VOLUME XXI

PERPETUAL TROUBLE SHOOTER'S MANUAL

REG. U.S. PAT. OFF.

JOHN F. RIDER

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MODEL 94RA1-43-8510B,
94RA1-43-8511B

GENERAL DESCRIPTION

This radio is a 7 tube (including rectifier tube) AC receiver designed for reception of stations in the standard broadcast band between 540 and 1600 kilocycles and FM (Frequency Modulation) stations in the newly allocated FM Band of 88 - 108 megacycles. Controls are provided on the front panel for tuning, tone, volume and band or phono selection. Special features include a built-in loop antenna for broadcast reception, a hank antenna for the reception of FM stations, automatic volume control, compensator circuits to prevent oscillator drift, beam power output stage, permanent magnet dynamic speaker and an electrostatic shield in the power transformer to reduce power line noise. A socket labeled PHONO is provided on the back of the chassis to which an external record player may be connected.

ELECTRICAL SPECIFICATIONS

Power Consumption —
117 volts AC—35 Watts

Power Output —
1.5 watts maximum
.9 watts 10% distortion

Speaker—5" PM dynamic

Frequency Ranges —
Broadcast 540-1600 KC
Frequency modulation 88-108 MC

Intermediate Frequency —
AM 455 KC — FM 10.7 MC

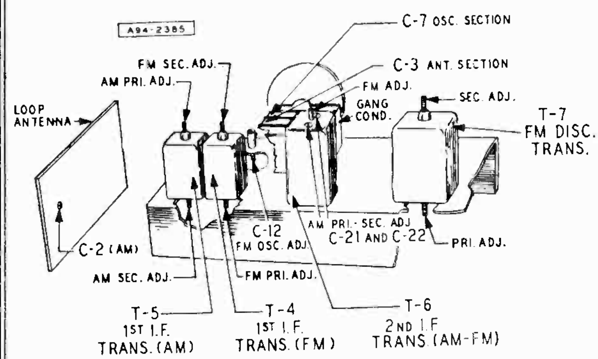
Selectivity — AM — 60 KC broad at 1000 times signal, measured at 1000 KC

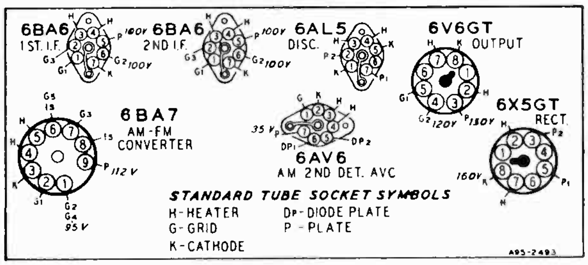
I.F. FM—200 KC broad at 2 times down

I.F. FM — 700 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





TUBE SOCKET VOLTAGES

Socket voltages are shown on the Bottom Socket 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 ±10% is usually permissible.

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MODEL 94RA1-43-8510B,
94RA1-43-8511B

SERVICE DATA

ALIGNMENT PROCEDURES

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.

FREQUENCY SETTING	SIGNAL GENERATOR CONNECTION AT RADIO	GROUND CONNECTION	DUMMY ANTENNA	GANG CONDENSER SETTING	ADJUST TUNING SLUGS AND TRIMMERS
455 KC	Control Grid 1st 6BA6 Pin No. 1	Chassis Base	.1 mf	Turn Rotor to Full Open	2nd I.F. C-21 & C-22
455 KC	Control Grid 6BA7 Pin No. 7 1st Det.	Same as above	.1 mf	Turn Rotor to Full Open	1st I.F. Pri. & Sec.
1620 KC	Control Grid 6BA7 Pin No. 7	Same as above	.1 mf	Turn Rotor to Full Open	Oscillator C-7
1400 KC	External Antenna Clip	Same as above	50 mmf	Turn Dial to 1400 KC. See Note A	Antenna C-2

NOTE A—Set pointer at the 1400 KC mark on the dial scale. Attach pointer to drive cord.

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—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.)

	SIGNAL GENERATOR FREQUENCY SETTING	SIGNAL GENERATOR 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	2500 mmf	FM	Rotor Fully Open	Disc. Pri. Note A
	10.7 MC	Same as above	2500 mmf	FM	Rotor Fully Open	Disc. Sec. Note B
	10.7 MC	Same as above	2500 mmf	FM	Rotor Fully Open	Disc. Pri. Note A
	10.7 MC	Same as above	2500 mmf	FM	Rotor Fully Open	Disc. Sec. Note B
I-F	10.7 MC Note E	6BA6 1st I-F Pin 1 & Chassis	2500 mmf	FM	Rotor Fully Open	2nd I-F Note C
Discriminator	10.7 MC	6BA6 2nd I-F Pin 1 & Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Pri. Note A
I-F	10.7 MC	Antenna and Chassis	2500 mmf	FM	Rotor Fully Open	1st. I-F Pri. and Sec. and Note C
	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. Note C
	10.7 MC	Antenna and Chassis Note D	2500 mmf	FM	Rotor Fully Open	1st. I-F Sec. Note C
RECHECK I-F ADJUSTMENTS IN ORDER GIVEN						
Oscillator	108.4 Note F	Disconnect hank antenna and connect generator to dipole terminals with resistor in series	300 ohms	FM	Rotor Fully Open	Osc. C-12
Antenna	104.5	Same as above	300 ohms	FM	Tune rotor for max. AVC voltage	Ant. C-3
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 to 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.

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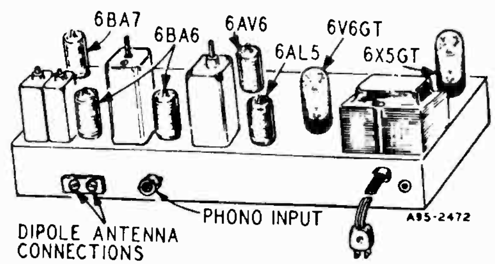
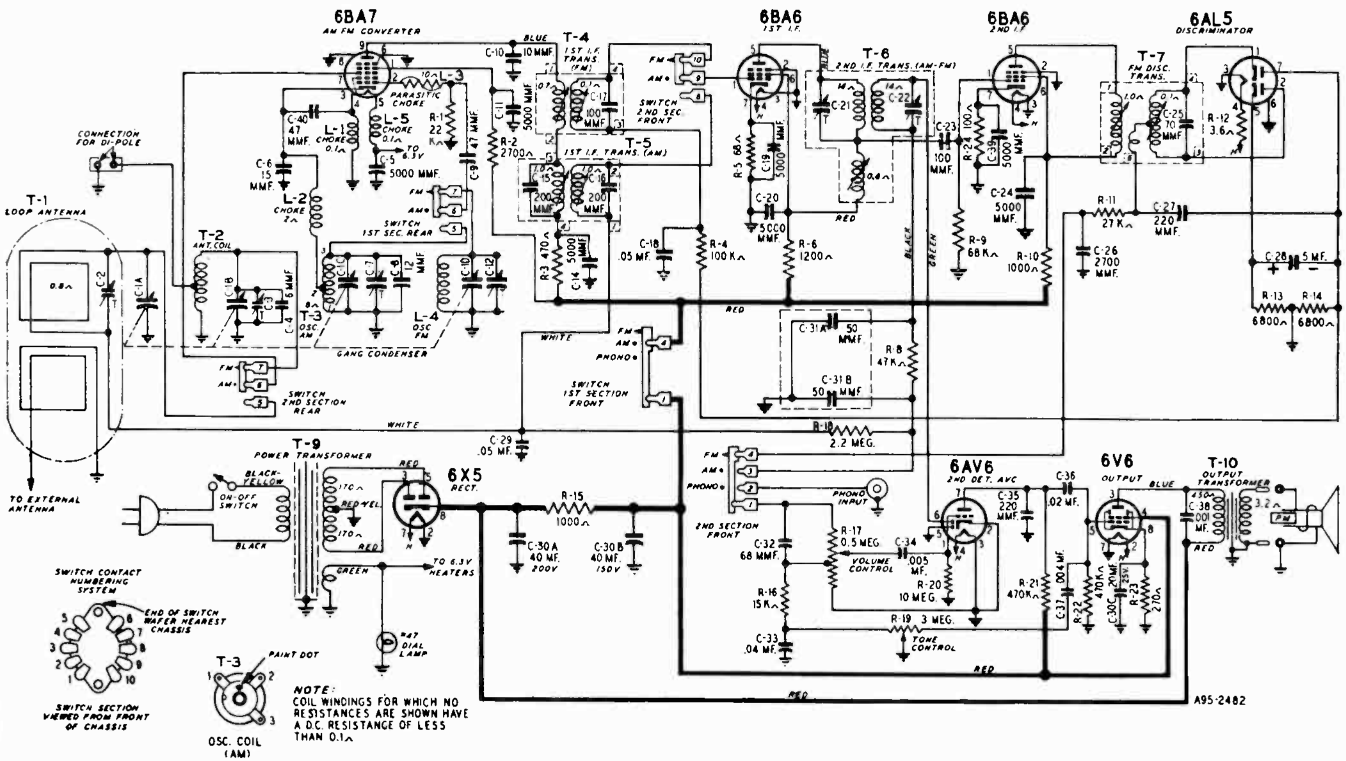
Tube and Dial Lamp Complement

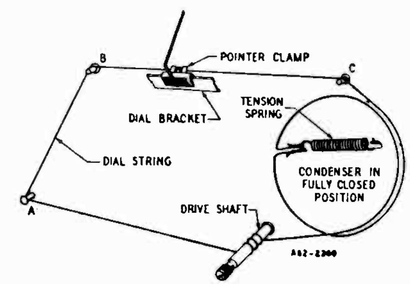
1 6BA7 FM-AM Converter
1 6BA6 1st I-F Amplifier
1 6BA6 2nd I-F Amplifier
1 6AL5 FM Discriminator
1 6AV6 Audio Amplifier, AM 2nd Detector and AVC
1 6V6GT Audio Output
1 6X5GT Rectifier
1 No. 47 Dial Lamp



DRIVE CORD REPLACEMENT

Replacement of the drive cord may be accomplished as shown in the illustration. For this purpose use the new drive cord assembly listed in the Replacement Parts List. Turn the gang condenser until the plates are fully meshed. Then install the string as shown, winding three turns clockwise around the tuning shaft with the turns progressing away from the chassis. After the cord is installed, rotate the tuning shaft several times in order to take up any slack in the cord.





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MODEL 94RA1-43-8510B, 94RA1-43-8511B

REPLACEMENT PARTS LIST

CAPACITORS

Ref. No.	DESCRIPTION	Part No.
C-1	Gang Condenser & Pulley	14A204
C-2	Capacitor, Trimmer; 2-24 mmf	17A256
C-3, C-7	Part of C-1 (Gang Condenser)	
C-4	Capacitor, Ceramic; 6 mmf	47X521
C-5, C-11, C-14, C-19, C-20, C-24, C-39	Capacitor, Ceramic; 5000 mmf	47X507
C-6	Capacitor, Ceramic; 15 mmf	47X552
C-8	Capacitor, Ceramic; 12 mmf	47X522
C-9	Capacitor, Ceramic; 47 mmf ± 10%	47X517
C-10	Capacitor, Ceramic; 10 mmf	47X512
C-12	Capacitor, Trimmer; 1-8 mmf	17A255
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	Capacitor, Tubular; .05 mf 200 V	B66503
C-21, C-22	Part of T-6 (2nd I-F Trans. AM-FM)	
C-23	Capacitor, Ceramic; 100 mmf	47X476
C-25	Part of T-7 (FM Disc. Trans.)	
C-26	Capacitor, Molded Mica; 2700 mmf	47X492
C-27, C-35	Capacitor, Ceramic; 220 mmf	47X468
C-28	Capacitor, Dry Electrolytic; 5 mf 100 V	45X361
C-30A, C-30B, C-30C	Capacitor, Dry Electrolytic; 40 mf 200 V, 40 mf 150 V, 20 mf 25 V	45X360
C-31A, C-31B	Capacitor, Dual Mica; 50-50 mmf	47X112
C-32	Capacitor, Molded Mica; 68 mmf	47X471
C-33	Capacitor, Tubular; .04 mf 200 V	B66403
C-34	Capacitor, Tubular; .005 mf 400 V	D66502
C-36	Capacitor, Tubular; .02 mf 400 V	D66203
C-37	Capacitor, Tubular; .004 mf 200 V	B66402
C-38	Capacitor, Tubular; .001 mf 800 V	H66102
C-40	Capacitor, Ceramic; 47 mmf ± 20%	47X509

RESISTORS

Ref. No.	DESCRIPTION	Part No.
R-1	Resistor, Carbon; 22K ohms 0.5 W	B84223
R-2	Resistor, Carbon; 2700 ohms 0.5 W	B84272
R-3	Resistor, Carbon; 470 ohms 0.5 W	B84471
R-4	Resistor, Carbon; 100K ohms 0.5 W	B85104
R-5	Resistor, Carbon; 68 ohms 0.5 W	B83680
R-6	Resistor, Carbon; 1200 ohms 0.5 W	B85122
R-8	Resistor, Carbon; 47K ohms 0.5 W	B85473
R-9	Resistor, Carbon; 68K ohms 0.5 W	B84683
R-10	Resistor, Carbon; 1000 ohms 0.5 W	B85102
R-11	Resistor, Carbon; 27K ohms 0.5 W	B85273
R-12	Resistor, Wirewound; 3.6 ohms 0.5 W	43X233
R-13, R-14	Resistor, Carbon; 6800 ohms 0.5 W	B84682
R-15	Resistor, Carbon; 1000 ohms 2.0 W	D84102
R-16	Resistor, Carbon; 15K ohms 0.5 W	B85153
R-17	Volume Control & Switch; .5 megohm	36X372
R-18	Resistor, Carbon; 2.2 megohms 0.5 W	B85225
R-19	Tone Control; 3 megohms	40X285
R-20	Resistor, Carbon; 10 megohms 0.5 W	B85106
R-21, R-22	Resistor, Carbon; 470K ohms 0.5 W	B85474
R-23	Resistor, Carbon; 270 ohms 0.5 W	B84271
R-24	Resistor, Carbon; 100 ohms 0.5 W	B84101

TRANSFORMERS AND COILS

Ref. No.	DESCRIPTION	Part No.
L-1, L-5	Choke, Filament	9A2044
L-2	Choke, Insulated 2 uh.	35A5
L-3	Choke, Parasitic	9A1940
L-4	Coil, Oscillator (FM)	9A2021
T-1	"B" Range Loop Antenna Assembly	9A2040
T-2	Coil, Antenna	9A1956
T-3	Coil, Oscillator (AM)	9A1997
T-4	1st I-F Trans. (FM)	9A2037
T-5	1st I-F Trans. (AM)	9A2038
T-6	2nd I-F Trans. (AM-FM)	9A1999
T-7	Discriminator Coil Assembly	9A2036
T-9	Power Transformer	53X291
T-10	Output Transformer (See Miscellaneous)	

DIAL AND TUNING PARTS

DESCRIPTION	Part No.
Diffuser & Clamp Assembly	25A1044
consisting of:	
Diffuser Clamp	30X541
Diffuser	41X82
Rubber Grommets (mtg. Gang Cond.)	6X67
Pointer	15X236
Crystal	17X100
"C" Washer (Drive Shaft)	19X192
Condenser Cushion Stud	20X260
Drive Shaft	26X486
Drive Cord Tension Spring	28X113
Dial Clamp	30X532
Dial Glass (Brown Cabinet)	58X712
Dial Glass (Ivory Cabinet)	58X713
Dial Bracket Assembly	S-25X28
consisting of:	
Rivet	20X1580
Dial Bracket	25X1606

MISCELLANEOUS

DESCRIPTION	Part No.
Band Change Switch	2A375
Tube Socket, Molded (Octal)	3A303
Phono Socket (Single Pin)	3A305
Tube Socket (Miniature)	3A426
Tube Socket (AM-FM Converter)	3A443
No. 47 Pilot Light	7A103
Pilot Light Socket Assembly	7A216
Knob (Tuning) — Brown Cabinet	10A699
Knob (Off-Volume) — Brown Cabinet	10A700
Knob (Tone) — Brown Cabinet	10A701
Knob (FM-BC-PH) — Brown Cabinet	10A702
Knob (Tuning) — Ivory Cabinet	10A703
Knob (Off-Volume) — Ivory Cabinet	10A704
Knob (Tone) — Ivory Cabinet	10A705
Knob (FM-BC-PH) — Ivory Cabinet	10A706
Speaker, 5" P.M. with Output Transformer	12A493
Drive Cord Assembly	10X68
Line Cord & Plug Assembly	13X546
Line Cord Clamp	30X547
Grille Cloth (Ivory Cabinet)	14X444
Grille Cloth (Brown Cabinet)	14X445
Speaker Baffle	14X463
Cabinet (Ivory)	55X338
Cabinet (Brown)	55X339

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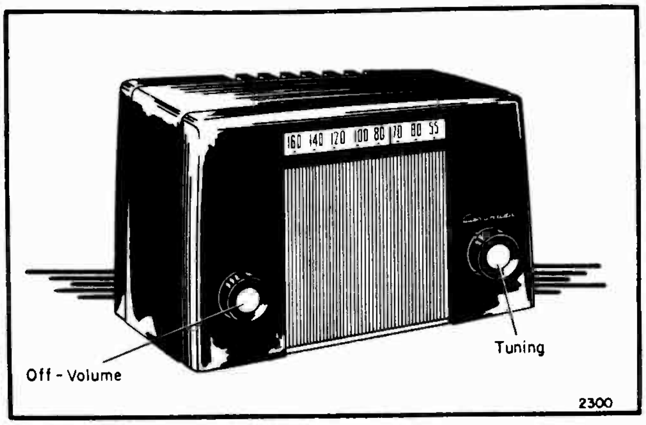
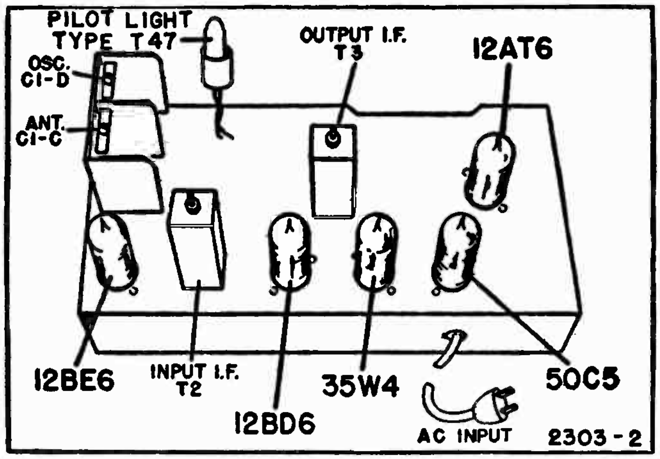
MODEL 94RA2-43-8230A

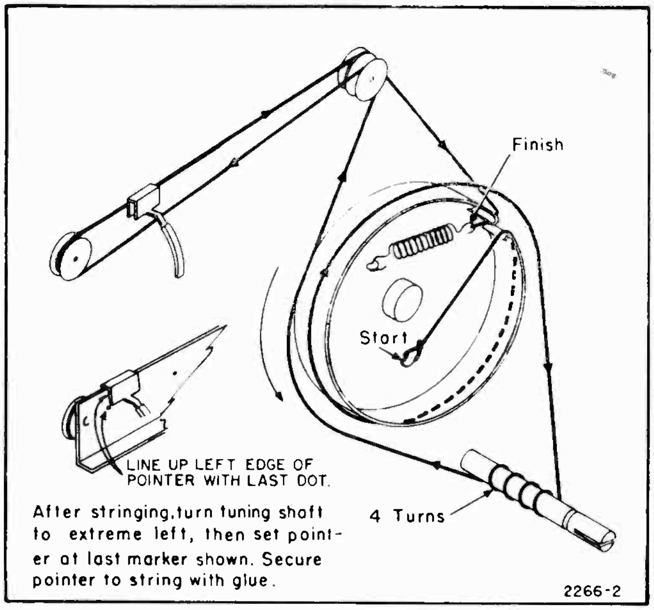


SERVICE DATA

POWER SUPPLY................105 to 125 volts, DC or 50-60 cycle AC, 24 watts.
FREQUENCY RANGE......535 to 1620 Kc.
INTERMEDIATE FREQ....455 Kc.
SELECTIVITY.....................At 1000 Kc., 60 Kc. at 1000 x signal.
SENSITIVITY.....................150 u. v. per meter.
POWER OUTPUT.............0.8 watt undistorted, 1.0 watt max.
LOUD SPEAKER...............4" round PM., v. c. impedance 3.2 ohms.
TUBE COMPLEMENT......
12BE6, Converter.
12BD6, IF Amplifier.
12AT6, Detector, AVC, Audio.
50C5, Output Amplifier.
35W4, Rectifier.



Chassis View



Dial Stringing Diagram

ALIGNMENT PROCEDURE

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	HEAVY BUSS LEAD ACROSS CENTER OF CHASSIS	Capacitor full open (plates out of mesh)	Top and bottom Cores in output and input I.F. cans	65 microvolts
1620 kc.	.1 mf.	12BE6, Pin 7		Capacitor full open (plates out of mesh)	Oscillator trimmer C1-D on gang	70 microvolts
535 kc.	.1 mf.	12BE6, Pin 7		Capacitor fully closed	Check for adequate range	70 microvolts
1400 kc.	———	Lay Generator lead near back of cabinet		Tune in 1400 kc. signal	Antenna trimmer C1-C on gang	200 to 400 microvolts
400 cycles	.1 mf.	12AT6, Pin 1		———	———	.06 volts

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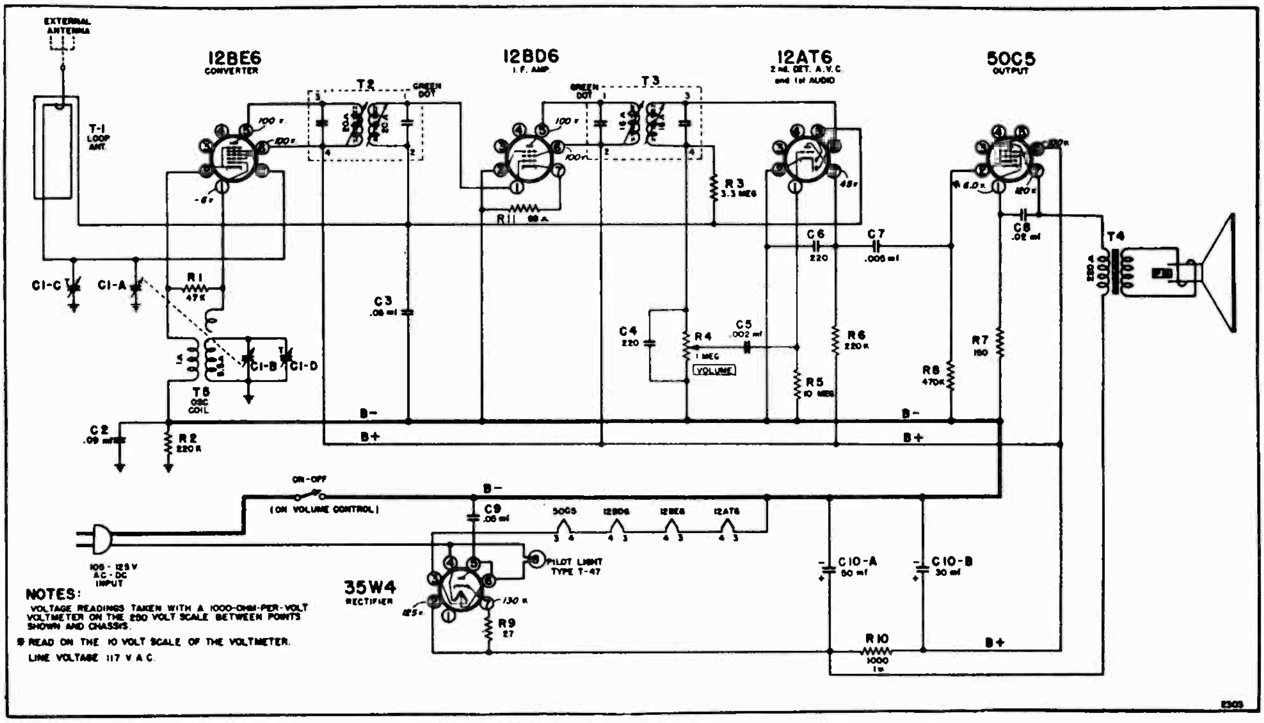
MODEL 94RA2-43-8230A

SCHEMATIC DIAGRAM WITH VOLTAGES



NOTE: In some sets capacitor C-2 is .18 mfd

REPLACEMENT PARTS LIST

Ref. No.	Part No.	Description	Qty. Used in Set
		Condensers	
C1A, B	B-8A-17377	Gang tuning condenser	1
C1C, D		Trimmers on gang	2
C2	C-8D-11251	.09 mf, 400 volts, paper	1
C3	C-8D-10770	.05 mmf, 200 volts, paper	1
C4, C6 / C5 / C7	A-201-14397	220 mmf / .002 mf, / .005 mf audio coupling strip	1
C8	C-8D-10774	.02 mf, 400 volts, paper	
C9	C-8-J-16081	.047 mf, molded, paper, 400 v.	1
C10A, B	A-8C-17391	50-30 mf x 150 volts, lytic	1
		Resistors	
R1	C-9B1-82	47K ohms, ½ watt, 10%	1
R2, 6	C-9B1-27	220K ohms, ½ watt, 20%	2
R3	C-9B1-34	3.3 megohms, ½ watt, 20%	1
R4	A-10A-18650	1 megohm, volume control and switch	1
R5	C-9B1-37	10 megohms, ½ watt, 20%	1
R7	C-9B1-52	150 ohms, ½ watt, 10%	1
R8	C-9B1-29	470K ohms, ½ watt, 20%	1
R9	C-9B1-43	27 ohms, ½ watt, 10%	1
R10	C-9B2-62	1000 ohms, 1 watt, 10%	1
R11	C-9B1-48	68 ohms, ½ watt, 20%	1
		Transformers and Coils	
T1	C-13E-18653	Loop antenna	1
T2	B-13B-17397	Input I.F. transformer	1
T3	B-13B-17399	Output I.F. transformer	1
T4	B-12C-17595	Audio output transformer	1

Ref. No.	Part No.	Description	Qty. Used in Set
T5	B-13D-17583	Oscillator coil	1
	B-18A-18656	4" PM speaker	1
		Dial Parts	
	A-3A-18612	Tuning shaft	1
	A-40A-17591	Bushing	1
	B-29E-17592	Spring washer	1
	A-43D-16401	Spring clip	1
	B-29C-10630	"C" washer	1
	A-2M-18612	Dial cross bar	1
	A-2D-17584	Support bracket	1
	B-27A-11039	Shoulder rivet	2
	A-6E-11492	Pulley	3
	A-53A-10989	Dial string (approx. 40" req.)	yd.
	A-49A-10078	Tension spring	1
	A-2G-18615	Dial pointer	1
	B-6D-16383	Dial scale	1
	A-43D-17611	Dial mounting clip	2
	A-47A-18613	Pilot light assembly	1
	A-46A-10793	Pilot light bulb	1
		Miscellaneous	
	A-2M-17580	I.F. mounting clip	2
	A-15C-16007	7-pin, miniature socket	5
	B-14M-11088-1	AC line cord	1
	R-5C-16147-75	Cabinet, bakelite	1
	B-29A-2164	Steel chassis mounting washer	2
	134-103	Rubber chassis mtg. washer	2
	42A-10097	Chassis mounting screw	2
	B-5B-18657-58	Knob	2
	B-23J-18651	Cardboard speaker baffle	1

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MODELS 05RA1-43-7755A, 05RA1-43-7755B

GENERAL DESCRIPTION

This radio is an 8 tube (including rectifier tube) AC receiver with automatic record changer, designed for reception of stations in the standard broadcast band between 540 and 1600 kilocycles and FM (Frequency Modulation) stations in the FM Band of 88-108 megacycles. Controls are provided on the front panel for tuning, tone, volume and band or phono selection. Special features include two built-in antennas, a grounded grid R-F amplifier stage on the FM Band, automatic volume control, compensator circuits to prevent oscillator drift, beam power output stage, permanent magnet dynamic speaker and an electrostatic shield in the power transformer to reduce power line noise.

ELECTRICAL SPECIFICATIONS

Power Consumption
117 volts AC—60 cycles 40 Watts
60 watts phono operating

Power Output —
1.5 watts maximum
.8 watts 10% distortion

Speaker—8" PM dynamic

Frequency Ranges —
Broadcast 540-1600 KC
Frequency modulation 88-108 MC

Intermediate Frequency —
AM 455 KC — FM 10.7 MC

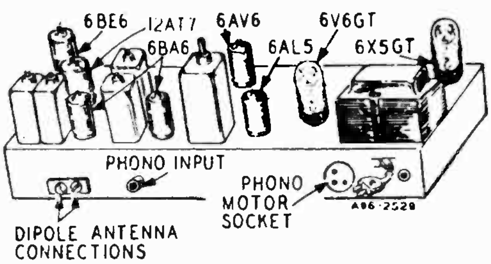
Selectivity — AM — 45 KC broad at 1000 times signal, measured at 1000 KC
I.F. FM—200 KC broad at 2 times down
I.F. FM — 950 KC broad at 200 times down

AM Sensitivity—(For .5 watt output with external antenna)
25 microvolts average

FM Sensitivity—(For .5 watt output)
25 microvolts average

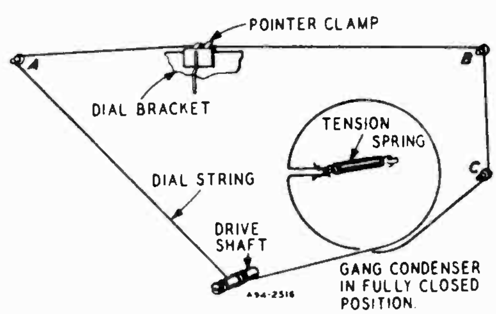
Tube and Dial Lamp Complement

1 6BE6 AM Converter & FM Osc.
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 12AT7 R-F Amplifier & Mixer
2 No. 47 Dial Lamps



DRIVE CORD REPLACEMENT

Replacement of the drive cord may be accomplished as shown in the illustration. For this purpose use the new drive cord assembly listed in the Replacement Parts List. Turn the gang condenser until the plates are fully meshed. Then install the string as shown, winding three turns clockwise around the tuning shaft with the turns progressing away from the chassis. After the cord is installed, rotate the tuning shaft several times in order to take up any slack in the cord.



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MODELS 05RA1-43-7755A, 05RA1-43-7755B

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. (1) and Sec. (2)	Maximum Output
455 KC	Control Grid 6BE6 Pin No. 7 1st Det.	.1 mf	Chassis Base	Rotor Fully Open	1st I.F. Pri. (3) and Sec. (4)	Maximum Output
455 KC	Control Grid 6BE6 Pin No. 7	.1 mf	Chassis Base	Rotor Fully Open	2nd I-F Pri. (1) and Sec. (2)	Maximum Output
1620 KC	Control Grid 6BE6 Pin No. 7	.1 mf	Chassis Base	Rotor Fully Open	Oscillator C-41	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

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. (5) Note A	Maximum Deflection
	10.7 MC	6BA6 2nd I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Sec. (6) Note B	
I-F	10.7 MC Note C	6BA6 1st I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	2nd I-F Pri. (7) Sec. (8) Note D	Maximum Deflection
Discriminator	10.7 MC	6BA6 1st I-F Pin 1 and Chassis	2500 mmf	FM	Rotor Fully Open	Disc. Pri. (5) Note D	Maximum Deflection
I-F	10.7 MC	Junction C-32A & B (Dual 100 mmf cond.) And chassis	2500 mmf	FM	Rotor Fully Open	1st I-F Pri. (9) & Sec. (10) 2nd I-F Pri. (7) & Sec. (8) Disc. Pri. (5) In Order Shown Note D	Maximum Deflection
	10.7 MC	Same as above	2500 mmf	FM	Rotor Fully Open	Disc. Sec. (6) Note B	Maximum Deflection
RECHECK I-F ADJUSTMENTS IN ORDER GIVEN							
Oscillator	108.5	Disconnect built-in dipole antenna and connect generator to dipple terminals with resistor in series.	300 ohms	FM	Rotor Fully Open	Osc. C-25	Maximum Deflection
Antenna	104.5	Same as above	300 ohms	FM	Tune rotor for max. AVC voltage	Ant. C-39	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-10) and its junction with the terminal strip. Adjust for zero voltage indication.

NOTE C—AM I-F coils must be aligned before attempting to align the FM I-F coils.

NOTE D—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.

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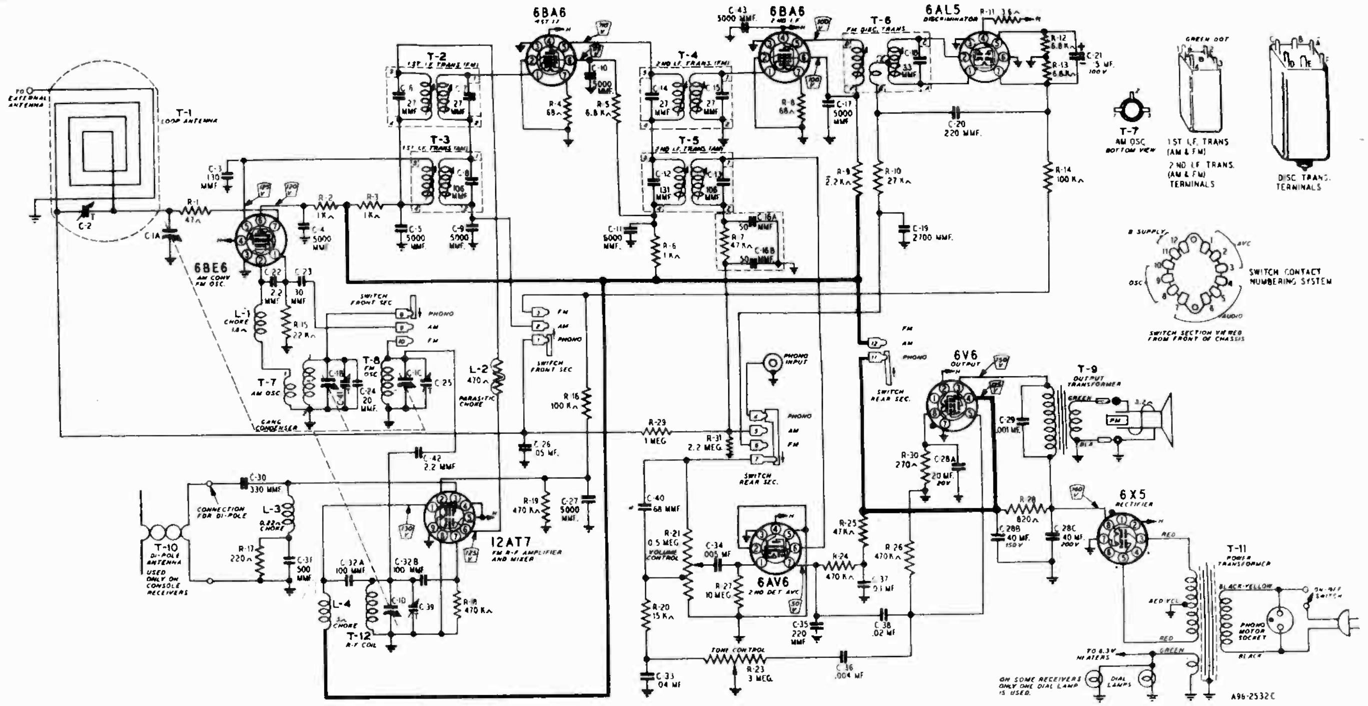
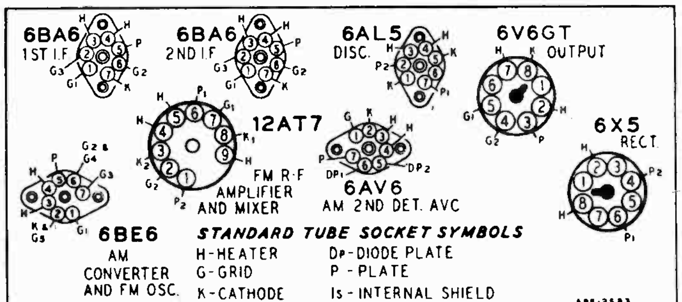
MODELS 05RA1-43-7755A,
05RA1-43-7755B

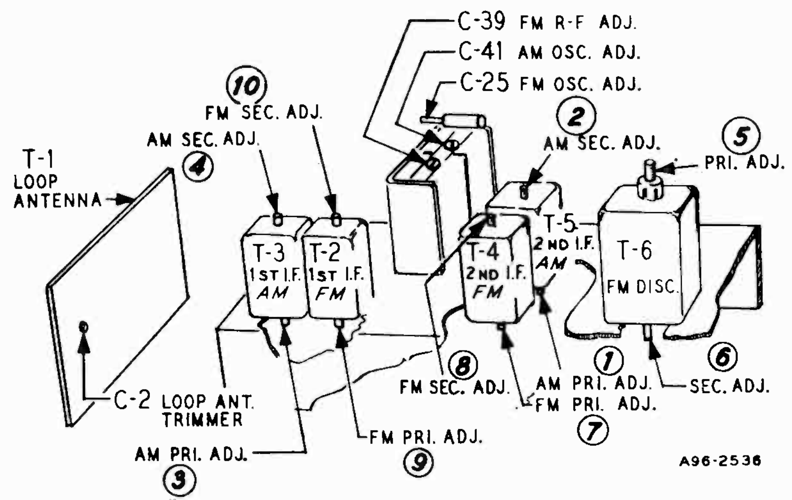


TUBE SOCKET VOLTAGES

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 ±10% is usually permissible.





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MODELS 05RA1-43-7755A,
05RA1-43-7755B

REPLACEMENT PARTS LIST

CAPACITORS

Ref. No.	DESCRIPTION	Part No.
C-1	Gong Condenser Assembly	14A209
C-2	Capacitor, Trimmer; 2-24 mmf	17A256
C-3	Capacitor, Ceramic; 130 mmf	47X559
C-4, C-5, C-9, C-10, C-11, C-17, C-27, C-43	Capacitor, Ceramic; 5000 mmf	47X507
C-6, C-7	Part of T-2 (1st I-F Trans. F.M.)	
C-8	Part of T-3 (1st I-F Trans. AM)	
C-12, C-13	Part of T-5 (2nd I-F Trans. AM)	
C-14, C-15	Part of T-4 (2nd I-F Trans. FM)	
C-16A, C-16B	Capacitor, Dual Mica; 50-50 mmf	47X112
C-18	Part of T-6 (Discriminator Trans.)	
C-19	Capacitor, Molded Mica; 2700 mmf	47X492
C-20, C-35	Capacitor, Ceramic; 220 mmf	47X468
C-21	Capacitor, Dry Electrolytic; 5 mf 100 V	45X361
C-22, C-42	Capacitor, Ceramic; 2.2 mmf	47X557
C-23	Capacitor, Ceramic; 30 mmf	47X558
C-24	Capacitor, Ceramic; 20 mmf	47X516
C-25	Capacitor, Trimmer; 1-8 mmf	17A255
C-26	Capacitor, Tubular; .05 mf 200 V	B66503
C-28A, C-28B, C-28C	Capacitor; Dry Electrolytic; 20 mf 20 V, 40 mf 150 V, 40 mf 200 V	45X360
C-29	Capacitor, Tubular; .001 mf 800 V	H66102
C-30	Capacitor, Molded Mica; 330 mmf	47X470
C-31	Capacitor, Ceramic; 500 mmf	47X508
C-32A, C-32B	Capacitor, Dual Ceramic; 100 mmf	76X4
C-33	Capacitor, Tubular; .04 mf 200 V	B66403
C-34	Capacitor, Tubular; .005 mf 400 V	D66502
C-36	Capacitor, Tubular; .004 mf 200 V	B66402
C-37	Capacitor, Tubular; .1 mf 400 V	D66104
C-38	Capacitor, Tubular; .02 mf 400 V	D66203
C-39, C-41	Part of C-1 (Gong Condenser)	
C-40	Capacitor, Ceramic; 68 mmf	47X471

RESISTORS

Ref. No.	DESCRIPTION	Part No.
R-1	Resistor, Carbon; 47 ohms 0.5 W	B85470
R-2, R-3, R-6	Resistor, Carbon; 1000 ohms 0.5 W	B85102
R-4, R-8	Resistor, Carbon; 68 ohms 0.5 W	B84680
R-5, R-12, R-13	Resistor, Carbon; 6800 ohms 0.5 W	B84682
R-7, R-25	Resistor, Carbon; 47 K ohms 0.5 W	B85473
R-9	Resistor, Carbon; 2200 ohms 0.5 W	B85222
R-10	Resistor, Carbon; 27 K ohms 0.5 W	B85273
R-11	Resistor, Wirewound; 3.6 ohms 0.5 W	43X233
R-14, R-16	Resistor, Carbon; 100 K ohms 0.5 W	B85104
R-15	Resistor, Carbon; 22 K ohms 0.5 W	B85223
R 17	Resistor, Carbon; 220 ohms 0.5 W	B84221
R-18, R-19, R-24, R-26	Resistor, Carbon; 470 K ohms 0.5 W	B85474
R-20	Resistor, Carbon; 15 K ohms 0.5 W	B85153
R-21	Volume Control & Switch; .5 megohm	36X372
R-23	Tone Control; 3 megohms	40X285
R-27	Resistor, Carbon; 10 megohms 0.5 W	B85106
R-28	Resistor, Carbon; 820 ohms 2.0 W	D84821
R-29	Resistor, Carbon; 1 megohm 0.5 W	B85105
R-30	Resistor, Carbon; 270 ohms 0.5 W	B84271
R-31	Resistor, Carbon; 2.2 megohms 0.5 W	B85225

TRANSFORMERS AND COILS

Ref. No.	DESCRIPTION	Part No.
L-1	Choke, Insulated	35A5
L-2	Choke, Parasitic	9A2103
L-3	Choke, Insulated	35A9
L-4	Choke, Insulated	35A8
T-1	"B" Range Loop Antenna	9A2099
T-2	1st I-F Trans. (FM)	9A2060
T-3	1st I-F Trans. (AM)	9A2062
T-4	2nd I-F Trans. (FM)	9A2061
T-5	2nd I-F Trans. (AM)	9A2063
T-6	Discriminator Transformer	9A2064
T-7	Oscillator Coil (AM)	9A2065
T-8	Oscillator Coil (FM)	9A2057
T-9	Output Transformer	51X134
T-10	Dipole Antenna	9A2003
T-11	Power Transformer	53X291
T-12	Antenna Coil (FM)	9A2066

DIAL AND TUNING PARTS

DESCRIPTION	Part No.
No. 47 Pilot Light	7A103
Pilot Light Socket Assembly	7A199
Escutcheon	4X1060
Rubber Grommets (mtg. Gang Cond.)	6X66
Drive Cord Assembly	10X72
Pointer	15X251
"C" Washer (Drive Shaft)	19X192
Condenser Cushion Stud	20X260
Drive Shaft	26X486
Drive Cord Tension Spring	28X113
Spring (Dial Glass)	28X564
Dial Glass	58X732

MISCELLANEOUS

DESCRIPTION	Part No.
Band Change Switch	2A393
Phono Motor Socket	3A304
Phono Socket (Single Pin)	3A305
Tube Socket (1st 6BA6)	3A426
Tube Socket (6BE6)	3A427
Tube Socket, Molded (Octal)	3A435
Tube Socket (Miniature)	3A439
Tube Socket (12AT7)	3A443
Knob (Tuning)	10A699
Knob (Off-Volume)	10A700
Knob (Tone)	10A701
Knob (FM-BC-PH)	10A702
Speaker, 8" P.M.	12A477
Record changer—3 speed	28A166
Line Cord & Plug Assembly	13X546
Line Cord Clamp	30X560

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MODEL 05RA1-43-7901A

ELECTRICAL SPECIFICATIONS

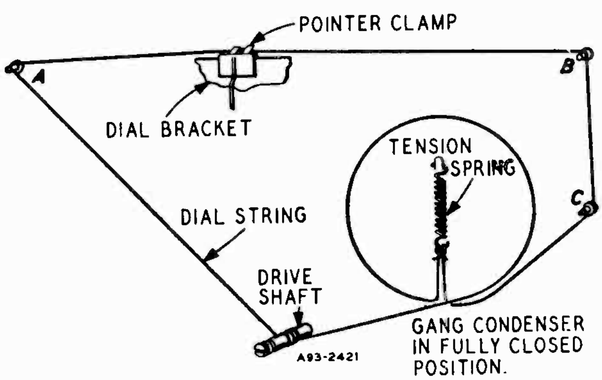
Power Supply	105-125 volts AC 60 cycles, 80 watts, 100 watts with record changer
Frequency Ranges	Broadcast 540-1600 KC Frequency Modulation 88-108 MC
Intermediate Frequency	AM—455 KC FM—10.7 MC
Selectivity	AM—43 KC broad at 1000 times signal, measured at 1000 KC I.F. FM—200 KC broad at 2 times down I.F. FM—760 KC broad at 200 times down
AM Sensitivity	(For .5 watt output with external antenna) 10 microvolts average
FM Sensitivity	(For .5 watt output) 30 microvolts average
Power Output	8.5 watts maximum 6.0 watts 10% distortion
Loud Speaker	12" PM Dynamic
Voice Coil Impedance	3.2 ohms 400 cycles

DRIVE CORD REPLACEMENT

Use a new 10X38 drive cord assembly or a new length of cord 46 inches long for the installation, 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.

Tube and Dial Lamp Complement

1 6BA6 AM-FM R-F Amplifier
1 12AT7 FM & AM Osc. & Mixer
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
2 6K6-GT Audio Output
1 5Y3-GT Rectifier
1 6AV6 Phase Inverter
2 No. 47 Dial Lamps



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MODEL 05RA1-43-7901A

ALIGNMENT PROCEDURE

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, 200 mmf.

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	BAND SWITCH SETTING	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
I-F	455 kc	12AT7 Pin 7 and Chassis	.1 mf	Broadcast	Rotor Fully Open	2nd I-F Pri. & Sec. 1 & 2 1st I-F Pri. & Sec. 3 & 4	Maximum Output
Broadcast	1620 kc	External ant. term.	200 mmf	Broadcast	Rotor Fully Open	Broadcast Oscillator C-33	
	1400 kc	External ant. term.	200 mmf	Broadcast	Turn Rotor to Max. Output	Broadcast Interstage C-29	
	1400 kc	External ant. term.	200 mmf	Broadcast	Set pointer to 1400 kc See Note A	Loop Antenna C-48	

Note A—If the pointer is not at 1400 KC on dial, reset pointer at the 1400 KC mark on the dial scale.

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 1000 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						
	FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO	THROUGH DUMMY ANTENNA	BAND SWITCH SETTING	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
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
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
Discriminator	10.7 MC Note F	6BA6 1st I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	Disc. Pri. 5 Note A	Maximum Deflection
	10.7 MC Note F	6BA6 1st I-F Pin 1 and Chassis	.01 mf	FM	Rotor Fully Open	Disc. Sec. 6 Note C	Zero Center
	10.7 MC Note F	FM-RF Gang Condenser terminal	.01 mf	FM	Rotor Fully Open	1st I-F Pri. 9 1st I-F Sec. 10 Notes A, D & E	Maximum Deflection
Recheck I-F Adjustments in order given							
R-F & Osc.	108.4 Note H	Disconnect dipole and connect generator to dipole terminals with resistor in series	300 ohms	FM	Rotor Fully Open	Oscillator C-35 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	FM Interstage C-32	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-47	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 junction of resistor R-22 and condenser C-18 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 connect to junction of R-18 and C-62. Adjust for zero voltage indication.

NOTE D—Before adjusting Pri. core connect 1000 ohm load resistor across the 2nd I.F. secondary terminals. Input may have to be increased to .1 volt if receiver is *badly* mis-aligned.

NOTE E—Disconnect 1000 ohm load resistor from secondary terminals and connect across the 2nd I.F. primary terminals. Input may have to be increased to .1 volt if receiver is *badly* mis-aligned.

NOTE F—Input can be reduced to 10,000 microvolts.

NOTE G—Oscillator frequency above signal frequency.

NOTE H—Remove the 1000 ohm load resistor before attempting to check the R-F and oscillator adjustments.

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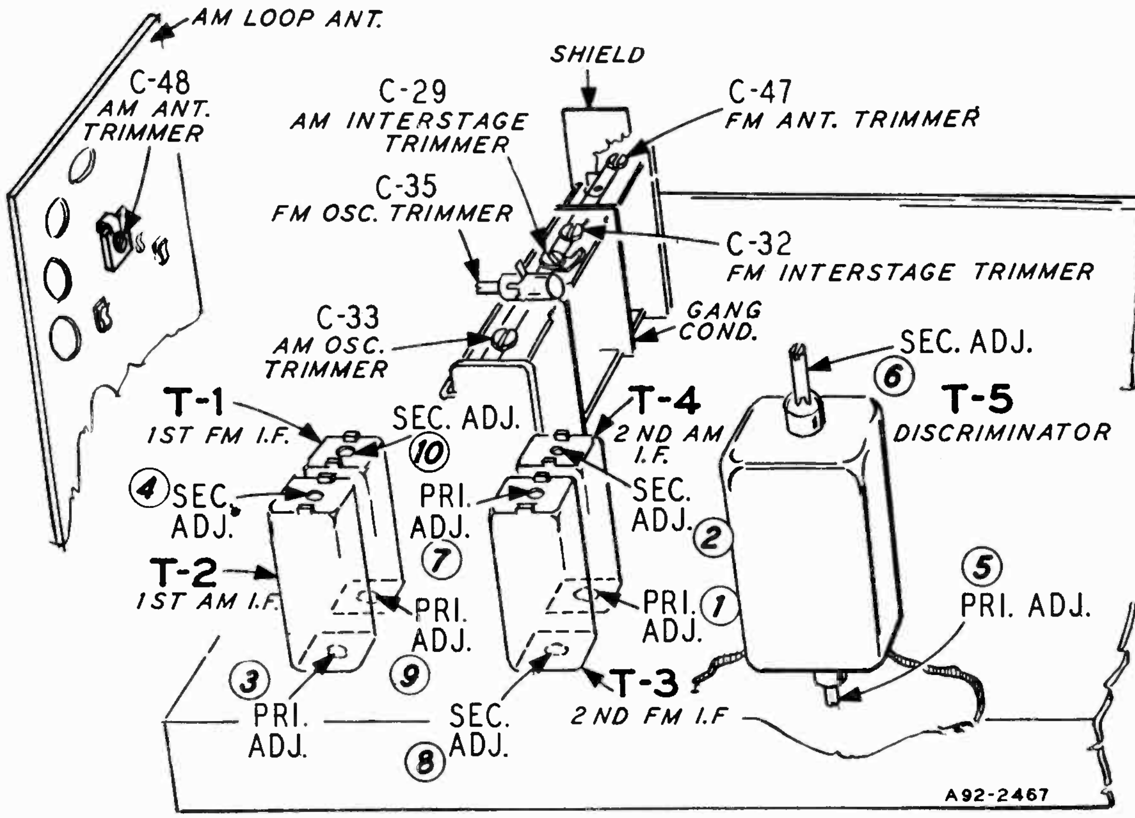
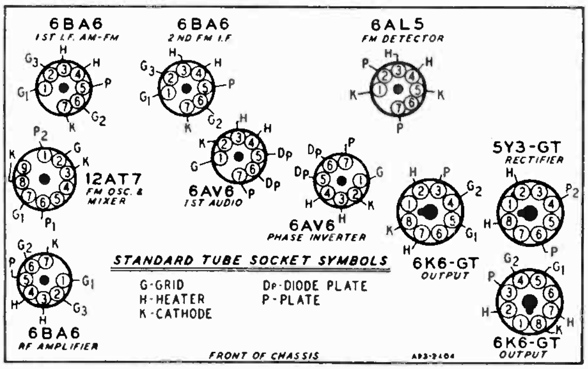
MODEL 05RA1-43-7901A



NOTE—T-5 discriminator transformers with Part No. 9A1970 stamped on the can must be aligned as outlined in this service manual.

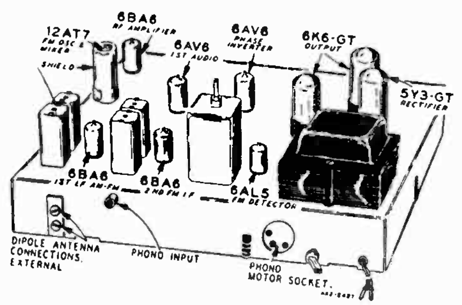
Discriminator transformers with Part No. 9A2064 stamped on the can have the primary adjustment at the top and the secondary adjustment at the bottom.



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 ±10% is usually permissible.



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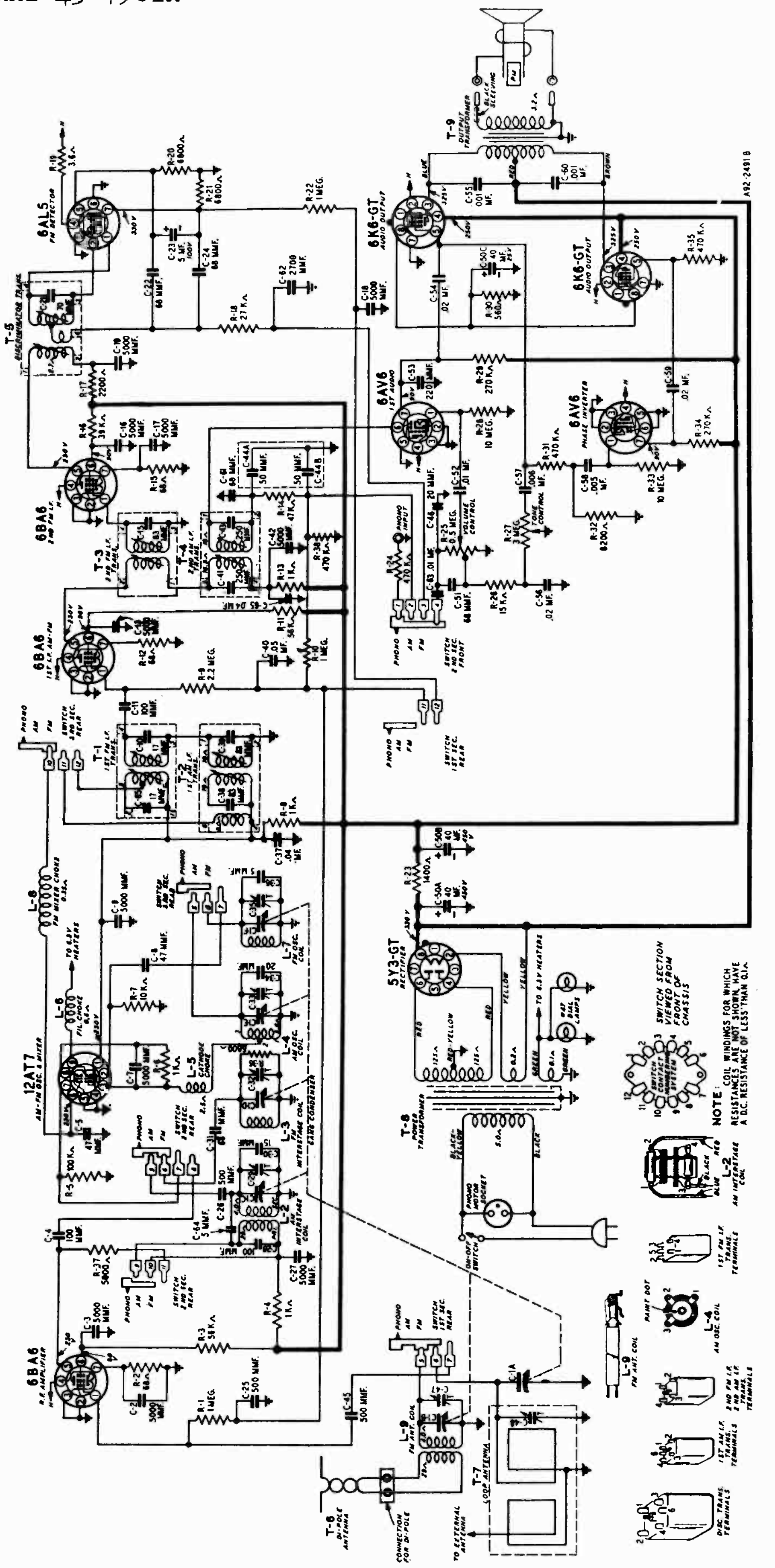

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REPLACEMENT PARTS LIST

When ordering parts, specify part number, model number and any other pertinent information

Ref. No.	DESCRIPTION	Part No.
	CAPACITORS	
C-1	Gang Condenser and Pulley	14A207
C-2, C-3, C-7, C-9, C-13, C-16, C-17, C-18, C-19, C-27, C-42	Capacitor, Silvered Mica, 5000 mmf	47X507
C-4	Capacitor, Ceramic, 100 mmf ± 20%	47X497
C-5	Capacitor, Ceramic, 47 mmf ± 5%	47X499
C-8	Capacitor, Ceramic 47 mmf ± 10%	47X498
C-10, C-65	Part of T-1	
C-11, C-28	Capacitor, Ceramic, 100 mmf ± 10%	47X550
C-15	Part of T-3	
C-21	Part of T-5	
C-22, C-24, C-31, C-51	Capacitor, Ceramic, 68 mmf ± 10%	47X501
C-23	Capacitor, Dry Electrolytic, 5 mf 100 V.	45X361
C-25, C-45	Capacitor, Ceramic, 500 mmf ± 20%	47X496
C-26	Capacitor, Ceramic, 5 mmf	47X549
C-29, C-32, C-33, C-47	Part of C-1	
C-30	Capacitor, Ceramic, 15 mmf ± 10%	47X552
C-34, C-46	Capacitor, Ceramic 20 mmf ± 10%	47X516
C-35	Capacitor, Trimmer, 1-8 mmf	26A489
C-36, C-64	Capacitor, Ceramic, 5 mmf ± 10%	47X549
C-37, C-65	Capacitor, Tubular, .04 mf 600 V	F66403
C-38, C-39	Part of T-2	
C-40	Capacitor, Tubular, .05 mf 200 V.	B66503
C-41, C-43	Part of T-4	
C-44A, C-44B	Capacitor, Dual Mica, 50-50 mmf.	47X112
C-48	Part of T-7	
C-50A, C-50B, C-50C	Capacitor, 3 section Electrolytic (40 mf 450 V., 40 mf 450 V., 40 mf 25 V.)	45X374
C-52	Capacitor, Tubular, .01 mf 600 V.	F66103
C-53	Capacitor, Ceramic, 220 mmf ± 20%	47X468
C-54, C-59	Capacitor, Tubular, .02 mf 600 V	F66203
C-55, C-60	Capacitor, Tubular, .001 mf 600 V.	F66102
C-56	Capacitor, Tubular, .02 mf 200 V.	B66203
C-57	Capacitor, Tubular, .006 mf 600 V.	F66602
C-58	Capacitor, Tubular, .005 mf 200 V.	B66502
C-61	Capacitor, Ceramic, 68 mmf ± 20%	47X471
C-62	Capacitor, Molded Mica, 2700 mmf ± 10%	47X492
C-63	Capacitor, Tubular, .01 mf 120 V.	46X328
	RESISTORS	
R-1, R-10, R-22	Resistor, Carbon 1 Megohm .5 W.	B85105
R-2, R-12, R-15	Resistor, Carbon 68 Ohms .5 W.	B83680
R-3, R-11	Resistor, Carbon 56K Ohms .5 W.	B84563
R-4, R-6, R-8, R-13	Resistor, Carbon 1000 Ohms .5 W.	B84102
R-5	Resistor, Carbon 100K Ohms .5W.	B85104
R-7	Resistor, Carbon 10K Ohms .5 W.	B84103
R-9	Resistor, Carbon 2.2 Megohm .5 W.	B85225
R-14	Resistor, Carbon 47K Ohms .5 W.	B85473
R-16	Resistor, Carbon 39K Ohms 1.0 W.	C84393
R-17	Resistor, Carbon 2200 Ohms .5 W.	B85222
R-18	Resistor, Carbon 27K Ohms .5 W.	B84273
R-19	Resistor, Wire Wound 3.6 Ohms .5 W.	43X233
R-20, R-21	Resistor, Carbon 6800 Ohms .5 W.	B83682
R-23	Resistor, Wire Wound 1400 Ohms 5.0 W.	43X242
R-25	Volume Control & Switch .5 meg.	36X379
R-26	Resistor, Carbon 15K Ohms .5 W.	B85153
R-27	Tone Control 3 meg.	40X288
R-28, R-33	Resistor, Carbon 10 Megohm .5 W.	B85106
R-29, R-34	Resistor, Carbon 270K Ohms .5 W.	B85274
R-30	Resistor, Carbon 560 Ohms 2.0 W.	D83561
R-31, R-35, R-38	Resistor, Carbon, 470 K Ohms .5 W	B85474

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MODEL 05RA1-43-7901A

REPLACEMENT PARTS LIST (continued)

When ordering parts, specify part number, model number and any other pertinent information

Ref. No.	DESCRIPTION	Part No.
R-32	Resistor, Carbon 8200 Ohms .5 W.	B84822
R-36	Resistor, Carbon 6800 Ohms .5 W.	B84682
R-37	Resistor, Carbon 5600 Ohms .5 W.	B84562

COILS AND TRANSFORMERS

Ref. No.	DESCRIPTION	Part No.
L-2	Coil, Interstage (AM)	9A2025
L-3	Coil, Interstage (FM)	9A2024
L-4	Coil, Oscillator (AM)	9A2022
L-5	Choke, Insulated	35A5
L-6	Choke, Filament	9A1881
L-7	Coil, Oscillator (FM)	9A2023
L-8	Choke (FM Mixer Plate)	35A7
L-9	Coil, Antenna (FM)	9A2027
T-1	1st I.F. Coil Assembly (FM)	9A2043
T-2	1st I.F. Coil Assembly (AM)	9A2029
T-3	2nd I.F. Coil Assembly (FM)	9A2030
T-4	2nd I.F. Coil Assembly (AM)	9A2042
T-5	Discriminator Coil Assembly	9A2064
T-6	Dipole Antenna Assembly	9A2004
T-7	"B" Range Loop Antenna Assembly	9A1972
T-8	Power Transformer	53X286
T-9	Output Transformer	51X142

DIAL AND TUNING PARTS

Description	Part No.
Escutcheon	4X1073
Rubber Grommets } Mtg. Gang Condenser	6X67
Condenser Mtg. Bracket } Mtg. Gang Condenser	25X1630
Drive Cord Assembly	10X38
Pointer	15X251
"C" Washer (Drive Shaft)	19X192
Drive Shaft	26X509
Drive Cord Tension Spring	28X113
Dial Bracket Assembly	S-25X31
Consisting of:	
Tubular Rivet	20X1564
Shoulder Rivet	20X1580
Shoulder Rivet	20X1581
Eyelet	20X1508
Dial Bracket	25X1610
Support Bracket, L. H.	25X1611
Support Bracket, R. H.	25X1612
Dial Assembly	S-58X41
Consisting of:	
Dial Bracket Assembly	S-25X31
Rubber Strip	8X195
Trimount Stud	28X56
Spring	28X564
Light Shield	41X86
Dial Glass	58X716

MISCELLANEOUS

Description	Part No.
Band Change Switch	2A404
Phono Motor Socket	3A304
Phono Socket (Single Pin)	3A305
Molded Octal Tube Socket	3A435
Tube Socket (miniature, for AM-FM Converter)	3A436
Tube Socket (Miniature)	3A439
No. 47 Pilot Light	7A103
Pilot Light Socket Assembly	7A215
Knobs	10A767
12" P.M. Speaker	12A502
Record Changer	28A171
Line Cord & Plug Assembly	13X546
Tube Shield (AM-FM Converter)	32X388
Tube Shield (Miniature)	32X390

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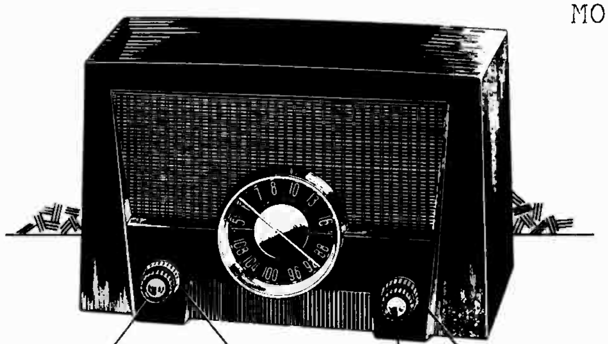
MODEL 05RA2-43-8515A

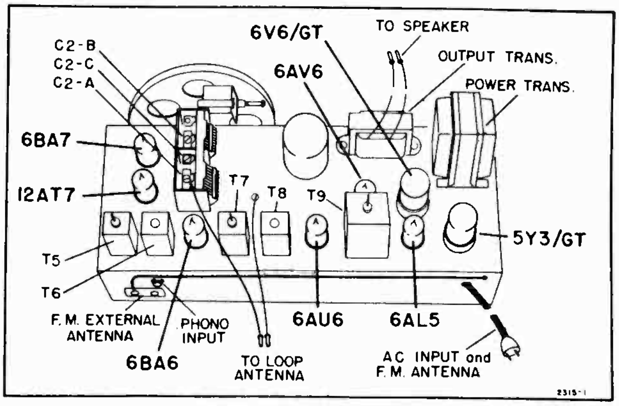


ALIGNMENT PROCEDURE

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 500 milliwatts. 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 1.27 volts AC across this resistor will be approximately equivalent to 500 milliwatt 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 permissable.



Chassis View

AM—I. F. ALIGNMENT

Band Switch in AM Position, Gang Open, Dummy Antenna .1 Mfd.

SIGNAL GENERATOR FREQUENCY	CONNECTION TO RADIO	ADJUSTMENTS TO BE MADE	ADJUST FOR
400 cycles. Use 65 millivolts	High Side of Volume Control and chassis	None	Maximum output Should be 500 Milliwatts
455 Kc. Use 3300 microvolts	Pin 1 of 6BA6 I.F. Amp. and chassis	Primary and Secondary of T8. See chassis view.	Maximum output Should be 500 Milliwatts
455 Kc. Use 55 microvolts	Pin 7 of 6BA7 Converter and chassis	Primary and Secondary of T6. See chassis view.	Maximum output Should be 500 Milliwatts

BROADCAST BAND—R. F. ALIGNMENT

Check pointer so that the right hand edge of the pointer skirt coincides with the right hand edge of dial marker at the extreme left when gang is closed. For adjustment, see dial mechanism illustration.

SIGNAL GENERATOR FREQUENCY	SET POINTER AT	CONNECT TO RADIO	ADJUST
1620 Kc.	Extreme Right Calibration Marker	RADIATION COUPLING Use six turn loop across generator output. Place close to cabinet back.	Oscillator trimmer C2-B for maximum
1400 Kc.	Third Calibration from Right		Antenna Trimmer C2-A for maximum

Check tracking at 1000 Kc, 600 Kc, and 535 Kc to be sure oscillator is set correctly.

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MODEL 05RA2-43-8515A

ELECTRICAL SPECIFICATIONS

Power Supply .... 115 volts, AC, 60-cycles; Chassis only 75 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-47 kc. broad at 1000 times signal, measured at 1000 kc.
I.F. FM-230 kc. broad at 2 times down.
I.F. FM-470 kc. broad at 10 times down.

AM Sensitivity .... (For .5 watt output)—200 microvolts per meter average.

FM Sensitivity .... (For .5 watt output)—12 microvolts average.

Power Output .... 2.0 watts. 10% distortion. 4.5 watts maxmium.

Loud Speaker .... 5"x7" PM. Voice coil impedance 3.2 ohms, 400 cycles.

Tube Complement ......
12AT7, FM-RF amp. mixer;
6BA7, AM converter, FM oscillator;
6BA7, IF amplifier;
6AU6, FM driver;
6AL5, FM detector;
6AV6, AM detector;
6V6 output;
5Y3, rectifier.

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 a long period of time.

NOTE

The following alignment is based on the use of the new Simpson vacuum tube voltmeter which has a "floating ground". In other words, the meter, when used as a vacuum tube voltmeter, can have both the positive and negative sides connected to points above ground and still give true readings. (See note "C" below.)

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 .05 volt	Pin No. 1 of 6AU6	Pin No. 7 of 6AL5 and chassis	Bottom Core Primary of T9 Ratio Detector	Resonance should be about 3 volts
10.7 Mc. Use about .05 volt	Pin No. 1 of 6AU6	See note "A"	Top Core Secondary of T9 Ratio Detector	Zero. Use zero center scale See note "B"
10.7 Mc. Use about 1800 microvolts	Pin No. 1 of 6BA6	Pin No. 7 of 6AL5 and chassis	Primary and Secondary of T7. FM Driver IF See chassis view	Resonance should be about 3 volts
10.7 Mc. Use about 400 microvolts	Top end of C2-C	Pin No. 7 of 6AL5 and chassis	Primary and Secondary of T5. FM Input IF See chassis view	Resonance should be about 3 volts

NOTES ON FM — I. F. ALIGNMENT

NOTE "A"—Connect two resistors in series, 100K OHMS each, from Pin No. 7 of 6AL5 to chassis (Pin No. 5). These resistors must be matched within 5%. Connect vacuum tube voltmeter between the midpoint of the resistors and point ɪɪ.

NOTE "B"—If T9 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.

NOTE "C"—To use a VTVM which does not have the "floating ground" feature, in step 2 above, connect "ground" side of VTVM to midpoint of resistors (Note "A") and "high" side to point ɪɪ.

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.

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MODEL 05RA2-43-8515A

FM—R. F. ALIGNMENT

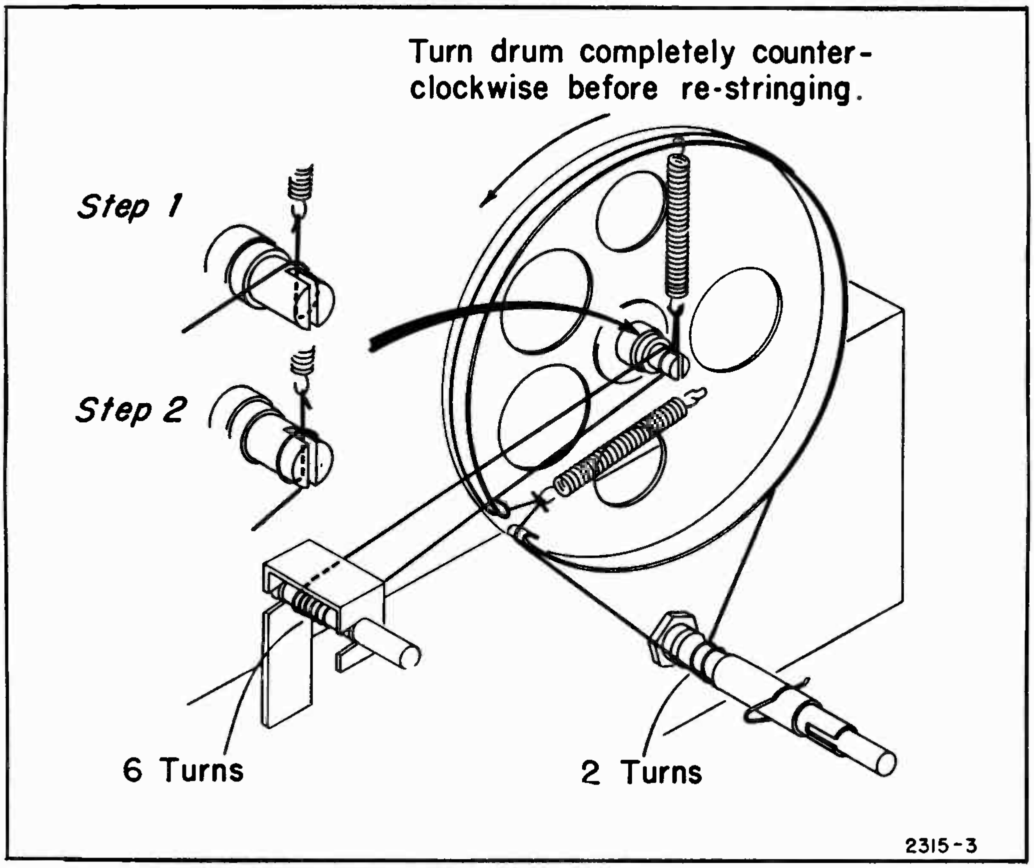
Check pointer so that the right hand edge of the pointer skirt coincides with the right hand edge of dial marker at the extreme left when gang is closed.
For adjustment, see dial mechanism illustration.

SIGNAL GENERATOR FREQUENCY	POINTER	CONNECTION TO RADIO	ADJUST	VTVM CONNECTIONS
108 mc.	108 mc. Marker	FM antenna terminals	FM Osc. C3 for maximum	Pin No. 7 of 6AL5 to chassis.
98 mc.	Tune in Gen. Signal	See Note "B" below	FM Mixer C2-C for maximum	

NOTE "A"—If a signal generator with the above fundamental frequency is not available, it is sometimes possible to use 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 voltmeter as above for resonance indication. A weak carrier, however, will not produce 3 volts.

NOTE "B"—Connect 300 ohms in series with "hot" side of generator and connect to left hand screw of external FM Antenna Terminals. Connect cold side of generator to right hand screw.

REPLACEMENT OF DIAL CORDS



Pointer Stringing and Alignment

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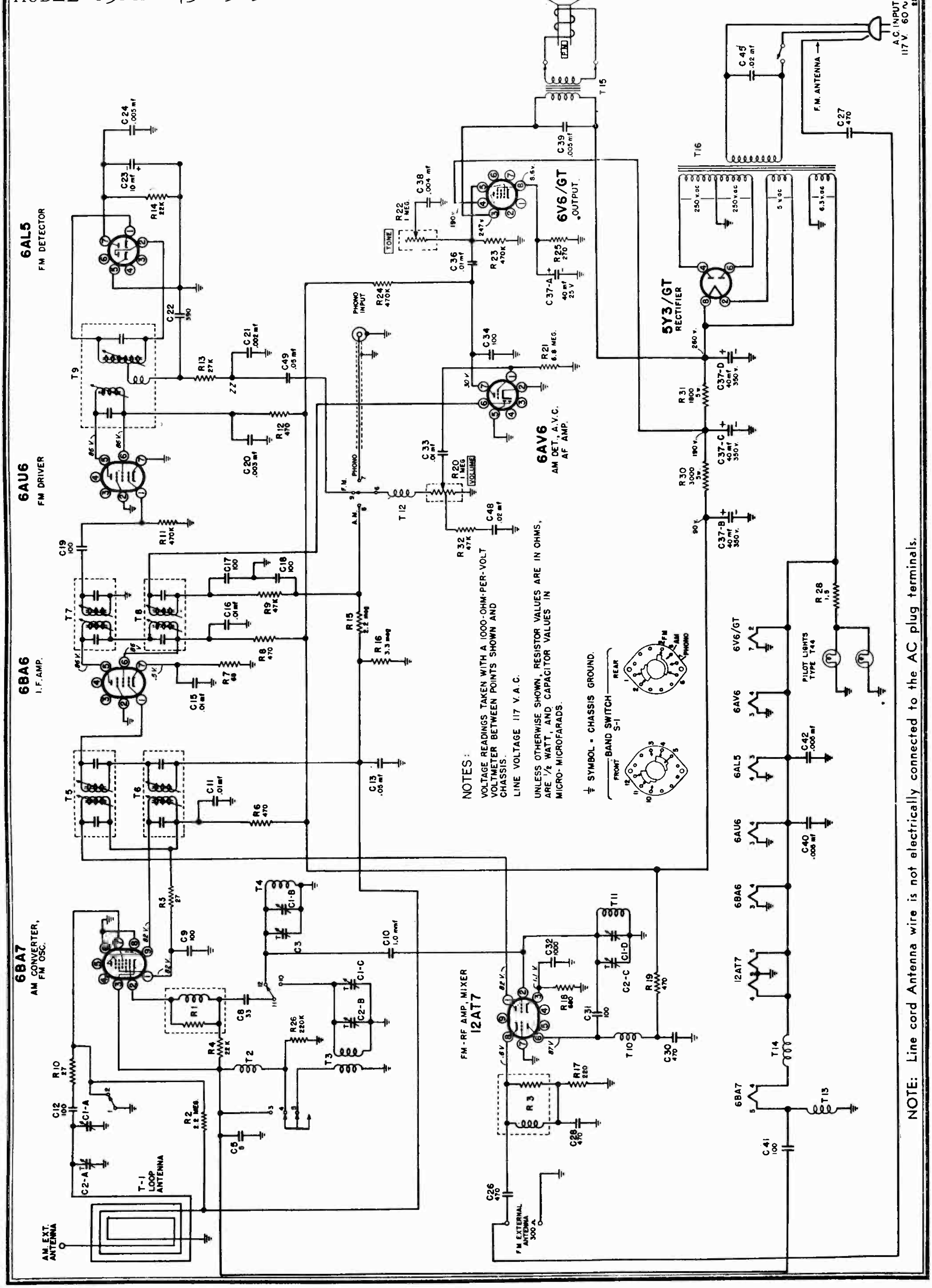

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REPLACEMENT PARTS INFORMATION

Please specify *PART* number and chassis model number when ordering replacements.

Ref. No.	Part No.	Description	Qty.
		CAPACITORS	
C1A,B,C,D	B-8A-18706	Gang tuning condenser	1
C2A,B,C		Trimmers on gang	3
C3	A-201-15142	Trimmer condenser	1
C5	C-8G-12166	5 mmf, ceramic, 10%	1
C8	C-8G-14172	33 mmf, ceramic, 10%	1
C9-31-41	C-8G-12759	100 mmf, ceramic, 10%	3
C10	A-8G-12495-2	1.0 mmf, ceramic, 20%	1
C11-16-36	C-8D-10761	.01 mfd, 400 volts, 20%	3
C12	C-8G-13131	100 mmf, ceramic, 10%	1
C13-49	C-8D-10770	.05 mfd, 200 volts, 20%	2
C15-33	C-8D-11738	.01 mfd, 200 volts, 20%	2
C17-18	A-8F-13127	.0001 mfd, dual mica, +30% —20%	1
C-19-34	C-8G-11734	100 mmf, ceramic, 10%	2
C20	C-8D-11013	.003 mfd, 600 volts, 10%	1
C21	C-8G-16049	.002 mf, ceramic, 10%	1
C22	C-8F3-120	390 mmf, mica, 10%	1
C23	A-8C-18128	10 mfd, 50 volts	1
C24-40-42	A-8G-13962	.005 mfd, ceramic	3
C26-27-28-30	C-8G-11732	470 mmf, ceramic, 20%	4
C32	C-8G-13201	1000 mmf, ceramic	1
C37-A,B,C,D	A-8C-18125	40-40-40 mfd x 350 volts, 40 mfd x 25 volts	1
C38	C-8D-10788	.004 mfd, 600 volts, 20%	1
C39	C-8D-10935	.005 mfd, 600 volts, +40% 15%	1
C45	C-8J-11321	.02 mfd, 600 volts, 20%	1
C48	C-8D-11304	.02 mfd, 200 volts, 20%	1
		RESISTORS	
R1	A-16B-16615	Suppressor	1
R2-15	C-9B1-33	2.2 megohms, ½ watt, 20%	2
R3	A-16B-16616	Suppressor	1
R4-14	C-9B1-78	22K ohms, ½ watt, 10%	2
R5-10	C-9B1-43	27 ohms, ½ watt, 10%	1
R6-8-12-19	C-9B1-58	470 ohms, ½ watt, 10%	4
R7	C-9B1-48	68 ohms, ½ watt, 10%	1
R9-32	C-9B1-82	47K ohms, ½ watt, 10%	2
R11-23-24	C-9B1-94	470K ohms, ½ watt, 10%	3
R13	C-9B1-79	27K ohms, ½ watt, 10%	1
R16	C-9B1-34	3.3 megohms, ½ watt, 20%	1
R17	C-9B1-54	220 ohms, ½ watt, 10%	1
R18	C-9B1-60	680 ohms, ½ watt, 10%	1
R20-22	A-10A-18703	Dual volume and Tone control	2
R21	C-9B1-36	6.8 megohms, ½ watt, 20%	1
R25	C-9B1-55	270 ohms, ½ watt, 10%	1
R26	C-9B1-27	220K ohms, ½ watt, 20%	1
R28	C-9C2-1065	1.5 ohms, 1 watt, 10%	1
R30	C-9C12-2059	3000 ohms, 5 watts, 5%	1
R31	C-9C12-1102	1800 ohms, 5 watts, 10%	1

Ref. No.	Part No.	Description	Qty.
		COILS, TRANSFORMERS, CHOKES	
T1	C-13E-18849	Loop antenna assembly	1
T2-T13-T14	A-16B-16023	RF choke coil assembly	3
T3	B-13D-16611	Oscillator coil (AM)	1
T4	A-13D-16617	Oscillator coil (FM)	1
T5	B-13A-18567	Input IF transformer (FM)	1
T6	B-13A-16662	Input IF transformer (AM)	1
T7	B-13B-18568	Output IF transformer (FM)	1
T8	B-13A-16662	Output IF transformer (AM)	1
T9	B-13M-16001	Ratio detector transformer	1
T10	A-16B-16613	RF choke coil	1
T11	A-13E-16618	RF coil (FM)	1
T12	A-16A-16637	RF choke coil	1
T15	B-12C-18143	Output transformer	1
T16	B-12A-18856	Power transformer	1
		MISCELLANEOUS	
	A-15B-13430	9-prong, miniature tube socket	2
	A-15B-10440	8-prong, octal socket	2
	A-15C-16007	7-prong, miniature tube socket	4
	B-20A-18705	Band change switch	1
	B-14M-18147	AC line cord and plug	1
	A-23A-16328	Line cord lock	1
	A-19A-12170	Phono pick-up socket	1
	A-7B-13050	Dipole socket	1
	A-3A-18704	Tuning shaft	1
	A-2D-10033	Tuning shaft bracket	1
	B-47A-18855	Pilot light assembly	1
	A-46A-11971	Pilot light bulb, T-51	2
	B-18A-18857	5" x 7" PM speaker	1
		DIAL PARTS	
	A-3A-18702	Pointer shaft	1
	A-2D-18701	Pointer bracket	1
	A-53A-10989	Dial string	13"
	B-53A-18547	Dial string	20"
	A-49A-10078	Tension spring	2
	B-2G-18792	Dial pointer	1
	A-43D-18853	Compression spring	1
	B-2M-19071	Dial scale	1
		CABINET PARTS	
	R-5C-18750-78	Bakelite cabinet	1
	C-24M-18858	Baffle board	1
	B-23K-18863	Grille cloth	1
	B-5B-18832-80	Knob (tone-tuning)	2
	B-5B-18831-80	Knob	1
	B-5B-18867-80	Knob	1

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MODEL 05RA4-43-9876A

ELECTRICAL SPECIFICATIONS

Power Supply .... 90 volts "B"; 9 volts "A"
117 volts AC/DC

Frequency Range .... 540-1605 KC

I.F. Frequency .... 455 KC

Antenna .... Self-contained loop

Tuning .... 3 gang capacitor

Speaker .... 5" P.M. Dynamic
3.2 ohm voice coil

Power Consumption .... 11 watts

Power Output .... 250 milliwatts maximum
120 milliwatts @ 10%

Sensitivity, loop .... 100 microvolts/meter average
for 50 milliwatts

Selectivity . . 45 KC broad at 1000 times signal at 1000 KC

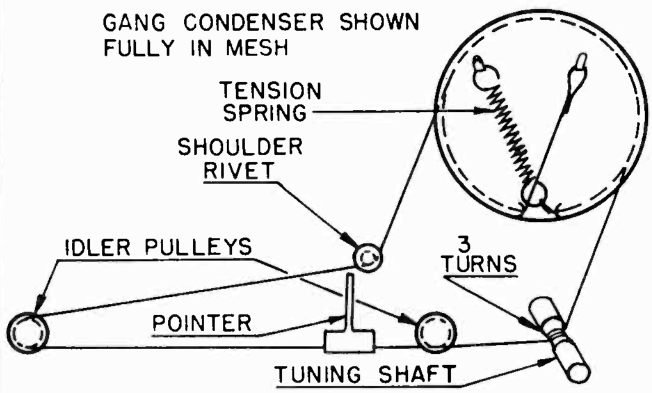

Fig. 1—Dial Stringing

BATTERIES

2 CORONADO 45 volt portable "B" batteries, #43-302
2 CORONADO 4½ volt portable "A" batteries, #43-266

THIS RECEIVER CONTAINS THE FOLLOWING:

1U4	R.F. Amplifier
1R5	Oscillator - Converter
1U4	I.F. Amplifier
1U5	Detector - Audio - AVC
3V4	Power Output

Selenium Rectifier

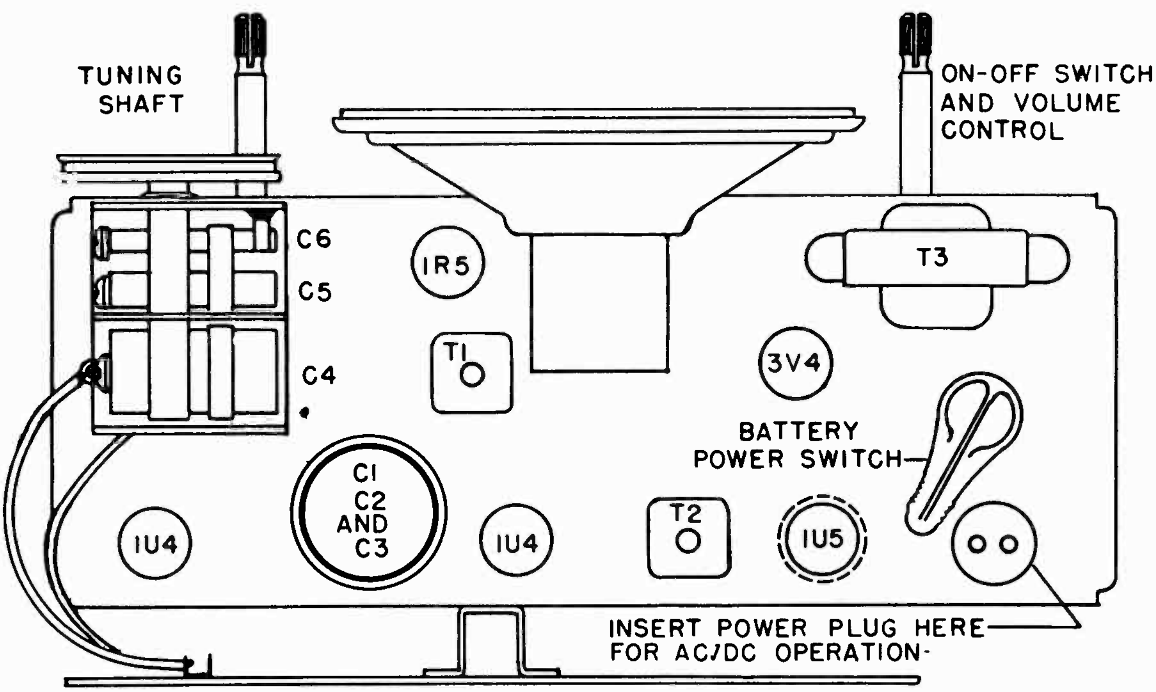

Fig. 2. Top Chassis View.

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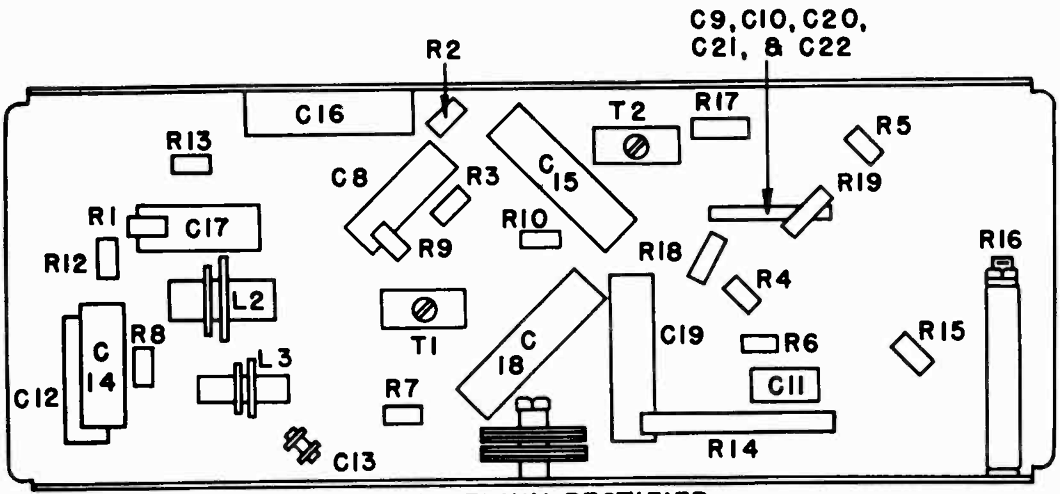

Fig. 3. Bottom Chassis View.

TO REMOVE CHASSIS FROM CABINET

Remove control knobs. Loosen retaining brackets on rear apron of chassis. Remove shelf above batteries. Pull chassis straight back.

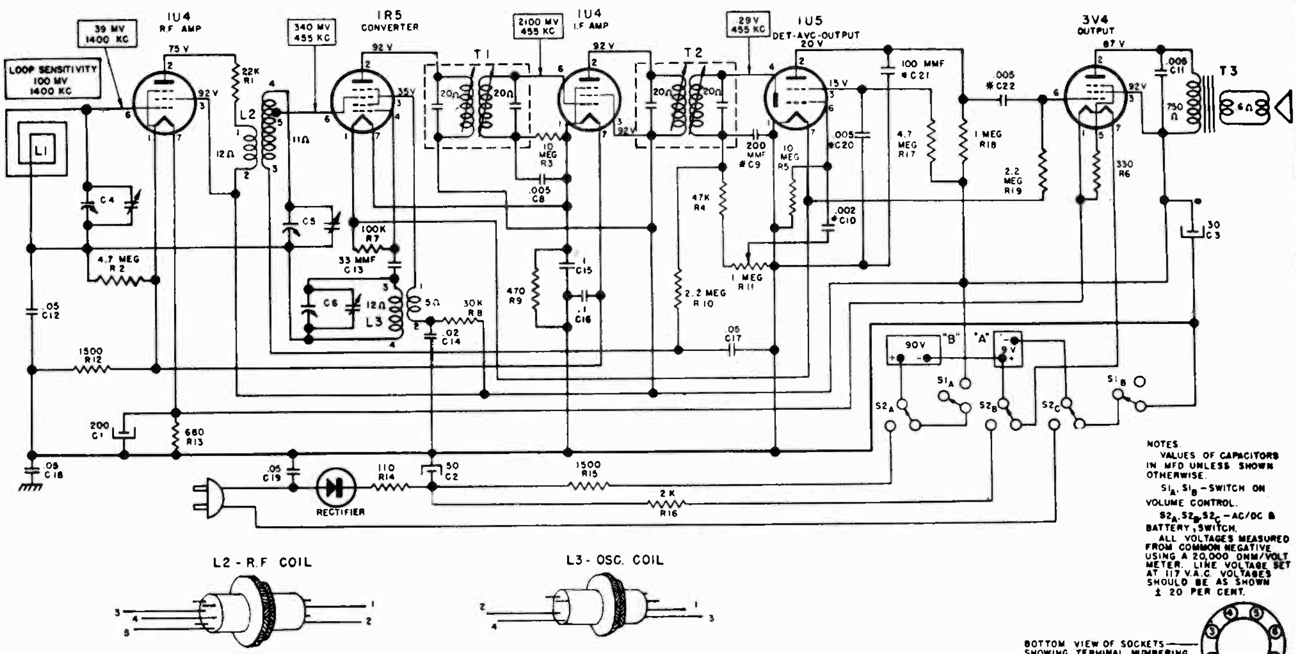

Fig. 4. Schematic Diagram.

ALIGNMENT PROCEDURE

Output meter reading to indicate 0.05 watt across voice coil	0.4 v.
Generator ground lead connected	To B- through 0.1 mfd. capacitor
Generator modulation	30%, 400 cycles
Position of volume control	Fully on
Position of pointer with tuner fully closed	Center of pointer lined up with extreme right dot on dial backing plate. (Chassis right side up.)

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MODEL 05RA4-43-9876A

Position of Tuner	Generator Freq.	Dummy Antenna	Generator Connection	Adjustments (in order shown)	Function	Max. Microvolts Input to produce .05 w. output
Min. Cap.	455 kc	0.1 mfd.	Pin #6 of 1U4 I-F Amp.	T2 (top and bottom)	I.F.	5000
Min. Cap.	455 kc	0.1 mfd.	Pin #6 of 1R5 Conv.	T1 (top and bottom)	I.F.	250
Min. Cap.	1610 kc	0.1 mfd.	Stator ant. tuner	C6	Osc.	
1400 kc	1400 kc	0.1 mfd.	Stator ant. tuner	C5	R.F.	30
1400 kc	1400 kc		Loosely coupled to loop	C4	Loop	

ALIGNMENT NOTES:

1. It is recommended that this set be connected to an isolation transformer when aligning on AC.
2. The alignment must be done in the order given above.
3. While making the above adjustments, keep the volume control set for maximum output and the signal generator output attenuated to avoid AVC action.

REPLACEMENT PARTS LIST

Ref. No.	Part No.	Description
		CAPACITORS
C1, C2, C3	18-296	Capacitor, electrolytic
C4, C5, C6	19-208	Capacitor, variable (3 gang)
C8, C11	16-153	Capacitor, .005 mfd. 600 v.
C9, C10, C20, C21, C22	17-103	Ceramic unit
C12, C17	16-152	Capacitor, .05 mfd. 200 v.
C13	15-186	Capacitor, 10 mmfd. mica
C14	16-150	Capacitor, .02 mfd. 400 v.
C15, C16	16-157	Capacitor, .1 mfd. 200 v.
C18, C19	16-179	Capacitor, .05 mfd. 400 v.
		RESISTORS
R1	60-744	Resistor, 22,000 ohm, ½ watt, 10%
R2, R17	60-669	Resistor, 4.7 megohm, ½ watt
R3, R5	60-728	Resistor, 10 megohm, ½ watt
R4	60-730	Resistor, 47,000 ohm, ½ watt
R6	60-704	Resistor, 330 ohm, ½ watt, 10%
R7	60-727	Resistor, 100,000 ohm, ½ watt
R8	60-676	Resistor, 30,000 ohm, ½ watt
R9	60-770	Resistor, 470 ohm, ½ watt, 10%
R10, R19	60-726	Resistor, 2.2 megohm, ½ watt
R11, S1	24-186	Volume control and switch
R12, R15	60-729	Resistor, 1500 ohm, ½ watt, 10%
R13	60-708	Resistor, 680 ohm, ½ watt, 10%
R14	60-796	Resistor, 110 ohm, 3 watt, 10%
R16	60-757	Resistor, 2000 ohm, 10 watt, 5%
R18	60-668	Resistor, 1 megohm, ½ watt
		COILS AND TRANSFORMERS
L1	82-66	Loop, antenna
L2	10-535	R.F. coil
L3	10-553	Oscillator coil
T1, T2	10-508	Transformer, 1st and 2nd I.F.
T3	80-228	Transformer, output

MISCELLANEOUS

Part No.	Description
44-11	Baffle
42-465	Cabinet
84-419	Cable assembly, battery
83-421	Clip, I.F., transformer mounting
84-77	Cord, power AC/DC
51-105	Cord, pointer travel, 28"
67-552	Dial scale
40-156	Escutcheon
98-13	Grille cloth
47-108	Grommet, variable condenser
76-13	Insulator, electrolytic
52-196	Knob, AC/DC/battery
52-305	Knob, ON-OFF-VOLUME and TUNING
45-121	Plug, AC/DC
58-63	Pointer
84-418	Pointer rail assembly
83-642	Rectifier, selenium
71-42	Shield, tube
68-39	Socket, miniature wafer
79-380	Speaker, 5" P.M.
70-122	Spring, dial cord
69-173	Switch, AC/DC/battery

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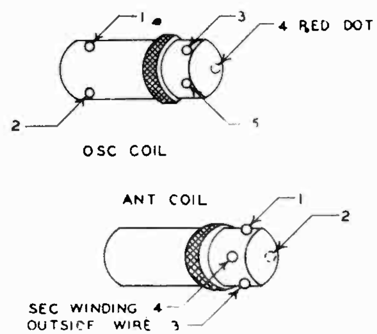
MODEL 05RA33-43-8120A, Bantam

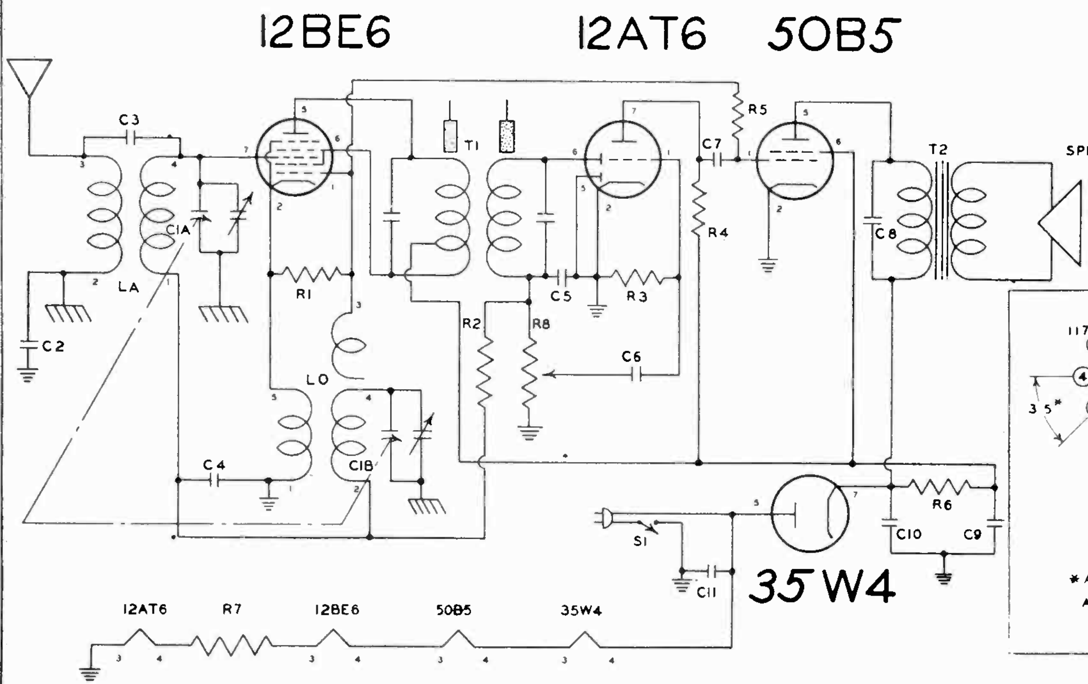
SPECIFICATIONS

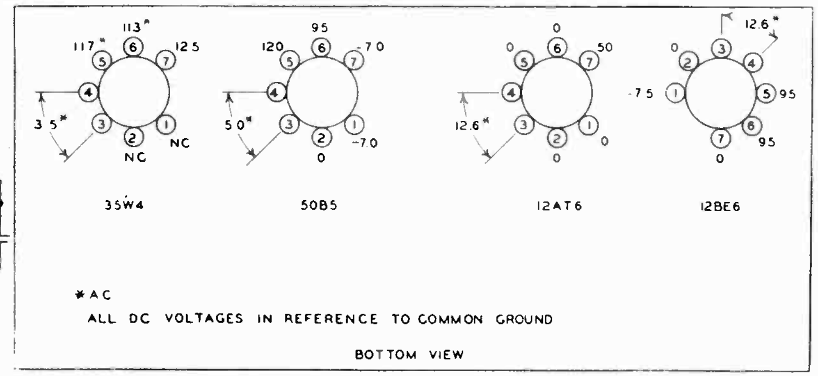
Power Supply	117 volts 60 cycle AC, 117 volts DC, 28 watts
Frequency Range	535 KC to 1630 KC
Intermediate Frequency	455 KC
Antenna	Hank style
Tuning	Variable Capacity
Speaker	4", P.M. voice coil impedance 3.2 ohms
Power Output	0.75 watt undistorted, 1.8 watts maximum
Sensitivity	500 uv average for 50 milliwatts output
Selectivity	70 KC broad at 100 times, signal at 1000 KC

Tubes used are as follows:

- 12BE6 Oscillator-Converter
- 12AT6 AVC, Detector, and Audio
- 50B5 Power Output
- 35W4 Power Rectifier







VOLTAGE DIAGRAM

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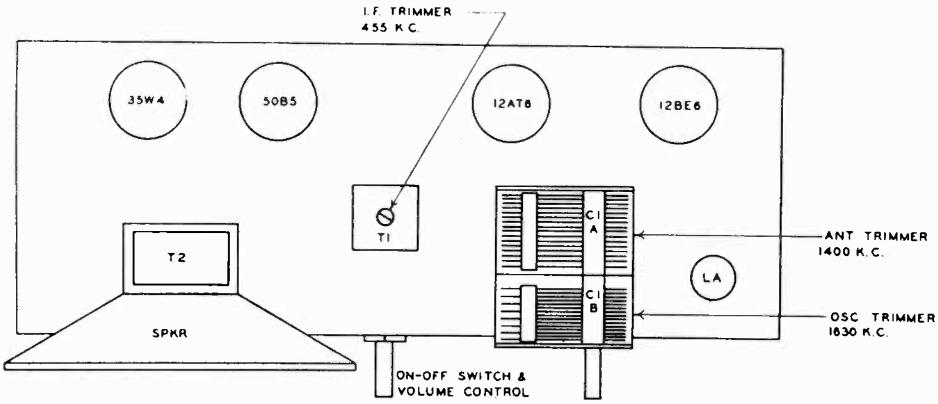
MODEL 05RA33-43-8120A,
Bantam



CHASSIS TOP VIEW

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 OF VARIABLE	ADJUST FOR MAXIMUM OUTPUT
Frequency	Dummy Antenna	Connection to Radio		
455 KC	100 MMFD	12BE6 Grid Stator C1A	Fully Open	T1
1630 KC	100 MMFD	12BE6 Grid Stator C1A	Fully Open	C1B Oscillator
1400 KC	100 MMFD	Coupled to Antenna Lead	Tune in Signal Generator	C1A Antenna

Connect low side of signal generator to chassis.

