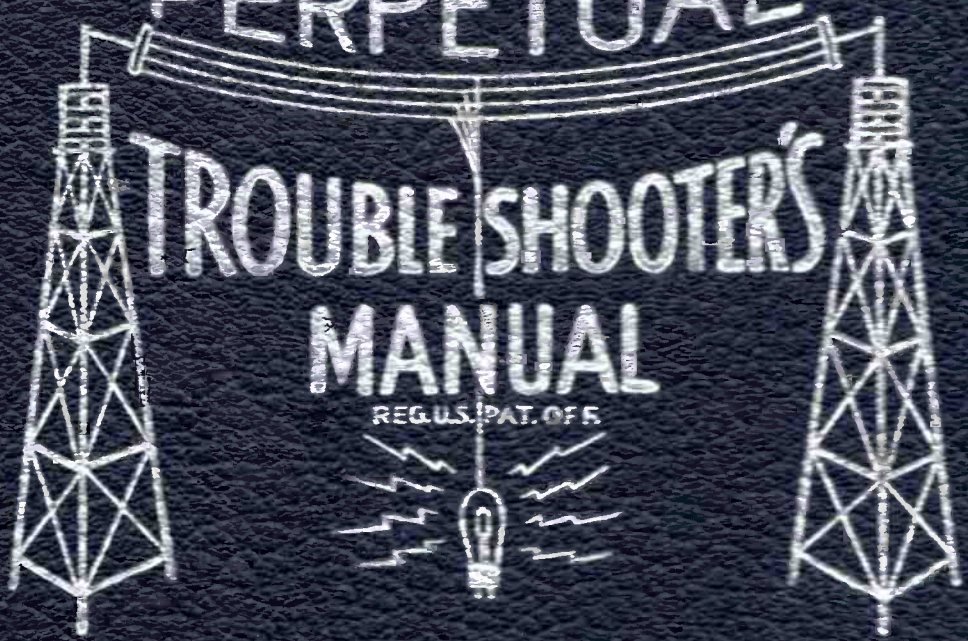
VOLUME XV

PERPETUAL TROUBLE SHOOTER'S MANUAL

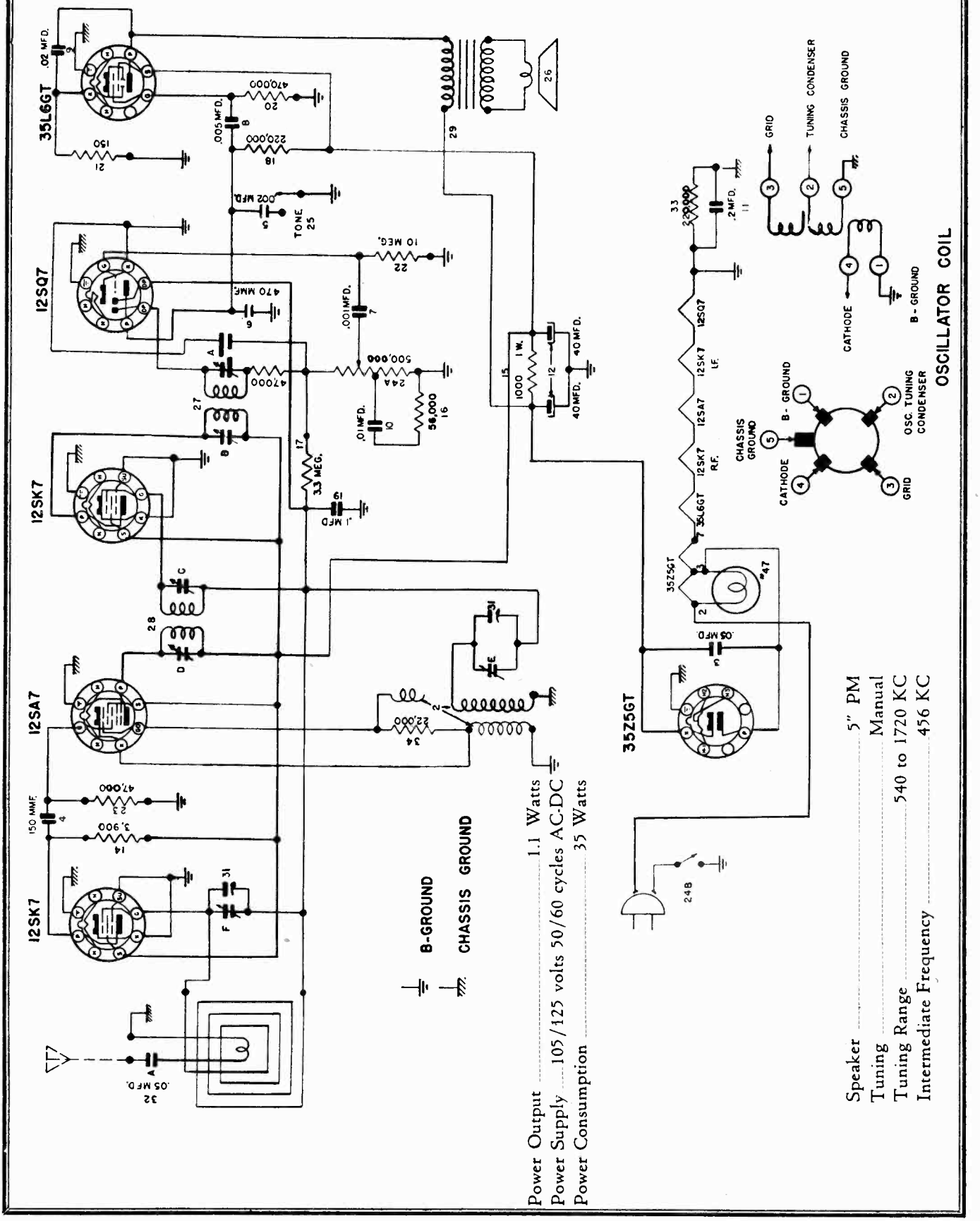
REG. U.S. PAT. OFF.



JOHN F. RIDER

DELCO RADIO DIV.-GENERAL MOTORS

MODELS R-1234, R-1235

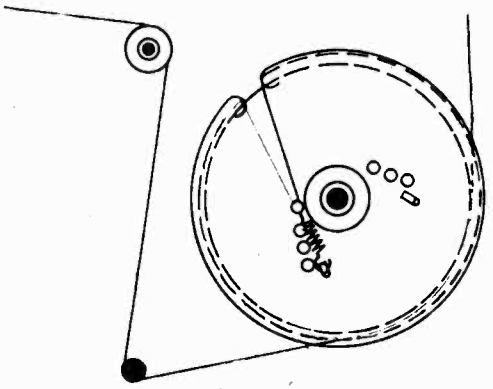


Power Output ..... 1.1 Watts
Power Supply ..... 105/125 volts 50/60 cycles AC-DC
Power Consumption ..... 35 Watts

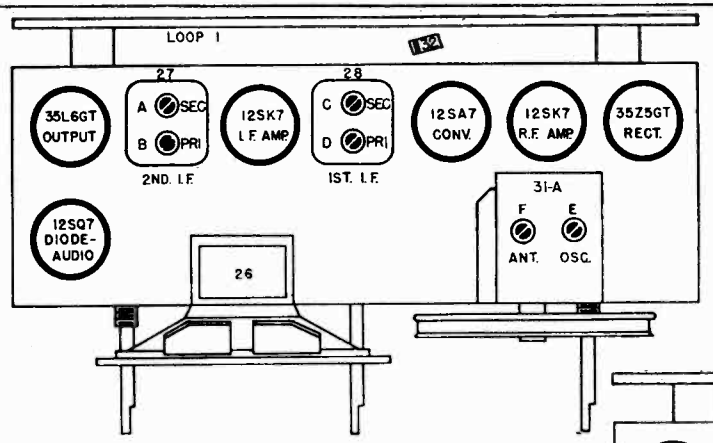
Speaker ..... 5" PM
Tuning ..... Manual
Tuning Range ..... 540 to 1720 KC
Intermediate Frequency ..... 456 KC

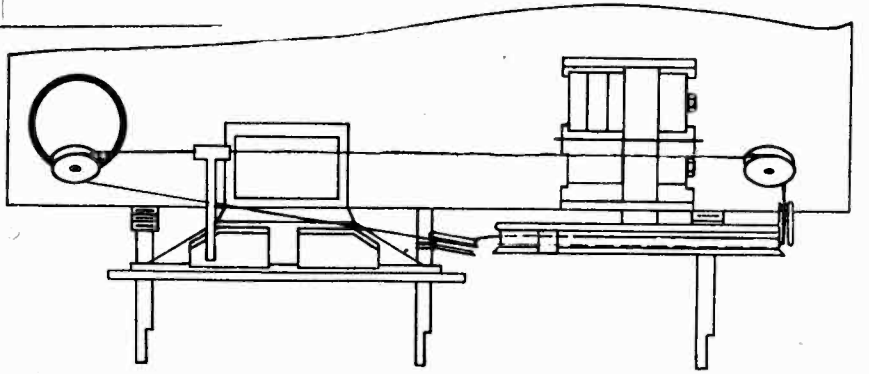
Output Meter Connections ..... Plate and Screen of 35L6
Generator Ground ..... To Chassis through .01 MFD
Dummy Antenna ..... In Series with generator
Volume Control Position ..... Fully on

Steps	Series Condenser or Dummy Antenna	Connect Signal Generator To	Adjust Signal Generator To	Turn Radio Dial To	Adjust Trimmers
1	.02 Mfd. Cond.	12SA7 Grid (Pin #8)	456 KC	Quiet Point near H. F. end	A-B (2nd IF Trans) C-D (1st IF Trans)
2	200 Mmf Cond.	Ant. lead	1720 KC	1720 KC	E (Osc.)
3	200 Mmf Cond.	Ant. lead	1400 KC	1400 KC	F (Ant.)

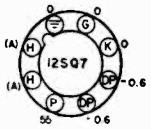


DIAL STRING DRAWING



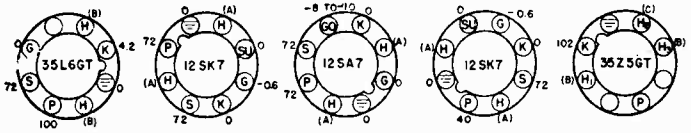


PARTS LAYOUT — TUBE VIEW
TRIMMERS ON TOP OF TUNING CONDENSER

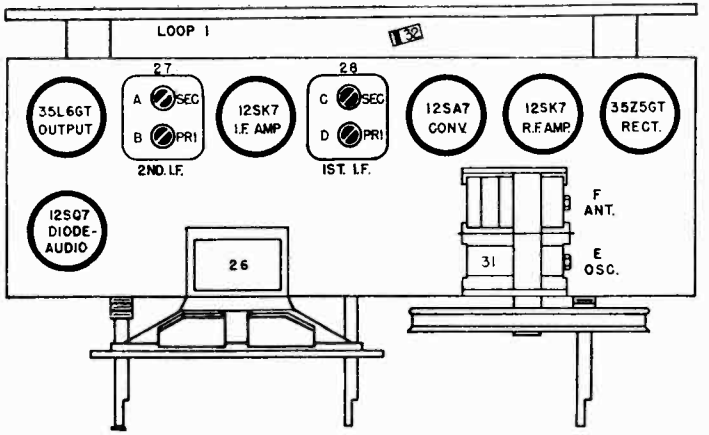


BOTTOM VIEW OF CHASSIS

DC VOLTAGES MEASURED WITH ELECTRONIC VOLTMETER BETWEEN SOCKET TERMINALS AND B-.
(A) 12 VOLTS BETWEEN PINS H & H
(B) 35 VOLTS BETWEEN PINS H & H
(C) 6 VOLTS BETWEEN PINS 2 & 3
AC LINE VOLTAGE 117 VOLTS



TUBE SOCKET VOLTAGE CHART

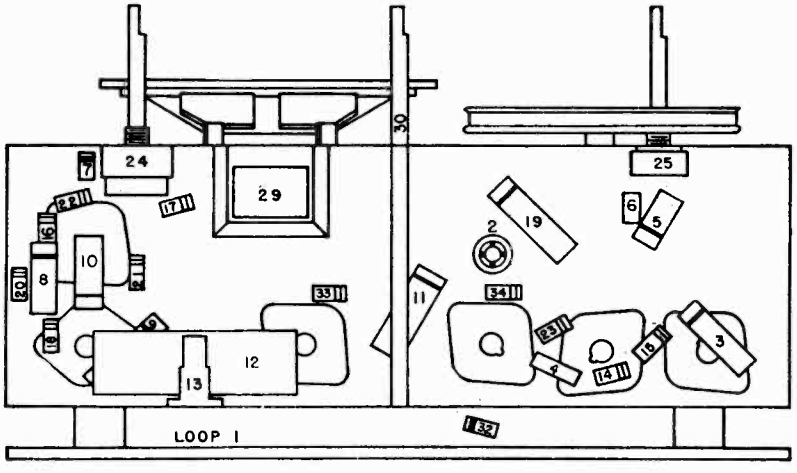


PARTS LAYOUT — TUBE VIEW
TRIMMERS ON SIDE OF TUNING CONDENSER

MODELS R-1234, R-1235

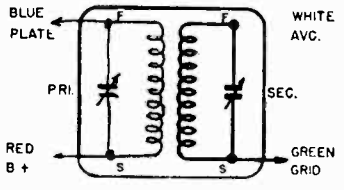
DELCO RADIO DIV.-GENERAL MOTORS

Illus. No.	Service Part No.	Name	Description
1	1216621	Antenna Assembly	Loop and Back Cover
2	1216915	Coil	Oscillator Coil Complete
3	7230592	Condenser	.05 Mfd. 600 V. Tubular
4	7230893	Condenser	150 MMF Moulded
5	1209148	Condenser	.002 Mfd. 800 V. Tubular
6	7238879	Condenser	470 MMF Moulded
7	1212097	Condenser	.001 Mfd. 800 V. Tubular
8	7230912	Condenser	.005 Mfd. 600 V. Tubular
9	1212099	Condenser	.02 Mfd. 600 V. Tubular
10	1208600	Condenser	.01 Mfd. 600 V. Tubular
11	7231594	Condenser	.25 Mfd. 400 V. Tubular
12	1217026	Condenser	40-40 Mfd. 150 V. Electrolytic
13	1216559	Clip	Condenser Clip
14	1214546	Resistor	3,900 Ohms ½ Watt Insulated
15	1211037	Resistor	1,000 Ohms 1 Watt Insulated
16	1213267	Resistor	56,000 Ohms ½ Watt Insulated
17	1214564	Resistor	3.3 Meg. ½ Watt Insulated
18	1214555	Resistor	220,000 Ohms ½ Watt Insulated
19	1207908	Condenser	.10 Mfd. 400 V. Tubular
20	1214559	Resistor	470,000 Ohms ½ Watt Insulated
21	1213220	Resistor	150 Ohms ½ Watt Insulated
22	1215548	Resistor	10 Meg. ½ Watt Insulated
23	1214553	Resistor	47,000 Ohms ½ Watt Insulated
24	1216505	Control and Switch	Volume Control and Switch
25	1216544	Switch	Tone Control
26	1217361	Speaker	Speaker (5" P. M.) and Brkt. Assy.
27	1216570	Coil	2nd I. F. Coil Assembly
28	1216605	Coil	1st I. F. Coil Assembly
29	1216557	Transformer	Output Transformer Complete
30	1216650	Shaft	Drive Shaft
	7245333	Washer	"C" Washer
31	1217414	Condenser and Pulley Parts Package Variable Condenser and Pulley Assembly Grommet (3) — Lockwasher (2) Spacer - Sleeve (3) — Solder Lug Screw (3)	
31A	1217415	Condenser and Pulley Parts Package (Alt. for 1217414) Variable Condenser and Pulley Assembly Grommet (3) — Lockwasher (2) Spacer - Sleeve (3) — Solder Lug Screw (3)	
32	7230592	Condenser	.05 Mfd. 600 V. Tubular
33	1214555	Resistor	220,000 Ohms ½ Watt Insulated
34	1214550	Resistor	22,000 Ohms ½ Watt Insulated
	1216512	Cord	Power Cord
	1212233	Cord	Dial Drive (49" Length)
	1216562	Indicator	Dial Pointer
	47	Lamp	Dial Light (Mazda #47)
	1216564	Socket	Dial Light Assy. (Includes Mazda #47)
	7236279	Socket	Tube Socket
	1217323	Spring	Cord Tension
	1213813	Tube 12SQ7	
	1213809	Tube 12SA7	
	1213812	Tube 12SK7	
	1213848	Tube 35Z5GT	
	1213818	Tube 35L6GT	

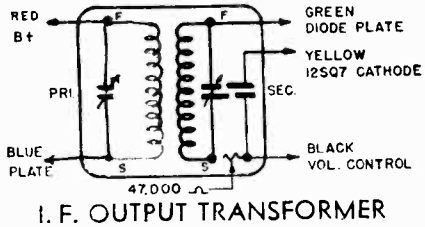


PARTS LAYOUT — CHASSIS VIEW

COIL CONNECTIONS



I. F. INPUT TRANSFORMER

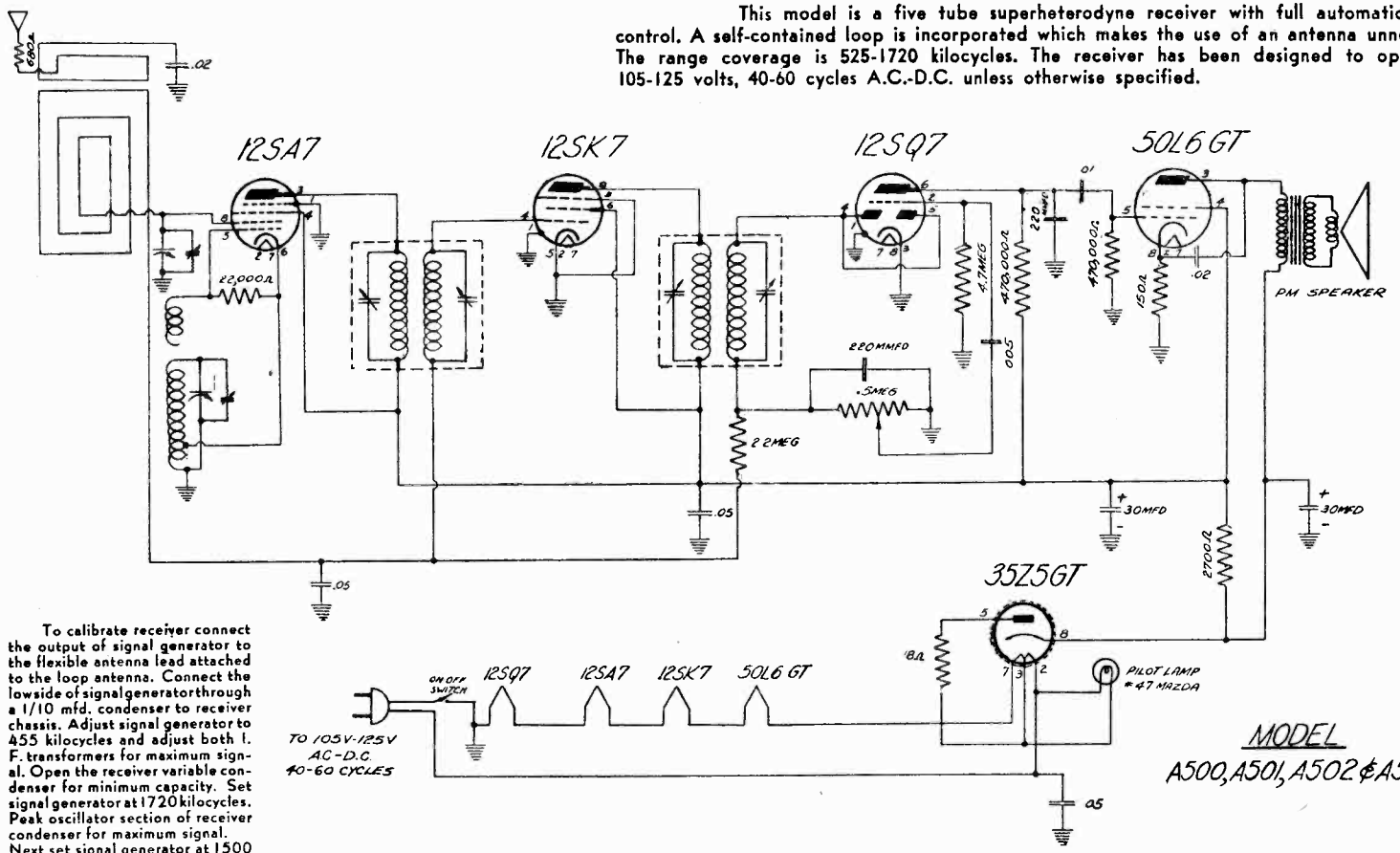


I. F. OUTPUT TRANSFORMER

DEWALD RADIO MFG. CORP.

MODELS A500, A501, A502, A503

This model is a five tube superheterodyne receiver with full automatic volume control. A self-contained loop is incorporated which makes the use of an antenna unnecessary. The range coverage is 525-1720 kilocycles. The receiver has been designed to operate at 105-125 volts, 40-60 cycles A.C.-D.C. unless otherwise specified.



To calibrate receiver connect the output of signal generator to the flexible antenna lead attached to the loop antenna. Connect the lowside of signal generator through a 1/10 mfd. condenser to receiver chassis. Adjust signal generator to 455 kilocycles and adjust both I. F. transformers for maximum signal. Open the receiver variable condenser for minimum capacity. Set signal generator at 1720 kilocycles. Peak oscillator section of receiver condenser for maximum signal.
Next set signal generator at 1500 kilocycles. Tune in this signal. Adjust R. F. section of receiver variable condenser for maximum signal strength. Keep the signal generator output as low as possible when making all of these measurements.

IF PEAK 455 KC

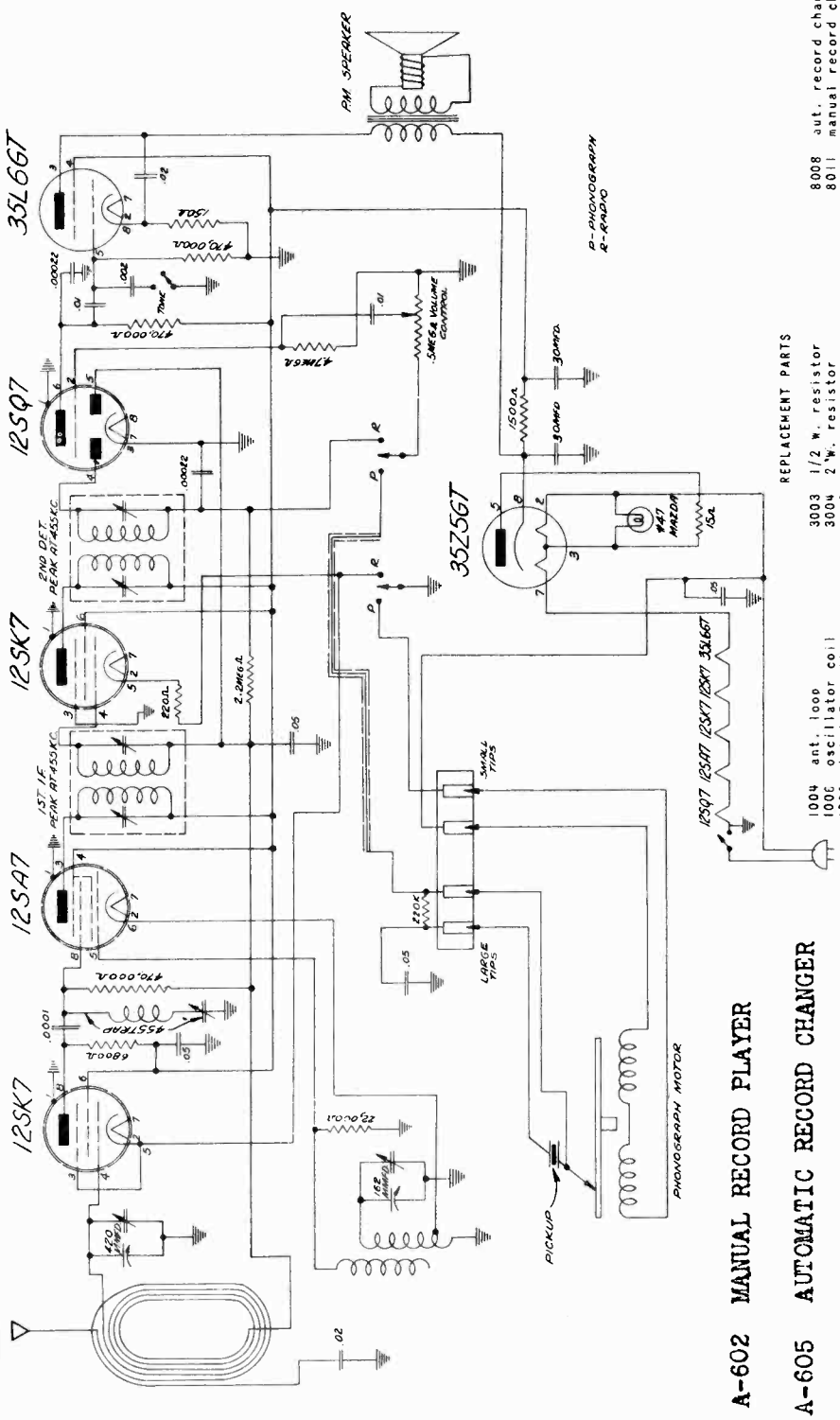
REPLACEMENT PARTS

1001 ant. loop
1003 oscillator coil
1000 1st I.F. coil
1002 2nd detector coil
2000 paper condensers
2001 mica condensers
2002 comb. electrolytic
2003 var. condenser
3000 1/4 W. resistors
3001 2 W. resistors
3002 vol. cont. and switch
5000 line cord
6000 dial scale
7000 speaker
8001 pilot lamp socket
9000 shaft
9002 bushing
9762 drive spring
#20 dial cord
#47 pilot lamp

	A-500	A-501	A-502	A-503
CABINET	4004	4281B	4000	4016
KNOB	4017	4010	4003	4017
BACK	4018	4013	4019	4020

MODELS A602,A605

DEWALD RADIO MFG. CORP.



REPLACEMENT PARTS

1004	ant. loop	3003	1/2 w. resistor	8008	aut. record changer
1006	oscillator coil	3004	2 w. resistor	8011	manual record changer
1000	1st I.F. coil	1005	wave trap	8009	crystal pick-up
1032	2nd detector coil	3002	vol. contr. and switch	9010	shaft
2000	paper condenser	8003	tone contr. and switch	9818	bushing
2001	mica condenser	8004	phono. switch	9762	drive spring
2005	comb. electrolytic	5000	line cord	#20	dial cord
2003	var. condenser	6002	dial scale	#47	pilot lamp
2006	trimmer condenser	7001	speaker	4017	knob
3000	1/4 w. resistor	8001	pilot lamp socket		
			A-602	A-603	
		CABINET	4005	4007	
		BACK	4022	4021	

MODEL A-602 MANUAL RECORD PLAYER

MODEL A-605 AUTOMATIC RECORD CHANGER

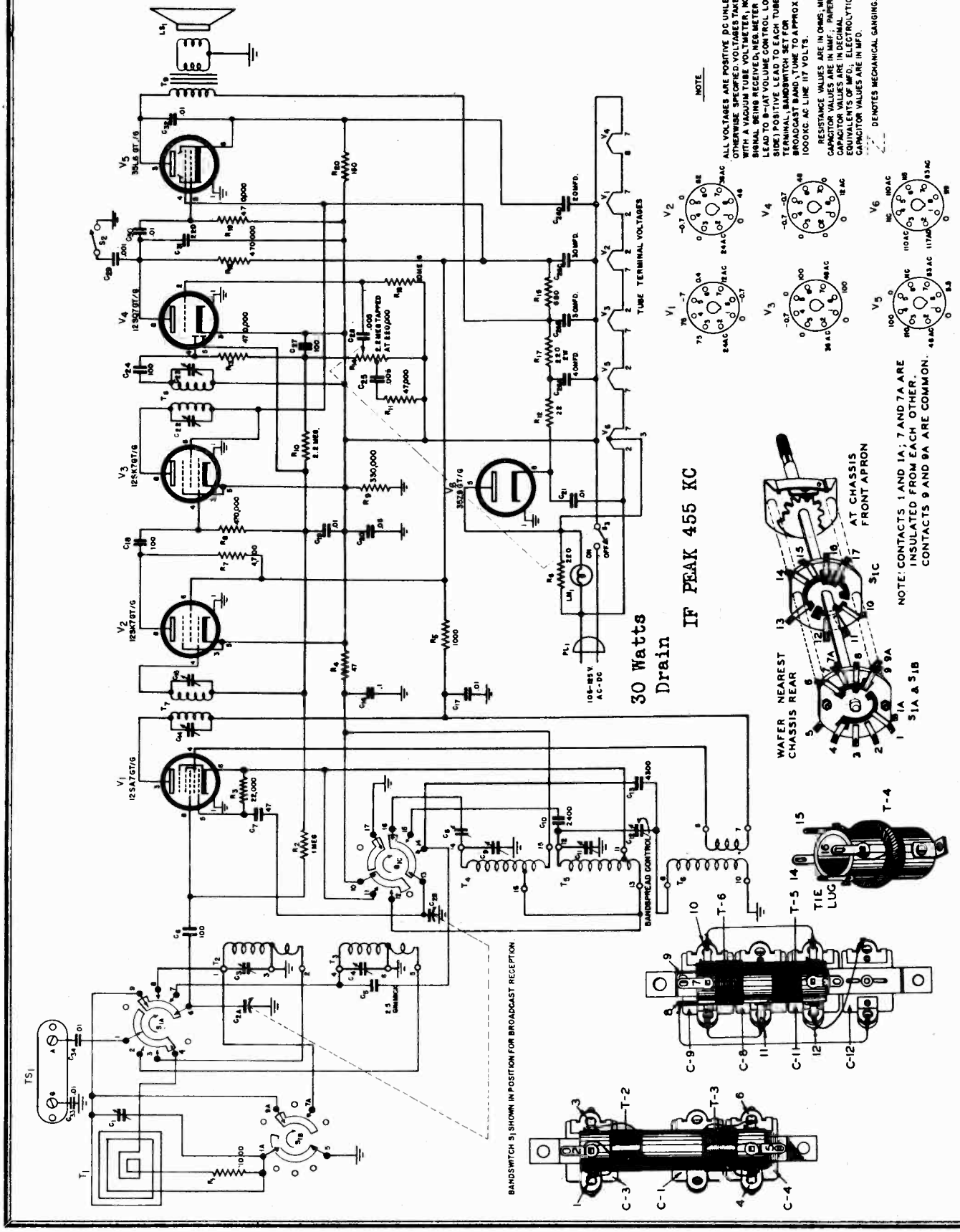
ALIGNMENT INSTRUCTIONS

Connect signal generator to flexible antenna lead attached to the loop antenna; connect low side of signal generator through 0.1-mf condenser to receiver chassis. Open wavetrap condenser. Set signal generator to 455 kc; adjust both i-f transformers for maximum signal. Repeak wavetrap condenser for minimum 455-kc signal. Open receiver variable condenser for minimum capacity. Set signal generator to 1720 kc. Peak oscillator section of variable condenser for maximum signal. Set Signal Generator to 1500 kc; tune in this signal. Adjust r-f section of receiver variable condenser for maximum signal strength. Keep signal generator output to minimum.

Record Changer: Gen. Instrument Model 204

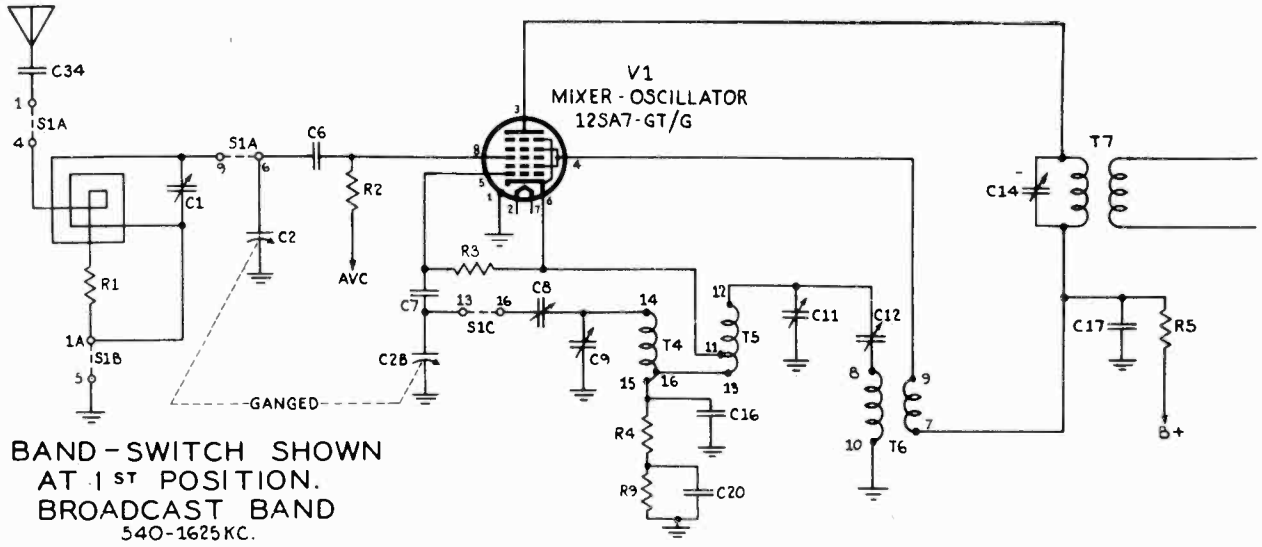
MODELS EC-112, EC-113

ECHOPHONE RADIO
A HALLICRAFTERS PRODUCT

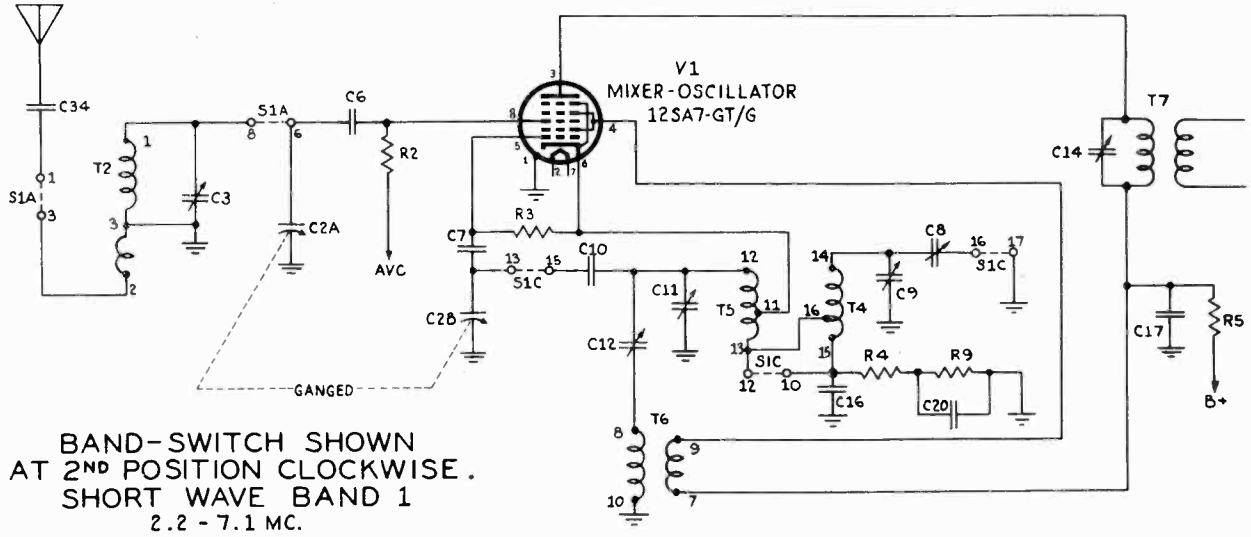


MODELS EC-112, EC-113

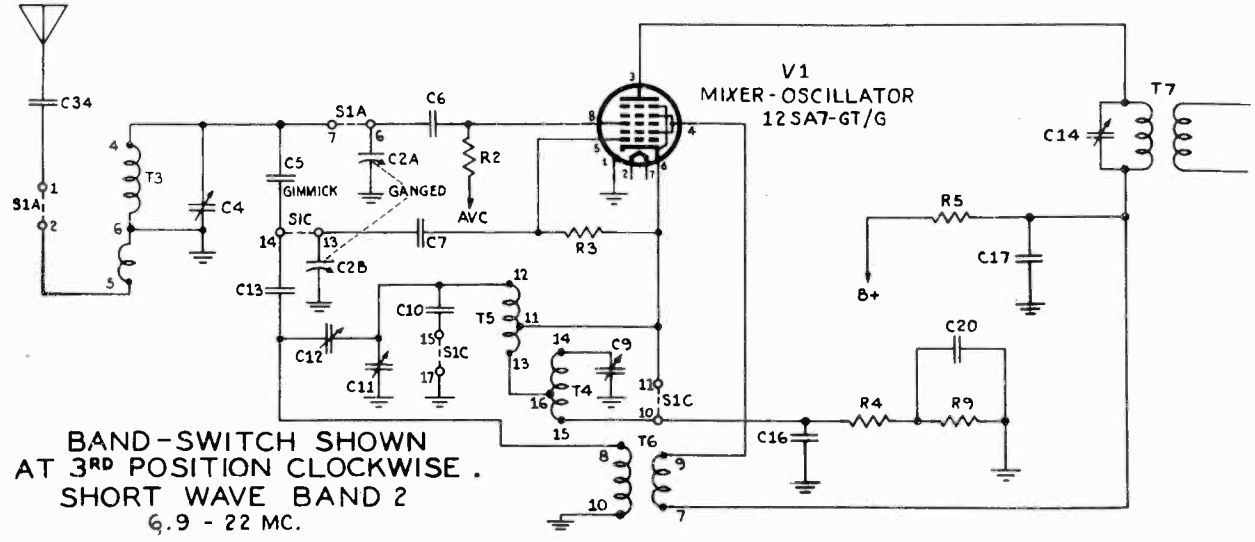
ECHOPHONE RADIO
HALLICRAFTERS PRODUCT



BAND-SWITCH SHOWN AT 1ST POSITION. BROADCAST BAND
540-1625 KC.



BAND-SWITCH SHOWN AT 2ND POSITION CLOCKWISE. SHORT WAVE BAND 1
2.2 - 7.1 MC.



BAND-SWITCH SHOWN AT 3RD POSITION CLOCKWISE. SHORT WAVE BAND 2
6.9 - 22 MC.

EQUIPMENT:

1. Signal Generator capable of ranges indicated in the ALIGNMENT CHART, including a 400 cycle audio modulator.
2. Output meter capable of handling 1 watt of audio power.
3. Standard RMA dummy antenna consisting of a 200 mmf condenser in series with a 20uh r-f choke, the choke being shunted by a 400 mmf condenser in series with a 400 ohm carbon resistor.
4. Non-metal screw-driver.

CONNECTIONS: Connect the Sig. Gen. "cold" lead to "G" on the antenna terminal strip except for i-f adjustments (see chart below); the "hot" lead is connected as indicated in the chart.

Connect the output meter across voice coil of the speaker and adjust the meter for 3 ohm impedance.

Caution: Set the meter at a sufficiently high range to prevent possible damage from overload. Band 3 must be aligned before band 2 in all instances.

CONTROL SETTINGS: After allowing about a ten minute warm up period, set the receiver's control as follows:

VOLUME control at full clockwise.

BANDSPREAD tuning control at "0", (min. cap.).

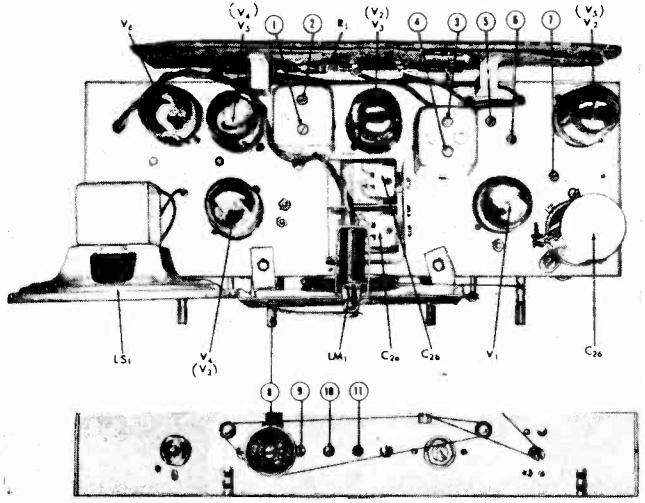


Fig. 6. Top and front views of the receiver showing tube locations and location of padder, trimmer and i-f adustment points.

NOTE: Bandspread indicator MUST be at ZERO when making all adj. Band 2 osc. trim. (9) must be set AFTER bandspread trim. (8) (Range 3 osc. trim.) is aligned. *Standard RMA dummy ant. consists of a 200mmf cond. in series with a 20uh r-f choke, the choke being shunted by a 400mmf cond. in series with a 400 ohm carbon res. **Connect Sig. Gen. ground lead to receiver negative return, not to chassis. This applies only to I-F adjustment.

ALIGNMENT CHART

DUMMY ANT. IN SERIES WITH SIG. GENERATOR	CONNECTION OF SIG. GENERATOR OUTPUT TO RECEIVER	SIGNAL GEN. FREQUENCY SETTING	BAND SWITCH SETTING	RECEIVER DIAL SETTING	ADJUST SLUG PADDER, OR TRIMMER NO.	TRIMMER DESCRIPTION	TYPE OF ADJUSTMENT MAKE ADJUSTMENT FOR:	STEP NO.
IF ADJUSTMENT								
None	**On mixer section stator of tuning condenser gang	455kc	Range 1 (Broadcast)	1625kc	3 & 4 1 & 2	Diode IF Input IF	Maximum output Maximum Output Repeat steps 1 & 2	1 2 3
RANGE 1 (Broadcast band)—								
Standard	Couple to loop	1500kc	Range 1	1500kc	11	Osc. Trimmer	Maximum output	4
RMA	aerial	1500kc	(Broadcast)	1500kc	6	Antenna shunt trimmer	Maximum output	5
Dummy*		600kc		600kc	10	Osc. padder	Maximum output Repeat step 4	6 7
RANGE 3 (Short wave range 6.9 to 22mc)—Align oscillator for this band with bandspread indicator drive pulley set screw loose and pointer set at zero. After completing the OSCILLATOR alignment, tighten the screws securely without changing the pointer setting from zero.								
Standard								
RMA	"A" on antenna	22mc	Range 3	22mc	8	Bandspread & Osc. trimmer	Maximum output	8
Dummy*	terminal strip	20mc		20mc	†5	Antenna shunt trimmer	Maximum output	9
RANGE 2 (Short wave range 2.2 to 7.1mc,)—								
Standard*	"A" on antenna	6mc	Range 2	6mc	9	Osc. trimmer	Maximum output	10
RMA	terminal strip	6mc		6mc	7	Antenna shunt trimmer	Maximum output	11
Dummy*								

DETAILED SERVICE INFORMATION

IF FREQUENCY	RECEIVER OVERALL SELECTIVITY	IMAGE RATIO	*RECEIVER OVERALL SENSITIVITY	AUDIO OUTPUT
455kc	8.5kc wide at 6db down 16kc wide at 20db down 32kc wide at 40db down (for 500 milliwatt output)	65:1 at 1000kc (loop) 20:1 at 2.5mc (ant.) 8:1 at 7.0mc (ant.) 6:1 at 15.0mc (ant.) 3:1 at 20.0mc (ant.)	45 microvolt at 1000 kc 80 microvolt at 2.5 mc 35 microvolt at 6mc 140 microvolt at 8mc 50 microvolt at 20mc	0.8 watt with less than 10% distortion

*Readings for 500 milliwatt constant output. Speaker disconnected and replaced with a 3.2 ohm load resistor. Signal from generator modulated 30% at 400 cycles.

To restring the main tuning dial cord, cut a 25" length of 18 lb test dial cord and tie one end to the tension spring of the main tuning capacitor drive pulley at position "A" on the diagram. Following the letters "A" through "S", wind the cord on the pulley and knob drive shaft. At position "S", stretch the tension spring and tie the cord securely. Cut off the excess cord. Note that three turns are wound on the knob drive shaft.

To restring the bandspread tuning dial cord, cut a 30" length of the dial cord and follow the procedure as explained above, except start at position "1" on the diagram and proceed through position "14". Then turn knob pulley maximum clockwise, slide pointer to 100 and insert cord in clip on pointer. Note that the knob pulley has two turns.

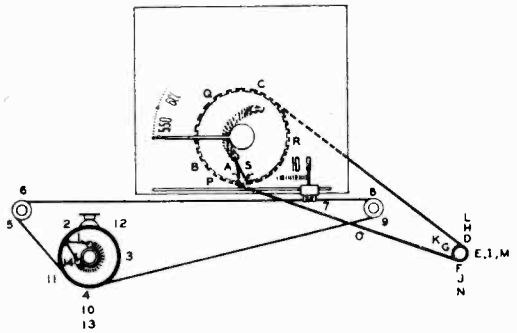
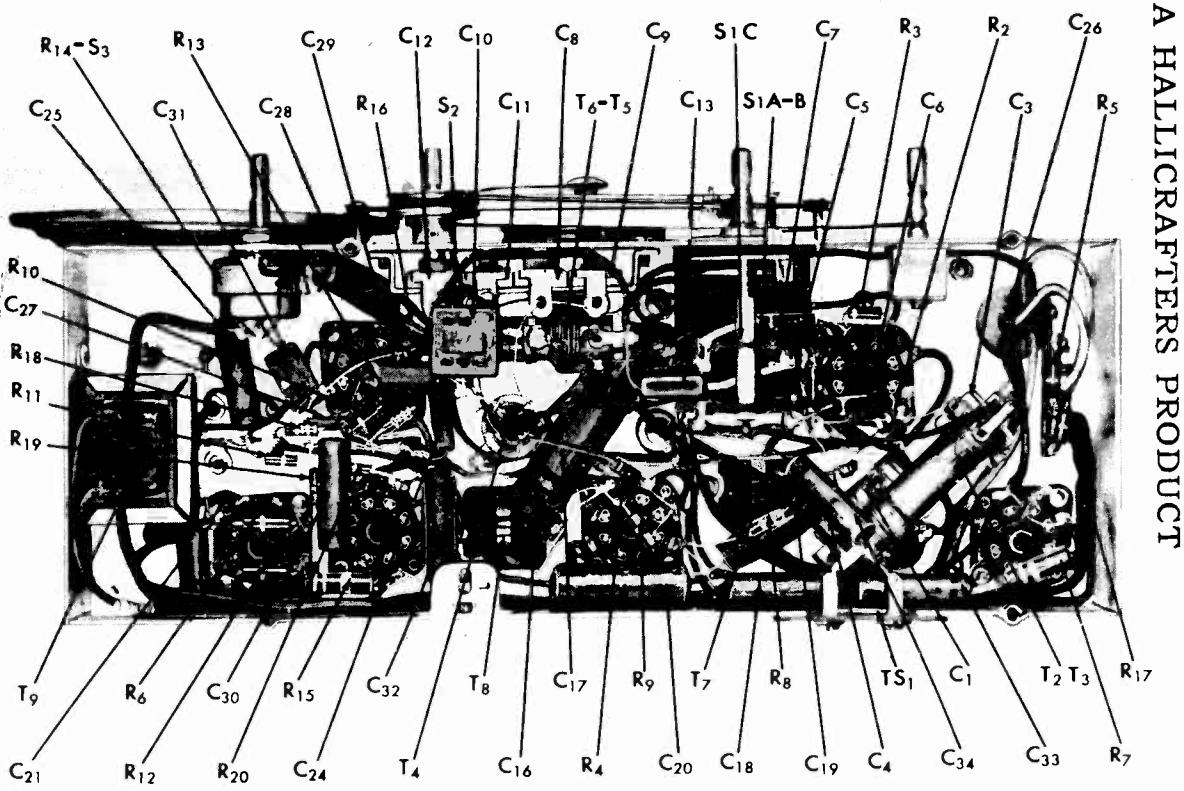


Fig. 3. Dial cable stringing procedure; main tuning is indicated by letters, and band spread tuning is indicated by numbers.



Model EC-112 and EC-113 bottom view of chassis showing location of component parts.

REF. NO.	DESCRIPTION	HALLICRAFTER'S PART NUMBER	LIST PRICE PER COMPONENT
	CAPACITORS		
C-1, 3 & 4	Antenna trimmers; 3 section unit	44A162	$ .40
C-2	Main tuning capacitor; 2 sections, ganged; 12.3 to 354.6 mmf, each section; air	48B165	2.17
C-5	2.5 mmf gimmick; twisted insulated leads. NOT FURNISHED AS A REPLACEMENT PART SHOWN FOR REFERENCE ONLY.		
C-6, 18, 24 & 27	100 mmf; 20%; 500 vdcw; mica	CM20A101M	.10
C-7	47 mmf; 20%; 500 vdcw; mica	CM20A470M	.10
C-8, 9, 11 & 12	Oscillator trimmer; 4 section	44B161	*
C-10	2400 mmf; 20%; 500 vdcw; mica	CM30A242M	.25
C-13	4300 mmf; 10%; 500 vdcw; mica	CM35A432K	.35
C-14 & 15	Trimmers for IF transformer, T-7. NOT A REPLACEABLE PART. Furnished with replacement transformer T-7. SEE LISTING REF. No. T-7.		
C-16	0.1 mfd; +40-15%; 600 vdcw; tubular paper	46AX104J	.10
C-17, 19, 21 30 & 32	0.01 mfd; 20%; 600 vdcw; tubular paper	46AX103F	.10
C-28	0.001 mfd; +40 −15%; 600 vdcw; tubular paper	46AZ502J	.10
C-20	0.05 mfd; +40 −15%; 600 vdcw; tubular paper	46AY503J	.15
C-22 & 23	Trimmers for IF transformer, T-8. NOT A SEPARATE REPLACEMENT PART. FURNISHED WITH REPLACEMENT TRANSFORMER T-8. SEE LISTING REF. NO. T-8.		
C-26A, B, C & D	Electrolytic; 4 section unit; sect. A— 40 mfd, 150 vdcw; sect. B & C—are each 30 mfd, 150 vdcw; Sect. D—20 mfd, 25 vdcw	45B095	1.10
C-29	0.001 mfd; 20%; 600 vdcw; tubular paper	46AZ102H	.10
C-31	220 mmf; 20%; 500 vdcw; mica	CM20A221M	.15
C-25	0.005 mfd; 20%; 600 vdcw; tubular paper	46AZ502J	.10
	PILOT LAMPS		
LM-1	6/8 volt @ 150 ma; brown bead; bayonet base; G.E. type 47	39A004	.10
	LOUD SPEAKER		
LS-1	Loud Speaker	85B038	3.02
	PLUGS		
PL-1	Line cord with two prong plug; 6 ft cord	87A078	.35
	RESISTORS		
R-1 & 5	1000 ohm; 20%; ½ watt; carbon; (NOTE: R-1 is included with antenna loop transformer ref. no. T-1, but is available as a separate replacement part.)	RC20A102M	.10
R-2	1 megohm; 20%; ½ watt; carbon	RC20AE105M	.10
R-3 & 11	47,000 ohm; 20%; ½ watt; carbon	RC20AE473M	.10
R-4	47 ohm; 20%; ½ watt; carbon	RC20AE470M	.10
R-6	220 ohm; 20%; 1 watt; carbon	RC20AE221M	.10
R-7	4700 ohm; 20%; 1 watt; carbon	RC20AE472M	.10
R-8, 13, 18 & 19	470,000 ohm; 20%; ½ watt; carbon	RC20AE474M	.10
R-9	330,000 ohm; 20%; ½ watt; carbon	RC20AE334M	.10
R-10	2.2 megohm; 20%; ½ watt; carbon	RC20AE225M	.10
R-12	22 ohm; 20%; 1 watt; carbon	RC30AE220M	.10
R-14 & S-3	VOLUME control; 2.2 megohm, tapped at 220,000 ohm, variable; includes SPST toggle action switch, S-3 on rear	25A561	.80
R-15	680 ohm; 20%; 1 watt; carbon	RC30AE681M	.10
R-16	10 megohm; 20%; ½ watt; carbon	RC20AE106M	.10
R-17	470 ohm; 20%; ½ watt; carbon	RC20AE471M	.10
R-20	150 ohm; 20%; ½ watt; carbon	RC20AE151M	.10

REF. NO.	DESCRIPTION	HALLICRAFTER'S PART NUMBER	LIST PRICE PER COMPONENT
	SWITCHES		
S-1	Banswitch; rotary; 2 section, 3 position	60B050	$ 1.35
S-2	Tone control switch	60A246	.25
S-3	Receiver on/off switch; part of resistor R-14 assembly. NOT FURNISHED AS A SEPARATE REPLACEMENT PART. SEE LISTING REF. NO. R-14.		
	TRANSFORMERS		
T-1	Antenna loop assembly; includes resistor R-1	57C104	1.05
T-2 & 3	Mixer coil assembly for short wave bands, both short wave ranges	51B814	.93
T-4	Oscillator coil for local broadcast band	51A811	.45
T-5 & 6	Oscillator coil assembly for short wave bands, both short wave ranges	51B815	.93
T-7	Input IF transformer; 455kc; trimmer tuned	50B196-5	.95
T-8	Diode IF transformer; 455kc; trimmer tuned	50B196-2	.95
T-9	Audio output transformer; matches output tube to 3 ohm voice coil of PM speaker	55B080-2	.80
	TERMINAL STRIPS		
TS-1	External antenna and ground connector strip	88A569	.10

MISCELLANEOUS COMPONENTS COMMON TO BOTH MODELS

QUANT. IN EQUIPMENT	DESCRIPTION	HALLICRAFTER'S PART NUMBER	LIST PRICE PER COMPONENT
1	Pilot lamp dial socket; bayonet base	86A036-1	.15
1	Bracket; tuning capacitor mounting	67B581	.10
1	Bracket; tuning shaft mounting	67A582	.10
1	Steel tuning shaft	74A176	.10
1	Acetate dial window	22B161	.25
1	Main tuning dial scale pointer	82A106	.15
1	Bandspread tuning dial scale pointer	82A107	.15
1	Calibrated dial scale	83B271	.68
1	Drive pulley	28A022	*
2	Idler pulley	28A023	.10
1	Line cord lock	76A299	.10
1	Electrolytic capacitor (C-26) hold down clamp	76A300	.10
1	Cam for switch, S—	77A207	.10
6	Tube sockets; octal; Amphenol type MIP-8	6A256	.10

MISCELLANEOUS COMPONENTS FOR MODEL EC-112 ONLY

1	Cabinet; bakelite; walnut finish	66E307-2	*
3	Knob; bakelite; walnut finish	15B067-2	.10
1	Knob; bakelite; walnut finish with dot	15B075-2	.10
1	Cabinet; bakelite; ivory finish	66E307-3	*
3	Knob; bakelite; ivory finish	15B067-1	.10
1	Knob; bakelite; ivory finish with dot	15B075-1	.10
1	Cabinet bottom plate	63C246	.40

MISCELLANEOUS COMPONENTS FOR MODEL EC-113 ONLY

1	Cabinet; wood	66E316	*
4	Knob; wood	15B075-4	.10
1	Dial escutcheon; brass	7C027	.73
1	Cabinet back; cardboard	32C339	.10

* Prices available on request.
When ordering, please specify Model number of receiver and part number of item.
NOTE: All prices subject to change without notice.

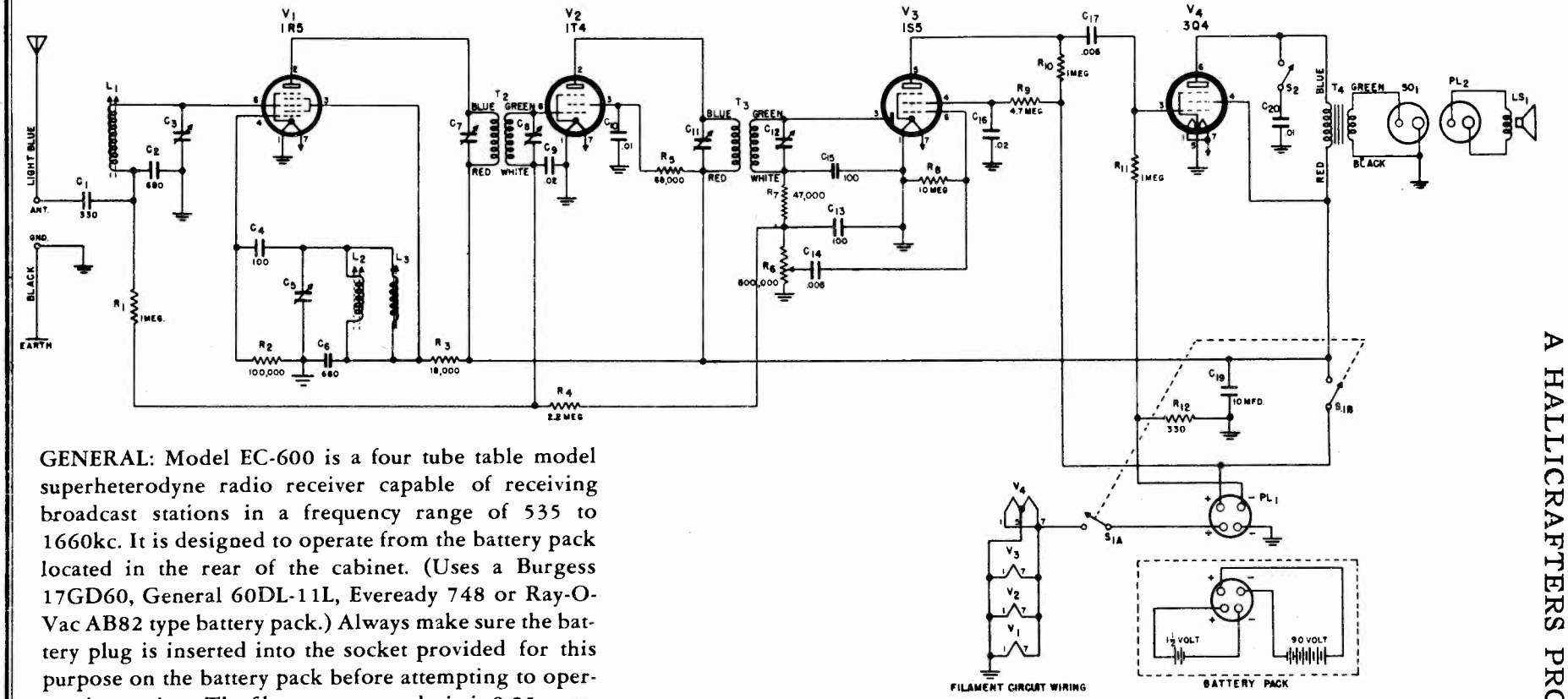
POWER SUPPLY DATA: Both receiver models are designed to operate from a line voltage of 105 to 125 volts AC/DC with a power drain of 30 watts nominal. Power to the receivers is supplied through the line cord extending from the rear of the cabinets.

TUBE TYPES AND FUNCTIONS: 12SA7GT/G-mixer-oscillator; 2-12SK7GT/G's as I-F amplifiers; 12SQ7GT/G-Detector, AVC and First audio amplifier; 35L6GT/G-Audio power amplifier; 35Z5GT/G-Power rectifier for a-c operation.

MODEL EC-600

ECHOPHONE RADIO

A HALLICRAFTERS PRODUCT



GENERAL: Model EC-600 is a four tube table model superheterodyne radio receiver capable of receiving broadcast stations in a frequency range of 535 to 1660kc. It is designed to operate from the battery pack located in the rear of the cabinet. (Uses a Burgess 17GD60, General 60DL-11L, Eveready 748 or Ray-O-Vac AB82 type battery pack.) Always make sure the battery plug is inserted into the socket provided for this purpose on the battery pack before attempting to operate the receiver. The filament current drain is 0.25 amp.; B plus drain is 14 ma. Leads are provided at rear of chassis for connection to an external antenna and ground. Note that the loudspeaker is connected to the receiver through the plug on the rear of the chassis. Always make sure the speaker is plugged in before turning the set on.

TUBES, TYPES and FUNCTIONS:

Type 1R5-mixer/oscillator
Type 1T4- IF amplifier
Type 1S5- detector, AVC, audio amplifier
Type 3Q4- audio power amp.

DETAILED SERVICE INFORMATION

IF FREQUENCY	RECEIVER OVERALL SELECTIVITY	IMAGE RATIO	RECEIVER OVERALL SENSITIVITY	AUDIO OUTPUT
455 kc	6 kc wide at 6 db down 13 kc wide at 20 db down 41 kc wide at 60 db down (1000 kc input to the antenna; output constant)	83:1 at 1000 kc	50 microvolt at 1000 kc for 0.05 watt output	0.15 watt with less than 10% distortion. Audio section bandpass: 45 to 10,000 C.P.S.

EQUIPMENT:

1. Signal generator capable of the ranges indicated on the alignment chart, including a 400 cycle audio modulator.
2. Output meter capable of handling 1.5 watts of audio power.
3. *Standard RMA dummy antenna.
4. Non-metallic screw driver.

*Standard RMA dummy antenna consists of a 200 mmf condenser in series with a 20uh r-f choke which is shunted by a 400mmf condenser in series with a 400 ohm carbon resistor.

CONNECTIONS: Connect the signal generator "cold" lead to the receiver chassis, the "hot" lead as indicated in the chart.

Connect the output meter across the speaker voice coil.

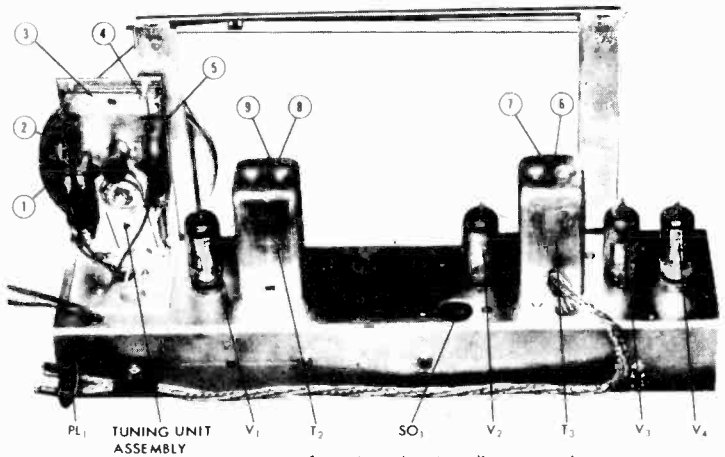


Fig. 6. Top view of receiver showing alignment points.

