1400 kc.	Adjust position of antenna coil (see coil view)*	—

*This adjustment and the previous adjustment are interlocking; therefore repeat the two adjustments alternately for best results.



Chassis View

Ref. No.	Part No.	Description	Qty. Used
----------	----------	-------------	-----------

CAPACITORS

C13-A, C13-B, C13-C	A-8C-10077	Electrolytic, 40 x 20 x 20, 150 volts	1
C15-A, C15-B	A-8E-10723	Trimmer condenser, dual antenna and oscillator	1
C14	C-8D-11251	.09 mf x 400 v., 10%, tubular	1
C6	C-8D-10942	.2 mf x 400 volts, 10%, tubular	1
C5	C-8D-10770	.05 mf x 200 v., 20%, tubular	1
C10	C-8D-10785	.006 mf x 600 v., 20%, tubular	1
C8	C-8D-10789	.002 mf x 600 v., 20%, tubular	1
C11	C-8D-10774	.02 mf x 400 v., 20%, tubular	1
C12	C-8D-10760	.1 mf x 400 v., 10%, tubular	1
C1	C-8F3-119	330 mmf x 500 v., 10%, mica	1
C3	C-8F3-247	820 mmf x 500 v., 5%, mica	1
C9	C-8F3-118	270 mmf x 500 v., 10%, mica	1
C2, C4	C-8F3-113	100 mmf x 500 v., 10%, mica	3
C7			

RESISTORS

R7	A-10A-10720	Volume control (500M ohms) and switch	1
S1			
R15	C-9B2-44	33 ohms, 1 watt, 10%	1
R8, R16	C-9B1-90	220K ohms, 1/2 watt, 10%	2
R13	C-9B2-54	220 ohms, 1 watt, 10%	1
R14	C-9B2-63	1200 ohms, 1 watt, 10%	1
R12	C-9B1-43	27 ohms, 1/2 watt, 10%	1
R4	C-9B1-82	47K ohms, 1/2 watt, 10%	1
R3	C-9B1-50	100 ohms, 1/2 watt, 10%	1
R5	C-9B1-34	3.3 megohms, 1/2 watt, 20%	1
R9	C-9B1-95	560K ohms, 1/2 watt, 10%	2
R11			
R10	C-9B1-52	150 ohms, 1/2 watt, 10%	1
R6	C-9B1-302	15 megohms, 1/2 watt, 10%	1
R2	C-9B1-60	680 ohms, 1/2 watt, 10%	1
R1	C-9B1-78	22K ohms, 1/2 watt, 10%	1

COILS AND TRANSFORMERS

T1	C-211-10171	Tuner unit, permeability tuned, Ant., and Oscillator coils	1
T2			
T3	B-13A-10728	Input I.F. transformer	1
T4	B-13B-10729	Output I.F. transformer	1
T5	B-12C-10074-I	Output speaker transformer	1

Ref. No.	Part No.	Description	Qty. Used
----------	----------	-------------	-----------

DIAL AND TUNING PARTS

	B-6D-15198	Dial scale	1
	B-6A-15199	Dial crystal	1
	C-5B-12718-2-37	Knob, "Volume"	1
	C-5B-12718-3-37	Knob, "Tuning"	1
	B-200-10980-2	Dial and bracket assembly	1
	A-55A-10093	Pilot lite and bracket	1
P1	A-46A-10793	Pilot light bulb, 6-8 volt type	1
	A-2G-10162	Pointer	1

MISCELLANEOUS

T6	B-18A-11089	4 x 6" oval P.M. speaker	1
	A-15C-13174	Tube socket	5
	A-2H-10718	Shield base	2
	A-2H-10974	Tube shield	2
	B-15B-10076	Mounting base for electrolytic	1
S2	A-20A-10722	Radio-phono switch	1
	A-19B-10727	Phono-motor socket	1
	A-55A-7386-1	Phono input socket	1
	A-19B-11044	Speaker socket	1
	A-23A-10344	Line cord lock	1
	B-14M-11085	A.C. line cord and plug	1
	B-2E-11038	Antenna plate	1
	A-5B-11239-1	Knob for radio-phono switch	1
	A-3A-15134	Extension shaft for radio-phono switch	1
	A-2M-11074	Spring clamp for shaft	1
	A-2C-10972	Indicator plate	1

PHONO PARTS

	C-201-11406-8	Phono motor and turntable assembly, 115 volts, 60-cycles	1
	A-20F-15201	Pushbutton on-off switch, for phono motor	1
	C-48C-10889-46	Pick-up arm with crystal cartridge CR-1	1
		Crystal cartridge, CR-1 only	1

[illegible]

RECORD CHANGERS: For 84BR-2715C, Webster Model 148, RCD.CH. 18-1, V-M Model 800, RCD.CH. 17-1; For 84BR-2722A, Gen. Inst. Model 204, RCD.CH. 15-1, Russell Model C-10M, RCD.CH. 18-1

MODELS 84BR-2715C,
84BR-2722A

MONTGOMERY WARD

GENERAL DESCRIPTION

This is a 2-band, seven tube (plus rectifier) superheterodyne receiver for the reception of both AM and FM stations. It features the most advanced type of FM ratio detector, permeability tuning of both bands, combination double-frequency I.F. coils and miniature tubes. Built-in antennas are provided for broadcast and FM reception; provision is also made for connection of an external broadcast antenna as well as an FM antenna with a 300 ohm lead-in. Both antennas may be connected to the radio at the same time.

The phonograph is equipped with an automatic changer which plays up to ten 12-inch records or twelve 10-inch records at one loading.

ELECTRICAL SPECIFICATIONS

Power Supply..... 105 to 125 volts, AC, 60-cycles;
Chassis only 75 watts. With
phono operation 100 watts.
Frequency Ranges... Broadcast Band—535 to 1620 kc.
FM Band— 88 to 108 mc.
Intermediate Freq. AM-455 kc.; FM-10.7 mc.
Selectivity AM-42 kc. broad at 1000 times sig-
nal, measured at 1000 kc.

AM Sensitivity (For .5 watt output with external
antenna)—5 microvolts average.
FM Sensitivity (For .5 watt output)—25 micro-
volts average.
Power Output..... 2 watts, 10% distortion. 4 watts
maximum.
Loud Speaker..... 12" electrodynamic. Voice coil
impedance 3.2 ohms, 400 cycles.
Tube and Lamp
Complement..... 6BA6, FM—AM R.F. stage.
12AT7, FM—AM oscillator and
mixer.
6BA6, FM—AM 1st I.F.
6BA6, FM—2nd I.F.
6AL5, FM ratio detector.
6AT6, AM detector.
A.F. AMP. and A.V.C.
6AQ5, Audio output.
5Y3, rectifier.
T-44 dial lamp (2 used).
Automatic Changer... See Manuals 5058A, 5057B, 5069,
5050A, 5032A.

ALIGNMENT PROCEDURE

Broadcast Band Section I.F. and R.F.

The alignment procedure below includes the sensitivities at the inputs of various stages. All signal input values are based on an output of $\frac{1}{2}$ watt. This may be measured by disconnecting the speaker voice coil and substituting a 3.2-ohm resistor across the secondary winding of the output transformer. A reading of 1.3 volts AC across this resistor will be approximately equivalent to a $\frac{1}{2}$ -watt output with the speaker connected. The volume control

must be set at maximum. The tone control must be set for maximum treble.

The signal source must be an accurately calibrated signal generator capable of supplying the frequencies designated, modulated 30% with a 400-cycle audio signal. A 400 cycle audio signal is required for the audio measurement. Variations in sensitivities of plus or minus 25% are usually permissible.

AM - I. F. ALIGNMENT

Band Switch in AM Position. Tune Set to 1400 Kc. Dummy Antenna .1 Mfd.

SIGNAL GENERATOR FREQUENCY	CONNECTION TO RADIO	ADJUSTMENTS TO BE MADE	ADJUST FOR
455 Kc. Use 2400 microvolts	Pin No. 1 of 6BA6 No. 2 and ground	Primary and Secondary of T9 AM windings. See top and bottom views	Maximum output Should be $\frac{1}{2}$ watt
455 Kc. Use 70 microvolts	Pin No. 2 of 12AT7 and ground	Primary and Secondary of T8 AM windings. See top and bottom views	Maximum output Should be $\frac{1}{2}$ watt
400 cycles. Use 60 millivolts	Hot end of volume control and ground	None	Maximum output Should be $\frac{1}{2}$ watt

BROADCAST BAND - R. F. ALIGNMENT

Check pointer so that it coincides with the marker to the extreme right when iron cores are all the way out. For adjustment, see dial mechanism illustration.

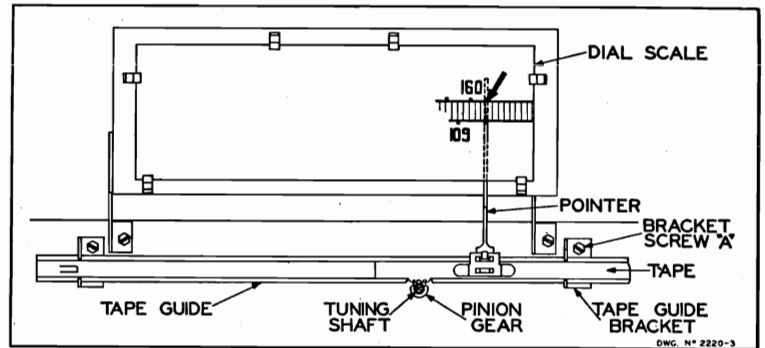
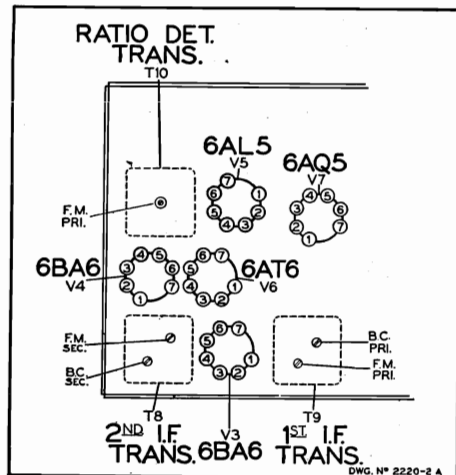
SIGNAL GENERATOR FREQUENCY	CONNECTION TO RADIO	DUMMY ANTENNA	ADJUST
1620 Kc.	AM Antenna and Ground	200 mmf.	C11 Osc. trimmer for maximum
535 Kc.	AM Antenna and Ground	200 mmf.	T5 for maximum $\frac{1}{2}$ watt
1620 Kc. Use 5 microvolts	AM Antenna and Ground	200 mmf.	C4 and C18 for max. $\frac{1}{2}$ watt. See note

NOTE: Recheck first two adjustments after this adjustment because of inter-locking effects.

MONTGOMERY WARD

MODELS 84BR-2715C,
84BR-2722A

Procedure for disassembly and assembly of dial mechanism.



TO ALIGN POINTER—Loosen bracket screw "A". Then tape guide bracket can be moved up to allow proper meshing of tape teeth with pinion gear. Readjust bracket to eliminate backlash.

ALIGNMENT PROCEDURE

FM Band Section. I.F. and R.F.

A non-metallic alignment tool must be used.

IMPORTANT

No alignment of the FM section of this radio should be attempted unless you are positive that the circuits are in need of adjustment and you have the necessary equipment.

All components used in this radio are extremely stable and the tuned circuits should require no adjustment over long periods of time.

NOTE

The following alignment is based on the use of the new Simpson vacuum tube volt-meter which has a "floating ground". In other words, the meter, when used as a vacuum tube volt-meter, can have both the positive and negative sides connected to points above ground and still give true readings.

A standard AM signal generator is required.

FM - I. F. ALIGNMENT

Band Switch in FM Position. Dummy Antenna .1 Mfd.

SIGNAL GENERATOR FREQUENCY	CONNECTION TO RADIO	VACUUM TUBE VOLT METER CONNECTION TO RADIO	ADJUSTMENTS TO BE MADE	ADJUST FOR
10.7 Mc. Use about .1 volt	Pin No. 1 of 6BA6 no. 3 and ground	Pin No. 2 of 6AL5 and ground	Primary of T10	Resonance should be about 3 volts
10.7 Mc. Use about .1 volt	Pin No. 1 of 6BA6 no. 3 and ground	See note "A"	Secondary of T10	Zero. Use zero center scale See note "B"
10.7 Mc. Use about 3300 microvolts	Pin No. 1 of 6BA6 no. 2 and ground	Pin No. 2 of 6AL5 and ground	Primary and Secondary of T9 10.7 m.c. windings See top and bottom views	Resonance should be about 3 volts
10.7 Mc. Use about 200 microvolts	Pin No. 2 of 12AT7 and ground	Pin No. 2 of 6AL5 and ground	Primary and Secondary of 10.7 m.c. windings of T8 See top and bottom views	Resonance should be about 3 volts

NOTE ON FM - I.F. ALIGNMENT

NOTE "A" Connect two resistors, 100K OHMS each, from Pin No. 2 of 6AL5 to ground. These resistors must be matched within 5%. Connect as shown in dotted lines on schematic diagram. Connect vacuum tube volt-meter between the mid-point of the resistors and points xx.

NOTE "B" If T10 has been tampered with, it is possible that no crossover point will be found at first. Careful adjustment of both primary and secondary is necessary.

GENERAL: Input signals should be adjusted to give approximately 3 volts. The ratio detector is operating at a reasonable level at this point and will give the truest indication of correct alignment with the procedure specified.

MODELS 84BR-2715C,
84BR-2722A

MONTGOMERY WARD

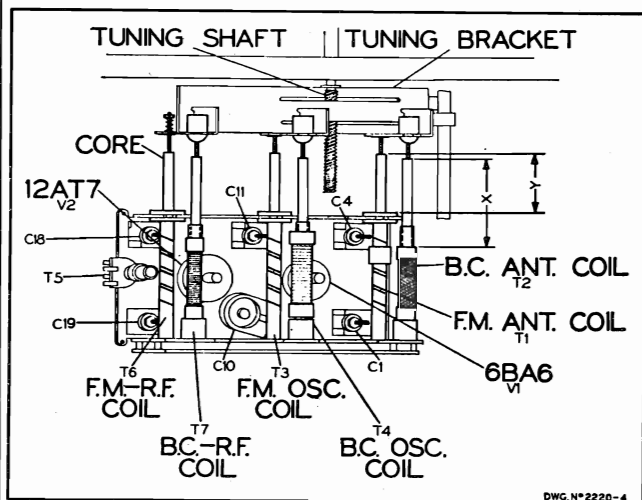
FM - R. F. ALIGNMENT

Check pointer so that it coincides with the marker to the extreme right when iron cores are all the way out. For adjustment, see dial mechanism illustration.

SIGNAL GENERATOR FREQUENCY	CONNECTION TO RADIO	DUMMY ANTENNA	ADJUST	VACUUM TUBE VOLT METER CONNECTION TO RADIO	ADJUST TO
100 Mc. Use about 25 microvolts	FM Antenna Terminals See note	300 ohms	C10 Osc. C19 R.F. C1 Ant.	Pin No. 2 of 6AL5 and Ground	Resonance about 3 volts

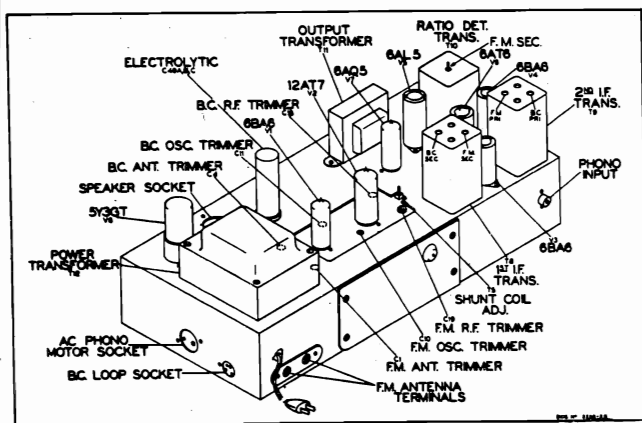
NOTE: If a signal generator with the above fundamental frequency is not available, it is sometimes possible to use harmonics. Use extreme care in picking harmonics. An alternate procedure is to use a local station carrier of known frequency to align the FM

Band and to use the vacuum tube volt-meter as above for resonance indication. A weak carrier, however will not produce 3 volts. NOTE: Connect 300 ohms in series with hot side of generator and connect to one screw. Connect cold side of generator to other screw.

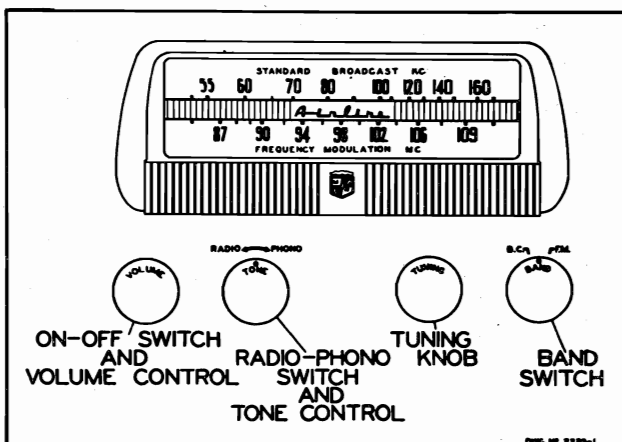


TUNER ADJUSTMENT

With tuner all the way out, dimension "X" should be 1 1/2 inches. "Y" should be 1-1/16 inches. "X" is from the end of the slug to the edge of the coil winding. Check these dimensions before R.F. alignment is attempted of either the AM or FM band. No slug adjustment should be necessary since the slugs are properly set at the factory.



Chassis-top view



REPLACEMENT PARTS ONLY USED IN MODEL 2722A

Part No.	Description	Qty. Used
B-18B-14140	Electrodynamic speaker, 10-inch, less output transformer	1
C-30A-15335	Dial scale	1
B-5B-13978-56	Knob "Tone and Volume"	2
B-5B-13737-56	Knob, "Tuning and Bandswitch"	2
B-5C-15078-56	Escutcheon side pieces	2
A-25A-13818	Chassis rubber grommet	4

Part No.	Description	Qty. Used
RECORD CHANGER		
B-201-15417	G.I. 204 Changer, with automatic stop	1
OR		
B-201-14063-1	Russell C-10M Changer with automatic stop	1

MONTGOMERY WARD

MODELS 84BR-2715C,
84BR-2722A

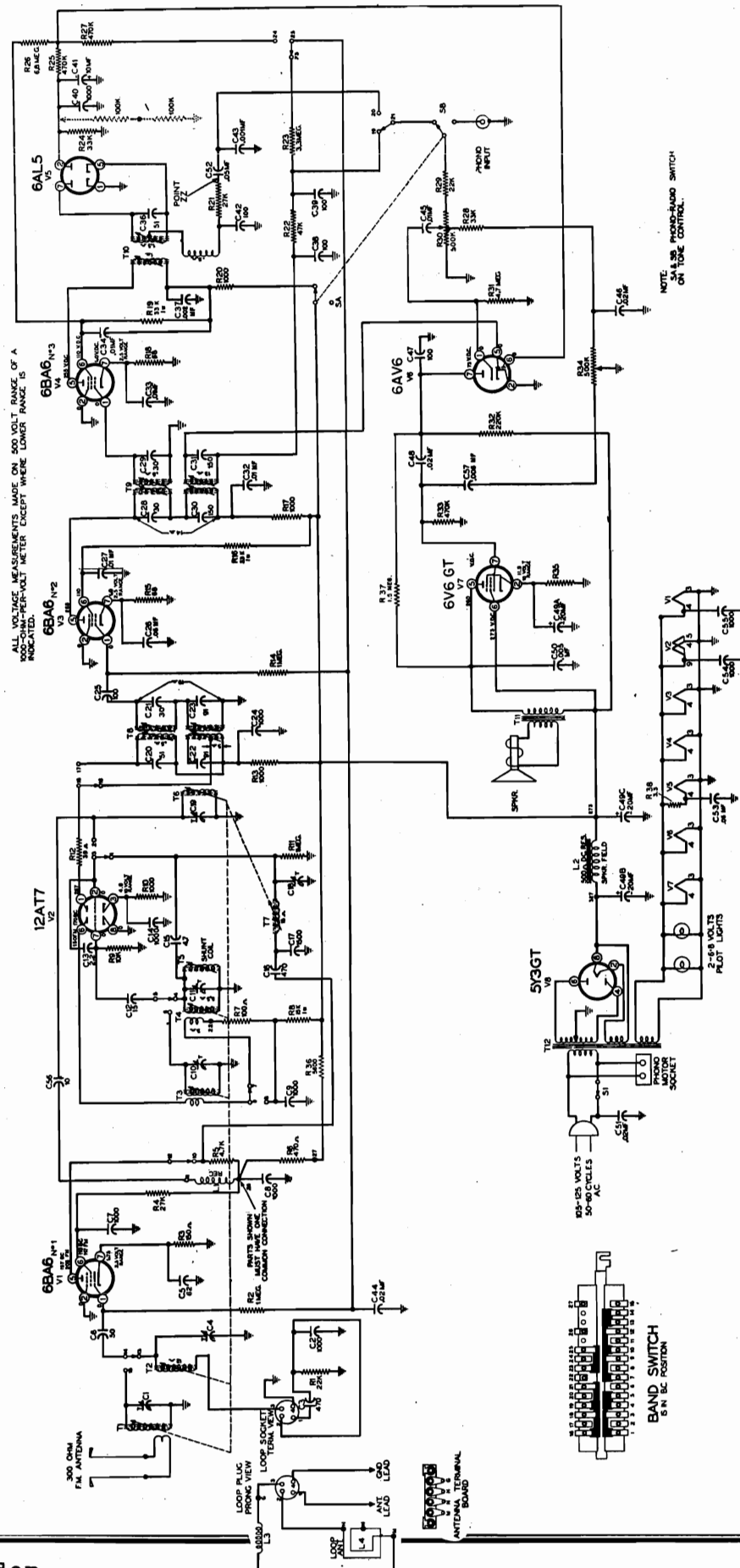
REPLACEMENT PARTS LIST

Use Only Genuine Factory Replacement Parts

Ref. No.	Part No.	Description	Qty. Used In Set	Ref. No.	Part No.	Description	Qty. Used In Set
TUNER CHASSIS PARTS							
CONDENSERS							
C10	A-8E-13575	Trimmer condenser	1	C48	C-8J-11321	.02 x 600 volts, 20 %	1
C1, 4, 11, 19, 18	A-2M-12618	Trimmer cond. plate	5	C25, 47	C-8G-13131	100 mmf, ceramic, 10 %	2
C3, 16	C-8G-11732	470 mmf, ± 20 %	2	C24, 40, 53	C-8G-13016	1000 mmf, ceramic, 20 %	3
C2	C-8G-13695	1000 mmf, ± 20 %	1	C42	C-8F3-225	100 mmf, mica, 5 %	1
C8, 7, 9, 14, 54, 55	C-8G-13201	1000 mmf, ± 20 %—10 %	6	C38, 39	A-8F-13127	.0001 mf. dual mica, 20 %	1
C5	C-8G-13018	62 mmf, ± 10 %	1	C22, 23	C-8G-12160	91 mmf, ceramic, 5 %	2
C17	C-8G-11731	1500 mmf, ± 20 %	1	C20	C-8G-13026	51 mmf, ceramic, 5 %	1
C12	C-8G-13017	15 mmf, ± 10 %	1	C30, 31	C-8G-13025	150 mmf, ceramic, 5 %	2
C6	C-8G-11484	50 mmf, ± 10 %	1	C21, 28, 29	C-8G-12159	30 mmf, ceramic, 5 %	3
C56	C-8G-11789	10 mmf, ± 10 %	1	C36	C-8G-11891	51 mmf, ceramic	1
C15	A-8G-12495-6	4.7 mmf, ± 20 %	1	RESISTORS			
C13	A-8G-12495-4	2.2 mmf, ± 20 %	1	R30, S1	A-10A-13114	Volume control (500K ohms) and switch	1
C44	C-8D-11304	.02 mfd, 200 volts, ± 20 %	1	R34, SA, SB	A-11A-13115	Tone control (500K ohms) and radio-phono switch	1
RESISTORS				R32	C-9B1-27	220K ohms, $\frac{1}{2}$ watt, 20 %	1
R4	C-9B2-79	27K ohms, 1 watt, 10 %	1	R15, 18	C-9B1-48	68 ohms, $\frac{1}{2}$ watt, 10 %	2
R1	C-9B1-21	22K ohms, $\frac{1}{2}$ watt, 20 %	1	R14	C-9B1-31	1 megohm, $\frac{1}{2}$ watt, 20 %	1
R3	C-9B1-52	150 ohms, $\frac{1}{2}$ watt, 10 %	1	R19, 16	C-9B2-78	22K ohms, 1 watt, 10 %	2
R5	C-9B1-17	4700 ohms, $\frac{1}{2}$ watt, 20 %	1	R24, 28	C-9B1-80	33K ohms, $\frac{1}{2}$ watt, 10 %	2
R6	C-9B1-11	470 ohms, $\frac{1}{2}$ watt, 20 %	1	R21	C-9B1-79	27K ohms, $\frac{1}{2}$ watt, 10 %	1
R9	C-9B1-19	10K ohms, $\frac{1}{2}$ watt, 20 %	1	R8	C-9B2-71	5600 ohms, 1 watt, 10 %	1
R2, 11	C-9B1-31	1 megohm, $\frac{1}{2}$ watt, 20 %	2	R22	C-9B1-23	47K ohms, $\frac{1}{2}$ watt, 20 %	1
R10	C-9B1-62	1000 ohms, $\frac{1}{2}$ watt, 10 %	1	R29	C-9B1-21	22K ohms, $\frac{1}{2}$ watt, 20 %	1
R23	C-9B1-34	3.3 megohms, $\frac{1}{2}$ watt, 20 %	1	R31	C-9B1-35	4.7 megohms, $\frac{1}{2}$ watt, 20 %	1
R7	C-9B1-50	100 ohms, $\frac{1}{2}$ watt, 10 %	1	R25, 27, 33	C-9B1-29	470K ohms, $\frac{1}{2}$ watt, 20 %	3
R12	C-9B1-45	39 ohms, $\frac{1}{2}$ watt, 10 %	1	R35	C-9B1-55	270 ohms, $\frac{1}{2}$ watt, 10 %	1
COILS				R26	C-9B1-36	6.8 megohms, $\frac{1}{2}$ watt, 20 %	1
T3	B-13D-13027	FM oscillator coil assembly	1	R13, 20, 17	C-9B1-13	1000 ohms, $\frac{1}{2}$ watt, 20 %	2
—	B-51B-13056	Core for FM oscillator coil	1	COILS			
T1	B-13E-13028	FM antenna coil assembly	1	T8	B-13A-15473	Input I.F. transformer, combination, 455 kc. and 10.7 mc.	1
—	B-51A-13058	Core for FM antenna coil	1	T9	B-13B-15474	Second I.F. transformer, combination, 455 kc. and 10.7 mc.	1
T6	B-13C-13029	FM R.F. coil assembly	1	T10	B-13M-15475	Ratio det. coil assembly, 10.7 mc.	1
—	B-51A-13057	Core for FM R.F. coil	1	L3	A-16A-13243	Loop loading coil	1
T4	B-13D-13030	AM oscillator coil assembly	1	L4	A-14MA-11066-1	Loop antenna ribbon	1
—	B-51A-12722	Core for B.C. oscillator coil	1	TRANSFORMERS			
T2	B-13E-13031	AM antenna coil assembly	1	T12	B-12A-13120	Power transformer, primary, 50-60 cycles, 105-125 volts A.C.	1
T7	B-13C-13032	AM R.F. coil assembly	1	T11	B-12C-13556	Output transformer, for speaker	1
L1	A-16A-13033	Choke coil assembly	1	SPEAKER			
T5	B-13D-12974	AM osc. shunt coil assembly	1	L2	B-18B-13585-1	Electrodynamic speaker, 12-inch, less output transformer	1
MISCELLANEOUS				MISCELLANEOUS			
	B-208-13553	Band change slide switch	1	B-30A-13611	Dial scale	1	
	or			B-5B-13744	Knob, mahog. or wal. "Volume"	1	
	B-201-12967	Band change slide switch	1	B-5B-13745	Knob, mahog. or wal. "Tone"	1	
	A-15B-12997	7 prong, miniature tube socket	1	B-5B-13746	Knob, mahog. or wal. "Tuning"	1	
	A-15B-13430	9 prong, miniature tube socket	1	B-5B-13747	Knob, mahog. or wal. "Band switch"	1	
	C-2D-14437	Drive bracket assembly	1	B-2G-13612	Escutcheon, mahog. or walnut	1	
	A-25A-13019	Core grommets, for AM Band	3	B-14M-11479	Line cord and plug	1	
	A-3M-13020	Insert for core grommet	3	A-3A-12933-1	Band switch shaft	1	
	A-49A-12394	Spiral spring for FM cores	3	A-55C-12935	Ball bearing	1	
	A-2J-11041	Pointer tension spring, "M" shaped	1	B-47A-11094-4	Pilot lite and bracket assembly	1	
	B-2D-12316	Tape guide	1	A-46A-11739	Pilot lite, 6-8 volts, T-44	2	
	B-2J-12922	Rack tape, with teeth and pointer bracket	1	A-15C-13174	Miniature socket, 7 prong	5	
	B-2G-13613	Pointer	1	A-15B-10440	Octal socket, 8 prong	1	
	A-200-15016	Drive, pinion and lead screw assembly	1	A-19B-12644	Loop antenna socket	1	
MAIN CHASSIS PARTS				B-7B-13050	FM terminal strip	1	
CONDENSERS				A-15B-11538	Speaker socket	1	
C49B, 49C, 49A	A-8C-13555	Electrolytic, 20—20 x 350 volts; 20 x 25 volts	1	A-19B-12468	Phono motor socket	1	
C50	C-8D-10935	.005 mf x 600 volts	1	A-19B-12170	Phono input socket	1	
C27, 32, 33, 34, 37, 45	C-8D-10761	.01 mf x 400 volts, 20 %	6	RECORD CHANGER			
C57	C-8D-10785	.006 mf x 600 volts, 20 %	1	B-201-15176	148 Changer with P-30 cart- ridge	1	
C41	A-8C-13132	Electrolytic, 10 mf x 50 volts	1	OR			
C43	C-8D-10787	.001 x 600 volts, 20 %	1	B-201-16042	146 changer with P-30 cartridge	1	
C52, C26	C-8D-10770	.05 x 200 volts, 20 %	2	OR			
C51, 46	C-8D-10774	.02 x 400 volts, 20 %	2	D-21H-13293 P-30	V-M changer with P-30 cartridge Crystal cartridge with needle	1	

MODEL 84BR-2715D

MONTGOMERY WARD



MONTGOMERY WARD

MODEL 84BR-2715D

GENERAL DESCRIPTION

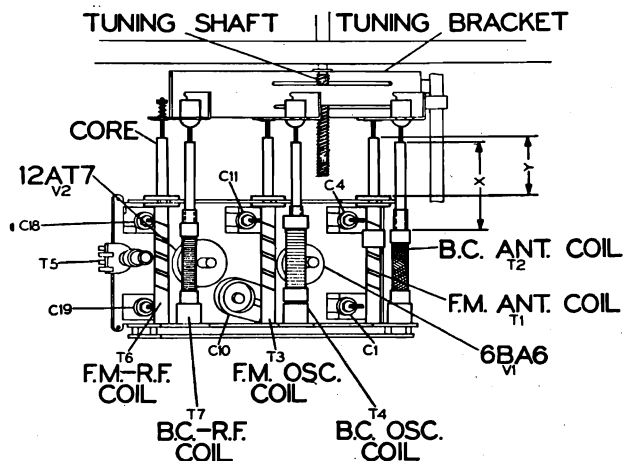
This is a 2-band, seven tube (plus rectifier) superheterodyne receiver for the reception of both AM and FM stations. It features the most advanced type of FM ratio detector, permeability tuning of both bands, combination double-frequency I.F. coils and miniature tubes. Built-in antennas are provided for broadcast and FM reception; provision is also made for connection of an external broadcast antenna as well as an FM antenna with a 300 ohm lead-in. Both antennas may be connected to the radio at the same time.

The phonograph is equipped with an automatic changer which plays up to ten 12-inch records or twelve 10-inch records at one loading, and also accommodates the new long-play microgroove records.

ELECTRICAL SPECIFICATIONS

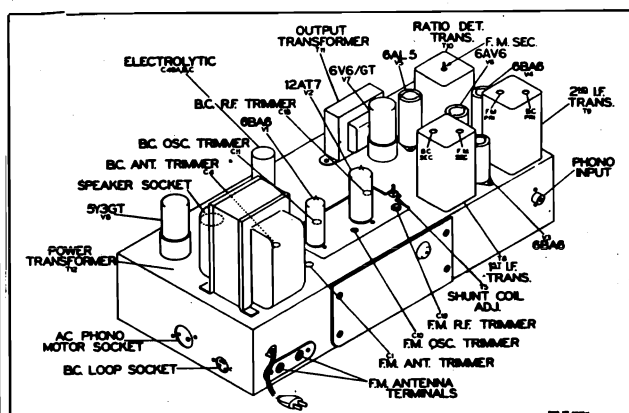
Power Supply..... 105 to 125 volts, AC, 60-cycles;
Chassis only 75 watts. With
phono operation 100 watts.
Frequency Ranges... Broadcast Band—535 to 1620 kc.
FM Band— 88 to 108 mc.
Intermediate Freq.... AM-455 kc.; FM-10.7 mc.
Selectivity..... AM-42 kc. broad at 1000 times signal, measured at 1000 kc.

I.F. FM-200 kc. broad at 2 times down.
I.F. FM-400 kc. broad at 10 times down.
AM Sensitivity..... (For .5 watt output with external antenna)—5 microvolts average.
FM Sensitivity..... (For .5 watt output)—25 microvolts average.
Power Output..... 3.2 watts, 10% distortion. 5.5 watts maximum.
Loud Speaker..... 12" electrodynamic. Voice coil impedance 3.2 ohms, 400 cycles.
Tube and Lamp Complement..... 6BA6, FM—AM R.F. stage.
12AT7, FM—AM oscillator and mixer.
6BA6, FM—AM 1st I.F.
6BA6, FM—2nd I.F.
6AL5, FM ratio detector.
6AV6, AM detector.
A.F. AMP. and A.V.C.
6V6GT/G, Audio output.
5Y3, rectifier.
T-44 dial lamp (2 used).
Automatic Changer See Manual 5069A.

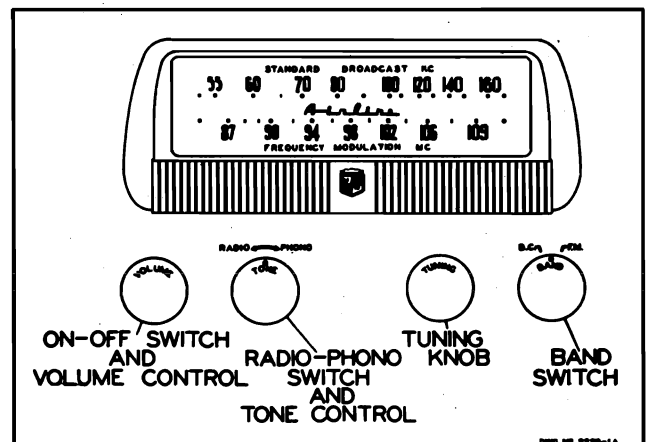


TUNER ADJUSTMENT

With tuner all the way out, dimension "X" should be $1\frac{1}{2}$ inches. "Y" should be $1\frac{1}{16}$ inches. "X" is from the end of the slug to the edge of the coil winding. Check these dimensions before R.F. alignment is attempted of either the AM or FM band. No slug adjustment should be necessary since the slugs are properly set at the factory.



Chassis-top view



MODEL 84BR-2715D

MONTGOMERY WARD

ALIGNMENT PROCEDURE

Broadcast Band Section I.F. and R.F.

The alignment procedure below includes the sensitivities at the inputs of various stages. All signal input values are based on an output of $\frac{1}{2}$ watt. This may be measured by disconnecting the speaker voice coil and substituting a 3.2-ohm resistor across the secondary winding of the output transformer. A reading of 1.3 volts AC across this resistor will be approximately equivalent to a $\frac{1}{2}$ -watt output with the speaker connected. The volume control

must be set at maximum. The tone control must be set for maximum treble.

The signal source must be an accurately calibrated signal generator capable of supplying the frequencies designated, modulated 30% with a 400-cycle audio signal. A 400 cycle audio signal is required for the audio measurement. Variations in sensitivities of plus or minus 25% are usually permissible.

AM - I. F. ALIGNMENT

Band Switch in AM Position. Tune Set to 1400 Kc. Dummy Antenna .1 Mfd.

SIGNAL GENERATOR FREQUENCY	CONNECTION TO RADIO	ADJUSTMENTS TO BE MADE	ADJUST FOR
455 Kc. Use 2400 microvolts	Pin No. 1 of 6BA6 No. 2 and ground	Primary and Secondary of T9 AM windings. See top and bottom views	Maximum output Should be $\frac{1}{2}$ watt
455 Kc. Use 70 microvolts	Pin No. 2 of 12AT7 and ground	Primary and Secondary of T8 AM windings. See top and bottom views	Maximum output Should be $\frac{1}{2}$ watt
400 cycles. Use 60 millivolts	Hot end of volume control and ground	None	Maximum output Should be $\frac{1}{2}$ watt

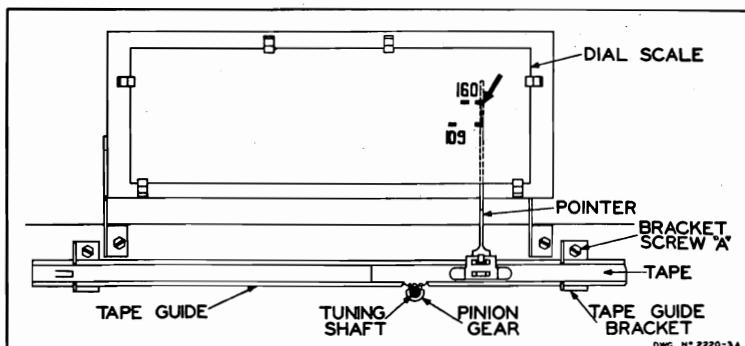
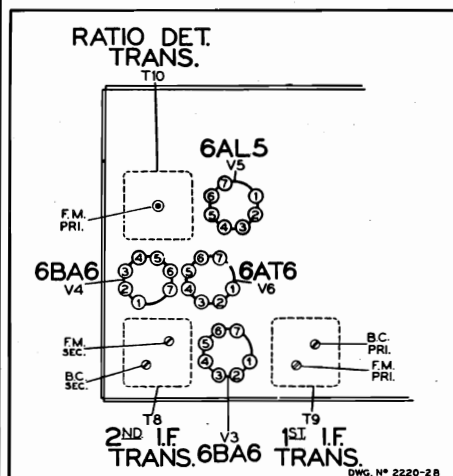
BROADCAST BAND - R. F. ALIGNMENT

Check pointer so that it coincides with the marker to the extreme right when iron cores are all the way out. For adjustment, see dial mechanism illustration.

SIGNAL GENERATOR FREQUENCY	CONNECTION TO RADIO	DUMMY ANTENNA	ADJUST
1620 Kc.	AM Antenna and Ground	200 mmf.	C11 Osc. trimmer for maximum
535 Kc.	AM Antenna and Ground	200 mmf.	T5 for maximum $\frac{1}{2}$ watt
1620 Kc. Use 5 microvolts	AM Antenna and Ground	200 mmf.	C4 and C18 for max. $\frac{1}{2}$ watt. See note

NOTE: Recheck first two adjustments after this adjustment because of inter-locking effects.

Procedure for disassembly and assembly of dial mechanism.



TO ALIGN POINTER— Loosen bracket screw "A". Then tape guide bracket can be moved up to allow proper meshing of tape teeth with pinion gear. Readjust bracket to eliminate backlash.

MONTGOMERY WARD

MODEL 84BR-2715D

ALIGNMENT PROCEDURE*FM Band Section. I.F. and R.F.*

A non-metallic alignment tool must be used.

IMPORTANT

No alignment of the FM section of this radio should be attempted unless you are positive that the circuits are in need of adjustment and you have the necessary equipment.

All components used in this radio are extremely stable and the tuned circuits should require no adjustment over long periods of time.

NOTE

The following alignment is based on the use of the new Simpson vacuum tube volt-meter which has a "floating ground". In other words, the meter, when used as a vacuum tube volt-meter, can have both the positive and negative sides connected to points above ground and still give true readings.

A standard AM signal generator is required.

FM - I. F. ALIGNMENT*Band Switch in FM Position. Dummy Antenna .1 Mfd.*

SIGNAL GENERATOR FREQUENCY	CONNECTION TO RADIO	VACUUM TUBE VOLT METER CONNECTION TO RADIO	ADJUSTMENTS TO BE MADE	ADJUST FOR
10.7 Mc. Use about .1 volt	Pin No. 1 of 6BA6 no. 3 and ground	Pin No. 2 of 6AL5 and ground	Primary of T10	Resonance should be about 3 volts
10.7 Mc. Use about .1 volt	Pin No. 1 of 6BA6 no. 3 and ground	See note "A"	Secondary of T10	Zero. Use zero center scale See note "B"
10.7 Mc. Use about 3300 microvolts	Pin No. 1 of 6BA6 no. 2 and ground	Pin No. 2 of 6AL5 and ground	Primary and Secondary of T9 10.7 m.c. windings See top and bottom views	Resonance should be about 3 volts
10.7 Mc. Use about 200 microvolts	Pin No. 2 of 12AT7 and ground	Pin No. 2 of 6AL5 and ground	Primary and Secondary of 10.7 m.c. windings of T8 See top and bottom views	Resonance should be about 3 volts

NOTE ON FM - I.F. ALIGNMENT

NOTE "A" Connect two resistors, 100K OHMS each, from Pin No. 2 of 6AL5 to ground. These resistors must be matched within 5%. Connect as shown in dotted lines on schematic diagram. Connect vacuum tube volt-meter between the mid-point of the resistors and points zz.

NOTE "B" If T10 has been tampered with, it is possible that no crossover point will be found at first. Careful adjustment of both primary and secondary is necessary.

GENERAL: Input signals should be adjusted to give approximately 3 volts. The ratio detector is operating at a reasonable level at this point and will give the truest indication of correct alignment with the procedure specified.

FM - R. F. ALIGNMENT

Check pointer so that it coincides with the marker to the extreme right when iron cores are all the way out. For adjustment, see dial mechanism illustration.

SIGNAL GENERATOR FREQUENCY	CONNECTION TO RADIO	DUMMY ANTENNA	ADJUST	VACUUM TUBE VOLT METER CONNECTION TO RADIO	ADJUST TO
100 Mc. Use about 25 microvolts	FM Antenna Terminals See note	300 ohms	C10 Osc. C19 R.F. C1 Ant.	Pin No. 2 of 6AL5 and Ground	Resonance about 3 volts

NOTE: If a signal generator with the above fundamental frequency is not available, it is sometimes possible to use harmonics. Use extreme care in picking harmonics. An alternate procedure is to use a local station carrier of known frequency to align the FM

Band and to use the vacuum tube volt-meter as above for resonance indication. A weak carrier, however will not produce 3 volts. NOTE: Connect 300 ohms in series with hot side of generator and connect to one screw. Connect cold side of generator to other screw.

MODEL 84BR-2715D

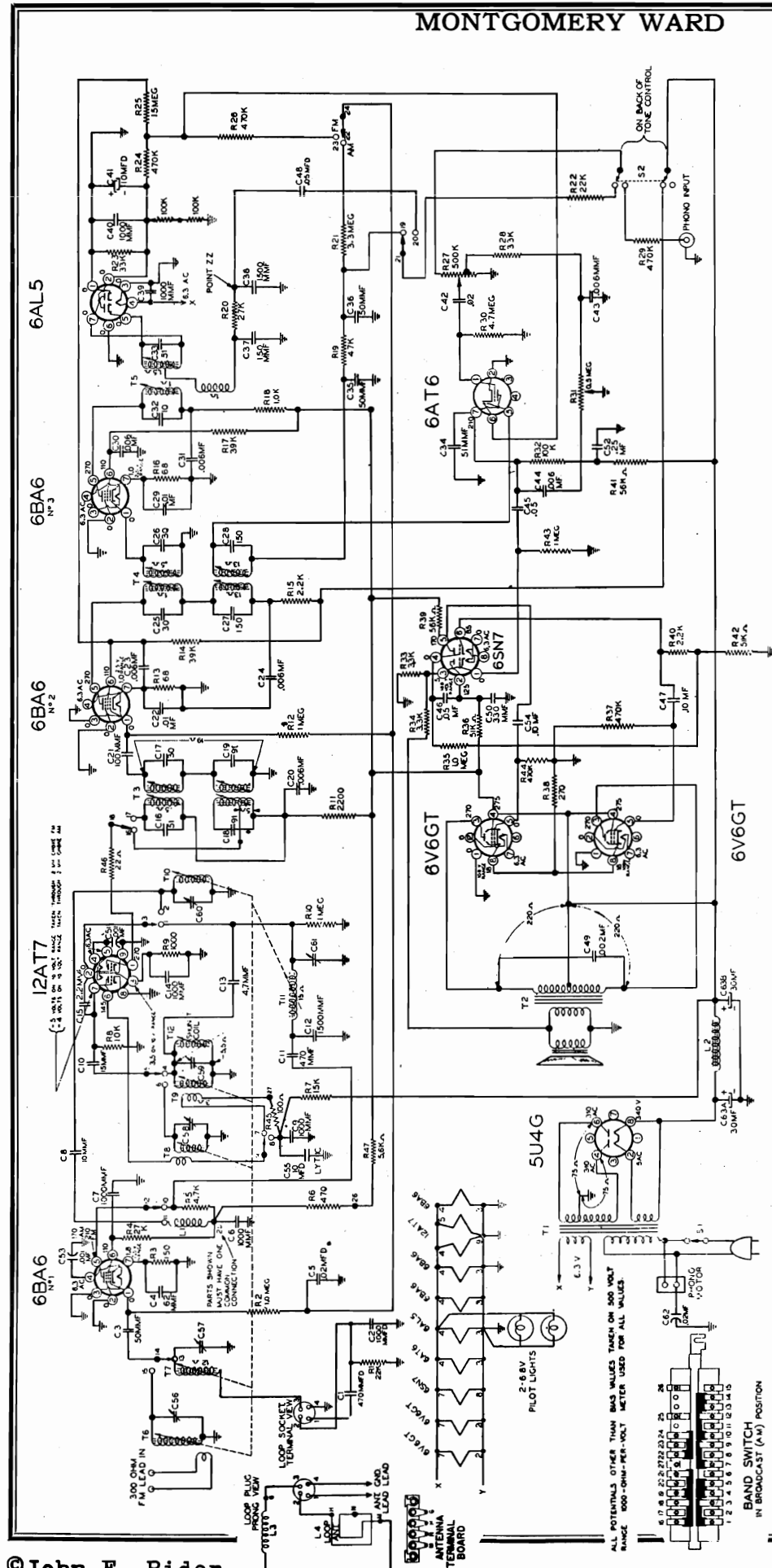
MONTGOMERY WARD

REPLACEMENT PARTS LIST Use Only Genuine Factory Replacement Parts

Ref. No.	Part No.	Description	Qty. Used In Set	Ref. No.	Part No.	Description	Qty. Used In Set
TUNER CHASSIS PARTS							
CONDENSERS							
C10	A-8E-13575	Trimmer condenser	1	C48, 46	C-8D-10774	.02 x 400 volts, 20 %	2
C1, 4, 11, 19, 18	A-2M-12618	Trimmer cond. plate	5	C51	C-8J-11321	.02 x 600 volts, 20 %	1
C3, 16	C-8G-11732	470 mmf, $\pm 20\%$	2	C25, 47	C-8G-13131	100 mmf, ceramic, 10 %	2
C2	C-8G-13695	1000 mmf, $\pm 20\%$	1	C24, 40	C-8G-13016	1000 mmf, ceramic, 20 %	3
C8, 7, 9, 14, 54, 55	C-8G-13201	1000 mmf, $\pm 20\%$ —10 %	6	C42	C-8F3-225	100 mmf, mica, 5 %	1
C5	C-8G-13018	62 mmf, $\pm 10\%$	1	C38, 39	A-8F-13127	.0001 mf, dual mica, 20 %	1
C17	C-8G-11731	1500 mmf, $\pm 20\%$	1	C22, 23	C-8G-12160	91 mmf, ceramic, 5 %	2
C12	C-8G-13017	15 mmf, $\pm 10\%$	1	C20	C-8G-13026	51 mmf, ceramic, 5 %	1
C6	C-8G-11484	50 mmf, $\pm 10\%$	1	C30, 31	C-8G-13025	150 mmf, ceramic, 5 %	2
C56	C-8G-11789	10 mmf, $\pm 10\%$	1	C21, 28, 29	C-8G-12159	30 mmf, ceramic, 5 %	3
C15	A-8G-12495-6	4.7 mmf, $\pm 20\%$	1	C36	C-8G-11891	51 mmf, ceramic	1
C13	A-8G-12495-4	2.2 mmf, $\pm 20\%$	1	C37	C-8D-15638	.002 x 600 volts, 10 %	1
C44	C-8D-11304	.02 mfd, 200 volts, $\pm 20\%$	1	RESISTORS			
RESISTORS				R30, S1	A-10A-13114	Volume control (500K ohms) and switch	1
R4	C-9B2-79	27K ohms, 1 watt, 10 %	1	R34, SA, SB	A-11A-13115	Tone control (500K ohms) and radio-phono switch	1
R1	C-9B1-21	22K ohms, $\frac{1}{2}$ watt, 20 %	1	R32	C-9B1-27	220K ohms, $\frac{1}{2}$ watt, 20 %	1
R3	C-9B1-52	150 ohms, $\frac{1}{2}$ watt, 10 %	1	R15, 18	C-9B1-48	68 ohms, $\frac{1}{2}$ watt, 10 %	2
R5	C-9B1-17	4700 ohms, $\frac{1}{2}$ watt, 20 %	1	R14	C-9B1-31	1 megohm, $\frac{1}{2}$ watt, 20 %	1
R6	C-9B1-11	470 ohms, $\frac{1}{2}$ watt, 20 %	1	R19, 16	C-9B2-80	33K ohms 1 watt, 10 %	2
R9	C-9B1-19	10K ohms, $\frac{1}{2}$ watt, 20 %	1	R24, 28	C-9B1-80	33K ohms, $\frac{1}{2}$ watt, 10 %	2
R2, 11	C-9B1-31	1 megohm, $\frac{1}{2}$ watt, 20 %	2	R21	C-9B1-79	27K ohms, $\frac{1}{2}$ watt, 10 %	1
R10	C-9B1-62	1000 ohms, $\frac{1}{2}$ watt, 10 %	1	R8	C-9B2-76	15K ohms, 1 watt, 10 %	1
R23	C-9B1-34	3.3 megohms, $\frac{1}{2}$ watt, 20 %	1	R22	C-9B1-23	47K ohms, $\frac{1}{2}$ watt, 20 %	1
R7	C-9B1-50	100 ohms, $\frac{1}{2}$ watt, 10 %	1	R29	C-9B1-21	22K ohms, $\frac{1}{2}$ watt, 20 %	1
R12	C-9B1-45	39 ohms, $\frac{1}{2}$ watt, 10 %	1	R31	C-9B1-35	4.7 megohms, $\frac{1}{2}$ watt, 20 %	1
R36	C-9B2-71	5600 ohms, 1 watt, 10 %	1	R25, 27, 33	C-9B1-29	470K ohms, $\frac{1}{2}$ watt, 20 %	3
COILS				R35	C-9B2-144	240 ohms, 1 watt, 5 %	1
T3	B-13D-13027	FM oscillator coil assembly	1	R26	C-9B1-36	6.8 megohms, $\frac{1}{2}$ watt, 20 %	1
—	B-51B-13056	Core for FM oscillator coil	1	R13, 20, 17	C-9B1-13	1000 ohms, $\frac{1}{2}$ watt, 20 %	2
T1	B-13E-13028	FM antenna coil assembly	1	R37	C-9B1-100	1.5 megohm, $\frac{1}{2}$ watt, 10 %	1
—	B-51A-13058	Core for FM antenna coil	1	R38	C-9B1-1069	3.3 ohms, $\frac{1}{2}$ watt, 5 %	1
T6	B-13C-13029	FM R.F. coil assembly	1	COILS			
—	B-51A-13057	Core for FM R.F. coil	1	T8	B-13A-15473	Input I.F. transformer, combination, 455 kc. and 10.7 mc.	1
T4	B-13D-13030	AM oscillator coil assembly	1	T9	B-13B-15474	Second I.F. transformer, combination, 455 kc. and 10.7 mc.	1
—	B-51A-12722	Core for B.C. oscillator coil	1	T10	B-13M-15475	Ratio det. coil assembly 10.7 mc.	1
—	B-51A-12723	Core for B.C. ant. and R.F. coil	1	L3	A-16A-13243	Loop loading coil	1
T2	B-13E-13031	AM antenna coil assembly	1	L4	A-14MA-11066-1	Loop antenna ribbon	1
T7	B-13C-13032	AM R.F. coil assembly	1	TRANSFORMERS			
L1	A-16A-13033	Choke coil assembly	1	T12	B-12A-15385	Power transformer, primary, 50-60 cycles. 105-125 volts A.C.	1
T5	B-13D-12974	AM osc. shunt coil assembly	1	T11	B-12C-13556	Output transformer, for speaker	1
MISCELLANEOUS				SPEAKER			
—	B-208-13553	Band change slide switch	1	L2	B-18B-13585-2	Electrodynamic speaker, 12-inch, less output transformer	1
—	or			MISCELLANEOUS			
—	B-201-12967	Band change slide switch	1	B-30A-13611	Dial scale	1	
—	A-15B-12997	7 prong, miniature tube socket	1	B-5B-13744	Knob, mahog. or wal. "Volume"	1	
—	A-15B-13430	9 prong, miniature tube socket	1	B-5B-13745	Knob, mahog. or wal. "Tone"	1	
—	C-2D-14437	Drive bracket assembly	1	B-5B-13746	Knob, mahog. or wal. "Tuning"	1	
—	A-25A-13019	Core grommets, for AM Band	3	B-5B-13747	Knob, mahog. or wal. "Band switch"	1	
—	A-3M-13020	Insert for core grommet	3	B-2G-13612	Escutcheon, mahog. or walnut	1	
—	A-49A-12394	Spiral spring for FM cores	3	B-14M-11479	Line cord and plug	1	
—	A-2J-11041	Pointer tension spring, "M" shaped	1	A-3A-12933-1	Band switch shaft	1	
—	B-2D-12316	Tape guide	1	A-55C-12935	Ball bearing	1	
—	B-2J-12922	Rack tape, with teeth and pointer bracket	1	B-47A-11094-4	Pilot lite and bracket assembly	1	
—	B-2G-13613	Pointer	1	A-46A-11739	Pilot lite, 6-8 volts, T-44	2	
—	A-200-15016	Drive, pinion and lead screw assembly	1	A-15C-13174	Miniature socket, 7 prong	5	
MAIN CHASSIS PARTS				A-15B-10440	Octal socket, 8 prong	1	
CONDENSERS				A-19B-12644	Loop antenna socket	1	
C49B, 49C, 49A	A-8C-15387	Electrolytic, 20—20 x 450 volts; 20 x 25 volts	1	B-7B-13050	FM terminal strip	1	
C50	C-8D-10935	.005 mf x 600 volts	1	A-15B-11538	Speaker socket	1	
C27, 32, 33, 34, 45	C-8D-10761	.01 mf x 400 volts, 20 %	6	A-19B-12468	Phono motor socket	1	
C57	C-8D-10785	.006 mf x 600 volts, 20 %	1	A-19B-12170	Phono input socket	1	
C41	A-8C-13132	Electrolytic, 10 mf x 50 volts	1	RECORD CHANGER			
C43	C-8D-10787	.001 x 600 volts, 20 %	1	B-201-16042	146 changer with P-30 cartridge	1	
C53, C26, C52	C-8D-10770	.05 x 200 volts, 20 %	2	P-30	Crystal cartridge with needle	1	

MONTGOMERY WARD

MODEL 84BR-2719A



©John F. Rider

NOTES: On some sets R11 and R15 are 1000 ohms.

The two 100K ohm resistors in series from PIN NO.2 to ground are connected as shown only when aligning the FM I.F. Refer to FM I.F. alignment procedure.

On some sets C22 is .05 mfd.

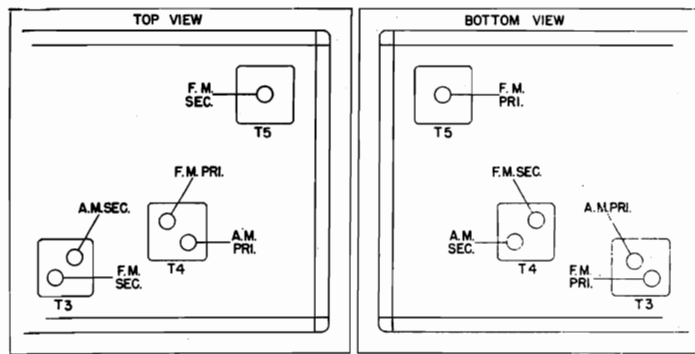
On some sets R46—22 ohm resistor is replaced with a 39 ohm resistor, Part no. C-981-45.

When T5 is top and bottom tuned, C30 is .01—400 volts, and returned to bottom end of C32. C31 becomes .002—600 volts; C37 becomes 100 mmfd.; R17 is connected to the top of R18 instead of the bottom. A 1000 mmf. condenser is connected between the B+ supply line of the ratio detector assembly and ground.

RECORD CHANGER: V-M Model 800, RCD.CH. 17-1

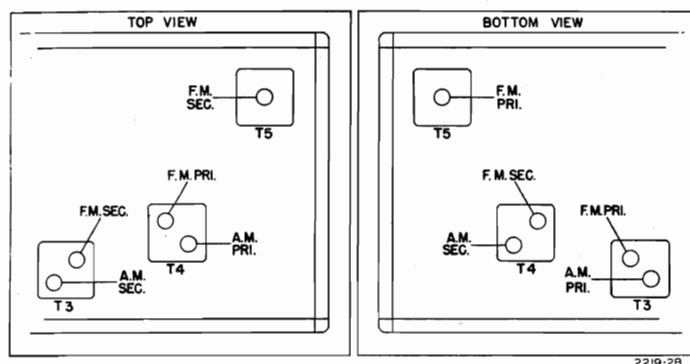
SPECIAL ALIGNMENT INFORMATION

Do not attempt any I.F. alignment until you have referred to the views below. This radio is built with 3 combinations of I. F. coils. Refer to part numbers on the coils. See notes under the circuit diagram.



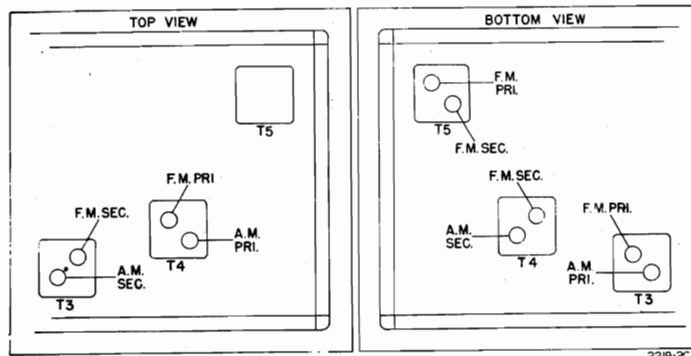
This combination uses the following part numbers:

T3.....B-13A-15473
 T4.....B-13B-15474
 T5.....B-13M-15475 (top and bottom tuned).



This combination uses the following part numbers:

T3.....C-13A-13009-1
 T4.....C-13B-13014-1
 T5.....B-13M-15475 (top and bottom tuned).



This combination uses the following part numbers:

T3.....C-13A-13009-1
 T4.....C-13B-13014-1
 T5.....C-203-11745-1 (bottom tuned). Use this view when T5 has no trimmer on top.

ELECTRICAL SPECIFICATIONS

Power Supply.....105 to 125 volts, AC, 60-cycles;
 Chassis only 122 watts. With
 phono operation 150 watts.
 Frequency Ranges.....Broadcast Band—535 to 1620 kc.
 FM Band—88 to 108 mc.
 Intermediate Freq.....AM-455 kc.; FM-10.7 mc.
 Selectivity.....AM-48 kc. broad at 1000 times sig-
 nal, measured at 1000 kc.
 I.F. FM-180 kc. broad at 2 times
 down.
 I.F. FM-320 kc. broad at 10 times
 down.
 AM Sensitivity.....(For .5 watt output with external
 antenna)—3 microvolts average
 FM Sensitivity.....(For .5 watt output—10 micro-
 volts average.
 Power Output.....8 watts, 10% distortion. 10 watts
 maximum.
 Loud Speaker.....12" electrodynamic. Voice coil
 impedance 3.2 ohms, 400 cycles.

GENERAL DESCRIPTION

This is a 2-band, nine tube (plus rectifier) superheterodyne receiver for the reception of both AM and FM stations. It features the most advanced type of FM ratio detector, permeability tuning of both bands, combination double-frequency I.F. coils and miniature tubes. Built-in antennas are provided for broadcast and FM reception; provision is also made for connection of an external broadcast antenna as well as an FM antenna with a 300 ohm lead-in. Both antennas may be connected to the radio at the same time.

The phonograph is equipped with an automatic changer which plays up to ten 12-inch records or twelve 10-inch records at one loading.

ALIGNMENT PROCEDURE**Broadcast Band Section I.F. and R.F.**

The alignment procedure below includes the sensitivities at the inputs of various stages. All signal input values are based on an output of $\frac{1}{2}$ watt. This may be measured by disconnecting the speaker voice coil and substituting a 3.2-ohm resistor across the secondary winding of the output transformer. A reading of 1.3 volts AC across this resistor will be approximately equivalent to a $\frac{1}{2}$ -watt output with the speaker connected. The volume control

must be set at maximum. The tone control must be set for maximum treble.

The signal source must be an accurately calibrated signal generator capable of supplying the frequencies designated, modulated 30% with a 400-cycle audio signal. A 400 cycle audio signal is required for the audio measurement. Variations in sensitivities of plus or minus 25% are usually permissible.

AM - I. F. ALIGNMENT

Band Switch in AM Position. Tune Set to 1400 Kc. Dummy Antenna .1 Mfd.

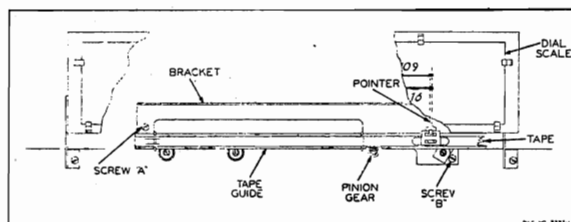
SIGNAL GENERATOR FREQUENCY	CONNECTION TO RADIO	ADJUSTMENTS TO BE MADE	ADJUST FOR
455 Kc. Use 1000 microvolts	Pin No. 1 of 6BA6 No. 2 and ground	Primary and Secondary of T4 AM windings. See top and bottom views	Maximum output Should be $\frac{1}{2}$ watt
455 Kc. Use 30 microvolts	Pin No. 2 of 12AT7 and ground	Primary and Secondary of T3 AM windings. See top and bottom views	Maximum output Should be $\frac{1}{2}$ watt
400 cycles. Use 28 millivolts	Hot end of volume control and ground	None	Maximum output Should be $\frac{1}{2}$ watt

BROADCAST BAND - R. F. ALIGNMENT

Check pointer so that the right hand edge of the pointer skirt coincides with the right hand edge of marker to the extreme right when iron cores are all the way out. For adjustment, see dial mechanism illustration.

SIGNAL GENERATOR FREQUENCY	CONNECTION TO RADIO	DUMMY ANTENNA	ADJUST
1620 Kc.	AM Antenna and Ground	200 mmf.	C59 Osc. trimmer for maximum
535 Kc.	AM Antenna and Ground	200 mmf.	T12 for maximum $\frac{1}{2}$ watt
1620 Kc. Use 3 microvolts	AM Antenna and Ground	200 mmf.	C57 and C61 for max. $\frac{1}{2}$ watt. See note

NOTE: Recheck first two adjustments after this adjustment because of inter-locking effects.

Procedure for disassembly and assembly of dial mechanism

TO ALIGN POINTER—Loosen bracket screw "A". Then tape guide bracket can be moved up to allow proper meshing of tape teeth with pinion gear. Readjust bracket to eliminate backlash.

MODEL 84BR-2719A

MONTGOMERY WARD

ALIGNMENT PROCEDURE*FM Band Section. I.F. and R.F.*

A non-metallic alignment tool must be used.

IMPORTANT

No alignment of the FM section of this radio should be attempted unless you are positive that the circuits are in need of adjustment and you have the necessary equipment.

All components used in this radio are extremely stable and the tuned circuits should require no adjustment over long periods of time.

NOTE

The following alignment is based on the use of the new Simpson vacuum tube volt-meter which has a "floating ground". In other words, the meter, when used as a vacuum tube volt-meter, can have both the positive and negative sides connected to points above ground and still give true readings.

A standard AM signal generator is required.

FM - I. F. ALIGNMENT*Band Switch in FM Position. Dummy Antenna .1 Mfd.*

SIGNAL GENERATOR FREQUENCY	CONNECTION TO RADIO	VACUUM TUBE VOLT METER CONNECTION TO RADIO	ADJUSTMENTS TO BE MADE	ADJUST FOR
10.7 Mc. Use about .1 volt	Pin No. 1 of 6BA6 no. 3 and ground	Pin no. 2 of 6AL5 and ground	Primary of T5	Resonance should be about 3 volts
10.7 Mc. Use about .1 volt	Pin No. 1 of 6BA6 no. 3 and ground	See note "A"	Secondary of T5	Zero. Use zero center scale. See note "B"
10.7 Mc. Use about 3300 microvolts	Pin No. 1 of 6BA6 no. 2 and ground	Pin no. 2 of 6AL5 and ground	Primary and Secondary of T4 10.7 m.c. windings See top and bottom views	Resonance should be about 3 volts
10.7 Mc. Use about 200 microvolts	Pin no. 2 of 12AT7 and ground	Pin no. 2 of 6AL5 and ground	Primary and Secondary of 10.7 m.c. windings of T3 See top and bottom views	Resonance should be about 3 volts

NOTES ON FM—I.F. ALIGNMENT

NOTE "A" Connect two resistors, 100K OHMS each, from Pin No. 2 of 6AL5 to ground. These resistors must be matched within 5%. Connect as shown in dotted lines on schematic diagram. Connect vacuum tube voltmeter between the mid-point of the resistors and point Σ .

NOTE "B" If T5 has been tampered with, it is possible that no crossover point will be found at first. Careful adjustment of both primary and secondary is necessary.

GENERAL: Input signals should be adjusted to give approximately 3 volts. The ratio detector is operating at a reasonable level at this point and will give the truest indication of correct alignment with the procedure specified.

FM - R. F. ALIGNMENT

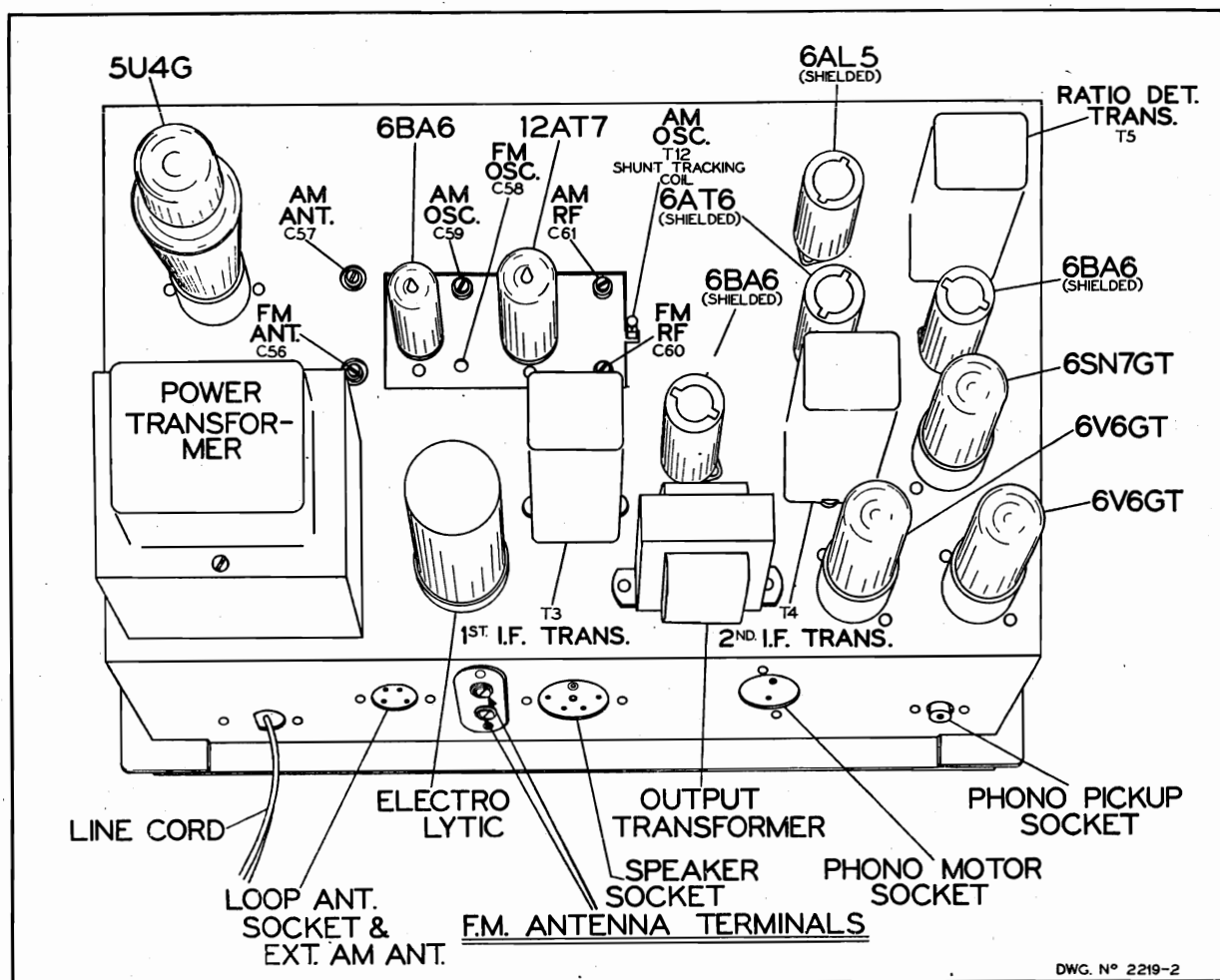
Check pointer so that the right hand edge of the pointer skirt coincides with the right hand edge of marker to the extreme right when iron cores are all the way out.

For adjustment, see dial mechanism illustration.

SIGNAL GENERATOR FREQUENCY	CONNECTION TO RADIO	DUMMY ANTENNA	ADJUST	VACUUM TUBE VOLT METER CONNECTION TO RADIO	ADJUST TO
100 Mc. Use about 10 microvolts	FM Antenna Terminals See note	300 ohms	C58 Osc. C60 R.F. C56 Ant.	Pin no. 2 of 6AL5 and Ground	Resonance about 3 volts

NOTE: If a signal generator with the above fundamental frequency is not available, it is sometimes possible to use harmonics. Use extreme care in picking harmonics. An alternate procedure is to use a local station carrier of known frequency to align the FM

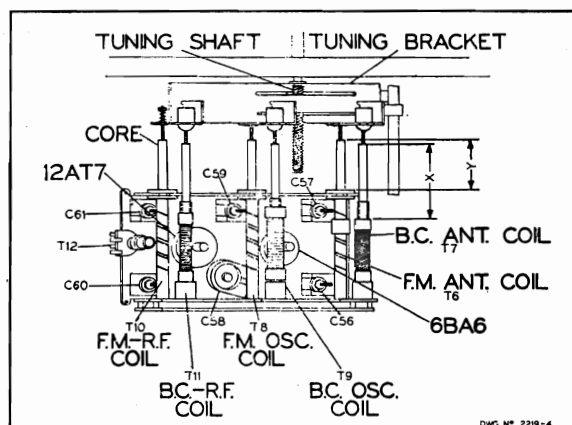
Band and to use the vacuum tube volt-meter as above for resonance indication. A weak carrier, however will not produce 3 volts. NOTE: Connect 300 ohms in series with hot side of generator and connect to one screw. Connect cold side of generator to other screw



Chassis—top view

Tube and Lamp Complement..... 6BA6, FM—AM R.F. stage.
12AT7, FM—AM oscillator and mixer.
6BA6, FM—AM 1st I.F.
6BA6, FM— 2nd I.F.
6AL5, FM— ratio detector.

6AT6, AM detector.
A. F. AMP. and A.V.C.
6SN7, Push-pull. Driver and phase inverter.
5U4G, rectifier.
6V6, output.
6V6, output.
T-44 dial lamp (2 used).

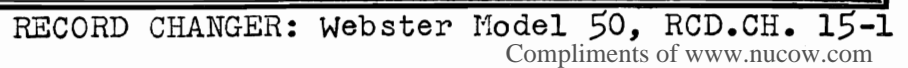


TUNER ADJUSTMENT

With tuner all the way out, dimension "X" should be 1 1/2 inches. "Y" should be 1-1/16 inches. "X" is from the end of the slug to the edge of the coil winding. Check these dimensions before R.F. alignment is attempted of either the AM or FM band. No slug adjustment should be necessary since the slugs are properly set at the factory.

REPLACEMENT PARTS LIST

Ref. No.	Part No.	Description	Qty. Used In Set	Ref. No.	Part No.	Description	Qty. Used In Set
TUNER PARTS				RESISTORS			
CONDENSERS				C33	C-8G-11891	51 mmf, ceramic, 5%	1
C58	A-8E-13575	Trimmer condenser	1	C27, 28	C-8G-13025	150 mmf, ceramic	2
C56, 57, 59, 60, 61	A-2M-12618	Trimmer cond. plate	5	C17, 25, 26	C-8G-12159	30 mmf, ceramic	3
C1, C11	C-8G-11732	470 mmf, $\pm 20\%$	2	C18, 19	C-8G-12160	91 mmf, ceramic	2
C2	C-8G-13695	1000 mmf, $\pm 20\%$	1	C16	C-8G-13026	51 mmf, ceramic	1
C6, 7, 9, 14	C-8G-13201	1000 mmf, $\pm 20\%$ —10%	6	RESISTORS			
51, 53				R27	A-10A-13001	Volume control (500K) and switch	1
C4	C-8G-13018	62 mmf, $\pm 10\%$	1	R31	A-11A-12988	Tone control (500K) and radio-phono switch	1
C12	C-8G-11731	1500 mmf, $\pm 20\%$	1	R32	C-9B1-86	100K ohms, $\frac{1}{2}$ watt, 10%	1
C10	C-8G-13017	15 mmf, $\pm 10\%$	1	R29, 44	C-9B1-94	470K ohms, $\frac{1}{2}$ watt, 10%	2
C3	C-8G-11484	50 mmf, $\pm 10\%$	1	R39, 41	C-9B1-83	56K ohms, $\frac{1}{2}$ watt, 10%	2
C8	C-8G-11789	10 mmf, $\pm 10\%$	1	R33, 34	C-9B1-68	3300 ohms, $\frac{1}{2}$ watt, 10%	2
C13	A-8G-12495-6	4.7 mmf, $\pm 20\%$	1	R30	C-9B1-35	4.7 megohms, $\frac{1}{2}$ watt, 20%	1
C15	A-8G-12495-4	2.2 mmf, $\pm 20\%$	1	R23, 28	C-9B1-80	33K ohms, $\frac{1}{2}$ watt, 10%	2
C5	C-8D-11304	.02 mfd, 200 volts, $\pm 20\%$	1	R20	C-9B1-79	27K ohms, $\frac{1}{2}$ watt, 10%	1
RESISTORS				R22	C-9B1-78	22K ohms, $\frac{1}{2}$ watt, 20%	1
R4	C-9B2-79	27K ohms, 1 watt, 10%	1	R13, 16	C-9B1-48	68 ohms, $\frac{1}{2}$ watt, 10%	2
R1	C-9B1-21	22K ohms, $\frac{1}{2}$ watt, 20%	1	R14, 17	C-9B2-81	39K ohms, 1 watt, 10%	2
R3	C-9B1-52	150 ohms, $\frac{1}{2}$ watt, 10%	1	R24, 26, 37	C-9B1-29	470K ohms, $\frac{1}{2}$ watt, 20%	3
R5	C-9B1-17	4700 ohms, $\frac{1}{2}$ watt, 20%	1	R25	C-9B1-302	15 megohms, $\frac{1}{2}$ watt, 10%	1
R6	C-9B1-11	470 ohms, $\frac{1}{2}$ watt, 20%	1	R19	C-9B1-23	47K ohms, $\frac{1}{2}$ watt, 20%	1
R8	C-9B1-19	10K ohms, $\frac{1}{2}$ watt, 20%	1	R7	C-9B4-76	15K ohms, 2 watts, 10%	1
R2, R10	C-9B1-31	1 megohm, $\frac{1}{2}$ watt, 20%	2	R12, 35, 43	C-9B1-31	1 megohm, $\frac{1}{2}$ watt, 20%	3
R9	C-9B1-62	1000 ohms, $\frac{1}{2}$ watt, 10%	1	R40	C-9B1-66	2200 ohms, $\frac{1}{2}$ watt, 10%	1
R21	C-9B1-34	3.3 megohms, $\frac{1}{2}$ watt, 20%	1	R36, 42	C-9B1-200	51K ohms, $\frac{1}{2}$ watt, 5%	2
R45	C-9B1-50	100 ohms, $\frac{1}{2}$ watt, 10%	1	R38	C-9B4-55	270 ohms, 2 watts, 10%	1
R46	C-9B1-42	22 ohms, $\frac{1}{2}$ watt, 10%	1	R47	C-9B1-71	5600 ohms, $\frac{1}{2}$ watt, 10%	1
COILS				R18	C-9B1-13	1000 ohms, $\frac{1}{2}$ watt, 20%	1
T8	B-13D-13027	FM oscillator coil assembly	1	R15, 11	C-9B2-15	2200 ohms, 1 watt, 20%	2
T6	B-13E-13028	FM antenna coil assembly	1	COILS			
T10	B-13C-13029	FM R.F. coil assembly	1	See notes on page 2 when ordering I.F. coils.			
T9	B-13D-13030	AM oscillator coil assembly	1	T3	C-13A-13009-1	or Input I.F. transformer, combination	
T7	B-13E-13031	AM antenna coil assembly	1		* B-13A-15473	455 kc. and 10.7 mc.	1
T11	B-13C-13032	AM R.F. coil assembly	1	T4	C-13B-13014-1	or Output I.F. transformer, combination	
L1	A-16A-13033	Choke coil assembly	1		* B-13B-15474	455 kc. and 10.7 mc.	1
T12	B-13D-12974	AM osc. shunt coil assembly	1	T5	C-203-11745-1	or Ratio det. coil assembly	
MISCELLANEOUS					* B-13M-15475	10.7 mc.	1
	B-208-13553	Band change slide switch	1	L3	A-16A-13243	Loop loading coil	1
	or			L4	B-14MA-11065	Loop antenna,	1
	B-201-12967	Band change slide switch	1	TRANSFORMERS			
	A-15B-12997	7 prong, miniature tube socket	1	T2	B-12C-13042	Output transformer for speaker	1
	A-15B-13430	9 prong, miniature tube socket	1		B-12A-13038	Power transformer, primary, 50-60 cycles, 105-125 volts, AC	1
	C-2D-14437	Yoke and bracket	1	SPEAKER			
	* A-200-15060	Pinion gear and lead screw assembly	1	B-18B-13043-1	Electrodynamic speaker, 12" less output transformer	1	
	A-49A-13447	Tension spring for lead screw	1	MISCELLANEOUS			
	A-25A-13019	Core grommets, for AM Band	3	B-30A-15010	Dial scale	1	
	A-3M-13020	Insert for core grommet	3	B-5B-14153-37	Knob, small, with dot, walnut	2	
	A-49A-12394	Spiral spring for FM cores	3	B-5B-14153-41	Knob, small, with dot, mahogany	2	
	C-2D-12990	Tape Guide	1	B-5B-13308-37	Knob, large, without dot, walnut	2	
	B-2J-13006	Rack, with teeth, with A-2D-12910 bracket	1	B-5B-13308-41	Knob, large, without dot, mahog.	2	
	B-2G-15009	Pointer	1	A-2G-14482	Escutcheon	1	
MAIN CHASSIS PARTS				B-14M-11479	A.C. line cord	1	
CONDENSERS				A-3A-13003	Switch shaft	1	
63A, 63B	B-8C-11629	Electrolytic condenser, dual, 30-30 x 450 volts	1	A-2D-12983	Detent bracket (U shaped on front of set)	1	
C21	C-8G-11734	100 mmf, 20%, ceramic	1	A-43D-12934	"U" speed clip	1	
C37	C-8F3-229	150 mmf, mica	1	A-55C-12935	Ball bearing	1	
C38	C-8G-13059	1500 mmf, ceramic	1	A-2D-13004	Switch activator bracket	1	
C34	C-8G-13060	51 mmf, ceramic	1	B-47A-11094-5	Pilot lite assembly	1	
C20, 23, 24, 30, 31, 43, 44	C-8D-10785	.006 mf x 600 volts, paper	7	A-46A-11739	Pilot lite, 6-8 volts, T-44	2	
C22, C29	C-8D-10761	.01 mf x 400 volts, paper	2	A-25G-13448	Rubber chassis mounting cushion	4	
C45, 46	C-8D-10813	.05 mf x 400 volts, paper	2	32K10-14306	10-32 x 1" Chassis mtg. bolts	4	
C55	A-8C-12154	Electrolytic condenser 10 mf x 50 volts	1	A-15C-10717	7 prong, miniature tube socket	4	
C49	C-8D-10789	.002 mf x 600 volts, paper	1	A-15B-10440	8 prong, octal socket	4	
C39, 40	C-8G-13201	1000 mmf, ceramic	2	A-19B-12644	Antenna socket	1	
C41	A-8C-13132	Electrolytic condenser 10 mf x 50 volts	1	A-7B-13050	FM dipole, 2-screw strip	1	
C62	C-8J-11321	.02 mf x 600 volts	1	A-15B-11538	Speaker socket	1	
C48	C-8D-10770	.05 mf x 200 volts	1	A-19B-12468	Phono motor socket	1	
C50	C-8G-11741	330 mmf, ceramic	1	A-19B-12170	Phono input socket	1	
C42	C-8D-11304	.02 mf x 200 volts	1	RECORD CHANGER			
C52	C-8D-13439	.25 mf x 400 volts	1	* B-201-13304-1	Record changer (V-M 800) with P-30 cartridge	1	
C47, 54	C-8D-10760	.1 mf x 400 volts	2	P-30	Crystal cartridge with needle	1	
C35, 36	A-8F-13047	50 mmf, dual mica	1				
C32	C-8G-11789	10 mmf, ceramic, 10%	1				



GENERAL DESCRIPTION

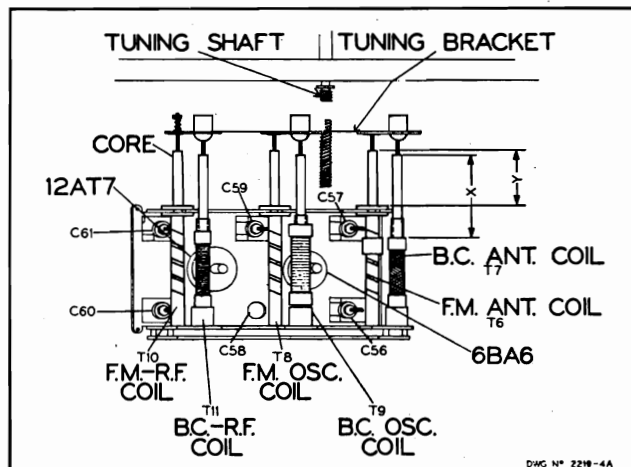
This is a 2-band, nine tube (plus rectifier) superheterodyne receiver for the reception of both AM and FM stations. It features the most advanced type of FM ratio detector, permeability tuning of both bands, combination double-frequency I.F. coils and miniature tubes. Built-in antennas are provided for broadcast and FM reception; provision is also made for connection of an external broadcast antenna as well as an FM antenna with a 300 ohm lead-in. Both antennas may be connected to the radio at the same time.

The phonograph is equipped with an automatic changer which plays up to ten 12-inch records or twelve 10-inch records at one loading.

ELECTRICAL SPECIFICATIONS

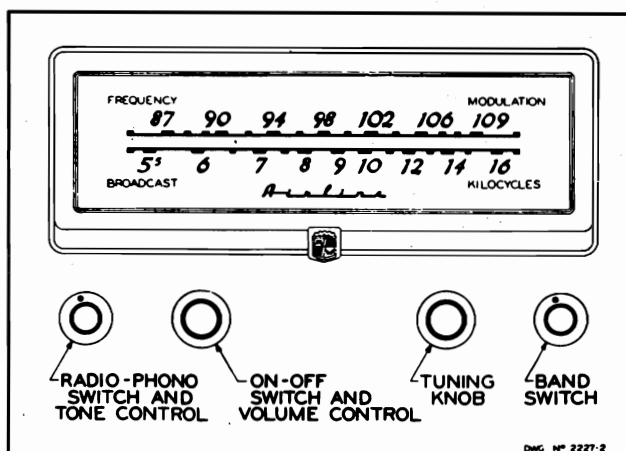
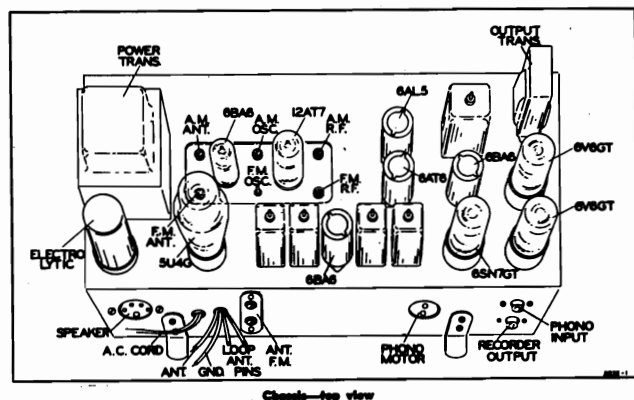
Power Supply.....105 to 125 volts, AC, 60-cycles;
Chassis only 122 watts. With
phono operation 150 watts.
Frequency Ranges.....Broadcast Band—535 to 1620 kc.
FM Band—88 to 108 mc.
Intermediate Freq.....AM-455 kc.; FM-10.7 mc.
Selectivity.....AM-48 kc. broad at 1000 times signal,
measured at 1000 kc.

I.F. FM-180 kc. broad at 2 times down.
I.F. FM-320 kc. broad at 10 times down.
AM Sensitivity.....(For .5 watt output with external antenna)—3 microvolts average
FM Sensitivity.....(For .5 watt output—10 microvolts average.
Power Output.....8 watts, 10% distortion. 10 watts maximum.
Loud Speaker.....12" electrodynamic. Voice coil impedance 3.2 ohms, 400 cycles.
Tube and Lamp Complement.....6BA6, FM—AM R.F. stage.
12AT7, FM—AM oscillator and mixer.
6BA6, FM—AM 1st I.F.
6BA6, FM—2nd I.F.
6AL5, FM—ratio detector.
6AT6, AM detector.
A. F. AMP. and A.V.C.
6SN7, Push-pull. Driver and phase-inverter.
5U4G, rectifier.
6V6, output.
6V6, output.
T-44 dial lamp (2 used).
Automatic Changer See Manual ~~5030A~~ 5035 A



TUNER ADJUSTMENT

With tuner all the way out, dimension "X" should be 1 1/2 inches. "Y" should be 1-1/16 inches. "X" is from the end of the slug to the edge of the coil winding. Check these dimensions before R.F. alignment is attempted of either the AM or FM band. No slug adjustment should be necessary since the slugs are properly set at the factory.



MONTGOMERY WARD

MODEL 84BR-2719B

ALIGNMENT PROCEDURE*Broadcast Band Section I.F. and R.F.*

The alignment procedure below includes the sensitivities at the inputs of various stages. All signal input values are based on an output of $\frac{1}{2}$ watt. This may be measured by disconnecting the speaker voice coil and substituting a 3.2-ohm resistor across the secondary winding of the output transformer. A reading of 1.3 volts AC across this resistor will be approximately equivalent to a $\frac{1}{2}$ -watt output with the speaker connected. The volume control

must be set at maximum. The tone control must be set for maximum treble.

The signal source must be an accurately calibrated signal generator capable of supplying the frequencies designated, modulated 30% with a 400-cycle audio signal. A 400 cycle audio signal is required for the audio measurement. Variations in sensitivities of plus or minus 25% are usually permissible.

AM - I. F. ALIGNMENT*Band Switch in AM Position. Tune Set to 1400 Kc. Dummy Antenna .1 Mfd.*

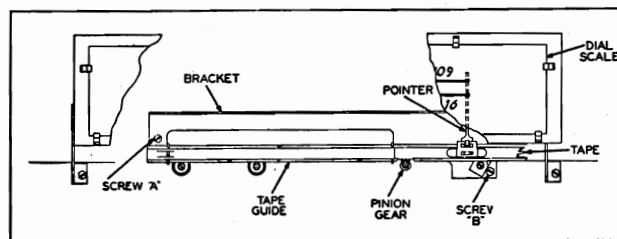
SIGNAL GENERATOR FREQUENCY	CONNECTION TO RADIO	ADJUSTMENTS TO BE MADE	ADJUST FOR
455 Kc. Use 1000 microvolts	Pin No. 1 of 6BA6 No. 2 and ground	Primary and Secondary of T4 AM windings. See IF views	Maximum output Should be $\frac{1}{2}$ watt
455 Kc. Use 30 microvolts	Pin No. 2 of 12AT7 and ground	Primary and Secondary of T3 AM windings. See IF views	Maximum output Should be $\frac{1}{2}$ watt
400 cycles. Use 28 millivolts	Hot end of volume control and ground	None	Maximum output Should be $\frac{1}{2}$ watt

BROADCAST BAND - R. F. ALIGNMENT

Check pointer so that the right hand edge of the pointer skirt coincides with the right hand edge of marker to the extreme right when iron cores are all the way out.

For adjustment, see dial mechanism illustration.

SIGNAL GENERATOR FREQUENCY	CONNECTION TO RADIO	DUMMY ANTENNA	ADJUST
1620 Kc. Use 3 microvolts	AM Antenna and Ground	200 mmf.	C59, C57, C61 For maximum, $\frac{1}{2}$ watt

Procedure for disassembly and assembly of dial mechanism

TO ALIGN POINTER—Loosen bracket screw "A". Then tape guide bracket can be moved up to allow proper meshing of tape teeth with pinion gear. Readjust bracket to eliminate backlash.

MODEL 84BR-2719B

MONTGOMERY WARD

ALIGNMENT PROCEDURE*FM Band Section. I.F. and R.F.*

A non-metallic alignment tool must be used.

IMPORTANT**NOTE**

No alignment of the FM section of this radio should be attempted unless you are positive that the circuits are in need of adjustment and you have the necessary equipment.

All components used in this radio are extremely stable and the tuned circuits should require no adjustment over long periods of time.

The following alignment is based on the use of the new Simpson vacuum tube volt-meter which has a "floating ground". In other words, the meter, when used as a vacuum tube volt-meter, can have both the positive and negative sides connected to points above ground and still give true readings.

A standard AM signal generator is required.

FM - I. F. ALIGNMENT*Band Switch in FM Position. Dummy Antenna .1 Mfd.*

SIGNAL GENERATOR FREQUENCY	CONNECTION TO RADIO	VACUUM TUBE VOLT METER CONNECTION TO RADIO	ADJUSTMENTS TO BE MADE	ADJUST FOR
10.7 Mc. Use about .1 volt	Pin No. 1 of 6BA6 no. 3 and ground	Pin no. 2 of 6AL5 and ground	Primary of T5	Resonance should be about 3 volts
10.7 Mc. Use about .1 volt	Pin No. 1 of 6BA6 no. 3 and ground	See note "A"	Secondary of T5	Zero. Use zero center scale. See note "B"
10.7 Mc. Use about 3300 microvolts	Pin No. 1 of 6BA6 no. 2 and ground	Pin no. 2 of 6AL5 and ground	Primary and Secondary of T4A 10.7 m.c. windings See IF views	Resonance should be about 3 volts
10.7 Mc. Use about 200 microvolts	Pin no. 2 of 12AT7 and ground	Pin no. 2 of 6AL5 and ground	Primary and Secondary of 10.7 m.c. windings of T3A See IF views	Resonance should be about 3 volts

NOTES ON FM—I.F. ALIGNMENT

NOTE "A" Connect two resistors, 100K OHMS each, from Pin No. 2 of 6AL5 to ground. These resistors must be matched within 5%. Connect as shown in dotted lines on schematic diagram. Connect vacuum tube voltmeter between the mid-point of the resistors and point zz.

NOTE "B" If T5 has been tampered with, it is possible that no crossover point will be found at first. Careful adjustment of both primary and secondary is necessary.

GENERAL: Input signals should be adjusted to give approximately 3 volts. The ratio detector is operating at a reasonable level at this point and will give the truest indication of correct alignment with the procedure specified.

FM - R. F. ALIGNMENT

Check pointer so that the right hand edge of the pointer skirt coincides with the right hand edge of marker to the extreme right when iron cores are all the way out.

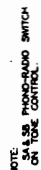
For adjustment, see dial mechanism illustration.

SIGNAL GENERATOR FREQUENCY	CONNECTION TO RADIO	DUMMY ANTENNA	ADJUST	VACUUM TUBE VOLT METER CONNECTION TO RADIO	ADJUST TO
100 Mc. Use about 10 microvolts	FM Antenna Terminals See note	300 ohms	C58 Osc. C60 R.F. C56 Ant.	Pin no. 2 of 6AL5 and Ground	Resonance about 3 volts

NOTE: If a signal generator with the above fundamental frequency is not available, it is sometimes possible to use harmonics. Use extreme care in picking harmonics. An alternate procedure is to use a local station carrier of known frequency to align the FM

Band and to use the vacuum tube volt-meter as above for resonance indication. A weak carrier, however will not produce 3 volts.

NOTE: Connect 300 ohms in series with hot side of generator and connect to one screw. Connect cold side of generator to other screw



GENERAL DESCRIPTION

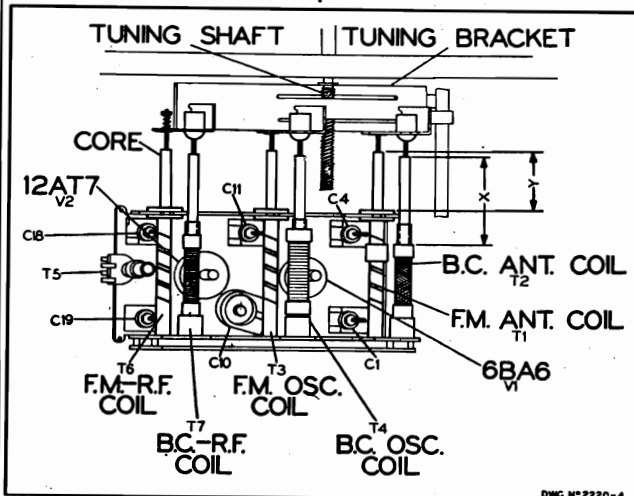
This is a 2-band, seven tube (plus rectifier) superheterodyne receiver for the reception of both AM and FM stations. It features the most advanced type of FM ratio detector, permeability tuning of both bands, combination double-frequency I.F. coils and miniature tubes. Built-in antennas are provided for broadcast and FM reception; provision is also made for connection of an external broadcast antenna as well as an FM antenna with a 300 ohm lead-in. Both antennas may be connected to the radio at the same time.

The phonograph is equipped with an automatic changer which plays up to ten 12-inch records or twelve 10-inch records at one loading, and also accommodates the new long-play microgroove records.

ELECTRICAL SPECIFICATIONS

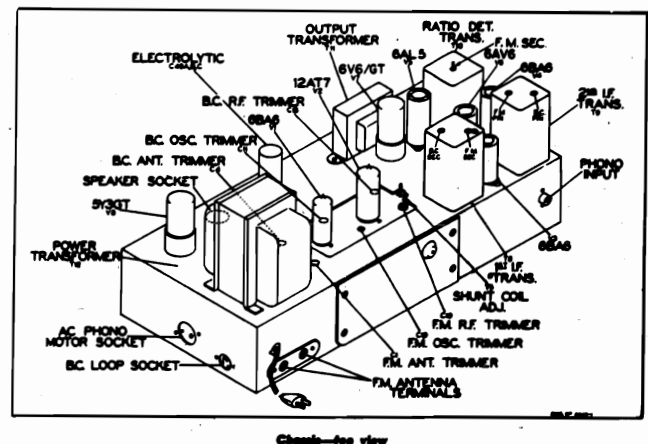
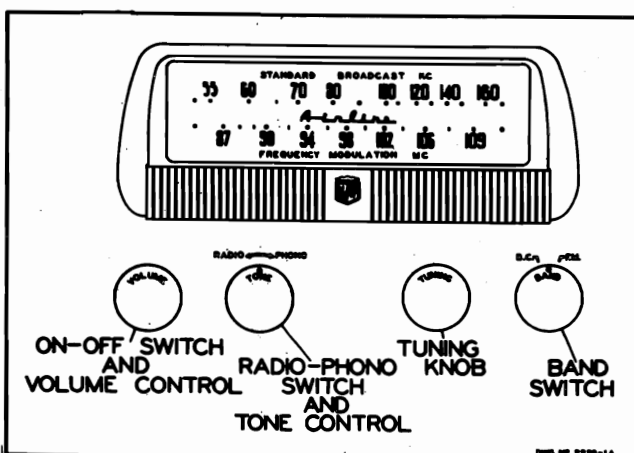
Power Supply..... 105 to 125 volts, AC, 60-cycles;
Chassis only 75 watts. With
phono operation 100 watts.
Frequency Ranges..... Broadcast Band—535 to 1620 kc.
FM Band— 88 to 108 mc.
Intermediate Freq..... AM-455 kc.; FM-10.7 mc.
Selectivity..... AM-42 kc. broad at 1000 times sig-
nal, measured at 1000 kc.

I.F. FM-200 kc. broad at 2 times
down.
I.F. FM-400 kc. broad at 10 times
down.
AM Sensitivity (For .5 watt output with external
antenna)—5 microvolts average.
FM Sensitivity (For .5 watt output)—25 micro-
volts average.
Power Output..... 3.2 watts, 10% distortion. 5.5
watts maximum.
Loud Speaker..... 12" electrodynamic. Voice coil
impedance 3.2 ohms, 400 cycles.
Tube and Lamp
Complement..... 6BA6, FM—AM R.F. stage.
12AT7, FM—AM oscillator and
mixer.
6BA6, FM—AM 1st I.F.
6BA6, FM—2nd I.F.
6AL5, FM ratio detector.
6AV6, AM detector.
A.F. AMP. and A.V.C.
6V6GT/G, Audio output.
5Y3, rectifier.
T-44 dial lamp (2 used).
Automatic Changer See Manual 5068A.



TUNER ADJUSTMENT

With tuner all the way out, dimension "X" should be 1½ inches. "Y" should be 1-1/16 inches. "X" is from the end of the slug to the edge of the coil winding. Check these dimensions before R.F. alignment is attempted of either the AM or FM band. No slug adjustment should be necessary since the slugs are properly set at the factory.



MODEL 84BR-2726A

MONTGOMERY WARD

ALIGNMENT PROCEDURE

Broadcast Band Section I.F. and R.F.

The alignment procedure below includes the sensitivities at the inputs of various stages. All signal input values are based on an output of $\frac{1}{2}$ watt. This may be measured by disconnecting the speaker voice coil and substituting a 3.2-ohm resistor across the secondary winding of the output transformer. A reading of 1.3 volts AC across this resistor will be approximately equivalent to a $\frac{1}{2}$ -watt output with the speaker connected. The volume control

must be set at maximum. The tone control must be set for maximum treble.

The signal source must be an accurately calibrated signal generator capable of supplying the frequencies designated, modulated 30% with a 400-cycle audio signal. A 400 cycle audio signal is required for the audio measurement. Variations in sensitivities of plus or minus 25% are usually permissible.

AM - I. F. ALIGNMENT

Band Switch in AM Position. Tune Set to 1400 Kc. Dummy Antenna .1 Mfd.

SIGNAL GENERATOR FREQUENCY	CONNECTION TO RADIO	ADJUSTMENTS TO BE MADE	ADJUST FOR
455 Kc. Use 2400 microvolts	Pin No. 1 of 6BA6 No. 2 and ground	Primary and Secondary of T9 AM windings. See top and bottom views	Maximum output Should be $\frac{1}{2}$ watt
455 Kc. Use 70 microvolts	Pin No. 2 of 12AT7 and ground	Primary and Secondary of T8 AM windings. See top and bottom views	Maximum output Should be $\frac{1}{2}$ watt
400 cycles. Use 60 millivolts	Hot end of volume control and ground	None	Maximum output Should be $\frac{1}{2}$ watt

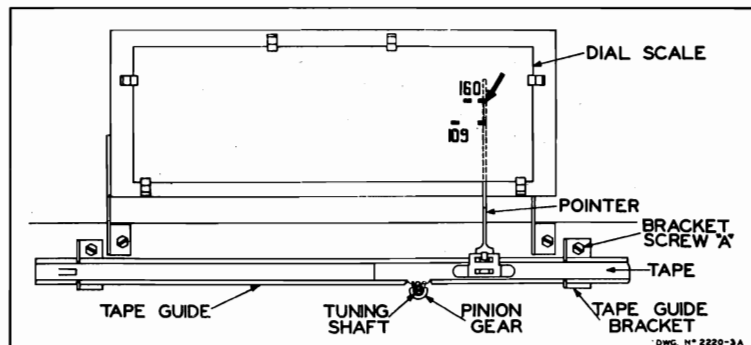
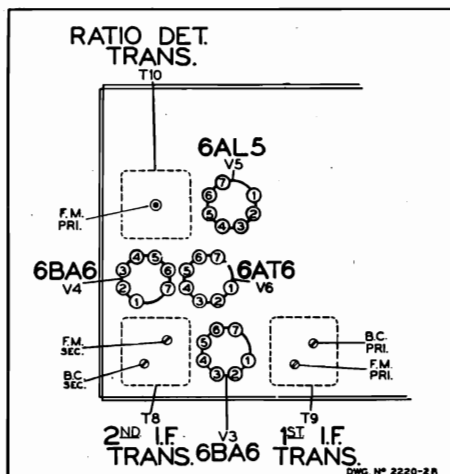
BROADCAST BAND - R. F. ALIGNMENT

Check pointer so that it coincides with the marker to the extreme right when iron cores are all the way out. For adjustment, see dial mechanism illustration.

SIGNAL GENERATOR FREQUENCY	CONNECTION TO RADIO	DUMMY ANTENNA	ADJUST
1620 Kc.	AM Antenna and Ground	200 mmf.	C11 Osc. trimmer for maximum
535 Kc.	AM Antenna and Ground	200 mmf.	T5 for maximum $\frac{1}{2}$ watt
1620 Kc. Use 5 microvolts	AM Antenna and Ground	200 mmf.	C4 and C18 for max. $\frac{1}{2}$ watt. See note

NOTE: Recheck first two adjustments after this adjustment because of inter-locking effects.

Procedure for disassembly and assembly of dial mechanism.



TO ALIGN POINTER— Loosen bracket screw "A". Then tape guide bracket can be moved up to allow proper meshing of tape teeth with pinion gear. Readjust bracket to eliminate backlash.

MONTGOMERY WARD

MODEL 84BR-2726A

ALIGNMENT PROCEDURE*FM Band Section. I.F. and R.F.*

A non-metallic alignment tool must be used.

IMPORTANT

No alignment of the FM section of this radio should be attempted unless you are positive that the circuits are in need of adjustment and you have the necessary equipment.

All components used in this radio are extremely stable and the tuned circuits should require no adjustment over long periods of time.

NOTE

The following alignment is based on the use of the new Simpson vacuum tube volt-meter which has a "floating ground". In other words, the meter, when used as a vacuum tube volt-meter, can have both the positive and negative sides connected to points above ground and still give true readings.

A standard AM signal generator is required.

FM - I. F. ALIGNMENT*Band Switch in FM Position. Dummy Antenna .1 Mfd.*

SIGNAL GENERATOR FREQUENCY	CONNECTION TO RADIO	VACUUM TUBE VOLT METER CONNECTION TO RADIO	ADJUSTMENTS TO BE MADE	ADJUST FOR
10.7 Mc. Use about .1 volt	Pin No. 1 of 6BA6 no. 3 and ground	Pin No. 2 of 6AL5 and ground	Primary of T10	Resonance should be about 3 volts
10.7 Mc. Use about .1 volt	Pin No. 1 of 6BA6 no. 3 and ground	See note "A"	Secondary of T10	Zero. Use zero center scale See note "B"
10.7 Mc. Use about 3300 microvolts	Pin No. 1 of 6BA6 no. 2 and ground	Pin No. 2 of 6AL5 and ground	Primary and Secondary of T9 10.7 m.c. windings See top and bottom views	Resonance should be about 3 volts
10.7 Mc. Use about 200 microvolts	Pin No. 2 of 12AT7 and ground	Pin No. 2 of 6AL5 and ground	Primary and Secondary of 10.7 m.c. windings of T8 See top and bottom views	Resonance should be about 3 volts

NOTE ON FM - I.F. ALIGNMENT

NOTE "A" Connect two resistors, 100K OHMS each, from Pin No. 2 of 6AL5 to ground. These resistors must be matched within 5%. Connect as shown in dotted lines on schematic diagram. Connect vacuum tube volt-meter between the mid-point of the resistors and points zz.

NOTE "B" If T10 has been tampered with, it is possible that no crossover point will be found at first. Careful adjustment of both primary and secondary is necessary.

GENERAL: Input signals should be adjusted to give approximately 3 volts. The ratio detector is operating at a reasonable level at this point and will give the truest indication of correct alignment with the procedure specified.

FM - R. F. ALIGNMENT

Check pointer so that it coincides with the marker to the extreme right when iron cores are all the way out. For adjustment, see dial mechanism illustration.

SIGNAL GENERATOR FREQUENCY	CONNECTION TO RADIO	DUMMY ANTENNA	ADJUST	VACUUM TUBE VOLT METER CONNECTION TO RADIO	ADJUST TO
100 Mc. Use about 25 microvolts	FM Antenna Terminals See note	300 ohms	C10 Osc. C19 R.F. C1 Ant.	Pin No. 2 of 6AL5 and Ground	Resonance about 3 volts

NOTE: If a signal generator with the above fundamental frequency is not available, it is sometimes possible to use harmonics. Use extreme care in picking harmonics. An alternate procedure is to use a local station carrier of known frequency to align the FM

Band and to use the vacuum tube volt-meter as above for resonance indication. A weak carrier, however will not produce 3 volts. NOTE: Connect 300 ohms in series with hot side of generator and connect to one screw. Connect cold side of generator to other screw.

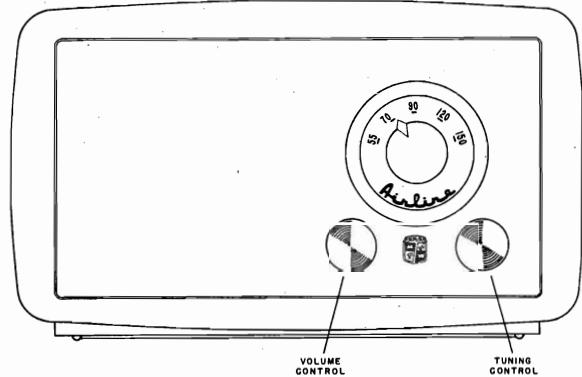
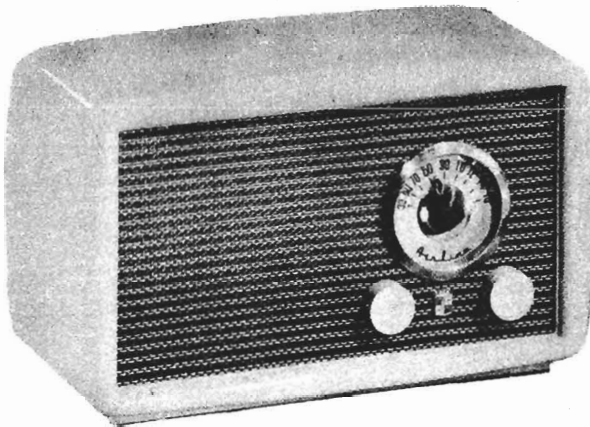
MODEL 84BR-2726A

MONTGOMERY WARD

REPLACEMENT PARTS LIST

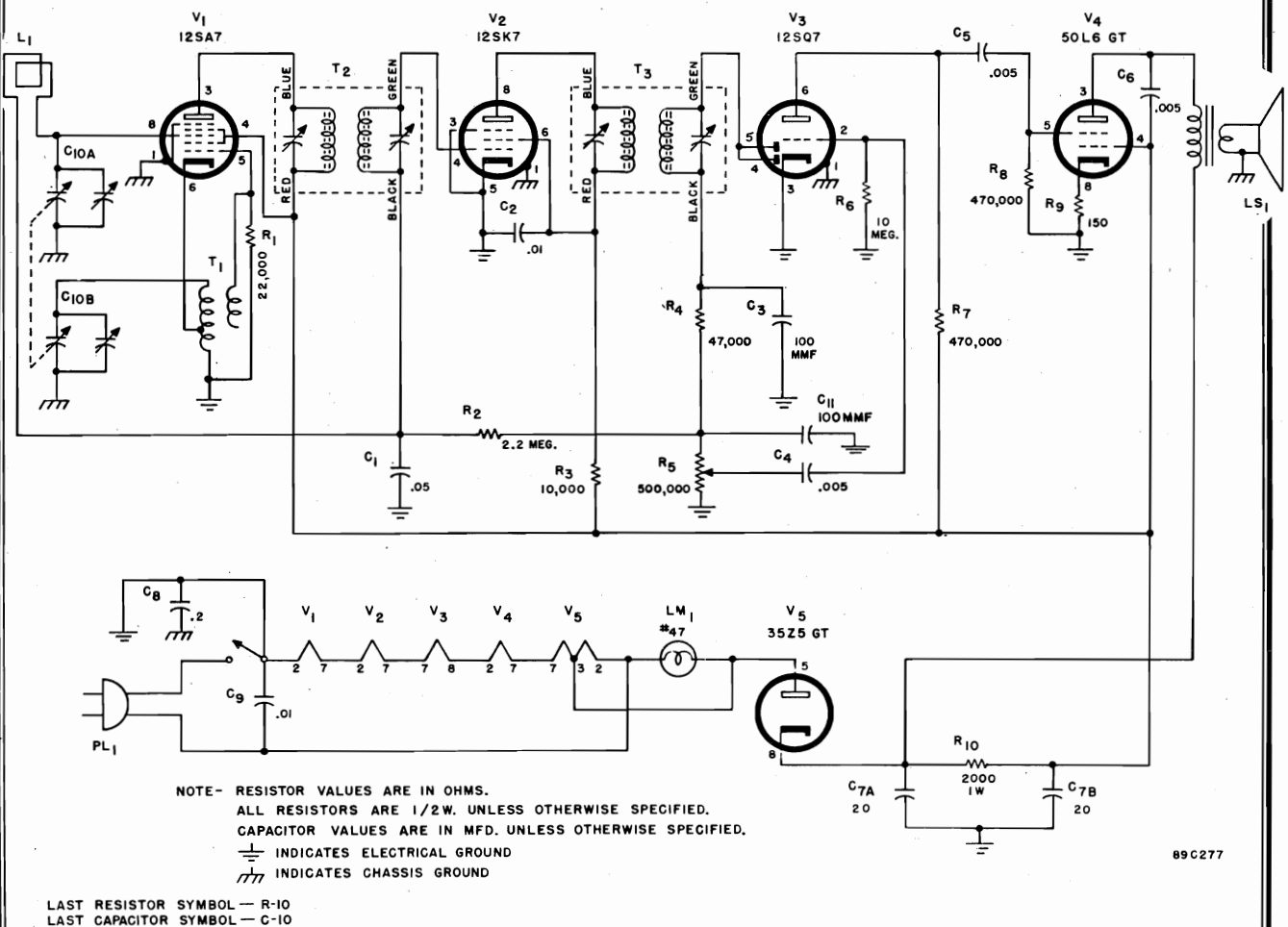
Ref. No.	Part No.	Description	Qty. Used In Set	Ref. No.	Part No.	Description	Qty. Used In Set
TUNER CHASSIS PARTS							
CONDENSERS							
C10	A-8E-13575	Trimmer condenser	1	C48, 46	C-8D-10774	.02 x 400 volts, 20 %	2
C1, 4, 11, 19, 18	A-2M-12618	Trimmer cond. plate	5	C51	C-8J-11321	.02 x 600 volts, 20 %	1
C3, 16	C-8G-11732	470 mmf, $\pm 20\%$	2	C25, 47	C-8G-13131	100 mmf, ceramic, 10 %	2
C2	C-8G-13695	1000 mmf, $\pm 20\%$	1	C24, 40	C-8G-13016	1000 mmf, ceramic, 20 %	3
C8, 7, 9, 14, 54, 55	C-8G-13201	1000 mmf, $\pm 20\% - 10\%$	6	C42	C-8F3-225	100 mmf, mica, 5 %	1
C5	C-8G-13018	62 mmf, $\pm 10\%$	1	C38, 39	A-8F-13127	.0001 mf, dual mica, 20 %	1
C17	C-8G-11731	1500 mmf, $\pm 20\%$	1	C22, 23	C-8G-12160	91 mmf, ceramic, 5 %	2
C12	C-8G-13017	15 mmf, $\pm 10\%$	1	C20	C-8G-13026	51 mmf, ceramic, 5 %	1
C6	C-8G-11484	50 mmf, $\pm 10\%$	1	C30, 31	C-8G-13025	150 mmf, ceramic, 5 %	2
C56	C-8G-11789	10 mmf, $\pm 10\%$	1	C21, 28, 29	C-8G-12159	30 mmf, ceramic, 5 %	3
C15	A-8G-12495-6	4.7 mmf, $\pm 20\%$	1	C36	C-8G-11891	51 mmf, ceramic	1
C13	A-8G-12495-4	2.2 mmf, $\pm 20\%$	1	C37	C-8D-15638	.002 x 600 volts, 10 %	1
C44	C-8D-11304	.02 mfd, 200 volts, $\pm 20\%$	1	RESISTORS			
RESISTORS				R30, S1	A-10A-13114	Volume control (500K ohms) and switch	1
R4	C-9B2-79	27K ohms, 1 watt, 10 %	1	R34, SA, SB	A-11A-13115	Tone control (500K ohms) and radio-phonograph switch	1
R1	C-9B1-21	22K ohms, $\frac{1}{2}$ watt, 20 %	1	R32	C-9B1-27	220K ohms, $\frac{1}{2}$ watt, 20 %	1
R3	C-9B1-52	150 ohms, $\frac{1}{2}$ watt, 10 %	1	R15, 18	C-9B1-48	68 ohms, $\frac{1}{2}$ watt, 10 %	2
R5	C-9B1-17	4700 ohms, $\frac{1}{2}$ watt, 20 %	1	R14	C-9B1-31	1 megohm, $\frac{1}{2}$ watt, 20 %	1
R6	C-9B1-11	470 ohms, $\frac{1}{2}$ watt, 20 %	1	R19, 16	C-9B2-80	33K ohms, 1 watt, 10 %	2
R9	C-9B1-19	10K ohms, $\frac{1}{2}$ watt, 20 %	1	R24, 28	C-9B1-80	33K ohms, $\frac{1}{2}$ watt, 10 %	2
R2, 11	C-9B1-31	1 megohm, $\frac{1}{2}$ watt, 20 %	2	R21	C-9B1-79	27K ohms, $\frac{1}{2}$ watt, 10 %	1
R10	C-9B1-62	1000 ohms, $\frac{1}{2}$ watt, 10 %	1	R8	C-9B2-76	15K ohms, 1 watt, 10 %	1
R23	C-9B1-34	3.3 megohms, $\frac{1}{2}$ watt, 20 %	1	R22	C-9B1-23	47K ohms, $\frac{1}{2}$ watt, 20 %	1
R7	C-9B1-50	100 ohms, $\frac{1}{2}$ watt, 10 %	1	R29	C-9B1-21	22K ohms, $\frac{1}{2}$ watt, 20 %	1
R12	C-9B1-45	39 ohms, $\frac{1}{2}$ watt, 10 %	1	R31	C-9B1-35	4.7 megohms, $\frac{1}{2}$ watt, 20 %	1
R36	C-9B2-71	5600 ohms, 1 watt, 10 %	1	R25, 27, 33	C-9B1-29	470K ohms, $\frac{1}{2}$ watt, 20 %	3
COILS				R35	C-9B2-144	240 ohms, 1 watt, 5 %	1
T3	B-13D-13027	FM oscillator coil assembly	1	R26	C-9B1-36	6.8 megohms, $\frac{1}{2}$ watt, 20 %	1
—	B-51B-13056	Core for FM oscillator coil	1	R13, 20, 17	C-9B1-13	1000 ohms, $\frac{1}{2}$ watt, 20 %	2
T1	B-13E-13028	FM antenna coil assembly	1	R37	C-9B1-100	1.5 megohm, $\frac{1}{2}$ watt, 10 %	1
—	B-51A-13058	Core for FM antenna coil	1	R38	C-9B1-1069	3.3 ohms, $\frac{1}{2}$ watt, 5 %	1
T6	B-13C-13029	FM R.F. coil assembly	1	COILS			
—	B-51A-13057	Core for FM R.F. coil	1	T8	B-13A-15473	Input I.F. transformer, combination, 455 kc. and 10.7 mc.	1
T4	B-13D-13030	AM oscillator coil assembly	1	T9	B-13B-15474	Second I.F. transformer, combination, 455 kc. and 10.7 mc.	1
—	B-51A-12722	Core for B.C. oscillator coil	1	T10	B-13M-15475	Ratio det. coil assembly 10.7 mc.	1
—	B-51A-12723	Core for B.C. ant. and R.F. coil	1	L3	A-16A-13243	Loop loading coil	1
T2	B-13E-13031	AM antenna coil assembly	1	L4	A-14MA-11066-1	Loop antenna ribbon	1
T7	B-13C-13032	AM R.F. coil assembly	1	TRANSFORMERS			
L1	A-16A-13033	Choke coil assembly	1	T12	B-12A-15385	Power transformer, primary, 50-60 cycles, 105-125 volts A.C.	1
T5	B-13D-12974	AM osc. shunt coil assembly	1	T11	B-12C-13556	Output transformer, for speaker	1
MISCELLANEOUS				SPEAKER			
—	B-208-13553	Band change slide switch	1	L2	B-18B-13585-2	Electrodynamic speaker, 12-inch, less output transformer	1
—	or			MISCELLANEOUS			
—	B-201-12967	Band change slide switch	1	B-30A-13611	Dial scale	1	
—	A-15B-12997	7 prong, miniature tube socket	1	B-5B-13744	Knob, mahog. or wal. "Volume"	1	
—	A-15B-13430	9 prong, miniature tube socket	1	B-5B-13745	Knob, mahog. or wal. "Tone"	1	
—	C-2D-14437	Drive bracket assembly	1	B-5B-13746	Knob, mahog. or wal. "Tuning"	1	
—	A-25A-13019	Core grommets, for AM Band 3	3	B-5B-13747	Knob, mahog. or wal. "Band switch"	1	
—	A-3M-13020	Insert for core grommet	3	B-2G-13612	Escutcheon, mahog. or walnut	1	
—	A-49A-12394	Spiral spring for FM cores	3	B-14M-11479	Line cord and plug	1	
—	A-2J-11041	Pointer tension spring, "M" shaped	1	A-3A-12933-1	Band switch shaft	1	
—	B-2D-12316	Tape guide	1	A-55C-12935	Ball bearing	1	
—	B-2J-12922	Rack tape, with teeth and pointer bracket	1	B-47A-11094-4	Pilot lite and bracket assembly	1	
—	B-2G-13613	Pointer	1	A-46A-11739	Pilot lite, 6-8 volts, T-44	2	
—	A-200-15016	Drive, pinion and lead screw assembly	1	A-15C-13174	Miniature socket, 7 prong	5	
MAIN CHASSIS PARTS				A-15B-10440	Octal socket, 8 prong	1	
CONDENSERS				A-19B-12644	Loop antenna socket	1	
C49B, 49C, 49A	A-8C-15387	Electrolytic, 20—20 x 450 volts; 20 x 25 volts	1	B-7B-13050	FM terminal strip	1	
C50	C-8D-10935	.005 mf x 600 volts	1	A-15B-11538	Speaker socket	1	
C27, 32, 33, 34, 45	C-8D-10761	.01 mf x 400 volts, 20 %	6	A-19B-12468	Phono motor socket	1	
C57	C-8D-10785	.006 mf x 600 volts, 20 %	1	A-19B-12170	Phono input socket	1	
C41	A-8C-13132	Electrolytic, 10 mf x 50 volts	1	RECORD CHANGER			
C43	C-8D-10787	.001 x 600 volts, 20 %	1	B-201-16345	246 Changer with cartridge	1	
C53, C26, C52	C-8D-10770	.05 x 200 volts, 20 %	2	—	Webster V42-2 cartridge	1	
—	—	—	—	—	NE-214 Tandem point needle	1	

MONTGOMERY WARD

MODELS 84HA-1527A,
84HA-1528A

92C434

This radio is a condenser tuned receiver using a cut plate tracking mixer section and employs four tubes in a conventional superheterodyne circuit. The loop provides for signal pickup as well as the inductive component in the tuned circuit of the mixer stage. No provision is made for the use of an external antenna.



MODELS 84HA-1527A,
84HA-1528A

MONTGOMERY WARD

ELECTRICAL SPECIFICATIONS

Power Supply 105-125 volts DC or 60 cycle
AC, 25 watts

Frequency Range Broadcast 540-1620 KC

Intermediate Frequency. 455 KC

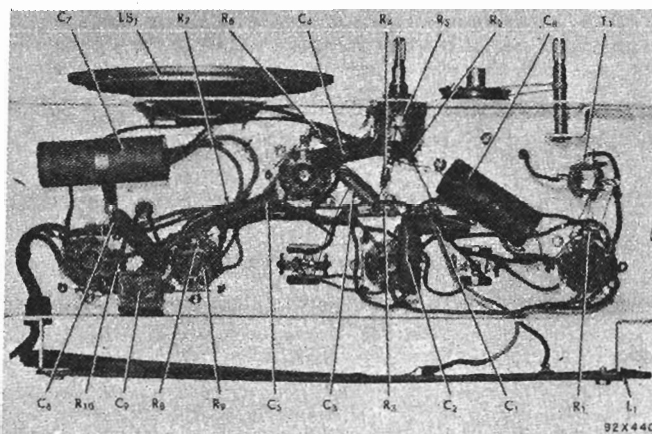
Antenna Built in loop

Power Output 0.6 watt

Speaker 5 inch P.M.

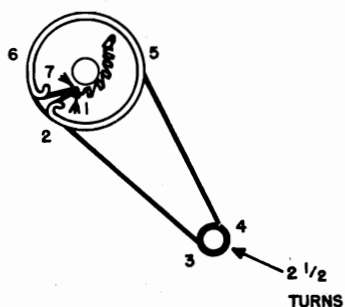
Voice Coil Impedance. 3 ohms

Tube and Dial Lamp Complement. 12SA7 Mixer
12SK7 I.F. Amplifier
12SQ7 Detector & Audio
50L6GT Power Amplifier
35Z5GT Rectifier
Mazda No. 47 Dial Lamp

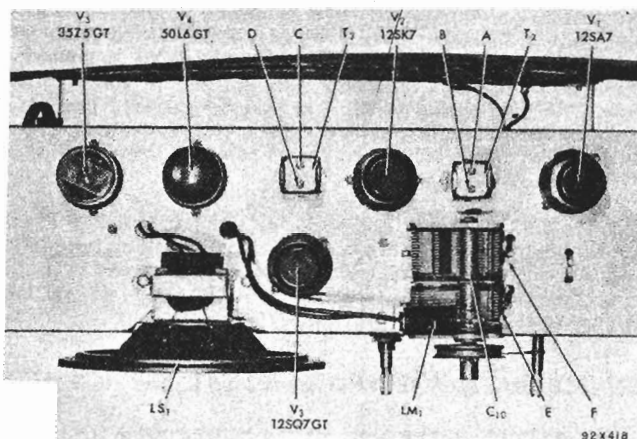


For placement of these tubes, see the diagram showing layout.

DIAL CORD STRINGING INSTRUCTIONS



To restring the dial cable, pull the two control knobs and dial pointer from their shafts remove the chassis bolts and pull the chassis from the cabinet. Restring the dial drive with a 12-inch length of 30 lb. test dial cord following the stringing sequence shown in the accompanying illustration. Reinstall the receiver chassis and replace the knobs. Set the tuning condenser at maximum capacity and clip on the dial pointer so that its pointer falls on the left hand limit of the dial scale.



ALIGNMENT PROCEDURE

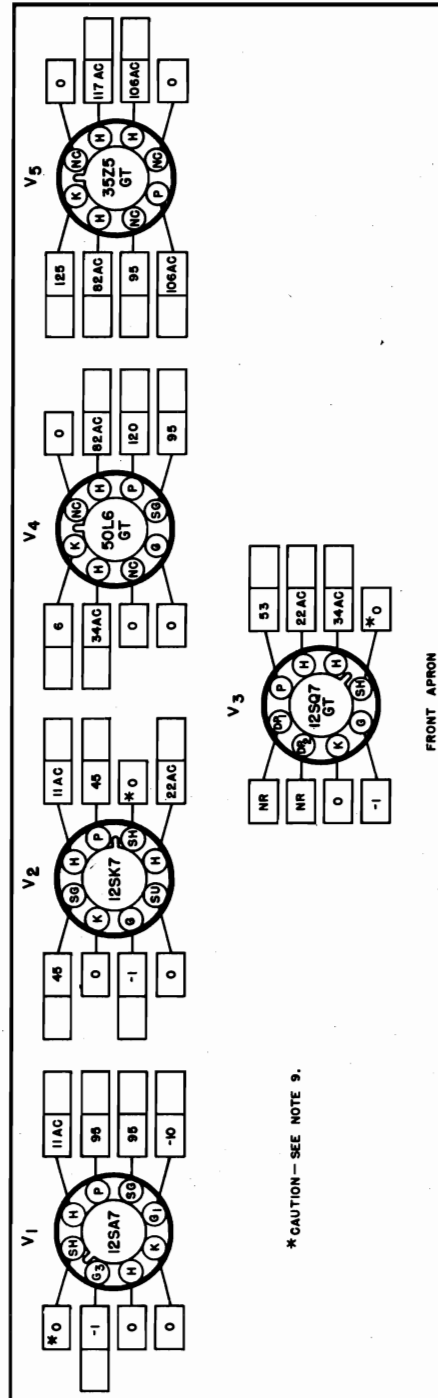
Output meter connection. Across voice coil
Generator ground To chassis
Volume control position Maximum

ALIGNMENT CHART

Dummy Antenna	Signal Generator Coupling	Signal Generator Frequency	Radio Tuned To	Adjust	Remarks
0.01 mfd. cap.	Connect to pin #5 of of 12SA7 through dummy ant.	455 kc	1000 kc	A,B,C,D	Adjust for max. output. IF sensitivity for 50 milliwatt output is approx. 150 microvolts.
None	Do not couple directly to loop, pickup generator signal by radiation only	1500 kc	1500 kc	E*F	Adjust for max. output.

*Note - Calibration adjustment.

TUBE SOCKET VOLTAGE CHART



REPLACEMENT PARTS LIST

Ref. No.	Part No.	Description
C-1	46AY503J	.05 mfd. 600 V., tubular
C-2	46AZ103J	.01 mfd. 600 V., tubular
C-3	CM20A101M	100 mmf. 500 V., mica
C-4,5,6	46AZ502J	.005 mfd. 600 V., tubular
C-7	45B127	20-20 mfd. 150., electrolytic
C-8	46AX204H	.2 mfd. 600., tubular
C-9	46AG103J	.01 mfd. 600., tubular
C-10	48B201	Tuning condenser
R-1	RC20AE223M	22,000 ohms $\frac{1}{2}$ watt, carbon
R-2	RC20AE225M	2.2 megohms $\frac{1}{2}$ watt, carbon
R-3	RC20AE103M	10,000 ohms $\frac{1}{2}$ watt, carbon
R-4	RC20AE473M	47,000 ohms $\frac{1}{2}$ watt, carbon
R-5	25B641	Volume control
R-6	RC20AE106M	10 megohms $\frac{1}{2}$ watt, carbon
R-7,8	RC20AE474M	470,000 ohms $\frac{1}{2}$ watt, carbon
R-9	RC20AE151M	150 ohms $\frac{1}{2}$ watt, carbon
R-10	RC30AE202M	2000 ohms 1 watt, carbon
L-1	57C119	Loop antenna
T-1	51B1058	Oscillator coil
T-2,3	50B374	Transformer IF & Det.

COILS AND TRANSFORMERS

Loop antenna
Oscillator coil
Transformer IF & Det.

CONDENSERS

.05 mfd. 600 V., tubular
.01 mfd. 600 V., tubular
100 mmf. 500 V., mica
.005 mfd. 600 V., tubular
20-20 mfd. 150., electrolytic
.2 mfd. 600., tubular
.01 mfd. 600., tubular
Tuning condenser

RESISTORS

22,000 ohms $\frac{1}{2}$ watt, carbon
2.2 megohms $\frac{1}{2}$ watt, carbon
10,000 ohms $\frac{1}{2}$ watt, carbon
47,000 ohms $\frac{1}{2}$ watt, carbon
Volume control
10 megohms $\frac{1}{2}$ watt, carbon
470,000 ohms $\frac{1}{2}$ watt, carbon
150 ohms $\frac{1}{2}$ watt, carbon
2000 ohms 1 watt, carbon

MISCELLANEOUS

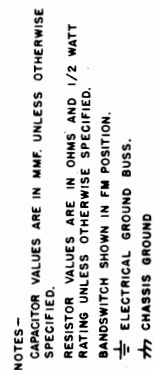
Speaker
Pilot light socket & bracket
Socket, octal
Line cord
Line cord lock
Escutcheon
Pointer
Dial scale
Knob, ivory
Knob, brown
Cabinet, ivory finish
Cabinet, brown finish

NOTES-

1. SOCKET VIEWS ARE BOTTOM VIEWS.
2. ALL VOLTAGES ARE MEASURED BETWEEN TUBE SOCKET TERMINALS AND ELECTRICAL GROUND (NOT CHASSIS) WITH ZERO SIGNAL INPUT.
3. LINE VOLTAGE—117 V. AC.
4. ALL VOLTAGES SHOWN ARE DC UNLESS OTHERWISE SPECIFIED.
5. DC VOLTAGES SHOWN BECOME DC WHEN OPERATING FROM A DC LINE.
6. "NR"—NO CONNECTION (VOLTAGE SHOWN FOR THIS TERMINAL ONLY WHEN TERMINAL IS USED AS A TIE LUG).
7. "NR"—NOT READABLE (READING GENERALLY MEANINGLESS).
8. [] SPACE PROVIDED FOR SERVICE METER READINGS.
9. ALL READINGS TAKEN WITH LINE PLUG POLARIZED SO THAT GROUND BUSS AND CHASSIS ARE AT THE SAME POTENTIAL WITH THE CHASSIS GROUNDED.

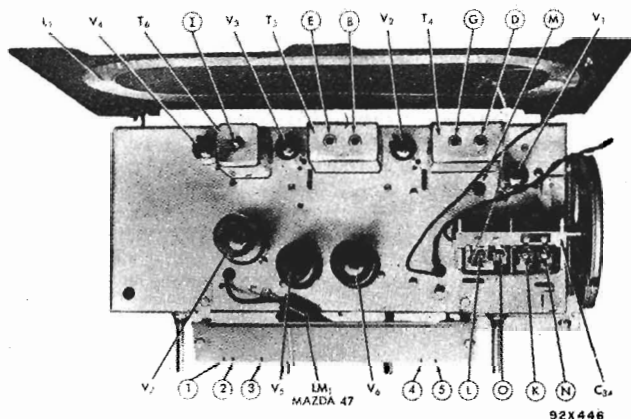
FRONT APRON
BOTTOM VIEW OF CHASSIS

920488



MONTGOMERY WARD

MODEL 84HA-1810A



This radio is a condenser tuned receiver using a cut plate tracking mixer section in the BC band and uncut plates in a conventional two section gang for FM reception. The built-in loop provides pickup for both the BC and FM bands. The BC section of the loop acts as the mixer stage coil while the FM section of the loop is coupled to the FM mixer stage coil. A single terminal (Back cover) is provided for an external BC antenna and a pair of terminals (D-D) are provided for a 300-ohm FM antenna transmission line for an external FM antenna. For FM reception the IF amplifier consists of two conventional amplifier stages feeding a ratio detector circuit. On the BC band the second IF amplifier stage becomes a conventional diode detector circuit using the control grid on the second IF amplifier tube as a diode plate. Since the receiver operates from AC and DC current, a separate ground buss is used and isolated from the chassis.

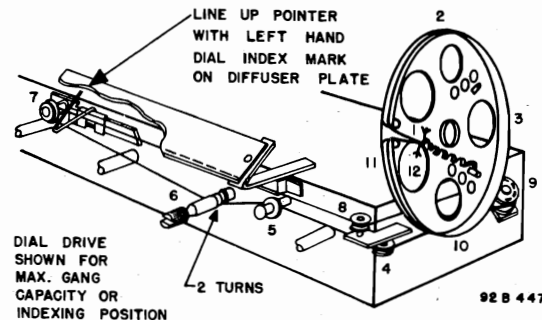
ELECTRICAL SPECIFICATIONS

Power Supply	105-125 volts DC or 60 cycle AC, 28 watts
Frequency Range	Broadcast 540-1600 KC Frequency Modulation 88-108 MC
Intermediate Frequency	455 KC/10.7 MC
Antenna	Built in loop. Provisions for external BC and FM antennas.
Power Output	1.5 watts max.
Speaker	4 X 6-inch PM.
Voice Coil Impedance.	3.2 ohms
Tube and Dial Lamp Complement	12BE6 Mixer/Osc. 6BJ6, 1st I.F. Amp. 6BJ6, 2nd I.F. Amp. (FM) & Detector (BC) 12AL5 Ratio Detector (FM) 12SQ7 Audio Amp. 35L6GT Power Amp. 35Z5GT Rectifier Mazda No. 47 Dial Lamp

For placement of these tubes, see the diagram showing tube layout.

DIAL CORD STRINGING INSTRUCTIONS

To restring the dial cable, pull the four control knobs from their shafts, remove the chassis bolts and pull the chassis from the cabinet. Restring the dial drive with a 48-inch length of 30-lb. test dial cord following the stringing sequence shown in the accompanying illustration. With the gang condenser at maximum capacity (closed) attach the dial pointer to the drive string and line it up with the left hand #1 index marker on the diffuser plate.



ALIGNMENT PROCEDURE

Generator connection.	See chart
Generator ground	To chassis
Output meter connection	Across voice coil
Electronic voltmeter connection	See chart
Volume control position	Maximum
Tone control position	Optional

NOTE - Index marks are provided on the diffuser plate to supplement the dial scale when the chassis is removed from the cabinet for alignment. Check the pointer position with the gang fully closed to make sure it lines up with the first marker before starting the alignment procedure outlined below.

The standard RMA dummy specified in the alignment chart consists of a 200 mmf condenser in series with a 20 uh r-f choke which is shunted by a 400 mmf condenser in series with a 400 ohm carbon resistor.

The loop antenna must be connected during alignment.

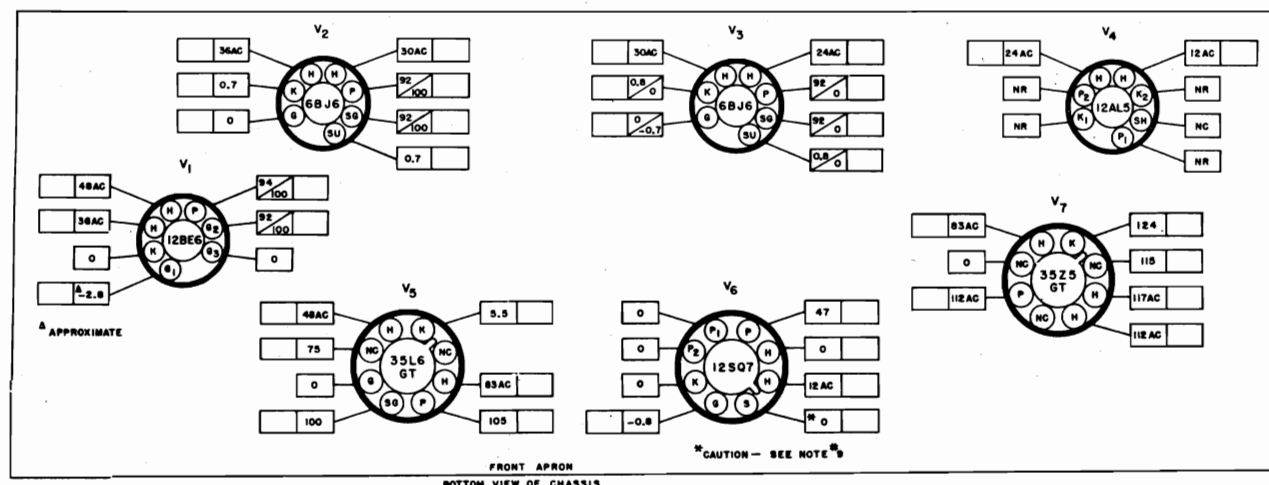
MODEL 84HA-1810A

MONTGOMERY WARD

ALIGNMENT CHART

Step	Dummy Antenna	Signal Generator Coupling	Signal Generator Frequency	Radio Range Switch Position	Diffuser Plate Index Mark	Adjust	Remarks
1.	.01 mfd.	To stator plates of high cap. mixer section	455 kc	2	None (Midscale)	A,B,C,D	Adjust for max. audio output at voice coil. Keep audio output below 50 mw to avoid AVC action.
2.	.01 mfd. cap.	To stator plates of low cap. mixer section	10.7 mc (No modulation)	1	None (Midscale)	E,F,G,H	Adjust for max. DC voltage between pin #7 of the 6AL5 and ground buss. Connect a 500,000 ohm resistor in series with voltmeter probe. Use just enough signal generator output to obtain approx. 2 volts at the electronic voltmeter.
3.	After completing the adjustments required by step 2. detune the signal generator on each side of 10.7 mc and note the generator dial or frequency reading for one half of the DC voltage measured by the electronic voltmeter. Use just enough signal generator output to obtain a maximum of 2 volts at the center frequency of the IF channel. Set the signal generator frequency at the midpoint of the two readings obtained above and align the FM detector transformer as follows:						
4.	Without changing the setup, adjust the primary of the FM detector transformer (I) for maximum DC voltage. Disconnect the electronic voltmeter probe and reconnect it at the junction of R13 and R14 using the 500,000-ohm resistor as before for isolation. Adjust the secondary of the FM detector (J) for the null or zero DC voltage. This completes the IF amplifier adjustment.						
5.	Std. RMA dummy	To BC antenna terminal on cabinet back	1500 kc 600 kc	2 2	#4 #3	*K,L *M	Adjust for max. audio output as in step 1.
6.	300-ohm carbon resistor	To terminals "D-D" on rear chassis apron. Connect resistor to high side or ungrounded terminal	108 mc	1	#5	*N,O	Adjust for max. DC voltage as in step 2.

*Calibration adjustment.



NOTES -

1. SOCKET VIEWS ARE BOTTOM VIEWS.
2. ALL VOLTAGES ARE MEASURED BETWEEN TUBE SOCKET TERMINALS AND ELECTRICAL GROUND BUSS (NOT CHASSIS) WITH ZERO SIGNAL INPUT. WHERE TWO READINGS ARE SHOWN THE FIRST IS FOR FM THE SECOND FOR BC.
3. LINE VOLTAGE - 117V. AC. AC VOLTAGES SHOWN WILL BE DC WHEN OPERATING FROM A DC LINE.
4. ALL VOLTAGES SHOWN ARE DC UNLESS OTHERWISE SPECIFIED.
5. DC VOLTAGES SHOWN WERE MEASURED WITH AN ELECTRONIC VOLTMETER.
6. "NC" - NO CONNECTION. (VOLTAGES SHOWN FOR THIS TERMINAL ONLY WHEN TERMINAL IS USED AS A TIE LUM).
7. "NR" - NOT READABLE. (READING GENERALLY MEANINGLESS).
8. SPACE PROVIDED FOR SERVICE METER READINGS.
9. ALL READINGS TAKEN WITH LINE PLUS POLARIZED SO THAT GROUND BUSS AND CHASSIS ARE AT THE SAME POTENTIAL WITH CHASSIS GROUNDED.

920448

MONTGOMERY WARD

MODEL 84HA-1810A

REPLACEMENT PARTS LIST

Ref. No.	Part No.	Description
RESISTORS (Cont.)		
R-23	RC20AE151K	150 ohms $\frac{1}{2}$ watt, carbon
R-24	RC20AE101M	100 ohms $\frac{1}{2}$ watt, carbon
R-25	RC30AE561K	560 ohms 1 watt, carbon
R-27	RC20AE120K	12 ohms $\frac{1}{2}$ watt, carbon
R-28	RC20AE270K	27 ohms $\frac{1}{2}$ watt, carbon
R-39,30,31	RC20AE100K	10 ohms $\frac{1}{2}$ watt, carbon

TRANSFORMERS AND COILS

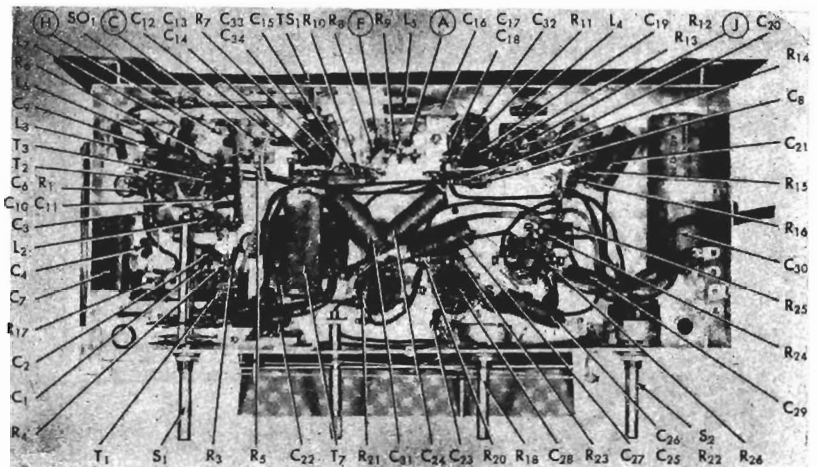
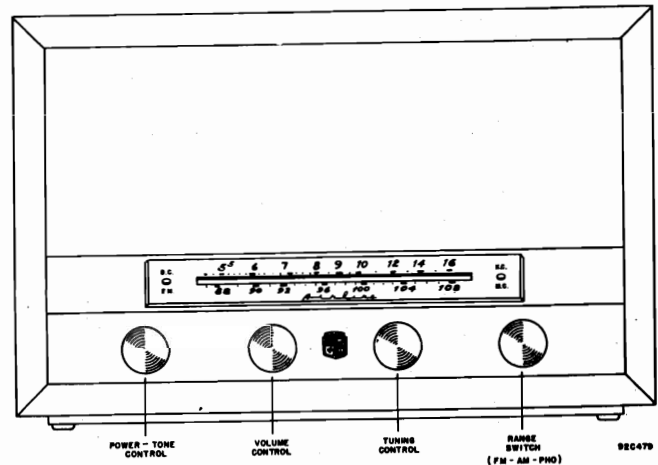
T-1	51A1061	Transformer, FM mixer stage
T-2	51A1062	Transformer, FM osc. stage
T-3	51B1063	Transformer, AM osc. stage
T-4	50B399	Transformer, 1st IF
T-5	50B400	Transformer, 2nd IF
T-6	50B401	Transformer, FM detector
T-7	55B111	Transformer, audio output
L-1	57C121	Loop antenna (cabinet back)
L-2,3,4,5, 6,7	53A136	Coil, RF choke

PLUGS AND SOCKETS

PL-1	87B1669	Line cord and plug
	6A308	Socket, miniature (tube)
	6A296	Socket, octal
SO-1	36A029	Phono jack
	86B069	Socket, pilot light

MISCELLANEOUS

S-1	60B328	Band switch assembly
	88A379	Terminal strip, antenna (D-D)
	76A397	Lock, line cord
	82A151	Pointer, dial
	22B210	Dial scale
	67A822	Bracket, dial light diffuser
	8B806	Diffuser, dial light
	38A019	Dial cord
	75A012	Spring, dial drive
	15B068-3	Knob
LS-1	85B076	Speaker

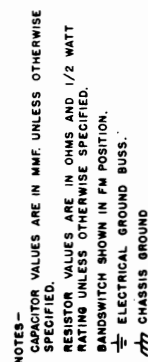


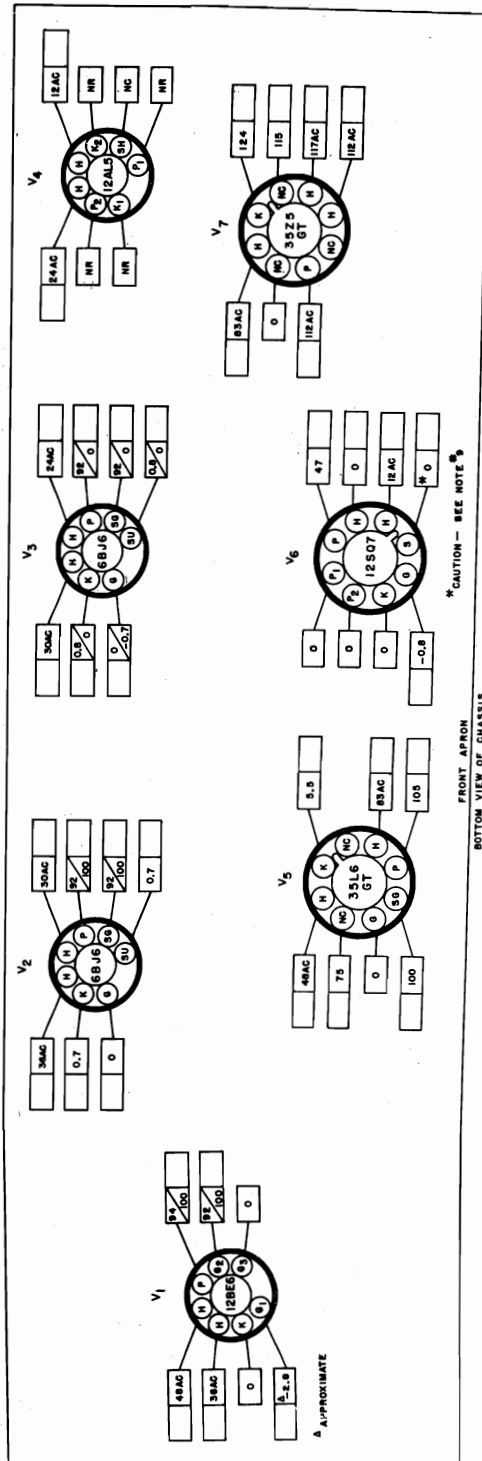
92X445

RESISTORS:

R-1	RC20AE223K	22,000 ohms $\frac{1}{2}$ watt, carbon
R-3,8,12, 26	RC20AE331M	330 ohms $\frac{1}{2}$ watt, carbon
R-4	RC20AE102M	1000 ohms $\frac{1}{2}$ watt, carbon
R-5	RC20AE105M	1 megohm $\frac{1}{2}$ watt, carbon
R-6	RC20AE225M	2.2 megohm $\frac{1}{2}$ watt, carbon
R-7,11	RC20AE680K	68 ohms $\frac{1}{2}$ watt, carbon
R-9,13, 14,17	RC20AE473M	47,000 ohms $\frac{1}{2}$ watt, carbon
R-10,21	RC20AE334M	330,000 ohms $\frac{1}{2}$ watt, carbon
R-15,16	RC20AE682K	6800 ohms $\frac{1}{2}$ watt, carbon
R-18	25B624	2 megohm volume control
R-19	RC20AE565M	5.6 megohms $\frac{1}{2}$ watt, carbon
R-20	RC20AE474M	470,000 ohms $\frac{1}{2}$ watt, carbon
R-22	25B758	500,000 ohms, tone control (switch S2)

Ref. No.	Part No.	Description
CONDENSERS		
C-1,2	CC26UK101K	100 mmf. 500 V., ceramic
C-3	CC21UK470K	47 mmf. 500 V., ceramic
C-4	CC21UK510J	51 mmf. 500 V., ceramic
C-5	47A177	1000 mmf. 500 V., ceramic
C-6	CC21UK050K	5 mmf. 500 V., ceramic
C-7	46AY503J	.05 mfd. 600 V., tubular paper
C-8,32,33, 35	47B20A102N5	1000 mmf. 500 V., ceramic
C-9,28	CM20A221M	220 mmf. 500 V., mica
C-10,11,12, 13,14,17, 18,36	47A168	.005 mfd. 500 V., ceramic
C-15,16,20	CM20A471M	470 mmf. 500 V., mica
C-19,23	47B20A202M5	2000 mmf. 500 V., ceramic
C-21,27	45A121	10 mfd. 25 V., electrolytic
C-24	46AU104J	.1 mfd. 200 V., tubular paper
C-25,31	46AZ103J	.01 mfd. 600 V., tubular paper
C-26	46AZ402J	.004 mfd. 600 V., tubular paper
C-29	46AG103J	.01 mfd. 600 V., molded paper
C-30	45B130	40-40-20 mfd. 150 V., electrolytic
C-34	48C203	Capacitor, main tuning





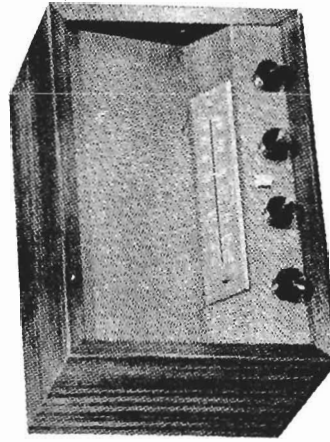
NOTES -

1. SOCKET VIEWS ARE BOTTOM VIEWS.
2. ALL VOLTAGES ARE MEASURED BETWEEN TUBE SOCKET TERMINALS AND ELECTRICAL GROUND BUSES (NOT CHASSIS) UNLESS OTHERWISE NOTED. WHERE TWO READINGS ARE SHOWN THE FIRST IS FOR FM RECEPTION, THE SECOND FOR BC.
3. LINE VOLTAGE - 117V.
4. ALL VOLTAGES SHOWN ARE DC UNLESS OTHERWISE NOTED.
5. DC VOLTAGES SHOWN WERE MEASURED WITH AN ELECTRONIC VOLTMETER.
6. "NC" - NO CONNECTION. (VOLTAGES SHOWN FOR THIS TERMINAL ONLY WHEN TERMINAL IS USED AS A TIE LUG).
7. "INT" - NOT READABLE. (READING GENERALLY MEANINGLESS).
8. [] SINCE PROVIDED FOR SERVICE METER READINGS.
9. ALL READINGS TAKEN WITH LINE PLUG POLARIZED SO THAT GROUND BUSS AND CHASSIS ARE AT THE SAME POTENTIAL WITH CHASSIS GROUNDED.

ELECTRICAL SPECIFICATIONS

Power Supply	105-125 volts DC or 60 cycle AC, 28 watts
Frequency Range	Broadcast 540-1600 KC Frequency Modulation 88-108 MC
Intermediate Frequency	455 KC/10.7 MC
Antenna	Built in loop. Provisions stringing for external BC and FM antennas.
Power Output	1.5 watts max.
Speaker	4 X 6-inch PM.
Voice Coil Impedance	3.2 ohms
Tube and Dial Lamp Complement	12BE6 Mixer/Osc. 6BJ6, 1st I.F. Amp. (FM) 6BJ6, 2nd I.F. Amp. & Detector (BC) 12AL5 Ratio Detector (FM) 12SQ7 Audio Amp. 35L6GT Power Amp. 35Z5GT Rectifier Mazda No. 47 Dial Lamp

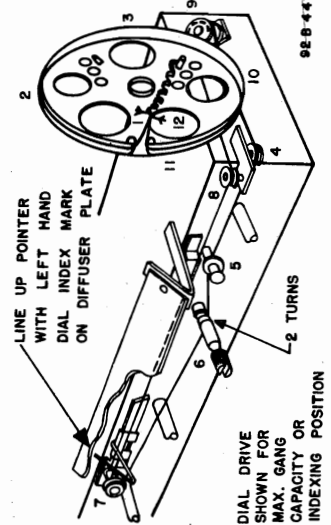
For placement of these tubes, see the diagram showing tube layout.



92D448

DIAL CORD STRINGING INSTRUCTIONS

To restring the dial cable, pull the four control knobs from their shafts, remove the chassis bolts and pull the chassis from the cabinet. Restring the dial drive with a 48-inch length of 20-lb. test dial cord following the stringing sequence shown in the accompanying illustration. With the gang condenser at maximum capacity (closed) attach the dial pointer to the drive antenna.

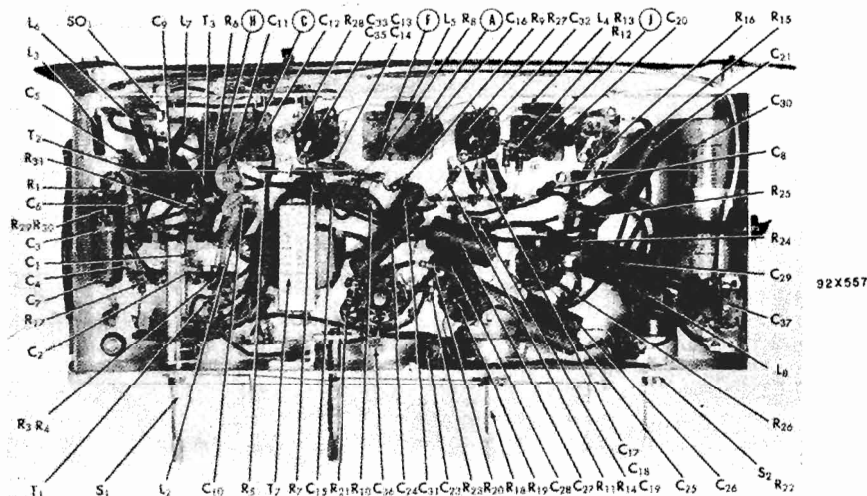


92B447

This radio is a condenser tuned receiver using a cut plate tracking mixer section in the BC band and uncut plates in a conventional two section gang for FM reception. The built-in loop provides pickup for both the BC and FM bands. The BC section of the loop acts as the mixer stage coil while the FM section of the loop is coupled to the FM mixer stage coil. A single terminal (Back cover) is provided for an external BC antenna and a pair of terminals (D-D) are provided for a 300-ohm FM antenna transmission line for an external FM antenna. For FM reception the IF amplifier consists of two conventional amplifier stages feeding a ratio detector circuit. On the BC band the second IF amplifier stage becomes a conventional diode detector circuit using the control grid on the second IF amplifier tube as a diode plate. Since the receiver operates from AC and DC current, a separate ground buss is used and isolated from the chassis.

MODEL 84HA-1810C

MONTGOMERY WARD



NOTE - Index marks are provided on the diffuser plate to supplement the dial scale when the chassis is removed from the cabinet for alignment. Check the pointer position with the gang fully closed to make sure it lines up with the first marker before starting the alignment procedure outlined below.

The standard RMA dummy specified in the alignment chart consists of a 200 mmf condenser in series with a 20 uh r-f choke which is shunted by a 400 mmf condenser in series with a 400 ohm carbon resistor.

The loop antenna must be connected during alignment.

ALIGNMENT PROCEDURE

Generator connection.	See chart
Generator ground	To chassis
Output meter connection	Across voice coil
Electronic voltmeter connection	See chart
Volume control position	Maximum
Tone control position	Optional

ALIGNMENT CHART

Step	Dummy Antenna	Signal Generator Coupling	Signal Generator Frequency	Radio Range Switch Position	Diffuser Plate Index Mark	Adjust	Remarks
1.	.01 mfd. cap.	To stator plates of high cap. mixer section	455 kc	2	None (Midscale)	A,B,C,D	Adjust for max. audio output at voice coil. Keep audio output below 50 mw to avoid AVC action.
2.	.01 mfd. cap.	To stator plates of low cap. mixer section	10.7 mc (No modulation)	1	None (Midscale)	E,F,G,H	Adjust for max. DC voltage between pin #7 of the 12AL5 and ground buss. Connect a 500,000 ohm resistor in series with voltmeter probe. Use just enough signal generator output to obtain approx. 2 volts at the electronic voltmeter.
3.	After completing the adjustments required by step 2, detune the signal generator on each side of 10.7 mc and note the generator dial or frequency reading for one half of the DC voltage measured by the electronic voltmeter. Use just enough signal generator output to obtain a maximum of 2 volts at the center frequency of the IF channel. Set the signal generator frequency at the midpoint of the two readings obtained above and align the FM detector transformer as follows:						
4.	Without changing the setup, adjust the primary of the FM detector transformer (I) for maximum DC voltage. Disconnect the electronic voltmeter probe and reconnect it at the junction of R13 and R14 using the 500,000-ohm resistor as before for isolation. Adjust the secondary of the FM detector (J) for the null or zero DC voltage. This completes the IF amplifier adjustment.						
5.	Std. RMA dummy	To BC antenna terminal on cabinet back	1500 kc	2	#4	*K,L	Adjust for max. audio output as in step 1.
			600 kc	2	#3	*M	
6.	300-ohm carbon resistor	To terminals "D-D" on rear chassis apron. Connect resistor to high side or ungrounded terminal	108 mc	1	#5	*N,O	Adjust for max. DC voltage as in step 2.

*Calibration adjustment.

Power Supply 105-125 volts AC, 60 cycles, 55 watts. (80 watts phono operating).

Frequency Range 540 - 1620 KC.

Selectivity 40 KC broad at 1000 times signal, 1000 KC.

Sensitivity (for .5 watt output) with external antenna 5 microvolts average.

**Power Output 6 watts maximum, 3.2 watts
10% distortion.**

Loud Speaker 6x9" EM dynamic, 750 ohms.

Voice Coil Impedance. 3.2 ohms at 400 cycles.

MONTGOMERY WARD

MODEL 84KR-2716A

ALIGNMENT PROCEDURE

VOLUME CONTROL — MAXIMUM FOR ALL ADJUSTMENTS.

Tone control — In "HIGH" position.

Connect radio chassis to ground connection of Signal Generator.

Allow the chassis and signal generator to "heat up" for several minutes.

The following equipment is required for aligning:

A signal generator which will provide an accurately calibrated signal at the test frequencies as listed.

Output indicating meter; non-metallic screw driver.

Dummy antennas — .1 mfd., 200 mmfd.

Place loop antenna in its normal relation to the chassis.

Signal Generator		Connection To Radio	Condenser Setting	Adjust Trimmers To Maximum
Frequency Setting	Dummy Antenna			
455 kc	.1 Mfd.	6SA7, Pin 8	Turn rotor plates to full open	1st IF Transformer. 2nd IF Transformer.
1620 kc	200 Mmfd.	Antenna Lead	Turn rotor plates to full open	Osc. trimmer on tuning condenser.
1400 kc	200 Mmfd.	Antenna Lead	Tune rotor to maximum output.	RF Section trimmer on tuning condenser. Antenna trimmer on loop antenna.

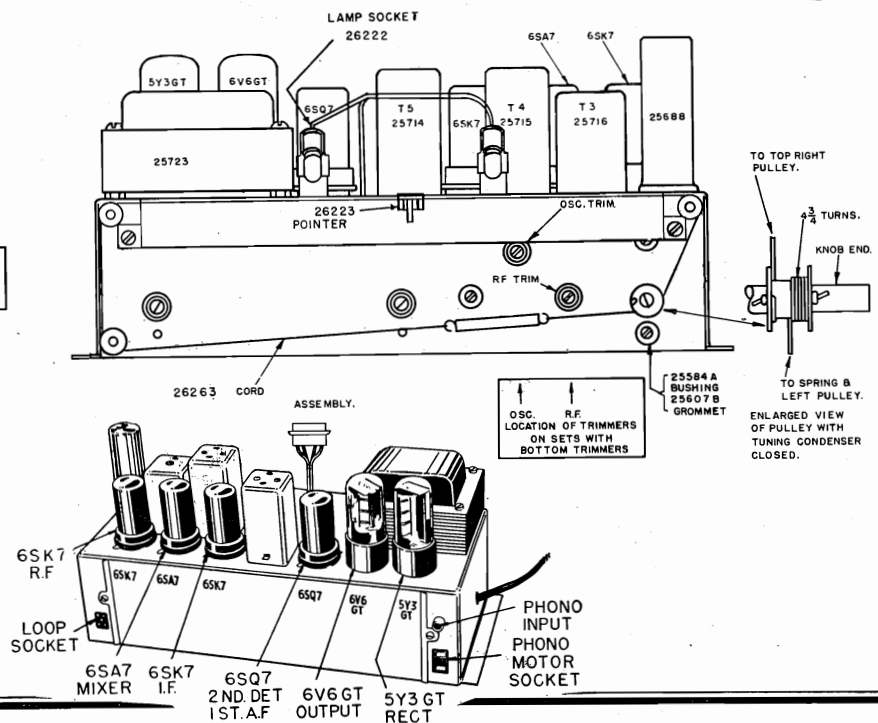
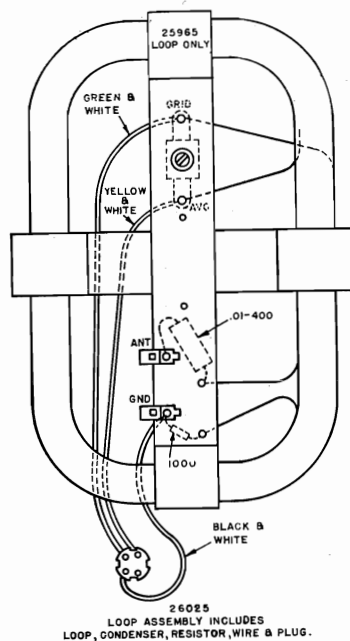
The dial pointer may be adjusted to the scale calibration by slipping the pointer on the dial cord.

RECEIVER STAGE SENSITIVITIES

The following table lists the sensitivity at the input of each stage. The receiver should be tuned to 1000 KC for all readings. All measurements are based on an output of .5 watts. This may be measured by disconnecting the speaker voice coil and substituting a 3.2 ohm, 5 watt resistor across the secondary winding of the output transform-

er. A reading of 1.26 volts across this resistor will be equivalent to a .5 watt output with the speaker connected. The volume control must be set to maximum. The signal source must be an accurately calibrated signal generator capable of supply both 1000 KC and 455 KC signals modulated 30% with a 400 cycle audio signal. Variations of Plus or Minus 25% are usually permissible.

SIGNAL GENERATOR				INPUT FOR .5 WATT OUTPUT
Frequency	Coupling Capacitor	Connection to Receiver	Ground Connection	
1000 kc	200 mmf or RMA Dummy Antenna	External Antenna Lead	Chassis	5 microvolts
1000 kc	.05 mfd.	6SA7 Mixer, Pin 8	Same as above	175 microvolts
455 kc.	.05 mfd.	6SA7 Mixer, Pin 8	Same as above	160 microvolts
455 kc.	.05 mfd.	6SK7 1-F, Pin 4	Same as above	1600 microvolts
400 cycles	.05 mfd.	6SQ7 1st A-F, Pin 2	Same as above	.12 volts
400 cycles	.05 mfd.	6V6GT Output, Pin 5	Same as above	4.32 volts





Ref. No.	Part No.	Description	Qty. Used In Set
-------------	----------	-------------	---------------------

DIAL AND DRIVE ASSEMBLY

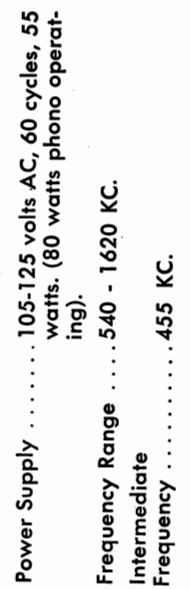
25596	Bearing for Wood Pulleys	3
25572	Bracket - Tuning Condenser — Front	1
25573	Bracket - Tuning Condenser — Rear	1
26263	Cord-Dial	1
26213	Dial Scale — Plastic	1
26223	Dial Pointer	1
26209	Knob — Tone	1
26208	Knob - Volume — Tuning	2
25336	Pulley — Wood — Small	3
25933	Pulley — Manual Drive With Shaft	1
25607	Rubber — Grommets	3
26026	Screw — Set for Worm Gear (Tuning Condenser)	2
26222	Socket — Dial Lamp	2
25963	Spring — Dial Cord	1
26187	Track	1
26191B	Dial - Escutcheon	1

MISCELLANEOUS

26264	6x9" EM SPEAKER — With Transformer and Plug	1
25620	Socket — Octal	6
25700	Receptacle — Phono Motor	1
25006	Socket — For Loop Antenna	1
25710	Socket — Phono Pick-up ..	1
25562	Switch — Tone	1
25068	Cord — AC and Plug	1
25693	Plug — For Loop	1

RECORD CHANGER PARTS

26034	Motor, 60 cycle, 117 volts	1
26035	Shure P-30 Crystal Pickup Cartridge and Needle	1
26036	Replacement Needle Only	1
26116	Storage Shaft Assembly	1



MODEL 84KR-2723A

MONTGOMERY WARD

ALIGNMENT PROCEDURE**VOLUME CONTROL — MAXIMUM FOR ALL ADJUSTMENTS.**

Tone control — In "HIGH" position.

Connect radio chassis to ground connection of Signal Generator.

Allow the chassis and signal generator to "heat up" for several minutes.

The following equipment is required for aligning:
 A signal generator which will provide an accurately calibrated signal at the test frequencies as listed.
 Output indicating meter; non-metallic screw driver.
 Dummy antennas — .1 mfd., 200 mmfd.
 Place loop antenna in its normal relation to the chassis.

Signal Generator		Connection To Radio	Condenser Setting	Adjust Trimmers To Maximum
Frequency Setting	Dummy Antenna			
455 kc	.1 Mfd.	6SA7, Pin 8	Turn rotor plates to full open	1st IF Transformer. 2nd IF Transformer.
1620 kc	200 Mmfd.	Antenna Lead	Turn rotor plates to full open	Osc. trimmer on tuning condenser.
1400 kc	200 Mmfd.	Antenna Lead	Tune rotor to maximum output.	RF Section trimmer on tuning condenser. Antenna trimmer on loop antenna.

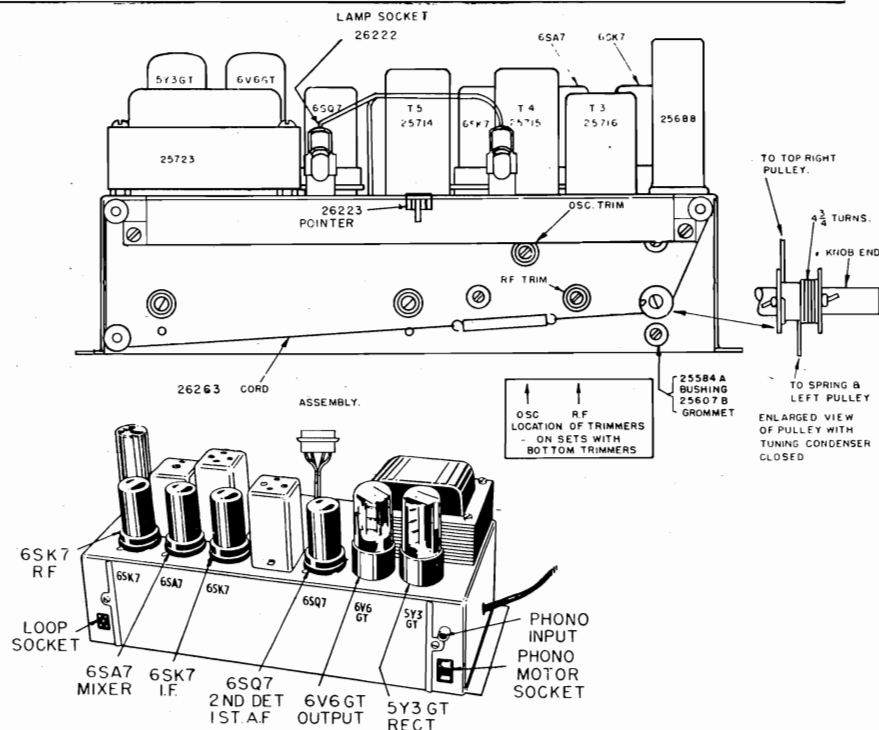
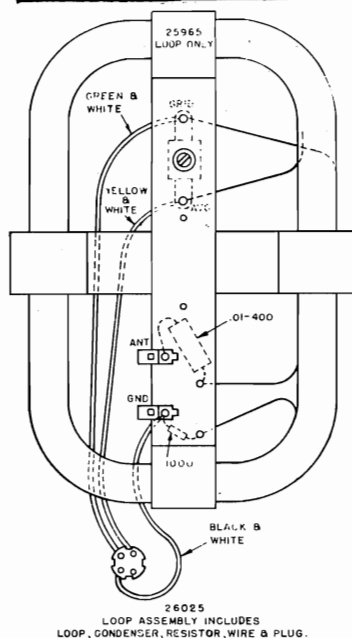
The dial pointer may be adjusted to the scale calibration by slipping the pointer on the dial cord.

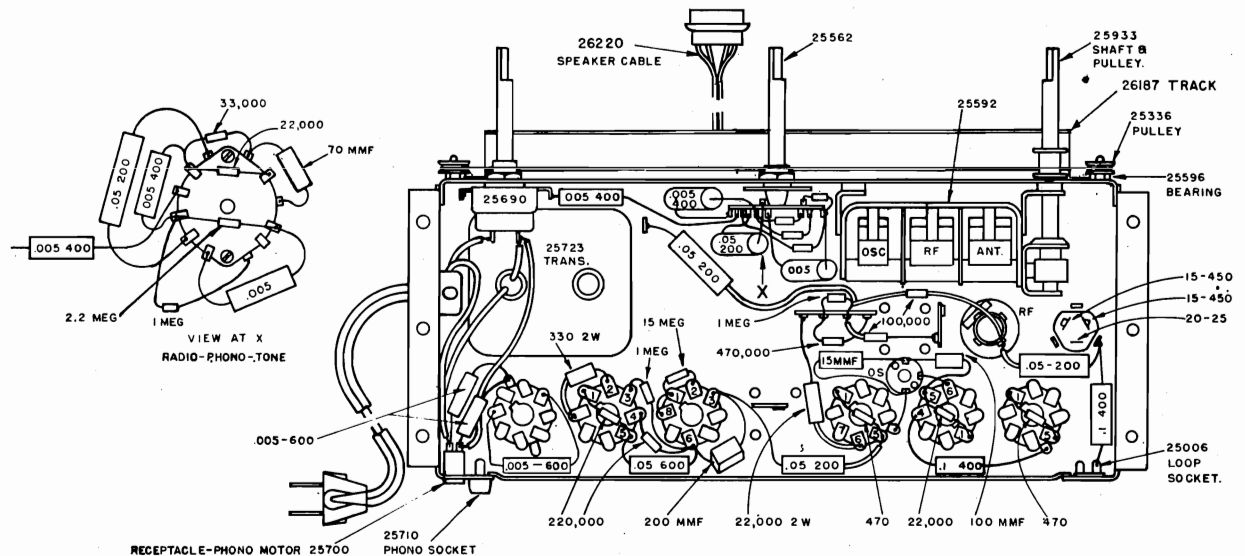
RECEIVER STAGE SENSITIVITIES

The following table lists the sensitivity at the input of each stage. The receiver should be tuned to 1000 KC for all readings. All measurements are based on an output of .5 watts. This may be measured by disconnecting the speaker voice coil and substituting a 3.2 ohm, 5 watt resistor across the secondary winding of the output transform-

er. A reading of 1.26 volts across this resistor will be equivalent to a .5 watt output with the speaker connected. The volume control must be set to maximum. The signal source must be an accurately calibrated signal generator capable of supply both 1000 KC and 455 KC signals modulated 30% with a 400 cycle audio signal. Variations of Plus or Minus 25% are usually permissible.

SIGNAL GENERATOR				INPUT FOR .5 WATT OUTPUT
Frequency	Coupling Capacitor	Connection to Receiver	Ground Connection	
1000 kc	200 mmf or RMA Dummy Antenna	External Antenna Lead	Chassis	5 microvolts
1000 kc	.05 mfd.	6SA7 Mixer, Pin 8	Same as above	175 microvolts
455 kc.	.05 mfd.	6SA7 Mixer, Pin 8	Same as above	160 microvolts
455 kc.	.05 mfd.	6SK7 1-F, Pin 4	Same as above	1600 microvolts
400 cycles	.05 mfd.	6SQ7 1st A-F, Pin 2	Same as above	.12 volts
400 cycles	.05 mfd.	6V6GT Output, Pin 5	Same as above	4.32 volts





Ref. No.	Part No.	Description	Qty. Used In Set
CAPACITORS			
	26221	.000015 Ceramic	1
C 1-2-3	25592	Gang Tuning Capacitor Trimmers	1
	25688	Electrolytic 15-15 Mfd. 450V., 20 Mfd. 25V.	1
	8878	.05 Mfd.—600V. Tubular	1
	8661	.05 Mfd.—200V. Tubular	5
	17646	.005 Mfd.—400V. Tubular	3
	17647	.1 Mfd.—400V. Tubular	1
	8583	.01 Mfd. — 400V Tubular	1
	14370	.0002 Mfd. Mica	1
	8872	.0001 Mfd. Mica	1
	25689	.005 Mfd. 600V. Moulded	2
	25964	70 Mmfd. Mica	1
	14061	.005 MMFD—600V Tubular	1
RESISTORS			
	25414	1000 Ohm ½W. Carbon	1
	25742	330 Ohm 2W. Carbon	1
	25085	470 Ohm ½W. Carbon	2
	25721	22,000 Ohm, 2W. Carbon	1
	25038	22,000 Ohm ½W. Carbon	2
	25144	33,000 Ohm ½W. Carbon	1
	25042	470,000 Ohm ½W. Carbon	1
	8885	100,000 Ohm ½W. Carbon	2
	25041	220,000 Ohm ½W. Carbon	2
	8766	1,000,000 Ohm ½W. Carbon	3
	25134	2.2 Megohm ½W. Carbon	1
	14365	15 Megohm ½W. Carbon	1
R 1	25690	Volume Control With Switch S2	1
TRANSFORMERS AND COILS			
T 1	25965	Loop Antenna	1
T 2	25724	Coil — Oscillator	1
T 3	25597	Coil — RF	1
T 4	25715	Transformer — IF Input	1
T 5	25714	Transformer — IF Output	1
T 6	26226	Transformer — Output Speaker	1
	25723	Transformer — Power — 60 cycle	1

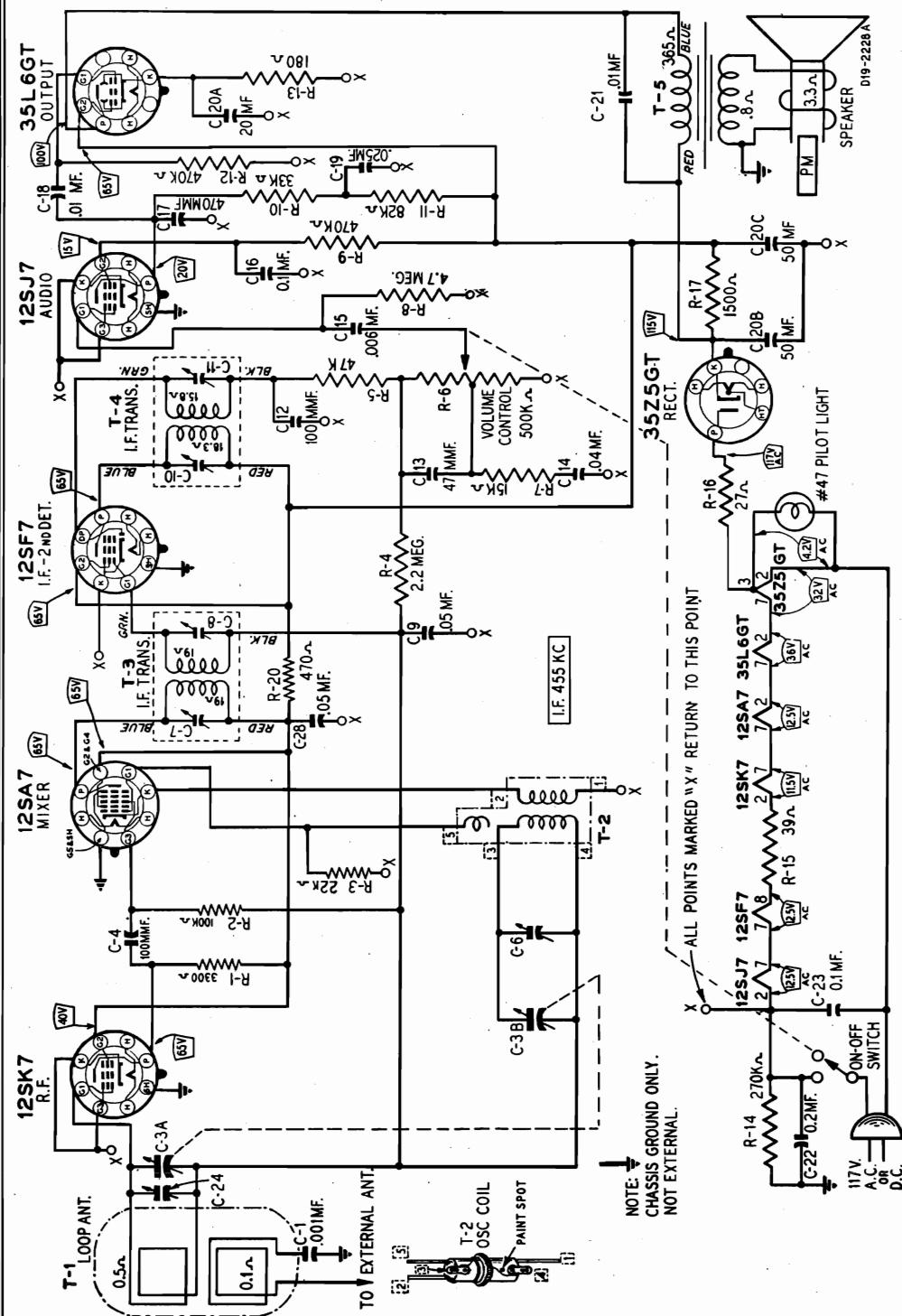
Ref. No.	Part No.	Description	Qty. Used In Set
DIAL AND DRIVE ASSEMBLY			
25596		Bearing for Wood Pulleys	3
25572		Bracket - Tuning Condenser — Front	1
25573		Bracket - Tuning Condenser — Rear	1
26263		Cord-Dial	1
26214		Dial Scale — Plastic	1
26223		Dial Pointer	1
26209		Knob — Tone	1
26208		Knob - Volume — Tuning	2
25336		Pulley — Wood — Small	3
25933		Pulley — Manual Drive With Shaft	1
25607		Rubber — Grommets	3
26026		Screw — Set for Worm Gear (Tuning Condenser)	2
26222		Socket — Dial Lamp	2
25963		Spring — Dial Cord	1
26187		Track	1
26192		Dial - Escutcheon	1
MISCELLANEOUS			
26264		6x9" EM SPEAKER — With Transformer and Plug	1
25620		Socket — Octal	6
25700		Receptacle — Phono Motor	1
25006		Socket - For Loop Antenna	1
25008		Socket - Phono Pick-up	1
S 1 25562		Switch — Tone	1
25068		Cord — AC and Plug	1
25693		Plug — For Loop	1

RECORD CHANGER PARTS

26034	Motor, 60 cycle, 117 volts	1
26035	Shure P-30 Crystal Pickup Cartridge and Needle	1
26036	Replacement Needle Only	1
26116	Storage Shaft Assembly.	1

MODELS 84WG-1804D,
84WG-1806A

MONTGOMERY WARD

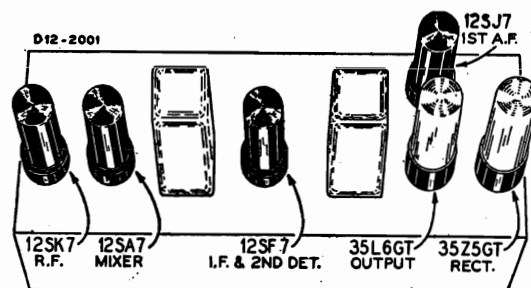
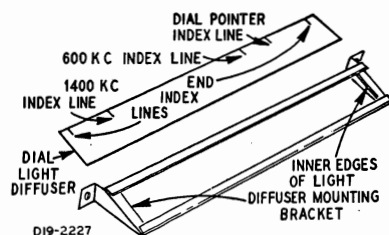


DIAL CALIBRATION

In order to align the receiver, the dial pointer must be positioned on the dial string correctly with reference to the dial. Index lines are provided on the dial light diffuser for this purpose.

Before aligning the receiver (or when replacing the dial light diffuser) check the position of the diffuser strip, making certain that the two end index lines are aligned with the inner edges of the diffuser mounting bracket opening. The bracket should be crimped at one point to prevent movement of the diffuser strip. To position the dial pointer, turn the gang condenser to the fully closed position. The dial pointer should be directly over the dial pointer index line. (See illustration)

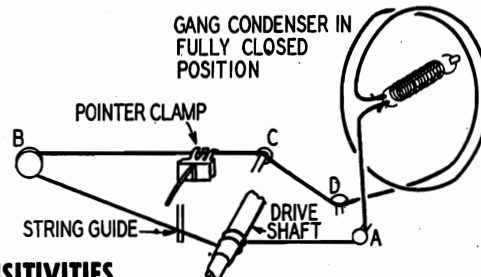
The 1400 KC index line is for use when aligning the receiver.



DRIVE CORD REPLACEMENT

Turn the gang condenser to the fully closed position. Use a new 10X44 drive cord assembly and fasten one end to the tension spring. Hook the other end of the tension spring over the tab on the drive pulley. Pass the cord through the slot on the drive pulley rim, under stud A and wind two turns clockwise (from front of chassis) around the tuning shaft. Turns must progress away from chassis. Pass cord over pulley B and stud C under stud D. Pass cord under drive pulley and wind 4 turns counterclockwise around drive pulley. Stretch tension spring and fasten free end of cord to spring.

Attach the dial pointer to the cord and position as instructed in paragraph DIAL CALIBRATION.



RECEIVER STAGE SENSITIVITIES

The table below lists the sensitivity at the input of each stage. The receiver should be tuned to 1000 KC for all readings. All measurements are based on an output of 50 milliwatts. This may be measured by disconnecting the speaker voice coil and substituting a 3.2 ohm 5 watt resistor across the secondary winding of the output transformer. A reading of .4 volt AC

across this resistor will be equivalent to a 50 milliwatt output. The volume control must be set to maximum. The signal source must be an accurately calibrated signal generator capable of supplying both 1000 KC and 455 KC signals modulated 30% with a 400 cycle audio signal. Variations in sensitivity of Plus or Minus 25% are usually permissible.

SIGNAL GENERATOR				INPUT FOR 50 MILLIWATT OUTPUT
Frequency	Coupling Capacitor	Connection to Receiver	Ground Connection	
1000 kc	200 mmf or RMA Dummy Antenna	Loop Antenna— External antenna clip	Chassis	.19.5 microvolts
1000 kc	.05 mf.	12SA7 Mixer—Pin 8	Point "X" (12SK7 Pin 3)	150 microvolts
455 kc	.05 mf	12SA7 Mixer—Pin 8	Same as above	100 microvolts
455 kc	.05 mf	12SF7 I-F—Pin 2	Same as above	3500 microvolts
400 cycles	.05 mf	12SJ7 1st A-F—Pin 4	Same as above	.042 volt
400 cycles	.05 mf	35L6GT Output—Pin 5	Same as above	1 volt

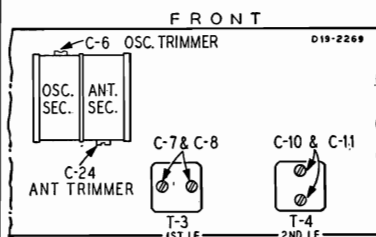
Volume Control—Maximum All Adjustments.

Signal Generator which will provide an accurately calibrated signal at the test frequencies as listed.

Output Indicating Meter; Non-Metallic Screwdriver.

Dummy Antennas—.1 mf., 50 mmf.

The equipment in column at right is required for aligning:



NOTE A:—Index line is on dial light diffuser strip. See DIAL CALIBRATION paragraph.

SIGNAL GENERATOR			Coupling Capacitor	DIAL SETTING	ADJUST TRIMMERS TO MAXIMUM OUTPUT IN ORDER SHOWN (See Trimmer Illustration)
Frequency Setting	Connection to Receiver	Ground Connection			
455 kc	Control Grid 12SF—I-F (Prong No. 2)	Point "X" 12SK7—R-F (Prong No. 3)	.1 mf	Turn Rotor to full open	2nd I-F (C10) & (C11)
455 kc	Control Grid 12SA7—1st Det. (Prong No. 8)	Same as above	.1 mf	Turn Rotor to full open	1st I-F (C7) & (C8)
1620 kc	Control Grid 12SA7—1st Det. (Prong No. 8)	Same as above	.1 mf	Turn Rotor to fully open position	Oscillator (C6)
1400 kc	External Antenna Clip on Loop	Chassis	50 mmf	Turn Rotor to 1400 kc Index Line. See Note A	Antenna (C24)

Power Supply.....105-125 volts AC, 25-60 cycles, 35 watts or 105-125 volts DC

Frequency Range.....540-1600 KC

Intermediate Frequency . 455 KC

Selectivity.....At 1000 KC, 50 KC wide at 1000 times signal

Sensitivity..... (for .05 watt output with external antenna) 15 microvolts average

Power Output.....1.3 watts maximum
.75 watt 10% distortion

Loud Speaker.....4" x 6" PM dynamic

Voice Coil Impedance...3.2 ohms at 400 cycles

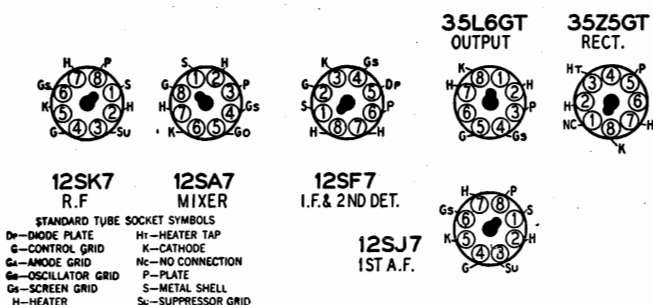
Tube and Dial Light Complement		
1	12SK7 R-F Amplifier	
1	12SA7 Mixer	
1	12SF7 I-F and 2nd Detector	
1	12SJ7 1st A-F	
1	35L6GT Power Output	
1	35Z5GT Rectifier	
1	47 Dial Lamp	

Socket voltages are shown on the schematic diagram at the tube socket terminals. All voltages except those for the heater and dial lamp are between the socket terminal and "X" point.

The readings were taken with a 1000 ohm-per-volt meter and all plate and screen voltages read on a 500 volt scale. Conditions of measurement are:

Line voltage.....117 volts AC
Volume control.....maximum
Signal input.....none

A variation of $\pm 10\%$ is usually permissible.



MONTGOMERY WARD

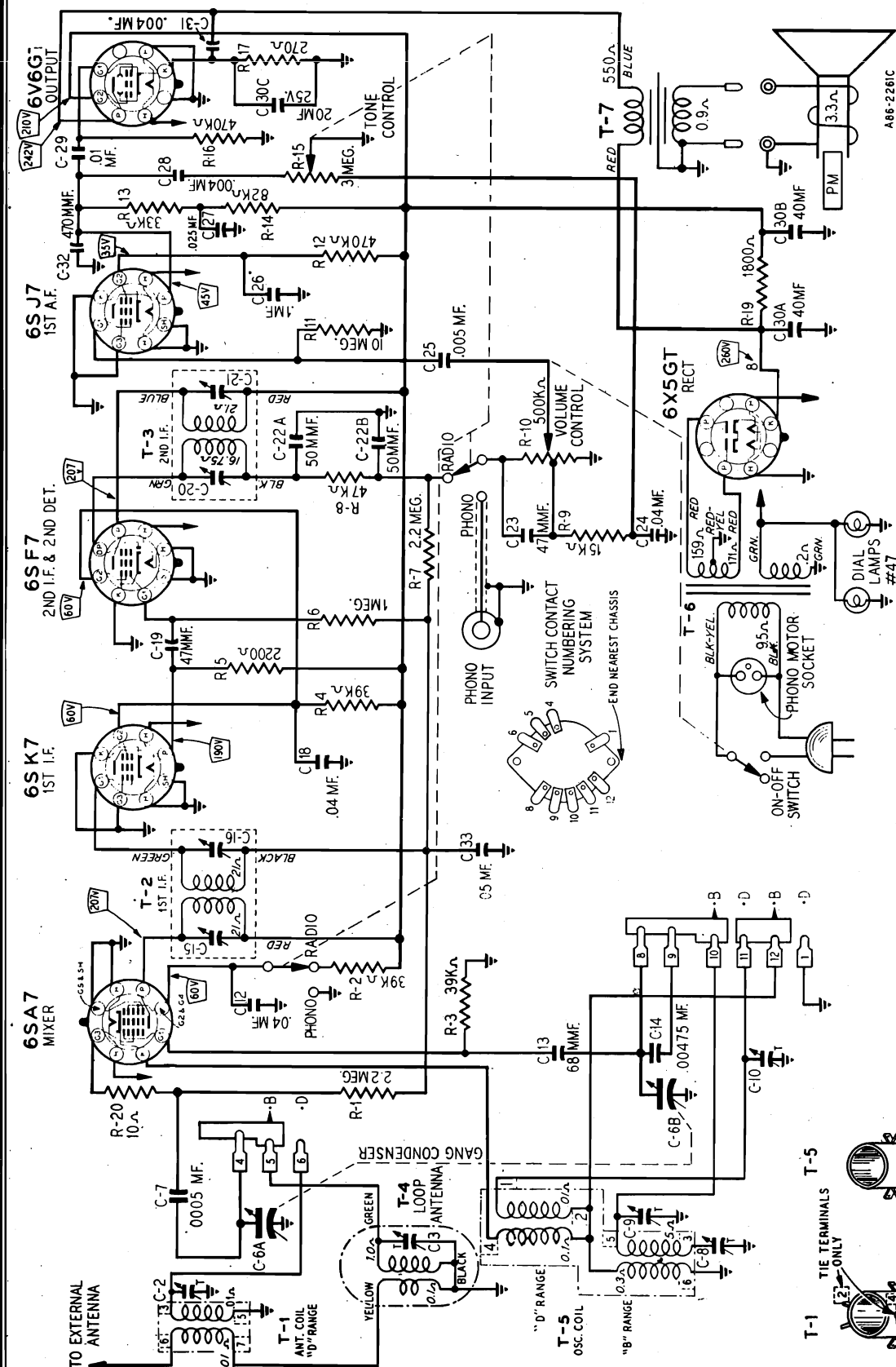
MODELS 84WG-1804D,
84WG-1806A

REPLACEMENT PARTS LIST

Ref. No.	Part No.	Description	Qty. Used in Set
CAPACITORS			
C-1	D67102	.001 mf 400 V Tubular	1
C-3A } C-3B }	14A194	Gang condenser and pulley assembly	1
C-4 } C-12 }	47X476	100 mmf Molded	2
C-6	Part of C-3		
C-7 } C-8 }	Part of T-3, 1st I-F Transformer		
C-9	B66503	.05 mf 200 V Tubular	1
C-10 } C-11 }	Part of T-4, 2nd I-F Transformer		
C-13	47X463	47 mmf Molded	1
C-14	B67403	.04 mf 200 V Tubular	1
C-15	B67602	.006 mf 200 V Tubular	1
C-16	B66104	.1 mf 200 V Tubular	1
C-17	47X467	470 mmf Molded	1
C-18 } C-21 }	B66103	.01 mf 200 V Tubular	2
C-19	B67253	.025 mf 200 V Tubular	1
C-20A } C-20B } C-20C }	45X344	20 mf 25 V Dry electrolytic 50 mf 150 V condenser 50 mf 150 V	1
C-22	B67204	0.2 mf 200 V Tubular	1
C-23	D67104	.1 mf 400 V Tubular	1
C-24	Part of C-3		
C-28	B67503	.05 mf 200 V Tubular	1
RESISTORS			
		Ohms Watts	
R-1	B84332	3300 0.5 Carbon	1
R-2	B85104	100,000 0.5 Carbon	1
R-3	B85223	22,000 0.5 Carbon	1
R-4	B85225	2.2 meg. 0.5 Carbon	1
R-5	B85473	47,000 0.5 Carbon	1
R-6	36X347	500,000 Volume control and switch	1
R-7	B84153	15,000 0.5 Carbon	1
R-8	B85475	4.7 meg. 0.5 Carbon	1
R-9	B84474	470,000 0.5 Carbon	1
R-10	B84333	33,000 0.5 Carbon	1
R-11	B84823	82,000 0.5 Carbon	1
R-12	B85474	470,000 0.5 Carbon	1
R-13	B83181	180 0.5 Carbon	1
R-14	B84274	270,000 0.5 Carbon	1
R-15	D84390	39 2.0 Carbon	1
R-16	B84270	27 0.5 Carbon	1
R-17	C84152	1500 1.0 Carbon	1
R-20	B85471	470 0.5 Carbon	1
TRANSFORMERS AND COILS			
T-1	9A1944	"B" Range loop antenna	1
T-2	9A1911	Oscillator coil assembly	1
T-3	9A1775	1st I-F Transformer and can assembly	1
T-4	9A1776	2nd I-F Transformer and can assembly	1
T-5	51X116	Output transformer	1
DIAL AND DRIVE ASSEMBLY			
6X21	Rubber grommet	} Gang cond. { } mtg. {	3
20X329	Cond. cushion stud		3
58X667	Dial		1
25X1461	Dial bracket		1
26A446	Pointer bracket assembly		1
15X217	Pointer		1
25X1398	Pilot light bracket		1
7A192	Pilot light socket assembly		1
7A103	Pilot light No. 47		1
10X44	Drive cord assembly		1
28X95	Drive cord tension spring		1
26X464	Drive shaft		1
19X192	"C" washer (for drive shaft)		2
41X81	Dial light diffuser		1
4X884	Escutcheon (for Walnut Cabinet)		1
4X1025	Escutcheon (for Mahogany Cabinet)		1
25X1460	Escutcheon mounting bracket		2
MISCELLANEOUS			
12A431	4" x 6" speaker with mtg. bracket		1
3A303	Tube socket—octal (8 prong) molded		5
3A421	Tube socket with shield		1
10A297	Knob (walnut) on-off switch, volume control and tuning		2
10A712	Knob (Mahogany)		2
28X292	Snap button (mtg. loop to cabinet)		2
	6 x 1/4" slotted hex head P-K type "Z" screw mounting loop to chassis		2
13X328	Line cord and plug assembly		1

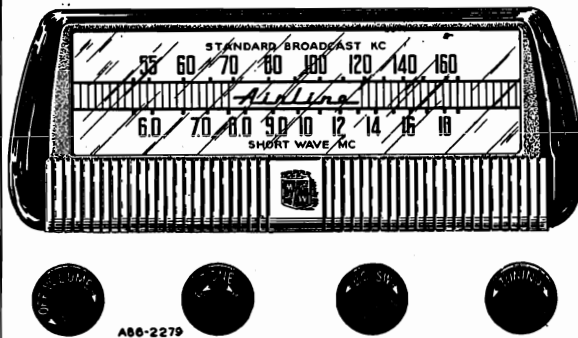
MODEL 84WG-2504D

MONTGOMERY WARD



MONTGOMERY WARD

MODEL 84WG-2504D

**ELECTRICAL SPECIFICATIONS**

Power Supply.....	105-125 volts AC, 50-60 cycles, 45 watts.
Frequency Range.....	B range—540-1600 KC D range—5.75 to 18.3 MC
Intermediate Frequency.....	455 KC
Selectivity.....	40 KC broad at 1000 times signal, 1000 KC
Sensitivity.....	(for .5 watt output) with external antenna B range—9 microvolts average D range—20 microvolts average
Power Output.....	4 watts maximum 2.3 watts, 10% distortion
Loud Speaker.....	10" PM dynamic
Voice Coil Impedance.....	3.2 ohms at 400 cycles

**Tube and
Dial Light
Complement**

- 1 6SA7 Mixer
- 1 6SK7 1st I-F Amplifier
- 1 6SF7 2nd I-F Amplifier & 2nd Det.
- 1 6SJ7 1st A-F Amplifier
- 1 6V6GT Power Output
- 1 6X5GT Rectifier
- 2 No. 47 Dial Lamps

GENERAL DESCRIPTION

This model is a five tube (plus rectifier tube) AC console receiver. Controls are provided for tuning, volume, tone, and band selection. The dial scale is calibrated in two bands, the broadcast band in channel numbers to cover frequencies between 540-1600 KC and the short wave band directly in megacycles from 5.75 to 18.3 MC. Other features include a built-in Air Wave Aerial, automatic volume control, beam power audio output stage and a PM dynamic speaker. A switch is provided on the tone control for selection of either radio or phono operation.

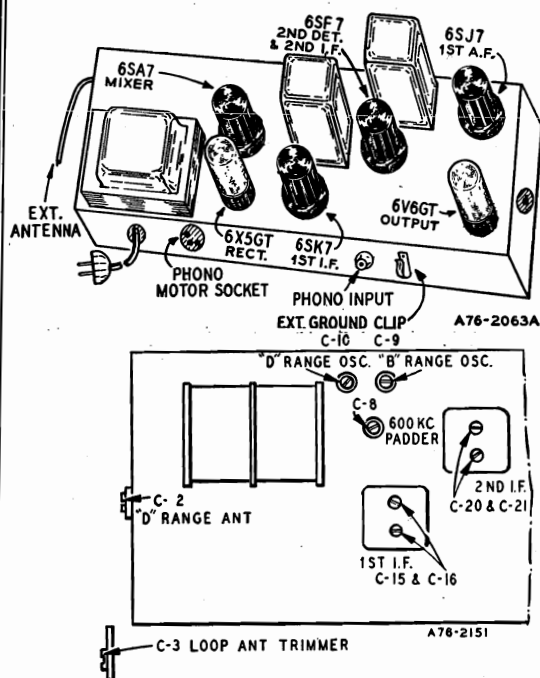
RECEIVER STAGE SENSITIVITIES

The table below lists the sensitivity at the input of each stage. The receiver should be tuned to 1000 KC for all readings. All measurements are based on an output of .5 watt. This may be measured by disconnecting the speaker voice coil and substituting a 3.2 ohm, 5 watt resistor across the secondary winding of the output transformer. A reading of 1.26 volts across this resistor will be equivalent to a .5 watt output with the speaker connected. The volume control must be set to maximum. The signal source must be an accurately calibrated signal generator capable of supplying both 1000 KC and 455 KC signals modulated 30% with a 400 cycle audio signal. Variations of Plus or Minus 25% are usually permissible.

SIGNAL GENERATOR				INPUT FOR .5 WATT OUTPUT
Frequency	Coupling Capacitor	Connection to Receiver	Ground Connection	
1000 kc	200 mmf or RMA Dummy Antenna	External antenna lead	Chassis	9 microvolts
1000 kc	.05 mf	6SA7 Mixer, Pin 8	Same as above	42 microvolts
455 kc	.05 mf	6SA7 Mixer, Pin 8	Same as above	40 microvolts
455 kc	.05 mf	6SK7 1st I-F, Pin 4	Same as above	1075 microvolts
455 kc	.05 mf	6SF7 2nd I-F, Pin 2	Same as above	3900 microvolts
400 cycles	.05 mf	6SJ7 1st A-F, Pin 4	Same as above	.08 volt
400 cycles	.05 mf	6V6GT Output, Pin 5	Same as above	3.75 volts

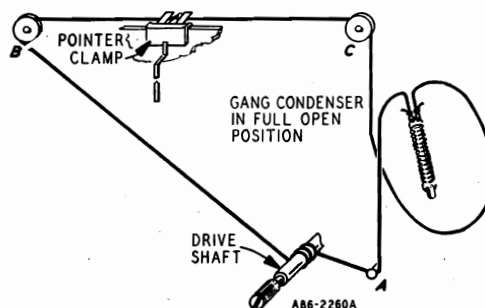
MODEL 84WG-2504D

MONTGOMERY WARD



DRIVE CORD REPLACEMENT

Turn the gang condenser to the fully open position. Use a new 10X65 drive cord assembly or a piece of cord 48 inches long and tie one end to the tension spring. Hook the other end of the tension spring to the tab on the drive pulley. Pass the cord through the slot in the drive pulley rim around idler stud A and wind three and one-half turns clockwise around the tuning shaft (turns must progress away from chassis). Then pass cord over idler pulleys B and C. Wrap cord counterclockwise around drive pulley, stretch tension spring and fasten free end of cord to spring.



ALIGNMENT PROCEDURE

Volume Control—Maximum All Adjustments.

Connect Radio Chassis to Ground Post of Signal Generator with a Short Heavy Lead.

Allow Chassis and Signal Generator to "Heat Up" for several minutes.

The following equipment is required for aligning:

An All Wave Signal Generator which will provide an accurately calibrated signal at the test frequencies as listed.

Output Indicating Meter; Non-Metallic Screwdriver.

Dummy Antennas—.1 mf., 50 mmf., and 400-ohms:

	SIGNAL GENERATOR		Dummy Antenna	Band Switch Setting	CONDENSER SETTING	ADJUST TRIMMERS TO MAXIMUM
	Frequency Setting	Connection at Radio				
I-F	455 kc	6SA7, Pin 8	.1 mf	B Range	Turn Rotor to Full Open	2nd I-F (C-20) & (C-21) 1st I-F (C-15) & (C-16)
RANGE B	1620 kc	Antenna Lead	50 mmf	B Range	Turn Rotor to Full Open	Oscillator Range B (C9)
	1400 kc	Antenna Lead	50 mmf	B Range	Tune Rotor to Max. Output. Set Indicator to 1400 KC. See Note A	Antenna Range B (C3)
	600 kc	Antenna Lead	50 mmf	B Range	Tune Rotor to Max. Output	600 kc (C8) Rock Rotor—See Note B
Repeat above oscillator adjustments at 1620 and 600 KC until readjusting the oscillator Range B Trimmer (C9) causes no further improvement in output.						
RANGE D	18.3 mc	Antenna Lead	400 Ohm	D Range	Turn Rotor to Full Open	Oscillator Range D (C10)
	16 mc	Antenna Lead	400 Ohm	D Range	Tune Rotor to Max. Output	Antenna Range D (C2) Rock Rotor—See Note B
LOOP RANGE B	Reassemble chassis in cabinet.					
	1400 kc	Antenna Lead	50 mmf	B Range	Tune Rotor to Max. Output	Antenna Range B (C3)

After each range is completed, repeat the procedure as a final check.

NOTE A—If the pointer is not at 1400 KC on the dial, re-set pointer at the 1400 KC mark on the dial scale.

NOTE B—Turn the rotor back and forth and adjust the trimmer until the peak of greatest intensity is obtained.

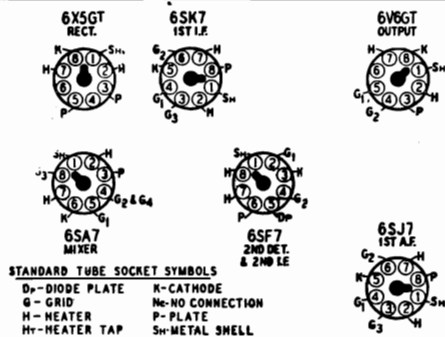
MONTGOMERY WARD

MODEL 84WG-2504D

Ref. No.	Part No.	Description	Qty. Used in Set
CAPACITORS			
C-2	17A164	5-50 mmf Trimmer	1
C-3	17A235	2-24 mmf Trimmer	1
C-6A } C-6B }	14A196	Gang Condenser with Drive Pulley	1
C-7	B66501	.0005 mf 200 V Tubular	1
C-8	17A155	350-430 mmf Trimmer	1
C-9 } C-10 }	17A109	2.5-35 mmf Dual Trimmer	1
C-12 } C-18 }	D66403	.04 mf 400 V Tubular	2
C-13	47X466	68 mmf Moulded	1
C-14	46X289	.00475 mf Tubular	1
C-15 } C-16 }	Part of T-2 (1st I-F Coil Assy.)		
C-19 } C-23 }	47X463	47 mmf Moulded	2
C-20 } C-21 }	Part of T-3 (2nd I-F Coil Assy.)		
C-22A } C-22B }	47X112	50-50 mmf Dual Mica	1
C-24	D64403	.04 mf 400 V Tubular	1
C-25	D66502	.005 mf 400 V Tubular	1
C-26	D67104	.10 mf 400 V Tubular	1
C-27	D64253	.025 mf 400 V Tubular	1
C-28	D66402	.004 mf 400 V Tubular	1
C-29	D66103	.01 mf 400 V Tubular	1
C-30A } C-30B } C-30C }	45X346	40 mf 450 V } 3 Section 40 mf 450 V } Electrolytic 20 mf 25 V }	1
C-31	H66402	.004 mf 800 V Tubular	1
C-32	47X467	470 mmf Moulded	1
C-33	B66503	.05 mf 200 V Tubular	1

RESISTORS

		OHMS	WATTS	
R-1 } R-7 }	B85225	2.2 meg.	0.5	Carbon
R-2 } R-4 }	C84393	39 K	1.0	Carbon
R-3	B84393	39 K	0.5	Carbon
R-5	B84222	2200	0.5	Carbon
R-6	B85105	1 meg.	0.5	Carbon
R-8	B85473	47 K	0.5	Carbon
R-9	B84153	15 K	0.5	Carbon
R-10	36X358	500 K		Volume Control & Line Switch
R-11	B85106	10 meg.	0.5	Carbon
R-12 } R-16 }	B85474	470 K	0.5	Carbon
R-13	B84333	33 K	0.5	Carbon
R-14	B84823	82 K	0.5	Carbon
R-15	40X276	3.0 meg.		Tone Control & Radio Phono Switch
R-17	C84271	270	1.0	Carbon
R-19	D84182	1800	2.0	Carbon
R-20	B85100	10	0.5	Carbon



Ref. No.	Part No.	Description	Qty. Used in Set
TRANSFORMERS AND COILS			
T-1	9A1917	"D" Range Antenna Coil Assembly	1
T-2	9A1814	1st I-F Coil Assembly	1
T-3	9A1815	2nd I-F Coil Assembly	1
T-4	26A474	"B" Range Loop Antenna Assembly	1
T-5	9A1918	"B" & "D" Range Oscillator Coil Assembly	1
T-6	53X282	117 Volt, 60 Cycle, Standard Power Transformer	1
T-7	51X134	Output Transformer	1

DIAL AND DRIVE ASSEMBLY

S-58X13	Dial Bracket Assembly (including Dial Bracket, Idler Pulley, Rivets, and Dial Glass)	1
6X21	Rubber Grommet	Mtg. Gang 3
20X329	Cond. Cushion Stud	Cond. 3
26X485	Drive Shaft	1
19X192	"C" Washer (For Drive Shaft)	2
15X241	Pointer	1
28X113	Drive Cord Tension Spring	1
10X65	Drive Cord Assembly	1
7A199	Pilot Light Socket Assembly	1
7A103	No. 47 Pilot Light Bulb	2
58X696	Dial Glass	1
4X999	Escutcheon	1

MISCELLANEOUS

12A476	10" P.M. Speaker	1
3A303	Tube Socket—Octal (8 prong) moulded	6
3A304	Phono Motor Socket	1
3A305	Phono Socket—Single Pin Tip	1
2A372	Band Change Switch	1
13X328	Line Cord and Plug Assembly	1
10A651	Knob (Tuning)	1
10A652	Knob (Off-On Volume)	1
10A653	Knob (SW-BC)	1
10A650	Knob (Tone—R.P.)	1

TUBE SOCKET VOLTAGES

Socket voltages are shown on the schematic diagram at the tube socket terminals. All voltages are between the socket terminal and chassis ground.

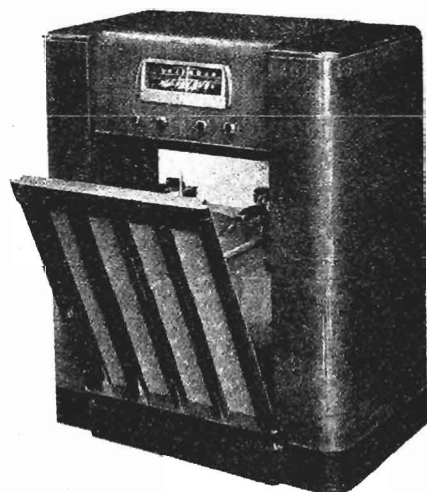
The readings were taken with a 1000 ohm per volt meter and all plate and screen voltages read on a 500 volt scale. Conditions of measurement are:

Line voltage	117 volts AC
Volume control	maximum
Signal input	none

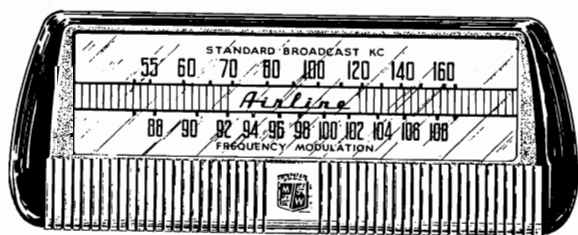
A variation of $\pm 10\%$ is usually permissible.

MODELS 84WG-2714A,
-B, -C, -D, -E

MONTGOMERY WARD



84WG-2714A, B



AB5-2329

Tube and Dial Lamp Complement

84WG-2714A, B

- 1 6BE6 FM-AM Converter
- 1 6BA6 1st I-F Amplifier
- 1 6BA6 2nd I-F Amplifier
- 1 6AL5 FM Discriminator
- 1 6AT6 Audio Amplifier, AM 2nd Detector and AVC
- 1 6V6GT Audio Output
- 1 5Y3GT Rectifier
- 2 No. 47 Dial Lamps

ELECTRICAL SPECIFICATIONS

- Power Supply.....105-125 volts AC 60 cycles, 60 watts, 80 watts with record changer
- Frequency Ranges.....Broadcast 540-1600 KC
Frequency Modulation 88-108 MC
- Intermediate Frequency...AM-455KC
FM-10.7 MC
- Selectivity.....AM-50 KC broad at 1000 times signal, measured at 1000 KC
I.F. FM-200 KC broad at 2 times down
I.F. FM-800 KC broad at 200 times down
- AM Sensitivity.....(For .5 watt output with external antenna) 20 microvolts average
- FM Sensitivity.....(For .5 watt output) 200 microvolts average
- Power Output.....4.5 watts maximum
2.5 watts 10% distortion
- Loud Speaker.....10" PM Dynamic
- Voice Coil Impedance.....3.2 ohms 400 cycles

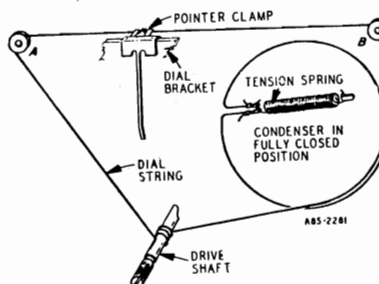
Tube and Dial Lamp Complement

- 1 6BE6 FM-AM Converter
- 1 6BA6 1st I-F Amplifier
- 1 6BA6 2nd I-F Amplifier
- 1 6AL5 FM Discriminator
- 1 6AV6 Audio Amplifier, AM 2nd Detector and AVC
- 1 6V6GT Audio Output
- 1 5Y3GT Rectifier
- 2 No. 47 Dial Lamps

DRIVE CORD REPLACEMENT

DIAL POINTER CORD

Use a new 10X66 drive cord assembly or a new length of cord 46 inches long for the installation. Install the cord as shown in the illustration, winding three turns clockwise around the drive shaft with the turns progressing away from the chassis. After completing the installation rotate the drive shaft a few turns to take up the slack in the cord.



MONTGOMERY WARD

MODELS 84WG-2714A,
-B, -C, -D, -ERECEIVER STAGE SENSITIVITIES
AM AND AUDIO STAGES

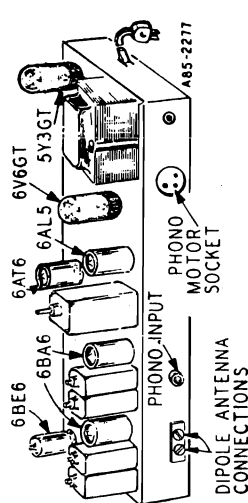
The table below lists the sensitivity at the input of each stage. The receiver should be tuned to 1000 KC for all readings. All measurements are based on an output of .5 watt. This may be measured by disconnecting the speaker voice coil and substituting a 3.2 ohm, 5 watt resistor across the secondary winding of the output transformer. A reading of 1.26 volts across this resistor will be equivalent to a .5 watt output.

The volume control must be set to maximum.

The signal source must be an accurately calibrated signal generator capable of supplying both 1000 KC and 455 KC signals modulated 30% with a 400 cycle audio signal. Variations in sensitivity of Plus or Minus 25% are usually permissible.

84WG-2714A, B SIGNAL GENERATOR

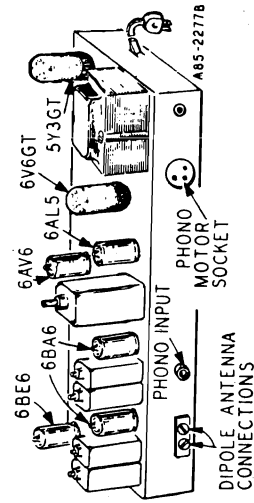
FREQUENCY	COUPLING CAPACITOR	CONNECTION TO RECEIVER	GROUND CONNECTION	INPUT FOR .5 WATT OUTPUT
1000 KC	200 mmf or RMA Dummy Antenna	External Antenna Lead	Chassis	25 Microvolts
1000 KC	.05 mf	6BE6 Converter Pin 7	Chassis	60 Microvolts
455 KC	.05 mf	6BE6 Converter Pin 7	Chassis	58 Microvolts
455 KC	.05 mf	6BA6 1st I-F Pin 1	Chassis	2400 Microvolts
400 cycles	.05 mf	6AT6 1st A-F Pin 1	Chassis	.07 Volt
400 cycles	.05 mf	6V6GT Output Pin 5	Chassis	3.2 Volts



84WG-2714A, B

84WG-2714C, D, E SIGNAL GENERATOR

FREQUENCY	COUPLING CAPACITOR	CONNECTION TO RECEIVER	GROUND CONNECTION	INPUT FOR .5 WATT OUTPUT
1000 KC	200 mmf or RMA Dummy Antenna	External Antenna Lead	Chassis	25 Microvolts
1000 KC	.05 mf	6BE6 Converter Pin 7	Chassis	60 Microvolts
455 KC	.05 mf	6BE6 Converter Pin 7	Chassis	58 Microvolts
455 KC	.05 mf	6BA6 1st I-F Pin 1	Chassis	2400 Microvolts
400 cycles	.05 mf	6AV6 1st A-F Pin 1	Chassis	.07 Volt
400 cycles	.05 mf	6V6GT Output Pin 5	Chassis	3.2 Volts



84WG-2714C, D, E

FM STAGES

The tables below lists the sensitivity for the FM stages of the receiver. The receiver must be tuned to 98 MC for all readings. Measurements are based on a .5 watt output the same as for the AM and Audio stage measurements.

The signal source must be an accurately calibrated signal generator capable of supplying a 98 MC signal modulated by a 400 cycle audio signal. For these measurements the generator must be adjusted for a 22.5 KC deviation. This will correspond to 30% AM modulation.

84WG-2714A, B, C, D, E SIGNAL GENERATOR

FREQUENCY	COUPLING TO RECEIVER	CONNECTION TO RECEIVER	GROUND CONNECTION	INPUT FOR .5 WATT OUTPUT
98 MC	300 ohms	External Antenna Lead	Chassis	200 Microvolts
10.7 MC	.01 mf	6BA6 1st I-F Pin 1	Chassis	1,000 Microvolts
10.7 MC	.01 mf	6BA6 2nd I-F Pin 1	Chassis	40,000 Microvolts

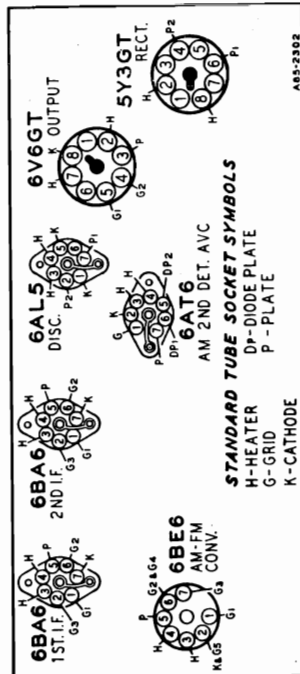
MODELS 84WG-2714A,
-B, -C, -D, -E

MONTGOMERY WARD

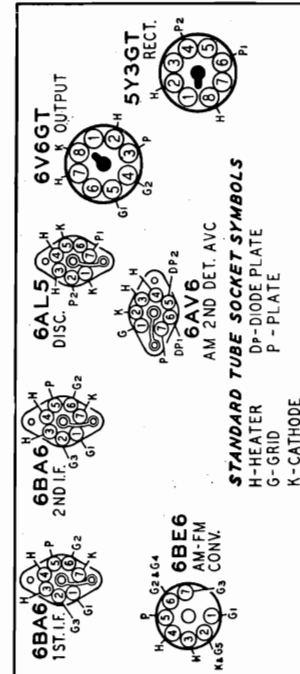
TUBE SOCKET VOLTAGES

Socket voltages are shown on the schematic diagram at the tube socket terminals. All voltages are between the socket terminal and chassis ground. Plate, screen and cathode voltages were taken with a 1000 ohm-per-volt meter with a 300 volt scale used for plate and screen voltages. Audio grid voltages were read with a vacuum tube volt-meter. Conditions of measurement are:

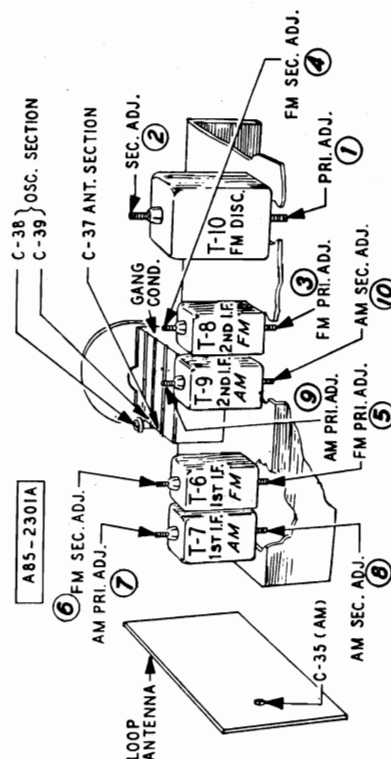
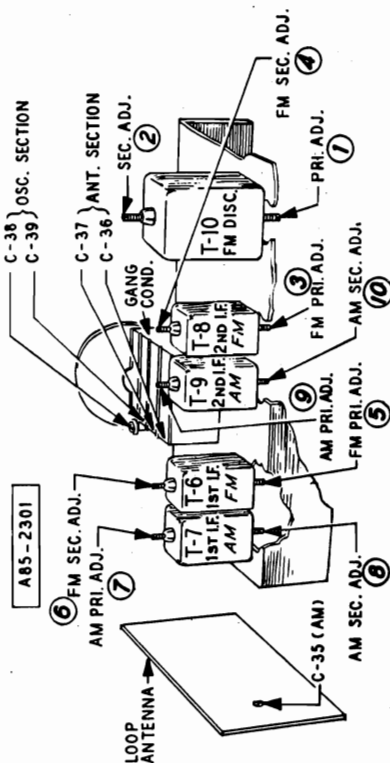
Line voltage.....117 Volts AC
Signal Input.....None
A variation of $\pm 10\%$ is usually permissible.



84WG-2714A, B



84WG-2714C, D, E



MONTGOMERY WARD

MODELS 84WG-2714A,
-B, -C, -D, -E**ALIGNMENT PROCEDURES**
AM STAGES

The following is required for aligning:

An All Wave Signal Generator Which Will Provide an Accurately
Calibrated Signal at the Test Frequencies as Listed.Output Indicating Meter, Non-Metallic Screwdriver, Dummy Antennas
— .1 mf, and 50mmf.

Volume Control Maximum all Adjustments.

Connect Radio Chassis to Ground Post of Signal Generator with a
Short Heavy Lead.Allow Chassis and Signal Generator to "Heat Up" for Several
Minutes.

SIGNAL GENERATOR				GANG CONDENSER SETTING	ADJUST	ADJUST FOR
FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO	THROUGH DUMMY ANTENNA	CONNECT GROUND TO			
455 KC	Control Grid 1st 6BA6 Pin No. 1	.1 mf	Chassis Base	Rotor Fully Open	2nd I.F. Pri. and Sec. (9) and (10)	Maximum Output
455 KC	Control Grid 6BE6 Pin No. 7 1st Det.	.1 mf	Chassis Base	Rotor Fully Open	1st I.F. Pri. and Sec. (7) and (8)	Maximum Output
1620 KC	Control Grid 6BE6 Pin No. 7	.1 mf	Chassis Base	Rotor Fully Open	Oscillator C-39	Maximum Output
1400 KC	External Antenna Lead	50 mmf	Chassis Base	Turn Rotor to Max. Output. Set Pointer to 1400 KC See Note A	Antenna C-35	Maximum Output

NOTE A—If the pointer is not at 1400 KC on the dial, reset pointer to the 1400 KC mark on the dial scale.

FM STAGES

The following is required for aligning:

An accurately calibrated signal generator providing unmodu-
lated signals at the test frequencies listed below.

Non-metallic screwdriver.

Dummy Antennas and I-F Loading Resistor — .01 mf, 300 ohms
and 100K ohmsZero center scale DC vacuum tube voltmeter having a range of
approximately 3 volts.(If a zero center scale meter is not available, a standard scale
vacuum tube voltmeter may be used by reversing the meter connec-
tions for negative readings).

Allow chassis and signal generator to "Heat Up" for several minutes.

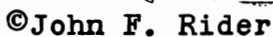
SIGNAL GENERATOR			THROUGH DUMMY ANTENNA	BAND SWITCH SETTING	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
	FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO					
Discriminator	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	Disc. Pri. (1) Note A	Maximum Deflection
	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	Disc. Sec. (2) Note B	
	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	Disc. Pri. (1) Note A	Maximum Deflection
	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	Disc. Sec. (2) Note B	
I-F	10.7 MC	6BA6 1st I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	2nd I-F Pri. (3) 2nd I-F Sec. (4) Note C	Maximum Deflection
	10.7 MC	Unsolder lead from Pin 7 to band switch. Insert 100K ohm resistor between Pin 7 and Ground and feed signal into Pin 7 of 6BE6	.01 mf	FM	Rotor Fully Open	1st I-F Pri. (5) Note C	Maximum Deflection
	10.7 MC	Same as above	.01 mf	FM	Rotor Fully Open	1st I-F Sec. (6) Note C	Maximum Deflection

RECHECK I-F ADJUSTMENTS IN ORDER GIVEN

Ant. and Osc.	108.5 Note D	Disconnect dipole and con- nect generator to dipole ter- minals with a 300 ohm resis- tor in series	300 ohms	FM	Rotor Fully Open	Osc. C-38	Maximum Deflection
	104.5	Same as above	300 ohms	FM	Tune rotor for max. AVC voltage	Ant. C-37	Maximum Deflection

RECHECK ANTENNA & OSC. ADJUSTMENTS IN ORDER GIVEN**FM ALIGNMENT NOTES**NOTE A—The zero center scale DC vacuum tube voltmeter is to be
connected between chassis ground and the A.V.C. line at
the 27 K. ohm resistor (R-11) and its junction with terminal
strip. A signal of .1 volt must be fed into the receiver for
this adjustment.Note output voltage on the zero center DC vacuum tube
voltmeter.NOTE B—Disconnect zero center DC vacuum tube voltmeter from
A.V.C. and connect it at the audio takeoff point at the 1megohm resistor (R-14) and its junction with the terminal
strip. Adjust for zero voltage indication.NOTE C—Connect zero center DC vacuum tube voltmeter as in Note
A. Adjust input to give same output on the zero center DC
vacuum tube voltmeter as in Note A.NOTE D—Remove the 100 K. ohm load resistor and solder the lead
from pin 7 of 6BE6 tube to the band switch before attempt-
ing to check the antenna and oscillator adjustments.

MODELS 84WG-2714A,
84WG-2714B

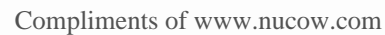


RECORD CHANGER: V-M Model 800, RCD, CH. 17-1

Registered Trademark

MONTGOMERY WARD

MODEL 84WG-2714A

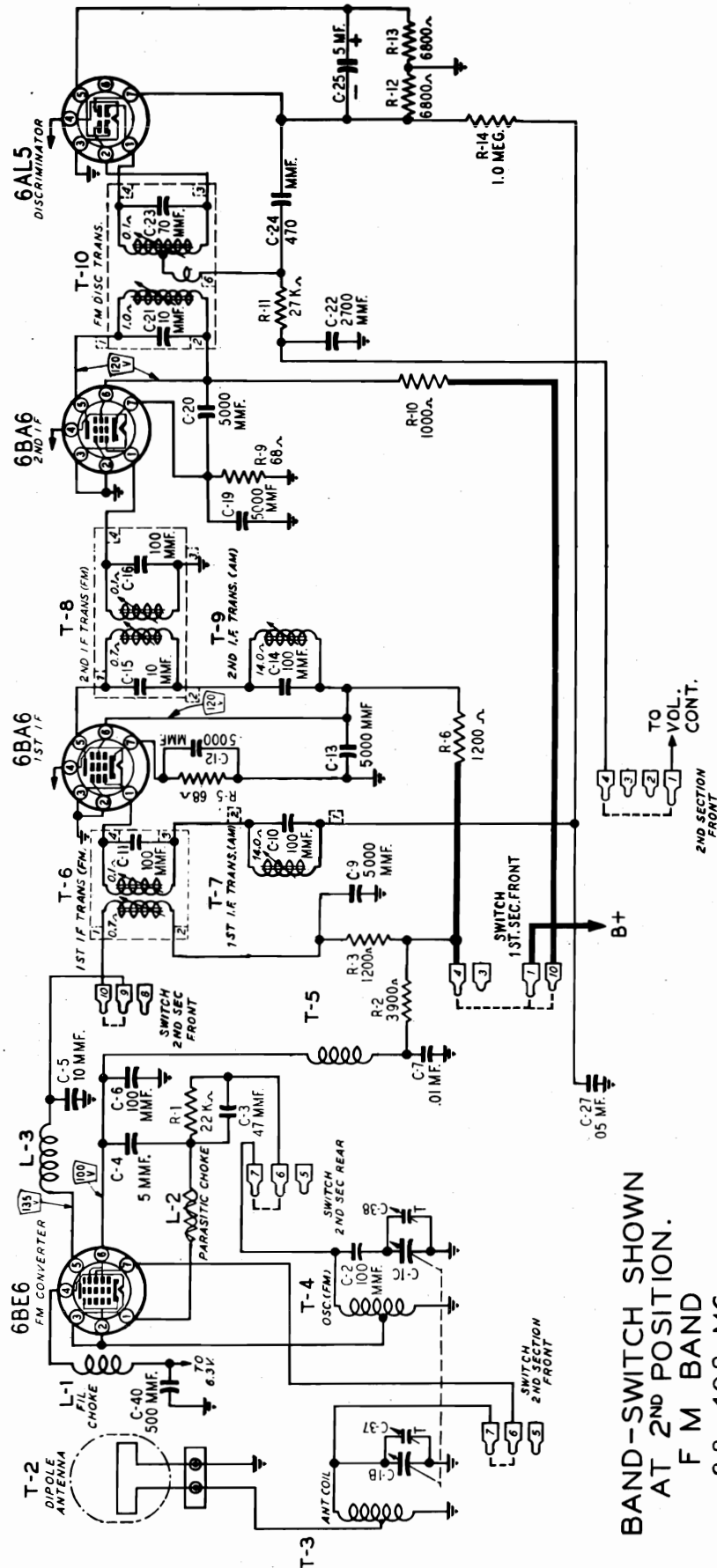


CLARI-SKEMATIX

Registered Trademark

MODEL 84WG-2714A

MONTGOMERY WARD

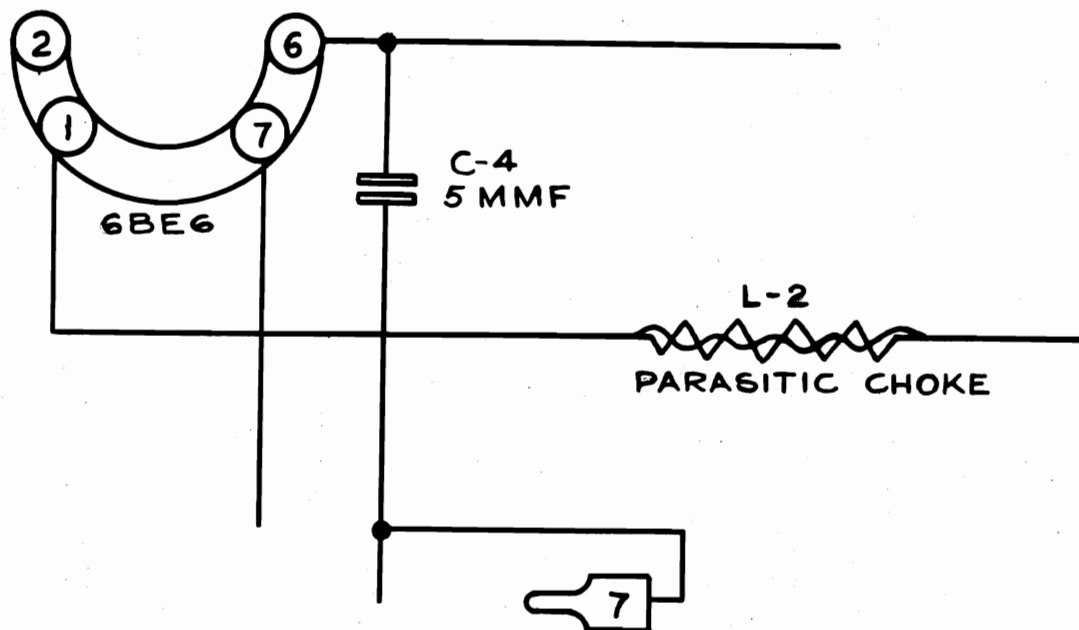


- (1) The part number and description of C-6 has been changed. The new description follows:

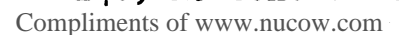
C-6 47X463 47 MMF Molded 1 used

- (2) Miniature tube shields (shown in the tube layout drawing and listed in the replacement parts list) are not used.

- (3) The circuit connection of the 5 MMF capacitor C-4 has been changed. The new circuit connection is shown in the partial schematic below:







Information applicable to Model "E" receivers is the same as Model "D" and this Supplement.

1. The part number and description of condenser C-6 has been changed and should read as follows:

C-6 47X476 100 mmf Molded Mica 1

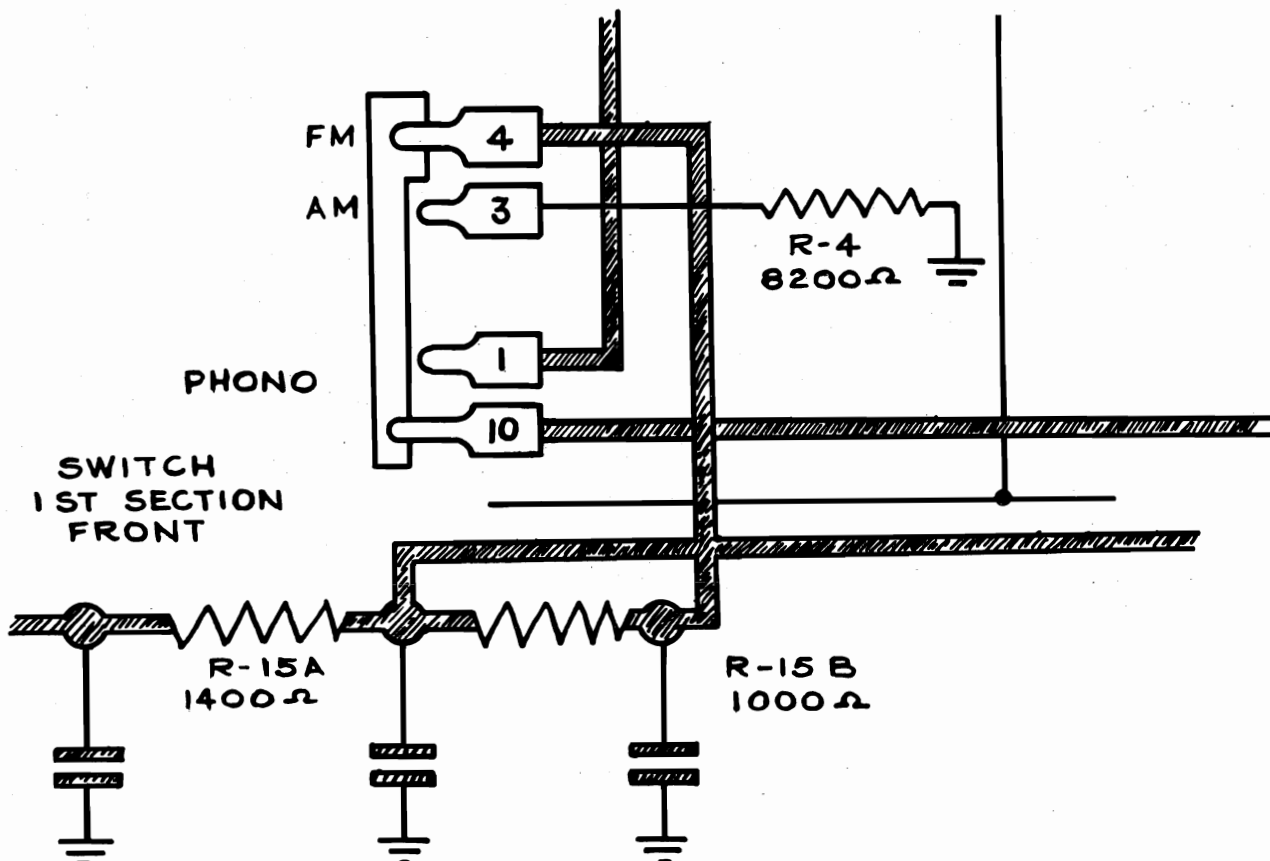
2. A 3.6 ohm resistor has been added in series with the hot side of the heater of the 6AL5 discriminator.

The part number and description is as follows:

R-25 43X233 3.6 ohm 0.5 W Wirewound 1

3. Schematic diagram change.

The wires on lugs 1 and 4 of "SWITCH 1st SEC. FRONT" have been interchanged. This change is shown on the partial schematic below.



MONTGOMERY WARD

MODELS 84WG-2714A,
-B, -C, -D, -E

Ref. No.	Part No.	Description	Qty. Used in Set	Ref. No.	Part No.	Description	Qty. Used in Set
CAPACITORS							
C-2	47X511	100 mmf Ceramic	1	R-10	B84102	1000 0.5 Carbon	1
C-3	47X517	47 mmf Ceramic	1	R-11	B84273	27 K 0.5 Carbon	1
C-5	47X512	10 mmf Ceramic	1	R-14	B85105	1 meg. 0.5 Carbon	1
C-7	D66103	.01 mf 400 V Tubular	1	R-15A } R-15B }	43X224	1400 6.0 1000 4.0	Wire Wound 1
C-8 } C-10 }	Part of T-7 (1st I.F. Trans.—AM).....			R-16 } R-21 } R-23 }	B85474	470 K 0.5 Carbon	3
C-11	Part of T-6 (1st I.F. Trans.—FM).....			R-17	B84153	15 K 0.5 Carbon	1
C-9 } C-12 } C-13 } C-19 } C-20 }	47X507	5000 mmf Silvered Ceramic	5	R-18	36X372	.5 meg. Volume control and switch	1
C-14 } C-17 }	Part of T-9 (2nd I.F. Trans.—AM)....			R-19	B85106	10 meg. 0.5 Carbon	1
C-15 } C-16 }	Part of T-8 (2nd I.F. Trans.—FM)....			R-20	40X285	3 meg. Tone Control	1
C-18A } C-18B }	50-50 mmf (Part of 76X1 Resistor-Capacitor Combination)			R-24	B84271	270 0.5 Carbon	1
C-21 } C-23 }	Part of T-10 (Discriminator Trans.)....			TRANSFORMERS AND COILS			
C-22	47X492	2700 mmf Molded Mica	1	L-1 } L-3 }	9A1882	Filament Choke	2
C-24	47X510	470 mmf Silvered Mica	1	L-2	9A1940	Parasitic Choke	1
C-25	45X361	5 mf 100 V Dry Electrolytic	1	T-3	9A1956	Antenna Coil Assembly	1
C-26A } C-26B } C-26C } C-26D }	45X359	40 mf 350 V } 40 mf 350 V } 20 mf 350 V } 20 mf 25 V }	1	T-4	9A1938	Oscillator Coil (FM)	1
C-27	B66503	.05 mf 200 V Tubular	1	T-5	9A1929	Oscillator Coil Assembly (AM)	1
C-28	47X471	68 mmf Molded Mica	1	T-6	9A1932	1st I.F. Transformer (FM)	1
C-29	B66403	.04 mf 200 V Tubular	1	T-7	9A1934	1st I.F. Transformer (AM)	1
C-30	D66502	.005 mf 400 V Tubular	1	T-9	9A1935	2nd I.F. Transformer (AM)	1
C-31	47X468	220 mmf Ceramic	1	T-11	53X290	Power Transformer	1
C-32	D66203	.02 mf 400 V Tubular	1	T-12	51X134	Output Transformer	1
C-33	B66402	.004 mf 200 V Tubular	1	MISCELLANEOUS			
C-34	H66102	.001 mf 800 V Tubular	1	76X1	Resistor-Capacitor Combination 1		
C-35	17A235	2-24 mmf Trimmer	1	12A480	10" P.M. Speaker..... 1		
C-40	47X508	500 mmf Ceramic	1	3A303	Tube Socket—Octal (8 prong) Molded 2		
RESISTORS				3A427	Tube Socket—Miniature (for AM-FM Converter Tube) 1		
		Ohms	Watts	3A304	Phono Motor Socket..... 1		
R-1	B84223	22 K	0.5 Carbon	3A305	Phono Socket—Single Pin Tip..... 1		
R-2	B83392	3900	0.5 Carbon	2A375	Band Change Switch..... 1		
R-3 } R-6 }	B84122	1200	0.5 Carbon	13X546	Line Cord and Plug Assembly..... 1		
R-4	D84822	8200	2.0 Carbon	10A651	Knob (Tuning) 1" Diameter..... 1		
R-5 } R-9 }	B83680	68	0.5 Carbon	10A652	Knob (Volume Control and Switch) 1" Diameter 1		
R-7	B85225	2.2 meg.	0.5 Carbon	10A654	Knob (Tone) 1" Diameter..... 1		
R-8	47 K	(Part of 76X1 Resistor-Capacitor Combination)		10A655	Knob (Phono BC-FM) 1" Diameter 1		
				4X999	Escutcheon 1		
				19X192	"C" Washer (Mtg. drive shaft)..... 2		
				6X21	Rubber Grommet (Mtg. gang cond.) 3		
				20X260	Condenser Cushion Stud (Mtg. gang condenser) 3		
				58X702	Dial background 1		

MODELS 84WG-2714A,
-B, -C, -D, -E

MONTGOMERY WARD

Ref. No.	Part No.	Description	Qty. Used in Set
----------	----------	-------------	---------------------

DIAL AND DRIVE ASSEMBLY

58X699	Dial Glass	1
24X446	Idler Pulley	2
15X241	Pointer	1
25X1569	Dial Bracket	1
7A103	No. 47 Pilot Light Bulb	2
7A202	Pilot Light Socket Assembly	1
26X486	Drive Shaft	1
41X26	Reflector, Dial Light	2
28X113	Drive Cord Tension Spring	1

84WG-2714A

C-6 47X518 100 mmf Ceramic 1

84WG-2714A, B

C-1A
C-1B
C-1C
C-1D

14A198 Gang Condenser & Pulley 1

C-4 47X513 5 mmf Ceramic 1

C-36 } Part of C-1 Gang Condenser
C-37 }

C-38 17A247 3-12 mmf Trimmer 1

T-2 9A1900 Di-Pole Antenna 1

3A312 Tube Socket—Miniature 4

10A644 Knob (Tuning) 1 1/8" Diameter 1

10A645 Knob (Volume Control and Switch)
1 1/8" Diameter 1

10A647 Knob (Tone) 1 1/8" Diameter 1

10A648 Knob (Phono—BC—FM) 1 1/8" Diam... 1

32X221 Tube Shield (miniature) 4

10X69 Drive Cord Assembly 1

TYPE V-28A139 RECORD CHANGER PARTS

V-961-B Motor Assembly, 60 cycles,
115-120 V. 1Shure P30-1 Crystal Cartridge and Semi-
Permanent Needle Assembly 1
Semi-Permanent Needle 1
(Specify part number and letters
stamped on crystal)

84WG-2714A, B, C

R-12 } B84682 6800 0.5 Carbon 2
R-13 }

T-1 26A478 "B" Range Loop Antenna Assembly 1

T-8 9A1933 2nd I.F. Transformer (FM) 1

T-10 9A1936 Discriminator Coil Assembly 1

Ref. No.	Part No.	Description	Qty. Used in Set
----------	----------	-------------	---------------------

84WG-2714B, C, D

C-6 47X463 47 mmf Ceramic 1

84WG-2714C

C-36 }
C-37 }
C-39 }

Part of C-1 Gang Condenser

84WG-2714C, D, E

C-1A }
C-1B }
C-1C }
C-1D }

14A204 Gang Condenser & Pulley 1

C-4 47X523 10 mmf Ceramic 1

C-38 26A489 1-8 mmf Trimmer 1

C-41 47X476 100 mmf Molded 1

C-42 47X521 6 mmf Ceramic 1

C-43 47X522 12 mmf Ceramic 1

L-4 9A1930 Line Choke 1

3A426 Tube Socket—Miniature 4

10X66 Drive Cord Assembly 1

TYPE W-28A148 RECORD CHANGER PARTS

W-15X090-1 Motor Assembly, 60 cycles,
115-120 V 1

W-17X412-11 50 Cycle Drive Sleeve Assembly 1

Shure P30-1 Crystal Cartridge and semi-
Permanent Needle Assembly 1
Semi-Permanent Needle 1
(Specify part numbers and letters
stamped on crystal)

84WG-2714D, E

C-37 }
C-39 }

Part of C-1 Gang Condenser

R-12 }
R-13 }

B84153 15 K 0.5 Carbon

L5 9A1967 Parasitic Choke 1

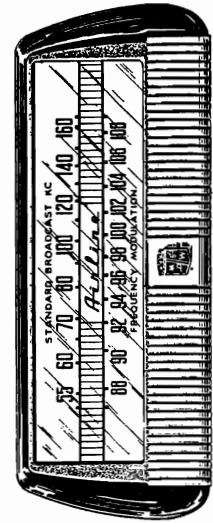
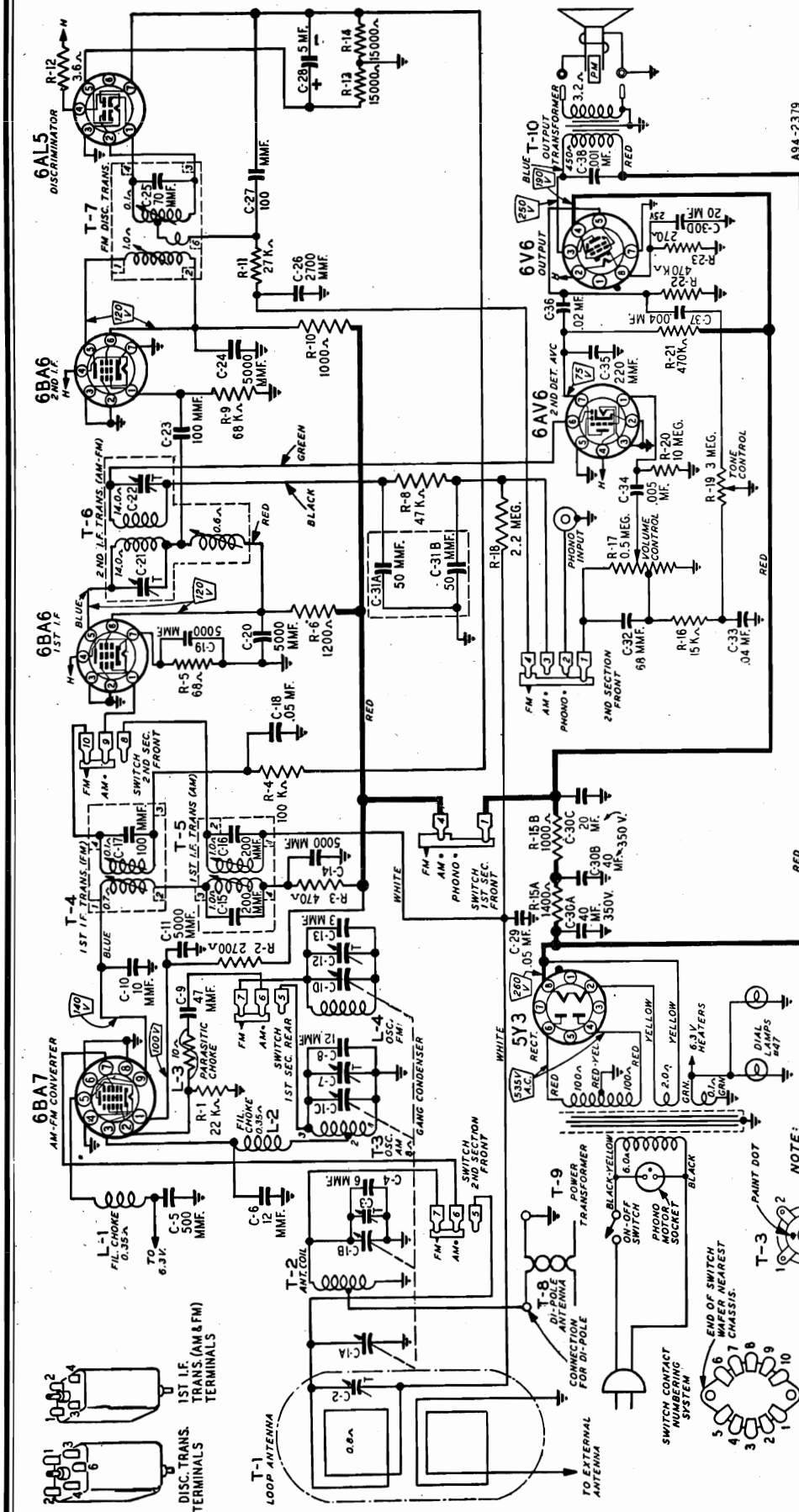
T-1 9A1972 "B" Range Loop Antenna Assembly 1

T-8 9A1933 2nd I.F. Transformer (FM) 1

T-10 9A1936 Discriminator Coil Assembly 1

MONTGOMERY WARD

MODEL 84WG-2714F



MODEL 84WG-2714F

MONTGOMERY WARD

ALIGNMENT PROCEDURES
AM STAGES

The following is required for aligning:

An All Wave Signal Generator Which Will Provide an Accurately Calibrated Signal at the Test Frequencies as Listed.

Output Indicating Meter, Non-Metallic Screwdriver, Dummy Antennas
— .1 mf, and 50mmf.

Volume Control Maximum all Adjustments.

Connect Radio Chassis to Ground Post of Signal Generator with a Short Heavy Lead.

Allow Chassis and Signal Generator to "Heat Up" for Several Minutes.

SIGNAL GENERATOR				GANG CONDENSER SETTING	ADJUST	ADJUST FOR
FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO	THROUGH DUMMY ANTENNA	CONNECT GROUND TO			
455 KC	Control Grid 1st 6BA6 Pin No. 1	.1 mf	Chassis Base	Rotor Fully Open	2nd I.F. C-21 and C-22	Maximum Output
455 KC	Control Grid 6BA7 Pin No. 7 1st Det.	.1 mf	Chassis Base	Rotor Fully Open	1st I.F. Pri. and Sec. (7) and (8)	Maximum Output
1620 KC	Control Grid 6BA7 Pin No. 7	.1 mf	Chassis Base	Rotor Fully Open	Oscillator C-7	Maximum Output
1400 KC	External Antenna Lead	50 mmf	Chassis Base	Turn Rotor to Max. Output. Set Pointer to 1400 KC See Note A	Antenna C-2	Maximum Output

NOTE A—If the pointer is not at 1400 KC on the dial, reset pointer to the 1400 KC mark on the dial scale.

FM STAGES

The following is required for aligning:

An accurately calibrated signal generator providing unmodulated signals at the test frequencies listed below.

Non-metallic screwdriver.

Dummy Antennas and I-F Loading Resistor—2500 mmf 300 ohms
and 100K ohms

Zero center scale DC vacuum tube voltmeter having a range of approximately 3 volts.

(If a zero center scale meter is not available, a standard scale vacuum tube voltmeter may be used by reversing the meter connections for negative readings).

Allow chassis and signal generator to "Heat Up" for several minutes.

SIGNAL GENERATOR			THROUGH DUMMY ANTENNA	BAND SWITCH SETTING	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
	FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO					
Discriminator	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Pri. (1) Note A	Maximum Deflection
	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Sec. (2) Note B	
	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Pri. (1) Note A	Maximum Deflection
	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Sec. (2) Note B	
I-F	10.7 MC Note E	6BA6 1st I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	2nd I-F (3) Note C	Maximum Deflection
	10.7 MC	Unsolder lead from Pin 7 to band switch. Insert 100K ohm resistor between Pin 7 and Ground and feed signal into Pin 7 of 6BA7.	2500 mmf	FM	Rotor Fully Open	1st I-F Pri. (5) Note C	Maximum Deflection
	10.7 MC	Same as above	2500 mmf	FM	Rotor Fully Open	1st I-F Sec. (6) Note C	Maximum Deflection

RECHECK I-F ADJUSTMENTS IN ORDER GIVEN

Ant. and Osc.	108.5 Note D	Disconnect built-in dipole antenna and connect generator to dipole terminals with resistor in series	300 ohms	FM	Rotor Fully Open	Osc. C-12	Maximum Deflection
	104.5	Same as above	300 ohms	FM	Tune rotor for max. AVC voltage	Ant. C-3	Maximum Deflection

RECHECK ANTENNA & OSC. ADJUSTMENTS IN ORDER GIVEN

FM ALIGNMENT NOTES

NOTE A—The zero center scale DC vacuum tube voltmeter is to be connected between chassis ground and the AVC line. A signal of .1 volt must be fed into the receiver for this adjustment.

Note output voltage on the zero center DC vacuum tube voltmeter

NOTE B—Disconnect zero center DC vacuum tube voltmeter from AVC and connect it at the audio takeoff point at the 27 K ohm resistor (R-11) and its junction with the terminal

strip. Adjust for zero voltage indication.

NOTE C—Connect zero center DC vacuum tube voltmeter as in Note A. Adjust input to give same output on the zero center DC vacuum tube voltmeter as in Note A.

NOTE D—Remove the 100 K. ohm load resistor and solder the lead from pin 7 of 6BA7 tube to the band switch before attempting to check the antenna and oscillator adjustments.

NOTE E—2nd I-F trimmers (AM) must be aligned before attempting to adjust 2nd I-F (FM) tuning slug.

MONTGOMERY WARD

MODEL 84WG-2714F

RECEIVER STAGE SENSITIVITIES AM AND AUDIO STAGES

The table below lists the sensitivity at the input of each stage. The receiver should be tuned to 1000 KC for all readings. All measurements are based on an output of .5 watt. This may be measured by disconnecting the speaker voice coil and substituting a 3.2 ohm, 5 watt resistor across the secondary winding of the output transformer. A reading of 1.26 volts across this resistor will be equivalent to a .5 watt output.

The volume control must be set to maximum.

The signal source must be an accurately calibrated signal generator capable of supplying both 1000 KC and 455 KC signals modulated 30% with a 400 cycle audio signal. Variations in sensitivity of Plus or Minus 25% are usually permissible.

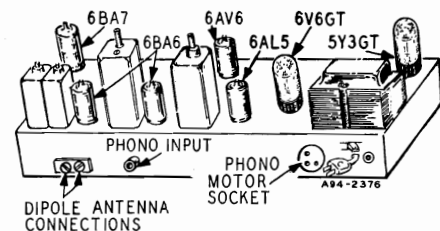
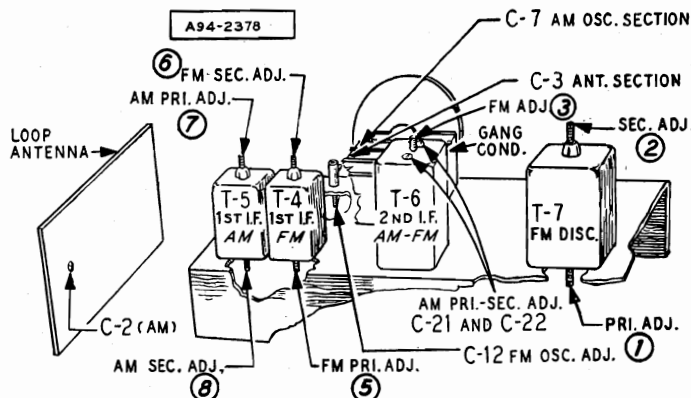
SIGNAL GENERATOR				INPUT FOR .5 WATT OUTPUT
FREQUENCY	COUPLING CAPACITOR	CONNECTION TO RECEIVER	GROUND CONNECTION	
1000 KC	200 mmf or RMA Dummy Antenna	External Antenna Lead	Chassis	10 Microvolts
1000 KC	.01 mf	6BA7 Converter Pin 7	Chassis	40 Microvolts
455 KC	.01 mf	6BA7 Converter Pin 7	Chassis	35 Microvolts
455 KC	.01 mf	6BA6 1st I-F Pin 1	Chassis	2000 Microvolts
400 cycles	.01 mf	6AV6 1st A-F Pin 1	Chassis	.07 Volt
400 cycles	.01 mf	6V6GT Output Pin 5	Chassis	3.2 Volts

FM STAGES

The table below lists the sensitivity for the FM stages of the receiver. The receiver must be tuned to 98 MC for all readings. Measurements are based on a .5 watt output the same as for the AM and Audio stage measurements.

The signal source must be an accurately calibrated signal generator capable of supplying a 98 MC signal modulated by a 400 cycle audio signal. For these measurements the generator must be adjusted for a 22.5 KC deviation. This will correspond to 30% AM modulation.

SIGNAL GENERATOR				INPUT FOR .5 WATT OUTPUT
FREQUENCY	COUPLING TO RECEIVER	CONNECTION TO RECEIVER	GROUND CONNECTION	
98 MC	300 ohms	External Antenna Terminal	Chassis	100 Microvolts
10.7 MC	.01 mf	6BA6 1st I-F Pin 1	Chassis	600 Microvolts
10.7 MC	2500 mmf	6BA6 2nd I-F Pin 1	Chassis	23,000 Microvolts

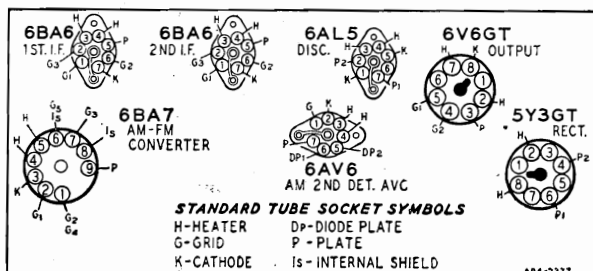


TUBE SOCKET VOLTAGES

Socket voltages are shown on the schematic diagram at the tube socket terminals. All voltages are between the socket terminal and chassis ground. Plate, screen and cathode voltages were taken with a 1000 ohm-per-volt meter with a 300 volt scale used for plate and screen voltages. Audio grid voltages were read with a vacuum tube volt-meter. Conditions of measurement are:

Line voltage.....117 Volts AC
Signal Input.....None

A variation of $\pm 10\%$ is usually permissible.



MODEL 84WG-2714F

MONTGOMERY WARD

Ref. No.	Part No.	Description	Qty. Used in Set
----------	----------	-------------	---------------------

CAPACITORS

C-1A } C-1B } C-1C } C-1D }	14A204	Gang Condenser Assembly	1
C-2	17A235	2-24 mmf Trimmer	1
C-3 } C-7 }	Part of Gang Condenser		
C-4	47X521	6 mmf Ceramic	1
C-5	47X508	500 mmf Ceramic	1
C-6 } C-8 }	47X522	12 mmf Ceramic	2
C-9	47X517	47 mmf Ceramic	1
C-10	47X512	10 mmf Ceramic	1
C-11 } C-14 } C-19 } C-20 } C-24 }	47X507	5000 mmf Silvered Ceramic	5
C-12	17A255	1-8 mmf Trimmer	1
C-13	47X547	3 mmf Ceramic	1
C-15 } C-16 }	Part of T-5 (1st I.F. Trans.—AM)		
C-17	Part of T-4 (1st I.F. Trans.—FM)		
C-18 } C-29 }	B66503	.05 mf 200 V Tubular	2
C-21 } C-22 }	Part of T-6 (2nd I.F. Trans.—AM-FM)		
C-23	47X497	100 mmf Ceramic	1
C-25	Part of T-7 (Discriminator Trans.)		
C-26	47X492	2700 mmf Molded Mica	1
C-27	47X526	100 mmf Molded Mica	1
C-28	45X361	5 mf 100 V Dry Electrolytic	1
C-30A } C-30B } C-30C } C-30D }	45X359	40 mf 350 V 40 mf 350 V 20 mf 350 V 20 mf 25 V Dry Electrolytic	1
C-31A } C-31B }	47X112	50-50 mmf Dual Mica	1
C-32	47X471	68 mmf Molded Mica	1
C-33	B66403	.04 mf 200 V Tubular	1
C-34	D66502	.005 mf 400 V Tubular	1
C-35	47X468	220 mmf Ceramic	1
C-36	D66203	.02 mf 400 V Tubular	1
C-37	B66402	.004 mf 200 V Tubular	1
C-38	H66102	.001 mf 800 V Tubular	1

Ref. No.	Part No.	Description	Qty. Used in Set
----------	----------	-------------	---------------------

RESISTORS

		Ohms	Watts	
R-1	B84223	22 K	0.5	Carbon..... 1
R-2	B83272	2700	0.5	Carbon..... 1
R-3	B84471	470	0.5	Carbon..... 1
R-4	B85104	100 K	0.5	Carbon..... 1
R-5	B83680	68	0.5	Carbon..... 1
R-6	B84122	1200	0.5	Carbon..... 1
R-8	B85473	47 K	0.5	Carbon..... 1
R-9	B85683	68 K	0.5	Carbon..... 1
R-10	B84102	1000	0.5	Carbon..... 1
R-11	B84273	27 K	0.5	Carbon..... 1
R-12	43X233	3.6	0.5	Wire Wound.... 1
R-13 } R-14 }	B84153	15 K	0.5	Carbon..... 2
R-15A } R-15B }	43X224	1400 1000	6.0 4.0	Wire Wound.... 1
R-16	B84153	15 K	0.5	Carbon..... 1
R-17	36X372	.5 meg.		Volume Control 1
R-18	B85225	2.2 meg.	0.5	Carbon..... 1
R-19	40X285	3 meg.		Tone Control 1
R-20	B85106	10 meg.	0.5	Carbon..... 1
R-21 } R-22 }	B85474	470 K	0.5	Carbon..... 2
R-23	B84271	270	0.5	Carbon..... 1

TRANSFORMERS AND COILS

L-1 } L-2 }	9A1882	Filament Choke Assembly	2
L-3	9A1940	Parasitic Choke Assembly	1
L-4	9A2021	Oscillator Coil Assembly (FM)	1
T-1	9A1972	"B" Range Loop Antenna Assem.	1
T-2	9A1956	Antenna Coil Assembly	1
T-3	9A1997	Oscillator Coil Assembly (AM)	1
T-4	9A1932	1st I.F. Trans. (FM)	1
T-5	9A1998	1st I.F. Trans. (AM)	1
T-6	9A1999	2nd I.F. Trans. (AM-FM)	1
T-7	9A1970	Discriminator Coil Assembly	1
T-8	9A2004	Dipole Antenna	1
T-9	53X290	Power Transformer	1
T-10	51X134	Output Transformer	1

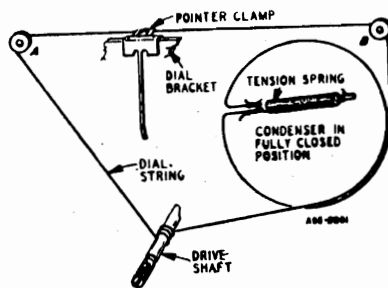
MONTGOMERY WARD

MODEL 84WG-2714F

ELECTRICAL SPECIFICATIONS

Power Supply.....	105-125 volts AC 60 cycles, 60 watts. 80 watts with record changer
Frequency Ranges.....	Broadcast 540-1600 KC Frequency Modulation 88-108 MC
Intermediate Frequency..	AM—455KC FM—10.7 MC
Selectivity.....	AM—45 KC broad at 1000 times signal, measured at 1000 KC I.F. FM—200 KC broad at 2 times down I.F. FM—950 KC broad at 200 times down
AM Sensitivity.....	(For .5 watt output with external antenna) 10 microvolts average
FM Sensitivity.....	(For .5 watt output) 100 microvolts average
Power Output.....	4.5 watts maximum 2.5 watts 10% distortion
Loud Speaker.....	10" PM Dynamic
Voice Coil Impedance.....	3.2 ohms 400 cycles
Record Changer	See Manual No. 5050A

Tube and Dial Lamp Complement	1 6BA7 FM-AM Converter
	1 6BA6 1st I-F Amplifier
	1 6BA6 2nd I-F Amplifier
	1 6AL5 FM Discriminator
	1 6AV6 Audio Amplifier, AM 2nd Detector and AVC
	1 6V6GT Audio Output
	1 5Y6GT Rectifier
	2 No. 47 Dial Lamps



DRIVE CORD REPLACEMENT

DIAL POINTER CORD

Use a new 10X66 drive cord assembly or a new length of cord 46 inches long for the installation. Install the cord as shown in the illustration, winding three turns clockwise around the drive shaft with the turns progressing away from the chassis. After completing the installation rotate the drive shaft a few turns to take up the slack in the cord.

Ref. No.	Part No.	Description	Qty. Used in Set
----------	----------	-------------	------------------

MISCELLANEOUS

12A480	10" P.M. Speaker	1
3A303	Tube Socket—Octal (8 prong) Molded	2
3A426	Tube Socket—Miniature	4
3A443	Tube Socket—Miniature (for AM- M Converter Tube)	1
3A304	Phono Motor Socket	1
3A305	Phono Socket—Single Pin Tip.....	1
2A384	Band Change Switch	1
13X546	Line Cord and Plug Assembly.....	1
10A651	Knob (Tuning)	1
10A652	Knob (Volume Control & Switch) 1	
10A654	Knob (Tone)	1
10A655	Knob (Phono—BC—FM)	1
4X999	Escutcheon	1

Ref. No.	Part No.	Description	Qty. Used in Set
----------	----------	-------------	------------------

DIAL AND DRIVE ASSEMBLY

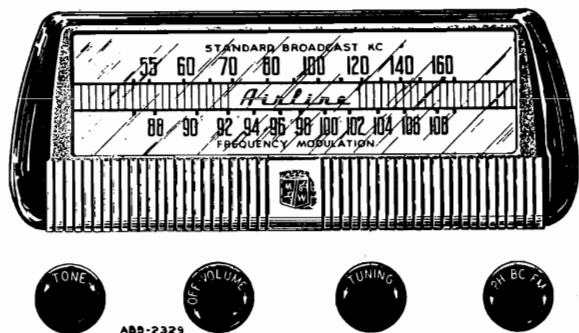
58X715	Dial Glass	1
24X446	Idler Pulley	2
15X241	Pointer	1
25X1569	Dial Bracket	1
7A103	No. 47 Pilot Light Bulb	2
7A202	Pilot Light Socket Assembly.....	1
26X486	Drive Shaft	1
41X26	Reflector, Dial Light	2
28X113	Drive Cord Tension Spring.....	1
10X66	Drive Cord Assembly	1
19X192	"C" Wa. her (Mtg. drive shaf.).....	2
6X21	Rubber Grommet (Mtg. gang cond.)	3
20X260	Condenser Cushion Stud (Mtg. gang condenser)	3

TYPE V-28A139 RECORD CHANGER PARTS

V-961-B	Motor Assembly, 60 cycles, 115-120 V....	1
Shure P30-1	Crystal Cartridge and Semi-Permanent Needle Assembly	1
	Semi-Permanent Needle	1
(Specify part number and letters stamped on crystal)		

MODEL 84WG-2714G

MONTGOMERY WARD



GENERAL DESCRIPTION

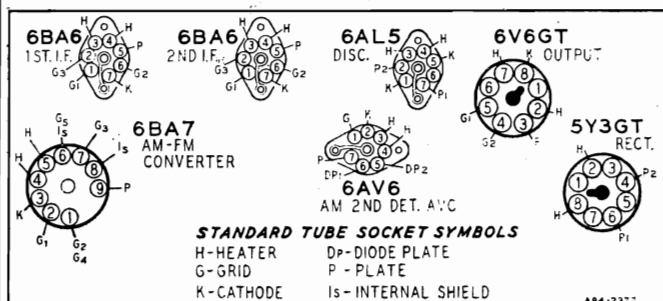
This is a two band, six tube (plus rectifier tube) receiver with automatic record changer for the reception of both AM and FM stations. The I-F stages use the latest type high gain miniature type tubes and built-in Air Wave Aerials are provided for the FM and Broadcast bands. Features include, compensator circuits to prevent oscillator drift, automatic volume control, beam power output stage, PM dynamic loud speaker and an electrostatic shield in the power transformer to reduce power line noise.

The receiver and record changer are housed in a console combination cabinet with controls provided for tuning, volume, tone and band or phono selection.

DRIVE CORD REPLACEMENT

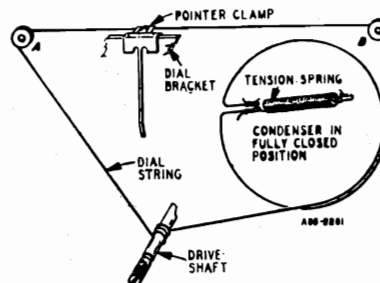
DIAL POINTER CORD

Use a new 10X66 drive cord assembly or a new length of cord 46 inches long for the installation. Install the cord as shown in the illustration, winding three turns clockwise around the drive shaft with the turns progressing away from the chassis. After completing the installation rotate the drive shaft a few turns to take up the slack in the cord.



ELECTRICAL SPECIFICATIONS

Power Supply.....	105-125 volts AC 60 cycles, 60 watts. 80 watts with record changer
Frequency Ranges.....	Broadcast 540-1600 KC Frequency Modulation 88-108 MC
Intermediate Frequency.....	AM-455KC FM-10.7 MC
Selectivity.....	AM-45 KC broad at 1000 times signal, measured at 1000 KC I.F. FM-200 KC broad at 2 times down I.F. FM-950 KC broad at 200 times down
AM Sensitivity.....	(For .5 watt output with external antenna) 10 microvolts average
FM Sensitivity.....	(For .5 watt output) 100 microvolts average
Power Output.....	4.5 watts maximum 2.5 watts 10% distortion
Loud Speaker.....	10" PM Dynamic
Voice Coil Impedance.....	3.2 ohms 400 cycles
Record Changer	See Manual No. 5050A
Tube and Dial Lamp Complement	1 6BA7 FM-AM Converter 1 6BA6 1st I-F Amplifier 1 6BA6 2nd I-F Amplifier 1 6AL5 FM Discriminator 1 6AV6 Audio Amplifier, AM 2nd Detector and AVC 1 6V6GT Audio Output 1 5Y3GT Rectifier 2 No. 47 Dial Lamps



TUBE SOCKET VOLTAGES

Socket voltages are shown on the schematic diagram at the tube socket terminals. All voltages are between the socket terminal and chassis ground. Plate, screen and cathode voltages were taken with a 1000 ohm-per-volt meter with a 300 volt scale used for plate and screen voltages. Audio grid voltages were read with a vacuum tube volt-meter. Conditions of measurement are:

Line Voltage.....	117 Volts AC
Signal Input.....	None

A variation of $\pm 10\%$ is usually permissible.

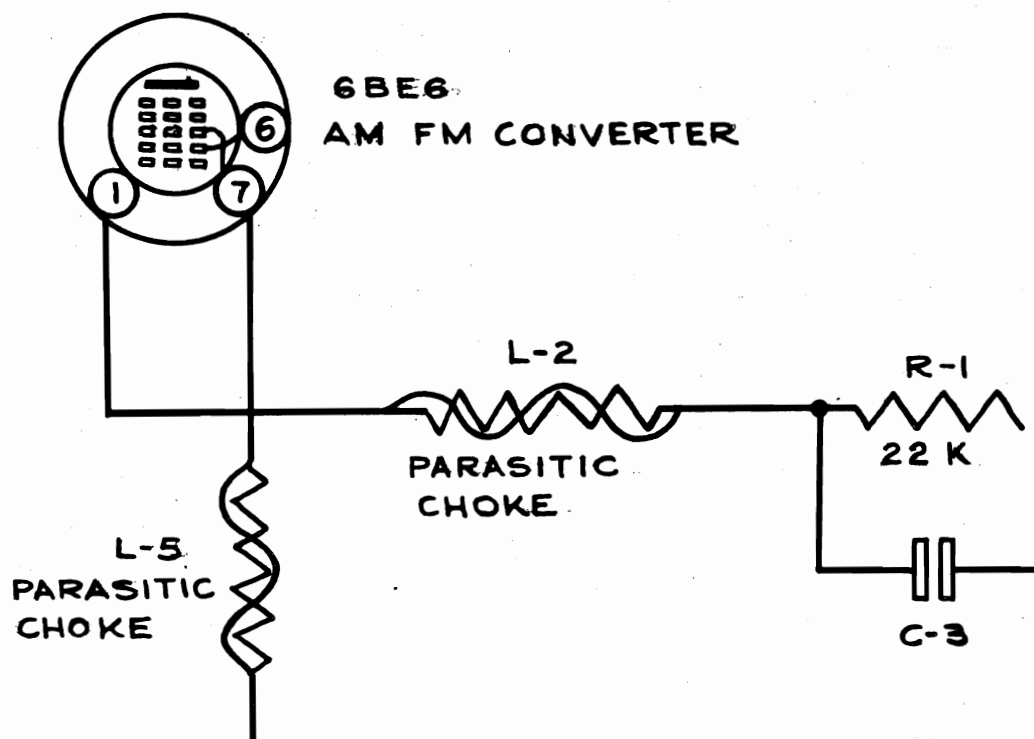


A choke has been added to the circuit to eliminate parasitic oscillation on the FM Band.

PARTS LIST ADDITION

<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>	<u>Qty. Used</u>
L-5	9A1967	Parasitic Choke	1

The circuit connection of L-5 is shown in the partial schematic below:



MONTGOMERY WARD

MODEL 84WG-2714G

ALIGNMENT PROCEDURES
AM STAGES

SIGNAL GENERATOR						
FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO	THROUGH DUMMY ANTENNA	CONNECT GROUND TO	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
455 KC	Control Grid 1st 6BA6 Pin No. 1	.1 mf	Chassis Base	Rotor Fully Open	2nd I.F. C-21 and C-22	Maximum Output
455 KC	Control Grid 6BA7 Pin No. 7 1st Det.	.1 mf	Chassis Base	Rotor Fully Open	1st I.F. Pri. and Sec. (7) and (8)	Maximum Output
1620 KC	Control Grid 6BA7 Pin No. 7	.1 mf	Chassis Base	Rotor Fully Open	Oscillator C-7	Maximum Output
1400 KC	External Antenna Lead	50 mmf	Chassis Base	Turn Rotor to Max. Output. Set Pointer to 1400 KC See Note A	Antenna C-2	Maximum Output

NOTE A—If the pointer is not at 1400 KC on the dial, reset pointer to the 1400 KC mark on the dial scale.

FM STAGES

The following is required for aligning:

An accurately calibrated signal generator providing unmodulated signals at the test frequencies listed below.

Non-metallic screwdriver.

Dummy Antennas and I-F Loading Resistor—2500 mmf, 300 ohms and a 3300 ohm .5 watt resistor with short leads.

Zero center scale DC vacuum tube voltmeter having a range of approximately 3 volts.

(If a zero center scale meter is not available, a standard scale vacuum tube voltmeter may be used by reversing the meter connections for negative readings).

Allow chassis and signal generator to "Heat Up" for several minutes.

SIGNAL GENERATOR							
	FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO	THROUGH DUMMY ANTENNA	BAND SWITCH SETTING	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
Discriminator	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Pri. (1) Note A	Maximum Deflection
	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Sec. (2) Note B	
	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Pri. (1) Note A	Maximum Deflection
	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Sec. (2) Note B	
I-F	10.7 MC Note E	6BA6 1st I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	2nd I-F (3) Note C	Maximum Deflection
Discriminator	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Pri. (1) Note A	Maximum Deflection
I-F	10.7 MC	Antenna and Chassis	2500 mmf	FM	Rotor Fully Open	1st. I-F Pri. and Sec. (5) and (6) Note C	Maximum Deflection
	10.7 MC	Antenna and Chassis Solder a 3300 ohm resistor across terminals 3 and 4 of 1st. I-F trans.	2500 mmf	FM	Rotor Fully Open	1st. I-F Pri. (5) Note C	Maximum Deflection
	10.7 MC	Antenna and Chassis Note D	2500 mmf	FM	Rotor Fully Open	1st. I-F Sec. (6) Note C	Maximum Deflection

RECHECK I-F ADJUSTMENTS IN ORDER GIVEN

Oscillator	108.4 Note F	Disconnect built-in dipole antenna and connect generator to dipole terminals with resistor in series	300 ohms	FM	Rotor Fully Open	Osc. C-12	Maximum Deflection
Antenna	104.5	Same as above	300 ohms	FM	Tune rotor for max. AVC voltage	Ant. C-3	Maximum Deflection

RECHECK ANTENNA & OSC. ADJUSTMENTS IN ORDER GIVEN

FM ALIGNMENT NOTES

NOTE A—The zero center scale DC vacuum tube voltmeter is to be connected between chassis ground and the AVC line. A signal of .1 volt must be fed into the receiver for this adjustment.

Note output voltage on the zero center DC vacuum tube voltmeter

NOTE B—Disconnect zero center DC vacuum tube voltmeter from AVC and connect it at the audio takeoff point at the 27 K ohm resistor (R-11) and its junction with the terminal strip. Adjust for zero voltage indication.

NOTE C—Connect zero center DC vacuum tube voltmeter as in Note A. Adjust input to give same output on the zero center DC vacuum tube voltmeter as in Note A.

NOTE D—Unsolder 3300 ohm resistor from terminals 3 and 4 of 1st I-F transformer and resolder across terminals 1 and 2.

NOTE E—2nd I-F trimmers (AM) must be aligned before attempting to adjust 2nd I-F (FM) tuning slug.

NOTE F—Remove the 3300 ohm load resistor before attempting to check the antenna and oscillator adjustments.

MODEL 84WG-2714G

MONTGOMERY WARD

RECEIVER STAGE SENSITIVITIES

AM AND AUDIO STAGES

The table below lists the sensitivity at the input of each stage. The receiver should be tuned to 1000 KC for all readings. All measurements are based on an output of .5 watt. This may be measured by disconnecting the speaker voice coil and substituting a 3.2 ohm, 5 watt resistor across the secondary winding of the output transformer. A reading of 1.26 volts across this resistor will be equivalent to a .5 watt output.

The volume control must be set to maximum.

The signal source must be an accurately calibrated signal generator capable of supplying both 1000 KC and 455 KC signals modulated 30% with a 400 cycle audio signal. Variations in sensitivity of Plus or Minus 25% are usually permissible.

SIGNAL GENERATOR

FREQUENCY	COUPLING CAPACITOR	CONNECTION TO RECEIVER	GROUND CONNECTION	INPUT FOR .5 WATT OUTPUT
1000 KC	200 mmf or RMA Dummy Antenna	External Antenna Lead	Chassis	10 Microvolts
1000 KC	.01 mf	6BA7 Converter Pin 7	Chassis	40 Microvolts
455 KC	.01 mf	6BA7 Converter Pin 7	Chassis	35 Microvolts
455 KC	.01 mf	6BA6 1st I-F Pin 1	Chassis	2000 Microvolts
400 cycles	.01 mf	6AV6 1st A-F Pin 1	Chassis	.07 Volt
400 cycles	.01 mf	6V6GT Output Pin 5	Chassis	3.2 Volts

FM STAGES

The table below lists the sensitivity for the FM stages of the receiver. The receiver must be tuned to 98 MC for all readings. Measurements are based on a .5 watt output the same as for the AM and Audio stage measurements.

The signal source must be an accurately calibrated signal generator capable of supplying a 98 MC signal modulated by a 400 cycle audio signal. For these measurements the generator must be adjusted for a 22.5 KC deviation. This will correspond to 30% AM modulation.

SIGNAL GENERATOR

FREQUENCY	COUPLING TO RECEIVER	CONNECTION TO RECEIVER	GROUND CONNECTION	INPUT FOR .5 WATT OUTPUT
98 MC	300 ohms	External Antenna Terminal	Chassis	100 Microvolts
10.7 MC	.01 mf	6BA6 1st I-F Pin 1	Chassis	600 Microvolts
10.7 MC	2500 mmf	6BA6 2nd I-F Pin 1	Chassis	23,000 Microvolts

Ref. No. Part No.

Description

Qty. Used
in Set

Ref. No. Part No.