PARTS VALUES FOR T-64 GAMBLE'S AC-DC BANTAM

CIRCUIT SYMBOL	COMPONENTS PART NO.	DESCRIPTION	VALUE	RATING
C1A-C1B	C8120	Condenser, 2 gang	.05 MFD	200 volt
C2, C4	C052	Condenser, paper	5 MMFD	500 volt
C3	C55C	Condenser, ceramic	100 MMFD	500 volt
C5	C1005M	Condenser, mica	.002 MFD	600 volt
C6	C0026	Condenser, paper	.005 MFD	600 volt
C7, C8	C0056	Condenser, paper	20 MFD	150 volt
C9	C40-20-1.5	Electrolytic	40 MFD	150 volt
C10	C40-20-1.5	Electrolytic	.05 MFD	400 volt
C11	C054	Condenser, paper	22K ohm	½ watt
R1	R223.5	Resistor	2.2 megohm	½ watt
R2	R225.5	Resistor	10 megohm	½ watt
R3	R106.5	Resistor	220K ohm	½ watt
R4	R224.5	Resistor	330K ohm	½ watt
R5	R334.5	Resistor	2200 ohm	½ watt
R6	R222.5	Resistor	68 ohm	2 watt
R7	R6802	Resistor	1 megohm	
R8	VRT64	Volume control		
S1	VRT64	Switch S.P.S.T. on volume control		
LA	T64LA	Antenna coil		
LO	T64LO	Oscillator coil		
T1	T112-10	I.F. transformer		
T2	SPKT64-T	Output transformer		
SPKR	SPKT64-S	Speaker, 4" P.M.		

MECHANICAL PARTS

PART NO.	DESCRIPTION	PART NO.	DESCRIPTION
M-1701	Chassis T64	T-112-10-B	I.F. mounting clip
H-81644-6	Miniature tube socket, wafer	P-1701	Cabinet T64
W-1701	Line cord and plug	P-1706	Cabinet back
H-1701	Bushing T64	P-1704-A	Pointer knob
W-1702	Antenna hank	P-1704-B	Round knob

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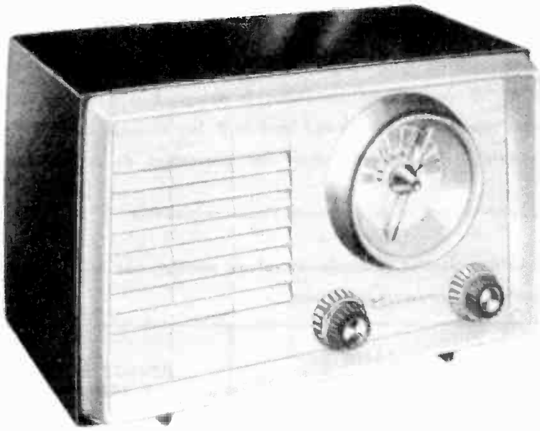
MODEL 05RA37-43-8360A



GENERAL DESCRIPTION

This radio is a 6 tube (including rectifier tube) AC-DC receiver housed in a beautiful plastic cabinet. Controls are provided on the front of the set for tuning, volume and tone operation. Special features include a built-in loop antenna, 3 section tuning condenser, automatic volume control, continuously variable tone control, beam power output tube and a permanent magnet dynamic speaker. Provision has been made for connection of an external antenna. The receiver is designed for reception of radio stations in the standard broadcast band between 540 and 1600 kilocycles.

ELECTRICAL SPECIFICATIONS

Power Supply:
117 volts A.C. 50 or 60 cycles or
117 volts D.C.

Frequency Range:
Broadcast 540-1600 Kc.

Intermediate Frequency:
455 Kc.

Antenna:
High impedance loop

Tuning:
3 section, shock mounted gang condenser

Speaker:
5 inch PM Dynamic
Voice coil impedance—3.2 ohms

Power Consumption:
30 watts

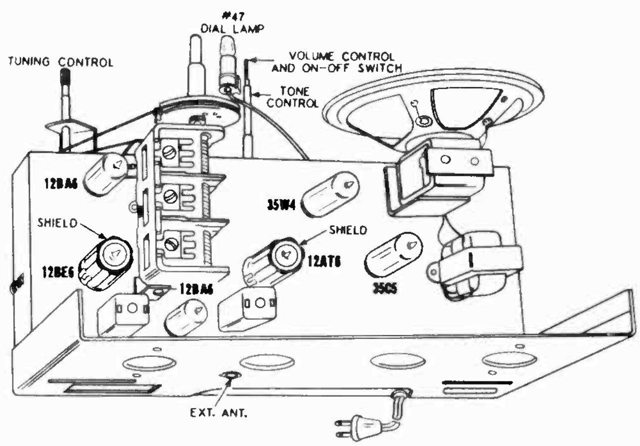
Power Output:
Undistorted — .6 watts
Maximum — 1 watt

Sensitivity—(Measured with signal injection at external antenna terminal and for 50 milliwatt output):
12 microvolts average

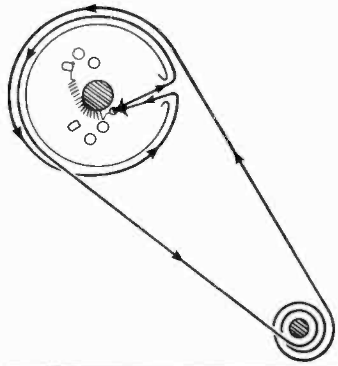
Selectivity:
40 Kc. broad at 1000 times signal, measured at 1000 Kc.

Tube and Dial Lamp Complement:

1	12BA6	R.F. Amplifier
1	12BE6	Converter
1	12BA6	I.F. Amplifier
1	12AT6	Detector—A.V.C.—Audio Amplifier
1	35C5	Audio Output
1	35W4	Rectifier
1	#47	Dial Lamp



DIAL CORD ARRANGEMENT



To string dial cord, turn the main drive drum to maximum counterclockwise position and use following parts:

114955 Clip on end of cord

117057 Cord (2 feet)

505161 Tension Spring

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MODEL 05RA37-43-8360A

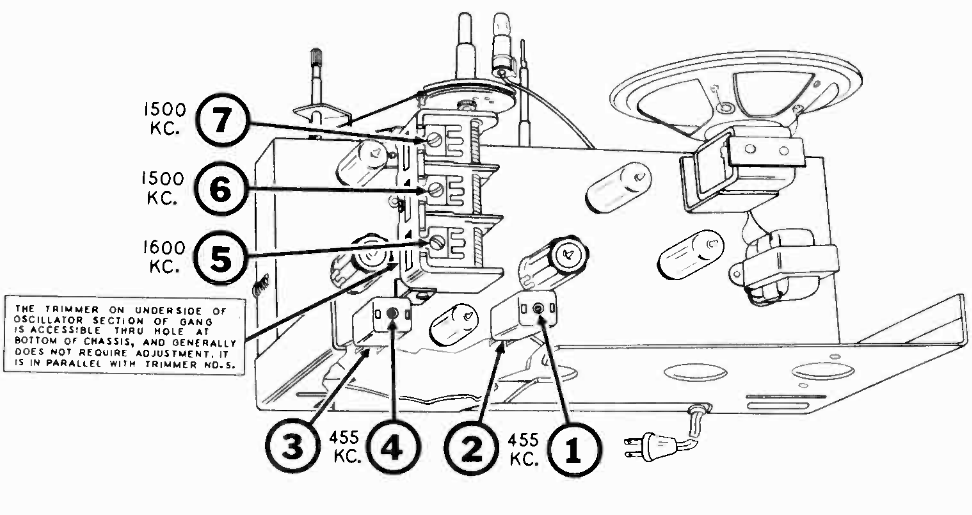
ALIGNMENT PROCEDURE

1. Remove chassis from cabinet. Allow loop antenna to remain attached to chassis.
2. With gang condenser fully closed, dial pointer should be in the position indicated by the last division below 55 on the dial. If it is set incorrectly, hold gang in this position and reset pointer.
3. Connect an output meter across the speaker voice coil or from plate of 35C5 to B- through a 0.1 Mfd. condenser. (See voltage chart for convenient B- connection.)
4. Connect ground lead of signal generator to B- lug.

CAUTION: If your signal generator is designed with an AC-DC power supply, connect ground lead to B- lug through a .25 Mfd. condenser. (See voltage chart for convenient B- connection.)

5. Set tone control to its maximum clockwise position.
6. Set volume control to maximum volume position and use a weak signal from the signal generator.

RANGE	SIGNAL GENERATOR		DUMMY ANTENNA	GANG CONDENSER SETTING	ADJUST SLUGS OR TRIMMERS
	FREQUENCY SETTING	CONNECTION AT RADIO			
I.F. 455 KC	455 KC	Grid pin #7 of 12BE6 Converter tube.	0.1 Mfd. Condenser	Any point where it does not affect the signal.	(2nd I.F.) #1 & #2 for maximum output
	455 KC	Grid pin #7 of 12BE6 Converter tube.	0.1 Mfd. Condenser	Any point where it does not affect the signal.	(1st I.F.) #3 & #4 for maximum output
BROADCAST 540—1600 KC	1600 KC	External Antenna Terminal on Loop Frame.	200 Mmfd. Condenser	1600 KC	(Oscillator) Trimmer #5 for maximum output
	1500 KC	External Antenna Terminal on Loop Frame.	200 Mmfd. Condenser	Tune to 1500 KC generator signal	(R.F.) Trimmer #6 for maximum output
	1500 KC	External Antenna Terminal on Loop Frame.	200 Mmfd. Condenser	Tune to 1500 KC generator signal	(Antenna) Trimmer #7 for maximum output



TRIMMER LOCATION CHART

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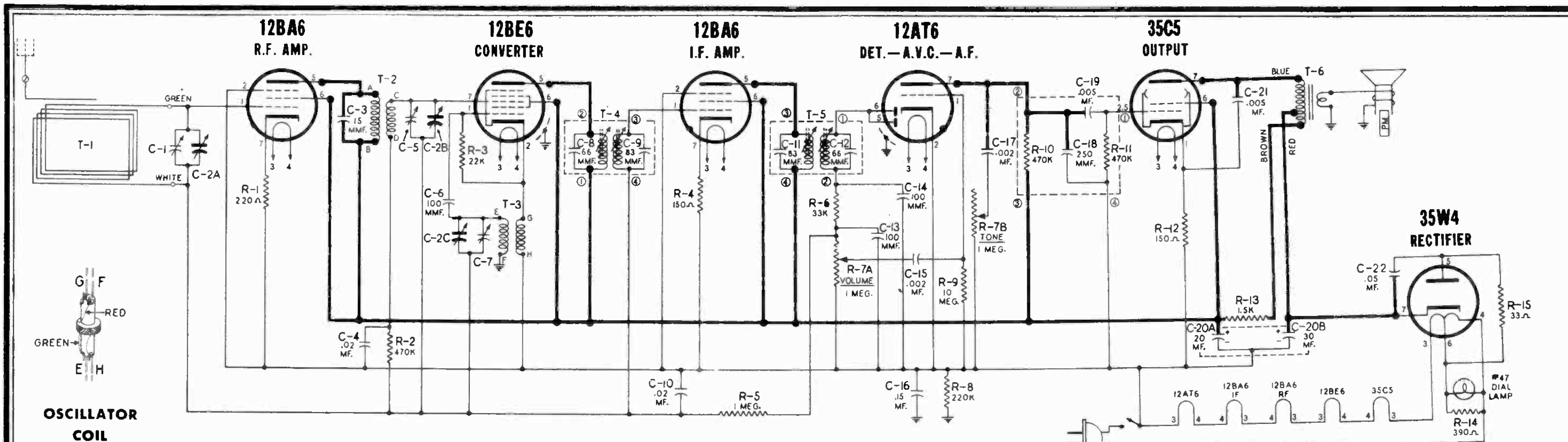
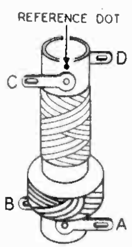


OSCILLATOR COIL 506094

I.F.—455KC



R.F. COIL 508692

Lettered terminals in illustration correspond to similarly lettered terminals on the circuit diagram.

SOCKET VOLTAGES

1. All measurements made with a voltmeter having a sensitivity of 1000 ohms per volt except where indicated by (*). The (*) symbol designates a vacuum tube voltmeter measurement.

2. Terminals on loop antenna are shorted together to minimize noise signal pickup.

3. Dial tuned to 540 Kc.

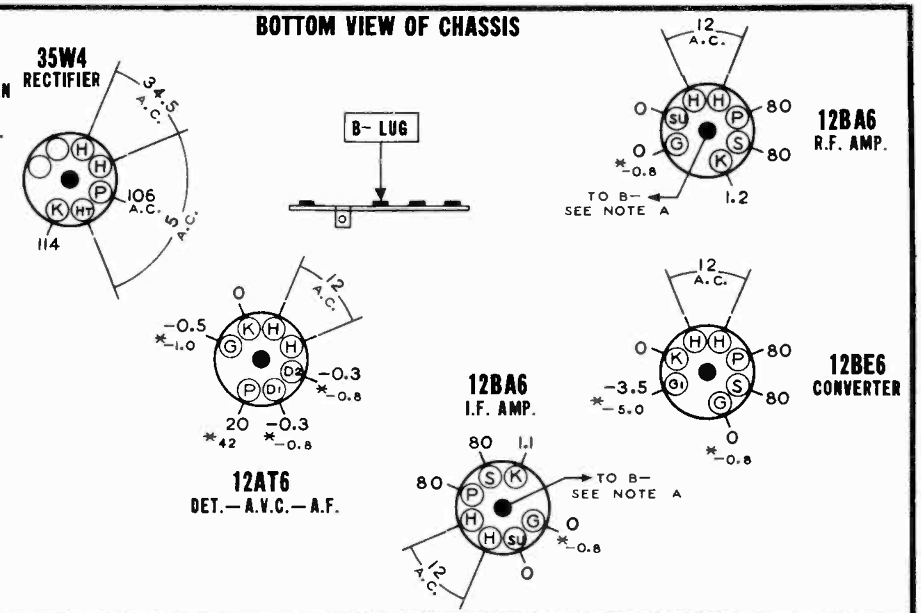
4. Volume control set to maximum with no signal.

5. Tone control set at its maximum clockwise position.

NOTE A: The center stud of this tube must be connected to B- to reduce capacity coupling between pins. Oscillation may result if this connection is omitted.

117 VOLT 60 CYCLE A. C. POWER SUPPLY USED FOR THESE MEASUREMENTS. ALL VOLTAGES MEASURED BETWEEN SOCKET TERMINALS AND B- LUG UNLESS OTHERWISE INDICATED.

BOTTOM VIEW OF CHASSIS



REAR OF CHASSIS

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MODEL 05RA37-43-8360A

REPLACEMENT PARTS LIST

REF. NO.	DESCRIPTION	PART NO.
	CONDENSERS	
C- 1	Condenser—trimmer; part of Gang Condenser C-2	———
C- 2	Condenser—variable gang (with drum)	508584
C- 3	Condenser—ceramic 15 Mmfd. 500 volt (Temperature Compensating)	513405
C- 4	Condenser—.02 Mfd. 400 volt	512016
C- 5	Condenser—trimmer; part of Gang Condenser C-2	———
C- 6	Condenser—mica; 100 Mmfd. 500 volt	512503
C- 7	Condenser—trimmer; part of Gang Condenser C-2	———
C- 8	Condenser—ceramic 66 Mmfd.; part of 1st I.F. Transformer T-4	———
C- 9	Condenser—ceramic 83 Mmfd.; part of 1st I.F. Transformer T-4	———
C-10	Condenser—.02 Mmfd. 400 volt	512016
C-11	Condenser—ceramic 83 Mmfd.; part of 2nd I.F. Transformer T-5	———
C-12	Condenser—ceramic 66 Mmfd.; part of 2nd I.F. Transformer T-5	———
C-13, C-14	Condenser—mica 100 Mmf. 500 volt	512503
C-15	Condenser—.002 Mfd. 600 volt	512002
C-16	Condenser—.15 Mfd. 400 volt	512040
C-17	Condenser—.002 Mfd. 600 volt	512002
C-18	Condenser—ceramic 250 Mmfd. 450 volt; part of Audio Coupling Unit, see miscellaneous listing	———
C-19	Condenser—ceramic .005 Mfd. 450 volt; part of Audio Coupling Unit, see miscellaneous listing	———
C-20A, C-20B	Condenser—electrolytic	
	A—20 Mfd. 150 volt B—30 Mfd. 150 volt	508147
C-21	Condenser—.005 Mfd. 600 volt	512006
C-22	Condenser—.05 Mmd. 600 volt	512030
	RESISTORS	
R- 1	Resistor—carbon 220 Ohms ½ watt	510125
R- 2	Resistor—carbon 470,000 Ohms ½ watt	510185
R- 3	Resistor—carbon 22,000 Ohms ½ watt	510161
R- 4	Resistor—carbon 150 Ohms ± 10% ½ watt	510121
R- 5	Resistor—carbon 1 Meg. ½ watt	510191
R- 6	Resistor—carbon 33,000 Ohms ½ watt	510164
R- 7A, R- 7B	Volume Control and ON-OFF Switch—1 Meg. Tone Control—1 Meg.	508583
R- 8	Resistor—carbon 220,000 Ohms ½ watt	510179
R- 9	Resistor—carbon 10 Meg. ½ watt	510197
R-10, R-11	Resistor—carbon 470,000 Ohms 1/5 watt; part of Audio Coupling Unit, see miscellaneous listing	———
R-12	Resistor—carbon 150 Ohms ± 10% ½ watt	510121
R-13	Resistor—carbon 1500 Ohms 1 watt	510240
R-14	Resistor—carbon 390 Ohms ± 10% ½ watt	510129
R-15	Resistor—carbon 33 Ohms 1 watt	510210

REF. NO.	DESCRIPTION	PART NO.
	TRANSFORMER AND COILS	
T- 1	Loop Antenna	508740
T- 2	Coil—R.F.	508692
T- 3	Coil—oscillator	506094
T- 4	Transformer—1st I.F.	505867
T- 5	Transformer—2nd I.F.	505867
T- 6	Transformer—output	508146
	DIAL AND TUNING PARTS	
	"C" washer for tuning shaft	505165
	Clip—retainer on end of dial cord	114955
	Cord—dial drive (2 ft. required)	117057
	Dial cup and bracket	508686
	Dial scale (plastic)	508690
	Pointer	508653
	Shaft, tuning	508587
	Spring, dial cord tension	505161
	Window for dial; clear plastic	508601
	MISCELLANEOUS	
	Audio Coupling Unit A—Condensor—ceramic .005 Mfd. 450 volt B—Resistor—carbon 470,000 Ohms 1 5 watt C—Condensor—ceramic 250 Mmfd. 450 volt D—Resistor—carbon 470,000 Ohms 1/5 watt	505858
	Base for tube shield (miniature)	505368
	Back for cabinet	508244
	Cabinet	508759
	Clip for mounting R.F. coil	112745
	Clip for mounting I.F. transformer	505101
	Clip for mounting loop antenna	508149
	Clip retains cabinet back	508235
	Diffuser for dial light	508689
	Knob—tone (clear plastic)	508628
	Knob—"TUNING" (brown and clear)	508602
	Knob—"VOLUME-ON" (brown)	508629
	Lamp—dial (Mazda #47) 6-8 V. 150 Ma.	118921
	Screw #8 x ⅞" chassis mounting	18785
	Socket—dial lamp (with leads)	500499
	Socket—miniature (7 pin)	507364
	Shield pilot light	508652
	Shield, tube (miniature)	505367
	Speaker—P.M. Dynamic (5")	508699

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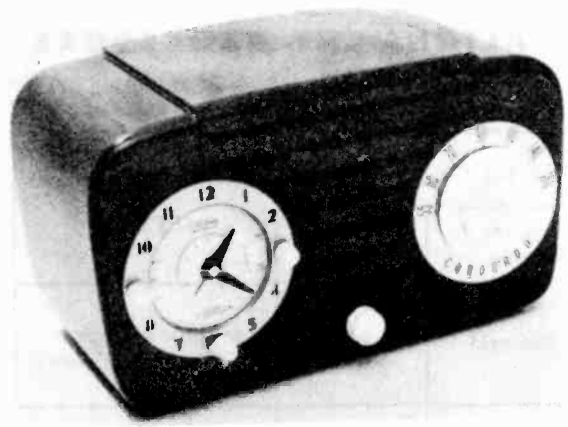
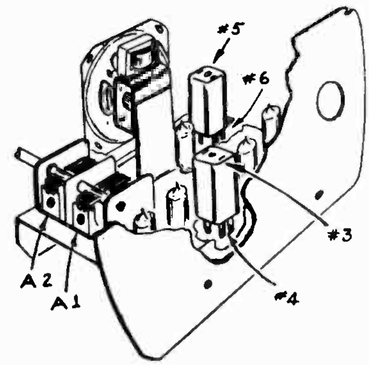
MODELS 15RA38-43-8235A,
15RA38-43-8236A



ELECTRICAL SPECIFICATIONS

Power Supply:—105-125 Volts AC, 60 Cycles
Freq. Range:—540-1650 Kilocycles
Intermediate Frequency:—455 Kilocycles
Antenna:—Duron high impedance loop with external antenna terminal
Tuning:—Shock mounted, 2 section gang condenser, direct knob drive
Speaker:—4 inch PM Voice Coil Impedance 3.2 OHM
Power Consumption:—30 Watts
Power Output:—1.6 Watts Max., 10% distortion. 95 Watts
Sensitivity:—Measured with signal radiated by signal generator into receiver loop antenna for 05 W output 400 μV 600 KC; 250 μV 1000 KC; 200 μV 1500 KC
Selectivity:—Bandwidths 2 times down 10 KC; 10 times down 22 KC; 100 times down 22 KC; 1000 times down 76 KC



GENERAL DESCRIPTION

This 5-Tube AC Receiver (including rectifier tube) houses a Telechron Electric Clock Movement which actuates contacts that connect the receiver to the power line at a pre-set time.

The Clock "Radio" Control Knob located at nine o'clock position is a single pole double thrown switch. (A)—Thrown counter clockwise it connects the line to the clock contacter for automatic closing by the clock movement. (B)—In mid-position the receiver is disconnected (Lullaby Time Switch being at O). (C)—Thrown clockwise closes the line to the receiver.

The "Lullaby" Switch Knob located at six o'clock position is a time switch which closes the line to the receiver for the number of minutes its adjustment calls for.

The "Alarm" Control located at three o'clock position when pulled out engages the alarm setting position. When in out position turns on buzzer alarm approximately 10 minutes after radio circuit.

Tuning and volume controls are provided.

An external antenna connection is provided.

TUBE COMPLEMENT

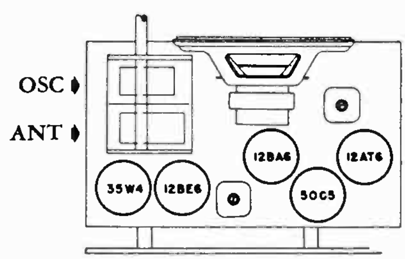
12BE6 Converter

12BA6 I.F. Amplifier

12AT6 Det. AVC-AUDIO

50C5 Power Output

35W4 Rectifier



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MODELS 15RA38-43-8235A,
15RA38-43-8236A

ALIGNMENT PROCEDURE

- Output meter across voice coil (3.2 ohm)
- Volume control at maximum for all adjustments.
- Align for maximum output. Reduce input as needed to keep output near 1.28 volts (0.5 watt).

SIGNAL GENERATOR				*TUNER SETTING*	*ADJUST TRIMMERS TO MAXIMUM OUTPUT (in order shown)*
Frequency	*Coupling Capacitor*	*Connections to Receiver*	*Ground Connection*		
455 kc	0.1 mfd.	12BE6 grid	B—	Rotor full open (Plates out of mesh)	Input and output slugs of IF cans
1650 kc	0.1 mfd.	12BE6 grid	B—	Rotor full open (Plates out of mesh)	Oscillator trimmer A2
1500 kc		Radiating Loop		1500 kc	Antenna trimmer A1

REPLACEMENT PARTS LIST

Ref. No.	*Part No.*	*DESCRIPTION*
		CAPACITORS
C1	30-15	Variable Condenser, 2 gang
C2	31-13	40 mfd.—40 mfd., 150 volt dual electrolytic condenser
C3	32-32	.2 mfd., 200 volt, paper
C4	32-5	.05 mfd., 400 volt, paper
C5	32-4	.05 mfd., 200 volt, paper
C6	32-1	.01 mfd., 400 volt, paper
C7	32-1	.01 mfd., 400 volt, paper
C8	32-20	.005 mfd., 600 volt, paper
C9	35-4	.0001 mfd., 500 volt, mica
C10	35-4	.0001 mfd., 500 volt, mica
		RESISTORS
R1	20-73	1500 ohm, 1 watt 20%
R2	20-57	10 megohm, ¼ watt 20%
R3	20-92	470,000 ohm, ¼ watt 20%
R4	20-92	470,000 ohm, ¼ watt 20%
R5	20-81	150 ohm, ½ watt 20%
R6	20-89	150 ohm, ¼ watt 20%
R7	20-56	3.3 megohm, ¼ watt 20%
		RESISTORS— (Continued)
R8	20-82	22,000 ohm, ¼ watt 20%
R9	20-93	22 ohm, ½ watt 20%
R10	20-74	220,000 ohm, ¼ watt 20%
R11	50-15B	½ meg. volume control
		COILS AND TRANSFORMERS
O-1	60-9	Oscillator coil
T-2	61-11	Input IF transformer
T-3	61-11	Output IF transformer
LP-1	A125-32	Loop antenna
		MISCELLANEOUS
80-14	80-14	4 inch P.M. speaker with output transformer
	122-19	Selector knob
	122-15	Volume knob
	120-33	Cabinet—ivory / walnut { in carton specify color
CK	140-6	Clock

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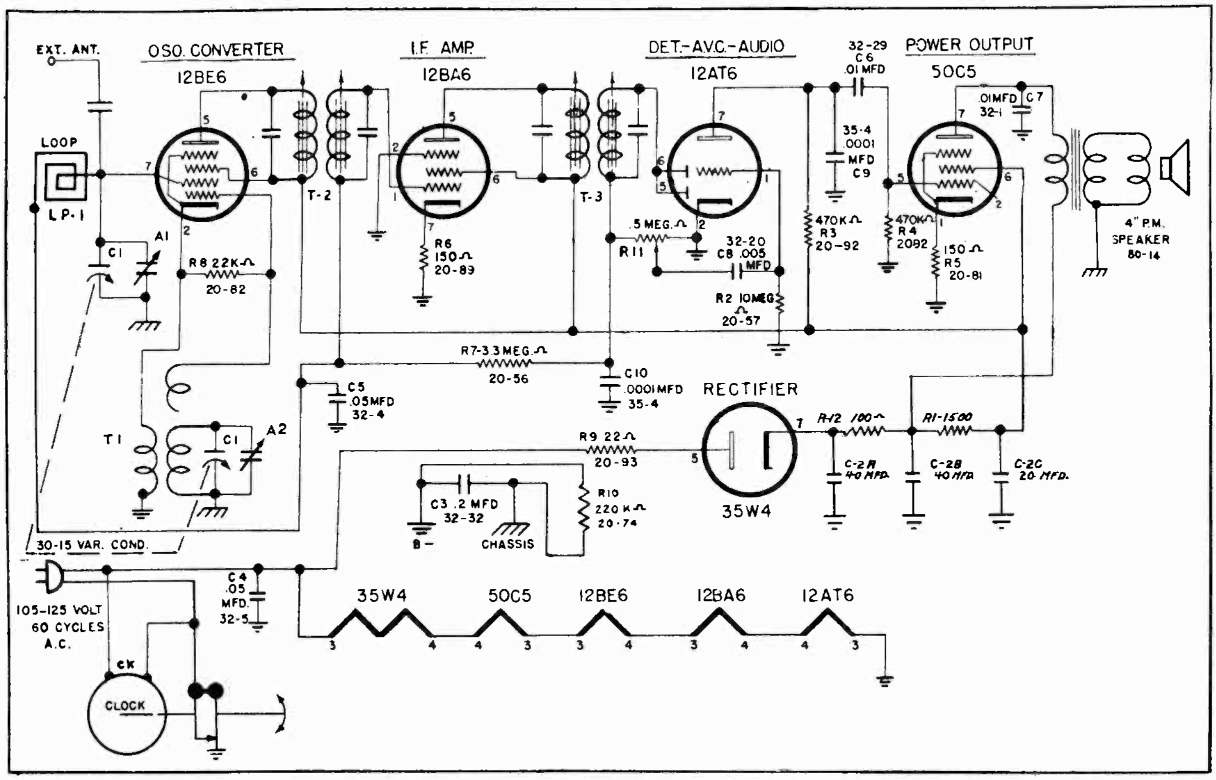
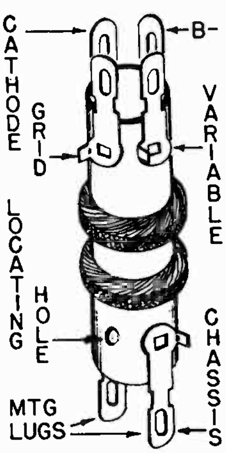
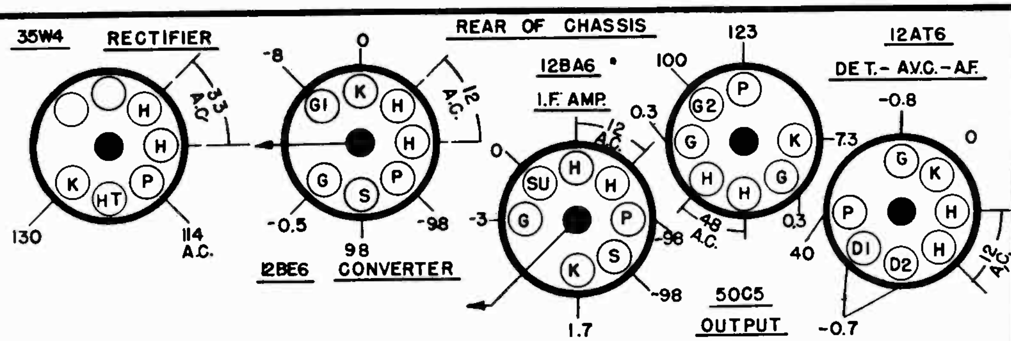
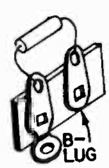
MODELS 15RA38-43-8235A, 15RA38-43-8236A







SOCKET VOLTAGES
1. ALL MEASUREMENTS MADE WITH RCA VOLTOHMYST.
2. DIAL TUNED TO 540 KC.
3. VOLUME CONTROL SET TO MINIMUM.



117 VOLT 60 CYCLE A.C. POWER SUPPLY USED FOR THESE MEASUREMENTS.

ALL VOLTAGES MEASURED BETWEEN SOCKET TERMINALS AND B- LUG UNLESS OTHERWISE INDICATED.

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MODELS 15RA38-43-8235A,
15RA38-43-8236A

SERVICING OF TELECHRON MOVEMENT

The Telechron movement is warranted under normal use and service against defects in workmanship and material for a period of one year from the date that the timer is sold by Telechron. Telechron agrees to repair or replace without charge any part or parts proved to be defective within the warranty period.

Telechron has established service stations which are prepared to service the movement unit when delivered by itself—that is when physically removed from the plastic cabinet. These service stations, under no circumstances, will service clocks not removed from cabinets. For information regarding service on Telechron clock movements, see your Service Reference File.

"CAUTION"—See instructions for clock removal below.

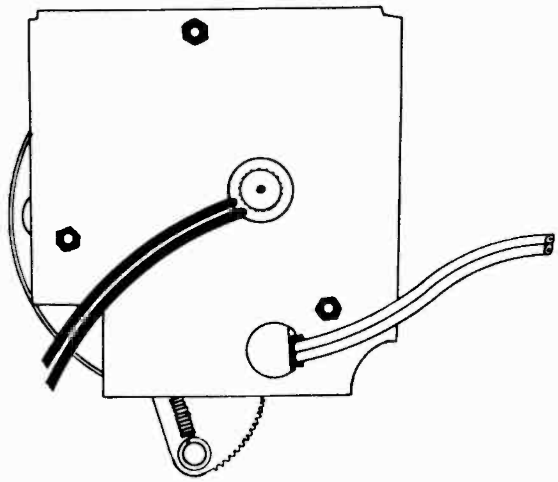

FIGURE A

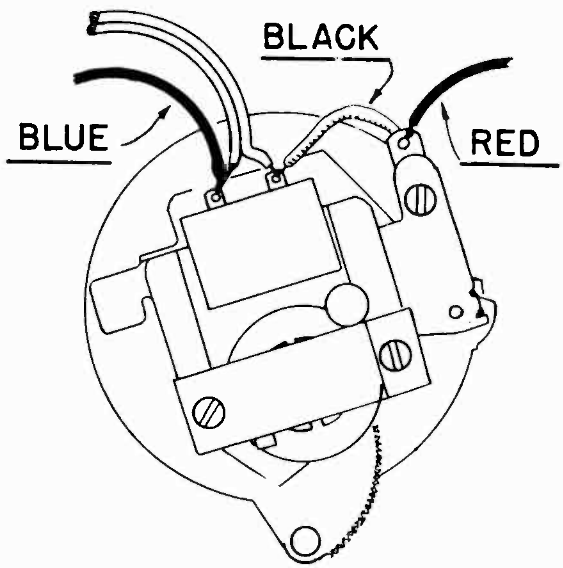

FIGURE B

To take clock movement out of cabinet proceed as follows:

Remove the following:

A—Line cord from power line.

B—Tuning knob, volume control knob, and chassis from cabinet.

C—3 nuts holding clock clamping shield shown in Figure A above.

D—As this shield is sufficiently pulled back unsolder red and blue wires and power cord shown in Figure B above.

E—Before movement can be withdrawn from cabinet, it is necessary to have the lullaby time switch in the full 60-minute position. With this switch in this position, the clock can be withdrawn by turning the rim clockwise approximately 5 to 10 degrees so that movement parts can pass openings in cabinet.

F—In shipping a movement to a service station, be certain that it is suitably packed to withstand transportation. Care should be taken with the glass crystal so that it is not subject to strain during shipment.

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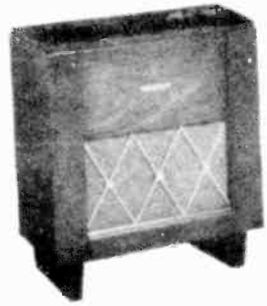
Model 129



Model 131

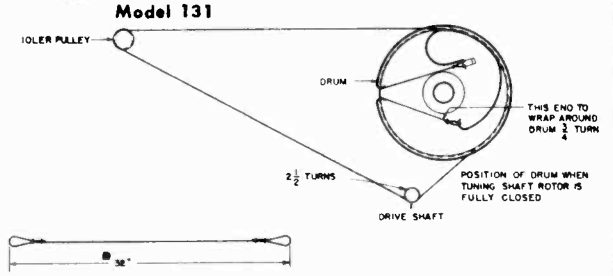


Fig. 1 Dial cord stringing

SPECIFICATIONS

CABINET:

Model	129	131
Material	Wood	Wood
Height	10 13/16 in.	31 1/8 in.
Width	21 in.	28 in.
Depth	14 1/4 in.	14 3/4 in.

ELECTRICAL (INPUT):

Voltage (A-C only)	105-125
Frequency	60 cps
Wattage (on Radio)	35
Wattage (on Phono)	55

OPERATING FREQUENCIES:

Broadcast Band	540-1600 kc
I-F Amplifier	455 kc

POWER OUTPUT (117 Volts Line):

Undistorted	.95 watts
Maximum	2.2 watts

LOUDSPEAKER:

Model	129	131
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 PICKUP:

Type	Variable Reluctance
D-C Resistance	340 ohms

TUBE COMPLEMENT:

Converter-Oscillator	Type 12BE6
I-F Amplifier	Type 12SK7
Detector and Audio Amplifier	Type 12SQ7
Output	Type 50L6
Phono Preamplifier	Type 6SC7
Rectifier	Type 35Z5
Pilot Lamps	Mazda No. 47

GENERAL INFORMATION

The Models 129 and 131 are combination radio-phonograph receivers which differ in cabinet. Each employs a 6-tube superheterodyne receiver and a record changer, Model P15. The servicing information given herein is complete except that it does not cover servicing of the record changer. Service data on record changer Model P15 is covered in service notes ER-S-P15.

CAUTION

One side of the power line is connected to B−. Use an isolating transformer when making service adjustments with the chassis removed from the cabinet.

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 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 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 1/4 volts.

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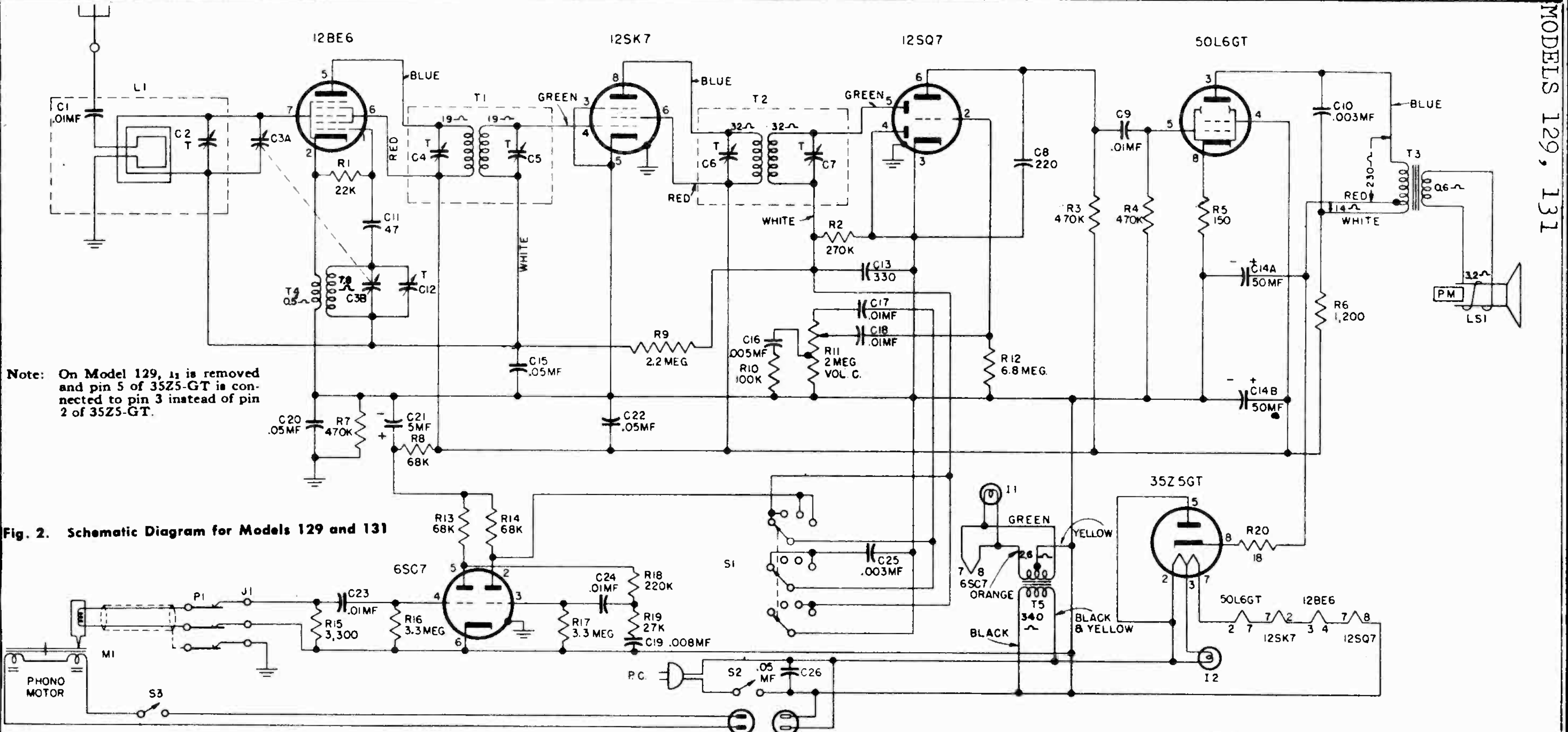
MODELS 129, 131



Note: On Model 129, I1 is removed and pin 5 of 35Z5-GT is connected to pin 3 instead of pin 2 of 35Z5-GT.

Fig. 2. Schematic Diagram for Models 129 and 131

RECORD CHANGER: Model P15, pages RCD.CH.21-13, through RCD.CH.21-18.

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.

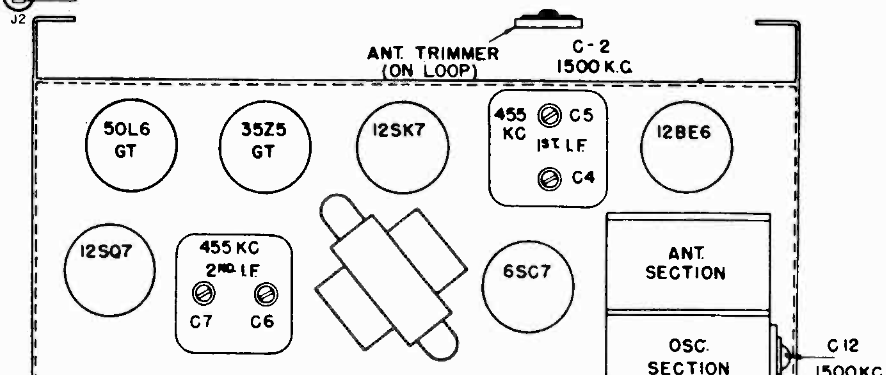


Fig. 3. Tube and Trimmer Location

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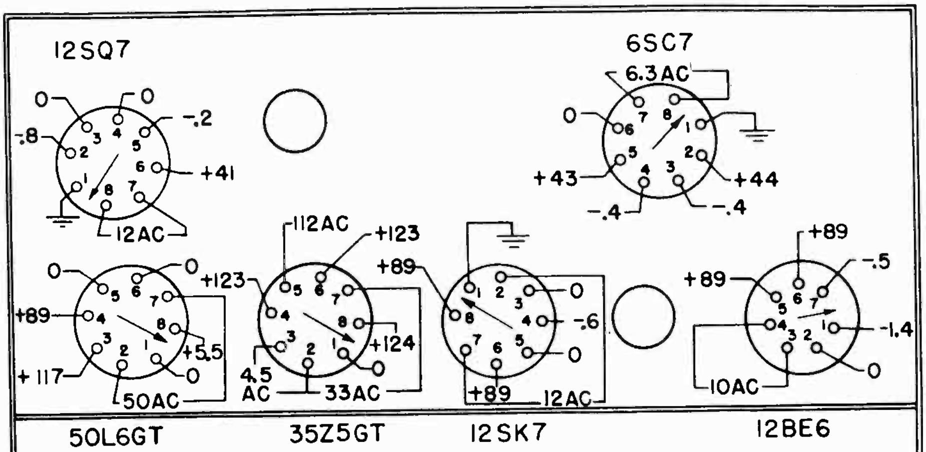
BOTTOM VIEW OF CHASSIS



CONDITION OF TEST
MEASUREMENTS TAKEN ON 20,000 OHMS PER VOLT METER
MEASURED FROM PIN TO B-BUS UNLESS OTHERWISE SHOWN.
117 VOLT LINE-VOLUME CONTROL CLOCKWISE-NO SIGNAL INPUT.

Fig. 4. Socket Voltage Diagram

REPLACEMENT PARTS LIST—MODELS 129, 131

Cat. No.	Symbol	Description
		UNIVERSAL REPLACEMENT PARTS
*UCC-008	C23	CAPACITOR—.01 mf., 200 v., paper
*UCC-020	C25	CAPACITOR—.003 mfd., 400 v., paper
*UCC-025	C17	CAPACITOR—.01 mf., 400 v., paper
*UCC-028	C15, 20, 22	CAPACITOR—.05 mf., 400 v., paper
*UCC-040	C1, 24	CAPACITOR—.01 mf., 600 v., paper
*UCC-045	C26	CAPACITOR—.05 mf., 600 v., paper
*UCU-020	C11	CAPACITOR—47 mmf., mica
*UCU-036	C8	CAPACITOR—220 mmf., mica
*UCU-040	C13	CAPACITOR—330 mmf., mica
*UOP-557		SPEAKER—Model 129, Same as S525D-7
*UOP-1241		SPEAKER—Model 131. Same as S1200D-7
*UOX-005		SPEAKER REPAIR KIT—For Model 131
*UOX-008		SPEAKER REPAIR KIT—For Model 129
*URD-029	R5	RESISTOR—150 ohms, ½ w., carbon
*URD-061	R15	RESISTOR—3300 ohms, ½ w., carbon
*URD-081	R1	RESISTOR—22,000 ohms, ½ w., carbon
*URD-083	R19	RESISTOR—27,000 ohms, ½ w., carbon
*URD-093	R8, 13, 14	RESISTOR—68,000 ohms, ½ w., carbon
*URD-097	R10	RESISTOR—100,000 ohms, ½ w., carbon
*URD-105	R18	RESISTOR—220,000 ohms, ½ w., carbon
*URD-107	R2	RESISTOR—270,000 ohms, ½ w., carbon
*URD-113	R3, 4, 7	RESISTOR—470,000 ohms, ½ w., carbon
*URD-129	R9	RESISTOR—2.2 meg., ½ w., carbon
*URD-133	R16, 17	RESISTOR—3.3 meg., ½ w., carbon
*URD-141	R12	RESISTOR—6.8 meg., ½ w., carbon
*URF-051	R6	RESISTOR—1200 ohms, 2 w., carbon
		SPECIALIZED REPLACEMENT PARTS
*RAC-051		LID—For Model 131 (mahogany)
*RAC-058		LID—For Model 129
*RAL-001		BEZEL—For pilot light
*RAM-003		BASE—2 for Model 131 (mahogany)
*RAV-045		CABINET—For Model 131 (mahogany)
*RAV-054		CABINET—Model 129
*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, 14B	CAPACITOR—50-50 mfd., 150 v., electrolytic
*RCE-056	C21	CAPACITOR—5 mf., 150 v., electrolytic
*RCT-026	C3A, 3B	CAPACITOR—Tuning capacitor
*RCY-005	C2	CAPACITOR—Trimmer for Model 129
*RCY-034	C2	CAPACITOR—Trimmer for Model 131
*RDC-032		CORD—Dial cord (10 yds. min.)
*RDK-036		KNOB—Plain
*RDK-039		KNOB—With arrow
*RDS-055		SCALE—Dial scale
*RDX-033		POINTER—Dial scale pointer assembly
*RHC-008		CLIP—For mounting filter capacitor
*RHG-015		GROMMET—Rubber grommet for mounting tuning capacitor
*RHJ-005		SPACER—For mounting tuning capacitor
*RHM-001		RING—Tuner shaft retaining ring
*RHM-014		STUD—For dial idler pulley
*RHM-016		CLIP—Oscillator coil clip
*RHM-037		CLIP—For mounting dial scale
*RHR-003		STUD—For mounting scale
*RHS-004		SPACER—Between loop and cabinet
*RJP-003	P2, 3	PLUG—Phono power
*RJS-006		SOCKET—Octal tube socket
*RJS-027		SOCKET—For dial light
*RJS-031		SOCKET—Tube socket for 6SC7
*RJS-034		SOCKET—Bezel pilot light socket
*RJS-049	J2, 3	SOCKET—Phono power
*RJS-092		SOCKET—Miniature for 12BE6
*RJS-097	J1	SOCKET—Phono pickup socket
*RJX-007	P1	—Phono plug
*RLC-061	T4	COIL—Oscillator coil
*RLL-026	L1	LOOP ASSEMBLY—Model 131
*RLL-028	L1	LOOP ASSEMBLY—Model 129
*RMM-034		HOOD—Hood for dial light
*RMM-054		SUPPORT—Lid support
*RMS-118		SPRING—Dial cord tension spring
*RMU-036		SHAFT—Tuning shaft
*RMW-037		PULLEY—Dial cord idler pulley
*RRC-060	R11	VOLUME CONTROL—2 meg.
*RRW-005	R21	RESISTOR—70 ohms, wirewound, for 50-cycle operation of phono motor
*RRW-008	R20	RESISTOR—18 ohms, 1 w., wirewound
*RSW-065	S1	SWITCH—Radio phono switch
*RTF-001	T5	TRANSFORMER—Filament transformer for 6SC7
*RTL-050	T1	TRANSFORMER—1st I-F transformer
*RTL-051	T2	TRANSFORMER—2nd I-F transformer
*RTO-038	T3	TRANSFORMER—Output transformer
*RWL-009		CORD—Power cord

* Used on previous production receivers.

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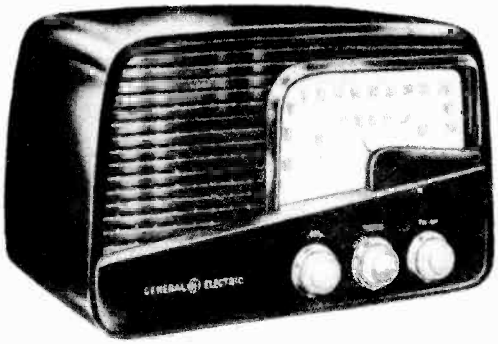
MODEL 218



MODEL 218

CAUTION

ALWAYS USE AN ISOLATION TRANSFORMER IN THE RECEIVER POWER LINE, WHEN SERVICING OR ALIGNING THIS RECEIVER, TO PROTECT TEST EQUIPMENT.

SPECIFICATIONS

CABINET

Material	plastic
Color	mahogany
Height	8⅜ inches
Width	13⅝ inches
Depth	6⅞ inches

ELECTRICAL

Voltage	105-125 v. AC or DC
Frequency on AC	50 to 60 cps
Wattage	33 watts

TUNING RANGE

AM	540-1620 kc
FM	88-108 mc

INTERMEDIATE FREQUENCIES

AM	455 kc
FM	10.7 mc

POWER OUTPUT (120 VOLTS LINE)

Undistorted	1.1 watt
Maximum	1.8 watt

LOUDSPEAKER

Type	permanent magnet
Cone Diameter	5¼ inches
Voice Coil Impedance at 400 cps	3.2 ohms

TUBE COMPLEMENT

(V1) FM R-F and 1st I-F Amplifier	12BA6
(V2) Oscillator and Converter	12BE6
(V3) I-F Amplifier	12BA6
(V4) Limiter	12AU6
(V5) FM Discriminator, AM Detector and Audio Amplifier	19T8
(V6) Power Output	50B5

ANTENNA

AM	loop antenna
FM	power line antenna or 300-ohm FM antenna

GENERAL

Model 218 is a table model receiver providing reception on the AM and FM bands. The receiver is housed in a mahogany colored plastic cabinet.

The receiver has a built-in FM power line antenna; to operate from this antenna it is necessary to connect the brown wire coming out of the cabinet back to the right-hand screw of the antenna terminal strip.

On AM operation, the AM r-f signal is fed directly into the grid of the converter V2 through the 1st AM i-f transformer T2 into the grid of V3. From V3 the signal is fed to the second AM i-f transformer T5 and is detected by a diode section of V5 which is pin 6. The secondary of T1 which is in series with the primary of T2 offers a low impedance to the AM i-f frequency.

V1 (12BA6) in the FM reflex circuit acts both as an r-f and an i-f amplifier. The r-f signal is put into the grid (pin 1) of V1 through the secondary of T1. It is amplified by V1 and put into the grid of V2 the converter through capacitor C7. Choke L3 prevents the r-f signal from getting into the second FM i-f transformer T3. The 10.7 mc FM i-f is fed from the plate of V2 to the primary of T1 the 1st FM i-f transformer which now puts the FM i-f signal onto the grid of V1. From the plate of V1 the FM i-f signal is fed through choke L3 to the primary of T3 through to the grid of V3. The plate of V3 feeds the FM i-f signal through C50 in the primary of T5 to the 3rd FM i-f tuning coil T4 and through C21 to the grid of the limiter grid pin 1 of V4. The FM i-f signal is detected in T6 discriminator transformer and two diode sections of V5, pins 1 and 2.

STAGE GAIN AND VOLTAGE CHECKS

1. R-F AND I-F STAGE GAINS

Signal applied through an IRE dummy antenna:

V2 Grid to V3 Grid	38 at 455 kc
Dipole Terminals to V1 Grid	1.3 at 98 mc
V1 to V2 Grid	8.0 at 98 mc
V2 to V1 Grid	1.6 at 10.7 mc
V1 to V3 Grid	22 at 10.7 mc
V3 to V4 Grid	26 at 10.7 mc

2. AUDIO GAIN

.09 volts at 400 cps across the volume control with the volume control set at maximum should give approximately ½ watt output across the speaker voice coil.

3. OSCILLATOR GRID BIAS

D-c voltage developed across R6:
4.8 volts at 1000 kc
2.2 volts at 98 mc

4. SOCKET PIN VOLTAGES

Figure 4 shows typical tube pin voltages.

5. HUM MEASUREMENT

Hum measured across the voice coil of the speaker with the volume control at minimum and the band switch on AM should not exceed 7 millivolts.

On FM ground the limiter grid (pin 1 of V4) through a .01 mfd. capacitor and measure the hum across the voice coil terminals with the volume control at maximum. Hum should not exceed 15 millivolts.

ALIGNMENT

EQUIPMENT NECESSARY FOR METER ALIGNMENT

1. Signal generator G-E YGS-3, or equivalent.
2. 20,000 ohm-per-volt meter.
3. Output meter.
4. .01 mfd. capacitor.
5. Four-turn, six-inch diameter loop of bell wire for AM, r-f and oscillator alignment.
6. Isolation transformer.

NOTES FOR METER ALIGNMENT

1. Connect a 20,000 ohm-per-volt meter from junction of C29 and R18 to chassis. Use a ten-volt scale for steps 3, 4 and 5.

2. Connect a 20,000 ohm-per-volt meter from the grid of the limiter (pin 1 of V4) to cathode of limiter (pins 2 or 7 of V4) in series with a 200,000-ohm resistor. The resistor must be connected directly to the grid pin to minimize capacity loading and to isolate the i-f signal voltage from the meter. Keep signal generator down so that the meter does not indicate more than one volt at the grid (5 microamps through 200,000 ohms).

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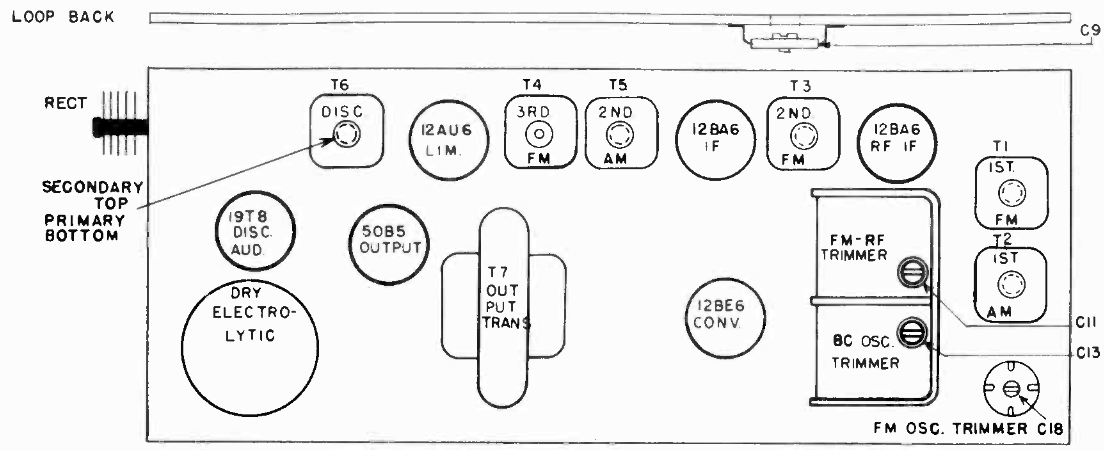

TOP VIEW OF CHASSIS

Fig. 1. Tube and Trimmer Location

3. Connect a standard output meter across the speaker voice coil. Turn volume control full on. Keep signal generator output low so that output meter indicates not more than ½ watt during alignment.

4. Align the AM oscillator trimmer (C13) and the AM r-f trimmer (C9) by coupling the signal to the loop antenna inductively. Connect a four-turn, six-inch diameter loop of bell wire across the signal generator output terminals, and locate the loop about one foot from the radio loop antenna. The position of the loop in respect to the radio loop antenna should not be changed during any one set of adjustments to prevent possible errors in the peak readings.

5. Disconnect the copper strap from the band switch to pin 7 of the 12BE6 to align the 1st FM i-f transformer. Unsolder the strap from the tube pin connection. Resolder the strap after T1 is aligned to 10.7 mc as in step 8.

6. The AM r-f alignment should be made before the FM r-f alignment. With the gang condenser fully closed, the pointer should point to the dot on the dial scale after the letters "FM" on the left end of the dial scale.

7. The termination impedance of the signal generator should be 300 ohms for FM r-f alignment.

METER ALIGNMENT CHART

Step	Signal Generator Frequency	Signal Input Point	Band Switch Setting	Dial Setting	Adjust	See Note
			AM I-F ALIGNMENT			
1	455 kc modulated with 400 cps	12BE6 grid (pin 7 of V2) thru .01 mfd.	AM	550 kc	Secondary and primary slugs of T5 for maximum.	3
2					Secondary and primary slugs of T2 for maximum.	
			FM DISCRIMINATOR AND I-F ALIGNMENT			
3	10.7 un-modulated	12BA6 grid (pin 1 of V3) thru 0.1 mfd.	FM	—	Adjust T6 secondary for zero. Apply 1 volt signal input.	1
4	See adjust col.				Detune signal generator to point of maximum meter reading.	
5	Same freq. as in step 4				Adjust T6 primary for maximum meter reading.	
6	10.7 mc unmodulated				Adjust slug of T4 for maximum.	2
7		12BA6 grid (pin 1 of V1) thru .01 mfd.			Adjust secondary and primary slugs of T3 for maximum.	
8		12BE6 grid (pin 7 of V2) thru .01 mfd. and 4700 ohms. See note 5.			Adjust secondary and primary slugs of T1 for maximum.	2, 5

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MODEL 218

METER ALIGNMENT CHART (Cont'd)

Step	Signal Generator Frequency	Signal Input Point	Band Switch Setting	Dial Setting	Adjust	See Note
AM R-F ALIGNMENT						
9	1500 kc AM modulated with 400 cps	Inductively coupled. See note 4.	AM	1500 kc	Adjust C13 for maximum.	3, 4, 6.
10					Adjust C9 for maximum while rocking dial.	
FM R-F ALIGNMENT						
11	108 mc unmodulated	Dipole terminals	FM	108 mc	Adjust C18 for maximum.	2, 6, 7.
12	98 mc unmodulated			For max. output	Adjust C11 for maximum while rocking dial.	

EQUIPMENT REQUIRED FOR VISUAL ALIGNMENT

1. General Electric YGS-3 sweep generator or equivalent.
2. General Electric ST-2A oscilloscope or equivalent.
3. 200,000 ohms, ½ watt, resistor.
4. .01 mfd. paper capacitor.
5. Isolation transformer.

NOTES FOR VISUAL ALIGNMENT

1. Connect the vertical plates of the scope across R11 in the grid circuit of V4 (steps 3, 4, 5, 11 and 12).

2. Connect the vertical plates of the scope between the junction of R18 and C29 and chassis (FM audio) (steps 6, 7, 8).

3. Connect the vertical plates of the scope between the junction of R14 and C27 and chassis (steps 1, 2, 9, 10).

4. In some cases tuning of the converter grid will cause "pulling in" of the oscillator and will change the oscillator frequency. If peaking C9 or C11 as in steps 10 or 12 causes the curve to move off the screen, it is necessary to recalibrate the oscillator as in steps 9 or 11.

5. The termination impedance of the signal generator should be 300 ohms to properly match the FM input impedance of this receiver (steps 11 and 12).

6. To align the 1st i-f transformer T1 (step 5), it is necessary to disconnect the copper strap from pin 7 of V2, the 12BE6. After alignment of T1, resolder the copper strap to pin 7 of the 12BE6.

7. To position the dial pointer, close the gang condenser. The pointer should be set to the dot on the dial scale after the letters FM on the left end of the dial scale.

8. For alignment of the AM oscillator and r-f trimmers (steps 9 and 10), the signal should be inductively coupled to the loop antenna by connecting a four-turn, six-inch diameter loop of bell to the signal generator terminals. 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 antenna should not be changed during any one set of adjustments.

VISUAL ALIGNMENT CHART

Step	Sweep Generator Frequency	Signal Input Point	Band Switch Setting	Dial Setting	Adjust	See Note
AM I-F VISUAL ALIGNMENT						
1	455 KC ±20 KC at 60 cps sweep rate	12BE6 grid (pin 7 of V2) thru .01 mfd.	AM	—	Two slugs of T5 for maximum amplitude and minimum distortion of curve.	3
2					Two slugs of T2 for maximum amplitude and minimum distortion of curve.	
FM I-F AND DISCRIMINATOR VISUAL ALIGNMENT						
3	10.7 MC ±300 KC at 60 cps sweep rate	12BA6 grid (pin 1 of V1) thru .01 mfd.	FM	—	Tuning slugs of T4 for maximum amplitude of curve, Fig. 2A.	1
4					Tuning slugs of T3 for maximum amplitude of curve. Fig. 2A.	
5		12BE6 grid (pin 1 of V2). See note 7.			Tuning slugs of T1 for maximum amplitude of curve. Fig. 2A.	1, 6
6		12BA6 grid (pin 1 of V3)			Primary of T6 for maximum amplitude of positive and negative peaks of output curve. Fig. 2B.	2
7					Secondary of T6 for vertical symmetry with respect to the mid-point horizontal trace. See Fig. 2B.	
8					Primary of T6 for straightest line between positive and negative peaks of output curve. See Fig. 2B.	

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VISUAL ALIGNMENT CHART (Cont.)

Step	Sweep Generator Frequency	Signal Input Point	Band Switch Setting	Dial Setting	Adjust	See Note
AM R-F VISUAL ALIGNMENT						
9	1500 KC AM modulated with 60 cps	Inductively coupled. See note 8.	AM	1500 KC. See note.	C13 for steepest slope of straight-line trace on scope.	3, 4, 7, 8.
10	1500 KC ±20 KC at 60 cps sweep rate			For maximum amplitude of curve.	C9 for maximum amplitude and minimum distortion.	3, 4, 7, 8.
FM R-F VISUAL ALIGNMENT						
11	108 MC AM modulated with 60 cps	Dipole terminals. See note 5.	FM	108 MC	C18 for steepest slope of straight-line trace on scope.	1, 4, 5, 7.
12	98 MC ±300 KC at 60 cps rate			For maximum output.	C11 for maximum amplitude and minimum distortion of curve.	1, 4, 5.

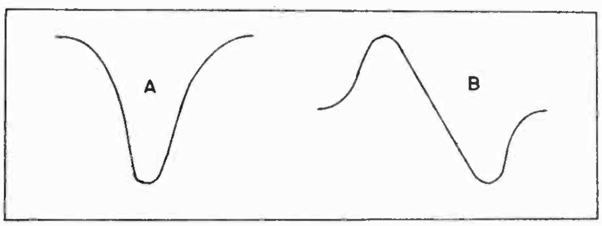


Fig. 2. I-F and Discriminator Curves

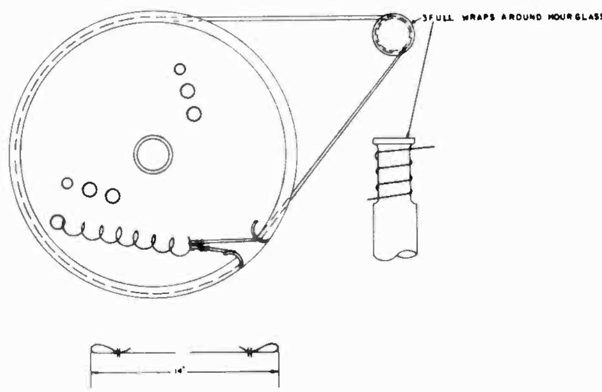
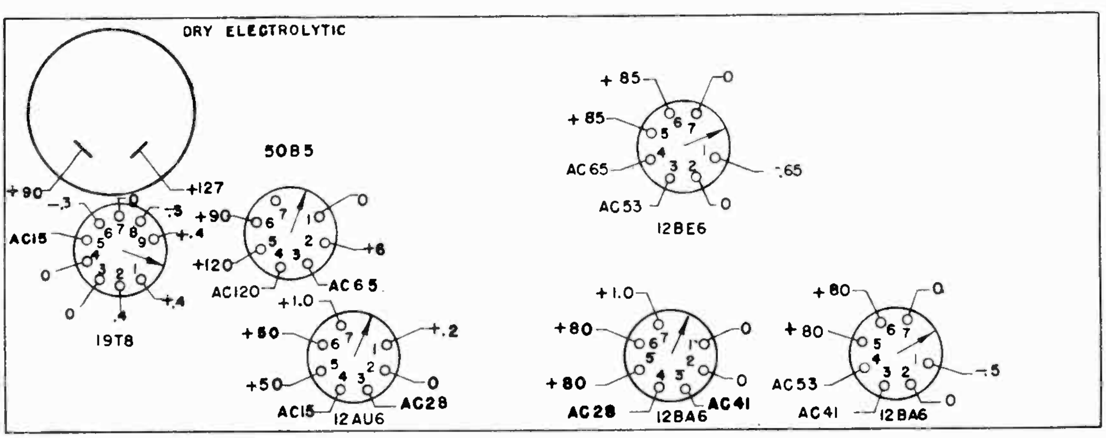


Fig. 3. Dial Stringing Diagram



ALL VOLTAGES ARE + DC
UNLESS OTHERWISE SPECIFIED
ALL VOLTAGES TO CHASSIS
BAND SWITCH IN A.M POSITION
VOLUME MINIMUM

BACK OF CHASSIS
BOTTOM VIEW OF CHASSIS

VOLTAGES MEASURED WITH
D.C. VOLTAGES WITH 20,000 OHMS PER VOLT METER
A.C. VOLTAGES WITH 1,000 OHMS PER VOLT METER

Fig. 4. Socket Voltage Diagram

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MODEL 218

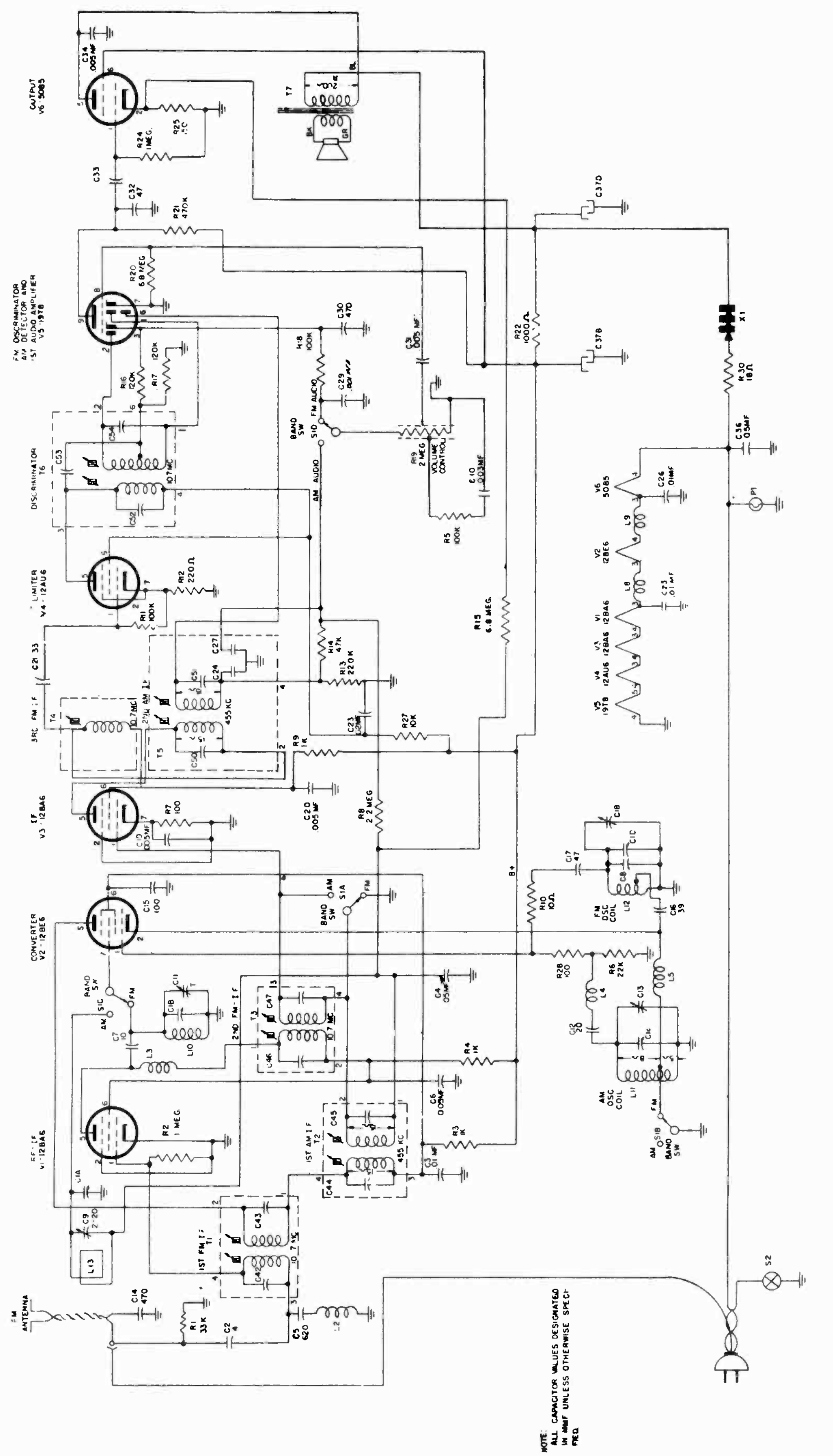

Fig. 5. Schematic diagram

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MODEL 218
REPLACEMENT PARTS LIST

UNIVERSAL REPLACEMENT PARTS

Cat. No.	Symbol	Description
UCC-037	C10	CAPACITOR—.003 mfd., 600 v., paper
UCC-039	C6, 19, 20, 31, 34	CAPACITOR—.005 mfd., 600 v., paper
UCC-040	C3, 23, 25, 26, 33	CAPACITOR—.01 mfd., 600 v., paper
UCC-045	C4, 36	CAPACITOR—.05 mfd., 600 v., paper
UCU-001	C2	CAPACITOR—4 mmf., 500 v., mica
UCU-020	C32	CAPACITOR—47 mmf., 500 v., mica
UCU-028	C15	CAPACITOR—100 mmf., 500 v., mica
UCU-044	C29, 30	CAPACITOR—470 mmf., 500 v., mica
UCU-516	C21	CAPACITOR—33 mmf., 500 v., mica
UCU-2047	C5	CAPACITOR—620 mmf., 500 v., mica
UOP-577		SPEAKER
URD-001	R10	RESISTOR—10 ohms, ½ w., carbon
URD-007	R30	RESISTOR—18 ohms, ½ w., carbon
URD-025	R7, 28	RESISTOR—100 ohms, ½ w., carbon
URD-033	R12	RESISTOR—220 ohms, ½ w., carbon
URD-049	R3, 4, 9	RESISTOR—1000 ohms, ½ w., carbon
URD-073	R27	RESISTOR—10,000 ohms, ½ w., carbon
URD-081	R6	RESISTOR—22,000 ohms, ½ w., carbon
URD-085	R1	RESISTOR—33,000 ohms, ½ w., carbon
URD-089	R14	RESISTOR—47,000 ohms, ½ w., carbon
URD-097	R5, 11, 18	RESISTOR—100,000 ohms, ½ w., carbon
URD-099	R16, 17	RESISTOR—120,000 ohms, ½ w., carbon
URD-105	R13	RESISTOR—220,000 ohms, ½ w., carbon
URD-113	R21, 24	RESISTOR—470,000 ohms, ½ w., carbon
URD-121	R2	RESISTOR—1 meg., ½ w., carbon
URD-129	R8	RESISTOR—2.2 meg., ½ w., carbon
URD-141	R15, 20	RESISTOR—6.8 meg., ½ w., carbon
URE-029	R25	RESISTOR—150 ohms, 1 w., carbon
URF-049	R22	RESISTOR—1000 ohms, 2 w., carbon

SPECIALIZED REPLACEMENT PARTS

Cat. No.	Symbol	Description
RAB-104	L13	LOOP AND BACK ASSEMBLY
RAU-309		CABINET—Brown
RCE-101	C37A, 37B	CAPACITOR—80 mfd.-40 mfd., 150 v., electrolytic
RCT-038	C1A, 1B, 1C, 1D, C11, 13	CAPACITOR—Tuning capacitor
*RCW-176	C14	CAPACITOR—470 mmf., Hi-K
*RCW-1043	C17	CAPACITOR—47 mmf.
*RCW-1057	C16	CAPACITOR—39 mmf.
*RCW-1060	C7	CAPACITOR—10 mmf.
*RCW-1070	C12	CAPACITOR—20 mmf., ceramic
*RCW-1075	C8	CAPACITOR—4 mmf., ceramic
RCY-055	C18	CAPACITOR—Trimmer
RCY-056	C9	CAPACITOR—2-20 mmf., trimmer
*RDC-032		CORD—Dial cord
RDK-177		KNOB AND BEZEL ASSEMBLY
*RDP-048		POINTER
RDS-086		PLATE—Dial scale back plate
RDW-029		WINDOW—For dial scale
*RER-001	X1	RECTIFIER—Selenium rectifier
*RHF-006		CHASSIS FOOT
*RHH-002		STUD—Tri-mount
RHH-004		SNAP FASTENER
RII-028		INSULATOR—Pointer insulator
RIX-001		BRACKET—Tuning shaft bracket and insulating strip
*RJS-118		SOCKET—9 prong tube socket for V5
*RJS-125		SOCKET—7 prong tube socket for V1, V2, V3, V4, V6
RJX-033		SOCKET ASSEMBLY—For pilot light
RJX-034		INTERLOCK ASSEMBLY—Female
*RLB-029	L10	COIL—FM r-f choke coil
RLC-092	L11	COIL—B-C oscillator coil
RLC-093	L12	COIL—FM oscillator coil
*RLI-085	L4, 8, 9	COIL—2 mmh. choke
RLI-087	L3, 5	COIL—.5 mmh. choke
RLI-088	L2	COIL—FM antenna choke
*RMS-035		SPRING—Dial cord tension
RUM-054		SHAFT—Tuning
RRC-111	R19, S2	VOLUME CONTROL
*RSI-003		INTERLOCK ASSEMBLY—Male
*RSW-072	S1	BAND SWITCH
*RTD-006	T6	TRANSFORMER—Discriminator
RTL-097	T2	TRANSFORMER—1st BC i-f
RTL-098	T5	TRANSFORMER—2nd BC i-f
RTL-099	T1, 3	TRANSFORMER—1st and 2nd FM i-f
RTL-100	T4	TRANSFORMER—3rd FM i-f
*RTO-039	T7	TRANSFORMER—Output
RWL-022		POWER CORD—3 wire

*USED ON PREVIOUS RECEIVERS

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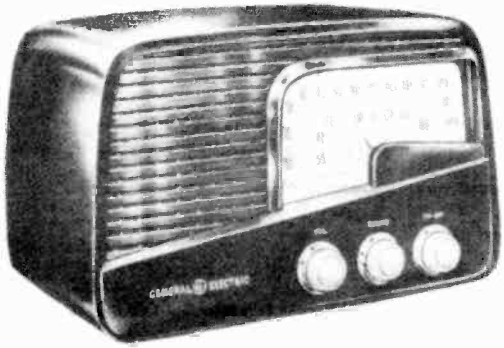
MODEL 218,
"H" Version



MODEL 218 "H" VERSION

CAUTION

ALWAYS USE AN ISOLATION TRANSFORMER IN THE RECEIVER POWER LINE, WHEN SERVICING OR ALIGNING THIS RECEIVER, TO PROTECT TEST EQUIPMENT.

SPECIFICATIONS

CABINET

Material	plastic
Color	mahogany
Height	8 3/8 inches
Width	13 5/8 inches
Depth	6 7/8 inches

ELECTRICAL

Voltage	105-125 v. AC or DC
Frequency on AC	50 to 60 cps
Wattage	33 watts

TUNING RANGE

AM	540-1620 kc
FM	88-108 mc

INTERMEDIATE FREQUENCIES

AM	455 kc
FM	10.7 mc

POWER OUTPUT (120 VOLTS LINE)

Undistorted	1.1 watts
Maximum	1.8 watts

LOUDSPEAKER

Type	permanent magnet
Cone Diameter	5 1/4 inches
Voice Coil Impedance at 400 cps	3.2 ohms

TUBE COMPLEMENT

(V1) FM R-F and 1st I-F Amplifier	12BA6
(V2) Oscillator and Converter	12BE6
(V3) I-F Amplifier	12BA6
(V4) Limiter	12AU6
(V5) FM Discriminator, AM Detector and Audio Amplifier	19T8
(V6) Power Output	50B5

ANTENNA

AM	loop antenna
FM	power line antenna or 300-ohm FM antenna

GENERAL

Model 218 "H" version is a table model receiver providing reception on the AM and FM bands. It is housed in a mahogany colored plastic cabinet.

It is the same as the Model 218 except that the local oscillator is designed to operate on the high side of the incoming signal on FM reception. This change reduces the possibility of local oscillator radiation interfering with television reception.

The receiver has a built-in FM power line antenna; to operate from this antenna it is necessary to connect the brown wire coming out of the cabinet back to the right-hand screw of the antenna terminal strip.

On AM operation, the AM r-f signal is fed directly into the grid of the converter V2 through the 1st AM i-f transformer T2 into the grid of V3. From V3 the signal is fed to the second AM i-f transformer T5 and is detected by a diode section of V5 which is pin 6. The secondary of T1 which is in series with the primary of T2 offers a low impedance to the AM i-f frequency.

V1 (12BA6) in the FM reflex circuit acts both as an r-f and an i-f amplifier. The r-f signal is put into the grid (pin 1) of V1 through the secondary of T1. It is amplified by V1 and put into the grid of V2 the converter through capacitor C7. Choke L3 prevents the r-f signal from getting into the second FM i-f transformer T3. The 10.7 mc FM i-f is fed from the plate of V2 to the primary of T1 the 1st FM i-f transformer which now puts the FM i-f signal onto the grid of V1. From the plate of V1 the FM i-f signal is fed through choke L3 to the primary of T3 through to the grid of V3. The plate of V3 feeds the FM i-f signal through C50 in the primary of T5 to the 3rd FM i-f tuning coil T4 and through C21 to the grid of the limiter grid pin 1 of V4. The FM i-f signal is detected in T6 discriminator transformer and two diode sections of V5, pins 1 and 2.

ALIGNMENT

For the Model 218 receivers "H" version, the alignment remains the same as that outlined for Model 218 in service notes ER-S-218. However, the calibration will change in the "H" version receiver which necessitates the use of a new back plate, Stock No. RDS-093.

REPLACEMENT PARTS

All parts for the Model 218 "H" version are identical to those listed in Service Notes ER-S-218 except for those parts listed below.

Cat. No.	Symbol	Description
*URD-069	R31	RESISTOR—6800 ohms, 1/2 w.
*RCW-1077	C61	CAPACITOR—22 mmf., ceramic
*RCW-2027	C60	CAPACITOR—15 mmf., ceramic
RDS-093		DIAL SCALE—Model 218 "H" back plate dial scale
RLC-102	L14	COIL—FM oscillator coil
RTD-010	T8	TRANSFORMER—Discriminator IF transformer
URD-077	R32	RESISTOR—15,000 ohms, 1/2 w.

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MODEL 218,
"H" Version

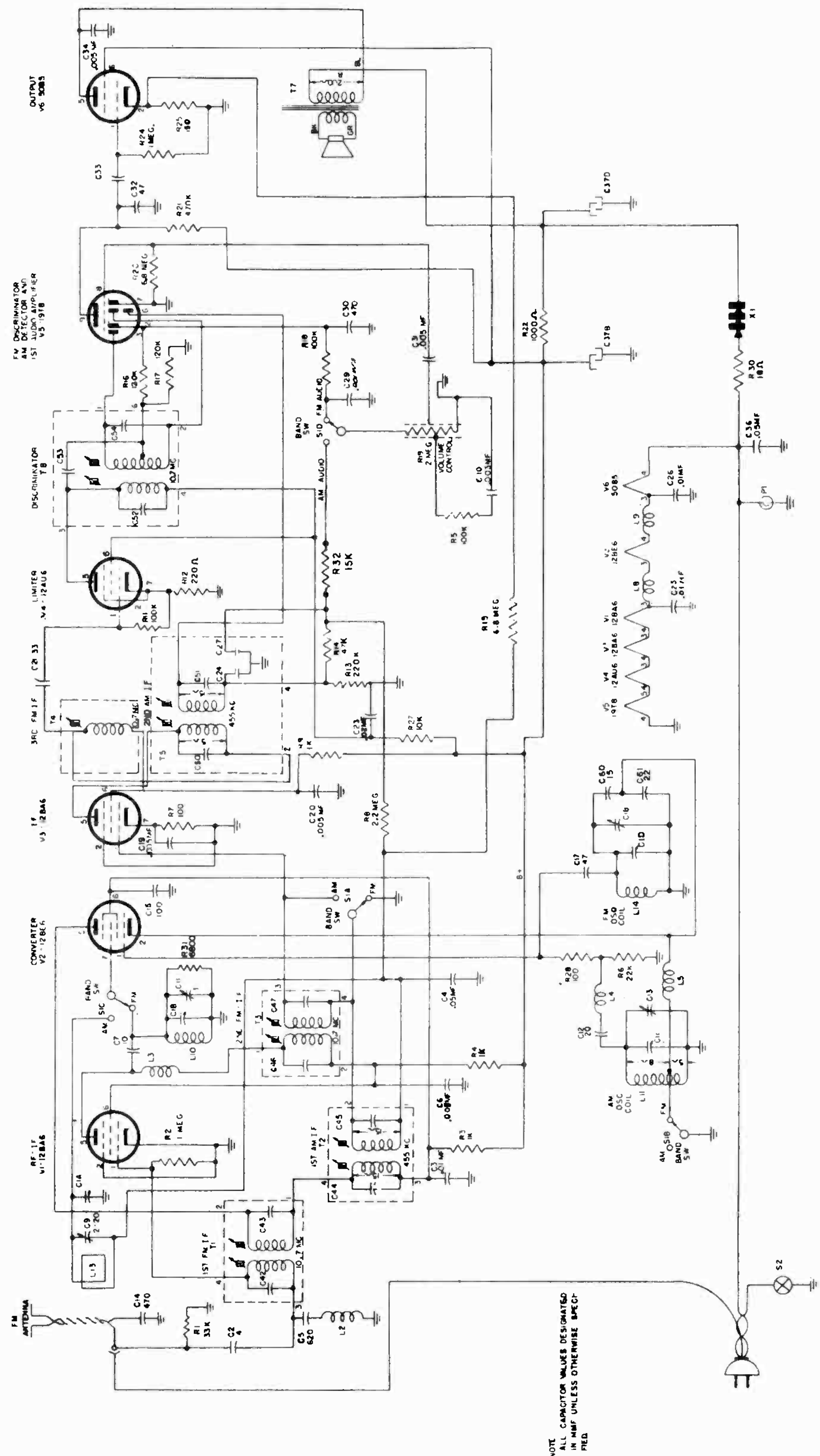

Fig. 1. Schematic Diagram, Model 218 "H" Version

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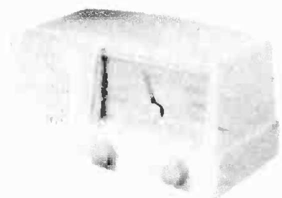
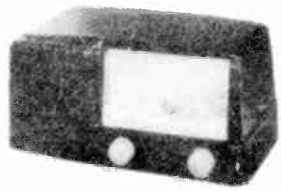
MODELS 400,
401, 411



MODEL 401



MODELS 400, 411

SPECIFICATIONS

CABINET	Model	400	411	401
	Material	Brown	Maroon	Ivory
	Height	$6\frac{1}{8}$ in.		
	Width	$12\frac{1}{2}$ in.		
	Depth	$7\frac{1}{4}$ in.		
ELECTRICAL RATING	Voltage	105–125		
	Frequency	50-60 cycles or DC		
	Wattage	26 watts at 117 volts input		
OPERATING FREQUENCIES	Standard Broadcast	540–1600 kc		
	I-F Amplifier	455 kc		
POWER OUTPUT	Undistorted	1 watt		
	Maximum	1.75 watts		
LOUDSPEAKER	Type	Alnico V PM		
	Outside Cone Diameter	4 inches		
	Voice Coil Impedance at 400 Cycles	3.2 ohms		
TUBE COMPLEMENT	(V1) Oscillator-Converter	12SA7		
	(V2) I-F Amplifier	12BA6		
	(V3) Detector-Audio	12SQ7		
	(V4) Rectifier	35W4		
	(V5) Audio Power Amplifier	50C5		
	(I1) Pilot Lamp	G-E Mazda No. 47		

GENERAL INFORMATION

The Models 400, 401 and 411 are five-tube a-c or d-c superheterodyne AM standard broadcast receivers equipped with an efficient built-in antenna loop and incorporating automatic volume control, a permanent magnet speaker, and beam power output.

ELECTRICAL CIRCUIT ALIGNMENT

EQUIPMENT REQUIRED

1. Test oscillator, tone amplitude-modulated.
2. A-C output meter, $1\frac{1}{2}$ volts full scale.
3. .05 mfd., paper capacitor.
4. Insulated screwdriver.
5. Coupling loop for test oscillator (see text).
6. Isolation power transformer.

ALIGNMENT PROCEDURE

The alignment steps are given in the table form of the Alignment Chart. Adjustment trimmers are shown in the illustration of Fig. 2.

1. The chassis is removed from the cabinet with the antenna loop and back attached and the speaker leads reconnected.

2. An isolation transformer should be used for the receiver power source when aligning or servicing, AC-DC receivers, to prevent short circuiting of equipment and shock hazard.

3. The output meter is connected across the terminals of the loudspeaker voice coil.

4. The receiver volume control should be turned to maximum and test oscillator signal output attenuated during alignment to develop not more than $1\frac{1}{4}$ volts output meter reading at the loudspeaker.

5. For i-f alignment, the high side of the signal generator output cable should be connected through a .05 mfd. paper capacitor to the points indicated in the Alignment Chart. The low side of the output cable is connected to the receiver chassis.

6. To align the oscillator and r-f trimmers, the signal generator output is inductively coupled to the radio loop, L1, by connecting a four-turn, six-inch diameter loop of bell wire across its output terminals and then locating the loop about one foot from the radio loop antenna. To prevent possbile errors in comparative peak readings, the position of signal generator loop with respect to the radio loop antenna should not be changed during measurement.

ALIGNMENT CHART

Step	Connect Test Oscillator to:	Test Osc. Setting	Radio Dial Setting	Adjust Trimmers For Maximum
	I-F ALIGNMENT			
1	V2, 12BA6 grid (Pin 1), in series with .05 mfd.	455 KC	......	C9 and C8 of second i-f transformer, T3
2	V1, 12SA7 grid (Pin 8), in series with .05 mfd.	455 KC	......	C6 and C5 of first i-f transformer, T2
3	V1, 12SA7 grid (Pin 8), in series with .05 mfd.	455 KC	......	Recheck adjustment of C9, C8, C6, C5, for maximum
	R-F ALIGNMENT			
4	Inductively coupled to radio loop	1620 KC	Minimum capacity C2A, C2B	C3, oscillator trimmer
5	Inductively coupled to radio loop	1500 KC	1500 KC	C1, r-f trimmer

STAGE GAINS AND VOLTAGE CHECKS

Stage gain measurements by 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 are taken with low signal input so that AVC is not effective.

1. I-F GAIN

12SA7 Grid to 12BA6 Grid .... 50 @ 455 KC
12BA6 Grid to 12SQ7 Diode Plate .... 50 @ 455 KC

2. AUDIO GAIN

Input of 0.15 volts at 400 cycles across volume control (R4) with control set at maximum will develop approximately $\frac{1}{2}$ watt output across the speaker voice coil terminals.

3. OSCILLATOR GRID BIAS

D-C voltage developed across the oscillator grid leak (R1) averages 8.5 volts at 1000 kc.

4. TUBE SOCKET PIN VOLTAGES

Fig. 3 shows voltages from tube pins to B−. Voltage readings differing greatly from those specified may help localize defective components.

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MODELS 400, 401, 411

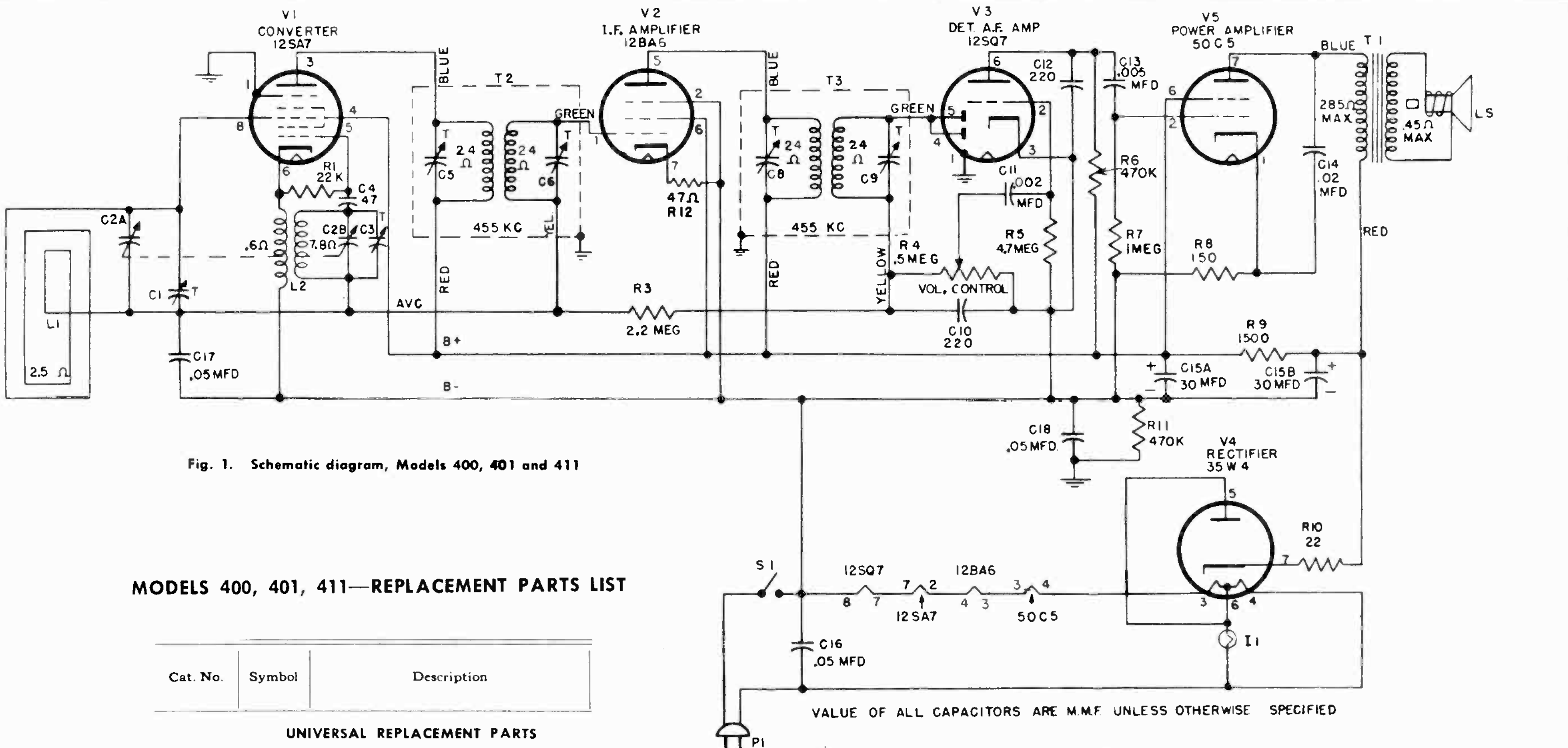

Fig. 1. Schematic diagram, Models 400, 401 and 411

MODELS 400, 401, 411—REPLACEMENT PARTS LIST

Cat. No.	Symbol	Description
		UNIVERSAL REPLACEMENT PARTS
*UCC-041	C14	CAPACITOR—.02 mfd., 600 v., paper
*UCC-045	C16, C17, C18	CAPACITOR—.05 mfd., 600 v., paper
*UCC-020	C4	CAPACITOR—47 mmf., 600 v., mica
*URD-009	R10	RESISTOR—22 ohms, ½ w., carbon
*URD-017	R12	RESISTOR—47 ohms, ½ w., carbon
*URD-029	R8	RESISTOR—150 ohms, ½ w., carbon
*URD-081	R1	RESISTOR—22K ohms, ½ w., carbon
*URD-113	R6, R11	RESISTOR—470K ohms, ½ w., carbon
*URD-121	R7	RESISTOR—1 meg., ½ w., carbon
*URD-129	R3	RESISTOR—2.2 meg., ½ w., carbon
*URD-137	R5	RESISTOR—4.7 meg., ½ w., carbon
*URF-053	R9	RESISTOR—1500 ohms, 2 w., carbon
*S403D	LS1	SPEAKER, PM SPEAKER—4 inch
		SPECIALIZED REPLACEMENT PARTS
*RAB-095	L1	LOOP BACK
*RAU-306		CABINET (400) (Brown)
*RAU-307		CABINET (401) (Ivory)
*RAU-321		CABINET (411) (Maroon)
*RCE-046	C15A, C16B	ELECTROLYTIC CAPACITOR—30-30 mfd., 150 v.
RCT-042	C1, C2A, C2B, C3	TUNING CAPACITOR

* Used on previous models.

SPECIALIZED REPLACEMENT PARTS (Cont'd)

Cat. No.	Symbol	Description
*RCW-3013	C10, 11, 12, 13	CAPACITOR—BULL PLATE, .002 mf., 220 mmf., 220, mmf., and .005 mfd.
*RDC-032		DIAL CORD—25 yards
*RDK-174		KNOB (400) (Wheat)
*RDK-175		KNOB (401, 411) (Maroon)
RDP-052		POINTER—Dial pointer
RDS-095		BACK PLATE AND DIAL SCALE
RDW-021		WINDOW—Dial window
*RHC-017		CLIP—Oscillator mounting
*RHG-018		GROMMET (For mounting tuning capacitor)
*RHH-002		TRIMONT STUD (For mounting dial glass)
*RHJ-007		SPACER (For mounting tuning capacitor)
*RJS-003		TUBE SOCKET—For V1 and V3
*RJS-092		TUBE SOCKET—For V4
*RJS-141		TUBE SOCKET—For V2
*RJX-031		PILOT LIGHT SOCKET ASSEMBLY
*RLC-090	L2	OSCILLATOR COIL
*RMS-118		SPRING—Drum spring
RMX-170		DRIVE SHAFT BUSHING ASSEMBLY
*RRC-106	R4, S1	VOLUME CONTROL AND SWITCH
*RTL-094	T2	1st I.F. TRANSFORMER
*RTO-095	T3	2nd I.F. TRANSFORMER
*RTO-069	T1	OUTPUT TRANSFORMER
*RWL-009		POWER CORD

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MODELS 400, 401, 411

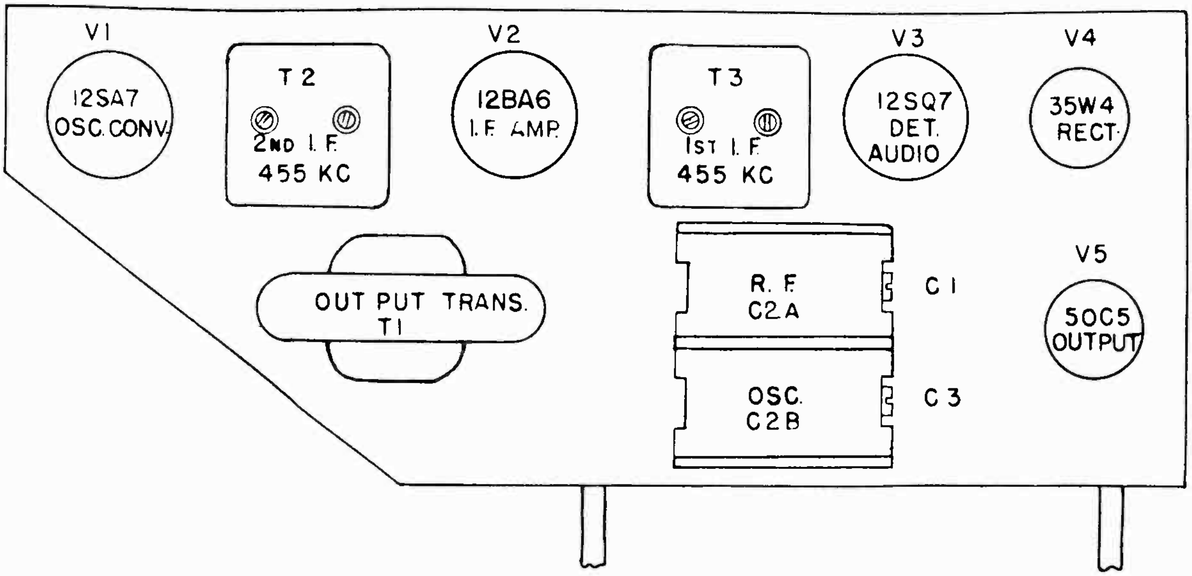
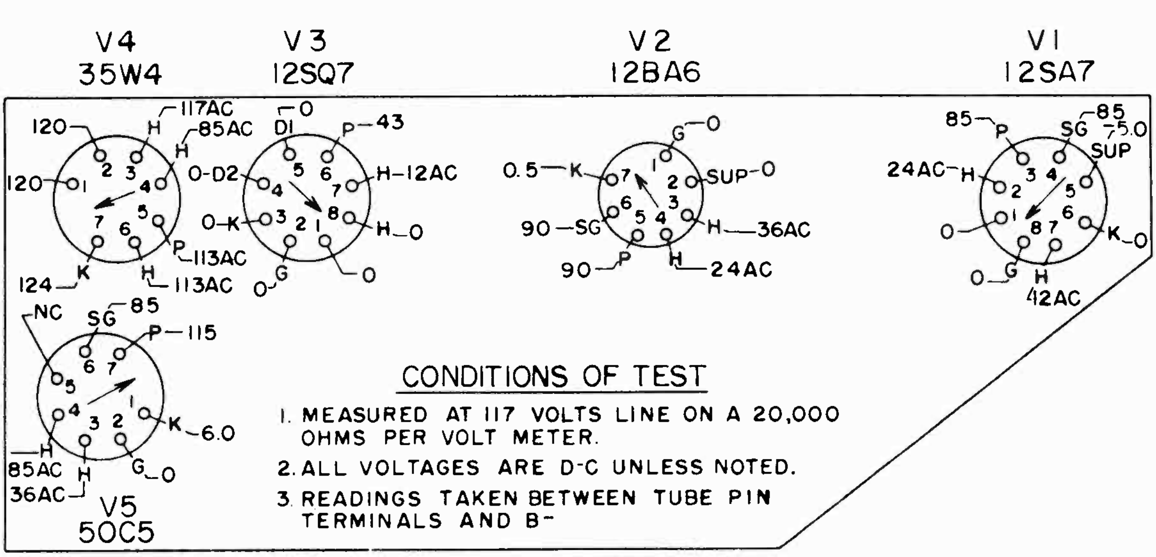


Fig. 2. Tube and Trimmer Location



VIEWED FROM BOTTOM OF CHASSIS

Fig. 3. Socket Voltages

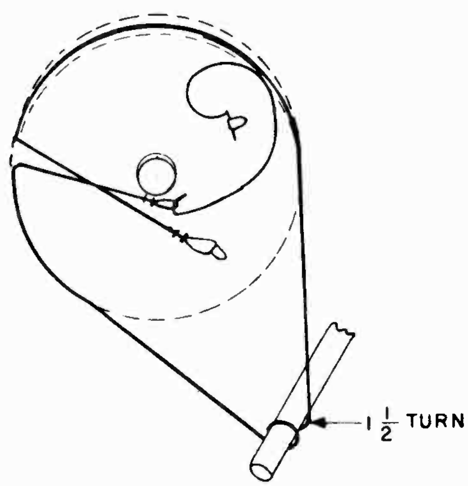


Fig. 4. Dial Stringing Diagram

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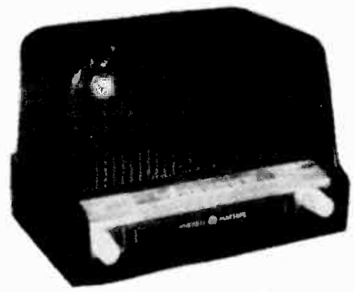
MODEL 402



SPECIFICATIONS

CABINET	Material	Plastic (brown)
	Height	8⅝ in.
	Width	13 1/16 in.
	Depth	8 in.
ELECTRICAL RATING	Voltage	105-125
	Frequency	50-60 cycles or DC
	Wattage	25 at 117 volts input
OPERATING FREQUENCIES	Standard Broadcast	540-1600 kc
	I-F Amplifier	455 kc
POWER OUTPUT	Undistorted	1 watt
	Maximum	1.75 watts
LOUDSPEAKER	Type	Alnico V PM
	Outside Cone Diameter	5½ inches
	Voice Coil Impedance at 400 Cycles	3.2 ohms
TUBE COMPLEMENT	(V1) Oscillator-Converter	12SA7
	(V2) I-F Amplifier	12BA6
	(V3) Detector-Audio	12SQ7
	(V4) Rectifier	35Z5GT
	(V5) Audio Power Amplifier	50L6GT
	(I1) Pilot Lamp	G-E Mazda No. 47

GENERAL INFORMATION

The Model 402 is a four-tube (plus rectifier tube) a-c or d-c superheterodyne AM standard broadcast receiver equipped with an efficient built-in antenna loop and incorporating automatic volume control, an oversize permanent magnet speaker, and beam power output.