CONTROL SETTINGS: After allowing about a ten minute warm up period, set the receiver controls as follows: Volume control—maximum clockwise; tuning control is set as indicated in the chart.

ALIGNMENT CHART

DUMMY ANT. IN SERIES WITH SIG. GENERATOR	CONNECTION OF SIG. GENERATOR OUTPUT TO RECEIVER	SIGNAL GEN. FREQUENCY SETTING	RECEIVER DIAL SETTING	ADJUST SLUG, PADDER, OR TRIMMER NO.	DESCRIPTION	TYPE OF ADJUSTMENT MAKE ADJUSTMENT FOR	STEP NO.
			IF ADJUSTMENT				
None	Antenna lead at chassis rear	455kc	1000kc	6 & 7	Diode IF	Maximum output	1
				8 & 9	Input IF	Maximum output	2
						Repeat steps 1 & 2	3
			BROADCAST BAND ADJUSTMENT				
Standard RMA Dummy	Antenna lead at chassis rear	1660kc	Maximum clockwise	3	Osc. Trimmer	Maximum output	4
		1660kc	Maximum clockwise	4	Ante. Trimmer	Maximum output	5
		1400kc	1400kc	5	Ant. coil	Maximum output by moving coil mounting up or down on chassis	6
						Repeat step 4	7
		600kc	600kc	22	Osc. Padder slug	* Maximum output	8

NOTE: Repeat adjustments 4 through 7 as often as necessary, in order listed.
Do NOT change the position of the OSCILLATOR coil (ref. 1 on Fig. 2). Adjusting the ANTENNA coil location is sufficient.
* Rotate the tuning control when making this adjustment.

MODEL EC-600

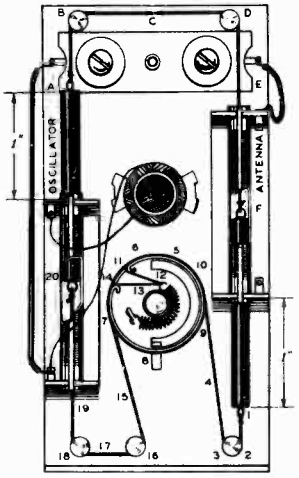
ECHOPHONE RADIO
A HALLICRAFTERS PRODUCT

HOW TO RESTRING TUNING ASSEMBLY DRIVE CORDS

Cut a 6″ length of 18 lb. test dial cord and tie one end to osc. coil slug eye at point "A" as shown in diagram. Following letters "A" through "F" tie other end to antenna coil slug at point "F". When complete, be sure slugs take the position shown in diagram. Cut off excess cord.

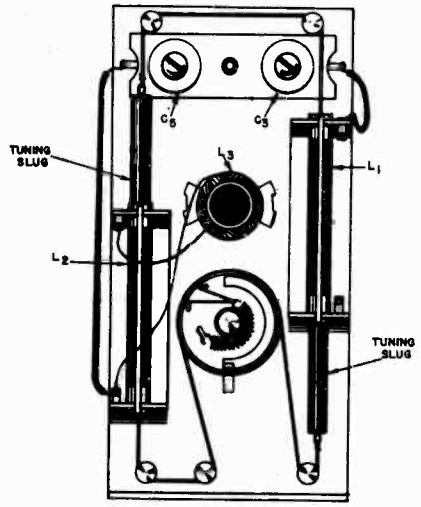
To restring cord at other end of slugs, cut a 9″ length of 18 lb. test dial cord and tie one end to slug eye at position "1" as shown on diagram. Following the numbers "1" through "20" bring cord under post, around pulley, through slot to tension spring, back out through slot, then under the two posts to slug eye on oscillator coil slug at position "20." Pull on cord so as to put tension on spring and tie securely. Cut off excess cord.

Receiver calibration will depend on relative position of slugs in coils. Slugs must be in position as shown on drawing.

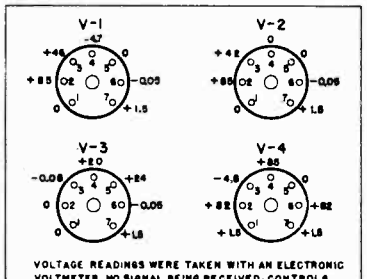


NOTE: TUNING SLUGS FOR L_1 AND L_2 ARE MECHANICALLY GANGED

PICTORIAL VIEW OF TUNING UNIT



TUBE TERMINAL AND VOLTAGE INFORMATION



VOLTAGE READINGS WERE TAKEN WITH AN ELECTRONIC VOLTMETER, NO SIGNAL BEING RECEIVED; CONTROLS SET AS FOLLOWS:

BATTERY SWITCH —— CLOCKWISE ('ON')
VOLUME CONTROL —— (MIN) COUNTER CLOCKWISE
TONE —— COUNTER CLOCKWISE ("NORMAL")
TUNING —— SET AT 1000KC ON TUNING DIAL

ALL VOLTAGES ARE POSITIVE D.C. UNLESS OTHERWISE SPECIFIED.

NEG. METER LEAD TO CHASSIS; POS. METER LEAD TO EVERY TERMINAL OF EACH TUBE.

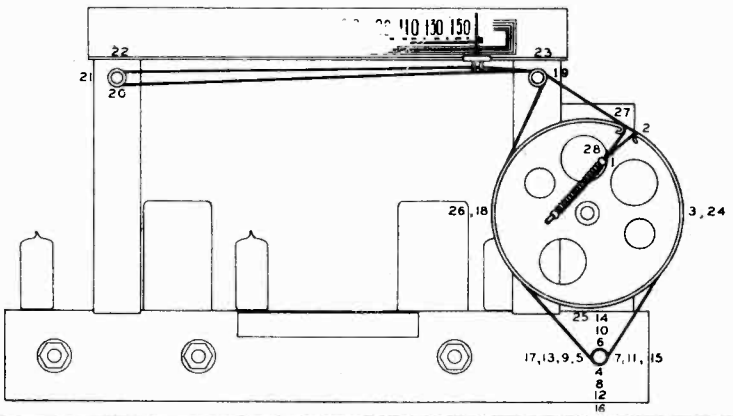
NOTE

RESISTANCE VALUES ARE IN OHMS, MICA CAPACITOR VALUES ARE IN MMF, PAPER CAPACITOR VALUES ARE IN DECIMAL EQUIVALENTS OF MFD. ELECTROLYTIC CAPACITOR VALUES ARE IN MFD.

DENOTES MECHANICAL GANGING.

HOW TO RESTRING DIAL CORD

To restring the main dial cord, cut a 35″ length of 18 lb. test dial cord and tie one end to the tension spring of the main tuning dial drive pulley at position "1" on the diagram. Following the numbers 1 through 28, wind the cord on the pulley, knob drive shaft and two pointer drive pulleys. At position "28" stretch the tension spring and tie the cord securely. Cut off the excess cord. Note that four complete turns are wound on the knob drive shaft.



ECHOPHONE RADIO
A HALLICRAFTERS PRODUCT

MODEL EC-600

REF. NO.	DESCRIPTION	HALLICRAFTER'S PART NUMBER	LIST PRICE
	CAPACITORS		
C-1	330 mmf; 20%; 500 vdcw; mica	CM20A331M	.15
C-2 & 6	680 mmf; 20%; 500 vdcw; mica	CM20A681M	.20
C-3	Trimmer for mixer coil; part of tuning unit assembly; shown for reference only; NOT AVAILABLE AS A SEPARATE REPLACEMENT PART		
C-4, 13 & 15	100 mmf; 20%; 500 vdcw; mica	CM20A101M	.10
C-5	Trimmer for oscillator coil; part of tuning unit assembly; shown for reference only; NOT AVAILABLE AS A SEPARATE REPLACEMENT PART.		
C-7 & 8	Trimmer for input IF transformer T-2; shown for reference only; NOT AVAILABLE AS A SEPARATE REPLACEMENT PART.		
C-9 & 16	0.02 mfd; 20%; 200 vdcw; tubular paper	46AU203F	.10
C-10 & 20	0.01 mfd; 20%; 200 vdcw; tubular paper	46AU103F	.10
C-11 & 12	Trimmer for diode IF transformer, T-3; shown for reference only; NOT AVAILABLE AS A SEPARATE REPLACEMENT PART.		
C-14 & 17	0.005 mfd; +40—10%; 200 vdcw; tubular paper	46AU502J	.10
C-18	0.05 mfd; 20%; 200 vdcw; tubular paper	46AU503F	.10
C-19	Electrolytic; 10 mfd; 150 vdcw; dry	45B098	.36
	PLUGS		
PL-1	Battery connector plug and cable assembly	87A1555	*
PL-2	Loudspeaker voice coil connector plug; part of speaker assembly, LS-1; also is available as a separate replacement part	10A243	.10
	LOUDSPEAKER		
LS-1	6" diam. cone; PM type; 3 ohm voice coil; includes two connector cable and plug for connection to output transformer secondary winding through socket SO-1	85C039	3.43
	RESISTORS		
R-1, 10 & 11	1 megohm; 20%; ½ watt; carbon	RC20AE105M	.10
R-2	100,000 ohm; 10%; ½ watt; carbon	RC20AE104K	.10
R-3	18,000 ohm; 10%; ½ watt; carbon	RC20AE183K	.10
R-4	2.2 megohm; 20%; ½ watt; carbon	RC20AE225M	.10
R-5	58,000 ohm; 20%; ½ watt; carbon	RC20AE683M	.10
R-6	Volume Control; 500,000 ohm; no taps	25A567	.58
R-7	47,000 ohm; 20%; ½ watt; carbon	RC20AE473M	.10
R-8	10 megohm; 20%; ½ watt; carbon	RC20AE106M	.10
R-9	4.7 megohm; 20%; ½ watt; carbon	RC20AE475M	.10
R-12	330 ohm; 20%; ½ watt; carbon	RC20AE331M	.10

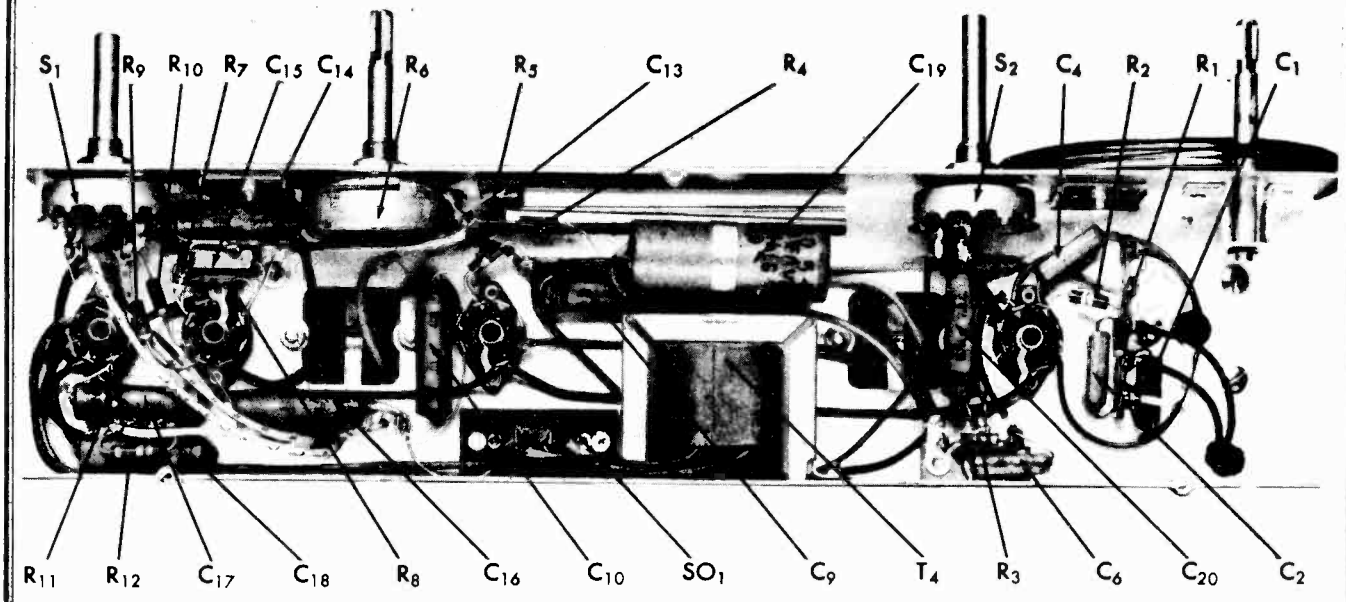
REF. NO.	DESCRIPTION	HALLICRAFTER'S PART NUMBER	LIST PRICE PER COMPONENT
	SWITCHES		
S-1A & B	On/Off battery switch; DPST; rotary action	60A258	.54
S-2	Normal/Bass tone switch; SPST; Rotary action	60A259	.48
	TUNING UNIT ASSEMBLY		
	Complete tuning unit; includes mixer coil L-1 and its trimmer C-3; also oscillator coil L-2, its trimmer C-5 and its padding adjustment slug tuned coil L-3; supplied as one complete assembly only	50B199	*
	TRANSFORMERS		
T-2	Input IF transformer; 455 kc; includes trimmer capacitors C-7 and C-8	50C196-3	.95
T-3	Diode IF transformer; 455 kc; includes trimmer capacitors C-11 and C-12	50C196-4	.95
T-4	Audio output transformer; matches the output of a tube type 3Q4 to the voice coil of a 3 ohm, PM type loudspeaker	55B085	1.08

MISCELLANEOUS MECHANICAL COMPONENTS

QUANTITY IN EQUIPMENT	DESCRIPTION	HALLICRAFTER'S PART NUMBER	LIST PRICE PER COMPONENT
4	Tube socket; 7 prong miniature; bakelite	6A219	.10
3	Idler pulley; bakelite	28A023	.10
1	Dial pointer; painted metal	82A113	.15
1	Calibrated dial scale plate	83B272	.73
1	Glass dial window	22B163	.10
2	Dial window mounting bracket	67A617	.10
2	Dial plate mounting bracket	67B612	.15
1	Tuning shaft mounting bracket	67A582	.10
1	Tuning shaft; steel	74A192	.10
1	Drive pulley; for tuning unit assembly	28A025	.10
1	Dial tension spring for drive pulley	75A102	.10
3	Knobs; bakelite; walnut	15B068-1	.10
1	Cabinet; wood; walnut	66F328	*
1	Knob; bakelite; walnut with dot	15B077-1	.10

* Price available on request.

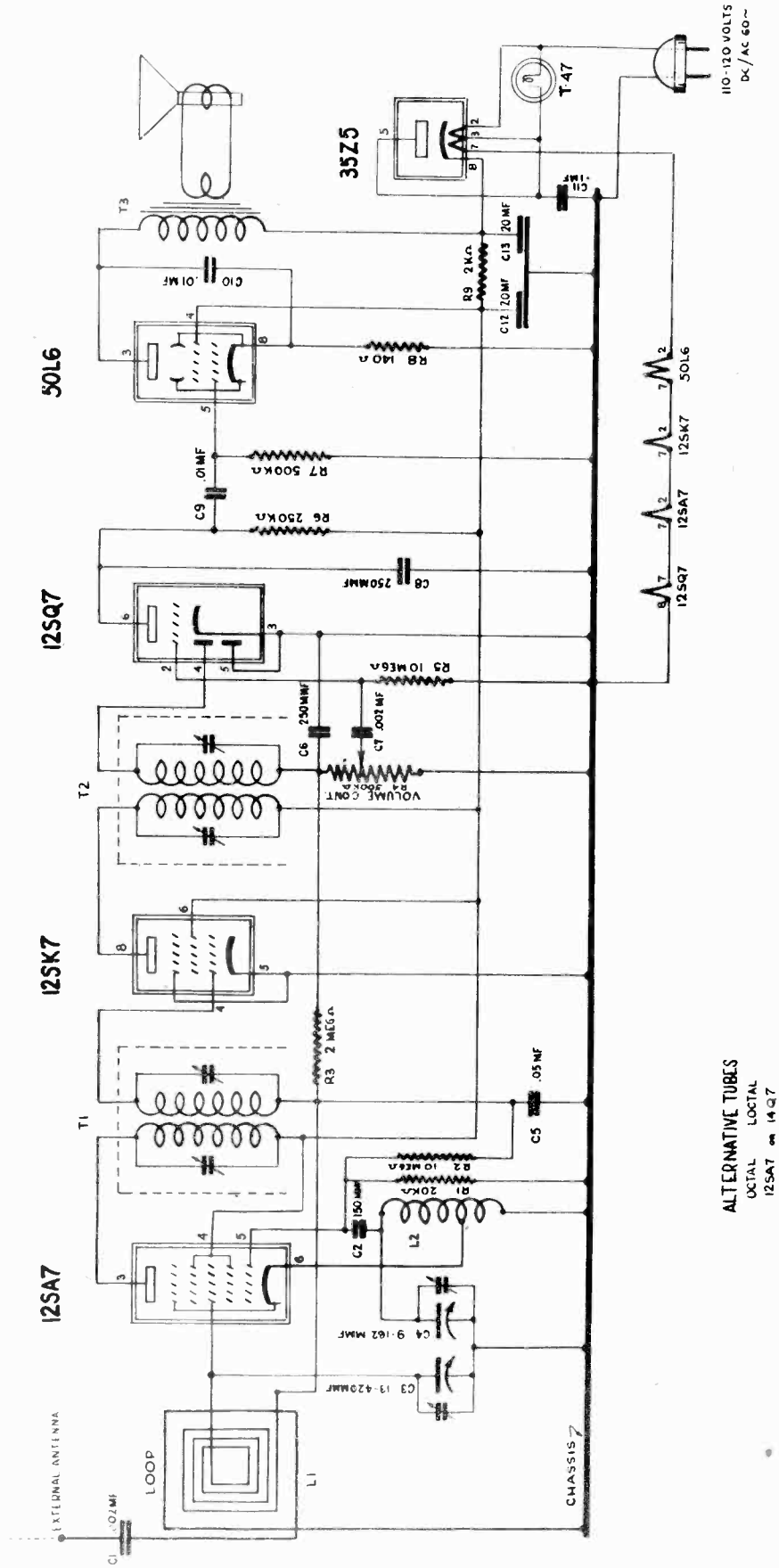
NOTE: Prices subject to change without notice. When ordering parts, specify model number of set and part number of item.



Radio Receiver Model EC-600, bottom view showing location of components.

MODEL AR-501

ELECTROMATIC MFG. CORP.



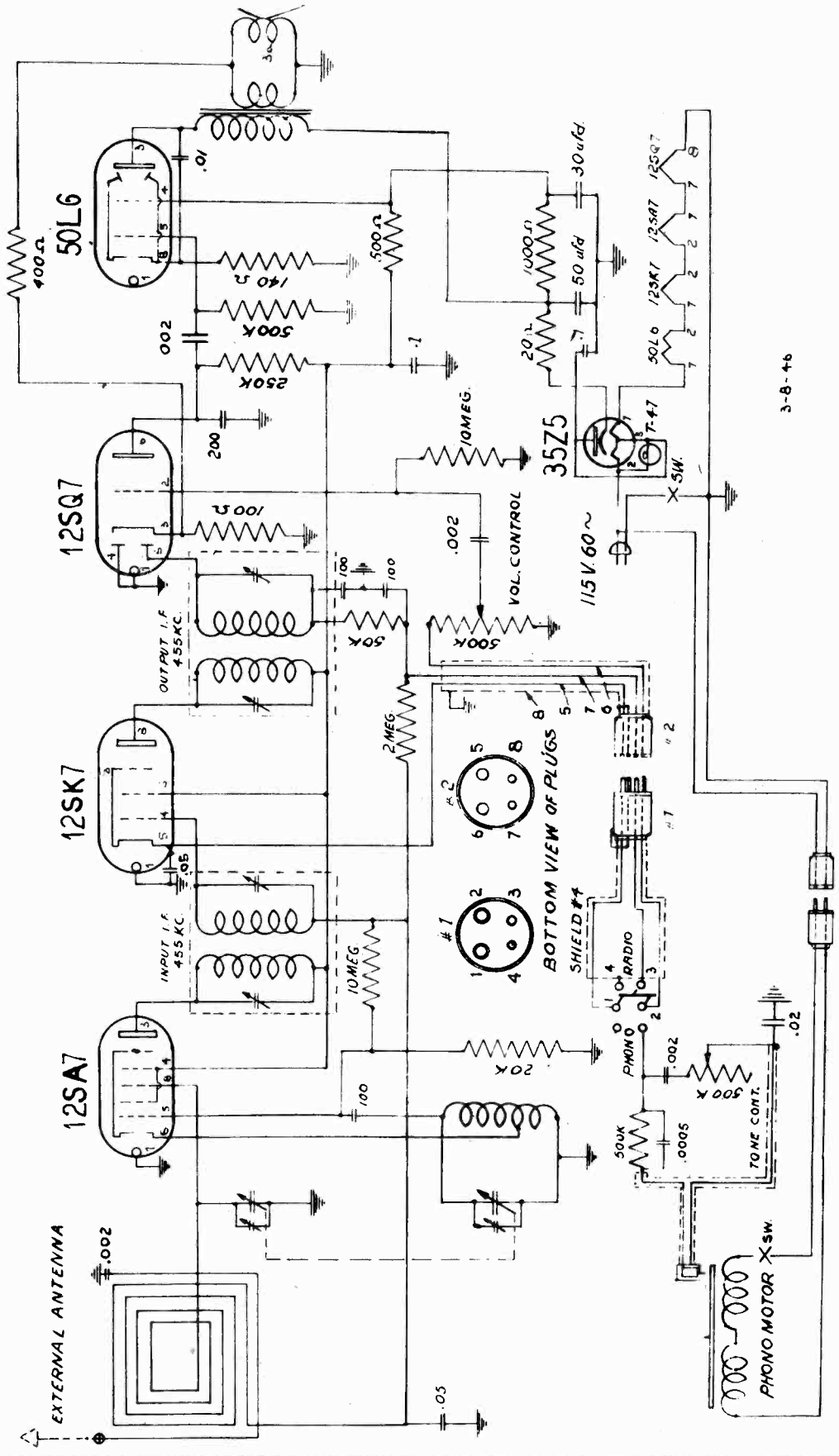
ALTERNATIVE TUBES

OCTAL	LOCTAL
12SA7	14Q7
12SK7	14A7/1287
12SQ7	14B6
50L6	50A5
35Z5	35Y4

MODEL AR-501
I.F.-455KC
INPUT POWER-30 WATTS

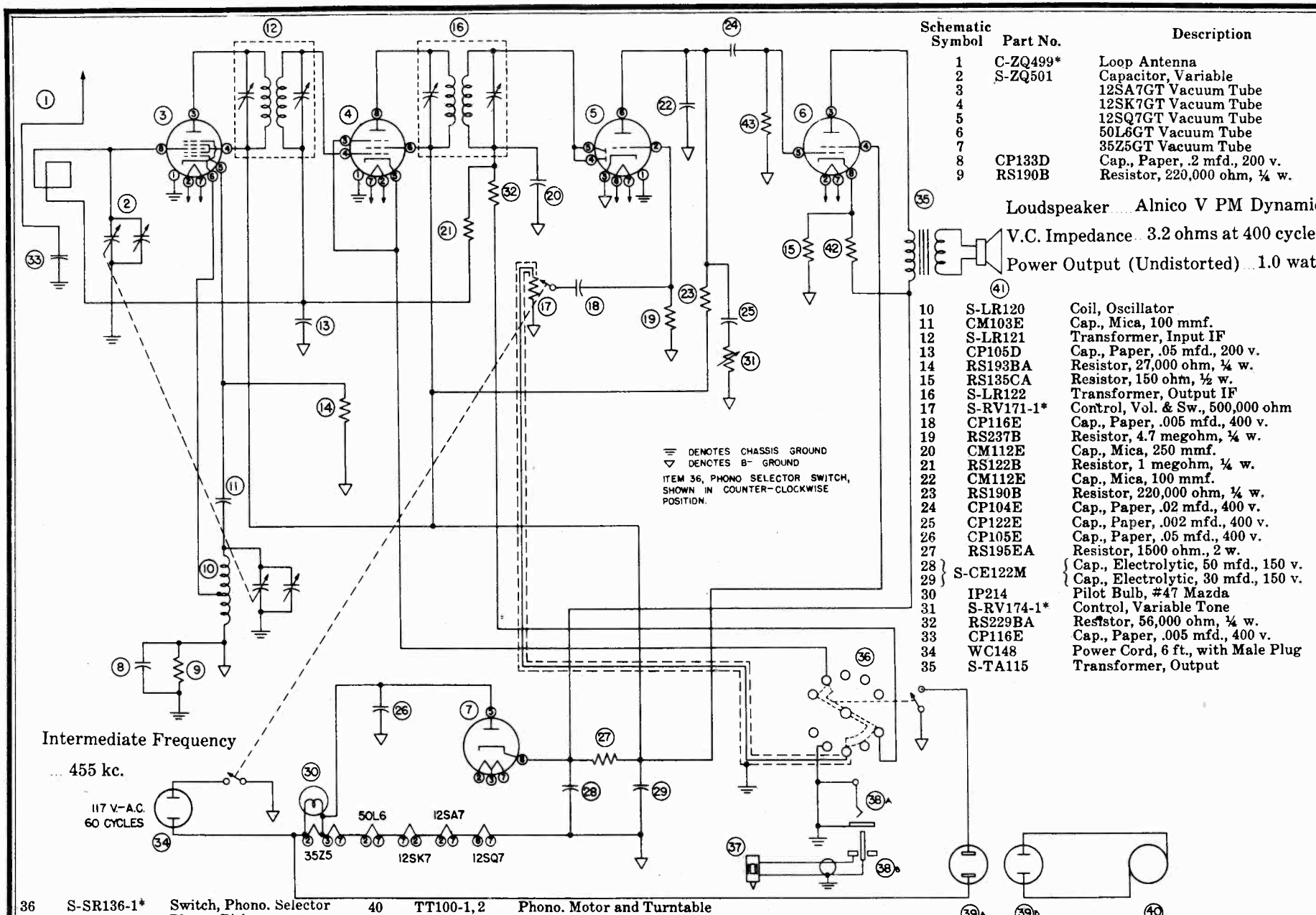
MODEL 512

ELECTROMATIC MFG. CORP.



ELECTRONIC CORP. OF AMERICA

MODELS 104, 105, 106
Early



Schematic Symbol	Part No.	Description
1	C-ZQ499*	Loop Antenna
2	S-ZQ501	Capacitor, Variable
3		12SA7GT Vacuum Tube
4		12SK7GT Vacuum Tube
5		12SQ7GT Vacuum Tube
6		50L6GT Vacuum Tube
7		35Z5GT Vacuum Tube
8	CP133D	Cap., Paper, .2 mfd., 200 v.
9	RS190B	Resistor, 220,000 ohm, ¼ w.

Loudspeaker ..... Alnico V PM Dynamic
V.C. Impedance ..... 3.2 ohms at 400 cycles
Power Output (Undistorted) ..... 1.0 watt

10	S-LR120	Coil, Oscillator
11	CM103E	Cap., Mica, 100 mmf.
12	S-LR121	Transformer, Input IF
13	CP105D	Cap., Paper, .05 mfd., 200 v.
14	RS193BA	Resistor, 27,000 ohm, ¼ w.
15	RS135CA	Resistor, 150 ohm, ½ w.
16	S-LR122	Transformer, Output IF
17	S-RV171-1*	Control, Vol. & Sw., 500,000 ohm
18	CP116E	Cap., Paper, .005 mfd., 400 v.
19	RS237B	Resistor, 4.7 megohm, ¼ w.
20	CM112E	Cap., Mica, 250 mmf.
21	RS122B	Resistor, 1 megohm, ¼ w.
22	CM112E	Cap., Mica, 100 mmf.
23	RS190B	Resistor, 220,000 ohm, ¼ w.
24	CP104E	Cap., Paper, .02 mfd., 400 v.
25	CP122E	Cap., Paper, .002 mfd., 400 v.
26	CP105E	Cap., Paper, .05 mfd., 400 v.
27	RS195EA	Resistor, 1500 ohm., 2 w.
28	S-CE122M	Cap., Electrolytic, 50 mfd., 150 v.
29		Cap., Electrolytic, 30 mfd., 150 v.
30	IP214	Pilot Bulb, #47 Mazda
31	S-RV174-1*	Control, Variable Tone
32	RS229BA	Resistor, 56,000 ohm, ¼ w.
33	CP116E	Cap., Paper, .005 mfd., 400 v.
34	WC148	Power Cord, 6 ft., with Male Plug
35	S-TA115	Transformer, Output

36	S-SR136-1*	Switch, Phono. Selector	40	TT100-1, 2	Phono. Motor and Turntable
37	QP100	Phono. Pickup	41	S-QL104	Speaker, 5" PM
38A	JJ237	Phono. Receptacle, Pickup	42	RS193DA	Resistor, 27,000 ohm, 1 w.
38B	JJ241	Phono. Plug, Pickup	43	RS189BA	Resistor, 470,000 ohm, ¼ w.
39A	JJ236	Phono. Motor Receptacle		WC147	Dial Cord
39B	JJ240	Phono. Motor Plug		A-AQ589	Dial Cord Spring

*For Model 105, substitute the following:
B-ZQ587 for C-ZQ499
S-RV171-2 for S-RV171-1
S-RV174-2 for S-RV174-1
S-SR136-2 for S-SR136-1

Record Changer: General Instrument Model 205
For Alignment, see P.15-6

MODELS 104,105,106
Early

ELECTRONIC CORP. OF AMERICA

ALIGNMENT PROCEDURE

The following equipment is necessary to properly align this chassis:

1. A signal generator which will provide an accurately calibrated signal at the frequencies listed.
2. An output meter.
3. A non-metallic screwdriver.
4. Any loop similar to the one used in the receiver.

PROCEDURE

1. Mount the loop in a vertical position on a block of wood so that it may be coupled parallel to the set loop.
2. Connect the loop to the output terminals of the signal generator.

INPUT SIGNAL	DISTANCE BETWEEN GEN. AND SET LOOP	SET DIAL AT	TRIMMERS	PURPOSE
455 kc.	Close	HF end	1 2 3 4	Align IF
1720 kc.	Close	HF end	5	Set limit of band
1400 kc.	1½'	1400 kc.	6	Align antenna

SOCKET VOLTAGES

TUBE	POSITION	1	2	3	4	5	6	7	8
12SA7GT	Oscillator and Mixer	0	24 AC	84	84	−11*	0	125 AC	0
12SK7GT	IF Amplifier	0	24 AC	0	0	0	84	35 AC	84
12SQ7GT	2nd Det.–1st Audio	0	0	0	0	0	18	0	125 AC
50L6GT	Power Output	0	83 AC	108	84	0	0	35 AC	6
35Z5GT	Rectifier	0	117 AC	111 AC	0	111 AC	0	83 AC	117

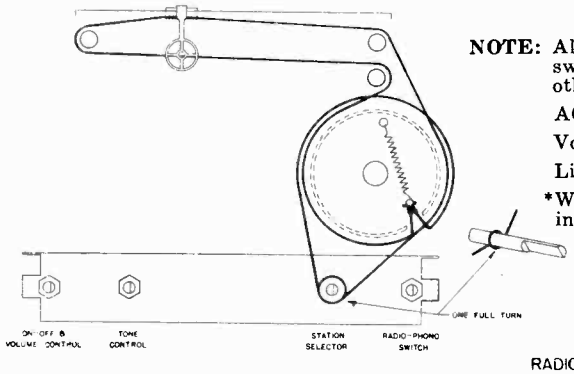
NOTE: All DC voltages measured with a 1000 ohm-per-volt meter from ON-OFF switch (—B) to socket contact indicated. All voltages are positive DC unless otherwise marked.

AC switch on.

Volume control in minimum position; no signal.

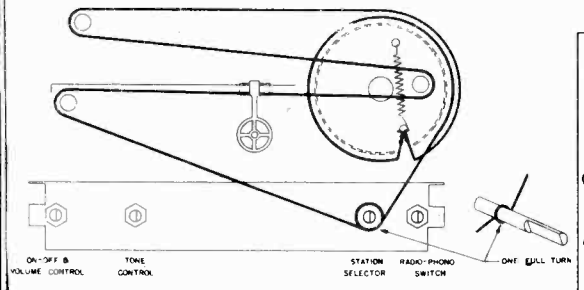
Line voltage 117 volts AC.

*When a vacuum tube voltmeter with approximately 10 megohms or higher input resistance is used.



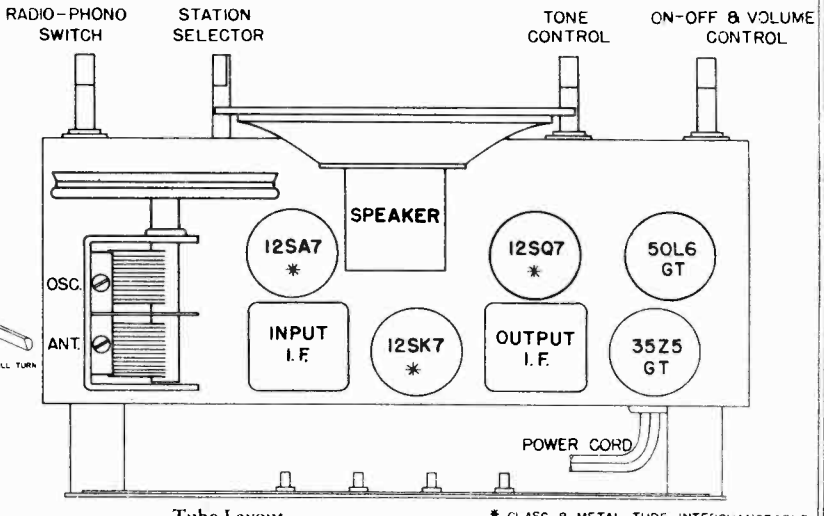
Dial Mechanism

Models 104, 106



Dial Mechanism

Model 105

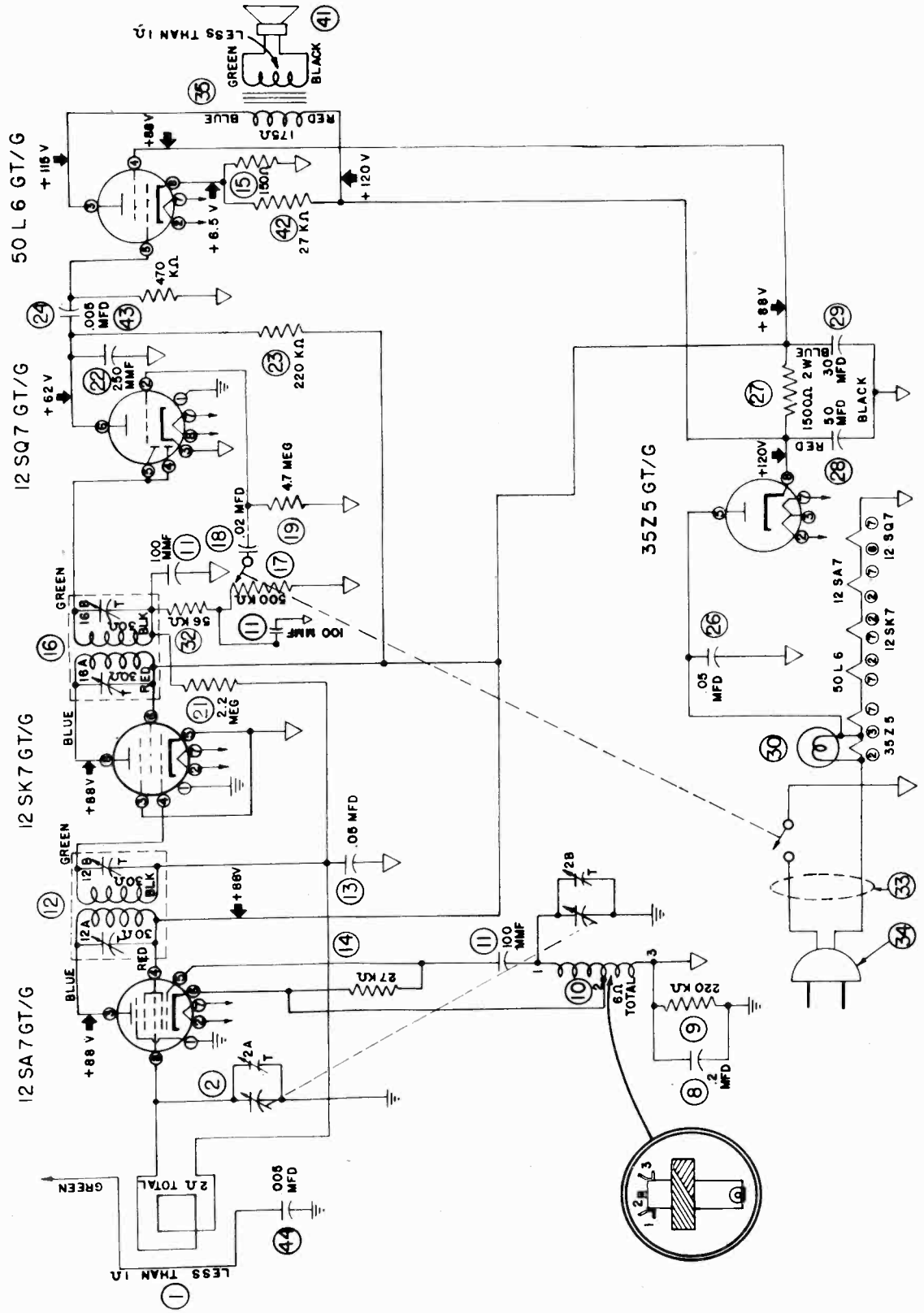


Tube Layout

* GLASS & METAL TUBE INTERCHANGEABLE

ELECTRONIC CORP. OF AMERICA

MODELS 101,102,133
Ch. AA

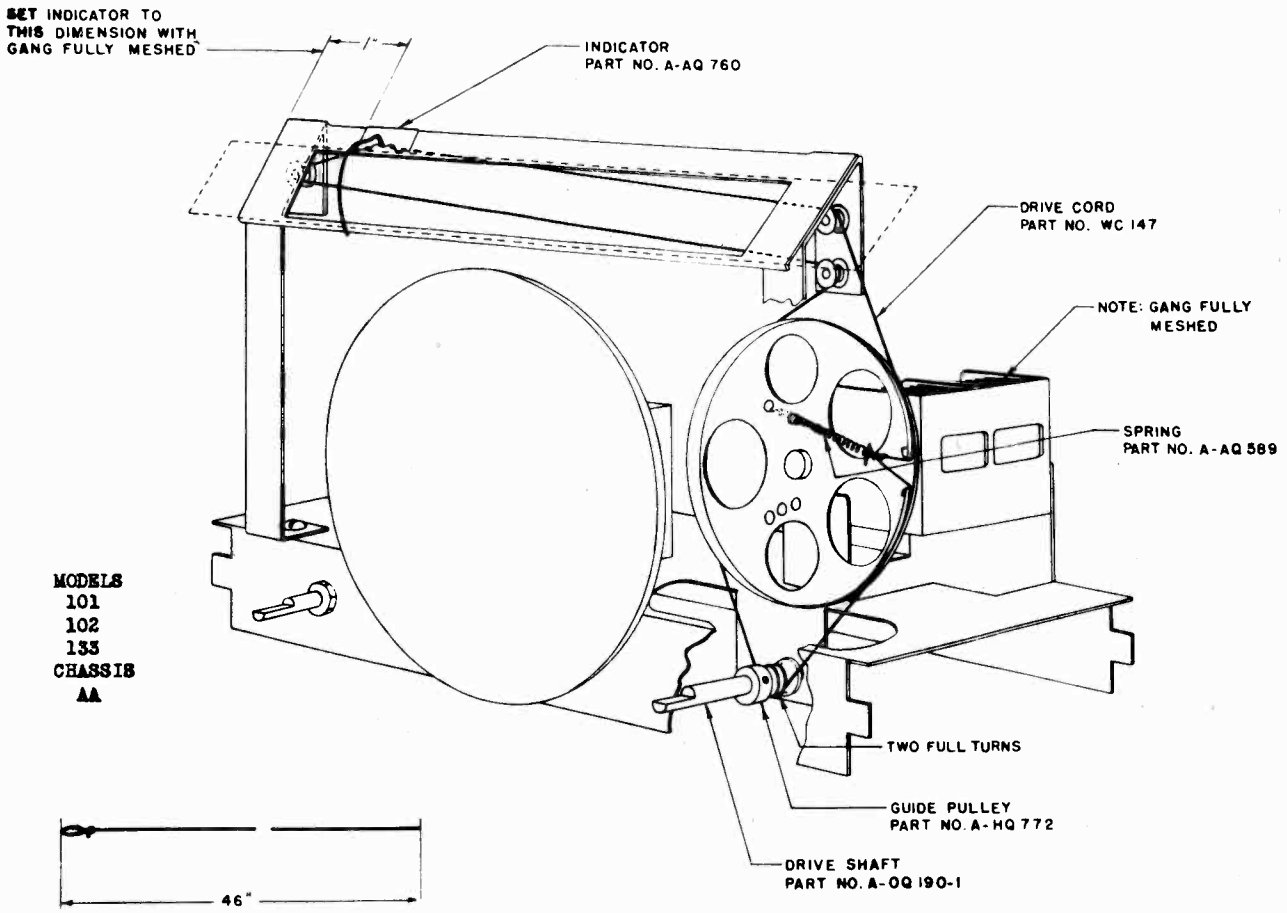


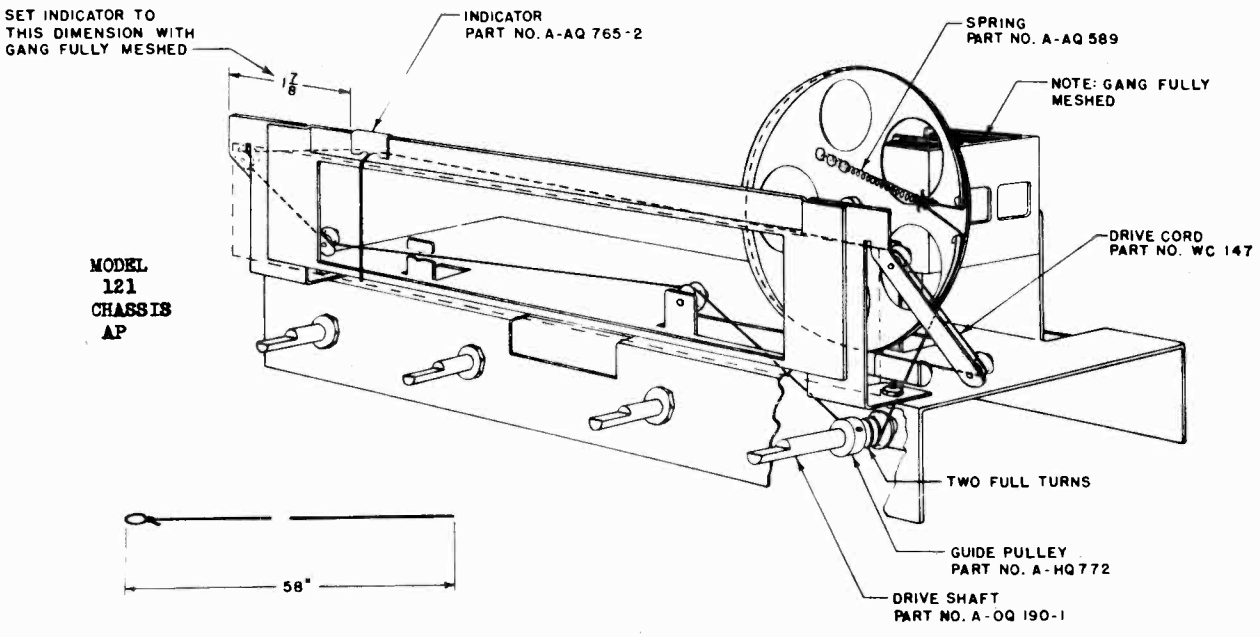
NOTE: ALL VOLTAGES MEASURED FROM B- WITH A 20,000 Ω/VOLT VOLTMETER - LINE VOLTAGE 117 V. A. C.- VOLUME CONTROL AT MAXIMUM - NO SIGNAL RECEIVED.
I. F. FREQUENCY 455 K.C.
▽ DENOTES B- GROUND.
⏚ DENOTES CHASSIS GROUND.

For Alignment, see P.15-6

MODELS 101,102,133
MODEL 121

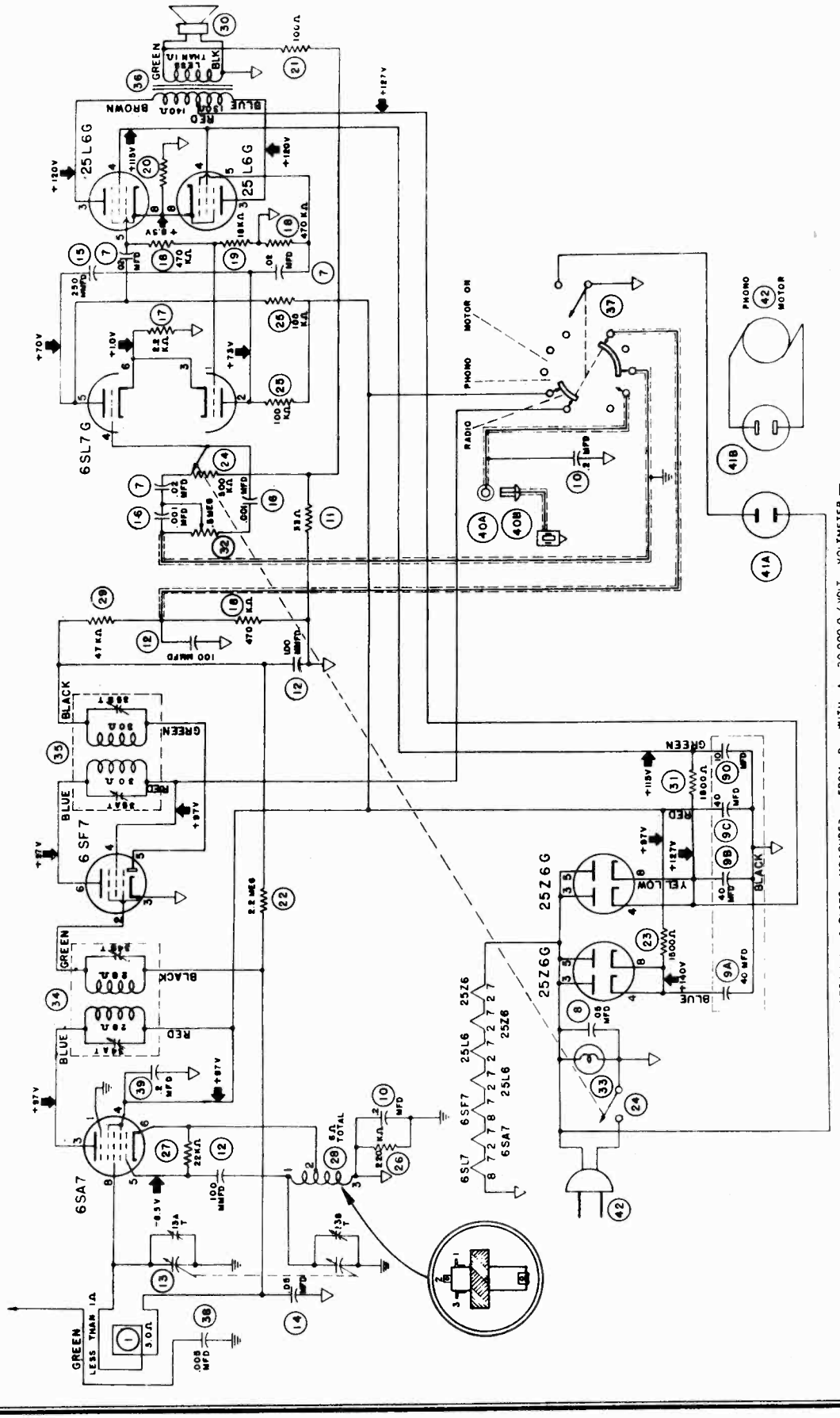
ELECTRONIC CORP. OF AMERICA





MODEL 121,,Ch.AP

ELECTRONIC CORP. OF AMERICA



MODELS 101,102,133
MODELS 104,105,106
MODEL 121

ELECTRONIC CORP. OF AMERICA

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

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

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

ALIGNMENT DATA

MODELS 104, 105, 106, 102, 101, 133

I.F. FREQ. - 455KC.

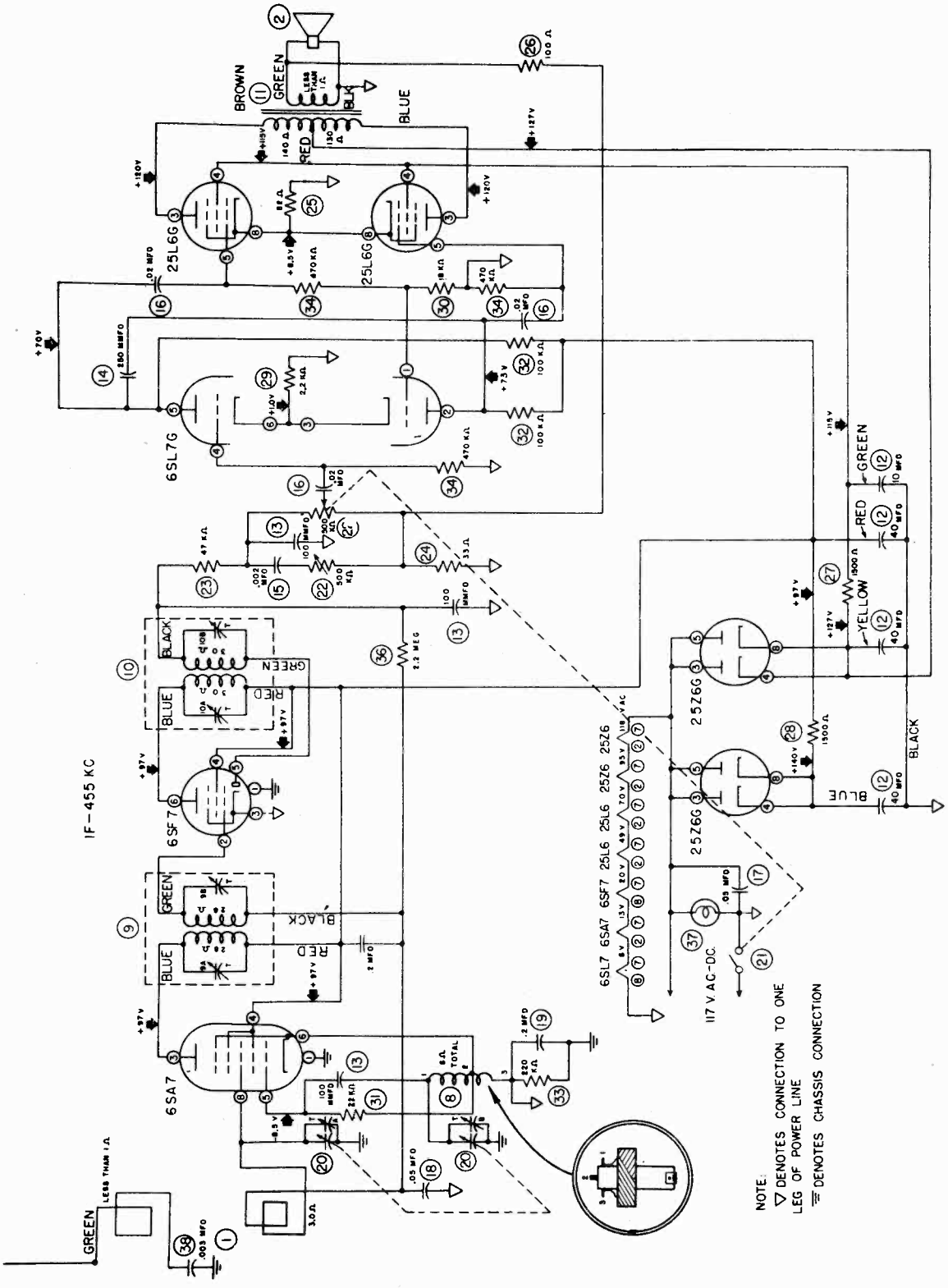
SET SIGNAL GENERATOR AT	SET GANG	LOOP DISTANCE	ADJUST TRIMMER	TUNE FOR	OPERATION
455 KC	Fully Meshed	Close	12a 12b 16a 16b	Max.	Align I.F.
1720 KC	Fully Open	Close	2b	Max.	Set Osc.
1400 KC	1400 KC	Close	2a	Max.	Align R.F.

MODEL 121

I.F. FREQ. - 455 KC.

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

ELECTRONIC CORP. OF AMERICA



ELECTRONIC CORP OF AMERICA

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

1. A signal generator capable of providing a modulated radio frequency output over the frequencies required.

2. A suitable output meter or sensitive AC voltmeter with a .1 mfd series blocking condenser.

3. A coupling loop, made of three turns of stiff hookup wire, 4 inches in diameter, mounted on a suitable block of wood or stand.

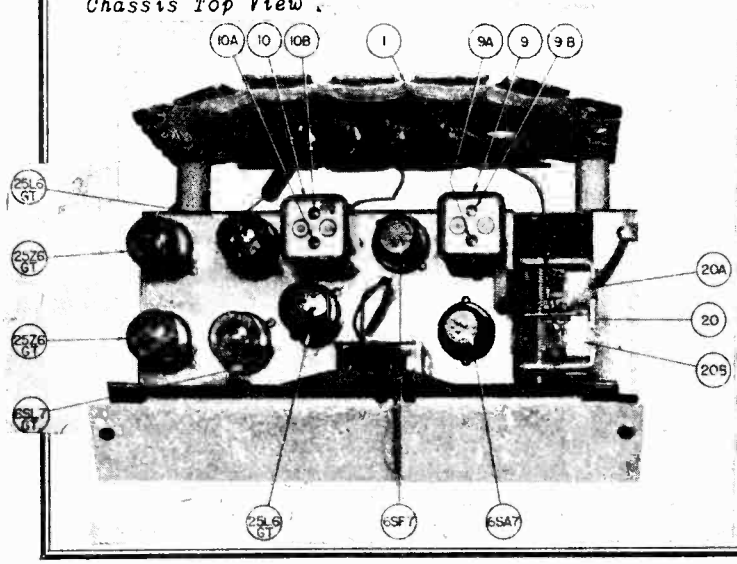
4. A non-metallic screwdriver.

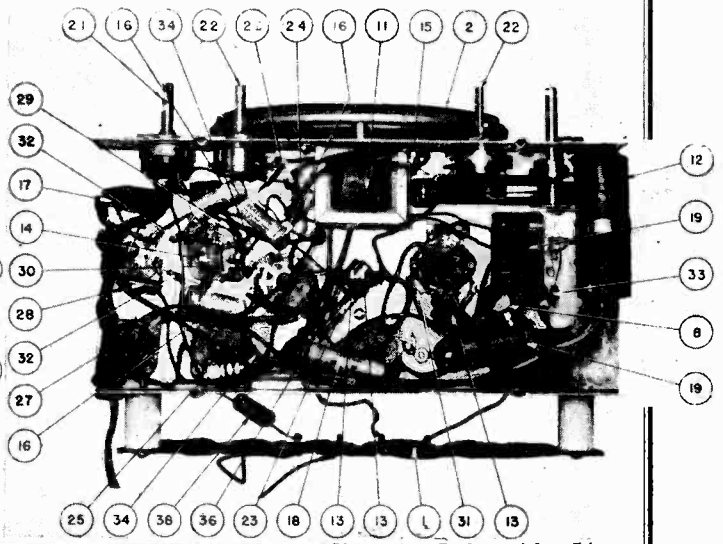
With the receiver on and the volume control at maximum, connect the signal generator to the coupling loop and bring the loop close to the receiver chassis. Adjust the signal generator output to minimum necessary to give a suitable indication on the output meter, which should be connected from B minus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

With the gang condenser fully meshed, adjust the pointer so that the left hand edge of the pointer saddle is one inch from the end of the dial frame. *(See Dial Installation drawing)* Using the dial scale contained in this Service Bulletin, align the pointer to the indicated reference mark with the pointer set as above. Then proceed with the alignment in accordance with the chart below:

SET SIGNAL GENERATOR AT	SET GANG	LOOP DISTANCE	ADJUST TRIMMER	TUNE FOR	OPERATION
455 KC	Meshed	Close	9a 9b 10a 10b	Max.	Align - I.F.
1720 KC	Fully Open	Close	20a	Max.	Align Oscillator
1400 KC	1400 KC	Close	20b	Max.	Align - R.F.

Chassis Top View





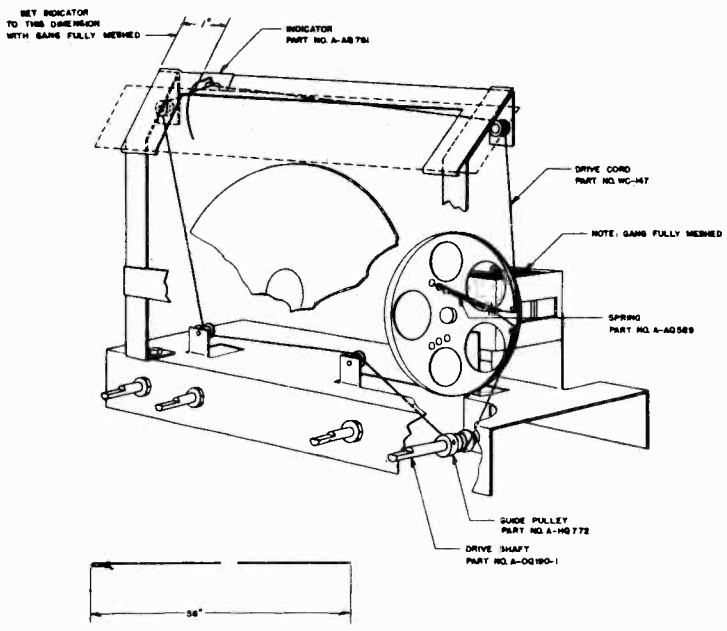
Chassis Underside View

ELECTRONIC CORP. OF AMERICA

Replacement of Dial Drive Cord

Completely remove remainder of defective dial cord. Inspect all pulleys and make sure they revolve freely. Determine that no grease or oil is present on any pulley surface. Attach the cord spring, part #A-AQ589, to one end of the drive cord. Fully mesh the gang condenser and hook the spring to the hole closest to the cord cutout on the dial drum. Proceed to string dial cord in accordance with the detail drawing. Take two full turns around the drive drum, part #A-HQ772. Pull the cord snug at this point. Wrap one complete turn around gang drum and pull cord snug. Securely tie free end of cord to the cord spring. Next, adjust spring tension by moving the hook end of the spring into the next spring hole.

Clip the pointer on to the dial cord with sufficient tension so as to prevent slippage and adjust pointer position, so that with fully meshed gang, the left edge of the pointer saddle is one inch from the edge of the dial support frame. Insert chassis in cabinet and check pointer and scale agreement. Then make final adjustment of pointer position. Remove the chassis and firmly crimp the pointer prongs on the dial cord, and secure with a small drop of speaker cement.



Replacement of Audio Output Transformers

When replacing the audio output transformer, original lead dress must be maintained. If either primary or secondary windings are reversed, the set will have a a severe audio oscillation, due to the inverse feedback network.

Replacement of I.F. Transformers

When replacing intermediate frequency transformers, either input or output, use caution to observe original lead dress.

MODEL 108

ELECTRONIC CORP. OF AMERICA

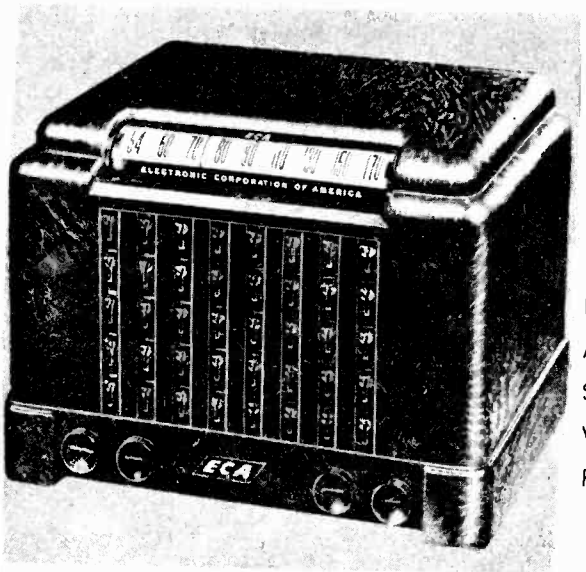
Service Parts List

No.	PART NAME	PART NO.
1	Loop Antenna	C-ZQ-522*
2	Speaker	S-QL-105E*
8	Oscillator Coil	S-LR-120*
9	Input I.F. Transformer	S-LR-127*
10	Output I.F. Transformer	S-LR-128*
11	Output Transformer	S-TA-116*
12	Electrolytic Condenser	S-CE-126M*
13	Condenser, Mica, 100 mmf.	CM-103E
14	" " 250 mmf.	CM-112E
15	" Paper, .002 mf., 400 v.	CP-122E
16	" " .02 mf.	CP-104E
17	" " .05 mf.	CP-105E
18	" " .05 mf., 200 v.	CP-105D
19	" " .2 mf., 200 V.	CP-133D
20	Variable Capacitor and Drum	S-ZQ-500*
21	On-off Switch	S-SR-137*
22	Vol.Control, Tone Control, 500K ohms	S-RV-174-1*
23	Resistor, Fixed, 47K ohm, 1/4 w.	RS-186B
24	" " 33 " 1/4 w.	RS-220B
25	" " 82 " 1 w., 10%	RS-221D
26	" " 100 " 1/4 w.	RS-114B
27	" " 1500 " 1/2 w.,10%	RS-195C
28	" " 1500 " 2 w., 10%	RS-195E
29	" " 2.2K " 1/4 w.	RS-185B
30	Resistor,Fixed, 18K ohm, 1/4 w.,10%	RS-222B
31	" " 22K " 1/4 w.	RS-197B
32	" " 100K " 1/4 w.,10%	RS-120B
33	" " 220K " 1/4 w.	RS-190B
34	" " 470K " 1/4 w.,10%	RS-189B
36	" " 2.2 meg.	RS-223B
37	Pilot Bulb, G.E., 3 w., 110 v.	IP-115
38	Condenser, Paper, .005 mf., 200 v.	CP-116D
	Cabinet, Bakelite	E-AQ-640*
	Knob Assembly	A-ZQ-577*
	Dial Scale	C-NP-157-3*
	Pointer	A-AQ-761*
	Dial Cord Spring	A-AQ-589*
	Tuning Shaft	A-OQ-190-1*
	"C" Washer	HN-405*
	Dial Cord Bushing	A-HQ-772*
	Pilot Light Socket	S-XQ-164*
	Dial Background Plate	B-AQ-758*
	Loop Spacer Block	A-AQ-637*
	Felt Knob Washers	HN-365*
	Dial and Speaker Support	C-ZQ-619*
	5 Lug Terminal Panel	EQ-380*
	Line Cord and Plug	WC-148*

Note: All items followed by an asterisk (*) will be stocked by the Electronic Corporation of America. All unmarked items may be replaced by any high quality component of equal electrical value.