Description

Qty. Used
in Set

DIAL AND DRIVE ASSEMBLY

58X715	Dial Glass	1
24X446	Idle Pulley	2
15X241	Pointer	1
25X1569	Dial Bracket	1
7A103	No. 47 Pilot Light Bulb	2
7A202	Pilot Light Socket Assembly.....	1
26X486	Drive Shaft	1
41X26	Reflector, Dial Light	2
28X113	Drive Cord Tension Spring.....	1
10X66	Drive Cord Assembly	1
19X192	"C" Washer (Mtg. drive shaft).....	2
6X21	Rubber Grommet (Mtg. gang cond.)	3
20X260	Condenser Cushion Stud (Mtg. gang condenser)	3

TYPE V-28A139 RECORD CHANGER PARTS

V-961-B	Motor Assembly, 60 cycles, 115-120 V....	1
Shure P30-1	Crystal Cartridge and Semi-Permanent Needle Assembly	1
	Semi-Permanent Needle	1
	(Specify part number and letters stamped on crystal)	

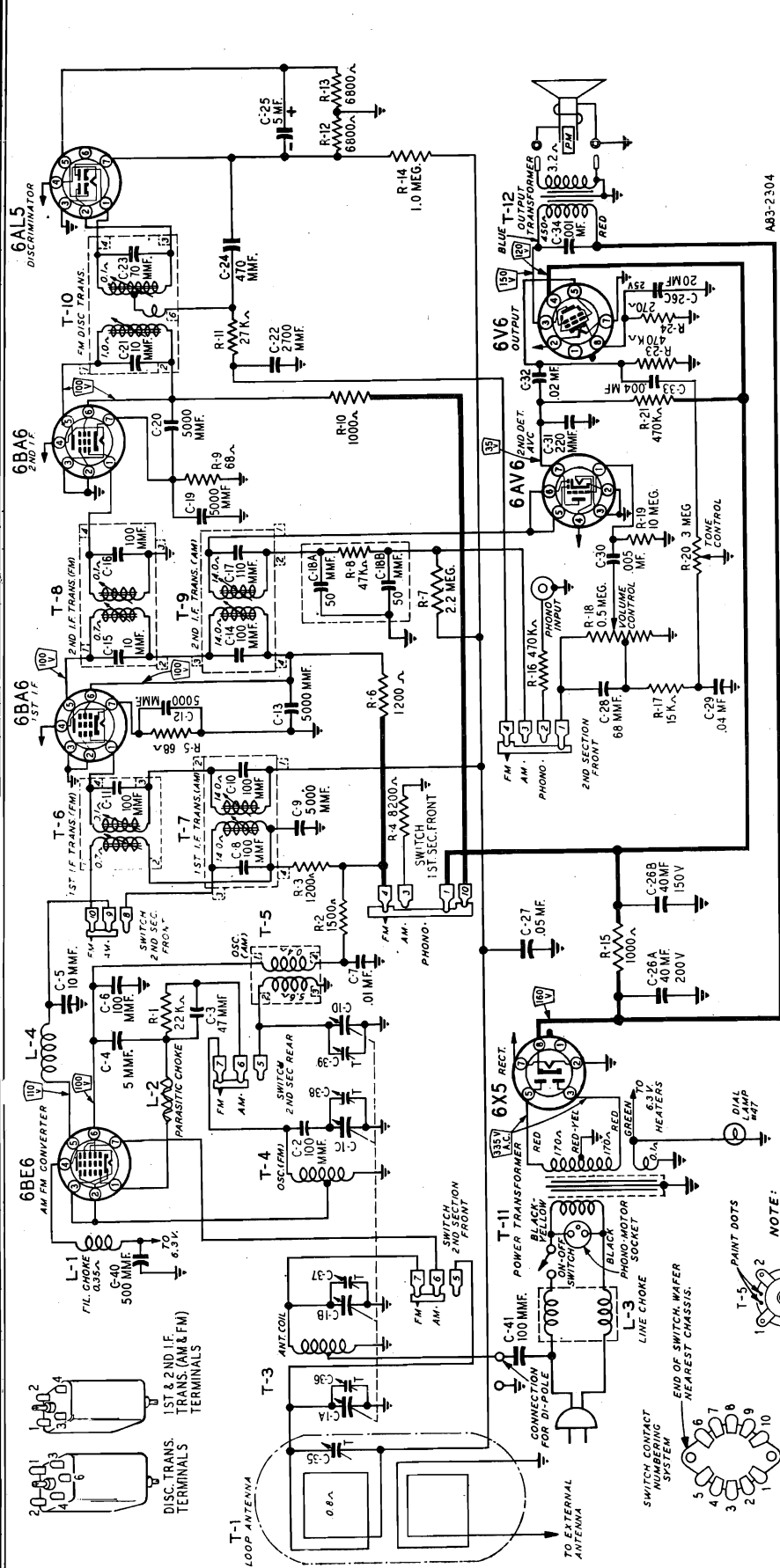
MISCELLANEOUS

12A480	10" P.M. Speaker	1
3A303	Tube Socket—Octal (8 prong) Molded	2
3A426	Tube Socket—Miniature	4
3A443	Tube Socket—Miniature (for AM-FM Converter Tube)	1
3A304	Phono Motor Socket	1
3A305	Phono Socket—Single Pin Tip.....	1
2A384	Band Change Switch	1
13X546	Line Cord and Plug Assembly.....	1
10A651	Knob (Tuning)	1
10A652	Knob (Volume Control & Switch) 1	
10A654	Knob (Tone)	1
10A655	Knob (Phono—BC—FM)	1
4X999	Escutcheon	1

MONTGOMERY WARD

MODEL 84WG-2714G

Ref. No.	Part No.	Description	Qty. Used in Set		Ref. No.	Part No.	Description	Qty. Used in Set
RESISTORS					CAPACITORS			
		Ohms	Watts					
R-1	B84223	22 K	0.5	Carbon..... 1	C-1A } C-1B } C-1C } C-1D }	14A204	Gang Condenser Assembly	1
R-2	B83272	2700	0.5	Carbon..... 1	C-2	17A235	2-24 mmf Trimmer.....	1
R-3	B84471	470	0.5	Carbon..... 1	C-3 } C-7 }	Part of Gang Condenser		
R-4	B85104	100 K	0.5	Carbon..... 1	C-4	47X521	6 mmf Ceramic.....	1
R-5	B83680	68	0.5	Carbon..... 1	C-5	47X508	500 mmf Ceramic.....	1
R-6	B84122	1200	0.5	Carbon..... 1	C-6 } C-8 }	47X522	12 mmf Ceramic.....	2
R-8	B85473	47 K	0.5	Carbon..... 1	C-9	47X517	47 mmf Ceramic.....	1
R-9	B85683	68 K	0.5	Carbon..... 1	C-10	47X512	10 mmf Ceramic.....	1
R-10	B84102	1000	0.5	Carbon..... 1	C-11 } C-14 } C-19 } C-20 } C-24 }	47X507	5000 mmf Silvered Ceramic	5
R-11	B84273	27 K	0.5	Carbon..... 1	C-12	17A255	1-8 mmf Trimmer.....	1
R-12	43X233	3.6	0.5	Wire Wound.... 1	C-13	47X547	3 mmf Ceramic.....	1
R-13 } R-14 }	B84103	10 K	0.5	Carbon..... 2	C-15 } C-16 }	Part of T-5 (1st I.F. Trans.—AM)		
R-15A } R-15B }	43X224	1400 1000	6.0 4.0	Wire Wound.... 1	C-17	Part of T-4 (1st I.F. Trans.—FM)		
R-16	B84153	15 K	0.5	Carbon..... 1	C-18 } C-29 }	B66503	.05 mf 200 V Tubular.....	2
R-17	36X372	.5 meg.		Volume Control 1	C-21 } C-22 }	Part of T-6 (2nd I.F. Trans.—AM-FM)		
R-18	B85225	2.2 meg.	0.5	Carbon..... 1	C-23	47X497	100 mmf Ceramic.....	1
R-19	40X285	3 meg.		Tone Control 1	C-25	Part of T-7 (Discriminator Trans.)		
R-20	B85106	10 meg.	0.5	Carbon..... 1	C-26	47X492	2700 mmf Molded Mica..	1
R-21 } R-22 }	B85474	470 K	0.5	Carbon..... 2	C-27	47X526	100 mmf Molded Mica..	1
R-23	B84271	270	0.5	Carbon..... 1	C-28	45X361	5 mf 100 V Dry Electrolytic	1
TRANSFORMERS AND COILS					C-30A } C-30B } C-30C } C-30D }	45X359	40 mf 350 V 40 mf 350 V 20 mf 350 V 20 mf 25 V Dry Electrolytic	1
L-1	9A1882	Filament Choke Assembly	1		C-31A } C-31B }	47X112	50-50 mmf Dual Mica.....	1
L-2	35A1	Insulated Choke	1		C-32	47X471	68 mmf Molded Mica.....	1
L-3	9A1940	Parasitic Choke Assembly	1		C-33	B66403	.04 mf 200 V Tubular.....	1
L-4	9A2021	Oscillator Coil Assembly (FM)	1		C-34	D66502	.005 mf 400 V Tubular.....	1
T-1	9A1972	"B" Range Loop Antenna Assem. 1			C-35	47X468	220 mmf Ceramic.....	1
T-2	9A1956	Antenna Coil Assembly.....	1		C-36	D66203	.02 mf 400 V Tubular.....	1
T-3	9A1997	Oscillator Coil Assembly (AM).....	1		C-37	B66402	.004 mf 200 V Tubular.....	1
T-4	9A1932	1st I.F. Trans. (FM)	1		C-38	H66102	.001 mf 800 V Tubular.....	1
T-5	9A1998	1st I.F. Trans. (AM)	1					
T-6	9A1999	2nd I.F. Trans. (AM-FM)	1					
T-7	9A1970	Discriminator Coil Assembly.....	1					
T-8	9A2004	Dipole Antenna	1					
T-9	53X290	Power Transformer	1					
T-10	51X134	Output Transformer	1					



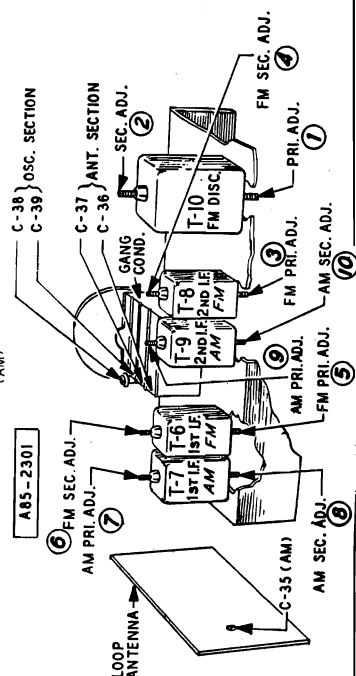
FM Sensitivity.....(For .5 watt output)
300 microvolts average

Power Output.....1.5 watts maximum
.7 watts 10% distortion

Loud Speaker.....5"x7" Oval PM Dynamic

Voice Coil Impedance.....3.2 ohms 400 cycles

Power Supply	105-125 volts AC 60 cycles, 35 watts, 55 watts with record changer
Frequency Ranges	Broadcast 540-1600 KC Frequency Modulation 88-108 MC
Intermediate Frequency	AM—455KC FM—10.7 MC
Selectivity	AM—60 KC broad at 1000 times signal, measured at 1000 KC I.F. FM—200 KC broad at 2 times down I.F. FM—800 KC broad at 200 times down
AM Sensitivity	(For .5 watt output with external antenna) 40 microvolts average



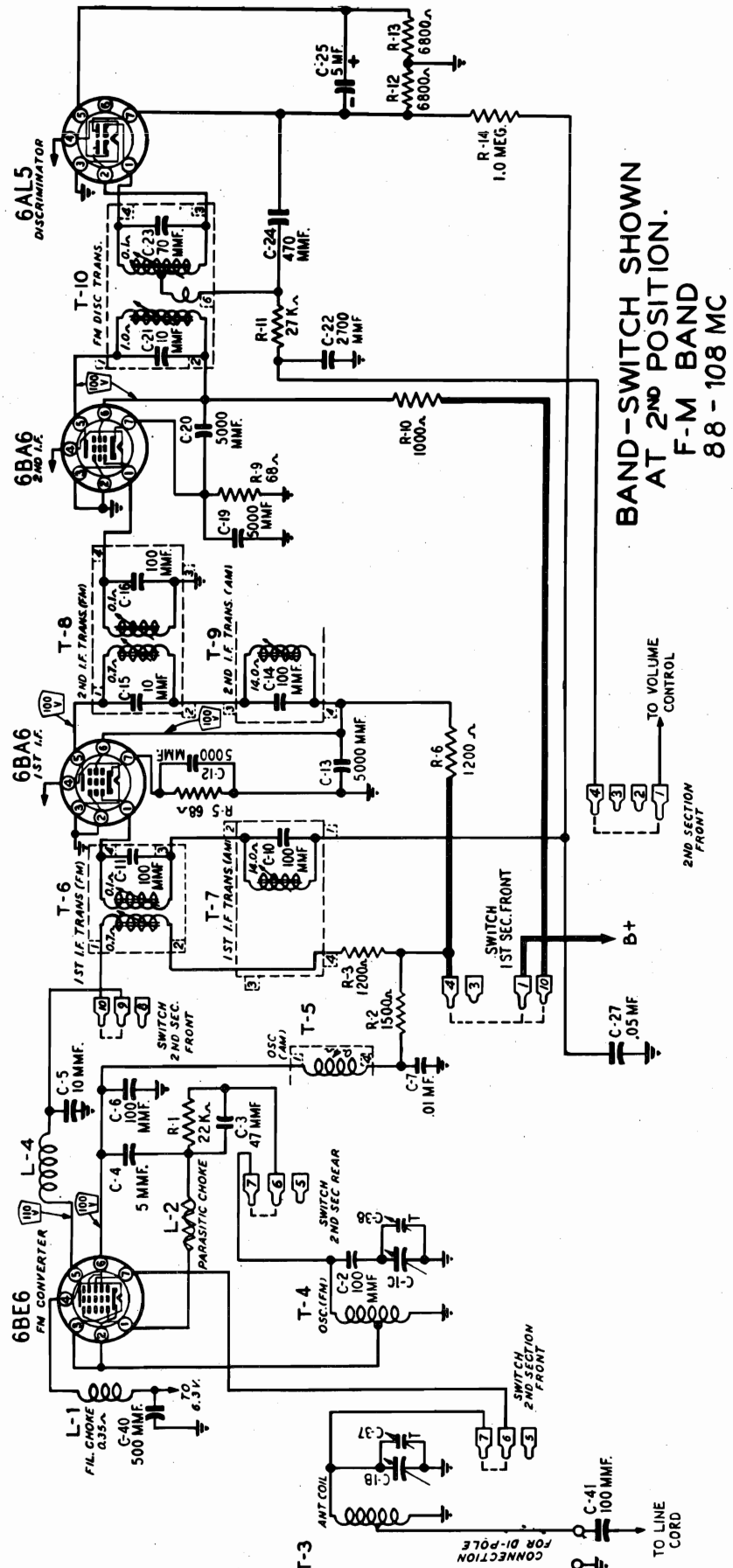
CLARI - SKEMATIX

Registered Trademark

MONT WARD PAGE 19-85

MONTGOMERY WARD

MODEL 84WG-2015A



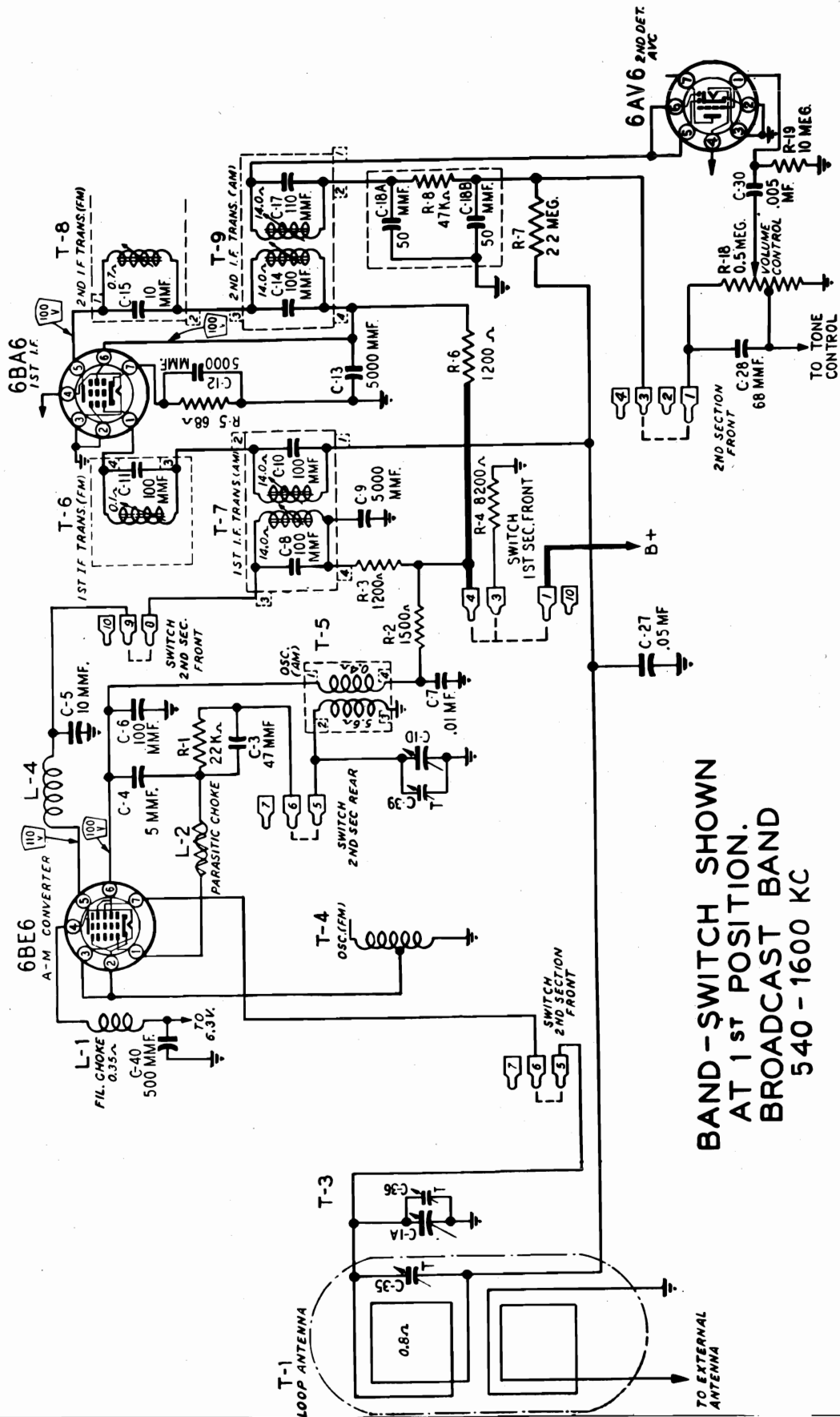
CLARI-SKEMATIX

Registered Trademark

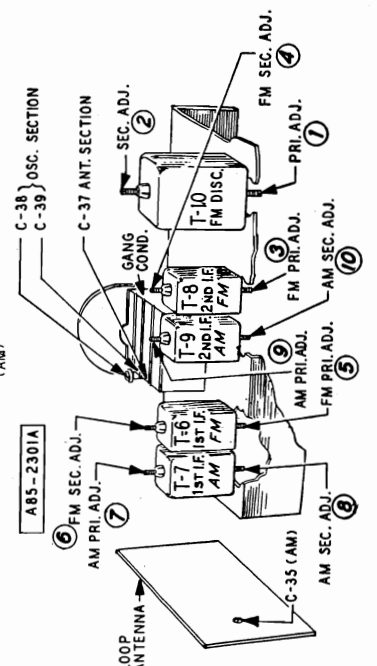
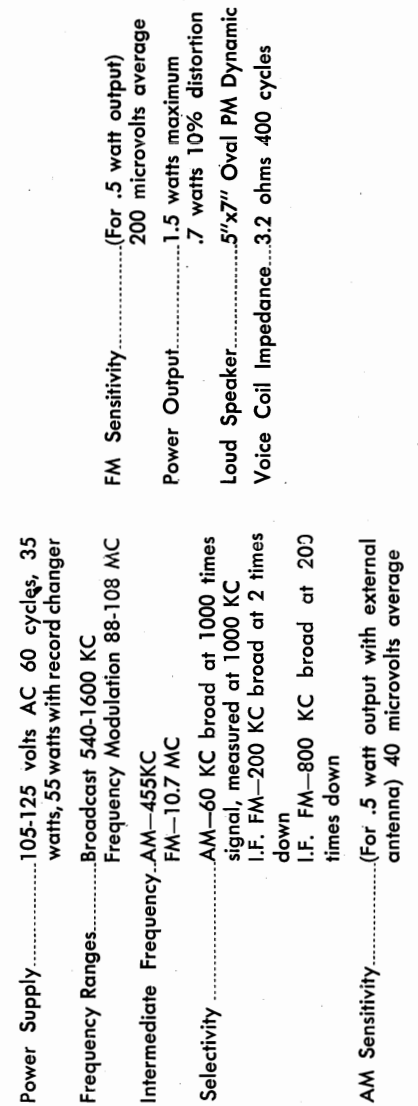
PAGE 19-86 MONT WARD

MODEL 84WG-2015A

MONTGOMERY WARD



BAND-SWITCH SHOWN
AT 1ST POSITION.
BROADCAST BAND
540 - 1600 KC



MODELS 84WG-2015A,
84WG-2015B

MONTGOMERY WARD

ALIGNMENT PROCEDURES
AM STAGES

The following is required for aligning:

An All Wave Signal Generator Which Will Provide an Accurately
Calibrated Signal at the Test Frequencies as Listed.Output Indicating Meter, Non-Metallic Screwdriver, Dummy Antennas
— .1 mf, and 50mmf.

Volume Control Maximum all Adjustments.

Connect Radio Chassis to Ground Post of Signal Generator with a
Short Heavy Lead.Allow Chassis and Signal Generator to "Heat Up" for Several
Minutes.

SIGNAL GENERATOR

FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO	THROUGH DUMMY ANTENNA	CONNECT GROUND TO	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
455 KC	Control Grid 1st 6BA6 Pin No. 1	.1 mf	Chassis Base	Rotor Fully Open	2nd I.F. Pri. and Sec. (9) and (10)	Maximum Output
455 KC	Control Grid 6BE6 Pin No. 7 1st Det.	.1 mf	Chassis Base	Rotor Fully Open	1st I.F. Pri. and Sec. (7) and (8)	Maximum Output
1620 KC	Control Grid 6BE6 Pin No. 7	.1 mf	Chassis Base	Rotor Fully Open	Oscillator C-39	Maximum Output
1400 KC	External Antenna Lead	50 mmf	Chassis Base	Turn Rotor to Max. Output. Set Pointer to 1400 KC See Note A	Antenna C-35	Maximum Output

NOTE A—If the pointer is not at 1400 KC on the dial, reset pointer to the 1400 KC mark on the dial scale.

FM STAGES

The following is required for aligning:

An accurately calibrated signal generator providing unmodu-
lated signals at the test frequencies listed below.

Non-metallic screwdriver.

Dummy Antennas and I-F Loading Resistor — .01 mf, 300 ohms
and 100K ohmsZero center scale DC vacuum tube voltmeter having a range of
approximately 3 volts.(If a zero center scale meter is not available, a standard scale
vacuum tube voltmeter may be used by reversing the meter connec-
tions for negative readings).

Allow chassis and signal generator to "Heat Up" for several minutes.

SIGNAL GENERATOR

	FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO	THROUGH DUMMY ANTENNA	BAND SWITCH SETTING	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
Discriminator	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	Disc. Pri. (1) Note A	Maximum Deflection
	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	Disc. Sec. (2) Note B	
	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	Disc. Pri. (1) Note A	Maximum Deflection
	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	Disc. Sec. (2) Note B	
I-F	10.7 MC	6BA6 1st I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	2nd I-F Pri. (3) 2nd I-F Sec. (4) Note C	Maximum Deflection
	10.7 MC	Unsolder lead from Pin 7 to band switch. Insert 100K ohm resistor between Pin 7 and Ground and feed signal into Pin 7 of 6BE6	.01 mf	FM	Rotor Fully Open	1st I-F Pri. (5) Note C	Maximum Deflection
	10.7 MC	Same as above	.01 mf	FM	Rotor Fully Open	1st I-F Sec. (6) Note C	Maximum Deflection

RECHECK I-F ADJUSTMENTS IN ORDER GIVEN

Ant. and Osc.	108.5 Note D	Disconnect built-in line an- tenna and connect generator to dipole terminals with re- sistor in series	300 ohms	FM	Rotor Fully Open	Osc. C-38	Maximum Deflection
	104.5	Same as above	300 ohms	FM	Tune rotor for max. AVC voltage	Ant. C-37	Maximum Deflection

RECHECK ANTENNA & OSC. ADJUSTMENTS IN ORDER GIVEN

FM ALIGNMENT NOTES

NOTE A—The zero center scale DC vacuum tube voltmeter is to be
connected between chassis ground and AVC line. A
signal of .1 volt must be fed into the receiver for this
adjustment. Note output voltage on the zero center DC
vacuum tube voltmeter.NOTE B—Disconnect zero center DC vacuum tube voltmeter from
AVC and connect it at the audio takeoff point at the27 K ohm resistor (R-11) and its junction with the terminal
strip. Adjust for zero voltage indication.NOTE C—Connect zero center DC vacuum tube voltmeter as in Note
A. Adjust input to give same output on the zero center DC
vacuum tube voltmeter as in Note A.NOTE D—Remove the 100 K. ohm load resistor and solder the lead
from pin 7 of 6BE6 tube to the band switch before attempt-
ing to check the antenna and oscillator adjustments.

MONTGOMERY WARD

MODELS 84WG-2015A,
84WG-2015BRECEIVER STAGE SENSITIVITIES
AM AND AUDIO STAGES

The table below lists the sensitivity at the input of each stage. The receiver should be tuned to 1000 KC for all readings. All measurements are based on an output of .5 watt. This may be measured by disconnecting the speaker voice coil and substituting a 3.2 ohm, 5 watt resistor across the secondary winding of the output transformer. A reading of 1.26 volts across this resistor will be equivalent to a .5 watt output.

The volume control must be set to maximum.

The signal source must be an accurately calibrated signal generator capable of supplying both 1000 KC and 455 KC signals modulated 30% with a 400 cycle audio signal. Variations in sensitivity of Plus or Minus 25% are usually permissible.

SIGNAL GENERATOR				INPUT FOR .5 WATT OUTPUT
FREQUENCY	COUPLING CAPACITOR	CONNECTION TO RECEIVER	GROUND CONNECTION	
1000 KC	200 mmf or RMA Dummy Antenna	External Antenna Lead	Chassis	25 Microvolts
1000 KC	.05 mf	6BE6 Converter Pin 7	Chassis	60 Microvolts
455 KC	.05 mf	6BE6 Converter Pin 7	Chassis	58 Microvolts
455 KC	.05 mf	6BA6 1st I-F Pin 1	Chassis	2400 Microvolts
400 cycles	.05 mf	6AV6 1st A-F Pin 1	Chassis	.07 Volt
400 cycles	.05 mf	6V6GT Output Pin 5	Chassis	3.2 Volts

FM STAGES

The table below lists the sensitivity for the FM stages of the receiver. The receiver must be tuned to 98 MC for all readings. Measurements are based on a .5 watt output the same as for the AM and Audio stage measurements.

The signal source must be an accurately calibrated signal generator capable of supplying a 98 MC signal modulated by a 400 cycle audio signal. For these measurements the generator must be adjusted for a 22.5 KC deviation. This will correspond to 30% AM modulation.

SIGNAL GENERATOR				INPUT FOR .5 WATT OUTPUT
FREQUENCY	COUPLING TO RECEIVER	CONNECTION TO RECEIVER	GROUND CONNECTION	
98 MC	300 ohms	External Antenna Lead	Chassis	200 Microvolts
10.7 MC	.01 mf	6BA6 1st I-F Pin 1	Chassis	1,000 Microvolts
10.7 MC	.01 mf	6BA6 2nd I-F Pin 1	Chassis	40,000 Microvolts

TUBE SOCKET VOLTAGES

Socket voltages are shown on the schematic diagram at the tube socket terminals. All voltages are between the socket terminal and chassis ground. Plate, screen and cathode voltages were taken with a 1000 ohm-per-volt meter with a 300 volt scale used for plate and screen voltages. Audio grid voltages were read with a vacuum tube voltmeter. Conditions of measurement are:

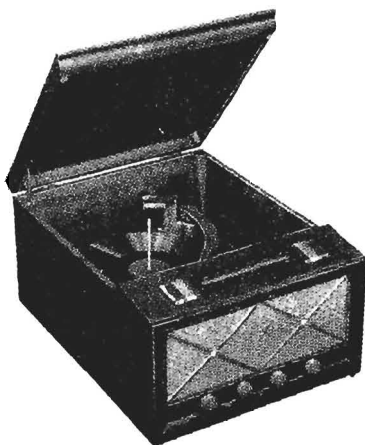
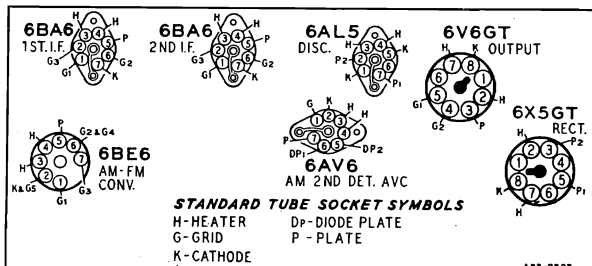
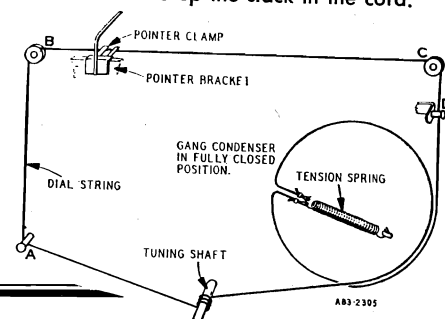
Line voltage.....117 Volts AC
Signal Input.....None

A variation of $\pm 10\%$ is usually permissible.

DRIVE CORD REPLACEMENT

DIAL POINTER CORD

Use a new 10X70 drive cord assembly or a new length of cord 51 inches long for the installation. Install the cord as shown in the illustration, winding three turns clockwise around the drive shaft with the turns progressing away from the chassis. After completing the installation rotate the drive shaft a few turns to take up the slack in the cord.



MODEL 84WG-2015A

MONTGOMERY WARD

Ref. No.	Part. No.	Description	Qty. Used in Set	Ref. No.	Part. No.	Description	Qty. Used in Set
CAPACITORS							
C-1A } C-1B } C-1C } C-1D }	14A202	Gang Condenser & Pulley.....	1	R-10	B84102 1000	0.5 Carbon	1
C-2	47X511	100 mmf Ceramic.....	1	R-11	B84273 27 K	0.5 Carbon	1
C-3	47X517	47 mmf Ceramic.....	1	R-12 } R-13 }	B84682 6800	0.5 Carbon	2
C-4	47X513	5 mmf Ceramic.....	1	R-14	B85105 1 meg.	0.5 Carbon	1
C-5	47X512	10 mmf Ceramic.....	1	R-15	D84102 1000	2.0 Carbon	1
C-6	47X518	100 mmf Ceramic.....	1	R-16 } R-21 } R-23 }	B85474 470 K	0.5 Carbon	3
C-7	D66103	.01 mf 400 V Tubular.....	1	R-17	B84153 15 K	0.5 Carbon	1
C-8 } C-10 }		Part of T-7 (1st I.F. Trans.—AM)....		R-18	36X347 .5 meg.	Volume control and switch..	1
C-11		Part of T-6 (1st I.F. Trans.—FM)....		R-19	B85106 10 meg.	0.5 Carbon	1
C-9 } C-12 } C-13 } C-19 } C-20 }	47X507	5000 mmf Silvered Ceramic	5	R-20	40X254 3 meg.	Tone Control	1
C-14 } C-17 }		Part of T-9 (2nd I.F. Trans.—AM)		R-24	B84271 270	0.5 Carbon	1
C-15 } C-16 }		Part of T-8 (2nd I.F. Trans.—FM)....		TRANSFORMERS AND COILS			
C-18A } C-18B }		50-50 mmf (Part of 76X1 Resistor-Capacitor Combination).....		L-1 } L-4 }	9A1882	Filament Choke	2
C-21 } C-23 }		Part of T-10 (Discriminator Trans.)		L-2	9A1940	Parasitic Choke.....	1
C-22	47X492	2700 mmf Molded Mica.....	1	L-3	9A1930	Line Choke	1
C-24	47X510	470 mmf Silvered Mica.....	1	T-1	9A1954	B" Range Loop Antenna Assembly..	1
C-25	45X361	5 mf 100 V Dry Electrolytic	1	T-3	9A1956	Antenna Coil Assembly.....	1
C-26A } C-26B } C-26C }	45X360	40 mf 200 V Dry Electrolytic	1	T-4	9A1938	Oscillator Coil (FM).....	1
		40 mf 150 V Dry Electrolytic	1	T-5	9A1929	Oscillator Coil Assembly (AM)	1
		20 mf 25 V	1	T-6	9A1932	1st I.F. Transformer (FM).....	1
C-27	B66503	.05 mf 200 V Tubular	1	T-7	9A1934	1st I.F. Transformer (AM).....	1
C-28	47X471	68 mmf Molded Mica.....	1	T-8	9A1933	2nd I.F. Transformer (FM).....	1
C-29	B66403	.04 mf 200 V Tubular	1	T-9	9A1935	2nd I.F. Transformer (AM).....	1
C-30	D66502	.005 mf 400 V Tubular	1	T-10	9A1936	Discriminator Coil Assembly.....	1
C-31	47X468	220 mmf Ceramic	1	T-11	53X291	Power Transformer	1
C-32	D66203	.02 mf 400 V Tubular	1	T-12	51X136	Output Transformer	1
C-33	B66402	.004 mf 200 V Tubular	1	MISCELLANEOUS			
C-34	H66102	.001 mf 800 V Tubular	1	76X1	Resistor-Capacitor Combination.....	1	
C-35	17A123	1.5-12 mmf Trimmer	1	12A484	5" x 7" Oval P.M. Speaker.....	1	
C-36 } C-37 } C-39 }		Part of C-1 Gang Condenser.....		3A303	Tube Socket—Octal (8 prong) Molded	2	
C-38	17A247	3-12 mmf Trimmer	1	3A312	Tube Socket—Miniature	4	
C-40	47X508	500 mmf Ceramic	1	3A427	Tube Socket—Miniature (for AM-FM Converter Tube)	1	
C-41	47X476	100 mmf Molded	1	3A304	Phono Motor Socket.....	1	
RESISTORS				3A305	Phono Socket—Single Pin Tip.....	1	
		OHMS	WATTS	2A374	Band Change Switch.....	1	
R-1	B84223	22 K	0.5 Carbon	13X546	Line Cord and Plug Assembly.....	1	
R-2	B84152	1500	0.5 Carbon	10A659	Knob (Tuning)	1	
R-3 } R-6 }	B84122	1200	0.5 Carbon	10A660	Knob (Volume Control and Switch)	1	
R-4	D84822	8200	2.0 Carbon	10A653	Knob (Tone).....	1	
R-5 } R-9 }	B83680	68	0.5 Carbon	10A661	Knob (Phono—BC—FM)	1	
R-7	B85225	2.2 meg.	0.5 Carbon	4X1001	Escutcheon	2	
R-8	47 K	(Part of 76X1 Resistor-Capacitor Combination)		14X429	Grille Ventilator	1	
				28X290	Snap Buttons (Mtg. Grille)	4	

MONTGOMERY WARD

MODELS 84WG-2015A,
84WG-2015B

Ref. No.	Part. No.	Description	Qty. Used in Set	Ref. No.	Part. No.	Description	Qty. Used in Set
DIAL AND DRIVE ASSEMBLY							
	58X703	Dial Glass	1	C-29	B66403	.04 mf 200 V Tubular	1
	24X446	Idler Pulley.....	2	C-30	D66502	.005 mf 400 V Tubular	1
	15X244	Pointer	1	C-31	47X468	220 mmf Ceramic	1
	25X1587	Pointer & Diffuser, Mtg. Bracket.....	1	C-32	D66203	.02 mf 400 V Tubular	1
	7A103	No. 47 Pilot Light Bulb.....	1	C-33	B66402	.004 mf 200 V Tubular	1
	7A221	Pilot Light Socket Assembly.....	1	C-34	H66102	.001 mf 800 V Tubular	1
	26X506	Drive Shaft	1	C-35	17A123	1.5-12 mmf Trimmer	1
	28X113	Drive Cord Tension Spring.....	1	C-37 }		Part of C-1 Gang Condenser.....	
	10X70	Drive Cord Assembly	1	C-39 }			
	19X192	"C" Washer (Mtg. drive shaft).....	2	C-38	26A489	1-8 mmf Trimmer Assy.	1
	6X21	Rubber Grommet (Mtg. gang cond.)..	3	C-40	47X508	500 mmf Ceramic	1
	20X260	Condenser Cushion Stud (Mtg. gang condenser)	3	C-41	47X476	100 mmf Molded	1
TYPE W-28A145 RECORD CHANGER PARTS				C-42	47X521	6 mmf Ceramic.....	1
	W-15X090-1	Motor Assembly, 60 cycles, 115-120 V.	1	C-43	47X522	12 mmf Ceramic.....	1
	W-17X412-11	50 Cycle Drive Sleeve Assembly ..	1	RESISTORS			
	Shure P30-1	Crystal Cartridge and Semi- Permanent Needle Assembly	1			OHMS WATTS	
		Semi-Permanent Needle	1	R-1	B84223	22 K 0.5 Carbon	1
		(Specify part number and letters stamped on crystal)		R-2	B84152	1500 0.5 Carbon	1
MODEL 84WG-2015B				R-3 }	B84122	1200 0.5 Carbon	2
CAPACITORS				R-6 }			
C-1A }				R-4	D84822	8200 2.0 Carbon	1
C-1B }				R-5 }	B83680	68 0.5 Carbon	2
C-1C }	14A204	Gang Condenser & Pulley	1	R-9 }	B85225	2.2 meg. 0.5 Carbon	1
C-1D }				R-8		47 K (Part of 76X1 Resistor- Capacitor Combination)	
C-2	47X511	100 mmf Ceramic.....	1	R-10	B84102	1000 0.5 Carbon	1
C-3	47X517	47 mmf Ceramic.....	1	R-11	B84273	27 K 0.5 Carbon	1
C-4	47X523	10 mmf Ceramic.....	1	R-12 }	B84153	15 K 0.5 Carbon	3
C-5	47X512	10 mmf Ceramic.....	1	R-13 }			
C-6	47X463	47 mmf Ceramic	1	R-17 }			
C-7	D66103	.01 mf 400 V Tubular.....	1	R-14	B85105	1 meg. 0.5 Carbon	1
C-8 }				R-15	D84102	1000 2.0 Carbon	1
C-10 }		Part of T-7 (1st I.F. Trans.—AM)...		R-16 }			
C-11		Part of T-6 (1st I.F. Trans.—FM)....		R-21 }	B85474	470 K 0.5 Carbon	3
C-9 }				R-23 }			
C-12 }				R-18	3CX347	.5 meg. Volume control and switch....	1
C-13 }	47X507	5000 mmf Silvered Ceramic.....	5	R-19	B85106	10 meg. 0.5 Carbon	1
C-19 }				R-20	40X287	3 meg. Tone Control....	1
C-20 }				R-24	B84271	270 0.5 Carbon	1
C-14 }				TRANSFORMERS AND COILS			
C-17 }		Part of T-9 (2nd I.F. Trans.—AM)...		L-1 }			
C-15 }				L-4 }	9A1882	Filament Choke.....	2
C-16 }		Part of T-8 (2nd I.F. Trans.—FM)....		L-2	9A1940	Parasitic Choke.....	1
C-18A }				L-3	9A1930	Line Choke	1
C-18B }		50-50 mmf (Part of 76X1 Resistor- Capacitor Combination).....		L-5	9A1967	Parasitic Choke	1
C-23		Part of T-10 (Discriminator Trans.)..		T-1	9A1971	"B" Range Loop Antenna Assembly	1
C-22	47X492	2700 mmf Molded Mica....	1	T-3	9A1956	Antenna Coil Assembly.....	1
C-24	47X510	470 mmf Silvered Mica..	1	T-4	9A1938	Oscillator Coil (FM)	1
C-25	45X361	5 mf 100 V Dry Electrolytic	1	T-5	9A1929	Oscillator Coil Assembly (AM)	1
C-26A }				T-6	9A1932	1st I.F. Transformer (FM).....	1
C-26B }	45X360	40 mf 200 V Dry Electrolytic	1	T-7	9A1934	1st I.F. Transformer (AM).....	1
C-26C }		20 mf 25 V		T-8	9A1969	2nd I.F. Transformer (FM).....	1
C-27	B66503	.05 mf 200 V Tubular	1				
C-28	47X471	68 mmf Molded Mica	1				

MODELS 84WG-2015A,
84WG-2015B

MONTGOMERY WARD

Ref. No.	Part. No.	Description	Qty. Used in Set
T-9	9A1935	2nd I.F. Transformer (AM).....	1
T-10	9A1970	Discriminator Coil Assembly.....	1
T-11	53X291	Power Transformer	1
T-12	51X136	Output Transformer	1
MISCELLANEOUS			
	76X1	Resistor-Capacitor Combination.....	1
	12A484	5" x 7" Oval P.M. Speaker.....	1
	3A303	Tube Socket—Octal (8 prong) Molded	2
	3A426	Tube Socket—Miniature	4
	3A427	Tube Socket—Miniature (for AM-FM Converter Tube).....	1
	3A304	Phono Motor Socket.....	1
	3A305	Phono Socket—Single Pin Tip.....	1
	2A374	Band Change Switch.....	1
	13X546	Line Cord and Plug Assembly.....	1
	10A659	Knob (Tuning).....	1
	10A660	Knob (Volume Control and Switch)....	1
	10A658	Knob (Tone).....	1
	10A661	Knob (Phono—BC—FM).....	1
	4X1001	Escutcheon	2
	14X438	Grille Ventilator	1
	28X290	Snap Buttons (Mtg. Grille)	4

Ref. No.	Part. No.	Description	Qty. Used in Set
DIAL AND DRIVE ASSEMBLY			
	58X703	Dial Glass.....	1
	24X446	Idler Pulley.....	2
	15X244	Pointer	1
	25X1587	Pointer & Diffuser Mtg. Bracket.....	1
	7A103	No. 47 Pilot Light Bulb.....	1
	7A221	Pilot Light Socket Assembly.....	1
	26X506	Drive Shaft	1
	28X113	Drive Cord Tension Spring.....	1
	10X70	Drive Cord Assembly.....	1
	19X192	"C" Washer (Mtg. drive shaft).....	2
	6X21	Rubber Grommet (Mtg. gang cond.)..	3
	20X260	Condenser Cushion Stud (Mtg. gang condenser)	3
TYPE W-28A145 RECORD CHANGER PARTS			

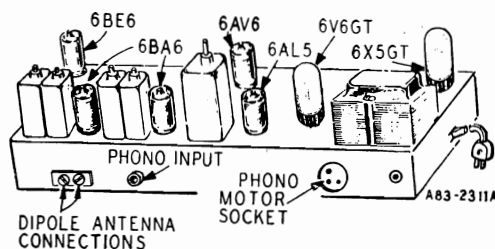
W-15X090-1	Motor Assembly, 60 cycles, 115-120 V.	1
W-17X412-11	50 Cycle Drive Sleeve Assembly.....	1
Shure P30-1	Crystal Cartridge and Semi- Permanent Needle Assembly.....	1
	Semi-Permanent Needle	1
	(Specify part number and letters stamped on crystal)..	

MODELS 84WG-2015A, B

50 CYCLE OPERATION

If it is desired to use the record changer on a 50 cycle power supply, it will be necessary to replace the drive sleeve assembly on the record changer motor shaft with a 50 cycle drive sleeve assembly. This assembly is listed in the parts list.

To change the sleeve turn the record selector shelf to the 12" position and lift the turntable off of the record changer. Loosen the set screw holding the drive sleeve on the motor shaft and remove the old sleeve. Install the new 50 cycle drive sleeve and replace the turntable.



Tube and Dial Lamp Complement	1 6BE6 FM-AM Converter
	1 6BA6 1st I-F Amplifier
	1 6BA6 2nd I-F Amplifier
	1 6AL5 FM Discriminator
	1 6AV6 Audio Amplifier, AM 2nd Detector and AVC
	1 6V6GT Audio Output
	1 6X5GT Rectifier
	1 No. 47 Dial Lamp

MONTGOMERY WARD

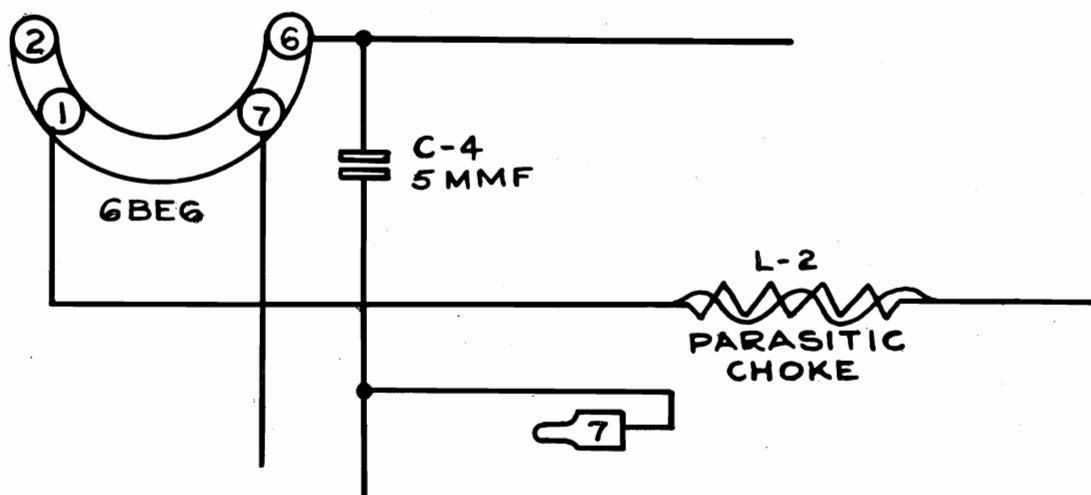
MODEL 84WG-2015A
 MODELS 84WG-2718A,
 84WG-2720A

MODEL 84WG-2015A

- (1) The part number and description of C-6 has been changed.
 The new description follows:

C-6 47X463 47 MMF Molded 1 used

- (2) The circuit connection of the 5 MMF Capacitor C-4 has
 been changed. The new circuit connection is shown
 in the partial schematic below:



MODELS 84WG-2718A,
 84WG-2720A

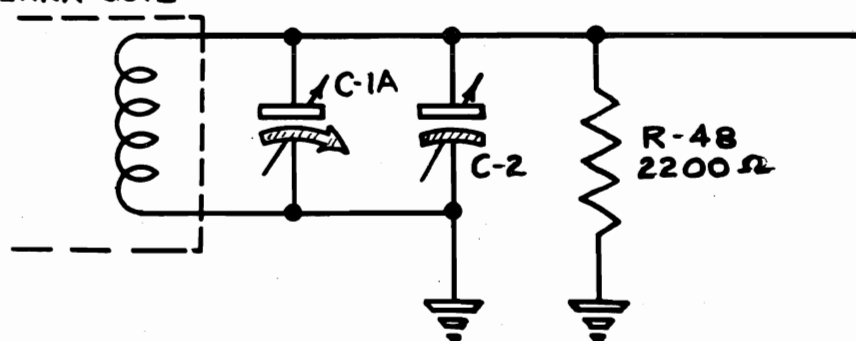
PARTS LIST ADDITION

The description of the new part follows:

<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>	<u>Qty.Used</u>
R-48	B84222	2200 ohms 0.5 watt	1

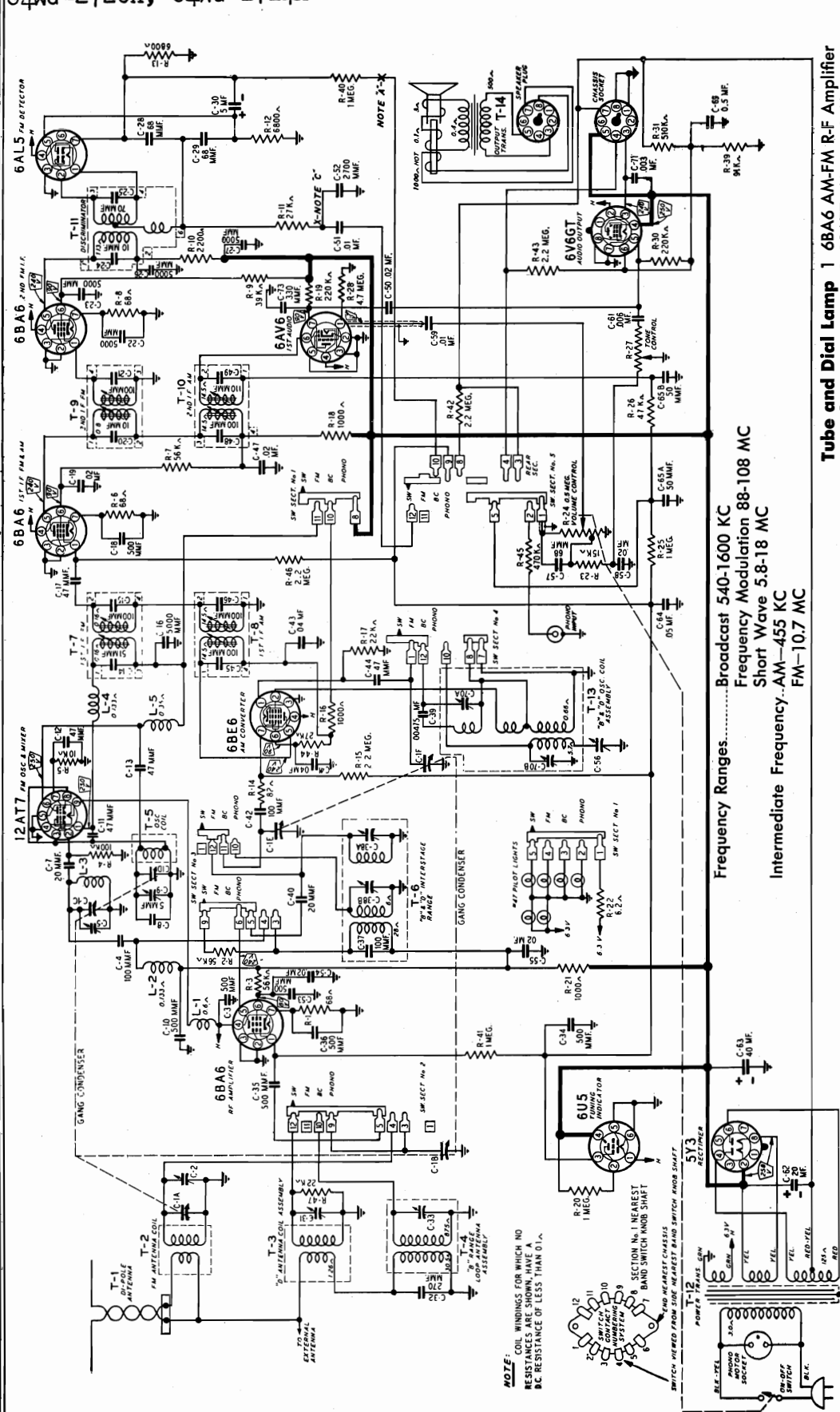
The circuit connection of resistor R-48 is shown in the
 partial schematic below. This also applies to Model's
 84 WG-2718B, 2724A.

T2

FM ANTENNA COIL

MODELS 84WG-2718A, -B,
84WG-2720A, 84WG-2724A

MONTGOMERY WARD



- Tube and Dial Lamp Complement**
- 1 6BA6 AM-FM Osc. & Mixer
 - 1 12AT7 FM Osc. & Mixer
 - 1 6BE6 AM Converter
 - 1 6BA6 FM-AM 1st I-F Amplifier
 - 1 6BA6 FM 2nd I-F Amplifier
 - 1 6AL5 FM Detector
 - 1 6AV6 Audio Amplifier, AM 2nd Detector and AVC
 - 1 6U5/6G5 Tuning Indicator
 - 1 5Y3 Rectifier
 - 6 No. 47 Dial Lamps

Frequency Ranges.....Broadcast 540-1600 KC
Frequency Modulation 88-108 MC
Short Wave 5.8-18 MC
Intermediate Frequency-AM-455 KC
FM-10.7 MC

AM Sensitivity.....(For .5 watt output with external antenna)
Broadcast, 2 microvolts average
Short Wave, 4 microvolts average
FM Sensitivity.....(For .5 watt output)
25 microvolts average
Power Output.....6.5 watts maximum
Loud Speaker.....3.5 watts 10% distortion
Voice Coil Impedance.....3.2 ohms 400 cycles

ELECTRICAL SPECIFICATIONS

Power Supply.....105-125 volts AC 60 cycles, 80 watts, 100 watts with record changer
Selectivity.....AM-37 KC broad at 1000 times signal, measured at 1000 KC
I.F. FM-200 KC broad at 2 times down
I.F. FM-700 KC broad at 200 times down

Registered Trademarks

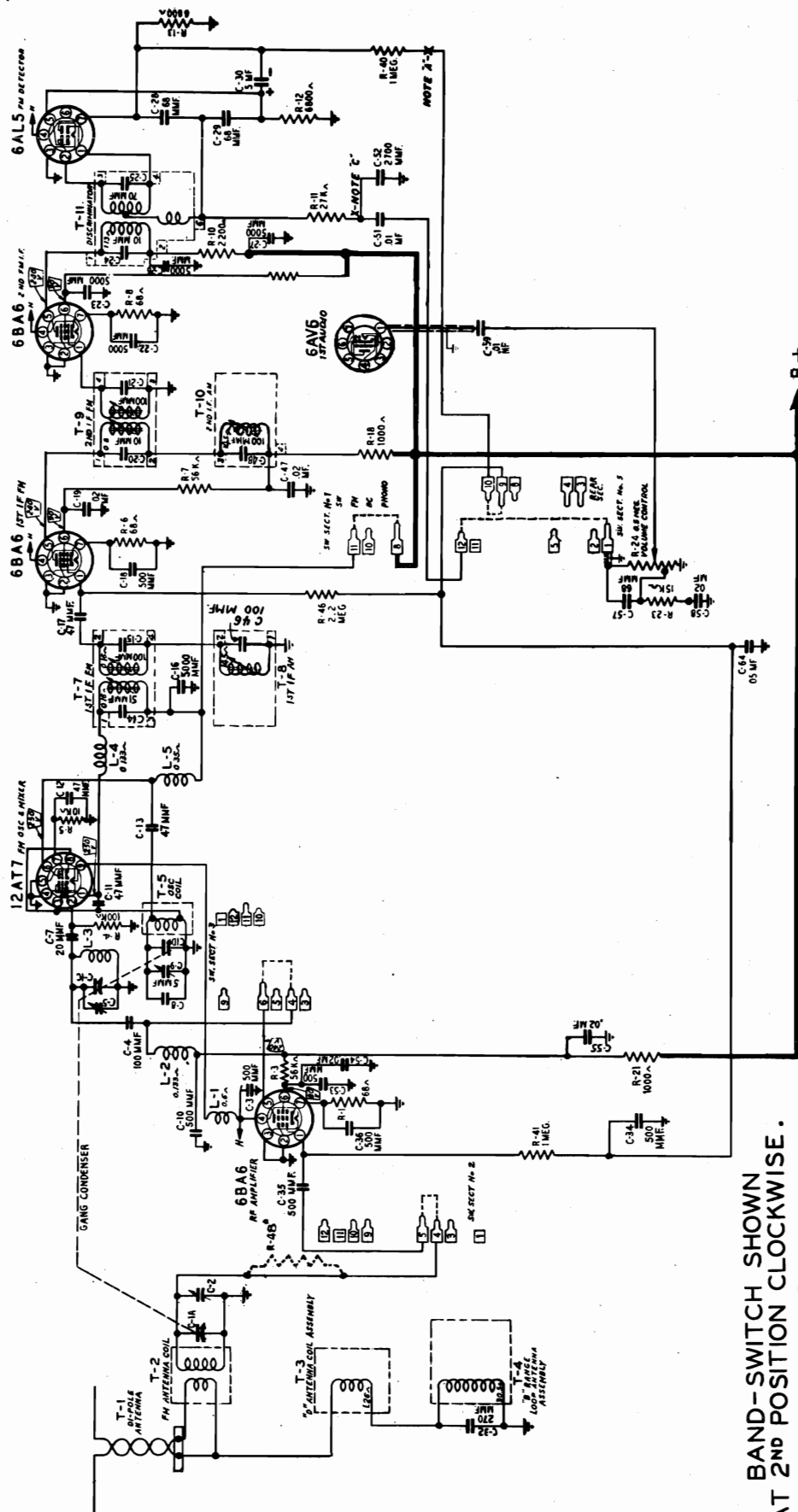
MONTGOMERY WARD

MODELS 84WG-2718A,
84WG-2720A



MODELS 84WG-2718A,
84WG-2720A

MONTGOMERY WARD



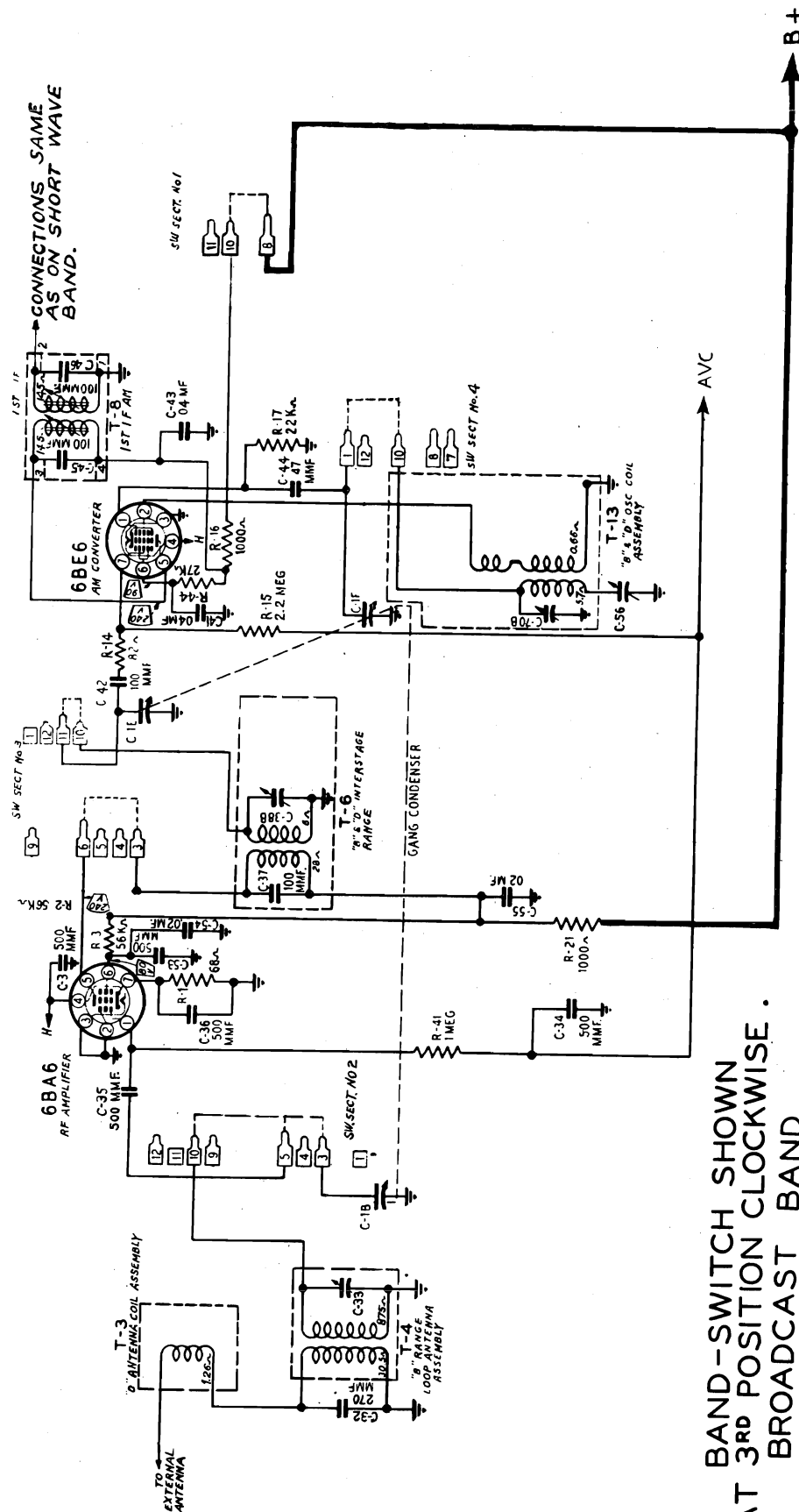
* R-48 SHOWN IN DOTTED LINES
USED IN MODELS 84WG-2718B,
84WG-2724A ONLY.

BAND-SWITCH SHOWN
AT 2ND POSITION CLOCKWISE.
F-M BAND
88-108 MC

Registered Trademark

MONTGOMERY WARD

CONNECTIONS SAME
AS ON SHORT WAVE
BAND.



BAND-SWITCH SHOWN
AT 3RD POSITION CLOCKWISE.
BROADCAST BAND
540-1600 KC

MODELS 84WG-2718A, -B,
84WG-2720A, 84WG-2721A

MONTGOMERY WARD

RECEIVER STAGE SENSITIVITIES AM AND AUDIO STAGES

The table below lists the sensitivity at the input of each stage. The receiver should be tuned to 1000 KC for all readings. All measurements are based on an output of .5 watt. This may be measured by disconnecting the speaker voice coil and substituting an 8 ohm, 10 watt resistor across the secondary winding of the output transformer. A reading of 2 volts across this resistor will be equivalent to a .5 watt output.

The volume control must be set to maximum.

The signal source must be an accurately calibrated signal generator capable of supplying both 1000 KC and 455 KC signals modulated 30% with a 400 cycle audio signal. Variations in sensitivity of Plus or Minus 25% are usually permissible.

SIGNAL GENERATOR				INPUT FOR .5 WATT OUTPUT
FREQUENCY	COUPLING CAPACITOR	CONNECTION TO RECEIVER	GROUND CONNECTION	
1000 KC	200 mmf or RMA Dummy Antenna	External Antenna Lead	Chassis	2 Microvolts
1000 KC	.05 mf	6BA6 Interstage Pin 1	Chassis	8 Microvolts
1000 KC	.05 mf	6BE6 Converter Pin 7	Chassis	65 Microvolts
455 KC	.05 mf	6BE6 Converter Pin 7	Chassis	55 Microvolts
455 KC	.05 mf	6BA6 1st I-F Pin 1	Chassis	2500 Microvolts
400 cycles	.05 mf	6AV6 1st A-F Pin 1	Chassis	.05 Volt
400 cycles	.05 mf	6V6GT Output Pin 5	Chassis	2.8 Volts

FM STAGES

The table below lists the sensitivity for the FM stages of the receiver. The receiver must be tuned to 98 MC for all readings. Measurements are based on a .5 watt output the same as for the AM and Audio stage measurements.

The signal source must be an accurately calibrated signal generator capable of supplying a 98 MC signal modulated by a 400 cycle audio signal. For these measurements the generator must be adjusted for a 22.5 KC deviation. This will correspond to 30% AM modulation.

SIGNAL GENERATOR				INPUT FOR .5 WATT OUTPUT
FREQUENCY	COUPLING TO RECEIVER	CONNECTION TO RECEIVER	GROUND CONNECTION	
98 Mc	300 ohms	External Antenna Terminal	External Ant. Terminal	25 Microvolts
10.7 MC	.01 mf	6BA6 1st I-F Pin 1	Chassis	2200 Microvolts
10.7 MC	.01 mf	6BA6 2nd I-F Pin 1	Chassis	50,000 Microvolts

ALIGNMENT PROCEDURE AM BROADCAST AND SHORT WAVE BAND

The following is required for aligning:

An All Wave Signal Generator Which Will Provide an Accurately Calibrated Signal at the Test Frequencies as Listed.

Output Indicating Meter, Non-Metallic Screwdriver, Dummy Antennas
—.1 mf, 200 mmf and 400 ohms.

Volume Control—Maximum all Adjustments.

Connect Radio Chassis to Ground Post of Signal Generator with a Short Heavy Lead.

Allow Chassis and Signal Generator to "Heat Up" for Several Minutes.

	SIGNAL GENERATOR		THROUGH DUMMY ANTENNA	BAND SWITCH SETTING	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
	FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO					
I-F	455 kc	6BE6 Pin 7 and Chassis	.1 mf	Broadcast	Rotor Fully Open	1st I-F Pri. & Sec. ③ & ④ 2nd I-F. Pri. & Sec. ① & ②	Maximum Output
Broadcast	1620 kc	External ant. lead	200 mmf	Broadcast	Rotor Fully Open	Broadcast Oscillator C-70B	
	1400 kc	External ant. lead	200 mmf	Broadcast	Turn Rotor to Max. Output Set pointer to 1400 kc See Note A	Broadcast Interstage C-38B	
	1400 kc	External ant. lead	200 mmf	Broadcast		Loop Antenna C-33	
	600 kc	External ant. lead	200 mmf	Broadcast	Turn Rotor to Max. Output and Rock See Note B	600 kc padder C-56	
Repeat above oscillator adjustments at 1620 and 600 KC until readjusting the oscillator Range B Trimmer C-70B causes no further improvement in output.							
Short Wave	18.3 MC	External ant. lead	400 ohm	Short Wave	Rotor Fully Open	SW Oscillator C-70A	Maximum Output
	17 MC	External ant. lead	400 ohm	Short Wave	Turn Rotor to Max. Output	SW Interstage C-38A "D" Antenna C-31	
Reassemble chassis in cabinet							
Broadcast	1400 kc	External ant. lead	200 mmf	Broadcast	Turn Rotor to Max. Output	Loop Antenna C-33	

After each range is completed, repeat the procedure as a final check.

Note A—If the pointer is not at 1400 KC on the dial, reset pointer at the 1400 KC mark on the dial scale.

Note B—Turn the rotor back and forth and adjust the trimmer until the peak of greatest intensity is obtained.

MONTGOMERY WARD

MODELS 84WG-2718A, -B,
84WG-2720A, 84WG-2724AALIGNMENT PROCEDURE
FM STAGES

The following equipment is required for aligning:

An accurately calibrated signal generator providing unmodulated signals at the test frequencies listed below.

Non-metallic screwdriver.

Dummy Antennas and I-F Loading Resistor—.01 mf, 300 ohms and 5000 ohms.

Zero center scale DC vacuum tube voltmeter having a range of approximately 3 volts.

(If a zero center scale meter is not available, a standard scale vacuum tube voltmeter may be used by reversing the meter connections for negative readings.)

Allow chassis and signal generator to warm up for several minutes.

	SIGNAL GENERATOR		THROUGH DUMMY ANTENNA	BAND SWITCH SETTING	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
	FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO					
Discriminator	10.7 MC Note B	6BA6 2nd I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	Disc. Pri. (5) Note A	Maximum Deflection
	10.7 MC Note B	6BA6 2nd I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	Disc. Sec. (6) Note C	Zero Center
	10.7 MC Note B	6BA6 2nd I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	Disc. Pri. (5) Note A	Maximum Deflection
	10.7 MC Note B	6BA6 2nd I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	Disc. Sec. (6) Note C	Zero Center
I-F	10.7 MC Note F	6BA6 1st I-F, Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	2nd I-F Pri. Note A and D (7) 2nd I-F Sec. Note A and E (8)	Maximum Deflection
	10.7 MC Note F	FM-RF Gang Condenser terminal on top of chassis	.01 mf	FM	Rotor Fully Open	1st I-F Pri. (9) 1st I-F Sec. (10) Note A	Maximum Deflection
Recheck I-F Adjustments in order given							
R-F & Osc.	108.4	Disconnect dipole and connect generator to dipole terminals with resistor in series	300 ohms	FM	Rotor Fully Open	Oscillator C-9 Note G	Maximum Deflection
	104.5	Disconnect dipole and connect generator to dipole terminals with resistor in series	300 ohms	FM	Tune Rotor for Max. AVC voltage	RF. C-5	Maximum Deflection
	104.5	Disconnect dipole and connect generator to dipole terminals with resistor in series	300 ohms	FM	Tune Rotor for Max. AVC voltage	Ant. C-2	Maximum Deflection
Recheck R-F and Osc. Adjustments in order given							

NOTE A—Test Equipment connections are as given in the table. The zero center scale DC vacuum tube voltmeter is to be connected between chassis ground and the AVC line at the 1 megohm resistor R-40 and the band switch terminal for all adjustments except the discriminator secondary adjustment, for which see Note C.

NOTE B—A signal of .1 volt must be fed into the receiver for this adjustment.

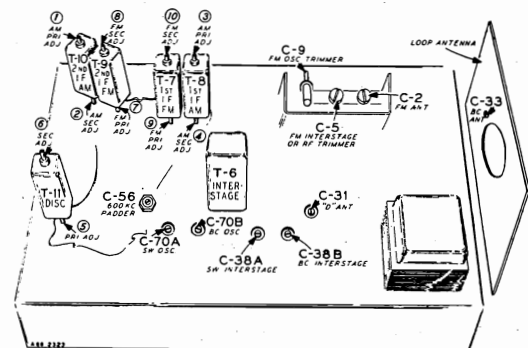
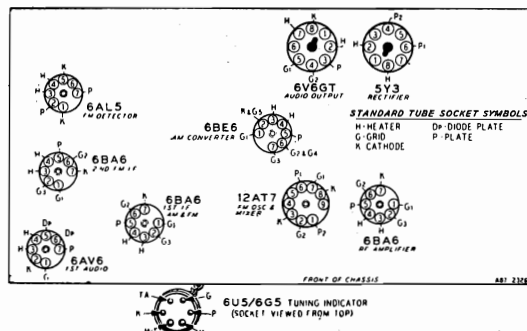
NOTE C—Disconnect zero center DC vacuum tube voltmeter from AVC and reconnect to junction of R-11, C-51 and C-52. Adjust for zero voltage indication.

NOTE D—Before adjusting Pri. core connect 5000 ohm load resistor across the 2nd I-F. secondary terminals.

NOTE E—Disconnect 5000 ohm load resistor from secondary terminals and reconnect across the 2nd I-F. primary terminals.

NOTE F—Input can be reduced to 10,000 microvolts.

NOTE G—Oscillator frequency below signal frequency.



TUBE SOCKET VOLTAGES

Socket voltages are shown on the schematic diagram at the tube socket terminals. All voltages are between the socket terminal and chassis ground. Plate, screen and cathode voltages were taken with a 1000 ohm-per-volt meter with a 300 volt scale used for plate and screen voltages. Audio grid voltages were read with a vacuum tube voltmeter. Conditions of measurement are:

Line voltage.....117 Volts AC

Signal Input.....None

A variation of $\pm 10\%$ is usually permissible.

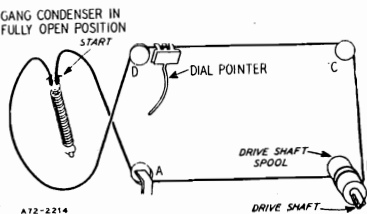
MODELS 84WG-2718A, -B,
84WG-2720A, 84WG-2724A

MONTGOMERY WARD

DRIVE CORD REPLACEMENT

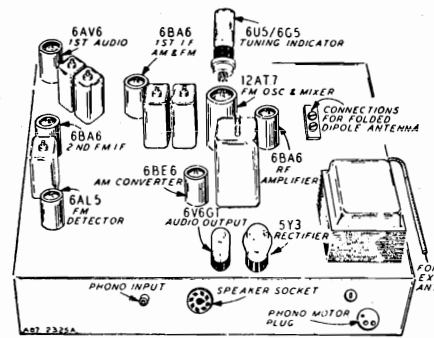
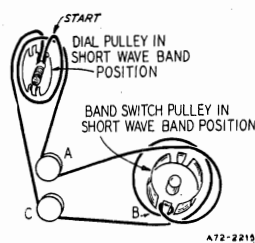
DIAL POINTER CORD

Use a new 10X66 drive cord assembly or a new length of cord 50 inches long for the installation. Install the cord as shown in the illustration, winding three turns counterclockwise around the drive shaft spool with the turns progressing towards the front end of the drive shaft. After completing the installation rotate the drive shaft a few turns to take up the slack in the cord.



DIAL ROTATION CORD

Use a new 10X60 drive cord assembly or a new length of cord 21 inches long for the installation. Both the dial pulley and the band switch pulley must be turned to the short wave band position as shown in the illustration. Install the new cord exactly as shown then change the position of the band switch several times and note the movement of the dial.

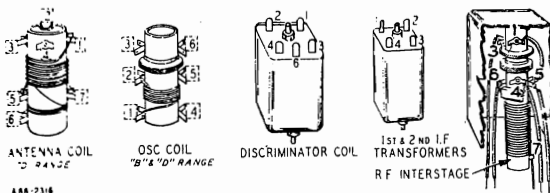


This is a three band, eight tube (plus tuning eye and rectifier tube) receiver with automatic record changer, for the reception of both AM and FM stations. The R-F and I-F stages use the latest type high gain miniature type tubes and built-in Air Wave Aerials are provided for the FM and Broadcast bands. Features include the new Roto-Selector dial with only one band visible at a time, compensator circuits to prevent oscillator drift, automatic volume control, beam power output stage, electro dynamic loud speaker and an electrostatic shield in the power transformer to reduce power line noise.

the radio chassis.

If it is desired to use the record changer on a 50 cycle power supply, it will be necessary to replace the drive sleeve assembly on the record changer motor shaft with a 50 cycle drive sleeve assembly. This assembly is listed in the parts list.

To change the sleeve turn the recorder selector shelf to the 12" position and lift the turntable off of the record changer. Loosen the set screw holding the drive sleeve on the motor shaft and remove the old sleeve. Install the new 50 cycle drive sleeve and replace the turntable.



50 CYCLE AC OPERATION

If it is desired to operate this radio on a 50 cycle 105-125 volt AC power source no changes are necessary to

Ref. No.	Part No.	Description	Qty. Used in Set
----------	----------	-------------	------------------

CAPACITORS

C-1	26A483	Tuner and Gang Assembly.....	1
C-2	17A247	3.0-12 mmf Trimmer.....	2
C-3			
C-10			
C-18			
C-34	47X496	500 mmf Ceramic.....	7
C-35			
C-36			
C-53			
C-4			
C-42	47X497	100 mmf Ceramic.....	2
C-7	47X516	20mmf Ceramic.....	1
C-8	47X500	5 mmf Ceramic.....	1
C-9	17A255	1-8 mmf Trimmer.....	1
C-11	47X499	47 mmf Ceramic.....	1
C-12			
C-13	47X498	47 mmf Ceramic.....	3
C-44			
C-14		Part of T-7 1st I-F (FM)	
C-15			
C-16			
C-22			
C-23	47X507	5000 mmf Ceramic.....	5
C-26			
C-27			
C-17	47X495	47 mmf Ceramic.....	1
C-19			
C-47			
C-50	D66203	.02 mf 400 V Tubular.....	5
C-54			
C-55			

Ref. No.	Part No.	Description	Qty. Used in Set
----------	----------	-------------	------------------

C-20		Part of T-9 2nd I-F (FM)	
C-21			
C-24		Part of T-11 Discriminator	
C-25			
C-28			
C-29	47X501	68 mmf Ceramic.....	3
C-57			
C-30	45X361	5 mf 100 V Dry Electrolytic	1
C-31	17A253	5-50 mmf Trimmer.....	1
C-32	47X445	270 mmf Molded.....	1
C-37	47X57	100 mmf Molded.....	1
C-39	46X289	.00475 mf 180 V Tubular.....	1
C-38A			
C-38B	17A252	1.3-12 mmf Dual Trimmer..	1
C-40	47X516	20 mmf Ceramic.....	1
C-41			
C-43	D66403	.04 mf 400 V Tubular.....	2
C-45		Part of T-8 1st I-F (AM)	
C-46			
C-48		Part of T-10 2nd I-F (AM)	
C-49			
C-51	B66103	.01 mf 200 V Tubular.....	2
C-59			

MODELS 84WG-2718A,
84WG-2720A

C-52	47X492	2700 mmf Molded.....	1
------	--------	----------------------	---

MODELS 84WG-2718B,
84WG-2724A

C-52	47X528	1500 mmf Molded.....	1
C-56	17A241	300-475 mmf Trimmer.....	1
C-58	B66203	.02 mf 200 V Tubular.....	1

MONTGOMERY WARD

MODELS 84WG-2718A, -B,
84WG-2720A, 84WG-2724A

Ref. No.	Part No.	Description	Qty. Used in Set
C-61	D66602	.006 mf 400 V Tubular.....	1
C-62	45X351	20 mf 450 V Dry Electrolytic 1	
C-63	45X302	40 mf 450 V Dry Electrolytic 1	
C-64	B66503	.05 mf 200 V Tubular.....	1
C-65A } C-65B }	47X112	50-50 mmf Dual Mica.....	1
C-69	A66504	.5 mf 100 V Tubular.....	1
C-70A } C-70B }	17A246	3.2-35 mmf Dual Trimmer..	1
C-71	D66302	.003 mf 400 V Tubular.....	1
C-73	47X470	330 mmf Molded.....	1

RESISTORS

R-1 }	Ohms	Watts		
R-6 }	B83680	68	0.5	Carbon..... 3
R-8 }				
R-2	C85223	22K	1.0	Carbon..... 1
R-3	B85563	56K	0.5	Carbon..... 1
R-4	B84104	100K	0.5	Carbon..... 1
R-5	B84103	10K	0.5	Carbon..... 1
R-7	C84563	56K	1.0	Carbon..... 1
R-9	C84393	39K	1.0	Carbon..... 1
R-10	B85222	2200	0.5	Carbon..... 1
R-11	B84273	27K	0.5	Carbon..... 1
R-12 }				
R-13 }	B83682	6800	0.5	Carbon..... 2
R-14	B84820	82	0.5	Carbon..... 1
R-15 }				
R-42 }	B85225	2.2 meg.	0.5	Carbon..... 3
R-46 }				
R-16 }				
R-18 }	B85102	1000	0.5	Carbon..... 3
R-21 }				
R-17 }	B84223	22K	0.5	Carbon..... 2
R-47 }				
R-19 }	B85224	220K	0.5	Carbon..... 2
R-30 }				
R-20	Part of 13X549 Cable and Socket Assembly			
R-22	43X217	6.2		Wire Wound.. 1
R-23	B85153	15K	0.5	Carbon..... 1
R-24	36X363	.5 meg.		Volume Control 1
R-25 }				
R-40 }	B85105	1 meg.	0.5	Carbon..... 3
R-41 }				
R-26	B85473	47 K	0.5	Carbon..... 1
R-27	40X286	3 meg.		Tone Control.. 1
R-28	B85475	4.7 meg.	0.5	Carbon..... 1
R-31	B83514	510K	0.5	Carbon..... 1
R-39	B83913	91K	0.5	Carbon..... 1
R-43	B84225	2.2 meg.	0.5	Carbon..... 1
R-44	C84273	27K	1.0	Carbon..... 1
R-45	B85474	470K	0.5	Carbon..... 1

TRANSFORMERS AND COILS

L-1	9A1881	Filament Choke Assembly.....	1
L-2 }			
L-4 }	9A1880	FM R-F Plate Choke.....	2
L-3	9A1946	FM R-F Coil.....	1
L-5	9A1882	FM Oscillator Plate Choke.....	1

MODELS 84WG-2718A,
84WG-2720A

T-1	9A1960	Di-Pole Antenna Assembly.....	1
T-2	9A1945	FM Antenna Coil.....	1

MODELS 84WG-2718B,
84WG-2724A

T-1	9A1968	Di-Pole Antenna Assembly.....	1
T-2	9A1966	FM Antenna Coil.....	1
T-3	9A1957	"D" Antenna Coil Assembly.....	1
T-4	26A436	Loop Antenna Assembly.....	1
T-5	9A1948	Oscillator Coil (FM).....	1
T-6	9A1947	Interstage "B" & "D" Range Coil Assembly.....	1
T-7	9A1950	1st I-F Transformer (FM).....	1
T-8	9A1934	1st I-F Transformer (AM).....	1
T-9	9A1933	2nd I-F Transformer (FM).....	1
T-10	9A1935	2nd I-F Transformer (AM).....	1
T-11	9A1936	Discriminator Coil.....	1
T-12	53X286	Power Transformer.....	1
T-13	9A1918	"B" & "D" Oscillator Coil Assembly	1
T-14		Output Transformer.....	1

Ref. No.	Part No.	Description	Qty. Used in Set
----------	----------	-------------	---------------------

MISCELLANEOUS

12A482	12" E.D. Speaker complete with out- put transformer.....	1
3A303	Tube socket—octal (8 prong) molded	3
3A425	Tube socket (miniature).....	5
32X346	Tube shield (miniature).....	6
32X388	Tube Shield (For 12AT7).....	1
3A436	Tube socket (For 12AT7).....	1
3A427	Tube socket (R-F Amp).....	1
3A304	Phono Motor Socket.....	1
3A305	Phono Socket—Single pin.....	1
2A377	Band Switch.....	1
13X328	Line Cord and Plug Assembly.....	1
26A486	Escutcheon and Crystal Assy. (Walnut)	1
26A487	Escutcheon and Crystal Assy. (Blond)	1
10A509	Tuner Buttons (Walnut).....	6
10A674	Tuner Buttons (Blond).....	6
28X320	Springs (Tuner Button).....	6
4X870	Escutcheon Eye (Walnut).....	1
4X1015	Escutcheon Eye (Blond).....	1
10A662	Knob, Band.....	1
10A667	Knob, Tuning.....	1
10A668	Knob, On-Off, Volume.....	1
10A669	Knob, Tone.....	1
10A670	Knob, Tuning.....	1
10A671	Knob, Tone.....	1
10A672	Knob, Band.....	1
10A673	Knob, On-Off, Volume.....	1
25X498	Tuning Eye Clamp.....	1
25X1396	Tuning Eye Bracket.....	1
13X549	Cable and Socket Assembly—Tuning Indicator.....	1
6X21	Rubber Grommets.....	Mtg. Gang 4
20X329	Condenser Cushion Stud.....	Cond. 4

DIAL AND DRIVE ASSEMBLY

26A435	Dial Bracket Assembly.....	1
26A484	Dial and Drum Assembly Complete with Dial Background, Collar, Dial Drum and Dial Scale.....	1
15X221	Pointer.....	1
26X500	Dial Drum Shaft.....	1
26A440	Pulley and Collar Assembly (For dial drum shaft).....	1
26A437	Band Switch Pulley Assembly.....	1
26X468	Band Switch Shaft.....	1
26A441	Crown Gear Assembly (For Mtg. to Band Switch).....	2
26A434	Idle Bracket Assembly.....	1
25X1389	Drive Shaft Bracket.....	1
26X467	Drive Shaft.....	1
24X551	Drive Shaft Spool.....	1
10X60	Drive Cord Assembly (Band Change)	1
28X524	Tension Spring (Band Change).....	1
10X66	Drive Cord and Clip Assembly (Dial Drive).....	1
28X530	Tension Spring (Dial Drive).....	1
41X72	Light Shield (Band Indicator).....	4
41X35	Light Shield (Dial).....	2
7A103	No. 47 Pilot Light.....	6
7A187	Pilot Light Socket Assembly (Dual).....	1
7A209	Indicator Light Socket Assembly.....	4

MODELS 84WG-2718A, 2720A

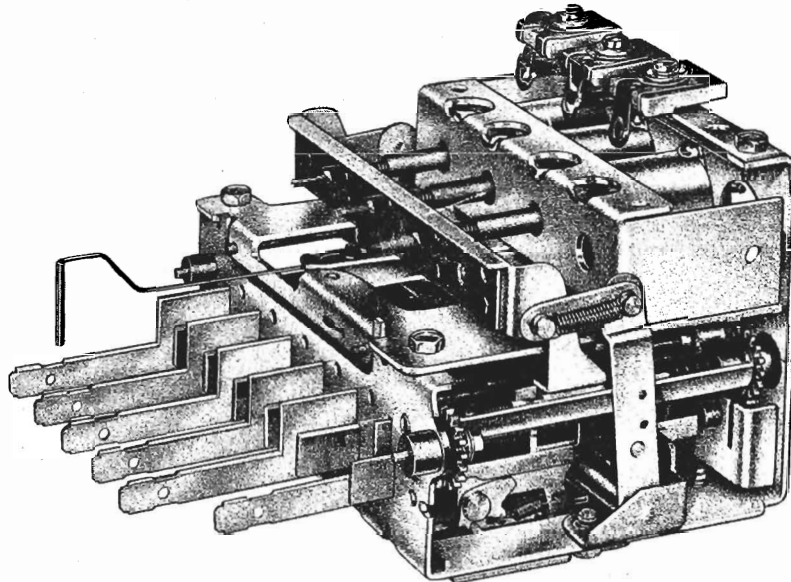
TYPE W-28A147 RECORD CHANGER PARTS

W-15X090-1	Motor Assembly, 60 cycles, 115-120 V.....	1
W-17X412-11	50 Cycle Drive Sleeve Assembly.....	1
Shure P30-1	Crystal Cartridge and semi- Permanent Needle Assembly.....	1
	Semi-Permanent Needle.....	1
	(Specify part number and letters stamped on crystal)	

MODELS 84WG-2718B, 2724B

TYPE V-28A150 RECORD CHANGER PARTS

V-1525-A	Motor Assembly, 60 cycles, or 115-120 V.....	1
V-1923	Motor Assembly, 50 Cycles, 115-120 V.....	1
Shure P30-1	Crystal Cartridge and Semi- Permanent Needle Assembly.....	1
	Semi-Permanent Needle.....	1
	(Specify part number and letters stamped on crystal)	



GENERAL INFORMATION

DESCRIPTION

Automatic Tuner AT-58 is used in Motorola specific auto receivers using Chassis 8A, and also in Model CR8. Tuner AT-58 is adapted to fit any receiver using Chassis 8A or Model CR8 by simply using the correct pointer and push buttons.

This is a 3-gang permeability type tuner, mechanically operated by movement of its push buttons. Five pre-set and one manual tuning positions are provided. The frequency range is 535 to 1600 Kc. The pre-set positions can be set in any sequence to any frequency within this range.

SERVICE TOOLS

The simplicity of the tuner allows easy servicing with:

1. 1/4" open end and 1/4" box end wrench.
2. A stiff steel hook 1/16" diameter made of 1/8" rod, ground down and shaped like a #5 to #10 size crochet hook, to hook and unhook the springs.
3. Slab head wrench for coil adjustment: #2/56 head.

TO REMOVE TOP DECK

Unscrew two #8 sheet metal screws (45) on the back of the tuner and two #8 sheet metal screws (45) on the top front of the tuner. (Do not unscrew screws (45) at trimmer bracket). Before removing top deck, unhook springs (53) and links (25). Grasp top deck and lift up and tip back. This leaves both decks open for servicing. See Figures 1 and 2.

SERVICING LOWER DECK

Looking at the top of the lower deck (with front to you), on the right we have the manual drive lead screw assembly (42). The other 5 assemblies (43) are the station set-up screw assemblies.

Note that all assemblies can be easily lifted

out after springs (50) are unhooked.

Note also that unless a push button arm (1) is pushed in, all assemblies lay flat. When a push button arm (1) is pushed in, the assembly is tilted about 30°.

Visual inspection will show correct location of all springs in the assemblies and those which hold down the assemblies.

Note action of gear train as manual knob is turned and push button arm is pushed in so gears mesh. Automatic tuning buttons can be checked for any binding by trying each button at their present setting.

DRIVE ARM ADJUSTMENT

It is very important that the carriage drive assembly (12) be correctly adjusted in its bearings so as not to bind or be too loose and allow it to twist and force the tuner out of alignment.

On the left side of the lower deck, you will find a set screw (47) and lock nut (30) for assembly adjustment. Note that the assembly is floated in the base bracket (7) between two ball bearings (4), one on each end. Adjust by loosening lock nut (30) and then turn set screw (47) so that all bearing play is eliminated but yet carriage drive assembly (12) moves freely. Tighten lock nut (30) after adjustment. Before hooking spring (54), tip the tuner several times to make sure carriage drive assembly (12) is free enough to swing up or down by its own weight.

POINTER REPLACEMENT

The pointer is easily removed by downward and outward pressure to unhook it from the pointer arm (2). Pointer is replaced by reversing procedure. Be sure that the correct pointer is used; pointers vary in length, depending on which receiver tuner is to be used in. See Specific Radio Service Manual (i.e., FD8, OE2, etc.) for part number of pointer.

ANT., RF OR OSC. CORE REPLACEMENT

The tuner cores (18) are easily unscrewed from clip (14) and pulled out when carriage assembly (13) is extended. Note that the cores are coded with a paint dot on the screw portion; always use replacement cores bearing the same color coding. When ordering replacement cores, always specify color coding together with part number.

TO SET THE PUSH BUTTONS

1. Turn receiver "on" and allow it to warm up for a few minutes.

2. Push the first automatic tuning button in as far as it will go and HOLD IT THAT WAY.

3. With the tuning knob, tune in the station you desire to set up. Tune carefully until you are exactly on the station; tuning to either side of it will result in poor tone quality. The pointer will indicate station being set up. Release button and knob after tuning in station.

4. Follow above steps 2 and 3 for the remaining four buttons.

SERVICE INFORMATION

The entire top deck of this tuner may be removed, while tuner is mounted in receiver chassis, allowing complete accessibility to all mechanical parts.

TO REPLACE PARTS ON LOWER DECK

Remove top deck of tuner (follow previous instructions). This exposes the 5-station set up screw assemblies (43) and manual lead screw assembly (42). These may be removed by unhooking springs (50) and lifting them out.

If push button arms or slider arms are to be replaced, it will be necessary to remove spring (54); then take out screws (46) from bottom of tuner to allow bracket (7) to move back and permit push button arm assemblies (1) or slider arms (3) to be removed after springs (53) have been removed.

Patience is required to assemble push button arm assemblies (1) and slider arms (3) back into bracket (7). Reassemble tuner by working in reverse order.

Test all parts of lower deck for free operation before assembling to upper deck.

TO REPLACE TOP DECK

Make sure that carriage drive assembly (12) is tipped back (spring (54) unhooked) and carriage assembly (13) carrying the tuning cores is out. Slip in the top deck, making sure the spring washer (70) on the manual drive assembly (42) is between the drive assembly gear and the back of the base before putting in screws and locking the two decks together.

SERVICE HINTS

1. **STATION DRIFT** (Push Buttons). Check the flat friction spring (56) for breaks or permanent set.

2. **TUNER STICKING**. Check collars on manual drive assembly (42). If they are cocked or stuck, replace with new assembly.

3. **HARD TUNING FOR PRE-SETTING**. Check lubricant on the gear train. It should be Stayput #512 or equal.

4. **TWISTING CARRIAGE PLATE**. Due to poor setting of carriage drive assembly (12). See "Drive Arm Adjustment".

5. **ROUGH DRIVE** - Check die cast gears (19, 20 & 21). Check for lubrication (Stayput #512). Check manual

drive bushings.

6. **LATCH BAR JAMMING OUT**. Check the latch bar spring (51) on the back. If it is bent out of shape, turn it 180° and reshape. If it is weak- replace.

7. **STICKING POINTERS**. Check the pointer bearing (6) and make sure the linkage of the assembly is free.

8. **POINTER NOT RE-POSITIONING OR SLOPPY ACTION**. Be sure to check the torsion spring (58) (on the under side of the top deck) for breakage or slipping from the notches on the base and the pointer link plate (34).

MOTOROLA INC.

MODEL AT-58

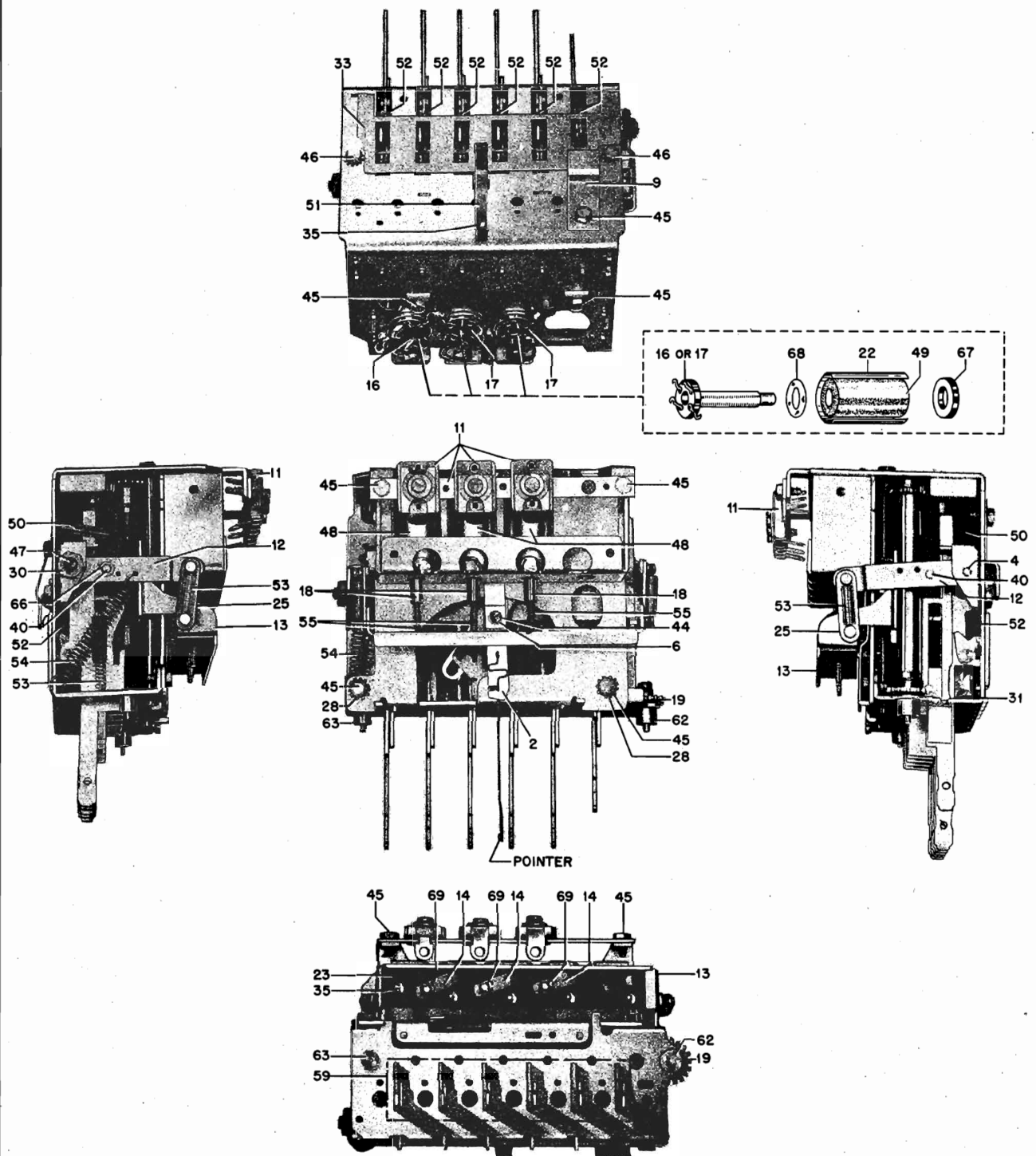


FIGURE 1. AUTOMATIC TUNER AT-58 PARTS LOCATIONS

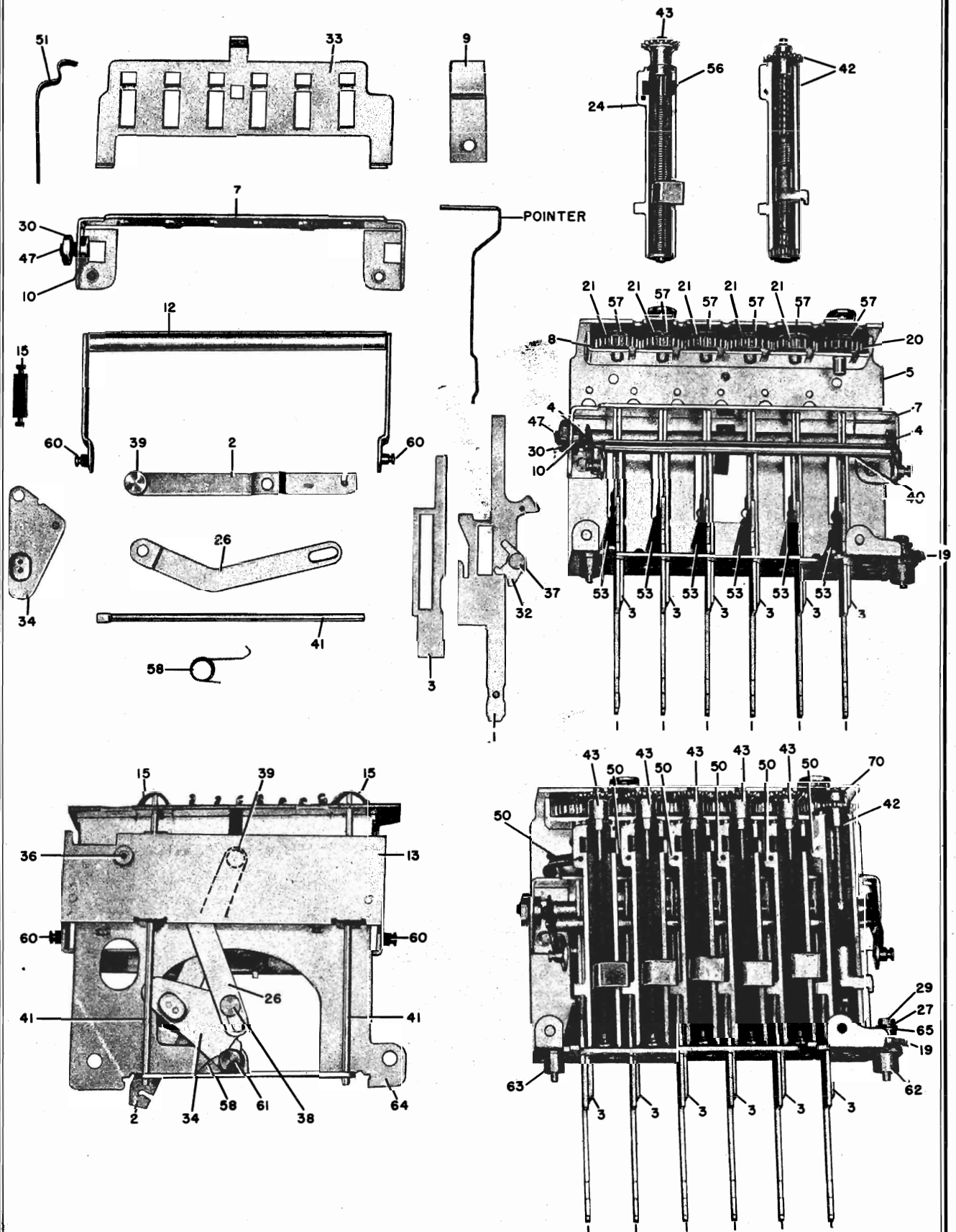


FIGURE 2. AUTOMATIC TUNER AT-58 PARTS LOCATION

REPLACEMENT PARTS LIST

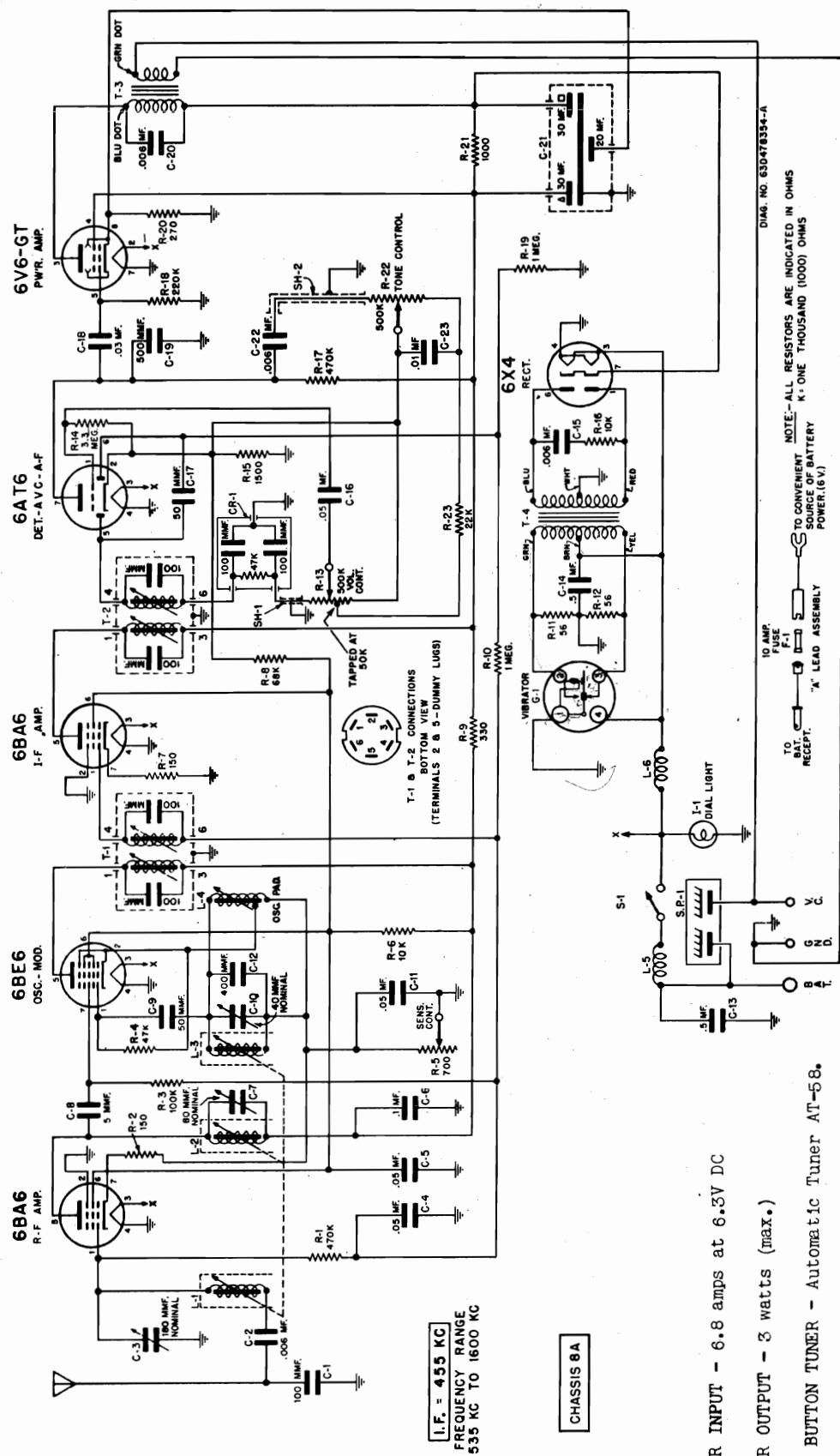
REF. NO.	PART NO.	DESCRIPTION	REF. NO.	PART NO.	DESCRIPTION
1	1X472775	Arm Assembly: push button arm with trip pawl	40	47A472678	Rod, drive
2	45A472698	Arm, pointer	41	47A472682	Rod, guide
3	45A472692	Arm, slider	42	1A472720	Screw Assembly, manual lead: complete with gears, stop & stop actuating lever
4	43A4326	Ball, steel: .125 diameter (tuner drive carriage bearings)	43	1A472722	Screw Assembly, station set-up: complete with gear & carriage stop; stop actuating lever not included
5	1X472773	Base, Gears & Stud Assembly: consists of tuner base, station set-up gear train and locating studs only	44	3S1021	Screw: 2-56 x 1/8 slotted binderhead machine screw; cad pl (pointer bearing mtg)
6	43A472889	Bearing, pointer	45	3S7454	Screw: #8 x 1/4 PKZ plain hex head sheet metal screw; cad pl
7	1X472776	Bracket & Bushing Assembly	46	3S7205	Screw: 8-32 x 1/4 slotted hex head locking type machine screw; cad pl (push arm brkt. mtg)
8	7A472723	Bracket, gear retaining	47	3S3852	Setscrew: 10-32 x 3/8 allen head cup point machine screw (tuner drive carriage mtg)
9	7A482508	Bracket, latch plate retaining	48	26A70878	Shield, coil
10	43A472684	Bushing, drive arm adjustment	49	43A70881	Sleeve, coil: powdered iron
11	20A480600	Capacitors & Bracket Assembly: 3 mica trimmers on bracket	50	41A472675	Spring, coil
12	1X472777	Carriage Drive Assembly	51	41A472780	Spring, latch bar
13	1X472788	Carriage, Insulator & Studs Assembly	52	41A472694	Spring, coil
14	42A70184	Clip, core adjustment: phosphor bronze	53	41A485614	Spring, coil
15	42A472671	Clip, guide rod retaining	54	41A472781	Spring, coil
16 *	24B71879	Coil, oscillator	55	41A77595	Spring, coil slug
17 *	24B71881	Coil, RF & Antenna	56	41A472681	Spring, flat friction (on station set-up lead screw)
18 *	46K472679	Core, Iron & Screw (tuning cores)	57	41A472685	Spring, set-up gear
19	44B472721	Gear, idler	58	41A472659	Spring, torsion
20	44A472682	Gear, manual	59	35A485615	Strip, anti-rattle: felt (cemented to front of tuner base to prevent push button arms from rattling. NOTE: If this strip is used on tuner not previously equipped with one, replace push button arm springs with stronger springs, Part No. 41A485614)
21	44A472676	Gear, station set-up	60	46A472686	Stud
22	14A70876	Insulator, coil sleeve	61	46A472657	Stud, link
23	14A472680	Insulator, core: bakelite (on carriage plate)	62	46A472669	Stud, gear mounting
24	45B472696	Lever, stop actuating (on station set-up lead screw)	63	46A472672	Stud, locating
25	45A472689	Link, drive	64	1X472782	Top Deck Assembly: complete top deck of tuner including coils
26	45A472708	Link, pointer drive	65	4S7551	Washer: 9/32 x .120 x .025 thick; brass (idler gear mtg)
27	4S7683	Lockwasher: #4 internal; cad pl (idler gear mtg)	66	4K73809	Washer, "C" (drive rod retainer)
28	4S7657	Lockwasher: #8 external; cad pl (top deck mtg)	67	4A70873	Washer, coil spacer
29	2S8376	Nut: 4-40 x 3/16 hex; nkl pl (idler gear mtg)	68	4A74571	Washer, paper
30	2S7009	Nut: 10-32 x 3/8 hex; cad pl (setscrew lock)	69	4A70956	Washer, slug insulator: bakelite
31	35A472695	Pad, felt (push button arm cushion)	70	4A473875	Washer, spring (on manual lead screw) ..
32	46A472718	Pawl, trip			
33	64B472716	Plate, latch			
34	64A472706	Plate, pointer link			
35	5S8479	Rivet: .088 x 1/8; steel; nkl pl (latch spring & core ins. mtg)			
36	5A472705	Rivet, eccentric shoulder			
37	5A472670	Rivet, shoulder (pawl mtg)			
38	5A472648	Rivet, shoulder			
39	5A472649	Rivet, shoulder			

* Specify color of paint dot coding on old part when ordering.

MODELS OE8, PC3, PC8,
SR6, 8FDT, 8GMT, etc.
CHASSIS 8A

MOTOROLA INC.

MODELS BK8, BK8X, CT8,
FD8, KR8, NH8, OE2



TO SET THE PUSH BUTTONS

1. Turn radio ON and allow it to warm up for a few minutes.
2. Push the number "1" button in as far as it will go and HOLD IT THAT WAY.
3. With the tuning knob, tune in the station you desire to set up. Tune carefully until you are exactly on the station; tuning to either side of it will result in poor quality. Release button and knob after tuning-in station.
4. Follow above steps 2 and 3 for the remaining four buttons.

MOTOROLA INC.

CHASSIS 8A,
All Models

ALIGNMENT

EQUIPMENT REQUIRED

1. A special tool for adjusting the tuner cores. Use Alignment Tool, Motorola Part No. 66A76278.
2. A small screwdriver for IF & RF alignment.
3. An accurately calibrated AM modulated signal generator.
4. A low range output meter.

5. A special dummy antenna for RF alignment. Construct dummy antenna as shown in Figure 1. The 21" coaxial lead needed in its construction is the same type as used for lead-in on Motorola car antennas.

PROCEDURE

1. Expose alignment adjustment screws as follows:
Remove the top and bottom covers; replace three front plate screws to hold front plate in position after making sure that the plastic idler gear engages gear on tuner and power switch operating stud engages power switch throw plate. On some models it will also be necessary to remove the escutcheon and escutcheon spacer.
2. Connect a PM speaker (3.2 ohm VC) to VC and GND terminals and connect the output meter across voice coil.
3. Connect a .6 volt storage battery to GND (or chassis) and BAT terminals of receiver; turn receiver on and allow it to warm up for a few minutes. Set receiver volume control at maximum. Push "M" button (far enough so it will lock in) to place tuner in manual position.
4. Sensitivity Control. This control must be set to provide $2 \pm 1/2$ volts bias on the RF tubes before alignment is started. Measure this voltage between sensitivity control terminal and chassis.
5. For greatest accuracy, keep output of receiver at approximately 1 watt (1 watt = 1.79 volts on output meter) throughout alignment by reducing generator output (not receiver volume control) as stages are brought into alignment.

6. IF & RF ALIGNMENT - See Alignment Chart

IMPORTANT: Do not push in on the alignment tool when adjusting the tuner cores. The slightest inward pressure on the alignment tool may move the tuner carriage and result in inaccurate alignment.

7. SETTING THE SENSITIVITY CONTROL - After alignment is completed, set signal generator to 600 Kc and adjust its output to 1.3 microvolts. Adjust the sensitivity control to provide 1 watt output (1 watt = 1.79 volts on output meter).

8. ANTENNA TRIMMER ADJUSTMENT - Once alignment has been satisfactorily performed, no further ad-

justment of any alignment screws should be made except to align the antenna trimmer (7) to car antenna after receiver is installed in car. This adjustment should be made with antenna fully extended and receiver set to approximately 1400 Kc. Peak the trimmer for maximum volume of a weak station or background noise between stations.

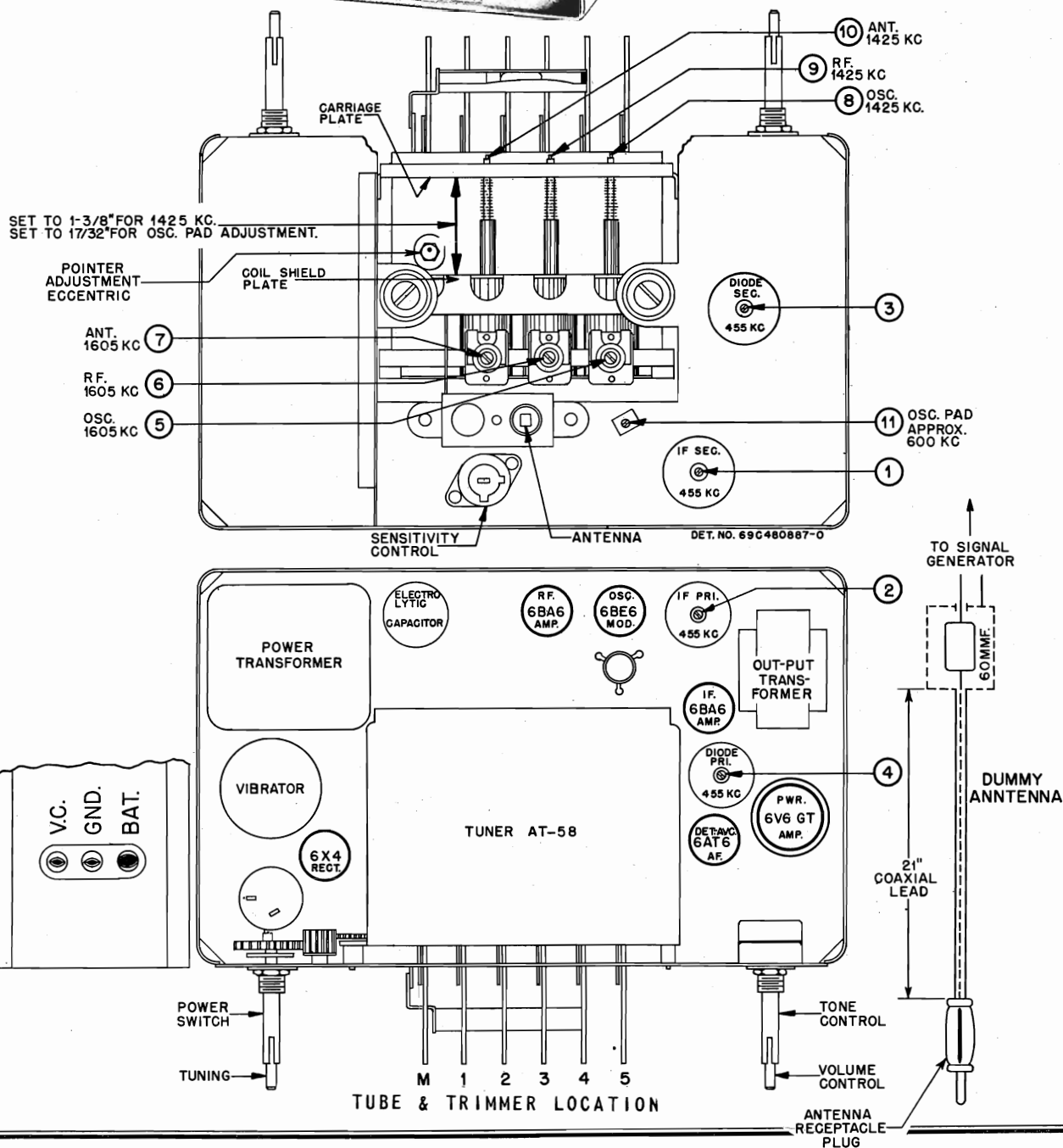
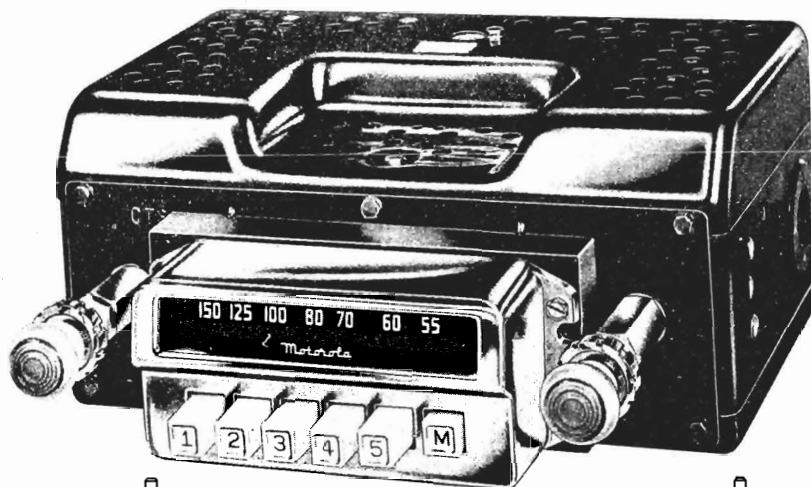
9. POINTER ADJUSTMENT - The pointer can be moved slightly for calibration correction by turning the eccentric adjustment rivet. This rivet has a 1/4" hex head and is exposed only when tuner is tuned to high frequency end. See Figure 1 for its location.

STEP	TUNER SET TO	DUMMY ANTENNA	SIGNAL GENERATOR CONNECTED TO	SIGNAL GENERATOR FREQUENCY	ADJUST TRIMMER OR CORE	REMARKS
1.	High frequency end (cores out)	.1 mf	H1 side - 6BE6 grid (pin #7) Lo side - chassis	455 Kc	1, 2, 3 & 4	Peak for maximum in order indicated. Check by repeating procedure.
2.	High frequency end. Cores should project 1-1/8" from cans. (Screw out if necessary).	Special - See Fig. 1.	Ant. receptacle through special dummy.	1605 Kc	5, 6 & 7	Peak for max. in order indicated.
3.	Set spacing between carriage plate and coil shield plate to 1-3/8".	"	"	1425 Kc	8, 9 & 10	Peak for max. in order indicated.
4.	Set spacing between carriage plate and coil shield plate to 17/32"	"	"	Turn generator power off.	11	Peak oscillator padder for maximum noise. See *
5.	Approx. 1400 Kc	-	-	-	7	With set installed in car, peak antenna trimmer for maximum noise or volume of a weak station. Car antenna should be fully extended.

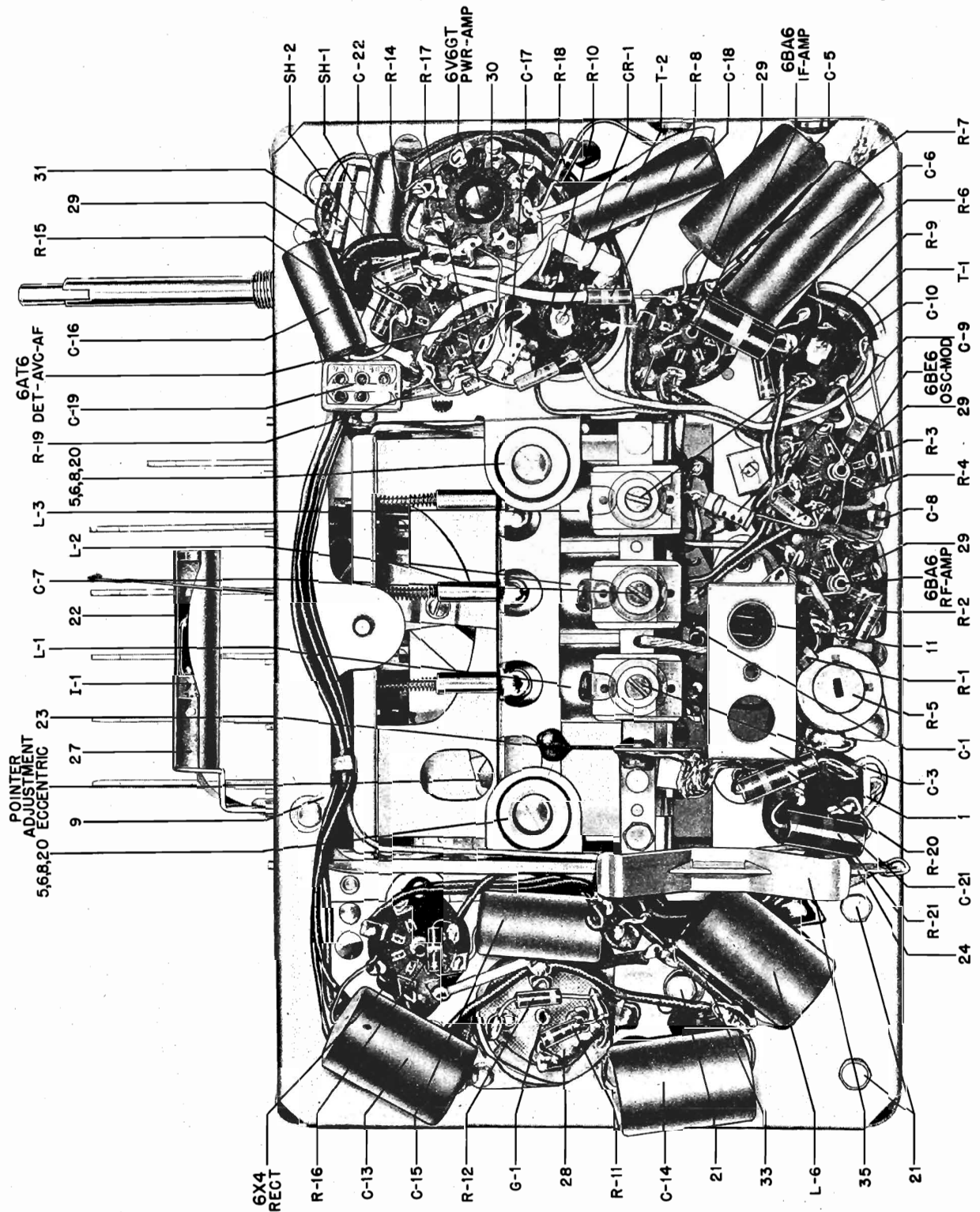
* If padder core (11) must be moved more than 1/2 turn from its original position, repeat steps 2, 3 & 4 until it is necessary to move the padder core less than 1/2 turn in this step.

CHASSIS 8A,
All Models

MOTOROLA INC.



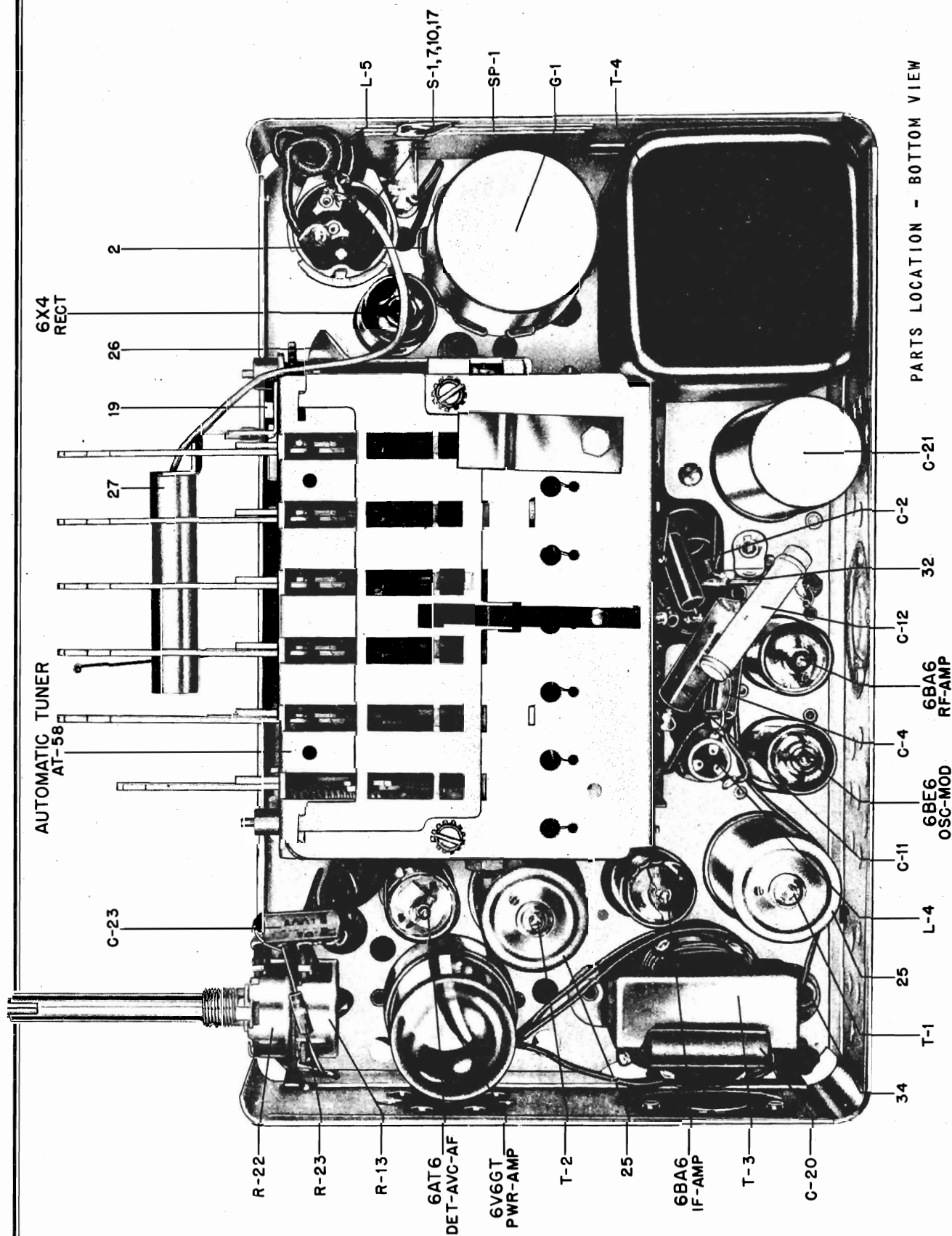
MOTOROLA INC.

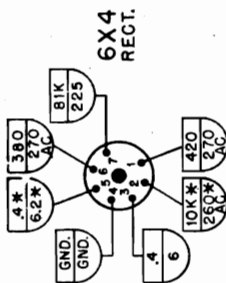
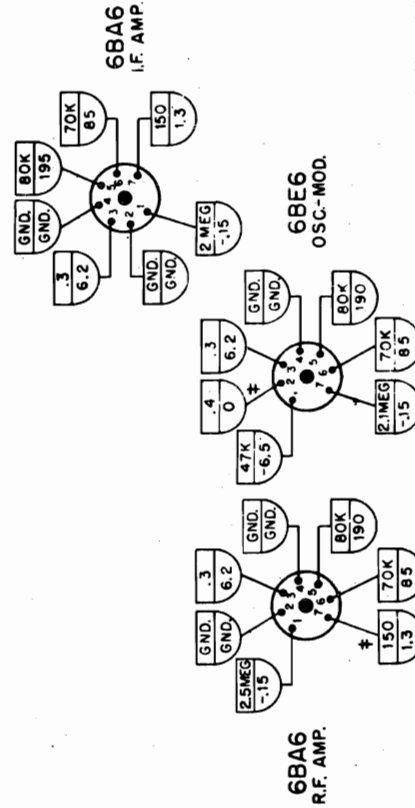
CHASSIS 8A,
All Models

CHASSIS 8A PARTS LOCATION - BOTTOM VIEW

CHASSIS 8A,
All Models

MOTOROLA INC.





NOTE

A V.T.V.M. WAS USED TO MAKE ALL MEASUREMENTS.
MEASUREMENTS MADE FROM TUBE BASE PIN TERMINAL TO CHASSIS.
VOLUME CONTROL ON FULL & NO STATION TUNED IN.
TONE CONTROL IN 'HIGH' POSITION.
SENSITIVITY CONTROL SET TO MINIMUM RESISTANCE.
6.3 VOLTS INPUT AT SPARK PLATE.
ALL VOLTAGE MEASUREMENTS D.C. UNLESS OTHERWISE SPECIFIED.
VOLTAGE TOLERANCE $\pm 10\%$
RESISTANCE TOLERANCE $\pm 20\%$
* = TIE POINT.
* READINGS VARY WITH SENSITIVITY CONTROL MINIMUM RESISTANCE OR SETTING.
N.C. = NO CONNECTION.
GND. = GROUND TO CHASSIS.
K = 1000 (ONE THOUSAND) OHMS.
☐ = RESISTANCE MEASUREMENTS.
☐ = VOLTAGE MEASUREMENTS.

REF.	NO.	PART NO.	DESCRIPTION
			CHASSIS 8A ELECTRICAL PARTS
			CAPACITORS
	C-1	21B77562	Ceramic: 100 mmf 500V
	C-2	8A4528	Paper: .006 mf 100V
	C-3	20A480600	Trimmer, variable mica: 50 to 180 mmf; on same bracket as C-7 and C-10
	C-4	8A13514	Paper: .05 mf 100V
	C-5	8A14791	Paper: .05 mf 400V
	C-6	8K12166	Paper: .1 mf 400V
REF.	NO.	PART NO.	DESCRIPTION
	C-7	20A480600	Trimmer, variable mica: 50 to 180 mmf; on same bracket as C-3 & C-10
	C-8	21K70720	Molded: 5 mmf 500V
	C-9	21K74681	Ceramic: 50 mmf 300V
	C-10	20A480600	Trimmer, variable mica: 30 to 60 mmf; on same bracket as C-3 & C-7
	C-11	8A13514	Paper: .05 mf 100V
	C-12	21A71872	Ceramic: 400 mmf 5% 500V
	C-13	8A17028	Paper: .5 mf 100V

CHASSIS 8A, All models

MOTOROLA INC.

REF. NO.	PART NO.	DESCRIPTION
C-14	8A17028	Paper: .5 mf 100V
C-15	8A12840	Paper: .006 mf 1600V
C-16	8A13514	Paper: .05 mf 100V
C-17	21K74661	Ceramic: 50 mmf 300V
C-18	8A71911	Paper: .03 mf 400V
C-19	21R6639	Mica: 500 mmf 500V
C-20	8A71910	Paper: .008 mf 400V
C-21	23A473015	Electrolytic: 30-30-20 mf/350-300-25V...
C-22	8A71910	Paper: .008 mf 400V
C-23	8A472754	Paper: .01 mf 100V

CAPACITOR-RESISTOR

CR-1	21A472571	Capacitor-Resistor: 100 mmf-47,000 ohms 100 mmf
------	-----------	--

FUSE

F-1	65A10266	Fuse: 10 amp; type 3AG
-----	----------	------------------------------

VIBRATOR

G-1	48B3333	Vibrator: non-sync; 4 pin
-----	---------	---------------------------------

DIAL LIGHT

I-1	65X10867	Bulb: 6.3V; .25A; bayonet base; clear...
-----	----------	--

COILS

L-1,2	24B71881	RF & Antenna coil (specify color of paint dot on old coil when ordering)
L-3	24B71879	Oscillator coil (specify color of paint dot on old coil when ordering)
L-4	24B70227	Oscillator padder coil: complete with iron tuning core
L-5	24K78026	Choke
L-6	24A472535	Choke, hash

RESISTORS

NOTE: All resistors are 1/2W 20% carbon insulated type unless otherwise specified.

R-1	6R6032	470,000
R-2	6R3992	150
R-3	6R6075	100,000
R-4	6R6056	47,000
R-5	18K77552	Sensitivity control: 700 ohms
R-6	6R476060	10,000 2W
R-7	6R3992	150
R-8	6R6001	68,000
R-9	6R6010	330
R-10	6R6004	1 meg
R-11	6R5614	56 10%
R-12	6R5614	56 10%
R-13	18A472863	Volume Control 500,000 ohms; tapped at 50,000 ohms (dual-also includes tone con- trol R-22)
R-14	6R2118	3.3 Meg
R-15	6R6161	1500
R-16	6R6054	10,000
R-17	6R6032	470,000
R-18	6R6015	220,000
R-19	6R6004	1 meg
R-20	6R6336	270 10% 1W
R-21	6R476004	1,000 2W
R-22	18A472863	Tone Control: 500,000 ohms (dual - also includes volume control R-13)
R-23	6R6028	22,000

SWITCH

S-1	1A472891	Power Switch: complete with mounting stud
-----	----------	---

SHIELDS

SH-1	30K472998	Cable, volume control: single-conductor; white; shielded
------	-----------	---

REF. NO.	PART NO.	DESCRIPTION
SH-2	30K472997	Cable, volume control: single-conductor; blue; shielded
SPARK PLATE		
SP-1	1A472606	Spark Plate Assembly
TRANSFORMERS		
T-1,2	24B76553	Diode or IF, 455 Kc: complete with padding capacitors & tuning cores, but less shield
T-3	25B70171	Output transformer
T-4	25B472533	Power transformer

TUNER

1X472770	AT-58 Automatic Tuner (see separate Ser- vice Manual-Motorola Part No. 54P480955 for complete breakdown)
----------	--

CHASSIS 8A MECHANICAL PARTS

1	7A472580	Bracket, antenna receptacle mtg
2	42A4215	Clip, vibrator grounding
3	15K472593	Cover, bottom
4	15C472592	Cover, top
5	4A51289	Cupwasher (tuner mtg)
6	37A12949	Grommet, rubber (tuner mtg)
7	4S7657	Lockwasher: #8 external; cad. pl. (power sw. mtg)
8	4S7671	Lockwasher: #8 split; cad. pl. (tuner mtg)
9	29R5239	Lug, soldering
10	6A4472735	Plate, throw (power switch actuating plate)
11	1X70641	Receptacle, antenna
12	5S7771	Rivet: .088 x 3/16 steel; nickel plated (tube socket mtg)
13	7S7706	Rivet: .122 x 1/8 steel; nickel plated (term. strip mtg)
14	5S7707	Rivet: .122 x 5/32 steel; nickel plated (tube socket mtg)
15	5S7701	Rivet: .122 x 3/16 steel; nickel plated (vib. socket & output trans. mtg)
16	5S7751	Rivet: .122 x 1/4 steel; antique copper finish (spark plate mtg)
17	3S7150	Screw: #8 x 3/16 slotted binderhead machine screw, cad. pl. (pwr. switch mtg)
18	3S7456	Screw: #8 x 1/4 PKA slotted acorn head sheet metal screw; antique copper finish (housing screws)
19	3S7454	Screw: #8 x 1/4 PKZ plain hex head sheet metal screw; cad. pl. (pilot light socket mounting)
20	3S7154	Screw: 8-32 x 1/4 slotted binderhead machine screw; cad. pl. (tuner mtg) ...
21	3S3397	Screw: #8 x 5/16 PKZ plain hex head sheet metal screw; cad. pl. (pwr trans mtg) ..
22	1X473150	Shield Assembly, light
23	26A473201	Shield, hash
24	26A472560	Shield, hash
25	1A71049	Shield & Sleeve Assembly (for T-1 & T-2)
26	26A472602	Shield, tuner
27	9A472905	Socket, pilot light: includes brackets..
28	9A70208	Socket, tube: 4 pin; with grounding lug (vibrator socket)
29	9A472534	Socket, tube: miniature; 7 prong
30	9A8788	Socket, tube: octal
31	31K27504	Strip, terminal: 1 insulated lug, #1 mtg
32	31K66126	Strip, terminal: 2 insulated lugs, #2 mtg
33	31A472574	Strip, terminal: 4 insulated lugs, #4 mtg
34	4S7555	Washer: 1/4-.128-.033; steel; cad. pl. (output trans. mtg)
35	39A260A8	Wiper, grounding

RECEIVER AND SPEAKER INSTALLATION

Install the antenna following instructions supplied with antenna. (Use Motorola Antenna M-276, M-277, M-280, M-255 or M-306).

Refer to Figure 1 for installation detail.

1. Expose the radio openings in the instrument panel.
2. Screw the four speaker mounting screws into the holes provided in the back of the grille. The screws are thread-forming type and may start hard; use a 1/4" Spin-tite wrench for easier installation. Install the speaker on the screws as shown.
3. Assemble the receiver mounting bracket to in-

strument panel brace. Do not tighten as yet.

4. Plug antenna lead-in into antenna receptacle located on the top of the set.

5. Remove knobs and mounting nuts from receiver and lift receiver into position behind instrument panel.

6. Holding receiver in position, place mounting nuts on control shaft bushings and tighten securely.

7. Assemble receiver mounting bracket to receiver rear mounting stud. Use the hole which most closely lines up with the receiver rear mounting stud. Adjust position of the mounting bracket so the receiver is supported without any undue strain being placed on the control shafts bushings, then tighten all mounting nuts.

8. If the receiver is installed in a Plymouth car,

POWER INPUT - 9 Amps at 6.3V

POWER OUTPUT - 6 watts (max.)

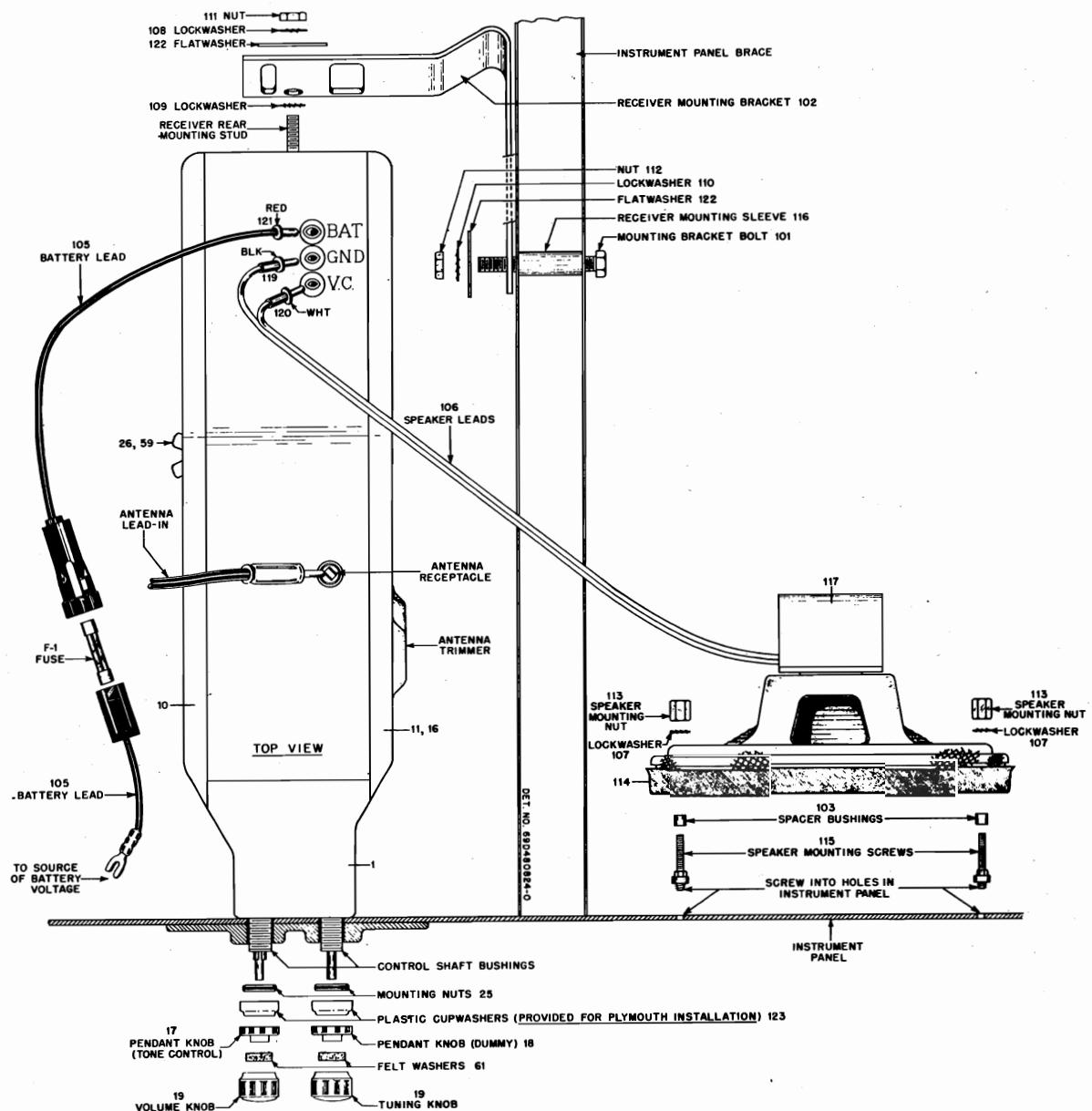


FIGURE 1. RECEIVER & SPEAKER INSTALLATION

use the plastic cup washers to cover the exposed portions of the shaft bushings.

9. Place the tone control and dummy pendant knobs on the shafts.
10. Place a felt washer over each pendant knob.
11. Place knobs on volume and tuning shafts and tighten setscrews securely.
12. Connect speaker leads as shown.
13. Connect the battery lead plug terminal to receiver receptacle marked "BAT" and the lug terminal to a convenient source of battery voltage.
14. Turn radio on. (See OPERATING INSTRUCTIONS). With the dial set to 1400 Kc, the volume control on full, and the antenna fully extended, adjust the antenna trimmer for maximum volume of a weak station or background noise.

TO SET THE PUSH BUTTONS

1. Turn radio on by pushing the top button "in". Allow radio to warm up for a few minutes.
2. Push the number "1" button in as far as it will go and HOLD IT THAT WAY.
3. With the tuning knob, tune in the station you desire to set up. The pointer will indicate the frequency of the station. Tune carefully until you are exactly on the station; tuning to either side of it will result in poor tone quality. Release button and knob after tuning in station.
4. Follow above steps 2 and 3 for the remaining four buttons.

WARNING

Many late model cars develop exceedingly high voltage due to improper adjustment of voltage regulator; this shortens life of radio tubes, vibrator and all other car electrical equipment. If the voltage exceeds 7.4 volts with no load on a fully

charged battery when motor is running at a speed which corresponds to 35 miles per hour, the voltage regulator is defective. Have your auto mechanic replace the voltage regulator.

ELIMINATE INTERFERENCE AS FOLLOWS:

1. Install generator capacitor (Part No. 8A4491) as shown in Figure 2. **WARNING:** Do not connect capacitor to field terminal.

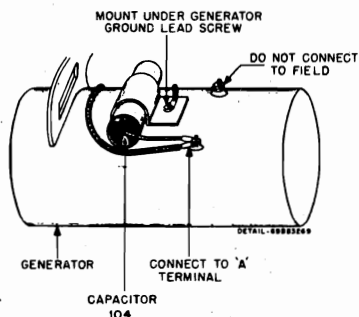


FIGURE 2.

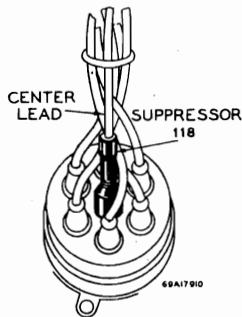


FIGURE 3.

2. Install distributor suppressor as shown in Figure 3.
3. When checking the car for motor noise, clamp the hood down tight. If necessary, install Hood Bond at the shoulder so that the hood makes a good ground to the cowl of the car on the side the antenna is mounted.

OPERATING INSTRUCTIONS

POWER SWITCH. The top button turns the radio ON and OFF. Radio is ON when button is in. Alternate pushes on this button will turn radio on and off.

VOLUME CONTROL. The left-hand knob operates the volume control.

MANUAL TUNING. Push the "M" button in far enough so that it will lock in, then tune stations with the right-hand knob. The dial scale is read in kilocycles by adding one zero to the figures. Always tune carefully until you are exactly on the station; tuning to either side of it will result in poor tone quality.

PUSH BUTTON TUNING. After push buttons have been set up, it is only necessary to push in the button (1, 2, 3, 4 or 5) that has been set to the desired station. Push the button far enough so that it will lock in. The dial pointer will indicate the frequency of the station being received.

tone control. Tone can be varied by turning pendant tone knob which is located on the same shaft but behind the volume knob.

ALIGNMENT

EQUIPMENT REQUIRED

1. A special tool for adjusting the tuner cores. Use Alignment Tool, Motorola Part No. 66A78278.
2. A small screwdriver for IF & RF alignment.
3. An accurately calibrated AM modulated signal generator.
4. A low range output meter.
5. A special dummy antenna for RF alignment. Construct dummy antenna as shown in Figure 4. The 21" coaxial lead needed in its construction is the same type as used for lead-in on Motorola car antennas.

PROCEDURE

1. Remove the right and left housing covers. Also remove the chrome plated escutcheon from the front of the set. All adjustments are now exposed.
2. Connect a PM speaker (3.2 ohm VC) to VC and GND. terminals and connect the output meter across the voice coil.
3. Connect a 6 volt storage battery to chassis and BAT. terminals of receiver; turn receiver on and allow it to warm up for a few minutes. Push "M" button to place tuner in manual position. Set re-

ceiver volume control at maximum and tone control to treble (high) position.

4. **Sensitivity Control.** This control must be set to provide $2 \pm 1/2$ volts bias on the RF tubes before alignment is started. Measure this voltage between sensitivity control terminal and chassis.

5. For greatest accuracy, keep output of receiver at approximately 1 watt (1 watt = 1.79 volts on output meter) throughout alignment by reducing generator output (not receiver volume control) as stages are brought into alignment.

6. IF ALIGNMENT

A. Connect high side of signal generator through .1 mf capacitor to 6BE6 grid (pin #7) and the low side to chassis. Set generator to 455 Kc and peak adjustments (1, 2, 3 & 4), in this order, for maximum output.

7. RF ALIGNMENT

A. Connect signal generator to antenna receptacle through special dummy antenna (60 mmf capacitor in series with 21" coax lead).

B. With the tuning knob, tune to the extreme high frequency position and screw coil cores out so that at least $1-1/8$ " of all three cores shall be outside of the coil shield can. Set signal generator to 1605 Kc and peak trimmers (5, 6 & 7), in this order.

C. Turn the tuning knob until carriage plate is spaced exactly $1-3/8$ " from coil shield plate. Set signal generator to 1425 Kc and adjust coil cores (8, 9 & 10), in this order, for maximum output.

D. Turn the tuning knob until the carriage plate is spaced approx. $17/32$ " from coil shield plate. Leave signal generator connected but turn signal generator power off. Peak oscillator padder core (11) for maximum noise. If the padder core must be moved more than $1/2$ turn from its original position, the carriage plate should be moved to extreme high frequency position, the coil cores (8, 9 & 10) should be screwed out so that $1-1/8$ " of each core is exposed and steps 7A, B, C & D repeated until it is necessary to move the padder

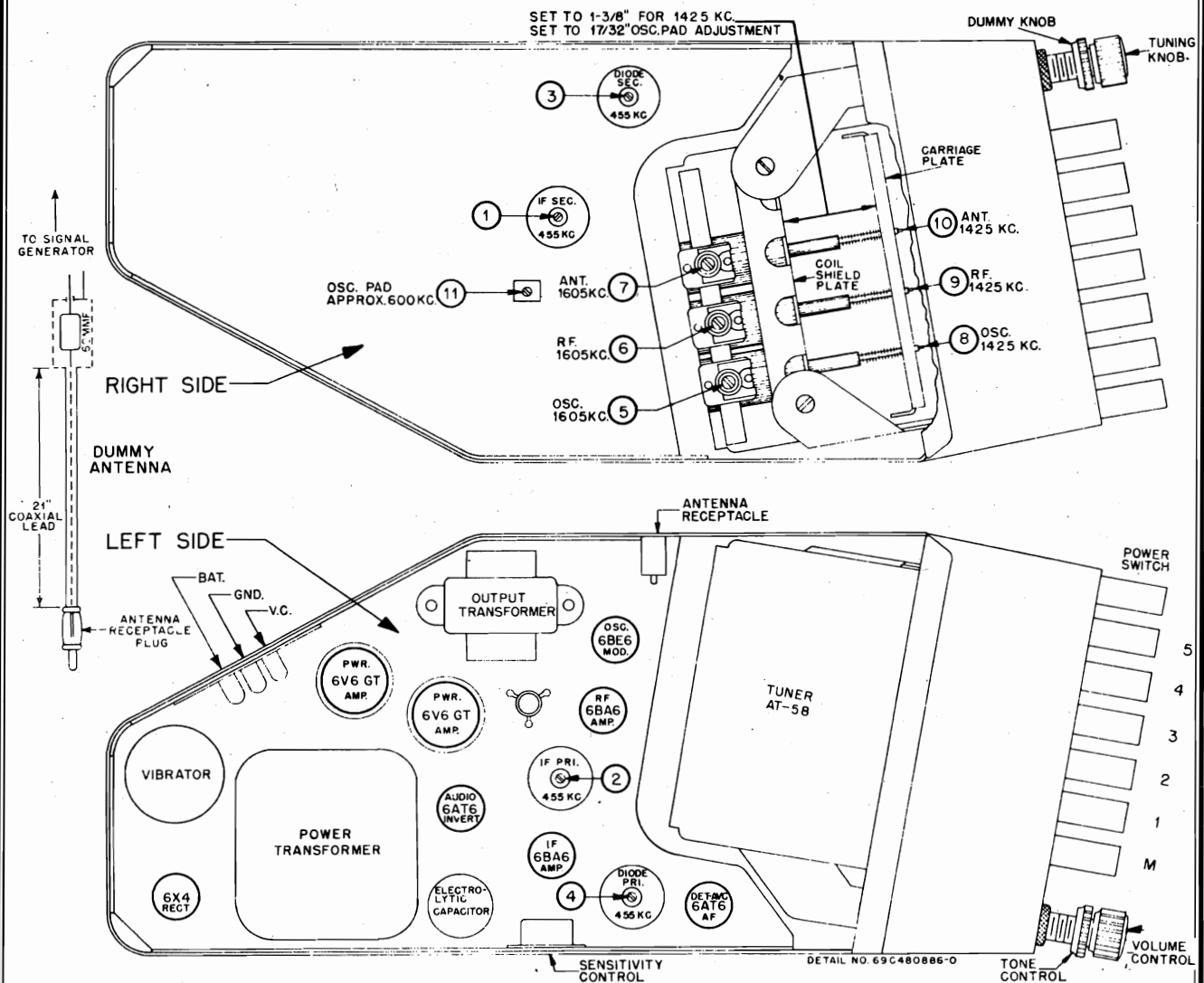


FIGURE 4. TUBE & TRIMMER LOCATIONS

core less than 1/2 turn in this step.

IMPORTANT: Do not push in on the alignment tool when adjusting the tuner cores. The slightest inward pressure on the alignment tool may move the tuner carriage and result in inaccurate alignment.

8. SETTING THE SENSITIVITY CONTROL. After alignment is completed, set signal generator to 600 Kc and adjust its output to 1.3 microvolts. Adjust the sensitivity control to provide 1 watt output (1 watt = 1.79 volts on output meter).

9. ANTENNA TRIMMER ADJUSTMENT. Once steps 7A, B, C, D & 8 have been satisfactorily performed, no further adjustment of any alignment screws should be made except to align the antenna trimmer (7) to car antenna after receiver is installed in car. This adjustment should be made with antenna fully extended and receiver set to approximately 1400 Kc. Peak the trimmer for maximum volume of a weak station or background noise between stations.

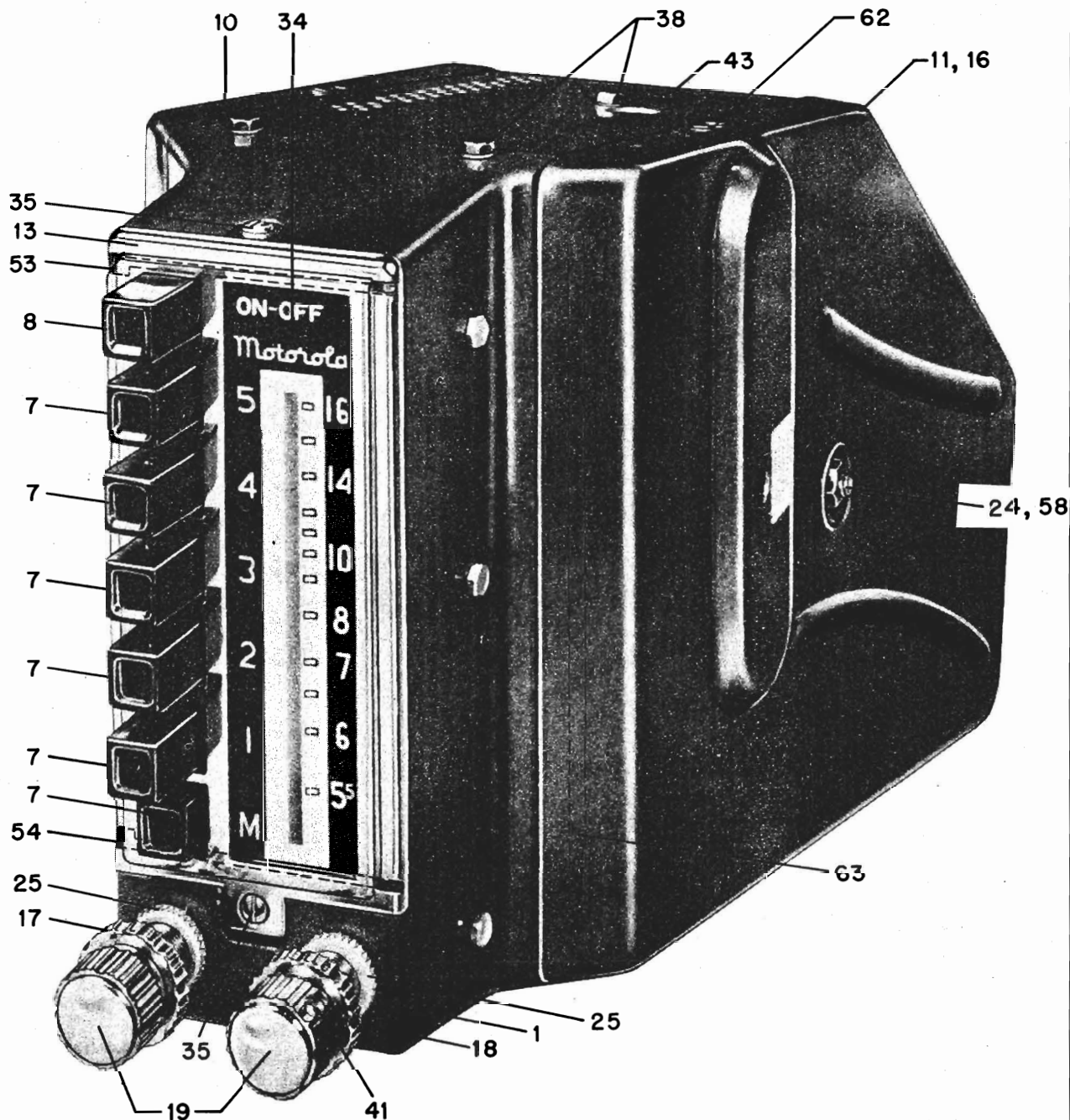


FIGURE 5. PARTS LOCATION - FRONT OF RECEIVER

MOTOROLA INC.

MODEL CR8

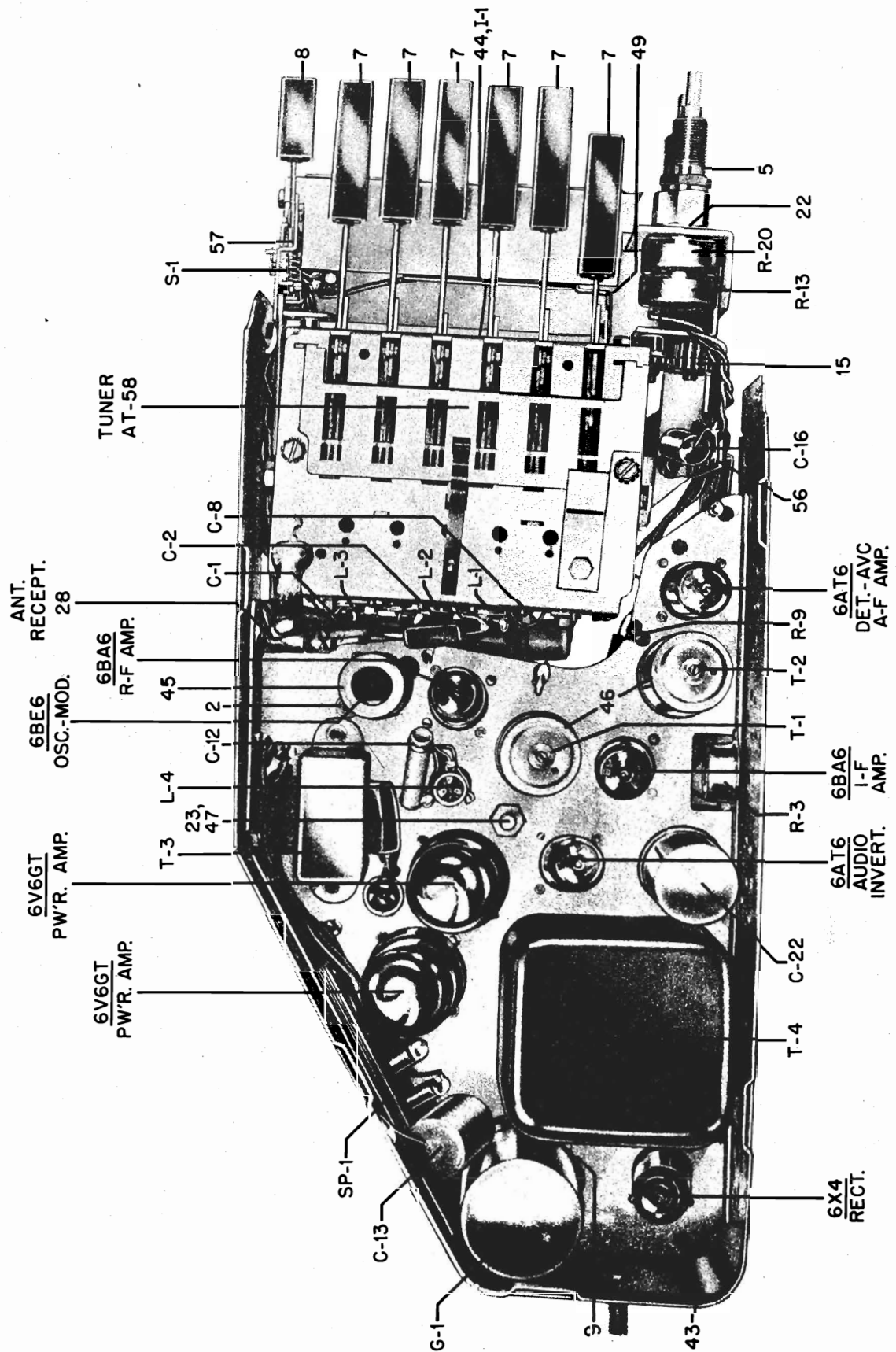


FIGURE 6. PARTS LOCATION - LEFT SIDE OF RECEIVER

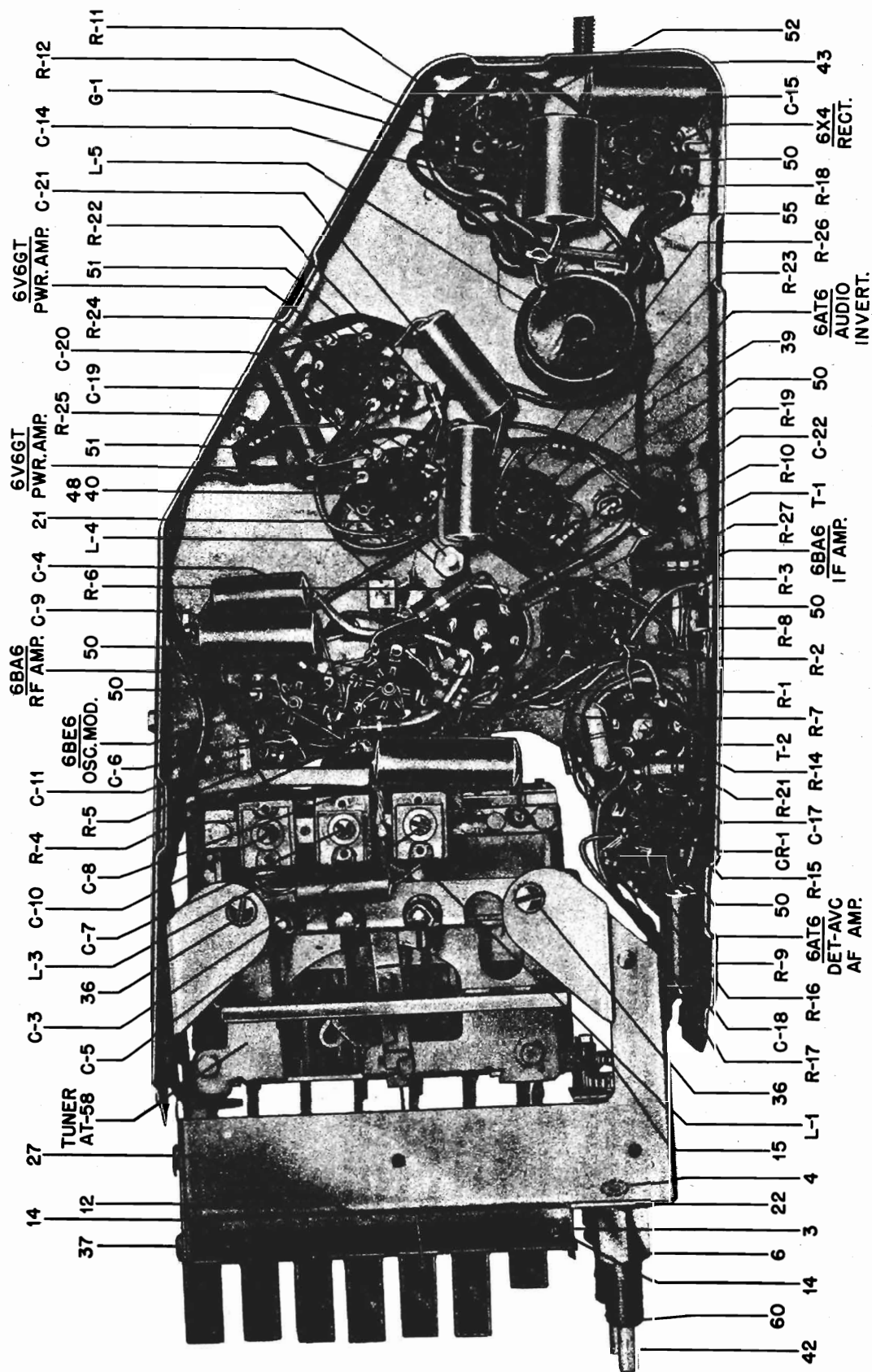


FIGURE 7. PARTS LOCATION - RIGHT SIDE OF RECEIVER

MOTOROLA INC.

MODEL CR8

ELECTRICAL PARTS

CAPACITORS

C-1	21B77582	Ceramic: 100 mmf
C-2	8C4529	Paper: .008 mf 100V
C-3	20A480800	Trimmer, variable mica: 50 to 180 mmf; on same bracket as C-7 and C-10
C-4	8A13514	Paper: .05 mf 100V
C-5	8A13514	Paper: .05 mf 100V
C-6	21K70720	Molded: 5 mmf
C-7	20A480800	Trimmer, variable mica: 50 to 180 mmf; on same bracket as C-3 and C-10
C-8	8K13188	Paper: .1 mf 400V
C-9	8A14791	Paper: .05 mf 400V
C-10	20A480800	Trimmer, variable mica: 30 to 60 mmf; on same bracket as C-3 and C-7
C-11	21R6513	Mica: 50 mmf 300V
or	21K74661	Ceramic: 50 mmf 300V
C-12	21A71872	Ceramic: 400 mmf
C-13	8A17028	Paper: .5 mf 100V
C-14	8A17028	Paper: .5 mf 100V
C-15	8K15188	Paper: .007 mf 1600V
C-16	8A13514	Paper: .05 mf 100V
C-17	21R6513	Mica: 50 mmf 300V
or	21K74661	Ceramic: 50 mmf 300V
C-18	8A71910	Paper: .006 mf 400V
C-19	8K71911	Paper: .03 mf 400V
C-20	8K13185	Paper: .003 mf 1000V
C-21	8K71911	Paper: .03 mf 400V
C-22	23A472570	Electrolytic: 20-80 mf/ 400-350V

CAPACITOR-RESISTOR

CR-1	21A472571	Capacitor-Resistor: 100 mmf - 47,000 ohms; 100 mmf
------	-----------	--

FUSE

F-1	65K4165	Fuse: 15 amp; type 3AG
-----	---------	------------------------------

VIBRATOR

G-1	48B3333	Vibrator: non-sync; 4 pin
-----	---------	---------------------------------

PILOT LIGHT

I-1	65X10867	Bulb: 6.3V, .25A; bayonet base; clear ...
-----	----------	---

COILS

L-1,2	24B71881	RF and Antenna Coil (specify color of paint dot on old coil when ordering) ..
L-3	24B71879	Oscillator Coil (specify color of paint dot on old coil when ordering)
L-4	24B70227	Oscillator padder coil: complete with iron tuning core
L-5	24A473954	Choke, hash

RESISTORS

Note: All resistors are 1/2 watt, 20% carbon, insulated type unless otherwise specified.

R-1	6R8032	470,000
R-2	6R3982	150
R-3	18K77552	Sensitivity control: 700 ohms
R-4	6R8075	100,000
R-5	6R8056	47,000
R-6	6R476080	10,000 2W
R-7	6R3992	150
R-8	6R8004	1 meg
R-9	6R8001	68,000
R-10	6R8010	330
R-11	6R5614	56 10%
R-12	6R5614	56 10%
R-13	18A472999	Volume Control: 500,000 ohms (dual -also includes tone control R-20)
R-14	6R8004	1 meg
R-15	6R8004	1 meg
R-16	6R2118	3.3 meg
R-17	6R6161	1500
R-18	6R8054	10,000
R-19	6R8069	2200 10%
R-20	18A472999	Tone control: 500,000 ohms (dual -also includes volume control R-13)
R-21	6R8015	220,000
R-22	6R8015	220,000
R-23	6R8015	220,000
R-24	6R8015	220,000
R-25	6R8889	220 10% 1W
R-26	6R8320	10,000 10%
R-27	6R476130	2200 2W

SWITCH

S-1	40B473204	Power switch: SPST; switch only
-----	-----------	---------------------------------------

SPARK PLATE ASSEMBLY

SP-1	1X480604	Spark Plate Assembly: complete
------	----------	--------------------------------------

TRANSFORMERS

T-1,2	24B76553	Diode or IF, 455 Kc: complete with padding capacitors and tuning cores, but less shield
T-3	25B472558	Output Transformer
T-4	25C472586	Power transformer

TUNER

1X472770	AT-58 Automatic Tuner (See separate Service Manual -Motorola Part No. 54P480955 for complete breakdown)
----------	---

MODEL CR8

MOTOROLA INC.

MECHANICAL PARTS

1	13D472973	Base, escutcheon	33	5S7728	Rivet: .122 x 5/16 steel; nickel plated (spark plate mtg)
2	26A473002	Base, tube shield mounting	34	34B473122	Scale, dial: glass
3	7B473037	Bracket, dial background mtg	35	3S8022	Screw: 4-40 x 1/4 slotted binder head machine screw; cadmium plated (escutcheon mtg)
4	43A472869	Bushing, mounting (tuning shaft bushing mtg)	36	3S7150	Screw: #8-32 x 3/16 slotted binder head machine screw; (tuner mtg)
5	43K472992	Bushing, receiver mtg: with groove (volume shaft bushing)	37	3S7454	Screw: #8 x 1/4 PKZ slotted hex head sheet metal screw; cad. pl. (pilot light bracket, dial background mtg, etc.)
6	43B472978	Bushing, receiver mounting: without groove (tuning shaft bushing)	38	3S7458	Screw: #8 x 1/4 PKA slotted acorn head sheet metal screw; antique copper finish (housing screws)
7	1X473153	Button, push: includes clip (station selector)	39	3S3397	Screw: #8 x 5/16 PKZ plain hex head sheet metal screw; cad. pl. (pwr. trans mtg).
8	1X473154	Button, push: includes clip (on-off button)	40	3A17388	Screw, cover mtg: 10-24 thread, 4-8/8" long; has formed nut near one end
9	42A4215	Clip, vibrator grounding	41	3S7104	Setscrew: 8-32 x 3/16 slotted headless machine screw; cad. pl.
10	1X473005	Cover Assembly, left-hand	42	1A472995	Shaft Assembly, tuning: consists of tuning shaft and gear
11	1X473007	Cover Assembly, right-hand	43	15D472967	Shell, housing
12	1X473941	Dial Background and Strip Assembly	44	1X473150	Shield, pilot light
13	13C472961	Escutcheon, front plate: polished chrome finish; less dial scale	45	26A90301	Shield, tube
14	5S7805	Eyelet: .140 x .141 (dial background mtg).	46	1A71049	Shield and Sleeve Assembly (for T-1 & T-2)
15	44B472979	Gear, compound idler	47	43K17389	Sleeve, cover spacer (long)
16	14B480671	Insulator, guard (used on right-hand cover)	48	43K17390	Sleeve, cover spacer (short)
17	36B473120	Knob, pendant (tone control)	49	9A472905	Socket, pilot light and bracket
18	36K482504	Knob, pendant (dummy)	50	9A472534	Socket, tube: miniature; 7 prong
19	1X473155	Knob, control: includes setscrew	51	9A8788	Socket, tube: octal
20	4S7651	Lockwasher: #8 internal; cad.pl. (tuner mounting)	52	9A70208	Socket, tube: 4 pin (for vibrator)
21	4S7658	Lockwasher: #10 internal; cadmium plated (on cover mounting screw)	53	42K473148	Strap, dial scale mtg (top)
22	4S7655	Lockwasher: 3/8 internal; cadmium plated (vol. & tuning shaft bushing mtg)	54	42K473149	Strap, dial scale mtg (bottom)
23	2S7030	Nut: #10-24 x 3/8 hex; brass (cover screw mounting)	55	31A472573	Strip, terminal: 2 insulated lugs, #2 mtg
24	2S8351	Nut: #10-24 x 3/8 hex; copper oxide finish (cover mounting)	56	31A473004	Strip, terminal: 3 insulated lugs, end mtg
25	2K473140	Nut, mounting: round; knurled (receiver mounting)	57	1X473142	Switch Assembly: complete; includes push arm, bracket and switch
26	2A17569	Nut, wing: 10-24 x 1-3/8; copper oxide finish (cover mounting)	58	4S7611	Washer: 1/2-7/32-.048; copper oxide finish (cover mtg)
27	1X473152	Pointer & Sleeve Assembly	59	4S7613	Washer: 3/4-.203-.027; copper oxide finish (cover mtg)
28	1X70646	Receptacle, antenna	60	4A21577	Washer, #C* (tuning shaft and idler gear retainer)
29	5S7771	Rivet: .088 x 3/16 steel; nickel plated (tube socket mtg)	61	4K481587	Washer, felt (used behind control knobs)
30	5S7707	Rivet: .122 x 5/32 steel; nickel plated (tube socket mtg)	62	39A17383	Wiper, contact (cover grinding wiper)
31	5S7706	Rivet: .122 x 1/8 steel; nickel plated (sensitivity control mtg, switch assembly mtg and terminal strip mtg)	63	39A17391	Wiper, housing: brass strip; 5/32 wide x 5/8 long
32	5S7701	Rivet: .122 x 3/16; nickel plated (vibrator grounding clip and output trans. mtg)			

MOTOROLA INC.

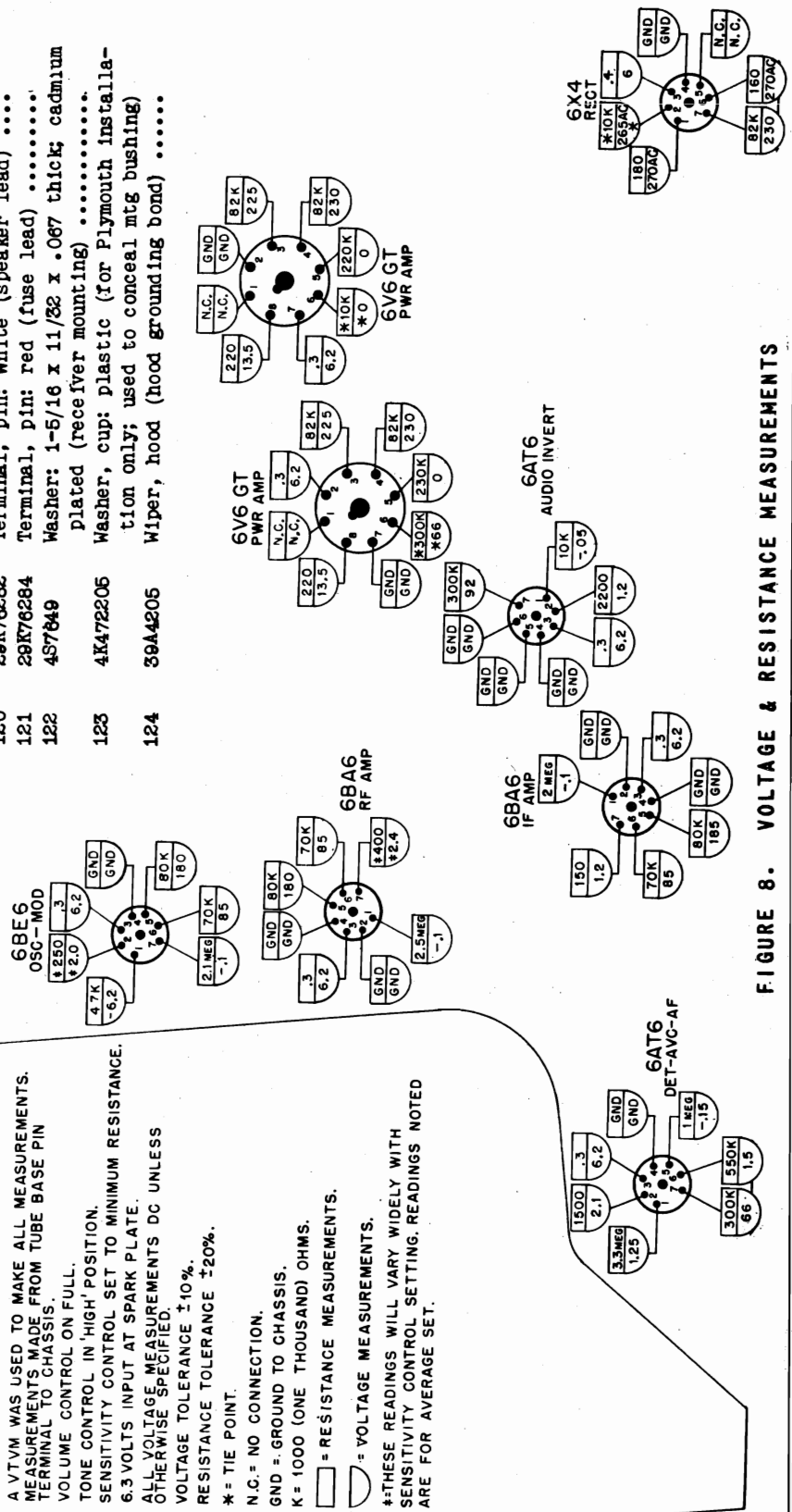
MODEL CR8

MOUNTING PARTS & ACCESSORIES

101	3A18008	Bolt, hex head: 5/16-18 x 2-1/4 long (bracket mtg)
102	7B24365	Bracket, receiver mounting
103	43K28242	Bushing, spacer: brass (speaker mtg) ...
104	8A4491	Capacitor, generator
105	9K473160	Lead Assembly, fuse: complete with 15 amp fuse
106	1X78859	Lead Assembly, speaker: 2 conductor: 36" long; pin terminals on one end
107	4S7660	Lockwasher: #8 external; phosphor bronze (speaker mtg)
108	4S7670	Lockwasher: 1/4 internal; cadmium plated (receiver mtg)
109	4S7678	Lockwasher: 1/4 external; cadmium plated (receiver mtg)
110	4S7674	Lockwasher: 5/16 internal; cadmium plated (receiver mtg)
111	2S7022	Nut: 1/4-20 x 7/16 hex; cadmium plated (receiver mtg)
112	2S2863	Nut: 5/16-18 x 9/16 hex; cadmium plated (receiver mtg)
113	2K74308	Nut, speaker mtg: 8-32 thread x 3/8 thk.
114	6AB17583	Screen, speaker: includes gasket
115	1X17921	Screw, speaker mounting: includes bushing.
116	43K17931	Sleeve, receiver mounting
117	50B473253 or 50B473698 or 50B481519	Speaker: 7" PM; 3.2 ohm VC; less spkr lead
118	6X17117	Suppressor, distributor
119	29A76280	Terminal, pin: black (speaker lead)
120	29K76282	Terminal, pin: white (speaker lead)
121	29K76284	Terminal, pin: red (fuse lead)
122	4S7649	Washer: 1-5/16 x 11/32 x .067 thick; cadmium plated (receiver mounting)
123	4K472206	Washer, cup: plastic (for Plymouth installation only; used to conceal mtg bushing)
124	39A4205	Wiper, hood (hood grounding bond)

NOTES:

- A VTVM WAS USED TO MAKE ALL MEASUREMENTS. MEASUREMENTS MADE FROM TUBE BASE PIN TERMINAL TO CHASSIS.
- VOLUME CONTROL ON FULL.
- TOE CONTROL IN 'HIGH' POSITION.
- SENSITIVITY CONTROL SET TO MINIMUM RESISTANCE.
- 6.3 VOLTS INPUT AT SPARK PLATE.
- ALL VOLTAGE MEASUREMENTS DC UNLESS OTHERWISE SPECIFIED.
- VOLTAGE TOLERANCE $\pm 10\%$.
- RESISTANCE TOLERANCE $\pm 20\%$.
- * = TIE POINT.
- N.C. = NO CONNECTION.
- GND = GROUND TO CHASSIS.
- K = 1000 (ONE THOUSAND) OHMS.
- = RESISTANCE MEASUREMENTS.
- = VOLTAGE MEASUREMENTS.
- * THESE READINGS WILL VARY WIDELY WITH SENSITIVITY CONTROL SETTING. READINGS NOTED ARE FOR AVERAGE SET.

**FIGURE 8. VOLTAGE & RESISTANCE MEASUREMENTS**

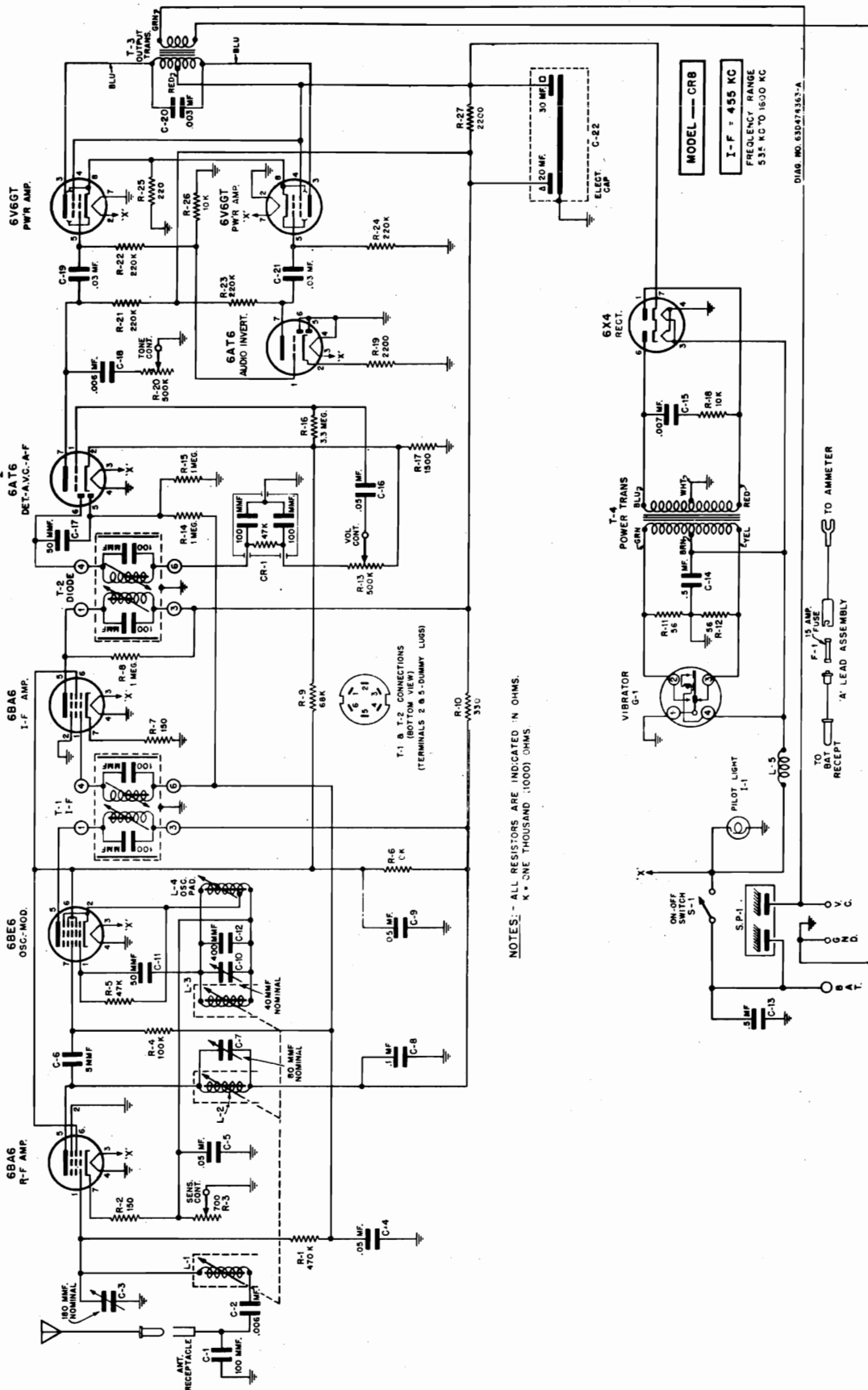
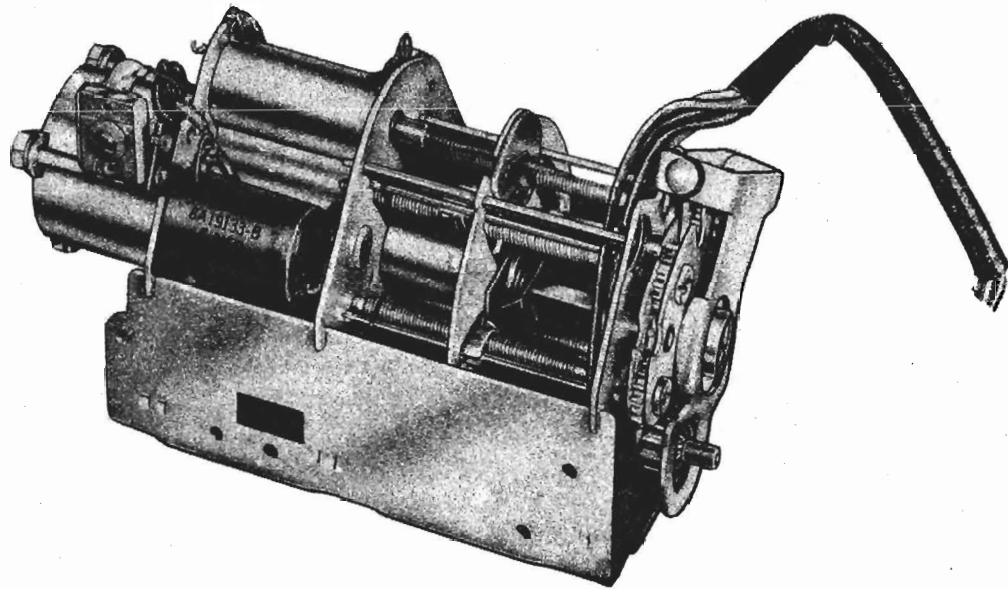


FIGURE 9. SCHEMATIC DIAGRAM



GENERAL

Solenoid Tuners ST-56 (ST-56 - CR6, ST-56 - FD6 etc.,) are used in 1946 and 1947 Motorola automatic tuning specific auto receivers.

Fundamentally, all ST-56 tuners are the same except for the manual tuning shaft, dial cord pulleys and pushbutton switch lead lengths. These variations are brought about by mechanical differences between the specific receivers in which this tuner is used. The receiver model number is included in the tuner model number to identify which specific receiver the tuner will fit, i.e., ST-56-CR7, ST-56-BK6 etc.

This is a 3 gang permeability type tuner operated by a solenoid. Five pre-set and one manual tuning positions are provided. The frequency range is 535 to 1600 kc. The pre-set positions can be set to any frequency within this range.

The tuner is designed to operate satisfactorily with 4-1/2 to 7.3 volts input. Before attempting any service work on a tuner that operates too slowly or one that doesn't operate at all, check the battery voltage directly at the receiver spark plate. Normally, this voltage is 6.3 volts. At the moment any pushbutton is pressed, the voltage at the

spark plate should not drop to less than 4-1/2 volts. If the voltage is less than 4-1/2, it is an indication of poor wiring between the car battery and receiver or a defective car battery.

This tuner depends on "dash-pot" action between the plunger and the solenoid for proper operation. When the fit between the plunger and solenoid is too tight, the air can't get out fast enough. The result is a slow or sluggish operating tuner. All late production tuners have an adjustable air release in the solenoid end plate. Early production tuners that do not have this adjustable air release and operate sluggishly, due to dash-pot action, should have the solenoid end plate replaced with an end plate having the adjustable air release. Order part number 1X76556.

The tuner solenoid coil must be in a horizontal or near horizontal position or the tuner will not operate properly. If it is operated with the coil in a vertical position, the solenoid and carriage return spring may not be strong enough to operate tuner.

FIGURE 1. TUNER FUNCTIONAL DETAIL

MOTOROLA INC.

MODEL ST-56

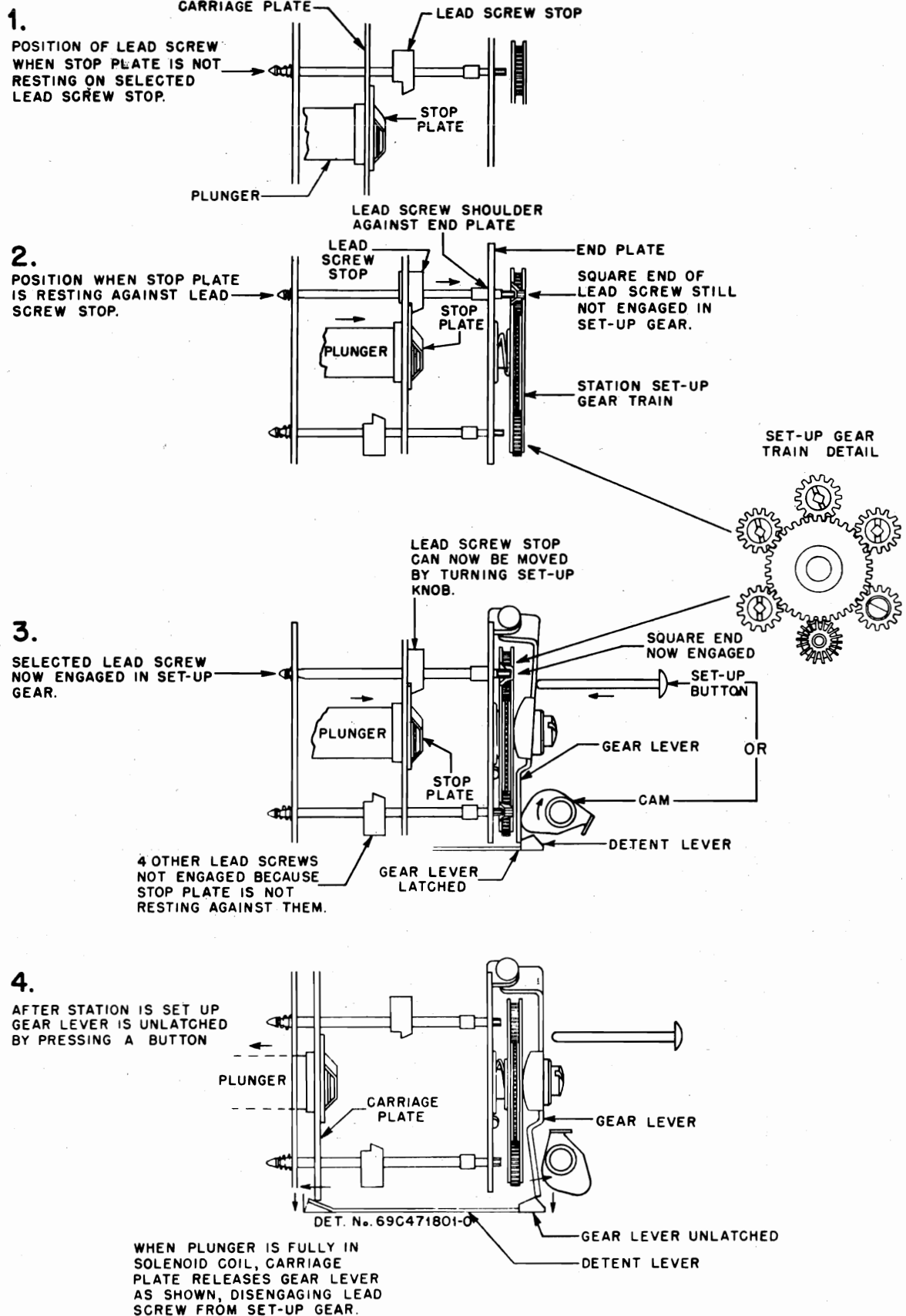


FIGURE 2 STATION SET-UP MECHANISM

TO REMOVE TUNER FROM CHASSIS

Should it become necessary to remove the solenoid tuner from the receiver chassis, proceed as follows:

1. Remove the covers from the set, completely exposing the chassis.
2. Mark all leads connecting tuner to receiver.
3. Disconnect all leads connecting tuner to receiver. Do not unsolder leads from the tuner selector switch; unsolder them at the push-switch. The .5 mf paper capacitor need not be removed.
4. The tuner is held to the chassis by self-tapping screws driven into the sides of the tuner. Do not remove any other screws.

ADJUSTMENTS

AIR RELEASE ADJUSTMENT

The speed at which the tuner operates is governed by dash-pot action of the solenoid plunger within the closed solenoid coil form. The rate at which air is allowed to enter or escape determines the speed of the plunger.

An adjustable air release is provided on all late production tuners. See Fig. 3. To adjust, loosen the screw and move the eccentric washer which covers the air release hole to expose or cover more of the air release hole as required. Early production tuners did not have a solenoid end plate with an adjustable air release. If such a tuner is slow or sluggish because of too much "dash-pot" action, replace the solenoid end plate with the adjustable air release type. Order part number 1X76556.

1. If tuner operates too slowly, open the air release hole. Open it only far enough to secure reliable operation. Too little "dash-pot" action (air release open too much) may cause the plunger to hammer and sometimes even to make the tuner operate continuously due to the selector switch

END VIEW OF TUNER

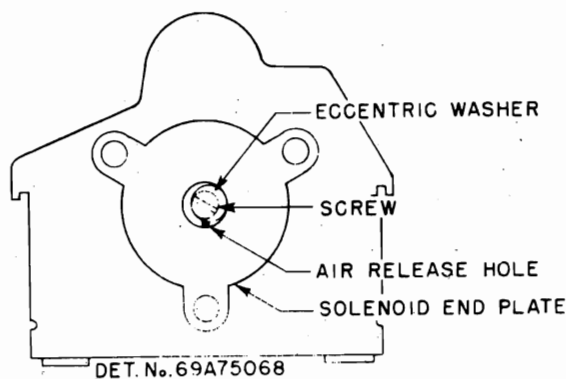


FIGURE 3. AIR RELEASE ADJUSTMENT

rotor being turned so rapidly as to overshoot its contacts.

2. If the tuner operates too rapidly increase dash-pot action by closing the air release hole slightly. Close it only enough to eliminate hammering.

PLUNGER RATCHET ADJUSTMENT

The plunger ratchet mechanism in Figure 4. This mechanism rotates the actuator rod which, in turn, rotates the carriage stop plate and the selector switch 60° for each inward motion of the plunger.

If this adjustment is incorrect, tuner may operate continuously once current is applied.

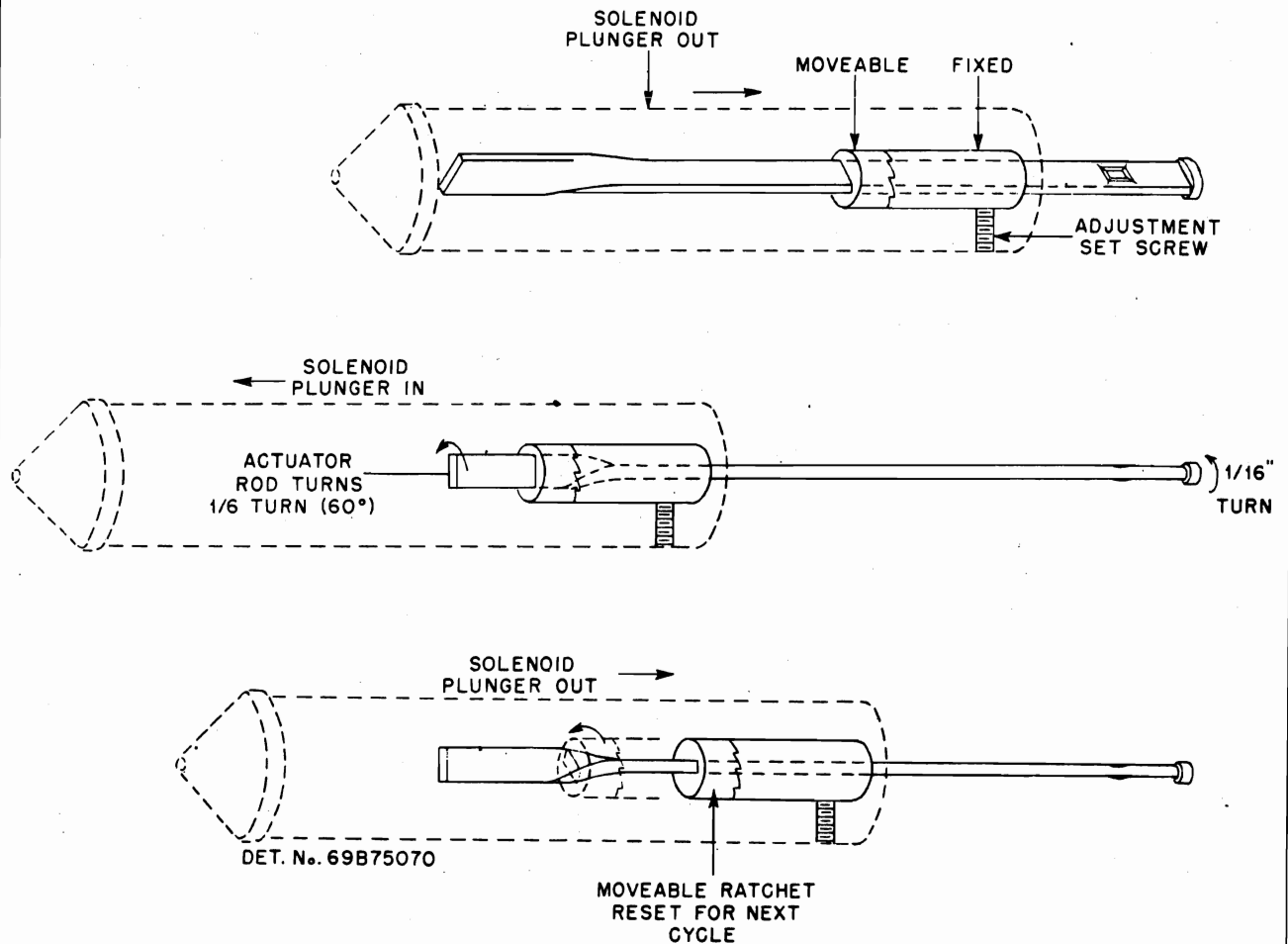
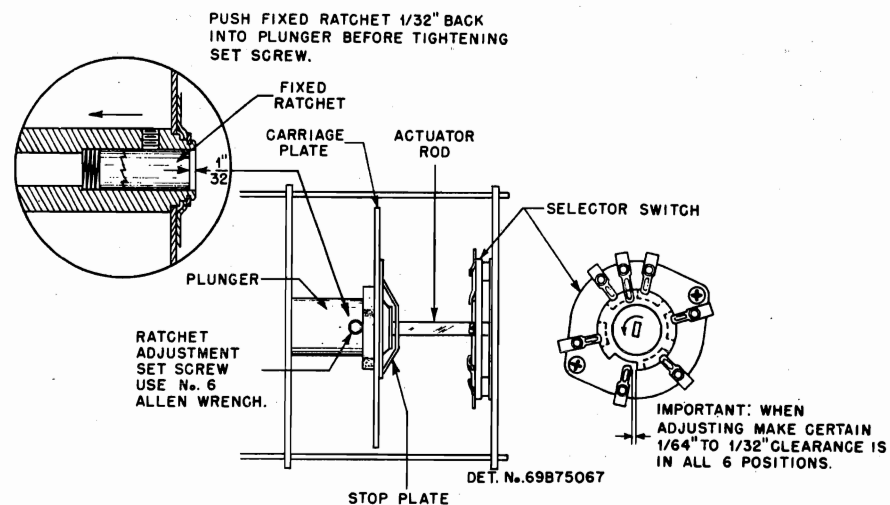
Correct ratchet adjustment is indicated when 1/64 to 1/32" clearance is observed between selector switch contacts and the selec-

tor switch rotor as shown in Figure 5. Slowly work the plunger by hand and observe clearance at each contact position. If the average clearance is not 1/64 to 1/32", correction can be made by loosening ratchet adjustment set-screw and turning actuator rod by hand until correct clearance is observed.

Before ratchet adjustment setscrew is finally tightened, push fixed ratchet 1/32" back into plunger. This increases spring tension against rotating ratchet, thus insuring more positive operation.

MOTOROLA INC.

MODEL ST-56

**FIGURE 4. PLUNGER RATCHET MECHANISM****FIGURE 5. PLUNGER RATCHET ADJUSTMENT**

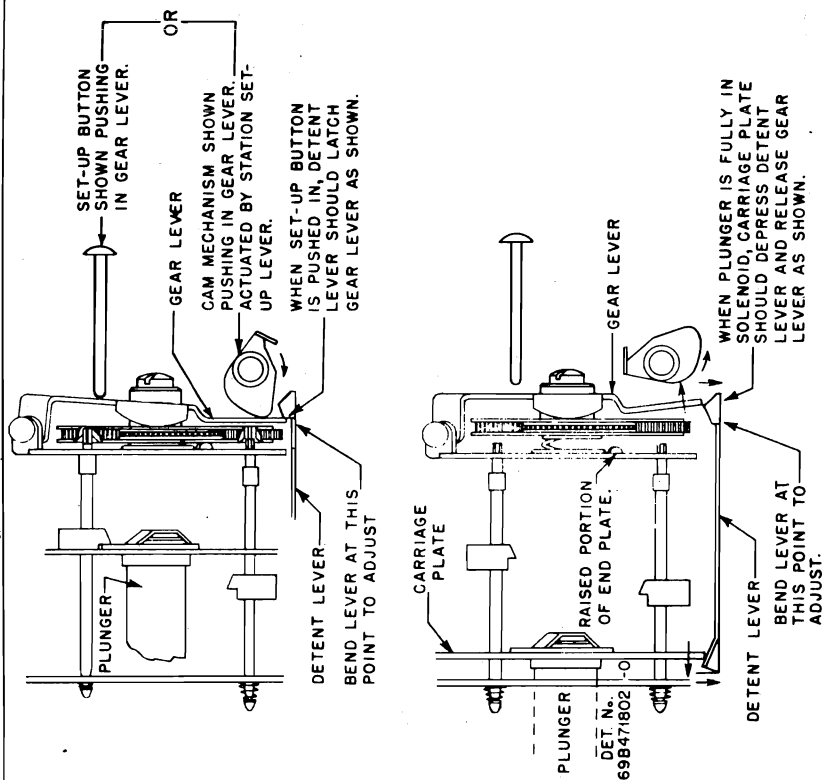


FIGURE 7. GEAR LEVER LATCH ADJUSTMENT
ADJUSTMENT OF GEAR LEVER LATCH

The gear lever latch holds the station set-up gear train in position while setting up stations. Failure of the latch to engage properly when the set-up button is pushed in or the station set-up knob is turned (whichever is applicable) would result in the inability to set up pre-set stations. Failure of the latch to disengage after station is set up would result in faulty automatic tuning because the lead screws might not seat themselves properly against the tuner end plate. Figure 7 above shows the latch detail and adjustment.

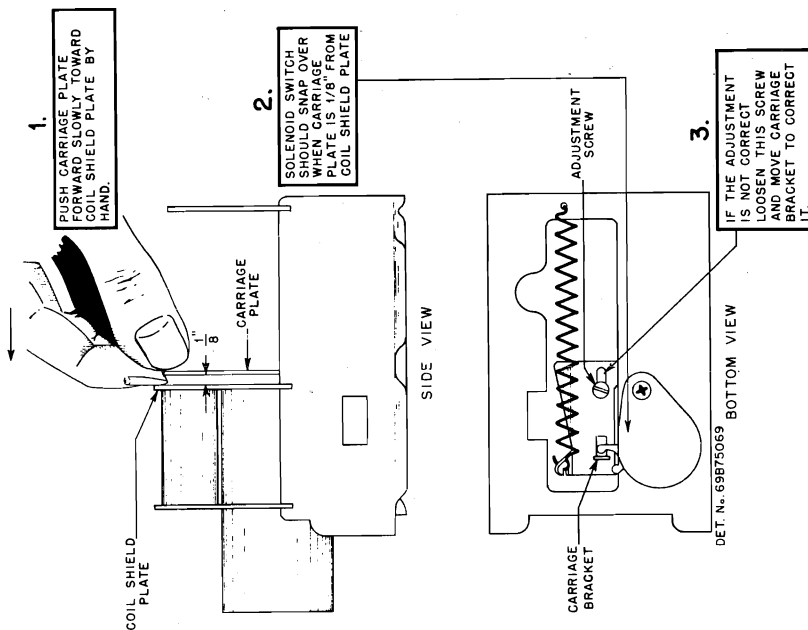


FIGURE 6. SOLENOID SWITCH ADJUSTMENT
SOLENOID SWITCH TRIP ADJUSTMENT

The solenoid switch tripping mechanism should be adjusted as shown in Figure 6.

If the solenoid switch is tripped too early, the ratchet mechanism may fail to operate; if it trips too late, the plunger may hammer violently or should the solenoid switch fail to trip, the plunger would be held within the solenoid.

SERVICE NOTES

FAILURE OF SOME LEAD SCREW TO ENGAGE IN SET-UP GEARS

If some of the lead screws fail to engage in the set-up gears during station setting up procedure, check the gear lever to see if it is bent. When the set-up button is pushed in and the gear lever latches on the detent lever, the set-up gear train should be parallel with the tuner end plate and the bottom of the gear train should be resting on the raised portions of the tuner end plate.

LUBRICATION

Should lubrication ever be required, it is recommended that a very fine grease, commercially called Lubriplate, or its equivalent, be used.

Remove all old and sticky lubricant with a solvent such as carbon tetrachloride and then, very sparingly, lubricate only the following points:

1. Carriage guide rods.
2. Actuator rod.
3. Manual lead screw.

IMPORTANT

Do not lubricate or permit lubricant to get on Selector Switch contacts. The friction drag is required for proper operation of tuner.

LEAD DRESSING

Make sure that the selector switch and solenoid coil leads are dressed so that carriage plate does not rub against them. Leads rubbing against the carriage plate may cause the tuner to stick, especially at the high frequency end.

REPLACEMENT OF SOLENOID COIL OR SOLENOID PLUNGER

Should replacement of the solenoid coil or solenoid plunger be required, it will be necessary to replace the entire tuner. A close fit between solenoid plunger and solenoid coil form is required; a proper match can only be secured at the factory. When service of this kind is required, return the tuner to the factory for exchange.

ALIGNMENT

In the event that some part of the R.F. circuit has been changed or the adjustments

shifted by mishandling, it is suggested that the receiver be realigned. Follow the alignment instructions found in the receiver service manual.

The tuner must be in good working order and assembled onto the chassis before attempting alignment of its tuned circuits.

TO REPLACE ANT. R.F., OR OSC. COILS

IMPORTANT: When ordering replacement coils, order by part number and also specify the color coding (paint dots) on old coil. THE REPLACEMENT COIL SHOULD CARRY THE SAME COLOR CODING AS THE ORIGINAL OR THE TUNER WILL NOT TRACK PROPERLY.

1. If coil is not readily accessible remove the tuner from the chassis as outlined under "TO REMOVE TUNER FROM CHASSIS."
2. Unsolder the two lugs holding the coil to the tuner plate.
3. Carefully remove the old coil. Save the thin paper washer that is found at the base of the coil.
4. Slip the paper washer over the replacement coil and slip coil into shield can.
5. Orient coil so its lugs are in same position as before and resolder to tuner plate.
6. Reassemble tuner and install in receiver.
7. Realign ANT., R.F. and OSC. stages per instructions found in the receiver service manual.

TO REPLACE ANT. R.F. OR OSC COIL TUNING CORES

IMPORTANT: When ordering coil tuning cores, order by part number and also specify the color coding (paint spot) on the old core. ALL 3 TUNING CORES MUST CARRY THE SAME COLOR CODING OR THE TUNER WILL NOT TRACK PROPERLY.

1. The core which tunes the top coil is readily accessible and presents no replacement problem. To reach the two bottom coil tuning cores, remove the tuner from the chassis base as outlined under "TO REMOVE TUNER FROM CHASSIS."
2. Remove the carriage return spring.
3. Move the carriage plate back as far as it can go. The tuning cores can now be screwed "out" or "in" by grasping the portion that sticks out the back of the coil.

MODEL ST-56

MOTOROLA INC.

When installing a new core, make sure that the insulating washer and adjustment clip are replaced properly. The insulating washer goes on the core side; the core adjustment clip has an ear on it and this ear must fit into a hole in the bakelite insulator on the carriage plate. Refer to Figure 8.

4. Replace the carriage return spring.
5. Install tuner in receiver.
6. Realign ANT., R.F. and OSC. stages following the instructions found in the receiver service manual.

PLUNGER RATCHET REMOVAL

The plunger ratchets are not removable from early production tuners. Late production tuners have removable plunger ratchets. To remove ratchets, proceed as follows: (Refer to Figure 8 for parts identification).

1. Remove gear plate mounting screw (49).
2. Pull out actuator rod (37). Don't lose washers (74), (68) & (87).
3. Remove stop plate bracket (89) by sliding it out of the retaining slots.
4. Loosen setscrew (45).
5. The large fixed ratchet (90), small floating ratchet (91) and ratchet spring (92) can now be removed.
6. Reassemble in reverse order.

TUNER HANGS UP

The beginning of this trouble is usually a condition where the tuner "runs wild" (fails to stop at a station). Eventually, the stop plate gets "hung up" by getting on the wrong side of the station stops (51). The cause of the trouble is that the selector switch (65) does not turn the correct amount with each dash of the plunger.

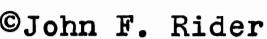
Since the actuator rod (37) determines the rotation of the selector switch, it is usually at fault. Check the twist in the actuator rod. It should be 82 degrees. Also check the fit between the "head" end of the actuator rod (37) and the rotary section of the selector switch (65). We have found that some sloppiness sometimes occurred at this point. If the fit is loose, replace the actuator rod (37). This can be easily done by removing gear plate mounting screw (49).

REF. NO.	PART NO.	DESCRIPTION
1	1X71358	Base & Spring Assembly
2	7A70928	Bracket, carriage
5	38A70954	Button, mute switch; fibre
6	20A70214	Capacitor, variable: mica; 30-60 mmf; with mounting bracket
7	20A70801	Capacitor, variable: mica; 50-180 mmf. with mounting bracket
8	8A19133	Capacitor, fixed: paper; .5 mf. 100 vdc
9	42A70980	Clip, lead screw
10	42A70184	Clip, core adjustment
11	34B71881	Coil, antenna or R.F. (specify color of paint dots on old coil when ordering)
12	34B71879	Coil, oscillator (specify color of paint dots on old coil when ordering)
13	59B70889	Coil, solenoid (RETURN entire tuner to factory for exchange when this part requires replacement)
14	46A70880	Core; powdered iron: with molded-in adj. screw (specify color of paint dot on old core when ordering)
15	32A70972	Gasket, solenoid
16	14A70876	Insulator, coil sleeve: armite
17	14A74198	Insulator, magnet winding: armite
18	14A70979	Insulator, slug: bakelite
19	14A70973	Insulator, switch: armite
20	45B70928	Lever, detent
21	45B70930	Lever, gear
22	487651	Lockwasher, steel: #8 internal; Cad. Pl.
23	2A76558	Nut, knurled (takes spring pressure off of iron core)
24	287003	Nut, Steel: 8-32 x 5/16 Hex; Cad. Pl.
25	1X73012	Plate, Bushing and Stud Assembly; stop end plate with actuator rod bushing and gear locating stud
26	1X73007	Plate & Coil Shields Assembly: consists of tuner plate, solenoid shield, 3 coil shields and 3 solenoid mtg. bolts
27	1X76556	Plate, end: solenoid end plate assembly; with gasket and adjustable air release
28	1X71359	Plate & Gears Assembly (station set-up gear train)
29	1X73008	Plate & Plunger Assembly: consists of carriage plate with 3 bakelite core screw insulators and solenoid plunger rod with ratchets & stop plate (RETURN entire tuner to factory for exchange when this part requires replacement)
30	1X71357	Plate & Trimmers Assembly: consists of coil end plate, 3 trimmers and terminal strip

MOTOROLA INC.

MODEL ST-56

REF. NO.	PART NO.	DESCRIPTION	REF. NO.	PART NO.	DESCRIPTION
31	64A11647	Plate, switch mounting	65	40B70952	Switch, selector
32	9A13298	Receptacle, plug: 9 prong	66	1B70944	Switch, solenoid: with mtg. plate
33	5S8497	Rivet, steel: .088 x 1/8; Nkl. Pl.	67	4A70961	Washer, actuator rod: rectangular hole
34	5S7770	Rivet, steel: .088 x 5/32; Nkl. Pl. (slug insulator mtg.)	68	4A70962	Washer, bearing (actuator rod)
35	5S7706	Rivet, steel: .122 x 1/8; Nkl. Pl. (lockup spring mtg.)	69	4A75683	Washer, brass: special
36	5S7707	Rivet, steel: .122 x 5/32 Nkl. Pl. (trimmer mtg.)	70	4A73378	Washer, bumper
37	47A70976	Rod, actuator	71	4A70015	Washer, "C" (lever shaft retainer)
38	47A472003	Rod, carriage guide	72	47A70873	Washer, coil spacer: fibre
39	47A73787	Rod, manual stop guide	73	4A76542	Washer, eccentric (air release hole adjustable cover)
40	47A70921	Rod, stop guide	74	4A70974	Washer, insulator (actuator rod)
41	3S8175	Screw, steel: #4 x 3/16 PKZ S1. HH. Cad. Pl. (Holds lead screw stop brkt. to manual lead stop)	75	4A70956	Washer, iron core insulator: bakelite
42	3S2950	Screw, steel: 4-40 x 1/4 S1. Lk. BHMS; Cad. Pl. (carriage brkt. mtg.)	76	4A74571	Washer, paper
43	3S2681	Screw, steel: #4 x 3/8 Ph Fil. Hd; Cad. Pl. (selector switch mtg.)	77	4A73621	Washer, spring (manual lead screw)
44	3S7327	Screw, steel: 5-40 x 3/8 S1 HH MS; Cad. Pl. (mute sw. mtg.)	78	4A70932	Washer, "C" spring (manual lead screw retainer)
45	3S7148	Setscrew; steel: 6-32 x 1/8 Allen Hd; Nkl. Pl. (ratchet setscrew in plunger)	79	1X75187	Pulley & Bracket Assembly
46	3S7200	Screw, steel: 6-32 x 3/16 S1. Fil. Hd. MS; Cad. Pl. (air release adj. screw)	80	1X74114	Pulley & Bracket Assembly
47	3S2684	Screw, steel: #8 x 1/4 Ph. Fit. Hd; Cad. Pl. (solenoid switch mtg.)	81	1X74113	Pulley & Bracket Assembly
48	3S7205	Screw (lockscrew): 8-32 x 1/4 S1. HH; Cad. Pl. (base mtg.)	82	3S7454	Screw, steel: #8 x 1/4 PKZ
49	3A74390	Screw, special (gear plate mtg.)	83	1A73374	Manual Tuning Shaft Assem. (CR6,7)
51	1X73015	Screw & Stop Assembly; lead screw with carriage stop	84	1X74262	Manual Tuning Shaft Assem. (FD6, NH6, CT6, OE6, PC6)
52	47A70934	Shaft, lever	85	1X75408	Manual Tuning Shaft Assem. (PD6 & SR7)
53	26A70878	Shield, Coil (Ant. R.F. & OSC. Coil Shield)	86	41A73685	Spring, lead screw
54	43A70881	Sleeve, Coil; powdered iron	87	43A77118	Sleeve, lead screw
55	43A70953	Spacer, selector switch; fibre	88	41A472134	Spring, carriage balance
56	2S7988	Speednut, steel: for .093 dia. rod	89	7A77585	Bracket, stop plate (stainless steel)
57	41A70941	Spring, carriage	90	43A70905	Ratchet, fixed (large)
58	41A70958	Spring, coil iron core	91	43A70904	Ratchet, floating (small)
59	41A70968	Spring, gear plate	92	41A70955	Spring, ratchet
60	41A70949	Spring, lead screw		1X471070	STOCK SOLENOID TUNER. Use with adaptor kits listed below.
61	41A70971	Spring, lockup		1X471071	Kit #1 - Adapts Stock Tuner to fit Models 605 & 705
62	46A70983	Stop, manual lead		1X471072	Kit #2 - Adapts Stock Tuner to fit Model BK6.
63	31A70948	Strip, Terminal Lug		1X471073	Kit #3 - Adapts Stock Tuner to fit Models FD6, FD7, NH6, CT6, OE6, CT7, and PC6.
64	40A70931	Switch, mute		1X471074	Kit #4 - Adapts Stock Tuner to fit Models PD6 & SR7.
				1X471075	Kit #5 - Adapts Stock Tuner to fit Model CR6 & CR7.



MOTOROLA INC.

MODELS 58A11, 58A12,
CHASSIS HS-158

ALIGNMENT

Maximum performance can only be obtained if extreme care is exercised during alignment. Follow the procedure carefully.

A low range output meter should be connected across the speaker voice coil. Set receiver volume control to maximum. For greatest accuracy, keep output of receiver at approximately .05 watt thru-out alignment by reducing generator output (not receiver volume control) as stages are brought into alignment. (.05 watt = .40 volt on output meter).

If receiver is operated from AC line during alignment, it is suggested that an isolating transformer be used between receiver and power line. If no isolation transformer is used and hum is encountered during alignment, connect the ground side of the signal generator through a .1 mf capacitor to B- instead of the receiver chassis.

Refer to Figure 1 for location of all adjustments.

STEP	DIAL SET TO	DUMMY	SIGNAL GENERATOR CONNECTED TO	SIGNAL GENERATOR SET TO	ADJUST TRIMMER	REMARKS
IF ALIGNMENT 1.	Gang fully opened	.1 mf	Conv. grid*	455 Kc	1,2,3 & 4	Adjust for maximum.
RF ALIGNMENT 2.	Gang fully opened	-	Radiation loop***	1620 Kc	5	Adjust for maximum. This sets osc. to dial scale**
3.	1400 Kc	-	Radiation loop***	1400 Kc	6	Tune signal for max. with receiver tuning knob, then peak trimmer 6.

* A convenient point is the stator of the antenna section of the tuning capacitor.

** With gang fully closed, pointer should be parallel with chassis; reset if necessary

*** Connect output of signal generator to a 5" diameter, 3 turn loop and bring loop close enough to receiver loop to obtain output of .05 watt (.40V) on output meter. Vary distance between loops to maintain this output during alignment. Minimum distance between loops should never be less than 12".

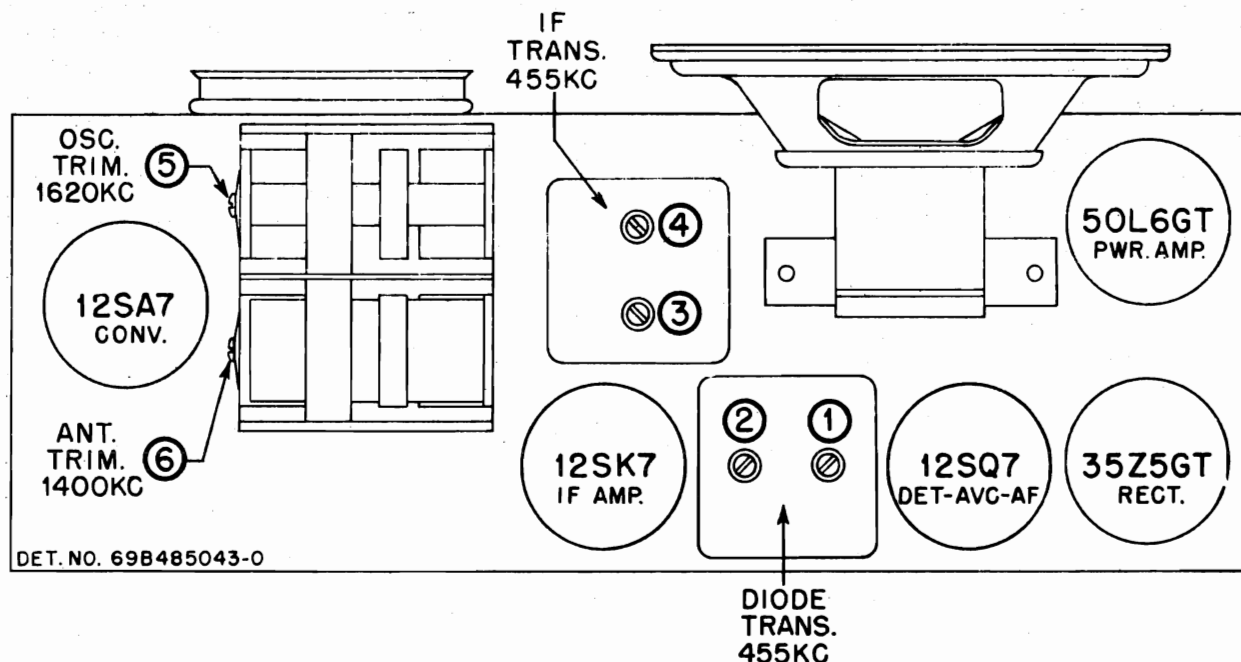


FIGURE 1. CHASSIS HS-158 TUBE & TRIMMER LOCATIONS

MODELS 58A11, 58A12,
CHASSIS HS-158

MOTOROLA INC.

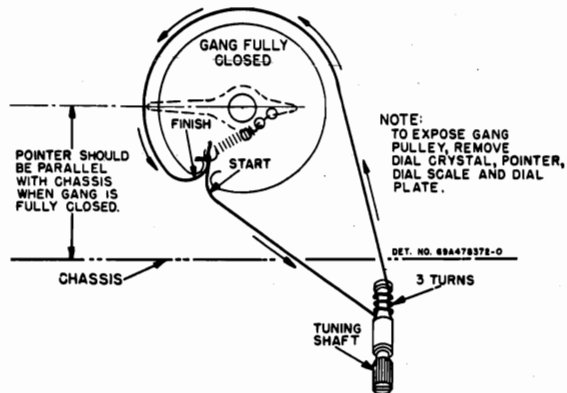
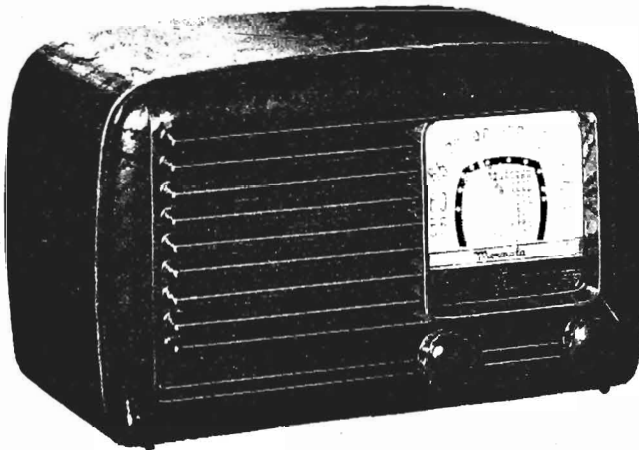
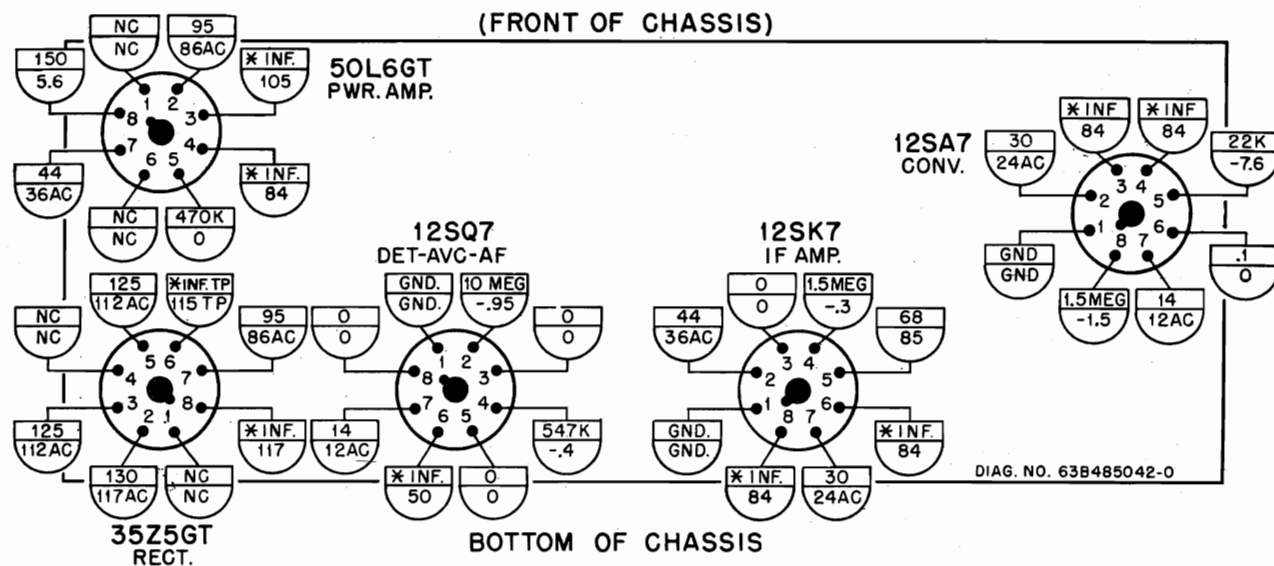


FIGURE 2. CHASSIS HS-158 STRING DRIVE DETAIL

CAUTION: Never connect antenna or chassis to water pipe, radiator or other ground.

POWER SUPPLY - 105-125V AC or DC, 35 watts



NOTES:

117V. AC INPUT TO SET DURING MEASUREMENTS.

A VTVM WAS USED FOR ALL MEASUREMENTS.

MEASUREMENTS MADE FROM TUBE BASE PIN TERMINAL TO B-(→)
VOLUME CONTROL SET TO MINIMUM AND NO STATION TUNED IN.

VOLTAGE TOLERANCE $\pm 10\%$; RESISTANCE TOLERANCE $\pm 20\%$.

ALL VOLTAGE MEASUREMENTS DC UNLESS OTHERWISE SPECIFIED.

= RESISTANCE MEASUREMENTS.

= VOLTAGE MEASUREMENTS.

* = MAY VARY DEPENDING ON CONDITION
OF ELECTROLYTIC CAPACITOR.

GND. = GROUND TO CHASSIS.

TP = LUG USED AS TIE POINT.

NC = NO CONNECTION.

FIGURE 3. CHASSIS HS-158 VOLTAGE & RESISTANCE DIAGRAM

MOTOROLA INC.

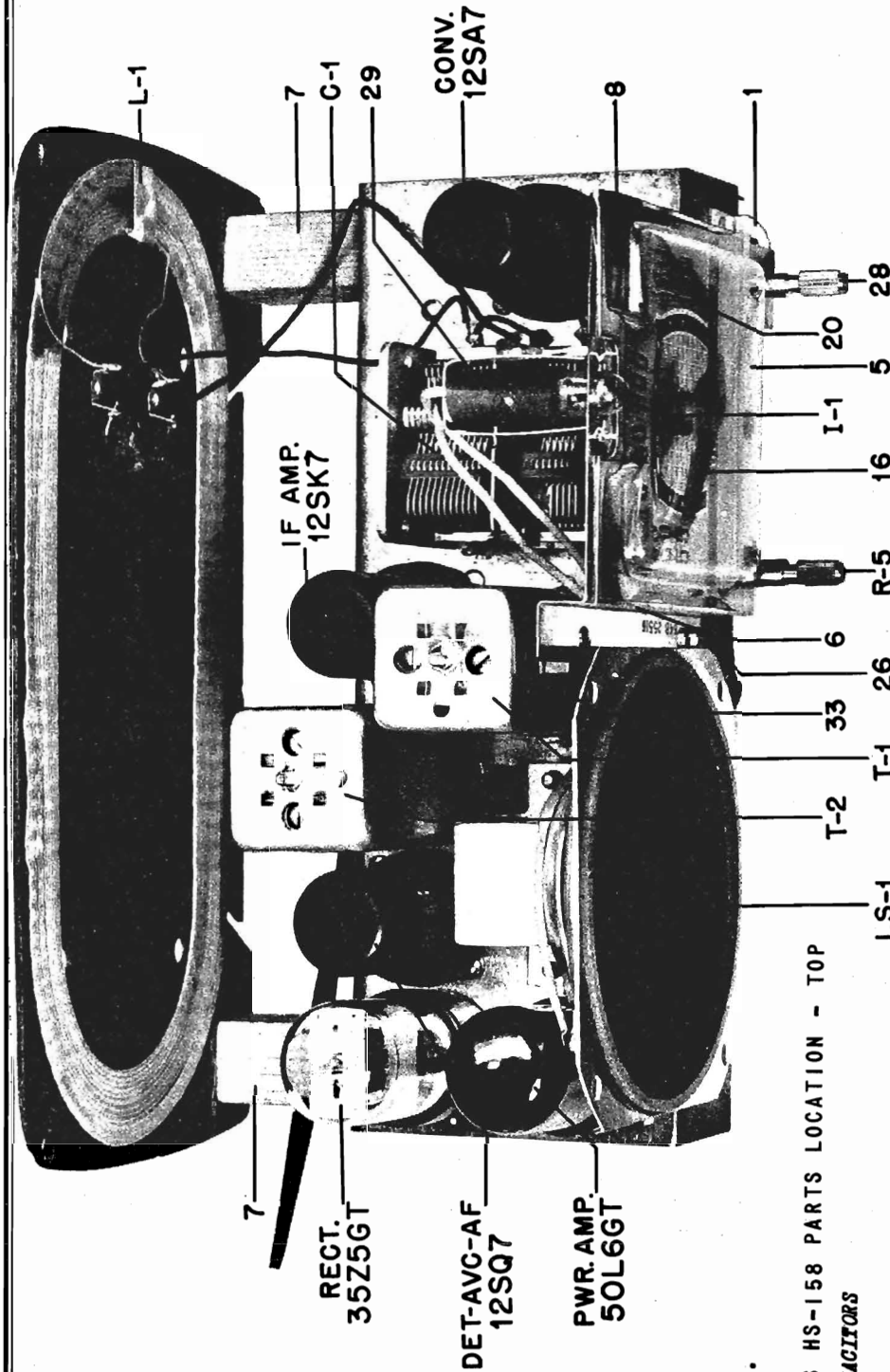
MODELS 58A11, 58A12,
CHASSIS HS-158

FIGURE 4.

CHASSIS HS-158 PARTS LOCATION - TOP

CAPACITORS

C-1	1X485137	Variable: 2 gangs with pulley	LS-1	T-1	
C-2	8S9816	Paper: .05 mf 400V			
C-3	8S9816	Paper: .05 mf 400V			
C-4	8A72886	Paper: .15 mf 200V			
C-5A, B, C&D	21B482847	Multiple Ceramic: 220 mmf (C-5A); .002 mmf (C-5B); 220 mmf (C-5C); .005 mmf (C-5D)			
C-6	8S9802	Paper: .02 mf 400V			
C-7	23K485148	Electrolytic: 50-30 mf 150V			
COILS					
L-1	24C485151	Loop Antenna: complete			
L-2	24A484251	Oscillator coil			
PILOT LIGHT					
I-1	65X11854	Bulb: 6.3V, .15 amp; tubular, clear, #47			

RESISTORS

LS-1	50C485152	Speaker: 4" PM; 3.2 ohm voice coil			
R-1	6R6028	22,000 1/2W			
R-2	6R6015	220,000 1/2W			
R-3	6R6007	68 1/2W			
R-4	6R6004	1 meg 1/2W			
R-5	18A14829	Volume control: .5 meg; with SPST switch			
R-6	6R6056	47,000 1/2W			
R-7	6R62109	10 meg 1/2W			

Note: All resistors are 20% insulated carbon type, unless otherwise specified.

MODELS 58A11, 58A12,
CHASSIS HS-158

MOTOROLA INC.

R-8	6R6032	470,000 1/2W	22	3S2294	Screw: 6-32 x 1/2 plain hex head locking type machine screw; cadmium plated (gang mounting)
R-9	6R6032	470,000 1/2W			
R-10	6R6373	150 10% 1/2W			
R-11	6R5683	27 10% 1/2W			
R-12	6R3953	1,000 1W	23	3S7339	Screw: 6-32 x 5/8 plain hex head machine screw; cadmium plated (osc coil mtg)...
TRANSFORMERS					
T-1	24B485171	IF, 455 Kc: complete; includes shield ...	24	3S7248	Screw: 6-32 x 1/8 plain hex head machine screw; cadmium plated (dial plate mtg)...
T-2	24B485172	Diode, 455 Kc: complete; includes shield	25	3S7205	Screw: 6-32 x 1/4 slotted hex head locking type machine screw; cadmium plated (speaker mtg)
T-3	25K485148	Output Transformer	26	3S7454	Screw: #8 x 1/4 PKZ plain hex head sheet metal screw; cadmium plated (dial plate mtg)
CHASSIS PARTS - MECHANICAL					
1	7A14610	Bracket, tuning shaft	27	3S3383	Screw: #8 x 2" PKZ plain hex head sheet metal screw; cadmium plated (loop mtg)...
2	42A75825	Clip, electrolytic mounting	28	47A14835	Shaft, tuning
3	11M8944	Cord, dial: 18 lb; black	29	60A25505	Socket, dial light, clip & leads
4	30A470651	Cord, line & plug: 2 conductor; 6 ft long	30	9A76209	Socket, tube: octal; plain type
5	61B25515	Crystal, dial: clear plastic	31	9A485922	Socket, tube: octal; shielded type (for IF Amp)
6	1X25530	Dial Plate & Bracket Assembly	32	41A14244	Spring, tension coil (drive cord spring)
7	57A77084	Dowel, wood (back mtg)	33	37K20865	Strip, channel: rubber
8	587805	Eyelet, snap-in (dial scale and crystal mounting)	34	31A15555	Strip, terminal: 2 insulated lugs, #3 mtg
9	5A19658	Eyelet, spacer: .286 x .212; copper plated (gang mtg)	35	4A70015	Washer, "C" (tuning shaft retainer)
10	37A12691	Grommet, rubber (gang cushion)	36	4S1719	Washer: 3/8 x .140 x .030 thick; steel; cad pl (line cord lock mtg)
11	32A24815	Lock, line cord: fibre	37	4S7597	Washer: 7/16 x .171 x .032 thick; cadmium plated (gang mtg)
12	4S7650	Lockwasher: #6 internal; cadmium plated (IF & diode trans mtg)	38	4S7614	Washer: 11/16 x 11/64 x .036 thick; steel; cad pl (loop mtg)
13	29R5248	Lug, soldering: 6L; hot tinned	CABINET PARTS		
14	2S7005	Nut: 6-32 x 1/4 hex; cadmium plated (IF & diode trans mtg)	101	68D25502	Cabinet, table model: walnut plastic (58A11)
15	2S7051	Nut: 3/8-32 x 9/16 hex Nutnut; cadmium plated (volume control mtg)	102	68D25540	Cabinet, table model: ivory plastic (58A12)
16	52B20520	Pointer: red plastic	103	36A470443	Knob, control: walnut plastic (58A11) ...
17	5S7707	Rivet: .122 x 5/32 steel; nickel plated (term. strip, electrolytic mtg clip, tube socket mtg and output trans mtg)...	104	36K485144	Knob, control: ivory plastic (58A12) ...
18	5S7701	Rivet: .122 x 3/16 steel; nickel plated (tuning shaft bracket mtg)	105	38A25507	Plug, split (holds cabinet back to cabinet)
19	5S7708	Rivet: .122 x 9/32 steel; nickel plated (line cord lock mtg)	106	3S476106	Screw: #8 x 1 PKA plain hex head sheet metal screw; cad pl (chassis mtg)
20	34B485147	Scale, dial	107	32K481494	Washer, paper: 3/8 x .171 x .020 thick; (chassis mtg)
21	3S7508	Screw: #6 x 1/4 PKZ plain hex head sheet metal screw; cadmium plated (diode trans mtg)			

MOTOROLA INC.

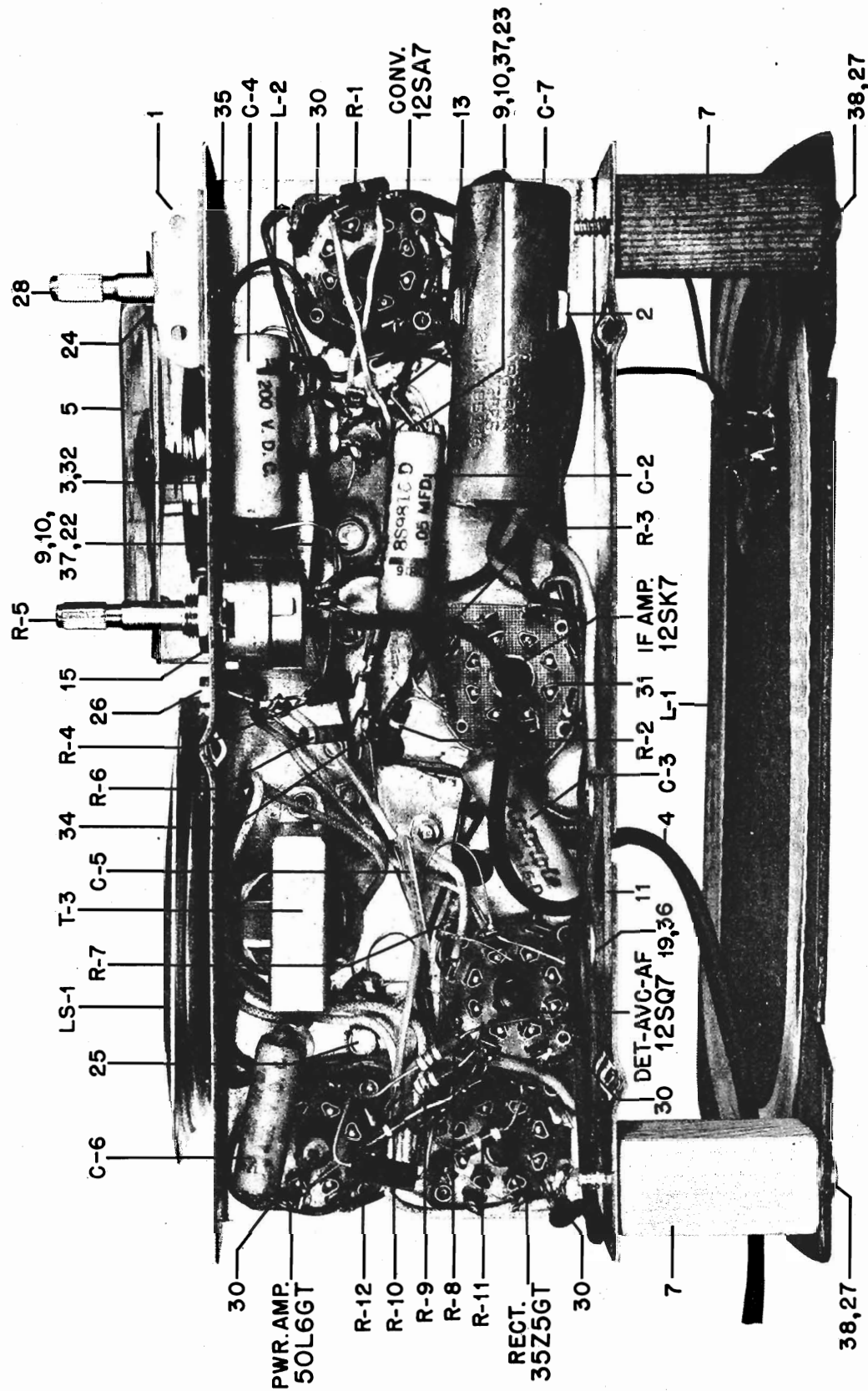
MODELS 58A11, 58A12,
CHASSIS HS-158

FIGURE 5. CHASSIS HS-158 PARTS LOCATION - BOTTOM

MODELS 58A11, 58A12,
CHASSIS HS-158

MOTOROLA INC.

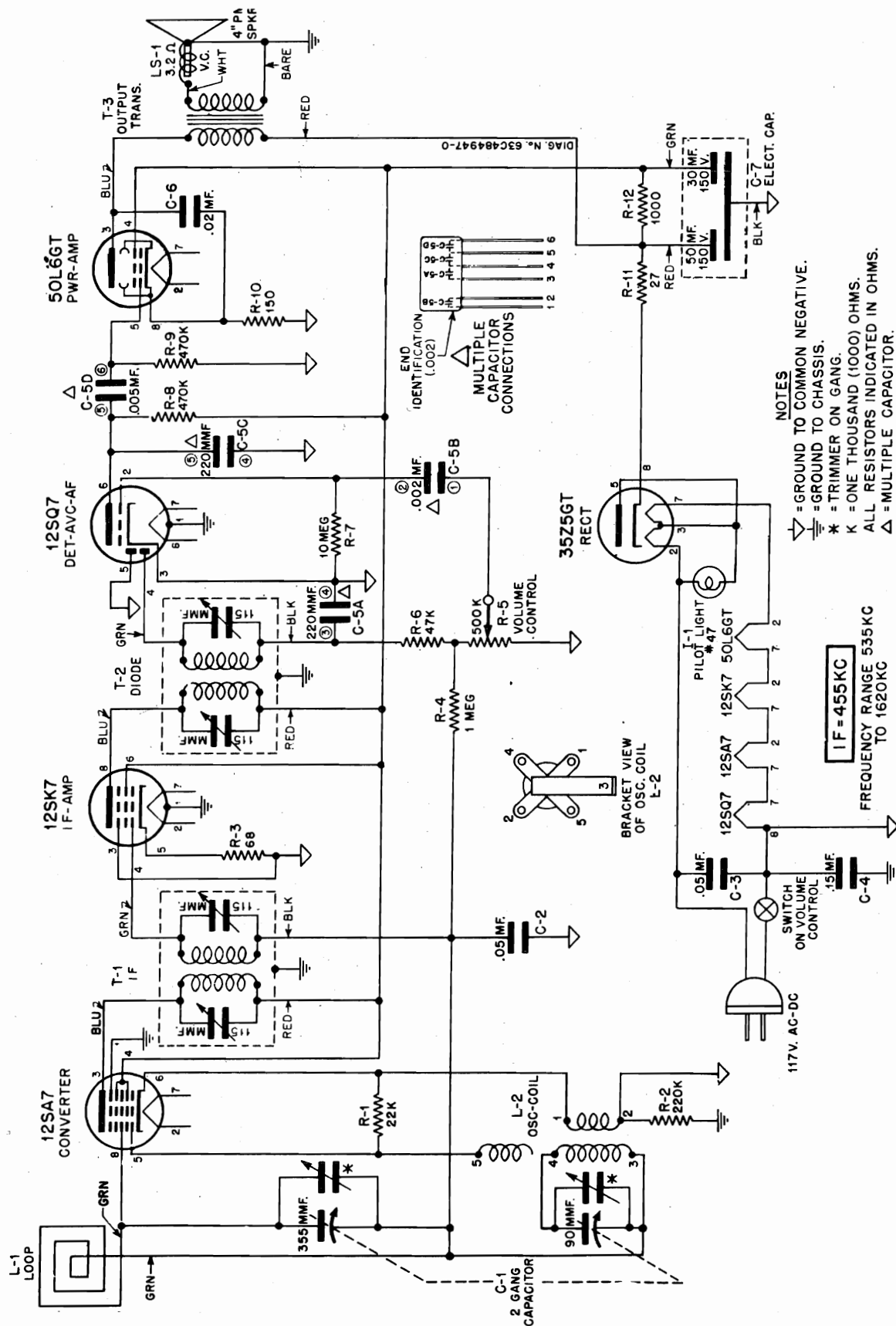


FIGURE 6. CHASSIS HS-158 SCHEMATIC DIAGRAM

MOTOROLA INC.

SERVICE NOTE

MODELS 58R11, 58R12,
58R13, 58R14, 58R15,
58R16, CHASSIS HS-116

The chassis of this receiver is connected directly to the power line. When operating chassis outside of its cabinet (from an AC power line) use

an isolating transformer between power line and receiver to reduce possibility of electrical shock.

ALIGNMENT

Maximum performance can only be obtained if extreme care is exercised during alignment. Follow the procedure carefully.

A low range output meter should be connected to the speaker voice coil terminal and receiver

chassis. Set receiver volume control to maximum. For greatest accuracy, keep output of receiver at approximately .05 watt (.05 watt = .40 volt on output meter) throughout alignment by reducing generator output (not receiver volume control) as stages are brought into alignment.

ALIGNMENT PROCEDURE

Refer to Figure 1 for location of all alignment trimmers and cores.

STEP	DIAL SET TO	DUMMY	SIG. GEN. CONNECTED TO	SIG. GEN. SET AT	ADJUST TRIMMER OR CORE	REMARKS
IF ALIGNMENT						
1.	Gang fully opened	.1 mf	Converter Grid & chassis*	455 Kc	1,2,3 & 4	Adjust for maximum.
RF ALIGNMENT						
2.	Gang fully opened	.1 mf	Converter Grid & Chassis*	1620 Kc	5	This sets oscillator to dial scale.
3.	1400 Kc	None	Radiation loop**	1400 Kc	6	Tune signal in on receiver, then adjust loop trimmer (6) for maximum.

* A convenient point for this connection is the stator lug of the loop section of the tuning capacitor.

** Connect output of signal generator to a 5" diameter, 3 turn loop and bring loop close enough to receiver loop to obtain output of 50 milliwatts (.40) on output meter. Vary distance between loops to maintain this output during alignment. Minimum distance between loops should never be less than 12".

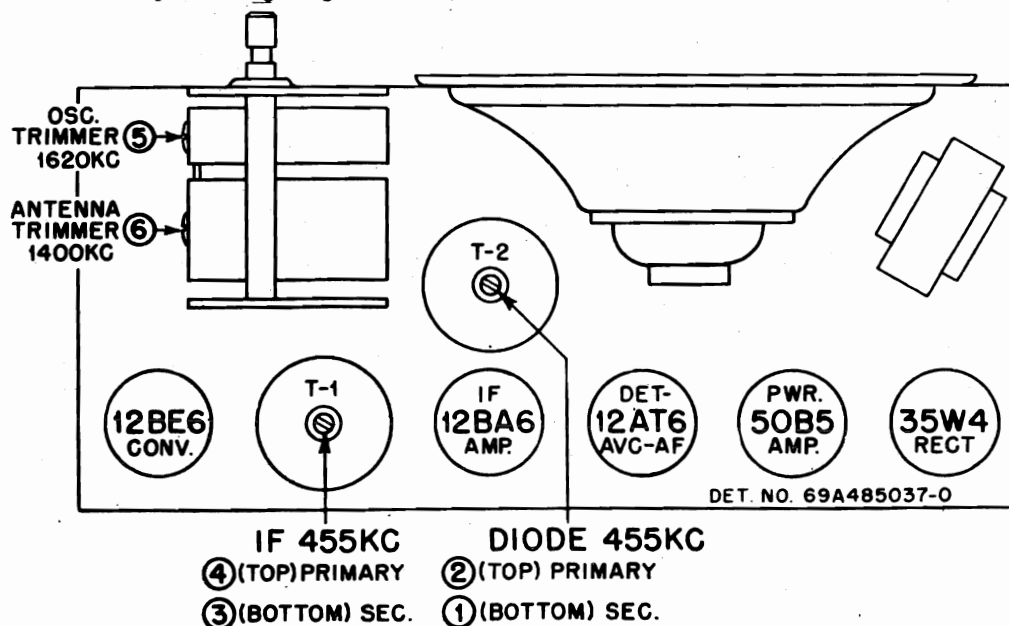


FIGURE 1. CHASSIS HS-116 TUBE & TRIMMER LOCATIONS

MODELS 58R11, 58R12,
58R13, 58R14, 58R15,
58R16, CHASSIS HS-116

MOTOROLA INC.

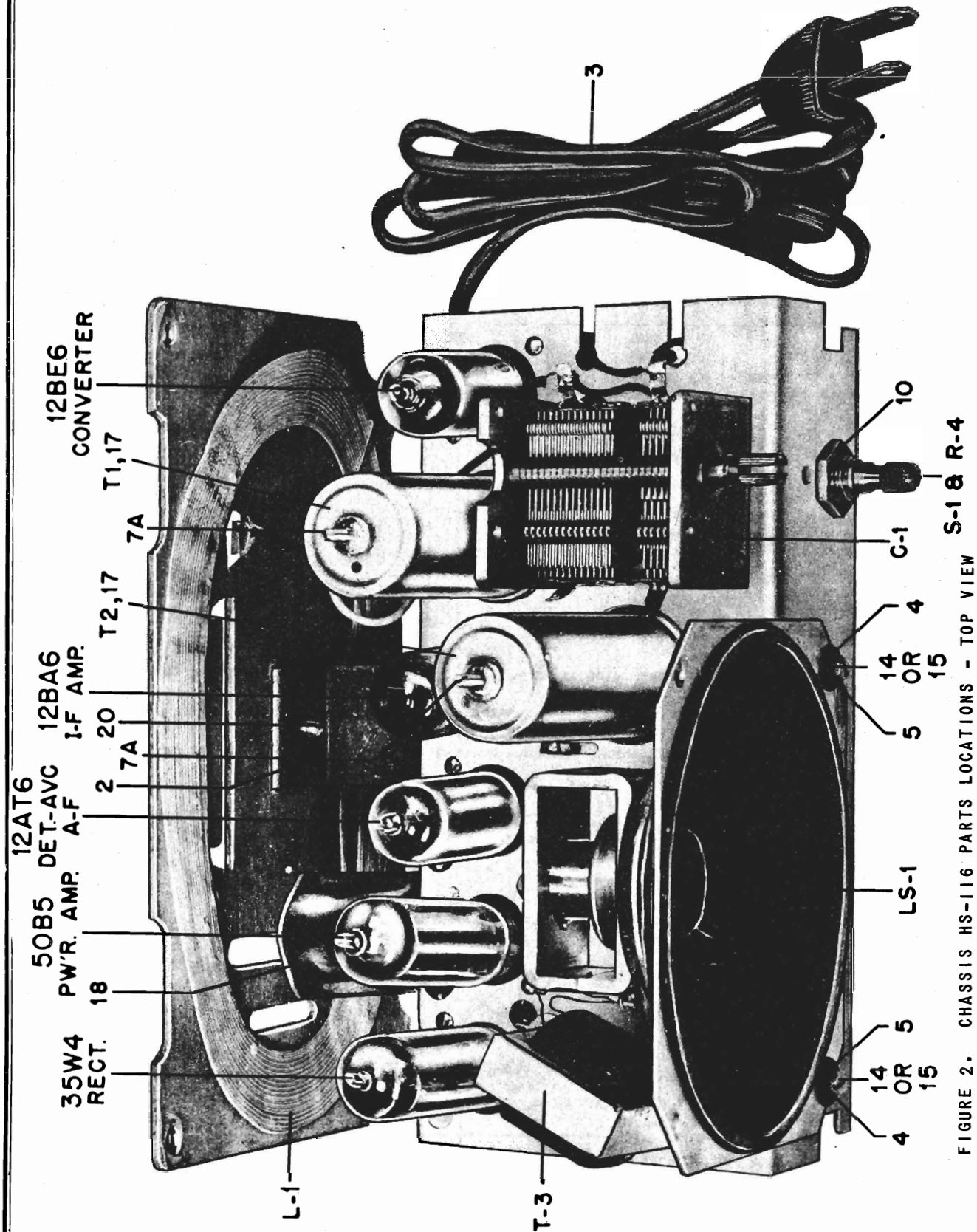
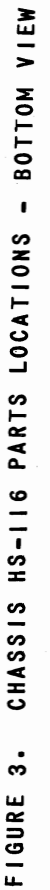


FIGURE 2. CHASSIS HS-116 PARTS LOCATIONS - TOP VIEW S-18 R-4



MODELS 58R11, 58R12,
58R13, 58R14, 58R15,
58R16, CHASSIS HS-116

MOTOROLA INC.

NOTE: A VTVM WAS USED TO TAKE VOLTAGE MEASUREMENTS. VOLUME CONTROL SET AT MINIMUM & NO SIGNAL TUNED IN.
MEASUREMENTS TAKEN FROM TUBE SOCKET TERMINALS TO CHASSIS.
ALL VOLTAGE MEASUREMENTS TAKEN WITH 117 V. AC INPUT TO SET.
ALL VOLTAGE MEASUREMENTS DC UNLESS OTHERWISE SPECIFIED.
VOLTAGE MEASUREMENTS $\pm 10\%$.
RESISTANCE MEASUREMENTS $\pm 20\%$.

□ = RESISTANCE READINGS.

○ = VOLTAGE READINGS.

GND. = GROUND CONNECTIONS TO CHASSIS.

NC = NO CONNECTION.

* = MAY VARY DEPENDING ON CONDITION OF ELECTROLYTIC CAPACITOR.

† = TIE POINT.

K = ONE THOUSAND (1000) OHMS.

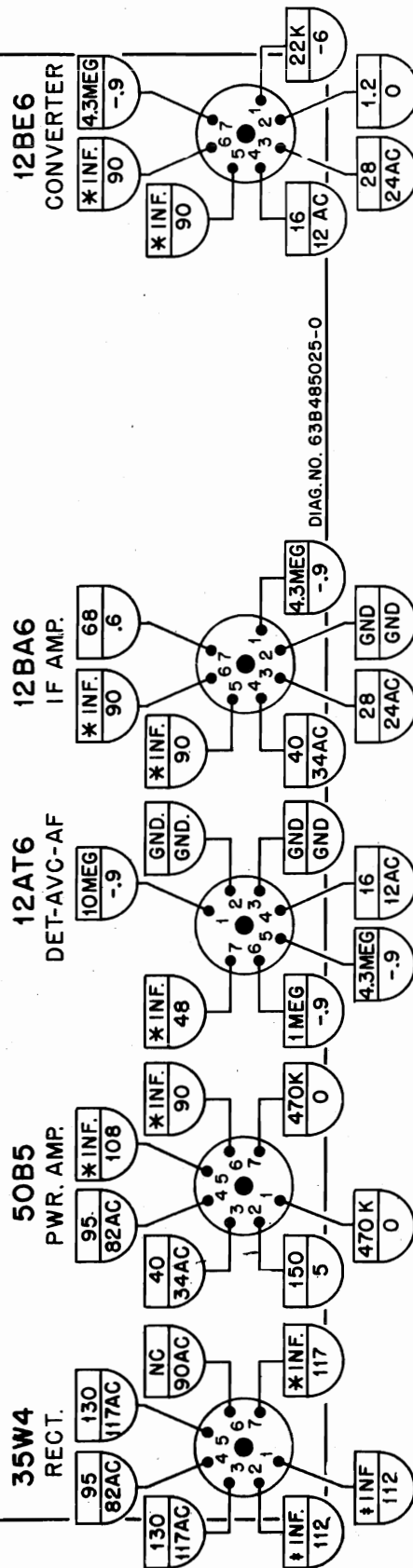
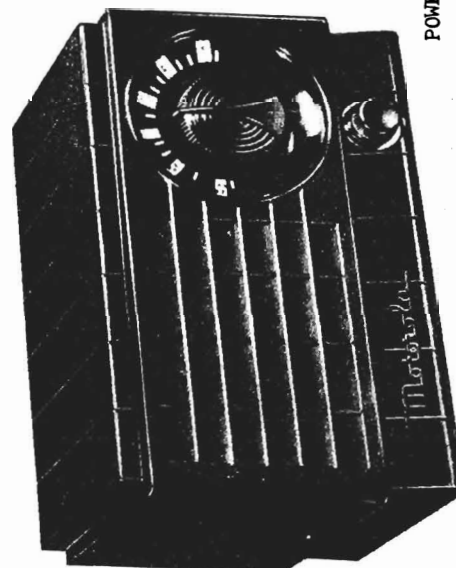


FIGURE 4. CHASSIS HS-116 VOLTAGE & RESISTANCE DIAGRAM



POWER SUPPLY - Operates from 105-125 volts AC or DC, 50 to 60 cycles, 35 watts

MOTOROLA INC.

MODELS 58R11, 58R12,
58R13, 58R14, 58R15,
58R16, CHASSIS HS-116

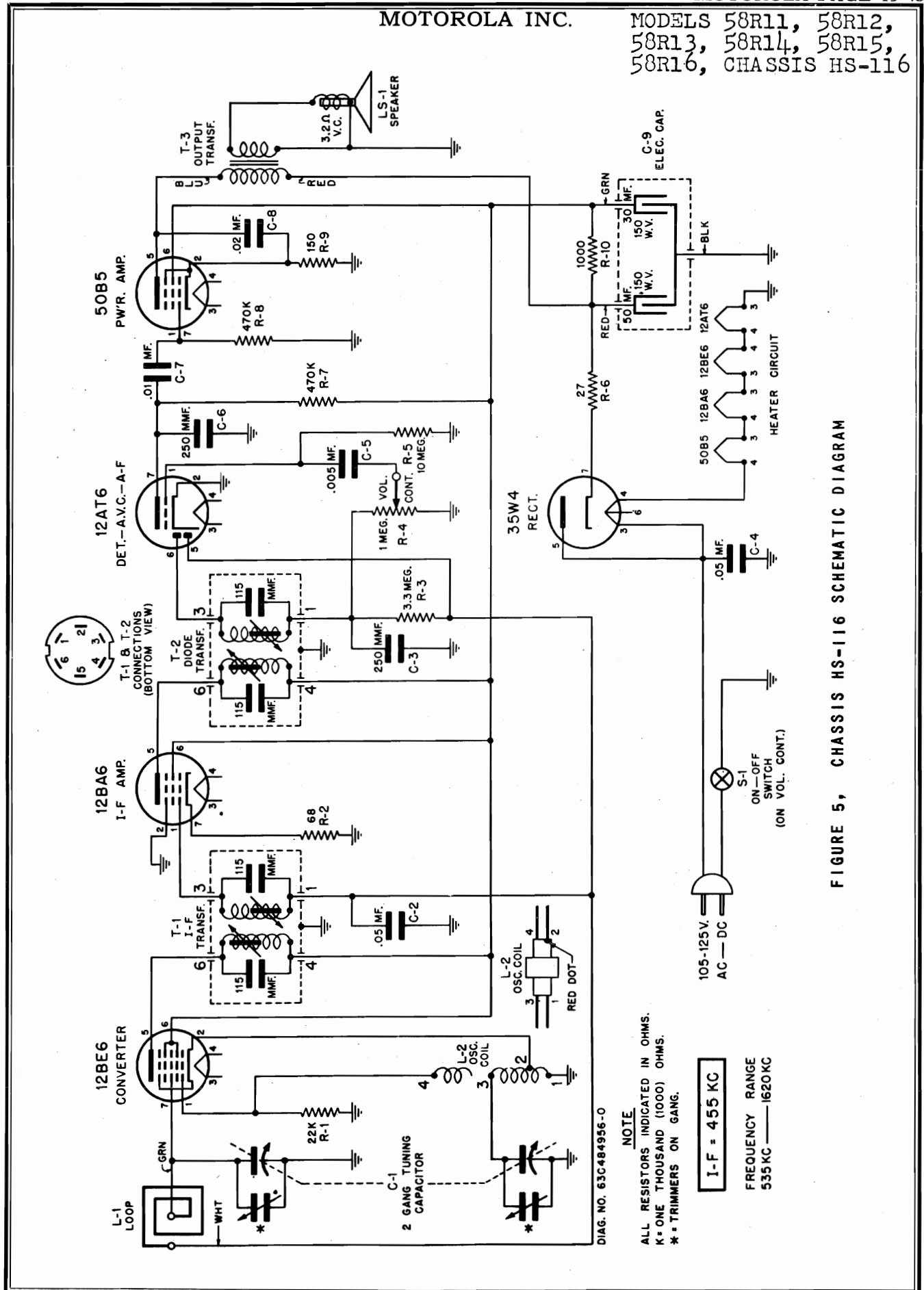


FIGURE 5, CHASSIS HS-116 SCHEMATIC DIAGRAM

DIAG. NO. 63C484956-0

NOTE

ALL RESISTORS INDICATED IN OHMS.
K=ONE THOUSAND (1000) OHMS.
*=TRIMMERS ON GANG.

I-F = 455 KC

FREQUENCY RANGE
535 KC — 1620 KC

MODELS 58R11, 58R12,
58R13, 58R14, 58R15,
58R16, CHASSIS HS-116

CHASSIS PARTS - ELECTRICAL		
CAPACITORS		
C-1	19B478128	Variable: 2 gang
C-2	8S9821	Paper: .05 mf 200V
C-3	21K77375	Ceramic: 250 mmf
C-4	8S9816	Paper: .05 mf 400V
C-5	8S9813	Paper: .005 mf 600V
C-6	21K77375	Ceramic: 250 mmf
C-7	8S9809	Paper: .01 mf 400V
C-8	8S9802	Paper: .02 mf 400V
C-9	23B478135	Electrolytic: 50-30 mf 150V
COILS		
L-1	24B478139	Loop Antenna: includes panel
L-2	24A478129	BC Oscillator
SPEAKER		
LS-1	50C478138	Speaker: 4" PM; 3.2 ohm VC
TRANSFORMERS		
T-1,2	24B478123	IF & Diode, 455 Kc: complete with tuning cores but less shield
T-3	25B478121	Output Transformer
RESISTORS		
Note: All resistors are insulated carbon type, 20%, 1/2W, unless otherwise specified.		
R-1	6R6028	22,000
R-2	6R6007	68
R-3	6R2118	3.3 meg
R-4	16A478122	Volume control: 1 meg; with SPST switch
R-5	6R2109	10 meg
R-6	6R5683	27 10%
R-7	6R6032	470,000
R-8	6R6032	470,000
R-9	6R3992	150
R-10	6R3953	1,000 1 watt
CHASSIS PARTS - MECHANICAL		
1	37A27142	Band, rubber (capacitor mtg)
2	7A478118	Bracket, loop mtg
3	30K478137	Cord, line, and plug: 6 ft long
4	5S7946	Eyelet, speaker mtg
5	5A484268	Grommet, speaker mtg; rubber
6	14A478119	Insulator, loop mtg
7	1X71048	Iron Core & Clip Assembly (IF & Diode trans. bottom core)
7A	1X71047	Iron Core & Palnut Assembly (IF & diode trans. top core)
8	4S7886	Lockwasher: #5 ext (speaker mtg - use with 3S7324 mounting screw only)
9	2S7010	Nut; #5 - 40 x 1/4 hex; steel; cad plated (speaker mtg - use with 3S7327 mtg screw only)
10	2S7051	Nut: 3/8-32 x 9/16 hex; steel; cad plated; Palnut (vol. cont. mtg)
11	5S7771	Rivet: .086 x 3/16; steel; nickel plated (tube socket mtg)
12	5S7707	Rivet: .122 x 5/32; steel; nickel plated (electrostatic shield mtg and output transformer mtg)
13	5S7703	Rivet: .122 x 7/32; steel; nickel plated (antenna bracket mtg)
14	3S3367	Screw: #5 x 3/8 PKA plain hex head sheet metal screw; black parkerized (speaker mtg-late production sets only)
15	or 3S7327	Screw: 5-40 x 3/8 plain hex head machine screw; cad pl (speaker mtg-used in early production sets)
16	3S7247	Screw: 6-32 x 3/16; slotted hex head machine screw; steel cad plated; lock-screw (gang mtg)
17	24B70107	Shield, coil: for IF and diode transformers
18	26A478117	Shield, electrostatic
19	9A472534	Socket, tube: miniature
20	46A478145	Stud, tri-mount (antenna mtg)
21	14A11493	Washer, fibre: insulating (antenna bracket mtg)
CABINET PARTS		
101	16D478088	Cabinet, plastic: brown (58R11)
102	16K484338	Cabinet, plastic: white (58R12)
103	16K484340	Cabinet, plastic: red (58R13)
104	16K485161	Cabinet, plastic: gray (58R14)
105	16K485162	Cabinet, plastic: green (58R15)
106	16K485163	Cabinet, plastic: yellow (58R16)
107	36B478147	Knob, tuning (58R11)
108	36A478148	Knob, volume control (58R11)
109	36K484377	Knob, tuning: ivory (58R12 & 58R13)
110	36K484375	Knob, volume control: ivory (58R12 & 58R13)
111	36K485157	Knob, tuning: gold (58R14, 58R15 & 58R16)
112	36K485156	Knob, volume control; gold (58R14, 58R15 & 58R16)
113	38A25507	Plug, split: copper oxide finish (mounts loop panel to cabinet)
114	38478083	Screw: 6-32 x 5/16 slotted hex head; steel, cad plated; lock screw (chassis mounting)
115	11M476113	Tape, aluminum foil: 3-1/2" wide x 7" long (heat shield)

MOTOROLA INC.

MODELS 58X11, 58X12,
CHASSIS HS-125

ALIGNMENT

Maximum performance can only be obtained if extreme care is exercised during alignment. Follow the procedure carefully.

A low range output meter should be connected across the speaker voice coil. Set receiver volume control to maximum. For greatest accuracy, keep output of receiver at approximately .05 watt thru-out alignment by reducing generator output (not receiver volume control) as stages are brought into alignment. (.05 watt = .40 volt on output meter).

If receiver is operated from AC line during alignment, it is suggested that an isolating transformer be used between receiver and power line.

If no isolation transformer is used and hum is encountered during alignment, connect the ground side of the signal generator through a .1 mf capacitor to B- instead of the receiver chassis.

NOTE: Two types of IF & diode transformers are used in this chassis. One type has cores with slotted brass adjustment screws; the other type has threaded cores that move inside a threaded coil form. To adjust the latter type, use a small fibre screwdriver and do not use undue pressure as damage to the core or coil form may result.

Refer to Figure 1 for location of all adjustments.

STEP	DIAL SET TO	DUMMY	SIGNAL GENERATOR CONNECTED TO	SIGNAL GENERATOR SET TO	ADJUST TRIMMER OR CORE	REMARKS
IF ALIGNMENT						
1.	Gang fully opened	.1 mf	Converter grid*	455 Kc	1,2,3 & 4	Adjust for maximum.
RF ALIGNMENT						
2.	1600 Kc**	-	Radiation loop***	1600 Kc	5	Adjust for maximum. This sets osc. to dial scale.
3.	1400 Kc	-	Radiation loop***	1400 Kc	6	Tune signal for maximum with receiver tuning knob, then peak trimmer 6.

* A convenient point is the stator of the antenna section of the tuning capacitor.

** First close gang fully and set pointer to calibration mark at left hand side of dial background; then set pointer to 1600 Kc. by turning knob till pointer lines up with right-hand calibration mark.

*** Connect output of signal generator to a 5" diameter, 3 turn loop and bring loop close enough to receiver loop to obtain output of .05 watt (.40V on output meter). Vary distance between loops to maintain this output during alignment. Minimum distance between loops should never be less than 12".

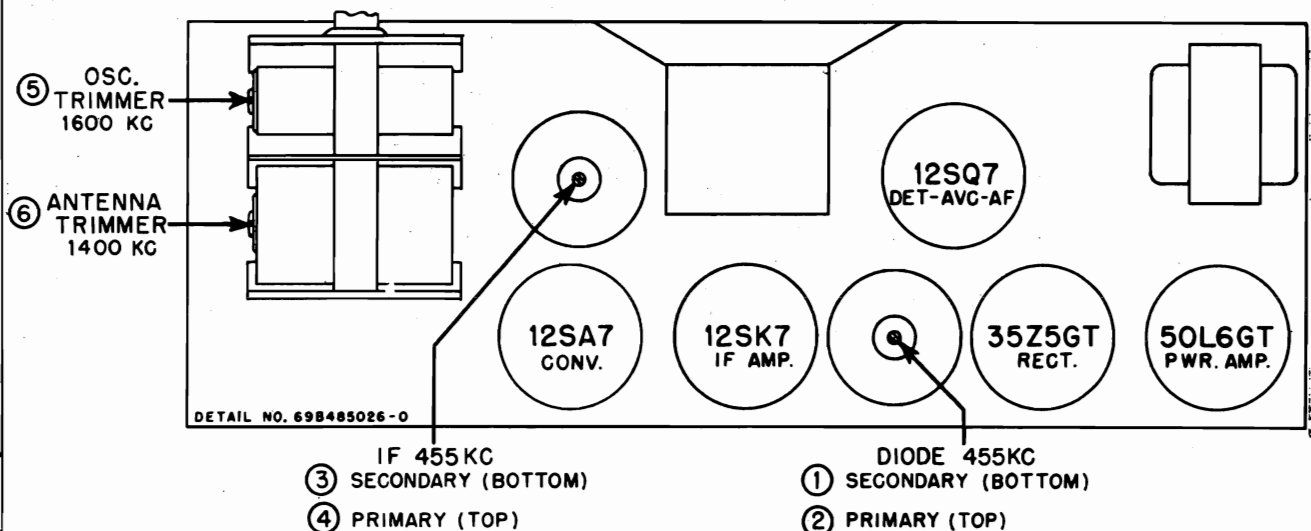


FIGURE 1. CHASSIS HS-125 TUBE & TRIMMER LOCATIONS

MODELS 58X11, 58X12,
CHASSIS HS-125

MOTOROLA INC.

SERVICE NOTE

Two types of IF & Diode transformers are being used in this model. One type has iron cores that are tuned by means of slotted brass screws. These transformers must be used with shields having an internal iron core sleeve.

The other type of transformers have threaded cores moving inside of a threaded coil form. These transformers must be used with plain shields.

Replacement transformer should always be of the same type as the original.

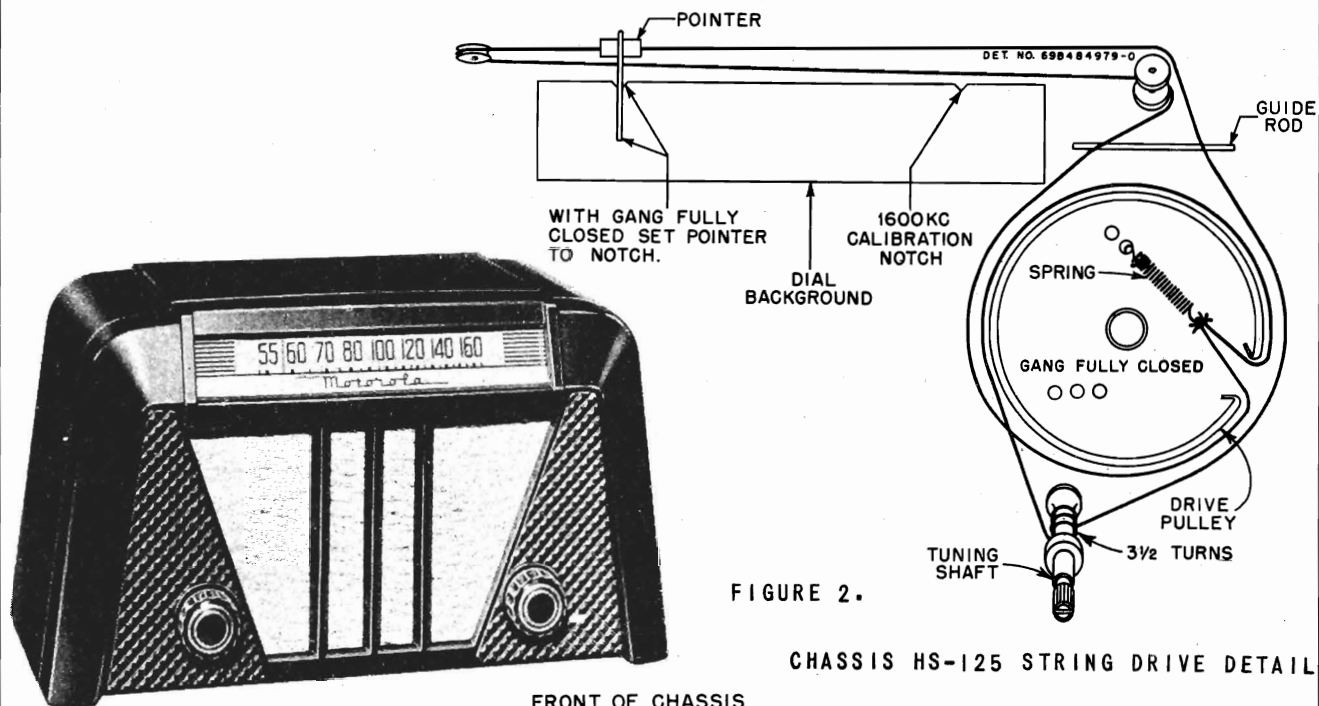


FIGURE 2.

CHASSIS HS-125 STRING DRIVE DETAIL

FRONT OF CHASSIS

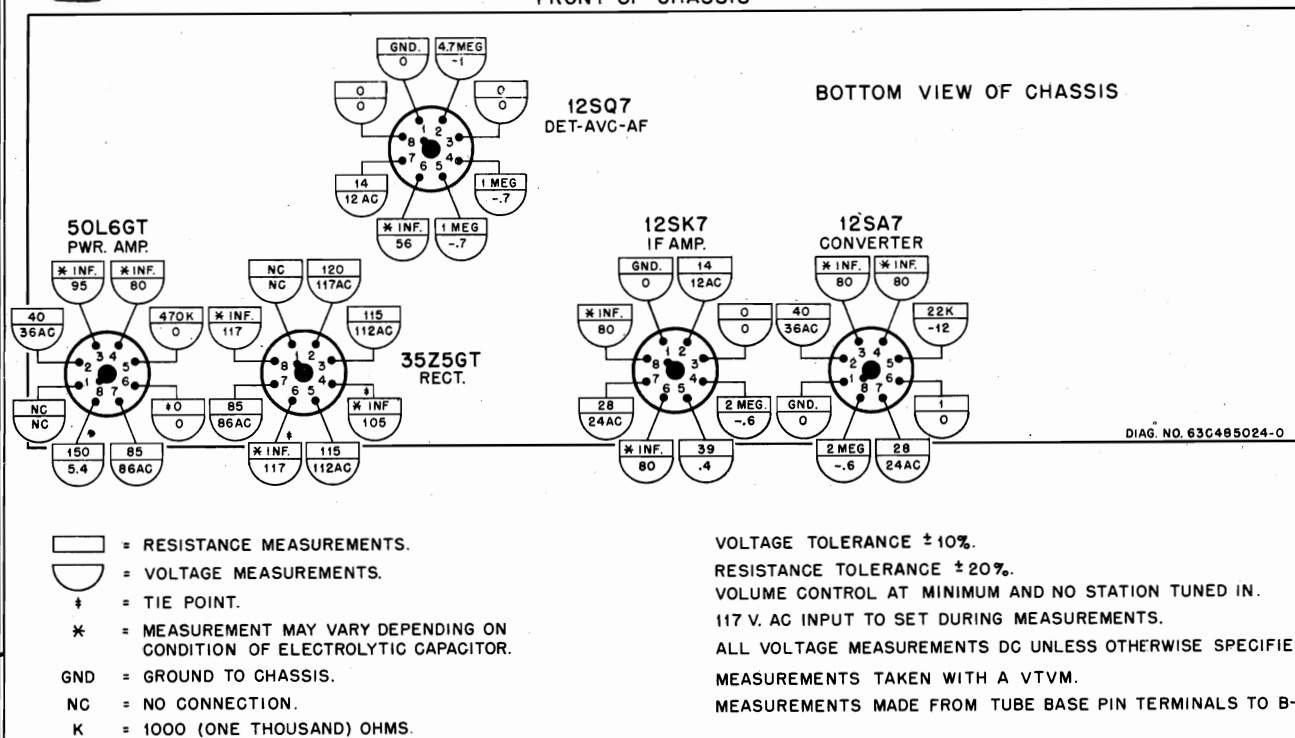


FIGURE 3. CHASSIS HS-125 VOLTAGE & RESISTANCE DIAGRAM

MOTOROLA INC.

MODELS 58X11, 58X12,
CHASSIS HS-125

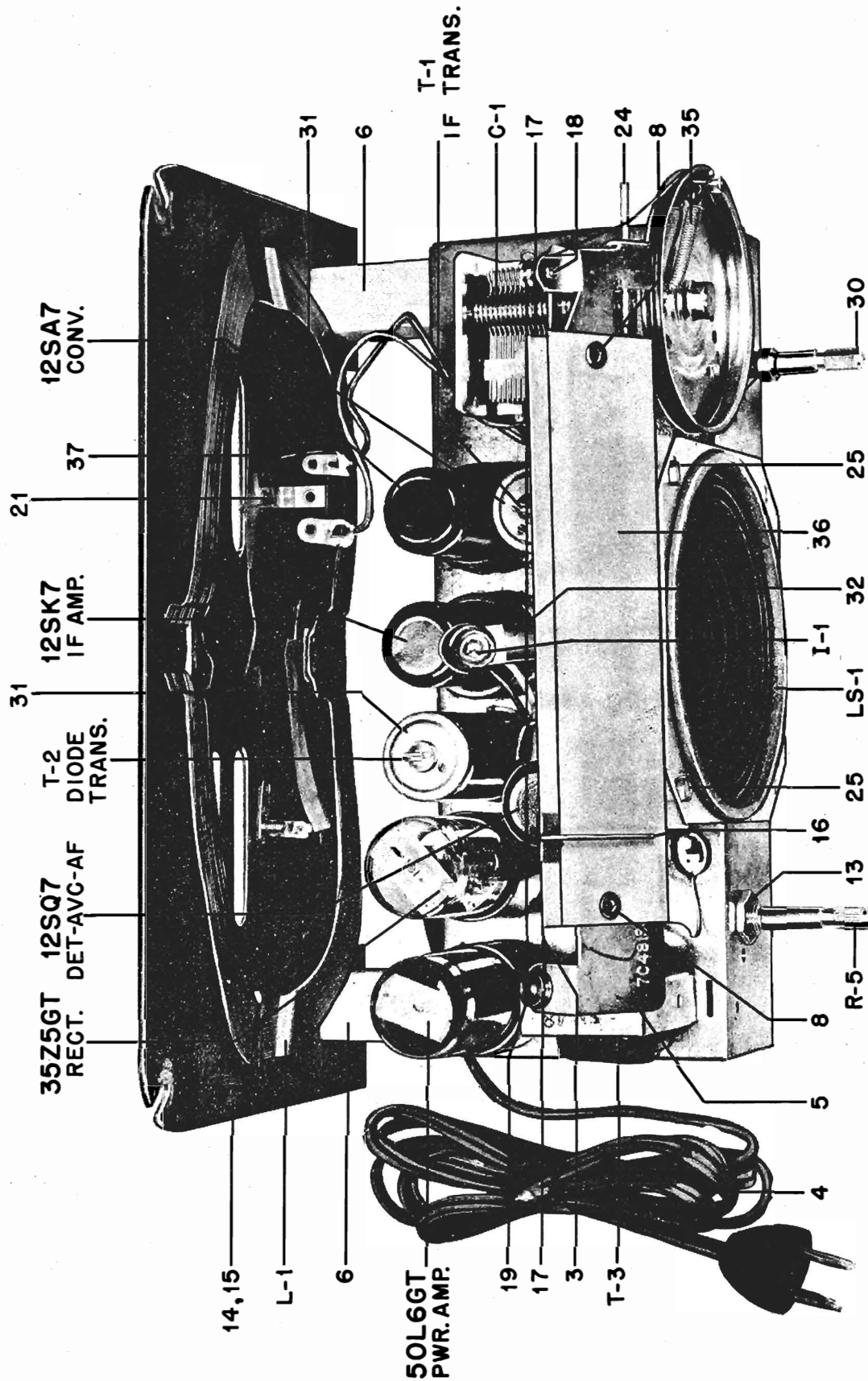


FIGURE 4. CHASSIS HS-125 PARTS LOCATION - TOP VIEW

MODELS 58X11, 58X12,
CHASSIS HS-125

MOTOROLA INC.

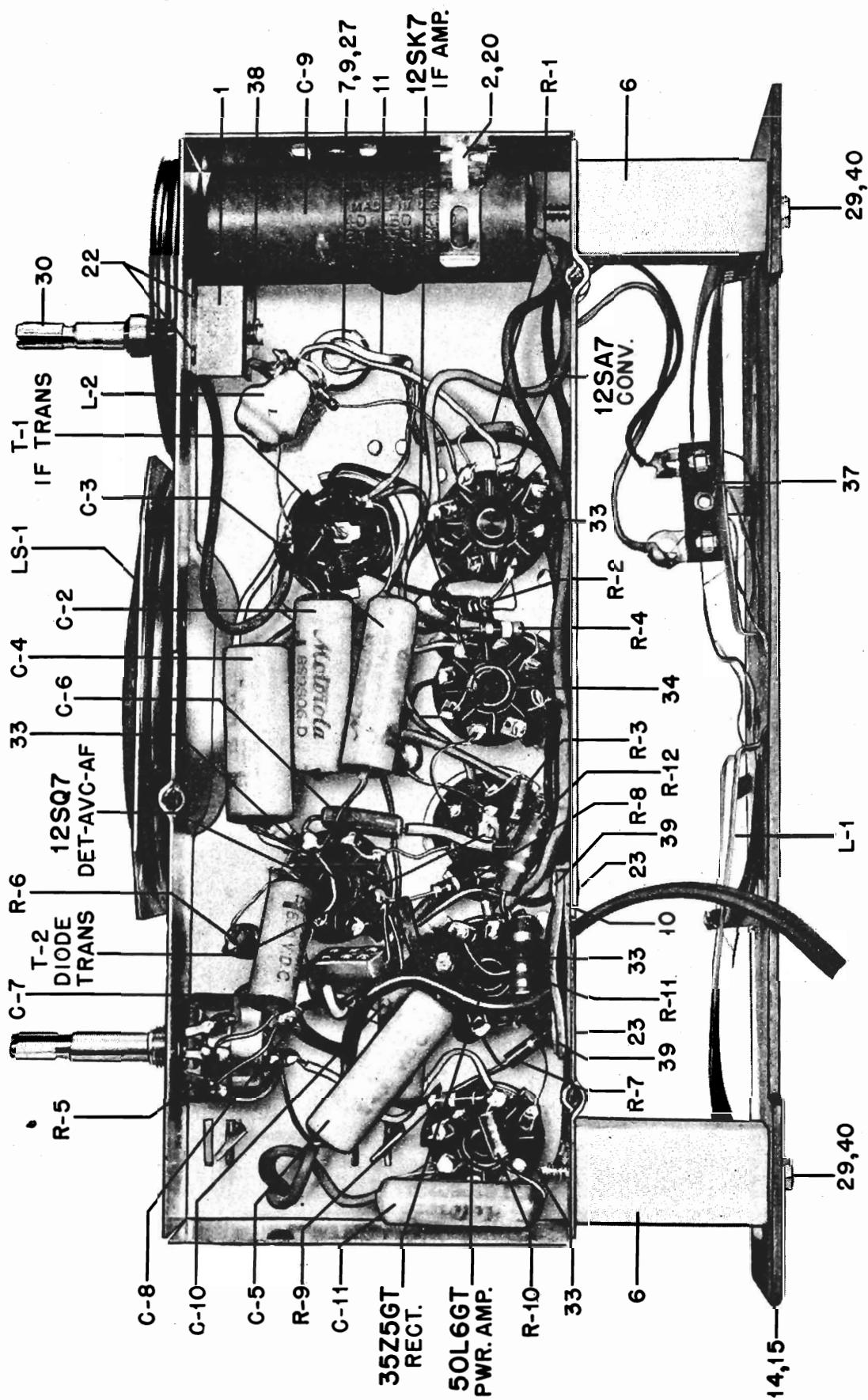
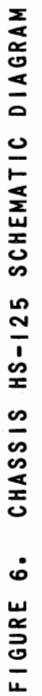


FIGURE 5. CHASSIS HS-125 PARTS LOCATION - BOTTOM VIEW



MODELS 58X11, 58X12,
CHASSIS HS-125

MOTOROLA INC.

CHASSIS PARTS - ELECTRICAL

CAPACITORS

C-1	1X77204	Variable: 2 gang; cut oscillator plates; includes pulley
C-2	8S9806	Paper: .1 mf 200V
C-3	8S9816	Paper: .05 mf 400V
C-4	8A72686	Paper: .15 mf 200V
C-5	8S9816	Paper: .05 mf 400V
C-6	21R6640	Mica: 250 mmf 500V
C-7	8S9813	Paper: .005 mf 600V
C-8	21R6648	Mica: 250 mmf 500V
C-9	23B75808	Electrolytic: 40-20-20 mf 150V
C-10	8S9813	Paper: .005 mf 600V
C-11	8S9802	Paper: .02 mf 400V

DIAL LIGHT

I-1	65X11854	Bulb, pilot: 6.3V, .15A; tubular, bayonet base; #47
-----	----------	---

COILS

L-1	24K77096	Loop Winding only - less cabinet back ..
L-2	24A74616	Oscillator

RESISTORS

NOTE: All resistors are insulated carbon type, 20% unless otherwise specified.

R-1	6R6028	22,000 1/2W
R-2	6R6015	220,000 1/2W
R-3	6R6004	1 meg 1/2W
R-4	6R2085	39 10% 1/2W
R-5	18A70032	Volume Control: 1 meg; includes switch ..
R-6	6R2122	4.7 meg 1/2W
R-7	6R5683	27 10% 1/2W
R-8	6R6015	220,000 1/2W
R-9	6R6032	470,000 1/2W
R-10	6R6373	150 10% 1/2W
R-11	6R6152	220 1W N.I.
R-12	6R3972	1200 10% 1W N.I.