ELECTRICAL CIRCUIT ALIGNMENT

EQUIPMENT REQUIRED

1. Test oscillator, tone amplitude-modulated.
2. A-C output meter, 1½ volts full scale.
3. .05 mfd., paper capacitor.
4. Insulated screwdriver.
5. Coupling loop for test oscillator (see text).
6. Isolation power transformer.

ALIGNMENT PROCEDURE

The alignment steps are given in the table form of the Alignment Chart. Adjustment trimmers are shown in the illustration of Fig. 3.

1. The chassis is removed from the cabinet with the antenna loop and back attached and the speaker leads reconnected.

2. An isolation transformer should be used for the receiver power source when aligning or servicing AC-DC receivers, to prevent short circuiting of equipment and shock hazard.

3. The output meter is connected across the terminals of the loudspeaker voice coil.

4. The receiver volume control should be turned to maximum and test oscillator signal output attenuated during alignment to develop not more than 1¼ volts output meter reading at the loudspeaker.

5. For i-f alignment, the high side of the signal generator output cable should be connected through a .05 mfd. paper capacitor to the points indicated in the Alignment Chart. The low side of the output cable is connected to the receiver chassis.

6. To align the oscillator and r-f trimmers, the signal generator output is inductively coupled to the radio loop, L1, by connecting a four-turn, six-inch diameter loop of bell wire across its output terminals and then locating the loop about one foot from the radio loop antenna. To prevent possible errors in comparative peak readings, the position of signal generator loop with respect to the radio loop antenna should not be changed during measurement.

ALIGNMENT CHART

Step	Connect Test Oscillator to:	Test Osc. Setting	Radio Dial Setting	Adjust Trimmers For Maximum
	I-F ALIGNMENT			
1	V2, 12BA6 grid (Pin 1), in series with .05 mfd.	455 KC	....	C9 and C8 of second i-f transformer, T3
2	V1, 12SA7 grid (Pin 8), in series with .05 mfd.	455 KC	....	C6 and C5 of first i-f transformer, T2
3	V1, 12SA7 grid (Pin 8), in series with .05 mfd.	455 KC	....	Recheck adjustment of C9, C8, C6, C5, for maximum
	R-F ALIGNMENT			
4	Inductively coupled to radio loop	1620 KC	Minimum capacity C2A, C2B	C3, oscillator trimmer
5	Inductively coupled to radio loop	1500 KC	1500 KC	C1, r-f trimmer

STAGE GAINS AND VOLTAGE CHECKS

Stage gain measurements by 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 are taken with low signal input so that AVC is not effective.

1. I-F GAIN

12SA7 Grid to 12BA6 Grid .... 50 @ 455 KC
12BA6 Grid to 12SQ7 Diode Plate .... 50 @ 455 KC

2. AUDIO GAIN

Input of 0.15 volts at 400 cycles across volume control (R4) with control set at maximum will develop approximately ½ watt output across the speaker voice coil terminals.

3. OSCILLATOR GRID BIAS

DC voltage developed across the oscillator grid leak (R1) averages 8.5 volts at 1000 kc.

4. TUBE SOCKET PIN VOLTAGES

Fig. 5 shows voltages from tube pins to B−. Voltage readings differing greatly from those specified may help localize defective components.

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MODEL 402

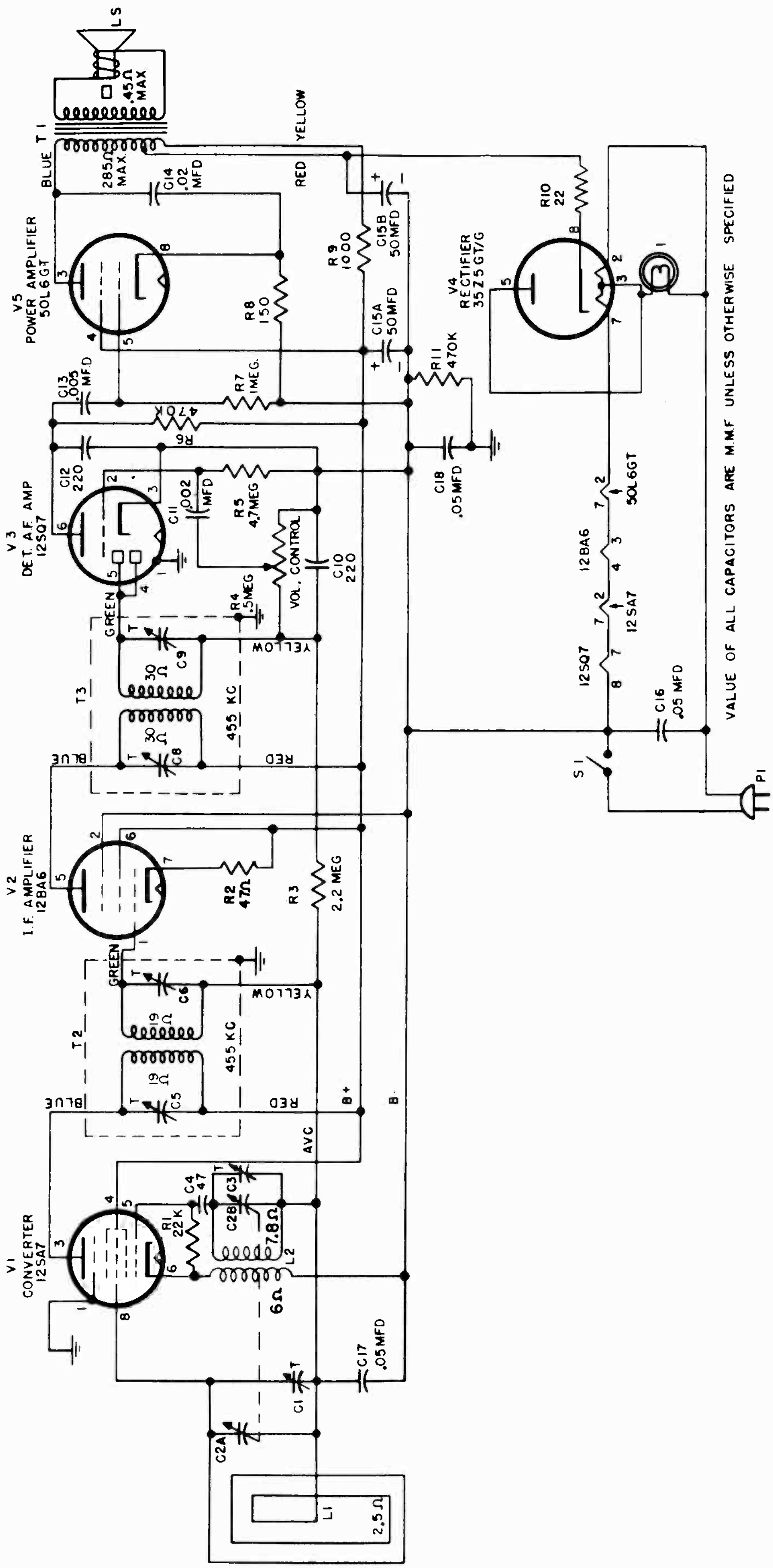

Fig. 1. Schematic Diagram, Model 402

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CAPACITORS C10, 11, 12, AND C13

UNIT K67J836

Some production receivers use a four-section ceramic unit incorporating capacitors C10, 11, 12 and C13. The ceramic unit, RCW-3013, is illustrated in Fig. 2 for lead identification to capacitor sections and chassis circuit wiring. Other receivers may be found to have individual component capacitors in place of the four-section ceramic unit.

REPLACEMENT

If in a circuit analysis the ceramic unit is found to be defective; the entire unit may be replaced by the identical part RCW-3013 or, the defective section may be located and disconnected from the receiver circuit and the equivalent single components used in its place. The alternate capacitors are listed in the parts section as follows: UCC-036, C11, UCC-039, C13; and UCU-1036, C10 or C12.

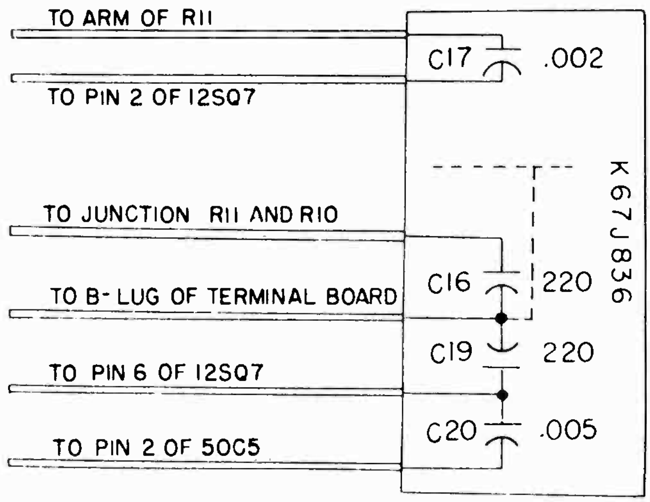

Fig. 2. Capacitor RCW-3013 (K67J836)

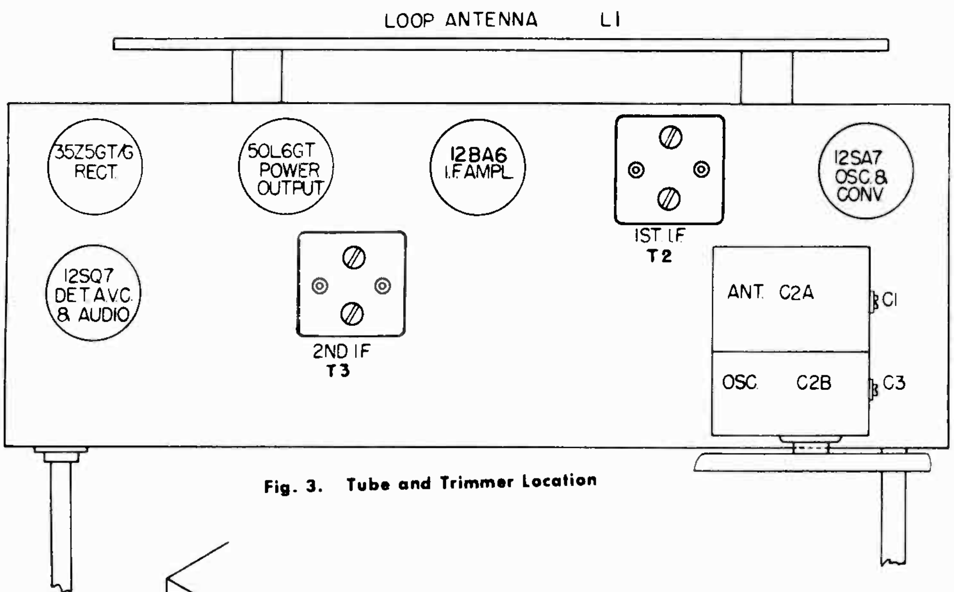

Fig. 3. Tube and Trimmer Location

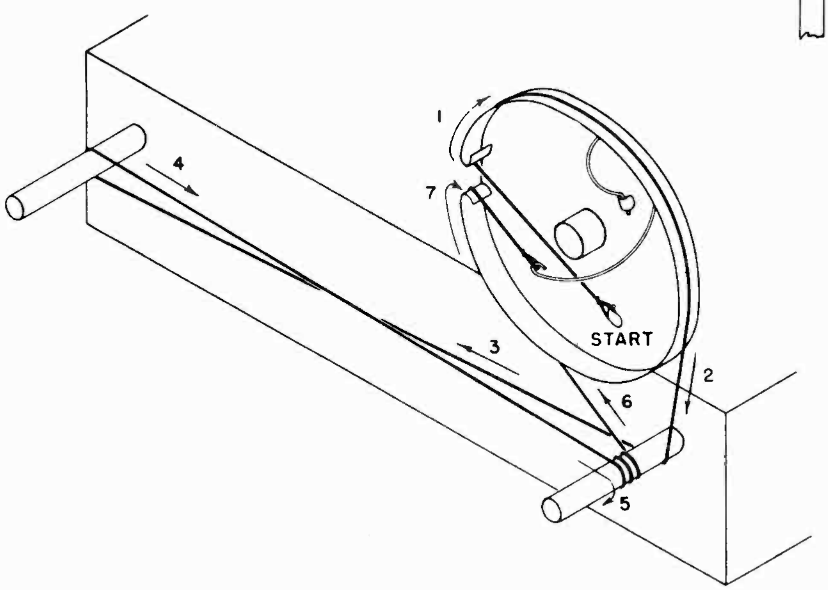

Fig. 4. Dial Stringing Diagram

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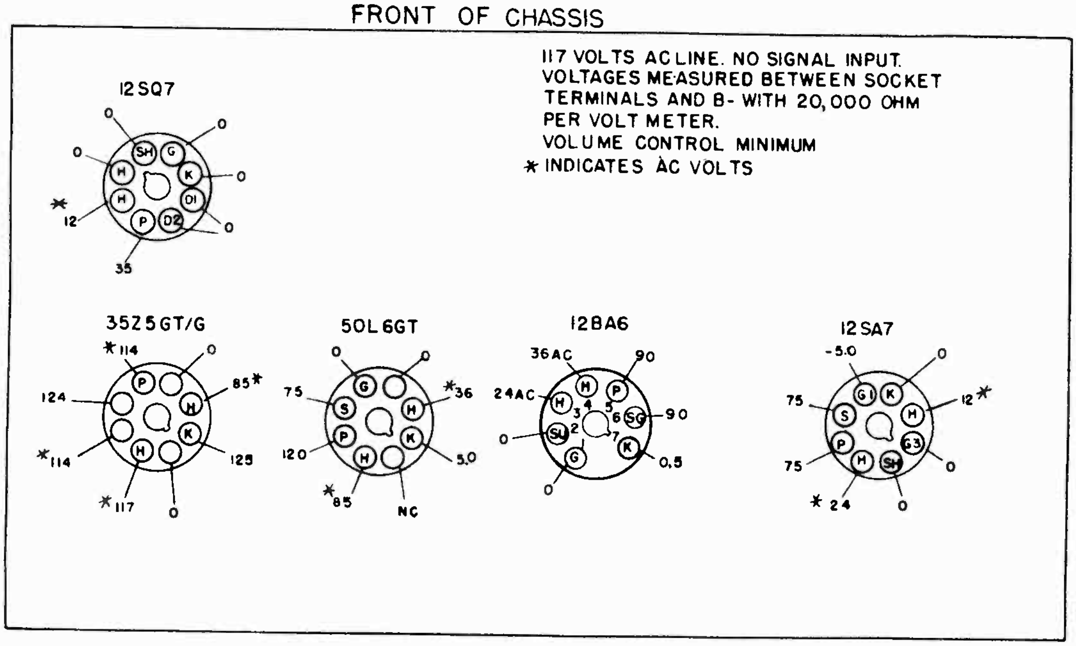
MODEL 402

MODEL 402 PRELIMINARY REPLACEMENT PARTS LIST

Cat. No.	Symbol	Description
UNIVERSAL REPLACEMENT PARTS		
*UCC-041	C14	CAPACITOR—.02 mf., 600 v., paper
UCC-036	C11	CAPACITOR—.002 mf., 600 v., paper (alternate replacement for C11 of RCW-3013)
UCC-039	C13	CAPACITOR—.005 mf., 600 v., paper (alternate replacement for C13 of RCW-3013)
*UCC-045	C16, C17, C18	CAPACITOR—.05 mf., 600 v., paper
*UCU-020	C4	CAPACITOR—47 mmf., 500 v., mica
UCU-1036	C10, C12	CAPACITOR—220 mmf, mica (alternate replacement for C10 or C12 of RCW-3013)
*URD-009	R10	RESISTOR—22 ohms, ½ w., carbon
URD-017	R2	RESISTOR—47 ohms, ½ w., carbon
*URD-029	R8	RESISTOR—150 ohms, ½ w., carbon
*URD-081	R1	RESISTOR—22,000 ohms, ½ w., carbon
*URD-113	R6, R11	RESISTOR—470,000 ohms, ½ w., carbon
*URD-121	R7	RESISTOR—1 megohm, ½ w., carbon
*URD-129	R3	RESISTOR—2.2 megohms, ½ w., carbon
*URD-137	R5	RESISTOR—4.7 megohms, ½ w., carbon
*URF-049	R9	RESISTOR—1000 ohms, 2 w., carbon
SPECIALIZED REPLACEMENT PARTS		
*RAB-108	L1	CABINET BACK AND LOOP ASSEMBLY
*RAU-311		CABINET—(brown)
SPECIALIZED REPLACEMENT PARTS (CONT'D)		
*RCE-050	C15A, B	CAPACITOR—Electrolytic—50 mf., 150 v., 50 mf., 150 v.
*RCT-036	C2A, B	CAPACITOR—Tuning
*RCW-3013	C10, 11, 12, 13	CAPACITOR—.220 mmf., .002 mf., 220 mmf., .005 mf. respectively (Bull Plate)
*RDC-032		DIAL CORD—Quantity, 25 yds.
*RDK-181		KNOB—Volume or tuning control
*RDP-049		POINTER—Dial scale pointer
RDS-096		DIAL SCALE
*RHC-017		CLIP—Osc. coil clip for L2
*RHC-024		CLIP—(capacitor mounting) 1 in.
*RHG-018		GROMMET (Tuning Gang mounting)
*RHH-004		SNAP FASTENER (For Loop Back)
*RHJ-007		SPACER (Tuning Gang Mounting)
*RHM-039		CLIP—(Pilot light) ½ in.
*RHM-046		MOUNTING CLIP (Dial scale)
*RJC-004		CLIP (Antenna loop connecting clip)
*RJS-003		TUBE SOCKET—For V1, 3, 4 and 5
*RJS-141		TUBE SOCKET—For V2
*RJS-096		PILOT LIGHT SOCKET
*RLC-090	L2	OSCILLATOR COIL
*RMS-118		DRUM SPRING (Dial cord spring)
*RMX-149		TUNING SHAFT AND BUSHING ASSEMBLY
*RRC-077	R4, S1	VOLUME CONTROL AND SWITCH
*RTL-092	T2	1st I.F. TRANSFORMER
*RTL-093	T3	2nd I.F. TRANSFORMER
*RTO-078	T1	OUTPUT TRANSFORMER
*RWL-009		POWER CORD
S527D		SPEAKER—5½ in.

*Used on previous Models.

FRONT OF CHASSIS



BOTTOM VIEW OF CHASSIS

Fig. 5. Socket Voltages

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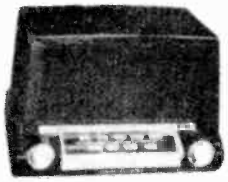
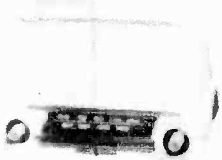
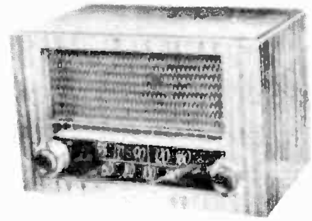
MODELS 404, 405, 410



MODEL 404



MODEL 405



MODEL 410

SPECIFICATIONS

	Model	404	405	410
CABINET:	Composition	Brown, plastic	Ivory, plastic	Wood, mah.
	Height	8¾ in.		9⅛ in.
	Width	7¼ in.		7 in.
	Length	13 in.		13¼ in.
POWER SUPPLY:	Voltage	105–120 volts		
	Frequency	50-60 cycles or DC		
	Voltage	30 watts		
OPERATING FREQUENCIES:	Broadcast Band	540–1600 KC		
	IF Amplifier	455 KC		
POWER OUTPUT:	Undistorted	1 watt		
	Maximum	1.75 watts		
LOUDSPEAKER:	Type	Alnico 5 PM		
	Outside Cone Diameter	5¼ inches		
	Voice coil impedance at 400 cycles	3.2 ohms		

TUBE COMPLEMENT:

Symbol	Purpose	Type
V1	RF Amplifier	12SK7
V2	Oscillator Converter	12SA7
V3	IF Amplifier	12BA6
V4	Detector-Audio Amplifier	12SQ7
V5	Rectifier	35Z5
V6	Audio Power Amplifier	35L6GT
I1	Pilot Lamp	GE Mazda No. 47

STAGE GAINS AND VOLTAGE CHECKS

Stage gain measurements by 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 are taken with low signal input so that AVC is not effective.

1. I-F Gain

12SA7 Grid to 12BA6 Grid	50 @ 455 KC
12BA6 Grid to 12SQ7 Diode Plate	50 @ 455 KC

2. Audio Gain

Input of 0.15 volts at 400 cycles across volume control (R6) with control set at maximum will develop approximately ½ watt output across the speaker voice coil terminals.

3. Oscillator Grid Bias

D-C voltage developed across the oscillator grid leak (R4) averages 8.5 volts at 1000 kc.

4. Tube Socket Pin Voltages

Fig. 3 shows voltages from tube pins to B−. Voltage readings differing greatly from those specified may help localize defective components.

RCW-3036, Bull Plate K71J736

The lead connections for the three-section ceramic capacitor unit containing C11, C12 and C13 are identified from the illustration of Fig. 4.

Replacement

The three-section unit is cataloged RCW-3036 in the parts list for direct replacement. However, any single section may be replaced by one of the single unit capacitors cataloged for the respective capacitor symbol. These items are: UCC-037, C11; UCC-039, C13; and UCU-1036, C12.

ELECTRICAL CIRCUIT ALIGNMENT

Equipment required:

1. Test oscillator with tone modulation
2. AC voltmeter, 1½ volts full scale.
3. Paper capacitor, 0.05 mf.
4. Insulated screwdriver.
5. Coupling loop for test oscillator (see text).
6. Isolation transformer.

Alignment Procedure

The alignment steps are given in table form of the Alignment Chart. Adjustment trimmers are shown in the illustration of Fig. 5.

1. The chassis is removed from the cabinet with the antenna loop and back attached and the speaker leads reconnected.

2. An isolation transformer should be used for the receiver power source when aligning or servicing AC-DC receivers to prevent short circuiting of equipment and shock hazard.

3. The output meter is connected across the terminals of the loudspeaker voice coil.

4. The receiver volume control should be turned to maximum and test oscillator signal output attenuated during alignment to develop not more than 1¼ volts output meter reading at the loudspeaker.

5. For i-f alignment, the high side of the signal generator output cable should be connected through a .05 mfd. paper capacitor to the points indicated in the Alignment Chart. The low side of the output cable is connected to the receiver chassis.

6. To align the oscillator and r-f trimmers, the signal generator output is inductively coupled to the radio loop, L1, by connecting a four-turn, six-inch diameter loop of bell wire across its output terminals and then locating the loop about one foot from the radio loop antenna. To prevent possible errors in comparative peak readings, the position of signal generator loop with respect to the radio loop antenna should not be changed during measurement.

ALIGNMENT CHART

Step	Connect Test Oscillator to:	Test Osc. Setting	Radio Dial Setting	Adjust Trimmers for Maximum
I-F ALIGNMENT				
1	V3, 12BA6 grid (Pin 1), in series with 0.5 mfd.		......	C9 and C8 of second i-f transformer T3.
2	V2, 12SA7 grid (Pin 8), in series with .05 mfd.	455 KC	......	C7 and C6 of first i-f transformer, T2
3			......	Recheck adjustment of C9, C8, C7, C6, for maximum
R-F ALIGNMENT				
4	Inductively coupled to radio loop.	1620 KC	Minimum capacity C1A, C1B	C3, oscillator trimmer
5		1500 KC	Tune for Maximum	C1, r-f trimmer C2, ant. trimmer

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MODELS 404, 405, 410

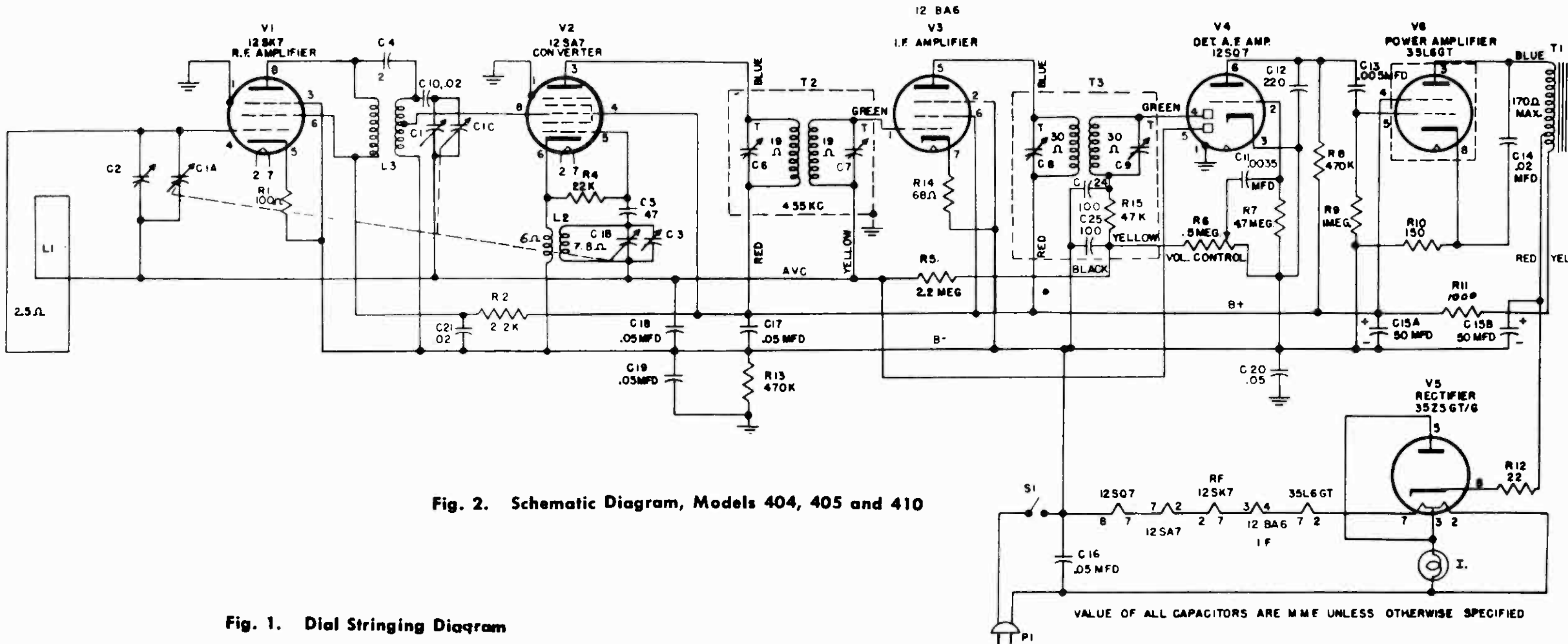
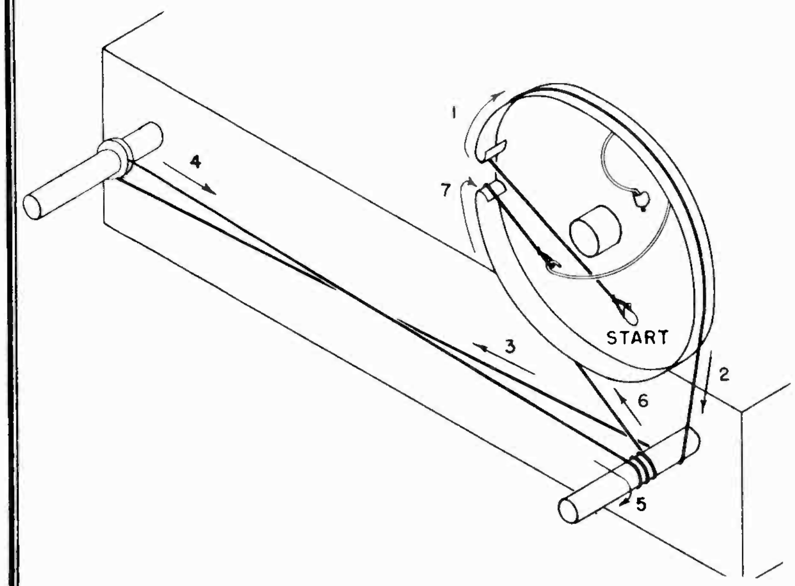


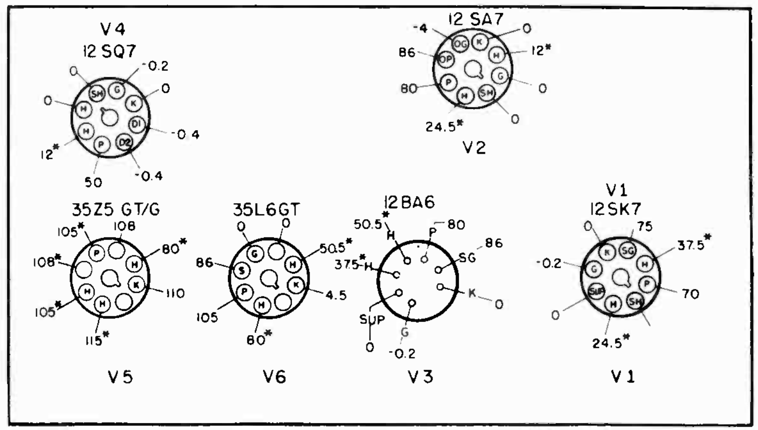
Fig. 2. Schematic Diagram, Models 404, 405 and 410

VALUE OF ALL CAPACITORS ARE MMF UNLESS OTHERWISE SPECIFIED

Fig. 1. Dial Stringing Diagram



FRONT OF CHASSIS



BOTTOM VIEW OF CHASSIS

117 VOLTS AC LINE, NO SIGNAL INPUT.
VOLTAGES MEASURED BETWEEN
SOCKET TERMINALS AND B- WITH
20,000 OHMS PER VOLT METER.
VOLUME CONTROL MINIMUM
* INDICATES AC VOLTS.

Fig. 3. Socket Voltage Diagram

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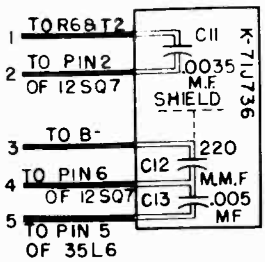

Fig. 4. Capacitor RCW-3036

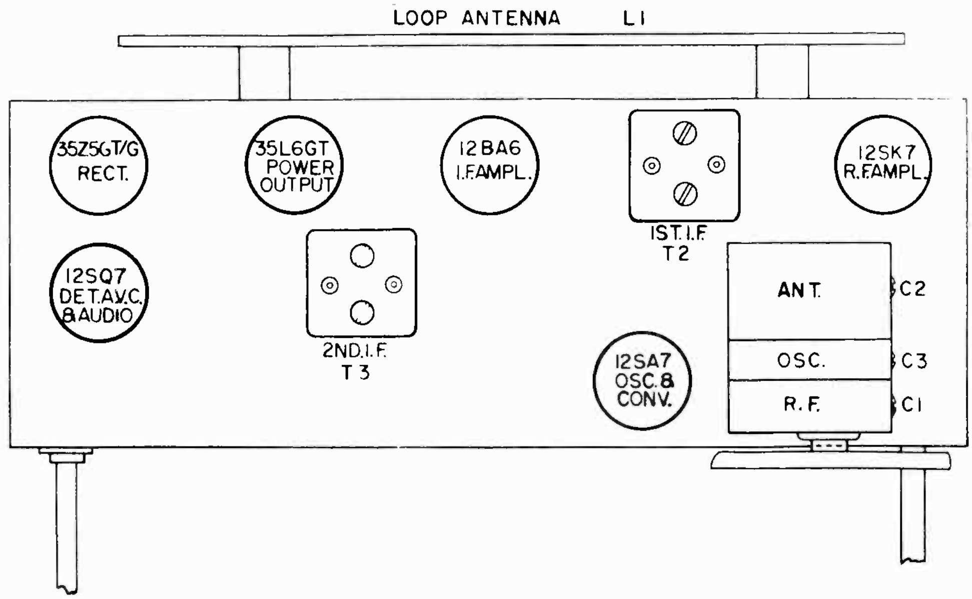

Fig. 5. Tube and Trimmer Location

MODELS 404, 405 AND 410 REPLACEMENT PARTS LIST

Cat. No.	Symbol	Description
UNIVERSAL REPLACEMENT PARTS		
UCC-037	C11	CAPACITOR—.003 mf., 600 v., paper (alternate replacement for RCW-3036)
UCC-039	C13	CAPACITOR—.005 mf., 600 v., paper (alternate replacement for RCW-3036)
UCC-041	C14, C21	CAPACITOR—.02 mf., 600 v., paper
UCC-045	C16, C17, C18, C19, C20	CAPACITOR—.05 mf., 600 v., paper
UCU-020	C5	CAPACITOR—47 mmf., mica
UCU-028	C4	CAPACITOR—100 mmf., mica
UCU-1036	C10, C12	CAPACITOR—220 mmf., mica (alternate replacement for RCW-3036)
URD-009	R12	RESISTOR—22 ohms, ½ w., carbon
URD-021	R14	RESISTOR—68 ohms, ½ w., carbon
URD-025	R1	RESISTOR—100 ohms, ½ w., carbon
URD-029	R10	RESISTOR—150 ohms, ½ w., carbon
URD-057	R2	RESISTOR—2.2 K ohms, ½ w., carbon
URD-081	R4	RESISTOR—22,000 ohms, ½ w., carbon
URD-113	R8, R13	RESISTOR—470,000 ohms, ½ w., carbon
URD-121	R9	RESISTOR—1 meg., ½ w., carbon
URD-129	R5	RESISTOR—2.2 meg., ½ w., carbon
URD-137	R7	RESISTOR—4.7 meg., ½ w., carbon
URF-049	R11	RESISTOR—1000 ohms, 2 w., carbon
SPECIALIZED REPLACEMENT PARTS		
RAB-142	L1	CABINET BACK—With antenna loop, Models 404, & 405
RAB-143	L1	CABINET BACK—With antenna loop, Model 410
RAV-128		CABINET—Wood cabinet, Model 410
RAU-345		CABINET—Brown cabinet (plastic) with dial scale & knob bezels, for Model 404
RAU-346		CABINET—Ivory cabinet (plastic) with dial scale & knob bezels, 405
RCE-050	C15A, B	CAPACITOR—50 mf., 150 v., 50 mf., 150 v.; dry electrolytic
RCN-039	C4	CAPACITOR—2 mmf., mica
RCT-046	C1A, B, C, C2, C3	CAPACITOR—Tuning capacitor with trimmers
RCW-3036	C11, C12, C13	CAPACITOR—.0035 mf., 220 mmf., .005 mf., three section, ceramic (see UCC-037, UCC-039, UCU-1036)
RDC-032		CORD—Bulk dial cord
RDK-181		KNOB—Model 404
RDK-228		KNOB—Knob and Bezel assembly, Model 410
SPECIALIZED REPLACEMENT PARTS (CONT'D)		
RDK-229		KNOB—Model 405
RDM-024		MASK—Cardboard mask
RDP-055		POINTER—Dial scale pointer Models 404, 405
RDP-057		POINTER—Dial scale pointer Model 410
RDS-100		DIAL SCALE, Models 404 & 405
RDS-101		DIAL SCALE, Model 410
RHC-017		CLIP—Mounting clip for oscillator coil L2
RHC-037		CLIP—for dial drum
RHC-038		CLIP—for RF coil
RHG-006		GROMMET—On tuning shaft
RHG-018		GROMMET—Cushion mounting for tuning capacitor
RHG-032		GROMMET—Speaker lead ins.
RHH-004		SNAP FASTENER—Holds loop back to cabinet
RHJ-007		SPACER—Spacer bushing for mounting tuning capacitor
RHS-061		SCREW—for loop back mounting
RHS-062		SCREW—for chassis mounting
RHS-063		SCREW—for tuning capacitor mounting
RJC-004		CONNECTOR—Antenna loop lead connecting clip
RJS-003		SOCKET—Tube socket
RJS-141		SOCKET—Tube socket for 12 BA6
RJS-151		SOCKET ASSEMBLY—Pilot light socket
RLC-105	L2	COIL—Oscillator coil
RLI-125		COIL—R-F coil
RMS-118		SPRING—Dial cord tension spring
RMW-070		PULLEY—Idler pulley
RMX-174		SHAFT AND BUSHING—Tuning shaft and mounting bushing, Models 404 405
RMX-175		DRIVE SHAFT AND BUSHING ASSEMBLY, for Model 410
ROP-020		SPEAKER—PM speaker, Models 404 and 405
RRC-149	R6, S1	POTENTIOMETER—500,000 ohms; volume control and switch S1, Models 404 and 405
RRC-150		POTENTIOMETER—0.5 megohm volume control and switch, Model 410
RTL-115	T2	TRANSFORMER—First i-f transformer
RTL-116	T3	TRANSFORMER—Second i-f transformer
RTO-083	T1	TRANSFORMER—Audio output transformer
RWL-009		POWER CORD—A-c power cord and plug

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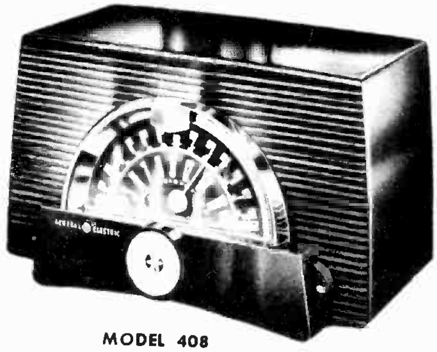
MODEL 408



MODEL 408

CAUTION

ALWAYS USE AN ISOLATION TRANSFORMER IN THE RECEIVER POWER LINE WHEN SERVICING OR ALIGNING THIS RECEIVER TO PROTECT TEST EQUIPMENT.

SPECIFICATIONS

CABINET

Material	plastic
Color	mahogany
Height	$8\frac{1}{16}$ inches
Width	$13\frac{1}{2}$ inches
Depth	$7\frac{9}{32}$ inches

ELECTRICAL

Voltage	105–125 AC or DC
Frequency on AC	50 to 60 cps
Wattage	40 watts

TUNING RANGE

AM	540–1620 kc
FM	88–108 mc

INTERMEDIATE FREQUENCIES

AM	455 kc
FM	10.7 mc

POWER OUTPUT

Undistorted	1.0 watts

LOUDSPEAKER

Type	permanent magnet
Size	$5\frac{1}{4}$ inches
Voice Coil Impedance at 410 cps	3.2 ohms

ANTENNA

AM	built-in loop
FM	power line antenna or 300 FM ant.

GENERAL

Model 408 is a table model receiver providing reception on the AM band (540 to 1620 kc) and the FM band (88–100 mc). The receiver is housed in a mahogany colored plastic cabinet.

The receiver has a built-in FM power-line antenna. To operate the receiver from the built-in FM power cord antenna it is necessary to connect the power-line antenna wire to FM antenna terminal which is connected to pin 1 of V2 through C3.

Note: To remove the dial scale it is necessary to remove the escutcheon to gain access to the dial scale mounting screws. Remove the escutcheon by pushing forward on the escutcheon mounting studs from inside of the cabinet.

VOLTAGE CHECKS

1. AM STAGE GAIN MEASUREMENTS AT 455 KC.

Grid (Pin 1) of V3 to Grid (Pin 1 of V4)	70
Grid (Pin 1) of V4 to Pin 6 of V6	80

2. FM SENSITIVITY MEASUREMENTS.

The following voltages are required at the point of input designated to produce one volt d-c from the limiter grid (pin 1 of V5) to chassis. Measure with a VTVM or a 20,000 ohm per volt meter in series with a 200,000 ohm resistor. Connect the 200,000 ohm resistor directly to the grid of V5. Use the microamp scale of meter to measure 5 microamps d-c through 200,000 ohms (1 volt d-c). Use a 10,000 ohm resistor connected directly to the grid (pin 1) of V5 to isolate the VTVM.

FM-IF.

Couple the input signal to the point of input through a 3300 ohm resistor and a 1000 mmfd. capacitor in series. Make chassis connections short and as close to the point of input as possible.

V4 Grid (Pin 1) for One Volt at Pin 1 of V5	45,000 microvolts at 10.7 mc
V3 Grid (Pin 1) for One Volt at Pin 1 of V5	1,000 microvolts at 10.7 mc
V1 Cathode (Pin 8) for One Volt at Pin 1 of V5	30,000 microvolts at 10.7 mc
*V1 Grid (Pin 7) for One Volt at Pin 1 of V5	100 microvolts at 10.7 mc

*Note: It is necessary to disconnect the copper strap from pin 7 of V1 to the gang condenser C1 at the gang end when coupling into the converter grid.

FM-RF.

Couple the input signal into the antenna terminals.

The signal generator should be properly terminated in 300 ohms to match the input impedance of this receiver. This may be done by adding a resistor in the high side of the generator output so that the sum of the generator output impedance and the resistor totals 300 ohms. Connect high side of generator to antenna terminal which is connected to Pin 1 of V2 by C3.

Disconnect power cord antenna from the antenna terminal 25 microvolts at 88 mc for 1 volt d-c at pin 1 of V5.

3. AUDIO GAIN

.1 Volt at 400 cps applied across the volume control with volume control set at maximum should give approximately ½ watt output.

4. OSCILLATOR GRID BIAS

D-c voltage developed across R28 should be approximately 8 volts at 1000 kc, and approximately 3 volts at 98 mc measured with a vacuum tube voltmeter.

5. HUM MEASUREMENT

Hum measured across the voice coil of the speaker, with the volume control set at minimum and the band switch set on AM should not exceed 7 millivolts.

Turn the band switch to FM and connect the limiter grid (Pin 1 of V5) to chassis through .01 mfd. Set the volume control at maximum. The hum should not exceed 15 millivolts.

ALIGNMENT

EQUIPMENT REQUIRED FOR METER ALIGNMENT

1. General Electric YGS-3 or equivalent signal generator.
2. 20,000 ohm per voltmeter or vacuum tube voltmeter.
3. One 200,000 ohm ½ watt resistor.
4. Output meter.
5. Loop for coupling AM r-f signal to radio loop.
6. One 3,300 ohm ½ watt resistor.
7. One 1000 mmfd mica capacitor.

METER ALIGNMENT NOTES

1. Connect a 20,000 ohm-per-volt meter across the volume control. Use the ten volt d-c scale.

2. Connect a 20,000 ohm per volt meter from the grid (pin 1 of V5) to the chassis in series with a 200,000 ohm resistor. The resistor must be connected directly to the grid pin to minimize capacity loading and to isolate the i-f signal from the meter. Keep the signal generator output low so that the meter does not indicate more than one volt d-c at the grid (pin 1) of V5 (5 microamps through 200,000 ohms). (Use microamp scale of meter.)

A vacuum tube voltmeter may be used to measure the one volt d-c at the grid of V5.

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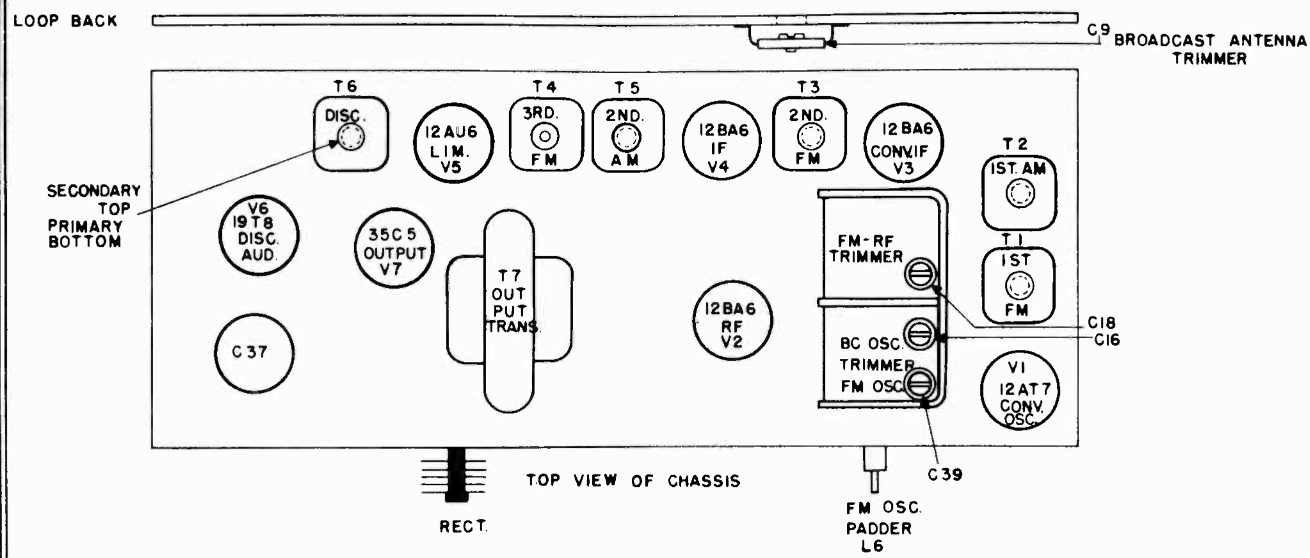

Fig. 1. Tube and Trimmer Location

3. Connect an output meter across the speaker voice coil. Turn the volume control full on. Keep the signal generator output low so that the output meter does not indicate more than ½ watt output.

4 Align the AM oscillator (C16) and the r-f trimmer (C9) by coupling the signal to the loop antenna inductively. Connect a four-turn, six-inch diameter loop of wire across the signal generator output terminals and locate the loop about one foot from the radio loop antenna. The position of the loop should not be changed during alignment to prevent possible errors in peak readings.

5. Calibration points are stamped on the back side of the tuning drum of C1. Set the wire indicator to the zero mark with C1 at maximum capacity (gang fully closed).

6. The pointer must be indexed to the vertical mark on the cabinet when the 98 mark on the back side of the tuning drum is opposite the wire indicator.

7. The termination impedance of the signal generator should be 300 ohms for FM r-f alignment. The generator impedance should be low for step 10 alignment. For steps 5, 6, 7, 8 and 9 couple the high side of the signal generator to the signal input point through a 1000 mmf capacitor in series with a 3300 ohm ½ watt carbon resistor. Make chassis connections for FM i-f alignment as short as possible and near to the input point.

METER ALIGNMENT CHART

Step No.	Signal Generator Frequency	Signal Input Point	Band Switch Setting	Dial Setting	Adjust	See Note
			AM I-F ALIGNMENT			
1	455 kc AM modulated	Pin 1 of V4 chassis.	AM	—	T5 for max.	3
2		Pin 1 of V3 and chassis			T2 for max.	
			RF I-F ALIGNMENT			
3	1620 kc AM mod.	Inductively coupled. See note 4.	AM	Gang C1 fully open	C16 for max.	3, 4, 5, 6
4	1500 kc AM mod.			Tune for max. output	C9 for max. while rocking gang C1	
			FM DISCRIMINATOR AND I-F ALIGNMENT			
5	10.7 mc unmodulated	Pin 1 of V4 and chassis	FM	—	Core of T4 for max.	2, 7
6					Secondary of T6 for zero.	1, 7
7	Detune signal generator for max. reading				Primary of T6 for max.	
8	10.7 mc unmodulated				Core of T4 for max.	2, 7
9		Pin 1 of V3 and chassis.			Cores of T3 for max.	
10		Pin 8 of V1 and chassis.			Cores of T1 for max.	
			FM R-F ALIGNMENT			
11	88 mc unmodulated	FM antenna terminals.	FM	At 88 on drum	Core of L6 for max.	2, 5, 6, 7
12	108 mc unmodulated			At 108 on drum	C39 for max.	
13				Rock in C1 for max.	C18 for max.	

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MODEL 408

EQUIPMENT REQUIRED FOR VISUAL ALIGNMENT

1. General Electric YGS-3 or equivalent sweep generator.
2. General Electric ST2A scope or equivalent and chassis.
3. One megohm ½ watt resistor.
4. One 3300 ohm ½ watt resistor.
5. One 1000 mmfd mica capacitor.

NOTES FOR VISUAL ALIGNMENT

1. Connect vertical plates of scope to the grid of limiter (pin 1 of V5) through 1 meg. resistor and to chassis.

2. Connect vertical slates of scope to pin 3 of V6 through 1 meg. and to chassis.

3. Connect vertical plates of scope across volume control R19 through 1 meg.

4. In some cases tuning of the converter grid will cause "pulling in" of the oscillator and will change the oscillator frequency. If peaking C9 or C18 as in steps 4 or 14 causes the curve to move off the screen, it is necessary to recalibrate the oscillator as in steps 3, 12 and 13.

5. The termination impedance of the signal generator should be 300 ohms to properly match the FM input impedance on this receiver.

6. The pointer must be indexed to the vertical mark on the cabinet when the 98 mark on the back of the tuning drum is opposite the wire indicator (see note 7).

7. Calibration points are stamped on the rear side of the tuning drum of C1. Set the wire indicator to the zero mark with C1 at maximum capacity (gang condenser fully closed).

8. 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 wire to the signal generator terminals. Locate this loop about one foot from the radio loop antenna. The position of this loop to the radio antenna loop should not be changed during alignment to prevent errors in the peak readings.

9. When coupling generator to grid in steps 5, 6, 7, 8, 9, and 10 use couple through a 3300 ohm resistor and a 1000 mmfd mica capacitor in series. Use short chassis connections to prevent regeneration. When coupling to the grid of V1 pin 8 in step 11 the output impedance of the signal generator should be low (below 100 ohms) to give maximum signal for alignment.

VISUAL ALIGNMENT CHART

Step No.	Signal Generator Frequency	Signal Input Point	Band Switch Setting	Dial Setting	Adjust	See Note
			AM I-F VISUAL ALIGNMENT			
1	455 kc FM mod. ± 20 kc at 60 cps rate	Pin 1 of V4 through .01 mfd. and chassis	AM	—	T5 for max. amplitude of curve. See Fig. 2A.	3
2		Pin 1 of V3 through .01 mfd. and chassis			T2 for max. amplitude of curve. See Fig. 2A.	
			AM R-F ALIGNMENT			
3	1620 kc AM mod. with 60 cps	Inductively coupled	AM	Gang C1 completely open	C16 for steepest slope of straight line on scope.	3, 4, 6, 7, 8
4	1500 kc FM mod. ± 20 kc at 60 cps rate			Gang C1 for max amplitude of curve	C9 for max. amplitude of curve. See Fig. 2A.	
			FM I-F AND DISCRIMINATOR ALIGNMENT			
5	10.7 mc FM mod. ±300 kc at 60 cps rate	Pin 1 of V4	—		Core of T4 for max. amplitude of curve. See Fig. 2A.	1, 9
6					Secondary of T6 for symmetry of curve of Fig. 2B.	2, 9
7					Primary of T6 for max. amplitude of positive and negative peak.	
8	Repeat step 6					
9	10.7 mc FM mod. ±300 kc at 60 cps rate	Pin 1 of V4	FM	—	Core of T4 for max. amplitude of curve. See Fig. 2A.	1, 9
10		Pin 1 of V3 and chassis			Cores of T3 for max. amplitude of curve. See Fig. 2A.	
11		Pin 8 of V1 and chassis			Cores of T1 for max. amplitude of curve. See Fig. 2A.	
			FM R-F VISUAL ALIGNMENT			
12	88 mc AM mod. at 60 cps.	FM antenna terminals	FM	At 88 on C1 drum	Core of L6 steepest slope of straight line trace on scope.	1, 4, 5, 6, 7
13	108 mc AM mod. at 60 cps.			At 108 on C1 drum	C39 for steepest slope of straight line trace on scope.	
14	108 mc FM mod. ±300 kc at 60 cps rate			Rock in C1 for max.	Adjust C18 for max. amplitude of response. See Fig. 2A.	

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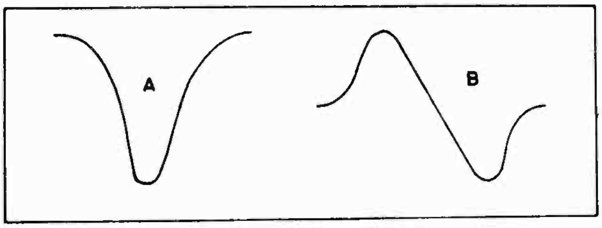


Fig. 2. I-F and Discriminator Curves

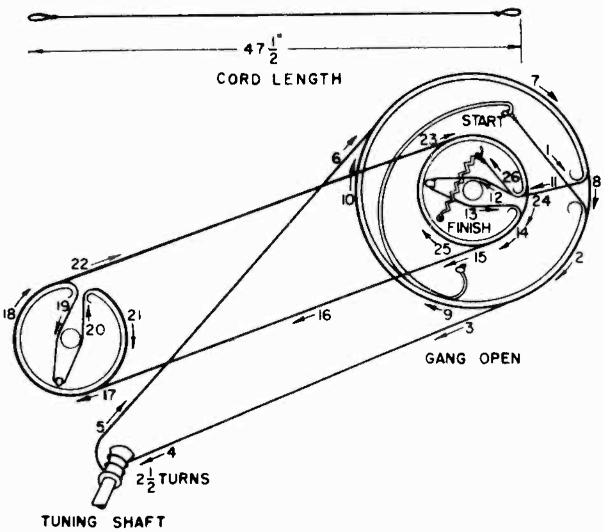


Fig. 3. Dial Stringing Diagram

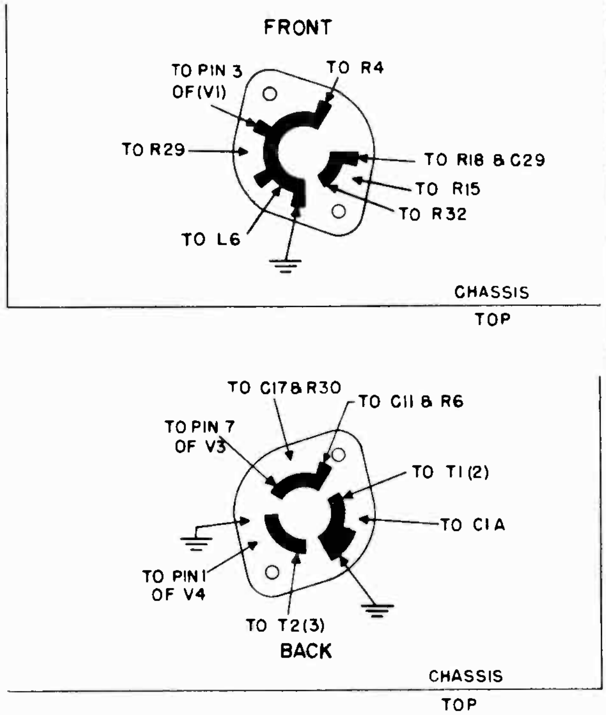
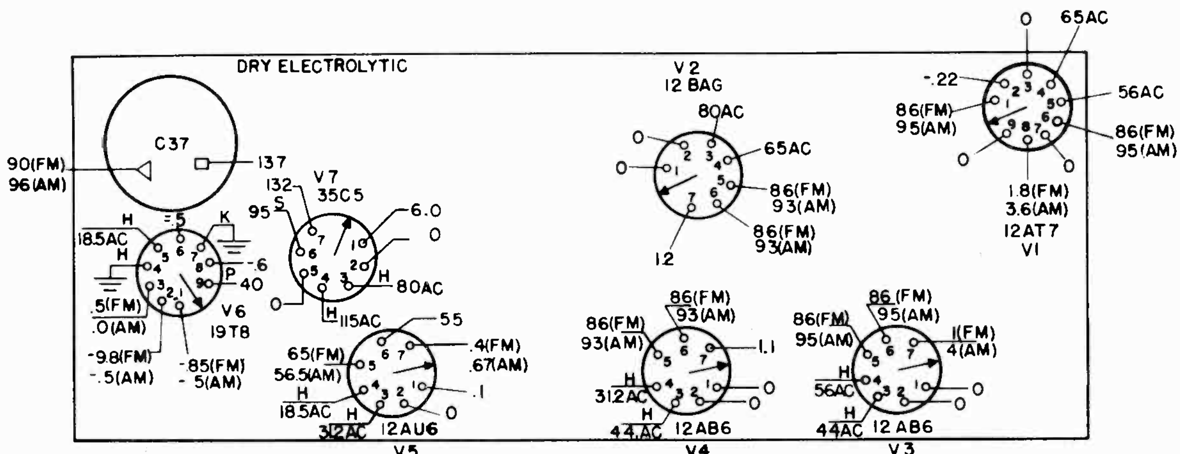


Fig. 4. Band Switch Connections



ALL VOLTAGES ARE +DC
UNLESS OTHERWISE SPECIFIED
ALL VOLTAGES TO CHASSIS
VOLUME MINIMUM

BACK OF CHASSIS
BOTTOM VIEW OF CHASSIS

VOLTAGES MEASURED WITH EL-120V
D.C. VOLTAGES WITH 20,000 OHMS PER VOLT METER
A.C. VOLTAGES WITH 1,000 OHMS PER VOLT METER

Fig. 5. Socket Voltage Diagram

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MODEL 408

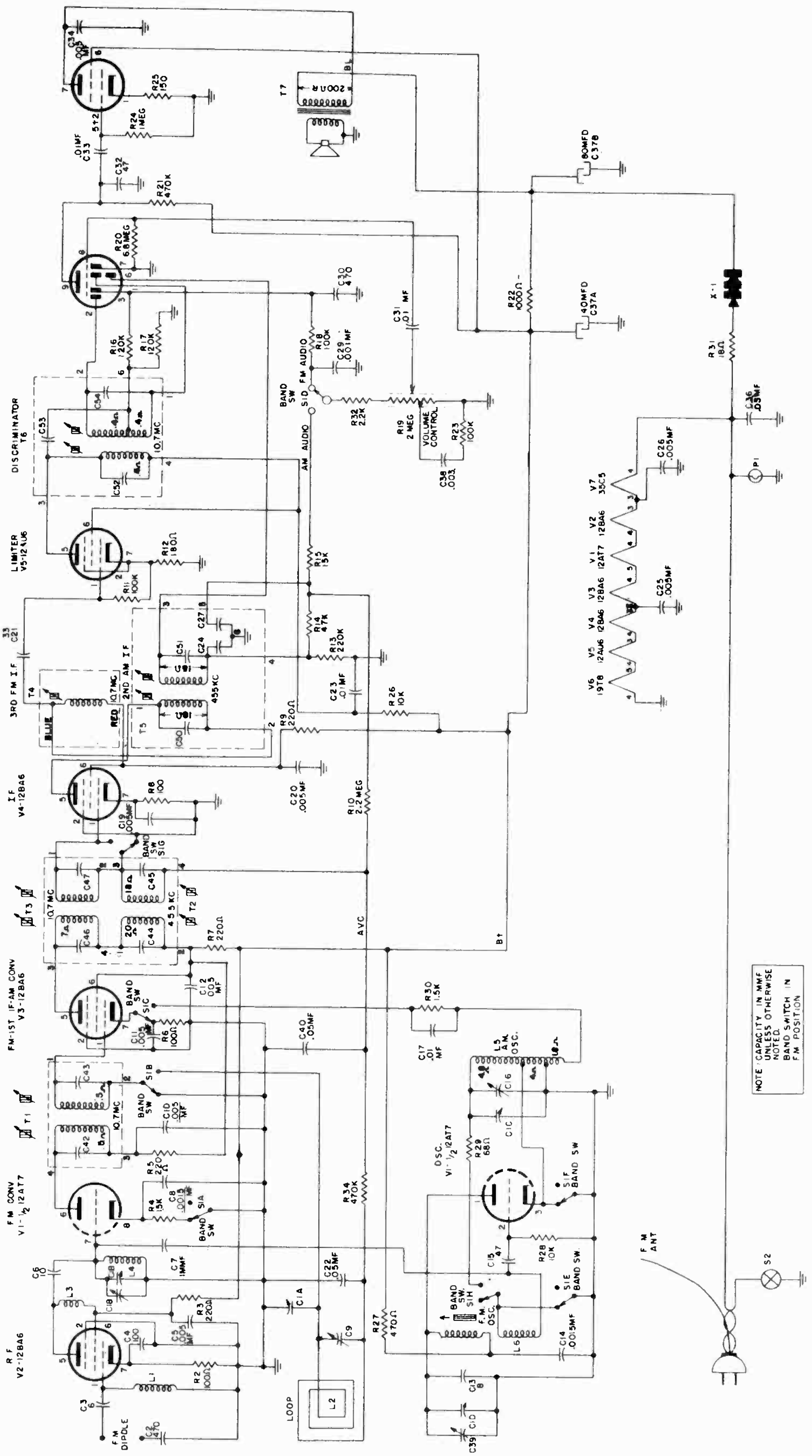

Fig. 6. Schematic diagram

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MODEL 408
REPLACEMENT PARTS LIST

UNIVERSAL REPLACEMENT PARTS

Cat. No.	Symbol	Description
*UCC-035	C29	CAPACITOR—.001 mfd., 600 v., paper
UCC-037	C38	CAPACITOR—.003 mfd., 600 v., paper
*UCC-039	C34, 36	CAPACITOR—.005 mfd., 600 v., paper
*UCC-040	C17, C23, C31, C33	CAPACITOR—.01 mfd., 600 v., paper
*UCC-045	C40, C22	CAPACITOR—.05 mfd., 600 v., paper
UCG-002	C3	CAPACITOR—6 mmf., mica
UCG-004	C6	CAPACITOR—10 mmf., mica
UCG-016	C21	CAPACITOR—33 mmf., mica
*UCG-020	C15, C32	CAPACITOR—47 mmf., mica
*UCU-044	C2, C30	CAPACITOR—470 mmf., mica
*URD-007	R31	RESISTOR—18 ohms, ½ w., carbon
*URD-021	R29	RESISTOR—68 ohms, ½ w., carbon
*URD-025	R2, R6, R8	RESISTOR—100 ohms, ½ w., carbon
*URD-029	R25	RESISTOR—150 ohms, ½ w., carbon
*URD-031	R12	RESISTOR—180 ohms, ½ w., carbon
*URD-033	R3, R5, R7, R9	RESISTOR—220 ohms, ½ w., carbon

Cat. No.	Symbol	Description
*URD-041	R27	RESISTOR—470 ohms, ½ w., carbon
*URD-053	R4, R30	RESISTOR—1500 ohms, ½ w., carbon
*URD-057	R32	RESISTOR—2200 ohms, ½ w., carbon
*URD-073	R26, R28	RESISTOR—10,000 ohms, ½ w., carbon
*URD-077	R15	RESISTOR—15,000 ohms, ½ w., carbon
*URD-089	R14	RESISTOR—47,000 ohms, ½ w., carbon
*URD-097	R11, R18, R23	RESISTOR—100,000 ohms, ½ w., carbon
*URD-099	R16, R17	RESISTOR—120,000 ohms, ½ w., carbon
*URD-105	R13	RESISTOR—220,000 ohms, ½ w., carbon
*URD-113	R21, R24, R34	RESISTOR—470,000 ohms, ½ w., carbon
*URD-129	R10	RESISTOR—2.2 meg., ½ w., carbon
*URD-141	R20	RESISTOR—6.8 meg., ½ w., carbon

SPECIALIZED REPLACEMENT PARTS

Cat. No.	Symbol	Description
RAB-129	L2	LOOP AND BACK ASSEMBLY
RAD-049		BRACKET (Pilot light)
RAU-335		CABINET (408)
RCE-101	C37A-B	CAPACITOR—150 v., electrolytic—80-40 mfd.
RCN-001	C7	CAPACITOR—1 mmf., ceramic
RCT-041	C1A, B, C, D, 16, 18	CAPACITOR—Tuning
*RCW-026	C8, C14	CAPACITOR—1500 mmf., ceramic
RCW-3029	C4	CAPACITOR—100 mmf., ceramic
*RCW-3014	C5, C10, C11, C12, C19, C20, C25, C26	CAPACITOR—.005 mfd., 600 v., ceramic
RCW-3034	C13	CAPACITOR—8 mmf., ceramic
*RCY-016	C9	CAPACITOR—2-20 mf., trimmer
*RDC-032		DIAL CORD
RDE-080		ESCUTCHEON—(Cabinet)
RDK-208		KNOB—(408) (band)
RDK-210		KNOB ASSEMBLY (tuning) (408)
RDK-211		KNOB (volume) (408)
RDP-051		POINTER—Dial pointer
RDS-094		DIAL SCALE
RDX-046		POINTER SHAFT AND DRUM
RER-010	X1	SELENIUM RECTIFIER
*RHC-017		CLIP—(Coil mounting)
RHC-034		CLIP—(Coil mounting)
*RHH-004		SNAP FASTENER
*RHM-043		RETAINING RING—Type "C"
RHS-048		TUBE SHIELD

Cat. No.	Symbol	Description
*RHX-010		SPACER—(Tuning condenser)
		GROMMET—(Tuning condenser)
RJS-118		TUBE SOCKET—Nine prong for V6
RJS-125		SUB TUBE SOCKET—(Seven prong)
RJS-143		TUBE SOCKET—For VI
*RJX-034		INTERLOCK TERMINAL—Female
		METAL CAP—Female
		INSULATING CAP—Female
RLA-035	L1	CHOKE—F.M. Antenna
*RLB-029	L4	CHOKE—F.M. R.F. Grid
RLC-103	L5	COIL—B.C. Oscillator
RLC-104	L6	COIL—F.M. Oscillator
RLP-017	L3	CHOKE—R.F. Plate
*RMF-006		CHASSIS FOOT
RML-049		KNOB LINK
*RMS-111		SPRING (Lg. Drum)
RMU-062		TUNING SHAFT ASSEMBLY
RMU-063		SHAFT (Band Switch)
RRC-148	R19, S2	VOLUME CONTROL AND SWITCH
*RRW-055	R22	RESISTOR—1000 ohms, w.w., 2 w.
*RSI-003		INTERLOCK—Male
RSW-078	S1	BAND SWITCH
*RTD-006	T6	F.M. DISCRIMINATOR
*RTL-079	T2	I.F. TRANSFORMER—1st B.C.
*RTL-100	T4	I.F. TRANSFORMER—3rd F.M.
RTL-111	T5	I.F. TRANSFORMER—2nd B.C.
RTL-112	T1	I.F. TRANSFORMER—1st F.M.
RTL-113	T3	I.F. TRANSFORMER—2nd F.M.
RTO-087	T7	OUTPUT TRANSFORMER
*RWL-022		POWER CORD SET—(Three wire)
RWX-031		PILOT LIGHT SOCKET ASSEMBLY
S527D		SPEAKER—5¼-inch

*USED ON PREVIOUS MODELS

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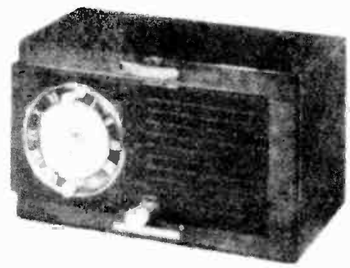
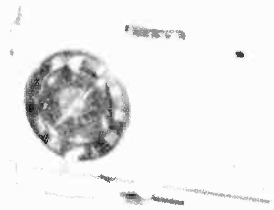
MODELS 500, 501



Model 500



Model 501

SPECIFICATIONS

CABINET

Model	500	501
Color	Mahogany	Ivory
Height	6$\frac{3}{16}$ in.	6$\frac{3}{16}$ in.
Width	10½ in.	10½ in.
Depth	5⅜ in.	5⅜ in.

ELECTRICAL RATING (INPUT)

Voltage . . . . . 105-120 volts, a-c
Frequency . . . . . 60 cycles
Wattage . . . . . 30 watts

OPERATING FREQUENCIES

Intermediate Frequency . . . . . 455 kc
Broadcast Band . . . . . 540-1600 kc

POWER OUTPUT

Undistorted 1
Maximum 1.75

LOUDSPEAKER

Type . . . . . Alnico 5 PM
Outside Cone Diameter 4-inch
Voice Coil Impedance (400 Cycles) . . . . . 3.5 ohms

TUBE COMPLEMENT

Oscillator-Converter . . . . . Type 12SA7
I-F Amplifier . . . . . Type 12BA6
Detector and 1st Audio . . . . . Type 12SQ7
Power Output . . . . . Type 50C5
Rectifier . . . . . Type 35W4

CAUTION: One side of the power line is connected to B−. Avoid any ground connections direct to B−. Use an isolating transformer when making service adjustments, with the chassis removed from the cabinet.

RADIO CIRCUIT ALIGNMENT

ALIGNMENT FREQUENCIES

R-F . . . . . 1500 kc
R-F . . . . . 1620 kc
I-F . . . . . 455 kc

EQUIPMENT REQUIRED

1. Test oscillator with tone modulation.
2. A-c output meter, 1½ volts full scale.
3. 0.05 mf. paper capacitor.
4. Loop.
5. Insulated screwdriver.

PROCEDURE—GENERAL

1. With the tuning scale control wheel turned so that the gang condenser plates are fully meshed, the index should read approximately $\frac{3}{16}$ inch to the right of the 550 kc scale calibration mark. If it does not, remove the control wheel from the gang condenser shaft and replace it for correct position. CAUTION: Do not attempt to correct the position by rotating the wheel on the shaft as this will cause the knob to slip.

2. For i-f alignment, it is necessary to remove the chassis from the cabinet.

3. Connect the output meter across the loudspeaker voice coil terminals.

4. Keep radio volume control at maximum and attenuate the test oscillator signal output so that the output meter reading never exceeds 1.0 volt.

5. Connect the capacitor as listed in column 2 between the output "High Side" of the test oscillator and the point of input specified.

6. For alignment of the oscillator and antenna trimmers, the input signal should be inductively coupled to the radio loop antenna, L1, by connecting a four-turn, six-inch diameter loop of bell wire across the signal generator output terminals, and then locating the loop to face the radio antenna loop about one foot away. To prevent possible errors in reference to previous signal measurement readings, the loop with respect to the radio loop should not be changed during any one set of adjustments.

ALIGNMENT CHART

Step	Connect Test Oscillator to	Test Osc. Setting	Dial Drum Setting	Adjust Trimmers for Maximum Output
1	12BA6 grid (1) in series with 0.05 mf. cap.	455 kc	Minimum Capacity	2nd i-f trans. trimmers, C14 and C15
2	12SA7 grid (8) in series with 0.05 mf. cap.	455 kc	Minimum Capacity	1st i-f trans. trimmers, C8 and C9
3	Inductively coupled to radio loop	1620 kc	Minimum Capacity	C4 (oscillator)
4	Inductively coupled to radio loop	1500 kc	Tune for Maximum	C3 (antenna)

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 input so that AVC is not effective.

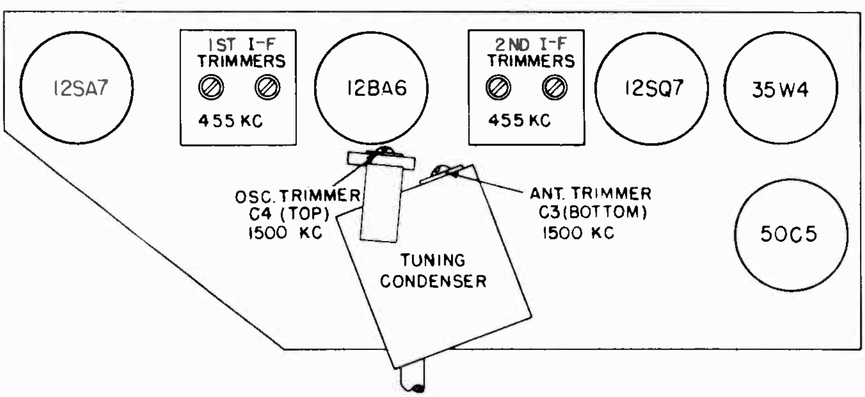


Fig. 1. Tube and Trimmer Location

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MODELS 500, 501

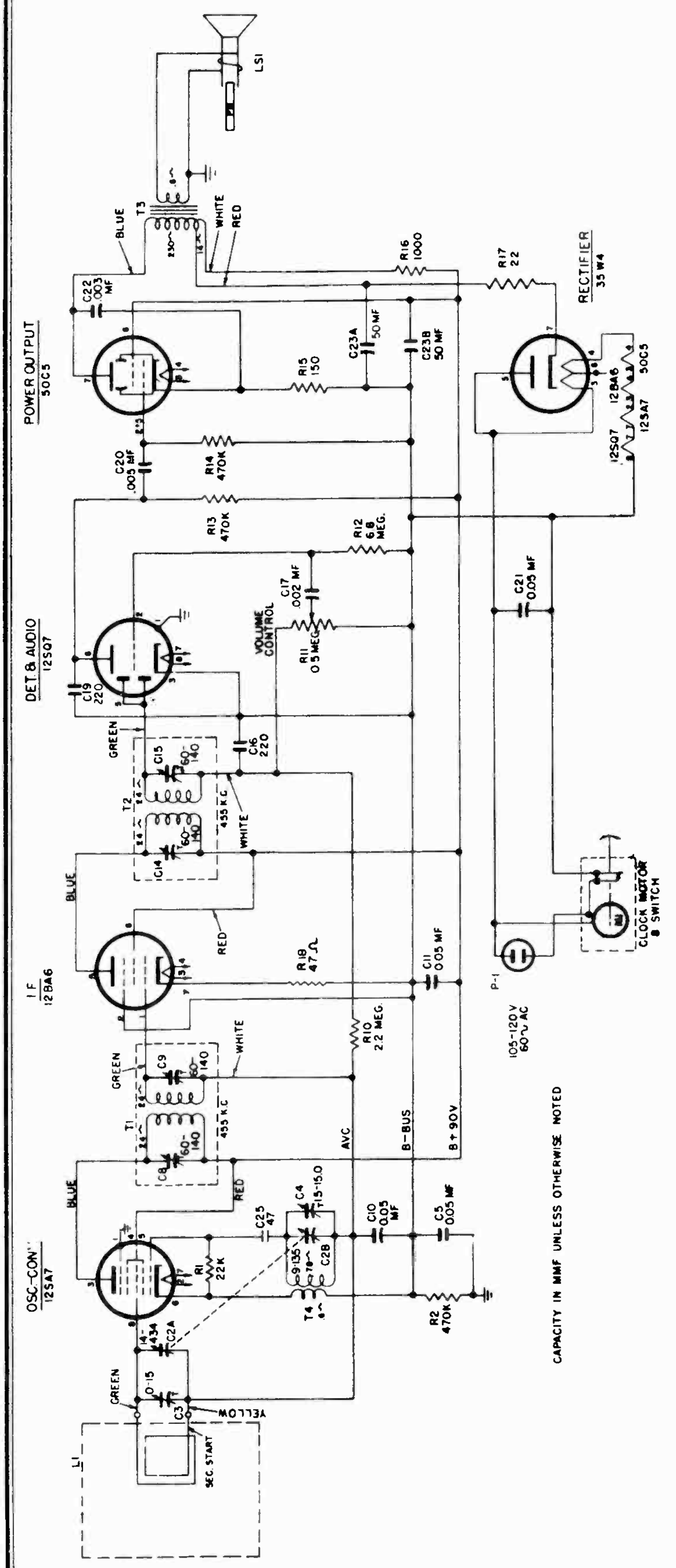

Fig. 2. Schematic Diagram, Models 500 and 501

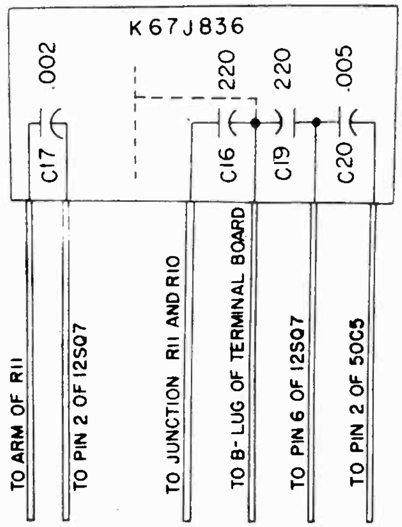

Fig. 4. Capacitor RCW-3013 (K67J836)

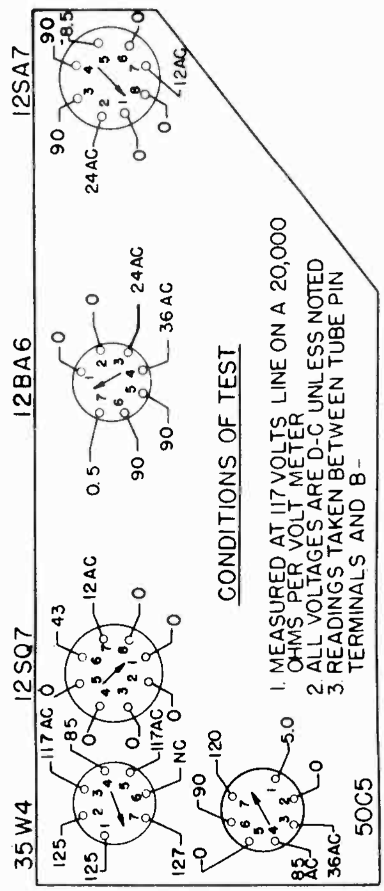

Fig. 3. Socket Voltages

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MODELS 500, 501

(1) R-F and I-F Stage Gains.
12SA7 Grid to 12BA6 Grid .... 50 @ 455 kc
12BA6 Grid to 12SQ7 Diode Plate .... 50 @ 455 kc
(2) Audio Gain.
0.15 volts at 400 cycles across the volume control (R11) with control set at maximum will give approximately ½-watt output across the loudspeaker, LS1, voice coil.
(3) Oscillator Grid Bias.
D-c voltage developed across the oscillator grid leak (R1) averages 8.5 volts at 1000 kc.
(4) Socket Pin Voltages.
Figure 3 shows d-c voltages from all tube pins to B− unless otherwise specified. Voltage readings much higher or lower than those specified may help localize defective components or tubes.

CLOCK SERVICE

Figure 4 shows clock parts referred to in the following paragraphs and the parts list.

CLOCK MOVEMENT DISASSEMBLY

1. Remove clock movement from case. When removing knobs, note that the Alarm-Set knob is a left-hand thread, while Alarm-Radio is a pull-off knob.
2. Remove Bezel, Hands and Dial Face.
3. Remove the motor assembly by removing two screws (A) and break two soldered joints on Field. The Field and Rotor Assembly (R) can now be removed. The Rotor is held by friction only to the Field.
4. Remove Switch Assembly (B) by removing two screws from base plate.
5. Remove Switch Shaft Assembly (C) and spacer.
6. Remove Alarm-Set Shaft Assembly (D) and spacer.
7. Remove the three front plate assembly screws that are located under the Dial Face and then remove Front Plate.
8. Remove Alarm Gear Sleeve Assembly (E), Hour Gear Sleeve Assembly (F), Minute Gear Sleeve Assembly (G), and Sweep Second Gear Shaft Assembly (H).
9. Remove Alarm Cam Gear Assembly (I) and Spring Washer (J).
10. Remove Alarm-Set Gear (K).
11. Remove Time-Set Gear and Shaft Assembly (L).
12. Remove Switch Cam Lever (M).

CLOCK MOVEMENT REASSEMBLY

Reassemble in the reverse order of disassembly, observing the following precautions:

1. The spring washer (J) should curve away from the gear when placed on the Alarm Cam Gear Assembly (I).
2. The Switch Cam Lever (M) fork must straddle the base plate post as shown in the illustration.
3. After reassembly of front plate, check the Sweep Second Gear (H) through the hole in the base plate to make sure it is free to turn.
4. Proceed with Alarm and Switch Adjustments as described below before installing hands.

ALARM AND SWITCH ADJUSTMENTS

1. Turn Alarm-Radio shaft to ALARM position.
2. Slowly rotate Time-Set shaft clockwise until the contacts of the Switch Assembly (B) close.
3. Replace Dial Face, Alarm Dial, the Minute, Hour and Second Hands. Set all Hands and Dial so that they indicate 12 o'clock. Make sure all Hands and Alarm Dial are tight on their respective shafts.
4. With Alarm-Set knob pulled out, continue to rotate Time-Set shaft clockwise and note that the vibrator arm (N) drops against field core approximately 7–10 minutes later.
5. Set alarm at some other selected position and make sure mechanism actuates within limits (±1 minute).
6. Check alarm tone of vibrator. This can be adjusted by either bending vibrator arm nearer or farther away from field core. Bend arm near anchor point.

CLEANING AND LUBRICATION

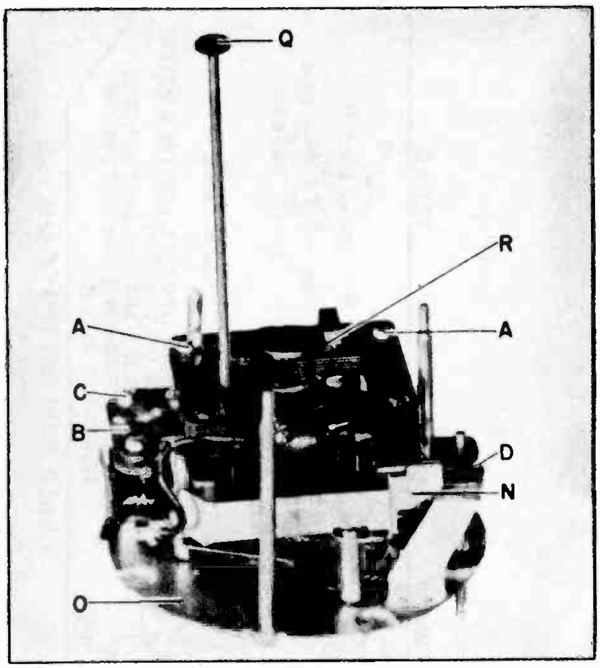
To clean, completely diassemble and clean all moving parts in carbon tetrachloride or some similar cleaner.

The inside of the sleeves and shaft surfaces may be cleaned of oxidized oil by rubbing with a fine grade of steel wool dampened in carbon tetrachloride.

Do not use too much oil and apply by means of a small wire (drop oiler). Too much oil collects dust and later oxidizes. Use only recommended clock oil, such as Nye's Celebrated Oil which may be purchased from Wm. F. Nye Co., Inc., New Bedford, or equivalent.

CLOCK TROUBLES

1. Clock will not operate—Defective field coil, defective rotor, binding of parts.
2. Clock loses time—Binding parts, too little friction on minute hand sleeve assembly, defective rotor. Clock time-set shaft bent and rubs against hole in clock bracket.
3. Noisy Clock—Rotor defective, alarm armature improperly adjusted, loose parts, or binding of moving parts.



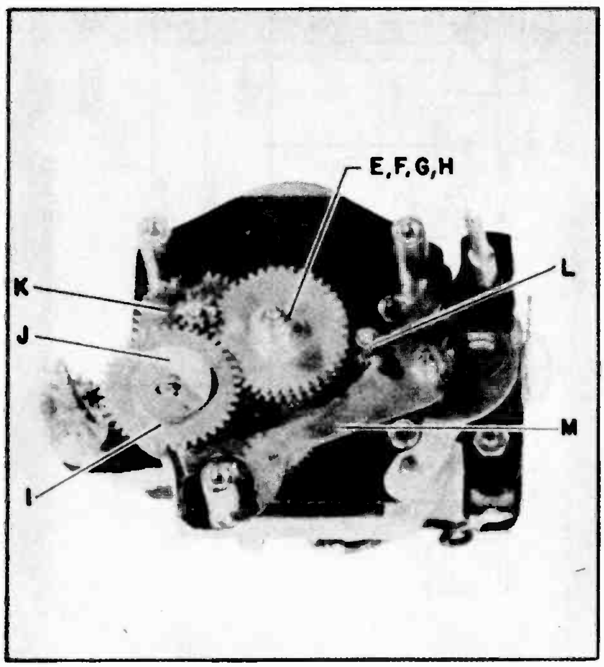


Fig. 5. Clock Part Identification

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MODEL 500 AND 501 REPLACEMENT PARTS

Cat. No.	Symbol	Description
		UNIVERSAL REPLACEMENT PARTS
*UCC-045	C5, 10, 11, 21	CAPACITOR—.05 mf., 600 v., paper
*UCC-630	C17, 20	CAPACITOR—.01 mf., 600 v., paper (used in early production) (may replace respective sections of RCW-3013)
*UCU-036	C16, 19	CAPACITOR—220 mmf., mica (used in early production) (may replace respective sections of RCW-3013)
*UOP-421	LS1	SPEAKER—PM loudspeaker
*URD-009	R17	RESISTOR—22 ohms, ½ w., carbon
*URD-017	R18	RESISTOR—47 ohms, ½ w., carbon
*URD-029	R15	RESISTOR—150 ohms, ½ w., carbon
*URD-081	R1	RESISTOR—22,000 ohms, ½ w., carbon
*URD-113	R2, 13, 14	RESISTOR—470,000 ohms, ½ w., carbon
*URD-129	R10	RESISTOR—2.2 meg., ½ w., carbon
*URD-141	R12	RESISTOR—6.8 meg., ½ w., carbon
*URF-049	R16	RESISTOR—1000 ohms, 2 w., carbon
		SPECIALIZED REPLACEMENT PARTS
*RAB-097	L1	BACK—Cabinet back cover (includes loop L1)
*RAC-074		MOUNTING BRACKET—Metal back cover holds clock to cabinet
RAU-319		CABINET—Brown plastic (Model 500)
RAU-320		CABINET—White plastic (Model 501)
*RCC-074	C22	CAPACITOR—.003 mf., 600 v., paper
*RCE-050	C23A, 23B	CAPACITOR—50 mf., 150 v., 50 mf., 150 v., dry electrolytic

Cat. No.	Symbol	Description
		SPECIALIZED REPLACEMENT PARTS (Cont'd)
*RCT-021	C2A, 2B, C3, C4	CAPACITOR—Tuning capacitor (oscillator and r-f section) with trimmers
*RCW-1043	C25	CAPACITOR—47 mmf., ceramic
*RCW-3013	C16, 17, 19, 20	CAPACITOR—220 mmf., .002 mf., 220 mmf., .005 mf., (4 section ceramic) (see UCC-630, UCU-036)
*RDK-028		KNOB—Volume control knob
*RDK-094		KNOB—Tuning dial wheel
*RDS-047		SCALE—Dial scale (Model 500)
*RDS-050		SCALE—Dial scale (Model 501)
*RJC-004		CLIP—Loop connector clip
*RJS-092		SOCKET—Tube socket for 50C5, 35W4
*RJS-116		SOCKET—Tube socket for 12SA7
*RJS-117		SOCKET—Tube socket for 12SQ7, 35Z5-GT
*RJS-141		SOCKET—Tube socket for 12BA6
*RLC-090	T4	COIL—Oscillator coil
*RHG-015		GROMMET—Cushion mounting for C2A, C2B
*RHH-004		SNAP FASTENER—For cabinet back
*RHJ-005		SPACER—Washer used with RHG-015
*RRC-054	R11	POTENTIOMETER—0.5 meg., volume control
*RTL-094	T1, C8, C9	TRANSFORMER—1st I-F transformer
*RTL-095	T2, C14, C15	TRANSFORMER—2nd I-F transformer
*RTO-036	T3	TRANSFORMER—Output transformer
*RWL-009		CORD—Power cord (brown) for Model 500
*RWL-016		CORD—Power cord (white) for Model 501
*RYN-005		NAMEPLATE—G-E monogram
*RZC-010	M1	CLOCK—60 cycle, 105-125 v., clock assembly

CLOCK REPLACEMENT PARTS LIST

Cat. No.	Symbol	Description
		MISCELLANEOUS
*XC3X49	Q	TIME SET SHAFT KNOB—Bronze
*XC4X5		ALARM SET KNOB—Ivory
*XC10X131	L	TIME SET GEAR AND SHAFT ASSEMBLY
*XC11X11	D	ALARM SET SHAFT ASSEMBLY
*XC31X26		SWEEP SECOND HAND
*XC32X199		HOUR AND MINUTE HANDS
*XC34X139	O	FRONTPLATE ASSEMBLY
*XC55X15		ALARM DIAL
*XC58X16		CRYSTAL—2 9 16 in., round
XC59X247		NUMERAL COLOR RING—Red
*XC59X699	C	SWITCH SHAFT ASSEMBLY
*XC59X716		SWITCH KNOB—Ivory
XC61X941		DIAL FACE—(On frontplate)
XC53X128		NUMERAL RING—Bronze
		CLOCK MOVEMENT
*XC1X1	A	SCREW—Holds Field, No. 4-40X1 ¼ in. R.H.
*XC1X2		No. 1204 LOCKWASHER
*XC1X6		SCREW No. 4-40 x ⅝ in. R. H.
*XC1X43		HEX NUT
*XC13X11	F	HOUR GEAR SLEEVE ASSEMBLY

Cat. No.	Symbol	Description
		CLOCK MOVEMENT (Cont'd)
*XC14X15	G	MINUTE GEAR SLEEVE ASSEMBLY
*XC15X3	E	ALARM GEAR SLEEVE ASSEMBLY
*XC16X14	H	SWEEP SECOND GEAR SHAFT ASSEMBLY
*XC17X8	I	ALARM GEAR SHAFT ASSEMBLY
*XC35X39		BASEPLATE ASSEMBLY
*XC40X13		RIVET—Vibrator
*XC40X76		SWITCH ASSEMBLY—Consists of Contact Block (top), Contact Block (bottom), Contact Spring Insulator
*XC40X77	K	ALARM SET GEAR ASSEMBLY
*XC40X78	M	SWITCH CAM LEVER ASSEMBLY
*XC40X79		UPPER CONTACT SPRING ASSEMBLY
*XC40X80		LOWER CONTACT SPRING AND TIP ASSEMBLY
*XC40X202		SPREADER POST
*XC40X252	J	CAM GEAR SPRING WASHER
*XC40X260		SPACER—Switch shaft
*XC40X261		TIME SET SHAFT SPACER
*XC40X262		TIME SET SHAFT SPACER
*XC40X263		ALARM SHUT-OFF SPACER
*XC44X38		ROTOR UNIT—60 cycles
*XC45X69	R	FIELD COIL ASSEMBLY—60 cycles
*XC64X1-2-3		FRONTPLATE SCREW

* Used on other models.

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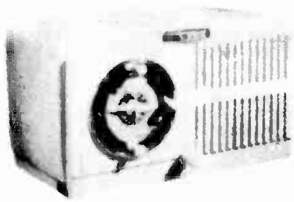
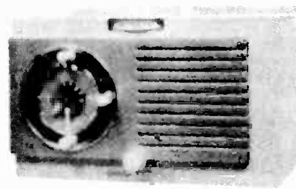
MODELS 505,
506, 507, 508

MODEL 505, 507



MODEL 506



MODEL 508

SPECIFICATIONS

CABINET:

Model	508	505	507	506
Color	Blond Mah.	Brown	Maroon	Ivory
Height	6⅜ in.	6⅜ in.	6⅜ in.	6⅜ in.
Width	11½ in.	11½ in.	11½ in.	11½ in.
Depth	6¼ in.	6¼ in.	6¼ in.	6¼ in.

ELECTRICAL RATING (INPUT):

Voltage............105-120 volts, a-c
Frequency............60 cycles
Wattage............30 watts

OPERATING FREQUENCIES:

Intermediate Frequency............455 kc
Broadcast Band............540-1600 kc

POWER OUTPUT:

Undistorted............1
Maximum............1.75

LOUDSPEAKER:

Type............Alnico 5 PM
Outside Cone Diameter............4-inch
Voice Coil Impedance (400 cycles)............3.5 ohms

TUBE COMPLEMENT:

Oscillator-Converter............Type 12SA7
I-F Amplifier............Type 12BA6
Detector and 1st Audio............Type 12SQ7
Power Output............Type 50C5
Rectifier............Type 35W4

CAUTION: One side of the power line is connected to B–. Avoid any ground connections direct to B–. Use an isolating transformer when making service adjustments with the chassis removed from the cabinet.

GENERAL INFORMATION

The Models 505, 506, 507 and 508 are four-tube, plus rectifier tube, a-c/d-c superheterodyne receivers, employing a Beam-a-scope antenna. Special features include an electric time clock with wake-up alarm and sleep control switch. In addition, the timer receptacle at the rear of the receiver provides an outlet connection for external appliances which is controlled by the normal function of the alarm and sleep control mechanism of the clock. The radio OFF-ON switch adjacent to the timer outlet provides control of radio operation so that the radio receiver may be turned off if so desired while using the external appliance. When radio operation is to be resumed, this switch must be turned to the on position.

RADIO CIRCUIT ALIGNMENT

ALIGNMENT FREQUENCIES:

R-F............1500 kc
R-F............1620 kc
I-F............455 kc

EQUIPMENT REQUIRED:

1. Test oscillator with tone modulation.
2. A-c output meter, 1½ volts full scale.
3. 0.05 mf. paper capacitor.
4. Loop
5. Insulated screwdriver.

PROCEDURE—GENERAL:

1. With the tuning scale control wheel turned so that the gang condenser plates are fully meshed, the index should read approximately $\frac{3}{16}$ inch to the right of the 550 kc scale calibration mark. If it does not, remove the control wheel from the gang condenser shaft and replace it for correct position. CAUTION: Do not attempt to correct the position by rotating the wheel on the shaft as this will cause the knob to slip.

2. For i-f alignment, it is necessary to remove the chassis from the cabinet.

3. Connect the output meter across the loudspeaker voice coil terminals.

4. Keep radio volume control at maximum and attenuate the test oscillator signal output so that the output meter reading never exceeds 1.0 volt.

5. Connect the capacitor as listed in column 2 between the output "High Side" of the test oscillator and the point of input specified. The oscillator output cable ground lead is connected to receiver chassis.

6. For alignment of the oscillator and antenna trimmers, the input signal should be inductively coupled to the radio loop antenna, L1, by connecting a four-turn, six-inch diameter loop of bell wire across the signal generator output terminals, and then locating the loop to face the radio antenna loop about one foot away. To prevent possible errors in reference to previous signal measurement readings, the loop with respect to the radio loop should not be changed during any one set of adjustments.

ALIGNMENT CHART

Step	Connect Test Oscillator to	Test Osc. Setting	Dial Drum Setting	Adjust Trimmers for Maximum Output
1	12SK7 grid (4) in series with 0.05 mf. cap.	455 kc	Minimum Capacity	2nd I-F trans. trimmers, C14 and C15
2	12BA6 grid (1) in series with 0.05 mf. cap	455 kc	Minimum Capacity	1st I-F trans. trimmers, C8 and C9
3	Inductively coupled to radio loop	1620 kc	Minimum Capacity	C4 (oscillator)
4	Inductively coupled to radio loop	1500 kc	Tune for Maximum	C3 (antenna)

STAGE GAIN AND VOLTAGE CHECKS

Stage gain measurements by vacuum tube voltmeter or similar measuring devices may be used to check circuit per-

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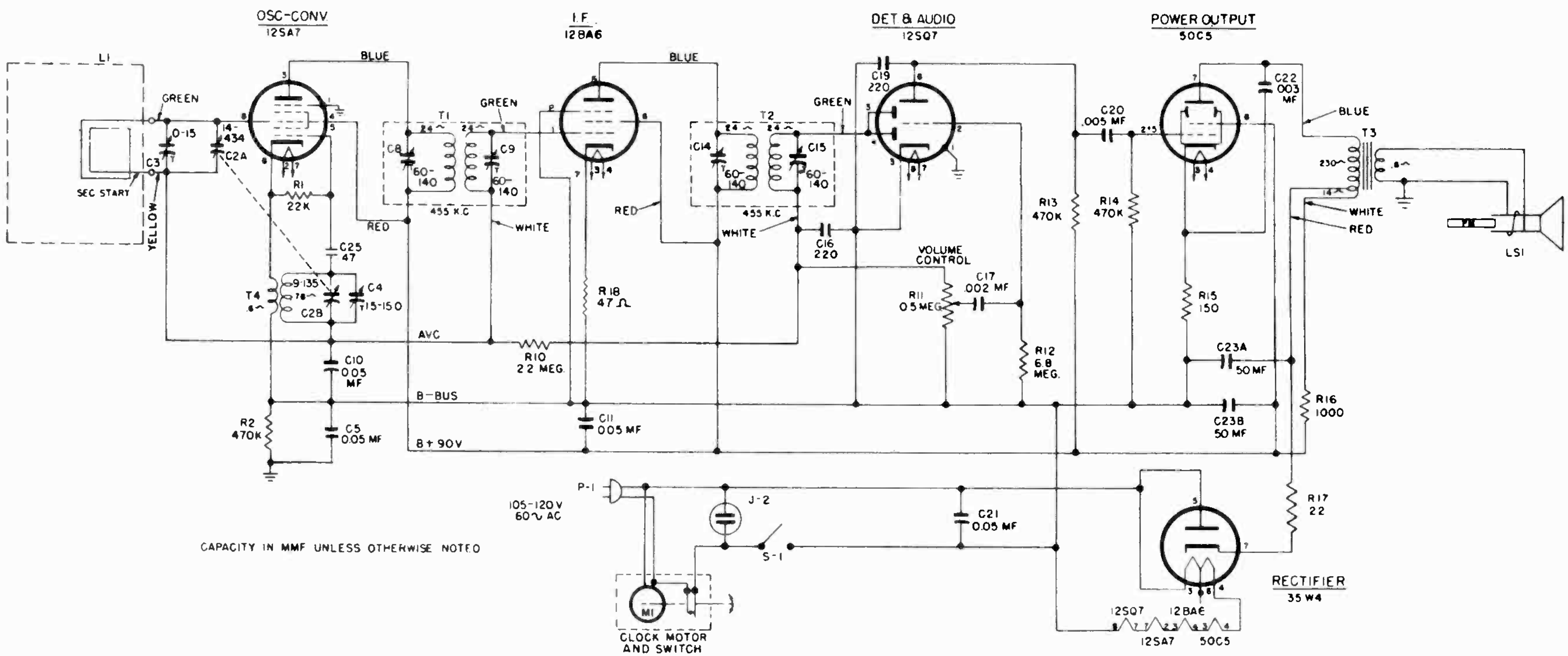
formance and isolate trouble. The gain values listed may have tolerances of 20%. Readings taken with low signal input so that AVC is not effective.

(1) I-F Stage Gains.
12SA7 Grid to 12SK7 Grid . . . . 50 @ 455 kc
12SK7 Grid to 12SQ7 Diode Plate . . . . 50 @ 455 kc

(2) Audio Gain.
0.15 volts at 400 cycles across the volume control (R11) with control set at maximum will give approximately ½-watt output across the loudspeaker, LS1, voice coil.

(3) Oscillator Grid Bias.
D-c voltage developed across the oscillator grid leak (R1) averages 8.5 volts at 1000 kc.

(4) Socket Pin Voltages.
Figure 3 shows voltages from all tube pins to B— unless otherwise specified. Voltage readings much higher or lower than those specified may help localize defective components or tubes.



NOTE: Loop connections are: green lead to inside turn of antenna loop, yellow lead to outside turn.

Fig. 1. Schematic Diagram

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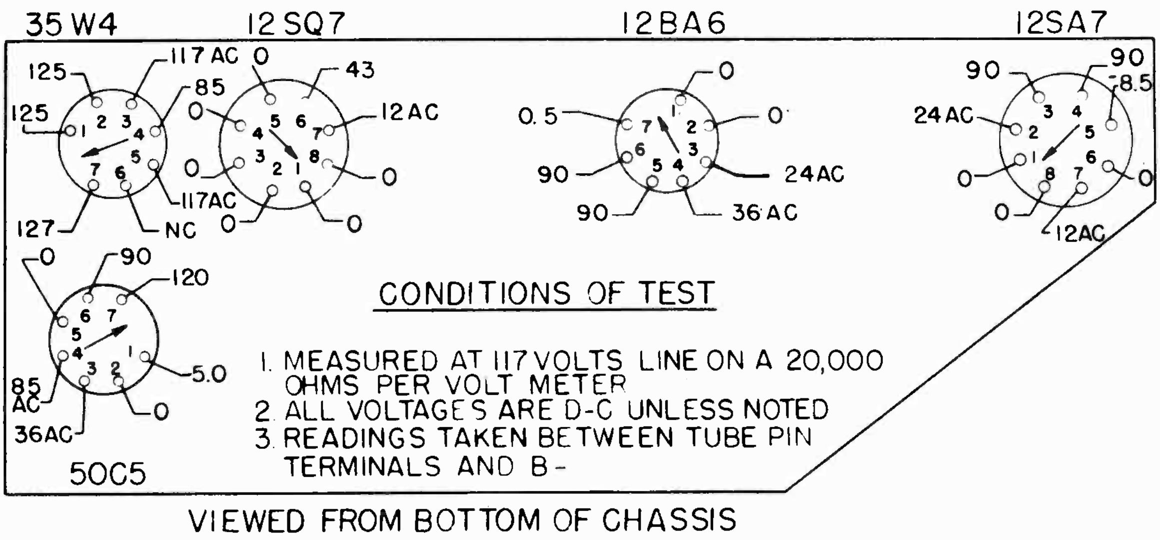

Fig. 2. Socket Voltages

CLOCK SERVICE

Figures 4 and 5 show clock parts referred to in the following paragraphs and the parts list.