All DC voltage measurements in this Service Bulletin have been made with a 20,000 ohms per volt voltmeter, using B minus as a common reference point. All AC voltage measurements are with 1000 ohms per volt voltmeter. Line voltage was maintained at 117 volts for all voltage measurements. The condenser gang should be fully meshed and the volume control at its minimum point. Voltages may vary ±10% from the indicated nominal value.

Measurements of oscillator grid bias voltage should be made with a 50,000 ohm resistor in series with the negative probe of the meter, and the positive prod connected to B minus. Rotate the tuning condenser throughout its complete range with the meter connected. Absence of bias voltage at any point is an indication that the oscillator is not functioning.



CABINET	Plastic, Walnut Finish
CIRCUIT	7 Tube, Superheterodyne
FREQUENCY RANGE	540 to 1720 KC
INTERMEDIATE FREQ.	455 KC
POWER INPUT	110 to 125 V. AC-DC
POWER CONSUMPTION	60 Watts
ANTENNA	Built-in Loop
SPEAKER	Alnico V PM Dynamic 6"
V.C. IMPEDANCE	3.2 ohms at 400 Cycles
POWER OUTPUT	3 Watts Undistorted

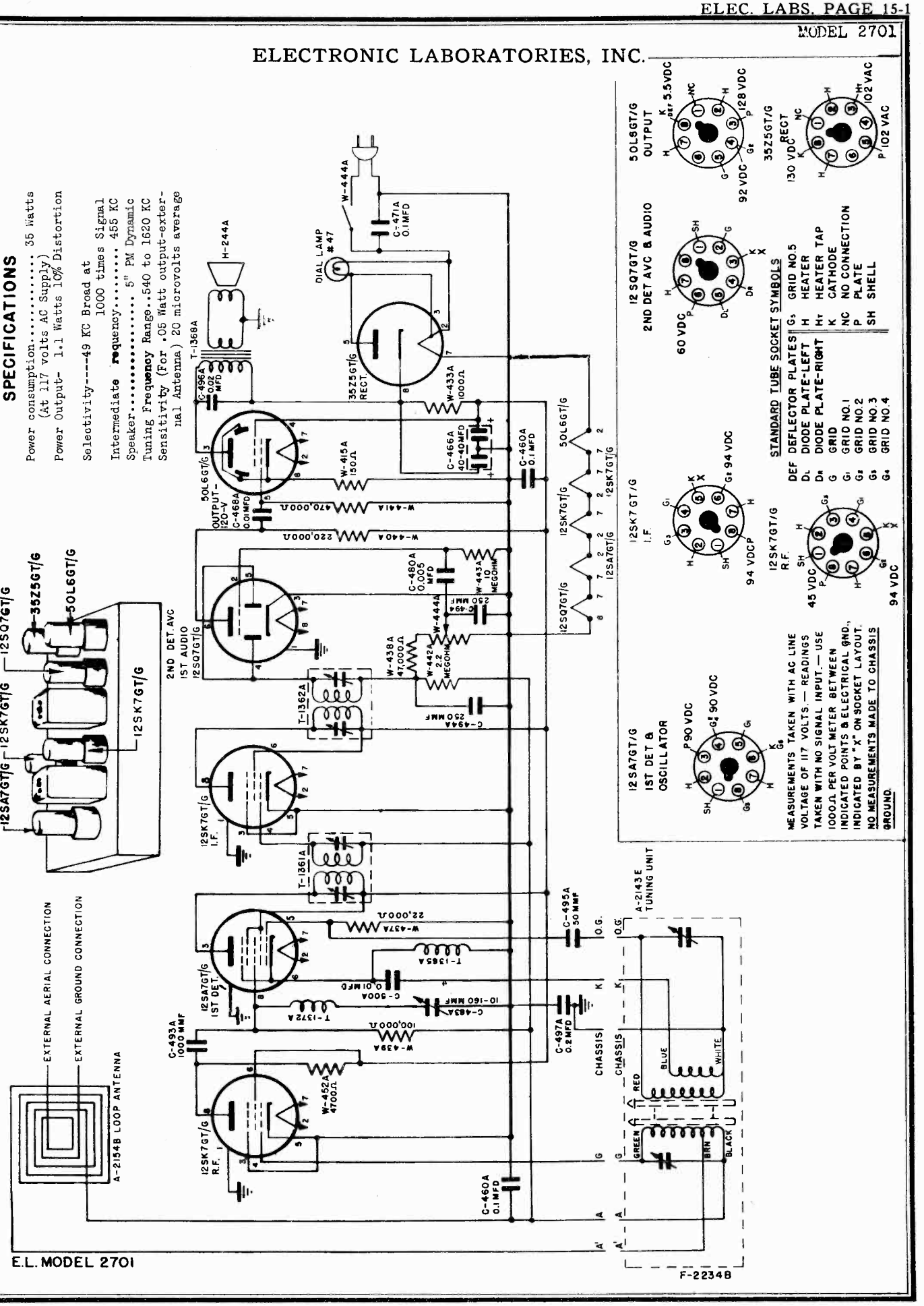
MODEL 2701

ELECTRONIC LABORATORIES, INC.

SPECIFICATIONS

Power consumption..... 35 Watts
(At 117 volts AC Supply)
Power Output- 1.1 Watts 10% Distortion

Selectivity----49 KC Broad at
1000 times Signal
Intermediate frequency..... 455 KC
Speaker..... 5" PM Dynamic
Tuning Frequency Range..540 to 1620 KC
Sensitivity (For .05 Watt output-external Antenna) 20 microvolts average



MODEL 2701

ELECTRONIC LABORATORIES, INC.

ALIGNMENT PROCEDURE

Volume Control-Maximum All Adjustments.

Allow Chassis and Signal Generator to "Heat Up" for several minutes.

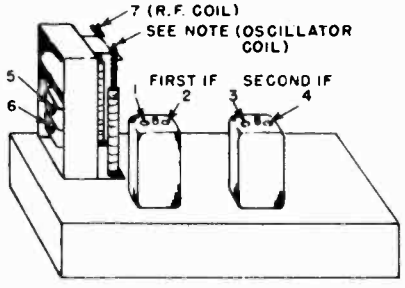
The equipment in column at right is required for Aligning:

Signal Generator which will provide an accurately calibrated signal at test frequencies as listed.

Output Indicating Meter; Non-Metallic Screwdriver.

Dummy Antennas-.01 mf., and 400 ohms.

SIGNAL GENERATOR FREQUENCY SETTING	ANTENNA CONNECTION	COUPLING	DUMMY ANTENNA	TUNER SETTING	TRIMMER ADJUSTMENT (SEE DIAGRAM)	NOTES
I.F. 455 KC	Grid of RF tube 12SK7	Ground generator to chassis	0.01 mfd	Out	Adjust for Max. 1, 2, 3 and 4	No signal will be heard unless trimmer condenser under chassis is unscrewed and reduced from original setting
I.F. 455 KC	Grid of RF tube 12SK7	Ground generator to chassis	0.01 mfd	Out	Trim condenser under chassis for Min. output.	If it is found that regeneration prevails when the loop antenna is put in its normal position close to the tubes, then the under chassis trimmer is incorrectly set, and should be adjusted to prevent the regenerative condition.
1620 KC	Inductive Coupling to Loop	Loop coupling with leads brought out	400 ohms in series with Antenna & Gnd.leads	Out	Adjust Osc. #5 per Max. signal	
1400 KC	Inductive Coupling to Loop	Loop coupling with leads brought out	400 ohms in series with Antenna & Gnd.leads	Dial set for 1400KC	Adjust RF trimmer #6 per Max. Signal.	
700 KC	Inductive Coupling to Loop	Loop Coupling with leads brought out	400 ohms in series with Antenna & Gnd.leads	Dial set for 700KC	Adjust RF tuning core #7 for Max. (care should be taken not to disturb carriage position of tuner)	



ALIGNMENT NOTES

A. MECHANICAL ALIGNMENT:- The following mechanical adjustments should be made before alignment:

1. Rotate shaft of tuning unit until carriage is against top stop position.
2. Space oscillator coil slug 1-5/32" out from top of oscillator coil form.
3. Space R.F. coil slug 1-29/64" out from top end of R.F.coil winding. (Note:-The distance 1 and 2 should be measured from mounted end of the slug)
4. Adjust screw on trimmer of wave trap towards open position so that condenser plates are open at least 1/32".

B. I.F. ALIGNMENT PROCEDURE

1. Feed I.F. frequency from the signal generator through a 0.01 mfd condenser to the control grid of the R. F. tube.
2. No signal will be heard unless trimmer condenser under chassis is unscrewed and reduced from original setting.
3. Turn volume control full on.
4. Make preliminary I.F.adjustment with signal level approximately 50 Mv.
5. Tune I.F. trimmers for maximum signal, reducing I.F. signal input to coupling loop to keep output voltage less than 0.5 V.
6. When maximum output has been secured, adjust trimmer condenser in the I.F. trap (under chassis) by turning clockwise to the minimum signal.

C. R.F. ALIGNMENT PROCEDURE

1. Volume control full on.
2. Adjust tuning unit to top stop position.
3. Feed 1620 kc signal into external loop. Hold audio output below 0.5 V. Adjust the oscillator trimmer condenser to maximum output.
4. Move slugs in by means of tuning dial so that pointer is approximately 1" from the stop end, and a signal received from the external loop on a frequency of 1400 kc. Adjust lower trimmer (R.F. trimmer) to maximum output. Reduce R.F.input to keep signal output voltage below 0.5 V.
5. Rotate tuning shaft until pointer is approximately 1" from the other end of the scale. Feed to the external loop a test signal at 700 kc. Adjust the R. F. coil slug by rotation to maximum output.

D

1. Alternately adjust R.F. trimmers at 1400 kc. and R.F. slug at 700 Kc. until maximum sensitivity is attained at both frequencies.

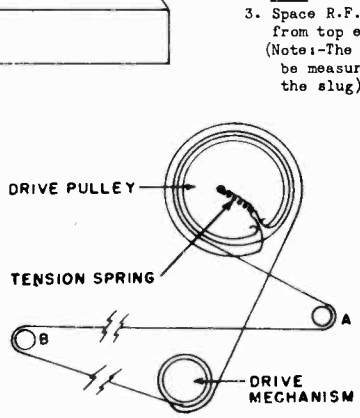
E. When set is correctly aligned, the low frequency end of the tuning range should fall at 540 Kc.

CAUTION: Extreme care should be taken in the 700 kc. position to make sure that the tuner carriage is not moved by the adjusting tools or hand pressure on the slug screw. Carriage should not be held against the frame, but should be allowed to assume its normal position when adjusting the R.F. coil slug.

DRIVE CORD REPLACEMENT

Turn the tuner to the fully open position. Use a new cord 50" long and tie one end to the tension spring. Fasten the other end of the tension spring to the drive pulley. Pass cord through slot in pulley ring; add spring tension and continue one and one-half turns counterclockwise over top of pulley Then pass cord around idler pulley A, starting over top and going around clockwise. Pass cord over idler pulley B, starting over top and going around counter clockwise.. Wind one full turn counterclockwise around drive mechanism Then wind one full turn counterclockwise around drive pulley, pass through slot in pulley and tie string to tension spring. Cut off excess string.

Attach dial pointer to cord.



TUNER & DRIVE PARTS

A-2143E	Tuner Assembly
L-2450A	Pulley-Drive
L-2451A	Pulley-Idler

U-1442A	Shoulder Rivet
H-247B	Glass Dial
H-246A	Translucent Screen
U-1445A	Snaps for Screen
U-1461A	Pointer
U-1444A	Spring
S-599A	Pilot Light Socket Assembly
A-2155A	Dial Drive Assembly

RESISTORS

W-415A	150 ohm, 0.5 Watt	Carbon
W-452A	4700 ohm, 0.5 Watt	Carbon
W-433A	1000 ohm, 1.0 Watt	Carbon
W-437A	22,000 ohm, 0.25 Watt	Carbon
W-438A	47,000 ohm, 0.25 Watt	Carbon
W-439A	100,000 ohm, 0.25 Watt	Carbon
W-440A	220,000 ohm, 0.25 Watt	Carbon
W-441A	470 ohm, 0.25 Watt	Carbon
W-442A	2.2 megohm, 0.25 Watt	Carbon
W-443A	10 megohm, 0.25 Watt	Carbon
W-444A	Switch & Pot,500,000 ohm,	Carbon

COILS

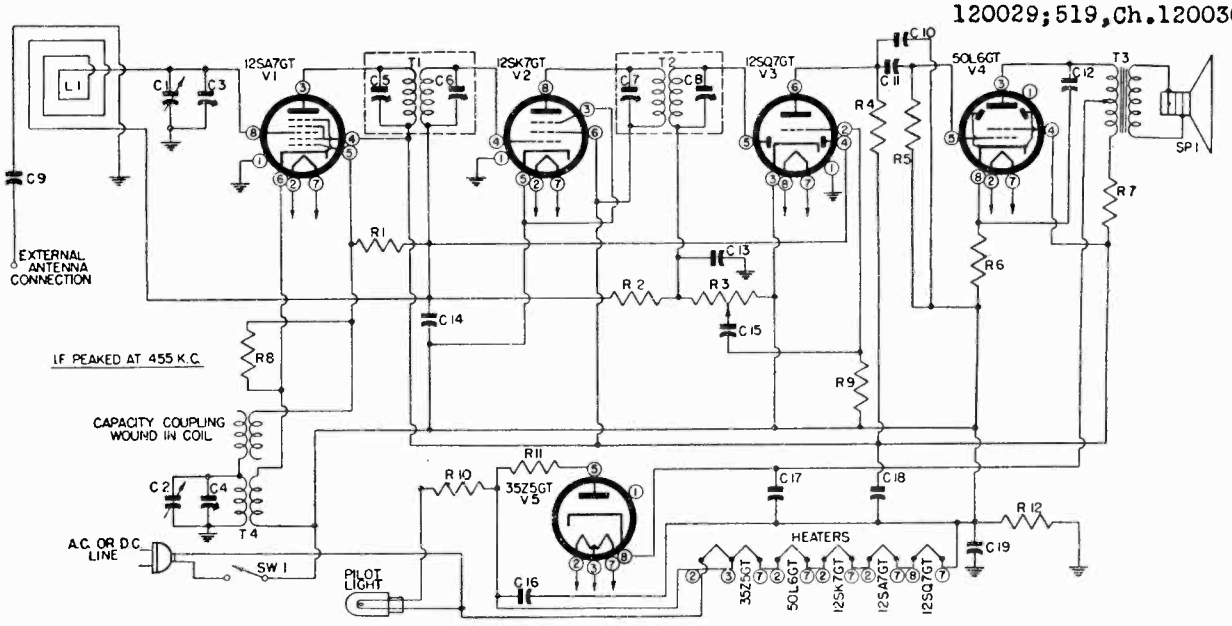
A-2154B	Antenna & Back Cover Assembly	
T-1361A	1st I.F. Transformer	455 KC
T-1362A	2nd I.F. Transformer	455 KC
T-1365A	R. F. Choke Coil	1.4 MH
T-1368A	Audio Transformer	
T-1372A	R.F. Choke Coil	3.0 MH

CAPICATORS

C-471A	0.1 mfd, 400 V	Tubular
C-493A	1000 mmf, 350 V	Ceramic
C-494A	250 mmf, 350 V	Ceramic
C-495A	50 mmf, 500 V	Ceramic
C-480A	0.005 mfd, 400 V	Tubular
C-466A	40-40 mfd, 150 V	Electrolytic
C-483A	10-160 mmf	Trimmer
C-496A	0.02 mfd, 200 V	Tubular
C-460A	0.1 mfd, 200 V	Tubular
C-497A	0.2 mfd, 400 V	Tubular
C-500A	0.01 mfd, 400 V	Molded

EMERSON RADIO & PHONO. CORP.

MODELS 501,502,503,504, 510,520,Ch.120,000, 120029;519,Ch.120030



The following voltage readings are d-c measurements taken from B— (line switch) in the indicated tube-socket pin. A 1000 ohms-per-volt meter should be used for all readings except those indicated by an asterisk (*), which should be taken with a d-c vacuum-tube voltmeter. Line voltage for these readings was 117 volts, 60 cycles, a.c. Measurements made with 117 volts d.c. will be lower than those given below. Take readings with the volume control set at minimum and the variable condenser closed.

	PIN NUMBER							
TUBE	1	2	3	4	5	6	7	8
12SA7			89	89	*-10			*-1.6
12SK7				*-1.6		89		89
12SQ7		*-0.7		*-1.6	-0.5	37.5		
50L6GT			110	89				6.2
35Z5GT				116		116		117

An oscillator with frequencies of 455, 600 and 1425 kc is required.

An output meter should be connected across the primary or secondary of the output transformer for observing maximum response.

Always use as weak a test signal as possible when aligning the receiver.

Plug the receiver into the power supply outlet in such a way that the ground side of the power line is connected to the receiver B—.

Location of Coils and Trimmer Adjustments

The first i-f transformer (T1) is mounted on top of the chassis deck to the right of the variable condenser. The trimmers (C5, C6) are accessible through holes in the top of the can.

The second i-f transformer (T2) is mounted on top of the chassis between the variable condenser and the speaker. The trimmers (C7, C8) are accessible through holes in the top of the can.

The trimmer for the antenna (C3) and the trimmer for the oscillator coil (C4) are located on the variable condenser. The trimmer on the front section is for the oscillator coil.

The oscillator coil (T4) is located underneath the chassis. The loop antenna acts as the antenna coil.

FREQUENCY RANGE: 540-1620 kc.

NUMBER OF TUBES: Five.

TYPE OF TUBES:
1—12SA7, pentagrid oscillator-modulator
1—12SK7, first i-f amplifier
1—12SQ7, diode detector, a-f amplifier, a.v.c.
1—50L6GT, beam power output
1—35Z5GT, half-wave rectifier

I-F Alignment

1. Rotate the variable condenser to the minimum capacity position.
2. Feed 455 kc to the converter grid (stator of the r-f section of the variable condenser) and adjust the four i-f trimmers (C5, C6, C7, C8) for maximum response.

R-F Alignment

1. Connect the oscillator to a coil composed of three to four turns of wire wound in a circle approximately 12" in diameter. This coil should be held parallel to and in line with the loop antenna of the receiver at a distance of 15 to 20 inches.
2. Radiate a signal at 1425 kc, set the dial indicator to 1425 kc, and adjust the trimmers on the variable condenser (C3, C4) for maximum response.
3. Radiate a 600 kc signal and tune in the signal on the receiver. Adjust the loose outside turn of the loop antenna for maximum response. This loose turn may be moved to either side of the center. Fasten it in the position which gives maximum response.
4. Repeat steps 2 and 3 until no further improvement is evident.

POWER SUPPLY: A.C. or D.C.

VOLTAGE RATING: 105-125 volts.

POWER CONSUMPTION: 30 watts.

DIAL CORD REPLACEMENT

Draw the cord snugly around the condenser pulley and knot it, with no slack, near the notch in the pulley, after which the spring may be hooked to the cord and pulley.

MODELS 501,502,503,504, 510,520,Ch.120000 and EMERSON RADIO & PHONO. CORP. MODELS 507, 509, 511, 518 120029;519,Ch.120030 Ch.120005,120010

The color coding of the i-f transformer leads is as follows:
Grid—green Plate—blue
Grid return—black B+—red

All models have self-contained antennas and do not require additional antenna connections. For permanent home installations, however, if it is desired to improve reception of weak stations, an additional outdoor antenna may be used. For this purpose a lead has been brought out of the rear near the line cord.

Models using 120000 chassis use a dial plate on which the frequency is calibrated through 320°. The dial plate on 120029 chassis is calibrated through 180°.

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

In operating the receiver on d.c., it may be necessary to reverse the line plug for correct polarity.

PARTS LIST FOR MODELS 501,502,503,504,510,519,520 WITH EXCEPTIONS AS NOTED BELOW

Schematic Symbol	Part No.	DESCRIPTION	PRICE
C1, C2	900170	Two-gang variable condenser (120000 chassis)	$
C1, C2	900290	Two-gang variable condenser (120029 chassis), or	
C1, C2	900160	Two-gang variable condenser (120029 chassis) and 120030 Chassis	4.50
C3		Trimmer, part of variable condenser	
C4		Trimmer, part of variable condenser	
C5, C6		Trimmers, part of first i-f transformer	
C7, C8		Trimmers, part of second i-f transformer	
C9, C15	920010	0.002 mfd., 600 volt condenser	.20
C10	920170	0.001 mfd., 600 volt condenser	.20
C11, C12	920020	0.02 mfd., 400 volt condenser	.20
C13	910000	0.00022 mfd. mica condenser	.20
C14	920040	0.1 mfd., 200 volt condenser	.20
C16	920030	0.05 mfd., 400 volt condenser	.20
C17, C18	925000	30-50 mfd., 150 V. dual dry-electrolytic condenser; C17—30 mfd., C18—50 mfd.	1.25
C19	920050	0.2 mfd., 200 volt condenser	.25
L1	700000	Loop antenna, or	1.05
L1	700200	Loop antenna	1.25
R1, R9	397000	15 meg., ½ watt resistor	.12
R2	321330	3.3 meg., ¼ watt resistor	.12
R3	390010	0.5 meg. volume control	1.10
R4, R5	321130	470,000 ohms, ¼ watt resistor	.12
R6	340290	150 ohms, ½ watt resistor	.14
R7	370490	1000 ohms, 1 watt resistor	.16
R8	310810	22,000 ohms, ¼ watt resistor	.12
R10	340010	10 ohms, ½ watt resistor	.14
R11	397040	15 ohms, 1 watt wire-wound resistor	.16
R12	321050	220,000 ohms, ¼ watt resistor	.12
SP1	180000	P.M. speaker	5.00
SW1		Line switch, part of volume control	
T1	720000	First i-f transformer	1.65
T2	720100	Second i-f transformer	1.65
T3	734000	Output transformer	1.85
T4	716010	Oscillator coil	1.00
	140000	Cabinet, catalin (Models 501, 502)	9.75
	140005	Cabinet, walnut (Model 504)	9.00
	140006	Cabinet, mahogany (Model 504)	9.00
	460000	Lucite front, square holes	5.00
	460010	Lucite front, round holes	5.00
	460370	Rear cover (Models 501, 502)	1.35
	460380	Rear cover (Model 504), or	1.35
	450040	Rear cover (Model 504)	1.35
	460470	Knob	.10
		DIAL PARTS	
	807000	Pilot light	.09
	507100	Pilot light socket	.20
	520019	Dial backplate (120000 chassis)	1.00
	520500	Dial backplate (120029 chassis)	
	525010	Dial pointer assembly	.10
	280103	Drive shaft	.20
	280330	Shaft extension (for use with 900160 variable condenser)	.15
	587000	Pully spring	.05

(Specify part numbers when ordering. List price each effective as of January 1, 1946. (Subject to change without notice.)

MODEL 503

140001	Cabinet, walnut	9.00	
140014	Cabinet, mahogany	9.00	
620000	Rear cover, walnut	1.35	
620001	Rear cover, mahogany	1.35	
460140	Knob	.10	
520080	Dial crystal	.20	
520200	Dial crystal escutcheon	.45	

MODEL 510

140005	Cabinet, walnut	9.00	
140006	Cabinet, mahogany	9.00	
450330	Black plastic front, square holes	1.25	
450040	Rear cover, or	1.35	
460380	Rear cover	1.35	
460470	Knob	.10	
520080	Dial crystal	.20	

MODEL 519

140031	Cabinet, walnut	9.00	
450040	Rear cover, or	1.35	
460380	Rear cover	1.35	
460140	Knob	.10	
412600	Dial backplate	.35	
525120	Dial pointer assembly	.20	
520470	Dial crystal	.65	
520200	Dial crystal escutcheon	.45	

MODEL 520

140000	Cabinet, onyx catalin	9.75	
450230	Ivory plastic front, square hole	2.00	
450250	Ivory plastic front, round hole	2.00	
460370	Rear cover	1.35	
460150	Knob	.10	
520080	Dial crystal	.20	

Specify part numbers when ordering. List price each effective as of January 1, 1946. (Subject to change without notice.)

Schematic Symbol	Part No.	DESCRIPTION	PRICE
		MODELS: 507, 509, 518	
C1, C2	900160	Two-gang variable condenser	$4.50
*C3, C4		Trimmers, part of variable condenser	
*C5, C6, C7, C8		Trimmers, part of i-f transformers	
C9, C15	920010	0.002 mfd., 600 V. paper condenser	.20
C10	920240	500 mmfd., 600 V. paper condenser	.20
C11, C12	920020	0.02 mfd., 400 V. paper condenser	.20
C13	910000	220 mmfd., 600 V. mica condenser	.20
C14	920040	0.1 mfd., 200 V. paper condenser	.20
C16	920030	0.05 mfd., 400 V. paper condenser	.20
C17, C18	925000	Dual electrolytic condenser, 150 V.; C20—30 mfd., C21—50 mfd.	1.25
C19	920050	0.2 mfd., 200 V. paper condenser	.25
L1	700000	Loop antenna assembly, or	1.05
L1	700200	Loop antenna assembly	1.25
R1, R9	397000	15 meg., ½ watt carbon resistor	.12
R2	321330	3.3 meg., ¼ watt carbon resistor	.12
R3	390000	Volume control with line switch, 0.5 megohm	1.10
R4, R5	321130	470,000 ohms, ¼ watt carbon resistor	.12
R6	340290	150 ohms, ½ watt carbon resistor	.14
R7	370490	1000 ohms, 1 watt carbon resistor	.16
R8	310810	22,000 ohms, ¼ watt carbon resistor	.12
R10	340010	6.8 ohms, ¼ watt carbon resistor	.12
R11	397040	15 ohms, 1 watt wire-wound resistor	.16
R12	321050	220,000 ohms, ¼ watt carbon resistor	.12
SP1	180000	Speaker, 5" permanent magnet (less output transformer)	5.00
*SW1		Line switch, part of R3	
T1	720000	Double-tuned 455 kc. first i-f transformer	1.65
T2	720100	Double-tuned 455 kc. second i-f transformer	1.65
T3	734000	Output transformer	1.85
T4	716010	Oscillator coil	1.00
	140007	Cabinet (Model 507, ivory)	4.35
	140015	Cabinet (Model 507, mottled brown)	2.55
	140010	Cabinet (Model 509, black)	2.55
	140016	Cabinet (Model 509, mottled brown)	2.55
	140034	Cabinet (Model 518)	2.55
	460150	Knob for 140007 cabinet	.10
	460140	Knob for 140015 and 140034 cabinets	.10
	460470	Knob for 140010 and 140016 cabinet	.10
	450050	Molded back for 140007 cabinet	1.30
	450060	Molded back for 140015 cabinet	.65
	450070	Molded back for 140010 cabinet	.65
	450080	Molded back for 140016 and 140034 cabinets	.65
	560120	Masonite back for 140007 cabinet	.50
	560110	Masonite back for 140015 cabinet	.50
	560130	Masonite back for 140010 cabinet	.50
	560140	Masonite back for 140016 cabinet	.50
	560220	Masonite back for 140034 cabinet	.25
	583010	Line cord	.60
		DIAL PARTS	
	507090	Pilot light socket	.20
	807000	Pilot light, 6.3 V., 0.15 amp., Mazda No. 47	.09
	520009	Dial backplate	.20
	525080	Dial pointer	.10
	520190	Dial crystal (Models 507 and 509), or	.50
	520350	Dial crystal (Models 507 and 509)	.75
	520440	Dial crystal (Model 518)	.45
	587000	Drive cord spring	.05
	280003	Drive shaft	.15

*Not supplied separately.

MODEL: 511*

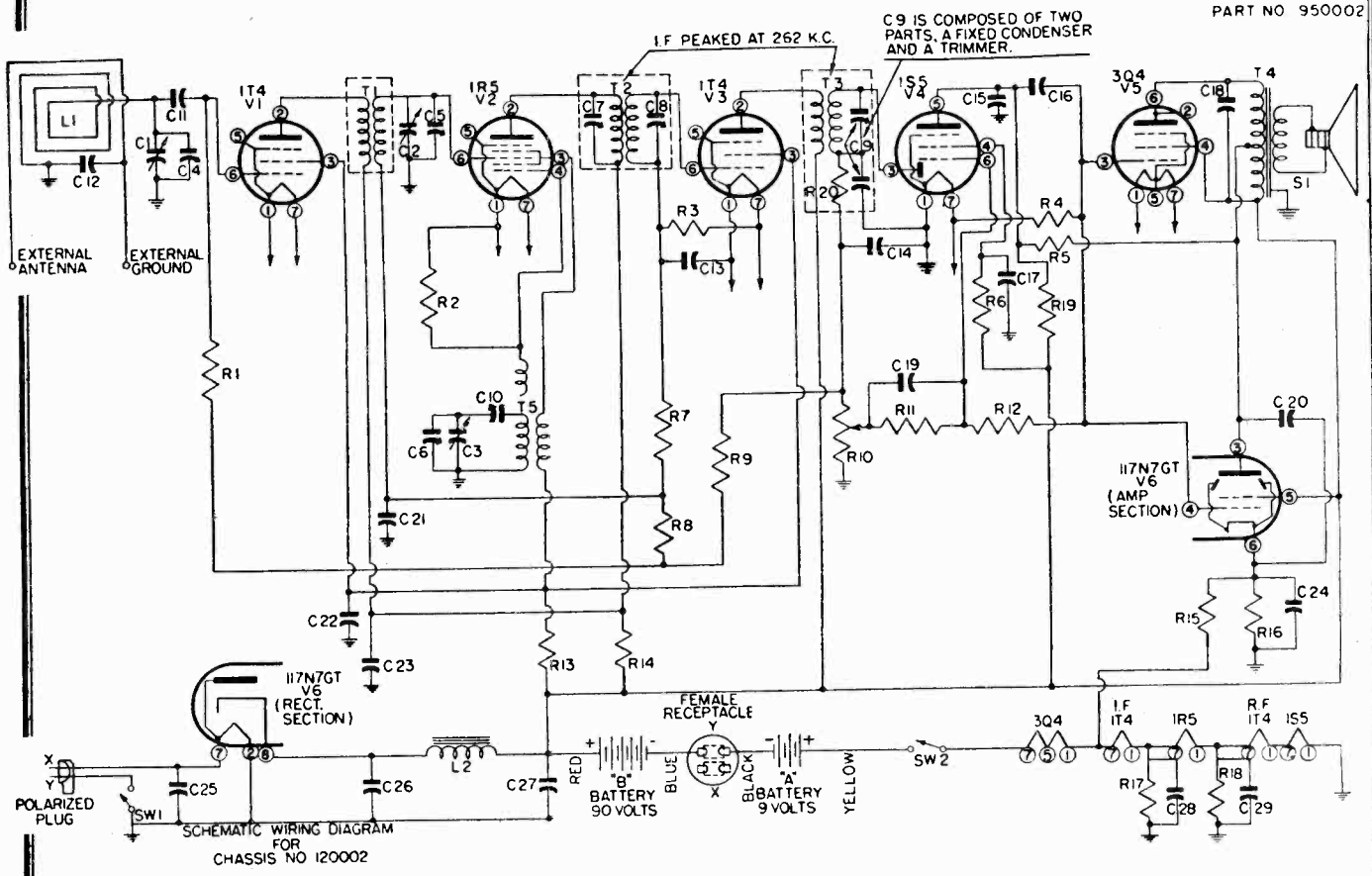
*PARTS LIST OF MODEL 511 SAME AS THAT OF MODEL 507 WITH THE FOLLOWING EXCEPTIONS:

C1, C2	900280	Two-gang variable condenser	$4.50
C10	920000	200 mmfd., 600 V. paper condenser	.20
R3	390090	Volume control with line switch, 0.5 megohm	1.10
T4	716010	Oscillator coil	1.00
	140017	Cabinet, walnut	2.95
	450110	Knob	.10
	470020	Bottom cover assembly	.80
	583010	Line cord	.60
		DIAL PARTS	
	507120	Pilot light socket	.20
	807000	Pilot light, 6.3 V., 0.15 amp., Mazda No. 47	.09
	525140	Dial pointer assembly	.35
	520240	Dial crystal	.50
	587000	Drive cord spring	.05
	280203	Drive shaft	.15

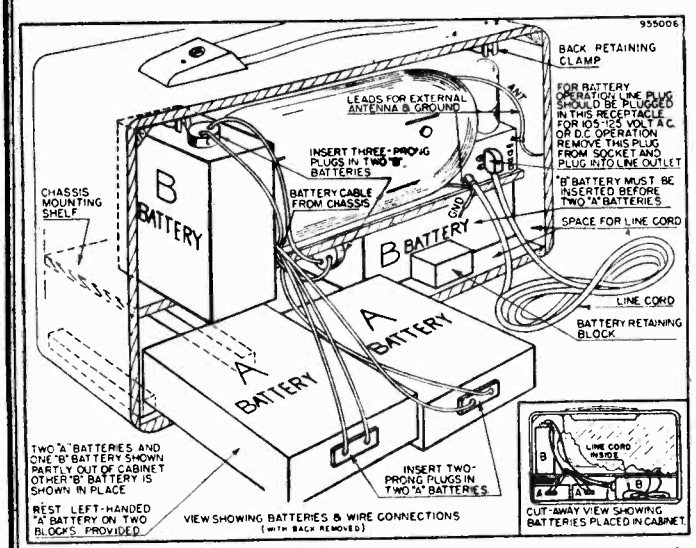
EMERSON RADIO & PHONO. CORP.

MODEL 505, Ch. 120002

PART NO 950002



Battery Installation



TYPE OF TUBES:

1—1R5, oscillator-modulator

2—1T4, r-f and i-f amplifiers

1—1S5, 2nd detector, a.v.c., a-f amplifier

1—3Q4, beam power output (battery operation)

1—117N7, beam power output and half-wave rectifier (line operation)

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

VOLTAGE RATING: 105-125 volts a.c.-d.c. (line operation).

POWER CONSUMPTION: 20 watts (line operation).

CURRENT DRAIN:

"A" Battery—0.05 amp.

"B" Battery—0.01 amp.

BATTERY COMPLEMENT

The cabinet is designed to house the complete set of batteries. The battery complement should be as follows:

Battery Type	Number Required	Eveready Part No.	Rayovac Part No.	Burgess Part No.
4½ volt "A"	2	746 (plug-in type)	P83A or EM-83 (plug-in type)	3G (plug-in type)
45 volt "B"	2	482 Minimax (plug-in type)	———	———

MODEL 505,Ch.120002

EMERSON RADIO & PHONO. CORP.

Schematic Symbol	Part No.	DESCRIPTION	PRICE
C1, C2, C3	900080	Three-gang variable condenser	$5.50
*C4		Trimmer part of C1	
*C5		Trimmer, part of C2	
*C6		Trimmer, part of C3	
*C7, C8		Trimmers, part of T2	
*C9		Trimmer and fixed condenser, part of T3	
C10	900110	Padding condenser	.45
C11, C13	920060	0.05 mfd., 200 V. condenser	.20
C12, C18	920010	0.002 mfd., 600 V. condenser	.20
C14	910010	110 mmfd., mica condenser	.20
C15	910050	400 mmfd., mica condenser	.25
C16, C19, C21, C22, C29	920100	0.02 mfd., 200 V. condenser	.20
C17, C20	920090	0.01 mfd., 400 V. condenser	.20
C23	920020	0.02 mfd., 400 V. condenser	.20
C24	925090	100 mfd., 25 V. electrolytic condenser	.90
C25	920030	0.05 mfd., 400 V. condenser	.20
C26, C27	925050	20-40 mfd., 135 V. dual electrolytic condenser	1.20
C28	920110	0.25 mfd., 100 V. condenser	.25
L1	700090	Loop antenna	1.20
L2	737010	Filter choke	1.95
R1, R3, R5, R6, R7, R8	311330	3.3 meg., ¼ watt resistor	.12
R2	310970	100,000 ohms, ¼ watt resistor	.12
R4, R19	321130	470,000 ohms, ¼ watt resistor	.12
R9	321290	2.2 meg. ¼ watt resistor	.12
R10	390020	Volume control, 500,000 ohms	1.10
R11	311390	5.6 meg., ¼ watt resistor	.12
R12	321450	10 meg., ¼ watt resistor	.12
R13	340770	15,000 ohms, ½ watt resistor	.14
R14	340630	3,900 ohms, ½ watt resistor	.14
R15	310130	33 ohms, ¼ watt resistor	.12
R16	310610	3,300 ohms, ¼ watt resistor	.12
R17	310570	2,200 ohms, ¼ watt resistor	.12
R18	310450	680 ohms, ¼ watt resistor	.12
*R20		47,000 ohms, ¼ watt resistor, part of T4	
S1	180006	Permanent magnet speaker, 5"	5.00
*SW1		Line switch on volume control R10	
*SW2		Battery switch on volume control R10	
T1	713000	R.F. coil	1.60
T2	720170	First i-f transformer	1.65
T3	720190	Second i-f transformer	2.20
T4	734040	Output transformer	1.85
T5	716030	Oscillator coil	1.10
	140002	Cabinet	7.50
	460470	Knob	.10
*Not supplied separately.		DIAL PARTS	
	280133	Drive shaft	.15
	587000	Drive cord spring	.05
	520039	Dial backplate	.10
	525120	Pointer assembly	.20
	460040	Dial crystal	.75

List price each effective as of January 1, 1946. (Prices subject to change without notice.)

GENERAL NOTES

1. The color coding of the i-f transformer leads is as follows:
   Grid—green — Plate—blue
   Grid return—black — B+—red
2. The color coding of the battery cable is as follows:
   Red—B+, 90 Volts — Yellow—A+, 9 Volts
   Blue—B— — Black—A—
3. If replacements are made in the r-f section of the circuit, the receiver should be carefully realigned.
4. A.C.-D.C. Operation: Remove the rear cover; it is held in place by two spring latches. Take out the line cord, removing the plug from its receptacle at the rear of the chassis. Insert the plug in the wall outlet. If the power supply is d.c. and the receiver does not operate at first, remove the plug from the wall outlet, turn it half way around and reinsert it in the outlet, thus obtaining the proper polarity.

An oscillator with frequencies of 262, 600 and 1425 kc is required.

An output meter should be connected across the primary or secondary of the output transformer for observing maximum response.

Always use as weak a test signal as possible, turning down the output of the test oscillator as the alignment of the receiver progresses.

Plug the receiver into the power supply in such a way that the ground side of the power line is connected to the receiver B—.

Location of Coils and Trimmer Adjustments

The oscillator coil (T5) is located beneath the chassis. The trimmer for the oscillator (C6) is on the middle section of the variable condenser.

The interstage coil (T1) is the shielded coil located beneath the chassis. Its trimmer (C5) is on the front section of the variable condenser.

The trimmer for the loop antenna (C4) is on the last section of the variable condenser (the section nearest the loop).

The i-f transformers are mounted on top of the chassis. The first i-f transformer (T2) is mounted next to the loop. The second i-f transformer (T3) is mounted next to the dial.

The series padder (C10) is located on the chassis between the variable condenser and the shielded 1T4 tube.

I-F Alignment

Rotate the variable condenser to the minimum capacity position. Feed 262 kc to the converter grid and adjust the three i-f trimmers for maximum response.

Interstage Alignment

1. Set the dial indicator to 1425 kc, feed 1425 kc to the r-f grid, and adjust the oscillator and interstage trimmers for maximum response.
2. Set the dial indicator to 600 kc, feed 600 kc to the r-f grid, and adjust the oscillator padding trimmer by rocking in the signal for maximum response.
3. Repeat steps 1 and 2 until no further improvement is possible.

Loop Alignment

Connect the test oscillator to a coil composed of three or four turns of wire wound in a loop approximately 12" in diameter. This coil should be held parallel to and in line with the receiver's loop at a distance of 15 to 20 inches.

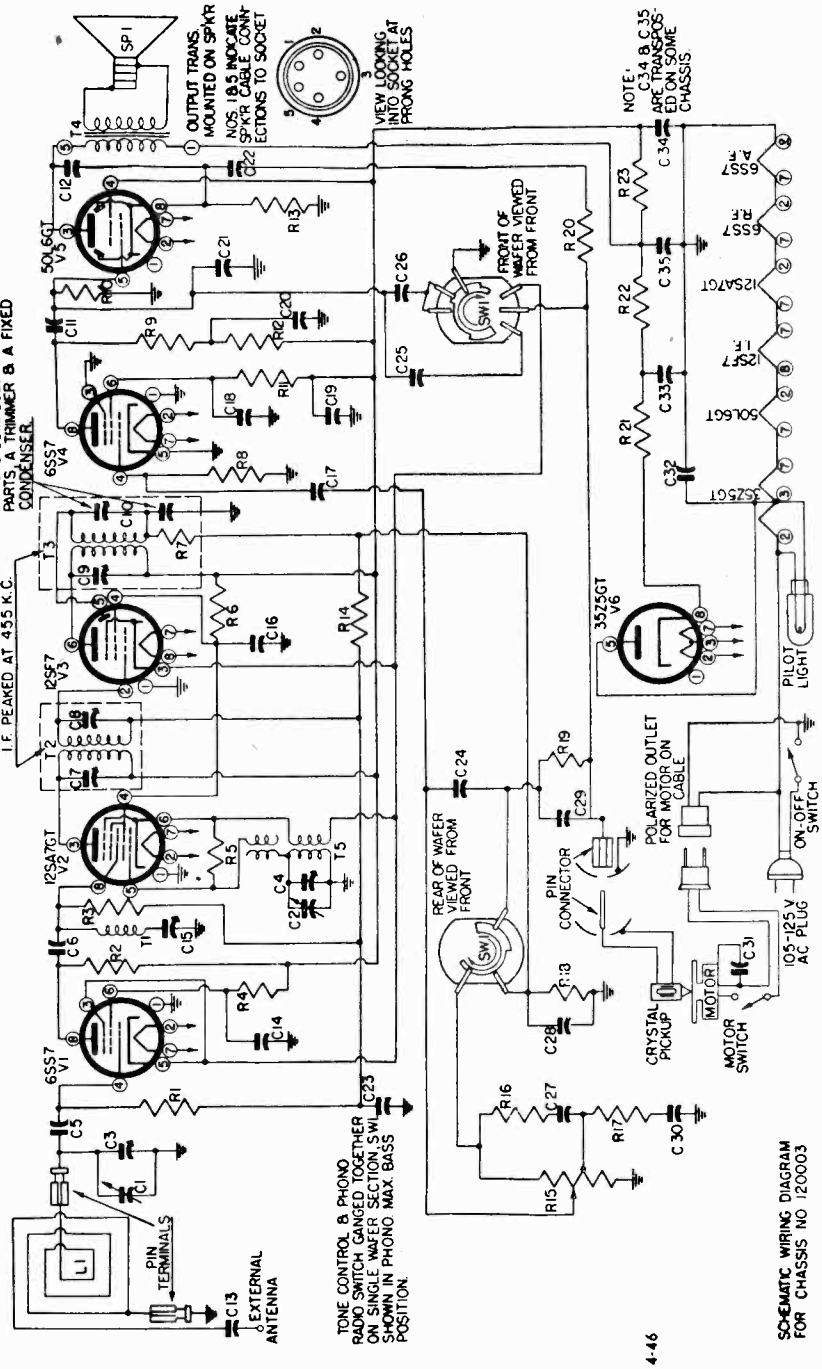
1. Radiate a signal at 1425 kc, tune in the signal on the receiver, and adjust the loop trimmer for maximum response.
2. Radiate a signal at 600 kc, tune in the signal on the receiver, and adjust the loose outside turn of the loop antenna for maximum response. This loose turn may be moved to either side of the center. Fasten it in the position which gives maximum response.
3. Repeat steps 1 and 2 until no further improvement is possible.

TUBE	PIN NUMBER 1	2	3	4	5	6	7	8
1T4(V1)	1.2	88	56		1.2	*0.3	2.4	
1R5	2.4	88	56	-8	2.4	*1.5	3.7	
1T4(V2)	3.7	98	56		3.7	*2.3	4.9	
1S5	0		*-0.3	*19	*50	*-0.2	1.2	
3Q4	4.9	92	*1.1	98	4.9	92	4.9	
117N7			92	*1.1	98	6.25		125

The following voltage readings are d-c measurements taken with a line voltage of 117 volts, 60 cycles from B— (chassis) to the indicated tube-socket pin. A 1000 ohms-per-volt meter should be used for all readings except those indicated by an asterisk (*), which should be taken with a d-c vacuum-tube voltmeter. Take readings with the volume control set at minimum and the variable condenser closed.

MODEL 506, Ch. 120003

EMERSON RADIO & PHONO. CORP.



SCHEMATIC WIRING DIAGRAM FOR CHASSIS NO 120003

The following voltage readings are d-c measurements taken from B— (chassis) to the indicated tube-socket pin. A 1000 ohms-per-volt meter should be used for all readings except those indicated by an asterisk (*), which should be taken with a d-c vacuum-tube voltmeter. Line voltage for these readings was 117 volts, 60 cycles, a.c. Take readings with the volume control set at minimum, the variable condenser closed, and the phonograph-radio switch in the treble radio position.

TUBE	PIN NUMBER							
	1	2	3	4	5	6	7	8
6SS7(V1)				*-0.9		55		52
12SA7			92	84	*-8.6			*-0.82
12SF7				84		92		
6SS7(V4)				*7.5		*9		*42
50L6GT			100	93		75		5.6
35Z5GT				115		108		120

The color coding of the i-f transformer leads is as follows:
Grid return—black
Grid—green
Plate—blue
B+—red

2—6SS7, r-f and a-f amplifiers
1—12SA7, pentagrid oscillator-modulator
1—12SF7, diode detector, i-f amplifier, a.v.c.
1—50L6GT, beam power output
1—35Z5GT, half-wave rectifier

POWER SUPPLY: A.C. only, 60 cycles.

VOLTAGE RATING: 105-125 volts.

POWER CONSUMPTION:
30 watts for the receiver.
20 watts for the phono motor.

An oscillator with frequencies of 455, 600, and 1425 kc is required.

An output meter should be connected across the primary or secondary of the output transformer for observing maximum and minimum response, as required.

Always use as weak a test signal as possible, turning down the output of the test oscillator as the alignment of the receiver progresses.

Turn the volume control on full and set the tone control in the most brilliant position.

Location of Coils and Trimmer Adjustments

The first i-f transformer (T2) is mounted on top of the chassis deck next to the 12SA7 tube. The trimmers (C7, C8) are accessible through holes in the top of the can.

The second i-f transformer (T3) is mounted on top of the chassis next to the 50L6 tube. The trimmers (C9, C10) are accessible through holes in the top of the can.

The trimmer (C2) for the oscillator coil (T5) is located on the rear section of the variable condenser.

The antenna trimmer (C3) is mounted on the variable condenser mounting bracket.

The oscillator coil is located underneath the chassis. The loop antenna acts as the antenna coil.

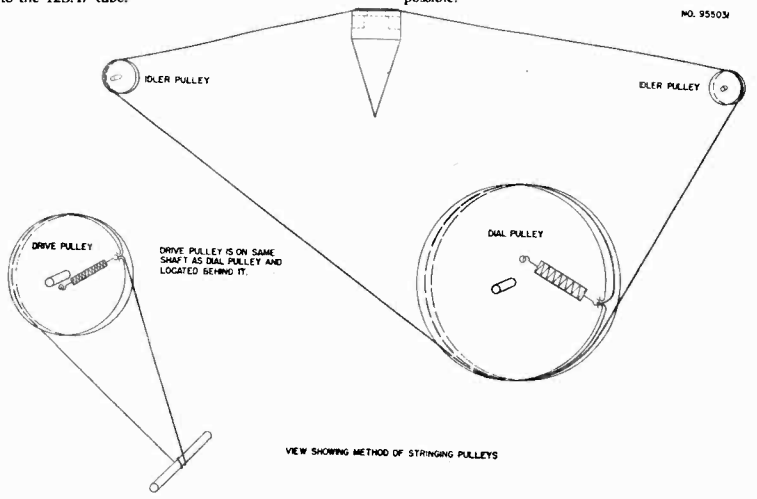
The wave trap (T1) is located on the top deck of the chassis base adjacent to the 12SA7 tube.

I-F Alignment and Wave Trap Alignment

1. Set the variable condenser to the minimum capacity position.
2. Feed 455 kc to the grid (pin 8) of the 12SA7 tube through a 0.01 mfd. condenser and adjust the four i-f trimmers (C7, C8, C9, C10) for maximum response.
3. Feed 455 kc to the external antenna lead and adjust the wave trap (T1, C15) for minimum response.

R-F Alignment

1. Set the variable condenser at maximum capacity and the front edge of the pointer opposite the maximum capacity marker on the lower edge of the dial plate. The markers are small triangular indentations on the front edge. Looking at the front of the set from left to right are calibration points for maximum capacity, 600 kc, 1425 kc, and 1600 kc.
2. Connect the test oscillator to a coil composed of three or four turns of wire wound in a circle approximately 12" in diameter. Place the coil parallel to and in line with the receiver loop at a distance of approximately 15 to 20 inches. During alignment procedure, make sure the relative positions of the receiver and loop are similar to actual operating positions when mounted on the cabinet.
3. Radiate a signal at 1425 kc, set the dial indicator opposite the 1425 kc marker, and adjust both oscillator and antenna trimmers for maximum response.
4. Radiate a 600 kc signal, tune in the signal on the receiver, and adjust the loose outside turn of the loop antenna for maximum response. This loose turn may be moved to either side of the center. Fasten it in the position which gives maximum response.
5. Repeat steps (3) and (4) until no further improvement is possible.



VIEW SHOWING METHOD OF STRINGING PULLEYS

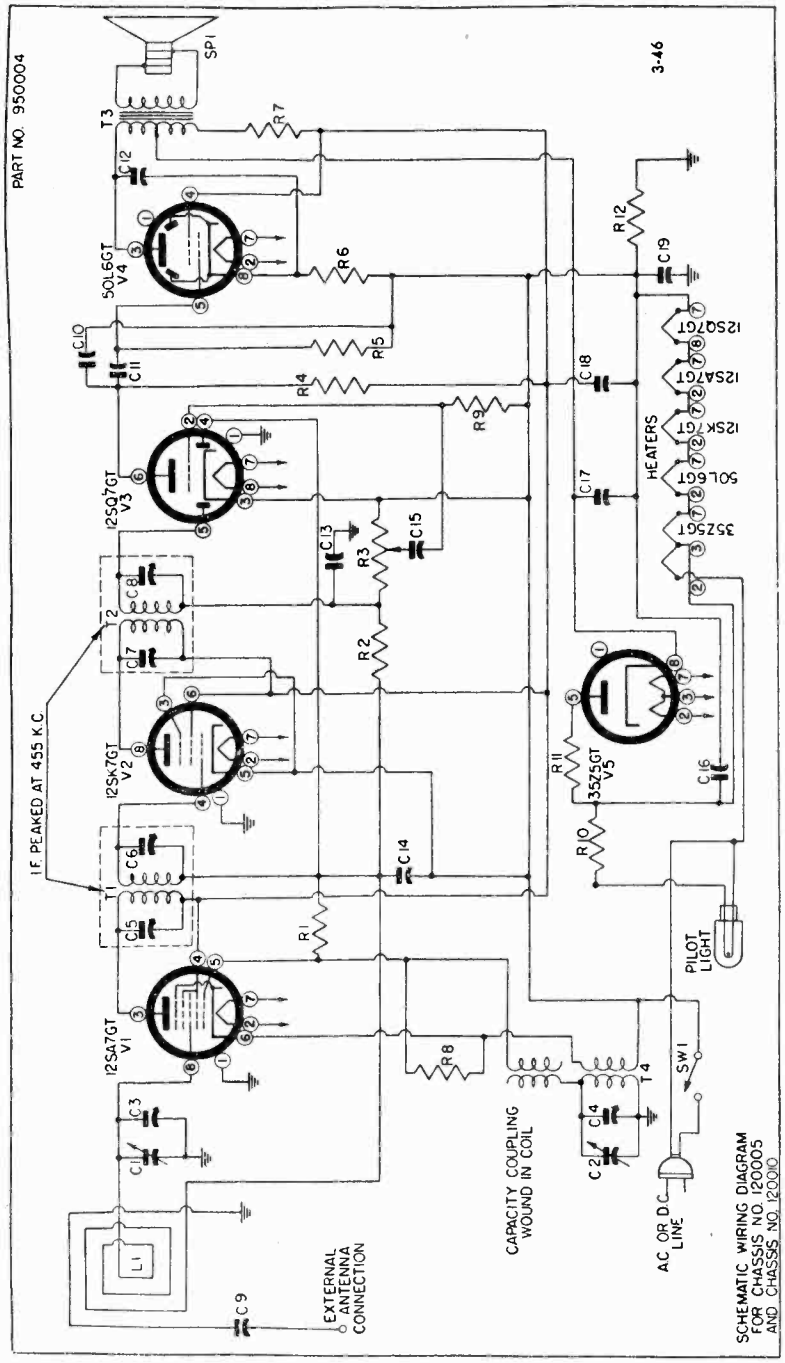
Schematic Symbol	Part No.	DESCRIPTION	PRICE
C1, C2	900180	Two-gang variable condenser	$4.50
C3	900190	1.6 - 12 mmfd. trimmer	.25
C4		Trimmer, part of C2	
C5, C28	910000	0.00022 mfd. mica condenser	.20
C6, C29	910010	0.00011 mfd. mica condenser	.20
*C7, C8		Trimmers, part of T2	
*C9		Trimmer, part of T3	
*C10		Trimmer and fixed condenser, part of T3	
C11	920020	0.02 mfd., 400 V. condenser	.20
C12, C25	920180	0.005 mfd., 400 V. condenser	.20
C13, C17	920010	0.002 mfd., 600 V. condenser	.20
C14, C18, C19, C20, C22	920060	0.05 mfd., 200 V. condenser	.20
C15		Trimmer, part of T1	
C16	925100	8 mfd. 150 V. electrolytic condenser	.60
C21	910050	0.0004 mfd. mica condenser	.25
C23	920040	0.1 mfd., 200 V. condenser	.20
C24	910030	0.000026 mfd. mica condenser	.20
C26	920010	0.002 mfd., 600 V. condenser	.20
C27	910040	0.00025 mfd. mica condenser	.20
C30	920170	0.001 mfd., 600 V. condenser	.20
C31	920500	0.05 mfd., 200 V. condenser	.20
C32	920030	0.05 mfd., 400 V. condenser	.20
C33, C34, C35	925080	20, 40, 80 mfd., 150 V. multiple electrolytic condenser; C33—40 mfd., C34—20 mfd., C35—80 mfd.	1.75
L1	700070	Loop antenna	1.25
R1	321210	1 meg., ¼ watt resistor	.12
R2	310730	10,000 ohms, ¼ watt resistor	.12
R3, R5	310810	22,000 ohms, ¼ watt resistor	.12
R4	310850	33,000 ohms, ¼ watt resistor	.12
R6	340490	1,000 ohms, ½ watt resistor	.14
*R7		47,000 ohms, ¼ watt resistor, part of T3	.12
R8	321450	10 meg., ¼ watt resistor	.12
R9	321050	220,000 ohms, ¼ watt resistor	.12
R10, R16, R18, R19	321130	470,000 ohms, ¼ watt resistor	.12
R11, R20	321290	2.2 meg., ¼ watt resistor	.12
R12	310890	47,000 ohms, ¼ watt resistor	.12
R13	340290	150 ohms, ½ watt resistor	.14
R14	321330	3.3 meg., ¼ watt resistor	.12
R15	390050	2.5 meg. volume control and switch	1.15
R17	320970	100,000 ohms, ¼ watt resistor	.12
R21	310050	15 ohms, ¼ watt resistor	.12
R22	397010	180 ohms, 1 watt ceramic resistor	.16
R23	370410	470 ohms, 1 watt resistor	.16
SP1	180004	Speaker, 6½" permanent magnet (less output transformer)	7.00
SW1	510100	Phono and tone switch	1.15
T1	708000	Wave trap	.90
T2	720270	First i-f transformer	1.65
T3	720370	Second i-f transformer	2.00
T4	734030	Output transformer	2.00
T5	716050	Oscillator coil, or	.80
T5	716060	Oscillator coil	.80
	583090	Line cord	.60
	140003	Cabinet, walnut	42.50
	140011	Cabinet, mahogany	42.50
	460470	Knob, volume and selector	.10
	460300	Knob, phono-radio	.10
	560080	Bottom cover	.85
	819005	Record changer, or	45.00
	819003	Record changer	40.00
		DIAL PARTS	
	807010	Pilot light No. 51	.09
	507110	Pilot light socket	.20
	411070	Dial plate	.40
	525100	Pointer	.30
	280153	Drive shaft	.15
	587000	Drive cord spring, dial	.05
	587070	Drive cord spring, variable condenser	.05

*Not supplied separately.

Specify part numbers when ordering. List price each effective as of January 1, 1946. (Prices subject to change without notice.)

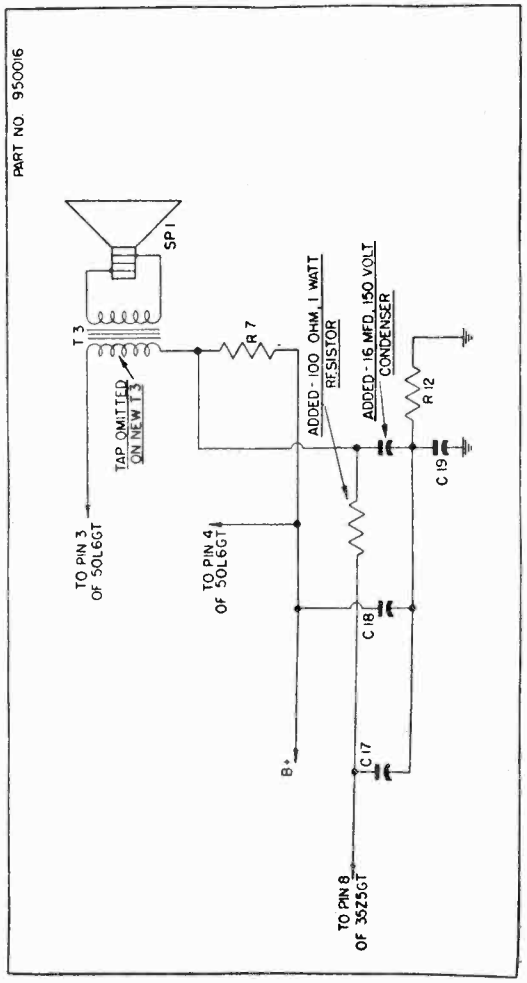
EMERSON RADIO & PHONO. CORP.

MODELS 507,509,511, 518,Ch.120005,120010



NOTE

Some 120005 chassis have a modified filter circuit and untapped output transformer. The partial schematic circuit diagram at the left indicates the revision.



For Parts List, see P.15-2

MODELS 507,509,511, 518,Ch.120005,120010 EMERSON RADIO & PHONO. CORP.

An oscillator with frequencies of 455, 600, and 1425 kc. is required.

An output meter should be connected across the primary or secondary of the output transformer for observing maximum response.

Plug the receiver into the power supply outlet in such a way that the ground side of the power line is connected to the receiver B—.

Always use as weak a test signal as possible, turning down the output of the test oscillator as the alignment of the receiver progresses.

Location of Coils and Trimmer Adjustments

The first i-f transformer (T2) is mounted on top of the chassis deck to the right of the variable condenser. The trimmers (C6, C7) are accessible through holes in the top of the can.

The second i-f transformer (T3) is mounted on top of the chassis between the variable condenser and the speaker. The trimmers (C8, C9) are accessible through holes in the top of the can.

The trimmer for the antenna (C5) and the trimmer for the oscillator coil (C11) are located on the variable condenser. The trimmer on the front section is for the oscillator coil.

The oscillator coil (T4) is located underneath the chassis. The loop antenna acts as the antenna coil.

TYPE: Single-band superheterodyne.

FREQUENCY RANGE: 540-1620 kc.

NUMBER OF TUBES: Five.

TYPE OF TUBES:

1—12SA7, pentagrid oscillator-modulator

1—12SK7, first i-f amplifier

1—12SQ7, diode detector, a-f amplifier, a.v.c.

1—50L6, beam power output

1—35Z5, half-wave rectifier

POWER SUPPLY: A.C. or D.C.

VOLTAGE RATING: 105-125 volts.

POWER CONSUMPTION: 30 watts.

I-F Alignment

1. Rotate the variable condenser to the minimum capacity position.
2. Feed 455 kc. to the converter grid (stator of the r-f section of the variable condenser) and adjust the four i-f trimmers for maximum response.

R-F Alignment

1. Connect the oscillator to a coil composed of three to four turns of wire wound in a circle approximately 12" in diameter. This coil should be held parallel to and in line with the loop antenna of the receiver at a distance of 15 to 20 inches.
2. Radiate a signal at 1425 kc., set the dial indicator to 1425 kc., and adjust the trimmers on the variable condenser (C5, C11) for maximum response.
3. Radiate a 600 kc. signal and tune in the signal on the receiver. Adjust the loose outside turn of the loop antenna for maximum response. This loose turn may be moved to either side of the center. Fasten it in the position which gives maximum response.
4. Repeat steps (2) and (3) until no further improvement is evident.