SPEAKER

LS-1	50K482754	Speaker: 4" PM; 3.2 ohms VC
------	-----------	-----------------------------------

TRANSFORMERS

T-1	24B70531	IF, 455 Kc: complete with iron cores and padding capacitors, but less shield (use with shield & sleeve 1A71049)
or	24B482863	IF, 455 Kc: complete with iron cores and padding capacitors, but less shield (use with shield 26K485936)
T-2	24B70533	Diode, 455 Kc: complete with iron cores and padding capacitors, but less shield (use with shield & sleeve 1A71049)
or	24B482865	Diode, 455 Kc: complete with iron cores and padding capacitors, but less shield (use with shield 26K485936)
T-3	25B76117	Output Transformer

CHASSIS PARTS - MECHANICAL

1	7A77337	Bracket, tuning shaft
2	42K75826	Clip, electrolytic mtg
3	11M8944	Cord, dial: 18 lb black
4	30A470651	Cord, line: 6 ft lg with plug
5	1X481486	Dial Background Bracket & Pulley Assembly: background bracket with 3 cord pulleys and cord guide rod
6	57A77084	Dowel, wood (cabinet back mtg)
7	5A19658	Eyelet, spacer: 19/64 x .212 ID x 1/2 (gang mtg)
8	5S7805	Eyelet, snap-in (dial background strip mounting)
9	5A70404	Grommet, rubber (gang cushion)
10	32A24815	Lock, line cord: fibre
11	29R5235	Lug, soldering: #6
12	29R5348	Lug, soldering: #8
13	2S7051	Nut: 3/8-32 x 9/16 hex, cad pl (volume control mtg)
14	1X485924	Panel Assembly, cabinet back: less loop; includes terminal strip and antenna connector

15	24K481389	Panel and Loop Assembly: complete cabinet back panel; includes loop winding
16	52A481378	Pointer, dial
17	49A23960	Pulley, cord: 1/4" groove
18	5K74560	Rivet, shoulder: .312 shoulder; nkl pl (cord pulley mtg)
19	5A12814	Rivet, shoulder: .156 shoulder; nkl pl (cord pulley mtg)
20	5S7706	Rivet: .122 x 1/8; steel; nkl pl (electrolytic mtg clip mtg)
21	5S7707	Rivet: .122 x 5/32; steel; nkl pl (terminal strip mtg)
22	5S7701	Rivet: .122 x 3/16; steel; nkl pl (tuning shaft bracket mtg)
23	5S7708	Rivet: .122 x 9/32; steel; nkl pl (line cord lock mtg)
24	47A484382	Rod, cord guide
25	3S2695	Screw: #6 x 3/16 PKZ slotted hex head sheet metal screw; cad pl (dial background bracket mtg)
26	3S2294	Screw: 6-32 x 1/2 plain hex head locking type machine screw; cad pl (gang mtg) ..
27	3S1925	Screw: 6-32 x 5/8 slotted hex head machine screw; cad pl (oscillator coil mtg)
28	3S7205	Screw: 8-32 x 1/4; slotted hex head locking type machine screw; cad pl (spkr mounting)
29	3S3383	Screw: #8 x 2" PKZ slotted hex head sheet metal screw; cad pl (cabinet back mtg)..
30	1X484556	Shaft, tuning
31	1A71049	Shield and Iron Core Sleeve Assembly (for T-1 and T-2; used only with 24B70531 IF & 24B70533 Diode Trans)
or	2K485936	Shield, coil (for T-1 and T-2 -used only with 24B482863 IF & 24B482865 Diode trans)
32	9A482746	Socket, pilot light: with bracket and leads
33	9A6790	Socket, tube: octal; plain type
or	9A6788	Socket, tube (replacement) molded octal plain type (to be used in place of 9A6790 when mounting lugs on chassis break off)
34	9A6792	Socket, tube: octal; with center shield (for IF amp)
or	9A70165	Socket (replacement) octal; with center shield (to be used in place of 9A6792 when mounting lugs on chassis break off)
35	41A14244	Spring, tension coil (drive cord)
36	35A481384	Strip, dial background: tan plastic
37	31K86126	Strip, terminal: 2 insulated lugs, #2 mtg (on loop antenna panel)
38	4A70015	Washer, "C" (tuning shaft retainer)
39	4S1719	Washer: 3/8 x .140 x .030 thick; steel; cad pl (line cord lock mtg)
40	4S7563	Washer: 5/8 x .203 x .033 thick; steel; cad pl (cabinet back mtg)

CABINET PARTS

101	35K481468	Baffle & Grille Cloth Assembly
102	37K70069	Band, rubber (on dial scale)
103	16E480031	Cabinet: plastic; walnut (58X11)
104	16K481445	Cabinet: plastic; white (58X12)
105	36B77212	Knob, control: walnut plastic (58X11) ...
106	36K77214	Knob, control: ivory plastic (58X12)....
107	38A25507	Plug, split: 5/8 long; for 1/8 hole (mounts cabinet back to cabinet)
108	34B481438	Scale, dial
109	3S3365	Screw: #8 x 1" PKA slotted hex head sheet metal screw; parkerized finish (chassis mounting)
110	2S7089	Speednut: for .187 round (baffle & grille cloth assembly mtg)
111	2A481437	Speednut (dial scale mtg)
112	4K19943	Washer, paper: 11/16 x 17/64 x 1/32 thick (under knobs)
113	4S7633	Washer, steel: 9/16 x 11/64 x .033 thick; cad pl (chassis mtg)

MOTOROLA INC.

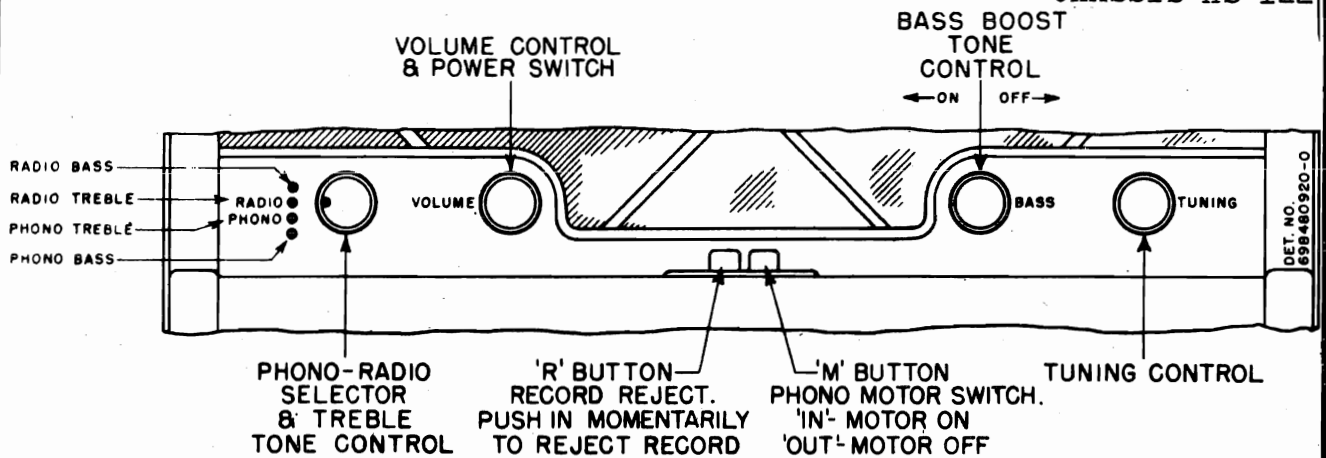
MODEL 67F14,
CHASSIS HS-122

FIGURE 1. FRONT PANEL CONTROLS

TUNING RANGE.- 535 to 1620 Kc

ALIGNMENT

IF FREQUENCY - 455 Kc

Maximum performance can only be obtained if extreme care is exercised during alignment. Follow the procedure carefully.

A low range output meter should be connected across the speaker voice coil. Set receiver volume control to maximum. For greatest accuracy, keep output of receiver at approximately .05 watt thru-out alignment by reducing generator output (not receiver volume control) as stages are brought into alignment. (.05 watt = .40 volt on output meter).

If receiver is operated from AC line during alignment, it is suggested that an isolating transformer be used between receiver and power line. If no isolation transformer is used and hum is encountered during alignment, connect the ground side of the signal generator through a .1 mf capacitor to B- instead of the receiver chassis.

Refer to Figure 2 for location of all adjustments.

STEP	DIAL SET TO	DUMMY	SIGNAL GENERATOR CONNECTED TO	SIGNAL GENERATOR SET TO	ADJUST TRIMMER OR CORE	REMARKS
IF ALIGNMENT						
1.	Gang fully opened	.1 mf	RF Amp. grid*	455 Kc	1,2,3 & 4	Adjust for maximum output.
WAVE TRAP ADJUSTMENT						
2.	Gang fully opened	.1 mf	RF Amp. grid	455 Kc	5	Adjust for minimum response.
RF ALIGNMENT						
3.**	Gang fully opened	.1 mf	RF Amp. grid*	1620 Kc	6	Adjust for maximum output; this sets osc. to dial scale
4.	1400 Kc	—	Radiation loop***	1400 Kc	7	Tune signal for max. with receiver tuning knob, then peak trimmer 7.

* A convenient point for this connection is the stator of the RF section of the tuning capacitor.

** First close gang fully and set pointer to calibration mark as shown in Figure 3, then proceed with Step 3.

*** Connect output of signal generator to a 5" diameter, 3 turn loop and bring close enough to receiver loop to obtain output of 50 milliwatts (.40V) on output meter. Vary distance between loops to maintain this output during alignment. Minimum distance between loops should never be less than 12".

MODEL 67F14,
CHASSIS HS-122

MOTOROLA INC.

POWER SUPPLY - 105-125 volts AC, 60 cycles, 60 watts

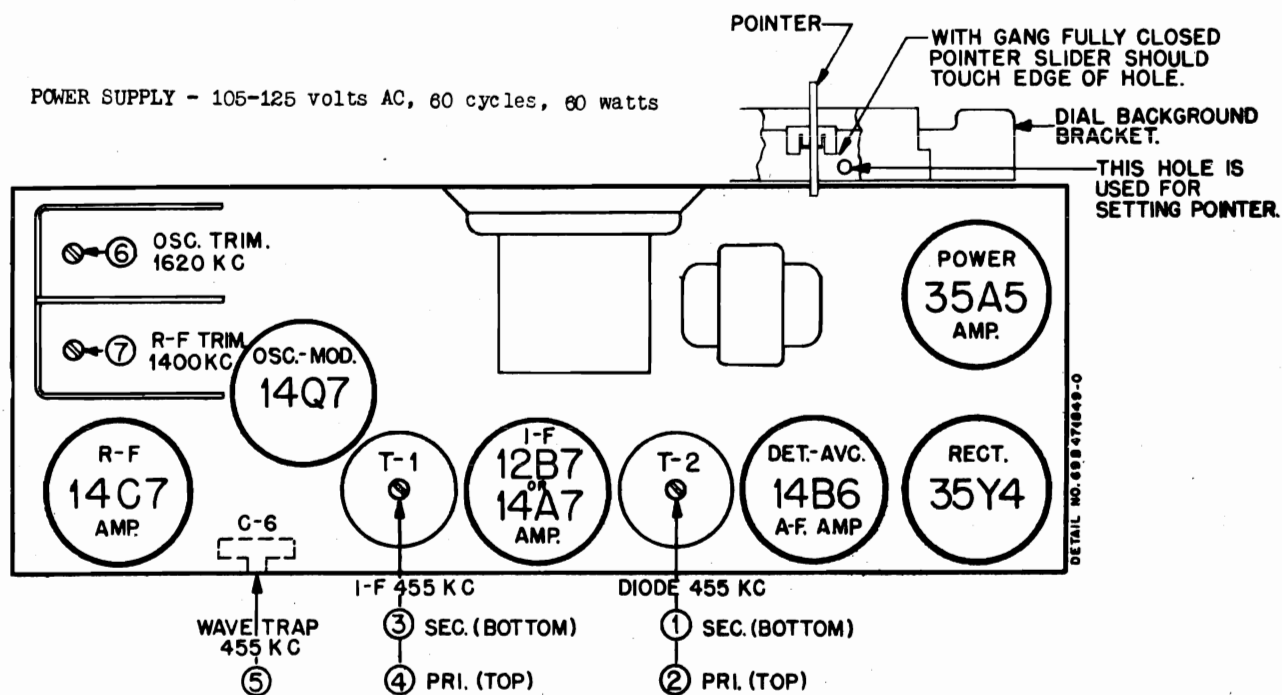


FIGURE 2. CHASSIS HS-122 TUBE & TRIMMER LOCATIONS

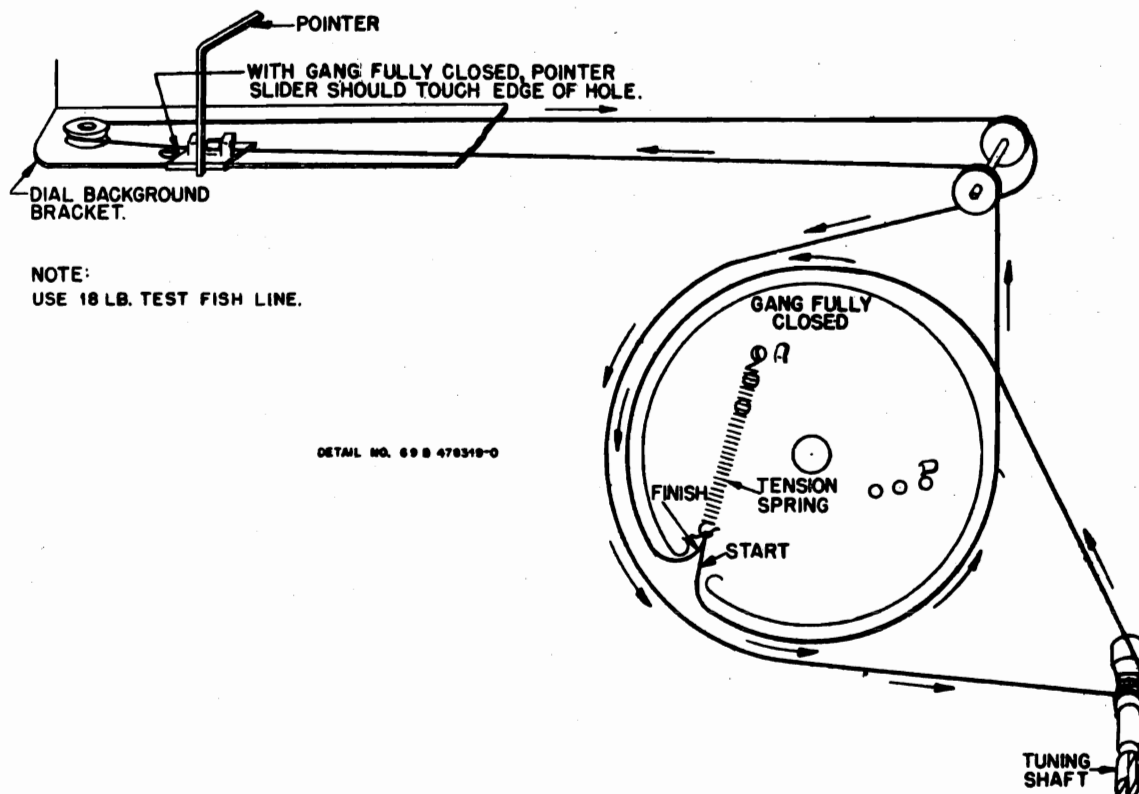


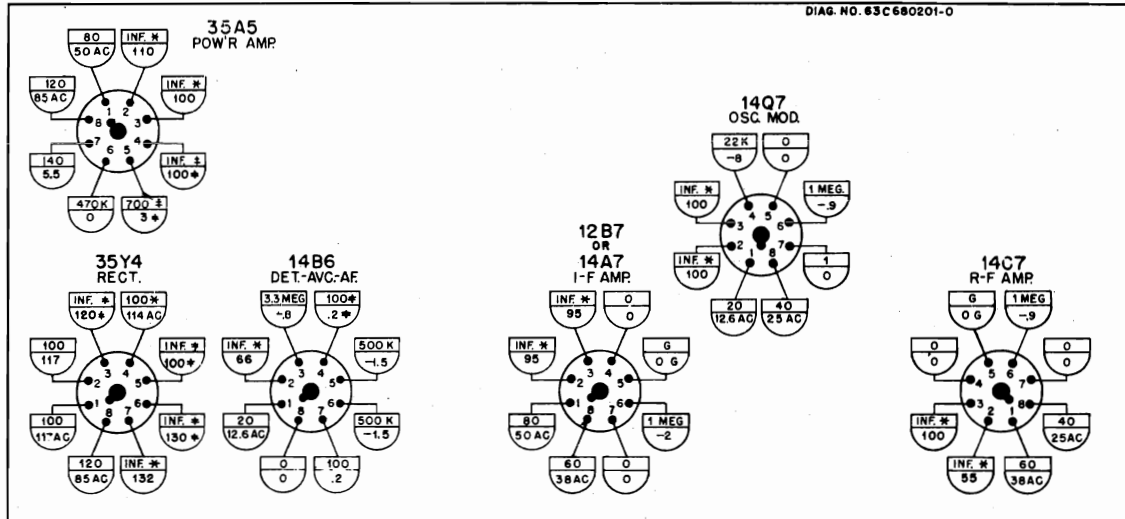
FIGURE 3. CHASSIS HS-122 STRING DRIVE DETAIL

MOTOROLA INC.

MODEL 67F14,
CHASSIS HS-122

BOTTOM VIEW OF CHASSIS

DIAG. NO. 63C680201-0



□ = RESISTANCE READINGS.

○ = VOLTAGE READINGS.

G = GROUND TO CHASSIS.

* = MAY VARY, DEPENDING ON CONDITION OF ELECTROLYTIC CAPACITORS.

= TIE POINT.

K = ONE THOUSAND (1000) OHMS


NOTE: A VTVM WAS USED TO MAKE VOLTAGE MEASUREMENTS. VOLUME CONTROL SET AT MINIMUM AND NO SIGNAL TUNED IN. MEASUREMENTS TAKEN FROM TUBE SOCKET TERMINALS INDICATED TO B-(). ALL VOLTAGE MEASUREMENTS TAKEN WITH 117V. AC INPUT TO SET. ALL VOLTAGE MEASUREMENTS DC UNLESS OTHERWISE SPECIFIED. ALL MEASUREMENTS $\pm 10\%$. PHONO-RADIO-TONE SWITCH IN RADIO-BASS POSITION. BASS BOOST CONTROL IN 'ON' POSITION.

FIGURE 4. CHASSIS HS-122 VOLTAGE & RESISTANCE DIAGRAM

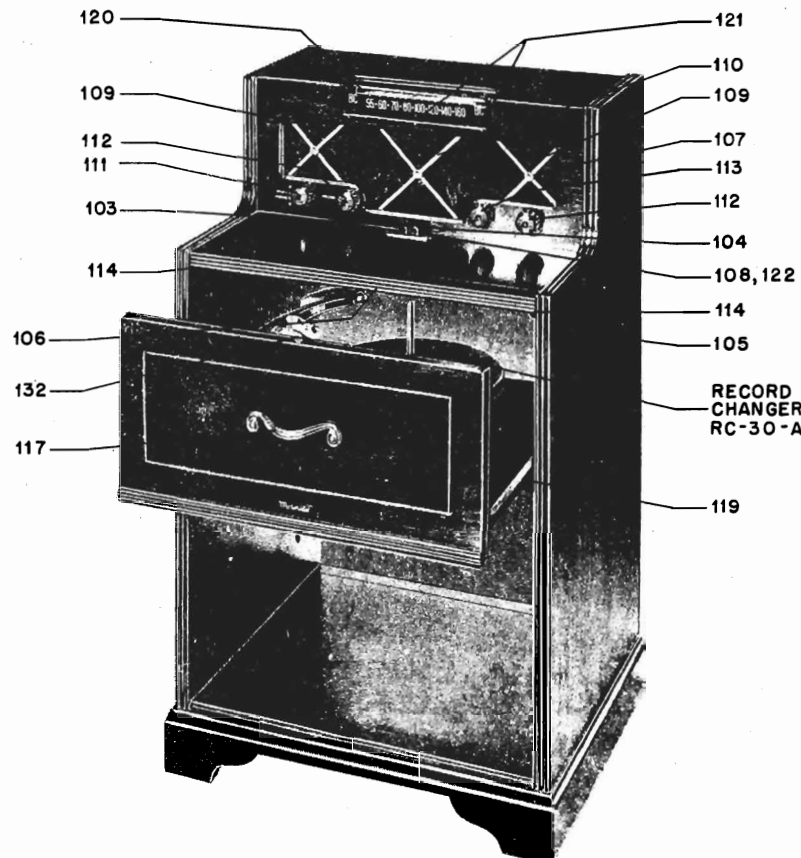


FIGURE 5. MODEL 67F14 CABINET PARTS LOCATIONS

MODEL 67F14,
CHASSIS HS-122

MOTOROLA INC.

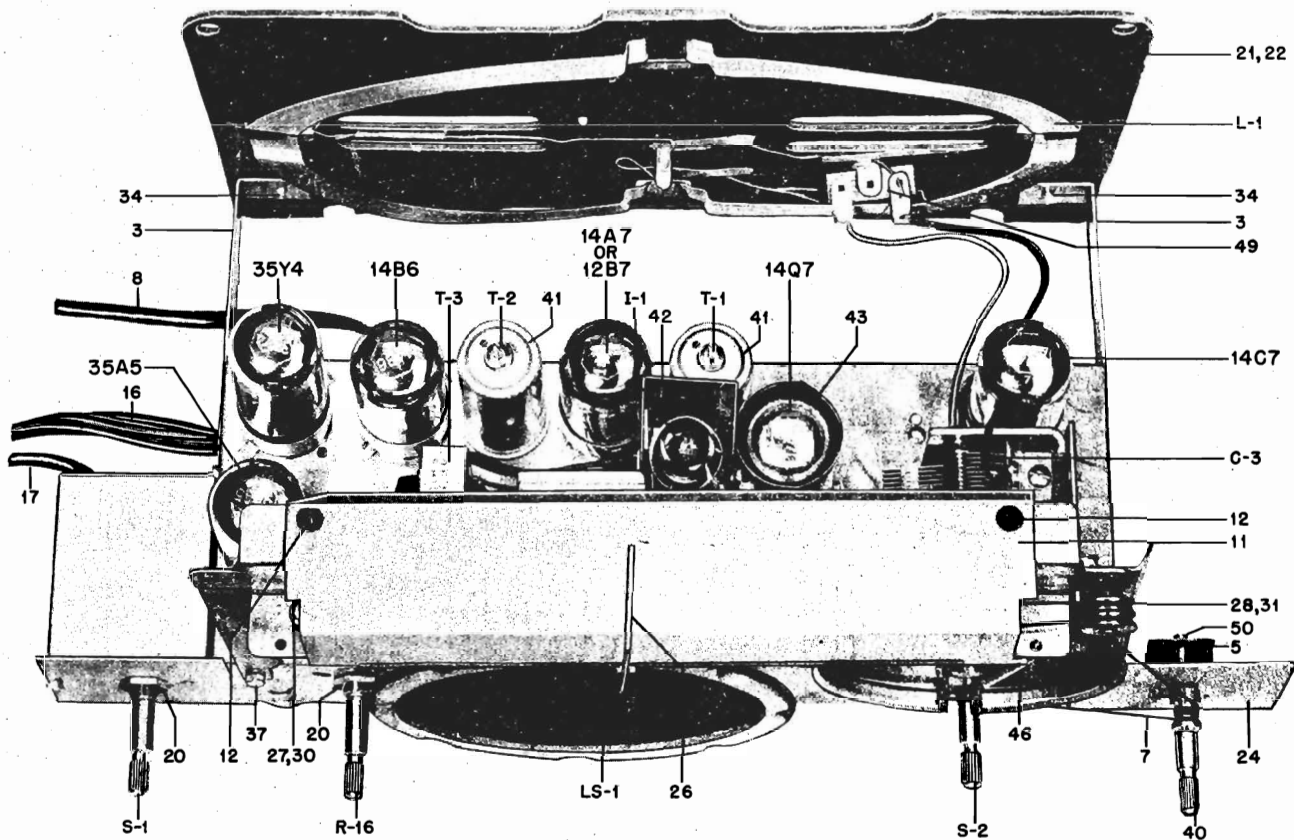


FIGURE 6. CHASSIS HS-122 PARTS LOCATIONS - TOP VIEW

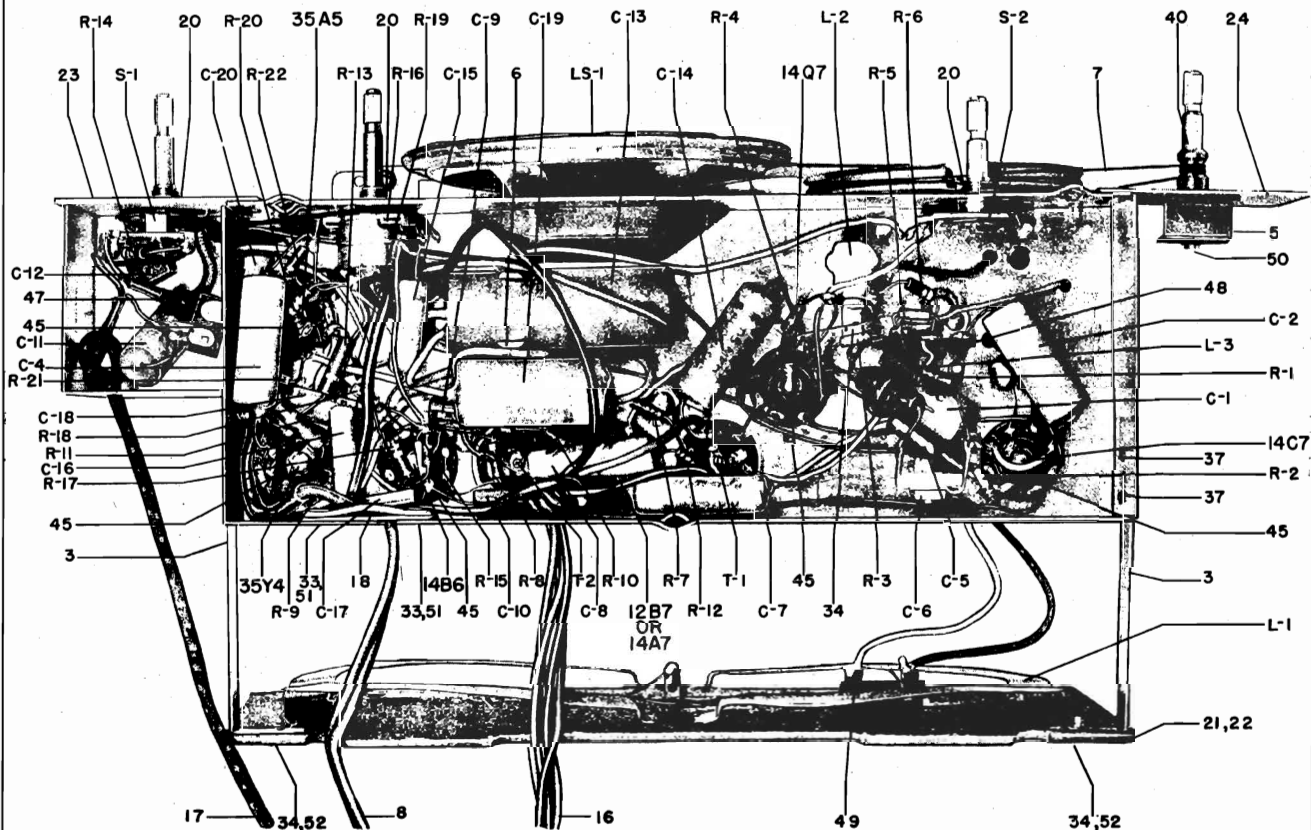


FIGURE 7. CHASSIS HS-122 PARTS LOCATIONS - BOTTOM VIEW

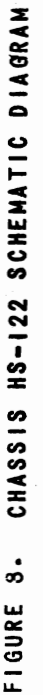


FIGURE 3. CHASSIS HS-122 SCHEMATIC DIAGRAM

MODEL 67F14,
CHASSIS HS-122

MOTOROLA INC.

REPLACEMENT PARTS LIST

REF. NO.	PART NO.	DESCRIPTION
CHASSIS PARTS - ELECTRICAL		
CAPACITORS		
C-1	8S9816	Paper: .05 mf 400V
C-2	8A72686	Paper: .15 mf 200V
C-3	1X77339	Variable: 2 gang; with pulley
C-4	8S9816	Paper: .05 mf 400V
C-5	21R6641	Mica; 100 mmf 500V
C-6	20A26941	Variable, mica: 6-60 mmf; includes bracket
C-7	8S9816	Paper: .05 mf 400V
C-8	8S9816	Paper: .05 mf 400V
C-9	21R6648	Mica: 250 mmf 500V
C-10	21R6648	Mica: 250 mmf 500V
C-11	8S9807	Paper: .1 mf 400V
C-12	21R6648	Mica: 250 mmf 500V
C-13	23B75808	Electrolytic: 40-20-20 mf 150V
C-14	8S9816	Paper: .05 mf 400V
C-15	8S9809	Paper: .01 mf 400V
C-16	8S9824	Paper: .002 mf 400V
C-17	21R6648	Mica: 250 mmf 500V
C-18	8S9809	Paper: .01 mf 400V
C-19	8S9839	Paper: 1 mf 100V
C-20	8S9802	Paper: .02 mf 400V

RESISTORS

Note: All resistors are insulated carbon type, unless otherwise specified.

R-1	6R6004	1 meg 20% 1/2W
R-2	6R6054	10,000 20% 1/2W
R-3	6R6028	22,000 20% 1/2W
R-4	6R6028	22,000 20% 1/2W
R-5	6R3927	2.2 meg 20% 1/2W
R-6	6R2122	4.7 meg 20% 1/2W
R-7	6R3933	220 20% 1/2W
R-8	6R6004	1 meg 20% 1/2W
R-9	6R5683	27 10% 1/2W
R-10	6R6056	47,000 20% 1/2W
R-11	6R6389	220 10% 1W
R-12	6R6028	22,000 20% 1/2W
R-13	6R5770	1200 10% 1W
R-14	6R6032	470,000 20% 1/2W
R-15	6R6326	100 10% 1/2W
R-16	18A76191	Volume Control: 500,000 ohms; tapped at 25,000 ohms; with SPST switch
R-17	6R2118	3.3 meg 20% 1/2W
R-18	6R6393	1200 10% 1/2W
R-19	6R6015	220,000 20% 1/2W
R-20	6R6032	470,000 20% 1/2W
R-21	6R6393	1200 10% 1/2W
R-22	6R6373	150 10% 1/2W

COILS

L-1	24K77323	Antenna Loop: winding only
-----	----------	----------------------------------

REF. NO.	PART NO.	DESCRIPTION
L-2	24A76192	BC Oscillator coil
L-3	24A77336	Wavetrap

SPEAKER

LS-1	50C470684	Speaker: 5" PM; 3.2 ohm VC
------	-----------	----------------------------------

SWITCHES

S-1A,B	40K470676	Phono-Radio & Tone
S-2	40A30444	Bass: SPST
S-3	40K471447	Pushswitch, dual (phono motor ON-OFF & REJECT)

TRANSFORMERS

T-1	24B470038	IF, 455 Kc: includes tuning cores & padding capacitors but less shield
T-2	24B75487	Diode, 455 Kc: includes tuning cores & padding capacitors but less shield
T-3	25B76117	Output Transformer

PILOT LIGHT

I-1	65A470930	Lamp, incandescent; 117V-10W, clear
-----	-----------	--

CHASSIS PARTS - MECHANICAL

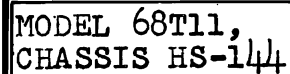
1	1X476177	Background Bracket, Support & Pullies Assem.
2	7B18748	Bracket, gang mtg
3	7A482882	Bracket, loop support
4	7K470917	Bracket, pilot light mounting
5	7A77337	Bracket, tuning shaft
6	42K75886	Clip, electrolytic mtg
7	11M8944	Cord, dial: 18 lb black
8	3A470651	Cord, line & plug: 6 ft long
9	15A471444	Cover, pushswitch
10	15B470677	Cover, switch (on chassis)
11	35B77311	Dial Background: tan plastic; with reinforcing strip
12	587805	Eyelet, snap-in (dial background mtg) ..
13	5A19658	Eyelet, spacer (gang bracket mtg)
14	37A12891	Grommet, rubber (gang bracket mtg)
15	14A471446	Insulator, pushswitch cover: armite
16	1X484205	Lead Assembly, phono: with 4 pin receptacle & dual push switch
17	1X471449	Lead Assembly, phono pickup: single shielded conductor with one pin plug 43" long
18	32A24815	Lock, line cord: fibre
19	29P5227	Lug, soldering: 6L
20	2S7051	Nut: 3/8-32 x 9/16 hex; Palnut; cad pl (volume control, phono-radio-tone sw. & bass sw. mtg)
21	1X484247	Panel Assembly, cabinet back; less loop winding
22	24C77322	Panel Assembly, cabinet back: complete including loop
23	64A470680	Plate, switch mounting

MOTOROLA INC.

MODEL 67F14,
CHASSIS HS-122

REF. NO.	PART NO.	DESCRIPTION	REF. NO.	PART NO.	DESCRIPTION
24	64A470681	Plate, tuning shaft mounting	103	38B471506	Button, push: "M"
25	28K71775	Plug: 1 pin (phono pickup lead)	104	38K471507	Button, push: "R"
26	52A77307	Pointer & Slider Assembly	105	16K484213	Cabinet, consolette model: wood; mahogany
27	49A12646	Pulley, cord: 1/4 groove	106	55A72307	Catch, bullet
28	49A21552	Pulley, cord: 1/2 groove	107	13K478036	Cloth, grille
29	9K470402	Receptacle: 4 prong(phono receptacle) ..	108	3A471458	Escutcheon, push button
30	5A71246	Rivet, shoulder: .187 long (cord pulley mtg)	109	13A478037	Grille, cabinet: painted; 3-5/8"
31	5A15045	Rivet, shoulder: .437 long (cord pulley mounting)	110	13K478039	Grille, cabinet: painted; 4-7/8"
32	5S7707	Rivet: .122 x 5/32 ; steel; nkl pl (re- placement socket mtg, etc)	111	36K478403	Knob, control: mahogany plastic; branded; 7/16" shank (tone-phono-radio)
33	5S7708	Rivet: .122 x 9/32 steel; nkl pl (line cord lock mtg)	112	36K478402	Knob, control: mahogany plastic; plain; 7/16" shank (volume & tuning)
34	3S7506	Screw: #6 x 1/4 PKZ plain hex head sheet metal screw (osc coil mtg and back mtg)	113	36K484200	Knob, control: mahogany plastic; plain; 9/16" shank (BASS)
35	3S7152	Screw: 6-32 x 1/4 slotted hex head machine screw; steel; cad pl (gang mtg)	114	35K470657	Pad, felt: 1/2 diameter x 1-16 thick (drawer stop)
36	3S7350	Screw: 6-32 x 1/4 slotted hex head lock- ing type machine screw; steel; cad pl (gang mtg)	115	64K478063	Panel, cabinet rear: wood; mahogany finish
37	3S7454	Screw: #8 x 1/4 PKZ plain hex head sheet metal screw; cad pl (switch cover mounting, loop bracket mtg and background bracket assembly mtg)	116	38A25507	Plug, split: 5/8 long; for 1/8 hole; copper oxide finish (holds loop panel to cabinet)
38	3S7507	Screw: #8 x 5/8 PKZ plain hex head sheet metal screw; cad pl (gang mtg)	117	55K481403	Pull, drawer: statuary bronze
39	3S7205	Screw: 6-32 x 1/4 slotted hex head locking type machine screw; steel; cad pl (spkr mounting)	118	55K74786	Rail, support: right-hand (phono drawer rail)
40	1K77694	Shaft & Pulley Assembly (tuning shaft) .	119	55K74787	Rail, support: left-hand (phono drawer rail)
41	1A71049	Shield & Sleeve Assembly (for T-1 & T-2)	120	1X484215	Scale, dial & escutcheon
42	26A476109	Shield, light & static	121	3S7401	Screw: #2 x 3/8 Phillips oval head wood screw; antique copper finish (dial scale mounting)
43	26A72635	Shield, tube	122	3S1343	Screw: #4 x 3/8 Phillips oval head wood screw; brass finish (pushbutton escutcheon mounting)
44	9A470407	Socket, dial light & bracket	123	3S7156	Screw: 6-32 x 3/16 slotted binderhead machine screw; cad pl (phono motor-re- ject switch mtg)
45	9A76185	Socket, tube: loctal	124	3S1314	Screw: #6 x 3/4 round head wood screw (drawer rail mtg)
or 9A72549		Socket, tube (replacement) use in place of 9A76185 when mounting lugs on chassis are broken	125	3S7526	Screw: #8 x 1-1/8 PKA slotted hex head sheet metal screw; cad pl (chassis mtg)
46	41A14244	Spring, tension coil (drive cord tension)	126	3S7396	Screw: 10-32 x 2" slotted hex head machine screw; copper plated (record changer mounting)
47	31K85348	Strip, terminal: 1 insulated lug, #2 mtg	127	36K481398	Screw: washer head: statuary bronze finish (pull mtg)
48	31K76184	Strip, terminal: 2 insulated lugs, #1 gnd	128	41A21807	Spring, cushion: bottom (record changer cushion)
49	31K86126	Strip, terminal: 2 insulated lugs, #2 mtg (on rear panel)	129	41A28190	Spring, cushion: top (record changer cushion)
50	4A70015	Washer, "C" (tuning shaft retainer,	130	41A478162	Spring, push button insert
51	4S1719	Washer: 3/8 x .140 x .030 thick; steel; cad pl (line cord lock mtg)	131	22S7905	Staple, insulated
52	4S7563	Washer: 5/8 x .203 x .033 thick; steel; cad pl (back panel mtg)	132	55K72308	Strike, bullet: (includes 1/2" nail)
			133	4S8214	Washer: 7/8 x .203 x .067 thick; cad pl (chassis mtg)
			134	4S7611	Washer: 1/2 x 7/32 x .048 thick; antique copper finish (record changer mtg)
CABINET PARTS					
101	7A471456	Bracket, switch mounting (phono motor & reject sw mtg)			
102	38K470830	Button, plug for 1/4" hole; green (for concealing shipping screw holes in re- cord changer base)			

MODEL 68T11,
CHASSIS HS-144



K = ONE THOUSAND (1000) ONMS.

* = TRIMMERS ON GANG.

* - TYPE 65A7 USED IN SOME CHASSIS. WHEN

REPLACING USE 6SG7 TUBE.

Δ. TYPE 7B6 USED IN PLACE OF 6SQ7 IN 5

CHASSIS. TUBES ARE SIMILAR EXCEPT FOR

SOCKET & BASE CONNECTIONS.

786 CONNECTIONS ARE AS FOLLOWS:

○

100



MODEL 68T11,
CHASSIS HS-144

MOTOROLA INC.

ALIGNMENT

Maximum performance can only be obtained if extreme care is exercised during alignment. Follow the procedure carefully.

A suitable output meter should be connected across the speaker voice coil. Set receiver volume control at maximum. For greatest accuracy, keep output of receiver at approximately .05 watt (.05 watt = .40 volt on output meter) throughout alignment by reducing signal generator output (not receiver volume control) as stages are brought into alignment. Use a fibre screwdriver for aligning

the IF & diode transformers.

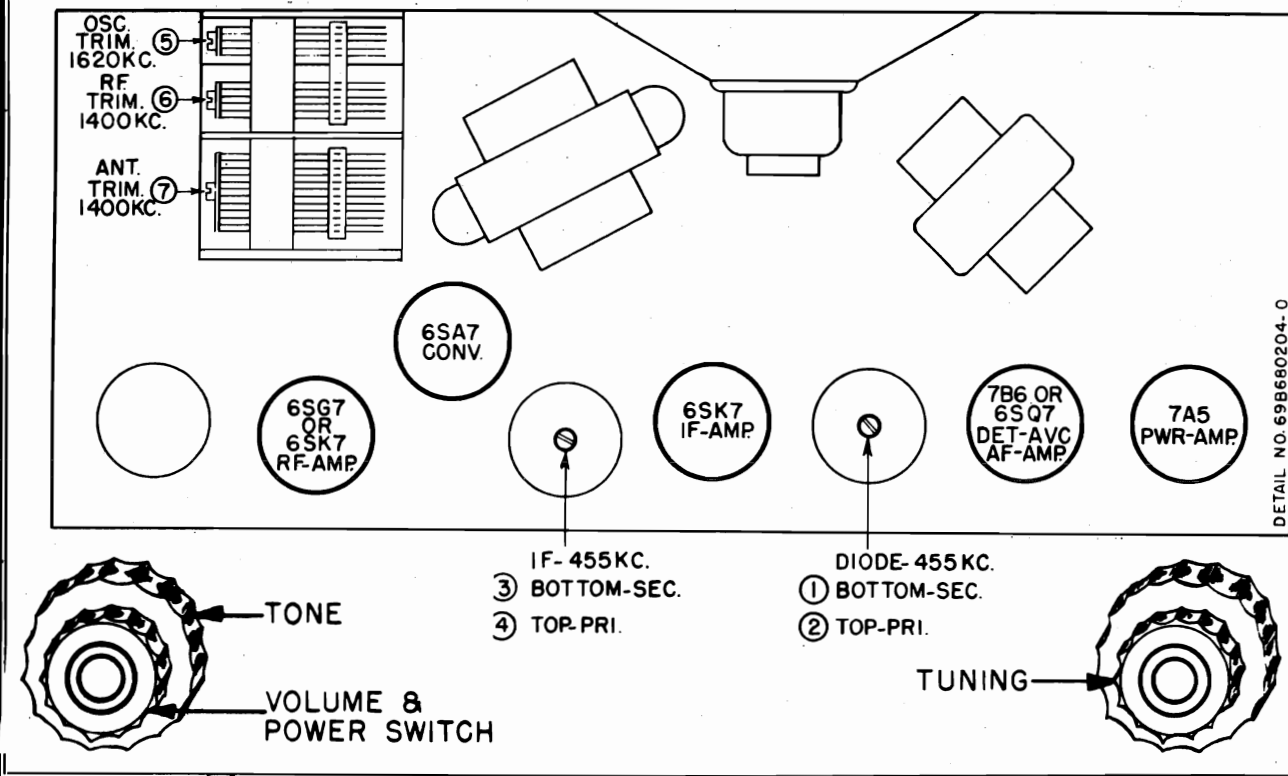
It is suggested that an isolating transformer be used between receiver and power line. If no isolation transformer is available and hum is encountered during alignment, connect the ground side of the signal generator through a .1 mf capacitor to receiver B- instead of the chassis.

Refer to Figure 2 for location of all alignment trimmers and cores.

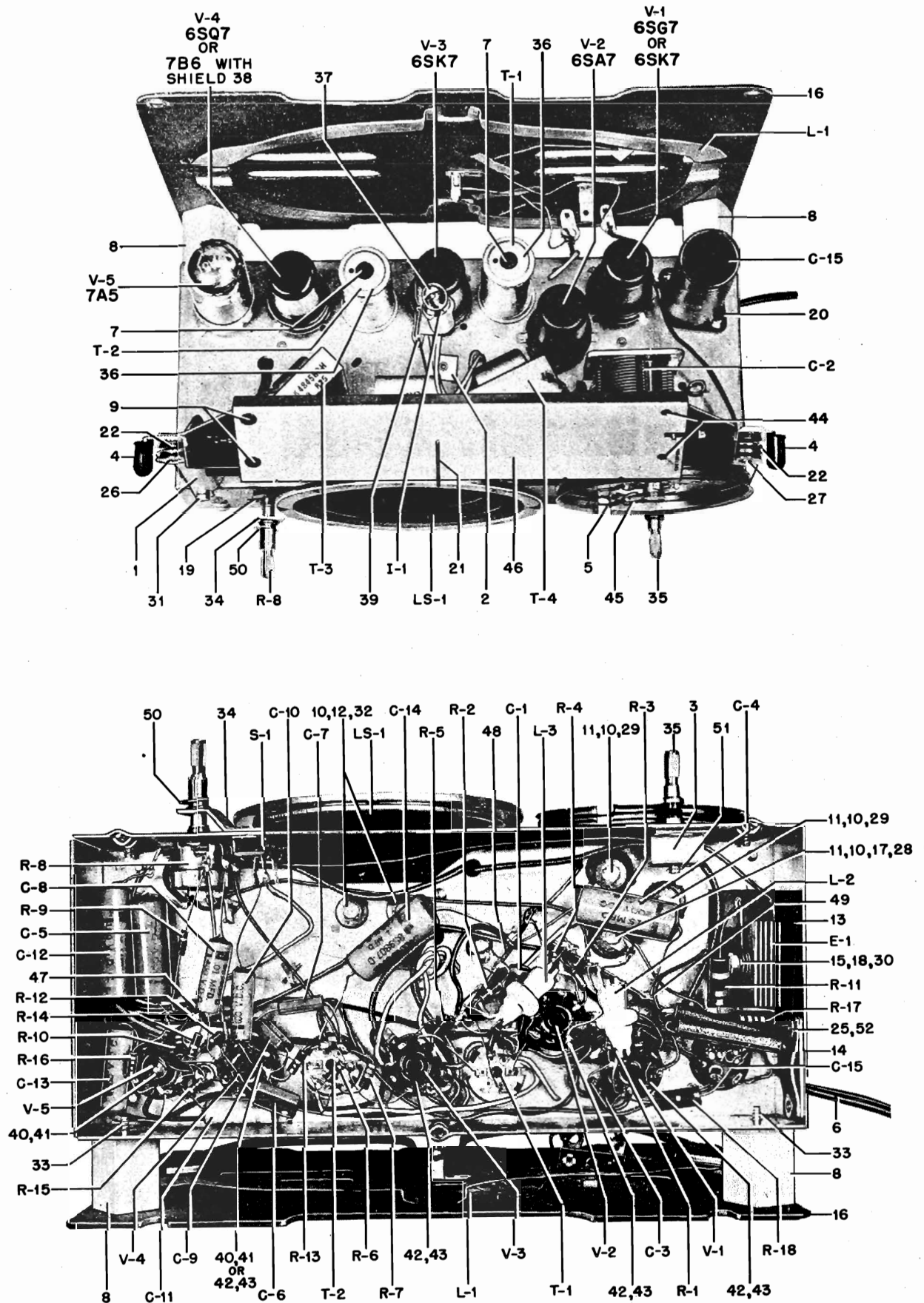
STEP	DIAL SET TO	DUMMY	SIGNAL GENERATOR CONNECTED TO	SIGNAL GENERATOR SET TO	ADJUST TRIMMER OR CORE	REMARKS
IF ALIGNMENT						
1.	Gang fully opened	.1 mf	6SA7 (conv.) grid*	455 Kc	1, 2, 3 & 4	Adjust for maximum.
RF ALIGNMENT						
2.	Gang fully opened	-	Radiation loop**	1620 Kc	5	Adjust for maximum output. This sets osc. to dial scale.
3.	1400 Kc	-	Radiation loop**	1400 Kc	6 & 7	Tune signal for maximum with receiver tuning knob, then peak trimmers 6 & 7.

* A convenient point is center stator of the tuning capacitor.

** Connect output of signal generator to a 5" diameter, 3 turn loop and bring loop close enough to receiver loop to obtain output of .05 watts (.40 volt) on output meter. Vary distance between loops to maintain this output during alignment. Distance between loops should never be less than 12".



MOTOROLA INC.

MODEL 68T11,
CHASSIS HS-144

MODEL 68T11,
CHASSIS HS-144

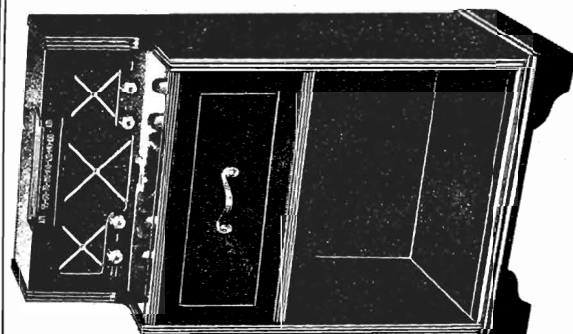
MOTOROLA INC.

REF. NO.	PART NO.	DESCRIPTION	REF. NO.	PART NO.	DESCRIPTION
CHASSIS PARTS - ELECTRICAL					
CAPACITORS					
C-1	8A71213	Paper: .05 mf 100V	R-6	6R3927	2.2 Meg 20% 1/2W .....doz
C-2	1X485124	Variable, 3 gang includes trimmers and drive pulley	R-7	6R6056	47,000 20% 1/2W .....doz
C-3	21R6631	Mica: 100 mmf 300V	R-8	18K482778	Volume Control: .5 meg; tapped at 25,000 ohms; includes SPST switch
C-4	8A75586	Paper: .15 mf 400V	R-9	6R6326	100 10% 1/2W .....doz
C-5	89816	Paper: .05 mf 400V	R-10	6R2118	3.3 meg 20% 1/2W .....doz
C-6	21R6648	Mica: 250 mmf 500V	R-11	6R3994	27 10% 2W
C-7	21R6648	Mica: 250 mmf 500V	R-12	6R6383	1200 10% 1/2W .....doz
C-8	89809	Paper: .01 mf 400V	R-13	6R6015	220,000 20% 1/2W .....doz
C-9	21R6648	Mica: 250 mmf 500V	R-14	6R6032	470,000 20% 1/2W .....doz
C-10	89835	Paper: .003 mf 600V	R-15	6R6393	1200 10% 1/2W .....doz
C-11	89809	Paper: .01 mf 400V	R-16	6R6373	150 10% 1/2W .....doz
C-12	89810	Paper: .25 mf 100V	R-17	6R3968	180 10% 2W
C-13	89802	Paper: .02 mf 400V	R-18	6R478004	1000 20% 2W
C-14	89807	Paper: .1 mf 400V	SWITCHES		
C-15	23B470429	Electrolytic: 40 mf/200V, 20-20 mf/150V	S-1	40K21758	Slider Switch: SPDT (tone control)
RECTIFIER					
E-1	48B90140	Rectifier, selenium type: half-wave	TRANSFORMERS		
DIAL LIGHT					
I-1	65X11854	Bulb: 6.3V .15A; tubular bayonet base; clear; #47	T-1	24B482863	IF, 455 Kc: complete with tuning cores and padding capacitors, but less shield ..
COILS					
L-1	24K77323	Loop Antenna: winding only	T-2	24B482865	Diode, 455 Kc: complete with tuning cores and padding capacitors, but less shield.
L-2	24B484512	RF Coil	T-3	25K484589	Output Transformer
L-3	24B484511	BC Oscillator Coil	T-4	25B484582	Filament Transformer
SPEAKER					
LS-1	50B485935	Speaker: 5" PM; 3.2 ohm VC	CHASSIS PARTS - MECHANICAL		
RESISTORS					
Note: All resistors are insulated, carbon type, unless otherwise specified.					
R-1	6R3949	470 20% 1/2W	1	1X48358	Background Bracket, Support and Pulley Assembly: less dial background strip, pointer & rubber bumpers
R-2	6R6182	150,000 20% 1/2W	2	7A77303	Bracket, pilot light mtg
R-3	6R6028	22,000 20% 1/2W	3	7A77337	Bracket, tuning shaft
R-4	6R3933	220 20% 1/2W	4	25A481328	Bumper, rubber (background support brkt) doz
R-5	6R6007	68 20% 1/2W	5	11M8944	Cord, dial: 18 lb black
			6	30A470651	Cord, line and plugs 6 ft long
			7	46A470885	Core, iron: threaded (for T-1 & T-2 pri. & sec. tuning)
			8	57K470568	Dowel, back mounting wood
			9	5S7805	Eyelet, snap-in (dial background mtg) .doz
			10	5A70098	Eyelet, spacer (gang & spkr mtg)
			11	37K15125	Grommet, rubber (gang mtg)
			12	5A70404	Grommet, rubber (spkr mtg)
			13	14A470428	Insulator, rectifier

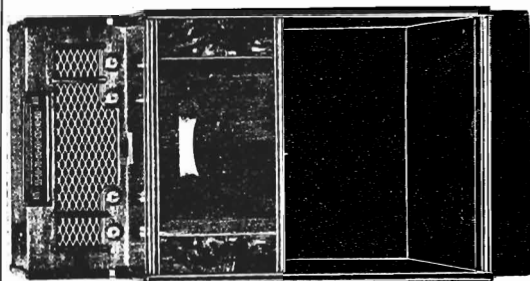
Compliments of www.nucow.com

MODELS 77FM21, 77FM22,
77FM22M, 77FM22WM,
77FM23, CHASSIS HS-89,
HS-97

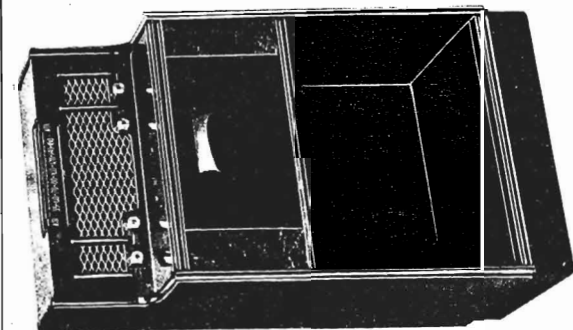
MOTOROLA INC.



MODEL 77FM23



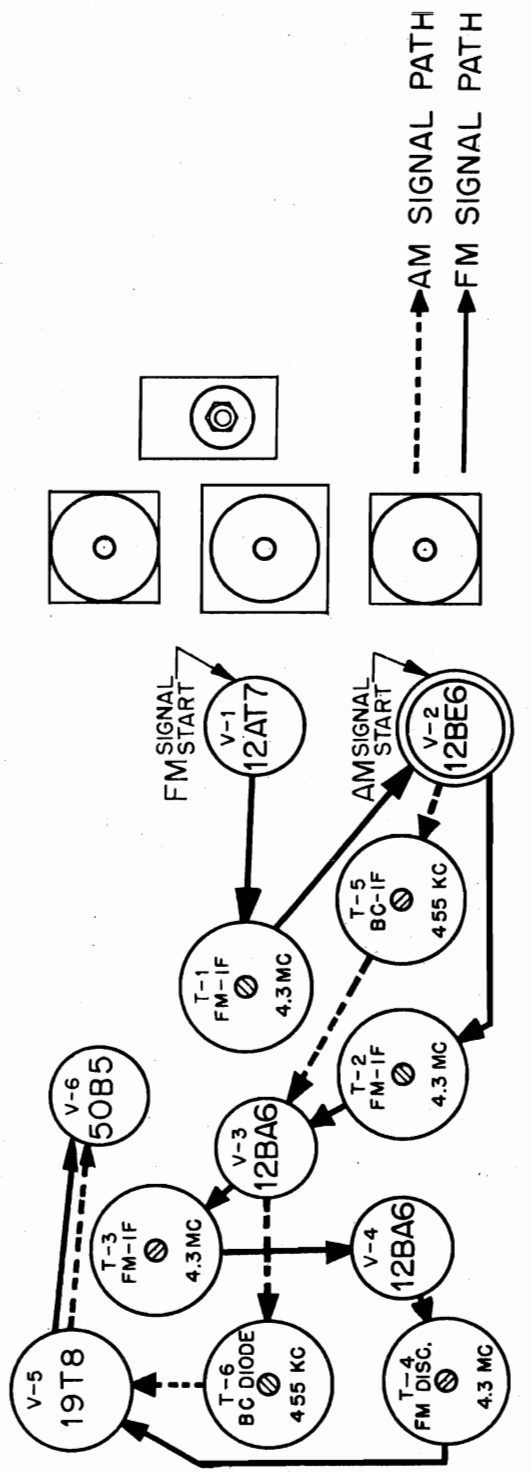
MODEL 77FM22, 22M & 22WM



MODEL 77FM21

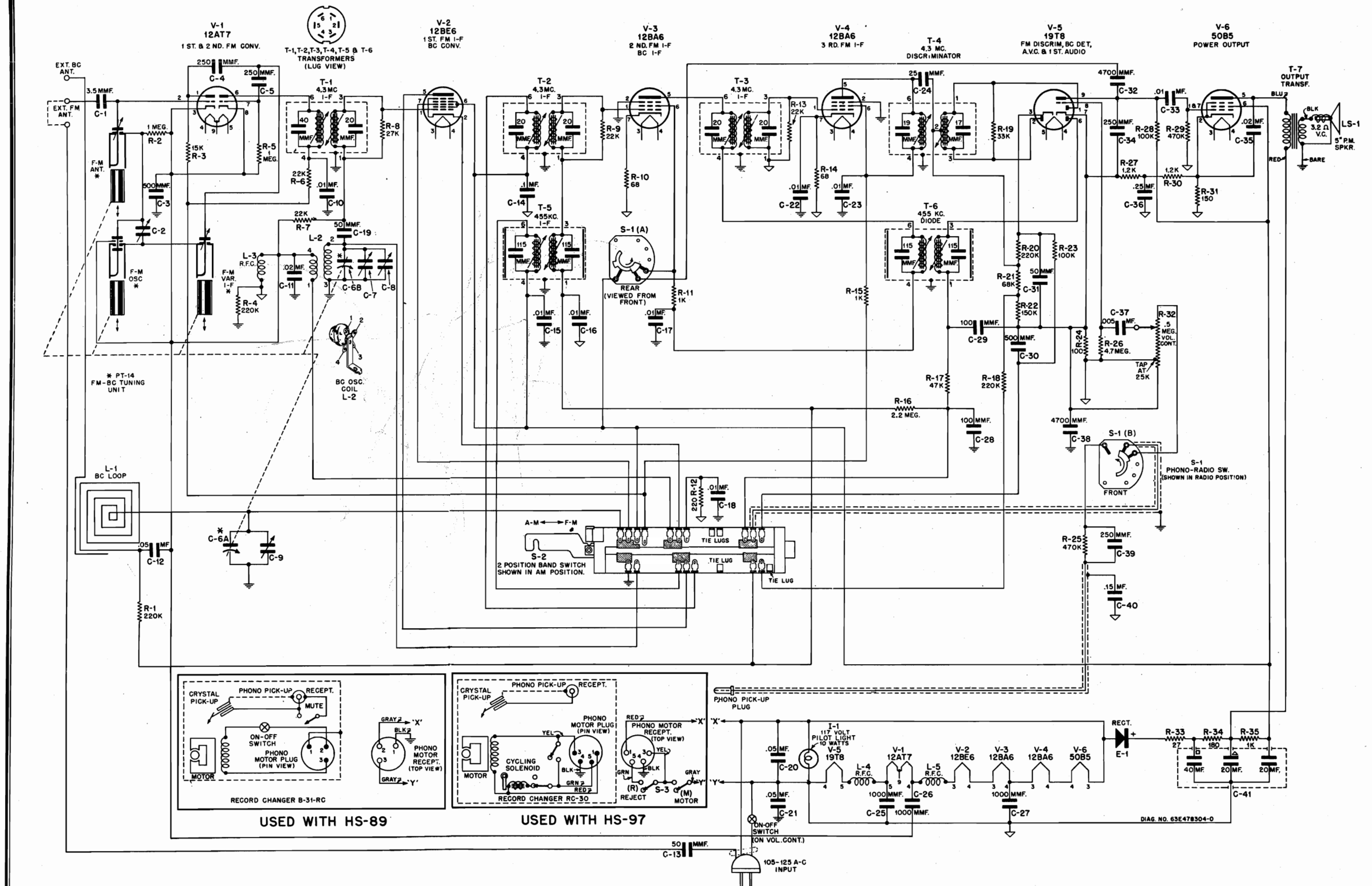
BOTTOM OF CHASSIS

AM & FM SIGNAL PATHS THROUGH RECEIVER



MOTOROLA INC.

MODELS 77FM21, 77FM22, 77FM22M,
77FM22WM, 77FM23, CHASSIS HS-89,
HS-97



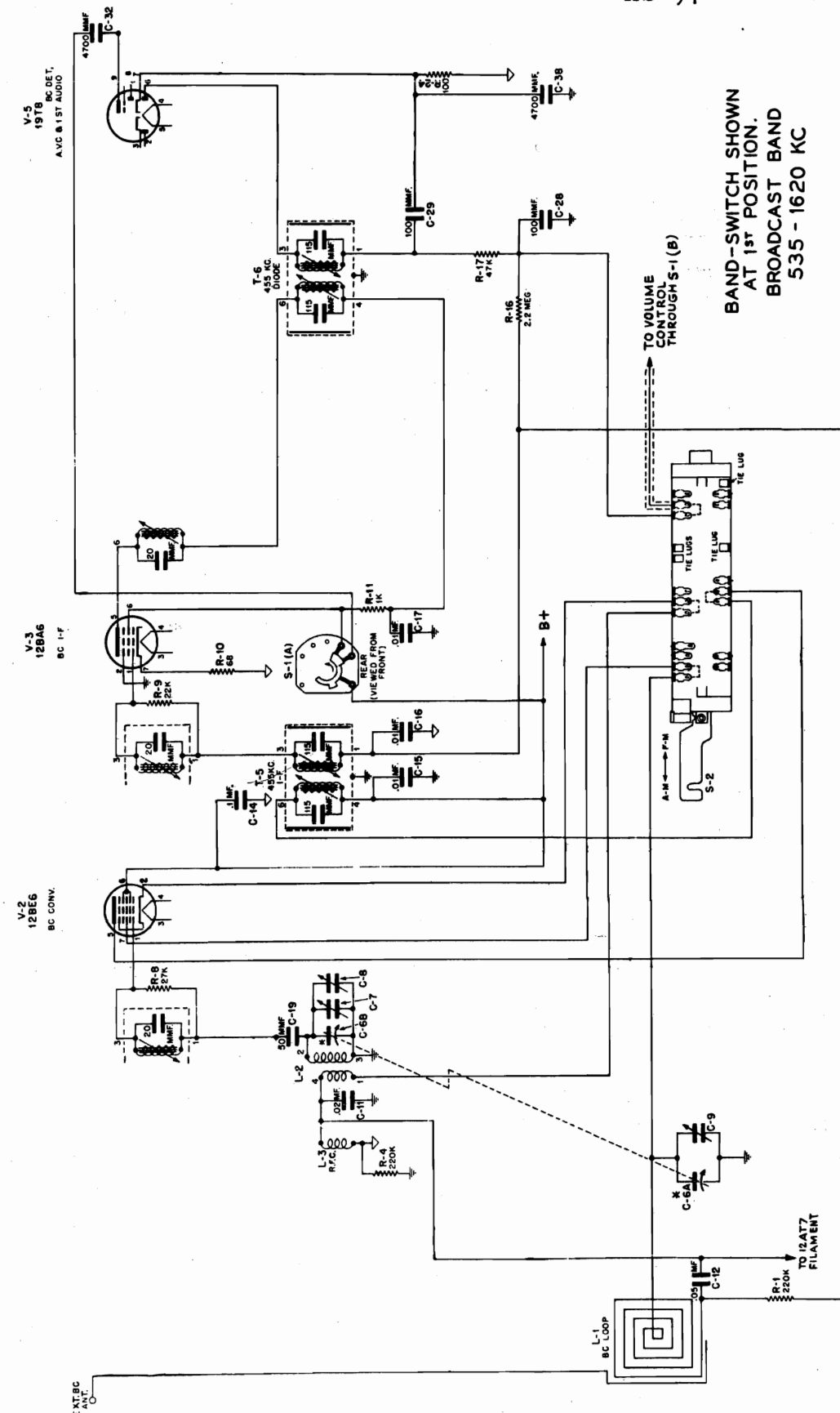
CLARI-SKEMATIX

Registered Trademark

MOTOROLA PAGE 19-67

MOTOROLA INC.

MODELS 77FM21, 77FM22,
77FM22M, 77FM22WM,
77FM23, CHASSIS HS-89,
HS-97



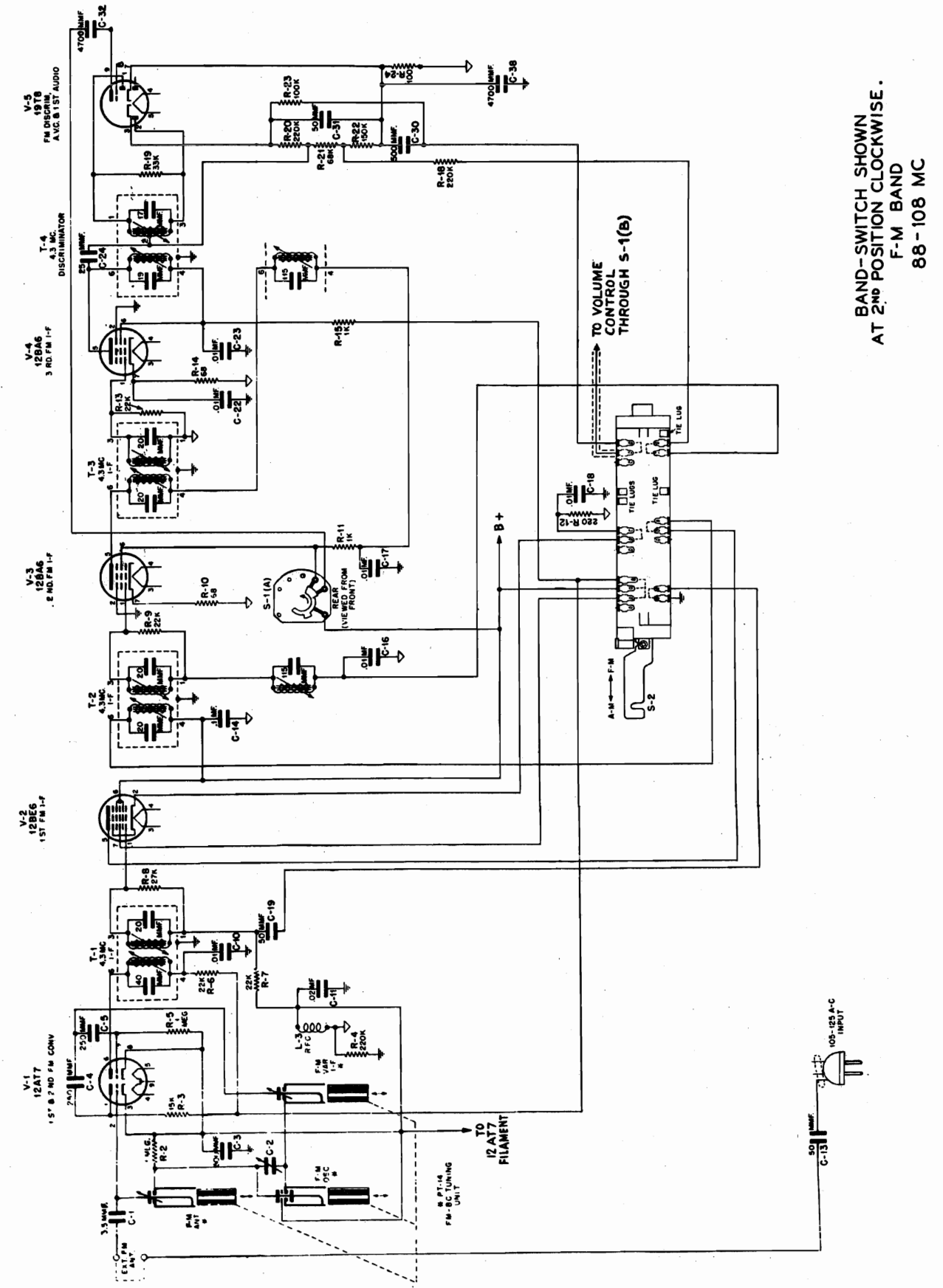
CLARI-SKEMATIX

Registered Trademark

PAGE 19-68 MOTOROLA

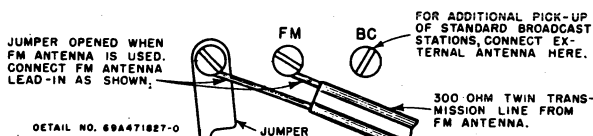
MOTOROLA INC.

MODELS 77FM21, 77FM22,
-22M, -22WM, 77FM23,
CHASSIS HS-89, HS-97



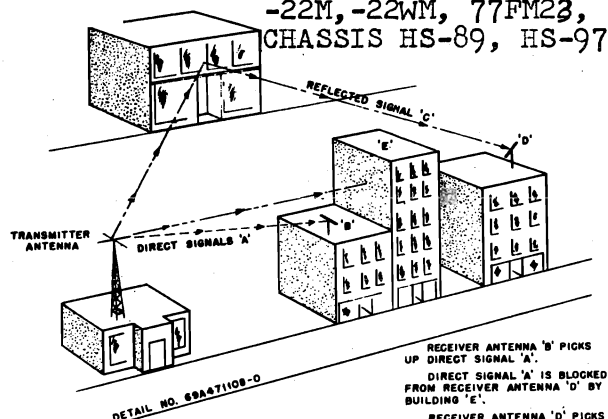
MOTOROLA INC.

MODELS 77FM21, 77FM22,
-22M, -22WM, 77FM23,
CHASSIS HS-89, HS-97



DETAIL NO. 69A471827-0

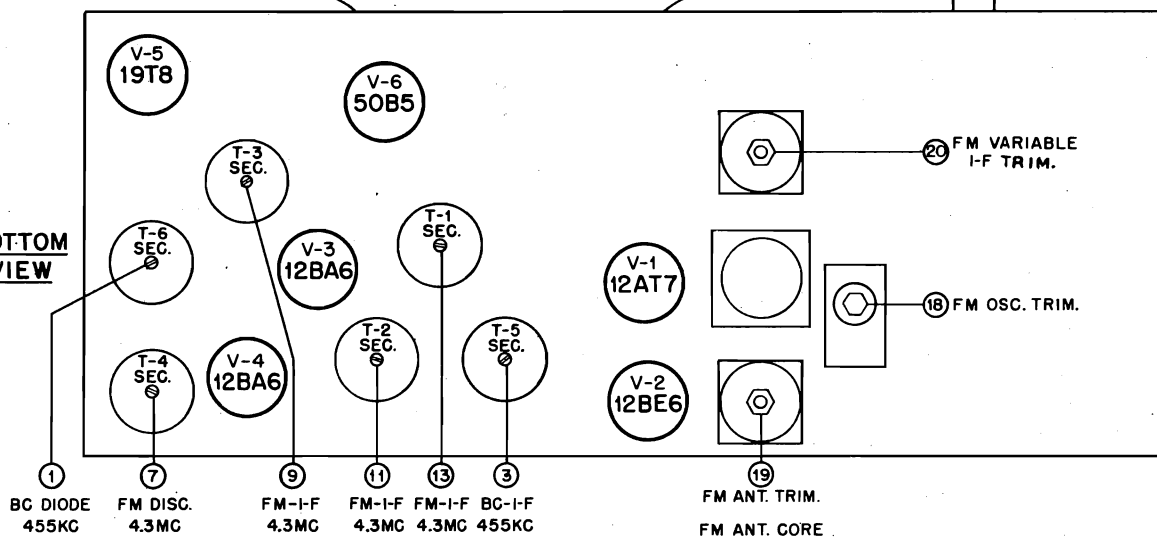
EXTERNAL ANTENNA TERMINALS



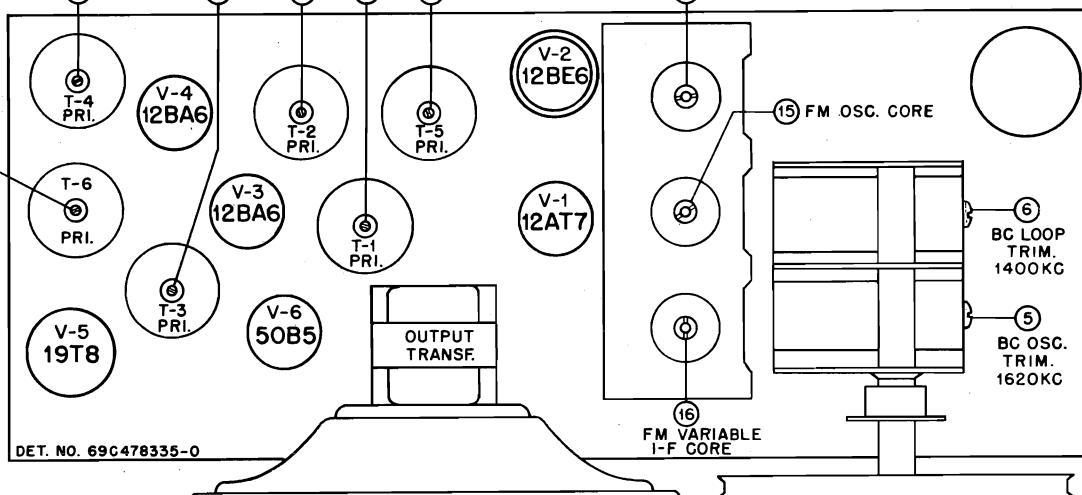
DETAIL NO. 69A471108-0

DIRECT AND REFLECTED FM RECEPTION PATHS

BOTTOM VIEW



TOP VIEW

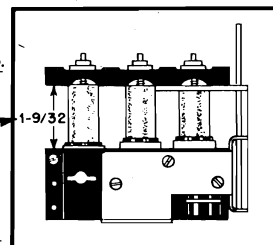


DET. NO. 69C478335-0

TUBE & TRIMMER LOCATION

METHOD OF SETTING TUNER TO 98 MC.

TURN TUNING SHAFT UNTIL DISTANCE BETWEEN BAKELITE PIECES IS $1-9/32$ " AS SHOWN IN ILLUSTRATION.



MODELS 77FM21, 77FM22,
77FM22M, 77FM22WM,
77FM23, CHASSIS HS-89,
HS-97

MOTOROLA INC.

ALIGNMENT

Maximum performance can only be obtained if extreme care is exercised during alignment.

It is suggested that an isolation transformer be used between receiver and power line. If no isolation transformer is used and hum is encountered during alignment, connect the ground side of the signal generator output to B- instead of the receiver chassis.

If set oscillates when aligning the broadcast band, connect receiver B- to receiver chassis. CAUTION: Don't forget to disconnect B- from receiver chassis after alignment!

An AM (amplitude modulated) signal generator covering the frequencies shown in alignment chart, is used to align the broadcast and FM bands. A low range output meter, connected across the speaker voice coil, is used as an output indicator.

The broadcast alignment is conventional; full instructions are given in the following alignment chart.

The FM band alignment can be satisfactorily performed by following the instructions in the chart. When properly aligned, the discriminator

does not respond to amplitude modulation and since an AM type signal generator is used for aligning the FM circuits, it is necessary to detune the discriminator secondary and leave it that way until all of the FM circuits have been aligned. After completing the alignment of the FM circuits, proceed to align the discriminator secondary by applying a 4.3 Mc AM signal to the control grid (pin #7) of the 2nd FM converter tube and adjusting the discriminator secondary core for minimum audio output. No adjustment of the FM circuits should be attempted with AM after the discriminator secondary has been properly aligned.

Use a 30% AM (amplitude modulated) signal throughout entire alignment procedure.

Use an insulated wrench when adjusting the FM tuner trimmers. Order Motorola FM Alignment wrench, part number 66A471864.

A special wrench for adjusting the slotted nuts on the tuner cores will be required also. You can easily fabricate one from a Motorola auto set Volume Control Shaft and Coupling Assembly (Part Number 1B70847, \$.30 list) by simply spreading out the forked ends and filing to fit. Solder the assembly together to make it rigid.

ALIGNMENT PROCEDURE WHEN USING AM MODULATED SIGNAL
GENERATOR AND STANDARD OUTPUT METER FOR COMPLETE RECEIVER ALIGNMENT

STEP	DIAL SET TO	BAND SW. SET TO	DUMMY	SIGNAL GENERATOR CONNECTED TO	SIGNAL GENERATOR SET AT	ADJUST TRIMMER OR CORE	REMARKS
455 Kc IF CHANNEL ALIGNMENT							
1.	1620 Kc	BC	.1 mf	12BE6, (V-2) BC Conv. Grid (Pin #1)	455 Kc	1,2,3 & 4	Adjust for maximum output.
BROADCAST BAND ALIGNMENT							
2.	1620 Kc (gang fully opened)	BC	.1 mf	12BE6 (V-2) BC Conv. Grid (Pin #1)	1620 Kc	5	This sets oscillator to dial. (Calibrate pointer by fully closing gang and noting position of pointer slider. Pointer slider should be in line with right hand hole in dial background bracket as shown in Figure 12.)
3.	1400 Kc	BC	None	Radiation loop*	1400 Kc	6	Tune in signal with receiver tuning knob, then peak trimmer 6.
4.3 Mc IF CHANNEL ALIGNMENT							
4.	-	-	-	-	-	7	Detune discriminator secondary by screwing core out as far as it will go.
5.	(extreme high frequency end)	FM	.001 mf	12AT7 (V-1) 2nd FM Converter Grid (#7 pin)	4.3 Mc.	8,9,10, 11, 12, 13 & 14	Adjust for maximum output.
FM BAND ALIGNMENT							
6.	-	-	-	-	-	15	Check the position of the FM Osc. tuning core 15. Set spacing between the core and bakelite piece to which it is mounted, to two turns from tight by turning tuning core slotted nut.

MOTOROLA INC.

MODELS 77FM21, 77FM22,
-22M, -22WM, 77FM23,
CHASSIS HS-89, HS-97

(Alignment continued)

STEP	DIAL SET TO	BAND SW. SET TO	DUMMY	SIGNAL GENERATOR CONNECTED TO	SIGNAL GENERATOR SET AT	ADJUST TRIMMER OR CORE	REMARKS
7.	98 Mc	FM	None	FM Ant. terminal	98 Mc	18	Tuner is set to 98 Mc by moving cores out with tuning shaft until spacing between bakelite pieces is 1-9/32". See Figure 9. Peak 18 for maximum output.
8.	90 Mc	FM	None	FM Ant. terminal	90 Mc	19 & 20	Tune in signal with receiver tuning knob, then adjust 19 & 20 for maximum output.
9.	105 Mc	FM	None	FM Ant. terminal	105 Mc	16 & 17	Tune in signal with receiver tuning knob, then adjust 16 & 17 for maximum output.
10.	-	-	-	-	-	-	Repeat Steps 8 & 9 several times until further adjustment does not increase the output. Make the final trimmer adjustment at 105 Mc. (i.e., trimmers 19 & 20 at 105 Mc).
11.	105 Mc	FM	None	Radiate signal (or use station after performing Step 12)	105 Mc	19	Adjust for maximum output with built-in antenna connected.
ALIGN DISCRIMINATOR SECONDARY							
12.	-	FM	.001 mf	12AT7 (V-1) 2nd FM Converter Grid (Pin #7)	4.3 Mc	7	Adjust discriminator secondary for minimum response. The correct adjustment is sharply defined minimum response point between the two peaks.

* Connect output of signal generator to a 5" diameter, 3 turn loop and radiate signal into receiver loop. Minimum distance between loops should never be less than 12".

ALIGNMENT PROCEDURE WHEN USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

STEP

OPERATION

455 Kc IF Channel Alignment

1. Same as Step 1 in Chart I (Use AM signal generator)

Broadcast Band Alignment

2. Same as steps 2 & 3 in Chart I (Use AM signal generator)

4.3 Mc IF Channel Alignment Use FM Signal Generator & Oscilloscope

3. (A) Discriminator

1. Connect the input terminals of the oscilloscope vertical amplifier to the high side of the receiver volume control and B-.
2. Connect the FM generator synchronizing voltage output terminals to a phase shifting network, consisting of a variable 1/2 megohm resistor in series with a .002 mf capacitor. The input to the oscilloscope horizontal amplifier is connected across the .002 mf capacitor. See Figure 10. (This phase shifting network may not work with every oscilloscope. Different values of R & C may be required.)
3. Apply an FM 4.3 Mc signal (125 Kc deviation) through a .001 mf capacitor to the control grid (pin #1) of tube V-4 in the third FM IF Amplifier stage.

MODELS 77FM21, 77FM22,
-22M, -22WM, 77FM23,
CHASSIS HS-89, HS-97

MOTOROLA INC.

4. Adjust discriminator primary (8) for maximum amplitude. The phase shifting network resistor is adjusted to give only one trace.
5. Adjust discriminator secondary (7) until a symmetrical pattern is obtained, with peaks occurring at about 100 Kc above and below 4.3 Mc and is substantially linear between peaks. The trace should pass through the intersection of the vertical and horizontal axis. The phase shifting network should be adjusted to give only a single pattern at all times. See Figure 11. It will be necessary to go over discriminator primary (8) and secondary (7) adjustments several times before a pattern of maximum amplitude and correct symmetry is obtained.

(B) 4.3 Mc IF Amplifiers

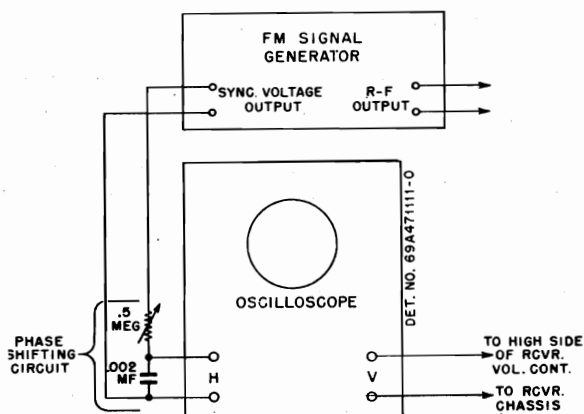
1. Apply an FM 4.3 Mc signal (100 Kc deviation) to the control grid (pin #1) of tube V-3 in the 2nd FM IF amplifier stage, through a .001 mmf capacitor and adjust both primary and secondary cores (9 & 10) to get a symmetrical pattern as before, with peaks occurring at a slightly lower deviation.
2. Apply an FM 4.3 Mc signal (100 Kc deviation) to the control grid (pin #1) of tube V-2 and adjust both primary and secondary cores (11 & 12) until a symmetrical pattern substantially linear between peaks, is obtained.
3. Apply an FM 4.3 Mc signal (100 Kc deviation) to the FM antenna terminal and adjust both primary and secondary cores (13 & 14) until a symmetrical pattern substantially linear between peaks, is obtained.

FM Band Alignment - Use FM Signal Generator & Output Meter

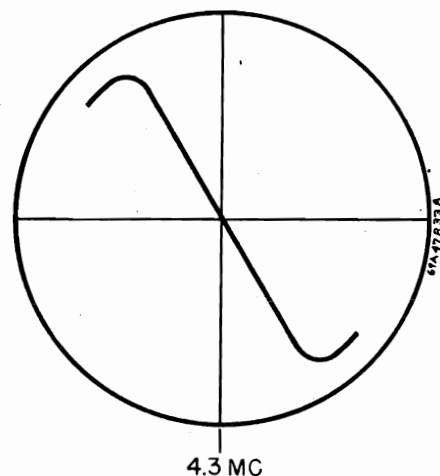
4. Check the position of the FM oscillator tuning core (15). Set the spacing between the core and the bakelite piece to two turns from tight by turning tuning core slotted nut.
5. Connect generator output directly to the receiver FM antenna terminal.
6. Set receiver tuner to 98 Mc by moving cores out with tuning shaft until spacing between bakelite pieces is $1-9/32"$. See Figure 9. Also set FM signal generator to 98 Mc (22-1/2 Kc deviation). Adjust FM oscillator trimmer (16) for maximum output.
7. Set FM signal generator to 90 Mc (22-1/2 Kc deviation). Tune in signal with receiver tuning knob and then adjust FM variable IF & FM antenna trimmers (19 & 20) for maximum output.
8. Set FM signal generator to 105 Mc (22-1/2 Kc deviation). Tune in signal with receiver tuning knob and then adjust variable IF and antenna cores (16 & 17) for maximum indication on output meter.

Repeat steps 7 & 8 several times until further adjustment does not increase the output. Make the final trimmer adjustment at 105 Mc. (i.e., trimmers 19 & 20 at 105 Mc.)

9. Close FM antenna link on loop panel. Radiate an FM 105 Mc (22-1/2 Kc deviation) signal into FM antenna (line cord). Tune in signal with receiver tuning knob and then repeak FM antenna trimmer (19).



SIGNAL GENERATOR &
OSCILLOSCOPE HOOK-UP

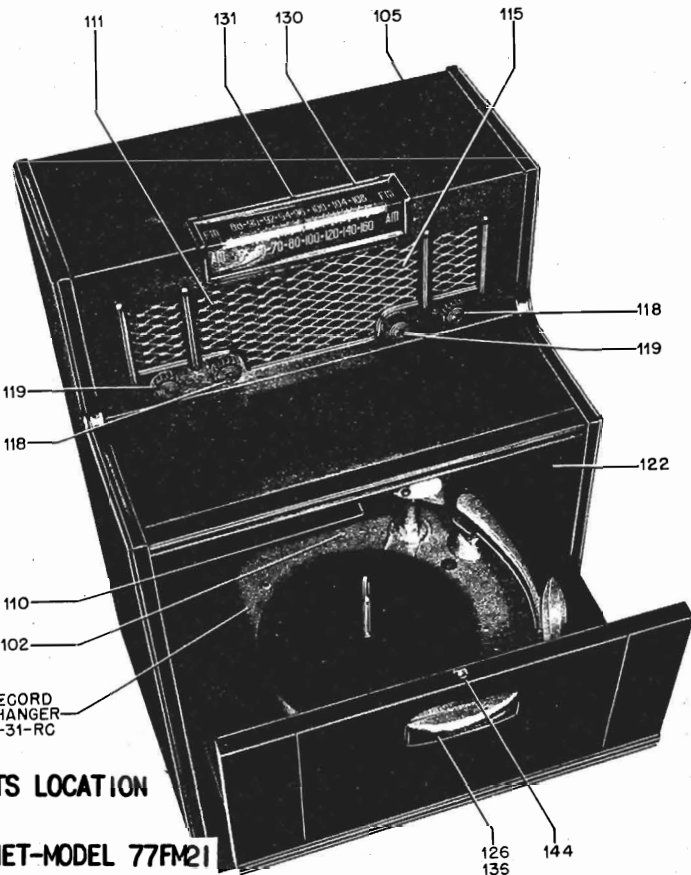
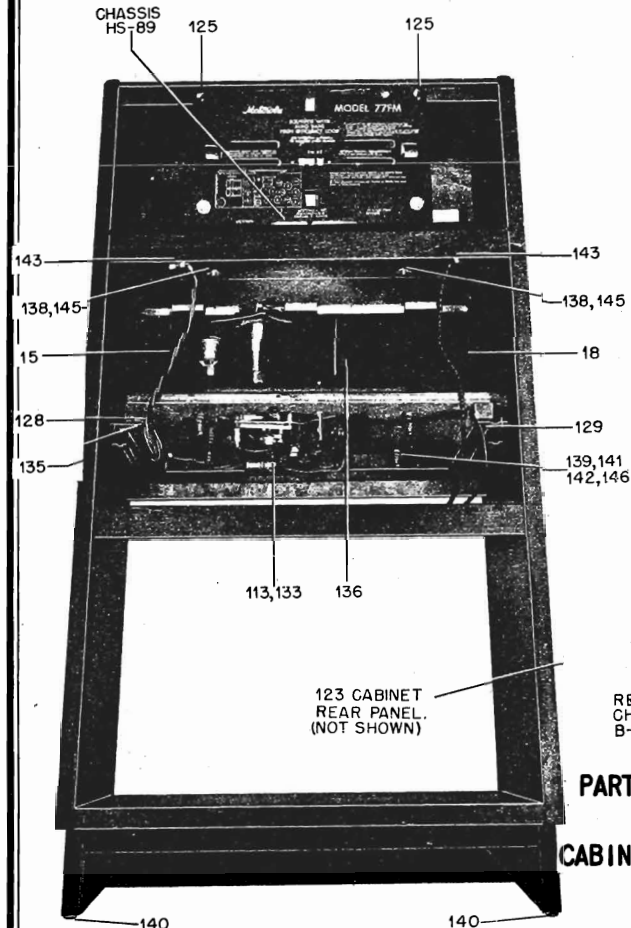


OSCILLOSCOPE PATTERN

MODELS 77FM21, 77FM22,
-22M, -22WM, 77FM23

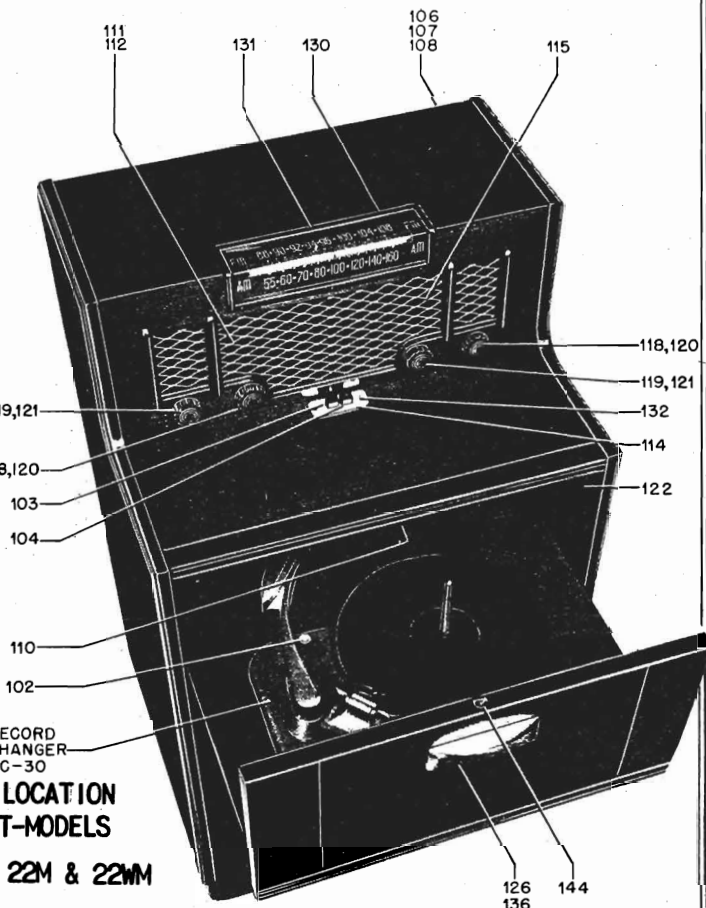
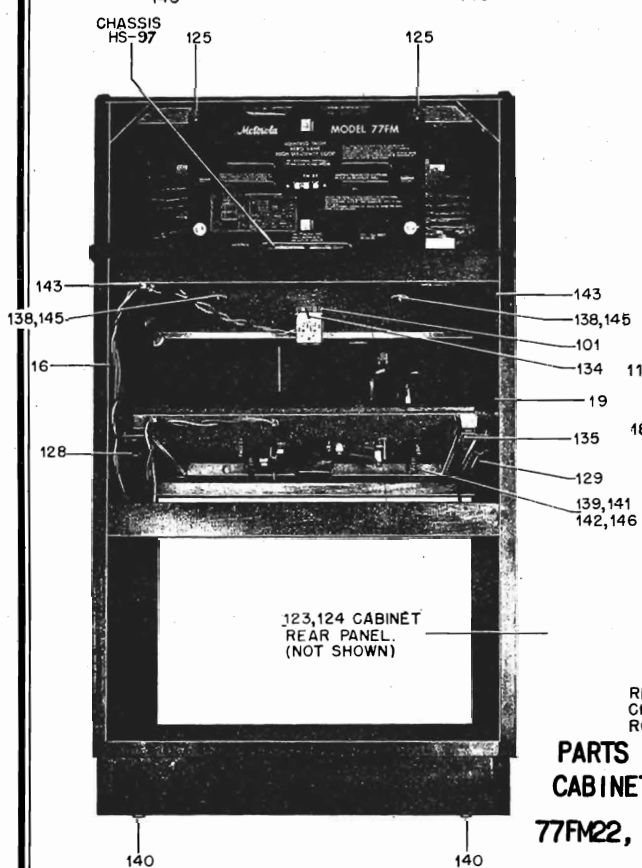
MOTOROLA INC.

CHASSIS HS-89, HS-97



PARTS LOCATION

CABINET-MODEL 77FM21

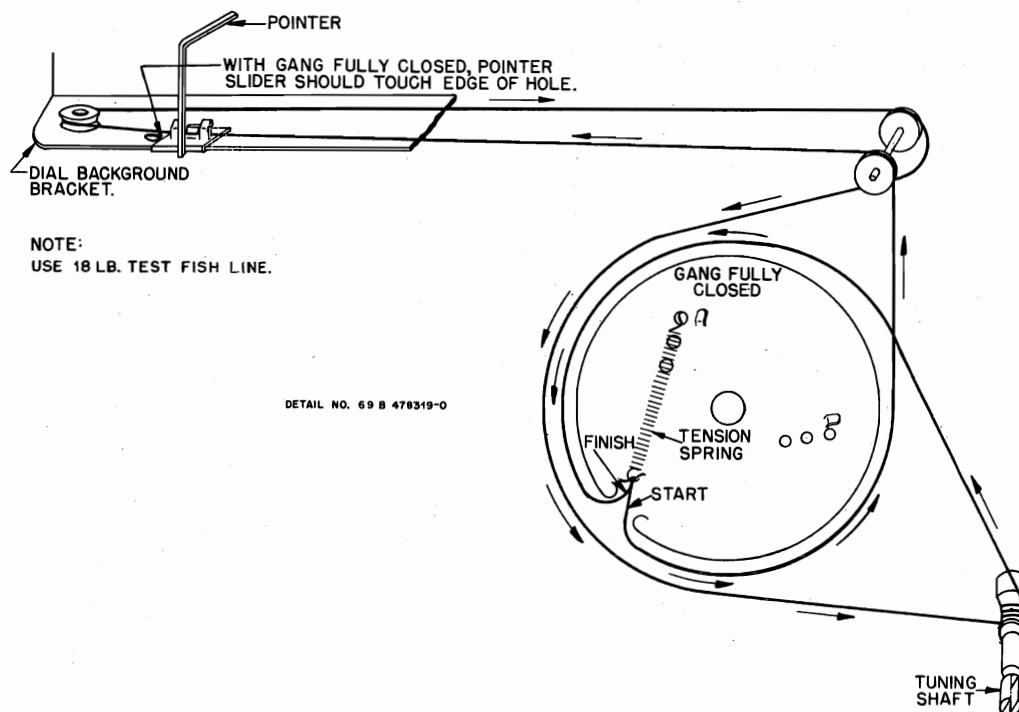
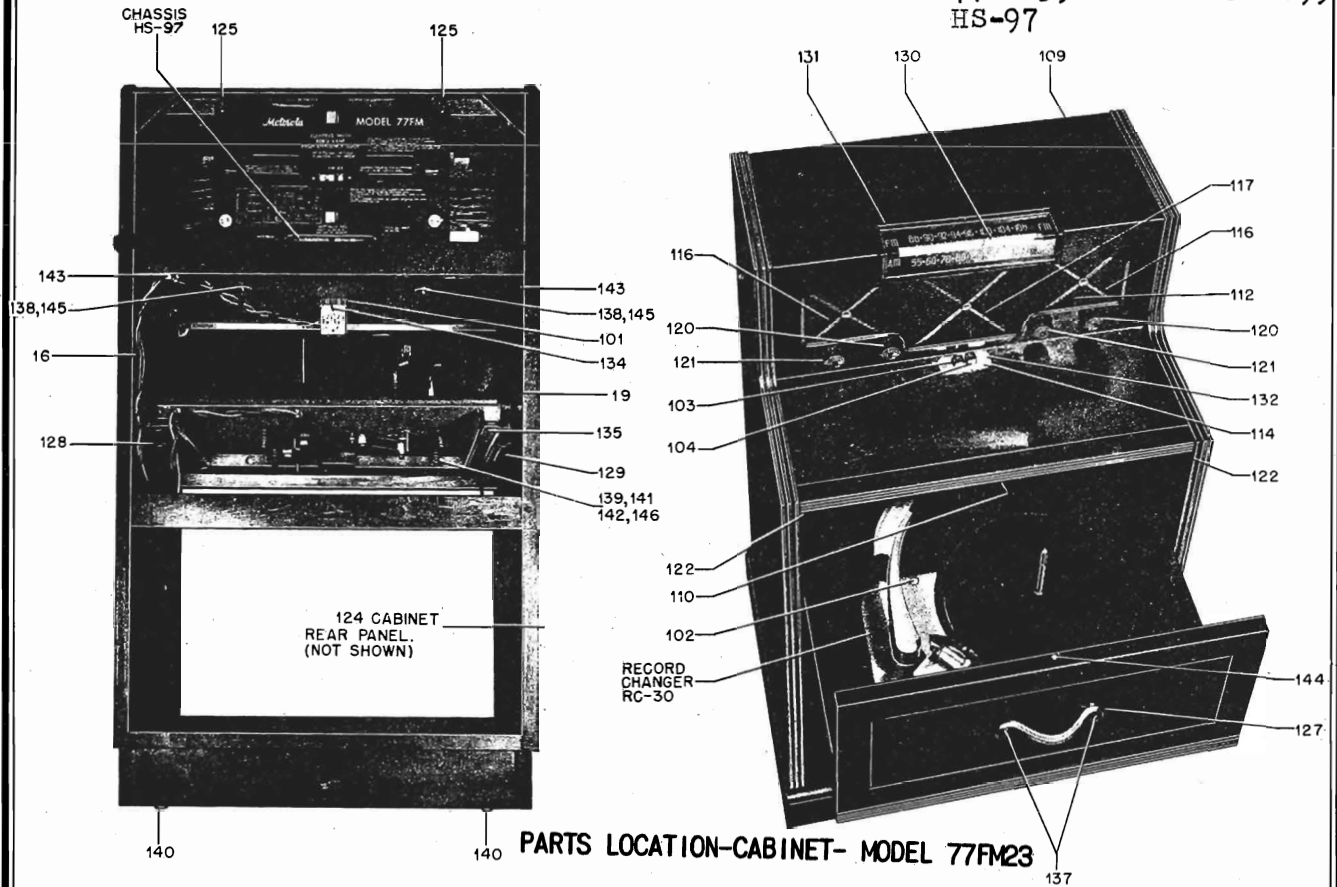


PARTS LOCATION
CABINET-MODELS

77FM22, 22M & 22WM

MOTOROLA INC.

MODELS 77FM21, 77FM22,
77FM22M, 77FM22WM,
77FM23, CHASSIS HS-89,
HS-97



STRING DRIVE

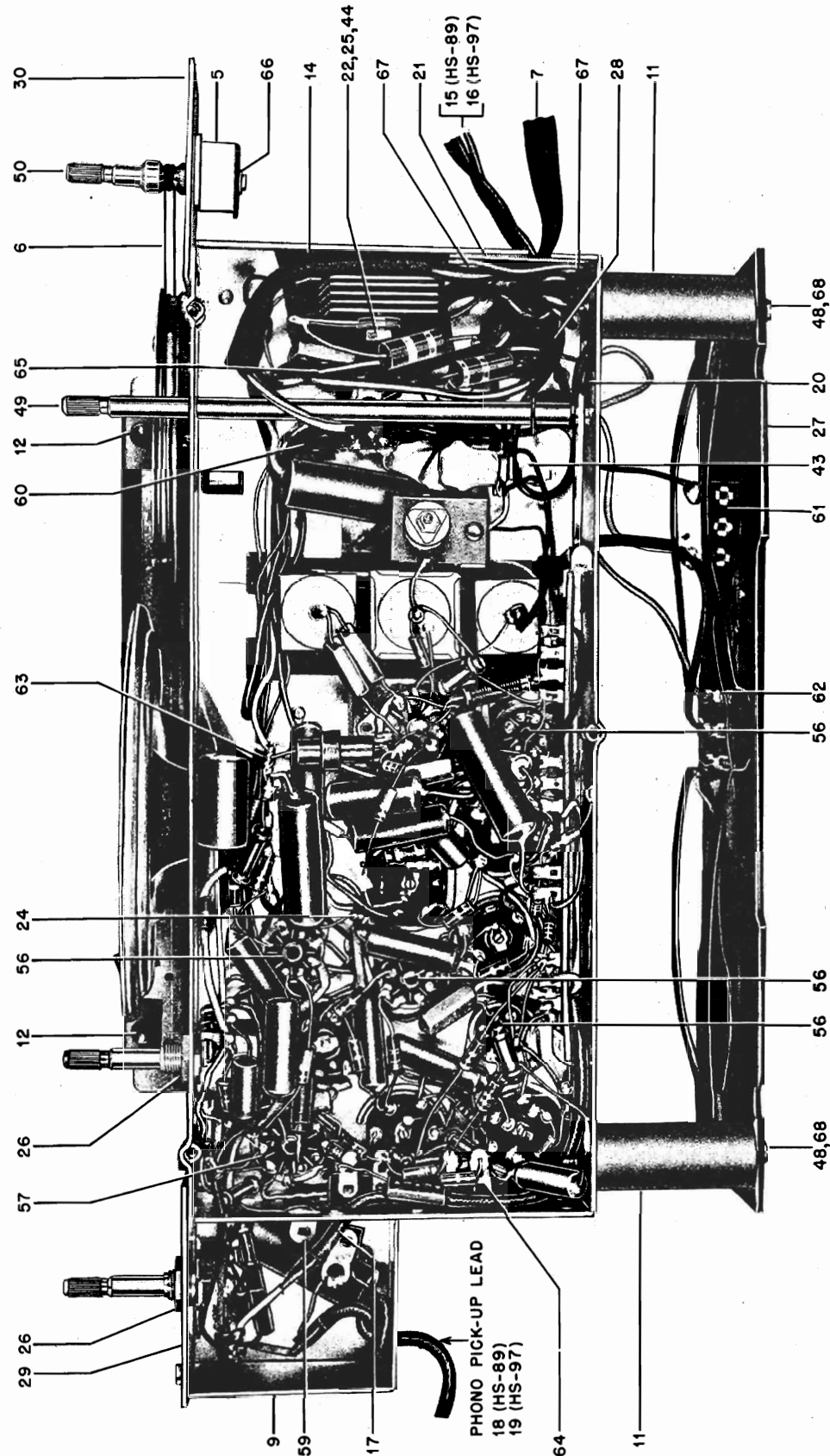
FM-BC TUNING UNIT

50B5

PT-14
I-1
T-1
V-6
LS-1
R-32
T-3
51
19T8
V-5
C-7
C-8
C-6
C-6
C-41
47
28
8,13
S-3
15,35
PHONO PWR. RECEPT.
(ON HS-89 ONLY)
16,36
PHONO
11
61
54
62
2
12BE6
V-2
52
51
12BA6
L-1
27
11
18(HS-89)
19(HS-97)
PHONO PICKUP LEAD
31
51
46
T-4
51
T-5
T-6
9
52
32
R-32
T-3
12
51
19T8
V-5
66
30
5
50
6
38
12
10
4
56
I-1
T-1
3
51
T-7
51
3
51
12BA6
V-3
51
19T8
V-5

PARTS LOCATION-CHASSIS HS-89 & HS-97-TOP

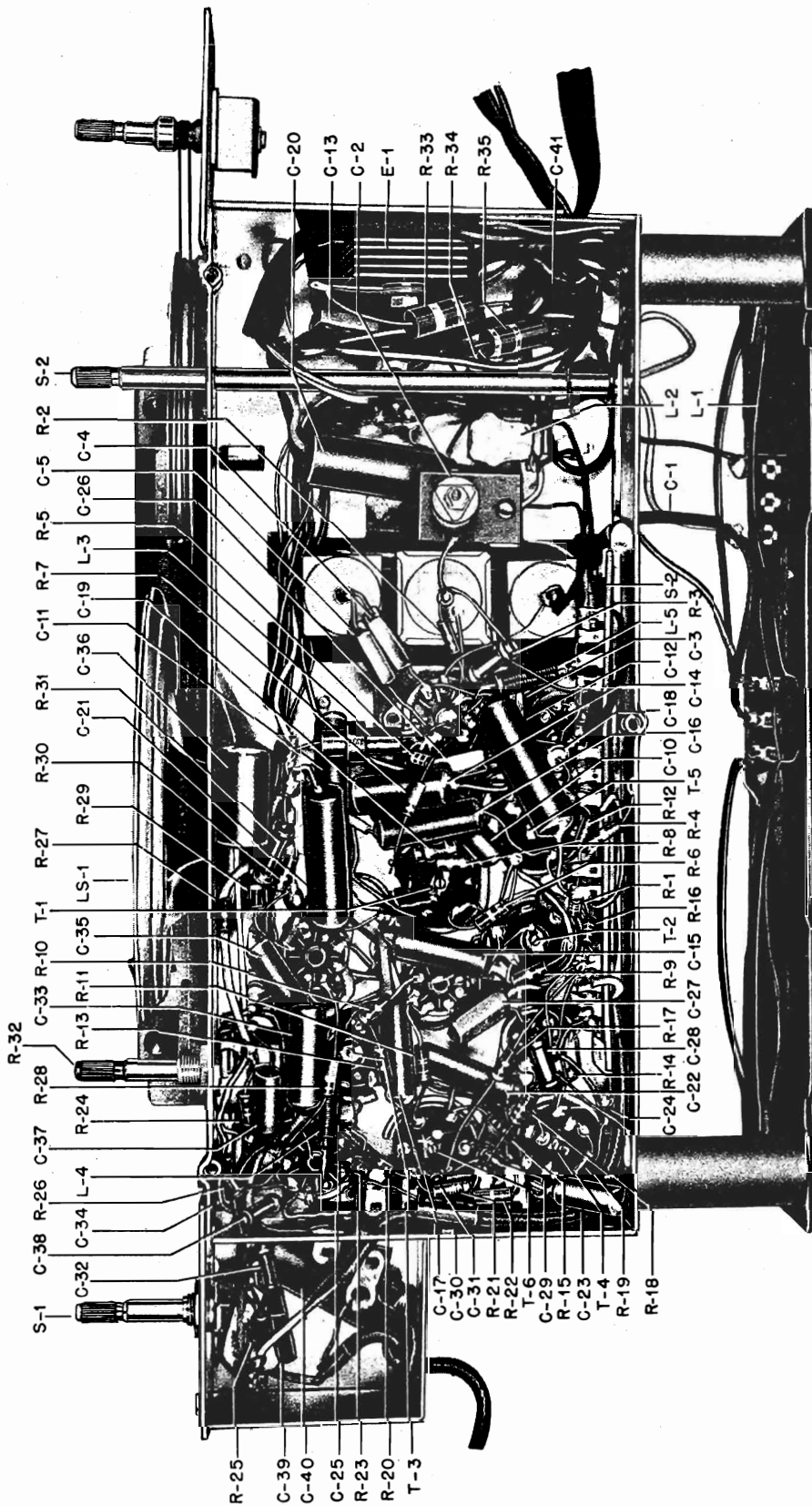
PWR. RECEPT.
(ON HS-97 ONLY)



PARTS LOCATION-CHASSIS HS-89 & HS-97-BOTTOM (MISCELLANEOUS PARTS)

MODELS 77FM21, 77FM22,
77FM22M, 77FM22WM,
77FM23, CHASSIS HS-89,
HS-97

MOTOROLA INC.



**PARTS LOCATION-CHASSIS HS-89 & HS-97-BOTTOM
(CAPACITORS, RESISTORS, COILS, TRANSFORMERS, SWITCHES)**

Model	Chassis	Record Changer	Cabinet
77FM21	HS-89	B31RC	Consolette - walnut
77FM22	HS-97	RC-30	Consolette - walnut
77FM22M	HS-97	RC-30	Consolette - mahogany
77FM22WM	HS-97	RC-30	Consolette - walnut, mahogany finished
77FM23	HS-97	RC-30	Consolette - mahogany finish

The standard broadcast dial scale is read in kilocycles by adding one "0" to figures. The FM band dial scale is read in megacycles (88 to 108).
NOTE: When tuning, tune carefully until you are exactly ON the station. Tuning to either side of it will result in poor tone quality and excessive noise. Tuning of FM stations should be done very carefully, as 3 peaks are present; the center peak is the correct one; distortion and low volume are characteristic of the other two peaks.

MOTOROLA INC.

MODELS 77FM21, 77FM22,
77FM22M, 77FM22WM,
77FM23, CHASSIS HS-89,
HS-97

REF.
NO. PART NO. DESCRIPTION

CHASSIS PARTS - HS-89 & HS-97

CAPACITORS

C-1 21K470578 Special: fixed: 3.5 mmf
C-2 19A470426 Trimmer: variable air; 2.5 mmf to 30 mmf
C-3 21R2730 Silver mica: 500 mmf 500V
C-4 21R2729 Silver mica: 250 mmf 500V
C-5 21R2729 Silver mica: 250 mmf 500V
C-6 19K75415 Variable: 2 gang; cut oscillator plates;
with trimmers C-7, C-8 & C-9
C-7 - Trimmer: part of gang capacitor C-6
C-8 - Trimmer: part of gang capacitor C-6
C-9 - Trimmer: part of gang capacitor C-6
C-10 8S9825 Paper: .01 mf 200 V
C-11 8S9802 Paper: .02 mf 400 V
C-12 8K471635 Paper: .05 mf 400 V
C-13 21R6642 Mica: 50 mmf 500 V
C-14 8K471636 Paper: .1 mf 200 V
C-15 8S9825 Paper: .01 mf 200V
C-16 8S9801 Paper: .01 mf 100V
C-17 8S9825 Paper: .01 mf 200V
C-18 8S9801 Paper: .01 mf 100V
C-19 21K77373 Ceramic: 50 mmf 500V
C-20 8S9816 Paper: .05 mf 400V
C-21 8A471623 Paper: .05 mf 200V
C-22 8S9801 Paper: .01 mf 100V
C-23 8S9825 Paper: .01 mf 200V
C-24 21K28816 Ceramic: 25 mmf 500V
C-25 21R6638 Mica: 1000 mmf 500V
C-26 21R6638 Mica: 1000 mmf 500V
C-27 21R6638 Mica: 1000 mmf 500V
C-28 21B77286 Ceramic: 100 mmf 500V
C-29 21B77286 Ceramic: 100 mmf 500V
C-30 21R6639 Mica: 500 mmf 500V
C-31 21K77373 Ceramic: 50 mmf 500V
C-32 21B470567 Ceramic: 4700 mmf 500V
C-33 8S9809 Paper: .01 mf 400V
C-34 21K77375 Ceramic: 250 mmf 500V
C-35 8A471019 Paper: .02 mf 400V
C-36 8A470504 Paper: .25 mf 50V
C-37 8A24966 Paper: .005 mf 100V
C-38 21B470567 Ceramic: 4700 mmf 500V
C-39 21R2729 Silver mica: 250 mmf 500V
C-40 8A72686 Paper: .15 mf 200V
C-41 23B470429 Electrolytic: 40 mf-200V, 20-20 mf 150V.
includes insulating tube

RECTIFIER

E-1 48B90140 Selenium type: half-wave

DIAL LIGHT

I-1 65A470930 Lamp, incandescent: 117V, 10 watt; clear

COILS

L-1 24K470674 Loop Antenna: winding only
L-2 24A470556 BC Oscillator
L-3 24A470505 RF Choke
L-4 24A74989 Filament choke
L-5 24A74989 Filament choke

SPEAKER

LS-1 50C470684 5" PM; 3.2 ohm voice coil

REF.
NO. PART NO. DESCRIPTION

RESISTORS

Note: All resistors are insulated, carbon type, 1/2 watt,
20% unless otherwise specified.

R-1 6R6015 220,000
R-2 6R6004 1 meg
R-3 6R3996 15,000; not insulated
R-4 6R6015 220,000
R-5 6R6046 1 meg 10%
R-6 6R6028 22,000
R-7 6R6028 22,000
R-8 6R6434 27,000 10%
R-9 6R6028 22,000
R-10 6R2039 68 10%
R-11 6R6301 1000
R-12 6R3933 220
R-13 6R6028 22,000
R-14 6R2039 68 10%
R-15 6R6301 1000
R-16 6R3927 2.2 meg
R-17 6R6056 47,000
R-18 6R6015 220,000
R-19 6R6410 33,000 10%
R-20 6R6015 220,000
R-21 6R6001 68,000
R-22 6R6182 150,000
R-23 6R6075 100,000
R-24 6R6018 100
R-25 6R6032 470,000
R-26 6R2122 4.7 meg
R-27 6R6393 1200 10%
R-28 6R6075 100,000
R-29 6R6032 470,000
R-30 6R6393 1200 10%
R-31 6R6293 150; not insulated
R-32 18A76191 Volume Control: .5 megohm; tapped at
25,000 ohms, with SPST switch
R-33 6R3994 27 10% 2 watt
R-34 6R3968 180 10% 2 watt
R-35 6R476004 1000 2 watt

SWITCHES

S-1 40K470676 Phono-radio & tone switch
S-2 40B470432 Bandswitch
S-3 40K471447 Pushswitch: dual; with switch cover and
insulator (phono ON-OFF & phono reject)
HS-97)

TRANSFORMERS

T-1 24B471668 1st IF, 4.3 Mc: complete with iron cores
and padding capacitors, but less shield
T-2 24B471670 2nd IF, 4.3 Mc: complete with iron cores
and padding capacitors, but less shield.
T-3 24B471672 3rd IF, 4.3 Mc: complete with iron cores
and padding capacitors, but less shield
T-4 24B471674 Discriminator, 4.3 Mc: complete with
iron cores and padding capacitors,
but less shield
T-5 24B75487 IF, 455 Kc: complete with iron cores and
padding capacitors, but less shield....
T-6 24B471666 Diode: 455 Kc: complete with iron cores
and padding capacitors, but less shield
T-7 25K471947 Output

MODELS 77FM21, 77FM22,
-22M, -22WM, 77FM23,
CHASSIS HS-89, HS-97
REF.

MOTOROLA INC.

NO.	PART NO.	DESCRIPTION			
1	1X77345	Background Support & Pullies Assembly ..	44	3S2927	Screw: 6-32 x 7/8 slotted hex head machine screw; cadmium plated (rectifier mtg)
2	26A24869	Base, tube shield			
3	7K471005	Bracket, output transformer mounting ..			
4	7K470917	Bracket, pilot light mounting	45	3S7163	Screw: 8-32 x 1/4 slotted hex head machine screw; cadmium plated (speaker & output transformer brkt mtg)
5	7A77337	Bracket, tuning shaft			
6	11M8944	Cord, dial: 18 lb. black			
7	30K31258	Cord, line & plug: 3 conductor	46	3S7454	Screw: #8 x 1/4 PKZ plain hex head sheet metal screw; cadmium plated (switch cover mounting)
8	15A471444	Cover, pushswitch			
9	15B470677	Cover, switch (on chassis)			
10	35B77311	Dial Background: tan plastic; with reinforcing strip	47	3S7481	Screw: #8 x 3/4 PKZ slotted hex head sheet metal screw; cadmium plated (tuner mtg)
11	57K77085	Dowel, back panel mounting: wood; 1-7/8" long	48	3S3384	Screw: #8 x 2-1/4 PKZ slotted hex head sheet metal screw; cadmium plated (back panel mtg)
12	5S7805	Eyelet, snap-in (dial background mtg) ..			
13	14A471448	Insulator, pushswitch cover: armite			
14	14A470428	Insulator, rectifier: armite paper	49	47A470682	Shaft, band switch
15	1X470698	Lead Assembly, phono-motor: with 3 pin receptacle; 3 leads (for Chassis HS-89)	50	1A77694	Shaft & Pulley Assembly (tuning shaft) .
			51	26B70107	Shield, coil (shield for T-1, T-2, T-3 & T-4)
16	1X471448	Lead Assembly, phono: with 4 pin receptacle & dual push switch (for HS-97 Chassis)	52	1A71049	Shield & Sleeve Assembly (shield for T-5 & T-6)
17	1X470696	Lead Assembly, shielded: 8" long (audio lead)	53	26A478087	Shield, light (used behind dial light) .
18	1X470697	Lead Assembly, phono pick-up: single shielded conductor with one pin plug; 35" long (HS-89)	54	26A24970	Shield, tube
			55	9A470407	Socket, dial light & bracket
			56	9A470506	Socket, tube: miniature 7 prong; black bakelite
19	1X471449	Lead Assembly, phono pick-up: single shielded conductor with one pin plug; 43" long (HS-97)	57	9K470425	Socket, tube; noval 9 prong; black bakelite
20	1X470545	Lever & Rivet Assembly (on band switch shaft)	58	41A14244	Spring, tension coil (drive cord tension)
21	32K31259	Lock, line cord: fibre			
22	4S7650	Lockwasher: #6 internal (rectifier mtg).	59	31K85348	Strip, terminal; 1 insulated lug, #2 mtg
23	4S7657	Lockwasher: #8 external (speaker mtg) ..	60	31K83993	Strip, terminal; 2 insulated lugs, #1 mtg
24	29R5227	Lug, soldering: #6L	61	31K86126	Strip, terminal; 2 insulated lugs, #2 mtg (on rear panel)
25	2S7002	Nut: 6-32 x 5/16 hex; cadmium plated (rectifier mtg)	62	31A470403	Strip, terminal; 3 screw with jumper (Ext Ant terminals)
26	2S7051	Nut: 3/8-32 x 9/16 hex; Palnut; cadmium plated (volume control & phono-radio sw. mtg)	63	31A471913	Strip, terminal; 4 insulated lugs, #2 gnd
			64	31K75232	Strip, terminal; 4 insulated lugs, #3 mtg
			65	31K22174	Strip, terminal; 4 insulated lugs, #4 mtg
27	1X470669	Panel Assembly, cabinet back: less loop winding but includes 3 screw terminal strip and 2 lug terminal strip	66	4A70015	Washer, "C" (band sw shaft & tuning shaft retainer)
28	9A12705	Plate, electrolytic mounting: bakelite..	67	4S1719	Washer: 3/8 x .140 x .030 thick; steel; cadmium plated (line cord lock mtg) ...
29	64A470680	Plate, switch mounting	68	4S7563	Washer: 5/8 x .203 x .033 thick; steel; cadmium plated (back panel mtg)
30	64A470681	Plate, tuning shaft mounting			
31	28K71775	Plug: 1 pin (phono pickup lead)			
32	52A77307	Pointer & Slider Assembly			
33	49A12646	Pulley, cord: 1/4 groove			
34	49A21552	Pulley, cord: 1/2 groove			
35	9A30680	Receptacle: 3 prong; with shell (chassis HS-89 phono motor receptacle)	101	7A471456	Bracket, switch mounting (phono motor & reject sw. mtg)
36	9K470402	Receptacle: 4 prong (Chassis HS-97 phono receptacle)	102	38K470830	Button, plug: for 1/4" hole; green (for concealing shipping screw holes in record changer base)
37	5A71246	Rivet, shoulder: (.187 long) (cord pulley mtg)			
38	5A15045	Rivet, shoulder: .437 long (cord pulley mounting)	103	38B471506	Button, push: M
			104	38K471507	Button, push: R
39	5S8497	Rivet: .088 x 1/8; steel; nickel plated (tube socket mtg)	105	16E470802	Cabinet, consolette model: wood; walnut (77FM21)
40	5S7707	Rivet: .122 x 5/32; steel; nickel plated)	106	16F471531	Cabinet, consolette model: wood; walnut (77FM22)
41	5S7701	Rivet: .122 x 3/16 steel; nickel plated (electrolytic mtg)	107	16K478056	Cabinet, consolette model: wood; mahogany (77FM22M)
42	5S7708	Rivet: .122 x 9/32 steel; nickel plated (line cord lock mtg)			
43	3S7506	Screw: #6 x 1/4 PKZ plain hex head sheet metal screw (BC osc coil mtg)			

CABINET PARTS - MODELS 77FM21, 22, 22M, 22WM & 23

MOTOROLA INC.

MODELS 77FM21, 77FM22,
77FM22M, 77FM22WM,
77FM23, CHASSIS HS-89,
HS-97

REF. NO.	PART NO.	DESCRIPTION			
108	16K478055	Cabinet, consolette model: wood; walnut- mahogany finished (77FM22WM)	129	55K74787	Rail, support: left hand (phono drawer rail)
109	16E478043	Cabinet, consolette model: wood; mahogany (77FM23)	130	34K470863	Scale, dial & escutcheon
110	55A72307	Catch, bullet	131	3S7401	Screw: #2 x 3/8 Phillips oval head wood screw; antique copper finish (dial scale mtg)
111	13K470803	Cloth, grille (77FM21 & 22)	132	3S1343	Screw: #4 x 3/8 Phillips oval head wood screw; brass finish (pushbutton es- cutcheon mounting)
112	13K478036	Cloth, grille (77FM22M & WM & 77FM23) ..	133	3S3367	Screw: #5 x 3/8 PKA slotted hex head sheet metal screw; black parkerized finish (77FM21 pwr conn. mtg)
113	42A75825	Clip, mounting (phono power connector mtg) 77FM21	134	3S7156	Screw: 6-32 x 3/16 slotted binderhead machine screw; cadmium plated (phono motor-reject switch mtg)
114	3A471458	Escutcheon, push button: brushed brass finish	135	3S1314	Screw: #6 x 3/4 round head wood screw (drawer rail mtg)
115	13C470840	Grille, cabinet: metal; brass plated (77FM21, 22, 22M & 22WM)	136	3K471952	Screw: 8-32 x 15/16 washer head machine screw; antique copper finish (drawer pull mtg 77FM21, 22, 22M & 22WM)
116	13A478037	Grille, cabinet: painted; 3-5/8" (77FM23 only)	137	3A471791	Screw: tri-slot head; statuary bronze finish (77FM23 drawer pull mtg)
117	13K478039	Grille, cabinet: painted; 4-7/8" (77FM23 only)	138	3S7526	Screw: #8 x 1-1/8 PKA slotted hex head sheet metal screw; cadmium plated (chassis mtg)
118	36K470846	Knob, control: walnut plastic; plain (77FM21 & 22)	139	3S7396	Screw: 10-32 x 2" slotted hex head machine screw; copper plated (record changer mtg)
119	36K471695	Knob, control: walnut plastic; branded (77FM21 & 22)	140	55X11497	Silencer, dome
120	36K478064	Knob, control: mahogany plastic; plain (77FM22M, 22WM & 23)	141	41A21807	Spring, cushion: bottom (record changer cushion)
121	36K478065	Knob, control: mahogany plastic; branded (77FM22M, 22WM & 23)	142	41A28190	Spring, cushion: top (record changer cushion)
122	35K470657	Pad, felt: 1/2 diameter x 1/16 thick (drawer stop)	143	22S7905	Staple, insulated
123	64B470847	Panel, cabinet rear: wood; walnut finish (77FM21 & 22)	144	55K72308	Strike, bullet (includes 1/2" nail)
124	64K478063	Panel, cabinet rear: wood; mahogany finish (77FM22M, 22WM & 23)	145	4S8214	Washer: 7/8 x .203 x .067 thick; cadmium plated (chassis mtg)
125	36A25507	Plug, split: 5/8 long; for 1/8 hole; copper oxide finish (holds loop panel to cabinet)	146	4S7611	Washer: 1/2 x 7/32 x .046 thick; antique copper finish (record changer mtg)
126	55B470846	Pull, drawer: Old English finish (77FM21 & 22, 22M & 22WM)			
127	55B471551	Pull, drawer: antique copper finish (77FM23 only)			
128	55K74786	Rail, support: right hand (phono drawer rail)			

MODELS 78F11,
78F11-M, 78F12-M

MOTOROLA INC.

GENERAL INFORMATION

TYPE - BC radio-phonograph combination with loop antenna. A selenium rectifier is used in the power supply.
Chassis HS-150 & HS-155 are identical except for dial arrangements.

TUNING RANGE - 535 to 1620 Kc

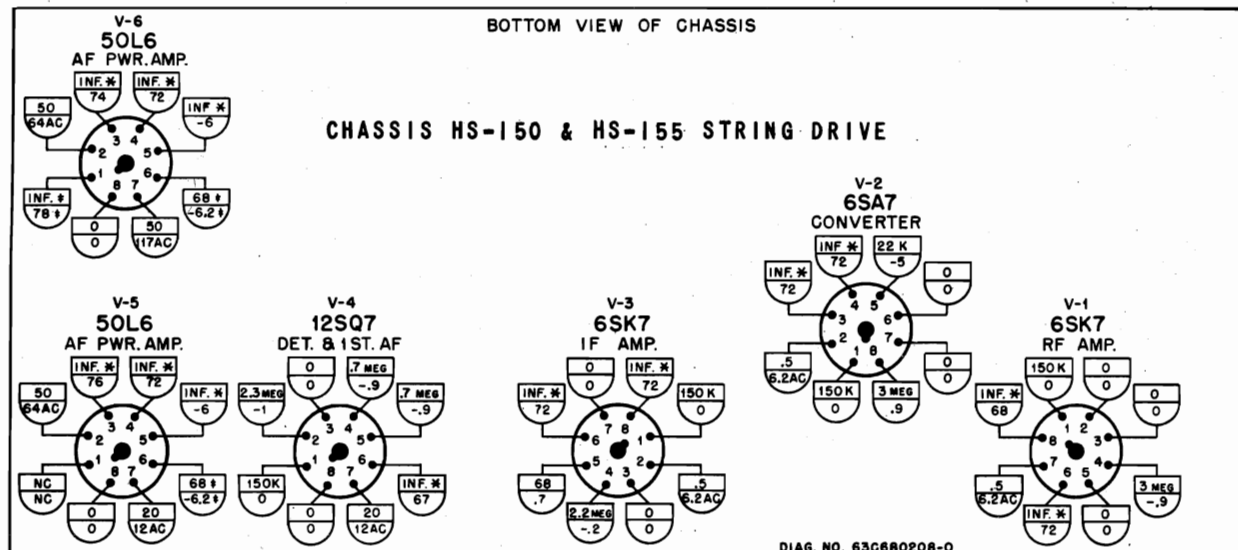
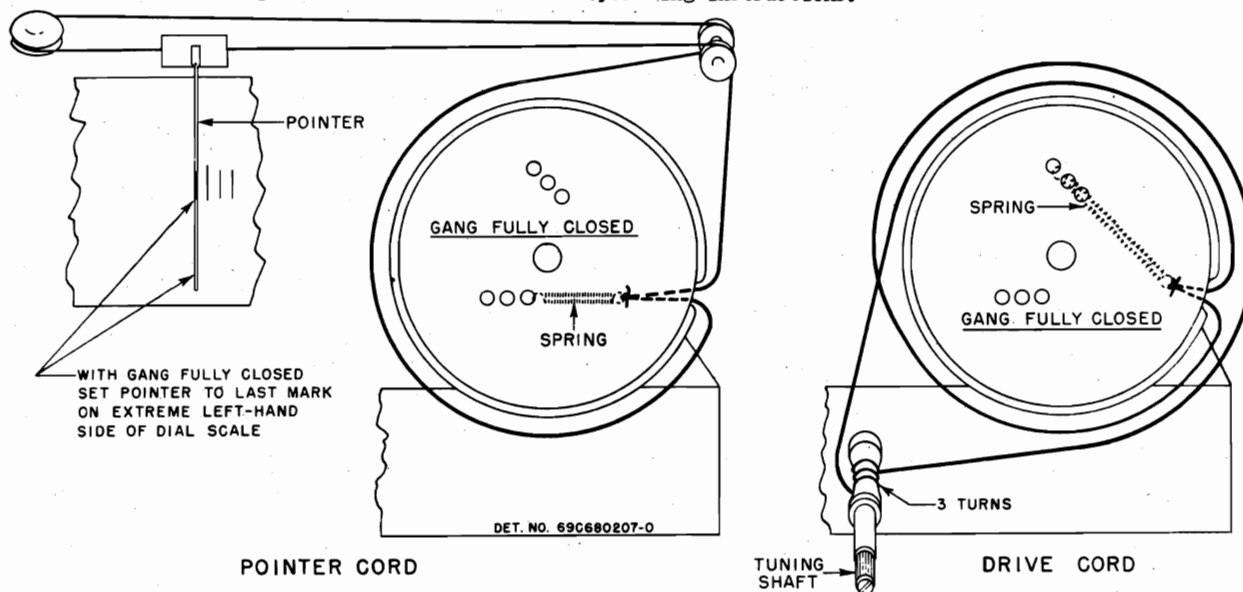
IF FREQUENCY - 455 Kc

TUBE COMPLEMENT - 6SK7 - RF Amplifier
6SA7 - Converter
6SK7 - IF Amplifier

12SQ7 - Detector, AVC & 1st AF Amp
2- 50L6 - Power Amplifiers
Rectifier - Selenium type

POWER SUPPLY - 105-125 volts AC, 60 cycles, 75 watts

RECORD CHANGER - Model RC-34. Refer to Motorola Model RC-34 Service Manual, Part No. 54P484953, for record changer service information and operating instructions.



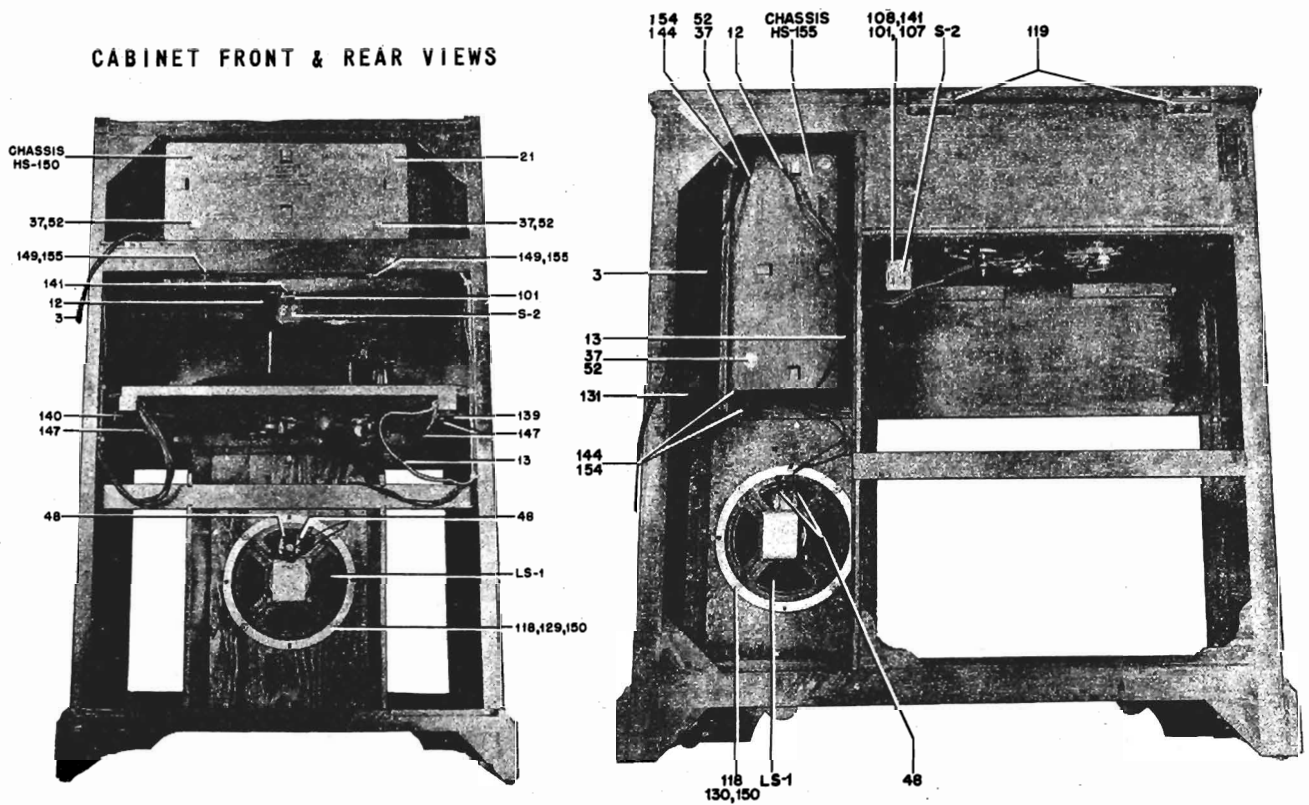
- = RESISTANCE MEASUREMENTS.
- ◐ = VOLTAGE MEASUREMENTS.
- * = MEASUREMENTS MAY VARY DEPENDING ON CONDITION OF ELECTROLYTIC IN CIRCUIT.
- K = 1000 (ONE THOUSAND) OHMS.
- † = LUG USED AS TIE POINT.
- NC = NO CONNECTION.

NOTES:
A VTVM WAS USED FOR ALL MEASUREMENTS.
ALL MEASUREMENTS, EXCEPT FILAMENTS, MADE FROM TUBE BASE PIN TERMINAL TO COMMON NEGATIVE. (SEE SCHEMATIC DIAGRAM)
FILAMENT MEASUREMENTS MADE FROM TUBE BASE TERMINAL TO MINUS SIDE OF LINE INPUT.
ALL VOLTAGES DC UNLESS OTHERWISE SPECIFIED.
INPUT TO SET 117 V. AC.
VOLTAGE TOLERANCE $\pm 10\%$; RESISTANCE TOLERANCE $\pm 20\%$.
VOLUME CONTROL AT MINIMUM AND NO STATION TUNED IN.

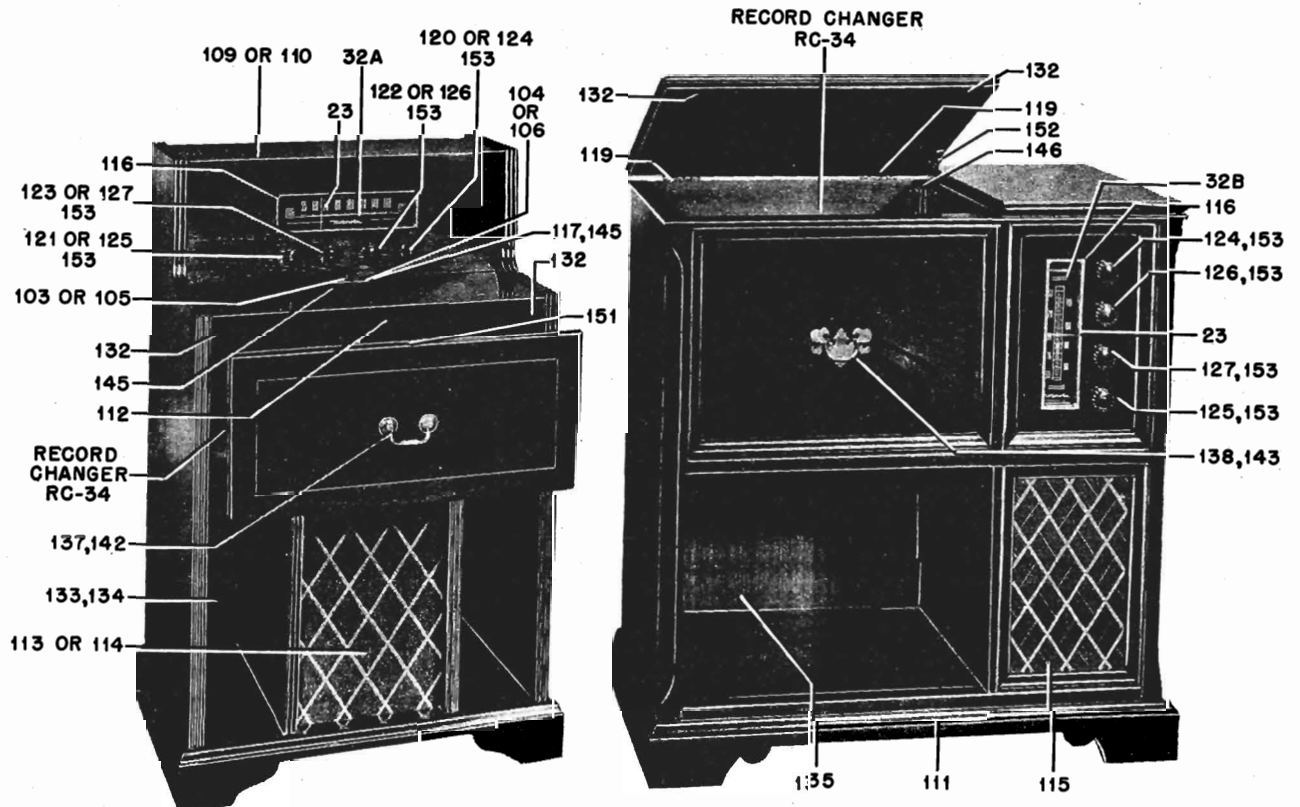
MOTOROLA INC.

MODELS 78F11,
78F11-M, 78F12-M

CABINET FRONT & REAR VIEWS

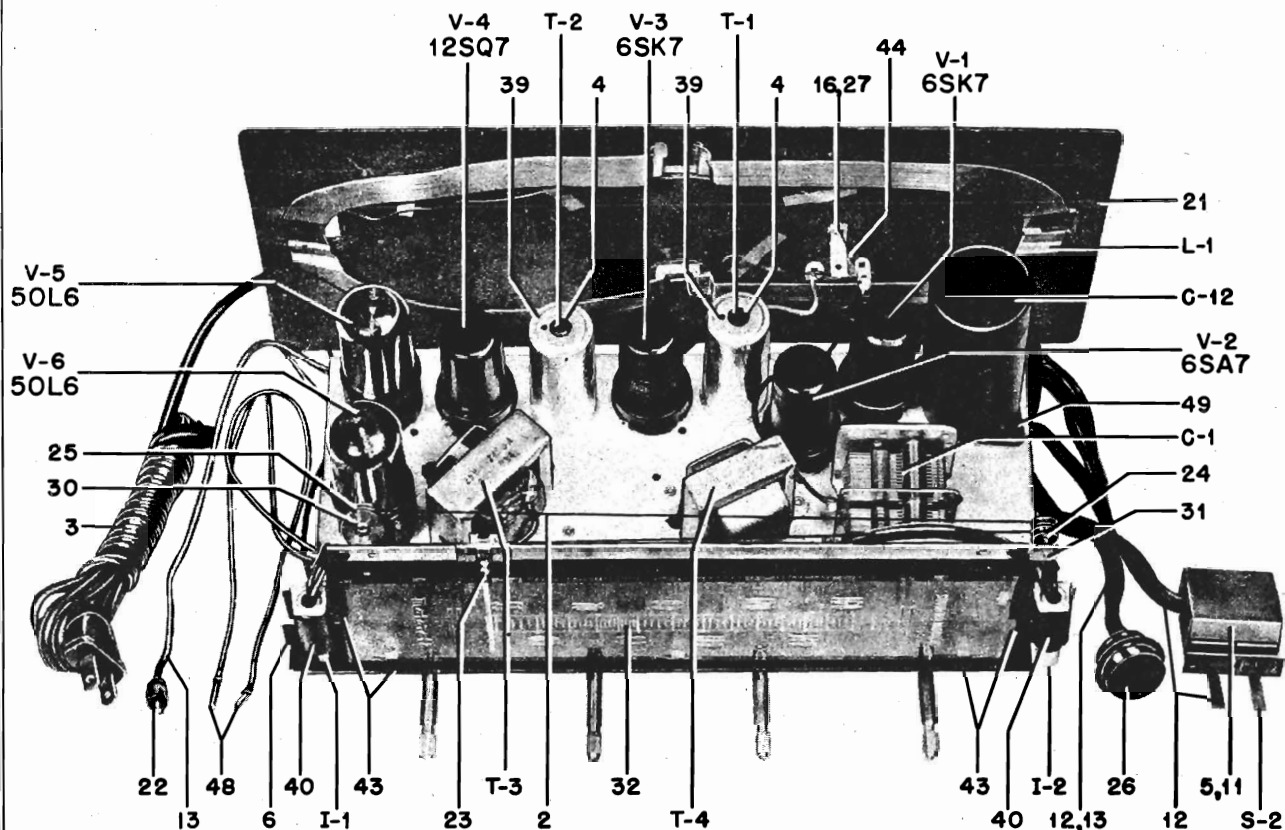


PARTS LOCATIONS

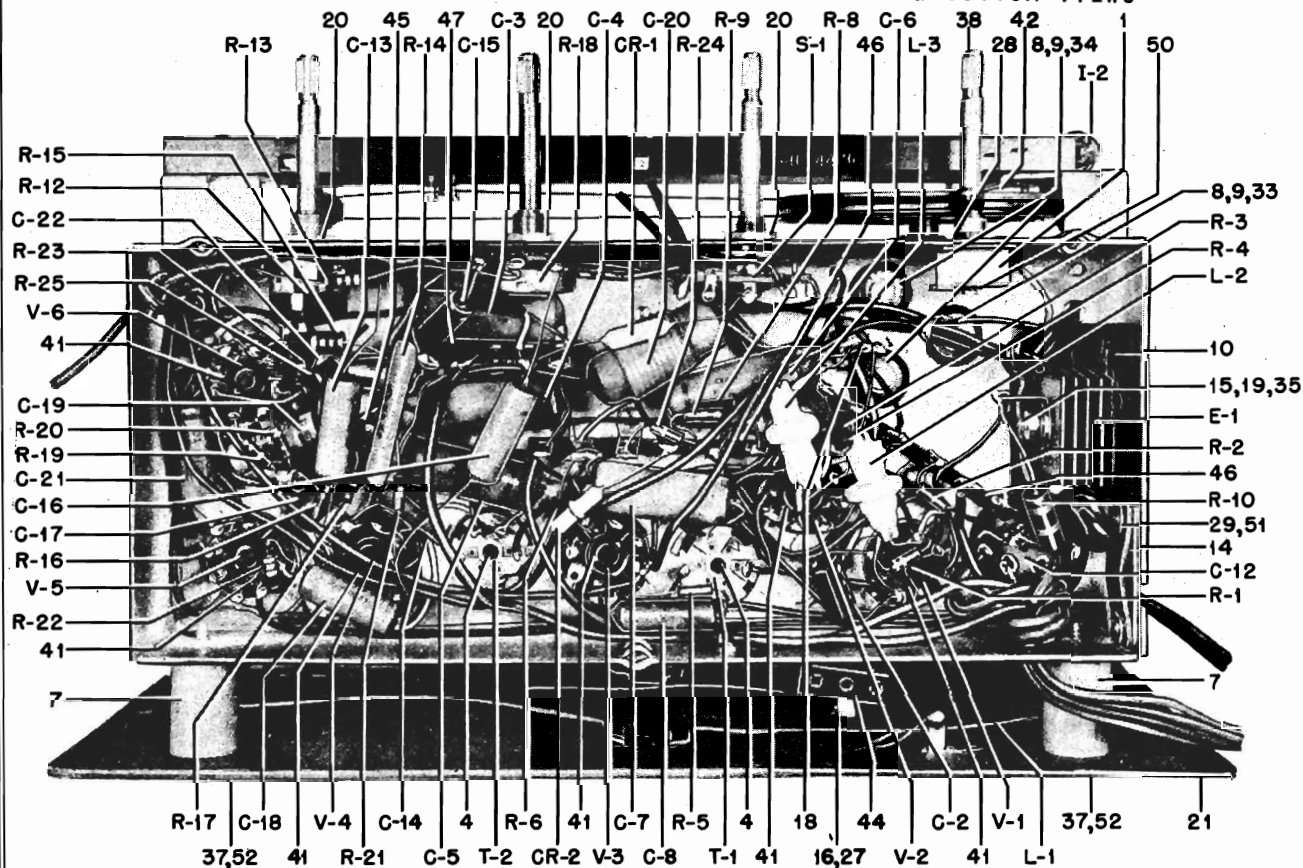


MODELS 78F11,
78F11-M, 78F12-M

MOTOROLA INC.



CHASSIS HS-150 & HS-155 PARTS LOCATIONS - TOP & BOTTOM VIEWS



MOTOROLA INC.

MODELS 78F11,
78F11-M, 78F12-M

ALIGNMENT

Maximum performance can only be obtained if extreme care is exercised during alignment. Follow the procedure carefully.

A low range output meter should be connected across the speaker voice coil. Set receiver volume control to maximum. For greatest accuracy, keep output of receiver at approximately .05 watt thru-out alignment by reducing generator output (not receiver volume control) as stages are brought into alignment. (.05 watt = .40 volt on output meter).

It is suggested that an isolation transformer be used between receiver and power line. If no isolation transformer is used and hum is encountered during alignment, connect the ground side of the signal generator through a .1 mf capacitor to receiver common negative (see schematic diagram) instead of the receiver chassis.

Refer to Figure 2 for location of all adjustments.

STEP	DIAL SET TO	DUMMY	SIGNAL GENERATOR CONNECTED TO	SIGNAL GENERATOR SET TO	ADJUST TRIMMER OR CORE	REMARKS
IF ALIGNMENT						
1.	Gang fully opened	.1 mf	Conv. grid (pin #8)	455 Kc	1,2,3 & 4	Adjust for maximum output.
RF ALIGNMENT						
2.	Gang fully opened	-	Radiation loop**	1620 Kc	5	Adjust for maximum. This sets osc. to dial scale*
3.	1400 Kc	-	Radiation loop**	1400 Kc	6 & 7	Tune signal for max. with receiver tuning knob, then peak trimmers 6 and 7.

* With gang fully closed, pointer should be in line with mark on extreme left hand side of dial scale.

** Connect output of signal generator to a 5" diameter, 3 turn loop and bring loop close enough to receiver loop to obtain output of .05 watt (.40V) on output meter. Vary distance between loops to maintain this output during alignment. Minimum distance between loops should never be less than 12".

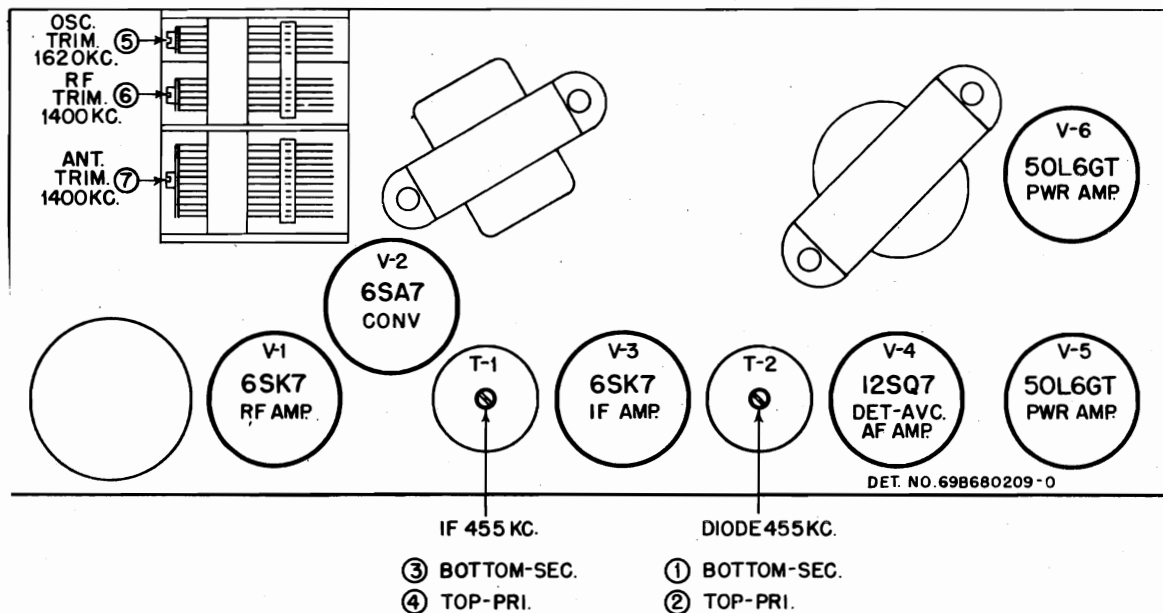
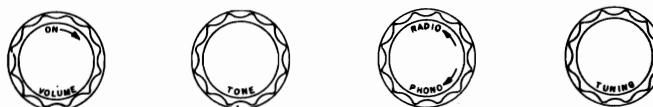


FIGURE 2. CHASSIS HS-150 & HS-155 TUBE & TRIMMER LOCATIONS



MODELS 78F11,
78F11-M, 78F12-M

MOTOROLA INC.

RESISTORS

Note: All resistors are insulated carbon type unless otherwise specified.

R-1	6R3949	470 20% 1/2W	.....
R-2	6R6028	22,000 20% 1/2W	.....
R-3	6R6028	22,000 20% 1/2W	.....
R-4	6R3933	220 20% 1/2W	.....
R-5	6R3927	2.2 meg 20% 1/2W	.....
R-6	6R6007	68 20% 1/2W	.....
R-8	6R3927	2.2 meg 20% 1/2W	.....
R-9	6R3927	2.2 meg 20% 1/2W	.....
R-10	6R3994	27 10% 2W wirewound	.....
R-12	18K471518	Volume Control: 1 meg; tapped at 300,000 ohms, includes power switch	.....
R-13	6R6056	47,000 20% 1/2W	.....
R-14	17K484399	560 10% 5W wirewound; coated	.....
R-15	6R6336	270 10% 1W	.....
R-16	6R3927	2.2 meg 20% 1/2W	.....
R-17	6R6075	100,000 20% 1/2W	.....
R-18	18K484386	Tone control: 1 meg	.....
R-19	6R2030	12 10% 1/2W	.....
R-20	6R6614	56 10% 1/2W	.....
R-21	6R6015	220,000 20% 1/2W	.....
R-22	6R6032	470,000 20% 1/2W	.....
R-23	6R6032	470,000 20% 1/2W	.....
R-24	6R6182	150,000 20% 1/2W	.....
R-25	6R6330	150 10% 1W	.....

SWITCH

S-1	40A484381	Phono-Radio Switch	.....
S-2	40K471447	Pushswitch: dual (Motor-Reject)	.....

TRANSFORMERS

T-1	24B482863	IF, 455 Kc: complete with iron tuning cores and padding capacitors but less shield.
-----	-----------	---	-------

COILS

L-1	24K484516	Loop Antenna: winding only	.....
L-2	24B484512	RF coil	.....
L-3	24B484511	Oscillator coil	.....

SPEAKER

LS-1	50C480010	Speaker: 8" PM; 3.2 ohm voice coil
------	-----------	------------------------------------	-------

REF. NO. PART NO. DESCRIPTION

CHASSIS PARTS - ELECTRICAL

CAPACITORS

C-1	1X484546	Variable, 3 gang: includes pulley	.....
C-2	21R6641	Mica: 100 mmf 500V	.....
C-3	8S9807	Paper: .1 mf 400V	.....
C-4	8S9816	Paper: .05 mf 400V	.....
C-5	8S9816	Paper: .05 mf 400V	.....
C-6	8S9807	Paper: .1 mf 400V	.....
C-7	8S9807	Paper: .1 mf 400V	.....
C-8	8A71213	Paper: .05 mf 100V	.....
C-12	23B482811	Electrolytic: 125-125-40 mf/150V, 100 mf/251	.....
C-13	8S9809	Paper: .01 mf 400V	.....
C-14	21K77375	Ceramic: 250 mmf 500V	.....
C-15	8K471828	Paper: .02 mf 100V	.....
C-16	8S9813	Paper: .005 mf 600V	.....
C-17	8A71213	Paper: .05 mf 100V	.....
C-18	8S9809	Paper: .01 mf 400V	.....
C-19	8S9809	Paper: .01 mf 400V	.....
C-20	1A77283	Paper: .15 mf 200V; includes 10 turns of #24 wire	.....
C-21	8S9809	Paper: .01 mf 400V	.....
C-22	8S9809	Paper: .01 mf 400V	.....

CAPACITOR-RESISTOR

CR-1A, 21K481868	Capacitor-Resistor: consists of 250 mmf capacitor and 470,000 ohm resistor as one unit	.....
CR-2A, 21A473040	Capacitor-Resistor: consists of two 100 mmf capacitors and one 47,000 ohm resistor as one unit	.....

RECTIFIER

E-1	48B482807	Selenium type: 150 ma; half-wave
-----	-----------	----------------------------------	-------

PILOT LIGHTS

I-1,2	65X11854	Bulb: 6-8V; clear; bayonet base; #47	...
-------	----------	--------------------------------------	-----

CHASSIS PARTS - MECHANICAL

1	7A77337	Bracket, tuning shaft
2	11M8944	Cord, dial: 18 lb black
3	30K21859	Cord, line and plug: 9 ft long
4	46A470885	Core, iron: threaded (for tuning T-1 & T-2 primary and secondary)
5	15A471444	Cover, switch (for S-2)
6	1X471776	Dial Plate, Brackets and Pulleys Assembly: complete except for dial scale & rubber scale mtg channels
7	57K470568	Dowel, back mtg: wood
8	5A70098	Eyelet, spacer (gang mtg)
9	37K15125	Grommet, gang mtg
10	1A4470428	Insulator, rectifier mtg: fiber
11	1A4471446	Insulator, switch cover (for S-2)
12	1X484553	Lead Assembly, phono-motor: includes leads, receptacle, pushswitch, cover and insulator; 35" long (HS-150 only)
13	1X484552	Lead Assembly, phono pick-up: includes 1-pin plug; 49" long (HS-150 only)
14	32A24815	Lock, line cord
15	457650	Lockwasher: #6 internal (rectifier)
16	457686	Lockwasher: #6 external; cad plated (terminal strip mtg)
17	29B5227	Lug, soldering: #8; hot-tinned
18	29B5209	Lug, soldering: #8D; hot-tinned
19	297002	Nut: 6-32 x 5/16; steel; cad plated (rectifier mtg)
20	287051	Nut: 3/8-32 x 9/16; steel; cad pl; Pal-nut (volume control, tone control and phono-radio switch mtg)
21	24C484513	Panel & Loop Assembly: includes back panel and loop antenna
22	28K71775	Plug, insulated: 1-pin (phono pickup)
23	52B461704	Pointer, dial
24	49A23960	Pulley, cord: 1/4" groove
25	49A21552	Pulley, cord: 1/2" groove
26	9K470402	Receptacle, phono-motor
27	587707	Rivet: .122 x 5/32 steel; nickel plated (terminal strip, trans and soldering lug mounting)
28	587701	Rivet: .122 x 3/16 steel; nkl pl (tuning shaft bracket and electrolytic wafer mounting)
29	587708	Rivet: .122 x 9/32 steel; nkl pl (line cord lock mtg)

30	5A71246	Rivet, shoulder: .187" lg (pulley mtg).
31	5A71735	Rivet, shoulder: 1/2" lg (pulley mtg) ..
32A	34C484382	Scale, dial: glass (HS-150 only)
32B	34C484517	Scale, dial: glass (HS-155 only)
33	387339	Screw: 6-32 x 5/8 plain hex head machine screw; steel; cad pl (gang mtg)
34	382999	Screw: 6-32 x 5/8 slotted locking type machine screw; steel; cad pl (gang mtg).
35	382977	Screw: 6-32 x 1-1/8 plain hex head machine screw; steel; cad pl (rectifier mtg)
36	387454	Screw: #8 x 1/4 PKZ plain hex head machine screw; steel; cad pl (dial assembly mounting)
37	387530	Screw: #8 x 1-1/2 PKZ plain hex head machine screw; steel; cad pl (back mtg).
38	1K471779	Shaft and Pulley Assembly, tuning
39	26K485936	Shield, coil (for T-1 & T-2)
40	9A482898	Socket, dial light and bracket
41	9A6790	Socket, tube: molded, octal
42	or 9A6788	Socket, tube: replacement type; used in place of 9A6790 when mounting ears on chassis break off
43	41A14244	Spring, tension coil (pointer & drive cord tension)
44	37K51114	Strip, channel: rubber; (dial scale mtg)
45	31K86126	Strip, terminal: 2 insulated lugs, #2 (on loop panel assembly)
46	31K470746	Strip, terminal: 3 insulated lugs, #2
47	31K471899	Strip, terminal: 5 insulated lugs, #4
48	31K471562	Strip, terminal: 5 insulated lugs, #4
49	28A5400	Terminal, plain pin (speaker terminal)
50	9A22058	Wafer, electrolytic mtg bakelite
51	4A70015	Washer "C" (tuning shaft retainer)
52	4S1719	Washer: 3/8 x .140 x .030 thick; steel; cad pl (line cord lock mtg)
53	4S7813	Washer: 3/4 x 13/64 x .027 thick; copper oxide finish (back mtg)

CABINET PARTS

101	7A481713	Bracket, push switch mtg
102	38K482819	Button, plug: 1/4"; red mahogany finish (for concealing shipping screw holes in record changer)
103	1X485913	Button, push: "M"; walnut (78F11)
104	1X485914	Button, push: "R"; walnut (78F11)
105	1X485195	Button, push: "M"; mahogany (78F11M) ..
106	1X485196	Button, push: "R"; mahogany (78F11M)

REF. NO.	PART NO.	DESCRIPTION
107	1X485915	Button, push: "M"; mahogany (78F12M) ...
108	1X485916	Button, push: "M"; mahogany (78F12M) ...
109	16K482799	Cabinet, spinet combination; brown mahogany (78F11)
110	16F481718	Cabinet, spinet combination: red mahogany (78F11M)
111	16F481758	Cabinet, console combination: red mahogany (78F12M)
112	55B72307	Catch, bullet
113	13K482798	Cloth, grille: brown mahogany (78F11) ..
114	13K481719	Cloth, grille: red mahogany (78F11M) ...
115	13K481763	Cloth, grille: red mahogany (78F12M) ...
116	13K482128	Escutcheon, dial: antique brass finish .
117	13A471458	Escutcheon, push button: statuary bronze finish
118	5A12691	Grommet, rubber (speaker cushion)
119	55A471394	Hinge, lid mtg (78F12M)
120	36K484526	Knob, control: walnut plastic; "TUNING" (78F11)
121	36K484528	Knob, control: walnut plastic; "ON-VOLUME" (78F11)
122	36K484525	Knob, control: walnut plastic; "RADIO-PHONO" (78F11)
123	36K484527	Knob, control: walnut plastic; "TONE" (78F11)
124	36K484522	Knob, control: mahogany plastic; "TUNING" (78F11M and 78F12M)
125	36K484524	Knob, control: mahogany plastic; "ON-VOLUME" (78F11M & 78F12M)
126	36K484521	Knob, control: mahogany plastic; "RADIO-PHONO" (78F11M & 78F12M)
127	36K484523	Knob, control: mahogany plastic; "TONE" (78F11M & 78F12M)
128	22S1647	Nail, furniture: #42; antique brass (rear panel mtg)
129	2K38759	Nut, self-locking (speaker mtg -78F11 and 78F11M)
130	2B880009	Nut, self-locking (speaker mtg -78F12M) ..
131	2A72610	Nut, tee: 8-32 thread (on cabinet-chassis mounting)
132	35K470657	Pad, felt
133	6A484557	Panel, cabinet rear; walnut (78F11)
134	6A481724	Panel, cabinet rear: mahogany (78F11M) ..

135	64K481725	Panel, cabinet rear: mahogany (78F12M) .
136	64C482829	Panel, record changer cover (78F11 & 11M)
137	55A481715	Pull, drawer: English antique finish (78F11 and 78F11M)
138	55A481759	Pull, drawer: dummy (78F12M)
139	55C74786	Rail, support: right-hand
140	55K74787	Rail, support: left-hand
141	3S7156	Screw: 6-32 x 3/16 slotted blind head machine screw; steel; cad pl (push switch mounting)
142	3K481722	Screw: 8-30 x 7/8 washerhead machine screw; antique copper finish (drawer pull mtg - 78F11 & 78F11M)
143	3K481761	Screw: 8-32 x 1/4 washerhead machine screw' statuary bronze (drawer pull mtg - 78F12M)
144	3S2963	Screw: 8-32 x 1-3/4; slotted hex head machine screw; steel; cad pl (chassis mounting - 78F12M)
145	3S488129	Screw: #4 x 5/8 Phillips oval head machine screw; statuary bronze finish (push button escutcheon mtg)
146	3S7436	Screw: #6 x 1/2 slotted round head machine screw; antique copper finish (lid support mtg - 78F12M)
147	3S1314	Screw: #6 x 3/4 slotted round head wood screw; statuary bronze finish (support rail mtg)
148	3S476106	Screw: #8 x 1 PKA slotted hex head sheet metal screw; steel; cad pl (chassis mtg- 78F11 and 78F11M)
149	3S2396	Screw: #8 x 1-1/4 PKA plain hex head sheet metal screw; steel; cad pl (chassis mtg- 78F12M)
150	3K853	Screw, speaker mounting
151	55K72308	Strike, bullet: includes nail
152	55B482802	Support, lid: statuary bronze finish (78F12M)
153	4K485917	Washer, felt: used behind control knobs.doz
154	4S7630	Washer: 1/2 x 7/32 x .033 thick; steel; cad pl (chassis mtg -78F12M)
155	4S8214	Washer: 7/8 x .203 x .067 thick; steel; cad pl (chassis mtg)
T-2	24B482865	Diode, 455 Kc: complete with iron tuning cores and padding capacitors but less shield
T-3	25B482808	Output Transformer
T-4	25B482810	Filament Transformer

MOTOROLA INC.

MODELS 95F31, 95F33,
CHASSIS HS-38; 95F31B,
95F31M, CHASSIS HS-39

FIGURE 3. CONTROLS

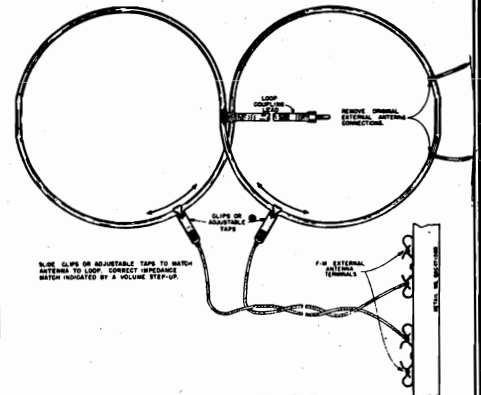
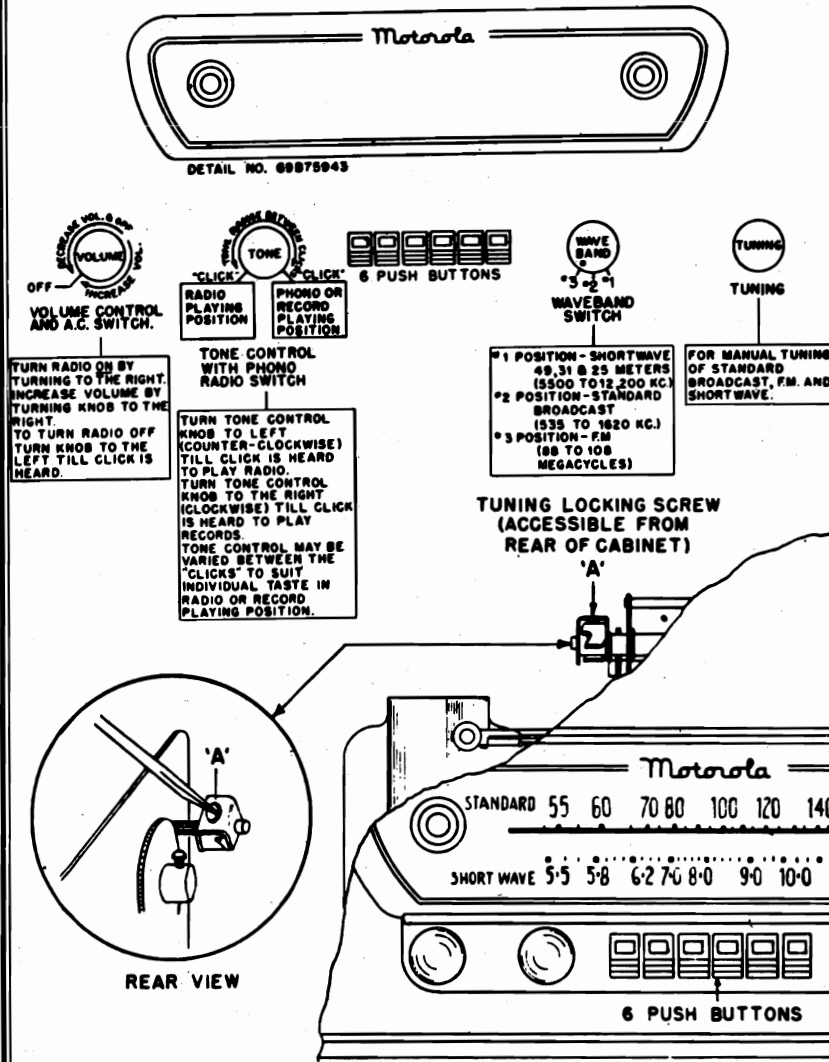


FIGURE 2. FM LOOP ANTENNA

FIGURE 4. TUNER LOCKING SCREW LOCATION

INSTRUCTIONS FOR SETTING AUTOMATIC TUNER PUSH BUTTONS

1. Turn the radio ON and allow it to warm up for a period of at least fifteen minutes.
2. While waiting for the radio to warm up, loosen the tuner locking screw (A) all the way. The locking screw is accessible from the rear of the cabinet. (See Figure 4).
3. Make a list of the frequencies of the local stations you wish to tune in automatically. It is recommended that you select the most powerful stations only.
4. Turn the band switch to FM or BC position, depending on the station being setup, and carefully tune in the first station.

NOTE: The buttons may be used on either BC, FM, or any combination of AM and FM. BE SURE TO SET THE BAND SWITCH ON THE PROPER BAND!

5. Adjust a signal generator to zero beat with the AM station.

NOTE: While it is advisable to use a signal generator for accuracy, it is not an absolute necessity. The station signal may be used.

6. Tune to the desired station or to the signal generator, with the tuning knob (right hand control).
7. Holding the tuning knob, push the selected button and HOLD IN UNTIL THE MOTOR STOPS.
8. Repeat steps 6 and 7 for each of the buttons.
9. Carefully tighten the tuner locking screw (A).
10. Check the setting of the button by tuning in the station manually, then push the button set for that station; no effect on volume or tone should be noticed. If not correctly set, readjust--following steps 4 through 9.

MODELS 95F31, 95F33,
CHASSIS HS-38; 95F31B,
95F31M, CHASSIS HS-39

MOTOROLA INC.

FM SERVICE NOTES

In some cases, people are not tuning FM sets properly. FM is more difficult to tune than AM, although Motorola receivers are easier than most. There are three peaks present; the center peak, which is the correct one, is hard to locate. The peaks on either side of the center are slightly distorted. If you get a distorted peak on only one side of the center, the discriminator is probably out of alignment.

Some people expect too much of FM. You cannot expect great distance. The horizon, as viewed from the transmitting antenna, is the normal service area. Many FM stations are now operating on the low power, waiting for new equipment. Reception will improve greatly when power is increased. Most of the bad reports have come from the fringe areas. In many cases reception can be improved by using a dipole antenna, mounted as high above the roof as possible, and aimed directly at the station.

Location of the radio is important when it is operated on its built-in loop antenna. Moving the set even a few feet away from its present location may increase or reduce signal strength by more than 50% because a stronger signal may exist at one location than another. Therefore, in homes where reception is poor, you may be able to improve it by placing the set against another wall. The Motorola figure 8 loop antenna is omnidirectional.

Motorola FM sets use a relatively new circuit known as the Ratio Detector, instead of the usual limiters. The following paragraph of explanation is quoted from the R.C.A. License Laboratory Bulletin:

"Since a circuit of this type is

relatively immune to amplitude modulation, it is unnecessary to precede it by a limiter stage. Also, since its immunity is not a direct function of the signal strength, there is no threshold action of the type encountered where limiters are employed."

It has been thought, erroneously, that the use of limiters in an FM receiver is imperative for proper reception. This is not the case. In this connection, it is important to understand that a limiter requires several volts at its grid to become effective. If the received signal strength is too weak to provide the required voltage at the limiter grid, the limiters do not function. This means that below a certain threshold of signal level, the limiters do not work and as a result do not contribute to amplitude (noise) rejection. Furthermore, noise voltages are not purely amplitude modulated, but contain frequency modulated components against which no amplitude rejection device will discriminate.

From the above comparison, you can see that there is little, if any, difference between the two circuits insofar as noise reception is concerned. In either case, low signal levels from the FM stations will result in noise reception, if there is any noise in the neighborhood.

The main advantages of ratio detection, as used in Motorola FM are, first, very little between station noise, and second, easier tuning because the side peaks are slightly subdued (as compared to the limiter type of receiver), making it easier to find the center peak.

MOTOROLA INC.

MODELS 95F31, 95F33,
CHASSIS HS-38; 95F31B,
95F31M, CHASSIS HS-39

ALIGNMENT

ALIGNMENT PROCEDURE WHEN USING AM MODULATED SIGNAL GENERATOR AND STANDARD OUTPUT METER FOR COMPLETE RECEIVER ALIGNMENT.

An AM (amplitude modulated) signal generator covering the frequencies shown in alignment chart, is used to align the broadcast, short wave and FM bands. A low range output meter, connected across the speaker voice coil is used as an output indicator.

The broadcast and short wave alignment is conventional; full instructions are given in the following alignment chart.

The FM band alignment can be satisfactorily performed by following the instructions in the chart. When properly aligned, the discriminator does not respond to amplitude modulation and since an AM type signal generator is used for aligning the FM circuits, it is necessary to detune the discriminator secondary and leave it that way until all of the FM circuits have been aligned. After completing the alignment of the FM circuits,

proceed to align the discriminator secondary by applying a 4.3 Mc AM signal to the control grid of the 7F8 2nd FM converter tube and adjusting the discriminator secondary core for minimum audio output. No adjustment of the FM circuits should be attempted with AM after the discriminator secondary has been properly aligned.

Use a 30% AM (amplitude modulated) signal throughout entire alignment procedure.

A dial scale should be temporarily mounted or held in position on Chassis HS-38 to facilitate calibration.

Use an insulated screwdriver when adjusting the FM tuner trimmers.

A special wrench for adjusting the slotted nuts on the tuner cores will be required. You can easily fabricate one from a Motorola auto set Volume Control Shaft and Coupling Assembly (Part No. 1B70847, \$.30 list) by simply spreading out the forked ends and filing to fit. Solder the assembly together to make it rigid.

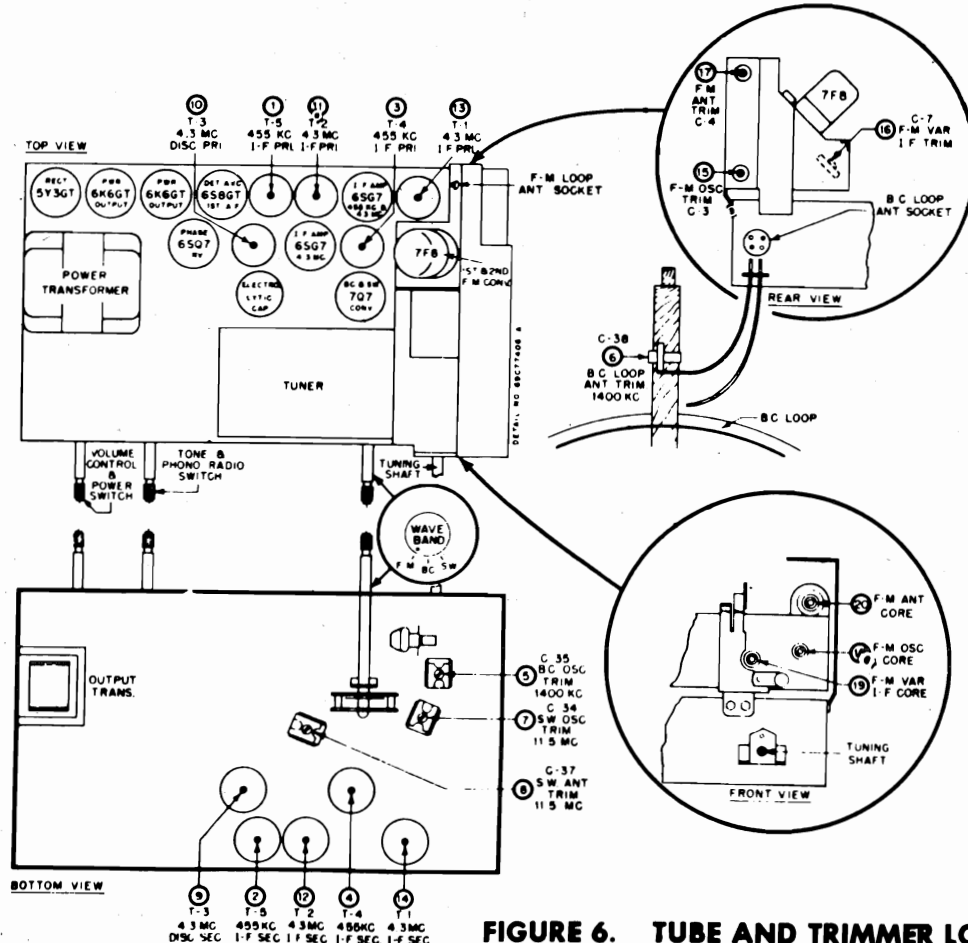


FIGURE 6. TUBE AND TRIMMER LOCATIONS

Compliments of www.nucow.com

CHART 1. ALIGNMENT PROCEDURE WHEN USING AM MODULATED SIGNAL GENERATOR AND STANDARD OUTPUT METER FOR COMPLETE RECEIVER ALIGNMENT.									
STEP	DIAL SET TO	BAND SW. SET TO	DUMMY	SIGNAL GENERATOR CONNECTED TO	SIGNAL GENERATOR SET AT	ADJUST TRIMMER OR CORE	REMARKS	STEP	DIAL SET TO
455 KC I.F. CHANNEL ALIGNMENT									
1.	1650 KC B.C.	.1 MF.		707 B.C. & S.W. CONV. GRID (PIN #4) & CHASSIS	455 KC	1, 2, 3 & 4	ADJUST FOR MAXIMUM OUTPUT	7.	112 MC FM
BROADCAST BAND ALIGNMENT									
2.	1400 KC B.C.	.1 MF.		707 B.C. & S.W. CONV. GRID (PIN #4) & CHASSIS	1600 KC	5 (B.C. OSC. TRIM)	SET OSCILLATOR TO DIAL. ION CHASSIS HS-38, MOUNT OR HOLD DIAL SCALE TEMPORARILY ON CHASSIS WITH GANG FULLY MESSED, POINTER SHOULD BE AT LAST MARK ON DIAL. THEN SET TO 1400 KC. AND SET OSCILLATOR.)	8.	
3.	1400 KC B.C.	NONE		RADIATION LOOP	1400 KC	6 (B.C. LOOP ANTENNA TRIM.)	ADJUST FOR MAXIMUM OUTPUT	9.	90 MC FM
SW. BAND ALIGNMENT									
4.	11.5 MC S.W.	.1 MF		707 B.C. & S.W. CONV. GRID (PIN #4) & CHASSIS	11.5 MC	7 (S.W. OSC. TRIM)	SET OSC. TO DIAL. MAKE SURE OSC. IS HIGHER IN FREQUENCY THAN THE SIGNAL BY CHECKING IMAGE RESPONSE WHICH SHOULD OCCUR WITH THE INPUT SIGNAL AT 12.4 MC.	10.	105 MC FM
5.	11.5 MC S.W.	50 MHF		S.W. ANT. TERMINAL AND CHASSIS.	11.5 MC	8 (S.W. ANT. COIL TRIM)	B.C. LOOP PLUG SHOULD BE DISCONNECTED. ADJ. FOR MAXIMUM OUTPUT	11.	
9.3 MC I.F. CHANNEL ALIGNMENT									
6.						9 (DISC. SEC.)	DETUNE DISCRIMINATOR SECONDARY BY SCREWING CORE OUT AS FAR AS IT WILL GO.	12.	105 MC
ALIGN DISCRIMINATOR SECONDARY									
								13.	FM

* CONNECT OUTPUT OF SIGNAL GENERATOR TO A 5" DIAMETER, 3 TURN LOOP & RADIATE SIGNAL INTO RECEIVER LOOP. MINIMUM DISTANCE BETWEEN LOOPS SHOULD NEVER BE LESS THAN 12".

MOTOROLA INC.

MODELS 95F31, 95F33,
CHASSIS HS-38; 95F31B,
95F31M. CHASSIS HS-39**CHART II. ALIGNMENT PROCEDURE WHEN USING FM SIGNAL GENERATOR AND OSCILLOSCOPE.****STEP****OPERATION**455 Kc. I.F. Channel Alignment

1. Same as step 1 in Chart I (Use AM signal generator)

Broadcast Band Alignment

2. Same as steps 2 & 3 in Chart I (Use AM signal generator)

S. W. Band Alignment

3. Same as steps 4 & 5 in Chart I (Use AM signal generator)

4.3 Mc I.F. Channel Alignment Using FM Signal Generator & Oscilloscope

4. (A) Discriminator -

1. Connect the input terminals of the oscilloscope vertical amplifier to the high side of the receiver volume control and the chassis.
2. Connect the FM generator synchronizing voltage output terminals to a phase shifting network, consisting of a variable 1/2 megohm resistor in series with a .002 mf capacitor. The input to the oscilloscope horizontal amplifier is connected across the .002 mf capacitor. See Figure 7. (This phase shifting network may not work with every oscilloscope. Different values of R & C may be required).
3. Apply an FM 4.3 Mc Signal (125 Kc deviation) through a .01 mf capacitor to the control grid (pin #4) of the 6SG7 tube in the second I.F. amplifier stage.
4. Screw discriminator secondary core (9) out as far as it will go.
5. Adjust discriminator primary until the pattern obtained on the scope is symmetrical about the vertical axis. The phase shifting network resistor is adjusted to give only one trace. The pattern obtained is the resonance curve of the primary, whose maximum response should be at exactly 4.3 Mc. (See Figure 8).
6. Adjust discriminator secondary until a symmetrical pattern is obtained, with peaks occurring at about 100 Kc above and below 4.3 Mc and is substantially linear between peaks. The trace should pass through the intersection of the vertical and horizontal axis. The phase shifting network should be adjusted to give only a single pattern at all times. (See Figure 9).

(B) 4.3 Mc I.F. Amplifiers -

1. Apply an FM 4.3 signal (100 Kc deviation) to the control grid (pin #4) of the 6SG7 tube in the 1st I.F. amplifier stage, through a .001 mf capacitor and adjust both primary and secondary cores (11 & 12) to get a symmetrical pattern as before, with peaks occurring at a slightly lower deviation.
2. Apply an FM 4.3 Mc signal (100 Kc deviation) to the control grid (pin #1) of the 7F8 tube, and adjust both primary and secondary cores (13 & 14) until a symmetrical pattern substantially linear between peaks, is obtained.

FM Band Alignment

5. Check the position of the FM oscillator tuning core (18). Set the spacing between the core and the bakelite piece to which it is mounted, to 1/32" by turning tuning core slotted nut.

MODELS 95F31, 95F33,
CHASSIS HS-38; 95F31B,
95F31M, CHASSIS HS-39

MOTOROLA INC.

OPERATION

STEP

6. Remove the FM loop and connect generator output directly to the receiver FM loop receptacle.
7. Set receiver dial to 90 Mc and also FM signal generator to 90 Mc. (22-1/2 Kc deviation). Adjust FM oscillator, antenna & variable I.F. trimmers (15, 16 & 17) for maximum indication on output meter. (Output meter should be connected across speaker voice coil).
8. Set receiver dial to 105 Mc and also FM signal generator to 105 Mc (22-1/2 Kc deviation). Adjust FM oscillator, antenna and variable I.F. Cores (18, 19 & 20) for maximum indication on output meter.
9. Repeat steps 7 & 8 several times until further adjustment does not increase the output. Make the final trimmer adjustment at 105 Mc. (i.e. trimmers 15, 16 and 17 at 105 Mc.).
10. Connect FM loop antenna to receiver receptacle. Radiate an FM 105 Mc (22-1/2 Kc deviation) signal into FM loop. Set receiver dial to 105 Mc and adjust trimmer (17) for maximum.

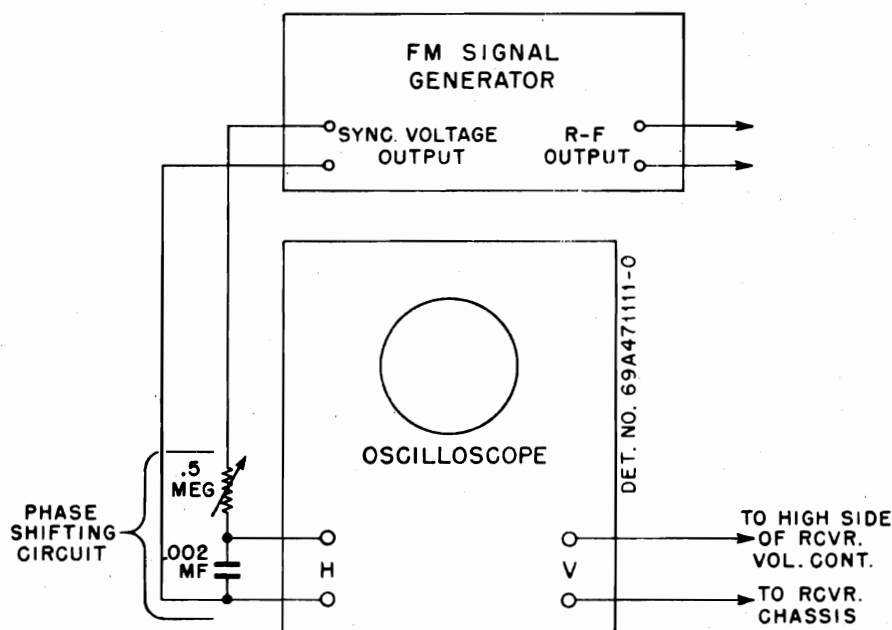
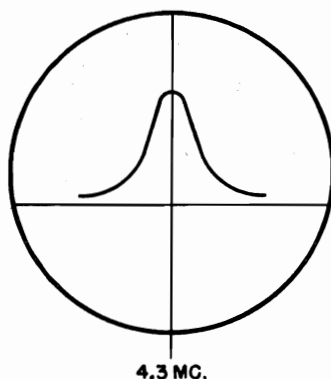
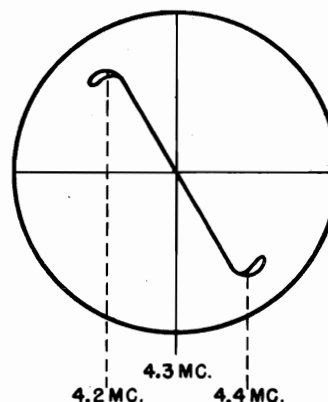


FIGURE 7. SIGNAL GENERATOR & OSCILLOSCOPE HOOK-UP



PATTERN WITH DISCRIMINATOR
PRIMARY (10) CORRECTLY ADJUSTED.

FIGURE 8.

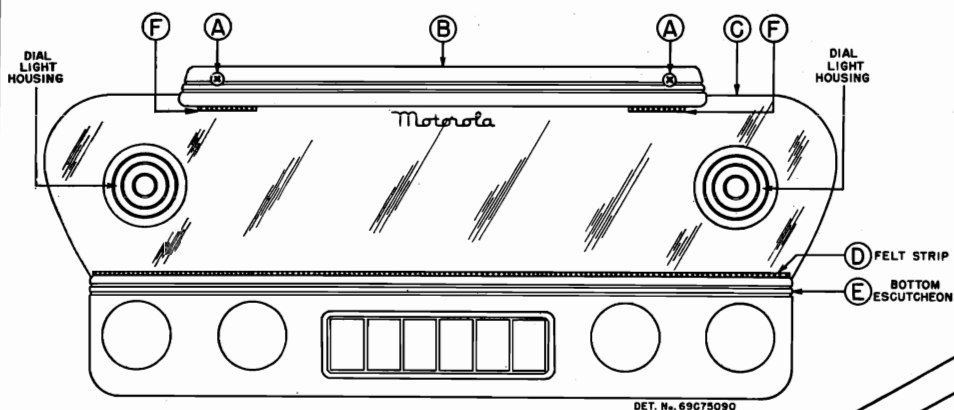


PATTERN WITH DISCRIMINATOR
SECONDARY (9) CORRECTLY ADJUSTED.

FIGURE 9.

MODELS 95F31B, 95F31M, MOTOROLA INC.
CHASSIS HS-39

MODELS 95F31, 95F33,
CHASSIS HS-38



DET. No. 69C75090

TO SERVICE LONG LIFE PILOT LIGHTS, PROCEED AS FOLLOWS:

- 1- UNSCREW THE TWO SCREWS MARKED 'A' AND REMOVE BAKELITE ESCUTCHEON 'B'.
- 2- PULL TOP OF GLASS DIAL SCALE 'C' FORWARD UNTIL DIAL LIGHT HOUSINGS CLEAR CABINET, THEN LIFT GLASS DIAL SCALE CLEAR OF CABINET.
- 3- REPLACE DEFECTIVE PILOT LIGHT. USE #51 BULBS ONLY.
- 4- BEFORE REPLACING DIAL SCALE, REMOVE FELT STRIP 'D' FROM BOTTOM ESCUTCHEON 'E'. FLATTEN FELT AND LAY OVER GROOVE IN ESCUTCHEON 'E'.
- 5- REPLACE DIAL SCALE BY LAYING LOWER EDGE ON FELT IN BOTTOM ESCUTCHEON 'E' AND PRESSING DIAL SCALE DOWN UNTIL PILOT LIGHT HOUSINGS SNAP INTO PLACE.
- 6- REPLACE UPPER ESCUTCHEON 'B'. MAKE CERTAIN THE TWO FELT STRIPS 'F' ARE PROPERLY PLACED BEFORE FASTENING ESCUTCHEON.

FIGURE 11. DIAL LIGHT REPLACEMENT DETAIL (95F33 ONLY)

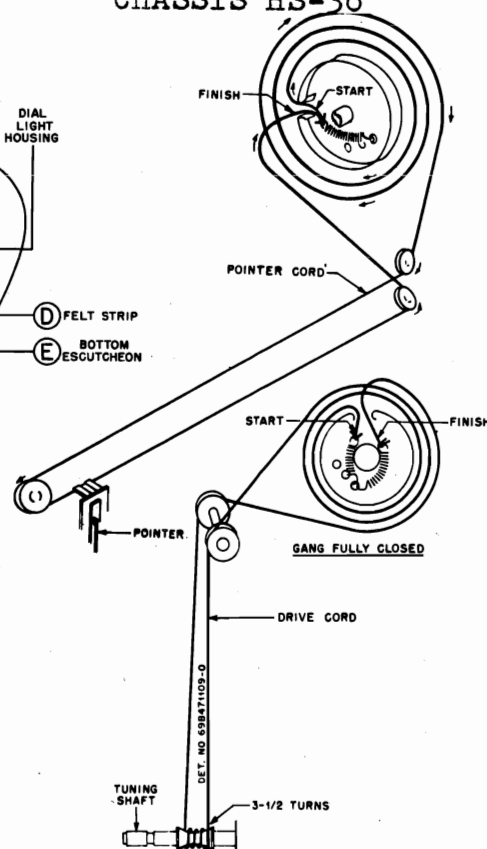


FIGURE 10. POINTER AND DRIVE CORD DETAIL

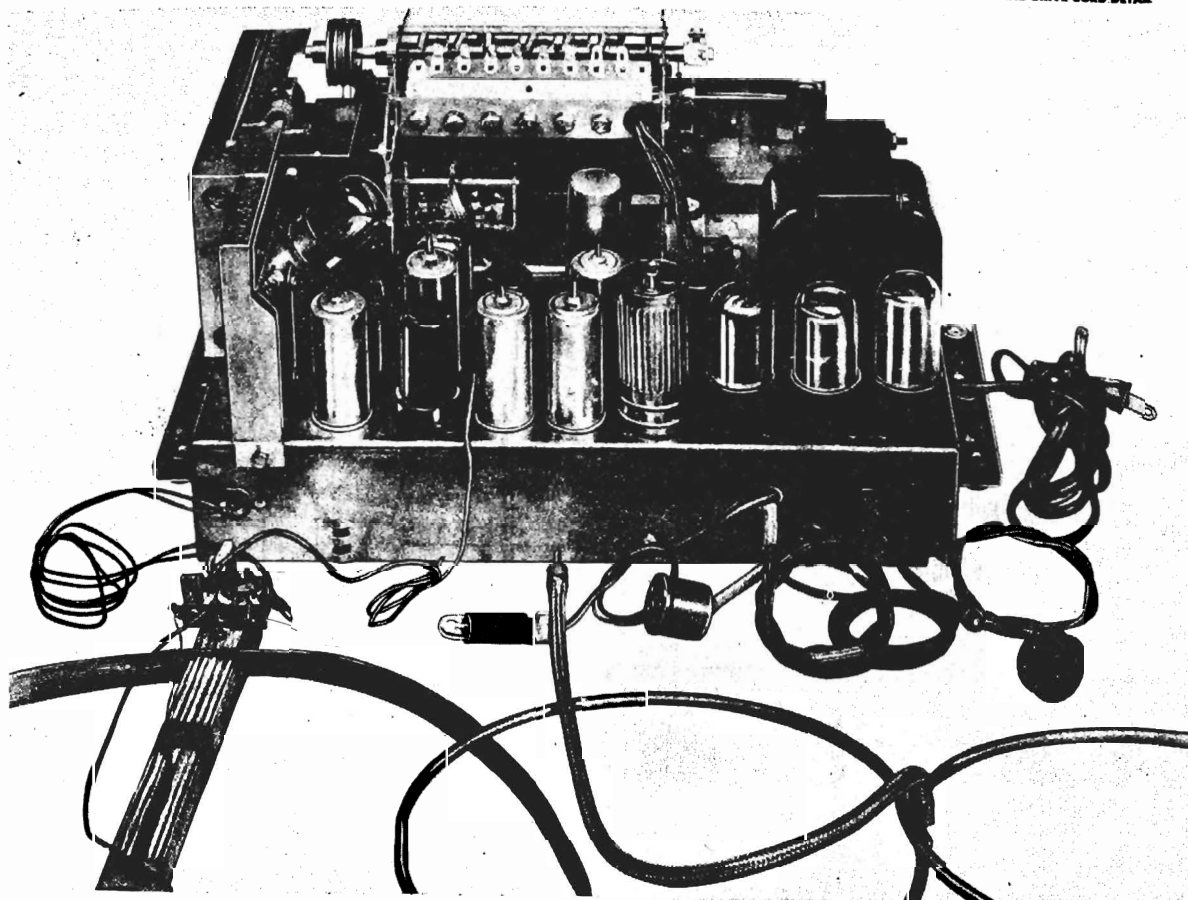


FIGURE 12. TOP VIEW OF CHASSIS

MODELS 95F31, 95F33,
CHASSIS HS-38; 95F31B,
95F31M, CHASSIS HS-39

MOTOROLA INC.

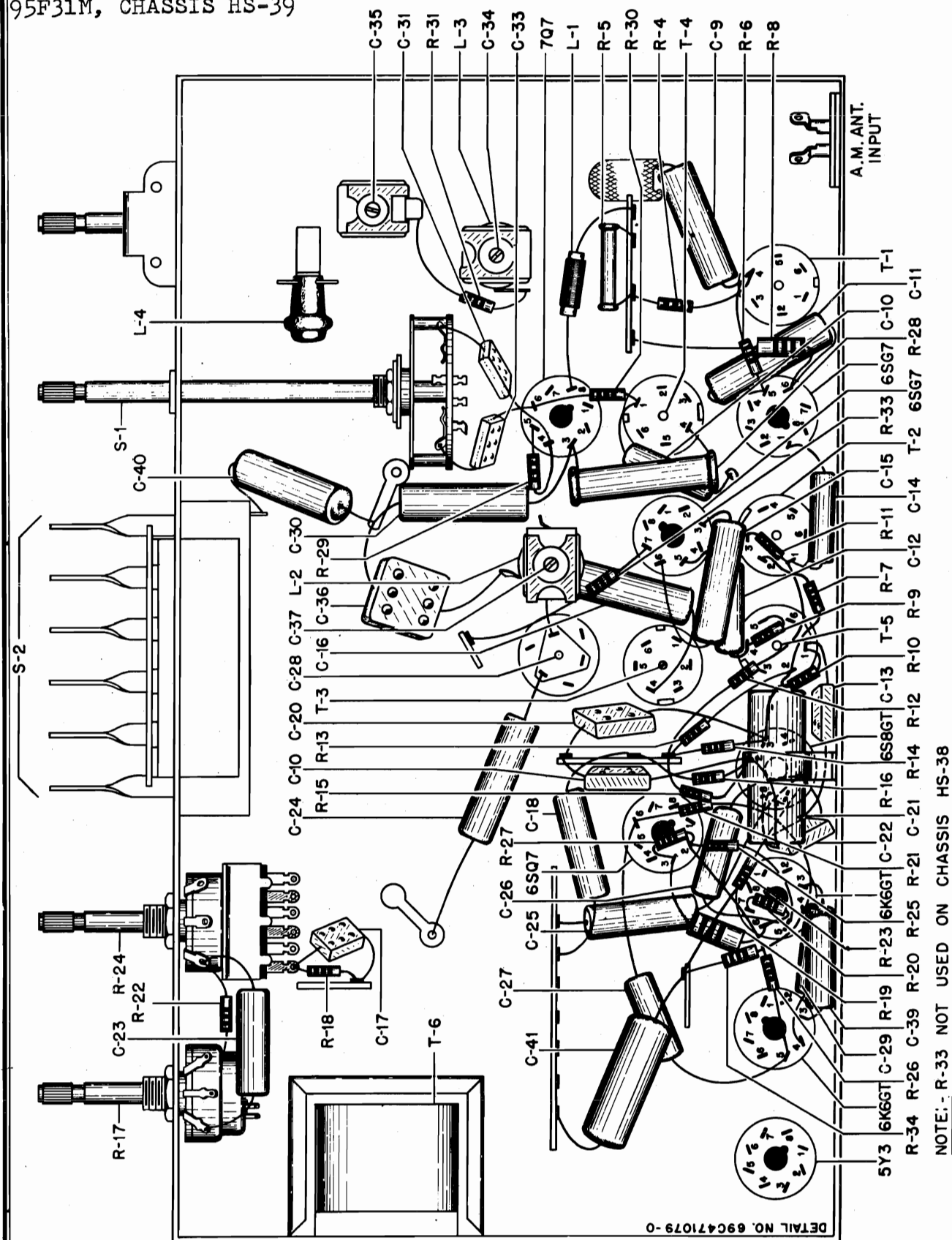


FIGURE 13. BOTTOM VIEW OF CHASSIS

MOTOROLA INC.

MODELS 95F31, 95F33,
CHASSIS HS-38; 95F31B,
95F31M, CHASSIS HS-39

CAPACITORS:

C-1	21A75479	Special: 1.3 mmf	C-41	8S9813	Paper: .005 mf 600V
C-2	21A112247	Silver mica: 250 mmf	C-42	8S9806	Paper: .1 mf 200V
C-3	20K74940	Variable ceramic: 7-45 mmf	RESISTORS:		
C-4	20A74939	Variable ceramic: 5-25 mmf	R-1	6R2109	10 meg 1/2W
C-5	21R2729	Mica: 250 mmf 500V	R-2		
C-6	21A76320	Ceramic: 16 mmf	R-3	6R6013	1.5 meg 1/2W
C-7	20K74940	Variable ceramic: 7-45 mmf	R-4	6R6477	15,000 10% 1/2W
C-8	21R2730	Mica: 500 mmf 500V	R-5	6R6313	22,000 10% 1W not Ins.
C-9	8S9801	Paper: .05 mf 100V	R-6	6R6410	33,000 10% 1/2W
C-10	8S9809	Paper: .01 mf 400V	R-7	6R6433	2.2 meg 10% 1/2W
C-11	8S9816	Paper: .05 mf 400V	R-8	6R5588	39,000 10% 1W
C-12	8S9809	Paper: .01 mf 400V	R-9	6R6301	1000 1/2W
C-13	21R6648	Mica: 250 mmf 500V	R-10	6R6056	47,000 1/2W
C-14	8S9801	Paper: .01 mf 100V	R-11	6R6398	150,000 10% 1/2W
C-15	8S9816	Paper: .05 mf 400V	R-12	6R6397	22,000 10% 1/2W
C-16	8S9816	Paper: .05 mf 400V	R-13	6R6004	1 meg 1/2W
C-17	21R6641	Mica: 100 mmf 500V	R-14	6R6397	22,000 10% 1/2W
C-18	8S9813	Paper: .005 mf 600V	R-15	6R6320	10,000 10% 1/2W
C-19	21R6661	Mica: .004 mf 10% 300V	R-16	6R6448	4.7 meg 10% 1/2W
C-20	21R6661	Mica: .004 mf 10% 300V	R-17	18K74891	Volume control & switch: 1 meg;
C-21	23K77635	Electrolytic: 10 mf 100V			tapped at 300K
C-22	21R6648	Mica: 250 mmf 500V	R-18	6R6046	1 meg 10% 1/2W
C-23	8S9813	Paper: .005 mf 600V	R-19	6R3968	180 10% 2W
C-24	8S9816	Paper: .05 mf 400V	R-20	6R5621	10 10% 1/2W
C-25	8S9813	Paper: .005 mf 600V	R-21	6R6015	220,000 1/2W
C-26	8S9809	Paper: .01 mf 400V	R-22	6R6410	33,000 10% 1/2W
C-27	8S9809	Paper: .01 mf 400V	R-23	6R6000	88,000 1/2W
C-28	23A27718	Electrolytic: 30-30-20 mf/350-300-25V	R-24	18A28062	Tone Control & Phono-Radio Switch;
C-29	8S9813	Paper: .005 mf 600V	R-25	6R6032	470,000 1/2W
C-30	8S9816	Paper: .05 mf 400V	R-26	6R6032	47,000 1/2W
C-31	21R6642	Mica: 50 mmf 500V	R-27	6R6075	100,000 1/2W
C-32	19B72580	Variable: 2 gang	R-28	6R3967	12,000 10% 3W Not Ins.
C-33	21R6642	Mica: 50 mmf 500V	R-29	6R6028	22,000 1/2W
C-34	20A71141	Mica Trimmer: 10-80 mmf	R-30	6R6032	470,000 1/2W
C-35	20A75234	Mica Trimmer: 10-80 mmf: with mounting bracket	R-31		220 1/2W
C-36	21R2724	Mica: 1000 mmf 5% 300V	R-32	6R6013	15,000 1W Not Ins.
C-37	20A71141	Mica trimmer: 10-80 mmf	R-33	17K77634	Wire wound: 2.7 1/2W
C-38	20A71226	Mica trimmer: 2-12 mmf: with mounting bracket	R-34	6R6075	100,000-1/2W
C-39	8S9813	Paper: .005 mf 600V	SWITCHES:		
C-40	8S9806	Paper: .1 mf 200V	S-1	40B74864	Switch, band: 3 position
			S-2	1X75820	Switch, push button: 6 button; with muting switch

MODELS 95F31, 95F33,
CHASSIS HS-38; 95F31B,
95F31M, CHASSIS HS-39

MOTOROLA INC.

COILS:		Dial Plate, Brackets & Pulleys Assembly:	
L-1	24A74989	Filament choke	complete dial assembly, but less
L-2	24A74822	S. W. Antenna	pointer, glass dial scale and dial
L-3	24A74820	S. W. oscillator	scale rubber channel strips (HS-39 chassis)
L-4	24A74831	B. C. oscillator	
L-5	1X76328	Loop Assembly, FM Band: with leads	Lead Assembly, phono pick up: with
L-6	14A75142	Insulator, FM loop mtg: bakelite	1 pin plug: 42" long
	24C75532	Loop Assembly, BC band: complete with leads and trimmer (95F33)	Lead Assembly, speaker: includes receptacle
	24K76103	Same as above except for (95F31, 95F31B & 95F31M)	Lock, line cord: fibre
	29K19871	Plug, 4 pin (loop plug)	Plate, electrolytic capacitor mtg: bakelite
TRANSFORMERS:			
T-1	24B75481	1st I.F.: 4.3 Mc; complete with iron cores and padding, capacitors, but less shield	Plug, 1 pin (phono pick-up)
T-2	24B75473	2nd I.F.: 4.3 Mc; complete with iron cores and padding capacitors but less shield	Pointer, dial (HS-38)
T-3	24B75456	Discriminator: 4.3 Mc; complete with iron cores and padding capacitors but less shield	Pointer, dial (HS-39)
T-4	26B70107	Shield, coil (for T-1, T-2, & T-3)	Pulley Assembly: two 1-5/16" pulleys on brass bushing (tuner shaft)
T-5	24B70537	I.F.: 455 Kc; complete with iron cores and padding capacitors but less shield	Pulley, cord: 1/4 groove (cord guide)
	1A71049	Diode: 455 Kc; complete with iron cores and padding capacitors but less shield	Pulley, cord: 1/2 groove (cord guide)
T-6	25K74706	Shield & Iron Core Sleeve Assembly (for T-4 & T-5)	Pulley, cord: 3/8 groove (cord guide)
T-7	25C75489	Output	Receptacle, 3 prong (on phono power cord)
SPEAKER:		Power	Receptacle, 4 prong (loop receptacle)
	50B72379	Electrodynamic: 10"; 800 ohm field; 3.2 ohms V.C.	Scale, dial: glass (HS-39 chassis)
CHASSIS PARTS (HS-38 & HS-39)			Shaft Assembly, tuning
	7A14684	Bracket, tuning shaft	Shield, tube
	65X11854	Bulb: 6-8V, bayonet base; tubular; #47	Socket, pilot light (HS-38 chassis)
	65X4151	Bulb: 6-8V, bayonet base; round; #51	Socket, pilot light (HS-39 chassis)
	1M8944	Cord, dial: 18 lb; black	Socket, pilot light: with clip & leads (HS-39-on cabinet)
	30K21859	Cord, line: 9 ft. long; with plug	Socket, tube: molded octal; plain type
	1X76406	Dial Assembly: includes pointer rail with slider, 2 mtg. brackets, 5 cord pullies and 2 pilot light sockets	Socket, tube: molded octal; shielded type
(HS-38 chassis)			Socket, tube: molded loctal
			Spring, tension coil (string drive)
			Strip, channel: rubber; 1" long
			Strip, shaft bearing: fibre (for band sw.)
			Strip, terminal: 1 insulated lug, #2 mtg.
			Strip, terminal: 1 large insulated lug, #2 mtg.

MOTOROLA INC.

MODELS 95F31, 95F33,
CHASSIS HS-38; 95F31B,
95F31M, CHASSIS HS-39

31A14655	Strip, terminal: 3 insulated lugs, #3 mtg.	5K74560	Rivet, shoulder: 5/16 long (cord pulley mtg.)
31A75232	Strip, terminal: 4 insulated lugs, #3 mtg.	5A71246	Rivet, shoulder; 3/16 long (cord pulley mtg.)
31A75233	Strip, terminal: 7 insulated lugs, #1 & 9 mtg.	3S7506	Screw: #6 x 1/4 PKZ plain hex head sheet metal screw; cadmium plated (coil mtg.)
39A24524	Wiper, tube base grounding	3S7454	Screw: #8 x 1/4 PKZ plain hex head sheet metal screw; cadmium plated (general mtg.)
MISC. CHASSIS HARDWARE:			
42A5480	Clip, grid: small	3S7467	Screw: #8 x 3/8 PKZ plain hex head sheet metal screw (trans. mtg.)
4S7655	Lockwasher: 3/8 internal; cadmium plated (band switch mounting)	3S7481	Screw: #8 x 3/4 PKZ slotted hex head sheet metal screw; cadmium plated (tuner mtg.)
2S7018	Nut: 3/8-32 x 1/2 hex; cadmium plated (band switch mtg.)		
2S7051	Nut: 3/8-32 x 9/16; hex palnut; cadmium plated (volume & tone control mtg.)		
5A12814	Rivet, shoulder: 5/32 long. (cord pulley mtg.)		

BLOCK DIAGRAMS OF RECEIVER FUNCTIONS

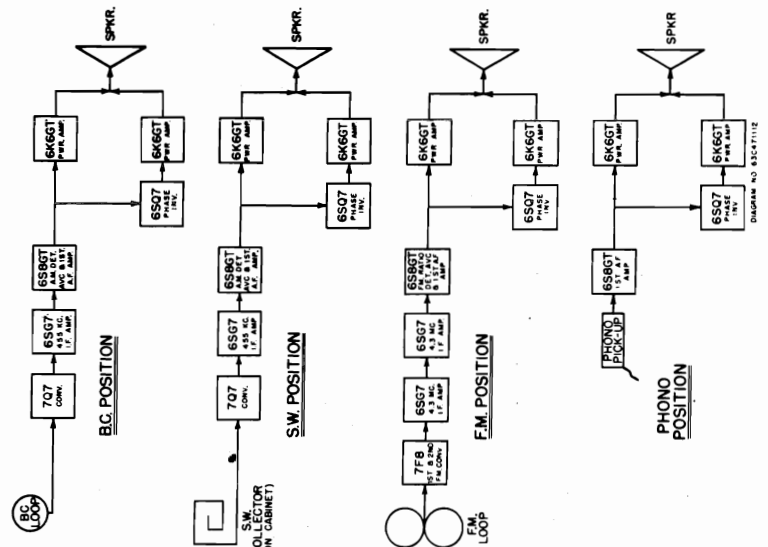


FIGURE 15. BLOCK DIAGRAMS

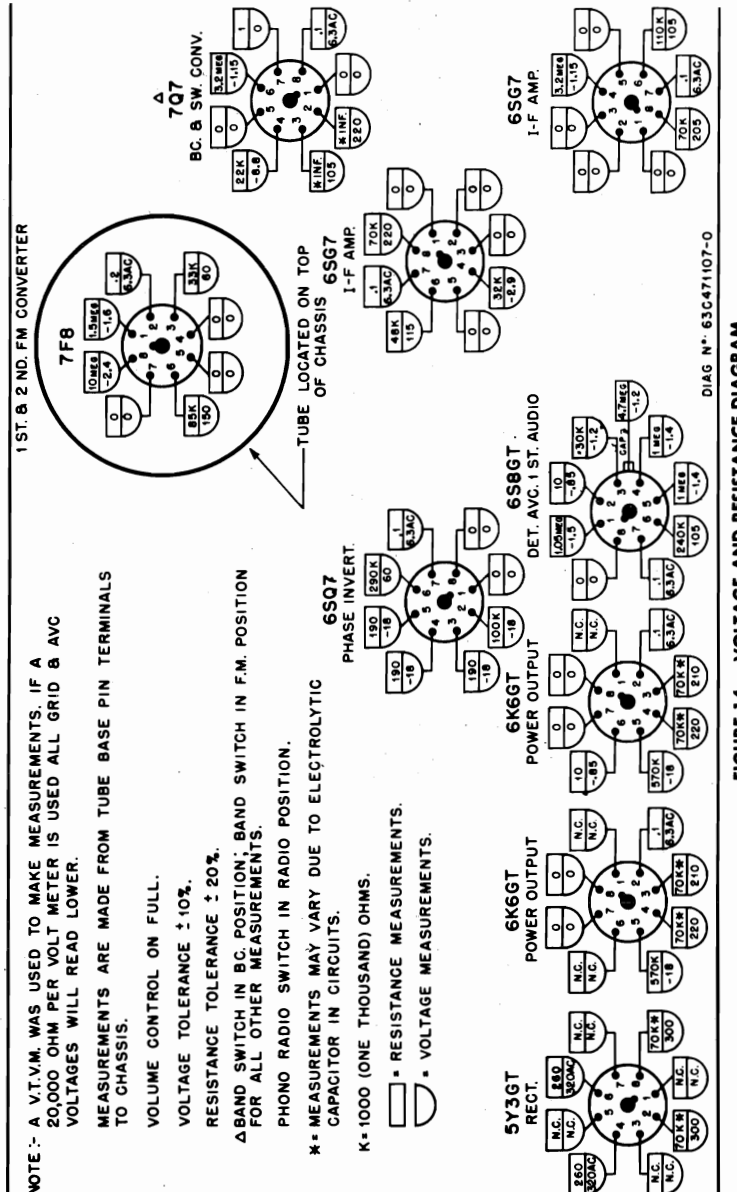


FIGURE 14. VOLTAGE AND RESISTANCE DIAGRAM

NOTE: - A V.I.V.M. WAS USED TO MAKE MEASUREMENTS. IF A
20,000 OHM PER VOLT METER IS USED ALL GRID & AVC
VOLTAGES WILL READ LOWER.

MEASUREMENTS ARE MADE FROM TUBE BASE PIN TERMINALS
TO CHASSIS.

VOLUME CONTROL ON FULL.

VOLTAGE TOLERANCE $\pm 10\%$.

RESISTANCE TOLERANCE $\pm 20\%$.

Δ BAND SWITCH IN BC POSITION; BAND SWITCH IN FM POSITION
FOR ALL OTHER MEASUREMENTS.

PHONO RADIO SWITCH IN RADIO POSITION.

* - MEASUREMENTS MAY VARY DUE TO ELECTROLYTIC
CAPACITOR IN CIRCUITS.

K = 1000 (ONE THOUSAND) OHMS.

□ - RESISTANCE MEASUREMENTS.
○ - VOLTAGE MEASUREMENTS.

MODELS 95F31, 95F33,
CHASSIS HS-38; 95F31B,
95F31M, CHASSIS HS-39

MOTOROLA INC.

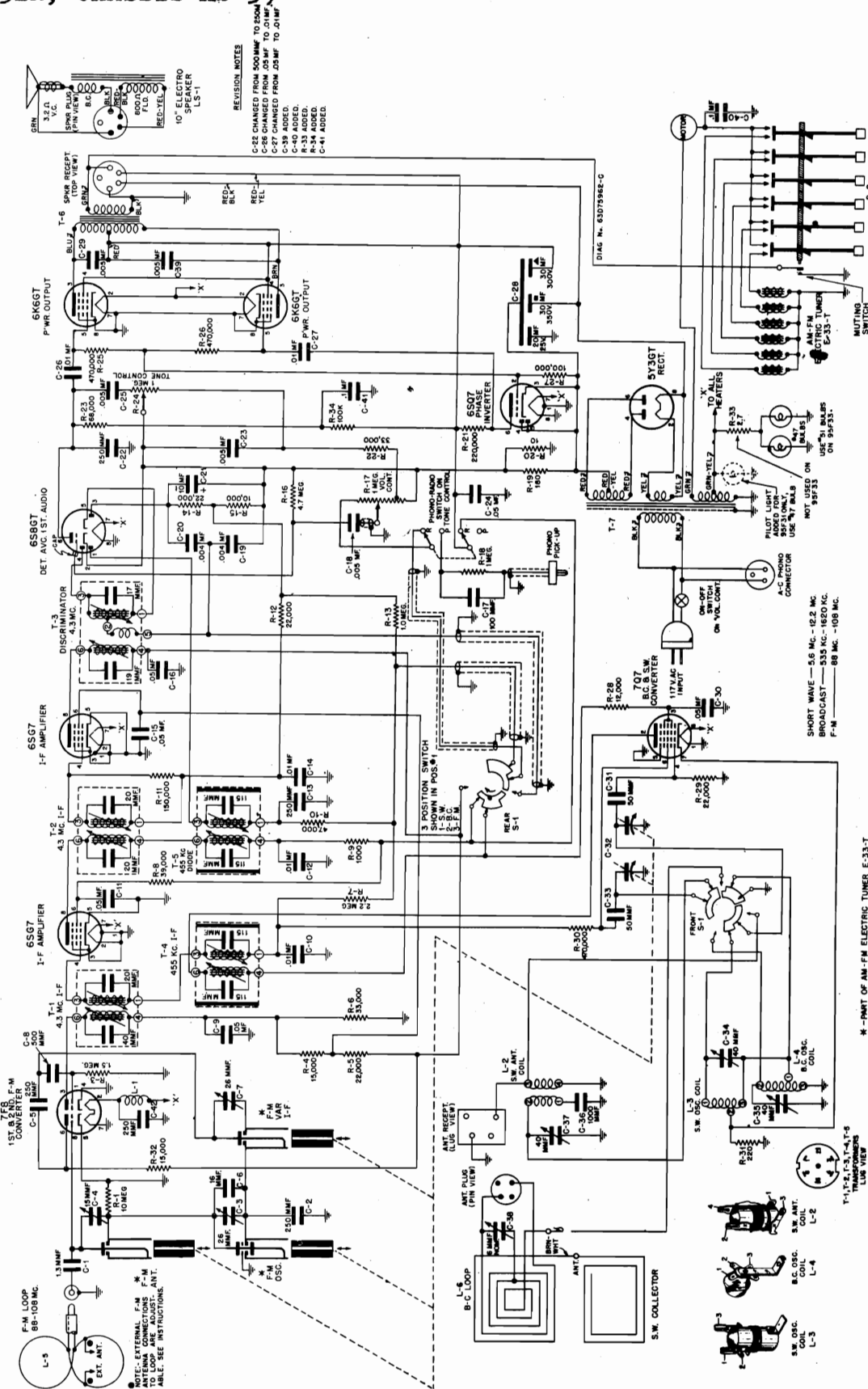


FIGURE 16. COMPLETE SCHEMATIC DIAGRAM

CLARI-SKEMATIX

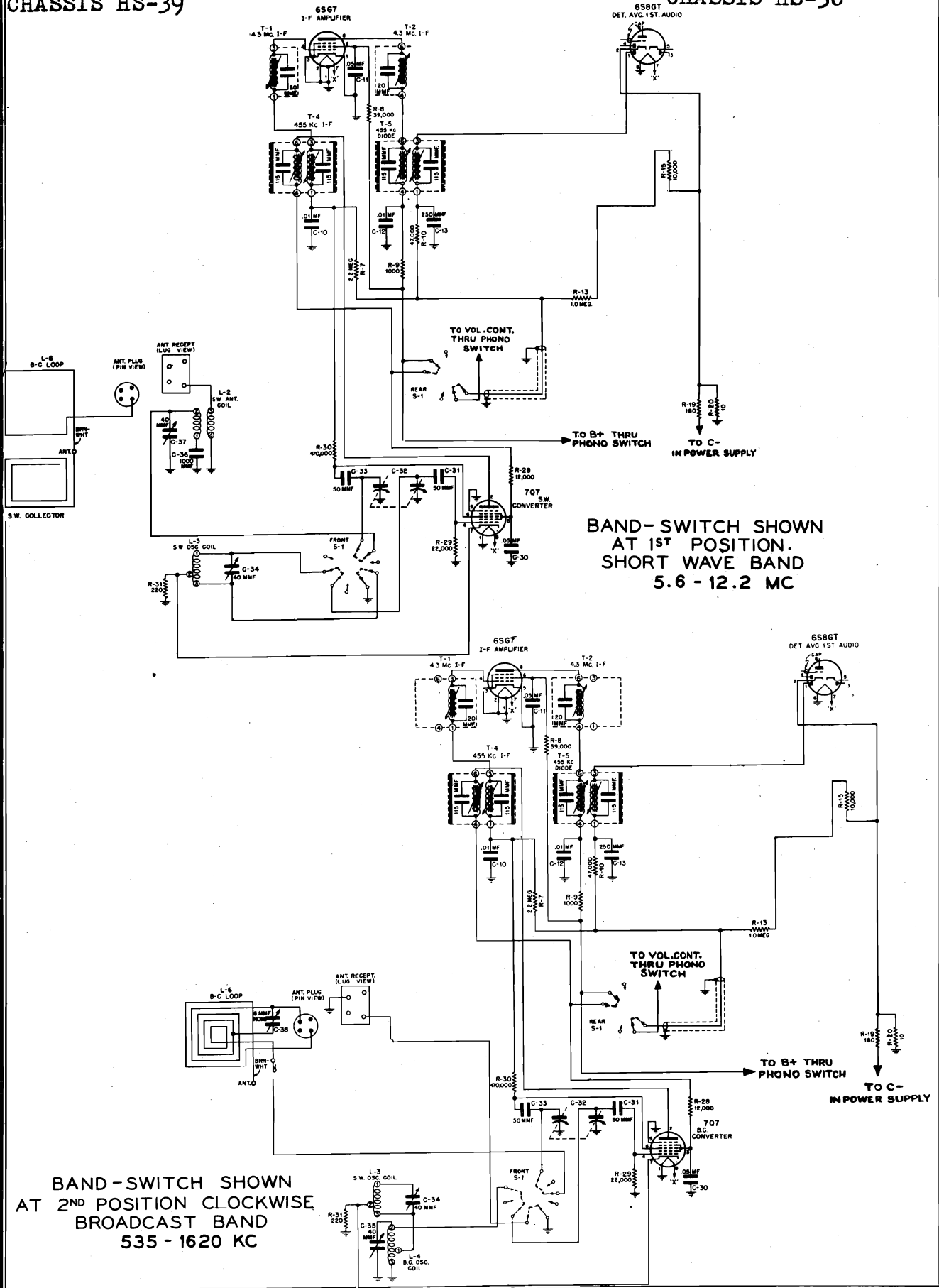
Registered Trademark

MOTOROLA PAGE 19-103

MODELS 95F31B, 95F31M,
CHASSIS HS-39

MOTOROLA INC.

MODELS 95F31, 95F33,
CHASSIS HS-38



CLARI-SKEMATIX

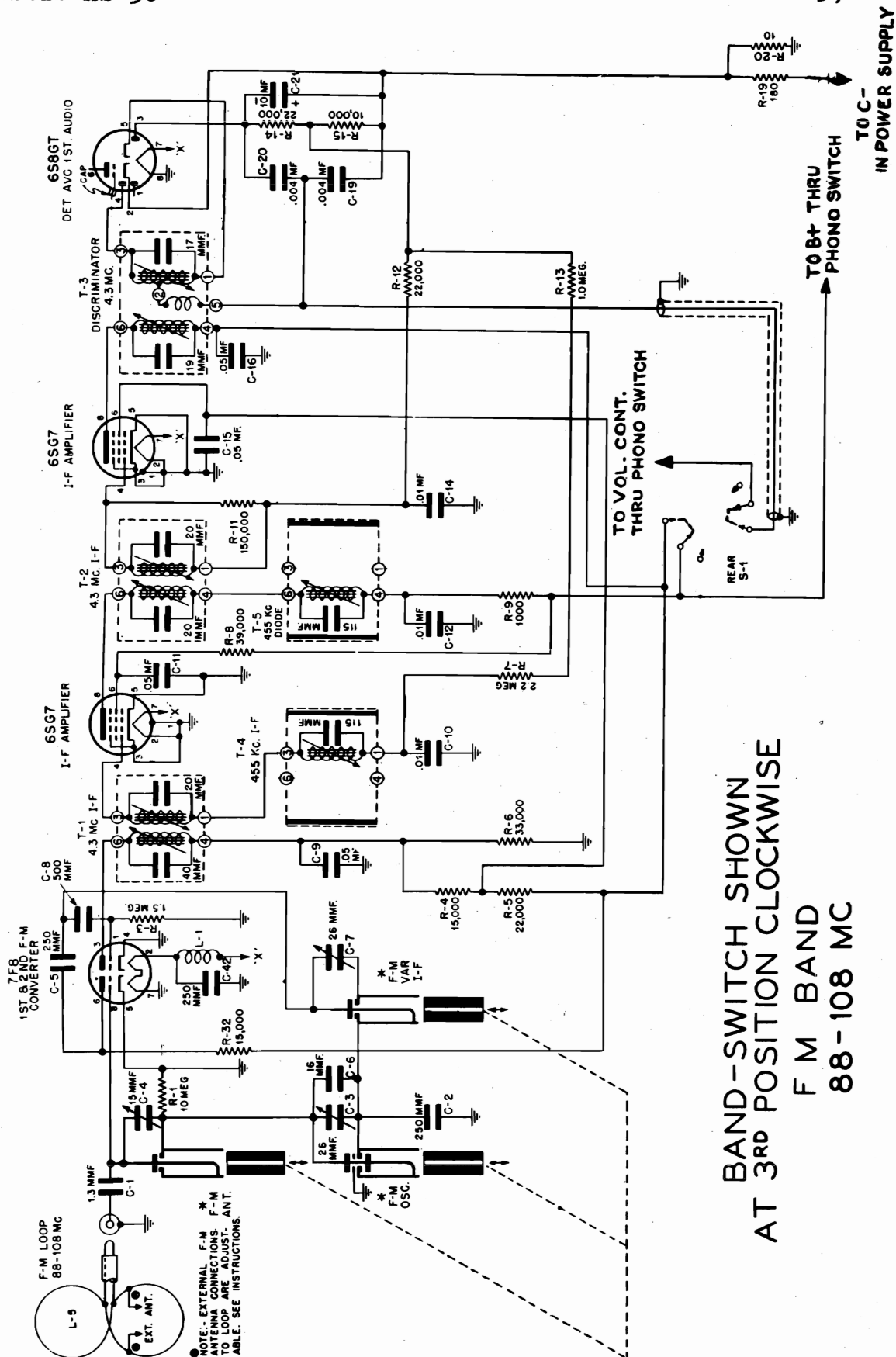
Registered Trademark

PAGE 19-104 MOTOROLA

MODELS 95F31, 95F33,
CHASSIS HS-38

MOTOROLA INC.

MODELS 95F31B, 95F31M,
CHASSIS HS-39



BAND-SWITCH SHOWN
AT 3RD POSITION CLOCKWISE
F M BAND
88-108 MC

MODELS 95F31, 95F31B,
95F31M, 95F33

MOTOROLA INC.

E-33-T

MODEL E-33-T AM-FM TUNER

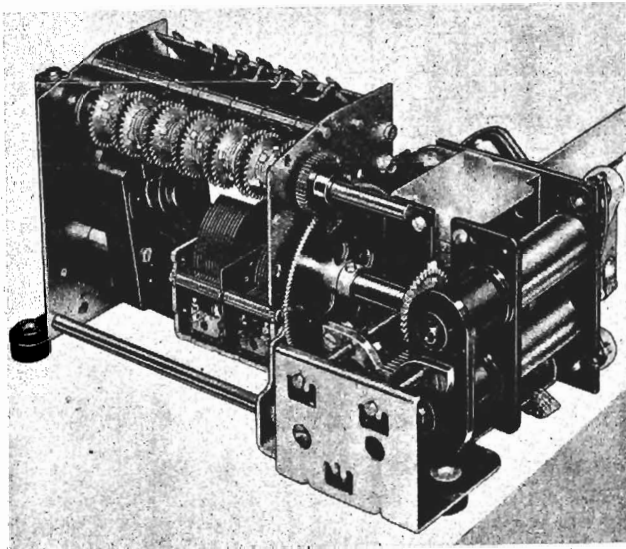


FIGURE 17. MODEL E-33-T FM-AM TUNER

Figure 17 shows the complete AM-FM Tuner E-33-T.

THEORY OF THE FM TUNER

Referring to the functional schematic diagram in Fig. 18, the triode T1 serves both as an oscillator and first converter, and triode T2 serves as the second converter. Oscillator voltage injection through the coupling capacitor from the plate of T1. T1 and T2 are sections of the 7F8 twin-triode tube.

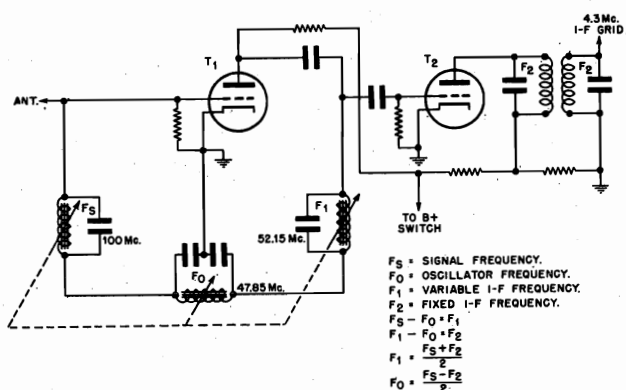


FIGURE 18. FUNCTIONAL SCHEMATIC DIAGRAM OF FM TUNER

The frequency relationships are given in Fig. 18. The oscillator F_o beats with the incoming signal F_s to produce the first intermediate frequency F_1 , which is variable. F_1 then beats with the same oscillator frequency F_o in the second converter to produce the second intermediate frequency F_2 which is 4.3 mc. With a 100 mc signal the oscillator frequency is 47.85 mc and the variable intermediate frequency is 52.15 mc.

This system of reception permits the oscillator to be resonated with a high capacitance, 250 micromicrofarads in this case. Consequently, changes in the tube characteristics during warm-up do not produce objectionable changes in oscillator frequency. This contributes materially to the stability of the system.

The actual FM tuner schematic is shown in Figure 19.

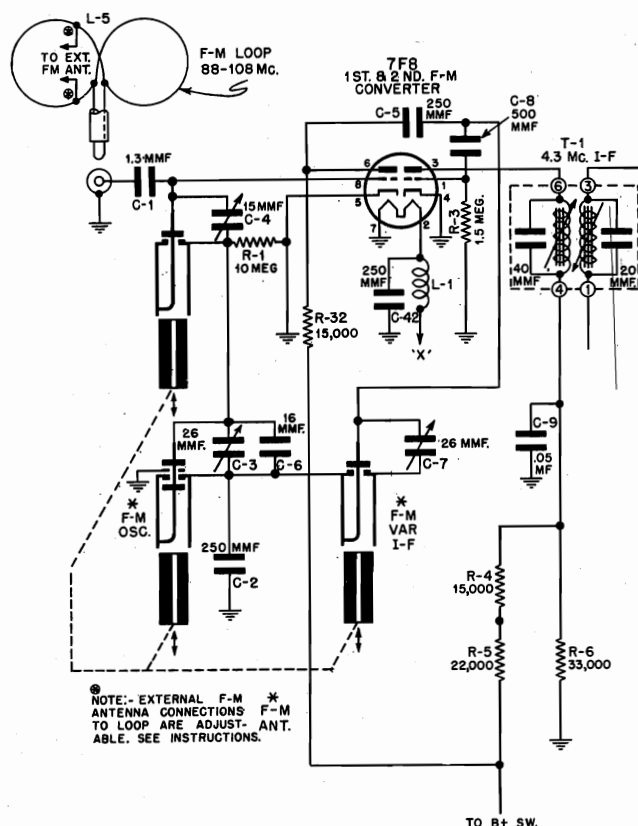


FIGURE 19. SCHEMATIC DIAGRAM OF COMPLETE FM TUNER

E-33-T

MOTOROLA INC.

MODELS 95F31, 95F33,
CHASSIS HS 38; 95F31B,
95F31M, CHASSIS HS-39

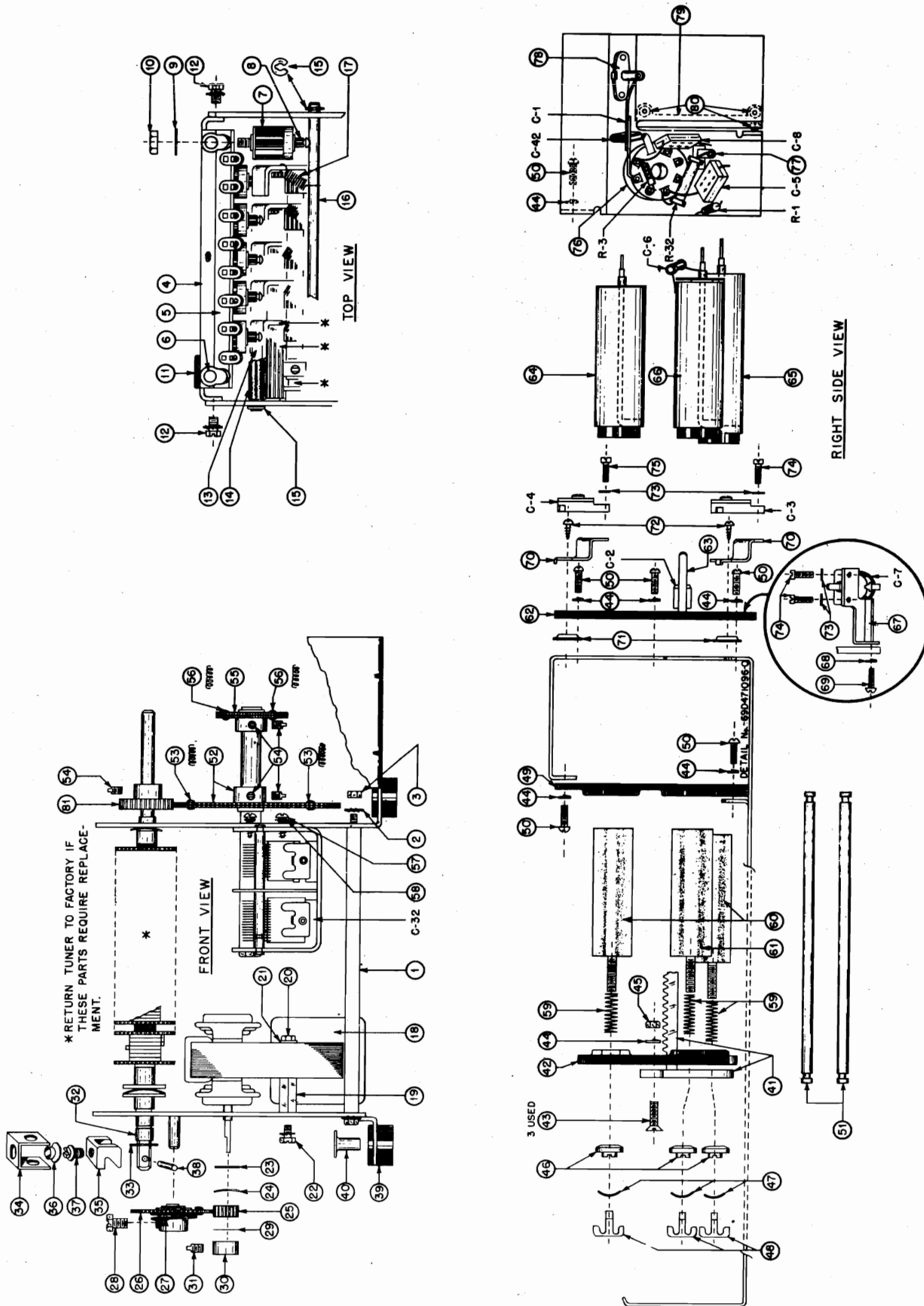


FIGURE 20. MODEL E-33-T FM-AM TUNER PARTS LOCATION

MODELS 95F31, 95F31B,
95F31M, 95F33

MOTOROLA INC.

E-33-T

REF.

NO. PART NO.

DESCRIPTION

CAPACITORS:

C-1 21A75479 Special: 1.3 mmf.
C-2 21A112247 Silver mica: 250 mmf.
C-3 20K74940 Variable ceramic: 7-45 mmf.
C-4 20A74939 Variable ceramic: 5-25 mmf.
C-5 21R2729 Mica: 250 mmf 500V
C-6 21A76320 Ceramic: 16 mmf.
C-7 20K74940 Variable ceramic: 7-45 mmf.
C-8 21R2730 Mica: 500 mmf 500V
C-32 19B72560 Variable; 2 gang
C-42 21A112247 Silver mica: 250 mmf.

RESISTORS:

R-1 6R2109 10 meg 1/2w Ins.
R-3 6R3966 1.5 meg 1/2w Ins.
R-32 6R6013 15,000 1w N.I.

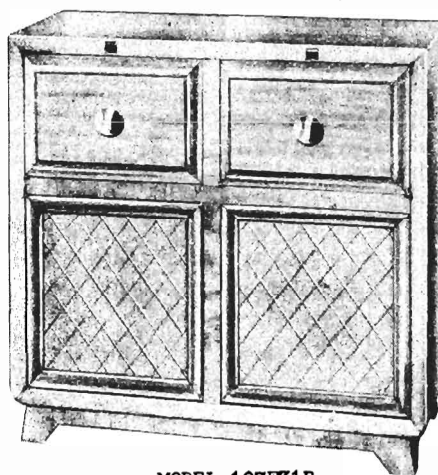
1	45A21419	Rod, tie: threaded	34	42A10982	Yoke, retainer
2	4S7651	Lockwasher: #8 internal	35	42A10981	Yoke, cam
3	2S7007	Nut: 8-32 x 1/4 hex.	36	5S7818	Eyelet: .135 x .268
4	1X76383	Magnet Assembly: 6 electromagnets mounted on channel; with terminal	37	3A10990	Screw, yoke lock
5	31A74480	Strip, terminal: 8 insulated lugs, #1 & 10 mtg.	38	47A11004	Pin, drive shaft
6	5S7707	Rivet: .122 x 5/32 steel	39	37K15125	Grommet, tuner mounting
7	1K75593	Magnet Assembly: single electromagnet	40	5A12105	Eyelet, mounting
8	37A22059	Bumper, armature: rubber	41	44B72706	Rack, drive gear: die cast
9	4S7562	Washer: 7/16 x .187 x .033 thick	42	64B72707	Plate, core mounting: bakelite
10	2S7009	Nut: 10-32 x 3/8 hex.	43	3S7184	Screw: 6-32 x 1/2 slotted flat head machine screw
11	37A22664	Grommet: for 7/16" hole	44	4S2619	Lockwasher: #6 split
12	3S7205	Lockscrew: 8-32 x 1/4 slotted hex head	45	2S7005	Nut: 6-32 x 1/4 hex
13	46K75519	Rod, stop	46	2A72728	Nut, swivel
14	11M9504	Sleeving: #4 black	47	4A74936	Washer, spring
15	4A21577	Washer, "C" spring	48	42A72725	Clip, swivel nut
16	46A21765	Rod, stop: grooved	49	64B72704	Plate, front mounting: bakelite
17	41A22507	Spring, armature	50	3S7185	Screw: 6-32 x 3/8 slotted round head machine screw
18	59B75421	Motor, tuner	51	47B72712	Rod, guide
19	2K75462	Nut: hex; .594 long; 6-32 thread (motor spacer)	52	1X76389	Split Gear & Bushing Assembly (large)
20	3S2927	Screws: 6-32 x 7/8 slotted hex head machine screw	53	41A4547	Spring, coil
21	4S7650	Lockwasher: #6 internal	54	3S7100	Set screw: 8-32 x 5/16 slabhead
22	3S7350	Lockscrew: 6-32 x 1/4 slotted hex head	55	1X76390	Split Gear & Bushing Assembly (small)
23	4A21409	Washer (clutch)	56	41A76498	Spring, coil
24	4A21408	Washer, spring (clutch)	57	3S7156	Screw: 6-32 x 3/16 slotted binder head machine screw
25	44A21417	Pinion, clutch	58	4S7666	Lockwasher: #6 external
26	1X21576	Gear & Hub Assembly	59	41A74880	Spring, core tension
27	41A22471	Spring, cushion	60	46A71749	Core, iron (ant. & Var.I.F.)
28	3S7163	Screw: 8-32 x 1/4 slotted hex head machine screw	61	46K76172	Core, iron (with paint dot) (osc.)
29	14A21424	Washer, fibre: 7/16 x .130 x .010 thick	62	1X76388	Rear Mounting Plate & Lug Assembly: bakelite plate with soldering lug
30	43A21407	Bushing, clutch retaining	63	29R3005	Lug, soldering
31	3S7114	Set screw: 8-32 x 3/8 slab head	64	24C75492	Inductor, VHF (Ant.): 2-1/2" long
32	43K21412	Bushing, spacer	65	24K75494	Inductor, VHF (I.F.): 2-3/4" long
33		Washer	66	24K75496	Inductor, VHF (Osc.): 2-5/8" long
			67	7A74712	Bracket, trimmer mounting
			68	4S8412	Lockwasher: #4 split
			69	3S1937	Screw: 4-40 x 5/16 slotted round head machine screw
			70	7A74711	Bracket, trimmer mounting
			71	2A74710	Nut, Tinnerman (#4 PKZ)
			72	3S3356	Screw: #4 x 5/16 PKZ slotted round head sheet metal screw
			73	4A74884	Washer, trimmer: fibre
			74	3S1525	Screw: 3-48 x 3/8 slotted fillister head machine screw
			75	3S2975	Screw: 3-48 x 5/16 slotted fillister head machine screw
			76	9K75544	Socket, tube: loctal
			77	31A81399	Strip, terminal: 1 insulated lug; #1 mtg.
			78	9A54664	Receptacle, ferrule: 1 prong
			79	15A74714	Cover, tuner (rear)
			80	3S8175	Screw: #4 x 3/16 PKZ slotted hex head sheet metal screw
			81	44A21873	Pinion: gang drive

MODELS 107F31,
107F31B, CHASSIS
HS-87

MOTOROLA INC.



MODEL 107F31



MODEL 107F31B

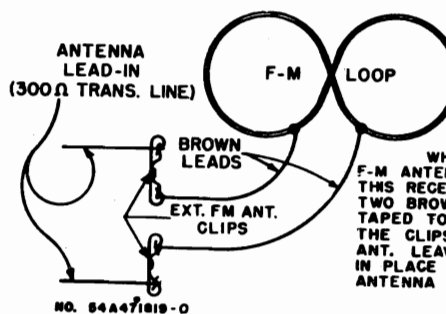
IF FREQUENCY - 4.3 Mc (FM)

455 Kc (BC & SW)

TUNING RANGE - BC - 535 to 1620 Kc

SW - 5.6 to 12.2 Mc

FM - 88 to 108 Mc



IMPORTANT

WHEN AN EXTERNAL F-M ANTENNA IS USED WITH THIS RECEIVER, CONNECT THE TWO BROWN LEADS WHICH ARE TAPED TO THE F-M LOOP, TO THE CLIPS MARKED EXT. F-M ANT. LEAVE THE LEADS TAPED IN PLACE IF NO EXTERNAL F-M ANTENNA IS REQUIRED.

FIGURE 1. FM LOOP ANTENNA

POWER SUPPLY - 117 Volts, 60 cycles, 130 watts (with record changer)

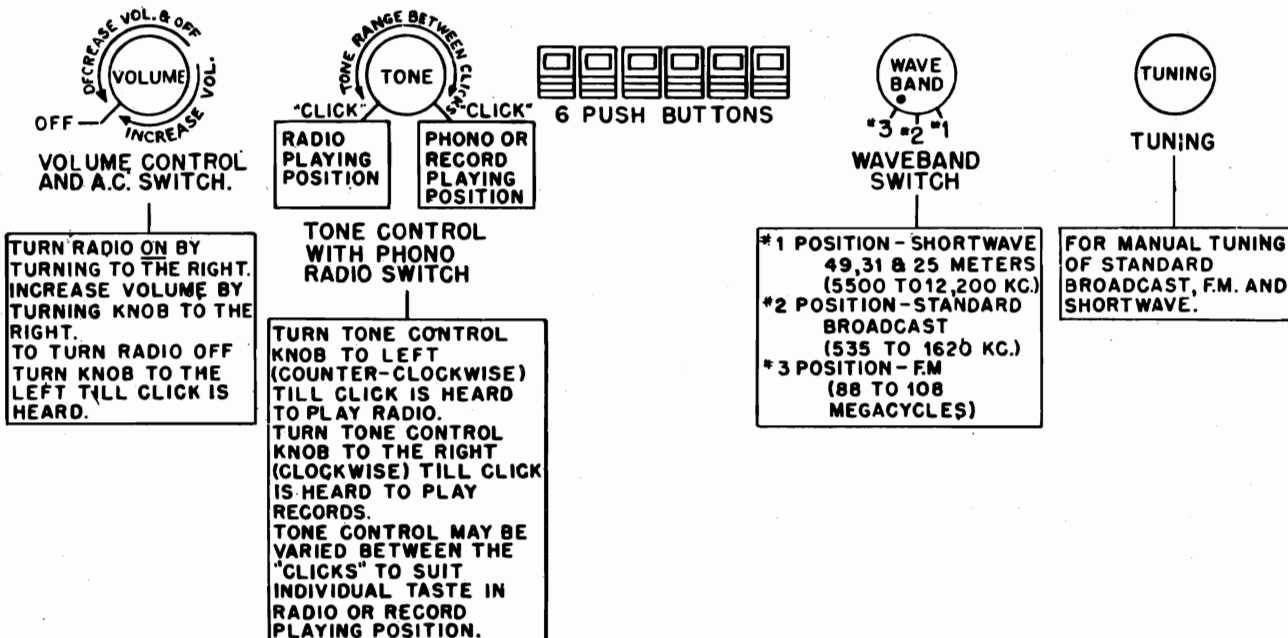


FIGURE 3. CONTROLS

MOTOROLA INC.

MODELS 107F31,
107F31B, CHASSIS
HS-87

INSTRUCTIONS FOR SETTING AUTOMATIC TUNER PUSH BUTTONS

1. Turn the radio ON and allow it to warm up for a period of at least fifteen minutes.
2. While waiting for the radio to warm up, loosen the tuner locking screw (A) all the way. The locking screw is accessible from the rear of the cabinet. (See Figure 12.)
3. Make a list of the frequencies of the local stations you wish to tune in automatically. It is recommended that you select the most powerful stations only.
4. Turn the band switch to FM or BC position, depending on the station being set up, and carefully tune in the first station.

NOTE: The buttons may be used on either BC, FM or any combination of AM and FM. BE SURE TO SET THE BAND SWITCH ON THE PROPER BAND!

5. Adjust a signal generator to zero beat with the station.

NOTE: While it is advisable to use a signal generator for accuracy, it is not an absolute necessity. The station signal may be used.

6. Tune to the desired station or to the signal generator, with the tuning knob.
7. Holding the tuning knob, push the selected button and HOLD IN UNTIL THE MOTOR STOPS.
8. Repeat Steps 6 and 7 for each of the buttons.
9. Carefully tighten the tuner locking screw (A).
10. Check the setting of the button by tuning in the station manually, then push the button set for that station; no effect on volume or tone should be noticed. If not correctly set, readjust--following Steps 4 through 9.

FM SERVICE NOTES

In some cases, people are not tuning FM sets properly. FM is more difficult to tune than AM, although Motorola receivers are easier than most. There are three peaks present; the center peak, which is the correct one, is hard to locate. The peaks on either side of the center are slightly distorted. If you get a distorted peak on only one side of the center, the discriminator is probably out of alignment.

Some people expect too much of FM. You cannot expect great distance. The horizon, as viewed from the transmitting antenna, is the normal service area. Many FM stations are now operating on low power, waiting for new equipment. Reception will improve greatly when power is increased. Most of the bad reports have come from the fringe areas. In many cases, reception can be improved by using a dipole antenna, mounted as high above the roof as possible, and aimed directly at the station.

Location of the radio is important when it is operated on its built-in loop antenna. Moving the set even a few feet away from its present location may increase or reduce signal strength by more than 50% because a stronger signal may exist at one location than another. Therefore, in homes where reception is poor, you may be able to improve it by placing the set against another wall. The Motorola figure 8 loop antenna is omnidirectional.

Motorola FM sets use a relatively new circuit known as the Ratio Detector, instead of the usual limiters. The following paragraph of explanation is quoted from the R.C.A. License Laboratory Bulletin:

"Since a circuit of this type is relatively immune to amplitude modulation, it is unnecessary to precede it by a limiter stage. Also, since its immunity is not a direct function of the signal strength, there is no threshold action of the type encountered where limiters are employed."

It has been thought, erroneously, that the use of limiters in an FM receiver is imperative for proper reception. This is not the case. In this connection, it is important to understand that a limiter requires several volts at its grid to become effective. If the received signal strength is too weak to provide the required voltage at the limiter grid, the limiters do not function. This means that below a certain threshold of signal level, the limiters do not work and, as a result, do not contribute to amplitude (noise) rejection. Furthermore, noise voltages are not purely amplitude modulated, but contain frequency modulated components against which no amplitude rejection device will discriminate.

From the above comparison, you can see that there is little, if any, difference between the two circuits, insofar as noise reception is concerned. In either case, low signal levels from the FM stations will result in noise reception, if there is any noise in the neighborhood.

The main advantages of ratio detection, as used in Motorola FM are, first, very little in-between station noise, and second, easier tuning because the side peaks are slightly subdued (as compared to the limiter type of receiver), making it easier to find the center peak.

MODELS 107F31,
107F31B, CHASSIS
HS-87

MOTOROLA INC.

ALIGNMENT

Maximum performance can only be obtained if extreme care is exercised during alignment.

Use an insulated screwdriver when adjusting the FM tuner trimmers.

A special wrench for adjusting the slotted nuts on the tuner cores will be required. You can easily fabricate one from a Motorola auto set Volume Control Shaft and Coupling Assembly (Part Number 1B70847, \$.30 list) by simply spreading out the forked ends and filing to fit. Solder the assembly together to make it rigid.

An AM (30% amplitude modulated) signal generator covering the frequencies shown in Alignment Chart I, is used to align the broadcast and short wave and FM bands. A low range output meter, connected across the speaker voice coil, is used as an output indicator.

The broadcast and short wave band alignment is conventional; instructions are given in the following alignment chart.

The FM band alignment can be satisfactorily performed by following the instructions in the chart. When properly aligned, the discriminator does not respond to amplitude modulation and since an AM type signal generator is used for aligning the FM circuits, it is necessary to detune the discriminator secondary and leave it that way until all of the FM circuits have been aligned. After completing the alignment of the FM circuits, proceed to align the discriminator secondary by applying a 4.3 Mc AM signal to the control grid of the 2nd FM converter tube and adjusting the discriminator secondary core for minimum audio output. No adjustment of the FM circuits should be attempted with AM after the discriminator secondary has been properly aligned.

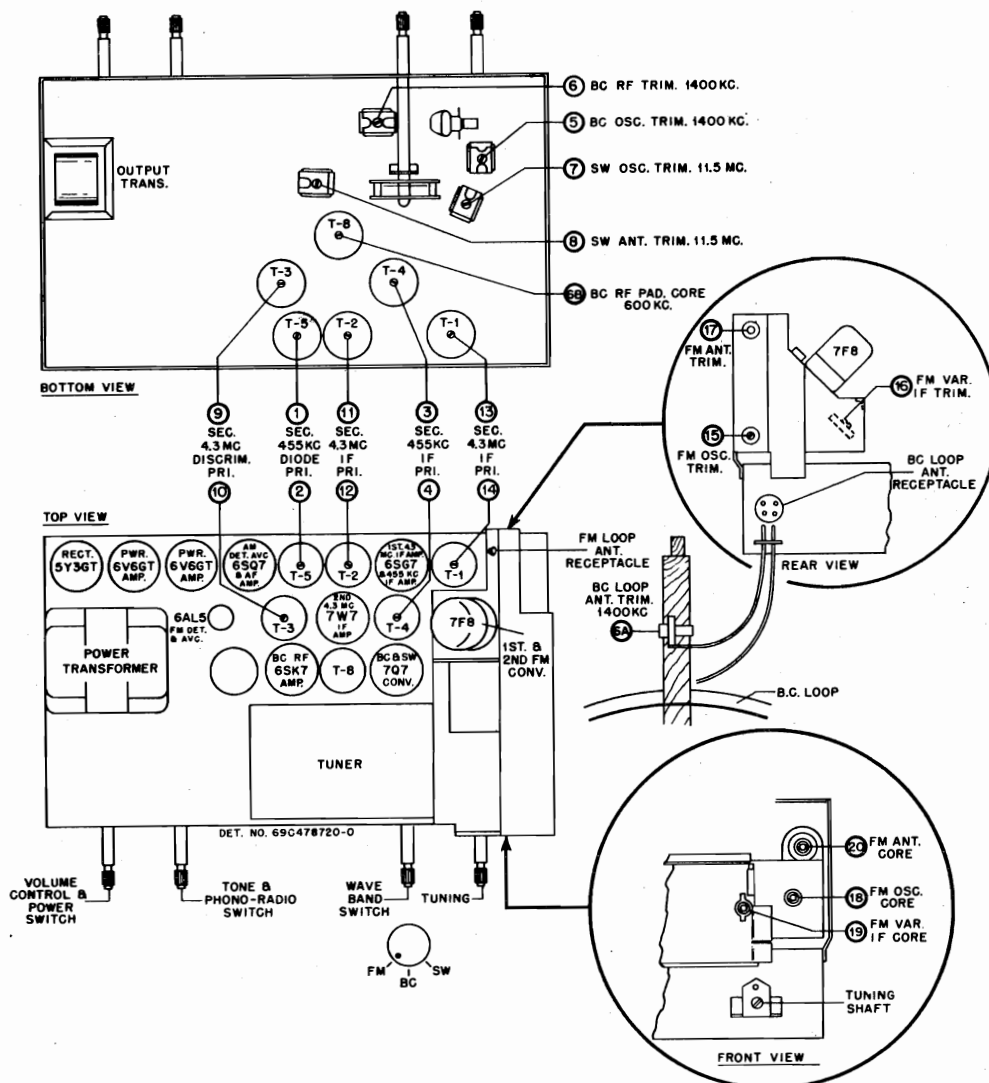


FIGURE 7. TUBE & TRIMMER LOCATIONS

MOTOROLA INC.

MODELS 107F31,
107F31B, CHASSIS
H8-87

**CHART 1. ALIGNMENT PROCEDURE WHEN USING AN MODULATED SIGNAL GENERATOR
AND STANDARD OUTPUT METER FOR COMPLETE ALIGNMENT**

Refer to Figure 7 for location of all adjustment trimmers and cores.

CHART 1. ALIGNMENT PROCEDURE WHEN USING AM MODULATED SIGNAL GENERATOR
AND STANDARD OUTPUT METER FOR COMPLETE ALIGNMENT

Refer to Figure 7 for location of all adjustment trimmers and cores.

STEP	DIAL SET TO	BAND SW. SET TO	DUPPLY	SIGNAL GENERATOR CONNECTED TO	SIGNAL GENERATOR SET AT	ADJUST TRIMMER OR CORE	REMARKS
455 KC IF CHANNEL ALIGNMENT							
1.	1620 Kc (gang fully opened)	BC	.1 mf	7Q7 BC & SW Conv. Grid (Pin #4) & Chassis	455 Kc	1,2,3 & 4	Adjust for maximum output.
BROADCAST BAND ALIGNMENT							
2.	1400 Kc	BC	.1 mf	7Q7 BC & SW Conv. Grid (Pin #4) & Chassis	1400 Kc	5 (BC Osc. Trims)	This sets oscillator to dial. 9. With gang fully washed, pointer should be at last mark on dial; then set to 1400 Kc and set oscillator.
3.	1400 Kc	BC	None	Radiation Loop *	1400 Kc	6 & 6A (BC RF & Loop Antenna Trimmers)	Adjust for maximum output.
3A	NOTE: The inductance of the BC RF transformer (T-8) is set at time of manufacture by adjusting iron core (6B). No resetting of this core should be made unless it has been tampered with. If so, readjustment can be made as follows: Tune in 600 Kc signal and peak RF pad core (6B). Next tune in 1400 Kc signal and peak trimmer (6). Repeat both adjustments until maximum response is obtained at both ends; the last adjustment should be trimmer (6).						
SW. BAND ALIGNMENT							
4.	11.5 Mc	SW	.1 mf	7Q7 BC & SW Conv. Grid (Pin #4) & Chassis	11.5 Mc	7 (SW Osc. Trims)	This sets osc. to dial. Make sure osc. is higher in frequency than the signal by checking image response which should occur with the input signal at 12.41 Mc.
5.	11.5 Mc	SW	50 mmf	SW Ant. Terminal and Chassis	11.5 Mc	8 (SW Ant. Coil Trims)	BC loop plug should be disconnected. Adj. for maximum output.
4.3 MC IF CHANNEL ALIGNMENT							
6.						9 (Disc. Sec.)	Detune discriminator secondary by screwing core out as far as it will go.
7.	Extreme high freq. end.	FM	.001 mf	7F8 2nd FM Converter Grid (Pin #1) & Chassis	4.3 Mc	10, 11, 12, 13 & 14 (4.3 Mc IF)	Adjust for maximum output.
FM BAND ALIGNMENT							
8.						18 (FM Osc. Core)	Check the position of the FM Osc. tuning core 18. Set spacing between the core and bakelite piece to which it is mounted, to 1/32" by turning tuning core slotted nut.
		FM	None	FM loop antenna receptacle and chassis; remove FM loop.	90 Mc	15, 16 & 17 (FM Osc., Ant. & Variable IF Trims)	Adjust for maximum output.
10.	106 Mc	FM	None	FM loop antenna receptacle and chassis; remove FM loop	106 Mc	18, 19 & 20 (FM Osc., Ant. & Variable IF cores)	Adjust for maximum output
11.							Repeat steps 9 and 10 several times until further adjustment does not increase the output. Make the final trimmer adjustment at 106 Mc (i.e., trimmers 15, 16 and 17 at 106 Mc.)
12.	106 Mc	FM	None	Radiation Loop *	106 Mc	17 (FM Ant. Trims)	Adjust for maximum output with FM loop antenna connected.
ALIGN DISCRIMINATOR SECONDARY							
13.		FM	.001 mf	7F8 2nd FM Converter Grid (Pin #1) & Chassis	4.3 Mc	9 (Disc. Sec.)	Adjust discriminator secondary for minimum response. The correct adjustment is the SHARPLY defined minimum response point between the two peaks.

* Connect output of signal generator to a 5" diameter, 3 turn loop & radiate signal into receiver loop.

* Connect output of signal generator to a 5" diameter, 3 turn loop & radiate signal into receiver loop. Minimum distance between loops should never be less than 12".

MODELS 107F31, 107F31B, MOTOROLA INC.
CHASSIS HS-87

CHART 11. ALIGNMENT PROCEDURE WHEN USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Refer to Figure 7 for location of all adjustment trimmers and cores.

STEP

OPERATION

455 Kc IF Channel Alignment

1. Same as Step 1 in Chart I (Use AM signal generator)

Broadcast Band Alignment

2. Same as Steps 2, 3 & 3A in Chart I (Use AM signal generator)

SW Band Alignment

3. Same as Steps 4 & 5 in Chart I (Use AM signal generator)

4.3 Mc IF Channel Alignment Using FM Signal Generator & Oscilloscope

4. (A) Discriminator -

1. Connect the input terminals of the oscilloscope vertical amplifier to the high side of the receiver volume control and the chassis.
2. Connect the FM generator synchronizing voltage output terminals to a phase shifting network, consisting of a variable 1/2 megohm resistor in series with a .002 mf capacitor. The input to the oscilloscope horizontal amplifier is connected across the .002 mf capacitor. See Figure 8. (This phase shifting network may not work with every oscilloscope. Different values of R & C may be required.)
3. Apply an FM 4.3 Mc signal (125 Kc deviation) through a .01 mf capacitor to the control grid (pin #4) of the 7W7 tube in the second IF amplifier stage.
4. Screw discriminator secondary core (9) out as far as it will go.
5. Adjust discriminator primary (10) until the pattern obtained on the scope is symmetrical about the vertical axis. The phase shifting network resistor is adjusted to give only one trace. The pattern obtained is the resonance curve of the primary, whose maximum response should be at exactly 4.3 Mc. (See Figure 9).
6. Adjust discriminator secondary (9) until a symmetrical pattern is obtained, with peaks occurring at about 100 Kc above and below 4.3 Mc and is substantially linear between peaks. The trace should pass through the intersection of the vertical and horizontal axis. The phase shifting network should be adjusted to give only a single pattern at all times. (See Figure 10).

(B) 4.3 Mc IF Amplifiers -

1. Apply an FM 4.3 signal (100 Kc deviation) to the control grid (pin #4) of the 6SG7 tube in the 1st IF amplifier stage, through a .001 mf capacitor and adjust both primary and secondary cores (11 & 12) to get a symmetrical pattern as before, with peaks occurring at a slightly lower deviation.
2. Apply an FM 4.3 signal (100 Kc deviation) to the control grid (pin #1) of the 7F8 tube, and adjust both primary and secondary cores (13 & 14) until a symmetrical pattern substantially linear between peaks, is obtained.

FM Band Alignment

5. Check the position of the FM oscillator tuning core (18). Set the spacing between the core and the bakelite piece to which it is mounted, to 1/32" by turning tuning core slotted nut.

MOTOROLA INC.

MODELS 107F31,
107F31B, CHASSIS
HS-87

6. Remove the FM loop and connect generator output directly to the receiver FM loop receptacle.
7. Set receiver dial to 90 Mc and also FM signal generator to 90 Mc (22-1/2 Kc deviation). Adjust FM oscillator, antenna and variable IF trimmers (15, 16 & 17) for maximum indication on output meter. (Output meter should be connected across speaker voice coil.)
8. Set receiver dial to 105 Mc and also FM signal generator to 105 Mc (22-1/2 Kc deviation). Adjust FM oscillator, antenna and variable IF cores (18, 19 & 20) for maximum indication on output meter.
9. Repeat Steps 7 and 8 several times until further adjustment does not increase the output. Make the final trimmer adjustment at 105 Mc. (i.e., trimmers 15, 16 & 17 at 105 Mc).
10. Connect FM loop antenna to receiver receptacle. Radiate an FM 105 Mc (22-1/2 Kc deviation) signal into FM loop. Set receiver dial to 105 Mc and adjust trimmer (17) for maximum.

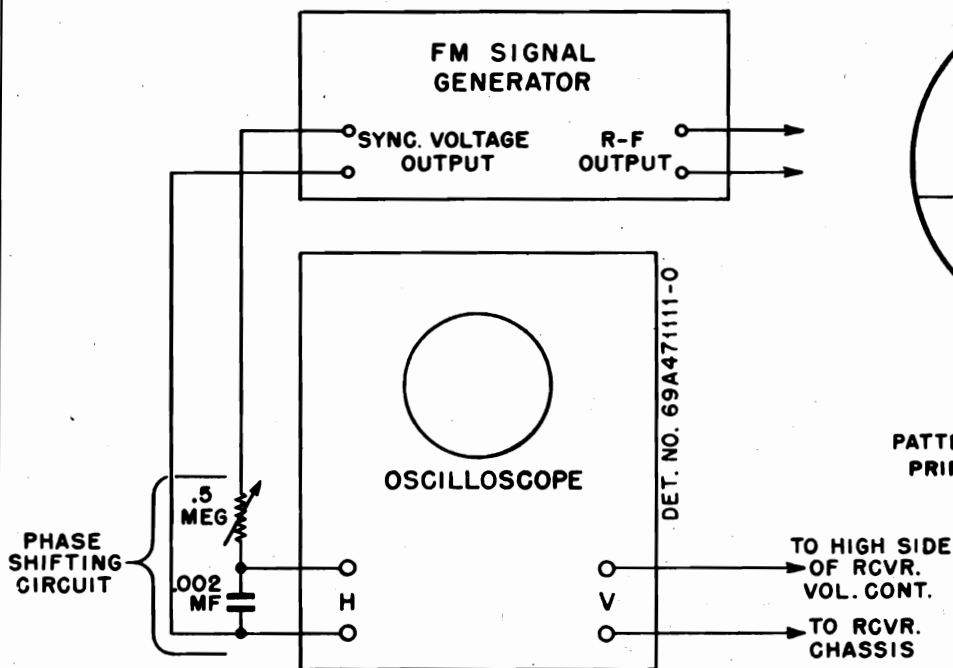


FIGURE 8. SIGNAL GENERATOR & OSCILLOSCOPE HOOK-UP

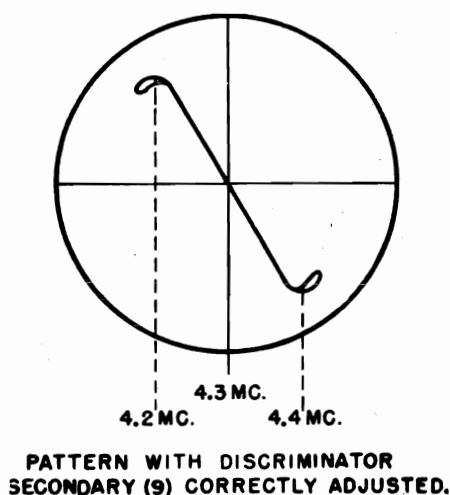
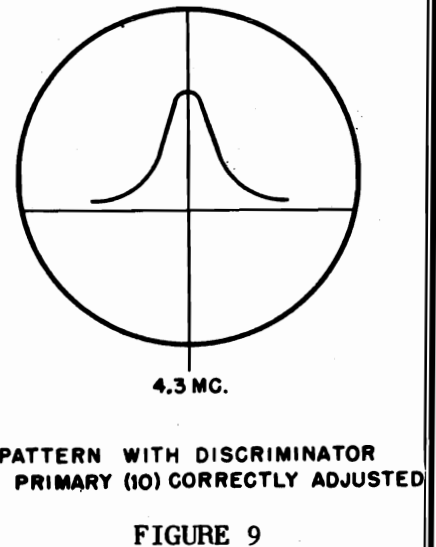


FIGURE 10

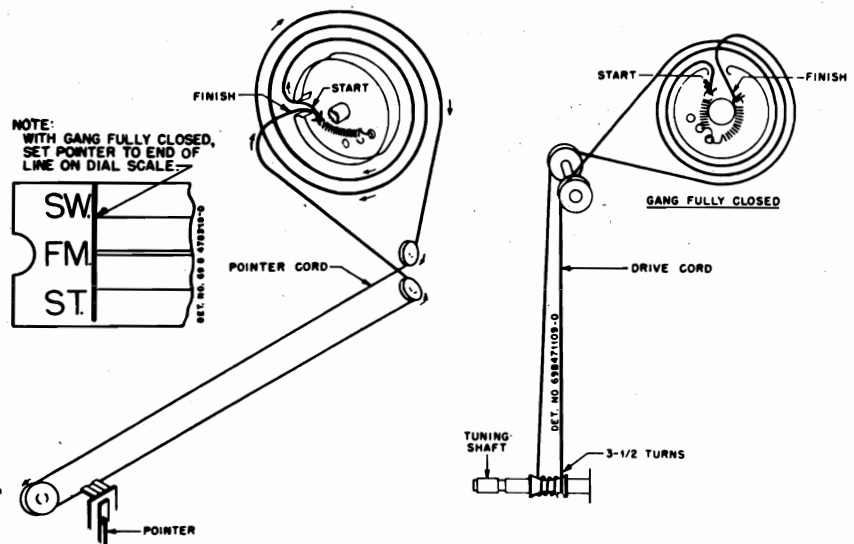


FIGURE 11. POINTER AND DRIVE CORD DETAIL

MODELS 107F31,
107F31B, CHASSIS
HS-87

MOTOROLA INC.

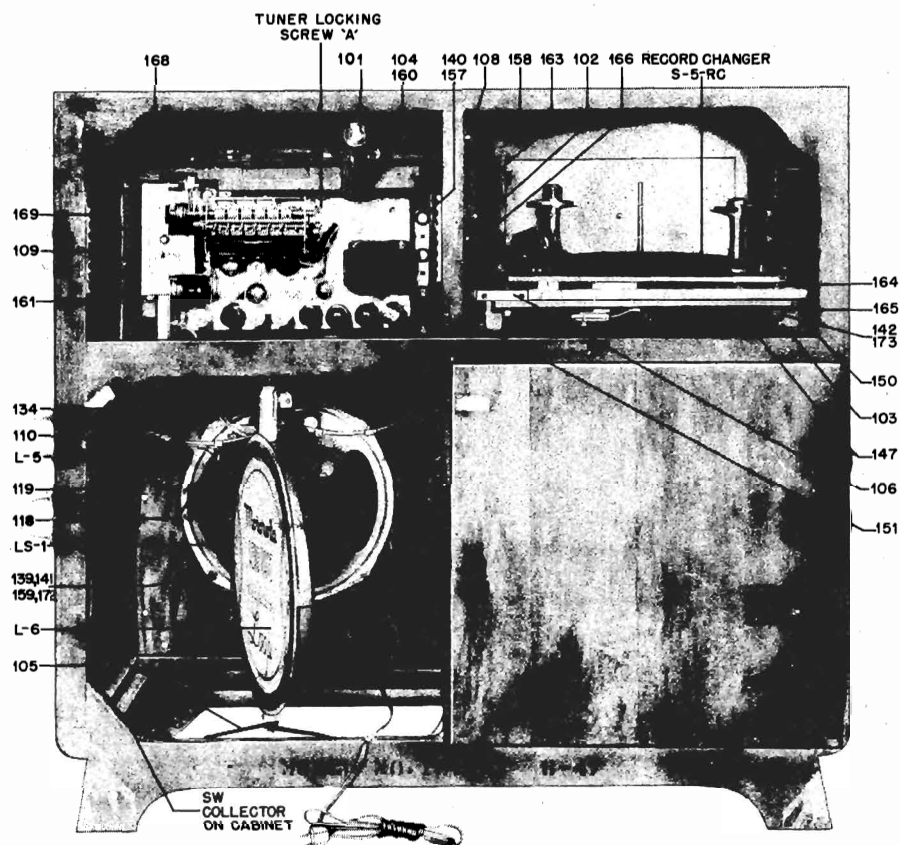
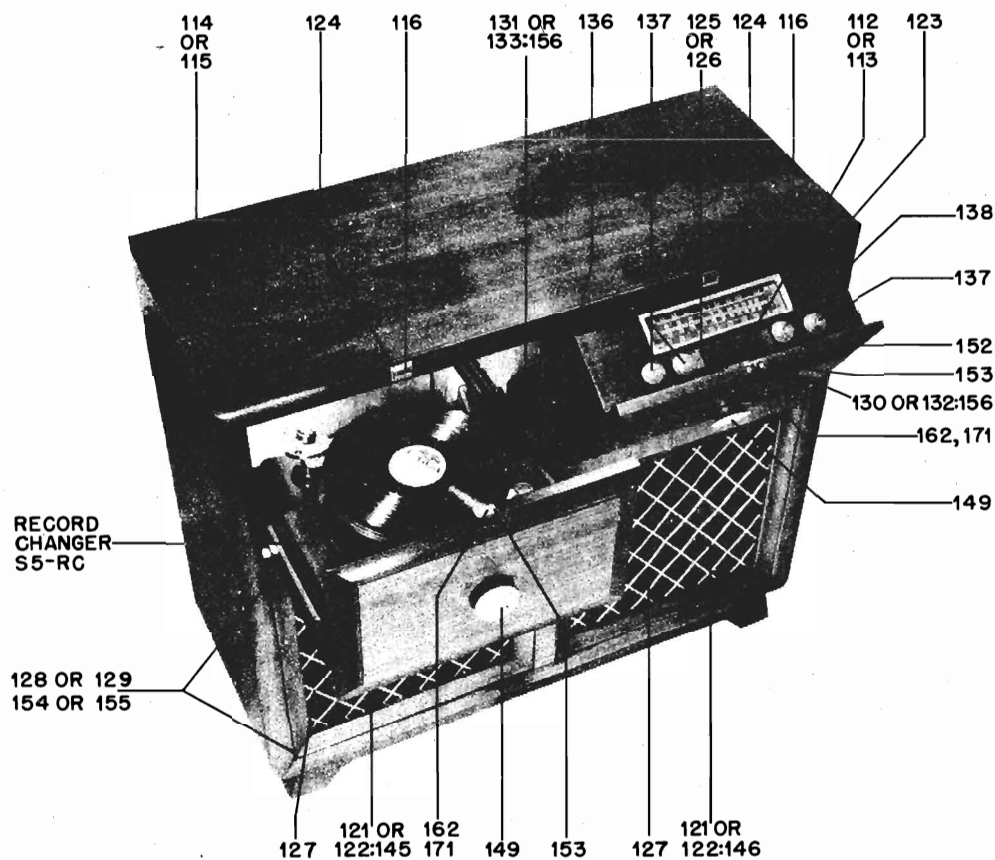


FIGURE 12. PARTS LOCATION - CABINET - MODELS 107F31 & 107F31B

MOTOROLA INC.

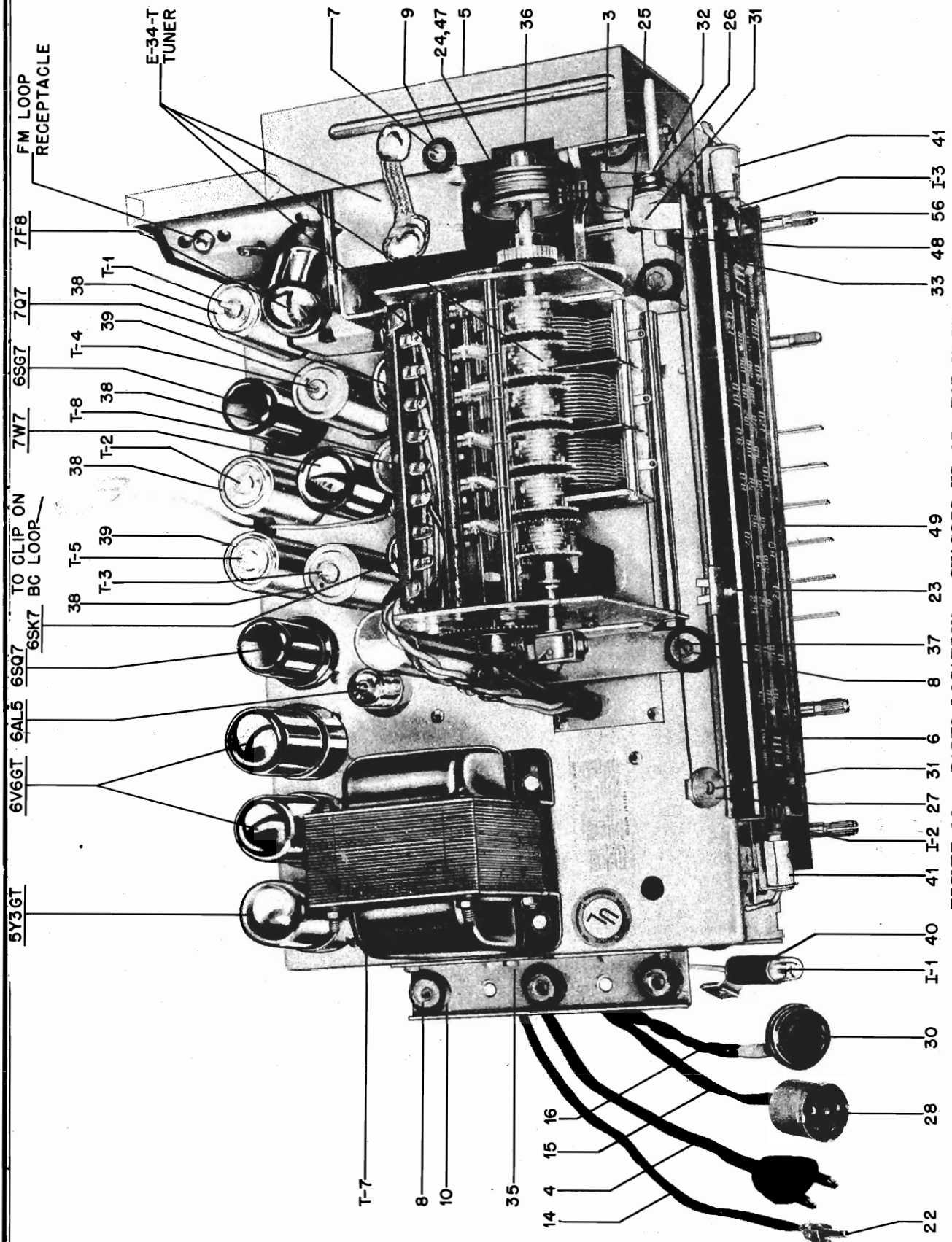
MODELS 107F31,
107F31B, CHASSIS
HS-87

FIGURE 13. PARTS LOCATION - CHASSIS HS-87, TOP VIEW

MODELS 107F31,
107F31B, CHASSIS
HD-87

MOTOROLA INC.

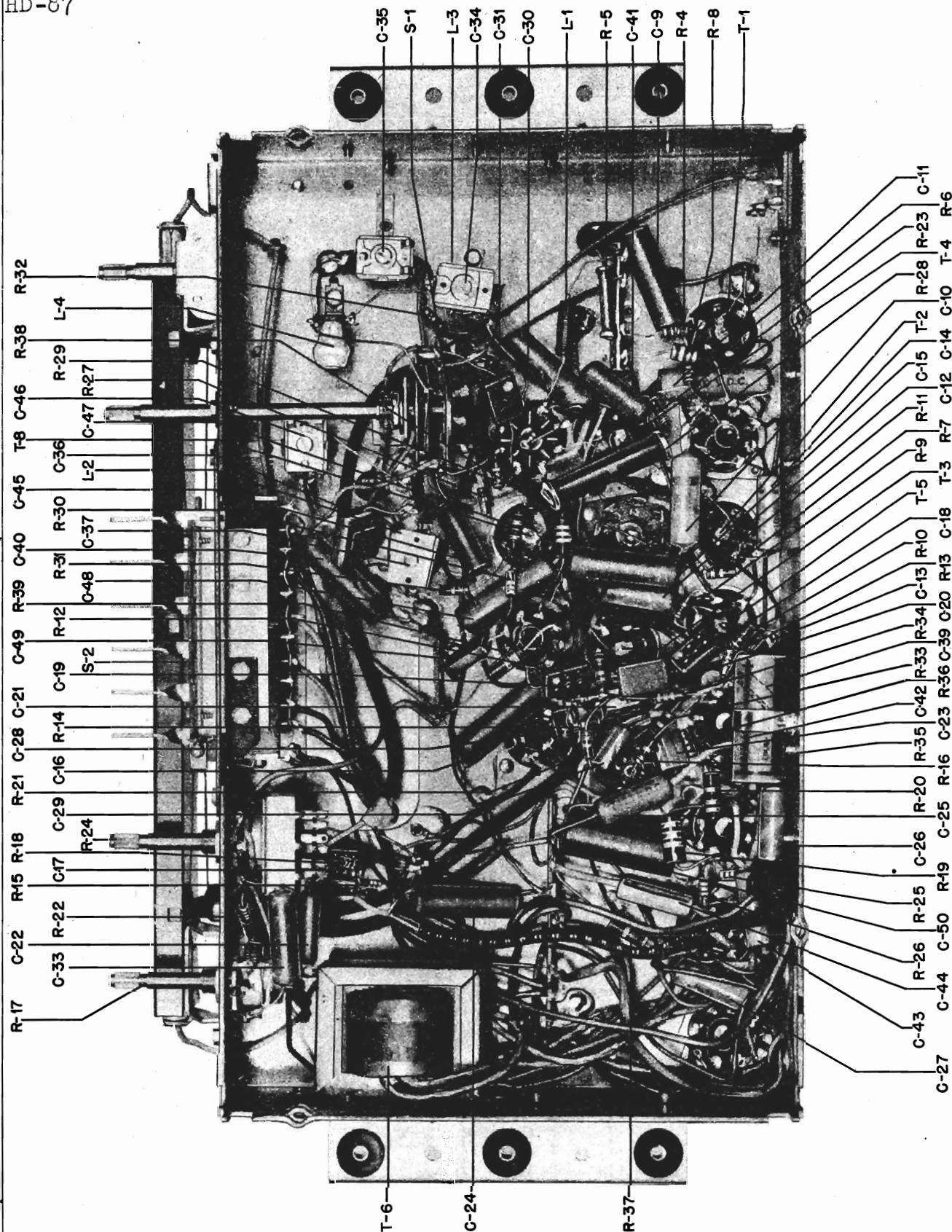


FIGURE 14. PARTS LOCATION - CHASSIS HS-87, BOTTOM VIEW
ELECTRICAL PARTS

MOTOROLA INC.

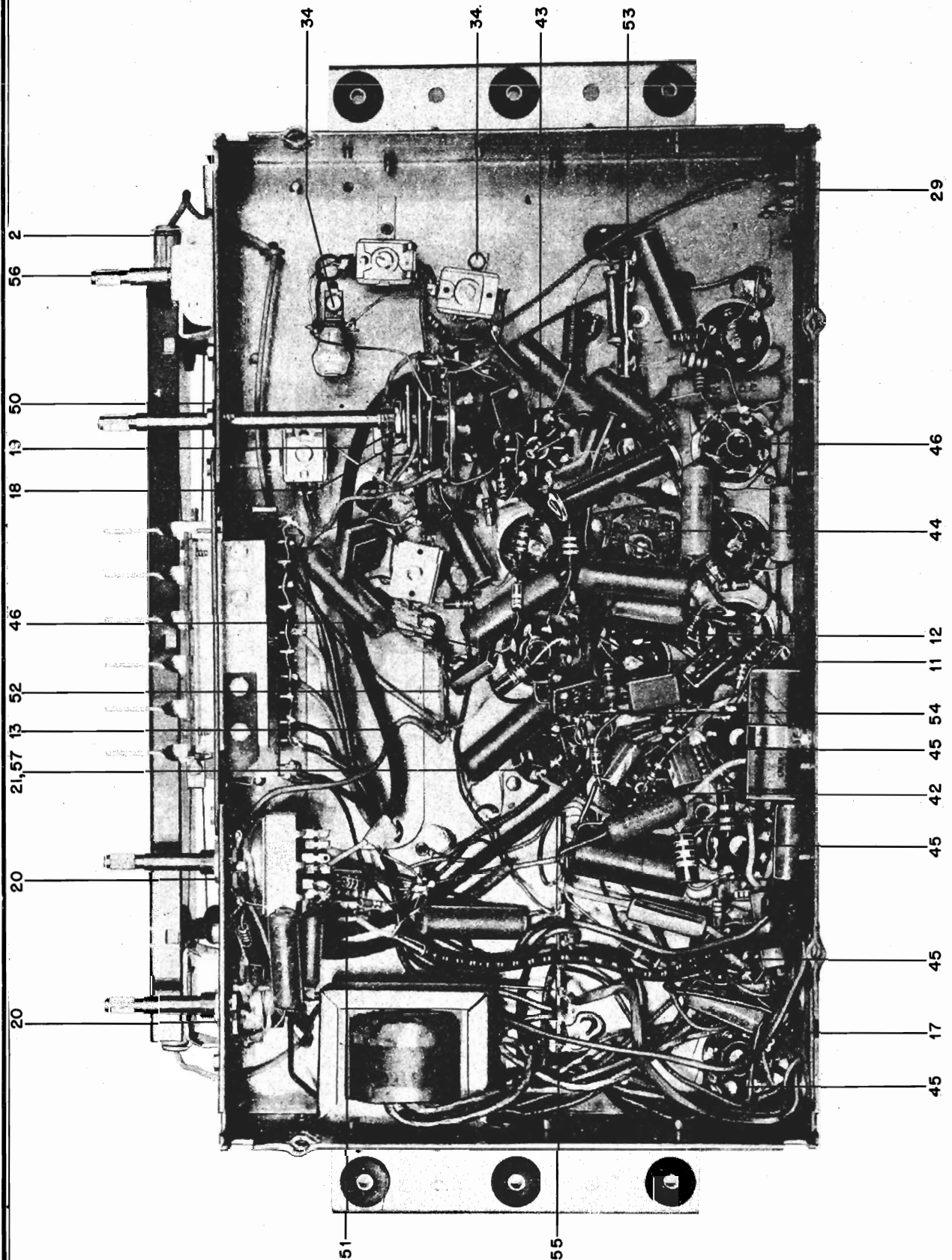
MODELS 107F31,
107F31B, CHASSIS
HS-87

FIGURE 15. PARTS LOCATION - CHASSIS HS-87, BOTTOM VIEW - MECHANICAL PARTS

MODELS 107F31,
107F31B, CHASSIS
HS-87

MOTOROLA INC.

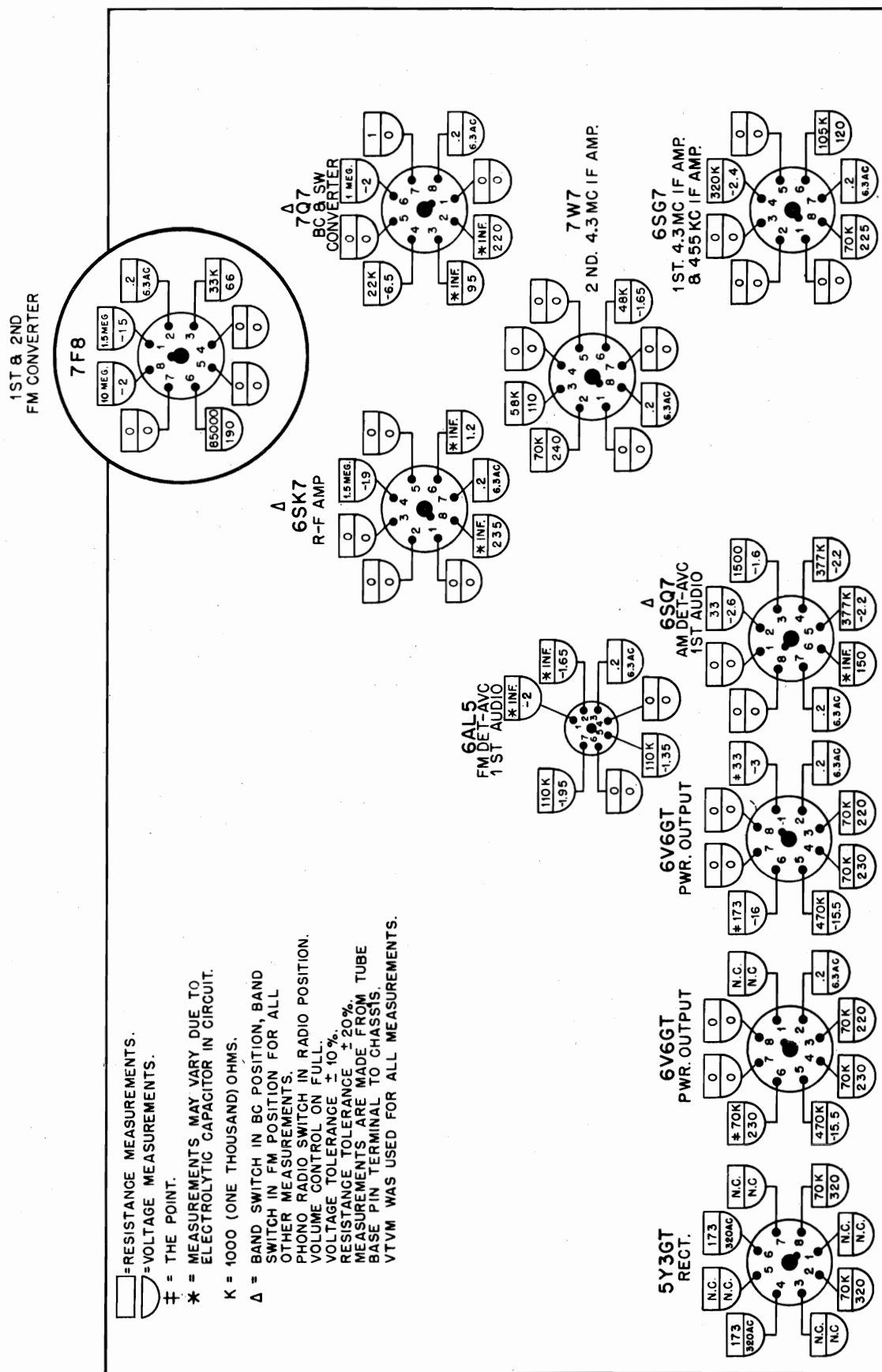


FIGURE 16. VOLTAGE & RESISTANCE DIAGRAM

MOTOROLA INC.