CLOCK MOVEMENT DISASSEMBLY

1. Remove clock movement from case. When removing knobs, note that the Alarm-Set knob is a left-hand thread, while Wake-Up Manual and Sleep are pull-off knobs.
2. Remove Bezel, Hands and Dial Faces.
3. Remove the motor assembly by removing two screws (3 and 4) and break two soldered joints on Field. The Field and Rotor Assembly (11 and 2) can now be removed. The Rotor is held by friction only, to the Field.
4. Remove Switch Assembly by removing two screws (12) from base plate.
5. Remove Switch Shaft Assembly (13) and spacer.
6. Remove Alarm-Set Shaft Assembly (6) and spacer.
7. Remove the three front plate assembly screws that are located under the Dial Face and then remove Front Plate.
8. Remove the following gear assemblies and control levers in the order listed below:
   - (a) Sweep Control Shaft and Segment Gear (30)
   - (b) Alarm Dial Gear (16)
   - (c) Hour Hand Gear (17)
   - (d) Alarm Signal Cam and Gear, and Friction Washer (27, 26)
   - (e) Sweep Control Switch Lever (29)
   - (f) Pinion Drive Gear Assembly (15) (drives Sleep Control Segment Gear)
   - (g) Alarm Control Switch Cam Lever (8)
   - (h) Time Set Shaft and Gear, and Spacer (14, 20)
   - (i) Drive Gear and Pinion Assembly (28)
   - (j) Minute Hand Gear (18)
   - (k) Sweep Second Hand Gear (19)

CLOCK MOVEMENT REASSEMBLY

Reassemble in the reverse order of diassembly, observing the following precautions:

1. The spring washer (26) should curve away from the gear when placed on the Alarm Cam Gear Assembly (27).
2. The Switch Cam Lever fork (8) must straddle the base plate post as shown in the illustration.
3. After reassembly of front plate, check the Sweep Second Gear (19) through the hole in the base plate to make sure it is free to turn.
4. Proceed with Alarm and Switch Adjustments as described below before installing hands.

ALARM AND SWITCH ADJUSTMENTS

1. Turn Wake-Up Manual shaft to WAKE UP position.
2. Slowly rotate Time Set shaft clockwise until the contacts 21 and 22 of the Switch Assembly close.
3. Replace Dial Face, Alarm Dial, the Minute, Hour and Second Hands. Set all Hands so that they indicate 12 o'clock. Set figure 12 of the alarm dial to index with the smaller pointer of the hour hand. Make sure all Hands and Alarm Dial are tight on their respective shafts.
4. With Alarm Set knob pulled out, continue to rotate Time Set shaft clockwise and note that the Alarm vibrator arm drops against field core approximately 7–10 minutes later.
5. Set alarm at some other selected position and make sure mechanism actuates within limits (±1 minute).
6. Check alarm tone of vibrator. This can be adjusted by either bending vibrator arm nearer or farther away from field core. Bend arm near anchor point.

CLEANING AND LUBRICATION

To clean, completely disassemble and clean all moving parts in carbon tetrachloride or some similar cleaner.

The inside of the sleeves and shaft surfaces may be cleaned of oxidized oil by rubbing with a fine grade of steel wool dampened in carbon tetrachloride.

Do not use too much oil and apply by means of a small wire (drop oiler). Too much oil collects dust and later oxidizes. Use only recommended clock oil, such as Nye's Celebrated Oil which may be purchased from Wm. F. Nye Co., Inc., New Bedford, or equivalent.

CLOCK TROUBLES

1. Clock will not operate—Defective field coil, defective rotor, binding of parts.
2. Clock loses time—Binding parts, too little friction on minute hand sleeve assembly, defective rotor. Clock time set shaft bends and rubs against hole in clock bracket.
3. Noisy Clock—Rotor defective, alarm armature improperly adjusted, loose parts, or binding of moving parts.

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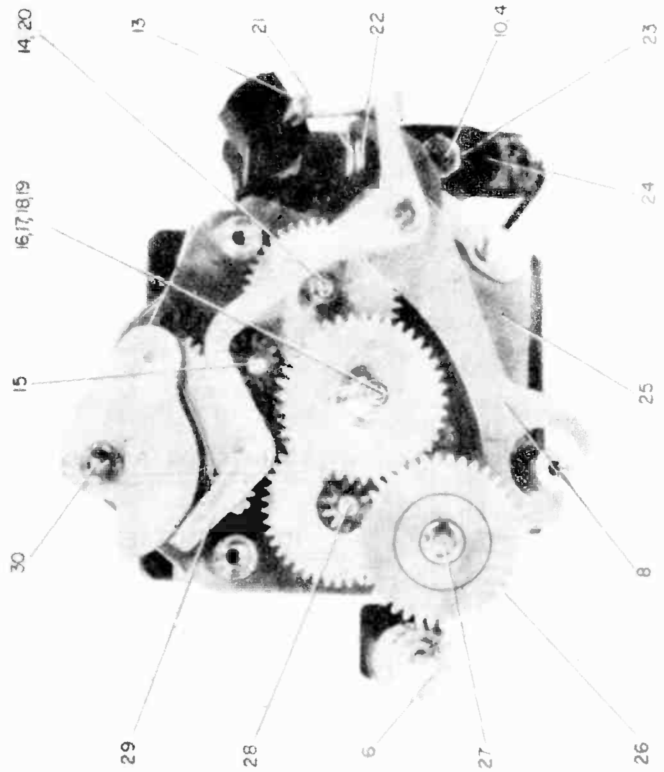

Fig. 4. Front View of Clock, Front Plate Removed

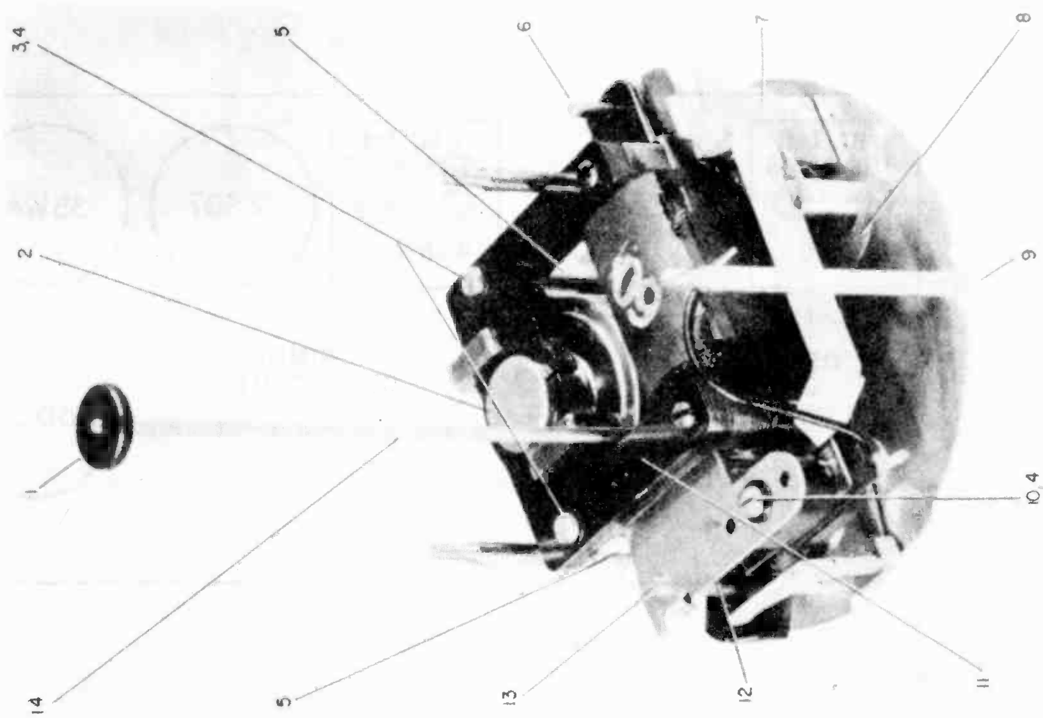

Fig. 3. Back View of Clock

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SLEEP CONTROL BOOSTER SPRING

The illustration of Figure 5 shows the position of the booster spring, Cat. No. RMS-205, as viewed from the rear of the clock mechanism. This spring provides tension for proper segment gear and cam operation. One end of the spring is fastened to the cam stud, the other end to the brass Front Plate Stud.

C16, C17, C19, AND C20

The lead identification for the four-section ceramic capacitor RCW-3013 (K67J836) can be observed from the illustration of Figure 6.

Should it become necessary to service this unit, either the defective section can be cut out of the circuit and replaced by an individual capacitor (see Parts Replacement List, items UCC-036, UCU-039 and UCU-1036), or a complete new four-section unit, RCW-3013, can be installed.

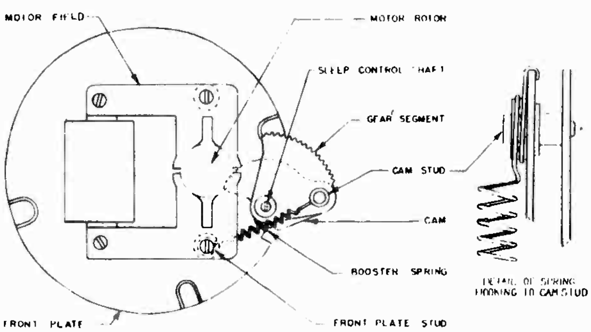

Fig. 5. Sleep Control Mechanism

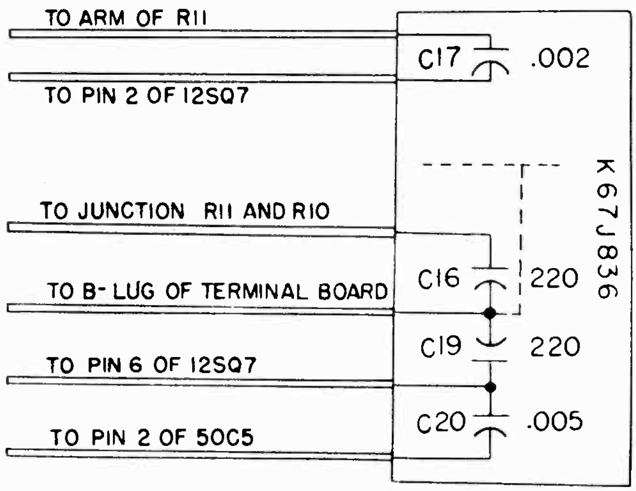

Fig. 6. Capacitor RCW-3013 (K67J836)

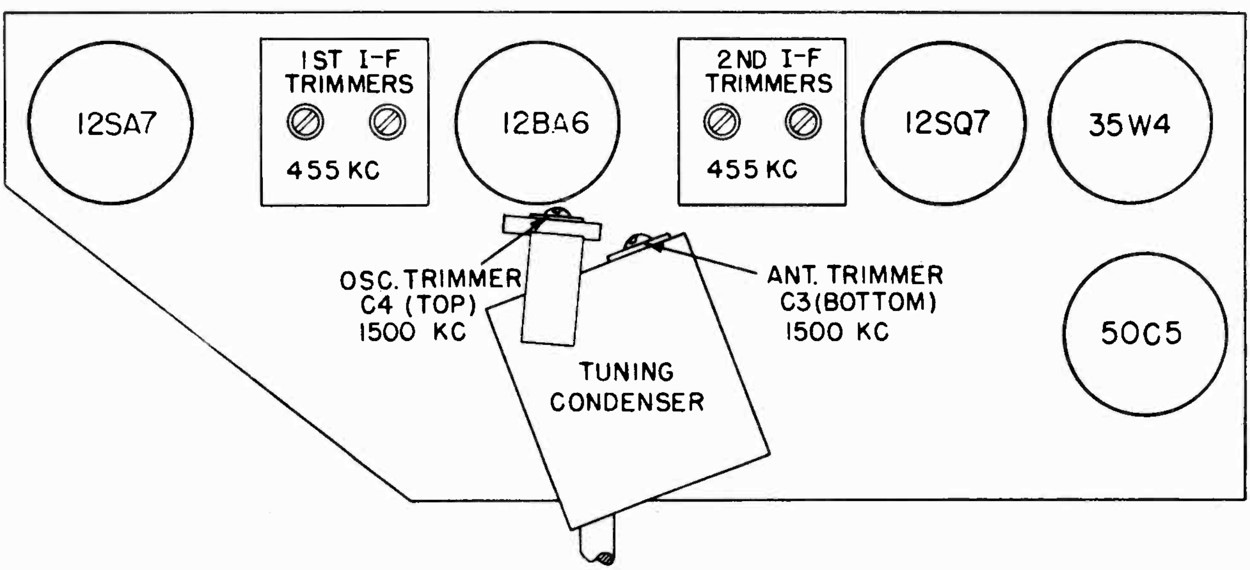

Fig. 7. Tube and Trimmer Location

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RADIO REPLACEMENT PARTS LIST

Cat. No.	Symbol	Description
UNIVERSAL REPLACEMENT PARTS		
UCC-028	C5, 10, 11	CAPACITOR—.05 mf., 400 v., paper
UCC-036	C17	CAPACITOR—.002 mf., 600 v., paper
UCC-039	C20	CAPACITOR—.005 mf., 600 v., paper
UCC-045		CAPACITOR—.05 mf., 600 v., paper (will replace respective sections of RCW-3013).
UCU-1036	C16, 19	CAPACITOR—220 mmf., mica
UOP-421	LS1	SPEAKER—PM loudspeaker
URD-009	R17	RESISTOR—22 ohms, ½ w., carbon
URD-017	R18	RESISTOR—47 ohms, ½ w., carbon
URD-029	R15	RESISTOR—150 ohms, ½ w., carbon
URD-081	R1	RESISTOR—22,000 ohms, ½ w., carbon
URD-113	R2, 13, 14	RESISTOR—470,000 ohms, ½ w., carbon
URD-129	R10	RESISTOR—2.2 meg., ½ w., carbon
URD-141	R12	RESISTOR—6.8 meg., ½ w., carbon
URF-049	R16	RESISTOR—1000 ohms, 1 w., carbon
SPECIALIZED REPLACEMENT PARTS		
RAB-116	L1	BACK—Cabinet back cover (includes loop L1) for Models 505, 506, 507
RAB-120	L1	BACK—Cabinet back cover (includes loop L1) for Model 508
*RAC-060		SHIELD PLATE—Metal plate covers bottom of chassis, Models 505, 506, 507
*RAC-073		MOUNTING BRACKET—Metal back cover holds clock to cabinet
RAU-305		CABINET—Ivory plastic (Model 506)
RAU-317		CABINET—Brown plastic (Model 505)
RAU-318		CABINET—Maroon plastic (Model 507)
RAU-322		CABINET—Blond mahogany finish plastic (Model 508)
*RCC-045	C21	CAPACITOR—.05 mf., 600 v., paper
*RCC-074	C22	CAPACITOR—.003 mf., 600 v., paper
*RCE-050	C23A, B	CAPACITOR—50 mf., 150 v.; 50 mf., 150 v., dry electrolytic

Cat. No.	Symbol	Description
SPECIALIZED REPLACEMENT PARTS (Cont.)		
*RCT-021	C2A, 2B	CAPACITOR—Tuning capacitor (oscillator and r-f-section)
*RCW-1043	C25	CAPACITOR—47 mmf., ceramic
*RCW-3013	C16, 17, 19, 20	CAPACITOR—220 mmf., .002 mf., 220 mmf., .005 mf. (4 section ceramic)
*RDK-028		KNOB—Volume control knob
*RDK-094		KNOB—Tuning dial wheel. Does not include dial scale, see item RDS-090
RDS-090		DIAL SCALE—Paper scale
*RHC-018		SNAP FASTENER—For cabinet back
RHG-015		GROMMET—For tuning cond.
RHH-004		FASTENER—Snap fastener for holding back
RHI-010		STRAIN RELIEF GROMMET
*RHJ-005		SPACER FOR TUNING CONDENSER
RHS-043		PLUG AND SWITCH MOUNTING CABINET—Model 508
*RJC-004		CLIP—Loop connector clip
RJJ-008		APPLIANCE RECEPTACLE
*RJS-116		SOCKET—Tube oscket for 12SA7
*RJS-117		SOCKET—Tube socket for 12SQ7
*RJS-092		SOCKET—Tube socket for 50C5, 35W4
*RJS-141		SOCKET—For 12BA6 tube, 7 pin
*RLC-090	T4	COIL—Oscillator coil
RMS-205		SLEEP CONTROL BOOSTER SPRING
*RRC-054	R11	POTENTIOMETER—0.5 meg., volume control
*RSS-005		SWITCH—ON-OFF Switch
*RTL-094	T1	TRANSFORMER—1st I-F transformer
*RTL-095	T2	TRANSFORMER—2nd I-F transformer
RTO-036	T3	TRANSFORMER—Output transformer
*RWL-009		CORD—Power cord (brown) for Model 64
*RWL-016		CORD—Power cord (white) for Model 65
RYN-005		NAMEPLATE G.E. MONOGRAM
*RZC-009	M1	CLOCK—60 cycle, 105-125 v., clock assembly

CLOCK REPLACEMENT PARTS LIST

Cat. No.	Symbol	Description
MISCELLANEOUS		
*XC3X36	1	KNOB—Time set shaft knob (bronze)
*XC4X5		KNOB—Alarm set knob (ivory)
*XC31X26		HAND—Sweep second hand
*XC32X199		HANDS—Hour and minute hands (luminous)
*XC53X31		BEZEL—Outer mounting rim
*XC53X117		BEZEL—Numeral ring (gold finish)
*XC55X15		DIAL—Alarm dial scale
*XC58X16		CRYSTAL—Glass crystal
*XC59X247		RING—Color ring for numeral bezel
*XC59X716		KNOB—Wake-up Manual and Sleep control knob (ivory)
*XC61X937		DIAL—Clock dial scale (luminous)
CLOCK MOVEMENT		
*XC1X1	3	SCREW—Holds field core to baseplate, #4-40 x 1⅛" long, round head
*XC1X2	4	LOCKWASHER—Under screw head of switch assembly mounting screw and field core mounting
*XC1X6	10	SCREW—Used to assemble switch assembly to switch bracket
*XC1X43	23	HEX NUT—For screw mounting switch assembly to switch bracket
*XC10X141	14	SHAFT ASSEMBLY—Time set shaft and gear assembly
*XC11X11	6	SHAFT ASSEMBLY—Alarm set shaft and gear assembly
*XC13X11	17	GEAR ASSEMBLY—Hour hand gear and sleeve assembly
*XC14X32	18	GEAR ASSEMBLY—Minute hand friction gear, pinion gear and sleeve assembly
*XC15X3	16	GEAR ASSEMBLY—Alarm dial gear and sleeve assembly
*XC16X14	19	GEAR ASSEMBLY—Sweep second hand gear and shaft assembly
*XC17X8	27	GEAR AND CAM—Alarm signal cam and gear assembly
*XC34X173	9	FRONT PLATE ASSEMBLY—Complete with case studs and alarm set shaft spring (7)
*XC35X93	25	BASE PLATE AND BACK GEAR—Base plate assembled complete with studs, back gear and pinion, and vibrator

Cat. No.	Symbol	Description
CLOCK MOVEMENT (Cont.)		
*XC40X76	24	SWITCH INSULATOR ASSEMBLY—Consists of: two plastic and one fibre switch contact spring spacers
*XC40X77	28	GEAR AND SPRING ASSEMBLY—Drives alarm dial gear and hour hand gear (complete with pinion and shaft, pinion and gear, spring, washers and retaining clip)
*XC40X80	21	CONTACT ASSEMBLY—Lower switch contact and spring
*XC40X185		SPRING—Switch control shaft index spring (for cam indexed control shafts)
*XC40X194	29	LEVER—Sleep control switch lever
*XC40X196	15	GEAR AND SPRING ASSEMBLY—Pinion drive for sleep control segment gear (consists of pinion gear, pinion gear and shaft, spring, washers, and retaining clip)
*XC40X197	8	LEVER—Alarm control switch cam lever
*XC40X198	22	CONTACT ASSEMBLY—Upper switch contact and spring with attached fibre arm
*XC40X202	5	SPACER BUSHING—Field core spacer at screw mounting to base plate
*XC40X252	26	WASHER—Alarm signal cam and gear friction washer
*XC40X275		SPACER BUSHING—Wake-up Manual switch control shaft bushing
*XC40X276	20	SPACER BUSHING—For time set shaft
XC40X277	30	SHAFT—Sleep control shaft and gear segment assembly
*XC44X38	2	MOTOR ROTOR ASSEMBLY—Cased rotor and pinion (60 cycles)
*XC45X69	11	MOTOR FIELD ASSEMBLY—Consists of: core, shading poles, and field coil (60 cycles)
*XC59X699	13	SHAFT ASSEMBLY—Wake-up Manual control shaft assembly (detent spring index type)
*XC59X723	13	SHAFT ASSEMBLY—Wake-up Manual control shaft assembly (cam index type)
*XC64X1		SCREW—Switch bracket and front plate mounting screws

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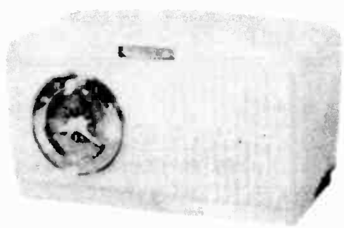
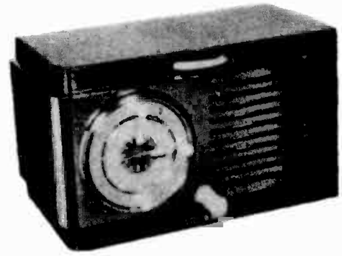
MODELS 509, 530



MODEL 509



MODEL 530

SPECIFICATIONS

CABINET:

Model	530	509
Color	Bleached Mah.	White
Height	6⅜ in.	6⅜ in.
Width	11½ in.	11½ in.
Depth	6¼ in.	6¼ in.

ELECTRICAL RATING (INPUT):

Voltage . . . . . 105-120 volts, a-c
Frequency . . . . . 60 cycles
Wattage . . . . . 30 watts

OPERATING FREQUENCIES:

Intermediate Frequency . . . . . 455 kc
Broadcast Band . . . . . 540-1600 kc

POWER OUTPUT:

Undistorted 1
Maximum 1.75

LOUDSPEAKER:

Type . . . . . Alnico 5 PM
Outside Cone Diameter 4-inch
Voice Coil Impedance (400 cycles) . . . . . 3.5 ohms

TUBE COMPLEMENT:

Oscillator-Converter . . . . . Type 12SA7
I-F Amplifier . . . . . Type 12BA6
Detector and 1st Audio . . . . . Type 12SQ7
Power Output . . . . . Type 50C5
Rectifier . . . . . Type 35W4

CAUTION: One side of the power line is connected to B−. Avoid any ground connections direct to B−. Use an isolating transformer when making service adjustments with the chassis removed from the cabinet.

GENERAL INFORMATION

The Models 509 and 530 are four-tube, plus rectifier tube, a-c/d-c superheterodyne receivers, employing a Beam-a-scope antenna. Special features include an electric time clock with wake-up alarm and sleep control switch. In addition, the timer receptacle at the rear of the receiver provides an outlet connection for external appliances which is controlled by the normal function of the alarm and sleep control mechanism of the clock. The radio OFF-ON switch adjacent to the timer outlet provides control of radio operation so that the radio receiver may be turned off if so desired while using the external appliance. When radio operation is to be resumed, this switch must be turned to the on position.

RADIO CIRCUIT ALIGNMENT

ALIGNMENT FREQUENCIES:

R-F . . . . . 1500 kc
R-F . . . . . 1620 kc
I-F . . . . . 455 kc

EQUIPMENT REQUIRED:

1. Test oscillator with tone modulation.
2. A-c output meter, 1½ volts full scale.
3. 0.05 mf. paper capacitor.
4. Loop.
5. Insulated screwdriver.

PROCEDURE—GENERAL:

1. With the tuning scale control wheel turned so that the gang condenser plates are fully meshed, the index should read approximately $\frac{3}{16}$ inch to the right of the 550 kc scale calibration mark. If it does not, remove the control wheel from the gang condenser shaft and replace it for correct position. CAUTION: Do not attempt to correct the position by rotating the wheel on the shaft as this will cause the knob to slip.

2. For i-f alignment, it is necessary to remove the chassis from the cabinet.

3. Connect the output meter across the loudspeaker voice coil terminals.

4. Keep radio volume control at maximum and attenuate the test oscillator signal output so that the output meter reading never exceeds 1.0 volt.

5. Connect the capacitor as listed in column 2 between the output "High Side" of the test oscillator and the point of input specified. The oscillator output cable ground lead is connected to receiver chassis.

6. For alignment of the oscillator and antenna trimmers, the input signal should be inductively coupled to the radio loop antenna, L1, by connecting a four-turn, six-inch diameter loop of bell wire across the signal generator output terminals, and then locating the loop to face the radio antenna loop about one foot away. To prevent possible errors in reference to previous signal measurement readings, the loop with respect to the radio loop should not be changed during any one set of adjustments.

ALIGNMENT CHART

Step	Connect Test Oscillator to	Test Osc. Setting	Dial Drum Setting	Adjust Trimmers for Maximum Output
1	12SK7 grid (4) in series with 0.05 mf. cap.	455 kc	Minimum Capacity	2nd I-F trans. trimmers, C14 and C15
2	12BA6 grid (1) in series with 0.05 mf. cap	455 kc	Minimum Capacity	1st I-F trans. trimmers, C8 and C9
3	Inductively coupled to radio loop	1620 kc	Minimum Capacity	C4 (oscillator)
4	Inductively coupled to radio loop	1500 kc	Tune for Maximum	C3 (antenna)

STAGE GAIN AND VOLTAGE CHECKS

Stage gain measurements by vacuum tube voltmeter or similar measuring devices may be used to check circuit per-

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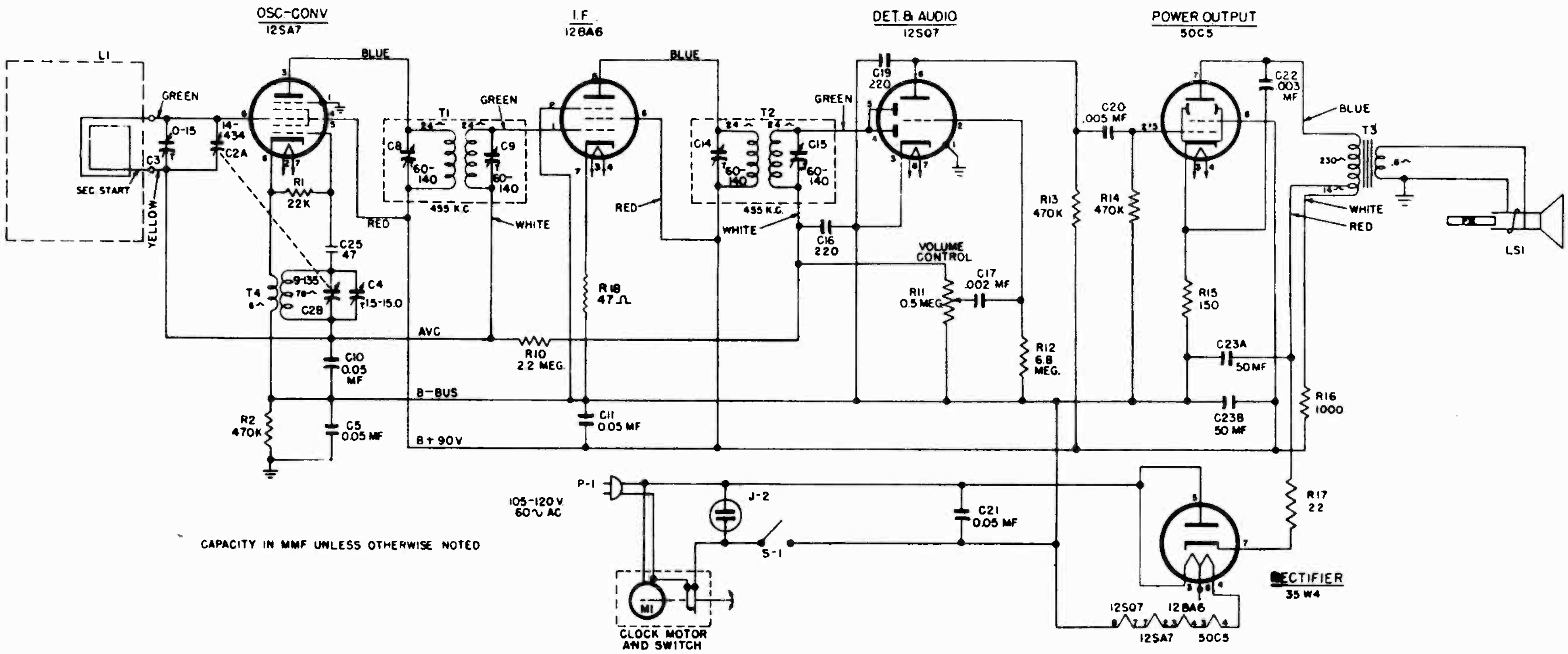
formance and isolate trouble. The gain values listed may have tolerances of 20%. Readings taken with low signal input so that AVC is not effective.

(1) I-F Stage Gains.
12SA7 Grid to 12SK7 Grid . . . . 50 @ 455 kc
12SK7 Grid to 12SQ7 Diode Plate . . . . 50 @ 455 kc

(2) Audio Gain.
0.15 volts at 400 cycles across the volume control (R11) with control set at maximum will give approximately ½-watt output across the loudspeaker, LS1, voice coil.

(3) Oscillator Grid Bias.
D-c voltage developed across the oscillator grid leak (R1) averages 8.5 volts at 1000 kc.

(4) Socket Pin Voltages.
Figure 2 shows voltages from all tube pins to B− unless otherwise specified. Voltage readings much higher or lower than those specified may help localize defective components or tubes.



NOTE: Loop connections are: green lead to inside turn of antenna loop, yellow lead to outside turn.

Fig. 1. Schematic Diagram

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MODELS 509, 530

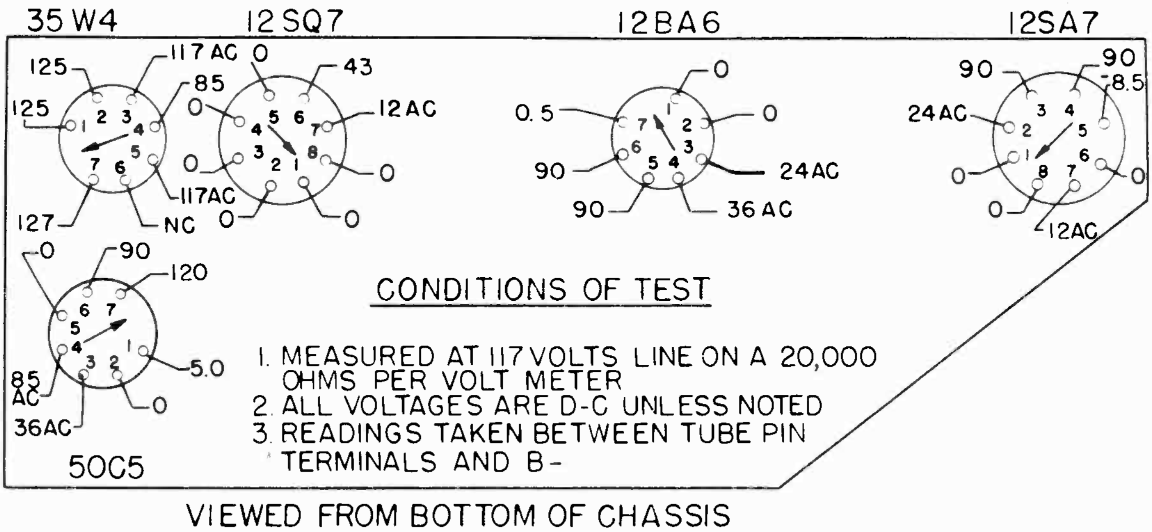

Fig. 2. Socket Voltages

CLOCK SERVICE

Figures 3 and 4 show clock parts referred to in the following paragraphs and the parts list.

CLOCK MOVEMENT DISASSEMBLY

1. Remove clock movement from case. When removing knobs, note that the Alarm-Set knob is a left-hand thread, while Wake-Up Manual and Sleep are pull-off knobs.
2. Remove Bezel, Hands and Dial Faces.
3. Remove the motor assembly by removing two screws (3 and 4) and break two soldered joints on Field. The Field and Rotor Assembly (11 and 2) can now be removed. The Rotor is held by friction only, to the Field.
4. Remove Switch Assembly by removing two screws (12) from base plate.
5. Remove Switch Shaft Assembly (13) and spacer.
6. Remove Alarm-Set Shaft Assembly (6) and spacer.
7. Remove the three front plate assembly screws that are located under the Dial Face and then remove Front Plate.
8. Remove the following gear assemblies and control levers in the order listed below:
   (a) Sweep Control Shaft and Segment Gear (30)
   (b) Alarm Dial Gear (16)
   (c) Hour Hand Gear (17)
   (d) Alarm Signal Cam and Gear, and Friction Washer (26, 27)
   (e) Sweep Control Switch Lever (29)
   (f) Pinion Drive Gear Assembly (15) (drives Sleep Control Segment Gear)
   (g) Alarm Control Switch Cam Lever (8)
   (h) Time Set Shaft and Gear, and Spacer (14, 20)
   (i) Drive Gear and Pinion Assembly (28)
   (j) Minute Hand Gear (18)
   (k) Sweep Second Hand Gear (19)

CLOCK MOVEMENT REASSEMBLY

Reassemble in the reverse order of disassembly, observing the following precautions:

1. The spring washer (26) should curve away from the gear when placed on the Alarm Cam Gear Assembly (27).
2. The Switch Cam Lever fork (8) must straddle the base plate post as shown in the illustration.
3. After reassembly of front plate, check the Sweep Second Gear (19) through the hole in the base plate to make sure it is free to turn.
4. Proceed with Alarm and Switch Adjustments as described below before installing hands.

ALARM AND SWITCH ADJUSTMENTS

1. Turn Wake-Up Manual shaft to WAKE UP position.
2. Slowly rotate Time Set shaft clockwise until the contacts 21 and 22 of the Switch Assembly close.
3. Replace Dial Face, Alarm Dial, the Minute, Hour and Second Hands. Set all Hands so that they indicate 12 o'clock. Set figure 12 of the alarm dial to index with the smaller pointer of the hour hand. Make sure all Hands and Alarm Dial are tight on their respective shafts.
4. With Alarm Set knob pulled out, continue to rotate Time Set shaft clockwise and note that the Alarm vibrator arm drops against field core approximately 7–10 minutes later.
5. Set alarm at some other selected position and make sure mechanism actuates within limits (±1 minute).
6. Check alarm tone of vibrator. This can be adjusted by either bending vibrator arm nearer or farther away from field core. Bend arm near anchor point.

CLEANING AND LUBRICATION

To clean, completely disassemble and clean all moving parts in carbon tetrachloride or some similar cleaner.

The inside of the sleeves and shaft surfaces may be cleaned of oxidized oil by rubbing with a fine grade of steel wool dampened in carbon tetrachloride.

Do not use too much oil and apply by means of a small wire (drop oiler). Too much oil collects dust and later oxidizes. Use only recommended clock oil, such as Nye's Celebrated Oil which may be purchased from Wm. F. Nye Co., Inc., New Bedford, or equivalent.

CLOCK TROUBLES

1. Clock will not operate—Defective field coil, defective rotor, binding of parts.
2. Clock loses time—Binding parts, too little friction on minute hand sleeve assembly, defective rotor. Clock time set shaft bends and rubs against hole in clock bracket.
3. Noisy Clock—Rotor defective, alarm armature improperly adjusted, loose parts, or binding of moving parts.

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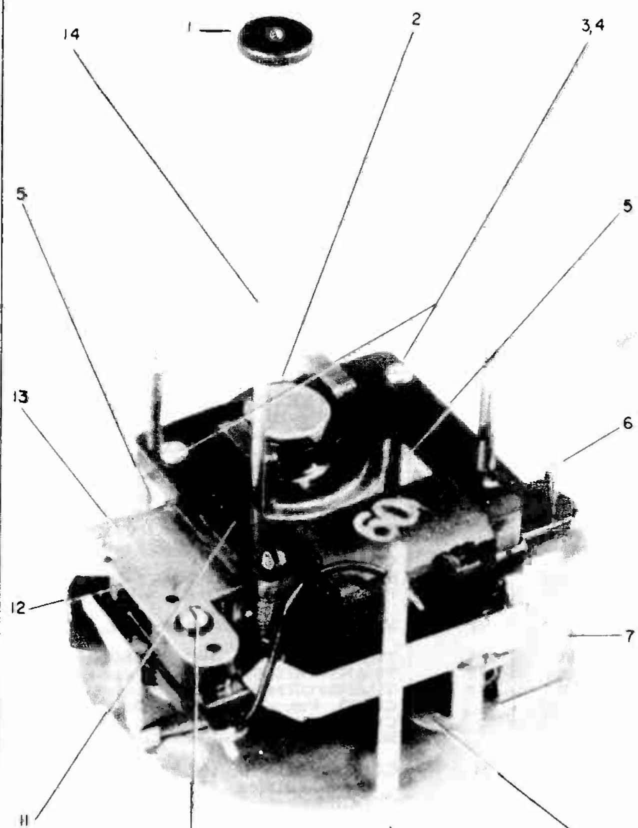

Fig. 3. Back View of Clock

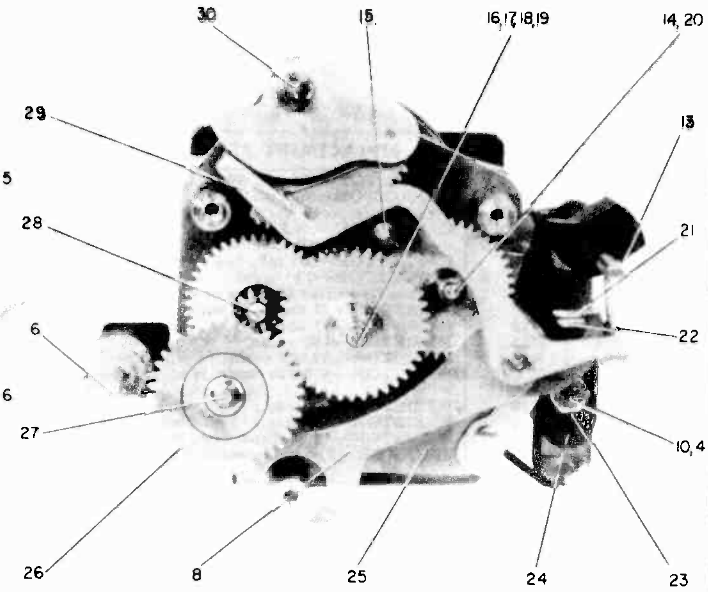

Fig. 4. Front View of Clock, Front Plate Removed

C16, C17, C19, AND C20

The lead identification for the four-section ceramic capacitor RCW-3013 (K67J836) can be observed from the illustration of Figure 6.

Should it become necessary to service this unit, either the defective section can be cut out of the circuit and replaced by an individual capacitor (see Parts Replacement List, items UCC-036, UCU-039 and UCU-1036), or a complete new four-section unit, RCW-3013, can be installed.

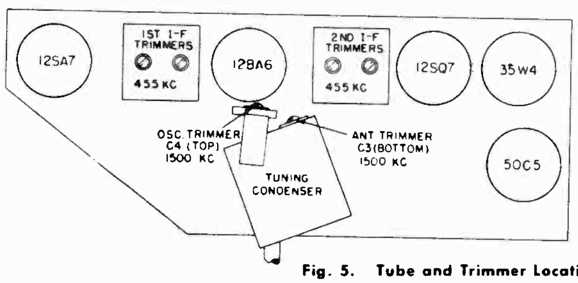

Fig. 5. Tube and Trimmer Location

SLEEP CONTROL BOOSTER SPRING

The illustration of Figure 7 shows the position of the booster spring, Cat. No. RMS-205, as viewed from the rear of the clock mechanism. This spring provides tension for proper segment gear and cam operation. One end of the spring is fastened to the cam stud, the other end to the brass Front Plate Stud.

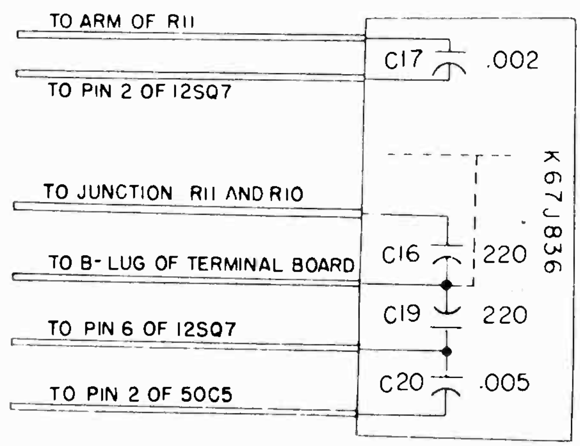

Fig. 6. Capacitor RCW-3013 (K67J836)

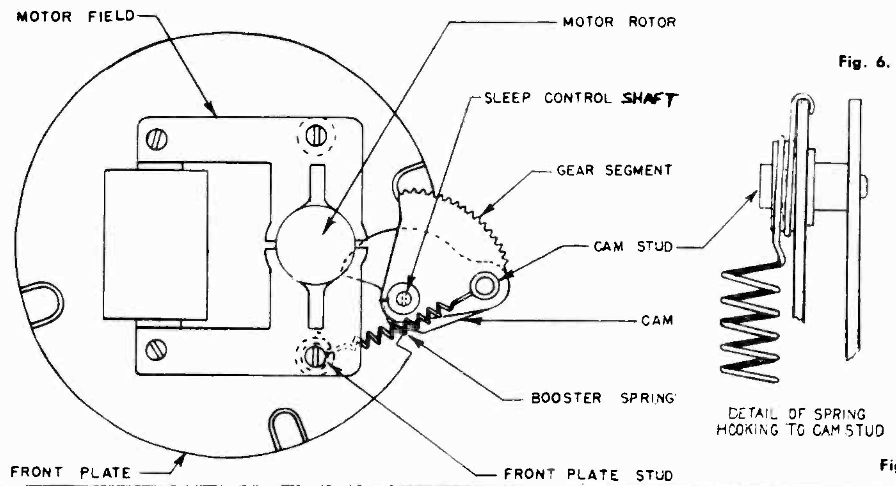

Fig. 7. Sleep Control Mechanism

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MODELS 509, 530

RADIO REPLACEMENT PARTS LIST—MODELS 509 AND 530

Cat. No.	Symbol	Description
UNIVERSAL REPLACEMENT PARTS		
*UCC-028	C5, 10, 11	CAPACITOR—.05 mf., 400 v., paper
*UCC-036	C17	CAPACITOR—.002 mf., 600 v., paper (will replace respective sections of RCW-3013).
*UCC-039	C20	CAPACITOR—.005 mf., 600 v., paper (will replace respective sections of RCW-3013).
*UCC-045	C21	CAPACITOR—.05 mf., 600 v., paper
*UCU-1036	C16, 19	CAPACITOR—220 mmf., mica (will replace respective sections of RCW-3013).
*URD-009	R17	RESISTOR—22 ohms, ½ w., carbon
*URD-017	R18	RESISTOR—47 ohms, ½ w., carbon
*URD-029	R15	RESISTOR—150 ohms, ½ w., carbon
*URD-081	R1	RESISTOR—22,000 ohms, ½ w., carbon
*URD-113	R2, 13, 14	RESISTOR—470,000 ohms, ½ w., carbon
*URD-129	R10	RESISTOR—2.2 meg., ½ w., carbon
*URD-141	R12	RESISTOR—6.8 meg., ½ w., carbon
*URF-049	R16	RESISTOR—1000 ohms, 2 w., carbon
*DL1RS-400-CG16	LS1	SPEAKER—PM loudspeaker (less T3)
SPECIALIZED REPLACEMENT PARTS		
*RAB-116	L1	BACK—Cabinet back cover (includes loop L1) for Model 509
*RAB-120	L1	BACK—Cabinet back cover (includes loop L1) for Model 530
*RAC-060		SHIELD PLATE—Metal plate covers bottom of chassis
*RAC-073		MOUNTING BRACKET—Metal back cover holds clock to cabinet
RAU-325		CABINET—White plastic (Model 509)
RAU-330		CABINET—Bleached mahogany finish plastic (Model 530)
*RCC-074	C22	CAPACITOR—.003 mf., 600 v., paper
*RCE-050	C23A, B	CAPACITOR—50 mf., 150 v.; 50 mf., 150 v., dry electrolytic
*RCT-021	C2A, 2B	CAPACITOR—Tuning capacitor (oscillator and r-f section)
SPECIALIZED REPLACEMENT PARTS (Cont.)		
*RCW-1043	C25	CAPACITOR—47 mmf., ceramic
*RCW-3013	C16, 17, 19, 20	CAPACITOR—220 mmf., .002 mf., 220 mmf., .005 mf. (4 section ceramic)
*RDK-028		KNOB—Volume control knob, Model 530
*RDK-094		KNOB—Tuning dial wheel. Does not include dial scale, see item RDS-090
RDK-203		KNOB—Volume control knob (red) for Model 509
*RDS-090		DIAL SCALE—Paper scale
*RHG-015		GROMMET—For tuning cond.
*RHH-004		FASTENER—Snap fastener for holding back
RHI-010		STRAIN RELIEF INSULATOR
*RHJ-005		SPACER FOR TUNING CONDENSER
RHS-043		BRACKET—For receptacle, J2 and switch, S1
*RJC-004		CLIP—Loop connector clip
*RJJ-008	J2	APPLIANCE RECEPTACLE
*RJS-116		SOCKET—Tube socket for 12SA7
*RJS-117		SOCKET—Tube socket for 12SQ7
*RJS-092		SOCKET—Tube socket for 50C5, 35W4
*RJS-141		SOCKET—For 12BA6 tube, 7 pin
*RLC-090	T4	COIL—Oscillator coil
RMS-205		SLEEP CONTROL BOOSTER SPRING
*RRC-054	R11	POTENTIOMETER—0.5 meg., volume control
RSW-067	S1	SWITCH—Radio ON-OFF switch at rear of receiver
*RTL-094	T1	TRANSFORMER—1st I-F transformer
*RTL-095	T2	TRANSFORMER—2nd I-F transformer
RTO-036	T3	TRANSFORMER—Output transformer
*RWL-009		CORD—Power cord (brown) for Model 530
*RWL-106		CORD—Power cord (white) for Model 509
RYN-007		NAMEPLATE—General Electric monogram
*RZC-009	M1	CLOCK—60 cycle, 105-125 v., clock assembly, for Model 530
RZC-011	M1	CLOCK—60 cycle, 105-125 v., clock assembly

†CLOCK REPLACEMENT PARTS LIST—MODELS 509 AND 530

Cat. No.	Symbol	Description
MISCELLANEOUS		
*XC3X36	1	KNOB—Time set shaft knob (bronze)
*XC4X5		KNOB—Alarm set knob (ivory)
*XC31X26		HAND—Sweep second hand (Model 530)
*XC32X199		HANDS—Hour and minute hands (luminous) (Model 530)
*XC53X31		BEZEL—Outer mounting rim (Model 530)
*XC53X117		BEZEL—Numeral ring (gold finish) (Model 530)
*XC55X15		DIAL—Alarm dial scale
*XC58X16		CRYSTAL—Glass crystal
*XC59X247		RING—Color ring for numeral bezel (Model 530)
*XC59X716		KNOB—Wake-up Manual and Sleep control knob (ivory)
*XC61X937		DIAL—Clock dial scale (luminous) (Model 530)
¶RZA-001		BEZEL—Outer mounting rim
¶RZA-002		BEZEL—Numeral ring (gold finish)
¶RZA-003		RING—Color ring for numeral bezel
¶RZD-001		DIAL—Clock dial scale (luminous)
¶RZH-001		HAND—Sweep second hand
¶RZH-002		HANDS—Hour and minute hands
CLOCK MOVEMENT		
*XC1X1	3	SCREW—Holds field core to baseplate, #4-40 x 1¼" long, round head
*XC1X2	4	LOCKWASHER—Under screw head of switch assembly mounting screw and field core mounting
*XC1X6	10	SCREW—Used to assemble switch assembly to switch bracket
*XC1X43	23	HEX NUT—For screw mounting switch assembly to switch bracket
*XC10X141	14	SHAFT ASSEMBLY—Time set shaft and gear assembly
*XC11X11	6	SHAFT ASSEMBLY—Alarm set shaft and gear assembly
*XC13X11	17	GEAR ASSEMBLY—Hour hand gear and sleeve assembly
*XC14X32	18	GEAR ASSEMBLY—Minute hand friction gear, pinion gear and sleeve assembly
*XC15X3	16	GEAR ASSEMBLY—Alarm dial gear and sleeve assembly
*XC16X14	19	GEAR ASSEMBLY—Sweep second hand gear and shaft assembly
*XC17X8	27	GEAR AND CAM—Alarm signal cam and gear assembly
CLOCK MOVEMENT (Cont.)		
*XC34X173	9	FRONT PLATE ASSEMBLY—Complete with case studs and alarm set shaft spring (7)
*XC35X93	25	BASE PLATE AND BACK GEAR—Base plate assembled complete with studs, back gear and pinion, and vibrator
*XC40X76	24	SWITCH INSULATOR ASSEMBLY—Consists of: two plastic and one fibre switch contact spring spacers
*XC40X77	28	GEAR AND SPRING ASSEMBLY—Drives alarm dial gear and hour hand gear (complete with pinion and shaft, pinion and gear, spring, washers and retaining clip)
*XC40X80	21	CONTACT ASSEMBLY—Lower switch contact and spring
*XC40X185		SPRING—Switch control shaft index spring (for cam indexed control shafts)
*XC40X194	29	LEVER—Sleep control switch lever
*XC40X196	15	GEAR AND SPRING ASSEMBLY—Pinion drive for sleep control segment gear (consists of pinion gear, pinion gear and shaft, spring, washers, and retaining clip)
*XC40X197	8	LEVER—Alarm control switch cam lever
*XC40X198	22	CONTACT ASSEMBLY—Upper switch contact and spring with attached fibre arm
*XC40X202	5	SPACER BUSHING—Field core spacer at screw mounting to base plate
*XC40X252	26	WASHER—Alarm signal cam and gear friction washer
*XC40X275		SPACER BUSHING—Wake-up Manual switch control shaft bushing
*XC40X276	20	SPACER BUSHING—For time set shaft
XC40X277	30	SHAFT—Sleep control shaft and gear segment assembly
*XC44X38	2	MOTOR ROTOR ASSEMBLY—Cased rotor and pinion (60 cycles)
*XC45X69	11	MOTOR FIELD ASSEMBLY—Consists of: core, shading poles, and field coil (60 cycles)
*XC59X699	13	SHAFT ASSEMBLY—Wake-up Manual control shaft assembly (detent spring index type)
*XC59X723	13	SHAFT ASSEMBLY—Wake-up Manual control shaft assembly (cam index type)
*XC64X1		SCREW—Switch bracket and front plate mounting screws

* Parts used on previous receivers.

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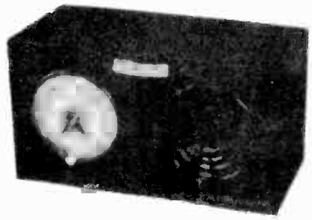
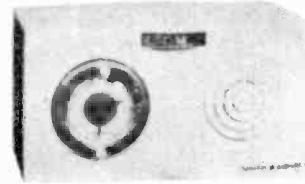
MODELS 510, 511



Model 510



Model 511

SPECIFICATIONS

CABINET	Model	510	511
	Composition	Brown plastic	Ivory plastic
	Height		$6\frac{1}{4}$ inches
	Width		$5\frac{19}{32}$ inches
	Length		$11\frac{3}{8}$ inches
POWER SUPPLY	Voltage		105–120 volts
	Frequency		60 cycles
	Wattage		30 watts
OPERATING FREQUENCIES	Broadcast Band		540–1600 kc
	I-F Amplifier		455 kc
POWER OUTPUT	Undistorted		1 watt
	Maximum		1.75 watts
LOUDSPEAKER	Type		Alnico 5 PM
	Outside Cone Diameter		4 inches
	Voice Coil Impedance (400 cycles)		3.5 ohms
TUBE COMPLEMENT	Oscillator-Converter		12SA7
	I-F Amplifier		12BA6
	Detector and 1st Audio		12SQ7
	Power Output		50C5
	Rectifier		35W4

GENERAL INFORMATION

The Models 510 and 511 are table model receivers providing reception on the Broadcast Band and incorporate as a special feature an electric time clock with wake-up alarm. A Beam-a-scope antenna is built in the radio providing good reception without an outside antenna.

RADIO CIRCUIT ALIGNMENT

EQUIPMENT REQUIRED

1. Test oscillator with tone modulation.
2. A-c output meter, $1\frac{1}{2}$ volts full scale.
3. Paper capacitor, 0.05 mf.
4. Loop (see explanation below).
5. Insulated screwdriver.
6. Isolation transformer.

PROCEDURE—GENERAL

1. With the tuning scale control wheel turned so that the tuning condenser plates are fully meshed, the index should read approximately $\frac{3}{16}$ inch to the right of the 500 kc scale calibration mark. If the reading is incorrect, remove the control wheel from the tuning condenser and replace for correct position. Do not attempt to correct the position by rotating the wheel on the shaft as this will cause the knob to slip.

2. For i-f alignment, it is necessary to remove the chassis from the cabinet.

3. Connect the output meter across the loudspeaker voice terminals.

4. Keep volume control at maximum and attenuate the test oscillator signal output so that the output meter reading never exceeds 1.0 volt.

5. Connect the capacitor as listed in column 2 between the output "High Side" of the test oscillator and the point of input specified. The oscillator output cable ground lead is connected to the receiver B –

ALIGNMENT CHART

Step	Connect Test Oscillator to	Test Osc. Setting	Dial Drum Setting	Adjust Trimmer for Max. Output
1	12BA6 grid (1) in series with 0.05 mf cap.	455 kc	Minimum capacity	2nd i-f trans. trimmers, C14 and C15.
2	12SA7 grid (8) in series with 0.05 mf. cap.			1st i-f trans. trimmer, C8 and C9.
3	Inductively coupled to radio loop.	1620 kc		C4 (oscillator)
4		1500 kc	Tune for maximum	C3 (antenna) (Rock-in)

6. For alignment of the oscillator and antenna trimmers, the input signal should be inductively coupled to the radio loop antenna, L1, by connecting a four-turn, six-inch diameter loop of bell wire across the signal generator output terminals, and then locating the loop to face the radio antenna loop about one foot away. To prevent possible errors in reference to previous signal measurement readings, the loop should not be changed with respect to the radio loop during any one set of adjustments.

STAGE GAIN AND VOLTAGE CHECKS

Trouble shooting is greatly enhanced by stage gain measurements which must be made by vacuum tube voltmeter or similar measuring instrument. The gain listed may have tolerances of ±20%. Use only low signal input so that the AVC is inoperative.

1. I-F STAGE GAINS

12SA7 Grid to 12BA6 Grid .... 50 @ 455 kc
12BA6 Grid to 12SQ7 Diode Plate .... 50 @ 455 kc

2. AUDIO GAINS

With the volume control (R11) at maximum, an input signal of 0.15 volts at 400 cycles across the control R11 will give approximately 0.5 watt output across the loudspeaker voice coil.

3. OSCILLATOR GRID BIAS

The d-c voltage developed across the oscillator grid leak (R1) averages 8.5 volts at 1000 kc, measured with V.T.V.M.

4. SOCKET VOLTAGES

The tube voltages are shown on Figure 3. They are taken from tube pins to B – unless specified otherwise. Great deviations of voltage values may help to localize defective components or tubes.

5. HUM

The hum voltage measured at the primary of the output transformer should not exceed 3mV volts. This measurement should be made with an a-c voltmeter of a sensitivity of 20,000 ohm volt in series with 0.5 mf. capacitor.

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MODELS 510, 511

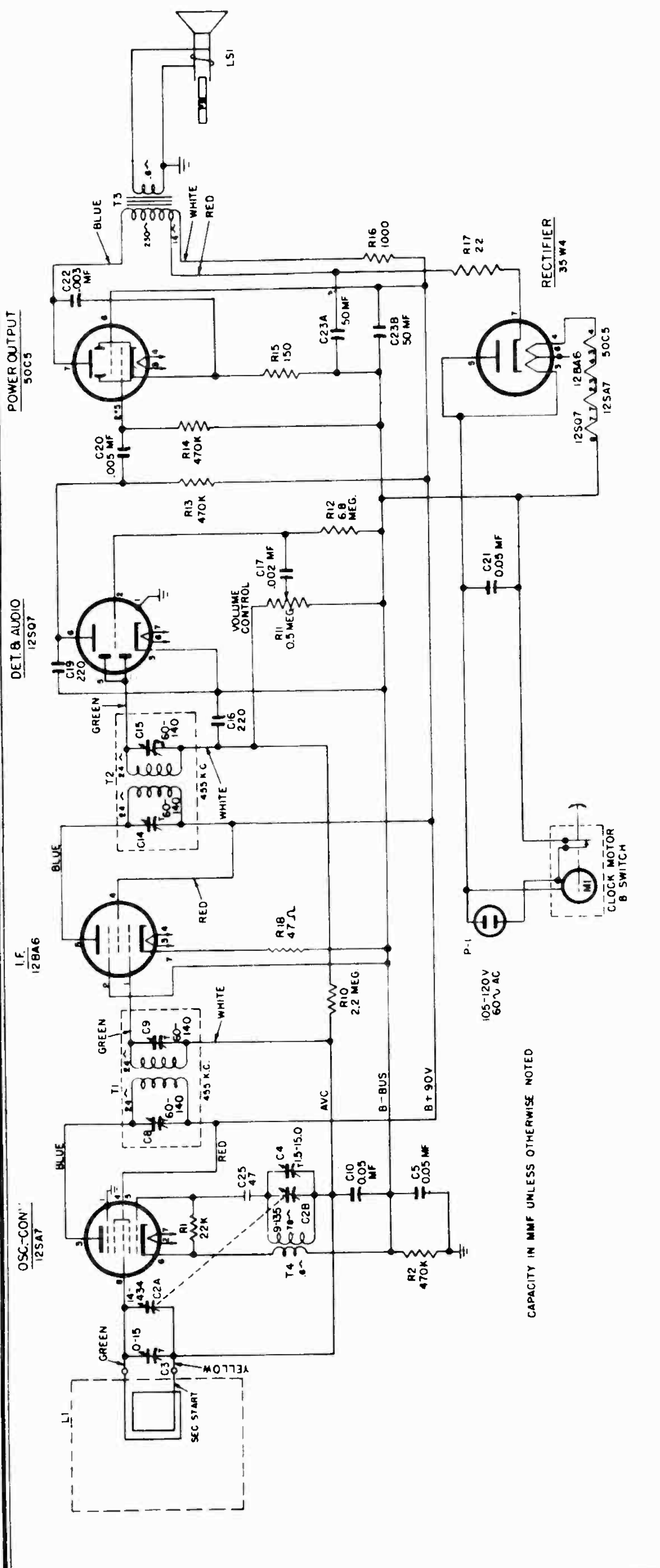

Fig. 1. Schematic Diagram, Models 510 and 511

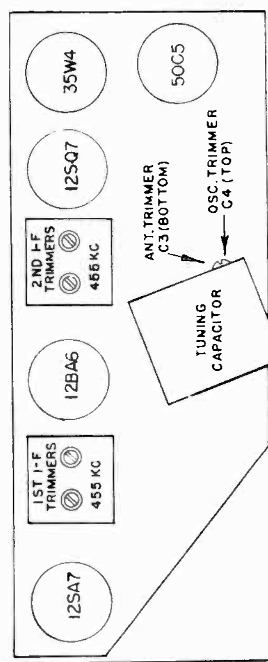

Fig. 2. Tube and Trimmer Location

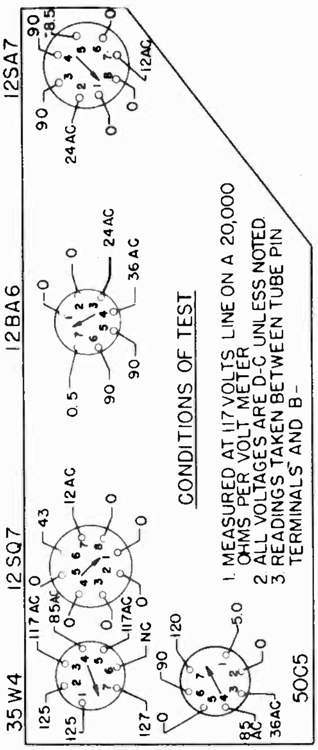

Fig. 3. Socket Voltage Diagram

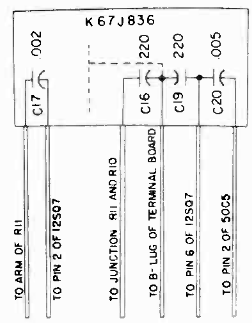

Fig. 4. Capacitor RC-3013 (K67J836)

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CLOCK SERVICE

Figure 5 shows clock parts referred to in the following paragraphs and the parts list.

CLOCK MOVEMENT DISASSEMBLY

1. Remove clock movement from case. When removing knobs, note that the Alarm-Set knob is a left-hand thread, while Alarm-Radio is a pull-off knob.
2. Remove Bezel, Hands and Dial Face.
3. Remove the motor assembly by removing two screws (A) and break two soldered joints on Field. The Field and Rotor Assembly (R) can now be removed. The Rotor is held by friction only to the Field.
4. Remove Switch Assembly (B) by removing two screws from base plate.
5. Remove Switch Shaft Assembly (C) and spacer.
6. Remove Alarm-Set Shaft Assembly (D) and spacer.
7. Remove the three front plate assembly screws that are located under the Dial Face and then remove Front Plate.
8. Remove Alarm Gear Sleeve Assembly (E), Hour Gear Sleeve Assembly (F), Minute Gear Sleeve Assembly (G), and Sweep Second Gear Shaft Assembly (H).
9. Remove Alarm Cam Gear Assembly (I) and Spring Washer (J).
10. Remove Alarm-Set Gear (K).
11. Remove Time-Set Gear and Shaft Assembly (L).
12. Remove Switch Cam Lever (M).

CLOCK MOVEMENT REASSEMBLY

Reassemble in the reverse order of disassembly, observing the following precautions:

1. The spring washer (J) should curve away from the gear when placed on the Alarm Cam Gear Assembly (I).
2. The Switch Cam Lever (M) fork must straddle the base plate post as shown in the illustration.
3. After reassembly of front plate, check the Sweep Second Gear (H) through the hole in the base plate to make sure it is free to turn.
4. Proceed with Alarm and Switch Adjustments as described below before installing hands.

ALARM AND SWITCH ADJUSTMENTS

1. Turn Alarm-Radio shaft to ALARM position.
2. Slowly rotate Time-Set shaft clockwise until the contacts of the Switch Assembly (B) close.
3. Replace Dial Face, Alarm Dial, the Minute, Hour and Second Hands. Set all Hands and Dial so that they indicate 12 o'clock. Make sure all Hands and Alarm Dial are tight on their respective shafts.
4. With Alarm-Set knob pulled out, continue to rotate Time-Set shaft clockwise and note that the vibrator arm (N) drops against field core approximately 7–10 minutes later.
5. Set alarm at some other selected position and make sure mechanism actuates within limits (±1 minute).
6. Check alarm tone of vibrator. This can be adjusted by either bending vibrator arm nearer or farther away from field core. Bend arm near anchor point.

CLEANING AND LUBRICATION

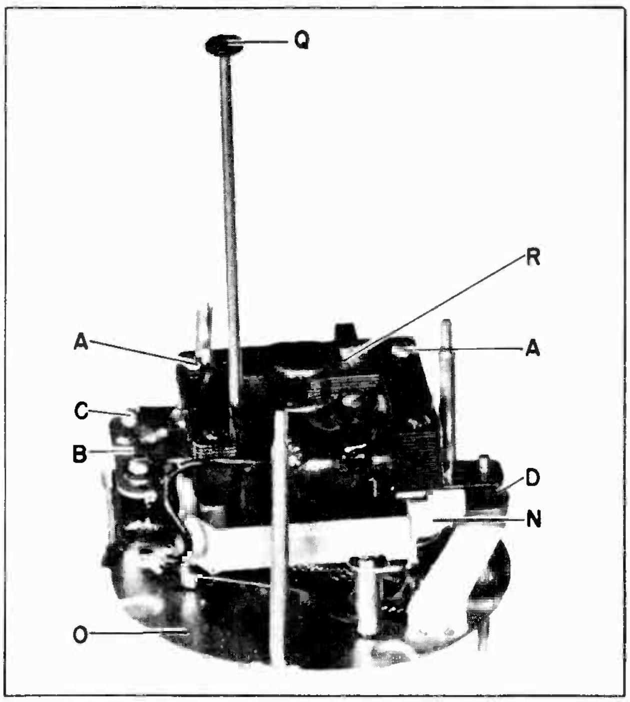
To clean, completely disassemble and clean all moving parts in carbon tetrachloride or some similar cleaner.

The inside of the sleeves and shaft surfaces may be cleaned of oxidized oil by rubbing with a fine grade of steel wool dampened in carbon tetrachloride.

Do not use too much oil and apply by means of a small wire (drop oiler). Too much oil collects dust and later oxidizes. Use only recommended clock oil, such as Nye's Celebrated Oil, which may be purchased from Wm. F. Nye Co., Inc., New Bedford, or equivalent.

CLOCK TROUBLES

1. Clock will not operate—Defective field coil, defective rotor, binding of parts.
2. Clock loses time—Binding parts, too little friction on minute hand sleeve assembly, defective rotor. Clock time-set shaft bent and rubs against hole in clock bracket.
3. Noisy Clock—Rotor defective, alarm armature improperly adjusted, loose parts, or binding of moving parts.



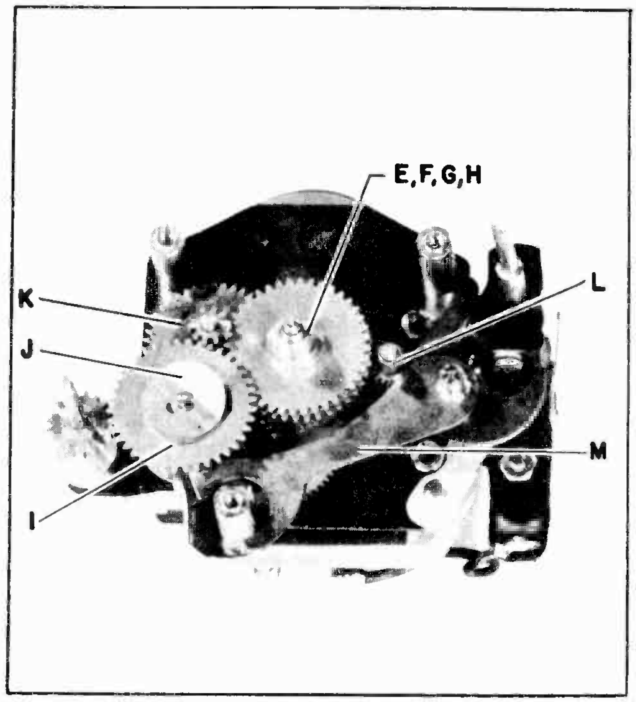


Fig. 5. Clock Part Identification

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MODELS 510, 511

MODEL 510 AND 511 REPLACEMENT PARTS

Cat. No.	Symbol	Description
UNIVERSAL REPLACEMENT PARTS		
UCC-037	C22	CAPACITOR—.003 mf., 600 v., paper
*UCC-045	C5, C10, C11, C21	CAPACITOR—.05 mf., 600 v., paper
*UCC-630	C17, C20	CAPACITOR—.01 mf., 600 v., paper (may replace respective sections of RCW-3013)
UCG-020	C25	CAPACITOR—47 mmf., silver mica
*UCU-036	C16, C19	CAPACITOR—220 mmf., mica (may replace respective sections of RCW-3013)
*URD-009	R17	RESISTOR—22 ohms, ½ w., carbon
*URD-017	R18	RESISTOR—47 ohms, ½ w., carbon
*URD-029	R15	RESISTOR—150 ohms, ½ w., carbon
*URD-081	R1	RESISTOR—22,000 ohms, ½ w., carbon
*URD-113	R2, R13, R14	RESISTOR—470,000 ohms, ½ w., carbon
*URD-129	R10	RESISTOR—2.2 meg., ½ w., carbon
*URD-141	R12	RESISTOR—6.8 meg., ½ w., carbon
*URF-049	R16	RESISTOR—1000 ohms, 2 w., carbon
S400C	LS1	SPEAKER—4-in. PM speaker, less output transformer
SPECIALIZED REPLACEMENT PARTS		
*RAB-131	L1	BACK—Cabinet back cover (includes loop L1)
RAC-060		SHIELD—Bottom shield
*RAC-085		MOUNTING BRACKET—Metal back cover holds clock to cabinet
RAG-033		GRILLE CLOTH ASSEMBLY Model 510
RAG-034		GRILLE CLOTH ASSEMBLY—Model 511
RAU-336		CABINET — Brown plastic (Model 510)
SPECIALIZED REPLACEMENT PARTS (Cont'd)		
RAU-337		CABINET — White plastic (Model 511)
*RCC-074	C22	CAPACITOR—.003 mf., 600 v., paper
*RCE-116	C23A, C23B	CAPACITOR—50 mf., 150 v., 50 mf., 150 v., dry electrolytic
*RCT-045	C2A, C2B, C3, C4	CAPACITOR—Tuning capacitor (oscillator and r-f section) with trimmers
*RCW-3013	C16, C17, C19, C20	CAPACITOR—220 mmf., .002 mf., 220 mmf., .005 mf. (4 section ceramic) (see UCC-630, UCU-036)
*RDK-216		KNOB—Tuning dial wheel
*RDK-218		KNOB—Volume control knob
RHC-017		CLIP—Coil clip
RHC-024		CLIP—Condenser clip
*RHG-015		GROMMET—Cushion mounting for C2A, C2B
*RHI-010		STRAIN RELIEF
*RHJ-005		SPACER—Washer used with RHG-015
*RJC-004		CLIP—Loop connector clip
*RJS-092		SOCKET—Tube socket for 50C5, 35W4
*RJS-116		SOCKET—Tube socket for 12SA7
*RJS-117		SOCKET—Tube socket for 12SQ7, 35Z5-GT
*RJS-141		SOCKET—Tube socket for 12BA6
*RLC-090	T4	COIL—Oscillator coil
RMS-214		SPRING—Compression spring
*RRC-054	R11	POTENTIOMETER — 0.5 meg., volume control
*RTL-094	T1, C8, C9	TRANSFORMER — 1st I-F transformer
*RTL-095	T2, C14, C15	TRANSFORMER — 2nd I-F transformer
*RTO-036	T3	TRANSFORMER — Output transformer
RTO-091	T3	TRANSFORMER — Output transformer (bolt mount)
*RWL-009		CORD—Power cord (brown) for Model 510
*RWL-016		CORD—Power cord (white) for Model 511
*RZC-012	M1	CLOCK—60 cycle, 105–125 v., clock assembly

CLOCK REPLACEMENT PARTS LIST

Cat. No.	Symbol	Description
MISCELLANEOUS		
XC3X49	Q	TIME SET SHAFT KNOB—Bronze
XC4X5		ALARM SET KNOB—Ivory
XC10X131	L	TIME SET GEAR AND SHAFT ASSEMBLY
XC11X11	D	ALARM SET SHAFT ASSEMBLY
RZH-003		SWEEP SECOND HAND
RZH-004		HOUR AND MINUTE HANDS
XC34X139	O	FRONTPLATE ASSEMBLY
RZA-004		ALARM DIAL
XC58X16		CRYSTAL—2 9/16 in., round
RZA-004		NUMERAL COLOR RING—Red
XC59X699	C	SWITCH SHAFT ASSEMBLY
XC59X716		SWITCH KNOB—Ivory
RZD-003		DIAL FACE—(On front plate)
RZA-005		NUMERAL RING—Bronze
CLOCK MOVEMENT		
*XC1X1	A	SCREW—Holds Field, No. 4-40X1 ⅛ in. R.H.
*XC1X2		No. 1204 LOCKWASHER
*XC1X6		SCREW No. 4-40 x ⅝ in. R.H.
*XC1X43		HEX NUT
*XC13X11	F	HOUR GEAR SLEEVE ASSEMBLY
CLOCK MOVEMENT (Cont'd)		
*XC14X15	G	MINUTE GEAR SLEEVE ASSEMBLY
*XC15X3	E	ALARM GEAR SLEEVE ASSEMBLY
*XC16X14	H	SWEEP SECOND GEAR SHAFT ASSEMBLY
*XC17X8	I	ALARM GEAR SHAFT ASSEMBLY
*XC35X39		BASEPLATE ASSEMBLY
*XC40X13		RIVET—Vibrator
*XC40X76		SWITCH ASSEMBLY—Consists of Contact Block (top), Contact Block (bottom), Contact Spring Insulator
*XC40X77	K	ALARM SET GEAR ASSEMBLY
*XC40X78	M	SWITCH CAM LEVER ASSEMBLY
*XC40X79		UPPER CONTACT SPRING ASSEMBLY
*XC40X80		LOWER CONTACT SPRING AND TIP ASSEMBLY
*XC40X202		SPREADER POST
*XC40X252	J	CAM GEAR SPRING WASHER
*XC40X260		SPACER—Switch shaft
*XC40X261		TIME SET SHAFT SPACER
*XC40X262		TIME SET SHAFT SPACER
*XC40X263		ALARM SHUT-OFF SPACER
*XC44X38		ROTOR UNIT—60 cycles
*XC45X69	R	FIELD COIL ASSEMBLY—60 cycles
*XC64X1		FRONTPLATE SCREW

*Used on other models.

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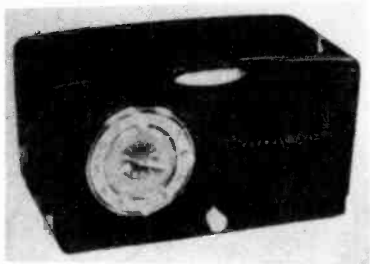
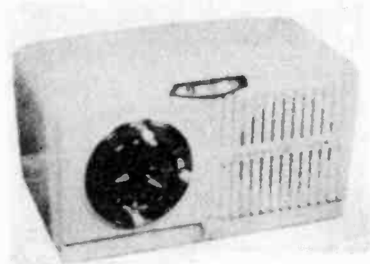
MODELS 515,
516, 517, 518



MODEL 515 (Brown Mottle)
MODEL 517 (Maroon)



MODEL 516 (Ivory)
MODEL 518 (White)

SPECIFICATIONS

CABINET:

Height	$6\frac{3}{16}$ inches
Width	$11\frac{15}{16}$ inches
Depth	$4\frac{1}{4}$ inches

ELECTRICAL RATING (INPUT):

Voltage	105-120 volts, a-c
Frequency	60 cycles
Wattage	30 watts

OPERATING FREQUENCIES:

Intermediate Frequency	455 kc
Broadcast Band	540-1600 kc

POWER OUTPUT:

Undistorted	1 watt
Maximum	1.75 watts

LOUDSPEAKER:

Type	Alnico 5 PM
Outside Cone Diameter	4-inch
Voice Coil Impedance (400 cycles)	3.5 ohms

TUBE COMPLEMENT:

Oscillator-Converter	Type 12SA7
I-F Amplifier	Type 12BA6
Detector and 1st Audio	Type 12SQ7
Power Output	Type 50C5
Rectifier	Type 35W4

CAUTION: One side of the power line is connected to B−. Avoid any ground connections direct to B−. Use an isolating transformer when making service adjustments with the chassis removed from the cabinet.

GENERAL INFORMATION

The Models 515, 516, 517 and 518 are four-tube, plus rectifier tube, a-c/d-c superheterodyne receivers, employing a Beam-a-scope antenna. Special features include an electric time clock with wake-up alarm and sleep control switch. In addition, the timer receptacle at the rear of the receiver provides an outlet connection for external appliances which is controlled by the normal function of the alarm and sleep control mechanism of the clock. The radio OFF-ON switch adjacent to the timer outlet provides control of radio operation so that the radio receiver may be turned off if so desired while using the external appliance. When radio operation is to be resumed, this switch must be turned to the on position.

C16, C17, C19, AND C20

The lead identification for the four-section ceramic capacitor RCW-3013 (K67J836) can be observed from the illustration of Figure 1.

Should it become necessary to service this unit, either the defective section can be cut out of the circuit and replaced by an individual capacitor (see Parts Replacement List, items UCC-036, UCC-039 and UCU-1036), or a complete new four-section unit, RCW-3013, can be installed.

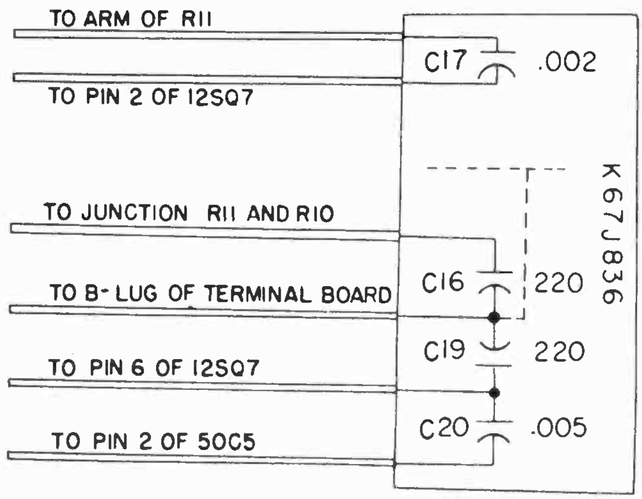


Fig. 1. Capacitor RCW-3013

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 input so that AVC is not effective.

(1) I-F Stage Gains.

12SA7 Grid to 12BA6 Grid	50 @ 455 kc
12BA6 Grid to 12SQ7 Diode Plate	50 @ 455 kc

(2) Audio Gain.

0.15 volts at 400 cycles across the volume control (R11) with control set at maximum will give approximately ½-watt output across the loudspeaker, LS1, voice coil.

(3) Oscillator Grid Bias.

D-c voltage developed across the oscillator grid leak (R1) averages 8.5 volts at 1000 kc.

(4) Socket Pin Voltages.

Figure 3 shows voltages from all tube pins to B− unless otherwise specified. Voltage readings much higher or lower than those specified may help localize defective components or tubes.

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MODELS 515, 516, 517, 518

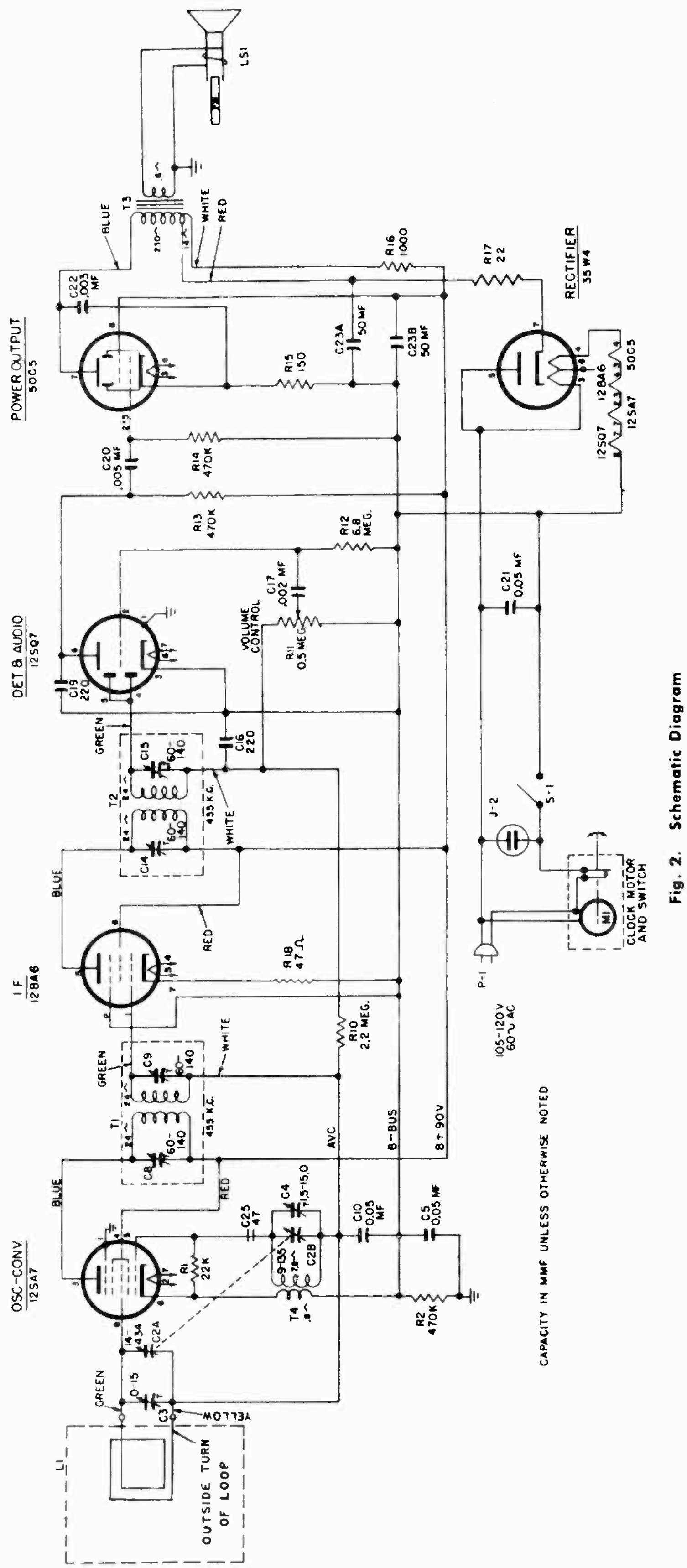

Fig. 2. Schematic Diagram

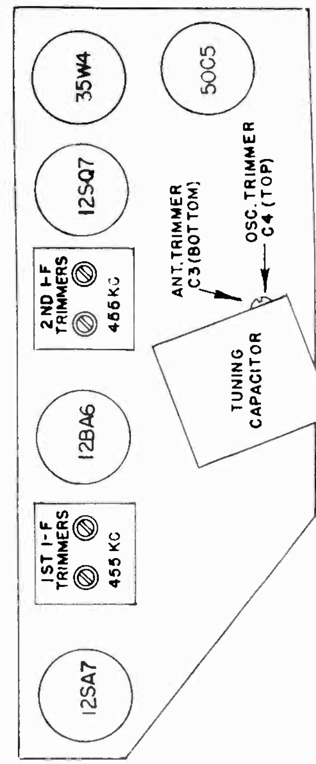

Fig. 4. Tube and Trimmer Location

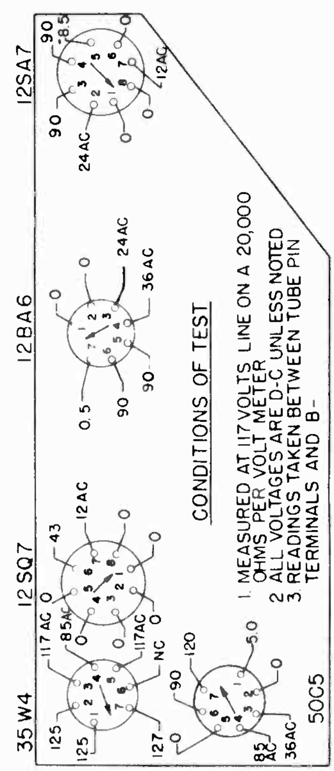

Fig. 3. Socket Voltages

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RADIO CIRCUIT ALIGNMENT

ALIGNMENT FREQUENCIES:

R-F .... 1500 kc
R-F .... 1620 kc
I-F .... 455 kc

EQUIPMENT REQUIRED:

1. Test oscillator with tone modulation.
2. A-c output meter, 1½ volts full scale.
3. 0.05 mf. paper capacitor.
4. Loop. (See note 6.)
5. Insulated screwdriver.

PROCEDURE—GENERAL:

1. With the tuning scale control wheel turned so that the gang condenser plates are fully meshed, the index should read approximately $\frac{3}{16}$ inch to the right of the 550 kc scale calibration mark. If it does not, remove the control wheel from the gang condenser shaft and replace it for correct position. CAUTION: Do not attempt to correct the position by rotating the wheel on the shaft as this will cause the knob to slip.

2. For i-f alignment, it is necessary to remove the chassis from the cabinet.

3. Connect the output meter across the loudspeaker voice coil terminals.

4. Keep radio volume control at maximum and attenuate the test oscillator signal output so that the output meter reading never exceeds 1.0 volt.

5. Connect the capacitor as listed in column 2 between the output "High Side" of the test oscillator and the point of input specified. The oscillator output cable ground lead is connected to receiver chassis.

6. For alignment of the oscillator and antenna trimmers, the input signal should be inductively coupled to the radio loop antenna, L1, by connecting a four-turn, six-inch diameter loop of bell wire across the signal generator output terminals, and then locating the loop to face the radio antenna loop about one foot away. To prevent possible errors in reference to previous signal measurement readings, the loop with respect to the radio loop should not be changed during any one set of adjustments.

ALIGNMENT CHART

Step	Connect Test Oscillator to	Test Osc. Setting	Dial Drum Setting	Adjust Trimmers for Maximum Output
1	12BA6 grid (1) in series with 0.05 mf. cap.	455 kc	Minimum Capacity	2nd I-F trans. trimmers, C14 and C15
2	12SA7 grid (8) in series with 0.05 mf. cap.	455 kc	Minimum Capacity	1st I-F trans. trimmers, C8 and C9
3	Inductively coupled to radio loop	1620 kc	Minimum Capacity	C4 (oscillator)
4	Inductively coupled to radio loop	1500 kc	Tune for Maximum	C3 (antenna)

CLOCK SERVICE

Figures 5 and 6 show clock parts referred to in the following paragraphs and the parts list.

CLOCK MOVEMENT DISASSEMBLY

1. Remove clock movement from case. When removing knobs, note that the Alarm-Set knob is a left-hand thread, while Wake-Up Manual and Sleep are pull-off knobs.
2. Remove Bezel, Hands and Dial Faces.
3. Remove the motor assembly by removing two screws (3) and break two soldered joints on Field. The Field and Rotor Assembly (11 and 2) can now be removed. The Rotor is held by friction only, to the Field.
4. Remove Switch Assembly by removing two screws (12) from base plate.
5. Remove Switch Shaft Assembly (13) and spacer.
6. Remove Alarm-Set Shaft Assembly (6) and spacer.
7. Remove the three front plate assembly screws that are located under the Dial Face and then remove Front Plate.
8. Remove the following gear assemblies and control levers in the order listed below:

(a) Sweep Control Shaft and Segment Gear (30)
(b) Alarm Dial Gear (16)
(c) Hour Hand Gear (17)
(d) Alarm Signal Cam and Gear, and Friction Washer (27, 26)
(e) Sweep Control Switch Lever (29)
(f) Pinion Drive Gear Assembly (15) (drives Sleep Control Segment Gear)
(g) Alarm Control Switch Cam Lever (8)
(h) Time Set Shaft and Gear, and Spacer (14, 20)
(i) Drive Gear and Pinion Assembly (28)
(j) Minute Hand Gear (18)
(k) Sweep Second Hand Gear (19)

CLOCK MOVEMENT REASSEMBLY

Reassemble in the reverse order of disassembly, observing the following precautions:

1. The spring washer (26) should curve away from the gear when placed on the Alarm Cam Gear Assembly (27).
2. The Switch Cam Lever fork (8) must straddle the base plate post as shown in the illustration.
3. After reassembly of front plate, check the Sweep Second Gear (19) through the hole in the base plate to make sure it is free to turn.
4. Proceed with Alarm and Switch Adjustments as described below before installing hands.

ALARM AND SWITCH ADJUSTMENTS

1. Turn Wake-Up Manual shaft to WAKE UP position.
2. Slowly rotate Time Set shaft clockwise until the contacts 21 and 22 of the Switch Assembly close.
3. Replace Dial Face, Alarm Dial, the Minute, Hour and Second Hands. Set all Hands so that they indicate 12 o'clock. Set figure 12 of the alarm dial to index with the smaller pointer of the hour hand. Make sure all Hands and Alarm Dial are tight on their respective shafts.
4. With Alarm Set knob pulled out, continue to rotate Time Set shaft clockwise and note that the Alarm vibrator arm drops against field core approximately 7–10 minutes later.
5. Set alarm at some other selected position and make sure mechanism actuates within limits (±1 minute).
6. Check alarm tone of vibrator. This can be adjusted by either bending vibrator arm nearer or farther away from field core. Bend arm near anchor point.

CLEANING AND LUBRICATION

To clean, completely disassemble and clean all moving parts in carbon tetrachloride or some similar cleaner.

The inside of the sleeves and shaft surfaces may be cleaned of oxidized oil by rubbing with a fine grade of steel wool dampened in carbon tetrachloride.

Do not use too much oil and apply by means of a small wire (drop oiler). Too much oil collects dust and later oxidizes. Use only recommended clock oil, such as Nye's Celebrated Oil which may be purchased from Wm. F. Nye Co., Inc., New Bedford, or equivalent.

CLOCK TROUBLES

1. Clock will not operate—Defective field coil, defective rotor, binding of parts.
2. Clock loses time—Binding parts, too little friction on minute hand sleeve assembly, defective rotor. Clock time set shaft bends and rubs against hole in clock bracket.
3. Noisy Clock—Rotor defective, alarm armature improperly adjusted, loose parts, or binding of moving parts.

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MODELS 515, 516, 517, 518

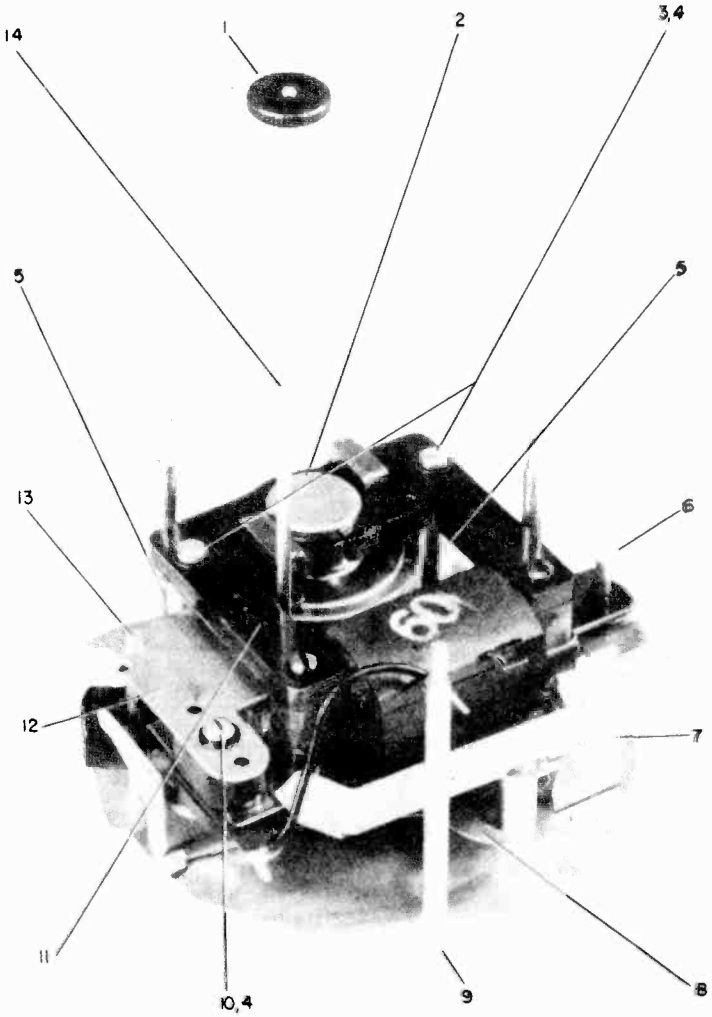

Fig. 5. Back View of Clock

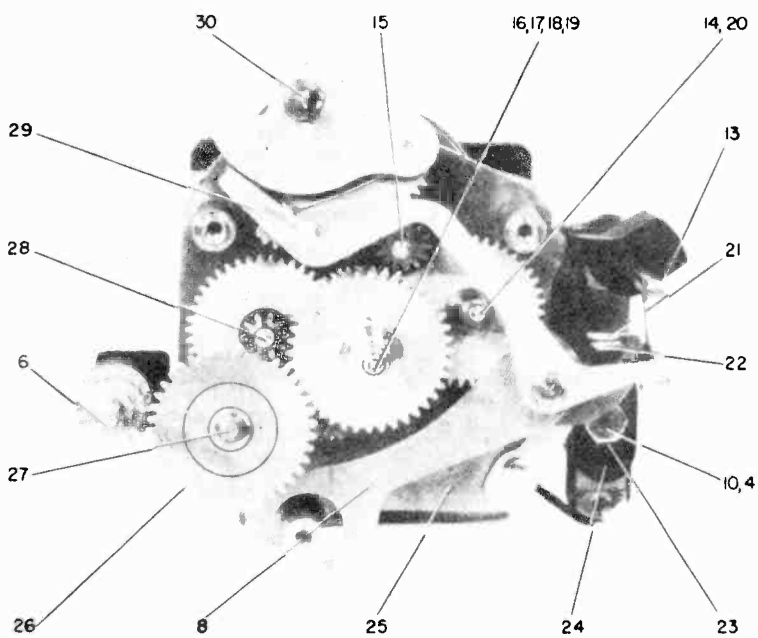

Fig. 6. Front View of Clock, Front Plate Removed

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REPLACEMENT PARTS LIST—MODELS 515, 516, 517 AND 518

Cat. No.	Symbol	Description
UNIVERSAL RADIO PARTS		
*UCC-036	C17	CAPACITOR—.002 mf., 600 v., paper (see paragraph, page 5)
*UCC-037	C22	CAPACITOR—.003 mf., 600 v., paper
*UCC-039	C20	CAPACITOR—.005 mf., 600 v., paper, (see paragraph, page 5)
*UCC-045	C5, C10, C21	CAPACITOR—.05 mf., 600 v., paper
*UCG-1020	C25	CAPACITOR—47 mmf., silver mica
*UCU-1036	C16, C19	CAPACITOR—220 mmf., mica (see paragraph, page 5)
*URD-009	R17	RESISTOR—22 ohms, ½ w., carbon
*URD-017	R18	RESISTOR—47 ohms, ½ w., carbon
*URD-029	R15	RESISTOR—150 ohms, ½ w., carbon
*URD-081	R1	RESISTOR—22,000 ohms, ½ w., carbon
*URD-113	R2, R13, R14	RESISTOR—470,000 ohms, ½ w., carbon
*URD-129	R10	RESISTOR—2.2 meg., ½ w., carbon
*URD-141	R12	RESISTOR—6.8 meg., ½ w., carbon
*URF-049	R16	RESISTOR—1000 ohms, 2 w., carbon
SPECIALIZED RADIO PARTS		
RAB-130		CABINET BACK—includes antenna loop, L1
*RAC-060		BOTTOM SHIELD—Metal plate, covers bottom of chassis
RAC-085		CLOCK MOUNTING BRACKET ASSEMBLY—Clock back cover
RAG-033		GRILLE CLOTH ASSEMBLY—For speaker grille on models 515, 517
RAG-034		GRILLE CLOTH ASSEMBLY—For speaker grille on Model 516
RAG-035		GRILLE CLOTH ASSEMBLY—For speaker grille on Model 518
RAU-338		CABINET—Model 515 (brown)
RAU-339		CABINET—Model 516 (ivory)
RAU-340		CABINET—Model 517 (maroon)
RAU-341		CABINET—Model 518 (white)
RCE-116	C23, A & B	CAPACITOR—50-50 mf., 150 v., electrolytic
RCT-045		CAPACITOR—(420-126 mmf.) tuning
*RCW-3013	C16, C17, C19, C20	CAPACITOR—220 mmf., .002 mf., 220 mmf., .005 mf., Ceramic (bullplate)
RDK-215		KNOB—Volume control—For Model 518
*RDK-217		KNOB—Dial tuning—For Models 515, 516, 517
*RDK-218		KNOB—Volume control—For Models 516, 517, 518
RDK-219		KNOB—Dial tuning—For Model 518
*RHC-017		COIL CLIP—For oscillator coil
*RHC-024		CONDENSER CLIP—For mounting electrolytic, C23
*RHG-015		GROMMET—Tuning capacitor mounting
*RHI-010		STRAIN RELIEF—Grommet in chassis for power cord
*RHJ-005		SPACER—Tuning capacitor mounting
*RHS-043		BRACKET—For receptacle J2 and switch S1
*RJC-004		CLIP—Loop connector lead clip
*RJJ-008	J2	RECEPTACLE—Appliance outlet (rear of receiver)
*RJS-092		TUBE SOCKET—For 50C5, 35W4
*RJS-116		TUBE SOCKET—For 12SA7
*RJS-117		TUBE SOCKET—For 12SQ7
RJS-141		TUBE SOCKET—For 12BA6 (7 Pin)
*RLC-090	T4	OSCILLATOR COIL
*RMS-214		SPRING CLIP—Locks drum dial to shaft
*RRC-054	R11	POTENTIOMETER—0.5 meg., volume control
*RSW-067	S1	SWITCH—ON-OFF switch
*RTL-094	T1	TRANSFORMER—1st I.-F.
*RTL-095	T2	TRANSFORMER—2nd I.-F.
RTO-036	T3	TRANSFORMER—Output transformer
*RWL-009		CORD SET—(brown) for Models 515, 517
*RWL-016		CORD SET—(ivory) for Model 516
RWL-024		CORD SET—(white) for Model 518
*RZC-009		CLOCK—60 cycles, 105-125 v., clock assembly for Models 515, 516, 517
*RZC-011		CLOCK—60 cycles, 105-125 v., clock assembly for Model 518
*S400C		SPEAKER—4" PM loudspeaker
†MISCELLANEOUS CLOCK PARTS		
*XC3X36	1	KNOB—Time set shaft knob (bronze)
*XC4X5		KNOB—Alarm set knob (ivory)
*XC31X26		HAND—Sweep second hand (Model 515, 516, 517)
*XC32X199		HANDS—Hour and minute hands (luminous) (Model 515, 516, 517)
*XC53X31		BEZEL—Outer mounting rim (Model 518)
*XC53X117		BEZEL—Numeral ring (gold finish) (Model 515, 516, 517)
*XC55X15		DIAL—Alarm dial scale
*XC58X16		CRYSTAL—Glass crystal
*XC59X247		RING—Color ring for numeral bezel (Model 515, 516, 517)

Cat. No.	Symbol	Description
MISCELLANEOUS CLOCK PARTS (Cont'd)		
*XC59X716		KNOB—Wake-up Manual and Sleep control knob (ivory)
*XC61X937		DIAL—Clock dial scale (luminous) (Model 515, 516, 517)
*¶RZA-001		BEZEL—Outer mounting rim (Model 518)
*¶RZA-002		BEZEL—Numeral ring (gold finish) (Model 518)
*¶RZA-003		RING—Color ring for numeral bezel (Model 518)
*¶RZD-001		DIAL—Clock dial scale (luminous) (Model 518)
*¶RZH-001		HAND—Sweep second hand (Model 518)
*¶RZH-002		HANDS—Hour and minute hands (Model 518)
†CLOCK MOVEMENT PARTS		
*XC1X1	3	SCREW—Holds field core to baseplate, #4-40 x 1⅛" long, round head
*XC1X2	4	LOCKWASHER—Under screw head of switch assembly mounting screw and field core mounting
*XC1X6	10	SCREW—Used to assemble switch assembly to switch bracket
*XC1X43	23	HEX NUT—For screw mounting switch assembly to switch bracket
*XC10X141	14	SHAFT ASSEMBLY—Time set shaft and gear assembly
*XC11X11	6	SHAFT ASSEMBLY—Alarm set shaft and gear assembly
*XC13X11	17	GEAR ASSEMBLY—Hour hand gear and sleeve assembly
*XC14X32	18	GEAR ASSEMBLY—Minute hand friction gear, pinion gear and sleeve assembly
XC15X3	16	GEAR ASSEMBLY—Alarm dial gear and sleeve assembly
*XC16X14	19	GEAR ASSEMBLY—Sweep second hand gear and shaft assembly
*XC17X8	27	GEAR AND CAM—Alarm signal cam and gear assembly
*XC34X173	9	FRONT PLATE ASSEMBLY—Complete with case studs and alarm set spring (7)
*XC35X93	25	BASE PLATE AND BACK GEAR—Base plate assembled complete with studs, back gear and pinion, and vibrator
*XC40X76	24	SWITCH INSULATOR ASSEMBLY—Consists of: two plastic and one fiber switch contact spring spacers
*XC40X77	28	GEAR AND SPRING ASSEMBLY—Drives alarm dial gear and hour hand gear (complete with pinion and shaft, pinion and gear, spring, washers and retaining clip)
*XC40X80	21	CONTACT ASSEMBLY—Lower switch contact and spring
*XC40X185		SPRING—Switch control shaft index spring (for cam indexed control shafts)
*XC40X194	29	LEVER—Sleep control switch lever
*XC40X196	15	GEAR AND SPRING ASSEMBLY—Pinion drive for sleep control segment gear (consists of pinion gear, pinion gear and shaft, spring, washers, and retaining clip)
*XC40X197	8	LEVER—Alarm control switch cam lever
*XC40X198	22	CONTACT ASSEMBLY—Upper switch contact and spring with attached fiber arm
*XC40X202	5	SPACER BUSHING—Field core spacer at screw mounting to base plate
*XC40X252	26	WASHER—Alarm signal cam and gear friction washer
*XC40X275		SPACER BUSHING—Wake-up Manual switch control shaft bushing
*XC40X276	20	SPACER BUSHING—For time set shaft
XC40X277	30	SHAFT—Sleep control shaft and gear segment assembly
*XC44X38	2	MOTOR ROTOR ASSEMBLY—Cased rotor and pinion (60 cycles)
*XC45X69	11	MOTOR FIELD ASSEMBLY—Consists of: core, shading poles, and field coil (60 cycles)
*XC59X699	13	SHAFT ASSEMBLY—Wake-up Manual Control shaft assembly (detent spring index type)
*XC59X723	13	SHAFT ASSEMBLY—Wake-up Manual control shaft assembly (cam index type)
*XC64X1		SCREW—Switch bracket and front plate mounting screws

* Parts used on previous receivers.