1. If replacements are made or the wiring disturbed in the r-f section of the circuit, the receiver should be carefully realigned.
2. In operating the receiver on d.c., it may be necessary to reverse the line plug for correct polarity.
3. The color coding of the i-f transformer leads is as follows:
   Grid—green Plate—blue
   Grid return—black B+—red
4. All models have self-contained antennas and do not require additional antenna connections. For permanent home installations, however, if it is desired to improve reception of weak stations, an additional outdoor antenna may be used. For this purpose a lead has been brought out of the rear of the chassis near the line cord.
5. Some models have the loop antenna molded into the rear cover and others have a separate loop antenna assembly. Both antennas have directional properties. It is important, therefore, once the station is tuned in, to rotate the cabinet back and forth through a quarter of a circle (90 degrees), leaving it at the position where the station is received with maximum volume.

VOLTAGE ANALYSIS

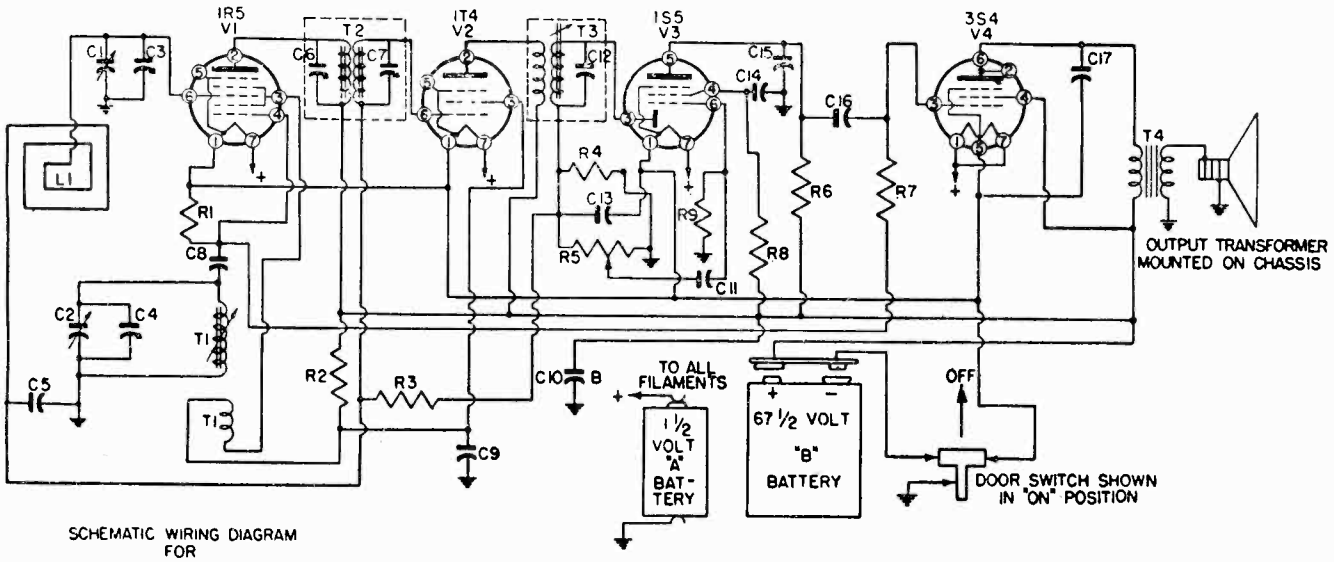
The following voltage readings are d-c measurements taken from B— (line switch) to the indicated tube-socket pin. A 1000 ohms-per-volt meter should be used for all readings except those indicated by an asterisk (*), which should be taken with a d-c vacuum-tube voltmeter. Line voltage for these readings was 117 volts, 60 cycles, a.c. Measurements made with 117 volts d.c. will be lower than those given below. Take readings with the volume control set at minimum and the variable condenser closed.

	PIN NUMBER							
TUBE	1	2	3	4	5	6	7	8
12SA7			89	89	*-10			*-1.6
12SK7				*-1.6		89		89
12SQ7		*-0.7		*-1.6	*-0.5	37.5		
50L6			110	89				6.2
35Z5				116		116		117

MODEL 508, Ch. 120008

EMERSON RADIO & PHONO. CORP.

NO. 950005



SCHEMATIC WIRING DIAGRAM FOR CHASSIS NO. 120008

FREQUENCY RANGE: 540-1600 kc.

NUMBER OF TUBES: Four.

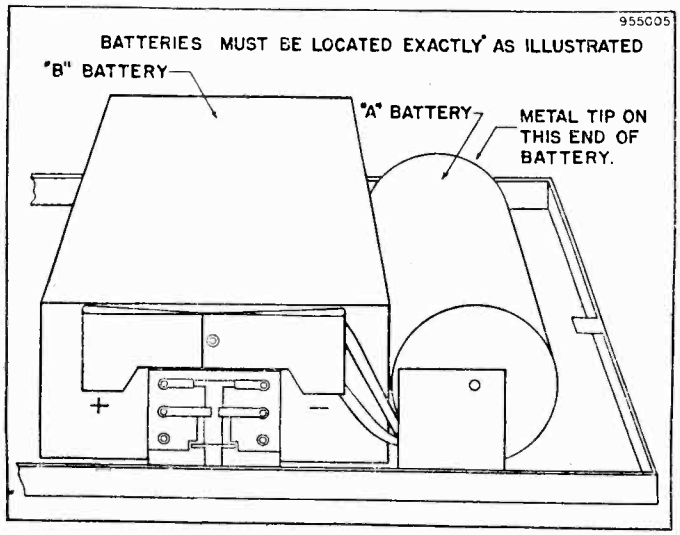
TYPE OF TUBES:
1—1R5, oscillator-modulator
1—1T4, i-f amplifier
1—1S5, 2nd detector, a.v.c., a-f amplifier
1—3S4, pentode output

POWER SUPPLY: "A" and "B" batteries.

VOLTAGE RATING:
"A" Battery—1.5 volts
"B" Battery—67.5 volts

CURRENT DRAIN:
"A" Battery—0.25 amp.
"B" Battery—0.0075 amp.

The receiver is turned on when the door is open and turned off when the door is closed.



1. Slide the button on the catch near the handle in the direction of the arrow. This loosens the rear cover, making the batteries accessible.
2. Insert batteries as shown in the accompanying diagram.
3. To reassemble fit the two slots on the end of the plastic shell opposite the handle to the tongues on the lower end of the metal frame. Keep the "B" battery in place.
4. Carefully close the shell until it fits and catches in place.

VOLTAGE ANALYSIS

The following voltage readings are d-c measurements taken from B— (chassis) to the indicated tube-socket pin. A 1000 ohms-per-volt meter should be used for all readings except those indicated by an asterisk (*), which should be taken with a d-c vacuum-tube voltmeter. Take readings with the volume control set at minimum and the variable condenser closed. Use fresh batteries.

	PIN NUMBER						
TUBE	1	2	3	4	5	6	7
1R5		67.5	40	*-7.0		*-0.3	1.5
1T4		67.5	40			*-0.3	1.5
1S5			*-0.35	*16.5	*39	*-0.3	1.5
3S4	1.5	65	*-7.0	67.5		65	1.5

MODEL 508,Ch.120008

EMERSON RADIO & PHONO. CORP.

An oscillator with frequencies of 455, 600, 1500, and 1610 kc is required.

An output meter should be connected across the primary or secondary of the output transformer for observing maximum response..

Always use as weak a test signal as possible, turning down the output of the test oscillator as the alignment of the receiver progresses.

Turn the volume control on full.

Location of Coils and Trimmer Adjustments

The first i-f transformer (T2) is located next to the output transformer (T4). The trimmers (C6, C7) are accessible through holes in the top of the can.

The second i-f transformer (T3) is located between the 1T4 and 1S5 tubes. The single trimming core screw (C12) extends from the end of the can.

The oscillator coil (T1) is located next to the first i-f transformer. The trimmer for the oscillator (C4) is located on the smaller variable condenser section. The 600 kc oscillator core adjustment is the brass screw protruding from the end of the oscillator coil.

The loop antenna acts as the antenna coil. The trimmer for the loop (C3) is located on the larger section of the variable condenser.

I-F Alignment

1. Rotate the variable condenser to the minimum capacity position.
2. Feed 455 kc to the grid (pin 6) of the 1R5 tube through a 0.01 mfd. condenser.
3. Adjust the three i-f trimmer screws (C6, C7, C12) for maximum response. (Clip the test signal lead to the stator of the larger capacity section of the variable condenser.)

R-F Alignment

1. Connect the test oscillator to a coil composed of three or four turns of wire wound in a circle approximately 12 inches in diameter. This coil should be placed parallel to and in line with the receiver loop at a distance of approximately 15 to 20 inches.
2. Radiate a signal at 1610 kc, rotate the variable condenser to minimum capacity, and adjust the oscillator trimmer (C4), on the smaller section of the variable condenser, for maximum response.
3. Radiate a signal at 1500 kc, tune in the 1500 kc signal, and adjust the antenna trimmer (C3), on the larger section of the variable condenser, for maximum response.
4. Radiate a signal at 600 kc, set the dial indicator to 60, and adjust the oscillator coil core trimmer while rocking the variable condenser for maximum response.
5. Return to 1610 kc and check alignment. If readjustment is necessary, repeat steps (2) to (4) until no further improvement is noted.

Battery Type	Number Required	Model
1½-volt "A"	1	Standard D-size flashlight cell (1 5/16" diameter)
67½-volt "B'	1	Eveready "Minimax" No. 467

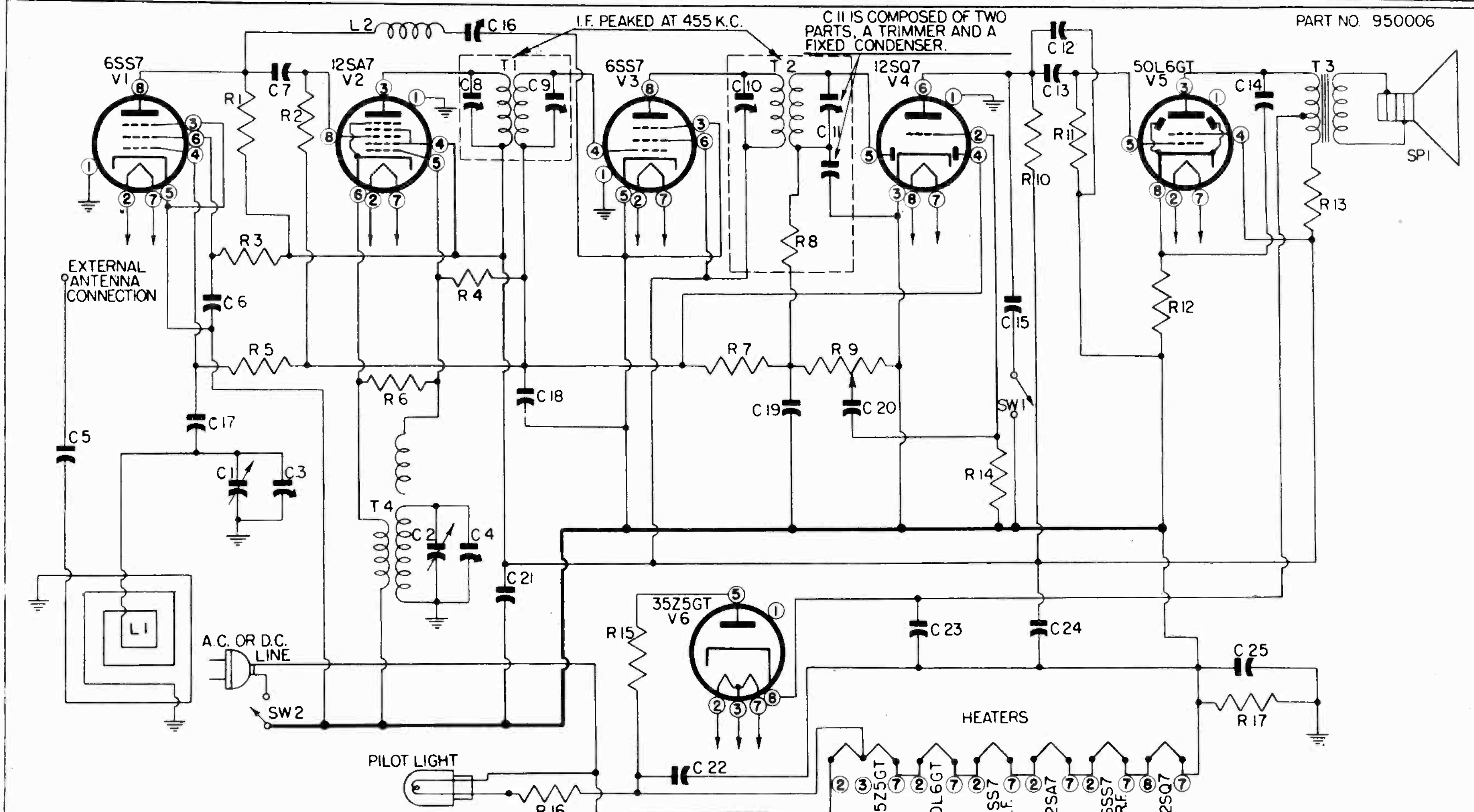
Specify part numbers when ordering. List price each effective as of January 1, 1946. (Prices subject to change without notice.)

Schematic Symbol	Part No.	DESCRIPTION	PRICE
C1, C2	900120	Variable condenser, or	$2.50
C1, C2	900140	Variable condenser	3.50
*C3, C4		Trimmers, part of C1, C2	
C5, C9, C14	920120	0.02 mfd., 100 V. roll-type condenser	.60
*C6, C7		Trimmers, part of T2	
C8	910110	0.0002 mfd. mica condenser, or	.20
C8	928020	0.0002 mfd. ceramic condenser	.20
C10	925070	8 mfd., 100 V. dry electrolytic condenser	.60
C11, C17	920140	0.003 mfd., 150 V. roll-type condenser	.25
*C12		Condenser, part of T3	
C13, C15	928010	0.0001 mfd., ceramic condenser	.25
C16	920130	0.001 mfd., 100 V. flat roll-type condenser	.25
L1	700030	Loop assembly	.65
R1	320970	100,000 ohms, ¼ watt resistor	.12
†R2	310730	10,000 ohms, ¼ watt resistor	.12
R3	321330	3.3 meg., ¼ watt resistor	.12
R4, R7	321210	1 meg., ¼ watt resistor	.12
R5	390040	Volume control 3 megohms	.65
R6	321130	0.47 meg., ¼ watt resistor	.12
R8	321370	4.7 meg., ¼ watt resistor	.12
R9	321450	10 meg., ¼ watt resistor	.12
T1	716040	Oscillator coil	1.20
T2	760240	First i-f transformer	2.20
T3	720260	Second i-f transformer	1.75
T4	734090	Output transformer	1.80
	180002	Permanent magnet dynamic speaker	5.00
	585000	"B" battery cable	.45
	510040	Lid switch	.50
	460020	Plastic shell (black)	1.35
	460030	Plastic door	.75
	630000	Plastic loop cover (black)	.25
	410389	Metal front (maroon)	2.25
	460050	Plastic tuning wheel (black)	.20
	460060	Plastic volume wheel (black)	.20
	595000	Leather handle	.25
	410969	Release catch, male	.20
	410959	Release catch, female	.40

†Some units contain R2 resistors varying in value from 8200 to 22,000 ohms, as selected in production. *Not supplied separately

EMERSON RADIO & PHONO. CORP.

MODELS 512,515, 516,Ch.120006



SCHEMATIC WIRING DIAGRAM FOR CHASSIS NO. 120006

ITEM	PART NO.	DESCRIPTION	
C 1, C 2	90?070	TWO GANG VARIABLE CONDENSER	
C 3	PT OF C 1	TRIMMER	
C 4	PT. OF C 2	TRIMMER	
C 5	920010	.002 MF	600 VOLT
C 6	920060	.05 MF	200 VOLT
C 7	910010	.00011 MF	MICA
C 8, C 9	PT OF T1	TRIMMERS	
C 10	PT. OF T2	TRIMMER	
C 11	PT. OF T2	TRIMMER & FIXED CONDENSER	
C 12	910000	.00022 MF	MICA
C 13	920020	.02 MF	400 VOLT
C 14	920020	.02 MF	400 VOLT
C 15	920010	.002 MF	600 VOLT
C 16	PT. OF L 2	TRIMMER	
C 17	910000	.00022 MF	MICA
C 18	920060	.05 MF	200 VOLT
C 19	910010	.00011 MF	MICA
C 20	920010	.002 MF	600 VOLT

ITEM	PART NO.	DESCRIPTION	
C 21	920030	.05 MF	400 VOLT
C 22	920030	.05 MF	400 VOLT
C 23 / C 24	925110	30 MF / 50 MF 150 V. DUAL ELECT. COND	
C 25	920050 OR 920410	2 MFD 200 VOLTS (USED ON 120006 ONLY) / 2 MFD 600 VOLTS (USED ON 120006-C ONLY)	
L 1	700010	LOOP ANTENNA	
L 2	708060 (10)	455 K.C. WAVE TRAP	
R 1	310730	10,000 OHMS	1/4 WATT
R 2	310810	22,000 OHMS	1/4 WATT
R 3	310870	39,000 OHMS	1/4 WATT
R 4	397000	15 MEG.	1/4 WATT
R 5	321130	470,000 OHMS	1/4 WATT
R 6	310810	22,000 OHMS	1/4 WATT
R 7	321330	3.3 MEG.	1/4 WATT
R 8	PT. OF T2	47,000 OHMS	1/4 WATT

ITEM	PART NO.	DESCRIPTION	
R 9	390180 (5)	.5 MEG. VOLUME CONTROL	
R 10	321130	470,000 OHMS	1/4 WATT
R 11	321130	470,000 OHMS	1/4 WATT
R 12	340290	150 OHMS	1/2 WATT
R 13	370490	1,000 OHMS	1 WATT
R 14	397000	15 MEG.	1/4 WATT
R 15	340050 (9)	15 OHMS 1/2 WATT	
R 16	340010 (8)	10 OHMS	1/2 WATT
R 17	321050	220,000 OHMS	1/4 WATT
SP 1	180008	P. M. SPEAKER	
SW 1	510120 (6)	TONE CONTROL SWITCH	
SW 2	510200 (7)	ROTARY LINE SWITCH	

ITEM	PART NO.	DESCRIPTION
T 1	720380	FIRST I.F. TRANSFORMER
T 2	720390	SECOND I.F. TRANSFORMER
T 3	734080	OUTPUT TRANSFORMER
T 4	716070	OSCILLATOR COIL
V 1	800060	VACUUM TUBE (6SS7)
V 2	800000	VACUUM TUBE (12SA7)
V 3	800060	VACUUM TUBE (6SS7)
V 4	800040	VACUUM TUBE (12SQ7)
V 5	800070	VACUUM TUBE (50L6GT)
V 6	800090	VACUUM TUBE (35Z5GT)

MODELS: 512,515,516

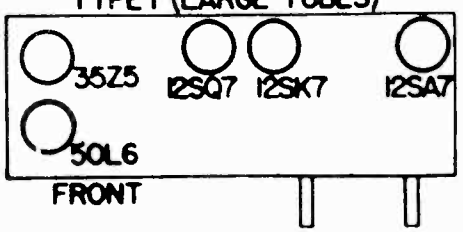
REVISIONS

BY	CH	DATE	CHANGE	SYM
L. C	12159	2-4-46	REDRAWN & REVISED ... ACT REVISION WAS NO. 4. WAS PART NO 390330; WAS PART NO 510070; WAS PART NO 510170; WAS PART NO 322000	(5) (6) (7) (8)
L. C.	13928	3-27-46	WAS PART NO 397040	(9)
L. C	13088	8-6-46	WAS PART NO 708080	(10)
L. C	15212	11-22-46	ON ITEM C 25 ADDED PT NO 920410 FOR USE ON MODEL 120006-C ONLY	

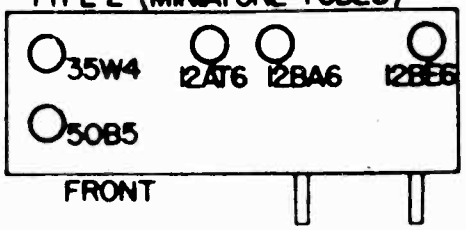
EMERSON RADIO & PHONO. CORP.
NEW YORK CITY

MODEL: 120006, 120006-C
ARTICLE: SCHEMATIC
DATE 2-5-46 DR: L. C. CH: ✓ APPR: ✓

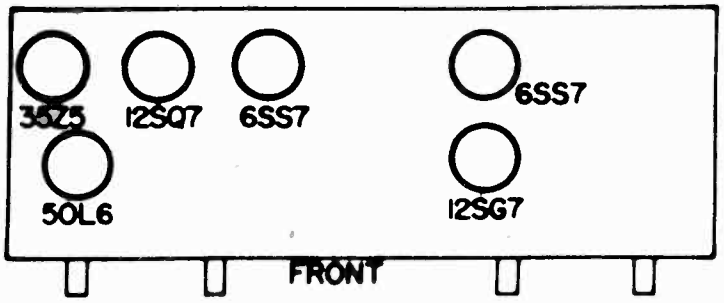
TYPE 1 (LARGE TUBES)



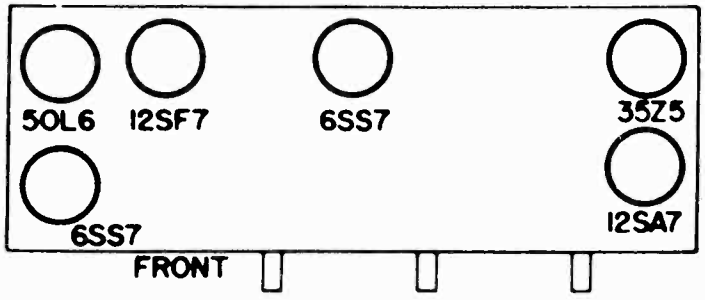
TYPE 2 (MINIATURE TUBES)



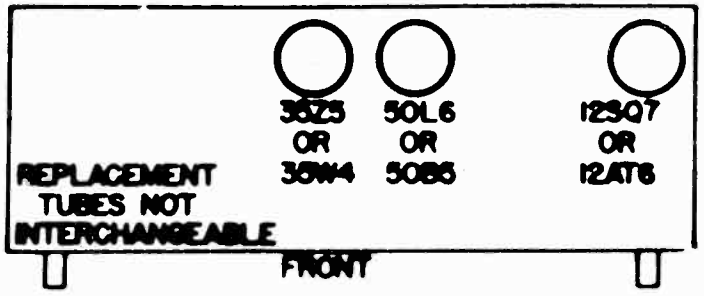
MODELS: 501,502,503,504,507,509,510,511, 517,518,519,520,525,539,541



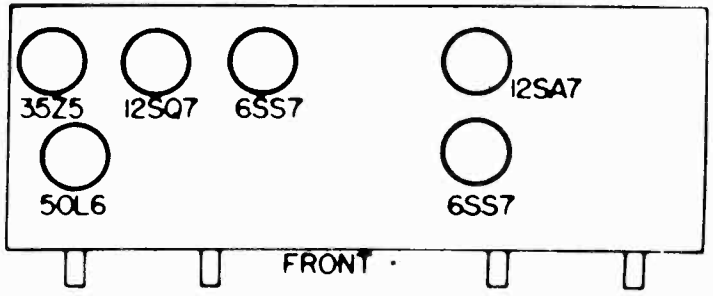
MODELS: 513,514



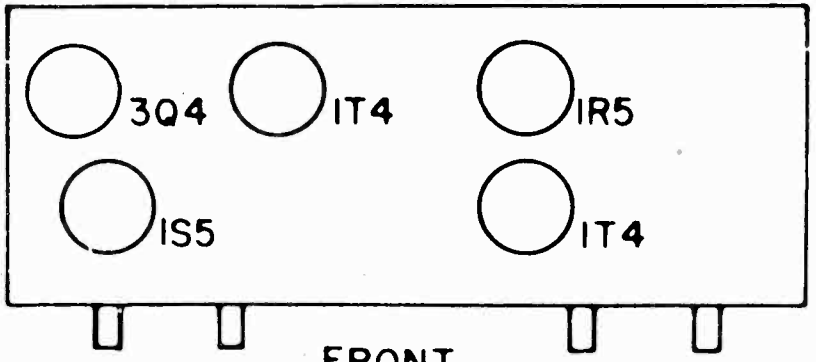
MODEL 506



MODELS: 521,542



MODELS: 512,515,516



MODELS: 531,532,533

EMERSON RADIO & PHONO. CORP.

MODELS 505, 523
MODEL 508

FOR BATTERY OPERATION:

Insert plug in socket on chassis. Place hanked cord into space under shelf.

IMPORTANT

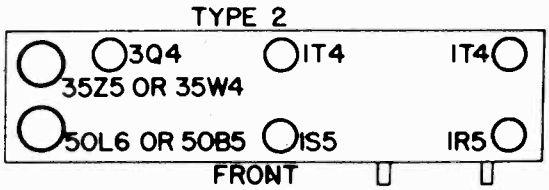
Remove batteries from receiver as soon as they are exhausted.

Batteries for Use with this Receiver

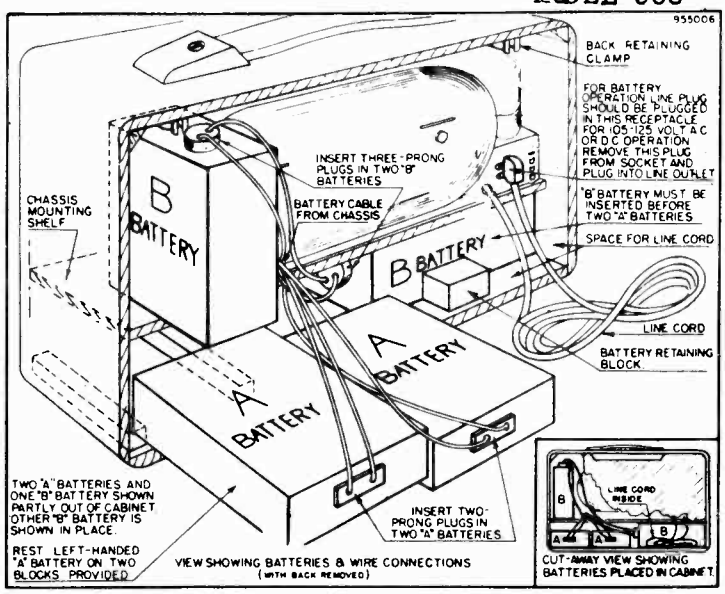
M'f'r.	4½ V. "A"	45 V. "B"
Eveready	746 2 required	482 Minimax 2 required
Ray-O-Vac	P-83A or EM-83 2 required	—
Burgess	G3 2 required	—

FOR 105-125 V. A.C. OR D.C. OPERATION:

Remove plug from chassis and insert it in wall outlet. On d.c. if set does not operate, reverse line plug in wall outlet.



35Z5 AND 35W4 NOT INTERCHANGEABLE
50L6 AND 50B5 NOT INTERCHANGEABLE

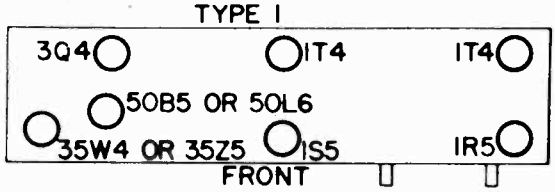


BATTERY INSTALLATION

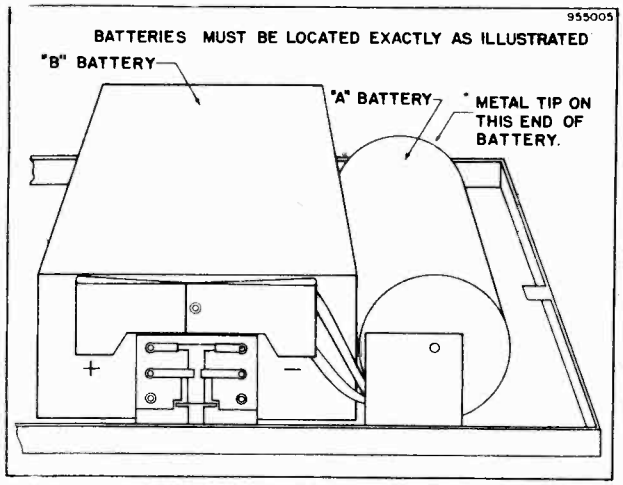
NOTE: Plug with Red Lead Should be connected to "B" Battery at Side of Chassis.

TUBE LOCATIONS

MODELS: 505, 523 — 7 TUBES



EMERSON RADIO MODEL 508



TO REASSEMBLE THE CASE

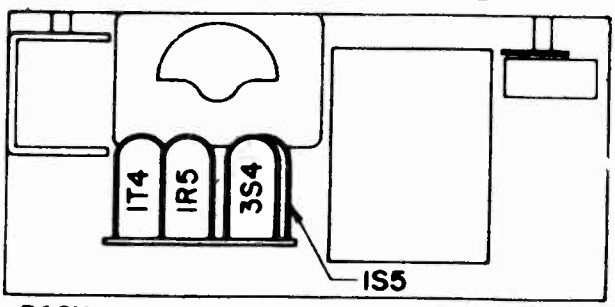
1. Hold the chassis face down with the batteries in place *and the plastic door open.*
2. Note the two tongues at one end of the metal front. Place the plastic housing over the chassis so that these two tongues fit into the corresponding slots at one end of the plastic housing.
3. Press the other end of the housing so that it snaps into place.

BATTERIES USED IN THIS RECEIVER

TYPE	MANUFACTURER'S NUMBER
1½ Volt "A"	Standard "D" size (1 1/16" diameter) flashlight unit cell.
67½ Volt "B"	Eveready Minimax No. 467.

IMPORTANT: Remove batteries as soon as they are exhausted. The "A" battery will require more frequent replacement than the "B" battery.

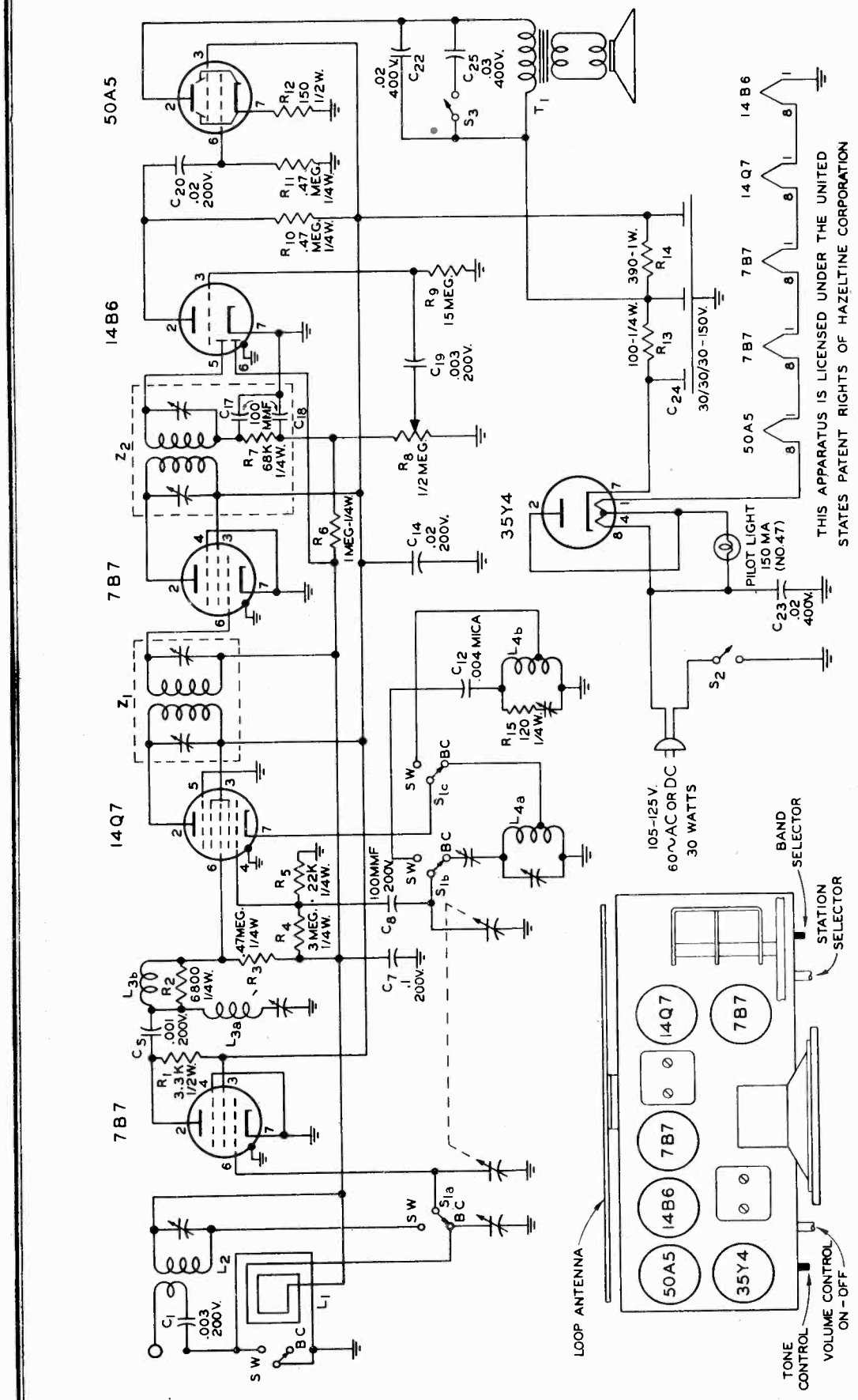
TUBE LOCATIONS



955043

MODEL RR-13L

ESPEY MFG. CO. INC.



MODEL NO. RR-13L

THIS APPARATUS IS LICENSED UNDER THE UNITED STATES PATENT RIGHTS OF HAZELTINE CORPORATION

NOTICE: IF SET IS INOPERATIVE ON DC REVERSE LINE PLUG

CAUTION:

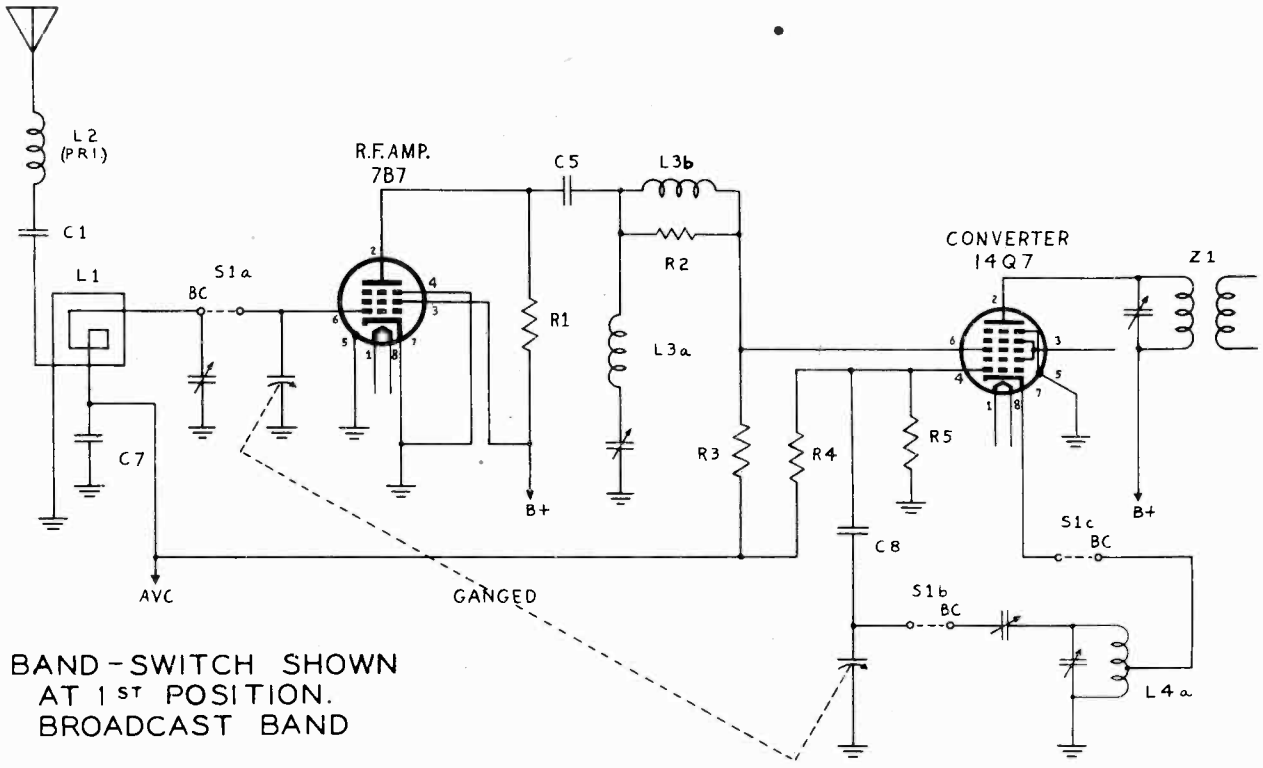
TO REPLACE TUBES, REMOVE SCREW & WASHER AT CENTER OF LOOP ANTENNA, AFTER FIRST REMOVING PLUG FROM CURRENT OUTLET

THIS APPARATUS USES INVENTIONS OF UNITED STATES PATENTS LICENSED BY RADIO CORPORATION OF AMERICA

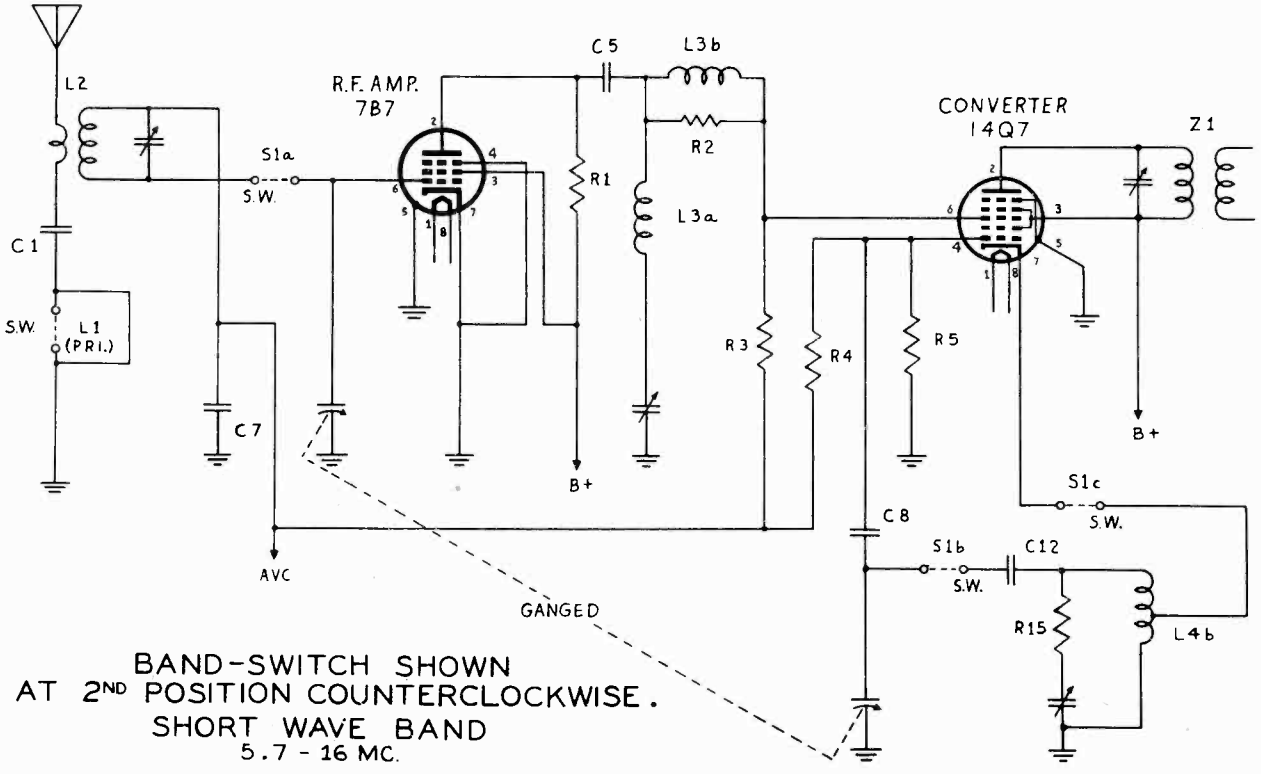
PATENT NUMBERS SUPPLIED UPON REQUEST.

MODEL RR-13L

ESPEY MFG. CO. INC.



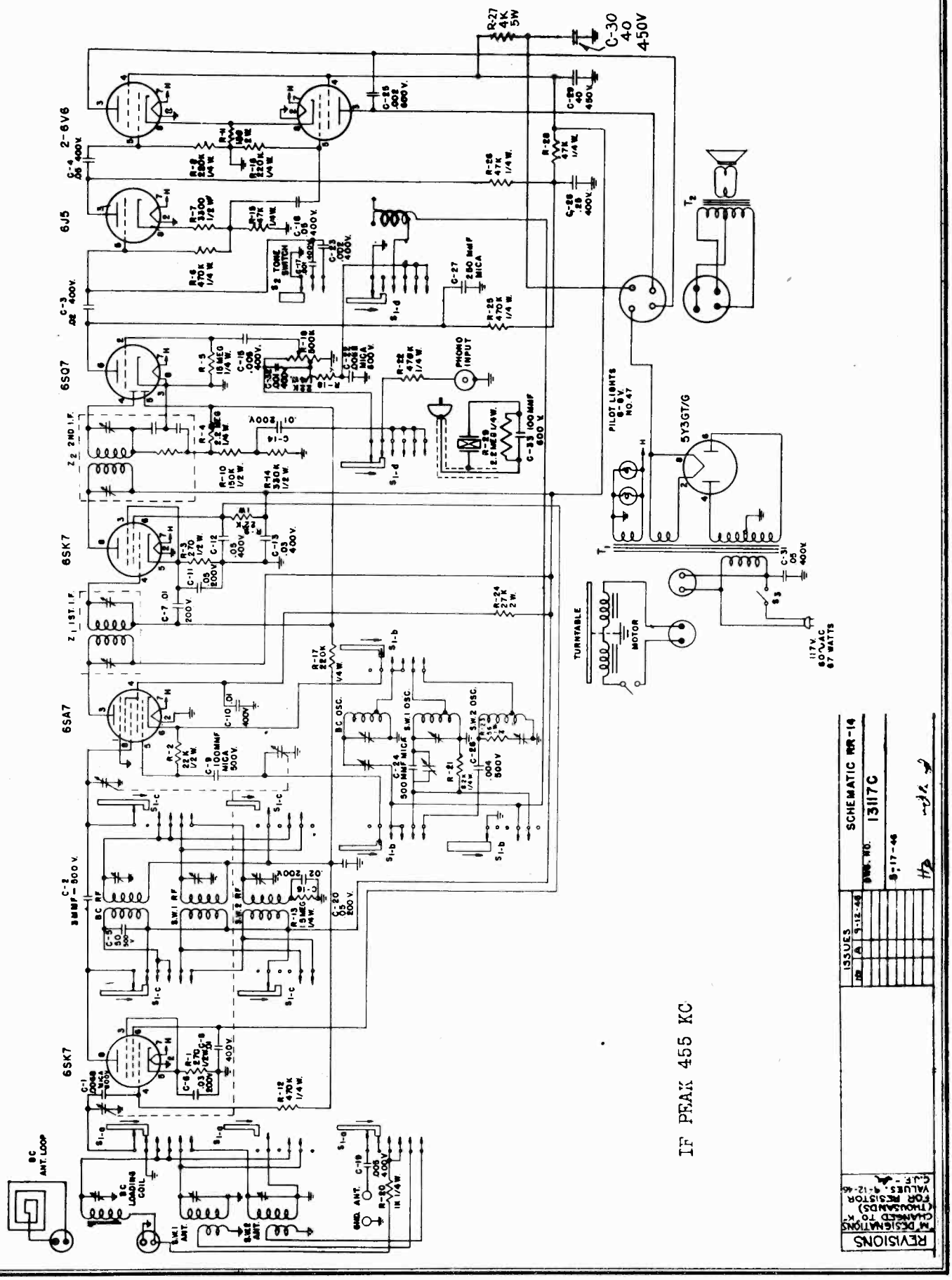
BAND-SWITCH SHOWN
AT 1ST POSITION.
BROADCAST BAND



BAND-SWITCH SHOWN
AT 2ND POSITION COUNTERCLOCKWISE.
SHORT WAVE BAND
5.7 - 16 MC.

MODEL RR-14

ESPEY MFG. CO. INC.

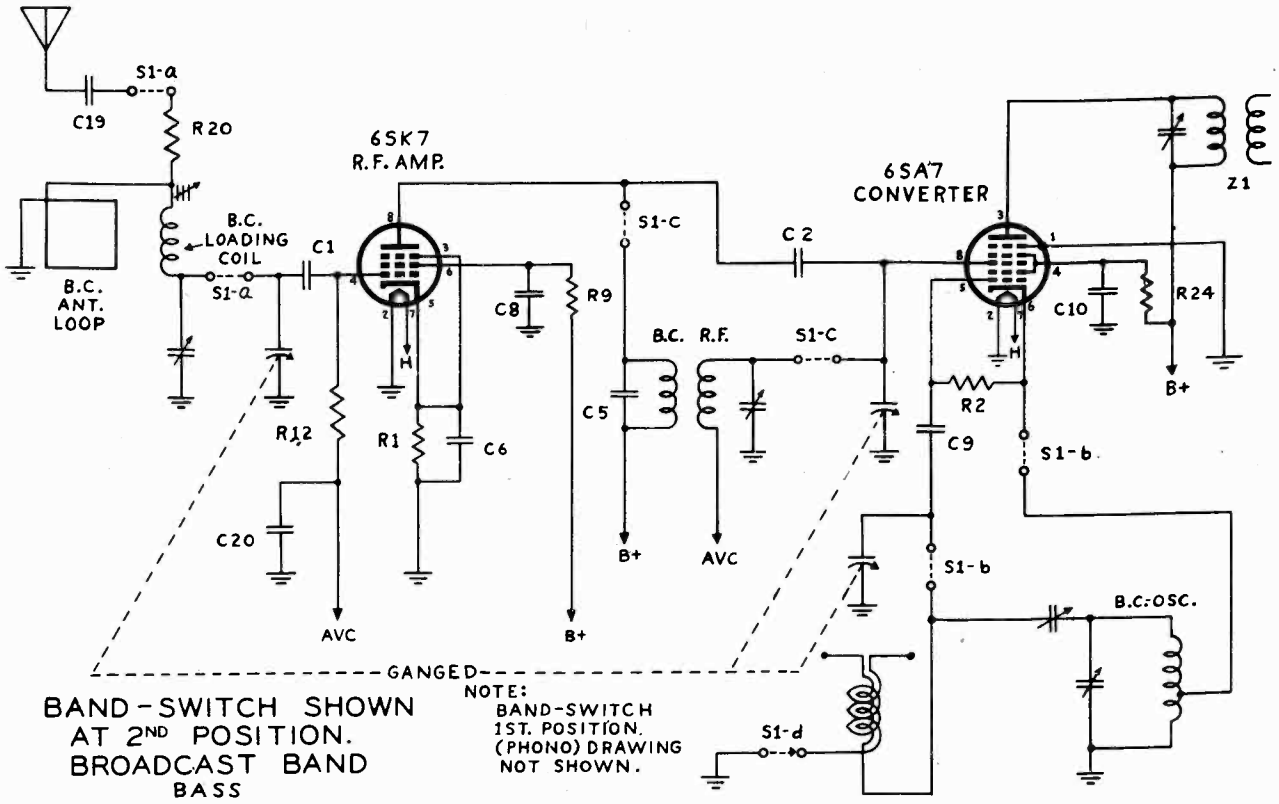


Record Changer: Seeburg Model K

"clarified schematics"

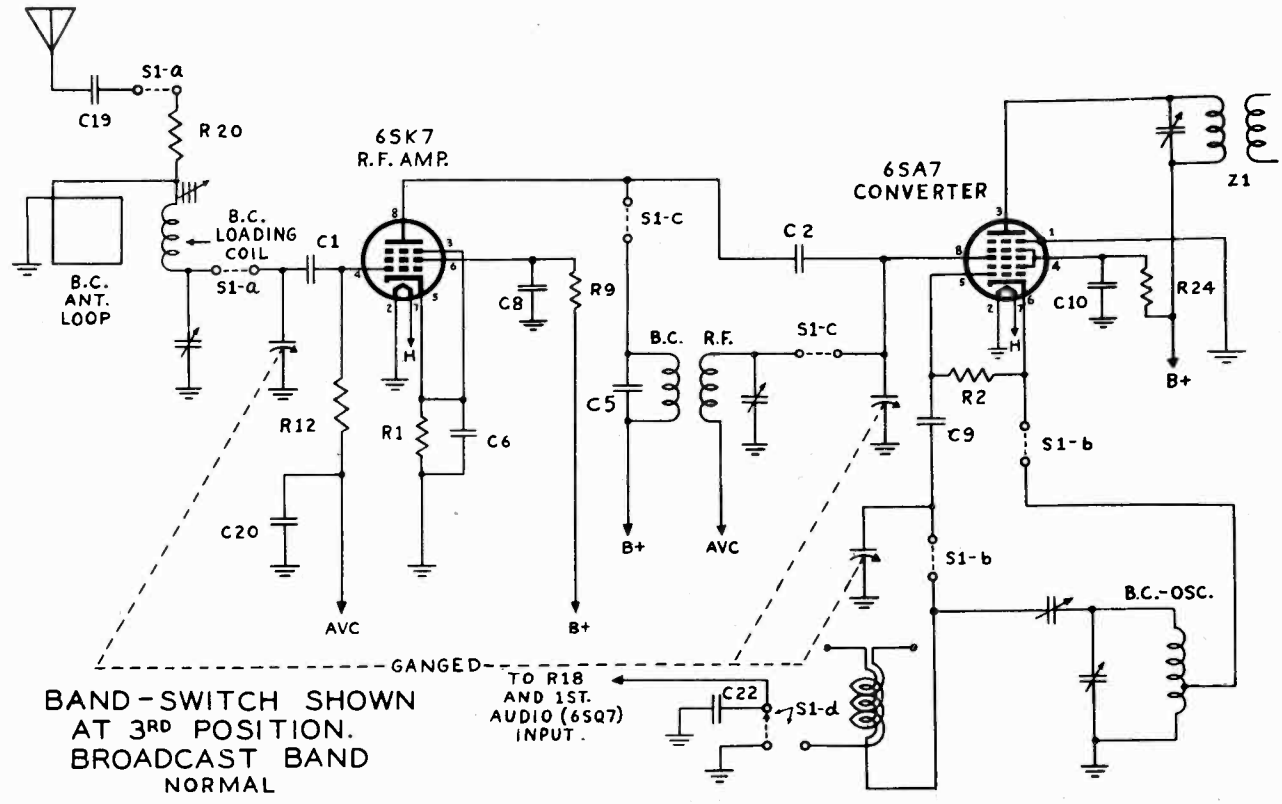
MODEL RR-14

ESPEY MFG. CO. INC.



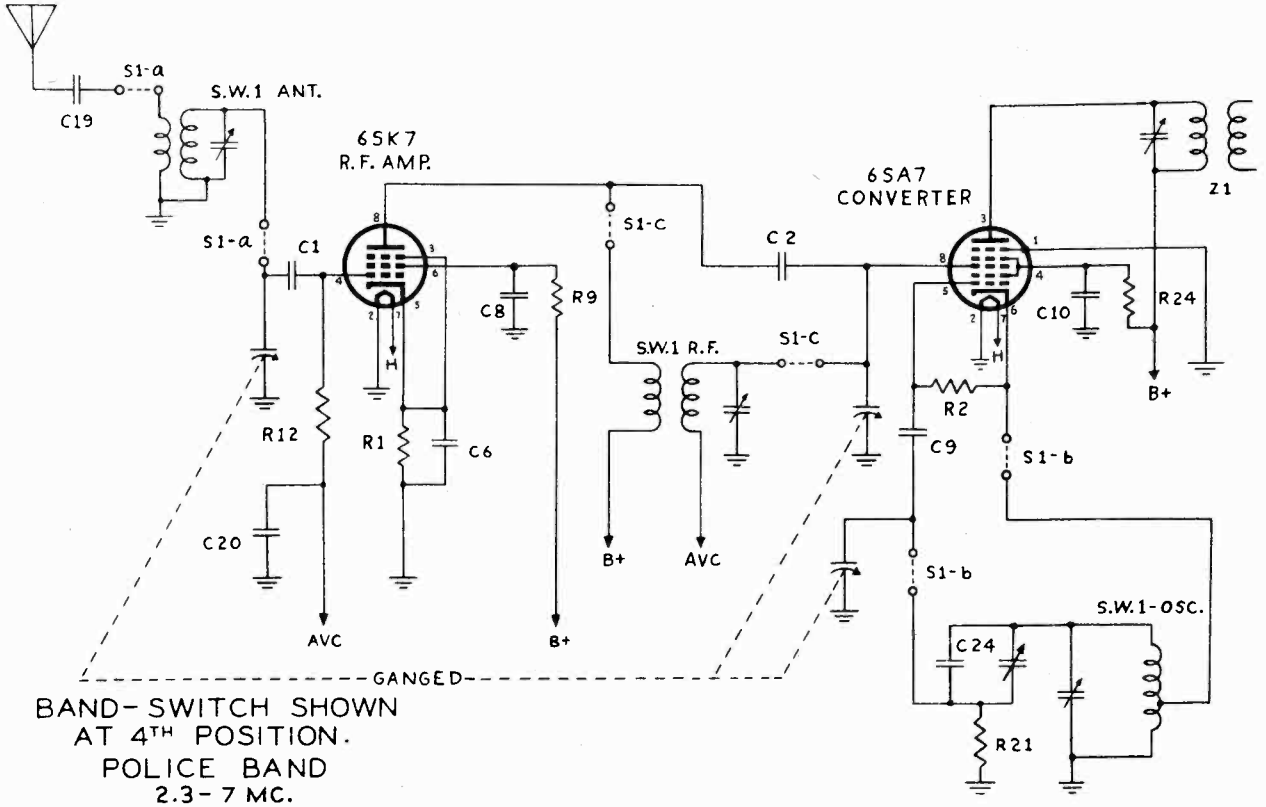
BAND-SWITCH SHOWN AT 2ND POSITION. BROADCAST BAND BASS

NOTE: BAND-SWITCH 1ST. POSITION. (PHONO) DRAWING NOT SHOWN.

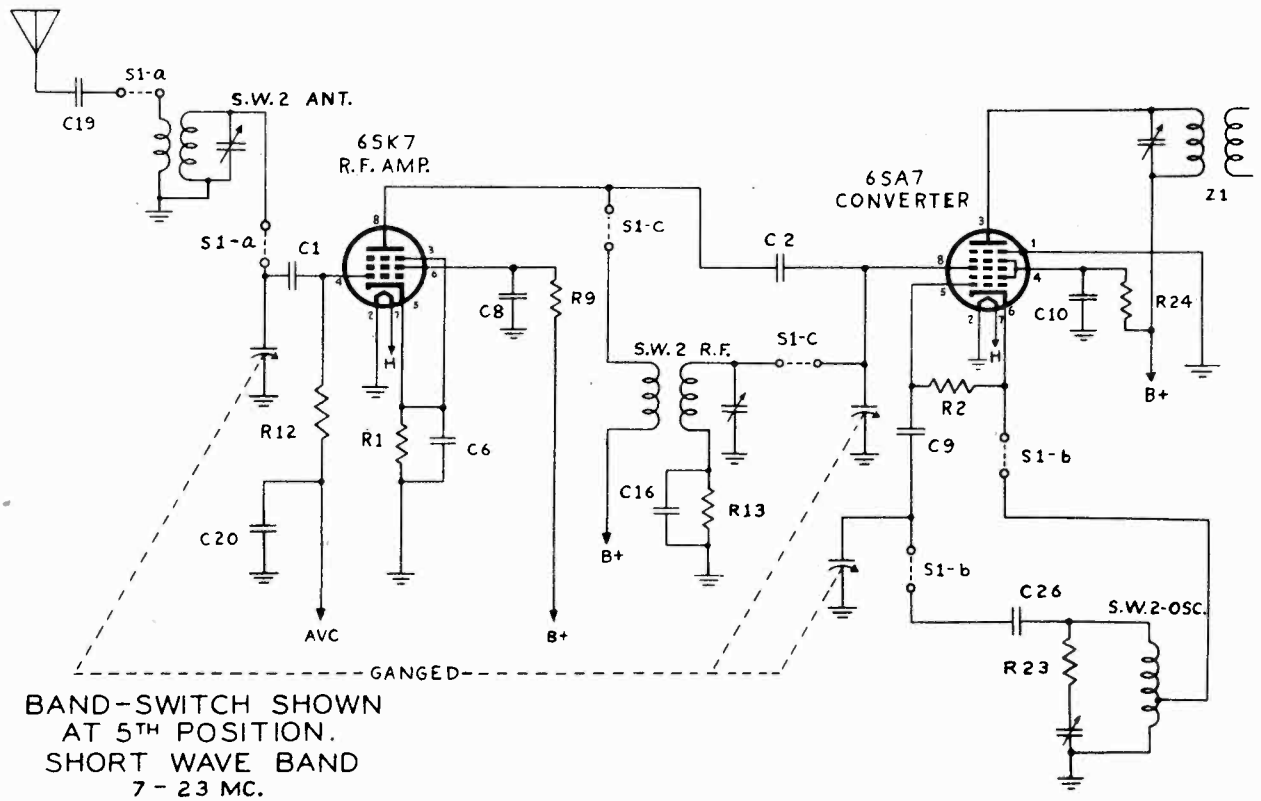


BAND-SWITCH SHOWN AT 3RD POSITION. BROADCAST BAND NORMAL

ESPEY MFG. CO. INC.



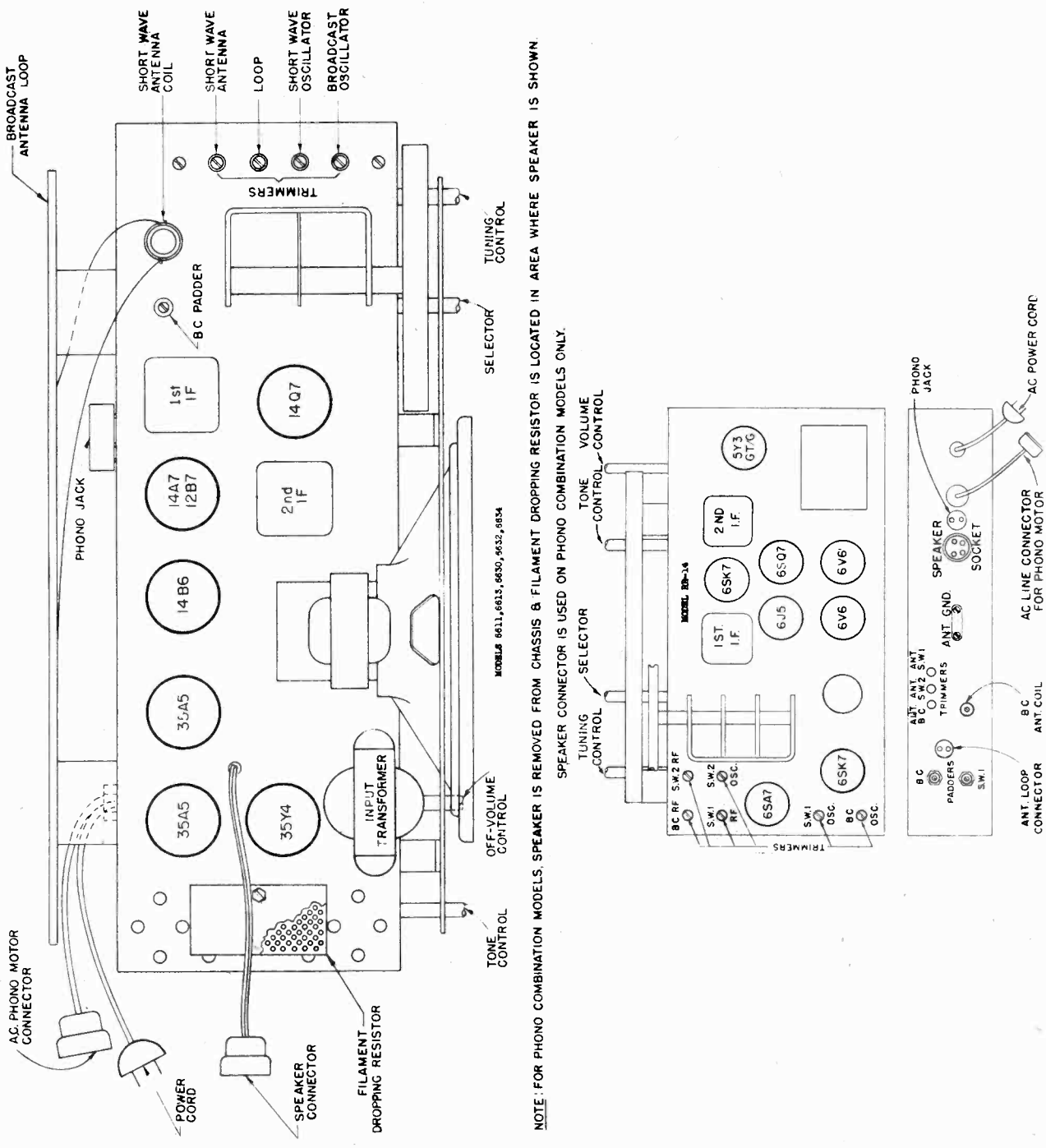
BAND-SWITCH SHOWN
AT 4TH POSITION.
POLICE BAND
2.3-7 MC.



BAND-SWITCH SHOWN
AT 5TH POSITION.
SHORT WAVE BAND
7-23 MC.