MODELS 107F31,
107F31B, CHASSIS
HS-87

CAPACITORS

*C-1	21A75479	Special: 1.3 mmf
*C-2	21A112247	Silver Mica: 250 mmf
*C-3	20K74940	Trimmer, ceramic: 7-45 mmf
*C-4	20A74939	Trimmer, ceramic: 5-25 mmf
*C-5	21R2729	Mica: 250 mmf 500V
*C-6	21A76320	Ceramic: 16 mmf
*C-7	20K74940	Trimmer, ceramic: 7-45 mmf
*C-8	21R2730	Mica: 500 mmf 500V
C-9	8S9816	Paper: .05 mf 400 V
C-10	8S9806	Paper: .01 mf 100V
C-11	8S9816	Paper: .05 mf 400V
C-12	8S9809	Paper: .01 mf 400V
C-13	21R6508	Mica: 150 mmf 500V
C-14	8S9801	Paper: .01 mf 100V
C-15	8S9816	Paper: .05 mf 400V
C-16	8S9816	Paper: .05 mf 400V
C-17	21R6648	Mica: 250 mmf 500V
C-18	21R6508	Mica: 150 mmf 500V
C-19	21R6641	Mica: 100 mmf 500V
C-20	21R6639	Mica: 500 mmf 500V
C-21	21R6638	Mica: 1000 mmf 500V
C-22	8S9824	Paper: .002 mf 400V
C-23	21R6638	Mica: 1000 mmf 500V
C-24	8S9816	Paper: .05 mf 400V
C-25	8S9809	Paper: .01 mf 400V
C-26	8S9834	Paper: .01 mf 600V
C-27	8S9834	Paper: .01 mf 600V
C-28	23A27718	Electrolytic: 20-50-30 mf/25-350-300V ..
C-29	21R6638	Mica: 1000 mmf 500V
C-30	8S9816	Paper: .05 mf 500V
C-31	21R6642	Mica: 50 mmf 500V
*C-32	19C77717	Tuning, 3 gang:
C-33	8S9813	Paper: .005 mf 600V
C-34	20A71141	Trimmer, mica: 10-80 mmf
C-35	20A76234	Trimmer, mica: 10-80 mmf; with mtg bracket
C-36	21R2724	Mica: 1000 mmf 5% 300V
C-37	20A71141	Trimmer, mica: 10-80 mmf
C-38	20A71226	Trimmer, mica: 2-12 mmf; includes mtg bracket; part of loop antenna
C-39	21R6641	Mica: 100 mmf 500V
C-40	8S9806	Paper: .1 mf 200V
C-41	8S9809	Paper: .01 mf 400V
C-42	23E77635	Electrolytic: 10 mf 100V
C-43	8S9824	Paper: .002 mf 400V
C-44	8S9824	Paper: .002 mf 400V
C-45	8S9801	Paper: .01 mf 100V
C-46	20A76234	Trimmer, mica: 10-80 mmf; with mtg bracket
C-47	21E471803	Ceramic: .68 mmf
C-48	8S9816	Paper: .05 mf 400V
C-49	21R6642	Mica: 50 mmf 500V
C-50	23E77635	Electrolytic: 10 mf 100V
*C-51	21A112247	Silver mica: 250 mmf

PILOT LIGHTS

I-1, 2		
& 3	65X11854	Bulb: 6.3V .15A tubular bayonet base; clear; #47

COILS

L-1	24A74989	Choke, filament
L-2	24B74822	Shortwave antenna
L-3	24A74820	Shortwave oscillator
L-4	24A74821	Broadcast oscillator
L-5	1X76326	FM loop antenna: with leads
L-6	24A78044	BC loop antenna

SPEAKER

LS-1	50B77716	Electrodynamic: 12"; 3.2 ohm VC; 800 ohm field
------	----------	--

RESISTORS

Note: All resistors are 1/2W 20% insulated carbon type unless otherwise specified.

*R-1	6R2109	10 meg
*R-2	6R6015	15,000 1W N.I.
*R-3	6R3966	1.5 meg
R-4	6R6477	15,000 10%
R-5	6R6313	22,000 10% 1W N.I.
R-6	6R6410	33,000 10%
R-7	6R6015	220,000
R-8	6R5588	39,000 10% 1W
R-9	6R6301	1000

* Part of E-34-T Tuner

R-10	6R6056	47,000
R-11	6R6398	150,000 10%
R-12	6R6010	330
R-13	6R6014	330,000
R-14	6R6028	22,000
R-15	6R6014	330,000
R-16	6R6054	10,000
R-17	18K74891	Volume Control: 1 Meg; tapped at 300,000 ohms; includes power switch
R-18	6R6046	1 meg 10%
R-19	6R3991	150 10% 2W
R-20	6R476076	33 10% 1W
R-21	6R6015	220,000
R-22	6R6410	33,000 10%
R-23	6R6301	1000
R-24	18A28062	Tone Control: 1 meg; includes Phono-Radio switch
R-25	6R6032	470,000
R-26	6R6032	470,000
R-27	6R6228	680,000
R-28	6R3967	12,000 10% 5W N.I.
R-29	6R6028	22,000
R-30	6R6032	470,000
R-31	6R6015	220,000
R-32	6R6270	220 10%
R-33	6R6064	10,000
R-34	6R6056	47,000
R-35	6R6075	100,000
R-36	6R6161	1500
R-37	6R6883	300 10% 1W
R-38	6R6341	22,000 10% 1W

SWITCHES

S-1	40B74864	Bandswitch, 3 position
S-2	1X75820	Pushbutton switch: 6 button; with muting switch (complete)

TRANSFORMERS

T-1	24B75481	1st IF, 4.3 Mc: complete with iron cores and padding capacitors, but less shield
T-2	24B75473	2nd IF, 4.3 Mc: complete with iron cores and padding capacitors, but less shield
T-3	24B77714	Discriminator, 4.3 Mc: complete with iron cores and padding capacitors, but less shield
T-4	24B75487	IF, 455 Kc: complete with iron cores and padding capacitors, but less shield ...
T-5	24B77712	Diode, 455 Kc: complete with iron cores and padding capacitors, but less shield
T-6	25B77709	Output
T-7	25C75489	Power
T-8	24B77710	RF Broadcast: complete with iron cores but less shield

MISCELLANEOUS

1	1X77631	Bracket, chassis mtg: includes rubber grommets and eyelets
2	7A14684	Bracket, tuning shaft
3	11M8944	Cord, dial: 18 lb black
4	50R21859	Cord, line and plug: 2 conductor, rubber; 9 ft long
5	15C74825	Cover, tuner
6	1X76370	Dial Plate, Brackets and Pullies Assembly: less dial scale, rubber channel strips and pointer
7	5S1615	Eyelet: .206 x .184; brass (tuner cover mtg)
8	5A12106	Eyelet, mounting (chassis & tuner mtg) ..
9	37A4163	Grommet, rubber (tuner cover mtg)
10	37K15125	Grommet, mounting; rubber (chassis cushions)
11	1X76357	Lead Assembly: single conductor; shielded; 7" long
12	1X76358	Lead Assembly: single conductor; shielded 8" long
13	1X76359	Lead Assembly: single conductor; shielded; 10" long
14	1X470488	Lead & Plug Assembly (phono pickup connector)
15	1X77730	Leads & Phono Motor Receptacle Assembly
16	1X77732	Leads & Speaker Receptacle Assembly
17	32A24815	Lock, line cord: fibre
18	4S7855	Lockwasher: 3/8 internal; cadmium plated (bandswitch mtg)

**MODELS 107F31,
107F31B, CHASSIS
HS-87**
MOTOROLA INC.

19	287018	Nut: 3/8-32 x 1/2 hex; cadmium plated (bandswitch mtg)	120	42A75825	Clip, mounting (phono connector mtg) ..
20	287051	Nut: 3/8-32 x 9/16 Palmut; cadmium plated (volume and tone control mtg)	121	35K471756	Cloth, grille: walnut (107F31)
21	9A12705	Plate, electrolytic capacitor mtg: bakelite	122	35K471762	Cloth, grille: blonde (107F31B)
22	28K22183	Plug, insulated: 1 pin (on phono pickup lead)	123	13B72750	Escutcheon, dial: brass; 9" x 2-3/8" ..
23	52B74418	Pointer, dial	124	13A75551	Escutcheon, panel catch push button: brass; 1" x 1-1/8"
24	1X76393	Pulley Assembly: two 1-5/16" pulleys on brass bushing	125	13B70494	Escutcheon, push button: brown plastic; gold stripes (107F31)
25	49A23900	Pulley, cord: 1/4 groove	126	13K76133	Escutcheon, push button: tan plastic; gold stripes (107F31B)
26	49A21741	Pulley, cord: 3/8 groove	127	13B76158	Grille, cabinet: brushed brass finish ..
27	49A21552	Pulley, cord: 1/2 groove	128	55K471893	Hinge, door (Universal): statuary bronze finish (compartment door - 107F31)
28	9A30680	Receptacle: 8-prong (phono motor recept)	129	55K471892	Hinge, door (Universal): brass (compartment door - 107F31B)
29	9K28049	Receptacle, 4 prong (BC loop ant. recept)	130	55K76149	Hinge, radio door: right hand; statuary bronze finish (107F31)
30	9A22367	Receptacle: 5 prong (speaker recept) ...	131	55K76150	Hinge, radio door: left hand; statuary bronze finish (107F31)
31	5A71246	Rivet, shoulder: .187 shoulder (cord pulley mtg)	132	55B76145	Hinge, radio door: right hand; brass (107F31B)
32	5K74560	Rivet, shoulder: .312 shoulder (cord pulley mtg)	133	55K76146	Hinge, radio door: left hand; brass (107F31B)
33	34C74423	Scale, dial: glass	134	14A75142	Insulator, FM loop mounting
34	3S7506	Screw: #6 x 1/4 PKZ plain hex head sheet metal screw; cadmium plated (BC osc. coil mtg and SW osc. coil mtg)	135	14A75554	Insulator, light: fibre
35	3S7454	Screw: #8 x 1/4 PKZ plain hex head sheet metal screw; cadmium plated (general mounting)	136	60A28520	Jewel, light: amber
36	3S7100	Setscrew: 8-32 x 5/16 slabhead; cadmium plated	137	36K70511	Knob, control: plastic; plain
37	3S7481	Screw: #8 x 3/4 PKZ slotted hex head sheet metal screw (tuner mtg)	138	36K70513	Knob, control: plastic; with red dot ...
38	26B70107	Shield, coil (for T-1, T-2, T-3 & T-5) ..	139	4S7657	Lockwasher: #8 external; cadmium plated (speaker mtg)
39	1A71049	Shield & Iron Core Sleeve Assembly (for T-4 and T-5)	140	2A72610	Nut, tee: 8-32 thread (chassis mtg)
40	60K75432	Socket, Clip & Leads	141	2S7003	Nut: 8-32 x 5/16 hex; cadmium plated (speaker mtg)
41	9A72747	Socket, dial light	142	2S7022	Nut: 1/4-20 x 7/16 hex; cadmium plated (record changer mtg)
42	9A471661	Socket, tube: miniature 7 prong; 1-5/16 mounting centers	143	35K471751	Pad, felt: 3/4 x 3/4 x 1/8
43	9A72519	Socket, tube: molded, octal	144	35K471748	Pad, felt: 1 x 1/2 x 1/8
44	9A471015	Socket, tube: wafer; octal	145	35K76174	Pad, grille (compartment door)
45	9A6788	Socket, tube: molded, octal; plain type ..	146	35B76173	Pad, grille (speaker panel)
46	9A70165	Socket, tube: molded, octal; shielded type	147	64C478078	Panel, record changer bottom cover
47	41A21332	Spring, tension coil	148	28K19871	Plug: 4 pin (BC loop connector)
48	35A75262	Strip, channel: rubber; 7/8 long (dial plate bumper)	149	55A76151	Pull, door: brushed brass finish; includes mtg screw
49	37E21114	Strip, channel: rubber; 1" long (dial scale mtg)	150	55K471731	Rail, guide: left hand
50	32A27678	Strip, shaft bearing: fibre	151	55C471730	Rail, support: right hand
51	31A15433	Strip, terminal: 1 large insulated lug, #2 mtg	152	3S1328	Screw: #2 x 3/8 Phillips oval head wood screw; brass plated (push button escutcheon mtg)
52	31K15026	Strip, terminal: 2 insulated lugs, #2 mtg	153	3S1327	Screw: #4 x 1/2 slotted flat head wood screw; brass (panel catch & trigger plate mtg)
53	31A75232	Strip, terminal: 4 insulated lugs, #3 mtg	154	3S7441	Screw: #5 x 5/8 slotted flat head wood screw; statuary bronze finish (compartment door hinge mtg - 107F31)
54	31K22174	Strip, terminal: 4 insulated lugs, #4 mtg	155	3S1331	Screw: #5 x 5/8 slotted flat head wood screw; brass (compartment door hinge mtg-107F31B)
55	31A75233	Strip, terminal: 7 insulated lugs, #1 & #9 mounting	156	3S1346	Screw: #6 x 3/4 slotted flat head wood screw; statuary bronze finish (radio door hinge mtg)
56	1X76352	Tuning Shaft & Pulley Assembly	157	3S2955	Screw: 8-32 x 1" slotted hex head machine screw; cadmium plated (chassis mtg)....
57	9K14906	Wafer, insulating: fibre (insulates electrolytic capacitor from mtg rivets)	158	3A75140	Screw, hook-eye
58	37A14888	Washer, compression: sponge rubber	159	3K653	Screw, speaker mounting
CABINET PARTS - MODELS 107F31 & 107F31B			160	2S7990	Speednut: for 3/16 diameter rod (air check rod retainer)
101	55B74771	Air check, tilt panel	161	41A74775	Spring, chassis shelf
102	45B471744	Arm, phono shelf-actuating	162	41A72780	Spring, coil (trigger)
103	57A476151	Block, panel mounting: wood	163	41A471741	Spring, phono shelf actuating
104	7A74778	Bracket, air check mtg	164	41K72515	Spring, support-upper (record changer cushion)
105	7K71220	Bracket, loop support	165	41K72516	Spring, support-lower (record changer cushion)
106	7A471733	Bracket, phono shelf	166	48A471742	Stop, lever: wood; 3/4" long
107	7A76156	Bracket, pilot light	167	55K72306	Strike, bullet: includes one 1/2" nail..
108	43A471759	Bushing, spacer (phono shelf actuating arm mtg)	168	35K471755	Strip, felt: 8-3/8 x 1 x 1/8
109	7A471736	Bracket, spring anchor	169	35K471752	Strip, felt: 11 x 1/2 x 1/8
110	7A74782	Bracket, tilt panel spring	170	38C75528	Tab, AM & FM Call Letters & Instructions
111	43A471743	Bumper, rubber	171	1X76333	Trigger & Plate Assembly: brushed brass finish (on phono & radio doors)
112	1X477001	Button & Spring Assembly: walnut pushbutton with insert spring (107F31)	172	4S7629	Washer: 1/2 x 3/16 x .048 thick; cadmium plated (speaker mtg)
113	1X477002	Button & Spring Assembly: tan pushbutton with insert spring (107F31B)	173	4S2623	Washer: 1 x 5/16 x .035 thick; cadmium plated (record changer mtg)
114	16E471749	Cabinet, console: walnut (107F31)			
115	16K471750	Cabinet, console: blonde (107F31B)			
116	1X76382	Catch Assembly (panel catch)			
117	55A72307	Catch, bullet			
118	42K76724	Clamp, cable (FM loop adj. tape & lead mtg)			
119	42K5628	Clip, Fahnestock: double			

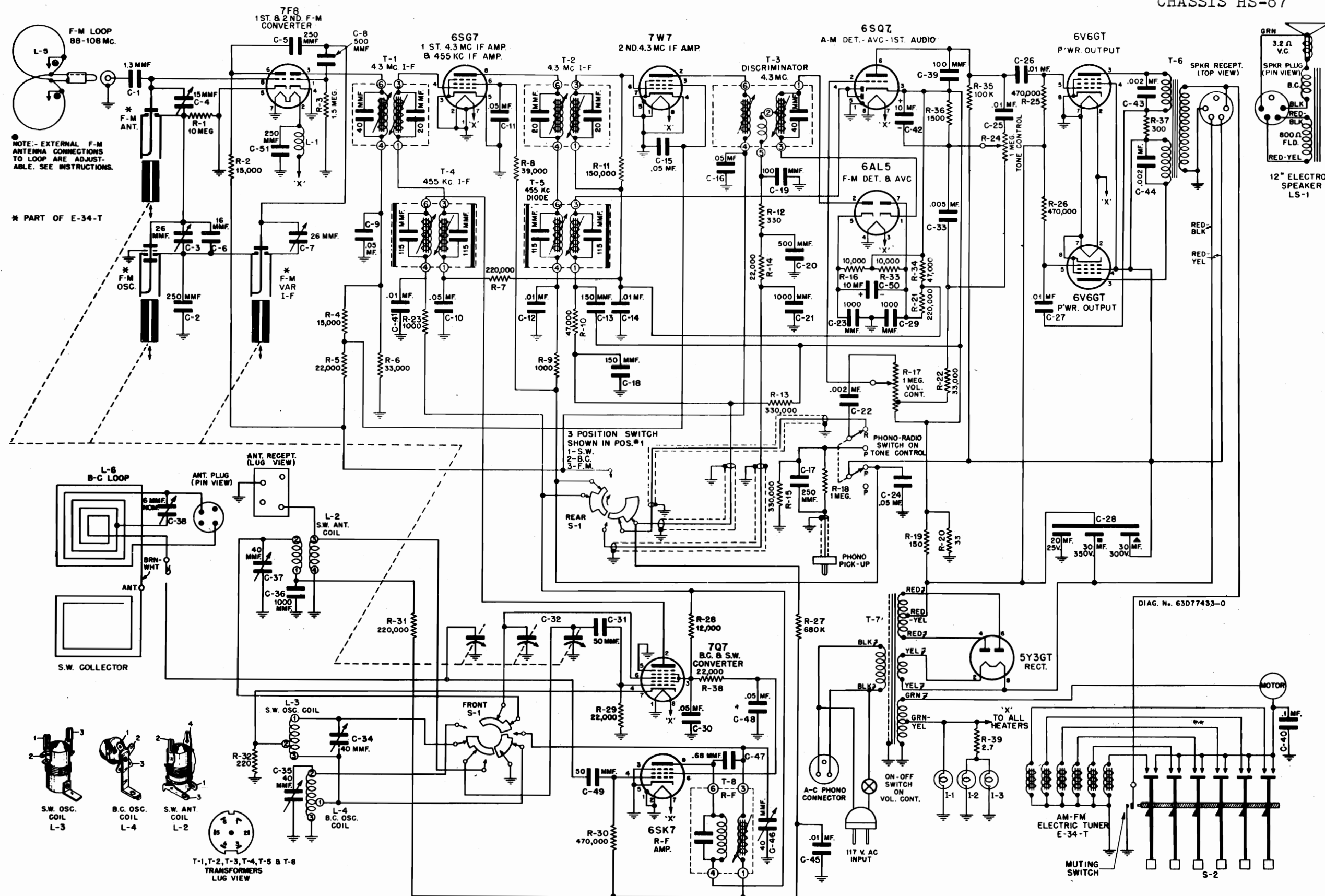
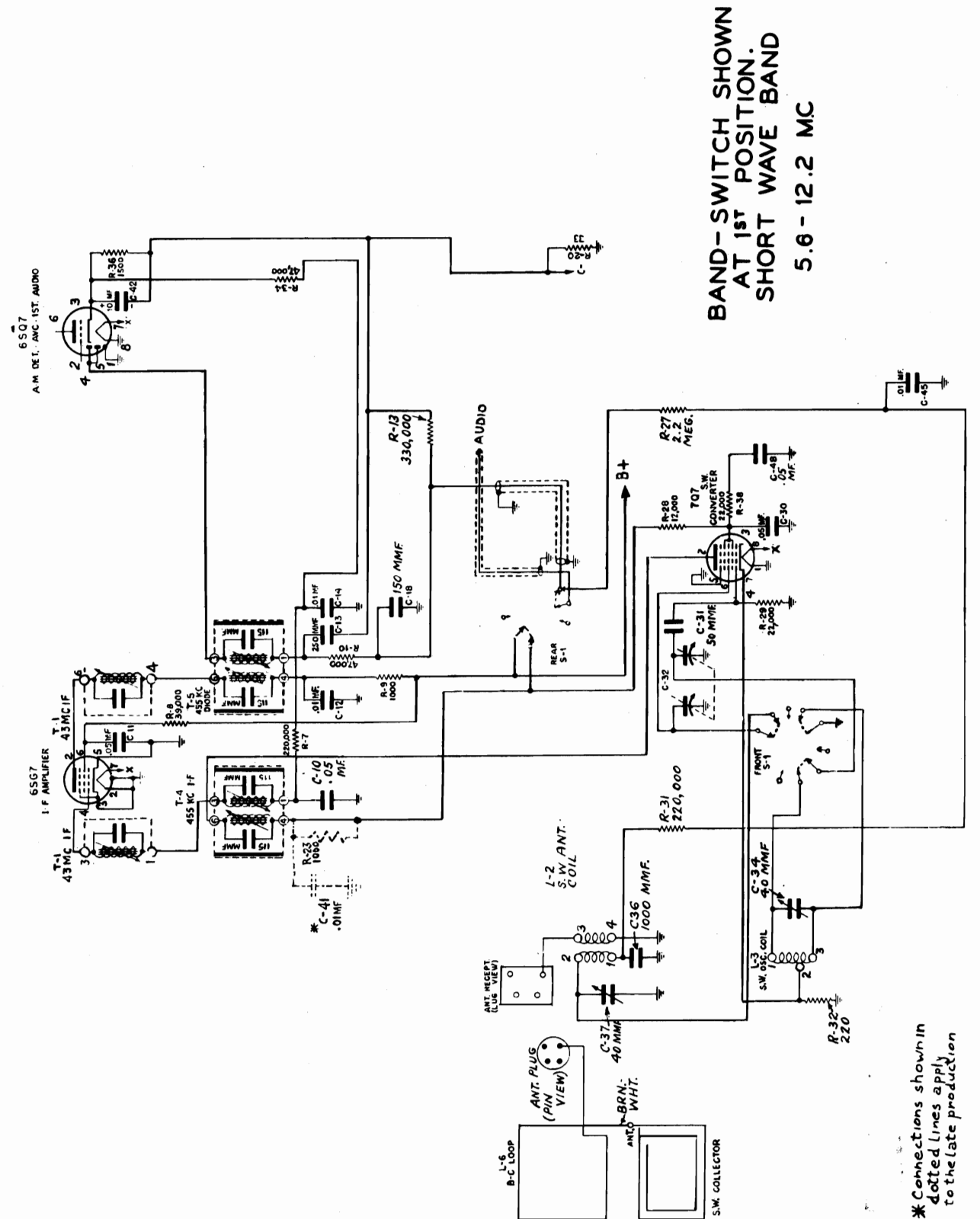
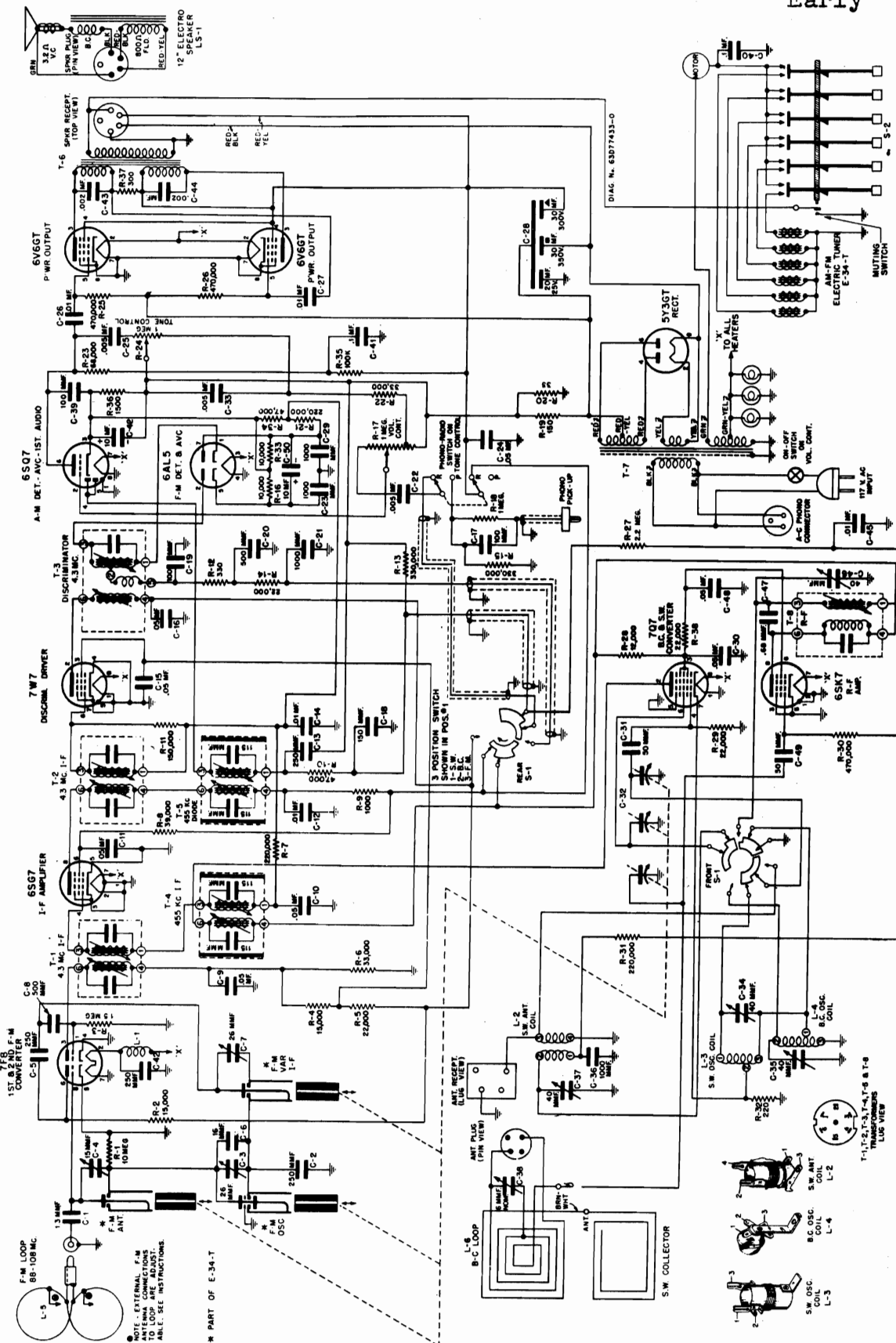
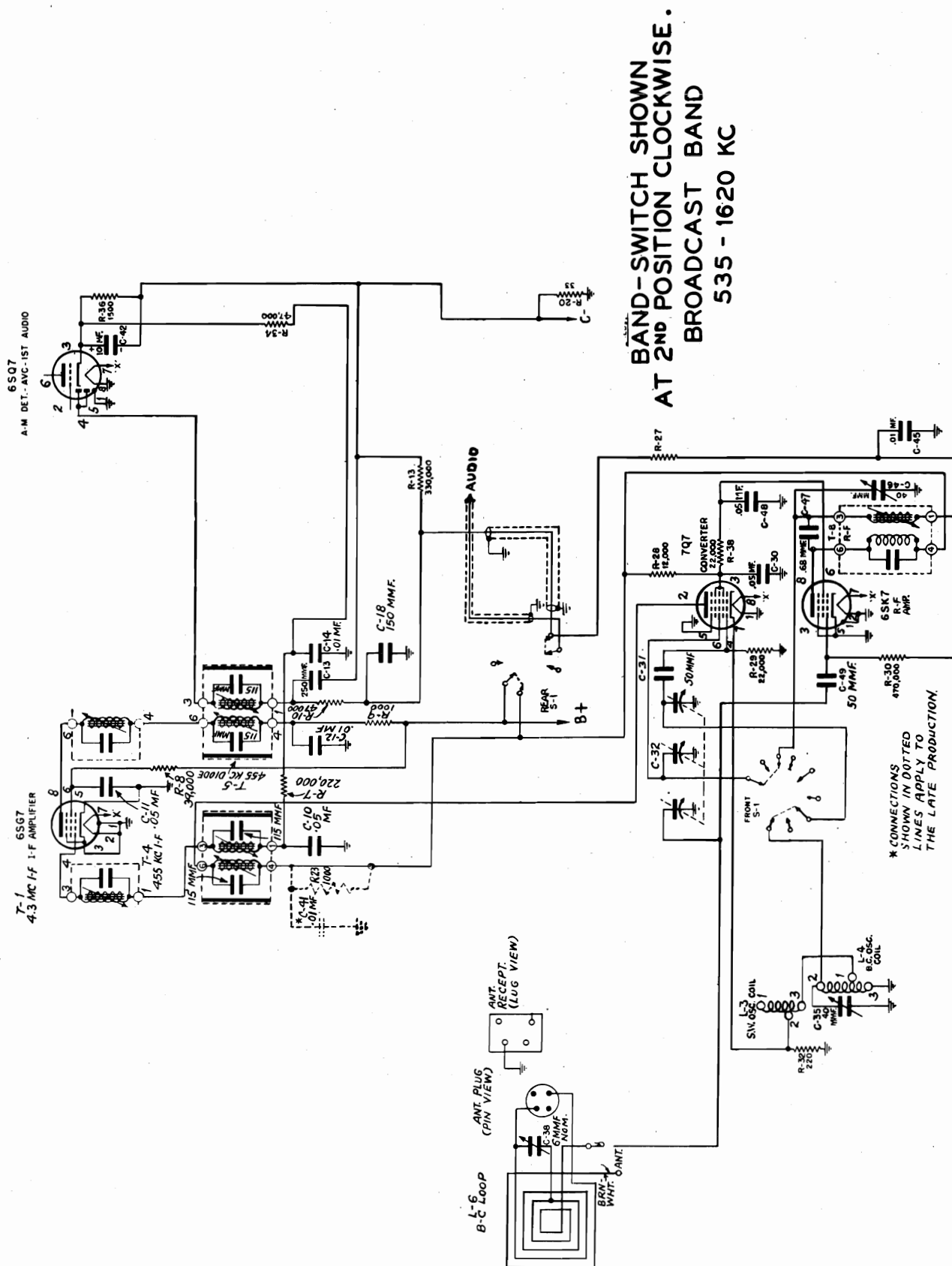


FIGURE 20. SCHEMATIC DIAGRAM -CHASSIS HS-87





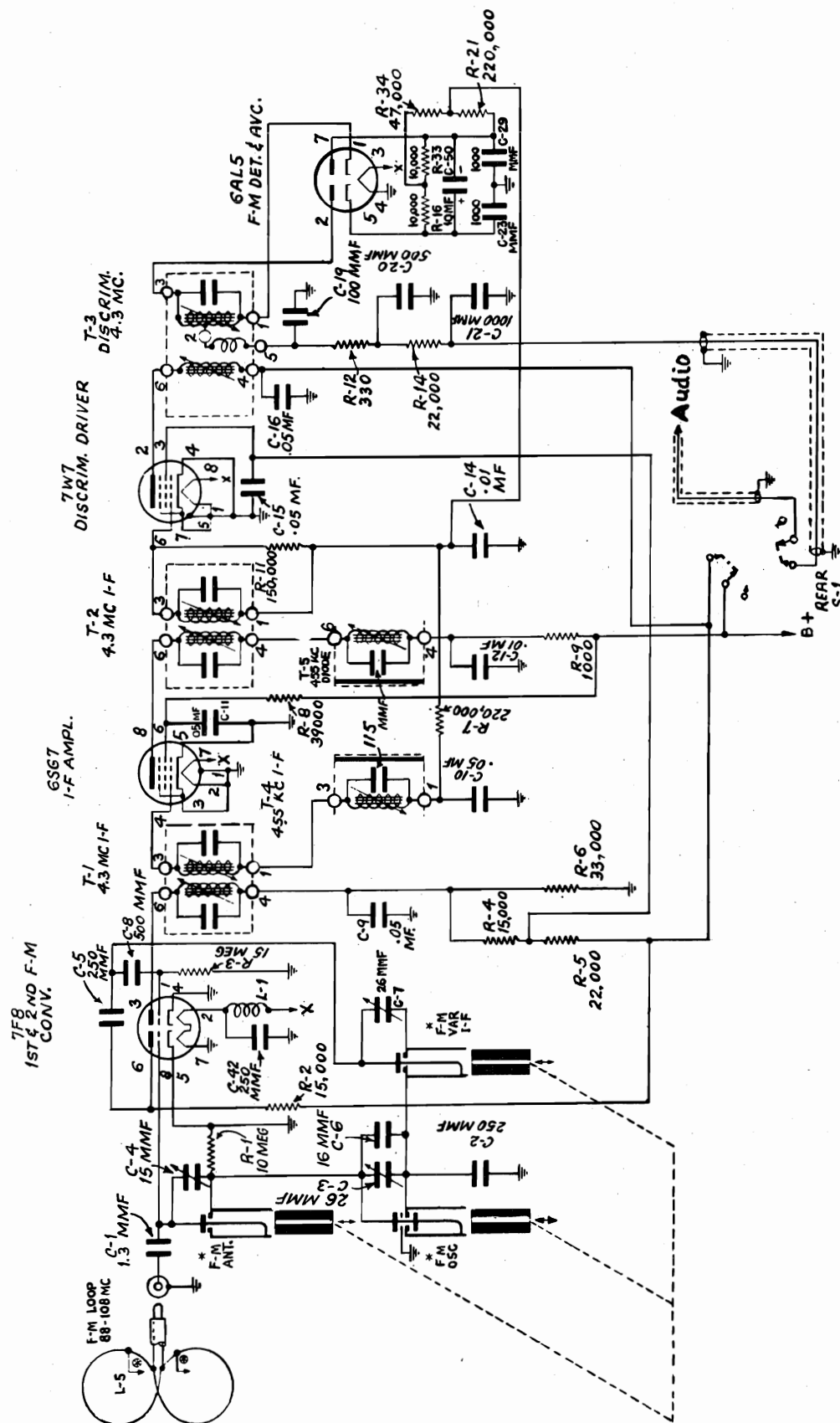
CLARI-SKEMATIX

Registered Trademark

PAGE 19-126 MOTOROLA

MODEL 107F31,
CHASSIS HS-87

MOTOROLA INC.



BAND-SWITCH SHOWN
AT 3RD POSITION CLOCKWISE.
F M BAND
88-108 MC

MODELS 107F31,
107F31B, CHASSIS
HS-87

MOTOROLA INC.

MODEL E-34-T

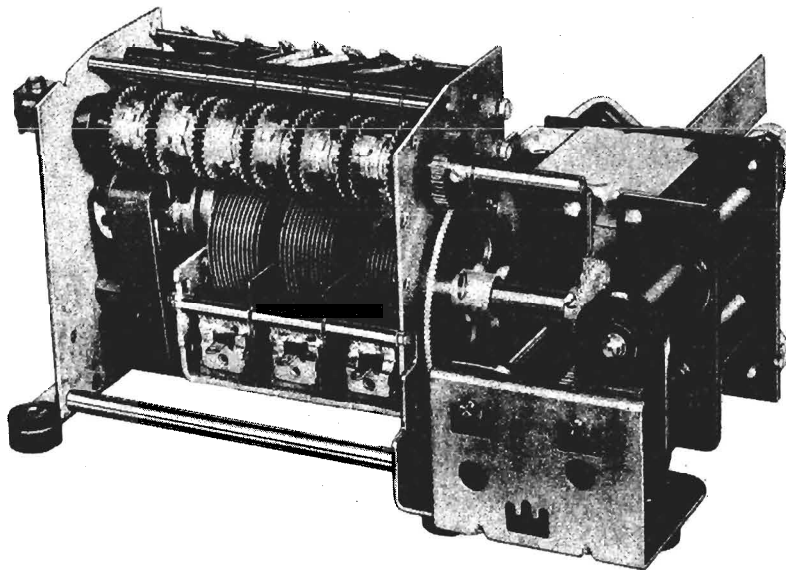


FIGURE 17. MODEL E-34-T AM-FM TUNER

THEORY OF THE FM TUNER

Referring to the functional schematic diagram in Figure 18, the triode T_1 serves both as an oscillator and first converter, and triode T_2 serves as the second converter. Oscillator voltage injection for the second converter is obtained through the coupling capacitor from the plate of T_1 . T_1 and T_2 are sections of the 7F8 twin-triode tube.

The frequency relationships are given in Figure 18. The oscillator F_0 beats with the incoming signal F_S to produce the first intermediate frequency F_1 , which is variable. F_1 then beats with the same oscillator frequency F_0 in the second converter to produce the second intermediate frequency

F_2 which is 4.3 mc. With a 100 mc signal the oscillator frequency is 47.85 mc and the variable intermediate frequency is 52.15 mc.

This system of reception permits the oscillator to be resonated with a high capacitance, 250 micromicrofarads in this case. Consequently, changes in the tube characteristics during warm-up do not produce objectionable changes in oscillator frequency. This contributes materially to the stability of the system.

The actual FM tuner schematic is shown in Figure 20.

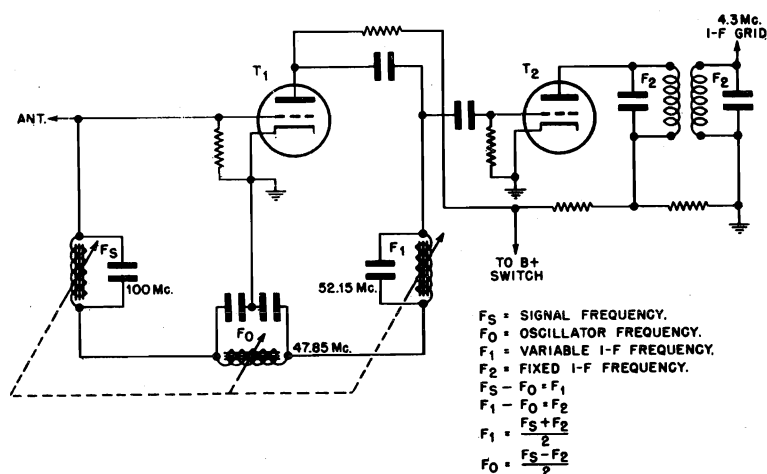


FIGURE 18. FUNCTIONAL SCHEMATIC DIAGRAM OF FM TUNER

Model E-34-T

MOTOROLA INC.

MODELS 107F31,
107F31B, CHASSIS
HS-87

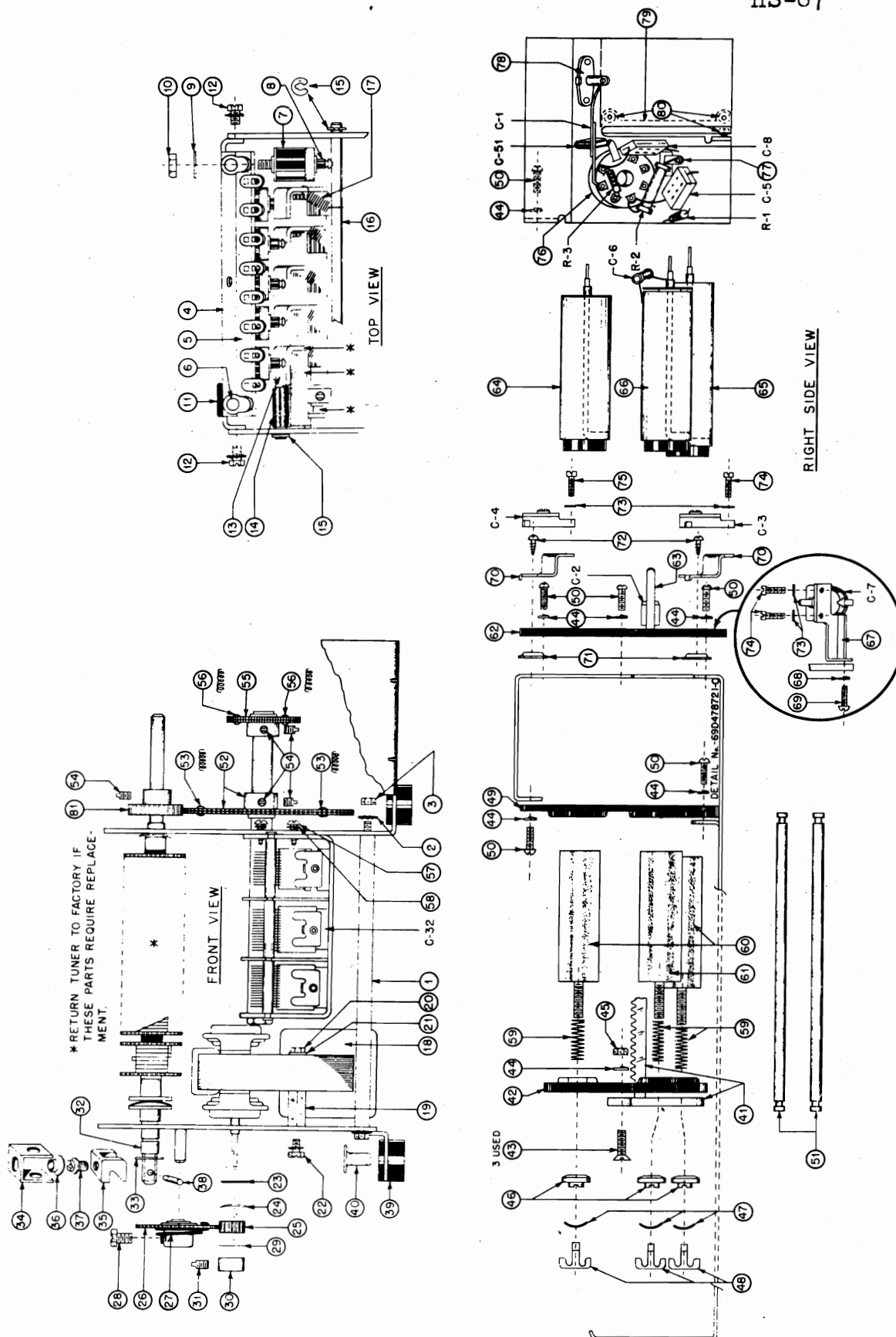


FIGURE 19. MODEL E-34-T AM-FM TUNER PARTS LOCATION

MODELS 107F31,
107F31B, CHASSIS
HS-87

MOTOROLA INC.

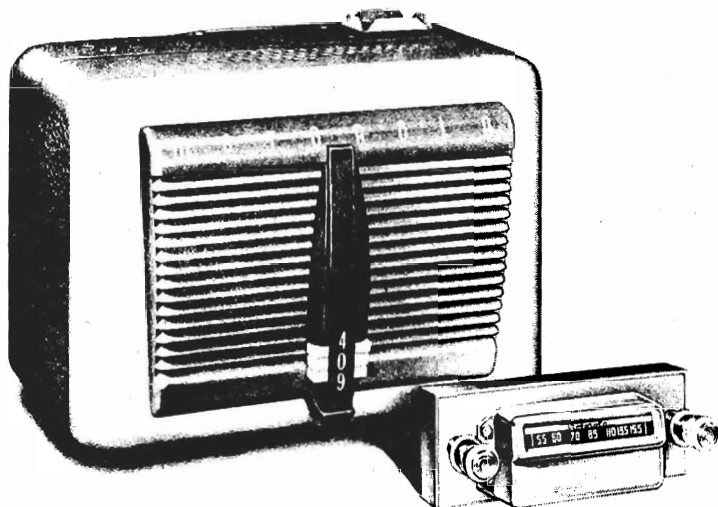
MODEL E-34-T

PARTS LIST
MODEL E-34-T AM-FM TUNER

REF. NO.	PART NO.	DESCRIPTION			
CAPACITORS					
C-1	21A75479	Special: 1.3 mmf	35	42A10981	Yoke, cam
C-2	21A112247	Silver mica: 250 mmf	36	587818	Eyelet: .135 x .288
C-3	20K74940	Variable ceramic: 7-45 mmf	37	3A10990	Screw, yoke lock
C-4	20A74939	Variable ceramic: 5-25 mmf	38	47A11004	Pin, drive shaft
C-5	21R2729	Mica: 250 mmf 500V	39	37K15125	Grommet, tuner mounting
C-6	21A76320	Ceramic: 18 mmf	40	5A12105	Eyelet, mounting
C-7	20K74940	Variable ceramic: 7-45 mmf	41	44B72706	Rack, drive gear: die cast
C-8	21R2730	Mica: 500 mmf 500V	42	64B72707	Plate, core mounting: bakelite
C-32	19C77717	Variable: 3 gang	43	3S7184	Screw: 6-32 x 1/2 slotted flat head machine screw
C-51	21A112247	Silver mica: 250 mmf	44	4S2619	Lockwasher: #6 split
RESISTORS					
R-1	6R2109	10 meg 1/2W Ins	45	2S7005	Nut: 6-32 x 1/4 hex
R-2	6R6013	15,000 1W N.I.	46	2A72726	Nut, swivel
R-3	6R3966	1.5 meg 1/2W Ins	47	4A74936	Washer, spring
1	45A21419	Rod, tie: threaded	48	42A72725	Clip, swivel nut
2	4S7651	Lockwasher: #8 internal	49	64B72704	Plate, front mounting: bakelite
3	2S7007	Nut: 8-32 x 1/4 hex	50	3S7185	Screw: 6-32 x 3/8 slotted round head machine screw
4	1X76383	Magnet Assembly: 6 electromagnets mounted on channel; with terminal strip	51	47B72712	Rod, guide
5	31A74480	Strip, terminal: 8 insulated lugs, #1 and 10 mtg.	52	1X76389	Split Gear & Bushing Assembly (large) ..
6	5S7707	Rivet: .122 x 5/32 steel	53	41A4547	Spring, coil
7	1K75593	Magnet Assembly: single electromagnet...	54	3S7100	Set screw: 8-32 x 5/16 slabhead
8	37A22059	Bumper, armature: rubber	55	1X76390	Split Gear & Bushing Assembly (small) ..
9	4S7562	Washer: 7/16 x .187 x .033 thick	56	41A78498	Spring, coil
10	2S7009	Nut: 10-32 x 3/8 hex	57	3S7156	Screw: 6-32 x 3/16 slotted binder head machine screw
11	37A22664	Grommet: for 7/16" hole	58	4S7666	Lockwasher: #6 external
12	3S7205	Lockscrew: 8-32 x 1/4 slotted hex head .	59	41A74880	Spring, core tension
13	46K75619	Rod, stop	60	46A71749	Core, Iron (ant. & var. IF)
14	11M9504	Sleeving: #4 black	61	46K76172	Core, Iron (with paint dot) (osc)
15	4A21577	Washer, "C" spring	62	1X76388	Rear Mounting Plate & Lug Assembly: bakelite plate with soldering lug
16	46A21765	Rod, stop: grooved	63	29R3005	Lug, soldering
17	41A22507	Spring, armature	64	24C75492	Inductor, VHF (Ant.): 2-1/2" long
18	59B75421	Motor, tuner	65	24K75494	Inductor, VHF (IF): 2-3/4" long
19	2K75462	Nut: hex; .594 long; 6-32 thread (motor spacer)	66	24K75496	Inductor, VHF (Osc): 2-5/8" long
20	3S2927	Screws: 6-32 x 7/8 slotted hex head machine screw	67	7A74712	Bracket, trimmer mounting
21	4S7650	Lockwasher: #6 internal	68	4S8412	Lockwasher: #4 split
22	3S7350	Lockscrew: 6-32 x 1/4 slotted hex head .	69	3S1937	Screw: 4-40 x 5/16 slotted round head machine screw
23	4A21409	Washer (clutch)	70	7A74711	Bracket, trimmer mounting
24	4A21408	Washer, spring (clutch)	71	2A74710	Nut, Tinnerman (#4 PKZ)
25	44A21417	Pinion, clutch; 1/4 P.D.	72	3S3356	Screw: #4 x 5/16 PKZ slotted round head sheet metal screw
26	1X21576	Gear & Hub Assembly; 1-5/8 P.D.	73	4A74884	Washer, trimmer: fibre
27	41A22471	Spring, cushion	74	3S1525	Screw: 3-48 x 3/8 slotted fillister head machine screw
28	3S7163	Screw: 8-32 x 1/4 slotted hex head machine screw	75	3S2975	Screw: 3-48 x 5/16 slotted fillister head machine screw
29	14A21424	Washer, fibre: 7/16 x .130 x .010 thick.	76	9K75544	Socket, tube: local
30	43A21407	Bushing, clutch retaining	77	31A81399	Strip, terminal: 1 insulated lug; #1 mounting
31	3S7114	Set screw: 8-32 x 3/8 slabhead	78	9A54664	Receptacle, ferrule: 1 prong
32	43K21412	Bushing, spacer	79	15A74714	Cover, tuner (rear)
33		Washer	80	3S8175	Screw: #4 x 3/16 PKZ slotted hex head sheet metal screw
34	42A10982	Yoke, retainer	81	44A21873	Pinion: gang drive

MOTOROLA INC.

MODEL 409



ALIGNMENT

EQUIPMENT REQUIRED

1. A special tool for adjusting the tuner cores. Use Alignment Tool, Motorola Part No. 66A76278.
2. A small screwdriver for IF & RF alignment.
3. An accurately calibrated AM modulated signal generator.
4. A low range output meter.
5. A special dummy antenna for RF alignment. Construct dummy antenna as shown in Figure 1. The 21" coaxial lead needed in its construction is the same type as used for lead-in on Motorola car antenna.

PROCEDURE

1. Remove the front and rear housings. All adjustments are now exposed.
2. Connect a PM speaker (3.2 ohm VC) to VC terminal and chassis of receiver and connect the output meter across the voice coil. If the receiver internal speaker is used, ground receiver front housing to chassis.
3. Connect a 6 volt storage battery to chassis and BATT terminal of receiver; turn receiver on and allow it to warm up for a few minutes. Set receiver volume control at maximum.
4. SENSITIVITY CONTROL. This control must be set to provide $2\frac{1}{2}$ volts bias on the RF tubes before alignment is started. Measure this voltage between sensitivity control terminal and chassis.
5. For greatest accuracy, keep output of receiver at approximately 1 watt (1 watt = 1.79 volts on output meter) throughout alignment by reducing generator output (not receiver volume control) as stages are brought into alignment.
6. IF ALIGNMENT
 - A. Connect high side of signal generator through .1 mf capacitor to 6BE6 grid (pin #7) and the low side to chassis. Set generator to 455 Kc and peak adjustments (1, 2, 3 & 4), in this order, for maximum output.
 - B. Check alignment by repeating procedure.

7. RF ALIGNMENT

A. Connect signal generator to antenna receptacle through special dummy antenna (60 mmf capacitor in series with 21" coax lead).

B. Move carriage plate (by turning manual tuning shaft) to extreme high frequency position and screw coil cores out so that at least $1\frac{1}{8}$ " of all three cores shall be outside of the coil shield can. Set signal generator to 1605 Kc and peak trimmers (5, 6 and 7), in this order.

C. Move the carriage plate (by turning manual shaft) so carriage plate is spaced exactly $1\frac{5}{64}$ " from coil shield plate. Set signal generator to 1425 Kc and adjust coil cores (8, 9 & 10), in this order, for maximum output.

D. Move carriage plate (by turning manual tuning shaft) so carriage plate is spaced approximately $7/32$ " from coil shield plate. Leave signal generator connected but turn signal generator power off. Peak oscillator padder core (11) for maximum noise. If the padder core must be moved more than $1/2$ turn from its original position, the carriage plate should be moved to extreme high frequency position, the coil cores (8, 9 & 10) should be screwed out so that $1\frac{1}{8}$ " of each core is exposed and steps 7A, B, C & D repeated until it is necessary to move the padder core less than $1/2$ turn in this step.

IMPORTANT: Do not push in on the alignment tool when adjusting the tuner cores. The slightest inward pressure on the alignment tool may move the tuner carriage and result in inaccurate alignment.

8. SETTING THE SENSITIVITY CONTROL. After alignment is completed, set signal generator to 600 Kc and adjust its output to 1.3 microvolts. Adjust the sensitivity control to provide 1 watt output (1 watt = 1.79 volts on output meter).

9. ANTENNA TRIMMER ADJUSTMENT. Once steps 7A, B, C, D & 8 have been satisfactorily performed, no further adjustment of any alignment screws should be made except to align the antenna trimmer (7) to car antenna after receiver is installed in car. This adjustment should be made with antenna fully extended and receiver set to approximately 1400 Kc. Peak the trimmer for maximum volume of a weak station or background noise between stations.

MODEL 409

MOTOROLA INC.

REPLACEMENT PARTS LIST

REF. NO.	PART NO.	DESCRIPTION	REF. NO.	PART NO.	DESCRIPTION
CHASSIS PARTS - ELECTRICAL					
CAPACITORS					
C-1	21B7562	Ceramic: 100 mf 500V	R-2	6R3992	150
C-2	20K485811	Trimmer, variable mica: range 50 to 180 mf (on same bracket as C-7 & C-22 and sold only as assembly)	R-3	18K77552	Sensitivity Control: 700 ohms
C-3	8A4529	Paper: .006 mf 100V	R-4	6R6075	100,000
C-4	8A13514	Paper: .05 mf 100V	R-5	6R6056	47,000
C-5	8A13514	Paper: .05 mf 100V	R-6	6R476060	10,000 2W
C-6	21K70720	Molded: 5 mf 500V	R-7	6R6001	68,000
C-7	20K485811	Trimmer, variable mica: range 50 to 180 mf (on same bracket as C-2 & C-22 and sold only as assembly)	R-8	6R3992	150
C-8	8K13166	Paper: .1 mf 400V	R-9	6R6010	330
C-9	21R6513	Mica: 50 mf 300V	R-10	6R5614	56 10K
C-10	21K74661	Ceramic: 50 mf 300V	R-11	6R5614	56 10K
C-12	8A14791	Paper: .05 mf 400V	R-12	18A480773	Volume Control: 500,000; with SPST switch
C-13	8A17028	Paper: .5 mf 100V	R-13	6R6004	1 Meg
C-14	8A19133	Paper: .5 mf 100V	R-14	6R6004	1 Meg
C-15	8A13514	Paper: .05 mf 100V	R-15	6R6161	1500
C-16	21R6513	Mica: 50 mf 300V	R-16	6R2118	3.3 Meg
C-17	21K74661	Ceramic: 50 mf 300V	R-17	6R6032	470,000
C-18	21R6639	Paper: .03 mf 400V	R-18	6R6015	220,000
C-19	8A12840	Paper: .006 mf 1600V	R-19	6R6336	270 10K 1W
C-20	8K23690	Paper: .01 mf 400V	R-20	6R476004	1000 2W
C-21	23A473015	Electrolytic: 30-30 20 mf/350-300-25V	R-21	6R6054	10,000
C-22	20K485811	Trimmer, variable mica: range 395 to 470 mf (on same bracket as C-2 & C-7 and sold only as assembly)	Power Switch (Part of volume control)		
SWITCHES					
S-1					
SHIELD					
SH-1 &					
SH-2	30K472998	Cable, shielded: 5' long, single conductor			
SPARK PLATE					
SP-1	1X472741	Spark Plate Assembly			
TRANSFORMERS					
T-1 &					
T-2	24B76553	Diode or IF, 455 Kc: complete with padding capacitors and tuning iron cores, but less shield			
T-3	25B70171	Output			
T-4	25B472533	Power			
TUNER					
	1X472702	Manual Tuner MT-59			
CHASSIS PARTS - MECHANICAL					
42A4215		Clip, vibrator grounding			
58A480774		Coupling, tinerman shaft (on volume control)			
1X70646		Receptacle, antenna			
S57771		Rivet: .088 x 3/16 steel; nhl			
S57706		pl (tube socket mtg)			
S57706		Rivet: .122 x 1/8 steel; nhl			
S57706		pl (terminal strip mtg and sensitivity control mtg)			
S57707		Rivet: .122 x 5/32 steel; nhl			
S57701		pl (tube socket mtg)			
S57701		Rivet: .122 x 3/16 steel; nhl			
S57701		pl (vibrator grounding clip mtg and output trans mtg)			
358140		Screw, sheet metal: #8 x 3/16			
357454		PKZ plain box head; cad pl (tuner mtg)			
357454		Screw, sheet metal: #8 x 1/4			
HOUSING PARTS					
1KX580617		Escutcheon (complete)			
1X580718		Housing, front: includes 2 grounding wipers; less escutcheon			
1KX580640		Housing, rear			
S57730		Rivet: .122 x 1/8 steel; antique copper finish (grounding wiper mtg)			
357454		Screw, sheet metal: #8 x 1/4 (escutcheon mtg)			
357454		PKZ plain box head; cad pl (escutcheon mtg)			
357456		Screw, sheet metal: #8 x 1/4; PHA slotted across head; antique copper finish (housing screws)			
352696		Screw, sheet metal: #10 x 3/8 PHA plain box washer head; cad pl (sprit mtg)			
39K470032		Wiper, grounding			
ACCESSORIES					
3A51494		Bolt, "J" (receiver mtg)			
8A4491		Capacitor, generator			
1X74340		Lead Assembly, dial light: complete with bulb			
9B473111		Lead Assembly, fuse: complete with 10 Amp fuse			
457653		Lockwasher: 5/16 int-ext; cad pl (receiver mtg)			
352B63		Nut; hex: 5/16-18 x 9/16 cad pl (receiver mtg)			
1K75148		Shaft, flexible: with hang; 24" long			
6X4141		Suppressor, distributor			

NATIONAL COMPANY, INC.

MODELS NC-108R,
NC-108T**SECTION 1. INSTALLATION****1-1. Installation Procedure**

After the NC-108 has been removed from its packing crate proceed as follows:

1. Connect a good external ground (water pipe or radiator) to the G terminal on the antenna terminal strip at the rear of the Receiver. This connection is not absolutely required but, in certain localities, better reception can be achieved by such a connection.

2. Connect the antenna as recommended in Section 1-2.

3. Connect the external audio amplifier, if one is used, as follows: connect the input terminals of the amplifier to the output terminals, X-2, at the rear of the NC-108, terminal 2 is the ground connection. The A.C. line plug of the amplifier may be connected to the A.C. socket, X-1, at the rear of the NC-108. With such a connection both units will receive their power from the same A.C. power source and the A.C. line switch on the NC-108 can be used to turn both units on and off.

4. Connect the power cord, P-1, to a 110/125 volt, 50/60 cycle, A.C. source of supply.

5. Set controls as recommended in Section 2 for the reception of stations.

1-2. Antenna Recommendations

The antenna input circuit of the NC-108 is arranged for operation from either a single-wire type, doublet type antenna or other types having impedances of 70 ohms or more. The input impedance of the antenna circuit is approximately 300 ohms.

The use of an efficient antenna with the NC-108 is strongly recommended if optimum results are to be obtained. Although, if the Receiver is to be operated in localities relatively close to F.M. transmitting stations, a single-wire antenna of from 2 to 10 feet may prove very satisfactory. The two types of antennae shown on Figure No. 2 have proven to be highly efficient. The drawing shows sufficient detail so that either one or the other type of antenna can

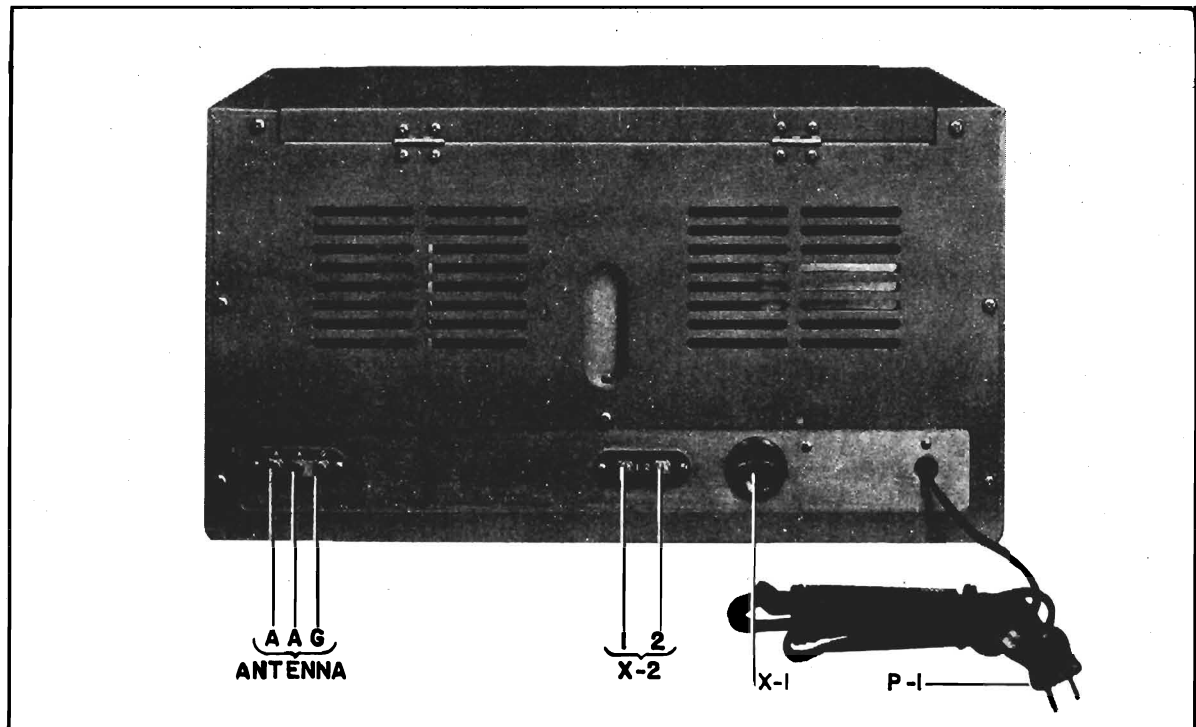


Figure No. 1. Rear View of Receiver

MODELS NC-108R,
NC-108T

NATIONAL COMPANY, INC.

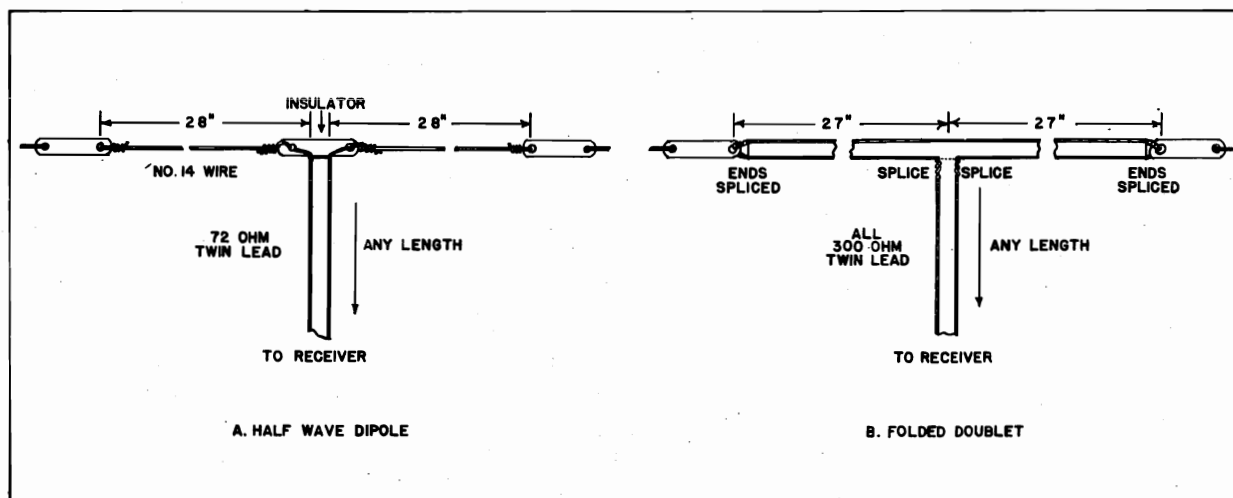


Figure No. 2. Typical Antenna Types

be easily assembled. It will be found that these types of antennae are directional, that is, best results are obtained with the antenna parallel to the transmitting antenna. Only by trial, of course, can the best position for the antenna be determined. There are also available various types of commercial antennae which are very satisfactory. Some of these are directional, while others are designed to give good results no matter what the position of the antenna is, relative to the transmitting antenna. Regardless of which type of antenna is employed, better reception will be obtained if the antenna is mounted in an

area free of obstructions. Atop the roof usually proves a good mounting place.

The method of connecting the various types of antennae to the antenna terminal strip at the rear of the Receiver is as follows:

1. Single-wire type--Connect antenna to terminal A at the left of the strip.
2. Doublet type--Connect the antenna feeders to the two terminals marked A.

For either of the above type of connections attaching the metal link on the G terminal to the adjacent A terminal should be tried and left in the position giving the best reception.

SECTION 2. OPERATION

2-1. Operating Instructions

After the NC-108 is properly installed, as outlined in Section 2-1, it is placed in operation by adjusting the receiver controls in the following manner:

1. Set the MONITOR switch at On. This switch silences the loud-speaker on the NC-108 when it is in the Off position. The MONITOR switch positions do not effect the external amplifier-loud-speaker system connected to the NC-108.

2. Turn the VOLUME control to approximately 5. This control adjusts receiver volume from a minimum at zero to a maximum at 10.

3. Turn the TONE control from A.C. Off to zero thus turning On the Receiver and the external audio system, if the A.C. socket, X-1, is used as the power source for the external system. The Tone control progressively adjusts the tonal output of the NC-108 from normal receiver reproduction at 10 to an output at zero, in which the higher tones are subdued, emphasizing the lower tones.

4. Tune in the desired station by means of the Main Tuning knob. The dial scale is calibrated directly in megacycles and also is marked with channel indicating numbers. The correct dial setting for any specific station will be indicated as

NATIONAL COMPANY, INC.

MODELS NC-108R,
NC-108T

follows:

a. NC-108T--maximum closing of the Tuning Eye.

b. NC-108R--maximum deflection of the Tuning Meter pointer.

After the four steps above have been completed, the operator may readjust the VOLUME and TONE controls to achieve the desired output characteristics of volume and tone, respectively.

2-2.. Operation with an External Audio System

After the external amplifier-loud-speaker system, to be used with the NC-108, has been installed as outlined in Section 2-1, operation of both units is accomplished as follows:

1. Initial adjustment of the NC-108 is the same as though it were to be used

alone, and the procedure in Section 2-1 should be followed.

2. After the desired station has been properly tuned in on the NC-108, set the MONITOR switch at Off and adjust the external amplifier controls (volume and tone) for the desired output from the external loud-speaker.

It is important that the control adjustments of the NC-108 are accomplished before those of the external amplifier.

It should be noted that use of the A.C. socket, X-1, as the power source for the external audio system will permit extreme flexibility in the placement of units. After the completion of the initial adjustments, the NC-108 may be located at the operating position and the external audio system may be placed at a remote position.

SECTION 3. ALIGNMENT DATA

3-1. General

The alignment of the NC-108 may be divided into two steps:

1. Intermediate Frequency Amplifier Alignment.

2. R.F. Amplifier Alignment

a. H.F. Oscillator

b. Mixer and R.F. Amplifier

The necessity for any realignment may be determined by checking the performance of the NC-108 against its normal operation, as outlined in Section 2, and the dial calibration. It is recommended that any indicated realignment be accomplished by experienced personnel.

3-2. I.F. Amplifier Alignment

The intermediate frequency of the NC-108 is 10.7 megacycles. The three I.F. transformers and the ratio detector transformer have permeability tuned iron-core inductors with screw adjustments for alignment purposes. The inductor adjustments L-3, L-5, L-7 and L-11 are accessible from the top inside of the cabinet and the inductor adjustments L-4, L-6, L-8 and L-10 from the bottom inside of the cabinet. See Figure Nos. 3 and 4.

The alignment procedure is as follows:

1. Connect the "high" output lead of an accurately calibrated signal generator to the stator of the mixer portion, C-2C, of the main tuning capacitor and the ground lead to any convenient grounded point on the chassis. Set the signal generator at 10.7 megacycles and turn the modulation off.

2. Connect the D.C. volt probe of a high-impedance vacuum tube voltmeter to the junction of R-27 and C-36 (diode load) and the common lead to chassis. Use the 10 volt scale of the meter.

3. Connect the power cord of the NC-108 to a 110/125 volt, 50/60 cycle, A.C. source of supply.

4. Set the VOLUME control at zero.

5. Set the MONITOR switch at OFF.

6. Set the TONE control at zero.

7. Adjust the attenuator of the signal generator for a reading of approximately 3 volts on the voltmeter. (The diode load voltage is negative with respect to chassis.)

8. Adjust the I.F. inductors L-3 thru L-8 and L-10 for maximum, as indicated on the voltmeter, retarding the attenuator as necessary to maintain a low reading in the

MODELS NC-108R,
NC-108T

NATIONAL COMPANY, INC.

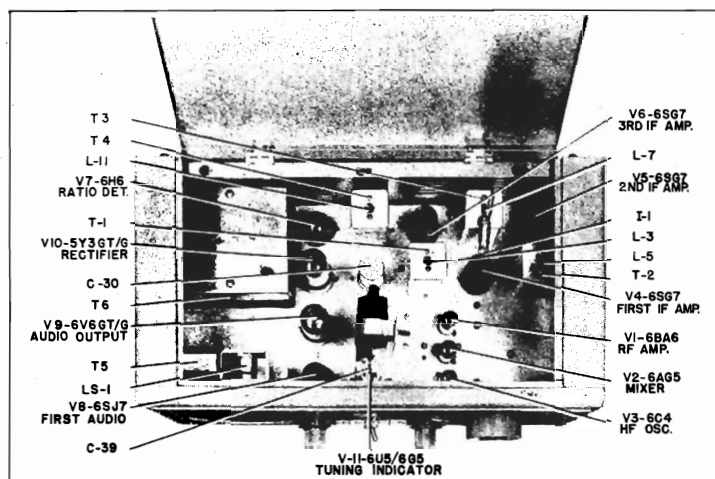


Figure No. 3. Top View of Receiver

vicinity of 3 volts on the voltmeter. The maintenance of a low meter reading is recommended to assure proper alignment.

9. Increase the attenuator of the signal generator until a reading of 10 volts is obtained on the voltmeter.

10. Connect the D.C. volt probe of the voltmeter to the junction of R-29 and C-37. Adjust the secondary inductor L-11 for a reading of 5 volts on the voltmeter without disturbing the setting of the attenuator of the signal generator.

11. Check the voltmeter reading with the voltmeter probe connected to R-27 and C-36. Repeat the adjustments of L-10 and L-11, as necessary, until the voltmeter reading obtained at R-29 and C-37 is one-half the reading at R-27 and C-36.

3-2. R.F. Amplifier Alignment

The R.F. amplifier, mixer and H.F. oscillator stages have variable trimmer capacitors, C-1, C-9 and C-5 respectively, for alignment adjustments. See Figure No. 4. Alignment is accomplished using an accurate test signal of 108 megacycles. The signal source may be a signal generator, crystal oscillator or an F.M. broad-

cast station of known frequency near the upper frequency limit of the NC-108. The alignment procedure is as follows:

1. Connect the signal source to the two A antenna terminals; disconnect the metal link. In the case where a signal generator is used, make the connection through a 300 ohm dummy antenna. In the case where the signal from an F.M. broadcast station is used, connect the antenna to the antenna terminals.

2. Connect the power cord of the NC-108 to a 110/125 volt, 50/60 cycle, A.C. source of supply.

3. Set the MONITOR switch at On.

4. Set the VOLUME control at approximately 5.

5. Set the TONE control at 10.

6. Set the main tuning dial pointer to the exact frequency of the test signal.

7. Adjust the H.F. oscillator trimmer capacitor, C-5, to receive the test signal.

8. Adjust trimmers C-1 and C-9 for maximum gain as observed on the visual tuning indicator.

9. Check step 7 and repeat steps 7 and 8 as necessary.

SECTION 4. MAINTENANCE AND TEST DATA

4-1. Circuit

A stage outline of the circuit employed in the NC-108 is given below together with the tube associated with each stage:

R.F. Amplifier.....	6BA6
Mixer.....	6AG5
H.F. Oscillator.....	6C4
First I.F. Amplifier.....	6SG7
Second I.F. Amplifier.....	6SG7
Third I.F. Amplifier.....	6SG7

NATIONAL COMPANY, INC.

MODELS NC-108R,
NC-108T

Ratio Detector.....6H6
 First Audio.....6SJ7
 Audio Output.....6V6GT/G
 Rectifier.....5Y3GT/G
 Tuning Indicator.....6U5/6G5

The tuning indicator tube, 6U5/6G5, is used on the NC-108T only.

4-2. General Maintenance Data

The NC-108 is designed and constructed to assure a long period of uninterrupted service. A few service hints are given below to aid in locating individual components which, due to age or weakness, cause abnormal operation of the NC-108.

Vacuum tube failure may be evidenced by reduction in sensitivity, intermittent operation or an inoperative Receiver. Tubes may be checked in suitable tube testing equipment, or by replacement with tubes of proven quality. Care must be taken that tubes removed for checking are returned to their original sockets. Tubes of the same type will vary slightly in their individual characteristics and selection of a new tube that closely approximates the replaced tube will reduce the necessity of realignment.

Bypass or filter capacitors which become open may cause decreased sensitivity, oscillation, or complete failure of the Receiver. The defective unit can be located by temporarily connecting a good capacitor in parallel with each suspected capacitor. Leaky or short-circuited capacitors can be detected by an ohmmeter check; a zero resistance reading of the ohmmeter will indicate a shorted capacitor.

Defective resistors, sometimes caused by capacitor failure in associated circuits, can be definitely located by measuring the resistance of each resistor. The Schematic Diagram should be consulted to ascertain that any particular resistor under test is not connected in parallel with some other circuit element which might produce a false measurement. An overloaded resistor may be located by visual inspection if the resistor becomes scorched due to excessive heating.

4-3. Voltage Tabulation

The measurements of voltage shown on the following table are tabulated using a high-impedance vacuum tube voltmeter with a line voltage of 115 volts and the antenna disconnected. The control settings to be

observed are as follows:

1. VOLUME control at zero.
2. Main tuning dial pointer at low frequency limit.
3. TONE control at zero.
4. MONITOR switch at On.

All voltages are measured between specified terminal and chassis.

TUBE TERMINAL	PIN	VOLTS $\pm 15\%$
R.F. Amp. Grid	1	-.76
R.F. Amp. Plate	5	208
R.F. Amp. Screen	6	90
R.F. Amp. Cathode	2-7	0
Mixer Grid	1	0
Mixer Plate	5	203
Mixer Screen	6	173
Mixer Cathode	2-7	3.7
H.F. Osc. Plate	1	90
H.F. Osc. Grid	6	-6
H.F. Osc. Cathode	7	0
First I.F. Amp. Cathode	3-5	0
First I.F. Amp. Grid	4	-.76
First I.F. Amp. Screen	6	103
First I.F. Amp. Plate	8	187
Second I.F. Amp. Cathode	3-5	0
Second I.F. Amp. Grid	4	-.8
Second I.F. Amp. Screen	6	100
Second I.F. Amp. Plate	8	190
Third I.F. Amp. Cathode	3-5	0
Third I.F. Amp. Grid	4	0
Third I.F. Amp. Screen	6	110
Third I.F. Amp. Plate	8	175
Ratio Det. Plate No. 2	3	-.45
Ratio Det. Plate No. 1	5	-.1
Ratio Det. Cathode No. 2	4	-.1
Ratio Det. Cathode No. 1	8	0
First Audio Grid	4	0
First Audio Cathode	5	1.35
First Audio Screen	6	36
First Audio Plate	8	73
Audio Output Plate	3	201
Audio Output Screen	4	208
Audio Output Grid	5	0
Audio Output Cathode	8	10.5
Tuning Indicator Plate	2	12*
Tuning Indicator Grid	3	-.1*
Tuning Indicator Target	4	208*
Tuning Indicator Cathode	5	0*
Rectifier Filament	2	235
Rectifier Plate No. 2	4	275 A.C.
Rectifier Plate No. 1	6	275 A.C.
Rectifier Filament	8	235

* Used on NC-108T only.

MODELS NC-108R,
NC-108T

NATIONAL COMPANY, INC.

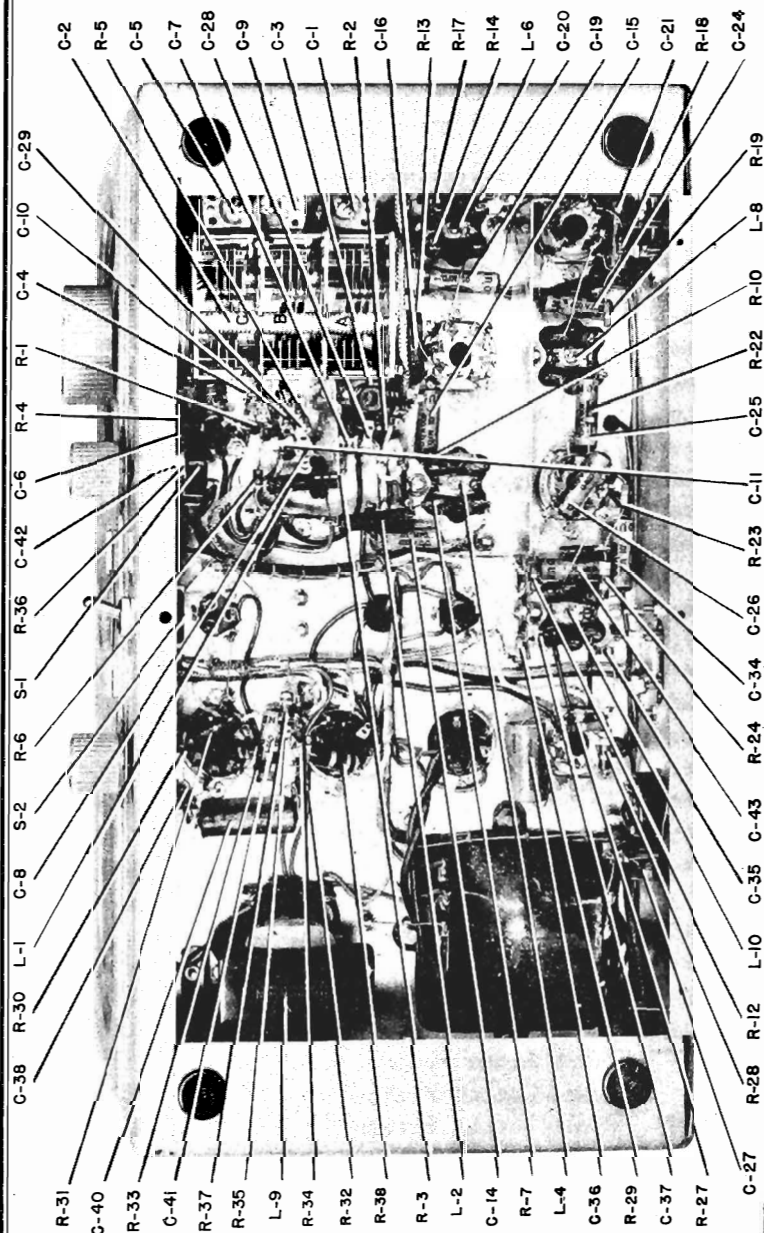
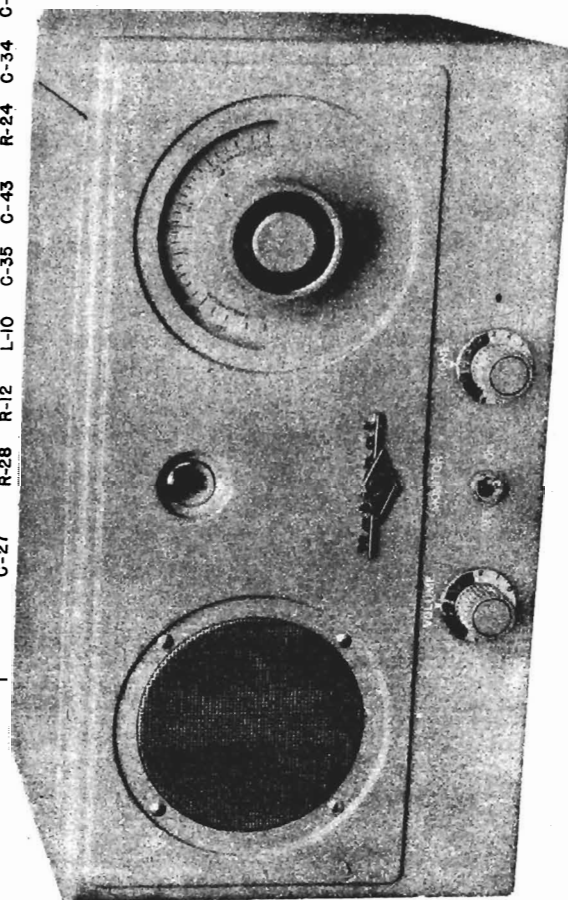


Figure No. 4. Bottom View of Receiver

The only electrical difference between the NC-108T, table model, and the NC-108R, rack model, is in the type of tuning indicator circuit used. The NC-108T employs a tuning eye tube, and the NC-108R employs a milliammeter, for use as a visual tuning indicator.

The milliammeter pointer on the NC-108R should be at the first scale marker with the Receiver turned on and with no signal input. If correction is required it is made by the screw-adjustment on the bezel of the meter.



NATIONAL COMPANY, INC.

MODELS NC-108R,
NC-108T

SECTION 5. PARTS LIST

Symbol	Function	Rating
CAPACITORS		
C-1	R.F. Amp. Trimmer	Ceramic, Var. 5-20 mmf.
C-2	Main Tuning	Air, Var. 3 Sec. Ganged
C-2A	R.F. Amp. Tuning	4-24 mmf., Part of C-2
C-2B	H.F. Osc. Tuning	4-24 mmf., Part of C-2
C-2C	Mixer Tuning	4-24 mmf., Part of C-2
C-3	R.F. Amp. Grid Coupling	Ceramic, 50 mmf. 500 vdcw
C-4	H.F. Osc. Plate Fil.	Ceramic, 100 mmf. 500 vdcw
C-5	H.F. Osc. Trimmer	Ceramic, Var. 5-20 mmf.
C-6	H.F. Osc. Grid Coupling	Ceramic, 100 mmf. 500 vdcw
C-7	R.F. Amp. Screen Bypass	Ceramic, 100 mmf. 500 vdcw
C-8	Mixer Grid Coupling	Ceramic, 100 mmf. 500 vdcw
C-9	Mixer Trimmer	Ceramic, Var. 5-20 mmf.
C-10	Mixer Cathode Bypass	Ceramic, 0.001 mfd 500 vdcw
C-11	Mixer Screen Bypass	Ceramic, 100 mmf. 500 vdcw
C-12	T-1 Primary Tuning	Ceramic, 100 mmf. 500 vdcw
C-13	T-1 Sec. Tuning	Ceramic, 100 mmf. 500 vdcw
C-14	Mixer Plate Bypass	Paper, 0.01 mfd. 400 vdcw
C-15	1st. I.F. Amp. Grid	Paper, 0.01 mfd. 400 vdcw
C-16	1st. I.F. Amp. Screen Bypass	Paper, 0.01 mfd. 400 vdcw
C-17	T-2 Primary Tuning	Ceramic, 100 mmf. 500 vdcw
C-18	T-2 Secondary Tuning	Ceramic, 100 mmf. 500 vdcw
C-19	1st. I.F. Amp. Plate Bypass	Paper, 0.01 mfd. 400 vdcw
C-20	2nd. I.F. Amp. Grid Fil.	Paper, 0.01 mfd. 400 vdcw
C-21	2nd. I.F. Amp. Screen Bypass	Paper, 0.01 mfd. 400 vdcw
C-22	T-3 Primary Tuning	Ceramic, 100 mmf. 500 vdcw
C-23	T-3 Secondary Tuning	Ceramic, 100 mmf. 500 vdcw
C-24	2nd. I.F. Amp. Plate Bypass	Paper, 0.01 mfd. 400 vdcw
C-25	3rd. I.F. Amp. Cathode Bypass	Paper, 0.01 mfd. 400 vdcw
C-26	3rd. I.F. Amp. Screen Bypass	Paper, 0.01 mfd. 400 vdcw
C-27	A.C. Line Bypass	Paper, 0.01 mfd. 400 vdcw
C-28	R.F. Amp. Filament Bypass	Ceramic, 100 mmf. 500 vdcw
C-29	Mixer Filament Bypass	Ceramic, 100 mmf. 500 vdcw
C-30		Elect, 10+10 mfd 450 vdcw
C-30A	Power Supply Filter	Part of C-30
C-30B	Power Supply Filter	Part of C-30
C-31	T-4 Primary Tuning	Mica, 100 mmf. 500 vdcw
C-32	T-4 Secondary Tuning	Mica, 200 mmf. 500 vdcw
C-33	T-4 Secondary Tuning	Mica, 200 mmf. 500 vdcw
C-34	3rd. I.F. Amp. Plate Bypass	Paper, 0.01 mfd. 400 vdcw

Symbol	Function	Rating
CAPACITORS (Continued)		
C-35	Ratio Det. Load	Ceramic, 0.001 mfd 500 vdcw
C-36	Ratio Det. Load	Elect, 10 mfd 50 vdcw
C-37	De-emphasis	Ceramic, 0.001 mfd 500 vdcw
C-38	Audio Coupling	Paper, 0.01 mfd. 400 vdcw
C-39		Elect, 25+25+8 mfd
C-39A	1st. Audio Cathode Bypass	25 mfd, 50 vdcw
C-39B	1st. Audio Plate Fil.	8 mfd, 450 vdcw
C-39C	Audio Output Cathode Bypass	25 mfd, 50 vdcw
C-40	1st. Audio Screen Bypass	Paper, 0.1 mfd. 400 vdcw
C-41	Audio Output Coupling	Paper, 0.01 mfd. 400 vdcw
C-42	Tone	Paper, 0.005 mfd, 500 vdcw
C-43	B Plus Bypass	Paper, 0.01 mfd. 400 vdcw
RESISTORS		
R-1	H.F. Osc. Plate Fil.	Fixed, 33,000 ohms 1 W
R-2	R.F. Amp. Grid	Fixed, 100,000 ohms 1/2 W
R-3	R.F. Amp. Screen Fil.	Fixed, 47,000 ohms 1/2 W
R-4	H.F. Osc. Grid	Fixed, 47,000 ohms 1/2 W
R-5	Mixer Cathode	Fixed, 2,200 ohms 1/2 W
R-6	Mixer Screen Fil.	Fixed, 100,000 ohms 1/2 W
R-7	Mixer Plate Fil.	Fixed, 2,200 ohms 1/2 W
R-8	T-1 Primary Load	Fixed, 47,000 ohms 1/2 W
R-9	T-1 Secondary Load	Fixed, 47,000 ohms 1/2 W
R-10	1st. I.F. Amp. Grid	Fixed, 220,000 ohms 1/2 W
R-11*	Tun. Indicator Plate Load	Fixed, 1,000,000 ohms 1/2W
R-12	A.V.C. Fil.	Fixed, 2,200,000 ohms 1/2W
R-13	1st. I.F. Amp. Screen Fil.	Fixed, 33,000 ohms 1/2 W
R-14	1st. I.F. Amp. Plate Fil.	Fixed, 2,200 ohms 1/2 W
R-15	T-2 Primary Load	Fixed, 47,000 ohms 1/2 W
R-16	T-2 Secondary Load	Fixed, 47,000 ohms 1/2 W
R-17	2nd. I.F. Amp. Grid	Fixed, 220,000 ohms 1/2 W
R-18	2nd. I.F. Amp. Screen Fil.	Fixed, 33,000 ohms 1/2 W
R-19	2nd. I.F. Amp. Plate Fil.	Fixed, 2,200 ohms 1/2 W
R-20	T-3 Primary Load	Fixed, 47,000 ohms 1/2 W
R-21	T-3 Secondary Load	Fixed, 47,000 ohms 1/2 W
R-22	3rd. I.F. Amp. Cathode	Fixed, 100 ohms 1/2 W
R-23	3rd. I.F. Amp. Screen Fil.	Fixed, 33,000 ohms 1/2 W
R-24	3rd. I.F. Amp. Plate Fil.	Fixed, 4,700 ohms 1/2 W
R-25	Ratio Det. Output	Fixed, 47,000 ohms 1/2 W
R-26	Ratio Det. Output	Fixed, 47,000 ohms 1/2 W
R-27	Diode Load	Fixed, 15,000 ohms 1/2 W
R-28*	Diode Load	Fixed, 4,700 ohms 1/2 W
R-28**	Diode Load	Fixed, 10,000 ohms 1/2 W

MODELS NC-108R,
NC-108T

NATIONAL COMPANY, INC.

MISCELLANEOUS (Continued)

L-7	T-3 Primary Ind.	Var. Iron-Core
L-8	T-3 Secondary Ind.	Var. Iron-Core
L-9	Fil. Choke	10 Henries, 100 ma.
L-10	T-4 Primary Ind.	Var. Iron-Core
L-11	T-4 Secondary Ind.	Var. Iron-Core
M-1**	Tun. Meter	0-1 Ma.
P-1	A.C. Power Plug	2 Contacts
S-1	A.C. Line Switch	D.P.D.T.
S-2	Monitor Switch	Toggle, S.P.D.T.
T-1	1st. I.F. Trans.	10.7 Mc.
T-2	2nd. I.F. Trans.	10.7 Mc.
T-3	3rd. I.F. Trans.	10.7 Mc.
T-4	Ratio Det. Trans.	10.7 Mc.
T-5	Audio Output Trans.	5,000/4 Ohms
T-6	Power Trans.	115 V., 50/60 cycles
X-1	A.C. Connector	2 Pole
X-2	Amplifier Connector	2 Terminals
LS-1	Loud-speaker	5" P.M.

* Used on NC-108 T only.

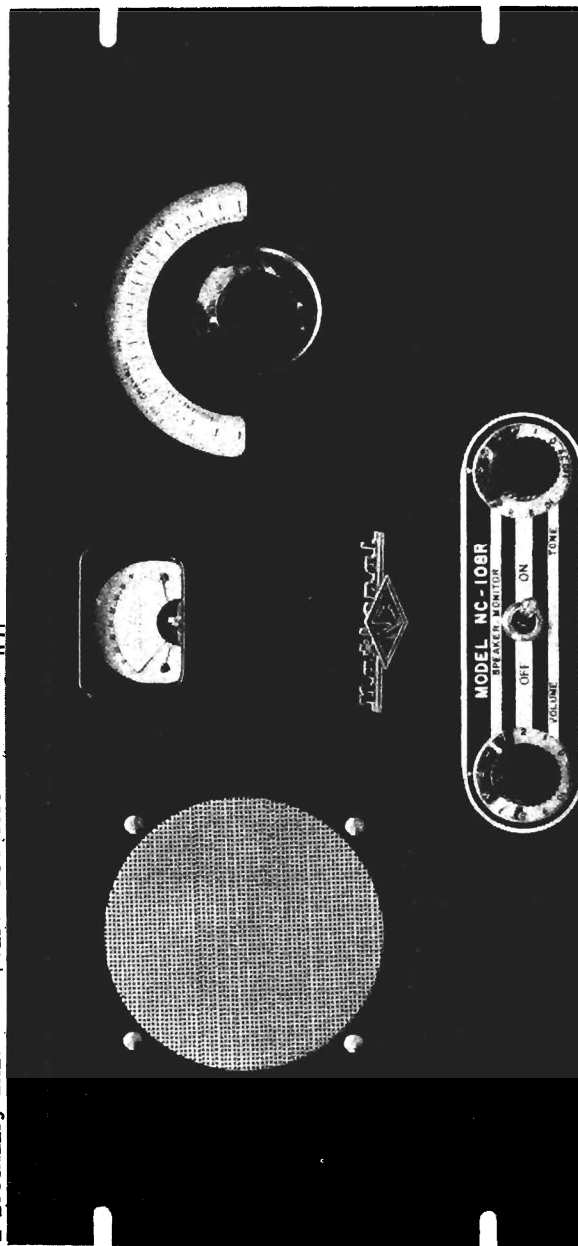
** Used on NC-108 R only.

RESISTORS (Continued)

R-29	De-emphasis	Fixed, 33,000 ohms 1/2 W
R-30	Volume Control	Variable, 500,000 ohms
R-31	1st. Audio Cathode	Fixed, 2,200 ohms 1/2 W
R-32	1st. Audio Screen Fil.	Fixed, 1,000,000 ohms 1/2W
R-33	1st. Audio Plate Load	Fixed, 220,000 ohms 1/2 W
R-34	1st. Audio Screen and Plate Fil.	Fixed, 22,000 ohms 1/2 W
R-35	Audio Output Grid	Fixed, 470,000 ohms 1/2 W
R-36	Tone Control	Variable, 500,000 ohms
R-37	Audio Output Grid Series	Fixed, 470,000 ohms 1/2 W
R-38	Audio Output Cathode	Fixed, 330 ohms 2 W
R-39**	Meter Adjusting	Fixed, 8,200 ohms 1/2 W

MISCELLANEOUS

I-1	Dial Lamp	6-8 V., 0.15 Amp.
I-2**	Meter Lamp	6-8 V., 0.15 Amp.
L-1	R.F. Amp. Plate Load	Choke, 4 microhenries
L-2	B Plus Fil.	Choke, 4 microhenries
L-3	T-1 Primary Ind.	Var. Iron-Core
L-4	T-1 Secondary Ind.	Var. Iron-Core
L-5	T-2 Primary Ind.	Var. Iron-Core
L-6	T-2 Secondary Ind.	Var. Iron-Core



NATIONAL COMPANY, INC.

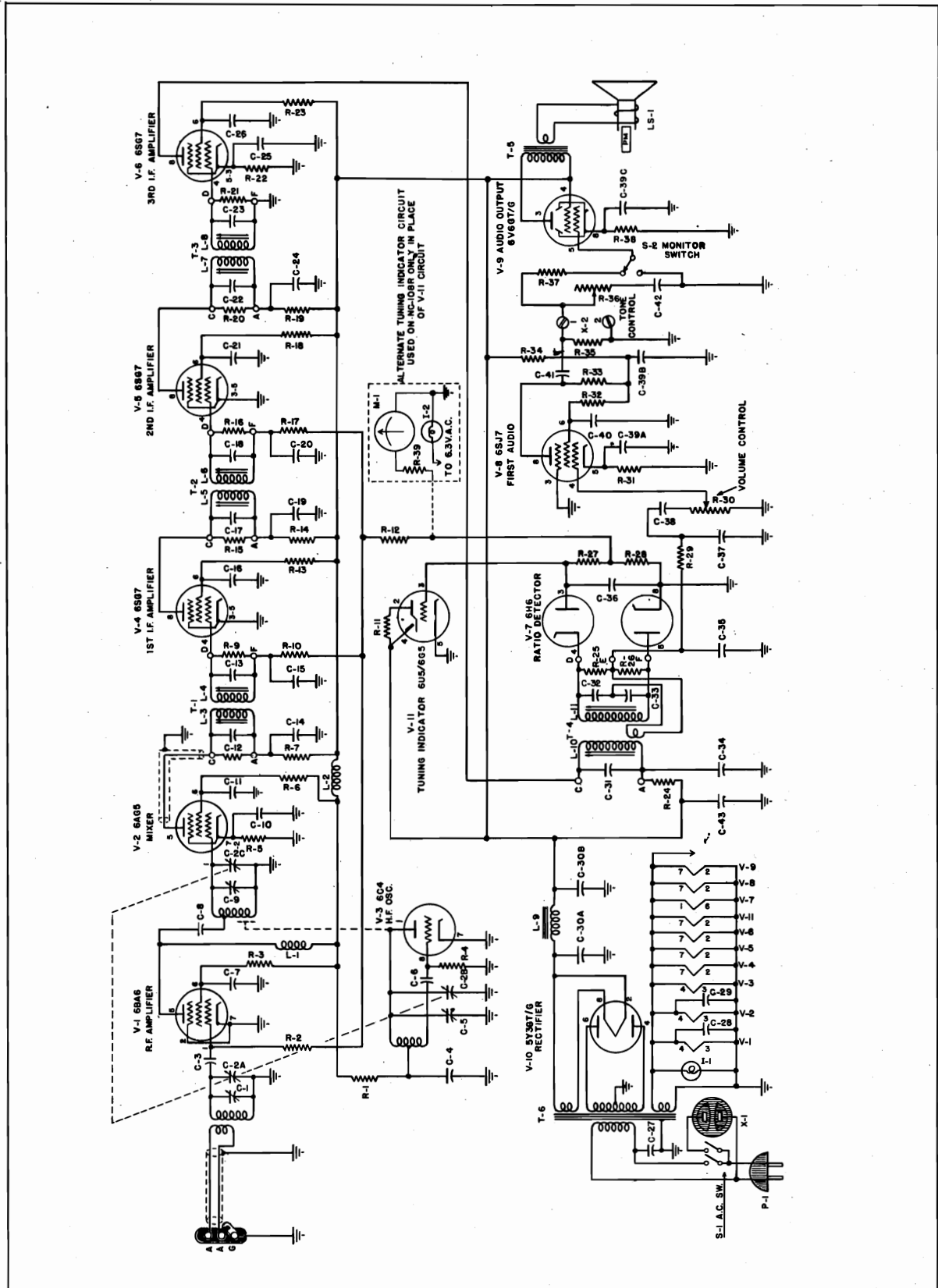
MODELS NC-108R,
NC-108T

Figure No. 5. Schematic Diagram NC-108 Receiver

MODELS NC-108R,
NC-108T

NATIONAL COMPANY, INC.

ADDENDA
NC-108 Receiver

1. A DE-EMPHASIS switch is mounted on the top side of the receiver chassis to the right of the power transformer. In the ON position, the de-emphasis circuit, R-29 and C-37, in the NC-108 functions in a manner to remove from the incoming signal the pre-emphasis (over-emphasis of the higher frequency tones) that is ordinarily imposed on the signal at the transmitter. The listener will, therefore, enjoy reproduction approaching "live" programs. In the OFF position, the DE-EMPHASIS switch alters the de-emphasis circuit in the NC-108 and the pre-emphasis on the signal is, for the most part, retained resulting in reproduction in which the higher frequency tones are over-emphasized.

In operation of the NC-108 the listener should select the position of the DE-EMPHASIS switch which provides, for him, the most enjoyable range of frequency tones. For example, if the NC-108 is used with an external amplifier-loud-speaker, either of which has a tendency to subdue the higher frequency tones, setting the DE-EMPHASIS switch at OFF will result in more realistic reproduction. The action of the TONE control is the same as described in paragraph 2-1 of Section 2, except that the range of the control will depend on the setting of the DE-EMPHASIS switch.

Schematically, the DE-EMPHASIS switch is an S.P.S.T. type and is connected between the ground side of capacitor, C-37, and chassis.

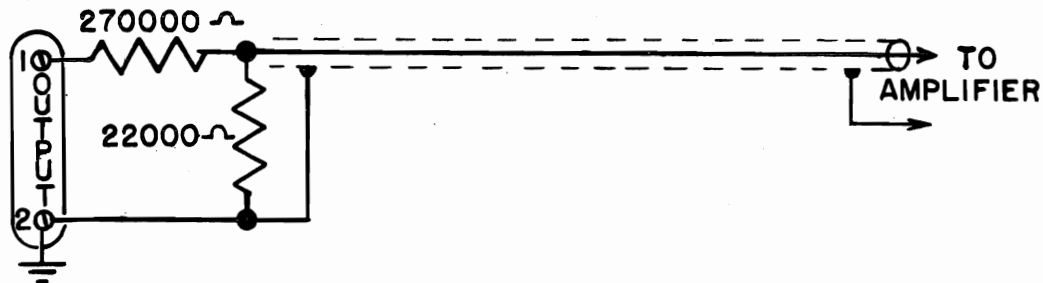
2. The coupling capacitor, C-8, is connected directly to the grid of the mixer tube instead of to the tap on the mixer coil as shown on the Schematic Diagram.

3. The output impedance of the NC-108 is approximately 150,000 ohms and approximately 11 volts, maximum, of undistorted output is available at the output terminals. Most amplifiers have high-impedance input circuits so that the NC-108 will work efficiently with such an amplifier without the use of a matching transformer. The 11 volts of output is more than ample, as the average amplifier requires approximately one volt for operation.

When using the NC-108 with an external amplifier, it is recommended that the interconnection be made using a low-loss shielded cable with a length not exceeding 10 feet and preferably as short as possible. This recommendation is made to prevent the attenuation of high frequency tones due to the capacity of the interconnecting cable.

However, if the NC-108 is to be used in an installation requiring a cable longer than 10 feet, a voltage divider network connected across the output terminals of the NC-108 will compensate for the resulting loss of high-frequency tones due to the longer cable. This network will result in an output with less gain at the NC-108 but this loss in gain can be tolerated when using a high gain amplifier.

The following drawing illustrates the method and components used to install the voltage divider network.

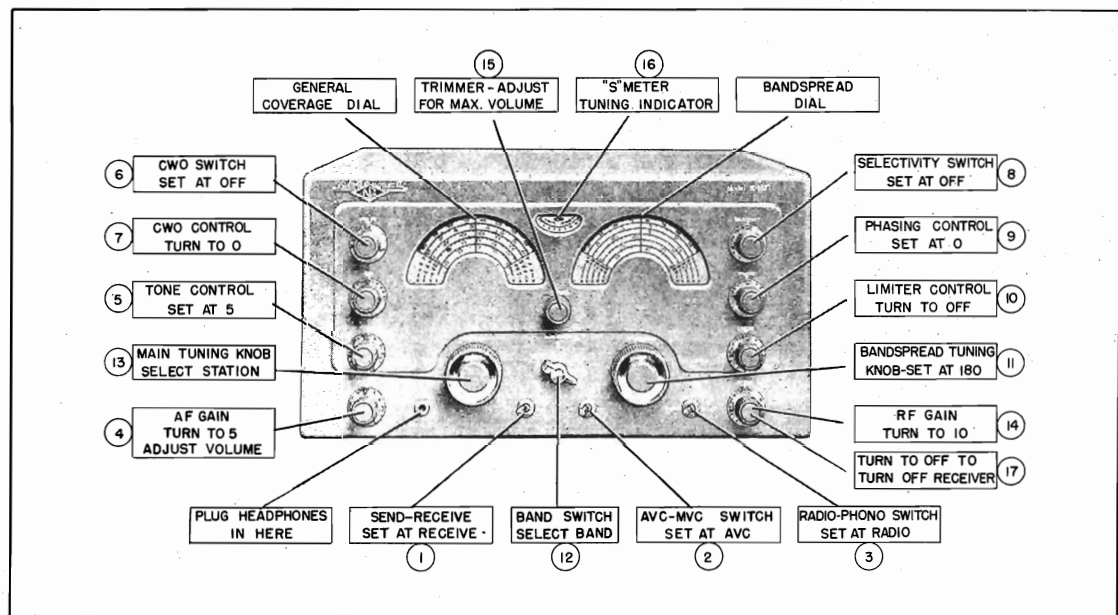


1. Operating Instructions

Operating instructions for the NC-183 Receiver are presented here in a non-technical manner to enable those persons not familiar with a communications-type Receiver to operate the NC-183 efficiently with a minimum of effort. To obtain the maximum in listening pleasure it is recommended that these two pages are thoroughly read before operation of the NC-183 is attempted, although no damage to the Receiver can result through improper adjustment of controls. Installation instructions have been intentionally omitted here because it is recommended that an experienced technician install the NC-183. However, in the event that an inexperienced person must, of necessity, install the Receiver, adhering to the instructions given in Section 2-3 of this Instruction Manual will enable him to do so.

The illustration on this page, identifying and locating Receiver controls, shows the operating procedure to follow in the proper sequence. This same procedure follows with a brief explanation of what each control does. The reader should refer to Section 3 of the Instruction Manual if more detailed and technical information is desired. To tune the Broadcast and Short Wave bands the operating instructions are as follows:

1. Set the SEND-RECEIVE switch at RECEIVE. The SEND position of this switch silences the Receiver for a period of time after which immediate resumption of reception may be had by setting the switch at RECEIVE.
2. Set the A.V.C.-M.V.C. switch at A.V.C. Automatic Volume Control is provided when this switch is in the A.V.C. position to compensate for fluctuating volume due to fading.
3. Set the RADIO-PHONO switch at RADIO. The PHONO position of this switch is used when a record player or similar device is connected to the Phono Input jack at the rear of the Receiver.
4. Turn A.F. GAIN control to 5. Adjustment of the audio volume is made with this control from a minimum at 0 to a maximum at 10. The setting given here is for average volume and should be adjusted to suit the listener.
5. Set the TONE control at 5. A variable selection of tonal output from a bass tone at 0 to a tone at 10 in which the highs are predominant is provided by this control. The setting recommended here will give a normal tonal output but may be changed for different types of programs.
6. Set the C.W.O. switch at OFF. This switch is used only for the reception of code signals.
7. Turn the C.W.O. control to 0. This control is used only for the reception of code signals and does not effect receiver performance with the C.W.O. switch at OFF.
8. Set the SELECTIVITY switch at OFF. This switch is generally used only when interference by other stations is encountered. Its operation is somewhat complex and is not recommended for the inexperienced operator. See Section 3 for detailed instructions.
9. Turn the PHASING control to 0. The PHASING control is used in conjunction with the



SELECTIVITY switch.

10. Turn the LIMITER control to OFF. Reduction of interference caused by static, automobile ignition, etc., can be effected by turning on the LIMITER. Its action is increasingly effective as the control is turned towards 10.

11. Turn the BANDSPREAD tuning dial knob to the set mark at 180 on the linear scale of the BANDSPREAD dial. The BANDSPREAD dial knob and scale should be kept at the above setting when the MAIN TUNING dial knob and scale are used. However, the BANDSPREAD dial may be rotated to either side of the set mark if fine tuning is preferred for Short Wave or Amateur bands.

-NOTE-

The operator is now ready to adjust the tuning controls to select the desired station. Let us, for example, suppose that the desired station is one on the Broadcast band at 1,000 kilocycles.

12. Set the BAND SWITCH at E. The BAND SWITCH selects the band of frequencies to be tuned and is marked with designating letters which correspond to the markings at the edges and throughout the dial scales.

13. Turn the MAIN TUNING dial knob to set the pointer on the GENERAL COVERAGE dial at 1.0 on the E band. Stations on the GENERAL COVERAGE dial scale are selected by means of this control.

14. Turn R.F. GAIN control to 10. This is a dual-purpose control; when turned from A.C. OFF to ON the Receiver is turned on; when turned from 0 to 10 the sensitivity (ability to receive weak and distant stations) is progressively increased to a maximum at 10.

15. Adjust the TRIMMER control for maximum volume. After a station has been tuned in, adjust this control for best reception.

16. S-METER. Maximum deflection of the meter pointer indicates the dial and TRIMMER control setting for optimum tuning.

17. Shutting off the Receiver. To shut off the Receiver, turn the R.F. GAIN control to OFF. This is the only adjustment which completely shuts off the Receiver and the only one which need be made.

2. Frequency Coverage

The GENERAL COVERAGE dial has five scales; four of which are calibrated directly in megacycles and the other has a linear scale numbered 0 to 200. All markings of the Standard Broadcast Band, E, are bright red for clear identification. The other three scales have red letters throughout their range for band identification plus heavy black underlines locating short-wave features marked F, A, and P indicating Foreign, Amateur and Police bands, respectively. The BAND SWITCH positions are also marked with band letter designations to correspond to the markings at the edges and throughout the dial scales. Newspapers and other publications sometimes give the frequency of stations in kilocycles, and as the dial scales of the NC-183 are calibrated in megacycles conversion from kilocycles to megacycles will facilitate location of the station on the Receiver dial. This is done by pointing off three places to the left of the decimal point on the kilocycle figure, i.e., 1,000. kilocycles becomes 1.0 megacycles.

The following table lists each band by its designating letter and the frequency coverage of that band. The frequencies are listed in both megacycles and kilocycles. Also listed are the frequencies of short-wave features to be found on the various bands.

BAND	FREQUENCY COVERAGE		POLICE	INT. B'DCAST	AMATEUR
	Megacycles	Kilocycles	Megacycles	Megacycles	Megacycles
B	12.0 - 31.0	12,000 - 31,000		15.1 - 15.3 17.7 - 17.9 21.5 - 21.7	14.0 - 14.4 21.0 - 21.5 27.160 - 27.430 28.0 - 29.7
C	4.3 - 12.0	4,300 - 12,000		6.0 - 6.2 9.5 - 9.7 11.7 - 11.9	7.0 - 7.3
D	1.6 - 4.3	1,600 - 4,300	1.6 - 1.8 2.25 - 2.5 2.7 - 2.85		3.5 - 4.0
E	0.54 - 1.6	540 - 1,600			

SECTION 1. DESCRIPTION**1-1. General**

The new NC-183 is a deluxe Radio Receiver featuring performance and versatility "plus". Two R.F. stages give the NC-183 that extra measure of sensitivity and image rejection so often needed to insure uninterrupted reception. A double-diode noise limiter, effective on both phone and code reception, minimizes interference caused by external noise pulses. The selectivity characteristic of the NC-183 is adjustable over a wide range from broad-band broadcast requirements to sharp amateur single-signal reception. Voltage regulated high-frequency and beat frequency oscillator circuits assures a minimum of frequency drift for both phone and code reception. Other highlights are an accessory connector socket, a push-pull audio output stage and an S-Meter, with a semi-permanent sensitivity adjustment, for signal strength readings of both phone and code signals.

The NC-183 provides reception of phone and code signals over its entire frequency range of 540 kcs. to 31 mcs. and 48 to 56 mcs. Calibrated bandspread tuning is furnished for the main amateur bands i.e., 6, 10-11, 20, 40 and 80 meters. Separate directly-calibrated dial scales with associated controls are used for general coverage and bandspread tuning.

1-2. Circuit

The NC-183 utilizes 14 tubes, plus a voltage regulator and rectifier, in a superhetrodyne circuit featuring circuit refinements such as two R.F. amplifier stages, a separate A.V.C. amplifier, a double-diode noise limiter and a push-pull audio output stage.

The circuit employed on all bands consists of two stages of radio frequency amplification, a first detector and separate stabilized high frequency oscillator, two intermediate frequency amplifier stages, a diode type second detector, an audio limiter, a high gain audio stage, a phase inverter and a push-pull audio output stage.

The remainder of the Receiver includes automatic volume control, beat frequency oscillator, voltage regulator and rectifier circuits. The crystal filter is connected between the first detector and first I.F. stages.

1-3. Tube Complement

The NC-183 is supplied complete with tubes which are tested in the Receiver at the time of alignment.

The tubes employed are as follows:

First R.F. Amplifier.....	6SG7
Second R.F. Amplifier.....	6SG7
First Detector.....	6SA7
H.F. Oscillator.....	6J5
First I.F. Amplifier.....	6SG7
Second I.F. Amplifier.....	6SG7
Second Detector-A.V.C. Detector.....	6H6
A.V.C. Amplifier.....	6AC7
Beat Frequency Oscillator.....	6SJ7
Noise Limiter.....	6H6
First Audio.....	6SJ7
Phase Inverter.....	6J5
Audio Output (2).....	6V6GT/G
Voltage Regulator.....	OD3/VR-150
Rectifier.....	5U4G

1-4. Tuning System

The main tuning capacitor C-3 and the bandspread tuning capacitor C-4 are connected in parallel on all bands. Separate knobs with associated dial scales are used to operate these two capacitors to tune the frequency range of the Receiver in five bands as follows:

BAND	GENERAL COVERAGE	BANDSPREAD
A		48 - 56 Mc.
B	12 - 31 Mc.	27 - 30 Mc. 14.0- 14.4 Mc.
C	4.3 - 12 Mc.	7.0- 7.3 Mc.
D	1.6 - 4.3 Mc.	3.5- 4.0 Mc.
E	0.54 - 1.6 Mc.	

As will be noted from the above table calibrated bandspread tuning is provided for the 6, 10-11, 20, 40 and 80 meter ama-

teur bands. This tuning system is extremely flexible, in that bandspread tuning may be employed to tune any portion of any band in the 540 kcs. to 31 mc. range.

Band changing is accomplished by means of a highly efficient bandswitch.

Tuning of the first R.F. stage on all bands can be readily adjusted to compensate for a wide range of antenna loading conditions by means of the front panel mounted antenna compensating capacitor.

1-5. Noise Limiter

A new concept in noise limiter design is employed in the NC-183 Receiver. This new limiter could be termed "double action plus" and the noise limiting action is equally effective whether receiving phone or code signals (C.W. oscillator On or Off). A threshold control on the front panel permits adjustments of the level at which limiting action starts.

1-6. Crystal Filter

The selectivity characteristic of the NC-183 is made adjustable by means of a crystal filter. This crystal filter is newly designed and incorporates features which make it highly flexible in its adjustments and superior in performance. The crystal filter provides uniform selectivity variation from the broad off position to the sharp number 5 position as well as phasing action for the attenuation of interfering signals.

1-7. Signal Strength Meter

An S-Meter for signal strength readings is associated with the A.V.C. circuit. The S-Meter scale is calibrated in S units from 1 to 9 with approximately 5 db per S unit and in db above S9 from 0 to 40 db. An adjustment is provided to enable the operator to change the above calibration if he so desires. For the purpose of comparing strong signals, which cause the S-Meter to read off-scale, with other weaker signals the sensitivity of the S-Meter may be lowered by retarding the R.F. GAIN control. The "no signal" S-Meter reading does not require adjustment.

1-8. Accessory Connector Socket

A standard octal socket is mounted on the receiver chassis wired in a manner to

permit connection of various accessories such as a narrow-band F.M. adaptor, crystal calibrator, etc. The drawing of the Accessory Connector Socket on the Schematic Diagram shows the various connections made to the pins of this socket and the voltages available. It will be noted that B+ and filament voltages are made available at this socket.

1-9. Tone Control

The tonal output of the NC-183 Receiver may be varied to suit the listener by means of the TONE Control. This control is helpful when receiving weak signals through interference.

1-10. Antenna Input

Antenna input terminals are provided at the rear of the Receiver. The input circuit is suitable for use with a single wire antenna, a balanced feed line or a low impedance (70 ohm) concentric transmission line. The average input circuit impedance is approximately 300 ohms.

1-11. Audio Output

Two audio output circuits are provided:

(1) The audio output leads are brought to the 3 prong output socket, at the rear of the Receiver, having both 8 and 500 ohm terminals and a common ground terminal. The loud-speaker furnished with the NC-183 is fitted with a cable and plug to connect to the 8 ohm terminal on the output socket, the 500 ohm terminal being available for connection to a 500 ohm line. Approximately 8 watts of undistorted audio output power is available at the output socket while the maximum power is 11 watts.

(2) A headphone jack is front-panel mounted and is wired so as to silence the loud-speaker on the insertion of a phone plug. The headphone load impedance is not critical allowing a wide range of headphone types to be used. If greater audio output is desired the headphone jack connection at terminal No. 2 on the audio output transformer (the 8 ohm tap) may be connected to terminal No. 3 (the 500 ohm tap).

1-12. Phono Input Jack

A phono input jack is mounted at the rear of the Receiver and can be used to

connect auxiliary apparatus, such as a record player, to the audio system of the Receiver. This input circuit is high impedance and feeds into the 6SJ7 first audio amplifier stage. The RADIO-PHONO switch on the front panel must be at the Phono position when the phono input jack is used. The AUDIO GAIN and TONE controls are operative with this connection.

Most record players are terminated in a single shielded wire. The phono input jack on the NC-183 is the type that accommodates a phono tip plug and if the record player to be used is not fitted with such a plug one can be easily attached. If the output circuit of the record player is low impedance (less than 100,000 ohms) better results will be obtained if a suitable resistor, with a value as specified for the particular record player, is connected across the phono tip plug to properly load the record player output circuit.

1-13. Power Supply

The NC-183 Receiver is designed for operation from a 110/120 volt or 220/240 volt 50/60 cycle power source. The Receiver is shipped from the factory with the power transformer wired for 110/120 volt operation only. A few simple wiring changes in the dual primary circuit of the power transformer are necessary to change

the NC-183 for 220/240 volt operation. These changes are made directly on the power transformer terminal lugs and are as follows:

(a) Remove the jumper between terminals 4 and 6 and between 5 and 7.

(b) Connect a jumper between terminals 5 and 6. A drawing of both possible primary circuits is shown on the Schematic Diagram.

Normal power consumption is approximately 125 watts. The built-in power unit supplies all voltages required by the heater and B supply circuits--130 milliamperes at 280 volts and 5.1 amperes at 6.3 volts, respectively. A 2 ampere fuse is connected in one side of the A.C. input line to protect the receiver circuits against any voltage surges in the power line or short circuits in the Receiver. This fuse is mounted in an extractor post at the rear of the Receiver and is easily removed for examination or replacement.

1-14. Loud-Speaker

The loud-speaker supplied with the NC-183 is a 10 inch permanent magnet field type and is mounted in a cabinet finished to match the Receiver. The loud-speaker impedance is 8 ohms and the attached plug connects to the 8 ohm Receiver output circuit.

SECTION 2. INSTALLATION

2-1. Arrangement

The Receiver and loud-speaker may be arranged in any desired position although it is not recommended that the loud-speaker be placed on top of the Receiver as undesirable "microphonics" may result.

2-2. Antenna Recommendations

The antenna input circuit of the Receiver is arranged for operation from either a single-wire antenna, a doublet antenna or other types having impedances of 70 ohms or more. The antenna terminal strip, at the rear of the Receiver, has three terminals, two are for antenna connections and the other for a ground. The ground terminal has connected to it a metal link which is used to ground one antenna

lead as necessary. With balanced antenna systems, such as the doublet type, the metal link is not used. With an unbalanced system, such as the single-wire antenna, it is desirable to ground the unused antenna terminal by means of the metal link. For an unbalanced system of the concentric transmission line type, it is recommended that the outside of the concentric line be grounded directly to the ground lug below the antenna terminal strip. The external ground connection to the ground lug below the antenna terminal strip should be maintained at all times.

The most practical antenna for use in installations where the Receiver is to be used over a wide range of frequencies is the single wire type. An antenna length of from 50 to 100 feet is recommended. The

antenna lead-in should be connected to one antenna terminal and the metal link used to ground the other terminal.

For best impedance matching to the antenna input circuit, an antenna with a 70 to 300 ohm transmission line is recommended. If a doublet type with a 70 to 300 ohm balanced transmission line is used the metal grounding link should not be used. For optimum results the antenna should be cut to the proper length corresponding to the desired operating frequency. See Fig. No. 1. It must be remembered that an antenna installation of this type will have maximum efficiency over a narrow band of frequencies near the frequency for which the antenna was designed and will be most useful in installations where the Receiver is tuned to one frequency or narrow band of frequencies. For other frequencies it

would be desirable to connect the two transmission line leads together at one antenna terminal and the metal link used to ground the other terminal. The antenna is thus utilized as a single wire type.

In an installation where the Receiver is to be used as the receiving unit in a transmitting station, the most efficient operation will usually result from use of the transmitting antenna as a receiving antenna also. This is especially true if the transmitting antenna is of the multi-element, directional type as the same antenna gain is available for both receiving and transmitting--a very desirable condition. For switching the antenna from transmitter to receiver, an antenna change-over relay with good high-frequency insulation is recommended. A second relay for controlling the transmitter plate supply and the Re-

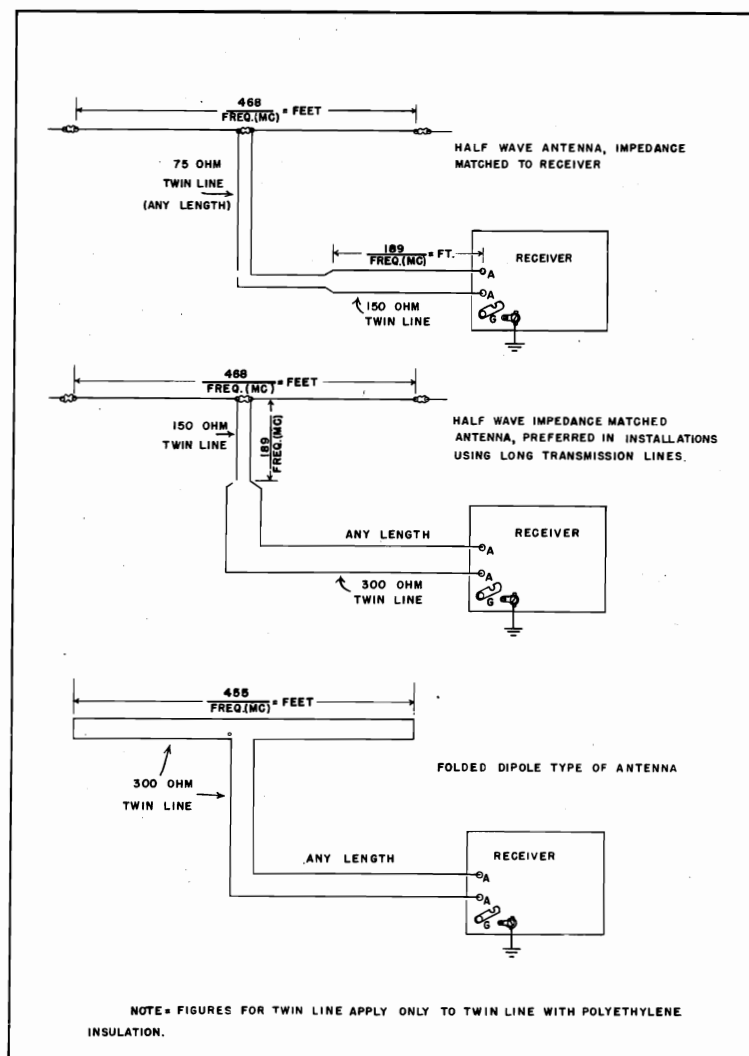


Figure No. 1. Typical Antenna Installations

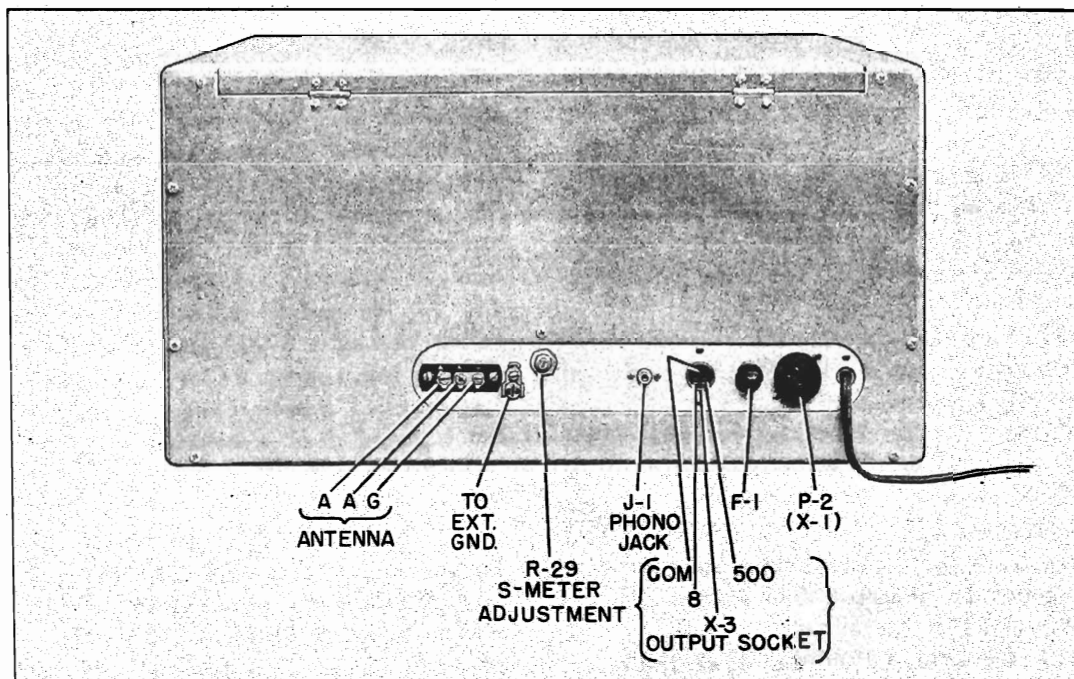


Figure No. 2. Rear View of Receiver

ceiver B+ circuit may be used to achieve single-switch control of the station. This second relay should be a double pole, single throw type having one normally open pair of contacts and one normally closed pair of contacts.

2-3. Installation Procedure

After unpacking the Receiver and Speaker proceed as follows:

- (1) Seat A.C. jumper plug and all tubes firmly in their sockets.
- (2) Insert the loud-speaker plug into the three pin output socket at the rear of the Receiver.
- (3) Connect a good external ground to the screw-type lug located at the rear of the Receiver below the antenna terminal strip.
- (4) Connect the antenna as recommended in paragraph 2-2.
- (5) Connect the power cord to a 115 volt, 50/60 cycle AC source of supply.
- (6) Set controls as recommended in Section 3 for reception of signals.

-NOTE-

Where the Receiver is located in the field of a relatively powerful transmitter, it is advisable to provide some means of preventing damage to the Receiver antenna coil. If a separate receiving antenna is used, a means for disconnecting or ground-

ing the antenna during transmission periods should be provided.

2-4. Battery Operation

The NC-183 may be operated in portable or emergency service by connecting batteries to the terminals of the power socket located at the rear of the Receiver. An octal plug, similar to the A.C. jumper plug, may be wired and used for interconnection between batteries and Receiver. The battery plug used must be wired in accordance with the drawing shown on the Schematic Diagram. A 6 volt heater supply (storage battery) should be connected to terminals 3 and 5 and 135 to 250 volt "B" supply connected to terminals 4 and 8. The recommended "B" voltage supply for battery economy is between 135 and 180 volts. At voltages between 135 and 150 the voltage regulator tube will not ignite affecting a further battery economy. For stand-by operation in all cases it is recommended that a switch be placed in the battery B+ lead for increased battery economy as the "B" switch on the Receiver does not open the B supply circuit to the H.F. oscillator, voltage regulator, and push-pull audio output tubes. A suggested refinement is to include a switch in the A+ lead so that the tube heaters may be turned off when the Receiver is not in use without the necessity of removing the battery plug from the battery socket.

SECTION 3. OPERATION**3-1. Controls**

All controls are identified by front panel markings for ease of identification. The controls are located in a symmetrical manner and are arranged for ease of operation.

The five positions of the BAND SWITCH are marked with identifying band letters plus numerical identification of the Amateur bands covered on the BAND-SPREAD dial scale. These identifying markers correspond to the markers on the dial scale escutcheons. The BAND SWITCH does not have any limit stops so that band changing may be accomplished with a minimum of BAND SWITCH turning.

The GENERAL COVERAGE dial knob operates the main tuning capacitor and turns the main dial scale through a combination pinch drive and anti-backlash gear train. The main dial has five scales; four of which are calibrated directly in frequency, the other having a 0-200 linear scale for auxiliary logging purposes. The main dial escutcheon is marked with frequency limits in megacycles and band letter designations identifying each scale on the dial.

The BANDSPREAD tuning dial knob operates the bandspread tuning capacitor

and turns the bandspread dial scale through a combination pinch drive and anti-backlash gear train which is similar to that used for general coverage tuning. The bandspread dial has six scales; five of which are calibrated in frequency for the 6, 10-11, 20, 40 and 80 meter Amateur bands, the other having a 0-200 linear scale for bandspread logging on other than the frequency calibrated bandspread frequencies. The bandspread dial escutcheon is marked with identifying band letters and amateur band designation for each scale.

The TRIMMER control operates a tuning capacitor which is connected across the first R.F. amplifier section of the main tuning capacitor. The TRIMMER control is used to tune the first R.F. amplifier stage properly under a wide variety of antenna loading conditions.

The R.F. GAIN control adjusts the amplification of the R.F. and I.F. amplifier stages. Clockwise rotation of the control (towards 10) increases Receiver gain. The A.C. POWER switch is associated with the R.F. GAIN control and A.C. power is turned ON as the R.F. GAIN control is advanced from A.C. OFF to 0 on the scale.

The A.F. GAIN control adjusts the

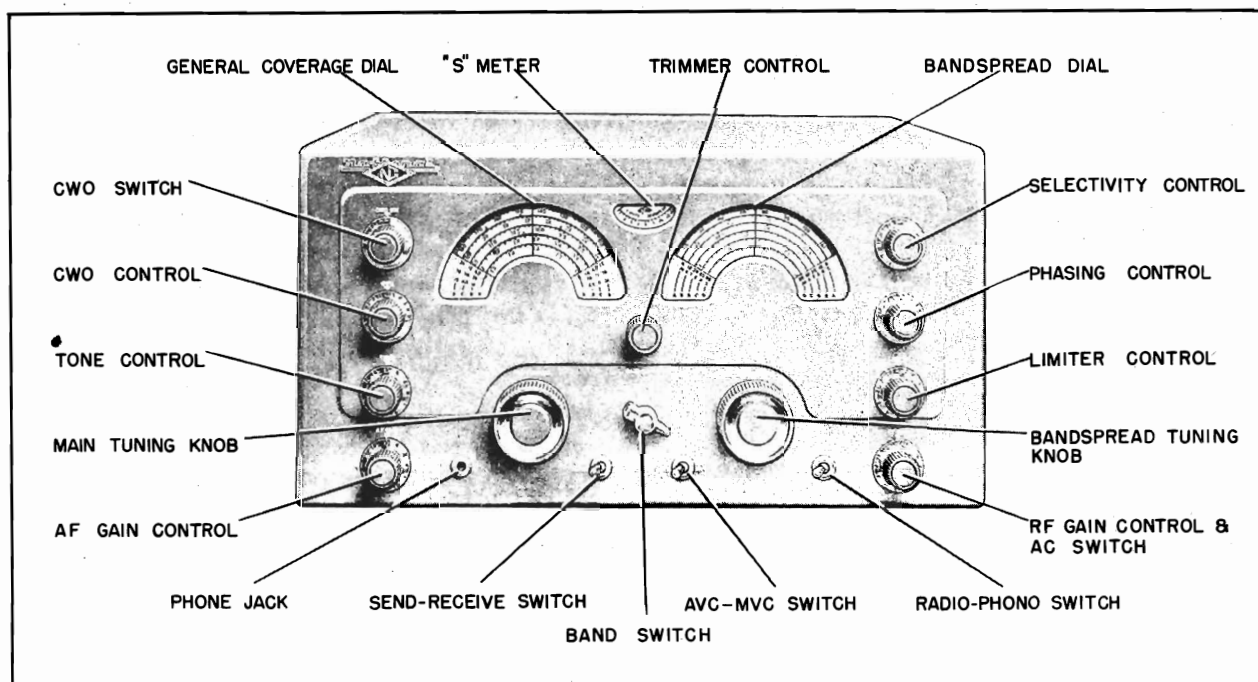


Figure No. 3. Front View of Receiver

amount of audio voltage applied to the first audio tube. Clockwise rotation of the control (towards 10) increases the audio output power of the Receiver. The A.F. GAIN control is operative when an audio signal is applied to the PHONO input jack.

The LIMITER control is used to switch the limiter into the circuit and also to adjust the threshold at which limiting action starts. The limiter is turned ON as the LIMITER control is advanced from OFF to 0 and the threshold is lowered as the control is advanced towards 10. Any noise peak voltages in excess of this adjustable threshold are prevented from reaching the audio amplifier. The limiter circuit is the double-diode type and is equally effective for both phone or code reception.

The TONE control is used to vary the frequency characteristic of the audio output of the Receiver. Turning this control towards 0 on its scale increasingly attenuates the higher frequencies.

The C.W.O. SWITCH and C.W.O. control are only used for the reception of radiotelegraph code signals. The C.W.O. SWITCH is used to turn the C.W. oscillator ON and the C.W.O. control is used to adjust the pitch of the C.W. note. At zero on the C.W.O. scale the C.W. oscillator is tuned to the intermediate frequency of the Receiver.

The PHASING and SELECTIVITY controls adjust the operation of the crystal filter. Receiver selectivity is made progressively sharper as the SELECTIVITY control is turned from OFF towards 5 on its scale. The PHASING control is inoperative with the SELECTIVITY control in the OFF position. The PHASING control is used to attenuate interfering signals and is connected in a bridge circuit so that the bridge can be balanced to reject the undesired signal.

The SEND-RECEIVE switch is used to quiet the Receiver during transmission periods or other times when it is desirable to resume reception immediately (not having to wait for the tubes to warm up). The SEND-RECEIVE switch is connected in the B circuit. See Section 2-4 for use of this switch in battery operation. The SEND-RECEIVE switch should not be used

to silence the Receiver after the completion of an operating period.

External (remote) stand-by control of the Receiver may be accomplished by connecting a switch or relay to terminals 1 and 4 of the A.C. jumper plug as shown on the Schematic Diagram. This is a parallel arrangement permitting the SEND-RECEIVE switch to remain operative with the external switch or relay in the circuit.

The A.V.C.-M.V.C. switch is used to adjust the Receiver for either Automatic Volume Control or Manual Volume Control operation. Automatic Volume Control can be used for either phone or code reception. The A.V.C. time constants have been adjusted so that receiver gain does not change appreciably during average code speed reception.

The RADIO-PHONO switch is set at the Phono position when it is desired to use the audio system of the NC-183 in the event a record player or similar apparatus is connected to the Phono Input jack. In the Phono position all receiver circuits but the audio are rendered inoperative; the AUDIO GAIN and TONE controls remain operative. If it is so desired the record player may remain connected to the Receiver and normal receiver operation resumed by setting the RADIO-PHONO switch at Radio.

The screw-type adjustment at the rear of the Receiver is provided to allow the operator to adjust the sensitivity of the S-Meter. The S-Meter is calibrated at National laboratories so that approximately 50 microvolts equals S-9 and roughly 5,000 microvolts equals 40 db above S-9.

3-2. Phone Reception

After the equipment is properly installed, as outlined in Section 2, it is placed in operation for the reception of phone signals by adjusting the receiver controls as follows:

1. Set the SEND-RECEIVE at Receive.
2. Set the RADIO-PHONO switch at Radio.
3. Set the A.V.C.-M.V.C. switch at A.V.C.
4. Turn the C.W.O. switch to OFF.
5. Set the SELECTIVITY control at OFF.

6. Set the PHASING control at 0.
7. Set the LIMITER control at OFF.
8. Advance the R.F. GAIN control to a point between 8 and 10.
9. Set the A.F. GAIN control at the point providing the desired audio volume.
10. Adjust the TONE control to give the desired audio characteristic.

The Receiver is now adjusted for the reception of phone signals and will tune to the frequency indicated by the tuning dial and band switch settings. Set the TRIMMER control for maximum S-Meter reading after the desired station has been selected, or alternately in the absence of a signal the TRIMMER may be set for maximum receiver background noise.

The tuning system in the NC-183 is arranged for ease of operation and accuracy of calibration. However, it is necessary that the proper settings of the GENERAL COVERAGE and BANDSPREAD dials be observed to maintain accuracy of calibration. For all general coverage tuning the BANDSPREAD dial must be at the 'Set' mark appearing at approximately 180 on the linear scale. For bandspread tuning the GENERAL COVERAGE dial must be set at the proper point corresponding to the Amateur band being tuned. The various "set points" are marked directly on the GENERAL COVERAGE dial scale and are clearly indicated by a circular marker containing the Amateur band designation. The following table lists the location of the GENERAL COVERAGE dial settings for bandspread tuning of the Amateur bands:

AMATEUR BAND	GENERAL COVERAGE DIAL SETTING
6	198 on linear scale
10-11	30.0 Mc.
20	14.4 Mc.
40	7.3 Mc.
80	4.0 Mc.

Tuning of the 6 meter band is accomplished by use of the BANDSPREAD dial only.

The BAND SWITCH setting determines the band of frequencies which the Receiver will tune at any one time.

With the A.V.C.-M.V.C. switch set at the A.V.C. position, the R.F. GAIN control should be advanced as far as receiving

conditions permit. However, if background noise proves objectionable, the R.F. GAIN control may be retarded to approximately 6 or 7 to reduce the level of background noise. The operator must remember that automatic volume control action will be restricted unless the R.F. GAIN control is fully advanced. Audio output should be adjusted entirely by means of the A.F. GAIN control.

The A.V.C.-M.V.C. switch may be set at the M.V.C. position to provide increased sensitivity in some cases. With such a setting the operator must be careful not to advance the R.F. GAIN control to a point where I.F. or audio amplifier overload occurs. Such overload is indicated by distortion. In general, the A.F. GAIN control may be set at a fixed position, approximately 5, and the R.F. GAIN control used to adjust the audio volume.

If a signal is weak and partially obscured by background noise and static, best signal-to-noise ratio will be obtained by turning the TONE control toward 0 on its scale. The most effective setting must be determined by trial as too much attenuation of the higher audio frequencies may not prove desirable.

When a signal is accompanied by static peaks or noise pulses of high intensity and short duration, the best signal-to-noise ratio will be obtained by turning the LIMITER control ON and advancing it as necessary. The optimum setting can only be determined by trial as too much limiter action may impair the audio quality.

The selectivity of the Receiver is adjusted by means of the crystal filter SELECTIVITY control. The normal setting of the SELECTIVITY control in phone reception is at one of the positions affording broad selectivity. Positions marked OFF, 1 or 2 are recommended. Selectivity may be progressively increased by turning the SELECTIVITY control to positions 3, 4 or 5. The evidences of increasing selectivity will be the attenuation of the higher frequency audio tones of the signal as well as sharper tuning. Increasing selectivity too much will attenuate these higher tones to such an extent that phone signals may become unintelligible.

The PHASING control is part of the crystal filter and is used to eliminate

or attenuate interfering heterodynes. The PHASING control is inoperative with the SELECTIVITY control in the OFF position but is operative at all other SELECTIVITY control settings. The normal setting of the PHASING control, with the crystal filter ON (SELECTIVITY control at 1,2,3,4 or 5), in phone reception is at 0 on the scale. If, after a signal has been tuned in, an interfering signal causes a heterodyne or whistle the PHASING control should be adjusted until interference is reduced to a minimum. The setting of the PHASING control which provides maximum attenuation of the heterodyne will depend on the pitch of the heterodyne whistle. If the heterodyne is below 1,000 cycles, the optimum PHASING control setting will be near one end of the scale or the other, depending upon whether the interfering signal has a higher or lower frequency than the desired signal.

3-3. C.W. Reception

The Receiver is placed in operation for the reception of C.W. signals in the same manner as that outlined for phone reception (Section 3-2) except that the C.W. O. switch should be set at ON and the C.W.O. control set at mid-scale. The C.W. code characters are made audible by the heterodyning action of the C.W. oscillator with the incoming signal. The frequency of the C.W. oscillator can be varied by rotation of the C.W.O. control.

The sensitivity of the Receiver should be adjusted by means of the R.F. GAIN control and the audio volume by means of the A.F. GAIN control. When receiving C.W. characters with slow keying or long pauses during keying it may be desirable to set the A.V.C.-M.V.C. switch at M.V.C. so that the receiver gain does not change during keying pauses. In this case, the A.F. GAIN control should be set at a fixed position, approximately 5, and the audio volume adjusted by means of the R.F. GAIN control. In either of the above cases care should be taken not to advance the R.F. GAIN control to a point where I.F. or audio amplifier overload occurs.

The action of the TONE and LIMITER controls will be similar to that described in Section 3-2. However, in C.W. reception it will be possible to

advance these controls considerably further than is desirable in phone reception since any impairing of audio quality is relatively unimportant.

Turning the C.W.O. control to either side of zero will change the characteristic pitch of the receiver background noise thus providing a means of adjusting the audio beat note to the operator's preference. The pitch will become higher as the C.W.O. oscillator is detuned from the I.F. amplifier.

Crystal filter operation for C.W. reception is similar to that described for phone reception (Section 3-2) with the exception that it is possible to utilize maximum selectivity without the loss of audio quality experienced in phone reception. When maximum selectivity is employed, i.e., SELECTIVITY control at 5, tuning is very critical and care must be taken to assure proper tuning. When tuning across the carrier of a received signal the audio beat note is very sharply peaked at a definite audio frequency. The maximum response indicates the proper dial setting. The pitch of the beat note peak may be adjusted by use of the C.W.O. control to provide an audio tone pleasing to copy. With the Receiver tuned to "crystal peak" an interfering signal may be attenuated by proper setting of the PHASING control since this control does not appreciably affect the desired signal.

A distinct advantage in the reception of weak C.W. signals through interference can be realized by use of the "single-signal" properties of the NC-183 Receiver. The C.W. oscillator should be detuned until the pitch of the receiver background noise is roughly 2,000 cycles. Under this condition the audio beat note of any C.W. code signal will show a broad peak in output at approximately 2,000 cycles. This peak is easily found by rotating the tuning dial slowly through the carrier of a received signal. This peak will appear on one side of "zero beat" only and on the other side of "zero beat" the 2,000 cycle note will be considerably weaker. It should be noted that depending on the frequency of the interfering signal better receiving conditions will be obtained by detuning the C.W. O. on one side of zero rather than on the other. The best setting of the C.W.O. con-

trol can only be determined by trial settings on either side of zero until optimum results are obtained.

3-4. Measurement of Signal Strength

The S-Meter in the NC-183 Receiver furnishes a means for the measurement of signal strength of incoming phone or code signals. To utilize the S-Meter the following control settings must be observed: R.F. GAIN at 10, A.V.C. -M.V.C. at A.V.C. and SELECTIVITY at OFF. The TRIMMER control should be adjusted for maximum S-Meter reading after a signal has been tuned in. All other control settings will not affect the S-Meter readings.

In instances where a strong signal causes the S-Meter to read off-scale the S-Meter sensitivity may be lowered by retarding the R.F. GAIN control until an on-scale reading is obtained. Without disturbing the setting of the R.F. GAIN control the comparative strength of this strong signal may be compared with other signals.

The sensitivity of the S-Meter is adjusted as outlined in Section 1-7, to meet average operating conditions. The S-Meter sensitivity adjustment at the rear of the Receiver enables the operator to change the sensitivity to meet the needs of his own particular installation.

SECTION 4. SERVICE AND TEST DATA

4-1. Tube Failures

The partial or complete failure of a vacuum tube in the Receiver may reduce the sensitivity, produce intermittent operation, or cause the equipment to be completely inoperative. If tube failure is suspected all tubes should be checked in suitable tube testing equipment, or by replacement with tubes of proven quality. Care should be taken that any tubes removed for checking purposes be returned to their original sockets thereby reducing the necessity for realignment.

Tubes of the same type will vary slightly in their individual characteristics and this fact should be borne in mind when replacements become necessary. The high frequency oscillator and I.F. tubes should be chosen with care to select a replacement which most nearly approaches the characteristics of the original tube. A replacement high frequency oscillator tube can be readily checked by noting any change in dial calibration, particularly in the amateur bands spread bands. Substitution of new I.F. amplifier tubes may possibly alter overall gain and selectivity characteristics. Instructions for realignment are given in detail in Section 6-2.

4-2. Circuit Failures

All components parts in the NC-183 Receiver have been carefully selected to as-

sure an ample factor of safety. Failure may occur in individual cases and the most common, excluding tubes, will probably be due to breakdown of a capacitor or resistor. Measurement of voltages in accordance with Section 4-4 will most likely indicate where failure has occurred. A by-pass capacitor which has failed may cause overload of associated resistors. These resistors should be checked for any change in resistance value. An overloaded or shorted resistor will sometimes be evidenced by scorching or discoloration on the surface of the resistor. An open capacitor, often the cause of oscillation or loss of sensitivity, may be checked by temporarily connecting a good capacitor across it. Intermittently poor connections can usually be located by lightly tapping each part with a piece of insulating material.

4-3. Stage Gain Measurements

The sensitivity measurements listed below are made with the Receiver set up as specified in Section 3-2 except that the A.V.C. -M.V.C. switch must be set at M.V.C. and the A.F. GAIN control at 10. An output meter with an impedance to match the Receiver output circuit (8 or 500 ohms) should be connected to the output socket in place of the loud-speaker. A three-prong plug, similar to the loud-speaker plug, can be wired for connection of the output meter to the Receiver. It is important that the

NATIONAL COMPANY, INC.

MODEL NC-183

proper output impedance matching be observed, i.e., 8 or 500 ohms depending upon which terminals of the output socket are used.

The high output lead of a signal generator should be connected through a 0.001 capacitor to the pin of the tube as specified in the following table and the ground lead connected to the receiver chassis. The signal generator should be adjusted to deliver a test signal of 455 Kc. plus or minus 2 Kc. either modulated or unmodulated.

The BAND SWITCH must be set at the mid-position between the A and E bands.

With 1 watt output at the audio output socket the test signal should be within the

limits specified below:

TERMINAL	TEST SIGNAL	
Mixer Grid	13±	3 Microvolts
First IF Grid	170±	30 Microvolts
Sec. Det. Grid	33,000±	6,000 Microvolts

4-4. Voltage Tabulation

All voltage measurements should be made using a high-impedance vacuum tube volt-meter. Readings taken with any other type of instrument will differ greatly from those shown on Figure No. 4. The control settings to be observed are shown on Figure No. 4. All voltages are measured between specified terminal and chassis.

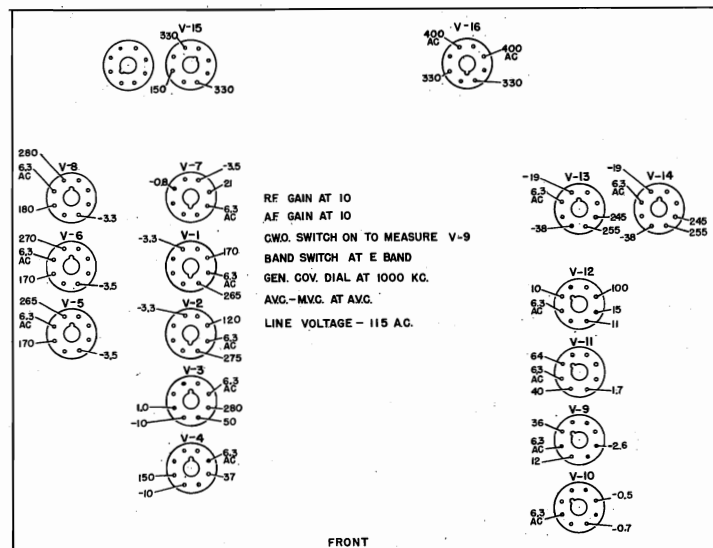


Figure No. 4. Tube Socket Voltages

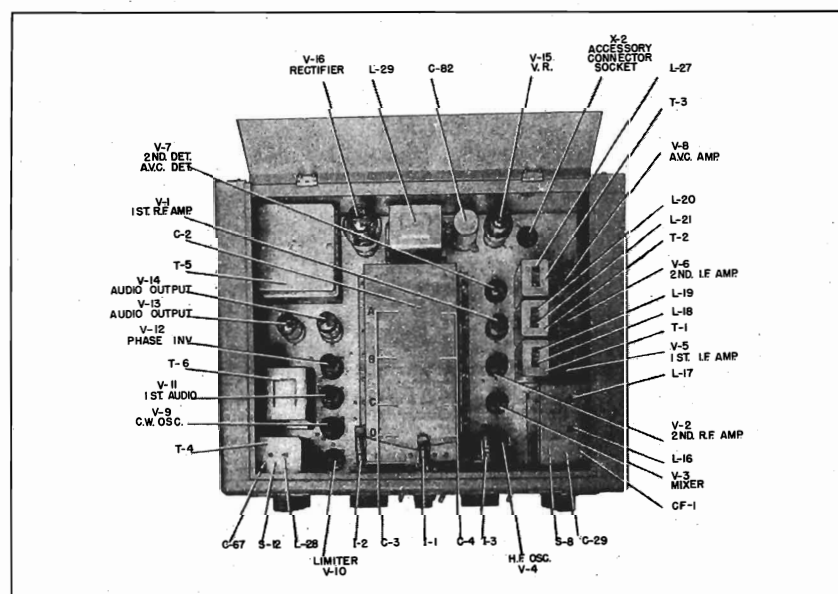


Figure No. 5. Top View of Receiver

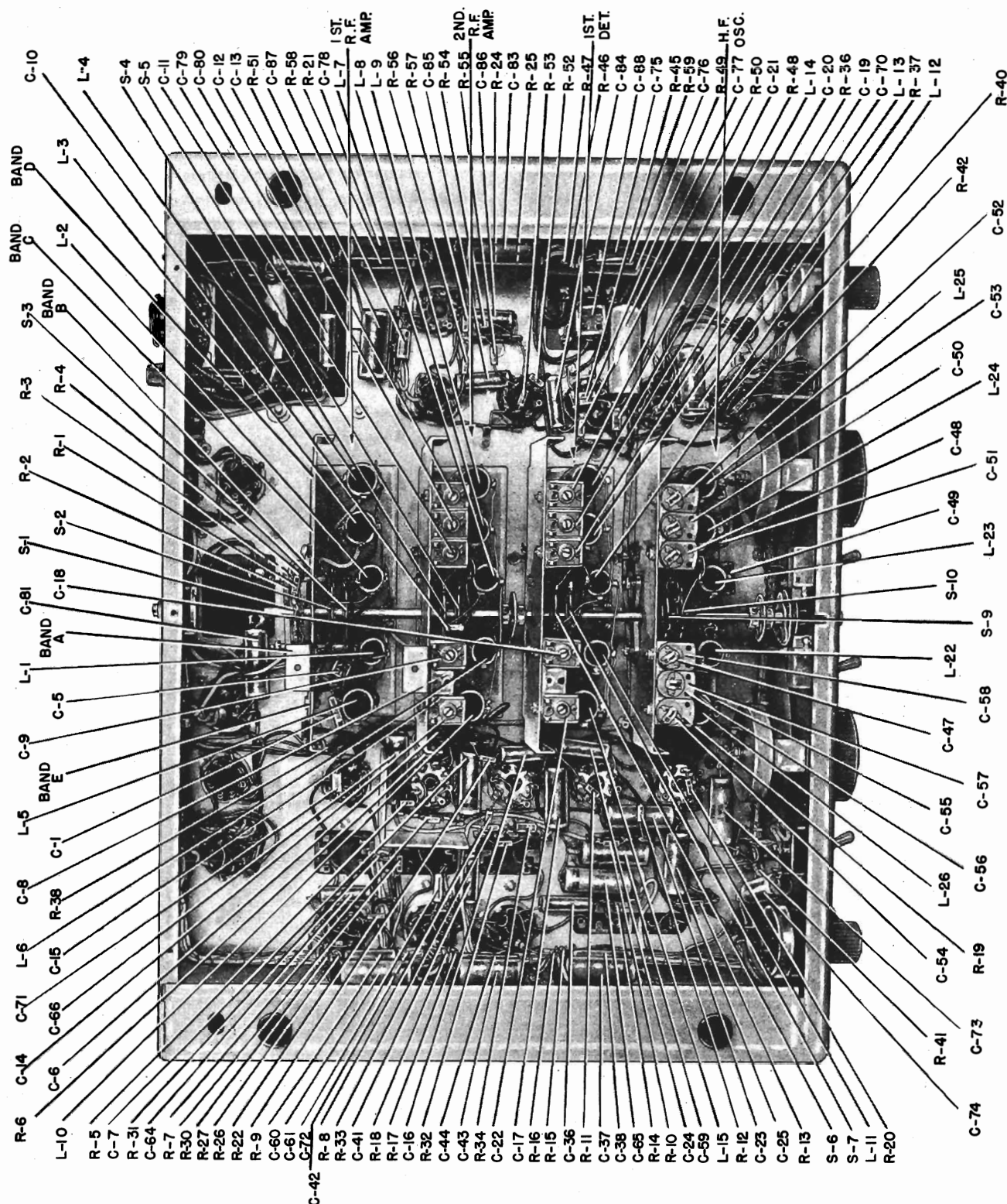


Figure No. 7. Bottom View of Receiver (Coil Compartment Side Plates Removed)

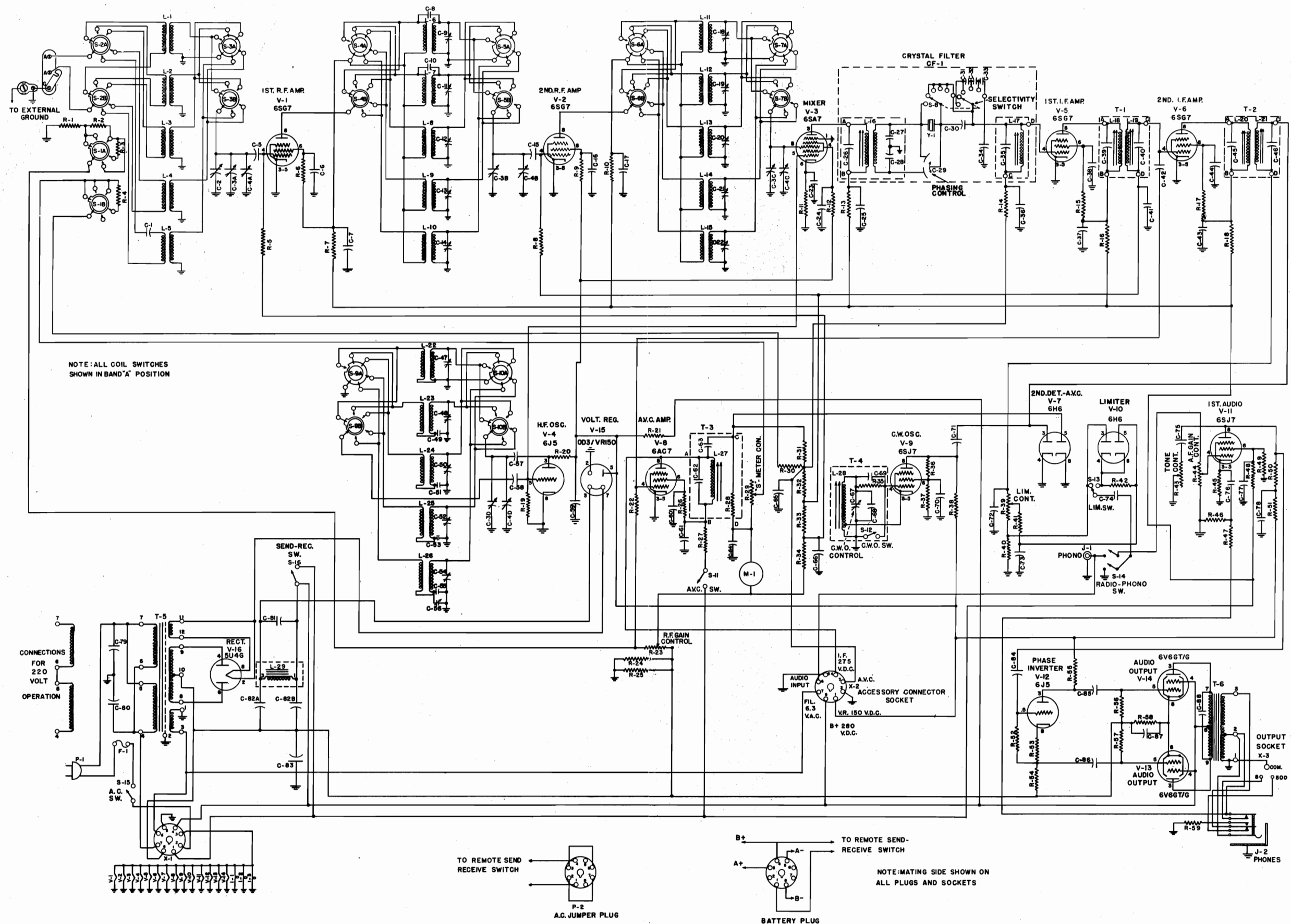


Figure No. 6. NC-183 Receiver Schematic Diagram

SECTION 5.

PARTS LIST

Symbol	Function	Type	Rating
CAPACITORS			
C-1	Ant. Coupling	Ceramic	250 Mmf., 500 VDCW
C-2	Trimmer Control	Air	Variable
C-3	Main Tuning	Air	Variable
C-3A	1st. R.F. Amp. Tuning	Air	Part of C-3
C-3B	2nd. R.F. Amp. Tuning	Air	Part of C-3
C-3C	1st. Det. Tuning	Air	Part of C-3
C-3D	H.F. Osc. Tuning	Air	Part of C-3
C-4	Bandsread Tuning	Air	Variable
C-4A	1st. R.F. Bandsread Tuning	Air	Part of C-4
C-4B	2nd. R.F. Bandsread Tuning	Air	Part of C-4
C-4C	1st. Det. Bandsread Tuning	Air	Part of C-4
C-4D	H.F. Osc. Bandsread Tuning	Air	Part of C-4
C-5	1st. R.F. Amp. Grid Coupling	Mica	0.001 Mfd., 300 VDCW
C-6	1st. R.F. Screen Bypass	Paper	0.01 Mfd., 600 VDCW
C-7	1st. R.F. Amp. Plate Filter	Paper	0.05 Mfd., 600 VDCW
C-8	A Band 2nd. R.F. Coupling	Ceramic	10 Mmf., 500 VDCW
C-9	A Band 2nd. R.F. Trimmer	Mica	Variable
C-10	B Band 2nd. R.F. Coupling	Ceramic	5 Mmf., 500 VDCW
C-11	B Band 2nd. R.F. Trimmer	Mica	Variable
C-12	C Band 2nd. R.F. Trimmer	Mica	Variable
C-13	D Band 2nd. R.F. Trimmer	Mica	Variable
C-14	E Band 2nd. R.F. Trimmer	Mica	Variable
C-15	2nd. R.F. Amp. Grid Coupling	Mica	0.001 Mfd., 300 VDCW
C-16	2nd. R.F. Screen Bypass	Paper	0.01 Mfd., 600 VDCW
C-17	2nd. R.F. Plate Filter	Paper	0.05 Mfd., 600 VDCW
C-18	A Band 1st. Det. Trimmer	Mica	Variable
C-19	B Band 1st. Det. Trimmer	Mica	Variable
C-20	C Band 1st. Det. Trimmer	Mica	Variable
C-21	D Band 1st. Det. Trimmer	Mica	Variable
C-22	E Band 1st. Det. Trimmer	Mica	Variable
C-23	Mixer Cathode Bypass	Paper	0.1 Mfd., 400 VDCW
C-24	Mixer Screen Bypass	Paper	0.01 Mfd., 600 VDCW
C-25	Mixer Plate Filter	Paper	0.05 Mfd., 600 VDCW
C-26	Crystal Filter Input Tuning	Mica	510 Mmf., 500 VDCW
C-27	Crystal Filter Bridge	Ceramic	85 Mmf., 500 VDCW
C-28	Crystal Filter Bridge	Ceramic	50 Mmf., 500 VDCW
C-29	Crystal Filter Phasing	Air	Variable
C-30	Crystal Filter Coupling	Ceramic	10 Mmf., 500 VDCW
C-31	Selectivity Adjusting	Ceramic	25 Mmf., 500 VDCW
C-32	Selectivity Adjusting	Ceramic	100 Mmf., 500 VDCW
C-33	Selectivity Adjusting	Ceramic	100 Mmf., 500 VDCW
C-34	Selectivity Adjusting	Ceramic	50 Mmf., 500 VDCW
C-35	Crystal Filter Output Tuning	Mica	510 Mmf., 500 VDCW

PARTS LIST (Continued)

Symbol	Function	Type	Rating
CAPACITORS (Continued)			
C-36	1st. I.F. Grid Filter	Paper	0.01 Mfd., 600 VDCW
C-37	1st. I.F. Plate Filter	Paper	0.05 Mfd., 600 VDCW
C-38	1st. I.F. Screen Bypass	Paper	0.01 Mfd., 600 VDCW
C-39	T-1 Primary Tuning	Mica	510 Mmf., 500 VDCW
C-40	T-1 Secondary Tuning	Mica	510 Mmf., 500 VDCW
C-41	2nd. I.F. Grid Filter	Paper	0.01 Mfd., 600 VDCW
C-42	2nd. I.F. Grid to A.V.C. Grid Coupling	Ceramic	47 Mmf.
C-43	2nd. I.F. Plate Filter	Paper	0.05 Mfd., 600 VDCW
C-44	2nd. I.F. Screen Bypass	Paper	0.01 Mfd., 600 VDCW
C-45	T-2 Primary Tuning	Mica	510 Mmf., 500 VDCW
C-46	T-2 Secondary Tuning	Mica	510 Mmf., 500 VDCW
C-47	A Band H.F. Osc. Trimmer	Ceramic	Variable
C-48	B Band H.F. Osc. Trimmer	Ceramic	Variable
C-49	B Band H.F. Osc. Padder	Mica	.0085 Mfd., 300 VDCW
C-50	C Band H.F. Osc. Trimmer	Ceramic	Variable
C-51	C Band H.F. Osc. Padder	Mica	.0042 Mfd., 300 VDCW
C-52	D Band H.F. Osc. Trimmer	Ceramic	Variable
C-53	D Band H.F. Osc. Padder	Mica	1250 Mmf., 500 VDCW
C-54	E Band H.F. Osc. Trimmer	Ceramic	Variable
C-55	E Band H.F. Osc. Padder	Mica	420 Mmf., 500 VDCW
C-56	E Band H.F. Osc. Padder	Ceramic	Variable
C-57	H.F. Osc. Plate Coupling	Mica	.001 Mfd., 300 VDCW
C-58	H.F. Osc. Grid Coupling	Ceramic	100 Mmf., 500 VDCW
C-59	B Supply Filter	Paper	.1 Mfd., 400 VDCW
C-60	A.V.C. Amp. Screen Bypass	Paper	.01 Mfd., 600 VDCW
C-61	A.V.C. Amp. Plate Filter	Paper	.05 Mfd., 600 VDCW
C-62	T-3 Tuning	Mica	510 Mmf., 500 VDCW
C-63	A.V.C. Amp. to A.V.C. Rectifier Coupling	Mica	.001 Mfd., 300 VDCW
C-64	S-Meter Bypass	Paper	.01 Mfd., 600 VDCW
C-65	A.V.C. Filter	Paper	.1 Mfd., 400 VDCW
C-66	A.V.C. Filter	Paper	.1 Mfd., 400 VDCW
C-67	C.W.O. Tuning	Air	Variable
C-68	C.W.O. Tuning	Mica	270 Mmf., 500 VDCW
C-69	C.W.O. Grid Coupling	Mica	270 Mmf., 500 VDCW
C-70	C.W.O. Screen Bypass	Paper	.1 Mfd., 400 VDCW
C-71	Det. Plate to C.W.O. Plate Coupling	Ceramic	10 Mmf.
C-72	2nd. Det. Load	Mica	270 Mmf., 500 VDCW
C-73	Limiter Plate Filter	Paper	.1 Mfd., 400 VDCW
C-74	Audio Coupling	Paper	.1 Mfd., 400 VDCW
C-75	Tone Adjusting	Paper	.005 Mfd., 500 VDCW
C-76	1st. Audio Cathode Bypass	Elect.	10 Mfd., 50 VDCW
C-77	1st. Audio Screen Bypass	Paper	.25 Mfd., 400 VDCW
C-78	1st. Audio Plate Filter	Paper	.1 Mfd., 400 VDCW

NATIONAL COMPANY, INC.

MODEL NC-183

PARTS LIST (Continued)

Symbol	Function	Type	Rating
CAPACITORS (Continued)			
C-79	A.C. Line Bypass	Paper	0.01 Mfd., 600 VDCW
C-80	A.C. Line Bypass	Paper	0.01 Mfd., 600 VDCW
C-81	B plus Filter	Paper	.1 Mfd., 400 VDCW
C-82		Elect.	10+10 Mfd., 475 VDCW
C-82A	Power Supply Filter	Elect.	Part of C-82
C-82B	Power Supply Filter	Elect.	Part of C-82
C-83	B Minus Bypass	Elect.	25 Mfd., 50 VDCW
C-84	1st. Audio Coupling	Paper	.01 Mfd., 600 VDCW
C-85	2nd. Audio Input Coupling	Paper	.01 Mfd., 600 VDCW
C-86	2nd. Audio Input Coupling	Paper	.01 Mfd., 600 VDCW
C-87	V-13, V-14, Cathode Bypass	Elect.	25 Mfd., 50 VDCW
C-88	Audio Compensating	Mica	.001 Mfd., 500 VDCW
RESISTORS			
R-1	Voltage Divider	Fixed	330 Ohms, 1/2 W.
R-2	Voltage Divider	Fixed	680 Ohms, 1/2 W.
R-3	Voltage Divider	Fixed	470 Ohms, 1/2 W.
R-4	S-Meter Adjusting	Fixed	220,000 Ohms, 1/2 W.
R-5	1st. R.F. Amp. Grid	Fixed	100,000 Ohms, 1/2 W.
R-6	1st. R.F. Amp. Screen Filter	Fixed	33,000 Ohms, 1/2 W.
R-7	1st. R.F. Amp. Plate Filter	Fixed	2,200 Ohms, 1/2 W.
R-8	2nd. R.F. Amp. Grid	Fixed	100,000 Ohms, 1/2 W.
R-9	2nd. R.F. Amp. Screen Filter	Fixed	33,000 Ohms, 1/2 W.
R-10	2nd. R.F. Amp. Plate Filter	Fixed	2,200 Ohms, 1/2 W.
R-11	Mixer Cathode	Fixed	220 Ohms, 1/2 W.
R-12	Mixer Screen Filter	Fixed	33,000 Ohms, 1/2 W.
R-13	Mixer Plate Filter	Fixed	2,200 Ohms, 1/2 W.
R-14	1st. I.F. Grid Filter	Fixed	470,000 Ohms, 1/2 W.
R-15	1st. I.F. Screen Filter	Fixed	33,000 Ohms, 1/2 W.
R-16	1st. I.F. Plate Filter	Fixed	2,200 Ohms, 1/2 W.
R-17	2nd. I.F. Screen Filter	Fixed	33,000 Ohms, 1/2 W.
R-18	2nd. I.F. Plate Filter	Fixed	2,200 Ohms, 1/2 W.
R-19	H.F. Osc. Grid	Fixed	22,000 Ohms, 1/2 W.
R-20	H.F. Osc. Plate	Fixed	47,000 Ohms, 1/2 W.
R-21	V.R. Dropping	Fixed	5,000 Ohms, 10 W.
R-22	A.V.C. Amp. Grid	Fixed	470,000 Ohms, 1/2 W.
R-23	R.F. Gain Control	Variable	10,000 Ohms, 1 1/2 W.
R-24	Voltage Divider	Fixed	1,000 Ohms, 2 W.
R-25	Voltage Divider	Fixed	1,000 Ohms, 2 W.
R-26	A.V.C. Amp. Screen Filter	Fixed	100,000 Ohms, 1/2 W.
R-27	A.V.C. Amp. Plate Filter	Fixed	2,200 Ohms, 1/2 W.
R-28	A.V.C. Load	Fixed	33,000 Ohms, 1/2 W.
R-29	S-Meter Adjustment	Variable	2,000,000 Ohms,

PARTS LIST (Continued)

<i>Symbol</i>	<i>Function</i>	<i>Type</i>	<i>Rating</i>
RESISTORS (Continued)			
R-30	S-Meter Adjusting	Fixed	150,000 Ohms, 1/2 W.
R-31	A.V.C. Voltage Divider	Fixed	470,000 Ohms, 1/2 W.
R-32	A.V.C. Voltage Divider	Fixed	470,000 Ohms, 1/2 W.
R-33	A.V.C. Voltage Divider	Fixed	270,000 Ohms, 1/2 W.
R-34	A.V.C. Voltage Divider	Fixed	220,000 Ohms, 1/2 W.
R-35	C.W. Osc. Grid Bias	Fixed	47,000 Ohms, 1/2 W.
R-36	C.W. Osc. Screen Filter	Fixed	100,000 Ohms, 1/2 W.
R-37	C.W. Osc. Screen Bleeder	Fixed	100,000 Ohms, 1/2 W.
R-38	C.W. Osc. Plate	Fixed	220,000 Ohms, 1/2 W.
R-39	Limiter Control	Variable	100,000 Ohms,
R-40	2nd. Det. Load	Fixed	68,000 Ohms, 1/2 W.
R-41	Limiter Plate Filter	Fixed	270,000 Ohms, 1/2 W.
R-42	Limiter Load	Fixed	270,000 Ohms, 1/2 W.
R-43	Tone Control	Variable	500,000 Ohms,
R-44	Audio Gain Control	Variable	500,000 Ohms,
R-45	1st. Audio Cathode	Fixed	2,200 Ohms, 1/2 W.
R-46	Inverse Feedback Voltage Divider	Fixed	100 Ohms, 1/2 W.
R-47	Inverse Feedback Voltage Divider	Fixed	4,700 Ohms, 1/2 W.
R-48	1st. Audio Screen Filter	Fixed	1,000,000 Ohms, 1/2 W.
R-49	1st. Audio Screen Bleeder	Fixed	470,000 Ohms, 1/2 W.
R-50	1st. Audio Plate Load	Fixed	100,000 Ohms, 1/2 W.
R-51	1st. Audio Plate Filter	Fixed	47,000 Ohms, 1/2 W.
R-52	Phase Inverter Grid	Fixed	470,000 Ohms, 1/2 W.
R-53	Phase Inverter Cathode Bias	Fixed	4,700 Ohms, 1/2 W.
R-54	Phase Inverter Cathode Load	Fixed	47,000 Ohms, 1/2 W.
R-55	Phase Inverter Plate Load	Fixed	47,000 Ohms, 1/2 W.
R-56	V-14 Grid	Fixed	270,000 Ohms, 1/2 W.
R-57	V-13 Grid	Fixed	270,000 Ohms, 1/2 W.
R-58	V-13 & V-14 Cathode Bias	Fixed	330 Ohms, 2 W.
R-59	Headphone Load	Fixed	470 Ohms, 2 W.
MISCELLANEOUS			
CF-1	Crystal Filter		455 Kc.
F-1	A.C. Line Fuse		2 Amp., 250 Volts
I-1	S-Meter Lamp	No. 47	0.15 Amp., 6-8 Volts
I-2	Dial Lamp	No. 47	0.15 Amp., 6-8 Volts
I-3	Dial Lamp	No. 47	0.15 Amp., 6-8 Volts
J-1	Phono Jack		Single-Circuit
J-2	Phones Jack		Multi-Circuit
L-1	1st. R.F. Amp. Inductor	A Band	
L-2	1st. R.F. Amp. Inductor	B Band	
L-3	1st. R.F. Amp. Inductor	C Band	
L-4	1st. R.F. Amp. Inductor	D Band	

NATIONAL COMPANY, INC.

MODEL NC-183

PARTS LIST (Continued)

Symbol	Function	Type	Rating
MISCELLANEOUS (Continued)			
L-5	1st. R.F. Amp. Inductor	E Band	
L-6	2nd. R.F. Amp. Inductor	A Band	
L-7	2nd. R.F. Amp. Inductor	B Band	
L-8	2nd. R.F. Amp. Inductor	C Band	
L-9	2nd. R.F. Amp. Inductor	D Band	
L-10	2nd. R.F. Amp. Inductor	E Band	
L-11	1st. Det. Inductor	A Band	
L-12	1st. Det. Inductor	B Band	
L-13	1st. Det. Inductor	C Band	
L-14	1st. Det. Inductor	D Band	
L-15	1st. Det. Inductor	E Band	
L-16	CF-1 Input Tuning	Variable	Iron-Core Inductor
L-17	CF-1 Output Tuning	Variable	Iron-Core Inductor
L-18	T-1 Input Tuning	Variable	Iron-Core Inductor
L-19	T-1 Output Tuning	Variable	Iron-Core Inductor
L-20	T-2 Input Tuning	Variable	Iron-Core Inductor
L-21	T-2 Output Tuning	Variable	Iron-Core Inductor
L-22	H.F. Osc. Inductor	A Band	
L-23	H.F. Osc. Inductor	B Band	
L-24	H.F. Osc. Inductor	C Band	
L-25	H.F. Osc. Inductor	D Band	
L-26	H.F. Osc. Inductor	E Band	
L-27	T-3 Tuning	Variable	Iron-Core Inductor
L-28	T-4 Tuning	Variable	Iron-Core Inductor
L-29	Filter Choke	No. 80	17 Henries
M-1	Signal Strength Meter	S-Meter	
P-1	A.C. Line Cord and Plug		2 Contact
P-2	A.C. Jumper Plug	Octal	
S-1		Rotary	D.P. 5 Position
S-1A	Gain Adjustment		S.P. 5 Position
S-1B	S-Meter Adjustment		S.P. 5 Position
S-2	1st. R.F. Transformer Band Switch	Rotary	D.P. 5 Position
S-2A			S.P. 5 Position
S-2B			S.P. 5 Position
S-3	1st. R.F. Transformer Band Switch	Rotary	D.P. 5 Position
S-3A			S.P. 5 Position
S-3B			S.P. 5 Position
S-4	2nd. R.F. Transformer Band Switch	Rotary	D.P. 5 Position
S-4A			S.P. 5 Position
S-4B			S.P. 5 Position
S-5	2nd. R.F. Transformer Band Switch	Rotary	D.P. 5 Position
S-5A			S.P. 5 Position
S-5B			S.P. 5 Position

MODEL NC-183

NATIONAL COMPANY, INC.

PARTS LIST (Continued)

Symbol	Function	Type	Rating
MISCELLANEOUS (Continued)			
S-6	1st. Det. Trans. Band Switch	Rotary	D.P. 5 Position
S-6A			S.P. 5 Position
S-6B			S.P. 5 Position
S-7	1st. Det. Trans. Band Switch	Rotary	D.P. 5 Position
S-7A			S.P. 5 Position
S-7B			S.P. 5 Position
S-8	Selectivity Control Switch	Rotary	D.P. 6 Position
S-9	H.F. Osc. Band Switch	Rotary	D.P. 5 Position
S-9A			S.P. 5 Position
S-9B			S.P. 5 Position
S-10	H.F. Osc. Band Switch	Rotary	D.P. 5 Position
S-10A			S.P. 5 Position
S-10B			S.P. 5 Position
S-11	A.V.C. Switch	Toggle	S.P.S.T.
S-12	C.W. Osc. Switch	Rotary	S.P.D.T.
S-13	Limiter Switch		S.P.D.T.
S-14	Radio-Phono Switch	Toggle	D.P.D.T.
S-15	A.C. Line Switch		S.P.S.T.
S-16	Send-Receive Switch	Toggle	S.P.S.T.
T-1	2nd. I.F. Transformer		455 Kc.
T-2	Det. Input Transformer		455 Kc.
T-3	A.V.C. Amp. Transformer		
T-4	C.W. Osc. Transformer		455 Kc.
T-5	Power Transformer		
T-6	Audio Output Transformer		
V-1	1st. R.F. Amp.	6SG7	
V-2	2nd. R.F. Amp.	6SG7	
V-3	Mixer	6SA7	
V-4	H.F. Osc.	6J5	
V-5	1st. I.F. Amp.	6SG7	
V-6	2nd. I.F. Amp.	6SG7	
V-7	2nd. Det.-A.V.C. Det.	6H6	
V-8	A.V.C. Amp.	6AC7	
V-9	C.W. Osc.	6SJ7	
V-10	Noise Limiter	6H6	
V-11	First Audio	6SJ7	
V-12	Phase Inverter	6J5	
V-13	Audio Output	6V6GT/G	
V-14	Audio Output	6V6GT/G	
V-15	Voltage Regulator	OD3/VR-150	
V-16	Rectifier	5U4G	
X-1	Battery Socket	Octal	
X-2	Accessory Connector Socket	Octal	
X-3	Output Socket	Three Pin	
Y-1	Crystal Resonator		455 Kc.

SECTION 6. ALIGNMENT DATA**6-1. General**

All circuits in the NC-183 Receiver are carefully aligned, before shipment, using precision test equipment insuring close conformability to the alignment frequency. No realignment of the various adjustments will be required, therefore, unless the Receiver is tampered with or damaged in transit.

The necessity for any realignment can be determined by checking the performance of the Receiver against its normal operation as outlined in Section 3. In no case should realignment be attempted unless tests indicate that such realignment is necessary. Even then, it must be remembered that the NC-183 is a communications Receiver and should not be serviced or realigned by any individual who does not have a complete understanding of the functioning of the equipment and who has not had previous experience adjusting a similar type of Receiver.

Before proceeding with the alignment of any circuit in the Receiver, the equipment must be set up as specified in Section 2-3, except that the antenna lead-in and loudspeaker must be disconnected. An output meter having an 8 or 500 ohm resistive load should be connected to the matching terminal on the Receiver's output socket. If it is so desired a high-impedance A.C. voltmeter may be connected to the phone output jack and used in place of the output meter.

Alignment of the equipment may be divided into two major steps:

- (1) I.F. and A.V.C. Amplifier Alignment.
- (2) General Coverage and Bandsread Alignment.

(a) H.F. Oscillator

(b) First Detector and R.F. Amplifiers

The circuits must be tuned in the above order when complete alignment is required.

6-2. I.F. and A.V.C. Amplifier Alignment

The intermediate frequency of the NC-183 Receiver is 455 kilocycles, plus or minus 2 kilocycles. The exact frequency is determined by the quartz crystal resonator Y-1.

The I.F. transformers, crystal filter, A.V.C. amplifier and C.W. oscillator transformers all have individual permeability-tuned iron core inductors with screw-type adjustments for alignment purposes. These adjustments are located on Figure No. 5.

The preliminary alignment procedure is as follows:

(1) Connect the high output lead of an accurately calibrated signal generator to the stator portion of the detector section of the main tuning capacitor C-3C and the grounded lead to any convenient grounded point on the chassis. This is a direct connection, no dummy antenna being required.

- (2) Set the C.W.O. switch at ON.
- (3) Set the A.V.C. switch at M.V.C.
- (4) Set the PHASING control at 0.
- (5) Set the SELECTIVITY control at 5.
- (6) Set the A.F. GAIN control at 10.
- (7) Set the R.F. GAIN control at 10.
- (8) Turn the modulation of the signal generator off to provide a steady C.W. test

signal.

Adjust the output attenuator of the signal generator to provide a signal of approximately 100 microvolts and vary the tuning control of the signal generator slowly between the frequencies of 453 and 457 kilocycles. At some frequency between these limits the I.F. amplifier of the Receiver will show a very sharply peaked response, as indicated on the output meter. This frequency is that of the crystal, Y-1, and I.F. alignment, as outlined below, is made to this frequency. The C.W.O. control must be set to provide an audible beat note; the presence of this beat note can readily be determined by temporarily connecting headphones or a loud-speaker to the Receiver.

While making I.F. amplifier adjustments, it will be necessary to retard the attenuator of the signal generator if I.F. amplifier gain increases to a point where overload occurs. Without altering the frequency setting of the signal generator set the SELECTIVITY and C.W.O. switches at OFF, and turn the modulation of the signal generator ON. The I.F. tuned inductors L-16 through L-21 should, at this point, each be carefully adjusted to give a maximum reading on the output meter. The order in which these adjustments are made is not important.

To align the A.V.C. amplifier turn the A.V.C.-M.V.C. switch to A.V.C. Adjust L-27 of transformer T-3 until a well-defined dip is observed in the output meter readings. The setting of L-27 where this dip occurs will provide maximum A.V.C. action.

Turn the modulation of the signal generator OFF and turn the C.W.O. switch ON and set the C.W.O. control at 0 at which setting the C.W. oscillator should be at zero beat with the test signal. If zero beat does not occur at 0, readjust the tuneable inductor L-28, of transformer T-4 until zero beat does occur with the C.W.O. control set at 0.

6-3. General Coverage and Bandsread Alignment

The data given in this section applies to the alignment of the H.F. oscillator, first detector and R.F. amplifier stages. Since the main tuning capacitor and bandspread capacitor are connected in parallel

on all bands General Coverage and Bandspread alignment are accomplished simultaneously. The 6 meter band, A, is tuneable by Bandsread tuning only.

The original alignment at National Laboratories is accomplished by the use of precision crystal-controlled test oscillators. No realignment of bands B, C, D and E should be attempted unless a test signal source with an accuracy of better than 1% is available. For band A, 6 meters, the test signal source must have the accuracy of precision calibrated crystals.

The need for realignment of the H.F. oscillator of bands B, C, D or E is indicated when the frequency calibration of the Receiver is in error by more than 2% at the high frequency end of any one band. Realignment of the H.F. oscillator of band A is indicated by a calibration error of 0.01%. Particular care should be taken when adjusting the high frequency oscillator trimmers. It is imperative that the high frequency oscillator is set to operate at a frequency above the first detector and R.F. amplifier frequency and not below. This can be checked by tuning in the image signal which should appear 910 kilocycles lower on the receiver dial. If it is found that the image signal does not appear at this setting the H.F. oscillator is incorrectly adjusted and the capacity of the H.F. oscillator trimmer must be decreased until the image and fundamental signals appear at the correct setting. Bands B, C and D each have an inductance adjustment, L-23, L-24, L-25, and Band E has a variable capacitor, C-56, for H.F. Oscillator alignment at the low frequency check point of these bands. After the H.F. oscillator is correctly calibrated the first detector and R.F. amplifier trimmers should be adjusted for maximum receiver gain as indicated on the output meter.

Correction of tracking errors of the first detector and R.F. amplifier stages at the low frequency check point of bands B, C and D is accomplished by the adjustments listed on the Alignment Chart. The tracking of the first detector and second R.F. amplifier stages may be checked by inserting a tuning wand into the opening of the coil form under test. Receiver gain should decrease the same amount on insertion of the iron or brass end of the tuning wand.

NATIONAL COMPANY, INC.

MODEL NC-183

The tracking of the first R.F. amplifier stage of bands B, C and D may be checked by rotating the TRIMMER control, C-2. If two definite peaks in output are observed, while rotating the TRIMMER control, the first R.F. amplifier stage is tracking correctly and the TRIMMER setting at either peak is correct. The lack of a peak in output or the presence of only one peak indicates the stage is not tracking properly and correction should be made.

The locations of the adjustments re-

ferred to on the Alignment Chart are shown on Figure No. 7.

The control settings used for alignment are as outlined in Section 3-2 except that the A.V.C.-M.V.C. switch should be at M.V.C. The following Alignment Chart gives the step by step procedure to follow in effecting alignment of each band. It is important that the chart of adjustments is adhered to in the order shown for each band.

ALIGNMENT CHART

Step	Band	Adjust Signal Source To:	Set Gen. Cov. Dial At:	Set Bandsread Dial At:	Adjust To Receive Test Signal	Adjust For Maximum Output
1	A	56 Mc.	⑥ (at 198 on linear scale)	56 Mc.	C-47	C-18, C-9, C-2
1	B	30.0 Mc.	30.0 Mc.	Set Mark	C-48	C-19, C-11, C-2
2	B	14.0 Mc.	14.0 Mc.	Set Mark	L-23	L-12, L-7, L-2
3	B	30.0 Mc.	30.0 Mc.	Set Mark	C-48	Check Step 1. Repeat Steps 1, 2 and 3 if necessary.
1	C	11.0 Mc.	11.0 Mc.	Set Mark	C-50	C-20, C-12, C-2
2	C	5.0 Mc.	5.0 Mc.	Set Mark	L-24	L-13, L-8, L-3
3	C	11.0 Mc.	11.0 Mc.	Set Mark	C-50	Check Step 1. Repeat Steps 1, 2 and 3 if necessary.
1	D	4.0 Mc.	4.0 Mc.	Set Mark	C-52	C-21, C-13, C-2
2	D	1.8 Mc.	1.8 Mc.	Set Mark	L-25	L-14, L-9, L-4
3	D	4.0 Mc.	4.0 Mc.	Set Mark	C-52	Check Step 1. Repeat Steps 1, 2 and 3 if necessary.
1	E	1.5 Mc.	1.5 Mc.	Set Mark	C-54	C-22, C-14, C-2
2	E	0.6 Mc.	0.6 Mc.	Set Mark	C-56	
3	E	1.5 Mc.	1.5 Mc.	Set Mark	C-54	Check Step 1. Repeat Steps 1, 2 and 3 if necessary.

NOTE: Inductance adjustments (indicated by "L-") consist of a loop of wire inside coil form--bending the loop one way or the other adds or subtracts to the inductance.

The Set Mark referred to above is located at 180 on the linear scale.



MODEL 160T, 161T,
CHASSIS RE-232

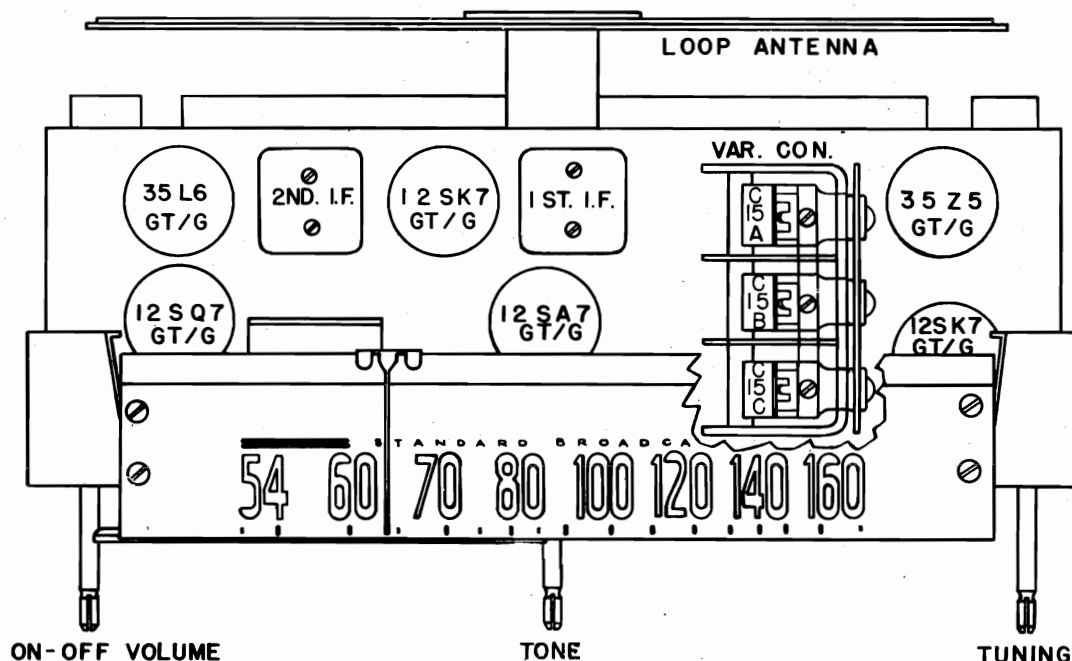
NOBLITT-SPARKS INDUSTRIES, INC.

ALIGNMENT PROCEDURE**PRELIMINARY:**

Output meter connection ----- Across loudspeaker voice coil
 Output meter reading to indicate 200 mw (standard output) ----- .8 volts
 Connection of generator ground lead ----- Floating ground
 Generator modulation ----- 30% 400 cycles
 Position of volume control ----- Fully clockwise
 Position of dial pointer with variable fully closed ----- Last mark at left end of dial

1. Connect signal generator lead through a .05 uf. condenser to converter grid. Open tuning condenser. Set signal generator to 455 Kc. Tune I. F. Transformers for maximum output.
2. Close tuning condenser and set pointer at end mark of dial. Open tuning condenser. Connect signal generator to test loop or to blue lead on set loop. Set signal generator to 1620 Kc. Tune trimmer on (C15C) oscillator section of tuning condenser for maximum output.
3. Set signal generator to 1400 Kc. Adjust tuning shaft until maximum output is obtained. Tune R. F. trimmer (C15B) and antenna trimmer (C15A) on tuning condenser for greatest output. Reset tuning shaft until output is again a maximum. Retune R. F. and antenna trimmers. Repeat this cycle of operations at 1400 Kc until no further increase of output can be obtained. Keep generator output at a low value to prevent detuning by A. V. C. action.
4. Set signal generator to 600 Kc. Adjust tuning shaft for maximum output. Adjust tuning condenser plates for maximum output.

Approximate stage by stage sensitivities with 117V. AC line voltage and .8 V. output across voice coil, should be: I. F. grid, 455 Kc - 10,000 uv., Mixer grid, 455 Kc - 150 uv., Mixer grid, 1000 Kc - 170 uv; Antenna, 14 00 Kc - 100 uv/m.

TUBE LAYOUT

NOBLITT-SPARKS INDUSTRIES, INC.

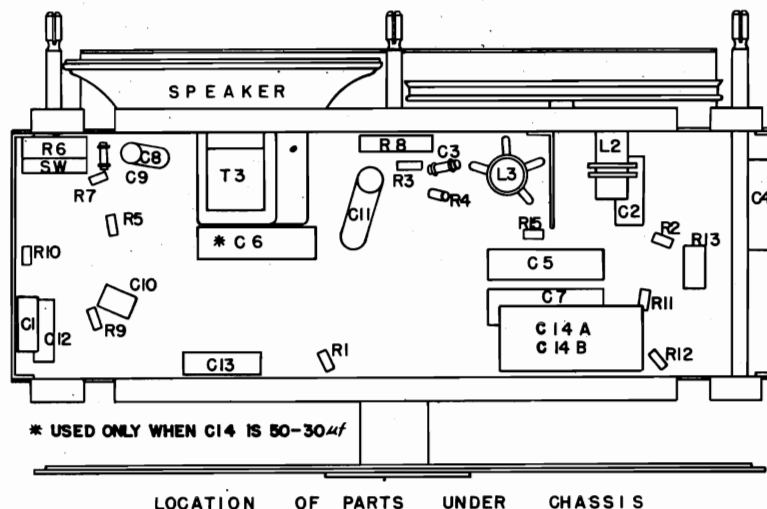
MODEL 160T, 161T,
CHASSIS RE-232

PARTS LIST

Schematic Location	Part No.	Description	Schematic Location	Part No.	Description
R1, 9	C20060-334	Resistor, 330,000 Ohms, 1/4 W	A19124	A19124	Snap-on Button for Mtg. Rear Cover to Cabinet
R2	C20120-822	Resistor, 8200 Ohms, 1/4 W	A19132	A19132	Dial Drive Cord
R3	C20060-223	Resistor, 22,000 Ohms, 1/4 W	A20149-8	A20149-8	Spacer Eyelet for Mtg. Variable Condenser
R4	C20060-685	Resistor, 6.8 Megohm, 1/4 W	A19138-1	A19138-1	Capacitor Mtg. Clip, for Mtg. Electrolytic Condenser
R5	C20060-105	Resistor, 1 Megohm, 1/4 W	A19205-3	A19205-3	Socket, Wafer, Center Pin Shielded
R6	C21554	Volume Control, 500,000 Ohms	A19233-1	A19233-1	Idle Pulley
R7	C20060-335	Resistor, 3.3 Megohm, 1/4 W	A19344-2	A19344-2	Dial Light Bulb, Mazda C47
R8	C21553	Tone Control & Switch, 500,000 Ohms	A19351	A19351	Hair Pin Clip
R10, 12	C20060-151	Resistor, 150 Ohms, 1/4 W	A20040-9	A20040-9	Washer, Brown Felt behind knobs (Model 160-T) (10)
R11			A20040-14	A20040-14	Washer, White Felt behind Knobs (Model 161-T) (10)
R13	C20223-122	Resistor, 1200 Ohms, 2 W	A20077-3	A20077-3	Grommet, Rubber for Mtg. Variable Condenser
R14	C200601473	Resistor, 47,000 Ohms, 1/4 W	A20216-1B	A20216-1B	Speed Nut for Mtg. Name Plate (10)
R15	C20060-473	Resistor, 6800 Ohms, 1/4 W	A20228-1B	A20228-1B	Speed Nut for Mtg. Name Plate (10)
C1	C20067-102	Condenser, .001 uf., 200 V., P. T.	A20229-1B	A20229-1B	Speed Nut for Mtg. Speaker Baffle (10)
C2	C20069-501	Condenser, .0005 uf., 600 V., P. T.	A21330	A21330	Name Plate
C3	C20204-500	Condenser, .00005 uf., 500 V., Ceramic	A21346-2	A21346-2	Socket, Dial Light
C4	C20067-104	Condenser, .1 uf., 200 V., P. T.	E21536-1	E21536-1	Cabinet, Walnut (160-T)
C5	C20067-503	Condenser, .05 uf., 200 V., P. T.	E21536-2	E21536-2	Cabinet, Ivory (161-T)
*C6	A22110	Condenser, 20 uf., 150 V. Elect.	C21559	C21559	Dial Crystal
C7	C20068-503	Condenser, .05 uf., 400 V., P. T.	C21561	C21561	Grille
C8	C20068-103	Condenser, .01 uf., 400 V., P. T.	C21562	C21562	Speaker Baffle
C9	C20226-221	Condenser, .00022 uf., 350 V., Ceramic	C21564	C21564	Dial Pointer
C10	C20065-101	Condenser, .0001 uf., 500 V., Mica	A21568	A21568	Tuning Shaft
C11	C20068-202	Condenser, .002 uf., 400 V., P. T.	C21579	C21579	Felt Baffle
C12, 13	C20068-502	Condenser, .005 uf., 400 V., P. T.	A21607	A21607	Carton, Complete with Fillers
*C14A, B	A21578	Electrolytic Condenser, 50 uf., 150 V., 30 uf., 150 V.	A21737-1	A21737-1	Knob, Walnut (160-T)
**C14A, B	C22111	Electrolytic Condenser, 50 uf., 150 V. 50 uf., 150 V.	A21737-2	A21737-2	Knob, Ivory 0(161-T)
C15A, B, C	AD21569-1	Variable Condenser & Pulley Assy.	A21979	A21979	Cabinet, Rear Cover Assembly, Walnut (160-T)
L1	AD21576-1	Antenna Loop Assembly	A21980	A21980	Cabinet, Rear Cover Assembly, Ivory (161-T)
L2	AC21575-1	R. F. Coil Assembly	A21981	A21981	Dial Scale & Backing Plate Assembly
L3	AC21576-1	Oscillator Coil Assembly			
T1	AC21572-1	1st I. F. Coil Assembly			
T2	AC21573-1	2nd I. F. Coil Assembly			
T3	AC21577-1	Output Transformer Assembly			
Spk.	C21570-1	Speaker, 5-1/4" P. M.			
P	A18254-1	Socket, Wafer, Plain			

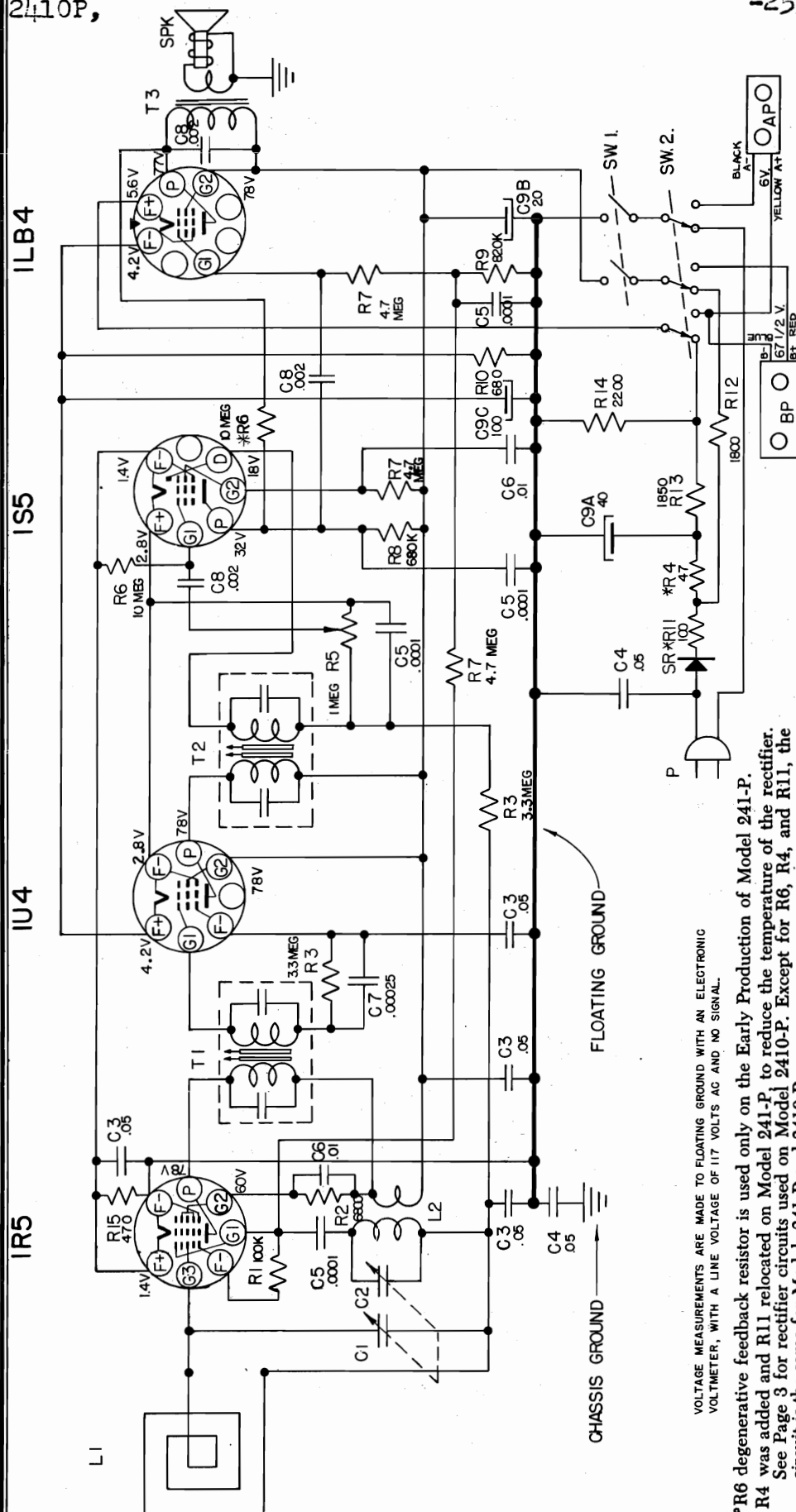
* used on first 18000 sets produced.

** used on sets Produced after first 18,000.



Models 160T is in a walnut cabinet. Model 161T is in an ivory cabinet. The Chassis is the same in both models.

MODELS 241P, 244P, NOBLITT-SPARKS INDUSTRIES, INC. CHASSIS RE-244,
2410P, -255, -256, -259, -254



VOLTAGE MEASUREMENTS ARE MADE TO FLOATING GROUND WITH AN ELECTRONIC VOLTMEETER, WITH A LINE VOLTAGE OF 117 VOLTS AC AND NO SIGNAL.

*R6 degenerative feedback resistor is used only on the Early Production of Model 241-P. R4 was added and R11 relocated on Model 241-P to reduce the temperature of the rectifier. See Page 3 for rectifier circuits used on Model 2410-P. Except for R6, R4, and R11, the circuit is the same for Models 241-P and 2410-P.

SPECIFICATIONS

FREQUENCY RANGE

Broadcast ----- 540-1600 kc

IF ----- 455 kc

TUBES AND FUNCTIONS

IR5 ----- Mixer-oscillator

IU4 ----- IF Amp.

IS5 ----- DET-AVC AF Amp.

ILB4 ----- Output

POWER SUPPLY

1. 67 1/2 V. B Battery, Eveready Minimax, No. 467 or Equal.

4. 1 1/2 V. D Size Flashlight Cells, 6 Volts total

LOUD SPEAKER

Type: Permanent magnet

Size: 4 Inch

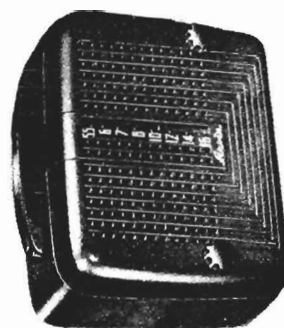
Voice coil impedance ----- 3.2 Ohms

POWER OUTPUT

Undistorted ----- .05 Watt

Maximum ----- .1 Watt

Plate Load ----- 14,000 ohms



NOBLITT-SPARKS INDUSTRIES, INC. MODELS 241P, 244P,
2410P, CHASSIS RE-244,
-255, -256, -259, -254

ALIGNMENT PROCEDURE

PRELIMINARY:

Output meter connection	-----	Across loudspeaker voice coil
Output meter reading to indicate 50 MW (Standard Output)	-----	.4 volts
Dummy antenna value to be used in series with generator output	-----	See chart below
Connection of generator output lead	-----	See chart below
Connection of generator ground lead	-----	Floating ground
Generator modulation	-----	30% 400 cycles
Position of volume control	-----	Fully clockwise

With variable condenser closed, place top edge of pointer across center of top hole on dial backing plate.

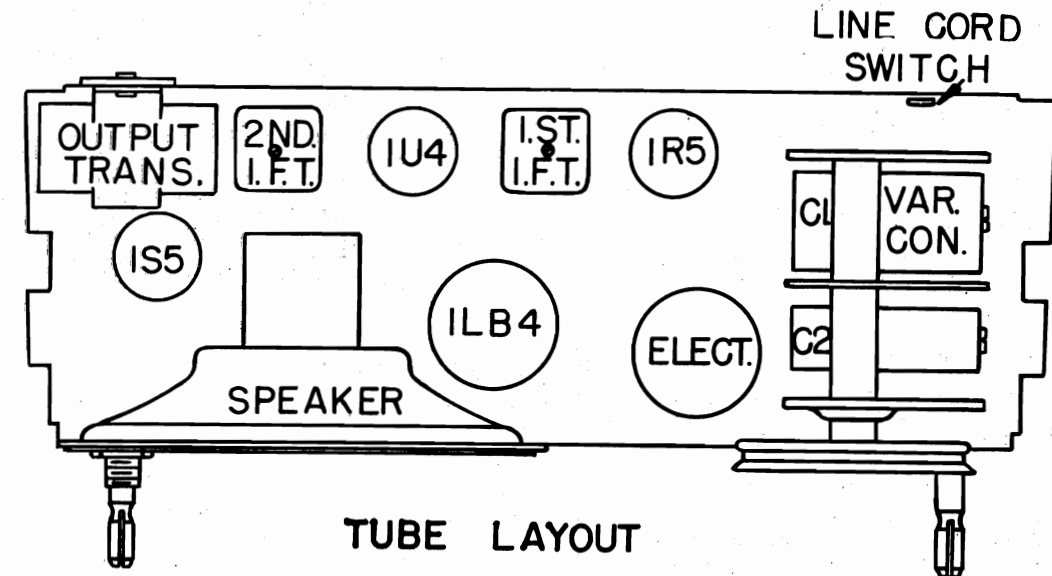
When adjusting C1, place the set loop the same distance from and in the same position with respect to the chassis and batteries, as it would be when mounted in the cabinet.

Position of Variable	Frequency of Generator	Dummy Antenna	Generator Output Connection	Trimmers Adjusted in Order Shown for Maximum Output	Function of Trimmer
Open	455	.05 mfd.	1R5 Grid (Stator of C1)	Top & Bottom of IF Trans. T2 & T1.	IF
1400	1400		*Test Loop	C2; C1, Trimmers on Variable Condenser	Oscillator Antenna
600	600		*Test Loop	**Check Point	

* Standard Hazeltine Test Loop Model 1150 or 3 turns of wire about 6" diameter, placed about one foot from the set loop.

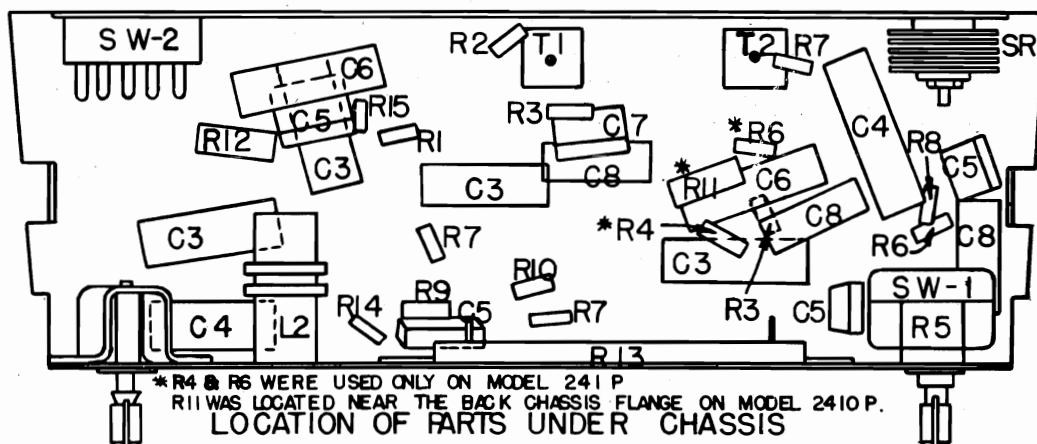
** If weak, adjust variable condenser plates for maximum output.

The alignment procedure should be repeated in the original order for greatest accuracy. Always keep the output from the signal generator at its lowest possible value to make the AVC action of the receiver ineffective.



ON-OFF SWITCH AND VOLUME

TUNING



MODELS 241P, 244P, NOBLITT-SPARKS INDUSTRIES, INC. 2410P, CHASSIS RE-244, -255, -256, -259, -254

241P, 244P & 2410P PARTS LIST

Schematic Location	Part No.	Description	Schematic Location	Part No.	Description
R1	C20060-104	Resistor, 100,000 Ohm, 1/4 Watt	T1	C21797-1	1st I. F. Coil Assy.
R2	C20060-682	Resistor, 6800 Ohm, 1/4 Watt	T2	C21797-2	2nd I. F. Coil Assy.
R3	C20060-335	Resistor, 3.3 Megohm, 1/4 Watt	T3	AC21799-1	Output Transformer Assy.
R4 241 only	C20060-470	Resistor, 47 Ohm, 1/4 Watt	SR	A20207-1	Selenium Rectifier, 75 Ma., Federal
R4 2410-P	C20060-680	Resistor, 68 Ohms 1/4 Watt	or	A20207-2	Selenium Rectifier, 100 Ma., Radio Receptor
R5	C21782	Volume Control & Switch, 1 Megohm	Spk	C21768	Speaker, 4" P. M.
R6	C20060-106	Resistor, 10 Megohm, 1/4 Watt	Sw-2	A21051	Slide Switch
R7	C20060-475	Resistor, 4.7 Megohm, 1/4 Watt	AP	A21861	"A" Battery Cable & Terminal Strip
R8	C20060-684	Resistor, 680,000 Ohm, 1/4 Watt	BP	A21842	"B" Battery Cable & Terminal Strip
R9	C20120-824	Resistor, 820,000 Ohm, 1/4 Watt, + or - 10%	P	B20246-1	Line Cord & Plug Assy.
R10	C20060-681	Resistor, 680 Ohm, 1/4 Watt		*AA21957-()	Cabinet Assy., Front Sec., with Grill Cloth & Latch
R11	C20070-101	Resistor, 100 Ohm, 1 Watt, + or - 10%		*C21766-()	Handle
R12	C20070-182	Resistor, 1800 Ohms, 1 Watt, + or - 10%		*A21764-()	Knob
R13	A21816	Resistor, 1850 Ohms, 10 Watt, + or - 10%		A21801	Line Cord Hook
R14	C20060-222	Resistor, 2200 Ohms, 1/4 Watt		A21802	Spring, Hinge (Set of two)
R15	C20060-471	Resistor, 470 Ohms, 1/4 Watt		A21803	Mtg. Stud for Handle
C1, C2	C19822	Condenser, Variable		A21241-1A	Speed Nut for Mtg. Handle (Set of two)
C3	C20067-503	Condenser, .05 uf., 200 Volts, P. T.		A21838	Carton (Complete with Fillers)
C4	C20068-503	Condenser, .05 uf., 400 Volts, P. T.		A21785	Tuning Shaft
C5	C20065-101	Condenser, .0001 uf., 500 Volts, Mica		A20077-3	Grommet, Variable Con. Mtg.
C6	C20068-103	Condenser, .01 uf., 400 Volts, P. T.		A19138-1	Eyelet, Spacer, Variable Condenser Mtg.
C7	C20065-251	Condenser, .00025 uf., 500 Volts, Mica		A19361	Hair Pin Clip for Tuning Shaft
C8	C20069-202	Condenser, .002 uf., 600 Volts, P. T.		A19132	Dial Drive Cord
C9	A21815	Condenser, Electrolytic, 40-20 uf., 150 Volts, 100 uf., 10 Volts		*A21783-()	Pointer
L1	*AC21795-()	Antenna Loop & Cabinet Back Assy.		A21792	Spring Clip, IF Coil Mtg.
L2	AC21796-1	Oscillator Coil Assy.		A19133	Spring, Dial Cord
				A20243-3	Socket, Miniature, Shielded
				A20243-1	Socket, Miniature, Unshielded
				A21851-1	Socket, Local Molded
				A21852	Electrolytic Mtg. Wafer
				AC21858-1	Battery Clip Assy.
				C21767-1	Spring Latch

* When ordering these parts use the following dash numbers as suffixes to the Part numbers.

Ivory - 1 for handle, 3 for all other Cabinet Parts; Red - 1 for all Colored Parts;

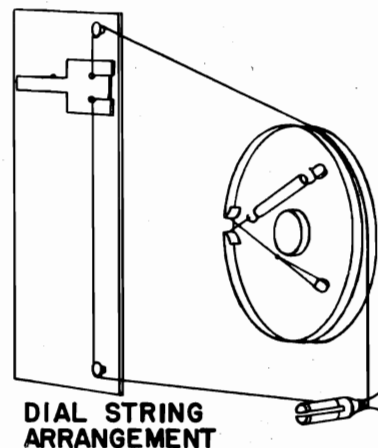
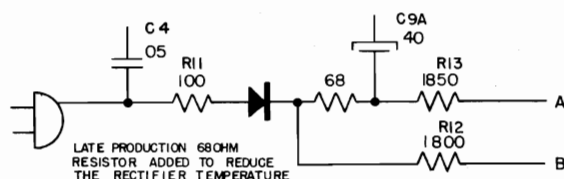
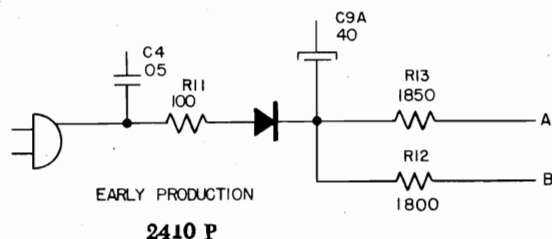
Tan - 1 for Pointer & handle - 3 for knobs, - 4 for Cabinet parts;

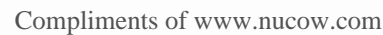
Green - 1 for Pointed, - 5 for knobs Cabinet parts & handle.

Model Number & Chassis Number Combinations.

Model	Chassis	Model	Chassis
241P Ivory	Re-244	241P Red	RE-245
241P Tan	RE-255	244P Green	RE-259

The above Chassis are identical except for Colored parts Model 2410P - Chassis RE-254 was produced in Red, Ivory & Tan, all using the same Chassis Number. It has Certain Circuit Variations which are covered in this bulletin.





MODELS 242T, 243T, NOBLITT-SPARKS INDUSTRIES, INC. CHASSIS RE-251

ALIGNMENT PROCEDURE

PRELIMINARY.

Output meter connection	-----	Across loudspeaker voice coil
Output meter reading to indicate 200 milliwatts (standard output)	-----	0.8 volts
Dummy antenna to be in series with signal generator output	-----	See chart below
Connection of generator ground lead	-----	Floating ground
Generator modulation	-----	30% 400 cycles
Position of Volume Control	-----	Fully clockwise
Position of pointer with variable fully closed	-----	55 on dial

Position of Variable	Generator Frequency	Dummy Antenna	Generator Output Connection	Trimmers Adjusted	Trimmer Function	Approximate Sensitivity
Open	455 Kc	.05 uf.	12SA7 Grid (Stator of C-1)	2 trimmers on IF. Trans.	IF	3000 uv.
1400 Kc	1400Kc	.00005 uf.	Antenna Lug with**C-2 Hank Removed		Oscillator	360 uv.

**Since the antenna section of the variable has no trimmer, the rotor of the variable should be rocked back and forth on both sides of 1400 Kc while adjusting the oscillator trimmer for maximum output. This is to obtain the combination of rotor and trimmer setting to give perfect tracking of the two sections of the variable condenser and consequently give maximum output.

Check sensitivity at 600 Kc. If weak, adjust antenna section plates for maximum output at 600 Kc. Tracking of the condenser at points other than 1400 Kc is accomplished by bending the outside plates on the variable condenser rotor, which are cut for this purpose. When bending plates to track the condenser at any given frequency, keep in mind the fact that this will effect the tracking at all frequencies below that point. A tuning wand is very helpful in checking the tracking of this condenser; to indicate whether more or less capacity is needed.

The alignment procedure should be repeated stage by stage in the original order for greatest accuracy.

Always keep the output from the test oscillator at its lowest possible value to make the AVC action of the receiver ineffective.

REF. NO.	DESCRIPTION	REF. NO.	DESCRIPTION
R1	C20060-334 Resistor, 330,000 Ohms, ¼ W.	C6, C9	C20065-101 Condenser, .0001 uf., 500 V.
R2	C20060-223 Resistor, 22,000 Ohms, ¼ W.	C7, C10	C20069-202 Condenser, .002 uf., 500 V.
R3	C20060-475 Resistor, 4.7 Megohms, ¼ W.	C11A	Condenser, 40 uf., 150 V.
R4	A19177 Resistor, 47 Ohms, 1 W.	C11B	A19176 Condenser, 20 uf., 150 V.
R5	C21630 Resistor, 2 Megohms, volume control and switch	C11C	Condenser, 20 uf., 25 V.
R6	C20060-156 Resistor, 15 Megohms, ¼ W.	C12	C20068-103 Condenser, .01 uf., 400 V.
R7	C20060-474 Resistor, 470,000 Ohms, ¼ W.	L1	AC18255-1 Coil, antenna
R8	C20060-105 Resistor, 1 Megohm, ¼ W.	L2	AC18256-1 Coil, oscillator
R9	C20060-150 Resistor, 15 Ohms, ¼ W.	T1	AC18257-1 Coil, i. f.
R10	C20060-151 Resistor, 150 Ohms, ¼ W.	T2	AC18258-1 Output transformer
R11	C20070-222 Resistor, 2,200 Ohms, 1 W.		*E22029-() Cabinet
C1, C2	C22047 Condenser, variable		*C19560-() Cabinet back cover
C3	C20067-503 Condenser, .05 uf., 200 V.		*C22028-() Knob, tuning
C4, C8	C20068-503 Condenser, .05 uf., 400 V.		*C22049-() Knob, volume
C5	C20065-500 Condenser, .00005 uf., 500 V.	Spk.	C21626 Speaker
		P	B20257-1 Line cord and plug assembly

*Be sure to use the dash number as outlined in the chart below when ordering colored parts:

MODEL	CABINET	REAR COVER	VOL. KNOB	TUN. KNOB
242T	E22029-2	C19560-2	A22049-1	C22028-1
Ivory	Ivory	Ivory	Light Tan	Light Tan
243T	E22029-3	C19560-3	A22049-2	C22028-2
Yellow	Yellow	Yellow	Lt. Blue	Lt. Blue
243T	E22029-5	C19560-5	A22049-5	C22028-5
Green	Green	Green	Banana Yellow	Banana Yellow
243T	E22029-6	C19560-6	A22049-3	C22028-3
Red	Red	Red	Pale Yellow	Pale Yellow

SPECIFICATIONS

FREQUENCY RANGE

Broadcast	-----	540-1600 kc
IF	-----	455 kc

TUBES AND FUNCTIONS

12SA7	-----	Mixer-oscillator
12SQ7	-----	Detector - AVC-AF.
50L6GT	-----	Output
35Z5CT	-----	Rectifier

POWER SUPPLY

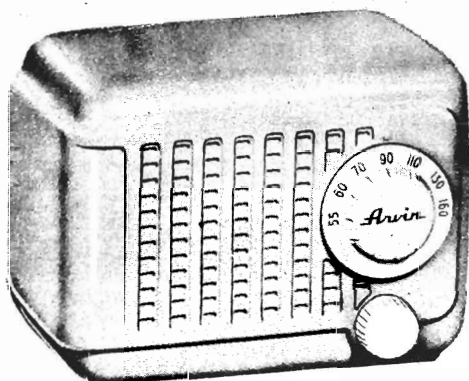
105-125 Volts, AC-DC, 30 Watts

POWER OUTPUT

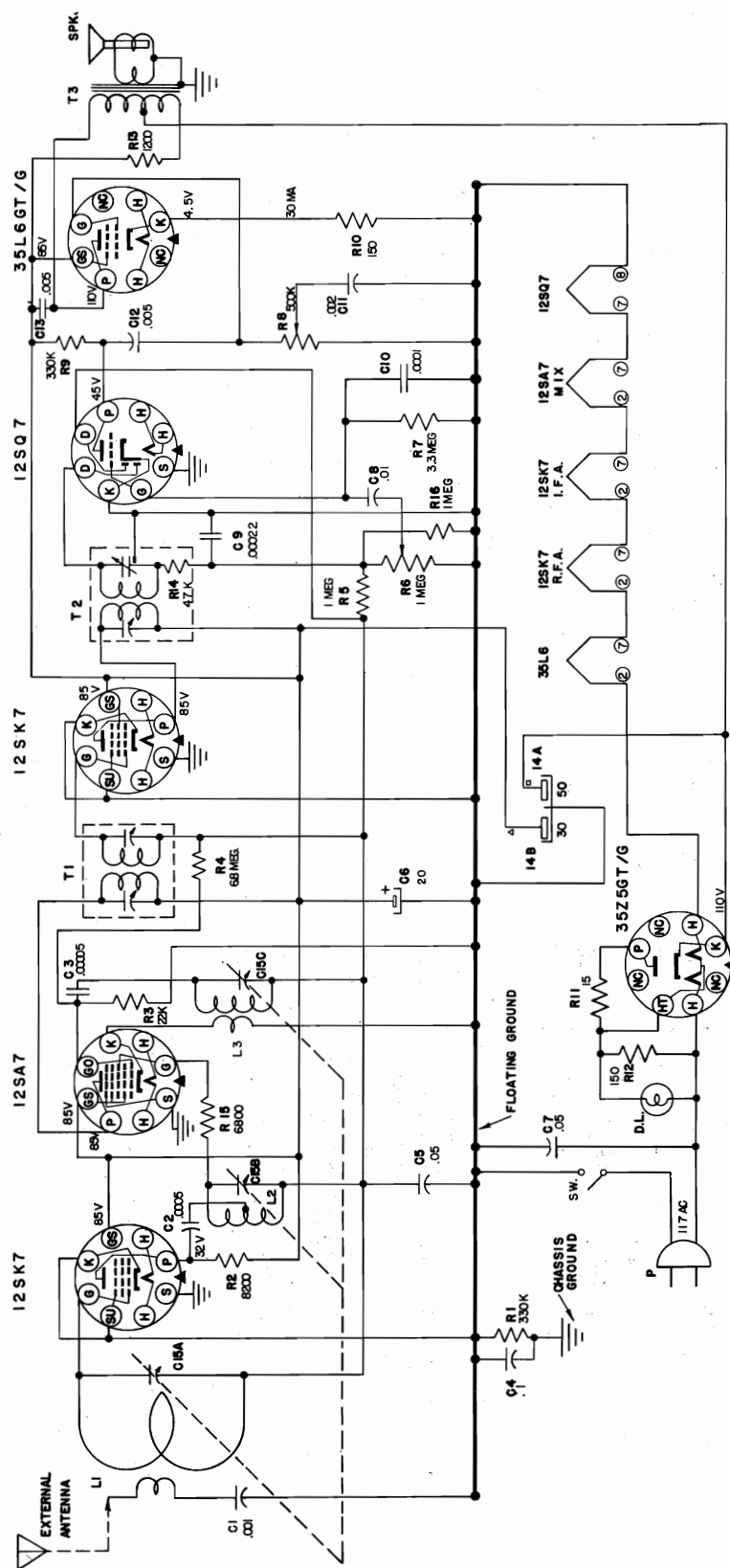
Type:	Beam tube	
Undistorted	-----	.8 Watts
Maximum	-----	2.5 Watts
Plate Load	-----	2000 Ohms

LOUD SPEAKER

Type:	Permanent magnet
Size:	4 inch
Voice coil impedance	----- 3.2 Ohms



NOBLITT-SPARKS INDUSTRIES, INC.

MODELS 264T, 265T,
CHASSIS RE-265

VOLTAGE MEASUREMENTS MADE WITH AN ELECTRONIC VOLTMETER,
100 OHM INPUT RESISTANCE & NO SIGNAL.

NOTE: TUBULAR PAPER
CAPACITORS
CURVED LINE
INDICATES
OUTSIDE FOIL.

SPECIFICATIONS

LOUD SPEAKER

Type: Permanent magnet, 1.47 oz. Alnico 5
Size: 5/4 Inch
Voice coil impedance ----- 3.2 Ohms

CHASSIS FEATURES
Automatic Volume Control
Built-in Loop
Tuned RF Stage

OPERATING CONTROLS

1. Left knob ----- Volume
2. Left Center knob ----- Tone
3. Right Center knob ----- ON-OFF Switch
4. Right ----- Tuning

PHYSICAL DIMENSIONS

Length ----- 14 inches
Height ----- 8 1/2 inches
Depth ----- 8 5/16 inches

FREQUENCY RANGE

Broadcast ----- 540-1600 kc
IF ----- 455 kc

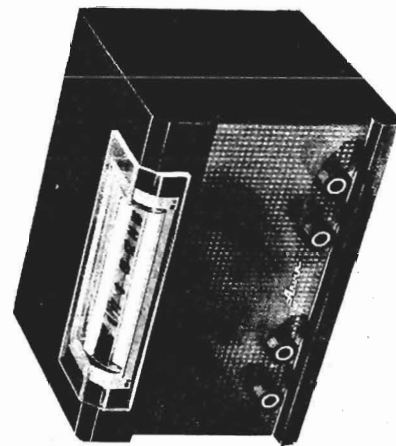
TUBES AND FUNCTIONS

12SK7 ----- RF Amp.
12SA7 ----- Mixer-oscillator
12SK7 ----- IF Amp.
12SQ7 ----- DET-AVC AF Amp.
35L6 ----- Output
35Z5GT ----- Rectifier

POWER OUTPUT

Undistorted ----- 8 Watts
Maximum ----- 1.1 Watts
Plate load ----- 2000 Ohms

Models 264T is in a Mahogany cabinet. Model 265T is in a Bleached Mahogany cabinet. The Chassis is the same in both models.



MODELS 264T, 265T, NOBLITT-SPARKS INDUSTRIES, INC.
CHASSIS RE-265

ALIGNMENT PROCEDURE

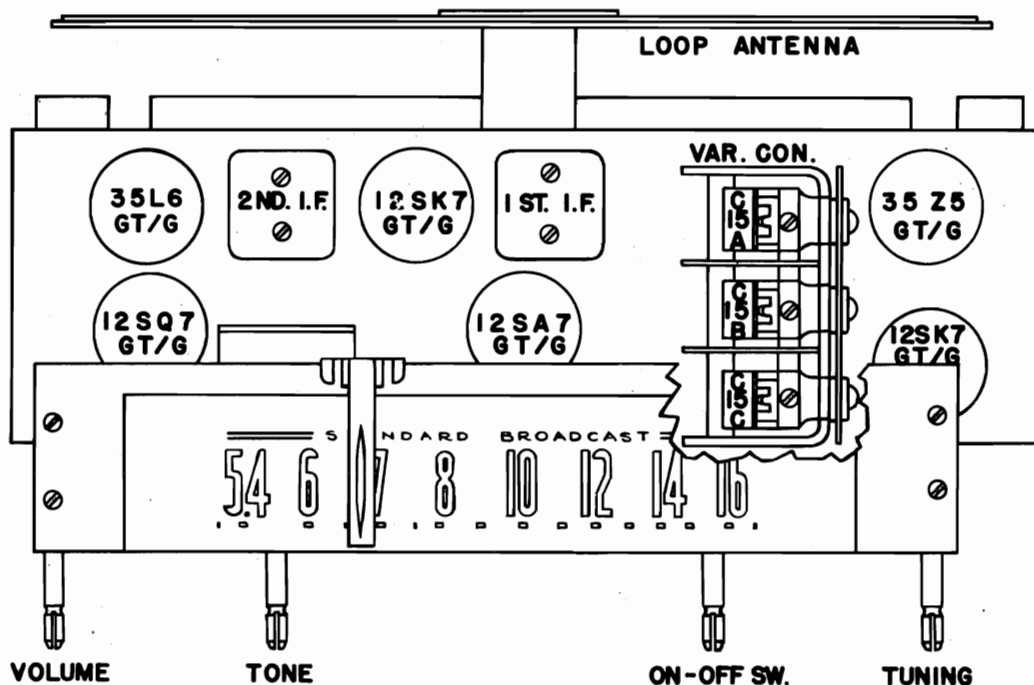
PRELIMINARY:

Output meter connection ----- Across loudspeaker voice coil
Output meter reading to indicate 200 mw (standard output) ----- .8 volts
Connection of generator ground lead ----- Floating ground
Generator modulation. ----- 30% 400 cycles
Position of volume control ----- Fully clockwise
Position of dial pointer with variable fully closed ----- Last mark at left end of dial

1. Connect signal generator lead through a .05 uf. condenser to converter grid. Open tuning condenser. Set signal generator to 455 Kc. Tune I. F. Transformers for maximum output.
2. Close tuning condenser and set pointer at end mark of dial. Open tuning condenser. Connect signal generator to test loop or to blue lead on set loop. Set signal generator to 1620 Kc. Tune trimmer on (C15C) oscillator section of tuning condenser for maximum output.
3. Set signal generator to 1400 Kc. Adjust tuning shaft until maximum output is obtained. Tune R. F. trimmer (C15B) and antenna trimmer (C15A) on tuning condenser for greatest output. Reset tuning shaft until output is again a maximum. Retune R. F. and antenna trimmers. Repeat this cycle of operations at 1400 Kc until no further increase of output can be obtained. Keep generator output at a low value to prevent detuning by A. V. C. action.
4. Set signal generator to 600 Kc. Adjust tuning shaft for maximum output. Adjust tuning condenser plates for maximum output.

Approximate stage by stage sensitivities with 117V. AC line voltage and .8 V. output across voice coil, should be: I. F. grid, 455 Kc - 10,000 uv., Mixer grid, 455 Kc - 150 uv., Mixer grid, 1000 Kc - 170 uv; Antenna, 1400 Kc - 100 uv/m.

TUBE LAYOUT

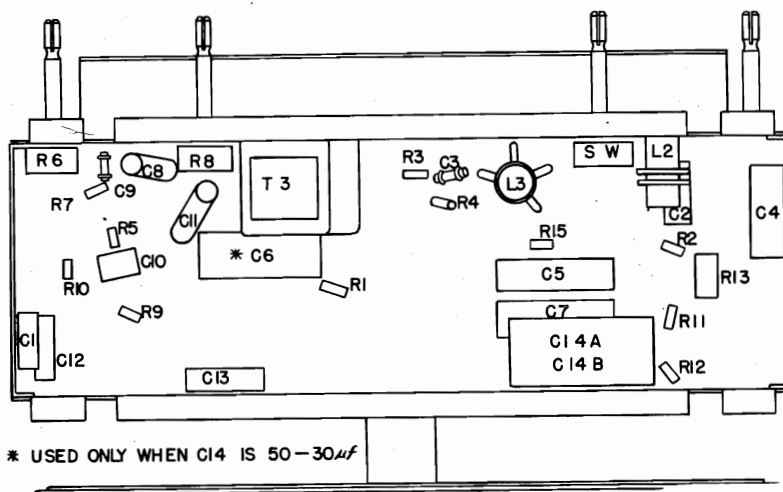


NOBLITT-SPARKS INDUSTRIES, INC. MODELS 264T, 265T, CHASSIS RE-265

PARTS LIST

Schematic Location	Part No.	Description	Schematic Location	Part No.	Description
R1, 9	C20060-334	Resistor, 330,000 Ohms, ¼ W	Spk.	C21331	Speaker, 5-1/4" P. M.
R2	C20120-822	Resistor, 8200 Ohms, ¼ W	DL	A19351	Dial Light Bulb
R3	C20060-223	Resistor, 22,000 Ohms, ¼ W	P	B20138-12	Line Cord and Plug Assembly.
R4	C20060-685	Resistor, 6.8 Megohm, ¼ W	SW	C22157	Switch On-Off
R5, R16	C20060-105	Resistor, 1 Megohm, ¼ W	R21379-3	Cabinet Mahogany 264-T	
R6	C21404-1	Volume Control, 1 Megohm	R21379-4	Cabinet Bleached Mahogany 265-T	
R7	C20060-335	Resistor, 3.3 Megohm, ¼ W	A21700	Carton Complete with Fillers	
R8	C21405-1	Tone Control & Switch, 500,000 Ohms	A19361	Clip, Hairpin for Tuning Shaft	
R10, 12	C20060-151	Resistor, 150 Ohms, ¼ W	A19205-3	Clip, Electrolytic Condenser Mounting	
R11	C20060-150	Resistor, 15 Ohms, ¼ W	A19132	Cord, Dial Drive	
R13	C20223-122	Resistor, 1200 Ohms, 2 W	AC21377-1	Dial Pointer	
R14	C20060-473	Resistor, 47,000 Ohms, ¼ W	D22152	Dial Scale	
R15	C20060-682	Resistor, 6800 Ohms, ¼ W	D21365	Escutcheon Clear Lucite	
C1	C20067-102	Condenser, .001 uf., 200 V., P. T.	C21426	Grille, Cabinet Front	
C2	C20069-501	Condenser, .0005 uf., 600 V., P. T.	C21498	Grille Felt	
C3	C20204-500	Condenser, .00005 uf., 500 V., Ceramic	A20077-3	Grommet, Rubber under Variable Condenser	
C4	C20067-104	Condenser, .1 uf., 200 V., P. T.	A20202-2	Idle Pulley (Quantity of 5)	
C5	C20067-503	Condenser, .05 uf., 200 V., P. T.	C21427	Knob, Volume	
*C6	A22110	Condenser, .20 uf., 150 V. Elect.	C21428	Knob, Tuning	
C7	C20068-503	Condenser, .05 uf., 400 V., P. T.	C22150	Knob, On-Off	
C8	C20068-103	Condenser, .01 uf., 400 V., P. T.	C22151	Knob, Tone	
C9	C20226-221	Condenser, .00022 uf., 350 V., Ceramic	A21330	Name Plate	
C10	C20065-101	Condenser, .0001 uf., 500 V., Mica	D21434	Rear Cover	
C11	C20068-202	Condenser, .002 uf., 400 V., P. T.	A20196-2	Rivet, Tubular, Shoulder (For Mtg. Idle Pulley Qty. of 5)	
C12, 13	C20068-502	Condenser, .005 uf., 400 V., P. T.	A20196-4	Rivet, Tubular, Shoulder (For Mtg. Idle Pulley Qty. of 5)	
*C14A, B	A21578	Electrolytic Condenser, 50 uf., 150 V., 30 uf., 150 V.	A21442	Shaft, Tuning	
C14A, B	C22111	Electrolytic Condenser, 50 uf., 150 V. 50 uf., 150 V.	A21346-2	Socket, Dial Light	
C15A, B, C	AD22154-1	Variable Condenser & Pulley Assy.	A19233-1	Socket, Tube, Wafer Center Pin Shielded	
L1	AD21574-1	Antenna Loop Assembly	A18254-1	Socket, Tube, Wafer Plain	
L2	AC21575-1	R. F. Coil Assembly	A19579	Socket, Speaker	
L3	AC21576-1	Oscillator Coil Assembly	A19138-1	Spacer Eyelet, Variable Condenser Mounting	
T1	AC21572-1	1st I. F. Coil Assembly	A19295	Spring, Dial Drive Cord	
T2	AC21573-1	2nd I. F. Coil Assembly	A20040-9	Washers, Brown Felt, Behind Knobs (Qty. of 10)	
T3	AC21577-1	Output Transformer Assembly			

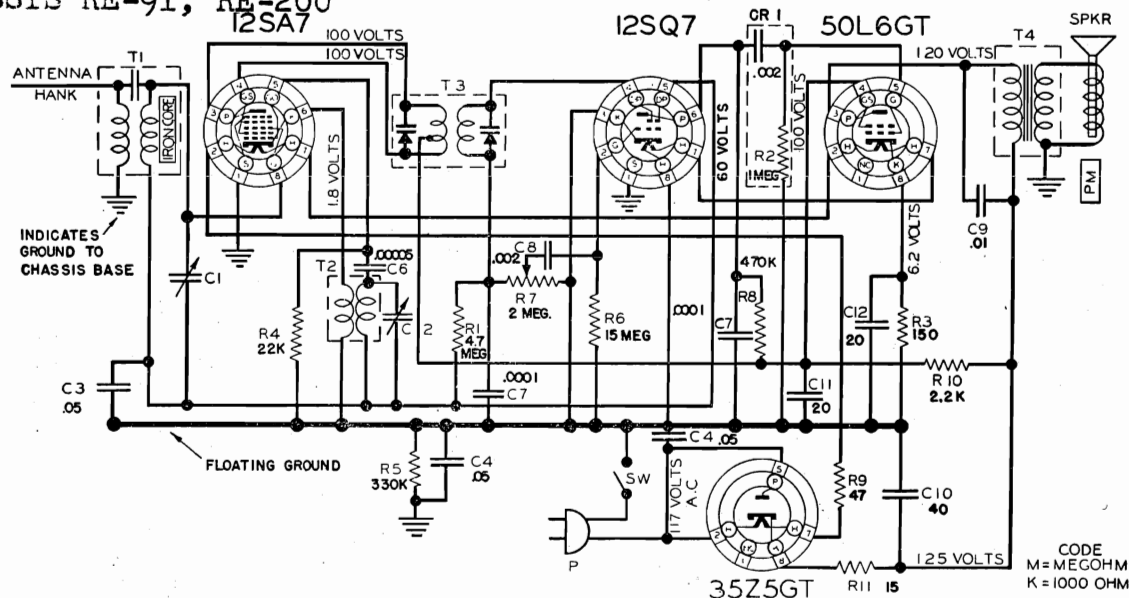
*C6 Part C22110 was used only on sets where C14 was Part 21578 50-30 mfd. Part 21578 was replaced by Part 22111, 50-50 mfd. in later production.



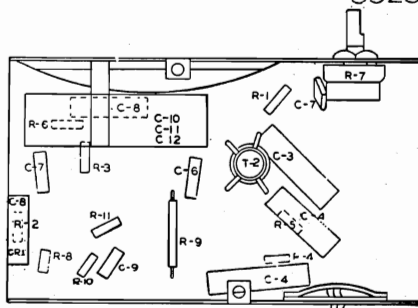
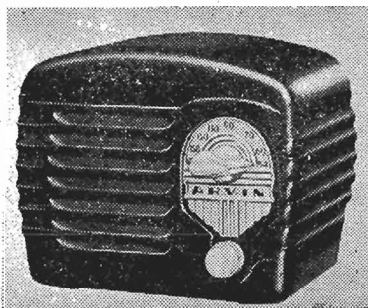
* USED ONLY WHEN C14 IS 50-30µf

LOCATION OF PARTS UNDER CHASSIS

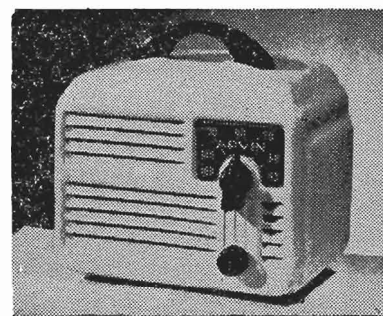
MODELS 442, 444AH, NOBLITT-SPARKS INDUSTRIES, INC.
CHASSIS RE-91, RE-200
12SA7



CODE
M = MEGOHM
K = 1000 OHM



LOCATION OF PARTS UNDER CHASSIS



Model 444-AH is the same as Model 444 except for the handle and cabinet.

Model 442 is wired from the same Schematic Diagram as the Model 444 and 444-AH but has different components as indicated in the Parts List.

Some of the first Model 442 chassis had the same components as the Model 444 chassis except for the chassis base.

The symbol CR1 on the Schematic Diagram represents a capristor which contains a .002 condenser and a 1 megohm resistor in one unit. This is used only on the Model 442.

FREQUENCY RANGE

Broadcast 540-1600 kc
IF 455 kc

TUBES AND FUNCTIONS

12SA7 Mixer-oscillator
12SQ7 Detector-AVC-AF
50L6GT Output
35Z5GT Rectifier

POWER SUPPLY

105-125 Volts AC-DC, 35 Watts

POWER OUTPUT

Type: Beam tube
Undistorted8 Watts
Maximum 2.5 Watts
Plate load 2000 ohms

LOUD SPEAKER

Type: Permanent magnet
Size: 4 inch
Voice coil impedance 3.2 ohms

PARTS LIST

REF. NO.	PART NO.	DESCRIPTION
R1	C20060-475	Resistor, 4.7 megohms, 1/4 watt
*R2	Part of A21642	Resistor, 1 megohm
**R2	C20060-105	Resistor, 1 megohm, 1/4 watt
R3	C20060-151	Resistor, 150 ohms, 1/4 watt
R4	C20060-223	Resistor, 22,000 ohms, 1/4 watt
R5	C20060-334	Resistor, 330,000 ohms, 1/4 watt
R6	C20060-156	Resistor, 15 megohms, 1/4 watt
R7	C21630	Resistor, 2 megohms, Vol. control & sw.
R8	C20060-474	Resistor, 470,000 ohms, 1/4 watt
R9	A19177	Resistor, 47 ohms, 1 watt
R10	C20070-222	Resistor, 2,200 ohms, 1 watt
R11	C20060-150	Resistor, 15 ohms, 1/4 watt
C1, C2	B17115	Condenser, variable
C3	C20067-503	Condenser, .05 mfd., 200 volt
C4	C20068-503	Condenser, .05 mfd., 400 volt
*C6	A21643	Condenser, .00005 mfd
**C6	C20065-500	Condenser, .00005 mfd., 500 volt
*C7	A21645	Condenser, .0001 mfd.
**C7	C20065-101	Condenser, .0001 mfd., 500 volt
*C8	C20068-202	Condenser, .002 mfd., 400 volt
**C8	C20069-202	Condenser, .002 mfd., 500 volt
*C9	C20208-103	Condenser, .01 mfd., 350 volt, ceramic
**C9	C20068-103	Condenser, .01 mfd., 400 volt

*Used on Model 442 only.

**Used on Model 444AH only.

REF. NO.	PART NO.	DESCRIPTION
C10)		Condenser, 40 mfd., 150 volt
C11)	A19176	Condenser, 20 mfd., 150 volt
C12)		Condenser, 20 mfd., 25 volt
T1	AC18255-1	Coil, Antenna
T2	AC18256-1	Coil, Oscillator
T3	AC18257-1	Coil, I. F.
T4	AC18258-1	Output Transformer
	A18263	Dial Scale Emblem
	*D16511-2	Cabinet, Black
	**E18124-3	Cabinet, Ivory
	*A18592-2	Knob, Tuning, Ivory
	**A18261-3	Knob, Tuning, Ivory
	*A21632	Knob, Volume, Ivory
	**A18262-3	Knob, Volume, Ivory
	C21626	Speaker
*Spk.	B17209	Speaker
*C5	C20068-502	Condenser, .005 mfd., 400 volt
*CR-1	A21642	Capristor, .002 uf., condenser and 1 megohm Resistor
	**A17010	Handle
	A21635	Carton with Fillers
	**A21666	Carton with Fillers
	B20237-1	Line Cord and Plug Assembly

MODELS 547, 547A, NOBLITT-SPARKS INDUSTRIES, INC. MODELS 442, 444AH,
CHASSIS RE-242 CHASSIS RE-91, RE-200

ALIGNMENT PROCEDURE

PRELIMINARY:

Output meter connection	Across loudspeaker voice coil
Output meter reading to indicate 200 milliwatts (standard output)	0.8 volts
Dummy antenna to be in series with signal generator output	See chart below
Connection of generator ground lead	Floating ground
Generator modulation	30% 400 cycles
Position of Volume Control	Fully clockwise
Position of pointer with variable fully closed	54 on dial

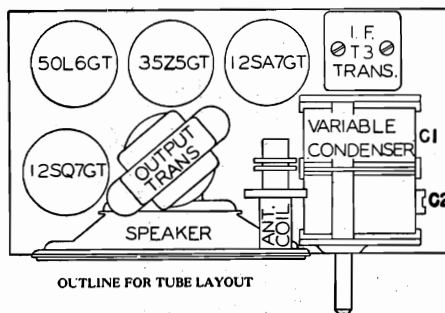
Position of Variable	Generator Frequency	Dummy Antenna	Generator Output Connection	Trimmers Adjuster	Trimmer Function	Approximate Sensitivity
Open	455 Kc	.05 uf	12SA7 Grid (Stator of C-1)	2 trimmers on top of T-3	IF	3000 uv
1400 Kc	1400 Kc	.00005 uf	Antenna lug with Ant. Removed	**C-2	Oscillator	360 uv

**Since the antenna section of the variable has no trimmer, the rotor of the variable should be rocked back and forth on both sides of 1400 Kc while adjusting the oscillator trimmer for maximum output. This is to obtain the combination of rotor and trimmer setting to give perfect tracking of the two sections of the variable condenser and consequently give maximum output.

Check sensitivity at 600 Kc. If weak, adjust antenna section plates for maximum output at 600 Kc. Tracking of the condenser at points other than 1400 Kc is accomplished by bending the outside plates on the variable condenser rotor, which are cut for this purpose. When bending plates to track the condenser at any given frequency, keep in mind the fact that this will affect the tracking at all frequencies below the point where the plates are bent. A tuning wand is very helpful in checking the tracking of this condenser, to indicate whether more or less capacity is needed.

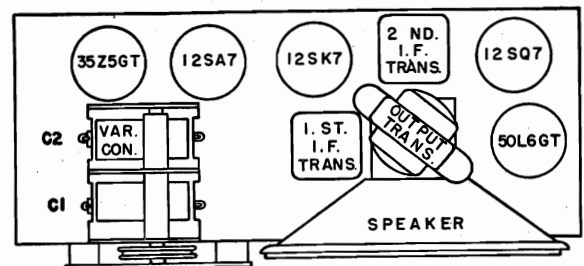
The alignment procedure should be repeated stage by stage in the original order for greatest accuracy.

Always keep the output from the test oscillator at its lowest possible value to make the AVC action of the receiver ineffective.



MODELS 547, 547A,
CHASSIS RE-242

MODELS 442, 444AH,
CHASSIS RE-91, RE-200



OUTLINE FOR TUBE LAYOUT

ALIGNMENT PROCEDURE

PRELIMINARY:

Output meter connection	Across loudspeaker voice coil
Output meter reading to indicate 200 milliwatts (standard output)	0.8 volts
Dummy antenna to be used in series with generator output	See chart below
Connection of generator output lead	See chart below
Connection of generator ground lead	Floating ground
Generator modulation	30% 400 cycles
Position of Volume Control	Fully clockwise
Position of dial pointer with variable fully closed	Horizontal

Place the set loop in the same position with respect to the rear of the chassis, and the same distance from the chassis, as it would be with the set mounted in the cabinet.

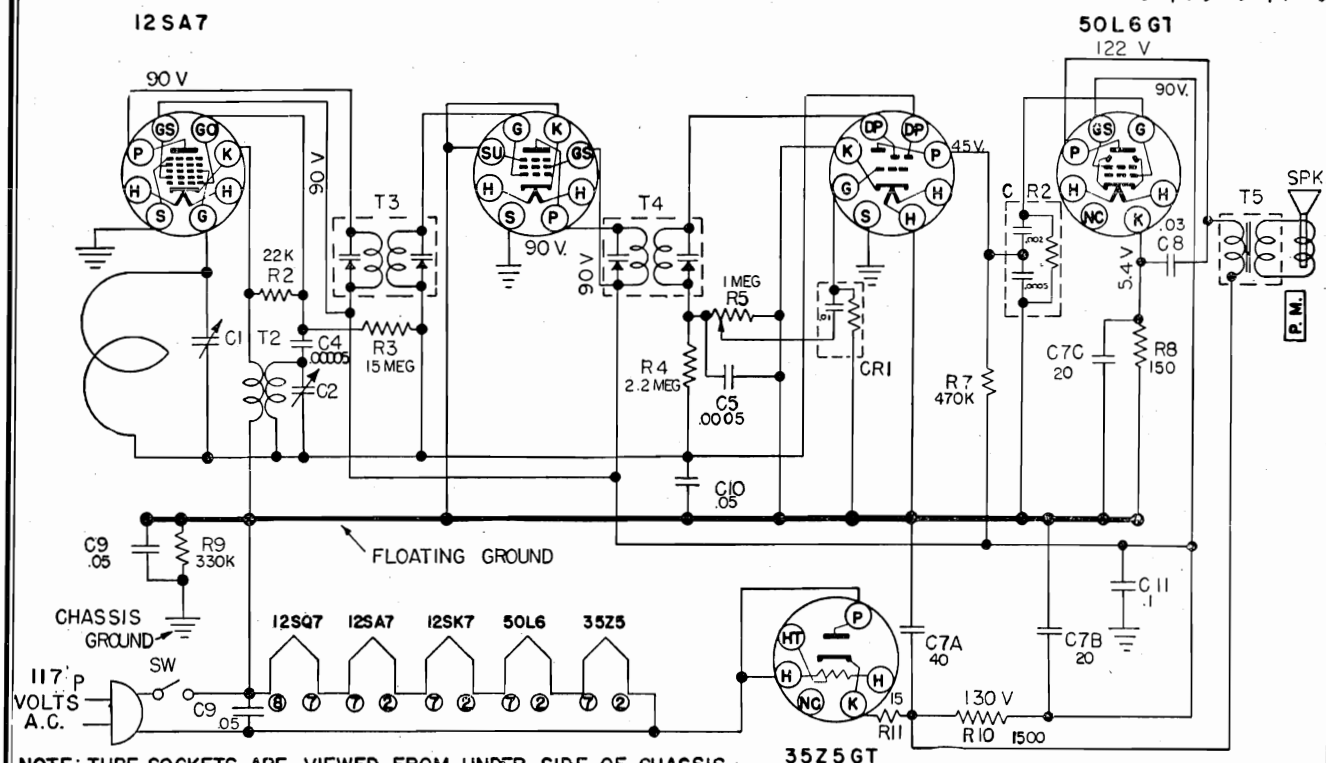
Position of Variable	Frequency of Generator	Dummy Antenna	Generator Output Connection	Trimmers Adjusted In Order Shown For Maximum Output	Function of Trimmer
Open	455	.05 mfd.	12SA7 Grid (Stator of C-1)	Top of 2nd & 1st IF trans. T2 & T1	IF
1400	1400		*Test Loop	C2; C1, Trimmers on Variable Condenser	Osc. Ant.
600	600		*Test Loop	Check Point (If weak, adjust variable plates for maximum output.)	

*Standard Hazeltine Test Loop Model 1150 or 3 turns of wire about 6" in diameter, placed about one foot from the set loop.

The alignment procedure should be repeated in the original order for greatest accuracy. Always keep the output from the signal generator at its lowest possible value to make the AVC action of the receiver ineffective.

CHASSIS RE-242

NOBLITT-SPARKS INDUSTRIES, INC. MODELS 547, 547A,



NOTE: TUBE SOCKETS ARE VIEWED FROM UNDER SIDE OF CHASSIS. VOLTAGE READINGS SHOWN AT SOCKET PRONGS ARE TO FLOATING GROUND AND ARE TAKEN WITH NO SIGNAL. A.C. LINE VOLTAGE AT 117 VOLTS. WHERE NO READING IS GIVEN, THE VOLTAGE IS ZERO OR TOO LOW TO READ.

LOUD SPEAKER

Type: Permanent magnet

Size: 4 inch

Voice coil impedance 3.2 ohms

FREQUENCY RANGE

Broadcast 540-1600 kc

IF 455 kc

TUBES AND FUNCTIONS

12SA7 Mixer-oscillator

12SK7 IF Amp.

12SQ7GT DET-AVC-AF

50L6GT Output

35Z5GT Rectifier

POWER SUPPLY

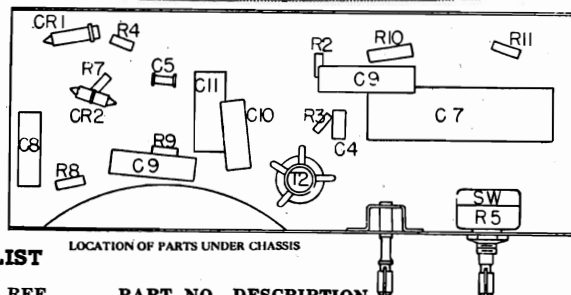
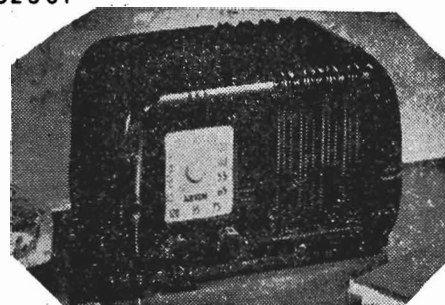
105-125 Volts AC-DC, 35 Watts

POWER OUTPUT

Undistorted8 Watts

Maximum 2.5 Watts

Plate load 2000 ohms

**PARTS LIST**

REF. NO.	PART NO.	DESCRIPTION
R2	C20060-223	Resistor, 22,000 ohm, 1/4 w
R3	C20060-156	Resistor, 15 megohm, 1/4 w
R4	C20060-225	Resistor, 2.2 megohm, 1/4 w
R5	B17291	Volume control & sw., 1 megohm
R7	C20060-474	Resistor, 470,000 ohm, 1/4 w
R8	C20060-151	Resistor, 150 ohm, 1/4 w
R9	C20060-334	Resistor, 330,000 ohm, 1/4 w
R10	C20070-152	Resistor, 1,500 ohm 1 w
R11	C20060-150	Resistor, 15 ohm, 1/4 w
C1, C2	B18869	Variable condenser
C4	A21643	Condenser, .00005 mfd., molded
C5	C20203-501	Condenser, .0005 mfd., 300 volt ceramic
C7	A19136	Condenser, elect., 40-20 mfd., 150 V, 20 mfd. - 25 V
C8	C20068-303	Condenser, .03 mfd., 400 volt P. T.
C9	C20068-503	Condenser, .05 mfd., 400 volt, P. T.
C10	C20067-503	Condenser, .05 mfd., 200 volt, P. T.
C11	C20068-104	Condenser, .1 mfd., 400 volt, P. T.
CR1	A21660	Capristor, 4.7 meg. resistor, .01 ufd. condenser
CR2	A21659	Capristor, 470 K resistor, .002 ufd. and .0005 ufd. condenser
T1	AC21647-1	Antenna Loop Assembly
T2	AC18646-1	Oscillator Coil

REF. NO.	PART NO.	DESCRIPTION
T3	AC18908-1	1st I. F. Coil
T4	AC18909-1	2nd I. F. Coil
T5	AC18647-1	Output Transformer
Spk.	C21657	Speaker
	E17232-3	Cabinet, Black
	E17232-2	Cabinet, Ivory
	A17304	Dial Crystal
	A19474	Knobs
	A19125	Grille Cloth
	A17296	Tuning Shaft
	A18640-1	Dial Scale
	A19132	Dial Drive Cord
	A19133	Spring
	A19205-3	Cap. Mtg. Clip
	A19233-1	Socket, Tube Shielded
	A18254-1	Socket, Tube Plain
	A16482	Tube Shield
	B20138-1	Line Cord and Plug Assembly
	A19478-1	Dial Pointer
	A19141	Terminal Strip
	A19547	Two Conductor Shielded Leads
	A21945	Speaker and Transformer Assembly
	A21651	Shipping Carton
	A19124	Snap on Button (10)

Models 547 and 547A are identical except for cabinets. Model 547 is in a walnut cabinet. Model 547A is in an ivory cabinet.

NORTHERN RADIO CO.

TYPES N600, N602,
MODELS A, B, C, D,
DQ, DQT, DT, E, ED

TYPE N600 TWO BAND COMMUNICATIONS RECEIVERS
TYPE N602 THREE BAND COMMUNICATIONS RECEIVERS

DESCRIPTION OF EQUIPMENT

The latest Type N600 and N602 Receivers are available in six different models for either direct or alternating current operation. Model A - 6 Volt DC and Model B - 12 Volt DC Receivers are designed for operation from 6 and 12 volt storage batteries, where other sources of power are not available. Model C - 32 Volt DC and Model D - 115 Volt DC Receivers are designed especially for marine installations and operate directly from the ship's battery without the use of a built-in power supply. Model E - 115 Volt AC Receiver is primarily designed for land stations and operated from a 115 Volt 50 - 60 cycle a.c. source. Model ED - 115 Volt AC-DC Receiver operates from either source, as implied, and is equally suited for marine or land installations.

The characteristics of the six models are essentially similar, with the exception of the audio frequency amplifier and power supply. The radio frequency components and controls are identical, thus the operation, alignment, servicing, etc., are the same. The following data is pertinent to the six models, describing them collectively where they are similar and individually where they are at variance.

One radio frequency stage of amplification employing a 6K7 eliminates the image frequency signal and insures an effective signal to noise ratio.

A separate oscillator employing a 6J5 reduces frequency drift to a minimum and improves the general stability of the receiver.

A 6L7 mixer converts the incoming signal to the intermediate frequency, where it is amplified by a second 6K7. By the use of iron core intermediate transformers sufficient gain and selectivity are obtained with a single stage. This permits the use of the other 6K7 as a radio frequency amplifier where it is considerably more effective as well as increasing the stability of the receiver.

Detection is accomplished by means of the diode in a type 6Q7. The rectified voltage is filtered and applied to the grids of the previous stages to provide automatic volume control.

When provision is made for c.w. reception, a 6J5 beat frequency oscillator is added. This is coupled into the diode detector to produce an audible tone when beating with the intermediate frequency. Receivers so equipped, are designated by the letter T following the model letter.

The triode section of the 6Q7 amplifies the diode output, functioning as the first audio stage. In the Model A - 6 Volt DC Receiver, the Model B - 12 Volt DC Receiver and the Model E - 115 Volt AC Receiver the power amplifier is a 6F6G, which is driven directly by the first audio stage. The Model C - 32 Volt DC Receiver incorporates a 25L6G Driver stage. This Driver is excited by the first audio stage and, in turn, excites the power amplifier which consists of four 25L6G's connected in push-pull parallel. A single 25L6G power amplifier driven by the first audio stage, is used in the Model D - 115 Volt DC Receiver and the Model ED - 115 Volt AC-DC Receiver.

In receivers equipped with an inter-carrier squelch circuit, the triode section of the 6Q7 functions as the squelch control and a 6F5 is added for the first audio stage. The 6F5 then feeds the respective power amplifiers as described in the preceding paragraph. Receivers so equipped, are designated by the letter Q following the model letter.

An output power of approximately $2\frac{1}{2}$ watts is obtained from the 6F6G power amplifier in the Model A - 6 Volt DC Receiver, Model B - 12 Volt DC Receiver and Model E - 115 Volt AC Receiver. The 25L6G push-pull parallel power amplifier in the Model C - 32 Volt DC Receiver has an output of approximately $\frac{1}{2}$ watt, which provides ample volume from the built-in speaker. In the Model D - 115 Volt DC Receiver and the Model ED - 115 Volt AC-DC Receiver, an output of approximately 2 watts is obtained from the 25L6G power amplifier. The built-in speaker is of the permanent magnet dynamic type.

Plate power for the Model A - 6 Volt DC Receiver and the Model B - 12 Volt DC Receiver is obtained from a built-in power supply of the vibrator type. The Model C - 32 Volt DC Receiver and the Model D - 115 Volt DC Receiver have no built-in power supply, all power being obtained directly from the ship's battery. Plate power for the Model E - 115 Volt AC Receiver is provided by a conventional rectifier-filter system using an 80 tube. In the Model ED - 115 Volt AC-DC Receiver, plate power is obtained from a half-wave rectifier-filter system using a 25Z6GT tube.

TYPES N600, N602,
MODELS A,B,C,D,DQ,
DQT,DT,E,ED

NORTHERN RADIO CO.

Controls

(1) Power switch marked "POWER". This switch functions as the Off-On control for the receiver.

(2) FOR TYPE N600 ONLY

Band Switch marked "BAND A-B". In position "A" the receiver is tuneable over the range between 1550 and 4200 kilocycles. In position "B" the receiver is tuneable between 550 and 1600 kilocycles.

(2) FOR TYPE N602 ONLY

Band Switch marked "BAND A-B-C". In position "A" the receiver is tuneable over the range between 540 and 1680 kilocycles, in position "B" between 1660 and 5350 kilocycles and in position "C" between 5.35 and 15.8 megacycles.

(3) FOR TYPE N600 ONLY

Receiver tuning. A semi-circular dial with a five-to-one reduction drive mechanism is employed as the tuning control. The band A scale is calibrated in kilocycles and the band B scale in megacycles. The dial is illuminated from the rear. A vernier dial with 100 divisions is provided for accurate station logging.

(3) FOR TYPE N602 ONLY

Receiver tuning. A semi-circular dial with a 33 to 1 reduction drive mechanism is employed as the tuning control. The band A and band B scales are calibrated in kilocycles and the band C scale in megacycles. Translucent material is used for the dial to permit illumination from the rear.

(4) Radio frequency gain control marked "SENSITIVITY". This control serves to limit the maximum sensitivity of the receiver.

(5) Audio frequency gain control marked "VOLUME". This controls the audio amplification after detection and functions as the volume control for the receiver.

(6) Tone control marked "TONE". This control reduces the high frequency response of the audio system and is used in receiving thru sharp high-pitched noise.

(7) Inter-carrier squelch control marked "SQUELCH". This control, if incorporated, determines the signal level at which the squelch tube functions to block the first audio grid and silence the receiver.

(8) Speaker - handset switch marked "SPEAKER" and "HANDSET". This switch connects the audio output of the receiver to the built-in speaker or to the receiver portion of the handset, as indicated.

(9) Headphone jack marked "PHONES". When the phones are plugged into the jack, the built-in speaker is disconnected from the circuit.

(10) Remote speaker jack marked "REM. SPKR.". This jack is connected directly across the audio output of the receiver to permit the use of a remote speaker in addition to the built-in speaker.

(11) Dial light switch marked "LIGHTS". This switch functions as the Off-On control for the dial lights, and is provided so that the lights may be turned off when it is necessary to darken the pilot house.

(12) Beat frequency oscillator switch marked "B.F.O.". This switch, if provided, functions as the Off-On control for the beat frequency oscillator, which is used for the reception of code signals.

(13) Beat frequency oscillator pitch control marked "PITCH". This control, if provided, varies the oscillator frequency over a narrow range to permit adjustment of the resultant audio tone.

INSTALLATION

The receiver is usually mounted in the transmitter cabinet, or housed in a separate cabinet which is bolted to the transmitter to form a compact communication unit. When separately housed, the receiver may be mounted in any desired location.

Connections

(1) Power & Control. Power for the receiver is obtained thru the cable or cables at the rear of the chassis. When used in conjunction with a transmitter the proper cables are provided for connection to the power and receiver control circuits in that particular transmitter. If the receiver is used separately, wires may be connected to the cable terminal points for power and external control. If external control is not required, the plate supply line "B break" circuit must be closed and the voice coil line returned to ground on the panel. Refer to drawings for circuit data.

(2) Ground. The receiver is grounded in the usual installation thru connection to the transmitter and between cabinets. If used separately the ground

NORTHERN RADIO CO.

TYPES N600, N602,
MODELS A, B, C, D,
DQ, DQT, DT, E, ED

should be connected to the cabinet. The receiver chassis is insulated from the panel and cabinet to permit a positive or negative ground in the D.C. Models, consequently a direct ground must not be connected to the chassis.

(3) Antenna. The regular receiver antenna connection is made thru the control cable and transmitter. If the receiver is used separately, connection may be made to the cable terminal marked "ANT". Refer to drawings for circuit data.

OPERATION

The operation of the receiver is similar to any regular communications receiver with similar capabilities. The following suggestions will aid in obtaining the most satisfactory results.

Place the receiver in operating condition as follows: Throw the POWER switch to the ON (up) position. Set the BAND switch to the band in which the desired frequency is located. Throw the SPEAKER - HANDSET switch to the SPEAKER position. Throw the LIGHTS switch to the On (up) position. Set the SENSITIVITY control to the point of maximum sensitivity by tuning in a clockwise direction to the end of the 270 degree rotation. If a Squelch Circuit is incorporated, set the SQUELCH control to the non-operating point by turning in a clockwise direction, to the end of the 270 degree rotation until the switch clicks. Then adjust the VOLUME control until some noise is heard. The receiver is now ready for the reception of phone signals. If a Beat Frequency Oscillator is provided, code signals may be received as described in the last paragraph under "General Procedure".

General Procedure

When tuning for a station it is necessary to tune slowly past the point where the station is expected. After having found the station tune on both sides of the best point in order to make sure its location. Operation to one side of the correct spot will result in distorted signals.

During periods when no phone signals are being received the AVC (Automatic Volume Control) will increase the volume to maximum (if the SENSITIVITY control is full on) and some noise will result. The incoming signal, however, reduces the amplification through the AVC action and consequently the noise level. If the prevailing noise level is high the SENSITIVITY control may be turned down to limit the maximum sensitivity of the receiver, or it may be similarly used to prevent very strong local signals from blocking the receiver.

The control to use for setting the signal volume at a comfortable room level is the VOLUME control. If the SENSITIVITY control is used for this purpose the AVC will not function properly.

If a squelch circuit is incorporated, the SQUELCH control should be adjusted for as low a signal level as possible to permit the reception of weak signals. Never adjust beyond the point where average noise drops out, or where only an occasional noise peak is heard. Refer to paragraph 8 under "Alignment" for further data.

If a beat frequency oscillator is provided code signals may be received as follows: Throw the B.F.O. switch to the On (up) position. Set the PITCH control so that the white dot on the knob is up. Tune in the station and adjust to approximately zero beat. Next adjust the PITCH control to obtain the desired beat note, and the SENSITIVITY control to set the r.f. signal at a level which produces a clear tone, as evidenced by a smooth pitch adjustment down to approximately zero beat. Then adjust the VOLUME control to set the signal volume at a comfortable level.

Note: Data relative to the operation of any controls not mentioned in this section will be found under "Controls".

MAINTENANCE

Receiver Alignment

(1) Before proceeding with the alignment, the #6 pin on the 7 prong control cable socket or plug must be connected to the panel to complete the voice coil circuit. It will also be necessary to provide a connection between the #4 and #5 pins to close the B break circuit.

(2) A signal generator set to 456 kilocycles should be used in aligning the intermediate frequency amplifier. Remove the grid clip from the 6L7 and connect the signal generator between grid and ground. If a signal generator is not available, tune in some convenient signal that is not too strong.

TYPES N600, N602,
MODELS A, B, C, D

NORTHERN RADIO CO.

MODELS DQ, DQT,
DT, E, ED

(3) For indication of correct tuning, an output meter or high resistance a.c. voltmeter should be connected between the power amplifier plate and chassis. A blocking condenser (.1 uf. or more) must be connected in series with the hot lead to the plate. If a low range meter (15 v. or less) is available, it may be plugged into the phone jack.

(4) Tune the trimmers on top of the I.F. transformers for maximum output meter deflection. It will be found best to experiment with the input level which gives the best indication.

(5) FOR TYPE N600 ONLY

After having tuned the intermediate amplifier, the grid clip should be replaced on the 6L7, the band switch set for band A and a signal of approximately 3500 kilocycles applied to the antenna input. This can be the signal from a distant station or a standard signal generator. Adjust the oscillator trimmer (top right hole in osc. shield can) so the signal is properly tuned in. Then adjust the R.F. and Detector trimmers for maximum signal. These are accessible through the top right holes in the next two shield cans. Refer to drawings for parts location.

(5) FOR TYPE N602 ONLY

After having tuned the intermediate amplifier, the grid clip should be replaced on the 6L7, the band switch set for band A and a signal of approximately 1400 kilocycles applied to the antenna input. This can be the signal from a distant station or a standard signal generator. Adjust the oscillator trimmer (top hole in left side of osc. shield can) so the signal is properly tuned in. Then adjust the R.F. and Detector trimmers for maximum signal. These are accessible through the top holes in the left side of the next two shield cans. Refer to drawings for parts location.

(6) FOR TYPE N600 ONLY

The above procedure should be followed with the band switch set for band B and an input signal of 1400 kilocycles applied to the antenna input. The trimmers for this band are accessible through the top left holes in the three shield cans, directly opposite the band A trimmers.

(6) FOR TYPE N602 ONLY

The above procedure should be followed for bands B and C. Set the band switch to band B, apply a signal of 4000 kilocycles to the antenna input and adjust the band B trimmers, accessible through the center holes in the left side of the shield cans. Then set the band switch to band C, apply a signal of 14 megacycles and adjust the band C trimmers, accessible through the bottom holes in the shield cans.

(7) FOR TYPE N600 ONLY

The signal should now be set to 1800 kilocycles for band A or 600 kilocycles for band B and the receiver tuned to this frequency. The padding condenser for the band being aligned should be adjusted to give maximum output while rocking the tuning condenser slightly to locate the most favorable position. It is advisable to return to the aligning point and repeat the adjustments given for best results. Refer to drawings for parts location.

(7) FOR TYPE N602 ONLY

The signal should now be set to 600 kilocycles for band A or 1800 kilocycles for band B and the receiver tuned to this frequency. The padding condenser for the band being aligned should be adjusted to give maximum output while rocking the tuning condenser slightly to locate the most favorable position. It is advisable to return to the aligning (trimming) point and repeat the adjustments given for best results. No padding adjustment is required for band C. Refer to drawings for parts location.

(8) If a squelch circuit is incorporated, it should be checked for normal operation. Rotating the SQUELCH control in a clockwise direction, decreases the signal level required to overcome the blocking bias and consequently increases the apparent sensitivity of the receiver. At the end of the clockwise rotation, a switch operates to short out the 6Q7 plate - 6F5 grid bias resistor and make the squelch inoperative. If operating properly, the squelch circuit should easily discriminate between signal levels differing by a voltage ratio of 2 to 1, that is, when adjusted so that a nominal signal input of 5 microvolts just drops out, increasing the input to 10 microvolts should bring the signal in again. This operation should hold down to an input of 2 microvolts, or less. If the operation is not normal, check the 6Q7 and 6F5 tubes, and the 6F5 grid bias, cathode and plate voltages. Refer to Test Readings and drawings.

(9) The beat frequency oscillator, if provided, should now be adjusted as follows: Set the receiver tuning dial pointer at about center scale on band A, introduce a modulated signal from the generator, carefully adjust the generator to resonance and cut off the modulation. Then throw the B.F.O. Switch to the On (up) position, set the PITCH Control so that the white dot on the knob is up and adjust the Trimmer on top of the B.F.O. Coil shield until resonance (zero beat) is obtained.

NORTHERN RADIO CO.

TYPES N600, N602,
MODELS A, B, C, D,
DQ, DQT, DT, E, ED

Servicing

When the receiver has been removed from the cabinet for servicing, the #6 pin on the 7 pin control cable socket or plug must be connected to the panel to complete the voice coil circuit. It will also be necessary to provide a connection between the #4 and #5 pins to close the B break circuit.

First the power source should be checked to make sure that all tubes are receiving correct filament and plate voltages, then the tubes should be suspected and replaced with the spares, one at a time, as a check on their operation.

After checking tubes, testing should progress from the receiver output to the input stage by stage eliminating each as it is found to operate properly. Listening in the loud speaker while testing will help greatly. The usual voltmeter and/or ohmmeter tests should be used in isolating the trouble. It is always best to test each stage in a logical definite order, in order to determine the location of the defect. After having found the location of the trouble, it can be quickly eliminated.

CAUTION: The negative side of the power line is common to the chassis in the D.C. Models, but the chassis is insulated from ground (panel and cabinet) to permit operation from a power source with either a negative or positive ground. Consequently, if the positive side of the power line is grounded, the chassis becomes Hot to ground and care must be used when removing same to avoid contact with the cabinet or a blown receiver fuse (F1) will result. Opening both sides of the incoming power line before removing the chassis will prevent this. In this connection it should be noted that all control shafts have an insulating washer between shaft, knob and panel which must not be removed in the event of knob replacement. If the negative side of the power line is grounded, no care need be used. Refer to drawings for circuit data.

Type N600 Receivers
and Type N602 Receivers

Model C & CT - 32 Volts, DC

Test Readings

The following test readings indicate average normal operating conditions:

Models	Stage	Tubes	Plate Volts	Screen Volts	Grid Volts	Cath. Volts	OFil. Volts
C & CT	R.F.A.	6K7	30.0	30.0	*Var.	0.6	6
C & CT	Mixer	6L7	29.5	30.0	x1.5 av.	0.1	6
C & CT	Osc.	6J5	30.0	--	x2.8 av.	0	6
C & CT	I.F.A.	6K7	29.5	30.0	*Var.	0.6	6
C & CT	Det. &	6Q7	*Var.	--	--	0	6
C & CT	1st A.F.	Same	5.5	--	0	0	Same
C & CT	2nd A.F.	25L6GT	22.5	30.5	0	3.0	24
C & CT	A.F.P.A.	4-25L6GT	30.5	32.0	0	2.8	24
CT	B.F.O.	6J5	12.5	--	--	0	6

Input voltage during test - 32 Volts.

Total filament current - Mdl. C, 1.7 Amps. - Mdl. CT, 2 Amps.

Total plate current - 36 Ma.

*Variable - dependent on signal and avc voltage. This also applies to the mixer (detector) control grid not listed above.

xAverage - mixer injection and oscillator grid voltages read with a VTVM having a d.c. input resistance of 11 megohms. These voltages vary over the frequency range.

OFilament voltage readings taken with dropping resistor R23 adjusted for 30 volts across the series-parallel filament circuit.

Note: Normal readings may vary plus or minus 6% from the values given. The maximum variation should not exceed 10%. Readings are taken with the SENSITIVITY (r.f. gain) control set at maximum. All voltages, except filament, are read between the circuit points and chassis. The meter should have a resistance of 1000 ohms per volt and a 50 or 60 volt scale should be used, if comparative readings are to be obtained. Current values may be computed by dividing the voltage across resistors by their resistance. Refer to drawings and "Parts List" for data.

TYPE N600,
MODEL C, CT

NORTHERN RADIO CO.

PARTS LIST N600C

Type M600 Receivers
Models C & CT - 32 Volts, DC

Condensers:

C1	Antenna isolating
C2.1	R.F. Amp. tuning
C2.2	Detector tuning
C2.3	Oscillator tuning
C3.1	Ant. trimmer - band A
C3.2	Ant. trimmer - band B
C4	R.F. Amp. grid filter
C5	R.F. Amp. cathode bypass
C6.1	R.F. trimmer - band A
C6.2	R.F. trimmer - band B
C7	Det. grid filter
C8	Mixer cathode bypass
C9.1	Osc. trimmer - band A
C9.2	Osc. trimmer - band B
C10.1	Osc. padding - band A
C10.2	Osc. padding - band A
C10.3	Osc. padding - band B
C11	Osc. grid blocking
C12	Osc. - Mixer coupling
C13	Plate & screen bypass
C14.1	First I.F.T. pri. tuning
C14.2	First I.F.T. sec. tuning
C15	I.F. Amp. grid filter
C16	I.F. Amp. cathode bypass
C17.1	Second I.F.T. pri. tuning
C17.2	Second I.F.T. sec. tuning
C18	Diode Det. r.f. bypass
C19	Diode Det. r.f. filter
C20	A.V.C. filter
C21	R13 A.F. coupling
C22	First A.F. grid coupling
C23	Second A.F. grid coupling
C24	Second A.F. cath. bypass
C25	Tone control
C26	A.F. Pwr. Amp. grid bypass
C27	Plate power filter - out.
C28	Plate power filter - in.
C29	32 Volt line bypass
C30	A.F. Pwr. Amp. plate bypass
C30	Condensers - Mdl. CT:
C31	B.F. Osc. tuning
C32	B.F. Osc. pitch control
C33	B.F. Osc. grid blocking
	B.F. Osc. - Diode coupling

Inductances:

L1.1	Ant. coil - band A
L1.2	Ant. coil - band B
L2.1	R.F. coil - band A
L2.2	R.F. coil - band B
L3.1	Osc. coil - band A
L3.2	Osc. coil - band B
L4	Plate power filter

Inductances - Mdl. CT:

L5	B.F. Osc. coil
----	----------------

Resistors:

R1	Sensitivity (R.F.) control
R2	R.F. Amp. Grid filter

Resistors:

R3	R.F. Amp. cathode bias
R4	Det. grid filter
R5	Mixer cathode bias
R6	Mixer grid leak
R7	Osc. grid leak
R8	I.F. Amp. grid filter
R9	I.F. Amp. cath. bias
R10	A.V.C. filter
R11	A.V.C. load
R12	Diode Det. r.f. filter
R13	Volume (A.F.) control
R14	First A.F. plate coupling
R15	First A.F. grid coupling
R16	Second A.F. plate coupling
R17	Second A.F. grid coupling
R18	Tone control
R19.1	A.F. Pwr. grid stabilizer
R19.2	A.F. Pwr. grid stabilizer
R20	A.F. Pwr. cathode bias
R21	Handset-receiver shunt
R22	Headphone shunt
R23	Filament dropping
R24	Plate power filter
R25	Dial light dropping

Resistors - Mdl. CT:

R26	B.F. Osc. grid leak
R27	B.F. Osc. plate coup.
R28	B.F. Osc. plate drop.
R29	B.F. Osc. fil. drop.

Switches:

S1.1	Ant. coils - primary
S1.2	Ant. coils - secondary
S2.1	R.F. coils - primary
S2.2	R.F. coils - secondary
S3.1	Osc. coils - plate
S3.2	Osc. coils - grid
S4	Power - 32 V. line
S5	Speaker - Handset
S6	Lights - Dial

Switches - Mdl. CT:

S7	B.F. Osc. control
----	-------------------

Transformers:

T1	I.F. Amp. input
T2	I.F. Amp. output
T3	A.F. Pwr. Amp. input
T4	A.F. Pwr. Amp. output

Tubes:

6K7	R.F. Amplifier
6L7	Mixer
6J5	Oscillator
6X7	I.F. Amplifier
6Q7	Diode Det. - AVC - First A.F.
25L6GT	Second A.F. Amplifier
25L6GT	A.F. Power Amplifier
	Tubes - Mdl. CT:
6J5	B.F. Oscillator

	Centralab AF-110 10000 ohm pot.
	IRC EW $\frac{1}{2}$ 1 megohm $\frac{1}{2}$ w.

IRC EW $\frac{1}{2}$	100 ohms $\frac{1}{2}$ w.
IRC EW $\frac{1}{2}$	1 megohm $\frac{1}{2}$ w.
IRC EW $\frac{1}{2}$	100 ohms $\frac{1}{2}$ w.
IRC EW $\frac{1}{2}$	50000 ohms $\frac{1}{2}$ w.
IRC EW $\frac{1}{2}$	50000 ohms $\frac{1}{2}$ w.
IRC EW $\frac{1}{2}$	1 megohm $\frac{1}{2}$ w.
IRC EW $\frac{1}{2}$	100 ohms $\frac{1}{2}$ w.
IRC EW $\frac{1}{2}$	.5 megohm $\frac{1}{2}$ w.
IRC EW $\frac{1}{2}$	.5 megohm $\frac{1}{2}$ w.
IRC EW $\frac{1}{2}$	30000 ohms $\frac{1}{2}$ w.
Centralab A-130	.5 meg. pot.
IRC EW $\frac{1}{2}$	1 megohm $\frac{1}{2}$ w.
IRC EW $\frac{1}{2}$	.25 megohm $\frac{1}{2}$ w.
IRC EW $\frac{1}{2}$	.4 megohm $\frac{1}{2}$ w.
IRC EW $\frac{1}{2}$	600 ohms $\frac{1}{2}$ w.
Centralab AF-115	25000 ohm pot.
IRC EW $\frac{1}{2}$	600 ohms $\frac{1}{2}$ w.
IRC EW $\frac{1}{2}$	600 ohms $\frac{1}{2}$ w.
IRC EW $\frac{1}{2}$	100 ohms 1 w.
IRC BW1	10 ohms 1w.
IRC BW1	10 ohms 1w.
Ohmite #0361	3 ohms 25 w.
IRC BW1	150 ohms 1 w.
Ohmite RD	250 ohms 10 w.

IRC EW $\frac{1}{2}$	1 megohm $\frac{1}{2}$ w.
IRC EW $\frac{1}{2}$	500 ohms $\frac{1}{2}$ w.
IRC EW $\frac{1}{2}$	30000 ohms $\frac{1}{2}$ w.
Ohmite #0368	100 ohms 25 w.

Centralab Part D 3P.	3 position
Part of S1.1 assembly	
Centralab Part D 3P.	3 position
Part of S2.1 assembly	
Centralab Part D 3P.	3 position
Part of S3.1 assembly	
H&H #20902 D.P.S.T. 3A.	*tog.
H&H #21189 S.P.D.T. 3A.	*tog.
H&H #20992 S.P.S.T. 3A.	*tog.

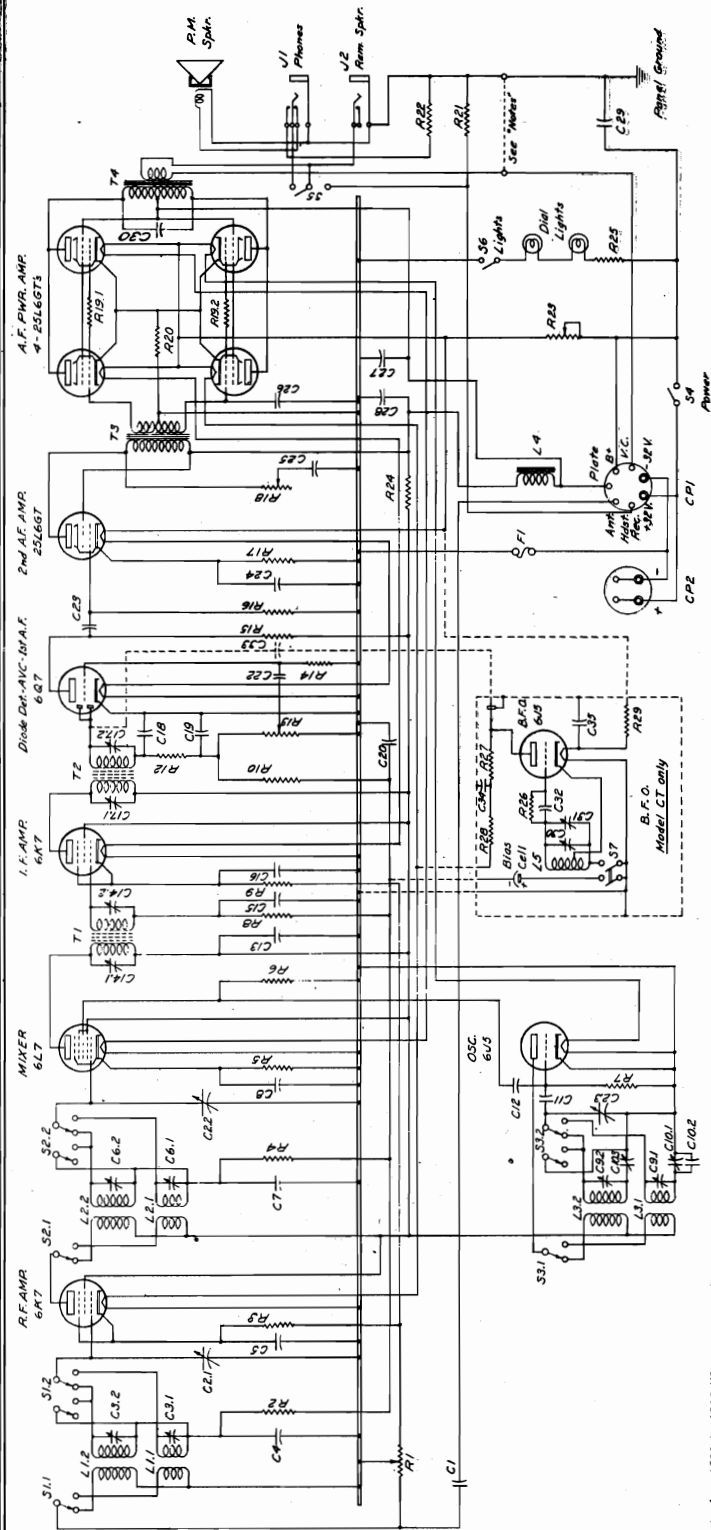
H&H #20902 D.P.S.T. 3A.	*tog.
-------------------------	-------

Miller #612-01	input
Miller #612-04	output - diode
Thermador G-26	driver 1.33:1
NRC #6000-10-1	output 23:1

Sylvania or equiv.	type 6K7
Sylvania or equiv.	type 6L7
Sylvania or equiv.	type 6J5
Sylvania or equiv.	type 6X7
Sylvania or equiv.	type 6Q7
Sylvania or equiv.	type 25L6GT
Sylvania or equiv.	type 25L6GT
See "Note"	re metal tubes

Sylvania or equiv.	type 6J5
--------------------	----------

NORTHERN RADIO CO.