¶ These are temporary Cat. No. assignments to be superseded by regular Cat. No. at a later date.

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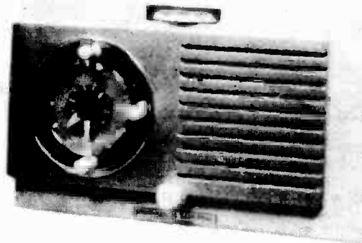
MODELS 521, 522



SPECIFICATIONS

CABINET

Model	521	522
Color	Dark Mahogany	Blond Mahogany
Height	6 3/16 in.	6 3/16 in.
Width	10 1/2 in.	10 1/2 in.
Depth	6 in.	6 in.

ELECTRICAL RATING (INPUT):

Voltage . . . . . 105-120 volts, a-c
Frequency . . . . . 60 cycles
Wattage . . . . . 30 watts

OPERATING FREQUENCIES:

Intermediate Frequency . . . . . 455 kc
Broadcast Band . . . . . 540-1600 kc

POWER OUTPUT:

Undistorted . . . . . 1 watt
Maximum . . . . . 1.75 watts

LOUDSPEAKER:

Type . . . . . Alnico 5 PM
Outside Cone Diameter 4-inch
Voice Coil Impedance (400 cycles) . . . . . 3.5 ohms

TUBE COMPLEMENT:

Oscillator-Converter . . . . . Type 12SA7
I-F Amplifier . . . . . Type 12BA6
Detector and 1st Audio . . . . . Type 12SQ7
Power Output . . . . . Type 50C5
Rectifier . . . . . Type 35W4

CAUTION: One side of the power line is connected to B—. Avoid any ground connections direct to B—. Use an isolating transformer when making service adjustments with the chassis removed from the cabinet.

GENERAL INFORMATION

•The Models 521 and 522 are four-tube, plus rectifier tube, a-c/d-c superheterodyne receivers, employing a Beam-a-scope antenna. Special features include an electric time clock with wake-up alarm and sleep control switch. In addition, the timer receptacle at the rear of the receiver provides an outlet connection for external appliances which is controlled by the normal function of the alarm and sleep control mechanism of the clock. The radio OFF-ON switch adjacent to the timer outlet provides control of radio operation so that the radio receiver may be turned off if so desired while using the external appliance. When radio operation is to be resumed, this switch must be turned to the on position.

RADIO CIRCUIT ALIGNMENT

ALIGNMENT FREQUENCIES:

R-F . . . . . 1500 kc
R-F . . . . . 1620 kc
I-F . . . . . 455 kc

EQUIPMENT REQUIRED:

1. Test oscillator with tone modulation.
2. A-c output meter, 1½ volts full scale.
3. 0.05 mf. paper capacitor.
4. Loop. (See note 6.)
5. Insulated screwdriver.

PROCEDURE—GENERAL:

1. With the tuning scale control wheel turned so that the gang condenser plates are fully meshed, the index should read approximately 3/16 inch to the right of the 550 kc scale calibration mark. If it does not, remove the control wheel from the gang condenser shaft and replace it for correct position. CAUTION: Do not attempt to correct the position by rotating the wheel on the shaft as this will cause the knob to slip.
2. For i-f alignment, it is necessary to remove the chassis from the cabinet.
3. Connect the output meter across the loudspeaker voice coil terminals.
4. Keep radio volume control at maximum and attenuate the test oscillator signal output so that the output meter reading never exceeds 1.0 volt.
5. Connect the capacitor as listed in column 2 between the output "High Side" of the test oscillator and the point of input specified. The oscillator output cable ground lead is connected to receiver chassis.
6. For alignment of the oscillator and antenna trimmers, the input signal should be inductively coupled to the radio loop antenna, L1, by connecting a four-turn, six-inch diameter loop of bell wire across the signal generator output terminals, and then locating the loop to face the radio antenna loop about one foot away. To prevent possible errors in reference to previous signal measurement readings, the loop with respect to the radio loop should not be changed during any one set of adjustments.

ALIGNMENT CHART

Step	Connect Test Oscillator to	Test Osc. Setting	Dial Drum Setting	Adjust Trimmers for Maximum Output
1	12BA6 grid (1) in series with 0.05 mf. cap.	455 kc	Minimum Capacity	2nd I-F trans. trimmers, C14 and C15
2	12SA7 grid (8) in series with 0.05 mf. cap.	455 kc	Minimum Capacity	1st I-F trans. trimmers, C8 and C9
3	Inductively coupled to radio loop	1620 kc	Minimum Capacity	C4 (oscillator)
4	Inductively coupled to radio loop	1500 kc	Tune for Maximum	C3 (antenna)

STAGE GAIN AND VOLTAGE CHECKS

Stage gain measurements by vacuum tube voltmeter or similar measuring devices may be used to check circuit per-

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formance and isolate trouble. The gain values listed may have tolerances of 20%. Readings taken with low signal input so that AVC is not effective.

(1) I-F Stage Gains.
12SA7 Grid to 12BA6 Grid .... 50 @ 455 kc
12BA6 Grid to 12SQ7 Diode Plate .... 50 @ 455 kc

(2) Audio Gain.
0.15 volts at 400 cycles across the volume control (R11) with control set at maximum will give approximately ½-watt output across the loudspeaker, LS1, voice coil.

(3) Oscillator Grid Bias.
D-c voltage developed across the oscillator grid leak (R1) averages 8.5 volts at 1000 kc.

(4) Socket Pin Voltages.
Figure 2 shows voltages from all tube pins to B— unless otherwise specified. Voltage readings much higher or lower than those specified may help localize defective components or tubes.

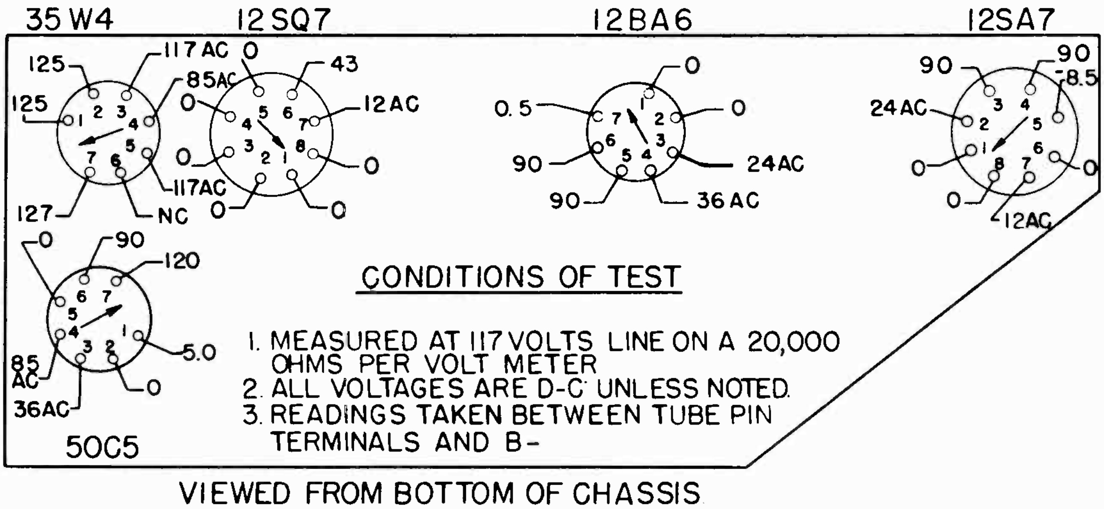

Fig. 2. Socket Voltages

CLOCK SERVICE

Figures 3 and 4 show clock parts referred to in the following paragraphs and the parts list.

CLOCK MOVEMENT DISASSEMBLY

1. Remove clock movement from case. When removing knobs, note that the Alarm-Set knob is a left-hand thread, while Wake-Up Manual and Sleep are pull-off knobs.
2. Remove Bezel, Hands and Dial Faces.
3. Remove the motor assembly by removing two screws (3) and break two soldered joints on Field. The Field and Rotor Assembly (11 and 2) can now be removed. The Rotor is held by friction only, to the Field.
4. Remove Switch Assembly (12) by removing two screws from base plate.
5. Remove Switch Shaft Assembly (13) and spacer.
6. Remove Alarm-Set Shaft Assembly (6) and spacer.
7. Remove the three front plate assembly screws that are located under the Dial Face and then remove Front Plate.
8. Remove the following gear assemblies and control levers in the order listed below:
   (a) Sweep Control Shaft and Segment Gear (30)
   (b) Alarm Dial Gear (16)
   (c) Hour Hand Gear (17)
   (d) Alarm Signal Cam and Gear, and Friction Washer (27, 26)
   (e) Sweep Control Switch Lever (29)
   (f) Pinion Drive Gear Assembly (15) (drives Sleep Control Segment Gear)
   (g) Alarm Control Switch Cam Lever (8)
   (h) Time Set Shaft and Gear, and Spacer (14, 20)
   (i) Drive Gear and Pinion Assembly (28)
   (j) Minute Hand Gear (18)
   (k) Sweep Second Hand Gear (19)

CLOCK MOVEMENT REASSEMBLY

Reassemble in the reverse order of disassembly, observing the following precautions:

1. The spring washer (26) should curve away from the gear when placed on the Alarm Cam Gear Assembly (27).
2. The Switch Cam Lever fork (8) must straddle the base plate post as shown in the illustration.
3. After reassembly of front plate, check the Sweep Second Gear (19) through the hole in the base plate to make sure it is free to turn.
4. Proceed with Alarm and Switch Adjustments as described below before installing hands.

ALARM AND SWITCH ADJUSTMENTS

1. Turn Wake-Up Manual shaft to WAKE UP position.
2. Slowly rotate Time Set shaft clockwise until the contacts 21 and 22 of the Switch Assembly close.
3. Replace Dial Face, Alarm Dial, the Minute, Hour and Second Hands. Set all Hands so that they indicate 12 o'clock. Set figure 12 of the alarm dial to index with the smaller pointer of the hour hand. Make sure all Hands and Alarm Dial are tight on their respective shafts.
4. With Alarm Set knob pulled out, continue to rotate Time Set shaft clockwise and note that the Alarm vibrator arm drops against field core approximately 7-10 minutes later.
5. Set alarm at some other selected position and make sure mechanism actuates within limits (± 1 minute).
6. Check alarm tone of vibrator. This can be adjusted by either bending vibrator arm nearer or farther away from field core. Bend arm near anchor point.

CLEANING AND LUBRICATION

To clean, completely disassemble and clean all moving parts in carbon tetrachloride or some similar cleaner.

The inside of the sleeves and shaft surfaces may be cleaned of oxidized oil by rubbing with a fine grade of steel wool dampened in carbon tetrachloride.

Do not use too much oil and apply by means of a small wire (drop oiler). Too much oil collects dust and later oxidizes. Use only recommended clock oil, such as Nye's Celebrated Oil which may be purchased from Wm. F. Nye Co., Inc., New Bedford, or equivalent.

CLOCK TROUBLES

1. Clock will not operate—Defective field coil, defective rotor, binding of parts.
2. Clock loses time—Binding parts, too little friction on minute hand sleeve assembly, defective rotor. Clock time set shaft bends and rubs against hole in clock bracket.
3. Noisy Clock—Rotor defective, alarm armature improperly adjusted, loose parts, or binding of moving parts.

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MODELS 521, 522

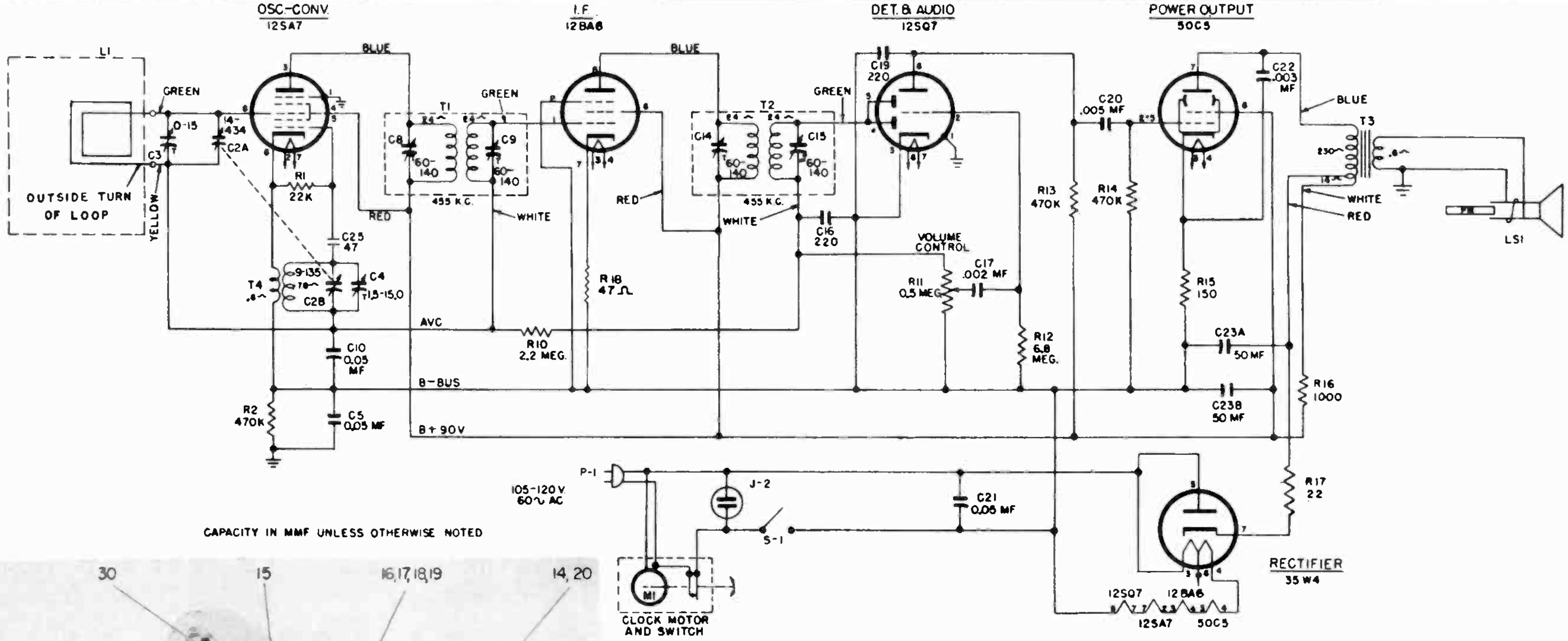

Fig. 1. Schematic Diagram

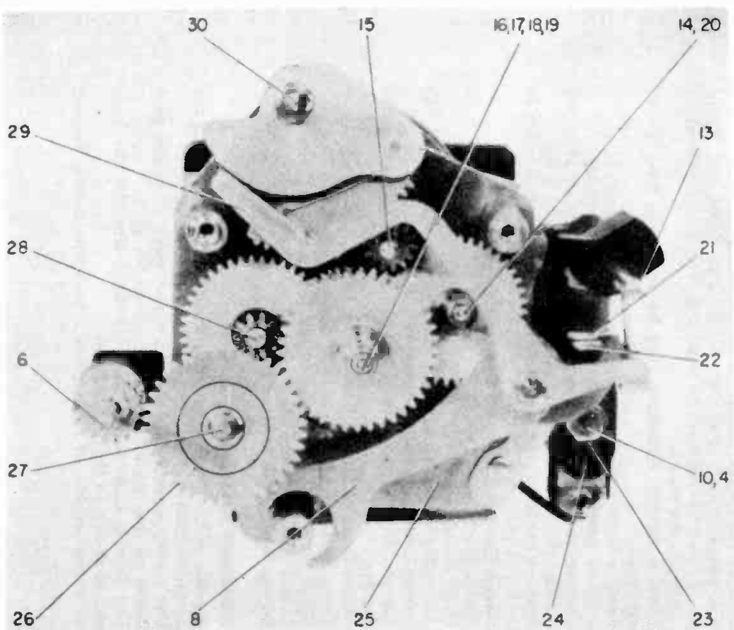

Fig. 4. Front View of Clock, Front Plate Removed

NOTE: Loop connections are: green lead to inside turn of antenna loop, yellow lead to outside turn.

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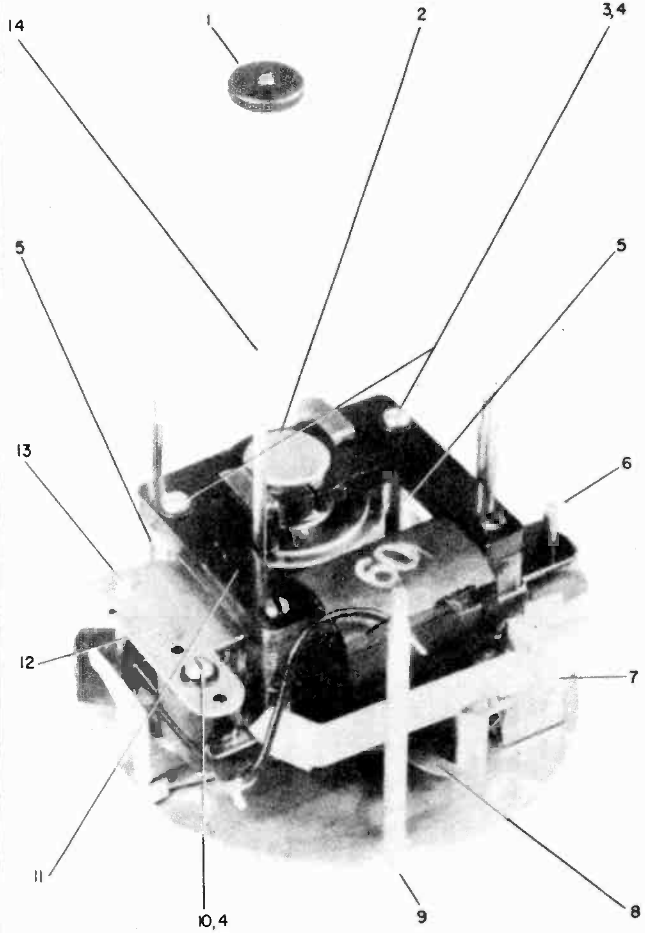


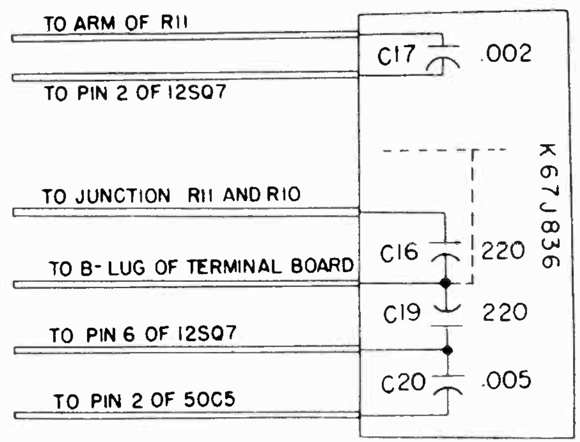
Fig. 3. Back View of Clock

C16, C17, C19, AND C20

The lead identification for the four-section ceramic capacitor RCW-3013 (K67J836) can be observed from the illustration of Figure 6.

Should it become necessary to service this unit, either the defective section can be cut out of the circuit and replaced by an individual capacitor (see Parts Replacement List, items UCC-036, UCU-039 and UCU-1036), or a complete new four-section unit, RCW-3013, can be installed.

Fig. 5. Capacitor RCW-3013 (K67J836)



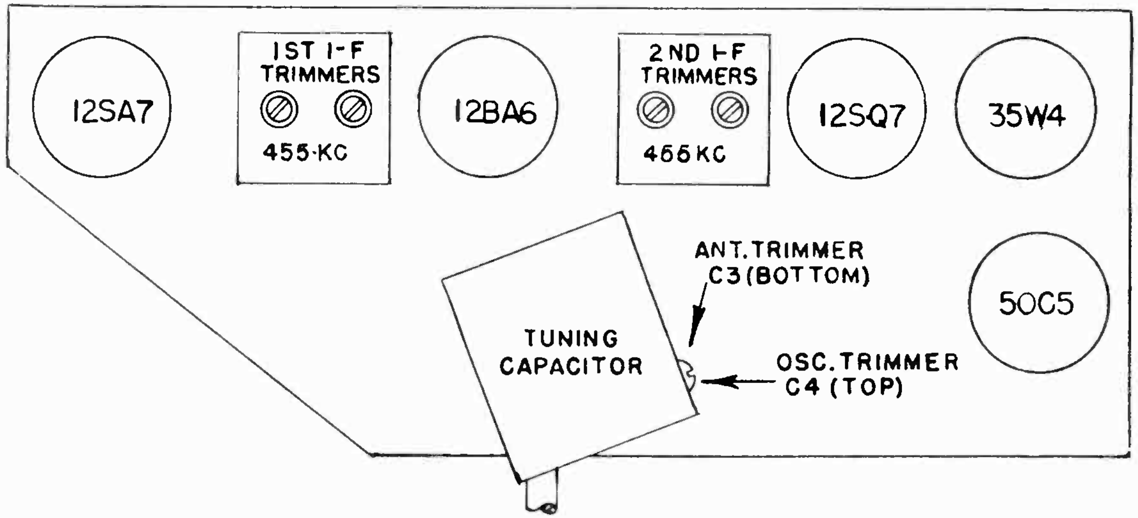


Fig. 6. Tube and Trimmer Location

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MODELS 521, 522

RADIO REPLACEMENT PARTS LIST

UNIVERSAL REPLACEMENT PARTS

Cat. No.	Symbol	Description
*UCC-036	C17	CAPACITOR—.002 mf., 600 v., paper
*UCC-039	C20	CAPACITOR—.005 mf., 600 v., paper
*UCC-045	C5, 10, 21	CAPACITOR—.05 mf., 600 v., paper (will replace respective sections of RCW-3013).
*UCU-1036	C16, 19	CAPACITOR—220 mmf., mica
*URD-009	R17	RESISTOR—22 ohms, ½ w., carbon
*URD-017	R18	RESISTOR—47 ohms, ½ w., carbon
*URD-029	R15	RESISTOR—150 ohms, ½ w., carbon
*URD-081	R1	RESISTOR—22,000 ohms, ½ w., carbon
*URD-113	R2, 13, 14	RESISTOR—470,000 ohms, ½ w., carbon
*URD-129	R10	RESISTOR—2.2 meg., ½ w., carbon
*URD-141	R12	RESISTOR—6.8 meg., ½ w., carbon
*URF-049	R16	RESISTOR—1000 ohms, 2 w., carbon

SPECIALIZED REPLACEMENT PARTS

Cat. No.	Symbol	Description
RAB-135	L1	BACK—Cabinet back cover (includes loop L1)
*RAC-085		MOUNTING BRACKET—Metal back cover holds clock to cabinet
RAU-342		CABINET—Dark mahogany, Model 521
RAU-343		CABINET—Blond mahogany, Model 522
*RCC-074	C22	CAPACITOR—.003 mf., 600 v., paper
*RCE-116	C23A, B	CAPACITOR—50 mf., 150 v.; 50 mf., 150 v., dry electrolytic
*RCT-045	C2A, 2B C3, 4	CAPACITOR—Tuning capacitor (oscillator and r-f-section)
*RCW-1043	C25	CAPACITOR—47 mmf., ceramic
*RCW-3013	C16, 17, 19, 20	CAPACITOR—220 mmf., .002 mf., 220 mmf., .005 mf. (4 section ceramic)
RDK-217		KNOB—Tuning dial wheel. Does not include dial scale, see item RDS-090

SPECIALIZED REPLACEMENT PARTS (Cont.)

Cat. No.	Symbol	Description
RDK-218		KNOB—Volume control knob
*RDS-090		DIAL SCALE—Paper scale
*RHC-017		CLIP—For mounting osc. coil, T4
*RHC-024		CLIP—For mounting C23
*RHG-015		GROMMET—For tuning cond.
*RHH-004		FASTENER—Snap fastener for holding back
*RHI-010		STRAIN RELIEF GROMMET—For power cord
*RHJ-005		SPACER FOR TUNING CONDENSER
*RHS-043		PLUG AND SWITCH MOUNTING BRACKET—For J2 and S1
*RJC-004		CLIP—Loop connector clip
RJJ-008	J2	APPLIANCE RECEPTACLE
*RJS-092		SOCKET—Tube socket for 50C5, 35W4
*RJS-116		SOCKET—Tube socket for 12SA7
*RJS-117		SOCKET—Tube socket for 12SQ7
*RJS-141		SOCKET—For 12BA6 tube, 7 pin
*RLC-090	T4	COIL—Oscillator coil
*RMS-205		SLEEP CONTROL BOOSTER SPRING
*RRC-054	R11	POTENTIOMETER—0.5 meg., volume control
RSW-067	S1	SWITCH—ON-OFF Switch
*RTL-094	T1	TRANSFORMER—1st I-F transformer
*RTL-095	T2	TRANSFORMER—2nd I-F transformer
RTO-036	T3	TRANSFORMER—Output transformer
*RWL-009		CORD—Power cord (brown)
*RYN-005		NAMEPLATE G.E. MONOGRAM
*RZC-009	M1	CLOCK—60 cycle, 105–125 v., clock assembly
*S400C	LS1	SPEAKER—PM loudspeaker

†CLOCK REPLACEMENT PARTS LIST

MISCELLANEOUS

Cat. No.	Symbol	Description
*XC3X36	1	KNOB—Time set shaft knob (bronze)
*XC4X5		KNOB—Alarm set knob (ivory)
*XC31X26		HAND—Sweep second hand
*XC32X199		HANDS—Hour and minute hands (luminous)
*XC53X31		BEZEL—Outer mounting rim
*XC53X117		BEZEL—Numeral ring (gold finish)
*XC55X15		DIAL—Alarm dial scale
*XC58X16		CRYSTAL—Glass crystal
*XC59X247		RING—Color ring for numeral bezel
*XC59X716		KNOB—Wake-up Manual and Sleep control knob (ivory)
*XC61X937		DIAL—Clock dial scale (luminous)

CLOCK MOVEMENT

Cat. No.	Symbol	Description
*XC1X1	3	SCREW—Holds field core to baseplate, No. 4-40 x 1 1/8 in. long, round head
*XC1X2	4	LOCKWASHER—Under screw head of switch assembly mounting screw and field core mounting
*XC1X6	10	SCREW—Used to assemble switch assembly to switch bracket
*XC1X43	23	HEX NUT—For screw mounting switch assembly to switch bracket
*XC10X141	14	SHAFT ASSEMBLY—Time set shaft and gear assembly
*XC11X11	6	SHAFT ASSEMBLY—Alarm set shaft and gear assembly
*XC13X11	17	GEAR ASSEMBLY—Hour hand gear and sleeve assembly
*XC14X32	18	GEAR ASSEMBLY—Minute hand friction gear, pinion gear and sleeve assembly
*XC15X3	16	GEAR ASSEMBLY—Alarm dial gear and sleeve assembly
*XC16X14	19	GEAR ASSEMBLY—Sweep second hand gear and shaft assembly
*XC17X8	27	GEAR AND CAM—Alarm signal cam and gear assembly
*XC34X173	9	FRONT PLATE ASSEMBLY—Complete with case studs and alarm set shaft spring (7)
*XC35X93	25	BASE PLATE AND BACK GEAR—Base plate assembled complete with studs, back gear and pinion, and vibrator

CLOCK MOVEMENT (Cont.)

Cat. No.	Symbol	Description
*XC40X76	24	SWITCH INSULATOR ASSEMBLY—Consists of: two plastic and one fibre switch contact spring spacers
*XC40X77	28	GEAR AND SPRING ASSEMBLY—Drives alarm dial gear and hour hand gear (complete with pinion and shaft, pinion and gear, spring, washers and retaining clip)
*XC40X80	21	CONTACT ASSEMBLY—Lower switch contact and spring
*XC40X185		SPRING—Switch control shaft index spring (for cam indexed control shafts)
*XC40X194	29	LEVER—Sleep control switch lever
*XC40X196	15	GEAR AND SPRING ASSEMBLY—Pinion drive for sleep control segment gear (consists of pinion gear, pinion gear and shaft, spring, washers, and retaining clip)
*XC40X197	8	LEVER—Alarm control switch cam lever
*XC40X198	22	CONTACT ASSEMBLY—Upper switch contact and spring with attached fibre arm
*XC40X202	5	SPACER BUSHING—Field core spacer at screw mounting to base plate
*XC40X252	26	WASHER—Alarm signal cam and gear friction washer
*XC40X275		SPACER BUSHING—Wake-up Manual switch control shaft bushing
*XC40X276	20	SPACER BUSHING—For time set shaft
XC40X277	30	SHAFT—Sleep control shaft and gear segment assembly
*XC44X38	2	MOTOR ROTOR ASSEMBLY—Cased rotor and pinion (60 cycles)
*XC45X69	11	MOTOR FIELD ASSEMBLY—Consists of: core, shading poles, and field coil (60 cycles)
*XC59X699	13	SHAFT ASSEMBLY—Wake-up Manual control shaft assembly (detent spring index type)
*XC59X723	13	SHAFT ASSEMBLY—Wake-up Manual control shaft assembly (cam index type)
*XC64X1		SCREW—Switch bracket and front plate mounting screws

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MODELS 600, 601, 603, 604

SPECIFICATIONS

CABINET:	Composition . . . plastic Height . . . 7½ inches Length . . . 10½ inches Width . . . 5½ inches Weight (with batteries) Model 600 . . . 8 pounds Model 601, 3, 4 . . . 8¾ pounds
POWER SUPPLY:	Model 600 Battery Operation only. Battery . . . Eveready No. 756, or equivalent Model 601, 3, 4 (AC or DC Operation) Voltage . . . 105–120 volts Frequency (on AC) . . . 50–60 cycles Power Consumption . . . 15 watts Battery Operation Battery . . . Eveready No. 756 or equivalent
OPERATING FREQUENCIES:	Broadcast Band . . . 540–1600 KC I-F Amplifier . . . 455 KC
POWER OUTPUT:	Undistorted . . . 130 milliwatts Maximum . . . 200 milliwatts
LOUDSPEAKER:	Type . . . Alnico PM Outside Cone Diameter . . . 4 inches Voice Coil Impedance (400 cycles) . . . 3.2 ohms
TUBE COMPLEMENT:	Oscillator-Converter . . . 1R5 I-F Amplifier . . . 1T4 Detector Audio Amplifier . . . 1S5 Power Amplifier . . . 3V4

GENERAL INFORMATION

The Model 600 or 601, 3, 4, portable radio is a four-tube superheterodyne broadcast receiver with a range of 540 to 1600 kc. The Model 600 operates on battery only, while for the Model 601, 3, 4 the power source may be either 105 to 120 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 (MODEL 601, 603, 604 ONLY)

The left knob turns on the battery provided that the power plug is well inserted into the socket on the chassis.

For AC or DC supply (105-120 volts, 50 to 60 cycle operation), the same knob switches on the power when the power plug is pulled out of its socket on the chassis and inserted into the house outlet.

ELECTRICAL CIRCUIT ALIGNMENT

ALIGNMENT FREQUENCIES

R-F . . . 1620 and 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.
5. Antenna Loop.

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.

ALIGNMENT CHART

Step	Test-Osc. Connected to:	Test-Osc. Frequency	Radio Pointer Setting	Adjust for Maximum Meter Reading
1	1T4 grid (Pin 6) in series with .05 mf capacitor	455 KC	550 KC	2nd I-F transformer (T2) primary and secondary coils.
2	1R5 grid (Pin 6) in series with .05 mf capacitor	455 KC	550 KC	1st I-F transformer (T1) primary and secondary coils.
3	Inductively coupled	1620 KC	Gang condenser completely open	C2B
4	Inductively coupled	1500 KC	Tune for max. signal. Then set dial pointer at 1500 KC on dial mark	C1B

The test oscillator output signal should be attenuated so that the output meter reading never exceeds ½ volt. Connect the capacitor listed in column 2 of Alignment Chart between the "high side" of the test oscillator and the point of input specified.

The output meter should be connected to the chassis ground; the "high side" of the oscillator output should be connected as indicated in the Alignment Chart. During the entire alignment procedure, the volume control should be at its maximum position. For alignment of the 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 output terminals, and locate the 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 antenna should not be changed during any one set of adjustments.

STAGE GAIN AND VOLTAGE CHECKS

Stage gain by vacuum 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. Reading should be taken with low signal input so that the AVC is not effective.

1. R-F STAGE GAINS

	600	601, 3, 4,	
1R5 Grid (Pin 6) to 1T4 (Pin 6)	17	20	@1000 KC
1T4 Grid (Pin 6) to 1S5 Diode Plate (Pin 3)	65	50	@ 455 KC

2. AUDIO GAINS

.02 volt at 400 cycles across volume control (R4) with control set at maximum will give approximately .050 watts output across speaker voice coil.

3.

DC voltage developed across oscillator grid resistor (R1) averages 2.0 volts at 1000 kc with respect to **B** minus.

4. SOCKET PIN VOLTAGES

Fig. 5 and 6 show voltages from all tube pins to B−. Voltage readings much lower than those specified may help localize defective components or tubes.

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MODELS 600, 601, 603, 604

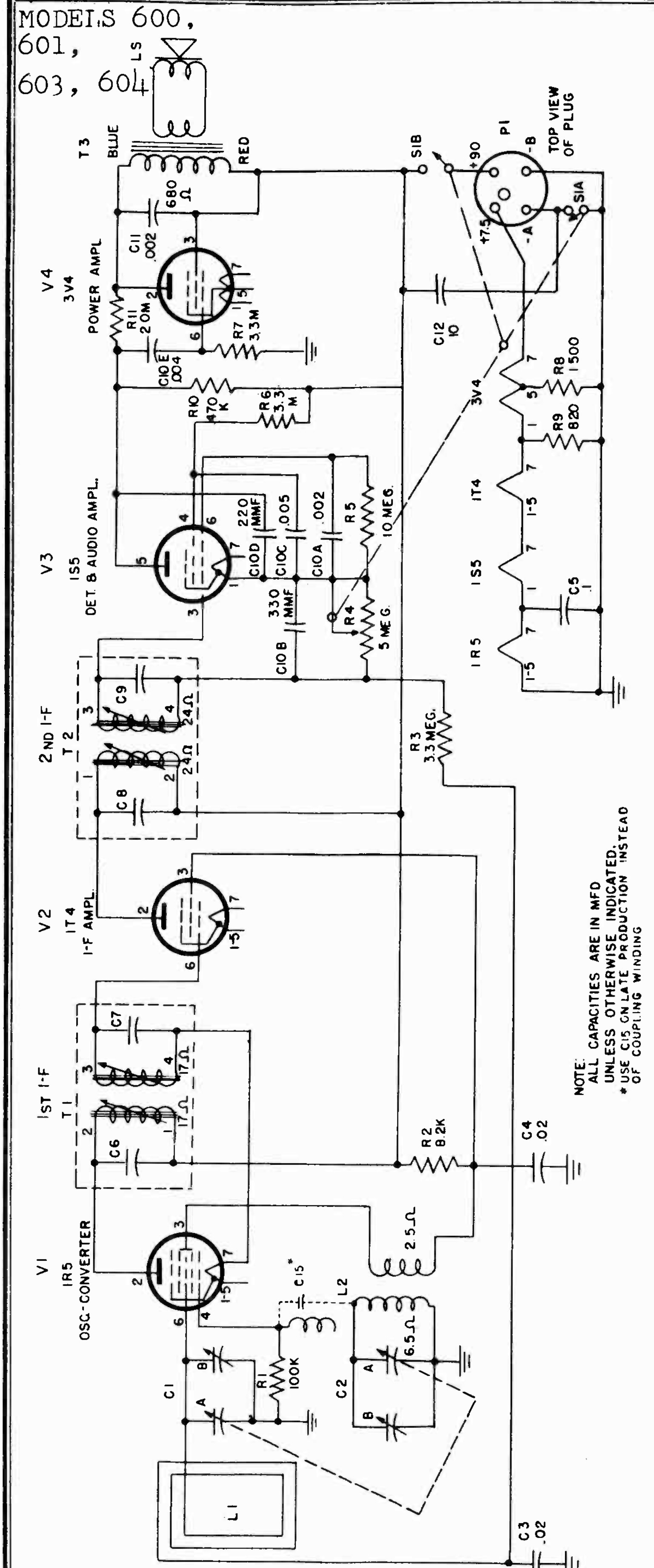

Fig. 1. Schematic Diagram, Model 600

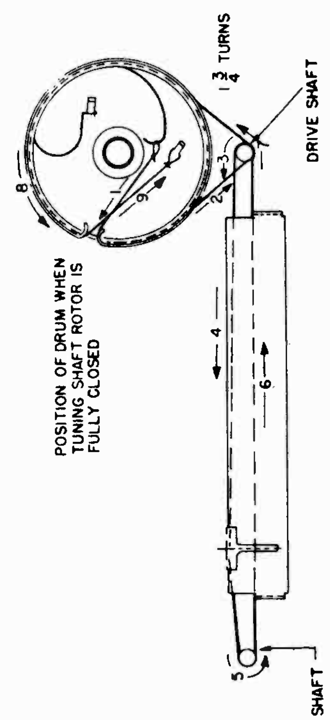

Fig. 3. Dial Stringing Diagram (Model 600, 601, 603 and 604)

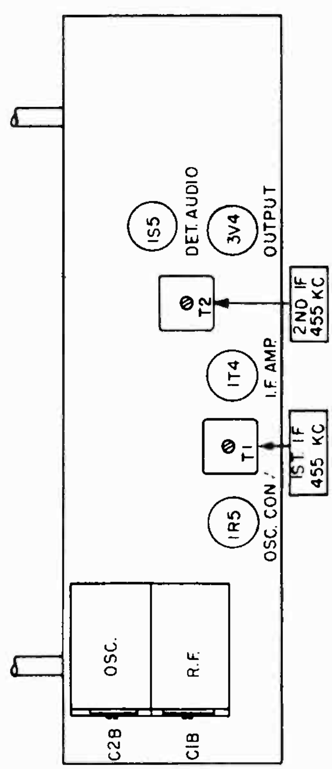

Fig. 2. Tube and Trimmer Location (Model 600, 601, 603 and 604)

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MODELS 601, 603, 604

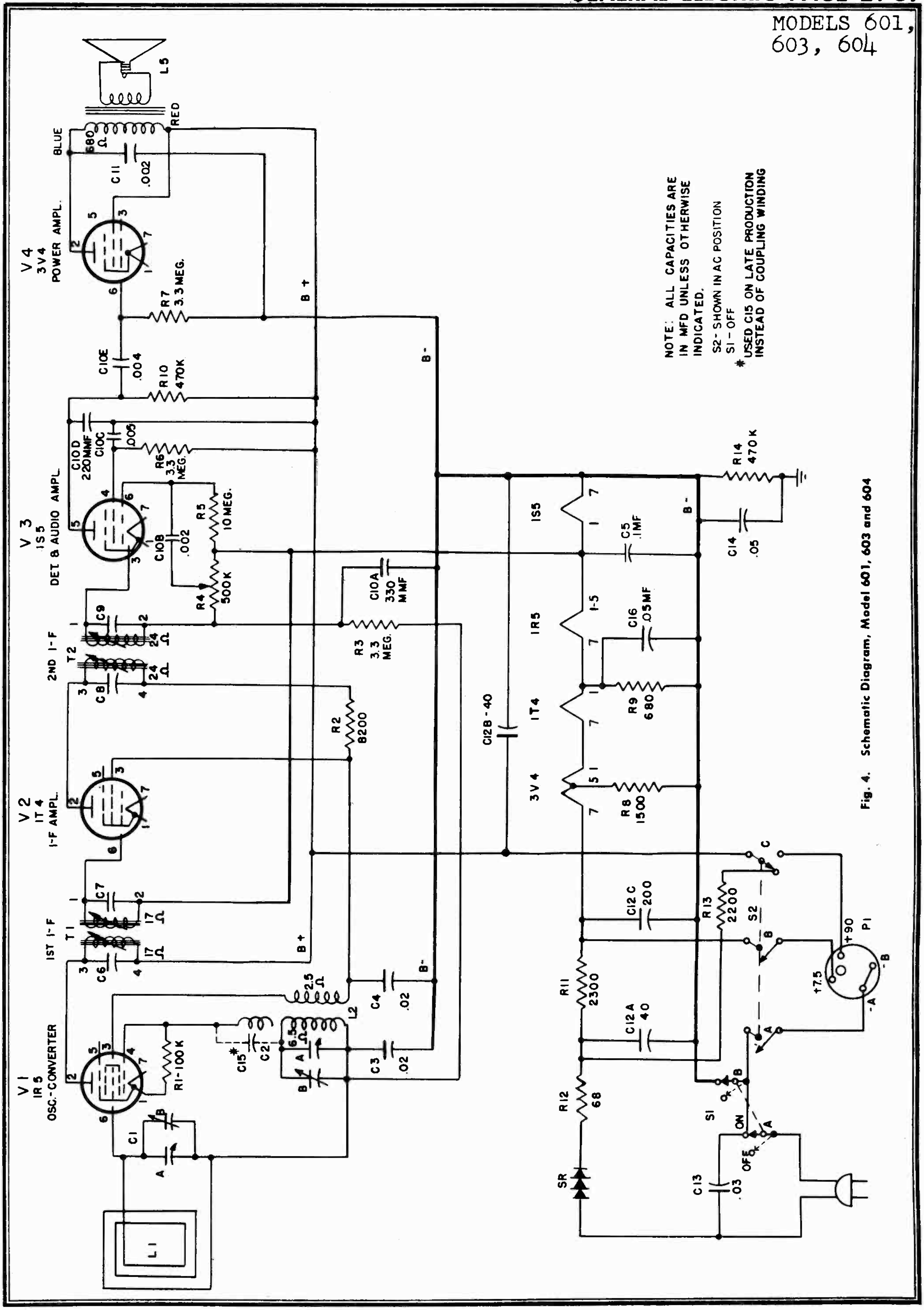

Fig. 4. Schematic Diagram, Model 601, 603 and 604

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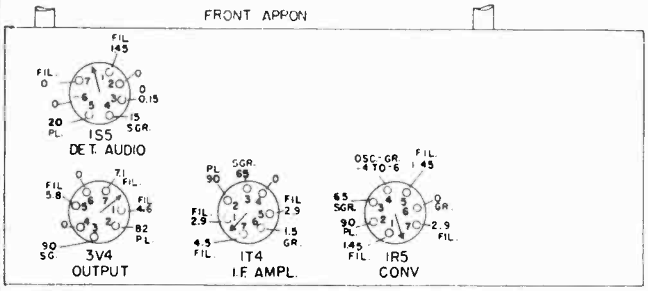
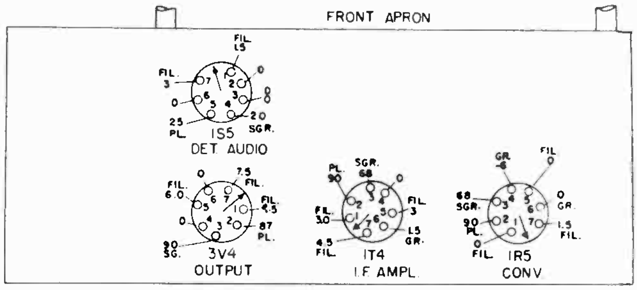
MODELS 600,
601, 603, 604



BOTTOM VIEW OF CHASSIS
DC VOLTAGE TO B MINUS MEASURED WITH 20,000 OHMS PER VOLT METER. RECEIVER OPERATING ON 120 VOLTS A.C. BATTERY VOLTAGES ARE SIMILAR.

Fig. 5. Socket Voltages, Model 600



BOTTOM VIEW OF CHASSIS
DC VOLTAGE TO B MINUS MEASURED WITH 20,000 OHMS PER VOLT METER. RECEIVER OPERATING ON FRESH BATTERY.

Fig. 6. Socket Voltages, Model 601, 603 and 604

MODELS 600, 601, 603, AND 604
REPLACEMENT PARTS LIST

Cat. No.	Symbol	Description
UNIVERSAL REPLACEMENT PARTS		
*UCC-002	C11	CAPACITOR—.002 mf, 200 v, paper
*UCC-009	C3, 4	CAPACITOR—.02 mfd, 200 v, paper
*UCC-028	C14	CAPACITOR—.05 mfd, 400 v, paper
*UCC-042	C13	CAPACITOR—.03 mfd, 400 v, paper
*UCC-048	C5	CAPACITOR—.1 mfd, 400 v, paper
*URD-045	R9††	RESISTOR—680 ohms, ½ w. carbon
*URD-047	R9†	RESISTOR—820 ohms, ½ w, carbon
*URD-053	R8	RESISTOR—1500 ohms, ½ w, carbon
*URD-071	R2	RESISTOR—8200 ohms, ½ w, carbon
*URD-097	R1	RESISTOR—100,000 ohms, ½ w, carbon
*URD-113	R10††, 14††	RESISTOR—470,000 ohms, ½ w, carbon
*URD-133	R3, 6, 7	RESISTOR—3.3 meg, ½ w, carbon
*URD-145	R5	RESISTOR—10 meg, ½ w, carbon
*URE-021	R12††	RESISTOR—68 ohms, 1 w, carbon
*URE-057	R13††	RESISTOR—2200 ohms, 1 w, carbon
*UOP-457		SPEAKER—PA speaker, 4 inches
*RHJ-005††		SPACER—For tuning capacitor
*RHM-062		CLIP—Speaker clip
*RHY-010		HANDLE—Handle for cabinet
*RJC-016		TERMINAL—Speed nut
*RJS-024††		MOUNTING PLATE—For electrolytic capacitor
*RJS-100		SOCKET—Tube socket for 1R5
*RJS-124		SOCKET—Tube socket for 1S5 & 3V4
*RJS-125		SOCKET—Tube socket for 1T4 tube
*RHC-015		CLIP—Oscillator coil clip
*RJC-016		TERMINAL—Speed nut
*RLC-101	L2	COIL—Oscillator coil
*RLL-035	L1	LOOP—Loop antenna
*RMC-040		CATCH—Spring catch
*RMS-118		SPRING—Dial spring
*RMU-049		SHAFT—Tuning shaft

*Used on other Models.
†For Model 600 only.
††for Model 601, 3, 4 only.

Cat. No.	Symbol	Description
*RRC-107	R4, S1	VOLUME CONTROL—Volume control and switch
*RRD-1015	R11†	RESISTOR—20 meg, ½ w, carbon
*RRW-042	R11††	RESISTOR—2300 ohms, 10 w, w.w.
*RSW-058	S2††	SWITCH—Power plug switch
*RTL-052	T1††	TRANSFORMER—I-F transformer
*RTL-051	T2†	TRANSFORMER—I-F transformer
*RTL-079	T1†, 2††	TRANSFORMER—I-F transformer
*RTO-070	T3	TRANSFORMER—Output transformer
*RWL-005††		POWER CORD
SPECIALIZED REPLACEMENT PARTS		
*RAB-096		BACK—Cabinet back
*RAU-308		CABINET—Plastic cabinet
*RCE-095††	C12A, B, C	CAPACITOR—Electrolytic capacitor 40 mf, 150 v; 40 mf, 250 v; 200 mf, 20 v
*RCE-098†	C12	CAPACITOR—Electrolytic capacitor 10 mf
*RCT-036	C1, 2	CAPACITOR—Tuning capacitor
*RCW-3015	C10A, B, 10C, D, E	CAPACITOR—Ceramic combination 220 mmf, .002 mf, .005, 220 mmf, .004 mf
*RDC-032		DIAL CORD
*RDK-136		KNOB
RDP-050		POINTER—Dial pointer
*REX-005	SR	RECTIFIER—Selenium rectifier
*RHB-006		BUTTON—Plug button
*RHC-015		CLIP—Oscillator coil clip
*RHC-016		COTTER PIN—For drive axle
*RHC-020		COTTER PIN—Cotter pin for handle
*RHE-009		EYELET—Eyelet for cabinet
*RHG-006††		GROMMET—For power cord
*RHG-018††		GROMMET—For tuning capacitor
*RHI-009		HINGE—Hinge for cabinet

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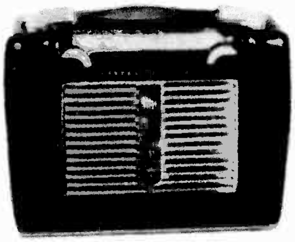
MODEL 650



SPECIFICATIONS

CABINET:	Composition	Plastic
	Height	9½ inches
	Length	12½ inches
	Width	5½ inches
	Weight (with batteries)	11 pounds
POWER SUPPLY:	Battery	Eveready No. 753, or equivalent
	AC or DC operation	105–115 volts
	Frequency (on AC)	60 cycles
	Power Consumption	25 watts
OPERATING FREQUENCIES:	Broadcast Band	540–1600 kc
	I-F Amplifier	455 kc
POWER OUTPUT:	Undistorted	180 milliwatts
	Maximum	250 milliwatts
LOUDSPEAKER:	Type	Alnico PM
	Outside Cone Diameter	4 inches
	Voice Coil Impedance (400 cycles)	3.2 ohms
TUBE COMPLEMENT:	R-F Amplifier	1T4
	Oscillator-Converter	1R5
	I-F Amplifier	1T4
	Detector Audio Amplifier	1S5
	Power Amplifier	3V4

GENERAL INFORMATION

The Model 650 portable radio is a five-tube superheterodyne broadcast receiver with a range of 540 to 1600 kc. The power source may be either 105 115 volts, 50 60 cycles a-c, or d-c, when a power outlet is available. The receiver will also operate from its battery source, thus making it independent of external electrical 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 a-c or d-c supply (105 115 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

EQUIPMENT REQUIRED:

1. Test Oscillator with Tone Modulation.
2. A-C Output Meter.
3. Paper Capacitor .05 Mf.
4. Insulated Screwdriver.
5. Coupling Loop for Test Oscillator (see text).
6. Isolation Transformer.

PROCEDURE—GENERAL.

1. 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. The locations of the i-f and r-f adjustments are shown in Figure 2.

2. The "low" side of the test oscillator output should be connected to the chassis ground; the "high" side should be connected as indicated in the alignment chart. The test oscillator output signal should be attenuated so that the output meter reading never exceeds ½ volt. Connect the capacitor listed in column 2 of the alignment chart between the "high" side of the test oscillator and the point of input specified.

PRECAUTION: *If the signal generator is a-c operated, use an isolating transformer between the power supply and the radio receiver 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. The output meter should be connected across the voice coil terminals of the speaker.

4. During the entire alignment procedure the volume control should be rotated clockwise to its maximum position.

5. For alignment of the 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 output terminals, and locate the loop about one foot from the radio loop for alignment. The position of the loop with respect to the radio loop should not be changed during any one set of adjustments to prevent possible errors in peak readings.

6. The antenna loop acquires a different inductance in the position when the back is closed. Therefore, the adjustment of the antenna and r-f trimmers has to be made with the back closed, through the two openings on the right side of the cabinet which normally are closed by plug buttons. After adjustments have been completed, the two plug buttons have to be put in place again.

ALIGNMENT CHART

Step	Test-Osc. Connected to:	Test-Osc. Frequency	Radio Pointer Setting	Adjust for Maximum Meter Reading
1	1T4 I-F grid in series with .05 mf. capacitor	455 KC	550 KC	Iron cores of I-F transformer T2
2	1R5 converter grid in series with .05 mf. capacitor	455 KC	550 KC	Iron cores of I-F transformer T1
3	Repeat Step 1 and 2			
4	Inductively coupled	1500 KC	1500 KC	Trimmers C15 and C16*
5	Inductively coupled	600 KC	600 KC	Iron core of T4 on back apron of chassis.

*Chassis in cabinet and cabinet back (with loop) closed; remove plug buttons for adjustment.

STAGE GAINS AND VOLTAGE CHECKS

In order to check circuit performance and facilitate trouble shooting, the measurement of stage gain by means of a vacuum voltmeter or similar measuring device is recommended. The gain values listed may have tolerances of 20%. 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) . . . 12 @ 1000 KC
1R5 Grid (Pin 6) to 1T4 Grid (Pin 6) . . . 18 @ 1000 KC
1T4 Grid (Pin 6) to 1S5 Diode Plate (Pin 3) . 45 @ 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.

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MODEL 650

(3)

D-C voltage developed across oscillator grid resistor (R9) averages −8 volts at 1000 kc with respect to B−.

(4) HUM

The hum voltage measured at the primary of the output transformer should not exceed 0.4 volts. This measurement should be made with an a-c voltmeter of a sensitivity of 20,000 ohm/volt in series with .5 mf. capacitor.

(5) 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.

(6) MULTIPLE CERAMIC CAPACITOR (K68J128).

This multiple capacitor unit is of the ceramic capacitor type and contains five capacitors C11A, B, C, D and C12. This unit, RCW-3015, is illustrated in Figure 5 for lead identification. If during service the ceramic capacitor unit is found to be defective, the entire unit may be replaced by the identical part, RCW-3015, or the defective section may be located and disconnected from the receiver circuit and a single universal capacitor of equivalent electrical value used in its place.

MODEL 650
REPLACEMENT PARTS LIST

Cat. No.	Symbol	Description
		UNIVERSAL REPLACEMENT PARTS
*UCC-037	C13	CAPACITOR—.003 mfd., 400 v., paper
*UCC-041	C7	CAPACITOR—.02 mfd., 200 v., paper
*UCC-042	C14	CAPACITOR—.03 mfd., 600 v., paper
UCC-045	C3, 4, 8	CAPACITOR—.05 mfd., 600 v., paper
*UCE-067	C10	CAPACITOR—100 mfd., 10 v., electrolytic
*URD-043	R6	RESISTOR—470 ohms, ½ w., carbon
*URD-045	R5	RESISTOR—680 ohms, ½ w., carbon
*URD-053	R4	RESISTOR—1500 ohms, ½ w., carbon
*URD-067	R11	RESISTOR—5600 ohms, ½ w., carbon
*URD-097	R9	RESISTOR—100,000 ohms, ½ w., carbon
*URD-113	R7, 15	RESISTOR—470,000 ohms, ½ w., carbon
*URD-129	R12, 16	RESISTOR—2.2 meg., ½ w., carbon
*URD-133	R14, 19	RESISTOR—3.3 meg., ½ w., carbon
*URD-137	R17	RESISTOR—4.7 meg., ½ w., carbon
*URE-013	R1	RESISTOR—33 ohms ±10%, 1 w., carbon
*URE-059	R2	RESISTOR—2700 ohms, 1 w., carbon
		SPECIALIZED REPLACEMENT PARTS
RAB-122		CABINET BACK—(maroon)
RAB-123		CABINET BACK—(grey)
RAG-029		GRILLE—(For maroon cabinet)
RAG-030		GRILLE—(For grey cabinet)
*RAS-001		BATTERY STRAP—Metal strap holds battery
RAU-323		CABINET—(Maroon)
RAU-324		CABINET—(Grey)
*RCE-095	C2A, B, C	CAPACITOR—200 mfd., 25 v; 40 mfd., 150 v; 40 mfd., 150 v; electrolytic
*RCT-039	C1	TUNING CAPACITOR
*RCW-1063	C6	CAPACITOR—47 mmf., ceramic
*RCW-3015	C11A, B, C, D C12	CAPACITOR—.002 mf., 220 mf., .005 mfd., 220 mmf., .005 mf., ceramic
*RDC-032		DIAL CORD
*RDK-136		KNOB—(Fawn) Volume or tuning
RDK-202		KNOB—(Grey) Volume or tuning
*RDP-040		POINTER—Dial pointer
RDS-092		DIAL SCALE
*RER-001	SR	SELENIUM RECTIFIER
		SPECIALIZED REPLACEMENT PARTS (Cont'd)
*RHB-006		PLUG BUTTON—(Maroon) on cabinet door
RHB-012		PLUG BUTTON—(Grey) on cabinet door
*RHC-015		CLIP—(Osc. coil)
*RHC-016		HAIRPIN COTTER—On tuning control shaft
*RHG-018		GROMMET—Tuning capacitor mounting
*RHJ-005		SPACER—Tuning capacitor mounting
*RHM-052		CLIP—(Speaker mounting)
*RHM-056		CLIP—(Grille mounting)
RHM-067		CAP—Brass cover over item RHS-047
RHM-068		CAP—Aluminum cover over item RHS-047
*RHR-005		TUBULAR RIVET—.121" x $\frac{1}{32}$" for door hinge
*RHS-010		TUBE SHIELD—For V4 tube
*RHS-041		SCREW FOR HINGE—(Hex head) #6 x ⅜
RHS-047		SCREW—(For handle mounting)
RHN-012		TEE NUT—(For handle mounting)
RHW-023		WASHER—(For handle mounting)
RHY-014		HANDLE—(Maroon)
RHY-015		HANDLE—(Grey)
*RJS-024		MOUNTING PLATE—(Electrolytic)
*RJS-100		TUBE SOCKET—For V2
*RJS-124		TUBE SOCKET—For V4, V5
*RJS-125		TUBE SOCKET—For V1, V3
*RLB-030	T4	R-F TRANSFORMER
*RLC-068	L2	OSCILLATOR COIL
*RLL-038	L1	LOOP ANTENNA
RMS-039		"C" CLIP—On idler pulley shaft
*RMS-118		SPRING—(Dial tension)
*RMS-191		SPRING CATCH—For back cover
RMW-009		IDLER PULLEY—For dial cord
*RPJ-025	PL1	BATTERY PLUG
*RRC-083	R13, S1	VOLUME CONTROL AND SWITCH
*RRW-027	R3	RESISTOR—2300 ohms, 10 w., w.w.
*RSW-058	S2	SWITCH—(Power cord)
*RTL-052	T1	TRANSFORMER—1st I-F transformer
*RTL-079	T2	TRANSFORMER—2nd I-F transformer
*RTO-050	T3	OUTPUT TRANSFORMER
*RWL-005		POWER CORD
*DL-1RS-400D		SPEAKER—4 inch PM speaker

*Used on previous production receivers.

600 volt paper capacitors are stocked to replace 200 or 400 volt rated production units, providing their larger size does not prohibit their use.

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MODEL 650

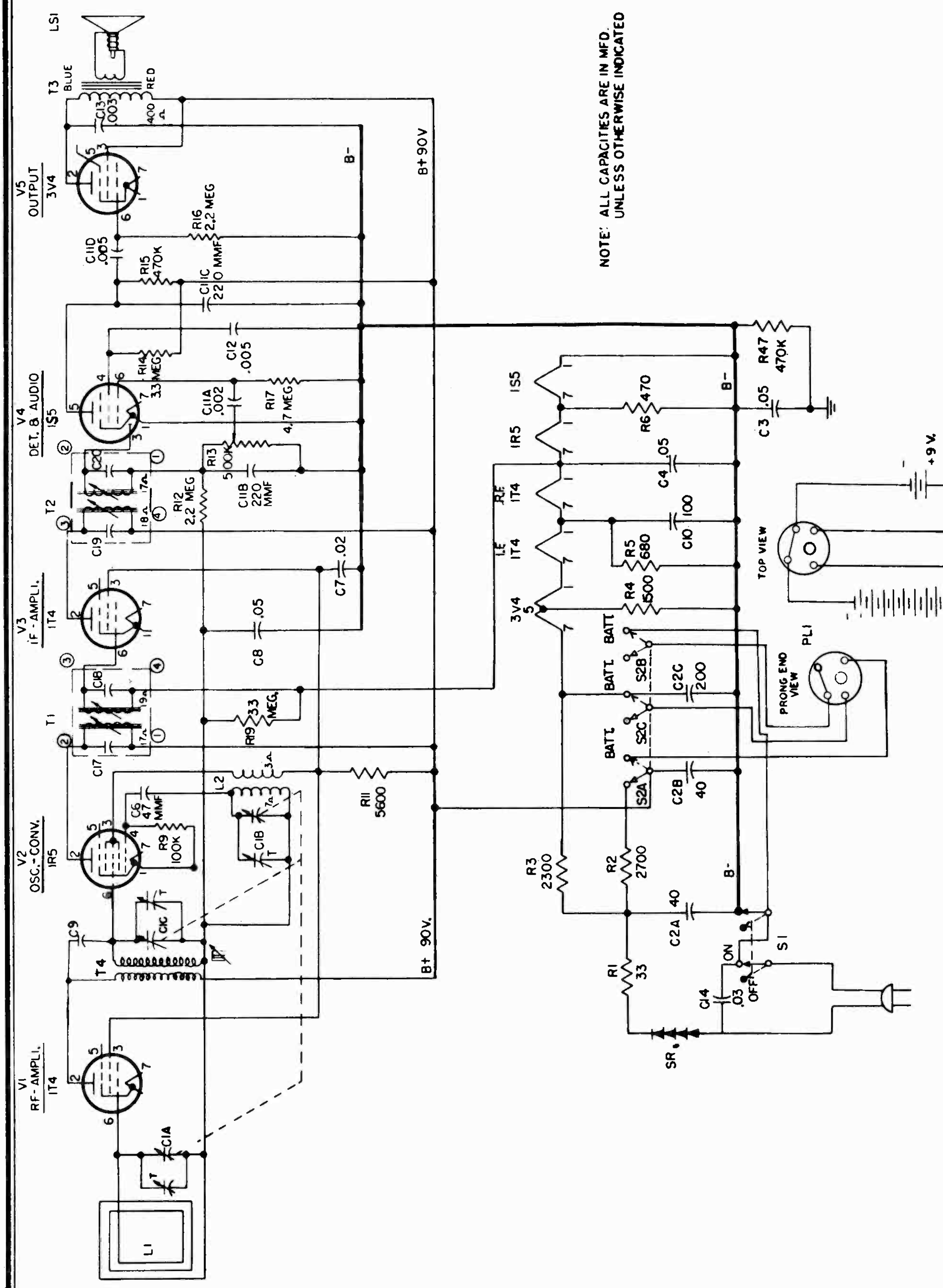

Fig. 1. Schematic Diagram. Model 650

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MODEL 650

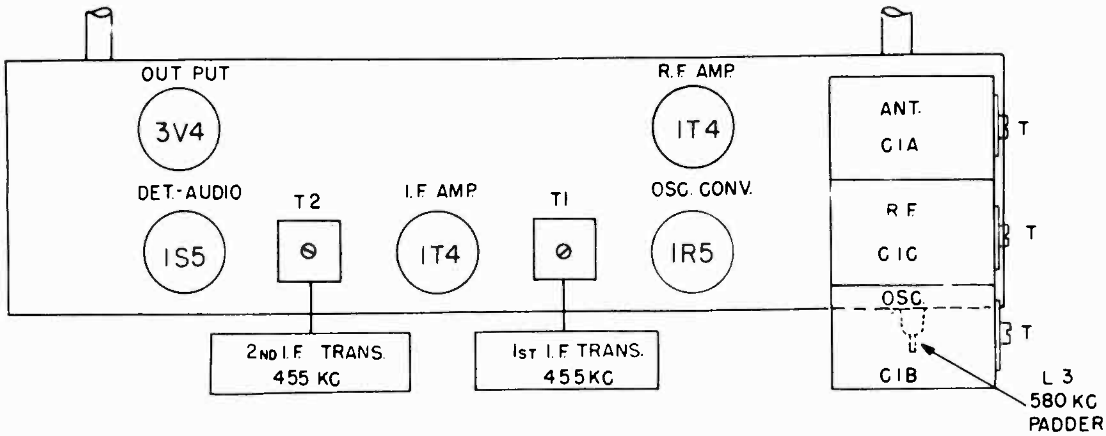


Fig. 2. Tube and Trimmer Location (Model 650)

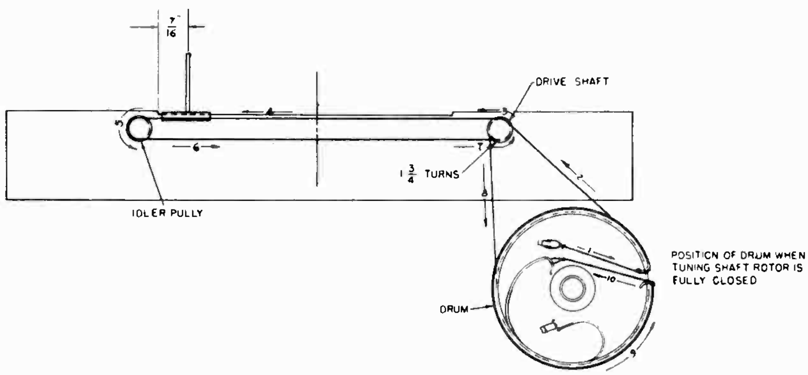
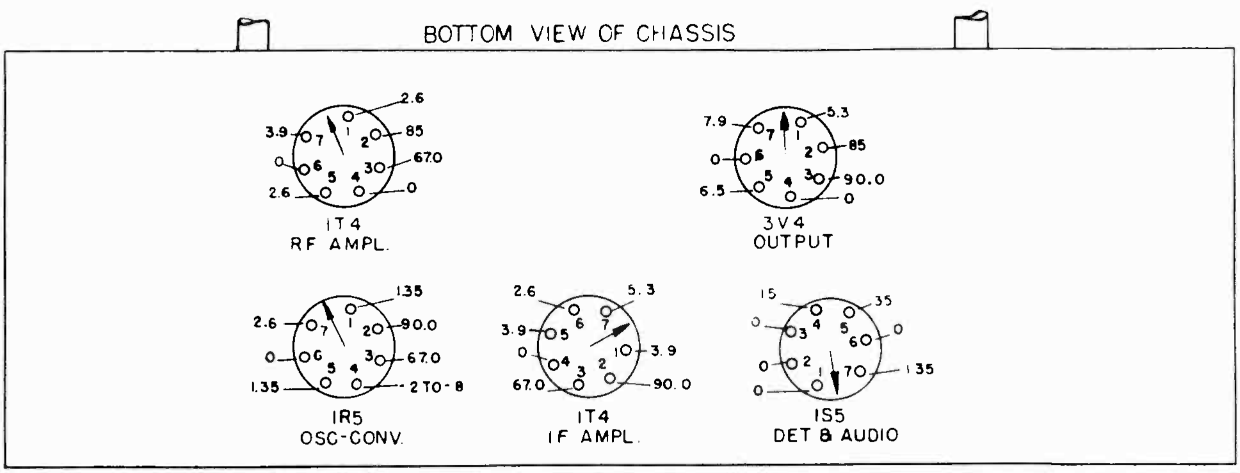


Fig. 3. Dial Stringing Diagram (Model 650)



D C VOLTAGES TO GROUND UNLESS OTHERWISE SPECIFIED
ALL RATINGS ARE A.C OPERATION MEASURED WITH REFERENCE TO B-
RATINGS FOR BATTERY ARE SIMILAR TO AC RATINGS
VOLTAGE IS MEASURED WITH 20,000 OHMS PER VOLT METER

Fig. 4. Socket Voltages (Model 650)

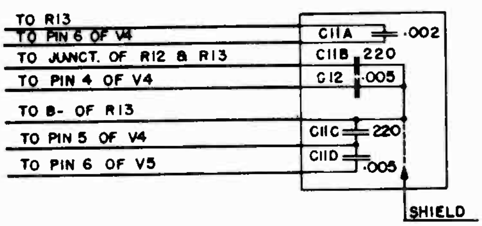


Fig. 5. Connections for Capacitor RCW-3015 (K68J128)

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MODEL 740

SPECIFICATIONS

CABINET:

Material	Wood
Height	33⅞ inches
Width	25 inches
Depth	15 3/16 inches

ELECTRICAL (INPUT):

Voltage (AC only)	105–120
Frequency	60 cps
Wattage (on Radio)	35
Wattage (on Phono)	55

OPERATING FREQUENCIES:

Broadcast Band	540–1600 kc
I-F Amplifier	455 kc

POWER OUTPUT (117 Volts Line):

Undistorted	1 watt
Maximum	1.75 watts

LOUDSPEAKER:

Type	Alnico PM
Outside Cone Diameter	10 inches
Voice Coil Impedance at 400 cps	3.2 ohms

PHONOGRAPH PICKUP:

Type	Dual Stylus Variable Reluctance
DC Resistance	280 ohms

RECORD CHANGER:

P15	33⅓, 45 and 78 RPM

TUBE COMPLEMENT:

V1	RF Amplifier	12SK7
V2	Oscillator Converter	12SA7
V3	IF Amplifier	12BA6
V4	Detector-Audio Amplifier	12SQ7
V5	Rectifier	35Z5GT/G
V6	Audio Power Amplifier	35L6GT
V7	Phono Preamplifier	6AU6
I1	Pilot Lamp	GE Mazda No. 47

GENERAL INFORMATION

The Model 740 is a combination radio-phonograph receiver. It employs a 6-tube superheterodyne receiver and a record changer, Model P15. The servicing information given herein is complete except that it does not cover servicing of the record changer. Service data on record changer Model P15 is covered in service notes ER-S-P15.

CAUTION

One side of the power line is connected to B−. Use an isolation transformer when making service adjustments with the chassis removed from the cabinet.

STAGE GAINS AND VOLTAGE CHECKS

Stage gain measurements by 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 are taken with low signal input so that AVC is not effective.

1. *I-F Gain*

12SA7 Grid to 12BA6 Grid	50 @ 455 KC
12BA6 Grid to 12SQ7 Diode Plate	50 @ 455 KC

2. *Audio Gain*

Input of 0.15 volts at 400 cycles across volume control (R6) with control set at maximum will develop approximately ½ watt output across the speaker voice coil terminals.

3. *Oscillator Grid Bias*

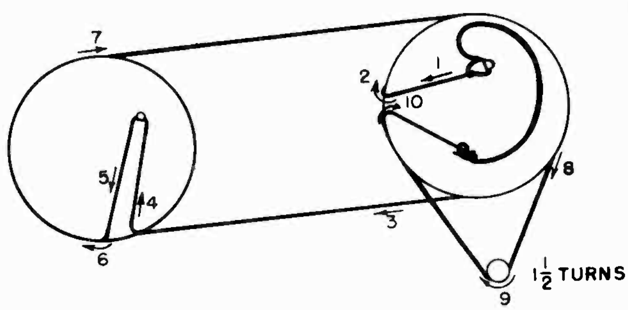
DC voltage developed across the oscillator grid leak (R4) averages 8.5 volts at 1000 kc.

4. *Tube Socket Pin Voltages*

Fig. 3 shows voltages from tube pins to B−. Voltage readings differing greatly from those specified may help localize defective components.

5. *Hum Measurement*

Hum measured across the voice coil of the speaker with the volume control set at minimum and band switch in the radio position should not exceed 7 millivolts.



TUNING CAP. AT MAX. CAP.

Fig. 1. Dial Stringing Diagram

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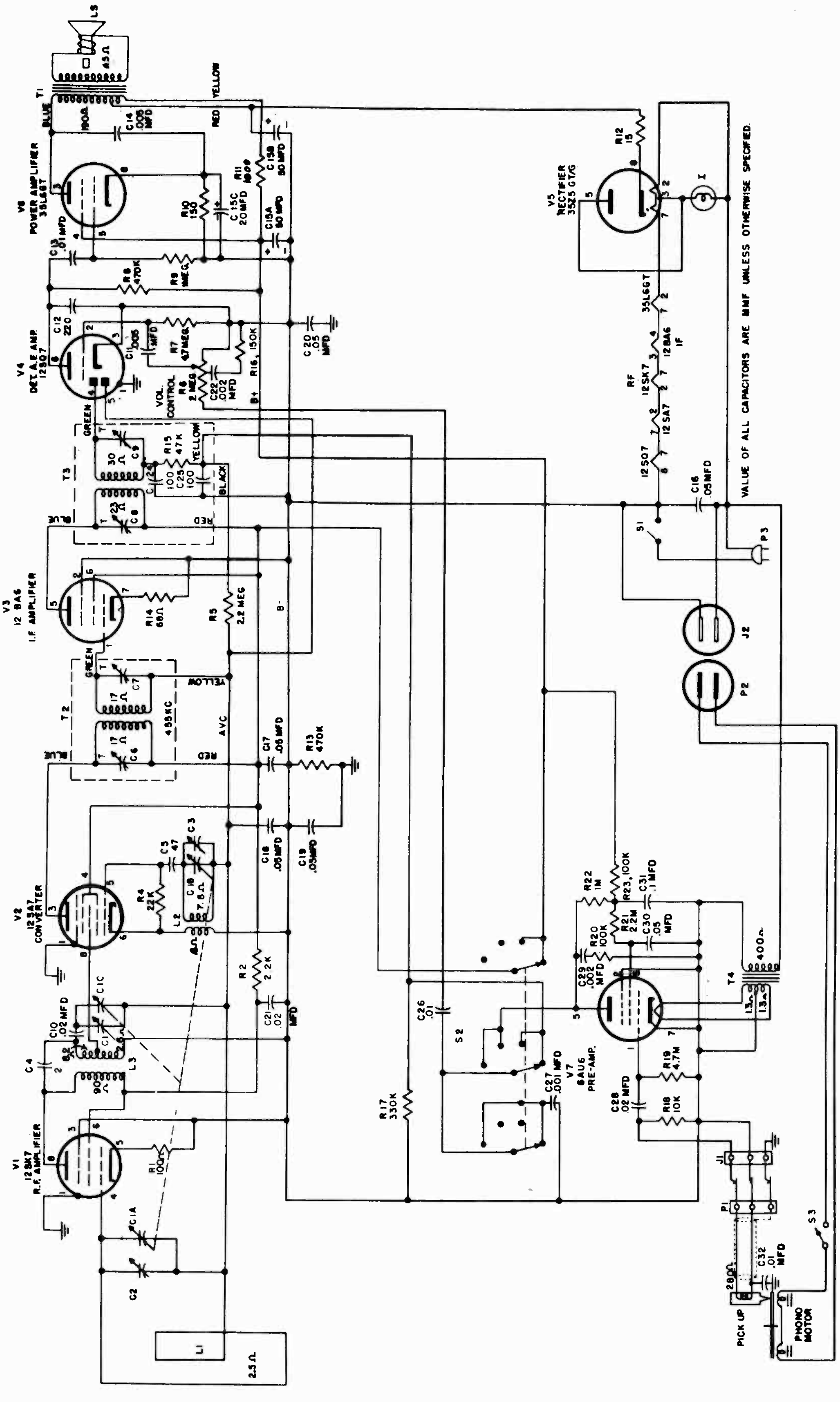
MODEL 740



RECORD CHANGER: Model P15, Pages RCD.CH.21-13, through RCD.CH.21-18.

Fig. 2. Schematic Diagram

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ELECTRICAL CIRCUIT ALIGNMENT

EQUIPMENT REQUIRED:

1. Test oscillator with tone modulation.
2. AC voltmeter, 1½ volts full scale.
3. Paper capacitor, 0.05 mf.
4. Insulated screwdriver.
5. Coupling loop for test oscillator (see text).
6. Isolation transformer.

ALIGNMENT PROCEDURE:

The alignment steps are given in table form of the Alignment Chart. Adjustment trimmers are shown in the illustration of Fig. 4.

1. The chassis should be removed from the cabinet with the antenna loop and back attached and the speaker leads reconnected.

2. An isolation transformer should be used for the receiver power source when aligning or servicing AC-DC receivers to prevent short circuiting of equipment and shock hazard.

3. The output meter should be connected across the terminals of the loudspeaker voice coil.

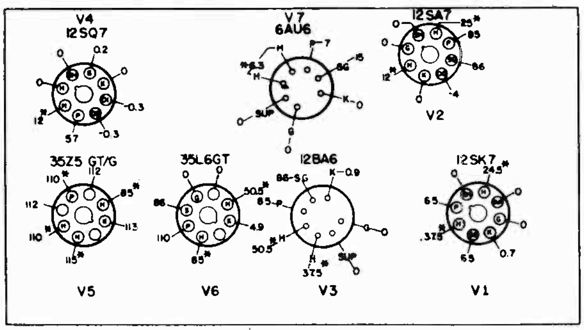
4. The receiver volume control should be turned to maximum and test oscillator signal output attenuated during alignment to develop not more than 1¼ volts output meter reading at the loudspeaker.

5. For i-f alignment, the high side of the signal generator output cable should be connected through a .05 mfd. paper capacitor to the points indicated in the Alignment Chart. The low side of the output cable is connected to the receiver chassis.

6. To align the oscillator and r-f trimmers, the signal generator output is inductively coupled to the radio loop, L1, by connecting a four-turn, six-inch diameter loop of bell wire across its output terminals and then locating the loop about one foot from the radio loop antenna. To prevent possible errors in comparative peak readings, the position of signal generator loop with respect to the radio loop antenna should not be changed during measurement.

ALIGNMENT CHART

Step	Connect Test Oscillator to:	Test Osc. Setting	Radio Dial Setting	Adjust Trimmers for Maximum
	I-F ALIGNMENT			
1	V3, 12BA6 grid (Pin 1), in series with .05 mfd.	455 KC	......	C9 and C8 of second i-f transformer T3
2	V2, 12SA7 grid (Pin 8), in series with .05 mfd.	455 KC	......	C7 and C6 of first i-f transformer, T2
3	V2, 12SA7 grid (Pin 8), in series with .05 mfd.	455 KC	......	Recheck adjustment of C9, C8, C7, C6, for maximum
	R-F ALIGNMENT			
4	Inductively coupled to radio loop.	1620 KC	Minimum capacity C1A, C1B	C3, oscillator trimmer
5	Inductively coupled to radio loop.	1500 KC	Tune for Maximum	C1, r-f trimmer C2, ant. trimmer on Loop



117 VOLTS AC LINE VOLTAGE
NO SIGNAL INPUT
MEASURE BETWEEN SOCKET TERMINALS & B-
USE 20,000 OHM PER VOLT METER
SET VOLUME CONTROL TO MINIMUM
* INDICATES AC FILAMENT VOLTAGES
SWITCH S2 IN RADIO POSITION

Fig. 3. Socket Voltage Diagram

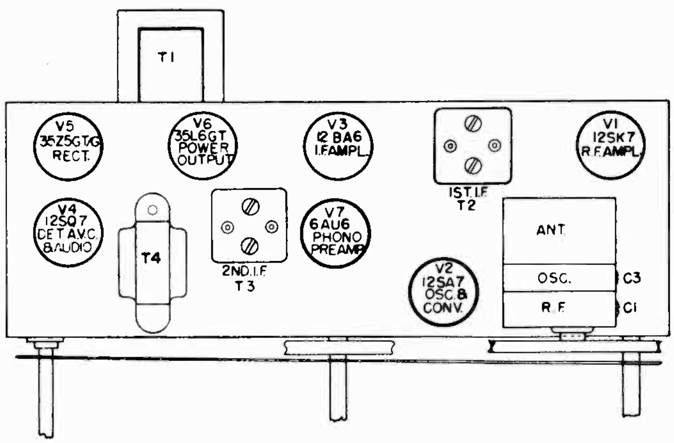


Fig. 4. Tube and Trimmer Location

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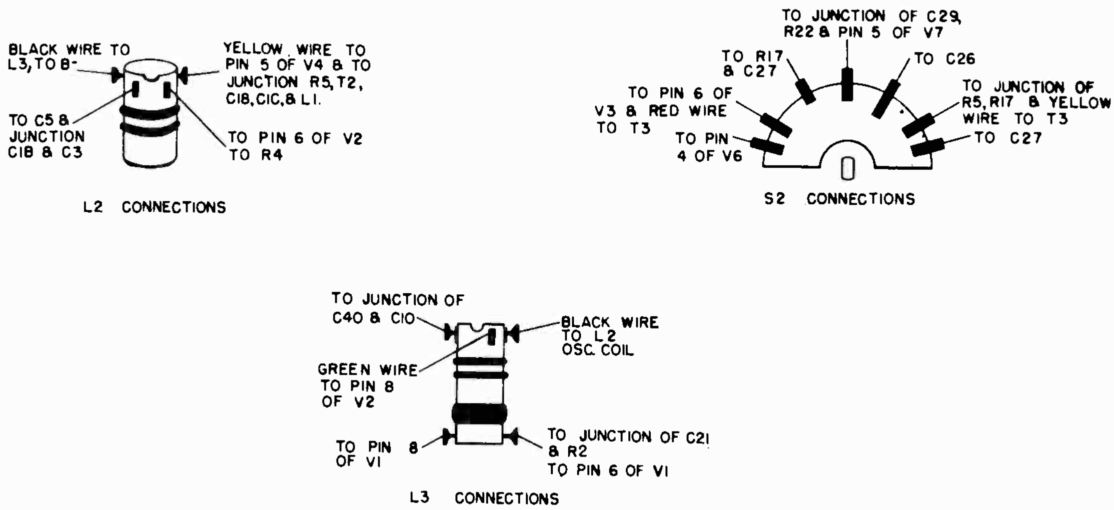

Fig. 5. Coil and Switch Connections

REPLACEMENT PARTS LIST—MODEL 740

Cat. No.	Symbol	Description
		UNIVERSAL REPLACEMENT PARTS
UCC-035	C27	CAPACITOR—.001 mf., 600 v., paper
UCC-036	C22, 29	CAPACITOR—.002 mf., 600 v., paper
UCC-039	C11	CAPACITOR—.005 mf., 600 v., paper
UCC-040	C13, 26	CAPACITOR—.01 mf., 600 v. paper
UCC-041	C21, 28, 10	CAPACITOR—.02 mf., 600 v., paper
UCC-045	C17, 18, 19, 20, 30	CAPACITOR—.05 mf., 600 v., paper
UCC-048	C31	CAPACITOR—.1 mf., 600 v., paper
UCU-020	C5	CAPACITOR—47 mmf., mica
UCU-036	C12	CAPACITOR—220 mmf., mica
URD-005	R12	RESISTOR—15 ohms, ½ w., carbon
URD-021	R14	RESISTOR—68 ohms, ½ w., carbon
URD-025	R1	RESISTOR—100 ohms, ½ w., carbon
URD-029	R10	RESISTOR—150 ohms, ½ w., carbon
URD-057	R2	RESISTOR—2200 ohms, ½ w., carbon
URD-073	R18	RESISTOR—10,000 ohms, ½ w., carbon
URD-081	R4	RESISTOR—22,000 ohms, ½ w., carbon
URD-097	R20, 23	RESISTOR—100,000 ohms, ½ w., carbon
URD-101	R16	RESISTOR—150,000 ohms, ½ w., carbon
URD-109	R17	RESISTOR—330,000 ohms, ½ w., carbon
URD-113	R8, 13	RESISTOR—470,000 ohms, ½ w., carbon
URD-121	R9, 22	RESISTOR—1 meg., ½ w., carbon
URD-129	R5, 21	RESISTOR—2.2 meg., ½ w., carbon
URD-137	R7, 19	RESISTOR—4.7 meg., ½ w., carbon
URF-049	R11	RESISTOR—1000 ohms, 2 w., carbon
		SPECIALIZED REPLACEMENT PARTS
RAB-144		CABINET BACK
RAC-084		CHANGER PAN (COVER)
RAV-140		CABINET (MAHOGANY)
RCE-117	C15A,B,C,D	CAPACITOR—Electrolytic
RCN-039	C4	CAPACITOR—2 mmf., mica
RCT-048	C1A,B,C,C3	TUNING CAPACITOR
RCY-016	C2	CAPACITOR—Trimmer

Cat. No.	Symbol	Description
		SPECIALIZED REPLACEMENT PARTS (Cont'd)
RDC-032		DIAL CORD
RDE-097		ESCUTCHEON
RDK-212		DRAWER PULL
RDK-231		KNOB
RDK-232		KNOB (ARROW)
RDP-051		POINTER—Dial pointer
RDS-102		BACK PLATE AND DIAL SCALE
RMC-002		CLIP—Oscillator coil
RHC-024		CLIP for capacitor
RHC-038		MOUNTING CLIP (RF CLIP)
RHG-018		GROMMET (TUNING CAPACITOR MTG.)
RHG-029		GROMMET
RHJ-007		SPACER (TUNING CAP. MTG.)
RHS-064		SCREW—Wood, No. 4 x 7/16 in., lg. rd. hd.
RJC-001		SPEAKER LEAD PINS
RJS-003		TUBE SOCKET for V1, V2, V4, V5, V6
RJS-049	J2	PHONO POWER SOCKET
RJS-092		TUBE SOCKET for V7
RJS-097	J1	PHONO SOCKET
RJS-141		TUBE SOCKET for V3
RJX-031		PILOT LAMP SOCKET
RLC-015	L2	OSCILLATOR COIL
RLI-125	L3	RF COIL
RLL-041	L1	LOOP—Antenna loop
RMM-151		CHANNEL RUBBER
RMM-153		DRAWER SLIDE
RMS-130		DIAL CORD SPRING
RMS-221		STABILIZER SPRING
RMX-174		DRIVE SHAFT AND BUSHING ASSEMBLY
ROP-018		SPEAKER—10 inch
RJP-003	P2	AC POWER PLUG
RJX-007	P1	PHONO PLUG
RRC-151	R6, S3	VOLUME CONTROL AND SWITCH
RSW-084	S2	PHONO-RADIO-TONE SWITCH
RTF-001	T4	FILAMENT TRANSFORMER
RTL-115	T2	1st I-F TRANSFORMER
RTL-116	T3	2nd I-F TRANSFORMER
RTO-038	T1	OUTPUT TRANSFORMER
RWL-004		POWER CORD

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MODEL 752 MAHOGANY
MODEL 753 BLONDE

SPECIFICATIONS

CABINET

Model	752	753
Material	Wood	Wood
Color	Mahogany	Blonde
Height, inches	33 15/16	33 15/16
Width, inches	32	32
Depth, inches	15 13/16	15 13/16

ELECTRICAL

Voltage .... 105–125 volts
Frequency .... 60 cps
Wattage (Radio) .... 65 w.
Wattage (Phono) .... 85 w.

OPERATING FREQUENCIES

AM Band .... 540–1620 kc
FM Band .... 88–108 mc

INTERMEDIATE FREQUENCIES

AM Band .... 455 kc
FM Band .... 10.7 mc

AUDIO POWER OUTPUT

Undistorted .... 3.0 watts
Maximum .... 5.0 watts

LOUDSPEAKER

Type .... Permanent magnet
Size .... 12 inches
Voice Coil Impedance at 400 cycles .... 3.2 ohms

TUBES

(V1) Converter 6BE6
(V2) RF and 1st FM Amplifier 6BA6
(V3) I-F Amplifier 6BA6
(V4) FM Limiter 6AU6
(V5) FM Discriminator, AM Detector and Audio Amplifier 6T8
(V6) Audio Power Output 6V6
(V7) Rectifier 5Y3GT
(V8) Phono Preamplifier 6AU6

DIAL LAMP .... Mazda No. 42

RECORD CHANGER .... P15 (33⅓, 45 and 78 RPM)

PHONOGRAPH PICK-UP

Type .... Dual Stylus, variable reluctance
DC Resistance .... 340 ohms

ANTENNA

AM .... Built-in loop
FM .... Power cord antenna or 300 ohm FM antenna

GENERAL

Models 752 and 753 are similar except for cabinet. For service information for the record changer, refer to General Electric service notes ER-S-P15.

These models are designed to operate from built-in antennas or from an external FM 300 ohm antenna. The receiver may be operated on the built-in FM antenna by connecting the brown wire which extends from the rear of the chassis to the left hand terminal of the dipole antenna terminals. If it is necessary to install an external FM antenna, the brown wire extending from the rear of the chassis should be disconnected from the antenna terminal strip.

These receivers use a reflex circuit to amplify the FM r-f signal in V2. The FM r-f signal is coupled to the grid of V2 through C46 and is amplified by V2. It is then coupled from the plate of V2 to the grid of V1, the converter, by C7. L9 keeps the FM r-f signal out of the FM i-f transformer T3, while C7 is a small value to keep the FM i-f from grid of the converter tube.

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 input so that AVC is not effective.

1. R-F AND I-F STAGE GAINS

Signal applied through an IRE dummy antenna:

(AM) V1 to V3 Grid .... 40 at 455 KC
(FM) Dipole Terminals to V1 Grid .... 1.0 at 98 MC
(FM) V1 Grid to V2 Grid .... 1.5 at 10.7 MC
(FM) V2 Grid to V3 Grid .... 50 at 10.7 MC
(FM) V3 Grid to V4 Grid .... 22 at 10.7 MC

2. AUDIO GAIN

.07 volts at 400 cps across the volume control will give approximately ½ watt output across the speaker voice coil. Set volume control at maximum.

3. OSCILLATOR GRID BIAS

D-c voltage developed across R3:
7 volts at 1000 KC (use 220K resistor to isolate VTVM)
3 volts at 98 MC (use 220K resistor to isolate VTVM)

4. SOCKET VOLTAGES

Figure 6 shows typical tube pin voltages. All readings should be made from the tube pin to chassis, unless otherwise indicated.

5. HUM MEASUREMENT

Hum measured across the voice coil of the speaker with the volume control set at minimum and band switch in the AM position should not exceed 7 millivolts.

On FM position ground the limiter grid through a .01 mfd. capacitor and measure the hum across the voice coil with volume control at maximum. Hum should not exceed 15 millivolts.

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MODELS 752, 753

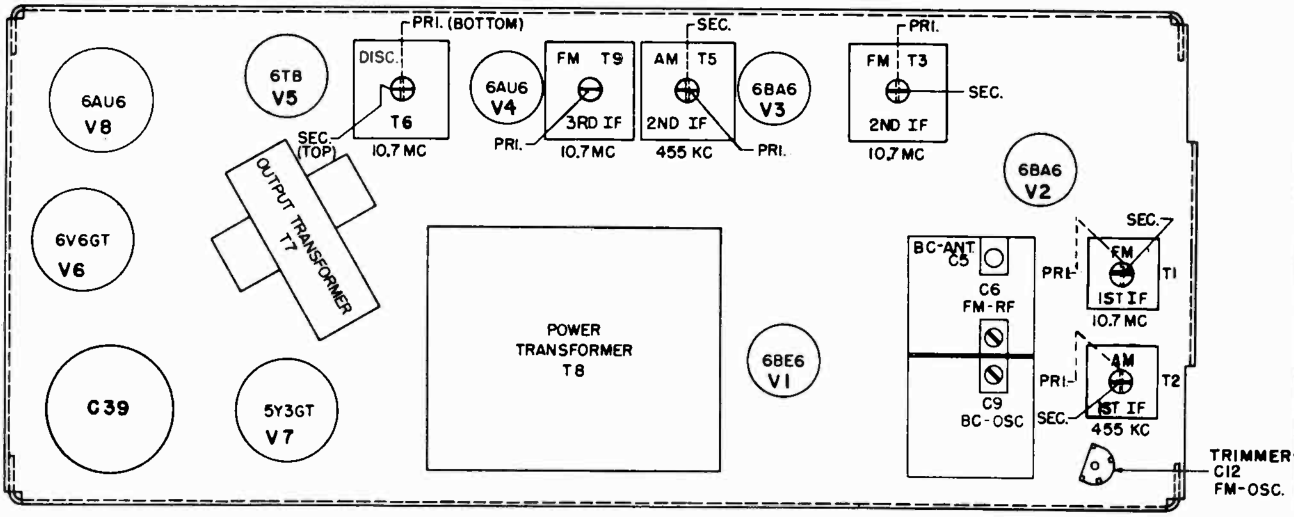

Fig. 1. Tube and Trimmer Location

METER ALIGNMENT

Two methods of alignment are given below (1) meter, and (2) visual alignment, which allows more precision in aligning the i-f transformers and particularly the discriminator transformer, T6.

EQUIPMENT REQUIRED FOR METER ALIGNMENT

1. Test oscillator with tone modulation to cover 455 kc; 520 to 1620 kc, 10.7 mc, and 88 to 108 mc.

2. 20,000 ohm-per-voltmeter, or vacuum tube voltmeter.

3. Output meter.

4. .01 mfd. paper capacitor.

5. 200,000 ohm, ½ watt resistor.

6. Loop of wire. See note 6.

METER ALIGNMENT NOTES

1. Use unmodulated signal.

2. Connect 20,000 ohm-per-volt meter from junction of R26 and C27 to chassis. Use 10-volt scale, steps 4 and 5.

3. Connect 20,000 ohm-per-volt meter from pin 1 of V4 to ground in series with a 200,000 ohm resistor. The resistor must be connected directly to the grid 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). (Use microamp scale.) A vacuum tube voltmeter may be used to measure 1 volt at the grid of V4.

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 ½ 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 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.

11. Make all chassis connections for FM-IF alignment as short as possible. In step 9 connect the ground side of the signal generator at the chassis ground in the center of the 6BE6 socket using a short ground connection.

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) thru .01 mfd.	AM	550 KC	Primary and secondary cores of T5 for maximum.	4, 5
2	455 KC	6BE6 grid (Pin 7 of V1) thru .01 mfd.	AM	550 KC	Primary and secondary cores of T2 for maximum.	4, 5

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FM DISCRIMINATOR ALIGNMENT

3	10.7 MC	6BA6 grid (Pin 1 of V3) thru .01 mfd.	FM	..	T6 secondary core for minimum.	4, 5, 8
4	See Note 10.			..	Detune signal generator to point of max. meter reading.	1, 2, 10
5				..	T6 primary for maximum.	
6	Repeat Step 3.					

FM-IF ALIGNMENT

7	10.7 MC unmodulated	6BA6 grid (Pin 1 of V3) thru .01 mfd.	FM	..	Core of T9 for maximum.	1, 3, 11
8		6BA6 grid (Pin 1 of V2) thru .01 mfd.		..	Primary and secondary cores of T3 for maximum.	
9		6BE6 grid (Pin 1 of V1) thru 22K resistor.		..	Primary and secondary cores of T1 for maximum.	1, 3, 7, 11

AM-RF ALIGNMENT

10	1620 KC	Inductively coupled	AM	C1 completely open.	Adjust C9 for maximum.	4, 5, 6
11	1500 KC			For maximum output.	Adjust C5 for maximum while rocking generator. Set pointer to 1500 KC.	

FM-RF ALIGNMENT

12	108 MC unmodulated	Dipole terminals	FM	C1 completely open.	Adjust C12 for maximum.	1, 3 6, 9
13	108 MC unmodulated			For maximum output.	Adjust C6 for maximum while rocking generator.	

VISUAL ALIGNMENT

EQUIPMENT REQUIRED FOR VISUAL ALIGNMENT

1. General Electric YGS-3 AM and FM signal generator, or equivalent.

2. General Electric ST-2A oscilloscope or equivalent.

3. One meg. resistor, one 22,000-ohm resistor, one .01 mfd capacitor.

NOTES FOR VISUAL ALIGNMENT

1. Connect vertical plates of scope to the limiter grid, pin 1 of V4, through 1 meg. and chassis.

2. Connect vertical plates of scope to junction of C24, R14, and R13 through 1 meg. Connect low side of scope to chassis.

3. Connect vertical plates of scope across C27 to align the discriminator transformer (T6). Connect high side of scope to junction of C27 and R26 through 1 meg.

4. Use a 60 cycle amplitude modulated signal for AM and FM oscillator alignment. Apply a 60 cps voltage to the horizontal plates of the scope.

5. 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 on the screen if peaking of C5 on AM alignment or C6 on FM alignment causes the curve to move off the screen, it will be necessary to recalibrate the oscillator as in steps 3 and 12.

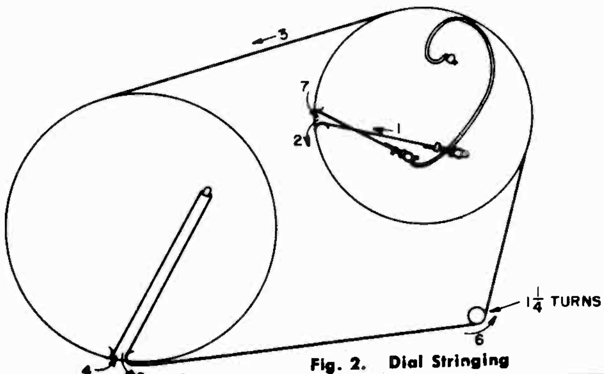

Fig. 2. Dial Stringing

6. The termination impedance of the signal generator should be 300 ohms to properly match the input impedance of this receiver for FM r-f alignment.

7. To align the 1st i-f FM transformer T1, it is necessary to disconnect the copper strap from pin 7 of V1 (6BE6 converter) to the band switch by unsoldering it from the tube pin. Resolder after aligning T1.

8. 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.

9. When using a sweep signal, it is necessary to apply the same sweep voltage to the horizontal plates of the oscilloscope which is used to sweep the r-f frequency.

It may be necessary to use an RF phase shift network to properly phase the input to the scope. This may be done by shunting a .005 mfd. capacitor across the horizontal plate terminals of the scope and by using a ½ megohm potentiometer in series with the high side of the horizontal sweep voltage line. Adjust the potentiometer to superimpose the retrace on the trace.

10. Make all chassis connections for FM-IF alignment as short as possible. In step 7 connect the ground side of the signal generator at the chassis ground at the center pin of the 6BE6 socket using a short ground connection.

11. If slight distortion is encountered on weak FM stations, it may be necessary to increase the FM-IF bandwidth to a minimum of 120 kc or a maximum of 140 kc wide at 50% of peak amplitude. This should be done by stagger tuning T3 only. The amplitude of the video IF response should not be reduced more than 20%. Use a signal generator accurately calibrated to supply markers for the bandwidth measurement.

To stagger tune T3, use a sweep voltage as in step 7, page 4. Connect a scope as in note 1. Turn the primary of T3 (bottom core) slightly clockwise. Turn the secondary of T3 (top core) counterclockwise to center the 10.7 mc marker at the peak of the curve. Check the bandwidth.