MODEL RR-14
MODELS 6611,6613,6630,
6632,6634

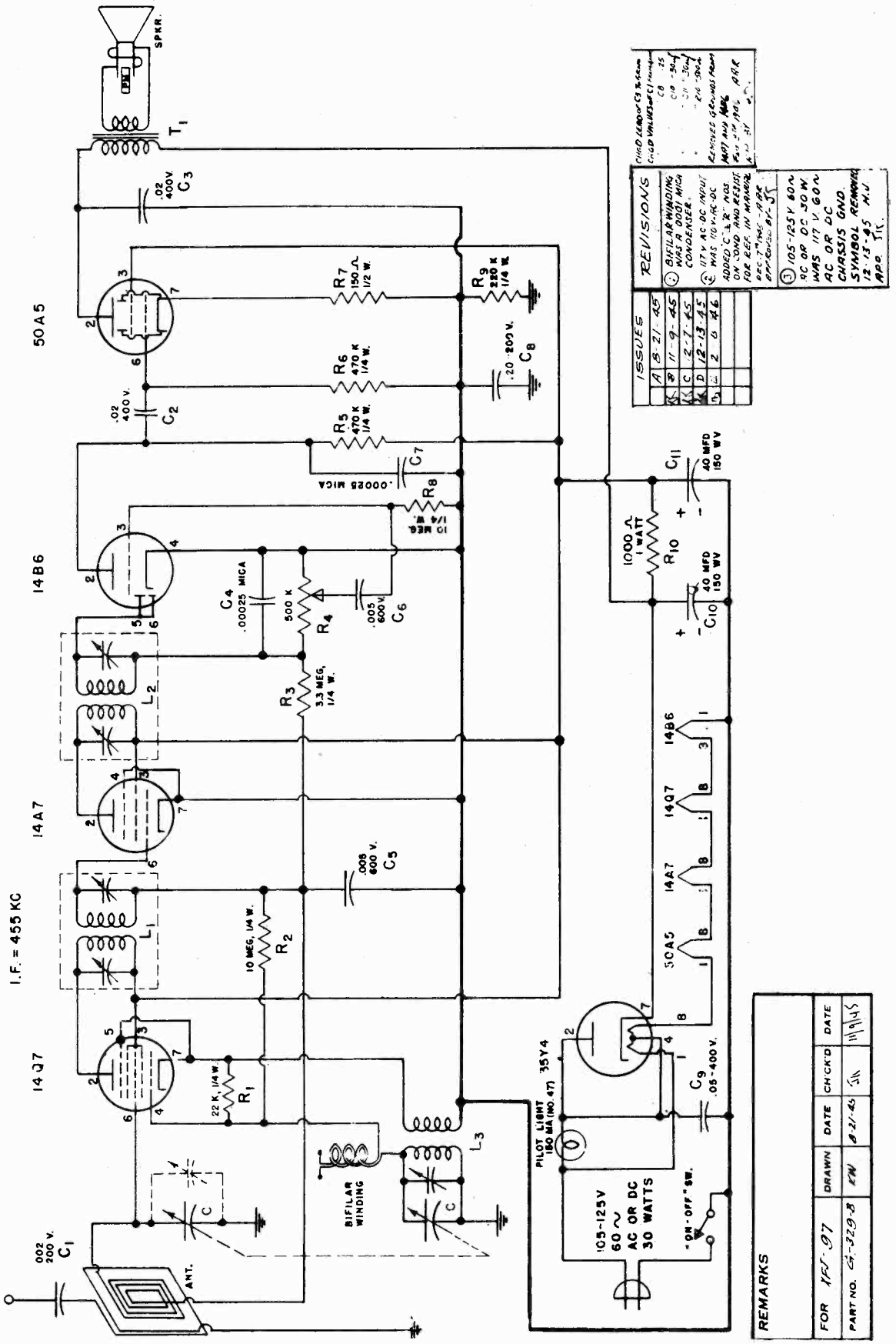
ESPEY MFG. CO. INC.



NOTE: FOR PHONO COMBINATION MODELS, SPEAKER IS REMOVED FROM CHASSIS & FILAMENT DROPPING RESISTOR IS LOCATED IN AREA WHERE SPEAKER IS SHOWN.

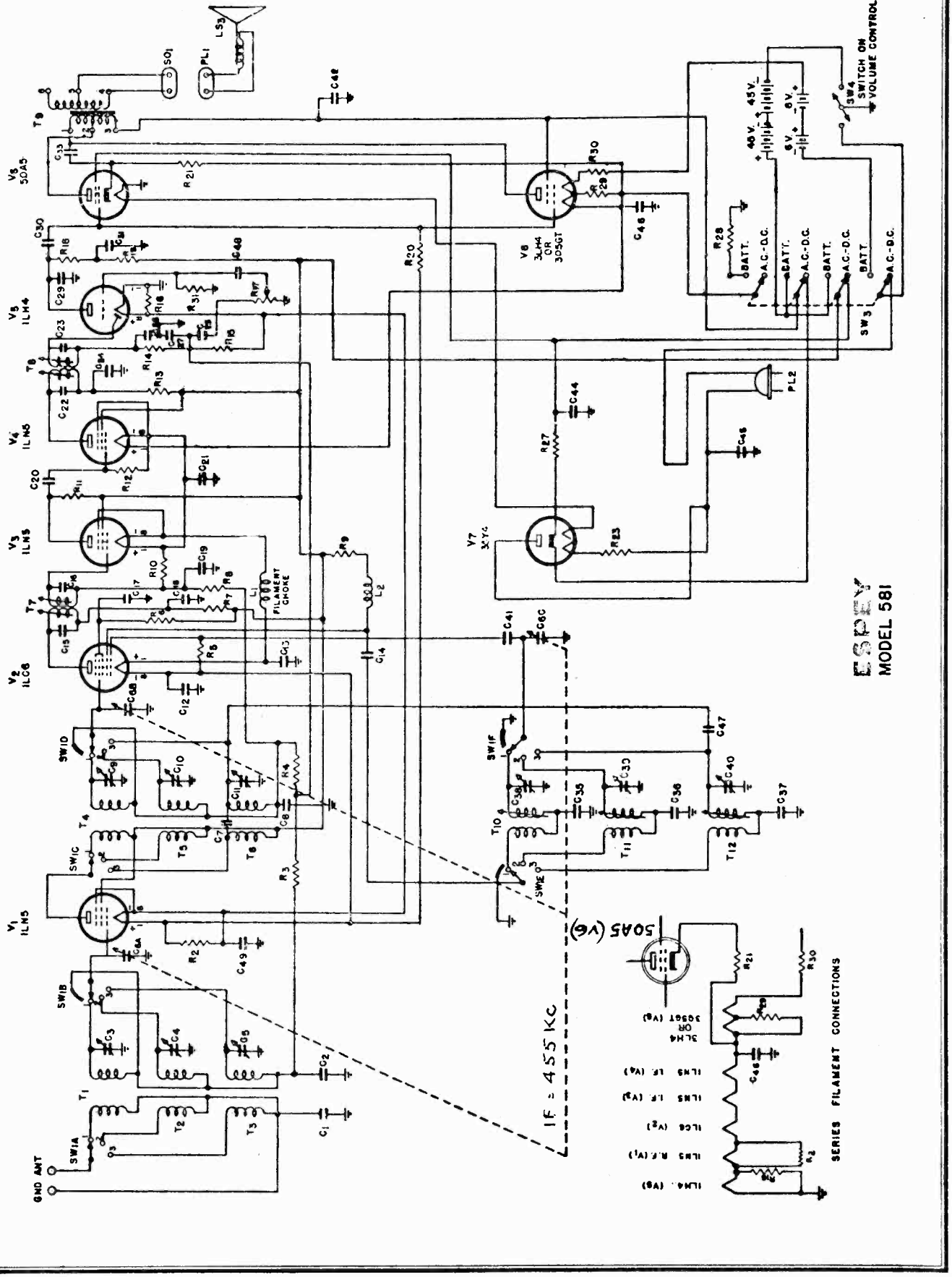
MODEL XFJ-97

ESPEY MFG. CO. INC.



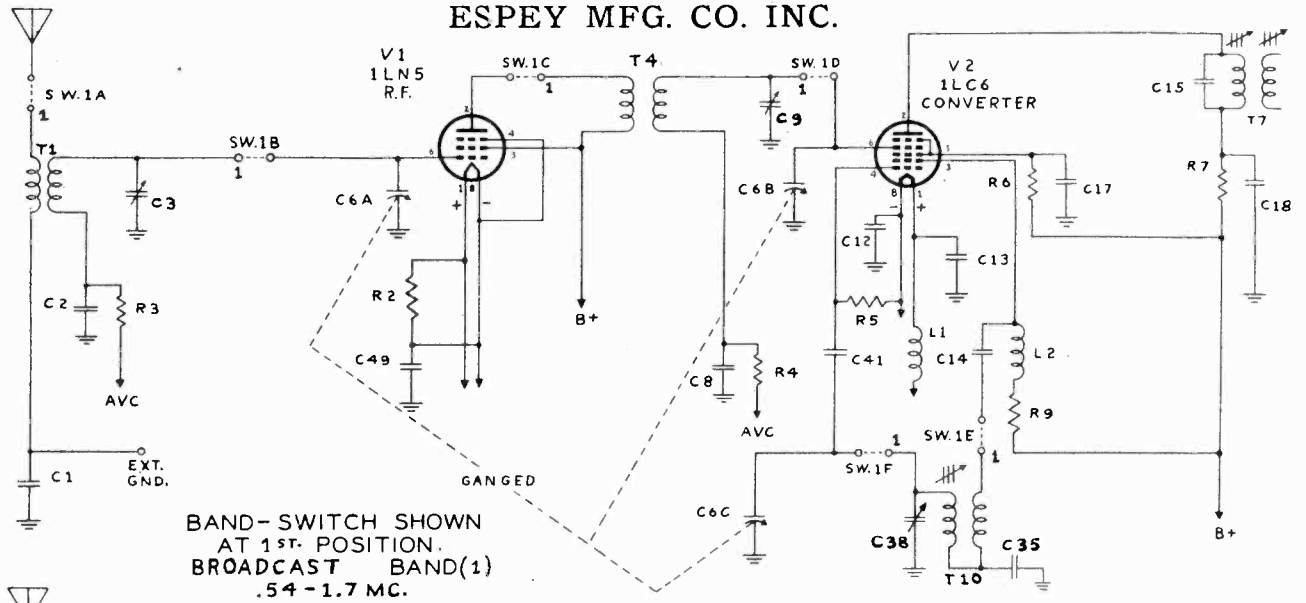
MODEL 581

ESPEY MFG. CO. INC.

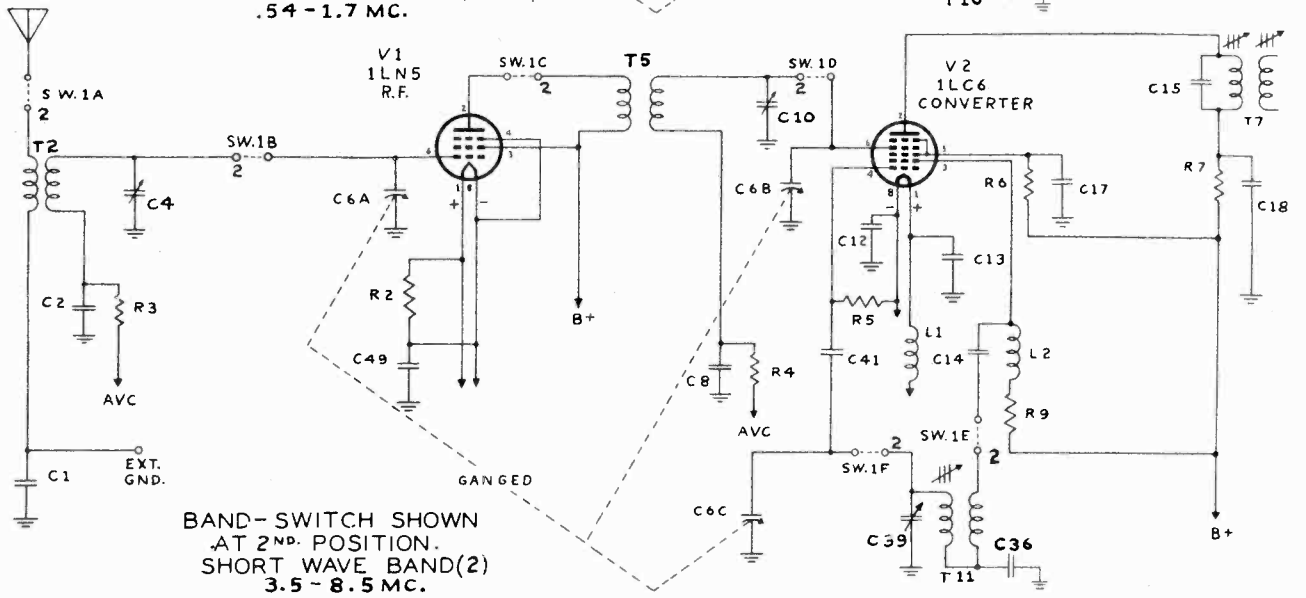


MODEL 581

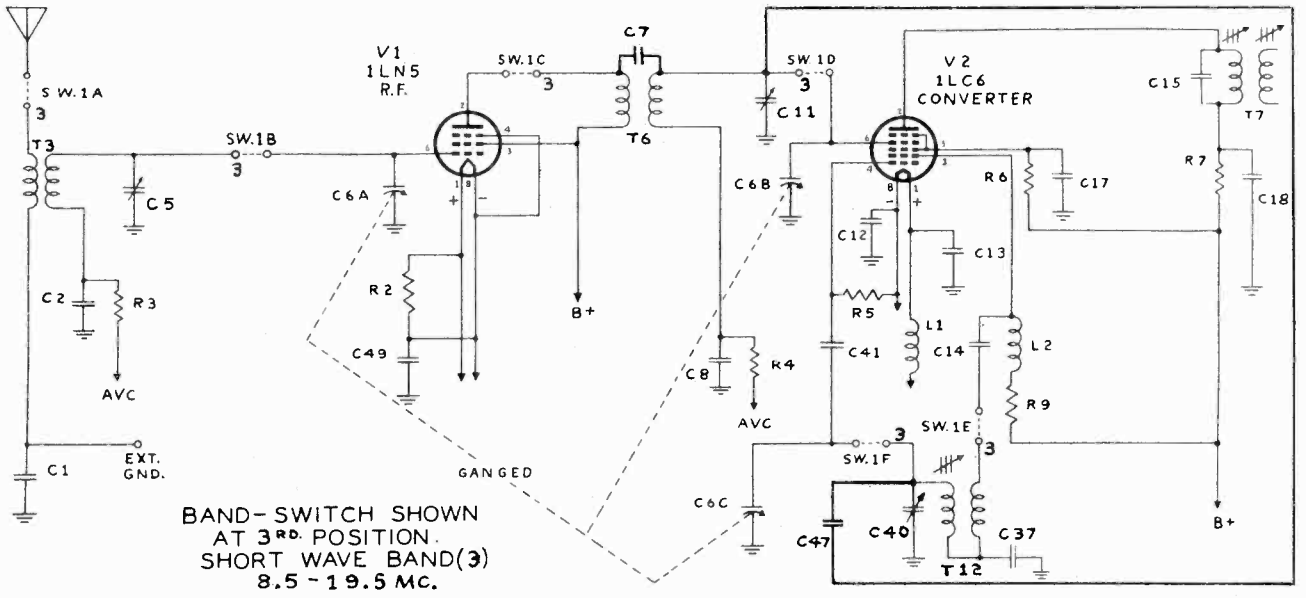
ESPEY MFG. CO. INC.



BAND-SWITCH SHOWN
AT 1ST. POSITION.
BROADCAST BAND(1)
.54-1.7 MC.



BAND-SWITCH SHOWN
AT 2ND. POSITION.
SHORT WAVE BAND(2)
3.5-8.5 MC.



BAND-SWITCH SHOWN
AT 3RD. POSITION.
SHORT WAVE BAND(3)
8.5-19.5 MC.

The Espey Model #581 is an eight-tube superheterodyne designed to operate on:

(a) 105-125 Volts A.C., 60 cycle.
(b) 105-125 Volts D.C.
(c) Self contained batteries.

The instrument provides for commercial broadcast and short wave reception in the following frequency ranges:

(a) .54-1.7 M.C.
(b) 3.5-8.5 M.C.
(c) 8.5-19.5 M.C.

Electric Operation:

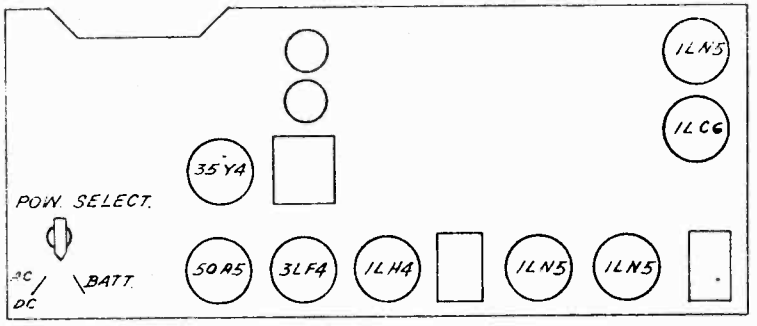
Set the power selector switch mounted on the rear left hand side of the chassis to "A.C.-D.C." for electric operation.

Battery Operation:

For battery operation, the power selector switch is set to the position marked "Batt". This switch is easily accessible through a door in the rear of the cabinet.

Two six (6) volt "A" batteries and two forty five (45) volt batteries are required for self-contained operation. These batteries are located under the chassis and may be inserted or replaced by removing the machine screw on either side of the cabinet holding the battery plate in place. The "A" batteries will provide approximately 30 hours of normal operation allowing the batteries to recuperate after several hours use. The "B" batteries will normally outlast two sets of "A" batteries. Batteries should be removed if radio set is to be stored for more than sixty (60) days.

Tube Location:



Batteries:

Suitable batteries for use with this Receiver are:

"A" Batteries: 6 Volt; Length, $3\frac{15}{16}$"; Width, $2\frac{3}{4}$"; Height, $5\frac{1}{2}$"; such as: Ever-Ready #718 or equivalent.

"B" Batteries: 45 Volt; Length, $4\frac{3}{16}$"; Width, $2\frac{19}{32}$"; Height, $5\frac{3}{8}$": such as: Ever-Ready #762-S, Burgess #5308, or equivalent.

Location of Parts:

C1—.006 mfd., ±20%, 600v., paper
C2—.01 mfd., +20 −10%, 200v., paper
C3—Ceramic trimmer (7-35-mmf.)
C4—Ceramic trimmer (35-55-mmf.)
C5—Ceramic trimmer (35-55-mmf.)
C6A—Variable 3 gang
C6B—Variable 3 gang
C6C—Variable 3 gang
C7—15 mmf., 20%, 500v., ceramic
C8—.05 mfd., +20 −10%, 200v., paper
C9—Ceramic trimmer (7-35-mmf.)
C10—Ceramic trimmer (7-35-mmf.)
C11—Ceramic trimmer (35-55 mmf.)
C12—.1 mfd., +40 −10%, 400v., paper
C13—.1 mfd., +40 −10%, 400v., paper
C14—.0022 mfd., 10%, 500v., mica
C15—150 mmf., 5%, 500v., mica
C16—82 mmf., 5%, 500v., mica
C17—.02 mfd., +40 −10%, 200v., paper
C18—.05 mfd., ±20%, 600v., paper
C19—.02 mfd., +40 −10%, 200v., paper
C20—220 mmf., 20%, 500v., mica
C21—.1 mfd., +40 −10%, 400v., paper
C22—51 mmf., 5%, 500v., mica
C23—82 mmf., 5%, 500v., mica
C24—.05 mfd., +40 −10%, 600v., paper
C26—100 mmf., 20%, 500v., mica
C27—100 mmf., 20%, 500v., mica
C28—.006 mfd., ±20%, 600v., paper
C29—100 mmf., 20%, 400v., mica
C30—.006 mfd., ±20%, 600v., paper
C31—.1 mfd., +40 −10%, 400v., paper
C33—.01 mfd., +40 −10%, 600v., paper
C35—430 mmf., 2%, 500v., mica
C36—2,200 mmf., 5%, 500v., mica
C37—4,300 mmf., 5%, 500v., mica
C38—Ceramic trimmer (7-35-mmf.)
C39—Ceramic trimmer (7-35-mmf.)
C40—Ceramic trimmer (7-35-mmf.)
C41—100 mmf., 20%, 500v., mica
C42 & C44—40 mfd., 250v. (dual electrolytic)
C45—.05 mfd., ±20%, 600v., paper
C46—1000 mfd., 15wv. (electrolytic)
C47—2 mmf., ±15%, 500v., bakelite
C48—.006 mfd., ±20%, 600v., paper
C49—.1 mfd., +40 −10%, 400v., paper

L1—Choke coil, line filter
L2—Choke, R. F.
LS3—Speaker, 6" P. M. dynamic

PL1—Plug, speaker
PL2—Plug, line cord

R2—270 ohms, 10%, ¼w.
R3—3.3 megohms, 10%, ¼w.
R4—3.9 megohms, 10%, ¼w.
R5—220,000 ohms, 20%, ¼w.
R6—68,000 ohms, 10%, ¼w.
R7—1,000 ohms, 20%, ¼w.
R8—3.3 megohms, 10%, ¼w.
R9—22,000 ohms, 10%, ¼w.
R10—3.3 megohms, 10%, ¼w.
R11—22,000 ohms, 10%, ¼w.
R12—470,000 ohms, 20%, ¼w.
R13—1,000 ohms, 20%, ¼w.
R14—47,000 ohms, 20%, ¼w.
R15—470,000 ohms, 20%, ¼w.
R16—330 ohms, 10%, ¼w.
R17—1 megohm, 20%—volume control
R18—470,000 ohms, 20%, ¼w.
R19—100,000 ohms, 20%, ¼w.
R20—470,000 ohms, 10%, ¼w.
R21—50 ohms, 5%, ½w.
R23—220 ohms, 5%, 30w.
R27—500 ohms, 10%, 1w.
R28—820 ohms, 10%, ¼w.
R29—330 ohms, 10%, ¼w.
R30—27 ohms, 10%, ¼w.
R31—12 megohms, 10%, ¼w.

SO1—Receptacle speaker
SW1A & B—C & D—Switch wafer
SW1E & F—Switch wafer
SW3—Switch AC-DC battery
SW4—Switch D.P.S.T.

T1—Transformer, band 1 Ant.
T2—Transformer, band 2 Ant.
T3—Transformer, band 3 Ant.
T4—Transformer, band 1 R.F.
T5—Transformer, band 2 R.F.
T6—Transformer, band 3 R.F.
T7—Transformer, 1st I.F.
T8—Transformer, 2nd I.F.
T9—Transformer, speaker output
T10—Transformer, band 1 osc.
T11—Transformer, band 2 osc.
T12—Transformer, band 3 osc.

V1, 3 & 4—R.F., 1st & 2nd I.F.	1LN5
V2—Converter	1LC6
V5—2nd Detector—1st audio	1LH4
V6—Output (power line)	50A5
V7—Rectifier	35Y4
V8—Output (batt.)	3LH4 or 3Q5GT

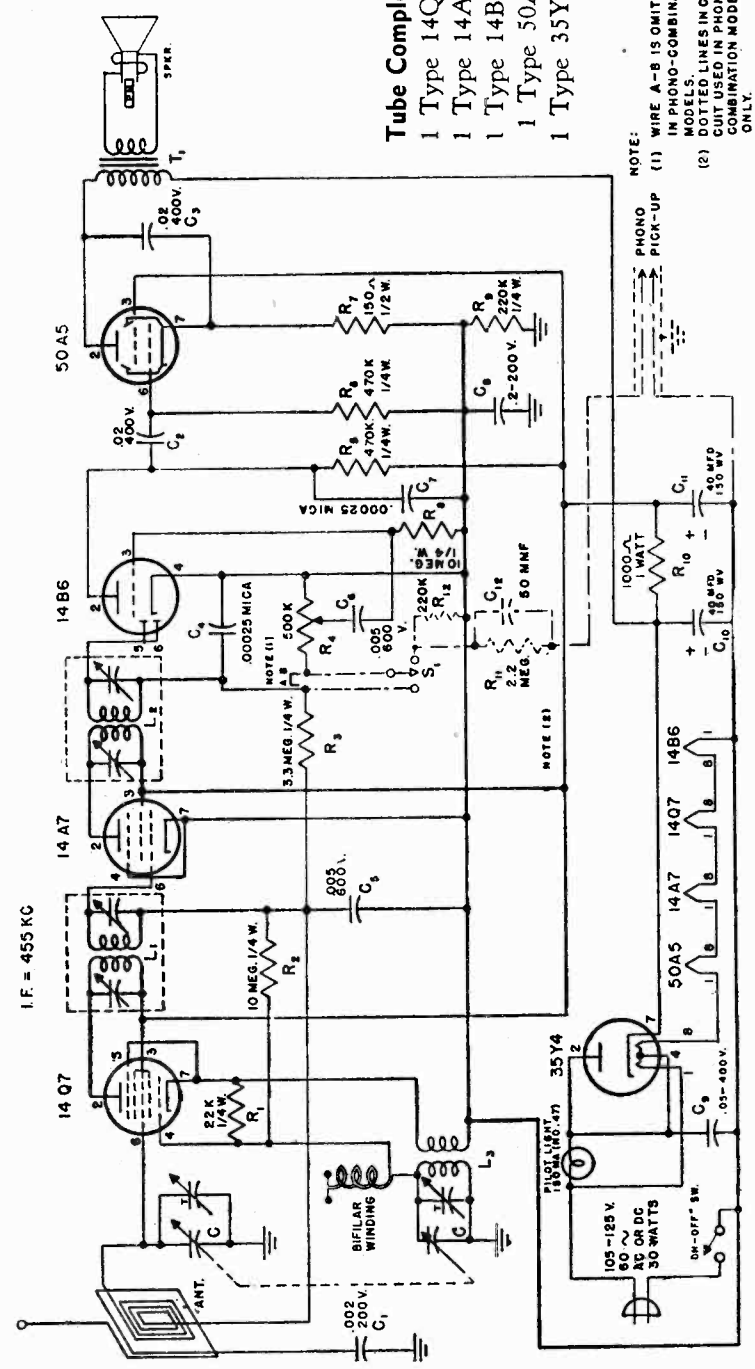
Miscellaneous
Adapter C.D. Wood No. 2053
Adapter C.D. Wood No. 2064
Adapter C.D. Wood No. 2073
Adapter C.D. Wood No. 2089
Binding post mounting board
Binding posts TM-150
Chassis anchoring stud assembly
Control knob for C6
Control knob for R17 & SW1
Dial cord
Dial pointer
Dial plate
Dial window

ESPEY MFG. CO. INC.

MODELS 651,652,653,6511 6511/2,6514,6516,6520, 6541,6545,6547,Ch.FJ97

Tube Complement:

1 Type 14Q7—Oscillator—Converter.
1 Type 14A7—I. F. Amplifier.
1 Type 14B6—Det. A.V.C. and Amp.
1 Type 50A5—Power Amp.
1 Type 35Y4—Rectifier.

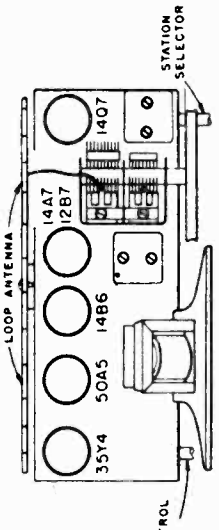


Alignment Procedure:

Steps	Connect output of oscillator to	Tune osc. to	Tune radio dial to	Adjust the following for max. peak output
1.	Tuning condenser stator (ant.) in series with .01 mfd.	455	Quiet point at high frequency end of dial.	1st and 2nd I. F. Transformers
2.	Antenna term. of Ant. loop in series with 100 mmf.	1720	Full clockwise (out of mesh)	Osc. trimmer
3.	Antenna term. of Ant. loop in series with 100 mmf.	1500	1500	Ant. trimmer

Output meter is connected across voice coil. Receiver volume is turned to maximum.

Fig. 1—Tube and Trimmer locations:



NOTE: Trimmers may be located on either long or short side of variable condenser.

Record Changer: Seeburg Model K

Nylon cord of the tuning and dial system may be replaced by following the diagram below

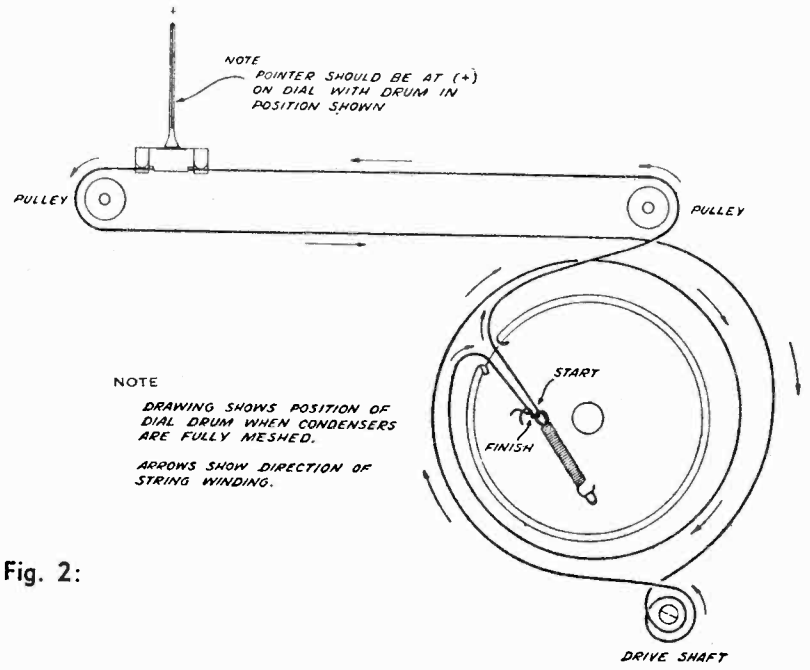


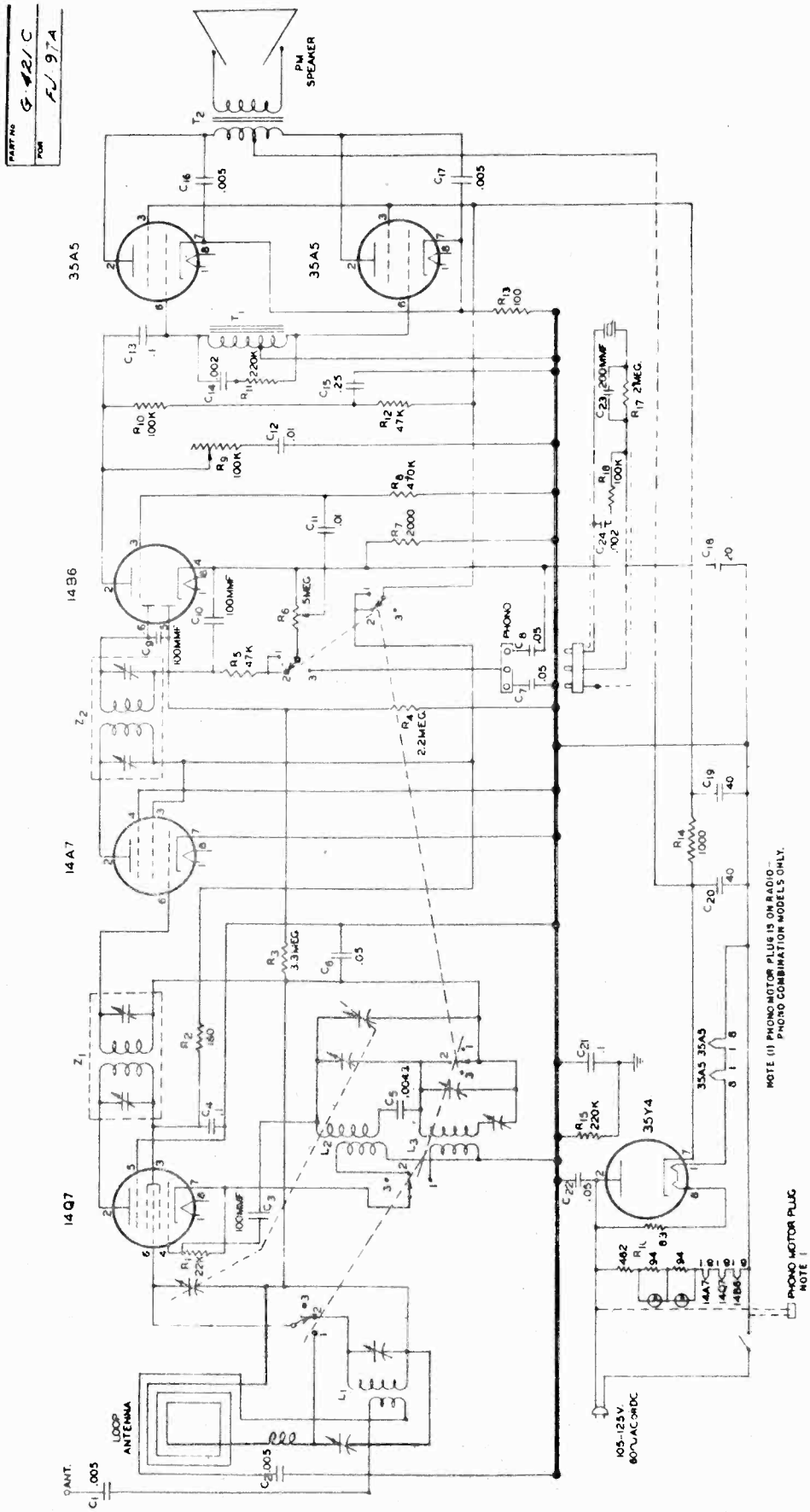
Fig. 2:

Parts List:	Part No.
C —Two gang variable cond. with trimmers.	C-6.032
C 1— 002 Mfd., 200V paper	
C 2— 02 Mfd., 400V paper	
C 3— 02 Mfd., 400V paper	
C 4— 00025 Mfd., mica	
C 5— 005 Mfd., 600V paper	
C 6—.005 Mfd., 400V (or 600V) paper	
C 7—.00025 Mfd., mica	
C 8—.25 Mfd. (or .20 Mfd.), 200V paper	
C 9—.05 Mfd., 400V, molded bakelite	
C10, 11—Dual 40 Mfd., 150V	A-25.019
*C12—50 Mmf., 20%	
R 1—22K, ¼W, 20%	
R 2—10 meg, ¼W, 20%	
R 3—3.3 meg, ¼W, 20%	
R 4—500K variable, audio taper, with SPST	A-9.066
R 5—470K, ¼W, 20%	
R 6—470K, ¼W, 20%	
R 7—150 ohms, ½W, 10%	
R 8—10 meg, ¼W, 20%	
R 9—220K, ¼W, 20%	
R10—1000 ohms, 2W (or 1W), 20%	
*R11—2.2 meg, ¼W, 20%	
*R12—220K, ¼W, 20%	
L 1—Transformer, IF input, 455KC	C-2.191-1
L 2—Transformer, IF output, 455KC	C-2.191-2
L 3—Coil, oscillator	B-2.192
Antenna, loop	B-5.006
Loudspeaker, PM, 5", Transformer to match 50A5	B-11.037
Pilot light, Mazda No. 47, 150 Ma.	

* Used in phono combinations only.

ESPEY MFG. CO. INC.

MODELS 6611,6613,6630,6632, 6634, Ch. FJ-97A

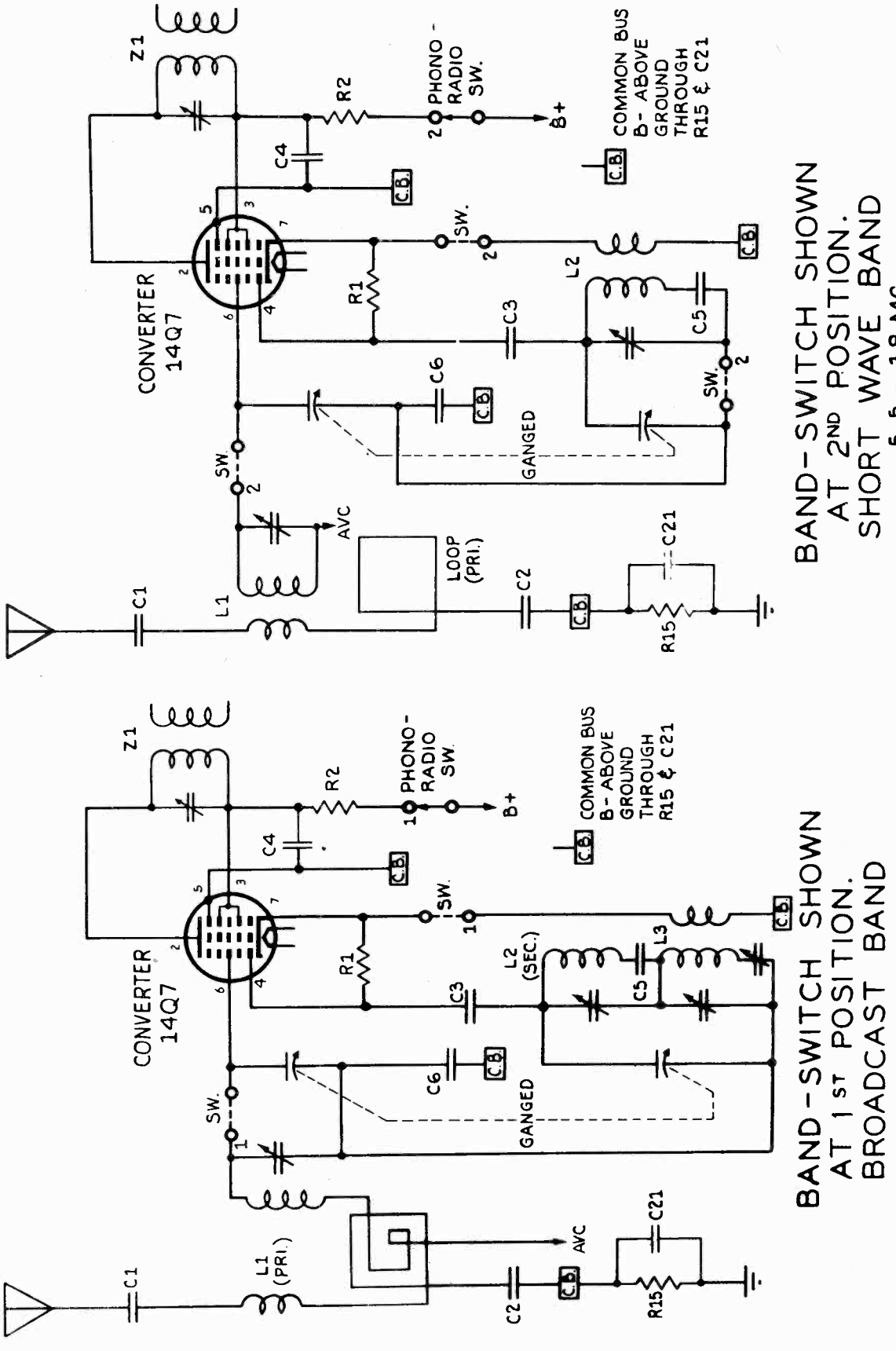


Record Changer: Seeburg Model K
For Layout, see P.15-6

"clarified schematics"

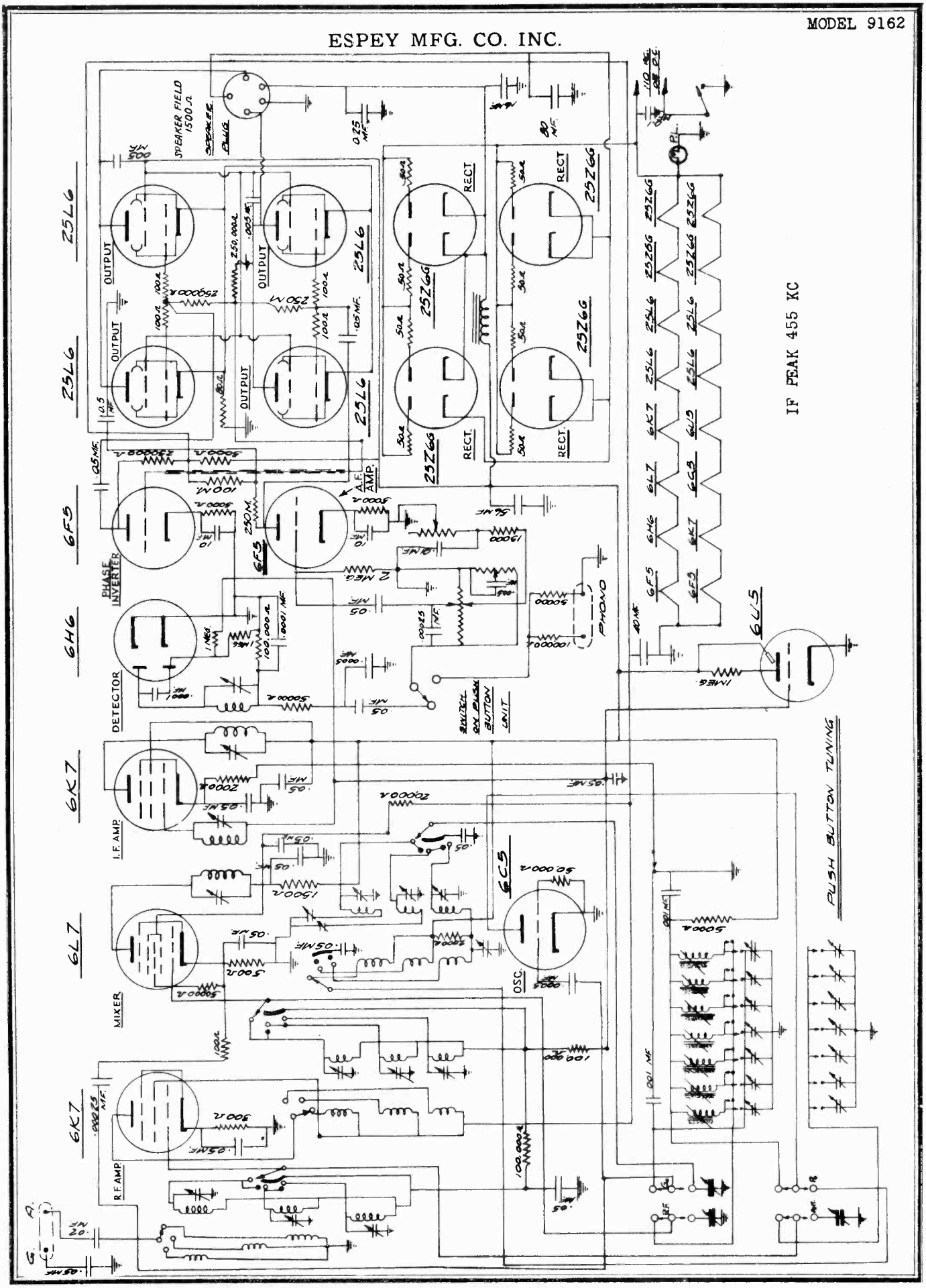
MODELS 6611,6613,6630,
6632,6634, Ch.FJ-97A

ESPEY MFG. CO. INC.



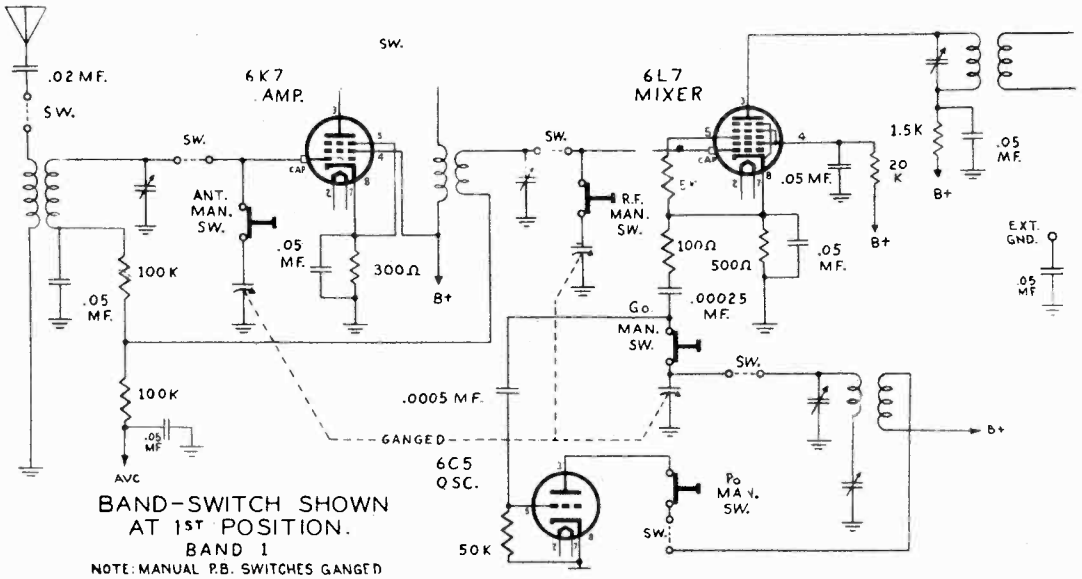
MODEL 9162

ESPEY MFG. CO. INC.

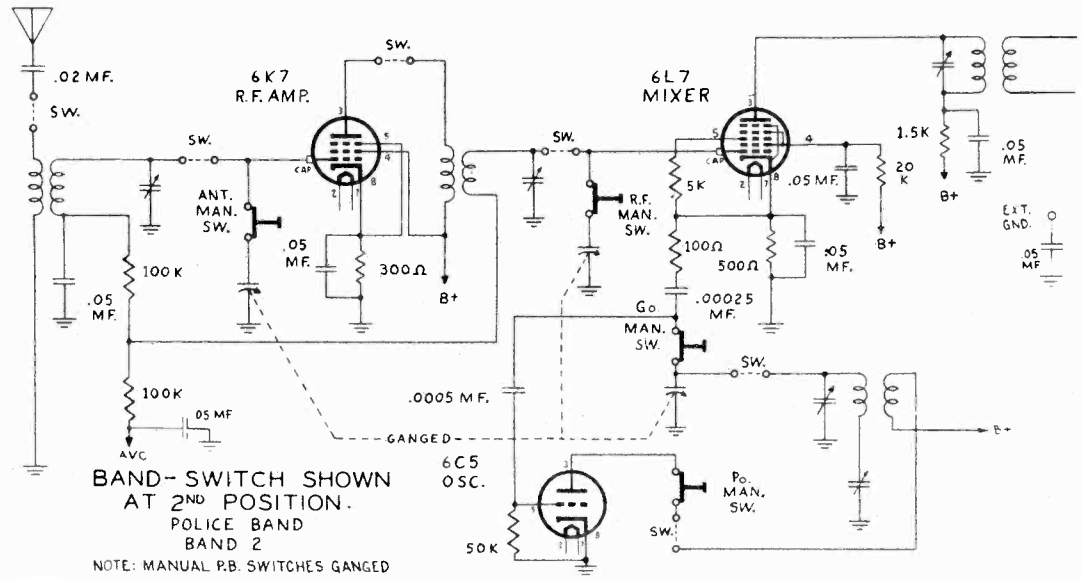


MODEL 9162

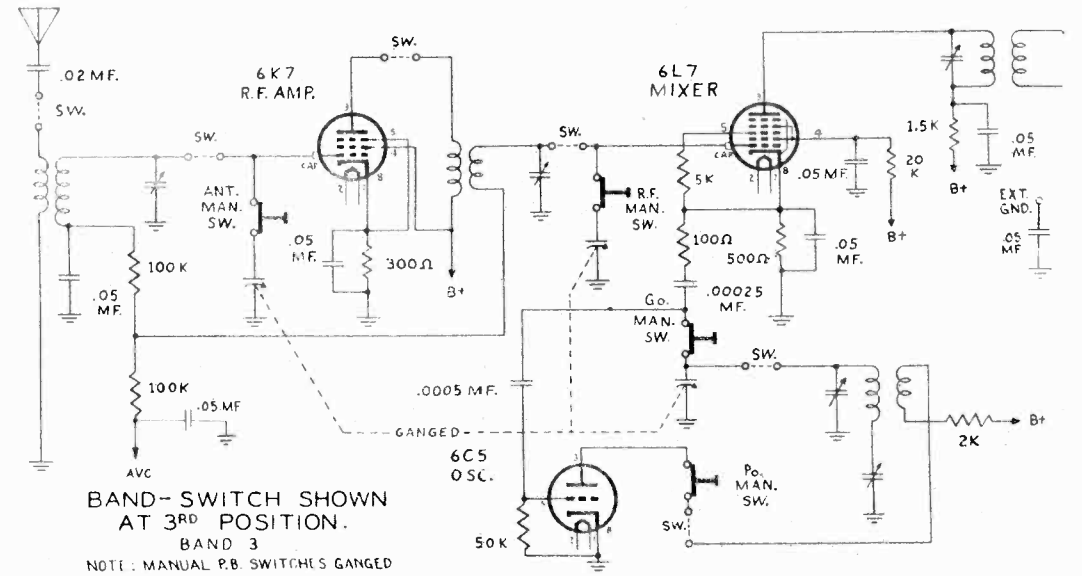
ESPEY MFG. CO. INC.



BAND-SWITCH SHOWN AT 1ST POSITION.
BAND 1
NOTE: MANUAL P.B. SWITCHES GANGED



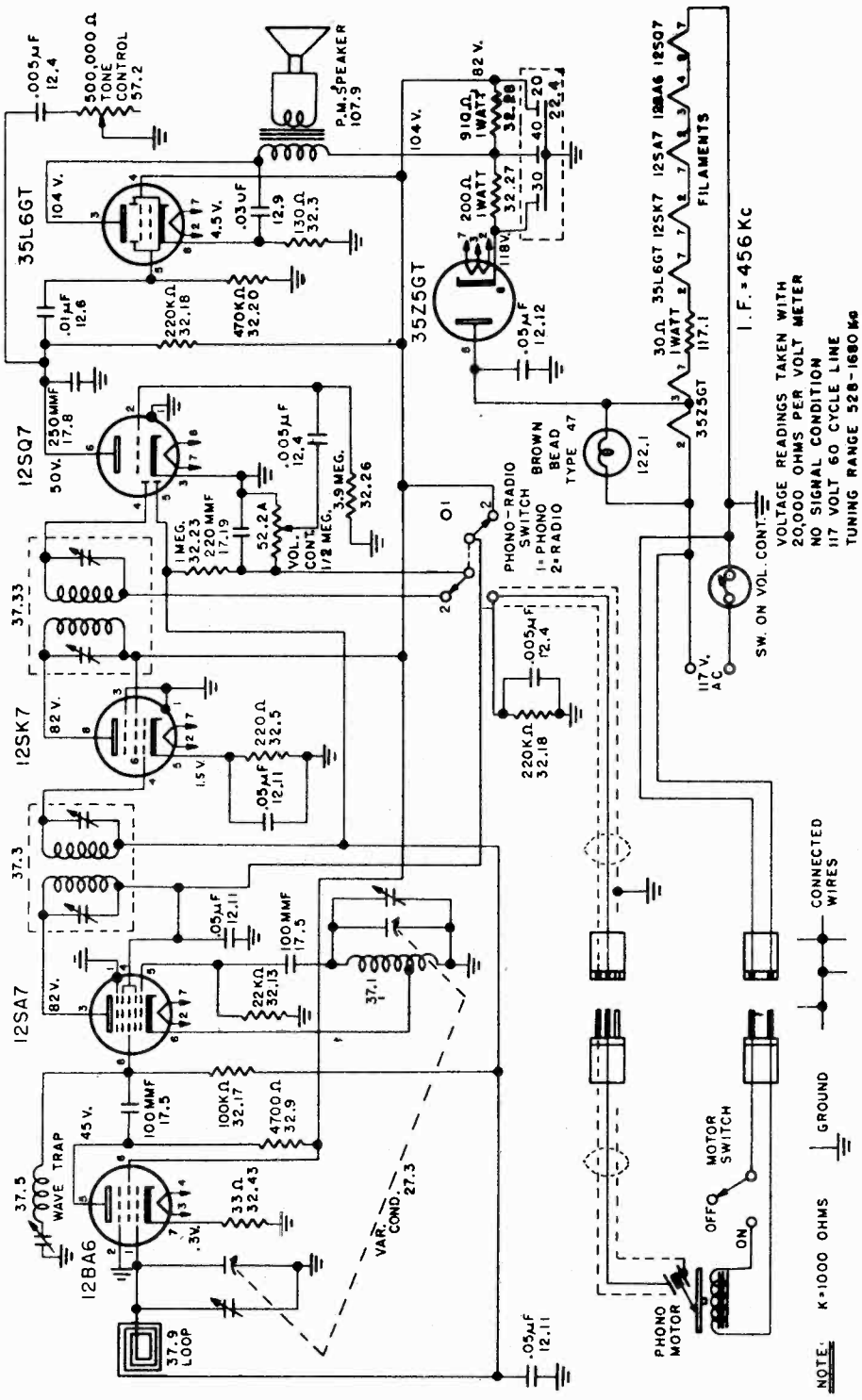
BAND-SWITCH SHOWN AT 2ND POSITION.
POLICE BAND
BAND 2
NOTE: MANUAL P.B. SWITCHES GANGED



BAND-SWITCH SHOWN AT 3RD POSITION.
BAND 3
NOTE: MANUAL P.B. SWITCHES GANGED

MODELS 602, 637

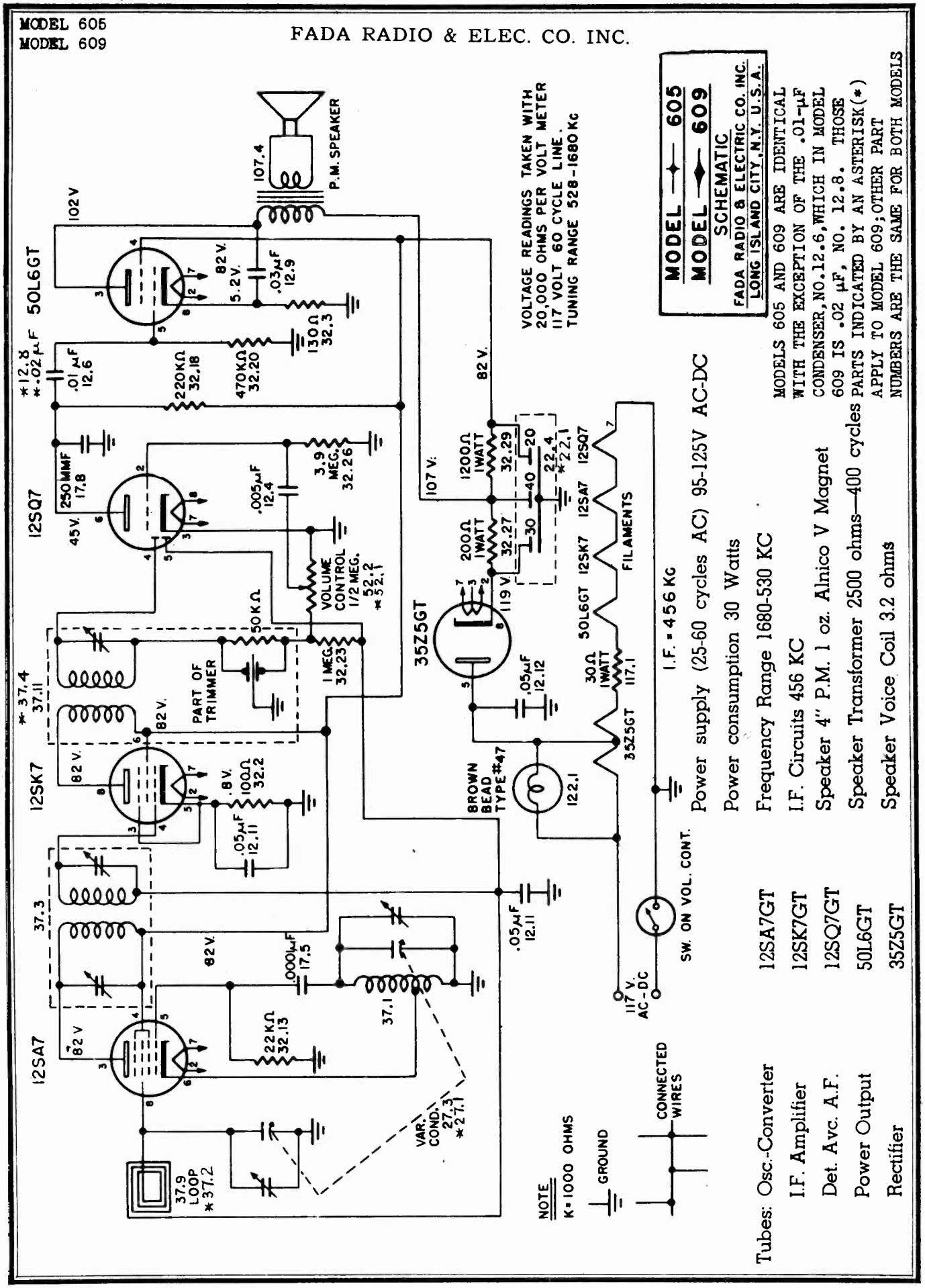
FADA RADIO & ELEC. CO. INC.



Record Changer: General Instrument Model 205

MODEL 605
MODEL 609

FADA RADIO & ELEC. CO. INC.



ALIGNMENT PROCEDURE

No attempt should be made to realign the various circuits until all other causes have been checked, unless the condition is so obvious as to indicate that realignment is necessary. Then proceed as follows:

Volume Control full on.

Low range A.C. meter connected across voice coil to indicate output.

Keep signal generator attenuated so as to maintain ½ scale reading on output meter.

Make certain that dial pointer is exactly on index line (top left side of dial plate) when variable condenser is fully meshed.

MODELS 605 AND 609

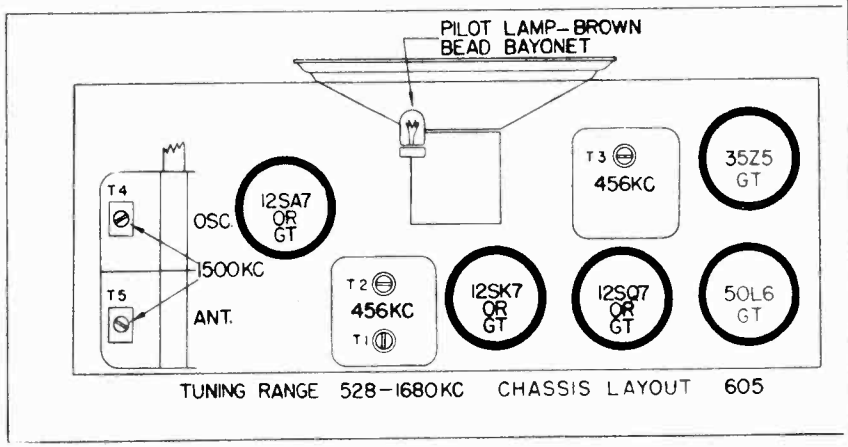
Receiver Dial at:	Signal Generator	Dummy Antenna	Connect Signal Generator to:	Refer to Chassis Layout for Location of Trimmers
1 Full Open	Exactly 456 KC	.1 MF	Control Grid 12SA7 Tube (Top) Rear Section Variable Condenser	Adjust for Maximum Output T1, T2 & T3
2 Exactly 1680 KC	Exactly 1680 KC		Radiating Loop (½ meter) 20" from Receiver Loop	Adjust for Maximum Output T4
3 Approx. 1500 KC	Approx. 1500 KC		Radiating Loop (½ meter) 20" from Receiver Loop	Adjust for Maximum Output T5
4 Approx. 600 KC	Aprox. 600 KC		Radiating Loop (½ meter) 20" from Receiver Loop	Check tracking and bend slotted end plate (rear section) of variable if necessary.
5				

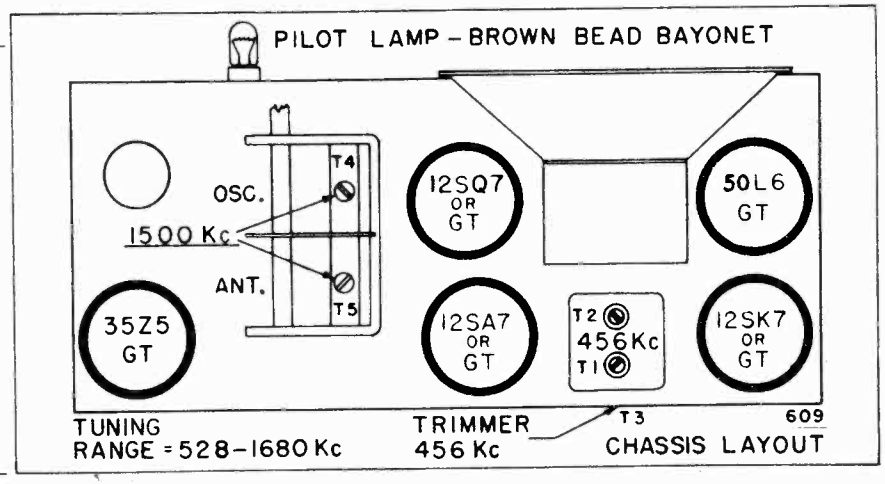
605 SERIES PARTS LIST

Part No.	Description
12.4	Tubular Condenser .005 mf 600 V
12.6	Tubular Condenser .01 mf 400 V
12.9	Tubular Condenser .03 mf 400 V
12.11	Tubular Condenser .05 mf 200 V
12.12	Tubular Condenser .05 mf 400 V
17.5	Mica Condenser 100 mmf ± 10%
17.8	Mica Condenser 250 mmf ± 20%
22.4	3 Section Electrolytic Condenser
27.3	Variable Condenser 30-40-20 mf
37.1	Oscillator Coil 150 W.V.
37.9	Loop Antenna
37.3	Input I.F. Transformer complete
37.11	Output I.F. Transformer complete
52.2	Volume Control w/switch
72.1	Power Cord (Approved)
77.16	Dial Pointer
77.18	Dial Scale (Calibrated)
97.12W	Cabinet—Walnut Bakelite
142.4W	Cabinet Knobs—Walnut
97.11	Cabinet Back
107.4	4" P.M. Speaker with Transformer
107.41	4" P.M. Speaker less Transformer
42.1	Speaker Transformer for Above
117.1	30 ohm 1 W Resistor

609 SERIES PARTS LIST

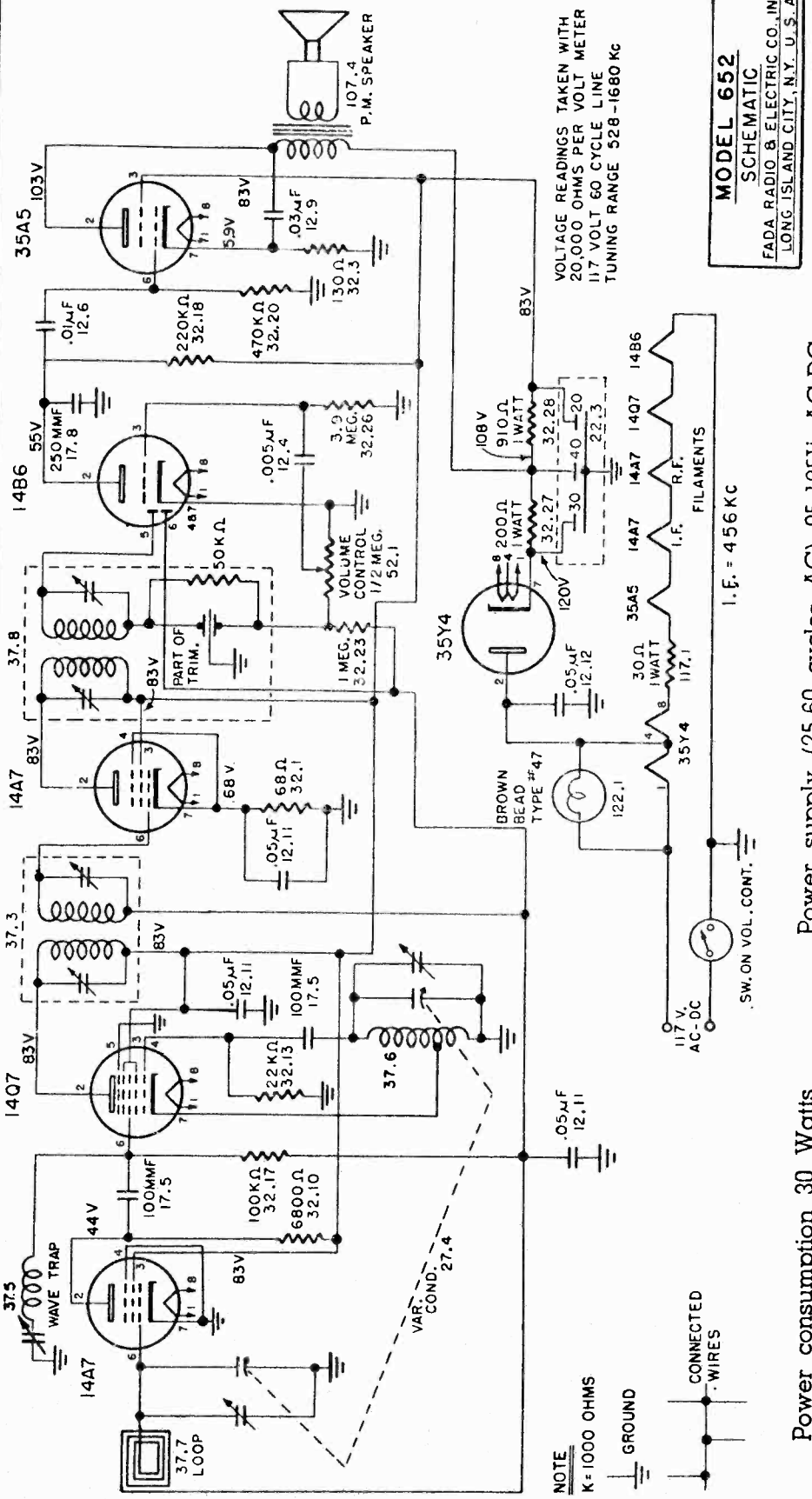
Part No.	Description
12.4	Tubular Condenser .005 mf 600 V
12.8	Tubular Condenser .02 mf 400 V
12.9	Tubular Condenser .03 mf 400 V
12.11	Tubular Condenser .05 mf 400 V
12.12	Tubular Condenser .05 mf 200 V
17.5	Mica Condenser 100 mmf ± 10%
17.8	Mica Condenser 250 mmf ± 20%
22.1	3 Section Electrolytic Condenser
27.1	Variable Condenser 30-40-20 mf
37.1	Oscillator Coil 150 W.V.
37.2	Loop Antenna
37.3	Input I.F. Transformer complete
37.4	Output I.F. Transformer complete
52.1	Volume Control with Switch
72.1	Power Cord (Aproved)
77.1	Dial Scale (Calibrated)
77.6	Dial Pointer
77.7	Dial Crystal
97.2W	Cabinet Bakelite—Walnut
97.2V	Cabinet Bakelite—Ivory
97.3	Cabinet Back
142.4W	Cabinet Knobs—Walnut
142.4V	Cabinet Knobs—Ivory
107.1	4" P.M. Speaker with Transformer
107.2	4" P.M. Speaker less Transformer
42.1	Speaker Transformer for above
117.1	30 ohm 1 W. Resistor





MODEL 652

FADA RADIO & ELEC. CO. INC.