TYPE N600,
MODEL C, CT

Band A - 1500 to 4500 KC.
Band B - 350 to 1500 KC.
I.F. - 456 KC.

NOTES:

All band switches shown in 'B' position.
V.C. is strapped to Panel Gnd. when receiver
is used with N501 Transmitter.

PARTS LIST N600C

Miscellaneous:

Dynamic Speaker
Dial lights
Dial light sockets
32 Volt line fuse F1
Fuse holder
Headphone jack J1
Remote speaker jack J2
Control cable plug CP1
*Power cable plug CP2
Tube sockets
Tuning dial mechanism
Tuning dial scale

Miscellaneous - Mdl. CT:

R.F. - I.F. fixed bias

*Used only where power is not obtained thru the control cable.

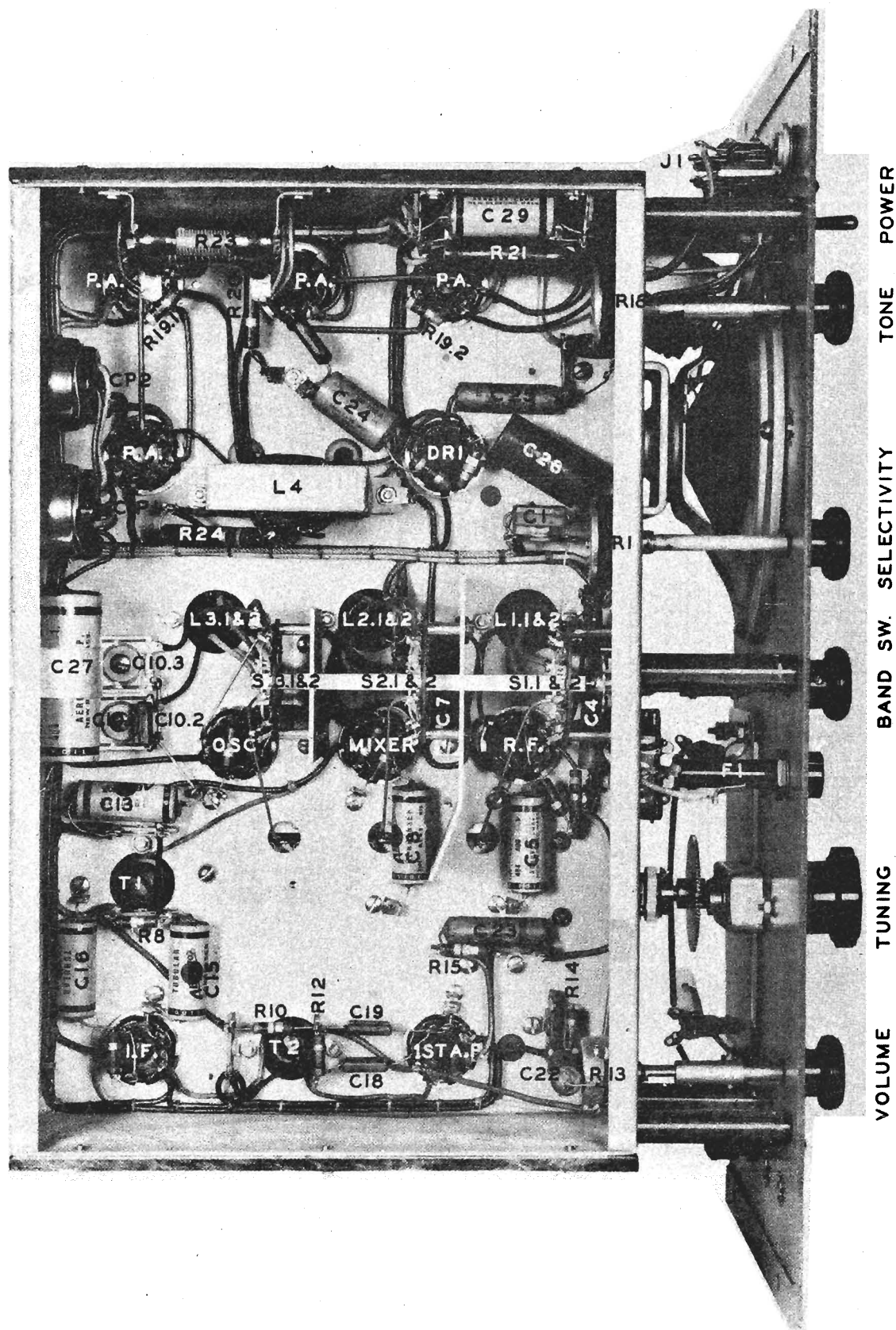
Note: Metal tubes may be replaced with GT tubes, if necessary

Jensen ST-445 or Utah GP 6" PM
Sylvania 847 6-8 V. 150 Ma. m.b.b.
Drake #206CE dial light bkt.
Killark or equiv. 3AG 5 amp.
Littelfuse #341001 extractor post
Mallory #703A Junior
Carter #2A single closed cir.
Amphenol #61-CP7S 7 prong
Amphenol #61-CP4 4 prong
Amphenol S8 8 prong
Bud D-1729 vernier dial
NRC #915-10 Std. 2 band

Mallory 1 1/2 V. grid bias cell

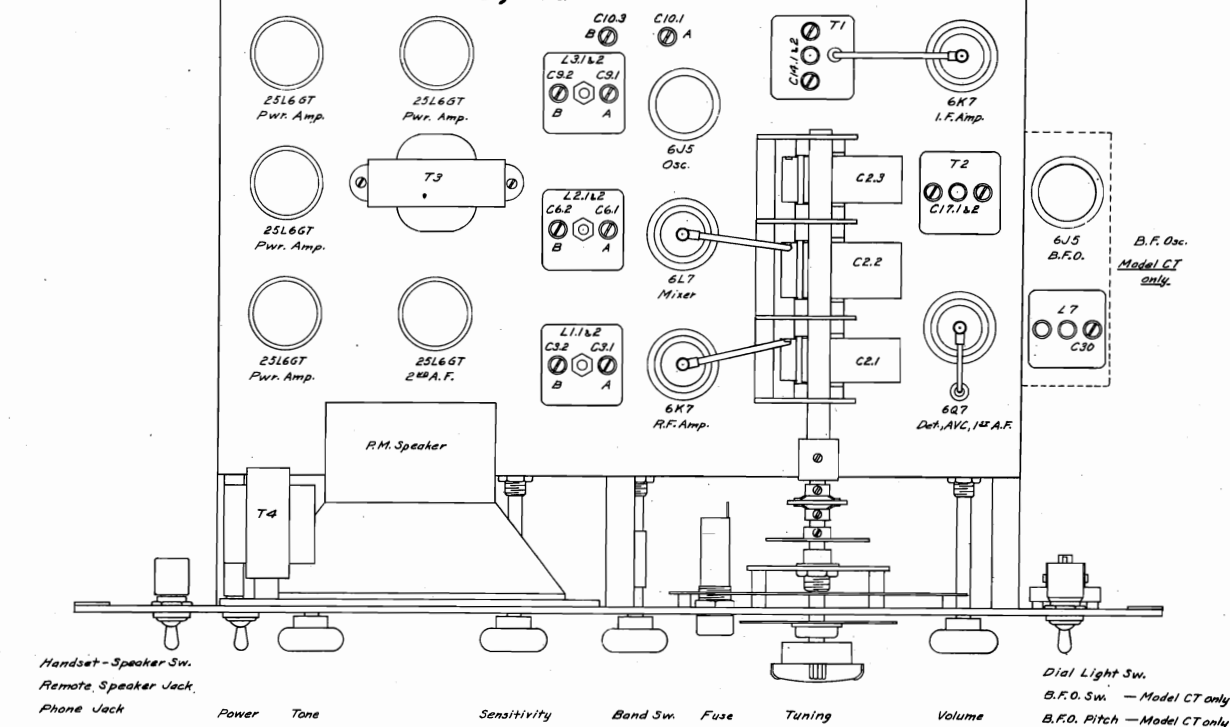
TYPE N600,
MODEL C

NORTHERN RADIO CO.



600C RECEIVER
BOTTOM VIEW

NORTHERN RADIO CO.

TYPE N600, MODELS
C, CT, D, DQ, DT,
DQTTYPE N600, MODELS
C, CT

Type N600 Receivers

Models D, DQ, DT & DQT - 115 Volts, DC

TYPE N600, MODELS
D, DQ, DT, DQTTest Readings

The following test readings indicate average normal operating conditions:

Models	Stage	Tubes	Plate Volts	Screen Volts	Grid Volts	Cath. Volts	Fil. Volts
All	R.F.A.	6K7	106.5	68.5	*Var.	1.6	6
All	Mixer	6L7	105.5	68.5	x4.0 av.	1.7	6
All	Osc.	6J5	106.5	--	x9.8 av.	0	6
All	I.F.A.	6K7	95.5	68.5	*Var.	1.5	6
D & DT	Det. &	6Q7	*Var.	--	--	0	6
D & DT	1st A.F.	Same	53.0	--	0	0	Same
All	A.F.P.A.	25L6GT	86.5	106.5	0	6.5	24
DQ & DQT	Det. &	6Q7	*Var.	--	--	0	6
DQ & DQT	Squelch	Same	10.0 (Sq.off)	--	*Var.	0	Same
DQ & DQT	1st A.F.	6F5	62.5	--	1.0	10.4	6
DT & DQT	B.F.O.	6J5	25.0	--	--	0	6

Input voltage during test - 115 volts.
Total filament current - .44 Amp.
Total plate current - 65 Ma.

*Variable - dependent on signal and avc voltage. This also applies to the mixer (detector) control grid not listed above.

xAverage - mixer injection and oscillator grid voltages read with a VTVM having a d.c. input resistance of 11 megohms. These voltages vary over the frequency range.

Note: Normal readings may vary plus or minus 6% from the values given. The maximum variation should not exceed 10%. Readings are taken with the SENSITIVITY (r.f. gain) control set at maximum. All voltages are read between the circuit points and chassis, except the filaments and 6F5 grid. The latter is read between the cathode and grid taps on the squelch voltage divider. The meter should have a resistance of 1000 ohms per volt and a 300 volt (or higher) scale should be used where there is much resistance in the circuit, if comparative readings are to be obtained. Current values may be computed by dividing the voltage across resistors by their resistance. Refer to drawings and "Parts List" for data.

PARTS LIST N600D

Type N600 Receivers

Model D, DQ, DT & DQT - 115 Volts, D.C.

Condensers:

C1	Antenna isolating
C2.1	R.F. Amp. tuning
C2.2	Detector tuning
C2.3	Oscillator tuning
C3.1	Ant. trimmer - band A
C3.2	Ant. trimmer - band B
C4	R.F. Amp. grid filter
C5	R.F. Amp. cathode bypass
C6	Screen bypass
C7.1	R.F. trimmer - band A
C7.2	R.F. trimmer - band B
C8	Det. grid filter
C9	Mixer cathode bypass
C10	Plate bypass
C11.1	Osc. trimmer - band A
C11.2	Osc. trimmer - band B
C12.1	Osc. padding - band A
C12.2	Osc. padding - band B
C12.3	Osc. padding - band A
C13	Osc. grid blocking
C14	Osc. - Mixer coupling
C15.1	First I.F.T. pri. tuning
C15.2	First I.F.T. sec. tuning
C16	I.F. Amp. grid filter
C17	I.F. Amp. cathode bypass
C18	I.F. Amp. plate filter
C19.1	Second I.F.T. pri. tuning
C19.2	Second I.F.T. sec. tuning
C20	Diode Det. r.f. bypass
C21	Diode Det. r.f. filter
C22	A.V.C. filter
C23	R15 A.F. coupling
C24	First A.F. grid coupling
C25	Pwr. Amp. grid coupling
C26	Pwr. Amp. cath. bypass
C27	Tone control
C28	Plate Pwr. filter - out.
C29	Pwr. Pwr. filter - in
C30	115 V. line bypass - pan
C31	115 V. line bypass
C32	Pwr. Amp. plate bypass
	Condensers - Mdl. Dq.

Condensers - Mdl's. DT & DQT:

C22	First A.F. cath. bypass	C-D BR-102A 10 uf. 25 v.
	Condensers - Mds. DT & DQT:	
	B.F. Osc. tuning	Part of L5 assembly
C32	B.F. Osc. pitch control	Bud LC-1641 15 uuf
C33	B.F. Osc. grid blocking	C-D 5W-52 .0002 uf. 500
C34	B.F. Osc. diode coup.	C-D 5W-5Q1 .00001 uf. 500
C35	B.F. Osc. plate filter	C-D DT-485 .05 uf. 400 v
C36	B.F. Osc. filament bypass	C-D DT-491 .01 uf. 400 v
C37	B.F. Osc. filament bypass	

Inductances:

L1.1	Ant.	coil	-	band A	Miller #3996 ANT.
L1.2	Ant.	coil	-	band B	Part of L1.1 assembly
L2.1	R.F.	coil	-	band A	Miller #3996 R.F.
L2.2	R.F.	coil	-	band B	Part of L2.1 assembly
L3.1	Osc.	coil	-	band A	Miller #3996 OSC.
L3.2	Osc.	coil	-	band B	Part of L3.1 assembly
L4	Plate power	filter	ch.		Thermador D9 2H. 125 Ma.

B.F. Osc. coll

	Resistors:
R1	Sensitivity (R.F.) control
R2	R.F. Amp. grid filter
R3	R.F. Amp. cathode bias
R4	Detector grid filter
R5	Mixer cathode bias
R6	Mixer grid leak
R7	Oscillator grid leak
R8	I.F. Amp. grid filter
R9	I.F. Amp. cathode bias
R10	I.F. Amp. plate filter
R11	Screen dropping
R12	Diode Det. r.f. filter
R13	A.V.C. filter
R14	A.V.C. load
R15	Volume (A.F.) control
R16	First A.F. grid coupling
R17	First A.F. plate coupling
R18	Pwr. Amp. grid coup.
R19	Pwr. Amp. cathode bias
R20	Tone control
R21	Handset - receiver shunt
R22	Headphone shunt
R23	Fil. voltage dropping
R24	Dial light voltage drop.

Resistors - Mdl. DQ:

- R14
- R15
- R16
- R17
- R18
- R19
- R20
- R21
- R22
- R23
- R24
- R25
- R26
- R27
- R28

Resistors - Mdl's. DT & DQT:

R29	B.F.	Osc.	grid leak
R30	B.F.	Osc.	plate coup.
R31	B.F.	Osc.	plate drop.

Switches:

1 2 3 4 5
1 1 2 2 3 3 4 5

Switches - Mdl. DQ:

Squelch Off - On control

Switches - Mdl's. DT & DQT:..

58 B.F. Osc. Off - On control

Inductances - Mdl's. DR & DQT:

Miller #512-C-5 B.F.O. unit

Resistors:

Centralab AP-110 10000 ohm pot
 IRC ET1 .1 megohm $\frac{1}{2}$ w.
 IRC ET2 350 ohms $\frac{1}{2}$ w.
 IRC ET3 .1 megohm $\frac{1}{2}$ w.
 IRC ET4 350 ohms $\frac{1}{2}$ w.
 IRC ET5 50000 ohms $\frac{1}{2}$ w.
 IRC ET6 50000 ohms $\frac{1}{2}$ w.
 IRC ET7 1 megohm $\frac{1}{2}$ w.
 IRC ET8 350 ohms $\frac{1}{2}$ w.
 IRC ET9 3000 ohms $\frac{1}{2}$ w.
 IRC ET10 7500 ohms $\frac{1}{2}$ w.
 IRC ET11 30000 ohms $\frac{1}{2}$ w.
 IRC ET12 1 megohm $\frac{1}{2}$ w.
 IRC ET13 .5 megohm $\frac{1}{2}$ w.
 Centralab A-130 .5 meg. pot.
 IRC ET14 1. megohm $\frac{1}{2}$ w.
 IRC ET15 .25 megohm $\frac{1}{2}$ w.
 IRC ET16 .4 megohm $\frac{1}{2}$ w.
 IRC ET17 150 ohms $\frac{1}{2}$ w.
 Centralab AP-115 25000 ohm pot
 IRC DMI 10 ohms lw.
 IRC EMI 10 ohms lw.
 Omnite #0567 200 ohms 50 w.
 Omnite #0375 1000 ohms 25 w.

Resistors - Mdl. DQ:

Centralab. A-128 .5 meg. pot.
Centralab A-132 1. meg. pot.
IRC BT $\frac{1}{2}$ 1. megohm $\frac{1}{2}$ w.
IRC BT $\frac{1}{2}$ 1. megohm $\frac{1}{2}$ w.
IRC BT1 2000 ohms 1 w.
IRC BW1/2 200 ohms 1/2w
IRC BT2 20000 ohms 2 w.

Resistors - Mdl's. DT & DQT:

IRC BT $\frac{1}{2}$	.1 megohm $\frac{1}{2}$ w.
IRC BW $\frac{1}{2}$	500 ohms $\frac{1}{2}$ w.
IRC BT $\frac{1}{2}$	.1 megohm $\frac{1}{2}$ w.

Switches:

Centralab Part D 3P. 3 pos.
Part of S1.1 assembly
Centralab Part D 3P. 3 pos.
Part of S2.1 assembly
Centralab Part D 3P. 3 pos.
Part of S3.1 assembly
H&H #20902-Z D.P.S.T. 3A. tog.
H&H #21189 S.P.D.T. 3A. tog.
H&H #20992 S.P.S.T. 3A. tog.

Switches - Mdl. DQ:

Centralab K-16 switch cover
Part of R14 assembly

Switches - Mdl's. DT & DQT:..

H&H #20902-Z D.P.S.T. 3A. tog.

NORTHERN RADIO CO.

TYPE N600, MODELS
D, DQ, DT, DQT

PARTS LIST N600D

Transformers:

T1 I.F. Amp. input
T2 I.F. Amp. output
T3 A.F. Pwr. Amp. output

Miller #612-C1 input
Miller #612-C4 output - diode
NRC #600C-10-1 output

Tubes:

6K7 R.F. Amplifier
6L7 Mixer
6J5 Oscillator
6K7 I.F. Amplifier
6Q7 Diode Det.- AVC - First A.F.
25L6GT A.F. Power Amplifier

Sylvania or equiv. type 6K7
Sylvania or equiv. type 6L7
Sylvania or equiv. type 6J5
Sylvania or equiv. type 6K7
Sylvania or equiv. type 6Q7
Sylvania or equiv. type 25L6GT
See "Note" re metal tubes

Tubes - Mdl. DQ:

6Q7 Diode Det.- AVC - Squelch
6F5 First A.F. Amplifier

Same as above
Sylvania or equiv. type 6F5

Tubes - Mdl. DT & DQT:

6J5 B.F. Oscillator

Sylvania or equiv. type 6J5

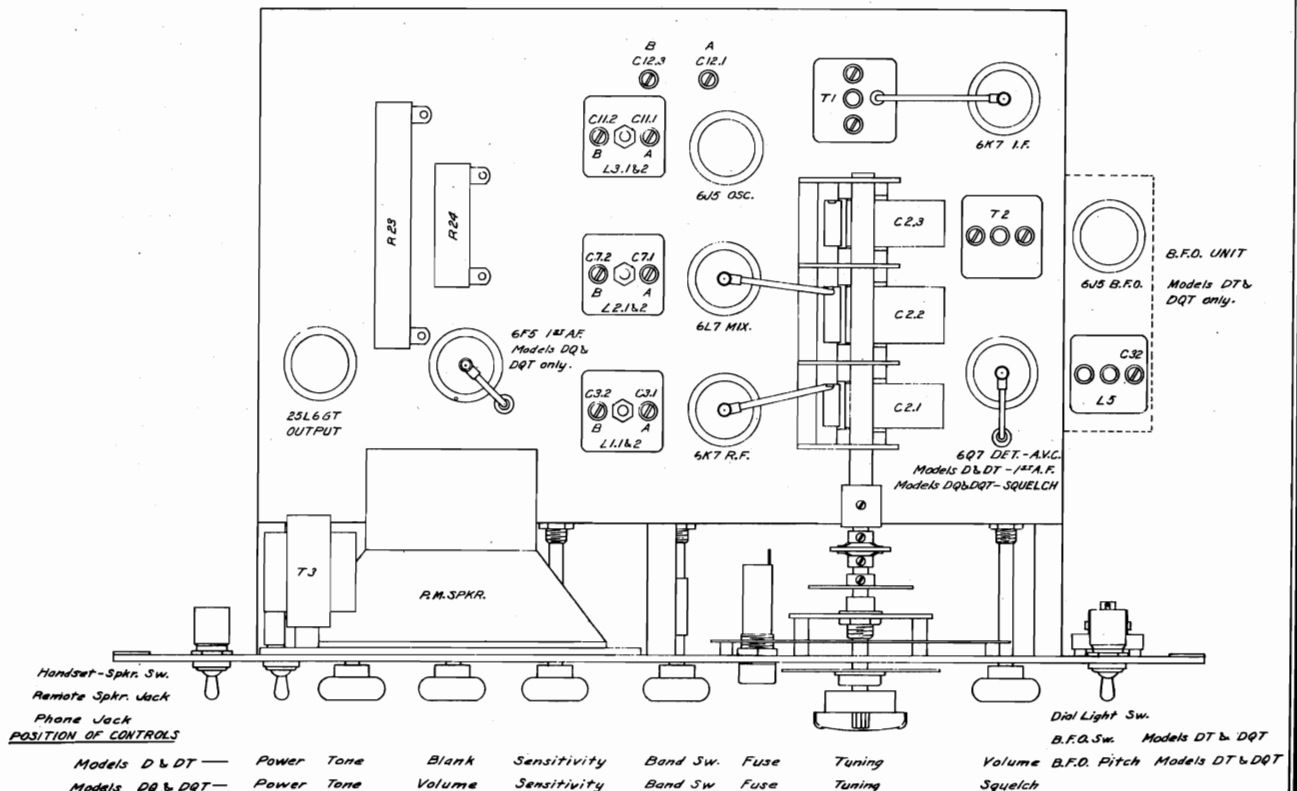
Miscellaneous:

Dynamic speaker
Dial lights
Dial light sockets
115 V. line fuse F1
Fuse holder
Headphone jack J1
Remote spkr. jack J2
Band switch knob
Control knobs
Control cable plug CP1
Control cable plugs
*Power cable plug CP2
Tube sockets
Tuning dial mechanism
Tuning dial scale

Jensen ST-445 or Utah 6P 6" PM
Sylvania S-47 6-8 v. 150 Ma. m.b.b.
Drake #206CE dial lig. bkts.
Killark or equiv. 3AG 3amp.
Littelfuse #341001 extractor post
Mallory #703A Junior
Carter #2A single closed cir.
Crowe #6144 1-1/8" rd. blk. pointer
Crowe #6132 1-1/8" rd. blk.
Amphenol #61-CP7S 7 prong
Amphenol PF7S & PM7S 7 prong
Amphenol #61-CP4 4 prong
Amphenol S8 8 prong
Bud D-1729 vernier dial
NRC #915-10 std. 2 band

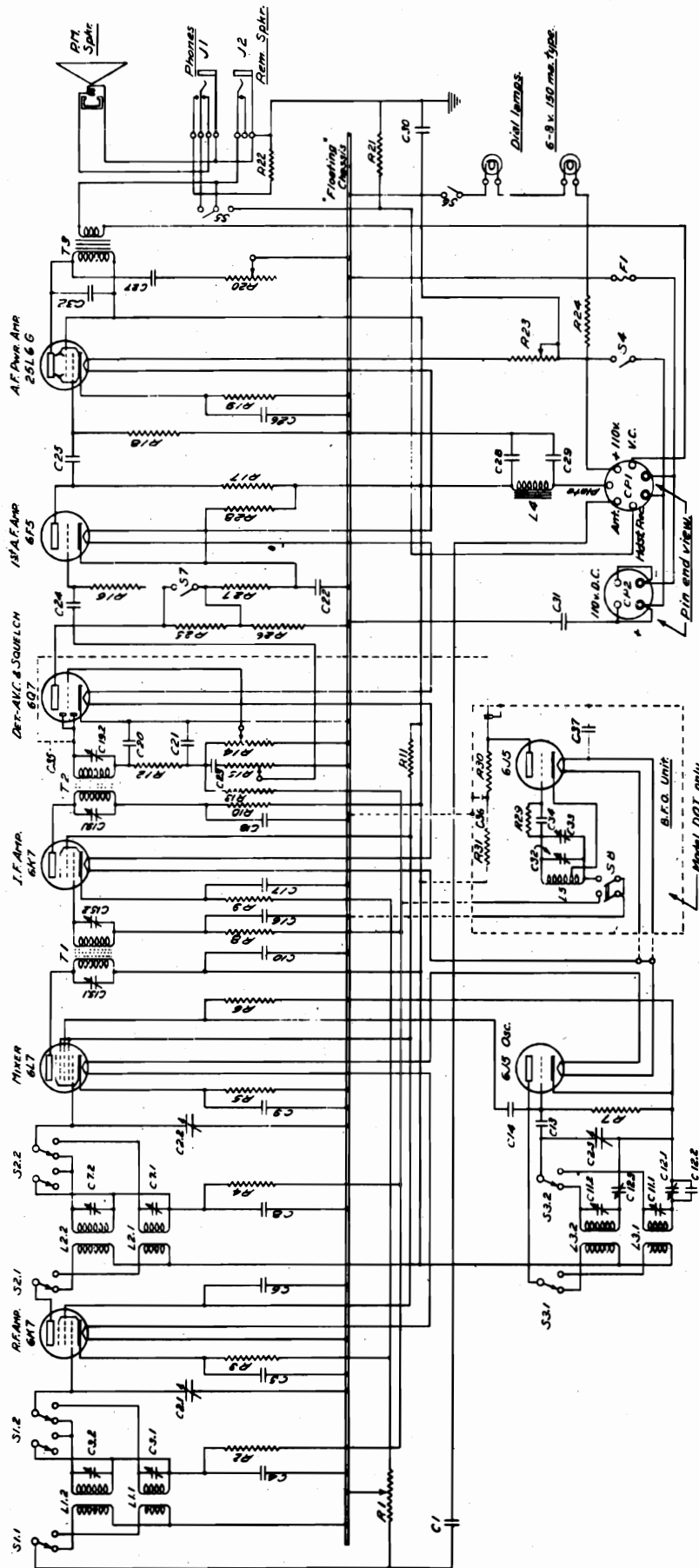
*Used only where power is not obtained thru the control cable.

Note: Metal tubes may be replaced with GT tubes, if necessary



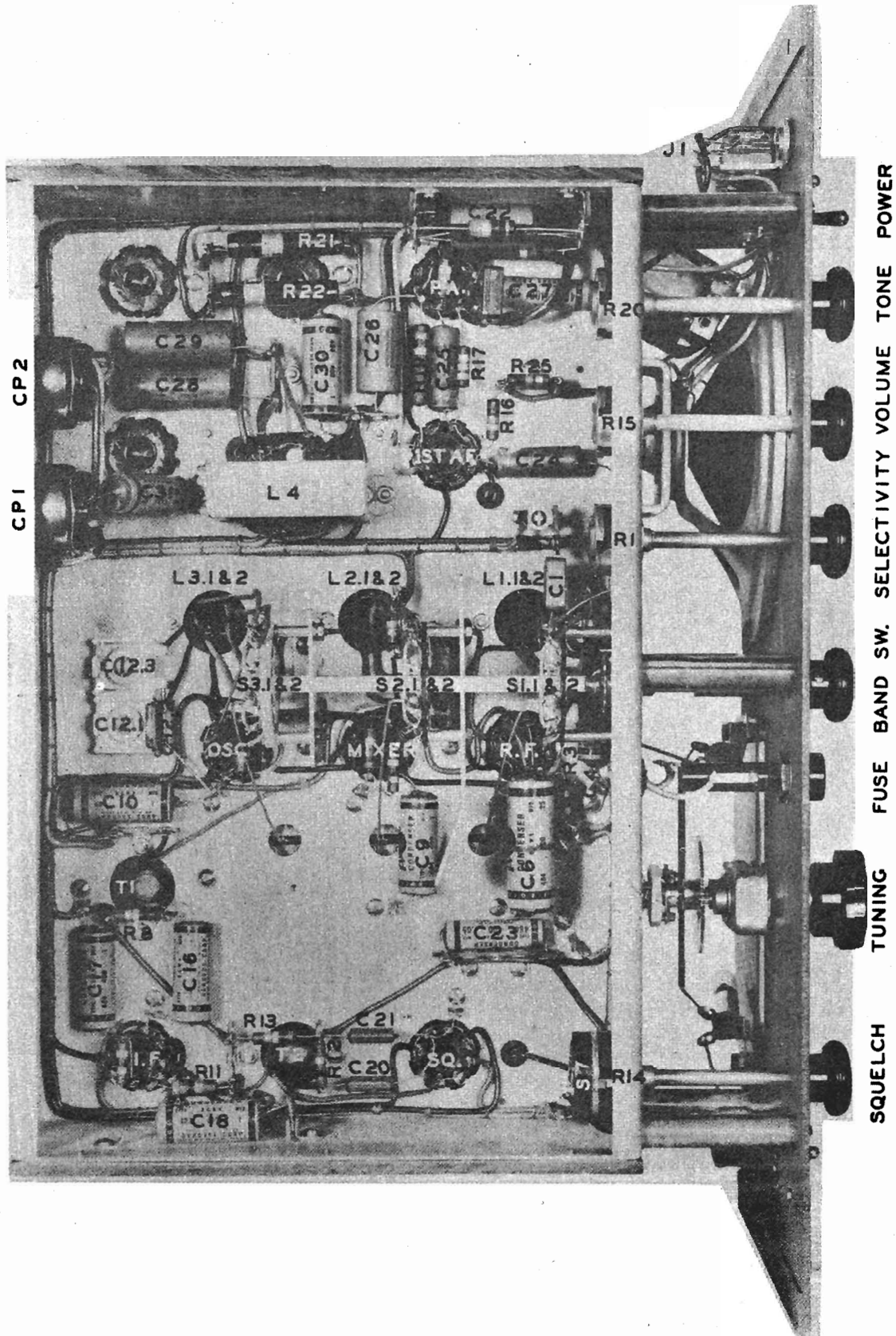
TYPE N600,
MODEL DQ

NORTHERN RADIO CO.



BAND A: 1350 TO 4200 MC
BAND B: 350 TO 1600 MC
INTERMEDIATE FREQ. 456 MC

Note: All band switches shown in "B" position.



SQUELCH TUNING FUSE BAND SW. SELECTIVITY VOLUME TONE POWER

600DQ RECEIVER
BOTTOM VIEW

1

Miller #512-C-5 B.F.O. unit

Centralab AF-110 10000 ohm pot.
 IRC ET1 1 megohm $\frac{1}{2}$ w.
 IRC ET2 100 ohms $\frac{1}{2}$ w.
 IRC ET3 100 ohms $\frac{1}{2}$ w.
 IRC ET4 1 megohm $\frac{1}{2}$ w.
 IRC ET5 100 ohms $\frac{1}{2}$ w.
 IRC ET6 51000 ohms $\frac{1}{2}$ w.
 IRC ET7 1200 ohms $\frac{1}{2}$ w.
 IRC ET8 51000 ohms $\frac{1}{2}$ w.
 IRC ET9 1 megohm $\frac{1}{2}$ w.
 IRC ET10 100 ohms $\frac{1}{2}$ w.
 IRC ET11 .51 megohm $\frac{1}{2}$ w.
 IRC ET12 30000 ohms $\frac{1}{2}$ w.
 Centralab A-130 .5 meg. pot.
 IRC ET1 1. megohm $\frac{1}{2}$ w.
 IRC ET2 .25 megohm $\frac{1}{2}$ w.
 IRC ET3 .75 megohm $\frac{1}{2}$ w.
 IRC ET4 620 ohms $\frac{1}{2}$ w.
 IRC ET5 620 ohms $\frac{1}{2}$ w.
 Centralab AF-115 25000 ohm pot.
 IRC ET1 620 ohms $\frac{1}{2}$ w.
 IRC ET2 620 ohms $\frac{1}{2}$ w.
 IRC ET3 100 ohms $\frac{1}{2}$ w.
 IRC ET4 100 ohms $\frac{1}{2}$ w.
 IRC ET5 10 ohms lw.
 IRC ET6 10 ohms lw.
 Omnite #0361 3 ohms 25 w.
 IRC BW1 150 ohms 1 w.
 Omnite ED 250 ohms 10 w.
 IRC BW2 250 ohms 10 w.

IIRC BT $\frac{1}{2}$.1 megohm $\frac{1}{2}$ w.
IIRC BW $\frac{1}{2}$ 510 ohms $\frac{1}{2}$ w.
IIRC BT $\frac{1}{2}$ 30000 ohms $\frac{1}{2}$ w.
Ohmite #0368 100 ohms 25 w.

Centralab Part D 3p. 3 position
Part of S1.1 assembly
Part of S1.1 assembly
Centralab Part D 3p. 3 position
Part of S2.1 assembly
Part of S2.1 assembly
Centralab Part D 3p. 3 position
Part of S3.1 assembly
Part of S3.1 assembly
H&H #20902 D.P.S.T. 3A. tog.
H&H #21189 S.P.D.T. 3A. tog.
H&H #20992 S.P.S.T. 3A. tog.
H&H #20992 S.P.S.T. 3A. tog.

H&H #20902 D.P.S.T. 3A. tog.

Miller #612-C1 input
Miller #612-C4 output - diode
Thermador G-26 driver 1.33:1
NRC #6020-10-1 output 23:1

Sylvania or equiv. type 6K7
Sylvania or equiv. type 6L7

Inductances - Model CT:

B.F. Osc. coll

Resistors - Models C & CT:

- Sensitivity (R.F.) control
- R.R.F. Amp. grid filter
- R.R.F. Amp. cathode bias
- Det. grid filter
- Mixer cathode bias
- Mixer grid leak
- 5.3 primary shunt
- Osc. grid leak
- I.F. Amp. grid filter
- I.F. Amp. cath. bias
- A.V.C. filter
- Diode Det. r.f. filter
- Volume control & AVC load
- First A.F. grid coupling
- Second A.F. plate coupling
- Second A.F. grid coupling
- Second A.F. cathode bias
- Tone control
- A.A.F. Pwr. grid stabilizer
- A.A.F. Pwr. grid stabilizer
- A.A.F. Pwr. cathode bias
- Handset-receiver shunt
- Headphone shunt
- Filament dropping
- Plate power filter
- Dial light dropping

Resistors - Model CT:

B.F. Osc. grid leak
B.F. Osc. plate coup.
B.F. Osc. plate drop.
B.F. Osc. fil. drop.

Switches - Models C & CT:

Ant. colls - primary
Ant. colls - secondary
Ant. colls - secondary short.
R.R.F. colls - primary
R.R.F. colls - secondary
R.R.F. colls - secondary short.
Osc. colls - plate
Osc. colls - grid
Osc. colls - grid shorting
Power - 32 V. line
Speaker - Handset
Lights - Dial

Switches - Model CT:

B.F. Osc. control

Transformers - Models C & CT:

I.F. Amp. input
I.F. Amp. output
A.F. Pwr. Amp. input
A.F. Pwr. Amp. output

Tubes - Models C & CT:

R.F. Amplifier Mixer

PARTS LIST N602C

Type N602 Receivers

Models C & CT - 32 Volts, DC

Condensers - Models C & CT:

C1	Antenna isolating	C-D 1W-3D5 .005 uf. 300 v.
C2.1	R.F. Amp. tuning	RC #817092 3 gang 365 uuf.
C2.2	Detector tuning	Part of C2.1 assembly - 365
C2.3	Oscillator tuning	Part of C2.1 assembly - 365
C3.1	Ant. trimmer - band A	Part of L1.1 assembly
C3.2	Ant. trimmer - band B	Part of L1.2 assembly
C3.3	Ant. trimmer - band C	Part of L1.3 assembly
C4	R.F. Amp. grid filter	C-D DT-485 .05 uf. 400 v.
C5	R.F. Amp. cathode bypass	C-D DT-4P1 .1 uf. 400 v.
C6.1	R.F. trimmer - band A	Part of L2.1 assembly
C6.2	R.F. trimmer - band B	Part of L2.2 assembly
C6.3	R.F. trimmer - band C	Part of L2.3 assembly
C7	Det. grid filter	C-D DT-4P1 .1 uf. 400 v.
C8	Mixer cathode bypass	Part of L3.1 assembly
C9.1	Osc. trimmer - band A	Part of L3.2 assembly
C9.2	Osc. trimmer - band B	Part of L3.3 assembly
C9.3	Osc. trimmer - band C	Part of L3.4 assembly
C10.1	Osc. padding - band A	NRC #602C-10-2 290-800 uuf.
C10.2	Osc. padding - band B	Miller #160A 360-1000 uuf.
C10.3	Osc. padding - band B	C-D 1W-5D1 .001 uf. 500 v.
C10.4	Osc. padding - band C	C-D 1D-5D5 .005 uf. 500 v.
C11	Osc. grid blocking	C-D 5W-545 .00005 uf. 500 v.
C12	Osc. - Mixer coupling	C-D 5W-5T1 .0001 uf. 500 v.
C13	Plate & screen bypass	C-D DT-4P1 .1 uf. 400 v.
C14.1	First I.F.T. pri. tuning	Part of T1 assembly
C14.2	First I.F.T. sec. tuning	Part of T1 assembly
C15	I.F. Amp. grid filter	C-D DT-4P1 .1 uf. 400 v.
C16	I.F. Amp. cathode bypass	C-D DT-4P1 .1 uf. 400 v.
C17.1	Second I.F.T. pri. tuning	Part of T2 assembly
C17.2	Second I.F.T. sec. tuning	Part of T2 assembly
C18	Diode Det. r.f. bypass	C-D 5W-5T2 .0002 uf. 500 v.
C19	Diode Det. r.f. filter	C-D 5W-5T2 .0002 uf. 500 v.
C20	Not used	
C21	First A.F. grid coupling	C-D DT-485 .05 uf. 400 v.
C22	Second A.F. grid coupling	C-D DT-485 .05 uf. 400 v.
C23	Second A.F. cath. bypass	C-D BR-102A 10 uf. 25 v.
C24	Tone control	C-D DT-485 .05 uf. 400 v.
C25	A.F. Pwr. Amp. plate bypass	C-D DT-481 .01 uf. 400 v.
C26	Plate power filter - out.	Mallory WB-39 50 uf. 50 v.
C27	Plate power filter - in.	C-D DT-4W1 .1 uf. 400 v.
C28	32 Volt line bypass	C-D DT-4P1 .1 uf. 400 v.
<hr/>		
Condensers - Model CT:		
C29	B.F. Osc. tuning	Part of L7 assembly
C30	B.F. Osc. pitch control	Bud IC-1641 15 uuf.
C31	B.F. Osc. grid blocking	C-D 5W-5T2 .0002 uf. 500 v.
C32	B.F. Osc. - Diode coupling	C-D 5W-5Q1 .00001 uf. 500 v.
C33	B.F. Osc. plate filter	C-D DT-485 .05 uf. 400 v.
C34	B.F. Osc. fil. bypass	C-D DT-481 .01 uf. 400 v.

Inductances - Model C & CT:

L1.1	Ant. coil	- band A	Miller #626-A 3 band
L1.2	Ant. coil	- band B	Part of L1.1 assembly
L1.3	Ant. coil	- band C	Part of L1.1 assembly
L2.1	R.F. coil	- band A	Miller #626-RF 3 band
L2.2	R.F. coil	- band B	Part of L2.1 assembly
L2.3	R.F. coil	- band C	Part of L2.1 assembly
L3.1	Osc. coil	- band A	NRC #602C-10-5 5 band
L3.2	Osc. coil	- band B	Part of L3.1 assembly
L3.3	Osc. coil	- band C	Part of L3.1 assembly
L4	Plate power filter		Thermador D-9 2H. 125 Ma.

NORTHERN RADIO CO.

TYPE N602,
MODELS C, CT

PARTS LIST N602C

Tubes - Models C & CT:

6J5 Oscillator
 6K7 I.F. Amplifier
 6Q7 Diode Det.- AVC. - First A.F.
 25L6GT Second A.F. Amplifier
 25L6GT A.F. Power Amplifier

Sylvania or equiv. type 6J5
 Sylvania or equiv. type 6K7
 Sylvania or equiv. type 6Q7
 Sylvania or equiv. type 25L6GT
 Sylvania or equiv. type 25L6GT (4)
 See "Note" re metal tubes

Tubes - Model CT:

6J5 B.F. Oscillator

Sylvania or equiv. type 6J5

Miscellaneous - Models C & CT:

Dynamic Speaker
 Dial lights
 Dial light sockets
 F1 32 Volt line fuse
 Fuse holder
 J1 Headphone jack
 J2 Remote speaker jack
 CP1 Control cable plugs
 CP2 Control cable plug-chassis
 *Power cable plug-chassis
 Band switch knob
 Control knobs
 Tube sockets
 Tuning dial mechanism
 Tuning dial scale

Jensen ST-445 or Utah 6P 6" PM
 Sylvania S47 6-8 V. 150 Ma. m.b.b.
 Drake #206CE dial light bkt.
 Killark or equiv. 3AG 5 amp.
 Littelfuse #341001 extractor post
 Mallory #703A Junior
 Carter #2A single closed cir.
 Amphenol PF7S & PM7S 7 prong
 Amphenol #61-CP7S 7 prong
 Amphenol #61-CP4 4 prong
 Crowe #6144 1-1/8" rd. blk. pointer
 Crowe #6132 1-1/8" rd. blk.
 Amphenol S8 8 prong
 NRC #602C-11-1 33:1
 NRC #915-11 std. 3 band

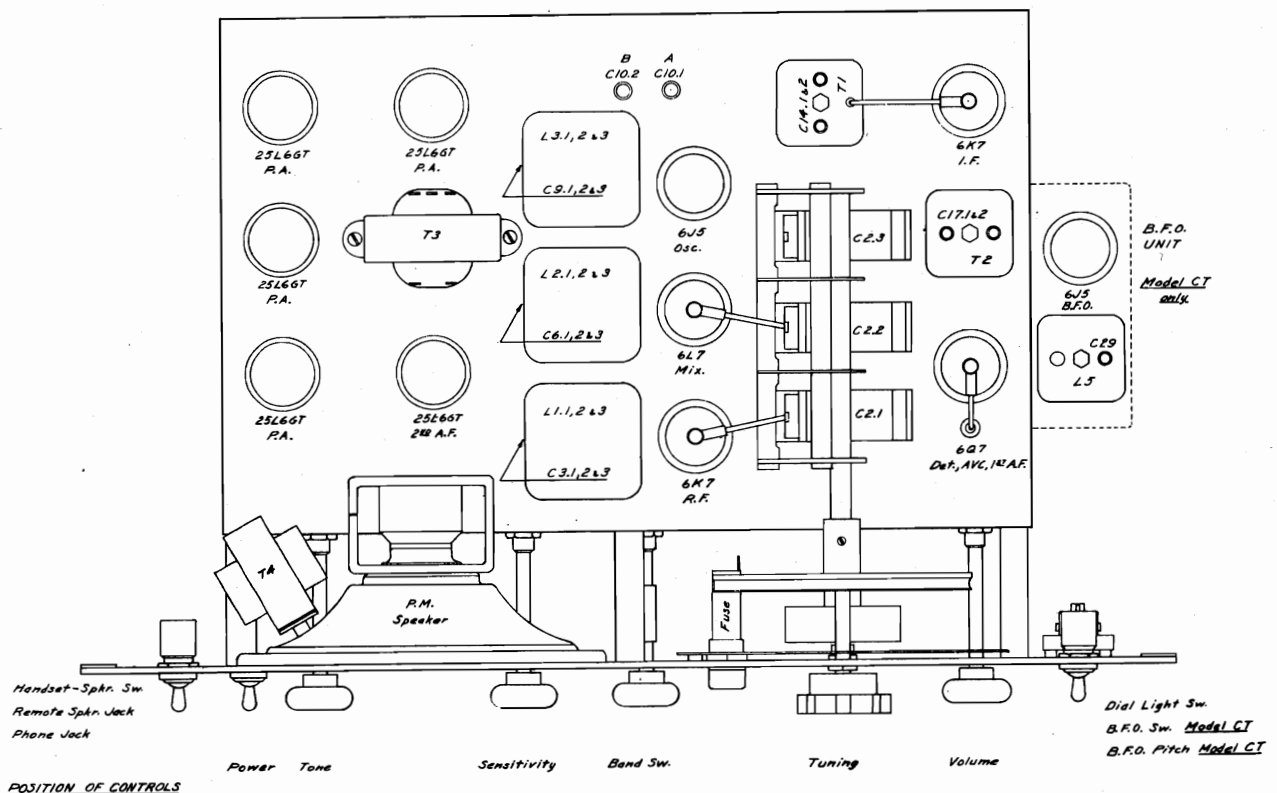
Miscellaneous - Model CT:

B1 R.F. - I.F. fixed bias

Mallory 1 1/2 V. grid bias cell

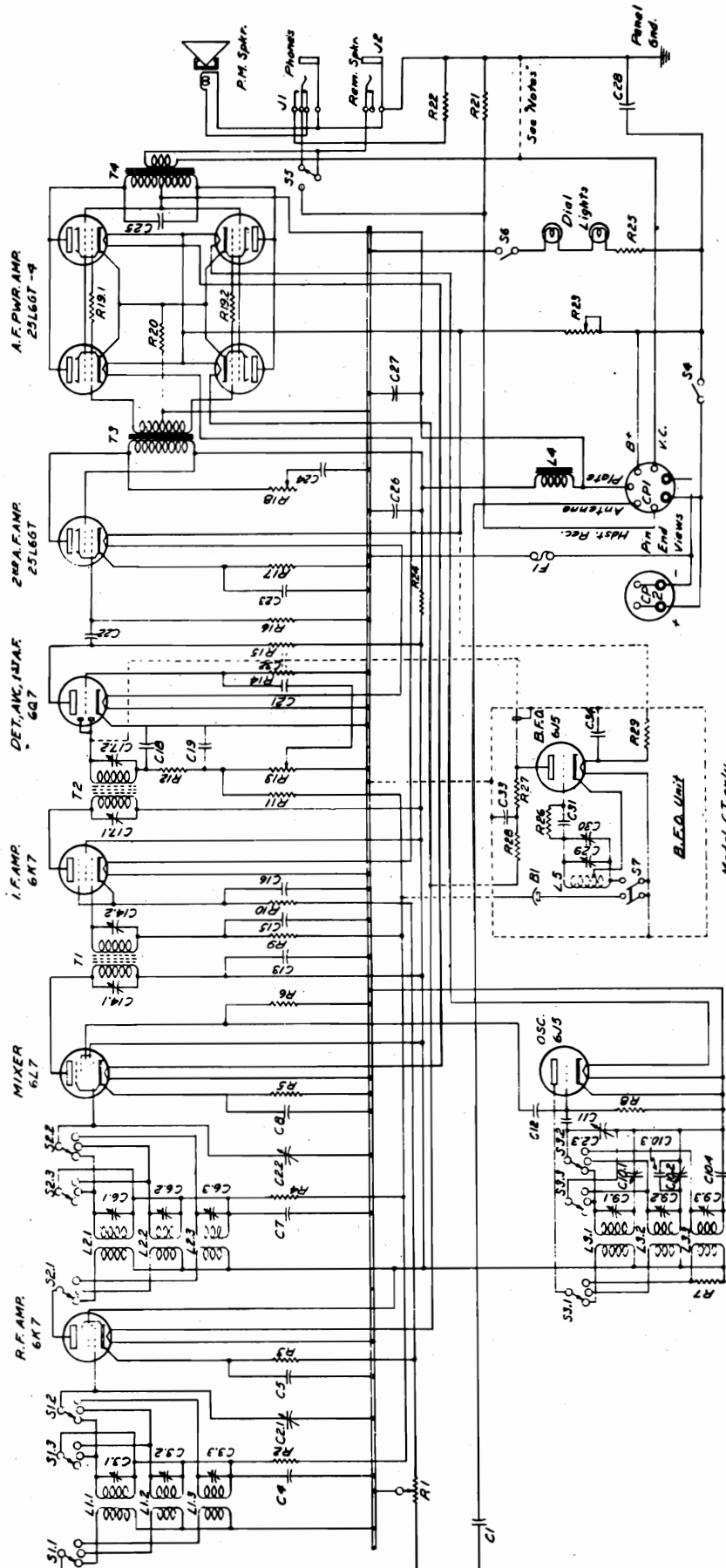
*Used only where power is not obtained thru the control cable.

Note: Metal tubes may be replaced with GT tubes, if necessary



TYPE N602,
MODEL C

NORTHERN RADIO CO.

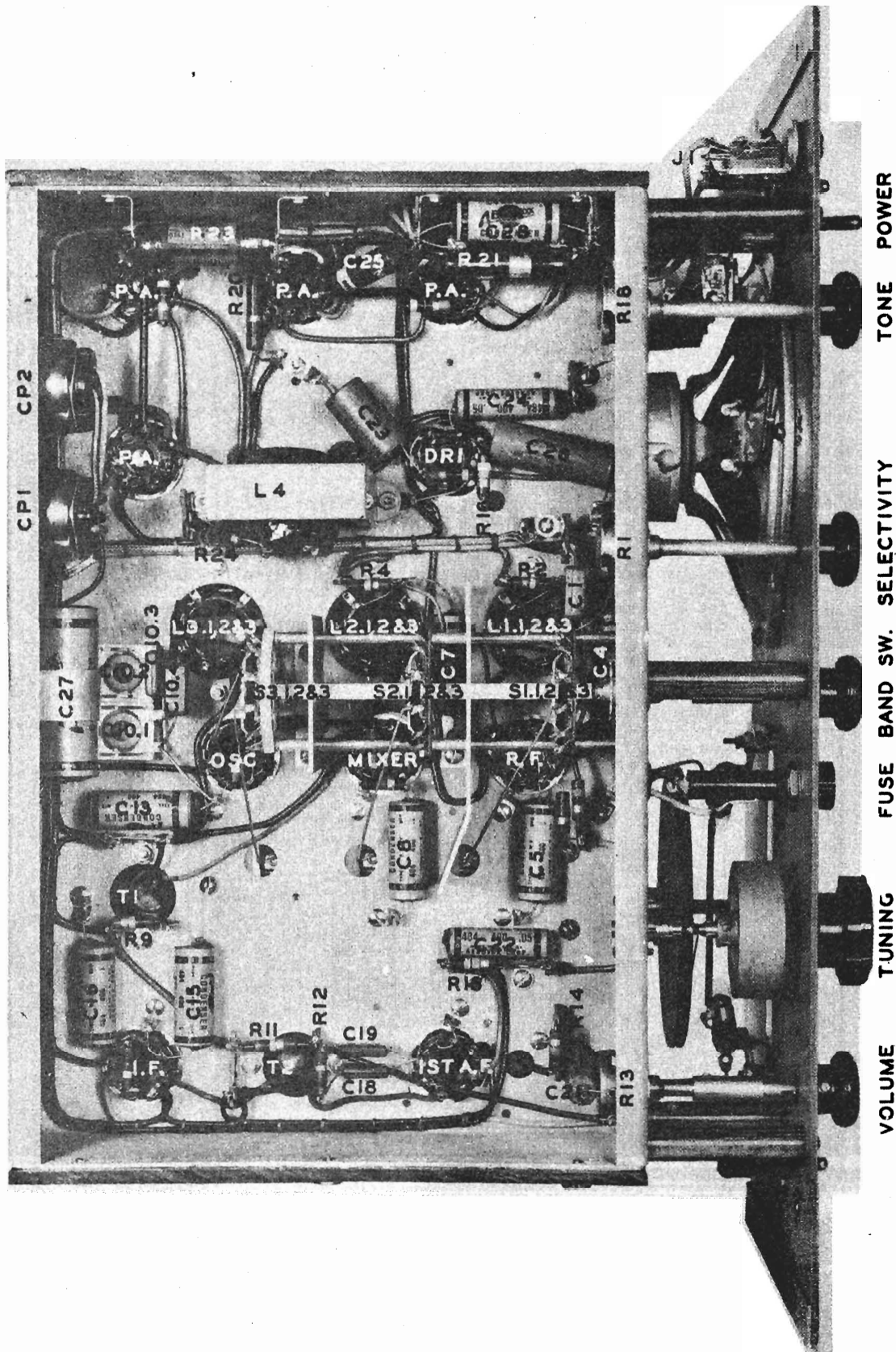


Band "A" — 340 to 1690 Mc.
Band "B" — 1660 to 3390 Mc.
Band "C" — 3.35 to 15.8 Mc.
Intermediate Freq. — 456 Kc.

NOTES:
All band switches shown in "A" position.
V.C. is strapped to Panel End when
used with N501 or N502 Transmitters.

NORTHERN RADIO CO.

TYPE N602,
MODEL C



602C RECEIVER
BOTTOM VIEW

TYPE N602, MODELS
D, DQ, DQT, DT

NORTHERN RADIO CO.

TYPE N602, MODELS
D, DQ, DQT, DT

Test Readings

The following test readings indicate average normal operating conditions:

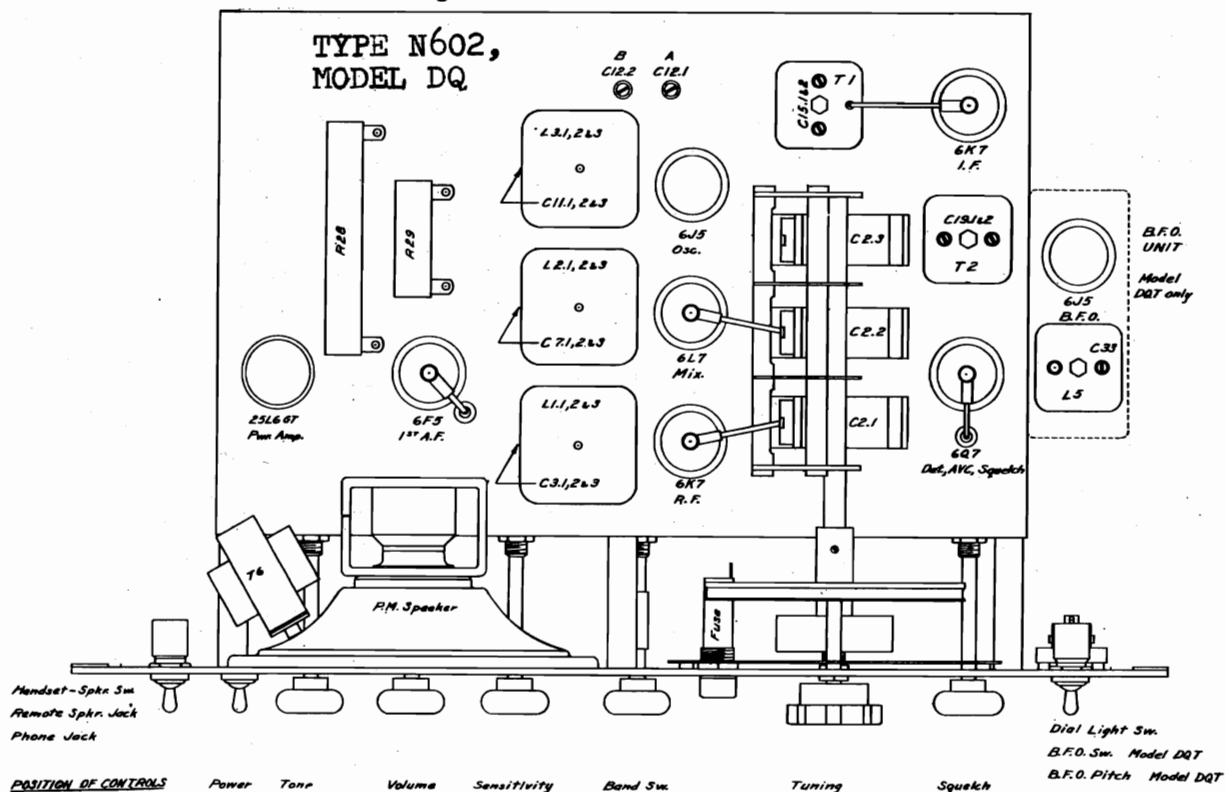
Models	Stage	Tubes	Plate Volts	Screen Volts	Grid Volts	Cath. Volts	Fil. Volts
All	R.F.A.	6K7	111.8	71.1	*Var.	1.5	6
All	Mixer	6L7	110.7	71.1	x4.0 av.	1.8	6
All	Osc.	6J5	111.8	--	x9.8 av.	0	6
All	I.F.A.	6K7	101.3	71.1	*Var.	1.4	6
D & DT	Det. &	6Q7	*Var.	--	--	0	6
D & DT	1st A.F.	Same	55.4	--	0	0	Same
All	A.F.P.A.	25L6GT	107.7	111.8	0	7.3	24
DQ & DQT	Det. &	6Q7	*Var.	--	--	0	6
DQ & DQT	Squelch	Same	9.4(Sq.off)	--	*Var.	0	Same
DQ & DQT	1st A.F.	6F5	60.6	--	1.0	10.4	6
DT & DQT	B.F.O.	6J5	26.1	--	--	0	6

Input voltage during test - 115 volts.
Total filament current - .44 Amp.
Total plate current - 75 Ma.

*Variable - dependent on signal and avc voltage. This also applies to the mixer (detector) control grid not listed above.

xAverage - mixer injection and oscillator grid voltages read with a VTVM having a d.c. input resistance of 11 megohms. These voltages vary over the frequency range.

Note: Normal readings may vary plus or minus 6% from the values given. The maximum variation should not exceed 10%. Readings are taken with the SENSITIVITY (r.f. gain) control set at maximum. All voltages are read between the circuit points and chassis, except the filaments and 6F5 grid. The latter is read between the cathode and grid taps on the squelch voltage divider. The meter should have a resistance of 1000 ohms per volt and a 300 volt (or higher) scale should be used where there is much resistance in the circuit, if comparative readings are to be obtained. Current values may be computed by dividing the voltage across resistors by their resistance. Refer to drawings and "Parts List" for data.



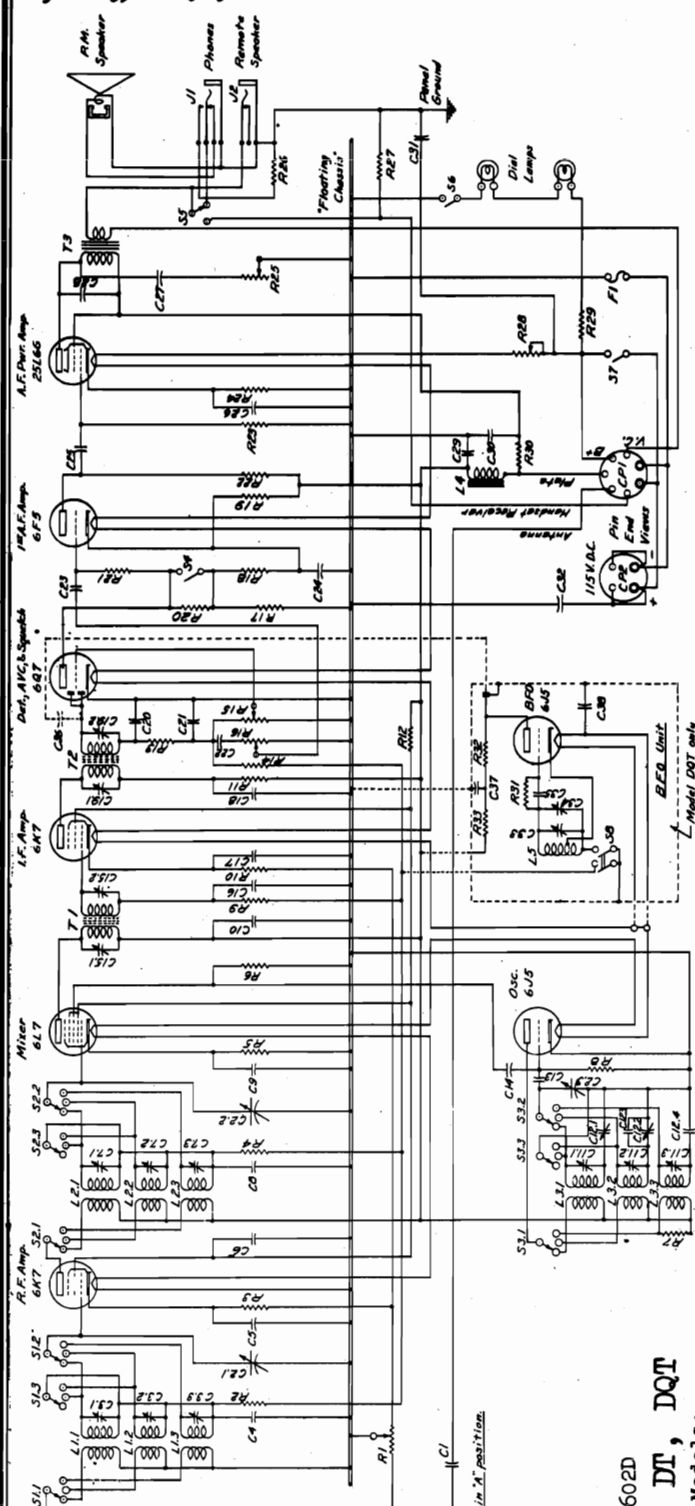
NORTHERN RADIO CO.

TYPE N602, MODELS
D, DQ, DQT, DT

PARTS LIST N602D		
Type N602 Receivers		
Models D, DQ, DT & DQT - 115 Volts, D.C.		
Condensers - All Models:		
C1	Antenna isolating	C-D 1D-5D5 .005 uf. 500 v.
C2.1	R.F. Amp. tuning	RC #817092 3 gang 365 uuf.
C2.2	Detector tuning	Part of C2.1 assembly - 365 uuf.
C2.3	Oscillator tuning	Part of C2.1 assembly - 365 uuf.
C3.1	Ant. trimmer - band A	Part of L1.1 assembly
C3.2	Ant. trimmer - band B	Part of L1.2 assembly
C3.3	Ant. trimmer - band C	Part of L1.3 assembly
C4	R.F. Amp. grid filter	C-D DT-4S5 .05 uf. 400 v.
C5	R.F. Amp. cathode bypass	C-D DT-4P1 .1 uf. 400 v.
C6	Screen bypass	C-D DT-4P25 .25 uf. 400 v.
C7.1	R.F. trimmer - band A	Part of L2.1 assembly
C7.2	R.F. trimmer - band B	Part of L2.2 assembly
C7.3	R.F. trimmer - band C	Part of L2.3 assembly
C8	Det. grid filter	C-D DT-4S5 .05 uf. 400 v.
C9	Mixer cathode bypass	C-D DT-4P1 .1 uf. 400 v.
C10	Plate bypass	C-D DT-4P1 .1 uf. 400 v.
C11.1	Osc. trimmer - band A	Part of L3.1 assembly
C11.2	Osc. trimmer - band B	Part of L3.2 assembly
C11.3	Osc. trimmer - band C	Part of L3.3 assembly
C12.1	Osc. padding - band A	NRC #602D-10-2 290-800 uuf.
C12.2	Osc. padding - band B	Miller #160A 360-1000 uuf.
C12.3	Osc. padding - band C	C-D 1W-5D1 .001 uf. 500 v.
C12.4	Osc. padding - band D	C-D 1D-5D5 .005 uf. 500 v.
C13	Osc. grid blocking	C-D 5W-5T1 .0001 uf. 500 v.
C14	Osc. - Mixer coupling	C-D 5W-5T1 .0001 uf. 500 v.
C15.1	First I.F.T. pri. tuning	Part of T1 assembly
C15.2	First I.F.T. sec. tuning	Part of T1 assembly
C16	I.F. Amp. grid filter	C-D DT-4P1 .1 uf. 400 v.
C17	I.F. Amp. cathode bypass	C-D DT-4P1 .1 uf. 400 v.
C18	I.F. Amp. plate filter	C-D DT-4P1 .1 uf. 400 v.
C19.1	Second I.F.T. pri. tuning	Part of T2 assembly
C19.2	Second I.F.T. sec. tuning	Part of T2 assembly
C20	Diode Det. R.F. bypass	C-D 5W-5T2 .0002 uf. 500 v.
C21	Diode Det. R.F. filter	C-D 5W-5T2 .0002 uf. 500 v.
C22	First A.F. grid coupling	C-D DT-4S2 .02 uf. 400 v.
C23	Pwr. Amp. grid coupling	C-D DT-4S2 .02 uf. 400 v.
C24	Pwr. Amp. cathode bypass	C-D BR-102A 10 uf. 25 v.
C25	Tone control	C-D DT-4S5 .05 uf. 400 v.
C26	Pwr. Amp. plate bypass	C-D 1D-5D6 .006 uf. 500 v.
C27	Plate power filter - RF & AF	C-D BR-825 8 uf. 250 v.
C28	Plate power filter - Pwr. Amp.	C-D BR-825 8 uf. 250 v.
C29	115 V. line bypass - panel	C-D DT-4P1 .1 uf. 400 v.
C30	115 V. line bypass - chassis	C-D DT-4S5 .05 uf. 400 v.
C31	Condensers - Models DQ & DQT:	
C32	R16 A.F. coupling	C-D DT-4S5 .05 uf. 400 v.
C33	First A.F. cathode bypass	C-D BR-102A 10 uf. 25 v.
C34	Condensers - Models DT & DQT:	
C35	B.F. Osc. tuning	Part of L5 assembly
C36	B.F. Osc. pitch control	Bud LC-1641 15 uuf.
C37	B.F. Osc. grid blocking	C-D 5W-5T2 .0002 uf. 500 v.
C38	B.F. Osc. Diode coupling	C-D 5W-5T2 .0001 uf. 500 v.
C39	B.F. Osc. plate filter	C-D DT-4S5 .05 uf. 400 v.
C40	B.F. Osc. filament bypass	C-D DT-4S1 .01 uf. 400 v.
C41	Inductances - All Models:	
L1.1	Ant. coil - band A	Miller #626-A 3 band
L1.2	Ant. coil - band B	Part of L1.1 assembly
L1.3	Ant. coil - band C	Part of L1.1 assembly
L2.1	R.F. coil - band A	
L2.2	R.F. coil - band B	
L2.3	R.F. coil - band C	
L3.1	Osc. coil - band A	
L3.2	Osc. coil - band B	
L3.3	Osc. coil - band C	
L4	Plate power filter choke	
L5	Inductances - Models DT & DQT:	
B.F. Osc. coil		
Resistors - All Models:		
Sensitivity (R.F.) control		
R.F. Amp. grid filter		
Detector grid filter		
Mixer cathode bias		
Mixer grid leak		
L3.3 primary shunt		
Osc. grid leak		
I.F. Amp. grid filter		
I.F. Amp. cathode bias		
I.F. Amp. plate filter		
Screen dropping		
Diode Det. r.f. filter		
A.V.C. filter		
First A.F. grid coupling		
First A.F. plate coupling		
Pwr. Amp. grid coupling		
Pwr. Amp. cathode bias		
Tone control		
Headphone shunt		
Handset-receiver shunt		
Pil voltage dropping		
Dial light voltage drop		
Pwr. Amp. plate filter		
Resistors - Models DQ & DQT:		
Volume control & AVC load		
Resistors - Models DT & DQT:		
Squelch control - A.V.C. load		
Volume (A.F.) control		
Squelch voltage divider		
Squelch voltage divider		
Squelch voltage dropping		
6Q7 plate - 6P5 block. bias		
Resistors - Models DT & DQT:		
B.F. Osc. grid leak		
B.F. Osc. plate coupling		
B.F. Osc. plate dropping		
Switches - All Models:		
Ant. coils - primary		
Ant. coils - secondary		
Ant. coils - secondary short.		
R.F. coils - primary		
R.F. coils - secondary		
R.F. coils - secondary short.		
Osc. coils - plate		
Osc. coils - grid		

TYPE N602, MODELS D, DQ, DQT, DT

NORTHERN RADIO CO.



SCHEMATIC MODEL DQ

Band 'A' - 540 to 1600 Kc.
Band 'B' - 1660 to 5300 Kc.
Band 'C' - 5.35 to 15.9 Mc.
Intermediate Freq. - 455 Kc.

Note: All band switches shown in 'A' position.

PARTS LIST N602D MODELS D, DQ, DT, DQT

Switches - All Models:

- S3.3 Osc. coils - grid shorting
- S5 Speaker-Handset
- S6 Lights - dial
- S7 Power - 115 V. line

Switches - Models DQ & DQT:

- S4 Squelch Off-On control

Switches - Models DT & DQT:

- S8 B.F. Osc. Off-On control

Transformers - All Models:

- T1 I.F. Amp. input
- T2 I.F. Amp. output
- T3 A.F. Pwr. Amp. output

Tubes - All Models:

- 6K7 R.F. Amplifier
- 6L7 Mixer
- 6J5 Oscillator
- 6K7 I.F. Amplifier
- 25L6GT A.F. Power Amplifier

Tubes - Models D & DT:

- 6Q7 Diode Det. - AVC - First A.F. Sylvania or equiv. type 6Q7

Tubes - Models DQ & DQT:

- 6Q7 Diode Det. - AVC - Squelch
- 6F5 First A.F. Amplifier

Tubes - Models DT & DQT:

- 6J5 Sylvania or equiv. type 6J5

B.F. Oscillator

Miscellaneous:

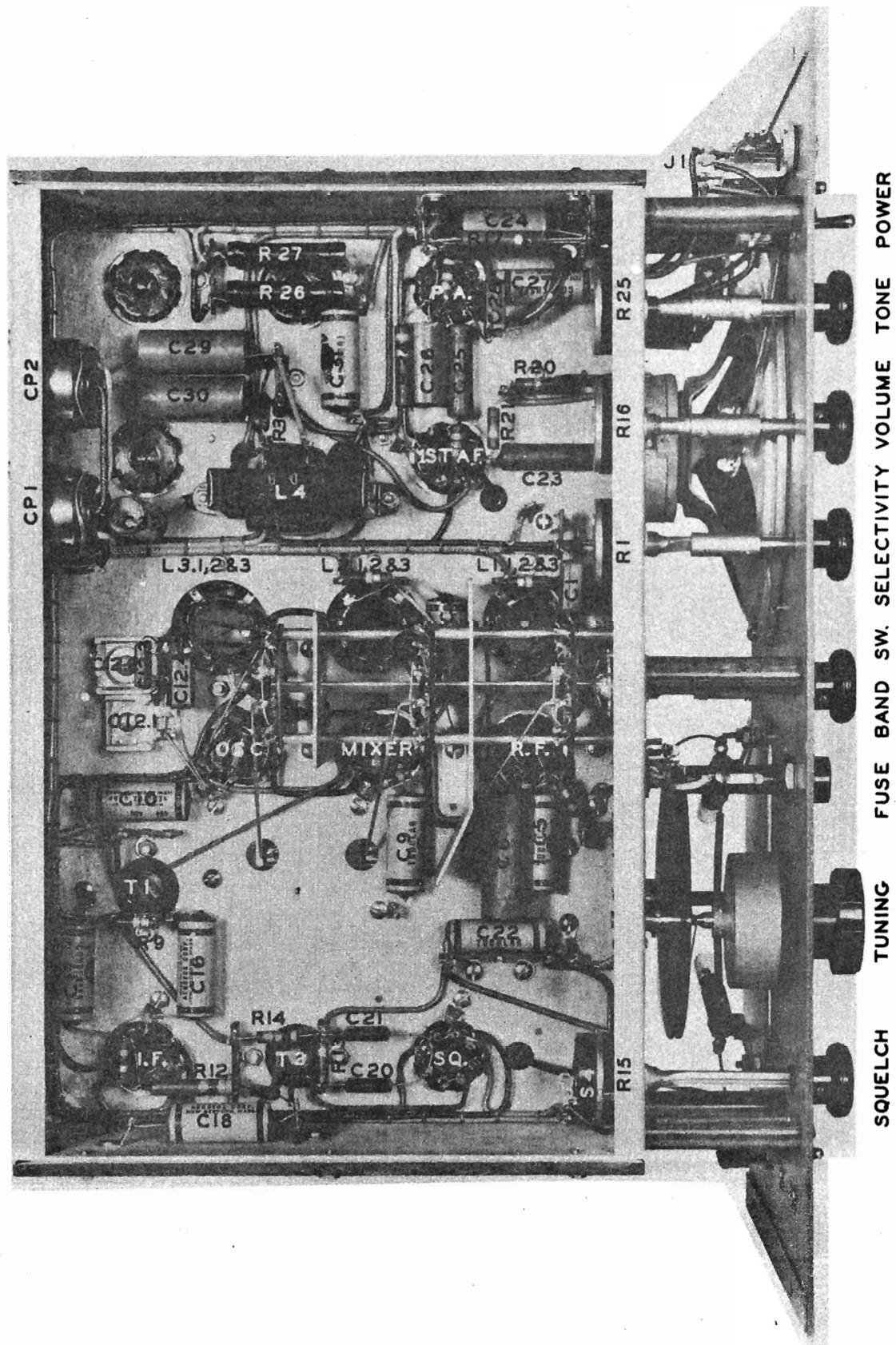
- Dynamic speaker
- Dial lamps
- Dial lamp sockets
- 115 Volt line fuse
- Fuse holder
- Headphone jack
- Remote speaker jack
- Control cable plugs
- Control cable plug - chassis
- *Power cable plug - chassis
- Band switch knob
- Control knobs
- Tube sockets
- Tuning dial mechanism
- Tuning dial scale

*Used only where power is not obtained thru the control cable.

Note: Metal tubes may be replaced with GT tubes, if necessary.

NORTHERN RADIO CO.

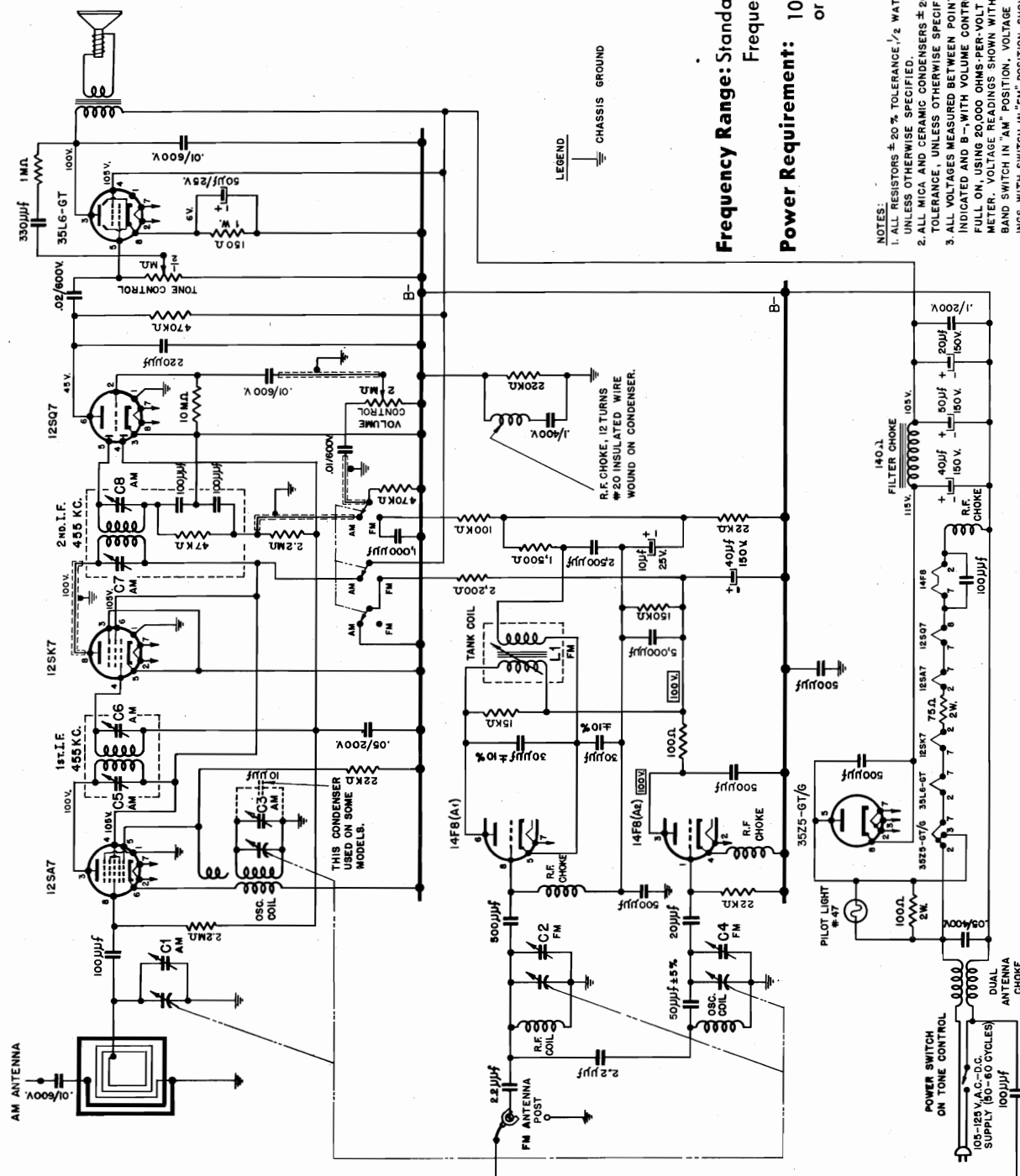
TYPE N602,
MODEL DQ



602DQ RECEIVER
BOTTOM VIEW

Model 7-532W Walnut
Model 7-532V Ivory

Frequency Range: Standard Broadcast: 530-1700 kc.
Frequency Modulation (FM) 88-108 MC
Power Requirement: 105-125 volts a-c 50-60 cycles
or 105-125 volts d-c



MODELS 7-532V,
7-532W

OLYMPIC RADIO & TELEV. INC.

ALIGNMENT PROCEDURE CHART				
STEP	SET BAND SWITCH ON	CONNECT HIGH SIDE OF SIGNAL GENERATOR TO—	SET SIGNAL GENERATOR TO—	TURN POINTER DIAL TO—
1	A.M.	R.F. SECTION OF VARIABLE CONDENSER OR PIN 4 OF THE 12SA7 TUBE IN SERIES WITH A .1MFD. 400 VOLT CONDENSER	455 KC.	EXTREME RIGHT HAND POSITION. (CONDENSER PLATES FULLY OPEN).
2	A.M.	R.F. SECTION OF VARIABLE CONDENSER OR PIN 8 OF THE 12SA7 TUBE IN SERIES WITH A .1MFD. 400 VOLT CONDENSER	455 KC.	EXTREME RIGHT HAND POSITION. (CONDENSER PLATES FULLY OPEN).
3	A.M.	REPEAT	1700 KC.	1700 KC. CALIBRATION POINT ON DIFFUSER PLATE.
4	A.M.	USE RADIATED SIGNAL (CONNECT BOTH SIDES OF SIGNAL GENERATOR TO RADIATION LOOP).	1700 KC.	1700 KC. CALIBRATION POINT ON DIFFUSER PLATE.
5	A.M.	CONNECT HIGH SIDE OF SIGNAL GENERATOR TO—	107 MC.	107 MC. CALIBRATION POINT ON DIFFUSER PLATE.
6	F.M.	F.M. ANTENNA POST IN SERIES WITH A 300 OHM RESISTOR	2175 MC.	EXTREME RIGHT HAND POSITION. (CONDENSER PLATES FULLY OPEN).
7	F.M.		107 MC.	CALIBRATION POINT ON DIFFUSER PLATE.
8	F.M.		103 MC.	103 MC. CALIBRATION POINT ON DIFFUSER PLATE.

Note: All tubes and the pilot light may be replaced without removing chassis from cabinet. Remove the cardboard back, and the screw holding the loop to the mounting bracket, then lift loop carefully off the bracket so as to avoid breaking of the wires connecting the loop to the chassis.

SERVICE AND ALIGNMENT INSTRUCTIONS

This receiver has been carefully aligned in the factory and the circuit is unusually stable. Realignment should only be attempted when necessary and only with a proper signal generator and in accordance with the service instructions. The receiver cannot be aligned on modulated signals. To insure proper broadcast alignment it is recommended to use a radiated signal. To radiate the signal connect a loop of about 6" to 8" diameter 1 turn of #14 or #12 wire across the output of the signal generator and place this loop parallel to the loop of the receiver to be aligned at a distance of 8" or 10". For complete alignment instructions on AM and FM Bands see alignment chart.

ALIGNMENT Equipment required: Modulated r-f signal generator, output meter, insulated screw driver, two .1 mfd. 400 volt condensers, one 300 ohm resistor. An FM signal generator is not required for the alignment of this receiver.

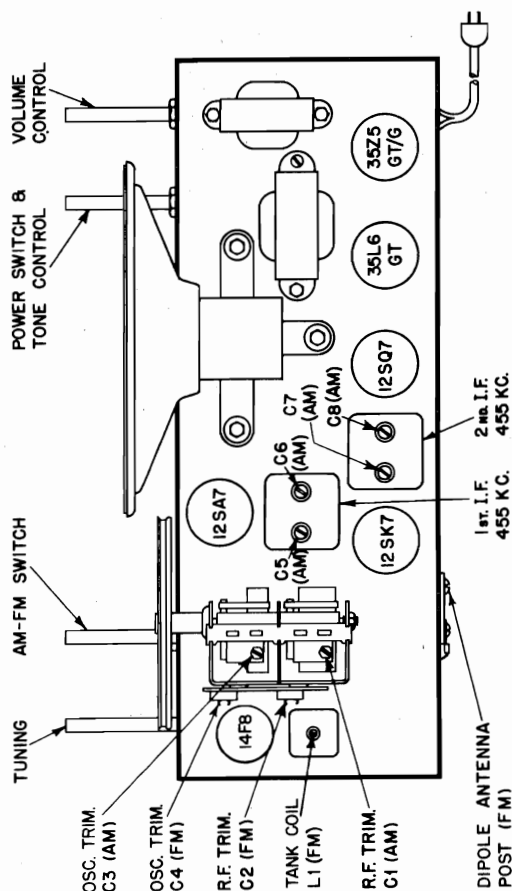
With the receiver removed from the cabinet connect output meter across voice coil. Connect ground side of the signal generator in series with a .1/400 volt condenser to the common B—; turn volume control fully on, and keeping the output of the signal generator as low as possible, proceed in the sequence as shown on the alignment chart.

To facilitate alignment of the receiver when removed from cabinet, calibration points are provided on the light diffuser plate, which is mounted to the chassis.

CAUTION: The diffuser strip is assembled to the chassis with 2 PK screws. The one at the left is fastened down tight. The one on the right should be backed off about 2 turns from tight position in order to permit free expansion of the strip and thereby avoid warpage which will interfere with proper movement of the pointer.

Before aligning, close the variable condenser fully counterclockwise (plates fully closed) and check that pointer coincides with the reference dot (extreme left dot) on the diffuser plate.

TUBE & TRIMMER LAYOUT



**MODELS 7-532V,
7-532W**
**OLYMPIC RADIO & TELEV. INC. MODELS 7-532W, 7-532V,
MODELS 7-537W, 7-537V**
REPLACEMENT PARTS LIST

Part No.	Description	Part No.	Description
BU-187	Bulb—#47 Mazda pilot light bulb	PO-334	Pointer—dial pointer
CA-154-1W	Cabinet—walnut bakelite cabinet	PT-105	Control—2 megohms volume control
CA-154-1V	Cabinet—ivory bakelite cabinet	PT-106	Control—1/2 megohm tone control with S.P.S.T. switch
CCA-101M	Condenser—100 mmfd. $\pm 20\%$ ceramic condenser	RCM20A100M	Condenser—10 mmfd. $\pm 20\%$ mica condenser
CCA-102M	Condenser—1000 mmfd. $\pm 20\%$ ceramic condenser	RCM20A221M	Condenser—220 mmfd. $\pm 20\%$ mica condenser
CCA-200M	Condenser—20 mmfd. $\pm 20\%$ ceramic condenser	RCM20A331M	Condenser—330 mmfd. $\pm 20\%$ mica condenser
CCA-501M	Condenser—500 mmfd. $\pm 20\%$ ceramic condenser	RCPI0W2104A	Condenser—.1/200 W.V. tubular paper condenser
CCA-L300K	Condenser—30 mmfd. $\pm 10\%$ ceramic condenser (negative 080)	RCPI0W2503A	Condenser—.05/200 W.V. tubular paper condenser
CCA-U500J	Condenser—50 mmfd. $\pm 5\%$ ceramic condenser (negative 750)	RCPI0W4104L	Condenser—.1/400 W.V. tubular paper condenser*
CCD-502X	Condenser—5000 mmfd. disc condenser	RCPI0W4503A	Condenser—.05/400 W.V. tubular paper condenser
CCR-252M	Condenser—2500 mmfd. $\pm 20\%$ ceramic condenser	RCPI0W6103A	Condenser—.01/600 W.V. tubular paper condenser
CK-114	Choke—140 ohms 85 mils filter choke	RCPI0W6203A	Condenser—.02/600 W.V. tubular paper condenser
CK-1109	Choke—dual antenna choke	REB-101M	Resistor—100 ohms $\pm 20\%$ 1/2 watt resistor
CK-1127	Choke—r-f choke	REB-104M	Resistor—100,000 ohms $\pm 20\%$ 1/2 watt resistor
CL-1111	Coil—F.M. r-f coil	REB-105M	Resistor—1 megohm $\pm 20\%$ 1/2 watt resistor
CL-1113	Coil—F.M. oscillator coil	REB-106M	Resistor—10 megohms $\pm 20\%$ 1/2 watt resistor
CL-1129	Coil—broadcast oscillator coil	REB-152M	Resistor—1500 ohms $\pm 20\%$ 1/2 watt resistor
CO-791	Condenser—50 + 20 + 40/150 W.V. electrolytic condenser	REB-153M	Resistor—15,000 ohms $\pm 20\%$ 1/2 watt resistor
CO-808	Condenser—50 mfd. 25 W.V. electrolytic condenser	REB-154M	Resistor—150,000 ohms $\pm 20\%$ 1/2 watt resistor
CO-1112	Condenser—2.2 mmfd. $\pm 20\%$ fixed condenser	REB-222M	Resistor—2200 ohms $\pm 20\%$ 1/2 watt resistor
CO-1133	Condenser—10 mfd. 25 W.V. electrolytic condenser	REB-223M	Resistor—22,000 ohms $\pm 20\%$ 1/2 watt resistor
CO-1248	Condenser—40 mfd. 150 W.V. electrolytic condenser	REB-224M	Resistor—220,000 ohms $\pm 20\%$ 1/2 watt resistor
CT-1114	Condenser—3-12 mmfd. ceramic trimmer condenser	REB-225M	Resistor—2.2 megohms $\pm 20\%$ 1/2 watt resistor
CV-841	Condenser—2 gang variable condenser	REB-474M	Resistor—470,000 ohms $\pm 20\%$ 1/2 watt resistor
DL-1115	Dial—glass dial scale	REC-151M	Resistor—150 ohms $\pm 20\%$ 1 watt resistor
KN-671	Knob—walnut knob marked "Volume"	RED-101M	Resistor—100 ohms $\pm 20\%$ 2 watt resistor
KN-672	Knob—walnut knob marked "Off-On Tone"	SK-792	Speaker—6" p.m. speaker
KN-673	Knob—walnut knob marked "Tuning"	SP-191	Spring—drive shaft retaining spring
KN-1117	Knob—walnut knob marked "AM-FM"	SP-218	Spring—dial drive spring
KN-675	Knob—ivory knob marked "Volume"	ST-412	Back—printed cardboard back
KN-676	Knob—ivory knob marked "Off-On Tone"	ST-1120	Diffuser—light diffuser plate with calibration marks
KN-677	Knob—ivory knob marked "Tuning"	SW-1121	Switch—3 pole double throw switch
KN-1118	Knob—ivory knob marked "AM-FM"	TR-781	Transformer—455 kc I.F. input transformer
LP-1122	Loop—loop antenna	TR-782	Transformer—455 kc I.F. output transformer
		TR-904	Transformer—output transformer for 35L6
		TR-1123	Coil—tank coil

* When ordering specify "with r-f choke"

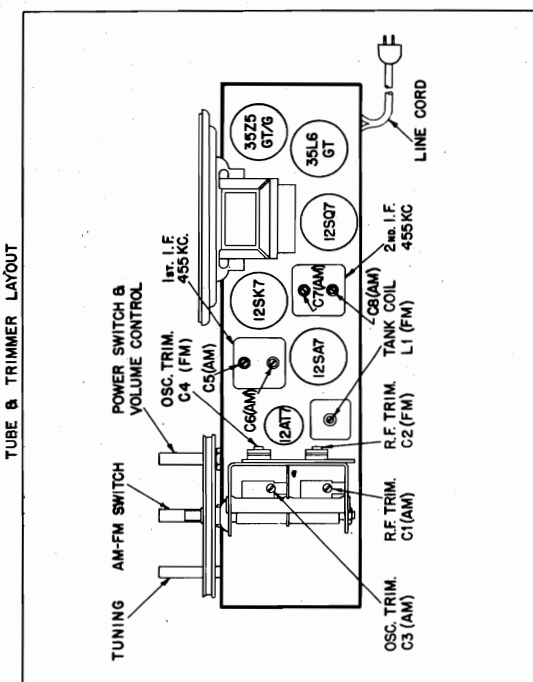
**MODELS 7-537V,
7-537W**

PART NUMBER	DESCRIPTION	PART NUMBER	DESCRIPTION
BU 187	Bulb—#47 Mazda pilot light bulb	PO 259V	Pointer—molded ivory pointer
CA 327W	Cabinet—walnut bakelite cabinet	PT 102	Control—1/2 megohm volume control with s.p.s.t. switch
CA 327V	Cabinet—ivory bakelite cabinet	RCM20A 100M	Condenser—10 mmfd $\pm 20\%$ mica condenser
CA 327X	Cabinet—black bakelite cabinet	RCM20A 221M	Condenser—220 mmfd $\pm 20\%$ mica condenser
CCA 101M	Condenser—100 mmfd $\pm 20\%$ ceramic condenser	RCPI0W 2104A	Condenser—.1/200 W.V. tubular paper condenser
CCA 102M	Condenser—1000 mmfd $\pm 20\%$ ceramic condenser	RCPI0W 2503A	Condenser—.05/200 W.V. tubular paper condenser
CCA 200M	Condenser—20 mmfd $\pm 20\%$ ceramic condenser	RCPI0W 4203A	Condenser—.02/400 W.V. tubular paper condenser
CCA 501M	Condenser—500 mmfd $\pm 20\%$ ceramic condenser	RCPI0W 4503A	Condenser—.05/400 W.V. tubular paper condenser
CCA L300K	Condenser—30 mmfd $\pm 10\%$ ceramic condenser (negative 080)	RCPI0W 6103A	Condenser—.01/600 W.V. tubular paper condenser
CCA U500J	Condenser—50 mmfd $\pm 5\%$ ceramic condenser (negative 750)	RCPI0W 6502A	Condenser—.005/600 W.V. tubular paper condenser
CCD 502X	Condenser—5000 mmfd disc type condenser	REB 101M	Resistor—100 ohms $\pm 20\%$ 1/2 watt resistor
CCR 252M	Condenser—2500 mmfd $\pm 20\%$ ceramic condenser	REB 104M	Resistor—100,000 ohms $\pm 20\%$ 1/2 watt resistor
CK 1109	Choke—dual antenna choke	REB 106M	Resistor—10 megohms $\pm 20\%$ 1/2 watt resistor
CK 1127	Choke—r-f choke (F.M.)	REB 152M	Resistor—1500 ohms $\pm 20\%$ 1/2 watt resistor
CL 1111	Coil—F. M. r-f coil	REB 153M	Resistor—15,000 ohms $\pm 20\%$ 1/2 watt resistor
CL 1113	Coil—F.M. oscillator coil	REB 154M	Resistor—150,000 ohms $\pm 20\%$ 1/2 watt resistor
CL 1129	Coil—B.C. oscillator coil	REB 222M	Resistor—2200 ohms $\pm 20\%$ 1/2 watt resistor
CO 111	Condenser—40 + 40/150 W.V. & 50/25 W.V. electrolytic condenser	REB 223M	Resistor—22,000 ohms $\pm 20\%$ 1/2 watt resistor
CO 1112	Condenser—2.2 mmfd $\pm 20\%$ fixed condenser	REB 225M	Resistor—2.2 megohms $\pm 20\%$ 1/2 watt resistor
CO 1133	Condenser—10 mfd 25 W.V. electrolytic condenser	REB 474M	Resistor—470,000 ohms $\pm 20\%$ 1/2 watt resistor
CO 1222	Condenser—10 mfd 150 W.V. electrolytic condenser	REC 151M	Resistor—150 ohms $\pm 20\%$ 1 watt resistor
CR 169	Crystal—round dial crystal	REC 221K	Resistor—220 ohms $\pm 10\%$ 1 watt resistor
CT 1114	Condenser—3-12 mmfd zero temperature coefficient trimmer condenser	RED 102M	Resistor—1000 ohms $\pm 20\%$ 2 watt resistor
CV 1141	Condenser—2 gang variable a-m; f-m condenser	RED 750M	Resistor—75 ohms $\pm 20\%$ 2 watt resistor
DL 1144	Dial—plastic dial	SK 1128	Speaker—5" permanent magnet speaker
KN 1077	Knob—walnut knob marked "Off-On Volume"	SO 1260	Socket—pilot light socket assembly
KN 1078	Knob—Walnut knob marked "Tuning"	SP 191	Spring—drive shaft retaining spring
KN 1224	Knob—walnut knob marked "AM-FM"	SP 218	Spring—pointer drive spring
KN 1103	Knob—ivory knob marked "Off-On Volume"	ST 255-1	Back—cardboard back
KN 1104	Knob—ivory knob marked "Tuning"	SW 1158	Switch—T.P.D.T. band switch
KN 1225	Knob—ivory knob marked "AM-FM"	TR 707	Transformer—455 k.c. input I.F. transformer
LP 1268	Loop—loop antenna	TR 708	Transformer—455 k.c. output I.F. transformer
PO 259W	Pointer—molded walnut pointer	TR 1123	Transformer—f.m. tank coil

MODELS 7-537V,
7-537W

OLYMPIC RADIO & TELEV. INC.

ALIGNMENT PROCEDURE CHART				
SET BAND SWITCH ON	CONNECT HIGH SIDE OF SIGNAL GENERATOR TO—	SET SIGNAL GENERATOR TO—	TURN RECEIVER DIAL TO—	ADJUST THE FOLLOWING FOR MAXIMUM OUTPUT (KEEP SIGNAL FROM SIGNAL GENERATOR AS LOW AS POSSIBLE.)
1	A.M. RF SECTION OF VARIABLE CONDENSER OR PIN 4 OF RESISTOR TUBE IN SERIES WITH A .1 MFD, 400 VOLT CONDENSER.	455 KC.	FULL COUNTER POSITION (CONDENSER PLATES FULLY OPEN).	C6 AND C7 (2nd I.F. TRANSFORMER)
2	A.M. RF SECTION OF VARIABLE CONDENSER OR PIN 4 OF RESISTOR TUBE IN SERIES WITH A .1 MFD, 400 VOLT CONDENSER.	455 KC.	FULL COUNTER POSITION (CONDENSER PLATES FULLY OPEN).	C6 AND C5 (1st I.F. TRANSFORMER)
3	A.M.	REPEAT STEPS 1 AND 2		
4	A.M. USE RADIATED SIGNAL (CONNECT BOTH SIDES OF SIGNAL GENERATOR TO RADIATION LOOP).	1700 KC. (170 ON DIAL)		C3 (OSCILLATOR TRIMMER)
5	A.M.	1400 KC.	RESONANCE (APPROX. 140 ON DIAL)	C1 (ANTENNA TRIMMER)
SET BAND SWITCH ON	CONNECT HIGH SIDE OF SIGNAL GENERATOR TO—	SET SIGNAL GENERATOR TO—	TURN RECEIVER DIAL TO—	ADJUST THE FOLLOWING FOR MINIMUM NOISE, AS INDICATED ON OUTPUT METER USING AN UNMODULATED SIGNAL (KEEP SIGNAL FROM SIGNAL GENERATOR AS LOW AS POSSIBLE.)
6	F.M. RF SECTION OF VARIABLE CONDENSER IN SERIES WITH A 300 OHM RESISTOR.	2.75 MC.	FULL COUNTER POSITION (CONDENSER PLATES FULLY OPEN).	L1 (TUNING SLUG ON TANK COIL)
7	F.M.	107 MC. A 300 OHM RESISTOR.	107 MC. (APPROX. 107 ON DIAL)	C4 (OSCILLATOR TRIMMER)
8	F.M.	103 MC.	RESONANCE (APPROX. 103 ON DIAL)	C2 (ANTENNA TRIMMER) ROCK VARIABLE FOR MAXIMUM SIGNAL



SERVICE AND ALIGNMENT INSTRUCTIONS

This receiver has been carefully aligned in the factory and the circuit is unusually stable. Realignment should only be attempted when necessary and only with a proper signal generator and in accordance with the service instructions. The receiver cannot be aligned on modulated signals. To insure proper broadcast alignment it is recommended to use a radiated signal. To radiate the signal connect a loop of about 6" to 8" diameter 1 turn of #14 or #12 wire across the output of the signal generator and place this loop parallel to the loop of the receiver to be aligned at a distance of 8" or 10". For complete alignment instructions on AM and FM Bands see alignment chart.

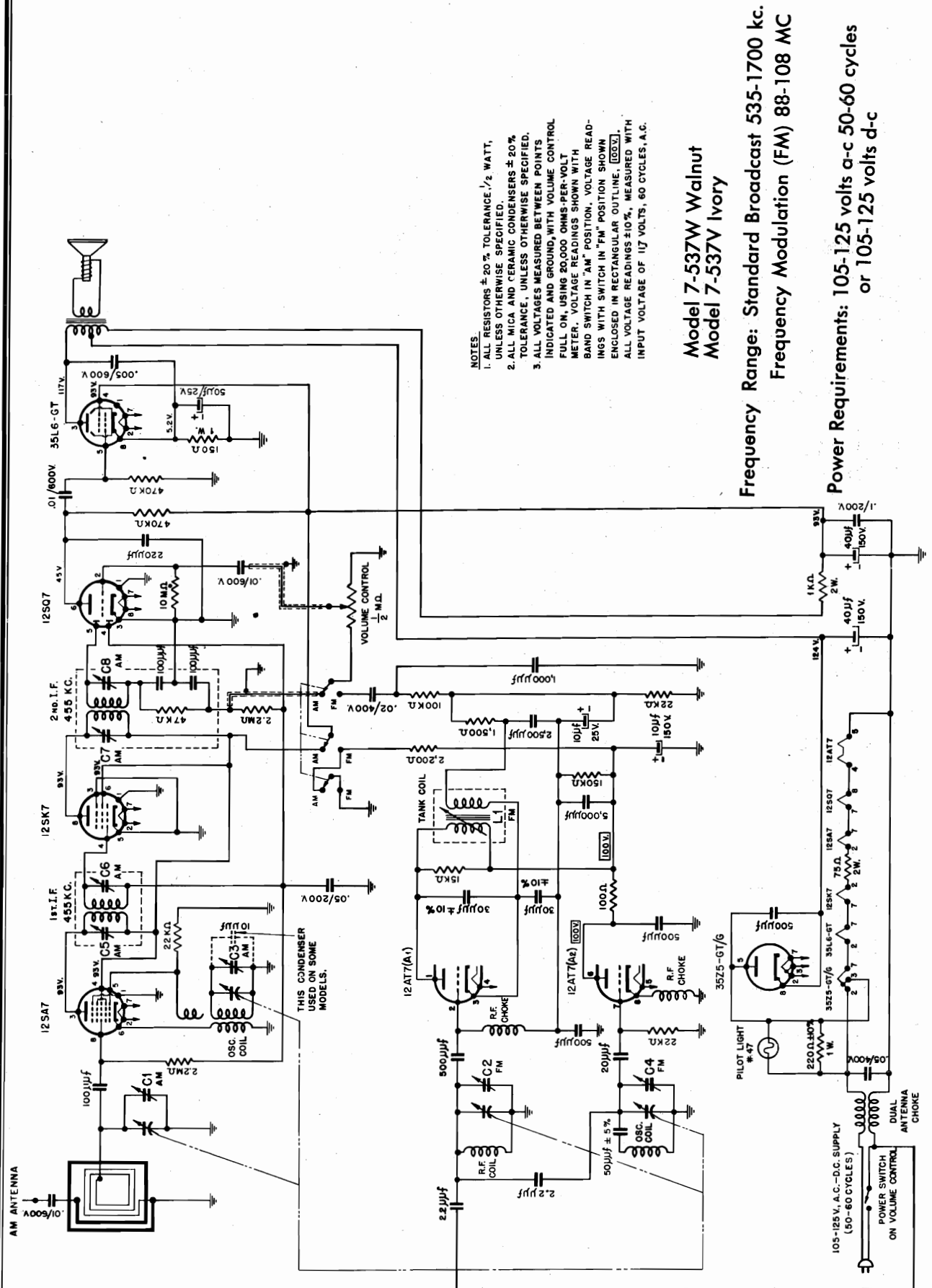
ALIGNMENT

Equipment required: Modulated r-f signal generator, output meter, insulated screw driver, two .1 mfd. 400 volt condensers, one 300 ohm resistor. An FM signal generator is not required for the alignment of this receiver.

With the receiver removed from the cabinet connect output meter across voice coil. Connect ground side of the signal generator in series with a .1/400 volt condenser to the common B—; turn volume control fully on, and keeping the output of the signal generator as low as possible, proceed in the sequence as shown on the alignment chart.

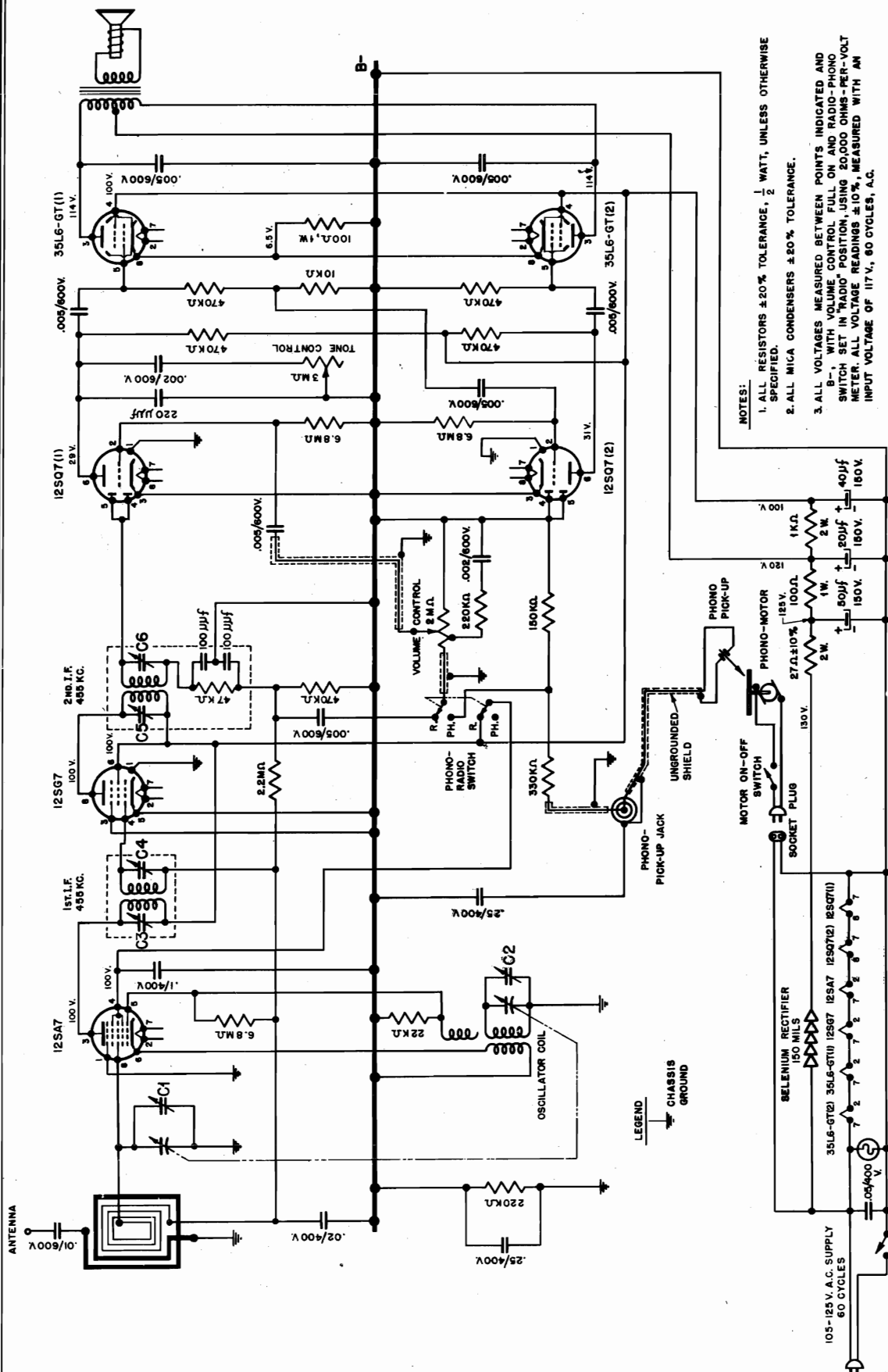
Before aligning, close the variable condenser fully counter clockwise (plates fully closed) and check that pointer coincides with the reference line. (horizontal line running through center of dial).

MODELS 7-537V,
7-537W



MODELS 7-622,
7-638

OLYMPIC RADIO & TELEV. INC.



Frequency Range: 537 k.c. to 1700 k.c.

Power Requirement: 105-125 volts a-c 60 cycles

Power Consumption: Receiver: 40 watts Receiver with Record Changer: 55 watts

SERVICE AND ALIGNMENT INSTRUCTIONS

For tube replacement it is not necessary to remove the chassis from its cabinet. Tilt cabinet forward and the tubes will be accessible through the opening in the cabinet bottom. To service this receiver it is necessary to remove the motorboard first and then remove the chassis through the top opening of the cabinet. To do this unfasten the screws holding the motorboard in place, lift the entire motorboard with the record changer, disconnect motor and pick-up plugs from chassis and remove motorboard. Now unsolder the leads from the chassis on the loop, or remove the screw holding the loop to the cabinet side to permit removal of the loop with the chassis. The chassis can now be removed by unfastening the two (2) screws holding it to the base plate. **WHEN REMOVING THE CHANGER BE SURE TO PLACE IT IN A POSITION WHEREBY THE CHANGER MECHANISM WILL NOT BE DAMAGED.**

To insure proper alignment it is suggested to use a radiated signal. To radiate a signal connect a loop of about 6" to 8" diameter, (one turn of #14 or #12 wire) across the output of the signal generator and place this loop parallel to the loop of the receiver to be aligned, at a distance of about 8" or 10". While aligning keep the distance between the receiver loop and the chassis approximately equal to their distance when assembled in their cabinet.

ALIGNMENT:

Equipment Required: Modulated r-f signal generator; output meter; insulated screw driver; one .1 mfd 400 volts and one 50 mmfd 400 volts condenser; one radiation loop.

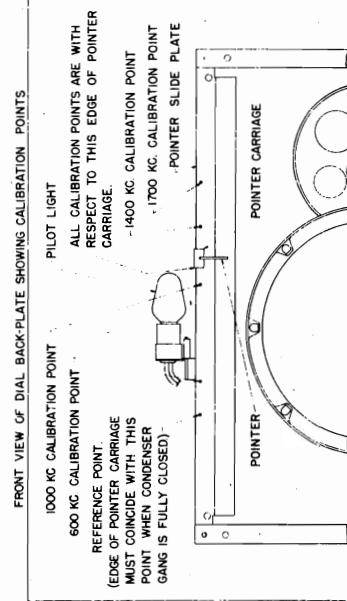
With the receiver removed from the cabinet, connect output meter across voice coil. Turn volume control fully on, and keeping the output of the signal generator as low as possible, proceed in the sequence as shown on the alignment chart.

To facilitate alignment of the receiver when removed from cabinet, calibration points are provided on the pointer slide bar (see drawing).

Before aligning, close the variable condenser fully counterclockwise (plates fully closed) and check that edge of pointer carriage coincides with the "reference line" on the pointer slidebar.

ALIGNMENT PROCEDURE CHART

STEP	CONNECT HIGH SIDE OF SIGNAL GENERATOR TO -	SET SIGNAL GENERATOR TO -	SET EDGE OF POINTER CARRIAGE TO -	ADJUST THE FOLLOWING FOR MAXIMUM OUTPUT. (KEEP SIGNAL FROM SIGNAL GENERATOR AS LOW AS POSSIBLE)
1	R.F. SECTION OF VARIABLE CONDENSER IN SERIES WITH A .1 MFD. 400 VOLT CONDENSER.	455 KC.	EXTREME RIGHTHAND POSITION (CONDENSER PLATES FULLY OPEN).	C6, C5, C4, C3 AND REPEAT IN SAME ORDER. (1st AND 2nd I.F. TRANSFORMERS)
2	USE RADIATED SIGNAL (CONNECT BOTH SIDES OF SIGNAL GENERATOR TO RADIATION LOOP)	1400 KC.	1400 KC. CALIBRATION POINT.	C2 AND C1 OSCILLATOR AND R.F. TRIMMERS
3		600 KC.	RESONANCE (APPROXIMATELY 600KC CALIBRATION POINT).	CHECK THAT EDGE OF POINTER CARRIAGE (AT RESONANCE) COINCIDES WITH 600 KC. CALIBRATION POINT.

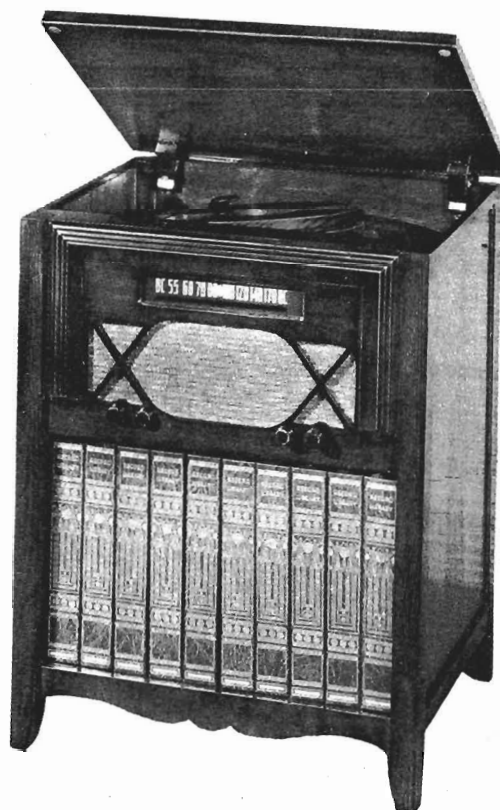


The pick-up is of the low pressure crystal type and is equipped with a permanent type needle which will give about 4,000 playings before requiring replacement. When first used a pronounced needle scratch will be heard which will be greatly reduced after about twenty playings. This "breaking-in-period" is essential on all needles of the permanent type in order to permit the point to become polished.

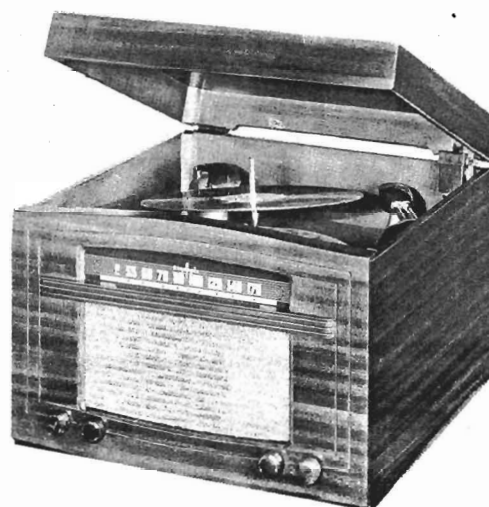
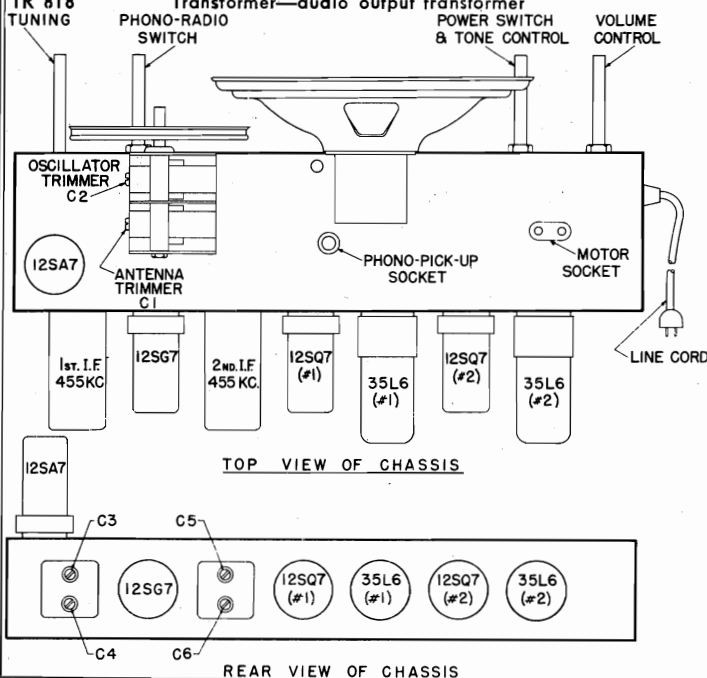
MODELS 7-622,
7-638

OLYMPIC RADIO & TELEV. INC.

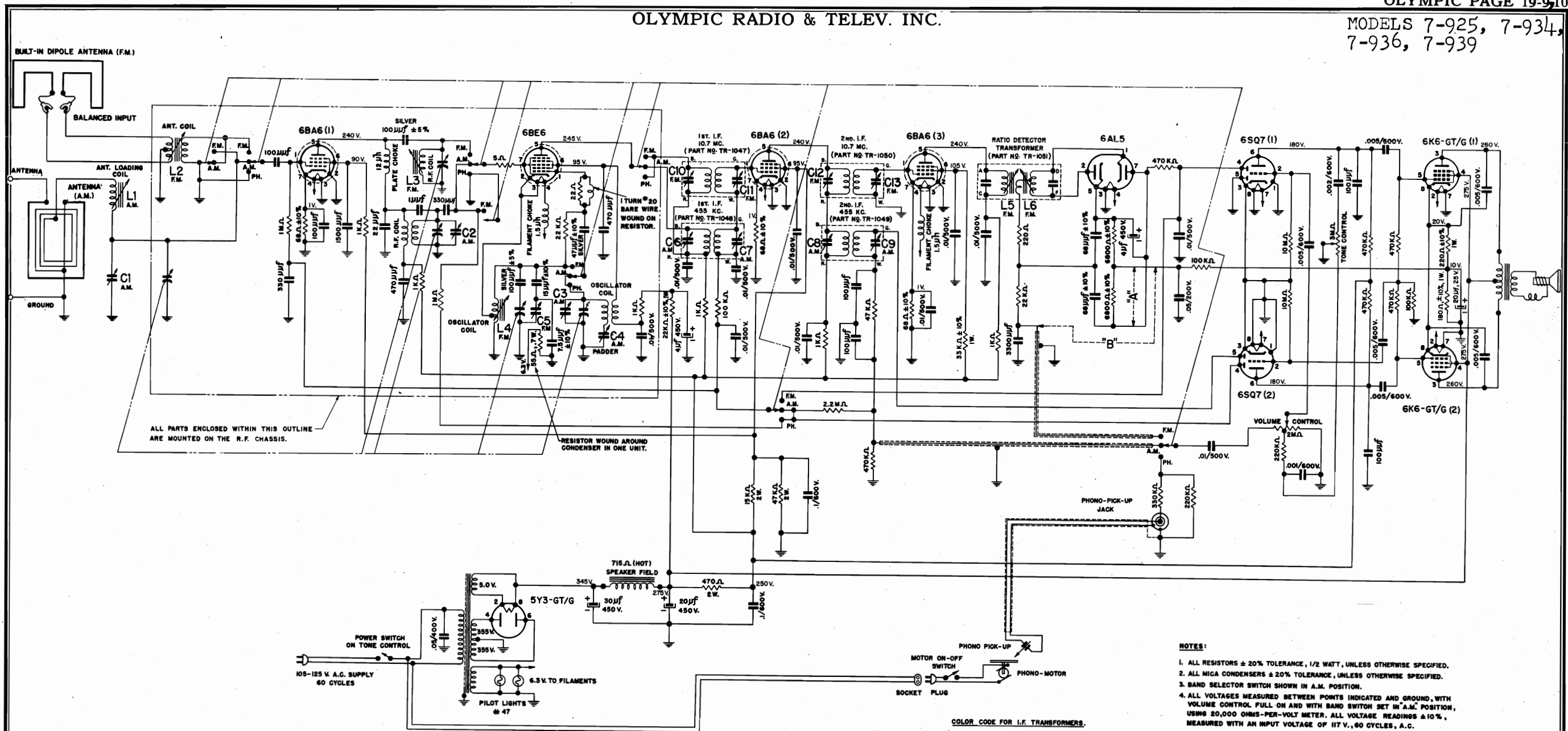
Part No.	Description
BU 910	Bulb—110 Volt pilot light bulb
CA 845	Cabinet—wood cabinet (for model 7-622 only)
CA 1098	Cabinet—wood cabinet (for model 7-638 only)
CL 869	Coil—oscillator coil
CO 791	Condenser—50/20 and 40/150 W.V. electrolytic cond.
CY 769	Condenser—2 gang variable condenser
DL 913	Dial—glass dial scale
KN 671	Knob—walnut knob marked "Volume"
KN 672	Knob—walnut knob marked "Off-On-Tone"
KN 673	Knob—walnut knob marked "Tuning"
KN 919	Knob—walnut knob marked "Phono-Radio"
LP 951	Loop—loop antenna
PO 959	Pointer—dial pointer
PT 793	Control—2 megohm tapped volume control
PT 794	Control—3 megohm tone control with Off-On Switch
RCM20A221M	Condenser—220 mmfd $\pm 20\%$ mica condenser
RCPI0W4104L	Condenser—.1/400 W.V. tubular paper condenser
RCPI0W4203A	Condenser—.02/400 W.V. tubular paper condenser
RCPI0W4254A	Condenser—.25/400 W.V. tubular paper condenser
RCPI0W4503A	Condenser—.05/400 W.V. tubular paper condenser
RCPI0W6103A	Condenser—.01/600 W.V. tubular paper condenser
RCPI0W6202M	Condenser—.002/600 W.V. tubular paper condenser
RCPI0W6502A	Condenser—.005/600 W.V. tubular paper condenser
REB 103M	Resistor—10,000 ohms $\pm 20\%$ $\frac{1}{2}$ watt resistor
REB 154M	Resistor—150,000 ohms $\pm 20\%$ $\frac{1}{2}$ watt resistor
REB 223M	Resistor—22,000 ohms $\pm 20\%$ $\frac{1}{2}$ watt resistor
REB 224M	Resistor—220,000 ohms $\pm 20\%$ $\frac{1}{2}$ watt resistor
REB 225M	Resistor—2.2 megohms $\pm 20\%$ $\frac{1}{2}$ watt resistor
REB 334M	Resistor—330,000 ohms $\pm 20\%$ $\frac{1}{2}$ watt resistor
REB 474M	Resistor—470,000 ohms $\pm 20\%$ $\frac{1}{2}$ watt resistor
REB 685M	Resistor—6.8 megohms $\pm 20\%$ $\frac{1}{2}$ watt resistor
REC 101M	Resistor—100 ohms $\pm 20\%$ 1 watt resistor
RED 102M	Resistor—1000 ohms $\pm 20\%$ 2 watt resistor
RED 270K	Resistor 27 ohms $\pm 10\%$ 2 watt resistor
RF 849	Rectifier—150 mil. selenium rectifier
SK 792	Speaker—6 inch permanent magnet speaker
SP 191	Spring—dial drive lock spring
SP 218	Spring—pointer drive spring
SW 141	Switch—phono-radio switch
TR 707	Transformer—455 K.C. I.F. input transformer
TR 708	Transformer—455 K.C. I.F. output transformer
TR 818	Transformer—audio output transformer



MODEL 7-638



MODEL 7-622

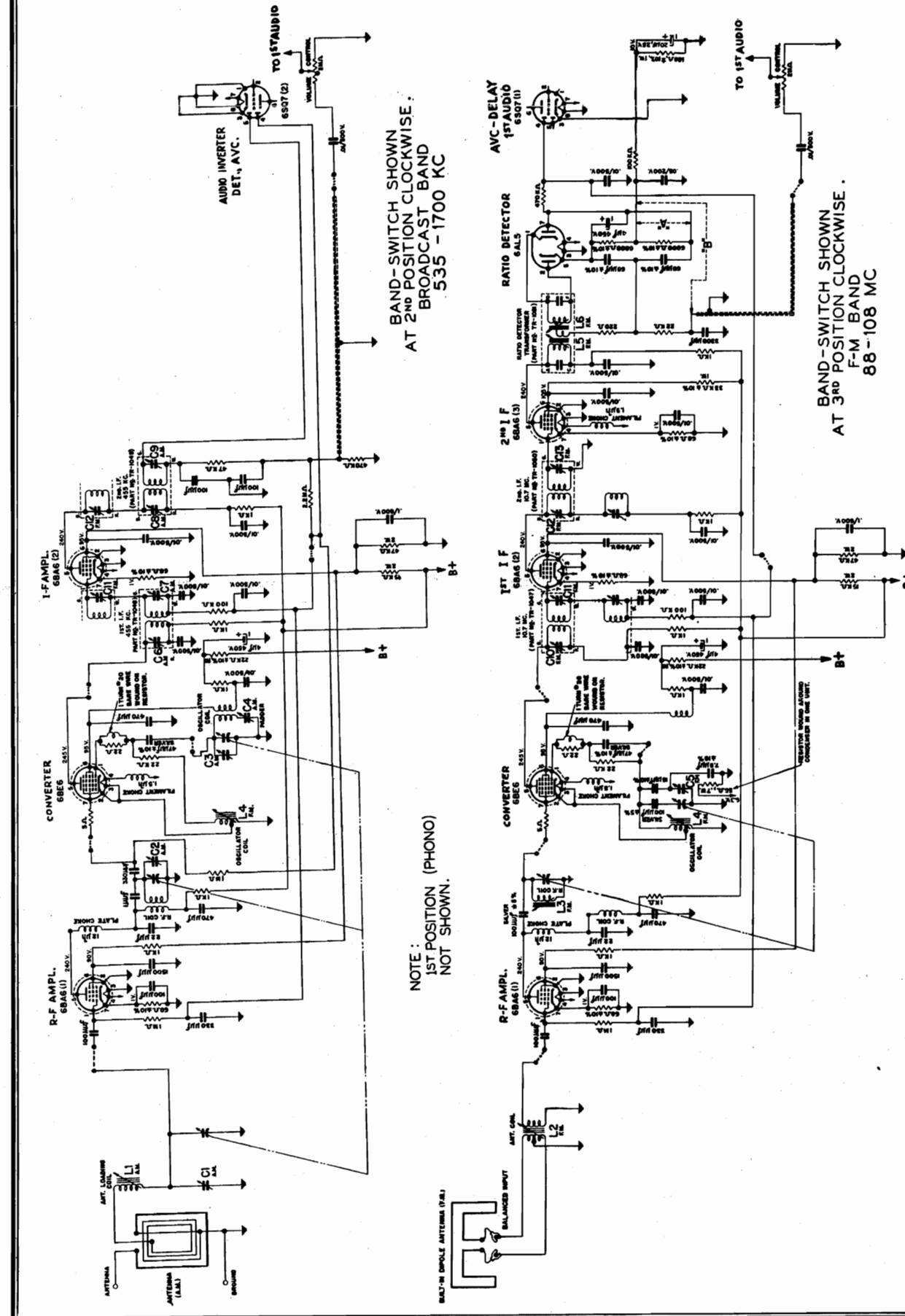


NOTES:
1. ALL RESISTORS $\pm 20\%$ TOLERANCE, $1/2$ WATT, UNLESS OTHERWISE SPECIFIED.
2. ALL MICA CONDENSERS $\pm 20\%$ TOLERANCE, UNLESS OTHERWISE SPECIFIED.
3. BAND SELECTOR SWITCH SHOWN IN A.M. POSITION.
4. ALL VOLTAGES MEASURED BETWEEN POINTS INDICATED AND GROUND, WITH VOLUME CONTROL FULL ON AND WITH BAND SWITCH SET IN A.M. POSITION, USING 20,000 OHMS-PER-VOLT METER. ALL VOLTAGE READINGS $\pm 10\%$, MEASURED WITH AN INPUT VOLTAGE OF 117 V., 60 CYCLES, A.C.

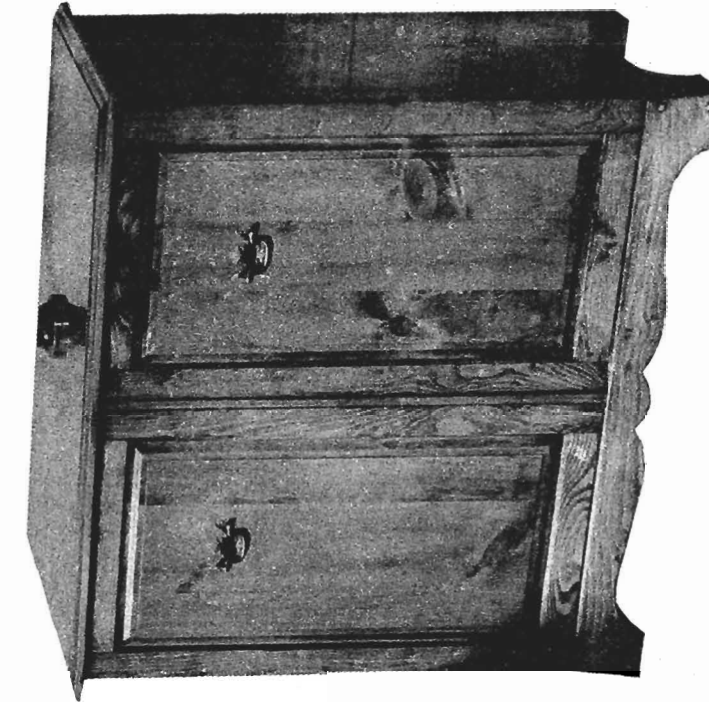
REPLACEMENT PARTS

Part No.	Description	Part No.	Description	Part No.	Description	Part No.	Description
CA-846	Cabinet—console used for model #7-934	CO-M-5103	Condenser—.01/500 W.V. midjet tubular paper condenser	RCM20CX470K	Condenser—47 mmfd. $\pm 10\%$ silver mica	REC 221K	Resistor—220 ohms $\pm 10\%$ 1W. resistor
CA-847	Cabinet—console used for model #7-925	CT-388	Condenser—220-680 mmfd. paddler	RCPI0W2503A	Condenser—.05/200 W.V. paper tub. condenser	REC 223K	Resistor—22,000 ohms $\pm 10\%$ 1W. resistor
CA-907	Cabinet—console used for model #7-936	CT-939	Condenser—3-35 mmfd. trimmer	RCPI0W6102A	Condenser—.001/600 W.V. paper tub. condenser	REC 333K	Resistor—33,000 ohms $\pm 10\%$ 1W. resistor
CA-1101	Cabinet—console used for model #7-939	CT-1002	Condenser—1.6-18 mmfd. trimmer	RCPI0W6103A	Condenser—.01/600 W.V. paper tub. condenser	RED 153M	Resistor—15,000 ohms $\pm 20\%$ 2W. resistor
CCA-332M	Condenser—3300 mmfd. $\pm 20\%$ Hi K ceramicon	CT-1036	Condenser—3-12 mmfd. F.M. trimmer	RCPI0W6104A	Condenser—.1/600 W.V. paper tub. condenser	RED 471M	Resistor—470 ohms $\pm 20\%$ 2W. resistor
CCA-U150K	Condenser—15 mmfd. $\pm 10\%$ (N750) ceramicon	CV-1053	Condenser—3 gang variable condenser	RCPI0W6202M	Condenser—.002/600 W.V. paper tub. condenser	RED 473M	Resistor—47,000 ohms $\pm 20\%$ 2W. resistor
CCR-152M	Condenser—1500 mmfd. $\pm 20\%$ Hi K ceramicon	DL-1070	Dial—glass dial scale	RCPI0W6502A	Condenser—.005/600 W.V. paper tub. condenser	RX-844	Automatic record changer for model 7-925 only
CK-1057	Choke—12 μ h plate choke	IC-1015	Core—iron core for CL-998	REB 100M	Resistor—10 ohms $\pm 20\%$ $1/2$ W. resistor	RX-227-1	Automatic record changer for models 7-934 and 7-936
CK-1058	Choke—1.5 μ h filament choke	IC-1088	Core—iron core for CL-1031	REB 102M	Resistor—1000 ohms $\pm 20\%$ $1/2$ W. resistor	RX-524	Automatic record changer for model 7-939
CL-998	Coil—broadcast antenna loading coil	KN-422	Knob—walnut knob marked "Volume"	REB 104M	Resistor—100,000 ohms $\pm 20\%$ $1/2$ W. resistor	SK-384	Speaker—12" dynamic speaker (715 ohms)
CL-1025	Coil—broadcast oscillator coil	KN-423	Knob—walnut knob marked "Off-On-Tone"	REB 105M	Resistor—1 megohm $\pm 20\%$ $1/2$ W. resistor	SP-191	Spring—dial drive lock spring
CL-1026	Coil—broadcast r-f coil	KN-425	Knob—walnut knob marked "Tuning"	REB 106M	Resistor—10 megohms $\pm 20\%$ $1/2$ W. resistor	SP-218	Spring—pointer drive spring
CL-1031	Coil—F.M. antenna coil	KN-1074	Knob—walnut knob marked "FM-AM-Phono"	REB 220M	Resistor—22 ohms $\pm 20\%$ $1/2$ W. resistor	SW-843	Switch—band switch
CL-1032	Coil—F.M. r-f coil	LP-1008	Loop—loop antenna	REB 221M	Resistor—220 ohms $\pm 20\%$ $1/2$ W. resistor	TR-1047	Transformer—10.7 mc first F.M. I.F. transformer
CL-1033	Coil—F.M. oscillator coil	PO-1011	Pointer	REB 223M	Resistor—22,000 ohms $\pm 20\%$ $1/2$ W. resistor	TR-1048	Transformer—455 kc first A.M. I.F. transformer
CO-311	Condenser—1 mmfd. $\pm 20\%$ fixed condenser (gimmick)	PT-567	Control—2 megohm tapped volume control	REB 224M	Resistor—220,000 ohms $\pm 20\%$ $1/2$ W. resistor	TR-1049	Transformer—455 kc second A.M. I.F. transformer
CO-715	Condenser—.05/400 W.V. molded paper condenser	PT-568	Control—3 megohm tone control with S.P.S.T. switch	REB 225M	Resistor—2.2 megohms $\pm 20\%$ $1/2$ W. resistor	TR-1050	Transformer—10.7 mc second F.M. I.F. transformer
CO-768	Condenser—30/20/450 W.V. & 20/25 W.V. electrolytic condenser	RCM20A101M	Condenser—100 mmfd. $\pm 20\%$ mica condenser	REB 334M	Resistor—330,000 ohms $\pm 20\%$ $1/2$ W. resistor	TR-1051	Transformer—ratio detector transformer
CO-890	Condenser—7.5 mmfd. $\pm 10\%$ (N750) ceramic condenser with 55 ohm heater	RCM20A220M	Condenser—22 mmfd. $\pm 20\%$ mica condenser	REB 473M	Resistor—47,000 ohms $\pm 20\%$ $1/2$ W. resistor	TR-1052	Transformer—power transformer (110 mA.)
CO-1056	Condenser—4 mfd. 450 W.V. electrolytic condenser	RCM20A331M	Condenser—330 mmfd. $\pm 20\%$ mica condenser	REB 474M	Resistor—470,000 ohms $\pm 20\%$ $1/2$ W. resistor	WI-1018	Wire—3 conductor parallel cable
		RCM20A471M	Condenser—470 mmfd. $\pm 20\%$ mica condenser	REB 680K	Resistor—68 ohms $\pm 10\%$ $1/2$ W. resistor	WI-1079	Wire—300 ohms transmission line
		RCM20A680K	Condenser—68 mmfd. $\pm 10\%$ mica condenser	REB 682K	Resistor—6800 ohms $\pm 10\%$ $1/2$ W. resistor		
		RCM20CX101J	Condenser—100 mmfd. $\pm 5\%$ silver mica	REC 181K	Resistor—180 ohms $\pm 10\%$ 1W. resistor		

OLYMPIC RADIO & TELEV. INC. MODELS 7-925, 7-934,
7-936, 7-939

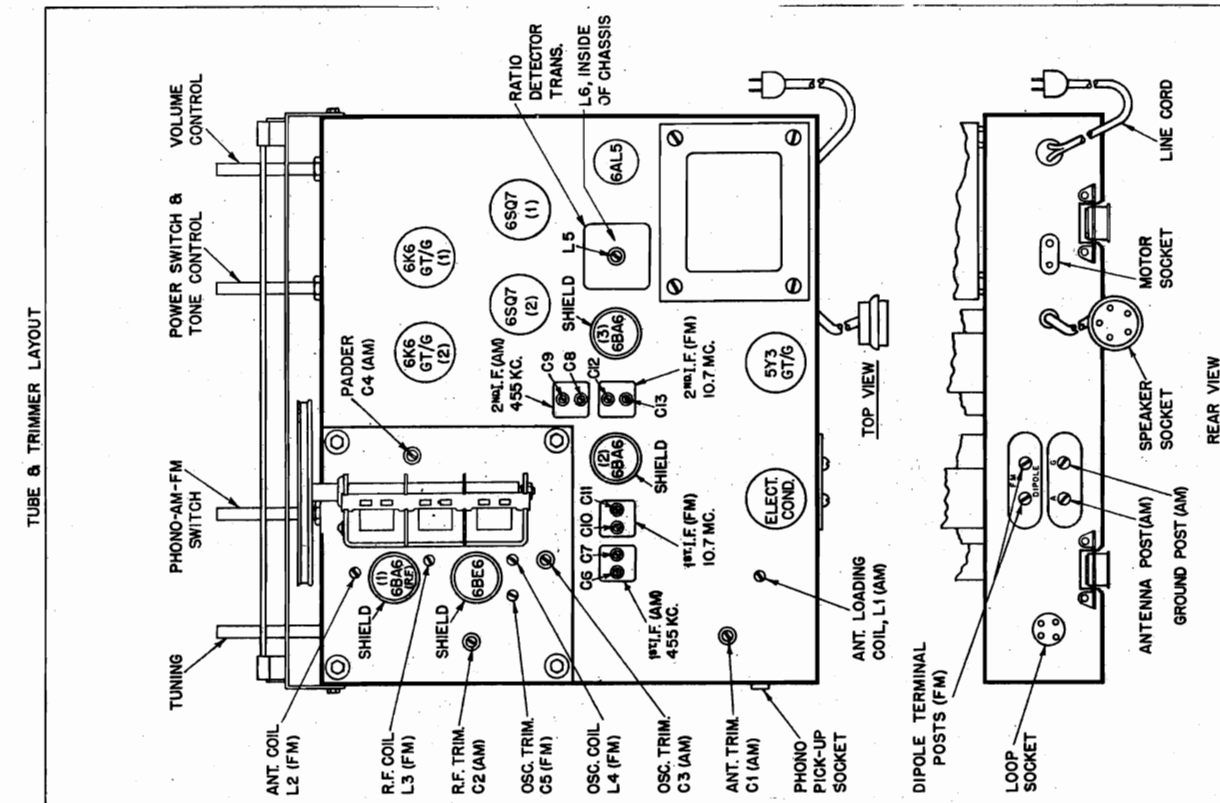


MODELS 7-925, 7-934, OLYMPIC RADIO & TELEV. INC.
7-936, 7-939



MODEL 7-936

Frequency Range: A.M. 535-1700 kc. and F.M. 88-108 mc
Power Requirement: 105-125 Volts a-c 60 cycles
Power Consumption: Receiver on a-m: 103 watts
Receiver with Record Changer: 120 watts



OLYMPIC RADIO & TELEV. INC. MODELS 7-925, 7-934, 7-936, 7-939

ALIGNMENT PROCEDURE CHART

STEP	SET BAND SWITCH ON-	CONNECT HIGH SIDE OF SIGNAL GENERATOR TO-	SET SIGNAL GENERATOR TO-	TURN POINTER TO-	READ OUTPUT ON-	ADJUST THE FOLLOWING- (KEEP SIGNAL FROM SIGNAL GENERATOR AS LOW AS POSSIBLE).
1	F.M.	PIN 1 OF 6BA6 (3) TUBE FOR 1 VOLT SIGNAL.	10.7 MC. UNMODULATED SIGNAL.	EXTREME RIGHT HAND POSITION. (CONDENSER PLATES FULLY OPEN).	VACUUM TUBE VOLTMETER ACROSS 6800 OHM RESISTOR (SEE "A" ON CIRCUIT DIAGRAM).	L5 (RATIO DETECTOR) FOR MAXIMUM READING.
					VACUUM TUBE VOLTMETER ACROSS "B" ON CIRCUIT DIAGRAM.	L6 (RATIO DETECTOR) FOR ZERO READING.
2	F.M.	PIN 7 OF 6BE6 TUBE IN SERIES WITH A .1MFD., 400 VOLT CONDENSER.			VACUUM TUBE VOLTMETER ACROSS 6800 OHM RESISTOR (SEE "A" ON CIRCUIT DIAGRAM).	C13 AND C12 (2nd. I.F. TRANSFORMER) FOR MAXIMUM READING.
3	F.M.				C11 AND C10 (1st. I.F. TRANSFORMER) FOR MAXIMUM READING.	
4	A.M.	R.F. SECTION OF VARIABLE CONDENSER OR PIN 7 OF THE 6BE6 TUBE IN SERIES WITH A .1MFD., 400 VOLT CONDENSER.	455 KC.		OUTPUT METER ACROSS SPEAKER VOICE COIL.	C9 AND C8 (2nd. I.F. TRANSFORMER) FOR MAXIMUM OUTPUT.
5	A.M.					C7 AND C6 (1st. I.F. TRANSFORMER) FOR MAXIMUM OUTPUT.
6	F.M.	REPEAT STEPS 2 AND 3.				
7	A.M.	ANTENNA SECTION OF VARIABLE CONDENSER OR PIN 1 OF THE 6BA6 TUBE IN SERIES WITH A .1MFD., 400 VOLT CONDENSER.	1700 KC.	1700 KC. ON DIAL.	OUTPUT METER ACROSS SPEAKER VOICE COIL.	C3 (OSCILLATOR TRIMMER) FOR MAXIMUM OUTPUT.
8	A.M.		1500 KC.	RESONANCE, APPROXIMATELY 1500 KC. ON DIAL.		C2 (R.F. TRIMMER) FOR MAXIMUM OUTPUT.
9	A.M.		600 KC.	RESONANCE, APPROXIMATELY 600 KC. ON DIAL.		C4 (PADDER) ROCK VARIABLE FOR MAXIMUM SIGNAL.
10	A.M.	REPEAT STEPS 7, 8 AND 9.				
11	A.M.	USE RADIATED SIGNAL (CONNECT BOTH SIDES OF SIGNAL GENERATOR TO RADIATION LOOP).	600 KC.	RESONANCE, APPROXIMATELY 600 KC. ON DIAL.	OUTPUT METER ACROSS SPEAKER VOICE COIL.	L1 (ANTENNA LOADING COIL) ROCK VARIABLE FOR MAXIMUM SIGNAL.
12	A.M.		1500 KC.	RESONANCE, APPROXIMATELY 1500 KC. ON DIAL.		C1 (ANTENNA TRIMMER) FOR MAXIMUM OUTPUT.
13	A.M.	REPEAT STEPS 11 AND 12.				
14	F.M.	CONNECT F.M. SIGNAL GENERATOR TO DIPOLE TERMINAL POSTS WITH A 150 OHM RESISTOR IN SERIES WITH EACH SIDE. 30% MODULATED SIGNAL.	108 MC.	108 MC. ON DIAL.	OUTPUT METER ACROSS SPEAKER VOICE COIL.	C5 (OSCILLATOR TRIMMER) FOR MAXIMUM OUTPUT.
15	F.M.		88 MC.	88 MC. ON DIAL. (CHECK IMAGE AT 109.4 MC.).		L4 (OSCILLATOR COIL) FOR MAXIMUM OUTPUT.
16	F.M.		REPEAT STEPS 14 AND 15.			
17	F.M.		102 MC.	102 MC. ON DIAL.	OUTPUT METER ACROSS SPEAKER VOICE COIL.	L3 (R.F. COIL) FOR MAXIMUM OUTPUT. L2 (ANTENNA COIL) FOR MAXIMUM OUTPUT.

The pick-up is of the low-pressure crystal type and is equipped with a permanent needle which will give about 4,000 playings before requiring replacement. When first used a pronounced needle scratch will be heard which will be greatly reduced after about twenty playings. This "breaking in" period is essential on all needles of the permanent type in order to permit the point to become polished.

This instrument is equipped with a sensitive 9 tube plus rectifier superheterodyne receiver. The rotatable built-in loop antenna will provide satisfactory reception under all normal operating conditions. The loop is mounted between springs, so that it can be freely rotated to the best position for reception. Once this position is established it is no longer necessary to make any further loop adjustments. The directional characteristic of the loop is particularly useful for the elimination of elevator noises or other local electrical disturbances.

SERVICE AND ALIGNMENT INSTRUCTIONS

To remove the chassis from the console, it is first necessary to disconnect the loop connector plug, the female connector plug on the speaker, the phono input plug, the motor plug and the two F.M. lugs on the F.M. antenna terminal post. Then remove the four knobs and the four screws holding the chassis to its mounting panel.

CAUTION: WHEN REMOVING THE CHANGER BE SURE TO PLACE IT IN A POSITION IN WHICH THE CHANGER MECHANISM WILL NOT BE DAMAGED.

ALIGNMENT

Equipment Required: Modulated a-m, r-f signal generator; modulated f-m signal generator covering the range from 88 to 108 megacycles; vacuum tube voltmeter; output meter; insulated screw driver; radiation loop (1 turn of about 6" to 8" diameter of #12 or #14 wire connected across output of signal generator and placed parallel to receiver loop about 8" or 10" away); one .1 mfd 400 volt condenser; two 150 ohm resistors.

With the receiver removed from the cabinet, connect output meter, or vacuum tube voltmeter and signal generator as indicated in the alignment procedure chart and keeping the output of the generator as low as possible, proceed exactly in the sequence as shown on the chart.

Before aligning, close the variable condenser fully counter clockwise (plates fully closed) and check that pointer coincides with the reference line on the dial.

MODELS 8-925,
8-934, 8-936

OLYMPIC RADIO & TELEV. INC.

Frequency Range: A.M. 535-1700 kc. and F.M. 88-108 mc**Power Requirement:** 105-125 Volts a-c 60 cycles**Power Consumption:** Receiver on a-m: 103 watts
Receiver with Record Changer: 120 watts

ALIGNMENT PROCEDURE CHART				
STEP	SET BAND SWITCH ON-	CONNECT HIGH SIDE OF SIGNAL GENERATOR TO-	SET SIGNAL GENERATOR TO-	TURN POINTER TO-
1	F.M.	PIN 1 OF 6BA6 (3) TUBE FOR .1 VOLT SIGNAL.	10.7 MC. UNMODULATED SIGNAL.	
2	F.M.	PIN 7 OF 6BE6 TUBE IN SERIES WITH A .1MFD., 400 VOLT CONDENSER.		EXTREME RIGHT HAND POSITION. (CONDENSER PLATES FULLY OPEN).
3	F.M.			
4	A.M.	R.F. SECTION OF VARIABLE CONDENSER OR PIN 7 OF THE 6BE6 TUBE IN SERIES WITH A .1MFD., 400 VOLT CONDENSER.	455 KC.	
5	A.M.			
6	F.M.			REPEAT STEPS 2 AND 3.
7	A.M.	ANTENNA SECTION OF VARIABLE CONDENSER OR PIN 1 OF THE 6BA6 TUBE IN SERIES WITH A .1MFD., 400 VOLT CONDENSER.	1700 KC. 1500 KC. 600 KC.	1700 KC. ON DIAL. RESONANCE, APPROXIMATELY 1500 KC. ON DIAL. RESONANCE, APPROXIMATELY 600 KC. ON DIAL.
8	A.M.			
9	A.M.			
10	A.M.			REPEAT STEPS 7, 8 AND 9.
11	A.M.	USE RADIATED SIGNAL (CONNECT BOTH SIDES OF SIGNAL GENERATOR TO RADIATION LOOP).	600 KC. 1500 KC.	RESONANCE, APPROXIMATELY 600 KC. ON DIAL. RESONANCE, APPROXIMATELY 1500 KC. ON DIAL.
12	A.M.			
13	A.M.			REPEAT STEPS 11 AND 12.
14	F.M.	CONNECT LOW SIDE OF F.M. SIGNAL GENERATOR TO DIPOLE TERMINAL OF PIN 1 OF THE 6BA6 TUBE AND CONNECT HIGH SIDE OF F.M. GENERATOR IN SERIES WITH A 300 OHM RESISTOR TO OTHER DIPOLE TERMINAL. USE 30% MODULATED F.M. SIGNAL.	108 MC. 88 MC.	108 MC. ON DIAL. 88 MC. ON DIAL. (CHECK IMAGE AT 109.4 MC.).
15	F.M.			REPEAT STEPS 14 AND 15.
16	F.M.			
17	F.M.			

To remove the chassis from the console, it is first necessary to disconnect the loop connector plug, the female connector plug on the speaker, the phono input plug, the motor plug and the two F.M. lugs on the F.M. antenna terminal post. Then remove the four knobs and the four screws holding the chassis to its mounting panel.

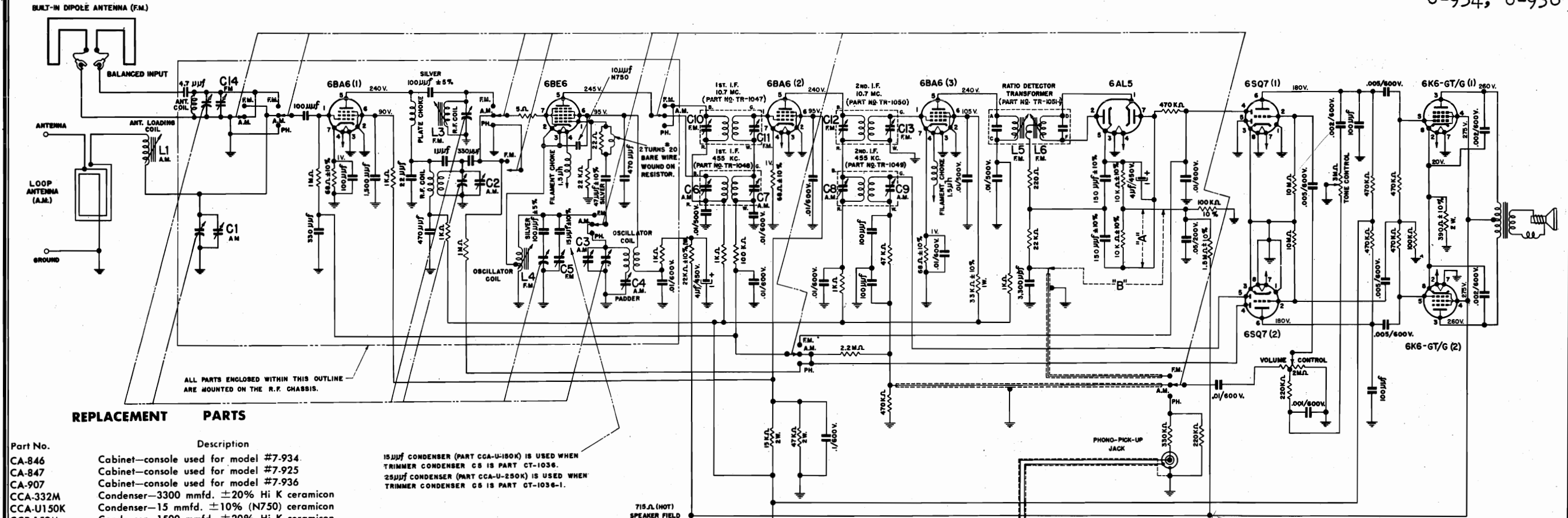
CAUTION: WHEN REMOVING THE CHANGER BE SURE TO PLACE IT IN A POSITION IN WHICH THE CHANGER MECHANISM WILL NOT BE DAMAGED.

ALIGNMENT

Equipment Required: Modulated a-m, r-f signal generator; modulated f-m signal generator covering the range from 88 to 108 megacycles; vacuum tube voltmeter; output meter; insulated screw driver; radiation loop (1 turn of about 6" to 8" diameter of #12 or #14 wire connected across output of signal generator and placed parallel to receiver loop about 8" or 10" away); one .1 mfd 400 volt condenser; two 150 ohm resistors.

With the receiver removed from the cabinet, connect output meter, or vacuum tube voltmeter and signal generator as indicated in the alignment procedure chart and keeping the output of the generator as low as possible, proceed exactly in the sequence as shown on the chart.

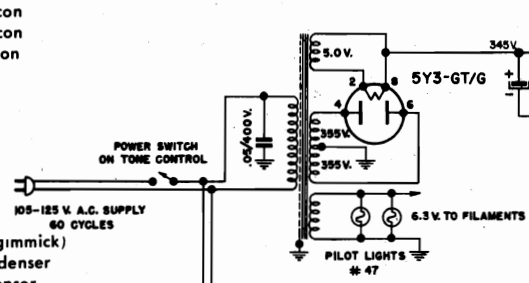
Before aligning, close the variable condenser fully counter clockwise (plates fully closed) and check that pointer coincides with the reference line on the dial.



REPLACEMENT PARTS

Part No.	Description
CA-846	Cabinet—console used for model #7-934.
CA-847	Cabinet—console used for model #7-925
CA-907	Cabinet—console used for model #7-936
CCA-332M	Condenser—3300 mmfd. $\pm 20\%$ Hi K ceramicon
CCA-U150K	Condenser—15 mmfd. $\pm 10\%$ (N750) ceramicon
CCR-152M	Condenser—1500 mmfd. $\pm 20\%$ Hi K ceramicon
CCR-U100K	Condenser—10mmfd. $\pm 10\%$ (N750) ceramicon
CK-1057	Choke—plate choke
CK-1058	Choke—1.5 μ h filament choke
CL-1025	Coil—broadcast oscillator coil
CL-1026	Coil—broadcast r-f coil
CL-1032	Coil—F.M. r-f coil
CL-1033	Coil—F.M. oscillator coil
CL-1269	Coil—F.M. antenna coil
CL-1278	Coil—broadcast antenna loading coil
CO-311	Condenser—1 mmfd. $\pm 20\%$ fixed condenser (gimmick)
CO-715	Condenser—.05/400 W.V. molded paper condenser
CO-1056	Condenser—4 mfd. 450 W.V. electrolytic condenser
CO-1083	Condenser—4.7 mmfd. $\pm 20\%$ fixed condenser
CO-1270	Condenser—30/500 W.V. & 20+4/450 W.V. electrolytic condenser
CO-M-5103	Condenser—.01/500 W.V. midjet tubular paper condenser
CT-388	Condenser—220-680 mmfd. padder
CT-939	Condenser—3-35 mmfd. trimmer
CT-1002	Condenser—1.6-18 mmfd. trimmer
CT-1036	Condenser—3-12 mmfd. F.M. trimmer
CY-1053	Condenser—3 gang variable condenser
DL-1070-1	Dial—glass dial scale
IC-1015	Care—iron core for CL-1278
KN-422	Knob—walnut knob marked "Volume"
KN-423	Knob—walnut knob marked "Off-On-Tone"
KN-425	Knob—walnut knob marked "Tuning"
KN-1074	Knob—walnut knob marked "FM-AM-Phono"
PO-1011	Pointer
PT-567	Control—2 megohm tapped volume control
PT-568	Control—3 megohm tone control with S.P.S.T. switch
RCM20A101M	Condenser—100 mmfd. $\pm 20\%$ mica condenser
RCM20A151K	Condenser—150 mmfd. $\pm 10\%$ mica condenser
RCM20A220M	Condenser—22 mmfd. $\pm 20\%$ mica condenser
RCM20A331M	Condenser—330 mmfd. $\pm 20\%$ mica condenser
RCM20A471M	Condenser—470 mmfd. $\pm 20\%$ mica condenser
RCM20CX101J	Condenser—100 mmfd. $\pm 5\%$ silver mica
RCM20CX470K	Condenser—47 mmfd. $\pm 10\%$ silver mica
RCP10W2503A	Condenser—.05/200 W.V. paper tub. condenser
RCP10W6102A	Condenser—.001/600 W.V. paper tub. condenser
RCP10W6103A	Condenser—.01/600 W.V. paper tub. condenser
RCP10W6104A	Condenser—.1/600 W.V. paper tub. condenser
RCP10W6202M	Condenser—.002/600 W.V. paper tub. condenser
RCP10W6502A	Condenser—.005/600 W.V. paper tub. condenser
REB 100M	Resistor—10 ohms $\pm 20\%$ $\frac{1}{2}$ W. resistor
REB 102M	Resistor—1000 ohms $\pm 20\%$ $\frac{1}{2}$ W. resistor

1500 μ f CONDENSER (PART CCA-U-150K) IS USED WHEN TRIMMER CONDENSER C8 IS PART CT-1036.
2500 μ f CONDENSER (PART CCA-U-250K) IS USED WHEN TRIMMER CONDENSER C8 IS PART CT-1036-1.

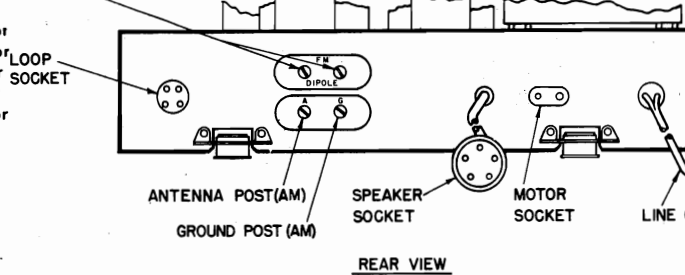


COLOR CODE FOR I.F. TRANSFORMERS.
B. BLUE
G. GREEN
R. RED
W. WHITE

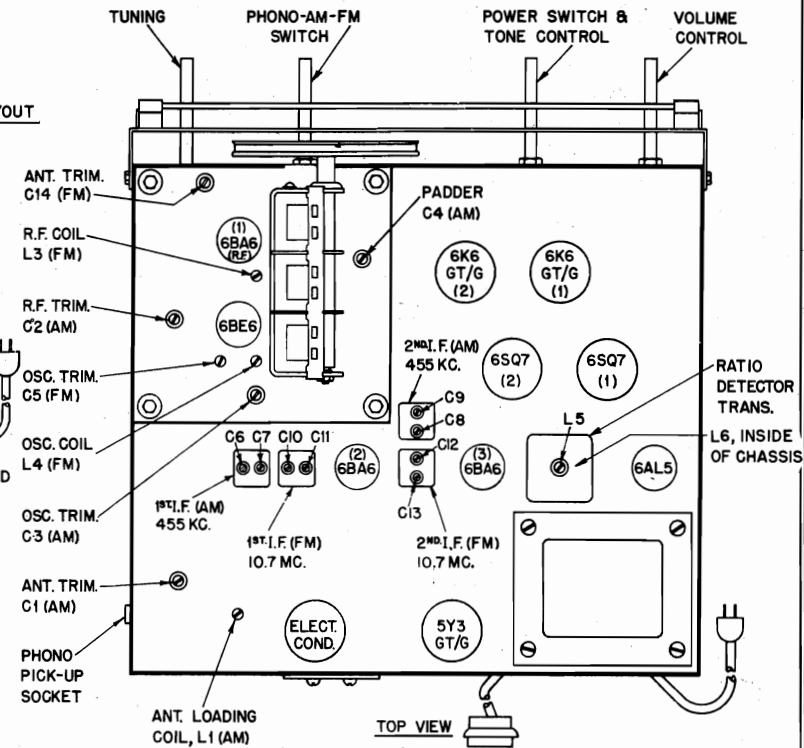
- NOTES:
1. ALL RESISTORS $\pm 20\%$ TOLERANCE, $\frac{1}{2}$ WATT, UNLESS OTHERWISE SPECIFIED.
 2. ALL MICA CONDENSERS $\pm 20\%$ TOLERANCE, UNLESS OTHERWISE SPECIFIED.
 3. BAND SELECTOR SWITCH SHOWN IN A.M. POSITION.
 4. ALL VOLTAGES MEASURED BETWEEN POINTS INDICATED AND GROUND, WITH VOLUME CONTROL FULL ON AND WITH BAND SWITCH SET IN A.M. POSITION, USING 20,000 OHMS-PER-VOLT METER. ALL VOLTAGE READINGS $\pm 10\%$, MEASURED WITH AN INPUT VOLTAGE OF 117 V., 60 CYCLES, A.C.

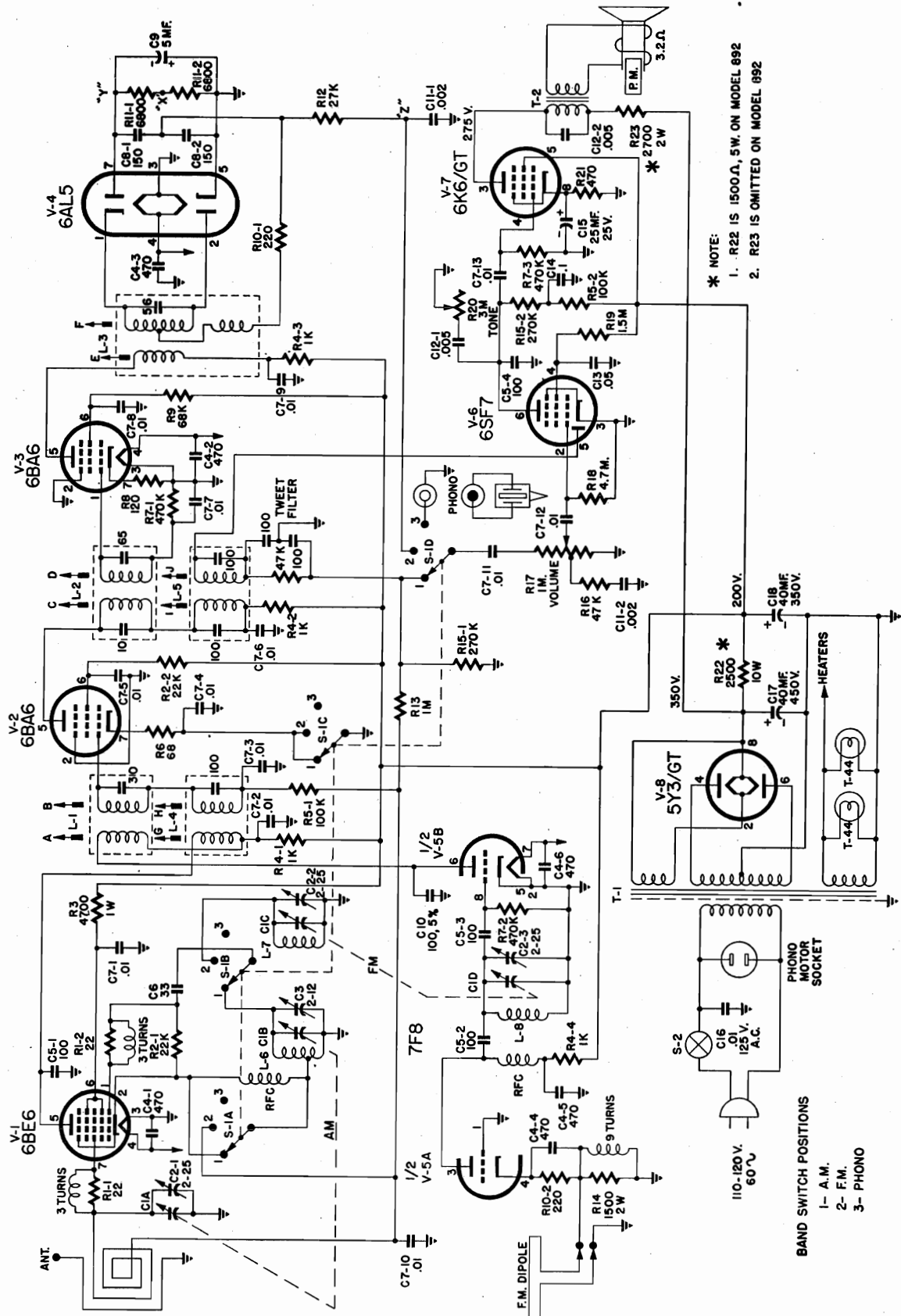
REB 103K	Resistor—10,000 ohms $\pm 10\%$ $\frac{1}{2}$ W. resistor
REB 104K	Resistor—100,000 ohms $\pm 10\%$ $\frac{1}{2}$ W. resistor
REB 104M	Resistor—100,000 ohms $\pm 20\%$ $\frac{1}{2}$ W. resistor
REB 105M	Resistor—1 megohm $\pm 20\%$ $\frac{1}{2}$ W. resistor
REB 106M	Resistor—10 megohms $\pm 20\%$ $\frac{1}{2}$ W. resistor
REB 155K	Resistor—1.5 megohms $\pm 10\%$ $\frac{1}{2}$ W. resistor
REB 220M	Resistor—22 ohms $\pm 20\%$ $\frac{1}{2}$ W. resistor
REB 221M	Resistor—220 ohms $\pm 20\%$ $\frac{1}{2}$ W. resistor
REB 223M	Resistor—22,000 ohms $\pm 20\%$ $\frac{1}{2}$ W. resistor
REB 224M	Resistor—220,000 ohms $\pm 20\%$ $\frac{1}{2}$ W. resistor
REB 225M	Resistor—2.2 megohms $\pm 20\%$ $\frac{1}{2}$ W. resistor
REB 334M	Resistor—330,000 ohms $\pm 20\%$ $\frac{1}{2}$ W. resistor
REB 473M	Resistor—47,000 ohms $\pm 20\%$ $\frac{1}{2}$ W. resistor
REB 474M	Resistor—470,000 ohms $\pm 20\%$ $\frac{1}{2}$ W. resistor
REB 680K	Resistor—68 ohms $\pm 10\%$ $\frac{1}{2}$ W. resistor
REC 223K	Resistor—22,000 ohms $\pm 10\%$ 1W. resistor
REC 333K	Resistor—33,000 ohms $\pm 10\%$ 1W. resistor
RED 153M	Resistor—15,000 ohms $\pm 20\%$ 2W. resistor
RED 391M	Resistor—390 ohms $\pm 20\%$ 2W. resistor
RED 471M	Resistor—470 ohms $\pm 20\%$ 2W. resistor
RED 473M	Resistor—47,000 ohms $\pm 20\%$ 2W. resistor
SK-384	Speaker—12" dynamic speaker (715 ohms)
SP-191	Spring—dial drive lock spring
SP-218	Spring—pointer drive spring
SW-843	Switch—band switch
TR-1047	Transformer—10.7 mc first F.M. I.F. transformer
TR-1048	Transformer—455 kc first A.M. I.F. transformer
TR-1049	Transformer—455 kc second A.M. I.F. transformer
TR-1050	Transformer—10.7 mc second F.M. I.F. transformer
TR-1051-1	Transformer—ratio detector transformer
TR-1052	Transformer—power transformer (110 mA.)
WI-1079	Wire—300 ohms transmission line

DIPLOLE TERMINAL POSTS (FM)



TUBE & TRIMMER LAYOUT





MODEL 884, 892

PACKARD-BELL CO.

SPECIFICATIONS

Overall Dimensions:

	884	892		884	892
Height	12 1/8"	34 1/4"	Depth	16 1/4"	21 1/2"
Width	18 1/4"	21 1/4"	Weight	35 Lbs.	85 Lbs.

Electrical Rating:

Line Voltage	110-120 volts, 50-60 cycle, A.C.
Power Consumption	75 watts

Tuning Frequency Range:

AM	540 to 1620 KC
FM	87.5 to 108.5 MC

Intermediate Frequency:

AM	455 KC
FM	10.7 MC

Electrical Output:

Maximum	2 watts
---------	---------

Loudspeaker:

	884	892
Type	Permanent Magnet	
Outside Cone Dia.	6 1/2"	10"
Voice Coil Impedance	3.2 ohms at 400 cycles	
Magnet Rating	2.15 Oz. Alnico V	3.16 Oz. Alnico V

Tubes:

Tube	No.	Function
6BE6	V-1	Oscillator & AM Converter
6BA6	V-2	I-F Amplifier
6BA6	V-3	FM Driver
6AL5	V-4	FM Detector
7F8	V-5A, B	FM R-F Amplifier & Converter
6SF7	V-6	AM Detector & Audio
6K6/GT	V-7	Power Amplifier
5Y3/GT	V-8	Rectifier

GENERAL INFORMATION

Models 884 and 892 are combination AM-FM radio phonograph receivers. Model 884 is housed in a wooden table model cabinet, and model 892 in a wooden console cabinet. The chassis wiring in each model is the same except as noted in the schematic diagram. Both models employ a specially designed "Hi-Q" loop antenna and a permanent magnet dynamic speaker.

For information concerning the record changer, refer to Webster Model 148 Automatic Record Changer Service Manual.

SPECIAL SERVICE INFORMATION

Stage Gain Measurements — AM

Measurements taken with volume and tone controls maximum. Switch in Radio position.

Standard Output	50 milliwatts
Dummy Antenna	200 Mmf.
Antenna to Converter Grid	4X at 1000 KC
Converter Grid to 1st I-F Grid	40X at 455 KC
1st I-F Grid to 2nd Detector	125X at 455 KC
Overall Audio Gain	18 MV into phono socket for 50 MW output at 1000 cycles

Stage Gain Measurements — FM

Dummy Antenna	270 ohms
Dipole to Converter Grid	5X at 98 MC
Converter Grid to 1st I-F Grid	70X at 10.7 MC
I-F Grid to Driver Grid	33X at 10.7 MC

Oscillator Cathode Voltages:

AM	FM
1500 KC . 3.5 volts AC	108 MC . 1.4 volts AC
1000 KC . 3.0 volts AC	98 MC . 1.4 volts AC
600 KC . 2.9 volts AC	88 MC . 1.8 volts AC

D.C. Resistance Measurements:

AM 1st & 2nd I-F Coils	
Primary	20 ohms
Secondary	20 ohms
FM I-F windings about 1.0 ohm.	
Oscillator Coil	
Ground to Tap	1.0 ohm
Ground to Finish	9.0 ohms

NOTE: Due to the variation in winding methods, the D.C. resistance on all coils is subject to a 20% tolerance.

ALIGNMENT PROCEDURE — AM

Alignment procedure consists of the 3 steps outlined in the Alignment Chart. Connect the test oscillator leads to the mixer grid and ground in series with an .01 Mfd. Capacitor for step No. 1, I-F Alignment.

Use the Hazeltine Standard Test Loop No. 1150 or a reasonable substitute for the balance of the alignment. Place the test loop about two feet from the receiver loop in a vertical position.

NOTE: Make certain that each alignment step is done with a minimum input signal.

ALIGNMENT CHART — AM

STEP	CONNECT TEST OSC. TO	TEST OSC. SETTING	POINTER SETTING	ADJUST FOR MAX. OUTPUT
1	6BE6 Grid & Gnd. .01 Mfd. Capac.	455 KC	540 KC	Trimmmers G, H, I, J
2	Standard Test Loop	1620 KC	1620 KC	Trimmer L to 1620
3	Standard Test Loop	1500 KC	1500 KC	Trimmer K

ALIGNMENT PROCEDURE — FM

Connect a Vacuum Tube Voltmeter between points X and Y on schematic diagram, and a Center-Zero meter between points X and Z on schematic diagram.

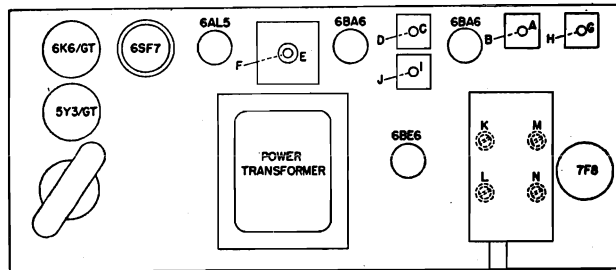
ALIGNMENT CHART — FM

STEP	CONNECT TEST OSC. TO	TEST OSC. SETTING	POINTER SETTING	ADJUST
1	Terminals 1 & 8 of 7F8	10.7 MC	88 MC	A, B, C, D, E for max. on V.T.V.M. & F for zero on Center-Zero meter
2	Repeat Step No. 1			
3	Dipole Terminals thru 300 ohms	108 MC	108 MC	N & M for max. on V.T.V.M.

NOTE: 1. Rock the variable condenser when adjusting M, step 3.
2. Reset F for zero if necessary, to coincide with max. on V.T.V.M. after step 3.

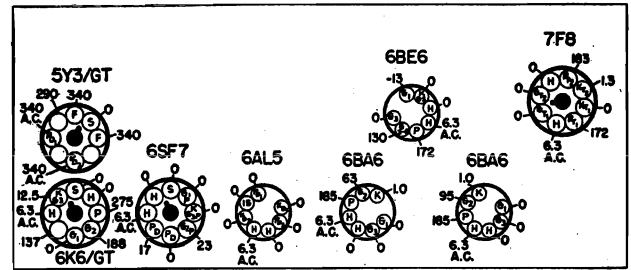
PACKARD-BELL CO.

MODEL 884, 892



TRIMMER LOCATIONS

A—Primary, 1st FM I-F
 B—(bottom) Secondary, 1st FM I-F
 C—Primary, 2nd FM I-F
 D—(bottom) Secondary, 2nd FM I-F
 E—Primary, FM Ratio Detector
 F—(bottom) Secondary, FM Ratio Detector
 G—Primary, 1st AM I-F
 H—(bottom) Secondary, 1st AM I-F
 I—Primary, 2nd AM I-F
 J—(bottom) Secondary, 2nd AM I-F
 K—AM R-F Trimmer M—FM R-F Trimmer
 L—AM Oscillator Trimmer N—FM Oscillator Trimmer

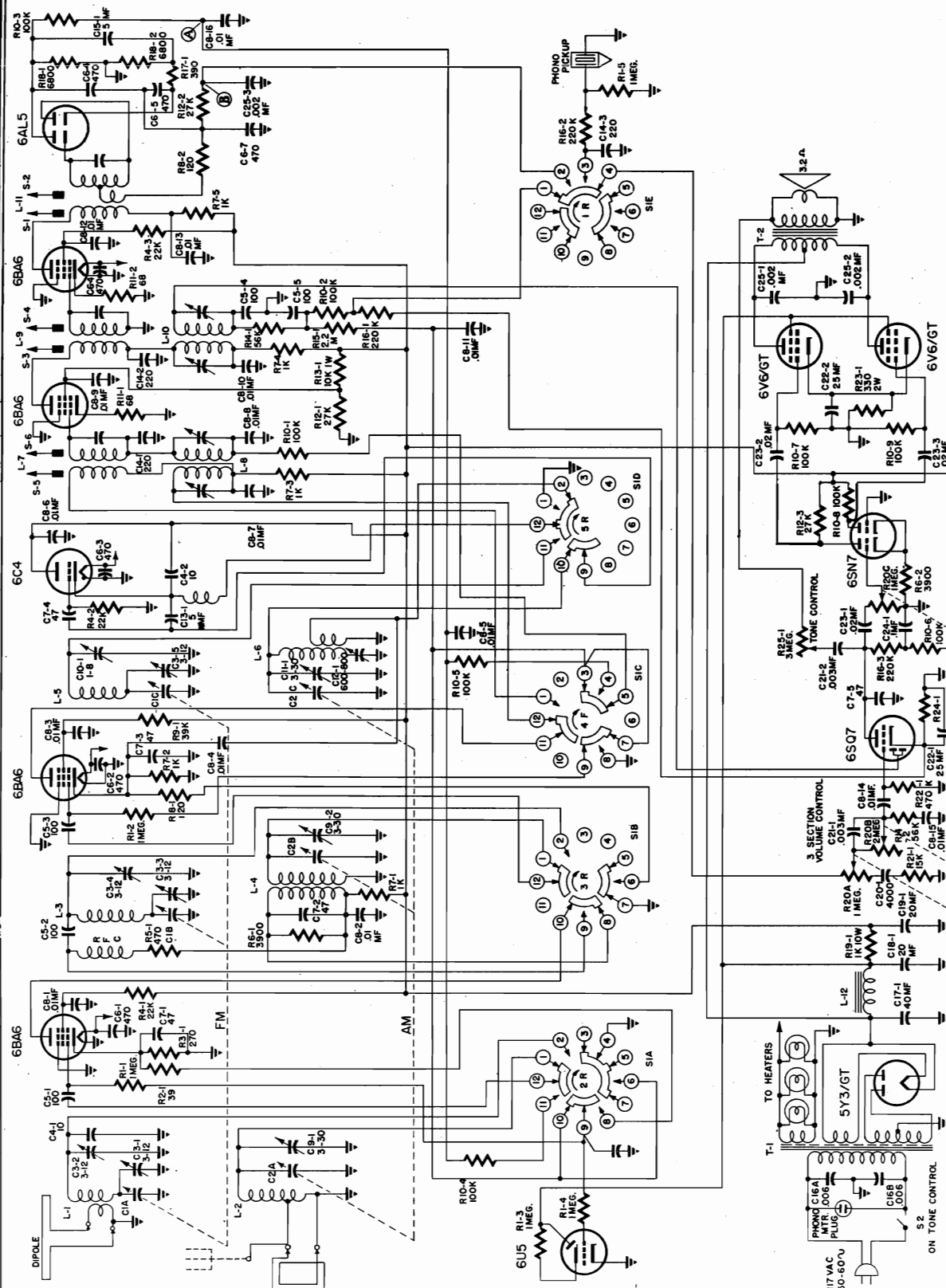


SOCKET VOLTAGES

All D.C. voltages measured with a vacuum tube voltmeter from socket contacts to chassis. A.C. voltages measured with a 1000 ohms per volt A.C. meter from socket contacts to chassis. Volume and tone controls maximum. Switch in Radio position. No signal. 117 volts A.C. line voltage. All voltages shown are positive D.C. unless otherwise noted.

TABLE OF REPLACEMENT PARTS

Part No.	Ref. Sym.	Description	Part No.	Ref. Sym.	Description
21073		Cabinet (884)	67033		Pointer, dial (884)
21077		Cabinet (892)	67015		Pointer, dial (892)
23526A	C1A,B,C,D	Condenser, variable, with pulley	69003C		Pulley
23916	C4-1 to 6	Capacitor, ceramic, 470 Mmf. 20%	73005	R1-1 to 2	Resistor, 22 ohm, ½ w. 10%
23914	C5-1 to 4	Capacitor, ceramic, 100 Mmf. 20%	73041	R2-1 to 2	Resistor, 22,000 ohm, ½ w. 10%
23940	C6	Capacitor, ceramic, 33 Mmf. N750 10%	73075	R3	Resistor, 4700 ohm, 1w. 10%
23023-1	C7-1 to 13	Capacitor, tubular, .01 Mf. 500 V.	73025	R4-1 to 4	Resistor, 1000 ohm, ½ w. 10%
23942	C8-1 to 2	Capacitor, ceramic, 150 Mmf. 10%	73047	R5-1 to 2	Resistor, 100,000 ohm, ½ w. 20%
24038	C9	Capacitor, electrolytic, 5 Mf. 50 V.	73011	R6	Resistor, 68 ohm, ½ w. 10%
23941	C10	Capacitor, ceramic, 100 Mmf. NPO 5%	73051	R7-1 to 3	Resistor, 470,000 ohm, ½ w. 20%
23002	C11-1 to 2	Capacitor, tubular, .002 Mf. 600 V.	73080	R8	Resistor, 120 ohm, 1w. 10%
23004	C12-1 to 2	Capacitor, tubular, .005 Mf. 600 V.	73046	R9	Resistor, 68,000 ohm, ½ w. 10%
23009	C13	Capacitor, tubular, .05 Mf. 400 V.	73017	R10-1 to 2	Resistor, 220 ohm, ½ w. 10%
23011	C14	Capacitor, tubular, .1 Mf. 400 V.	73035	R11-1 to 2	Resistor, 6800 ohm, ½ w. 10%
24006	C15	Capacitor, electrolytic, 25 Mf. 25 V.	73042	R12	Resistor, 27,000 ohm, ½ w. 10%
23932	C16	Capacitor, tubular, .01 Mf. 125 V.A.C.	73073	R13	Resistor, 1 megohm, 1w. 10%
24030	C17	Capacitor, electrolytic, 40 Mf. 450 V.	73126	R14	Resistor, 1500 ohm, 2w. 10%
24004-1	C18	Capacitor, electrolytic, 40 Mf. 350 V.	73049-3	R15-1 to 2	Resistor, 270,000 ohm, ½ w. 20%
29032	L-1	Coil, 1st FM I-F	73045	R16	Resistor, 47,000 ohm, ½ w. 10%
29022A	L-2	Coil, 2nd FM I-F	25010	R17	Control, volume, with switch, 1 megohm
29037	L-3	Coil, FM Ratio Detector	73057	R18	Resistor, 4.7 megohm, 1w. 10%
29033	L-4	Coil, 1st AM I-F	73054	R19	Resistor, 1.5 megohm, 1w. 10%
29034	L-5	Coil, 2nd AM I-F	25509	R20	Control, tone, 3 megohm
29202	L-6	Coil, AM Oscillator	73078	R21	Resistor, 470 ohm, 1w. 10%
29214	L-7	Coil, FM Oscillator	73917	R22	Resistor, 2500 ohm, 10w. 10% w.w. (884) 1500 ohm, 5w. 10% w.w. (892)
29111	L-8	Coil, FM R-F	73128	R23	Resistor, 2700 ohm, 2w. 10% (884 only)
29325		Loop, broadcast	78048		Shield, tube
29326		Dipole, FM	79002-2		Socket, tube, 8 prong
29104		Choke, R-F	79005		Socket, phono
32007-1		Cord, A.C. 8'	79012		Socket, tube, miniature
38104		Dial, stationized (884)	79007		Socket, phono motor
38105		Dial, stationized (892)	79056		Socket, tube, lock-in (7F8)
52008-AS		Knob, Dark Brown (884)	79058A		Socket, lamp
52008-BY		Knob, Oak (884)	79061		Socket, tube, miniature shock
52008-AL		Knob, Ivory (892)	83302		Speaker, 6 ½" P.M. (884)
52008-BM		Knob, Light Mahogany (892)	83705		Speaker, 10" P.M. (892)
54001		Lamp, dial #44 0.250 Amp.	86022A	S1A,B,C,D	Switch, band
58029		Record changer, Webster Model 148	89006	T-1	Transformer, power
63026		Cartridge, pickup, Shure P-30	89402	T-2	Transformer, output, 8,000 to 3.2 ohms
66004		Plug, pin			



SCHEMATIC NOTES: 1. Switch is shown in broadcast position.

2. Switching from left to right is broadcast, frequency modulation and phono.

Intermediate Frequency:

Standard Broadcast.....540 to 1620 Kc
 Frequency Modulation.....87.5 to 108.5 Mc

AM.....455 Kc
 FM.....10.7 Mc

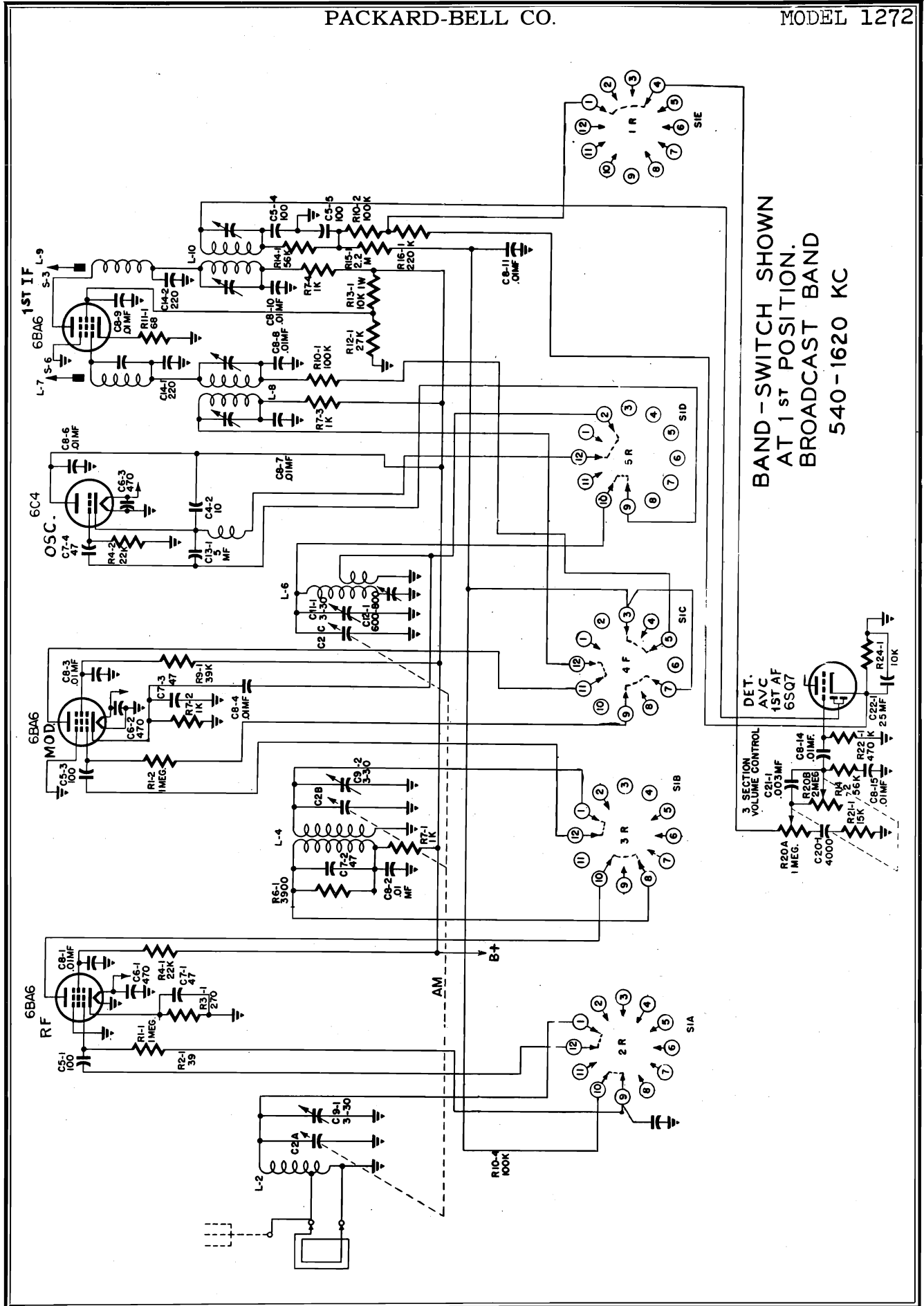
CLARI - SKEMATIX

Registered Trademark

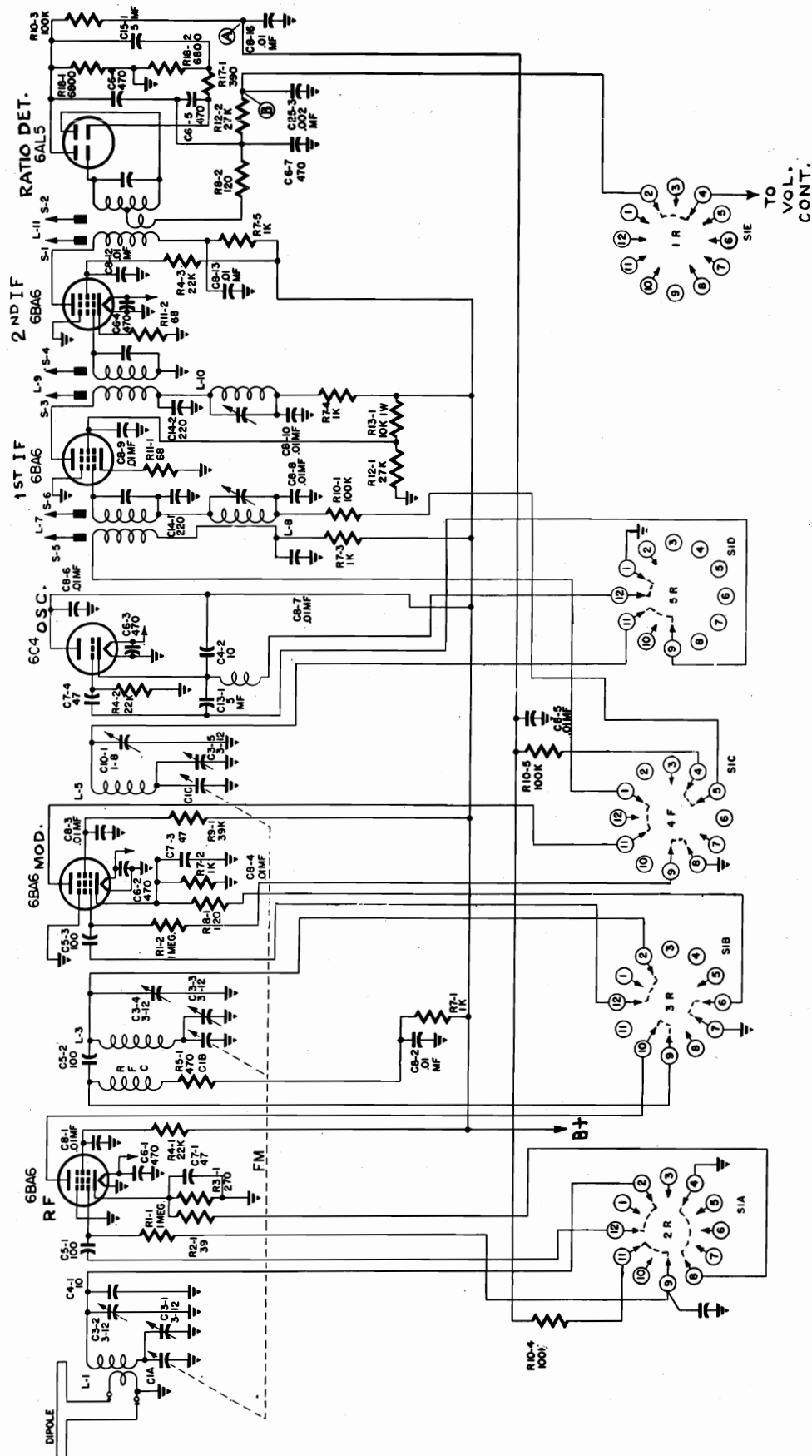
PACKARD-BELL PAGE 19-5

PACKARD-BELL CO.

MODEL 1272



BAND-SWITCH SHOWN
AT 1ST POSITION.
BROADCAST BAND
540-1620 KC



BAND-SWITCH SHOWN
AT 2ND POSITION CLOCKWISE.

F-M BAND

87.5 - 108.5 MC

GENERAL INFORMATION

Model 1272 is a 2 band console radio phonograph combination with Standard Broadcast and Frequency Modulation. It has 12 tubes including the rectifier and tuning eye, and employs a 12 inch permanent magnet speaker.

Listed below are some of the features included in this model:

1. Standard Broadcast and Frequency modulation bands
2. Phonograph with automatic record changer.
3. Tuning eye for accurate tuning of stations.

NOTE: R-23 which is called out 330 ohms, 2 watts in the schematic may be two 680 ohm, 1 watt resistors in parallel. Either is satisfactory.

SPECIAL SERVICE INFORMATION**Stage Gain Measurements: A M**

Measurements taken with volume and tone controls maximum. Band Switch in Standard Broadcast position.

AVC shorted out.

Standard Output.....50 milliwatts
 Dummy Antenna.....200 Mmf.
 Antenna Post to R.F. Grid.....12X at 1000 Kc
 R.F. Grid to Converter Grid.....6X at 1000 Kc
 Converter Grid to 1st I.F. Grid.....30X at 455 Kc
 1st I.F. Grid to 2nd Detector.....100X at 455 Kc
 Overall Audio Gain.....5000X at 1 watt 400 cycles

Stage Gain Measurements: F M

Measurements taken with volume and tone controls maximum. Band Switch in Frequency Modulation position.

AVC shorted out.

Dummy Antenna.....270 ohms
 Dipole Terminal to R.F. Grid.....9X at 98 Mc
 R.F. Grid to Converter Grid.....7X at 98 Mc
 Converter Grid to 1st I.F. Grid.....49X at 10.7 Mc
 1st I.F. Grid to Driver Grid.....35X at 10.7 Mc

OSCILLATOR CATHODE VOLTAGES:

Measured at 117 Volts AC line voltage with AC vacuum tube voltmeter input loading above 10 Megohms.

1620 KC.....3.5 volts AC
 1300 KC.....3.3 volts AC
 750 KC.....2.5 volts AC
 550 KC.....2.2 volts AC

OSCILLATOR GRID CURRENT: FM

Measured at 117 volt line voltage with DC micro-

ammeter connected in series with ground end of the 22,000 ohm grid resistor.

108 MC.....180 microamps
 98 MC.....300 microamps
 88 MC.....440 microamps

D.C. RESISTANCE MEASUREMENTS:**I.F. COILS**

1st I.F. 2nd I.F.
 Primary.....17 ohms Primary.....10 ohms
 Secondary.....10 ohms Secondary.....17 ohms*

*Note: To obtain the true reading of the secondary of the 2nd I.F. coil it must be removed from the can. This is so because of the 56,000 ohm resistor in series with the AVC lead inside the can.

OSCILLATOR COIL

Primary.....1 ohm
 Secondary.....6 ohms

ANTENNA COIL

Start to Finish.....12.2 ohms
 Start to Tap.....10.5 ohms

R.F. COIL

Primary.....5.8 ohms
 Secondary.....4.2 ohms

NOTE: Due to the variation of winding methods, the D.C. resistance on all coils is subject to a 20% tolerance.

Loudspeaker:

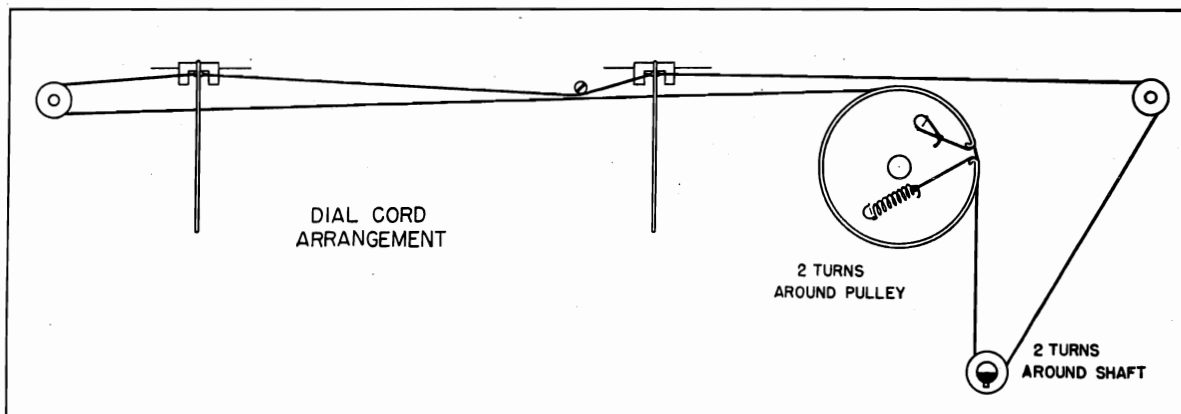
Type.....Permanent magnet
 Outside Cone Diameter.....12"
 Voice Coil Impedance.....3.2 ohms at 400 cycles
 Magnet Rating.....6.8 oz. Alnico 5

Tubes:

TUBE	No.	FUNCTION
6BA6	V-1	R.F. Amplifier
6BA6	V-2	Modulator
6C4	V-3	Oscillator
6BA6	V-4	1st I.F. Amplifier
6BA6	V-5	2nd I.F. Amplifier
6AL5	V-6	Detector
6SQ7	V-7	Audio Amplifier
6SN7-GT	V-8	Inverter
6V6-GT	V-9	Power Amplifier
6V6-GT	V-10	Power Amplifier
5Y3-GT	V-11	Rectifier
6U5-6G5	V-12	Tuning Eye

Electrical Rating:

Line Voltage.....110 - 120 volts 50-60 cycle AC
 Power Consumption.....120 watts



Dial Cord Arrangement

ALIGNMENT PROCEDURE

Alignment procedure consists of the steps outlined in the Alignment Chart. Make certain that each alignment step is done with a minimum input signal.

ALIGNMENT CHART AM

Step	Connect Test Osc. to	Test Osc. Setting	Pointer Setting	Adjust for Max. Output
Step	Connect Test Osc. to	Test Osc. Setting	Pointer Setting	Adjust for Max. Output
1	Mixer grid & ground	455 Kc	540 Kc	Trimmers A,B,C,D
2	R.F. grid & ground	1500 Kc	1500 Kc	Trimmers F & G
3	R.F. grid & ground	600 Kc	600 Kc	Trimmer E
4	Repeat Step No. 2			
5	Standard Test loop	1500 Kc	1500 Kc	Trimmer H
6	Check stationizing. Slide pointer on string if stations are uniformly off in one direction.			

NOTE: 1. Rock variable condenser for step 3.
2. Standard Test Loop is Hazeltine #1150 or a reasonable substitute.

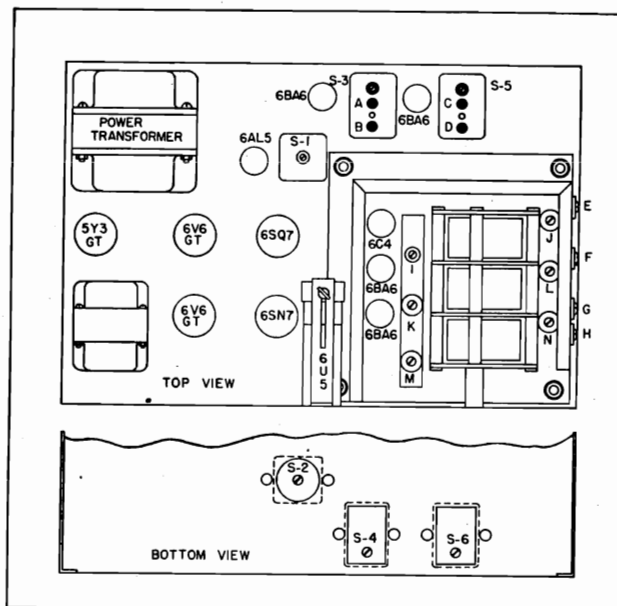
EQUIPMENT REQUIRED FOR FM ALIGNMENT

- Signal generator capable of generating signals at 10.7 Mc, and from 88 to 108 Mc.
- Vacuum tube voltmeter connected to point "A" (on schematic).
- Center-zero D.C. voltmeter connected to point "B" (on schematic).

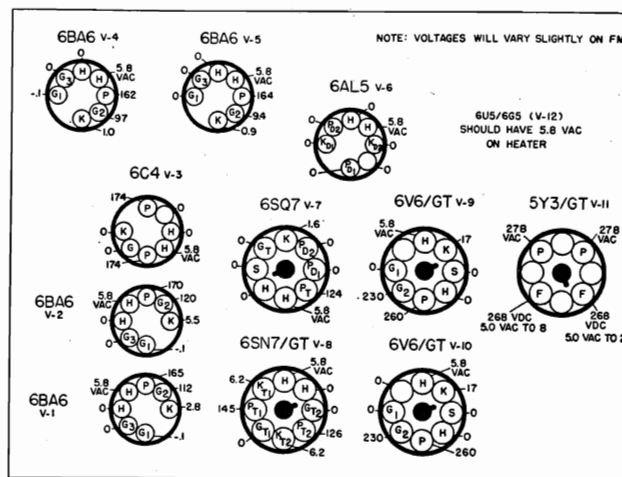
**ALIGNMENT CHART FM
ALIGNMENT PROCEDURE**

Step	Connect Test Osc. to	Test Osc. Setting	Pointer Setting	Adjust for Max. Output
1	R.F. grid & ground	10.7 Mc	88 Mc	S-1,S-3,S-4 S-5,S-6
2	Adjust S-2 for zero on zero-center meter.			
3	Repeat Steps 1 and 2.			
4	Doublet Terminals thru 270 ohms	88 Mc	88 Mc	Trimmers I, K, M
5	Doublet Terminals thru 270 ohms	108 Mc	108 Mc	Trimmers J, L, M
6	Repeat Step No. 4.			

NOTE: 1. Rock variable condenser for step 4.

**Trimmer Locations**

- | | |
|--|---------------------------|
| A I.F. Trimmer | E B.C. Oscillator Padder |
| B I.F. Trimmer | F B.C. Oscillator Trimmer |
| C I.F. Trimmer | G B.C. R.F. Trimmer |
| D I.F. Trimmer | H B.C. Antenna Trimmer |
| I F.M. Oscillator Low Frequency Trimmer | |
| J F.M. Oscillator High Frequency Trimmer | |
| K F.M. R.F. Low Frequency Trimmer | |
| L F.M. R.F. High Frequency Trimmer | |
| M F.M. Antenna Low Frequency Trimmer | |
| N F.M. Antenna High Frequency Trimmer | |

**Voltage Chart**

No signal
117 volts A.C. line voltage.
Switch in Standard Broadcast position.

All voltages shown are positive D.C. except heater voltages which are all 5.8 V.A.C.
A.C. voltages measured with a 1000 ohm per volt A.C. meter. Volume and tone controls maximum.

PACKARD-BELL CO.

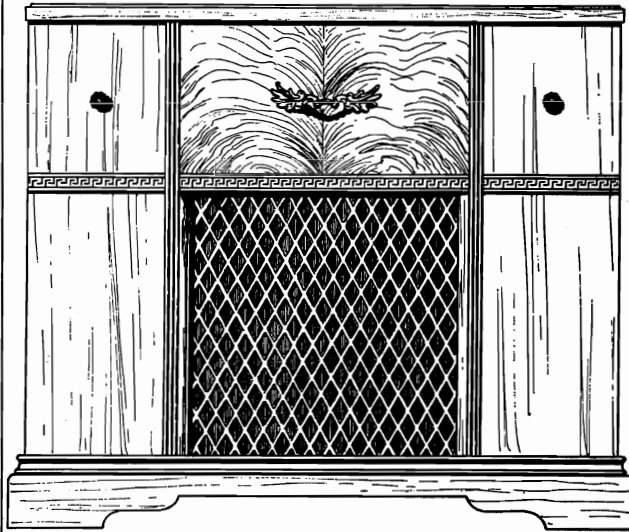
MODEL 1272

PART NO.	REF. SYMBOL	DESCRIPTION	PART NO.	REF. SYMBOL	DESCRIPTION
18088		Bracket, tuning eye	24006	C22-1	Capacitor, electrolytic, 25 Mf. 25 V.
21045BN		Cabinet, dark Mahogany	23007	C23-1 to 3	Capacitor, tubular, .02 Mf. 600 V.
21045BG		Cabinet, Walnut	23011	C24-1	Capacitor, tubular, .1 Mf. 400 V.
21045CU		Cabinet, Natural Mahogany	23002	C25-1 to 3	Capacitor, tubular, .002 Mf. 600 V.
21045BC		Cabinet, Bleached	27001		Choke, filter
21045-1		Cabinet back, right	28005A		Clip, antenna
21045-2		Cabinet back, left	28020		Clip, tuning eye.
21057A		Cabinet motorboard	29406	L1	Coil, FM antenna
23515	C1A to C2C	Capacitor, Variable	29400	L2	Coil, BC antenna
23408	C3-1 to 5	Capacitor, trimmer, Single 3-12 Mmf.	29104	L3	Coil, Choke R.F.
23909	C4-1 to 2	Capacitor, ceramic, 10 Mmf. 500 V.	29102F	L4	Coil, B.C. R.F.
23227	C5-1 to 5	Capacitor, ceramic, 100 Mmf. 500 V.	29106	L5	Coil, F.M. R.F. Oscillator
23229	C6-1 to 7	Capacitor, mica, 470 Mmf. 500 V.	29205C	L6	Coil, B.C. Oscillator
23912	C7-1 to 5	Capacitor, ceramic, 47 Mmf. 500V.	29011	L7, L8	Coil, 1st I.F. AM, FM.
23022	C8-1 to 15	Capacitor, tubular, .01 Mf. 400 V.	20912	L9, L10	Coil, 2nd I.F. AM, FM
23400A	C9-1	Capacitor, trimmer, Dual 3-30 Mmf.	29018	L11	Coil, Ratio detector, FM
23409	C10-1	Capacitor, trimmer, Single 1-8 Mmf.	29315		Antenna, B.C. Loop
23406	C11-1	Capacitor, trimmer, Single 3-30 Mmf.	29321		Antenna, F.M. Dipole
23402	C12-1	Capacitor, trimmer, Single 600-800 Mmf.	32003C		Cord, AC
24038	C13-1	Capacitor, electrolytic, 5Mmf50 V.	38069		Dial, stationized
23206	C14-1 to 3	Capacitor, mica, 220 Mmf. 500 V.	38070		Dial, Eastern
23908	C15-1	Capacitor, ceramic, 5 Mmf 500 V.	40003		Dial cord
23901	C16-1	Capacitor, trimmer, Dual .006-.006 Mmf. (metal case)	40101C		Drive, planetary
24030	C17-1	Capacitor, electrolytic, 40 Mf. 450 V.	52019BG		Knob, control, Walnut
24001	C18-1	Capacitor, electrolytic, 20 Mf. 450 V.	52019BN		Knob, control, dark mahogany
24003	C19-1	Capacitor, electrolytic, 20 Mf. 350 V.	52019CU		Knob, control, natural mahogany
23208	C20-1	Capacitor, mica, 4000 Mfm. 500 V.	52019BC		Knob, control, bleached
23016	C21-1 to 2	Capacitor, tubular, .003 Mf. 600 V.	52020BC		Knob, Control, Bleach
			52020BN		Knob, Control, Dark Mahogany
			520201CU		Knob, Control, Natural Mahogany
			52020BG		Knob, Control, Walnut
			54002		Lamp, dial, #47
			58022A		Changer, Record, Webster #56

MODEL 1272

PACKARD-BELL CO.

PART NO.	REF. SYMBOL	DESCRIPTION	PART NO.	REF. SYMBOL	DESCRIPTION
63026		Pickup Cartridge, Sure Bros. P-30	25008	R20-1	Control, volume, 3 section
69003C		Pulley, idler	73044	R9-1	Resistor, 39,000 ohm $\frac{1}{2}$ w, 10%
69006A		Pulley, variable capacitor	73047	R10-1 to 9	Resistor, 100,000 ohm, $\frac{1}{2}$ w, 20%
73053	R1-1 to 5	Resistor, 1 megohm, $\frac{1}{2}$ w, 10%	73011	R11-1	Resistor, 68 ohm, $\frac{1}{2}$ w, 10%
73008	R2-1 to 2	Resistor, 39 ohm, $\frac{1}{2}$ w, 10%	73042	R12-1 to 2	Resistor, 27,000 ohm, $\frac{1}{2}$ w, 10%
73018	R3-1	Resistor, 270 ohm, $\frac{1}{2}$ w, 10%	73039	R21-1	Resistor, 15,000 ohm, $\frac{1}{2}$ w, 10%
73041	R4-1 to 4	Resistor, 22,000 ohms, $\frac{1}{2}$ w, 10%	73045	R22-1 to 3	Resistor, 47,000 ohm, $\frac{1}{2}$ w, 10%
73021	R5-1	Resistor, 470 ohm, $\frac{1}{2}$ w, 10%	73131	R23-1	Resistor, 330 ohm, $\frac{1}{2}$ w, 10%
73032	R6-1 to 2	Resistor, 3900 ohm, $\frac{1}{2}$ w, 10%	73037	R24-1	Resistor, 10,000 ohm, $\frac{1}{2}$ w, 10%
73025	R7-1 to 5	Resistor, 1,000 ohm, $\frac{1}{2}$ w, 10%	50202A	R25-1	Control, tone, with switch
73014	R8-1 to 2	Resistor, 120 ohm, $\frac{1}{2}$ w, 10%	79002		Socket, tube, 8 prong
73073	R13-1	Resistor, 10,000 ohm $\frac{1}{2}$ w, 10%	79007		Socket, phono motor, A.C.
73060	R14-1	Resistor, 56,000 ohm, $\frac{1}{2}$ w, 10%	79010B		Socket, lamp
73055	R15-1	Resistor, 2.2 megohm, $\frac{1}{2}$ w, 20%	79018		Socket, speaker
73049	R16-1 to 3	Resistor, 220,000 ohm, $\frac{1}{2}$ w, 20%	79033		Socket, compartment lamp
73020	R17-1	Resistor, 390 ohm, $\frac{1}{2}$ w, 10%	79035		Socket, tube, miniature
73035	R18-1 to 2	Resistor, 6800 ohm, $\frac{1}{2}$ w, 10%	79045		Socket, antenna
73919	R19-1	Resistor, 1000 ohm 10 w, 10%	79041		Socket, tuning eye
			83802		Speaker, 12" PM
			84028		Spring, dial
			86016B	SLA to SLE	Switch, band
			89013	T1	Transformer, power
			89404	T2	Transformer, output

**Electrical Rating:**

Line Voltage 110-120 volts 50-60 cycle AC
 Power Consumption . . . 110 watts including phonograph

Tuning Frequency Range:

Standard Broadcast . . . 540 to 1620 Kc
 Frequency Modulation . . 87.5 to 108.5 Mc.

Intermediate Frequency:

AM 455 Kc
 FM 10.7 Mc

Loudspeaker:

Type Permanent Magnet
 Outside Cone Diameter . . 12"
 Voice Coil Impedance . . . 3.2 ohms at 400 cycles
 Magnet Rating 6.8 Oz. Alnico V

Tubes:

Tube:	No.:	Function:
6BA6	V-1	R.F. Amplifier
6BA6	V-2	Mixer
6BA6	V-3	I.F. Amplifier
6BA6	V-4	Driver
6AL5	V-5	F.M. Detector
6H6	V-6	A.M. Detector—AVC
6SF7	V-7	Audio Amplifier
6SN7-GT	V-8	Phase Inverter
6C4	V-9	Oscillator
6V6-GT	V-10	Output
6V6-GT	V-11	Output
5Y3-GT	V-12	Rectifier
6U5-6G5	V-13	Tuning Eye

GENERAL INFORMATION

Model 1273 is a 2 band console PhonOcord. It has 13 tubes including the rectifier and tuning eye, and employs a 12-inch speaker.

Listed below are some of the features included in this model:

1. Standard Broadcast from 540 to 1620 Kc.
2. Frequency Modulation from 87.5 to 108.5 Mc.
3. Tuning Eye for accurate tuning of stations.
4. Home recording combined with an automatic record changer.

In an early run of this model, R-4 connected to the Plate of the 6C4 instead of to R-5. Also you may find two 680 ohm resistors in place of the 330 ohm 2 watt resistor. Either is satisfactory.

RECORDING HEAD PRESSURE

The proper recording head pressure is $1\frac{1}{4}$ oz. Adjustment of this pressure is made by turning the small screw on the top of the recording arm. This adjustment is very critical and should be made in quarter turns. **TURN THE SCREW CLOCKWISE TO INCREASE THE CUTTING DEPTH and COUNTERCLOCKWISE TO DECREASE THE CUTTING DEPTH.**

This adjustment is made at the factory with an ordinary postal scale, consequently, field adjustments should be made in a like manner.

BRIEF DESCRIPTION OF COMPRESSION CIRCUIT

One diode section of the 6H6 serves as the compressor rectifier. The compression system is automatic, and is in the circuit on both record positions. A portion of the output voltage is rectified by the 6H6 and varies grid-bias of the first audio, 6SF7.

HOW TO CHECK COMPRESSION VOLTAGE

Turn the Selector Switch to Radio Record position. Feed a 2 volt (RMS) 1000 cycle signal into the diode return of the 2nd I.F. (brown lead). Connect the leads of a vacuum tube voltmeter to the point indicated on Figure 4, Schematic Diagram, and ground. The voltage at this point should be approximately a minus 2.5 volts.

SPECIAL SERVICE INFORMATION**STAGE GAIN MEASUREMENTS, AM:**

Measurements taken with volume and tone controls maximum. Band Switch in Standard Broadcast position.

AVC shorted out.

Standard Output 50 milliwatts

Dummy Antenna 200 Mmf.

Antenna Post to R.F. grid 12X at 1000 KC

R.F. grid to Converter grid 9X at 1000 Kc

Converter grid to 1st I.F. grid 20X at 455 Kc

1st R.F. grid to 2nd Detector 40X at 455 Kc

Overall Audio Gain 4600X at 1 watt 400 cycles

STAGE GAIN MEASUREMENTS, FM:

Measurements taken with volume and tone controls maximum. Band switch in Frequency Modulation position.

AVC shorted out.

Dummy Antenna 270 ohms

Dipole Terminal to R.F. grid 0.9X at 98 Mc

Converter grid to 1st I.F. grid 12X at 10.7 Mc

1st I.F. grid to Driver grid 45X at 10.7 Mc

OSCILLATOR CATHODE VOLTAGES:

Measured at 117 volts AC line voltage with AC vacuum tube voltmeter input loading above 10 Megohms.

1620 KC 8.5 volts AC

1200 KC 8.2 volts AC

800 KC 5.5 volts AC

540 KC 2.5 volts AC

OSCILLATOR GRID CURRENT, FM:

Measured at 117 volts line voltage with DC microammeter connected in series with ground end of the 22,000 ohm grid resistor.

108 MC 190 Microamps

98 MC 200 Microamps

88 MC 220 Microamps

MODEL 1273

PACKARD-BELL CO.

ALIGNMENT PROCEDURE

Alignment procedure consists of the steps outlined in the Alignment Chart. Make certain that each alignment step is done with a minimum input signal.

ALIGNMENT CHART A M

STEP	CONNECT TEST OSC. TO	TEST OSC. SETTING	POINTER SETTING	ADJUST FOR MAX. OUTPUT
1	Mixer grid & ground	455 Kc	540 Kc	Trimmers A, B, C, D
2	R.F. grid & ground	1500 Kc	1500 Kc	Trimmers G & H
3	R.F. grid & ground	600 Kc	600 Kc	Trimmer E
4	Repeat Step No. 2			
5	Standard Test Loop	1500 Kc	1500 Kc	Trimmer F
6	Check stationizing. Slide pointer on string if stations are uniformly off in one direction.			

NOTE: 1. Rock variable condenser for Step No. 3.

2. Standard Test Loop is Hazeltine No. 1150 or a reasonable substitute.

EQUIPMENT REQUIRED FOR FM ALIGNMENT

1. Vacuum tube type voltmeter connected to point "A" (on schematic) for Step No. 1.
2. Center-zero D.C. voltmeter connected to point "B" (on schematic) for step No. 2.

ALIGNMENT CHART F M

STEP	CONNECT TEST OSC. TO	TEST OSC. SETTING	POINTER SETTING	ADJUST FOR MAX. OUTPUT
1	R.F. grid & ground	10.7 Mc	88 Mc	S-1, S-3, S-4, S-5, S-6
2	Adjust S-2 for zero on zero-center meter.			
3	Repeat steps 1 and 2.			
4	Doublet terminals thru 270 ohms	108 Mc	108 Mc	Trimmers J, I, K
5	Doublet terminals thru 270 ohms	88 Mc	88 Mc	S-7, S-8
6	Repeat step No. 4.			

NOTE: Rock variable condenser for step No. 4.

D.C. RESISTANCE MEASUREMENTS:**I.F. COILS:****1st I.F.**

Primary . . . 17 ohms
Secondary . . . 10 ohms

2nd I.F.:

Primary . . . 10 ohms
Secondary . . . 17 ohms*

*NOTE: To obtain the true reading of the secondary of the 2nd I.F. coil, it must be removed from the can. This is true because of the 56,000 ohm resistor in series with the AVC lead inside the can.

Oscillator Coil:

Primary 1 ohm
Secondary 6 ohms

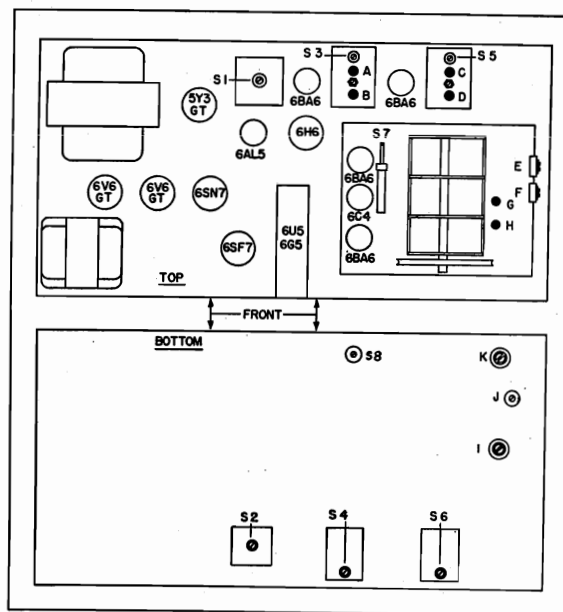
Antenna Coil:

Start to Finish . . . 12.2 ohms
Start to Tap 10.5 ohms

R.F. Coil:

Primary 5.8 ohms
Secondary 4.2 ohms

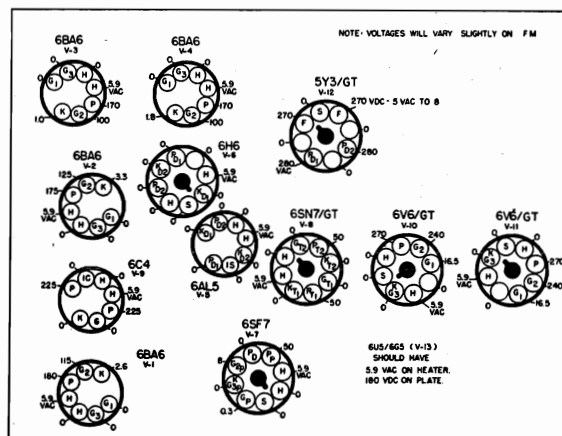
NOTE: Due to the variation of winding methods, the D.C. resistance on all coils is subject to a 20% tolerance.

**TRIMMER LOCATION**

- | | |
|-------------------|------------------------|
| A—I.F. trimmer | G—B.C. osc. trimmer |
| B—I.F. trimmer | H—B.C. R.F. trimmer |
| C—I.F. trimmer | I—F.M. R.F. trimmer |
| D—I.F. trimmer | J—F.M. osc. trimmer |
| E—B.C. padder | K—F.M. antenna trimmer |
| F—Antenna trimmer | |

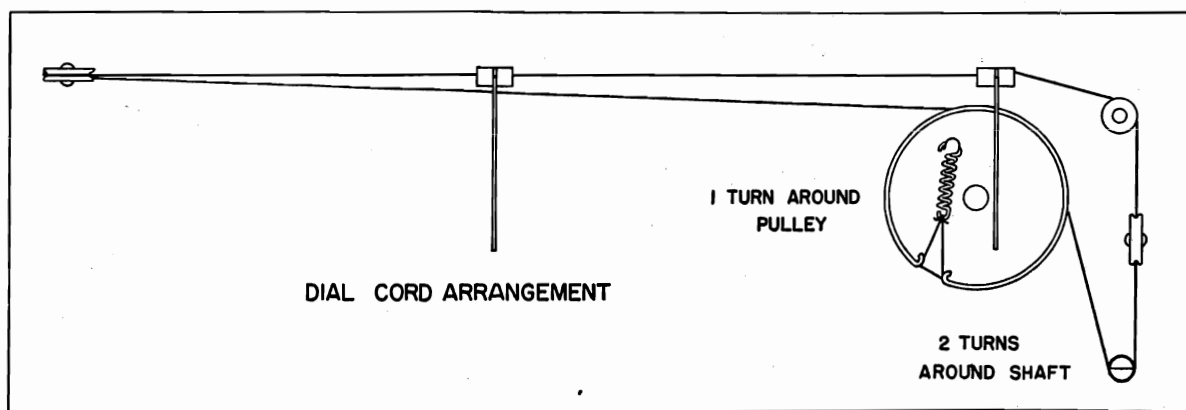
SOCKET VOLTAGES

All D.C. voltages measured with a vacuum tube voltmeter from socket contacts to chassis.—A.C. voltage measured with a 1000 ohms per volt A.C. meter from socket contacts to chassis.—Volume and tone controls maximum.—Switch in Radio Receive position. No signal. 117 volts A.C. line. All voltages shown are positive D.C. unless otherwise noted.

**SOCKET VOLTAGE**

PACKARD-BELL CO.

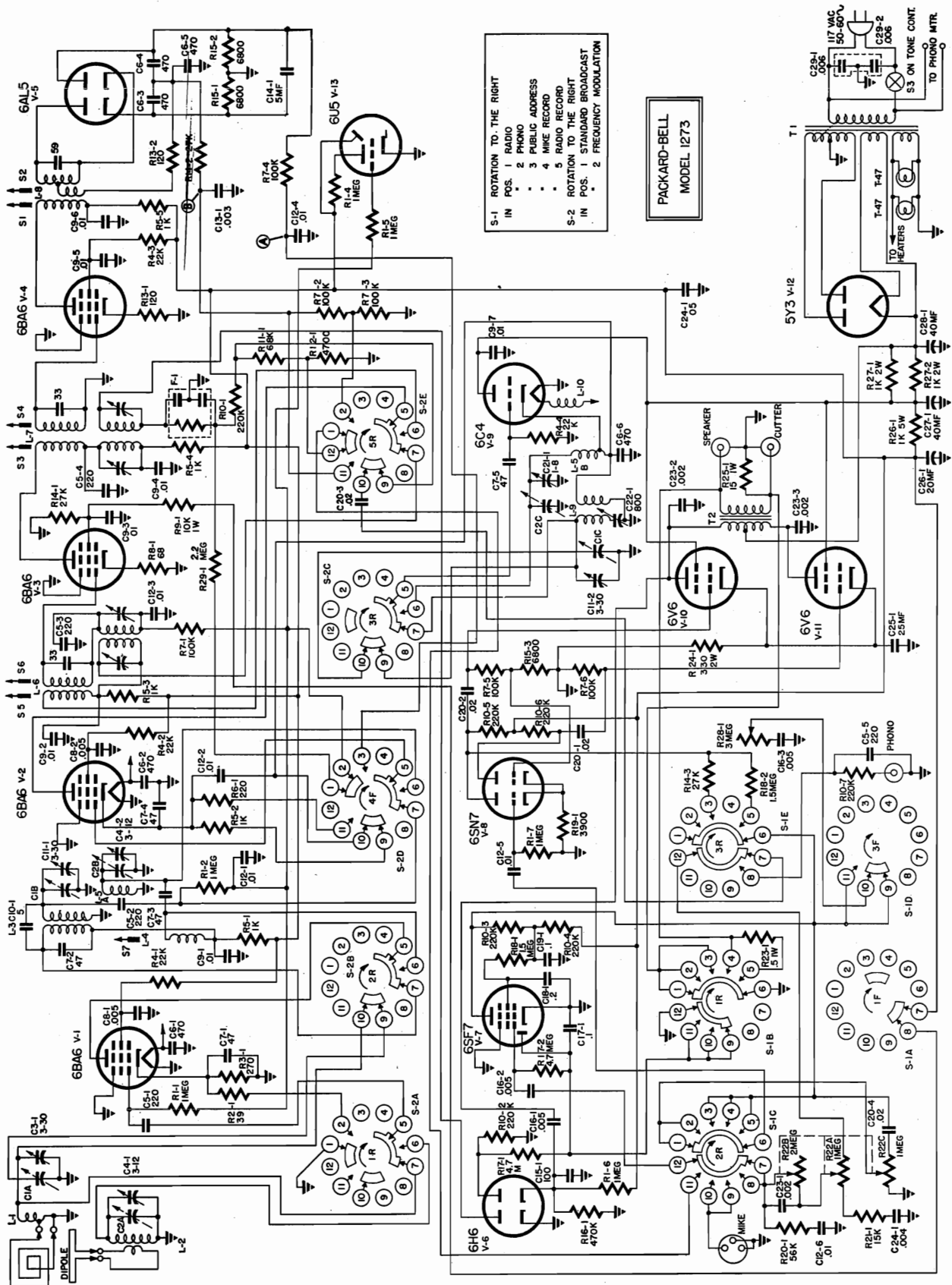
MODEL 1273

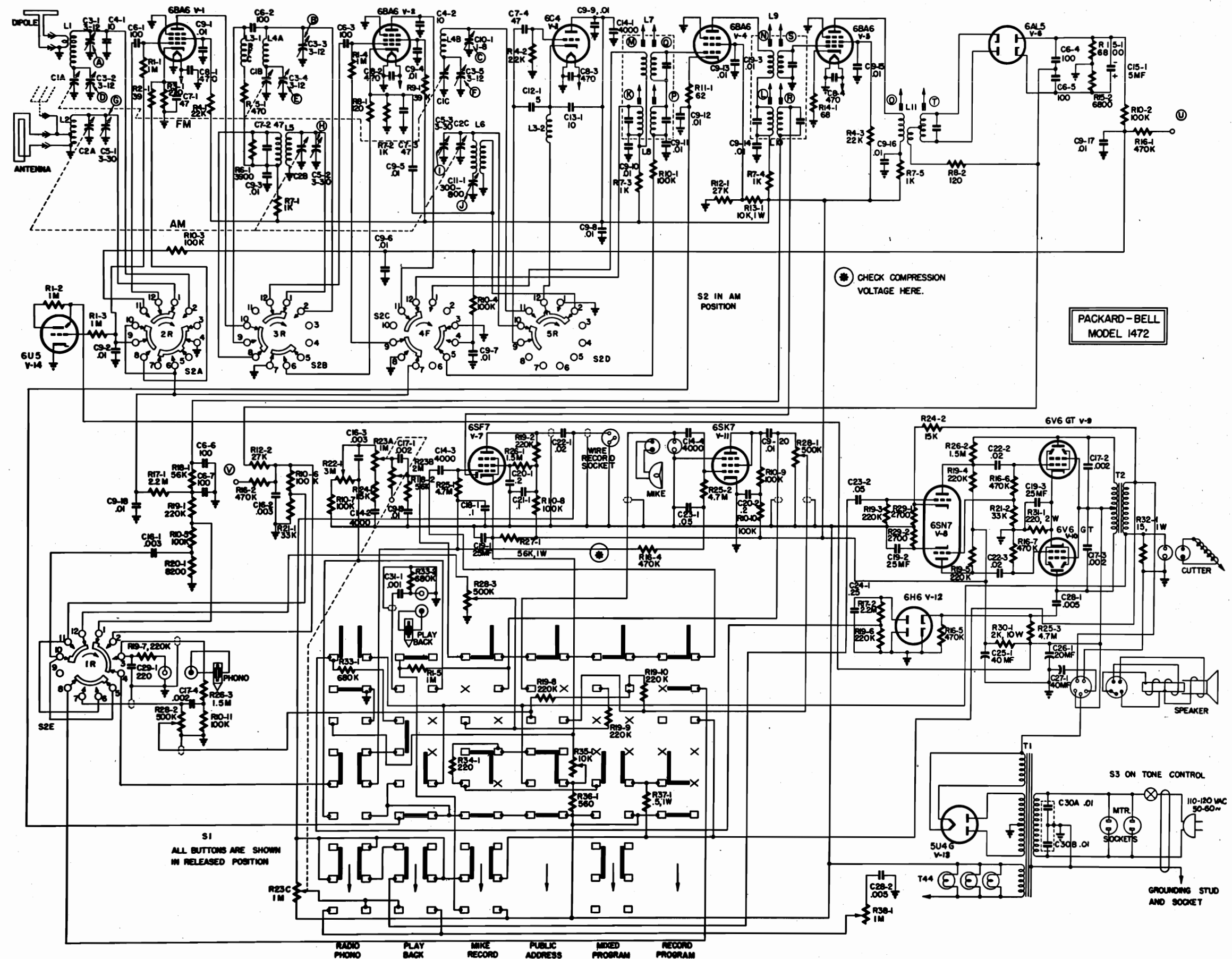


Dial Cord Diagram

TABLE OF REPLACEABLE PARTS

PART NO.	REF. SYMBOL	DESCRIPTION	PART NO.	REF. SYMBOL	DESCRIPTION
21058		Cabinet	65065G		Plate, dial
23525	C1,A,B,C	Capacitor, variable	65066A		Plate, rear
23406	C3-1	Capacitor, trimmer, single 3-30 Mmf.	66001		Plug, pin
23408	C4-1 to 2	Capacitor, trimmer, single 3-12 Mmf.	66004		Plug, speaker
23915	C5-1 to 5	Capacitor, ceramic, 220 Mmf. 20%	66013		Plug, microphone
23916	C6-1 to 6	Capacitor, ceramic, 470 Mmf. 20%	67030		Pointer assembly
23912	C7-1 to 5	Capacitor, ceramic, 47 Mmf. 20%	68163		Instruction book
23931	C8-1 to 2	Capacitor, tubular, .005 Mmf. "HI-KAP"	69001		Pulley
23023	C9-1 to 7	Capacitor, tubular, .01 Mf. 500 V.	69013A		Pulley
23908	C10-1	Capacitor, ceramic, 5 Mmf. 20%	69006A		Pulley, variable
23401	C11-1 to 2	Capacitor, trimmer, dual 3-30 Mmf.	73053	R1-1 to 7	Resistor, carbon, 1 Meg. $\frac{1}{2}$ w. 20%
23022	C12-1 to 6	Capacitor, tubular, .01 Mf. 400 V.	73008	R2-1	Resistor, carbon, 39 ohm, $\frac{1}{2}$ w. 10%
23016	C13-1	Capacitor, tubular, .003 Mf. 600 V.	73018	R3-1	Resistor, carbon, 270 ohm, $\frac{1}{2}$ w. 10%
24038	C14-1	Capacitor, electrolytic, 5 Mf. 50 V.	73041	R4-1 to 4	Resistor, carbon, 22,000 ohm, $\frac{1}{2}$ w. 10%
23914	C15-1	Capacitor, ceramic, 100 Mmf. 500 V.	73025	R5-1 to 5	Resistor, carbon, 1,000 ohm, $\frac{1}{2}$ w. 10%
23004	C16-1 to 3	Capacitor, tubular, .005 Mf. 600 V.	73017	R6-1	Resistor, carbon, 220 ohm, $\frac{1}{2}$ w. 10%
23019	C17-1	Capacitor, tubular, .1 Mf. 200 V.	73047	R7-1 to 7	Resistor, carbon, 100,000 ohm, $\frac{1}{2}$ w. 20%
23020	C18-1	Capacitor, tubular, .2 Mf. 400 V.	73011	R8-1	Resistor, carbon, 68 ohm, $\frac{1}{2}$ w. 10%
23011	C19-1	Capacitor, .1 Mf. 400 V.	73073	R9-1	Resistor, carbon, 10,000 ohm, 1 w. 10%
23007	C20-1 to 4	Capacitor, tubular, .02 Mf. 600 V.	73049	R10-1 to 7	Resistor, carbon, 220,000 ohm, $\frac{1}{2}$ w. 20%
23409	C21-1	Capacitor, trimmer, single 1-8 Mmf.	73046	R11-1	Resistor, carbon, 68,000 ohm, $\frac{1}{2}$ w. 10%
23402	C22-1	Capacitor, padder, 800 Mmf.	73033	R12-1	Resistor, carbon, 4700 ohm, $\frac{1}{2}$ w. 10%
23002	C23-1 to 3	Capacitor, tubular, .002 Mf. 600 V.	73014	R13-1 to 2	Resistor, carbon, 120 ohm, $\frac{1}{2}$ w. 10%
23208	C24-1	Capacitor, mica, 4000 Mmf.	73042	R14-1 to 3	Resistor, carbon, 27,000 ohm, $\frac{1}{2}$ w. 10%
24006	C25-1	Capacitor, electrolytic, 25 Mf. 25 V.	73035	R15-1 to 3	Resistor, carbon, 6800 ohm, $\frac{1}{2}$ w. 10%
24012	C26-1	Capacitor, electrolytic, 20 Mf. 350 V.	73051	R16-1	Resistor, carbon, 470,000 ohm, $\frac{1}{2}$ w. 20%
24004B	C27-1	Capacitor, electrolytic, 40 Mf. 350 V.	73057	R17-1 to 2	Resistor, carbon, 4.7 meg. $\frac{1}{2}$ w. 20%
24030	C28-1	Capacitor, electrolytic, 40 Mf. 450 V.	73054	R18-1 to 2	Resistor, carbon, 1.5 meg. $\frac{1}{2}$ w. 20%
23901	C29-1	Capacitor, dual .006 in can	73032	R19-1	Resistor, carbon, 3900 ohm, $\frac{1}{2}$ w. 10%
23930	F1	Capacitor, tweet filter	73060	R20-1	Resistor, carbon, 56,000 ohm, $\frac{1}{2}$ w. 10%
29400	L1	Coil, B.C. antenna	73039	R21-1	Resistor, carbon, 15,000 ohm, $\frac{1}{2}$ w. 10%
29409	L2	Coil, F.M. antenna	25016	R22-A,B,C	Control, volume, 3 section
29102F	L3	Coil, B.C. R.F.	73910	R23-1	Resistor, wire wound, $\frac{1}{2}$ ohm, 1 w.
29104	L4	Coil, R.F. choke	73131	R24-1	Resistor, carbon, 330 ohm, 2 w. 10%
29109	L5-A & B	Coil, F.M. R.F. oscillator	73903	R25-1	Resistor, wire wound, 15 ohm, 1 w.
29011	L6	Coil, 1st I.F. A.M., F.M.	73915	R26-1	Resistor, carbon, 1,000 ohm, 5 w. 10%
29012	L7	Coil, 2nd I.F. A.M., F.M.	73120	R27-1 to 2	Resistor, carbon, 1,000 ohm, 2 w. 10%
29018	L8	Coil, F.M. ratio detector	25510	R28-1	Control, tone
29205C	L9	Coil, B.C. oscillator	73055	R29-1	Resistor, carbon, 2.2 meg. $\frac{1}{2}$ w. 20%
29104	L10	Coil, R.F. choke	77020		Shaft, dial
29321		F.M. dipole	79002		Socket, tube, 8 prong
32003C		Cord, A.C.	79035		Socket, tube miniature
36024		Cartridge, cutter	79004		Socket, microphone
38073		Dial, stationized	79005		Socket, pickup
38074		Dial, export	79018		Socket, speaker and cutter
41017		Escutcheon	79041		Socket, tuning eye
52001A-BG		Knob, control	79007		Socket, A.C.
52014BG		Knob, bar type	79010B		Socket, lamp
54001		Lamp, pilot, 0.250 Amp.	79045		Socket, antenna terminal strip
57004		Microphone with cable	83802		Speaker, 12" PM
57005		Microphone handle	86009A	S1	Switch, phono, etc.
57006		Microphone base	86017B	S2	Switch, band
58004E		Recorder, changer	89013	T1	Transformer, power
59002		Needle, cutter	89404	T2	Transformer, output, 10,000 ohm to 3.2 ohms
63026		Cartridge, pickup, Shure P-30			





GENERAL INFORMATION

Model 1472 is a two band dual turntable, console PhonOcord. It has 12 tubes, plus a tuning eye and power rectifier, and employs a 12-inch electro dynamic speaker.

Listed below are some of the features included in this model:

1. Standard Broadcast—540 to 1620 KC.
2. Frequency Modulation—87.5 to 108.5 MC.
3. Cathode-Ray tuning indicator.
4. Push-button home recording and automatic record changer.

Electrical Rating:

Line Voltage . . . 110-120 volts, 50-60 cycles A.C.

Power Consumption 188 watts

Tuning Frequency Range:

Standard Broadcast 540 to 1620 KC.

Frequency Modulation 87.5 to 108.5 MC.

Intermediate Frequency:

AM 455 KC

FM 10.7 MC

Loudspeaker:

Type Electro Dynamic

Outside Cone Diameter 12"

Voice Coil Impedance 3.2 ohms at 400 cycles

Field Coil 500 ohms D.C.

Electrical Power Output:

Maximum 15 watts

Undistorted 10 watts

Tubes:

No.	Function
6BA6	R.F. Amplifier
6C4	Mixer
6BA6	Oscillator
6BA6	1st I.F. Amplifier
6AL5	Driver
6SF7	F.M. Detector
	Audio Amplifier, A.M. Detector
6SN7-GT	Phase Inverter
6V6-GT	Power Amplifier
6V6-GT	Power Amplifier
6SK7	Microphone Amplifier
6H6	Compressor Rectifier
5U4-G	Power Rectifier
6U5-6G5	Tuning Eye

NOTE: R26-2 shown as 1.5 M was replaced by 680 K in some instances to compensate for variations in recording level. See Special Service Information for method of checking for proper recording level.

SPECIAL SERVICE INFORMATION

Recording Head Pressure:

The proper recording head pressure is 1¼ ounces and is indicated by a small red dot on the indicator located on the cutter arm. In the event this has varied due to shipping vibrations it may be re-set with the aid of an ordinary pocket type postage scale. To increase pressure turn indicator wheel clockwise. Turn counter-clockwise to decrease pressure.

Brief Description of Compression Circuit:

One diode section of the 6H6 serves as the compressor rectifier. Delay is accomplished by applying a positive potential to the cathode of the 6H6. A portion of the output voltage is rectified by the 6H6 and varies the grid bias of the 1st audio tube 6SF7.

How to Check Compression Voltage:

Turn the Selector Switch to BC position and press the push-button labeled Record Program. Feed a 2 volt (RMS) 1000 cycle signal into the 2nd detector diode return between the 56K and 220K ohm resistors. Connect a V.T.V.M. to the termination of the 4.7 megohm resistor and .1 mfd. condenser in the control grid circuit of the 6SF7. This should read between 2.5 to 3.5 volts negative.

How to Check Recording Level (Radio Record):

Substitute a 3 ohm resistor in place of the cutting head and with the same test setup as outlined in the preceding paragraph the voltage across this resistor should be between 1.1 and 1.5 volts A.C.

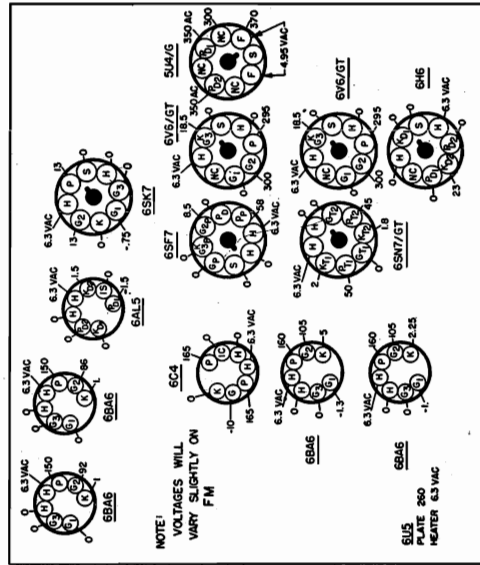
How to Check Recording Level (Record Phono):

Turn the Selector Switch to Phono position, press Record Program pushbutton and feed a 1000 cycle signal of 0.8 volts into the Phono input socket. Substitute a 3 ohm resistor in place of the cutting head. The voltage across the cutter should read between 1.1 and 1.5 volts A.C.

Socket Voltages:

All voltages shown are positive D.C. unless otherwise noted. Heater voltages are 6.3 volts A.C. D.C. voltages measured with a vacuum tube voltmeter from socket contacts to chassis.

A.C. voltages measured with a 1000 ohms per volt A.C. meter from socket contacts to chassis. Volume and tone controls maximum.



SOCKET VOLTAGES

Stage Gain Measurements: AM

Measurements taken with volume and tone controls maximum. Band Switch in Standard Broadcast position. AVC shorted out.

Standard Output 50 milliwatts
Dummy Antenna 200 Mmf.
Antenna Post to R.F. Grid . . . 12X at 1000 KC
R.F. Grid to Converter Grid . . . 6X at 1000 KC
Converter Grid to 1st I.F. Grid . 30X at 455 KC
1st I.F. Grid to 2nd Detector . . 100X at 455 KC
Overall Audio Gain . . . 0.1 volt into phono socket for 1.0 watt output at 400 cycles

Stage Gain Measurements: FM

Measurements taken with volume and tone controls maximum. Band Switch in Frequency Modulation position. AVC shorted out.

Dummy Antenna 270 ohms
Dipole Terminal to R.F. Grid . . 1.0X at 98 MC
R.F. Grid to Converter Grid . . . 7X at 98 MC
Converter Grid to 1st I.F. Grid . 49X at 10.7 MC
1st I.F. Grid to Driver Grid . . 35X at 10.7 MC

Alignment Procedure:

Alignment procedure consists of the steps outlined in the two alignment charts. A.M. alignment is carried out with minimum signal input. F.M. alignment signal should be strong enough to produce 3 volts A.V.C. voltage.

ALIGNMENT CHART AM

STEP	CONNECT TEST OSC. TO	TEST OSC. SETTING	POINTER SETTING	ADJUST FOR MAX. OUTPUT
1	Mixer Grid & Ground	455 KC	540 KC	Trimmers R, L, P, K
2	R.F. Grid & Ground	1500 KC	1500 KC	Trimmers I & H
3	R.F. Grid & Ground	600 KC	600 KC	Trimmer J
4	Repeat Step No. 2			
5	Standard Test Loop	1500 KC	1500 KC	Trimmer G
6	Check stationizing. Slide pointer on string if stations are uniformly off in one direction.			

NOTE: 1. Rock variable condenser for step 3.

2. Standard Test Loop is Hazeltine No. 1150 or a reasonable substitute.

Equipment Required for F.M. Alignment

1. Signal generator capable of generating signals at 10.7 MC and from 88 to 108 MC.
2. Vacuum tube voltmeter connected to point "A" (on Schematic).
3. Center-zero D.C. voltmeter connected to point "B" (on Schematic).

ALIGNMENT CHART FM

STEP	CONNECT TEST OSC. TO	TEST OSC. SETTING	POINTER SETTING	ADJUST FOR MAX. A.V.C.
1	R.F. Grid & Ground	10.7 MC	88 MC	O, S, N, Q, M
2	Adjust T for zero on zero-center meter.			
3	Repeat Steps 1 and 2.			
4	Doublet Terminals thru 270 Ohms	88 MC	88 MC	Trimmers F, E, D
5	Doublet Terminals thru 270 Ohms	108 MC	108 MC	Trimmers C, B, A
6	Repeat Step No. 4.			

NOTE: 1. Rock variable condenser for step 4.

Oscillator Cathode Voltages:

Measured at 117 volts AC line voltage with an AC vacuum tube voltmeter input impedance above 10 megohms.

1620 KC 3.8 volts A.C.
1300 KC 3.6 volts A.C.

750 KC 2.8 volts A.C.
550 KC 2.5 volts A.C.

Oscillator Grid Current: FM

Measured at 117 volts A.C. line voltage with a D.C. microammeter connected in series with ground end of the 22,000 ohm grid resistor.

108 MC 200 Microamps
98 MC 330 Microamps
88 MC 480 Microamps

D.C. Resistance Measurements:

A.M. I.F. Coils

1st I.F. 2nd I.F.
Primary . . . 9.0 ohms Primary . . . 9.0 ohms
Secondary . . 9.0 ohms Secondary . . 9.0 ohms

A.M. Oscillator Coil

Primary 1.0 ohms
Secondary 6.0 ohms

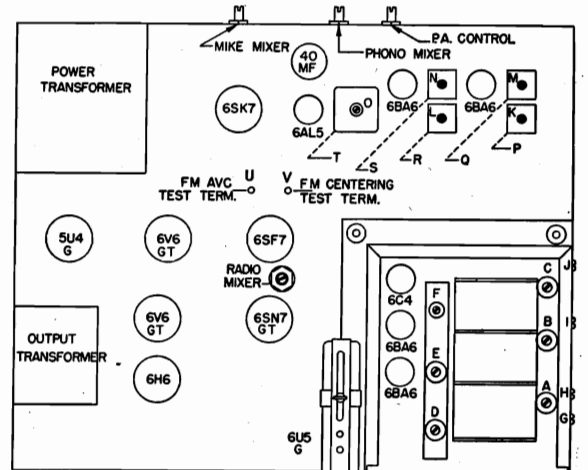
A.M. Antenna Coil

Start to Finish 12.2 ohms
Start to Tap 10.5 ohms

A.M. R.F. Coil

Primary 5.8 ohms
Secondary 4.2 ohms

NOTE: Due to the variation in winding methods, the D.C. resistance on all coils is subject to a 20% tolerance.



TRIMMER LOCATIONS

- A—F.M. Antenna High Frequency Trimmer
- B—F.M. R.F. High Frequency Trimmer
- C—F.M. Oscillator High Frequency Trimmer
- D—F.M. Antenna Low Frequency Trimmer
- E—F.M. R.F. Low Frequency Trimmer
- F—F.M. Oscillator Low Frequency Trimmer
- G—A.M. Antenna Trimmer
- H—A.M. R.F. Trimmer
- I—A.M. Oscillator High Frequency Trimmer
- J—A.M. Oscillator Low Frequency Trimmer
- K—A.M. 1st I.F. Primary
- L—A.M. 2nd I.F. Primary
- M—F.M. 1st I.F. Primary
- N—F.M. 2nd I.F. Primary
- Q—F.M. Ratio Detector Primary
- P—(Bottom) A.M. 1st I.F. Secondary
- Q—(Bottom) F.M. 1st I.F. Secondary
- R—(Bottom) A.M. 2nd I.F. Secondary
- S—(Bottom) F.M. 2nd I.F. Secondary
- T—(Bottom) F.M. Centering Adjustment

PACKARD-BELL CO.

MODEL 1472

PART NO.	REF. SYMBOL	DESCRIPTION	PART NO.	REF. SYMBOL	DESCRIPTION	PART NO.	REF. SYMBOL	DESCRIPTION
19018		Bushing, knob	40101C		Drive, Planetary	73073	R13-1	Resistor carbon, 10,000 ohm 1W 10%
21059		Cabinet	52019Y		Knob, Control—Gold (2)	73011	R14-1	Resistor carbon, 68 ohm 1/2W 10%
21059-7		Cabinet drawer panel	52019CU		Knob, Control—Mahogany (2)	73035	R15-1 to 2	Resistor carbon, 6800 ohm 1/2W 10%
21059-1		Cabinet back, left upper	52019BG		Knob, Control—Walnut (2)	73051	R16-1 to 7	Resistor carbon, 470,000 ohm 1/2W 20%
21059-3		Cabinet back, left lower	52020BG		Knob, Control—Walnut (2)	73055	R17-1 to 2	Resistor carbon, 2.2 megohm 1/2W 20%
21059-2		Cabinet back, right	52020Y		Knob, Control—Gold (2)	73060	R18-1 to 2	Resistor carbon, 56,000 ohm 1/2W 20%
23515A	C1 A,B,C	Capacitor, variable, 3 gang with F. M. sections	52020CU		Knob, Control—Mahogany (2)	73049	R19-1 to 10	Resistor carbon, 220,000 ohm 1/2W 20%
23408	C2 A,B,C	Capacitor, trimmer, Single 3-12 Mmf.	52023BG		Knob, Push Button—Walnut (6)	73036	R20-1	Resistor carbon, 8200 ohm 1/2W 10%
23923	C3-1 to 5	Capacitor, ceramic, 10 Mmf. 500 V.	52023Y		Knob, Push Button—Gold (6)	73043	R21-1 to 2	Resistor carbon, 33,000 ohm 1/2W 10%
23917	C4-1	NPO	52035A-S		Knob, Dual Control—Statuary Bronze (1)	Part of 25508B	R22-1	Control, bass, 3 megohm
23406	C5-1 to 3	Capacitor, trimmer, Single 3-30 Mmf.	52035A-K		Knob, Dual Control—Brass (1)	25008	R23-A,B,C	"Volume", 1 megohm-2 megohm-1 megohm
23914	C6-1 to 7	Capacitor, ceramic, 100 Mmf. 500 V.	52035A-Y		Knob, Dual Control—Gold (1)	73039	R24-1 to 2	Resistor carbon, 15,000 ohm 1/2W 10%
23912-1	C7-1 to 4	Capacitor, ceramic, 47 Mmf. 500 V.	54001		Lamp, Dial—T-44 (0.25 amp.)	73057	R25-1 to 3	Resistor carbon, 4.7 megohm 1/2W 20%
23916	C8-1 to 4	Capacitor, ceramic, 470 Mmf. 500 V.	58022A		Changer—Webster 56	73054	R25-1 to 3	Resistor carbon, 1.5 megohm 1/2W 20%
23923	C9-1 to 19	Capacitor, tubular, .01 Mf. 500 V.	57008		Microphone, Dynamic Universal	73076	R27-1	Resistor carbon, 56,000 ohm 1/2W 20%
23410	C10-1	Capacitor, trimmer, Single 1-8 Mmf.	57008-2		Microphone, base and handle	25800	R28-1 to 3	Controls, Mixer 500,000 ohms
23402	C11-1	Capacitor, trimmer, Single 300-800 Mmf.	57008-1		Microphone Cable with Connector	73080	R29-1 to 2	Resistor carbon, 2700 ohm 1/2W 10%
23917	C12-1	Capacitor, ceramic, 5 Mmf. 500 V.	58001-5		Recording Motor	73920	R30-1	Resistor, 2000 ohm 2W Wire Wound
23918	C13-1	Capacitor, ceramic, 10 Mmf. 500 V.	59002		Turntable Recorder	73130	R31-1	Resistor carbon, 220 ohm 2W 10%
23208	C14-1 to 4	Capacitor, mica, 4000 Mmf. 500 V.	59001		Needle, cutter	73903	R32-1	Resistor, 15 ohm 1W Wire Wound
24038	C15-1	Capacitor, electrolytic, 5 Mf. 50 V.	63005B		Needle, pickup playback	73052	R33-1 to 2	Resistor carbon, 680,000 ohm 1/2W 20%
23016	C16-1 to 3	Capacitor, tubular, .003 Mf. 600 V.	63027-2		Pickup, assembly	73017	R34-1	Resistor carbon, 220 ohm 1/2W 10%
23002	C17-1 to 4	Capacitor, tubular, .002 Mf. 600 V.	63005-1		Pickup, clip	25802	R35-1	Control—P.A. 10,000 ohm
23019	C18-1	Capacitor, tubular, .1 Mf. 200 V.	63003		Pickup Arm Rest	73022	R36-1	Resistor carbon, 560 ohm 1/2W 10%
24006	C19-1 to 3	Capacitor, electrolytic, 25 Mf. 25 V.	63026		Pickup Cartridge Astatic L-71A (Playback)	73910	R37-1	Resistor, 1/2ohm 1W Wire Wound
23020	C20-1 to 2	Capacitor, tubular, .2 Mf. 400 V.	63026		Pickup Cartridge, Shure P-30 (Phono)	Part of 25508B	R38-1	Control Treble, 1 megohm
23011	C21-1	Capacitor, tubular, .1 Mf. 400 V.	66004		Plug, Phono Playback	79002		Socket, tube 8 prong
23007	C22-1 to 3	Capacitor, tubular, .02 Mf. 600 V.	66021		Plug, Phono AC	79004		Socket, Wire record 3 prong
23017	C23-1 to 2	Capacitor, tubular, .05 Mf. 200 V.	66019		Plug, Mike	79005		Socket, Compartment light
23021	C24-1	Capacitor, tubular, .25 Mf. 200 V.	66020		Plug, Speaker	79007		Socket, Phono AC
24004-2	C25-1	Capacitor, electrolytic, 40 Mf. 350 V.	69003C		Pulley, Idler-Recorder	79010B		Socket, Lamp
24001	C26-1	Capacitor, electrolytic, 20 Mf. 450 V.	73053	R1-1 to 5	Pulley, dial	79017		Socket, Microphone
24014	C27-1	Capacitor, electrolytic, 40 Mf. 450 V.	73058	R2-1	Resistor carbon, 1 megohm 1/2W 20%	79018		Socket, Phono
23004	C28-1 to 2	Capacitor, tubular, .005 Mf. 600 V.	73053	R3-1	Resistor carbon, 30 ohm 1/2W 10%	79051		Socket, Tube miniature
23915	C29-1	Capacitor, ceramic, 220 Mmf. 500 V.	73018-1	R3-1	Resistor carbon, 270 ohm 1/2W 10%	79048		Socket, Speaker with cable
23932	C30A, B	Capacitor, ceramic, .01 Mf. 125 VAC	73041	R4-1 to 3	Resistor carbon, 22,000 ohm 1/2W 10%	79041		Socket, Tuning eye
23001	C31-1	Capacitor, tubular, .001 Mf. 600 V.	73021	R5-1	Resistor carbon, 470 ohm 1/2W 10%	79045		Socket, Loop
28004A		Clip, turntable	73032	R6-1	Resistor carbon, 3900 ohm 1/2W 10%	79046		Socket, Cutter
28005A		Clip, tuning eye	73025	R7-1 to 5	Resistor carbon, 1000 ohm 1/2W 10%	79049		Socket, Electrolytic Mounting
29406	L-1	Coil, F. M. Antenna	73014	R8-1 to 2	Resistor carbon, 120 ohm 1/2W 10%	83803A		Speaker, 12" Electro-Dynamic
29400B	L-2	Coil, B. C. Antenna	73044-1	R9-1	Resistor carbon, 39,000 ohm 1/2W 10%	86016B	S2A,B,C,D	Switch, Band
29104	L-3	Coil, R. F. Choke	73047	R10-1 to 11	Resistor carbon, 100,000 ohm 1/2W 20%	86301A	S1	Switch, Push Button
29102F	L-4AB	Coil, F. M. R. F. Oscillator	73010-1	R11-1	Resistor carbon, 62 ohm 1/2W 10%	86701A		Switch, Slide
29205C	L-5	Coil, B. C. R. F.	73042	R12-1 to 2	Resistor carbon, 27,000 ohm 1/2W 10%	88106		Terminal Test
292020	L-6	Coil, B. C. Oscillator				89023	T-1	Transformer, power
29021	L-7	Coil, 1st I. F. F. M.				89416A	T-2	Transformer, output, 8,000 to 3.2 ohms
29021	L-8	Coil, 1st I. F. A. M.						
29022A	L-9	Coil, 2nd I. F. F. M.						
29023	L-10	Coil, 2nd I. F. A. M.						
29018	L-11	Coil, Ratio Detector, F. M.						
32020		Cord, AC 8' 3 Conductor						
32006B		Cord, AC 1 1/2						
36019		Cutter, Assembly						
36021		Cutter Cartridge-Universal						
38077		Magnetic-3.2 ohms						
38078		Dial, stationized						
40003		Dial, Eastern						
		Cord, Dial						

PHILCO CORP.

MODEL C4608, Code 121;
Mopar MODEL 802,
Chrysler

CIRCUIT DESCRIPTION

The circuit of the Model C4608 custom-built auto radio consists of a 7A7 r-f stage, a 7B8 converter, a 7A7 i-f stage, a 7B6 second detector and first audio, a 7A4 phase inverter, and two 7C5 tubes in push-pull in the output. The power supply is of the six-volt non-synchronous vibrator type, using a 7Y4 full-wave rectifier.

An unusually high signal-to-noise ratio is achieved in this set by the use of a permeability-tuned r-f stage, coupled to the converter by a band-pass r-f transformer. This transformer is designed to give maximum transfer of signals in the broadcast band, while greatly attenuating all other frequencies. Permeability tuning of both r-f and oscillator stages provides the best possible sensitivity, selectivity, and stability. Both push-button and manual tuning utilize this markedly superior method.

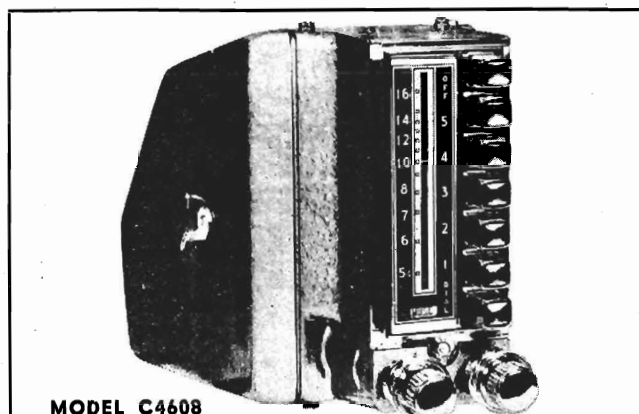
Automatic volume control is provided by filtering the rectified voltage from the diode section of the second detector-first audio tube, and applying it to the grids of the r-f and converter stages.

A feature of the audio system is the continuously variable tone control, which consists of an inverse feed-back circuit built around the first audio stage.

The phase-inverter stage provides push-pull drive for the output tubes, by means of equal load resistances in the plate and cathode circuits of the inverter tube. One signal is taken from the plate, and the other, equal in amplitude but opposite in phase, is taken from the cathode. The push-pull output stage delivers a full five watts of audio power through the output transformer to the electro-dynamic speaker.

PHILCO TROUBLE-SHOOTING PROCEDURE

In this manual, the circuit is divided into four sections, with a schematic and chassis layout, showing test points, for each section. The trouble-shooting procedure for each section is outlined in a chart. Tests indicated by a large asterisk (*) provide sectional master checks, making it possible to eliminate each section as a source of trouble without going through its entire test chart. Wherever trouble is found (indicated by failure to get a "Normal Indication" on any test) it should be isolated by voltage and resistance checks of the parts associated with the point under test, and remedied before testing further.



MODEL C4608

SPECIFICATIONS

CIRCUIT Eight-tube, superheterodyne
FREQUENCY RANGE 540 to 1600 kc.
INTERMEDIATE FREQUENCY 455 kc.
PHILCO TUBES 7A4, 7A7 (2), 7B6, 7B8, 7C5 (2) 7Y4
POWER INPUT 6.3 volts, 9.2 amps.
ANTENNA Retractable-tip, Philco Part No. 91-0484

All components in the receiver circuit are symbolized and located as follows:

C—condenser	LS—loud speaker	T—transformer
I—pilot lamp	R—resistor	VB—vibrator
L—choke or coil	S—switch	Z—electrical assembly

100-series components are in section 1—the power supply.

200-series components are in section 2—the audio system.

300-series components are in section 3—the i-f and second detector.

400-series components are in section 4—the r-f and first detector.

Before starting the trouble-shooting procedure, the following steps are recommended:

1. Before connecting the receiver to a source of power, inspect both sides of the chassis. Make sure that all tubes are securely in their sockets, and look for any broken or shorted connections, burned resistors, or other obvious sources of trouble.

2. Connect the receiver to the power source (6.3 volts, d. c.), and ascertain that all the tube filaments are lighted. If the 7Y4 rectifier is observed to be defective, check the filter condensers (C100 A, B, and C) for short circuits before inserting a new tube.

3. Turn the volume control fully on and set the sensitivity control (shown in Figure 9, page 6) at maximum. Connect an antenna or a signal generator to the antenna receptacle, and ascertain that the receiver definitely does not operate properly.

MODEL C4608, Code 121;
Mopar MODEL 802,
Chrysler

PHILCO CORP.

TESTS TO ISOLATE TROUBLE WITHIN SECTION 1

With the exception of the first, make all measurements for this section with a high-quality volt-ohmmeter, using the applicable d-c range. All voltages given in this manual are average, and were measured with the volume control set at minimum.

NOTE: If the vibrator (VB100) is found to be defective, check C101 and C100 for shorts before inserting a new vibrator.

TEST POINTS	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
Ammeter (0-30 amps, d-c) in series with power source.	9.2 amps	Defective power-supply components (isolate by following tests)
A to B—	215 volts	Defective 7Y4, VB100, C100, C101, T100.
C to B—	195 volts	Open R101, leaky C100B, C100C.
D to B—	180 volts	Open R102, leaky C100C.

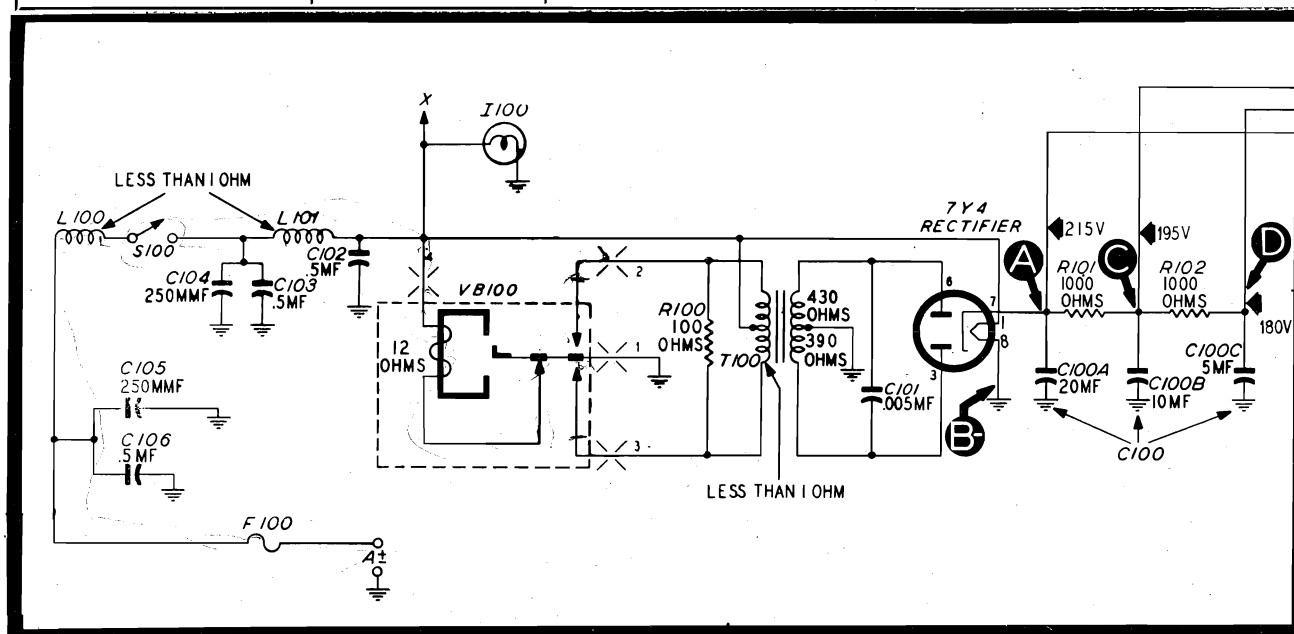


Figure 1. Section 1 schematic.

TP-1623A

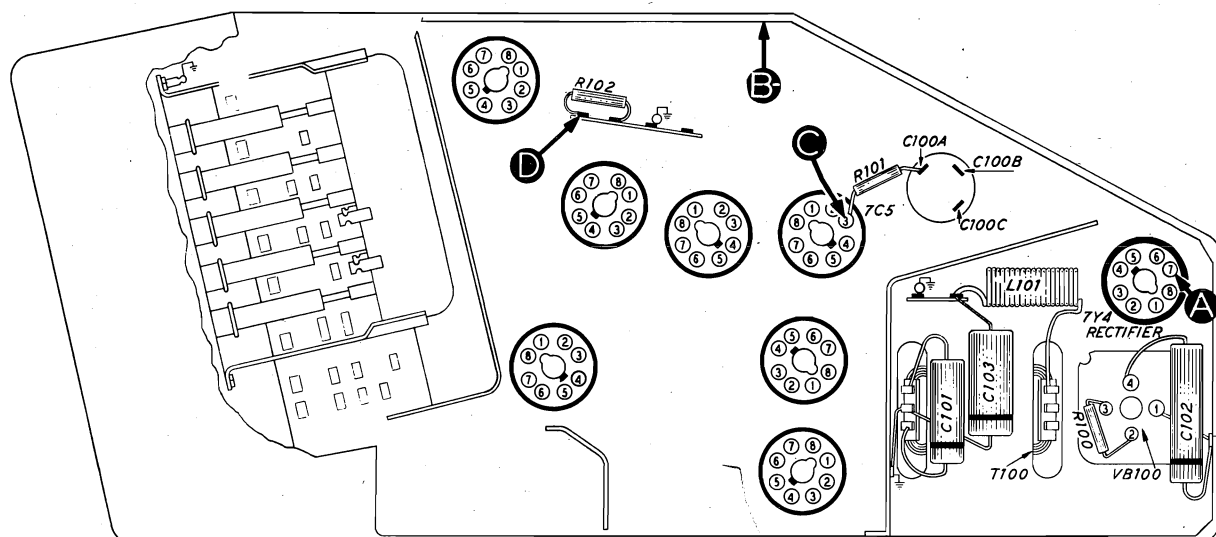


Figure 2. Bottom view, showing Section 1 test points.

TP-1623E

Mopar MODEL 802,
Chrysler

PHILCO CORP.

MODEL C4608, Code 121;

TESTS TO ISOLATE TROUBLE WITHIN

SECTION 2

For all tests in this section, use an audio signal. Connect the generator output lead through a condenser (.01 to .25 mf.) to the test points indicated; connect the generator ground lead to the receiver chassis (B-). Set the receiver volume control at maximum, and adjust the signal-generator output for a loud, clear signal on the first test.

TEST POINTS	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
E to B- (Remove 7A4)	Loud, clear signal from speaker.	Defective 7C5, T200, LS200; open R205; leaky C201.
F to B- (7A4 removed)	Loud, clear signal, same as previous test.	Defective 7C5, T200; leaky C202.
G to B- (7A4 removed)	Loud, clear signal.	Open C201.
H to B- (7A4 removed)	Loud, clear signal.	Open C202.
J to B- (Replace 7A4)	Clear signal, louder than previous tests.	Defective 7A4, C200; open R202, R201.

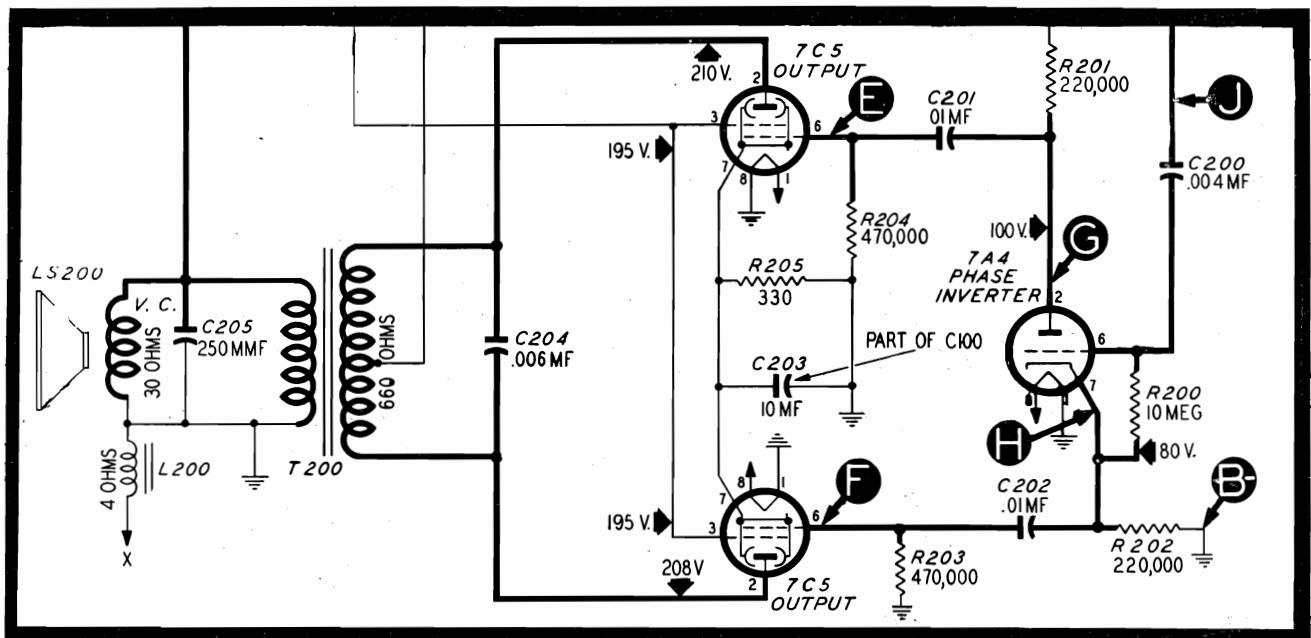


Figure 3. Section 2 schematic.

TP-1623B

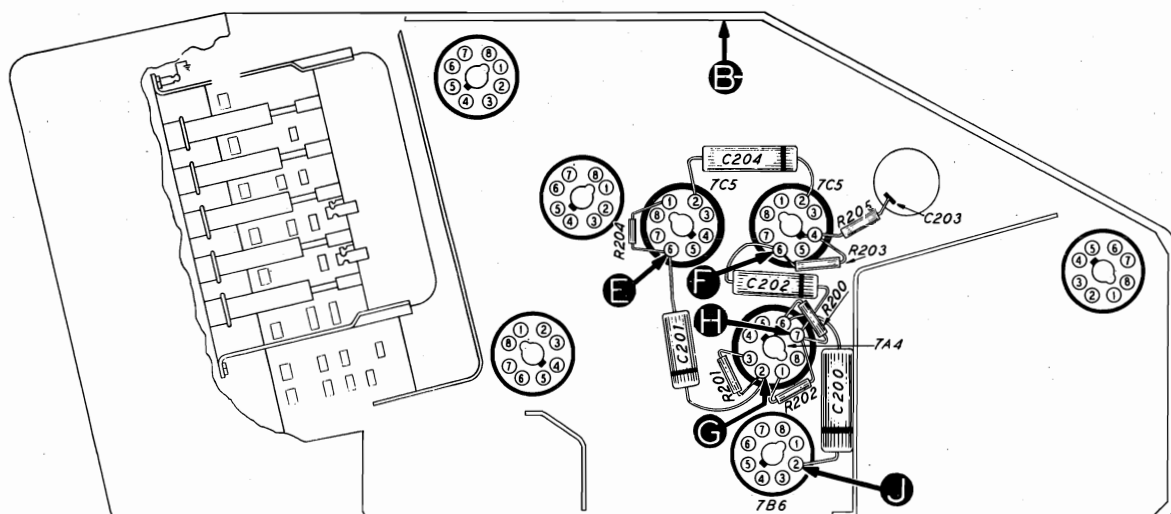


Figure 4. Bottom view, showing Section 3 test points.

TP-1623F

MODEL C4608, Code 121;

PHILCO CORP.

Mopar MODEL 802, TESTS TO ISOLATE TROUBLE WITHIN
Chrysler**SECTION 3**

For the first two tests in this section, use an audio signal. For the last two, use a modulated 455-kc signal. Connect the signal-generator output lead through a condenser (.01 to .25 mf.) to the test points indicated; connect the generator ground lead to the receiver chassis (B-). Set the receiver volume control at maximum, and adjust the signal-generator output for a loud, clear signal on the first test.

TEST POINTS	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
K to B- (audio sig.)	Loud, clear signal.	Defective 7B6; open R306, C304; shorted C305.
L to B- (audio sig.)	Loud, clear signal.	Open R307, C303; defective volume control (rotate through entire range for complete check.)
M to B- (455-kc. sig.)	Loud, clear signal.	Defective 7A7, Z301; open R302, R304; shorted C403 (see Section 4 for location.)
N to B- (455-kc. sig.)	Loud, clear signal.	Defective Z300.

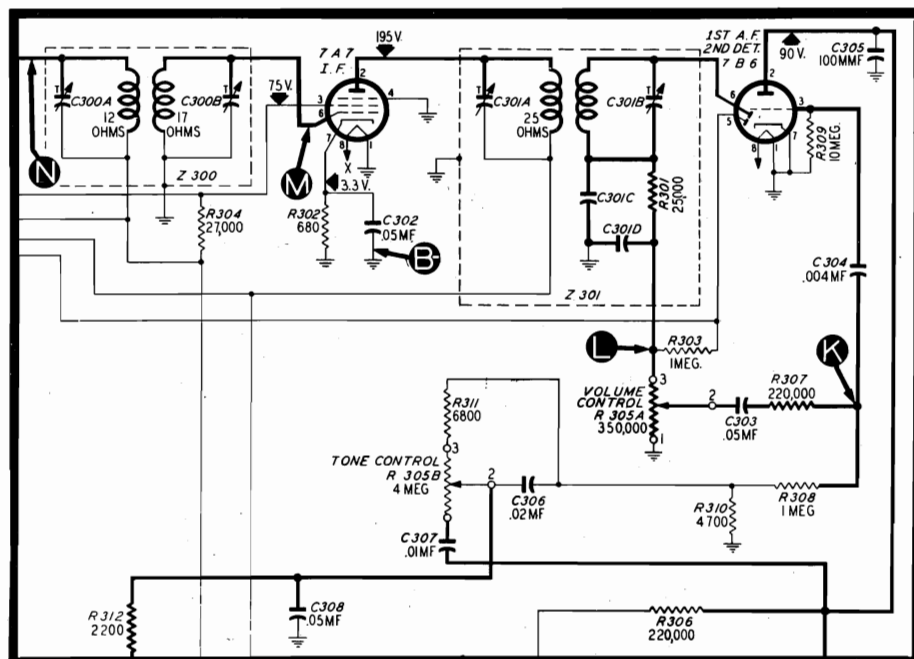


Figure 5. Section 3 schematic.

TP-1623C

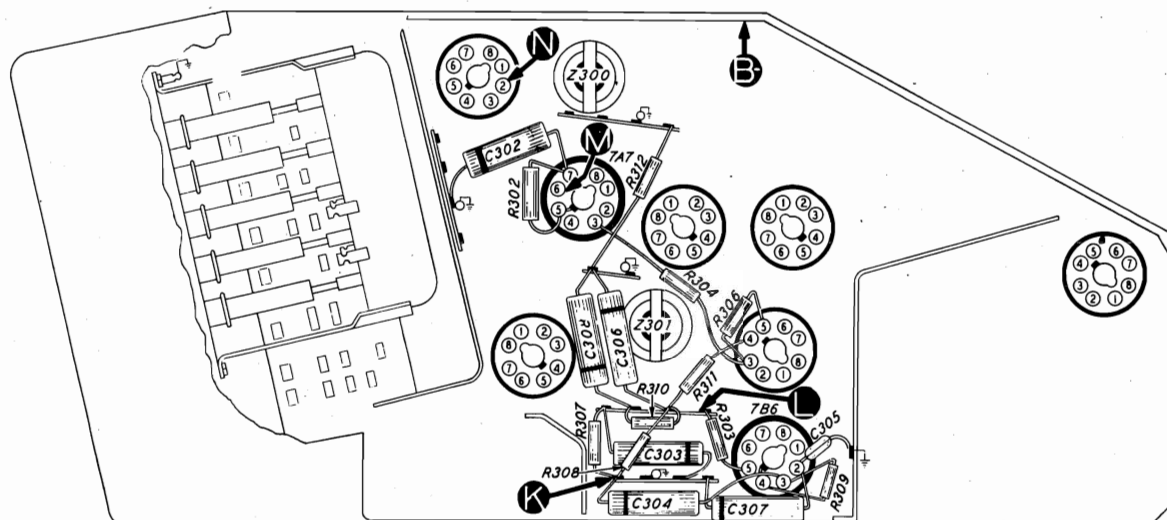


Figure 6. Bottom view, showing Section 3 test points.

TP-1623G

PHILCO CORP.

MODEL C4608, Code 121;
Mopar MODEL 802,
Chrysler**SECTION 4**

1. Attach the positive lead of a 20,000-ohms-per-volt meter to the receiver chassis, and the prod end of the negative lead through a 50,000-ohm resistor to point S. Set the meter on a 10-volt or similar range. Depress the "Dial" push-button, and rotate the tuning control through its entire range. Absence of voltage at any point indicates that the oscillator is not functioning. If so, check the components listed in the first test in the chart below.

2. Set the volume and sensitivity controls at maximum. Proceed through the chart tests below, connecting the signal-generator output lead through a condenser (.01 to .25 mf.) to the test points indicated. The "NORMAL INDICATION" in each test will be a loud, clear signal when the signal generator is tuned to the same frequency as the receiver.

TEST POINTS	PUSH-BUTTON SETTING	POSSIBLE CAUSE OF ABNORMAL INDICATION
P to B—	"DIAL"	Defective 7B8, L403, L404A, or push-button switch; open R404, C405, C407, C408, C409.
P to B—	pre-tuned, 1 to 5	Defective oscillator coils L401E to K, or push-button switches.
Q to B—	"DIAL"	Defective 7A7, Z400, L404A, L404C, or push-button switch; open R402, R401 (rotate R401 through its entire range for complete check.)
Q to B—	pre-tuned, 1 to 5	Defective r-f coils L401 A to E, or push-button switches.
R to B—	"DIAL"	Defective L402, C404, L404A, L404C, or push-button switch.
R to B—	pre-tuned, 1 to 5	Defective r-f coils L401A to E, or push-button switches.

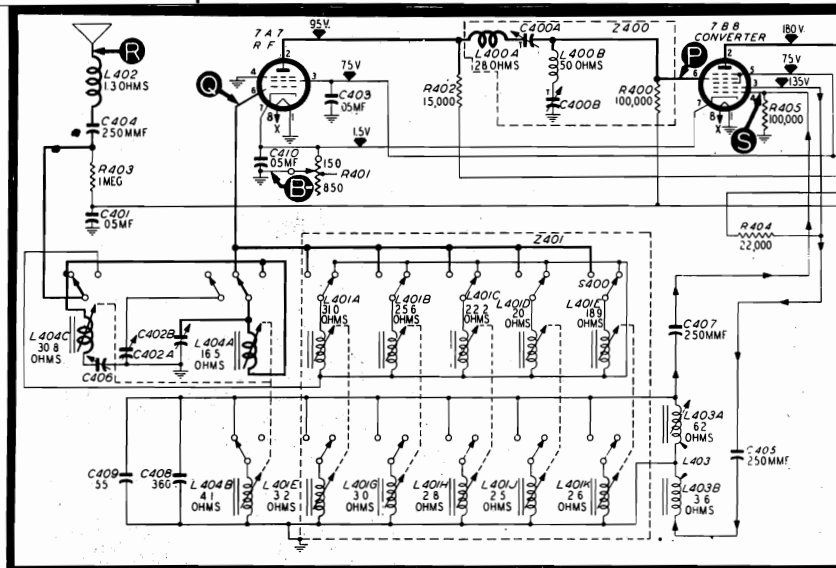


Figure 7. Section 4 schematic.

TP-1623D

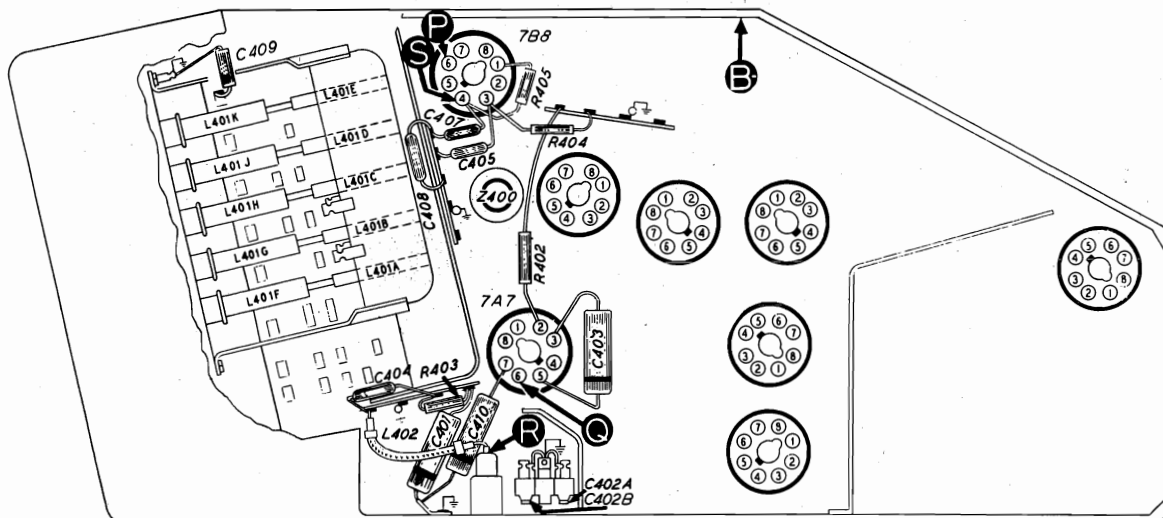


Figure 8. Bottom view, showing Section 4 test points.

TP-1623H

MODEL C4608, Code 121;

PHILCO CORP.

Mopar MODEL 802,
Chrysler

ALIGNMENT PROCEDURE

CONNECT THE OUTPUT METER between the voice-coil lug on the speaker and ground.

CONNECT THE SIGNAL-GENERATOR output lead as follows: For the i-f alignment (the first step in the chart), connect through a 20-mmfd. condenser to pin 6 of the 7B8 converter. For the r-f alignment (all steps after the first), connect through a 20-mmfd. condenser in series with an antenna lead (Part No. 95-0181) to the antenna receptacle. If the antenna lead is not available, connect a 30-mmfd. condenser from the antenna receptacle to ground.

CALIBRATE THE DIAL as follows: Turn the tuning control to its maximum clockwise position. The pointer should then be at 1600 kc. If not, insert

a stiff rod 2 1/4" into the small hole on the left side of the control head, near the number 8 on the dial scale. Rotate the tuning control until the pointer mechanism is stopped by the rod, and continue rotating the control for a fraction of a turn, to slide the pointer mechanism a short distance along the drive cord. Repeat this operation until the pointer coincides with the 1600-kc. mark on the dial when the tuning control is fully clockwise.

SET THE RECEIVER CONTROLS as follows: Set the tone control at "VOICE" (maximum high position). Set the volume and sensitivity controls at maximum. Adjust the signal-generator output as alignment progresses to keep the meter needle near center scale.

ADJUST IN ORDER	SPECIAL INSTRUCTIONS	SIG. GEN.	DIAL SETTINGS RECEIVER
C301B Max. C301A Max. C300B Max. C300A Max. C400B Min.	Ground pin 4 of the 7B8. Adjust the i-f trimmers for maximum in the order listed. Then adjust the i-f trap condenser (C400B) for <u>minimum</u> output.	455 kc.	1600 kc.
C402B Max.	Remove the ground from pin 4 of the 7B8. Adjust for maximum output.	1500 kc.	1500 kc.
L403A Max.	Adjust for overall maximum while rocking the tuning control.	580 kc.	580 kc.
	Tune the receiver for maximum output with the tuning control set at 550 kc.	550 kc.	550 kc. (approx.)
C406 Min.	Adjust for <u>minimum</u> output.	1460 kc.	550 kc.
C402B Max.	Adjust for maximum output. Final adjustment to be made after re-installing the set in the car.	1500 kc.	Tune in 1500 kc. signal
L403A Max.	Adjust for overall maximum while rocking the tuning control.	580 kc.	580 kc.