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MODELS 752, 753

VISUAL ALIGNMENT CHART

Step No.	Signal Generator Frequency	Signal Input Point	Band Switch	Dial Setting	Adjust	See Note
			AM-IF ALIGNMENT			
1	455 KC ±20 KC at 60 cps sweep rate	6BE6 grid (pin 1 of V1) thru .01 mfd.	AM		Cores of T5 for max. amplitude and symmetry. See Fig. 4 (A).	2
2					Cores of T2 for max. amplitude and symmetry. See Fig. 4 (A).	
			AM-RF ALIGNMENT			
3	1620 KC AM modulated with 60 cps.	Inductively coupled.	AM	C1 completely open. Min. capacity.	C9 for steepest slope of straight line trace.	2, 4, 8
4	1500 KC ±20 KC at 60 cps sweep rate			For max. amplitude of curve.	C5 for max. amplitude and symmetry of curve. See Fig. 4 (A).	2, 5, 8
			FM-IF ALIGNMENT			
5	10.7 MC ± 300 KC at 60 cps sweep rate	6BA6 grid (Pin 1 of V2) thru .01 mfd.	FM		Core of T4 for max. amplitude and symmetry. See Fig. 4 (A).	1, 10
6					Cores of T3 for max. amplitude and symmetry. See Fig. 4 (A).	1, 7, 10
7		6BE6 grid (pin 1 of V1) thru 22K (See note 7)			Cores of T1 for max. amplitude and symmetry. See Fig. 4 (A).	
			FM DISCRIMINATOR ALIGNMENT			
8	10.7 MC ± 300 KC at 60 cps sweep rate.	6BA6 grid (pin 1 of V3) thru .01 mfd.	FM		Primary of T6 for maximum amplitude. See Fig. 4 (B).	3, 10
9					Secondary of T6 for equal amplitude and symmetry of positive and negative peaks of curve. See Fig. 4 (B).	
10	Recheck step 8					
11	Recheck step 9					
			FM-RF ALIGNMENT			
12	108 MC AM modulated with 60 cps.	Dipole terminals	FM	C1 completely open. (Min. capacity)	C12 for steepest slope of straight line trace.	1, 4, 6
13	98 MC ±300 KC at 60 cps sweep rate			For max. amplitude of curve.	C6 for max. amplitude and symmetry of curve. See Fig. 4 (A).	1, 5, 6

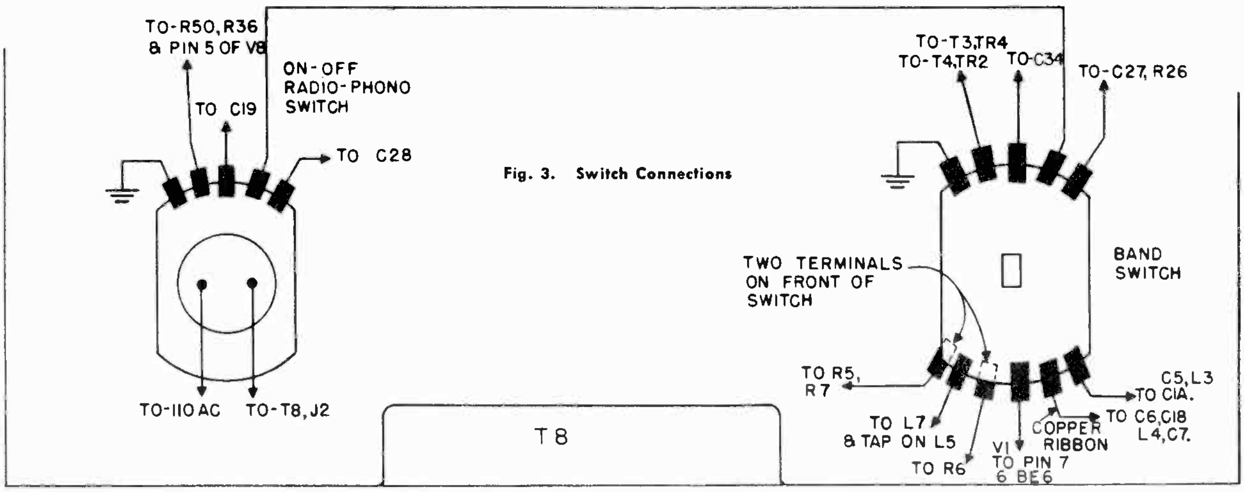

Fig. 3. Switch Connections

REAR VIEW OF SWITCHES WITH CHASSIS INVERTED

Fig. 4. IF and Discriminator Curves

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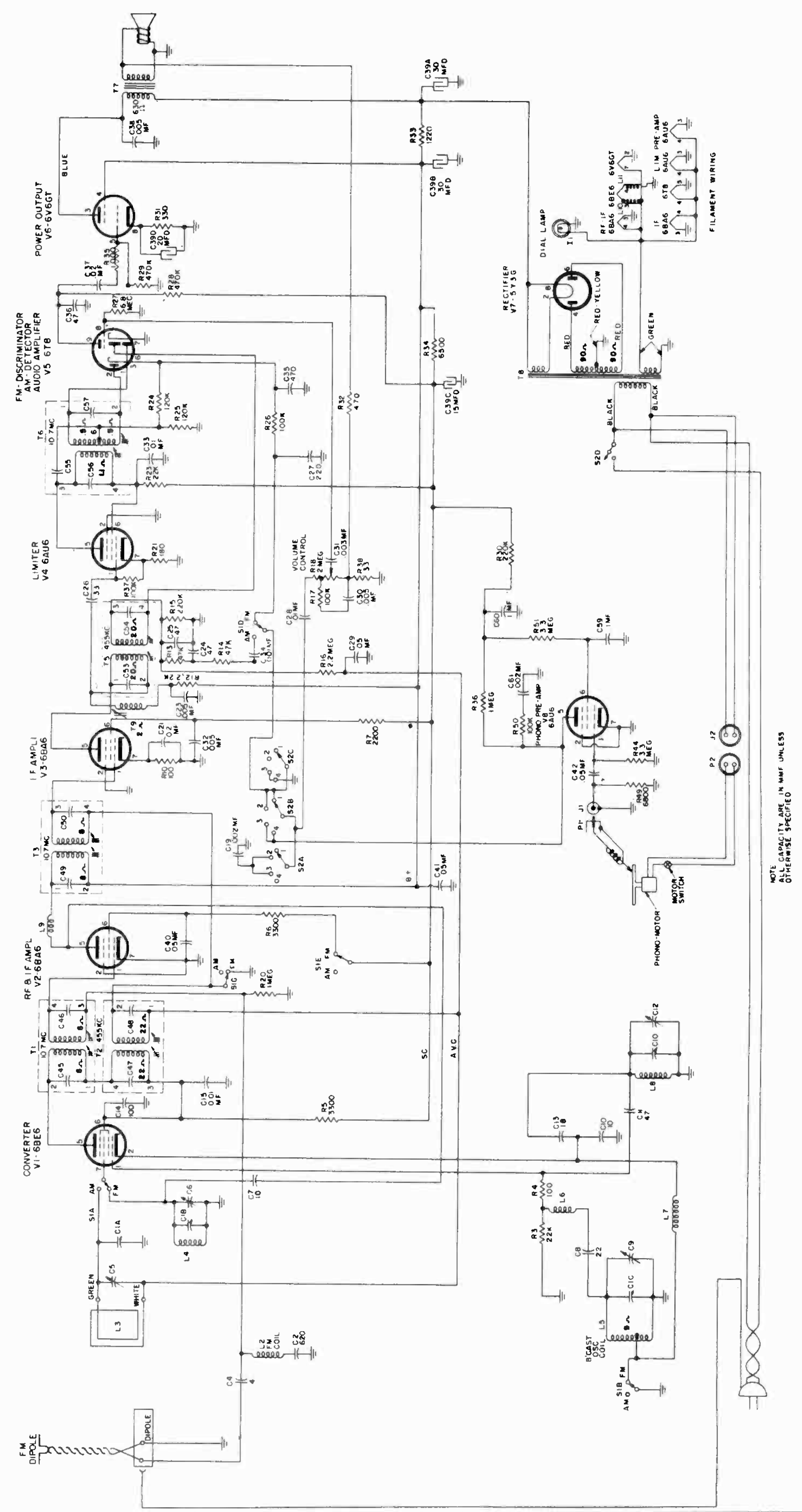

Fig. 5. Schematic Diagram

RECORD CHANGER: Model P15, Pages RCD.CH.21-13, through RCD.CH.21-18.

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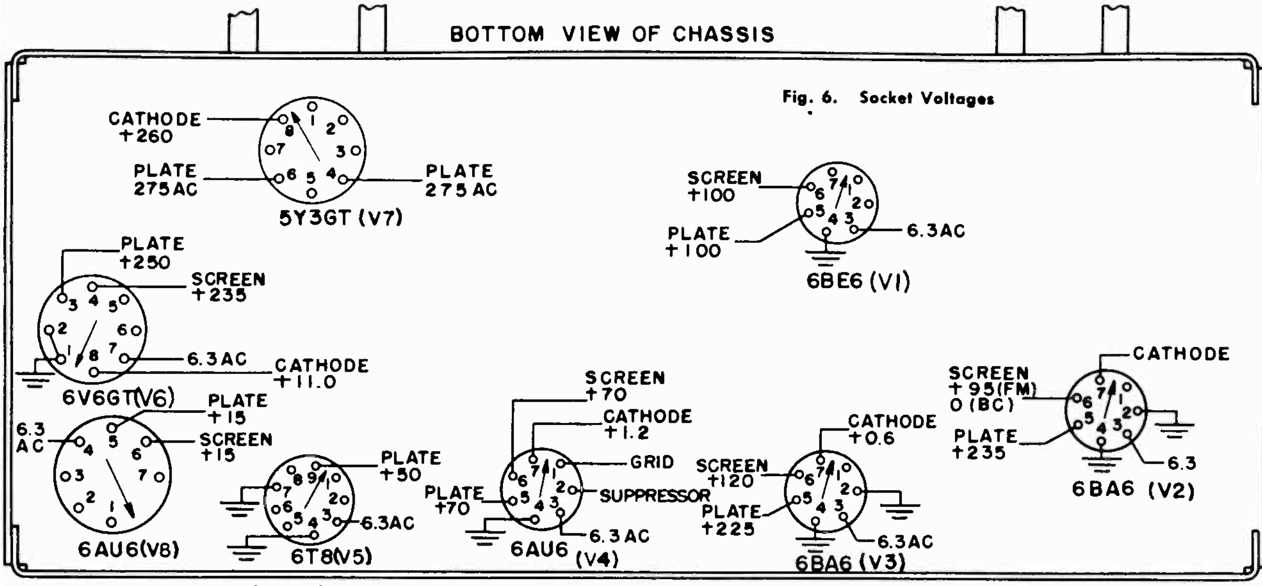
MODELS 752, 753

BOTTOM VIEW OF CHASSIS



ALL VOLTAGES MEASURED TO CHASSIS USING A 20,000 OHM PER VOLT METER

ALL VOLTAGES ON BC BAND UNLESS OTHERWISE NOTED

REPLACEMENT PARTS LIST

UNIVERSAL REPLACEMENT PARTS

Cat. No.	Symbol	Description
*UCC-035	C34	CAPACITOR—.001 mf., 600 v., paper
*UCC-036	C19, C61	CAPACITOR—.002 mfd., 600 v., paper
*UCC-037	C31	CAPACITOR—.003 mfd., 600 v., paper
*UCC-039	C30, C23, C32	CAPACITOR—.005 mfd., 600 v., paper
*UCC-040	C28, C15, C33, C42	CAPACITOR—.01 mfd., 600 v., paper
*UCC-041	C21, C37	CAPACITOR—.02 mfd., 600 v., paper
*UCC-045	C40, C41, C44	CAPACITOR—.05 mfd., 600 v., paper
*UCC-048	C59, C60	CAPACITOR—.1 mfd., 600 v., paper
*UCC-059	C38	CAPACITOR—.005—1000 v.
*UCU-001	C4	CAPACITOR—4 mmfd., 500 v., mica
*UCU-016	C26	CAPACITOR—33 mmfd., 500 v., mica
*UCU-020	C36	CAPACITOR—47 mmfd., 500 v., mica
*UCU-044	C35	CAPACITOR—470 mmfd., 500 v., mica
*UCU-1036		CAPACITOR—220 mmfd., 500 v., mica
*UCU-2047	C2	CAPACITOR—620 mmfd., 500 v., mica
*URD-013	R38	RESISTOR—33 ohms, ½ w., carbon
*URD-025	R4, R10	RESISTOR—100 ohms, ½ w., carbon
*URD-031	R21	RESISTOR—180 ohms, ½ w., carbon
*URD-041	R32	RESISTOR—470 ohms, ½ w., carbon
*URD-049	R35	RESISTOR—1000 ohms, ½ w., carbon
*URD-057	R7, R12	RESISTOR—2200 ohms, ½ w., carbon
URD-061	R6, R5	RESISTOR—3300 ohms, ½ w., carbon
*URD-069	R49	RESISTOR—6800 ohms, ½ w., carbon
*URD-081	R3, R23	RESISTOR—22,000 ohms, ½ w., carbon
*URD-089	R13, R14	RESISTOR—47,000 ohms, ½ w.
*URD-097	R17, R26, R37, R50	RESISTOR—100,000 ohms, ½ w.
*URD-099	R24, R25	RESISTOR—120,000 ohms, ½ w.
*URD-105	R15, R30	RESISTOR—220,000 ohms, ½ w.
*URD-113	R28, R29	RESISTOR—470,000 ohms, ½ w.
*URD-121	R20, R36	RESISTOR—1 meg., ½ w.
*URD-129	R16	RESISTOR—2.2 meg., ½ w.
*URD-133	R44, R51	RESISTOR—3.3 meg., ½ w.
*URD-141	R27	RESISTOR—6.8 meg., ½ w.
*URE-037	R31	RESISTOR—330 ohms, 1 w.

SPECIALIZED REPLACEMENT PARTS

Cat. No.	Symbol	Description
RAC-084		CHANGER PAN (COVER)
RAV-122		CABINET-752 (MAHOGANY)
RAV-123		CABINET-753 (BLONDE)
*RCE-039	C39A, C39B, C39C, C39D	CAPACITOR—Electrolytic
RCT-043	C1A, C1B, C1C, C1D	CAPACITOR (TUNING)
*RCW-1043	C11	CAPACITOR—47 mmf., ceramic
*RCW-1047	C14	CAPACITOR—100 mmf., ceramic
*RCW-1053	C8	CAPACITOR—22 mmf., ceramic
*RCW-1060	C7, C10	CAPACITOR—10 mmf., 0-coef., ceramic
*RCW-2031	C13	CAPACITOR—18 mmf., ceramic
RCY-055	C12	CAPACITOR—Trimmer
*RDC-032		DRIVE CORD
RDE-087		ESCUTCHEON
RDK-212		DRAWER PULL
RDK-213		KNOB
RDK-214		KNOB (ARROW)
RDP-053		POINTER
*RHC-017		COIL CLIP—For mounting L5
*RHC-034		CLIP—For mounting IF cam
*RHG-010		GROMMET RUBBER (tube)
*RHG-015		GROMMET TUNING (gang)
RHI-011		STRAIN RELIEF—On power cord
*RHJ-006		SPACER TUNING (gang)
RII-047		INSULATING WASHER—Under J1
*RJC-001		SPEAKER LEAD PINS
*RJC-002		SPEAKER LEAD CLIPS for S1212D7
RJP-003	P2	AC POWER PLUG
*RJP-004	P1	PHONO PLUG
*RJP-010	J1	PHONO JACK & PLUG (Female)
RJS-003		SOCKET—Tube socket for V6, V7
RJS-012		MOUNTING PLATE—For electrolytic
*RJS-049	J2	PHONO POWER SOCKET (Female)
RJS-092		SOCKET—Tube socket for V8
RJS-118		SOCKET—Tube socket for V5
RJS-145		SOCKET—Tube socket for V1, V2, V3, V4
RJX-031		PILOT LIGHT SOCKET
*RLB-029	L4	COIL—FM R-F
*RLC-066	L5	COIL—B-C osc.
*RLC-102	L8	COIL—FM osc.
*RLI-088	L2	CHOKE COIL—FM antenna
*RLI-122	L6, L7, L10, L11	CHOKE COIL
RLI-124	L9	CHOKE COIL—FM R-F pl. osc. cathode
RLL-039	L3	LOOP ASSEMBLY
RMM-151		CHANNEL RUBBER
RMM-153		DRAWER SLIDE, GRANT PULLEY HARDWARE
*RMS-111		SPRING (DIAL CORD)
RMS-221		STABILIZER SPRING—On changer pan
RMX-171		DRIVE SHAFT & BUSHING ASSEMBLY
RMX-172		DRUM AND SHAFT ASSEMBLY
RRC-141	R18	VOLUME CONTROL
*RRT-003	R33, R34	RESISTOR—1220-6500 ohms, 9 w., w.w.
RSW-079	S1A, S1B, S1C, S1D	BAND CHANGE SWITCH
RSW-080	S2A, S2B, S2C, S2D	TONE CONTROL SWITCH
*RTD-010	T6, C55, C56, C57	DISCRIMINATOR TRANSFORMER
*RTL-097	T2, C47, C48	1st I-F TRANSFORMER—AM
*RTL-098	T5, C25, C24, C53, C54	2nd I-F TRANSFORMER—AM
*RTL-099	T1, T3, C45, C46, C49, C50	1st, 2nd I-F TRANSFORMER—FM
*RTL-114	T9	FM COIL
RTO-089	T7	OUTPUT TRANSFORMER
RTP-304	T8	POWER TRANSFORMER
RWL-023		POWER CORD—3 wire, 8 ft.
S1212D7		SPEAKER—12 inch

*Parts used on previous models.

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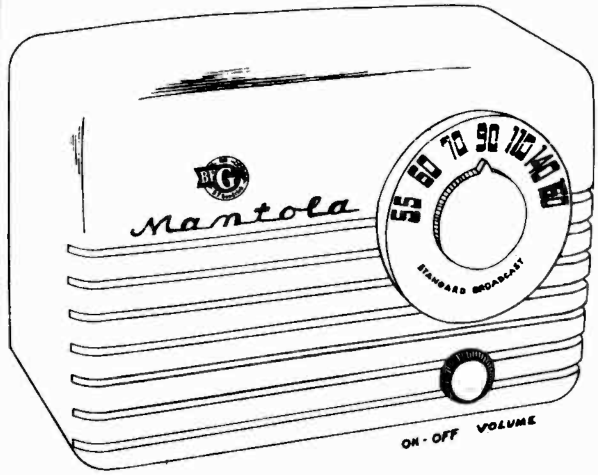
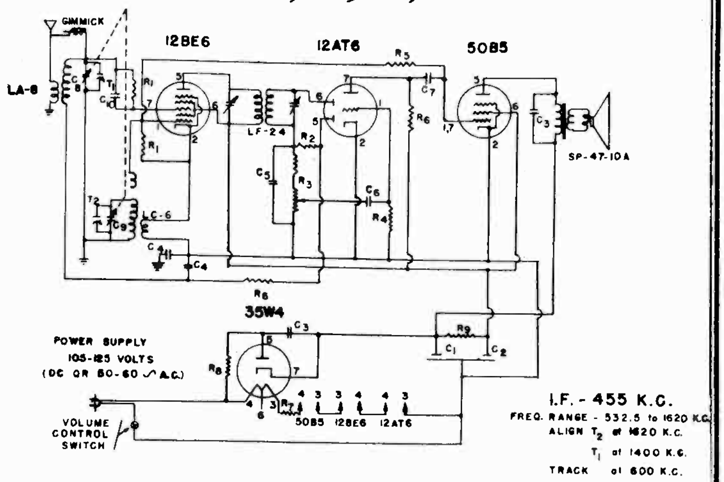
MODELS 92-520, 92-521, 92-522, Ch. AR





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

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	CP503-1	.05 mfd 400V paper cond.
C5	CM-101-1	.100 mmf 500V mica 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)
C10	CM501-1	.500 mmf 500V mica cond.
		RESISTORS
R1	RC183-2	18,000 ohms ½W 10%
R2	RC475-1	4.7 megohms ½W 20%
R3	VC-11	2 meg. vol. cont., 100 K stop
R4	RC106-1	10 megohms ½W 20%
R5	RC334-1	330,000 ohms ½W 20%
R6	RC224-1	220,000 ohms ½W 20%
R7	RW390-5	39 ohms 1W 10%
R8	RC180-2	18 ohms ½W 10%
R9	RC222-5	2200 ohms 1W 10%
		COILS & TRANSFORMERS
	LA-8	Antenna Coil
	LC-6	Oscillator Coil
	LF-24	I.F. Transformer
		MISCELLANEOUS
	CB-106	Cabinet
		Mahogany 92-520
		Ivory 92-521
		Sand 92-522
	KN-20-2	Knob
	KN-21-2	Pointer Knob
	SP-47-10A	4" PM Speaker w Output Trans.

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.

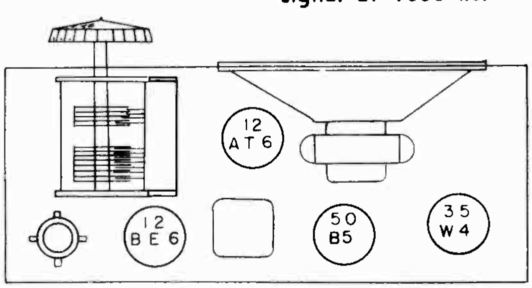
Tuning .... Two gang capacitor

Speaker .... 4 inch PM 3.5 ohm voice coil impedance

Power Output .... 1 watt undistorted, 1.5 watt maximum

Sensitivity .... 800 Microvolts at 50 milliwatts Output

Selectivity .... 120 kc broad at 1000 times signal at 1000 kc.



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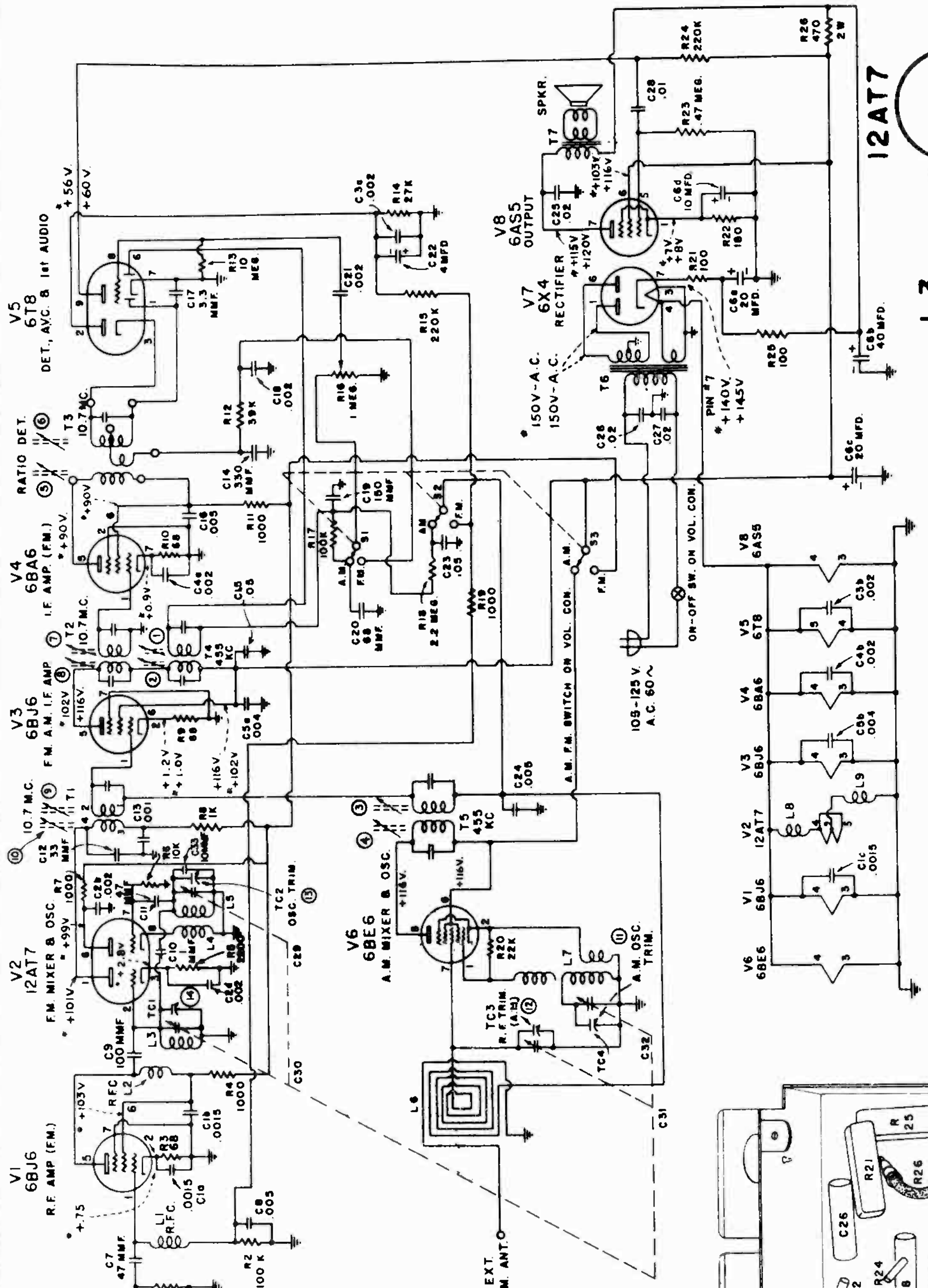
MODEL 92-529,
Ch. BJ



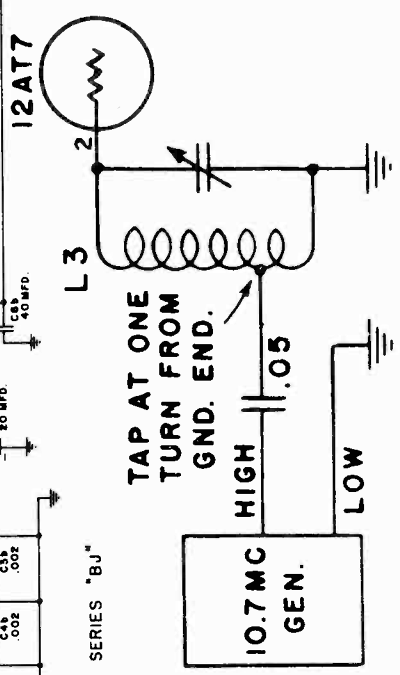
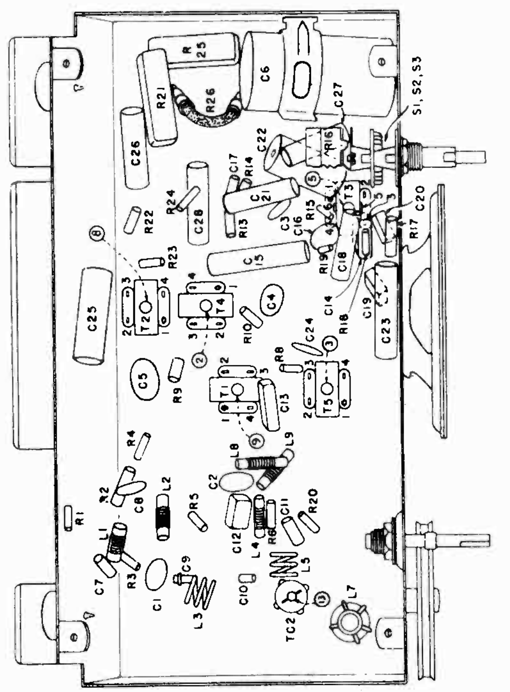


FIG. 2

NOTE: VOLTAGE READINGS SHOWN AT SOCKET PRONGS ARE TO CHASSIS, AND ARE TAKEN WITH NO SIGNAL. WHERE NO READING IS GIVEN, THE VOLTAGE IS ZERO OR TOO LOW TO READ.

* DENOTES F.M. VOLTAGES. UNDESIGNATED VOLTAGES ARE IN THE A.M. CIRCUIT.



LOCATION OF PARTS UNDER CHASSIS
FIG. 1

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MODEL 92-529,
Ch. BJ

ALIGNMENT PROCEDURE

PRELIMINARY:

Output meter connection .... Across speaker voice coil
Output meter reading to indicate 500 MW (Standard Output) .... 1.27 volt
Generator modulation .... 30% 400 cycles
Position of volume control .... Fully clockwise
Set Dial Pointer .... 1-3/32" from center of left shaft, variable condenser closed
Set band switch .... To left for AM alignment; to right for FM alignment

AM ALIGNMENT

POSITION OF VARIABLE	GENERATOR FREQUENCY	DUMMY ANTENNA	GENERATOR CONNECTION HIGH SIDE	GENERATOR CONNECTION GROUND LEAD	ADJUST TRIMMERS IN ORDER SHOWN FOR MAX. OUTPUT	TRIMMER FUNCTION
Open	455 Kc	.05 Mfd	Mixer grid	Chassis	1, 2, 3, 4	I.F.
1620 Kc	1620 Kc		*Test loop	Test loop	11	Oscillator
1400 Kc	1400 Kc		*Test loop	Test loop	12	Antenna
**600 Kc	600 Kc		*Test loop	Test loop	Check-point	Antenna

*Connect generator lead to a Standard Hazeltine Test Loop, Model 1150, placed two feet from the set loop, or three turns of wire about six inches in diameter, placed about one foot from the set loop.

**With a generator signal of 600 Kc, tune the set to the point where maximum output is obtained, which should be approximately 600 Kc on the dial. Adjust antenna section plates of variable 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 A. V. C. action of the receiver ineffective.

FM ALIGNMENT

DETECTOR AND IF ALIGNMENT USING SIGNAL GENERATOR AND OSCILLOSCOPE

1. Connect vertical input of scope across volume control of receiver (Grounded terminal to chassis, ungrounded terminal to high side of the control).
2. Connect FM Generator, High Side, to grid of 2nd IF tube through .01 mfd. dummy, Low Side, to chassis.
3. Connect sweep voltage of generator to horizontal terminals of scope.
4. Set generator frequency to 10.7 Mc modulated either 60 cycles or 400 cycles, 250 Kc sweep (125 Kc deviation).
5. Set volume control to maximum, variable condenser fully open, band switch to right (FM).
6. Adjust detector primary slug #5 for maximum vertical sweep of the scope pattern.
7. Adjust detector secondary slug #6 for symmetry of the pattern. Pattern should look like Fig. 4, with the same amount of curve on both ends.
8. Connect generator, high side, to mixer coil as in Fig. 2, low side to chassis.
9. Short A. V. C. to chassis at junction of R15 and R19.
10. Disconnect the negative lead of C22 from pin #2 of 6T8.
11. Connect vertical input of scope across R14. (Grounded terminal to chassis, ungrounded terminal to high side of resistor.)
12. Adjust IF slugs 7, 8, 9, 10 for greatest vertical sweep of the pattern. Stagger tune (detune) slightly so that pattern looks like Fig. 7.
13. Resolder the negative lead of condenser disconnected after alignment is completed.

NOTE: A double trace pattern, as in Fig. 5 or Fig. 6 for detector alignment, or Fig. 8 for IF alignment, may be caused by a slight out of phase condition between the sweep voltage to the horizontal terminals of the scope and the modulation on the generator signal. To correct this condition, connect a condenser of about .0005 mf. across the horizontal input terminals of the scope and a 1 megohm variable resistance in series with the lead to the ungrounded terminal. Adjust the resistance until the two traces coincide.

DETECTOR ALIGNMENT USING SIGNAL GENERATOR AND VTVM

POSITION OF VARIABLE	GENERATOR FREQUENCY	DUMMY ANTENNA	GENERATOR CONNECTION HIGH SIDE	GENERATOR CONNECTION GROUND LEAD	ADJUST TRIMMERS IN ORDER SHOWN	TRIMMER FUNCTION
Open	10.7 Mc	.01 Mfd.	2d IF grid	Chassis	#*5, #*6	Detector

#*5 is adjusted for maximum A. V. C. voltage. A vacuum tube voltmeter or a 20,000 ohm per volt voltmeter with a low V. range can be used to measure the A. V. C. voltage. Connect negative lead to junction of R15 and R19 on band switch and positive lead to the chassis.

#*6 is adjusted for zero reading of a vacuum tube voltmeter or a 20,000 ohm per volt voltmeter, connected as shown in Fig. 3. Rock this adjustment through the zero point to see that the voltage is positive on one side of the zero point and negative on the other.

NOTE: If a 10.7 Mc FM generator is not available for alignment of detector, an unmodulated signal of 10.7 Mc from an accurately calibrated conventional AM type generator can be used. (Voltmeter alignment only).

I.F. alignment using signal generator and V.T.V.M. not recommended.

RF

POSITION OF VARIABLE	GENERATOR FREQUENCY	DUMMY ANTENNA	GENERATOR CONNECTION HIGH SIDE	GENERATOR CONNECTION GROUND LEAD	ADJUST TRIMMERS IN ORDER SHOWN	TRIMMER FUNCTION
Open	109 Mc	300 Ohm	Ant. Term.	Ant. Term.	# 13	Oscillator
Closed	87.5 Mc	300 Ohm	Ant. Term.	Ant. Term.	Spacing of L-5	Oscillator
Repeat the above oscillator adjustments until proper coverage is obtained on both ends of band since the two adjustments effect each other.						
106 Mc	106 Mc	300 Ohm	Ant. Term.	Ant. Term.	# 14	RF
90 Mc	90 Mc	300 Ohm	Ant. Term.	Ant. Term.	Spacing of L-3	RF

Repeat "RF and Ant." adjustments until proper tracking is obtained at both 90 and 106 Mc, since tracing the set at one frequency effects the tracking at the other frequency.

All RF trimmers are adjusted for maximum output, measured with output meter across speaker voice coil.

For RF alignment, use FM generator signal modulated with 400 cycles 45 Kc sweep (22.5 Kc deviation).

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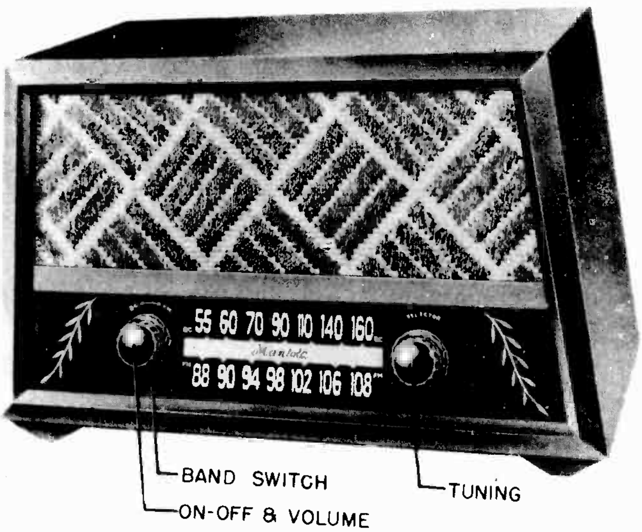
MODEL 92-529,
Ch. BJ



Schematic Location	Part Number	Description
C17	CC-3.3-11	Capacitor, 3.3 MMF +10%
C29, 30, 31, 32 } TC1, TC3, TC4 }	CV-17	{Capacitor, Variable (AM-FM) {Capacitors, Trimmer
C26, 27	CP-203-1	Capacitor, .02 — 400 V. Paper
R1, 4, 7, 8, 11, 19	RC-102-1	Resistor, 1000 ohms ½W 20%
R2, 17	RC-104-1	Resistor, 100,000 ohms ½W 20%
R3, 9, 10	RC-680-2	Resistor, 68 ohms ½W +10%
R5	RC-222-2	Resistor, 2200 ohms ½W +10%
R6	RC-103-2	Resistor, 10,000 ohms ½W +10%
R18	RC-225-1	Resistor, 2.2 Meg ohms ½W 20%
R22	RC-181-2	Resistor, 180 ohms ½W +10%
R14	RC-273-2	Resistor, 27,000 ohms ½W +5%
R21, 25	RW-101-8	Resistor, 100 ohms W.W. 2W +10%
R12	RC-393-2	Resistor, 39,000 ohms ½W 10%
R13	RC-106-1	Resistor, 10 Meg ohms ½W 20%
R16	VC-17	Control, On-Off & Volume 1 meg Includes S1, S2, S3-D.T. Switch
R15, 24	RC-224-1	Resistor, 220,000 ohms ½W 20%
R20	RC-223-1	Resistor, 22,000 ohms ½W 20%
R23	RC-474-1	Resistor, .47 Meg ohms ½W 20%
R26	RW-471-8	Resistor, 470 ohms 2W W.W. +10%
L6	LP-22-D	Loop Antenna
	CB-124-D	Cabinet
	BF-21-D	Baffle
	MS-129-D	Brass Angle
	DL-34-D	Plastic Dial
	PN-17	Dial Pointer
	KN-28	Knob Assembly
	KN-26	Knob, Large
	KN-27	Knob, Small
	IB-29	Instruction Booklet
	PY-3	Drive Shaft Pulley
	SA-24	Drive Shaft
	SG-1	Dial Spring
	CR-2	Dial Cord
T7	SP41-10B	Speaker 4" P.M. & O.T.
T1	LF-30	Transformer, FM-IF
T5	LF-32	Transformer, AM-IF
T3	LF-33	Transformer, Ratio Det.
T2	LF-34	Transformer, FM-IF
T4	LF-35	Transformer, AM-IF
T6	TR-21	Transformer, Power
L7	LC-9	Coil, Oscillator AM
L5	LC-11	Coil, Oscillator FM
L3	LC-12	Coil, RF FM
L8, 9	LC-13	Choke, Filament
L2	LC-14	Choke, Plate
L1	LC-15	Choke, Grid
L4	LC-16	Choke, Cathode
TC-2	TA-3	Ceramic Trimmer 5-20 MMF
C2a, 2b, 3a { 3b, 4a, 4b }	CC-2-1	Capacitor, 2 x .002 MFD Ceramic
C5a, 5b	CC-2-2	Capacitor, 2 x .004 MFD Herlec
C8, 16, 24	CC-1-1	Capacitor, .005 MFD Herlec
C6a, 6b, 6c, 6d	CE-22	Capacitor, 20 x 40 x 20 (200V) x 10 (25V) Electrolytic
C1a, 1b, 1c	CC-3-0	Capacitor, 3 x .0015 Herlec
C18, 21	CP 202-2	Capacitor, .002 MFD 400 V.
C7, 11	CC-047-8	Capacitor, 47 MMF Ceramic 10%
C9	CC-101-7	Capacitor, 100 MMF Ceramic 20%
C-33	CMS-010-8	Capacitor, 10 MMF Silver Mica 10%
C12	CMS-033-9	Capacitor, 33 MMF Silver Mica 5%
C13	CM-102	Capacitor, .001 MFD Mica
C10	CSP-1	Capacitor, 1 MMF 10%
C20	CC-068-7	Capacitor, 68 MMF Ceramic +20%
C19	CM-151-1	Capacitor, 150 MMF Mica 20%
C14	CM-331-8	Capacitor, 330 MMF Mica +10% 500 V.
C15, 23	CP-503-1	Capacitor, .05 MFD 400 V.
C22	CE-19	Capacitor, 4 MFD 50 W.V. Electrolytic
C25	CP-203-20	Capacitor, .02 MFD 800V.
C28	CP-103-1	Capacitor, .01 MFD 400 V.

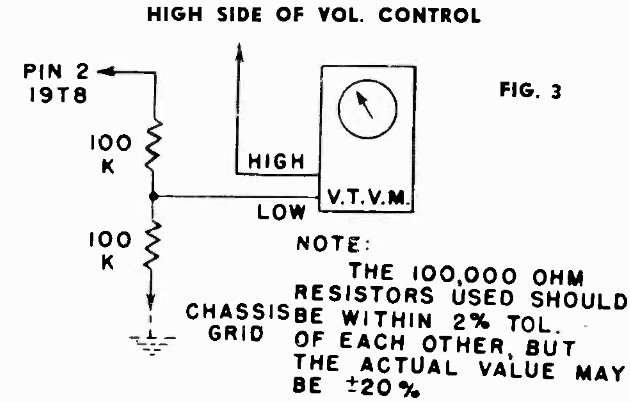
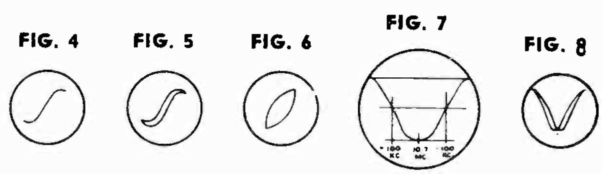
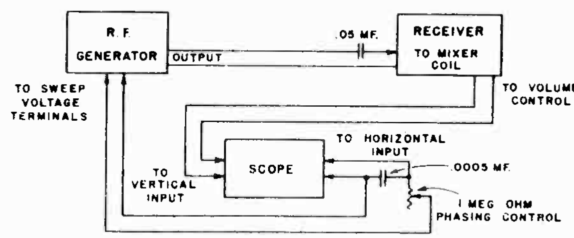


FIG. 3

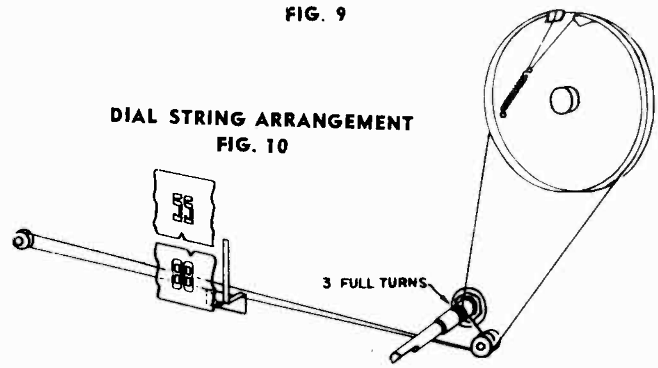
OSCILLOSCOPE PATTERNS

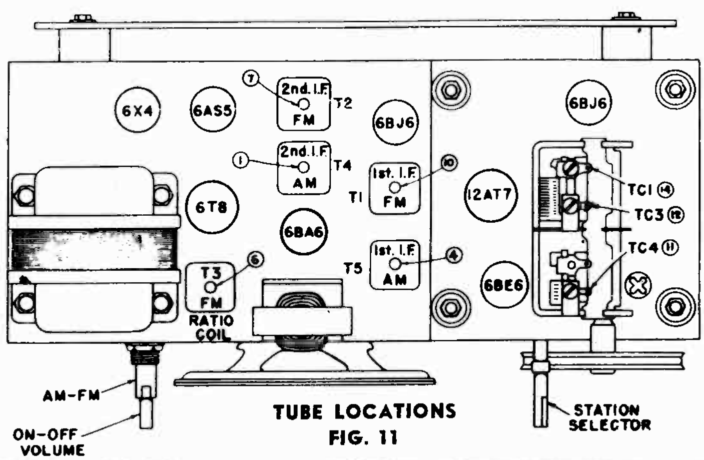




BLOCK DIAGRAM FOR I.F. AND DETECTOR ALIGNMENT USING SIGNAL GENERATOR AND OSCILLOSCOPE.
FIG. 9

DIAL STRING ARRANGEMENT
FIG. 10





TUBE LOCATIONS
FIG. 11

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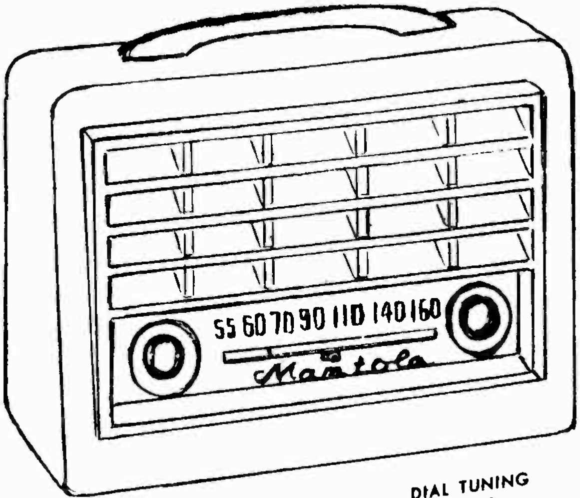
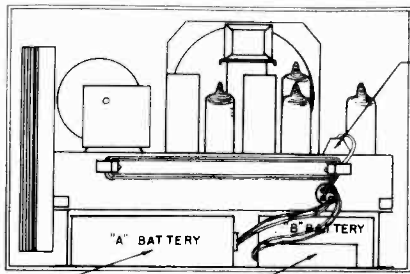
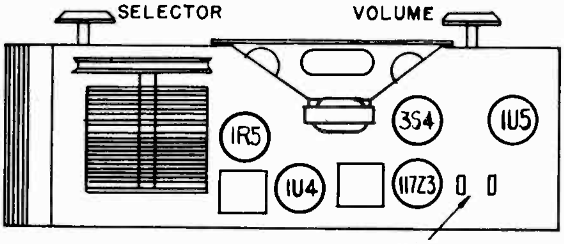
Ch. BF







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 .... 4½ volts
Eveready No. 746 "A" Battery or equivalent.

"B" supply .... 67½ volts
Eveready Minimax "B" Battery No. 467 or equivalent.

CAUTION

Always remove the power cord from its receptacle before starting to replace tubes or batteries.

Do not allow cells which have become too weak to operate the set properly to remain in the set for any length of time.

ELECTRICAL SPECIFICATIONS

Power Supply .... 105-125 volts DC or
50-60 cycles AC
15 watts

Batteries .... A—4½ volts. 100 ma.
B—67½ volts. 8 ma. average.

Frequency Range .... 532.5 to 1620 kc.

Intermediate Freq. ..... 455 kc.

Tuning .... Two-gang capacitor

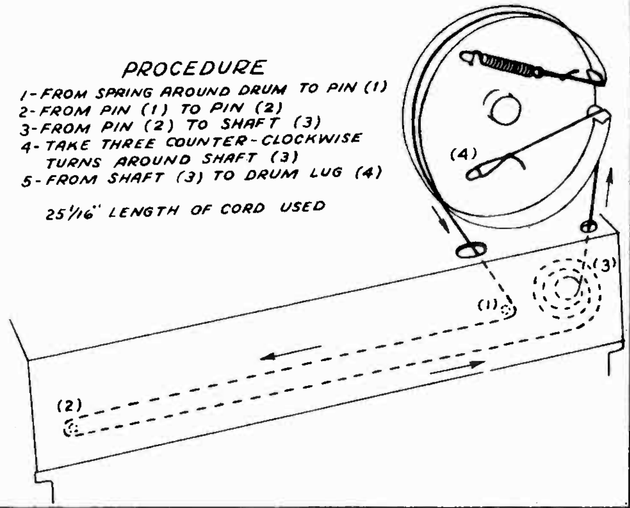
Antenna .... Built-in loop

Speaker .... 4 inch PM; voice coil
Impedance 3.5 ohms.

Power Output .... 80 milliwatts undistorted
140 milliwatts maximum

Sensitivity .... 750 microvolts per meter for
50 milliwatt output

Selectivity .... 55 kc broad at 1000 times
signal at 1000 kc.



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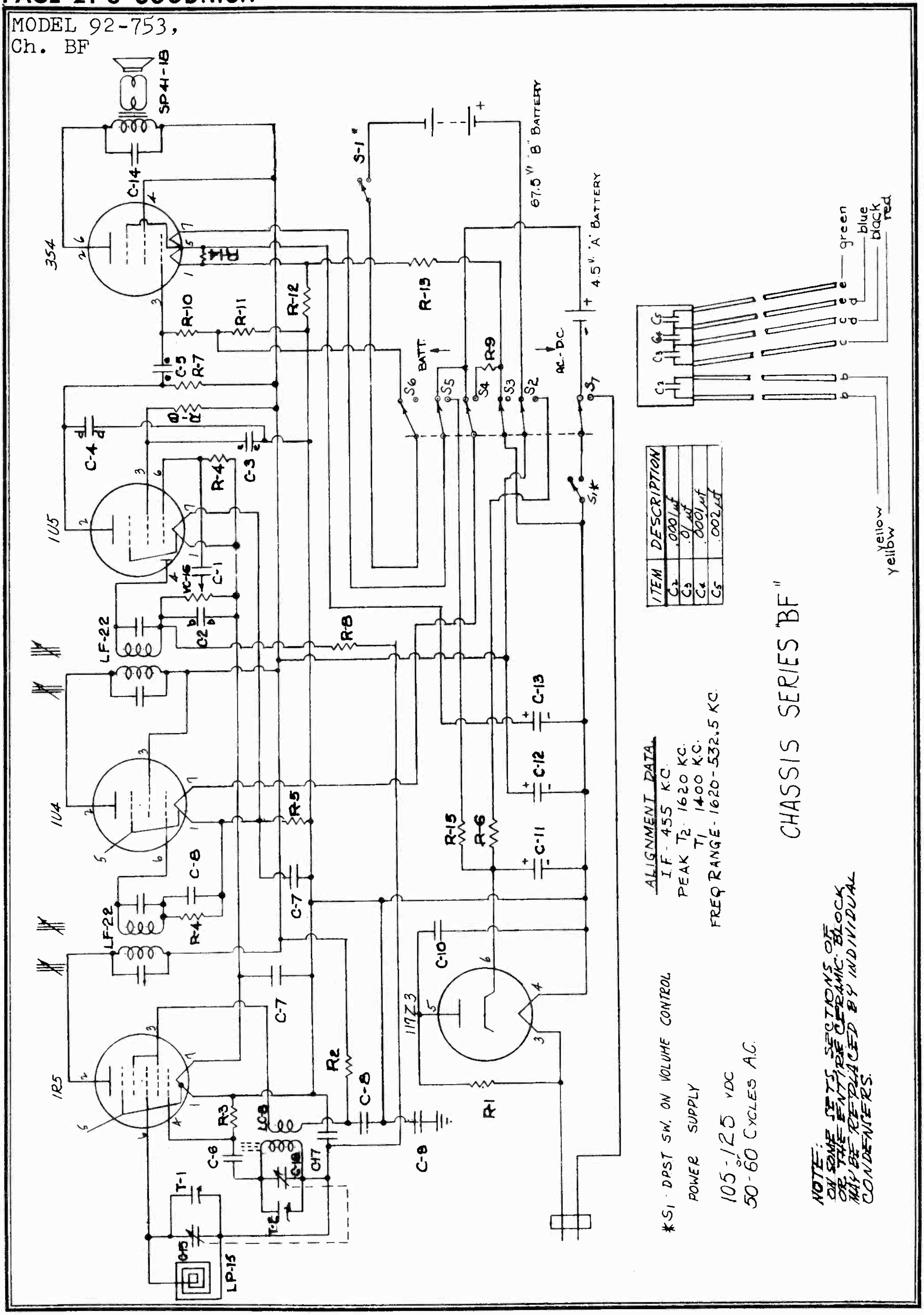

ITEM	DESCRIPTION
C_2	.0001 μf
C_3	.01 μf
C_4	.001 μf
C_5	.002 μf

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MODEL 92-753, Ch. BF

ALIGNMENT PROCEDURE

- Output meter across 3.2 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: Frequency	Coupling Factor	Connection to Receiver	Ground Connection	Setting Tuner	Adjust Trimmers to Maximum Output (in order shown)
455 kc	.1 mfd	1R5 Grid	B—	Rotor full open (Plates out of mesh)	Input and output trimmers on IF cans
1620 kc	.1 mfd	1R5 Grid	B—	Rotor full open (Plates out of mesh)	Oscillator trimmer T2
1400 kc		Radiating Loop		1400 kc*	Antenna trimmer T1

* Five markings on the dial bracket represent respectively 532½, 600 kc., 1000 kc., 1400 kc. and 1620 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, model number and series.

Ref. No.	Part No.	Description
		CAPACITORS
C1	CP-102-3	.001 mfd, 200 volt, paper
C1-C2-C3 C4-C5	CC-5-2	ceramic condenser block
C6	CM-470-1	.000047 mfd, Mica Cond.
C7	CP-503-2	.05 mfd, 150 volt, paper
C8	CP-103-2	.01 mfd, 150 volt, paper
C9	CP-104-1	.1 mfd, 200 volt, paper
C10, C17	CP-503-1	.05 mfd, 400 volt, paper
C11	CE-17	Elect. con. 40 mfd, 150 volt
C12	CE-17	Elect. con. 40 mfd, 150 volt
C13	CE-17	Elect. con. 200 mfd, 10 volt
C14	CP-502-2	.005 mfd, 400 volt, paper
C15, C16	CV-15	Variable condenser
T1, T2	CV-15	Trimmers on variable
C18	CP-103-7	.01 mfd, 400 volt, paper
		RESISTORS
R1	RC-180-1	18 ohms, ½ watt 20%
R2	RC-153-1	15,000 ohms, ½ watt 20%
R3	RC-104-1	100,000 ohms, ½ watt 20%
R4	RC-106-1	10 megohms, ½ watt 20%
R5	RC-222-2	2,200 ohms, ½ watt 10%
R6	RC-682-5	6800 ohms, 1 watt 10%
R7	RC-105-1	1 megohm, ½ watt 20%
R8	RC-335-1	3.3 megohms, ½ watt 20%
R9	RC-390-2	39 ohms, ½ watt 10%
R10	RC-225-1	2.2 megohms, ½ watt 20%
R11	RC-681-2	680 ohms, ½ watt 10%
R12	RC-152-2	1500 ohms, ½ watt 10%
R13	RC-270-3	27 ohms, ½ watt 5%
R14	RC-391-2	390 ohms, ½ watt 10%
R15	RP-5	Candohm Res., 2550 ohms. ±5%

Ref. No.	Part No.	Description
		COILS AND TRANSFORMERS
	LC-8	Oscillator coil
	LF-22	IF transformer
	LP-15	Loop antenna
		MISCELLANEOUS
	VC-16	Vol. Control, 1 meg., D.P.S.T., S.W.
S2, 3, 4, 5, 6, 7	SW-11	Battery Switch, 6 Pole, D.T.
	SP-41-18	4 inch Speaker, 1 oz. Mag., O.T.
	PN-16	Pointer
	CR-2	Drive cord
	SG-1	Spring for drive cord
	KN-24	Knob
	CB-112A	Assembled cabinet (without back and handle)
	HA-2	Handle for cabinet

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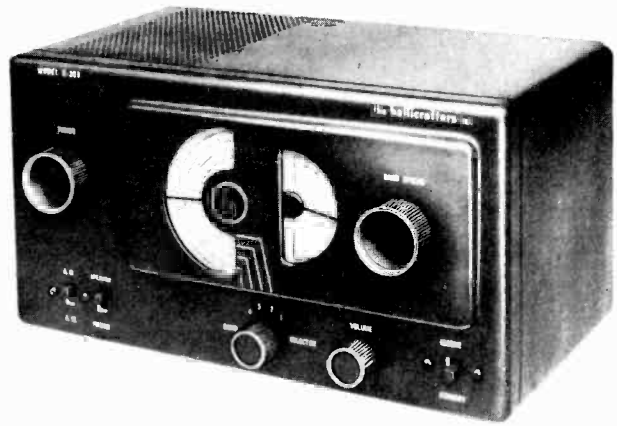
MODELS S-38A, S-38B

GENERAL



92X1153

Tubes	Four plus rectifier.
Speaker	5-inch PM.
Voice Coil Impedance	3.2 ohms.
Headset Output	Low impedance.
Antenna	Provisions for external antenna with transmission line or single wire feed.
Tuning	Manual

Tuning Range

Band Selector Position	Frequency Range
1	550 kc - 1650 kc.
2	1.7 mc - 5.1 mc.
3	5 mc - 14.5 mc.
4	13 mc - 31 mc.

Intermediate Frequency	455 kc.
Power Supply	105-125 V. DC or 60 cycles AC.
Power Consumption	30 Watts

CAUTION - The four rubber grommets insulate the chassis from the cabinet. Check the condition of these grommets and replace if necessary.

ALIGNMENT PROCEDURE

Holes in the bottom cover permit minor adjustment of the oscillator and mixer stage trimmers, however for complete alignment, the chassis will have to be removed from the cabinet. To separate the chassis from the cabinet, remove the back cover and bottom plate. The chassis is fastened to the cabinet by four front panel screws located near the slide switches and two cabinet screws located at the bottom rear of the cabinet.

The standard RMA dummy antenna 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.

Set the following controls before alignment.

AM/CW	Set at AM
SPEAKER/PHONES	Set at SPEAKER
VOLUME	Set at maximum
RECEIVE/STANDBY	RECEIVE
BAND SPREAD	Set at zero

For the settings of the remaining controls, see alignment chart.

ALIGNMENT CHART

Step	Dummy Antenna	Signal Generator Coupling	Signal Generator Frequency	Band Selector Setting	Receiver Dial Setting	Adjust	Remarks
1	.01 mfd cap.	Stator plates, front section of tuning gang.	455 kc	1	1000 kc	A,B,C,D	Adjust for max. audio output at speaker voice coil. Use just enough signal generator output to obtain a 50 mw signal level.
2**	See step 1	See step 1	455 kc (No modulation)	1	1000 kc	E	Set the AM/CW switch at CW. (Reset the switch at AM when step 2 is completed.) Correct BFO operation is obtained by varying the coupling between the wire "E" and the 12SK7 tube grid and plate terminals (Pins 4 and 8.) Pushing the wire toward the grid terminal increases the capacity and the strength of the beat.
3	Std. RMA dummy	High side to term. A1 on antenna strip. Jumper wire between A2 and G	30 mc	4	30 mc	*F,G	Max. output as in step 1.
4	Std. RMA dummy	See step 3.	14 mc	3	14 mc	*H,J	Max. output as in step 1.
5	Std. RMA dummy	See step 3	5 mc	2	5 mc	*K,L	Max. output as in step 1.
6	Std. RMA dummy	See step 3	1500 kc 600 kc	1	1500 kc 600 kc	*M,N *P	Max. output as in step 1.

* Note - Calibration adjustments.

** Note - This step is generally unnecessary. Adjustment should be made if a weak beat note is obtained on strong c-w signals indicating lack of coupling between wire "E" and tube socket wiring.

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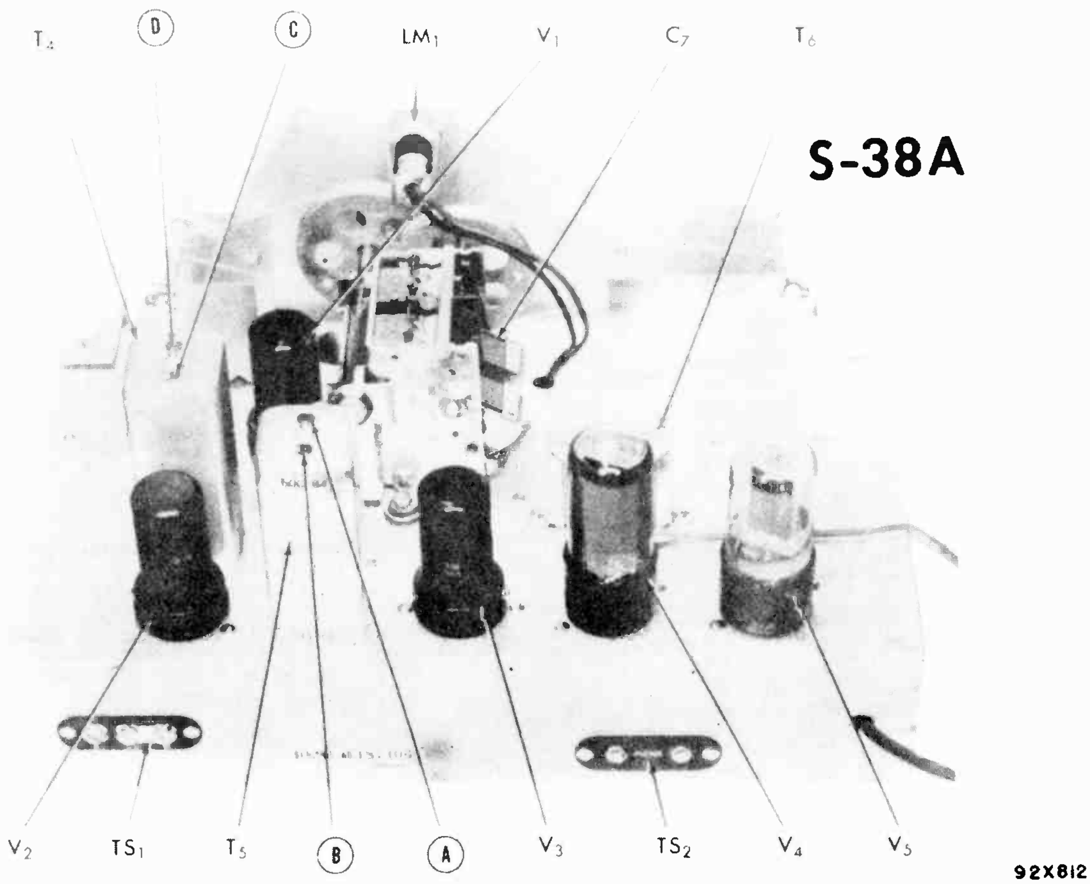

Fig. 2. Top view, alignment adjustments and component location

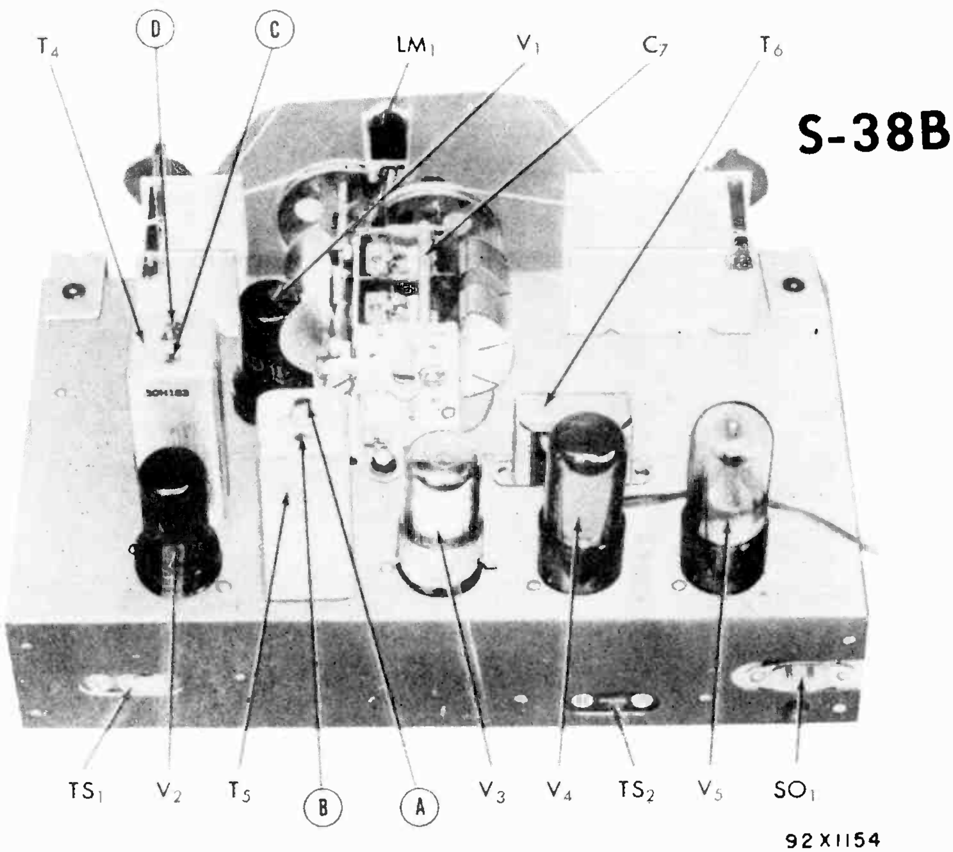

Fig. 2. Top view, alignment adjustments and component location

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MODELS S-38A, S-38B

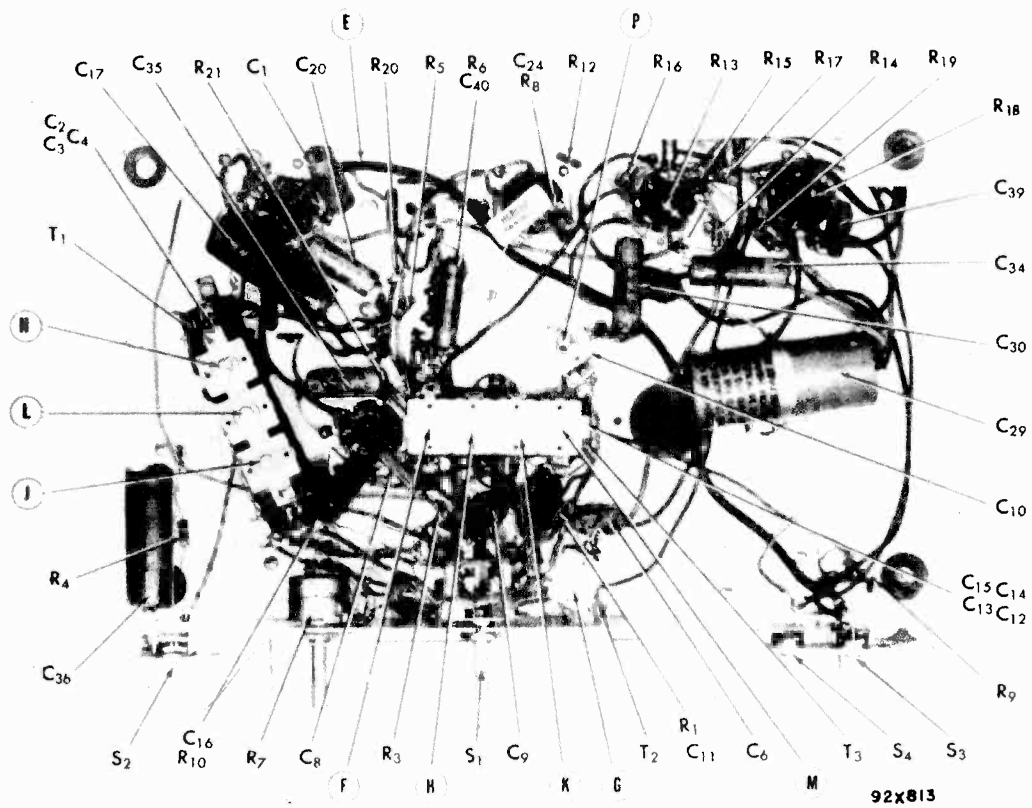

Fig. 3. Bottom view, alignment adjustments and component location

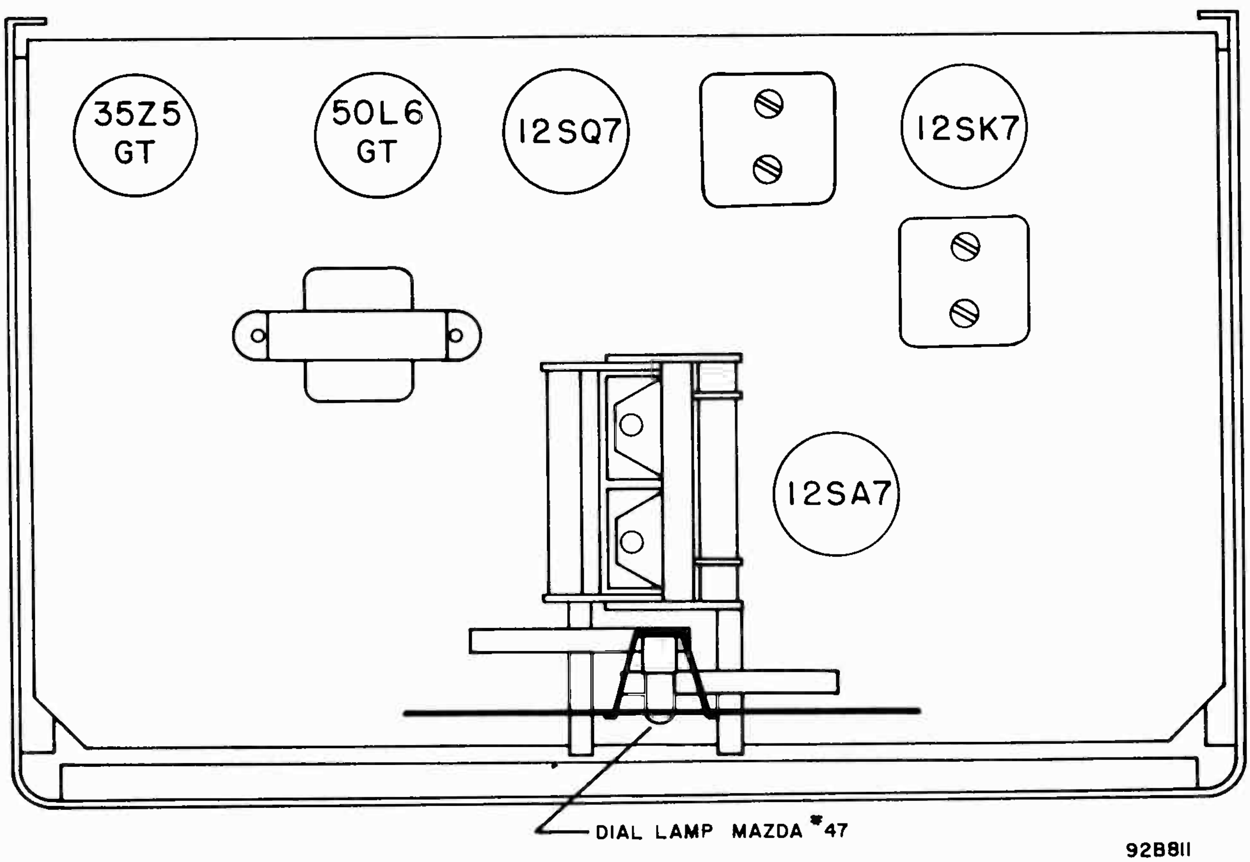

Fig. 4. Top view, location of tubes and dial lamps.

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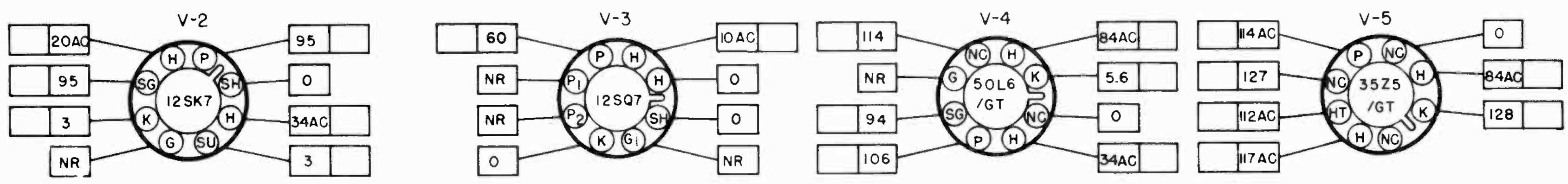
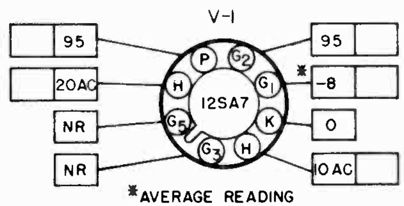
MODELS S-38A,
S-38B





1. SOCKET VIEWS ARE BOTTOM VIEWS.
2. ALL VOLTAGES ARE MEASURED BETWEEN TUBE SOCKET TERMINALS & CHASSIS, WITH ZERO SIGNAL INPUT.
3. LINE VOLTAGE—117 V. AC. AC VOLTAGES WILL BE DC VOLTAGES WHEN OPERATING FROM A DC SOURCE.
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 TERMINALS ARE USED AS A TIE LUG.)
7. "NR" NOT READABLE (READING GENERALLY MEANINGLESS)
8. ☐ SPACE PROVIDED FOR SERVICE METER READINGS.

92C786

Fig. 5. Tube socket voltage chart.

FRONT APRON

BOTTOM VIEW OF CHASSIS

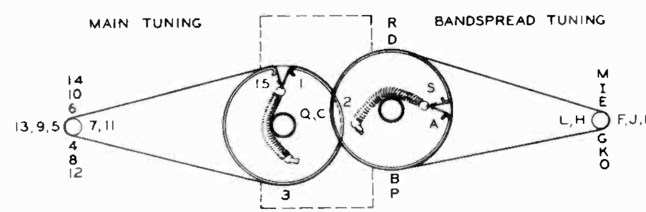
RESTRINGING DIAL CORD

To restring the general coverage tuning dial cord cut a 14-inch length of 30 lb. test dial cord and tie one end to the tension spring at position "1" on the diagram. Follow the sequence "1" through "15", and at position "15" stretch the tension spring and tie the cord securely.

To restring the band spread tuning dial cord, cut a 16-inch length of dial cord and follow the procedure as above, starting at position "A" on the diagram. Note that the tuning drive shafts are wrapped with two and a fraction turns of dial cord for proper traction.

REPLACING LAMPS

Refer to Fig. 4, for the location of the dial lamp used in receiver. To gain access to the defective lamp, reach in through the rear of the cabinet (cover removed) 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.



TUNING CAPACITOR FULLY CLOSED (BOTH SECTIONS).
FRONT VIEW

92X814

Fig. 1. Dial cable stringing procedure.

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MODELS S-38A, S-38B

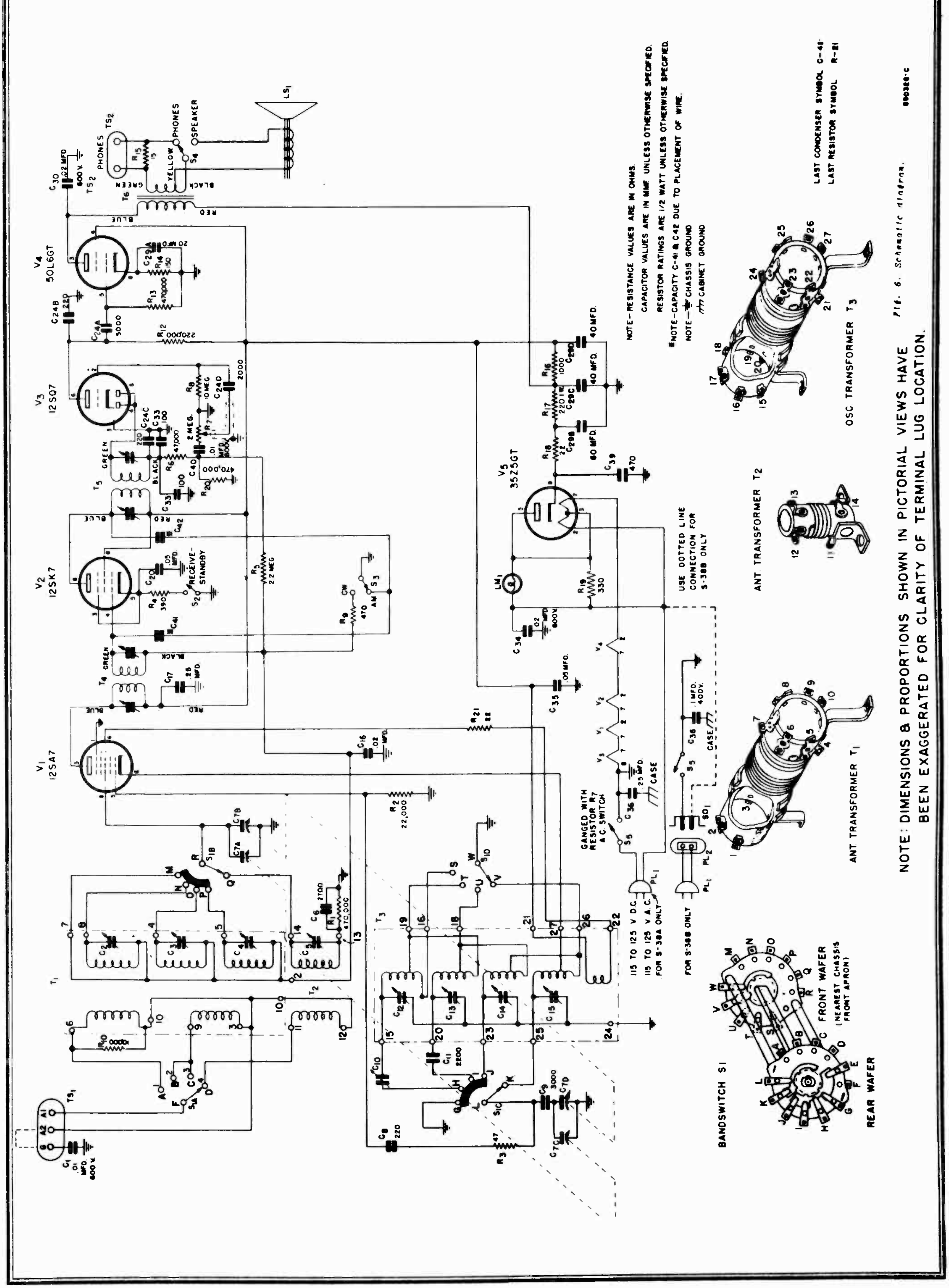

Fig. 6. Schematic diagram.

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MODELS S-38A, S-38B

SERVICE PARTS LIST

Ref. No.	Description	Manufacturer's Part Number
	CONDENSERS	
C-1,40	.01 mfd. 600 V., tubular	46AY103J
C-2,3,4	Trimmers, adjustable (Part of transformer T-1)	
C-5	Trimmer, adjustable (For transformer T-2)	44A039
C-6	2700 mmf 500 V, mica	47X30A272J
C-7	Tuning condenser, 2 sections	48C162-1
C-8	220 mmf 500 V, mica	47X20A221K
C-9	3000 mmf 500 V, mica	47X30A302J
C-10	Padder, adjustable (Band 1)	44A349
C-11	2200 mmf 500 V, mica	47X30A222J
C-12,13, 14,15	Trimmers, adjustable (Part of transformer T-3)	
C-16	.02 mfd 400 V, tubular	46AW203J
C-17	.25 mfd 200 V, tubular	46AT254J
C-20,35	.05 mfd. 200 V, tubular	46AU503J
C-24	Capacitor, composite; 5,000, 2X220, and 2000 mmf; 500 V.; ceramic	46A151
C-29	60-40-40 mfd 150 V, 20 mfd. 25 V, electrolytic	45B091
C-30,34	.02 mfd 600 V, tubular	46AY203J
C-33	100 mmf. 500 V, mica	47X20B101K
C-36	.1 mfd. 400 V., tubular	46AV104J
C-39	470 mmf 500 V, mica	CM20A471M
C-41,42	Wiring capacity	
	RESISTORS	
R-1,13,20	470,000 ohms 1/2 watt, carbon	23X20X474M
R-2	22,000 ohms 1/2 watt, carbon	23X20X223M
R-3	47 ohms 1/2 watt, carbon	23X20X470M
R-4	390 ohms 1/2 watt, carbon	23X20X391K
R-5	2.2 megohms 1/2 watt, carbon	23X20X225M
R-6	47,000 ohms 1/2 watt, carbon	23X20X473M
R-7	Resistor, variable; VOLUME control	25B896
R-8	10 megohms 1/2 watt, carbon	23X20X106M
R-9	470 ohms 1/2 watt, carbon	23X20X471K
R-10	10,000 ohms 1/2 watt, carbon	23X20X103M
R-12	220,000 ohms 1/2 watt, carbon	23X20X224M
R-14	150 ohms 1/2 watt, carbon	23X20X151K
R-15	15 ohms 1/2 watt, carbon	23X20X150M
R-16	1000 ohms 1/2 watt, carbon	23X20X102M
R-17	220 ohms 1 watt, carbon	23X30X221M
R-18,21	22 ohms 1/2 watt, carbon	23X20X220M
R-19	330 ohms 1/2 watt, carbon	23X20X221M
	TRANSFORMERS AND COILS	
T-1	Transformer, antenna stage, Bands 1, 2 and 3	51C821
T-2	Transformer, antenna stage, Band 4	51B1015
T-3	Transformer, oscillator stage, Bands 1, 2, 3 and 4	51C822
T-4	Transformer, i-f amp. stage	50B183
T-5	Transformer, i-f amp. stage (diode)	50B184
T-6	Transformer, audio output	55A127

Ref. No.	Description	Manufacturer's Part Number
	SWITCHES	
S-1	Bandswitch assembly	60C393
S-2	Switch, slide; RECEIVE-STANDBY	60A244
S-3,4	Switch, slide; SPST; AM-CW & SPEAKER-PHONES	60A243
S-5	Switch, power (Part of VOLUME control R-7)	
	CONNECTORS	
PL-1	Line cord (Includes PL-2)	87B1668-1
TS-1	Terminal strip, antenna	88A671
TS-2	Headset, jack	88A071
SO-1	Socket, a-c	10A286
	Socket, octal (tube)	6A250
	Socket, dial light	86A011
	TUBES, RECTIFIERS AND LAMPS	
V-1	Type 12SA7, mixer/oscillator	90X12SA7
V-2	Type 12SK7, i-f amplifier & BFO	90X12SK7
V-3	Type 12SQ7, detector & 1st audio amplifier	90X12SQ7
V-4	Type 50L6GT, audio power amplifier	90X50L6GT
V-6	Type 35Z5GT, rectifier	90X35Z5GT
LM-1	Lamp, dial light, Mazda #47	39A004
	CABINET PARTS	
	Clip, coil mtg (For transformer T-2)	76A362
	Shaft, main tuning	74A318
	Shaft, bandspread	74A319
	Washer, spring (for main tuning and bandspread drive shafts)	4A043
	Spring, retainer ("C" washer type)	75A062
	Dial cord	38A019
	Spring, dial cord	75A012
	Pointer, main tuning	82A177
	Pointer, bandspread tuning	82A103
	Dial scale	83C373
	Knob, VOLUME control and BAND SELECTOR	15A049
	Knob, TUNING and BANDSPREAD	15A047
LS-1	Speaker, PM	85C030
	Baffle, speaker	78B198
	Cabinet back	8C1139
	Cabinet bottom	8C1140
	Mounting foot, rubber	16A007
	Window, dial	22B311

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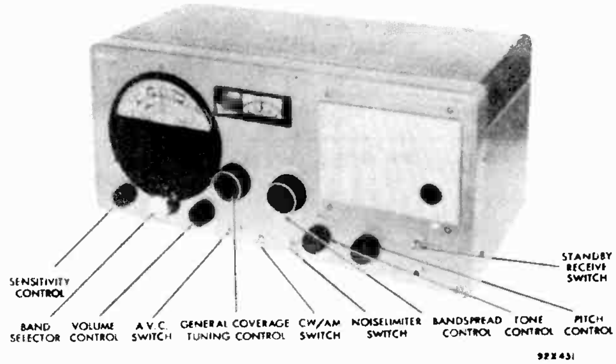
GENERAL

Tubes	Seven plus rectifier	
Speaker	5-inch PM	
Speaker V.C. Impedance	3.2 ohms	
Headset Output	High Impedance	
Antenna	Provision for external antenna	
Tuning	Manual	
Tuning Range	Band Selector Position	Frequency Range
	1.	540 kc - 1680 kc
	2.	1680 kc - 5.4 mc
	3.	5.3 mc - 15.5 mc
	4.	15.5 mc - 44 mc
Intermediate Frequency	455 kc.	
Power Supply	105-125 V. DC or 60 cycles AC	
Power Consumption	40 Watts	



REPLACING LAMPS

Refer to Fig. 7 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 #47 (Brown bead) lamps or equivalent.

RESTRINGING DIAL CORD

To restring the general coverage tuning dial cord, cut an 18-inch length of 30 lb. test dial cord and tie one end to the tension spring of the main tuning capacitor drive pulley at position "1" on the diagram. Follow the numbers "1" through "4", and at position "4" stretch the tension spring and tie the cord securely.

To restring the band spread tuning dial cord, cut a 36-inch length of dial cord and follow the procedure as above, starting at position "A" on the diagram. Note that the tuning drive shafts are wrapped with two and a fraction turns of dial cord for proper traction.

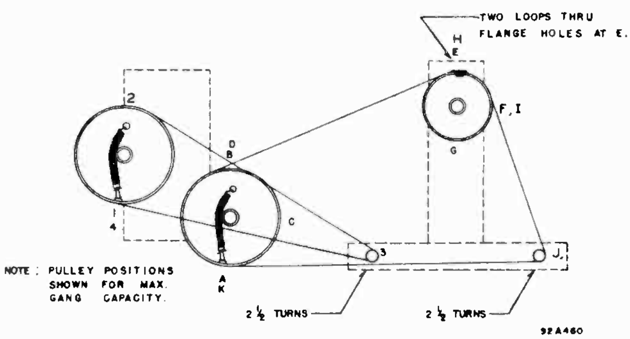


Fig. 1. Dial cable stringing procedure

ALIGNMENT PROCEDURE

It will be necessary to 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, check the position of the general coverage dial index marker on the low frequency end of the range and the bandspread dial on zero position. The general coverage condenser should index at max. capacity, and the bandspread condenser at min. capacity.

The standard RMA dummy antenna mentioned 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.

Set the following controls before alignment.

SENSITIVITY	Set at maximum
VOLUME	Set at maximum
AVC switch	Set at OFF
BAND SPREAD	Set at zero
CW/AM	Set at AM (See step 2)
NOISE LIMITER	Set at OFF
STANDBY RECEIVE	Set at RECEIVE
TONE SWITCH	Set at HIGH

For the settings of the remaining controls, see alignment chart.

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MODEL S-52

ALIGNMENT CHART

Step	Dummy Antenna	Signal Generator Coupling	Signal Generator Frequency	Band Switch Setting	Receiver Dial Setting	Adjust	Remarks
1	None	Stator plates in center section of tuning gang.	455 kc	"1"	1000 kc	A, B, C, D, E, F	Maximum audio output at speaker voice coil. Use just enough signal generator output to obtain a 50 mw signal level.
2	None	See step 1	455 kc (No modulation)	"1"	1000 kc	S1	With the CW/AM switch set at CW, remove the pitch control knob and adjust S1 for zero beat. Replace the knob with the dot in the center position.
3	Std RMA dummy	"A1" on antenna strip. Jumper connected between "A2" and "G"	36 mc	"4"	36 mc	*G, H, I	Maximum output as in step 1.
			18 mc		18 mc	*S2,S3,S4	
4	Std RMA dummy	See step 3	14 mc	"3"	14 mc	*J, K, L	Maximum output as in step 1.
			10 mc		10 mc	*S5, S6, S7	
5	Std RMA dummy	See step 3	5 mc	"2"	5 mc	*M, N, O	Maximum output as in step 1.
			1.8 mc		1.8 mc	*S8	
6	Std RMA dummy	See step 3	1500 kc	"1"	1500 kc	*P, Q, R	Maximum output as in step 1.
			600 kc		600 kc	*T	

*Note - Calibration adjustments.

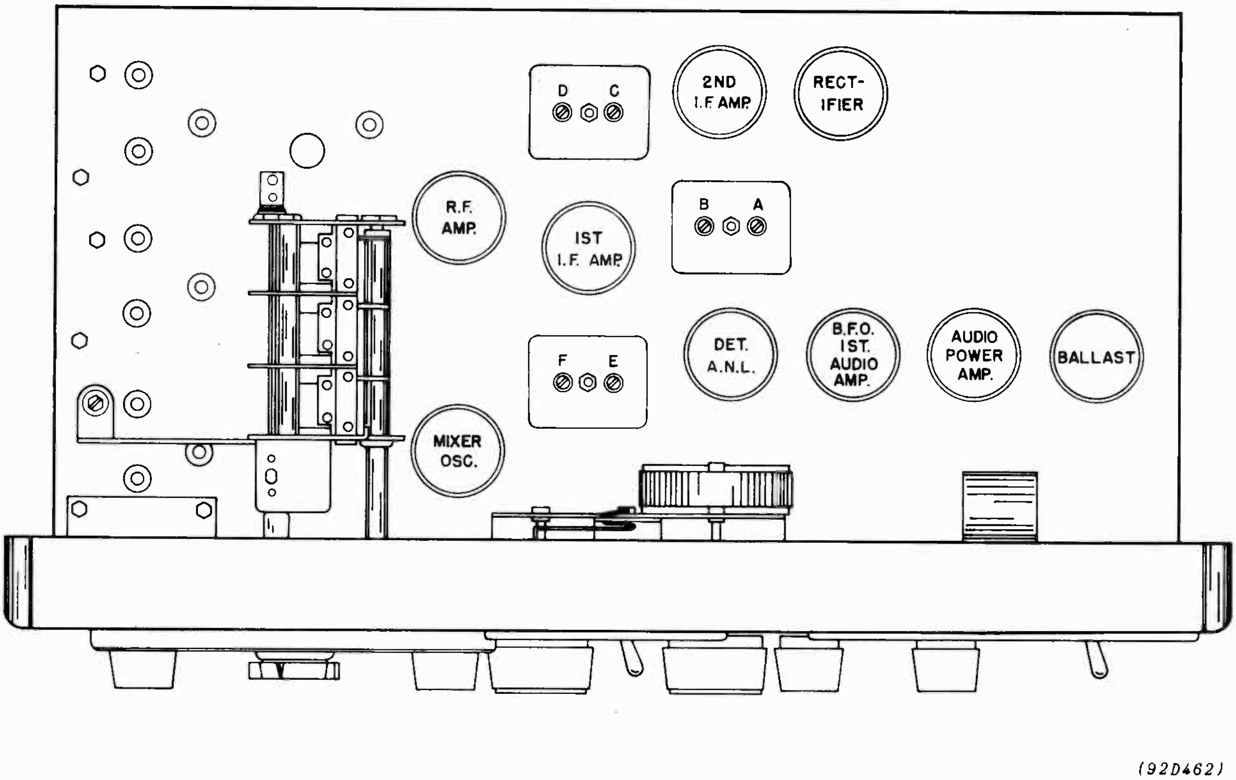

Fig. 2. Top view, alignment points

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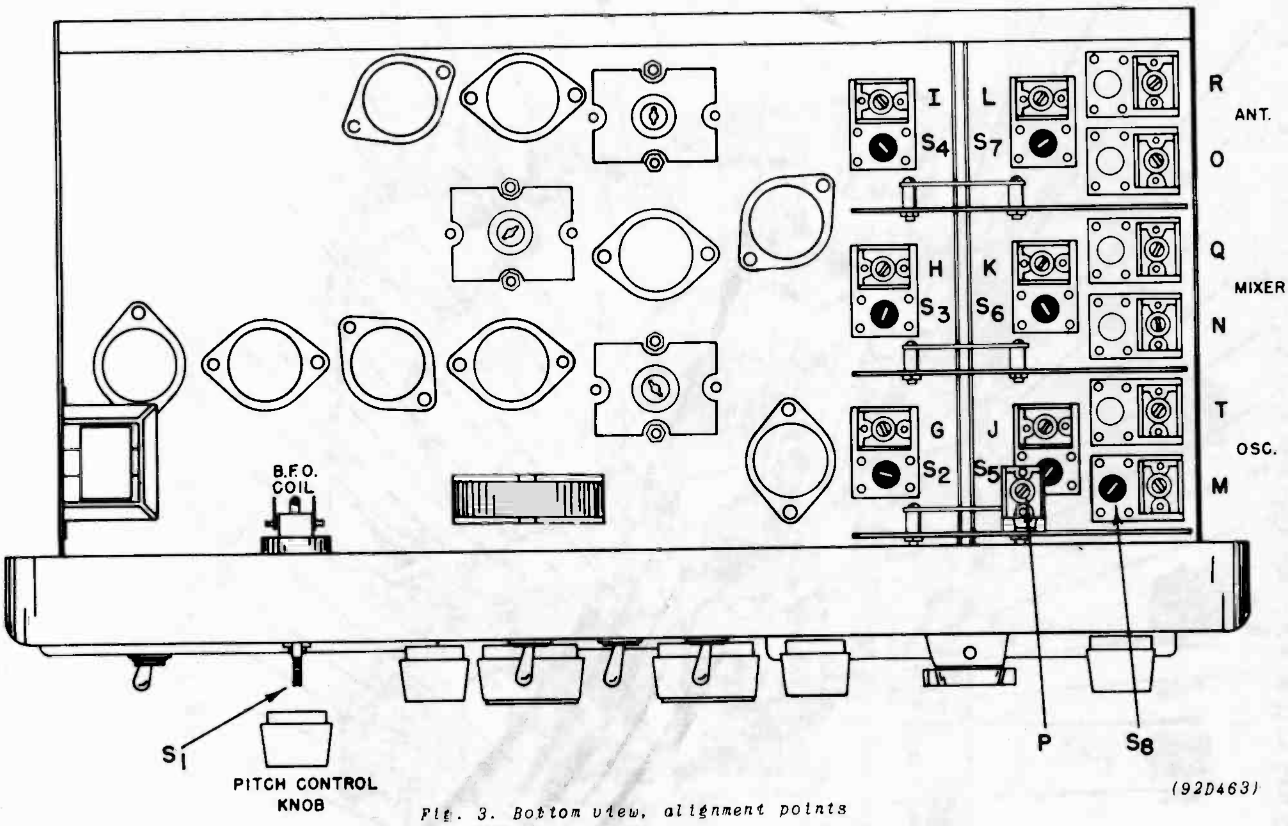

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Fig. 3. Bottom view, alignment points

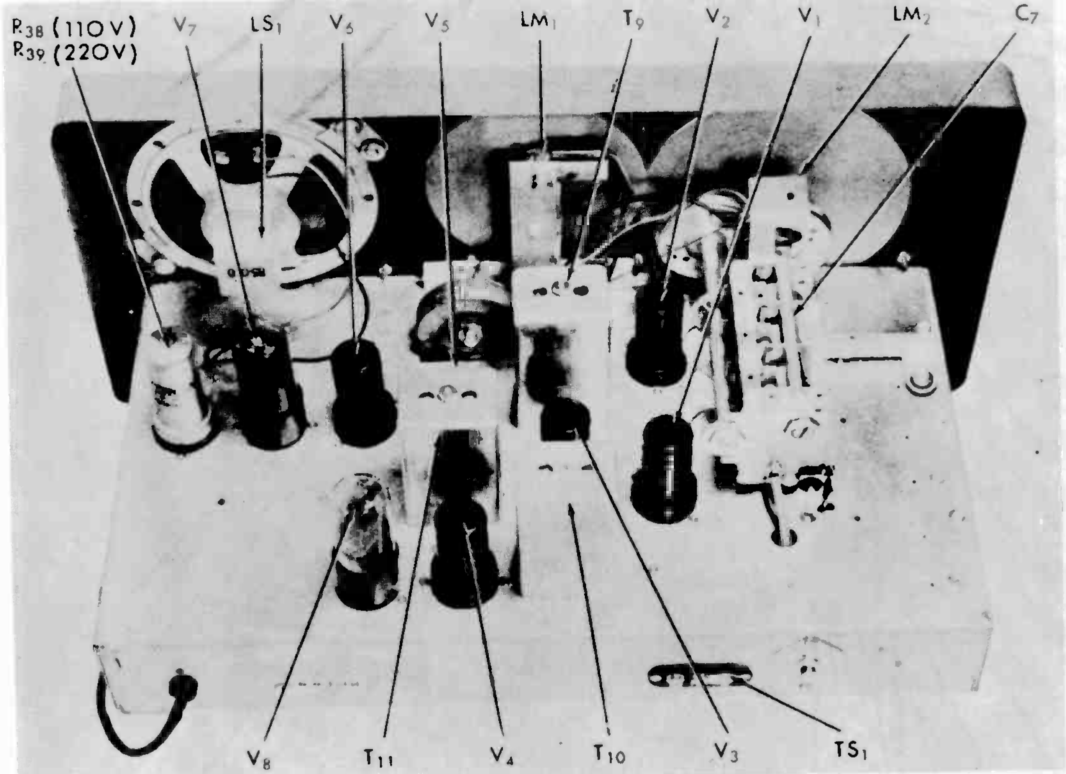

Fig. 4. Top view, component location

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MODEL S-52

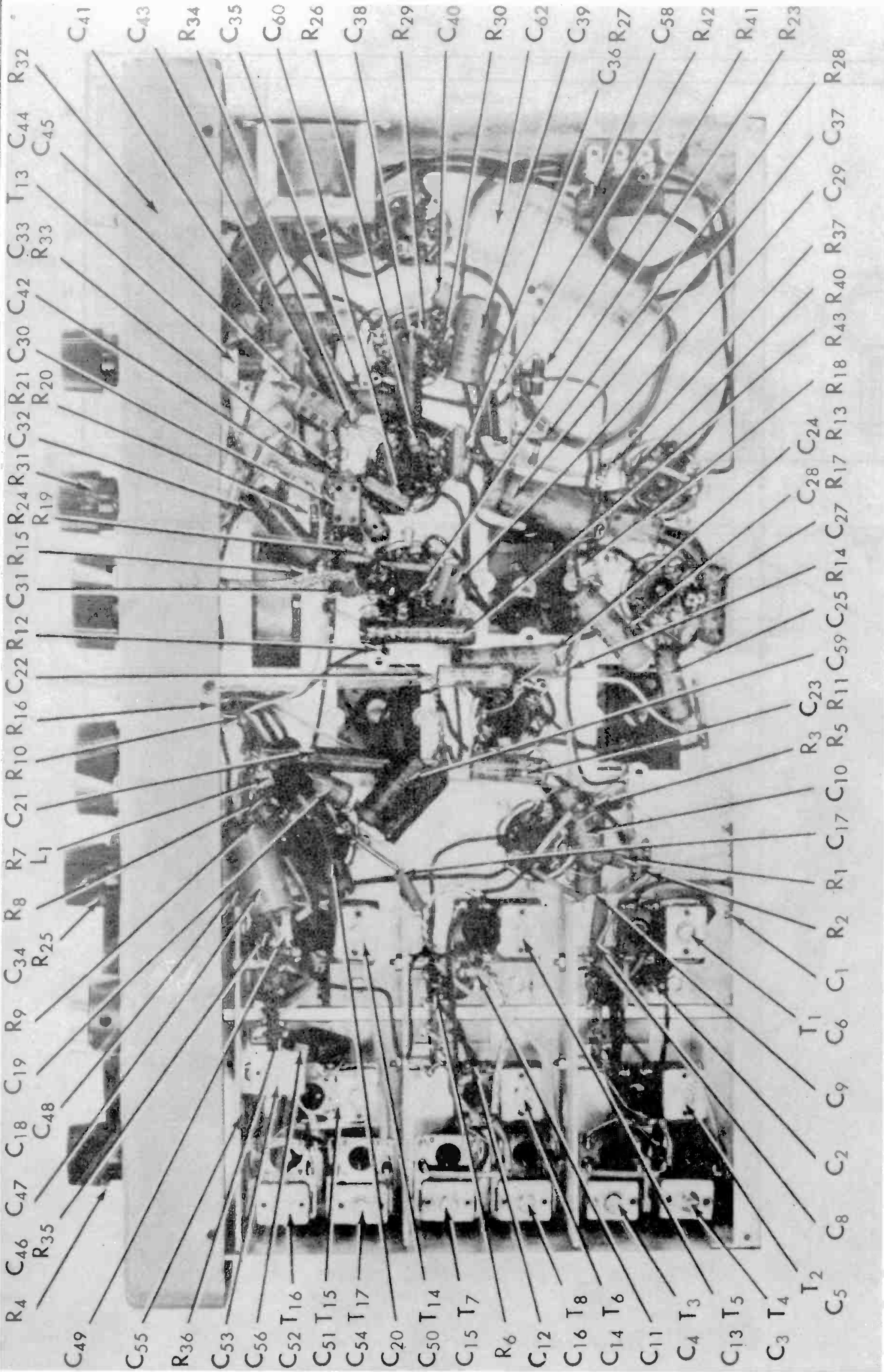

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Fig. 5. Bottom view, component location

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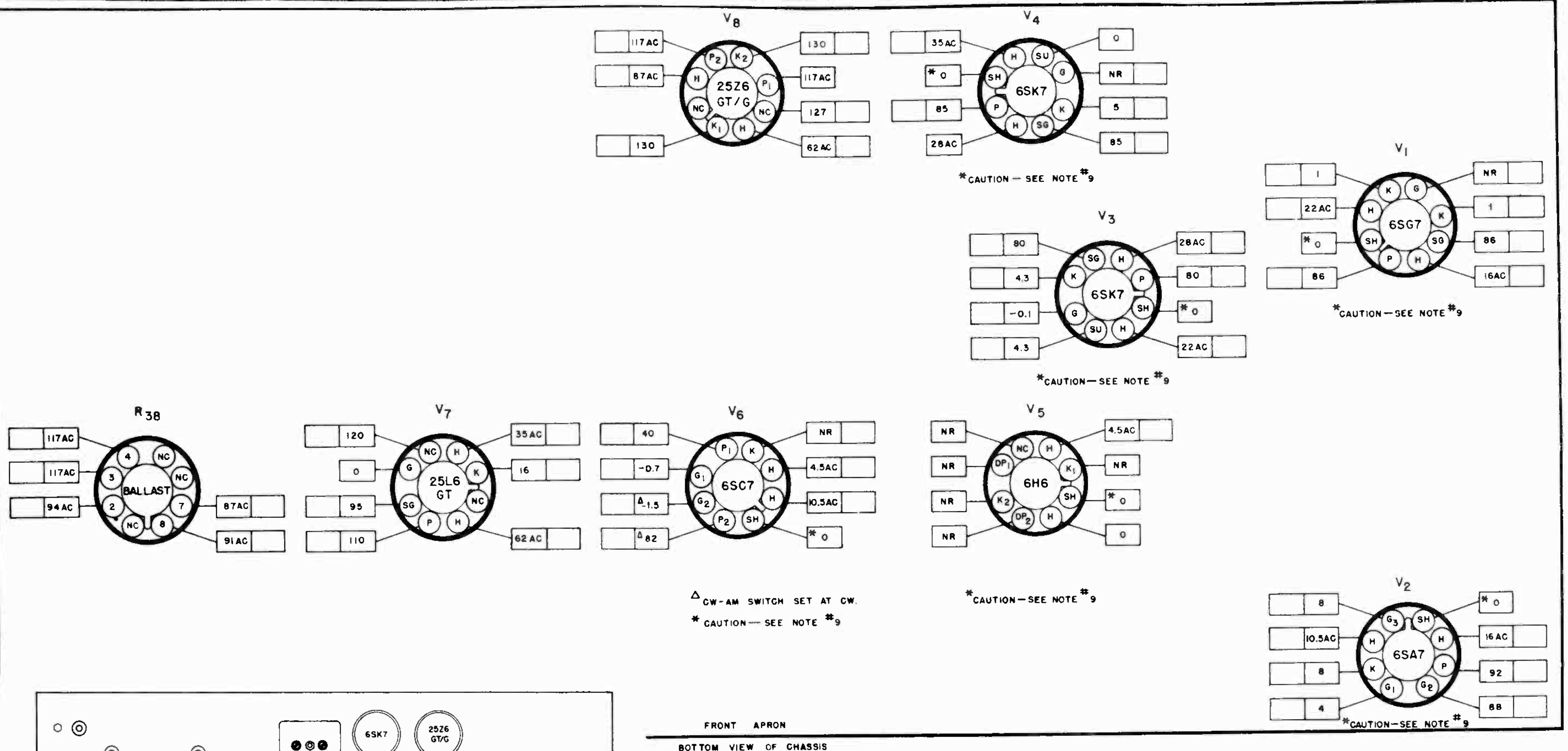

NOTES—

1. SOCKET VIEWS ARE BOTTOM VIEWS.
2. ALL VOLTAGES ARE MEASURED BETWEEN TUBE SOCKET TERMINALS AND THE ELECTRICAL GROUND BUSS (NOT CHASSIS) WITH ZERO SIGNAL INPUT.
3. LINE VOLTAGE—117 V. AC. AC VOLTAGES WILL BE DC VOLTAGES WHEN OPERATING FROM A DC SOURCE.
4. ALL VOLTAGES SHOWN ARE DC UNLESS OTHERWISE SPECIFIED.
5. DC VOLTAGES SHOWN WERE MEASURED WITH AN ELECTRONIC VOLTMETER.
6. "NC"—NO CONNECTION. (VOLTAGE SHOWN FOR THIS TERMINAL ONLY WHEN TERMINALS 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 SAME POTENTIAL WITH THE CHASSIS GROUND.