Power supply (25-60 cycles AC) 95-125V AC-DC
Speaker 4" P.M. 1 oz. Alnico V Magnet
Speaker Transformer 2500 ohms—400 cycles
Speaker Voice Coil 3.2 ohms

Power consumption	30 Watts
Frequency Range	1680-530 KC
Tubes: R.F. Amplifier	14A7
Osc. Converter	14Q7
I.F. Amplifier	14A7
Det. Avc. A.F.	14B6
Power Output	35A5
Rectifier	35Y4

ALIGNMENT PROCEDURE MODELS 652 AND 1000

No attempt should be made to realign the various circuits until all other causes have been checked, unless the condition is so obvious as to indicate that realignment is necessary. Then proceed as follows:

Volume Control full on.

Low range A.C. meter connected across voice coil to indicate output.

Keep signal generator attenuated so as to maintain ½ scale reading on output meter.

Make certain that dial pointer is exactly on index line (top left side of dial plate) when variable condenser is fully meshed.

ALIGNMENT DATA FOR MODELS 652 AND 1000 ARE SIMILAR WITH EXCEPTION OF STEPS 2 AND 3 IN COLUMNS SHOWING GENERATOR CONNECTIONS

MODEL 652 MODEL 1000

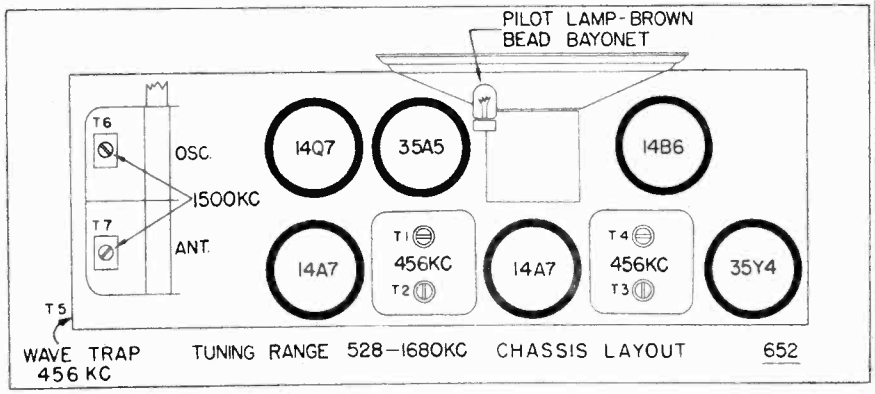
Receiver Dial at:	Signal Generator	Dummy Antenna	Connect Generator to:	Connect Signal Generator to:	Refer to Chassis Layout for Location of Trimmers
1 Full Open	Exactly 456 KC	.1 MF	Control Grid 14Q7 Tube Pin No. 6 on 14Q7 Socket	Control Grid 12SA7 Tube Pin No. 8 on 12SA7 Socket	Adjust for Maximum Output T1, T2, T3 & T4
2 Full Open	Exactly 456 KC	.1 MF	Control Grid 14A7 Tube (RF) (Top) Rear Section Variable Condenser	Control Grid 12SK7 Tube (R.F.) (Top) Rear Section Variable Condenser	Adjust for Minimum Output T5
3 Exactly 1680 KC	Exactly 1680 KC		Radiating Loop (½ meter) 20" from Receiver	Radiating Loop (½ meter) 20" from Receiver	Adjust for Maximum Output T6
4 Exactly 1500 KC	Exactly 1500 KC		Radiating Loop (½ meter) 20" from Receiver	Radiating Loop (½ meter) 20" from Receiver	Adjust for Maximum Output T7
5 Approx. 600 KC	Approx. 600 KC		Radiating Loop (½ meter) 20" from Receiver	Radiating Loop (½ meter) 20" from Receiver	Check tracking and bend slotted end plate (rear section) of variable if necessary.
6					

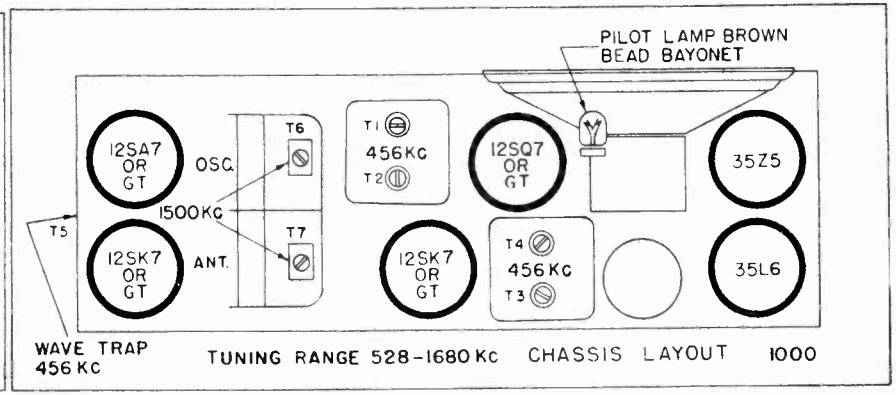
PARTS LIST 652 SERIES

Part No.	Description
12.4	Tubular Condenser .005 mf 600 V
12.6	Tubular Condenser .01 mf 400 V
12.9	Tubular Condenser .03 mf 400 V
12.11	Tubular Condenser .05 mf 200 V
12.12	Tubular Condenser .05 mf 400 V
17.5	Mica Condenser 100 mmf ± 10%
17.8	Mica Condenser 250 mmf ± 20%
22.3	3 Section Electrolytic Condenser 30-40-20 mf 150 W.V.
27.4	Variable Condenser
37.6	Oscillator Coil
37.7	Loop Antenna
37.3	Input I.F. Transformer complete
37.8	Output I.F. Transformer complete
37.5	I.F. Trap
52.3	Volume Control with Switch
72.1	Power Cord (approved)
77.12	Dial Pointer
77.10	Dial Scale (Calibrated)
97.7A	Cabinet—Alabaster
97.7B	Cabinet—Red & Alabaster
97.7C	Cabinet—Blue & Alabaster
97.7D	Cabinet—Maroon & Alabaster
97.7E	Cabinet—Onyx
97.8	Cabinet Back
142.3A	Cabinet Knobs Alabaster
142.3B	Cabinet Knobs Onyx
142.3C	Cabinet Knobs Red
107.4	4" Speaker with Transformer
107.41	4" Speaker less Transformer
42.1	Speaker Transformer for above
117.1	30 ohm 1 W. Resistor

PARTS LIST 1000 SERIES

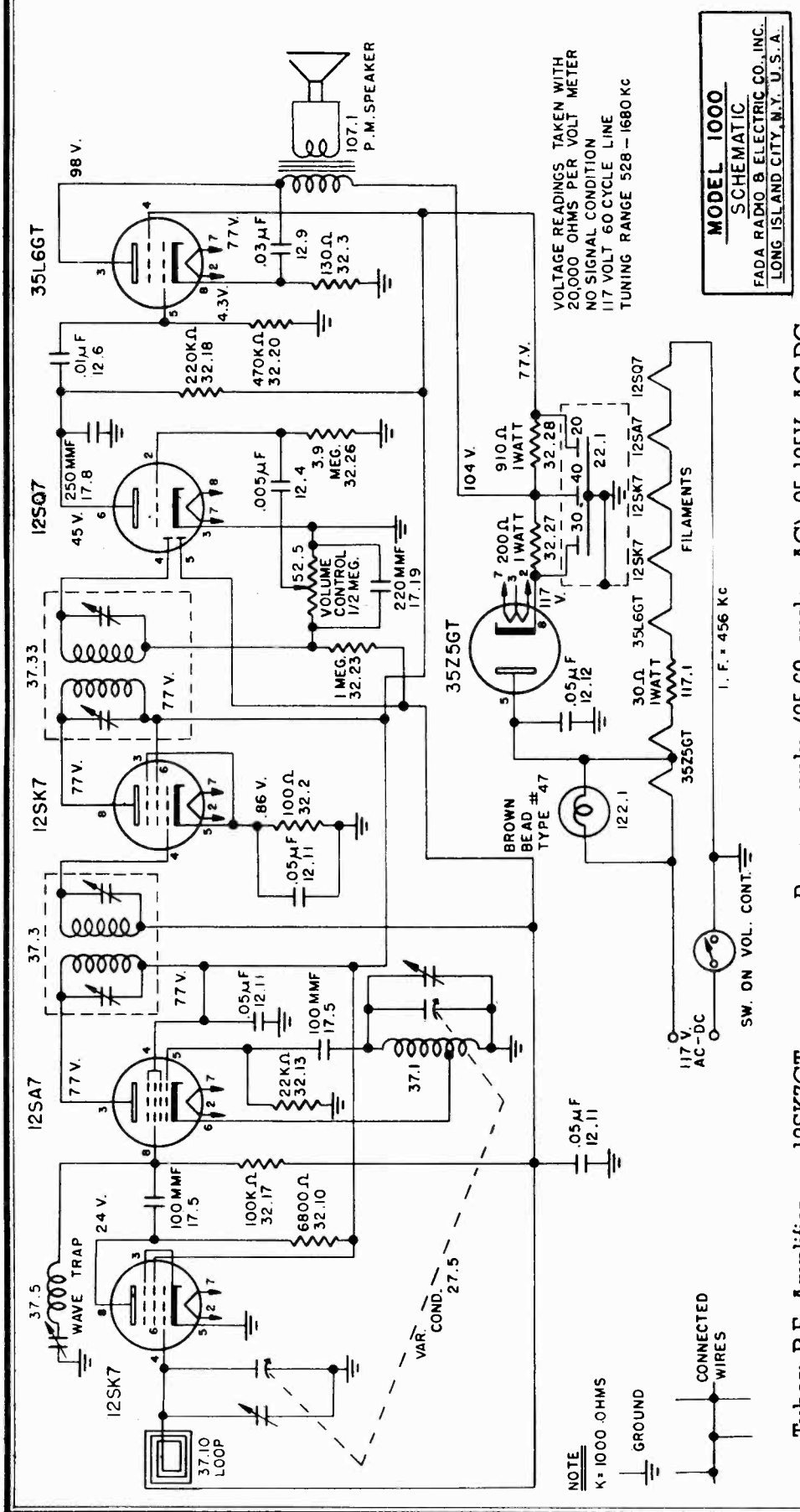
Part No.	Description
12.4	Tubular Condenser .005 mf 600 V
12.6	Tubular Condenser .01 mf 400 V
12.9	Tubular Condenser .03 mf 400 V
12.11	Tubular Condenser .05 mf 200 V
12.12	Tubular Condenser .05 mf 400 V
17.5	Mica Condenser 100 mmf ± 10%
17.8	Mica Condenser 250 mmf ± 20%
22.1	3 Section Electrolytic Condenser 30-40-20 mf 150 W.V.
27.5A	Variable Condenser
37.1	Oscillator Coil
37.10	Loop Antenna
37.3	Input I.F. Transformer complete
37.33	Output I.F. Transformer complete
37.5	I.F. Trap
52.5	Volume Control with Switch
72.1	Power Cord (Approved)
77.6	Dial Pointer
77.21	Dial Scale (Calibrated)
77.22	Dial Crystal
97.16A	Cabinet Alabaster
97.16B	Cabinet Red & Alabaster
97.16C	Cabinet Blue & Alabaster
97.16D	Cabinet Maroon & Alabaster
97.16E	Cabinet Onyx
142.5A	Cabinet Knobs Alabaster
142.5B	Cabinet Knobs Onyx
142.5C	Cabinet Knobs Red
107.1	4" P.M. Speaker with Transformer
42.1	Speaker Transformer for above





MODEL 1000

FADA RADIO & ELEC. CO. INC.



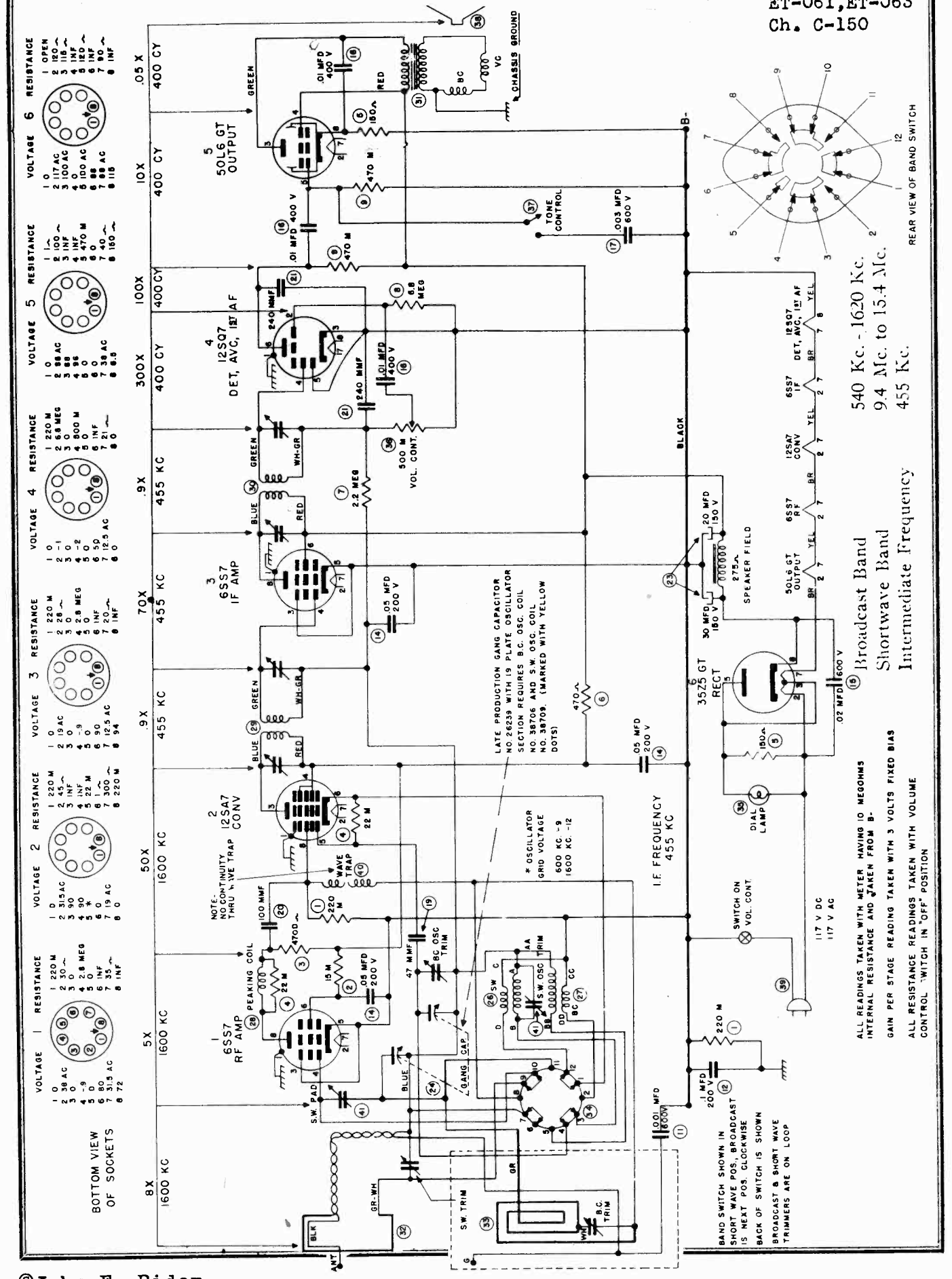
Tubes: R.F. Amplifier 12SK7GT
Osc. Converter 12SA7GT
I.F. Amplifier 12SK7GT
Det. Avc. A.F. 12SQ7GT
Power Output 35L6GT
Rectifier 35Z5GT
Speaker 4" P.M. 1 oz. Alnico V Magnet
Speaker Transformer 2500 ohms—400 cycles
Speaker Voice Coil 3.2 ohms

Power supply (25-60 cycles AC) 95-125V AC-DC
Power consumption 30 Watts
Frequency Range 1680-528 KC
I.F. Circuits 456 KC

For Alignment, trimmers, etc., see P. 15-5

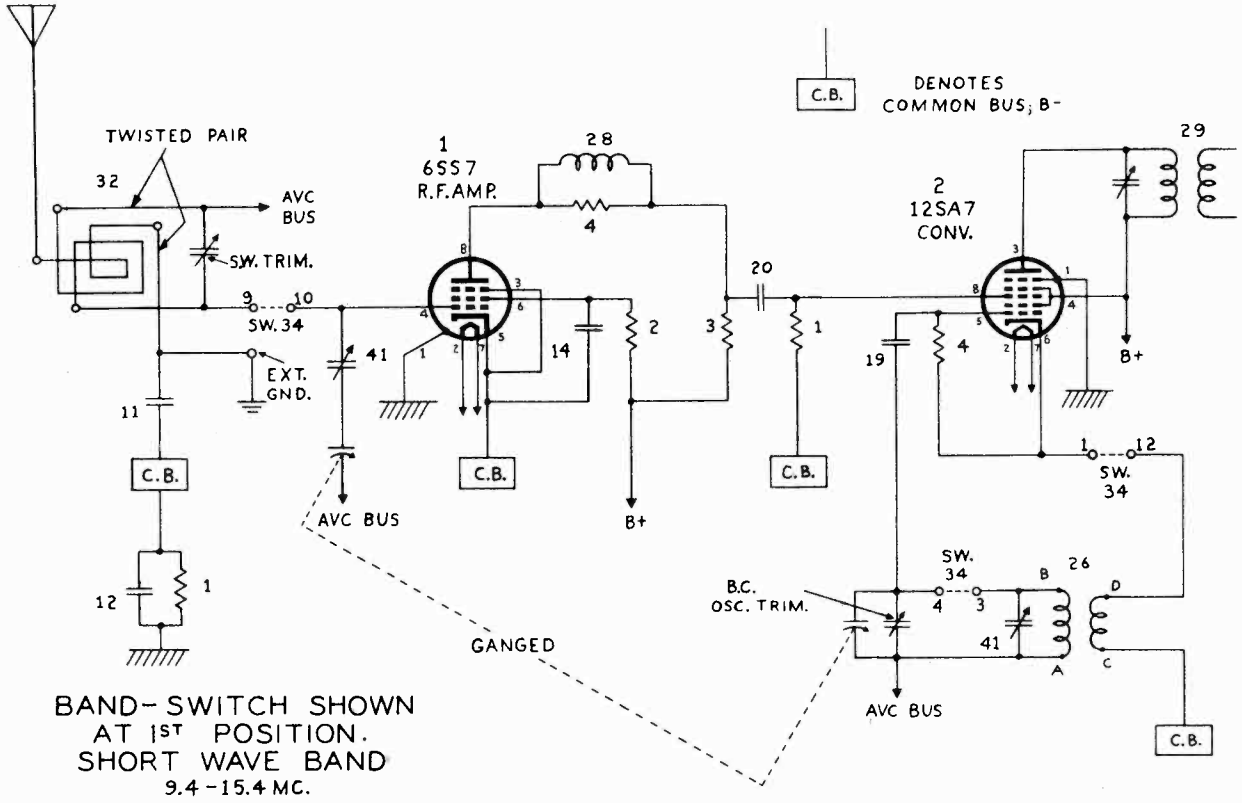
FARNSWORTH TELEV. & RADIO CORP.

MODELS ET-060, ET-061, ET-063
Ch. C-150

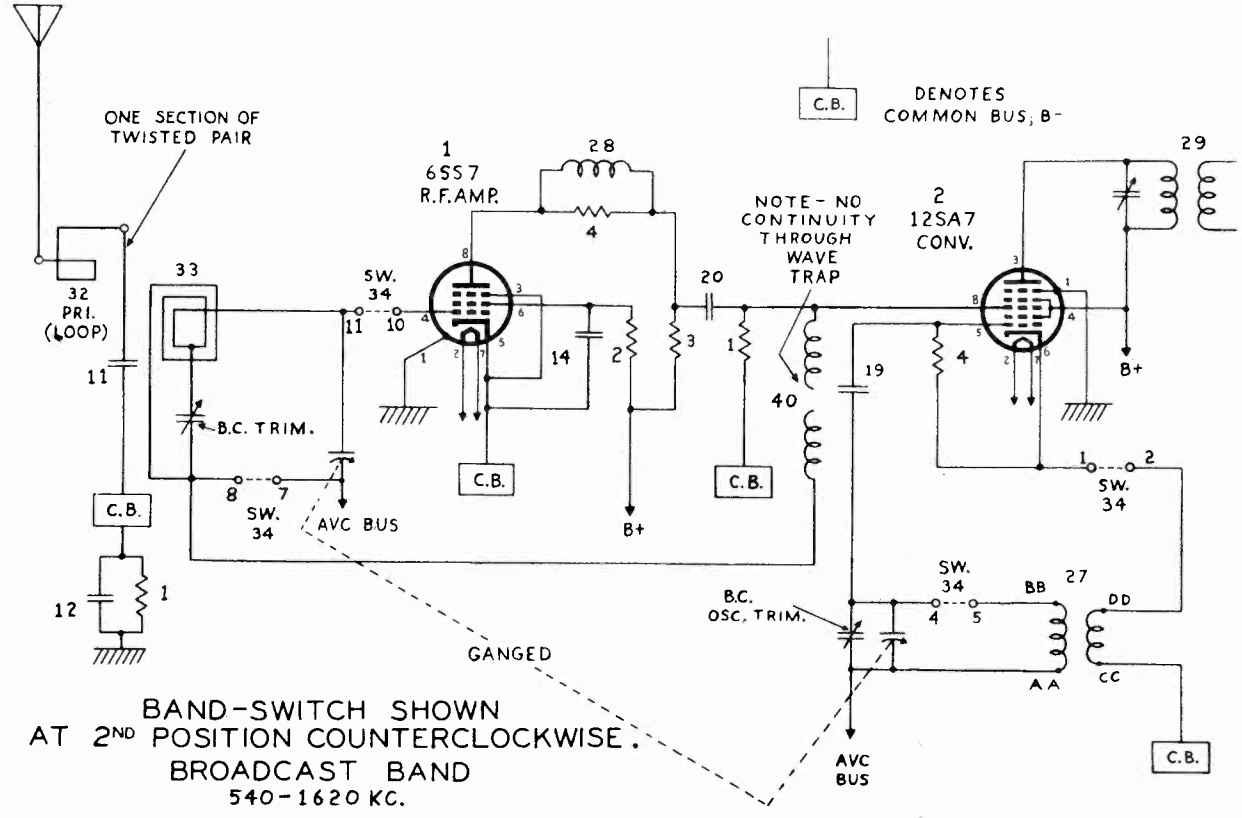


MODELS ET-060,
ET-061, ET-063
Ch. C-150

FARNSWORTH TELEV. & RADIO CORP.



BAND-SWITCH SHOWN
AT 1ST POSITION.
SHORT WAVE BAND
9.4 - 15.4 MC.



BAND-SWITCH SHOWN
AT 2ND POSITION COUNTERCLOCKWISE.
BROADCAST BAND
540 - 1620 KC.

FARNSWORTH TELEV. & RADIO CORP.

MODELS ET-060
ET-061, ET-063

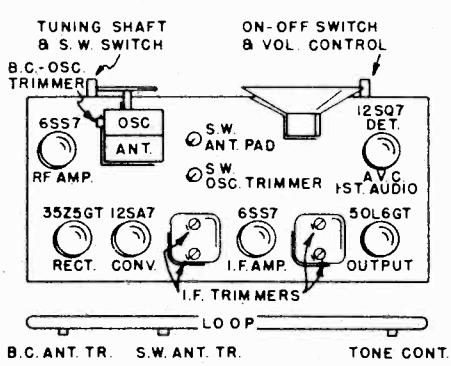
A Signal Generator calibrated at 455 Kc., 600 Kc., 1000 Kc., 1500 Kc., 15 Mc., 12.5 Mc., and 10 Mc., and an output indicator are required to properly align this receiver. All adjustments should be made with the volume control set for maximum, keeping the signal generator output as low as possible to prevent AVC action and incorrect adjustments.

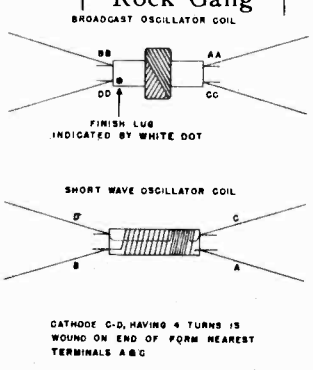
Connect the low side of the Signal Generator to the chassis through a .1 Mfd. condenser. Connect the high side to antenna lead at rear of set through dummy load of 100 MMF for Broadcast and 400 ohms for Shortwave.

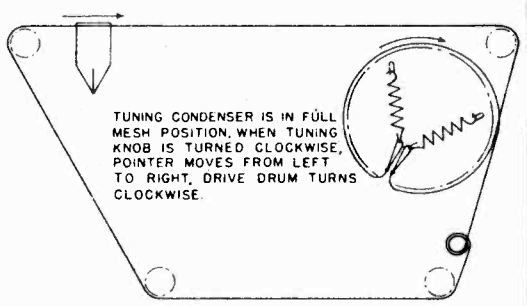
The loop antenna should be placed in approximately the position relative to chassis as when chassis is installed in cabinet.

When aligning the Shortwave Oscillator, use the peak found farthest out from maximum capacity on the oscillator trimmer. Use the peak nearest maximum capacity on the loop trimmer.

STEPS	DUMMY ANTENNA	SET GENERATOR AT	SET GANG AT	ADJUST	LOCATED	TO OBTAIN
1	SET VOLUME CONTROL FOR MAXIMUM OUTPUT					
2	100 MMF	455 Kc.	Minimum Capacity	2nd. I.F. Trimmers	Top of I.F. Transformer	Maximum Output
3				1st. I.F. Trimmers		
4		1500 Kc.	1500 Kc.	B.C. Osc. Trimmer	On Tuning Capacitor	
5		1500 Kc.	1500 Kc.	B.C. Ant. Trimmer	*On Loop Antenna	
6	Check Pointer for Calibration at 1000 Kc. and 600 Kc.					
	SHORT WAVE BAND					
7	400 Ohms	15 Mc.	Minimum Capacity	S.W. Osc. Trimmer	*Chassis Near Rear	Maximum Output
8		12.5 Mc.	12.5 Mc. Rock Gang	S.W. Ant. Trimmer	*On Loop	
9	Check	10 Mc.	10 Mc. Rock Gang	S.W. Ant. Padder	*Chassis Near Front	







MODELS ET-060, ET-061, ET-063

FARNSWORTH TELEV. & RADIO CORP.

Refer. No.	Part No.	DESCRIPTION	List Price
1	77216	220 M Ohms	$ .15
2	77265	15 M Ohms	.15
3	77211	4700 Ohms	.15
4	77266	22 M Ohms	.15
5	77259	150 Ohms	.15
6	77261	470 Ohms	.15
7	77270	2.2 Megohms	.15
8	77273	6.8 Megohms	.15
9	77217	470 M Ohms	.15
11	25197	.001 Mfd. 600 V.	.15
12	25215	.1 Mfd. 600 V.	.20
14	25196	.05 Mfd. 600 V.	.30
15	25195	.02 Mfd. 600 V.	.20
16	25194	.01 Mfd. 600 V.	.20
17	25184	.003 Mfd. 600 V.	.20
19	25193	47 Mmf. Mica	.30
20	25188	100 Mmf. Mica	.25
21	25187	240 Mmf. Mica	.30
23	25022	20 Mfd.—30 Mfd.—150 V. Elect. Cap.	1.15
24	26154	Gang Capacitor	4.45
24	26239	Gang Capacitor, (see note)	3.95
26	38549	S. W. Oscillator Coil (White dot) for 26154	.70
26	38709	S. W. Oscillator Coil (Yellow dot) for 26239 (see note)	.70
27	38483	B. C. Oscillator Coil (White dot) for 26154	.60
27	38707	B. C. Oscillator Coil (Yellow dot) for 26239 (see note)	.60
28	38550	Peaking Coil	.40
29	38536	1st. I. F. Transformer	1.70
30	38537	2nd. I. F. Transfomer	1.70
31	94091	Output Transformer	1.50
32	38535	S. W. Loop Assembly	.60
33	38465	B. C. Loop and Back Cover Ass'y ET-060 and ET-061	3.15
33	38480	B. C. Loop and Back Cover Ass'y ET-063	3.20
34	90095	Band Switch	1.50
35	42186	Dial Lamp (Mazda 47)	.15
36	78070	Volume Control	1.10
37	90073	Tone Control Slide Switch	.20
38	81091	Speaker	6.35
39	27118	Line Cord	.70
40	38484	Wave Trap	.55
41	26214	B. C. and S. W. Antenna Trimmer Strip	.60
	31276	Dial Background	.35
	31319	Dial Window	.50
	07334	Dial Pointer Assembly	.95
	31277	Dial Scale for ET-060 and ET-061	.40
	31279	Dial Scale for ET-063	.45
	41106	Universal Drive Cord Kit	.40
	56994	Drive Drum	.15
	09195	Knob and Set Screw for ET-060 and ET-063	.45
	09196	Knob and Set Screw for ET-061 Red	50
	09224	Knob and Set Screw for ET-061 Blue	.50
	09225	Knob and Set Screw for ET-061 Black	.50
	54118	Band Switch Lever ET-060 and ET-061	.15
	54091	Band Switch Lever ET-063	.15
	H-231	Cabinet and Packing for ET-060	6.15
	H-254	Cabinet and Packing for ET-061	8.75
	59168	Grille for ET-060	2.00
	59190	Grille for ET-061 Red	2.00
	59247	Grille for ET-061 Bue	2.00
	59248	Grille for ET-061 Black	2.00

NOTE: Models with R.F. trimmer on loop require removal of R. F. trimmer from gang capacitor having such trimmer. Late production gang capacitor 26239 (identified by red dot) with 19 plate oscillator section requires B.C. Oscillator Coil 38706 and S.W. Oscillator Coil 38709 (Marked with yellow dots).

The Service Department policy is to furnish ½ Watt 5% Carbon Resistors and 600 Volt Tub-

The parts shortage has resulted in the substitution of various types of tuning capacitors without change in part numbers stamped on them. In ordering replacement tuning capacitors for ET-060, 061, 063, 064, 065, 066, 069; EK-263, 264, and 265 the following suggestions should be observed:

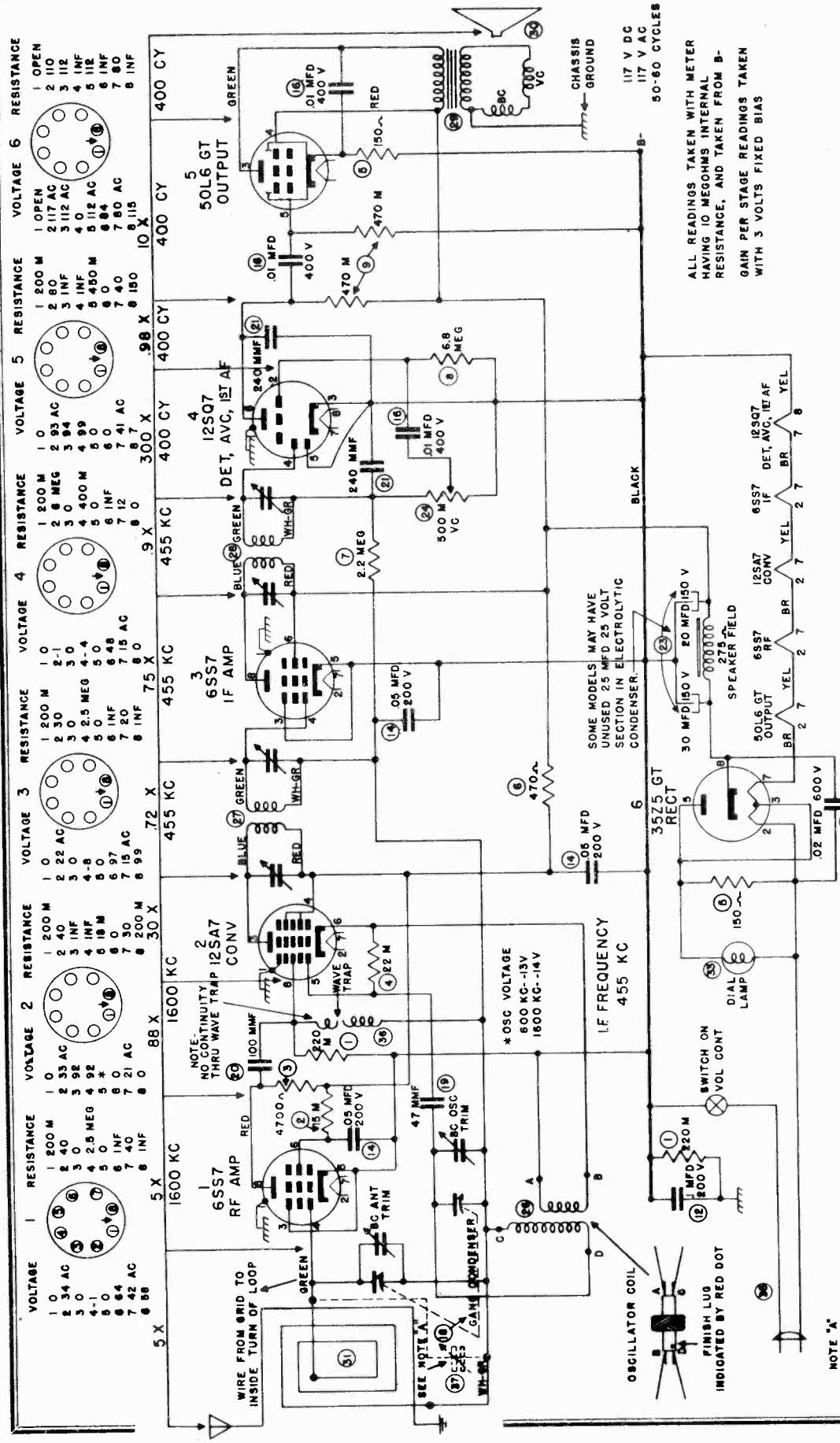
Gang Capacitor with 21 plate oscillator section requires the removal of trimmer from R.F. section of gang if the loop antenna has a R. F. trimmer located on it. This capacitor uses B. C. oscillator coil No. 38483 and if a S. W. oscillator coil is used, requires S. W. oscillator coil No. 38549. Both of these coils have a white dot to indicate finish lug.

No. 23239 gang capacitor with 19 plate oscillator section (identified by red dot on rear) may require the removal of R. F. trimmer as explained above. This capacitor requires B. C. oscillator coil No. 38706 and S. W. oscillator coil (if used) No. 38709. These oscillator coils are marked with a yellow dot at the finish lug.

Prices subject to change without notice

FARNSWORTH TELEV. & RADIO CORP.

MODELS ET-064, ET-065, Ch. C-158; ET-066, Ch. C-159



ELECTRICAL SPECIFICATIONS

Watts	at 117 Volts A. C.	30
Voltage	A. C. or D. C.	105-125

Six Tube A. C. — D. C. Single Band Superheterodyne

Broadcast Band	540 Kc — 1620 Kc
Intermediate Frequency	455 Kc

MODEL	CHASSIS	SPEAKER
ET-064	C-158	81091
ET-065	C-158	81091
ET-066	C-159	81091

MODELS ET-064,
ET-065,Ch.C-158;
ET-066,Ch.C-159

FARNSWORTH TELEV. & RADIO CORP.

EQUIPMENT AND PROCEDURE FOR ALIGNMENT

To properly align this receiver, a signal generator calibrated at 455 Kc., 600 Kc., and 1500 Kc., and an output indicator are required. All adjustments should be made with the volume control set for maximum volume, keeping the signal generator output as low as possible to prevent A. V. C. action and incorrect alignment.

Connect the low side of the signal generator to one of the wires found at the rear of the set. The high side of the signal generator is connected to the other lead.

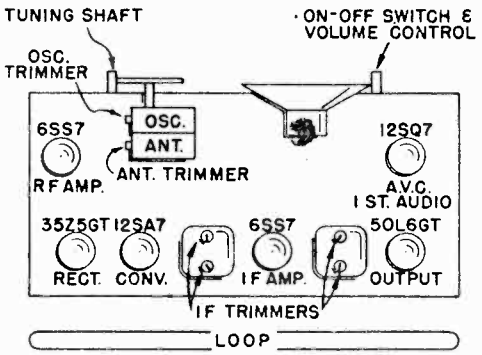
The loop should be spaced 3/4 inch from the chassis or the approximate position relative to the chassis as when installed in cabinet.

TABULATION FOR ALIGNMENT

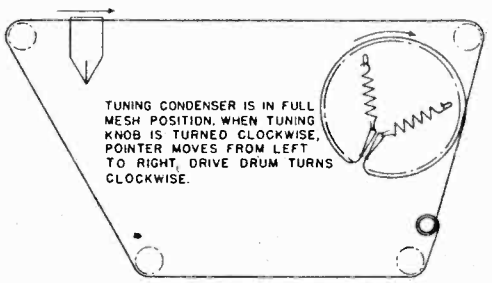
Steps	Dummy Antenna	Set Generator At	Set Gang At	Adjust	Located	To Obtain
1	Set Volume Control For Maximum Output					
2	100 MMF	455 Kc.	Minimum Capacity	2nd. I.F. Trimmers	Top of I.F. Transformer	Maximum Output
3				1st. I. F. Trimmers		
4		1500 Kc.	1500 Kc.	Osc. Trimmer	On Tuning Condenser	
5		1500 Kc.	1500 Kc.	Ant. Trimmer	On Tuning Condenser*	
6	Check Pointer Calibration at 600Kc.					

*On models using gang condenser #26154, the antenna trimmer is located on loop.

SIX TUBE LAYOUT



DIAL STRINGING



PARTS PRICE LIST

ET-064, ET-065, ET-066

Refer. No.	Part No.	Description	List Price
1	77216	220 M Ohms	PRICES NOT AVAILABLE AT PRESENT
2	77265	15 M Ohms	
3	77211	4700 Ohms	
4	77266	22 M Ohms	
5	77259	150 Ohms	
6	77261	470 Ohms	
7	77270	2.2 Meg Ohms	
8	77273	6.8 Meg Ohms	
9	77217	470 M Ohms	
12	25215	.1 Mfd. 600 V	
14	25196	.05 Mfd. 600 V	
15	25195	.02 Mfd. 600 V	
16	25194	.01 Mfd. 600 V	
18	09130	Two Gang Condenser & Drive Drum	
19	25193	47 Mmfd. Mica	
20	25188	100 Mmfd. Mica	
21	25187	240 Mmfd. Mica	
23	25022	Elect. Cond. 30 Mfd. & 20 Mfd	
24	78048	500 M Volume Control	
26	38483	Oscillator Coil Assembly	
27	38536	1st. I.F. Transformer	
28	38537	2nd. I.F. Transformer	
29	94091	Output Transformer	
30	81091	Speaker	
31	38478	Loop and Back Cover Assembly	
31	38479	Loop and Back Cover Assembly for ET-066	
33	42186	Dial Lamp	
35	27118	Line Cord	
36	38484	Wave Trap	
37	26233	Antenna Trimmer used with Gang Cond. #26154 Only	
	41106	Drive Cord Assembly	
	07316	Dial Pointer Assembly	
	31265	Dial Scale	
	31278	Dial Scale for ET-066	
	59193	Knob	
	59134	Knob fo ET-066	
	H-239	Cabinet and Packing for ET-064	
	H-240	Cabinet and Packing for ET-065	
	H-235	Cabinet and Packing for ET-066	

The Service Department policy is to furnish 1/2 Watt 5% Carbon Resistors and 600 Volt Tub lar Condensers.

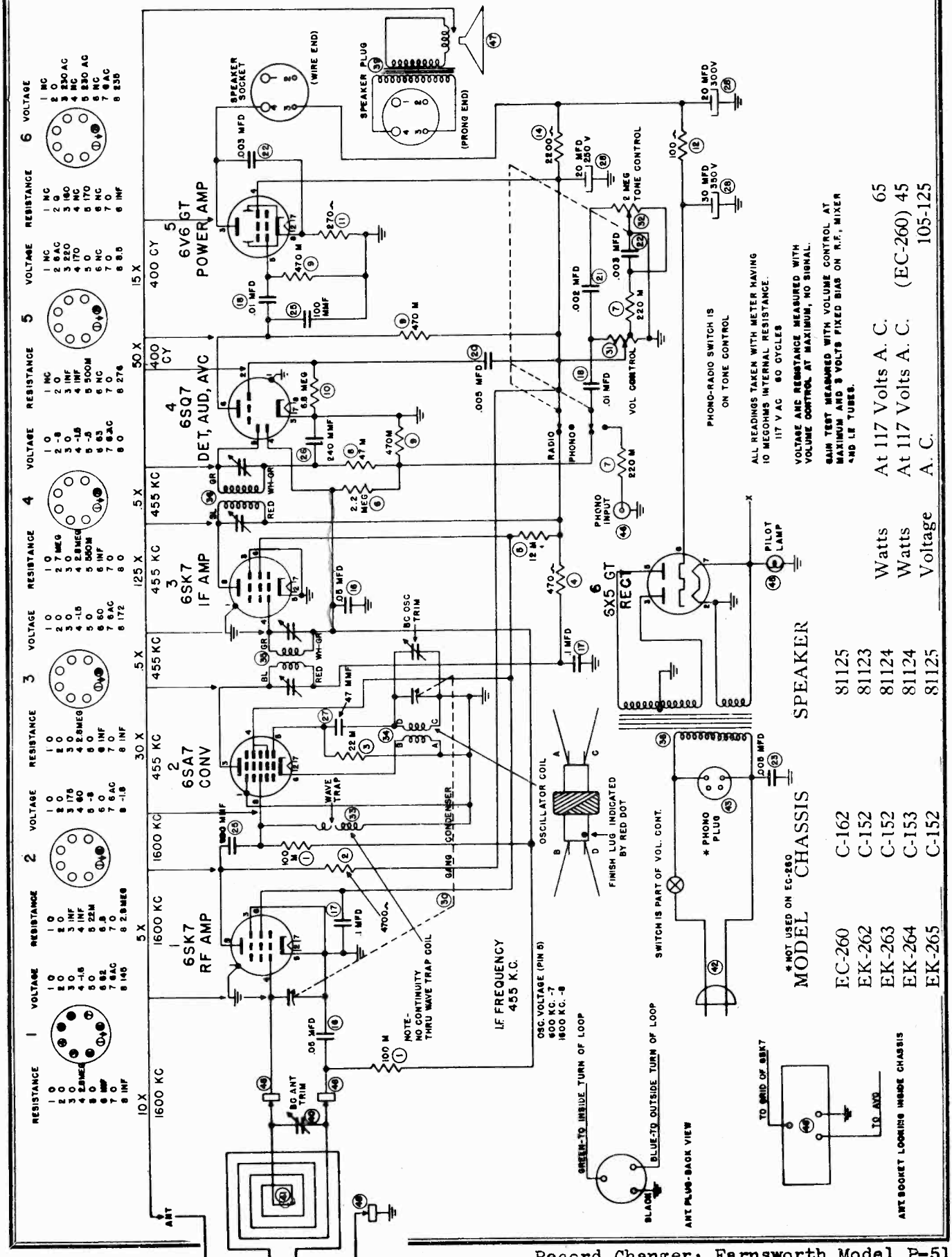
Prices subject to change without notice.

PARTS PRICE LIST

EC-260, EK-262, EK-263, EK-264, EK-265

Reference No.	Part No.	DESCRIPTION	List Price
1	77214	100 M Ohms	PRICES NOT AVAILABLE AT PRESENT
2	77211	4700 Ohms	
3	77266	22 M Ohms	
4	77261	470 Ohms	
5	77155	12 M Ohms 2 Watt	
6	77270	2.2 Megohms	
7	77216	220 M Ohms	
8	77213	47 M Ohms	
9	77217	470 M Ohms	
10	77273	6.8 Megohms	
11	77174	270 Ohms 1 Watt	
12	77258	100 Ohms	
14	77301	2200 Ohms 2 Watt	
16	25196	.05 Mfd. Tubular 600 V.	
17	25215	.1 Mfd. Tubular 600 V.	
18	25194	.01 Mfd. Tubular 600 V.	
20	25183	.005 Mfd. Tubular 600 V.	
21	25185	.002 Mfd. Tubular 600 V.	
22	25184	.003 Mfd. Tubular 600 V.	
23	25031	.005 Mfd. Line Buffer 600 V.	
25	25188	100 Mmf. Mica	
26	25187	240 Mmf. Mica	
27	25193	47 Mmf. Mica	
28	25180	Electrolytic Capacitor 30 Mf. 350 V.-20 Mf. 300 V.-20 Mf. 250 V.	
30	15136	Gang Condenser and Drive Drum	
31	78071	Volume Control	
32	90148	Tone Control and Phono Switch	
33	38484	Wave Trap	
34	38483	Oscillator Coil	
35	38536	1st. I. F. Transformer	
36	38537	2nd. I. F. Transformer	
38	94025	Power Transformer	
39	94197	Output Transformer EC-260, EK-265	
39	94198	Output Transformer EK-262	
39	94199	Output Transformer EK-263, EK-264	
40	26032	Antenna Trimmer	
41	38533	Loop Antenna for EK-262 and EK-264	
41	38545	Loop Antenna for EC-260, EK-263 and EK-265	
42	27118	Line Cord	
43	11210	Phono A.C. Cable and Plug	
45	42185	Dial Lamp Mazda 44	
46	80030	Phono Input Socket	
47	81125	Speaker EC-260, EK-265	
47	81124	Speaker EK-263, EK-264	
47	81123	Speaker EK-262	
48	80256	Antenna Socket	
	80252	Antenna Plug	
	80139	Molded Octal Tube Socket	
	07348	Dial Pointer Assembly	
	41106	Universal Drive Cord Kit	
	31318	Dial Glass for EC-260, EK-264	
	31280	Dial Glass for EK-262, EK-263, EK-265	
	59211	Dial Escutcheon EC-260, EK-264	
	59199	Dial Escutcheon EK-262, EK-263, EK-265	
	58006	Dial Background for EK-262, EK-263, EK-265	
	58039	Dial Background for EC-260, EK-264	
	64360	Dial Light Current Supply Spring	
	H-236	Cabinet and Packing for EC-260	
	H-221	Cabinet and Packing for EK-262	
	H-222-1	Cabinet and Packing for EK-263 Walnut	
	H-222-2	Cabinet and Packing for EK-263 Blonde	
	H-223	Cabinet and Packing for EK-265	
	H-220-1	Cabinet and Packing for EK-264 Walnut	
	H-220-2	Cabinet and Packing for EK-264 Blonde	
	59134	Knob for EC-260, EK-262, EK-263 Walnut, EK-264 Walnut, EK-265	
	59243	Knob for EK-263 Blonde, EK-264 Blonde	
	71223	Phono Needle	
	22147	P. U. Cable	

MODELS EC-260, EK-263, EK-265,
Ch.C-162; EK-262, FARNSWORTH TELEV. & RADIO CORP. Ch.C152; EK-264,
Ch.C-153



* NOT USED ON EC-260

MODEL CHASSIS		SPEAKER	
EC-260	C-162	81125	
EK-262	C-152	81123	
EK-263	C-152	81124	Watts 65
EK-264	C-153	81124	Watts 45 (EC-260)
EK-265	C-152	81125	Voltage A. C. 105-125

Record Changer: Farnsworth Model P-51

FARNSWORTH TELEV. & RADIO CORP.

MODELS EC-260, Ch.C-162;EK-262, EK-263,EK-265, Ch.C-152;EK-264, Ch.C-153

A Signal Generator calibrated at 455 Kc., 600 Kc. and 1500 Kc., and an output indicator are necessary to properly align this set. All adjustments should be made with the volume control set for maximum and the tone control for maximum treble, keeping the signal generator output as low as possible to prevent A.V.C. action and false settings.

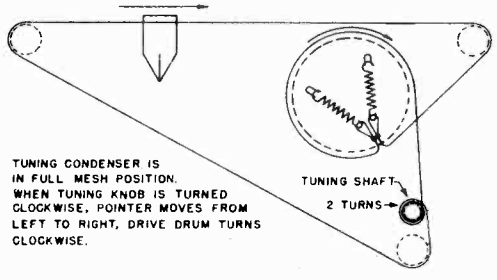
The low side of the signal generator is connected to the chassis.

TABULATION FOR ALIGNMENT

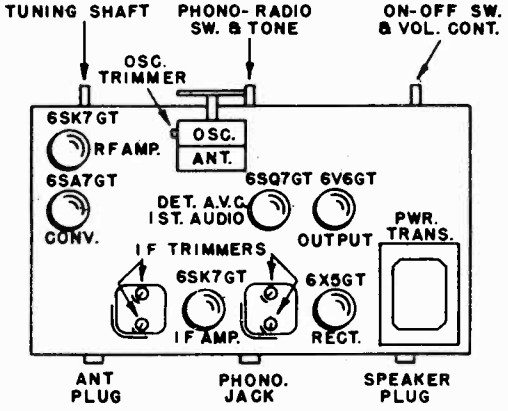
Steps	Connect High Side of Generator to	Set Generator At	Set Gang At	Adjust	Located	To Obtain
1	Set Volume Control at Maximum and Tone Control at Maximum Treble					
2	Stator of Ant. Section of Gang with .1 Mf. In Series	455 Kc.	Minimum	2nd. I.F. Transformer	Top of 2nd. I.F. Transformer	Maximum Output
3				1st. I. F. Transformer	Top of 1st. I.F. Transformer	
4	Ant. Lead With 250 Mmf. In Series*	1500 Kc.	1500 Kc.	Osc. Trimmer	On Gang	
5		1500 Kc.	1500 Kc.	Ant. Trimmer	On Loop	
6	Check Pointer Calibration on 600 Kc.					

*Antenna wire protrudes from loop.

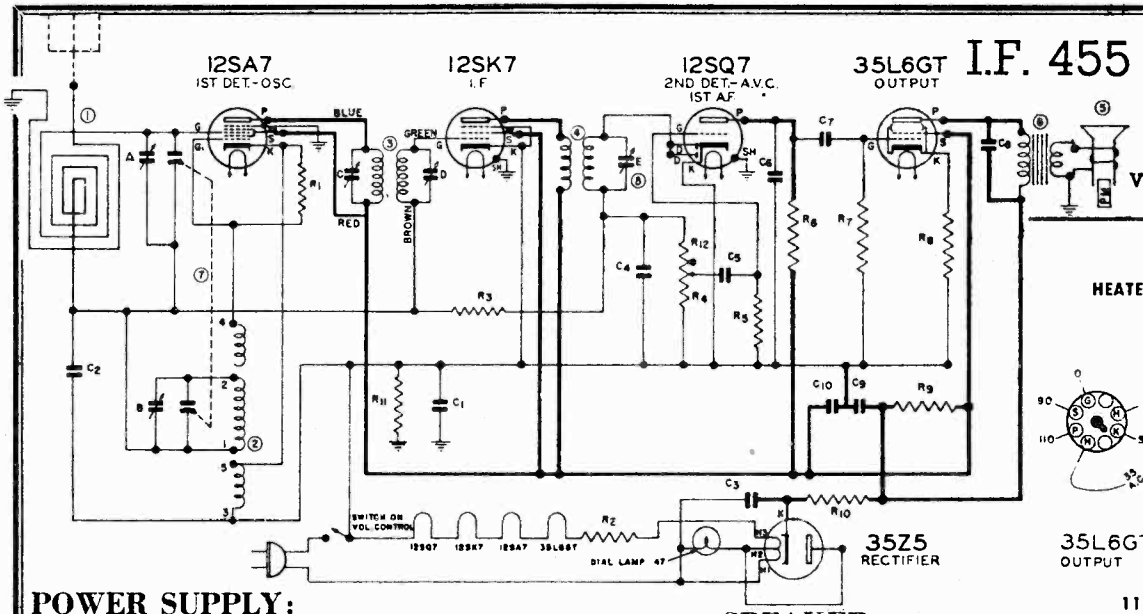
DIAL STRINGING



CHASSIS LAYOUT



I.F. 455 KC.



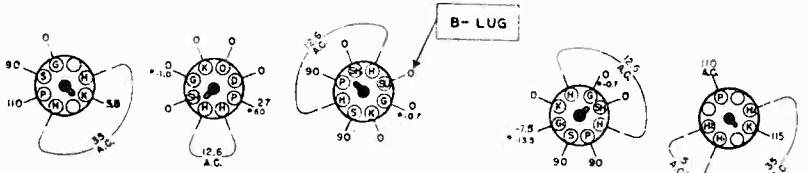
SOCKET VOLTAGES

Measured with voltmeter having sensitivity of 1000 ohms per volt except where indicated by (*).

VOLUME ON FULL WITH NO SIGNAL DIAL TURNED TO 540 KC.

BOTTOM VIEW OF CHASSIS

HEATER VOLTAGES MEASURED ACROSS SOCKET TERMINALS. ALL OTHER VOLTAGES MEASURED BETWEEN SOCKET TERMINALS AND B- LUG.



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

POWER SUPPLY:

117 volts
50-60 cycles A.C. or D.C.
30 watts

SPEAKER:

4 inch P-M Dynamic
Voice coil impedance—3.2 ohms

PARTS LIST

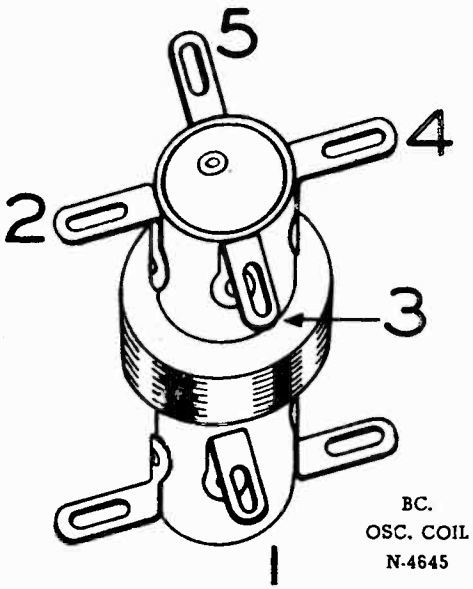
DIA-GRAM NO.	PART NO.	DESCRIPTION	LIST PRICE
		CONDENSERS	
C1	N-1345	Condenser .05 MFD 200 Volt	$
C2	N-1345	Condenser .05 MFD 200 Volt	
C3	N-1346	Condenser .05 MFD 400 Volt	
C4	N-1374	Condenser—Mica .0001 MFD 500 Volt	
C5	N-4894	Condenser .005 MFD 600 Volt	
C6	N-4890	Condenser .0005 MFD 600 Volt	
C7	N-1344	Condenser .01 MFD 400 Volt	
C8	N-1376	Condenser .02 MFD 400 Volt	
C9-C10	N-3302	Condenser—Electrolytic C9—35 MFD 150 Volt / C10—30 MFD 150 Volt	
		RESISTORS	
R1	N-4025	Resistor—Carbon 22,000 Ohm .5 Watt	$
R2	N-4023	Resistor—Carbon 82 Ohm 2.0 Watt	
R3	N-1262	Resistor—Carbon 1.0 Megohm .5 Watt	
R4	N 4843 / N-4999	Vol. Con., 500,000 ohm with switch—no shaft / Vol. Con., 500,000 ohm with switch & shaft	
R5	N-4028	Resistor—Carbon 6.8 Megohm .5 Watt	
R6	N-4026	Resistor—Carbon 220,000 Ohm .5 Watt	
R7	N-4027	Resistor—Carbon 470,000 Ohm .5 Watt	
R8	N-4024	Resistor—Carbon 220,000 Ohm .5 Watt	
R9	N-3341	Resistor—Carbon 1,000 Ohm .5 Watt	
R10	N-4022	Resistor—Carbon 33 Ohm .5 Watt	
R11	N-4026	Resistor—Carbon 220,000 Ohm .5 Watt	
R12		Resistor—Carbon (In Volume Control)	

DIA-GRAM NO.	PART NO.	DESCRIPTION	LIST PRICE
		OTHER ELECTRICAL PARTS	
1	N-3875	Coil—Loop with Cabinet Back	$
2	N-4645	Coil—Oscillator	
3	N-4813	Coil—1st I.F.	
4	N-4846	Coil—2nd I.F.	
5	N-4990	Speaker—4" P.M. Dynamic	
6	N-3899	Transformer—Output	
7A, 7B	N-5290	Condenser—Variable, 2 Gang & Pulley Assy	
8	N-4048	Condenser—Trimmer—70 to 130 MMFD	
		MISCELLANEOUS PARTS	
143		Cabinet	$
N-5250		Cord, Dial Drive (3 feet required)	$
N-4749		Knob	
N-1147		Lamp, Dial—Mazda 47 6-8 V. 150 Ma.	
N-3881		Pointer, Dial	
N-3879		Pulley, Idler	
N-3926		Scale, Dial	
N-3872		Shaft, Tuning	
N-5184		Shaft, Volume Control — Use with N-4843 Vol. Control	
N-3882		Socket, Dial Lamp—with leads	
N-4666		Socket, Tube—Laminated	
N-3229		Socket, Tube—Molded	
N-4864		Speednut	
N-2656		Spring, Dial Cord	
N-4854		Terminal, Screw	
N-3243		Washer, "C"—For Tuning Shaft	

PRICE SUBJECT TO CHANGE WITHOUT NOTICE

REAR OF CHASSIS

*—Measured with vacuum tube volt meter.



NUMBERED TERMINALS IN ILLUSTRATION CORRESPOND TO SIMILARLY NUMBERED TERMINALS ON THE CIRCUIT DIAGRAM.

For Gain data, see P.15-6

MODEL 4A2.
Commentator

THE FIRESTONE TIRE & RUBBER CO.