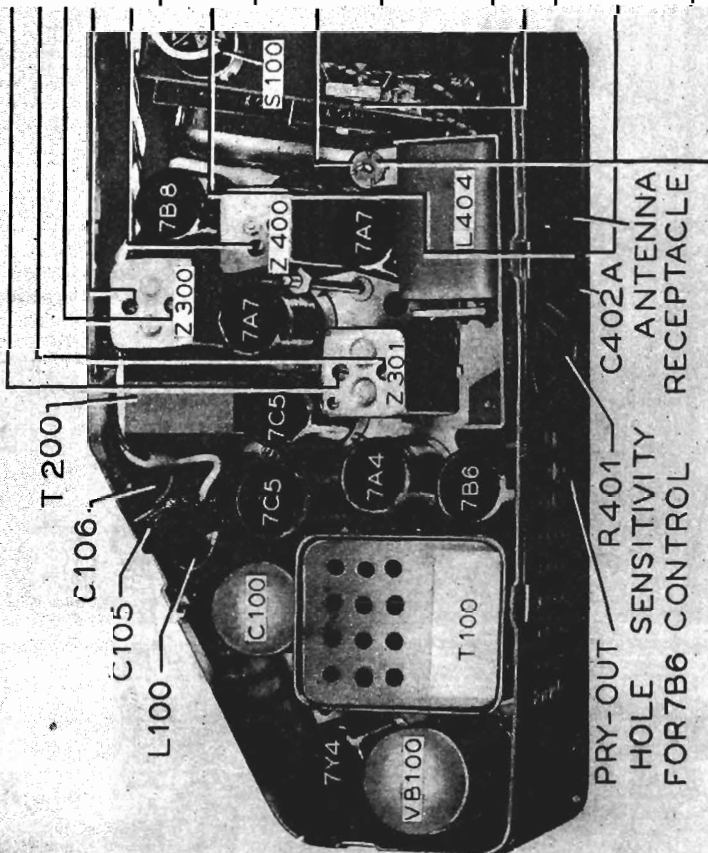


Figure 9. Chassis view, showing trimmer locations.

PHILCO CORP.

MODEL C4608, Code 121;
Mopar MODEL 802,
Chrysler

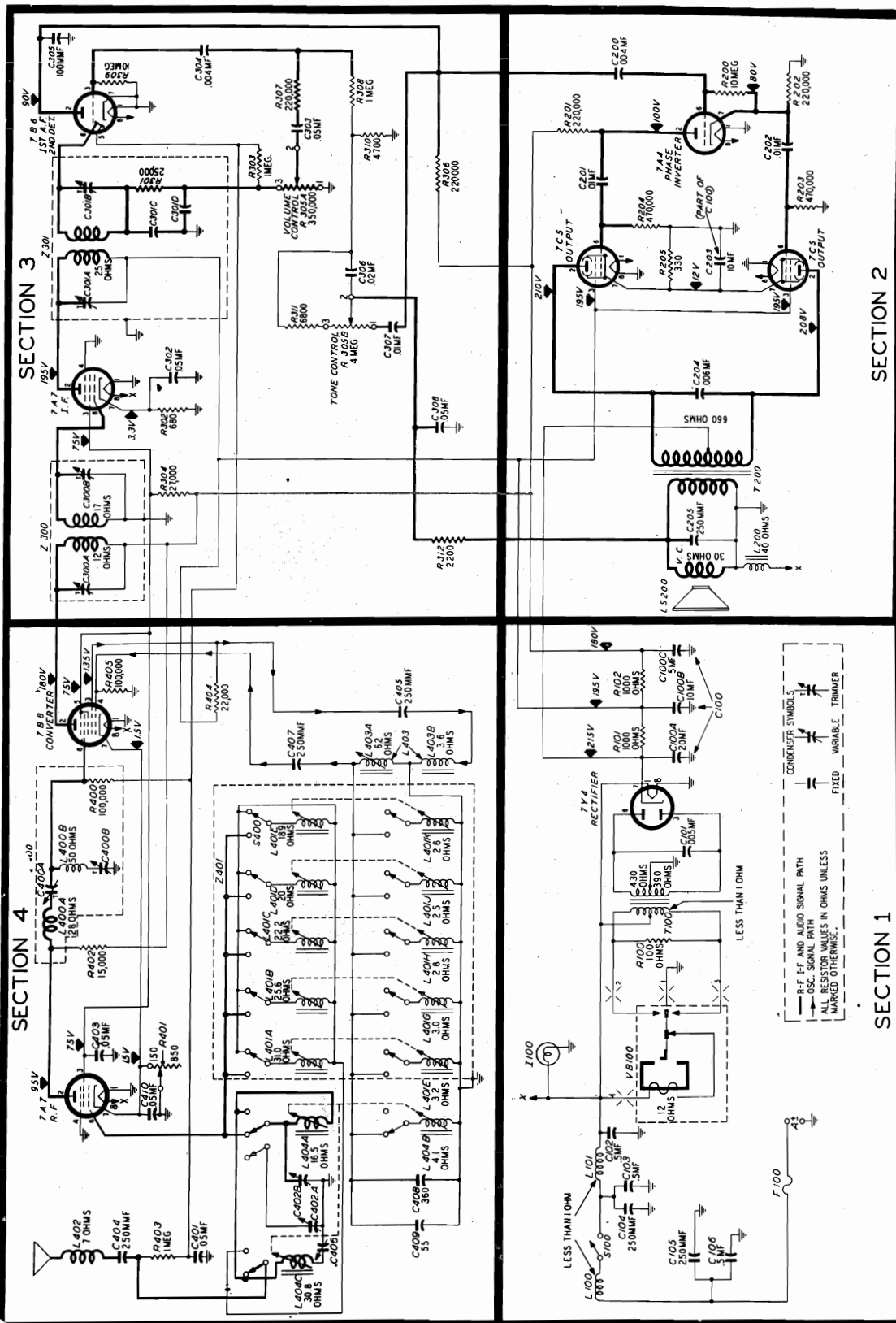


Figure 10. Complete schematic.

NOTE: All voltage, capacity, and resistance values shown are average. The voltages between B- (chassis) and other points indicated were measured with a 20,000 ohms-per-volt meter, with the volume control at minimum and the tuning control at 550 kc.

MODEL C4608, Code 121;

PHILCO CORP.

Mopar MODEL 802,
Chrysler**REPLACEMENT PARTS LIST**

NOTE: Parts marked with an asterisk (*) are general replacement items, and the numbers will not be identical with those used on factory assemblies. Use

only the "Service Part No." shown in the parts list when ordering replacements.

SECTION 1

Reference	Description	Service Part No.
C100	Condenser, electrolytic	61-0150*
	C100A: condenser, 20 mf.	Part of C100
	C100B: condenser, 10 mf.	Part of C100
	C100C: condenser, 5 mf.	Part of C100
C101	Condenser, .005 mf.	61-0153*
C102	Condenser, .5 mf.	61-0134*
C103	Condenser, .5 mf.	61-0137*
C104	Condenser, 250 mmf.	60-10255007*
C105	Condenser, 250 mmf.	60-10255007*
C106	Condenser, .5 mf.	61-0137*
F100	Fuse	45-2559
I100	Lamp, pilot	34-2064*
L100	Choke, "A"	32-1644
L101	Choke, vibrator	65-0389
R100	Resistor, 100 ohms	66-1104340*
R101	Resistor, 1,000 ohms	66-2104340*
R102	Resistor, 1,000 ohms	66-2104340*
S100	Switch, on-off	67-0046*
T100	Transformer, power	65-0347*
VB100	Vibrator	83-0026*

SECTION 2

C200	Condenser, .004 mf.	61-0179*
C201	Condenser, .01 mf.	61-0120*
C202	Condenser, .01 mf.	61-0169*
C203	Condenser, 10 mf.	Part of C100
C204	Condenser, .006 mf.	61-0105*
C205	Condenser, 250 mmf.	60-10255007*
L200	Coil, field	Part of LS200
LS200	Speaker unit	73-0042*
	Replacement cone	91-0164
R200	Resistor, 10 meg.	66-6101540*
R201	Resistor, 220,000 ohms	66-4221540*
R202	Resistor, 220,000 ohms	66-4221540*
R203	Resistor, 470,000 ohms	66-4471540*
R204	Resistor, 470,000 ohms	66-4471540*
R205	Resistor, 330 ohms	66-1334340*
T200	Transformer, output	65-0363*

SECTION 3

C302	Condenser, .05 mf.	61-0101*
C303	Condenser, .05 mf.	61-0101*
C304	Condenser, .004 mf.	61-0179*
C305	Condenser, 100 mmf.	60-10145307*
C306	Condenser, .02 mf.	61-0154*
C307	Condenser, .01 mf.	60-10105007*
C308	Condenser, .05 mf.	61-0101*
R302	Resistor, 680 ohms	66-1683340*
R303	Resistor, 1 meg.	66-5101540*
R304	Resistor, 27,000 ohms	66-3274340*
R305	Control, volume	67-0040*
	R305A: control, volume, 350,000 ohms	Part of R305
	R305B: control, tone, 4 meg.	Part of R305
R306	Resistor, 220,000 ohms	66-4221540*
R307	Resistor, 220,000 ohms	66-4221540*
R308	Resistor, 1 meg.	66-5101540*
R309	Resistor, 10 meg.	66-6101540*
R310	Resistor, 4,700 ohms	66-2471340*
R311	Resistor, 6,800 ohms	66-2681540*
R312	Resistor, 2,200 ohms	66-2221540*
Z300	Transformer, 1st i-f	65-0365
	C300A: condenser, trimmer	Part of Z300
	C300B: condenser, trimmer	Part of Z300
Z301	Transformer, 2nd i-f	65-0366
	C301A: condenser, trimmer	Part of Z301
	C301B: condenser, trimmer	Part of Z301
	C301C: condenser	Part of Z301
	C301D: condenser	Part of Z301
	R301: resistor	Part of Z301

SECTION 4

C401	Condenser, .05 mf.	61-0101*
C402	Condenser, antenna assembly	77-0788
	C402A: condenser, trimmer	Part of C402
	C402B: condenser, trimmer	Part of C402
C403	Condenser, .05 mf.	61-0111*
C404	Condenser, 250 mmf.	60-10255007*
C405	Condenser, 250 mmf.	60-10255007*
C406	Condenser, trimmer	63-0069
C407	Condenser, 250 mmf.	60-10255007*
C408	Condenser, 360 mmf.	30-1220-13*
C409	Condenser, 55 mmf.	61-0149*
C410	Condenser, .05 mf.	61-0101*
L402	Choke, antenna	65-0437
L403	Coil, oscillator shunt	65-0440
	Iron core and screw assembly	57-2325
	Mounting nut	218-1341
L404	Manual tuning unit assembly	77-0962
	Coil assembly, antenna	65-0449
	Coil assembly, oscillator	65-0439
	Coil, assembly, image trap	65-0382

SECTION 4 (Continued)

Reference	Description	Service Part No.
	Control, sensitivity, 1,000 ohms (R401)	67-0025*
	Core assembly, iron, image trap	77-0677
	Core, iron, antenna	57-1702
	Core, iron, oscillator	57-1703
	Guide assembly, core	77-0678
	Nut, backlash	57-1706
	Pin, hair	57-1868FA1
	Shaft, core guide	57-1672FA3
	Shaft, manual tuning	77-0767
	Spring, backlash nut	57-1705FA1
	Spring, coil retaining	57-1673
	Spring, core guide	57-1708
R401	Control, sensitivity (Part of L404)	67-0025*
R402	Resistor, 15,000 ohms	66-3153340*
R403	Resistor, 1 meg.	66-5101540*
R404	Resistor, 22,000 ohms	66-3223340*
R405	Resistor, 100,000 ohms	66-4101540*
Z400	Transformer, r-f and i-f wave trap	65-0421
	C400A: condenser, trimmer	Part of Z400
	C400B: condenser, trimmer	Part of Z400
	L400A: coil, r-f plate	Part of Z400
	L400B: coil, i-f trap	Part of Z400
	R400: resistor, 100,000 ohms	Part of Z400
Z401	Tuning unit assembly, push-button (complete)	77-0943
	Condenser, ceramic	61-0149*
	Condenser, padder	63-0069
	Coupling, push-button link	57-1700
	S400: switch, push-button	Part of Z401

MISCELLANEOUS

Front housing assembly	77-0941FC64
Cover, tube side	77-0879
Cover, wiring side	57-2186FC64
Receptacle, antenna	57-0591FA3
Socket, tube	27-6151*
Socket, vibrator	27-6044*
Tuning unit	77-0943
Front, housing	57-2211FC64
Push-button assembly (Dodge)	76-1910
Push-button assembly (Plymouth, De Soto, Chrysler)	76-1851
Cord, pointer drive (25-foot spool)	45-1459
Core and key assembly, push-button (off)	76-1955
Core and key assembly, push-button No. 2	76-1956
Core and key assembly, push-button No. 3	76-1957
Core and key assembly, push-button No. 4	76-1958
Core and key assembly, push-button No. 5	76-1959
Core and key assembly, push-button No. 6	76-1960
Core and key assembly, push-button (dial)	76-1961
Cover, nut (Chrome)	57-1683FA8
Cover, push-button (MoPar, Dodge)	56-3386
Dial, glass (Dodge)	27-5898
Dial, glass (Plymouth, MoPar)	27-5897
Bezel (Dodge)	57-2220FA8
Bezel (Plymouth, De Soto, Chrysler)	57-2221FA8
Bracket, diffusing screen	57-2242FA3
Pointer, dial	55-1366
Screen, diffusing	55-1428
Socket assembly, pilot lamp	76-1678
Spring, dial mounting	57-2218FA1
Drum assembly, tone indicator	77-0914
Cord, tone drum drive (25-foot spool)	45-1459
Shaft assembly, color cup	76-1855
Spring, tone indicator color drum	57-1693
Washer, "U", tone drum shaft	28-5990FE12
Fuse lead assembly	77-0052
Contact	54-4344
Housing, fuse	56-3595FA3
Spring	56-3593FA1
Tube, insulating	54-7192
Washer, fibre	54-7191
Set mounting	
Bolt	1W16167FA3
Grille spacer	57-2358FA8
Knob, manual-volume	77-0688
Knob (nut cover)	57-1683FA8
Knob, tone	57-1682FA8
Nut	1W19996FA3
Shaft, tuning	57-2217FA3
Spacer	57-1042FA3
Washer	97-0073FA1
Washer	W417FA3
Speaker mounting	
Nut	1W19988FA3
Stud and bushing assembly	77-0400
Suppressor kit	
Braid, bonding	95-0073
Clip	56-6276
Condenser, generator	61-0156*
Condenser, ignition switch	61-0177*
Filter assembly, fuel gauge	67-0050*
Suppressor, distributor	33-1196*

PHILCO CORP.

MODEL C4608, Code 122;
Chrysler

Func-

tionally, both sets are identical, but there have been several parts changes in Code 122 which, because of their effect upon the characteristics and adjustment of the set, definitely require the correct substitution. These changes involve the parts listed below.

In Code 122, the sensitivity control is replaced by a fixed resistor; also, the i-f transformers and wave trap are replaced by units which use permeability tuning instead of trimmer-condenser tuning.

Physically, the alignment procedure remains the same, except that the transformers are of the K type; therefore, the primary must be adjusted from the bottom of the can, while the secondary is adjusted from the top.

We suggest that you examine the list below and order the new parts. We feel that these parts may be required in the course of warranty service.

SECTION 1

Reference Symbol	Description	Service Part No. (Code 122)	Service Part No. (Code 121)
L101	Choke, vibrator	32-4170	65-0389

SECTION 2

C200	Condenser, grid blocking, .005 mf.	45-3502	61-0179
C201	Condenser, grid blocking, .01 mf.	61-0120	61-0105
C202	Condenser, grid blocking, .01 mf.	61-0120	61-0105
C204	Condenser, plate by-pass, .007 mf.	61-0127	61-0105
T200	Transformer, output	32-8316-1	65-0363

SECTION 3

Reference Symbol	Description	Service Part No. (Code 122)	Service Part No. (Code 121)
C304	Condenser, grid blocking, .005 mf.	45-3502	61-0179
C307	Condenser, tone compensation, .01 mf.	61-0120	61-0105
R302	Resistor, cathode bias, 470 ohms	66-1473340	61-1683340
Z300	Transformer, 1st i-f	32-4160	65-0365
Z301	Transformer, 2nd i-f	32-4161	65-0366

SECTION 4

L404	Manual-tuning-unit assembly	77-0666-2	77-0962
R401	Resistor, cathode bias, 220 ohms (replaces sensitivity control in Code 121)	66-1223340	67-0025
Z400	Transformer, r-f and i-f wave trap	32-4162	65-0421
Z401	Tuning-unit assembly, push-button (complete)	77-0657-1	77-0943

NOTE: On a small percentage of the first sets made, some difficulty may be encountered in keeping the i-f transformers aligned. If the radio is weak or the i-f transformers are far out of alignment, adjust the cores. If they seem to turn very easily, it will be necessary to replace the entire i-f transformer. This condition may occur only on some sets made prior to run #4, for Model C-4608, Code 122 only.

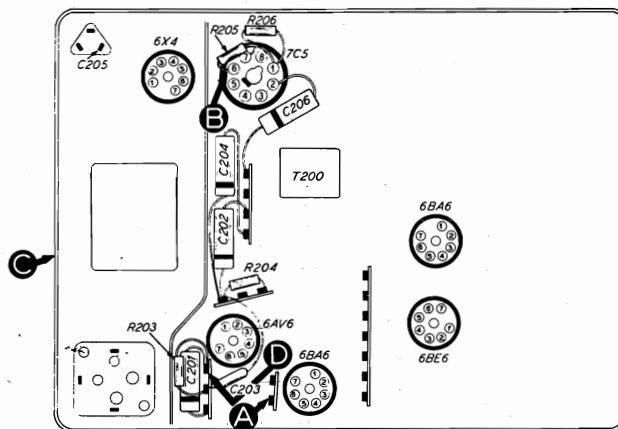
TROUBLE SHOOTING

Section 2

For the tests in this section, use an audio-frequency signal generator. Connect the generator ground lead to the chassis, test point C; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Turn the volume control to maximum, and the tone control fully counterclockwise. Adjust the signal-generator output as required for each step.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 3. If not, isolate and correct the trouble in this section.



TP-4049B

Bottom View, Showing Section 2 Test Points

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with weak signal input.	Trouble in this section. Isolate by the following tests.
2	B	Loud, clear signal with strong signal input.	Defective: 7C5. Open: R206, T200, LS200. Shorted: C203, C206, T200. Leaky: C206, C203.
3	D	Loud, clear signal with weak signal input.	Defective: 6AV6. Open: C204, R204. Shorted or leaky: C204, C202 (rotate R202).
4	A	Loud, clear signal with weak signal input.	Open: C201, R203. Shorted: C304*. Leaky: C304*.

Listening Test: Distortion may be caused by shorted or leaky C201, C204, or C205, or by open R203 or R205.

* This part, located in another section, may cause abnormal indication in this section.

TROUBLE SHOOTING

Section 3

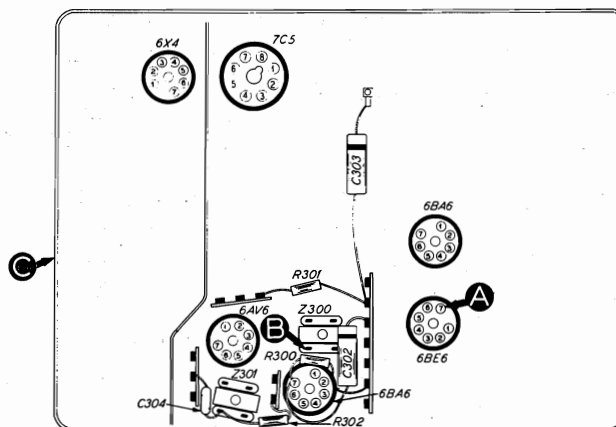
For the tests in this section, use an r-f signal generator, with modulated output, set at 455 kc. Connect the generator ground lead to the chassis, test point C; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Depress manual-tuning push button.

Turn the volume control to maximum, and the tone control fully counterclockwise.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 4; if not, isolate and correct the trouble in this section.

Since the circuit location of test point A for this section is the same as that of test point B for Section 4, the effectiveness of step 1 as a master check is dependent upon the condition of certain parts in Section 4; these parts are listed below under "POSSIBLE CAUSE OF ABNORMAL INDICATION."



TP-4049C

Bottom View, Showing Section 3 Test Points

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with weak signal input.	Trouble in this section. Isolate by the following tests.
2	B	Loud, clear signal with moderate signal input.	Defective: 6BA6, Z301. Misaligned: Z301. Open: R300, R301, R302. Shorted: C302, C303, C304.
3	A	Loud, clear signal with weak signal input.	Defective: 6BE6*, Z300. Misaligned: Z300. Open: L403*.

* This part, located in another section, may cause abnormal indication in this section.

TROUBLE SHOOTING

Section 4

For the tests in this section, with the exception of the oscillator tests, use an r-f signal generator, with modulated output. Connect the generator ground lead to the chassis, test point C; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Turn the radio volume control to maximum, and the tone control fully counterclockwise.

If the "NORMAL INDICATION" is not obtained in step 1 (a), isolate and correct the trouble before making the test in step 1 (b).

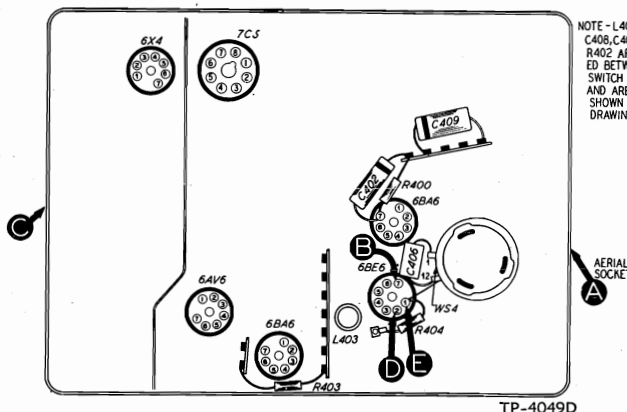


Figure 4. Bottom View, Showing Section 4 Test Points (locations of C404, WS1, 2, 3, 4, Z401, and Z402 are shown in figure 6)

STEP	TEST POINT	SIG. GEN. FREQ.	RADIO TUNING	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1 (a)	A	1000 kc.	Manual. Tune to signal.	Loud, clear signal with weak signal input.	Trouble in manual-tuning circuits; isolate by steps 2, 3, and 4, and correct trouble before proceeding.
1 (b)	A	Tune to freq. of each button.	Push button. Depress each button.	Loud, clear signal with weak signal input.	Trouble in push-button-tuning circuits; isolate by steps 5, 6, and 7.

MANUAL-TUNING TESTS

2	B	1000 kc.	Manual. Tune to signal.	Loud, clear signal with moderate signal input.	Defective: 6BE6. Open: R402. Trouble in oscillator circuit (step 3).
3	E to D Osc. Test (see note below).		Manual. Tune through range.	Negative 2 to 4 volts.	Defective: 6BE6, WS2(F). Open: L403, L402C, C406, C407, C408, R404. Shorted or leaky: C406, C407, C408.
4	A	1000 kc.	Manual. Tune to signal.	Loud, clear signal with weak signal input.	Defective: 6BA6, WS3(R), WS3(F), WS1(F), WS1(R), WS2(R). Open: L405, L402B, L402A, R400, R401, R402, R403, R405, C409, C404. Shorted or leaky: C409, C405, C404, C401.

PUSH-BUTTON-TUNING TESTS

5	B	Tune to freq. of each button.	Push button. Depress each button.	Loud, clear signal with moderate signal input.	Defective: WS1(F), WS1(R). Trouble in oscillator circuit (step 6).
6	E to D Osc. Test (see note below).		Push button. Depress each button.	Negative 2 to 4 volts.	Defective: WS2(F). Open or shorted: L401F, L401G, L401H, L401I, L401J.
7	A	Tune to freq. of each button.	Push button. Depress each button.	Loud, clear signal with weak signal input.	Defective: WS3(R), WS3(F), WS1(F), WS1(R), WS2(R), Z400. Open: L401A, L401B, L401C, L401D, L401E. Misaligned: Z400.

OSCILLATOR TESTS (steps 3 and 6)

Connect positive lead of high-resistance voltmeter to test point D (pin 2, cathode of 6BE6); connect prod end of negative lead through 100,000-ohm isolating resistor to test point E (pin 1, osc. grid of 6BE6). Use suitable meter range, such as 0—10 volts. Proper operation of oscillator is indicated by negative voltage, 2 to 4 volts (measured with 20,000-ohms-per-volt meter), throughout range of manual tuning, step 3, and of push-button tuning, step 6.

SETTING PUSH BUTTONS

Each adjusting rod controls ganged tuning cores for both aerial and oscillator circuits, so that only a single adjustment is required for a given frequency. The ganged tuning cores are adjusted by turning the small plastic knobs, numbered 1, 2, 3, 4, and 5, on the front of the radio.

1. Use an r-f signal generator to furnish test signals at the approximate frequencies of the desired stations. Connect the generator ground lead to the chassis. Connect the output lead through a 30-mmF. condenser to the aerial receptacle; connect another 30-mmF. condenser between the aerial receptacle and the chassis.

2. Turn on the power, set the volume control to maximum, and turn the tone control fully counter-clockwise.

3. Starting with the lowest frequency desired, set the signal generator, depress button No. 1 and adjust knob No. 1 for maximum output. Repeat the pro-

cedure for buttons 2, 3, 4, and 5.

4. After the radio is installed in the car, and the aerial connected, allow a fifteen-minute warm-up period, then readjust the tuning for each button while listening to the station for which the adjustment is being made.

REPLACEMENT PARTS LIST

SECTION 1

Reference Symbol	Description	Service Part No.
C100	Condenser, r-f by-pass, 330 mmf.	62-133001001
C101	Condenser, by-pass, .5 mf.	61-0137*
C102	Condenser, by-pass, 330 mmf.	62-133001001
C103	Condenser, by-pass, .5 mf.	61-0137*
C104	Condenser, buffer, .005 mf.	61-0153*
C105	Condenser, electrolytic, 2-section	61-0089
C105A	Condenser, filter, 15 mf., 350v	Part of C105
C105B	Condenser, filter, 10 mf., 350v	Part of C105
C106	Condenser, by-pass, .25 mf.	61-0125
C107	Condenser, by-pass, .05 mf.	30-4590
I100	Pilot lamp	34-2040
I101	Pilot lamp	34-2040
I102	Pilot lamp	34-2040
I103	Pilot lamp	34-2040
I104	Pilot lamp	34-2040
I105	Pilot lamp	34-2040
J100	Socket, control plug	27-6234
J101	Socket, foot control	27-6186*
L100	Choke, "A"	65-0037
L101	Choke, "A"	32-4170
L102	Solenoid	Part of Z100
PB1	Push-button switch	Part of Z101
PB2	Push-button switch	Part of Z101
PB3	Push-button switch	Part of Z101
PB4	Push-button switch	Part of Z101
PB5	Push-button switch	Part of Z101
PB6	Push-button switch	Part of Z101
PL100	Plug, control head	76-3124
R100	Resistor, damping, 100 ohms	66-1104340*
R101	Resistor, damping, 100 ohms	66-1104340*
R102	Resistor, filter, 1000 ohms	66-2104340*
R103	Resistor, filter, 4700 ohms	66-2473340*
S100	Switch, off-on	Part of R200
S101	Switch, muting	Part of Z101
S102	Switch, solenoid interrupter	Part of Z100
T100	Transformer, power	32-8313
VB100	Vibrator	45-8307*
WS4(F)	Wafer section, homing	Part of Z100
WS4(R)	Wafer section, homing	Part of Z100
Z100	Solenoid-and-wafer-switch assembly	76-2945
Z101	Switch-and-lamp-housing assembly	76-2957

SECTION 2

C200	Condenser, tone compensation, .01 mf. (in control head)	61-0120*
C201	Condenser, d-c blocking, .004 mf.	61-0179*
C202	Condenser, tone compensation, .01 mf. (in control head)	61-0120*
C203	Condenser, r-f by-pass, 100 mmf.	30-1224-18
C204	Condenser, d-c blocking, .01 mf.	61-0120*
C205	Condenser, cathode by-pass, 20 mf., 25v	Part of C105
C206	Condenser, tone compensation, .006 mf.	61-0105*
LS200	Loud-speaker	36-1609-6
R200	Volume control Universal	33-5557
	Buick, special	33-5557-1
R201	Resistor, tone compensation, 15,000 ohms (in control head)	66-3153340*
R202	Tone control, 5 megohms (in control head)	Part of R200
R203	Resistor, grid return, 10 megohms	66-6103340*
R204	Resistor, plate load, 220,000 ohms	66-4223340*
R205	Resistor, grid return, 470,000 ohms	66-4473340*
R206	Resistor, cathode bias, 220 ohms	66-1224340*
T200	Transformer, output	32-8315

SECTION 3

C300A	Condenser, fixed trimmer, 107 mmf.	Part of Z300
C300B	Condenser, fixed trimmer, 86 mmf.	Part of Z300
C301A	Condenser, fixed trimmer, 131 mmf.	Part of Z301
C301B	Condenser, fixed trimmer, 106 mmf.	Part of Z301
C302	Condenser, cathode by-pass, .05 mf.	61-0122*
C303	Condenser, screen grid by-pass, .05 mf.	61-0122*

NOTE: Part numbers marked with an asterisk (*) are general replacement items. These numbers may not be identical with those on factory assemblies; also, the electrical values of some replacement items may differ from the values indicated in the schematic diagram and parts list. The values substituted in any case are so chosen that the operation of the radio will be either unchanged or improved. When ordering replacements, use only the "Service Part No."

SECTION 3 (Continued)

Reference Symbol	Description	Service Part No.
C304	Condenser, r-f by-pass, 100 mmf.	30-1224-18
R300	Resistor, cathode bias, 2200 ohms	66-2223340*
R301	Resistor, screen dropping, 27,000 ohms	66-3274340*
R302	Resistor, r-f filter, 27,000 ohms	66-3273340*
Z300	Transformer, 1st i-f	32-4160
Z301	Transformer, 2nd i-f	32-4161

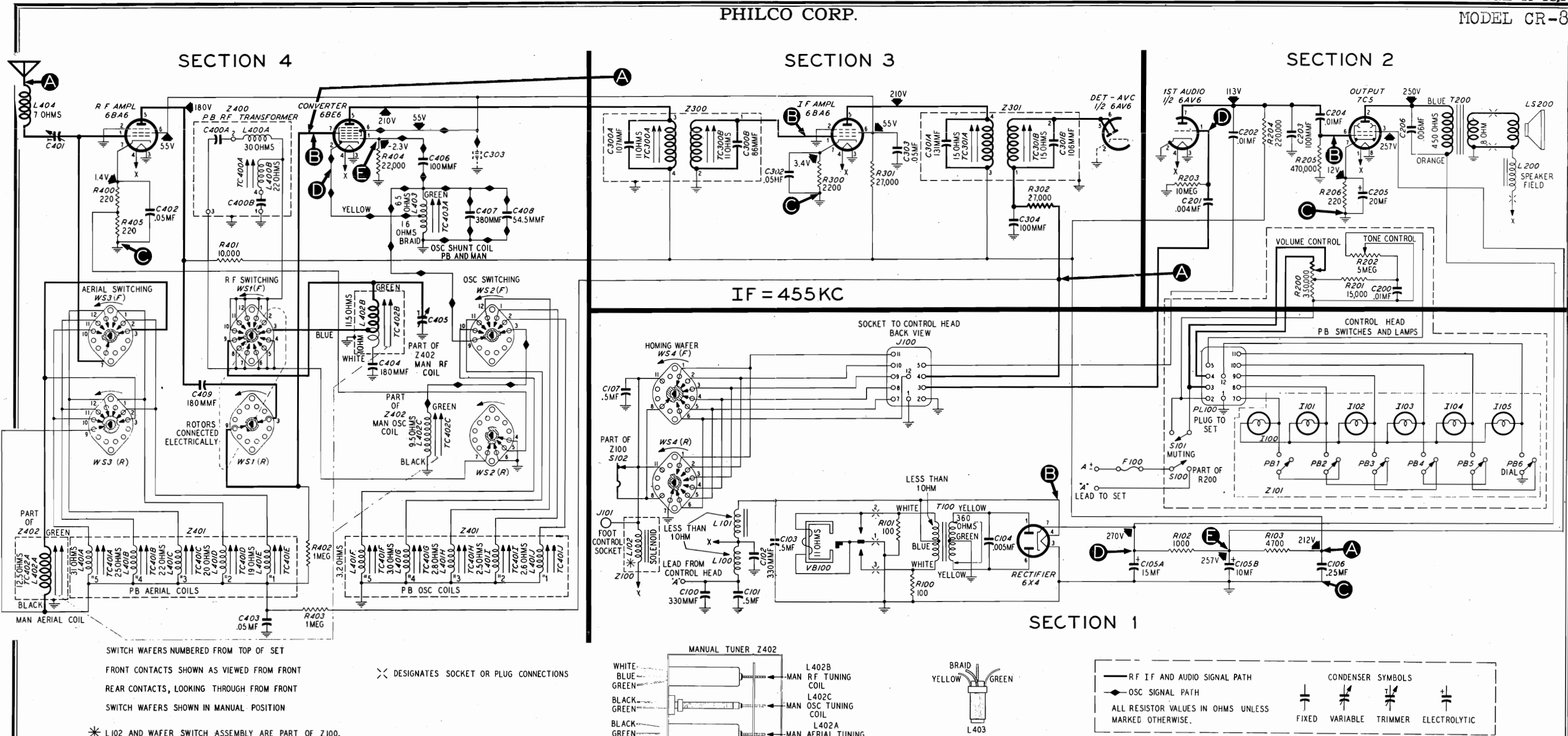
SECTION 4

C400A	Condenser, d-c blocking	Part of Z400
C400B	Condenser, fixed padder	Part of Z400
C401	Condenser, aerial padder	63-0055
C402	Condenser, cathode by-pass, .05 mf.	61-0122*
C403	Condenser, a-v-c filter, .05 mf.	61-0122*
C404	Condenser, fixed padder, 180 mmf.	60-10205307*
C405	Condenser, r-f trimmer	63-0055
C406	Condenser, grid blocking, 100 mmf.	30-1224-18
C407	Condenser, shunt, 380 mmf.	30-1220-37
C408	Condenser, shunt, 54.5 mmf.	61-0149
C409	Condenser, d-c blocking, 180 mmf.	60-10205307*
L400A	Coil, i-f trap	Part of Z400
L400B	Coil, i-f trap	Part of Z400
L401A	Coil, aerial, push-button	Part of Z401
L401B	Coil, aerial, push-button	Part of Z401
L401C	Coil, aerial, push-button	Part of Z401
L401D	Coil, aerial, push-button	Part of Z401
L401E	Coil, aerial, push-button	Part of Z401
L401F	Coil, osc. tuning, push-button	Part of Z401
L401G	Coil, osc. tuning, push-button	Part of Z401
L401H	Coil, osc. tuning, push-button	Part of Z401
L401I	Coil, osc. tuning, push-button	Part of Z401
L401J	Coil, osc. tuning, push-button	Part of Z401
L402A	Coil, aerial, manual (part of Z402)	65-0443-4
L402B	Coil, r-f, manual (part of Z402)	65-0443-5
L402C	Coil, oscillator, manual (part of Z402)	65-0443-6
L403	Coil, oscillator shunt	32-4110
L404	Coil, aerial	65-0437
R400	Resistor, cathode bias, 220 ohms	66-1223340*
R401	Resistor, plate dropping, 10,000 ohms	66-3103340*
R402	Resistor, grid return, 1 megohm	66-5103340*
R403	Resistor, a-v-c filter, 1 megohm	66-5103340*
R404	Resistor, grid return, 22,000 ohms	66-3223340*
R405	Resistor, cathode bias, 220 ohms	66-1223340*
Z400	Trap assembly, i-f.	32-4162
Z401	Coil assembly, push-button	76-2715
Z402	Coil assembly, push-button	76-2919
WS1(F)	Wafer section, r.f.	Part of Z100
WS1(R)	Wafer section, r.f.	Part of Z100
WS2(F)	Wafer section, osc.	Part of Z100
WS2(R)	Wafer section, osc.	Part of Z100
WS3(F)	Wafer section, aerial	Part of Z100
WS3(R)	Wafer section, aerial	Part of Z100

MISCELLANEOUS

Description	Service Part No.
"A" lead assembly	41-3187-1
Braid, bonding	95-0073
Cap, lamp-housing	54-4408
Clip, anti-rattle spring	28-2488FA1
Clip, spring, cover grounding	57-1335
Cover, tube side	76-3015FJ21
Cover, wiring side	56-4421FJ21
Driver-and-shaft assembly	76-2716
Housing assembly	76-2879FJ21
Knob, push-button	56-4406
Plate, speaker mtg.	56-4557FA3
Screen, speaker	57-4557FA3
Slider assembly, manual tuner	76-2730
Socket, Loktal	27-6138
Socket, miniature	27-6226
Socket, speaker	55-0438-1
Spring, back-lash nut, manual tuner	57-1705FA1
Spring, core guide, manual tuner	57-1708

PHILCO CORP.



SPECIFICATIONS

CIRCUIT Six-tube superheterodyne

FREQUENCY RANGE 535—1600 kc.

PUSH BUTTONS Six: five for station selection; one for manual tuning

AUDIO OUTPUT 3 watts

POWER INPUT 8 amperes at 6.6 volts, d.c.

AERIAL Any Philco auto-radio aerial

PHILCO TUBES (6) 6BA6 (2), 6BE6, 6AV6, 7C5, 6X4

SWITCH WAFERS NUMBERED FROM TOP OF SET

FRONT CONTACTS SHOWN AS VIEWED FROM FRONT

REAR CONTACTS, LOOKING THROUGH FROM FRONT

SWITCH WAFERS SHOWN IN MANUAL POSITION

* L102 AND WAFER SWITCH ASSEMBLY ARE PART OF Z100.

Circuit Description

Philco Auto Radio Model CR-8 is a six-tube superheterodyne radio of the universal-mounting type. The speaker and control head are separately mounted.

The aerial input circuit is designed for maximum reduction of signal interference without loss of signal strength. Permeability tuning is used for all main circuits. Of the six push buttons, located on the control head, five are used for automatic station selection, and one selects manual tuning. A foot switch and cable assembly (Foot Control Kit, Philco Part No. 45-1545) is available, for automatic tuning of stations by foot control; the switch cable is connected by plugging it into the pin jack, J101. The pilot lamps are connected, through the switch wafers, in a series-parallel circuit; the wiring is so arranged that the lamp which glows above the push button in use is in series with the parallel combination of the other five lamps.

Sectionalized Schematic Diagram, Showing Test Points

A tuned r-f amplifier stage, incorporating a 6BA6 pentode, provides good sensitivity and selectivity. The converter, a 6BE6, works into a 6BA6 i-f amplifier, which operates at 455 kc.

The 6AV6 duo-diode, triode tube provides detection and a-v-c voltage in the diode section; the triode section functions as the first audio amplifier. The first audio stage is resistance-coupled to the 7C5 beam-power output amplifier. Approximately three watts of audio power is supplied to the electrodynamic speaker.

The power supply includes a non-synchronous vibrator and a type 6X4 rectifier.

To avoid possible damage to the radio, the following preliminary checks should be made before turning on the power:

1. Inspect both the top and the bottom of the chassis. Make sure that all tubes are secure in the proper sockets, and look for any broken or shorted connections, burned resistors, or other obvious sources of trouble.

2. Measure the resistance between B+ (pin 7 of 6X4 rectifier tube) and the radio chassis, test point C, with the ohmmeter polarity such that the highest resistance reading is obtained. If the reading is lower than 5,000 ohms, check condensers C105A, C105B, and C106 for leakage or shorts.

The resistance value above, which is much lower than normal, is not intended as a quality check of these condensers; the value given is the lowest at which the rectifier will operate safely while the voltage tests of Section 1 are performed.

ALIGNMENT PROCEDURE

NOTE: THE CONTROL UNIT SHOULD BE PLUGGED INTO THE RADIO.

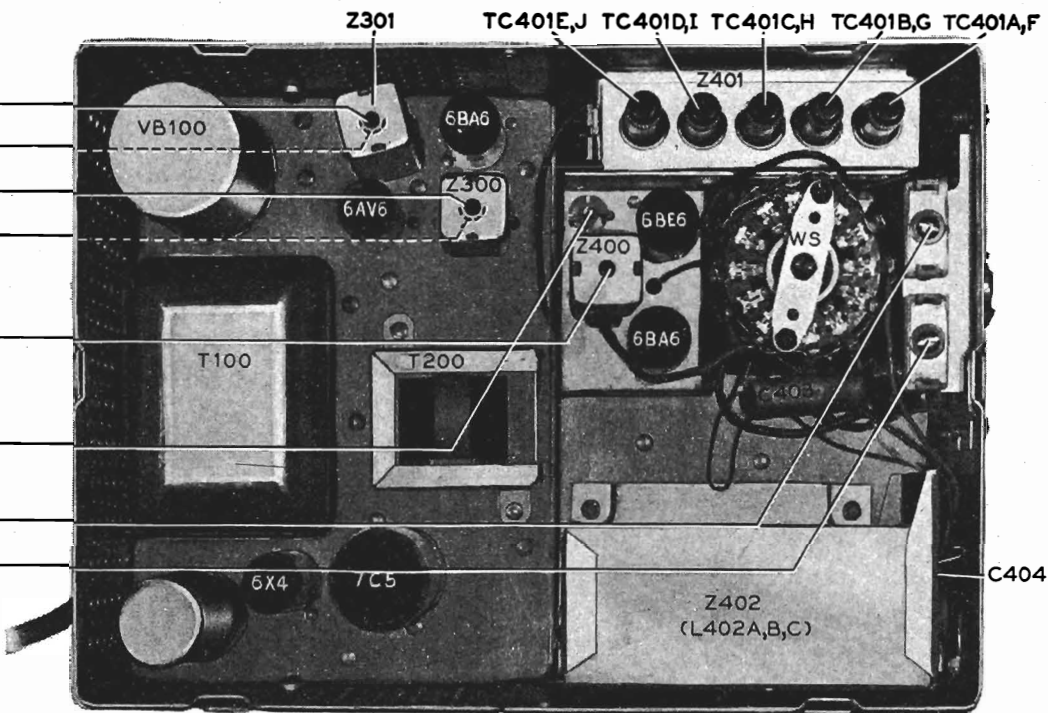
DIAL POINTER—With tuning cable disengaged, set tuning-core gang to full-mesh position; turn dial of tuning control to low-frequency end until pointer stops, then engage tuning cable.

OUTPUT METER—Connect across voice-coil terminals.
SIGNAL GENERATOR—Connect ground lead to chassis; connect output lead as indicated in chart. Use modulated output.

RADIO CONTROLS—Turn volume control to maximum, and tone control fully counterclockwise; use push buttons as directed in chart.

OUTPUT LEVEL—During alignment, adjust signal-generator output to maintain output-meter indication below 1 volt.

STEP	SIGNAL GENERATOR		RADIO		ADJUST
	CONNECTIONS TO RADIO	FREQUENCY	TUNING	SPECIAL INSTRUCTIONS	
1	Through .05-mf. condenser to aerial receptacle.	455 kc.	Manual. 1600 kc.	Adjust, in order given, for maximum output.	TC301B TC301A TC300B TC300A
2	Same as step 1.	455 kc.	Any push button except manual tuning.	Adjust for minimum output.	TC400A
3	Dummy aerial (see note below).	580 kc.	Manual. 580 kc.	Adjust for maximum output while rocking tuning control.	TC403A
4	Same as step 3.	1600 kc.	Manual. Tune to signal.	Adjust for maximum output.	C405 C401
5	Same as step 3.	1400 kc.	Manual. Tune to signal.	Re-engage tuning cable for correct calibration.	
6	Repeat steps 3, 4, and 5 until no further improvement is obtained.				
7	After reinstalling radio in car, adjust C401 for maximum output from weak station near 1400 kc. Re-engage tuning control for correct dial calibration.				



Top View, Showing Trimmer and Tuning-Core Locations (dotted lines indicate tuning screws located at bottom of chassis)

DUMMY AERIAL: Connect generator output lead through 30-mmfd. condenser to aerial receptacle; connect another 30-mmfd. condenser between aerial receptacle and chassis.

TROUBLE SHOOTING

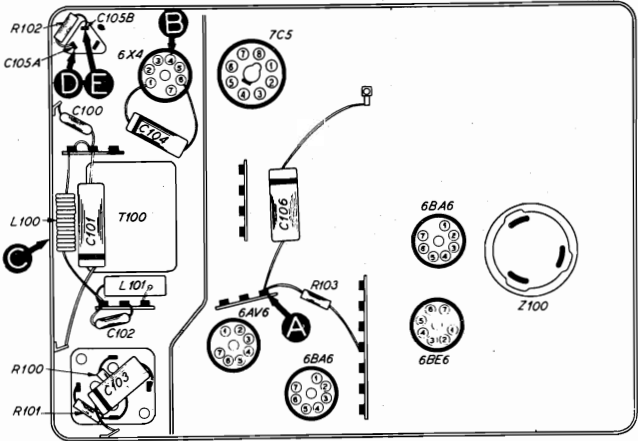
Section 1

NOTE: For all trouble-shooting tests given in this manual, the control unit should be plugged into the radio.

Make the tests for this section with a d-c voltmeter, connecting the leads between test point C (chassis) and the test points indicated in the chart. The voltage readings given were taken with a 20,000-ohms-per-volt meter, with an "A" supply voltage of 6.6 volts, d.c.

Turn on the power and depress the manual-tuning button. Turn the volume control to minimum, and the tone control fully counterclockwise.

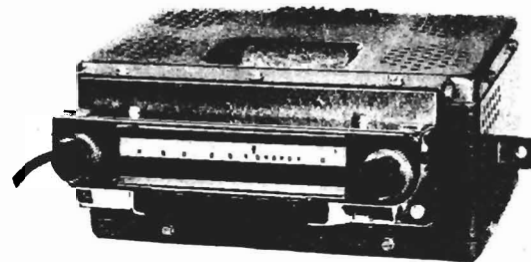
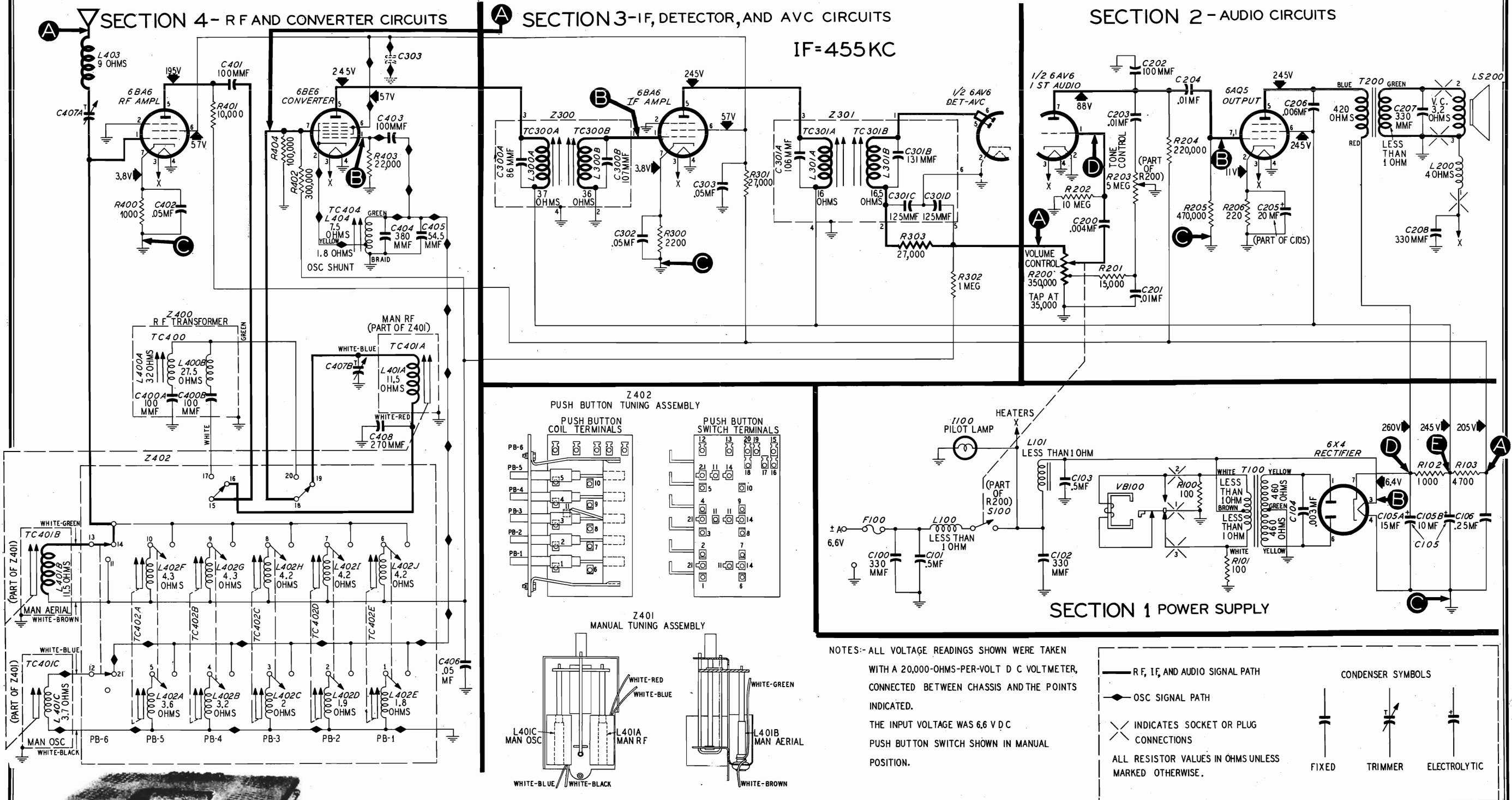
If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 2; if not, isolate and correct the trouble in this section.



Bottom View, Showing Section 1 Test Points

STEP	TEST POINT	NORMAL INDICATION	ABNORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A B	212v 6.6v		Trouble in this section. Isolate by the following tests.
2	B	6.6v	No voltage Low voltage	Open: F100, S100, L100, L101. Weak battery. Leaky: C100, C101, C102. Defective: VB100.
3	D	270v	No voltage Low voltage	Open: T100. Shorted: C100, C101, C102, C103, T100, C105A, C104. Defective: VB100, 6X4. Leaky: C105A. Defective: 6X4.
4	E	257v	No voltage Low voltage	Open: R102. Shorted: C105B. Leaky: C105B. Changed resistance: R102.
5	A	212v	No voltage Low voltage	Open: R103. Shorted: C106. Leaky: C106. Changed resistance: R103.

PHILCO CORP.



SPECIFICATIONS

CIRCUITSix-tube superheterodyne
FREQUENCY RANGE ..535—1600 kc.

PUSH BUTTONSSix: five for station selection;
one for manual tuning

INTERMEDIATE
FREQUENCY455 kc.

AUDIO OUTPUT2.5 watts

POWER INPUT7.3 amperes at 6.6 volts, d.c.,
with p-m speaker; 8.9 amperes
at 6.6 volts, d.c., with electro-
dynamic speaker

AERIALAny Philco Auto-Radio Aerial
PHILCO TUBES (6)6BA6(2), 6BE6, 6AV6, 6AQ5,
6X4

Circuit Description

Philco Model CR-9 is an auto radio of the custom-mounting type. The speaker is separately mounted. Permeability tuning is used in all r-f and i-f circuits. Of the six push buttons, five are used for instant automatic tuning of stations, and one for selecting manual tuning. In manual tuning, three tuned circuits are used. In push-button tuning, two tuned circuits are used, plus a broad-band r-f transformer (Z400) containing an i-f wave trap.

The circuit includes a 6BA6 r-f amplifier, a 6BE6 converter, a 6BA6 i-f amplifier, a 6AV6 detector, a.v.c., and first audio amplifier, and a 6AQ5 output amplifier. The power supply has a non-synchronous vibrator and a 6X4 rectifier. An iron-core choke (L101) is used for hash elimination.

The radio may come equipped with either an electrodynamic or a permanent-magnet speaker. Replacement speakers of either type are available; the speaker socket connections for both types are shown in the schematic diagram.

ALIGNMENT PROCEDURE

DIAL POINTER — Set tuning-core gang to full-mesh position. Adjust dial pointer to coincide with index mark, to left of "55."

OUTPUT METER — Connect across voice-coil circuit.

SIGNAL GENERATOR — Connect ground lead to chassis; connect output lead as indicated in chart. Use modulated output.

RADIO CONTROLS — Set volume control to maximum, and tone control fully clockwise. Set tuning control and push buttons as directed in chart.

OUTPUT LEVEL — During alignment, adjust signal-generator output to maintain output-meter indication below 1.5 volts.

DUMMY AERIAL — For steps 3, 4, and 5, connect signal-generator output lead through 30-mmfd. condenser to aerial receptacle; connect another 30-mmfd. condenser from receptacle to chassis.

IMPORTANT! These instructions for the use of a dummy aerial must be carefully followed if the radio is to perform at its best after being reinstalled in the car.

STEP	SIGNAL GENERATOR		RADIO		ADJUST
	CONNECTIONS TO RADIO	DIAL SETTING	PUSH BUTTON AND DIAL	SPECIAL INSTRUCTIONS	
1	Through .05 mf. condenser to mixer grid (pin 7) of 6BE6.	455 kc.	Manual. 1600 kc.	Adjust, in order given, for maximum output. (TC301A and TC300A are reached through holes in bottom of i-f transformers.)	TC301B — 2nd i-f sec. TC301A — 2nd i-f pri. TC300B — 1st i-f sec. TC300A — 1st i-f pri.
2	Through .05 mf. condenser to aerial receptacle.	455 kc.	Any push button except manual.	Adjust for minimum output.	TC400 — i-f trap
3	Through dummy aerial to aerial receptacle.	580 kc.	Manual. 580 kc.	Adjust for maximum, while rocking tuning control.	TC404 — osc. padding
4	Same as step 3.	1400 kc.	Manual. Tune to signal.	Adjust, in order given, for maximum output.	C407A — aerial (series) C407B — r-f (shunt)
5	Repeat steps 3 and 4 until no further improvement is obtained.				
6	After reinstalling radio in car, with aerial connected, depress manual push button, and tune in weak station near 1400 kc.; then adjust aerial series trimmer, C407A, for maximum output.				

TROUBLE-SHOOTING Procedure

For rapid trouble shooting, the radio circuit is divided into four sections, as follows:

Section 1—the power supply
Section 2—the audio circuits
Section 3—the i-f, detector, and a-v-c circuits
Section 4—the r-f and converter circuits

Test points are specified for each section, and are indicated in the sectionalized schematic diagram. The trouble-shooting procedure given for each section includes a simplified test chart and a bottom view of the chassis, showing the locations of the test points and the components of that section.

In each chart, the first step is a master check for determining whether trouble exists in that section, without going through the entire chart.

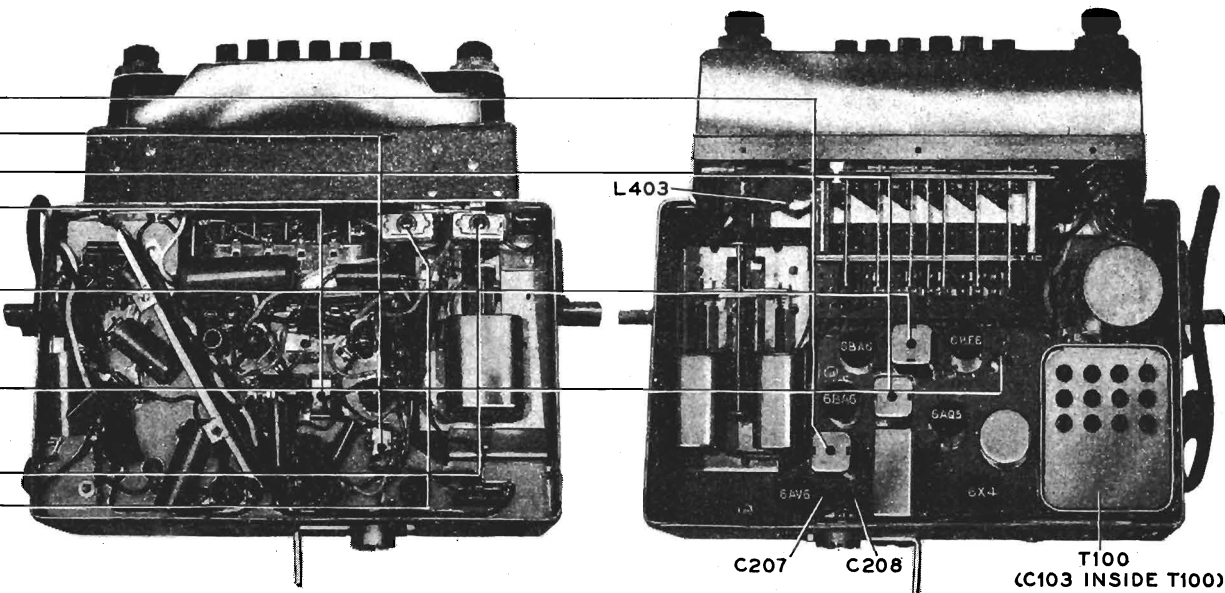
Failure to obtain the "NORMAL INDICATION" in any given step indicates trouble within the circuit under test.

After isolating the trouble to a single stage, the defect is located by: first, testing the tube; second, measuring tube electrode voltages; third, measuring circuit resistances; fourth, substituting condensers. The trouble revealed should be corrected before testing further.

Preliminary Checks

To avoid possible damage to the radio, the following preliminary checks should be made before connecting the radio to a source of power.

1. Inspect both the top and the bottom of the chassis. Make sure that all tubes are secure in the proper sockets, and look for any broken or shorted connections, burned resistors, blown fuse, or other obvious indications of trouble.
2. Measure the resistance between B+ (pin 7 of 6X4 rectifier) and the chassis, test point C. When the ohmmeter test leads are connected in the proper polarity, the highest resistance reading will be obtained. If the reading is lower than 2775 ohms, check condensers C105A and C105B for leakage or shorts.
NOTE: The resistance value above, which is much lower than normal, is not intended as a quality check of these condensers; the value given is the lowest at which the rectifier will operate safely while the voltage tests of Section 1 are performed.
3. If the fuse is blown, check the vibrator before installing a new fuse; if the vibrator is defective, check the buffer condenser, C104, before installing a new vibrator.



Top and Bottom Views, Showing Trimmer and Tuning-Core Locations

SETTING PUSH BUTTONS

The adjustments are made by removing the push-button caps and turning each of the adjusting rods. Each rod controls ganged tuning cores for both aerial and oscillator circuits, so that only a single adjustment is required for a given frequency.

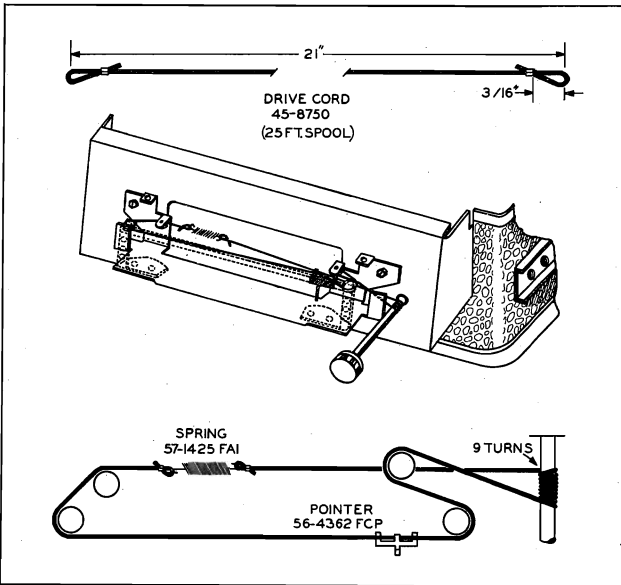
Use an r-f signal generator to furnish test signals at the approximate frequencies of the desired stations. Connect the dummy aerial described in the alignment procedure.

1. Turn on the power, and allow the radio to warm up for 15 minutes. Set the volume control for a moderate level, and the tone control fully clockwise.
2. Starting with the lowest frequency desired, set the signal generator, depress PB-5 (fifth from left), and adjust the rod for maximum output. Repeat the procedure for each remaining button, working from right to left.

The frequency ranges of the buttons are as follows:

PUSH BUTTON (Left to right, from front)	FREQUENCY RANGE
PB-1	850—1600 kc.
PB-2	750—1400 kc.
PB-3	700—1300 kc.
PB-4	650—1150 kc.
PB-5	540—1000 kc.

3. With the radio in the car, and the aerial connected, make a final adjustment of each rod while listening to the station for which the adjustment is being made.



TP-4734E

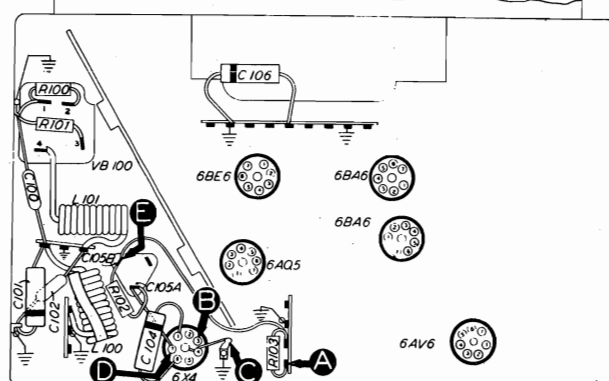
Drive-Cord Installation Details

Section 1 — Power Supply

Make the tests for this section with a d-c volt-meter, connecting the leads between the chassis and the test points indicated in the chart. The voltage readings given were taken with a 20,000-ohms-per-volt meter, with an input voltage of 6.6v, d.c. to the radio.

Depress the manual push button; set the volume control to minimum, and tone control fully clockwise.

Follow the steps in the order given. If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 2 (audio circuits); if not, isolate and correct the trouble in this section.



TP-4734A

Bottom View, Showing Section 1 Test Points
(location of C103 shown in figure 6)

STEP	TEST POINT	NORMAL INDICATION	ABNORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	205v		Trouble in this section. Isolate by the following tests.
2	B	6.4v	No voltage Low voltage	Open: F100, L100, S100, L101. Leaky: C100, C101, C102, C103. Weak battery.
3	D	260v	No voltage Low voltage High voltage	Defective: VB100†, 6X4. Open: T100. Shorted: T100, C104, C105A. Defective: 6X4, VB100†. Leaky: C105A, C104. Shorted: C105B, T100. Open: C105A, T100. Open: R102, T200*, R207*.
4	E	245v	No voltage Low voltage High voltage	Open: R102. Shorted: C105B. Leaky: C105B. Changed resistance: R102. Open: R103, R207*.
5	A	205v	No voltage Low voltage	Shorted: C106. Open: R103. Leaky: C106. Changed resistance: R103.

Listening Test: Abnormal hum may be caused by open C105A, C105B, or C104.

*This part, located in another section, may cause abnormal indication in this section.

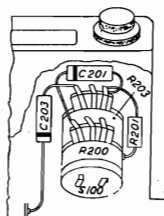
†If the vibrator is defective, check the buffer condenser, C104, before installing a new vibrator.

Section 2 — Audio Circuits

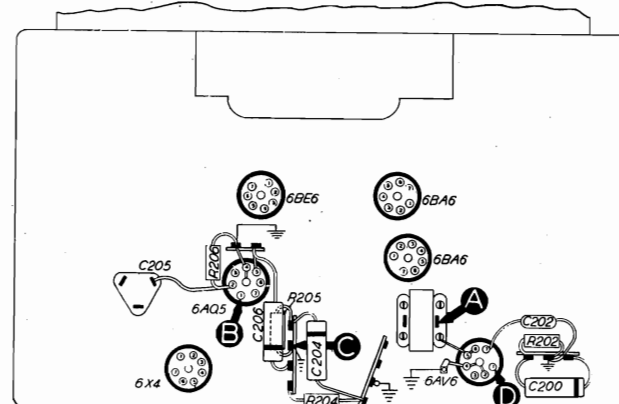
For the tests in this section, use an audio-frequency signal generator. Connect the generator ground lead to the chassis, test point C; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Depress the manual push button; set the volume control to maximum, and the tone control fully clockwise.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 3 (i-f, detector, and a-v-c circuits); if not, isolate and correct the trouble in this section.



TRouble SHOOTING



TP-4734B

Bottom View, Showing Section 2 Test Points
(locations of C207 and C208 shown in figure 6)

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with weak signal input.	Trouble in this section. Isolate by the following tests.
2	B	Clear signal with strong signal input.	Defective: 6AQ5. Open: T200, LS200, L200, R206. Shorted: T200, C206, C207, C204, C202.
3	D	Loud, clear signal with weak signal input.	Defective: 6AV6 (triode section). Open: C204, R204. Shorted or leaky: C203 (rotate R203 through range).
4	A	Loud, clear signal with weak signal input.	Open: R200 (rotate through range), C200.

Listening Test: Distortion may be caused by shorted or leaky C200, C204, C205, or open R202, R205.

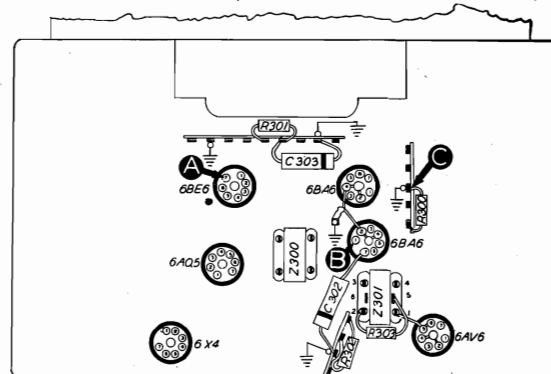
Section 3 — I-F, Detector, and A-V-C Circuits TROUBLE SHOOTING

For the tests in this section, use an r-f signal generator, with modulated output, set at 455 kc. Connect the generator ground lead to the chassis, test point C; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Depress the manual push button; set the volume control to maximum, and the tone control fully clockwise.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 4 (r-f and converter circuits); if not, isolate and correct the trouble in this section.

Since the circuit location of test point A for this section is in Section 4, the effectiveness of step 1 as a master check is dependent upon the condition of certain parts in Section 4; these parts are listed below under "POSSIBLE CAUSE OF ABNORMAL INDICATION."



Bottom View, Showing Section 3 Test Points

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with weak signal input.	Trouble in this section. Isolate by the following tests.
2	B	Clear signal with weak signal input.	Defective: 6AV6 (diode section), 6BA6. Misaligned: Z301. Open: L301A, L301B, R301, R300, C301A, C301B, R303. Shorted: C301C, C303, C301A, C301B, C301D, C300B.
3	A	Same as step 1.	Defective: 6BE6*. Misaligned: Z300. Open: L300A, L300B, L404*, C407B*. Shorted: C300A, C300B.

*This part, located in another section, may cause abnormal indication in this section.

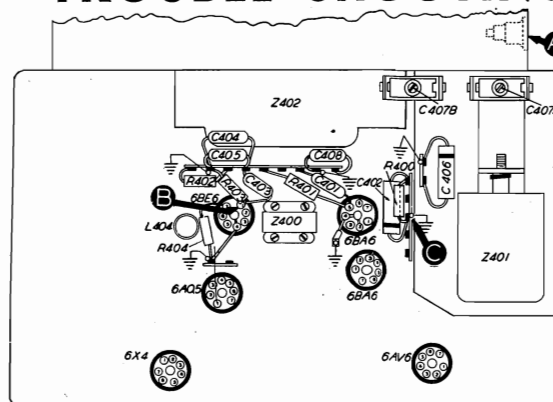
Section 4 — R-F and Converter Circuits TROUBLE SHOOTING

For the tests in this section, with the exception of the oscillator tests, use an r-f signal generator, with modulated output. Connect the generator ground lead to the chassis, test point C; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the volume control to maximum, and the tone control fully clockwise.

Set the push buttons, tuning control, and signal-generator frequency as indicated in the chart.

If the "NORMAL INDICATION" is not obtained in step 1(a) and (b), isolate the trouble by following the remaining steps.



Bottom View, Showing Section 4 Test Points (location of L403 shown in figure 6)

STEP	TEST POINT	SIGNAL GEN. FREQUENCY	RADIO TUNING	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1 (a)	A	1000 kc.	Manual. Tune to signal.	Loud, clear signal with weak signal input.	Trouble in manual-tuning circuits. Isolate by steps 2 and 3, and correct trouble before proceeding.
1 (b)	A	Tune to freq. of each push button	Depress each station push button.	Same as step 1 (a).	Trouble in push-button-tuning circuits. Isolate by steps 4 and 5.
2	B (Osc. test; see note below.)		Manual. Tune through range.	Negative .8 to 1.4 volts.	Defective: 6BE6 (osc. section). Open: R403, C403, L404, L401C, C404, C405, PB-6. Shorted: L404, L401C, C404, C405.
3	A	1000 kc.	Manual. Tune to signal.	Same as step 1 (a).	Defective: 6BA6. Open: L403, L401A, L401B, R400, R401, C401, PB-6, C408. Shorted: C408, C401, L401A, L401B.
4	B (Osc. test; see note below.)		Depress each station push button.	Negative 1.1 to 1.4 volts.	Open: Osc. coil or switch associated with any push button. Shorted: Osc. coil associated with any push button.
5	A	Tune to freq. of each push button	Depress each station push button.	Loud, clear signal with weak signal input.	Open: L400B, C400B, C407B, ant. coil associated with any push button. Shorted: L400B, C407A, ant. coil associated with any push button.

OSCILLATOR TEST

Connect the positive lead of a high-resistance voltmeter to the chassis, test point C; connect the prod end of the negative lead through a 100,000-ohm isolating resistor to the oscillator grid (pin 1) of the 6BE6, test point B. Proper operation of the oscillator is indicated by negative voltages of approximately the values given in the chart (measured with 20,000-ohms-per-volt meter), throughout the tuning range.

PHILCO CORP.

MODEL CR-9

SECTION 1
POWER SUPPLY

Reference Symbol	Description	Service Part No.
C100	Condenser, line filter, 330 mmf.	60-10335407*
C101	Condenser, line filter, 5 mf.	61-0137*
C102	Condenser, spark filter, 330 mmf.	60-10335407*
C103	Condenser, "A" filter, 5 mf.	61-0137*
C104	Condenser, buffer, .003 mf.	61-0115
C105	Condenser, electrolytic, 3-section	61-0089
C105A	Condenser, filter, 15 mf., 350v	Part of C105
C105B	Condenser, filter, 10 mf., 350v	Part of C105
C106	Condenser, plate filter, .25 mf.	61-0125
F100	Fuse, line, 14 amperes	45-2559
I100	Pilot lamp	34-2064
L100	Choke, "A"	65-0037
L101	Choke, "A", iron core	32-4170
R100	Resistor, damping, 100 ohms	66-1104340*
R101	Resistor, damping, 100 ohms	66-1104340*
R102	Resistor, filter, 1000 ohms	66-2104340*
R103	Resistor, filter, 4700 ohms	66-2473340*
S100	Switch, on-off	Part of R200
VB100	Vibrator	83-0026
T100	Transformer, power	32-8314-2

SECTION 2
AUDIO CIRCUITS

C200	Condenser, d-c blocking, .004 mf.	45-3502*
C201	Condenser, tone compensation, .01 mf.	30-4650-24
C202	Condenser, r-f by-pass, 100 mmf.	60-10105407*
C203	Condenser, tone control, .01 mf.	61-0120*
C204	Condenser, d-c blocking, .01 mf.	61-0120*
C205	Condenser, cathode by-pass, 20 mf., 25v	Part of C105
C206	Condenser, tone compensation, .006 mf.	61-0127*
C207	Condenser, hash filter, 330 mmf.	60-10335407*
C208	Condenser, hash filter, 330 mmf.	60-10335407*
L200	Speaker, field	Part of LS200 (electrodynamic)
LS200	Speaker	
	Electrodynamic	36-1622-1
	Permanent magnet	36-1622-2
R200	Volume control (with on-off switch and tone control), 350,000 ohms (tap at 35,000 ohms)	33-5537-3
R201	Resistor, tone compensation, 15,000 ohms	66-3153340*
R202	Resistor, grid return, 10 megohms	66-6103340*
R203	Tone control, 5 megohms	Part of R200
R204	Resistor, plate load, 220,000 ohms	66-4223340*
R205	Resistor, grid return, 470,000 ohms	66-4473340*
R206	Resistor, cathode bias, 220 ohms	66-1224340*
T200	Transformer, output	65-0317

SECTION 3
I-F, DETECTOR, AND A-V-C CIRCUITS

C300A	Condenser, shunt, 86 mmf.	Part of Z300
C300B	Condenser, shunt, 107 mmf.	Part of Z300
C301A	Condenser, shunt, 106 mmf.	Part of Z301
C301B	Condenser, shunt, 131 mmf.	Part of Z301
C301C	Condenser, i-f filter, 125 mmf.	Part of Z301
C301D	Condenser, i-f filter, 125 mmf.	Part of Z301
C302	Condenser, cathode by-pass, .05 mf.	61-0122*
C303	Condenser, screen by-pass, .05 mf.	61-0122*
L300A	Transformer, primary, 1st i-f	Part of Z300
L300B	Transformer, secondary, 1st i-f	Part of Z300
L301A	Transformer, primary, 2nd i-f	Part of Z301
L301B	Transformer, secondary, 2nd i-f	Part of Z301
R300	Resistor, cathode bias, 2200 ohms	66-2224340*
R301	Resistor, screen dropping, 27,000 ohms	66-3273350*
R302	Resistor, a-v-c filter, 1 megohm	66-5103340*
R303	Resistor, i-f filter, 27,000 ohms	66-3273340*
TC300A	Tuning core, primary, 1st i-f	Part of Z300
TC300B	Tuning core, secondary, 1st i-f	Part of Z300
TC301A	Tuning core, primary, 2nd i-f	Part of Z301
TC301B	Tuning core, secondary, 2nd i-f	Part of Z301
Z300	Transformer, 1st i-f	32-4160
Z301	Transformer, 2nd i-f	32-4240

SECTION 4
R-F AND CONVERTER CIRCUITS

C400A	Condenser, i-f trap, 100 mmf.	Part of Z400
C400B	Condenser, d-c blocking, 100 mmf.	Part of Z400
C401	Condenser, d-c blocking, 100 mmf.	60-10105407*
C402	Condenser, cathode by-pass, .05 mf.	61-0122*
C403	Condenser, d-c blocking, 100 mmf.	62-10105407*
C404	Condenser, shunt, 380 mmf.	40-1220-37
C405	Condenser, shunt, 54.5 mmf.	61-0149

Reference Symbol	Description	Service Part No.
C406	Condenser, a-v-c filter, .05 mf.	61-0122*
C407	Condenser, trimmer, 2-section	63-0035-6
C407A	Condenser, aerial trimmer	Part of C407
C407B	Condenser, r-f trimmer	Part of C407
C408	Condenser, series, 270 mmf.	60-10275407*
L400A	Coil, i-f trap	Part of Z400
L400B	Coil, band pass	Part of Z400
L401A	Coil, r-f, manual	Part of Z401
L401B	Coil, aerial, manual	Part of Z401
L401C	Coil, oscillator, manual	Part of Z401
L402A	Coil, oscillator, PB-5	Part of Z402
L402B	Coil, oscillator, PB-4	Part of Z402
L402C	Coil, oscillator, PB-3	Part of Z402
L402D	Coil, oscillator, PB-2	Part of Z402
L402E	Coil, oscillator, PB-1	Part of Z402
L402F	Coil, aerial, PB-5	Part of Z402
L402G	Coil, aerial, PB-4	Part of Z402
L402H	Coil, aerial, PB-3	Part of Z402
L402I	Coil, aerial, PB-2	Part of Z402
L402J	Coil, aerial, PB-1	Part of Z402
L403	Choke, spark	65-0439
L404	Coil, oscillator shunt	32-4110
PB-1	Push button No. 1	Part of Z402
PB-2	Push button No. 2	Part of Z402
PB-3	Push button No. 3	Part of Z402
PB-4	Push button No. 4	Part of Z402
PB-5	Push button No. 5	Part of Z402
PB-6	Push button, manual	Part of Z402
R400	Resistor, cathode bias, 1000 ohms	66-2103340*
R401	Resistor, plate load, 10,000 ohms	66-3104340*
R402	Resistor, grid return, 330,000 ohms	66-4333340*
R403	Resistor, grid bias, 22,000 ohms	66-3223340*
R404	Resistor, grid return, 100,000 ohms	66-4103340*
TC400	Tuning core, i-f trap	Part of Z400
TC401A	Tuning core, r-f, manual	Part of Z401
TC401B	Tuning core, aerial, manual	Part of Z401
TC401C	Tuning core, oscillator, manual	Part of Z401
TC402A	Tuning core, aerial and osc., PB-5	Part of Z402
TC402B	Tuning core, aerial and osc., PB-4	Part of Z402
TC402C	Tuning core, aerial and osc., PB-3	Part of Z402
TC402D	Tuning core, aerial and osc., PB-2	Part of Z402
TC402E	Tuning core, aerial and osc., PB-1	Part of Z402
T404	Tuning core, osc. padding	Part of L404
Z400	Transformer, r-f	32-4162
Z401	Manual-tuning assembly	76-3348
Z402	Push-button assembly	76-3349

MISCELLANEOUS

Description	Service Part No.
Background-plate-and-bracket assembly	76-3351
Bezel	56-4459-2FA0
Cable, speaker (electrodynamic)	41-3801-2
Cable, speaker (permanent magnet)	41-3801-3
Clip, dial mtg.	56-4456FA1
Cord, drive, (25-ft. spool)	45-8750
Cover-and-button assembly	76-3639FJ21
Cover, push button	56-3386-1FJ39
Cover, tube side	76-3355FJ21
Dial scale	27-5983
Fuse-lead assembly	76-2070-91
Gasket, speaker	55-1482
Grommet, "A" lead	27-4596
Hairpin (manual-tuner shaft)	57-1868FA11
Housing-and-bracket assembly	76-3354FJ21
Knob, adjusting	27-4687-5
Knob, tone control	77-1025-3
Knob, dummy	77-1026
Pointer	56-4362FCP
Push-button assembly	
Link	56-4034FCP
Core-and-key-assembly, push button	77-0915-1
Set-Mounting Kit	
Bracket	56-4767-2FA3
Screw, 12-24 x 5/8"	1W10677FA3
Washer, flat	1W52420FA3
Lock washer, ext.	1W24259FA1
Nut	1W19992FA3
Bolt, hook	57-2468FA3
Shaft (manual tuner)	56-5124FA3
Socket assembly, pilot lamp	76-1677-1
Socket, aerial	57-0590-1FA3
Socket, speaker	55-0438-1FA3
Socket, tube	27-6226
Socket, vibrator	27-6153
Spring, drive cord	57-1425FA1
Suppression kit	40-7486
Condenser, interference filter	30-4007
Resistor, distributor	33-1196

MODEL P-4735,
Packard

PHILCO CORP.

TROUBLE SHOOTING

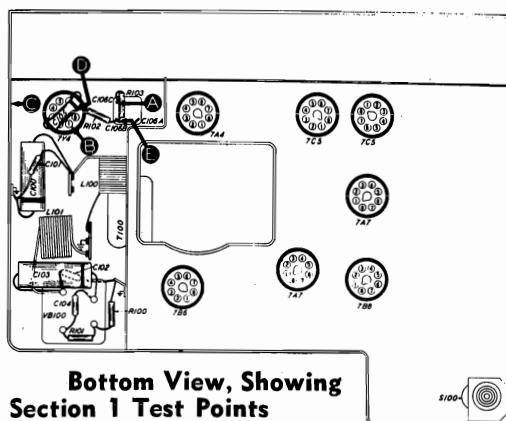
Section 1

Make the tests for this section with a d-c voltmeter, connecting the leads between test point B (B-) and the test points indicated in the chart. The voltage readings given were taken with a 20,000-ohms-per-volt meter, with an "A"-supply voltage of 6.6 volts, d.c.

Turn on the power, and set the sensitivity control to maximum (clockwise).

Turn the volume control to minimum, and the tone control fully counterclockwise.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 2; if not, isolate and correct the trouble in this section.



PHILCO CORP.

MODEL P-4735,
Packard

TROUBLE SHOOTING

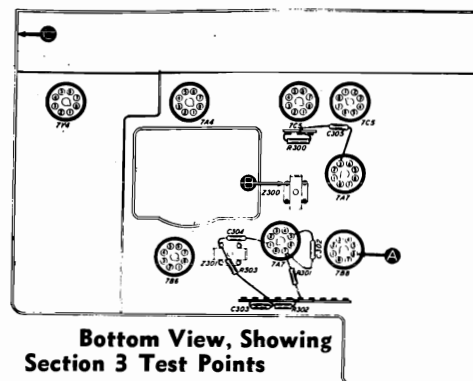
Section 3

For the tests in this section, use an r-f signal generator, with modulated output, set at 265 kc. Connect the generator ground lead to the chassis, test point C; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Turn the volume control to maximum, and the tone control fully counterclockwise. Set the sensitivity control to maximum.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 4; if not, isolate and correct the trouble in this section.

Since the circuit location of test point A for this section is the same as that of test point B for Section 4, the effectiveness of step 1 as a master check is dependent upon the condition of certain parts in Section 4; these parts are listed under "POSSIBLE CAUSE OF ABNORMAL INDICATION."



Bottom View, Showing
Section 3 Test Points

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with weak signal input.	Trouble in this section. Isolate by the following tests.
2	B	Loud, clear signal with moderate signal input.	Defective: 7A7, 7B6 (diode section). Misaligned: Z301. Open: Z301 pri. or sec., C301A, C301B, R301, R300, R406* (rotate through range), R303. Shorted: Z301 pri. or sec., C301A, C301B, C300B, C303, C304, C305.
3	C	Loud, clear signal with weak signal input.	Defective: 7B8.* Misaligned: Z300. Open: Z300 pri. or sec., C300A, C300B. Shorted: C405,* Z300 pri., C300A, C300B.

* This part, located in another section, may cause abnormal indication in this section.

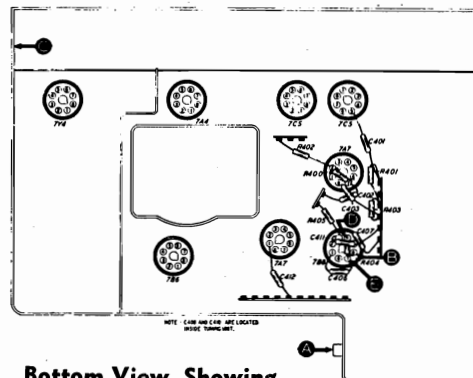
TROUBLE SHOOTING

Section 4

For the tests in this section, with the exception of the oscillator test, use an r-f signal generator, with modulated output. Connect the generator ground lead to the chassis, test point C; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Turn the volume control to maximum, and the tone control fully counterclockwise. Set the sensitivity control to maximum.

If the "NORMAL INDICATION" is not obtained in step 1, isolate the trouble by following the remaining steps.



Bottom View, Showing
Section 4 Test Points (locations of C404, L401,
R406, and Z400 are shown in figure 6)

STEP	TEST POINT	SIG. GEN. FREQ.	RADIO TUNING	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	1000 kc.	Tune to signal.	Loud, clear signal with weak signal input.	Trouble in this section. Isolate by the following tests.
2	B	1000 kc.	Tune to signal.	Loud, clear signal with moderate signal input.	Defective: 7B8. Shorted: L400B, C404, C405. Trouble in oscillator circuit (step 3).
3	D to E Osc. Test (see note below)		Tune through range.	Negative 2 to 4 volts.	Shorted or leaky: C411, C410, C407, C408, C409. Open: C411, L400D, C407, R404, R405, R406, L400C, C408, C410. Shorted: L400C, L400D.
4	A	1000 kc.	Tune to signal.	Loud, clear signal with weak signal input.	Defective: 7A7. Open: L401, R400, R401, R402, C403, R403, L400B, L400A. Shorted or leaky: C403, C412, C404.

OSCILLATOR TEST

Connect positive lead of high-resistance voltmeter to test point E (pin 7, cathode of 7B8); connect prod end of negative lead through 100,000-ohm isolating resistor to test point D (pin 4, osc. grid of 7B8). Use suitable meter range, such as 0—10 volts. Proper operation of oscillator is indicated by negative voltage, 2 to 4 volts (measured with 20,000-ohms-per-volt meter), throughout tuning range.

MODEL P-4735,
Packard

PHILCO CORP.

REPLACEMENT PARTS LIST

NOTE

Part numbers marked with an asterisk (*) are general replacement items. These numbers may not be identical with those on factory assemblies; also, the electrical values of some replacement items may differ from the values indicated in the schematic diagram and parts list. The values substituted in any case are so chosen that the operation of the radio will be either unchanged or improved. When ordering replacements, use only the "Service Part No."

SECTION 1

Reference Symbol	Description	Service Part No.
C100	Condenser, by-pass, .5 mf.	61-0137*
C101	Condenser, r-f by-pass, 220 mmf.	60-10205307*
C102	Condenser, r-f by-pass, 220 mmf.	60-10205307*
C103	Condenser, by-pass, .5 mf.	61-0137*
C104	Condenser, r-f by-pass 220 mmf.	60-10205307*
C105	Condenser, buffer, .003 mf.	61-0115
C106	Condenser, electrolytic, 4-section	61-0150
C106A	Condenser, input filter, 20 mf., 350v	Part of C106
C106B	Condenser, filter, 10 mf., 350v	Part of C106
C106C	Condenser, filter, 5 mf., 300v	Part of C106
C208	Condenser (see Section 2)	Part of C106
F100	Fuse	45-2559
I100	Lamp, pilot	34-2039
I101	Lamp, pilot	34-2039
L100	Choke, "A"	32-1644
L101	Choke, vibrator	65-0151
R100	Resistor, damping, 100 ohms	66-1104340*
R101	Resistor, damping, 100 ohms	66-1104340*
R102	Resistor, filter, 1000 ohms	66-2104340*
R103	Resistor, filter, 4700 ohms	66-2474340*
S100	Switch, on-off	Part of R200
T100	Transformer, power	32-8314-1
VB100	Vibrator	83-0026

SECTION 2

C200	Condenser, cathode by-pass, .25 mf.	61-0125*
C201	Condenser, d-c blocking, .0047 mf.	45-3502*
C202	Condenser, feedback, .068 mf.	45-3501*
C203	Condenser, tone compensation, .0082 mf.	61-0174*
C204	Condenser, r-f by-pass, 100 mmf.	60-10105407*
C205	Condenser, d-c blocking, .0047 mf.	45-3502*
C206	Condenser, d-c blocking, .01 mf.	61-0120*
C207	Condenser, d-c blocking, .01 mf.	61-0120*
C208	Condenser, cathode by-pass, 10 mf., 25v.	Part of C106
C209	Condenser, tone compensation .0068 mf.	45-3501*
L200	Speaker field	Part of LS200
LS200	Speaker	36-1609-4
R200	Volume control, 350,000 ohms	33-5557-2
R201	Resistor, cathode bias, 470 ohms	66-1473340*
R202	Resistor, grid return, 10 megohms	66-6103340*
R203	Resistor, feedback, 2200 ohms	66-2223340*
R204	Potentiometer, tone control, 4 megohms.	Part of R200
R205	Resistor, plate load, 220,000 ohms	66-4223340*
R206	Resistor, cathode load, 220,000 ohms	66-4223340*
R207	Resistor, grid return, 10 megohms	66-6103340*
R208	Resistor, plate load, 220,000 ohms	66-4223340*
R209	Resistor, grid return, 470,000 ohms	66-4473340*
R210	Resistor, grid return, 470,000 ohms	66-4473340*
R211	Resistor, cathode bias, 330 ohms	66-1334340*
R212	Resistor, feedback, 1500 ohms	66-2153340
T200	Transformer, output	32-8325

SECTION 3

C300A	Condenser, fixed trimmer, 107 mmf.	Part of Z300
C300B	Condenser, fixed trimmer, 86.6 mmf.	Part of Z300
C301A	Condenser, fixed trimmer, 107 mmf.	Part of Z301
C301B	Condenser, fixed trimmer, 86.6 mmf.	Part of Z301
C302	Condenser, cathode by-pass, .047 mf.	61-0122*
C303	Condenser, r-f by-pass, 220 mmf.	60-10205307*
C304	Condenser, r-f by-pass, 220 mmf.	60-10205307*
C305	Condenser, screen by-pass, .047 mf.	61-0122*
R300	Resistor, screen dropping, 27,000 ohms	66-3273340*
R301	Resistor, cathode bias, 1500 ohms	66-2153340*
R302	Resistor, α-v-c filter, 1 megohm	66-5103340*

SECTION 3 (Continued)

Reference Symbol	Description	Service Part No.
R303	Resistor, i-f filter, 27,000 ohms	66-3273340*
Z300	Transformer, 1st i-f	32-4160-2
Z301	Transformer, 2nd i-f	32-4161-2

SECTION 4

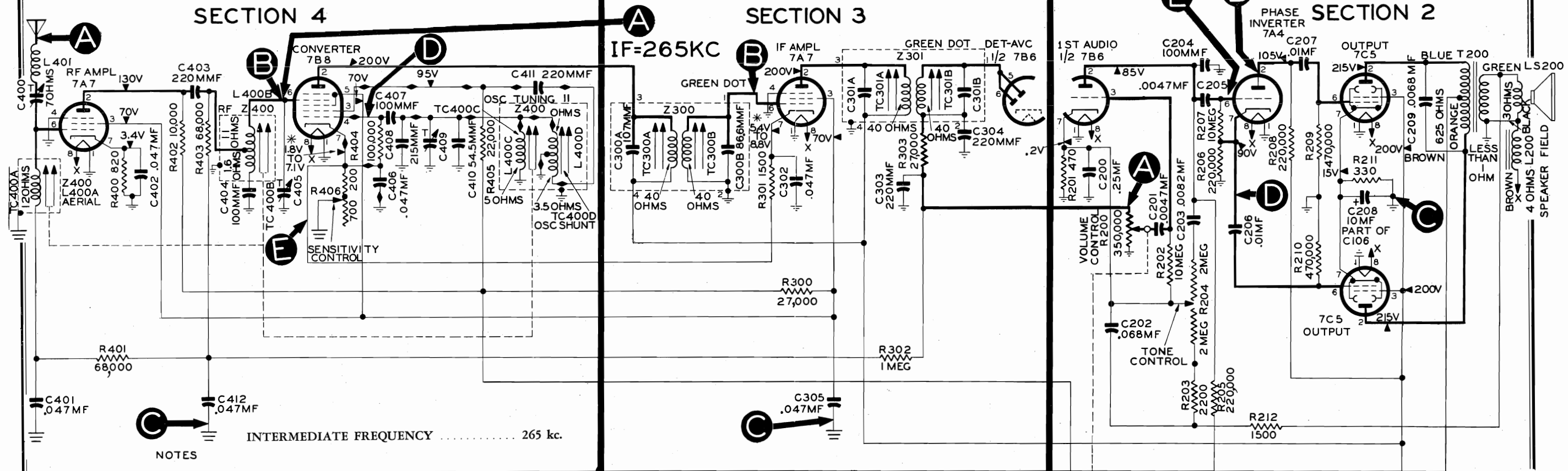
C400	Condenser, trimmer (ant. comp.)	31-6472
C401	Condenser, α-v-c by-pass, .047 mf.	61-0122*
C402	Condenser, cathode by-pass, .047 mf.	61-0122*
C403	Condenser, d-c blocking, 220 mmf.	60-10205307*
C404	Condenser, series, 100 mmf.	60-10105237
C405	Condenser, r-f trimmer	63-0052
C406	Condenser, cathode by-pass, .047 mf.	61-0122*
C407	Condenser, d-c blocking, 100 mmf.	60-10105407*
C408	Condenser, shunt, 215 mmf.	30-1220-4*
C409	Condenser, osc. trimmer	63-0055
C410	Condenser, shunt, 54.5 mmf.	62-056409001*
C411	Condenser, d-c blocking, 220 mmf.	30-1220-4*
C412	Condenser, α-v-c filter, .047 mf.	61-0122*
L400A	Coil, aerial tuning (part of Z400)	65-0349
L400B	Coil, r-f tuning (part of Z400)	65-0359
L400C	Coil, osc. tuning (part of Z400)	65-0350
L400D	Coil, osc. shunt (part of Z400)	65-0351
L401	Choke, aerial	65-0437
R400	Resistor, cathode bias, 820 ohms	66-1823340*
R401	Resistor, α-v-c decoupling, 68,000 ohms	66-3683340*
R402	Resistor, plate load, 10,000 ohms	66-3103340*
R403	Resistor, grid return, 68,000 ohms	66-3683340*
R404	Resistor, grid bias, 100,000 ohms	66-4103340*
R405	Resistor, plate feed, 22,000 ohms	66-3223340*
R406	Resistor, sensitivity control, 900 ohms (200-ohm minimum)	67-0036
Z400	Tuner assembly	77-0588-2

MISCELLANEOUS

Description	Service Part No.
Bezel Assembly	
Bezel	56-4693FA8
Dial	27-5962
Knob, manual tuning	56-4729FA8
Bumper support	54-4475
Cap, push-button	56-4747FA8
Cap, push-button (ends)	56-4746FA8
Connector, aerial	57-1243FA3
Cover-and-button assembly, tube side	76-3069FJ41
Cover, wiring side	56-4696FJ41
Fuse-lead assembly	76-3067
Housing-and-bracket assembly	76-3041FJ41
Knob, tone control	56-4699FA3
Knob, volume control	27-4687-6
Lead, "A"	76-3067-1
Shield, power-transformer	57-0875-1
Socket, Loktal	27-6207
Socket, vibrator	27-6153
Tuning-Unit Hardware	
Background assembly, dial	76-3126
Core, iron	57-1659
Core (oscillator), iron	57-1542
Core (r.f.), iron	57-1542
Filter, pilot lamp	54-7393
Insert assembly, push-button (center)	76-3074
Insert assembly, push-button (end)	76-3074-1
Insert assembly, push-button (manual)	76-3074-2
Lamp-socket assembly	41-3737-3

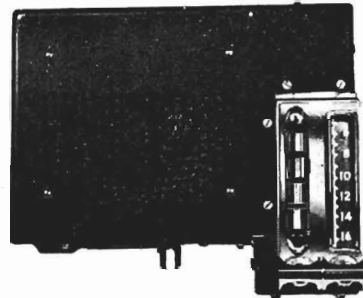
PHILCO CORP.

MODEL P-4735,
Packard



ALL RESISTOR VALUES IN OHMS UNLESS MARKED OTHERWISE.

CONDENSER SYMBOLS
FIXED VARIABLE TRIMMER ELECTROLYTIC
RF IF AND AUDIO SIGNAL PATH.
OSC SIGNAL PATH
INDICATES SOCKET OR PLUG CONNECTIONS
* VOLTAGES AT BOTH MAXIMUM AND MINIMUM SETTINGS OF SENSITIVITY CONTROL



CIRCUIT Eight-tube superheterodyne
FREQUENCY RANGE 540—1600 kc.
PUSH BUTTONS Six: five for station selection; one for manual tuning
AUDIO OUTPUT 5.9 watts
POWER INPUT 8.8 amperes at 6.6 volts, d.c.
AERIAL Retractable-tip, Philco Part No. 45-1468-1
PHILCO TUBES (8) 7A7 (2), 7B8, 7B6, 7A4, 7C5 (2), 7Y4

Sectionalized Schematic Diagram, Showing Test Points

Circuit Description

The circuit is an eight-tube superheterodyne, using permeability tuning. Of the six push buttons, five are used for automatic station selection, and one selects manual tuning. The ganged tuning cores of the aerial, r-f, and oscillator circuits are mechanically actuated (by pantograph drive) for either push-button or manual operation.

The tuned-r-f amplifier stage employs a 7A7. The converter, a 7B8, works into a 7A7 i-f amplifier, which operates at 265 kc.

The 7B6 duo-diode, triode tube provides detection and a-v-c voltage in the diode section; the triode sec-

tion functions as the first audio amplifier. A 7A4 plate-and-cathode-loaded phase inverter drives the two 7C5 push-pull output amplifiers, which, at full output, provide 5.9 watts of audio power to the electrodynamic speaker.

The power-supply circuit incorporates a non-synchronous vibrator and a 7Y4 full-wave rectifier.

A variable sensitivity control, R406, is connected in the common cathode circuit of the converter and i-f tubes. This control is mounted on the chassis as shown in figure 6, and may be adjusted with a screwdriver,

inserted through a hole in the back of the radio; in areas where most reception is from local stations, the control should be set for lower sensitivity, to permit quieter operation of the radio.

The tone control is part of a feed-back circuit in which the feedback to the first audio stage is degenerative at high audio frequencies and regenerative at the lower frequencies.

ALIGNMENT PROCEDURE

DIAL POINTER—Turn manual tuning knob until pointer stops at high-frequency end of dial; if pointer does not coincide with index mark at 1600 kc., carefully bend it to the correct position.

OUTPUT METER—Connect across voice-coil terminals.

SIGNAL GENERATOR—Connect ground lead to chassis; connect output lead as indicated in chart. Use modulated output.

RADIO CONTROLS—Set volume and sensitivity controls to maximum. Set tone control for maximum signal (approximate center of range).

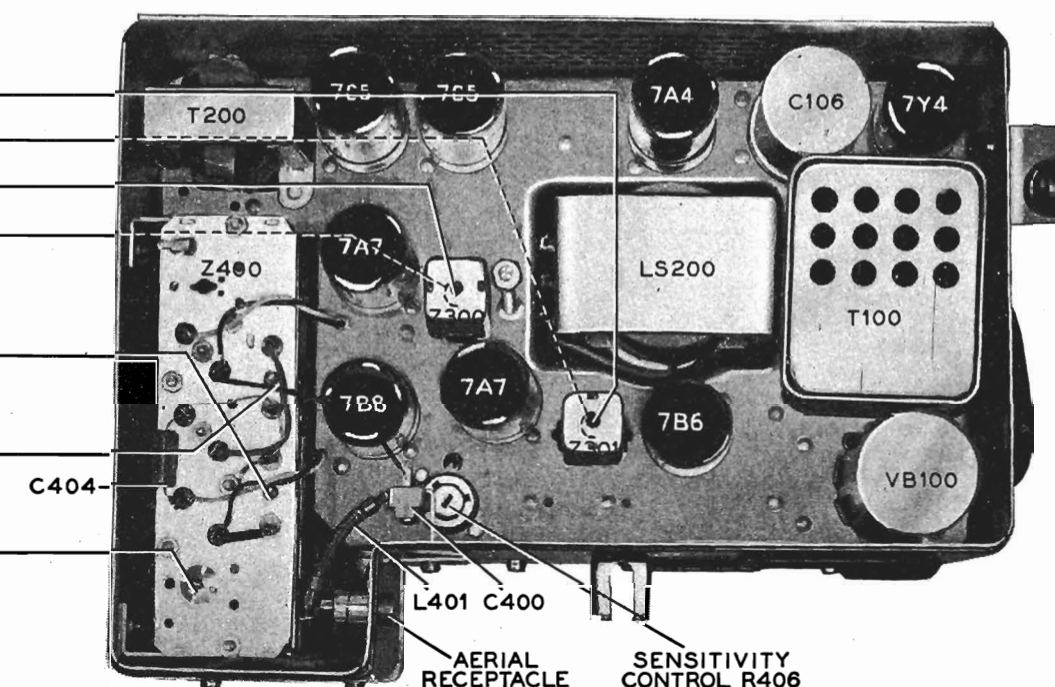
OUTPUT LEVEL—During alignment, adjust signal-generator output to maintain output-meter indication below 1 volt.

DUMMY AERIAL—For steps 2, 3, and 4, either of two dummy-aerial connections should be used: (1) connect generator output lead through 22-mm.f. condenser to shielded aerial lead (Philco Part No. 45-1468-1) plugged into aerial receptacle; (2) connect output lead through 22-mm.f. condenser to aerial receptacle, then connect 30-mm.f. condenser from receptacle to chassis.

IMPORTANT: The above instructions for the dummy aerial must be carefully followed if the radio is to perform at its best after being reinstalled in the car.

STEP	SIGNAL GENERATOR		RADIO		ADJUST
	CONNECTIONS TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	
1	Through .1-mf. condenser to aerial receptacle.	265 kc.	540 kc.	Adjust trimmers, in order given, for maximum output.	TC301B TC301A TC300B TC300A
2	Through dummy aerial.	1600 kc.	Tune to signal.	Adjust for maximum.	C405
3	Same as step 2.	1400 kc.	1400 kc.	Adjust for maximum.	C409
4	Same as step 2.	580 kc.	Tune to signal.	Adjust for maximum while rocking tuning control.	TC400D
5	Repeat steps 2, 3, and 4 until no further improvement is obtained.				
6	After reinstalling radio in car, with aerial connected, adjust C401 for maximum output from weak station near 1400 kc. If the radio is to be used in an area having local broadcasting stations, the sensitivity control may be adjusted for somewhat lower sensitivity, to permit quieter operation.				

Top View, Trimmer and Tuning-Core Locations
(dotted lines indicate tuning screws located at bottom of chassis)



SETTING PUSH BUTTONS

Any one of the five station push buttons may be set for any frequency within the broadcast band.

1. Turn on the power, and allow the radio to warm up for fifteen minutes.
2. Pull off the five uppermost push-button knobs (the lower knob selects manual tuning), thus exposing the shafts which operate the tuning mechanism.
3. Depress one of the shafts until it locks in, then rotate the shaft to tune in the desired station; turning the shaft causes the dial pointer to move, indicating the frequency to which the circuits are tuned.
4. Repeat the procedure for each button. Replace the knobs.

TROUBLE-SHOOTING Procedure

For rapid trouble shooting, the radio circuit is divided into four sections, with test points specified for each section; these sections and test points are indicated in the schematic diagram. The trouble-shooting procedure given for each section includes a simplified test chart and a bottom view of the chassis showing the locations of the test points and the components of that section.

In each chart, the first step is a master check for determining whether trouble exists in that section, without going through the entire test procedure.

Failure to obtain "NORMAL INDICATION" in any given step indicates trouble within the circuit under test.

After isolating the trouble to a single stage, the defect is located by: first, testing the tube; second, measuring tube electrode voltages; third, measuring circuit resistances; fourth, substituting condensers. The trouble revealed should be corrected before testing further.

Preliminary Checks

To avoid possible damage to the radio, the following preliminary checks should be made before turning on the power:

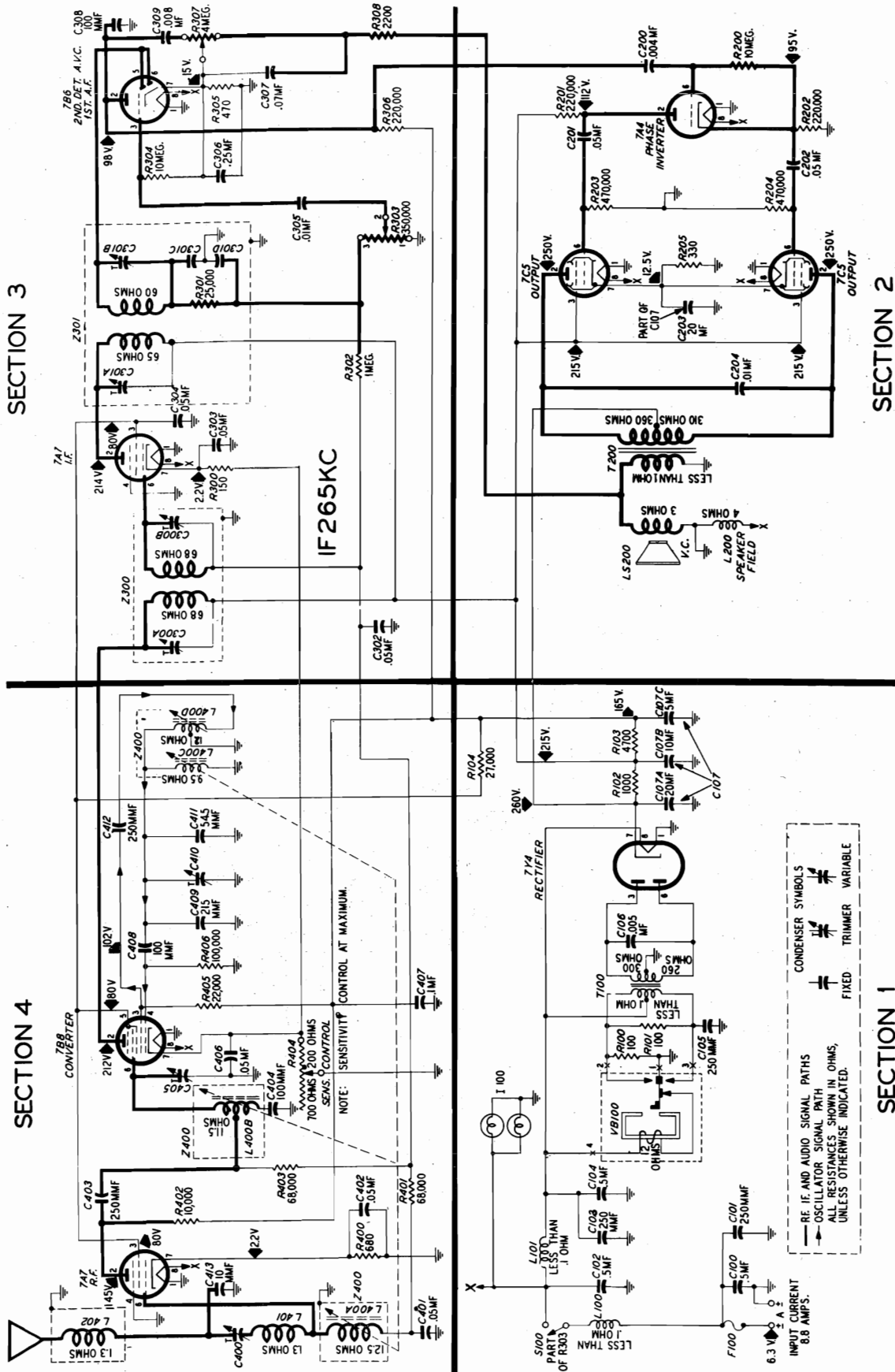
1. Inspect both the top and the bottom of the chassis. Make sure that all tubes are secure in the proper sockets, and look for any broken or shorted connections, burned resistors, or other obvious sources of trouble.

2. Measure the resistance between B+ (pin 7 of 7Y4 rectifier tube) and the radio chassis, test point C, with the ohmmeter polarity such that the highest resistance reading is obtained. If the reading is lower than 2700 ohms, check condensers C106A and C106B for leakage or shorts. The resistance value above, which is much lower than normal, is not intended as a quality check of these condensers; the value given is the lowest at which the rectifier will operate safely while the voltage tests of Section 1 are performed.

If the fuse is open, check the vibrator before installing a new fuse; if the vibrator is defective, check the buffer condenser, C105, for leak or short.

PHILCO CORP.

MODELS S-4626,
S-4627, Studebaker



ALIGNMENT PROCEDURE

CONNECT THE SIGNAL-GENERATOR output lead as follows:

For the i-f alignment (the first step in the chart), connect through a .05-mf. condenser to the aerial connector.

For the r-f alignment (all steps after the first), inject the signal through a dummy aerial consisting of a 20-mm.f. condenser in series with an aerial lead (Part No. 95-0181) plugged in to the aerial receptacle. If an aerial lead is not available, connect a 30-mm.f. condenser from the aerial receptacle to ground, and inject the signal through the 20-mm.f. condenser alone. The foregoing instruction must be carefully followed if the receiver is to give its best performance after being reinstalled in the car.

CONNECT THE OUTPUT METER between the voice-coil lug on the speaker and the receiver chassis.

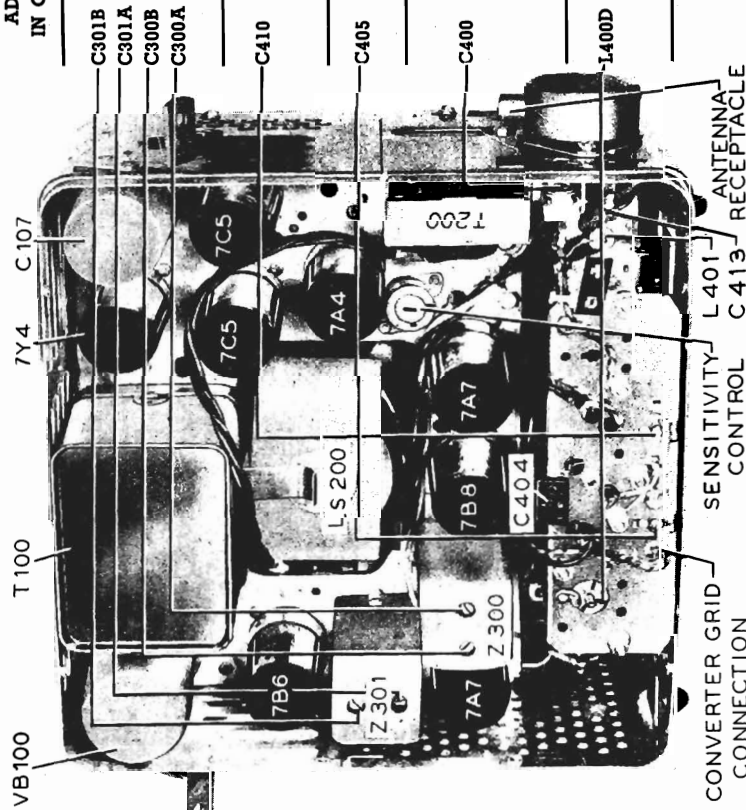
ADJUST THE RECEIVER CONTROLS as follows:

Set the volume and sensitivity controls at maximum. Set the tone control for maximum signal output (approximately the center of its range).

ADJUST THE SIGNAL-GENERATOR OUTPUT as alignment progresses to keep the meter needle near center scale, using the lowest range on the output meter.

AFTER REINSTALLING THE RECEIVER in the car and connecting the aerial, make the following adjustments: Set the aerial trimmer for maximum signal strength on a weak station near 1400 kc. Set the sensitivity control for low sensitivity, if the receiver is to be used mainly for local-station reception, or higher sensitivity depending on the degree of distant-station reception desired. The lower the sensitivity can be set, the less will be the noise and interference pickup.

ADJUST IN ORDER	SPECIAL INSTRUCTIONS	DIAL SETTINGS	
		SIG. GEN.	RECEIVER
VB100 T100 7Y4 C107 C301B C301A C300B C300A 7C5 7A4 L S 200 7B6 Z301 7A7 Z300 7B8 C404 C405 C410 C400 L400D	Ground pin 4. of the 7B8. Adjust for maximum in order as numbered, and then repeat procedure.	265 kc.	540 kc.
	Remove the ground from pin 4 of the 7B8. Adjust for maximum.	1600 kc.	1600 kc.
	Adjust for maximum.	1400 kc.	1400 kc.
	Adjust for maximum. Final adjustment to be made after installation in car, with aerial connected.	1400 kc.	1400 kc.
	Adjust for maximum while rocking tuning control back and forth across signal.	580 kc.	580 kc.
	Repeat all steps after the first.		



Chassis view, showing trimmer locations.

PHILCO CORP.

MODELS S-4626, S-4627,
Studebaker

TESTS TO ISOLATE TROUBLE WITHIN SECTION 1

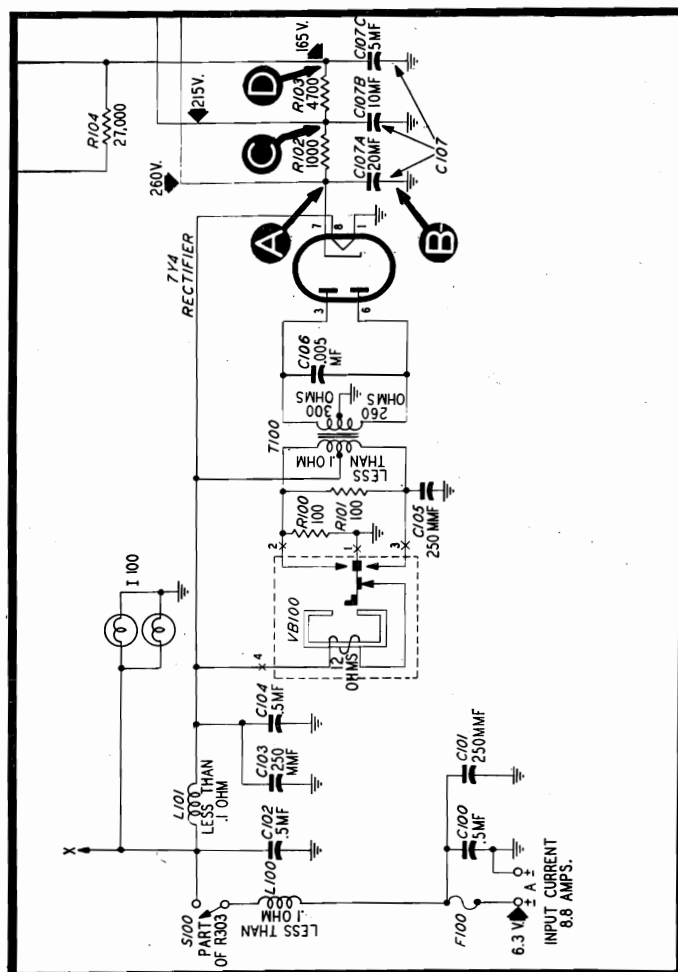
MAKE TEST NO. 1 FIRST!

If the "NORMAL INDICATION" for this test is obtained, proceed to Test No. 1 in the next section. If not, continue through the chart to isolate and remedy the trouble in this section.

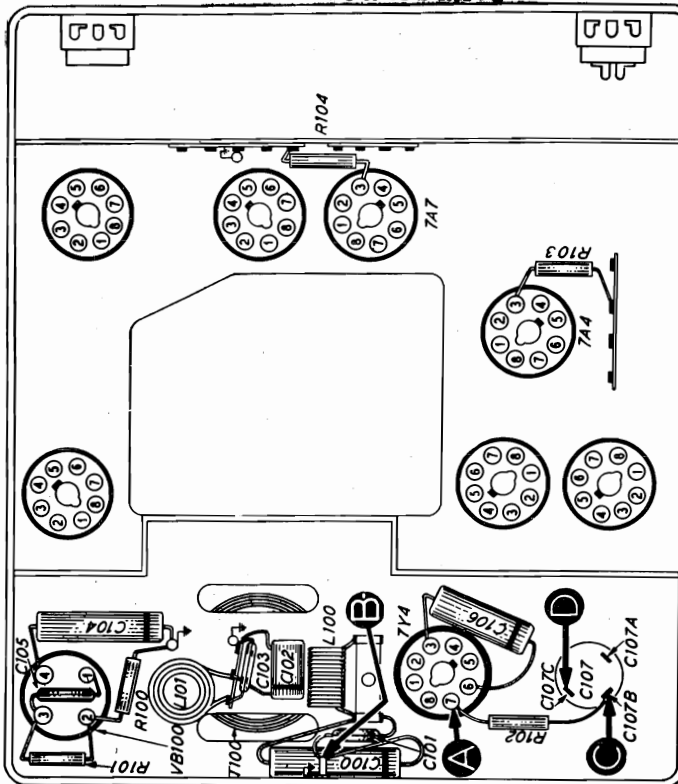
Make all measurements for this section with a volt-ohmmeter, using the applicable d-c range. All voltages given in this manual are average, and were taken with a 20,000 ohms-per-volt meter, with 6.3 volts d-c input; the volume control was set at minimum, and the tuning control at 540 kc.

WARNING: If the 7Y4 rectifier is found to be defective, check the main filter condenser, C107, for shorts before inserting a new tube. If the vibrator is found to be defective, check C106 for a short before inserting a new vibrator.

TEST POINTS	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1. D to B—	165 volts	Trouble within Section 1. Isolate by following tests.
2. A to B—	260 volts	Defective 7Y4, VB100, T100, C105, C106, C107A, or C107B.
3. C to B—	215 volts	Defective R102, C107B or C107C.
4. D to B—	165 volts	Defective R103, C107C or C407 (see Section 4 for location).



Section 1 schematic.



Bottom view, showing Section 1 test points.

MODEL S S-4626,
S-4627, Studebaker

TESTS TO ISOLATE TROUBLE WITHIN SECTION 2

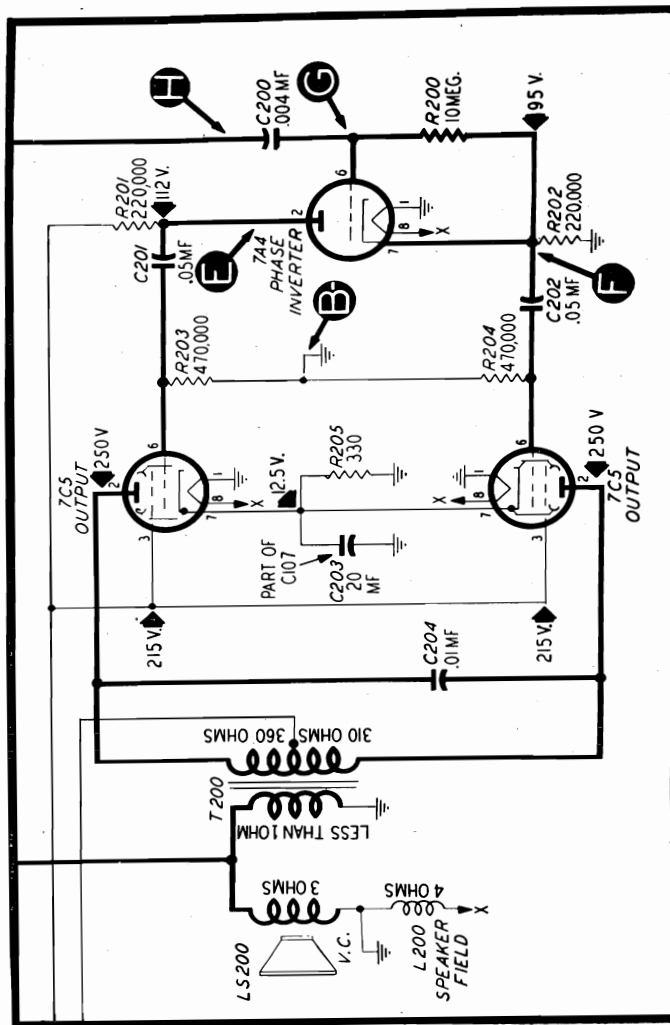
For all tests in this section, use an audio signal. Connect the generator output lead through a condenser (.01 to .25 mf.) to the test points indicated; connect the ground lead to the receiver chassis (B-).

Set the receiver volume control at maximum, and adjust the signal-generator output for a loud, clear signal.

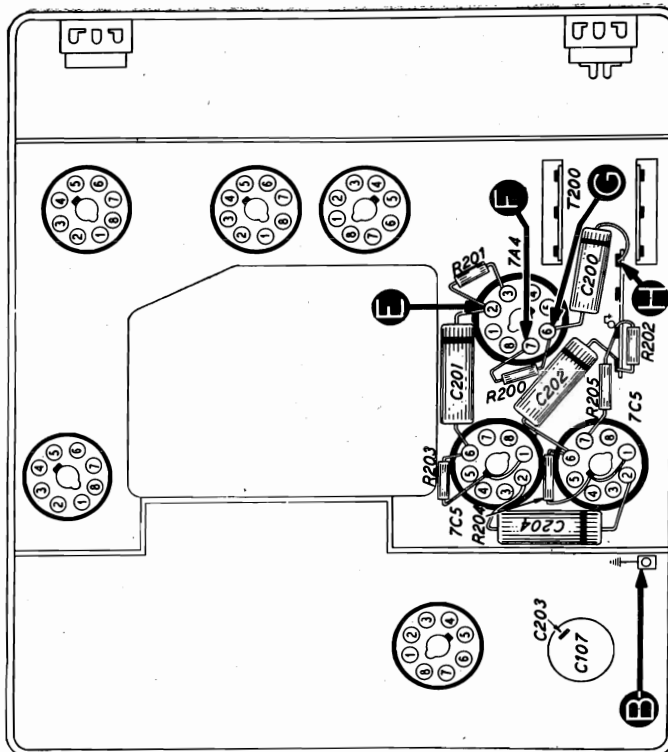
TEST POINTS	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1. H to B-	Loud, clear signal.	Trouble within Section 2. Isolate by following tests.
2. E to B- (Remove 7A4)	Loud, clear signal.	Defective 7C5, T200, LS200, R203, R205, C201, C203, or C204.
3. F to B- (7A4 removed)	Loud, clear signal, same as preceding test.	Defective 7C5, T200, R204, or C202.
4. G to B- (Replace 7A4)	Clear signal, louder than preceding test.	Defective 7A4, R202, R201, R200, or C200.
5. H to B-	Loud, clear signal, same as preceding test.	Defective C200, R200, or C308 (see Section 3 for location).

MAKE TEST NO. 1 FIRST!

If the "NORMAL INDICATION" for this test is obtained, proceed to Test No. 1 in the next section. If not, continue through the chart to isolate and remedy the trouble in this section.



Section 2 schematic.



Bottom view, showing Section 2 test points.

PHILCO CORP.

MODELS S-4626,
S-4627, Studebaker

TESTS TO ISOLATE TROUBLE WITHIN SECTION 3

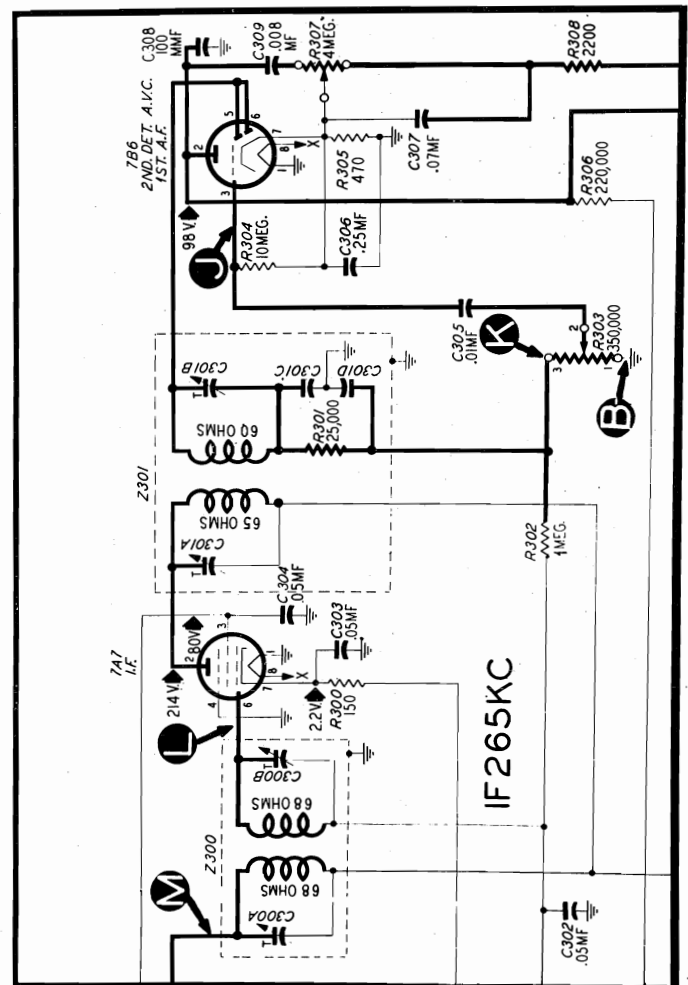
For the second and third tests in the chart for this section, use an audio signal. For the first, and the last two, use a modulated 265-kc. signal. Connect the signal-generator output lead through a condenser

MAKE TEST NO. 1 FIRST!

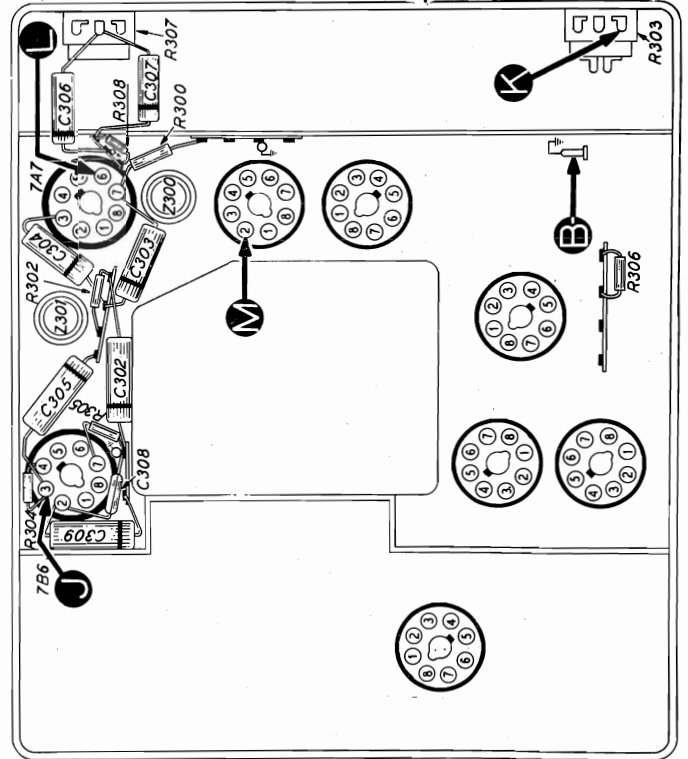
If the "NORMAL INDICATION" for this test is obtained, proceed to Test No. 1 in the next section. If not, continue through the chart to isolate and remedy the trouble in this section.

(.01 to .25 mf.) to the test points indicated; connect the ground lead to the receiver chassis (B-). Set the receiver volume control at maximum, and adjust the signal-generator output for a loud, clear signal.

TEST POINTS	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1. M to B- (265-kc. signal)	Loud, clear signal.	Trouble within Section 3. Isolate by following tests.
2. J to B- (audio signal)	Loud, clear signal.	Defective 7B6, R306, R305, R304, C306, or C308.
3. K to B- (audio signal)	Loud, clear signal.	Defective C305 or R303 (rotate R303 through its entire range for complete check).
4. L to B- (265-kc. signal)	Loud, clear signal.	Defective 7A7, C303, C304, R104 (shown in Section 1), R300, R404 (shown in Section 4), or Z301.
5. M to B- (265-kc. signal)	Loud, clear signal.	Defective R302, C302, or Z300.



Section 3 schematic.



Bottom view, showing Section 3 test points.

MODELS S-4626,
S-4627, Studebaker

PHILCO CORP.

TESTS TO ISOLATE TROUBLE WITHIN SECTION 4

PRELIMINARY OSCILLATOR CHECK:

Attach the positive lead of a 20,000-ohms-per-volt meter (10-volt range) to the receiver chassis, and the prod end of the negative lead through 50,000 ohms to point S. Rotate the tuning control; absence of voltage indicates that the oscillator is not functioning. If this is the case, check the components listed in the second test below.

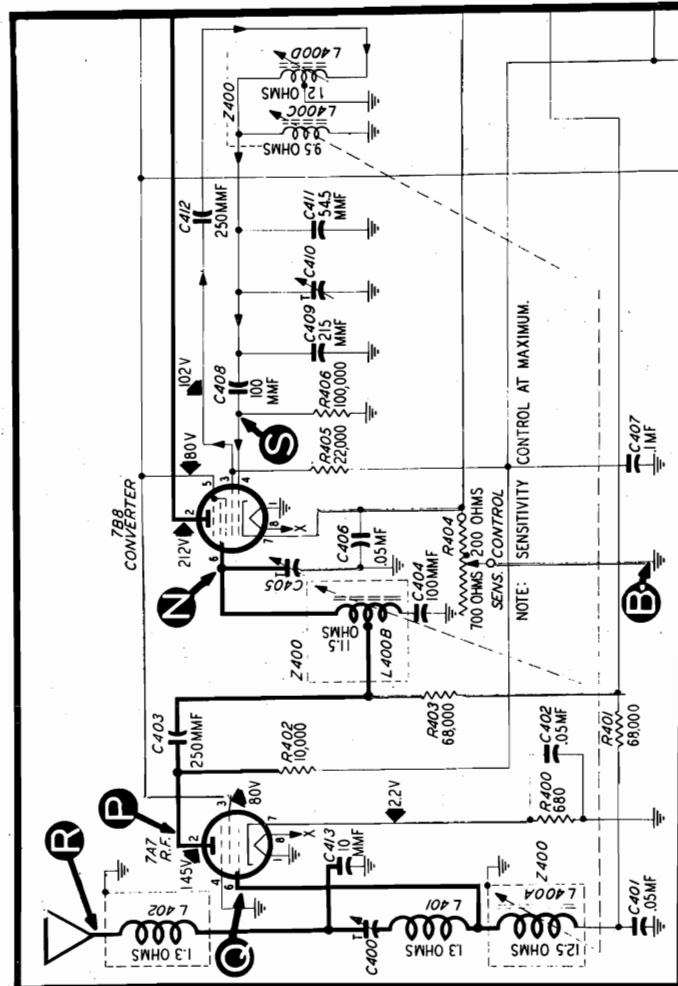
MAKE TEST NO. 1 FIRST!

If the "NORMAL INDICATION" for this test is not obtained, continue through the chart to isolate and remedy the trouble in this section.

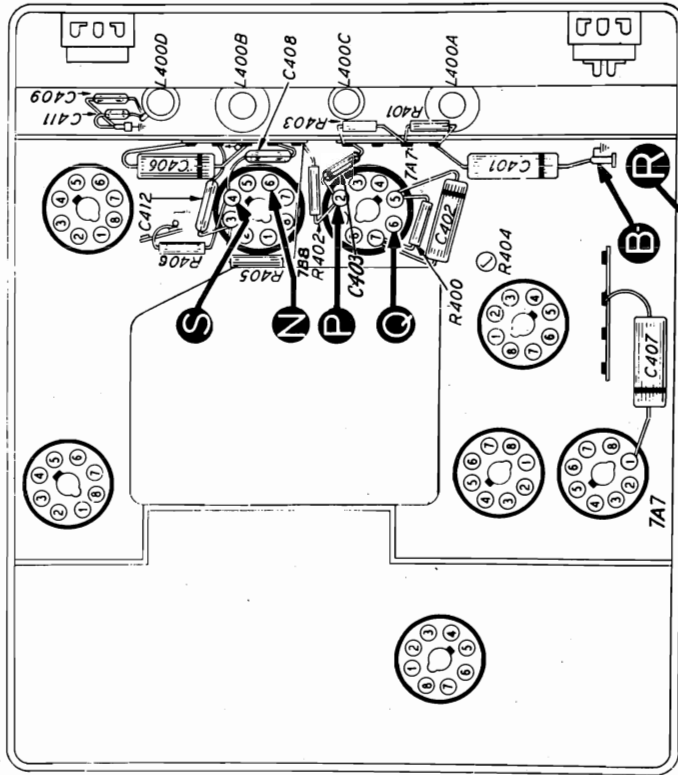
FOR CHART TESTS 1-5:

Connect the signal-generator output lead through a condenser (.01 to .25 mf.) to the test points indicated; connect the ground lead to the receiver chassis. Set the receiver volume control at maximum, tune the signal generator and receiver to 1000 kc., and adjust the generator output for a loud, clear signal.

TEST POINTS	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1. R to B-	Loud, clear signal.	Trouble within Section 4. Isolate by following tests.
2. N to B-	Loud, clear signal.	Defective 7B8, L400C, L400D, R403, R404, R405, R406, C403, C405, C408, C409, C410, C411, or C412.
3. P to B-	Loud, clear signal.	Defective C403, C404, R403, or L400B.
4. Q to B-	Clear signal, louder than preceding test.	Defective 7A7, L400A, R400, R402, or C402.
5. R to B-	Loud, clear signal.	Defective L401, L402, C400, C401, C413, or R401.



Section 4 schematic.



Bottom view, showing Section 4 test points.

PHILCO CORP.

MODELS S-4626,
S-4627, Studebaker

CIRCUIT DESCRIPTION

The circuit of the S4626 consists of a 7A7 r-f amplifier, a 7B8 converter, a 7A7 i-f amplifier, a 7B6 second detector-first audio, and an audio power amplifier using two 7C5's in push-pull, driven by a 7A4 phase inverter. The power supply is of the six-volt non-synchronous vibrator type, using a 7Y4 rectifier.

The aerial input circuit is designed for maximum interference elimination, without sacrifice of signal strength. Permeability tuning, controlled by a pantograph tuning unit, is used for both the r-f and oscillator stages. This method of tuning assures maximum sensitivity, selectivity, and stability for this type of receiver. A sensitivity control is pro-

vided (identified in figure 9, page 6), which consists of a variable resistor in the common cathode circuit of the converter and i-f stages. This should be adjusted for lower sensitivity in areas where most reception is from local stations, in order to minimize noise pickup.

The S4626 uses an intermediate frequency of 265 kc.

Two features of the audio system are the tone control, which is an inverse feed-back circuit built around the first audio amplifier, and the push-pull output stage, which delivers a full five watts of audio power to the dynamic speaker.

SECTION 1

Reference No.	Description	Service Part No.
C100	Condenser, .5 mf.	61-0137*
C101	Condenser, 250 mmf.	60-10245307*
C102	Condenser, .5 mf.	61-0137*
C103	Condenser, 250 mmf.	60-10245307*
C104	Condenser, .5 mf.	61-0137*
C105	Condenser, 250 mmf.	60-10245307*
C106	Condenser, .005 mf.	61-0153*
C107	Condenser, electrolytic	61-0150*
	C107A: condenser, 20 mf.	Part of C107
	C107B: condenser, 10 mf.	Part of C107
	C107C: condenser, 5 mf.	Part of C107
F100	Fuse	45-2559
I100	Lamp, pilot	34-2064*
L100	Choke, "A"	32-1644
L101	Choke, vibrator	65-0151
R100	Resistor, 100 ohms	66-1104340*
R101	Resistor, 100 ohms	66-1104340*
R102	Resistor, 1,000 ohms	66-2104340*
R103	Resistor, 4,700 ohms	66-2474340*
R104	Resistor, 27,000 ohms	66-3274340*
S100	Switch, off-on	Part of R303
T100	Transformer, power	65-0358*
VB100	Vibrator	83-0026*

SECTION 2

C200	Condenser, .004 mf.	61-0129*
C201	Condenser, .05 mf.	61-0170*
C202	Condenser, .05 mf.	61-0170*
C203	Condenser, 20 mf.	Part of C107
C204	Condenser, .01 mf.	61-0124*
L200	Field, speaker	Part of LS200
LS200	Speaker	73-0068*
R200	Resistor, 10 megs	66-6103340*
R201	Resistor, 220,000 ohms	66-4223340*
R202	Resistor, 220,000 ohms	66-4223340*
R203	Resistor, 470,000 ohms	66-4473340*
R204	Resistor, 470,000 ohms	66-4473340*
R205	Resistor, 330 ohms	66-1334340*
T200	Transformer, output	65-0409*

SECTION 3

C302	Condenser, .05 mf.	61-0122*
C303	Condenser, .05 mf.	61-0122*
C304	Condenser, .05 mf.	61-0122*
C305	Condenser, .01 mf.	61-0125*
C306	Condenser, .25 mf.	61-0152*
C307	Condenser, .07 mf.	61-0152*
C308	Condenser, 100 mmf.	60-10105407*
C309	Condenser, .008 mf.	61-0174*
R300	Resistor, 150 ohms	66-1153340*
R302	Resistor, 1 meg.	66-5103340*
R303	Control, volume, 350,000 ohms	33-5522*
R304	Resistor, 10 megs.	66-6103340*
R305	Resistor, 470 ohms	66-1473340*
R306	Resistor, 220,000 ohms	66-4223340*
R307	Control, tone, 4 megs.	33-5521*
R308	Resistor, 2,200 ohms	66-223340*
Z300	Transformer, 1st i-f	65-0352
	C300A: condenser, trimmer	Part of Z300
	C300B: condenser, trimmer	Part of Z300
	Transformer, 2nd i-f	65-0410
Z301	C301A: condenser, trimmer	Part of Z301
	C301B: condenser, trimmer	Part of Z301
	C301C: condenser, trimmer	Part of Z301
	C301D: condenser	Part of Z301
	R301: resistor, 25,000 ohms	Part of Z301

SECTION 4

C400	Condenser, trimmer aerial	63-0053
C401	Condenser, .05 mf.	61-0122*
C402	Condenser, .05 mf.	61-0122*
C403	Condenser, 250 mmf.	60-10245307*
C404	Condenser, 100 mmf.	60-10105407*
C405	Condenser, trimmer	Part of Z400*
C406	Condenser, .05 mf.	61-0122*

SECTION 4 (Continued)

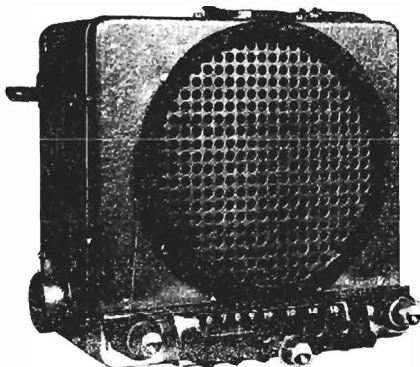
Reference No.	Description	Service Part No.
C407	Condenser, .1 mf.	61-0113*
C408	Condenser, 100 mmf.	60-10105407*
C409	Condenser, 215 mmf. (silver mica) (Part of Z400)	61-0148
C410	Condenser, trimmer	Part of Z400
C411	Condenser, 54.5 mmf. (silver mica) (Part of Z400)	61-0149
C412	Condenser, 250 mmf.	60-10245307*
L401	Choke, antenna	60-00105407
L402	Choke, antenna spark	65-0428
R400	Resistor, 680 ohms	66-1003340*
R401	Resistor, 68,000 ohms	66-3683340*
R402	Resistor, 10,000 ohms	66-3103340*
R403	Resistor, 68,000 ohms	66-3683340*
R404	Control, sensitivity	67-0036*
R405	Resistor, 22,000 ohms	66-3223340*
R406	Resistor, 100,000 ohms	66-4103340*
Z400	Pantograph tuning assembly	76-1990
	L400A: coil, r-f grid tuning (Part of Z400)	65-0349
	L400B: coil, converter grid tuning (Part of Z400)	65-0359
	L400C: coil, oscillator grid tuning (Part of Z400)	65-0350
	L400D: coil, oscillator tracking (Part of Z400)	65-0351

MISCELLANEOUS

"A" lead assembly (fuse-to-set)	77-0638
Cable and clamp assembly	77-0639
Cap, fuse, male	56-3594FA3
Clamp, "A" lead	28-1644FA3
Contact	54-4344
"A" lead assembly (fuse-to-ign. sw.)	77-0052
Contact	54-4344
Grommet	27-4676
Housing, fuse	28-5610
Spring, fuse housing	28-8841
Washer, fuse housing (fibre)	27-9049
Washer, fuse housing (rubber)	4169
Bezel assembly	
Back plate, dial	57-1487FA3
Bezel and stud assembly	76-2156
Dial	27-5905
Felt, dial	54-4267
Spring, dial retaining	28-9007FA1
Housing parts	
Button, plug	57-2646FA1
Button, plug (chrome)	2W15748FA8
Choke housing and connector assembly	65-0459
Cover, tube side	57-2415FC59
Cover, wiring side	57-1548FC59
Gasket, speaker (side cover)	55-1045
Housing assembly	77-1039FC59
Knobs	
Control knob assembly (tone and volume)	77-1043
Nut-cover assembly	76-2171
Manual-tuning knob assembly	57-2379
Extension, manual knob	56-3867
Spacer, manual knob	57-1669
Spring, manual knob	57-1628FA1
Push-button knob assembly	76-1984
Spring, push-button	57-1651
Pilot lamp socket assembly, left-hand	76-2157
Bracket, left-hand	57-2342FA3
Pilot lamp socket assembly, right-hand	76-2158
Bracket, right-hand	57-2343FA3
Set mounting parts	
Bolt, hook	97-0135FA3
Nut, wing	1W23750FA3
Nut	97-0229
Socket, tube (lokta)	27-6138*
Socket, vibrator (4-pin)	27-6153*
Speaker mounting parts	
Nut, speaker mounting	1W19988FA3
Screw, speaker mounting	W1582FA3
Washer, lock	1W24257FA1
Suppression parts	
Braid, copper	95-0073
Condenser, generator	30-4632
Distributor filter assembly	77-0947
Nipple, distributor cable	54-7159
Resistor, distributor	33-1333
Strap, fender ground	77-0966
Strap, ground	77-0336
Tuning unit parts	
Core, iron (antenna)	57-1540
Core, iron (oscillator)	57-1542
Core, iron (shunt oscillator tracking)	57-1659
Core, iron (r-f)	57-1541
Pointer and cam assembly	76-2079
Spring, tuning core draw bar	57-1649
Spring, latch bar	57-1650
Spring, pointer	57-1653

MODELS S-4626,
S-4627, Studebaker

PHILCO CORP.



SPECIFICATIONS

CIRCUIT Eight-tube, superheterodyne
FREQUENCY RANGE 540 to 1600 kc.
INTERMEDIATE FREQUENCY 265 kc.
POWER INPUT 6.3 volts, 8.8 amperes, d.c.
PHILCO TUBES 7A7(2), 7B8, 7B6, 7A4, 7C5(2), 7Y4
AERIAL Retractable-rod, Philco Part No. 91-0230

The dial scale on the S-4627 is a fluorescent type to match the panel indicators of the 1947 cars. The dial pointer and cam assembly is different thus giving a new part number to the tuning assembly which otherwise is the same. The "A" lead is dressed to the left side of the radio case instead of the right side for convenience to the new position of the ignition switch. A clip is provided on the side of the case to hold the fuse holder and prevent it from rattling against the set. The receiver is mounted in the same position as in the 1946 car, but hook bolts of a new design are provided to fit the installation.

The suppression material is different and complete information on the suppression of ignition interference is given in the installation instructions with the radio.

New part numbers have been given to the following items and apply only to the S-4627 receivers.

SECTION 4

Reference Number	Description	Model S-4627 Service Part No.
C400	Condenser, trimmer	31-6472
Z400	Pantograph tuning assembly	77-0970-1

MISCELLANEOUS

Bezel assembly	
Dial	27-5923
Set mounting parts	
Bolt, hook	56-3740
Tuning-unit parts	
Pointer and cam assembly	76-2482

IMPORTANT

The aerial and aerial lead-in form part of the r-f tuning circuit. When testing or aligning this receiver on the bench it is important that an aerial dummy load of equal capacity be used.

TROUBLE-SHOOTING PROCEDURE

This service manual provides a logical trouble-shooting procedure for the S4626, which will facilitate the isolation of most of the faults that may be encountered. The circuit is divided into four sections, with a schematic and chassis layout, showing test points, for each section. The trouble-shooting procedure is outlined in a chart for each section. The first test in each chart is a sectional master check, making it possible to eliminate the section under test as a source of trouble without going through its entire chart procedure.

Wherever trouble is indicated (by failure to get a "Normal Indication" on any one test) it should be isolated by voltage and resistance checks of the parts associated with the point under test, and remedied before testing further.

PRELIMINARY CHECKS

The following preliminary checks are recommended:

1. Carefully inspect both sides of the chassis. Make sure that all the tubes are secure, and look for bad connections, burned resistors, or other mechanical faults.
2. Check the fuse, and connect the receiver to a source of power (6.3 volts, d.c.). Look for unlighted tube filaments, overheated resistors (smoke, sweating, etc.), and listen for the hum of the vibrator.
3. Check the tubes and the vibrator. **WARNING:** If the 7Y4 is defective, check C107 for shorts before inserting a new tube. If the vibrator is defective, check C106 for a short before inserting a new vibrator.

The following additional parts are supplied with the Model S-4627:

Set mounting parts

Nut, hex mounting 97-0229FA3

Suppression parts

Condenser, ignition-coil 30-4007-1
 Ground strap, heater-cable 76-2505
 Bolt, heater-cable-clamp 1W10636FA3
 #8 lock washer 1W35046FA1
 Nut, heater-cable clamp-bolt 1W19988FA3
 Ground strap, battery-cable 76-2557
 Ground strap, windshield-wiper-motor 76-2556

Suppression parts in the Model S-4626 list that are not used in Model S-4627 are:

Distributor filter assembly 77-0947
 Strap, fender-ground 77-0966
 Strap, ground 77-0336

PHILCO CORP.

MODEL UN6-400

PHILCO AUTO RADIO

SPECIFICATIONS



Model UN6-400

CIRCUIT.....Six-tube, superheterodyne
 FREQUENCY RANGE.....550 to 1580 kc.
 INTERMEDIATE FREQUENCY.....455 kc.
 POWER INPUT.....6.3 volts, 8.3 amperes
 PHILCO TUBES USED.....7A7(2), 7B8, 7B6, 7C5, 7Y4
 ANTENNA.....Philco universal auto radio type

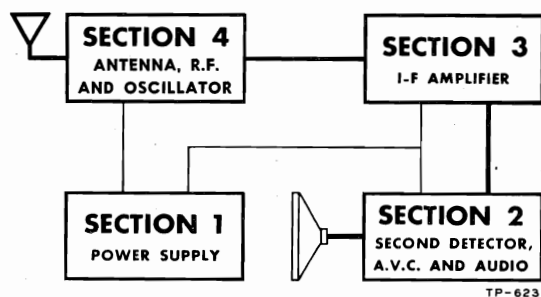


Figure 1. Block diagram (Heavy lines indicate signal path.)

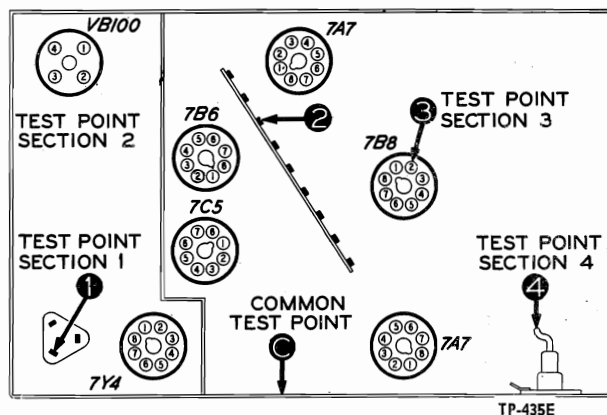


Figure 2. Bottom view, showing test points.

PHILCO TROUBLE-SHOOTING PROCEDURE

In this manual, the receiver circuit is divided into four sections, as shown in figure 1. One test point is designated for each section, as shown in figure 2. Normal indications, secured when checking these points, eliminate the section under test as a source of trouble. Isolation of the faulty part is accomplished by testing in the order shown in the sectional test charts. A high-quality signal generator and volt-ohmmeter, an ammeter (0-30 amperes, d.c.), and a 6.3-volt d-c power source are required. The voltage

readings shown were taken with a 20,000-ohms-per-volt meter.

To localize trouble, connect the receiver to the 6.3-volt d-c power source, and turn the receiver volume control to maximum; see that all tube filaments are lighted; then proceed in the order given in the following chart. When abnormal indications appear, make voltage and resistance checks of the circuit under test. Remedy any defect encountered before proceeding with the next step.

TESTS TO LOCALIZE TROUBLE TO ONE SECTION

SECTION	TEST	NORMAL RESULTS
1	Place ammeter in series with power source and check current drain. Measure voltage between point 1 and chassis (C).	Approximately 8.3 amps. 235 volts.
2	Apply audio signal between point 2 and chassis, through a condenser (.01 to .25 mf.).	Loud, clear signal from speaker.
3	Apply a weak, modulated r-f signal (455 kc.) between point 3 and chassis, through a condenser (.01 to .25 mf.).	Loud, clear signal.
4	Turn tuning condenser to half-meshed position. Apply weak, modulated r-f signal between point 4 and chassis, through a condenser (.01 to .25 mf.). Tune signal generator until the signal is heard in the speaker.	Loud, clear signal.

TESTS TO ISOLATE TROUBLE WITHIN SECTION 1

With the exception of the first, make all measurements for this section with a volt-ohmmeter, using the applicable d-c range. The voltages given were taken with the set operating and the volume control set at minimum.

TEST POINTS	NORMAL READING	POSSIBLE CAUSE OF ABNORMAL READING
Connect ammeter (0-30) in series with power source.	8.3 amps.	Excessively high or low current indicates defective VB100, T100, C103, or 7Y4.
A to C	250 volts	Defective 7Y4 or C104.
B to C	235 volts	Defective C104, open R102, or shorted C202 (see Section 2 for location).

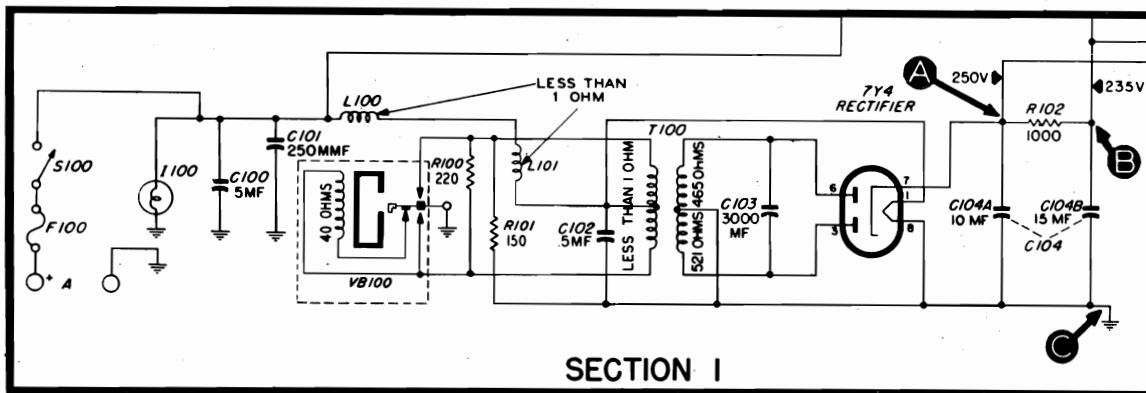


Figure 3. Section 1 schematic.

TP-435A

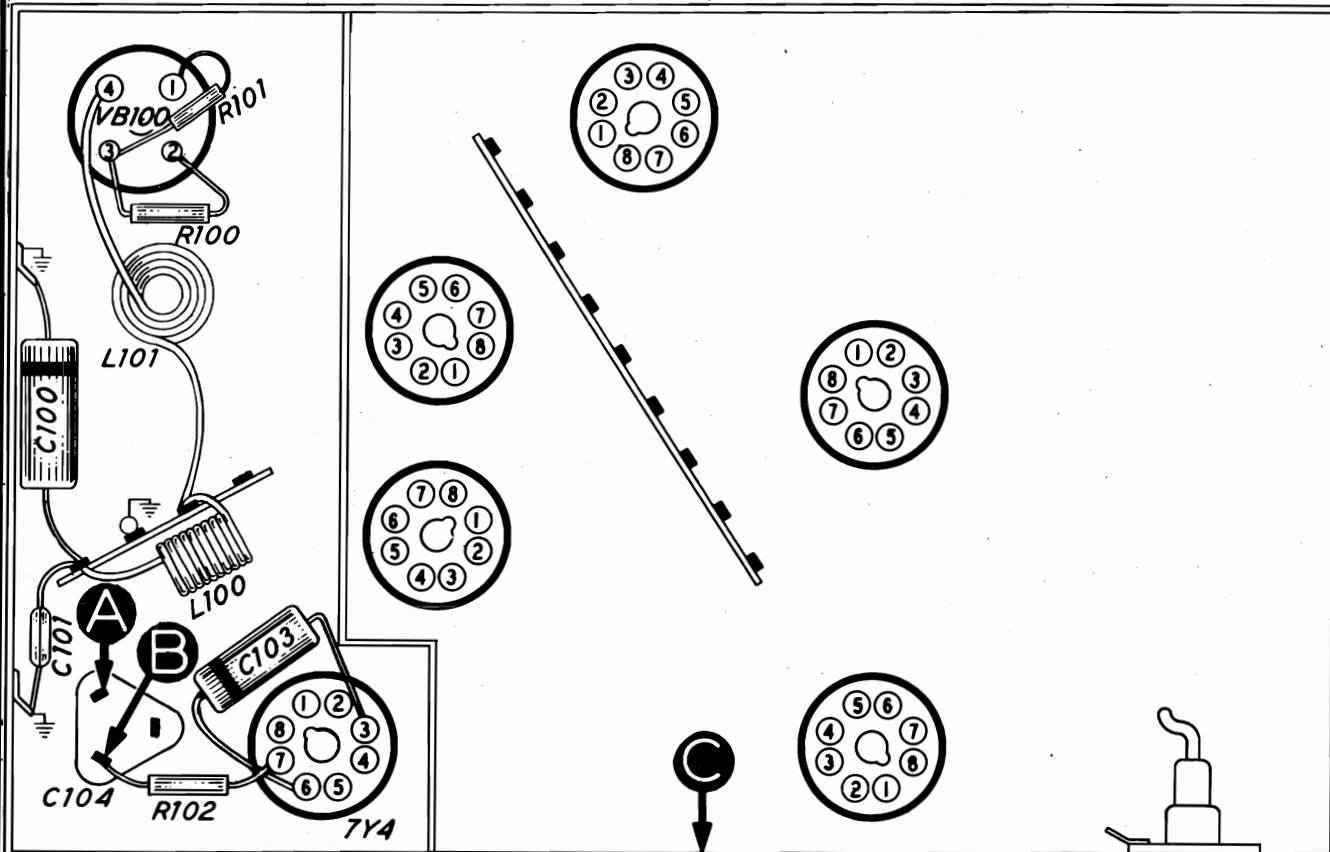
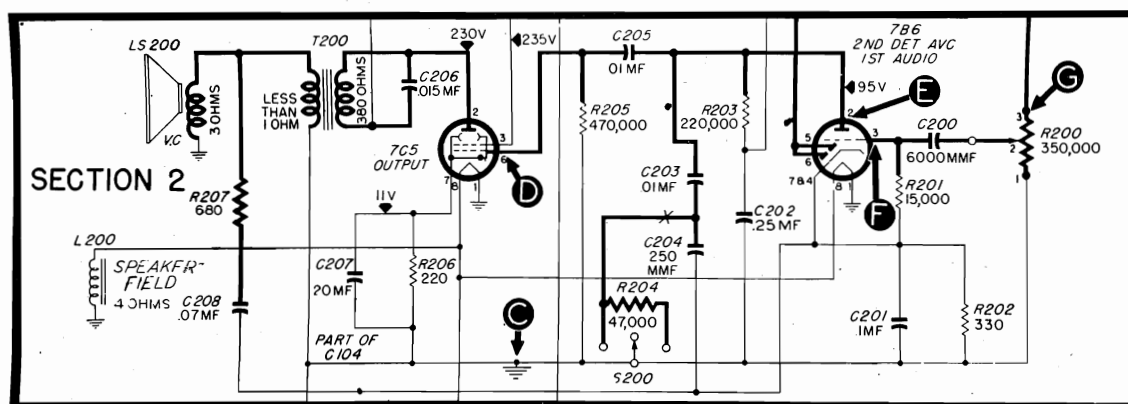


Figure 4. Bottom view, showing Section 1 test points.

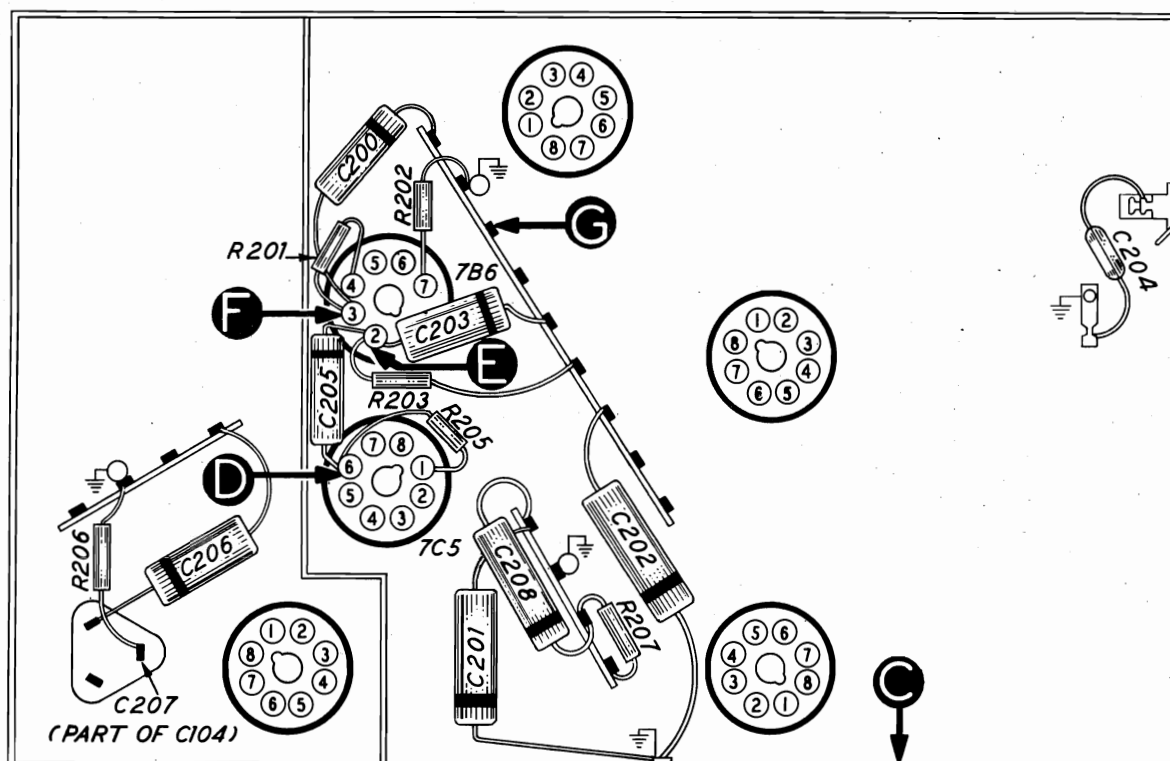
TP-435F

For all tests in this section, use an audio signal. Connect the generator output lead through a condenser (.01 to .25 mf.) to the points indicated; connect the ground lead to the receiver chassis (C). Set the receiver volume control at maximum and adjust the signal-generator output for a loud, clear signal.

TEST POINTS	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
D to C	Loud, clear signal from speaker.	Defective 7C5, T200, LS200, C205, or C206.
E to C	Loud, clear signal.	Open C205.
F to C	Clear signal, noticeably louder than preceding test.	Defective 7B6, or open R203, R202, or R406.
G to C	Loud, clear signal, same as preceding test.	Open C200, or defective R200 (rotate R200 through its entire range for complete check).



TP-435B



TP-435G

TESTS TO ISOLATE TROUBLE WITHIN SECTION 3

For all tests in this section, set the signal generator at 455 kc., with modulation on. Connect the generator output lead through a condenser (.01 to .25 mf.) to the points indicated; connect the ground lead to the receiver chassis (C). Set the receiver volume control at maximum and adjust the signal-generator output for a loud, clear signal.

TEST POINTS	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
H to C	Loud, clear signal from speaker.	Defective 7A7 or Z301, open R300, R302, or R404, or shorted C406.
J to C	Loud, clear signal.	Defective or misaligned Z300.

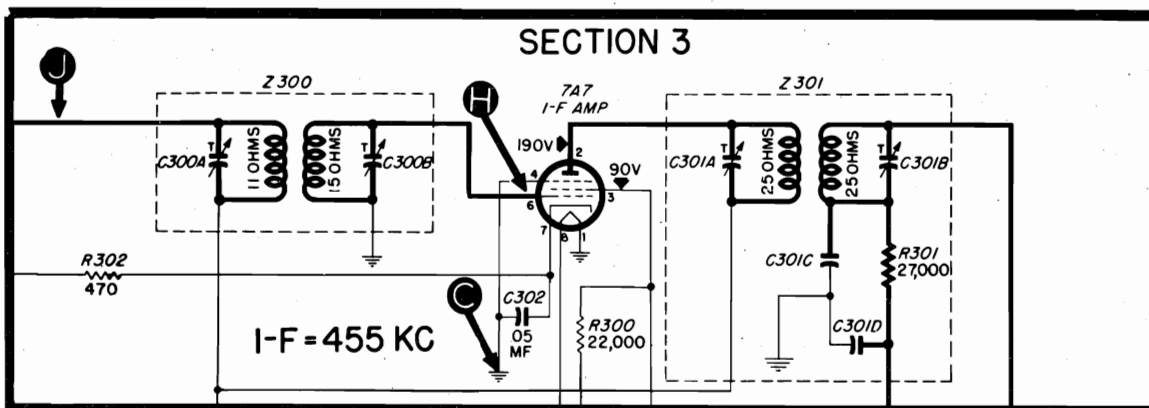


Figure 7. Section 3 schematic.

TP-435C

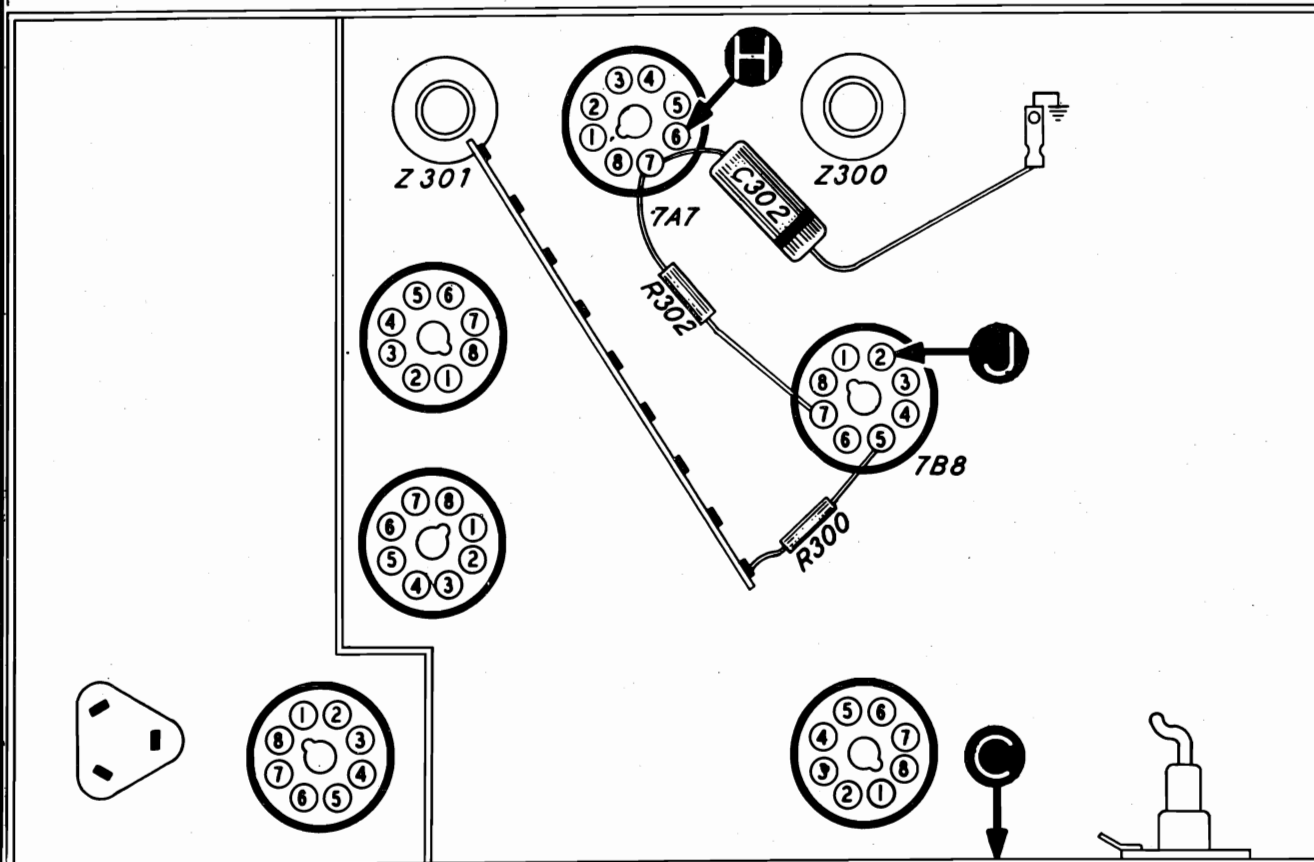


Figure 8. Bottom view, showing Section 3 test points.

TP-435H

TESTS TO ISOLATE TROUBLE WITHIN SECTION 4

1. Set the volume control at maximum. Rotate the tuning condenser through its entire range. Any scraping noise from the speaker indicates bent plates, or dirt between plates or on wiper contacts. Remedy such conditions before proceeding further.
2. Attach the positive lead of a 20,000-ohms-per-volt meter to chassis and the prod end of the negative lead through a 50,000-ohm resistor to point P. Set the meter on a 10-volt or similar

range, and rotate the tuning condenser through its entire range. Absence of voltage at any point indicates that the oscillator is not functioning. If so, check the components listed in the first test below.

3. Connect the signal generator as for previous tests, tune the generator and receiver to 1000 kc., and proceed as below.

TEST POINTS	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
K to C (chassis)	Loud, clear signal from speaker.	Defective 7B8, L402, C407, or open R407, R403 or C411.
L to C	Loud, clear signal.	Open C407.
M to C	Loud, clear signal.	Defective 7A7, or open R400 or R401.
N to C	Loud, clear signal.	Defective L400, C400, or L401.

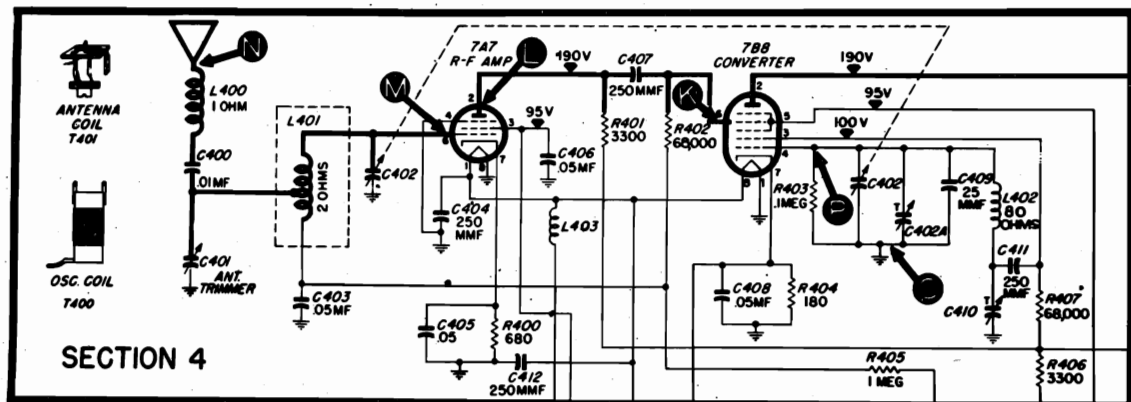


Figure 9. Section 4 schematic.

TP-435D

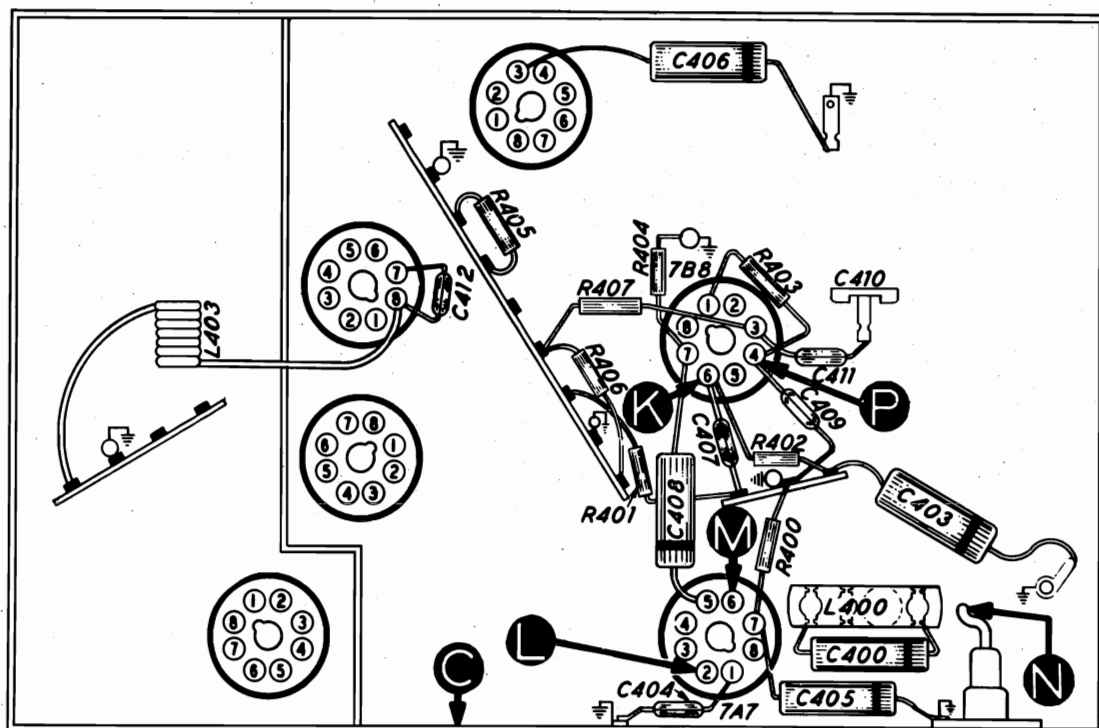


Figure 10. Bottom view, showing Section 4 test points.

TP-435J

PRELIMINARY INSTRUCTIONS

Remove the top chassis cover to reach adjustments.

OUTPUT METER:

Connect to the voice-coil lugs on the speaker.

SIGNAL GENERATOR:

Set the receiver volume control at maximum. Adjust the signal-generator output to give a readable deflection on the output meter, using a meter range that best indicates small changes in

output. Reduce the signal-generator output as alignment progresses, to prevent the meter needle from going off scale. Adjust all trimmers listed for maximum output.

DIAL CALIBRATION:

When the radio is re-installed in the car, the dial pointer must be set to coincide with the index dot at the low-frequency end of the dial, with the tuning condenser fully meshed.

ALIGNMENT CHART

	SIGNAL GENERATOR		RECEIVER		
	Connections to Receiver	Dial Setting	Tuning-Condenser Setting	Special Instructions	Adjust Trimmers
1	Through a .05 mf. condenser to stator of antenna section of tuning gang.	455 kc.	Fully meshed.	Ground stator of oscillator section of gang. Adjust in given order, and then repeat adjustment.	C301B C301A C300B C300A
2	Through a 10-mmf. condenser in series with antenna lead, Philco Part No. 95-0185, to antenna connector.	1580 kc.	Fully open.	Remove ground from oscillator section of gang. Adjust for maximum.	C402A
3	Same as 2.	1400 kc.	Tune in 1400 kc. signal.	Adjust for maximum. (Final adjustment should be made with receiver in car, connected to car antenna.)	C401
4	Same as 2.	580 kc.	Tune to maximum.	Adjust while rocking tuning condenser.	C410
5	Same as 2.			Repeat steps 2, 3, and 4.	

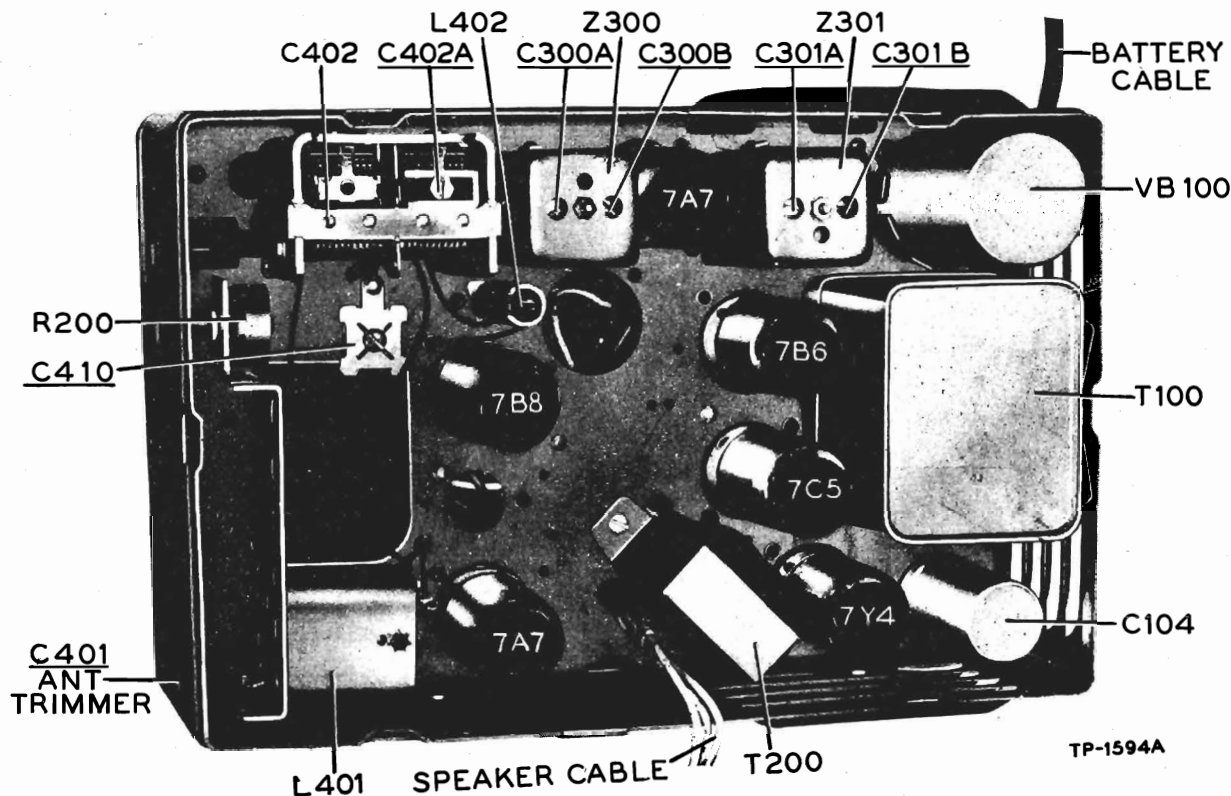


Figure 11. Top view, showing trimmer-condenser locations.

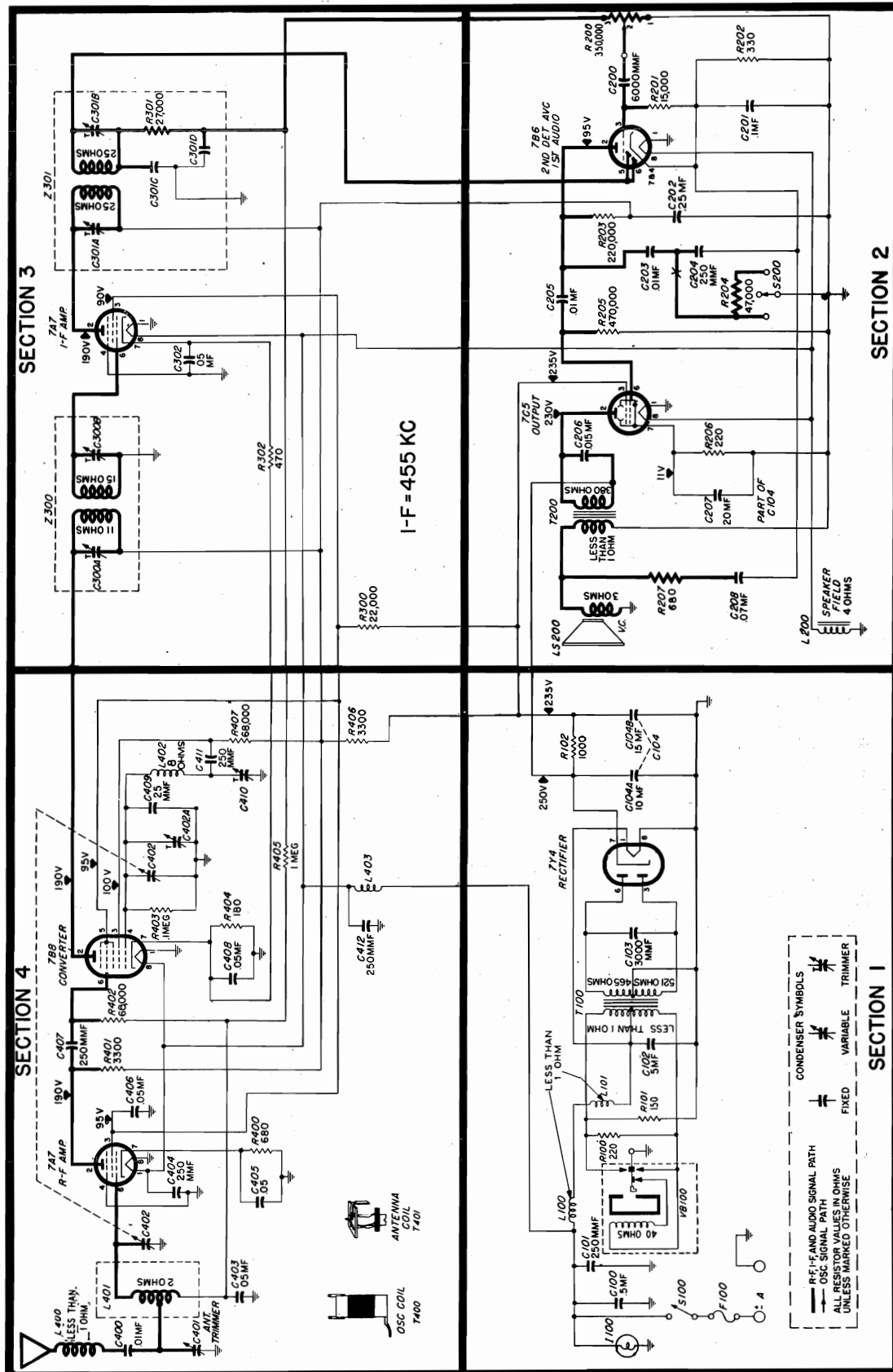


Figure 12. Complete schematic.

NOTE: All voltage, capacity, and resistance values shown are average. The voltages were measured with a 20,000-ohms-per-volt meter between the indicated test points and chassis (C).

MODEL UN6-400

PHILCO CORP.

REPLACEMENT PARTS LIST — Model UN6-400

Symbol designations used in the schematic
and parts list are as follows:

LA—loop antenna
LS—loudspeaker
R—resistor
C—condenser
I—pilot lamp

L—choke or coil
S—switch
T—transformer
W—power cord and plug
Z—i-f transformer assembly

NOTE: Parts marked with an asterisk (*) are general replacement items, and the numbers will not be identical with those used on factory assemblies. Use only the "Service Part No." shown in the parts list when ordering replacements.

SECTION 1

Reference	Description	Service Part No.
C100	Condenser, .5 mf.	61-0137*
C101	Condenser, 250 mmf.	60-1024037
C103	Condenser, 3,000 mmf.	61-0115
C104	Condenser, electrolytic, 10-15-20 mf.	61-0089
	C104A: condenser, 10 mf.	Part of C104
	C104B: condenser, 15 mf.	Part of C104
I100	Lamp, pilot	34-2039
L100	Choke, "A"	65-0037
L101	Choke, vibrator	65-0433
R100	Resistor, 220 ohms	66-1223340
R101	Resistor, 150 ohms	66-1153340
R102	Resistor, 1,000 ohms	66-2104340
S100	Switch	85-0112
T100	Transformer, power	65-0234*
VB100	Vibrator	83-0026*

SECTION 2

C200	Condenser, 6,000 mmf.	30-4504*
C201	Condenser, .1 mf.	30-4527*
C202	Condenser, .25 mf.	61-0125
C203	Condenser, .01 mf.	61-0120
C204	Condenser, 250 mmf.	60-10245307*
C205	Condenser, .01 mf.	61-0120
C206	Condenser, .015 mf.	61-0138
C207	Condenser, 20 mf.	Part of C104
C208	Condenser, .07 mf.	61-0152
LS200	Speaker	73-0059
	L200: coil, field	Part of LS200
R200	Control, volume, 350,000 ohms	67-0043
R201	Resistor, 15 megs.	66-6151540
R202	Resistor, 330 ohms	66-1333340
R203	Resistor, 220,000 ohms	66-4223340
R204	Resistor, 47,000 ohms	66-3473340*
R205	Resistor, 470,000 ohms	66-4473340*
R206	Resistor, 220 ohms	66-1224360
R207	Resistor, 680 ohms	66-2153340
S200	Switch, tone-control	77-0733
T200	Transformer, output	65-0419

SECTION 3

Z300	Transformer, 1st i-f	65-0319
	C300A: condenser, trimmer	Part of Z300
	C300B: condenser, trimmer	Part of Z300
Z301	Transformer, 2nd i-f	65-0320
	C301A: condenser, trimmer	Part of Z301
	C301B: condenser, trimmer	Part of Z301
	C301C: condenser, a-v-c filter	Part of Z301
	C301D: condenser, a-v-c filter	Part of Z301
	R301: Resistor, 27,000 ohms	Part of Z301
C302	Condenser, .05 mf.	30-4518*
R300	Resistor, 22,000 ohms	66-3224340
R302	Resistor, 470 ohms	66-1474360*

SECTION 4

C400	Condenser, .01 mf.	61-0120*
C401	Condenser, trimmer (antenna)	77-0545
C402	Condenser, tuning	63-0077
	C402A: condenser, trimmer	Part of C402
C403	Condenser, .05 mf.	30-4518*
C404	Condenser, 250 mmf.	60-10245307*

SECTION 4 (Continued)

Reference	Description	Service Part No.
C405	Condenser, .05 mf.	30-4518*
C406	Condenser, .05 mf.	30-4518*
C407	Condenser, 250 mmf.	60-10245307*
C408	Condenser, .05 mf.	30-4518*
C409	Condenser, 25 mmf.	60-00245307*
C410	Condenser, trimmer	63-0048
C411	Condenser, 250 mmf.	60-10245307*
C412	Condenser, 250 mmf.	60-10245307*
R400	Resistor, 680 ohms	66-1684360*
R401	Resistor, 3,300 ohms	66-2333340*
R402	Resistor, 68,000 ohms	66-3683340*
R403	Resistor, 100,000 ohms	66-4103340*
R404	Resistor, 180 ohms	66-1184360*
R405	Resistor, 1 meg.	66-5103340*
R406	Resistor, 3,300 ohms	66-2334340
R407	Resistor, 68,000 ohms	66-3683340*
L400	Choke, antenna	65-0168
L401	Coil, antenna-transformer	65-0323
L402	Coil, oscillator	65-0420
L403	Choke, "A"	65-0452

MISCELLANEOUS

Description	Service Part No.
Control assembly	42-5866
Cord, drive (25-foot spool)	45-1459
Dial	55-1194
Lead, "A" (control to set)	38-8221
Lead, "A" (control to fuse)	41-3387
Lead, "A" (fuse to ammeter)	77-0235
Lead, tone-control	95-0135
Plate, dial background	57-1888
Pointer	57-1889
Shaft assembly, tuning	57-1385
Shaft assembly, volume	57-1384
Sleeve, knob	57-1324FA3
Socket assembly, pilot-lamp	77-0541
Housing assembly	77-0751FJ20
Cover, tube-and-speaker side	57-1943FJ20
Cover, wiring side	57-1345FJ20
Screw, cover mounting	1W21813FA26
Set mounting kit	40-8536
Bolt, hook, set mounting	57-1340FA3
Clamp, cable	57-1463FA1
Lockwasher, set mounting	1W57223FA1
Nut, set mounting	1W21291FA3
Speaker mounting hardware	
Cloth, grille	89-0013
Lockwasher, speaker mounting	1W24257FA1
Screw, speaker mounting	1W19672FA3
Suppressor kit	40-9102
Condenser, interference	30-4007
Resistor, distributor	33-1196
Clamp, "A" lead	57-1429
Clamp, vibrator	57-1637FA3
Clip, coil-mounting	28-5002FA1
Connector, antenna	57-0591
Grommet, tuning-condenser mounting	27-4596
Screw, tuning-coil and volume-control assembly	1W19670FA3
Shield, power	57-1744FA3
Socket, tube	27-6128*
Socket, vibrator	27-6153*

PHILCO CORP.

MODELS 46-421,
46-421-I



**MODEL
46-421**



**MODEL
46-421-I**

SPECIFICATIONS

CABINET.....Model 46-421, walnut finish
Model 46-421-I, ivory finish
CIRCUIT.....Six tube superheterodyne
FREQUENCY RANGE.....540 to 1620 kc.

POWER INPUT.....A.C. or D.C., 105 to 120 volts
POWER CONSUMPTION.....30 watts at 117 volts
AERIAL.....Loop fastened to chassis; terminal
also provided for outside aerial

INTERMEDIATE FREQUENCY.....455 kc.
PHILCO TUBES USED.....7C7, 7A8, 7B7, 7C6,
50L6GT, 35ZGT/G
PILOT LAMP.....6-8-volt bayonet base,
Part No. 34-2068

PHILCO TROUBLE-SHOOTING PROCEDURE

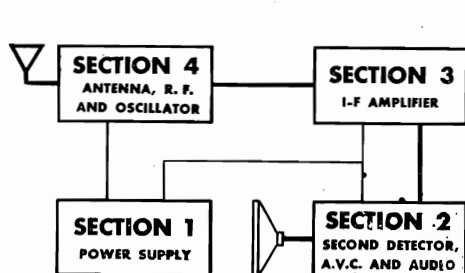


Figure 1. Block diagram (Heavy lines indicate signal path).

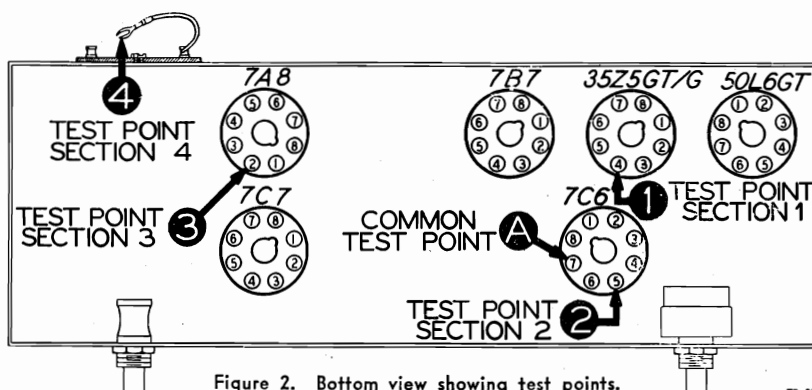


Figure 2. Bottom view showing test points.

In this bulletin, the receiver circuit is divided into four sections, as shown in figure 1. One test point is designated for each section, see figure 2, and tests made at these points localize the trouble to one section. After the trouble has been localized to one section by the tests given below, proceed with the tests outlined for that section. The equipment required for all tests outlined in this bulletin is a quality signal generator and a volt-ohm-

meter. Voltage readings shown in this bulletin were measured with a 20,000-ohm-per-volt meter. Connect the receiver to the power line, turn the volume control full on, and see that all tube filaments are lighted. Proceed with the section tests given in the following chart. If a normal result is not obtained at any test point, the trouble is in the section under test.

TESTS TO LOCALIZE TROUBLE TO ONE SECTION

SECTION	TEST	NORMAL RESULTS
1	Measure voltage between points 1 (+) and A (B-).	90 volts*.
2**	Apply audio signal between points 2 and A.	Loud, clear signal.
3**	Apply a weak, modulated r-f signal (455 kc.) between points 3 and A.	Loud, clear signal.
4**	Apply a weak, modulated r-f signal (frequency to which set is tuned) between points 4 and A.	Loud, clear signal.

*For 117-volt a-c input. When operating from a d-c power line and no voltage is measured, reverse the power plug.

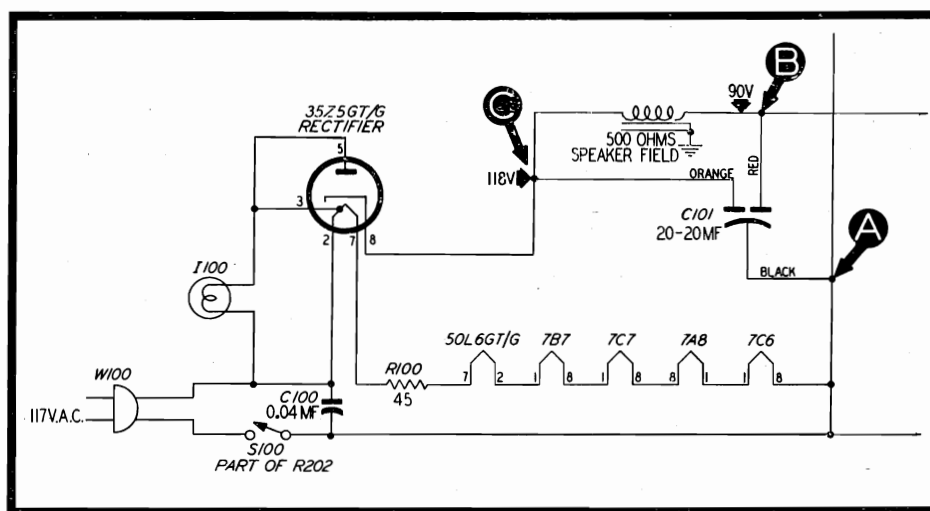
**Connect signal generator output lead through a condenser (.01 to .25 mf.).

MODELS 46-421,
46-421-I

PHILCO CORP.

TESTS TO ISOLATE TROUBLE WITHIN SECTION 1

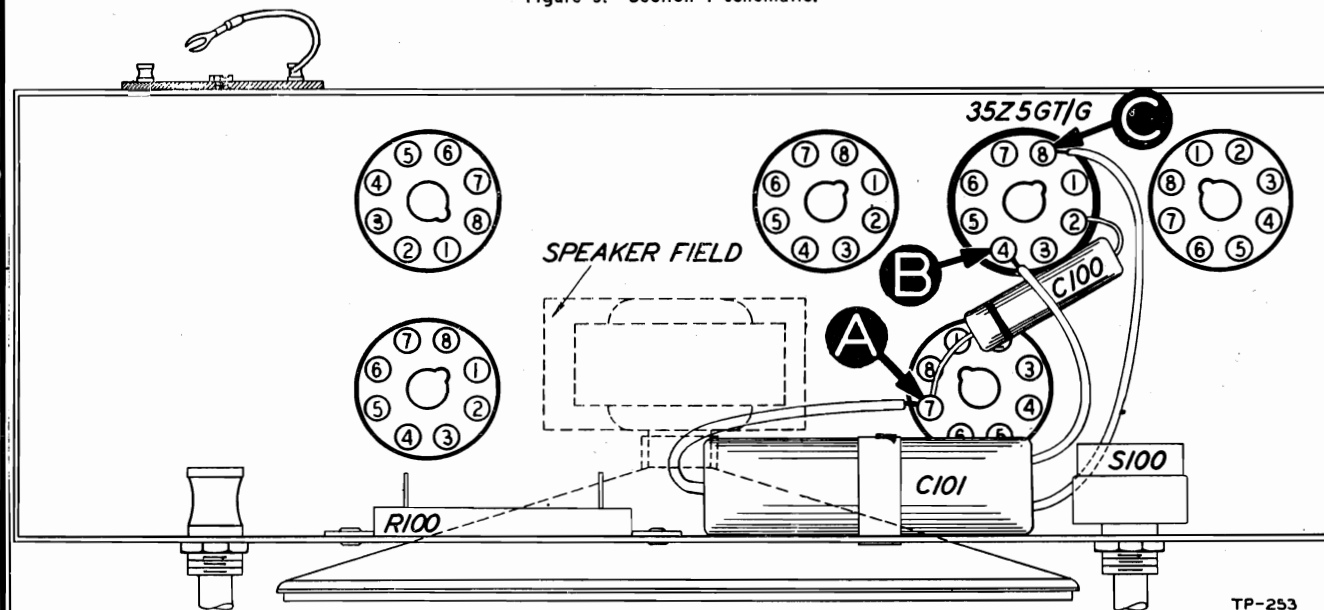
Test Points	Normal Reading	Possible Cause of Abnormal Reading
B to A	90 volts	No voltage indicates defective 35Z5GT/G tube, shorted condenser C101, or open speaker field. Low voltage indicates defective 35Z5GT/G tube, or leaky condenser C101, or shorted condenser C203.
C to A	118 volts	No voltage indicates defective 35Z5GT/G tube, or shorted condenser C101. Low voltage indicates defective 35Z5GT/G tube, or open condenser C101, or shorted condenser C203.



TP-257

Make all tests for this section with a volt-ohmmeter, using the 0-250v d-c range. See figures 3 and 4 for location of test points.

Figure 3. Section I schematic.



TP-253

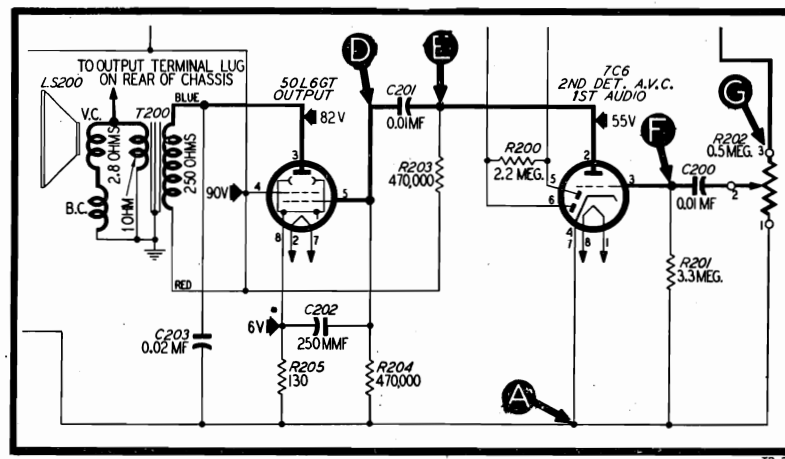
Figure 4. Bottom view showing section I test points.

PHILCO CORP.

MODELS 46-421,
46-421-I

TESTS TO ISOLATE TROUBLE WITHIN SECTION 2

Test Points	Normal Indication	Possible Cause of Abnormal Indication
D to A	Audible signal from speaker.	No signal indicates defective 50L6GT tube, defective output transformer T200, defective speaker LS200, shorted condenser C202 or C203, or open resistor R205.
E to A	Audible signal, same as previous test.	No signal indicates open condenser C201.
F to A	Noticeable increase of audible signal.	No signal indicates defective 7C6 tube, or open resistor R203.
G to A	With volume control full on, audible signal, same as previous test.	No signal indicates open condenser C200, or open volume control R202.



For all tests in this section, use the audio range of a signal generator. Connect the output lead through a condenser (.01 to .25 mf.); ground lead to point A.

Figure 5. Section 2 schematic.

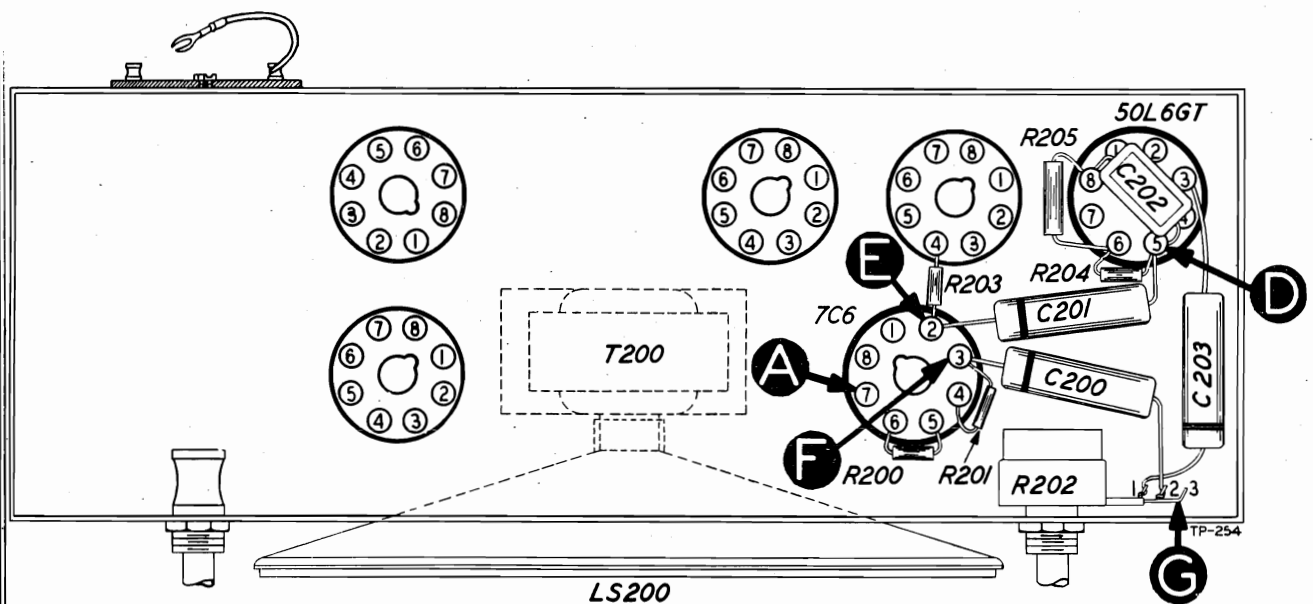


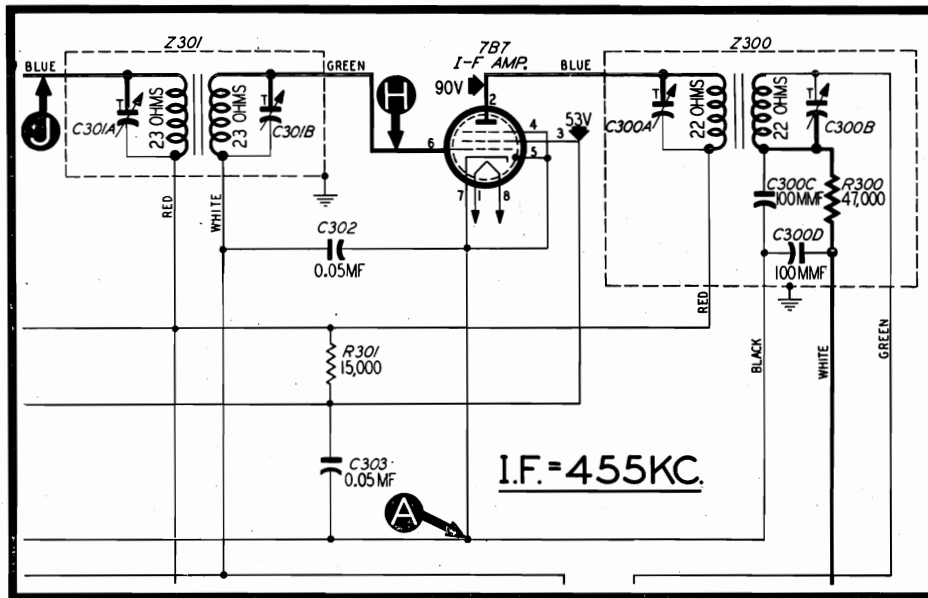
Figure 6. Bottom view showing section 2 test points.

MODELS 46-421,
46-421-I

PHILCO CORP.

TESTS TO ISOLATE TROUBLE WITHIN SECTION 3

Test Points	Normal Indication	Possible Cause of Abnormal Indication
H to A	Audible signal from speaker.	No signal indicates defective 7B7 tube, defective i-f transformer Z300, defective 7C6 tube, defective resistor R301, or shorted condenser C303.
J to A	Audible signal from speaker.	No signal indicates defective i-f transformer Z301.



For all tests in this section, set the signal generator to 455 kc., modulation on. Connect the output lead through a condenser (.01 to .25 mf.); ground lead to point A.

Figure 7. Section 3 schematic.

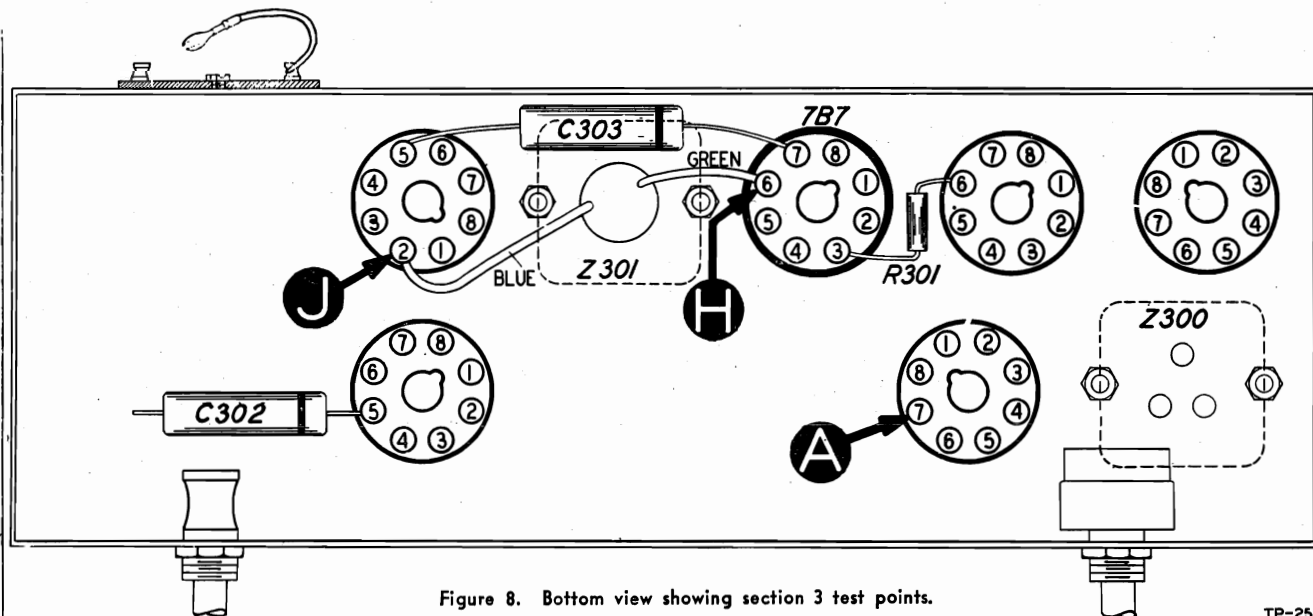


Figure 8. Bottom view showing section 3 test points.

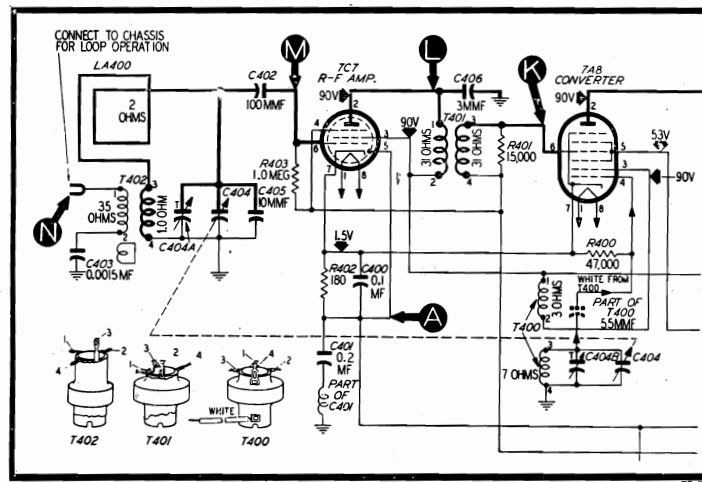
TP-255

PHILCO CORP.

MODELS 46-421,
46-421-I

TESTS TO ISOLATE TROUBLE WITHIN SECTION 4

Test Points	Normal Indication	Possible Cause of Abnormal Indication
K to A	Audible signal from speaker.	No signal indicates defective 7A8 tube, defective oscillator transformer T400, defective resistors R400 or R402, defective condenser C400, or shorted plates of condenser C404.
L to A	Audible signal from speaker.	No signal indicates defective r-f transformer T401.
M to A	Increase in audible signal from speaker.	No signal indicates defective 7C7 tube.
N to A	Same signal output as previous step.	No signal indicates defective antenna transformer T402, loop LA400, coupling condenser C402, or shorted plates of condenser C404.



For all tests in this section, set the signal generator and the receiver to 540 kc. Connect the output lead of the signal generator through a condenser (.01 to .25 mf.); ground lead to point A.

Figure 9. Section 4 schematic.

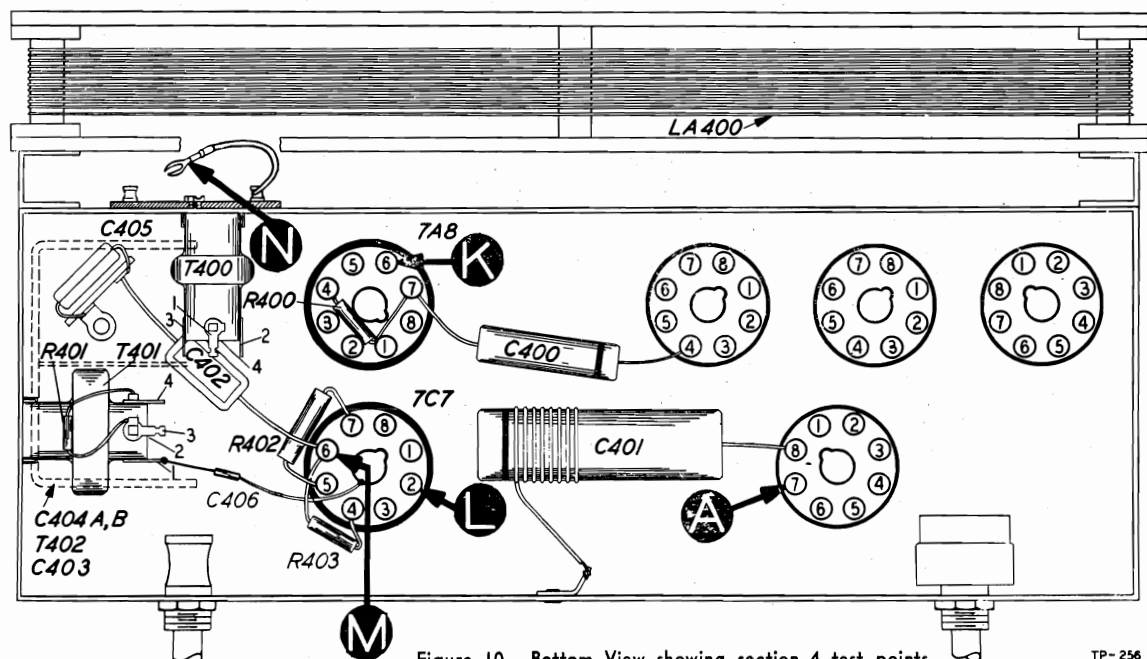


Figure 10. Bottom View showing section 4 test points.

TP-256

MODELS 46-421,
46-421-I

PHILCO CORP.

CONNECTING ALIGNING EQUIPMENT

OUTPUT METER. Connect to output (left hand) and ground (center) lugs of terminal panel on rear of chassis as shown in figure 11.

SIGNAL GENERATOR. Use a 100-mmf. condenser to couple the signal-generator output lead to the receiver. Adjust the output of the signal generator to give a signal strength sufficient to cause a readable deflection of the output meter, using the range on the meter which best indicates small variations in output. Reduce the output of the signal generator if the pointer of the output meter goes off scale as alignment progresses.

Make all adjustments in the order listed.

ALIGNMENT CHART

SIGNAL GENERATOR		RECEIVER				
Connections to Receiver	Dial Setting (kc.)	Dial Setting (kc.)	Volume Control Setting	Special Instructions	Adjust Trimmers in Given Order	Adjust Trimmers For
Stator plate terminal, antenna section of tuning condenser, and B-.	455	540	Max	Turn C-301B down tight. Turn tuning condenser plates to full-meshed position. Make sure that dial pointer is set to the left index line (small mark stamped on lower left side of scale plate reflector). This setting corresponds to a dial setting of 540 KC.	C300A C300B C301A C301B	Maximum output
Aerial lead and B-.	1600	1600	Max	Turn tuning condenser until dial pointer is on the first small index line (from right side) stamped on the scale plate reflector. This setting corresponds to a dial setting of 1600 KC.	C404B	Maximum output
Aerial lead and B-.	1500	1500	Max	Turn tuning condenser until dial pointer is on the second small index line (from right side) stamped on the scale plate reflector. This setting corresponds to a dial setting of 1500 KC.	C404A	Maximum output

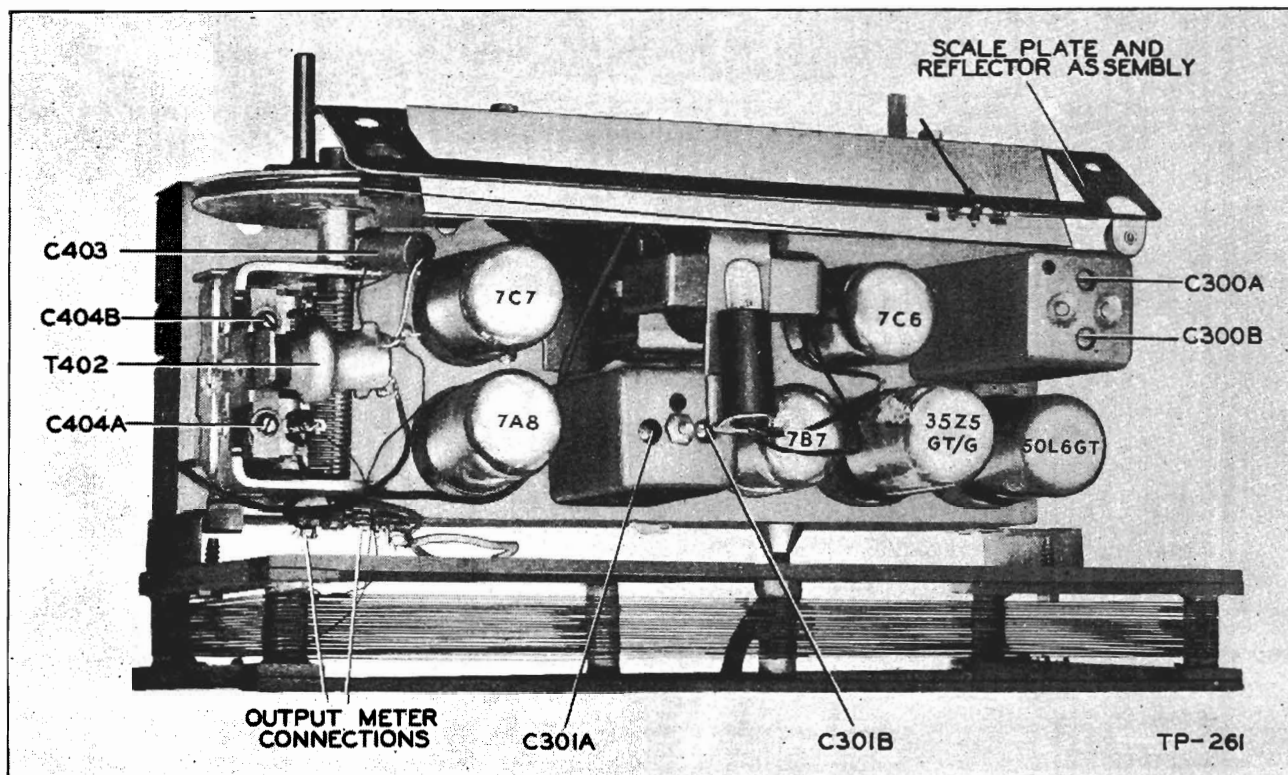


Figure 11. Top view showing trimmer condenser locations.



Figure 12. Complete schematic.

NOTE: All voltages and all capacity and resistance values shown are average. Voltages were measured between B- and the points indicated with a 20,000-ohm-per-volt meter; volume control at minimum, tuning condenser plates fully meshed.

MODELS 46-421,
46-421-I

PHILCO CORP.

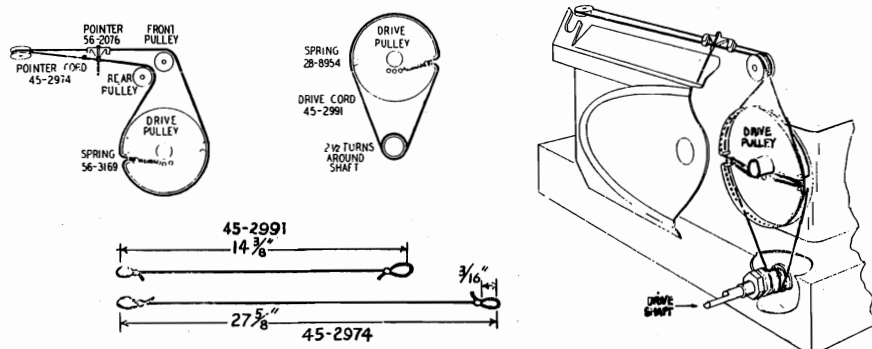


Figure 13. Drive cord installation details.

NOTE: Parts marked with an asterisk (*) are general replacement items and the numbers will not be identical with those used on factory assemblies. ALWAYS USE THE PART NUMBERS SHOWN IN THIS PARTS LIST WHEN ORDERING.

Symbol designations used in the schematics and parts list are as follows:

C—condenser S—switch
I—Pilot lamp T—transformer
LA—loop antenna W—power cord and plug
LS—loudspeaker Z—i-f transformer assembly
R—resistor

SECTION 1

Reference Number	Description	Service Part No.
C100	Condenser, .04 mf., 400V	30-4119
C101	Condenser, 20-20 mf., 150 V.	30-2547*
I100	Pilot Lamp, 6-8V., 150 ma.	34-2068
R100	Resistor, 50 ohms	33-3432
S100	Switch, Power	Part of R-202
W100	Power Cord and Plug	L-3199

SECTION 2

C200	Condenser, .01 mf., 400V.	61-0120*
C201	Condenser, .01 mf., 400V.	61-0120*
C202	Condenser, 250 mmf.	60-10245307*
C203	Condenser, .02 mf., 400V.	30-4599*
LS200	Speaker (with output transformer)	36-1591
R200	Resistor, 2.2 meg.	66-5223340*
R201	Resistor, 3.3 meg.	66-5333340*
R202	Volume Control, .5 meg.	33-5469
R203	Resistor, 470,000 ohms	66-4473340*
R204	Resistor, 470,000 ohms	66-4473340*
R205	Resistor, 130 ohms	66-1133340
T200	Transformer, Output	Part of LS-200

SECTION 3

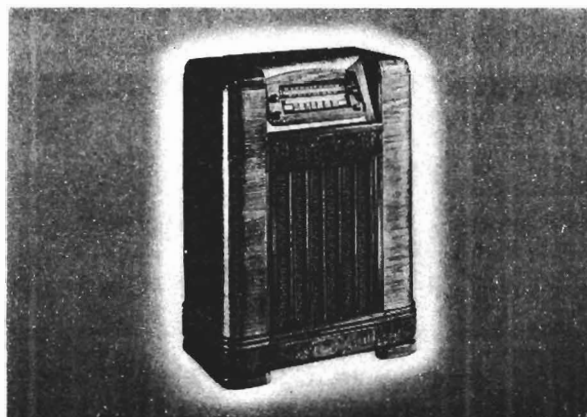
C300A	Condenser, Trimmer	Part of Z-300
C300B	Condenser, Trimmer	Part of Z-300
C300C	Condenser, 100 mmf.	Part of Z-300
C300D	Condenser, 100 mmf.	Part of Z-300
C301A	Condenser, Trimmer	Part of Z-301
C301B	Condenser, Trimmer	Part of Z-301
C302	Condenser, .05 mf., 200V.	30-4518*
C303	Condenser, .05 mf., 200V.	30-4518*
R300	Resistor, 47,000 ohms	Part of Z-300
R301	Resistor, 15,000 ohms	66-3153340
Z300	Transformer, 2nd I-F	32-4014
Z301	Transformer, 1st I-F	32-3962

SECTION 4

Reference Number	Description	Service Part No.
C400	Condenser, .1 mf., 200V.	30-4527*
C401	Condenser and Choke Assy	76-1198
C402	Condenser, 100 mmf.	60-10105407*
C403	Condenser, .0015 mf., 600V.	30-4621
C404	Condenser, 2-Section Tuning	31-2659
C404A	Condenser, Trimmer	Part of C-404
C404B	Condenser, Trimmer	Part of C-404
C405	Condenser, 10 mmf.	60-00105407
C-406	Condenser, 3 mmf.	30-1221
LA400	Loop Aerial	76-1877
R400	Resistor, 47,000 ohms	66-3473340*
R401	Resistor, 15,000 ohms	Part of T-401
R402	Resistor, 180 ohms	66-1184360*
R403	Resistor, 1 meg.	66-5103340*
T400	Transformer, Oscillator	32-3613
T401	Transformer, R-F	32-3595
T402	Transformer, Antenna	32-3394

MISCELLANEOUS

Baffle and cloth assembly, Model 46-421	40-6745
Model 46-421-I	40-6747
Backing plate, tuning condenser mounting	56-2105FA3
Bracket, antenna coil mounting	56-2058FA3
Cabinet, Model 46-421	10630
Model 46-421-I	10630A
Clamp, dial scale mounting	56-2068
Clamp, electrolytic condenser mounting	56-1346FA5
Clip, coil mounting	28-5002FE7
Dial scale, Model 46-421	27-5849
Model 46-421-I	27-5845
Drive cord, tuning condenser (25 ft. Spool)	45-2991*
Drive cord, pointer (25 ft. Spool)	45-2974*
Foot, felt	W-2190
Grommet, rubber, tuning condenser mounting	27-4610
Knob and spring assembly, Model 46-421	54-4227
Model 46-421-I	54-4228
Pointer, dial scale	56-2076FCP
Rubber band, dial scale mounting	54-4176
Scale plate and light reflector assembly	76-1476
Light reflector	27-9816
Screw-washer combination, chassis mounting	1W37656FA3
Shaft, tuning drive	31-2664
Shield, local tube	56-2731*
Socket, local	27-6138*
Socket, octal	27-6199*
Socket assembly, pilot lamp	76-2142
Spring, tuning condenser drive cord	28-8954
Spring, pointer drive cord	56-3167
Wiring panel, 2 lug	12W45646
Wiring panel, 3 lug	76-2148



TP-1442

MODEL 47-1227 SPECIFICATIONS

CABINET	Wood, walnut finish
CIRCUIT	Nine-tube superheterodyne
FREQUENCY RANGES:	
Broadcast	540 to 1720 kc
Frequency Modulation	88 to 108 mc
AUDIO OUTPUT	6 watts
OPERATING VOLTAGE	105—120 volts, 60 cycles, a.c.
POWER CONSUMPTION	110 watts
AERIALS	Built-in low-impedance loop and FM dipole. Provision for external aerial.
INTERMEDIATE FREQUENCIES:	
AM	455 kc
FM	9.1 mc
RECORD PLAYER	Philco Automatic Record Changer, Model D-10
SPEAKER	12" electrodynamic
PHILCO TUBES (9)	6AG5, 7F8, 6BA6, 7R7, 7X7, 6J5GT, 6K6GT (2), 5AZ4
PANEL LAMPS (2)	6—8-volt, Part No. 34-2040
BIN LAMP	6—8-volt, Part No. 34-2039

CIRCUIT DESCRIPTION

The Philco Model 47-1227 is a nine-tube superheterodyne radio-phonograph combination providing reception on the standard broadcast band, 540—1720 kc and the FM band, 88—108 mc.

A low-impedance loop within the cabinet provides adequate signal pickup on the broadcast band. Satisfactory FM reception usually requires the use of an outdoor dipole aerial (Philco Part No. 45-1462). In areas of high signal strength, however, the dipole built into the cabinet is sufficient for FM operation.

A tuned r-f stage, using a type 6AG5 high-frequency pentode tube, functions on the FM band. The converter stage employs a 7F8 high-frequency double triode. The converter and r-f stages are built on a separate chassis, to insure reliable performance at high frequencies. These stages provide high signal-to-noise ratio, high conversion efficiency, and good image rejection.

Two transformer-coupled i-f stages are used. The i-f transformers have two sets of windings; one set is tuned to 455 kc for AM operation, the other to 9.1 mc for FM operation. Switching of the windings to attenuate undesired beat frequencies is necessary only in the first i-f transformer. The large difference between intermediate frequencies makes further switching unnecessary.

The first i-f stage employs a 6BA6 (miniature type) high-frequency pentode amplifier; the pen-

tode section of a 7R7 double-diode-pentode tube checks of the parts associated with the point under functions as the second i-f amplifier. One diode test, and remedied before testing further. of the 7R7 tube is used for AM detection, while the other diode develops a-v-c voltage.

The ratio-detector circuit used for FM detection operates through the two diodes of the 7X7 tube; this circuit has good noise-reducing properties and a superior tuning characteristic. The triode section of the 7X7 tube is used as a first audio and phono amplifier stage. The output of the AM detector, FM detector, or phono pickup is switched into this circuit by the operation of the function switch.

A type 6J5GT triode tube operates as a phase inverter, driving the two 6K6GT output tubes in push-pull operation.

A more uniform frequency response is obtained by the use of inverse feedback. The inverse-feedback voltage is taken from the secondary of the output transformer, and applied through resistor R211 to the junction of R204 and the volume control.

The TONE control is continuously variable; with clockwise rotation, the bass is increased, and as rotation is continued, the high frequencies are attenuated.

The 12-inch electrodynamic speaker provides excellent bass reproduction.

For service information on the record changer, refer to the service manual PR-1156 for the Philco Automatic Record Changer, Models D-10 and D-10A.

SYMBOLIZATION AND TERMINOLOGY

All components in the radio circuit are symbolized and located as follows:

C—condenser	LA—loop aerial	S—switch
I—pilot lamp	LS—loudspeaker	T—transformer
L—choke or coil	R—resistor	Z—electrical ass'y

100-series components are in Section 1 — power supply

200-series components are in Section 2 — audio amplifier

300-series components are in Section 3 — i-f amplifier, second detector and/or discriminator, and a.v.c.

400-series components are in Section 4 — the aerial, r-f and oscillator.

The main switch assembly, commonly referred to in the past as the "Band Switch", is used, in many instances, for various purposes in addition to band switching. Therefore, in this manual, the main wafer-switch assembly is designated as the "Function Switch".

PRELIMINARY CHECKS

The following preliminary checks are recommended, before turning on the radio.

1. Carefully inspect both top and bottom of the chassis. Make sure that all tubes are secure in the proper positions. Look for bad connections, burnt resistors, or other obvious faults.

2. Measure the resistance between B+ (pin no. 8 of the 5AZ4 rectifier tube) and the radio chassis, with the ohmmeter polarity such that it gives the highest resistance reading; if the reading is lower than 50,000 ohms, check condensers C102, and be located by voltage, resistance, or capacitance C103 (A and B) for leakage or shorts.

PHILCO TROUBLE-SHOOTING PROCEDURE

In this manual, the circuit is divided into four sections, with individual chassis base layouts and a complete schematic showing test points for each section. The first step in each trouble-shooting chart is a master check, which makes it possible to determine whether trouble exists in that section without going through the entire test procedure. Failure to secure the "Normal Indication" in a given step indicates trouble, which should then be located by voltage, resistance, or capacitance.

CALIBRATING DIAL BACKPLATE

When the radio chassis is removed from the cabinet, dial calibration and alignment points may be marked by small pencil dots made on the dial-backplate assembly below the pointer.

The method of measuring for these points is illustrated in figure 1, which shows the relationship between dial marking and scale backplate.

Hold a ruler against the scale backplate in the position shown. Make dots at the proper points for the desired frequency settings. When the ruler is correctly placed, the index point is $1\frac{9}{16}$ inches from the reference point, as shown in figure 1.

With the tuning gang fully meshed, the pointer should be adjusted on the dial drive cord to coincide with the index mark.

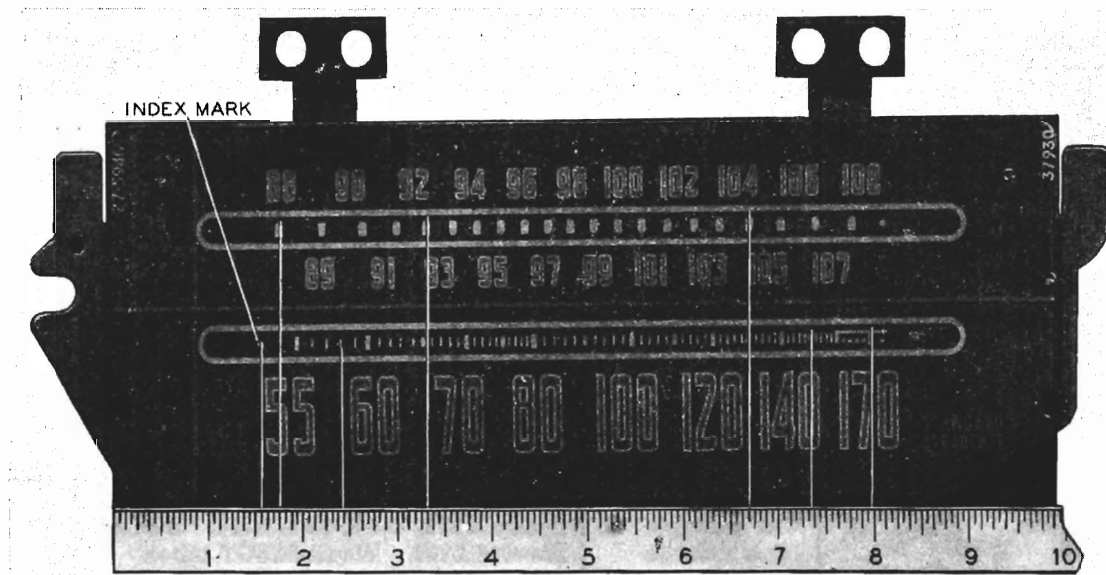


FIGURE 1. DIAL-BACKPLATE CALIBRATION MEASUREMENTS.

TP-2827

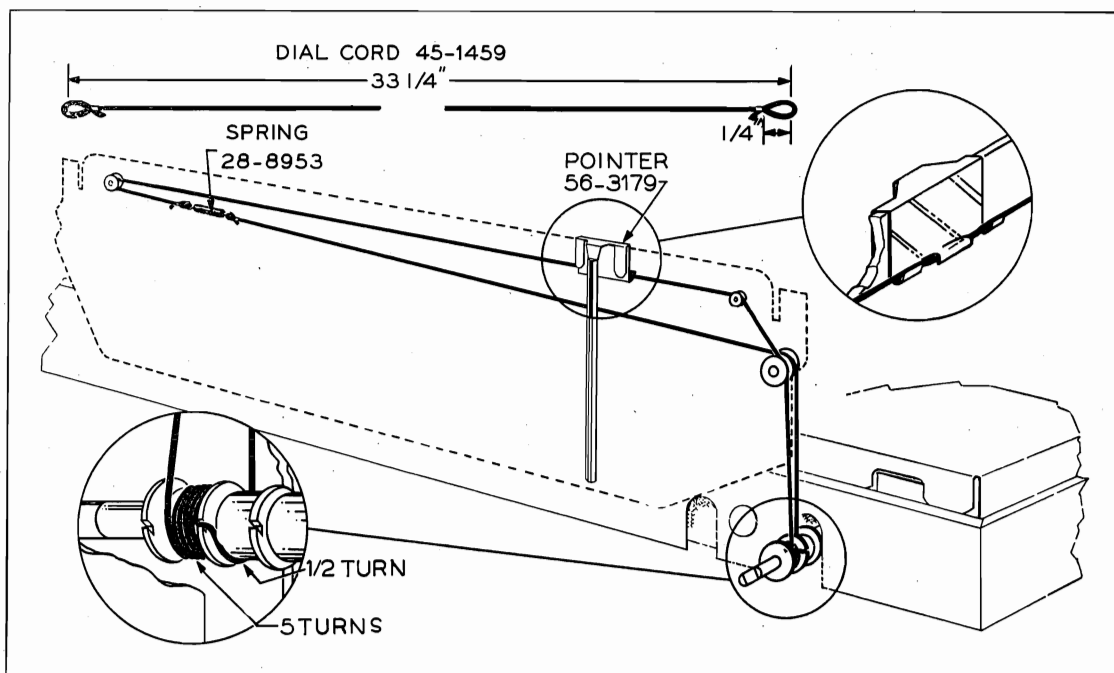


FIGURE 2. POINTER-DRIVE-CORD INSTALLATION DETAILS.

TP

SECTION 1 – TROUBLE SHOOTING

CAUTION: Do not turn on power with speaker disconnected, as this may cause damage to the radio.

Make all tests for this section with a volt-ohmmeter, using the applicable d-c ranges. Voltages were taken with a 20,000-ohms-per-volt meter at a line voltage of 117 volts, a.c. The VOLUME control was set at minimum and the TONE control fully counterclockwise; the function switch was set in BC (broadcast) position. See figure 3 for location of test points. Follow steps in proper sequence; if the "Normal Indication" is obtained in step 1, proceed with tests for Section 2; if not, isolate and remedy the trouble in this section. It will be noted that certain parts in other sections of the radio are listed under "Possible Cause of Abnormal Indication" because they may produce abnormal indication in Section 1.

STEP	TEST POINTS	NORMAL INDICATION	ABNORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	D to C E to C	208 volts 290 volts	No voltage or incorrect voltage	Trouble in this section. Isolate by the following tests.
2	A to C	350 volts	No voltage Low voltage High voltage	Defective 5A24 tube, T100, S100 or W100. Shorted C102. Open R100. Defective 5A24 tube. Shorted or leaky C102, C308, C311, C322, C309, C408 or C409. Shorted or leaky C103A or C103B. Open L100, R101 or T200.
3	B to C	Negative 20 volts	High voltage Low or no voltage	Open R100. Shorted R100. Weak 6K6GT tubes.
4	D to C	208 volts	No voltage Low voltage High voltage	Shorted C103B. Open R101. Leaky C103B, C319, C307 or C310. Open R300 or R303.
5	E to C	290 volts	No voltage Low voltage High voltage	Shorted C103A. Open L100. Leaky C211, C212, or C103A. Grounded T200. Shorted L100. Weak 6K6GT tubes.
Listening Test			Abnormal hum may be caused by open C100, C101, C102 or C103A.	

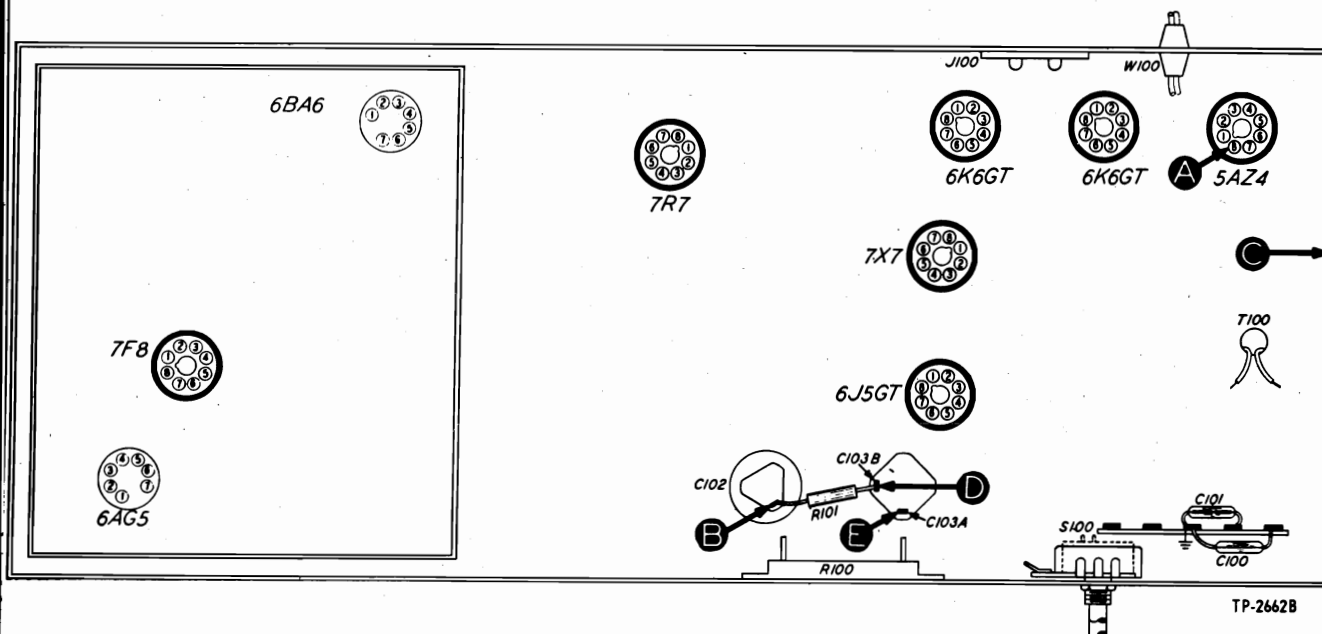


FIGURE 3. BOTTOM VIEW, SHOWING SECTION 1 TEST POINTS.

SECTION 2 – TROUBLE SHOOTING

Connect the audio-signal generator ground lead to test point "C" (chassis); connect the output lead through a .1-mf condenser to the test points indicated in the chart. Set the radio VOLUME control to maximum and adjust the signal-generator output as indicated in the chart. If the "Normal Indication" is obtained in step 1, proceed to Section 3; if not, isolate and remedy the trouble in this section.

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with low signal-generator output.	Trouble within this section. Isolate by the following tests.
2	B (Remove 6J5GT tube)	Loud, clear signal with high signal-generator output.	Defective 6K6GT tube, T200 or LS200. Open R214. Shorted or leaky C212 or C214.
3	D (Remove 6J5GT tube)	Same as step 2.	Defective 6K6GT tube. Shorted or leaky C211. Open R215.
4	E (Replace 6J5GT tube)	Loud, clear signal with moderate signal-generator output.	Defective 6J5GT tube. Open R212, R209 or R210. Leaky or shorted C210.
5	F	Loud, clear signal with low signal-generator output.	Defective 7X7 tube. Open R207 or C210. Shorted C206.
6	A	Same as step 5.	Shorted C202, C201 or C326. Open R201, C203, R203 or C208.
7	PL200 (Function switch on PHONO)	Same as step 5.	Defective PL200 or FS2 (R).
Listening Test		Distortion may be caused by leaky C210, C212, C211, C213 or C214. Hum will result if C213 is open.	

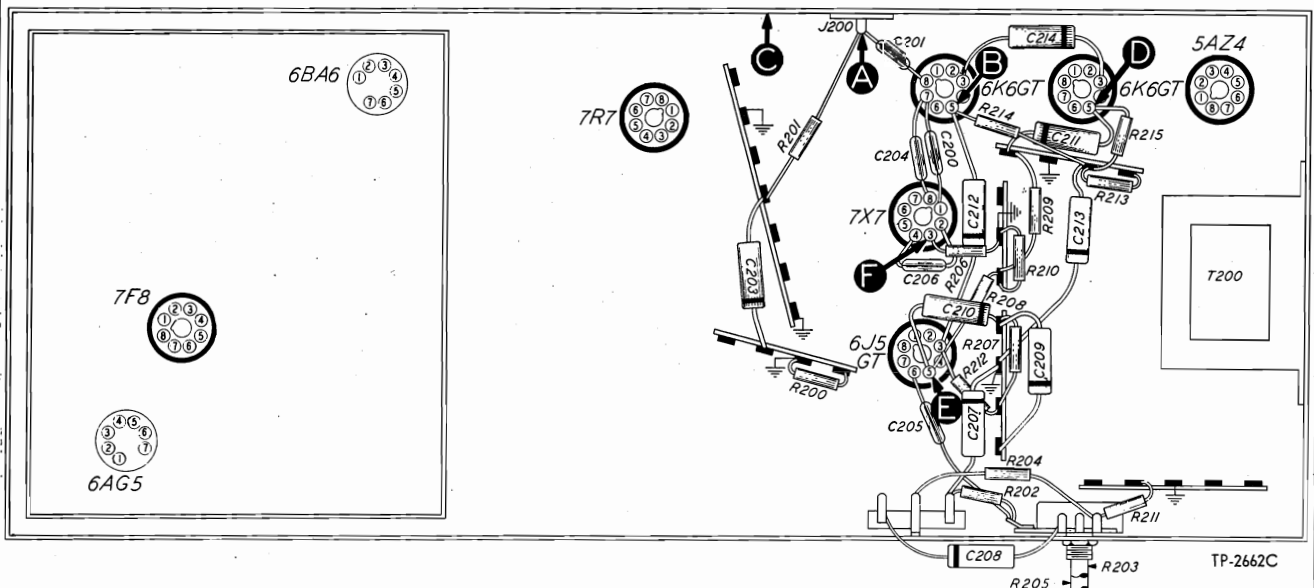


FIGURE 4. BOTTOM VIEW, SHOWING SECTION 2 TEST POINTS.

SECTION 3 – TROUBLE SHOOTING

AM TESTS

For the following tests, use an r-f signal generator, with modulated output, set at 455 kc. Connect the generator ground lead to the radio chassis, test point "C"; connect the output lead through a .1-mf condenser to the test points indicated.

Turn the radio VOLUME control to maximum, function switch to BC (broadcast) position, and TONE control fully counterclockwise.

If the "Normal Indication" is obtained in the first step, proceed to the FM tests, or to the tests in Section 4; if not, isolate and remedy the trouble in this section.

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with low signal-generator output.	Trouble within this section. Isolate by the following tests.
2	B	Loud, clear signal with high signal-generator output.	Defective 7R7 tube or Z302. Improperly aligned Z302. Open R313 or R314. Leaky or shorted C322, C321 or C326. Defective switch FS3 (R) or FS2 (R).
3	D	Loud, clear signal with moderate signal-generator output.	Defective or misaligned Z301. Defective 6BA6 tube. Open R306, R304, R305 or C307. Shorted or leaky C308, C309, C307, C311, or C310.
4	A	Loud, clear signal with low signal-generator output.	Defective or misaligned Z300. Shorted or leaky C303, C304, C305. Defective FS4 (R) or FS4 (F). Open R301.
Listening Test		Distorted signal with hum, may be caused by open C307, or C319.	

FM TESTS

Follow the instructions preliminary to the AM test chart, except set the signal-generator frequency to 9.1 mc, and detune to one side or the other until a satisfactory test signal is obtained; set function switch to FM position.

SECTION 3 — Continued

The most satisfactory check on the operation of the discriminator circuit is the ability to make proper alignment, as described on pages 14, 15 and 16.

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	B	Loud, clear signal with high signal-generator output.	Defective 7X7 tube or C325. Open R318. Leaky or shorted C324, C328 or C323. Defective or misaligned Z302.
2	D	Same as step 1.	Same parts as listed in AM tests, step 3.
3	A	Loud, clear signal with low signal-generator output.	Same parts as listed in AM tests, step 4.

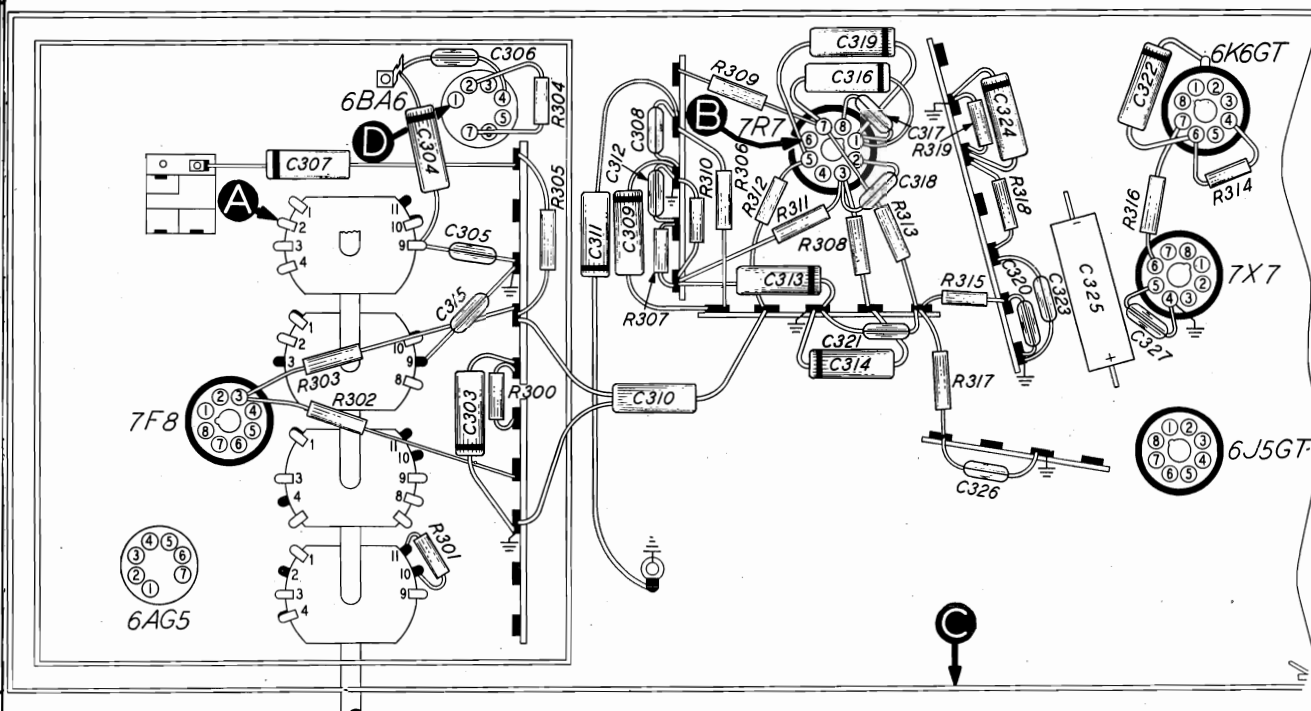


FIGURE 5. BOTTOM VIEW, SHOWING SECTION 3 TEST POINTS.

TP-2662D

SECTION 4 – TROUBLE SHOOTING

For tests indicated in this section with the exception of oscillator test, use an r-f signal generator with modulated output. Connect the generator ground lead to the radio chassis, test point "C"; connect the output lead through a .1-mf condenser to the test points indicated.

Turn the VOLUME control to maximum and the TONE control to nearly OFF position.

Set the function switch, TUNING control, and signal-generator frequency as indicated in chart.

Oscillator test: (AM tests, step 3, FM tests, step 3). Attach the positive lead of a high-resistance voltmeter to the 7F8 oscillator cathode (pin 4). Connect the negative lead through a 100,000-ohm isolating resistor to the 7F8 oscillator grid (pin 1) test point "D". Use a suitable meter range (0-10 to 0-50 volts).

Absence of negative grid voltage in either AM or FM position of function switch indicates that the oscillator is not functioning; check the parts listed in the chart for the oscillator tests.

AM TESTS

STEP	TEST POINT	SIG. GEN. FREQUENCY	FUNCTION SWITCH AND TUNING CONTROL	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	1000 kc	BC. Tune to signal from generator.	Loud, clear signal with low generator input.	Trouble in this section. Isolate by the following tests.
2	B	1000 kc	Same as step 1.	Same as step 1.	Defective 7F8 tube, Z300, C400, L406 or R408. Open C303, C402B, R405, R406, R303 or R300. Misaligned Z300. Trouble in oscillator section (step 3).
3	D (Osc. test)	Not used	BC. Rotate 540-1720 kc	Negative 2 to 3 volts.	Defective 7F8 tube, FS3 (F), FS2 (F), C411, C412, C413, C402B, L404 or C400.
4	A	1000 kc	BC. Tune to signal from generator.	Loud, clear signal with low generator input.	Defective L400, C400, C401 or FS1 (R). Open R404 or C410.

FM TESTS

1	E	95 mc	FM. Tune to signal from generator.	Loud, clear signal with low generator input.	Trouble in this section. Isolate by the following tests.
---	---	-------	------------------------------------	--	--

SECTION 4 — Continued

STEP	TEST POINT	SIG. GEN. FREQUENCY	FUNCTION SWITCH AND TUNING CONTROL	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
2	B	95 mc	Same as step 1.	Same as step 1.	Same troubles as in AM tests, step 2.
3	D (Osc. test)	Not used	FM. Rotate 88 to 108 mc.	Negative Voltage. Approx. 1 volt.	Defective 7F8 tube, FS3 (R), FS2 (R), C411, C412, C413, C400 or L405.
4	F	95 mc	FM. Tune to signal from generator.	Loud, clear signal with low generator input.	Defective C407, L403, C400, C400B, or FS1 (R).
5	E	95 mc	FM. Tune to signal from generator.	Loud, clear signal with low generator input.	Defective 6AG5 tube, C400, L401 or C400A. Open R400, R401, R402, R403, L402 or C403. Shorted or leaky C408 or C409.

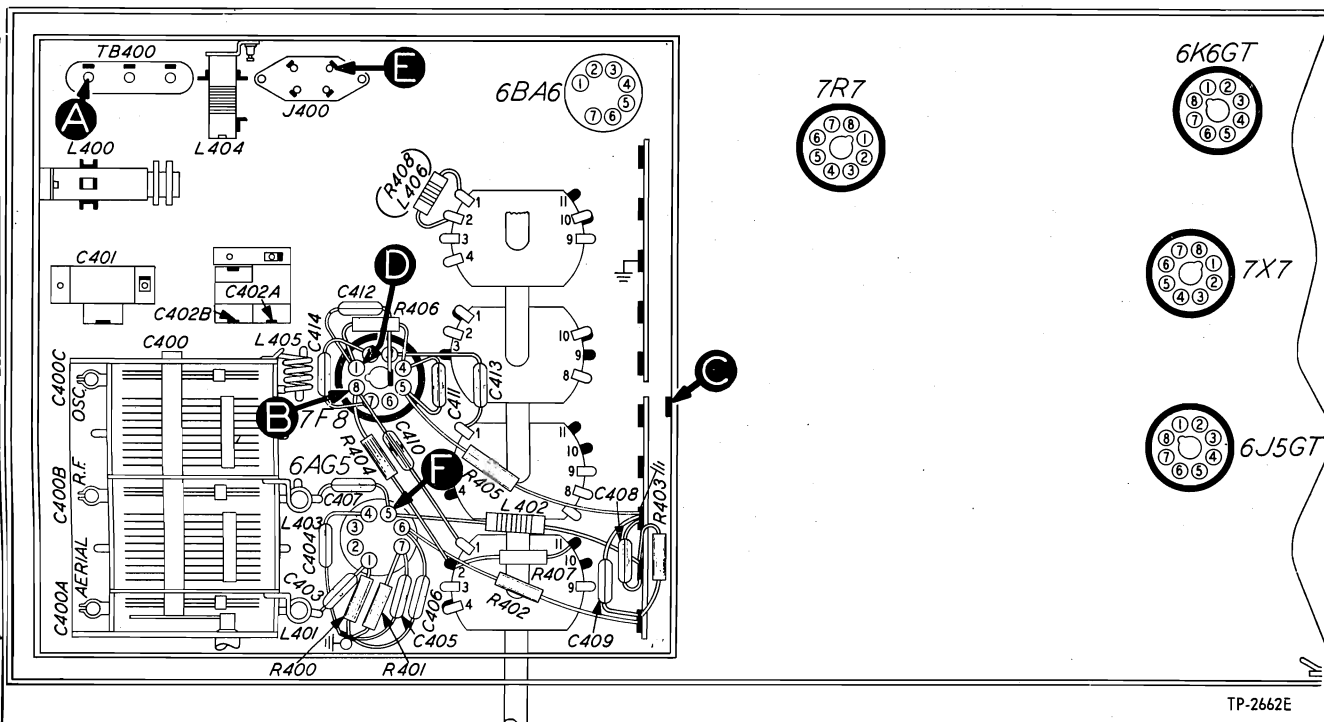


FIGURE 6. BOTTOM VIEW, SHOWING SECTION 4 TEST POINTS.

REPLACEMENT PARTS LIST

NOTE: Parts marked with an asterisk (*) are general replacement items, and the numbers may not be identical with those on factory assemblies; also, the electrical values of some replacement items furnished may differ from the values indicated in the schematic and parts list. The values substituted in any case are so chosen that the operation of the instrument will be either unchanged or improved. When ordering replacements, use only the "Service Part No." in this parts list.

SECTION 1

Reference No.	Description	Service Part No.
C100	Condenser, .01 mf, line filter	61-0120*
C101	Condenser, .01 mf, line filter	61-0120*
C102	Condenser, electrolytic 20 mf, high-voltage filter	30-2555*
C103	Condenser, electrolytic	30-2556*
	C301A: condenser, 25 mf, high-voltage filter	Part of C103
	C103B: condenser, 10 mf, isolating filter	Part of C103
I100	Lamp, bin	34-2039*
I101	Lamp, panel	34-2040*
I102	Lamp, panel	34-2040*
J100	Socket, a-c phono power	27-6200
L100	Field, speaker	Part of LS200
R100	Resistor, 165 ohms, 6K6 bias	33-3435-1
R101	Resistor, 15,000 ohms, voltage-dropping	66-3155340*
S100	Switch, power ON-OFF	Part of R205
S101	Bin-light switch	42-1702
S102	Switch, phono a-c power	Part of 42-1803
T100	Transformer, power	32-8248
W100	Cord, line	L-3199

SECTION 2

C200	Condenser, 100 mmf, filament by-pass	60-10105407*
C201	Condenser, 100 mmf, r-f by-pass	60-10105407*
C202	Condenser, 100 mmf, r-f by-pass	60-10105407*
C203	Condenser, .006 mf, audio coupling	45-3500-7*
C204	Condenser, 100 mmf, filament by-pass	60-10105407*
C205	Condenser, 100 mmf, audio by-pass	60-10105407*
C206	Condenser, 100 mmf, plate by-pass	60-10105407*
C207	Condenser, .01 mf, bass compensation	61-0120*
C208	Condenser, .006 mf, audio coupling	45-3500-7*
C209	Condenser, .01 mf, audio by-pass	61-0120*
C210	Condenser, .006 mf, audio coupling	45-3500-7*
C211	Condenser, .006 mf, audio coupling	45-3500-7*
C212	Condenser, .006 mf, audio coupling	45-3500-7*
C213	Condenser, .1 mf, grid phasing	61-0113*
C214	Condenser, .003 mf, audio by-pass	61-0117*
J200	Socket—FM TEST	27-6180
LS200	Speaker	36-1595
PL200	Cable and plug assembly, phono-input	41-3735-2
R200	Resistor, 150,000 ohms, phono grid load	66-4153340*
R201	Resistor, 100,000 ohms, r-f decoupling	66-4103340*
R202	Resistor, 33,000 ohms, bass compensating	66-3333340*
R203	Control, VOLUME, 2 meg. (tap at 1 meg.)	33-5535-1
R204	Resistor, 4.7 ohms, audio inverse feedback	66-9473340
R205	Control, TONE, 6 meg.	33-5538-1
R206	Resistor, 10 meg., grid leak, first audio	66-6103340*
R207	Resistor, 220,000 ohms, plate load 7X7	66-4223340*
R208	Resistor, 1 meg., grid load	66-5103340*
R209	Resistor, 4700 ohms, cathode bias	66-2473340*
R210	Resistor, 47,000 ohms, cathode bias	66-3473340*
R211	Resistor, 68 ohms, audio feedback	66-0683340*
R212	Resistor, 56,000 ohms, plate load 6J5	66-3563340*
R213	Resistor, 150,000 ohms, grid phasing	66-4153340*
R214	Resistor, 330,000 ohms, grid load	66-4333340*
R215	Resistor, 330,000 ohms, grid load	66-4333340*
T200	Transformer, output	32-8274

SECTION 3

Reference No.	Description	Service Part No.
C303	Condenser, .01 mf, plate decoupling	61-0120*
C304	Condenser, .01 mf, a-v-c decoupling	61-0120*
C305	Condenser, 100 mmf, a-v-c decoupling	60-10105407*
C306	Condenser, 100 mmf, filament by-pass	60-10105407*
C307	Condenser, .01 mf, screen by-pass	61-0120*
C308	Condenser, 100 mmf., plate decoupling	60-10105407*
C309	Condenser, .01 mf, plate decoupling	61-0120*
C310	Condenser, .01 mf, by-pass plate decoupling	30-4641
C311	Condenser, .01 mf, plate decoupling	61-0120*
C312	Condenser, 250 mmf, a-v-c decoupling	60-10255237*
C313	Condenser, .01 mf, a-v-c decoupling	61-0120*
C314	Condenser, .01 mf, a-v-c filter	61-0120*
C315	Condenser, 100 mmf, a-v-c decoupling	60-10105407*
C316	Condenser, .05 mf, cathode by-pass	61-0122*
C317	Condenser, 100 mmf, filament by-pass	60-10105407*
C318	Condenser, 100 mmf, a-v-c coupling	60-10105407*
C319	Condenser, .01 mf, screen by-pass	61-0120*
C320	Condenser, 100 mmf, r-f by-pass	60-10105407*
C321	Condenser, 100 mmf, r-f by-pass	60-10105407*
C322	Condenser, .05 mf, plate decoupling	61-0122*
C323	Condenser, 100 mmf, r-f by-pass	60-10105407*
C324	Condenser, .008 mf, r-f by-pass	61-0174*
C325	Condenser, 5 mf, noise limiter	30-2417*
C326	Condenser, 100 mmf, r-f by-pass	60-10105407*
C327	Condenser, 6 mmf, r-f by-pass	30-1224-9
C328	Condenser, 100 mmf, r-f by-pass	66-10105407*
R300	Resistor, 47,000 ohms, plate load, 7F8	66-3473340*
R301	Resistor, 2.2 meg., a-v-c decoupling	66-5223340*
R302	Resistor, 4700 ohms, plate load	66-2473340*
R303	Resistor, 33,000 ohms, plate load	66-3333340*
R304	Resistor, 68 ohms, cathode bias	66-0683340*
R305	Resistor, 10,000 ohms, screen dropping	66-3103340*
R306	Resistor, 1,000 ohms, plate load	66-2103340*
R307	Resistor, 2.2 meg., a-v-c decoupling	66-5223340*
R308	Resistor, 3.3 meg., a-v-c filter	66-5333340*
R309	Resistor, 150 ohms, cathode bias	66-1153340*
R310	Resistor, 220,000 ohms, a-v-c load	66-4223340*
R311	Resistor, 820,000 ohms, a-v-c load	66-4823340*
R312	Resistor, 33,000 ohms, screen dropping	66-3333340*
R313	Resistor, 330,000 ohms, r-f return	66-4333340*
R314	Resistor, 1000 ohms, plate load	66-2103340*
R315	Resistor, 47,000 ohms, diode decoupling	66-3473340*
R316	Resistor, 47,000 ohms, noise limiter	66-3473340*
R317	Resistor, 100,000 ohms, diode decoupling	66-4103340*
R318	Resistor, 100,000 ohms, FM decoupling	66-4103340*
R319	Resistor, 6.8 meg., discriminator load	66-5683340*
Z300	Transformer, 1st i-f	32-4146*
	C300A: condenser, FM trimmer	Part of Z300
	C300B: condenser, 3000 mmf, AM tuning	Part of Z300
	C300C: condenser, 6 mmf, i-f coupling	Part of Z300
	C300D: condenser, FM trimmer	Part of Z300
	C300E: condenser, AM trimmer	Part of Z300
	TC300, tuning core, AM	Part of Z300
Z301	Transformer, 2nd i-f	32-4156*
	C301A: condenser, FM trimmer	Part of Z301
	C301B: condenser, 300 mmf, AM tuning	Part of Z301
	C301C: condenser, FM trimmer	Part of Z301
	C301D: condenser, AM trimmer	Part of Z301

REPLACEMENT PARTS LIST — Continued

SECTION 3 — Continued

Reference No.	Description	Service Part No.
Z302	Transformer, 3rd i-f	32-4147*
	C302A: condenser, 470 mmf, AM tuning	Part of Z302
	C302B: condenser, AM trimmer	Part of Z302
	C302C: condenser, 27 mmf, FM coupling	Part of Z302
	C302D: condenser, FM trimmer	Part of Z302
	C302E: condenser, 25 mmf, FM tuning	Part of Z302
	C302F: condenser, 15 mmf, FM tuning	Part of Z302
	TC302: tuning core, FM tuning	Part of Z302

SECTION 4

C400	Condenser, tuning gang	31-2703-2
	C400A: condenser, FM aerial trimmer	Part of C400
	C400B: condenser, FM mixer trimmer	Part of C400
	C400C: condenser, FM oscillator trimmer	Part of C400
C401	Condenser, 1500-kc trimmer	31-6473
C402	Condenser trimmer assembly, two-section	31-6475-5
	C402A: condenser, shunt trimmer, BC osc.	Part of C402
	C402B: condenser, series trimmer, BC osc.	Part of C402
C403	Condenser, 51 mmf, FM coupling	60-00515307*
C404	Condenser, 100 mmf, filament by-pass	60-10105407*
C405	Condenser, 100 mmf, cathode by-pass	60-10105407*
C406	Condenser, 100 mmf, screen by-pass	60-10105407*
C407	Condenser, 33 mmf, FM coupling	60-00305307*
C408	Condenser, 1500 mmf, plate by-pass 6AG5	60-20155404*
C409	Condenser, 1500 mmf, screen by-pass 6AG5	60-20155404*
C410	Condenser, 220 mmf, converter coupling	60-10245307*
C411	Condenser, 750 mmf, cathode coupling	60-10755301*
C412	Condenser, 100 mmf, grid by-pass	60-10105407*
C413	Condenser, 220 mmf, osc. coupling	60-10245307*
C414	Condenser, 100 mmf, filament by-pass	60-10105407*
J400	Socket, 4-prong, external aerial	27-6214-1
L400	Coil, BC aerial	32-4033-2
L401	Coil, FM aerial	32-4158
L402	Choke, plate choke	32-4061
L403	Coil, FM r-f	32-4159
L404	Coil, BC oscillator	32-4019-4
L405	Coil, FM oscillator	32-4018-2
L406	Choke, parasitic oscillation suppressor	32-4157
LA400	Loop assembly, broadcast	76-1989
R400	Resistor, 2.2 meg., grid load	66-5223340*
R401	Resistor, 150 ohms, cathode bias	66-1151540
R402	Resistor, 47,000 ohms, screen dropping	66-3473340*
R403	Resistor, 1000 ohms, plate decoupling	66-2103340*
R404	Resistor, 2.2 meg., a-v-c decoupling	66-5223340*
R405	Resistor, 1500 ohms, cathode bias	66-2153340*
R406	Resistor, 15,000 ohms, grid leak	66-3153340*
R407	Resistor, 470,000 ohms, a-v-c decoupling	66-4473340*
R408	Resistor, 1500 ohms, a-v-c parasitic oscillation suppressor	Part of L406
FS	Function switch	42-1803
	FS1, section, function switch	Part of 42-1803
	FS2, section, function switch	Part of 42-1803
	FS3, section, function switch	Part of 42-1803
	FS4, section, function switch	Part of 42-1803
TB400	Terminal panel, aerial	38-9942

MISCELLANEOUS

Description	Service Part No.
Bin-Light Parts:	
Bin-light cable, socket and switch assembly	76-2728
Cord, pull (25-ft. spool)	45-1420*
Lamp, bin-light	34-2039*
Spring, pull-cord	28-8991
Cable assembly	41-3754-5
Cable, shielded	41-3754-11
Cabinet and Cabinet Hardware:	
Loop assembly, BC	76-1989
Spring washer (loop mtg.)	28-4186
Loop assembly, FM	76-2029-9
Washer (2 reqd.)	1W52540FA3
Bin mechanism, left hand	76-2176
Bin mechanism, right-hand	76-2174
Cabinet	10643C
Baffle, wood	219041
Baffle and cloth assembly	40-6770
Bezel, wood	16602
Bolt, speaker-mounting	W1587
Dial-scale plate assembly	76-2005
Frame, mounting assembly	76-2199
Hinge, baffle	45-6200
Lamp bracket	56-2332
Grommet (superstructure mounting)	27-4596
Capacitor mounting wafer	45-6409*
Chassis Mounting Hardware:	
Foot assembly, (4) mounting grommet	54-4122
Nut, "T"	W2502FA3
Washer	W2271FA3
Clip, aerial	28-5002FA1
Clip, BC oscillator	56-4303FA1
Dial-Scale Hardware:	
Cord, pointer-drive (25-ft. spool)	45-1459*
Pointer	56-3179
Scale and backplate assembly	76-2226-3
Mounting screws (4)	1W24894FE11
Spacer (2), scale backplate	56-3279FA3
Rubber band	54-4234
Spring, pointer-drive-cord	28-8953
Grommet (2), superstructure mtg. — sub. and plate assy.	27-4596
Spacer (2), superstructure mtg. — sub. and plate assy.	1W29184FA3
Washer (2)	1W52116FA3
Screw (2)	1W25349FA3
Function switch	42-1803
Function-Switch Hardware:	
Link assembly	76-2186
Phono OFF-ON switch	Part of 42-1803
Shaft	56-3298FA11
Washer, "C"	1W42535FA3
Grommet (3), r-f chassis mounting	54-4295
Knob (4)	54-4105
Lamp, panel (2)	34-2040*
Lamp-socket assembly, panel (2)	76-2109
Washer	1W52237FA3
Record Changer Mounting Parts:	
Bolt (4), changer-mounting	56-3295
Grommet (4), changer-mounting	54-4313
Nut, "T" (4), changer-mounting	1W56643FA3
Palnut (4), changer-mounting	1W29061FA3
Spring (8), changer-mounting	56-3043
Socket (3), Loktal	27-6138*
Socket (1), Loktal (7F8)	27-6213*
Socket (1), Miniature (6BA6)	27-6203-4
Socket (3), octal	27-6199*
Socket (1), Miniature (6AG5)	27-6203-3
Speaker Hardware:	
Bolt, mounting	W1587FA3
Cable and plug assembly	41-3701
Nut (4), speaker-mounting	1W19988FA3
Plug, speaker-cable	27-4419-2

AM ALIGNMENT PROCEDURE

When the complete AM and FM alignments are to be made, the AM alignment should be made first; if FM alignment is not required, the AM alignment alone may be made.

RADIO DIAL POINTER: With tuning-condenser plates fully meshed, adjust pointer to coincide with index mark at low-frequency end of scale.

VOLUME CONTROL: Maximum clockwise.

TONE CONTROL: Maximum counterclockwise.

AM SIGNAL GENERATOR: Connect ground lead to radio chassis and output lead as indicated in chart.

OUTPUT METER: Connect between terminal 3 (voice-coil connection) of aerial terminal strip (TB400) and chassis.

OUTPUT LEVEL: During alignment, the input signal must be attenuated to hold the output-meter reading below 1.5 volts.

RADIO FUNCTION SWITCH, RADIO DIAL and SIGNAL GENERATOR: Set as indicated in chart.

NOTE: Make up a coil of insulated wire consisting of 6 to 8 turns, about 6" in diameter. Connect coil ends to the signal generator leads and suspend coil near radio broadcast loop.

FM ALIGNMENT PROCEDURE

NOTE: Make AM alignment first.

D-C METER: Connect the negative lead of a 20,000-ohms-per-volt meter to pin 6 of the 7X7 tube and the positive lead to chassis (across the 5-mf condenser, C325, in the discriminator circuit). Use 10-volt meter range.

AM SIGNAL GENERATOR: Use modulated output for the entire alignment. The generator must have sufficient output to give a reading of approximately 9 volts on the d-c meter and the signal should be attenuated during the alignment to keep the meter at this value. Connect the generator ground lead to chassis and the output lead as indicated in the chart.

RADIO FUNCTION SWITCH, RADIO DIAL and SIGNAL GENERATOR: Set as indicated in chart. Allow the radio and generator to warm up for 15 minutes before starting the alignment.

NOTE 1: The resonance of the circuits using coils L401, L403, and L405 may be checked with a powdered-iron tuning core, such as Part No. 56-6100. If the signal strength (meter reading) increases when the iron end is inserted in the coil, compress the turns slightly. If the signal increases when the threaded brass end is inserted, spread the turns. Do not compress or spread the turns excessively; only a small change is required at these frequencies.

NOTE 2: Oscillator coil L405 — Adjust coil for maximum meter reading.

NOTE 3: R-F coil L403 — Adjust coil for maximum meter reading while rocking tuning control.

NOTE 4: Aerial coil L401 — Adjust coil for maximum meter reading.

FIGURE 7. PHILCO RADIO-PHONOGRAPH MODEL 47-1227 — COMPLETE SECTIONALIZED SCHEMATIC, SHOWING TEST POINTS.

AM ALIGNMENT CHART

SIGNAL GENERATOR			RADIO			
STEP	CONNECTIONS TO RADIO	DIAL	FUNCTION SWITCH	DIAL	SPECIAL INSTRUCTIONS	ADJUST
1	Through .1-mf condenser to terminal 1 of TB400	455 kc	BC	540 kc	Adjust for maximum once only in order.	C302B C301D C300E TC300
2	6" coil loosely coupled to loop. See note*	580 kc	BC	580 kc	Adjust for maximum.	C402B
3	Same as step 2	1700 kc	BC	1700 kc	Adjust for maximum.	C402A
4	Same as step 2	1500 kc	BC	1500 kc	Adjust for maximum.	C401
5	Same as step 2	580 kc	BC	580 kc (approx.)	Rock tuning condenser while adjusting for maximum.	C402B
6	Repeat steps 3, 4, 5 and 4 in order until no improvement results.					

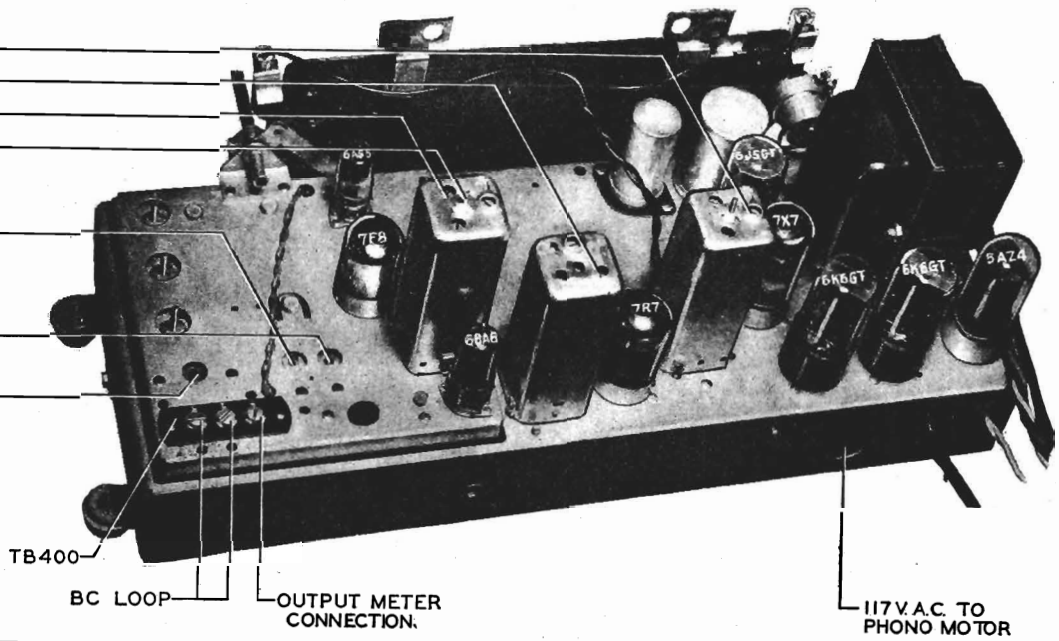


FIGURE 8. CHASSIS VIEW, SHOWING AM TRIMMER LOCATIONS.

TP

FM ALIGNMENT CHART

SIGNAL GENERATOR			RADIO			
STEP	CONNECTIONS TO RADIO	DIAL	FUNCTION SWITCH	DIAL	SPECIAL INSTRUCTIONS	ADJUST
1	Through .1-mf condenser to (pin 1) 6BA6 (test point E)	9.1 mc	FM	88 mc	Attenuate signal to give approximately 9-volt meter reading. Adjust for maximum. Repeat until no further improvement is noticed. After this step, do not touch any of these trimmers except C302D in step 3.	C302D TC302 C301C C301A
2	Through a .1-mf condenser to (pin 8) 7F8 (test point B)	9.1 mc	FM	88 mc	Attenuate signal to give approximately 9-volt meter reading. Adjust for maximum. Repeat until no further improvement is noticed. After this step, do not touch any of these trimmers.	C300D C300A
3	Same as step 2	9.1 mc	FM	88 mc	Double check the adjustment of C302D to make sure that minimum audio output is obtained from the speaker. This is a critical adjustment. Turn trimmer very slowly.	
4	Connect signal generator to terminal 4, J400	105 mc	FM	105 mc	Maximum meter reading. This is the oscillator high-frequency padder adjustment.	C400C
5	Same as step 4	105 mc	FM	105 mc	Max. — rock tuning control.	C400B
6	Same as step 4	105 mc	FM	105 mc	Maximum meter reading.	C400A
7	Same as step 4	92 mc	FM	92 mc	Adjust L405. See notes 1 and 2.	
8	Same as step 4	92 mc	FM	92 mc	Adjust L403. See notes 1 and 3.	
9	Same as step 4	92 mc	FM	92 mc	Adjust L401. See notes 1 and 4.	
10	Repeat steps 4 through 10 until no further increase is obtained.					

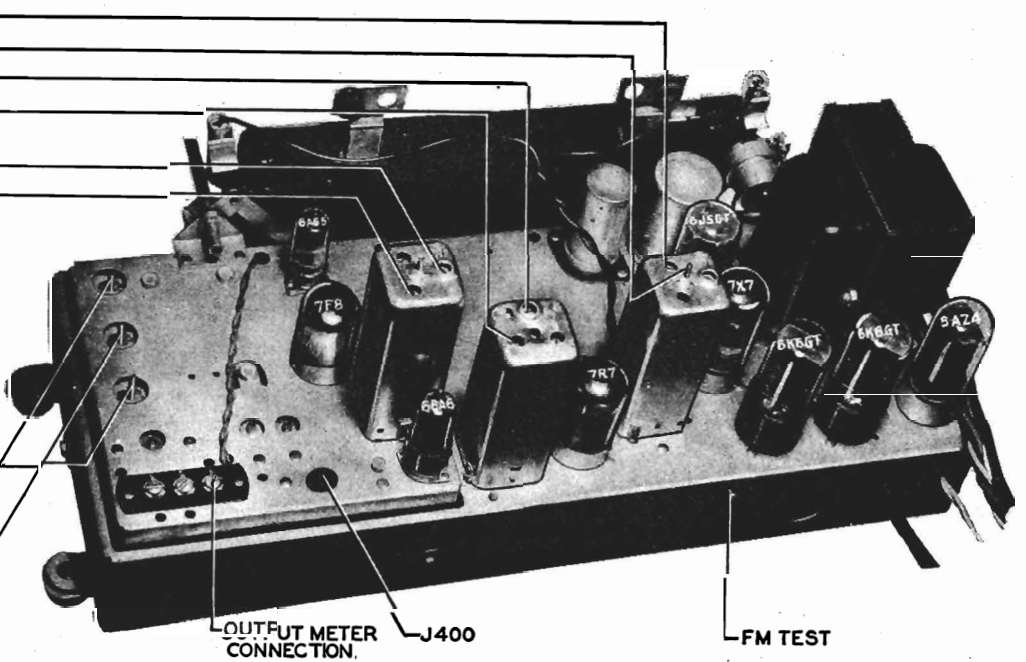


FIGURE 9. CHASSIS VIEW, SHOWING FM TRIMMER LOCATIONS.

sources of trouble.

2. Measure the resistance between B+ (pin no. 8 of 5Y3GT rectifier tube) and the radio chassis. When the ohmmeter test leads are connected in proper polarity, the highest resistance reading will be obtained. If the reading is lower than 50,000 ohms, check condensers C102 and C103 for leakage or shorts.

SYMBOLIZATION AND TERMINOLOGY

All components in the radio circuit are symbolized and located as follows:

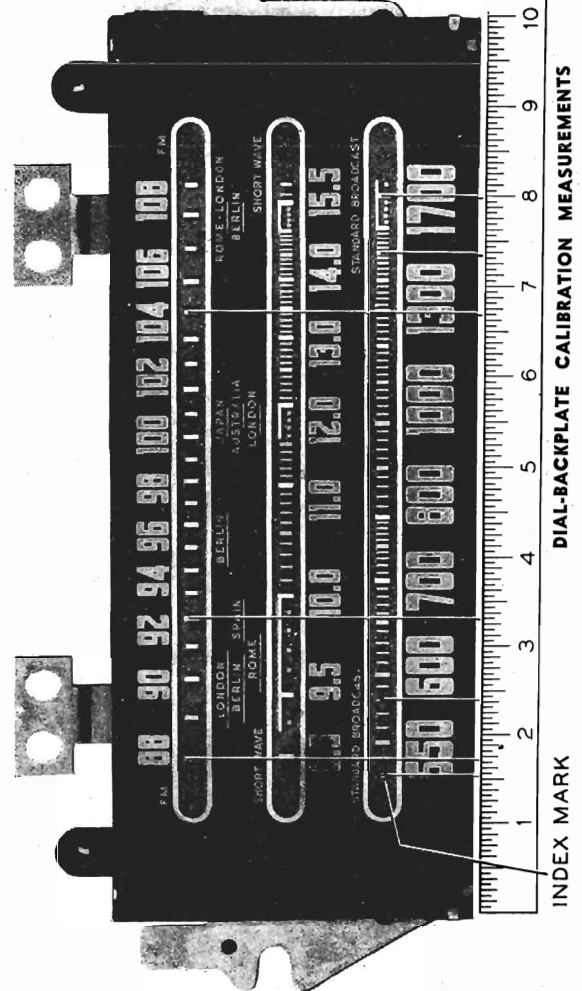
- C—condenser LA—loop antenna S—switch
I—pilot lamp LS—loudspeaker T—transformer
L—choke or coil R—resistor Z—electrical ass'y
- 100-series components are in section 1 — the power supply
200-series components are in section 2 — the audio amplifier
300-series components are in section 3 — the i-f amplifier, second detector and/or discriminator, and a.v.c.
400-series components are in section 4 — the antenna, r-f and oscillator.

CALIBRATING DIAL BACKPLATE

When the radio chassis has been removed from the cabinet, dial calibration and alignment points may be marked on the dial backplate below the pointer.

The method of measuring for these points is illustrated in figure 1. Hold a ruler against the scale backplate, with the start of the ruler at the reference line shown, and mark pencil dots at the proper points for the required frequency settings. When the ruler is correctly placed, the index mark is 1½ inches from the reference point indicated in figure 1.

With the tuning gang fully meshed, the pointer should be adjusted on the dial drive cord to coincide with the index mark.



CIRCUIT	Nine-tube superheterodyne
FREQUENCY RANGES:	
BROADCAST	540 to 1720 kc.
SHORT WAVE	9.3 to 15.5 mc.
FM	88 to 108 mc.
AUDIO OUTPUT	10 watts
PUSH BUTTONS	Six: Five for broadcast-station selection, one for phono operation
OPERATING VOLTAGE	105—120 volts, 60 cycles, a.c.
POWER CONSUMPTION	110 watts
AERIALS	Built-in cabinet loop, dipole, or external aerial
INTERMEDIATE FREQUENCIES:	
AM	455 kc.
FM	9.1 mc.
PHILCO TUBES USED (9)	6AG5, 7F8, 6BA6, 7R7, 7X7, 7AF7, 6V6GT (2), 5Y3GT
RECORD PLAYER	Philco Automatic Record Changer, Model D-10A
PANEL LAMPS (2)	6—8-volt, Part No. 34-2040
BIN LAMP	6—8-volt, Part No. 34-2039

PRELIMINARY CHECKS

Before connecting the radio to a source of power, the following steps are recommended:

1. Inspect both top and bottom of the chassis. Make sure that all tubes are secure in their proper sockets, and look for any broken or shorted connections, burned resistors, or other obvious

CIRCUIT DESCRIPTION

The radio is designed with three tuning ranges, covering the standard broadcast, short-wave and FM bands by manual tuning. In addition, six push buttons are provided, one for phono-radio switching and five for automatic instant tuning of stations in the broadcast band. The function switch selects manual tuning on the broadcast, short-wave or FM bands, or push-button tuning. The ON-OFF switch is combined with the tone control.

A low-impedance loop within the cabinet provides adequate signal pickup for the broadcast and short-wave bands. In most locations, the built-in FM aerial provides satisfactory reception on the FM band. In areas where FM signals are weak, an outdoor dipole aerial (Philco Part No. 45-1462) will provide additional pickup.

A high-frequency r-f pentode, type 6AG5, is used in the r-f stage (FM only) and a type 7F8 high-frequency dual-triode is employed as a converter. These stages provide high signal-to-noise ratio, high conversion efficiency and good image rejection.

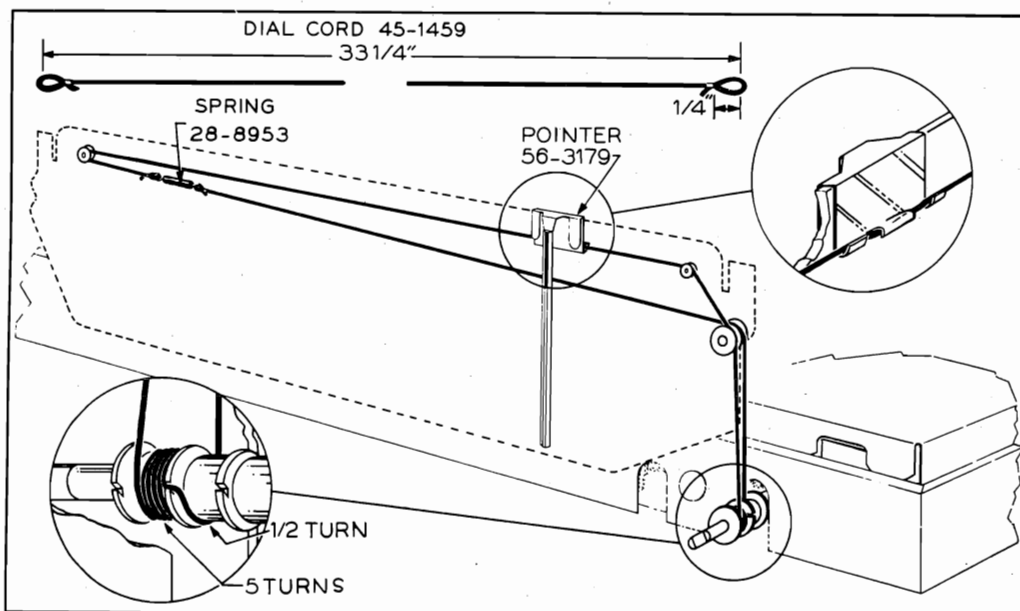
Two transformer-coupled i-f stages are used. The transformers have two sets of windings; one set is tuned to 455 kc for AM reception, the other to 9.1 mc for FM operation. Both primary and secondary FM windings are tuned to provide

additional gain at 9.1 mc. A 6BA6 high-frequency pentode is used in the first i-f amplifier stage and the pentode section of a 7R7 high-gain r-f amplifier is used in the second i-f stage. The diode section of the 7R7 is used for AM detection. The high gain achieved in the i-f amplifier at 9.1 mc gives improved FM reception by providing ample signal for proper operation of the FM detector.

A discriminator circuit having improved noise-reducing properties and a superior tuning characteristic is used for FM reception. Greater noise reduction on FM is achieved by preventing short-time amplitude variations across the secondary of the discriminator transformer. The two diodes of a 7X7 tube are connected in series with the secondary, with a large condenser (5 mf) connected across the output circuit of the diodes. As a result of the high current which flows to this condenser whenever the diodes conduct in series, amplitude variations across the secondary are dissipated.

The high-mu triode section of the 7X7 tube is used in the first audio stage. The output of this stage is applied to one section of a dual-triode 7AF7 tube which operates as a phase inverter to drive the two 6V6GT push-pull output tubes. When the PHONO push button is depressed, the cathode circuit of the second i-f amplifier is opened and the other section (phono preamplifier) of the 7AF7 tube is connected to the volume-control circuit in the input of the 7X7 tube.

The push-pull audio-output stage furnishes approximately 10 watts output to the 12-inch electrodynamic loudspeaker.



POINTER-DRIVE-CORD INSTALLATION DETAILS.

SECTION 1 – TROUBLE SHOOTING

CAUTION: Do not turn on power with speaker disconnected, as this may cause damage to the set.

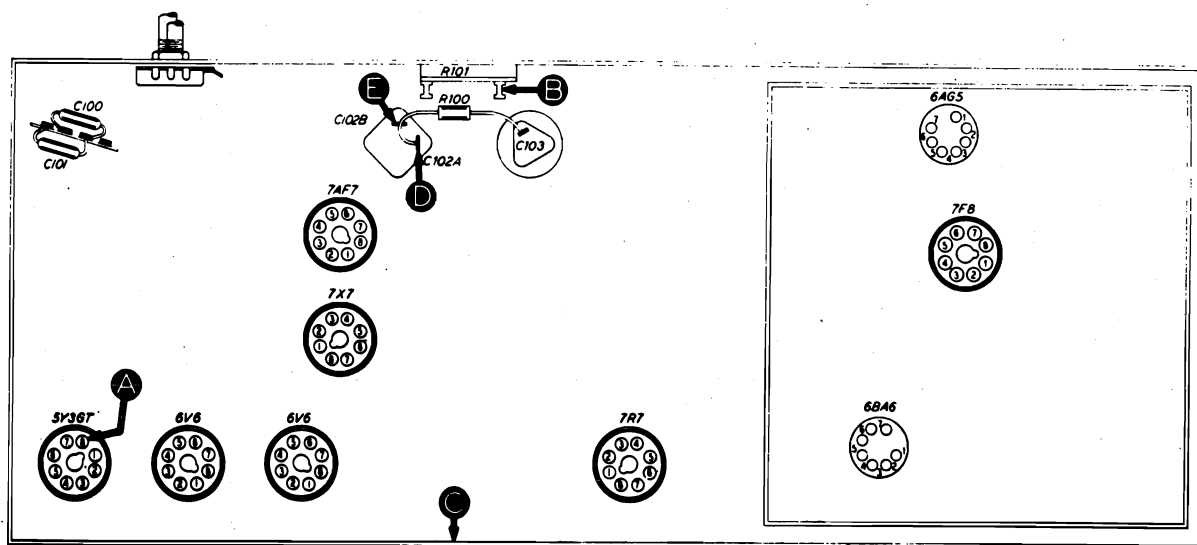
Make the tests for this section with a d-c voltmeter, connecting the leads to the test points indicated in the chart and in figure 3. The voltages given were taken with a 20,000-ohms-per-volt meter at a line voltage of 117 volts a.c.