(92D454)

Fig. 6. Tube socket voltage chart

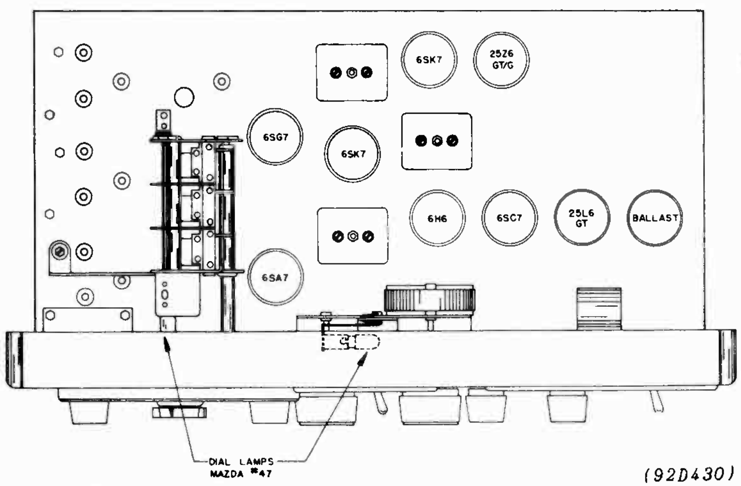

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Fig. 7. Top view, location of tubes and dial lamps

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MODEL S-52

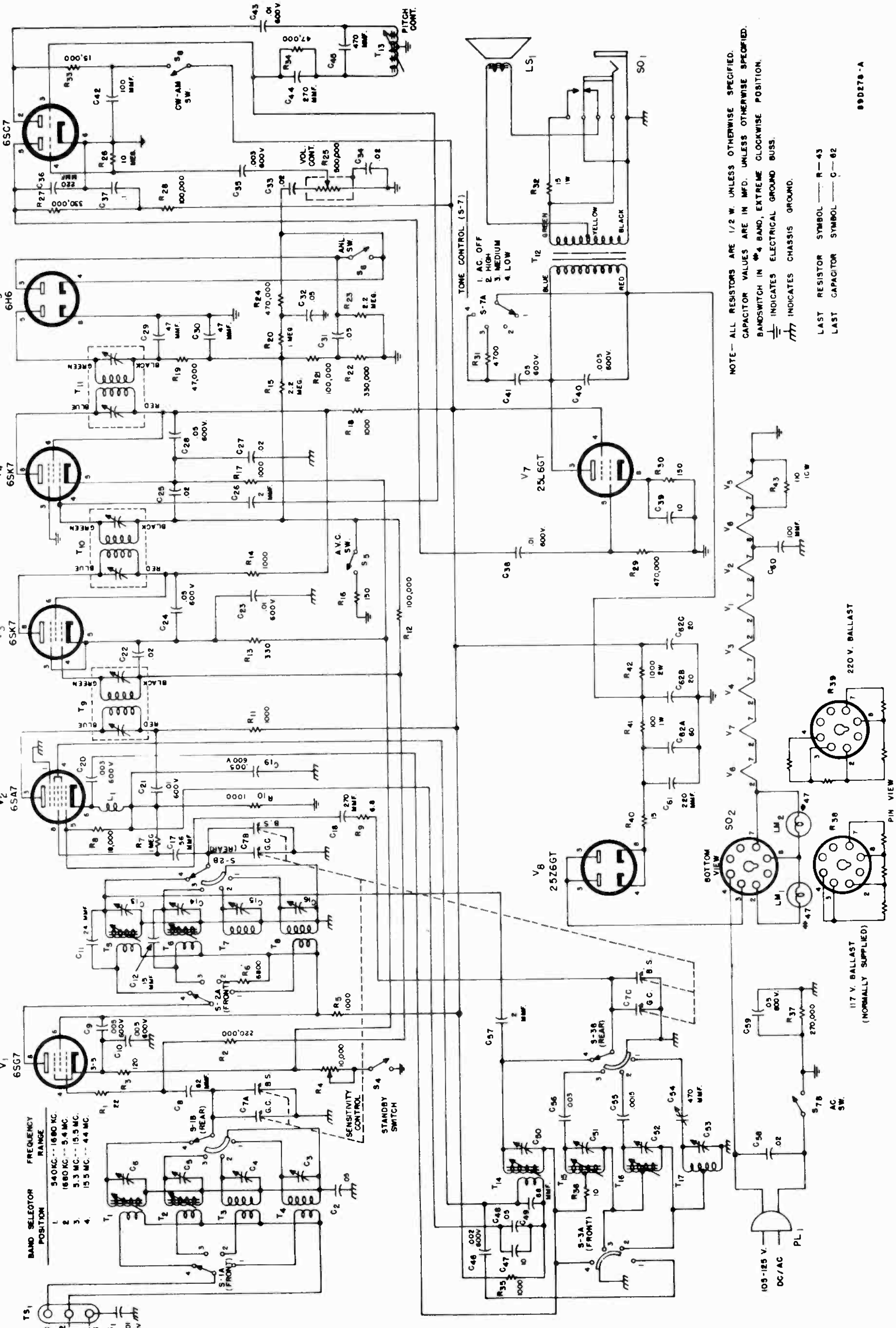

Fig. 8. Schematic diagram

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MODEL S-52

SERVICE PARTS LIST

Ref. No.	Description	Hallicrafters Part Number
	CONDENSERS	
C-1,21,23, 38,43	.01 mfd. 600 V., tubular paper	46AZ103J
C-2	.05 mfd. 200 V., tubular paper, braided leads	46A091
C-3,4	Trimmers, adjustable, part of transformers T-4,3 respectively	44A147
C-5,6	Trimmers, adjustable, part of transformers T-2,1 respectively	44A149
C-7	Tuning condenser, 3 section	48C138
C-8	82 mmf. 500 V., mica	CM20A820K
C-9,10,19,40	.005 mfd. 600 V., tubular paper	46AZ502J
C-11	24 mmf. 500 V., ceramic	CC21UK240M
C-12	15 mmf. 500 V., ceramic	CC21UK150M
C-13,14	Trimmers, adjustable, part of transformers T-5,6 respectively	44A149
C-15,16	Trimmers, adjustable, part of transformers T-7,8 respectively	44A147
C-17	56 mmf. 500 V., mica	CM20A560K
C-18,44	270 mmf. 500 V., mica	CM20A271K
C-20,35	.003 mfd. 600 V., tubular paper	46AZ302J
C-22,25,27, 33,34	.02 mfd. 200 V., tubular paper	46AU203J
C-24,28,41	.05 mfd. 600 V., tubular paper	46AY503J
C-26,57	2 mmf., twisted wire gimmick	
C-29,30	47 mmf. 500 V., mica	CM20A470M
C-31,32,48	.05 mfd. 200 V., tubular paper	46AU503J
C-36,61	220 mmf. 500 V., mica	CM20A221M
C-37	.1 mfd. 600 V., tubular paper	46AY104J
C-39	10 mfd. 25 V., electrolytic	45A121
C-42,60	100 mmf. 500 V., mica	CM20A101M
C-45	470 mmf. 500 V., mica	CM20A471J
C-46	.002 mfd. 600 V., tubular paper	46AZ202J
C-47	10 mfd. 150 V., electrolytic	45A097
C-49	68 mmf. 500 V., ceramic	CC25UK680K
C-50	Trimmer, adjustable, part of transformer T-14	44A149
C-51	Trimmer, adjustable, part of transformer T-15	44A148
C-52	Trimmer, adjustable, part of transformer T-16	44A147
C-53	Trimmer, adjustable	44A191
C-54	Trimmer, adjustable, part of transformer T-17	44A188
C-55	1500 mmf. 5% 500 V., mica	CM30C152J
C-56	3000 mmf. 500 V., mica	CM30C302K
C-58	.02 mfd. 600 V., moulded paper	46AC203J
C-59	.05 mfd. 600 V., tubular (Special)	46A150
C-62	60-20-20 mfd. 150 V., electrolytic	45B128
	RESISTORS	
R-1	22 ohms ½ watt, carbon	RC20AE220M
R-2	220,000 ohms ½ watt, carbon	RC20AE224M
R-3	120 ohms ½ watt, carbon	RC20AE121M
R-4	Resistor, variable, 10,000 ohms, SENSITIVITY control	25B587
R-5,11,14, 18,35	1,000 ohms ½ watt, carbon	RC20AE102M
R-6	6800 ohms ½ watt, carbon	RC20AE682K
R-7,20	1 megohm ½ watt, carbon	RC20AE105M
R-8	18,000 ohms ½ watt, carbon	RC20AE183K
R-9	6.8 ohms ½ watt, carbon	RC20AE068K
R-10,17	1,000 ohms ½ watt, carbon	RC20AE102K
R-12,21,28	100,000 ohms ½ watt, carbon	RC20AE104M
R-13	330 ohms ½ watt, carbon	RC20AE331K
R-15,23	2.2 megohms ½ watt, carbon	RC20AE225M
R-16,30	150 ohms ½ watt, carbon	RC20AE151M
R-19,34	47,000 ohms ½ watt, carbon	RC20AE473M
R-22,27	330,000 ohms ½ watt, carbon	RC20AE334M
R-24,29	470,000 ohms ½ watt, carbon	RC20AE474M
R-25	Resistor, variable, 500,000 ohms, VOLUME control	25B586
R-26	10 megohms ½ watt, carbon	RC20AE106M
R-31	4700 ohms ½ watt, carbon	RC20AE472M
R-32	15 ohms 1 watt, carbon	RC30AE150M
R-33	15,000 ohms ½ watt, carbon	RC20AE153M
R-36	10 ohms ½ watt, carbon	RC20AE100M
R-37	270,000 ohms ½ watt, carbon	RC20AE274M
R-38	Resistor, ballast, 110 V. operation	24B875
R-39	Resistor, ballast, 220 V. operation	24B874
R-40	15 ohms ½ watt, carbon	RC20AE150M
R-41	100 ohms 1 watt, carbon	RC30AE101K
R-42	1,000 ohms 2 watt, carbon	RC40AE102K
R-43	110 ohms 10 watt, carbon	24BG111E

SERVICE PARTS LIST (Cont.):

Ref. No.	Description	Hallicrafters Part Number
	TRANSFORMERS AND COILS	
T-1	Transformer, antenna stage, band 4	51B783
T-2	Transformer, antenna stage, band 3	51B782
T-3	Transformer, antenna stage, band 2	51B781
T-4	Transformer, antenna stage, band 1	51B780
T-5	Transformer, mixer stage, band 4	51B787
T-6	Transformer, mixer stage, band 3	51B786
T-7	Transformer, mixer stage, band 2	51B785
T-8	Transformer, mixer stage, band 1	51B784
T-9	Transformer, 1st I.F.	50C185
T-10	Transformer, 2nd I.F.	50C186
T-11	Transformer, detector stage	50C192
T-12	Transformer, audio output	55A110
T-13	Transformer, B.F.O.	54B033-2
T-14	Transformer, osc. stage, band 4	51B791
T-15	Transformer, osc. stage, band 3	51B913
T-16	Transformer, osc. stage, band 2	51B789
T-17	Transformer, osc. stage, band 1	51B912
L-1	Choke, R.F.	53B138
	SWITCHES	
S-1	Band switch section, antenna stage	62B039
S-2	Band switch section, mixer stage	62B039
S-3	Band switch section, oscillator stage	62B044
S-4,5,6,8	Switch, toggle, S.P.S.T., STANDBY-RECEIVE, A.V.C., A.N.L., and CW-AM	60A138
S-7	Switch, PWR-TONE control	60A225
	PLUGS AND SOCKETS	
PL-1	Line cord	87B1573
SO-1	Headset jack	36A004
SO-2	Socket, octal (tube and ballast)	6A035
	Socket, dial light, general coverage dial	86B071
	Socket, dial light, bandspread dial	86B068
	TUBES, RECTIFIERS AND LAMPS	
V-1	Type 6SG7, antenna	90X6SG7
V-2	Type 6SA7, mixer	90X6SA7
V-3,4	Type 6SK7, 1st and 2nd I.F. amplifiers	90X6SK7
V-5	Type 6H6, detector and noise limiter	90X6H6
V-6	Type 6SC7, 1st audio and B.F.O.	90X6SC7
V-7	Type 25L6GT, audio power amplifier	90X25L6GT
V-8	Type 25Z6GT, rectifier	90X25Z6GT
LM-1,2	Lamp, dial light, Mazda #47	39A004
	MISCELLANEOUS	
TS-1	Terminal strip, antenna	88A032
	Lock, line cord	76A397
	Shaft, bandswitch and index plate	74B172
	Collar, bandswitch	77A043
	Bracket, dial drive mtg.	67B503
	Dial shaft, bandspread	74A169
	Drive shaft, main tuning	74A171
	Drive shaft, bandspread	74A170
	Washer, spring (Bandswitch, bandspread dial, and main tuning drive shafts)	4A043
	Spring, retainer (Bandspread, and main tuning drive shaft)	75A062
	Flywheel, bandspread tuning	71A178
	Pulley, bandspread dial	28A012
	Dial cord	38A001
	Spring, dial cord	75A012
	Dial, bandspread	83B254
	Dial, general coverage	83D240
	Escutcheon, bandspread dial	7B017
	Escutcheon, general coverage dial	7C034
LS-1	Speaker, P.M.	85B050
	Baffle, speaker	63C223
	Grill, speaker	7C016
	Knob, PITCH CONTROL	15A058
	KNOB, SENSITIVITY, VOLUME and and TONE	15A049
	Knob, TUNING and BANDSPREAD	15A047
	Knob, BAND SELECTOR	15B053

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MODELS S-53-A,
S-53-AU

GENERAL

Tubes	Seven plus rectifier		
Speaker	5-inch PM		
Voice Coil Impedance	3.2 ohms		
Headset Output	Low Impedance		
Antenna	Provision for external antenna		
Tuning	Manual		
Tuning Range	Range	Frequency Coverage	
	A	550 KC - 1650 KC	
	B	2.6 MC - 6.4 MC	
	C	6.2 MC - 16.5 MC	
	D	14 MC - 31 MC	
	E	48 MC - 55 MC	
Intermediate Frequency	2,075 mc		
Power Supply S-53A	105-125 V. 50 to 60 cycles AC		
S-53AU	105-250 V. 40 to 130 cycles AC		
Power Consumption	50 watts		

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.

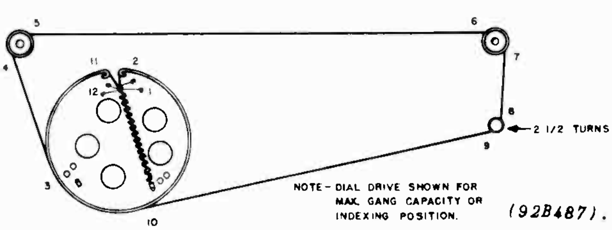
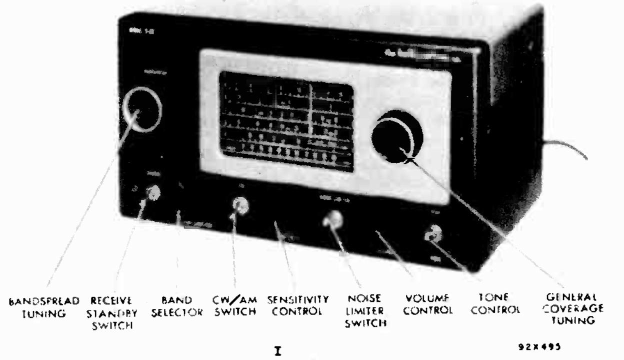


Fig. 1. Dial cable stringing procedure, general coverage dial.

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.



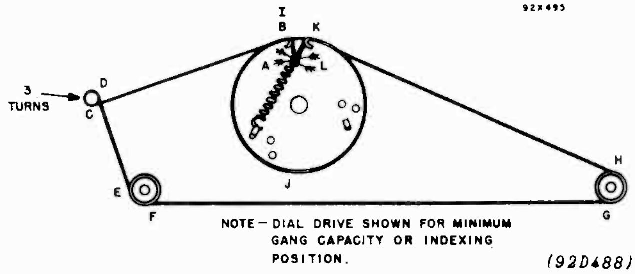


Fig. 2. Dial cable stringing procedure, band spread dial.

REPLACING LAMPS

Refer to Fig. 8. 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.

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.

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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.	455 kc	A	Tuning cap. fully open	S1,S2,S3,S4,S5, S6,	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.	455 kc	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 *C	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	*I,H	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.

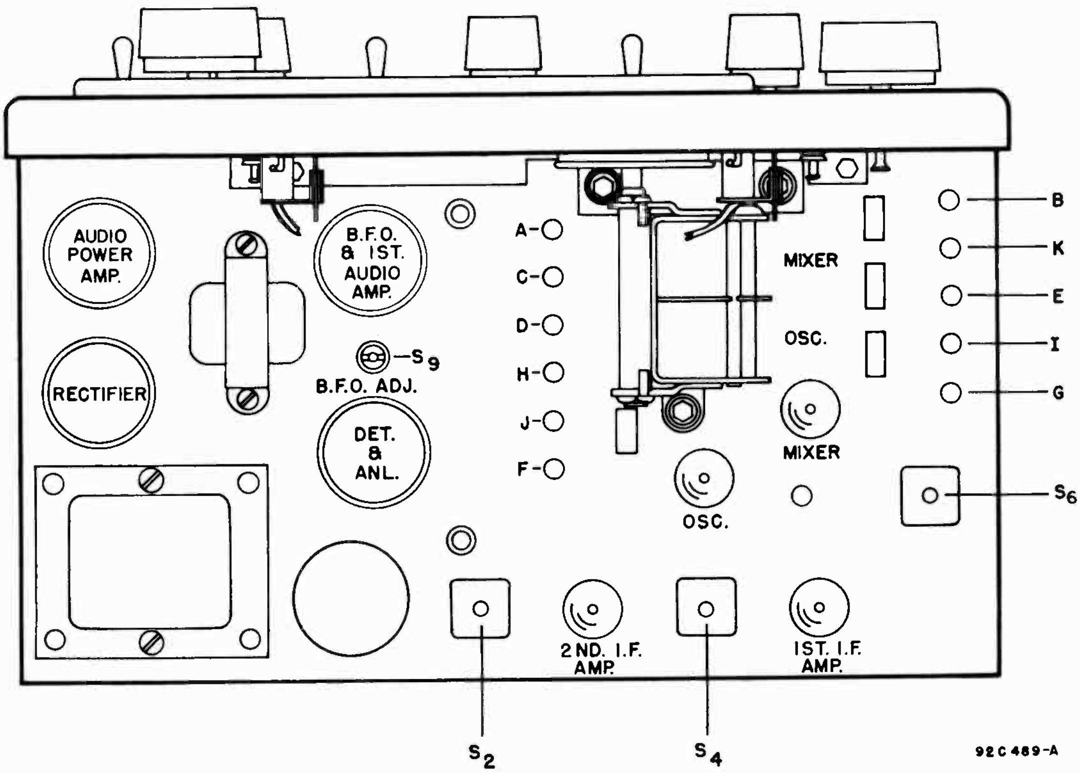

Fig. 3. Alignment points, top view.

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MODELS S-53-A,
S-53-AU

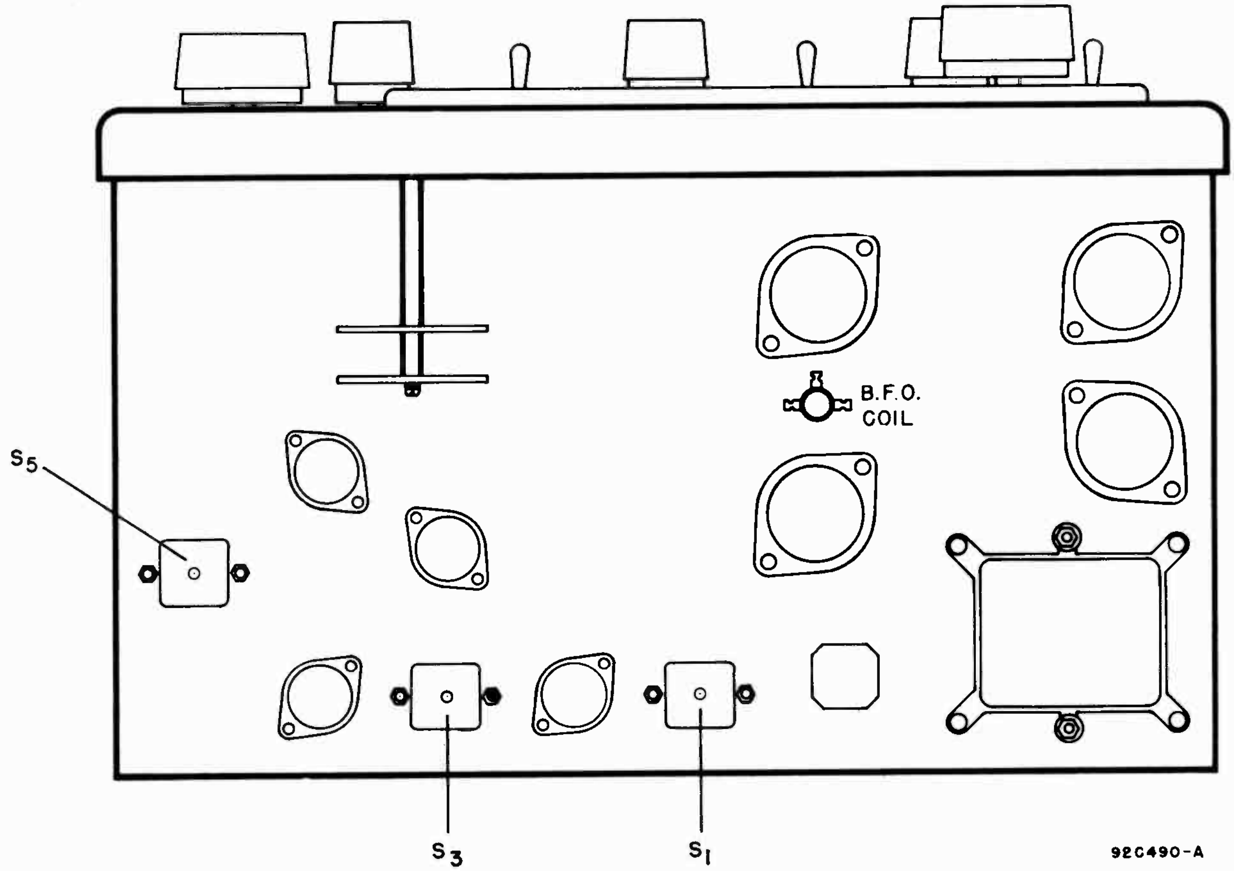

Fig. 4. Alignment points, bottom view.

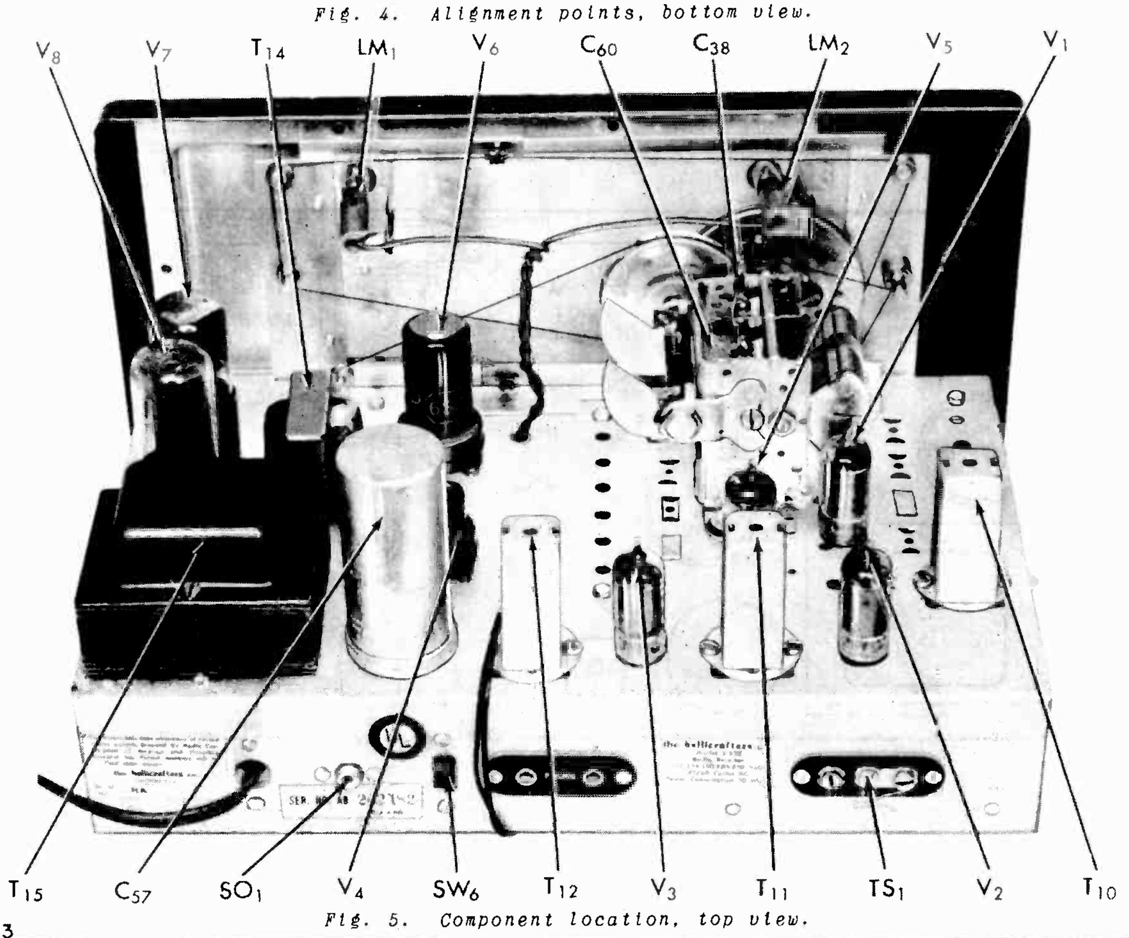

Fig. 5. Component location, top view.

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MODELS S-53-A,
S-53-AU

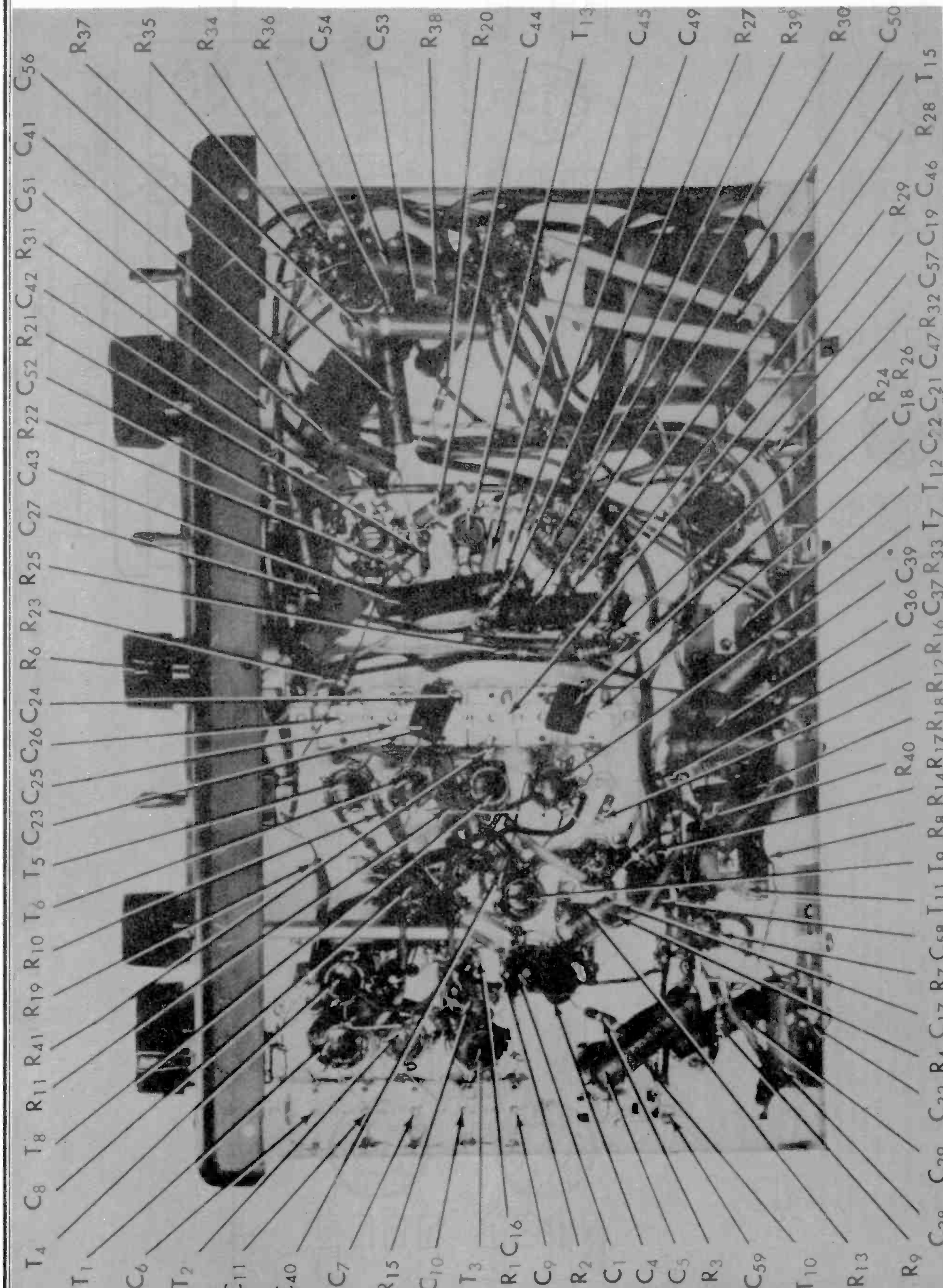

Fig. 6. Component location, bottom view.

92X492-A

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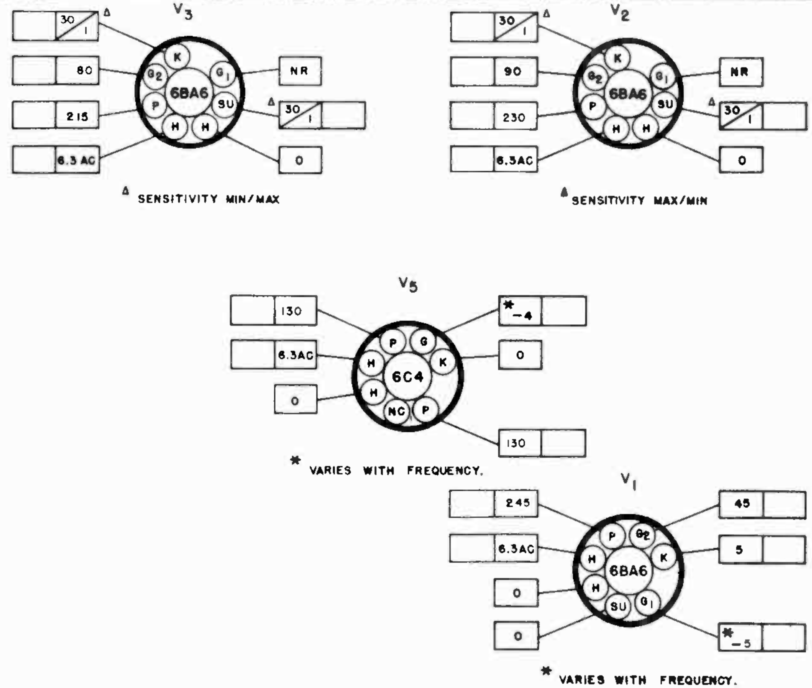
MODELS S-53-A, S-53-AU

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.



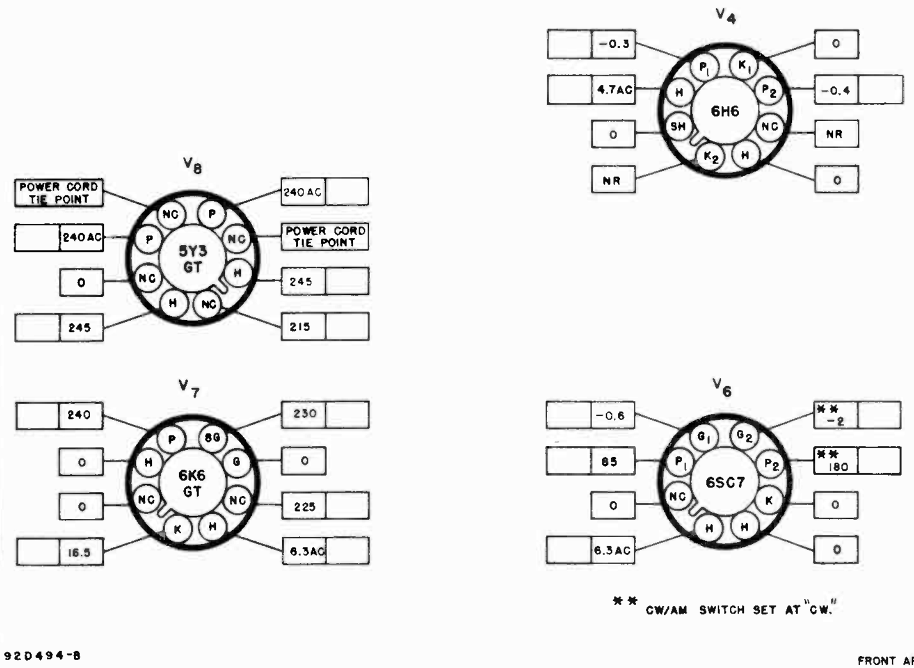


Fig. 7. Tube socket voltage chart

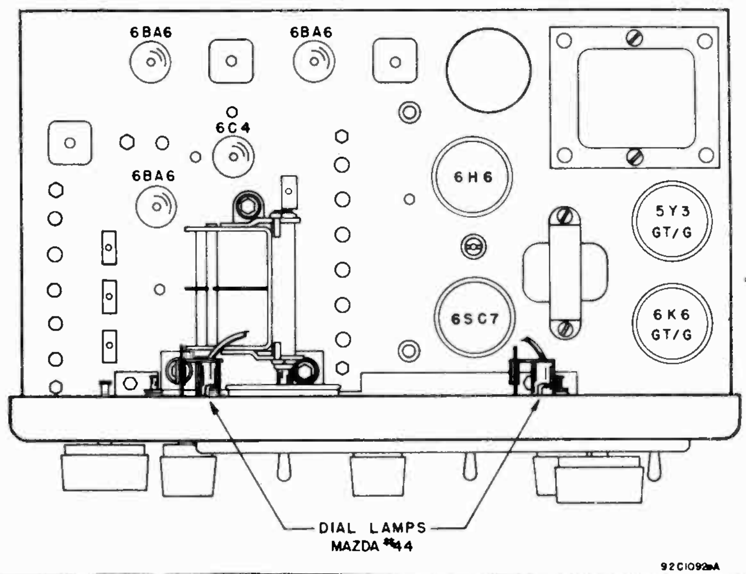


Fig. 8. Top view, location of tubes and dial lamps.

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MODELS S-53-A, S-53-AU

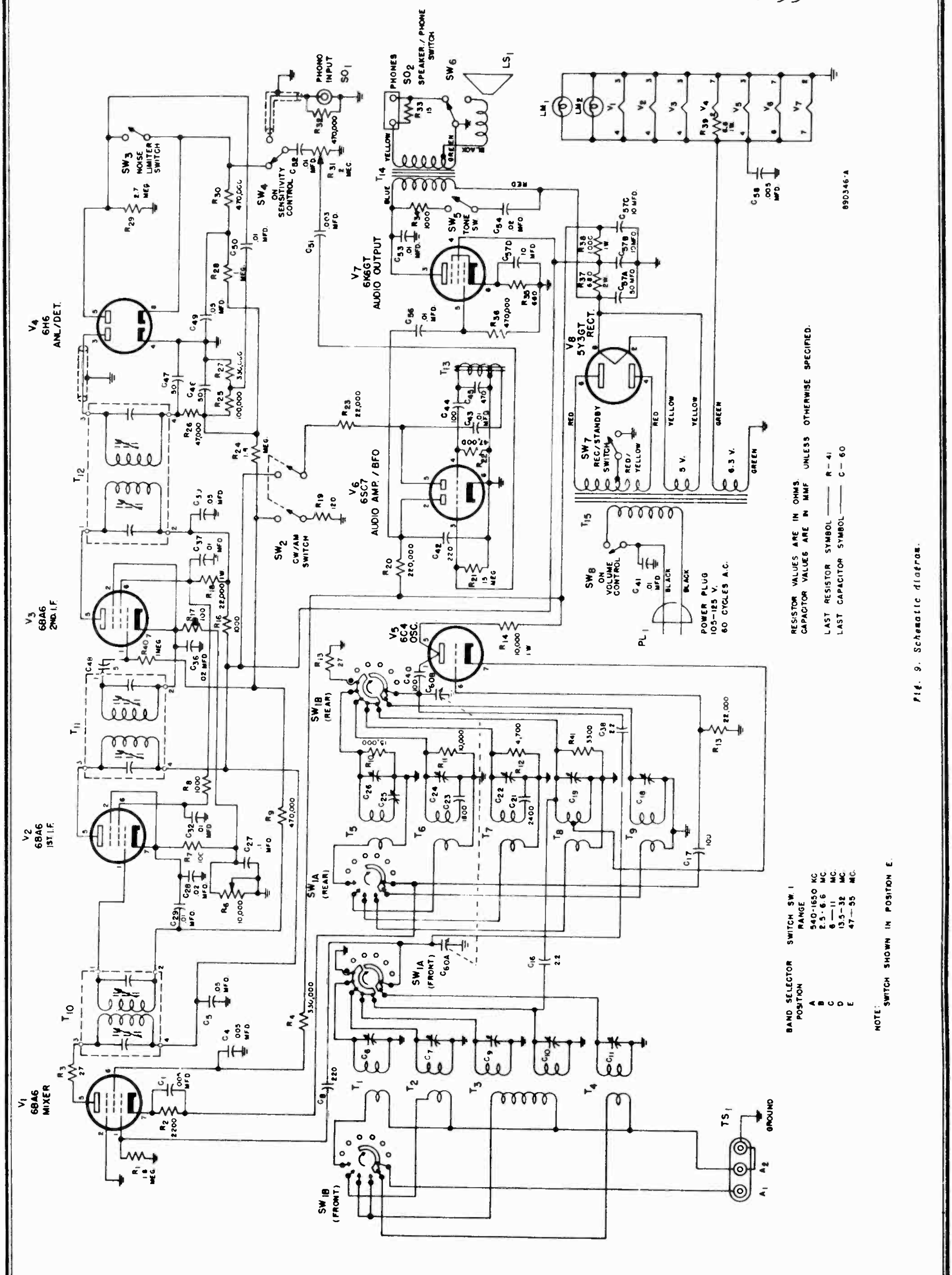

Fig. 9. Schematic diagram.

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MODELS S-53-A,
S-53-AU

SERVICE PARTS LIST

Ref. No.	Description	Manufacturers Part Number
	CONDENSERS	
C-1,4,58	.005 mfd. 450 V., ceramic	47A168
C-5,39,49	.05 mfd. 400 V., tubular	46AW503J
C-6,7,9,10 11	Trimmer assembly, 5 sections, antenna stage	44B355
C-8,42	220 mmf. 500 V., mica	47X20B221K
C-16,38,	2.2 mmf. 500 V., ceramic	47A160-4
C-17,40,44	100 mmf. 500 V., ceramic	47A086
C-18,19,22, 24,25,26	Trimmer assembly, 6 sections, oscillator stage	44B388
C-21	2400 mmf. 500 V., silver mica	47X20C242J
C-23	1800 mmf. 2% 500 V., silver mica	47X20C182G
C-27	.1 mfd. 200 V., tubular	46AU104J
C-28,36,54	.02 mfd. 600 V., tubular	46AY203J
C-29,32,37, 43,50,52, 53,56	.01 mfd. 600 V., tubular	46AZ103J
C-41	.01 mfd. 600 V., molded paper	46AC103J
C-45	470 mmf. 500 V., mica	47X20B471J
C-46,47	50 mmf. 500 V., ceramic	47A091
C-48	5 mmf. 500 V., ceramic	47X20UK050K
C-51	.003 mfd. 600 V., tubular	46AZ302J
C-57	50-10-10 mfd. 350-10-25 V., electrolytic	45B122
C-60	Tuning condenser, 2 section	48C198
	RESISTORS	
R-1,24	1.8 megohms 1/2 watt, carbon	23X20X185M
R-2	2200 ohms 1/2 watt, carbon	23X20X222M
R-3,15	27 ohms 1/2 watt, carbon	23X20X270M
R-4,27	330,000 ohms 1/2 watt, carbon	23X20X334K
R-6	10,000 ohms, variable SENSITIVITY control	25B603
R-7,17	100 ohms 1/2 watt, carbon	23X20X101K
R-8,16,34	1000 ohms 1/2 watt, carbon	23X20X102M
R-9,30,32, 36	470,000 ohms 1/2 watt, carbon	23X20X474M
R-10	15,000 ohms 1/2 watt, carbon	23X20X153K
R-11	10,000 ohms 1/2 watt, carbon	23X20X103K
R-12	4700 ohms 1/2 watt, carbon	23X20X472K
R-13,23	22,000 ohms 1/2 watt, carbon	23X20X223M
R-14	10,000 ohms 1 watt, carbon	23X30X103K
R-18	22,000 ohms 1 watt, carbon	23X30X223M
R-19	120 ohms 1/2 watt, carbon	23X20X121M
R-20	220,000 ohms 1/2 watt, carbon	23X20X224K
R-21	15 megohms 1/2 watt, carbon	23X20X156K
R-22,26	47,000 ohms 1/2 watt, carbon	23X20X473M
R-25	100,000 ohms 1/2 watt, carbon	23X20X104K
R-28,40	1 megohm 1/2 watt, carbon	23X20X105M
R-29	2.7 megohms 1/2 watt, carbon	23X20X275M
R-31	2 megohms, variable, VOLUME control	25B602
R-33	15 ohms 1/2 watt, carbon	23X20X150M
R-35	680 ohms 1/2 watt, carbon	23X20X681K
R-37	680 ohms 2 watts, carbon	23X40X681M
R-38	1000 ohms 1 watt, carbon	23X30X102M
R-39	6.8 ohms 1 watt, carbon	23X30X068K
R-41	3300 ohms 1/2 watt, carbon	23X20X332K
	TRANSFORMERS AND COILS	
T-1	Transformer, antenna stage, band A	51B1028
T-2	Transformer, antenna stage, band B	51B1244
T-3	Transformer, antenna stage, band C & D	51B1026
T-4	Transformer, antenna stage, band E	51B1030
T-5	Transformer, oscillator stage, band A	51B1235
T-6	Transformer, oscillator stage, band B	51B1236

Ref. No.	Description	Manufacturers Part Number
	TRANSFORMERS AND COILS (Cont.)	
T-7	Transformer, oscillator stage, band C	51A1237
T-8	Transformer, oscillator stage, band D	51B1238
T-9	Transformer, oscillator stage, band E	51B1239
T-10,11	Transformer, 1st and 2nd IF	50C241
T-12	Transformer, 3rd IF	50C242
T-13	Transformer, BFO	54B043
T-14	Transformer, audio output	55B107
T-15	Transformer, power (Standard) (Used on S-53-A)	52C164
T-15	Transformer, power (Universal) (Used on S-53-AU)	52C165
	SWITCHES	
SW-1	Band switch assembly	60B323
SW-2	Switch, toggle DPST, CW/AM control	60A285
SW-3,5,7	Switch, toggle, SPST, STANDBY/ REC., NOISE LIMITER & TONE control	60A138
SW-4	Switch, part of SENSITIVITY control, R-6	
SW-6	Switch, slide, SPDT, SPEAKER/ PHONE control	60A243
SW-8	Switch, part of VOLUME control R-31	
	PLUGS AND SOCKETS	
PL-1	Line cord and plug	87A078
SO-1	Receptacle, phono	36A041
SO-2	Receptacle, headphone jack	88A071
	Socket, octal (tube)	6A269
	Socket, miniature (tube)	6A297
	Socket, dial light	86B063
	TUBES, RECTIFIERS AND LAMPS	
V-1,2,3	6BA6, mixer, 1st & 2nd IF amplifier	90X6BA6
V-4	6H6, detector & ANL	90X6H6
V-5	6C4, oscillator	90X6C4
V-6	6SC7, audio amplifier & BFO	90X6SC7
V-7	6K6-GT, power amplifier	90X6K6-GT
V-8	5Y3-GT, rectifier	90X5Y3-GT
LM-1,2	Lamp, 6-8 V., 250 ma., Mazda #44	39A003
	MISCELLANEOUS	
TS-1	Terminal strip, antenna	88A032
	Lock, line cord	76A299
	Clip, coil mtg.	76A325
	Shaft, tuning drive	74A248
	"C" washer (tuning drive shaft)	4A139
	Spring, dial cord	75A012
	Dial cord	38A019
	Plate, dial	63C333
	Pointer, general coverage dial	82A149
	Pointer, band spread dial	82A148
	Dial Glass (Calibrated)	22C204
	Gasket, dial glass	12A042
	Clip, dial glass mtg.	76A390
	Pad, dial clip	16A126
	Pad, felt (round disc)	14A166
	Pad, sponge rubber	16A047-1
	Mounting feet, rubber	16A007
LS-1	Speaker, P.M.	85C030
	Knob, BAND SELECTOR, SENSITIVITY and VOLUME controls	15A050
	Knob, BANDSPREAD & general coverage controls	15A047

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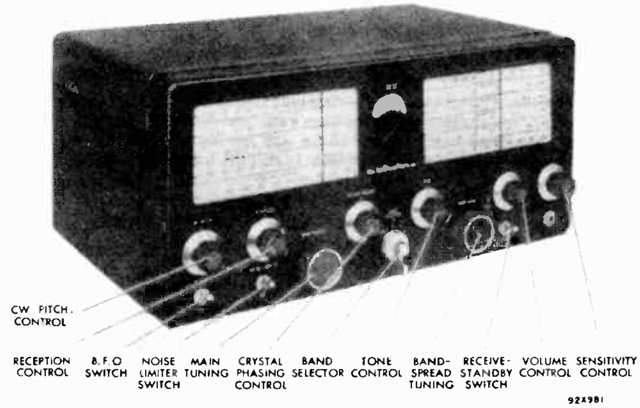
GENERAL

Tubes . . . . eleven plus voltage regulator and rectifier
Speaker Output . . . . 3.2/500 ohms
Headset Output . . . . 500 ohms
Antenna Input . . . . For 50 to 600 ohm line or single wire lead-in.
Phono Input . . . . High impedance
External Power Connector . . . Std. octal socket
Tuning Range

Band	*Frequency Range	Type of Reception
1	560 KC - 1600 KC	AM/NBFM/CW
2	1650 KC - 4700 KC	AM/NBFM/CW
3	4.7 MC - 13.4 MC	AM/NBFM/CW
4	12.8 MC - 34 MC	AM/NBFM/CW
5	46 MC - 56 MC	AM/NBFM/CW

* First and last dial calibration

Intermediate Frequency . . . . . 455kc/2.075 MC
Power Supply . . . . . Standard Model 105-125 V. 60 Cycles AC
Universal Model 105-250 V. 25/130 Cycles AC
Power Consumption . . . . 90 Watts.



RESTRINGING DIAL CORD

The dial drive system of the SX-71 consists of four separate spring drives. The two drive shaft string systems are identical; the two pointer drive systems are similar but right and left handed.

(1) DRIVE SHAFT. - To restring either one, use a 26 inch length of 30 lb. test dial cord. Tie one end of the cord to position "1" on the drum and follow the stringing sequence "1" to "9" as shown. At position "9" stretch the tension spring and tie the cord securely to the spring. Note that the dial cord is wrapped around the drive shaft three and one half times for proper traction.

(2) POINTER DRIVE - To restring either one, use a 66 inch length of 30 lb. test dial cord. Tie one end of the dial cord to position "A" and follow the stringing sequence "A" to "U" as shown. At position "U", stretch the tension spring and tie the cord securely to the spring. Two small pieces of spaghetti tubing approximately one half inch long should be threaded on the cord, as shown, to provide a suitable purchase for the dial pointer. With the pointer drive, pulleys positioned as shown on the diagram (Fig. 1.), the tuning capacitor should be entirely closed. The pointer may now be fastened to the cord and aligned with the 0 position on the logging scale and the index marks on the dial scales. The ends of the pointer should be carefully crimped around the spaghetti tubing and cemented fast.

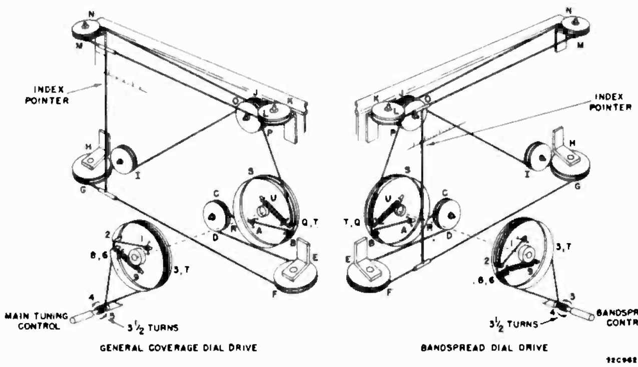
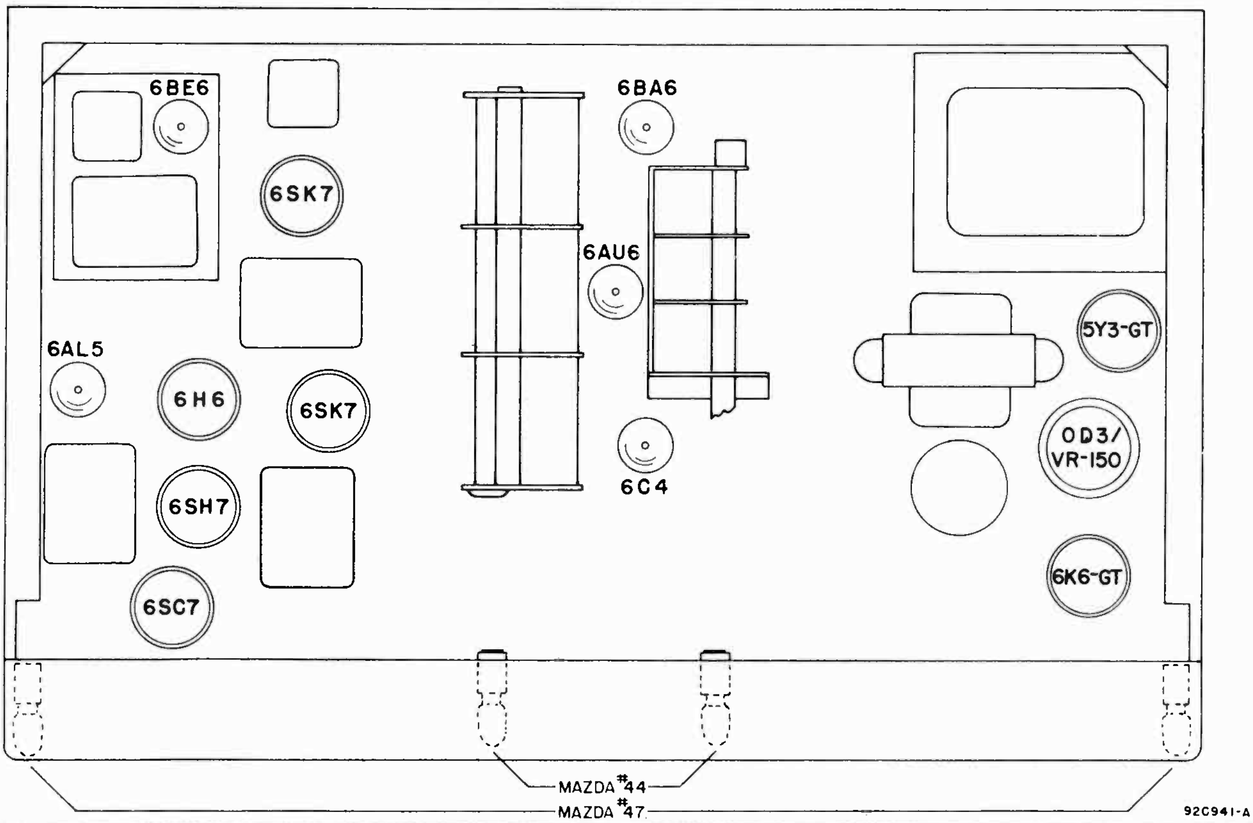


Figure 1. Dial cable stringing procedure



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MODEL SX-71

ALIGNMENT PROCEDURE

It will be necessary to remove the receiver chassis from the cabinet to make all alignment adjustments. The chassis is held in the cabinet by two screws on the bottom rear and by the flanges on the side and bottom.
The following control settings are to be set before alignment: TONE control at maximum. SENSITIVITY control at maximum. VOLUME control at maximum. NOISE LIMITER switch at OFF. RECEIVE/STANDBY switch at RECEIVE.

I-F ALIGNMENT

Step	Signal Gen. Coupling	Signal Gen. Frequency	Receiver Control Settings	Receiver Dial Set	Adjust	Remarks
1	Connect gen. to stator of gang, mixer sect.	455 KC Unmodulated	BAND SELECTOR at 2. RECEPTION switch at BROAD CRYSTAL. BFO switch at BFO.	Both dials set at 50 on the logging scale		Remove CW PITCH control knob and set shaft for zero beat. Replace knob with the zero at the index line.
2	Same as step 1.	Same as step 1.	Adjust CW-PITCH for a 1000 cycle note. Other controls same as step 1.	Same as step 1.	U	While turning the slug very slowly in one direction, "rock" the signal generator. As the adjustment passes thru the response of the crystal filter, the output goes thru a maximum, dips down, and starts going up again. The correct setting of this slug is in the center of the observed dip. A swishing note, in contrast to the sharp crystal tone will be apparent when the correct adjustment has been reached.
3	Same as step 1.	Same as step 1.	RECEPTION switch at SHARP CRYSTAL. Other controls same as step 1.	Same as step 1.		Set the generator frequency for maximum output on the crystal frequency.
4	Same as step 1.	Same as step 3. Modulated	RECEPTION switch at NORMAL I.F. BFO switch at OFF. Other controls same as step 1.	Same as step 1.	V W X Y Z (1) (2)	Maximum output Maximum output Maximum output Maximum output Maximum output Maximum output Maximum output Repeat above until maximum gain is obtained.
			F-M ALIGNMENT			
5	Same as step 1.	Same as step 3. Increase output to approx. 1000 microvolts.	RECEPTION switch at NBFM. Other controls same as step 1.	Same as step 1.	(3)	Set up circuit shown in Fig. 2. Until vacuum tube voltmeter shows zero voltage.
			I-F ALIGNMENT			
6	Same as step 1.	2.075 MC Modulated	RECEPTION switch at NORMAL I.F. BAND SELECTOR at 4.	Same as step 1.	(4) (5) (6)	Until a signal is heard. For maximum output. For maximum output. Repeat until the maximum output is obtained.

R-F ALIGNMENT

Leave BANDSPREAD dial at 100 for all steps. The following adjustments can be made without removing the chassis from the cabinet.

Step	Signal Gen. Coupling	Signal Gen. Frequency	Receiver Control Settings	Receiver Dial Set	Adjust	Remarks
1	Connect the high side of the gen. thru a 300 ohm resistor to term. A1 of the ant. term. strip. Connect a jumper between A2 & G. Use just enough gain to obtain a 500 milliwatt audio output level.	1500 KC 600 KC 1500 KC	BAND SELECTOR at 1. RECEPTION switch at NORMAL I.F. BFO switch at BFO	1500 KC 600 KC 1500 KC	A(osc.trim) B C D(osc.pad) A B Repeat	Until a signal is heard. For maximum output. For maximum output. Until a signal is heard. For maximum output. For maximum output Until maximum output is obtained.
2	Same as step 1	4 MC	BAND SELECTOR at 2. Other controls as in step 1.	4 MC	E(osc.trim) F G E F G	Until a signal is heard. For maximum output For maximum output For maximum output For maximum output For maximum output Repeat until maximum output is obtained
3	Same as step 1.	12 MC 5.2 MC 12 MC	BAND SELECTOR at 3. Other controls as in step 1.	12 MC 5.2 MC 12 MC	H(osc.trim) I H J K	Until a signal is heard Until a signal is heard For maximum output. ("Rock" the gang) For maximum output. ("Rock" the gang) For maximum output. ("Rock" the gang) Repeat until maximum results are obtained.
4	Same as step 1	30 MC 14 MC	BAND SELECTOR at 4. Other controls as in step 1.	30 MC 14 MC	L(osc.trim) M (slug) N O L P Q	Until a signal is heard. Until a signal is heard. For maximum output. ("Rock" the gang) For maximum output. ("Rock" the gang) For maximum output. ("Rock" the gang) For maximum output. ("Rock" the gang) For maximum output. ("Rock" the gang) Repeat until maximum results are obtained.
5	Same as step 1.	54 MC	BAND SELECTOR at 5. Other controls as in step 1.	100 on logging scale.	R(osc.trim) S T	Until a signal is heard. For maximum output. ("Rock" the gang) For maximum output. ("Rock" the gang) Repeat until maximum results are obtained.

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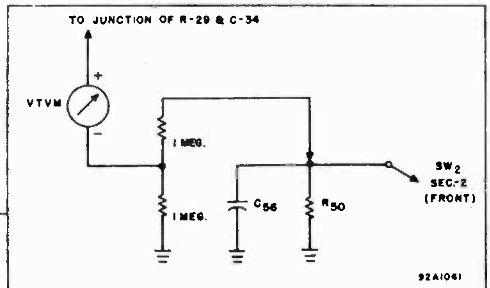

Fig. 2. FM Alignment

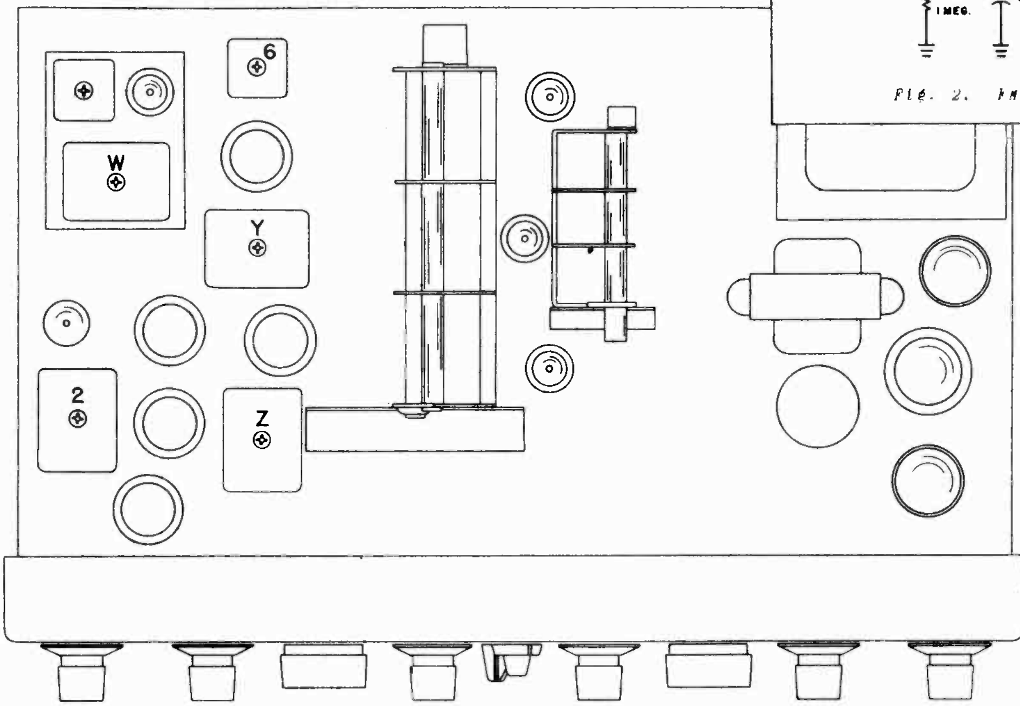

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Fig. 3. Alignment adjustments, top view

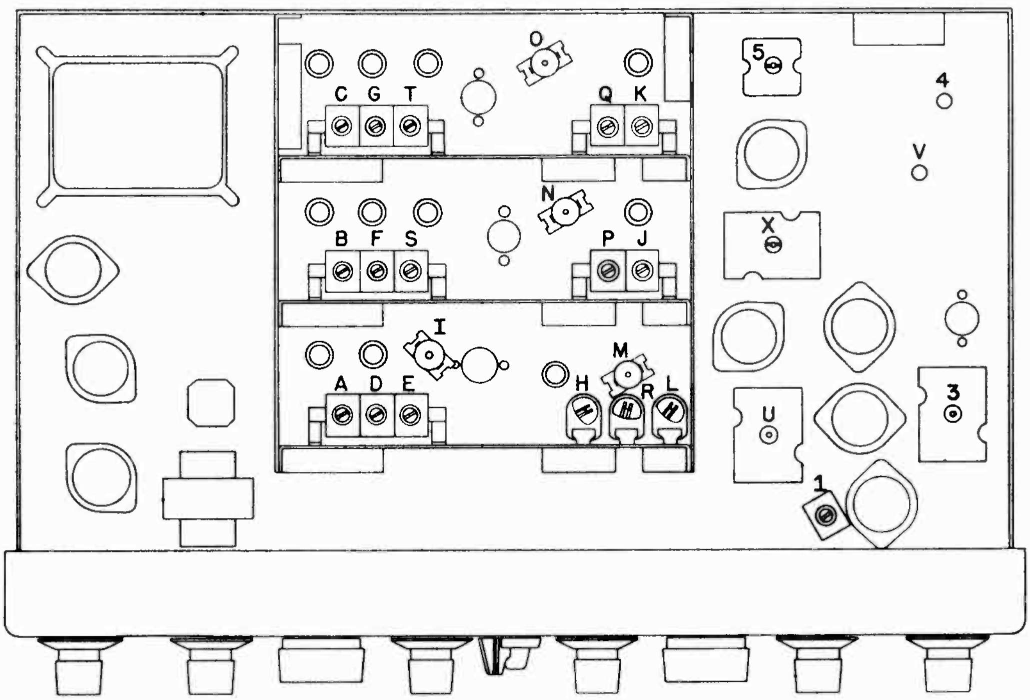

Fig. 4. Alignment adjustments, bottom view

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MODEL SX-71

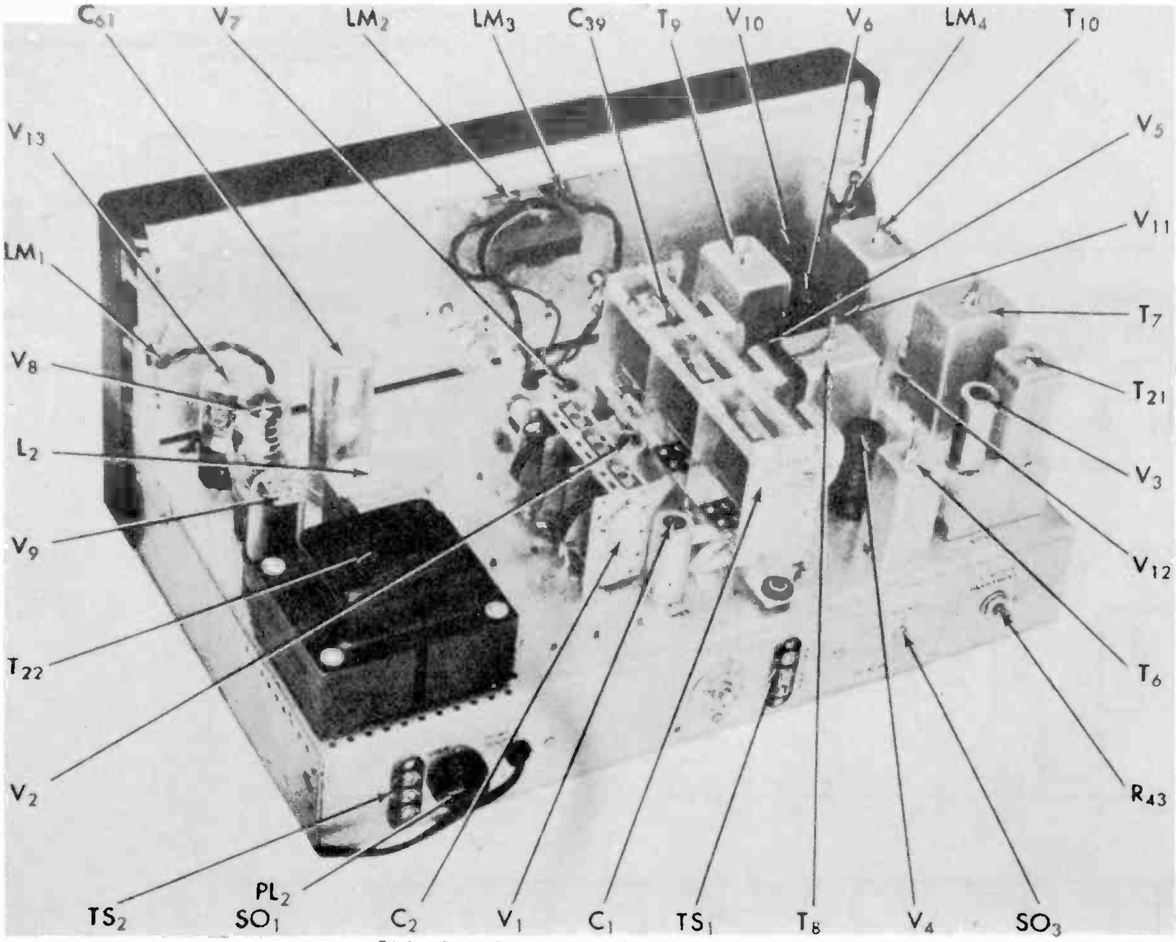

Fig. 5. Component locations, top view

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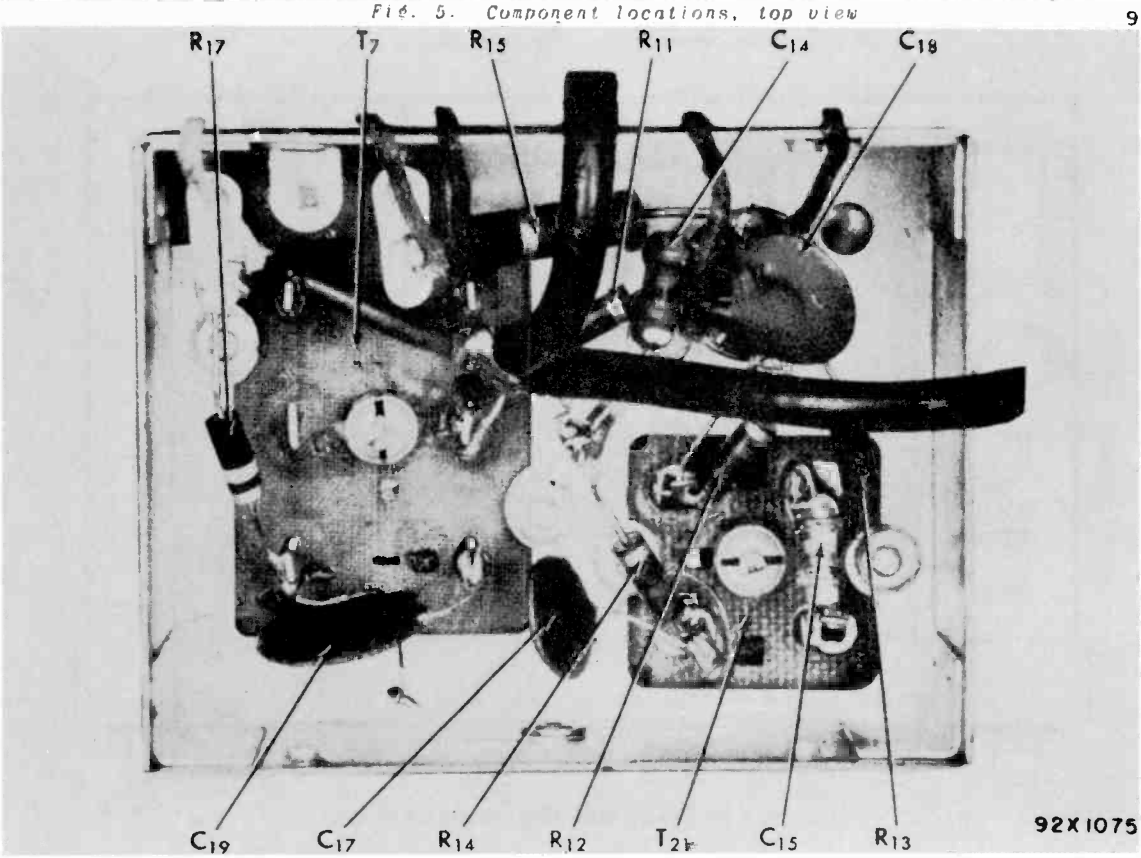

Fig. 6. Component locations, bottom view second converter unit

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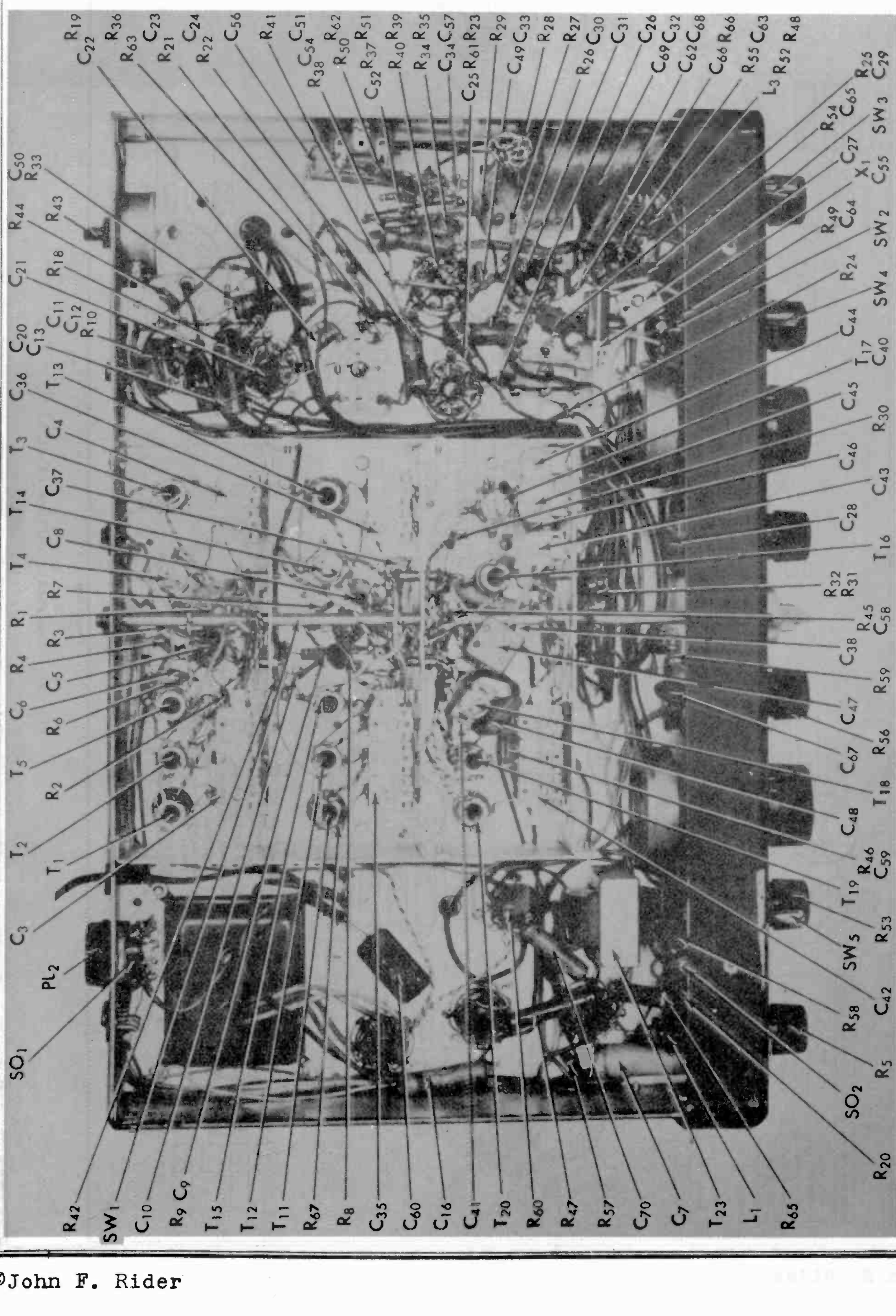

Fig. 7. Component locations, bottom view

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MODEL SX-71

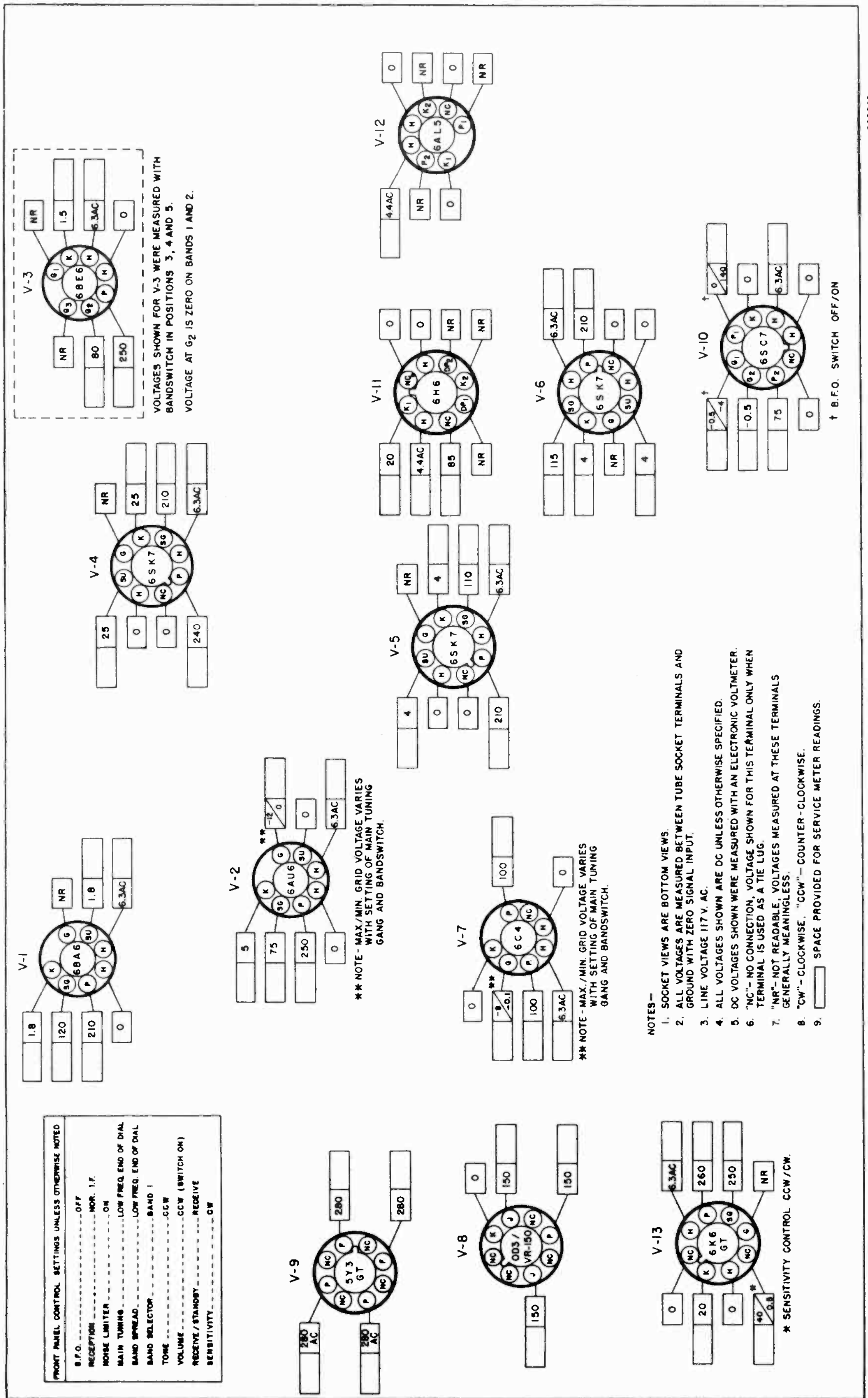

Fig. 9. Tube socket voltage chart

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SERVICE PARTS LIST

Ref. No.	Description	Manufacturer's Part Number
	CONDENSERS	
C-1	Capacitor, MAIN TUNING (3 section)	48D209
C-2	Capacitor, BANDSPREAD (3 section)	48C210
C-3	Trimmer Ass'y, antenna stage (Bands 1, 2 & 5)	44B381
C-4	Trimmer Ass'y, antenna stage (Bands 3 & 4)	44B379
C-5,33,34, 52,57, 63,68	220 mmf. 500 V., ceramic	47B20221K5
C-6,10,19, 67	2 x 4,000 mmf. 450 V., ceramic	47A218
C-7	.25 mfd. 200 V., tubular	46AT254J
C-8,14,38, 41,58	100 mmf. 500 V., ceramic	47X20UJ101K
C-9,12,17, 18,21,22, 23,25,26, 31,64,65,	5,000 mmf. 450 V., ceramic	47A168
**C-11,13	300 mmf. 500 V., mica	47X20B301J
C-15	47 mmf. 500 V., ceramic	47X20UK470K
C-16,20,24, 30,50	.05 mfd. 400 V., tubular	46AW503J
C-27	Trimmer, adjustable	44A047
C-28	Capacitor, variable CRYSTAL PHASING	48A182
C-29	33 mmf. 500 V., mica	47X20A330K
C-32	.25 mfd. 600 V., tubular	46AX254J
C-35	Trimmer Ass'y, mixer stage (Bands 1, 2 & 5)	44B382
C-36	Trimmer Ass'y, mixer stage (Bands 3 & 4)	44B380
C-37	15 mmf. 500 V., ceramic	47X20UJ150K
C-39	2.2 mmf. 450 V., ceramic	47A160-4
C-40,49	25 mmf. 500 V., ceramic	47X20UK250K
C-42	Trimmer Ass'y, oscillator stage (Bands 1 & 2)	44B383
C-43,44,45	Trimmer Ass'y, oscillator stage (Bands 3, 4, & 5)	44A378
**C-46	2200 mmf. 500 V., mica	47X30D222J
**C-47	910 mmf. 500 V., mica	47X30D911J
**C-48	1500 mmf. 500 V., mica	47X30D152G
C-51	.1 mfd. 200 V., tubular	46AU104J
C-54	.02 mfd. 200 V., tubular	46AU203J
C-55	10 mmf. 500 V., ceramic	47X20UK100K
C-56	1 mfd. 50 V., electrolytic	45A163
**C-59	Capacitor, temperature compensator	44A158
**C-60	.01 mfd. 600 V., moulded	46X35X103M
C-61	60-20 mfd. 450 V., & 20 mfd. 400 V., electrolytic	45B113
C-62,70	.01 mfd. 600 V., tubular	46AY103J
C-66	1 mmf. 450 V., ceramic	47A160-2
C-69	470 mmf. 500 V., mica	47X20B471J
	RESISTORS	
R-1,30	10 ohms 1/2 watt, carbon	23X20X100K
R-2,13	15 ohms 1/2 watt, carbon	23X20X150K
R-3,41	1 megohm 1/2 watt, carbon	23X20X105K
R-4,44	82 ohms 1/2 watt, carbon	23X20X820K
R-5	Resistor, variable, 10,000 ohms, SENSITIVITY control	25B582
R-6	8200 ohms 1/2 watt, carbon	23X20X822K
R-7,39,66	2.2 megohms 1/2 watt, carbon	23X20X225K
R-8	2200 ohms 1/2 watt, carbon	23X20X222K
	RESISTORS (Cont.)	
R-9	330,000 ohms 1/2 watt, carbon	23X20X334K
R-10, 24, 28,42	3300 ohms 1/2 watt, carbon	23X20X332K
R-11	220 ohms 1/2 watt, carbon	23X20X221K
R-12,45,52	22,000 ohms 1/2 watt, carbon	23X20X223K
R-14,48	150 ohms 1/2 watt, carbon	23X20X151K
R-15,46,60	10,000 ohms 1 watt, carbon	23X30X103K
R-17,21,25, 49,55	100,000 ohms 1/2 watt, carbon	23X20X104K
R-18,22,26	270 ohms 1/2 watt, carbon	23X20X271K
R-19,27	33,000 ohms 1/2 watt, carbon	23X20X333K
R-20	47,000 ohms 1 watt, carbon	23X30X473K
R-23	6800 ohms 1/2 watt, carbon	23X20X682K
R-29	56,000 ohms 1/2 watt, carbon	23X20X563K
R-31	680 ohms 1/2 watt, carbon	23X20X681K
R-32,33	2700 ohms 1/2 watt, carbon	23X20X272K
R-34,35,40	470,000 ohms 1/2 watt, carbon	23X20X474K
R-36	180,000 ohms 1/2 watt, carbon	23X20X184K
R-37	82,000 ohms 1/2 watt, carbon	23X20X823K
R-38,50,59	220,000 ohms 1/2 watt, carbon	23X20X224K
R-43	Resistor, variable, 500 ohms, S-METER ADJUSTMENT	25C022
R-47	Resistor, 2500 ohms 10 watts, wirewound	24BG252D
R-51	39,000 ohms 1/2 watt, carbon	23X20X393K
R-53	Resistor, variable, 500,000 ohms, VOLUME control	25B604
R-54	15 megohms 1/2 watt, carbon	23X20X156K
R-56	Resistor, variable, 500,000 ohms, TONE control	25B589
R-57,58	560 ohms 1 watt, carbon	23X30X561K
R-61,62	6.8 ohms 1 watt, carbon	23X30X068K
R-63	27,000 ohms 1/2 watt, carbon	23X20X273K
R-65	47,000 ohms 2 watts, carbon	23X40X473K
R-67	100 ohms 1/2 watt, carbon	23X20X101K
	TRANSFORMERS AND COILS	
T-1	Transformer, antenna stage, band 1	51B1088
T-2	Transformer, antenna stage, band 2	51B1089
T-3	Transformer, antenna stage, band 3	51B1090
T-4	Transformer, antenna stage, band 4	51B1091
T-5	Transformer, antenna stage, band 5	51B1092
T-6	Transformer, 1st IF (2.075 MC)	50C414
T-7,8	Transformer, 1st and 2nd IF (455 KC)	50C416
T-9	Transformer, 3rd IF (455 KC)	50C415
T-10	Transformer, FM detector	50C418
T-11	Transformer, mixer stage, band 1	51B1093
T-12	Transformer, mixer stage, band 2	51B1094
T-13	Transformer, mixer stage, band 3	51B1095
T-14	Transformer, mixer stage, band 4	51B1096
T-15	Transformer, mixer stage, band 5	51B1097
T-16	Transformer, osc. stage, band 5	51B1160
T-17	Transformer, osc. stage, band 4	51B1101

* Used on universal model SX-71U only.
** Use exact replacement part only.

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MODEL SX-71

Ref. No.	Description	Manufacturer's Part Number
	TRANSFORMERS AND COILS (Cont.)	
T-18	Transformer, osc. stage, band 3	51B1100
T-19	Transformer, osc. stage, band 2	51B1099
T-20	Transformer, osc. stage, band 1	51B1098
T-21	Transformer, 2.53 MC osc. stage, bands 3, 4 and 5	50C448
T-22	Transformer, power	52C174
*T-22	Transformer, power (Universal)	52C175
T-23	Transformer, output	55B120
L-1	Choke, RF	53A107
L-2	Choke, filter	56B107
L-3	Coil, BFO	54B039
	SWITCHES	
SW-1	Switch, BAND SELECTOR	
	Section 1 (Antenna stage) and Section 2 (Mixer stage)	62B051
	Section 3 (Osc. grid)	62B049
	Section 4 (Osc. plate)	62B050
	Section 5 (Converter plate and bias)	62B048
SW-2	Switch, RECEPTION	60B343
SW-3	Switch, BFO-OFF	60A285
SW-4	Switch, NOISE LIMITER-OFF	60A138
SW-5	Switch, RECEIVE-STANDBY	60A139
	PLUGS AND SOCKETS	
PL-1	Line Cord	87B1573
PL-2	Plug, AC shorting	35A003
SO-1	Socket, POWER (DC operation)	6B296
SO-2	Jack, PHONES	36A036
SO-3	Jack, PHONO	36A041
	Socket, octal (tube)	6B296
	Socket, octal (tube) with center shield	6A315
	Socket, miniature	6A347
	Socket, tuning dial scale lamps	86B092
	Socket, carrier lever meter dial lamps	86B091
	TUBES, RECTIFIERS AND LAMPS	
V-1	Type 6BA6, RF amplifier	90X6BA6
V-2	Type 6AU6, 1st converter	90X6AU6
V-3	Type 6BE6, 2nd converter	90X6BE6
V-4,5	Type 6SK7, 1st and 2nd IF amplifiers	90X6SK7
V-6	Type 6SH7, 3rd IF amplifier	90X6SH7
V-7	Type 6C4, oscillator	90X6C4
V-8	Type VR-150/OD3, voltage regulator	90XVR-150/OD3
V-9	Type 5Y3GT, rectifier	90X5Y3GT

Ref. No.	Description	Manufacturer's Part Number
	TUBES, RECTIFIERS AND LAMPS (Cont.)	
V-10	Type 6SC7, 1st audio amplifier and beat frequency oscillator	90X6SC7
V-11	Type 6H6, automatic volume control and automatic noise limiter	90X6H6
V-12	Type 6AL5, detector	90X6AL5
V-13	Type 6K6GT, audio output	90X6K6GT
LM-2,3	Lamp, carrier level meter light GE #44	39A003
LM-1,4	Lamp, main dial scale light GE #47	39A004
	MISCELLANEOUS	
TS-1	Terminal strip, antenna	88A032
TS-2	Terminal strip, speaker	88B578
	Escutcheon, meter	7B124
M-1	Meter, carrier level	82B166
	Plate, dial drive mounting	63B415
	Bracket, pulley mounting	67A1140
	Pulley, small idler	28A078
	Pulley, large idler	28A079
	Cord, dial	38A019
	Spring, dial cord	75A173
	Pointer, bandspread and main tuning	82A169
	Scale, dial	83D358
	Window, dial	22C284
	Flywheel, bandspread and main tuning	71A178
	Drum, bandspread and main tuning gang drives	28A080
	Shaft, bandspread and main tuning pulley drives	74A298
	Shaft, bandspread and main tuning gang drives	74A299
	Ring, retainer, tuning assembly drive shafts	76A552
	Ring, retainer, tuning assembly pulley shafts	76A551
	Washer, spring	4A043
	Coupling, bandspread gang shaft	29A126
	Coupling, main tuning gang shaft	29A123
	Shaft and index plate, band switch	74B267
	Collar, band switch	77A055
	Lock, line cord	76A397
	Knob, BANDSPREAD and MAIN TUNING	15A047
	Knob, CRYSTAL PHASING	15A087
	Knob, CW PITCH	15A089
	Knob, POWER-VOLUME, TONE and SENSITIVITY	15A097
	Knob, BAND SELECTOR	15B209
	Knob, RECEPTION	15A212
	Foot, rubber	16A007
X-1	Crystal, 455 KC	19A123

* Used on universal model SX-71U Only.

REPLACING LAMPS

Refer to Fig. 8 for the location of the dial lamps in the receiver. To gain access to the defective lamps, remove the chassis from the cabinet by removing the screws on the sides and bottom. The two end lamps are fastened by screws to an angle bracket. Remove the screws and change the lamp using a type Mazda #47 (brown bead) or equivalent. To change the two dial lamps in the center, remove the screws holding the sockets in place and replace the lamps using a type Mazda #44 (blue bead) or equivalent.

"S" METER ADJUSTMENT

MECHANICAL:

Turn off the receiver.

Immediately below the dial face of the "S" meter is a round metal disc. This disc is pivoted so that it may be moved to one side. Doing this discloses the pivot adjustment screw of the "S" meter. Use a screw driver and carefully rotate the screw in either direction until the needle indicates zero.

ELECTRICAL ADJUSTMENT:

Turn the receiver on.

Set the RECEIVE/STANDBY switch at RECEIVE.
Set BFO at OFF
Set the SENSITIVITY control at maximum.
Set the NOISE-LIMITER at OFF.
Short the antenna terminals to ground.

The "S" meter adjustment control is located on the left rear apron of the chassis. Turn this control slowly until the needle in the "S" meter indicates zero.

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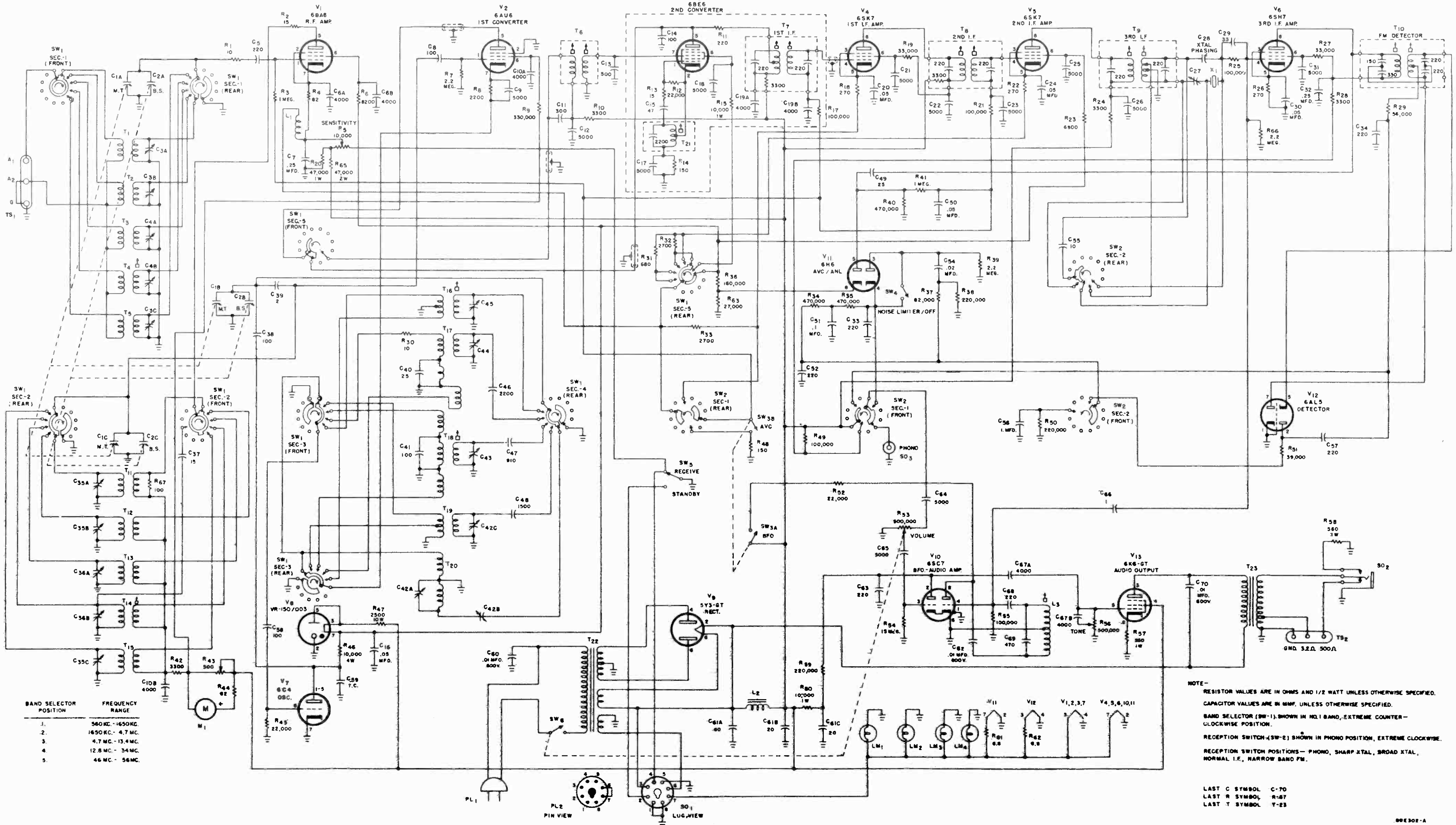
MODEL S X-71



BAND SELECTOR POSITION	FREQUENCY RANGE
1.	560 KC. - 1650 KC.
2.	1650 KC. - 4.7 MC.
3.	4.7 MC. - 13.4 MC.
4.	12.8 MC. - 34 MC.
5.	46 MC. - 56 MC.

NOTE-

RESISTOR VALUES ARE IN OHMS AND 1/2 WATT UNLESS OTHERWISE SPECIFIED.

CAPACITOR VALUES ARE IN MMF. UNLESS OTHERWISE SPECIFIED.

BAND SELECTOR (SW-1) SHOWN IN NO. 1 BAND, EXTREME COUNTER-CLOCKWISE POSITION.

RECEPTION SWITCH (SW-2) SHOWN IN PHONO POSITION, EXTREME CLOCKWISE.

RECEPTION SWITCH POSITIONS— PHONO, SHARP XTAL, BROAD XTAL, NORMAL I.F., NARROW BAND FM.

LAST C SYMBOL C-70
LAST R SYMBOL R-67
LAST T SYMBOL T-23

Fig. 10. Schematic diagram

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MODEL S-72L

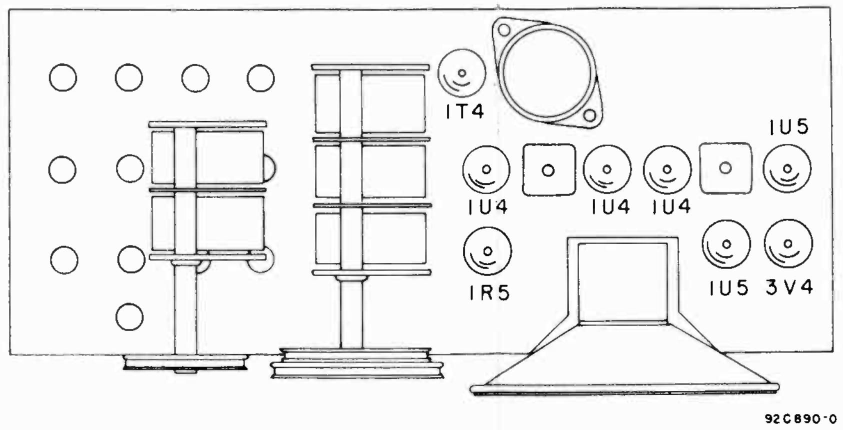

Fig. 8. Top view, location of tubes

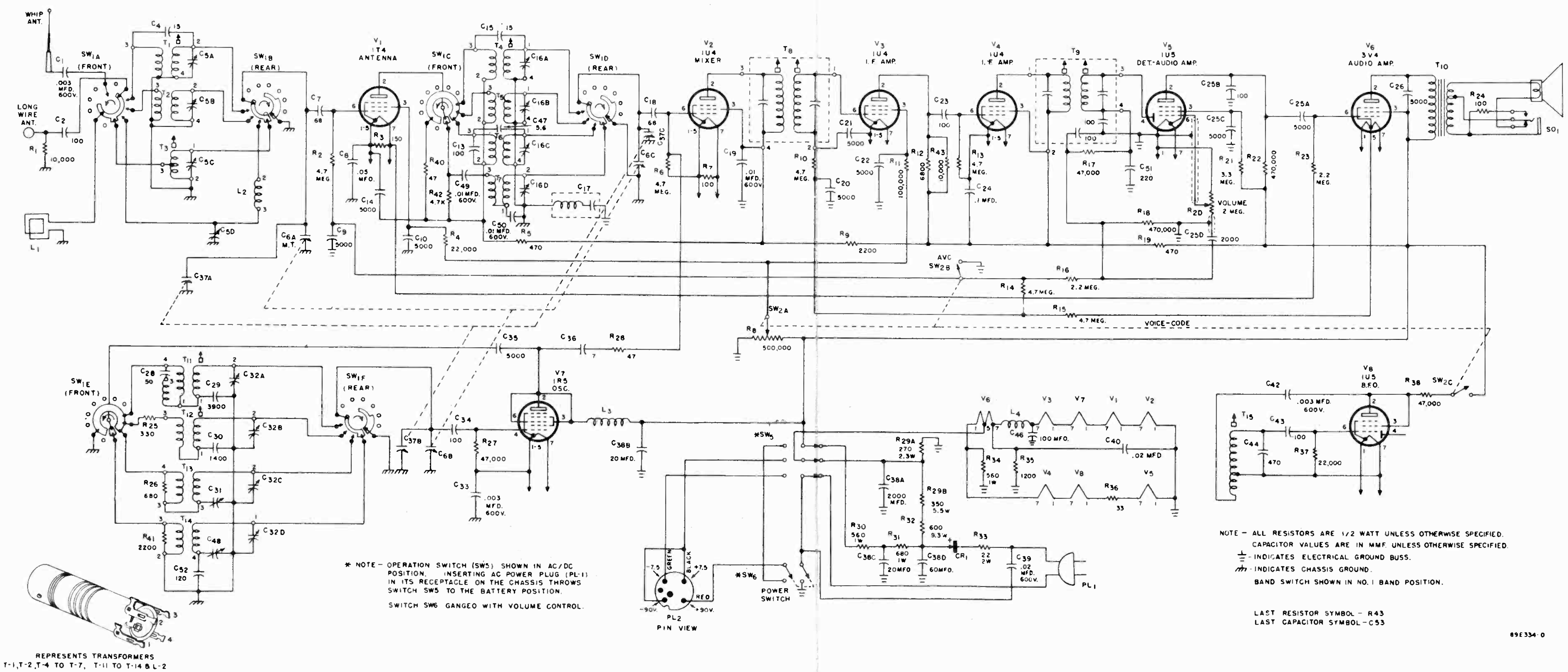

Fig. 9. Schematic diagram.

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GENERAL

Tubes . . . . Eight plus selenium rectifier

Speaker . . . . 5-inch PM

Speaker V.C. Impedance . . . 3.2 ohms (100 ohm headset tap)

Headset Output. . . . . For 500 to 5000-ohm phones

Antenna . . . . Loop for bands 1 and 2.

Whip for bands 3 and 4.

Provisions for connection to an external antenna

Tuning . . . . Manual

Tuning Range. . . . .

Band Selector Position	*Frequency Range
1.	180 kc - 400 kc
2.	550 kc - 1600 kc
3.	1.6 mc - 4.4 mc
4.	4.5 mc - 11.5 mc

*First and last dial calibration.

Intermediate Frequency. . . . 455 kc.

Power Supply. . . . . 105-125 V. DC/60 cycles AC or Battery Pack

Power Consumption . . . . . . 25 Watts

RESTRINGING DIAL CORD

GENERAL COVERAGE DIAL

The general coverage dial drive is a two string system, one between the drive shaft and the rear gang drum and the other between the front gang drum and the general coverage dial pointer. The drive shaft system requires a 30-inch length of 30 lb test dial cord, and the pointer system requires a 24-inch length of the same type cord.

To restring the drive shaft system, tie the string at position "1" (Fig. 1) and follow the sequence "1" through "11". Stretch the tension spring at "11" and tie the cord securely.

To restring the general coverage pointer drive system, tie the string at position "A" (Fig. 1) and follow the Sequence "A" through "I". Stretch the tension spring at "I" and tie the cord securely. Set the general coverage gang at maximum capacity and attach and index the pointer with the left hand reference mark on the dial scale.

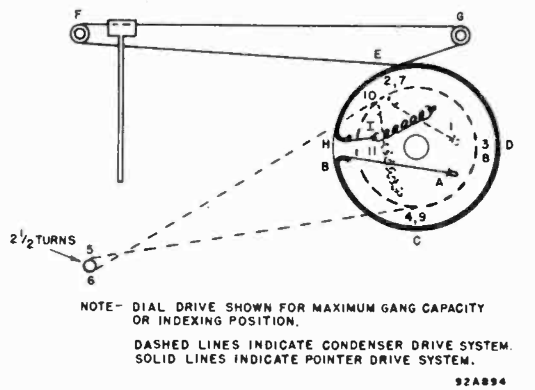
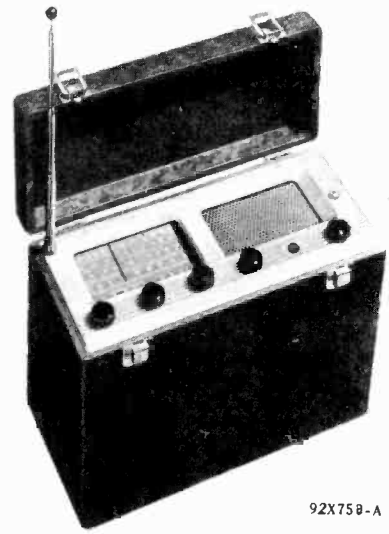


Fig. 1. Dial cable stringing procedure, general coverage



BAND SPREAD DIAL

To restring the bandspread tuning dial drive, cut an 18-inch length of 30 lb test dial cord and tie one end to the pulley anchor at position "1" shown in Fig. 2. String up the drive following the sequence "1" through "12" and at position "12" stretch the tension spring and tie the cord securely. Set the bandspread gang at minimum capacity and attach and index the pointer at "0" on the bandspread scale.

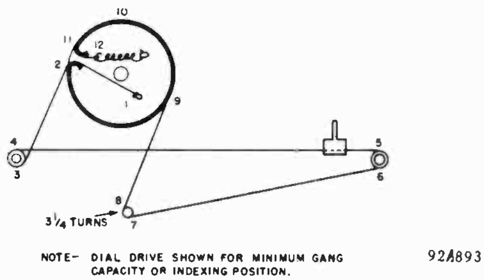


Fig. 2. Cable stringing procedure, band spread

BATTERY REPLACEMENT

A strip of canvas webbing and a hold down screw are used to keep the battery in the cabinet. To replace the battery, disconnect the battery plug and loosen the hold down screw. Refer to Fig. 3.