ALIGNMENT PROCEDURE

1. Remove the chassis and loop antenna from the cabinet at the same time. To accomplish this remove the two fasteners holding the top of the back to the cabinet and remove the two screws on the rear apron of the chassis.

2. Note that there are five calibrating lines stamped into the metal dial frame. When gang condenser is fully meshed, dial pointer should be in the position indicated by first line at the left. If it is set incorrectly, release pointer clip on dial cord and reposition pointer.

3. Connect an output meter across the speaker voice coil or from plate of 35L6GT tube to B— through a .1 Mfd. condenser (see voltage chart for convenient B— connection).

4. Connect ground lead from signal generator to B— through a .25 Mfd. condenser.

5. Set volume control at maximum volume position and use a weak signal from the signal generator.

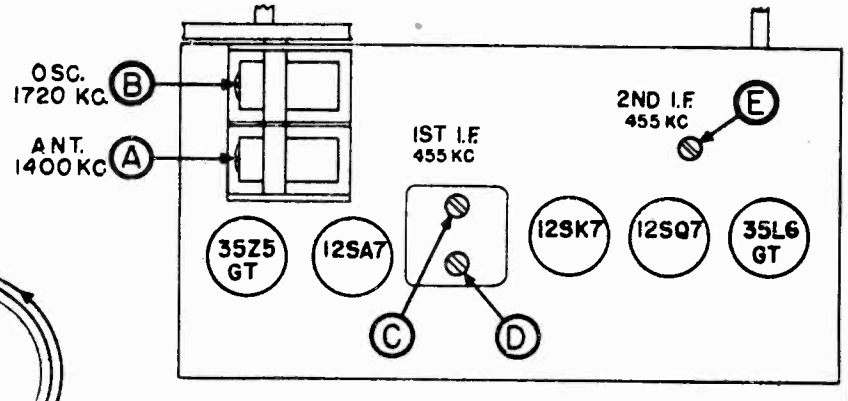
IMPORTANT—Align this receiver in exactly the order shown below.

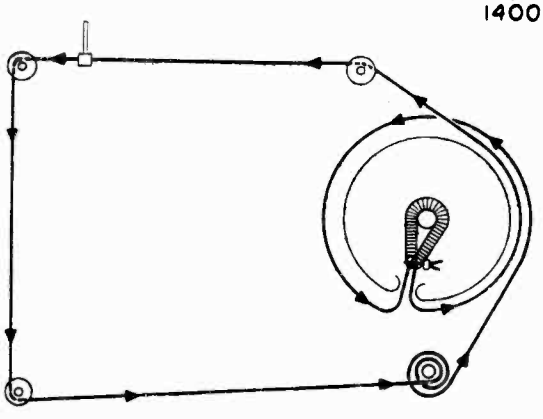
DUMMY ANT. IN SERIES WITH SIGNAL GENERATOR	CONNECT HIGH SIDE OF GENERATOR TO	SIGNAL GENERATOR FREQUENCY	RECEIVER DIAL SETTING	TRIMMER NUMBER	TRIMMER DESCRIPTION	TYPE OF ADJUSTMENT
.05 MFD. Paper Condenser	Control Grid of 12SA7	455 KC	Any point where it does not affect the signal.	E	2nd I.F.	Adjust for maximum output. Then repeat adjustment.
				C-D	1st I.F.	
100 MMFD. Mica Condenser	External Antenna Blue Lead on Loop	1720 KC	Set pointer to extreme right.	B	Oscillator	Adjust for maximum output.
100 MMFD Mica Condenser	External Antenna Blue Lead on Loop	1400 KC	Tune to 1400 KC generator signal.	A	Antenna	Adjust for maximum output.
100 MMFD. Mica Condenser	External Antenna Blue Lead on Loop	600 KC	Tune to 600 KC generator signal.	—	——	Check sensitivity.

POWER OUTPUT:

Undistorted — 1.0 watts
Maximum — 1.3 watts

TOP VIEW OF CHASSIS





DIAL AND POINTER DRIVE CORD ARRANGEMENT

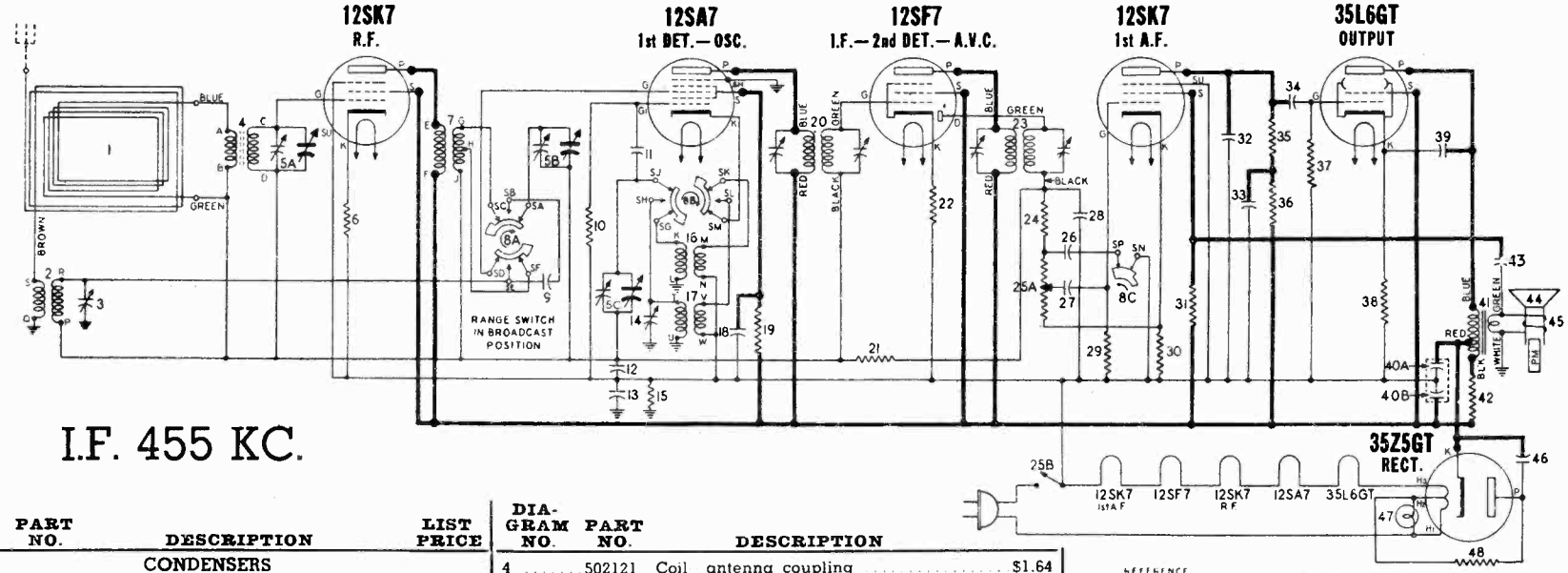
To string dial cord, set gang condenser to fully meshed position and use following parts:
N-2656 Tension Spring
N-5250 Cord (3 feet)

FREQUENCY RANGES:

Standard Broadcast Band { 535-1720 K.C.

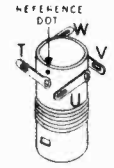
TUBE COMPLEMENT:

12SA7.....Osc.—1st Det.
12SK7.....I.F. Amp.
12SQ7.....2nd Det.—A.V.C.—1st Audio
35L6GT.....Power Output
35Z5GT.....Rectifier

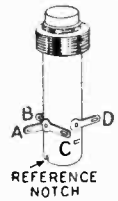


I.F. 455 KC.

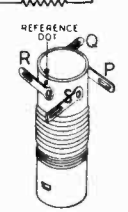
DIA-GRAM NO.	PART NO.	DESCRIPTION	LIST PRICE
		CONDENSERS	
3	502172	Condenser—trimmer; 25 to 100 Mmfd.	$0.36
5A-5B-5C	502123	Condenser—variable gang (with drum)	4.60
9	502162	Condenser—315 Mmfd. 500 volt	.45
11	502159	Condenser—mica—50 Mmfd. 500 volt	.24
12	502155	Condenser—.1 Mfd. 200 volt	.30
13	502158	Condenser—.2 Mfd. 400 volt	.36
14	502172	Condenser—trimmer; 25 to 100 Mmfd.	.36
18	502262	Condenser—.25 Mfd. 200 volt	.36
26	502470	Condenser—.0008 Mfd. 400 volt	.20
27	502453	Condenser—.002 Mfd. 400 volt	.20
28	502160	Condenser—mica—110 Mmfd. 500 volt	.24
32	502160	Condenser—mica—110 Mmfd. 500 volt	.24
33	502153	Condenser—.05 Mfd. 200 volt	.24
34	502156	Condenser—.004 Mfd. 400 volt	.20
39	502151	Condenser—.01 Mfd. 400 volt	.20
40A-40B	500256	Condenser—electrolytic A-40 Mfd. 150 volt / B-20 Mfd. 150 volt	1.50
43	502152	Condenser—.02 Mfd. 400 volt	.24
46	502157	Condenser—.05 Mfd. 400 volt	.24
		RESISTORS	
6	502140	Resistor—carbon 390 ohms ¼ watt	.12
10	502130	Resistor—carbon 22,000 ohms ¼ watt	.12
15	502133	Resistor—carbon 220,000 ohms ¼ watt	.12
19	502291	Resistor—carbon 4700 ohms ¼ watt	.12
21	502269	Resistor—carbon 3.3 Meg. ¼ watt	.12
22	502264	Resistor—carbon 47 ohms ¼ watt	.12
24	502131	Resistor—carbon 47,000 ohms ¼ watt	.12
25A-25B	502145	Volume control 500,000 ohms (with switch)	1.25
29	502136	Resistor—carbon 10 Meg. ¼ watt	.12
30	502128	Resistor—carbon 2200 ohms ¼ watt	.12
31	502135	Resistor—carbon 2.2 Meg. ¼ watt	.12
35-36	502133	Resistor—carbon 220,000 ohms ¼ watt	.12
37	502134	Resistor—carbon 470,000 ohms ¼ watt	.12
38	502138	Resistor—carbon 130 ohms ½ watt	.12
42	502469	Resistor—carbon 1500 ohms 1 watt	.16
48	502574	Resistor—carbon 33 ohms ½ watt	.12
		COILS & TRANSFORMERS	
1	502196	Loop antenna	3.95
2	502740	Coil—S. W. antenna	1.12
4	502121	Coil antenna coupling	$1.64
7	502142	Coil—BC. R.F.	2.26
16	502198	Coil—BC. oscillator	1.32
17	502197	Coil—S.W. oscillator	1.12
20	502102	Transformer—1st I.F.	2.30
23	502103	Transformer—2nd I.F.	2.30
41	500617	Transformer—output for R-500616 spkr.	2.50
	502906	Transformer—output for A-500616 spkr.	2.50
		OTHER ELECTRICAL PARTS	
8A-8B-8C	502199	Switch-tone & range	2.00
44	500587	Cone and voice coil for R-500616 spkr.	2.00
	502905	Cone and voice coil for A-500616 spkr.	2.00
45	500616	Speaker—P.M. dynamic (5 inch)	8.40
47	502473	Lamp-dial (Mazda 47) 6-8V. 150 Ma.	.22
		MISCELLANEOUS PARTS	
	116467	Base for mtg. electrolytic condenser	.04
	502115	Back for cabinet	.60
	502192	Cabinet	15.30
	501732	Clamp—dial scale mtg.	.05
	112745	Clip—coil mtg.	.01
	114955	Clip—retainer on end of dial cord	.01
	116563	Connector—for antenna leads	.01
	117057	Cord—dial drive (57 in. required) per ft.	.05
	500324	Cover—cardboard, for elect. cond.	.04
	502220	Dial scale—glass	1.00
	501186	Grounding plate (under I.F. trans. can)	.10
	501778	Knob—volume or tuning	.12
	501779	Knob—tone & band switch	.14
	502367	Pointer	.16
	81145	Retaining ring for tuning shaft	.01
	14771	Screw—No. 6x3/8; holds frame to cab.	.02
	83047	Screw—No. 8x7/8; chassis mtg.	.02
	500734	Screw—No. 4x5/16; holds clamps to cab.	.02
	501777	Screw—No. 4x1/2; for mtg. loop & back	.02
	502173	Shaft—tuning control	.15
	116690	Socket—octal base	.12
	160392	Socket—octal (rectifier)	.16
	500499	Socket—dial lamp (with leads)	.44
	161384	Spring dial cord tension	.06
	111456	Washer—spring washer for tuning shaft	.005
	500487	Washer—felt; for knobs	.01



S.W. OSC. COIL
502197

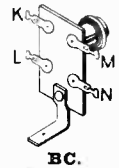


BC. ANTENNA COUPLING COIL
502121



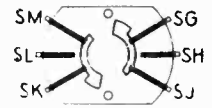
S.W. ANTENNA COIL
502740

R.F. COIL
502142

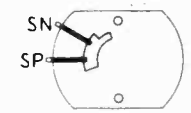


BC. OSC. COIL
502198

REAR DECK FRONT VIEW



FRONT DECK FRONT VIEW



FRONT DECK REAR VIEW

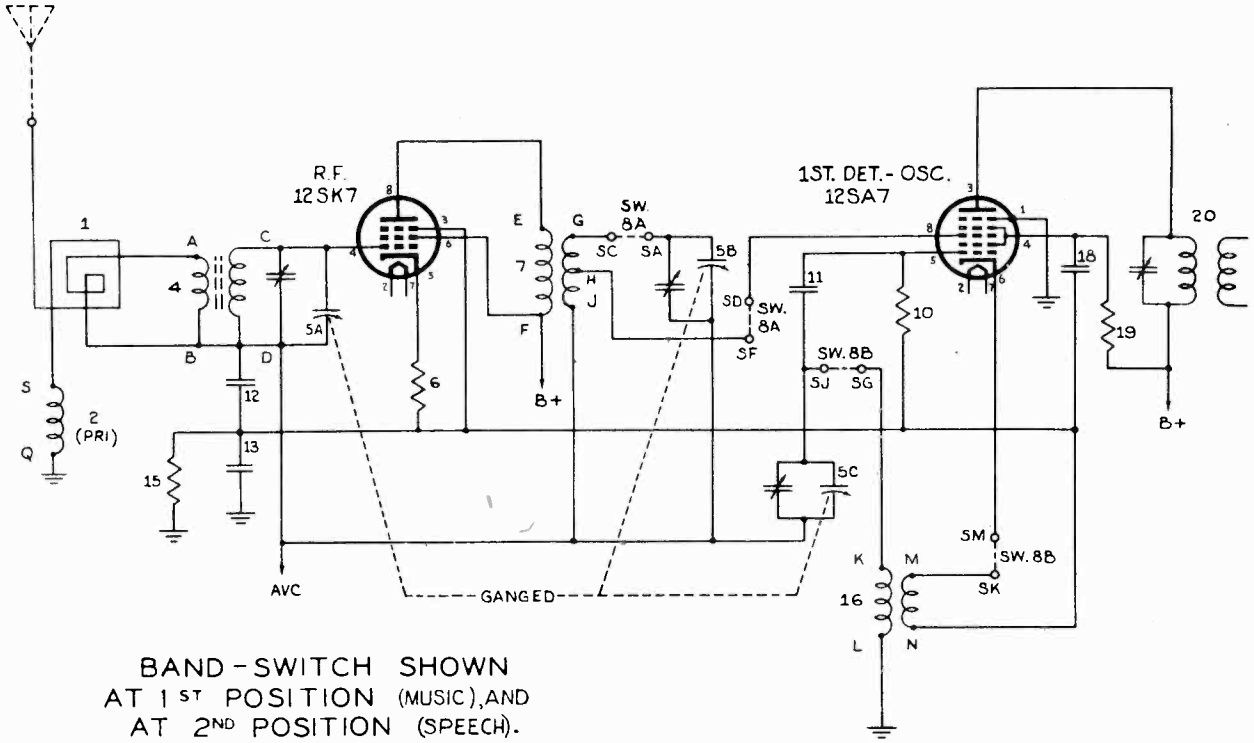
RANGE AND TONE SWITCH
502199

PRICES SUBJECT TO CHANGE WITHOUT NOTICE

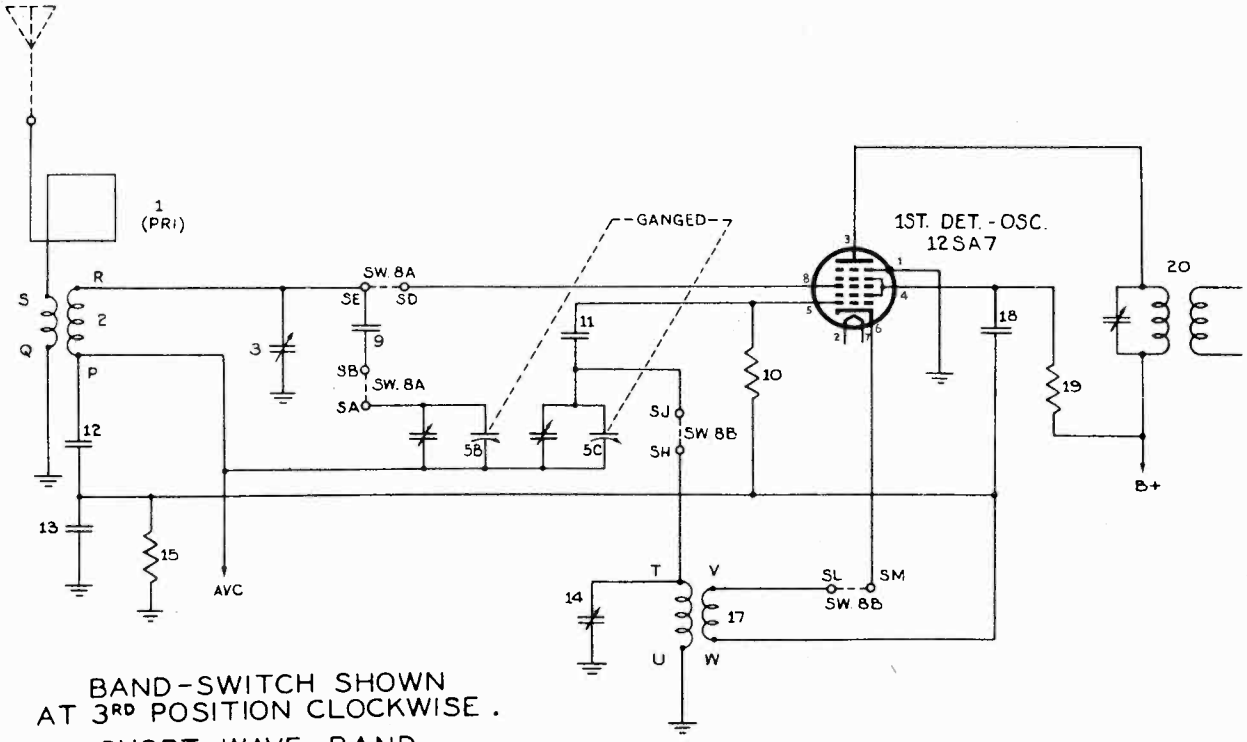
"clarified schematics"

MODEL 4A20

THE FIRESTONE TIRE & RUBBER CO.



BAND-SWITCH SHOWN
AT 1ST POSITION (MUSIC), AND
AT 2ND POSITION (SPEECH).
BROADCAST BAND
540-1650KC.



BAND-SWITCH SHOWN
AT 3RD POSITION CLOCKWISE.
SHORT WAVE BAND
9-12 MC

MODEL 4A20

THE FIRESTONE TIRE & RUBBER CO.

ALIGNMENT PROCEDURE

Remove chassis and loop antenna from cabinet (do not remove loop of wire stapled to cabinet.) After chassis has been removed, replace loop antenna in cabinet. Stand the chassis on one end and space it approximately same distance from loop as when installed in cabinet. Then reconnect all leads to loop antenna and to loop of wire stapled on cabinet.

Note that there are four calibrating lines stamped into the metal dial frame. When gang condenser is fully meshed, dial pointer should be in the position indicated by first line at the left. If it is set incorrectly, release pointer clip on dial cord and reposition pointer.

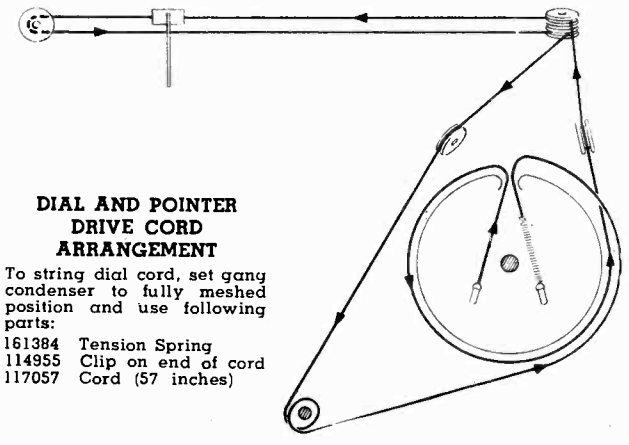
Connect an output meter across the speaker voice coil or from plate of 35L6GT tube to B— through a .1 Mfd. condenser (see voltage chart for convenient B— connection).

Connect ground lead from signal generator to B— through a .25 Mfd. condenser.

Set volume control at maximum volume position and use a weak signal from the signal generator.

IMPORTANT:—Align this receiver in exactly the order shown below. Broadcast band must be aligned before short wave band.

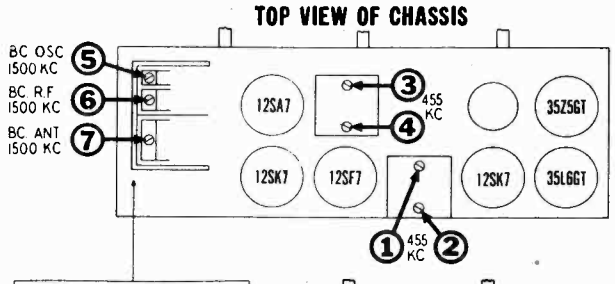
DUMMY ANT. IN SERIES WITH SIGNAL GENERATOR	CONNECT HIGH SIDE OF GENERATOR TO	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POSITION	RECEIVEB DIAL SETTING	TRIMMER NUMBER	TRIMMER DESCRIPTION	TYPE OF ADJUSTMENT
200 MMFD. Mica Condenser	Control Grid of 12SA7	455 KC	Broadcast	Any point where it does not affect the signal	1-2	2nd I.F.	Adjust for maximum output. Then repeat adjustment.
					3-4	1st I.F.	
200 MMFD. Mica Condenser	External Antenna Clip on Loop Frame	1500 KC	Broadcast	Set pointer to 1500 KC reference line stamped into metal dial plate (first line at the right)	5	Broadcast Oscillator (Shunt)	Adjust for maximum output.
200 MMFD. Mica Condenser	External Antenna Clip on Loop Frame	1500 KC	Broadcast	Tune to 1500 KC generator signal	6	Broadcast R.F.	Adjust for maximum output.
200 MMFD. Mica Condenser	External Antenna Clip on Loop Frame	1500 KC	Broadcast	Tune to 1500 KC generator signal	7	Broadcast Antenna	Adjust for maximum output.
400 OHM Resistor	External Antenna Clip on Loop Frame	12 MC	Short Wave	Set pointer to 12 MC. Reference line stamped into metal dial plate (second line from the right)	8	Short Wave Oscillator	Adjust to bring in signal. Check to see if proper peak was obtained by tuning in image at approx. 11.1 MC. If image does not appear, realign at 12 MC. with trimmer screw farther out. Recheck image.
400 OHM Resistor	External Antenna Clip on Loop Frame	12 MC	Short Wave	Tune to 12 MC generator signal	9	Short Wave Antenna	Adjust for maximum output. Try to increase output by detuning trimmer and retuning receiver dial until maximum output is obtained.

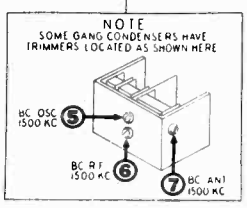


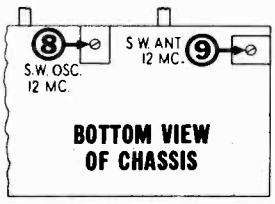
DIAL AND POINTER DRIVE CORD ARRANGEMENT

To string dial cord, set gang condenser to fully meshed position and use following parts:

161384 Tension Spring
114955 Clip on end of cord
117057 Cord (57 inches)







MODEL 4A2
MODEL 4A20

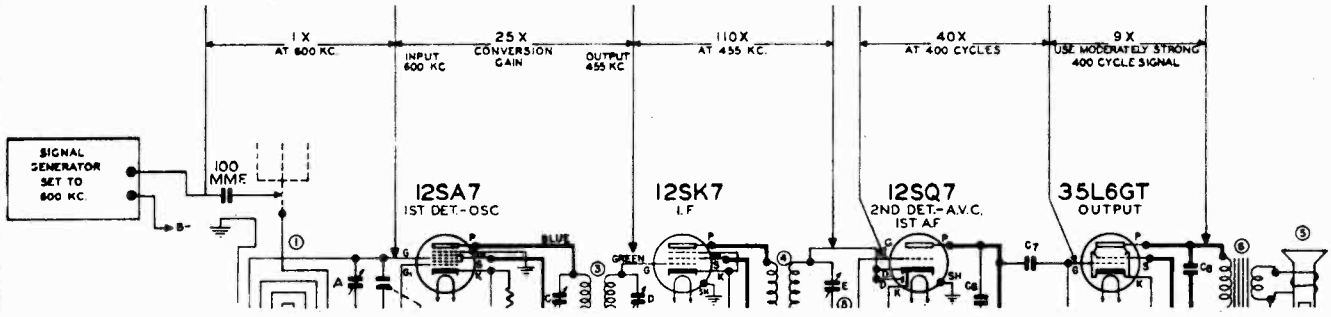
THE FIRESTONE TIRE & RUBBER CO.

APPROXIMATE STAGE GAIN DATA MODEL 4A2

Be sure Ant. and I.F. stages are accurately aligned before measuring gain. R.F. gains can be measured with a "channel" type instrument containing a tuned and calibrated R.F. amplifier. A vacuum tube voltmeter may be used for audio gain measurements. Observe following precautions:

1. For all gain measurements connect signal generator as shown. Use 600 KC. signal with 400 cycle modulation (use nearby frequency if local station interferes).
2. For I.F. measurements connect negative terminal of a 3 volt battery (two 1½ volt cells in series) to A.V.C. lead and positive terminal to B—. This provides a definite operating point. IMPORTANT: Disconnect battery when measuring audio stage gains.
3. Be sure radio is carefully tuned to generator signal (use weak signal for sharp tuning.
4. When using a "channel" type instrument carefully tune it for maximum output at desired frequency before making measurements.

I.F. stage gains shown below are less than under normal operating conditions due to the use of 3 volts fixed bias in order to establish a definite operating point. Therefore, these values are not intended to indicate the full capability of a stage.



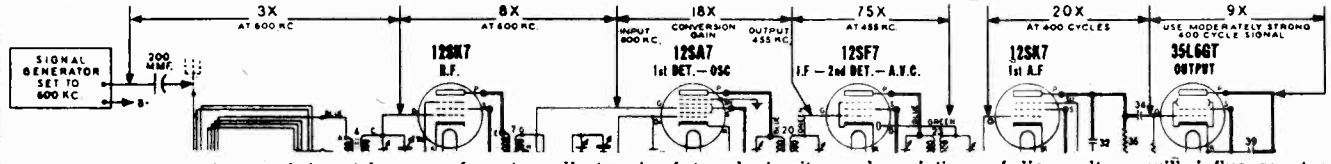
Differences in tube characteristics, tolerance of parts, adjustment of tuned circuits, and variations of line voltage will influence stage gain. Accuracy of measurements is dependent upon careful tuning of receiver to generator signal and experience in using your test equipment. These factors may create considerable variation in gain measurements.

APPROXIMATE STAGE GAIN DATA- MODEL 4A20

Be sure R.F. and I.F. stages are accurately aligned before measuring gain. R.F. gains can be measured with a "channel" type instrument containing a tuned and calibrated R.F. amplifier. A vacuum tube voltmeter may be used for audio gain measurements. Observe following precautions:

1. For all gain measurements connect signal generator as shown. Use 600 KC. signal with 400 cycle modulation (use nearby frequency if local station interferes.)
2. For R.F. and I.F. measurements connect negative terminal of a 3 volt battery (two 1½ volt cells in series) to A.V.C. lead and positive terminal to B—. This provides a definite operating point. IMPORTANT: Disconnect battery when measuring audio stage gains.
3. Be sure radio is carefully tuned to generator signal (use weak signal for sharp tuning.)
4. When using a "channel" type instrument carefully tune it for maximum output at desired frequency before making measurements.

The R.F. and I.F. stage gains shown below are less than under normal operating conditions due to the use of 3 volts fixed bias in order to establish a definite operating point. Therefore, these values are not intended to indicate the full capability of a stage.



Differences in tube characteristics, tolerance of parts, adjustment of tuned circuits, and variations of line voltage will influence stage gain. Accuracy of measurements is dependent upon careful tuning of receiver to generator signal and experience in using your test equipment. These factors may create considerable variation in gain measurements.

SOCKET VOLTAGES

Measured with voltmeter having sensitivity of 1000 ohms per volt except where indicated by (*).

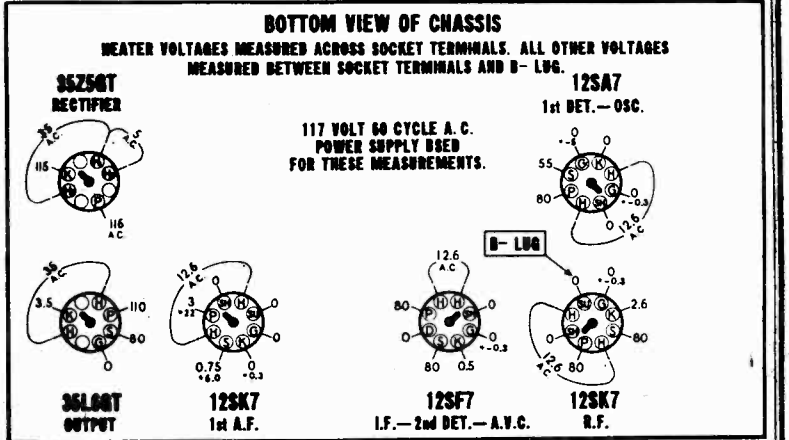
MODEL 4A20

VOLUME ON FULL WITH NO SIGNAL — DIAL TUNED TO 540 KC.

BOTTOM VIEW OF CHASSIS

HEATER VOLTAGES MEASURED ACROSS SOCKET TERMINALS. ALL OTHER VOLTAGES MEASURED BETWEEN SOCKET TERMINALS AND B- LUG.

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



REAR OF CHASSIS

*—Measured with vacuum tube voltmeter

FREQUENCY RANGES:

Standard Broadcast Band } 540-1650 KC.
Short Wave Band } 9-12 MC.

POWER SUPPLY:

117 volts
50-60 cycles A.C. or D.C.
30 watts

POWER OUTPUT:

Undistorted — 1.0 watts
Maximum — 1.6 watts

SPEAKER:

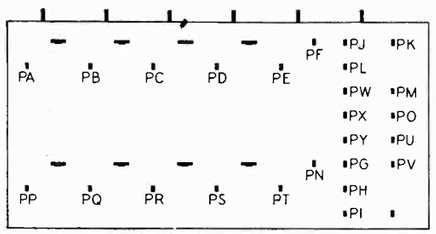
5 inch P-M Dynamic
Voice coil impedance—3.5 ohms

MODELS 4A21, 4A22
Adam

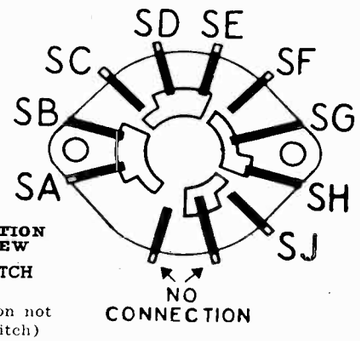
THE FIRESTONE TIRE & RUBBER CO.

PUSH-BUTTON RANGES:

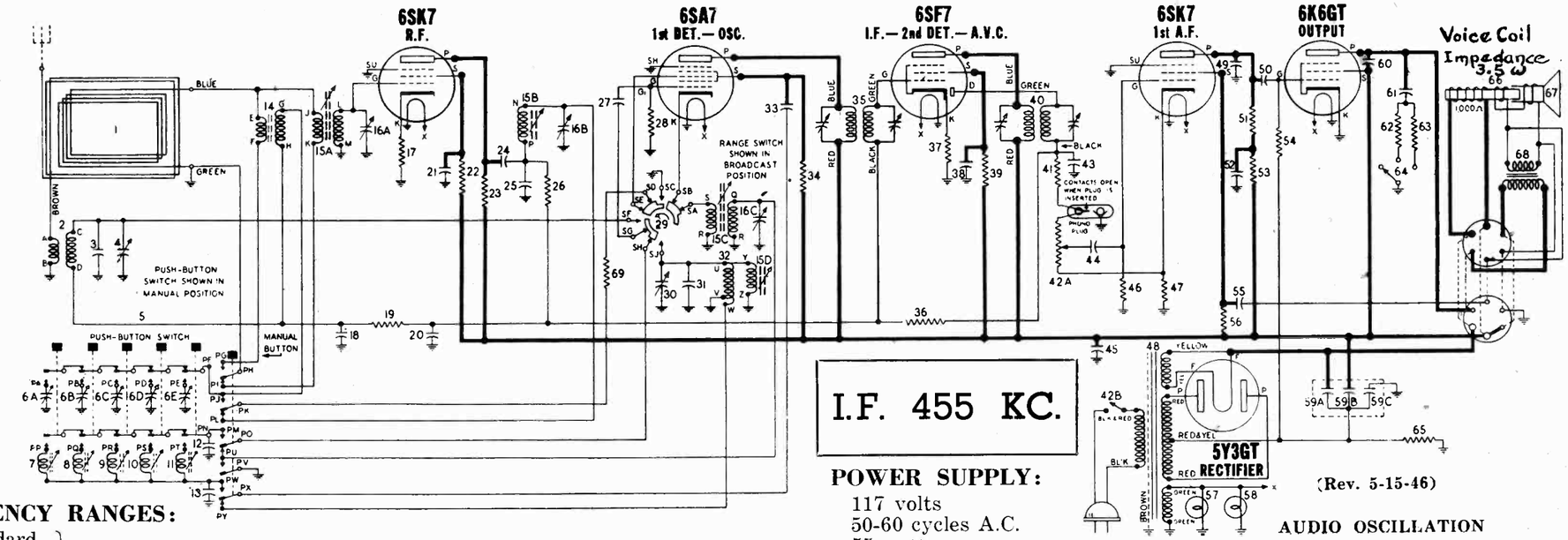
Button No. 1 —540-1000 KC.
Button No. 2 & 3—650-1300 KC.
Button No. 4 & 5—975-1600 KC.



PUSH-BUTTON SWITCH
502177



REAR SECTION REAR VIEW
BAND SWITCH
502147
(Front section not used as switch)



I.F. 455 KC.

POWER SUPPLY:

117 volts
50-60 cycles A.C.
55 watts

(Rev. 5-15-46)

FREQUENCY RANGES:

Standard Broadcast Band } 540-1600 KC.
Short Wave Band } 9.35-9.88 MC.

NOTE

The above circuit applies to chassis which have a letter "S" stamped on rear surface adjacent to model number. Early production chassis without the "S" designation do not contain Resistor No. 69.

If a broad tuning peak or a dead spot is encountered when attempting to align Broadcast Band oscillator trimmer No. 5 at 1600 Kc. (in chassis without "S" designation), this action is probably due to spurious oscillation resulting from extraneous coupling between leads. To prevent this condition, add Resistor No. 69 at position shown in above circuit.

AUDIO OSCILLATION

The audio system of this receiver utilizes a two stage type of inverse feed-back arrangement and, should it ever be necessary to replace the speaker or output transformer, it is important to maintain a definite phase relationship in the feed-back circuit. If the connections to the output transformer are reversed or if the feed-back connection is made to the wrong side of the output transformer secondary, the system will become regenerative instead of degenerative. Under those conditions audio oscillation may result. If that occurs, oscillation may be prevented by reversing the connections to the primary of the output transformer.

DIAGRAM NO.	PART NO.	DESCRIPTION	LIST PRICE
		CONDENSERS	
3	502884	Condenser—mica 120 Mmfd. 500 volt	$0.24
4	502171	Condenser—trimmer; 5 to 35 Mmfd.	.24
6A to E.	502910	Condenser—trimmer assem. for P-B tuner	3.00
12	502161	Condenser—mica 270 Mmfd. 500 volt	.45
13	502165	Condenser—mica 1,000 Mmfd. 500 volt	.45
16A, B, C	504086	Condenser—trimmer assembly A — 20 to 270 Mmfd. B — 40 to 370 Mmfd. C — 40 to 370 Mmfd.	1.10
18	502153	Condenser—.05 Mfd. 200 volt	.24
20	502155	Condenser—.1 Mfd. 200 volt	.30
21	502157	Condenser—.05 Mfd. 400 volt	.24
24	502271	Condenser—mica 260 Mmfd. 500 volt	.24
25	502165	Condenser—mica 1,000 Mmfd. 500 volt	.45
27	502159	Condenser—mica 50 Mmfd. 500 volt	.24
30	502172	Condenser—trimmer; 25 to 100 Mmfd.	.36
31	502159	Condenser—mica 50 Mmfd. 500 volt	.24
33	502151	Condenser—.01 Mfd. 400 volt	.20
38	502157	Condenser—.05 Mfd. 400 volt	.24
43	502271	Condenser—mica 260 Mmfd. 500 volt	.24
44	502150	Condenser—.004 Mfd. 600 volt	.20
45	502157	Condenser—.05 Mfd. 400 volt	.24
49	502160	Condenser—mica 110 Mmfd. 500 volt	.24
50	502152	Condenser—.02 Mfd. 400 volt	.24
52	502410	Condenser—.1 Mfd. 400 volt	.30
55	502405	Condenser—.25 Mfd. 400 volt	.36
59A, B, C	502207	Condenser—electrolytic A — 20 Mfd. 400 volt B — 10 Mfd. 400 volt C — 20 Mfd. 25 volt	2.20
60	502150	Condenser—.004 Mfd. 600 volt	.20
61	502154	Condenser—.05 Mfd. 600 volt	.24
		RESISTORS	
17	502127	Resistor—carbon 560 ohms ¼ watt	.12
19	502134	Resistor—carbon 470,000 ohms ¼ watt	.12
22	502132	Resistor—carbon 100,000 ohms ¼ watt	.12
23	502291	Resistor—carbon 4700 ohms ¼ watt	.12
26	502134	Resistor—carbon 470,000 ohms ¼ watt	.12
28	502130	Resistor—carbon 22,000 ohms ¼ watt	.12
34	502466	Resistor—carbon 33,000 ohms 1 watt	.16
36	502135	Resistor—carbon 2.2 Meg. ¼ watt	.12
37	502264	Resistor—carbon 47 ohms ¼ watt	.12
39	502467	Resistor—carbon 68,000 ohms ½ watt	.12
41	502131	Resistor—carbon 47,000 ohms ¼ watt	.12
42A, B	502148	Volume control 500,000 ohms (with switch)	1.25
46	502468	Resistor—carbon 4.7 Meg. ¼ watt	$ .12
47	502128	Resistor—carbon 2200 ohms ¼ watt	.12
51	502133	Resistor—carbon 220,000 ohms ¼ watt	.12
53	502132	Resistor—carbon 100,000 ohms ¼ watt	.12
54	502134	Resistor—carbon 470,000 ohms ¼ watt	.12
56	502135	Resistor—carbon 2.2 Meg. ¼ watt	.12
62	502291	Resistor—carbon 4700 ohms ¼ watt	.12
63	502127	Resistor—carbon 560 ohms ¼ watt	.12
65	502137	Resistor—wire wound 330 ohms 2 watt	.25
69	502264	Resistor—carbon 47 ohms ¼ watt	.12
		COILS & TRANSFORMERS	
1	502247	Loop antenna	4.15
2	504296	Coil—S. W. antenna	1.35
	502025	Complete coil and trimmer assembly for push-button tuner	8.80
7	502907	Coil less slug (540-1000 Kc.)	1.50
8, 9	502908	Coil less slug (650-1300 Kc.)	1.50
10, 11	502909	Coil less slug (975-1600 Kc.)	1.50
	502911	Slug for coils, 502907, 502908, 502909	.25
	501151	Clip—for mtg. push-button coils	.08
14	502112	Coil—B.C. antenna (for push-button)	1.70
15 (A, B, C, D)	504294	Tuning unit; complete assembly	10.60
15A	504210	Coil—B.C. antenna coupling (less slug)	1.20
15B	504214	Coil—R.F. (less slug)	.85
15C	504295	Coil—B.C. oscillator (less slug)	1.00
15D	504342	Coil—S.W. oscillator (less slug)	.75
	504211	Slug for B.C. antenna coupling or S.W. osc. coil (yellow end)	.45
	504213	Slug for B.C. oscillator coil (white end)	.45
	504215	Slug for R.F. coil (purple end)	.45
32	502111	Coil—S.W. oscillator (air core)	1.10
35	502102	Transformer—1st I.F.	2.30
40	502103	Transformer—2nd I.F.	2.30
48	502174	Transformer—power	7.50
68	502170	Transformer—output for R-502168 speaker	2.00
	504061	Transformer—output for M-502168 speaker	2.00
	504122	Transformer—output for D-502168 speaker	2.00
		OTHER ELECTRICAL PARTS	
5	502177	Switch—push button	4.10
29	502147	Switch—band	2.00
57, 58	110629	Lamp—dial (Mazda #44) 6.3 V 0.25 Amps.	.15
64	502146	Switch—tone control	.70
66	502168	Speaker—Electro-Dynamic (6 inch)	9.50
67	502169	Cone & voice coil for R-502168 speaker	2.75
	504062	Cone & voice coil for M-502168 speaker	2.75
	504123	Cone & voice coil for D-502168 speaker	2.75
		MISCELLANEOUS PARTS	
	502249	Back for cabinet	$0.80
	502229	Background for dial	.16
	116467	Base for mtg. electrolytic condenser	.04
	502194	Cabinet (Model 4-A-21)	14.10
	502195	Cabinet (Model 4-A-22)	14.10
	119739	Call letter tabs for push-buttons	.48
	119559	Clamp—dial glass	.08
	112745	Clip—coil mtg.	.01
	114955	Clip—retainer on end of dial cord	.01
	116563	Connector—antenna leads	.01
	117057	Cord—dial drive (54 in. required) per ft.	.05
	504292	Dial scale—glass	1.10
	500283	Escutcheon—(Model 4-A-22)	1.15
	501496	Escutcheon—(Model 4-A-21)	1.15
	502704	Knob—volume or tuning (Model 4-A-21)	.16
	502705	Knob—tone or band switch (Model 4-A-21)	.20
	502706	Knob—volume or tuning (Model 4-A-22)	.16
	502707	Knob—tone or band switch (Model 4-A-22)	.20
	504097	Plug—speaker	.25
	502601	Pointer	.18
	501497	Push-button (Model 4-A-21)	.15
	501651	Push-button (Model 4-A-22)	.15
	81145	Retaining ring for tuning shaft	.01
	119087	Ring for dial cord	.01
	85078	Rubber grommet for mtg. B.C. Ant. Coupling and R.F. coils	.03
	116584	Rubber spacer for mtg. dial scale	.02
	504045	Rubber grommet for mtg. S.W. osc. and B.C. Osc. coils	.04
	83552	Screw—No. 10x⅞"; for mtg. chassis	.03
	114914	Screw—No. 2x3/8"; for mtg. escutcheon	.02
	501777	Screw—No. 4x½"; for mtg. loop & back	.02
	118606	Shaft—tuning control	.18
	112818	Socket—dial lamp with lead	.10
	116690	Socket—octal base	.12
	160392	Socket—octal (rectifier)	.16
	502210	Socket—speaker	.25
	161384	Spring—dial cord tension	.06
	504012	Spring—tuning slug drive cord	.05
	119911	Terminal strip—phono	.16
	111456	Washer—spring washer for tuning shaft	.005
	500487	Washer—felt; for knobs	.01

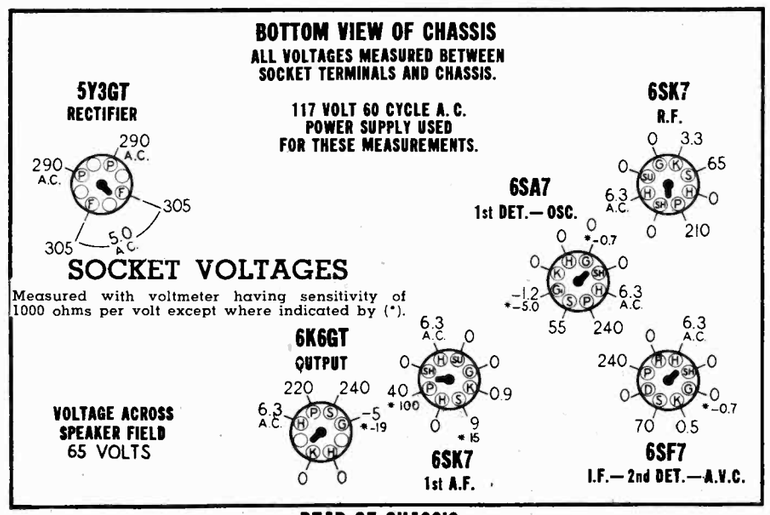
PRICES SUBJECT TO CHANGE WITHOUT NOTICE

POWER OUTPUT:

Undistorted — 2.3 watts
Maximum — 4.0 watts

VOLUME ON FULL WITH NO SIGNAL
BAND SWITCH IN BROADCAST POSITION

DIAL TUNED TO 540 KC.
MANUAL BUTTON PUSHED IN

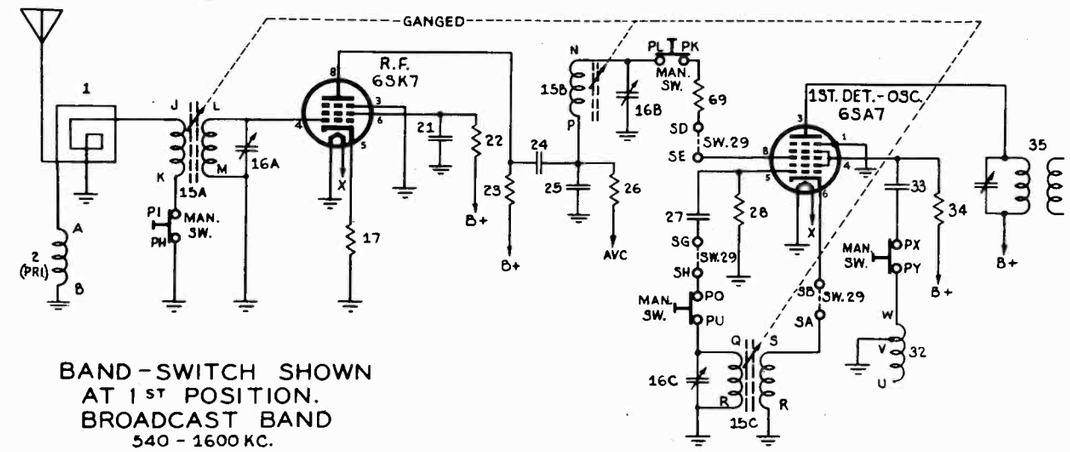


REAR OF CHASSIS

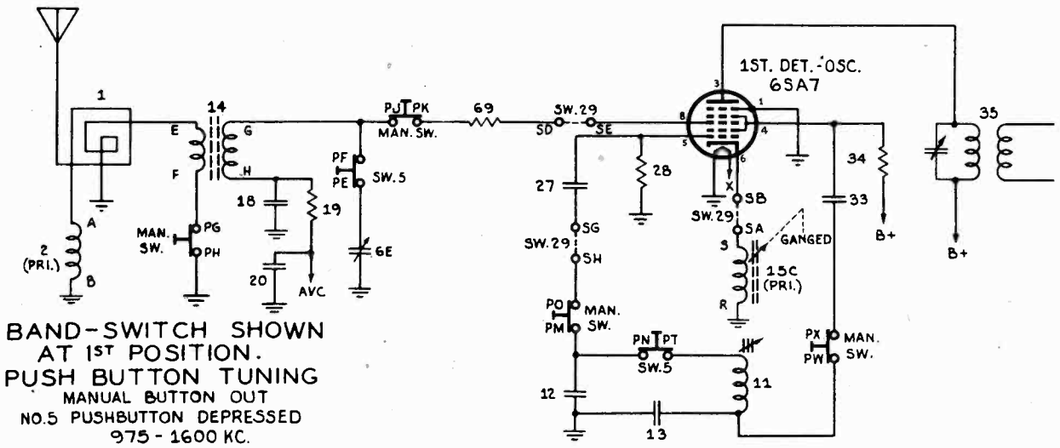
NOTE:—The 6K6GT grid bias of —19 volts can be measured across resistor No. 65.
*—Measured with vacuum tube voltmeter.

MODELS 4A21,4A22,
Adam

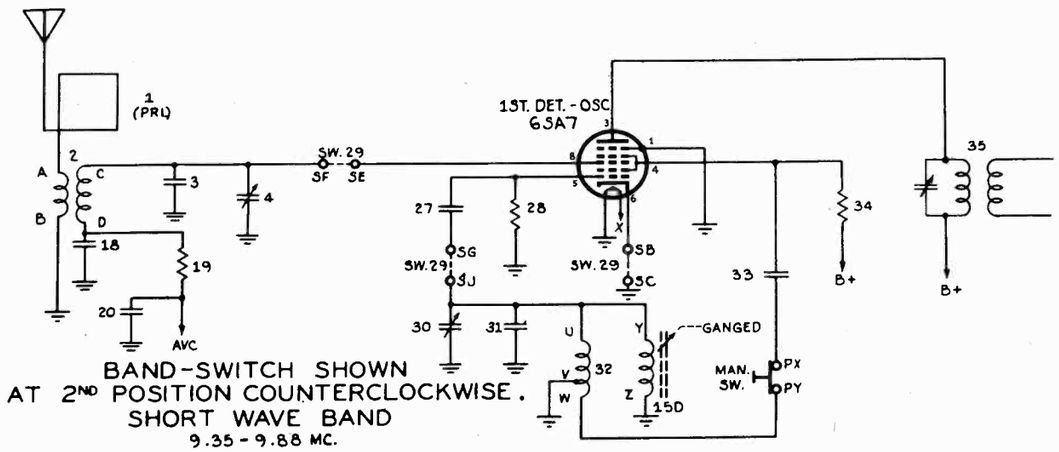
THE FIRESTONE TIRE & RUBBER CO.



BAND-SWITCH SHOWN
AT 1ST POSITION.
BROADCAST BAND
540 - 1600 KC.



BAND-SWITCH SHOWN
AT 1ST POSITION.
PUSH BUTTON TUNING
MANUAL BUTTON OUT
NO.5 PUSHBUTTON DEPRESSED
975 - 1600 KC.



BAND-SWITCH SHOWN
AT 2ND POSITION COUNTERCLOCKWISE.
SHORT WAVE BAND
9.35 - 9.88 MC.

MODELS 4A21,4A22
Adam

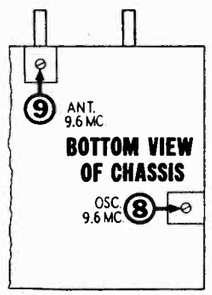
THE FIRESTONE TIRE & RUBBER CO.

ALIGNMENT PROCEDURE

1. Remove chassis and loop antenna from cabinet (do not remove loop of wire stapled to cabinet). After chassis has been removed, replace loop antenna in cabinet. Stand the chassis on one end and space it approximately same distance from loop as when installed in cabinet. Then reconnect all leads to loop antenna and to loop of wire stapled on cabinet.
2. Turn the tuning control knob clockwise as far as it will go (tuner mechanism is now in maximum open position with tuning slugs almost completely withdrawn from coils). Dial pointer should then point to 1600 KC mark on scale. If it is set incorrectly, release pointer clip on dial cord and reposition pointer.
3. Connect output meter across speaker voice coil or from 6K6GT plate to chassis through a .1 Mfd. condenser.
4. Connect the ground lead of the signal generator to the receiver chassis.
5. Set volume control at maximum volume position and use a weak signal from the signal generator.
6. Push in the manual button and leave it in that position throughout the alignment procedure.

IMPORTANT:—Align this receiver in exactly the order shown below.

DUMMY ANT. IN SERIES WITH SIGNAL GENERATOR	CONNECT HIGH SIDE OF SIGNAL GENERATOR TO	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POSITION	RECEIVER DIAL SETTING	TRIMMER NUMBER	TRIMMER DESCRIPTION	TYPE OF ADJUSTMENT
Set tuner mechanism to maximum open position by turning the tuning control knob clockwise as far as it will go (Dial pointer at 1600 KC). Then check whether the positions of the tuning slugs correspond to the positions shown in Fig. 2. If settings are incorrect, rotate the individual core and threaded stem until desired position is reached. Note that threaded stem is prevented from moving by a dab of speaker cement at top and this seal must be removed before stem can be rotated.							
.1 MFD. Condenser	Terminal "N" on Tuner Unit (See Fig. 2).	455 KC	Broadcast (Clockwise)	Any point where it does not affect the signal.	1-2	2nd I.F.	Adjust for maximum output. Then repeat adjustment.
					3-4	1st I.F.	
500 MMFD. Mica Condenser	External Antenna Clip on Loop Frame	1600 KC	Broadcast (Clockwise)	1600 Kc.	5	Broadcast Oscillator	Adjust for maximum output.
				Tune to 1600 Kc. generator signal.	6	Broadcast R.F.	Adjust for maximum output.
					7	Broadcast Ant.	Adjust for maximum output.
500 MMFD. Mica Condenser	External Antenna Clip on Loop Frame	1400 KC	Broadcast (Clockwise)	Set pointer to 1400 Kc. mark on dial scale. Do not attempt to tune to generator signal.	BC. Osc. coil tuning slug		Adjust position of slug for maximum output.
					BC. R.F. coil tuning slug		Adjust position of slug for maximum output.
					BC. Ant. coil tuning slug		Adjust position of slug for maximum output.
500 MMFD. Mica Condenser	External Antenna Clip on Loop Frame	1600 KC	Broadcast (Clockwise)	Set pointer to 1600 Kc. mark on dial scale. Do not attempt to tune to generator signal.	5	Broadcast Oscillator	Adjust for maximum output.
				Tune to 1600 Kc. generator signal.	6	Broadcast R.F.	Adjust for maximum output.
					7	Broadcast Antenna	Adjust for maximum output.
500 MMFD Mica Condenser	External Antenna Clip on Loop Frame	1400 KC	Broadcast (Clockwise)	Tune to 1400 Kc. generator signal.	BC. R.F. coil tuning slug		Adjust position of slug for maximum output.
					BC. Ant. coil tuning slug		Adjust position of slug for maximum output.
400 OHM Carbon Resistor	External Antenna Clip on Loop Frame	9.6 MC	Short wave (Counter-Clockwise)	9.6 Mc.	8	S.W. Oscillator	Adjust for maximum output. Check to see if proper peak was obtained by setting the signal generator to 10.5 Mc. and then tune radio in vicinity of 9.6 Mc. If image signal is not heard, realign at 9.6 Mc. with trimmer screw farther out. Recheck image.
400 OHM Carbon Resistor	External Antenna Clip on Loop Frame	9.6 MC	Short wave (Counter-Clockwise)	Tune to 9.6 Mc. generator signal.	9	S.W. Antenna	Adjust for maximum output. Try to increase output by detuning trimmer and retuning receiver dial until maximum output is obtained.
Apply a coating of speaker cement at top of each tuning core stem to prevent movement.							



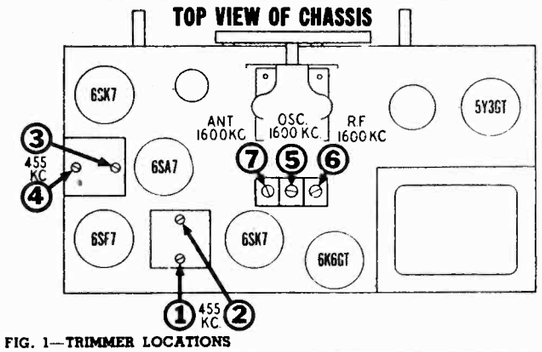


FIG. 1—TRIMMER LOCATIONS

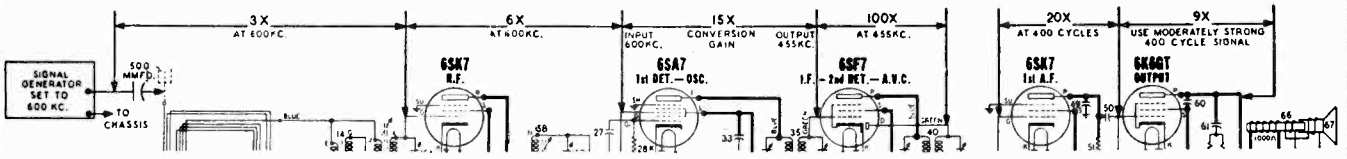
THE FIRESTONE TIRE & RUBBER CO. MODELS 4A21, 4A22 Adam

APPROXIMATE STAGE GAIN DATA

Be sure R.F. and I.F. stages are accurately aligned before measuring gain. R.F. gains can be measured with a "channel" type instrument containing a tuned and calibrated R.F. amplifier. A vacuum tube voltmeter may be used for audio gain measurements. Observe following precautions:

1. For all gain measurements connect signal generator as shown. Use 600 KC. signal with 400 cycle modulation (use nearby frequency if local station interferes.)
2. For R.F. and I.F. measurements connect negative terminal of a 3 volt battery (two 1½ volt cells in series) to A.V.C. lead at terminal "D" of S.W. Ant. coil. Then connect positive battery lead to receiver chassis. This provides a definite operating point. IMPORTANT: Disconnect battery when measuring audio stage gains.
3. Be sure radio is carefully tuned to generator signal (use weak signal for sharp tuning.)
4. When using a "channel" type instrument carefully tune it for maximum output at desired frequency before making measurements.

The R.F. and I.F. stage gains shown below are less than under normal operating conditions due to the use of 3 volts fixed bias in order to establish a definite operating point. Therefore, these values are not intended to indicate the full capability of a stage.



Differences in tube characteristics, tolerance of parts, adjustment of tuned circuits, and variations of line voltage will influence stage gain. Accuracy of measurements is dependent upon careful tuning of receiver to generator signal and experience in using your test equipment. These factors may create considerable variation in gain measurements.

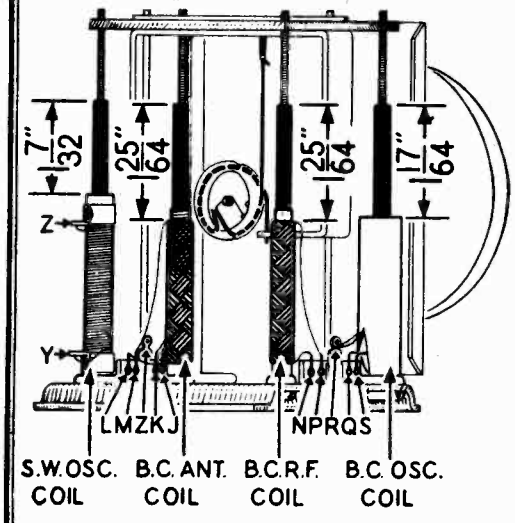
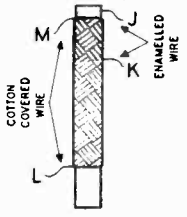


FIG. 2—SLUG TUNER ASSEMBLY (Rear View)

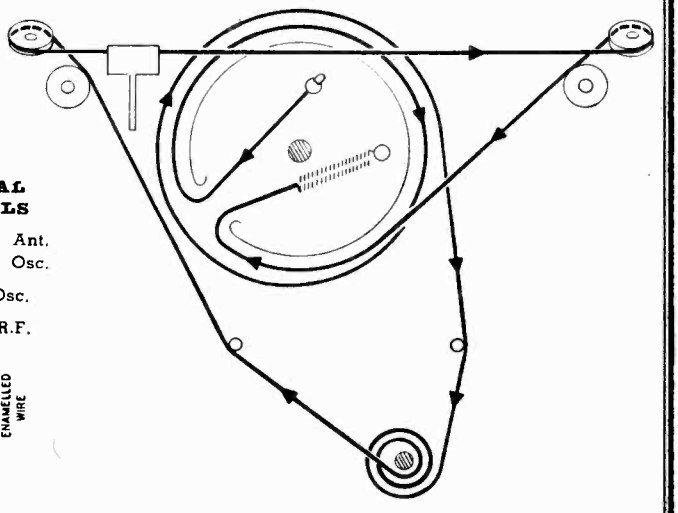
(Drive Parts)
117057 Cord (8")
114955 Clip on cord
504012 Spring

SLUGS FOR MANUAL TUNING COILS

504211—For B.C. Ant. and S.W. Osc.
504213—For B.C. Osc.
504215—For B.C. R.F.