With function switch set to push-button position, turn volume control to minimum and tone control to nearly off position.

Follow steps in proper sequence; if "NORMAL INDICATION" is obtained in step 1, proceed with tests for Section 2; if not, isolate and remedy the trouble in this section.

It will be noted that certain parts in other sections of the radio are listed under "POSSIBLE CAUSE OF ABNORMAL INDICATION", since they may produce abnormal voltage readings in Section 1.

STEP	TEST POINTS	NORMAL INDICATION	ABNORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	E to C D to C	240 volts 190 volts	No voltage or incorrect voltage	Trouble in this section. Isolate by the following tests.
2	A to C	310 volts	No voltage Low voltage High voltage	Defective 5Y3GT; T100, S100, W100, L100. Shorted C103. Open R100. Defective 5Y3GT, C103, C102A, C419, C314. Open R100, L100, or T200.
3	B to C	Negative 16 volts	Low or no voltage High voltage	Shorted R101. Open R101.
4	D to C	190 volts	No voltage Low voltage High voltage	Open R100. Shorted C102A. Leaky C102A, C103. Defective C419. Open L100, T200.
5	E to C	240 volts	No voltage Low voltage High voltage	Open L100. Shorted C103. Shorted or leaky C102B, C216. Shorted L100. Open R100, T200.
Listening test			Abnormal hum may be caused by open C102A or C103.	



BOTTOM VIEW, SHOWING SECTION 1 TEST POINTS.

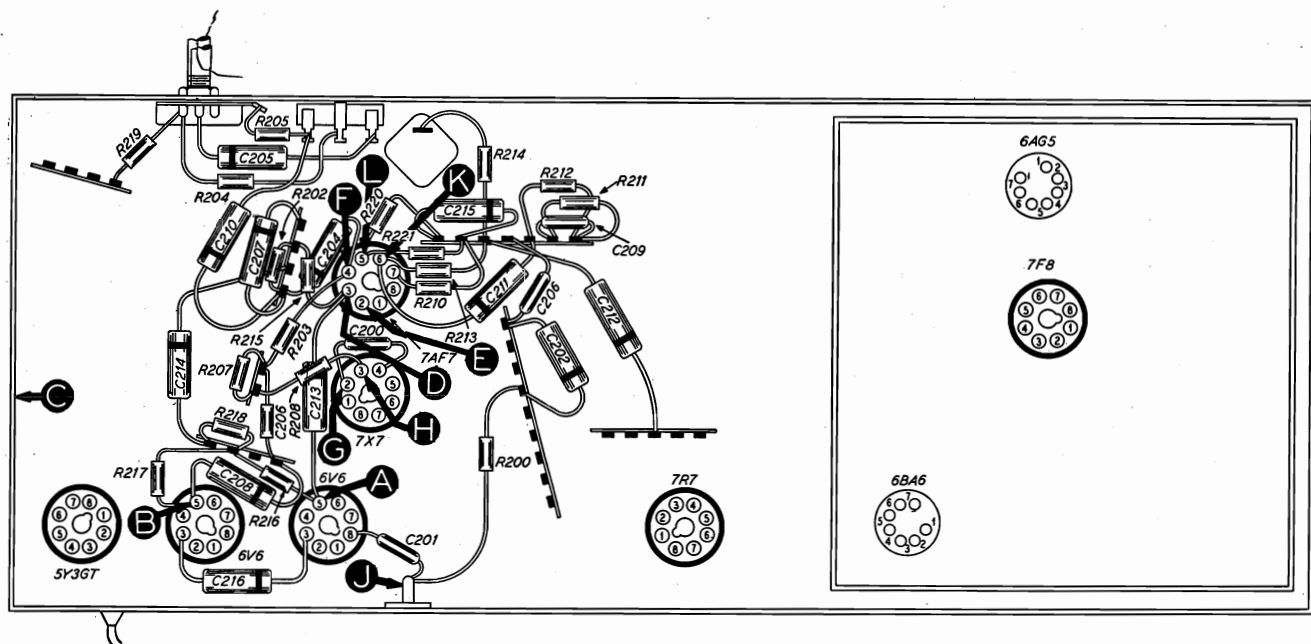
SECTION 2 – TROUBLE SHOOTING

For all tests in this section, use an audio-frequency signal generator. Connect the generator ground lead to the radio chassis, test point "C"; connect the output lead through a .1-mf condenser to the test points indicated.

Set the radio volume control at maximum, tone control at nearly off position and depress the PHONO push button. Adjust the signal-generator output as required for each step.

If the "NORMAL INDICATION" is obtained in step 1, proceed to the tests in Section 3. If not, isolate and remedy the trouble in this section.

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	L J	Loud, clear signal with weak signal input	Trouble within this section. Isolate by the following tests.
2	A (7AF7 tube removed)	Loud, clear signal with strong signal input	Defective 6V6GT tube, T200 or LS200. Shorted or leaky C216 or C213.
3	B	Loud, clear signal with strong signal input	Defective 6V6GT tube. Shorted or leaky C208.
4	D	Loud, clear signal with strong signal input	Open C213, R215, R216.
5	E	Loud, clear signal with strong signal input	Open C208 or R217.
6	F (7AF7 tube replaced)	Clear signal, louder than preceding test	Defective 7AF7 tube, C204, R203, R206, R207.
7	G	Clear signal, same volume as step 6	Defective C200, R202. Open C204.
8	H	Loud, clear signal with moderate signal input	Defective 7X7 tube, C205, C308. Open R208.
9	I	Loud, clear signal with moderate signal input	Open R200, C202. Shorted C201, C203. Defective R201 (rotate through entire range).
10	K	Loud, clear signal with moderate signal input	Defective C211, C212.
11	L	Loud, clear signal with weak signal input	Defective 7AF7 tube, push button PB1. Shorted C215.



BOTTOM VIEW, SHOWING SECTION 2 TEST POINTS.

SECTION 3 – TROUBLE SHOOTING

AM TESTS

For the following tests us an r-f signal generator with modulated output set at 455 kc. Connect the generator ground lead to the radio chassis, test point "C", and connect the output lead through a .1-mf condenser to the test points indicated.

Turn the radio volume control to maximum, tone control to nearly off position and set function switch to push-button position.

If the "NORMAL INDICATION" is obtained in the first step, proceed to the FM tests, or to the tests in Section 4; if not, isolate and remedy the trouble in this section.

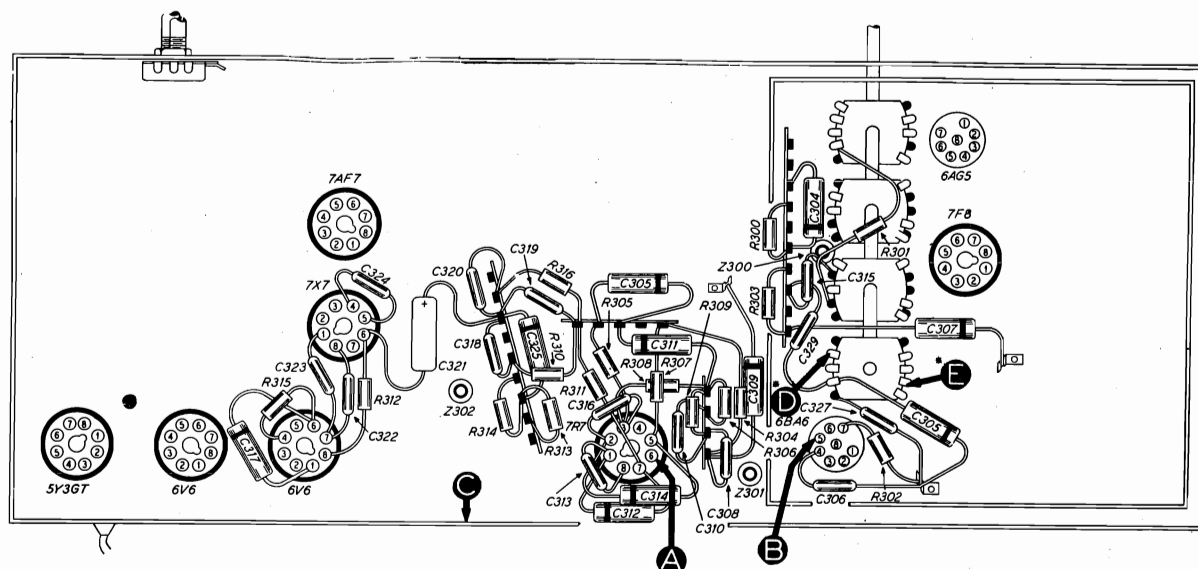
STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	E	Loud, clear signal with low signal-generator input	Trouble within this section. Isolate by the following tests.
2	A	Normal signal with moderate input	Defective 7R7 tube, 7X7 tube, Z302. Improperly aligned Z302. Defective C314, C419, C317, C310, C311, C315, C312, C314, C328, FS4 (F).
3	B	Same as step 2.	Defective C308, C309. Defective or improperly aligned Z301.
4	D	Much stronger signal than in step 3; decrease input to obtain normal signal	Defective 6BA6 tube, C307. Open R303, R302, FS4 (R), C303, C305.
5	E	Approximately the same strength signal as in step 4	Defective C304, FS4 (R). Defective or improperly aligned Z300.
	Listening test with station tuned in	Normal, clear reception	Distorted signal with hum: defective R316 or FS4 (F). Intense hum or motorboating: open C419 or C328.

NOTE: Test points marked with an asterisk (*) on the base view are physically located in a different position from the same test points on the corresponding section of the main schematic. However, both test points are electrically identical, but the one shown on the base view has been chosen for greatest accessibility during servicing procedure.

FM TESTS

Set the function switch to FM position and follow the instructions preliminary to the AM tests with these exceptions; set the signal-generator frequency to 9.1 mc and detune to one side or the other until a satisfactory test signal is obtained.

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Normal signal with moderate input	Defective or improperly aligned Z302. Defective FS4 (F).
2	B	Same strength signal as in step 1	Defective Z301.
3	D	Much stronger signal than in step 2; decrease input to obtain normal signal	Same parts listed in AM section, step 4.
4	E	Approximately the same strength signal as in step 3	Defective Z300 or any other part listed in AM section, step 5.



BOTTOM VIEW, SHOWING SECTION 3 TEST POINTS.

SECTION 4 – TROUBLE SHOOTING

For tests indicated in this section, with the exception of oscillator test, use an r-f signal generator with modulated output. Connect the generator ground lead to the radio chassis, test point "C", and connect the output lead through a .1-mf condenser to the test points indicated.

Turn the radio volume control to maximum and tone control to nearly off position.

Set the function switch, tuning control and signal-generator frequency as indicated in chart.

For oscillator tests (AM test chart, step 3; FM test chart, step 3) attach the positive lead of a high-resistance voltmeter to the 7F8 oscillator cathode, test point "E" (pin 4). Connect the negative lead through a 100,000-ohm isolating resistor to the 7F8 oscillator grid (pin 1), test point "F". Use a suitable meter range (0—10 volts).

Absence of negative grid voltage in either AM or FM position of function switch indicates that the oscillator is not working; check the parts listed in the chart for the oscillator tests.

FM TESTS

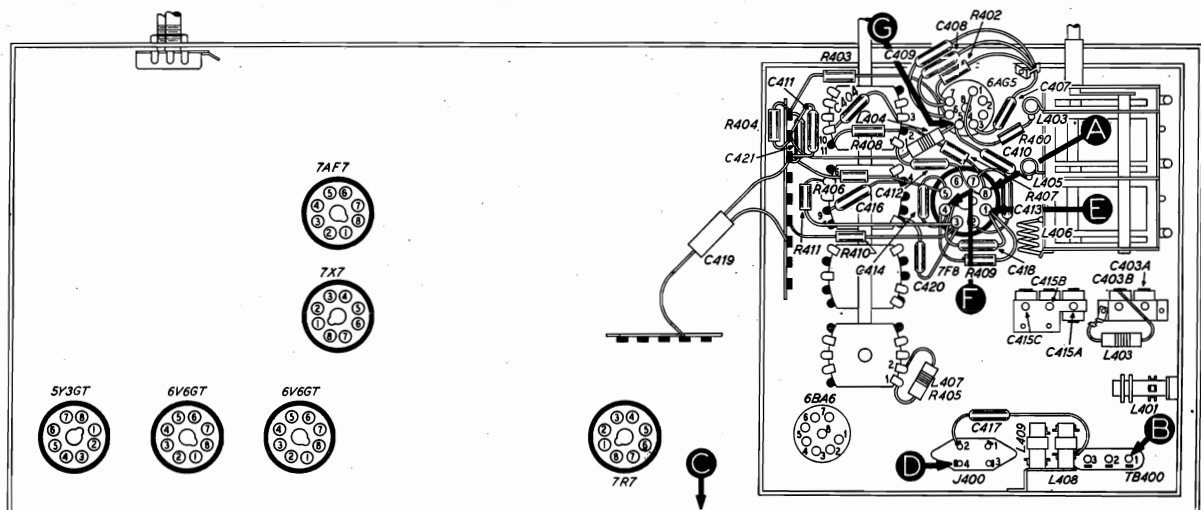
STEP	TEST POINT	SIG. GEN. SETTING	FUNCTION SWITCH AND TUNING CONTROL	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	D	95 mc	FM. Tune to signal from generator	Loud, clear signal with low signal input.	Trouble in this section. Isolate by the following tests.
2	A	95 mc	Same as step 1	Same as step 1	Defective 7F8 tube, C412, C414, C413, FS4 (R), R406. Defective or misaligned Z300. Trouble in FM oscillator circuit (step 3).
3	E to F (osc. test)	Not used	FM. Tune through range	Negative approx. 3 volts	Defective 7F8 tube, FS2 (F), FS2 (R), FS3 (R), L406
4	G	95 mc	FM. Tune to signal from generator	Loud, clear signal with moderate signal input	Defective FS1 (R), C410, C411, C421, L404, L405.
5	D	95 mc	FM. Tune to signal from generator	Loud, clear signal with low signal input	Defective 6AG5 tube, C406, C408, C409, L403.

PHILCO CORP.

MODEL 47-1230

AM TESTS

STEP	TEST POINT	SIG. GEN. SETTING	FUNCTION SWITCH AND TUNING CONTROL	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	B	1000 kc	BC (dial). Tune to signal from generator	Loud, clear signal with low generator input	Trouble in this section. Isolate by the following tests.
2	A	1000 kc	Same as step 1	Same as above	Defective 7F8 tube, C412, C414, C413, FS4 (R), R406. Open R300, R405. Shorted or leaky C304. Defective or misaligned Z300. Trouble in oscillator circuit (step 3).
3	E to F (osc. test)	Not used	BC. Tune through range	Negative approx. 3 volts	Defective 7F8 tube, C413, C414, C417, FS2 (F), FS2 (R), FS3 (R), R409. Shorted or leaky C419. Defective L408, C420.
4	B	1000 kc	BC (dial). Tune to signal from generator	Loud, clear signal with low generator input	Defective L401, FS3 (R), FS1 (R), C412.
5	B	Through range of each push button	PB. Operate each push button	Same as above	Defective FS3 (R), FS1 (R), PB 2, 3, 4, 5, 6. Trouble in push-button oscillator circuit (step 6).
6	E to F (osc. test)	Not used	PB. Operate each button		Defective 7F8 tube, FS2 (F), FS2 (R), L400 A, B, C, D, E or PB 2, 3, 4, 5, 6. C401, C402 or R400.
7	B	12 mc	SW. Tune to signal from generator		Defective FS1 (R), FS3 (R), L402, C404 or trouble in short-wave oscillator circuit (step 8).
8	E to F (osc. test)	Not used	SW. Tune through range	Negative approx. 3 volts	Defective 7F8 tube, FS2 (F), FS2 (R), FS3 (R), L408.



BOTTOM VIEW, SHOWING SECTION 4 TEST POINTS.

MODEL 47-1230

PHILCO CORP.

AM ALIGNMENT PROCEDURE

When the complete AM and FM alignment is to be made, the AM alignment should be made **FIRST**; however, if FM alignment is not required, the AM alignment alone may be made.

CONNECT OUTPUT METER between terminal 3 (voice-coil connection) of aerial terminal board and chassis.

ADJUST RADIO DIAL POINTER, with tuning-condenser plates fully meshed, to make pointer coincide with index mark at low-frequency end of scale.

CONNECT AM SIGNAL GENERATOR ground lead to radio chassis; connect output lead as indicated in chart.

SET VOLUME CONTROL at maximum and **TONE CONTROL** at nearly off position.

SET SIGNAL GENERATOR, RADIO FUNCTION SWITCH and **RADIO DIAL** as indicated in chart.

OUTPUT LEVEL: During alignment, the input signal must be attenuated to hold the output-meter reading below 1.5 volts.

NOTE: Make up a coil of wire, using 6 or 8 turns, about 6 inches in diameter; connect the signal-generator leads and suspend near the radio broadcast loop.

FM ALIGNMENT PROCEDURE

NOTE: Make AM alignment first.

Connect the negative lead of a 20,000-ohms-per-volt, d-c meter, to pin 6 of the 7X7 tube and the positive lead to ground (across the 5-mf condenser, C321, in the discriminator circuit). Use 10-volt range.

Use an r-f signal generator with **MODULATED** output for the entire alignment. The generator must have sufficient output to give a meter reading greater than 8.5 volts; the reading on the meter should be kept at approximately 9 volts throughout the alignment. Connect the generator ground lead to chassis and the output lead as indicated in the chart.

Set the function switch to FM position. Allow the radio and generator to warm up 15 minutes before starting the alignment.

NOTE: The resonance of the circuits using coils L403, L405 and L406 may be checked by the use of a powdered-iron tuning core, such as Philco Part No. 56-6100. If the signal strength (meter reading) increases when the iron end is inserted in the coil, compress the turns slightly. If the signal increases when the threaded brass end is inserted, spread the turns.

Do not spread or compress turns excessively, since only a small change is required at these frequencies.

Oscillator coil L406: Adjust coil for maximum meter reading.

R-F coil L405: Adjust coil for maximum meter reading while rocking tuning control.

Aerial coil L403: Adjust coil for maximum meter reading.

SETTING THE PUSH BUTTONS

1. Connect the output meter between terminal no. 3 on aerial terminal board and radio chassis.
2. Turn the radio volume control to maximum and the tone control counterclockwise to nearly OFF position.
3. Turn the radio function switch to PB position.
4. Couple the signal generator loosely through a coil of wire to the radio loop aerial, as described in AM alignment Procedure above.
5. Turn on the power and allow the radio to warm up for 15 minutes before starting the adjustments.
6. Starting with the lowest frequency desired, set the signal-generator frequency, push the button, and adjust the associated oscillator tuning core and aerial trimmer for maximum indication on the output meter. During alignment, the input signal must be attenuated to hold the output-meter reading below 1.5 volts.
7. Reset the signal-generator frequency and repeat the procedure for each remaining push button.
8. Turn off the signal generator and make a final adjustment of all tuning cores and trimmer condensers while listening to the stations for which the adjustments are being made.

PUSH-BUTTON (Left to right from front)	FREQUENCY RANGE	OSCILLATOR TUNING CORE	AERIAL TRIMMER
Phono	*****	*****	*****
PB1	540-1000 kc	L400A	C400A
PB2	600-1200 kc	L400B	C400B
PB3	650-1300 kc	L400C	C400C
PB4	850-1500 kc	L400D	C400D
PB5	900-1600 kc	L400E	C400E

NOTE: Parts marked with an asterisk (*) are general replacement items, and the numbers may not be identical with those on factory assemblies; also, the electrical values of some replacement items furnished may differ from the values indicated in the schematic and parts list. The values substituted in any case are so chosen that the operation of the radio will be either unchanged or improved. When ordering replacements, use only the "Service Part No." in this parts list.

SECTION 1

Reference No.	Description	Service Part No.
C100	Condenser, .01 mf, line filter	61-0120*
C101	Condenser, .01 mf, line filter	61-0120*
C102	Condenser, two section, electrolytic	30-2570-11
	C102A: condenser, 25 mf, electrolytic, power-supply filter	Part of C102
	C102B: condenser, 25 mf, electrolytic, power-supply filter	Part of C102
C103	Condenser, 20 mf, electrolytic, screen-supply filter	30-2555
C104	Condenser, 100 mmf, r-f by-pass	60-10105237*
I100	Lamp, panel	34-2040
I101	Lamp, panel	34-2040
I102	Lamp, bin-light	30-2039
L100	Field, speaker	Part of LS200
R100	Resistor, 15,000 ohms, isolating	66-3155340
R101	Resistor, 135 ohms, bias	33-3435-2
T100	Transformer, power	32-8248
S100	Switch, power on-off	Part of R209
S101	Switch, bin light	42-1702
W100	Cord, line	L3351

SECTION 2

C200	Condenser, 100 mmf, plate r-f by-pass	60-10105237*
C201	Condenser, 100 mmf, r-f by-pass	60-10105237*
C202	Condenser, .006 mf, audio coupling	45-3500-7*
C203	Condenser, 100 mmf, r-f by-pass	60-10105237*
C204	Condenser, .006 mf, audio coupling	45-3500-7*
C205	Condenser, .006 mf, audio coupling	45-3500-7*
C206	Condenser, 100 mmf, r-f by-pass	60-10105237*
C207	Condenser, .01 mf, audio by-pass	61-0120*
C208	Condenser, .006 mf, cathode by-pass	45-3500-7*
C209	Condenser, 100 mmf, r-f by-pass	60-10105237*
C210	Condenser, .01 mf, audio by-pass	61-0120*
C211	Condenser, .01 mf, audio by-pass	61-0120*
C212	Condenser, .2 mf, audio by-pass	45-3500-3*
C213	Condenser, .006 mf, audio coupling	45-3500-7*
C214	Condenser, .2 mf, audio by-pass	45-3500-3*
C215	Condenser, .001 mf, r-f by-pass	45-3500-5*
C216	Condenser, .003, high-frequency cut	61-0117*
J200	Socket, FM test	27-6180*
R200	Resistor, 100,000 ohms, decoupling	66-4103340*
R201	Control, volume, 2 megohms	33-5535-1
R202	Resistor, 220,000 ohms, plate dropping	66-4223340*
R203	Resistor, 1 megohm, grid	66-5103340*
R204	Resistor, 4.7 ohms, degeneration	66-9473340*
R205	Resistor, 33,000 ohms, bass compensation	66-3333340*
R206	Resistor, 4700 ohms, cathode	66-2473340*
R207	Resistor, 47,000 ohms, decoupling	66-3473340*
R208	Resistor, 2 megohms, grid	66-6103340*
R209	Control, tone, 4 megohms	33-5538-1
R210	Resistor, 6800 ohms, cathode	66-2683340*
R211	Resistor, 150,000 ohms, decoupling	66-4153340*
R212	Resistor, 220,000 ohms, decoupling	66-4223340*
R213	Resistor, 150,000 ohms, plate dropping	66-4153340*
R214	Resistor, 47,000 ohms, decoupling	66-3473340*
R215	Resistor, 56,000 ohms, plate dropping	66-3563340*
R216	Resistor, 330,000 ohms, grid	66-4333340*
R217	Resistor, 330,000 ohms, grid	66-4333340*
R218	Resistor, 150,000 ohms, bias filter	66-4153340*
R219	Resistor, 68 ohms, degeneration	66-0683340*
R220	Resistor, 220,000 ohms, decoupling	66-4223340*
R221	Resistor, 4.7 megohms, decoupling	66-5473340*

SECTION 2 (Continued)

Reference No.	Description	Service Part No.
T200	Transformer, output	32-8274
LS200	Loudspeaker	36-1595

SECTION 3

C303	Condenser, .01 mf, r-f by-pass	61-0120*
C304	Condenser, .01 mf, plate r-f by-pass	61-0120*
C305	Condenser, .01 mf, a-v-c filter	61-0120*
C306	Condenser, 100 mmf, filament r-f by-pass	60-10105237*
C307	Condenser, .01 mf, screen r-f by-pass	61-0120*
C308	Condenser, 100 mmf, plate r-f by-pass	60-10105237*
C309	Condenser, .01 mf, plate r-f by-pass	61-0120*
C310	Condenser, 250 mmf, r-f by-pass	60-10255237*
C311	Condenser, .01 mf, a-v-c filter	61-0120*
C312	Condenser, .05 mf, cathode by-pass	61-0170*
C313	Condenser, 100 mmf, filament r-f by-pass	60-10105237*
C314	Condenser, .01 mf, screen r-f by-pass	61-0120*
C315	Condenser, 100 mmf, a-v-c r-f by-pass	60-10105237*
C316	Condenser, 100 mmf, plate r-f by-pass	60-10105237*
C317	Condenser, .05 mf, plate r-f by-pass	61-0170*
C318	Condenser, 100 mmf, r-f by-pass	60-10105237*
C319	Condenser, 100 mmf, r-f by-pass	60-10105237*
C320	Condenser, 100 mmf, r-f by-pass	60-10105237*
C321	Condenser, 5 mf, electrolytic, discriminator	30-2417
C322	Condenser, 100 mmf, filament r-f by-pass	60-10105237*
C323	Condenser, 100 mmf, filament r-f by-pass	60-10105237*
C324	Condenser, 6 mmf, discriminator	30-1224-9
C325	Condenser, .008 mf, r-f by-pass	61-0174*
C326	Condenser, 100 mmf, r-f by-pass	60-10105237*
C327	Condenser, 100 mmf, r-f by-pass	60-10105237*
C328	Condenser, .01 mf, B bus by-pass	61-0120*
C329	Condenser, 100 mmf, r-f by-pass	60-10105237*
R300	Resistor, 47,000 ohms, plate dropping	66-3473340*
R301	Resistor, 2.2 megohms, decoupling	66-5223340*
R302	Resistor, 68 ohms, cathode	66-0683340*
R303	Resistor, 27,000 ohms, screen dropping	66-3273340*
R304	Resistor, 1000 ohms, decoupling	66-2103340*
R305	Resistor, 3.3 megohms, a-v-c filter	66-5333340*
R306	Resistor, 150 ohms, cathode	66-1153340*
R307	Resistor, 68,000 ohms, screen dropping	66-3683340*
R308	Resistor, 820,000 ohms, a.v.c.	66-4823340*
R309	Resistor, 220,000 ohms, a.v.c.	66-4223340*
R310	Resistor, 47,000 ohms, diode load	66-3473340*
R311	Resistor, 330,000 ohms, diode load	66-4333340*
R312	Resistor, 47,000 ohms, discriminator	66-3473340*
R313	Resistor, 6.8 megohms, discriminator	66-5683340*
R314	Resistor, 100,000 ohms, discriminator	66-4103340*
R315	Resistor, 1000 ohms, decoupling	66-2103340*
R316	Resistor, 100,000 ohms, decoupling	66-4103340*
Z300	Transformer, 1st i-f	32-4146
	C300A: condenser, trimmer	Part of Z300
	C300B: condenser, trimmer	Part of Z300
	C300C: condenser, 3000 mmf	Part of Z300
	C300D: condenser, trimmer	Part of Z300
	C300E: condenser, 6 mmf, coupling	Part of Z300
Z301	Transformer, 2nd i-f	32-4156
	C301A: condenser, trimmer	Part of Z301
	C301B: condenser, trimmer	Part of Z301
	C301C: condenser, 300 mmf	Part of Z301
	C301D: condenser, trimmer	Part of Z301
Z302	Transformer, AM detector/FM discriminator	32-4147
	C302A: condenser, 27 mmf	Part of Z302
	C302B: condenser, trimmer	Part of Z302
	C302C: condenser, 25 mmf	Part of Z302
	C302D: condenser, 470 mmf	Part of Z302
	C302E: condenser, trimmer	Part of Z302

MODEL 47-1230

PHILCO CORP.

SECTION 4

Reference No.	Description	Service Part No.
C400	Push-button padder-strip assembly	31-6479-1
	C400A, B, C, D, and E: condensers	Part of C400
C401	Condenser, 220 mmf. r-f voltage divider	30-1224-4
C402	Condenser, 1000 mmf. r-f voltage divider	30-1224-15
C403	Condenser, 2-section, trimmer	31-6476
	C403A: condenser, shunt trimmer,	
	BC aerial	Part of C403
	C403B: condenser, shunt trimmer,	
	SW aerial	Part of C403
C404	Condenser, 250 mmf. spread tuning,	
	SW aerial coil	60-10255237*
C405	Condenser, main tuning gang	31-2703-2
	C405A: condenser, FM aerial coil trimmer	Part of C405
	C405B: condenser, FM r-f coil trimmer	Part of C405
	C405C: condenser, FM osc. coil trimmer	Part of C405
C407	Condenser, 100 mmf. filament r-f by-pass	60-10105237*
C408	Condenser, 100 mmf. r-f by-pass	60-10105237*
C409	Condenser, 1500 mmf. screen r-f by-pass	60-20155404*
C410	Condenser, 33 mmf. r-f coupling	30-1223-6*
	SW osc. coil	60-10255237*
C411	Condenser, 1500 mmf. r-f by-pass	60-20155404*
C412	Condenser, 250 mmf. mixer grid, blocking	60-10255237*
C413	Condenser, 100 mmf. filament r-f by-pass	60-10105237*
C414	Condenser, 750 mmf. cathode coupling	60-10755301*
C415	Condenser, trimmer and padder assembly,	
	3-section	31-6464
	C415A: BC osc. series padder	Part of C415
	C415B: BC osc. shunt trimmer	Part of C415
	C415C: SW osc. shunt trimmer	Part of C415
C418	Condenser, 250 mmf. spread tuning,	
C417	Condenser, 6 mmf. neutralizing (SW)	30-1224-9
C418	Condenser, 100 mmf. osc. grid feedback	60-10105237*
C419	Condenser, .01 mf. B by-pass	61-0120*
C420	Condenser, 250 mmf. osc. plate feedback	60-10255237*
C421	Condenser, 1500 mmf. B bus r-f by-pass	60-20155404*
J400	Socket, external aerial	27-6214-1
L400	Push-button coils	
	L400A, B, C: coil, push-button	32-4059-2
	L400D, E: coil, push-button	32-3779
L401	Coil, broadcast aerial	32-4033-2
L402	Coil, FM aerial	32-4158
L403	Coil, short-wave aerial	32-4050-6
L404	Coil, r-f choke	32-4061
L405	Coil, FM r-f	32-4159
L406	Coil, FM oscillator	32-4018-2
L407	Coil, choke, parasitic suppressor	32-4157
L408	Coil, broadcast oscillator	32-4019-4
L409	Coil, short-wave oscillator	32-4113
LA400	Broadcast-loop assembly	76-1989
R400	Resistor, 10 ohms, FM grid	66-0103340*
R401	Resistor, 6800 ohms, push-button	
	oscillator cathode	66-2683340*
R402	Resistor, 150 ohms, FM r-f cathode	66-1153340*
R403	Resistor, 47,000 ohms, FM r-f screen dropping	66-3473340*
R404	Resistor, 1000 ohms, FM r-f plate decoupling	66-2103340*
R405	Resistor, 1500 ohms, mixer plate	
	parasitic suppressor	Part of C407
R406	Resistor, 1500 ohms, mixer cathode	66-2153340*
R407	Resistor, 2.2 megohms, mixer grid	66-5223340*
R408	Resistor, 470,000 ohms, isolating	66-4473340*
R409	Resistor, 15,000 ohms, oscillator grid	66-3153340*
R410	Resistor, 33,000 ohms, plate dropping	66-3333340*
R411	Resistor, 47,000 ohms, dropping	66-3473340*
R412	Resistor, 6800 ohms, push-button	
	oscillator grid	66-2683340*

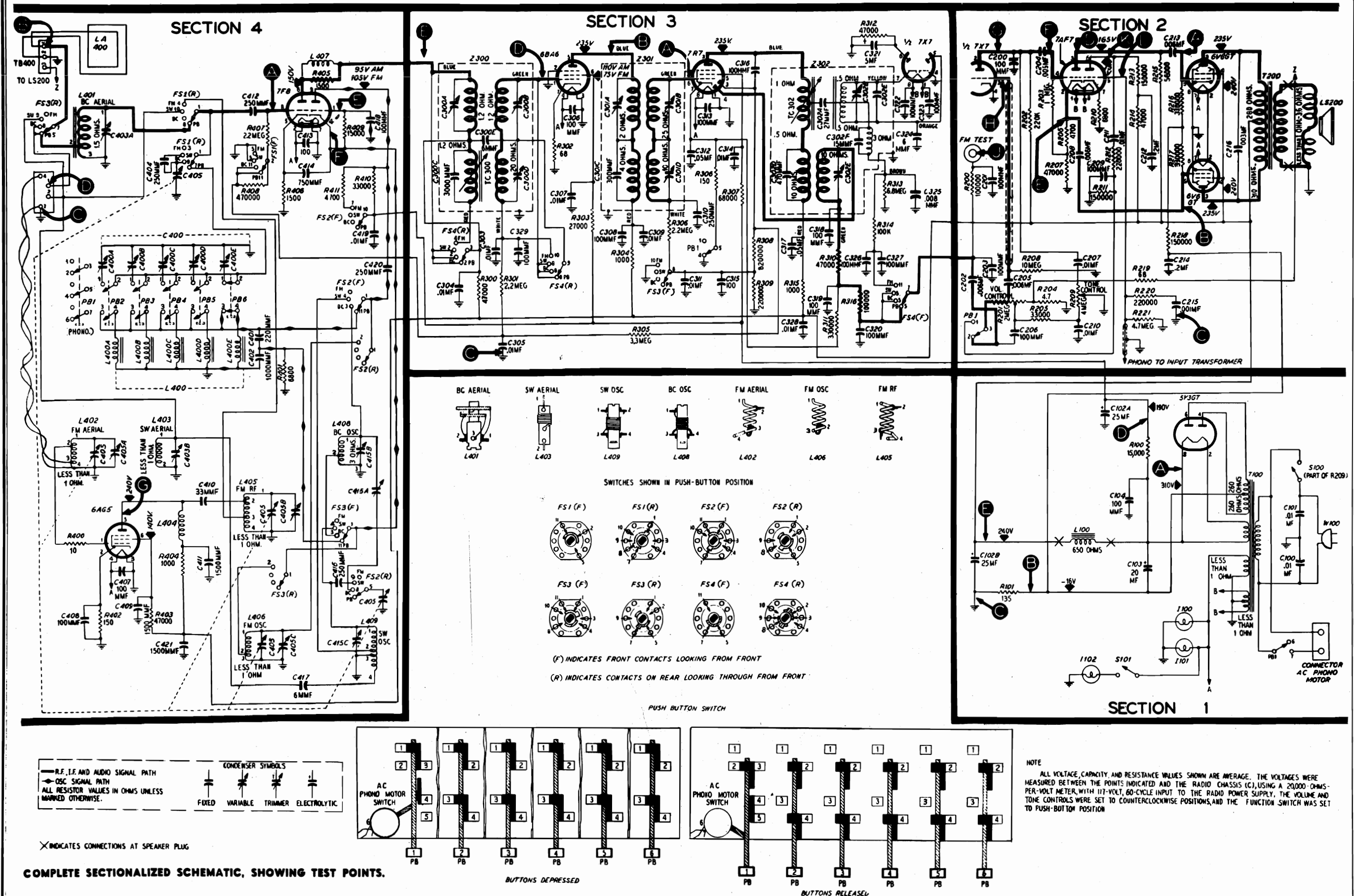
SECTION 4 (Continued)

Reference No.	Description	Service Part No.
S400	Switch, function	42-1801
TB400	Terminal board, aerial	38-9942

MISCELLANEOUS

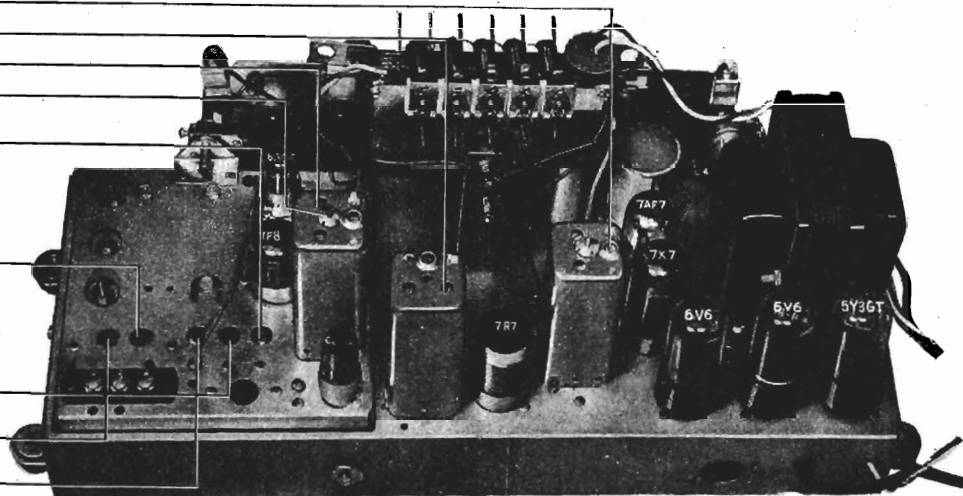
Description	Service Part No.
Bin-Light Parts:	
Bin-light cable, socket and switch assembly	76-2728
Bracket, bin-light	56-2332
Bracket, switch	56-3373
Cord, pull (25-ft. spool)	45-1420
Socket assembly, bin-light lamp	41-3742
Spring, pull-cord	28-8991
Cabinet and Cabinet Hardware:	
Back, cardboard	40-6825
Baffle, wood	219054
Baffle and cloth assembly	40-6772
Bezel, wood	16601
Bin mechanism, left-hand	76-2176
Bin mechanism, right-hand	76-2174
Cabinet	10645D
Dial scale and backplate assembly	76-2226-2
Foot, glide	45-6042
Frame, mounting assembly	76-2199
Front, tilt	45-6308
Hinge	45-6200
Stud, back cardboard	W2235FA9
Clip, BC aerial coil	28-5002FA1
Clip, BC or SW oscillator coil	56-4303FA1
Dial-Scale Hardware:	
Cord, pointer drive (25-ft. spool)	45-1459
Pointer	56-3179
Scale backplate and pulley assembly	76-2005
Spacer, scale backplate	56-3279
Spring, pointer-drive-cord	28-8953
Function-Switch Hardware:	
Bracket assembly, shaft	76-2187FA3
Link assembly	76-2186
Shaft, link assembly	56-3271FA11
Washer, "C"	1W42535FA3
Grommet, r-f chassis mounting	54-4295
Knob, tuning	54-4105
Lamp, panel	34-2040
Lamp-socket assembly, panel	54-7278
Loop assembly, BC	76-1989
Push-Button-Assembly Hardware:	
Bracket and lug assembly, rear mounting	76-2214
Core, push-button tuning	56-6100
Cover, push-button switch assembly	76-1343
Grommet, push-button switch mounting	27-4596
Knob, push-button	54-4217
Screw, mounting bracket	1W19670FA3
Sleeve, push-button switch mounting	28-5665FA3
Spring strip, tuning-core stabilizer	56-2249
Switch, a.c., phono motor	42-1756
Tab kit	40-6766
Tab cover	27-5737
Terminal strip, push-button coil mounting	56-2250
Record Changer Mounting Parts, etc.:	
Bolt, changer-mounting	56-3295
Grommet, changer-mounting	54-4313
Nut, T, changer-mounting	1W56643FA3
Palnut, changer-mounting	1W29061FA3
Spring, changer-mounting	56-3043
Cable and plug assembly, phono input	41-3735-2
Transformer, phono input	32-8256
Shield, panel lamp	54-7278
Scale backplate and pulley assembly	76-2005
Socket, external aerial	27-6214-1
Socket, Loktal	27-6177
Socket, Loktal	27-6213
Socket, miniature 7-pin (mica-filled)	27-6203-1
Socket, octal	27-6174
Socket, phono power	27-6200
Speaker Hardware:	
Bolt, mounting	W1587
Cable and plug assembly	41-3701
Nut, speaker-mounting	1W19988FA3
Plug, speaker-cable	27-4419-2
Wafer, capacitor-mounting	54-7101

PHILCO CORP



AM ALIGNMENT CHART

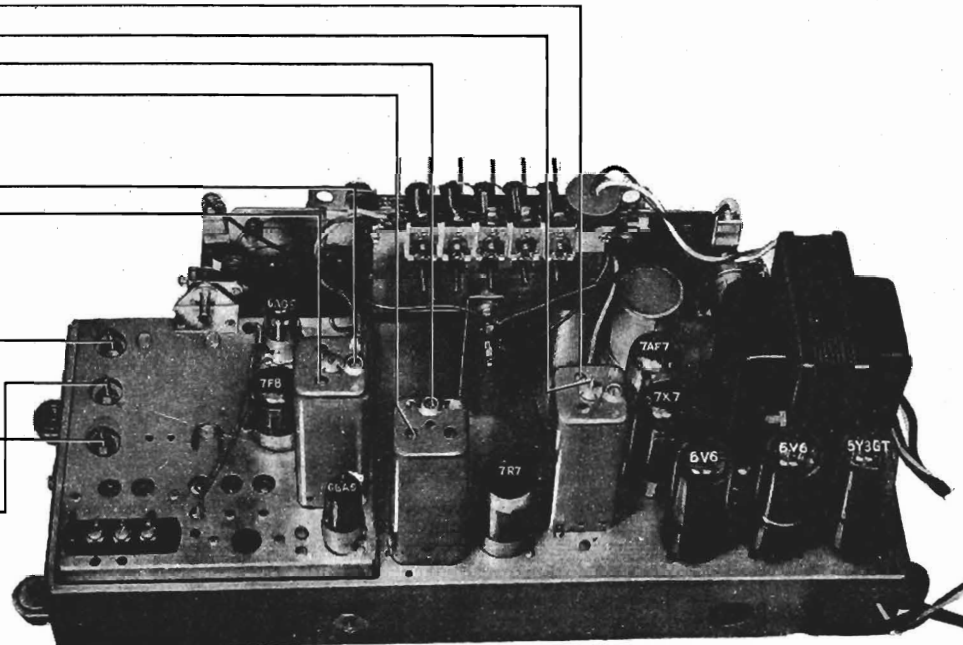
SIGNAL GENERATOR			RADIO			
STEP	CONNECTIONS TO RADIO	FRE-QUENCY	FUNCTION SWITCH	FRE-QUENCY	SPECIAL INSTRUCTIONS	ADJUST
1	Through .1-mf condenser to terminal 3 of TB400	455 kc	BDCST	540 kc	Adjust trimmers for maximum output-meter reading. Align <u>ONCE ONLY</u> in the order given.	C302E C301D C300D TC300
2	Loosely coupled to radio loop. (See Note *)	15 mc	SW	15 mc	Start with loose trimmer screw and adjust for maximum on <u>FIRST</u> signal heard. Image should be heard at 14.1 mc.	C415C
3	Same	15 mc	SW	15 mc	Adjust for maximum while rocking tuning control.	C403B
4	Same		BDCST		Preset C415A by tightening then backing off 1/4 turn.	C415A
5	Same	1700 kc	BDCST	1700 kc	Adjust for maximum.	C415B
6	Same	1500 kc	BDCST	1500 kc	Adjust for maximum.	C403A
7	Same	580 kc	BDCST	580 kc	Adjust for maximum while rocking tuning control.	C415A
8	Repeat steps 5, 6 and 7 until no further increase is noted.					



CHASSIS VIEW, SHOWING AM TRIMMER LOCATIONS.

FM ALIGNMENT CHART

SIGNAL GENERATOR			RADIO			
STEP	CONNECTIONS TO RADIO	FRE-QUENCY	FUNCTION SWITCH	FRE-QUENCY	SPECIAL INSTRUCTIONS	ADJUST
1	Through .1-mf condenser to pin 1 of 6BA6 (test point D)	9.1 mc	FM	88 mc	Attenuate signal to give approximately a 10-volt meter reading. Adjust for maximum. Repeat until no further improvement is noted. After this step do not touch any of these trimmers except C302B (in step 3).	C302B TC302 C301B C301A
2	Through .1-mf condenser to pin 8 of 7F8 (test point A)	9.1 mc	FM	88 mc	Attenuate signal to give approximately a 10-volt reading. Adjust for maximum. Repeat until no further improvement is noted. After this step do not touch these trimmers.	C300B C300A
3	Same	9.1 mc	FM	88 mc	Double check adjustment of C302B to make certain that minimum audio output is obtained from speaker. This is a critical adjustment; turn trimmer very slowly.	C302B
4	Connect to pin 4, J400	105 mc	FM	105 mc	Maximum meter reading. This is the oscillator high-frequency padder adjustment.	C405C
5	Same	105 mc	FM	105 mc	Adjust for maximum while rocking tuning control.	C405B
6	Same	105 mc	FM	105 mc	Adjust for maximum.	C405A
7	Same	92 mc	FM	92 mc	Adjust L406. (See note **).	
8	Same	92 mc	FM	92 mc	Adjust L405. (See note **).	
9	Same	92 mc	FM	92 mc	Adjust L403. (See note **).	
10	Repeat steps 4 through 10 until no further increase is obtained.					



CHASSIS VIEW, SHOWING FM TRIMMER LOCATIONS.

Philco TROUBLE SHOOTING Procedure

For rapid trouble shooting, the radio circuit is divided into four sections, with test points specified for each section; these sections and test points are indicated in the schematic diagram. The trouble-shooting procedure given for each section includes a simplified test chart and a bottom view of the chassis showing the locations of the test points and the components of that section.

In each chart, the first step is a master check for determining whether trouble exists in that section, without going through the entire test procedure.

Failure to obtain the "NORMAL INDICATION" in any given step indicates trouble within the circuit under test.

After isolating the trouble to a single stage, the defect is located by: first, testing the tube; second, measuring tube electrode voltages; third, measuring circuit resistances; fourth, substituting condensers. The trouble revealed should be corrected before testing further.

Circuit Description

Philco Model 48-1253 is a table-model radio-phonograph combination consisting of a five-tube superheterodyne radio and a Philco Model M-8 Automatic Record Changer, operating on a.c. only. The tuning range is 540—1600 kc. The built-in high-impedance loop aerial is adequate in most areas; where greater pickup is required, an external aerial may be connected. When the external aerial is not in use, the aerial lead on the radio should be connected to the chassis.

The converter stage employs a 7A8 pentagrid converter. The i-f amplifier is a 7B7 high-transconductance tube, followed by a 7C6 duo-diode, triode, operating as detector, a.v.c., and first-audio amplifier. The 50A5 output tube works into a permanent-magnet dynamic speaker.

In the power supply, a 50X6 operates in a voltage-doubler circuit. A resistance-capacitance type of filter is used.

For service information on the record changer, refer to service manual PR-1478, Philco Automatic Record Changer Model M-8.

Preliminary Checks

To avoid possible damage to the radio, the following preliminary checks should be made before turning on the power:

1. Inspect both the top and the bottom of the chassis. Make sure that all tubes are secure in the proper sockets, and look for any broken or shorted



MODEL 48-1253

SPECIFICATIONS

CABINET Wood, walnut finish
CIRCUIT Five-tube superheterodyne
FREQUENCY RANGE .. 540—1600 kc.
AUDIO OUTPUT 2.2 watts
OPERATING VOLTAGE .105—120 volts, 60 cycles, a.c.

POWER CONSUMPTION

Radio 60 watts
Phonograph 30 watts
AERIAL Built-in high-impedance loop; terminal provided for external aerial

INTERMEDIATE

FREQUENCY 455 kc.
PHILCO TUBES (5) ... 7A8, 7B7, 7C6, 50A5, 50X6
PHONOGRAPH Philco Automatic Record Changer Model M-8 (for service information, see manual PR-1478)

TP-3632

connections, burned resistors, or other obvious sources of trouble.

2. Measure the resistance between B+ (pin 2 of 50X6 rectifier tube) and the B- bus, test point B. When the ohmmeter test leads are connected in the proper polarity, the highest resistance reading will be obtained. If the reading is lower than 3700 ohms, check condensers C101, C102, and C103A for leakage or shorts.

The resistance value above, which is much lower than normal, is not intended as a quality check of these condensers; the value given is the lowest at which the rectifier will operate safely while the voltage tests of Section 1 are performed.

Section 1**TROUBLE SHOOTING**

Make the tests for this section with a d-c voltmeter. Connect the negative lead to B-, test point B; connect the positive lead to the test points indicated in the chart. The voltage readings given were taken with a 20,000-ohms-per-volt meter at a line voltage of 117 volts, a.c.

Set the radio-phono switch to RADIO, and the volume control to minimum.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 2; if not, isolate and correct the trouble in this section.

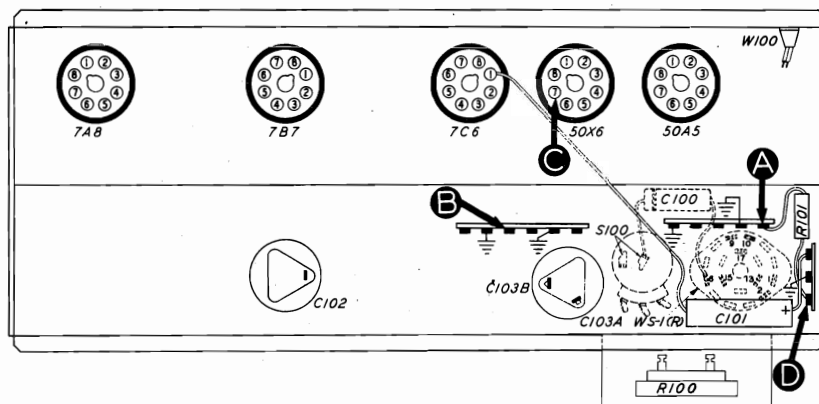


Figure 1. Bottom View, Showing Section 1 Test Points

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	96v	Trouble in this section. Isolate by the following tests.
2	C	220v	Defective: 50X6. Shorted or leaky: C101, C102. Open: R100, C101, C102, S100, WS-1(R).
3	D	207v	Shorted or leaky: C103A. Open: C103A, R101, T200*, R204*.
4	A	96v	Shorted or leaky: C103B. Open: R204*.

Listening test: Abnormal hum may be caused by open C101, C102, C103A, or C103B.

* This part, located in another section, may cause abnormal indication in this section.

Section 2**TROUBLE SHOOTING**

For the tests in this section, use an audio-frequency signal generator. Connect the generator ground lead to B-, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the volume control to maximum. For all the tests except step 5, set the radio-phono switch to RADIO.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 3. If not, isolate and correct the trouble in this section.

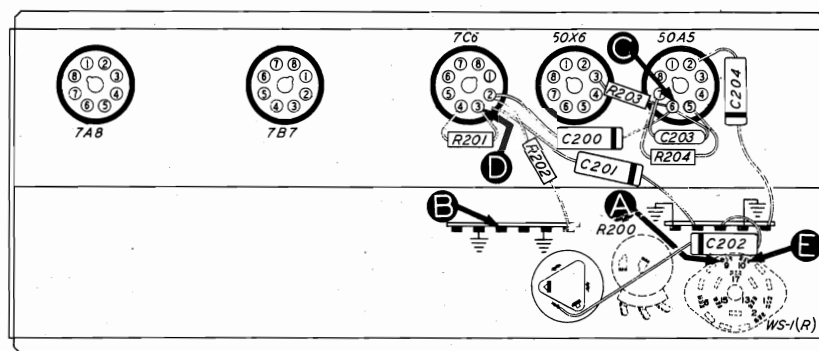


Figure 2. Bottom View, Showing Section 2 Test Points

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with weak signal input.	Trouble in this section. Isolate by the following tests.
2	C	Clear signal with strong signal input.	Defective: 50A5. Open: LS200, T200, R204, R203. Shorted: LS200, T200, C200, C204, C203. Leaky: C200, C203, C204.
3	D	Same as step 1.	Defective: 7C6. Open: R202, R203, C200. Shorted: C200.
4	A	Same as step 1.	Open: WS-1(R), C201, R200 (rotate through range).
5*	E	Same as step 1.	Open: WS-1(R).

Listening Test: Distortion may be caused by open R201 or R203, or by shorted or leaky C201. Hum in phono operation may be caused by open C202.

* Radio-phono switch in PHONO position.

Section 3

TROUBLE SHOOTING

For the tests in this section, use an r-f signal generator, with modulated output, set at 455 kc. Connect the generator ground lead to B-, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the radio-phonograph switch to RADIO, and the volume control to maximum.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 4; if not, isolate and correct the trouble in this section.

Since the circuit location of test point A for this section is the same as that of test point C for Section 4, the effectiveness of step 1 as a master check is dependent upon the condition of certain parts in Section 4; these parts are listed under "POSSIBLE CAUSE OF ABNORMAL INDICATION."

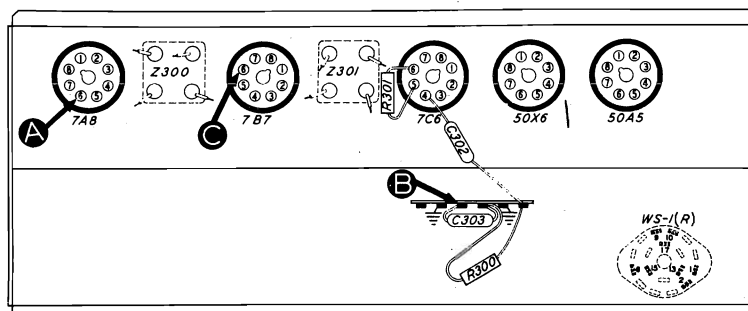


Figure 3. Bottom View, Showing Section 3 Test Points

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with weak signal input.	Trouble in this section. Isolate by the following tests.
2	C	Clear signal with strong signal input.	Defective: 7B7, 7C6 (diode section). Open or shorted: Z301 pri. or sec., C301A, C301B. Misaligned: Z301. Open: R404*, R300, WS-1(R). Shorted: C302, C303. Shorted or leaky: C405*.
3	A	Same as step 1.	Defective: 7A8*. Open or shorted: Z300 pri. or sec., C300A, C300B. Misaligned: Z300.

* This part, located in another section, may cause abnormal indication in this section.

Section 4

TROUBLE SHOOTING

For the tests in this section, with the exception of the oscillator test, use an r-f signal generator, with modulated output. Connect the generator ground lead to B-, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the radio-phonograph switch to RADIO, and the volume control to maximum.

If the "NORMAL INDICATION" is not obtained in step 1, isolate the trouble by following the remaining steps.

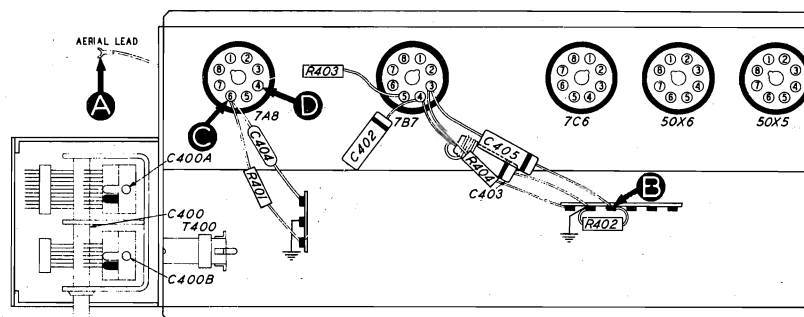


Figure 4. Bottom View, Showing Section 4 Test Points

STEP	TEST POINT	SIG. GEN. FREQ.	RADIO TUNING	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	1000 kc.	Tune to signal.	Loud, clear signal with weak signal input.	Trouble in this section. Isolate by the following tests.
2	C	1000 kc.	Tune to signal.	Same as step 1.	Shorted: C400, C400A. Trouble in oscillator circuit (step 3).
3	D to B Osc. Test (see note below).		Tune through range.	Negative 2.4 to 3 volts.	Defective: 7A8. Open or shorted: T400 pri. or sec., C400B. Shorted: C400.
4	A	1000 kc.	Tune to signal.	Same as step 1.	Open: C401, C404, LA400, C400A. Shorted: C400A.

Listening Test: Hum may be caused by open R401 or C402.

OSCILLATOR TEST

Connect the positive lead of a high-resistance voltmeter to B-, test point B; connect the prod end of the negative lead through a 100,000-ohm isolating resistor to the 7A8 oscillator grid (pin 4), test point D. Use a suitable meter range, such as 0-10 volts. Proper operation of the oscillator is indicated by a negative voltage, 2.4 to 3 volts (measured with a 20,000 ohms-per-volt meter), throughout the tuning range.

REPLACEMENT PARTS LIST

NOTE

Part numbers marked with an asterisk (*) are general replacement items. These numbers may not be identical with those on factory assemblies; also, the electrical values of some replacement items may differ from the values indicated in the schematic diagram and parts list. The values substituted in any case are so chosen that the operation of the radio will be either unchanged or improved. When ordering replacements, use only the "Service Part No."

SECTION 1

Reference Symbol	Description	Service Part No.
C100	Condenser, line filter, .05 mf.	61-0122*
C101	Condenser, electrolytic, voltage doubler, 15 mf., 200v	30-2568-13
C102	Condenser, electrolytic, voltage doubler, 15 mf., 200 v	30-2575-11
C103	Condenser, electrolytic, 2-section	30-2568-14
C103A	Condenser, filter, 40 mf., 250v	Part of C103
C103B	Condenser, filter, 10 mf., 250v	Part of C103
I100	Pilot lamp	34-2477*
R100	Resistor, filter, 500 ohms	33-3435-3
R101	Resistor, filter, 15,000 ohms	66-3154340*
S100	Switch, off-on	Part of R200
W100	Line cord and plug	41-3755-16
WS	Wafer switch (single wafer), radio-phono	42-1824
WS-1(R)	Wafer-switch section	Part of WS

SECTION 2

C200	Condenser, d-c blocking, .006 mf.	45-3500-7*
C201	Condenser, d-c blocking, .01 mf.	61-0120*
C202	Condenser, by-pass, .2 mf.	45-3500-3*
C203	Condenser, by-pass, 220 mmf.	60-10205307*
C204	Condenser, tone compensation, .05 mf.	61-0122*
LS200	Speaker	36-1625
R200	Volume control, .5 megohm	33-5558
R201	Resistor, grid bias, 10 megohms	66-6103340*
R202	Resistor, plate load, 470,000 ohms	66-4473340*
R203	Resistor, grid return, 470,000 ohms	66-4473340*
R204	Resistor, cathode bias, 130 ohms	66-1133340*
T200	Transformer, output	32-8329
WS-1(R)	Wafer-switch section (see WS, Section 1)	Part of WS

SECTION 3

C300A	Condenser, trimmer	Part of Z300
C300B	Condenser, trimmer	Part of Z300
C301A	Condenser, trimmer	Part of Z301
C301B	Condenser, trimmer	Part of Z301
C302	Condenser, i-f filter, 100 mmf.	60-10105407*
C303	Condenser, i-f filter, 100 mmf.	60-10105407*
R300	Resistor, i-f filter, 47,000 ohms	66-3473340*
R301	Resistor, a-v-c filter, 2.2 megohms	66-5223340*
WS-1(R)	Wafer-switch section (see WS, Section 1)	Part of WS
Z300	Transformer, 1st i-f	32-3962-3
Z301	Transformer, 2nd i-f	32-3948-11

SECTION 4

Reference Symbol	Description	Service Part No.
C400	Condenser, tuning gang	31-2727-1
C400A	Condenser, r-f trimmer	Part of C400
C400B	Condenser, oscillator trimmer	Part of C400
C401	Condenser, blocking, 5 mmf.	30-1221-5*
C402	Condenser, a-v-c filter, .05 mf.	61-0122*
C403	Condenser-and-choke assembly, r-f by-pass, .2 mf.	76-1161
C404	Condenser, d-c blocking, 100 mmf.	60-10105407*
C405	Condenser, screen by-pass, .05 mf.	61-0122*
LA400	Loop aerial	76-2127-5
R400	Resistor, aerial discharge, 150,000 ohms	66-4153340*
R401	Resistor, grid load, 1 megohm	66-5103340*
R402	Resistor, leakage, 120,000 ohms	66-4123340*
R403	Resistor, grid return, 120,000 ohms	66-4123340*
R404	Resistor, screen dropping, 47,000 ohms	66-3473340*
T400	Transformer, oscillator	32-4095-2

MISCELLANEOUS

Description	Service Part No.
Backplate Assembly and Hardware	
Backplate assembly	76-3228
Drive cord (25-foot spool), tuning gang	45-8750*
Drive cord (25-foot spool), pointer	45-8750*
Panel, diffusing	76-3203
Pointer, dial	56-4992
Spring, gang drive	56-2617
Spring, diffusing panel	56-4989FA3
Spring, pointer	28-8953
Cabinet and Hardware	
Baffle and cloth	40-6956
Cabinet	10684
Foot, rubber	54-4377
Hinge	45-6067
Lid support	45-6061
Scale, dial	27-5976
Scale trim, bottom	56-4998
Scale trim, top	56-4999
Strap, scale mounting	56-2068
Changer Mounting Hardware	
Grommet	54-4313
Plate, corner	56-3103
Nut	1W56643FA3
Spring	56-3043FA15
Cable, pickup	41-3735-11
Knob, radio-phono	54-4484
Knob, tuning	76-3138
Knob, volume	76-3138-1
Link assembly, radio-phono switch	76-3229
Pin nut	1W29061FA3
Pilot-lamp-socket assembly	27-6233-9
Pulley and shaft	76-3204
Socket, loktal	27-6138*
Shield, tube	56-2731

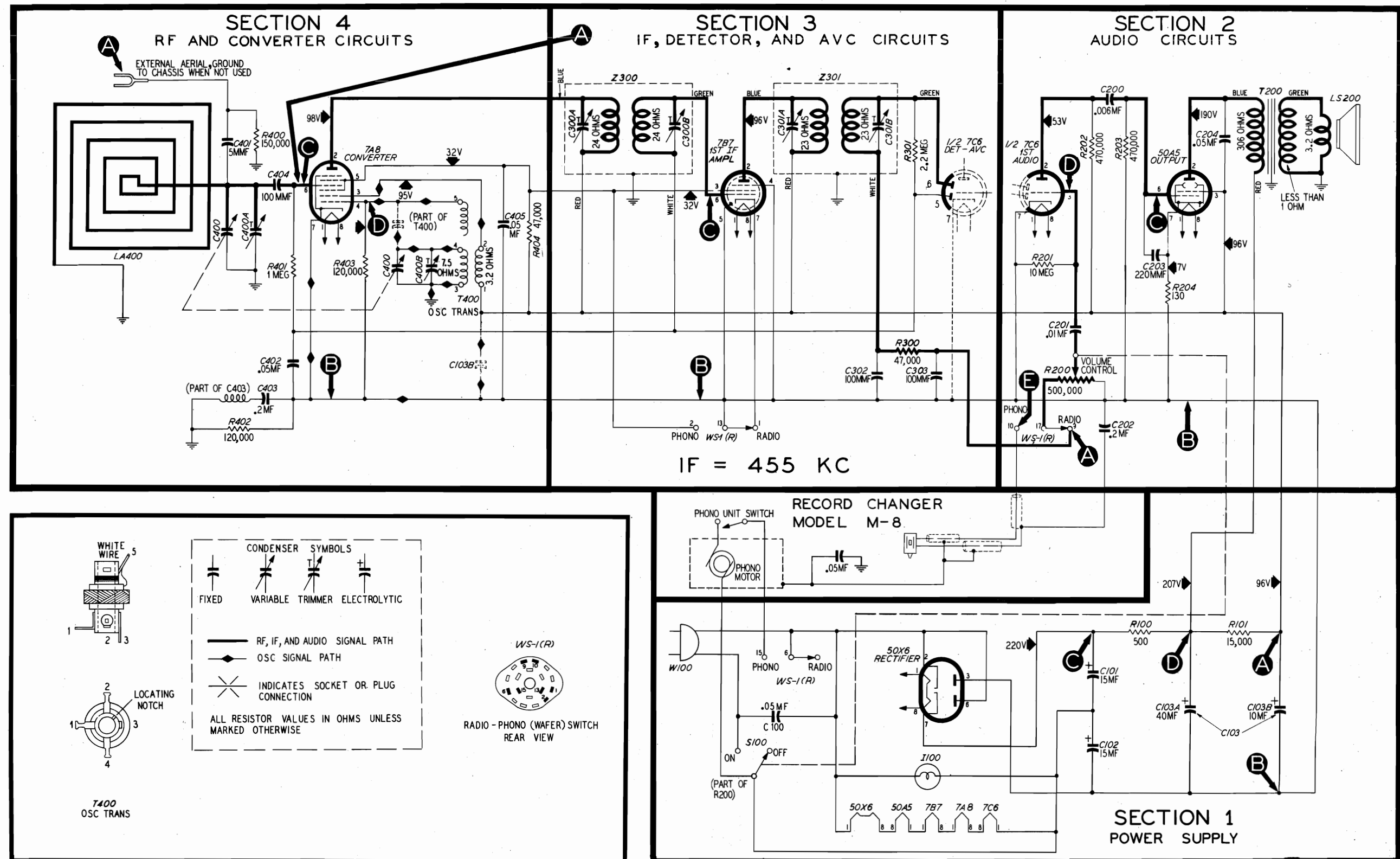


Figure 5. Philco Radio Model 48-1253, Sectionalized Schematic Diagram, Showing Test Points

TP-4091

ALIGNMENT PROCEDURE

The radio may be aligned with the chassis in the cabinet. To connect the signal generator, it is necessary to remove the bottom plate from the chassis.

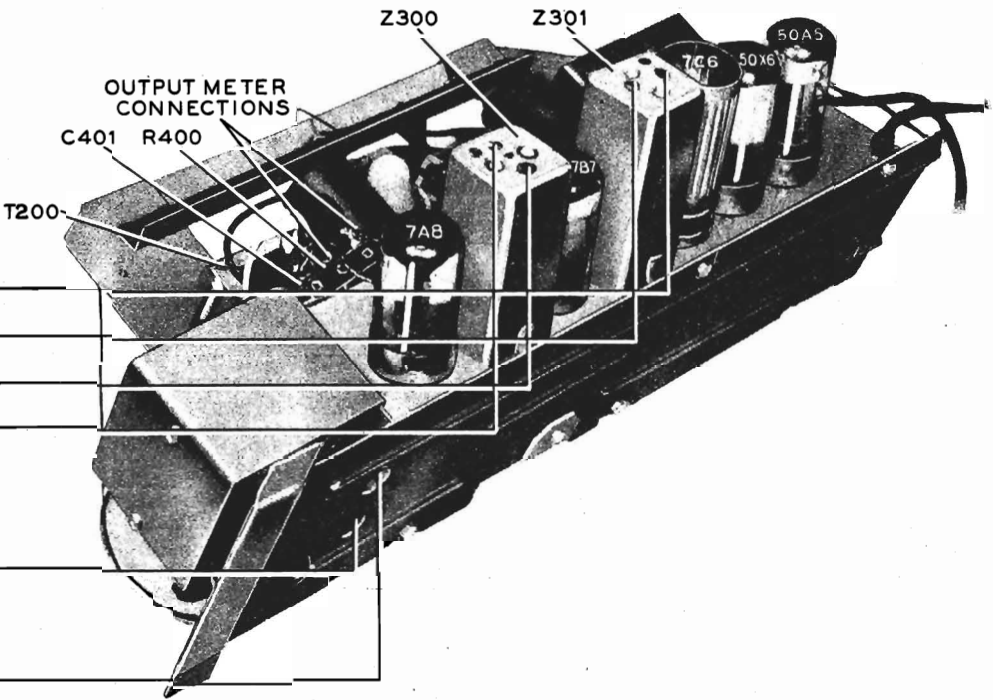
DIAL POINTER—Turn tuning condensers to full-mesh position. Adjust dial pointer to index dot, located to the left of "55."

OUTPUT METER—Connect between right-hand (output) lug and center (chassis) lug of terminal panel shown in figure 6.

SIGNAL GENERATOR—Connect as indicated in chart.

OUTPUT LEVEL—During alignment, input signal must be attenuated to hold output-meter reading below .5 volt.

STEP	SIGNAL GENERATOR		RADIO		ADJUST
	CONNECTIONS TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	
1				Turn C301B (copper screw) down tight.	
2	Ground lead to B-; output lead through .05-mf. condenser to pin 6 of 7A8 (test point C of Section 4).	455 kc.	540 kc.	Adjust trimmers, in order given, for maximum output.	C301B C301A C300B C300A
3	Radiating loop (see note below).	1600 kc.	1600 kc.	Adjust for maximum.	C400B
4	Same as step 3.	1500 kc.	1500 kc.	Adjust for maximum.	C400A



TP-3982

Figure 6. Chassis View, Showing Trimmer Locations

RADIATING LOOP: Make up a coil of insulated wire consisting of 6 to 8 turns, about 6 inches in diameter. Connect coil ends to signal-generator leads, and suspend coil near radio loop.

SYMBOLIZATION

The components in the radio circuit are symbolized according to the types of parts and the sections of the radio in which the parts are located. The prefix letter of the symbol designates the type of part, as follows:

C—condenser
I—pilot lamp
L—choke or coil
LA—loop aerial
LS—loud-speaker

R—resistor
S—switch
T—transformer
WS—wafer switch
Z—electrical assembly

The number of the symbol designates the section in which the part is located, as follows:

100-series components are in Section 1—the power supply.
200-series components are in Section 2—the audio circuits.
300-series components are in Section 3—the i-f amplifier, detector, and a-v-c circuits.
400-series components are in Section 4—the aerial and oscillator circuits.

A suffix letter identifies the part as a component of the assembly which bears an identical number without a suffix letter, and with perhaps a different prefix letter.

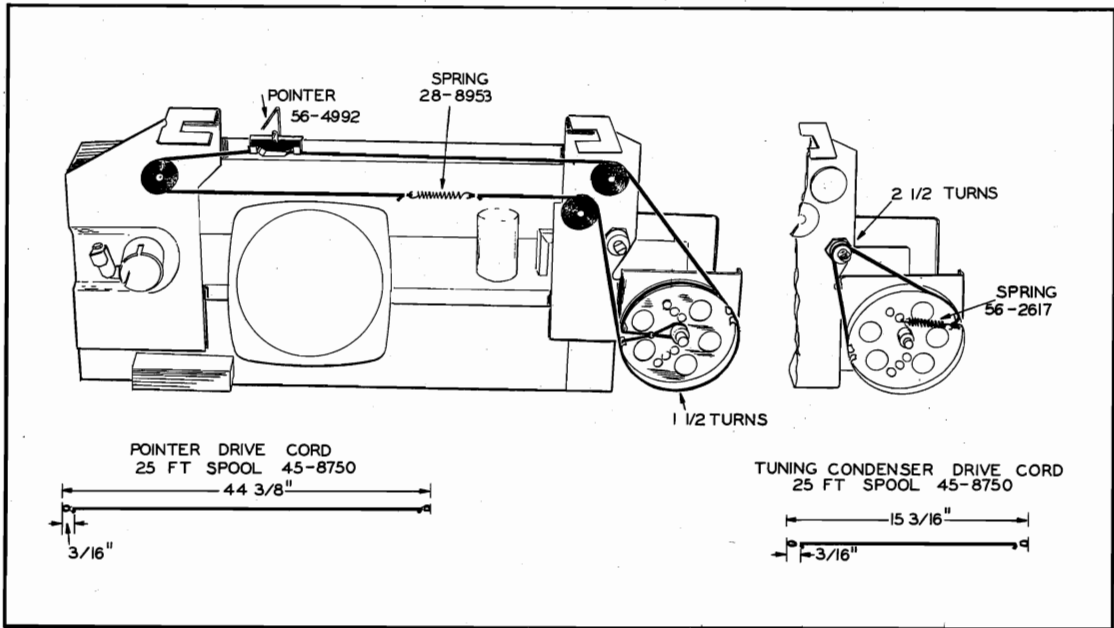


Figure 7. Drive-Cord Installation Details



MODEL 48-1264

PHILCO CORP.

AM ALIGNMENT CHART

STEP	SIGNAL GENERATOR		RADIO			ADJUST
	CONNECTIONS TO RADIO	DIAL	WAFER SWITCH	DIAL	SPECIAL INSTRUCTIONS	
1	Through .1-mf. condenser to terminal 1 of TB400.	455 kc.	BC	540 kc.	Adjust for maximum, once only, in order.	C302B C301D C300E TC300A
2	Radiating loop (see note below).	580 kc.	BC	580 kc.	Adjust for maximum.	C402B
3	Same as step 2.	1700 kc.	BC	1700 kc.	Adjust for maximum.	C402A
4	Same as step 2.	1500 kc.	BC	1500 kc.	Adjust for maximum.	C401
5	Same as step 2.	580 kc.	BC	580 kc. (approx.)	Rock tuning condenser while adjusting for maximum.	C402B
6	Repeat steps 3, 4, 5, and 4, in order, until no further improvement is obtained.					

RADIATING LOOP: Make up a coil of insulated wire consisting of 6 to 8 turns, about 6" in diameter. Connect coil ends to signal-generator leads, and suspend coil near radio broadcast loop.

FM ALIGNMENT CHART

STEP	SIGNAL GENERATOR		RADIO			ADJUST
	CONNECTIONS TO RADIO	DIAL	WAFER SWITCH	DIAL	SPECIAL INSTRUCTIONS	
1	Through .1-mf. condenser to pin 1 of 6BA6 (test point D, figure 5).	9.1 mc.	FM	88 mc.	Adjust for maximum. Repeat until no further improvement is noticed. After this step, do not touch any of these trimmers except C302D (step 3).	C302D TC302 C301C C301A
2	Through .1-mf. condenser to pin 8 of 7F8 (test point A, figure 5).	9.1 mc.	FM	88 mc.	Adjust for maximum. Repeat until no further improvement is noticed. After this step, do not touch either of these trimmers.	C300D C300A
3	Same as step 2.	9.1 mc.	FM	88 mc.	Double-check the adjustment of C302D to make sure that minimum audio output is obtained from the speaker. Use output meter. This is a critical adjustment; turn trimmer very slowly.	
4	Connect signal generator to terminal 4 of J400.	105 mc.	FM	105 mc.	Maximum meter reading. This is the oscillator high-frequency padder adjustment.	C400C
5	Same as step 4.	105 mc.	FM	105 mc.	Maximum — Rock tuning control.	C400B
6	Same as step 4.	105 mc.	FM	105 mc.	Maximum.	C400A
7	Same as step 4.	92 mc.	FM	92 mc.	Adjust L405. See notes 1 and 2.	
8	Same as step 4.	92 mc.	FM	92 mc.	Adjust L403. See notes 1 and 3.	
9	Same as step 4.	92 mc.	FM	92 mc.	Adjust L401. See notes 1 and 4.	
10	Repeat steps 4 through 9 until no further increase is obtained.					

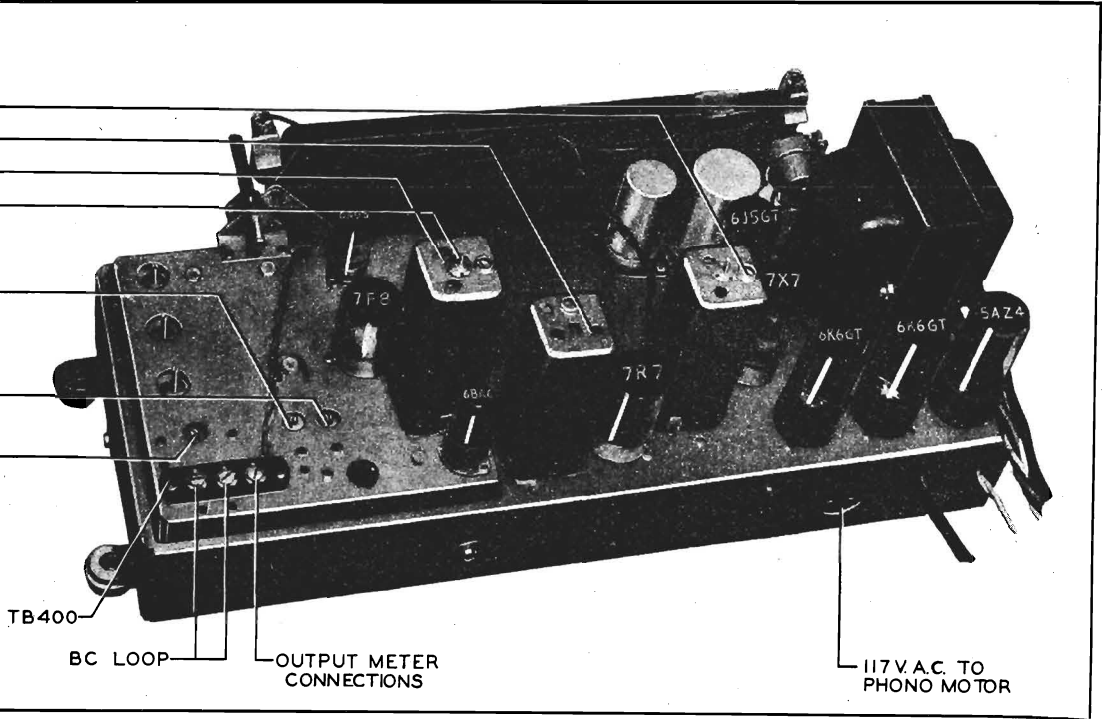


Figure 8. Top View, Showing AM Trimmer Locations

TP-2011

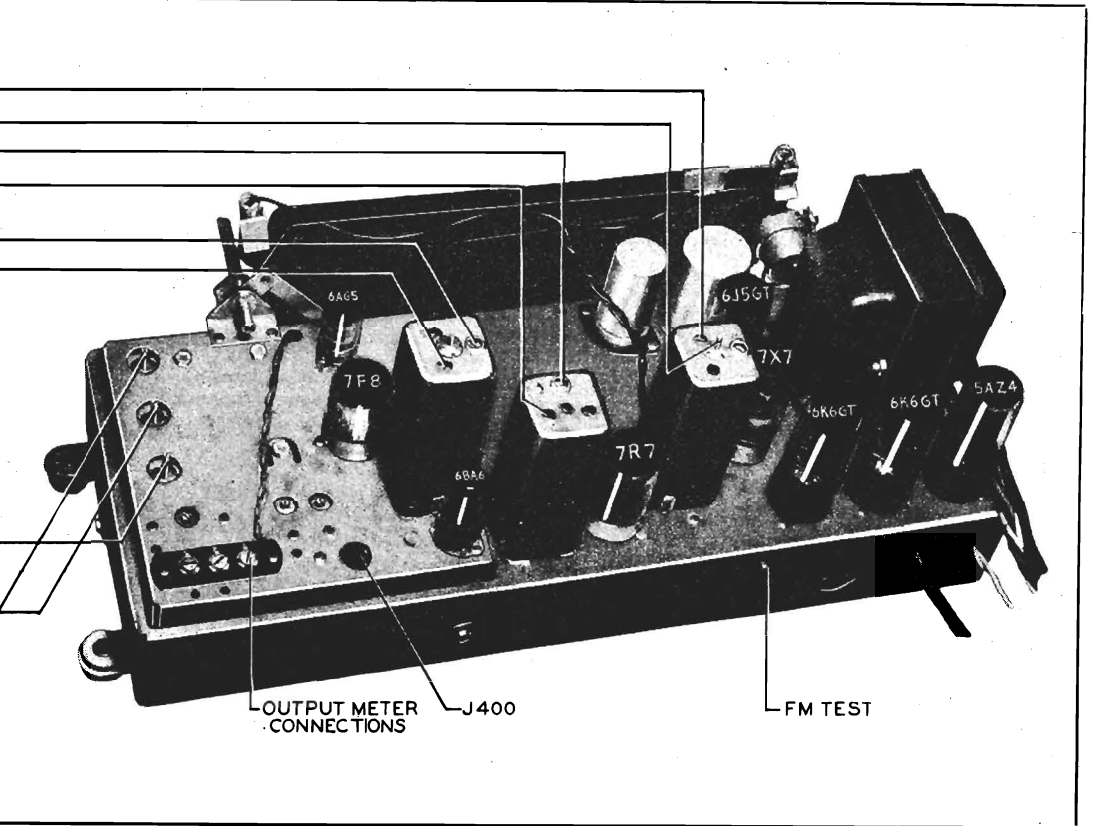


Figure 9. Top View, Showing FM Trimmer Locations

AM ALIGNMENT PROCEDURE

When the complete AM and FM alignments are to be made, the AM alignment should be made first; if FM alignment is not required, the AM alignment alone may be made.

DIAL POINTER: With tuning-condenser plates fully meshed, adjust pointer to coincide with index mark at low-frequency end of scale. See "CALIBRATING DIAL BACKPLATE," page 2.

VOLUME CONTROL: Set to maximum.

TONE CONTROL: Set to maximum counterclockwise, near the "off" position.

AM R-F SIGNAL GENERATOR: Connect ground lead to radio chassis, and output lead as indicated in chart. Use modulated output.

OUTPUT METER: Connect between terminal 3 (voice-coil connection) of aerial terminal panel (TB400) and chassis.

OUTPUT LEVEL: During alignment input signal must be attenuated to hold output-meter reading below 1.5 volts.

RADIO WAFER SWITCH, RADIO DIAL, and SIGNAL-GENERATOR DIAL: Set as indicated in chart.

FM ALIGNMENT PROCEDURE

MAKE AM ALIGNMENT FIRST

OUTPUT METER: Connect as for AM alignment (this meter is used only in step 3).

D-C METER: Connect a 20,000-ohms-per-volt meter across the 5-mf. condenser, C325, in the FM detector circuit—the negative lead to pin 6 of the 7X7 tube and the positive lead to the chassis. Use the 10-volt meter range.

AM R-F SIGNAL GENERATOR: Use modulated output for the entire alignment. The generator must have sufficient output to give a reading of approximately 9 volts on the d-c meter, and the signal should be attenuated during the alignment to keep the meter at this value. Connect the generator ground lead to the chassis, and the output lead as indicated in the chart.

RADIO WAFER SWITCH, RADIO DIAL, and SIGNAL-GENERATOR DIAL: Set as indicated in chart. Allow the radio and generator to warm up for 15 minutes before starting the alignment.

NOTE 1: The resonance of the circuits using coils L401, L403, and L405 may be checked with a powdered-iron tuning core, such as Part No. 56-6100. If the signal strength (meter reading) increases when the iron end is inserted in the coil, compress the turns slightly. If the signal increases when the threaded brass end is inserted, spread the turns. Do not compress or spread the turns excessively; only a small change is required at these frequencies,

NOTE 2: Oscillator coil L405—Adjust coil for maximum meter reading.

NOTE 3: R-F coil L403—Adjust coil for maximum meter reading while rocking tuning control.

NOTE 4: Aerial coil L401—Adjust coil for maximum meter reading.

MODEL 48-1264

PHILCO CORP.

Model 48-1264, Code 122, is identical to Model 48-1264, Code 121, with the following exceptions:

1. The FM r-f amplifier tube, type 6AG5, was changed to a type 6AU6 tube. In making this change, the suppressor grid (pin 2) of the 6AU6 was connected to ground (pin 3).
2. Resistor R402, 47,000 ohms, was changed to 33,000 ohms, Part No. 66-3333340.
3. Condenser C325, 5 mf., 50v (noise suppressor), was changed to 2 mf., 50v, Part No. 30-2417-7.
4. Condenser C202, 100 mmf., was removed.

Circuit Description

Philco Model 48-1264 is a nine-tube superheterodyne radio-phonograph combination providing reception on the standard broadcast band, 540—1720 kc., and the FM band, 88—108 mc.

A low-impedance loop within the cabinet provides adequate signal pickup on the broadcast band. Satisfactory FM reception usually requires the use of an outdoor dipole aerial (Philco Part No. 45-1462). In areas of high signal strength, however, the dipole built into the cabinet is sufficient for FM operation.

A tuned r-f stage, using a type 6AG5 high-frequency pentode, functions on the FM band. The converter stage employs a 7F8 high-frequency double triode. The converter and r-f stages are built on a separate chassis, to insure reliable performance at high frequencies. These stages provide high signal-to-noise ratio, high conversion efficiency, and good image rejection.

Two transformer-coupled i-f stages are used. The i-f transformers have two sets of windings; one set is tuned to 455 kc. for AM operation, and the other to 9.1 mc. for FM operation.

The first i-f stage employs a 6BA6 (miniature type) high-frequency pentode amplifier; the pentode section of a 7R7 double-diode pentode functions as the second i-f amplifier. One diode of this tube is used for AM detection, while the other diode develops a-v-c voltage.

The ratio-detector circuit used for FM detection operates through the two diodes of the 7X7 tube; this circuit has good noise-reducing properties and a superior tuning characteristic. The triode section of the 7X7 is used as a first-audio and phono-amplifier stage. The output of the AM detector, FM detector, or phono pickup is switched into this circuit by the wafer switch.

A type 6J5GT triode operates as a phase inverter, driving the two 6K6GT output tubes in push-pull operation.

A more uniform frequency response is obtained by the use of inverse feedback. This feed-back voltage is taken from the secondary of the output transformer, and applied through resistor R211 to the junction of R204 and the volume control.

The 12-inch electrodynamic speaker provides excellent bass reproduction.



MODEL 48-1264

SPECIFICATIONS

CABINET	Wood, light mahogany or walnut finish
CIRCUIT	Nine-tube superheterodyne
FREQUENCY RANGES:	
Broadcast	540—1720 kc.
FM	88—108 mc.
AUDIO OUTPUT	6 watts
OPERATING VOLTAGE	105—120 volts, 60 cycles, a.c.
POWER CONSUMPTION	110 watts
AERIALS	Built-in low-impedance loop, and FM dipole; provision for external aerial
INTERMEDIATE FREQUENCIES:	
AM	455 kc.
FM	9.1 mc.
PHONOGRAPH	Philco Automatic Record Changer, Model D-10 (for service information, see manual PR-1156)
SPEAKER	12" electrodynamic
PHILCO TUBES (9).....	6AG5, 7F8, 6BA6, 7R7, 7X7, 6J5GT, 6K6GT (2), 5AZ4

Philco TROUBLE - SHOOTING Procedure

For rapid trouble shooting, the radio circuit is divided into four sections, with test points specified for each section; these sections and test points are indicated in the schematic diagram. The trouble-shooting procedure given for each section includes a simplified test chart and a bottom view of the chassis showing the locations of the test points and components of that section.

In each chart, the first step is a master check for determining whether trouble exists in that section, without going through the entire test procedure.

Failure to obtain the "NORMAL INDICATION" in any given step indicates trouble within the circuit under test.

After isolating the trouble to a single stage, the defect is located by: first, testing the tube; second, measuring the tube electrode voltages; third, measuring circuit resistances; fourth, substituting condensers. The trouble revealed should be corrected before testing further.

Preliminary Checks

To avoid possible damage to the radio, the following preliminary checks should be made before turning on the power:

1. Carefully inspect both the top and the bottom of the chassis. Make sure that all tubes are secure in the proper sockets. Look for any broken or shorted connections, burned resistors, or other obvious faults.

2. Measure the resistance between B+ (pin 8 of the 5AZ4 rectifier) and the radio chassis, with the ohmmeter polarity such that it gives the highest resistance reading; if the reading is lower than 3500 ohms, check condensers C102, C103A, and C103B for leakage or shorts.

The above resistance value, which is much lower than normal, is not intended as a quality check of these condensers; the value given is the lowest at which the rectifier will operate safely while the voltage tests of Section 1 are performed.

CALIBRATING DIAL BACKPLATE

When the radio chassis has been removed from the cabinet, dial calibration and alignment points may be marked on the dial backplate below the pointer.

The measurements for these points are shown in figure 1. Hold a ruler against the scale backplate, with the start of the ruler at the reference line shown, and mark pencil dots at the proper points for the required

frequency settings. When the ruler is correctly placed, the index mark is approximately $1\frac{9}{16}$ " from the edge of the backplate.

With the tuning gang fully meshed, the pointer should be adjusted on the drive cord to coincide with the index mark.

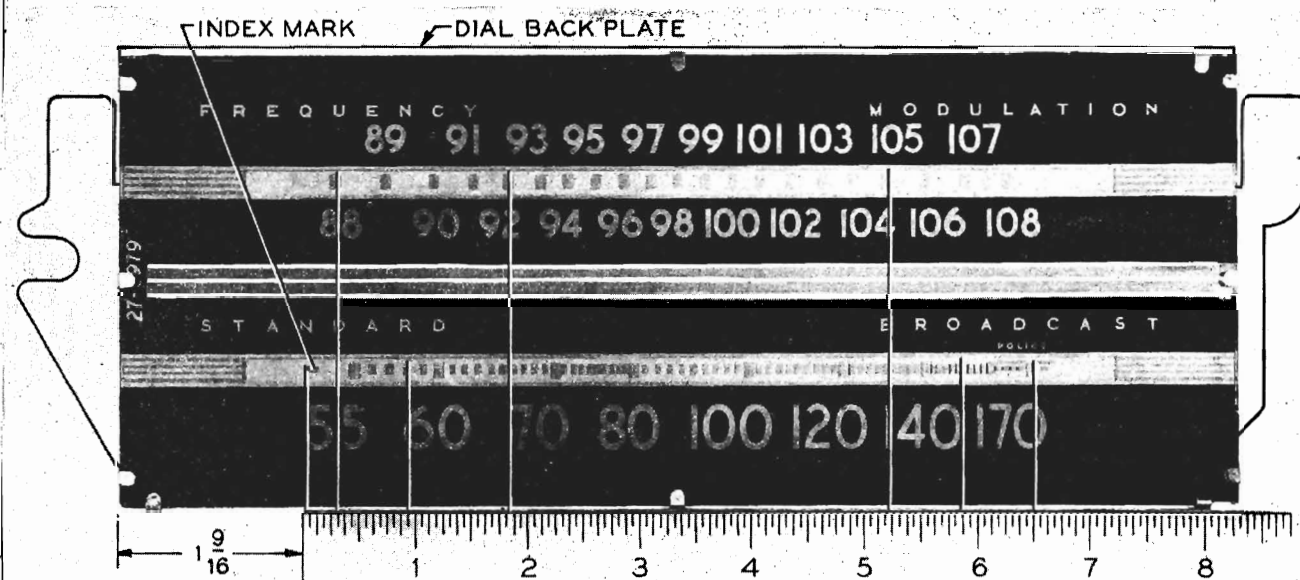


Figure 1. Dial-Backplate Calibration Measurements

SYMBOLIZATION

The components in the radio circuit are symbolized according to the types of parts and the sections of the radio in which the parts are located. The prefix letter of the symbol designates the type of part, as follows:

C—condenser

LA—loop aerial

S—switch

I—pilot lamp

LS—loud speaker

T—transformer

L—choke or coil

R—resistor

WS—wafer switch

Z—electrical assembly

The number of the symbol designates the section in which the part is located, as follows:

100-series components are in Section 1—the power supply.

200-series components are in Section 2—the audio circuits.

300-series components are in Section 3—the i-f amplifier, detector, and a-v-c circuits.

400-series components are in Section 4—the aerial, r-f, and oscillator circuits.

A suffix letter identifies the part as a component of the assembly which bears an identical number without a suffix letter, and with perhaps a different prefix letter.

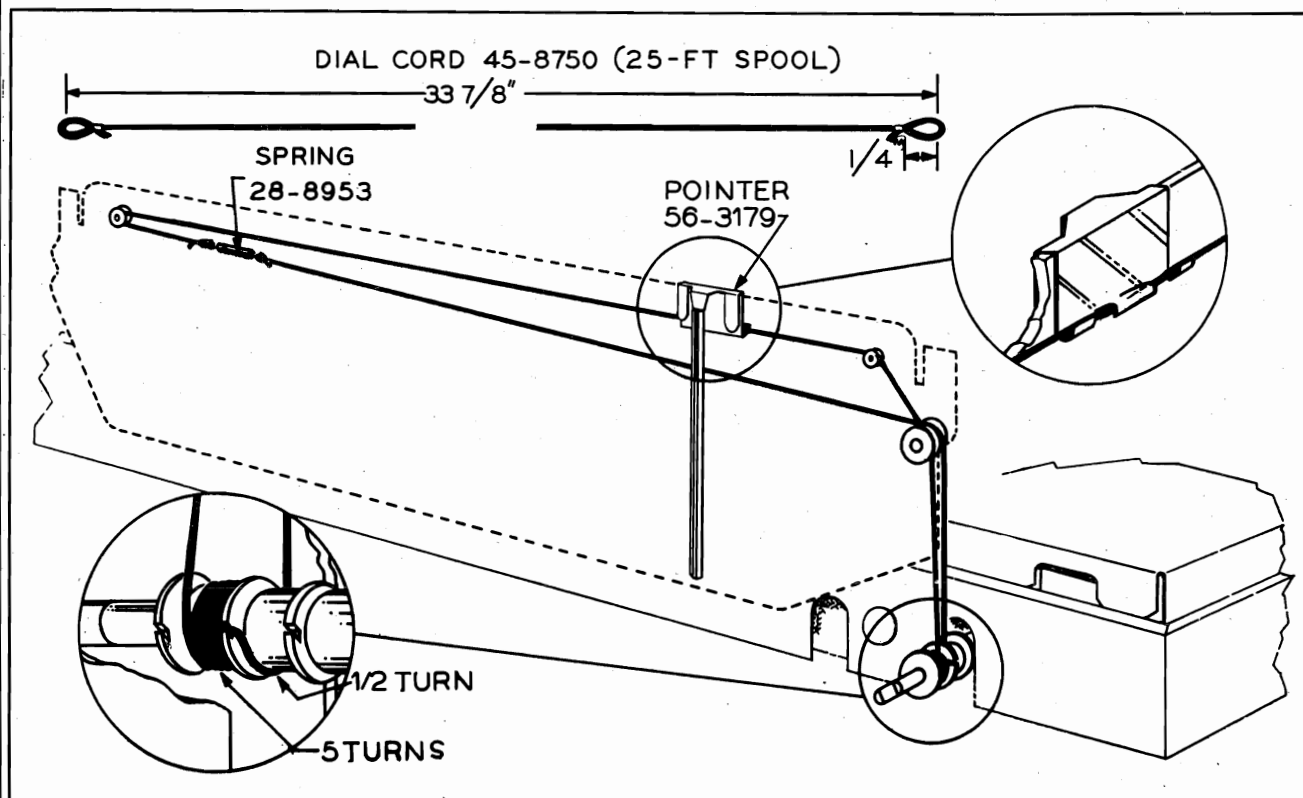


Figure 2. Pointer-Drive-Cord Installation Details

Section 1**TROUBLE SHOOTING**

CAUTION: Do not turn on the power with the speaker disconnected, as this may cause damage to the radio.

For the tests in this section, use a d-c voltmeter. Connect the voltmeter leads between the chassis, test point C, and the test points indicated in the chart. The voltage readings given were taken with a 20,000-ohms-

per-volt meter, at a line voltage of 117 volts, a.c.

Set the volume control to minimum, and the tone control near the "off" position. Set the wafer switch to the broadcast (BC) position.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 2; if not, isolate and correct the trouble in this section.

Step	Test Point	Normal Indication	Abnormal Indication	Possible Cause of Abnormal Indication
1	E A	200v 245v		Trouble within this section. Isolate by the following tests.
2	B	350v	No voltage Low voltage High voltage	Defective: 5AZ4, T100, S100, W100. Shorted: C102. Open: R100. Defective: 5AZ4. Shorted or leaky: C102, C308*, C311*, C322*, C309* C408*, C409*, C103A, C103B. Open: L100, R101, T200*.
3	D	Negative 18v	Low or no voltage High voltage	Shorted: R100. Weak 6K6GT tubes. Open: R100.
4	E	200v	No voltage Low voltage	Shorted: C103B. Open: R101. Leaky: C103B, C319*, C307*, C310*.
5	A	245v	No voltage Low voltage High voltage	Shorted: C103A. Open: L100. Leaky: C103A. Grounded T200*. Shorted: L100. Weak 6K6GT tubes.

Listening Test: Abnormal hum may be caused by open C100, C101, C102, or C103A.

*This part, located in another section, may cause abnormal indication in this section.

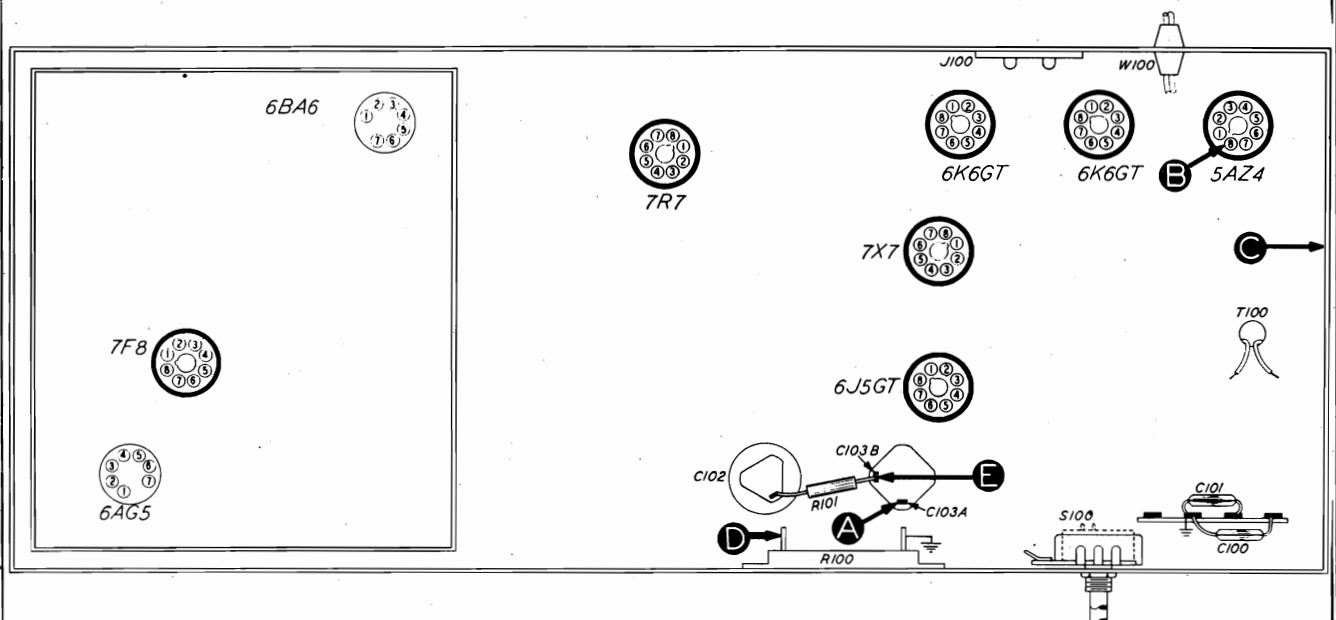


Figure 3. Bottom View, Showing Section 1 Test Points

Section 2

TROUBLE SHOOTING

For the tests in this section, use an audio-frequency signal generator. Connect the generator ground lead to the chassis, test point C; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the volume control to maximum, and the tone control near the "off" position. Adjust the signal-generator output as required for each step.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 3; if not, isolate and correct the trouble in this section.

Step	Test Point	Normal Indication	Possible Cause of Abnormal Indication
1	A	Loud, clear signal with weak signal input.	Trouble within this section. Isolate by the following tests.
2	B (Remove 6J5GT tube)	Clear signal with strong signal input.	Defective: 6K6GT, T200, LS200. Open: C212, R214. Shorted or leaky: C212, C214.
3	D (6J5GT removed)	Same as step 2.	Defective: 6K6GT. Shorted or leaky: C211. Open: R215, C211, T200.
4	E (Replace 6J5GT tube)	Loud, clear signal with moderate signal input.	Defective: 6J5GT. Open: R212, R209, R210. Shorted or leaky: C210, C206.
5	F	Loud, clear signal with weak signal input.	Defective: 7X7. Open: R207, C210.
6	A	Same as step 5.	Shorted: C202, C201, C326*. Open: C208, C216, R201, R200 (rotate through range).
7	PL200 (Wafer switch on PHONO)	Same as step 5.	Defective: PL200, WS2(R).

Listening Test: Distortion may be caused by leaky C210, C211, C212, C213, or C214. Hum will result if C213 is open.

*This part, located in another section, may cause abnormal indication in this section.

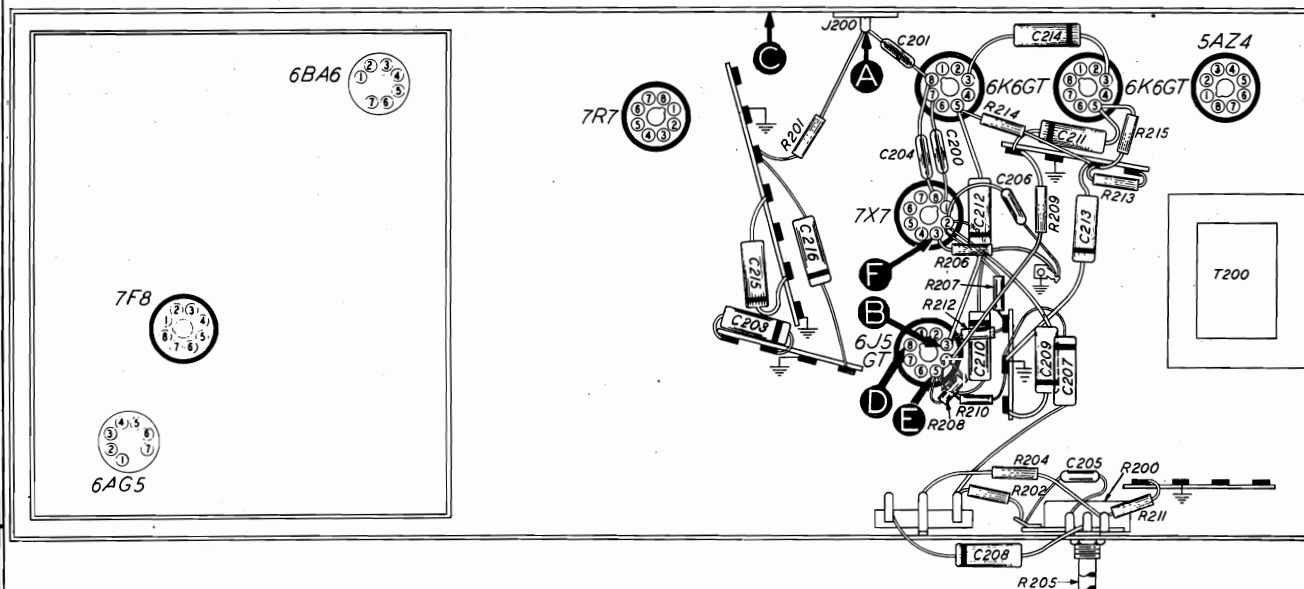


Figure 4. Bottom View, Showing Section 2 Test Points

Section 3

TROUBLE SHOOTING

AM CIRCUITS

For the following tests, use an r-f signal generator, with modulated output, set at 455 kc. Connect the generator ground lead to the chassis, test point C; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the volume control to maximum, the wafer switch to the broadcast (BC) position, and the tone control near the "off" position.

If the "NORMAL INDICATION" is obtained in

step 1, proceed with the tests for the FM circuits, or to the tests in Section 4; if not, isolate and correct the trouble in the AM circuits.

Since the circuit location of test point A for this section is the same as that of test point B for Section 4, the effectiveness of step 1 as a master check is dependent upon the condition of certain parts in Section 4; these parts are listed under "POSSIBLE CAUSE OF ABNORMAL INDICATION."

Step	Test Point	Normal Indication	Possible Cause of Abnormal Indication
1	A	Loud, clear signal with weak signal input.	Trouble in AM circuits. Isolate by the following tests.
2	B	Loud, clear signal with strong signal input.	Defective: 7R7, Z302, WS3(R), WS2(R). Shorted or leaky: C320, C321, C322. Open: R309, R312, R313, R314, R315, R317. Misaligned: Z302.
3	D	Loud, clear signal with moderate signal input.	Defective: 6BA6, Z301. Shorted or leaky: C307, C308, C309, C311. Open: R306, R304, R305, C307. Misaligned: Z301.
4	A	Loud, clear signal with weak signal input.	Defective: 7F8*, Z300, WS4(R), WS4(F). Shorted or leaky: C303, C304, C305. Open: R300, R301, R405*. Misaligned: Z300.
Listening Test: Distortion, with hum, may be caused by open C307 or C319.			

*This part, located in another section, may cause abnormal indication in this section.

FM CIRCUITS

These tests are also made with an AM r-f signal generator, using modulated output. Observe the instructions preliminary to the tests for the AM circuits, with the following exceptions: set the wafer switch to the FM position; set the signal-generator frequency to 9.1 mc., and detune to one side or the other until a satisfactory test signal is obtained.

The best indication of satisfactory FM-detector operation is the ability of this circuit to take the alignment properly (see page 14).

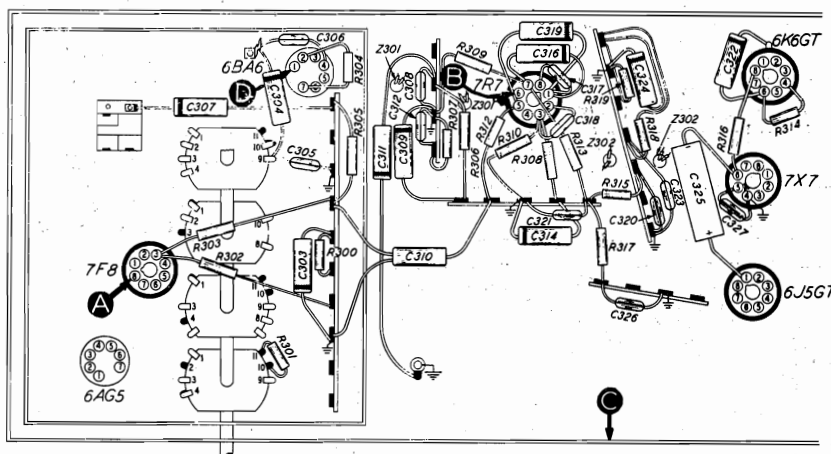


Figure 5. Bottom View, Showing Section 3 Test Points

Step	Test Point	Normal Indication	Possible Cause of Abnormal Indication
1	B	Loud, clear signal with strong signal input.	Defective: 7R7, 7X7 (diode section), C325, Z302. Shorted or leaky: C323, C324, C205*. Open: R318, R319. Misaligned: Z302.
2	D	Loud, clear signal with moderate signal input.	Same parts listed in AM test chart, step 3.
3	A	Loud, clear signal with weak signal input.	Same parts listed in AM test chart, step 4 and WS4(R), WS4(F).

Section 4

TROUBLE SHOOTING

For the tests in this section, with the exception of the oscillator tests, use an AM r-f signal generator, with modulated output. Connect the generator ground lead to the chassis, test point C; connect the output lead through a .1-mf. condenser to the test points indicated in the charts.

Set the volume control to maximum, and the tone control near the "off" position.

For the AM-circuit tests, set the wafer switch to the BC position, and set the signal-generator and radio dials to 1000 kc.

For the FM-circuit tests, set the wafer switch to the FM position, and set the signal-generator and radio

dials to 95 mc. (detune the generator to one side or the other until a satisfactory test signal is obtained).

OSCILLATOR TESTS: For the oscillator tests (step 3 in each chart), connect the positive lead of a high-resistance voltmeter to the 7F8 oscillator cathode (pin 4); connect the prod end of the negative lead through a 100,000-ohm isolating resistor to the 7F8 oscillator grid (pin 1), test point D. Use a suitable meter range, such as 0—10 volts. Proper operation of the oscillator for either AM or FM is indicated by a negative voltage throughout the range of the tuning condensers (the normal oscillator voltages given in the charts were measured with a 20,000-ohms-per-volt meter).

AM CIRCUITS

Step	Test Point	Normal Indication	Possible Cause of Abnormal Indication
1	A	Loud, clear signal with weak signal input.	Trouble in AM circuits. Isolate by the following tests.
2	B	Same as step 1.	Defective: 7F8. Shorted: C400. Open: L406, R408, C411. Trouble in oscillator circuit (step 3).
3	D Osc. Test	Negative 2 to 3 volts (turn tuning control through range.)	Defective: 7F8, WS3(F), WS2(F). Shorted: C411, C412, C413, C402B, C402A, C400, L404. Open: R406, R303*, L404, C412, C413.
4	A	Same as step 1.	Defective: WS1(R). Shorted: L400, C401. Open: L400, R404, C410.

*This part, located in another section, may cause abnormal indication in this section.

FM CIRCUITS

Step	Test Point	Normal Indication	Possible Cause of Abnormal Indication
1	E	Loud, clear signal with weak signal input.	Trouble in FM circuits. Isolate by the following tests.
2	B	Loud, clear signal with moderately weak signal input.	Same parts listed in AM test chart, step 2.
3	D Osc. Test	Negative. 1 volt (approx.).	Defective: 7F8, WS3(R), WS2(R), C400, C400C. Open: L405.
4	F	Loud, clear signal with moderately weak signal input.	Defective: WS1(R). Open: C407.
5	E	Loud, clear signal with weak signal input.	Defective: 6AG5. Shorted: C400, C400A. Shorted or leaky: C408, C406, C407. Open: R400, R401, R402, R403, L402.

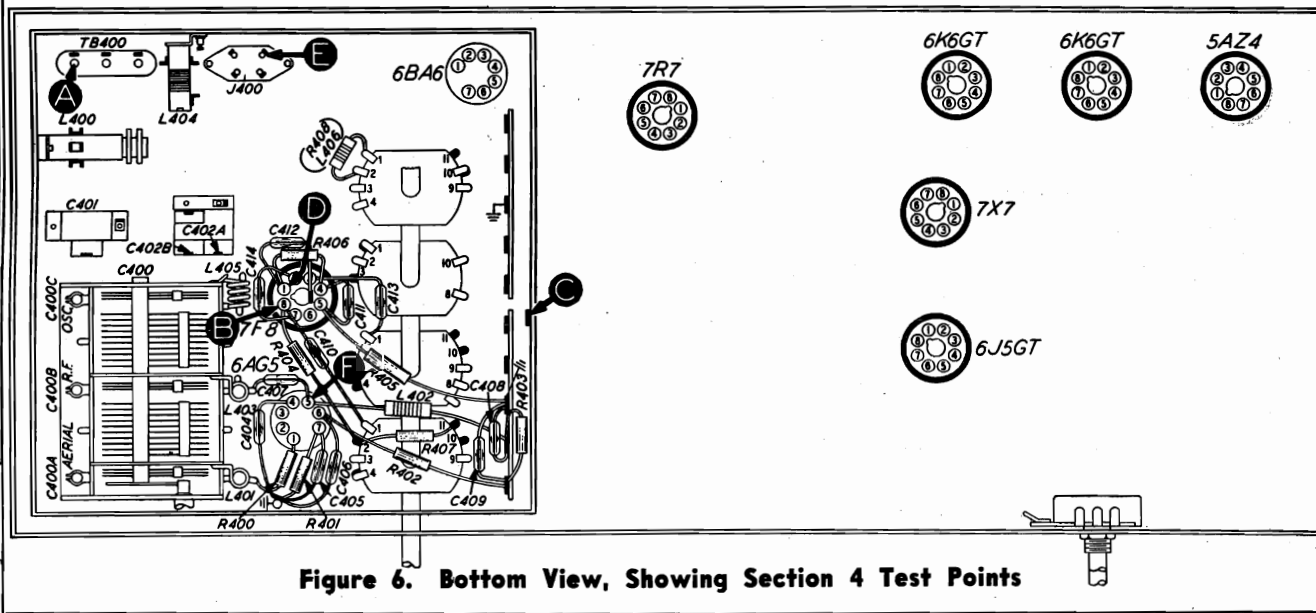


Figure 6. Bottom View, Showing Section 4 Test Points

PHILCO CORP.

MODEL 48-1264

REPLACEMENT PARTS LIST

NOTE

Part numbers marked with an asterisk (*) are general replacement items. These numbers may not be identical with those on factory assemblies; also, the electrical values of some replacement items may differ from the value indicated in the schematic diagram and parts list. The values substituted in any case are so chosen that the operation of the radio will be either unchanged or improved. When ordering replacements, use only the "Service Part No."

SECTION 1

Reference Symbol	Description	Service Part No.
C100	Condenser, line filter, .01 mf.	61-0120*
C101	Condenser, line filter, .01 mf.	61-0120*
C102	Condenser, electrolytic, high-voltage, filter, 20 mf.	30-2555*
C103	Condenser, electrolytic, 2-section	30-2556*
C103A	Condenser, high-voltage filter, 25 mf.	Part of C103
C103B	Condenser, isolating filter, 10 mf.	Part of C103
I100	Lamp, bin	34-2039*
I101	Lamp, panel	34-2064*
I102	Lamp, panel	34-2064*
J100	Socket, a-c phono power.	27-6200
L100	Field, speaker	Part of LS200
R100	Resistor, bias, 165 ohms.	33-3435-1
R101	Resistor, voltage dropping, 15,000 ohms	66-3155340*
S100	Switch, power on-off	Part of R205
S101	Switch, bin lamp	42-1702
S102	Switch, a-c phono power	Part of 42-1803
T100	Transformer, a-c power	32-8248
W100	Line cord and plug	L3339

SECTION 2

Reference Symbol	Description	Service Part No.
C200	Condenser, filament by-pass, 100 mmf.	60-10105407*
C201	Condenser, r-f by-pass, 100 mmf.	60-10105407*
C202	Condenser, r-f by-pass, 100 mmf.	60-10105407*
C203	Condenser, d-c blocking, .006 mf.	45-3500-7*
C204	Condenser, filament by-pass, 100 mmf.	60-10105407*
C205	Condenser, audio by-pass, 100 mmf.	60-10105407*
C206	Condenser, plate by-pass, 100 mmf.	60-10105407*
C207	Condenser, bass compensation, .01 mf.	61-0120*
C208	Condenser, d-c blocking, .006 mf.	45-3500-7*
C209	Condenser, tone compensation, .01 mf.	61-0120*

SECTION 2 (Cont.)

Reference Symbol	Description	Service Part No.
C210	Condenser, d-c blocking, .006 mf.	45-3500-7*
C211	Condenser, d-c blocking, .006 mf.	45-3500-7*
C212	Condenser, d-c blocking, .006 mf.	45-3500-7*
C213	Condenser, audio by-pass, .1 mf.	61-0113*
C214	Condenser, tone compensation, .003 mf.	61-0117*
C215	Condenser, d-c blocking, .006 mf.	45-3500-7*
C216	Condenser, coupling, .006 mf.	45-3500-7*
J200	Socket, FM test	27-6180
LS200	Speaker	36-1595
PL200	Cable-and-plug assembly, phono input.	41-3735-2
R200	Volume control, 2 meg. (tap at 1 meg.)	33-5535-1
R201	Resistor, r-f decoupling, 100,000 ohms	66-4103340*
R202	Resistor, bass compensation, 33,000 ohms	66-3333340
R203	Resistor, phono grid load, 1 megohm.	66-5103340
R204	Resistor, inverse feedback, 4.7 ohms	66-9473340
R205	Tone control, 6 megohms	33-5538-1
R206	Resistor, grid leak, 1st audio, 10 megohms	66-6103340*
R207	Resistor, plate load, 220,000 ohms	66-4223340*
R208	Resistor, grid load, 1 megohm	66-5103340*
R209	Resistor, cathode bias, 4700 ohms	66-2473340*
R210	Resistor, cathode load, 47,000 ohms.	66-3473340*
R211	Resistor, inverse feedback, 68 ohms	66-0683340*
R212	Resistor, plate load, 56,000 ohms	66-3563340*
R213	Resistor, filter, 150,000 ohms	66-4153340*
R214	Resistor, grid load, 330,000 ohms	66-4333340*
R215	Resistor, grid load, 330,000 ohms	66-4333340*
T200	Transformer, output	32-8274

SECTION 3

Reference Symbol	Description	Service Part No.
C300A	Condenser, FM trimmer	Part of Z300
C300B	Condenser, AM tuning, 3000 mmf.	Part of Z300
C300C	Condenser, i-f coupling, 6 mmf.	Part of Z300

REPLACEMENT PARTS LIST (Continued)

SECTION 3 (Cont.)

Reference Symbol	Description	Service Part No.
C300D	Condenser, FM trimmer	Part of Z300
C300E	Condenser, AM trimmer	Part of Z300
C301A	Condenser, FM trimmer	Part of Z301
C301B	Condenser, AM tuning, 300 mmf.	Part of Z301
C301C	Condenser, FM trimmer	Part of Z301
C301D	Condenser, AM trimmer	Part of Z301
C302A	Condenser, AM tuning, 470 mmf.	Part of Z302
C302B	Condenser, AM trimmer	Part of Z302
C302C	Condenser, FM coupling, 27 mmf.	Part of Z302
C302D	Condenser, FM trimmer	Part of Z302
C302E	Condenser, FM tuning, 25 mmf.	Part of Z302
C302F	Condenser, FM tuning, 15 mmf.	Part of Z302
C303	Condenser, plate by-pass, .01 mf.	61-0120*
C304	Condenser, a-v-c by-pass, .01 mf.	61-0120*
C305	Condenser, a-v-c by-pass, 100 mmf. ...	60-10105407*
C306	Condenser, filament by-pass, 100 mmf. ...	60-10105407*
C307	Condenser, screen by-pass, .01 mf.	61-0120*
C308	Condenser, plate by-pass, 100 mmf. ...	60-10105407*
C309	Condenser, plate decoupling, .01 mf.	61-0120*
C310	Condenser, plate by-pass, .01 mf.	30-4641.
C311	Condenser, plate by-pass, .01 mf.	61-0120*
C312	Condenser, a-v-c by-pass, 250 mmf. ...	60-10255237*
C313	Not used	
C314	Condenser, a-v-c filter, .01 mf.	61-0120*
C315	Not used	
C316	Condenser, cathode by-pass, .05 mf.	61-0122*
C317	Condenser, filament by-pass, 100 mmf. ...	60-10105407*
C318	Condenser, d-c blocking, 100 mmf. ...	60-10105407*
C319	Condenser, screen by-pass, .01 mf.	61-0120*
C320	Condenser, r-f by-pass, 100 mmf.	60-10105407*
C321	Condenser, r-f by-pass, 100 mmf.	60-10105407*
C322	Condenser, plate decoupling, .05 mf.	61-0122*
C323	Condenser, r-f by-pass, 100 mmf.	60-10105407*
C324	Condenser, r-f by-pass, .008 mf.	61-0174*
C325	Condenser, noise suppressor, 5 mf.	30-2417*
C326	Condenser, r-f by-pass, 100 mmf.	60-10105407*
C327	Condenser, coupling, 6 mmf.	30-1224-9
C328	Not used	
R300	Resistor, plate dropping, 47,000 ohms ...	66-3473340*
R301	Resistor, a-v-c decoupling, 2.2 megohms ...	66-5223340*
R302	Resistor, plate dropping, 4700 ohms	66-2473340*
R303	Resistor, plate dropping, 33,000 ohms ...	66-3333340*

SECTION 3 (Cont.)

Reference Symbol	Description	Service Part No.
R304	Resistor, cathode bias, 68 ohms	66-0683340*
R305	Resistor, screen dropping, 27,000 ohms ...	66-3273340*
R306	Resistor, plate decoupling, 1000 ohms ...	66-2103340*
R307	Resistor, grid return, 2.2 megohms	66-5223340*
R308	Resistor, a-v-c filter, 3.3 megohms	66-5333340*
R309	Resistor cathode bias, 150 ohms	66-1153340*
R310	Resistor, a-v-c load, 1 megohm	66-5103340*
R311	Not used	
R312	Resistor, screen dropping, 68,000 ohms ...	66-3683340*
R313	Resistor, diode load, 330,000 ohms	66-4333340*
R314	Resistor, plate decoupling, 1000 ohms ...	66-2103340*
R315	Resistor, diode decoupling, 47,000 ohms ...	66-3473340*
R316	Resistor, noise suppressor, 47,000 ohms ...	66-3473340*
R317	Resistor, diode decoupling, 100,000 ohms ...	66-4103340*
R318	Resistor, FM decoupling, 100,000 ohms ...	66-4103340*
R319	Resistor, FM-detector load, 6.8 megohms ...	66-5683340*
TC300A	Tuning core, AM tuning	Part of Z300
TC302A	Tuning core, FM tuning	Part of Z302
Z300	Transformer, 1st i-f, including C300A, C300B, C300C, C300D, C300E, and TC300A ...	32-4146*
Z301	Transformer, 2nd i-f, including C301A, C301B, C301C, and C301D	32-4156*
Z302	Transformer, 3rd i-f, including C302A, C302B, C302C, C302D, C302E, C302F, and TC302A	32-4147*

SECTION 4

Reference Symbol	Description	Service Part No.
C400	Condenser, tuning gang	31-2703-2
C400A	Condenser, FM aerial trimmer	Part of C400
C400B	Condenser, FM r-f trimmer	Part of C400
C400C	Condenser, FM oscillator trimmer	Part of C400
C401	Condenser, 1500-kc. trimmer	31-6473
C402	Condenser, trimmer assembly, 2-section ...	31-6476-5
C402A	Condenser, shunt trimmer, BC oscillator ...	Part of C402
C402B	Condenser, series trimmer, BC oscillator ...	Part of C402
C403	Not used	
C404	Condenser, filament by-pass, 100 mmf.	60-10105407*
C405	Condenser, cathode by-pass, 100 mmf.	60-10105407*

REPLACEMENT PARTS LIST (Continued)**SECTION 4 (Cont.)**

Reference Symbol	Description	Service Part No.
C406	Condenser, screen by-pass, 100 mmf.	60-10105407*
C407	Condenser, d-c blocking, 33 mmf. . .	60-00305307*
C408	Condenser, plate by-pass, 1500 mmf.	60-20155404*
C409	Condenser, screen by-pass, 1500 mmf.	60-20155404*
C410	Condenser, d-c blocking, 220 mmf. .	60-10245307*
C411	Condenser, d-c blocking, 750 mmf. .	60-10755301*
C412	Condenser, grid return, 100 mmf. . .	60-10105407*
C413	Condenser, d-c blocking, 220 mmf. .	60-10245307*
C414	Condenser, filament by-pass, 100 mmf.	60-10105407*
J400	Socket, 4-prong, external aerial	27-6214-1
L400	Coil, BC aerial	32-4033-2
L401	Coil, FM aerial	32-4158
L402	Choke, plate	32-4061
L403	Coil, FM r-f	32-4159
L404	Coil, BC oscillator	32-4019-4
L405	Coil, FM oscillator	32-4018-2
L406	Choke, parasitic suppressor, including R408	32-4157
LA400	Loop assembly, broadcast	76-2262-1
R400	Resistor, parasitic suppressor, 10 ohms	66-0103340*
R401	Resistor, cathode bias, 150 ohms. . . .	66-1151540*
R402	Resistor, screen dropping, 47,000 ohms	66-3473340*
R403	Resistor, plate decoupling, 1000 ohms	66-2103340*
R404	Resistor, grid return, 2.2 megohms. . .	66-5223340*
R405	Resistor, cathode bias, 1500 ohms . . .	66-2153340*
R406	Resistor, grid leak, 15,000 ohms	66-3153340*
R407	Resistor, grid return, 470,000 ohms. . .	66-4473340*
R408	Resistor, parasitic suppressor, 1500 ohms	Part of L406
TB400	Aerial terminal panel	38-9942
WS	Wafer switch	42-1803
WS1	1st section, wafer switch	Part of WS
WS2	2nd section, wafer switch	Part of WS
WS3	3rd section, wafer switch	Part of WS
WS4	4th section, wafer switch	Part of WS

MISCELLANEOUS**Bin Hardware**

Cable-socket-and-switch assembly, bin light . .	76-2728-5
Door, bin, changer 48-1264W	45-6396
Door, bin, changer 48-1264L	45-6397

Cabinet and Cabinet Hardware

Baffle and cloth	40-6932
Baffle, wood	219087
Bezel, metal	56-4878
Cabinet, walnut, less scale	10683
Cabinet, light mahogany, less scale	10683A
Frame assembly	76-3222
Grille, wire	56-4985
Loop assembly, FM cabinet dipole.	76-2029-10
Scale, dial	76-3187-1
Strap, dial-scale mounting	56-4916

Cable, shielded	41-3754-11
----------------------------------	-------------------

Cable, speaker	41-3734-7
---------------------------------	------------------

Dial Backplate and Associated Hardware

Backplate and pulley assembly	76-2005-3
Cord, pointer drive (25-ft. spool)	45-8750*
Pointer	56-3179
Spring, pointer-drive-cord	28-8953

Knob	54-4486
-----------------------	----------------

Lamp-socket assembly, pilot	76-2109
--	----------------

Plug, speaker	27-4419-2
--------------------------------	------------------

Record-Changer Mounting Hardware

Bolt	56-3295-1FA15
Grommet	54-4313
Nut	1W56643FA3
Palnut	1W29061FA3
Spring	56-3043-FA15

Socket, loktal (7F8 only)	27-6213
--	----------------

Socket, loktal	27-6138*
---------------------------------	-----------------

Socket, miniature (6AG5)	27-6203-1
---	------------------

Socket, miniature (6BA6)	27-6226
---	----------------

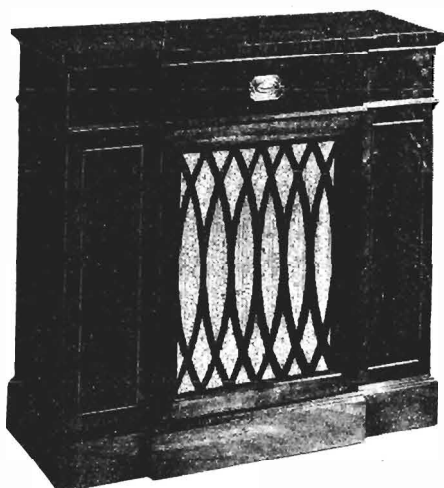
Socket, octal	27-6174
--------------------------------	----------------

Wafer-Switch Hardware

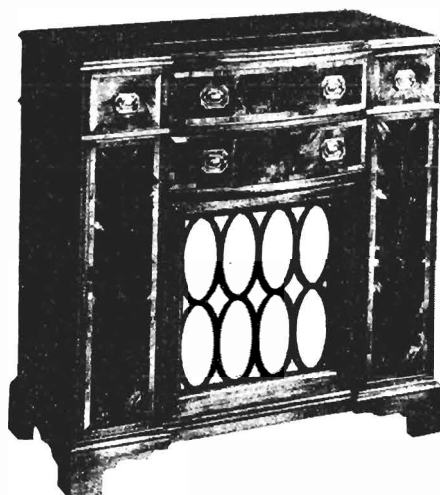
Link assembly	76-2186-3
Shaft	56-3298FA11
Washer, "C"	1W42535FA3

MODELS 48-1274,
48-1276

PHILCO CORP.



TP-1400

MODEL 48-1274

TP-1401

MODEL 48-1276

SPECIFICATIONS

CABINET

Model 48-1274 Wood, mahogany or walnut finish
 Model 48-1276 Wood, mahogany finish

CIRCUIT Sixteen-tube superheterodyne

FREQUENCY RANGES

Broadcast 540—1720 kc.
 Short Wave 9.25—15.5 mc.
 Frequency Modulation 88—108 mc.

AUDIO OUTPUT 15 watts

PUSH BUTTONS Ten: One for power OFF; one for phono operation; three for manual-tuning band selection (BC, SW, or FM); five for automatic (motor-driven) station and band selection (BC or FM)

OPERATING VOLTAGE 105—125 volts, 60 cycles, a.c.

POWER CONSUMPTION

Radio 175 watts
 Phonograph 20 watts

AERIALS Built-in loop for broadcast and short wave; cabinet dipole for FM; provision for external aerial

INTERMEDIATE FREQUENCIES

AM 455 kc.
 FM 9.1 mc.

PHILCO TUBES (16) 6AU6, 7E5, 7H7(2), 7B7, 7F8, FM1000, 6J5GT(3), 7E6, 6L6GA(2), 7F7, 7E7, 5U4G

PHONOGRAPH Philco Automatic Record Changer, Model M-4 (for service information, see manual PR-1157)

MOTOR-DRIVEN TUNING MECHANISM Philco Electromechanical Push-Button Tuner (for service information, see manual PR-1481)

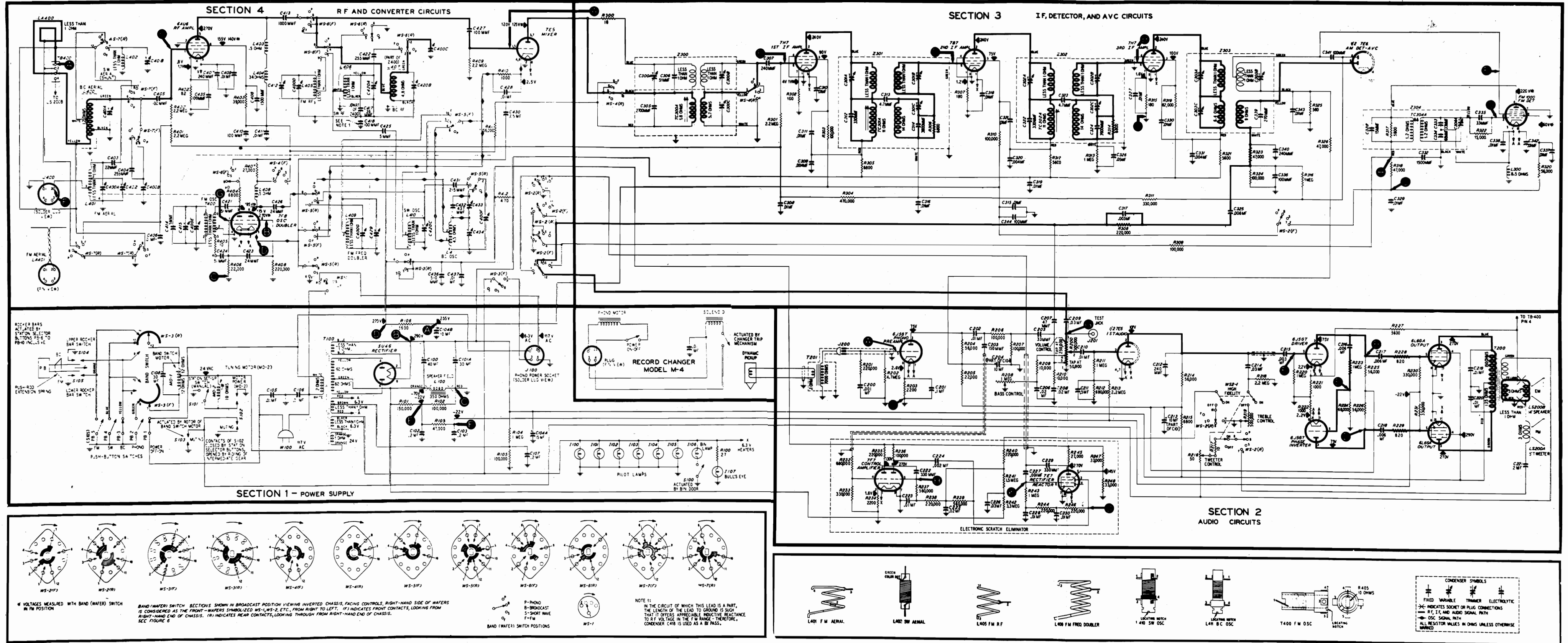


FIGURE 8. PHILCO RADIO-PHONOGRAPH MODELS 48-1274 AND 48-1276, SECTIONALIZED SCHEMATIC DIAGRAM, SHOWING TEST POINTS

MODELS 48-1274,
48-1276

SETTING PUSH BUTTONS

NOTE: Before setting the push buttons, allow the radio to warm up for about 15 minutes.

- Depress the BC push button, and rotate the tuning control until the Allen setscrew in the main camshaft is accessible from the rear of the chassis, as shown in figure 9.
- Loosen the setscrew four turns.

CAUTION: Remove the wrench before proceeding with the next step.

- Determine the dial positions of the desired stations (both FM and broadcast) in order, from left to right, and place the station tabs of these stations, in the same order, in the station-selector buttons.

- Position the push-rod extension spring of the station-selector button so that it will engage the correct rocker bar (upper bar for broadcast, and lower bar for FM).

- Depress the button for the band of the station to be set up on the left-hand station-selector button. Manually tune the radio to this station, and, while holding the manual-tuning control, depress the station-selector button.

- After the tuning motor stops, operate the set-up switch (see figure 9); hold the set-up switch closed until the motor stalls, then release it.

- Set the remaining four station-selector buttons, from left to right, in the same manner.

- Depress the BC button, and again rotate the tuning control until the Allen setscrew is accessible; tighten the setscrew and remove the wrench.

PHILCO CORP.

AM ALIGNMENT CHART

STEP	SIGNAL GENERATOR		RADIO			ADJUST
	CONNECTION TO RADIO	DIAL SETTING	BAND	DIAL SETTING	SPECIAL INSTRUCTIONS	
1	Through .1-mf. condenser to stator of ant. section of tuning gang.	455 kc.	BC	1700 kc.	Adjust trimmers, in order given, for maximum output. Do not repeat adjustments.	C303C — 4th i-f pri. C302C — 3rd i-f sec. TC302A — 3rd i-f pri. C301C — 2nd i-f sec. TC301A — 2nd i-f pri. C300C — 1st i-f sec. TC300A — 1st i-f pri.
2	Radiating loop (See note below.)	15 mc.	SW	15 mc.	Adjust for maximum. (Image should be heard with generator tuned to 14.1 mc.)	C420C — S-w osc.
3	Same as step 2.	15 mc.	SW	15 mc.	Adjust for maximum while rocking tuning control.	C420A — S-w r.f. C401B — S-w aerial
4	Same as step 2.	1720 kc.	BC	1720 kc.	Adjust for maximum.	C434 — Bc. osc. (shunt)
5	Same as step 2.	580 kc.	BC	580 kc.	Adjust for maximum.	C433 — Bc. osc. (series)
6	Same as step 2.	1500 kc.	BC	1500 kc.	Adjust for maximum.	C420B — Bc. r.f.
7	Same as step 2.	1500 kc.	BC	1500 kc.	Adjust for maximum.	C401A — Bc. aerial
8	Repeat steps 4, 5, 6, and 7 until no further increase is obtained.					

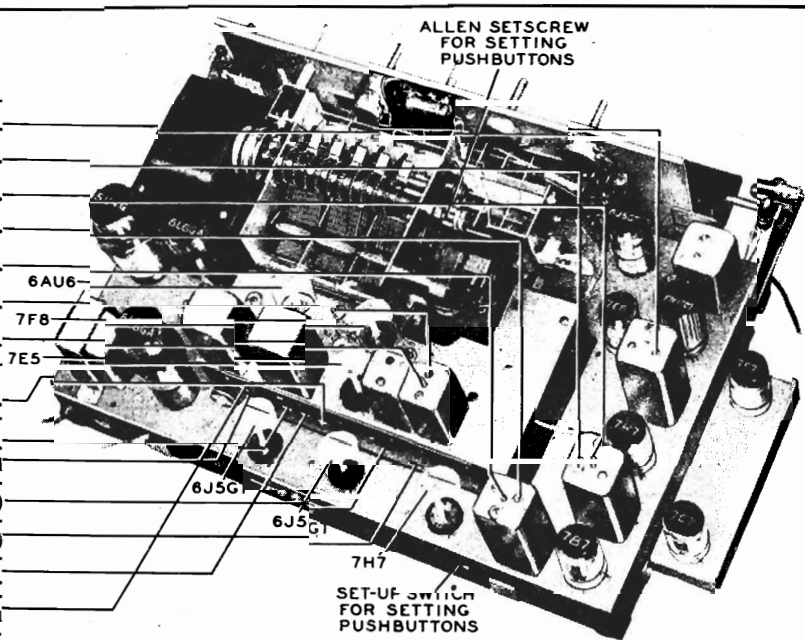


FIGURE 9. TOP VIEW, SHOWING AM TRIMMER LOCATIONS

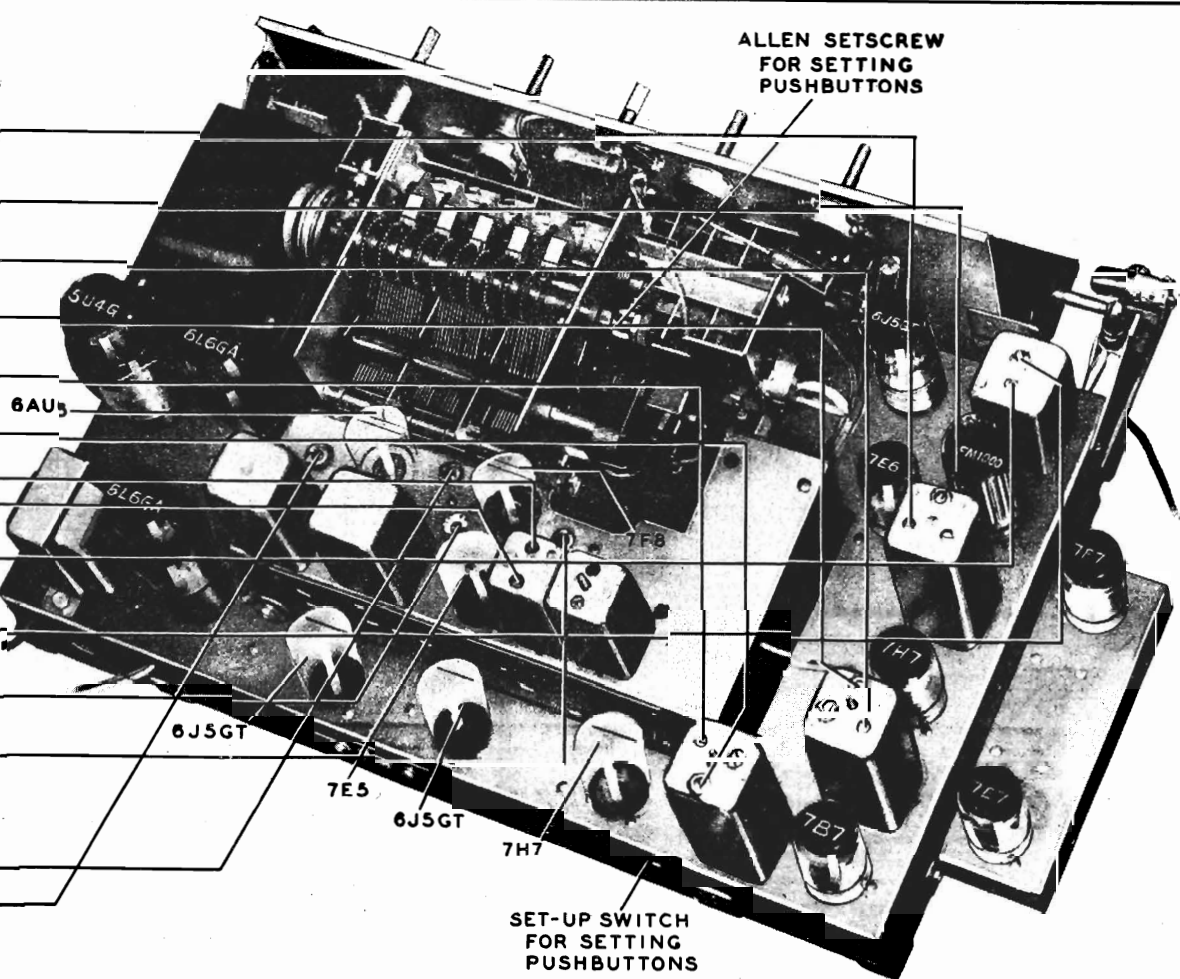
TP-3782

FM ALIGNMENT CHART

FIGURE 10. TOP VIEW, SHOWING FM TRIMMER LOCATIONS

TP-3782

STEP	SIGNAL GENERATOR		RADIO			ADJUST
	CONNECTION TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS		
1	To control grid (pin 5) of 7E5 (through hole in side of r-f chassis).	9.1 mc. (Mod. on)	Tuning gang fully closed.	Connect jumper between pin 2 (oscillator grid) of FM1000 and chassis (see note 1). Connect loading network (see note 2) between top of trimmer C303B and chassis (see note 3). Adjust for maximum.		C303A — 4th i-f pri.
2	Same as step 1.	9.1 mc. (Mod. on)	Same as step 1.	Connect loading network between pin 2 (blue lead) of 7H7 third i.f. and chassis. Adjust for maximum.		C303B — 4th i-f sec.
3	Same as step 1.	9.1 mc. (Mod. on)	Same as step 1.	Connect loading network between pin 6 (green lead) of 7H7 third i.f. and chassis. Adjust for maximum.		C302A — 3rd i-f pri.
4	Same as step 1.	9.1 mc. (Mod. on)	Same as step 1.	Connect loading network between pin 2 (blue lead) of 7B7 second i.f. and chassis. Adjust for maximum.		C302B — 3rd i-f sec.
5	Same as step 1.	9.1 mc. (Mod. on)	Same as step 1.	Connect loading network between pin 6 (green lead) of 7B7 second i.f. and chassis. Adjust for maximum.		C301A — 2nd i-f pri.
6	Same as step 1.	9.1 mc. (Mod. on)	Same as step 1.	Connect loading network between pin 2 (blue lead) of 7H7 first i.f. and chassis. Adjust for maximum.		C301B — 2nd i-f sec.
7	Same as step 1.	9.1 mc. (Mod. on)	Same as step 1.	Leave loading network connected as in step 6. Adjust for maximum.		C300B — 1st i-f sec. C300A — 1st i-f pri.
8	To control grid (pin 6) of 7H7 third i.f.	9.1 mc. (Mod. off)	Same as step 1.	Remove loading network, and remove jumper from pin 2 of FM1000 and chassis. Connect jumper between pin 4 (blue lead) of FM1000 and test point H (Section 3). Adjust for zero beat.		C304A — Det. osc.
9	Same as step 8.	9.1 mc. (Mod. off)	Same as step 1.	Remove jumper used in step 8. Adjust for zero beat (see note 4).		TC304A — Det. plate.
10	To terminal 2 of J400 (see note 5).	105 mc. (Mod. on)	105 mc.	Connect jumper between pin 2 of FM1000 and chassis. Adjust for maximum.		C415 — H-f osc.
11	Same as step 10.	105 mc. (Mod. on)	105 mc.	Same as step 10.		C429 — Freq. doubler.
12	Same as step 10.	92 mc. (Mod. on)	92 mc.	Adjust coil L409 for maximum (see note 6).		Freq-doubler tracking
13	Repeat steps 10 and 11 until no further increase is obtained.					
14	Same as step 10.	105 mc. (Mod. on)	105 mc.	Adjust for maximum while rocking tuning control.		C412 — R-f
15	See note 7.	105 mc. (Mod. on)	105 mc.	Adjust for maximum.		C402 — Aerial
16	Same as step 13.	92 mc. (Mod. on)	92 mc.	Adjust coils L405 and L401 for maximum (see note 6).		R-f and aerial tracking
17	Repeat steps 14, 15, and 16 until no further increase is obtained.					



PHILCO CORP.

MODELS 48-1274,
48-1276

AM ALIGNMENT PROCEDURE

CAUTION: Do not turn on the power with the speaker disconnected, or the radio may be damaged.

When the complete AM and FM alignments are to be made, the AM alignment should be made first; if AM alignment is not required, the FM alignment alone may be made. Before starting the alignment, allow the radio to warm up for about 15 minutes.

DIAL POINTER: With the tuning-condenser plates fully meshed, adjust the pointer to coincide with the index mark at the low-frequency end of the scale. See CALIBRATING DIAL BACKPLATE, page 12.

RADIO CONTROLS: Set the volume control to maximum. Turn the bass control fully counterclockwise, and the treble control fully clockwise.

AM R-F SIGNAL GENERATOR: Connect the ground lead to the radio chassis, and the output lead as indicated in the chart. Use modulated output.

OUTPUT METER: Connect between terminal 4 (voice-coil connection) of the aerial terminal panel and the chassis.

OUTPUT LEVEL: During the alignment, the input signal must be attenuated to hold the output-meter reading below 1.5 volts.

BAND PUSH BUTTONS, RADIO DIAL, AND SIGNAL-GENERATOR DIAL: Set as indicated in the chart.

FM ALIGNMENT PROCEDURE

MAKE AM ALIGNMENT FIRST

Follow the instructions preliminary to the AM alignment chart, except for the band selection; depress the FM push button. Use an AM r-f signal generator, with or without modulation, as indicated in the chart.

FM ALIGNMENT NOTES

1. When pin 2 of the FM1000 tube is shorted to the chassis, the detector oscillator is made inoperative, and the circuit is converted to an AM detector.

2. Make the loading network by connecting a 4700-ohm resistor and a .1-mf. condenser in series. Attach an alligator clip to each free end of the network. This network, when connected across the primary or secondary of an overcoupled i-f transformer, loads the circuit so that the transformer coupling is effectively below the critical value; the unloaded winding may then be correctly tuned to the center intermediate frequency.

3. The top of trimmer, C303B, can be reached only from the top of the shield can. Slide a length of flattened solder or wire down between the ceramic form and the edge of the trimmer plate. Attach the loading network between this connection and the chassis.

4. It is essential that the output of the generator be kept below the level at which the detector oscillator locks in, or an erroneous zero beat will be obtained. When a single very sharp zero-beat point is obtained, the adjustment is correct.

5. The use of a signal generator for steps 10 to 16, inclusive, is recommended only if the available generator is sufficiently accurate to insure correct frequency settings; otherwise, an alternate procedure employing FM broadcast-station signals instead of a signal generator is recommended. For adjustments at the high-frequency end of the band, use the station nearest 105 mc.; for the low-frequency adjustments, use the station nearest 92 mc. If the circuits are greatly misaligned, it may be necessary to adjust the trimmers and coils for maximum noise at each end of the band before station signals can be heard.

6. Check circuit resonance with a tuning wand. If the brass end, when placed in or near the coil, increases the output-meter reading, spread the coil turns; if the powdered-iron end increases the reading, compress the turns. If both ends cause a decrease in output, the coil is correctly tuned. Do not change the coils excessively, since only a small adjustment is required at these frequencies.

7. To feed signals from the signal generator into the aerial circuit of the radio, make two simple dipole aeriels. Each aerial may consist of two 30-inch lengths of rubber-covered wire. Connect one dipole aerial to terminals 1 and 2 on the FM aerial socket. Connect the other to the signal-generator leads. Arrange the two aeriels several feet apart.

SYMBOLIZATION

The components in the radio circuit are symbolized according to the types of parts and the sections of the radio in which the parts are located. The prefix letter of the symbol designates the type of part, as follows:

C—condenser	LA—loop aerial	PB—push-button switch	T—transformer
I—pilot lamp	LS—loud-speaker	R—resistor	WS—wafer switch
L—choke or coil	MO—motor	S—switch	Z—electrical assembly

The number of the symbol designates the section in which the part is located, as follows:

- 100-series components are in Section 1 — the power supply
- 200-series components are in Section 2 — the audio circuits
- 300-series components are in Section 3 — the i-f, detector, and a-v-c circuits
- 400-series components are in Section 4 — the r-f and converter circuits

A suffix letter identifies the part as a component of the assembly which bears an identical number without a suffix letter, and with perhaps a different prefix letter.

MODELS 48-1274,
48-1276

PHILCO CORP.

CIRCUIT DESCRIPTION

Philco Models 48-1274 and 48-1276 are 16-tube radio-phonograph combinations incorporating a sensitive superheterodyne radio and a Philco Automatic Record Changer, Model M-4. The two models are essentially identical except for the cabinets and cabinet hardware, as indicated in the Replacement Parts List.

Aerial System

A built-in, low-impedance loop provides signal pickup on the broadcast and short-wave bands. The cabinet dipole aerial gives satisfactory FM reception in areas of moderately high signal strength. For greater pickup on the FM band, the Philco Dipole Outdoor Aerial, Part No. 45-1462, should be used. To increase the pickup on all three bands, use the Philco Aerial Coupler, Part No. 76-2353, with the outdoor dipole. Information on aerial and coupler connections is given in external-aerial bulletin PR-1200.

Push Buttons

Nine of the ten push buttons are used for the selection of band, phono operation, or automatic station tuning; any one of these turns on the power. The OFF button turns off the power.

Push-Button Band Selectors

Any one of three push buttons (BC, SW, FM) selects the band for manual tuning by operating a motor-driven band switch. A muting switch, shorting out the speaker voice-coil circuit, operates simultaneously.

Push-Button Phono Switch

The PHONO push button operates the motor-driven band switch to select phono operation, and applies the power to the phonograph control on the record changer. The muting switch operates simultaneously.

Push-Button Station Selectors

Five push buttons are used for selecting any one of five standard-broadcast or FM stations. These buttons operate the motor-driven tuning mechanism, and, in addition, automatically actuate the motor-driven band switch whenever a band change is required. The muting switch operates simultaneously.

Radio Circuit

A 6AU6 r-f pentode is used as a tuned-r-f amplifier on all bands. See figure 8. Frequency conversion is accomplished by separate mixer and oscillator tubes. A 7E5, arranged for cathode injection, functions as the mixer on all bands. The oscillator system employs a 7F8 double triode. One section of this tube is em-

ployed as the oscillator for broadcast and short-wave reception. For FM reception, the second section of the tube, functioning as the oscillator, operates on frequencies of one-half those usually employed, while the first section of the tube functions as a frequency doubler, the tuning circuit being tracked with that of the oscillator. Another unique feature of the FM oscillator is the separate tuned circuit, which is inductively coupled to the untuned feed-back circuit. These oscillator design features achieve unusual stability.

The three stages of i-f amplification employ two 7H7's and one 7B7. In the i-f transformers the FM windings (9.1 mc.) are in series with the AM windings (455 kc.). The windings of the first i-f transformer are switched, to provide additional image rejection and conversion efficiency. No switching is required for the other i-f transformers.

The diode sections of the 7E6 provide AM detection and a.v.c.; the triode section of this tube functions as the first audio amplifier. For FM reception, the Philco Advanced FM Detector, using an FM1000, provides good sensitivity and noise rejection.

A positive voltage taken from a voltage divider (R104 and R105) is applied, through the center tap of the filament winding, to the first-audio and phono-pre-amplifier tubes; by making the filaments positive with respect to the cathodes and grids, emission from the filaments to these elements is prevented, and a-c hum is reduced in both radio and phono operation.

The first audio amplifier is resistance-coupled to a 6J5GT driver, which is resistance-coupled to one of the 6L6GA output tubes and, through a voltage divider (R223 and R224), to a 6J5GT phase inverter; the phase inverter drives the other 6L6GA output tube. Inverse feed-back voltage, taken from the secondary of the output transformer, is applied through a voltage divider (R221 and R227) to the 6J5GT driver, thus improving the fidelity of the audio system.

Both the tweeter and the large reproducer of the coaxial speaker system are used for FM reception. The tweeter is disconnected for broadcast and short-wave reception, and also for phono operation.

Phono Preamplifier

A 6J5GT is used in the phono-preamplifier stage. In phono operation, this stage is resistance-coupled to the first audio amplifier (triode section of the 7E6).

Scratch Eliminator

The Philco Electronic Scratch Eliminator, which is used in phono operation, reduces the high-frequency surface noise during the low-volume passages of a

PHILCO CORP.

MODELS 48-1274,
48-1276

record, and permits maximum treble response during the high-volume passages. The circuit employs a 7F7 double triode as a two-stage audio amplifier, and a 7E7 double diode, pentode as a half-wave rectifier and a reactance tube. The latter functions as a variable capacitance (at the output circuit of the phono preamplifier) which shunts a controlled portion of the higher audio frequencies to ground. The bias on the grid of the reactance tube controls the effective shunt capacitance, which becomes maximum with low bias, and minimum with high bias. The control bias is obtained from the audio signal, of which a definite amount is taken off, amplified by the 7F7, and rectified by the diode section of the 7E7.

High-Fidelity Switch

The high-fidelity switch, operating in conjunction with a band-switch section, WS-2(R), performs the following functions:

For broadcast and short-wave operation, the fidelity switch in the OFF position switches the treble control into the circuit, and in the ON position disconnects the treble control.

For FM operation, the fidelity switch in the ON position connects the tweeter speaker into the circuit, and also connects that section of the treble control

which controls the output of the tweeter; in the OFF position the fidelity switch disconnects the tweeter, and connects the treble control into the circuit.

For phono operation, the fidelity switch in the OFF position turns on the scratch eliminator, and switches the treble control into the circuit; in the ON position the switch disconnects the treble control, and turns off the scratch eliminator.

Treble Control

The treble control has two variable-resistance sections; the .5-megohm potentiometer operates in conjunction with a .05-mf. condenser for treble-attenuation control, and is in the circuit whenever the high-fidelity switch is in the OFF position; the 50-ohm potentiometer controls the output of the tweeter speaker for FM high-fidelity operation, and is in the circuit when the high-fidelity switch is in the ON position (with the FM push button depressed).

Bass Control

The bass control is in the circuit for both radio and phono operation. This control, a 1-megohm potentiometer, is combined with C206 and R209 to furnish any desired degree of bass accentuation.

PHILCO AUTOMATIC BAND SELECTOR

The Philco Automatic Band Selector consists of a motor-driven band switch (figure 5), operated by the various push buttons. The position of the switch is selected manually, by the BC, SW, FM, or PHONO push-button, or automatically, by any of the five station-selector push buttons.

The motor is a reversible, shaded-pole, induction motor, operating on 24 volts a.c. The operation of the motor is controlled through the contacts on the "homing" wafer, WS-3(F) and WS-3(R), which is a section of the band switch; the contacts on both sides of this wafer are shown schematically in figure 8. The direction of motor rotation depends upon which section of the center-tapped field is energized; therefore, the direction in which the band switch is driven is determined by the position of the homing-wafer rotor when a given band-selector switch is closed. In manual band selection, motor power is applied to the homing wafer by the contacts of the BC, SW, FM, or PHONO push button. In automatic band selection, the power is applied by either S104 for the standard broadcast band, or by S105 for the FM band. Switches S104 and S105 are combined with the upper and lower rocker bars, respectively, located on the front of the Philco Electromechanical Push-Button Tuner. Either bar is mechanically actuated, when a given station-selector button is depressed, by the individual push-rod extension spring, which is positioned so as to strike the rocker bar for the band in which the station is located.

When any one of the push-button switches is closed, power is supplied to the motor until the moving rotor

of the homing wafer breaks that circuit. Over-shooting is prevented by the use of a clutch, mounted on the motor shaft. When the motor is idle, a spring holds its rotor off-center with respect to the electromagnetic field, and keeps the motor disengaged from the gear train. When power is applied to the motor, the rotor attempts to center itself in the field, thus engaging the clutch in the gear train. When the power is removed, the clutch is immediately disengaged by the action of the spring.

As the clutch is disengaged, the muting switch (leaf type) is pushed open by the motor shaft. When the motor operates, the muting switch is allowed to close.

For an example of the band-changing operation, assume that the idle condition is as indicated in the schematic diagram, showing the BC push button, PB-3, depressed. Now, if PB-5 is depressed, the motor circuit is completed through contact 11 and the rotor of WS-3(R), thence through the upper section of the motor field winding. Power is supplied to the motor until the band switch is rotated sufficiently to break the circuit between contact 11 and the rotor of WS-3(R). At this instant, the rotor of the motor is thrown outward, disengaging the clutch from the gear train.

From the idle position shown, if PB-2, instead of PB-5, is depressed, the motor circuit is completed through contact 8 and the rotor of WS-3(F), thence through the lower section of the motor field winding, thus causing motor rotation in the direction opposite to that of the instance cited above.

MODELS 48-1274,
48-1276

PHILCO CORP.

PHILCO ELECTROMECHANICAL PUSH-BUTTON TUNER

As previously mentioned, the Philco Electromechanical Push-Button Tuner provides both automatic tuning and band selection, for five stations in the standard broadcast and FM bands, by the operation of push buttons. The five station-selector buttons operate the motor-driven tuning mechanism.

Band selection is determined by the position of the push-rod extension spring, one of these being attached to each of the five push rods; the push-rod extensions facing upward lock in the upper rocker bar (standard broadcast) when the buttons are depressed; the extensions facing downward lock in the lower rocker bar (FM).

The tuning-condenser gang is rotated to the correct position by the motor-driven tuning mechanism, which is operated by a 24-volt, a-c, series-wound motor. A 4-contact leaf switch (S102), located at the rear of the push rods, applies the motor power and closes the

muting circuit when any of the five station-selector buttons is depressed; this switch is locked in the closed position by a small latch on the push rod, which hooks onto the actuator bar. When the tuning gang locks in the preset position, the intermediate gear of the gear train rides upward and trips the actuator bar, to release the small latch, thus removing the motor power and opening the muting switch.

The set-up switch* (S101), which is used for setting the station-selector buttons, is connected in parallel with the motor power switch, and is operated by a small button located on the rear of the chassis.

Since the functioning of the tuning mechanism itself is somewhat complex, a detailed description of the tuner, with illustrations and complete service information, is presented in a separate manual, PHILCO ELECTROMECHANICAL PUSH-BUTTON TUNER, PR-1481.

PHILCO TROUBLE-SHOOTING PROCEDURE

For rapid trouble shooting, the radio circuit is divided into four sections, as follows:

- Section 1—the power supply
- Section 2—the audio circuits
- Section 3—the i-f, detector, and a-v-c circuits
- Section 4—the r-f and converter circuits

Test points are specified for each section, and are indicated in the sectionalized schematic diagram. The trouble-shooting procedure given for each section includes a simplified test chart and a bottom view of the chassis showing the locations of the test points and the components of that section.

In each chart, the first step is a master check for determining whether trouble exists in that section, without going through the entire test procedure.

Failure to obtain the "NORMAL INDICATION" in any given step indicates trouble within the circuit under test.

After isolating the trouble to a single stage, the defect is located by: first, testing the tube; second, measuring tube electrode voltages; third, measuring circuit resistances; fourth, substituting condensers. The trouble revealed should be corrected before testing further.

Important

To avoid the possibility of altering FM operation, special care should be used in replacing any part. Replacement parts should be placed in the same physical positions as the original parts; connections should be of the same length, and should be soldered to the same points. The placement or length of leads should not be changed.

PRELIMINARY CHECKS

To avoid possible damage to the radio, the following preliminary checks should be made before connecting the radio to a source of power:

1. Inspect both the top and the bottom of the chassis. Make sure that all tubes are secure in the proper sockets, and look for any broken or shorted connections, burned resistors, or other obvious sources of trouble.

2. Measure the resistance across condenser C100

(see figure 1). When the ohmmeter test leads are connected in the proper polarity, the highest resistance reading will be obtained. If the reading is lower than 1500 ohms, check condensers C100, C101A, C104A, C436, C437, C410, and C411 for leakage or shorts.

The resistance value above, which is much lower than normal, is not intended as a quality check of these condensers; the value given is the lowest at which the rectifier will operate safely while the voltage tests of Section 1 are performed.

PHILCO CORP.

MODELS 48-1274,
48-1276**Section 1 — Power Supply**

CAUTION: Do not turn on the power with the speaker disconnected, or the radio may be damaged.

Make the tests for this section with a d-c voltmeter; connect the leads between the chassis, test point C, and the test points indicated in the chart. The voltage readings given were taken with a 20,000-ohms-per-volt meter, at a line voltage of 117 volts, a.c.

TROUBLE SHOOTING

Depress the BC push button, PB-3; set the volume control to minimum, and the bass and treble controls fully clockwise.

Follow the steps in the order given. If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 2 (audio circuits); if not, isolate and correct the trouble in this section.

STEP	TEST POINT	NORMAL INDICATION	ABNORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	255v		Trouble in this section. Isolate by the following tests.
2	B	290v	Low voltage No voltage High voltage	Defective: 5U4G. Leaky: C100, C101A, C436*, C437*, C104A, C319*. Open: L100, T100, C100. Shorted: T100. Defective: 5U4G. Open: PB-1, T100. Shorted: C101A, C104A, C319*. Open: T200.
3	D	270v	Low voltage No voltage	Increased resistance: R412*. Leaky: C436*, C437*, C411*, C410*, C413*. Open: R412*, WS-3(R). Shorted: C436*, C437*, C416*, C419*, C411*, C410*, C413*.
4	A	255v	Low voltage No voltage	Increased resistance: R106. Leaky: C104B, C315*, C344*, C329* (in FM operation only). Open: R106. Shorted: C104B, C315*, C344*.
5	E	Negative 22v	Low voltage No voltage High voltage	Increased resistance: R101. Decreased resistance: R102. Open: R101. Shorted: C102. Open: R102, L100.
6	F	Negative 22v	No voltage	Open: R103. Shorted: C103.

Listening Test: Abnormal hum may be caused by open C101A, C104A, or C104B.

* This part, located in another section, may cause abnormal indication in this section.

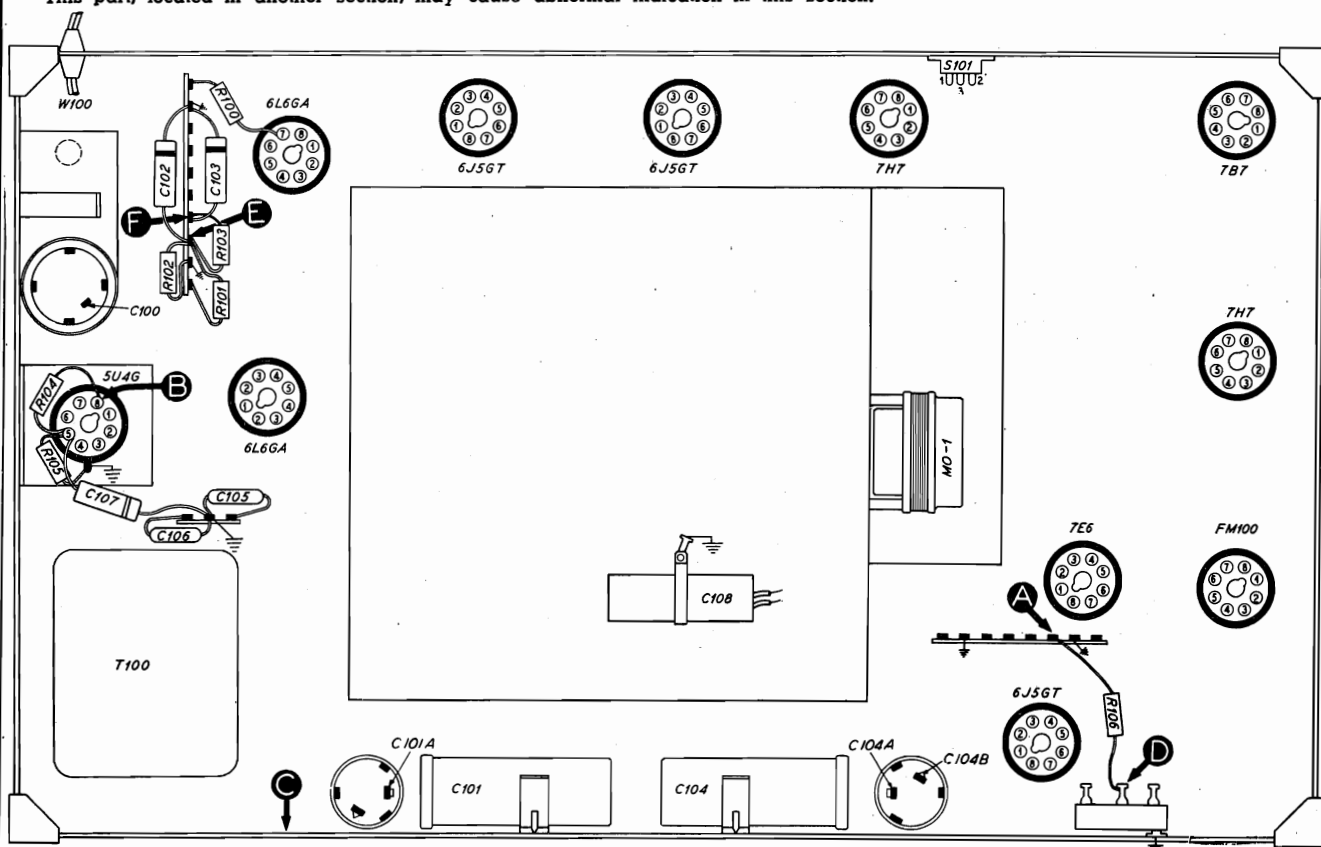


FIGURE 1. BOTTOM VIEW, SHOWING SECTION 1 TEST POINTS

TP-4723A

MODELS 48-1274,
48-1276

PHILCO CORP.

Section 2 — Audio Circuits**TROUBLE SHOOTING****AUDIO-AMPLIFIER AND PHONO-PREAMPLIFIER TESTS**

Use an audio-frequency signal generator. Connect the generator ground lead to the chassis, test point C; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the volume control to maximum, and the bass and treble controls fully clockwise. Depress the phono

push button, PB-2.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the scratch-eliminator tests; if not, isolate and correct the trouble in the audio-amplifier or phono-preamplifier circuits.

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with weak signal input.	Trouble in this section. Isolate by the following tests.
2	B (Remove 6J5GT phase inverter.)	Loud, clear signal with strong signal input.	Defective: 6L6GA. Open: LS200, T200, R230, C217, R228. Shorted or leaky: C217, C219.
3	D (Phase inverter removed.)	Loud, clear signal with strong signal input.	Defective: 6L6GA. Open: T200, R231, C218, R229. Shorted or leaky: C218, C220.
4	F (Phase inverter removed.)	Loud, clear signal with strong signal input.	Defective: 6J5GT driver. Open: R225, R221. Shorted or leaky: C215, C212.
5	E (Replace 6J5GT phase inverter.)	Loud, clear signal with strong signal input.	Defective: 6J5GT phase inverter. Open: R226, R222, R224. Shorted: C216.
6	G	Loud, clear signal with moderate signal input.	Defective: 7E6. Open: R200 (rotate through range), R214, R211, R212, C210, C215, R215. Shorted: C213. Leaky: C215, C213.
7	A	Loud, clear signal with weak signal input.	Defective: 6J5GT phono preamplifier. Open: R204, R205, C202, WS-2(F), R203, R202. Shorted or leaky: C204, C202.

Listening Test: Distortion may be caused by open R211 or R202, or by leaky C210 or C209.

SCRATCH-ELIMINATOR TESTS

Except for the volume control, set the radio controls as directed for the audio-amplifier and phono-preamplifier tests; set the volume control to maximum for all steps except 1(b); for this step, adjust the volume control as indicated in the chart.

Turn the scratch eliminator on or off as indicated in the chart. (The scratch eliminator is on when the high-fidelity switch is in the OFF position.)

Connect an output meter between terminal 4 (voice-coil connection) of the aerial terminal panel and the chassis.

Connect the ground lead of an audio signal generator to the chassis, test point C; connect the output lead

through a .1-mf. condenser to the test points indicated in the chart. Set the generator for 5000 cycles. Adjust the generator output as indicated in the chart.

If normal operation is indicated by the tests in step 1, (a) and (b), proceed with the tests for Section 3 (i-f, detector, and a-v-c circuits); if not, isolate and correct the trouble in the scratch-eliminator circuits.

NOTE: For steps 2, 3, and 4, connect the positive lead of a 20,000-ohms-per-volt, d-c voltmeter to the chassis, test point C; connect the prod end of the negative lead through a 100,000-ohm isolating resistor to the "VOLTMETER" test points indicated in the chart.

STEP	TEST POINT	SIGNAL GENERATOR OUTPUT	VOLT-METER	SPECIAL INSTRUCTIONS	POSSIBLE CAUSE OF ABNORMAL INDICATION
1 (a)	A	Adjust for 6v output-meter reading, with scratch eliminator off.		Turn scratch eliminator on; output voltage should drop to 2.5v (approx.).	

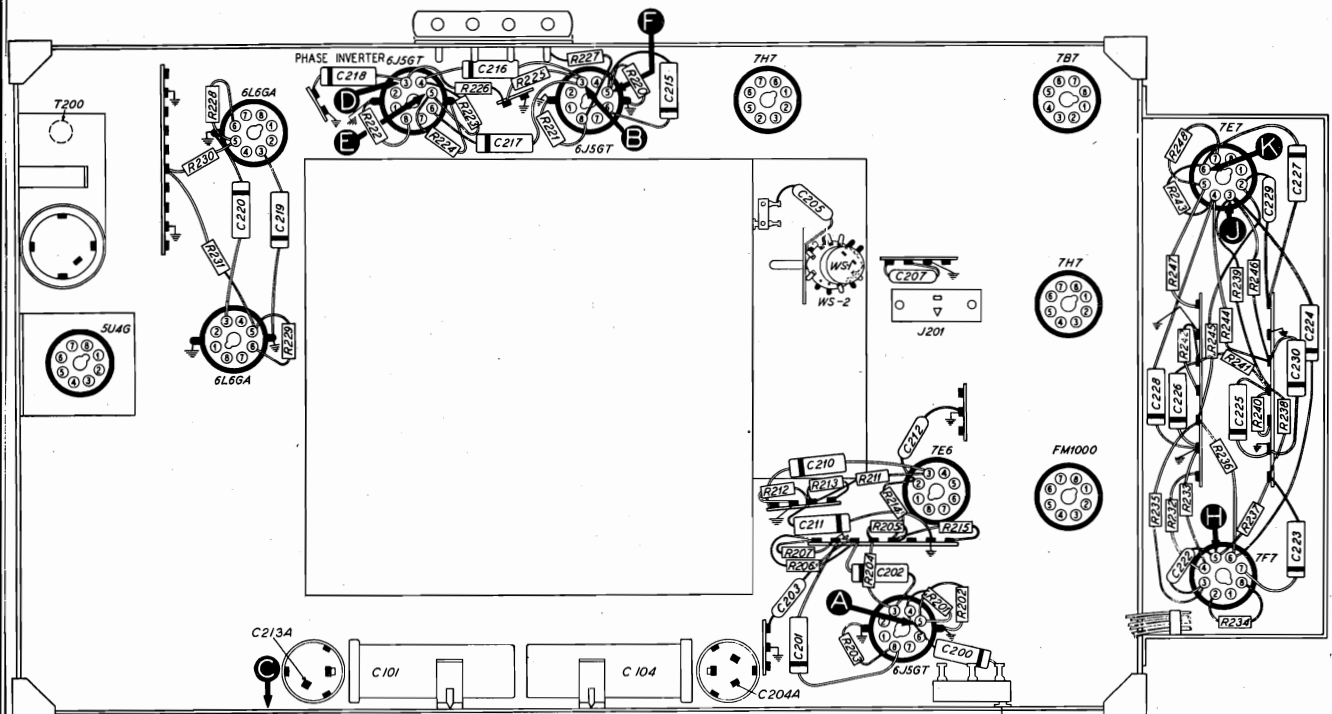
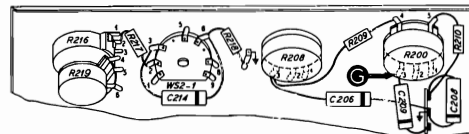
PHILCO CORP.

MODELS 48-1274,
48-1276

Section 2 — Audio Circuits (Cont.)

TROUBLE SHOOTING

STEP	TEST POINT	SIGNAL GENERATOR OUTPUT	VOLT-METER	SPECIAL INSTRUCTIONS	POSSIBLE CAUSE OF ABNORMAL INDICATION
1 (b)	A	Same as for step 1 (a).		Reduce volume control to obtain output-meter reading of 1v. Increase generator output to obtain output-meter reading of 6v. Turn scratch eliminator on; output voltage should not drop more than 1.5v (approx.).	Trouble in scratch-eliminator circuits. Isolate by the following tests.
2	H	See SPECIAL INSTRUCTIONS column.	J	With scratch eliminator on, increase generator output to obtain 11v, negative; failure to obtain this value indicates trouble.	Defective: 7F7, 7E7 (diode section). Open: R236, C224, R239, R240. Shorted or leaky: C224, C225.
3	H	Same setting which produced 11v reading in step 2, with scratch eliminator on.	K	With scratch eliminator on, voltage at point K should be 5v, negative.	Open: R243, R244, R246. Shorted or leaky: C228, C230, C227.
4	A	Same setting which produced 11v reading in step 2, with scratch eliminator on.	J	With scratch eliminator on, voltage at point J should be approx. 28v, negative.	Defective: 7F7. Open: R235, C222, R237, R234, R233, R232, C203. Shorted or leaky: C203, C222, C223.
5	A	Adjust for 6v output-meter reading, with scratch eliminator off.		Turn scratch eliminator on; output voltage should drop to 2.5v (approx.).	Defective: 7E7 (pentode section). Open: R245, R247, R248, C227, C229. Shorted or leaky: C229.



MODELS 48-1274,
48-1276

PHILCO CORP.

Section 3 — I-F, Detector, and A-V-C Circuits TROUBLE SHOOTING**AM CIRCUITS**

Use an r-f signal generator, with modulated output, set at 455 kc. Connect the generator ground lead to the chassis, test point C; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Depress the BC push button, PB-3. Set the volume control to maximum and turn the bass and treble controls fully clockwise.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for the FM circuits, or the tests for Section 4; if not, isolate and correct the trouble in the AM circuits.

Since the circuit location of test point A for this section is in Section 4, the effectiveness of step 1 as a master check is dependent upon the condition of certain parts in Section 4; these parts are listed below under "POSSIBLE CAUSE OF ABNORMAL INDICATION."

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with weak signal input.	Trouble in AM circuits. Isolate by the following tests.
2	B	Loud, clear signal with strong signal input.	Defective: 7H7. Misaligned: Z303. Open: R315, Z303 pri. or sec., R323, C325, WS-2(F), R321, R319, R324, C339. Shorted: C330, C331, C340, C336, C323, Z302 sec.
3	D	Loud, clear signal with moderate signal input.	Defective: 7B7. Misaligned: Z302. Open: R307, R310, R312, R313, Z302 pri. or sec., C322, C302C, C324, C321, C320. Shorted: Z302 pri. or sec., C322, C302C, C313, C324, C320.
4	E	Loud, clear signal with weak signal input.	Defective: 7H7. Misaligned: Z301. Open: R301, R302, R303, R304, R311, R305, Z301 pri. or sec., C312, C313, C314, C309, C311. Shorted: C309, C312, C301C, C314, Z301 pri. or sec.
5	A	Loud, clear signal with less signal input than in step 4.	Defective: 7E5. Misaligned: Z300. Open: Z300 pri. or sec. (AM), WS-5(F), WS-4(R), R411*, R410*, C307, C305. Shorted: Z300 pri. or sec. (AM), C305, C300C, C430*.

* This part, located in another section, may cause abnormal indication in this section.

FM CIRCUITS

The tests for the FM circuits are made with an AM r-f signal generator and a 20,000-ohms-per-volt, d-c voltmeter.

In steps 1(a), 4, 5, 6, 7, and 8, the oscillator section of the FM detector is made inoperative, thereby converting the circuit to an AM detector, and making it possible to use an AM signal for testing the i-f amplifiers and a section of the detector; the remaining section of the detector is tested by steps 1(b), 2, and 3.

In step 1(b), an unmodulated r-f signal is used to check the FM response of the detector; the test is made by observing the d-c voltage drops across the audio load resistor (R318) for different input frequencies within the i-f range of the detector. In steps 2 and 3, d-c voltage and r-f signal tests, respectively, are used to check the oscillator action in the FM detector.

Set the volume control to maximum, and turn the bass and treble controls fully clockwise. Depress the

FM push button, PB-5, and turn the high-fidelity switch on. Connect the generator ground lead to the chassis, test point C; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

NOTE: The "TEST POINT" column refers to signal-generator connections in all cases except step 2, in which the test is made with the voltmeter only.

If the "NORMAL INDICATION" is obtained in step 1, (a) and (b), proceed with the tests for Section 4; if not, isolate and correct the trouble in the FM circuits.

Since the circuit location of test point A for this section is in Section 4, the effectiveness of step 1(a), as a master check is dependent upon the condition of certain parts in Section 4; these parts are listed below under "POSSIBLE CAUSE OF ABNORMAL INDICATION."

PHILCO CORP.

MODELS 48-1274,
48-1276**Section 3 — I-F, Detector, and A-V-C Circuits**
(CONTINUED)**TROUBLE SHOOTING**

STEP	TEST POINT	SPECIAL INSTRUCTIONS	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1 (a)	A (I-F Ampl. Check.)	Set generator to 9.1 mc. (mod. on). Short test point G (pin 2 of FM1000) to chassis.	Loud, clear signal with very weak signal input.	Trouble in FM circuits. Isolate by steps 4, 5, 6, 7, and 8.
1 (b)	B (FM Det. Check.)	Set generator to 9.1 mc (mod. off) with high output. Remove short from test point G. Connect positive lead of voltmeter to test point H, and negative lead to test point J. Use 50-volt range.	15 to 30 volts for 9.1-mc. signal or NO signal. 12 to 20 volts when generator is set at 80 kc. above or 80 kc. below 9.1 mc.	Trouble in FM detector circuit. Isolate by steps 2 and 3.
2	G (FM Det. Osc. Check.)	Connect positive lead of d-c voltmeter to chassis; connect prod end of negative lead through 100,000-ohm isolating resistor to test point G. Use 10-volt range.	Negative 2.5 volts (approx.).	Defective: FM1000. Open: C335, R322, Z304 sec., C333, C334. Shorted: C335, C333, C334, C301A, Z304 sec.
3	B	Using low to moderate output (mod. off), tune generator across 9.1 mc.	Beat signal, with zero beat at 9.1 mc.	Misaligned: Z304. Shorted: Z304 pri. or sec. Changed value: C333, C334. Open: C301A, C338.
4	F	Set generator to 9.1 mc. (mod. on). Short test point G to chassis. Short test point B (for this step only) to chassis.	Clear signal with strong signal input.	Defective: FM1000. Open: L300, Z304 pri., R318, R320, WS-2(F). Shorted or leaky: C337, C332, C329, C303B.
5	B	Set generator to 9.1 mc. (mod. on). Leave test point G shorted. Remove short from test point B.	Loud, clear signal with strong signal input.	Defective: 7H7 (3rd i.f.). Shorted or leaky: C303A. Open: Z303 sec. (FM), R325, R326. Misaligned: Z303.
6	D	Set generator to 9.1 mc. (mod. on). Leave test point G shorted.	Loud, clear signal with moderate signal input.	Defective: 7B7. Misaligned: Z302. Shorted: C302A, C302E.
7	E	Set generator to 9.1 mc. (mod. on). Leave test point G shorted.	Loud, clear signal with weak signal input.	Defective: 7H7 (1st i.f.). Misaligned: Z301. Shorted: C301A, C301B.
8	A	Set generator to 9.1 mc. (mod. on). Leave test point G shorted.	Loud, clear signal with very weak signal input.	Defective: 7E5*. Misaligned: Z300. Open: WS-4(R), Z300 pri. or sec., L401*. Shorted: C306, C300A, C300B.

* This part, located in another section, may cause abnormal indication in this section.

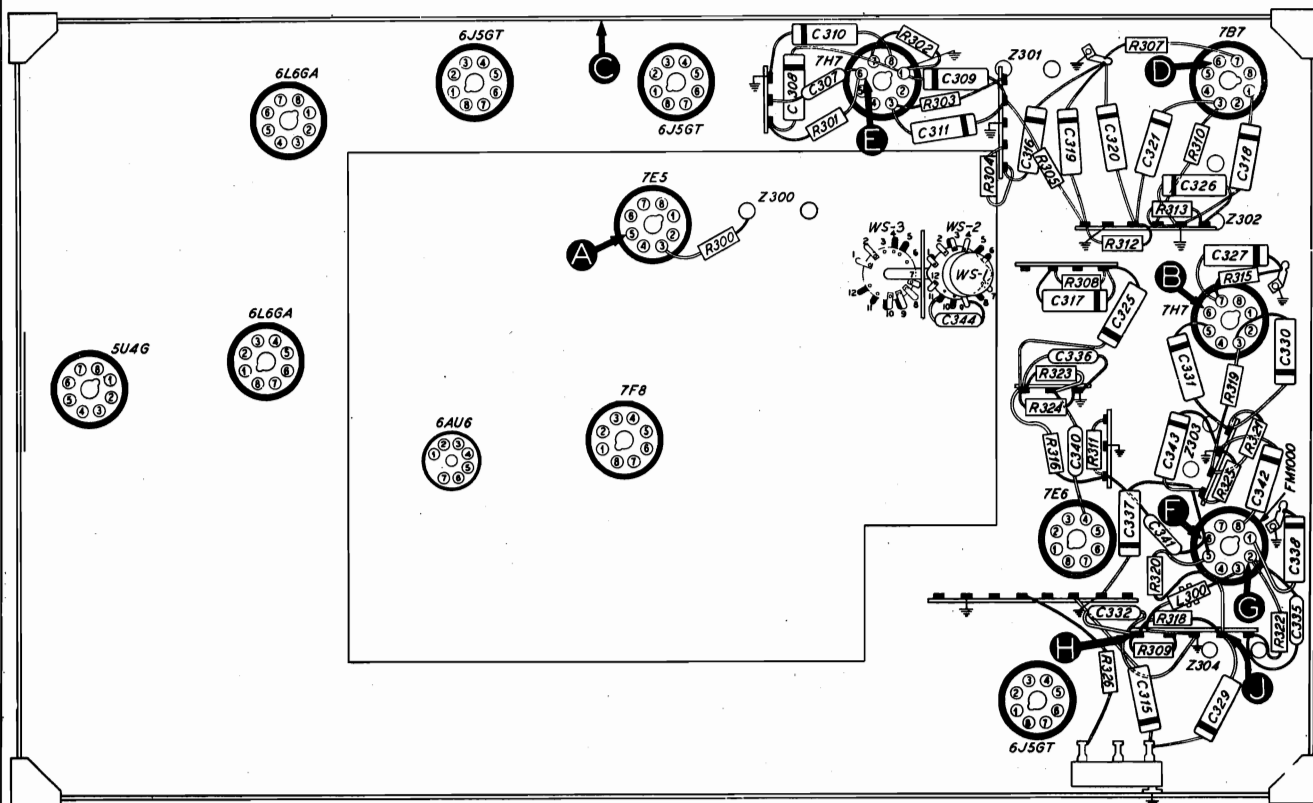


FIGURE 3. BOTTOM VIEW, SHOWING SECTION 3 TEST POINTS

TP-4722C

MODELS 48-1274,
48-1276

PHILCO CORP.

Section 4 — R-F and Converter Circuits**TROUBLE SHOOTING**

For the tests in this section, with the exception of the oscillator and frequency-doubler tests, use an AM r-f signal generator, with modulated output. Connect the generator ground lead to the chassis, test point C; connect the output lead as indicated in the chart. Set the volume control to maximum, and turn the bass and treble controls fully clockwise. Depress the push buttons indicated in the chart.

OSCILLATOR AND FREQUENCY-DOUBLER TESTS: For the broadcast and short-wave oscillator

tests (steps 2 and 5), and the FM frequency-doubler test (step 9), connect the positive lead of a 20,000-ohms-per-volt meter to test point D; connect the prod end of the negative lead through a 100,000-ohm isolating resistor to test point B. For the FM oscillator test (step 8), transfer the negative lead and isolating resistor to test point G. The negative grid-voltage readings given in the chart are those obtained when operation is normal. Absence of negative grid voltage at any dial position indicates that the oscillator (or the frequency doubler) is not operating properly.

STEP	TEST POINT	SIGNAL GENERATOR	RADIO TUNING	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1(a)	A	1000 kc. Through .1-mf. condenser.	BC (PB-3). Tune to signal.	Loud, clear signal with weak signal input.	Trouble in broadcast circuits. Isolate by steps 2, 3, and 4.
1(b)	A	11 mc. Through .1-mf. condenser.	SW (PB-4). Tune to signal.	Loud, clear signal with weak signal input.	Trouble in short-wave circuits. Isolate by steps 5, 6, and 7.
1(c)	F	98 mc. Through 100-mm.f. condenser.	FM (PB-5). Short test point G, Section 3, to chassis. Tune to signal.	Loud, clear signal with weak signal input.	Trouble in FM circuits. Isolate by steps 8, 9, 10, and 11.
2	B to D Osc. Test.		BC (PB-3). Tune through range.	Negative 1.5 to 4 volts.	Defective: 7F8. Open: WS-5(F), WS-5(R), L411, C432, L408, R408, C423, C426, R407. Shorted or leaky: C423, C426, C434, C432, C433, L411. Shorted: C400F.
3	E	1000 kc. Through .1-mf. condenser.	BC (PB-3). Tune to signal.	Loud, clear signal with moderate signal input.	Defective: 6AU6. Open: R402, R403, L404, L403, C413, WS-6(F), WS-6(R), L407, C427, R409. Shorted or leaky: C410, C411. Shorted: L407, C400C.
4	A	1000 kc. Through .1-mf. condenser.	BC (PB-3). Tune to signal.	Loud, clear signal with weak signal input.	Open: WS-7(R), WS-7(F), L400, C405, R400, LA400. Shorted or leaky: C401A, C400B, C405.
5	B to D Osc. Test.		SW (PB-4). Tune through range.	Negative 1.5 to 2 volts.	Defective: 7F8. Open: WS-5(R), WS-5(F), L410, C431. Shorted or leaky: C420C, C431. Shorted: L410.
6	E	11 mc. Through .1-mf. condenser.	SW (PB-4). Tune to signal.	Loud, clear signal with moderate signal input.	Open: WS-6(F), WS-6(R), L406, C422, C417. Shorted or leaky: C422, C420A, C417. Shorted: L406.
7	A	11 mc. Through .1-mf. condenser.	SW (PB-4). Tune to signal.	Loud, clear signal with weak signal input.	Open: WS-7(R), WS-7(F), L402, C404. Shorted or leaky: C401B, C404.
8	G Osc. Test.		FM (PB-5). Tune through range.	Negative 3.5 to 4 volts.	Defective: 7F8. Open: WS-6(F), R404, C421, C424, R406, R405, T400. Shorted or leaky: C421, C424, C414, C415. Shorted: C400E.
9	B to D Frequency Doubler Test.		FM (PB-5). Tune through range.	Negative 2.5 to 3.5 volts.	Defective: 7F8. Open: WS-5(F), WS-5(R), L409. Shorted: C400G, C429.
10	E	98 mc. Through 100-mm.f. condenser.	FM (PB-5). Short test point G, Section 3, to chassis. Tune to signal.	Loud, clear signal with moderate signal input.	Open: WS-6(F), WS-6(R), L405, C412, C418. Shorted or leaky: C412. Shorted: C400D.
11	F	98 mc. Through 100-mm.f. condenser.	FM (PB-5). Test point G shorted. Tune to signal.	Loud, clear signal with slightly less input than in step 9.	Open: WS-7(F), L401, C403, C402. Shorted or leaky: C402, C403. Shorted: C400M.

Section 4 — R-F and Converter Circuits (CONTINUED)

TROUBLE SHOOTING

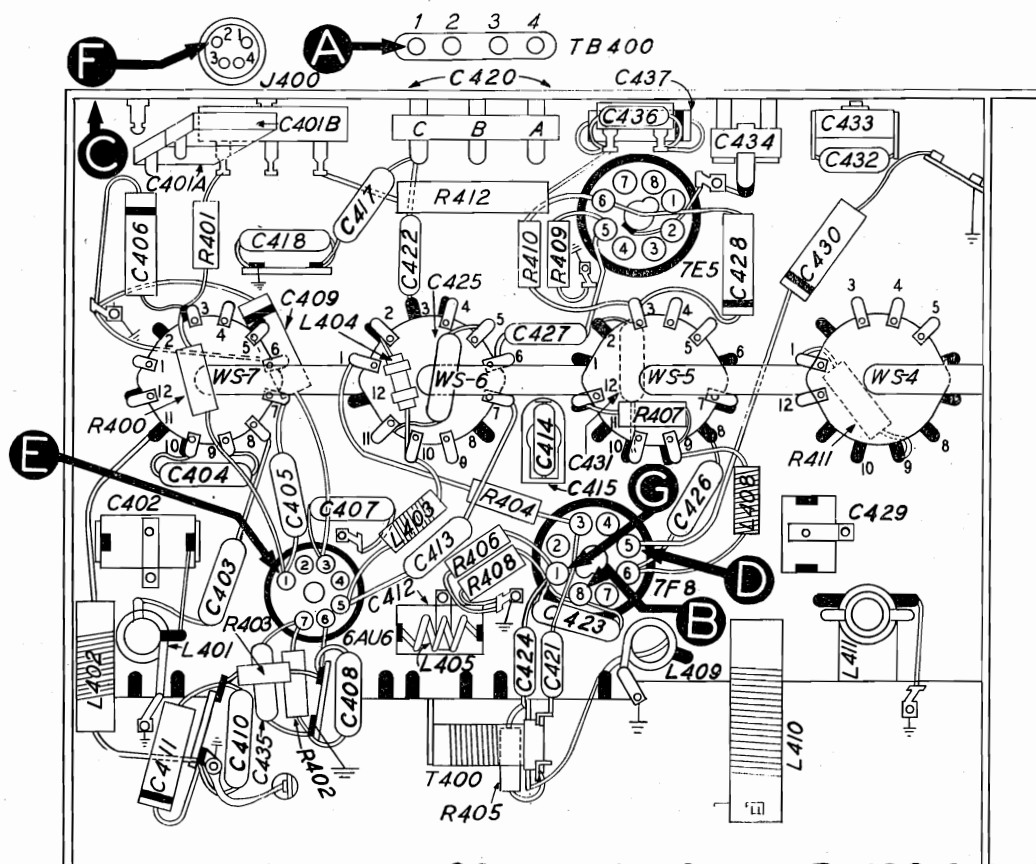


FIGURE 4. BOTTOM VIEW, SHOWING SECTION 4 TEST POINTS

TP 4723D

SERVICING PHILCO AUTOMATIC BAND SELECTOR

To make the motor-driven band switch accessible for repairs, remove the four self-tapping screws holding the r-f chassis, and unsolder a sufficient number of connecting wires to allow the r-f chassis to drop away from the main chassis about six inches.

To obtain access to the band-switch components, unsolder the wires and parts connected to the rear plate on the r-f chassis, and remove the plate.

To replace individual switch wafers, loosen the two Allen setscrews locking the drive gear to the switch shaft, and remove the two nuts from the tie rods, at the motor end. See figure 5. Then slide the tie rods and switch shaft through the holes in the side of the r-f chassis.

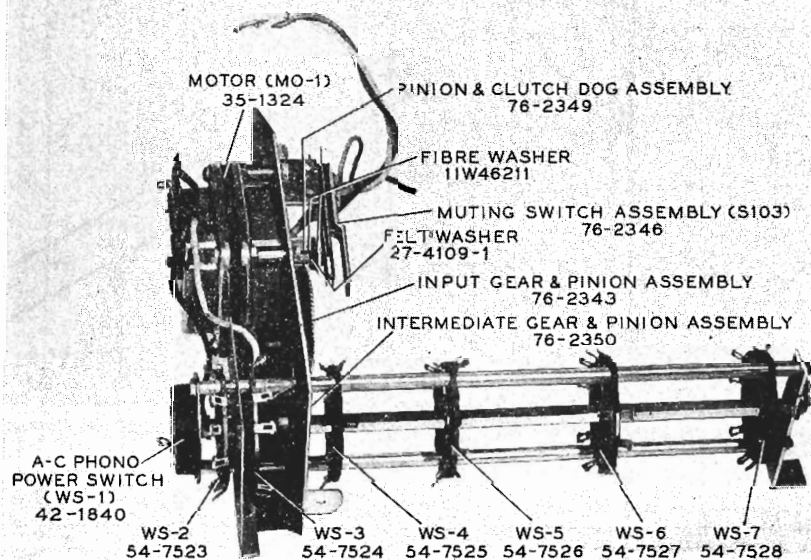


FIGURE 5. PHILCO AUTOMATIC-BAND-SELECTOR MECHANISM

TP-4406

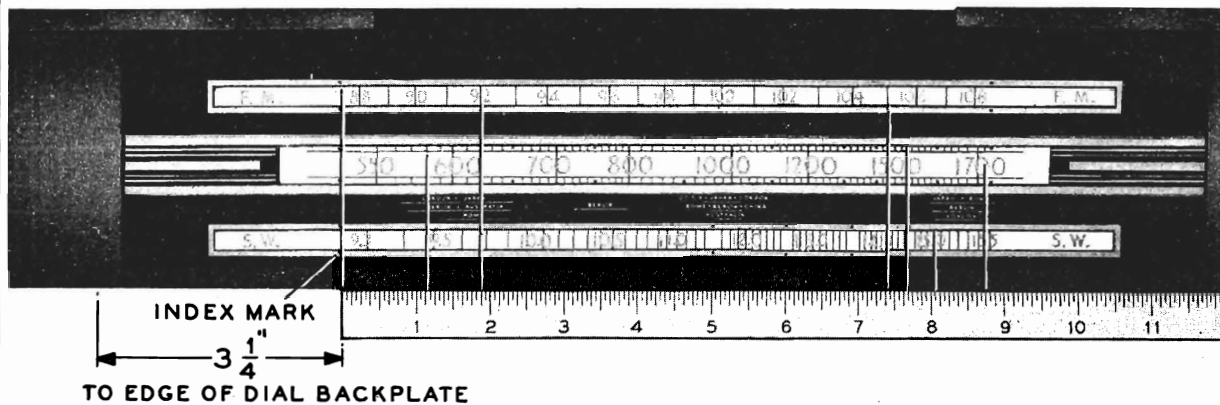
MODELS 48-1274,
48-1276

PHILCO CORP.

CALIBRATING DIAL BACKPLATE

With the radio out of the cabinet, dial calibration points should be located by making pencil marks on the backplate, below the pointer. Figure 6 shows the measurements for these points with respect to the left-hand edge of the backplate.

NOTE: The dial scale shown in figure 6 is for Model 48-1274. Although this scale is shorter than that for Model 48-1276, the calibration of the two scales is identical, and the relationship between the backplate and the calibration points is the same for both models.



REPLACEMENT PARTS LIST

NOTE: Part numbers marked with an asterisk (*) are general replacement items. These numbers may not be identical with those on factory assemblies; also, the electrical values of some replacement items may differ from the values indicated in the schematic diagram and parts list. The values substituted in any case are so chosen that the operation of the radio will be either unchanged or improved. When ordering replacements, use only the "Service Part No."

SECTION 1 — POWER SUPPLY

Reference Symbol	Description	Service Part No.
C100	Condenser, electrolytic, input filter, 40 mf., 450v	30-2568-20
C101	Condenser, electrolytic, 2-section	30-2570-3*
C101A	Condenser, filter, 30 mf., 450v	Part of C101
C102	Condenser, bias filter, 2 mf.	45-3500-3*
C103	Condenser, bias filter, 2 mf.	45-3500-3*
C104	Condenser, electrolytic, 2-section	30-2570-6*
C104A	Condenser, filter, 15 mf., 450v	Part of C104
C104B	Condenser, filter, 10 mf., 450v	Part of C104
C105	Condenser, line filter, .01 mf.	30-1226-1
C106	Condenser, line filter, .01 mf.	30-1226-1
C107	Condenser, by-pass, 2 mf.	45-3500-3*
C108	Condenser, a-c electrolytic, 30 mf., 30v, 60 cycles	30-2572
I100 to I105	Lamp, pilot	34-2064
I106	Lamp, bin	34-2039
I107	Lamp, bull's-eye	34-2040
I108	Socket, phono power	27-6182
L100	Coil, speaker field	Part of LS200
MO-1	Motor, band switching (part of 76-2333-1)	35-1324
MO-2	Motor, push-button tuning (part of 76-2150)	76-2428
PB-1	Push-button switch, master power off-on (part of 76-2150)	42-1789
PB-2	Push-button switch, PHONO	Part of 76-2150
PB-3	Push-button switch, BC	Part of 76-2150
PB-4	Push-button switch, SW	Part of 76-2150
PB-5	Push-button switch (rod actuating S105), FM	Part of 76-2150
PB-6 to PB-10	Push-button rod	Part of 76-2150
R100	Resistor, bull's-eye dropping, 27 ohms	66-0273340*
R101	Resistor, voltage divider, 150,000 ohms	66-4103340*
R102	Resistor, voltage divider, 100,000 ohms	66-4103340*
R103	Resistor, filter, 47,000 ohms	66-4103340*
R104	Resistor, voltage divider, 1 megohm	66-5103340*
R105	Resistor, voltage divider, 100,000 ohms	66-4103340*
R106	Resistor, filter, 5600 ohms	66-2568340*
S100	Switch, bin lamp	76-2140-2
S101	Switch, set-up	42-1702
S102	Switch, tuning motor	Part of 76-2150
S103	Switch, muting (part of 76-2333)	Part of 76-2333
S104	Switch, AM	Part of 76-2333
S105	Switch, FM	Part of 76-2150
T100	Transformer, power	32-8286
WS-3 (F, R)	Switch, wafer (part of 76-2333-1)	54-7524
W100	Power cord and plug	13351

Parts list changes:

C108	Condenser, electrolytic, 45 mf., 30v, 60 cycles	30-2355-2
LA401	Loop, FM Aerial	76-2029-13 or 76-2381-3
MO2	Motor, Pushbutton tuning, part of 76-2150	35-1336
R412	Resistor, filter, 470 ohms	66-1474340
Bin mechanism, left hand		76-3223-7
Bin mechanism, right hand		76-3223-8

NOTE: Above listed bin mechanisms are not interchangeable with those listed in the Service Manual. When replacing mechanisms with these part numbers, replace both sides.

SECTION 2 — AUDIO CIRCUITS

R208	Condenser, tone compensation, .001 mf.	45-3500-5*
R209	Condenser, cathode by-pass, .1 mf.	61-0113*
R210	Condenser, d-c blocking, .01 mf.	61-0120*
R211	Condenser, d-c blocking, 150 mmf.	60-10155407*
R212	Condenser, audio by-pass, 10 mf.	Part of C104
R213	Condenser, tone compensation, .02 mf.	60-00863307*
R214	Condenser, tone compensation, .02 mf.	61-0108*
R215	Condenser, tone compensation, .02 mf.	60-00515307*
R216	Condenser, tone compensation, .02 mf.	61-0108*
R217	Condenser, d-c blocking, .03 mf.	45-3500-1*
R218	Condenser, d-c blocking, .01 mf.	61-0120*
R219	Condenser, audio by-pass, .5 mf.	61-0133*
R220	Condenser, r-f by-pass, 240 mmf.	60-10243307*
R221	Condenser, audio by-pass, 10 mf., 450v. Part of C101	45-3500-1*
R222	Condenser, tone compensation, .03 mf.	61-0109*
R223	Condenser, d-c blocking, .006 mf.	61-0105*
R224	Condenser, d-c blocking, .006 mf.	61-0105*
R225	Condenser, d-c blocking, .006 mf.	61-0105*
R226	Condenser, d-c blocking, .006 mf.	61-0105*
R227	Condenser, tone compensation, .01 mf.	61-0120
R228	Condenser, frequency cross-over filter, 2 mf.	45-3030
R229	Condenser, d-c blocking, 330 mmf.	60-10335407*
R230	Condenser, audio by-pass, .01 mf.	61-0120*
R231	Condenser, d-c blocking, .002 mf.	61-0062*
R232	Condenser, filter, .02 mf.	61-0108*
R233	Condenser, filter, .03 mf.	45-3500-1*
R234	Condenser, coupling, .001 mf.	61-0120*
R235	Condenser, filter, .01 mf.	60-10335407*
R236	Condenser, d-c blocking, 330 mmf.	61-0120*
R237	Condenser, filter, .01 mf.	41-3735-1
R238	Condenser, filter, .01 mf.	36-1612
R239	Jack and cable, phono input	Part of 36-1612
R240	Test jack	36-1612
R241	Speaker, coaxial	36-1612
R242	Speaker, tweeter (part of 36-1612)	Part of 36-1612
R243	Speaker, woofer	36-1612
R244	Volume control, .5 megohm (taps at 50,000 ohms and 250,000 ohms)	33-5535-6
R245	Resistor, tone compensation, 220,000 ohms	66-4223340*
R246	Resistor, grid return, 4.7 megohms	66-5473340*
R247	Resistor, cathode bias, 2200 ohms	66-2223340*
R248	Resistor, plate load, 56,000 ohms	66-3563340*
T201	Resistor, plate decoupling, 22,000 ohms	66-3223340*
WS-2 (R)	Resistor, voltage divider, 100,000 ohms	66-4103340*
WS2-1	Resistor, voltage divider, 100,000 ohms	66-4103340*

Cabinet top, 48-1274-M	45-6429
Two section lid, 48-1274-M	45-6426
Tilt front, 48-1274-M	45-6427
Instrument panel, 48-1274-M	45-6428
Cabinet, 48-1276	10657A
Two section lid, 48-1276	45-6430
Tilt front, 48-1276	45-6431
Instrument panel, 48-1276	45-6432
Cabinet top, 48-1276	45-6433
Escutcheon, High Fidelity, 48-1276	56-4403FA30

MODELS 48-1274,
48-1276

PHILCO CORP.

REPLACEMENT PARTS LIST**SECTION 3****I-F, DETECTOR, AND A-V-C CIRCUITS**

Reference Symbol	Description	Service Part No.
C300A	Condenser, trimmer	Part of Z300
C300B	Condenser, trimmer	Part of Z300
C300C	Condenser, trimmer	Part of Z300
C301A	Condenser, trimmer	Part of Z301
C301B	Condenser, trimmer	Part of Z301
C301C	Condenser, trimmer	Part of Z301
C302A	Condenser, trimmer	Part of Z302
C302B	Condenser, trimmer	Part of Z302
C302C	Condenser, trimmer	Part of Z302
C303A	Condenser, trimmer	Part of Z303
C303B	Condenser, trimmer	Part of Z303
C303C	Condenser, trimmer	Part of Z303
C304A	Condenser, trimmer	Part of Z304
C305	Condenser, shunt (part of Z300), 2700 mmf.	60-20275404*
C306	Condenser, shunt (part of Z300), 51 mmf.	60-00515237*
C307	Condenser, d-c blocking, 240 mmf.	60-10245307*
C308	Condenser, a-v-c by-pass, .01 mf.	61-0120*
C309	Condenser, plate by-pass, .004 mf.	61-0179*
C310	Condenser, filament by-pass, .01 mf.	61-0120*
C311	Condenser, screen by-pass, .01 mf.	61-0120*
C312	Condenser, shunt (part of Z301), 330 mmf.	60-10335407*
C313	Condenser, d-c block. (part of Z301), 4.7 mmf.	30-1224-5*
C314	Condenser, shunt (part of Z301), 3900 mmf.	60-20395404*
C315	Condenser, r-f by-pass, .01 mf.	61-0120*
C316	Condenser, a-v-c filter, .01 mf.	61-0120*
C317	Condenser, tone compensation, .003 mf.	61-0109*
C318	Condenser, filament by-pass, .01 mf.	61-0120*
C319	Condenser, r-f by-pass, .01 mf.	61-0120*
C320	Condenser, plate by-pass, .004 mf.	61-0179*
C321	Condenser, screen by-pass, .01 mf.	61-0120*
C322	Condenser, shunt (part of Z302), 330 mmf.	60-10335407*
C323	Condenser, d-c blocking (part of Z302), 4.7 mmf.	30-1224-5*
C324	Condenser, shunt (part of Z302), 3900 mmf.	60-20395404*
C325	Condenser, d-c blocking, .006 mf.	61-0105*
C326	Condenser, r-f by-pass, .05 mf.	61-0122*
C327	Condenser, cathode by-pass, .01 mf.	61-0120*
C328	Condenser, shunt (part of Z304), 15 mmf.	30-1223-3*
C329	Condenser, r-f by-pass, .01 mf.	61-0120*
C330	Condenser, screen by-pass, .01 mf.	61-0120*
C331	Condenser, plate by-pass, .004 mf.	61-0179*
C332	Condenser, r-f by-pass, 1500 mmf.	60-20155404*
C333	Condenser, r-f voltage divider (part of Z304), 33 mmf.	30-1223-6*
C334	Condenser, r-f voltage divider (part of Z304), 68 mmf.	60-00685237*
C335	Condenser, d-c blocking, 33 mmf.	60-00365307*
C336	Condenser, r-f by-pass, 100 mmf.	60-10105407*
C337	Condenser, screen by-pass, .01 mf.	61-0120*
C338	Condenser, filament by-pass, .01 mf.	61-0120*
C339	Condenser, shunt (part of Z303), 270 mmf.	30-1220-5*
C340	Condenser, r-f by-pass, 240 mmf.	60-10245307*
C341	Condenser, d-c blocking, 100 mmf.	60-10105407*
C342	Condenser, filament by-pass, .01 mf.	61-0120*
C343	Condenser, r-f by-pass, .01 mf.	61-0120*
C344	Condenser, r-f by-pass, 100 mmf.	60-10105407*
L300	Choke, r-f	32-3352
R300	Resistor, parasitic suppressor, 10 ohms	66-0103340*
R301	Resistor, grid return, 2.2 megohms	66-5223340*
R302	Resistor, cathode bias, 180 ohms	66-1183340*
R303	Resistor, screen dropping, 100,000 ohms	66-4103340*
R304	Resistor, a-v-c decoupling, 470,000 ohms	66-4473340*
R305	Resistor, plate decoupling, 6800 ohms	66-2683340*
R306	Resistor, loading (part of Z301), 6800 ohms	66-2683340*
R307	Resistor, cathode bias, 180 ohms	66-1183340*
R308	Resistor, tone compensation, 220,000 ohms	66-4223340*
R309	Resistor, decoupling, 100,000 ohms	66-4103340*

SECTION 3 (Continued)**I-F, DETECTOR, AND A-V-C CIRCUITS**

Reference Symbol	Description	Service Part No.
R310	Resistor, screen dropping, 100,000 ohms	66-4103340*
R311	Resistor, a-v-c filter, 330,000 ohms	66-4333340*
R312	Resistor, plate decoupling, 5600 ohms	66-2563340*
R313	Resistor, grid return, 1 megohm	66-5103340*
R314	Resistor, loading (part of Z302), 6800 ohms	66-2683340*
R315	Resistor, cathode bias, 180 ohms	66-1183340*
R316	Resistor, a-v-c diode load, 1 megohm	66-5103340*
R317	Resistor, loading (part of Z304), 5600 ohms	66-2563340*
R318	Resistor, audio load, FM detector, 47,000 ohms	66-3473340*
R319	Resistor, screen dropping, 82,000 ohms	66-3823340*
R320	Resistor, screen dropping, 56,000 ohms	66-3563340*
R321	Resistor, plate decoupling, 5600 ohms	66-2563340*
R322	Resistor, grid leak, 15,000 ohms	66-3153340*
R323	Resistor, filter, 47,000 ohms	66-3473340*
R324	Resistor, diode load, 100,000 ohms	66-4103340*
R325	Resistor, voltage divider, 560 ohms	66-1563340*
R326	Resistor, voltage divider, 47,000 ohms	66-3473340*
WS-4 (R)	Switch-wafer section (part of 76-2333-1)	54-7525
WS-2 (F)	Switch-wafer section (part of 76-2333-1)	54-7523
Z300	Transformer, 1st i-f	32-4072
Z301	Transformer, 2nd i-f	32-4060
Z302	Transformer, 3rd i-f	32-4060
Z303	Transformer, 4th i-f	32-4003-1
Z304	Transformer, FM detector	32-4004

SECTION 4**R-F AND CONVERTER CIRCUITS**

C400	Condenser, tuning gang (See Note, Page 15)	Part of 76-2150
C400A	Condenser, tuning-gang section	Part of C400
C400B	Condenser, tuning-gang section	Part of C400
C400C	Condenser, tuning-gang section	Part of C400
C400D	Condenser, tuning-gang section	Part of C400
C400E	Condenser, tuning-gang section	Part of C400
C400F	Condenser, tuning-gang section	Part of C400
C400G	Condenser, tuning-gang section	Part of C400
C401	Condenser, trimmer, 2-section	31-6476-3
C401A	Condenser, trimmer, bc aerial	Part of C401
C401B	Condenser, trimmer, s-w aerial	Part of C401
C402	Condenser, trimmer, FM aerial	31-6473-4
C403	Condenser, blocking, FM, 22 mmf.	62-022009001
C404	Condenser, series tracking, s-w aerial, 255 mmf.	30-1220-24
C405	Condenser, d-c blocking, 100 mmf.	60-10105407*
C406	Condenser, a-v-c by-pass, .01 mf.	61-0120*
C407	Condenser, filament by-pass, 240 mmf.	60-10245307*
C408	Condenser, screen by-pass, 1500 mmf.	30-1225-1*
C409	Condenser, filament by-pass, .01 mf.	61-0120*
C410	Condenser, plate by-pass, 100 mmf.	60-10105407*
C411	Condenser, plate by-pass, .01 mf.	61-0120*
C412	Condenser, trimmer, FM r-f	31-6473-4
C413	Condenser, d-c blocking, 1000 mmf.	30-1225*
C414	Condenser, shunt, FM osc., 5 mmf.	60-90505007*
C415	Condenser, trimmer, FM osc.	31-6480
C416	Not used	
C417	Condenser, s-w r-f shunt, 36 mmf.	30-1224
C418	Condenser, r-f by-pass, 100 mmf.	60-10105407*
C419	Not used	
C420	Condenser, trimmer, 3-section	31-6477-1
C420A	Condenser, trimmer, s-w r-f	Part of C420
C420B	Condenser, trimmer, bc r-f	Part of C420
C420C	Condenser, trimmer, s-w osc.	Part of C420
C421	Condenser, d-c blocking, 51 mmf.	30-1224-2
C422	Condenser, series tracking, s-w r-f, 255 mmf.	30-1220-24
C423	Condenser, d-c blocking, 24 mmf.	30-1224-4
C424	Condenser, d-c blocking, 51 mmf.	30-1224-2
C425	Condenser, neutralizing, s-w, 5 mmf.	60-90505007*
C426	Condenser, d-c blocking, 24 mmf.	30-1224-4
C427	Condenser, d-c blocking, 100 mmf.	60-10105407*
C428	Condenser, cathode by-pass, .01 mf.	61-0120*

PHILCO CORP.

MODELS 48-1274,
48-1276

REPLACEMENT PARTS LIST

SECTION 4 (Continued)

R-F AND CONVERTER CIRCUITS

Reference	Symbol	Description	Service Part No.
C429		Condenser, trimmer, freq. doubler	31-6473-4
C430		Condenser, r-f by-pass, .05 mf.	61-0122*
C431		Condenser, series tracking, s-w osc., 215 mmf.	30-1220-4
C432		Condenser, series-padder shunt, bc. osc., 437 mmf.	30-1220-22
C433		Condenser, series padder, bc. osc.	31-6473-4
C434		Condenser, shunt trimmer, bc. osc.	31-6480-1
C435		Condenser, cathode by-pass, 100 mmf.	60-10105407*
C436		Condenser, by-pass, 510 mmf.	60-10515307*
C437		Condenser, by-pass, .01 mf.	61-0120*
L400		Coil, bc. aerial	32-4141
L401		Coil, FM aerial	32-4235
L402		Coil, shunt, s-w aerial	32-4050-5
L403		Coil, 6AU6 plate choke, FM	32-4061
L404		Coil, 6AU6 plate choke, AM	32-4189
L405		Coil, FM r-f	32-4067
L406		Coil, s-w r-f	Part of Z400
L407		Coil, bc. r-f	Part of Z400
L408		Coil, plate choke, osc.-doubler	32-4061
L409		Coil, frequency doubler	32-4071
L410		Coil, s-w osc.	32-4069
L411		Coil, bc. osc.	32-4188
LA400		Loop aerial	76-2344
LA401		FM aerial	76-2029-12
J400		Jack, FM aerial	27-6214-1
R400		Resistor, grid return, 2.2 megohms	66-5223340*
R401		Resistor, a-v-c volt. div., 2.2 megohms	66-5223340*
R402		Resistor, cathode bias, 82 ohms	66-0823340*
R403		Resistor, screen dropping, 39,000 ohms	66-3393340*
R404		Resistor, plate load, 6800 ohms	66-2683340*
R405		Resistor, parasitic suppressor, 10 ohms	66-0103340*
R406		Resistor, grid bias, 22,000 ohms	66-3223340*
R407		Resistor, plate load (AM), 27,000 ohms	66-3273340*
R408		Resistor, grid bias, 220,000 ohms	66-4223340*
R409		Resistor, grid return, 2.2 megohms	66-5223340*
R410		Resistor, cathode bias, 1000 ohms	66-2103340*
R411		Resistor, plate decoupling, 56,000 ohms	66-3563340*
R412		Resistor, filter, 470 ohms	66-3564340*
T400		Transformer, FM osc.	32-4070
TB400		Terminal panel, loop aerial	38-9870
WS-1		A-c switch, phono power off-on (part of 76-2333-1)	42-1840
WS-2 (F, R)		Switch-wafer (part of 76-2333-1)	54-7523
WS-3 (F, R)		Switch-wafer (part of 76-2333-1)	54-7524
WS-5 (F, R)		Switch-wafer (part of 76-2333-1)	54-7526
WS-6 (F, R)		Switch-wafer (part of 76-2333-1)	54-7527
WS-7 (F, R)		Switch-wafer (part of 76-2333-1)	54-7528
Z400		Transformer assembly, bc. and s-w r-f	32-4187

MISCELLANEOUS

Description	Model	Service Part No.
Bin lamp switch-and-cable assembly	48-1274, 76	76-2429-2
Bin lamp	48-1274, 76	34-2039
Cable and plug, speaker	48-1274, 76	41-3734-2
Cabinet Parts and Hardware		
Baffle, speaker	48-1274	219049
Baffle, speaker	48-1276	219048
Baffle and cloth	48-1274	40-6786
Baffle and cloth	48-1276	40-6820
Bin mechanism, l.h.	48-1274, 76	76-3223-2
Bin mechanism, r.h.	48-1274, 76	76-3223-3
Bracket, pilot lamp, l.h.	48-1274	56-3550-1FA3
Bracket, pilot lamp, r.h.	48-1274	56-3550-FA3
Bracket and cradle	48-1274	76-2188
Cabinet	48-1274 (mahogany)	10658B
Cabinet	48-1276	10657
Cabinet back	48-1274	40-6830
Cabinet back	48-1276	40-6831
Dome	48-1274, 76	45-6042
Hinge, continuous	48-1274	56-3627
Hinge, continuous	48-1276	56-3627-2
Hinge, lid separator	48-1274, 76	45-6301
Hinge, lid	48-1276	56-3837

MISCELLANEOUS (Continued)

Description	Model	Service Part No.
Hinge, pivot (2 req.)	48-1274, 76	45-6036
Lamp bracket	48-1274, 76	56-2332
Plate, high fidelity	48-1274, 76	56-4403FA30
Pull, door, brass	48-1274	56-3927
Pull, door, brass (2 req.)	48-1276	56-3928
Pull, door, brass (4 req.)	48-1276	56-3972
Chassis Mtg. Hardware		
Grounding spring	48-1274, 76	57-2140
Foot, rubber	48-1274, 76	54-4040
Dial Backplate and Hardware		
Backplate-and-pulley assembly	48-1274, 76	76-2326
Collar and pulley	48-1274, 76	76-2343
Dial backplate	48-1274, 76	56-3544
Drive cord, pointer (25-ft. spool)	48-1274, 76	45-8750*
Drive cord, tuning condenser (25-ft. spool)	48-1274, 76	45-8750*
Light conductor (plexiglass)	48-1274, 76	54-7279
Pointer	48-1274, 76	76-2327
Spring, pointer drive	48-1274, 76	28-8953
Spring, tuning-condenser drive	48-1274, 76	28-8751
Dial Scale and Hardware		
Dial-scale-and-rubber-shim assembly	48-1274 (mahogany)	76-3202
Dial-scale-and-rubber-shim assembly	48-1274 (walnut)	76-3202-1
Dial-scale-and-rubber-shim assembly	48-1276	76-3202-2
Scale bracket	48-1274, 76	56-3833
Scale bracket	48-1274, 76	56-3832
Knob	48-1274 (mahogany), 76	54-4329
Knob, high-fidelity	48-1274 (mahogany), 76	54-4338
Knob, push button	48-1274, 76	54-4292-1
Lamp brace (pilot)	48-1276	56-3628FA3
Lamp-socket assembly, pilot	48-1274, 76	76-2109-3
Lamp-socket assembly, telltale	48-1274, 76	41-3737-1
Mtg. frame	48-1276	76-2198
Pilot-lamp assembly	48-1274, 76	76-2109-3
Push-button cap	48-1274, 76	54-4294
Socket, loktal (1 req.)	48-1274, 76	27-6207-1
Socket, loktal (8 req.)	48-1274, 76	27-6138*
Socket, octal	48-1274, 76	27-6174
Socket, miniature	48-1274, 76	27-6203-1
Shield, 6AU6 tube	48-1274, 76	56-3978-1FA3
Shield, pilot lamp	48-1274, 76	56-3549
Tab, OFF	48-1274, 76	54-4317-1
Tab, BC	48-1274, 76	54-4317-2
Tab, SW	48-1274, 76	54-4317-3
Tab, FM	48-1274, 76	54-4317-4
Tab, PHONO	48-1274, 76	54-4317-5
Tab kit (station call letters)	48-1274, 76	40-6943
Telltale jewel	48-1274, 76	54-4304
Tuner assembly (Philco Electromechanical)		
Push-Button Tuner	48-1274, 76	76-2150
Wrench, push-button setting	48-1274, 76	W2524

NOTE: Tuning-condenser gang is not separately replaceable.
Order "Tuner assembly (Philco Electromechanical Push-Button Tuner), 76-2150."

PHILCO

AUTOMATIC BAND SELECTOR

Description	Service Part No.
A-c switch (WS-1), phono power	42-1840
Gear-and-switch assembly	76-2333-1
Gear-and-pinion assembly (input)	76-2348
Gear-and-pinion assembly (intermediate)	76-2350
Switch wafer WS-2, (F, R)	54-7523
Switch wafer WS-3, (F, R)	54-7524
Switch wafer WS-4, (F, R)	54-7525
Switch wafer WS-5, (F, R)	54-7526
Switch wafer WS-6, (F, R)	54-7527
Switch wafer WS-7, (F, R)	54-7528
Motor	35-1324
Muting-switch assembly (S103)	76-2346
Pinion-and-clutch-dog assembly	76-2349
Washer, felt	27-4109-1
Washer, fibre	11W46211

MODEL 49-100

PHILCO CORP.



MODEL 49-100

SPECIFICATIONS

CABINET	Plastic, brown finish
CIRCUIT	Four-tube superheterodyne
FREQUENCY RANGE	540 to 1720 kc.
AUDIO OUTPUT	220 mw.
POWER SUPPLY.....	Battery pack, Philco P-60B-6L
PLATE VOLTAGE AND CURRENT.....	90 volts, 10 ma.
FILAMENT VOLTAGE AND CURRENT,	
	1.5 volts, 25 amp.
POWER CONSUMPTION (total,	
plate and filament)	1 watt
AERIAL.....	External, Philco Part No. 45-1469
INTERMEDIATE FREQUENCY.....	455 kc.
PHILCO TUBES (4).....	1LA6, 1LN5, 1LH4, 3LF4

Philco TROUBLE-SHOOTING Procedure

For rapid trouble shooting, the radio circuit is divided into four sections, with test points specified for each section; these sections and test points are indicated in the schematic diagram. The trouble-shooting procedure given for each section includes a simplified test chart and a bottom view of the chassis showing the locations of the test points and the components of that section.

In each chart, the first step is a master check for determining whether trouble exists in that section, without going through the entire test procedure.

Failure to obtain the "NORMAL INDICATION" in any given step indicates trouble within the circuit under test.

After isolating the trouble to a single stage, the defect is located by: first, testing the tube; second, measuring tube electrode voltages; third, measuring circuit resistances; fourth, substituting condensers. The trouble revealed should be corrected before testing further.

Circuit Description

Philco Model 49-100 is a four-tube, battery-operated superheterodyne, providing reception on the standard broadcast band, 540-1720 kc. Manual tuning is employed. A 100-foot (overall), outdoor aerial, such as Philco Part No. 45-1469, is recommended.

The converter stage employs a type 1LA6 pentagrid converter tube; in this tube, the oscillator signal is fed to the mixer section through the electron stream within the tube.

A type 1LN5 pentode tube is used in the i-f amplifier stage. The diode section of the 1LH4 tube provides detection and a-v-c voltage, and the triode section functions as the first audio amplifier.

The first audio stage is resistance-coupled to the type 3LF4 output tube, which drives the permanent-magnet dynamic loud-speaker.

Preliminary Checks

The following preliminary checks should be made before turning on the radio:

1. Carefully inspect the top and bottom of the chassis. Make sure that all tubes are secure in the proper sockets, and look for any broken or shorted connections, burned resistors, or other obvious sources of trouble.

2. Disconnect the battery, and measure the resistance between B+ (red lead of battery plug) and chassis, with the ohmmeter polarity such that the highest resistance reading is obtained. If this reading is lower than 10,000 ohms, check condensers C100, C203, and C404 for leakage or shorts.

TROUBLE SHOOTING

Section 1

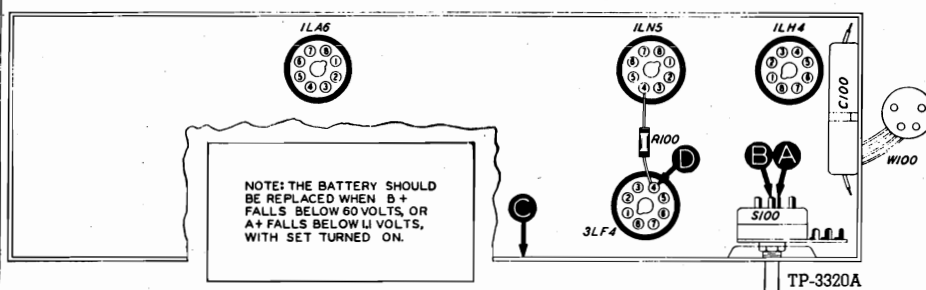


Figure 1. Bottom View, Showing Section 1 Test Points

For the tests in this section, use a d-c voltmeter, connecting the leads between the chassis, test point C, and the test points indicated in the chart. The voltages indicated were obtained from a fresh battery pack, and were measured with a 20,000-ohms-per-volt meter, with the radio turned on.

If the "NORMAL INDICATION" is obtained in the first step, proceed with the tests for Section 2; if not, isolate and correct the trouble in this section.

STEP	TEST POINT	NORMAL INDICATION	ABNORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A B D	85 volts 1.5 volts Negative 5 volts		Trouble within this section. Isolate by the following tests.
2	A	85 volts	No voltage Low voltage	Open battery cable. Defective S100. Open R100. Shorted C100. Weak battery. Change in value of R100. Leaky C100. Excessive current drain in Sections 2, 3, or 4.
3	B	1.5 volts	No voltage Low voltage	Open battery cable. Defective S100. Weak battery.
4	D	Negative 5 volts		Change in value of R100. Open R100. Excessive current drain in Sections 2, 3, or 4.

TROUBLE SHOOTING

Section 2

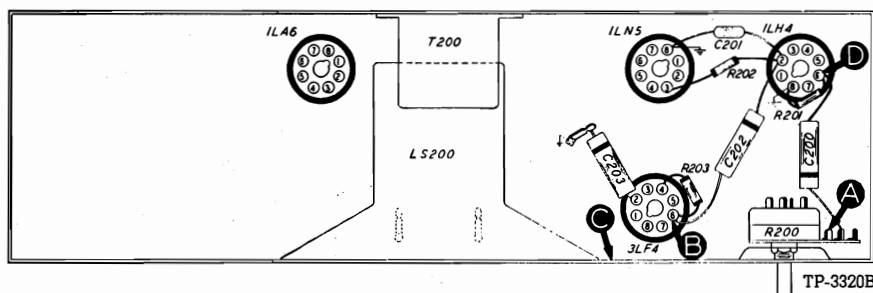


Figure 2. Bottom View, Showing Section 2 Test Points

For the tests in this section, use an audio signal. Connect the signal-generator ground lead to the radio chassis, test point C; connect the output lead through a .1-mf. condenser to the test points indicated in the chart. Set the radio volume control to maximum.

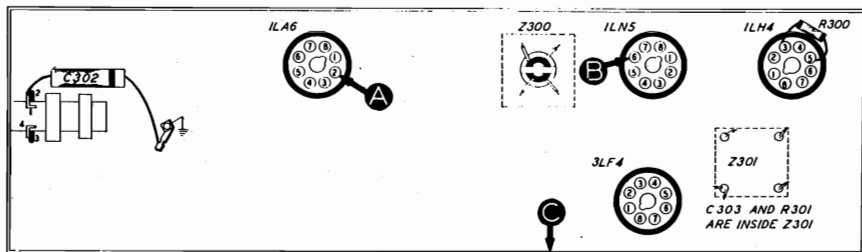
If the "NORMAL INDICATION" is obtained in the first step, proceed with the tests for Section 3; if not, isolate and correct the trouble in this section.

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with moderate signal input.	Trouble within this section. Isolate by the following tests.
2	B	Normal, clear signal with strong signal input.	Defective 3LF4 tube, T200, or LS200. Shorted or leaky C203 or C201.
3	D	Loud, clear signal with moderate signal input.	Defective 1LH4 tube. Open R202 or C202.
4	A	Loud, clear signal with moderate signal input.	Defective R200. Shorted C301D. Open C200.

Listening Test: Distortion may be caused by leaky C201, C202, C203, or C200, or by open R203 or R201.

TROUBLE SHOOTING

Section 3



TP-3320C

Figure 3. Bottom View, Showing Section 3 Test Points

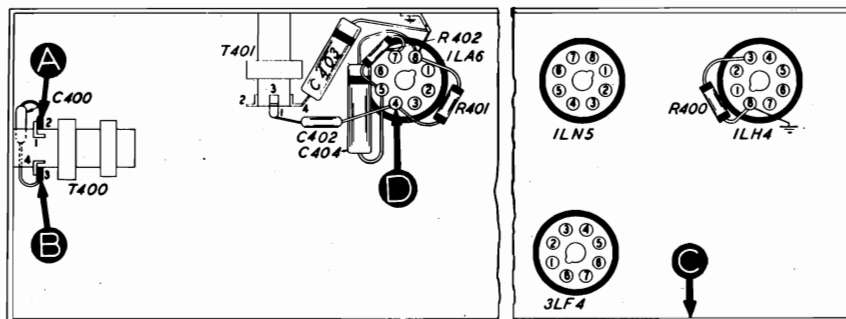
For the tests in this section, use an r-f signal generator with frequency set at 455 kc. (modulated output). Connect the generator ground lead to the chassis, test point C; connect the output lead through a .1-mf. condenser to the test points indicated in the chart. Set the radio volume control to maximum.

If the "NORMAL INDICATION" is obtained in the first step, proceed with the tests for Section 4; if not, isolate and correct the trouble in this section.

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with moderate signal input.	Trouble within this section. Isolate by the following tests.
2	B	Loud, clear signal with moderate signal input.	Defective 1LN5 or 1LH4 (diode section) tube. Defective or misaligned Z301. Open C302.
3	A	Loud, clear signal with moderate signal input.	Defective or misaligned Z300.

TROUBLE SHOOTING

Section 4



TP-3320D

Figure 4. Bottom View, Showing Section 4 Test Points

For the tests in this section, use an r-f signal generator with modulated output. Connect the generator ground lead to the chassis, test point C; connect the output lead through a .1-mf. condenser to the test points indicated in the chart. Set the generator and radio dials as noted in the chart.

Inspect the tuning condensers for bent plates, dirt, or poor wiper contacts; any of these conditions will cause noise.

If the "NORMAL INDICATION" is not obtained in the first step, isolate the trouble by following the remaining steps.

STEP	TEST POINT	DIAL SETTINGS		NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
		SIG. GEN.	RADIO		
1	A	540 kc.	540 kc.	Loud, clear signal with low signal input.	Trouble within this section. Isolate by the following tests.
2	B	540 kc.	540 kc.	Loud, clear signal with moderate signal input.	Defective 1LA6 tube, C401, C401A, or oscillator circuit. Shorted C404. Misaligned Z300.
3	D Osc. test (See Note below.)		540 to 1720 kc.	Negative voltage (at least 1.5 volts) over complete range.	Defective 1LA6 tube, T401, C401, or C401B. Open R401, R402, C402, or C403. Shorted or leaky C402 or C403.
4	A	540 kc.	540 kc.	Loud, clear signal with low signal input.	Defective T400 or C401.

NOTE: Connect positive lead of 20,000-ohms-per-volt meter to the chassis, test point C; connect prod end of negative lead through 100,000-ohm isolating resistor to test point D (oscillator grid, pin 4 of 1LA6 tube).

PHILCO CORP.

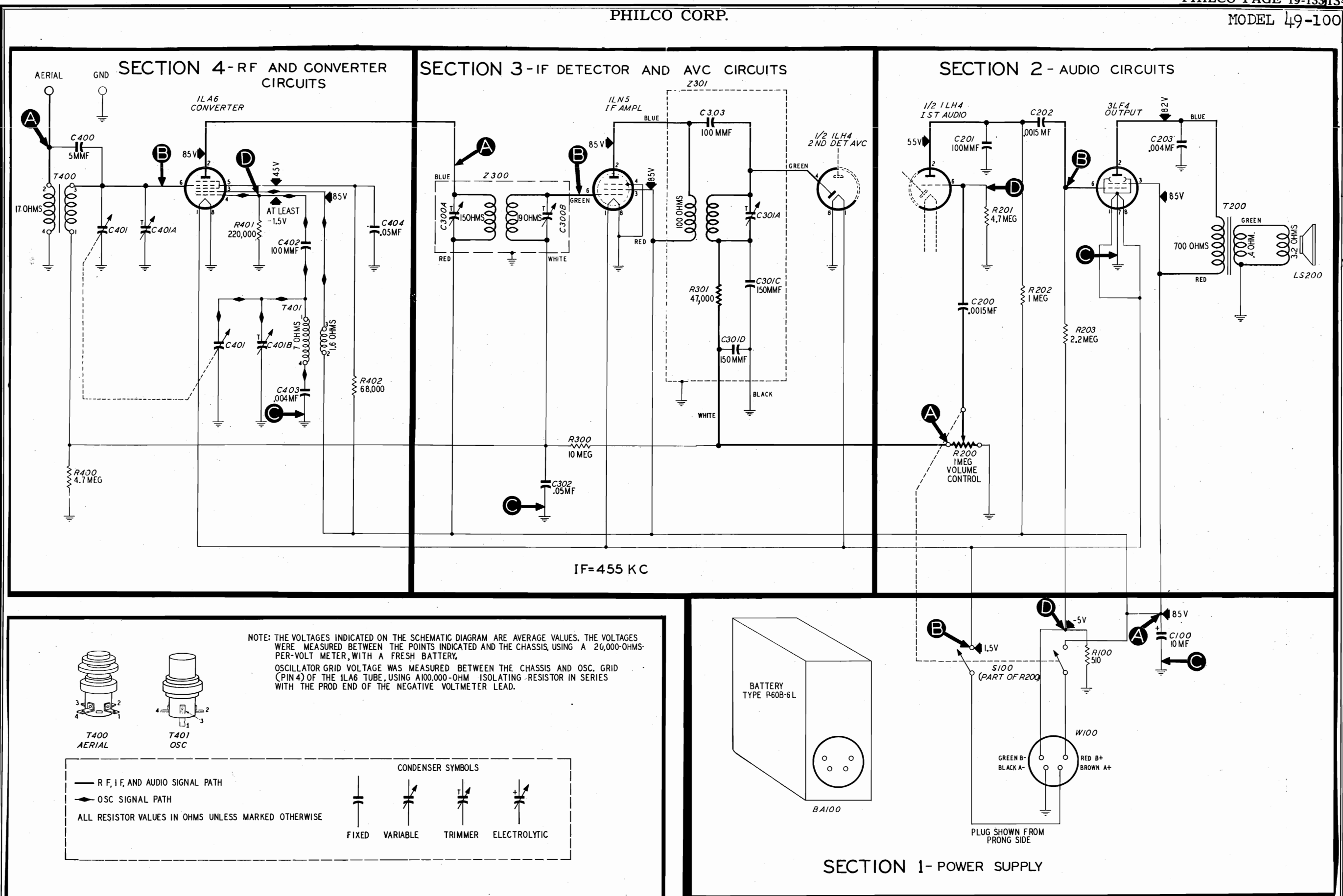


FIGURE 5. PHILCO RADIO MODEL 49-100, COMPLETE SECTIONALIZED SCHEMATIC, SHOWING ALL TEST POINTS

ALIGNMENT PROCEDURE
TURN ON RADIO POWER, AND SET VOLUME CONTROL TO MAXIMUM

DIAL—Alignment points should be marked on the dial backplate. Measurements for these points are shown in the composite dial-and-backplate photo, figure 8. With tuning condensers fully meshed, set dial pointer to index mark.

OUTPUT METER—Connect across speaker voice coil.

SIGNAL GENERATOR—Connect ground lead to chassis; connect output lead as indicated in chart.

OUTPUT LEVEL—During alignment, adjust signal-generator output to maintain output-meter indication below 1 volt.

STEP	SIGNAL GENERATOR		RADIO		ADJUST
	CONNECTIONS TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	
1	Through .1-mf. condenser to stator of aerial tuning condenser.	455 kc.	Tuning condenser fully meshed.	Adjust trimmers, in order given, for maximum output.	C301A C300A C300B
2	Through 200-mmf. condenser to external aerial connector.	1700 kc.	1700 kc.	Adjust for maximum output.	C401B
3	Same as Step 2.	1500 kc.	1500 kc. (approx.)	Tune radio to generator signal, and adjust trimmer for maximum output.	C401A

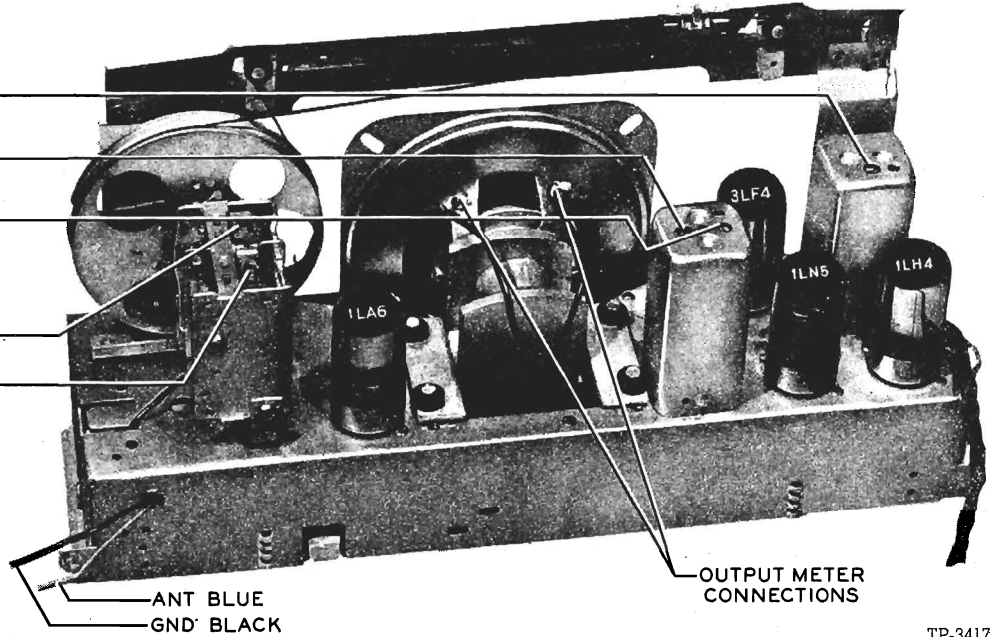


Figure 6. Top View, Showing Trimmer Locations

SYMBOLIZATION AND TERMINOLOGY

All components in the radio circuit are symbolized and located as follows:

- | | | |
|-----------------|-----------------|-----------------------|
| C—condenser | LA—loop aerial | S—switch |
| I—pilot lamp | LS—loud-speaker | T—transformer |
| L—choke or coil | R—resistor | Z—electrical assembly |

- 100-series components are in Section 1—the power supply.
- 200-series components are in Section 2—the audio circuits.
- 300-series components are in Section 3—the i-f, detector, and a-v-c circuits.
- 400-series components are in Section 4—the r-f and converter circuits.

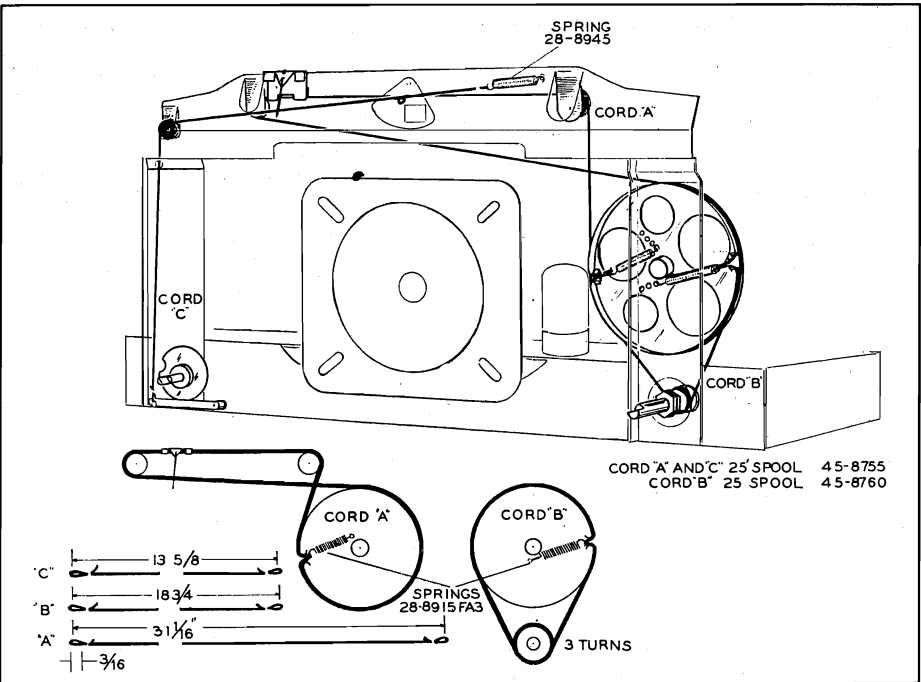


Figure 7. Drive-Cord Installation Details

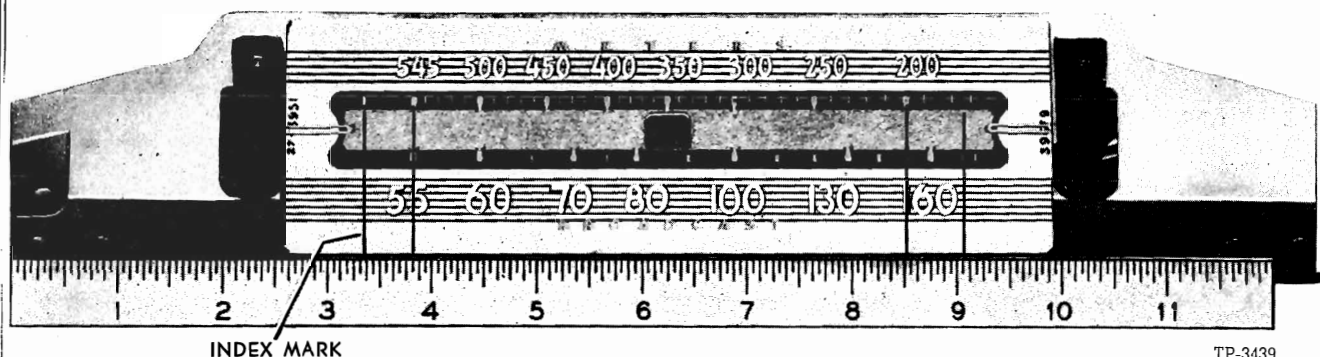


Figure 8. Composite Dial and Backplate, Calibration Details

REPLACEMENT PARTS LIST

NOTE: Part numbers marked with an asterisk (*) in the following parts list are general replacement items. These numbers may not be identical with those on factory assemblies; also, the electrical values of some replacement items may differ from the values indicated in the schematic diagram and parts list. The values substituted in any case are so chosen that the operation of the radio will be either unchanged or improved. When ordering replacements, use only the "Service Part No."

SECTION 1

Reference Symbol	Description	Service Part No.
BA100	Battery pack	P-60B-6L
C100	Condenser, electrolytic, 10 mf., a-f and r-f by-pass	30-2540*
R100	Resistor, 510 ohms, bias	66-1513340*
S100	Switch, power	Part of R200
W100	Battery-cable assembly	41-3477-1

SECTION 2

C200	Condenser, .0015 mf., d-c blocking	30-4621*
C201	Condenser, 100 mmf., r-f by-pass	60-10105407*
C202	Condenser, .0015 mf., d-c blocking	30-4621*
C203	Condenser, .004 mf., tone compensation	30-4623*
LS200	Speaker	36-1507-3
R200	Volume control, 1 megohm	33-5554
R201	Resistor, 4.7 megohms, d-c grid return	66-5473340*
R202	Resistor, 1 megohm, plate load	66-5103340*
R203	Resistor, 2.2 megohms, d-c grid return	66-5223340*
T200	Output transformer	32-8323

SECTION 3

C300A	Condenser, trimmer	Part of Z300
C300B	Condenser, trimmer	Part of Z300
C301A	Condenser, trimmer	Part of Z301
C301B	Not used	
C301C	Condenser, 150 mmf., i-f filter	Part of Z301
C301D	Condenser, 150 mmf., i-f filter	Part of Z301
C302	Condenser, .05 mf., a-v-c filter	30-4518*
C303	Condenser, 100 mmf., coupling, part of Z301	30-1225-2*
R300	Resistor, 10 megohms, a-v-c filter	66-6103340*
R301	Resistor, 47,000 ohms, i-f filter, part of Z301	66-3473340*
Z300	Transformer, 1st i-f, includes C300A and C300B	32-3949-1*
Z301	Transformer, 2nd i-f, includes C301A, C301C, C301D, C303, and R301	32-3897*

SECTION 4

Reference Symbol	Description	Service Part No.
C400	Condenser, 5 mmf., coupling	60-90505007
C401	Condenser, main tuning	31-2721-1
C401A:	Condenser, trimmer, aerial coil	Part of C401
C401B:	Condenser, trimmer, osc. coil	Part of C401
C402	Condenser, 100 mmf., osc. grid	30-1225-2*
C403	Condenser, .004 mf., osc. tracking	30-4623*
C404	Condenser, .05 mf., r-f by-pass	30-4518*
R400	Resistor, 4.7 megohms, a-v-c voltage divider	66-5473340*
R401	Resistor, 220,000 ohms, osc. grid leak	66-4223340*
R402	Resistor, 68,000 ohms, screen dropping	66-3683340*
T400	Transformer, aerial	32-3919-2
T401	Transformer, oscillator	32-3385-4

MISCELLANEOUS

Description	Service Part No.
Cabinet, Less Dial Scale	10618A
Cabinet Hardware	
Baffle and cloth assembly	40-6910
Dial Scale	27-5951
Dial-Scale Hardware	
Screw, strap mtg.	1W23129FA3
Strap, scale mtg., r.h.	56-2672FA3
Strap, scale mtg., l.h.	56-2671FA3
Knob (2)	54-4323
Stud, baffle mtg.	W2235-2FA9
Scale Plate, Flag and Upright Assembly	76-3131
Cord, drive (25-ft. spool) for flag	45-8755
Cord, drive (25-ft. spool), for pointer	45-8755
Pointer	56-2896
Spring, flag drive	28-8945FA3
Spring, cam plate, flag drive	57-0701FA1
Spring, retaining	57-1468FA1
Transfer-lever assembly	76-1655-2
Socket, Loktal	27-6207
Tuning-Condenser Hardware	
Cord, drive (25-ft. spool), for tuning condenser	45-8760
Spring, tuning-condenser drive	28-8913FA3
Tuning-shaft assembly	31-2640

MODEL 49-101

PHILCO CORP.

Circuit Description

Philco Model 49-101 is a four-tube superheterodyne operating on a.c., d.c., or battery, and providing reception on the standard-broadcast band. A 100-foot (overall length), outdoor aerial, such as Philco Part No. 45-1469, is recommended.

The aerial is transformer-coupled to the 1R5 converter, where the incoming signal is converted to the 455-kc. intermediate frequency. A 1T4 is used in a single high-gain stage of i-f amplification, which employs neutralization to suppress oscillation. A 1.5-mmf. condenser, C304, feeds part of the i-f voltage, of the proper phase, back to the 1T4 grid through the tube-socket capacitance.

A 1U5 diode-pentode is used in the detector, a-v-c, and first audio circuits. The pentode section is resistance-coupled to a 3V4 pentode output amplifier, which works into a p-m speaker.

The d-c operating voltages are obtained from either a battery pack, Philco type P-326, or from a 105—120 volt, a-c or d-c power line. For power-line operation, the plate, screen, and filament voltages are provided by a power supply using a selenium rectifier (CR100).

Philco TROUBLE-SHOOTING Procedure

For rapid trouble shooting, the radio circuit is divided into four sections, with test points specified for each section; these sections and test points are indicated in the schematic diagram. The trouble-shooting procedure given for each section includes a simplified test chart and a bottom view of the chassis showing the locations of the test points and the components of that section.

In each chart, the first step is a master check for determining whether trouble exists in that section, without going through the entire chart.

Failure to obtain the "NORMAL INDICATION" in any given step indicates trouble within the circuit under test.

After isolating the trouble to a single stage, the defect is located by: first, testing the tube; second, measuring tube electrode voltages; third, measuring circuit resistances; fourth, substituting condensers. The trouble revealed should be corrected before testing further.

Preliminary Checks

To avoid possible damage to the radio, the following preliminary checks should be made before turning on the power:



MODEL 49-101

SPECIFICATIONS

CABINET	Molded Polystyrene (dark brown)
CIRCUIT	Four-tube superheterodyne
FREQUENCY RANGE	540—1600 kc.
AUDIO OUTPUT	160 milliwatts
OPERATING VOLTAGES	Battery: "B", 90 volts; "A", 7.5 volts. A.c./d.c.: 105—120 volts
POWER CONSUMPTION	Battery: "B", 13 ma. at 90 volts; "A", 50 ma. at 7.5 volts. A.c./d.c.: 25 watts
AERIAL	Terminal provided for external aerial
INTERMEDIATE FREQUENCY	455 kc.
PHILCO TUBES (4)	1R5, 1T4, 1U5, 3V4
BATTERY TYPE	Philco P-326

TP-6524

1. Inspect both the top and the bottom of the chassis. Make sure that all tubes are secure in the proper sockets, and look for any broken or shorted connections, burned resistors, or other obvious sources of trouble.

2. Check the total filament resistance, with the power switch turned on, the battery plug disconnected from the battery, and the change-over switch in the battery position (power-cord plug inserted in receptacle on rear of chassis). If the resistance between the A⁺ and A⁻ pins on the battery plug is higher than 100 ohms, one of the tube filaments is probably open.

NOTE: If the 3V4 filament is open, check condenser C202 before replacing the tube.

3. Measure the resistance between B⁺ (output of selenium rectifier), test point D, and B⁻, test point B. See figure 1. When the ohmmeter leads are connected in the proper polarity, the highest resistance reading will be obtained. If the reading is lower than 2000 ohms, check condensers C101A and C101B for leakage or shorts.

The resistance value above, which is much lower than normal, does not represent a quality check of these condensers; it is the lowest value which will permit the rectifier to operate safely while the voltage checks of Section 1 (power supply) are performed.

Section 1—Power Supply

Make the tests for this section with a d-c voltmeter. Connect the negative lead to B—, test point B; connect the positive lead to the test points indicated in the chart. The voltage readings given were taken with a 20,000-ohms-per-volt meter at a line voltage of 117 volts, a.c.

Set the volume control to minimum.

The battery pack should be replaced when the "A" voltage drops below 5 volts, or the "B" voltage drops below 60 volts.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 2 (audio circuits); if not, isolate and correct the trouble in this section.

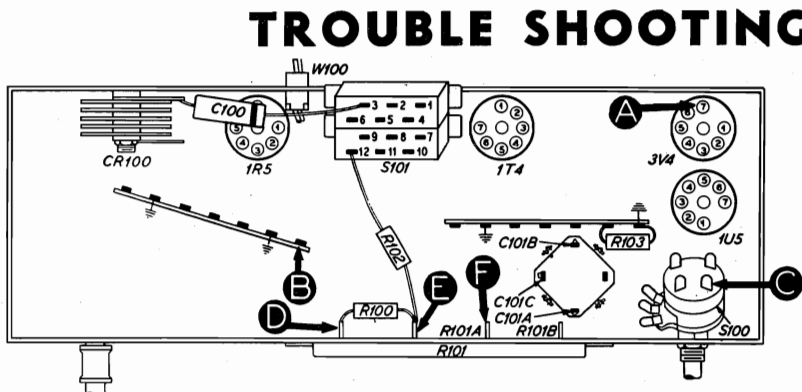


Figure 1. Bottom View, Showing Section 1 Test Points

TP-5355A

STEP	TEST POINT	NORMAL INDICATION	ABNORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1(a) 1(b)	A C	7.5v 90v		Trouble in this section. Isolate by the following tests.
2	D	125v	Low voltage No voltage	Defective: CR100. Open: C101A. Defective: CR100. Open: S100, S101.
3	E	120v	Low voltage No voltage	Changed resistance: R100. Leaky: C101A. Open: R100. Shorted: C101A.
4	F	65v	Low voltage No voltage	Changed resistance: R101A. Leaky: C101B. Open: R101A. Shorted: C101B.
5	A	7.5v	Low voltage High voltage No voltage	Changed resistance: R101B. Open: One or more filaments, R205*. Open: R101B, S101.
6	C	90v	Low voltage High voltage No voltage	Changed resistance: R102. Leaky: C101C. Open: R205*, T200*, S100. Open: R102, S101. Shorted: C101C.

Listening Test: Abnormal hum may be caused by open C101B, C101C, or C202*.

*This part, located in another section, may cause abnormal indication in this section.

Section 2—Audio Circuits

For the tests in this section, use an audio-frequency signal generator. Connect the generator ground lead to B—, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the radio volume control to maximum.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 3 (i-f, detector, and a-v-c circuits); if not, isolate and correct the trouble in this section.

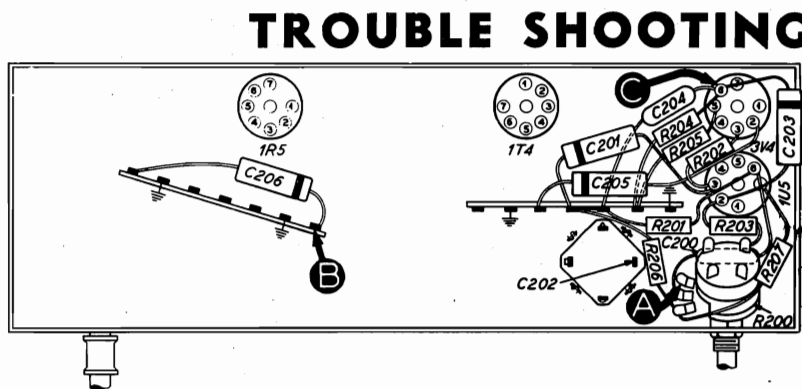


Figure 2. Bottom View, Showing Section 2 Test Points

TP-5355B

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear speaker output with moderate generator input.	Trouble in this section. Isolate by the following tests.
2	C	Clear speaker output with strong generator input.	Defective: 3V4, LS200. Open: R204, T200. Shorted: C203, C204, C205, T200.
3	A	Same as step 1.	Defective: 1U5, R200 (rotate). Open: C200, R201, R202, R203, C203. Shorted: C201, C301C*.

Listening Test: Distortion may be caused by leaky or shorted C203, or by changed resistance of R202. Distortion or strong signals may be caused by leaky or shorted C200.

*This part, located in another section, may cause abnormal indication in this section.

Section 3—I-F, Detector, And A-V-C Circuits**TROUBLE SHOOTING**

For the tests in this section, use an r-f signal generator, with modulated output, set at 455 kc. Connect the generator ground lead to B-, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the radio volume control to maximum.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 4 (r-f and converter circuits); if not, isolate and correct the trouble in this section.

To provide a complete i-f amplifier check, test point A for this section is placed at the grid of the mixer in Section 4; therefore, the effectiveness of step 1 as a master check is dependent upon the condition of certain parts in the mixer circuit. These parts are listed below under "POSSIBLE CAUSE OF ABNORMAL INDICATION."

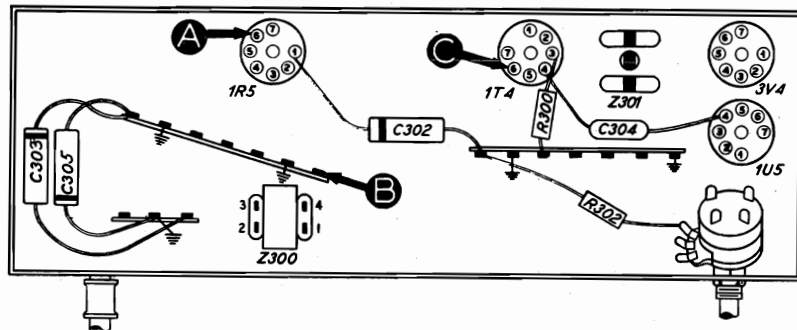


Figure 3. Bottom View, Showing Section 3 Test Points

TP-6983B

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear speaker output with weak generator input.	Trouble in this section. Isolate by the following tests.
2	C	Loud, clear output with moderate input.	Defective: 1T4, 1U5 (diode section). Misaligned: Z301. Open: R300, C303, L301A, R301, L301B, C301A. Shorted: C300B, C303, L301A, L301B, C301A, C301B.
3	A	Same as step 1.	Defective: 1R5*. Misaligned: Z300. Open: C300A, L300A, L300B, C300B, T400*. Shorted: C400A*, C400B*, C300A, L300A, L300B, C300B.

*This part, located in another section, may cause abnormal indication in this section.

Section 4—R-F And Converter Circuits**TROUBLE SHOOTING**

For the tests in this section, with the exception of the oscillator test, use an r-f signal generator with modulated output. Connect the generator ground lead to B-, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the radio volume control to maximum. Set the tuning control and signal-generator frequency as indicated in the chart.

If the "NORMAL INDICATION" is obtained in step 1, further steps should be unnecessary; if not, isolate and correct the trouble in this section. If the trouble is not revealed by the tests for this section, check the alignment.

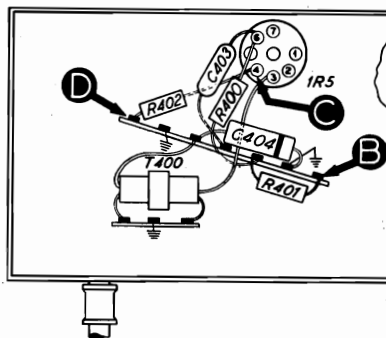


Figure 4. Bottom View, Showing Section 4 Test Points

TP-6983A

STEP	TEST POINT	SIGNAL GEN. FREQUENCY	RADIO TUNING	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	1000 kc.	Tune to signal.	Loud, clear speaker output with weak generator input.	Trouble in this section. Isolate by the following tests.
2	C to D (Osc. test; see note below.)		Rotate through range.	Negative 5 to 10 volts.	Defective: 1R5. Open: R402, T400, C404. Shorted: C402, C400, C400A.
3	A	1000 kc.	Tune to signal.	Same as step 1.	Open: C401, C403, R401, R400, T400. Shorted: C400, C400B.

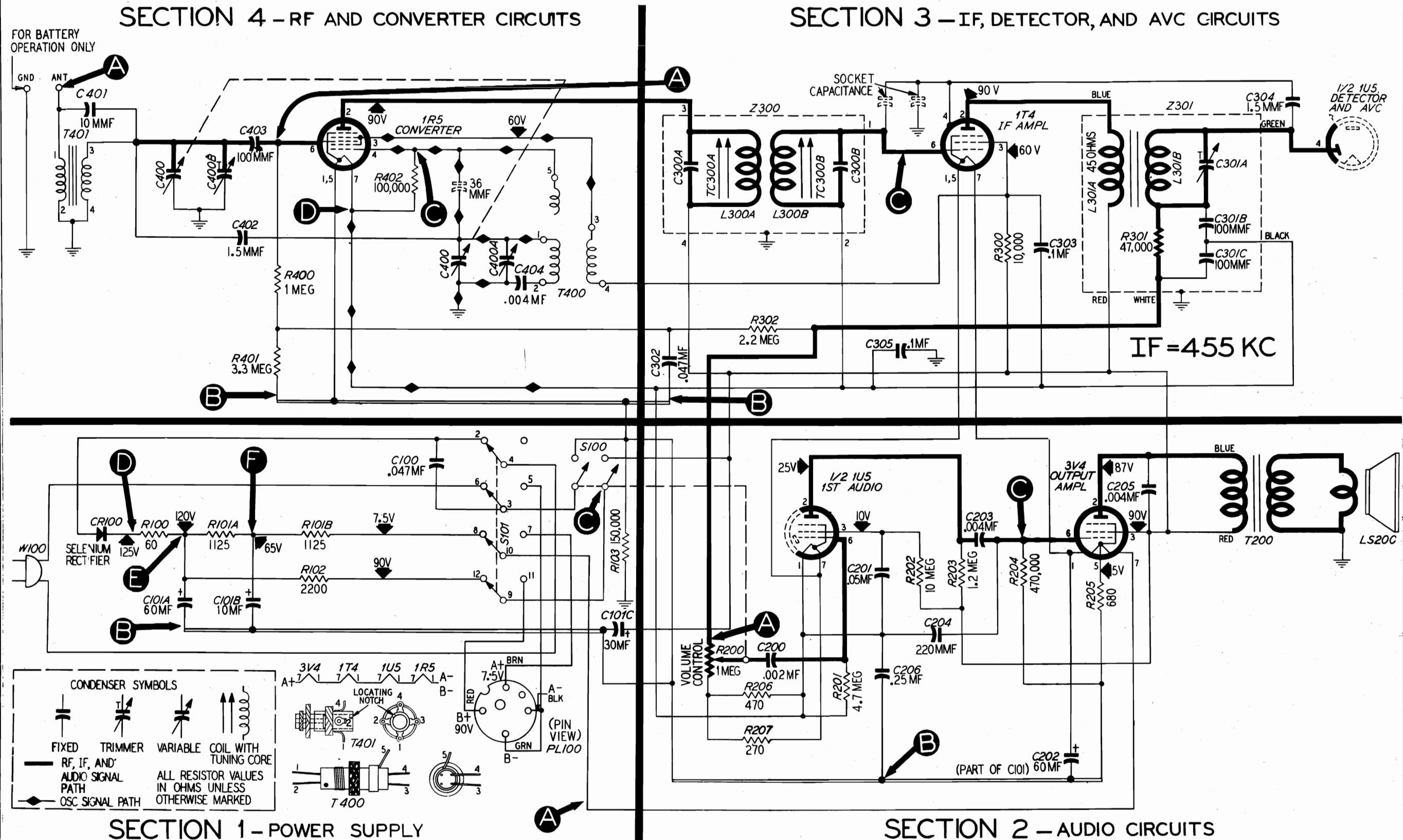


Figure 5. Philco Model 49-101, Sectionalized Schematic Diagram, Showing Test Points

OSCILLATOR TEST: Connect the positive lead of a high-resistance voltmeter to test point D; connect the prod end of the negative lead through a 100,000-ohm isolating resistor to the oscillator grid (pin 4 of the 1R5), test point C. Use a suitable meter range, such as 0-10 volts. Proper operation of the oscillator is indicated by negative voltage within the range given in the chart (measured with a 20,000-ohms-per-volt meter) throughout the tuning range.

ALIGNMENT PROCEDURE

DIAL—Calibration and pointer-index measurements are shown in figure 7. With tuning condenser fully meshed, set pointer to index mark.

RADIO CONTROLS—Set volume control to maximum.

OUTPUT METER—Connect across voice-coil terminals.

SIGNAL GENERATOR—Use modulated output.

OUTPUT LEVEL—During alignment, adjust signal-generator output to maintain output-meter indication below .5 volt.

SPECIAL NOTE—The orientation of the loop with respect to the chassis is critical for correct tracking. During alignment, with the cabinet back (containing the loop) laid down on the bench, the chassis should be laid on its back, in approximately its normal relation to the loop.

STEP	SIGNAL GENERATOR		RADIO		ADJUST
	CONNECTION TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	
1	Ground lead to B- (test point B in figure 4). Positive lead through .05-mf. condenser to external-aerial lead. Make sure that radio loop aerial is connected to radio.	455 kc.	Tuning condenser fully meshed.	Adjust, in order given, for maximum output.	C301A—2nd i-f sec. TC300B—1st i-f sec. TC300A—1st i-f pri.
2	Radiating loop (see note below).	1600 kc.	1600 kc.	Adjust for maximum output.	C400A—osc.
3	Same as step 2.	1500 kc.	1500 kc.	Adjust for maximum output while rocking tuning condenser.	C400B—aerial

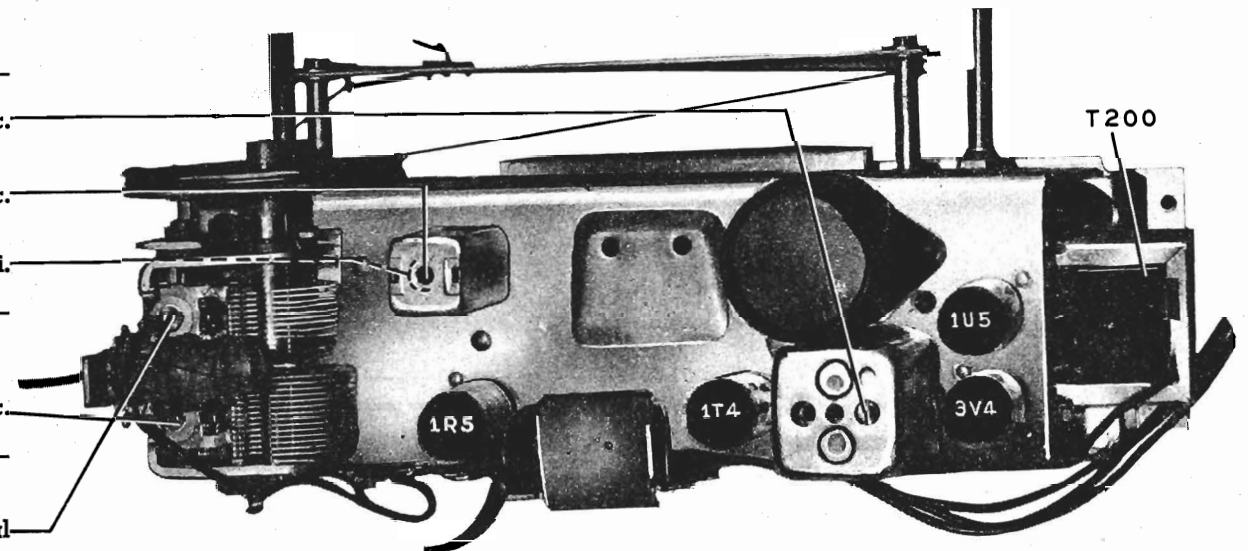


Figure 6. Top View, Showing Trimmer Locations

RADIATING LOOP: Make up a 6—8-turn, 6-inch-diameter loop, using insulated wire; connect to signal-generator leads and place near radio loop aerial. Make sure that radio loop aerial is connected to radio.

CALIBRATING DIAL BACKPLATE

When the radio chassis has been removed from the cabinet, dial-calibration and alignment points may be marked on the dial (chassis) backplate at the end of the pointer with a pencil. The method of measuring for these points is illustrated in figure 7.

With the tuning gang fully meshed, the pointer should be adjusted on the dial-drive cord to coincide with the index mark.

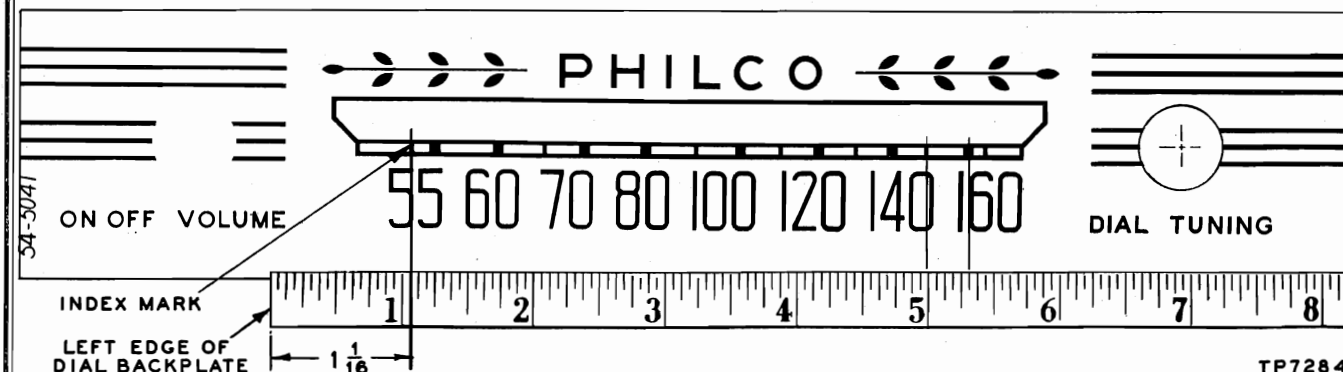


Figure 7. Dial-Backplate Calibration Measurements

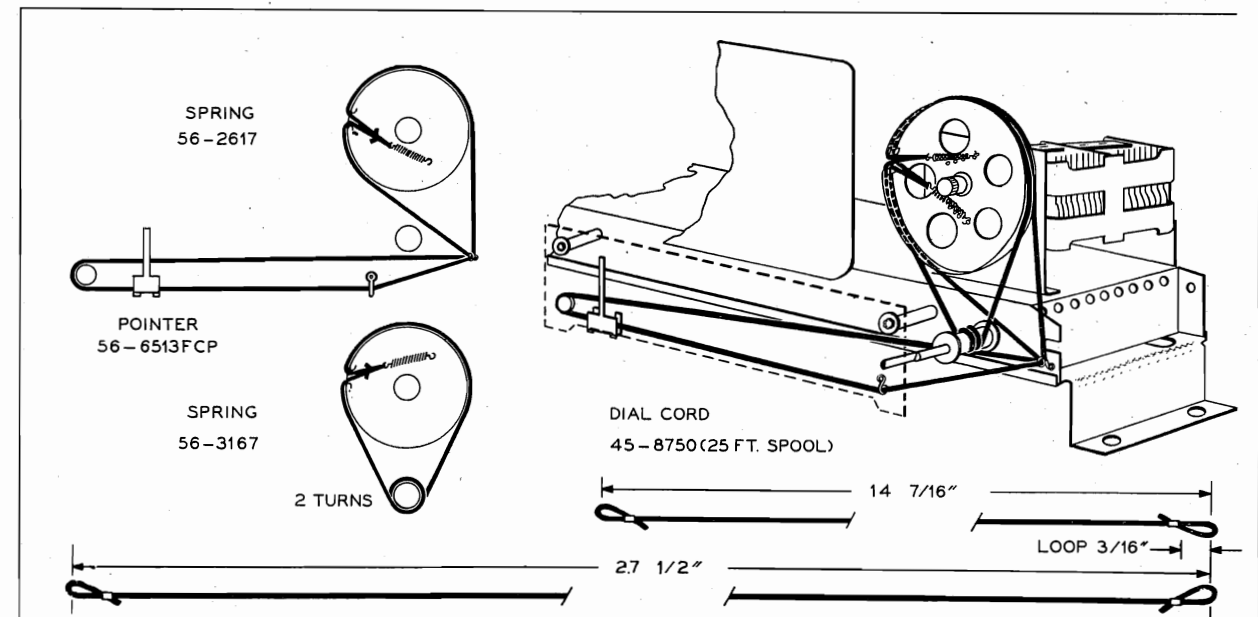


Figure 8. Drive-Cord Installation Details

TP-6983C

SYMBOLIZATION

The components in the radio circuit are symbolized according to the types of parts and the sections of the radio in which the parts are located. The prefix letter of the symbol designates the type of part, as follows:

C — condenser	LS — loud-speaker	T — transformer
I — pilot lamp	R — resistor	W — line cord
L — choke or coil	S — switch	Z — electrical assembly
LA — loop aerial		

The number of the symbol designates the section in which the part is located, as follows:

- 100-series components are in Section 1—the power supply
- 200-series components are in Section 2—the audio circuits
- 300-series components are in Section 3—the i-f, detector, and a-v-c circuits
- 400-series components are in Section 4—the r-f and converter circuits

A suffix letter identifies the part as a component of the assembly which bears an identical number without a suffix letter, and with perhaps a different prefix letter.

REPLACEMENT PARTS LIST

NOTE: Part numbers identified by an asterisk (*) are general-replacement items. These numbers may not be identical with those on factory assemblies; also, the electrical values of some replacement items may differ from the values indicated in the schematic diagram and parts list. The values substituted in any case are so chosen that the operation of the radio will be either unchanged or improved. When ordering replacements, use only the "Service Part No."

SECTION 1 POWER SUPPLY

Reference Symbol	Description	Service Part No.
C100	Condenser, line filter, .047 mf.	61-0122*
C101	Condenser, electrolytic, filter, 4-section	30-2568-26
C101A	Condenser, filter, 60 mf., 150v	Part of C101
C101B	Condenser, filter, 10 mf., 150v	Part of C101
C101C	Condenser, filter, 30 mf., 150v	Part of C101
CR100	Rectifier, selenium	34-8003
PL100	Battery-cable-and-plug assembly	41-3712-4
R100	Resistor, current-limiting, 60 ohms, 1w	33-1334
R101	Resistor, 2-section	33-3431-5
R101A	Resistor, filament dropping, 1125 ohms	Part of R101
R101B	Resistor, filament dropping, 1125 ohms	Part of R101
R102	Resistor, filter, 2200 ohms	66-2223340*
R103	Resistor, leakage, 150,000 ohms	66-4153340*
S100	Switch, on-off	Part of R200
S101	Switch, change-over	42-1821
W100	Line-cord-and-plug assembly	L-2183*

SECTION 2 AUDIO CIRCUITS

C200	Condenser, d-c blocking, .002 mf.	61-0108*
C201	Condenser, screen by-pass, .05 mf.	61-0122*
C202	Condenser, filter, 60 mf., 25v	Part of C101
C203	Condenser, d-c blocking, .004 mf.	61-0179*
C204	Condenser, r-f by-pass, 220 mmf.	30-1224-20*
C205	Condenser, tone compensation, .004 mf.	61-0179*
C206	Condenser, by-pass, .25 mf.	61-0125*
LS200	Speaker, p-m	36-1629-1
R200	Volume control (with on-off switch), 1 megohm	33-5538-28
R201	Resistor, grid return, 4.7 megohms	66-5473340*
R202	Resistor, screen dropping, 10 megohms	66-6103340*
R203	Resistor, plate load, 1.2 megohms	66-5123340*
R204	Resistor, grid return, 470,000 ohms	66-4473340*
R205	Resistor, bias, 680 ohms	66-1683340*
R206	Resistor, diode return, 470 ohms	66-1473340*
R207	Resistor, diode return, 270 ohms	66-1273340*
T200	Transformer, output	32-8259-3

SECTION 3 I-F, DETECTOR, AND A-V-C CIRCUITS

C300A	Condenser, shunt, fixed trimmer	Part of Z300
C300B	Condenser, shunt, fixed trimmer	Part of Z300
C301A	Condenser, trimmer	Part of Z301
C301B	Condenser, filter	Part of Z301
C301C	Condenser, filter	Part of Z301
C302	Condenser, a-v-c filter, .047 mf.	61-0122*
C303	Condenser, screen by-pass, .1 mf.	61-0113*

SECTION 3 (Continued) I-F, DETECTOR, AND A-V-C CIRCUITS

Reference Symbol	Description	Service Part No.
C304	Condenser, neutralizing, 1.5 mmf.	30-1221-3
C305	Condenser, i-f by-pass, .1 mf.	61-0113*
L300A	Transformer primary, 1st i-f	Part of Z300
L300B	Transformer secondary, 1st i-f	Part of Z300
L301A	Transformer primary, 2nd i-f	Part of Z301
L301B	Transformer secondary, 2nd i-f	Part of Z301
R300	Resistor, screen dropping, 10,000 ohms	66-3103340*
R301	Resistor, filter, 47,000 ohms (part of Z301)	66-3473340*
R302	Resistor, a-v-c filter, 2.2 megohms	66-5223340*
TC300A	Tuning core, 1st i-f pri.	Part of Z300
TC300B	Tuning core, 1st i-f sec.	Part of Z300
Z300	Transformer, 1st i-f	32-4160-4
Z301	Transformer, 2nd i-f	32-3987-3

SECTION 4 R-F AND CONVERTER CIRCUITS

C400	Condenser, tuning gang	31-2727-2
C400A	Condenser, trimmer, oscillator	Part of C400
C400B	Condenser, trimmer, aerial	Part of C400
C401	Condenser, isolating, 10 mmf.	30-1224-26*
C402	Condenser, neutralizing, 1.5 mmf.	30-1221-3
C403	Condenser, d-c blocking, 100 mmf.	62-110009001
C404	Condenser, fixed padder, .004 mf.	61-0179*
R400	Resistor, a-v-c divider, 1 megohm	66-5103340*
R401	Resistor, grid return, 3.3 megohms	66-5333340*
R402	Resistor, oscillator grid bias, 100,000 ohms	66-4103340*
T400	Transformer, oscillator	32-4282-1
T401	Transformer, aerial	32-3919-4

MISCELLANEOUS

Description	Service Part No.
Cabinet and Cabinet Parts	
Baffle-and-cloth assembly	40-7600
Back	54-7695
Cabinet	10732
Dial Hardware	
Dial-backplate assembly	76-4357
Drive cord (25-ft. spool)	45-8750*
Pointer	56-6513FCP
Scale	54-5041
Knob (2 required)	54-4227-5
Shaft-and-pulley assembly	76-3671-1
Socket, miniature (4 required)	27-6203
Spring, drive cord	56-2617
Switch-lever assembly	76-3666

MODELS 49-500,
49-500-I, 49-506

PHILCO CORP.

GENERAL INFORMATION

Philco Model 49-506 is a 5-tube superheterodyne. This set employs the same chassis as that used in Models 49-500 and 49-500-I, but is housed in a new-style cabinet which is supplied in either of two finishes, walnut or mahogany.

Circuit Description

The Philco Models 49-500 and 49-500-I are 5-tube, table-model superheterodyne radios, providing reception in the standard broadcast band.

The high-impedance loop aerial normally provides adequate signal pickup. An external aerial may be connected, if desired, by detaching the aerial lead (shown in figure 6) from the chassis, and connecting the lead to an external aerial lead-in. Do not use a ground.

The loop is coupled to the 7A8 converter tube. Variable-condenser tuning is employed, the oscillator rotor-section plates being shaped to obtain tracking, thus eliminating the necessity for a series padding condenser.

The 7A8 is transformer coupled to the 14A7 i-f amplifier, which is also transformer coupled to the diodes of the 14B6 second detector—first audio-frequency amplifier. A-v-c voltage is applied to the control grids of both the i-f and converter tubes.

The triode section of the 14B6 is the first audio stage, and is resistance coupled to the 50A5 output tube. The output tube is transformer coupled to a permanent-magnet dynamic speaker.

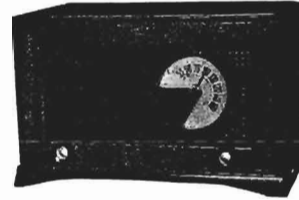
D-c operating voltages are obtained from a 35Z5GT half-wave rectifier, the output of which is filtered by a two-section resistor-condenser filter.

Condenser C304 in Section 3 is a special condenser, inductively wound to form a series-tuned circuit, resonant at the intermediate frequency. This special condenser offers less impedance at this frequency than a conventional condenser, thus permitting higher i-f gain, with no tendency toward instability. Since the tuning gang is connected to the chassis, by-passing at broadcast and short-wave frequencies is adequate. The inductive effect is negligible at audio frequencies.

The 150,000-ohm resistor, R100, in Section 1, prevents hum which might otherwise occur under conditions of high humidity.

Philco TROUBLE-SHOOTING Procedure

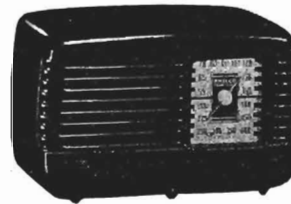
In this manual, the schematic diagram is divided into four sections, with a chassis layout for each section, showing components and test points for each section. The test points are also indicated on the schematic diagram in the corresponding section. A simplified trouble-shooting procedure is given in a chart for each section. The first step in each chart is a master check, indicating whether trouble exists in that section. Failure to obtain the "NORMAL INDICATION" in a



MODEL 49-506

SPECIFICATIONS

CABINET Wood, with plastic grille;
walnut or mahogany finish



MODEL 49-500 (Walnut)

MODEL 49-500-I (Ivory)

SPECIFICATIONS

CABINET Bakelite
CIRCUIT Five-tube superheterodyne
FREQUENCY RANGE 540 to 1620 kc.
OPERATING VOLTAGE 105 to 120 volts, a.c. or d.c.
POWER CONSUMPTION 30 watts
AERIAL Loop fastened to cabinet; terminal
also provided for outside aerial
INTERMEDIATE FREQUENCY 455 kc.
PHILCO TUBES (5) 7A8, 14A7, 14B6, 50A5, 35Z5GT

TP-2667

given step indicates trouble, which should be located by voltage, resistance, or capacitance checks of parts indicated in the step, and remedied before testing further.

Preliminary Checks

To avoid possible damage to the radio, the following preliminary checks should be made before turning on the power:

1. Carefully inspect both top and bottom of the chassis. Make sure that all tubes are secure in the proper sockets (see figure 6), and look for bad connections, burned resistors, or other obvious sources of trouble.
2. Measure the resistance between B+ and B- (test points C and B in figure 1), using the ohmmeter polarity giving the highest resistance reading; if the reading is lower than 50,000 ohms, check C101A, C101B, and C101C, for leakage or shorts. This resistance value, which is much lower than normal, does not represent a quality check of these condensers; it is the lowest value which will permit the rectifier to operate safely while the voltage tests of Section 1 (power supply) are performed.

PHILCO CORP.

MODELS 49-500,
49-500-I, 49-506

Section 1 — Power Supply

TROUBLE SHOOTING

For the tests in this section, use a d-c voltmeter; connect the leads to the test points indicated in the chart. The voltages shown were taken with a 20,000-ohms-per-volt meter at a line voltage of 117 volts, 60 cycles.

Turn the volume control to minimum, and set the dial pointer at 540 kc.

If the "NORMAL INDICATION" is obtained in step 1, proceed with tests for Section 2 (audio circuits); if not, isolate and correct the trouble within this section.

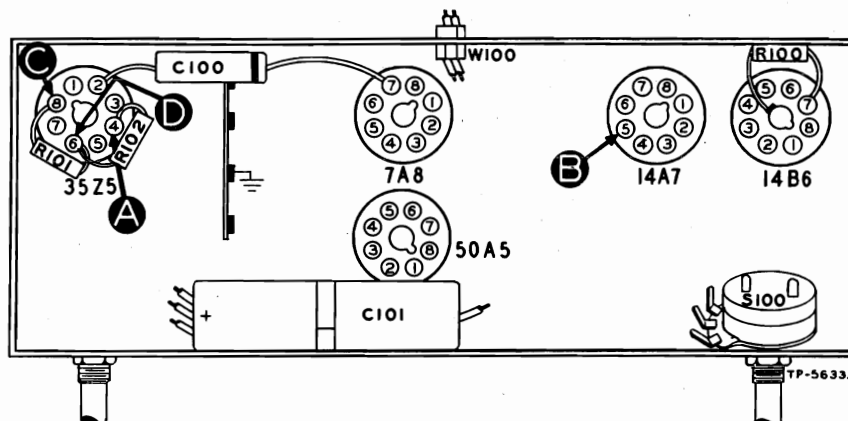


FIGURE 1. BOTTOM VIEW, SHOWING SECTION 1 TEST POINTS

STEP	TEST POINT	NORMAL INDICATION	ABNORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A to B	90v		Trouble within this section; isolate by the following tests.
2	C to B	115v	No voltage Low voltage High voltage	Defective 35Z5GT. Shorted: C101A. Defective: 35Z5GT. Open: C101A or I100. Leaky: C101A. Open: R101.
3	D to B	105v	No voltage Low voltage High voltage	Shorted: C101B. Open: C101B. Leaky: C101B or C203. Open: R102, T200, or R204.
4	A to B	90v	No voltage Low voltage High voltage	Shorted: C101C. Leaky: C101C. Open: R204.