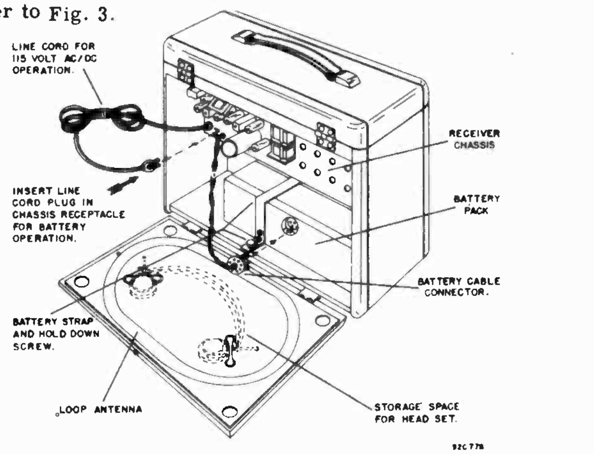


Figure 3. Battery compartment

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MODEL S-72L

Suitable replacement packs can be found from the list shown below.

REPLACEMENT BATTERY LIST

Manufacturer	Type No.	Manufacturer	Type No.
BRIGHT STAR	66-50	OLIN	0615 0614
BURGESS	G6M60 F6A60	RAY-O-VAC	AB878 AB994
DELCO	8760	RCA	VS018 VS019
EVERREADY	754 753	SEARS ROEBUCK	67E605
GENERAL	60BF65 60A6F65	USALITE	680
MONTGOMERY WARD	62A35M 62A33	WESTERN WIZARD	60B6F6/5 60A6F6/5
NATIONAL UNION	N808		

NOTE - Only one battery pack of the type listed above is required.

CAUTION - When the receiver is to operate on batteries it is necessary to insert the line cord plug in the chassis receptacle as shown in Fig. 3.

ALIGNMENT PROCEDURE

It will be necessary to remove the battery and receiver chassis from the cabinet to make the I.F. alignment adjustments. To do this remove the knobs and jack nut from the control panel; remove the panel escutcheon and unfasten the phone jack; unsolder the antenna connections, two for the loop antenna and one for the whip antenna; and remove the two wood screws anchoring the angle brackets of the chassis to the cabinet and lift out of the case.

The primaries of the I.F. transformers are adjusted from the bottom of the chassis and the secondaries are adjusted from the top of the chassis.

Before making any alignment adjustments, check the general coverage dial pointer and bandspread dial pointer for proper index. The general coverage dial pointer should index with its gang condenser set at maximum capacity and the bandspread dial pointer should index at zero with its gang condenser set at minimum capacity.

Set the following controls before alignment.

VOLUME . . . . Set at maximum

VOICE/CODE . . . . . Set max. clockwise (VOICE)

BAND SPREAD . . . . Set at 0

ALIGNMENT CHART

Step	Dummy Antenna	Signal Generator Coupling	Signal Generator Frequency	Band Switch Setting	Receiver Dial Setting	Adjust	Remarks
1.	None	Stator plates in center section of tuning gang	455 kc	"1"	1000 kc	A,B,C,D	Maximum audio output at speaker voice coil. Use just enough signal generator output to obtain a 50 mw signal level.
2.	None	See step 1.	455 kc (No mod.)	"1"	1000 kc	E	With the VOICE/CODE control set for code reception, adjust E for a 1000 cycle note.
3.	10 mmf from ext. antenna lead to chassis.	Couple the generator to the ext. ant. lead thru a 15 mmf capacitor	11.5 mc	"4"	11.5 mc	*F,G,H	Maximum output as in step 1.
			5 mc		5 mc	*S1,S2, S3	
4.	See step 3	See step 3	4.4 mc	"3"	4.4 mc	*I,J,K	Maximum output as in step 1.
			1800 kc		1800 kc	*S4	
**5.	See step 3	See step 3.	1500 kc	"2"	1500 kc	*L,M,N	Maximum output as in step 1.
			600 kc		600 kc	*P	
**6.	See step 3.	See step 3.	400 kc	"1"	400 kc	*Q,R,S	Maximum output as in step 1.
			180 kc		180 kc	*T,U	

NOTES -

*Calibration adjustment.
**Loop must be connected for this step.

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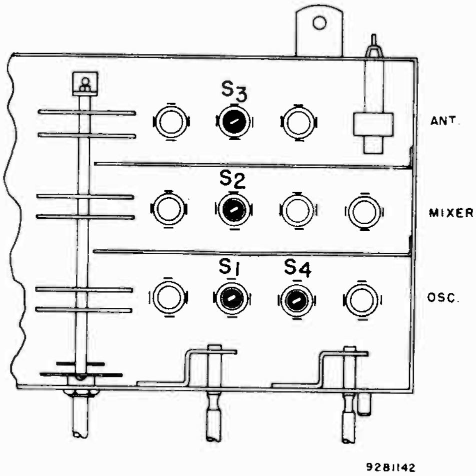

Bottom view alignment points.

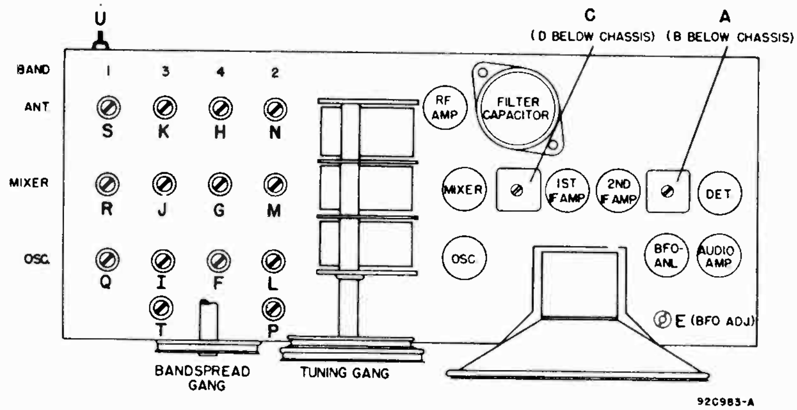

Figure 4. Alignment points

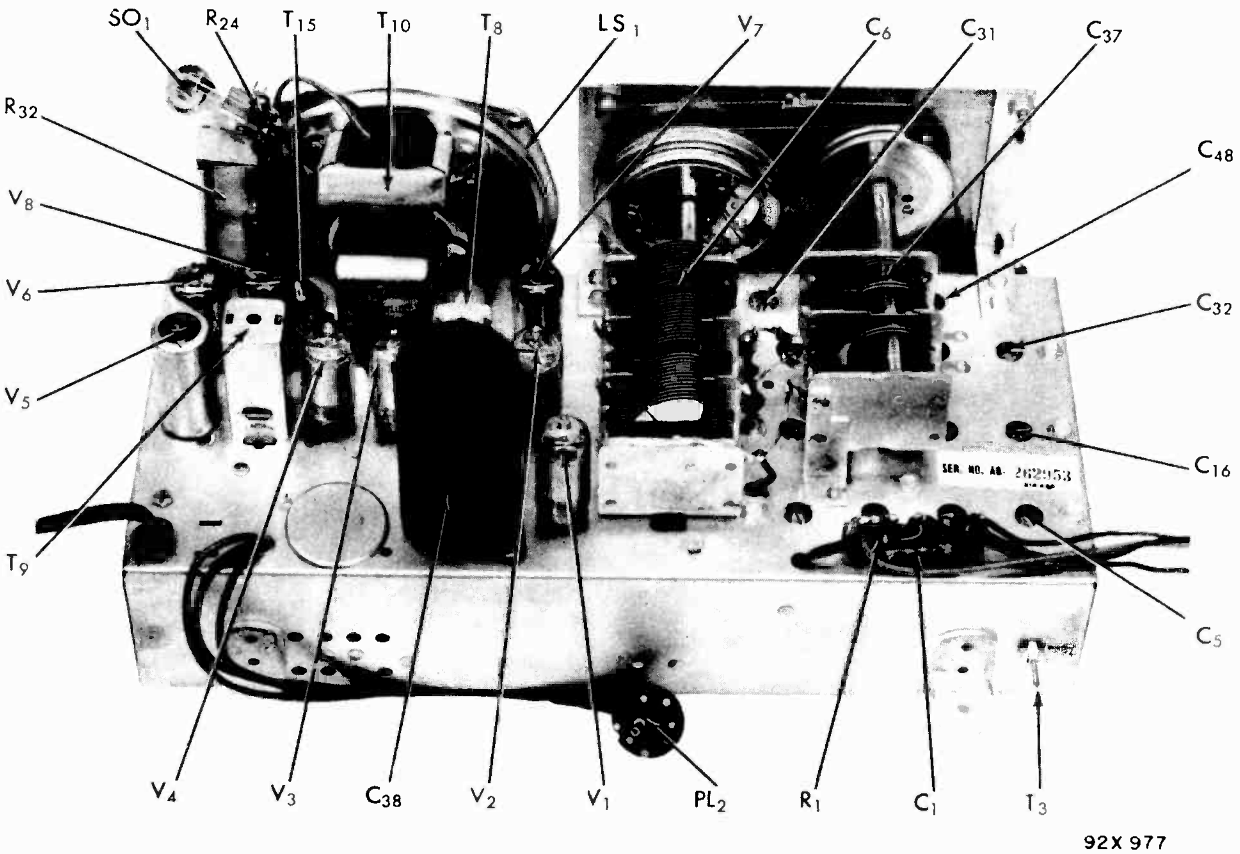

Figure 5. Top view, component location

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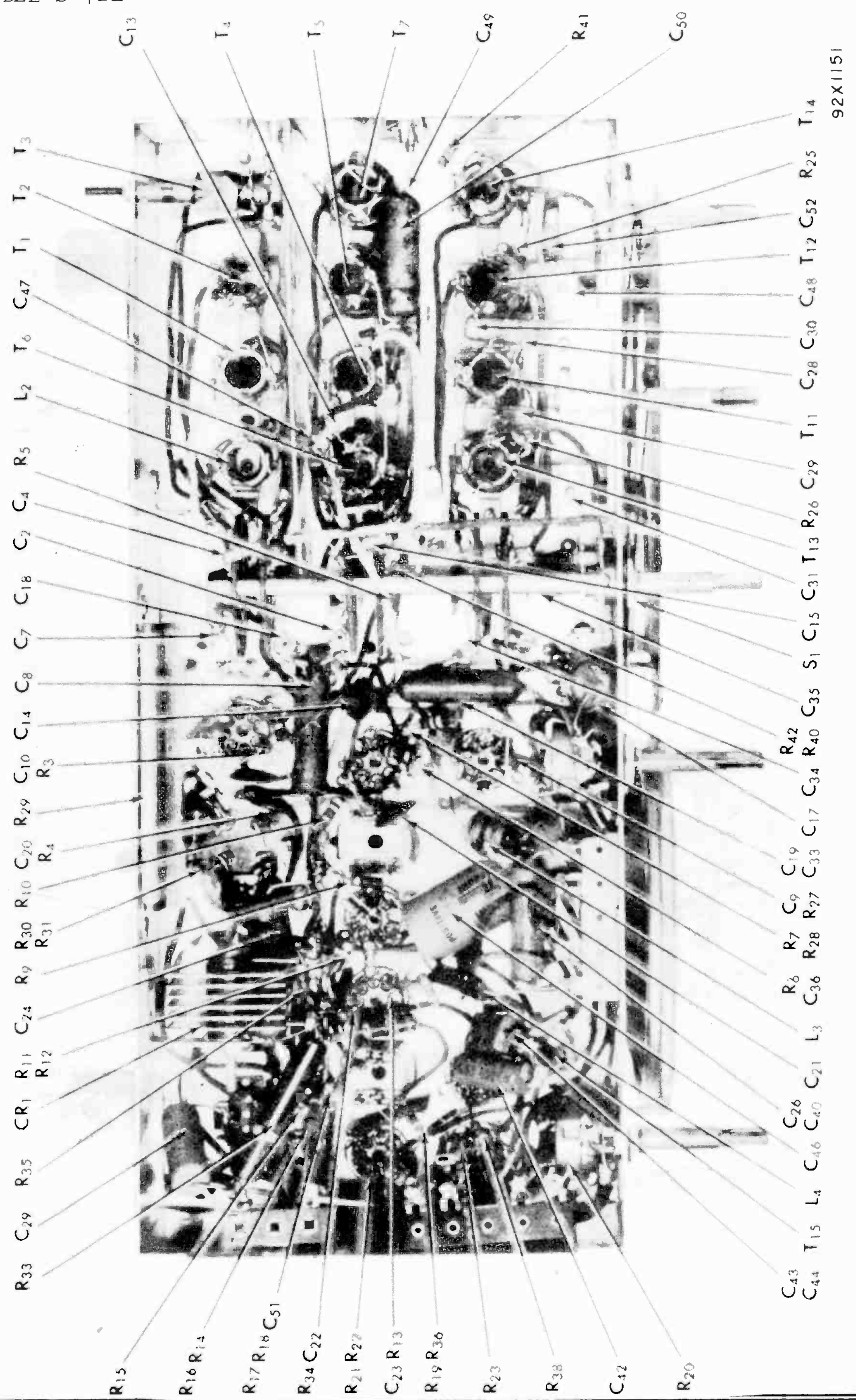

Figure 6. Bottom view, component location

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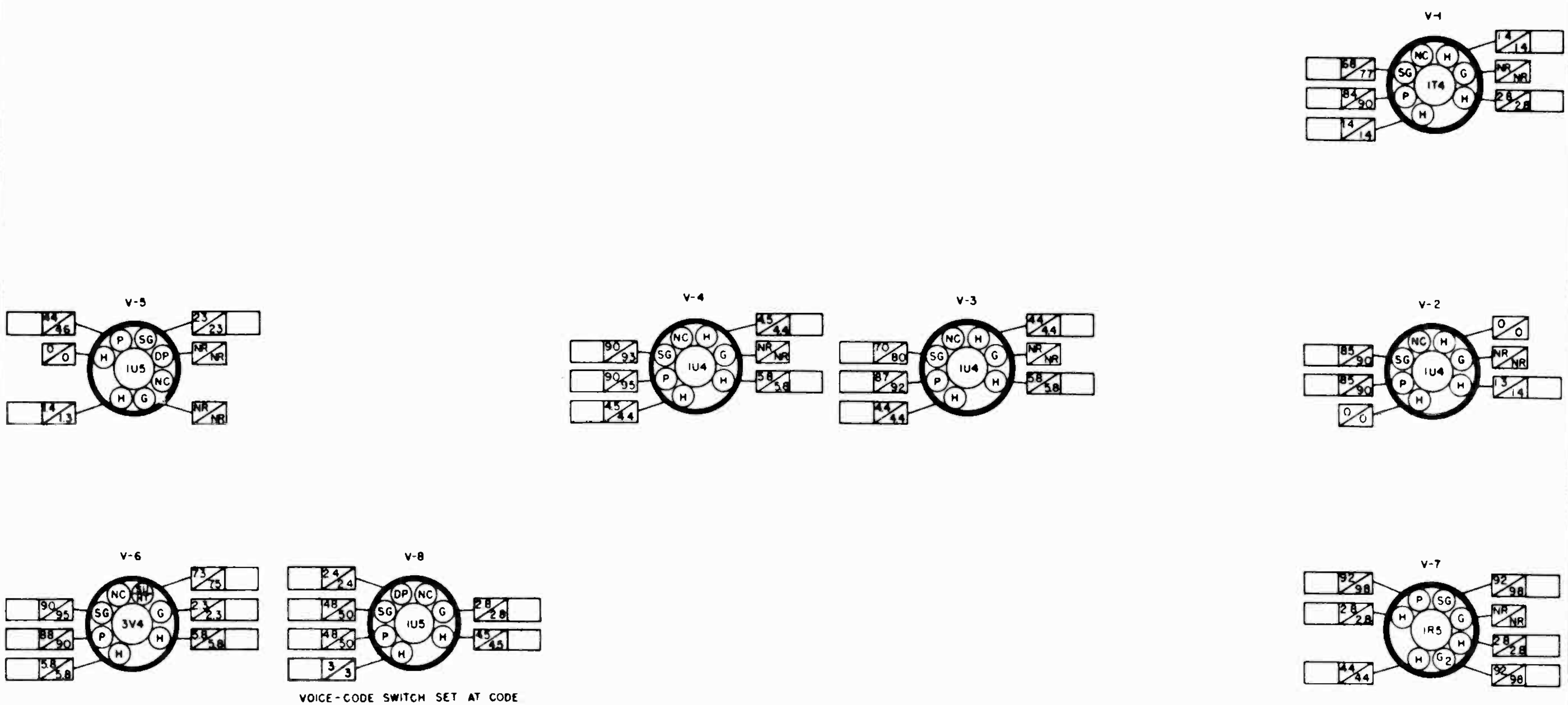

FRONT APRON
BOTTOM VIEW OF CHASSIS

NOTES –

1. SOCKET VIEWS ARE BOTTOM VIEWS
2. ALL VOLTAGES ARE MEASURED BETWEEN TUBE SOCKET TERMINALS & THE ELECTRICAL GROUND BUSS (NOT CHASSIS) WITH ZERO SIGNAL INPUT
3. LINE VOLTAGE — 117V AC. BATTERY VOLTAGES TAKEN WITH FRESH BATTERY PACK.
4. ALL VOLTAGES SHOWN ARE DC UNLESS OTHERWISE SPECIFIED
5. DC VOLTAGES SHOWN WERE MEASURED WITH AN ELECTRONIC VOLTMETER
6. "NC" — NO CONNECTION
7. "NR" — NOT READABLE (READING GENERALLY MEANINGLESS)
8. ☐ SPACE PROVIDED FOR SERVICE METER READINGS.
9. ⧄ UPPER VOLTAGE READINGS IN INDICATOR SPACE SHOW BATTERY OPERATION
10. VOLTAGES FOR TUBE V-8, ARE SHOWN WITH VOICE-CODE SWITCH IN CODE POSITION.
11. ALL READINGS TAKEN WITH LINE PLUG POLARIZED SO THAT GROUND BUSS & CHASSIS ARE AT SAME POTENTIAL AS THE CHASSIS GROUND.

92D777

Figure 7. Tube socket voltage chart

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MODEL S-72L

SERVICE PARTS LIST

Ref. No.	Description	Manufacturer's Part Number
	CAPACITORS	
C-1,33,42	.003 mfd., 600 V., tubular	46AZ302J
C-2,13,23,34	100 mmf., 500 V., ceramic	47B20101K5
C-4,15	15 mmf., 500 V., ceramic	47B20150K5
C-5	Trimmer, ant. ass'y., 4 sections (Bands 1,2,3,4)	44B385
C-6	Tuning capacitor, 3 sections	48C221
C-7,18	68 mmf., 500 V., ceramic	47B20680K5
C-8	.05 mfd., 200 V., tubular	46AU503J
C-9,10,14,20 21,22,26 35	5000 mmf., 500 V., ceramic	47A168
C-16	Trimmer, mixer ass'y., 4 sections, (Bands 1,2,3,4)	44B386
C-17	Capacitor, resonant (455KC)	46A174
C-19,49,50	.01 mfd., 600 V., tubular	46AY103J
C-24	.1 mfd., 200 V., tubular	46AU104J
C-25	Capacitor, composite; .002, .005, .0001, .005 mfd., 500 V., ceramic	47A203
C-28	50 mmf., 500 V., ceramic	47B20500K5
C-29	3900 mmf., 500 V., mica	47X35A392J
C-30	1400 mmf., 500 V., mica	47X30A142J
C-31	Padder, adjustable (Band 2)	44A376
C-32	Trimmer, osc. ass'y., 4 section (Bands 1,2,3,4)	44B387
C-36	7 mmf., 500 V., ceramic	47X20UK070K
C-37	Capacitor, band spread	48C227
C-38	60-20-20 mfd., 150 V., 2000 mfd., 15 V., electrolytic	45B162
C-39	.02 mfd., 600 V., moulded paper	46BR203L6
C-40	.02 mfd., 200 V., tubular	46AU203J
C-43	100 mmf., 500 V., mica	47X20A101M
C-44	470 mmf., 500 V., mica	47X20A471K
C-46	100 mfd., 25 V., electrolytic	45A116
C-47	5.6 mmf., 500 V., composition	47A160-7
C-48	Padder, adjustable (Band 1)	44A384
C-51	220 mmf., 500 V., ceramic	47B20221K5
C-52	120 mmf., 500 V., mica	47X20B121K
	RESISTORS	
R-1,43	10,000 ohms, 1/2 watt, carbon	23X20X103K
R-2,6,10, 13,14,15	4.7 megohms, 1/2 watt, carbon	23X20X475M
R-3	150 ohms, 1/2 watt, carbon	23X20X151K
R-4,37	22,000 ohms, 1/2 watt, carbon	23X20X223K
R-5,19	470 ohms, 1/2 watt, carbon	23X20X471K
R-7,24	100 ohms, 1/2 watt, carbon	23X20X101K
R-8	Resistor, variable, 500,000 ohms, VOICE/CODE control	25B847
R-9,41	2200 ohms, 1/2 watt, carbon	23X20X222K
R-11	100,000 ohms, 1/2 watt, carbon	23X20X104K
R-12	6800 ohm, 1/2 watt, carbon	23X20X682K
R-16,23	2.2 megohms, 1/2 watt, carbon	23X20X225M
R-17,27,38	47,000 ohms, 1/2 watt, carbon	23X20X473K
R-18,22	470,000 ohms, 1/2 watt, carbon	23X20X474K
R-20	Resistor, variable, 2 megohms, VOLUME control	25B839
R-21	3.3 megohms, 1/2 watt, carbon	23X20X335M
R-25	330 ohms, 1/2 watt, carbon	23X20X331K
R-26	680 ohms, 1/2 watt, carbon	23X20X681K
R-28,40	47 ohms, 1/2 watt, carbon	23X20X470K
R-29	270 ohms, 2.3 watts; 350 ohms, 5.5 watts; WW	24A912
R-30,34	560 ohms, 1 watt, carbon	23X30X561K
R-31	680 ohms, 1 watt, carbon	23X30X681K
R-32	600 ohms, 9.3 watts, WW	24A913
R-33	22 ohms, 2 watts, WW	24BV220E
R-35	1200 ohms, 1/2 watt, carbon	23X20X122K
R-36	33 ohms, 1/2 watt, carbon	23X20X330K
R-42	4700 ohms, 1/2 watt, carbon	23X20X472K

Ref. No.	Description	Manufacturer's Part Number
	TRANSFORMERS AND COILS	
T-1	Transformer, antenna stage, band 4	51B1250
T-2	Transformer, antenna stage, band 3	51B1137
T-3	Transformer, antenna stage, band 1	51B1191
T-4	Transformer, mixer stage, band 4	51B1253
T-5	Transformer, mixer stage, band 3	51B1248
T-6	Transformer, mixer stage, band 2	51B1247
T-7	Transformer, mixer stage, band 1	51B1192
T-8	Transformer, 1st I.F.	50C233
T-9	Transformer, 2nd I.F.	50C234
T-10	Transformer, audio output (part of speaker ass'y. LS-1)	
T-11	Transformer, osc. stage, band 4	51B1254
T-12	Transformer, osc. stage, band 3	51B1255
T-13	Transformer, osc. stage, band 2	51B1144
T-14	Transformer, osc. stage, band 1	51B1193
T-15	Transformer, B.F.O. (With mtg. clip)	50B402
L-1	Loop antenna	57C125
L-2	Coil, antenna loading band 2	51B1136
L-3	Choke, R.F.	53A008
L-4	Choke, filament	53A121
	SWITCHES	
SW-1	Switch, band (6 section ass'y. complete)	60C380
SW-2	Switch, VOICE/CODE, (Part of r-f gain control, R-8)	
SW-5	Switch, AC/DC - battery change over	60A363
SW-6	Switch, ON-OFF (D.P.S.T. power switch, part of volume control R-20)	
	PLUGS AND SOCKETS	
PL-1	Line cord	87B1683
PL-2	Battery plug, 6 prong	10A344
SO-1	Jack, phone	36A036
	TUBES AND RECTIFIERS	
V-1	Type 1T4, r-f amplifier	90X1T4
V-2,3,4	Type 1U4, mixer, 1st and 2nd i-f amplifier	90X1U4
V-5,8	Type 1U5, detector and B.F.O.	90X1U5
V-6	Type 3V4, audio power amplifier	90X3V4
V-7	Type 1R5, oscillator	90X1R5
CR-1	Rectifier, selenium	27A151
	MISCELLANEOUS	
	Socket, 7 prong miniature (tube)	6B300
	Lock, line cord (Female)	76A397-2
	Lock, line cord (Male)	76A397-1
	Escutcheon	7D109
	Escutcheon, dial	22B250
	Plate, dial (calibrated)	83C359
	Knob	15B172
	Knob (with dot)	15B177
	Pointer, main tuning	82A161
	Pointer, band spread	82A161-1
	Cord, dial drive	38A001
	Cord, pointer drive	38A017
	Spring, dial drive	75A012
	Pulley, idler	28A052-7
	Shaft, tuning	74A274
	Antenna, whip	57B142
	Antenna, insulator	65A534
LS-1	Speaker	85C093
	Strap, battery	76B467
	Cabinet	78F491

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The RF section uses separate oscillator and mixer tubes to allow maximum conversion gain over the short wave bands. The mixer and I.F. stages use 12SH7 high frequency type tubes and the sensitivity thus obtained is higher than normally obtained with an additional stage. Full AVC action is provided with both I.F. and mixer tubes controlled. Diode detection is used for maximum fidelity. The 12A6 beam power output is driven by the pentode section of the 12C8, giving adequate output. Inverse feedback is used from the voice coil winding to the 12A6 cathode, improving the frequency response.

The power supply uses a 5Y3 full wave rectifier and a husky, high quality varnish impregnated power transformer, with a metal cased filter condenser for adequate filtering and long life, thus providing full operating voltages for all tubes.

NOTE: If replacement of the 1626 oscillator tube is required, either another 1626, or a 12J5 tube may be used.

The band switching coil unit is assembled on a separate small chassis to simplify its construction resulting in one of the simplest coil turrets ever designed. The IF transformers are of the dual iron core tuned type which give the greatest gain per stage and are far more stable than the cheaper trimmer type usually supplied. The six inch calibrated slide rule dial has a 9 to 1 vernier drive to allow tuning of weak short wave signals.

Upon completion of the wiring, the tuned circuits must be aligned to produce maximum sensitivity and selectivity, and to calibrate the dial scale. If a signal generator is available (your own, or borrowed from a friend), follow the procedure as outlined. If a signal generator cannot be obtained, we suggest that you have your local radio service man align the receiver in accordance with the instructions in this manual.

For local reception, a short indoor antenna is generally sufficient. For best reception, a high outdoor antenna is recommended. The antenna should be connected to the antenna terminal (screw terminal nearest edge of chassis).

A ground connection may improve reception also, and should be tried if maximum performance is desired. For a good ground, use a COLD water pipe or a ground rod. Use as short and direct a wire as possible between the pipe or rod and the ground terminal (screw terminal farthest from edge of chassis).

A loudspeaker of the PM dynamic type with 3-4 ohm voice coil impedance should be connected to the set by attaching the two prong speaker plug to the speaker leads and plugging into the speaker socket. If a 6-8 ohm speaker is available, it may be used without materially affecting the performance. For best results in small cabinets, we recommend the Heathkit 5" speaker (Stock #320). If a larger cabinet is available, the Heathkit 8" speaker (Stock #325) will provide better reproduction of the lower register.

A record player or changer using a crystal type pickup cartridge may be connected to this receiver to provide superior reproduction of recordings. Connect the pickup by plugging the lead into the phono socket. If your player does not have the standard plug, remove existing plug and attach the phono plug supplied with the kit. Plug the line cord for the turn table motor into the 110V. outlet on the chassis.

The phono-radio switch is combined with the tone control. Turning the control fully counter-clockwise connects the record player, while turning the control fully clockwise connects the radio circuits. Full use of the tone control is possible on either switch setting.

Four controls are provided on the front of the receiver. From left to right, they are the on-off switch and volume control, the phono-radio switch and tone control, the tuning control and the bandswitch.

NOTE: The pilot light is connected in the rectifier circuit to permit the use of a standard pilot light bulb. The socket is, therefor, about 300 Volts above chassis. DO NOT TOUCH SOCKET WITH SET TURNED ON.

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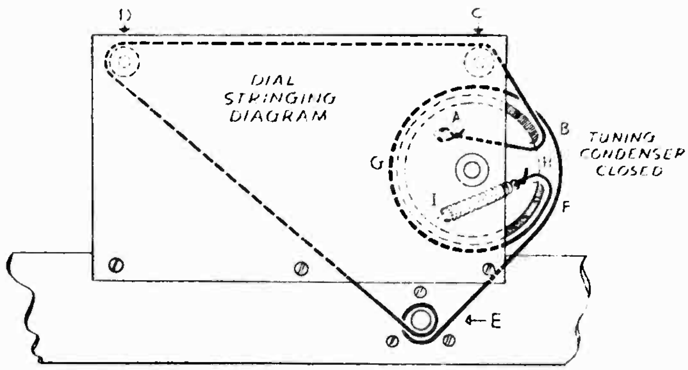
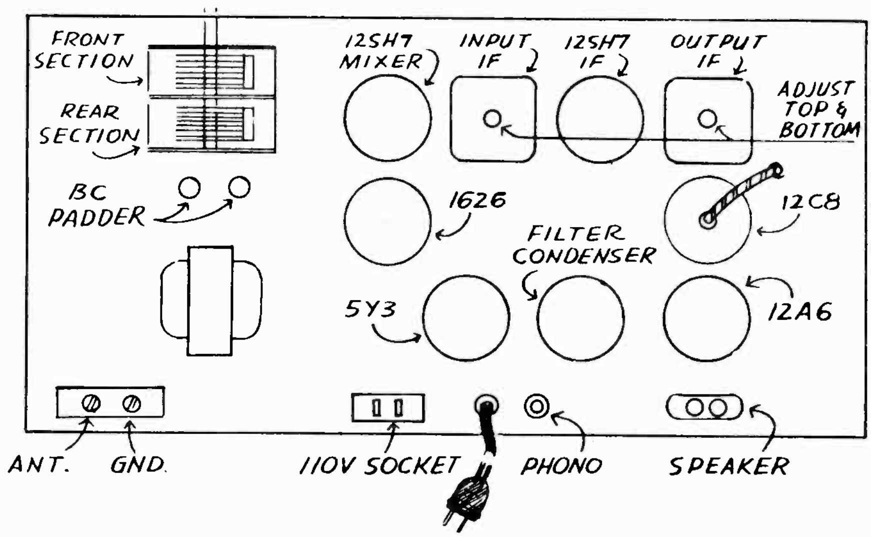
MODEL AR-1



TOP VIEW OF CHASSIS SHOWING LOCATION OF TUBES - I.F. ADJUSTMENT SCREWS - B.C. PADDER (SEE COIL BRACKET PICTORIAL FOR S.W. - POLICE - B.C. ADJUSTMENT SCREWS) . . . .



ALIGNMENT

Connect a signal generator ground lead to the chassis. Connect the signal generator output ("hot") lead through a .01 MFD condenser to pin #4 on the 12SH7 IF socket (IF grid). Turn signal generator on and set to 456 kc. The signal, if modulated, may be observed by noting the loudness at the speaker, or on the scale of an output meter connected across the speaker terminals. If the signal is unmodulated it may be observed on the scale of a vacuum tube voltmeter connected across the volume control. With the volume and tone controls turned fully clockwise, turn the brass screws in the top and bottom of the output IF transformer for maximum indication. Use as low an indication as possible by reducing the output from the signal generator as the receiver sensitivity increases.

Without disturbing the signal generator dial, remove the .01 MFD condenser from pin #4 on the 12SH7 IF socket and connect to pin #4 on the 12SH7 mixer socket (mixer grid). Set band switch to center (BC) position. Remove 1626 (oscillator) tube from its socket. Adjust the brass screws in top and bottom of input IF transformer for maximum indication as described in step 23. Note: Do not adjust the output IF screws with the signal generator connected to the converter grid. This completes the IF alignment.

Replace the oscillator tube. Remove the generator from the converter grid. Connect the generator to the ANT. post through a 400 ohm resistor (used as dummy antenna). Set band-switch clockwise to SW position. Turn tuning condenser till fully unmeshed or open. Set signal generator to 20.5 MC. Adjust the SW oscillator trimmer for reception of signal. Then check if setting is correct by tuning signal generator to 21.412 MC. (approximately), where the image should be observed. If the second signal is found at a signal generator setting of 19.588 MC. (approximately), the SW oscillator trimmer should be unscrewed slightly until proper response is obtained. Now set signal generator to 18 MC. Tune receiver to receive this signal at 18 MC., and adjust SW antenna trimmer for maximum indication. This completes the SW alignment.

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Set the bandswitch counter clockwise to the police band. Turn tuning condenser till fully unmeshed or open. Set signal generator to 5.6 MC. Adjust the police oscillator trimmer for reception of signal. Then check if setting is correct by tuning signal generator to 6.512 MC. (approximately), where the image should be observed. If the second signal is observed at a signal generator setting of 4.688 MC. (approximately), the police oscillator trimmer should be unscrewed until proper response is obtained. Now set signal generator to 5.0 MC. Tune receiver to receive this signal at 5.0 MC., and adjust police antenna trimmer for maximum indication. This completes the police band alignment.

Remove the 400 ohm resistor and use a 250 MMF condenser instead in series with the signal generator to the ANT. post. Set the bandswitch to center position (BC). Turn tuning condenser till fully unmeshed or open. Set signal generator to 1620 kc. Adjust the BC oscillator trimmer for reception of signal. Reset signal generator to 540 kc. Turn tuning condenser till fully meshed or closed. Adjust the BC Padder for maximum indication. Recheck the BC oscillator trimmer adjustment, as above. Set signal generator to 1500 kc. Tune receiver to receive this signal at 1.5 MC., and adjust BC antenna trimmer for maximum indication. This completes the alignment of the receiver.

Check the voltages at the tube sockets. A table of approximate voltages is given below. These readings were obtained with a Heathkit VTVM with 11 megohms input resistance. Variations of plus or minus 15% may be expected.

Pin No.	1626	12SH7 Mixer	12SH7 I.F.	12C8	12A6	5Y3
1	0	0	0	0	0	
2	10-14 VAC	10-14 VAC	10-14 VAC	10-14 VAC	10-14 VAC	290-330
3	70-120	1-2	$\frac{1}{2}$-1	50-90	280-320	
4	0	Slightly Neg.	Slightly Neg.	Slightly Neg.	220-260	300-340VAC
5	5-50 V Neg.	1-2	$\frac{1}{2}$-1	Slightly Neg.	0	
6		120-150	120-150	25-50		300-340VAC
7	0	0	0	0	0	Tie Point
8	0	220-260	220-260	0	9-15	290-330

HEATHKIT REPLACEABLE PARTS AVAILABLE

AR29 15-10 MFD--El. Cond. . .
AR10 Dual Tuning Cond. . . . .
AR18 1 Meg. Control w. Sw. . .
AR41 500 K. Control w. Sw. . . .
AR37 4 Pole 3 pos. Bandsw. . .
BR16 Input IF Transformer . . .
BR17 Output IF Transformer . .
BR24 Power Transformer. . . .
AR44 Output Transformer . . .
BR13 Ant. Pri. (BC) Coil . . . .
BR14 Ant. Sec. (BC) Coil . . . .
BR15 Oscillator (BC) Coil. . . .
PR10 Ant. (Police) Coil. . . . . . .
PR11 Oscillator (Police) Coil . .
SR10 Ant. (SW) Coil . . . .
SR11 Oscillator (SW) Coil. . . .
AR48 Panel . . . .

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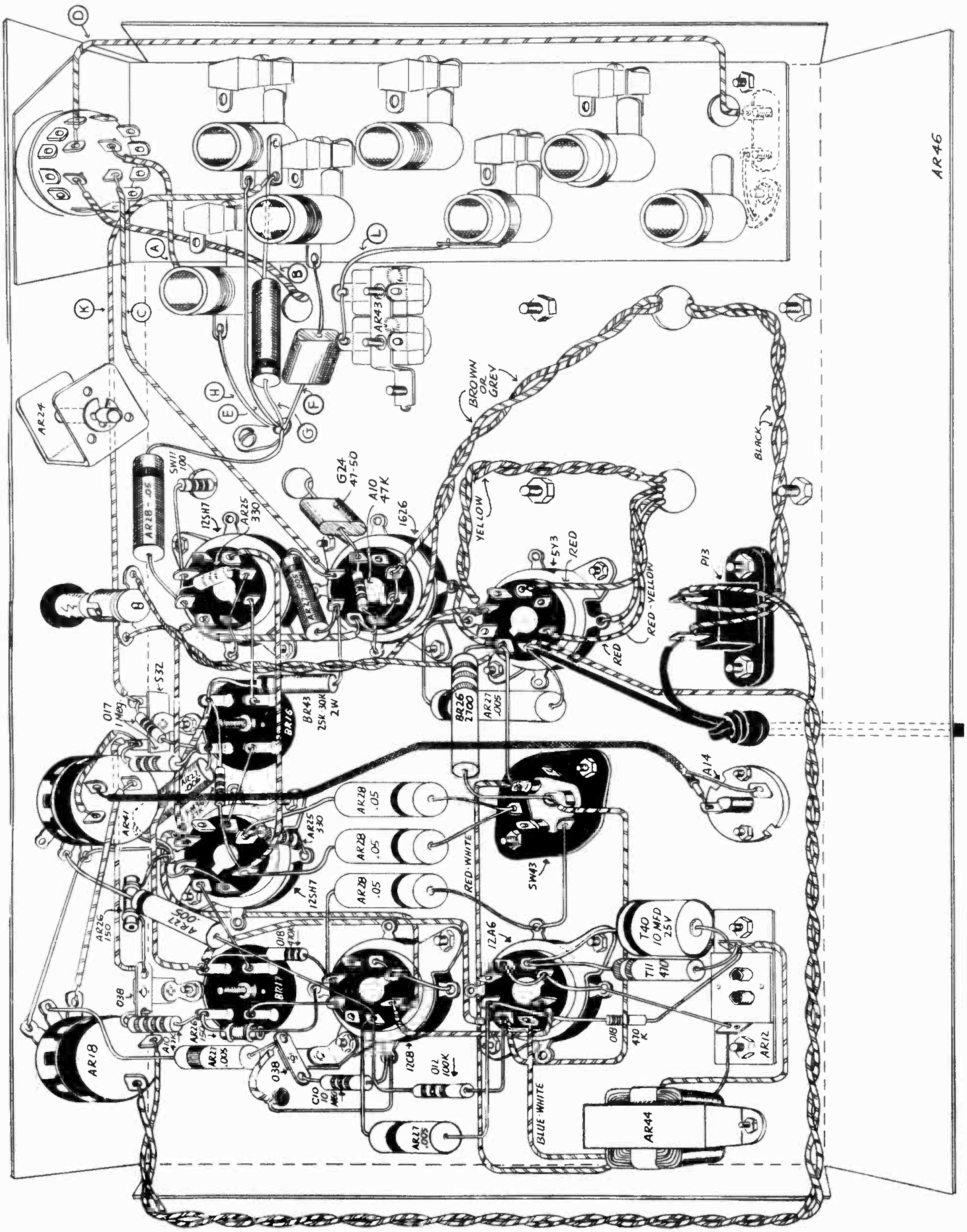
MODEL AR-1



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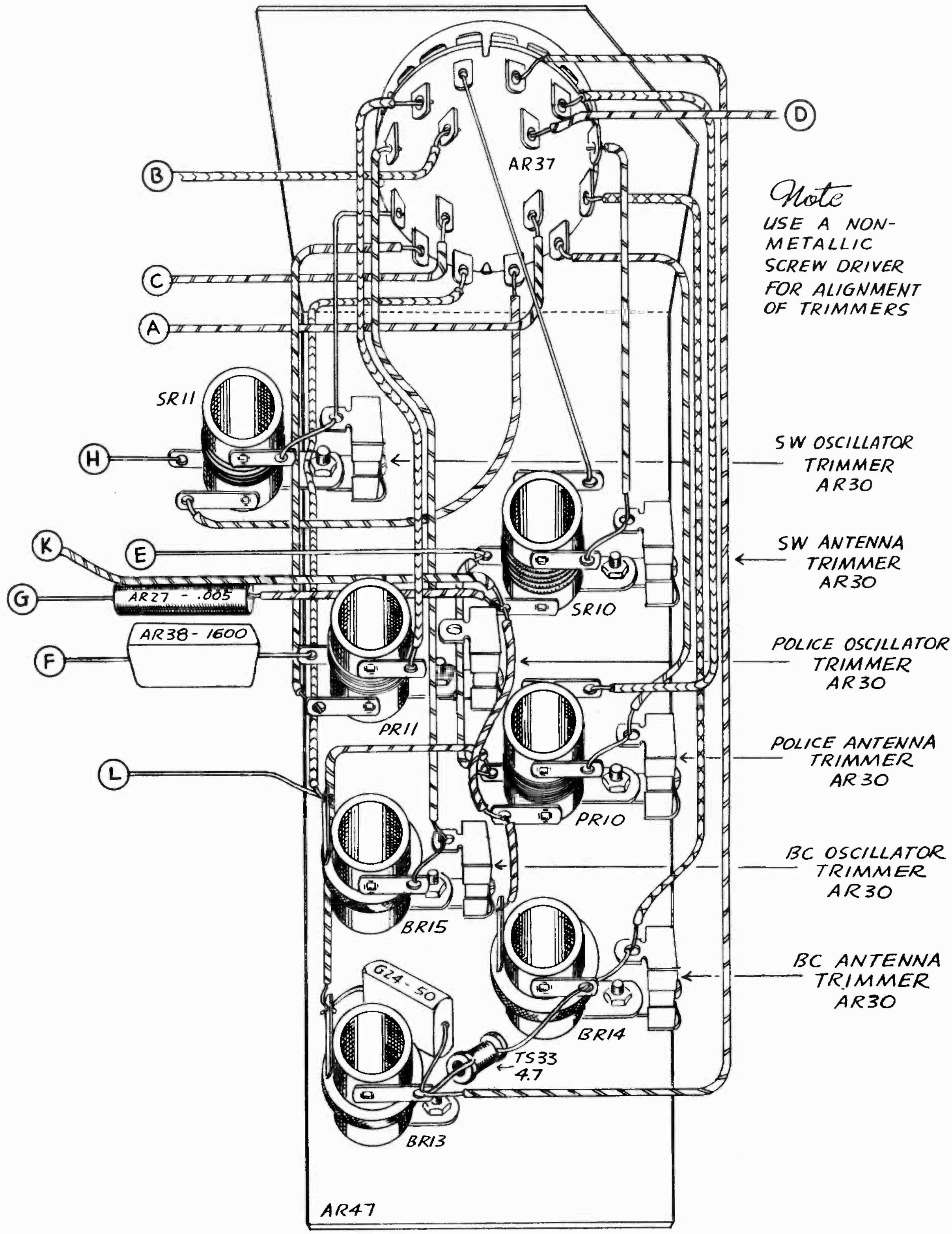

Note
USE A NON-METALLIC SCREW DRIVER FOR ALIGNMENT OF TRIMMERS

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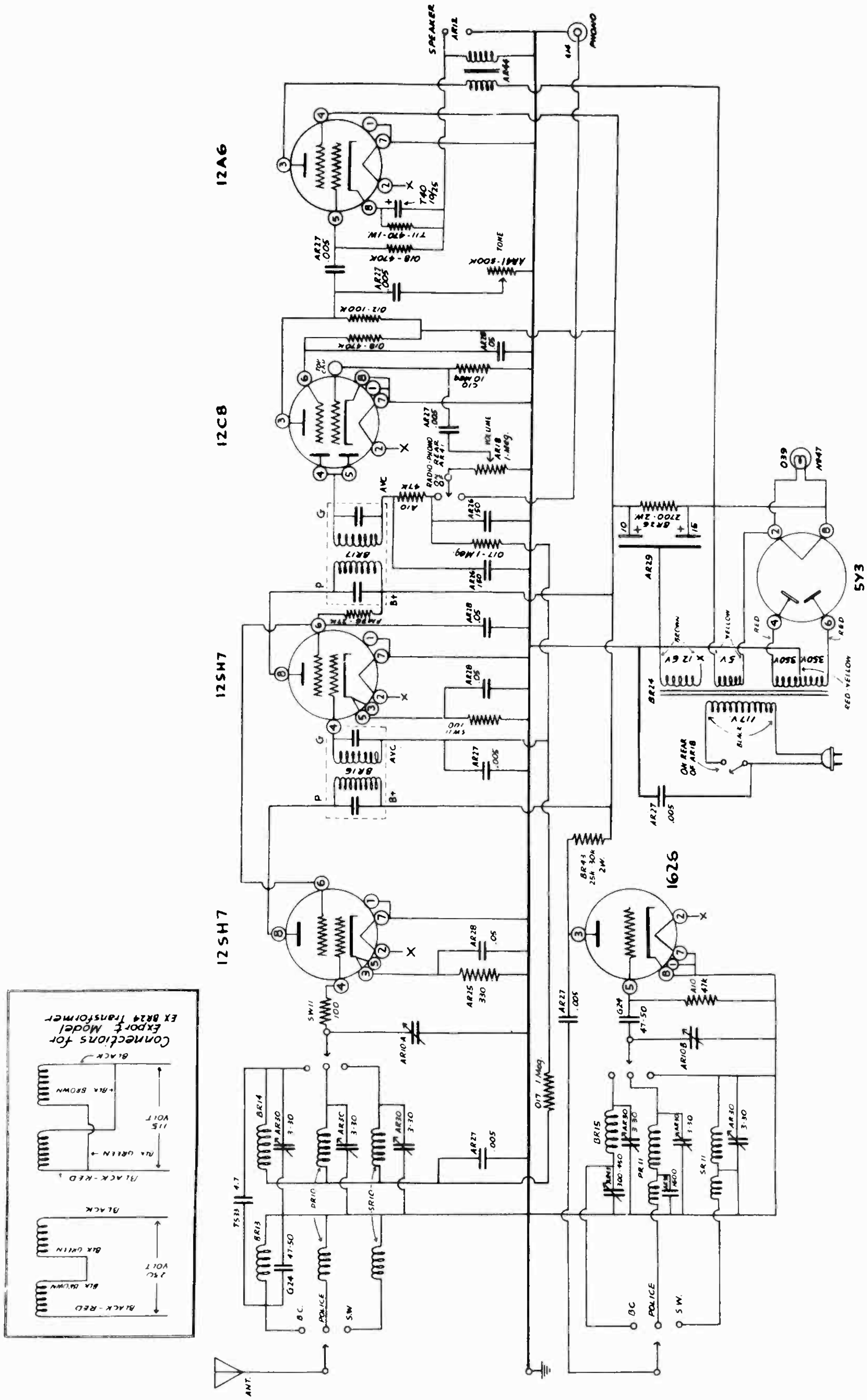
MODEL AR-1



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AR - 1 PARTS LIST

Part No.	Parts Per Kit	Description
Resistors		
SW11	2	100 Ohm
AR25	1	330 Ohm
T11	1	470 Ohm 1 Watt
BR26	1	2.700 Ohm 2 Watt
FM36	1	27 K Ohm
BR43	1	25K-30K Ohm 2 Watt
A10	2	47 K Ohm
O12	1	100 K Ohm
O18	2	470 K Ohm
O17	2	1 Megohm
C10	1	10 Megohm
Condensers		
TS33	1	4.7 MMF Ceramic
G24	2	47-50 MMF Mica
AR26	2	150 MMF Ceramic
AR38	1	1,600 MMF Mica
AR27	7	.005 MFD Paper
AR28	4	.05 MFD Paper
T40	1	10 MFD-25V. Electrolytic
AR29	1	15 - 10 MFD-450V Electro-
AR30	6	3-30 MMF Trimmer
AR43	1	300-450 MMF Padder
AR10	1	Dual tuning Condenser
Coils		
BR13	1	Ant. Pri (BC)
BR14	1	Ant. Sec. (BC)
BR15	1	Oscillator (BC)
PR10	1	Antenna (Police)
PR11	1	Oscillator (Police)
SR10	1	Antenna (SW)
SR11	1	Oscillator (SW)
BR16	1	Input IF Transformer
BR17	1	Output IF Transformer
Controls-Switches		
AR18	1	1 Megohm with SPST Sw.
AR41	1	500K Ohm with SPDT Sw.
AR37	1	4 Pole 3 Pos. Bandswitch
Tubes-Lamps		
K42	1	1626 or 12J5 tube
AR31	2	12SH7 or 12SH7GT Tubes
K24	1	12C8 Tube.
K23	1	12A6 or 12A6GT Tube
O66	1	5Y3GT Tube
O39	1	#47 Pilot Lamp
Grommets-Wafer-Clip-Lugs		
O35	1	3/8 Grommet
C24	1	7/16 Grommet
SW43	1	Condenser Mounting Wafer
K18	1	Grid Clip
O37	2	Solder Lugs

Part No.	Parts Per Kit	Description
Sockets-Plugs-Terminal Strips		
AR32	6	Tube Sockets
AR12	1	Speaker Socket
AR13	1	Speaker Plug
A14	1	Phono Socket
A19	1	Phono Plug
P13	1	110V Socket
C25A	1	Pilot Lamp Socket
FM17	1	Dual Binding Post
O38	2	Single Terminal Strip
S32	1	Dual Terminal Strip
Dial Parts-Knobs		
AR42	1	Dial Drum Assembly
AR16	1	Dial Plate Assembly
FM20	1	Dial Cord
FM21	1	Dial Cord Spring
AR33	1	Dial Pointer
AR24	1	Drive Shaft Bracket
AR21	1	Drive Shaft
AR23	2	"E" Washers
V48	4	Acorn Knobs
Transformers		
BR24	1	Power
AR44	1	Output
Screws-Nuts-Washers-Spacers		
O31	41	6-32 x 3/8 Screws
IB48	1	6-32 x 1 Screw.
TC46	7	#6 x 5/8 Sheet Metal Screws
G52	4	8-32 x 3/8 Screws
S22	43	6-32 Nuts
TP16	4	8-32 Nuts
O33	4	Control Nuts
TS72	46	#6 Lockwashers
BR36	4	#8 Lockwashers
O101	4	Control Lockwashers
FM18	1	8-32 x 3/16 Set Screw
AR35	3	1/8" Spacer
AR45	3	3/16" Spacer
AR36	5	3/8" Spacer
Wire-Spaghetti		
AR19	1	Line Cord
IB43	1	Length Bare Wire
A21	1	Length Shielded Wire
O77	1	Roll Hookup Wire
O81	1	Length Spaghetti
CHASSIS PARTS		
AR46	1	Chassis
AR47	1	Coil Mounting Bracket
BR35	1	Panel
BR19	4	Angle Brackets

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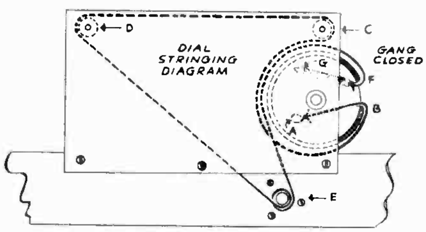
MODEL BR-1

A ground connection may improve reception also, and should be tried if maximum performance is desired. For a good ground, use a COLD water pipe or a ground rod. Use as short and direct a wire as possible between the pipe or rod and the ground terminal (screw terminal farthest from edge of chassis).

A loudspeaker of the PM dynamic type with 3-4 ohm voice coil impedance should be connected to the set by attaching the two prong speaker plug to the speaker leads and plugging into the speaker socket. If a 6-8 ohm speaker is available, it may be used without materially affecting the performance.

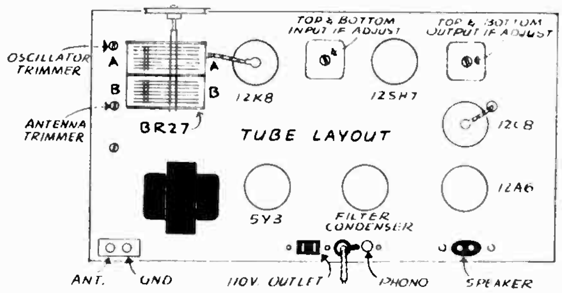
A record player or changer using a crystal type pickup cartridge may be connected to this receiver to provide superior reproduction of recordings. Connect the pickup by plugging the lead into the phono socket. If your player does not have the standard plug, remove existing plug and attach the phono plug supplied with the kit. Plug the line cord for the turn table motor into the 110V. outlet on the chassis. Turn the phono switch clockwise to switch from radio to record player.

NOTE: The pilot light is connected in the rectifier circuit to permit the use of a standard pilot light bulb. The socket is, therefor, about 300 Volts above chassis. DO NOT TOUCH SOCKET WITH SET TURNED ON.



ALIGNMENT

Connect a signal generator ground lead to the chassis. Connect the signal generator output ("hot") lead through a .01 MFD condenser to pin #4 on the 12SH7 socket (IF grid). Turn signal generator on and set dial to 456 Kc. The signal, if modulated, may be observed by noting the loudness at the speaker, or on the scale of an output meter connected across the speaker terminals, or with the aid of a vacuum tube voltmeter across the volume control. With the volume and tone controls turned fully clockwise, turn the brass screws in the output IF transformer for maximum indication. Use as low an indication as possible by reducing the output from the signal generator as the receiver sensitivity increases.



Without disturbing the signal generator dial, remove the .01 MFD condenser from pin #4 on the 12SH7 socket and connect to the grid cap of the 12K8 tube. Adjust the brass screws in the input IF transformer as above. NOTE: Do not adjust the output IF screws with the signal fed into the 12K8 tube. This completes the IF alignment.

Connect the signal generator output lead through a 200-300 MMF condenser to the ANT. terminal. Turn the tuning control until the condenser plates are fully unmeshed. Set the signal generator to 1720 Kc. Adjust the oscillator trimmer till the signal is noted. Reset the signal generator to 1400 Kc. Find the signal by turning the receiver tuning control. Now adjust the antenna trimmer for maximum indication. This completes the alignment. A short antenna should now bring in many stations.

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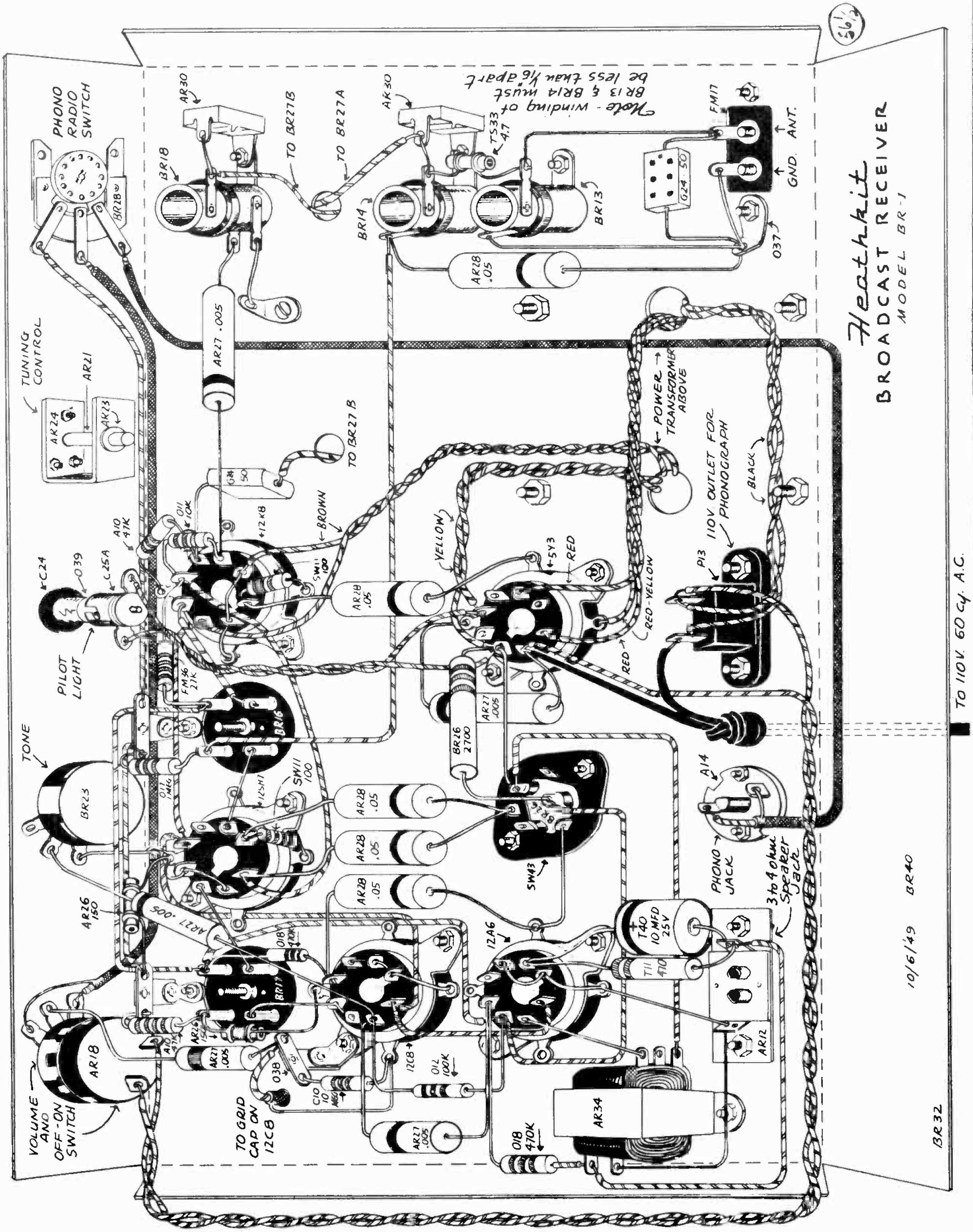
MODEL BR-1



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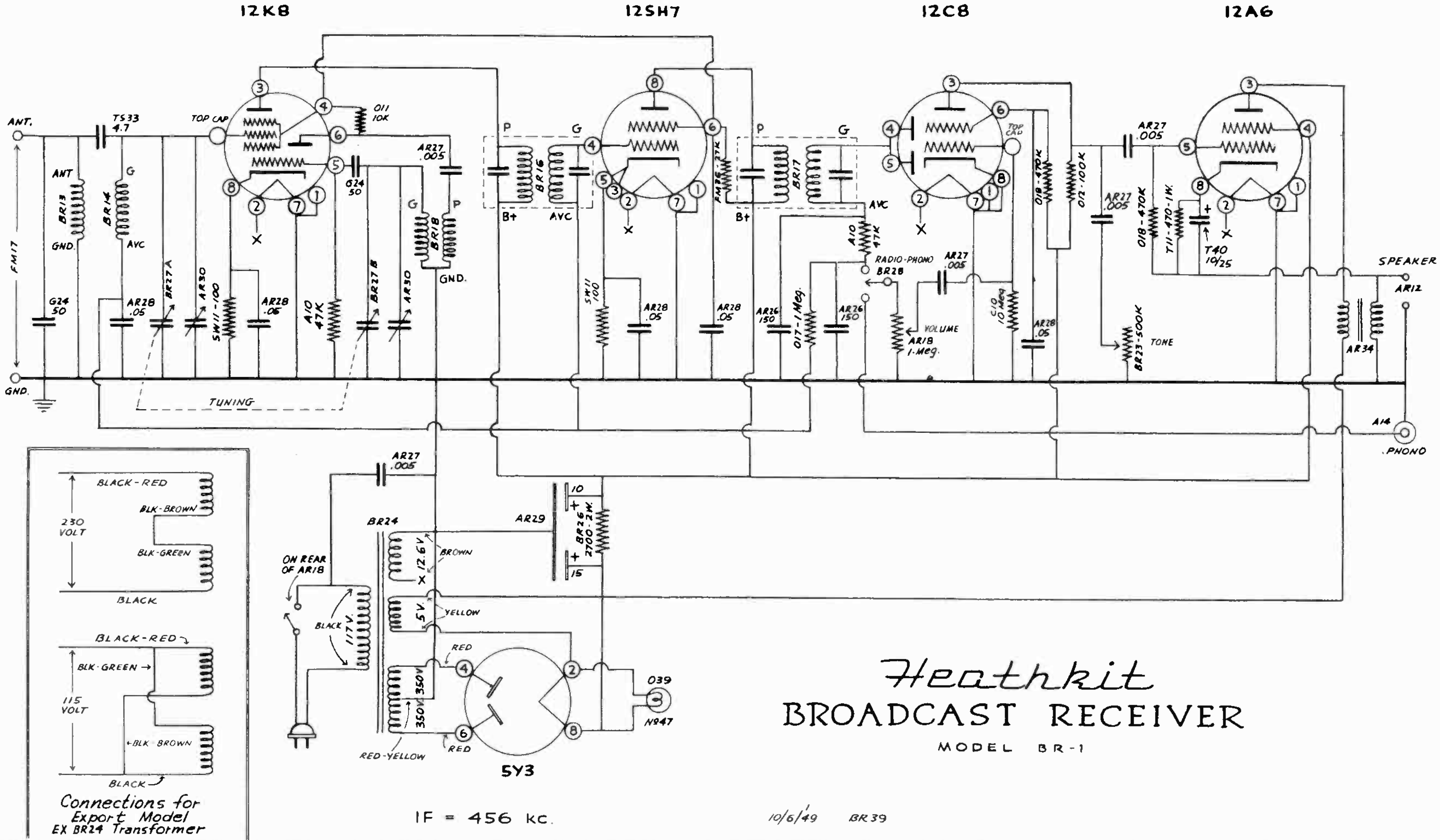
MODEL BR-1

Pin No.	12K8	12SH7	12C8	12A6	5Y3
1	0	0	0	0	
2	11-14 VAC	11-14 VAC	11-14 VAC	11-14 VAC	300-340
3	250-290	$\frac{1}{2}$ - $1\frac{1}{2}$	40-60 (15-30)	300-340	
4	100-130	Very slight neg.	Very slight neg.	250-290	300-340 VAC
5	5-15 V neg.	$\frac{1}{2}$ - $1\frac{1}{2}$	Very slight neg.	0	
6	80-100	100-130	25-45 (10-20)		300-340 VAC
7	0	0	0	0	Tie Point
8	$\frac{1}{2}$-$1\frac{1}{2}$	250-290	0	14-19	300-340



Heathkit
BROADCAST RECEIVER
MODEL BR-1

IF = 456 kc.

10/6/49 BR39

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BR 1 RECEIVER PARTS LIST

Part No.	Parts Per Kit	Description
Resistors		
SW11	2	100 Ohm Resistor
O11	1	10000 Ohm Resistor
BR43	1	25000 Ohm Resistor 2 W
A10	2	47000 Ohm Resistor
O12	1	100000 Ohm Resistor
O18	2	470000 Ohm Resistors
O17	1	1 Megohm Resistor
C10	1	10 Megohm Resistor
T11	1	470 Ohm 1 Watt Resistor
BR26	1	2700 Ohm 2 Watt Resistor
Condensers		
TS33	1	4.7 MMF Fixed Condenser
G24	2	47-50 MMF Fixed Cond.
AR26	2	150 MMF Fixed Cond.
AR27	5	.005 MFD Fixed Cond.
AR28	5	.05 MFD Fixed Cond.
T40	1	10 MFD 25V Electrolytic Cond.
AR29	1	15 + 10 MFD 450V Electrolytic Cond.
AR30	2	3-30 MMF Trimmer Cond.
BR27	1	Dual Tuning Cond.
Coils		
BR13	1	Antenna Primary Coil
BR14	1	Antenna Secondary Coil
BR18	1	Oscillator Coil
BR16	1	IF Trans. (Input)
BR17	1	IF Trans. (Output)
Controls and Switches		
BR23	1	500000 Ohm-6 Control
AR18	1	1 Megohm-6 Control with Sw.
BR28	1	SPDT Rotary Switch
Knobs-Sockets-Terminal Strips		
V48	4	Knobs
AR32	5	Tube Sockets
AR12	1	Speaker Socket
AR13	1	Speaker Plug
A14	1	Phono Socket
A19	1	Phono Plug
C25A	1	Pilot Socket
P13	1	110V Socket
FM17	1	Dual Binding Post
O38	3	Single Terminal Strips

Part No.	Parts Per Kit	Description
Tubes and Lamps		
O66	1	5Y3 Tube
K23	1	12A6 Tube
K24	1	12C8 Tube
BR29	1	12K8 Tube
AR31	1	12SH7 Tube
O39	1	6V Pilot Lamp
Miscellaneous		
BR19	4	Angle brackets
BR22	1	Condenser Mounting Bracket
BR21	1	Dial Drum Assembly
BR30	1	Dial Plate Assembly
FM21	1	Dial Spring
BR31	1	Dial Cable (31")
AR33	1	Pointer
AR21	1	Dial Drive Shaft
AR23	2	Dial Drive E Washers
AR24	1	Drive Shaft Bracket
TS55	1	#8-32 X 1/8" Set Screw
SW43	1	Condenser Mounting Wafer
O31	32	#6-32 X 3/8 Screws
TS74	3	#8-32 X 1/4" Screws
G52	4	#8-32 X 3/8" Screws
O102	3	#6-3/8" Sheet Metal Screws
TC46	7	#6-5/8" Sheet Metal Screws
S22	36	#6-32 Nuts
TP16	4	#8-32 Nuts
O33	3	Control Nuts
TS72	35	#6 Lock Washers
BR36	7	#8 Lock Washers
O101	3	Control Lock Washers
AR35	3	1/8" Spacers
AR36	4	3/8" Spacers
K18	2	Grid Clips
O35	1	3/8" Grommet
C24	1	7/16" Grommet
O37	2	Solder Lugs
BR24	1	Power Transformer
AR34	1	Output Transformer
BR32	1	Chassis
BR35	1	Panel
AR19	1	Line Cord 8'
BR33	1	Shielded Wire (30")
IB43	1	Length Bare Wire (18")
T24	1	Roll Hookup Wire (10")
P24	1	Length of Spaghetti (6")
BR1	1	Instruction Manual

Check the voltages at the tube sockets. A table of approximate voltages is given below. These readings were obtained with a Heathkit VTVM with 11 megohms input resistance. The occasional lower readings in brackets were obtained with a Heathkit Handitester at 1,000 ohms per volt. Variations of plus or minus 15% may be expected.

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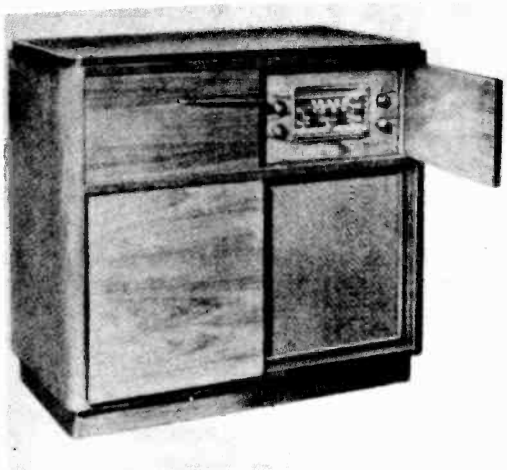
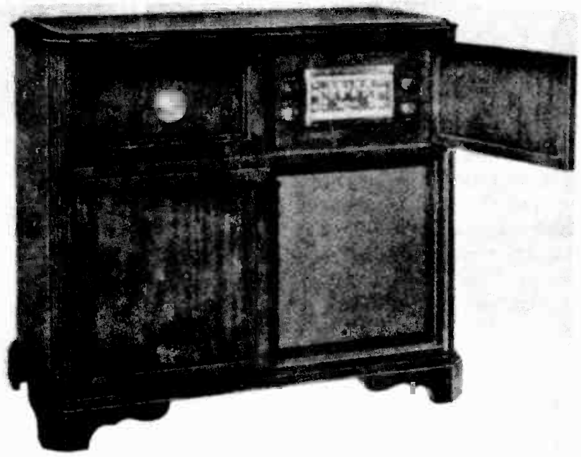
MODELS 522, 524, Ch. 138



MODEL 522
Modern style cabinet
Blonde oak
Mahogany
Walnut



MODEL 524
Traditional style cabinet
Mahogany finish

SPECIFICATIONS

The Hoffman Models 522 and 524 are 15 tube phonograph combination receivers for reception on the standard broadcast AM and FM radio frequencies. The sound is reproduced by a 12" PM speaker, and has an audio power output of 15 watts.

The record changer will automatically change and play up to twelve 10" records or ten 12" records. An optional record changer is available which will play either the standard 78 rpm records or the Long Playing 33 1/3 rpm records.

Connections are available at the rear of the radio tuner chassis for installation of a separate wire recorder, disc recorder, or 45 rpm record changer.

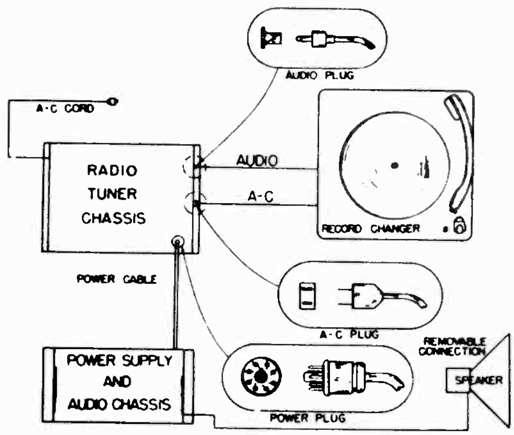
MAJOR COMPONENTS

Radio chassis	138
Cabinet	Model 522, Part No. 7523-1 Model 524, Part No. 7524-1
Speaker	12" PM, Part No. 9015 Voice coil impedance, 3.2 ohms
Record changer	One of the following: Webster Model 148, 78 rpm Webster Model 149, 78 rpm Webster Model 246, 78 and 33 1/3 rpm V-M Corp. Model 400D, 78 and 33 1/3 rpm
Dial Escutcheon	Part No. 8080

ELECTRICAL AND MECHANICAL DATA

Frequency Range	(AM) 535 KC to 1650 KC (FM) 88 MC to 108 MC
Intermediate Frequency	(AM) 455 KC, (FM) 10.7 MC
Power Source	117 volts AC, 60 cycles, 15 watts
Output Impedance, Audio	3.2 ohms at 400 cycles
Power Output, Audio	15 watts

BLOCK DIAGRAM



TUBE COMPLEMENT

1	6BA6	AM RF Amplifier
1	6BE6	AM Oscillator—Converter
1	7F8	FM Oscillator—Converter
1	6BA6	AM-FM 1st IF Amplifier
1	6BA6	FM 2nd IF Amplifier
1	6AL5	FM Ratio Detector
1	6AT6	AM 2nd Det., AVC, 1st Audio (AM & FM)
1	6J5	2nd Audio Amplifier
1	6J5	Audio Phase Inverter
4	6K6GT	Audio Power Output
1	5U4G	Power Rectifier
1	6E5	Tuning Indicator

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ALIGNMENT PROCEDURE

NOTES

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.

ALIGNMENT CHART

STEP NO.	BAND SWITCH POSITION	SIGNAL GENERATOR FREQ.	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.	Tuning gang wide open. Adjust trans. for max. output
2	AM	1600 KC Mod.	Ext. Ant. Clip	0.1 mfd	1600 KC	C10 BC Osc. Trimmer	Adjust for max. output
3	AM	1400 KC Mod.	Ext. Ant. Clip	0.1 mfd	1400 KC	C9, C8 RF Trimmer	Adjust for max. output
4	AM	600 KC Mod.	Ext. Ant. Clip	0.1 mfd	600 KC	T6 Sec.	Adjust for max. output
5	AM	600 KC Mod.	Ext. Ant. Clip	0.1 mfd	600 KC	See Note 5	See Note 5
6	AM	1000 KC Mod.	Ext. Ant. Clip	0.1 mfd	1000 KC	See Note 5	See Note 5
7	FM	10.7 MC CW	FM Ant. Terminals	0.1 mfd	107 MC	T1 Pri., Sec., T3 Pri., Sec. T5 Pri. only	Disconnect C23 at point A. Tune for maximum reading. VTVM from point A to chassis. See Ratio Det. Alignment.
8	FM	10.7 MC CW	FM Ant. Terminals	0.1 mfd	107 MC	T5 Sec.	Reconnect C23 to point A. Tune for zero reading, VTVM from resistor junction to point C. See Ratio Det. Alignment.
9	FM	107 MC CW	FM Ant. Terminals	300 ohms See Note 7	107 MC	C7 FM Osc. Trimmer	Adjust for max. with VTVM from point A to chassis. See Note 6.
10	FM	107 MC CW	FM Ant. Terminals	300 ohms See Note 7	107 MC	C6 FM RF Trimmer	Adjust for max. with VTVM from point A to chassis.
11	FM	98 MC CW	FM Ant. Terminals	300 ohms	98 MC	See Note 5	Adjust for max. with VTVM from point A to chassis.
12	FM	88 MC CW	FM Ant. Terminals	300 ohms	88 MC	See Note 5	Adjust for max. with VTVM from point A to chassis.

RATIO DETECTOR ALIGNMENT

TUNING T5 PRIMARY

(T1 and T3 should be tuned before tuning T5.)

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.) Condenser C23 should be disconnected at point "A" during IF and ratio detector primary adjustments. This prevents any stored charge on C23 from causing a time lag in the VTVM reading, and giving misleading peak indications.

TUNING T5 SECONDARY

Reconnect C23 to point "A." 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.

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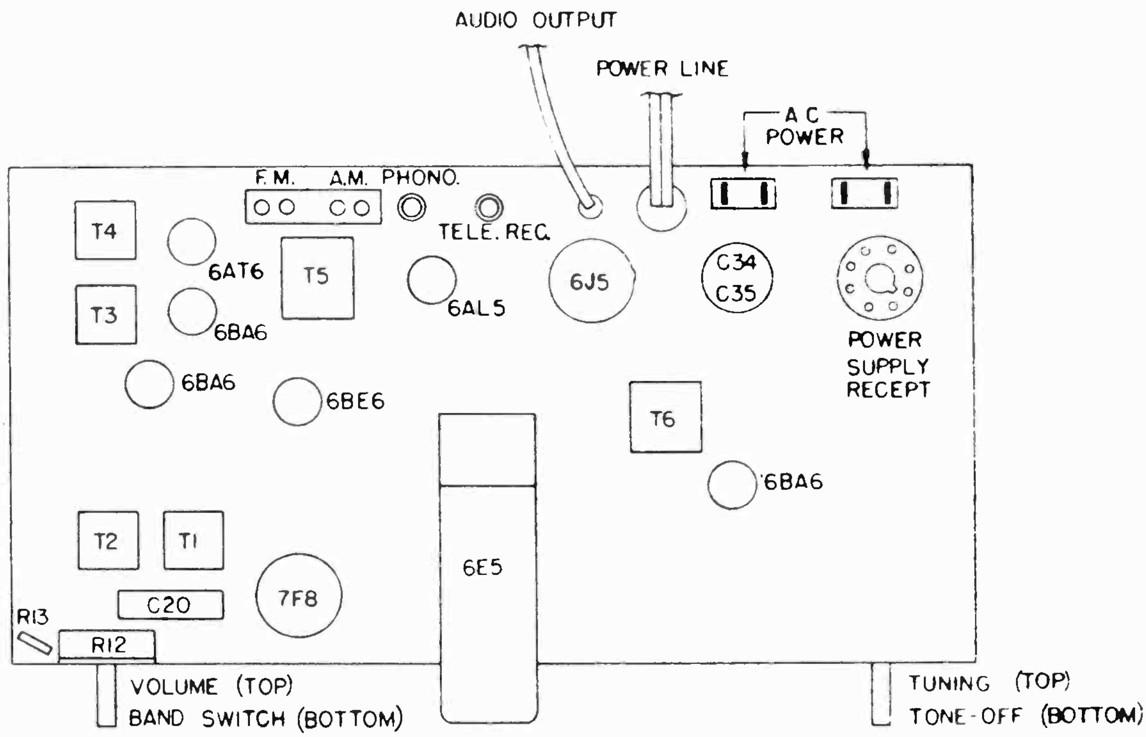
SOCKET VOLTAGES

Tube	Circuit	1	2	3	4	5	6	7	8	Band Switch
6BA6	AM RF Amp.	−.73*	G	6.2ac	G	232	168	.4	—	AM
6BE6	AM Osc. Conv.	−1.0*	0	G	6.2ac	222	104	−.55*	—	AM
7F8	FM Osc. Conv.	0	G	216	0	3.6	225	6.2ac	0	FM
6BA6	FM-AM IF	−.55*	G	G	6.2ac	217	115	1.0	—	FM-AM
6BA6	FM 2nd IF	0	G	G	6.2ac	212	96	1.1	—	FM-AM
6AL5	Ratio Det.	0	−.2*	G	6.2ac	−.1*	NC	0	—	FM
6AT6	AM Det.-1st AF	0	G	G	6.2ac	−.7*	G	48	—	AM
6J5	2nd AF Amp.	G	6.2ac	70	NC	0	NC	G	2.8	AM
6J5	Phase Invert.	G	6.2ac	140	NC	55	67'	G	70	AM
6K6	Audio Output	NC	6.2ac	290	270	0	NC	G	22	AM
5U4	Rectifier	NC	4.9ac'	NC	320ac	NC	320ac	NC	300	AM
6E5	Tuning Ind.	6.1ac	205*	−9.4*	255	G	G	—	—	FM-AM

All voltages measured to chassis unless otherwise noted.
DC voltages measured with 20,000 ohm/volt meter.
AC voltages measured with 1000 ohm/volt meter.
All measurements made with signal input to receiver.

*—Measured with VTVM.
G—Terminal grounded to chassis.
'—Tie point for R2-R3.
'—Measured from pin 2 to 8.

TUBE AND TRIMMER CONDENSER LOCATIONS



TOP VIEW OF CHASSIS

Tube Locations—Top View of Tuner Section

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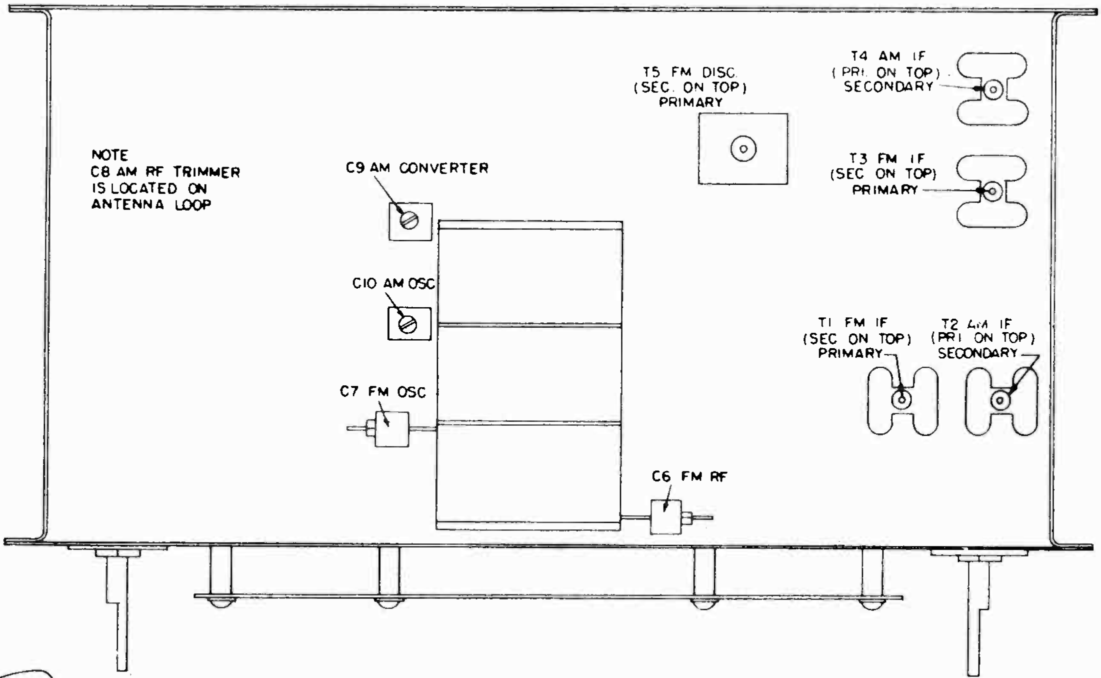
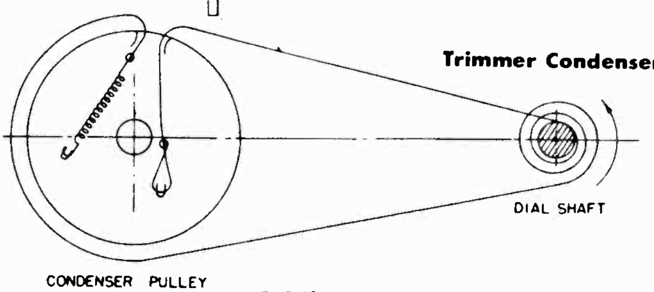
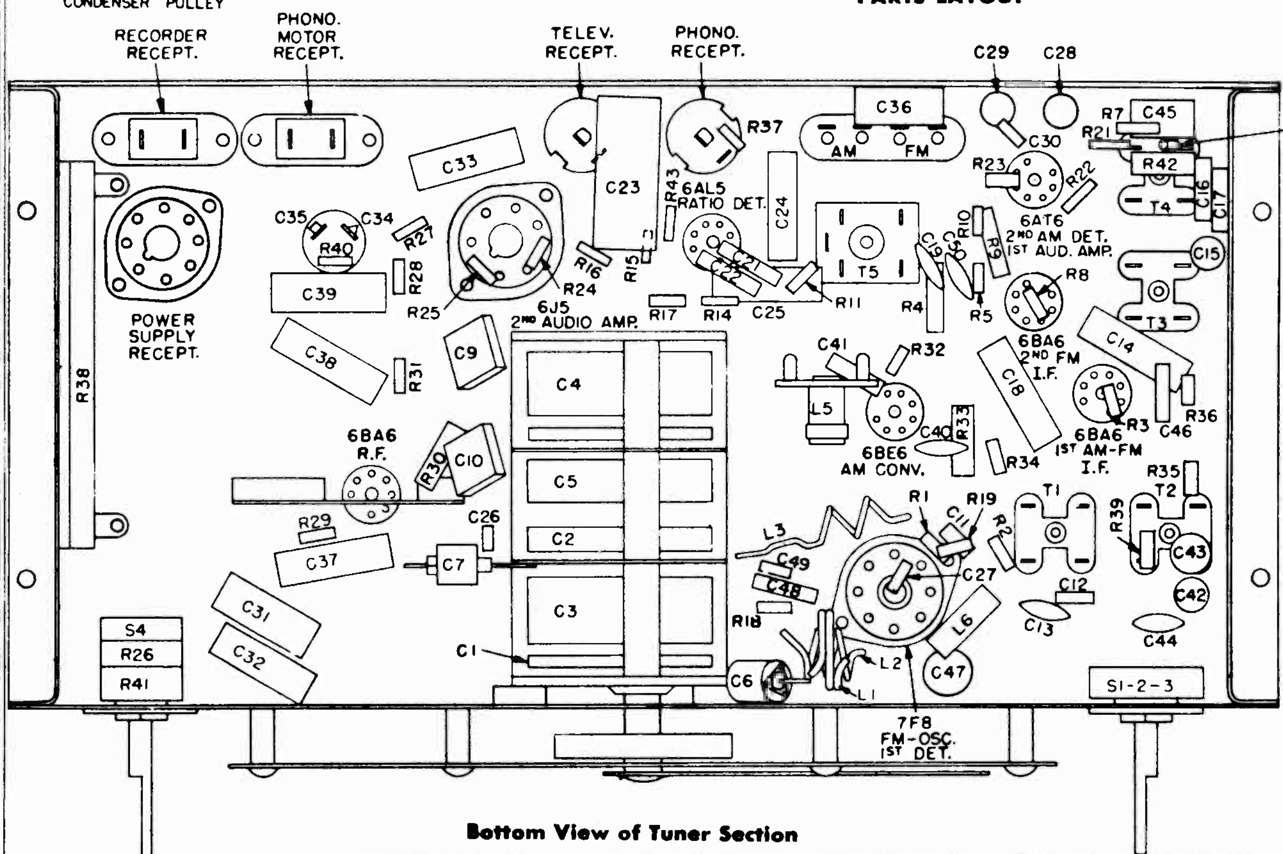


Trimmer Condenser Location—Bottom View of Tuner Section



Dial Stringing

PARTS LAYOUT



Bottom View of Tuner Section

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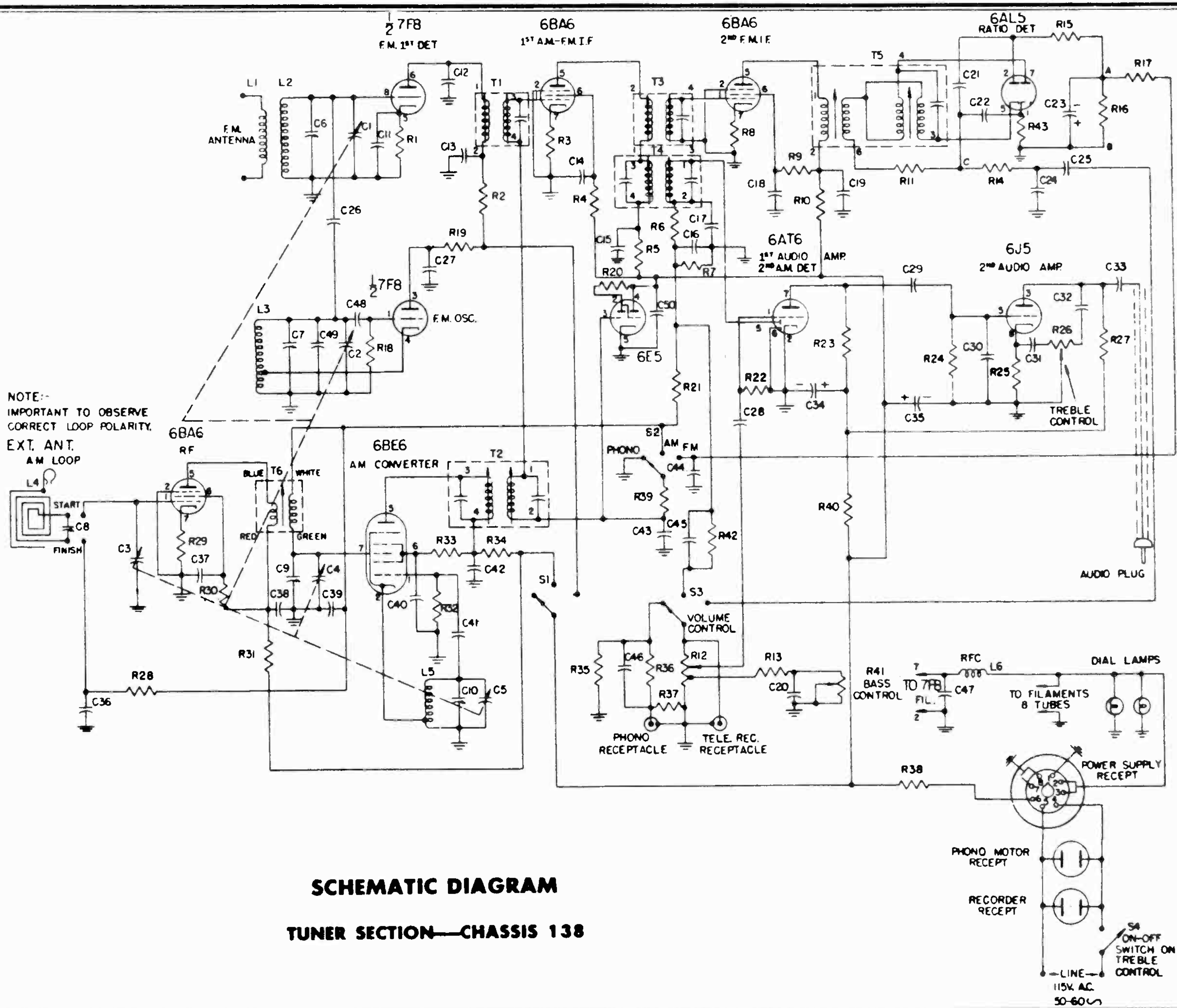

SCHEMATIC DIAGRAM

TUNER SECTION—CHASSIS 138

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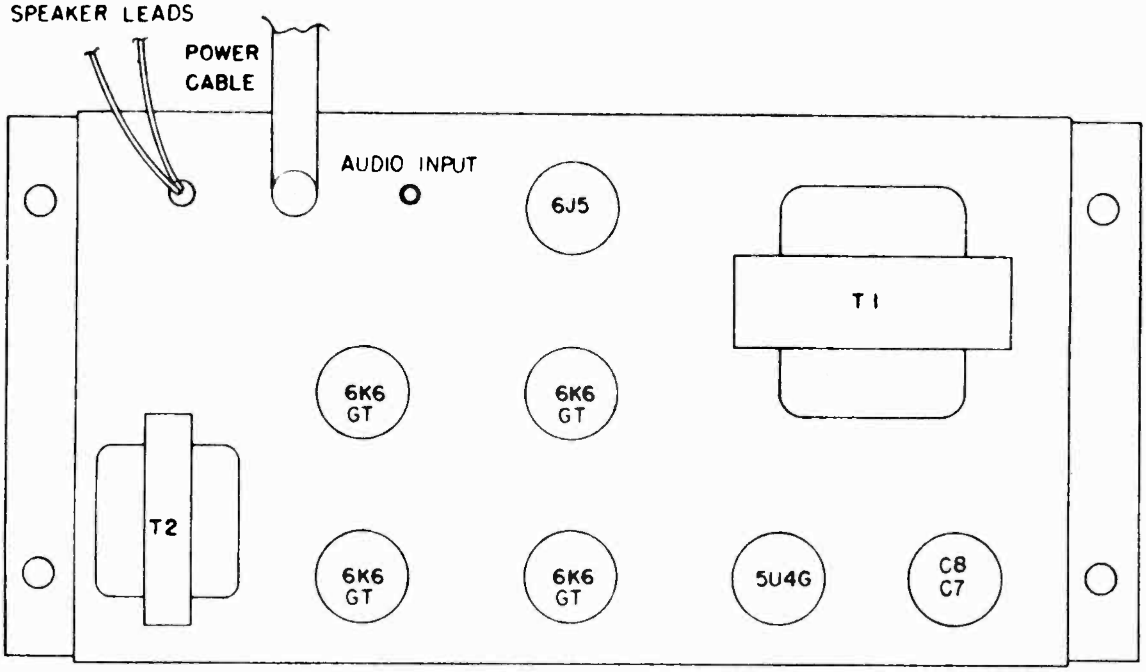
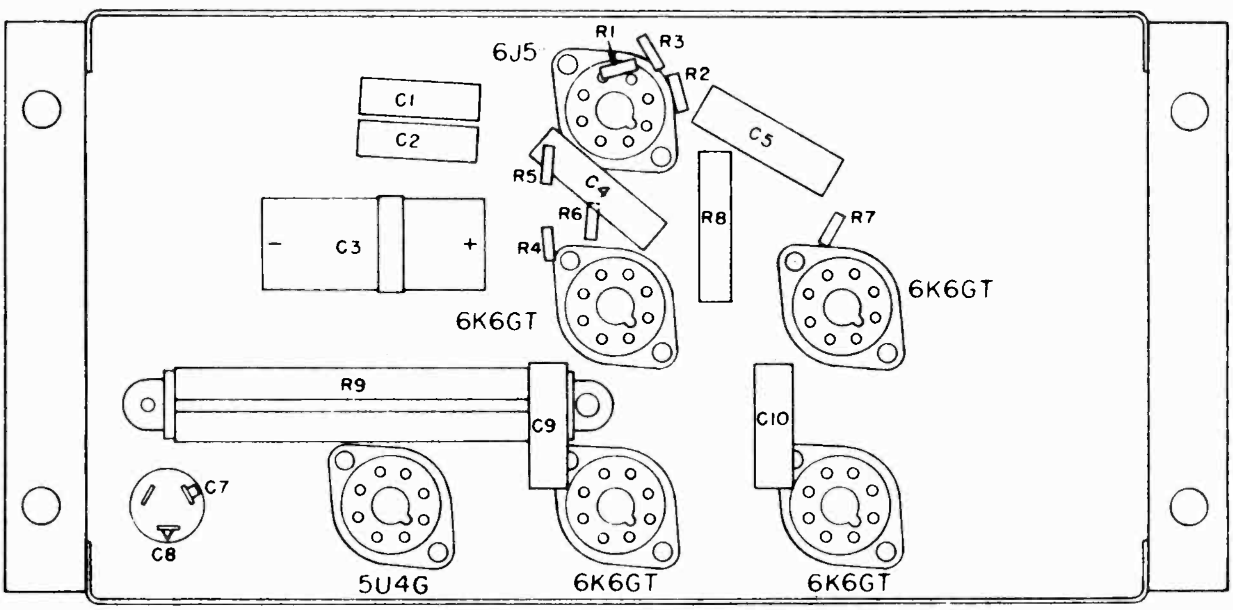
POWER SUPPLY AND AUDIO SECTION



Tube Locations—Top View of Chassis



Parts Layout—Bottom View of Chassis

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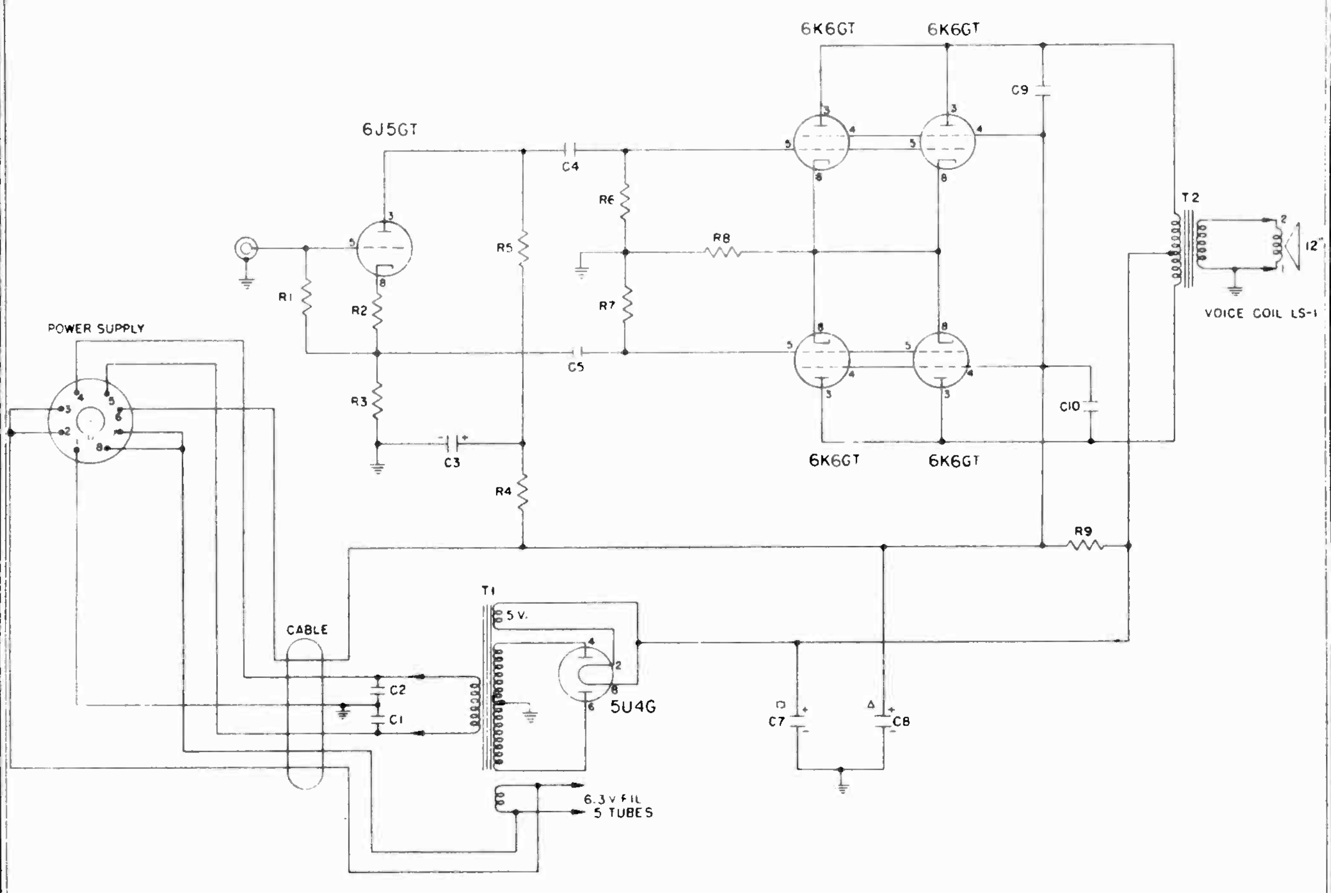
SCHEMATIC DIAGRAM

POWER SUPPLY AND AUDIO SECTION—CHASSIS 138



PARTS LIST—POWER SUPPLY AND AUDIO SECTION

Symbol	Description			Hoffman Number
C1, C2	.01 Mfd.	600V	Paper	4103
C3	10 Mfd.	450V Tub.	Electro	4203
C4, C5	.05	400V	Paper	4101
C6, C7, C8	20/45V, 20/450V, 20/450V		Electro	4200
C9, C10	.001	600 V	Paper	4104
R1	1 Meg.	20%	½ Watt	4513
R2	2200 Ohms	20%	½ Watt	4512
R3, R5	47000 Ohms	10%	½ Watt	4559
R4	10000 Ohms	20%	½ Watt	4515
R6, R7	.22 Meg.	20%	½ Watt	4500
R8	220 Ohms	20%	3 Watt	4706
R9	1500 Ohms	5%	6½ Watt	4701
LS1	Loudspeaker 12" P.M.			9044
T1	Power Transformer			5001
T2	Output Transformer			5108

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RADIO TUNER SECTION PARTS LIST

Symbol	Description		Hoffman Part No.
C1, C2, C3, C4, C5	3 Gang AM, FM (1 Section unused)		4411
C6, C7	Trimmers (FM Section)		4318
C8, C9, C10	Trimmers (AM Section)		4313
C11, C27	1000 Mmf	Ceramic Hi-K	4025
C12	10 Mmf	±10% Ceramic	4027
C13, C19, C40, C44, C47, C50	5000 Mmf	Ceramic Hi-K	4029
C14, C15, C18, C25, C28, C33, C37, C38, C42	.01 Mfd	400V Paper	4112
C16, C17, C21, C22	270 Mmf	±20% Mica	4001
C20	.02 Mfd	400V Paper	4106
C23	5 Mfd	50V Electrolytic	4209
C24	.002 Mfd	600V Paper	4118
C29, C32	.005 Mfd	600V Paper	4102
C30	470 Mmf	±20% Mica	4003
C31, C36, C39, C43	.05 Mfd	200V Paper	4100
C34, C35	20-20 Mfd	450V Electrolytic	4200
C41, C45	100 Mmf	±20% Mica	4000
C46, C48	22 Mmf	±10% N150 Ceramic	4021
C49	5 Mmf	±10% N750 Ceramic	4028
R1	1,200 Ohm	±20% ½W	4553
R2, R5, R10, R19, R31, R34	1,500 Ohm	±20% ½W	4534
R4, R9, R30	33,000 Ohm	±20% 1W	4556
R6, R14, R40	47,000 Ohm	±20% ½W	4504
R7	.68 Meg	±20% ½W	4555
R11	120 Ohm	±10% ½W	4546
R12	.5 Meg	Vol. Control, tapped	4814
R13	6800 Ohm	±10% ½W	4557
R15, R43	560 Ohm	±10% ½W	4507
R16	15,000 Ohm	±20% ½W	4521
R17, R28, R35, R39	.22 Meg	±20% ½W	4500
R18, R32	22,000 Ohm	±20% ½W	4501
R20, R42	1 Meg	±20% ½W	4513
R21, R22	2.2 Meg	±20% ½W	4502
R23, R24	.47 Meg	±20% ½W	4506
R25	2,700 Ohm	±10% ½W	4519
R26, R41	.5 Meg	Dual Bass & Treble Controls	4813
R27	100,000 Ohm	±20% ½W	4511
R33	15,000 Ohm	±20% 1W	4539
R36, R37	4.7 Meg	±20% ½W	4544
R38	500 Ohm	±10% 5W	4700
L1	FM Antenna Primary		5258
L2	FM Antenna Secondary		5248
L3	FM Oscillator Coil		5247
L4	AM Loop Antenna		5279
L5	AM Oscillator Coil		5282
L6	RFC Filament Choke		5266
T1	FM 1st IF Transformer		5284
T2	AM 1st IF Transformer		5286
T3	FM 2nd IF Transformer		5285
T4	AM 2nd IF Transformer		5287
T5	FM Discriminator (Ratio Detector)		5288
T6	AM RF Interstage Transformer		5289
S1, S2, S3	Band Change Switch (3 Pole - 3 Position Rotary)		6002
S4	Power Switch on Bass & Treble Control (Part of 4813)		
	Knob, Dual (Bass-Treble) (Specify Color)		3584
	Knob, Single (Specify Color)		3583
	Plug, Audio Output (Single prong)		6203
	Plug, Power Supply		6212
	Pointer, Dial		518
	Receptacle, Phono		6121
	Receptacle, Power Outlet		6108
	Socket, Loctal		6105
	Socket, Miniature		6118
	Socket, Octal		6103
	Socket, Pilot Lamp		6110
	Spring, Dial		9507
	Strip, Antenna Terminal		424
	Tuning Dial Backplate		2217

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