Listening Test: Abnormal hum may be caused by open C101A, C101B, or C101C.

Section 2 — Audio Circuits

TROUBLE SHOOTING

For the tests in this section, use an audio-signal generator. Connect the ground lead of the generator to B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart. Set the volume control at maximum. If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 3 (i-f, detector, and a-v-c circuits); if not, isolate and correct the trouble within this section.

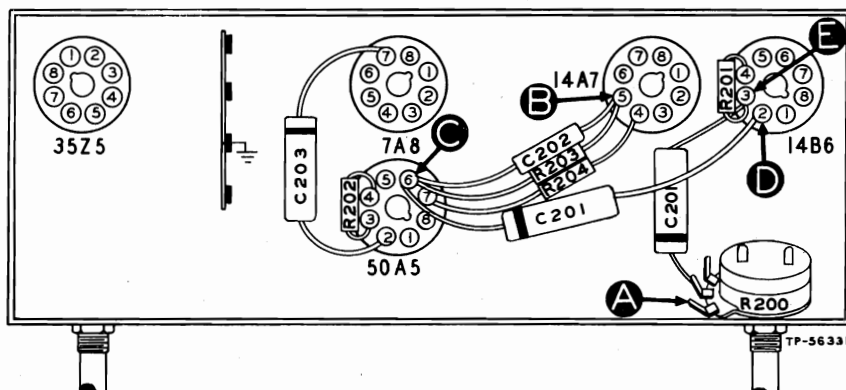


FIGURE 2. BOTTOM VIEW, SHOWING SECTION 2 TEST POINTS

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with weak signal-generator input.	Trouble within this section; isolate by the following tests.
2	C	Clear signal with weak signal-generator input.	No signal — Open or shorted: LS200 or T200. Shorted: C203. Open: R204. Defective: 50A5. Weak or distorted signal — Defective: 50A5 or LS200. Leaky: C202 or C201. Open: R203. Shorted: R204.
3	D	Same as step 2.	No signal — Open: C201. Weak or distorted signal — Leaky: C201.
4	E	Same as step 1.	No signal — Open: R202. Defective: 14B6. Weak or distorted signal — Shorted: C200. Open: R201. Defective: 14B6.
5	A	Same as step 1.	No signal — Open: C200. Shorted: C300D. Weak or distorted signal — Open: R200 (rotate through range).

MODELS 49-500,
49-500-I, 49-506

PHILCO CORP.

Section 3 — I-F, Detector, and A-V-C Circuits TROUBLE SHOOTING

For the tests in this section, use an r-f signal generator, with modulated output, set to 455 kc. Connect the ground lead of the signal generator to B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart. Set the volume control at maximum. If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 4 (r-f and converter circuits); if not, isolate and correct the trouble with in this section.

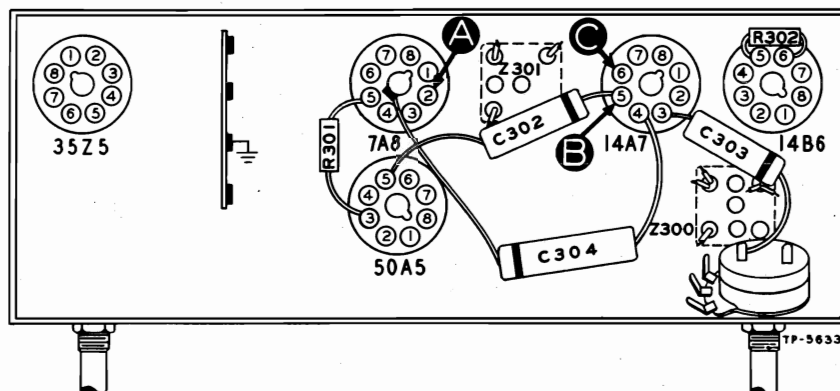


FIGURE 3. BOTTOM VIEW, SHOWING SECTION 3 TEST POINTS

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Clear signal with weak signal-generator input.	Trouble within this section; isolate by the following tests.
2	C	Same as step 1.	No signal — Open or shorted: Z300. Defective: 14B6 or 14A7. Open: R301. Shorted: C303. Weak or distorted signal — Leaky: C303. Open: C303 or C304. Defective: 14B6 or 14A7. Misaligned: Z300. Leaky or open: C302.
3	A	Same as step 1.	No signal — Open or shorted: Z301. Weak or distorted signal — Misaligned: Z301.

Section 4 — R-F and Converter Circuits

TROUBLE SHOOTING

For the tests in this section, use an r-f signal generator, with modulated output. Connect the generator ground lead to B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Inspect the tuning condensers for bent plates, dirt, or poor wiper contacts; any or all of these will cause noise. If the "NORMAL INDICATION" is not obtained in step 1, isolate the trouble by following the remaining steps.

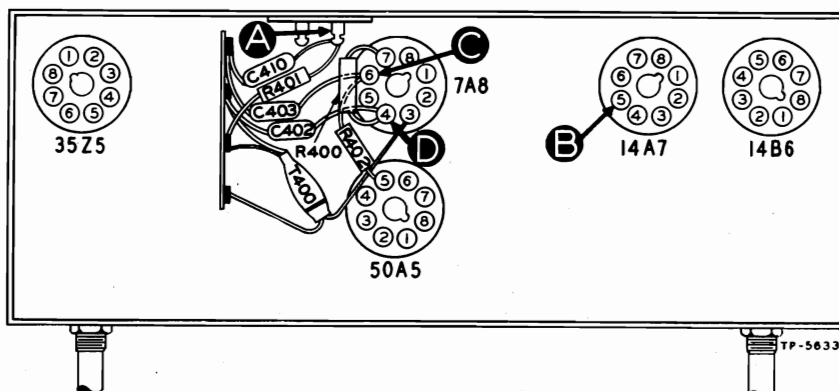
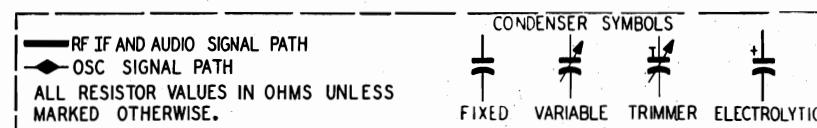
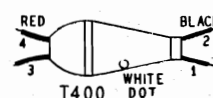
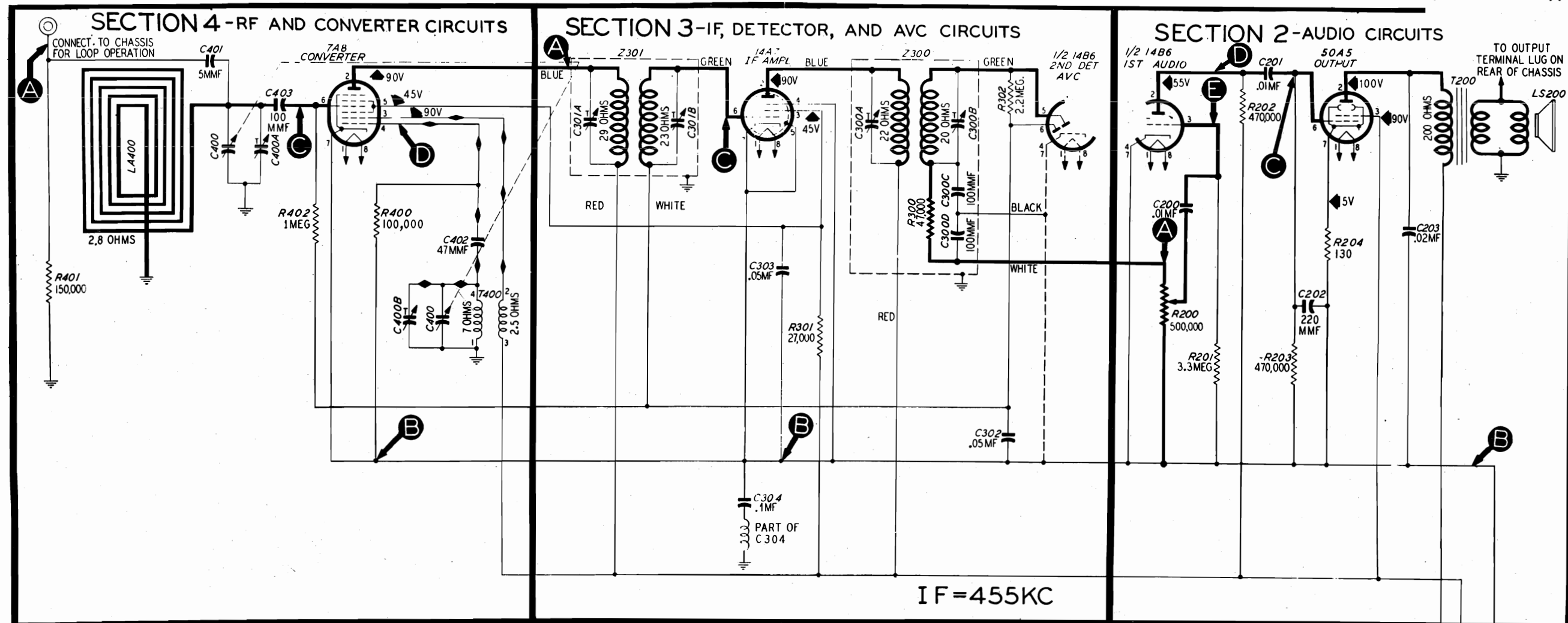


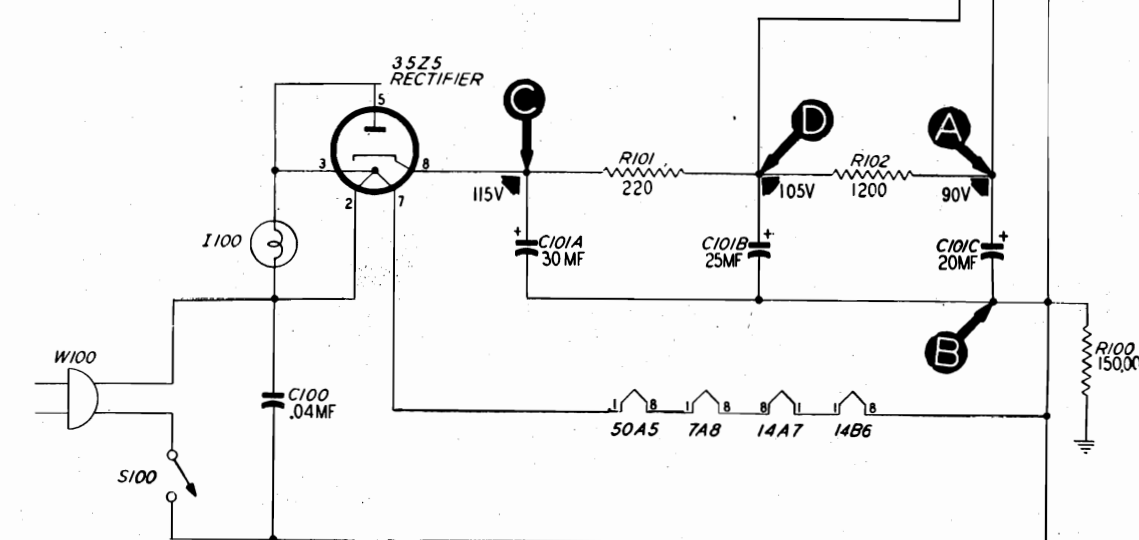
FIGURE 4. BOTTOM VIEW, SHOWING SECTION 4 TEST POINTS

STEP	TEST POINT	DIAL SETTINGS		NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
		SIG. GEN.	RADIO		
1	A	540 kc.	540 kc.	Clear signal with weak signal-generator input.	Trouble within this section; isolate by the following tests.
2	D (Osc. test; see note below.)		540 to 1620 kc.	Negative 9 to 12 volts.	Open or shorted: T400, C402, or R400. Shorted: C400 or C400B. Defective: 7A8.
3	C	540 kc.	540 kc.	Same as step 1.	No signal — Open or shorted: Z301. Shorted: C400 or C400A. Defective 7A8. Weak or distorted signal — Shorted or open: LA400. Defective: 7A8.
4	A	540 kc.	540 kc.	Same as step 1.	Weak signal — Open: C401.

OSCILLATOR-TEST NOTE: Connect positive lead of a 20,000-ohms-per-volt meter to B; connect prod end of negative lead through a 100,000-ohm isolating resistor to test point D. Proper operation of oscillator is indicated by a negative voltage of 9 to 12 volts throughout range of tuning condenser.



NOTE: ALL VOLTAGES AND CAPACITY AND RESISTANCE VALUES SHOWN ARE AVERAGE. THE VOLTAGES BETWEEN TEST POINT B AND OTHER POINTS INDICATED WERE MEASURED WITH A 20,000-OHMS-PER-VOLT METER VOLUME CONTROL AT MINIMUM AND TUNING CONDENSER PLATES FULLY MESHED.



SECTION 1 - POWER SUPPLY

SECTION 5. PHILCO RADIO MODELS 49-500 AND 49-500-I, SECTIONALIZED SCHEMATIC DIAGRAM, SHOWING TEST POINTS

MODELS 49-500,
49-500-I, 49-506

PHILCO CORP.

ALIGNMENT PROCEDURE

TURN ON THE RADIO, AND SET THE VOLUME CONTROL TO MAXIMUM.

DIAL POINTER — Turn tuning condensers to full-mesh position. Set dial pointer to index dot, located to the left of "55."

OUTPUT METER — Connect to left (output) lug and center (chassis) lug of terminal panel, shown in figure 6.

SIGNAL GENERATOR — Connect ground lead to B; connect output lead as indicated in the chart.

OUTPUT LEVEL — During alignment, adjust signal-generator output to maintain output-meter indication below 1.25 volts.

STEP	SIGNAL GENERATOR		RADIO		ADJUST
	CONNECTIONS TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	
1				Turn C301B (copper screw) down tight.	
2	Through .1-mf. condenser to pin 6 of 7A8 converter.	455 kc.	540 kc.	Adjust trimmers, in order given, for maximum output.	C300A C300B C301A C301B
3	Through 100-mmf. condenser to external aerial connector.	1600 kc.	1600 kc.	Disconnect external aerial lug from chassis. Adjust trimmer for maximum output.	C400B
4	Same as step 3.	1500 kc.	1500 kc.	Adjust for maximum output.	C400A

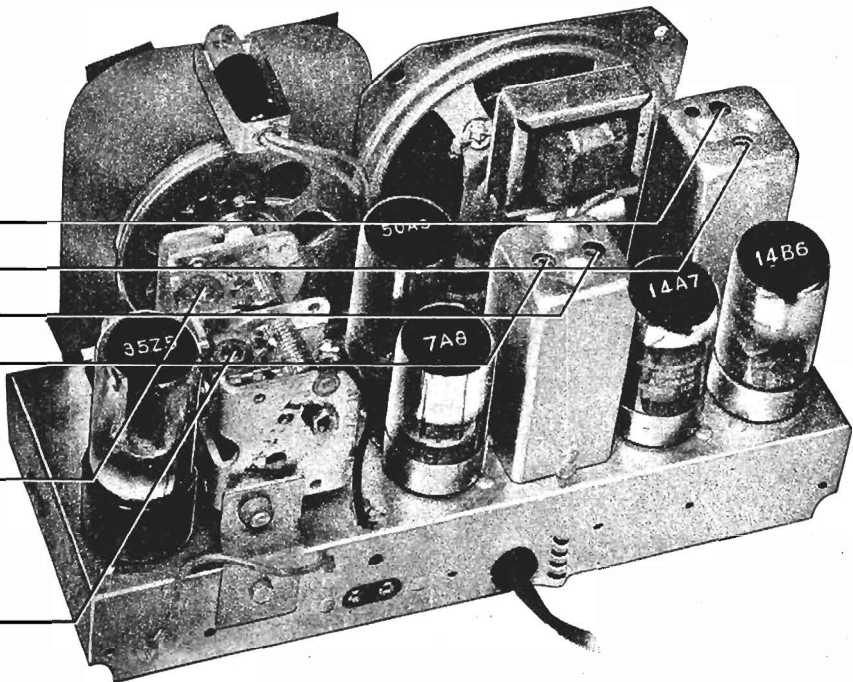


FIGURE 6. TOP VIEW, SHOWING TRIMMER LOCATIONS

TP 6000

MISCELLANEOUS

Description	Service Part No.	Description	Service Part No.
Cabinet			
Walnut	10728	Dial-Scale Hardware	
Mahogany	10728A	Cord, drive (25-ft. spool)	45-8750*
Cabinet Hardware			
Back	54-7682	Pointer	54-4505
Baffle-and-cloth assembly		Scale, dial	27-5978-2
Walnut	40-6945	Spring, (drive cord)	56-2617
Mahogany	40-6945-1	Pilot-lamp assembly	76-1280
Fastener, acetate window (4)	56-6161FE7	Shaft assembly, drive	31-2718
Knob		Socket, Loktal	27-6138*
Walnut	54-4527-11	Socket, octal	27-6174*
Mahogany	54-4527-10		
Window, acetate	54-4504		

REPLACEMENT PARTS LIST

Replacement parts are the same as those in Models 49-500 and 49-500-I, with the exceptions listed below.

SECTION 1

Reference Symbol	Description	Service Part No.
C100	Condenser, line filter, .04 mf.	30-1226-17

SECTION 4

LA400	Loop aerial	32-4052-28
-------	-------------	------------

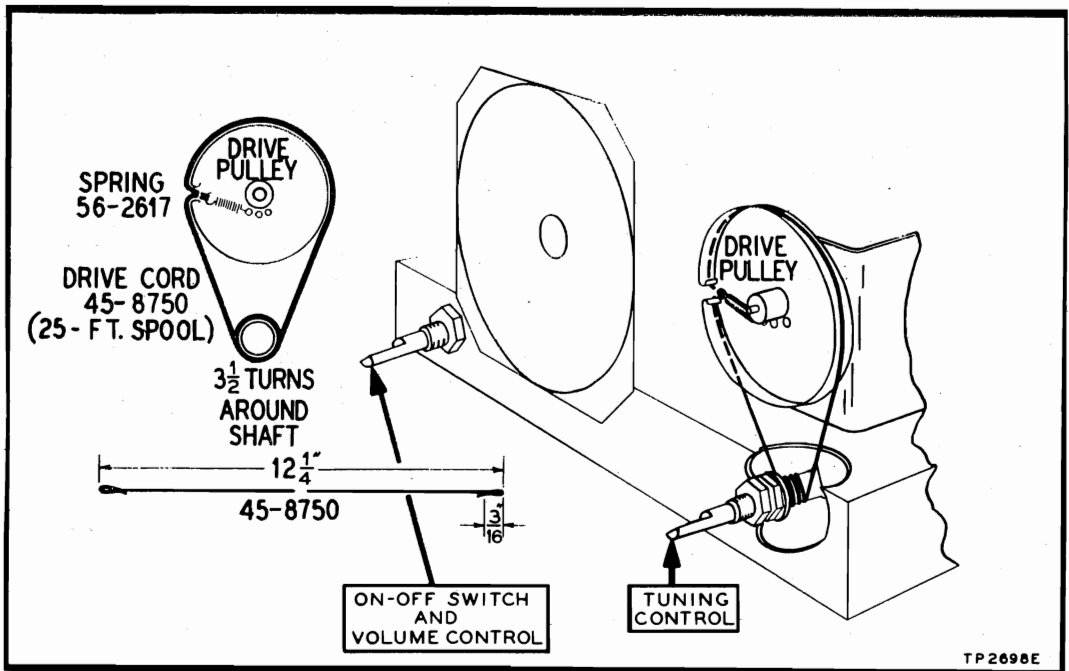


FIGURE 7. DRIVE-CORD INSTALLATION DETAILS

TP 2698E

PHILCO CORP.

MODEL S 49-500,
49-500-I, 49-506

REPLACEMENT PARTS LIST

NOTE: Parts marked with an asterisk (*) are general replacement items, and the numbers listed may not be identical with those on factory assemblies; also, the electrical values of some replacement items furnished may differ from the values indicated in the schematic diagram and parts list. The values substituted in any case are so chosen that the operation of the radio will be either unchanged or improved. When ordering replacements, use only the "Service Part No."

SECTION 1 POWER SUPPLY

Reference Symbol	Description	Service Part No.
C100	Condenser, line filter, .04 mf.	45-3500-2*
C101	Condenser, electrolytic, 3-section filter	30-2573
C101A	Condenser, electrolytic, 30 mf.	Part of C101
C101B	Condenser, electrolytic, 25 mf.	Part of C101
C101C	Condenser, electrolytic, 20 mf.	Part of C101
I100	Panel lamp	34-2068
R100	Resistor, leakage, 150,000 ohms	66-4153340*
R101	Resistor, filter, 220 ohms	66-1224340*
R102	Resistor, filter, 1200 ohms	66-2123340*
S100	Switch, power	Part of R200
W100	Power cord and plug	L2183*

SECTION 2 AUDIO CIRCUITS

C200	Condenser, coupling, .01 mf.	61-0120*
C201	Condenser, coupling, .01 mf.	61-0120*
C202	Condenser, by-pass, 220 mmf.	62-122001001
C203	Condenser, by-pass, .02 mf.	61-0108*
LS200	Speaker	36-1614
R200	Volume control (with power switch), 500,000 ohms	33-5429
R201	Resistor, grid load, 3.3 megohms	66-5333340*
R202	Resistor, plate load, 470,000 ohms	66-4473340*
R203	Resistor, grid load, 470,000 ohms	66-4473340*
R204	Resistor, bias, 130 ohms	66-1123340*
T200	Output transformer	Part of LS200

SECTION 3 I-F, DETECTOR, AND A-V-C CIRCUITS

C302	Condenser, a-v-c by-pass, .05 mf.	61-0122
C303	Condenser, screen by-pass, .05 mf.	61-0122*
C304	Condenser, special i-f by-pass, .1 mf.	30-4644-1
R300	Resistor, diode load, 47,000 ohms	Part of Z300
R301	Resistor, screen, 27,000 ohms	66-3273340*
R302	Resistor, a-v-c, 2.2 megohms	66-5223340*
Z300	Transformer, 2nd i-f	45-6365*
C300A	Condenser, trimmer	Part of Z300
C300B	Condenser, trimmer	Part of Z300
C300C	Condenser, by-pass, 100 mmf.	Part of Z300
C300D	Condenser, by-pass, 100 mmf.	Part of Z300
Z301	Transformer, 1st i-f	45-6365
C301A	Condenser, trimmer	Part of Z301
C301B	Condenser, trimmer	Part of Z301

SECTION 4

R-F AND CONVERTER CIRCUITS

Reference Symbol	Description	Service Part No.
C400	Condenser, tuning, 2-section	31-2727-1
C400A	Condenser, trimmer	Part of C400
C400B	Condenser, trimmer	Part of C400
C401	Condenser, coupling, 5 mmf.	60-90505007*
C402	Condenser, isolating, 47 mmf.	60-00515307*
C403	Condenser, blocking, 100 mmf.	60-10105407*
LA400	Loop aerial	32-4052-5
R400	Resistor, osc., grid, 100,000 ohms	66-4103340*
R401	Resistor, aerial discharge, 150,000 ohms	66-4153340*
R402	Resistor, grid return, 1 megohm	66-5103340*
T400	Transformer, oscillator	32-4263

MISCELLANEOUS

Description	Service Part No.
Cabinet	
Model 49-500	10542D
Model 49-500-I	10542E
Cabinet Hardware	
Back	
Model 49-500	27-9879
Model 49-500-I	27-9922
Fastener, acetate window (6)	28-4279FA1
Foot, felt	W2190
Knob	
Model 49-500	27-4820
Model 49-500-I	54-4118
Window, acetate	54-4088
Dial-Scale Hardware	
Cord, drive (25-ft. spool)	45-8750
Pointer	27-4891-1
Scale, dial	
Model 49-500	27-5965
Model 49-500-I	27-5965-1
Screw, scale mounting	1W19674FA3
Spring, drive cord	56-2617
Washer, scale mounting	2W54094
Panel, terminal, loop aerial	76-2148
Panel, lamp assembly	76-1472
Shaft, drive assembly	31-2718
Socket, Loktal	27-6138*
Socket, octal	27-6174*

MODELS 49-501,
49-501-I

PHILCO CORP.

REPLACEMENT PARTS LIST

NOTE: Part numbers identified by an asterisk (*) indicate general replacement items. These numbers may not be identical with those on factory assemblies; also, the electrical values of some replacement items may differ from the values indicated in the schematic diagram and replacement parts list. The values substituted in any case are so chosen that the operation of the radio will be either unchanged or improved. When ordering replacements, use only the "Service Part No."

SECTION 1 POWER SUPPLY

Reference Symbol	Description	Service Part No.
C100	Condenser, line filter, .04 mf.	30-4119*
C101	Condenser, electrolytic, 3-section	30-2575-10*
C101A	Condenser, filter, 30 mf.	Part of C101
C101B	Condenser, filter, 25 mf.	Part of C101
C101C	Condenser, filter, 20 mf.	Part of C101
I100	Lamp, pilot, 6.3v	34-2068
R100	Resistor, filter, 220 ohms	66-1224340*
R101	Resistor, filter, 1200 ohms	66-2123340*
R102	Resistor, leakage, 150,000 ohms	66-4153340*
S100	Switch, on-off	Part of R200
W100	Line cord	L-2183*



MODEL 49-501 (Brown)
MODEL 49-501-I (Ivory)

SPECIFICATIONS

CABINET	Model 49-501	Phenolic plastic, brown
	Model 49-501-I	Phenolic plastic, ivory
CIRCUIT	.....	Five-tube superheterodyne
FREQUENCY RANGE	.....	540—1620 kc.
AUDIO OUTPUT	.....	1 watt
OPERATING VOLTAGE	.....	117 volts, a.c. or d.c.
POWER CONSUMPTION	.....	30 watts
AERIAL	.....	Loop fastened to cabinet; terminal provided for external aerial.
INTERMEDIATE FREQUENCY	.....	455 kc.
PHILCO TUBES (5)	.....	7A8, 14A7, 14B6, 50A5, 35Y4

TP-5859

PHILCO CORP.

MODELS 49-501,
49-501-I**TROUBLE SHOOTING****POWER SUPPLY**

For the tests in this section, use a d-c voltmeter. Connect the negative lead to B-, test point B; connect the positive lead to the test points indicated in the chart. The voltage readings given were taken with a 20,000-ohms-per-volt meter at a line voltage of 117 volts, a.c.

Turn on the power and set the volume control to minimum.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 2 (audio circuits); if not, isolate and correct the trouble in this section.

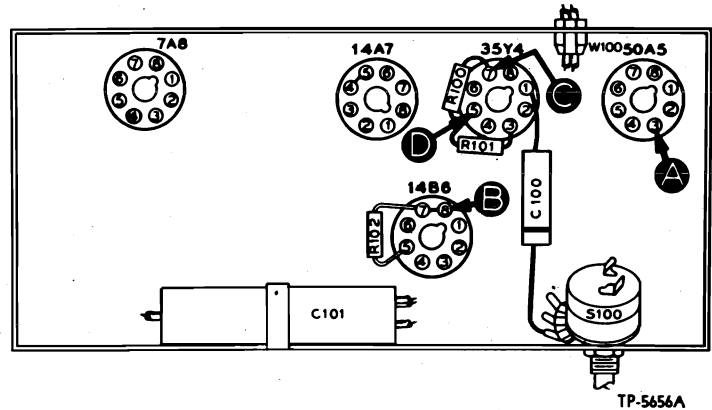


Figure 1. Bottom View, Showing Section 1 Test Points

STEP	TEST POINT	NORMAL INDICATION	ABNORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	92v		Trouble within this section. Isolate by the following tests.
2	C	105v	No voltage Low voltage High voltage	Defective: 35Y4. Open: S100, W100. Shorted: C101A. Open: C101A. Defective: 35Y4. Leaky: C101A. Open: R100.
3	D	116v	No voltage Low voltage High voltage	Shorted: C101B. Open: R100. Open: C101B. Leaky: C101B, C202*. Open: R101, T200*, R203*.
4	A	92v	No voltage Low voltage	Shorted: C101C. Open: R101. Leaky: C101C.
Listening Test: Abnormal hum may be caused by open C101A, C101B, or C101C.				

* This part, located in another section, may cause abnormal indication in this section.

Section 2

AUDIO CIRCUITS

For the tests in this section, use an audio-frequency signal generator. Connect the generator ground lead to B-, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the volume control to maximum.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 3 (i-f, detector, and a-v-c circuits); if not, isolate and correct the trouble in this section.

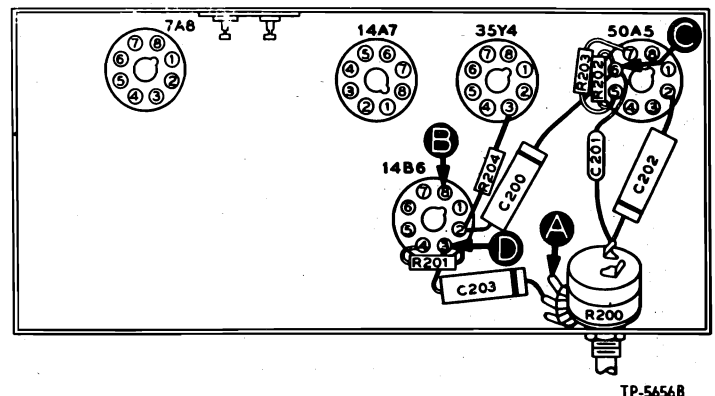
TROUBLE SHOOTING

Figure 2. Bottom View, Showing Section 2 Test Points

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear speaker output with weak signal-generator input.	Trouble within this section. Isolate by the following tests.
2	C	Clear output with strong input.	Defective: 50A5, LS200. Shorted: C201, C202. Open: R203, T200.
3	D	Same as step 2.	Defective: 14B6. Shorted: C200. Open: R204, R202, C200.
4	A	Same as step 1.	Shorted: C301D*. Open: R200, R201, C203.
Listening Test: Distortion may be caused by shorted or leaky C200.			

* This part, located in another section, may cause abnormal indication in this section.

MODELS 49-501,
49-501-I

PHILCO CORP.

**I-F, DETECTOR, AND
A-V-C CIRCUITS**

For the tests in this section, use an r-f signal generator, with modulated output, set at 455 kc. Connect the generator ground lead to B-, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the volume control to maximum.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 4 (r-f and converter circuits); if not, isolate and correct the trouble in this section.

To provide a complete i-f amplifier check, test point A for this section is placed at the grid of the converter in Section 4; therefore, the effectiveness of step 1 as a master check is dependent upon the condition of certain parts in the converter circuit. These parts are listed below under the "POSSIBLE CAUSE OF ABNORMAL INDICATION."

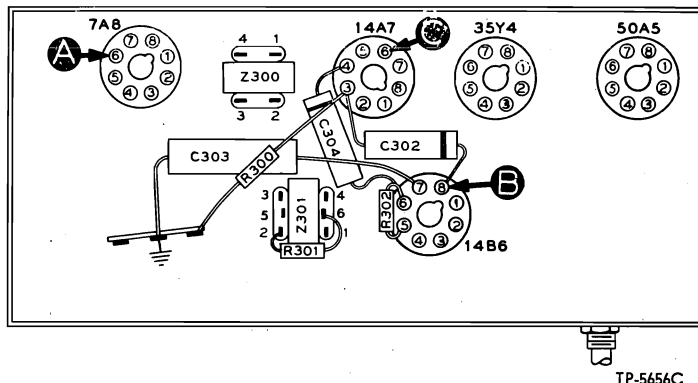


Figure 3. Bottom View, Showing Section 3 Test Points

These parts are listed below under the "POSSIBLE CAUSE OF ABNORMAL INDICATION."

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear speaker output with weak signal-generator input.	Trouble within this section. Isolate by the following tests.
2	C	Same as step 1.	Defective: 14A7, 14B6. Shorted: L300B, C300B, L301A, L301B, C301A, C301B, C301C, C301D. Open: L301A, L301B, C301A, C301B, C302, R300, R301. Misaligned: Z301.
3	A	Same as step 1.	Defective: 7A8*. Shorted: C400*, C400A*, L300A, C300A. Open: L300A, L300B, C300A, C300B. Misaligned: Z300.

* This part, located in another section, may cause abnormal indication in this section.

Section 4**R-F AND CONVERTER CIRCUITS**

For the tests in this section, with the exception of the oscillator test, use an r-f signal generator with modulated output. Connect the generator ground lead to B-, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the volume control to maximum. Set the tuning control and the signal-generator frequency as indicated in the chart.

If the "NORMAL INDICATION" is not obtained in step 1, isolate and correct the trouble in this section. If the trouble is not revealed by the tests for this section, check the alignment.

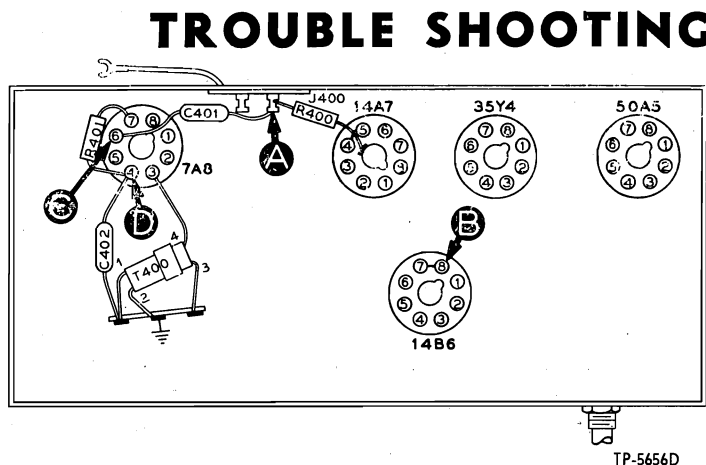


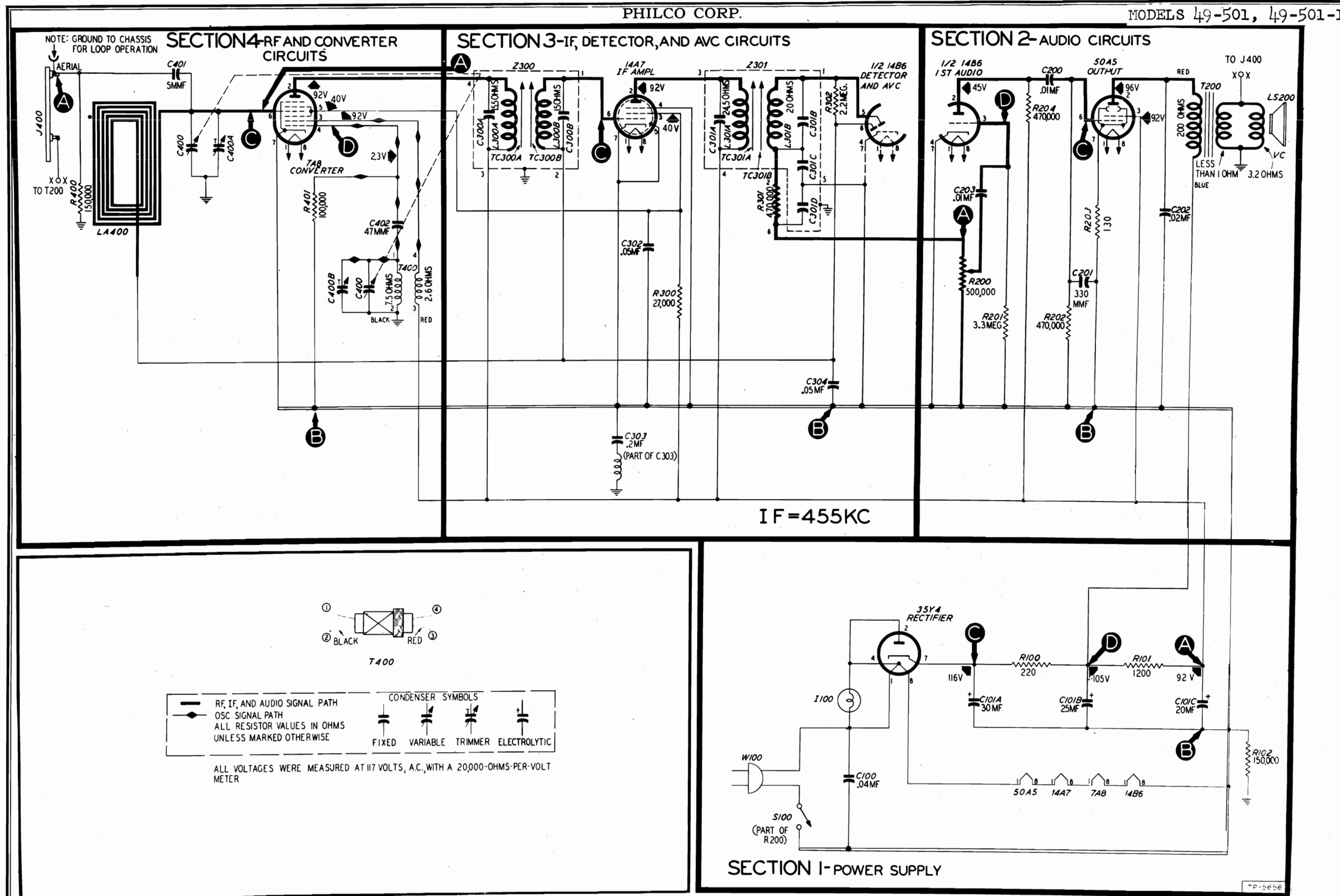
Figure 4. Bottom View, Showing Section 4 Test Points

STEP	TEST POINT	SIG. GEN. FREQ.	RADIO TUNING	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	1000 kc.	1000 kc.	Clear speaker output with weak signal-generator input.	Trouble within this section. Isolate by the following tests.
2	D (Osc. test; see note below.)		Rotate through range.	Negative 8 to 10 volts.	Shorted: T400, C400, C400B. Open: C402, R401, T400. Defective: 7A8.
3	C	1000 kc.	1000 kc.	Same as step 1.	Defective: 7A8. Shorted: C400, C400A, LA400. Open: LA400.
4	A	1000 kc.	1000 kc.	Same as step 1.	Open: C401.

OSCILLATOR TEST: Connect the positive lead of a high-resistance voltmeter to B-, test point B; connect the prod end of the negative lead through a 100,000-ohm isolating resistor to the oscillator grid (pin 4 of 7A8), test point D. Proper operation of the oscillator is indicated by a negative voltage of the value given in the chart (measured with a 20,000-ohms-per-volt meter) throughout the tuning range.

PHILCO CORP.

MODELS 49-501, 49-501-I



Philco Radio Models 49-501 and 49-501-I, Sectionalized Schematic Diagram. Showing Test Points

MODELS 49-501,
49-501-I

PHILCO CORP.

ALIGNMENT PROCEDURE

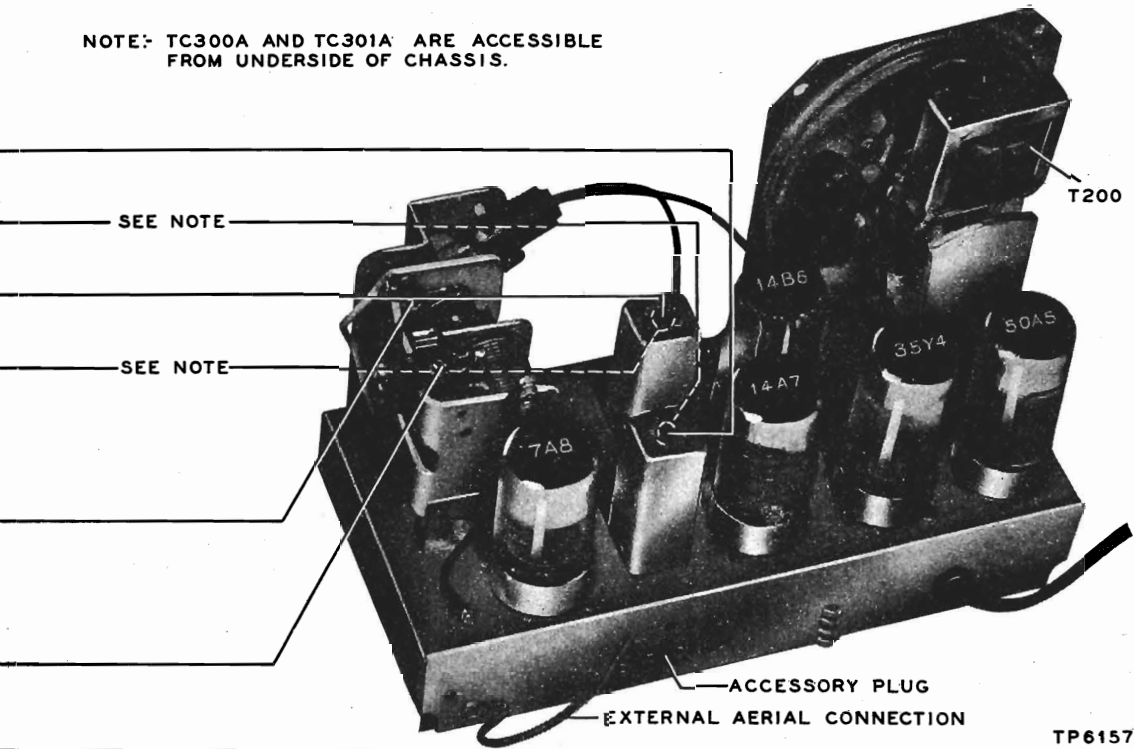
OUTPUT METER — Connect across voice-coil terminals.

SIGNAL GENERATOR—Connect as indicated in chart. Use modulated output.

RADIO CONTROLS—Set volume control to maximum, and rotate tuning control until tuning condenser is fully meshed.

STEP	SIGNAL GENERATOR		RADIO		ADJUST
	CONNECTION TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	
1	Ground lead to B-; output lead through .1-mf. condenser to pin 6 of 7A8.	455 kc.	Tuning condenser fully meshed.	Adjust tuning cores, in order given, for maximum output	TC301B—2nd i-f sec. TC301A—2nd i-f pri. TC300B—1st i-f sec. TC300A—1st i-f pri.
2	Radiating loop (see note below).	1600 kc.	1600 kc.	Adjust trimmer for maximum output.	C400B—Oscillator
3	Same as step 2.	1500 kc.	1500 kc.	Adjust trimmer for maximum output.	C400A—Aerial

NOTE: TC300A AND TC301A ARE ACCESSIBLE FROM UNDERSIDE OF CHASSIS.



RADIATING LOOP: Make up a 6 to 8 turn, 6-inch-diameter loop from insulated wire; connect to signal-generator leads and place near radio loop aerial. The loop aerial must be connected.

Figure 6. Top View, Showing Trimmer Locations

SYMBOLIZATION

The components in the radio circuit are symbolized according to the types of parts and the sections of the radio in which the parts are located. The prefix letter of the symbol designates the type of part as follows:

- C—condenser
I—pilot lamp
L—choke or coil
LA—loop aerial
LS—loud-speaker
- R—resistor
S—switch
T—transformer
W—line-cord-and-plug assembly
Z—electrical assembly

The number of the symbol designates the section in which the part is located as follows:

- 100-series components are in Section 1—the power supply.
- 200-series components are in Section 2—the audio circuits.
- 300-series components are in Section 3—the i-f, detector, and a-v-c circuits.
- 400-series components are in Section 4—the r-f and converter circuits.

OUTPUT LEVEL—During alignment, adjust signal-generator output to maintain output-meter indication below 1.25 volts.

Circuit Description

Philco Radio Models 49-501 and 49-501-I are 5-tube, table-model superheterodynes, providing reception in the standard broadcast band.

A high-impedance loop aerial normally provides adequate signal pickup. An external aerial may be connected, if desired, by detaching the aerial lead from the chassis, and connecting it to the external aerial lead-in. Do not use a ground.

The loop aerial is coupled to the 7A8 converter. The aerial and oscillator circuits are tuned by ganged, variable condensers, and the oscillator rotor-section plates are properly shaped to obtain tracking, thus eliminating the necessity for a series padding condenser.

The 7A8 converter is transformer-coupled to the 14A7 i-f amplifier, which is also transformer-coupled to the diodes of the 14B6 second detector—first audio amplifier. A-v-c voltage is applied to the control grids of both the i-f amplifier and converter tubes. The triode section of the 14B6 is the first audio stage, and is resistance-coupled to the 50A5 output tube. The output tube is transformer-coupled to a permanent-magnet speaker.

D-c operating voltages are supplied from a 35Y4 half-wave rectifier, and filtered by a three-section resistor-condenser network.

Condenser C303 is a special condenser inductively wound to form a series-tuned circuit, resonant at the intermediate frequency. This condenser offers less impedance at this frequency than a conventional condenser, and thus permits higher i-f gain, with no tendency toward instability.

The 150,000-ohm resistor, R102, prevents hum which might otherwise occur under conditions of high humidity.

PHILCO CORP.

MODELS 49-501,
49-501-I**REPLACEMENT PARTS LIST—Continued****SECTION 2
AUDIO CIRCUITS**

Reference Symbol	Description	Service Part No.
C200	Condenser, d-c blocking, .01 mf.	61-0120*
C201	Condenser, r-f by-pass, 330 mmf.	60-10335407*
C202	Condenser, tone compensation, .02 mf.	30-4599*
C203	Condenser, d-c blocking, .01 mf.	61-0120*
LS200	Speaker	36-1627
R200	Volume control, .5 megohm	45-5019*
R201	Resistor, grid return, 3.3 megohms	66-5333340*
R202	Resistor, grid return, 470,000 ohms	66-4473340*
R203	Resistor, cathode bias, 130 ohms	66-1123340*
R204	Resistor, plate load, 470,000 ohms	66-4473340*
T200	Transformer, output	Part of LS200

**SECTION 3
I-F, DETECTOR, AND A-V-C CIRCUITS**

C300A	Condenser, fixed trimmer, primary, 1st i-f	Part of Z300
C300B	Condenser, fixed trimmer, secondary, 1st i-f	Part of Z300
C301A	Condenser, fixed trimmer, primary, 2nd i-f	Part of Z301
C301B	Condenser, fixed trimmer, secondary, 2nd i-f	Part of Z301
C301C	Condenser, a-v-c filter	Part of Z301
C301D	Condenser, a-v-c filter	Part of Z301
C302	Condenser, screen by-pass, .05 mf.	30-4519*
C303	Condenser, special i-f by-pass, .2 mf.	30-4644
C304	Condenser, a-v-c filter, .05 mf.	30-4519*
L300A	Coil, primary, 1st i-f	Part of Z300
L300B	Coil, secondary, 1st i-f	Part of Z300
L301A	Coil, primary 2nd i-f	Part of Z301
L301B	Coil, secondary, 2nd i-f	Part of Z301
R300	Resistor, screen dropping, 27,000 ohms	66-3273340*
R301	Resistor, diode load, 47,000 ohms	66-3473340*
R302	Resistor, a-v-c filter, 2.2 megohms	66-5223340*
TC300A	Tuning core, primary 1st i-f	Part of Z300
TC300B	Tuning core, secondary, 1st i-f	Part of Z300

**SECTION 3 (Continued)
I-F, DETECTOR, AND A-V-C CIRCUITS**

Reference Symbol	Description	Service Part No.
TC301A	Tuning core, primary 2nd i-f	Part of Z301
TC301B	Tuning core, secondary, 2nd i-f	Part of Z301
Z300	Transformer, 1st i-f	32-4160-6*
Z301	Transformer, 2nd i-f	32-4240*

**SECTION 4
R-F AND CONVERTER CIRCUITS**

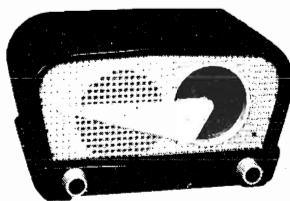
C400	Condenser, tuning gang	31-2731*
C400A	Condenser, trimmer, aerial	Part of C400
C400B	Condenser, trimmer, osc.	Part of C400
C401	Condenser, isolating, 5 mmf.	30-1223*
C402	Condenser, isolating, 47 mmf.	30-1224-2*
LA400	Aerial, loop	32-4052-19
R400	Resistor, isolating, 150,000 ohms	66-4153340*
R401	Resistor, grid return, 100,000 ohms	66-4103340*
T400	Coil, oscillator	32-4263

MISCELLANEOUS

Description	Service Part No.
Bracket, speaker	56-5653FA3
Cabinet (less scale)	
Model 49-501	10710
Model 49-501-I	10710A
Cabinet Hardware	
Back	
Model 49-501	54-7619
Model 49-501-I	54-7619-1
Baffle, speaker	54-4586
Fastener, cabinet back	2W2235-2FA9
Grille, metal	
Model 49-501	56-5769-FCP
Model 49-501-I	56-5769-1FCP
Knob	
Model 49-501	27-4815-3
Model 49-501-I	54-4118
Knob assembly	
Model 49-501	54-4581
Model 49-501-I	54-4581-1
Pilot-light assembly	27-6233-18
Scale, dial	
Model 49-501	54-5008
Model 49-501-I	54-5008-1
Speed fastener, baffle mounting	56-5857FE7
Speed fastener, baffle mounting	1W60211FE7
Socket, Loktal	27-6138*

MODEL 49-503

PHILCO CORP.



MODEL 49-503

SPECIFICATIONS

CABINET	Plastic, ebony or green
CIRCUIT	Five-tube superheterodyne
FREQUENCY RANGE	540 to 1620 kc.
AUDIO OUTPUT	1 watt
OPERATING VOLTAGE.....	105 to 125 volts, a.c./d.c.
POWER CONSUMPTION	30 watts
AERIAL.....	{ Built-in high-impedance loop; provision for connecting an external aerial
INTERMEDIATE FREQUENCY	455 kc.
PHILCO TUBES (5).....	7A8, 14B6, 14A7, 50A5, 35Z5GT

Circuit Description

Philco Radio Model 49-503 is a five-tube superheterodyne, providing reception in the standard broadcast band. A built-in high-impedance loop aerial normally provides adequate signal pickup; an external aerial may be connected, if desired, by detaching the aerial lead (shown in figure 6) from the chassis and connecting this lead to an external aerial lead-in. Do not use a ground.

The loop is coupled to a 7A8 converter. Variable-condenser tuning is employed; the oscillator rotor-section plates are shaped to obtain tracking, thus eliminating the need for a series-padding condenser.

The 7A8 is transformer-coupled to a 14A7 i-f amplifier, which is also transformer-coupled to a 14B6 second detector—first audio amplifier. A-v-c voltage is applied to the control grids of the i-f-amplifier and converter tubes.

The triode section of the 14B6 is the first audio stage, and is resistance-coupled to a 50A5 output tube. The output tube is transformer-coupled to a permanent-magnet speaker.

D-c operating voltages are obtained from a 35Z5GT half-wave rectifier, the output of which is filtered by a two-section, resistor-condenser filter.

Condenser C304 is a special condenser, inductively wound to form a series tuned circuit, resonant at the intermediate frequency. This special condenser offers less impedance at this frequency than a conventional condenser, thus permitting high i-f gain with no tendency toward instability.

The 150,000-ohm resistor, R100, prevents hum which might otherwise occur under conditions of high humidity.

Philco TROUBLE-SHOOTING Procedure

For rapid trouble shooting, the radio circuit is divided into four sections, with test points specified for each section; these sections and test points are indicated in the schematic diagram. The trouble-shooting procedure given for each section includes a simplified test chart and a bottom view of the chassis showing the locations of the test points and the components of that section.

In each chart, the first step is a master check for determining whether trouble exists in that section, without going through the entire test procedure.

Failure to obtain the "NORMAL INDICATION" in any given step indicates trouble within the circuit under test.

After isolating the trouble to a single stage, the defect is located by: first, testing the tube; second, measuring tube electrode voltages; third, measuring circuit resistances; fourth, substituting condensers. The trouble revealed should be corrected before testing further.

Preliminary Checks

To avoid possible damage to the radio, the following preliminary checks should be made before it is turned on:

1. Inspect both the top and the bottom of the chassis. Make sure that all tubes are secure in the proper sockets, and look for any broken or shorter connections, burned resistors, or other obvious sources of trouble.

2. Measure the resistance between B+ (pin 7 of 35Z5GT) and B—, test point B. When the ohmmeter test leads are connected in the proper polarity, the highest resistance reading will be obtained. If the reading is lower than 1500 ohms, check condensers C101A, C101B, and C203 for leakage or shorts. The resistance value given is much lower than normal, and is not intended as a quality check of these condensers; the value given is the lowest at which the rectifier will operate safely while the voltage checks of Section 1 (power supply) are performed.

TROUBLE SHOOTING

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 2 (audio circuits); if not, isolate and correct the trouble in this section.

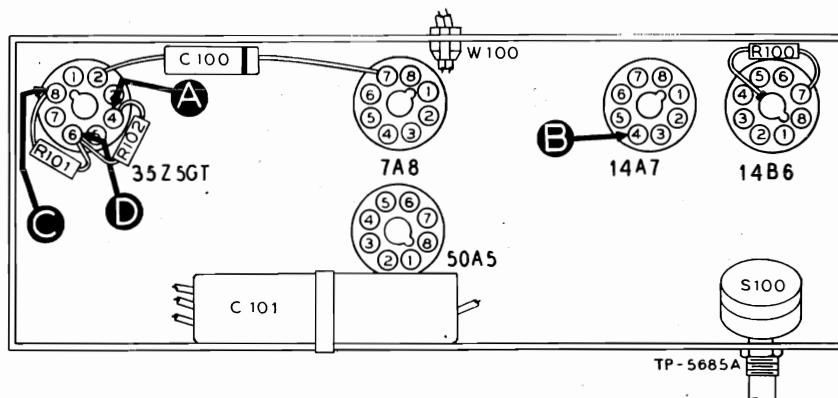


Figure 1. Bottom View, Showing Section 1 Test Points

STEP	TEST POINT	NORMAL INDICATION	ABNORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	90 v.		Trouble within this section. Isolate by the following tests.
2	C	115 v.	No voltage. Low voltage. High voltage.	Defective: 35Z5GT. Open: S100, W100. Shorted: C101A. Leaky: C101A. Open: R101.
3	D	105 v.	No voltage. Low voltage. High voltage.	Shorted: C101B. Open: R101. Leaky: C101B. Shorted: C203.* Open: R102.
4	A	90 v.	No voltage. Low voltage. High voltage.	Shorted: C101C. Open: R102. Leaky: C101B, C101C. Open: R204.*

Listening Test: Abnormal hum may be caused by open C101A, C101B, or C101C.

* This part, located in another section, may cause abnormal indication in this section.

TROUBLE SHOOTING

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 3 (i-f, detector, and a-v-c circuits); if not, isolate and correct the trouble in this section.

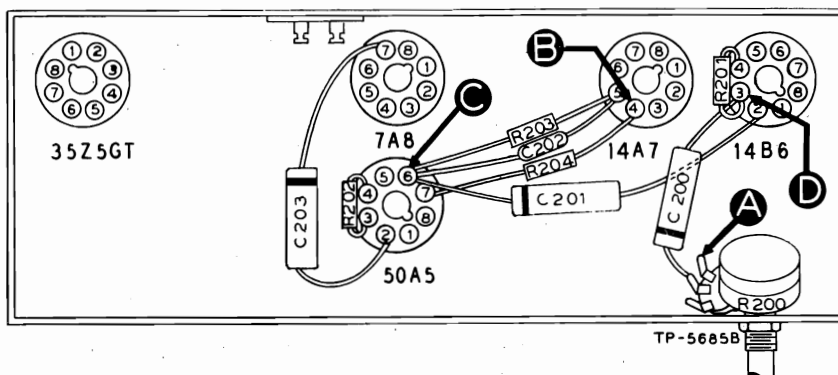


Figure 2. Bottom View, Showing Section 2 Test Points

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear speaker output with weak generator input.	Trouble within this section. Isolate by the following tests.
2	C	Loud, clear output with strong input.	Defective: 50A5, LS200. Shorted: C202, C203. Open: R204, T200.
3	D	Same as step 1.	Defective: 14B6. Shorted: C201. Open: R201, R202, C201.
4	A	Same as step 1.	Shorted: C200, C301D.* Open: R200 (rotate through range).

* This part, located in another section, may cause abnormal indication in this section.

Section 3—I-F, Detector, and A-V-C Circuits

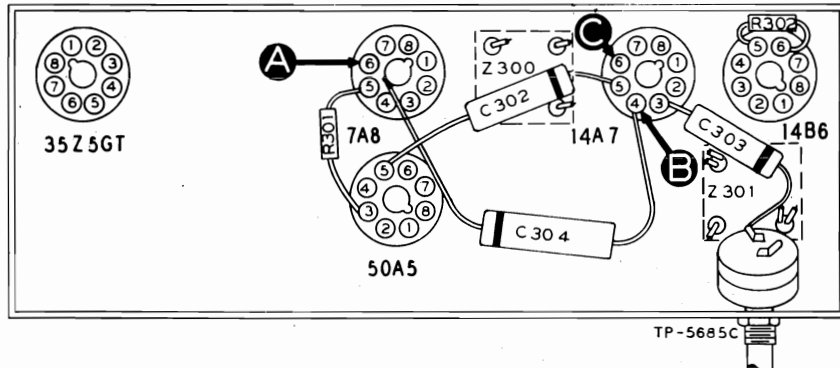
For the tests in this section, use an r-f signal generator, with modulated output, set at 455 kc. Connect the generator ground lead to B—, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the volume control to maximum, and rotate the tuning control until the tuning condenser is fully meshed.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 4 (r-f and converter circuits); if not, isolate and correct the trouble in this section.

To provide a complete i-f-amplifier check, test point A for this section is placed at the grid of the mixer in Section 4; therefore, the effectiveness of step 1 as a master check

is dependent upon the condition of certain parts in the mixer circuit. These parts are listed below under the "POSSIBLE CAUSE OF ABNORMAL INDICATION."

TROUBLE SHOOTING**Figure 3. Bottom View, Showing Section 3 Test Points**

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear speaker output with weak generator input.	Trouble within this section. Isolate by the following tests.
2	C	Same as step 1.	Defective: 14A7, 14B6. Shorted: C303, Z300, Z301. Open: R301, Z300, Z301. Misaligned: Z301.
3	A	Same as step 1.	Defective: 7A8.* Open or shorted: Z300. Misaligned: Z300.

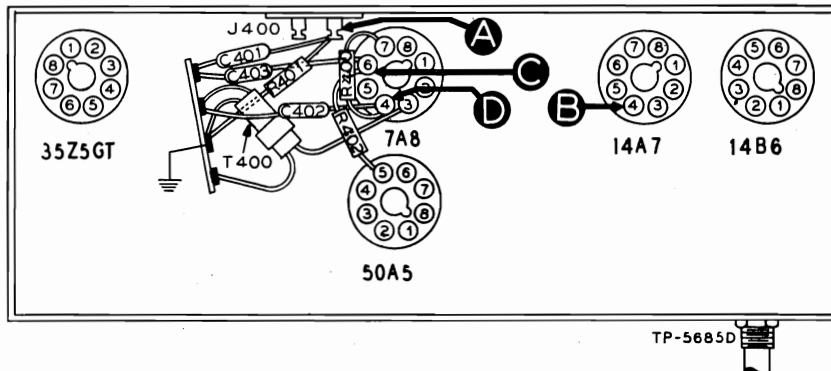
* This part, located in another section, may cause abnormal indication in this section.

Section 4—R-F and Converter Circuits**TROUBLE SHOOTING**

For the tests in this section, with the exception of the oscillator test, use an r-f signal generator with modulated output. Connect the generator ground lead to B—, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the volume control to maximum, and set the tuning control and the signal-generator frequency as indicated in the chart.

If the "NORMAL INDICATION" is not obtained in step 1, isolate and correct the trouble in this section. If the trouble is not revealed by the tests for this section, check the alignment.

**Figure 4. Bottom View, Showing Section 4 Test Points**

STEP	TEST POINT	SIG. GEN. FREQ.	RADIO TUNING	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	1000 kc.	1000 kc.	Loud, clear speaker output with weak generator input.	Trouble within this section. Isolate by the following tests.
2	D (Osc. test; see note below.)		Rotate through range.	Negative 7 to 10 volts.	Defective: 7A8. Shorted: C400, C402, C400B. Open: T400, C402, R400.
3	C	1000 kc.	1000 kc.	Same as step 1.	Defective: 7A8. Shorted: C400, C400A, C403.
4	A	1000 kc.	1000 kc.	Same as step 1.	Open: C401, C403. Shorted: LA400.

OSCILLATOR TEST: Connect the positive lead of a high-resistance voltmeter to B—, test point B; connect the prod end of the negative lead through a 100,000-ohm isolating resistor to the oscillator grid (pin 4 of 7A8), test point D. Use a suitable meter range, such as 0—10 volts. Proper operation of the oscillator is indicated by negative voltage of approximately the value given in the chart (measured with 20,000-ohms-per-volt meter) throughout the tuning range.

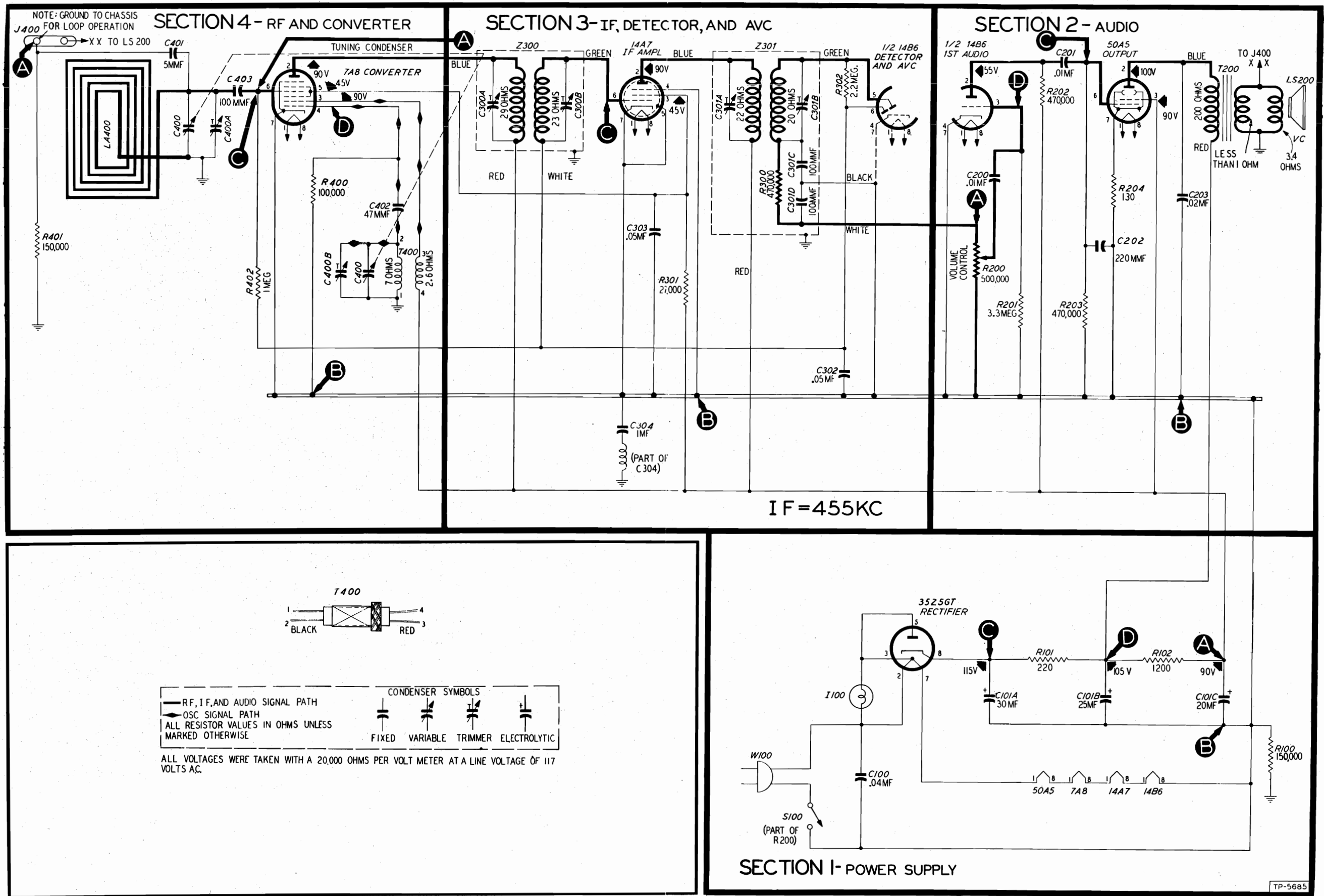


Figure 5. Philco Radio Model 49-503, Sectionalized Schematic Diagram, Showing Test Points

ALIGNMENT PROCEDURE

DIAL—With tuning condenser fully meshed, set pointer to index dot located to left of 55.

OUTPUT METER—Connect one lead to pin on left-hand side of plug at rear of chassis; connect other lead to B—.

SIGNAL GENERATOR—Connect generator ground lead to B—; connect output lead as indicated in chart. Use modulated output.

RADIO CONTROLS—Set volume control to maximum.

OUTPUT LEVEL—During alignment, adjust signal-generator output to maintain output-meter indication below 1.25 volts.

STEP	SIGNAL GENERATOR		RADIO		ADJUST
	CONNECTION TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	
1	Through .1-mf. condenser to pin 6 of 7A8.	455 kc.	540 kc.	Adjust trimmers, in order given, for maximum output.	C301B—2nd i-f sec. C301A—2nd i-f pri. C300B—1st i-f sec. C300A—1st i-f pri.
2	Through 100-mm.f. condenser to external aerial connector. (External aerial connector must be disconnected from chassis.)	1600 kc.	1600 kc.	Adjust trimmer for maximum output.	C400B—osc.
3	Same as step 2.	1500 kc.	1500 kc.	Adjust trimmer for maximum output.	C400A—aerial

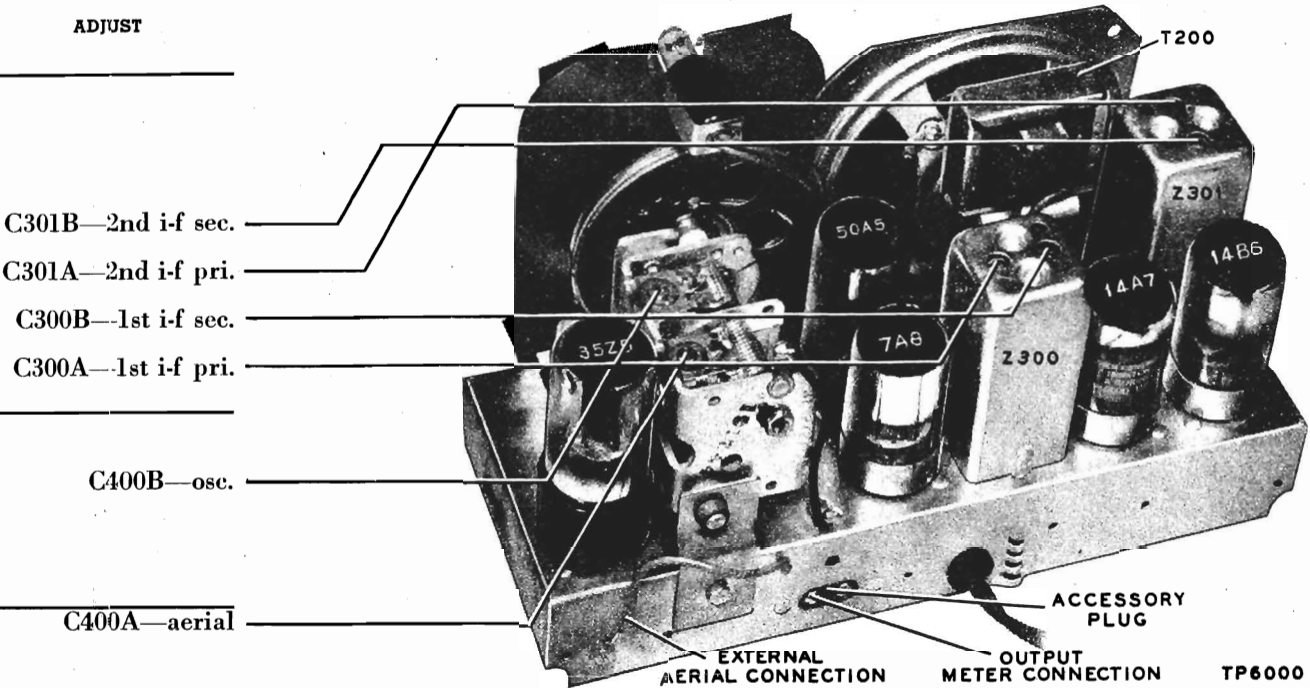


Figure 6. Top View, Showing Trimmer Locations

SYMBOLIZATION

The components in the radio circuit are symbolized according to the types of parts and the sections of the radio in which the parts are located. The prefix letter of the symbol designates the type of part as follows:

- | | | |
|-----------------------|-----------------|---------------|
| C—condenser | LA—loop aerial | S—switch |
| I—pilot lamp | LS—loud-speaker | T—transformer |
| L—choke or coil | R—resistor | W—line cord |
| Z—electrical assembly | | |

The number of the symbol designates the section in which the part is located, as follows:

- 100-series components are in Section 1—the power supply.
- 200-series components are in Section 2—the audio circuits.
- 300-series components are in Section 3—the i-f, detector, and a-v-c circuits.
- 400-series components are in Section 4—the r-f and converter circuits.

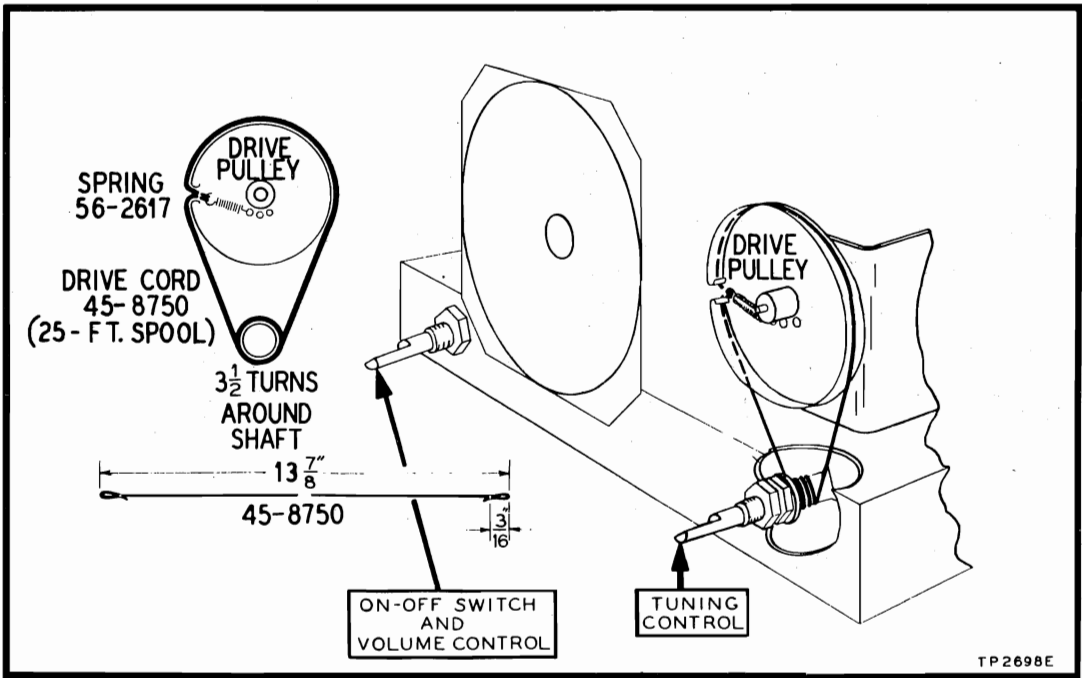


Figure 7. Drive-Cord Installation Details

REPLACEMENT PARTS LIST

NOTE: Part numbers identified by an asterisk (*) indicate general replacement items. These numbers may not be identical with those on factory assemblies; also, the electrical values of some replacement items may differ from the values indicated in the schematic diagram and replacement parts list. The values substituted in any case are so chosen that the operation of the radio will be either unchanged or improved. When ordering replacements, use only the "Service Part No."

SECTION 1—POWER SUPPLY

Reference Symbol	Description	Service Part No.
C100	Condenser, line filter, .04 mf.....	45-3500-2
C101	Condenser, electrolytic, 3-section	30-2573
C101A:	Condenser, filter, 30 mf., 150 v.....	Part of C101
C101B:	Condenser, filter, 25 mf., 150 v.....	Part of C101
C101C:	Condenser, filter, 20 mf., 150 v.....	Part of C101
I100	Lamp, pilot	34-2068*
R100	Resistor, leakage, 150,000 ohms.....	66-4153340*
R101	Resistor, filter, 220 ohms	66-1224340*
R102	Resistor, filter, 1200 ohms.....	66-2123340*
S100	Switch, on-off	Part of R200
W100	Line cord and plug.....	L-2183*

SECTION 2—AUDIO CIRCUITS

C200	Condenser, blocking, .01 mf.....	61-0120*
C201	Condenser, d-c blocking, .01 mf.....	61-0120*
C202	Condenser, parasitic suppressor, 220 mmf.	62-122001001*
C203	Condenser, tone compensation, .02 mf....	61-0108*
LS200	Speaker	36-1614
R200	Volume control (with power switch), 500,000 ohms	33-5429
R201	Resistor, grid return, 3.3 megohms....	66-5333340*
R202	Resistor, plate load, 470,000 ohms....	66-4473340*
R203	Resistor, grid return, 470,000 ohms....	66-4473340*
R204	Resistor, cathode bias, 130 ohms....	66-1133340*
T200	Output transformer	Part of LS200

SECTION 3—I-F, DETECTOR, AND A-V-C CIRCUITS

C300A	Condenser, trimmer, 1st i-f primary..	Part of Z300
C300B	Condenser, trimmer, 1st i-f secondary..	Part of Z300
C301A	Condenser, trimmer, 2nd i-f primary..	Part of Z301
C301B	Condenser, trimmer, 2nd i-f secondary	Part of Z301
C301C	Condenser, by-pass, 100 mmf.....	Part of Z301
C301D	Condenser, by-pass, 100 mmf.....	Part of Z301
C302	Condenser, a-v-c by-pass, .05 mf.....	61-0122*
C303	Condenser, screen by-pass, .05 mf.....	61-0122*
C304	Condenser-and-choke assembly, .1 mf....	30-4644-1
R300	Resistor, diode load, 470,000 ohms....	66-4473340*

Reference Symbol	Description	Service Part No.
R301	Resistor, screen dropping, 27,000 ohms	66-3273340*
R302	Resistor, a-v-c filter, 2.2 megohms....	66-5223340*
Z300	Transformer, 1st i-f	32-3967
Z301	Transformer, 2nd i-f	32-3952

SECTION 4—R-F AND CONVERTER CIRCUITS

C400	Condenser, tuning gang	31-2727-1
C400A:	Condenser, trimmer, aerial	Part of C400
C400B:	Condenser, trimmer, oscillator	Part of C400
C401	Condenser, aerial isolating, 5 mmf.....	30-1224-5
C402	Condenser, isolating, 47 mmf.....	30-1224-2
C403	Condenser, blocking, 100 mmf.....	60-10105407*
LA400	Aerial, high-impedance loop	32-4052-11
R400	Resistor, grid return, 100,000 ohms....	66-4103340*
R401	Resistor, aerial discharge, 150,000 ohms	66-4153340*
R402	Resistor, grid return, 1 megohm.....	66-5103340*
T400	Transformer, oscillator	32-4263

MISCELLANEOUS

Description	Service Part No.
Cabinet and Cabinet Parts	
Back-and-clip assembly	76-4268
Baffle and cloth	40-6945
Cabinet, ebony	10690B
Cabinet, green	10690A
Grille, plastic	54-4506-3
Knob assembly, ebony (2 required).....	54-4486-4
Knob assembly, green (2 required).....	54-4486-3
Shaft assembly	31-2718
Window, acetate	54-4504
Window fastener (4 required).....	56-6161FE7
Dial-Scale Hardware	
Drive cord (25-ft. spool).....	45-8750*
Fastener, speed	56-5028FA9
Pointer	54-4505
Scale	27-5978-2
Spring	56-2617
Pilot-lamp-socket assembly	76-1280
Socket, Loktal	27-6138
Socket, octal	27-6174

MODELS 49-504,
49-504-I

PHILCO CORP.



MODEL 49-504 (Walnut)

MODEL 49-504-I (Ivory)

Circuit Description

The Philco Radio Model 49-504 is a five-tube, table-model superheterodyne, providing reception in the standard-broadcast band.

The high-impedance loop aerial normally provides adequate signal pickup. Provisions are made for the connection of an external aerial.

The loop is coupled to the 7A8 converter. Variable condenser tuning is employed; the oscillator rotor-section plates are properly shaped to obtain tracking, thus eliminating the need for a series padding condenser.

The 7A8 is transformer-coupled to the 14A7 i-f amplifier, which is also transformer-coupled to the diodes of the 14B6 second detector—first audio-frequency amplifier. A-v-c voltage is applied to the control grids of both the i-f and converter tubes.

The triode section of the 14B6 is the first audio stage, and is resistance-coupled to the 50A5 output stage. The output tube is transformer-coupled to the permanent-magnet dynamic speaker.

D-c operating voltages are obtained from the 35Z5GT half-wave rectifier, the output of which is filtered by a two-section resistor-condenser filter.

Condenser C302 in Section 3 is a special condenser, inductively wound to form a series-tuned circuit, resonant at the intermediate frequency. This special condenser offers less impedance at this frequency than a conventional condenser, thus permitting higher i-f gain, with no tendency towards instability. The inductive effect at audio frequencies is negligible. Since the tuning gang is connected to the chassis, by-passing at broadcast frequencies is adequate.

Resistor R100, the 150,000-ohm resistor in Section 1, prevents hum which might otherwise occur under conditions of high humidity.

SPECIFICATIONS

CABINET.....	Plastic (ivory or walnut)
CIRCUIT.....	Five-tube superheterodyne
FREQUENCY RANGE.....	540—1620 kc.
OPERATING VOLTAGE.....	105—120 volts, a.c. or d.c.
POWER CONSUMPTION.....	30 watts
AERIAL.....	Loop fastened to cabinet; terminal also provided for outside aerial
INTERMEDIATE FREQUENCY.....	455 kc.
PHILCO TUBES (5).....	7A8, 14A7, 14B6, 50A5, 35Z5GT

Philco TROUBLE-SHOOTING Procedure

For rapid trouble shooting, the radio circuit is divided into four sections, with test points specified for each section; these sections and test points are indicated in the schematic diagram. The trouble-shooting procedure given for each section includes a simplified test chart and a bottom view of the chassis showing the locations of the test points and the components of that section.

In each chart, the first step is a master check for determining whether trouble exists in that section without going through the entire test procedure.

Failure to obtain the "NORMAL INDICATION" in any given step indicates trouble within the circuit under test.

After isolating the trouble to a single stage, the defect is located by: first, testing the tube; second, measuring tube-electrode voltages; third, measuring circuit resistances; fourth, substituting condensers. The trouble revealed should be corrected before testing further.

Preliminary Checks

To avoid possible damage to the radio, the following preliminary checks should be made before turning on the power.

1. Inspect the top and bottom of the chassis. Make sure that all tubes are secure in the proper sockets, and look for any broken or shorted connections, burned resistors, or other obvious sources of trouble.
2. Measure the resistance between B+ (pin 8 of the 35Z5GT rectifier) and B- (test point B). When the ohmmeter test leads are connected in the proper polarity, the highest resistance reading will be obtained. If the reading is lower than 1500 ohms, check condensers C101A, C101B, and C101C for leakage or shorts. The resistance value, which is much lower than normal, is not intended as a quality check of these condensers; the value given is the lowest at which the rectifier will operate safely while the voltage tests of Section 1 (power supply) are performed.

PHILCO CORP.

MODELS 49-504,
49-504-I**Section 1 — Power Supply**

For the tests in this section, use a d-c voltmeter. Connect the negative lead to B-, test point B; connect the positive lead to the test points indicated in the chart. The voltage readings given were taken with a 20,000-ohms-per-volt meter, at a line voltage of 117 volts, a-c.

Turn on the power, and set the volume control to minimum.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 2 (audio circuits); if not, isolate and correct the trouble in this section.

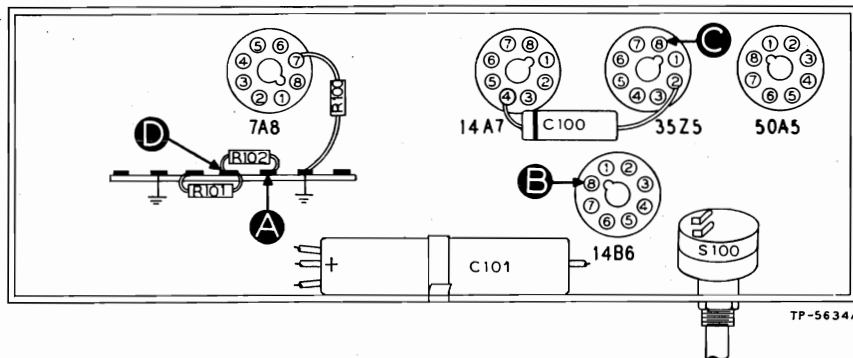


FIGURE 1. BOTTOM VIEW, SHOWING SECTION 1 TEST POINTS

STEP	TEST POINT	NORMAL INDICATION	ABNORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	107v		Trouble within this section. Isolate by the following tests.
2	C	130v	No voltage Low voltage High voltage	Defective: 35Z5GT, S100, W100. Shorted: C101A. Defective: 35Z5GT. Open: C101A, I100. Leaky: C101A. Open: R101, R102, R203*, T200*.
3	D	120v	No voltage Low voltage High voltage	Shorted: C101B. Open: R101. Shorted: C203*. Leaky: C101B, C203*. Open: R102, R203*, T200*.
4	A	107v	No voltage Low voltage High voltage	Shorted: C101C. Leaky: C101C. Open: R203*.

Listening Test: Abnormal hum may be caused by open C101B, C101C, or R100.

* This part, located in another section, may cause abnormal indication in this section.

Section 2 — Audio Circuits

For the tests in this section, use an audio signal generator. Connect the ground lead of the generator to B-, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the radio volume control to maximum.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 3 (i-f, detector, and a-v-c circuits); if not, isolate and correct the trouble in this section.

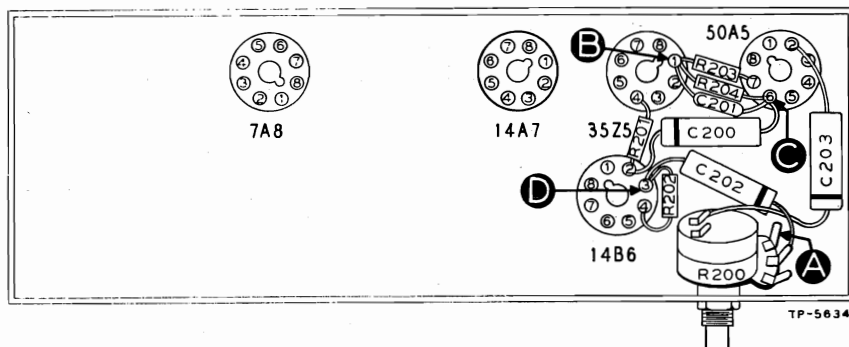


FIGURE 2. BOTTOM VIEW, SHOWING SECTION 2 TEST POINTS

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with weak signal input.	Trouble within this section. Isolate by the following tests.
2	C	Clear signal with strong signal input.	No signal—Open or shorted: LS200, T200. Shorted: C201, C203. Open: R203. Defective: 50A5.
3	D	Same as step 1.	Open: R201, R202, R204. Open, shorted, or leaky: C200. Defective: 14B6.
4	A	Same as step 1.	Open: R200 (rotate through entire range). Open, shorted, or leaky: C202. Shorted: C301D*.

* This part, located in another section, may cause trouble in this section.

MODELS 49-504,
49-504-I

PHILCO CORP.

Section 3 — I-F, Detector, and A-V-C Circuits TROUBLE SHOOTING

For the tests in this section use an r-f signal generator, with modulated output, set at 455 kc. Connect the generator ground lead to B-, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 4 (r-f and converter circuits); if not, isolate and correct the trouble in this section.

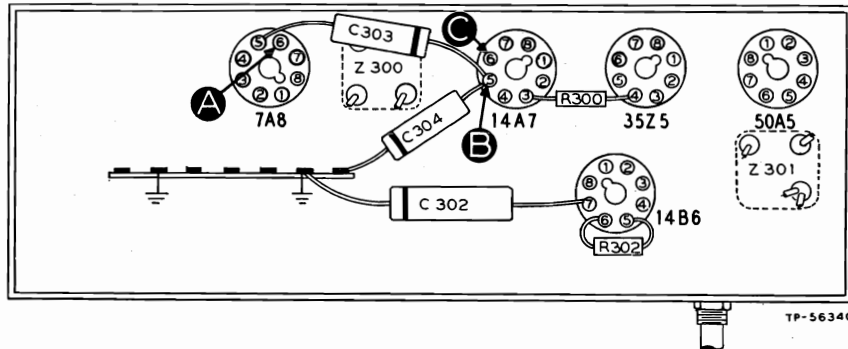


FIGURE 3. BOTTOM VIEW, SHOWING SECTION 3 TEST POINTS

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Clear signal with weak signal input.	Trouble within this section. Isolate by the following tests.
2	C	Clear signal with moderate signal input.	Defective or misaligned: Z301. Defective: 14B6 (diode section), 14A7. Open: R300, C302. Shorted, leaky, or open: C303.
3	A	Same as step 1.	Defective or misaligned: Z300. Defective: 7A8*. Open: C302, LA400*.

* This part, located in another section, may cause trouble in this section.

Section 4 — R-F and Converter Circuits TROUBLE SHOOTING

For the tests in this section, with the exception of the oscillator test, use an r-f signal generator with modulated output. Connect the generator ground lead to B-, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the radio volume control to maximum.

Set the radio and signal-generator dials as indicated in the chart.

If the "NORMAL INDICATION" is not obtained in step 1, isolate and correct the trouble in this section.

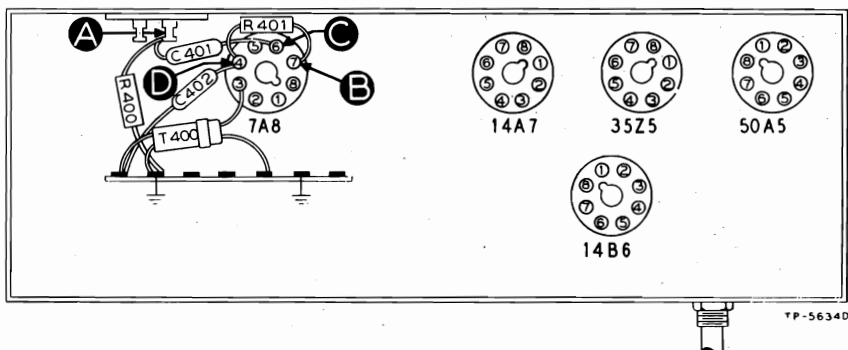
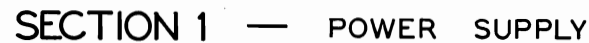
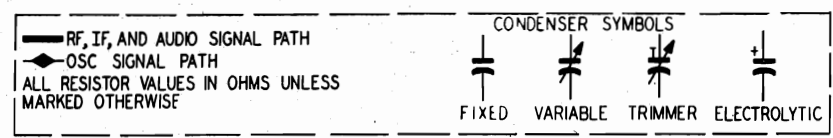
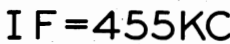


FIGURE 4. BOTTOM VIEW, SHOWING SECTION 4 TEST POINTS

STEP	TEST POINT	DIAL SETTINGS		NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
		SIG. GEN.	RADIO		
1	A	540 kc.	540 kc.	Clear signal with weak signal input.	Trouble within this section. Isolate by the following tests.
2	C	540 kc.	540 kc.	Same as step 1.	Shorted: C400, C400A. Defective: 7A8. Trouble in oscillator section.
3	D (Osc. test; see note below.)		540 to 1620 kc.	Negative 7 to 11 volts.	Defective: T400, 7A8. Open or shorted: C402. Shorted: C400, C400B.
4	A	540 kc.	540 kc.	Same as step 1.	Defective: LA400. Open C401.

OSCILLATOR-TEST NOTE: Connect positive lead of high-resistance voltmeter to B-, test point B; connect prod end of negative lead through a 100,000-ohm isolating resistor to the 7A8 oscillator grid, test point D. Use suitable meter range, such as 0-50 volts. Proper operation of oscillator is indicated by negative voltage of 7 to 11 volts (measured with a 20,000-ohms-per-volt meter) throughout range of tuning control.



TP-5634

MODELS 49-504,
49-504-I

PHILCO CORP.

ALIGNMENT PROCEDURE

TURN ON THE RADIO, AND SET THE VOLUME CONTROL TO MAXIMUM.

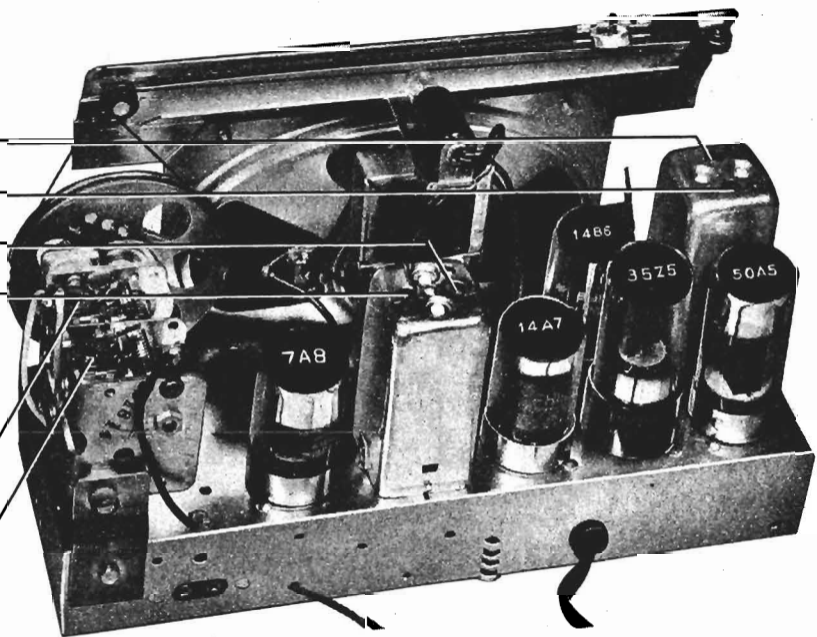
DIAL — Turn tuning condensers to full-mesh position. Set dial pointer to coincide with index mark, located to the left of "550."

OUTPUT METER — Connect to left (output) plug of terminal jack and chassis, as shown in figure 6.

SIGNAL GENERATOR — Connect as indicated in chart. Use modulated output.

OUTPUT LEVEL — During alignment, adjust signal-generator output to maintain output-meter indication below 1.25 volts.

STEP	SIGNAL GENERATOR		RADIO		ADJUST
	CONNECTIONS TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	
1	Ground lead to B-; output lead through a .1-mf. condenser to pin 6 of 7A8 converter.	455 kc.	540 kc.	Turn C300B (copper screw) fully tight, then adjust trimmers, in order given, for maximum output.	C301B C301A C300B C300A
2	Radiating loop (see note below).	1600 kc.	1600 kc.	Adjust for maximum.	C400B
3	Same as step 2.	1500 kc.	1500 kc.	Adjust for maximum.	C400A



NOTE: Make up a six-to-eight-turn, 6-inch-diameter loop, using insulated wire; connect to signal-generator leads and place near radio loop.

FIGURE 6. TOP VIEW, SHOWING TRIMMER LOCATIONS

TP-6161

SYMBOLIZATION

The components in the radio circuit are symbolized according to the types of parts and the sections of the radio in which the parts are located. The prefix letter of the symbol designates the type of part, as follows:

- | | | |
|-----------------|-----------------|-----------------------|
| C—condenser | LA—loop aerial | S—switch |
| I—pilot lamp | LS—loud-speaker | T—transformer |
| L—choke or coil | R—resistor | Z—electrical assembly |

The number of the symbol designates the section in which the part is located, as follows:

- 100-series components are in Section 1—the power supply.
- 200-series components are in Section 2—the audio circuits.
- 300-series components are in Section 3—the i-f, detector, and a-v-c circuits.
- 400-series components are in Section 4—the r-f and converter circuits.

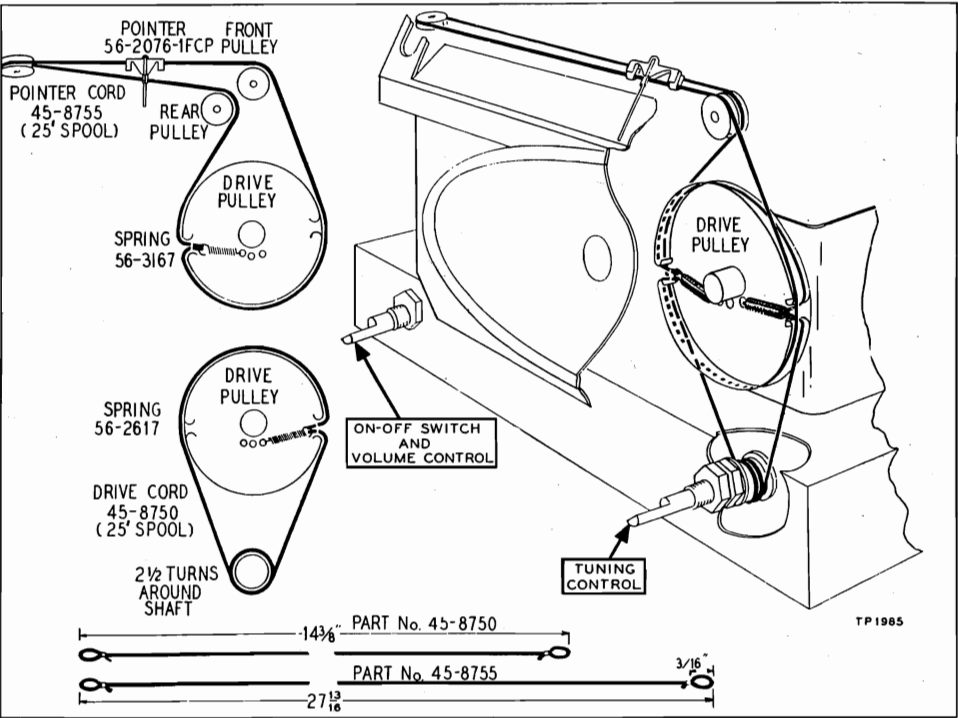


FIGURE 7. DRIVE-CORD INSTALLATION DETAILS

PHILCO CORP.

MODELS 49-504,
49-504-I

REPLACEMENT PARTS LIST

NOTE: Part numbers marked with an asterisk (*) are general replacement items. These numbers may not be identical with those on factory assemblies; also, the electrical values of some replacement items may differ from the values indicated in the schematic diagram and parts list. The values substituted in any case are so chosen that the operation of the radio will be either unchanged or improved. When ordering replacements, use only the "Service Part No."

SECTION 1 POWER SUPPLY

Reference Symbol	Description	Service Part No.
C100	Condenser, line filter, .04 mf.	45-3500-2*
C101	Condenser, electrolytic, 3-section	30-2573*
C101A	Condenser, filter, 30 mf.	Part of C101
C101B	Condenser, filter, 25 mf.	Part of C101
C101C	Condenser, filter, 20 mf.	Part of C101
I100	Lamp, pilot	34-2068
R100	Resistor, leakage, 150,000 ohms	66-4153340*
R101	Resistor, filter, 220 ohms	66-1224340*
R102	Resistor, filter, 1200 ohms	66-2123340*
S100	Switch, power	Part of R200
W100	Power cord and plug	L-3199

SECTION 2 AUDIO CIRCUITS

C200	Condenser, blocking, .01 mf.	61-0120*
C201	Condenser, by-pass, 220 mmf.	62-122001001*
C202	Condenser, blocking, .01 mf.	61-0120*
C203	Condenser, tone compensating, .02 mf.	61-0108*
LS700	Speaker	36-1615
R200	Volume control, 5 megohm	45-5019*
R201	Resistor, plate load, 470,000 ohms	66-4473340*
R202	Resistor, grid load, 3.3 megohms	66-5333340*
R203	Resistor, bias, 130 ohms	66-1123340*
R204	Resistor, grid load, 470,000 ohms	66-4473340*
T200	Transformer, output	Part of LS200

SECTION 3 I-F, DETECTOR, AND A-V-C CIRCUITS

C300A	Condenser, trimmer	Part of Z300
C300B	Condenser, trimmer	Part of Z300
C301A	Condenser, trimmer	Part of Z301
C301B	Condenser, trimmer	Part of Z301
C301C	Condenser, by-pass	Part of Z301
C301D	Condenser, by-pass	Part of Z301
C302	Condenser and choke assembly, i-f by-pass, .2 mf.	30-4644
C303	Condenser, screen by-pass, .05 mf.	61-0122*
C304	Condenser, a-v-c filter, .05 mf.	61-0122*
R300	Resistor, screen dropping, 27,000 ohms	66-3273340
R301	Resistor, i-f filter, 47,000 ohms	Part of Z301
R302	Resistor, a-v-c filter, 2.2 megohms	66-5223340*
Z300	Transformer, 1st i-f, including C300A and C300B	32-3968
Z301	Transformer, 2nd i-f, including C301A, C301B, C301C, C301D, and R301	45-6365*

SECTION 4 R-F AND CONVERTER CIRCUITS

Reference Symbol	Description	Service Part No.
C400	Condenser, tuning, 2-section	31-2527-2
C400A	Condenser, trimmer	Part of C400
C400B	Condenser, trimmer	Part of C400
C401	Condenser, coupling, 5 mmf.	60-90505007*
C402	Condenser, isolating, 47 mmf.	60-00515307*
LA400	Loop aerial	32-4052-4
R400	Resistor, aerial discharge, 150,000 ohms	66-4153340*
R401	Resistor, oscillator grid, 100,000 ohms	66-4103340*
T400	Transformer, oscillator	32-4263

MISCELLANEOUS

Description	Service Part No.
Cabinet	
Model 49-504 (less scale)	10524P
Model 49-504-I (less scale)	10524R
Cabinet Hardware	
Back	
Model 49-504	27-9817
Model 49-504-I	27-9870
Knob assembly	
Model 49-504	54-4052
Model 49-504-I	27-4805
Scale, dial	
Model 49-504	27-5907
Model 49-504-I	27-5908
Scale strap	56-2059FA3
Screw	1W23129FA3
Stud, back mounting (4)	W2235FA9
Dial Backplate and Associated Hardware	
Cord, drive (pointer)	45-8755
Cord, drive (gang)	45-8750
Dial-backplate assembly	
Model 49-504	76-1476
Model 49-504-I	76-1192
Diffusing panel, Model 49-504-I	54-4343
Light reflector, Model 49-504	27-9816-1*
Pointer	56-2076-1
Spring	
Gang drive cord	56-2617
Pointer drive cord	56-3167
Spring clip, diffusing screen, Model 49-504-I	56-3587
Pilot-lamp assembly	76-2142
Shaft, assembly	31-2663
Socket, tube	
Loktal	27-6138*
Octal	27-6174

MODEL 49-505

PHILCO CORP.



MODEL 49-505

Circuit Description

The Philco Radio, Model 49-505, is a five-tube, table-model superheterodyne, providing reception in the standard-broadcast band.

The high-impedance loop aerial normally provides adequate signal pickup. Provisions are made for the connection of an external aerial.

The loop is coupled to the 7A8 converter. Variable-condenser tuning is employed; the oscillator rotor-section plates are properly shaped to obtain tracking, thus eliminating the necessity for a series padding condenser.

The 7A8 is transformer-coupled to the 14A7 i-f amplifier, which is also transformer-coupled to the diodes of the 14B6 second detector—first audio-frequency amplifier. A-v-c voltage is applied to the control grids of both the i-f and converter tubes.

The triode section of the 14B6 is the first audio stage, and is resistance-coupled to the 50A5 output stage. The output tube works into a permanent-magnet dynamic speaker.

D-c operating voltages are obtained from the 35Y4 half-wave rectifier, the output of which is filtered by a two-section resistor-condenser filter.

Condenser C302 in Section 3 is a special condenser, inductively wound to form a series-tuned circuit, resonant at the intermediate frequency. This special condenser offers less impedance at this frequency than a conventional condenser, thus permitting higher i-f gain, with no tendency toward instability. The inductive effect at audio frequencies is negligible. Since the tuning gang is connected to the chassis, by-passing at broadcast frequencies is adequate.

Resistor R100, the 150,000-ohm resistor in Section 1, prevents hum which might otherwise occur under conditions of high humidity.

SPECIFICATIONS

CABINET	Plastic (walnut)
CIRCUIT	Five-tube superheterodyne
FREQUENCY RANGE.....	540—1620 kc.
OPERATING VOLTAGE.....	105—120 volts, a.c. or d.c.
POWER CONSUMPTION.....	30 watts
AERIAL.....	Loop fastened to cabinet; connection also provided for outside aerial
INTERMEDIATE FREQUENCY.....	455 kc.
PHILCO TUBES (5).....	7A8, 14A7, 14B6, 50A5, 35Y4

Philco TROUBLE-SHOOTING Procedure

For rapid trouble shooting, the radio circuit is divided into four sections, with test points specified for each section; these sections and test points are indicated in the schematic diagram. The trouble-shooting procedure given for each section includes a simplified test chart and a bottom view of the chassis showing the locations of the test points and the components of that section.

In each chart, the first step is a master check for determining whether trouble exists in that section without going through the entire test procedure.

Failure to obtain the "NORMAL INDICATION" in any given step indicates trouble within the circuit under test.

After isolating the trouble to a single stage, the defect is located by: first, testing the tube; second, measuring tube-electrode voltages; third, measuring circuit resistances; fourth, substituting condensers. The trouble revealed should be corrected before testing further.

Preliminary Checks

To avoid possible damage to the radio, the following preliminary checks should be made before turning on the power.

1. Inspect the top and bottom of the chassis. Make sure that all tubes are secure in the proper sockets, and look for any broken or shorted connections, burned resistors, or other obvious sources of trouble.
2. Measure the resistance between B+ (pin 7 of the 35Y4 rectifier) and B— (test point B). When the ohmmeter test leads are connected in the proper polarity, the highest resistance reading will be obtained. If the reading is lower than 1500 ohms, check condensers C101A, C101B, and C101C for leakage or shorts.

The resistance value, which is much lower than normal, is not intended as a quality check of these condensers; the value given is the lowest at which the rectifier will operate safely while the voltage tests of Section 1 (power supply) are performed.

PHILCO CORP.

MODEL 49-505

Section 1—Power Supply

For the tests in this section, use a d-c voltmeter. Connect the negative lead to B—, test point B; connect the positive lead to the test points indicated in the chart. The voltage readings given were taken with a 20,000-ohms-per-volt meter, at a line voltage of 117 volts, a.c.

Turn on the power, and set the volume control to minimum.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 2 (audio circuits); if not, isolate and correct the trouble in this section.

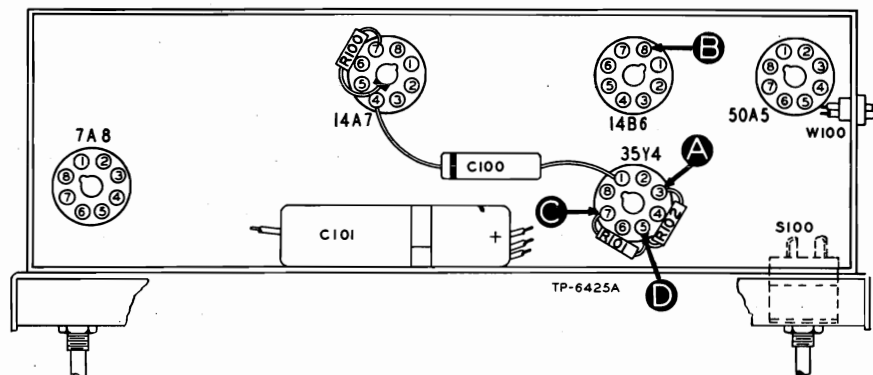


Figure 1. Bottom View, Showing Section 1 Test Points

STEP	TEST POINT	NORMAL INDICATION	ABNORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	107 volts		Trouble within this section. Isolate by the following tests.
2	C	130 volts	No voltage Low voltage High voltage	Defective: 35Y4, S100, W100. Shorted: C101A. Defective: 35Y4. Open: C101A, I100. Leaky: C101A. Open: R101, R102, R203*, T200*.
3	D	120 volts	No voltage Low voltage High voltage	Shorted: C101B. Open: R101. Shorted: C203*. Leaky: C101B, C203*. Open: R102, R203*, T200*.
4	A	107 volts	No voltage Low voltage High voltage	Shorted: C101C. Leaky: C101C. Open: R203*.

Listening Test: Abnormal hum may be caused by open C101B, C101C, or R100.

* This part, located in another section, may cause abnormal indication in this section.

Section 2—Audio Circuits

For the tests in this section, use an audio signal generator. Connect the ground lead of the generator to B—, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the radio volume control to maximum.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 3 (i-f, detector, and a-v-c circuits). If not, isolate and correct the trouble in this section.

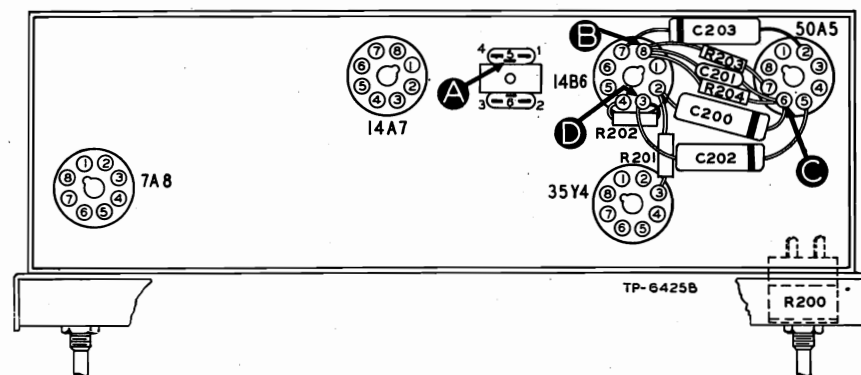


Figure 2. Bottom View, Showing Section 2 Test Points

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with weak signal input.	Trouble within this section. Isolate by the following tests.
2	C	Clear signal with strong signal input.	Open or shorted: LS200, T200. Shorted: C201, C203. Open: R203. Defective: 50A5.
3	D	Same as step 1.	Open: R201, R202, R204. Open, shorted, or leaky: C200. Defective: 14B6.
4	A	Same as step 1.	Defective: R200 (rotate through entire range). Open, shorted, or leaky: C202. Shorted: C301D*.

* This part, located in another section, may cause abnormal indication in this section.

Section 3—I-F, Detector, and A-v-c Circuits**TROUBLE SHOOTING**

For the tests in this section, use an r-f signal generator, with modulated output, set at 455 kc. Connect the generator ground lead to B-, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the radio volume control to maximum.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 4 (r-f and converter circuits); if not, isolate and correct the trouble in this section.

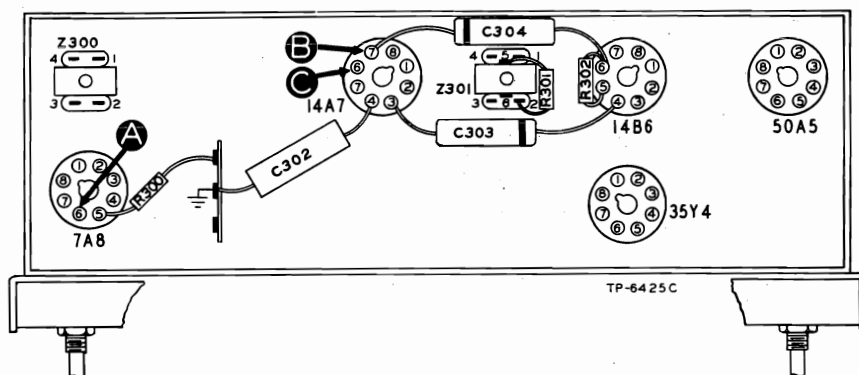


Figure 3. Bottom View, Showing Section 3 Test Points

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Clear signal with weak signal input.	Trouble within this section. Isolate by the following tests.
2	C	Clear signal with moderate signal input.	Misaligned: Z301. Defective: 14B6 (diode section), 14A7. Open: R300, C302. Shorted, leaky, or open: C303, Z301.
3	A	Same as step 1.	Defective or misaligned: Z300. Defective: 7A8*. Open: C302, LA400*, Z300. Shorted: Z300.

* This part, located in another section, may cause abnormal indication in this section.

Section 4—R-F and Converter Circuits**TROUBLE SHOOTING**

For the tests in this section, with the exception of the oscillator test, use an r-f signal generator with modulated output. Connect the generator ground lead to B-, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the radio volume control to maximum.

Set the radio and signal-generator dials as indicated in the chart.

If the "NORMAL INDICATION" is not obtained in step 1, isolate and correct the trouble in this section.

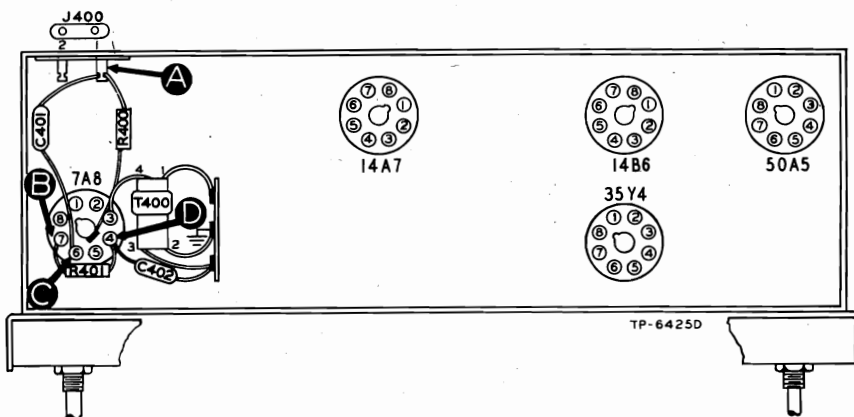


Figure 4. Bottom View, Showing Section 4 Test Points

STEP	TEST POINT	DIAL SETTINGS		NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
		SIG. GEN.	RADIO		
1	A	540 kc.	540 kc.	Clear signal with weak signal input.	Trouble within this section. Isolate by the following tests.
2	C	540 kc.	540 kc.	Same as step 1.	Shorted: C400, C400A. Defective: 7A8. Trouble in oscillator section.
3	Oscillator Test (see Note below)		540 to 1620 kc.	Negative 7 to 11 volts.	Defective: 7A8. Open or shorted: C402, T400. Shorted: C400, C400B.
4	A	540 kc.	540 kc.	Same as step 1.	Defective: LA400. Open: C401.

OSCILLATOR-TEST NOTE: Connect positive lead of high-resistance voltmeter to B-, test point B; connect prod end of negative lead through a 100,000-ohm isolating resistor to the 7A8 oscillator grid, test point D. Use suitable meter range, such as 0—50 volts. Proper operation of oscillator is indicated by negative voltage of 7 to 11 volts (measured with a 20,000-ohms-per-volt meter) throughout range of tuning control.

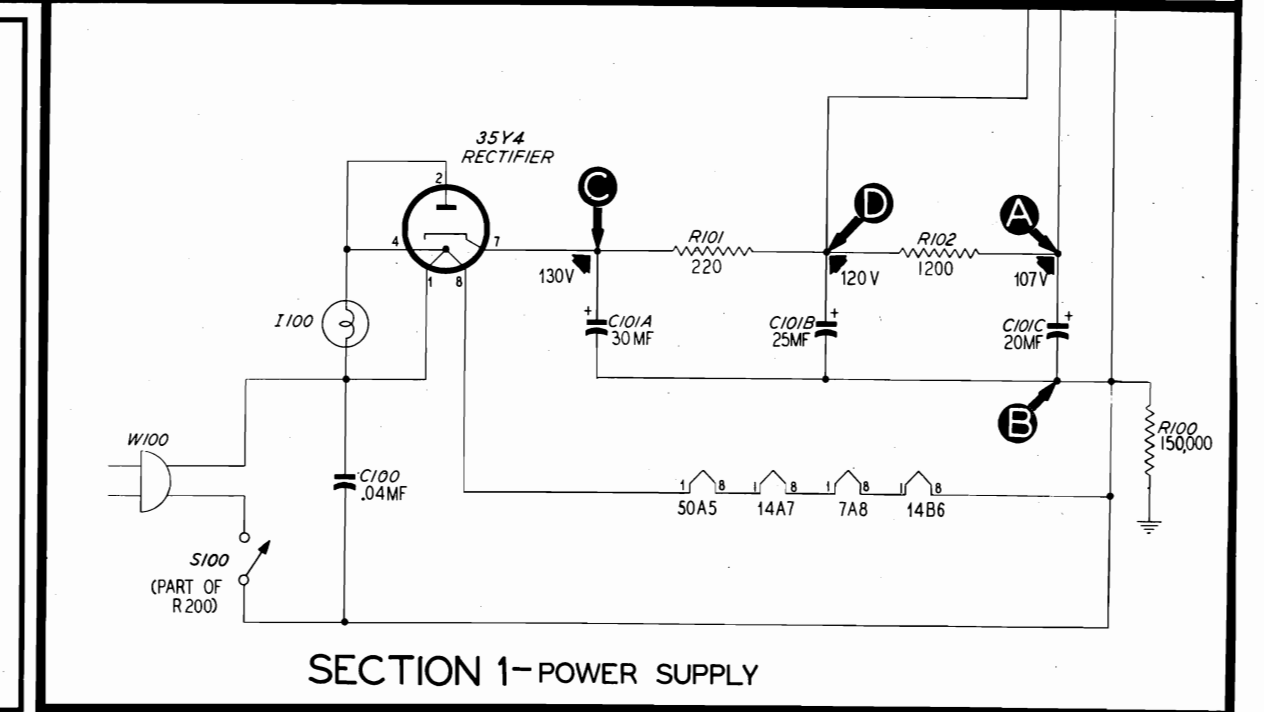
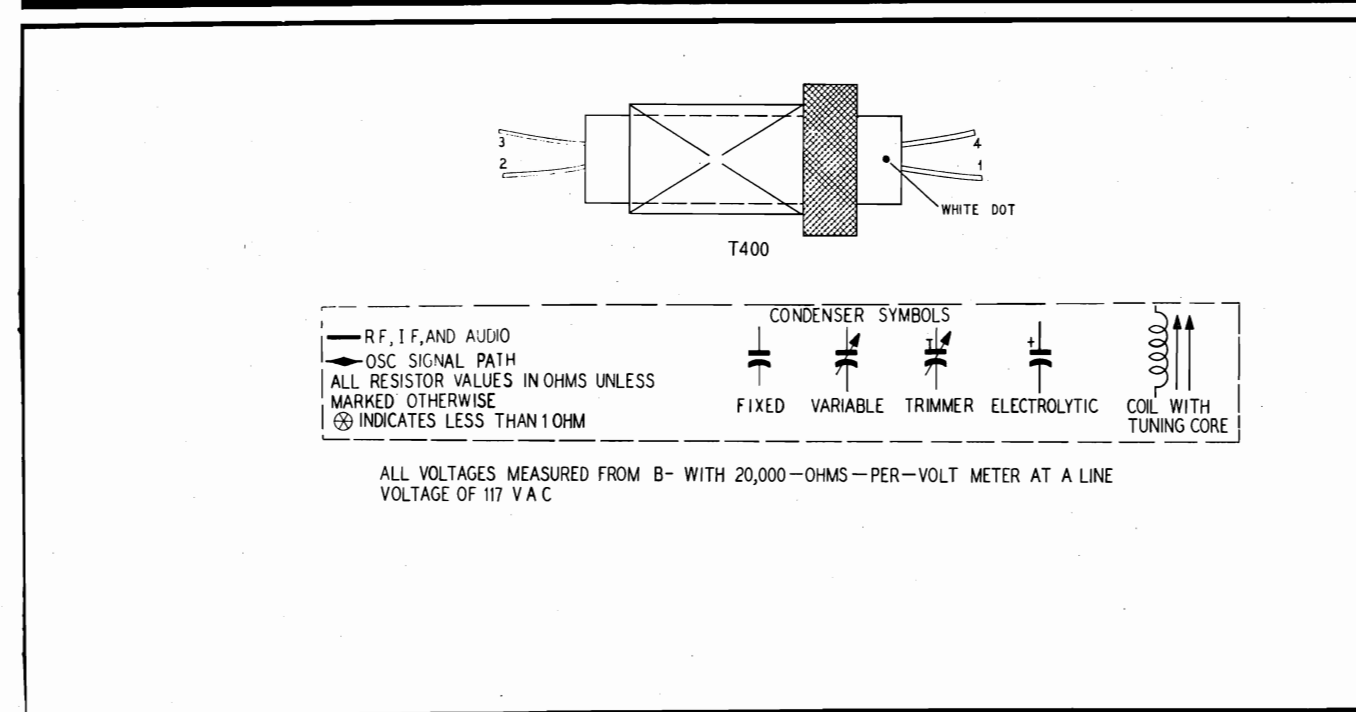
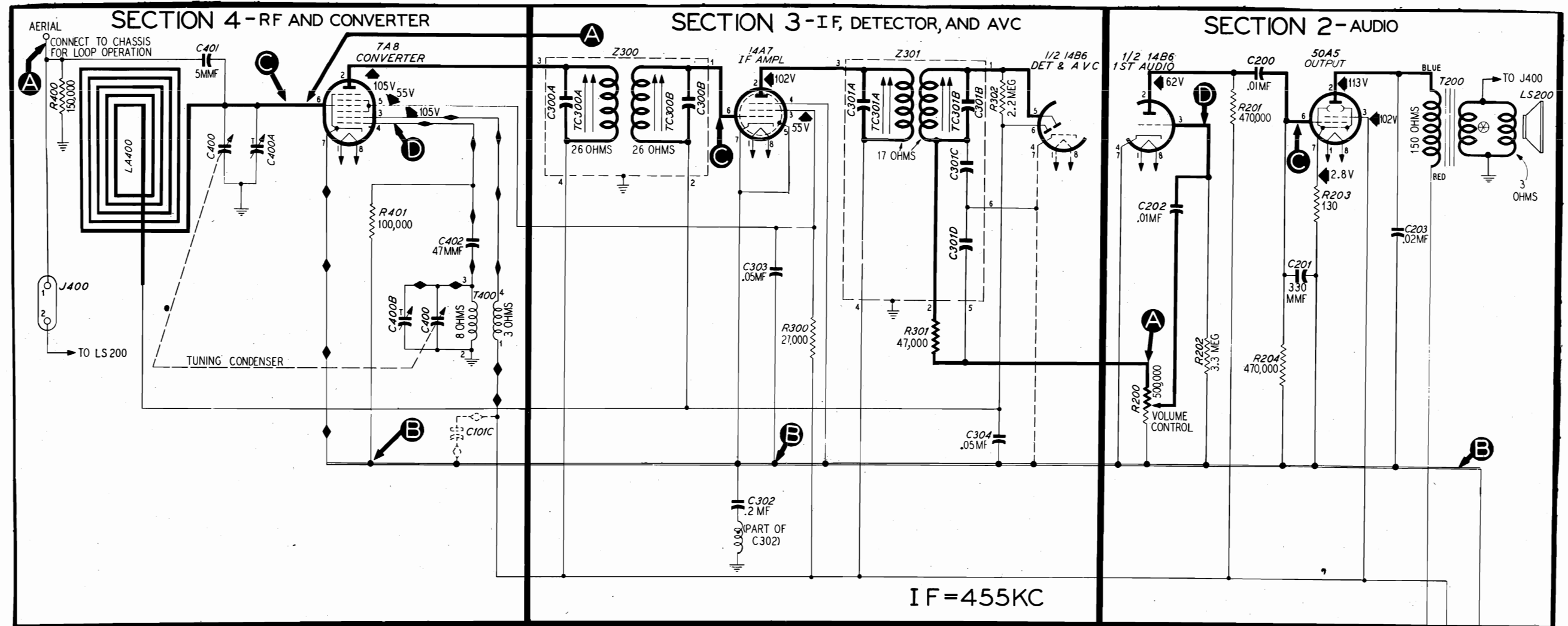


Figure 5. Philco Radio Model 49-505, Sectionalized Schematic Diagram, Showing Test Points

TP-6425

ALIGNMENT PROCEDURE

TURN ON THE RADIO, AND SET THE VOLUME CONTROL TO MAXIMUM

DIAL—Turn tuning condensers to full-mesh position. Set dial pointer to coincide with index mark; see figure 7.

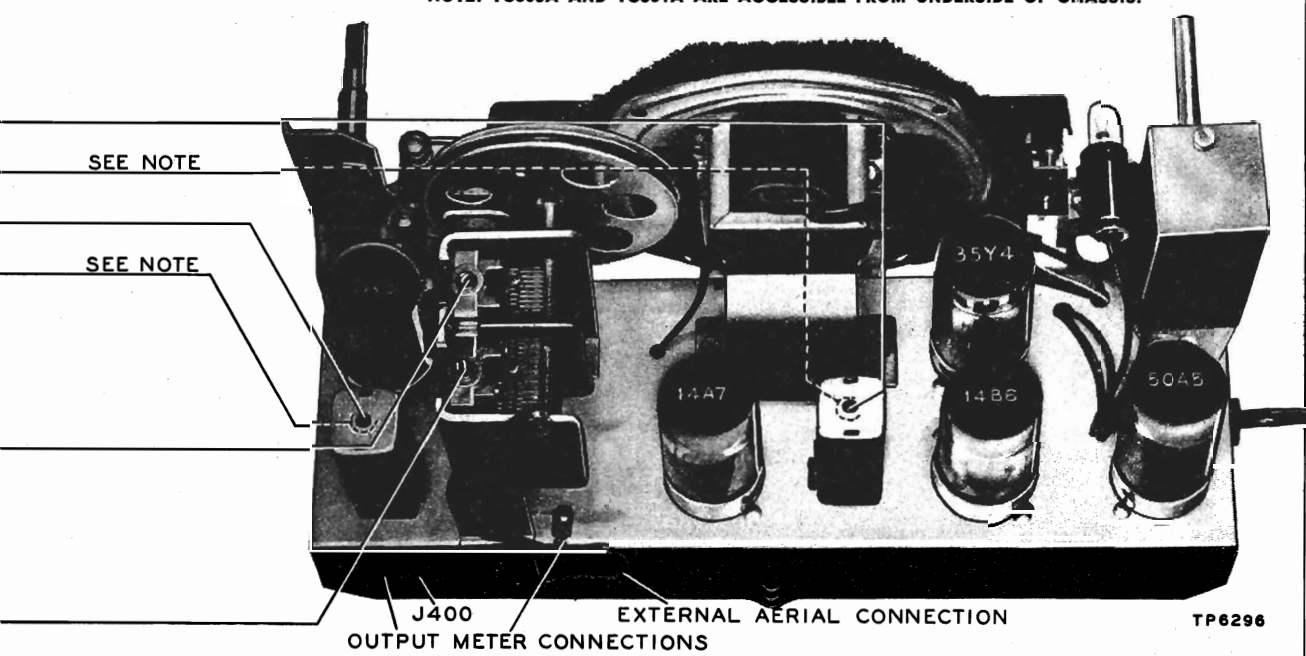
OUTPUT METER—Connect to left (output) terminal of J400 and chassis.

SIGNAL GENERATOR—Connect as indicated in chart. Use modulated output.

OUTPUT LEVEL—During alignment, adjust signal-generator output to hold output-meter indication below 1.25 volts.

STEP	SIGNAL GENERATOR		RADIO		ADJUST
	CONNECTIONS TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	
1	Ground lead to B-; output lead through .1-mf. condenser to test point C of Section 4.	455 kc.	540 kc.	Adjust tuning cores, in order given, for maximum output.	TC301B—2nd i-f sec. TC301A—2nd i-f pri. TC300B—1st i-f sec. TC300A—1st i-f pri.
2	Radiating loop (see note below).	1600 kc.	1600 kc.	Adjust for maximum.	C400B—osc.
3	Same as step 2.	1500 kc.	1500 kc.	Adjust for maximum.	C400A—aerial

NOTE: TC300A AND TC301A ARE ACCESSIBLE FROM UNDERSIDE OF CHASSIS.



RADIATING LOOP: Make up a six-to-eight-turn, 6-inch-diameter loop, using insulated wire; connect to signal-generator leads and place near radio loop.

SYMBOLIZATION

The components in the radio circuit are symbolized according to the types of parts and the sections of the radio in which the parts are located. The prefix letter of the symbol designates the type of part, as follows:

- C—condenser
- I—pilot lamp
- L—choke or coil
- LA—loop aerial
- LS—loud-speaker
- R—resistor
- S—switch
- T—transformer
- Z—electrical assembly

The number of the symbol designates the section in which the part is located, as follows:
100-series components are in Section 1—the power supply.
200-series components are in Section 2—the audio circuits.
300-series components are in Section 3—the i-f, detector, and a-v-c circuits.
400-series components are in Section 4—the r-f and converter circuits.

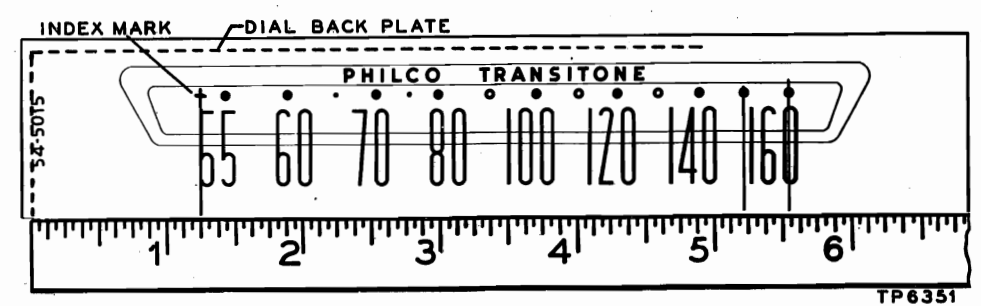


Figure 7. Calibration Measurements for Dial Backplate

Figure 6. Top View, Showing Trimmer Locations

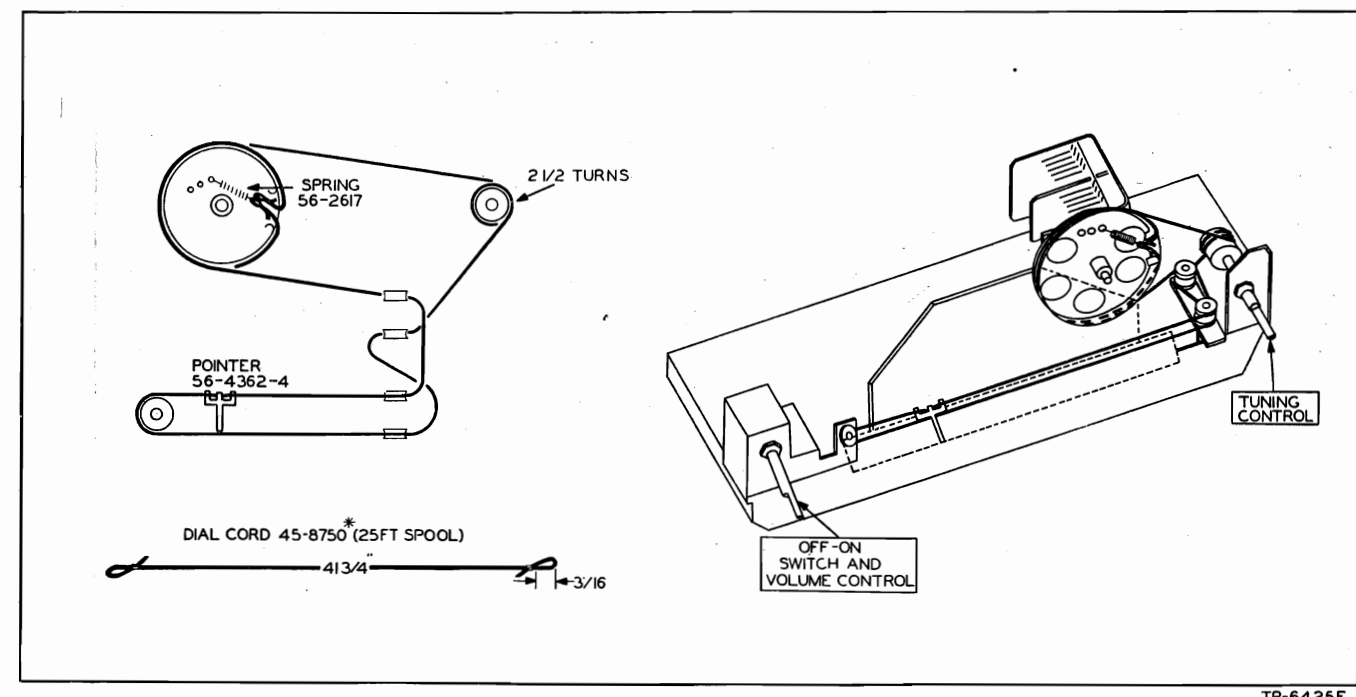


Figure 8. Drive-Cord Installation Details

REPLACEMENT PARTS LIST

NOTE: An asterisk (*) indicates a general replacement item. The part numbers of these items may not be identical with those on factory parts; also, the electrical values of some replacement items may differ from the values given in the schematic diagram and parts list. The values substituted in any case are so chosen that the operation of the radio will be either unchanged or improved. When ordering replacements, use only the "Service Part No."

SECTION 1—POWER SUPPLY

Reference Symbol	Description	Service Part No.
C100	Condenser, line filter, .04 mf.....	45-3500-2*
C101	Condenser, electrolytic, 3-section	30-2574*
C101A:	Condenser, filter, 30 mf.....	Part of C101
C101B:	Condenser, filter, 25 mf.....	Part of C101
C101C:	Condenser, filter, 20 mf.....	Part of C101
I100	Lamp, pilot	34-2068
R100	Resistor, leakage, 150,000 ohms.....	66-4153340*
R101	Resistor, filter, 220 ohms.....	66-1224340
R102	Resistor, filter, 1200 ohms.....	66-2124340
S100	Switch, power	Part of R200
W100	Power cord and plug.....	L-2183*

SECTION 2—AUDIO

C200	Condenser, blocking, .01 mf.....	61-0120*
C201	Condenser, by-pass, 330 mmf.....	62-133001001*
C202	Condenser, blocking, .01 mf.....	61-0120*
C203	Condenser, tone compensating, .02 mf....	61-0108*
LS200	Speaker	36-1625-6
R200	Volume control, .5 megohm.....	45-5007*
R201	Resistor, plate load, 470,000 ohms....	66-4473340*
R202	Resistor, grid load, 3.3 megohms.....	66-5333340*
R203	Resistor, bias, 130 ohms.....	66-1123340*
R204	Resistor, grid load, 470,000 ohms....	66-4473340*
T200	Transformer, output	Part of LS200

SECTION 3—I-F, DET., AND A-V-C

C300A	Condenser, fixed trimmer	Part of Z300
C300B	Condenser, fixed trimmer	Part of Z300
C301A	Condenser, fixed trimmer	Part of Z301
C301B	Condenser, fixed trimmer	Part of Z301
C301C	Condenser, by-pass	Part of Z301
C301D	Condenser, by-pass	Part of Z301
C302	Condenser and choke assembly, i-f by-pass, .2 mf.....	30-4644
C303	Condenser, screen by-pass, .05 mf.....	61-0122*
C304	Condenser, a-v-c filter, .05 mf.....	61-0122*
R300	Resistor, screen dropping, 27,000 ohms	66-3273340
R301	Resistor, i-f filter, 47,000 ohms.....	66-3473340*
R302	Resistor, a-v-c filter, 2.2 megohms....	66-5223340*
TC300A	Tuning core	Part of Z300

SECTION 3—I-F, DET., AND A-V-C (Continued)

TC300B	Tuning core	Part of Z300
TC301A	Tuning core	Part of Z301
TC301B	Tuning core	Part of Z301
Z300	Transformer, 1st i-f, including TC300A, TC300B, C300A, and C300B.....	32-4160-6
Z301	Transformer, 2nd i-f, including TC301A, TC301B, C301A, C301B, C301C, and C301D	32-4240

SECTION 4—R-F AND CONVERTER

C400	Condenser, tuning, 2-section	31-2727-1
C400A:	Condenser, trimmer	Part of C400
C400B:	Condenser, trimmer	Part of C400
C401	Condenser, coupling, 5 mmf.....	30-1224-5*
C402	Condenser, isolating, 47 mmf.....	30-1224-2*
LA400	Loop aerial	32-4052-24
R400	Resistor, aerial discharge, 150,000 ohms	66-4153340*
R401	Resistor, oscillator grid, 100,000 ohms.	66-4103340*
T400	Transformer, oscillator	32-4263

MISCELLANEOUS

Description	Service Part No.
Baffle-and-cloth assembly	40-7525
Bracket, rear condenser mounting.....	56-5701FA3
Bracket, scale	56-5698FA3
Cabinet	10717
Cord, drive (25-foot spool).....	45-8750*
Cover, bottom	56-5706FA3
Cover, handle	54-4596
Cover, volume control.....	56-5699FA3
Knob	54-4609
Pilot-lamp-socket assembly	27-6233-12
Plate, guard	54-7709
Pointer	56-4362-4FCP
Rail, pointer	56-5697FCP
Rubber mount	27-4771-1
Scale-and-backplate assembly	76-4167
Shaft assembly, drive	78-4075
Socket, tube	27-6177
Spring	56-2617
Stud, baffle	W2235-1FA9

Circuit Description

Philco Model 49-602 is a portable four-tube superheterodyne providing reception on the standard-broadcast band. A high-impedance loop within the cabinet normally provides adequate signal pickup. However, provisions have been made for connecting an external aerial, if required.

The aerial circuit works directly into a 1R5 converter, where the incoming signal is converted to the 455-kc. intermediate frequency. A 1T4 is used in a single high-gain stage of i-f amplification, which employs neutralization to suppress oscillation. A 1.5-mmfd. condenser, C304, feeds part of the i-f voltage, of the proper phase, back to the 1T4 grid through the tube-socket capacitance.

A 1U5 diode-pentode is used in the detector, a-v-c, and first audio circuits. The pentode section is resistance-coupled to a 3V4 pentode output amplifier, which works into a p-m speaker.

The d-c operating voltages are obtained from either a battery pack, Philco type P-361, or from a 105—120 volt, a-c or d-c power line. For power-line operation, the plate, screen, and filament voltages are provided by a power supply using a selenium rectifier, CR100.

Philco TROUBLE-SHOOTING Procedure

For rapid trouble shooting, the radio circuit is divided into four sections, with test points specified for each section; these sections and test points are indicated in the schematic diagram. The trouble-shooting procedure given for each section includes a simplified test chart and a bottom view of the chassis showing the locations of the test points and the components of that section.

In each chart, the first step is a master check for determining whether trouble exists in that section, without going through the entire chart.

Failure to obtain the "NORMAL INDICATION" in any given step indicates trouble within the circuit under test.

After isolating the trouble to a single stage, the defect is located by: first, testing the tube; second, measuring tube electrode voltages; third, measuring circuit resistances; fourth, substituting condensers. The trouble revealed should be corrected before testing further.

Preliminary Checks

To avoid possible damage to the radio, the following preliminary checks should be made before turning on the power:



SPECIFICATIONS

CABINET	Molded Polystyrene (maroon, tan, ivory or green)
CIRCUIT	Four-tube superheterodyne
FREQUENCY RANGE	540—1600 kc.
AUDIO OUTPUT	160 milliwatts
OPERATING VOLTAGES	Battery: "B", 90 volts; "A", 7.5 volts. A.c./d.c.: 105—120 volts
POWER CONSUMPTION	Battery: "B", 13 ma. at 90 volts; "A", 50 ma. at 7.5 volts. A.c./d.c.: 25 watts
AERIAL	Built-in high-impedance loop; terminal also provided for external aerial
INTERMEDIATE FREQUENCY	455 kc.
PHILCO TUBES (4)	1R5, 1T4, 1U5, 3V4
BATTERY TYPE	Philco P-361

TP-4523

1. Inspect both the top and the bottom of the chassis. Make sure that all tubes are secure in the proper sockets, and look for any broken or shorted connections, burned resistors, or other obvious sources of trouble.

2. Check the total filament resistance, with the power switch turned on, the battery plug disconnected from the battery, and the change-over switch in the battery position (power-cord plug inserted in receptacle on rear of chassis). If the resistance between the A+ and A—pins on the battery plug is higher than 100 ohms, one of the tube filaments is probably open.

NOTE: If the 3V4 filament is open, check condenser C202 before replacing the tube.

3. Measure the resistance between B+ (output of selenium rectifier), test point D, and B—, test point B. See figure 1. When the ohmmeter leads are connected in the proper polarity, the highest resistance reading will be obtained. If the reading is lower than 2000 ohms, check condensers C101A and C101B for leakage or shorts.

The resistance value above, which is much lower than normal, does not represent a quality check of these condensers; it is the lowest value which will permit the rectifier to operate safely while the voltage checks of Section 1 (power supply) are performed.

Section 1—Power Supply

Make the tests for this section with a d-c voltmeter. Connect the negative lead to B—, test point B; connect the positive lead to the test points indicated in the chart. The voltage readings given were taken with a 20,000-ohms-per-volt meter at a line voltage of 117 volts, a.c.

Set the volume control to minimum.

The battery pack should be replaced when the "A" voltage drops below 5 volts, or the "B" voltage drops below 60 volts.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 2 (audio circuits); if not, isolate and correct the trouble in this section.

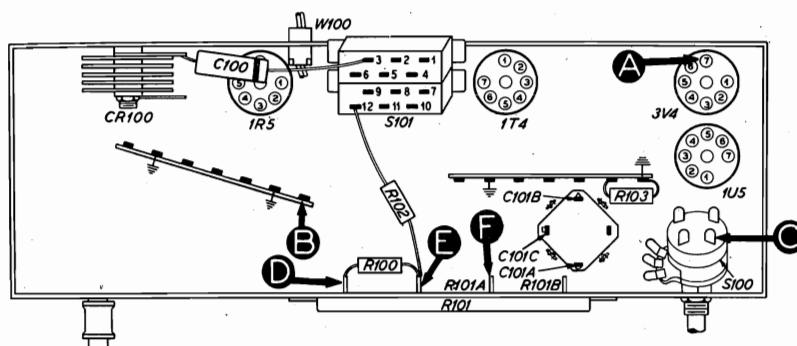


Figure 1. Bottom View, Showing Section 1 Test Points

TP-5355A

STEP	TEST POINT	NORMAL INDICATION	ABNORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1(a)	A	7.5v		Trouble in this section. Isolate by the following tests.
1(b)	C	90v		
2	D	125v	Low voltage No voltage	Defective: CR100. Open: S100, S101.
3	E	120v	Low voltage No voltage	Changed resistance: R100. Leaky: C101A. Open: R100. Shorted: C101A.
4	F	65v	Low voltage No voltage	Changed resistance: R101A. Leaky: C101B. Open: R101A. Shorted: C101B.
5	A	7.5v	Low voltage High voltage No voltage	Changed resistance: R101B. Open: One or more filaments, R205*. Open: R101B, S101.
6	C	90v	Low voltage High voltage No voltage	Changed resistance: R102. Leaky: C101C. Open: R205*, T200*, S100. Open: R102, S101. Shorted: C101C.

Listening Test: Abnormal hum may be caused by open C101B, C101C, or C202*.

*This part, located in another section, may cause abnormal indication in this section.

Section 2—Audio Circuits

For the tests in this section, use an audio-frequency signal generator. Connect the generator ground lead to B—, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the radio volume control to maximum.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 3 (i-f, detector, and a-v-c circuits); if not, isolate and correct the trouble in this section.

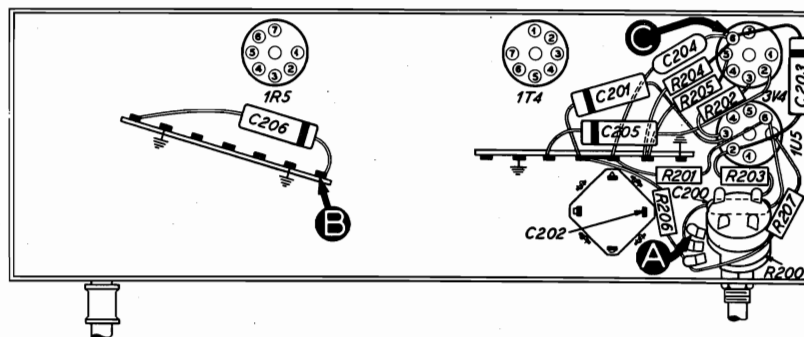


Figure 2. Bottom View, Showing Section 2 Test Points

TP-5355B

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear speaker output with moderate generator input.	Trouble in this section. Isolate by the following tests.
2	C	Clear speaker output with strong generator input.	Defective: 3V4, LS200. Open: R204, T200. Shorted: C203, C204, C205, T200.
3	A	Same as step 1.	Defective: 1U5, R200 (rotate). Open: C200, R201, R202, R203, C203. Shorted: C201, C301C*.

Listening Test: Distortion may be caused by leaky or shorted C203, or by changed resistance of R202. Distortion or strong signals may be caused by leaky or shorted C200.

*This part, located in another section, may cause abnormal indication in this section.

Section 3—I-F, Detector, And A-V-C Circuits

For the tests in this section, use an r-f signal generator, with modulated output, set at 455 kc. Connect the generator ground lead to B—, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the radio volume control to maximum.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 4 (r-f and converter circuits); if not, isolate and correct the trouble in this section.

To provide a complete i-f amplifier check, test point A for this section is placed at the grid of the mixer in Section 4; therefore, the effectiveness of step 1 as a master check is dependent upon the condition of certain parts in the mixer circuit. These parts are listed below under "POSSIBLE CAUSE OF ABNORMAL INDICATION."

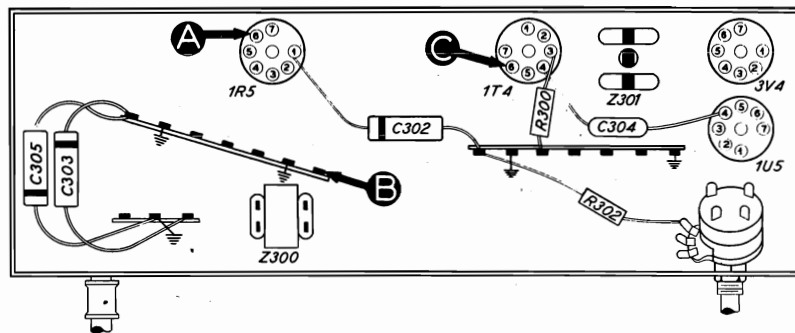


Figure 3. Bottom View, Showing Section 3 Test Points

TP-5355C

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear speaker output with weak generator input.	Trouble in this section. Isolate by the following tests.
2	C	Loud, clear output with moderate input.	Defective: 1T4, 1U5 (diode section). Misaligned: Z301. Open: R300, C303, L301A, R301, L301B, C301A. Shorted: C300B, C303, L301A, L301B, C301A, C301B.
3	A	Same as step 1.	Defective: 1R5*. Misaligned: Z300. Open: C300A, L300A, L300B, C300B, T400*. Shorted: C400A*, C400B*, C300A, L300A, L300B, C300B.

*This part, located in another section, may cause abnormal indication in this section.

Section 4—R-F And Converter Circuits

For the tests in this section, with the exception of the oscillator test, use an r-f signal generator with modulated output. Connect the generator ground lead to B—, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the radio volume control to maximum. Set the tuning control and signal-generator frequency as indicated in the chart.

If the "NORMAL INDICATION" is obtained in step 1, further tests should be unnecessary; if not, isolate and correct the trouble in this section. If the trouble is not revealed by the tests for this section, check the alignment.

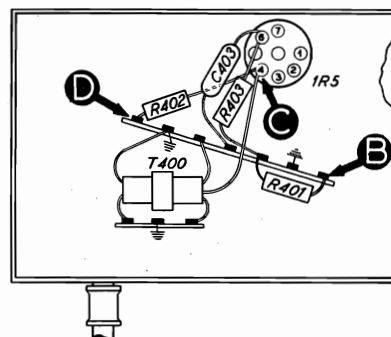


Figure 4. Bottom View, Showing Section 4 Test Points

TP-5355D

STEP	TEST POINT	SIGNAL GEN. FREQUENCY	RADIO TUNING	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	1000 kc.	Tune to signal.	Loud, clear speaker output with weak generator input.	Trouble in this section. Isolate by the following tests.
2	C to D (Osc. test; see note below.)		Rotate through range.	Negative 5 to 10 volts.	Defective: 1R5. Open: R402, T400. Shorted: C402, C400C, C400D.
3	A	1000 kc.	Tune to signal.	Same as step 1.	Open: C401, C403, R401, R403, LA400.

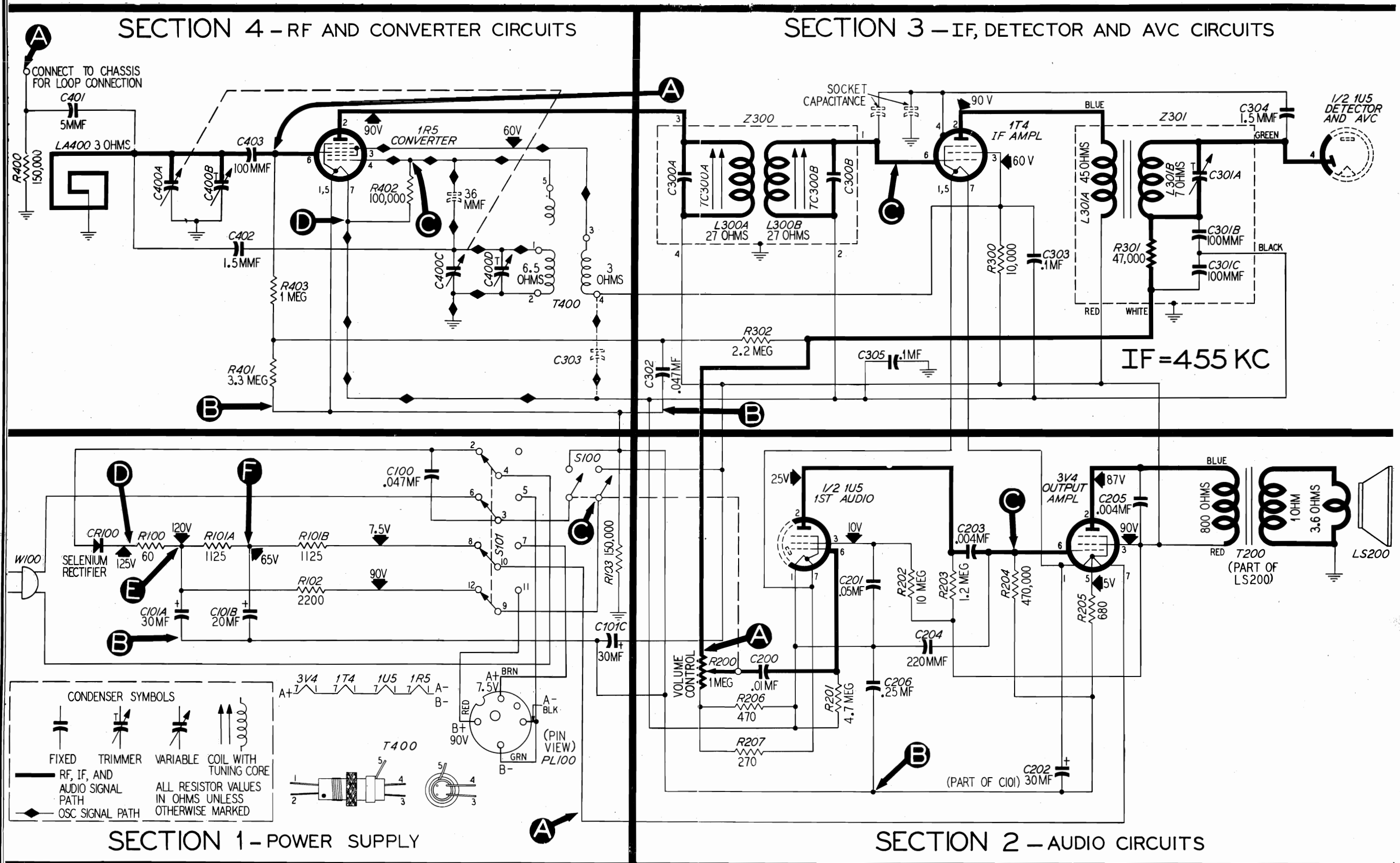


Figure 5. Philco Model 49-602, Sectionalized Schematic Diagram, Showing Test Points

OSCILLATOR TEST: Connect the positive lead of a high-resistance voltmeter to test point D; connect the prod end of the negative lead through a 100,000-ohm isolating resistor to the oscillator grid (pin 4 of the 1R5), test point C. Use a suitable meter range, such as 0-10 volts. Proper operation of the oscillator is indicated by negative voltage within the range given in the chart (measured with a 20,000-ohms-per-volt meter) throughout the tuning range.

ALIGNMENT PROCEDURE

DIAL—Calibration and pointer-index measurements are shown in figure 7. With tuning condenser fully meshed, set pointer to index mark.

RADIO CONTROLS—Set volume control to maximum.

OUTPUT METER—Connect across voice-coil terminals.

SIGNAL GENERATOR—Use modulated output.

OUTPUT LEVEL—During alignment, adjust signal-generator output to maintain output-meter indication below .5 volt.

SPECIAL NOTE—The orientation of the loop with respect to the chassis is critical for correct tracking. During alignment, with the cabinet back (containing the loop) laid down on the bench, the chassis should be laid on its back, in approximately its normal relation to the loop.

STEP	SIGNAL GENERATOR		RADIO		ADJUST
	CONNECTION TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	
1	Ground lead to B— (test point B in figure 4). Positive lead through .05-mf. condenser to external-aerial lead. Make sure that radio loop aerial is connected to radio.	455 kc.	Tuning condenser fully meshed.	Adjust, in order given, for maximum output.	C301A—2nd i-f sec. TC300B—1st i-f sec. TC300A—1st i-f p.r.i.
2	Radiating loop (see note below).	1600 kc.	1600 kc.	Adjust for maximum output.	C400D—osc.
3	Same as step 2.	1500 kc.	1500 kc.	Adjust for maximum output while rocking tuning condenser.	C400B—aerial.

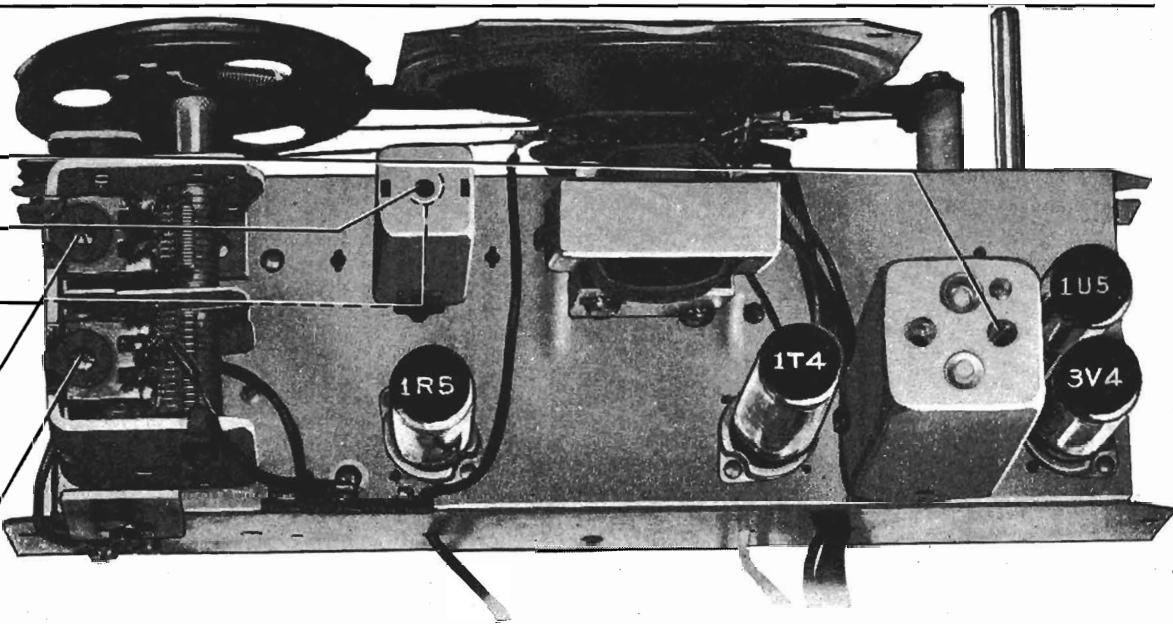


Figure 6. Top View, Showing Trimmer Locations

RADIATING LOOP: Make up a 6—8-turn, 6-inch-diameter loop, using insulated wire; connect to signal-generator leads and place near radio loop aerial. Make sure that radio loop aerial is connected to radio.

CALIBRATING DIAL BACKPLATE

When the radio chassis has been removed from the cabinet, dial calibration and alignment points may be marked on the dial (chassis) backplate at the end of the pointer with a pencil. The method of measuring for these points is illustrated in figure 7.

With the tuning gang fully meshed, the pointer should be adjusted on the dial-drive cord to coincide with the index mark.

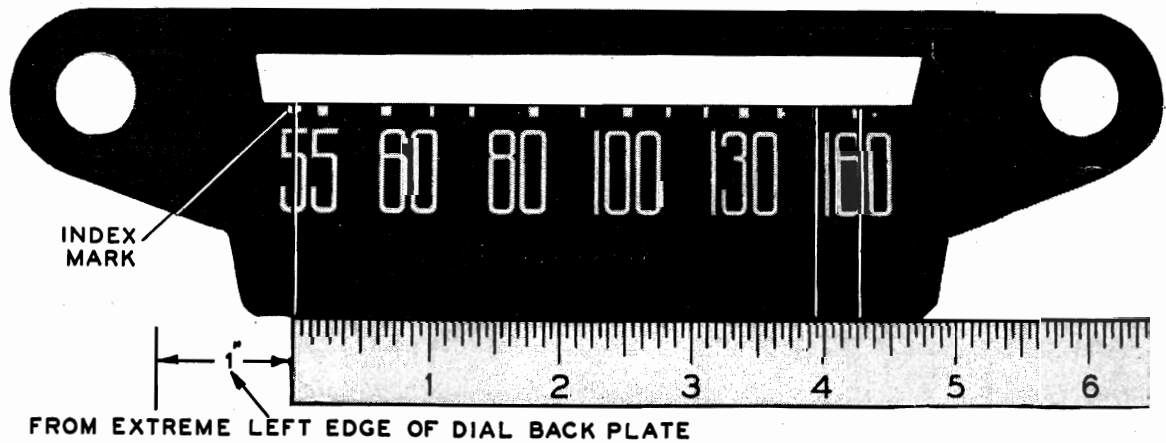


Figure 7. Dial-Backplate Calibration Measurements

TP-5776

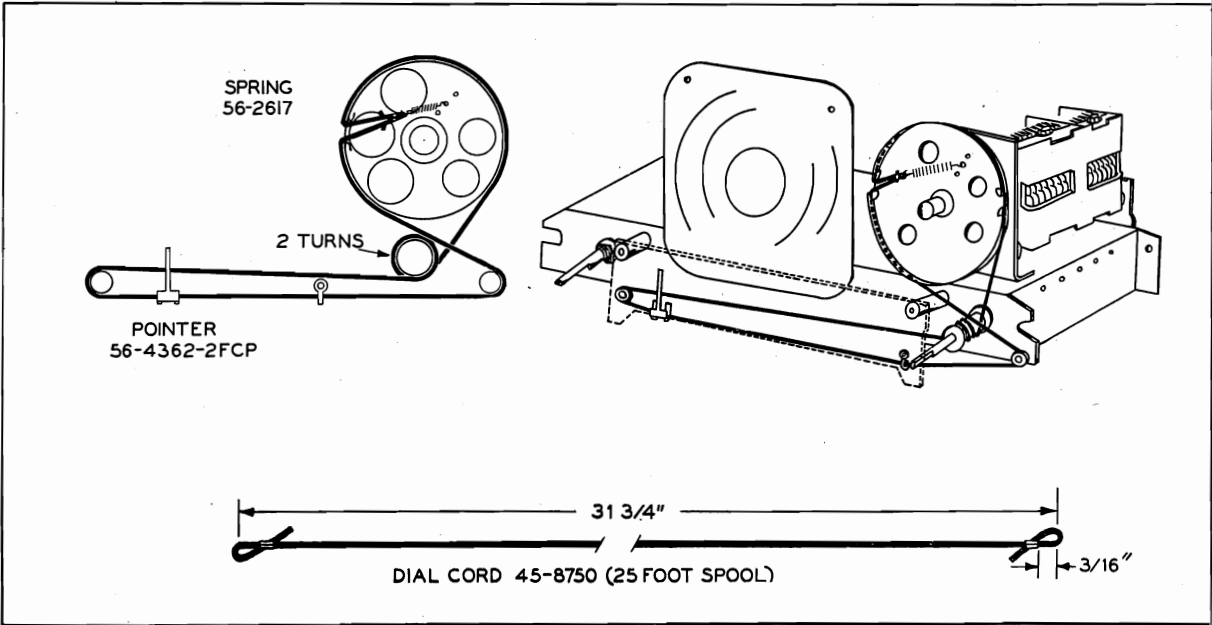


Figure 8. Drive-Cord Installation Details

TP-535

REPLACEMENT PARTS LIST

SECTION 1 POWER SUPPLY

Reference Symbol	Description	Service Part No.
C100	Condenser, line filter, .047 mf.	61-0122*
C101	Condenser, electrolytic, 4-section	30-2568-21
C101A	Condenser, filter, 30 mf., 150v	Part of C101
C101B	Condenser, filter, 20 mf., 150v	Part of C101
C101C	Condenser, filter, 30 mf., 150v	Part of C101
CR100	Rectifier, selenium	34-8003-1
PL100	Battery-cable-and-plug assembly	41-3712-3
R100	Resistor, current limiting, 80 ohms, 1 watt	33-1334
R101	Resistor, 2-section	33-3431-5
R101A	Resistor, filament-dropping, 1125 ohms, 3 watts	Part of R101
R101B	Resistor, filament-dropping, 1125 ohms, 3 watts	Part of R101
R102	Resistor, filter, 2200 ohms	66-2223340*
R103	Resistor, leakage 150,000 ohms	66-4153340*
S100	Switch, on-off	Part of 33-5538-28
S101	Switch, change-over	42-1821
W100	Line-cord-and-plug assembly	L2183*

SECTION 2 AUDIO CIRCUITS

C200	Condenser, d-c blocking, .01 mf.	61-0120*
C201	Condenser, screen by-pass, .05 mf.	61-0122*
C202	Condenser, filter, 30 mf., 25v	Part of 30-2568-21
C203	Condenser, d-c blocking, .004 mf.	61-0179*
C204	Condenser, r-f by-pass, 220 mmf.	62-122001001*
C205	Condenser, tone compensation, .004 mf.	61-0179*
C206	Condenser, by-pass, .25 mf.	61-0125*
LS200	Loud-speaker, p-m	36-1627-1
R200	Volume control, 1 megohm	33-5538-28
R201	Resistor, grid return, 4.7 megohms	66-5473340*
R202	Resistor, screen dropping, 10 megohms	66-6103340*
R203	Resistor, plate load, 1.2 megohms	66-5123340*
R204	Resistor, grid return, 470,000 ohms	66-4473340*
R205	Resistor, bias, 680 ohms	66-1683340*
R206	Resistor, diode return, 470 ohms	66-1473340*
R207	Resistor, diode return, 270 ohms	66-1273340*
T200	Transformer, output	Part of LS200

SECTION 3 I-F, DETECTOR, AND A-V-C CIRCUITS

C300A	Condenser, shunt	Part of Z300
C300B	Condenser, shunt	Part of Z300
C301A	Condenser, trimmer	Part of Z301
C301B	Condenser, filter	Part of Z301
C301C	Condenser, filter	Part of Z301
C302	Condenser, a-v-c filter, .047 mf.	61-0122
C303	Condenser, screen by-pass, .1 mf.	61-0113*
C304	Condenser, neutralizing, 1.5 mmf.	30-1221-3

SECTION 3 (Continued) I-F, DETECTOR, AND A-V-C CIRCUITS

Reference Symbol	Description	Service Part No.
C305	Condenser, i-f by-pass, .1 mf.	30-4527
L300A	Transformer primary, 1st i-f	Part of Z300
L300B	Transformer secondary, 1st i-f	Part of Z300
L301A	Transformer primary, 2nd i-f	Part of Z301
L301B	Transformer secondary, 2nd i-f	Part of Z301
R300	Resistor, screen dropping, 10,000 ohms	66-3103340*
R301	Resistor, filter, 47,000 ohms (Part of Z301)	66-3473340*
R302	Resistor, a-v-c filter, 2.2 megohms	66-5223340*
Z300	Transformer, 1st i-f	32-4160-4
Z301	Transformer, 2nd i-f	32-3987-2*

SECTION 4 R-F AND CONVERTER CIRCUITS

C400	Condenser, tuning gang	31-2727-2
C400A	Condenser, tuning, aerial section	Part of C400
C400B	Condenser, trimmer, aerial	Part of C400
C400C	Condenser, tuning, oscillator section	Part of C400
C400D	Condenser, trimmer, oscillator	Part of C400
C401	Condenser, isolating, 5 mmf.	30-1224-5*
C402	Condenser, neutralizing, 1.5 mmf.	30-1221-3
C403	Condenser, d-c blocking, 100 mmf.	60-10105407*
LA400	Loop aerial	32-4274
R400	Resistor, leakage, 150,000 ohms	66-4153340*
R401	Resistor, grid return, 3.3 megohms	66-5333340*
R402	Resistor, oscillator bias, 100,000 ohms	66-4103340*
R403	Resistor, a-v-c divider, 1 megohm	66-5103340*
T400	Transformer, oscillator	32-4282

MISCELLANEOUS

Description	Service Part No.
Cabinet and Cabinet Parts	
Cabinet (M), maroon	10703
Cabinet (T), tan	10703A
Cabinet (I), ivory	10703B
Cabinet (G), green	10703C
Handle	76-3742
Lever assembly, switch	76-3666
Terminal, aerial strip	76-3674
Dial-Scale Hardware	
Dial-backplate assembly	56-5425FCP
Drive cord, 25-foot spool	45-8750*
Pointer	56-4362-2FCP
Spring, drive-cord	56-2617
Knob (M)	54-4557
Knob (T)	54-4557-1
Knob (I)	54-4557-2
Knob (G)	54-4557-3
Socket, tube, miniature	27-6203
Spring, voltage change-over switch	28-9010FA1—Part of 76-3666

MODEL 49-605

PHILCO CORP.

Circuit Description

Philco Model 49-605 is a six-tube, portable, super-heterodyne radio, operating on a self-contained battery or a standard power source of a.c. or d.c. High sensitivity, selectivity, and power output are outstanding features. The frequency range is 540—1600 kc. The built-in loop aerial is adequate in most localities. Where signal strength is low, an external aerial may be used.

The tuned r-f stage, using a 1T4, provides a high signal-to-noise ratio. The converter employs a type 1R5 pentagrid converter.

The i-f stage, using another 1T4, has double-tuned transformers operating at 265 kc.; the voltage gain of this stage is increased considerably by positive screen feedback taken from the tertiary winding of the second i-f transformer.

The diode section of the 1U5 provides detection and a-v-c voltage. The pentode section functions as the first audio stage; this stage is resistance-coupled to the 3LF4 output amplifier. The speaker is a permanent-magnet dynamic type.

For a-c or d-c power-line operation, plate, screen, and filament power is supplied through the 117Z3 rectifier.

Philco TROUBLE-SHOOTING Procedure

For rapid trouble shooting, the radio circuit is divided into four sections, with test points specified for each section; these sections and test points are indicated in the schematic diagram. The trouble-shooting procedure given for each section includes a simplified test chart and a bottom view of the chassis showing the locations of the test points and components of that section.

In each chart, the first step is a master check for determining whether trouble exists in that section, without going through the entire test procedure.

Failure to obtain the "NORMAL INDICATION" in any given step indicates trouble within the circuit under test.

After isolating the trouble to a single stage, the defect is located by: first, testing the tube; second, measuring tube electrode voltages; third, measuring circuit resistances; fourth, substituting condensers. The trouble revealed should be corrected before testing further.

Preliminary Checks

To avoid possible damage to the radio, the following preliminary checks should be made before turning on the power:



MODEL 49-605

SPECIFICATIONS

CABINET	2-piece plastic, metal frame
CIRCUIT	6-tube superheterodyne
FREQUENCY RANGE	540—1600 kc.
AUDIO OUTPUT	160 milliwatts
OPERATING VOLTAGES	Battery: "B", 90 volts; "A", 9 volts. A.c./d.c.: 105—120 volts
POWER CONSUMPTION	Battery: "B", 12 ma. at 90 volts; "A", 50 ma. at 9 volts. A.c./d.c.: 25 watts
AERIAL	Built-in loop; terminal also provided for external aerial
INTERMEDIATE FREQUENCY	265 kc.
PHILCO TUBES (6)	1T4 (2), 1R5, 1U5, 3LF4, 117Z3
BATTERY TYPE	Philco P-841A

TP-5854A

1. Inspect the top and bottom of the chassis. Make sure that all tubes are secure in the proper sockets, and look for any broken or shorted connections, burned resistors, or other obvious indications of trouble.

2. Check the total filament resistance by measuring between the A⁺ and A⁻ pins on the battery-cable plug (disconnected from battery) while holding down the change-over switch, S100. If the resistance is higher than 100 ohms, one of the tube filaments is probably open.

3. With the change-over switch in the a.c./d.c. position, measure the resistance between B⁺ (pin 6 of the 117Z3 rectifier) and B⁻, test point B. When the ohmmeter test leads are connected in the proper polarity, the highest resistance reading will be obtained. If the reading is lower than 1100 ohms, check condensers C100A, C100B, and C100C for leakage or shorts.

The resistance value above, which is much lower than normal, is not intended as a quality check of these condensers; the value given is the lowest at which the rectifier will operate safely while the voltage tests of Section 1 (power supply) are performed.

PHILCO CORP.

MODEL 49-605

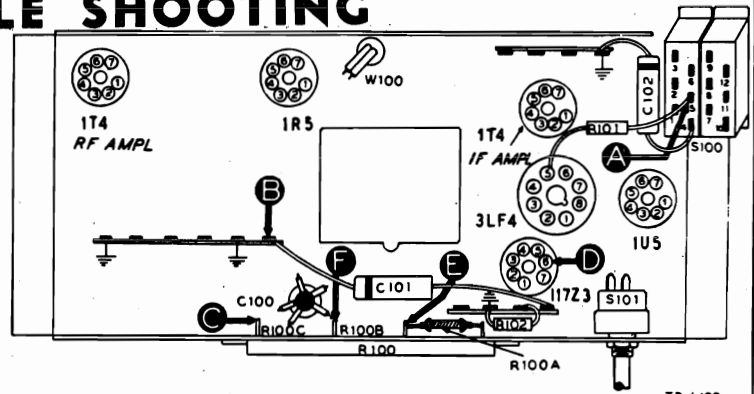
Section 1

POWER SUPPLY

For the tests in this section, use a d-c volt meter. Connect the negative lead to B-, test point B; connect the positive lead to the test points indicated in the chart. The voltage readings given were taken with a 20,000-ohms-per-volt meter, at a line voltage of 117 volts, a.c.

Turn on the power, and set the volume control to minimum.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 2 (audio circuits); if not, isolate and correct the trouble in this section.



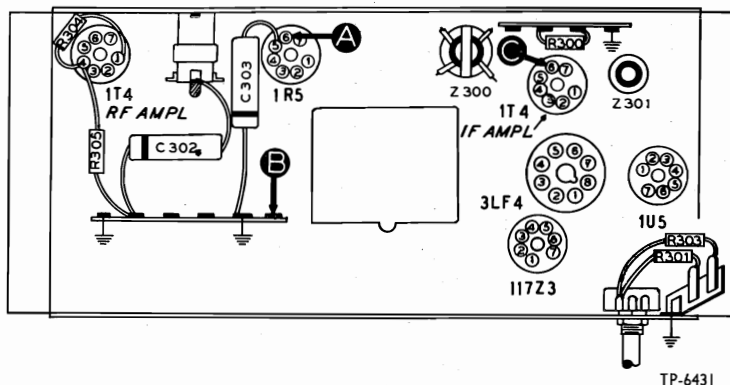
Section 3**TROUBLE SHOOTING****I-F, DETECTOR, AND A-V-C**

For the tests in this section, use an r-f signal generator, with modulated output, set at 265 kc. Connect the generator ground lead to B-, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the radio volume control to maximum.

If the "NORMAL INDICATION" is obtained in the first step, proceed with the tests for Section 4 (r-f and converter circuits); if not, isolate and correct the trouble in this section.

Since the circuit location of test point A for this section is the same as that of test point C for Section 4, the effectiveness of step 1 as a master check is dependent upon the condition of certain parts in Section 4; these parts are listed below under "POSSIBLE CAUSE OF ABNORMAL INDICATION."

**FIGURE 3. BOTTOM VIEW, SHOWING SECTION 3 TEST POINTS**

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear signal with weak signal input.	Trouble in this section. Isolate by the following tests.
2	C	Clear signal with strong signal input.	Defective: 1T4. Misaligned: Z301. Open: R300, C302, Z301. Shorted or leaky: C302. Shorted: Z301.
3	A	Loud, clear signal with weak signal input.	Defective: 1R5*. Misaligned: Z300. Shorted: C406*, Z300. Open: Z300.

* This part, located in another section, may cause abnormal indication in this section.

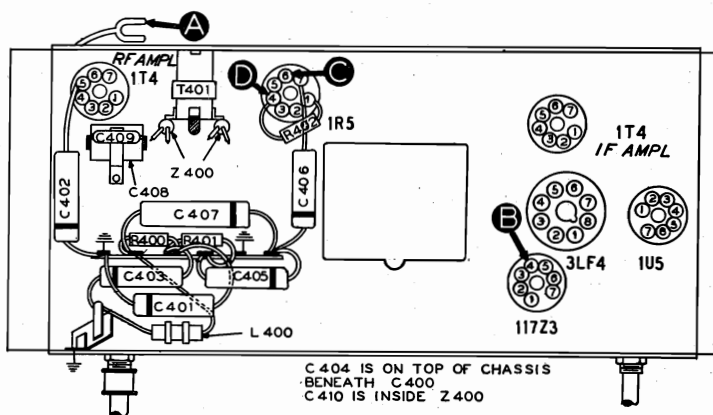
Section 4**TROUBLE SHOOTING****R-F AND CONVERTER**

For the tests in this section, with the exception of the oscillator test, use an r-f signal generator with modulated output. Connect the generator ground lead to B-, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the radio volume control to maximum.

Set the radio and signal-generator dials as indicated in the chart.

If the "NORMAL INDICATION" is not obtained in step 1, isolate the trouble by following the remaining steps.

**FIGURE 4. BOTTOM VIEW, SHOWING SECTION 4 TEST POINTS (Location of T400 shown in figure 6.)**

STEP	TEST POINT	DIAL SETTINGS		NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
		SIG. GEN.	RADIO		
1	A	1000 kc.	1000 kc.	Loud, clear signal with weak signal input.	Trouble in this section. Isolate by the following tests.
2	C	1000 kc.	1000 kc.	Clear signal with strong signal input.	Defective: 1R5. Open: C405, C406. Trouble in oscillator circuit.
3	B to D (Osc. test; see note below.)		Rotate tuning control.	Negative 4 to 8 volts.	Defective: 1R5 (osc. section). Open: R402, T400. Shorted: C408, C409, C404, C400, C400C, T400.
4	A	1000 kc.	1000 kc.	Loud, clear signal with weak signal input.	Defective: 1T4. Shorted: C400, C400A, C400B, T400, Z400, C401, C402, C403. Open: R400, R401, T400, Z400.

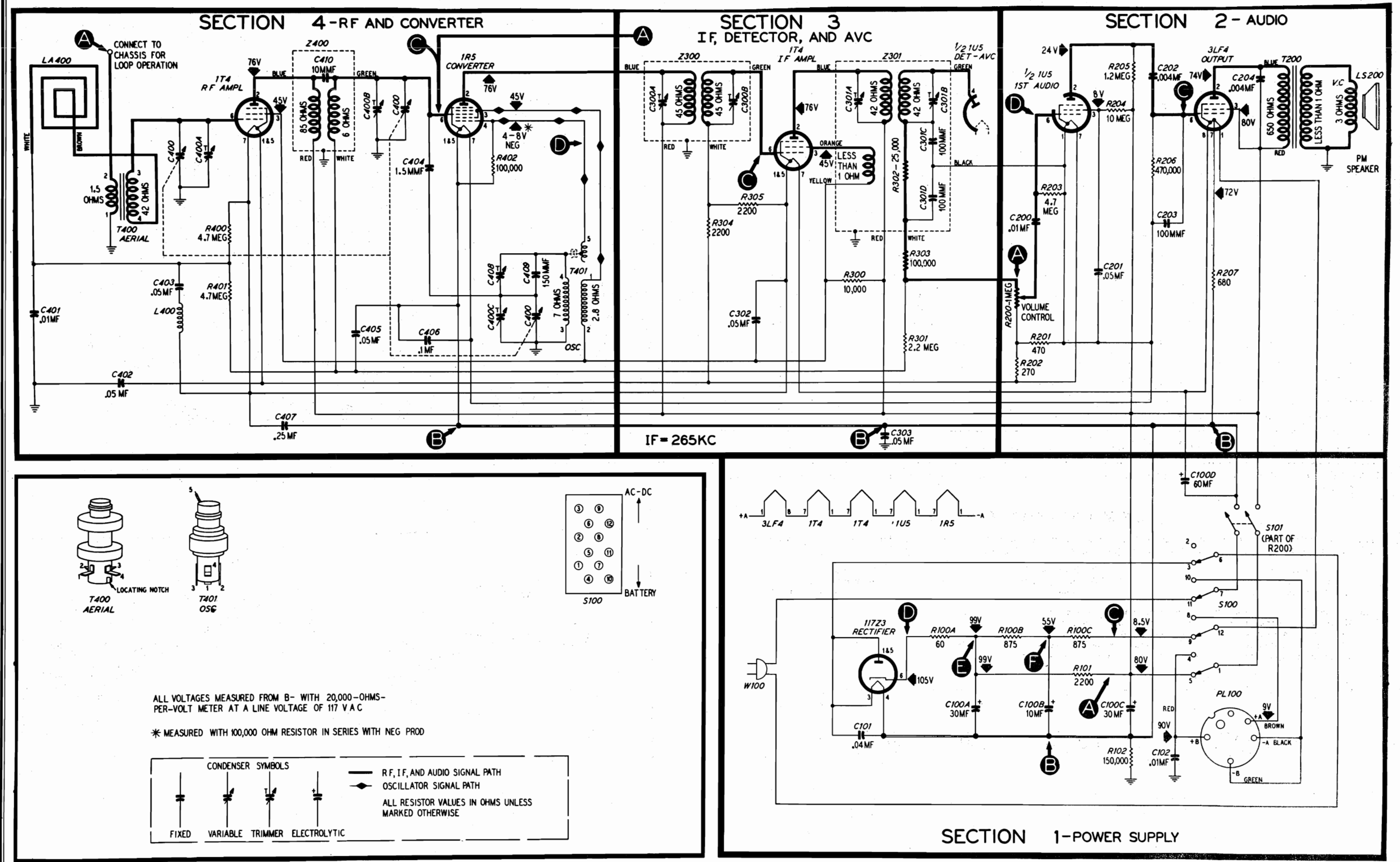


FIGURE 5. PHILCO RADIO MODEL 49-605, SECTIONALIZED SCHEMATIC DIAGRAM, SHOWING TEST POINTS

MODEL 49-605

PHILCO CORP.

ALIGNMENT PROCEDURE

THE ALIGNMENT SHOULD BE MADE WITH THE RADIO INSTALLED IN THE CABINET AND THE LOOP CONNECTED

DIAL—Turn tuning condensers to full-mesh position. Set dial pointer to coincide with index mark at low-frequency end of dial (see figure 7).

OUTPUT METER—Connect between chassis and voice-coil terminal on output transformer, T200.

SIGNAL GENERATOR (modulated)—Connect as indicated in chart.

OUTPUT LEVEL—During alignment, adjust signal-generator output to maintain output-meter indication below .4 volt.

STEP	SIGNAL GENERATOR		RADIO		ADJUST
	CONNECTIONS TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	
1	Ground lead to lug on T400 (see figure 6); output lead to ext. aerial lug.	265 kc.	Set at index mark.	Turn C300B fully tight, then adjust trimmers, in order given, for maximum output.	C301B C301A C300A C300B
2	Radiating loop (see note below).	1600 kc.	1600 kc.	Adjust for maximum.	C400C
3	Same as step 2.	580 kc.	580 kc.	Adjust for maximum while rocking tuning control.	C408
4	Same as step 2.	1600 kc.	1600 kc.	Adjust for maximum.	C400C
5	Same as step 2.	1500 kc.	1500 kc.	Adjust for maximum.	C400B
6	Same as step 2.	1500 kc.	1500 kc.	Adjust for maximum.	C400A
7	Repeat steps 3, 4, 5, and 6 until no further improvement is obtained.				

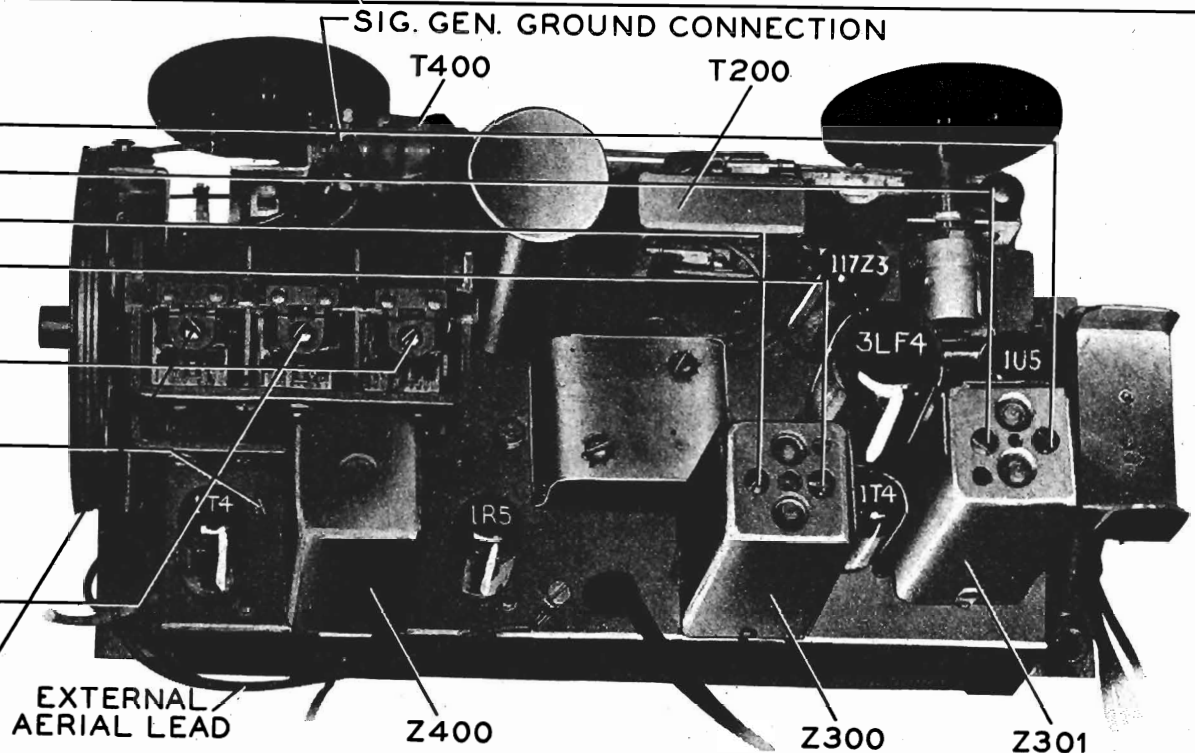


FIGURE 6. TOP VIEW, SHOWING TRIMMER LOCATIONS

RADIATING LOOP: Make up a six-to-eight-turn, 6-inch diameter loop, using insulated wire; connect to signal-generator leads and place near radio loop.

SYMBOLIZATION

The components in the radio circuit are symbolized according to the types of parts and the sections of the radio in which the parts are located. The prefix letter of the symbol designates the type of part, as follows:

C—condenser
I—pilot lamp
L—choke or coil

LA—loop aerial
LS—loud-speaker
R—resistor

S—switch
T—transformer
Z—electrical assembly

The number of the symbol designates the section in which the part is located, as follows:
100-series components are in Section 1—the power supply
200-series components are in Section 2—the audio circuits
300-series components are in Section 3—the i-f amplifier, detector, and a-v-c circuits
400-series components are in Section 4—the r-f and converter circuits

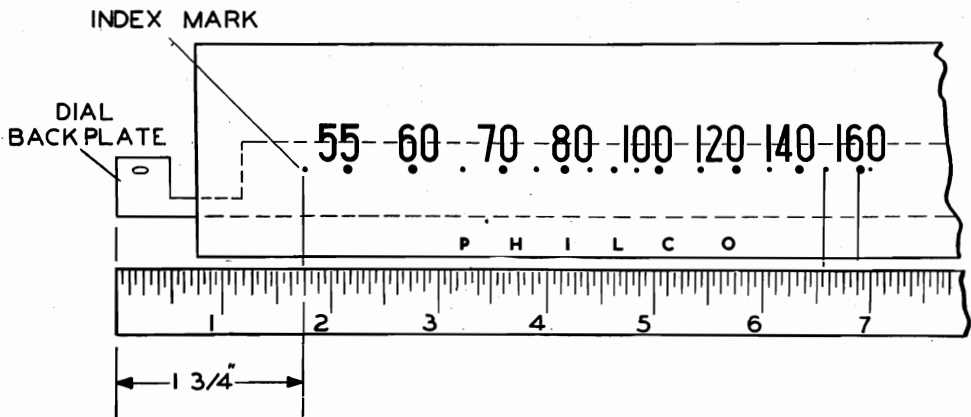


FIGURE 7. DIAL-BACKPLATE CALIBRATION MEASUREMENTS

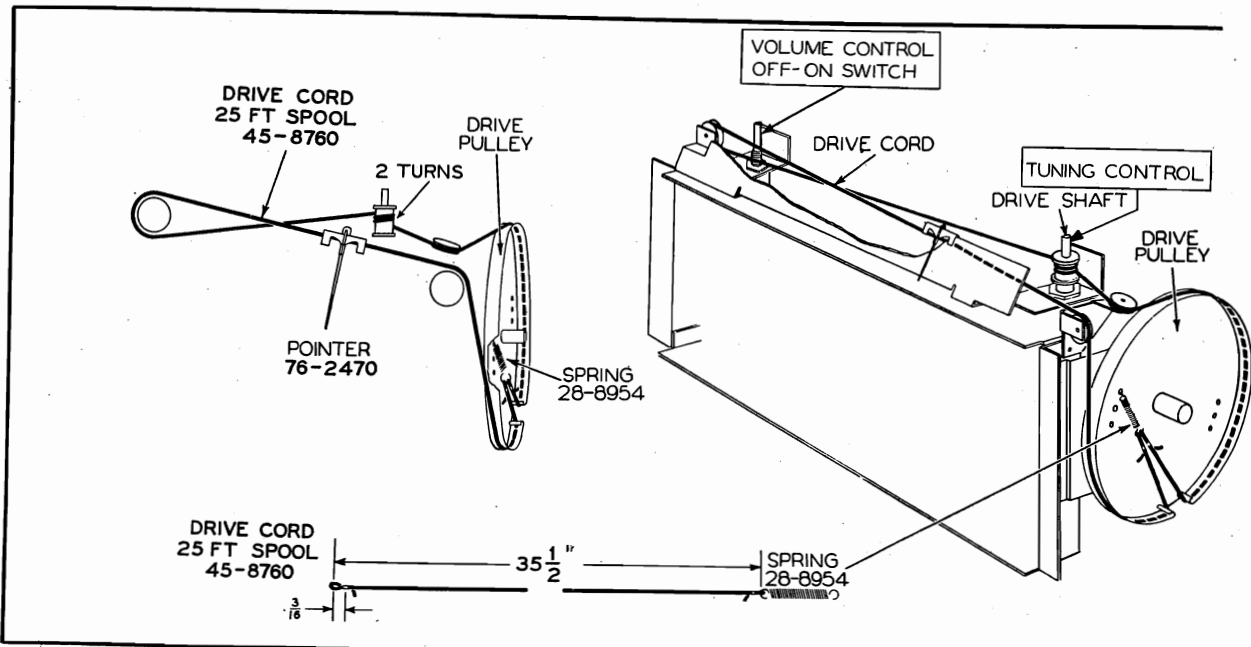


FIGURE 8. DRIVE-CORD INSTALLATION DETAILS

REPLACEMENT PARTS LIST

NOTE: An asterisk (*) indicates a general replacement item. The part numbers of these items may not be identical with those on factory parts; also, the electrical values of some replacement items may differ from the values given in the schematic diagram and parts list. The values substituted in any case are so chosen that the operation of the radio will be either unchanged or improved. When ordering replacements, use only the "Service Part No."

SECTION 1 POWER SUPPLY CIRCUIT

Reference Symbol	Description	Service Part No.
C100	Condenser, electrolytic, 4-section	30-2560-4
C100A	Condenser, filter, 30 mf.	Part of C100
C100B	Condenser, filter, 10 mf.	Part of C100
C100C	Condenser, filter, 30 mf.	Part of C100
C100D	Condenser, bias-resistor by-pass, 60 mf.	Part of C100
C101	Condenser, line filter, .04 mf.	45-3500-2*
C102	Condenser, by-pass, .01 mf.	61-0120*
PL100	Battery cable and plug	41-3712-1
R100	Resistor, 3-section	33-3431-4
R100A	Resistor, filament dropping, 60 ohms	Part of R100
R100B	Resistor, filament dropping, 875 ohms	Part of R100
R100C	Resistor, filament dropping, 875 ohms	Part of R100
R101	Resistor, plate dropping, 2200 ohms	66-2223340*
R102	Resistor, leakage, 150,000 ohms	66-4153340*
S100	Switch, change-over	42-1821
S101	Switch, on-off	Part of R200
W100	Power cord and plug	41-3755-17

SECTION 2 AUDIO CIRCUITS

C200	Condenser, coupling, .01 mf.	61-0120*
C201	Condenser, screen by-pass, .05 mf.	61-0122*
C202	Condenser, d-c blocking, .004 mf.	61-0179*
C203	Condenser, r-f by-pass, 100 mmf.	62-110009001*
C204	Condenser, tone compensating, .004 mf.	61-0179
LS200	Speaker	36-1598-1
R200	Volume control (with on-off switch), 1 megohm	33-5538-43
R201	Resistor, grid return, 470 ohms	66-1473340*
R202	Resistor, grid return, 270 ohms	66-1273340*
R203	Resistor, grid return, 4.7 megohms	66-5473340*
R204	Resistor, screen dropping, 10 megohms	66-6103340*
R205	Resistor, plate load, 1.2 megohms	66-5123340*
R206	Resistor, grid return, 470,000 ohms	66-4473340*
R207	Resistor, bias, 680 ohms	66-1683340*
T200	Output transformer	32-8259

SECTION 3 I-F, DETECTOR, AND A-V-C CIRCUITS

C300A	Condenser, trimmer, primary	Part of Z300
C300B	Condenser, trimmer, secondary	Part of Z300
C301A	Condenser, trimmer, primary	Part of Z301
C301B	Condenser, trimmer, secondary	Part of Z301
C301C	Condenser, i-f filter, 100 mmf.	Part of Z301
C301D	Condenser, i-f filter, 100 mmf.	Part of Z301
C302	Condenser, screen by-pass, .05 mf.	61-0122*
C303	Condenser, i-f by-pass, .05 mf.	61-0122*
R300	Resistor, screen dropping, 10,000 ohms	66-3103340*
R301	Resistor, a-v-c filter, 2.2 megohms	66-5223340*
R302	Resistor, filter, 25,000 ohms	Part of Z301
R303	Resistor, a-v-c filter, 100,000 ohms	66-4103340
R304	Resistor, grid return, 2200 ohms	66-2223340*
R305	Resistor, grid return, 2200 ohms	66-2223340*
Z300	Transformer, 1st i-f, including C300A and C300B	32-3970
Z301	Transformer, 2nd i-f, including C301A, C301B, C301C, and C301D	32-3971-2

SECTION 4 R-F AND CONVERTER CIRCUITS

Reference Symbol	Description	Service Part No.
C400	Condenser, tuning, 3-section	31-2689
C400A	Condenser, aerial trimmer	Part of C400
C400B	Condenser, r-f trimmer	Part of C400
C400C	Condenser, oscillator trimmer	Part of C400
C401	Condenser, i-f by-pass, .01 mf.	61-0120*
C402	Condenser, by-pass, .05 mf.	61-0122*
C403	Condenser, by-pass, .05 mf.	61-0122*
C404	Condenser, neutralizing, 1.5 mmf.	30-1221-3
C405	Condenser, by-pass, .05 mf.	61-0122*
C406	Condenser, by-pass, .1 mf.	61-0113*
C407	Condenser, by-pass, .25 mf.	61-0125
C408	Condenser, oscillator series padder	31-6410
C409	Condenser, tracking, 150 mmf.	60-10155407*
C410	Condenser, coupling, 10 mmf. (part of Z400)	62-010009001
LA400	Loop aerial	32-4080
L400	Choke	32-4007
R400	Resistor, grid return, 4.7 megohms	66-5473340*
R401	Resistor, a-v-c filter, 4.7 megohms	66-5473340*
R402	Resistor, osc. grid leak, 100,000 ohms	66-4103340
T400	Aerial transformer	32-3972
T401	Oscillator transformer	32-4095-1
Z400	R-f transformer, including C410	32-4210

MISCELLANEOUS

Description	Service Part No.
Cabinet (whole)	10726
Cabinet back half	54-4626
Cabinet front half	54-4625
Back catch assembly	76-2273
Casting, frame	56-5835
Foot, rubber	54-4650
Grille	56-6365
Fasteners	W-2543FE7
Handle, plastic	54-4646
Hinge	56-6419
Clip, coil mounting	28-5002FCP
Dial backplate	56-5833FCP
Cord, drive (25-ft. spool)	45-8750*
Pointer	56-5630-4FCP
Pulley-and-bracket assembly	76-4115
Scale, dial, plastic	54-5031
Spring, drive cord	28-8954
Cover switch (volume control)	56-5834-FA3
Grommet, tuning-condenser mounting (3 required)	27-4596
Knob (2 required)	54-4627
Shaft and pulley	76-2028
Socket, Loktal	27-6138
Socket, miniature	27-6226
Switch-plunger assembly	76-3061

Section 1—Power Supply

For the tests in this section, use a d-c voltmeter. Connect the negative lead to B—, test point B; connect the positive lead to the test points indicated in the chart. The voltage readings given were taken with a 20,000-ohms-per-volt meter, at a line voltage of 117 volts, a.c.

Turn on the power, and set the volume control to minimum.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 2 (audio circuits); if not, isolate and correct the trouble in this section.

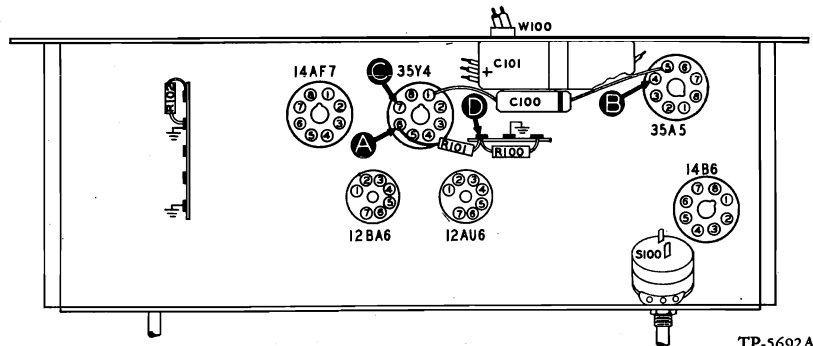


Figure 1. Bottom View, Showing Section 1 Test Points

STEP	TEST POINT	NORMAL INDICATION	ABNORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	90 volts		Trouble in this section. Isolate by the following tests.
2	C	105 volts	No voltage Low voltage High voltage	Defective: 35Y4. Shorted: C100, C101A. Open: S100, W100. Defective: 35Y4. Leaky: C101A. Shorted: C101B. Open: C101A. Open: R100.
3	D	115 volts	No voltage Low voltage High voltage	Shorted: C101B. Open: C101A. Leaky: C101B. Shorted: C101C, C203*. Open: R101.
4	A	90 volts	No voltage Low voltage	Shorted: C101C. Open: R101. Leaky: C101C. Shorted: C203*, C306*, C408*.

Listening Test: Abnormal hum may be caused by open C101A, C101B, or C101C.

*This part, located in another section, may cause abnormal indication in this section.

Section 2—Audio Circuits

For the tests in this section, use an audio-frequency signal generator. Connect the generator ground lead to B—, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the volume control to maximum.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 3 (i-f, detector, and a-v-c circuits); if not, isolate and correct the trouble in this section.

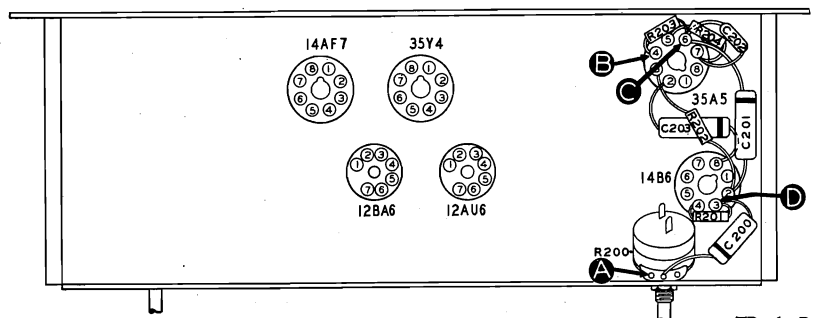


Figure 2. Bottom View, Showing Section 2 Test Points

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear speaker output with weak generator input.	Trouble in this section. Isolate by the following tests.
2	C	Loud, clear output with strong input.	Defective: 35A5, LS200. Shorted: C202, C203. Open: T200, R204, R203.
3	D	Loud, clear output with weak input.	Defective: 14B6. Shorted: C201. Open: C201, R201, R202.
4	A	Loud, clear output with weak input.	Shorted: C200, C301D*. Open: C200, R200.

Listening Test: Distortion may be caused by shorted or leaky C200, C201.

*This part, located in another section, may cause abnormal indication in this section.

Section 3—I-F, Detector, and A-V-C Circuits

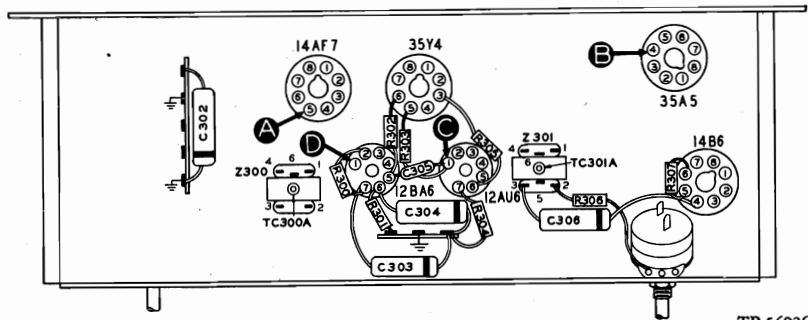
TROUBLE SHOOTING

For the tests in this section, use an r-f signal generator, with modulated output, set at 455 kc. Connect the generator ground lead to B—, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the volume control to maximum.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 4 (r-f and converter circuits); if not, isolate and correct the trouble in this section.

To provide a complete i-f-amplifier check, test point A for this section is placed at the grid of the mixer in Section 4; therefore, the effectiveness of step 1 as a master check is dependent upon the condition of certain parts in the mixer circuit. These parts are listed below under "POSSIBLE CAUSE OF ABNORMAL INDICATION."



TP-5692C

Figure 3. Bottom View, Showing Section 3 Test Points

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear speaker output with weak generator input.	Trouble in this section. Isolate by the following tests.
2	C	Loud, clear output with strong input.	Defective: 12AU6. Shorted: C306, Z301, C305. Open: R303, R304, R305, R306, Z301. Misaligned: Z301.
3	D	Loud, clear output with moderate input.	Defective: 12BA6. Shorted: C304. Open: C305, R301, R302.
4	A	Loud, clear output with weak input.	Defective: 14AF7. Shorted: C408*, Z300. Open: R401*, R404*, Z300. Misaligned: Z300.

*This part, located in another section, may cause abnormal indication in this section.

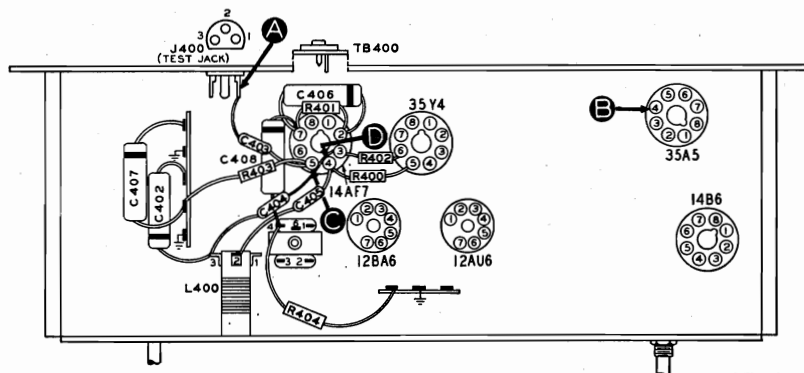
Section 4—R-F and Converter Circuits

TROUBLE SHOOTING

For the tests in this section, with the exception of the oscillator test, use an r-f signal generator, with modulated output. Connect the generator ground lead to B—, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the volume control to maximum. Set the tuning control and the signal-generator frequency as indicated in the chart.

If the "NORMAL INDICATION" is not obtained in step 1, isolate and correct the trouble in this section. If the trouble is not revealed by the tests for this section, check the alignment.



TP-5692D

Figure 4. Bottom View, Showing Section 4 Test Points

STEP	TEST POINT	SIG. GEN. FREQ.	RADIO TUNING	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	1000 kc.	1000 kc.	Loud, clear speaker output with weak generator input.	Trouble in this section. Isolate by the following tests.
2	C	1000 kc.	1000 kc.	Loud, clear output with weak input.	Defective: 14AF7. Shorted: C406, C407, C408. Open: R401, R403, R404.
3	D (Osc. Test: see note on p. 4.)			-1.5v to -2v	Defective: 14AF7. Shorted: C400, C400B, C402, C404, C405, L400. Open: C402, C404, R400, R402, L400.
4	A	1000 kc.	1000 kc.	Loud, Clear output with weak input.	Shorted: C400, C400A. Open: LA400.

REPLACEMENT PARTS LIST

Part numbers identified by an asterisk (*) are general replacement items. These numbers may not be identical with those on factory parts; also, the electrical values of some replacement items may differ from the values indicated in the schematic diagram and parts list. The values substituted in any case are so chosen that the operation of the radio will be either unchanged or improved. When ordering replacements, use only the "Service Part No."

SECTION 1

POWER SUPPLY

Reference Symbol	Description	Service Part No.
C100	Condenser, line by-pass, .04 mf.	45-3500-2*
C101	Condenser, electrolytic, 3-section	30-2575-27
C101A	Condenser, filter, 40 mf., 150v	Part of C101
C101B	Condenser, filter, 30 mf., 150v	Part of C101
C101C	Condenser, filter, 30 mf., 150v	Part of C101
I100	Pilot lamp	34-2068*
R100	Resistor, filter, 220 ohms	66-1225340*
R101	Resistor, filter, 1200 ohms	66-2124340*
R102	Resistor, isolating, 150,000 ohms	66-4153340*
S100	Switch, power on-off	Part of 45-5019†
W100	Line cord and plug assembly	L2183*

SECTION 2

AUDIO CIRCUITS

Reference Symbol	Description	Service Part No.
C200	Condenser, d-c blocking, .01 mf.	61-0120*
C201	Condenser, d-c blocking, .01 mf.	61-0120*
C202	Condenser, parasitic suppressor, 220 mmf.	62-122001001*
C203	Condenser, tone compensation, .02 mf.	61-0108*
LS200	Loud-speaker, p-m	36-1625
R200	Volume control (with on-off switch), 500,000 ohms	45-5019*
R201	Resistor, grid return, 3.3 megohms	66-5333340*
R202	Resistor, plate load, 470,000 ohms	66-4473340*
R203	Resistor, grid return, 470,000 ohms	66-4473340*
R204	Resistor, cathode bias, 130 ohms	66-1133340*
T200	Transformer, output	32-8310-3

SECTION 3

I-F, DETECTOR, AND A-V-C CIRCUITS

Reference Symbol	Description	Service Part No.
C300A	Condenser, fixed, 1st i-f primary	Part of Z300
C300B	Condenser, fixed, 1st i-f secondary ..	Part of Z300
C301A	Condenser, fixed, 2nd i-f primary ..	Part of Z301
C301B	Condenser, fixed, 2nd i-f secondary ..	Part of Z301
C301C	Condenser, i-f filter	Part of Z301
C301D	Condenser, i-f filter	Part of Z301
C302	Condenser, i-f by-pass (inductively wound), .1 mf.	30-4644-1
C303	Condenser, cathode by-pass, .001 mf.	45-3500-5*
C304	Condenser, screen by-pass, .05 mf.	61-0122*
C305	Condenser, d-c blocking, 220 mmf.	62-122001001*
C306	Condenser, screen by-pass, .05 mf.	61-0122*
R300	Resistor, cathode bias, 220 ohms	66-1223340*
R301	Resistor, screen dropping, 47,000 ohms	66-3473340*
R302	Resistor, plate load, 15,000 ohms	66-3153340*
R303	Resistor, grid return, 150,000 ohms	66-4153340*
R304	Resistor, cathode bias, 120 ohms	66-1123340*
R305	Resistor, decoupling, 1000 ohms	66-2103340*
R306	Resistor, i-f filter, 47,000 ohms	66-3473340*
R307	Resistor, a-v-c filter, 1 megohm	66-5103340*
TC300A	Tuning core, 1st i-f primary	Part of Z300
TC300B	Tuning core, 1st i-f secondary	Part of Z300
	†45-5019 Volume control with a-c switch.	

SECTION 3 (Cont.)

Reference Symbol	Description	Service Part No.
TC301A	Tuning core, 2nd i-f primary	Part of Z301
TC301B	Tuning core, 2nd i-f secondary	Part of Z301
Z300	Transformer, 1st i-f	32-4258
Z301	Transformer, 2nd i-f	32-4240-3

SPECIFICATIONS

CABINET	Plastic
CIRCUIT	6-tube superheterodyne
FREQUENCY RANGE	540—1620 kc.
AUDIO OUTPUT	1 watt
OPERATING VOLTAGE	105—125 volts, a.c. or d.c.

SECTION 4

R-F AND CONVERTER CIRCUITS

Reference Symbol	Description	Service Part No.
C400	Condenser, tuning gang, 2-section	31-2727-1
C400A	Condenser, trimmer, aerial section ..	Part of C400
C400B	Condenser, trimmer, osc. section ..	Part of C400
C401	Condenser, isolating, .0015 mf.	45-3500-6*
C402	Condenser, isolating, .05 mf.	61-0122*
C403	Condenser, blocking, 220 mmf.	62-122001001*
C404	Condenser, d-c blocking, 220 mmf.	62-122001001*
C405	Condenser, osc. grid, 220 mmf.	62-122001001*
C406	Condenser, cathode by-pass, .05 mf.	61-0122*
C407	Condenser, a-v-c filter, .1 mf.	61-0113*
C408	Condenser, plate decoupling, .01 mf.	61-0120*
LA400	Loop aerial	32-4052-25
L400	Coil, osc.	45-7502*
R400	Resistor, grid return, 47,000 ohms	66-3473340*
R401	Resistor, cathode bias, 2200 ohms	66-2223340*
R402	Resistor, plate load, 10,000 ohms	66-3103340*
R403	Resistor, grid return, 2.2 megohms	66-5223340*
R404	Resistor, decoupling, 2200 ohms	66-2223340*

MISCELLANEOUS

Description	Service Part No.
Cabinet and Cabinet Parts	
Baffle-and-cloth assembly	40-7546
Baffle-assembly fastener (4)	1W56920FE7
Cabinet	10693A
Cabinet back	54-7492-1
Grille	54-4600
Grille fastener (7)	1W56913FE7
Stud, back mtg. (4)	W2235FA9
Window	54-4608
Window fastener (5)	56-6161FE7

Dial-Scale Hardware

Cord, drive (25-ft. spool)	31-2695-33
Drive-cord spring	56-2617
Pointer	54-4617
Scale	54-5018
Tuning shaft	56-5688FA11
Tuning-shaft bushing	27-9437
Knob (2)	54-4527-8
Pilot-lamp assembly	76-1280
Speaker bracket	56-5690FA3
Socket, miniature (2)	27-6203
Socket, octal (4)	27-6138

Preliminary Checks

To avoid possible damage to the radio, the following preliminary checks should be made before it is turned on:

1. Inspect both the top and the bottom of the chassis. Make sure that all tubes are secure in the proper sockets, and look for any broken or shorted connections, burned resistors, or other obvious indications of trouble.

2. Measure the resistance between B+ (pin 7 of 35Y4 rectifier tube) and the B- bus, test point B. When the ohmmeter test leads are connected in the proper polarity, the highest resistance reading will be obtained. If the reading is lower than 1500 ohms, check condensers C101A, C101B, C101C, and C203 for leakage or shorts. The resistance value given is much lower than normal, and is not intended as a quality check of these condensers; the value given is the lowest at which the rectifier will operate safely while the voltage checks of Section 1 (power supply) are performed.

POWER CONSUMPTION

30 watts

AERIAL Built-in loop; also connector for external aerial

INTERMEDIATE FREQUENCY

455 kc.

PHILCO TUBES (6)

14AF7, 12BA6, 12AU6,

14B6, 35A5, 35Y4

PHILCO CORP.

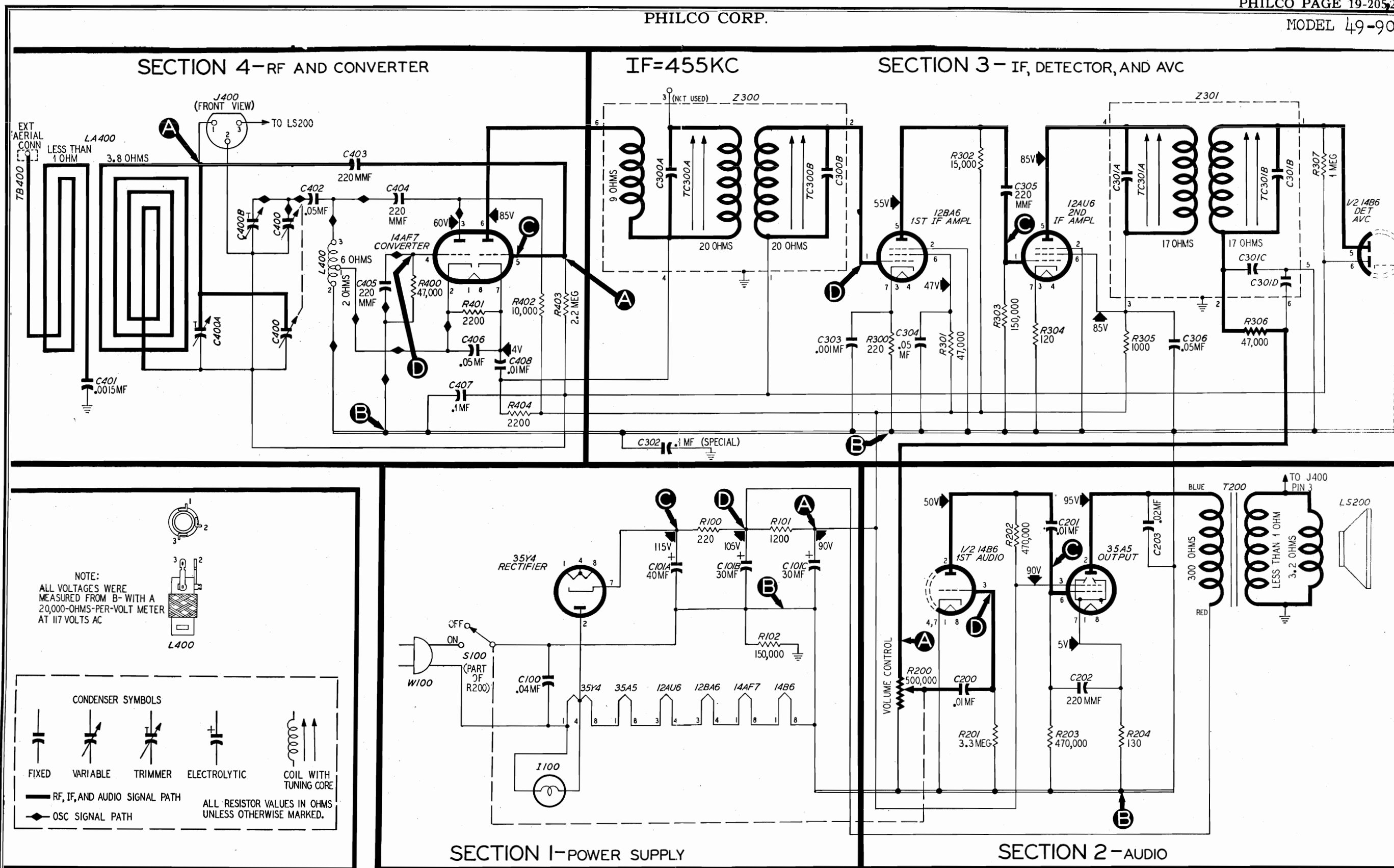


Figure 5. Philco Radio Model 49-902, Sectionalized Schematic Diagram, Showing Test Points

OSCILLATOR TEST

Connect the positive lead of a high-resistance voltmeter to B—, test point B; connect the prod end of the negative lead through

a 100,000-ohm isolating resistor to the oscillator grid (pin 4 of 14AF7), test-point D. Use a suitable meter range, such as 0—10

volts. Proper operation of the oscillator is indicated by negative voltage of approximately the value given in the chart (measured with 20,000-ohms-per-volt meter) throughout the tuning range.

MODEL 49-902

PHILCO CORP.

ALIGNMENT PROCEDURE

NOTE: The loop should be connected to the radio during alignment.

RADIO CONTROLS—Set volume control to maximum. Set tuning control as indicated in chart.

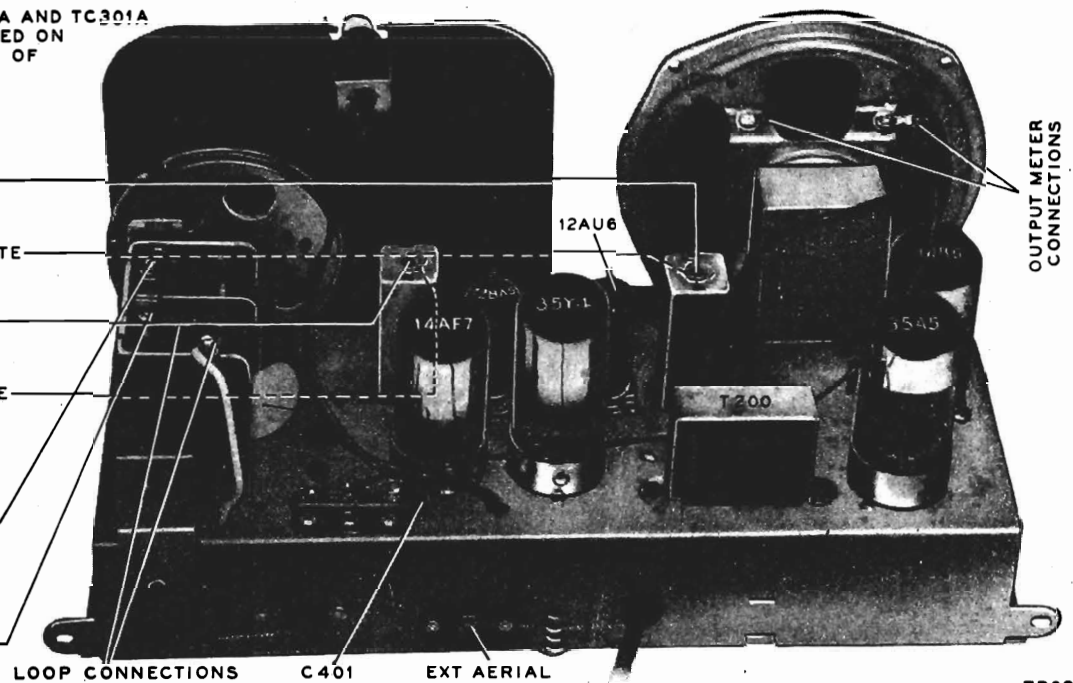
SIGNAL GENERATOR—Use modulated output. Connect leads and set frequency as indicated in chart.

OUTPUT METER—Connect across speaker voice-coil terminals (figure 6).

OUTPUT LEVEL—During alignment, adjust signal-generator output to hold output-meter reading below 1.25 volts.

STEP	CONNECTION TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	ADJUST TRIMMER
1	Ground lead to B-; output lead through .1-mf. condenser to external aerial terminal.	455 kc.	Tuning gang fully meshed	Adjust, in order given, for maximum output.	TC301B—2nd i-f sec. TC301A—2nd i-f pri. TC300B—1st i-f sec. TC300A—1st i-f pri.
2	Radiating loop. (See note below.)	1600 kc.	1600 kc.	Adjust for maximum.	C400B—Osc.
3	Radiating loop. (See note below.)	1500 kc.	1500 kc.	Adjust for maximum.	C400A—Aerial

NOTE: TC300A AND TC301A ARE LOCATED ON UNDERSIDE OF CHASSIS.



RADIATING LOOP: Make up a 6-to-8 turn, 6-inch-diameter loop, using insulated wire; connect to signal generator leads and place near radio loop.

Figure 6. Top View of Chassis, Showing Trimmer Locations

Circuit Description

Philco Model 49-902 is a 6-tube table-model super-heterodyne radio, providing reception in the standard broadcast band.

The loop aerial normally provides adequate signal pickup. If greater pickup is required, an external aerial may be connected.

The loop works into a 14AF7 converter. Condenser tuning is used. The two i-f stages employ two pentode tubes, a 12BA6 and a 12AU6. To obtain stability, resistance coupling is employed between the first and second i-f tubes. One diode (pin 5) of the 14B6 provides detection and a-v-c voltage. The triode section of this tube functions as the first audio amplifier, and is resistance-coupled to the 35A5 output tube. The speaker is a permanent-magnet dynamic. The power supply employs a 35Y4 rectifier, working into a resistance-capacitance filter system.

The 150,000-ohm resistor, R102, connected between B- and chassis, prevents hum which might otherwise occur under conditions of high humidity.

The i-f by-pass condenser, C302, is a specially designed, inductively wound condenser, which is series-resonant at the intermediate frequency, 455 kc., thereby functioning as a by-pass of exceptionally low impedance at this frequency.

Philco TROUBLE-SHOOTING Procedure

For rapid trouble shooting, the radio circuit is divided into four sections, with test points specified for each section; these sections and test points are indicated in the schematic diagram. The trouble-shooting procedure given for each section includes a simplified test chart and a bottom view of the chassis showing the locations of the test points and the components of that section.

In each chart, the first step is a master check for determining whether trouble exists in that section, without going through the entire test procedure.

Failure to obtain the "NORMAL INDICATION" in any given step indicates trouble within the circuit under test.

After isolating the trouble to a single stage, the defect is located by: first, testing the tube; second, measuring tube electrode voltages; third, measuring circuit resistances; fourth, substituting condensers. The trouble revealed should be corrected before testing further.

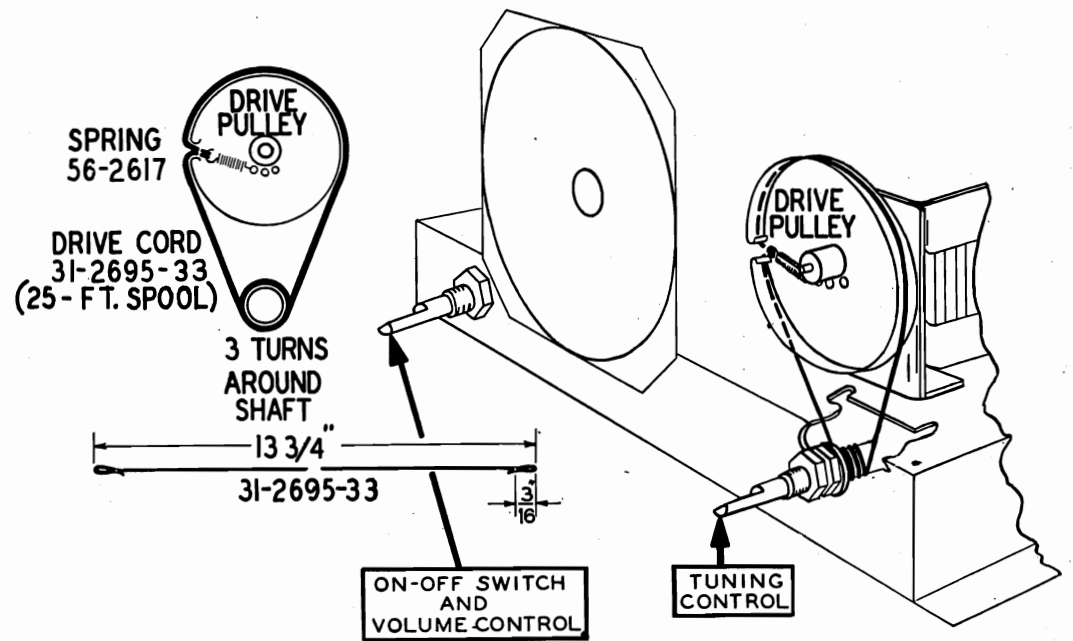
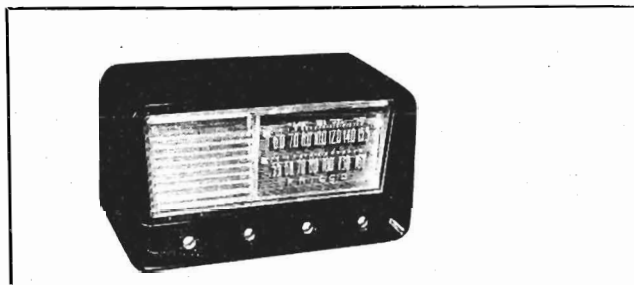


Figure 7. Drive-Cord-Installation Details

PHILCO CORP.

MODEL 49-904



Circuit Description

Philco Model 49-904 is a six-tube, manually tuned superheterodyne radio, providing reception on the standard broadcast band, 540—1620 kc., and on the short-wave range between 5.8 mc. and 15.5 mc. A low-impedance loop within the cabinet normally provides adequate signal pickup. Where additional pickup is required, an external aerial may be used. Do not use a ground.

The converter, employing a type 14AF7 twin triode, provides high signal-to-noise ratio and high conversion efficiency. The oscillator section of the tuning-condenser gang is shaped for correct tracking on the short-wave band. An adjustable series tracking padder is used for tracking on the broadcast band.

The i-f circuit employs two tubes; a 12BA6 1st i-f amplifier is resistance-coupled to a 12AU6 2nd i-f amplifier. Both i-f transformers have permeability-tuned primary and secondary windings.

The diode section of the 14B6 provides detection and a-v-c voltage, the triode section functions as the first audio amplifier, which is resistance-coupled to the type 35A5 audio output tube. A tone control is connected across the plate circuit of the 14B6 triode section.

The d-c operating voltages are furnished by a 35Y4 half-wave rectifier, working into a resistance-capacitance filter system. A 150,000-ohm resistor is connected between the B- bus and the chassis, to prevent hum which might otherwise occur under conditions of high humidity.

C306 is a special condenser, inductively wound to act as a series-resonant circuit at the intermediate frequency (455 kc.). This condenser provides an exceptionally low-impedance i-f by-pass between B- and the chassis.

mining whether trouble exists in that section, without going through the entire test procedure.

Failure to obtain the "NORMAL INDICATION" in any given step indicates trouble within the circuit under test.

After isolating the trouble to a single stage, the defect is located by: first, testing the tube; second, measuring tube electrode voltages; third, measuring circuit resistances; fourth, substituting condensers. The trouble revealed should be corrected before testing further.

Preliminary Checks

To avoid possible damage to the radio, the following preliminary checks should be made before it is turned on:

1. Inspect both the top and the bottom of the chassis. Make sure that all tubes are secure in the proper sockets, and look for any broken or shorted connections, burned resistors, or other obvious indications of trouble.

2. Measure the resistance between B+ (pin 7 of 35Y4 rectifier) and B-, test point B. When the ohmmeter test leads are connected in the proper polarity, the highest resistance reading will be obtained. If the reading is lower than 1500 ohms, check condensers C102, C101A, C101B, and C204 for leakage or shorts. The resistance value given is much lower than normal, and is not intended as a quality check of these condensers; the value given is the lowest at which the rectifier will operate safely while the voltage checks of Section 1 (power supply) are performed.

SPECIFICATIONS

CABINET	Plastic, brown
CIRCUIT	6-tube superheterodyne
FREQUENCY RANGES	
Broadcast	540—1620 kc.
Short Wave	5.8—15.5 mc.
AUDIO OUTPUT	1 watt
OPERATING VOLTAGE	105—120 volts, a.c. or d.c.
POWER CONSUMPTION	30 watts
AERIAL	Built-in loop; terminal also provided for external aerial
INTERMEDIATE FREQUENCY	455 kc.
PHILCO TUBES (6)	14AF7, 12BA6, 12AU6, 14B6, 35A5, 35Y4

TP-6153A

Philco TROUBLE-SHOOTING Procedure

For rapid trouble shooting, the radio circuit is divided into four sections, with test points specified for each section; these sections and test points are indicated in the schematic diagram. The trouble-shooting procedure given for each section includes a simplified test chart and a bottom view of the chassis showing the locations of the test points and the components of that section.

In each chart, the first step is a master check for deter-

MODEL 49-904

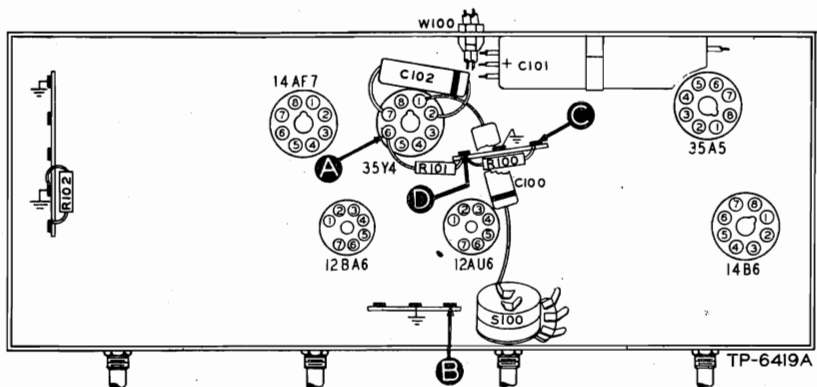
PHILCO CORP.

Section 1—Power Supply

For the tests in this section, use a d-c voltmeter. Connect the negative lead to B—, test point B; connect the positive lead to the test points indicated in the chart. The voltage readings given were taken with a 20-000-ohms-per-volt meter at a line voltage of 117 volts, a.c.

Turn on the power, and set the volume control to minimum. Set the tone control for minimum treble response (fully clockwise), and set the band switch to the broadcast position.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 2 (audio circuits); if not, isolate and correct the trouble in this section.



PHILCO CORP.

MODEL 49-904

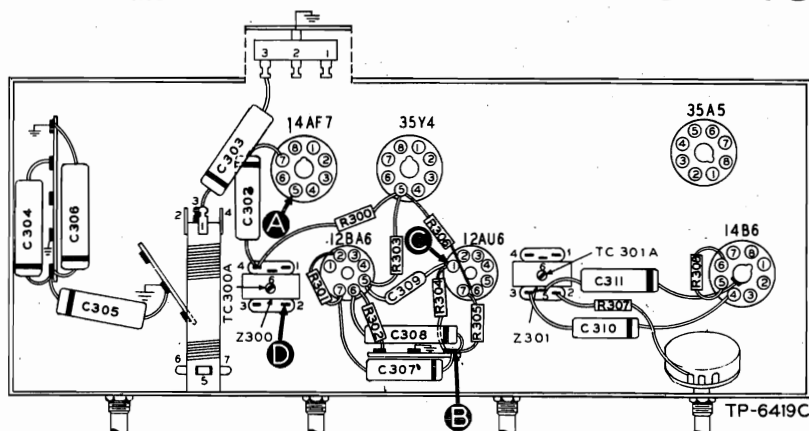
Section 3—I-F, Detector, and A-v-c Circuits**TROUBLE SHOOTING**

For the tests in this section, use an r-f signal generator, with modulated output, set at 455 kc. Connect the generator ground lead to B-, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the volume control to maximum, and set the tone control for maximum treble response (fully counterclockwise). Set the band switch to the broadcast position, and rotate the tuning control until the tuning condenser is fully meshed.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 4 (r-f and converter circuits); if not, isolate and correct the trouble in this section.

To provide a complete i-f-amplifier check, test point A for this section is placed at the grid of the mixer in Section 4; therefore, the effectiveness of step 1 as a master check is dependent upon the condition of certain parts in the mixer circuit. These parts are listed below under "POSSIBLE CAUSE OF ABNORMAL INDICATION."

**Figure 3. Bottom View, Showing Section 3 Test Points**

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear speaker output with weak generator input.	Trouble in this section. Isolate by the following tests.
2	C	Loud, clear output with strong input.	Defective: 14B6, 12AU6. Open: R304, R305, R306, R307, Z301. Shorted: C309, C310, C301C, Z301. Misaligned: Z301.
3	D	Loud, clear output with moderate input.	Defective: 12BA6. Open: R301, R302, R303, C309, Z300. Shorted: C308, C309, Z300.
4	A	Loud, clear output with weak input.	Defective: 14AF7. Open: R401*, R403*, R300, Z300. Shorted: C409*, C302, Z300. Misaligned: Z300.

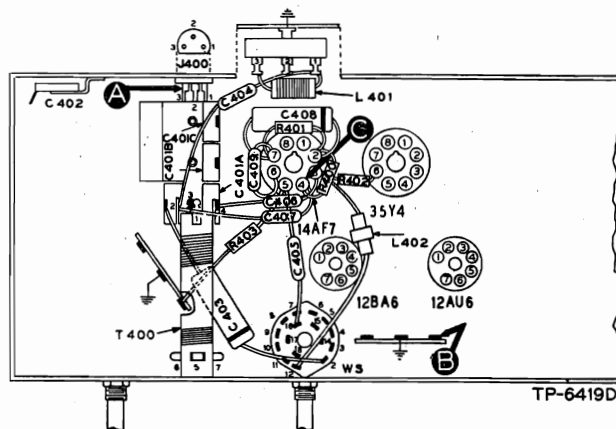
* This part, located in another section, may cause abnormal indication in this section.

Section 4—R-F and Converter Circuits**TROUBLE SHOOTING**

For the tests in this section, with the exception of the oscillator test, use an r-f signal generator with modulated output. Connect the generator ground lead to B-, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the volume control to maximum, and set the tone control for maximum treble response (fully counterclockwise). Set the band switch, the tuning control, and the signal-generator frequency as indicated in the chart.

If the "NORMAL INDICATION" is not obtained in step 1, isolate and correct the trouble in this section. If the trouble is not revealed by the tests for this section, check the alignment.

**Figure 4. Bottom View, Showing Section 4 Test Points****BC CIRCUITS**

STEP	TEST POINT	SIG. GEN. FREQ.	BAND SWITCH	RADIO TUNING	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	1000 kc.	BC	1000 kc.	Loud, clear speaker output with weak generator input.	Trouble in BC circuits. Isolate by steps 2 and 3.
2	C Osc. test; (see note on p. 5)		BC	Rotate through range.	-.8v to -1v	Defective: 14AF7. Open: C401A, C406, C407, R400, R402, T400, WS. Shorted: C406, C407, C401B, C400, T400, WS.
3	A	1000 kc.	BC	1000 kc.	Same as step 1.	Defective: 14AF7. Open: L400, LA400, WS, C405, R403, R401, C408. Shorted: C400A, C402, C400, L400, WS.

MODEL 49-904

PHILCO CORP.

REPLACEMENT PARTS LIST

NOTE: Part numbers identified by an asterisk (*) are general replacement items. These numbers may not be identical with those on factory parts; also, the electrical values of some replacement items may differ from the values indicated in the schematic diagram and parts list. The values substituted in any case are so chosen that the operation of the radio will be either unchanged or improved. When ordering replacements, use only the "Service Part No."

SECTION 1—POWER SUPPLY

Reference Symbol	Description	Service Part No.
C100	Condenser, by-pass, .04 mf.....	45-3500-2*
C101	Condenser, electrolytic, 3-section	30-2575-24
C101A:	Condenser, filter, 40 mf.....	Part of C101
C101B:	Condenser, filter, 30 mf.....	Part of C101
C101C:	Condenser, filter, 30 mf.....	Part of C101
C102	Condenser, by-pass, .04 mf.....	45-3500-2*
I100	Panel lamp	34-2068*
R100	Resistor, 1st B+ filter, 220 ohms.....	66-1224340*
R101	Resistor, 2nd B+ filter, 1200 ohms.....	66-2123340*
R102	Resistor, leakage, 150,000 ohms.....	66-4153340*
S100	Switch, a-c power	Part of R201
W100	Line-cord and plug	L2183*

SECTION 2—AUDIO CIRCUITS

C200	Condenser, d-c blocking, .01 mf.....	61-0121*
C201	Condenser, d-c blocking, .01 mf.....	61-0120*
C202	Condenser, parasitic suppressor, 220 mmf.	30-1224-20*
C203	Condenser, tone control, .006 mf.....	45-3500-7*
C204	Condenser, tone compensation, .02 mf.....	61-0108*
C205	Condenser, electrolytic, cathode by-pass, 25 mf.	45-3001*
LS200	Loud-speaker, PM	36-1625
R200	Volume control, .5 megohm.....	33-5539-46
R201	Tone control (including a-c switch), .5 megohm	33-5538-35
R202	Resistor, grid return, 3.3 megohms.....	66-5333340*
R203	Resistor, plate load, 470,000 ohms.....	66-4473340*
R204	Resistor, grid return, 470,000 ohms.....	66-4473340*
R205	Resistor, cathode bias, 130 ohms.....	66-1133340*
T200	Transformer, output	32-8310-5

SECTION 3—I-F, DETECTOR, AND A-V-C CIRCUITS

C300A	Condenser, fixed	Part of Z300
C300B	Condenser, fixed	Part of Z300
C301A	Condenser, fixed	Part of Z301
C301B	Condenser, fixed	Part of Z301
C301C	Condenser, i-f filter	Part of Z301
C301D	Condenser, i-f filter	Part of Z301
C302	Condenser, r-f by-pass, .05 mf.....	61-0122*
C303	Condenser, r-f by-pass, .01 mf.....	61-0120*
C304	Condenser, a-v-c filter, .1 mf.....	61-0113*
C305	Condenser, r-f by-pass, .01 mf.....	61-0120*
C306	Condenser (inductively wound), i-f by-pass, .1 mf.....	30-4644-1
C307	Condenser, cathode by-pass, .001 mf.....	45-3500-5*
C308	Condenser, screen by-pass, .05 mf.....	61-0122*
C309	Condenser, d-c blocking, 220 mmf.....	30-1224-20*
C310	Condenser, screen by-pass, .05 mf.....	61-0122*
C311	Condenser, r-f by-pass, .05 mf.....	61-0122*
R300	Resistor, plate decoupling, 2200 ohms.....	66-2223340*
R301	Resistor, cathode bias, 220 ohms.....	66-1223340*
R302	Resistor, screen dropping, 47,000 ohms	66-3473340*
R303	Resistor, plate load, 15,000 ohms.....	66-3153340*
R304	Resistor, grid return, 150,000 ohms.....	66-4153340*
R305	Resistor, cathode bias, 220 ohms.....	66-1223340*
R306	Resistor, plate and screen decoupling, 1000 ohms	66-2103340*
R307	Resistor, i-f filter, 47,000 ohms.....	66-3473340*

SECTION 3 (Cont.)

Reference Symbol	Description	Service Part No.
R308	Resistor, a-v-c load, 1 megohm.....	66-5103340*
TC300A	Tuning core, 1st i-f primary.....	Part of Z300
TC300B	Tuning core, 1st i-f secondary.....	Part of Z300
TC301A	Tuning core, 2nd i-f primary.....	Part of Z301
TC301B	Tuning core, 2nd i-f secondary.....	Part of Z301
Z300	Transformer, 1st i-f	32-4258
Z301	Transformer, 2nd i-f	32-4240-3

SECTION 4—R-F AND CONVERTER CIRCUITS

C400	Condenser, tuning, 2-gang	31-2727-4
C400A:	Condenser, trimmer, SW aerial.....	Part of C400
C401	Condenser strip, trimmer, 3-section.....	31-6477-2
C401A:	Condenser, series padder, BC osc.....	Part of C401
C401B:	Condenser, trimmer, BC osc.....	Part of C401
C401C:	Condenser, trimmer, SW osc.....	Part of C401
C402	Condenser, trimmer, BC aerial.....	31-6474
C403	Condenser, isolating, .02 mf.....	61-0108*
C404	Condenser, blocking, 10 mmf.....	30-1224-26*
C405	Condenser, isolating, 100 mmf.....	30-1225-2
C406	Condenser, d-c blocking, 220 mmf.....	30-1224-20
C407	Condenser, d-c blocking, 220 mmf.....	30-1224-20
C408	Condenser, cathode by-pass, .05 mf.....	61-0122*
C409	Condenser, r-f by-pass, 100 mmf.....	30-1225-2
J400	Jack, external aerial connector.....	27-6126
L400	Coil, BC aerial	32-4033-8
L401	Coil, shunt, SW aerial.....	32-3858
L402	Coil, choke, SW plate.....	32-4143-4
LA400	Loop-aerial assembly	Part of Cabinet
R400	Resistor, grid return, 10,000 ohms.....	66-3103340*
R401	Resistor, cathode bias, 2200 ohms.....	66-2223340*
R402	Resistor, plate load, 10,000 ohms.....	66-3103340*
R403	Resistor, grid return, 2.2 megohms.....	66-5223340*
T400	Coils, BC and SW oscillator.....	32-4311
WS	Wafer (band) switch	42-1869

MISCELLANEOUS

Description	Service Part No.
Baffle, speaker	54-4585
Bracket, pointer support rivet assembly.....	76-4027
Bracket, speaker	56-5690FA3
Cabinet-and-loop assembly	76-4026
Cabinet back	54-7639
Cord, drive (25-ft. spool).....	45-8750*
Fastener (7)	1W56913FA3
Grille (ornamental)	56-5694FCP
Knob, SW—BC	54-4527-7
Knob, tone—on-off	54-4527-5
Knob, tuning	54-4527-1
Knob, volume	54-4527-6
Pilot-lamp-socket assembly	76-1280
Pointer	76-3972
Scale, dial	54-5012
Shaft, tuning	56-5688FA11
Bushing, tuning shaft	27-9437
Socket, loktal	27-6177
Socket, miniature	27-6203
Spring, pointer drive	28-8953
Spring, tuning-condenser drive	56-2617
Stud (4)	W2235FA9
Stud, trimount (4)	W2235-1FA9

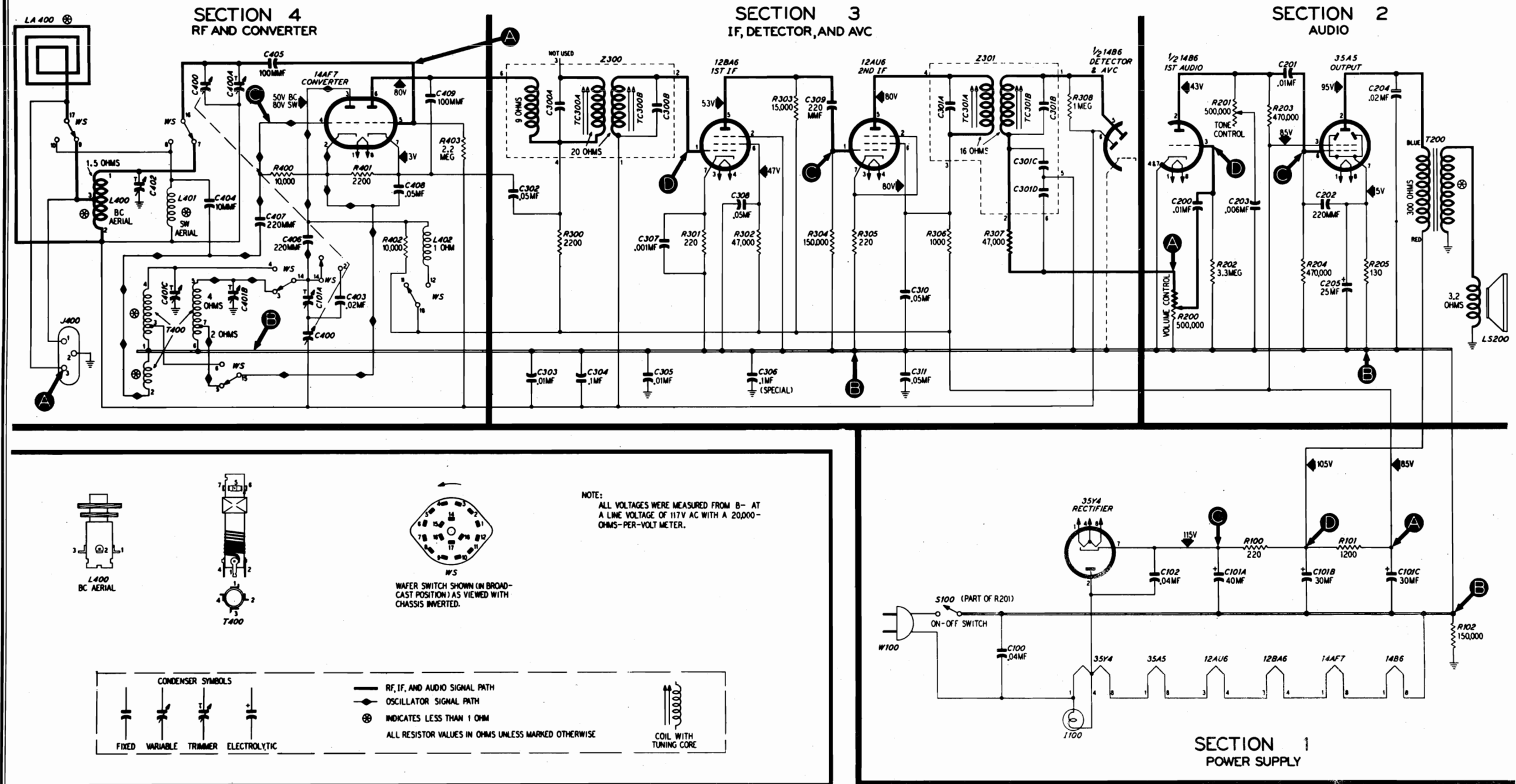


Figure 5. Philco Radio Model 49-904, Sectionalized Schematic Diagram, Showing Test Points

SW CIRCUITS

STEP	TEST POINT	SIG. GEN. FREQ.	BAND SWITCH	RADIO TUNING	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
4	A	15 mc.	SW	15 mc.	Same as step 1.	Trouble in SW circuits. Isolate by steps 5 and 6.
5	C Osc. test; (see note on p. 5)		SW	Rotate through range.	-.8v to -.2v	Defective: 14AF7. Open: C403, L402, T400, WS. Shorted: C401C, T400, WS.

SW CIRCUITS

STEP	TEST POINT	SIG. GEN. FREQ.	BAND SWITCH	RADIO TUNING	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
6	A	15 mc.	SW	15 mc.	Same as step 1.	Defective: 14AF7. Open: L401, C404, WS. Shorted: WS, L401.

OSCILLATOR TEST: Connect the positive lead of a high-resistance voltmeter to B-, test point B; connect the prod end of the negative lead through a 100,000-ohm isolating resistor to the oscillator grid (pin 4 of 14AF7), test point C. Use a suitable meter range, such as 0-10 volts. Proper operation of the oscillator is indicated by negative voltage, of approximately the value given in the chart (measured with 20,000-ohms-per-volt meter), throughout the tuning range.

MODEL 49-904

PHILCO CORP.

ALIGNMENT PROCEDURE

DIAL—Calibration and pointer-index measurements are shown in figure 8. With tuning condenser fully meshed, set pointer to index mark.

OUTPUT METER—Connect to terminals indicated in figure 7.

SIGNAL GENERATOR—Connect as indicated in chart. Use modulated output.

RADIO CONTROLS—Set volume control to maximum, and tone control fully counterclockwise (treble). Set band switch and tuning control as indicated in chart.

OUTPUT LEVEL—During alignment, adjust signal-generator output to hold output-meter indication below 1.25 volts.

STEP	SIGNAL GENERATOR		RADIO			ADJUST
	CONNECTION TO RADIO	DIAL SETTING	BAND SWITCH	DIAL SETTING	SPECIAL INSTRUCTIONS	
1	Ground lead to B-; output lead through .1-mf. condenser to tuning-condenser stator (aerial section).	455 kc.	BC	540 kc.	Adjust, in order given, for maximum output.	TC301B—2nd i-f sec. TC301A—2nd i-f pri. TC3008—1st i-f sec. TC300A—1st i-f pri.
2	Radiating loop (see note below).	580 kc.	BC	580 kc.	Adjust for maximum.	C401A—BC osc. (series)
3	Same as step 2.	1600 kc.	BC	1600 kc.	Adjust for maximum.	C401B—BC osc. (shunt)
4	Same as step 2.	15 mc.	SW	15 mc.	Adjust for maximum on first peak from loose position. Image should be heard with signal generator set at 14.1 mc.	C401C—SW osc.
5	Same as step 2.	15 mc.	SW	15 mc.	Adjust for maximum from tight position.	C400A—SW aerial
6	Same as step 2.	1500 kc.	BC	1500 kc.	Adjust for maximum.	C402—BC aerial
7	Same as step 2.	580 kc.	BC	580 kc.	Adjust for maximum while rocking tuning control.	C401A—BC osc. (series)
8	Same as step 2.				Repeat steps 3 and 7 until no further improvement is noted, then repeat step 3.	

NOTE: TC300A AND TC301A ARE LOCATED ON UNDERSIDE OF CHASSIS.

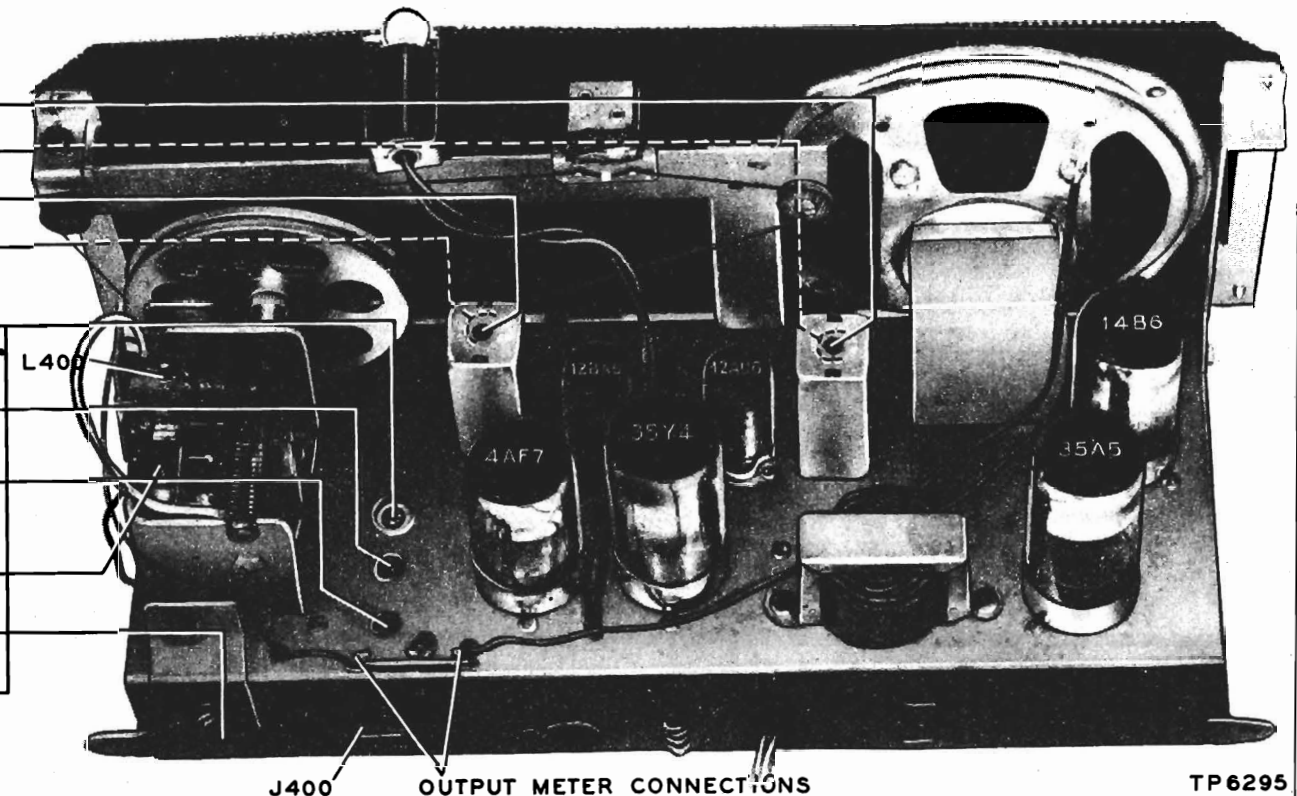


Figure 6. Top View, Showing Trimmer Locations

RADIATING LOOP: Make up a 6—8 turn, 6-inch-diameter loop from insulated wire; connect to signal-generator leads and place near radio loop aerial. Make sure that loop aerial is connected to radio.

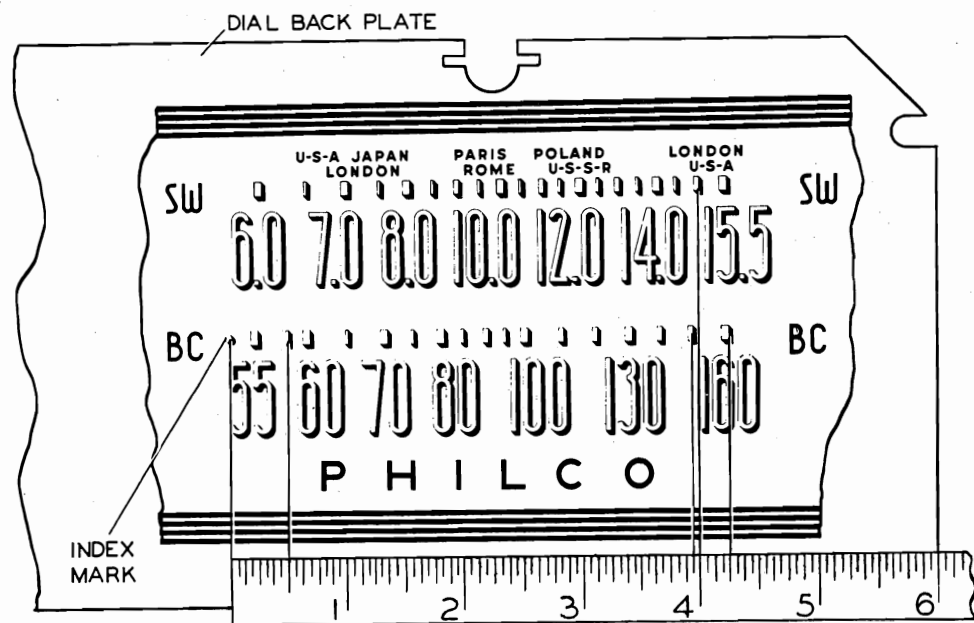


Figure 7. Calibration Measurements for Dial Backplate

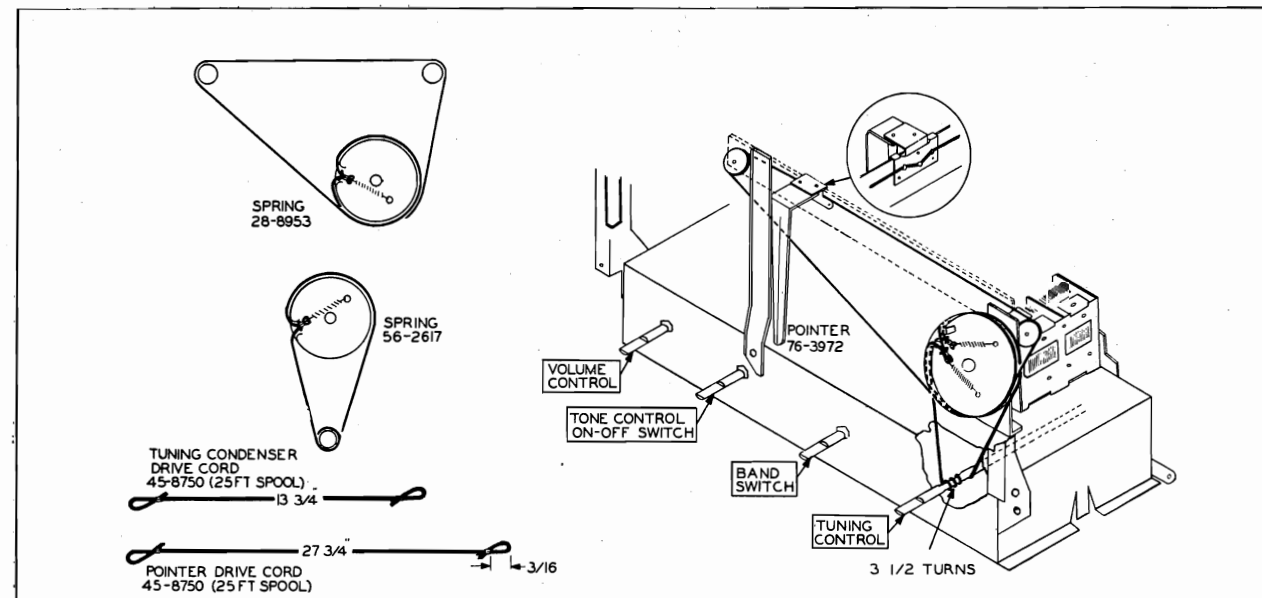


Figure 8. Drive-Cord Installation Details

PHILCO CORP.

MODEL 49-1405



MODEL 49-1405

SPECIFICATIONS

CABINET.....	Wood, mahogany finish
RADIO CIRCUIT	Five-tube superheterodyne
FREQUENCY RANGE	540—1600 kc.
AUDIO OUTPUT	2 watts
OPERATING VOLTAGES.....	105—120 volts, 60 cycles, a.c.
POWER CONSUMPTION	
Radio only	35 watts
Radio-phonograph	50 watts
AERIAL.....	Built-in loop; terminal also provided for external aerial
INTERMEDIATE FREQUENCY	455 kc.
PHILCO TUBES (5).....	12BE6, 12BA6, 6AQ6, 35L6GT, 50Y7GT
PHONOGRAPH.....	Philco Automatic Record Player Model M-9C (for service information see manual PR-1599)

Circuit Description

Philco Radio-Phonograph Model 49-1405 is a table-model 5-tube superheterodyne radio with a Model M-9C Automatic Record Changer. For service information on the record changer, refer to the Service Manual (PR-1599) for Model M-9C Automatic Record Changer.

Reception is provided on the standard broadcast band.

The built-in loop aerial normally provides adequate signal pickup; however, a terminal is provided for an external aerial, if additional pickup is required.

The loop works directly into a 12BE6 converter; no series padder is required for the oscillator, as the tuning-condenser plates are shaped for tracking.

The i-f stage employs a 12BA6, operating at 455 kc. Both transformers are permeability-tuned in both primary and secondary windings.

The diode section of a 6AQ6 provides detection and a-v-c voltage; the triode section is the 1st audio amplifier, and is resistance-coupled to a 35L6GT beam-power output amplifier, which works into a PM speaker.

The d-c operating voltages are supplied by a voltage-doubling circuit using a 50Y7GT rectifier and a resistance-capacitance filter.

The 120,000-ohm resistor, R103, is connected between B— and the chassis, to prevent hum due to condenser leakage under high-humidity conditions.

Philco TROUBLE-SHOOTING Procedure

For rapid trouble shooting, the radio circuit is divided into four sections, as follows:

Section 1—the power supply

Section 2—the audio circuits

Section 3—the i-f, detector, and a-v-c circuits

Section 4—the r-f and converter circuits

Test points are specified for each section, and are indicated in the sectionalized schematic diagram. The trouble-shooting procedure given for each section includes a simplified test chart and a bottom view of the chassis showing the locations of the test points and the components of that section.

In each chart, the first step is a master check for determining whether trouble exists in that section, without going through the entire chart.

Failure to obtain the "NORMAL INDICATION" in any given step indicates trouble within the circuit under test.

After isolating the trouble to a single stage, the defect is located by: first, testing the tube; second, measuring tube electrode voltages; third, measuring circuit resistances; fourth, substituting condensers. The trouble revealed should be corrected before testing further.

Preliminary Checks

To avoid possible damage to the radio, the following preliminary checks should be made before turning on the power:

1. Inspect both the top and the bottom of the chassis. Make sure that all tubes are secure in the proper sockets, and look for any broken or shorted connections, burned resistors, or other obvious indications of trouble.

2. Measure the resistance between B+ (pin 4 of the 50Y6GT) and B—, test point B. When the ohmmeter leads are connected in the proper polarity, the highest resistance reading will be obtained. If the reading is lower than 2000 ohms, check condenser C102A for leakage or a short. This resistance value, which is much lower than normal, does not represent a quality check of this condenser; it is the lowest value which will permit the rectifier to operate safely while the voltage checks of Section 1 (power supply) are performed.

MODEL 49-1405

PHILCO CORP.

Section 1—Power Supply

For the tests in this section, use a d-c voltmeter. Connect the negative lead to B—, test point B; connect the positive lead to the test points indicated in the chart. The voltage readings given were taken with a 20,000-ohms-per-volt meter at a line voltage of 117 volts, a.c.

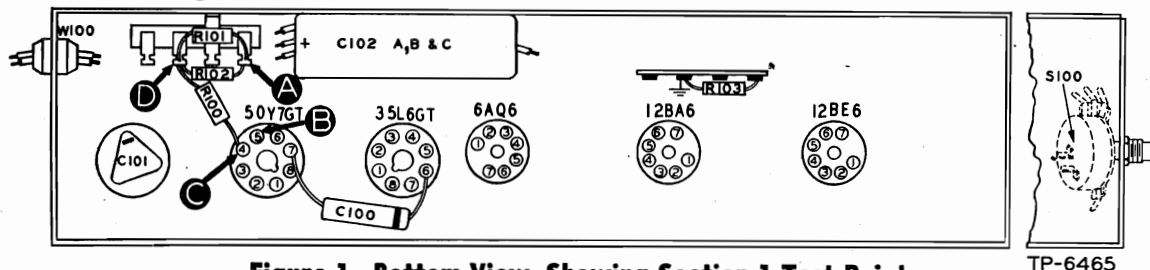


Figure 1. Bottom View, Showing Section 1 Test Points

TP-6465

STEP	TEST POINT	NORMAL INDICATION	ABNORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	120 volts		Trouble in this section. Isolate by the following tests.
2	C	212 volts	No voltage	Defective: 50Y7GT, I100.
			Low voltage	Shorted: C100, C101, C102A.
			High voltage	Leaky: C100, C101, C102A.
3	D	205 volts	No voltage	Open: R100.
			Low voltage	Defective: 50Y7GT.
			High voltage	Shorted: C102B.
4	A	120 volts	No voltage	Open: R101, R102, T200*.
			Low voltage	Shorted: C102C.
				Open: R101 and R102 (in parallel).
				Leaky: C102C.

* This part, located in another section, may cause abnormal indication in this section.

Section 2—Audio Circuits

For the tests in this section, use an audio-frequency signal generator. Connect the generator ground lead to B—, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

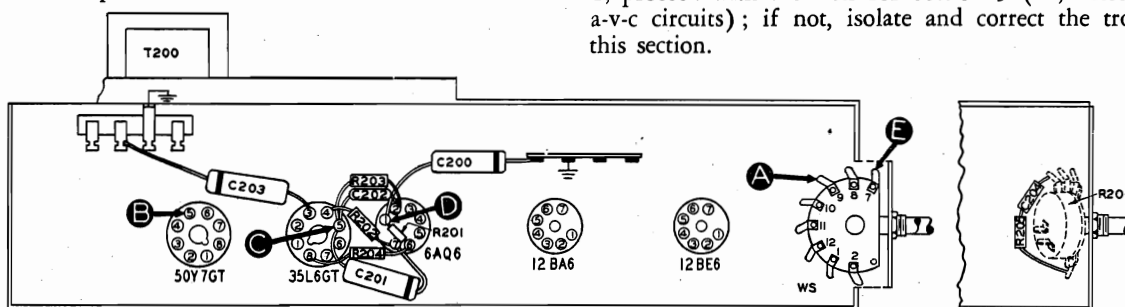


Figure 2. Bottom View, Showing Section 2 Test Points

TP-6467

STEP	TEST POINT	RADIO-PHONO SWITCH	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1 (a)	A	Radio	Loud, clear speaker output with moderate generator input.	Trouble in this section. Isolate by the following tests.
1 (b)	E	Phono		
2	C	Radio	Clear output with strong input.	Defective: LS200, 35L6GT. Shorted: T200, C203, C201, C204, C202. Open: T200, R204, R205, R203. Leaky: C203.
3	D	Radio	Loud, clear output with moderate input.	Defective: 6AQ6. Shorted: C200. Open: C201, R202, R201. Leaky: C201.
4	A	Radio	Loud, clear output with moderate input.	Open: R200 (rotate), C200, WS. Shorted: WS.
5	E	Phono	Same as step 4.	Open or shorted: WS.

Listening Test: Distortion may be caused by leaky C201. Distortion on strong signals may be caused by shorted or leaky C200.

Section 3—I-F, Detector, and A-V-C Circuits

For the tests in this section, use an r-f signal generator, with modulated output, set at 455 kc. Connect the generator ground lead to B—, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the radio volume control to maximum, and the radio-phono switch to the radio position. Rotate the tuning control until the tuning condenser is fully meshed.

If the "NORMAL INDICATION" is obtained in step 1, proceed with the tests for Section 4 (r-f and converter circuits); if not, isolate and correct the trouble in this section.

To provide a complete i-f amplifier check, test point A for this section is placed at the grid of the mixer in Section 4; therefore, the effectiveness of step 1 as a master check is dependent upon the condition of certain parts in the mixer circuit. These parts are listed below under "POSSIBLE CAUSE OF ABNORMAL INDICATION."

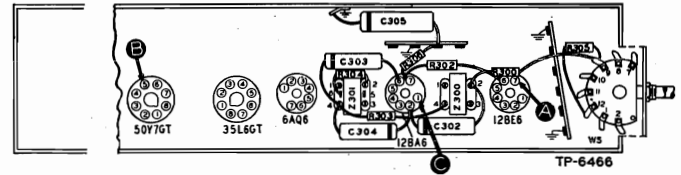


Figure 3. Bottom View, Showing Section 3 Test Points

STEP	TEST POINT	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	Loud, clear speaker output with weak generator input.	Trouble in this section. Isolate by the following tests.
2	C	Loud, clear output with strong input.	Defective: 12BA6, 6AQ6. Shorted: C300B, C301A, C301B, C301C, C301D, C303, C304, WS, L300B, L301A, L301B. Open: R302, R303, R304, R305, L300B, L301A, L301B, R301, C301A, C301B. Leaky: C303, C304. Misaligned: Z301.
3	A	Loud, clear output with weak input.	Defective: 12BE6*. Shorted: C400A*, C400B*, C300A, L300A, L300B, C302. Open: L300A, R300, C300A, C300B. Misaligned: Z300.

* This part, located in another section, may cause abnormal indication in this section.

Section 4—R-F and Converter Circuits

For the tests in this section, with the exception of the oscillator test, use an r-f signal generator with modulated output. Connect the generator ground lead to B—, test point B; connect the output lead through a .1-mf. condenser to the test points indicated in the chart.

Set the radio volume control to maximum, and the radio-phono switch to the radio position. Set the tuning control and signal-generator frequency as indicated in the chart.

If the "NORMAL INDICATION" is obtained in step 1, further tests should be unnecessary; if not, isolate and correct the trouble in this section. If the trouble is not revealed by the tests for this section, check the alignment.

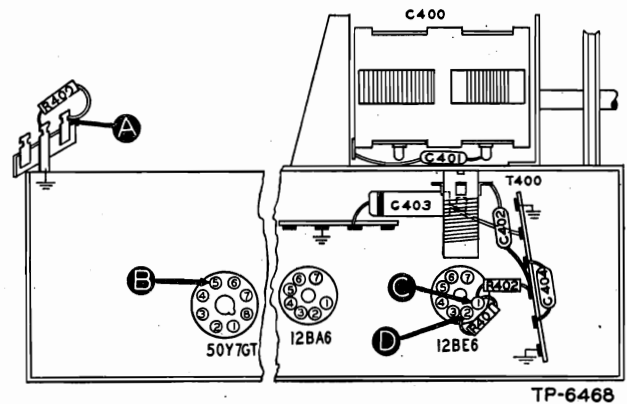


Figure 4. Bottom View, Showing Section 4 Test Points

STEP	TEST POINT	SIG. GEN. FREQ.	RADIO TUNING	NORMAL INDICATION	POSSIBLE CAUSE OF ABNORMAL INDICATION
1	A	1000 kc.	Tune to signal.	Loud, clear speaker output with weak generator input.	Trouble in this section. Isolate by the following tests.
2	C—D Osc. Test (see note below).		Rotate through range.	Negative	Defective: 12BE6. Shorted: C400, C400B, C402, C401, L400A, L400B. Open: C402, L400A, L400B, R401, R402.
3	A	1000 kc.	Tune to signal.	Same as step 1.	Shorted: LA400, C400, C400A. Open: LA400, C404.

OSCILLATOR TEST: Connect the positive lead of a high-resistance voltmeter to the oscillator cathode (pin 2 of 12BE6), test point D; connect the prod end of the negative lead through a 100,000-ohm isolating resistor to the oscillator grid (pin 1 of 12BE6), test point C. Use a suitable meter range, such as 0—10 volts. Proper operation of the oscillator is indicated by negative voltage within the range given in a chart (measured with a 20,000-ohms-per-volt meter) throughout the tuning range.

MODEL 49-1405

PHILCO CORP.

REPLACEMENT PARTS LIST

NOTE: Part numbers identified by an asterisk (*) indicates a general replacement item. The part numbers of these items may not be identical with those on factory parts; also, the electrical values of some replacement items may differ from the values given in the schematic diagram and parts list. The values substituted in any case are so chosen that the operation of the radio will be either unchanged or improved. When ordering replacements, use only the "Service Part No."

SECTION 1

POWER SUPPLY

Reference Symbol	Description	Service Part No.
C100	Condenser, line filter, .05 mf.	61-0107*
C101	Condenser, electrolytic, filter, 20 mf.	30-2568-22
C102	Condenser, electrolytic, 3-section	30-2575-26
C102A:	Condenser, filter, 40 mf.	Part of C102
C102B:	Condenser, filter, 40 mf.	Part of C102
C102C:	Condenser, filter, 20 mf.	Part of C102
I100	Pilot lamp	34-2605
R100	Resistor, filter, 180 ohms.	66-1184340*
R101	Resistor, filter, 10,000 ohms.	66-3103340*
R102	Resistor, filter, 10,000 ohms.	66-3103340*
R103	Resistor, isolating, 120,000 ohms.	66-4123340*
S100	Switch, power on-off	Part of R200
W100	Line cord and plug	L2183*
WS-A	Switch-wafer section	Part of 42-1847-1†

SECTION 2

AUDIO CIRCUITS

C200	Condenser, d-c blocking, .01 mf.	61-0120*
C201	Condenser, d-c blocking, .01 mf.	61-0120*
C202	Condenser, r-f by-pass, 220 mmf.	66-122001001*
C203	Condenser, tone compensation, .004 mf.	30-4623*
C204	Condenser, tone compensation, .01 mf.	61-0120*
R200	Volume control (with power on-off switch), 2 megohms, tapped at 1 megohm.	33-5535-15
R201	Resistor, grid return, 10 megohms.	66-6103340*
R202	Resistor, plate load, 220,000 ohms.	66-4223340*
R203	Resistor, grid return, 470,000 ohms.	66-4473340*
R204	Resistor, cathode bias, 180 ohms.	66-1183340*
R205	Resistor, tone compensation, 47,000 ohms.	66-3473340*
LS200	Loud-speaker, PM	36-1629
T200	Transformer, output	32-8242-2
WS-B	Switch-wafer section	Part of 42-1847-1†

† 42-1847-1 Wafer switch, single wafer, radio-phono (includes WS-A, WS-B, WS-C).

SECTION 3

I-F, DETECTOR, AND A-V-C CIRCUITS

C300A	Condenser, fixed, 1st i-f primary	Part of Z300
C300B	Condenser, fixed, 1st i-f secondary	Part of Z300
C301A	Condenser, fixed, 2nd i-f primary	Part of Z301
C301B	Condenser, fixed, 2nd i-f secondary	Part of Z301
C301C	Condenser, fixed, i-f filter	Part of Z301
C301D	Condenser, fixed, i-f filter	Part of Z301
C302	Condenser, a-v-c filter, .05 mf.	61-0122*
C303	Condenser, screen by-pass, .01 mf.	61-0120*
C304	Condenser, plate by-pass, .003 mf.	61-0109*
C305	Condenser, r-f by-pass, .1 mf.	61-0113*
R300	Resistor, a-v-c filter, 22,000 ohms.	66-3223340*
R301	Resistor, a-v-c filter, 2.2 megohms.	66-5223340*
R302	Resistor, screen dropping, 100,000 ohms.	66-4103340*
R303	Resistor, plate dropping, 1000 ohms.	66-2103340*
R304	Resistor, a-v-c filter, 47,000 ohms.	66-3473340*

SECTION 3 (Cont.)

Reference Symbol	Description	Service Part No.
R305	Resistor, diode load, 470,000 ohms.	66-4473340*
R306	Resistor, bias, 100 ohms.	66-1103340*
TC300A	Tuning core, 1st i-f primary	Part of Z300
TC300B	Tuning core, 1st i-f secondary	Part of Z300
TC301A	Tuning core, 2nd i-f primary	Part of Z301
TC301B	Tuning core, 2nd i-f secondary	Part of Z301
WS-C	Switch-wafer section	Part of 42-1847-1†
Z300	Transformer, 1st i-f	32-4160
Z301	Transformer, 2nd i-f	32-4240

SECTION 4

R-F AND CONVERTER CIRCUITS

C400	Condenser, tuning gang	31-2727
C400A:	Condenser, trimmer, aerial	Part of C400
C400B:	Condenser, trimmer, oscillator	Part of C400
C401	Condenser, ceramic, 10 mmf.	30-1224-6
C402	Condenser, ceramic, 56 mmf.	60-00515307*
C403	Condenser, r-f by-pass, .03 mf.	45-3500-1*
C404	Condenser, aerial coupling, 5 mmf.	60-90505007*
LA400	Loop aerial	76-2127-9
R400	Resistor, leakage, 150,000 ohms.	66-4153340*
R401	Resistor, grid return, 22,000 ohms.	66-3223340*
R402	Resistor, parasitic suppressor, 33 ohms.	66-0333340*
T400	Transformer, oscillator	32-4190-2

† 42-1847-1 Wafer switch, single wafer, radio-phono (includes WS-A, WS-B, WS-C).

MISCELLANEOUS

Description	Service Part No.
Cabinet and Cabinet Parts	
Bezel	56-5931
Cabinet	10727
Knob (3)	54-4527-9
Phonograph cover	45-6454
Window, acetate	54-4630
Dial Scale and Hardware	
Dial cord (25-ft. spool)	45-8750*
Pointer	56-5956FCP
Spring, pointer	56-6299
Scale	54-5022
Shaft assembly, drive	76-3731-1
Spring, drive cord	56-2617
Pilot-lamp-socket assembly	27-6233-1
Bracket-and-clip assembly	76-4164
Bracket	56-5928FA3
Clip	56-3545-6FA3
Bracket, rear	27-9508
Socket, octal	27-6174
Socket, miniature	27-6226
Wafer, condenser mounting	27-9508
Crystal pickup cartridge, P-30	35-2671-1
Needle for P-30 crystal	35-2670
Pickup cartridge and needle assembly	45-1609

PHILCO CORP.

MODEL 49-1405

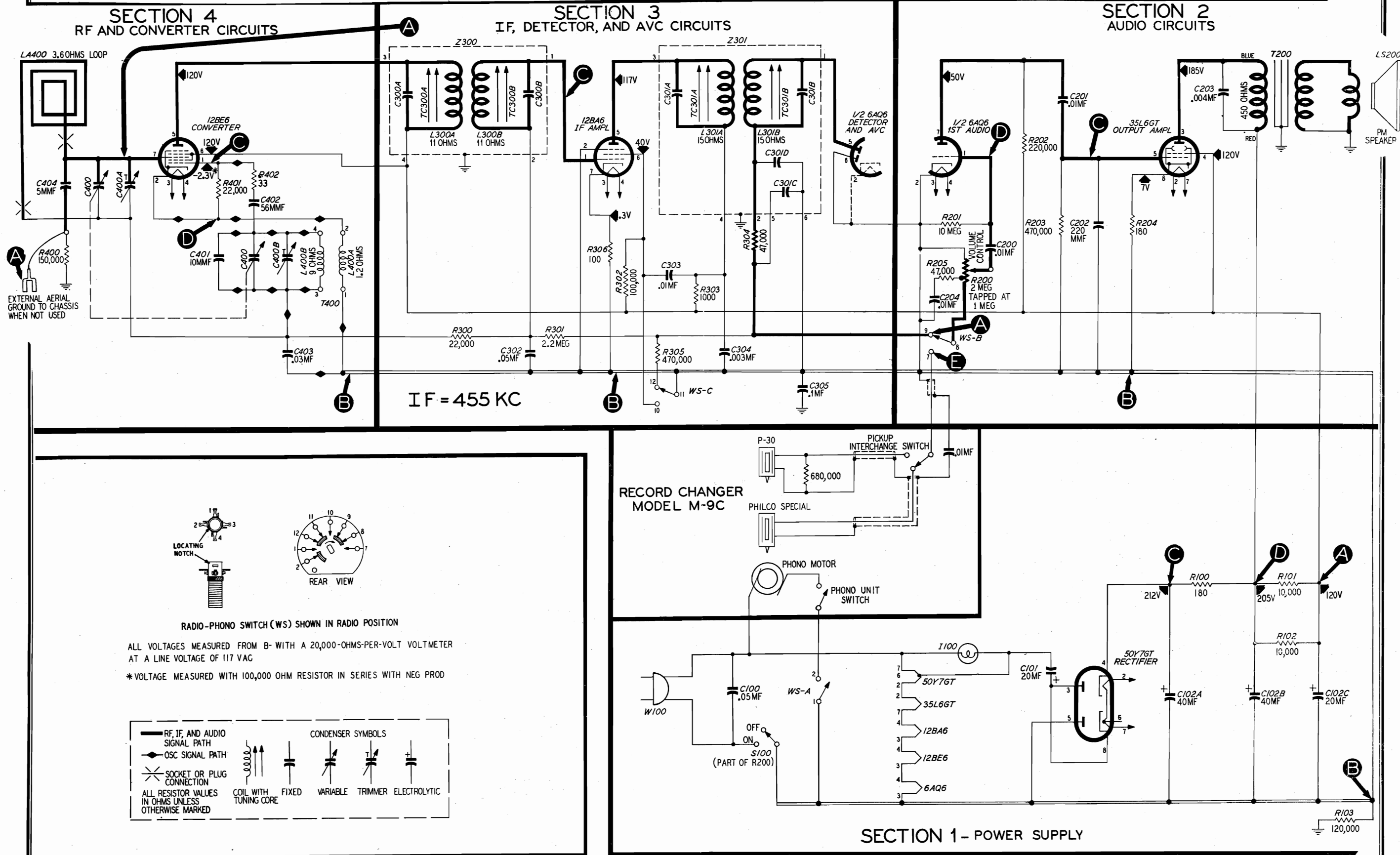


Figure 5. Philco Model 49-1405, Sectionalized Schematic Diagram, Showing Test Points

ALIGNMENT PROCEDURE

DIAL—With tuning condenser fully meshed, set pointer to index mark at low-frequency end of dial, beyond "55".

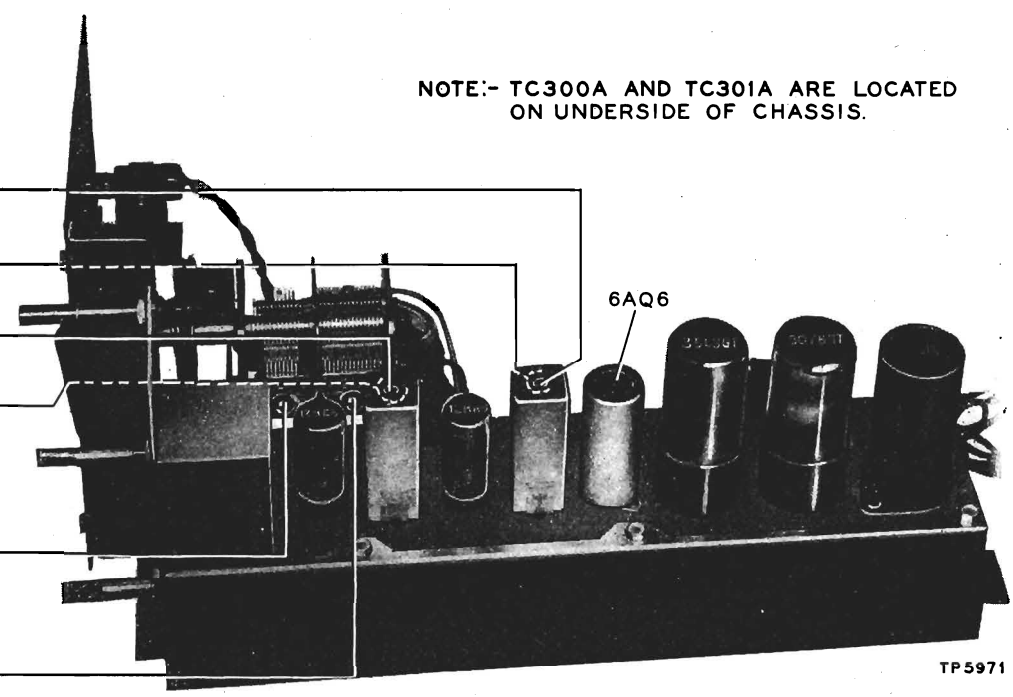
RADIO CONTROLS—Set volume control to maximum, and radio-phonograph switch to radio position.

OUTPUT METER—Connect to terminals indicated in figure 6.

SIGNAL GENERATOR—Connect ground lead to B—, test point B in figure 4, and connect output lead as indicated in chart. Use modulated output.

OUTPUT LEVEL—During alignment, adjust signal-generator output to hold output-meter indication below 1.25 volts.

STEP	SIGNAL GENERATOR		RADIO		ADJUST
	CONNECTION TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	
1	Through .1-mf. condenser to external-aerial lead. Make sure that radio loop aerial is connected to radio.	455 kc.	Tuning condenser fully meshed.	Adjust, in order given, for maximum output.	TC301B—2nd i-f sec. TC301A—2nd i-f pri. —SEE NOTE TC300B—1st i-f sec. TC300A—1st i-f pri. —SEE NOTE
2	Radiating loop (see note below).	1600 kc.	1600 kc.	Adjust for maximum output.	C400B—osc.
3	Same as step 2.	1500 kc.	1500 kc.	Adjust for maximum output.	C400A—aerial



RADIATING LOOP: Make up a 6—8-turn, 6-in-diameter loop, using insulated wire; connect to signal-generator leads and place near radio loop aerial.

Figure 6. Top View, Showing Trimmer Locations

SYMBOLIZATION

The components in the radio circuit are symbolized according to the types of parts and the sections of the radio in which the parts are located. The prefix letter of the symbol designates the type of part, as follows:

C—condenser	LS—loud-speaker	W—wire or cable
I—pilot lamp	R—resistor	WS—wafer switch
L—choke or coil	S—switch	Z—electrical assembly
LA—loop aerial	T—transformer	

The number of the symbol designates the section in which the part is located, as follows:

100-series components are in Section 1—the power supply
200-series components are in Section 2—the audio circuits
300-series components are in Section 3—the i-f, detector, and a-v-c circuits
400-series components are in Section 4—the r-f and converter circuits

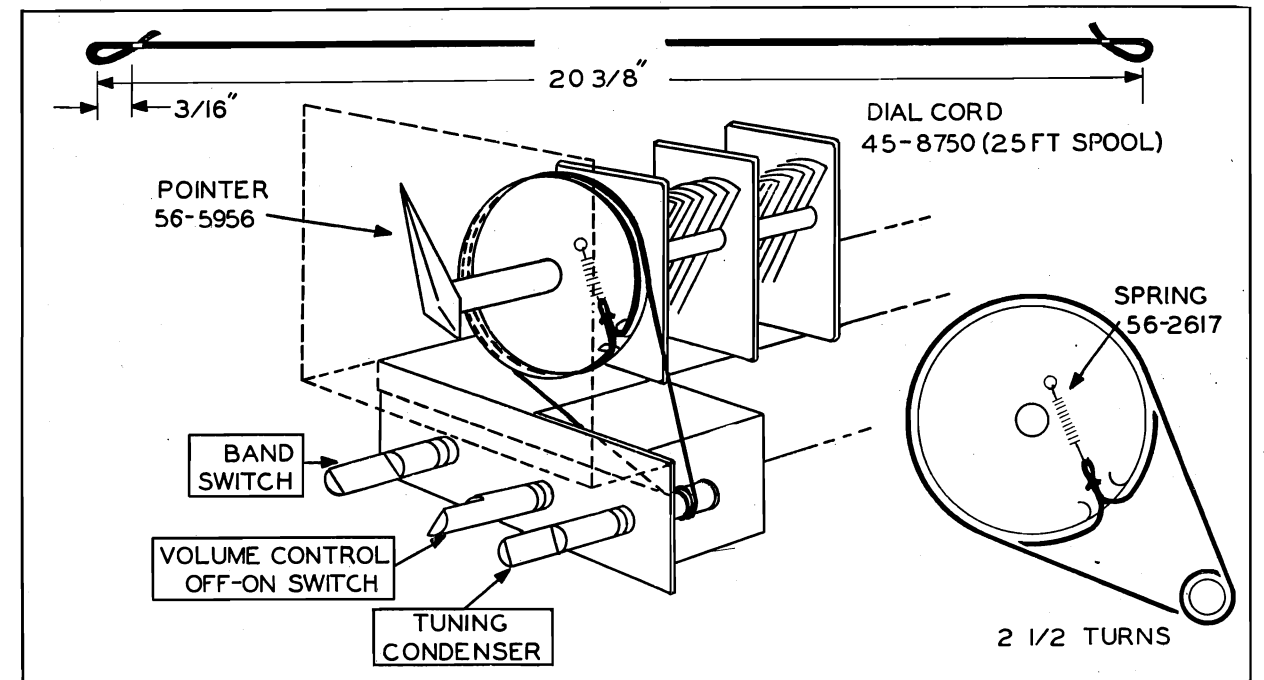


Figure 7. Drive-Cord Installation Details

TP-6471