B.C. ANTENNA COUPLING COIL 504210

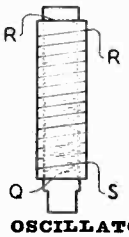


DIAL AND POINTER DRIVE CORD ARRANGEMENT

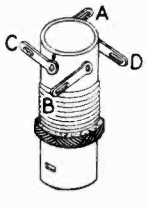
To string dial cord, turn the main drive drum to maximum **counter-clockwise** position and use following parts:

114955 Clip on end of cord
117057 Cord (54 inches)
119087 Ring for dial cord
161384 Tension Spring

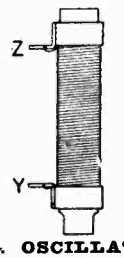
B.C. R.F. COIL 504214



B.C. OSCILLATOR COIL 504295

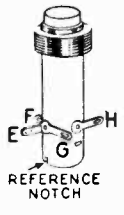


S.W. ANTENNA COUPLING COIL 504296



S.W. OSCILLATOR COIL 504342

S.W. OSCILLATOR COIL 502111



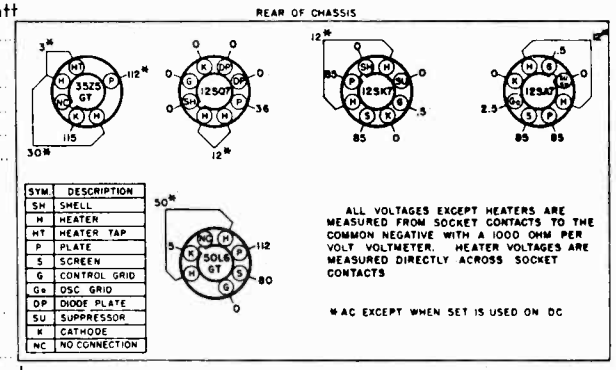
B.C. ANT. COUPLING COIL (PUSH-BUTTON) 502112

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

Ill. No.	Part No.	Part Name	Description
1	20E24	Antenna	Loop
2	20E21	Coil	1st I.F. Transformer
3	20E22	Coil	2nd I.F. Transformer
4	20E13	Coil	Oscillator
5	24E2	Condenser	Tuning, 2 Gang (3 Hole Mtg.)
	or		
5	24E18	Condenser	Tuning, 2 Gang (2 Hole Mtg.)
7	**25E1**	**Condenser**	**Dry Electrolytic, 50-50 Mfd. 150 V.**
9	23E416	Condenser	Tubular, .05 Mfd. 400 Volts
10	23E218	Condenser	Tubular, .1 Mfd. 200 Volts
11	23E211	Condenser	Tubular, .01 Mfd. 200 Volts
12	23E211	Condenser	Tubular, .01 Mfd. 200 Volts
13	23E211	Condenser	Tubular, .01 Mfd. 200 Volts
14	23E39	Condenser	Mica, .0001 Mfd.
15	23E39	Condenser	Mica, .0001 Mfd.
16	23E39	Condenser	Mica, .0001 Mfd.

Ill. No.	Part No.	Part Name	Description
17	27E106	Resistor	Carbon, 10 Megohm 1/3 Watt
18	27E335	Resistor	Carbon, 3.3 Megohm 1/3 watt
19	27E335	Resistor	Carbon, 3.3 Megohm 1/3 Watt
20	27E474	Resistor	Carbon, 470,000 Ohm, 1/3 Watt
21	27E224	Resistor	Carbon, 220,000 Ohm 1/3 Watt
23	27E223	Resistor	Carbon, 22,000 Ohm 1/3 Watt
24	27E222-3	Resistor	Carbon, 2,200 Ohm 1 Watt
25	27E151	Resistor	Carbon, 150 Ohm 1/3 Watt
26	27E101	Resistor	Carbon, 100 Ohm 1/3 Watt
27	27E470-2	Resistor	Carbon, 47 Ohm 1/2 Watt
30	1E9	Speaker	5" PM
31	**28E1**	**Volume Control**	**With S.P.S.T. Switch**
32	22E2	Transformer	Output for Speaker
40	23E39	Condenser	Mica, .0001 Mfd.
42	27E683	Resistor	Carbon, 68,000 Ohm, 1/3 W.

VOLTAGE READINGS AND PARTS LIST FOR MODEL 4 A 25



VOLTAGE TABLE
(BOTTOM VIEW OF CHASSIS)

MISCELLANEOUS PARTS

Part No.	Part Name	Description
7E76-2	**Cabinet**	**Ivory Plastic**
7E83	Cabinet Back	For Ivory Plastic Cabinet
41E1	Cord	6 Ft. Rubber Line Cord
20E12	Dial Plate Assem.	Dial Back Plate Assem. Less Scale
4E1	Dial Cord	30" of 18 lb. Dial Drive Cord
36E23	Dial Scale	Calibrated Scale
68E1	Dial Shaft	Drive Shaft

Part No.	Part Name	Description
19E3	Dial Shaft Bearing	Bearing for Drive Shaft
35E8	Dial Pointer	Dial Indicator
65E2	Dial Spring	Tension Spring For Drive Cord
37E27-19	Knob	For Ivory Cabinet
20E43	Pilot Lamp Socket	Pilot Lamp Socket Assembly
40E1	**Pilot Lamp**	**6-8 Volt .150 Amp. Type 47 Lamp**

SETTING-UP THE PUSH-BUTTONS MODELS 4A21 AND 4A22

1. Set band switch to "AM" position and allow set to operate 15 minutes before making adjustments.

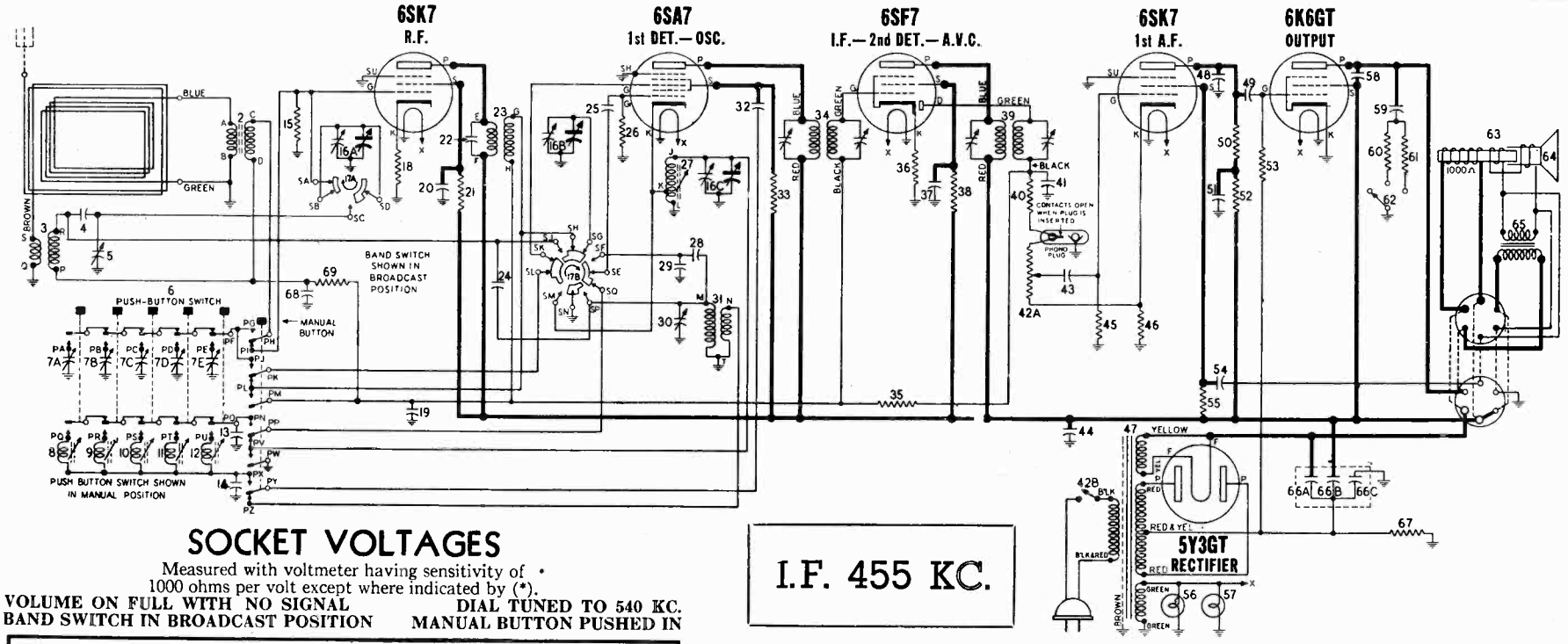
2. Note two rows of adjusting screws on back of radio chassis (visible and accessible through opening in cabinet back). Each **vertical pair** of adjusting screws is used to tune in a station for one of the push-buttons. A label under the row of screws specifies the frequency or tuning range that each screw will cover.

3. Select five powerful stations, each of which falls within the frequency range of the adjusting screw to be used to tune in that station.

4. Push in "MANUAL" button and listen to the program of the lowest frequency station you selected.

5. Now push in the first button **on the left.** Return to rear of radio and use vertical pair of adjusting screws **on extreme right** to tune in the same station. Adjust bottom screw first until desired station is heard. If station is not heard, change setting of top screw to a position where the slight static noise or rushing sound is the loudest. Then try adjusting bottom screw again; repeat this procedure until desired station is found. After locating station, carefully set bottom screw for deepest tone and top screw for maximum volume.

6. The set-up of the first push-button is now complete. Use a similar procedure to set-up the remaining buttons.



SOCKET VOLTAGES

Measured with voltmeter having sensitivity of 1000 ohms per volt except where indicated by (*).

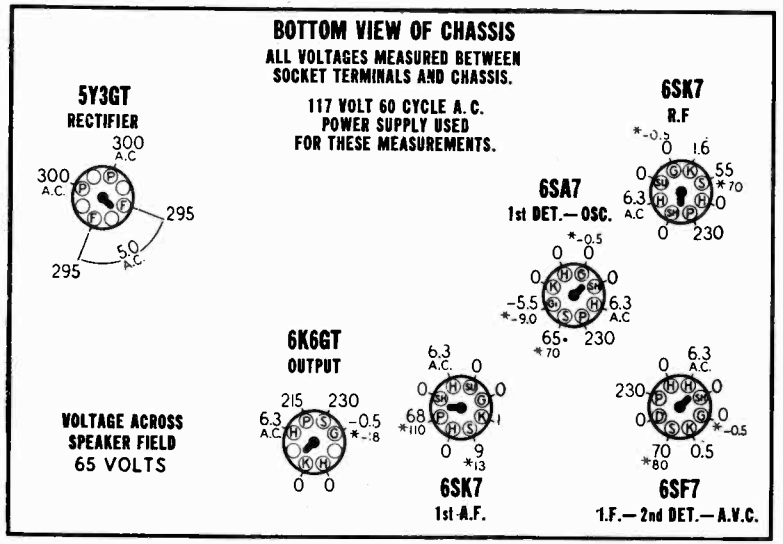
VOLUME ON FULL WITH NO SIGNAL — DIAL TUNED TO 540 KC.
BAND SWITCH IN BROADCAST POSITION — MANUAL BUTTON PUSHED IN

I.F. 455 KC.

BOTTOM VIEW OF CHASSIS

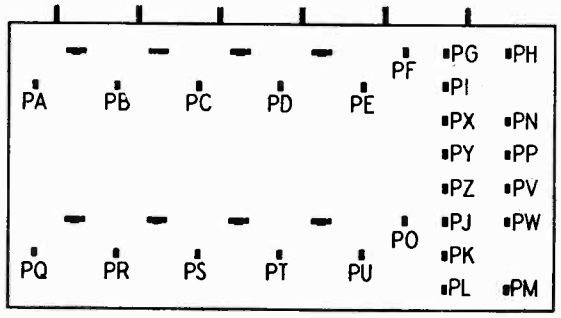
ALL VOLTAGES MEASURED BETWEEN SOCKET TERMINALS AND CHASSIS.

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



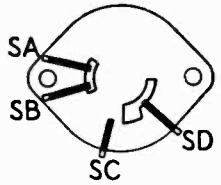
REAR OF CHASSIS

NOTE:—The 6K6GT grid bias of — 18 volts can be measured across resistor No. 67.
*—Measured with vacuum tube voltmeter.

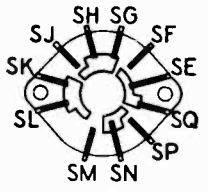


PUSH-BUTTON SWITCH
502177

LETTERED TERMINALS IN ILLUSTRATIONS CORRESPOND TO SIMILARLY LETTERED TERMINALS ON THE CIRCUIT DIAGRAM.



FRONT SECTION
REAR VIEW



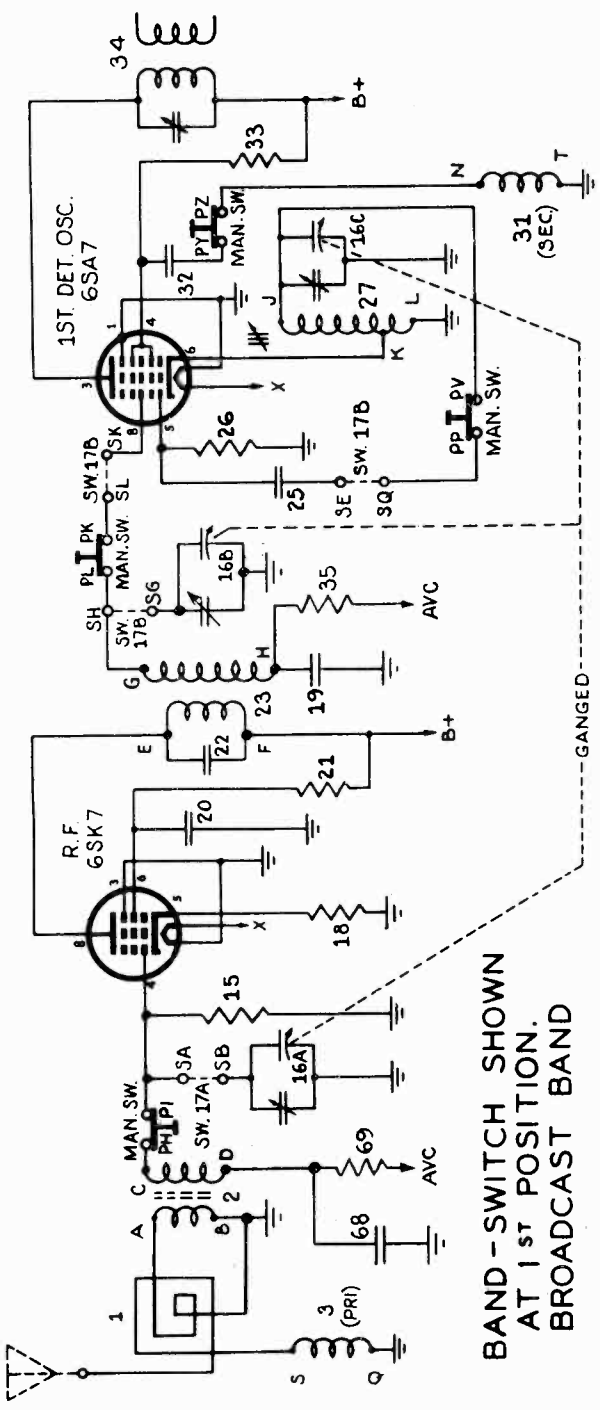
REAR SECTION
REAR VIEW

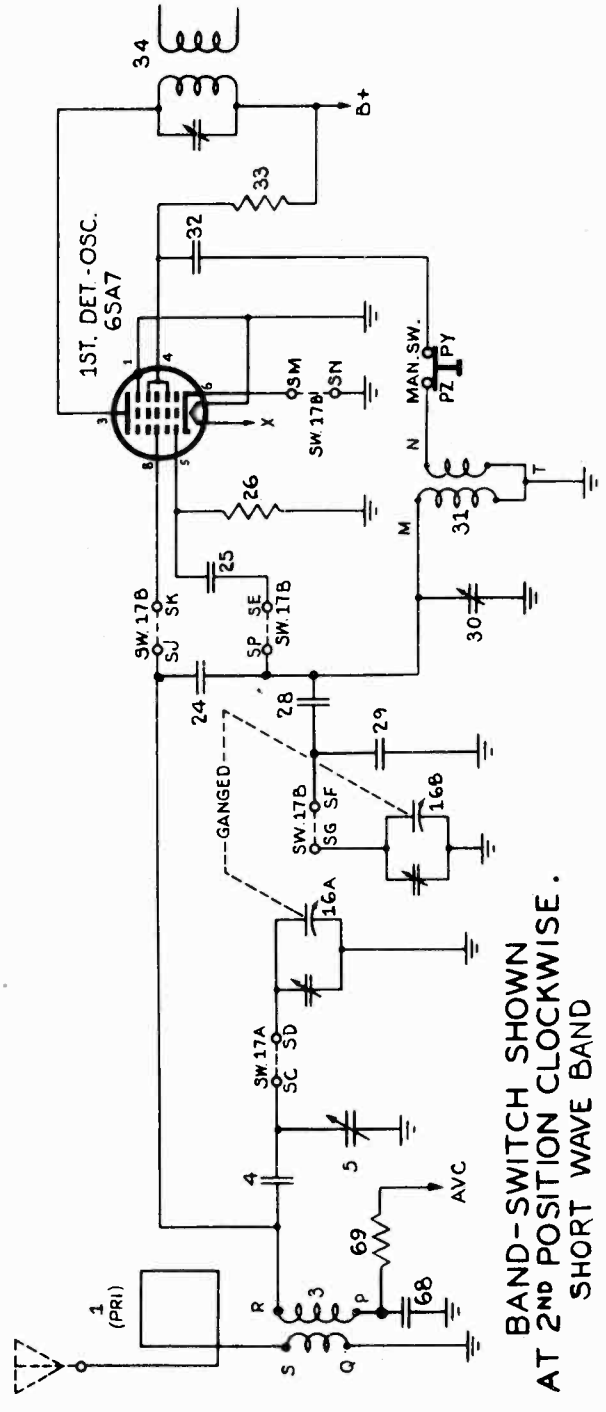
BAND SWITCH
502147

Oct. 1, 1946

MODELS 4A21X, 4A22X

THE FIRESTONE TIRE & RUBBER CO.





MODELS 4A21X, 4A22X

THE FIRESTONE TIRE & RUBBER CO.

ALIGNMENT PROCEDURE

1. Remove chassis and loop antenna from cabinet (do not remove loop of wire stapled to cabinet). After chassis has been removed, replace loop antenna in cabinet. Stand the chassis on one end and space it approximately same distance from loop as when installed in cabinet. Then reconnect all leads to loop antenna and to loop of wire stapled on cabinet.

2. With the gang condenser fully meshed, dial pointer should be in the position indicated by the last division below 55 on the dial. If it is set incorrectly, release pointer clip on dial cord and reposition pointer.

3. Connect output meter across speaker voice coil or from plate of 6K6GT tube to chassis through a .1 Mfd. condenser.

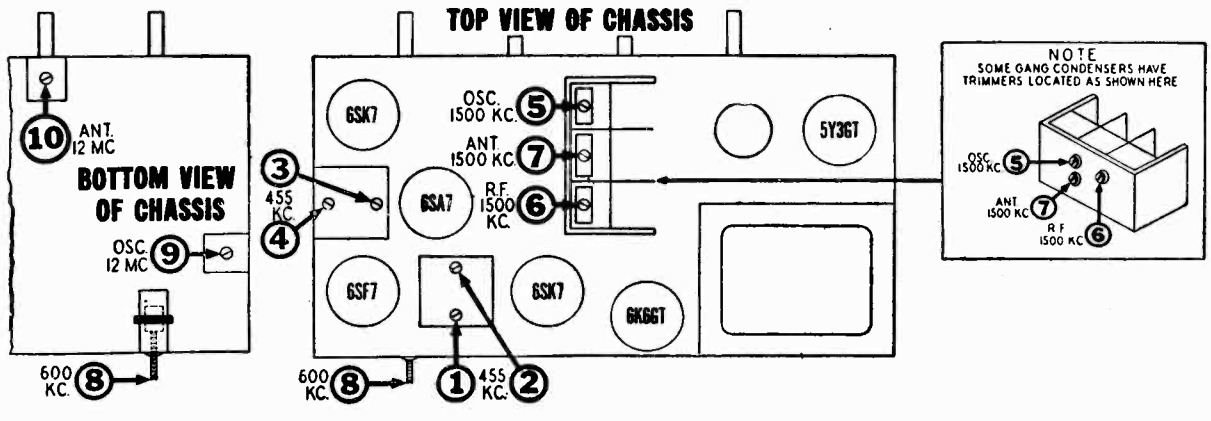
4. Connect the ground lead of the signal generator to the receiver chassis.

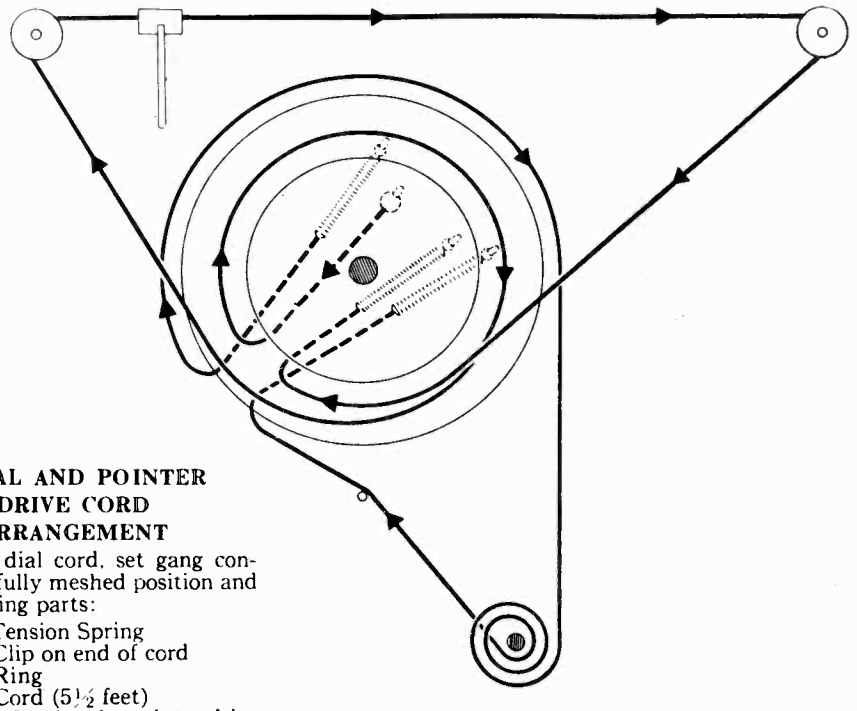
5. Set volume control at maximum volume position and use a weak signal from the signal generator.

6. Push in the manual button and leave it in that position throughout the alignment procedure.

IMPORTANT:—Align this receiver in exactly the order shown below. Broadcast band must be aligned before short wave band.

DUMMY ANT. IN SERIES WITH SIGNAL GENERATOR	CONNECT HIGH SIDE OF SIGNAL GENERATOR TO	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POSITION	RECEIVER DIAL SETTING	TRIMMER NUMBER	TRIMMER DESCRIPTION	TYPE OF ADJUSTMENT
.1 MFD. Condenser	Trimmer on rear section of gang	455 KC	Broadcast (Clockwise)	Any point where it does not affect the signal.	1-2	2nd I.F.	Adjust for maximum output. Then repeat adjustment.
					3-4	1st I.F.	
500 MMFD. Mica Condenser	External Antenna Clip on Loop Frame	1500 KC	Broadcast (Clockwise)	1500 KC	5	Broadcast Oscillator (Shunt)	Adjust for maximum output.
500 MMFD. Mica Condenser	External Antenna Clip on Loop Frame	1500 KC	Broadcast (Clockwise)	Tune to 1500 Kc. generator signal.	6	Broadcast R.F.	Adjust for maximum output.
500 MMFD. Mica Condenser	External Antenna Clip on Loop Frame	1500 KC	Broadcast (Clockwise)	Tune to 1500 Kc. generator signal.	7	Broadcast Antenna	Adjust for maximum output.
500 MMFD. Mica Condenser	External Antenna Clip on Loop Frame	600 KC	Broadcast (Clockwise)	Tune to 600 Kc. generator signal.	8	Adjustable core of Broadcast Oscillator Coil.	Adjust for maximum output. Try to increase output by rotating core in and out and retuning receiver dial until maximum output is obtained.
500 MFD. Mica Condenser	External Antenna Clip on Loop Frame	Repeat adjustment of trimmers 5, 6 and 7 at 1500 Kc. Then re-check adjustment of trimmer 8 at 600 Kc.					
400 OHM Carbon Resistor	External Antenna Clip on Loop Frame	12 MC	Short wave (Counter-Clockwise)	12 MC	9	S.W. Oscillator	Adjust for maximum output. Check to see if proper peak was obtained by tuning in image at approx. 11.1 MC. If image does not appear, realign at 12 MC, with trimmer screw farther out. Recheck image.
400 OHM Carbon Resistor	External Antenna Clip on Loop Frame	12 MC	Short wave (Counter-Clockwise)	Tune to 12 MC. generator signal.	10	S.W. Antenna	Adjust for maximum output. Try to increase output by detuning trimmer and retuning receiver dial until maximum output is obtained.





DIAL AND POINTER DRIVE CORD ARRANGEMENT

To string dial cord, set gang condenser to fully meshed position and use following parts:

113177 Tension Spring
114955 Clip on end of cord
119087 Ring
117057 Cord (5½ feet)
3 feet for pointer drive
2½ feet for tuning drive

POWER SUPPLY:

117 volts
50-60 cycles A.C.
55 watts

POWER OUTPUT:

Undistorted—2.3 watts
Maximum —3.5 watts

SPEAKER:

6 inch Electro-Dynamic
Voice coil impedance—3.5 ohms

BUILT-IN ANTENNA:

Noise reducing
low impedance loop

FREQUENCY RANGES:

Standard Broadcast Band	540-1725 KC.	Short Wave Band	9-12 MC.

PUSH-BUTTON RANGES:

Button No. 1 —540-1000 KC.
Button No. 2 & 3—650-1300 KC.
Button No. 4 & 5—975-1600 KC.

SETTING-UP THE PUSH-BUTTONS

1. Set band switch to "AM" position and allow set to operate 15 minutes before making adjustments.

2. Note two rows of adjusting screws on back of radio chassis (visible and accessible through opening in cabinet back). Each **vertical pair** of adjusting screws is used to tune in a station for one of the push-buttons. A label under the row of screws specifies the frequency or tuning range that each screw will cover.

3. Select five powerful stations, each of which falls within the frequency range of the adjusting screw to be used to tune in that station.

4. Push in "MANUAL" button and listen to the program of the lowest frequency station you selected.

5. Now push in the first button **on the left,** Return to rear of radio and use vertical pair of adjusting screws **on extreme right** to tune in the same station. Adjust bottom screw first until desired station is heard. If station is not heard, change setting of top screw to a position where the slight static noise or rushing sound is the loudest. Then try adjusting bottom screw again; repeat this procedure until desired station is found. After locating station, carefully set bottom screw for deepest tone and top screw for maximum volume.

6. The set-up of the first push-button is now complete. Use a similar procedure to set-up the remaining buttons.

MODELS 4A21X, 4A22X

THE FIRESTONE TIRE & RUBBER CO. MODEL 4A24

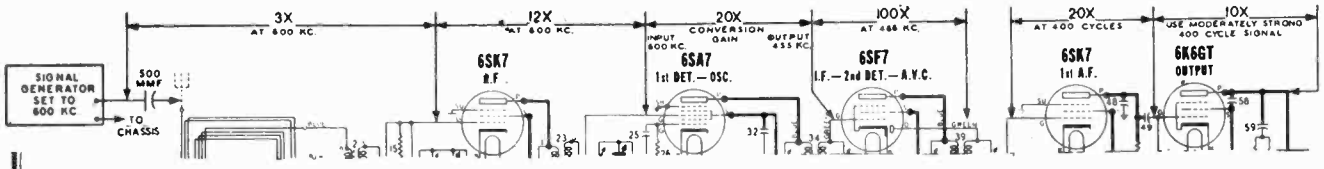
MODELS 4-A-21X, 4-A-22X

APPROXIMATE STAGE GAIN DATA

Be sure R.F. and I.F. stages are accurately aligned before measuring gain. R.F. gains can be measured with a "channel" type instrument containing a tuned and calibrated R.F. amplifier. A vacuum tube voltmeter may be used for audio gain measurements. Observe following precautions:

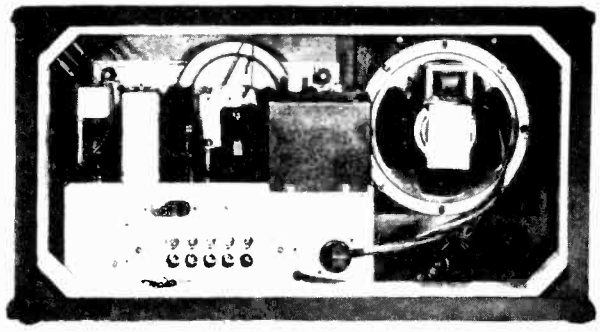
1. For all gain measurements connect signal generator as shown. Use 600 KC. signal with 400 cycle modulation (use nearby frequency if local station interferes.)
2. For R.F. and I.F. measurements connect negative terminal of a 3 volt battery (two $1\frac{1}{2}$ volt cells in series) to A.V.C. lead at terminal "P" of short wave antenna coil; then connect positive battery lead to chassis. This provides a definite operating point.
   IMPORTANT: Disconnect battery when measuring audio stage gains.
3. Be sure radio is carefully tuned to generator signal (use weak signal for sharp tuning.)
4. When using a "channel" type instrument carefully tune it for maximum output at desired frequency before making measurements.

The R.F. and I.F. stage gains shown below are less than under normal operating conditions due to the use of 3 volts fixed bias in order to establish a definite operating point. Therefore, these values are not intended to indicate the full capability of a stage.



AUDIO OSCILLATION

The audio system of this receiver utilizes a two stage type of inverse feed-back arrangement and, should it ever be necessary to replace the speaker or output transformer, it is important to maintain a definite phase relationship in the feed-back circuit. If the connections to the output transformer are reversed or if the feed-back connection is made to the wrong side of the output transformer secondary, the system will become regenerative instead of degenerative. Under those conditions audio oscillation may result. If that occurs, oscillation may be prevented by reversing the connections to the primary of the output transformer.

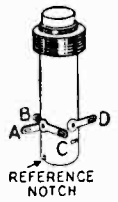


MODEL 4-A-24

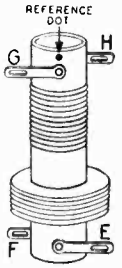
Illus. No.	Part No.	Part Name	Description
1	20E58	Cable	Battery, with 4 Prong Plug
2	20E32	Coil	Antenna
3	20E21	Coil	1st I.F. Transformer
4	20E35	Coil	2nd I.F. Transformer
5	20E77	Coil	Oscillator
6	24E4	Condenser	Tuning 2 Gang, 3 hole mounting
	or		
6	24E19	Condenser	Tuning 2 Gang, 2 hole mounting
7	**25E9**	**Condenser**	**Tubular, Dry Elect. 10 Mfd. 100 V.**
8	23E224	Condenser	Tubular, .5 Mfd. 200 V.
9	23E224	Condenser	Tubular, .5 Mfd. 200 V.
10	23E216	Condenser	Tubular, .05 Mfd. 200 V.
11	23E216	Condenser	Tubular, .05 Mfd. 200 V.
12	23E151	Condenser	Tubular, .01 Mfd. 120 V.
13	23E151	Condenser	Tubular, .01 Mfd. 120 V.
14	23E204	Condenser	Tubular, .001 Mfd. 200 V.
15	23E42	Condenser	Mica, .00025
16	23E11	Condenser	Fixed Ceramic, .0001 Mfd.
17	23E11	Condenser	Fixed Ceramic, .0001 Mfd.
18	27E475	Resistor	Carbon, 4.7 Megohm, 1/3 W.
19	27E335	Resistor	Carbon, 3.3 Megohm, 1/3 W.
20	27E106	Resistor	Carbon 10. Megohm, 1/3 W.
21	27E335	Resistor	Carbon, 3.3 Megohm, 1/3 W.
22	27E105	Resistor	Carbon, 1 Megohm, 1/3 W.
23	27E104	Resistor	Carbon, 100,000 Ohm, 1/3 W.
24	27E223	Resistor	Carbon, 22,000 Ohm, 1/3 W.
25	27E561	Resistor	Carbon, 560 Ohm, 1/3 W.
26	1E15	Speaker	6" P. M.
27	**28E15**	**Volume Control**	**With D.P.S.T. Switch**
28	**22E4**	**Transformer**	**Output**
29	27E470	Resistor	Carbon, 47 Ohm, 1/3 W.

MISCELLANEOUS PARTS

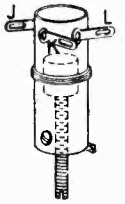
Part No.	Part Name	Description
7E57	Cabinet	Wood Table Model
4E1	Dial Cord	18 Lb. Drive Cord
65E2	Dial Cord Spring	Dial Cord Tension Spring
68E1	Dial Shaft	Drive Shaft
36E21	Dial Scale	Calibrated Scale
35E10	Dial Pointer	Dial Needle
36E20	Dial Indicator	"On-Off" Indicator
9E7	Dial Crystal	Clear Acetate Crystal
19E3	Dial Shaft Bearing	Bearing for Drive Shaft
65E3	Dial Indicator Spring	Tension Spring for "On-Off" Indicator
12E103-F10	Dial Shaft Washer	"C" Retainer Washer for Drive Shaft
37E30-1	Knob	
17E3-4	Plug	4-Prong Battery Plug
46E5	Throw Arm	Operates "On-Off" Indicator



BC. ANTENNA COUPLING COIL 502112

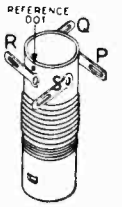


R.F. COIL 502113



BC. OSCILLATOR COIL 502114

S.W. OSCILLATOR COIL 502111



S.W. ANTENNA COIL 502110

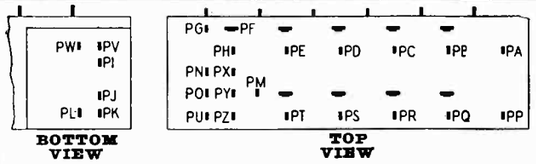
Lettered terminals in illustrations correspond to similarly lettered terminals on the circuit diagram.

DIAGRAM NO.	PART NO.	DESCRIPTION	LIST PRICE
		CONDENSERS	
4	502202	Condenser—ceramic 150 Mmfd. 500 volt	$0.50
5	502172	Condenser—trimmer; 25 to 100 Mmfd	.36
7A to E	502910	Condenser—trimmer assem. for P-B tuner	3.00
13	502161	Condenser—mica 270 Mmfd. 500 volt	.45
14	502165	Condenser—mica 1,000 Mmfd. 500 volt	.45
16A, B, C	502122	Condenser—variable gang	6.60
19	502155	Condenser—.1 Mfd. 200 volt	.30
20	502157	Condenser—.05 Mfd. 400 volt	.24
22	502295	Condenser—ceramic 10 Mmfd. 500 volt	.30
24	502411	Condenser—2 Mmfd. 500 volt	.10
25	502159	Condenser—mica 50 Mmfd. 500 volt	.24
28	502201	Condenser—ceramic 130 Mmfd. 500 volt	.50
29	502182	Condenser—ceramic 39 Mmfd. 500 volt	.40
30	502171	Condenser—trimmer; 5 to 35 Mmfd.	.24
32	502151	Condenser—.01 Mfd. 400 volt	.20
37	502157	Condenser—.05 Mfd. 400 volt	.24
41	502271	Condenser—mica 260 Mmfd. 500 volt	.30
43	502150	Condenser—.004 Mfd. 600 volt	.20
44	502157	Condenser—.05 Mfd. 400 volt	.24
48	502160	Condenser—mica 110 Mmfd. 500 volt	.24
49	502152	Condenser—.02 Mfd. 400 volt	.24
51	502410	Condenser—.1 Mfd. 400 volt	.30
54	502405	Condenser—.25 Mfd. 400 volt	.36
58	502150	Condenser—.004 Mfd. 600 volt	.20
59	502154	Condenser—.05 Mfd. 600 volt	.24
66A, B, C	502207	Condenser—electrolytic A—20 Mfd. 400 volt B—10 Mfd. 400 volt C—20 Mfd. 25 volt	2.20
68	502153	Condenser—.05 Mfd. 200 volt	.24
		RESISTORS	
15	502468	Resistor—carbon 4.7 Meg. ¼ watt	.12
18	502125	Resistor—carbon 220 ohms ¼ watt	.12
21	502132	Resistor—carbon 100,000 ohms ¼ watt	.12
26	502130	Resistor—carbon 22,000 ohms ¼ watt	.12
33	502466	Resistor—carbon 33,000 ohms 1 watt	.16
35	502135	Resistor—carbon 2.2 Meg. ¼ watt	12
36	502264	Resistor—carbon 47 ohms ¼ watt	.12
38	502467	Resistor—carbon 68,000 ohms ½ watt	.12
40	502131	Resistor—carbon 47,000 ohms ¼ watt	.12
42A, B	502148	Volume control 500,000 ohms (with switch)	$1.25
45	502468	Resistor—carbon 4.7 Meg. ¼ watt	.12
46	502128	Resistor—carbon 2200 ohms ¼ watt	.12
50	502133	Resistor—carbon 220,000 ohms ¼ watt	.12
52	502132	Resistor—carbon 100,000 ohms ¼ watt	.12
53	502134	Resistor—carbon 470,000 ohms ¼ watt	.12
55	502135	Resistor—carbon 2.2 Meg. ¼ watt	.12
60	502291	Resistor—carbon 4700 ohms ¼ watt	.12
61	502127	Resistor—carbon 560 ohms ¼ watt	.12
67	502137	Resistor—wire wound 330 ohms 2 watt	.25
69	503134	Resistor—carbon 470,000 ohms ¼ watt	.12
		COILS & TRANSFORMERS	
1	502247	Loop antenna	4.15
2	502112	Coil—B.C. antenna	1.70
3	502110	Coil—S.W. antenna	1.10
	502025	Complete coil and trimmer assembly for push-button tuner	8.80
8	502907	Coil less slug (540-1000 Kc.)	1.50
9, 10	502908	Coil less slug (650-1000 Kc.)	1.50
11, 12	502909	Coil less slug (975-1600 Kc.)	1.50
	502911	Tuning slug for coils, 502907, 502908, 502909	.25
	501151	Clip—for mtg. push-button coils	.08
23	502113	Coil—B.C. R.F.	1.85
27	502114	Coil—B.C. oscillator	1.45
31	502111	Coil—S.W. oscillator	1.10
34	502102	Transformer—1st I.F.	2.30
39	502103	Transformer—2nd I.F.	2.30
47	502174	Transformer—power	7.50
65	502170	Transformer—output for R-502168 spkr	2.00
	504061	Transformer—output for M-502168 spkr	2.00
	504122	Transformer—output for D-502168 spkr	2.00
		OTHER ELECTRICAL PARTS	
6	502177	Switch—push-button	4.10
17A, B	502147	Switch—band	2.00
56, 57	110629	Lamp—(Mazda No. 44) 6.3 V. 0.25 Amps.	.15
62	502146	Switch—tone control	.70
63	502168	Speaker—Electro-Dynamic (6 inch)	9.50
64	502169	Cone & voice coil for R-502168 spkr	2.75
	504062	Cone & voice coil for M-502168 spkr	2.75
	504123	Cone & voice coil for D-502168 spkr	2.75

PART NO.	DESCRIPTION	LIST PRICE
	MISCELLANEOUS PARTS	
502249	Back for cabinet	$0.80
502229	Background for dial	.16
116467	Base for mtg. electrolytic condenser	.04
502194	Cabinet for (Model 4-A-21X)	14.10
502195	Cabinet for (Model 4-A-22X)	14.10
119739	Call letter tabs for push-buttons	.48
119559	Clamp—for dial glass	.08
112745	Clip—coil mtg.	.01
114955	Clip—retainer on end of dial cord	.01
501151	Clip—for mtg. push-button coils	.08
116563	Connector—for antenna lead	.01
117057	Cord—dial drive (5½ ft. required) per ft.	.05
502218	Dial scale—glass	1.00
117029	Drum—for dial drive	.70
500283	Escutcheon (Model 4-A-22X)	1.15
501496	Escutcheon (Model 4-A-21X)	1.15
502704	Knob—volume or tuning (Model 4-A-21X)	.16
502706	Knob—volume or tuning (Model 4-A-22X)	.16
502705	Knob—tone or band switch (Mode 4-A-21X)	.20
502707	Knob—tone or band switch (Model 4-A-22X)	.20
504097	Plug for speaker	.25
502601	Pointer	.18
501497	Push-button (Model 4-A-21X)	.15
501651	Push-button (Model 4-A-22X)	.15
81145	Retaining ring for tuning shaft	.01
119087	Ring—for dial cord	.01
116584	Rubber spacer for mtg. dial scale	.02
83552	Screw—No. 10x⅞"; for mtg. chassis	.03
85827	Screw—No. 8-32 for dial drum	.02
114914	Screw—No. 2x⅜"; for mtg. escutcheon	.02
501777	Screw—No. 4x½"; for mtg. loop & back	.02
118606	Shaft—tuning control	.18
112818	Socket—dial lamp with lead	.10
116690	Socket—octal base	.12
160392	Socket—octal (rectifier)	.16
502210	Socket for speaker	.25
113177	Spring—dial cord tension	.09
119911	Terminal strip-phono	.16
111456	Washer—spring washer for tuning shaft	.005
119886	Washer—felt; for knobs	.005

PRICES SUBJECT TO CHANGE WITHOUT NOTICE

THE FIRESTONE TIRE & RUBBER CO.

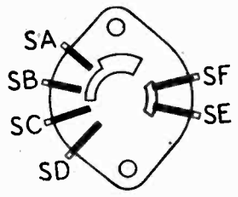


PUSH BUTTON SWITCH 502120

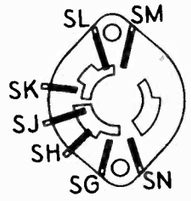
FREQUENCY RANGES:

Standard Broadcast Band	540-1725 KC.
Foreign Band	11.4-15.5 MC.
31-M Band	5.9-10.0 MC.

REAR SECTION REAR VIEW



FRONT SECTION REAR VIEW



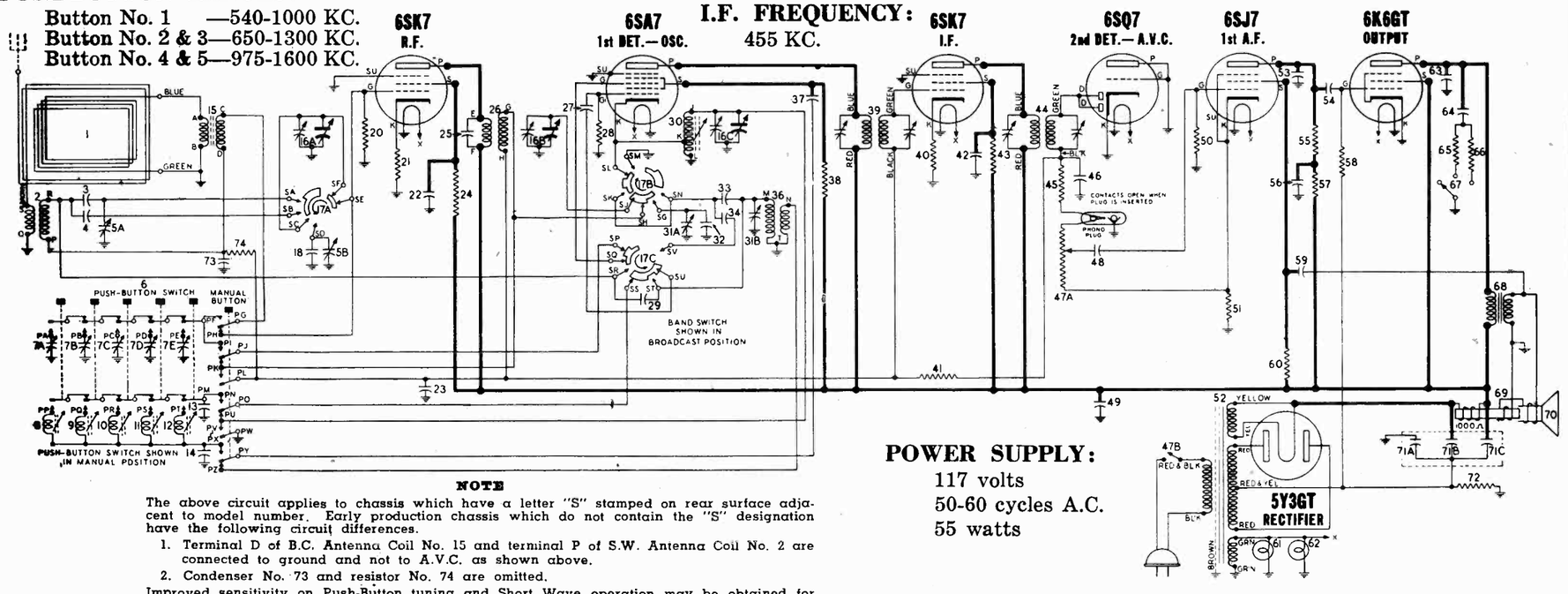
REAR SECTION FRONT VIEW

BAND SWITCH 502119

PUSH-BUTTON RANGES:

Button No. 1 —540-1000 KC.
Button No. 2 & 3—650-1300 KC.
Button No. 4 & 5—975-1600 KC.

I.F. FREQUENCY: 455 KC.



NOTE

The above circuit applies to chassis which have a letter "S" stamped on rear surface adjacent to model number. Early production chassis which do not contain the "S" designation have the following circuit differences.

1. Terminal D of B.C. Antenna Coil No. 15 and terminal P of S.W. Antenna Coil No. 2 are connected to ground and not to A.V.C. as shown above.
2. Condenser No. 73 and resistor No. 74 are omitted.

Improved sensitivity on Push-Button tuning and Short Wave operation may be obtained for chassis that do not contain the "S" designation by connecting coils No. 2 and No. 15 as shown on this page and adding parts No. 73 and No. 74.

POWER SUPPLY:

117 volts
50-60 cycles A.C.
55 watts

POWER OUTPUT:

Undistorted — 2.3 watts
Maximum — 3.5 watts

SPEAKER:

6 inch Electro-Dynamic
Voice coil impedance—3.5 ohms

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

DIAGRAM NO.	PART NO.	DESCRIPTION	LIST PRICE
		CONDENSERS	
3	502166	Condenser—ceramic 82 Mmfd. 500 volt	$0.30
4	502164	Condenser—mica 670 Mmfd. 500 volt	.70
5A, B	502109	Condenser—trimmer assembly Section A 2 to 15 Mmfd. Section B 10 to 40 Mmfd.	.65
7A to E	502910	Condenser—trimmer assem. for P-B tuner	3.00
13	502161	Condenser—mica 270 Mmfd. 500 volt	.45
14	502165	Condenser—mica 1,000 Mmfd. 500 volt	.45
16A, B, C	502122	Condenser—variable gang	6.60
18	502182	Condenser—ceramic 39 Mmfd. 500 volt	.40
22	502157	Condenser—.05 Mfd. 400 volt	.24
23	502155	Condenser—.1 Mfd. 200 volt	.30
25	502295	Condenser—ceramic 10 Mmfd. 500 volt	.30
27	502159	Condenser—mica 50 Mmfd. 500 volt	.24
29	502411	Condenser—2 Mmfd. 500 volt	.10
31A, B	502108	Condenser—trimmer assem. Section A 2 to 15 Mmfd. Section B 2 to 15 Mmfd.	.75
32	502182	Condenser—ceramic 39 Mmfd. 500 volt	.40
33	502167	Condenser—ceramic 68 Mmfd. 500 volt	.40
34	502163	Condenser—mica 430 Mmfd. 500 volt	.60
37	502151	Condenser—.01 Mfd. 400 volt	.20
42	502157	Condenser—.05 Mfd. 400 volt	.24
46	502271	Condenser—Mica 260 Mmfd. 500 volt	.30
48	502150	Condenser—.004 Mfd. 600 volt	.20
49	502157	Condenser—.05 Mfd. 400 volt	.24
53	502160	Condenser—mica 110 Mmfd. 500 volt	.24
54	502152	Condenser—.02 Mfd. 400 volt	.24
56	502410	Condenser—.1 Mfd. 400 volt	.30
59	502405	Condenser—.25 Mfd. 400 volt	.36
63	502150	Condenser—.004 Mfd. 600 volt	.20
64	502154	Condenser—.05 Mfd. 600 volt	.24
71A, B, C	502207	Condenser—Electrolytic A—20 Mfd. 25 volt B—20 Mfd. 400 volt C—10 Mfd. 400 volt	2.20
73	502153	Condenser—.05 Mfd. 200 volt	.24
		RESISTORS	
20	502468	Resistor—carbon 4.7 Meg. 1/4 watt	.12
21	502127	Resistor—carbon 560 Ohms 1/4 watt	.12
24	502132	Resistor—carbon 100,000 Ohms 1/4 watt	.12
28	502130	Resistor—carbon 22,000 Ohms 1/4 watt	.12
38	502466	Resistor—carbon 33,000 Ohms 1 watt	.16
40	502125	Resistor—carbon 220 Ohms 1/4 watt	.12
41	502135	Resistor—carbon 2.2 Meg. 1/4 watt	.12
43	502467	Resistor—carbon 68,000 Ohms 1/2 watt	.12
45	502131	Resistor—carbon 47,000 Ohms 1/4 watt	.12
47A, B	502117	Volume control 500,000 ohms (with switch)	1.25
50	502468	Resistor—carbon 4.7 Meg. 1/4 watt	.12
51	502128	Resistor—carbon 2200 Ohms 1/4 watt	.12
55	502133	Resistor—carbon 220,000 Ohms 1/4 watt	.12
57	502132	Resistor—carbon 100,000 Ohms 1/4 watt	.12
58	502134	Resistor—carbon 470,000 Ohm 1/4 watt	.12
60	502135	Resistor—carbon 2.2 Meg. 1/4 watt	.12
65	502291	Resistor—carbon 4700 Ohms 1/4 watt	.12
66	502127	Resistor—carbon 560 Ohms 1/4 watt	.12
72	502137	Resistor—wire wound 330 Ohms 2 watt	.25
74	502134	Resistor—carbon 470,000 Ohms 1/4 watt	.12
		COILS & TRANSFORMERS	
1	502186	Loop antenna	3.15
2	502110	Coil—S.W. antenna	1.10
	502025	Complete coil—trimmer assem. for P-B tuner	8.80
8	502907	Coil less slug (540-1000 Kc.)	1.50
9, 10	502908	Coil less slug (650-1300 Kc.)	1.50
11, 12	502909	Coil less slug (975-1600 Kc.)	1.50
	502911	Slug for coils 502907, 502908, 502909	.25
	501151	Clip—for mtg. push button coils	.08
15	502112	Coil—BC. antenna	1.70
26	502113	Coil—BC. R.F.	1.85
30	502114	Coil—BC. oscillator	1.45
36	502111	Coil—S.W. oscillator	1.10
39	502102	Transformer—1st I.F.	2.30
44	502103	Transformer—2nd I.F.	2.30
52	502174	Transformer—power	7.50
68	504206	Transformer—output for M-504205 speaker	2.00
	504208	Transformer—output for R-504205 speaker	2.00
	504124	Transformer—output for D-504205 speaker	2.00
		OTHER ELECTRICAL PARTS	
6	502120	Switch—push-button	4.00
17A, B, C	502119	Switch—band	2.80
61, 62	110629	Lamp—dial (Mazda 44) 6.3 V. 250 Ma.	.15
67	502118	Switch—tone control	.70
69	504205	Speaker—Electro-dynamic (6 inch)	9.00
70	504209	Cone & Voice coil for R-504205 speaker	3.00
	504207	Cone & Voice coil for M-504205 speaker	3.00
	504125	Cone & Voice coil for D-504205 speaker	3.00
		MISCELLANEOUS PARTS	
	502228	Background for dial	$0.15
	116467	Base for mtg. electrolytic condenser	.04
	502193	Cabinet	14.50
	502046	Cabinet back	.70
	117315	Call letter tabs for push-button	.55
	500420	Clamp—for dial glass	.15
	I12745	Clip—coil mtg.	.01
	114955	Clip—retainer on end of dial cord	.01
	501151	Clip—for mtg. push-button coils	.08
	116563	Connector—for antenna leads	.01
	117057	Cord—dial drive (102 in. required), per ft.	.05
	502215	Dial scale—glass	3.85
	113402	Drum—for dial drive	.70
	502699	Escutcheon for push-buttons	1.70
	502704	Knob—volume or tuning	.16
	502705	Knob—tone or band switch	.20
	160620	Pointer	.22
	501495	Push-button	.15
	81145	Retaining ring for tuning shaft	.01
	119087	Ring for dial cord	.01
	116584	Rubber spacer for mtg. dial scale	.02
	502702	Rubber spacer on frame behind escutcheon	.04
	83552	Screw—No. 10x7/8"; for mtg. chassis	.03
	85827	Screw—No. 8-32 for dial drum	.02
	501777	Screw—No. 4x1 1/2"; for mtg. loop & back	.02
	502116	Shaft—tuning control	.10
	114876	Socket—octal base (rectifier)	.15
	119791	Socket—octal base	.12
	500459	Socket—dial lamp (with mtg. bracket)	.15
	502980	Spacer for leads to push-button switch	.10
	113177	Spring—dial cord tension	.09
	119911	Terminal strip—phono	.16
	111456	Washer—spring; for tuning shaft	.005
	119886	Washer—felt; for knobs	.005

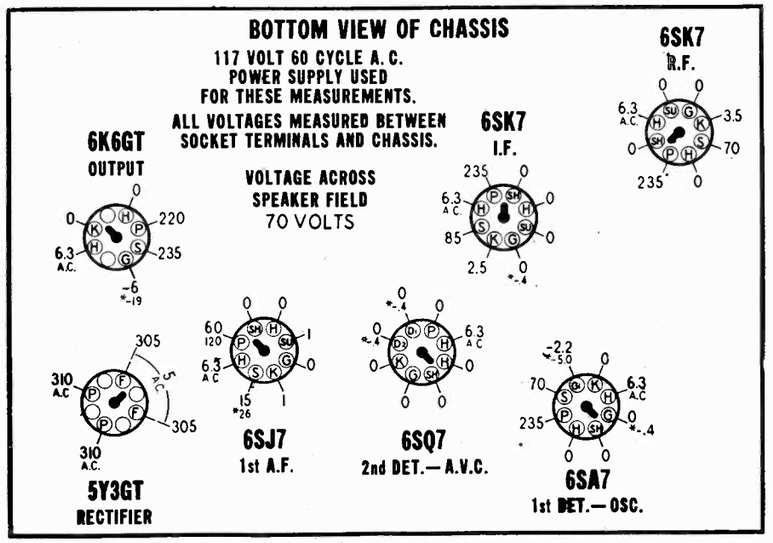
PRICES SUBJECT TO CHANGE WITHOUT NOTICE

SOCKET VOLTAGES

Measured with voltmeter having sensitivity of 1000 ohms per volt except where indicated by (*).

VOLUME ON FULL WITH NO SIGNAL
RANGE SWITCH IN BROADCAST POSITION

DIAL TUNED TO 540 KC.
MANUAL BUTTON PUSHED IN

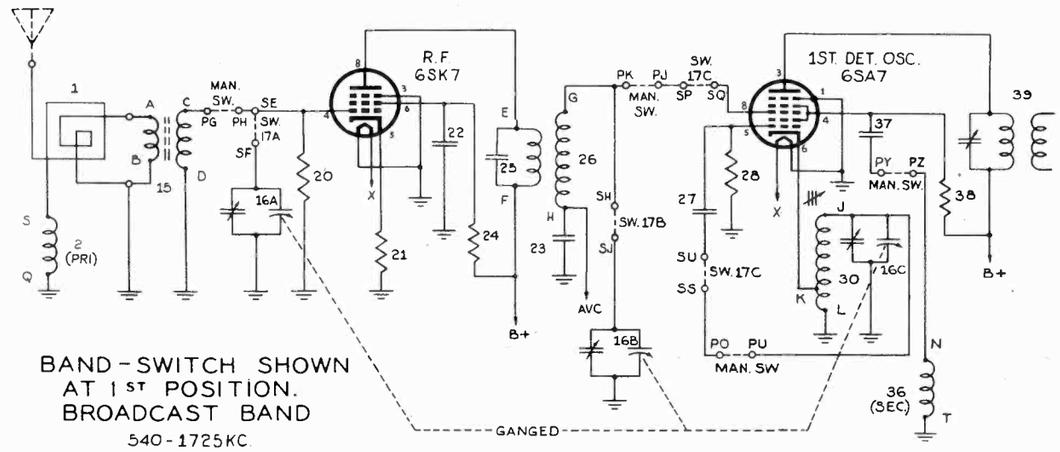


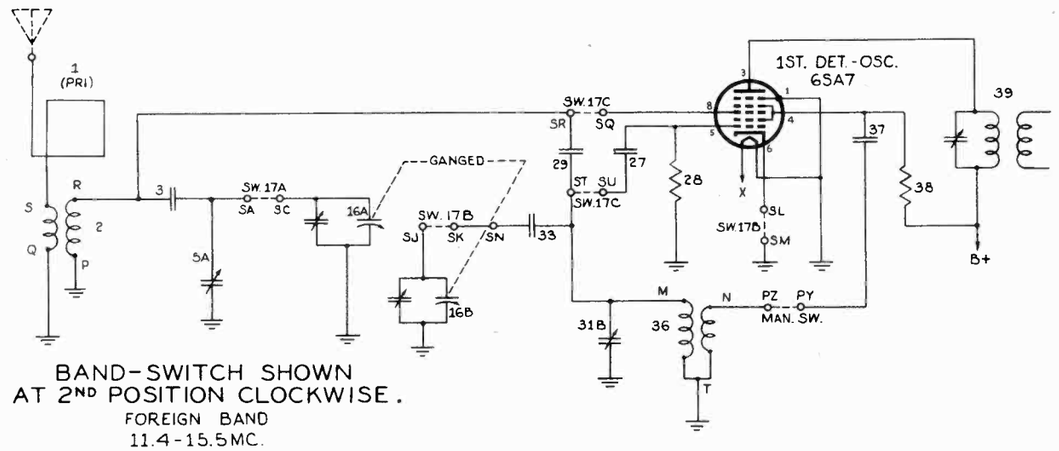
REAR OF CHASSIS

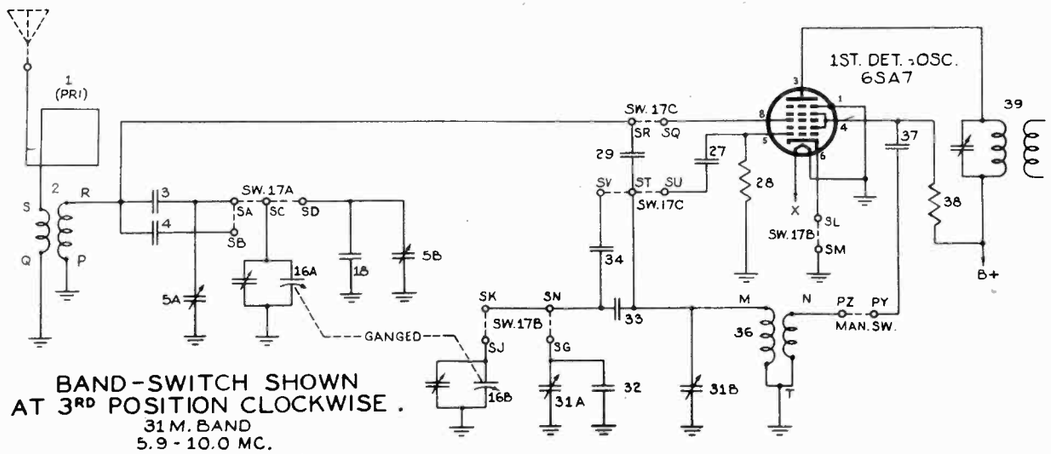
NOTE:—The 6K6GT grid bias of —19 volts can be measured across resistor No. 72.
*—Measured with vacuum tube voltmeter.

MODEL 4A23, Interceptor

THE FIRESTONE TIRE & RUBBER CO.







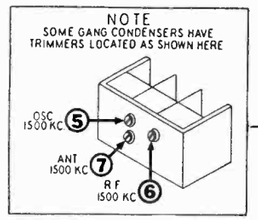
MODEL 4A23, Interceptor

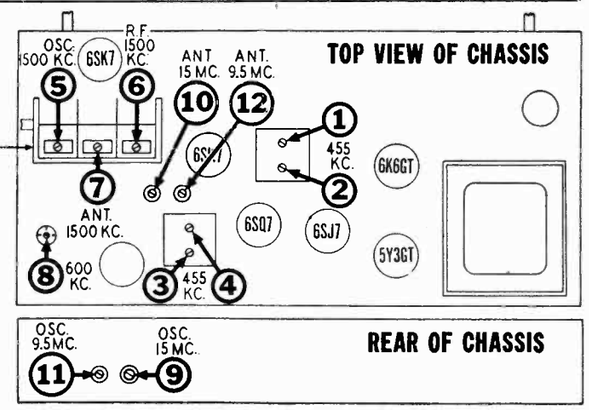
THE FIRESTONE TIRE & RUBBER CO.

1. The chassis and loop antenna should remain in their normal position in the cabinet throughout the following procedure.
2. Check arrangement of leads to push-button switch as shown in illustration on following page.
3. With the gang condenser fully meshed, dial pointer should be in the position indicated by the last division below 55 on the dial. If it is set incorrectly, release pointer clip on dial cord and reposition pointer.
4. Connect output meter across speaker voice coil.
5. Connect the ground lead of the signal generator to the receiver chassis.
6. Set volume control at maximum volume position and use a weak signal from the signal generator.
7. Push in the manual button and leave it in that position throughout the alignment procedure.

IMPORTANT:—Align this receiver in exactly the order shown below. Broadcast band must be aligned before short wave bands.

DUMMY ANT. IN SERIES WITH SIGNAL GENERATOR	CONNECT HIGH SIDE OF SIGNAL GENERATOR TO	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POSITION	RECEIVER DIAL SETTING	TRIMMER NUMBER	TRIMMER DESCRIPTION	TYPE OF ADJUSTMENT
.1 MFD. Condenser	Trimmer on rear section of gang	455 KC	Broadcast (counter-clockwise)	Any point where it does not affect the signal.	1-2	2nd I.F.	Adjust for maximum output. Then repeat adjustment.
					3-4	1st I.F.	
.003 MFD. Condenser	External Antenna Clip on Loop Frame	1500 KC	Broadcast (counter-clockwise)	1500 KC	5	Broadcast Oscillator (Shunt)	Adjust for maximum output.
.003 MFD. Condenser	External Antenna Clip on Loop Frame	1500 KC	Broadcast (counter-clockwise)	Tune to 1500 KC Generator Signal	6	Broadcast R.F.	Adjust for maximum output.
.003 MFD. Condenser	External Antenna Clip on Loop Frame	1500 KC	Broadcast (counter-clockwise)	Tune to 1500 KC Generator Signal	7	Broadcast Antenna	Adjust for maximum output.
.003 MFD. Condenser	External Antenna Clip on Loop Frame	600 KC	Broadcast (counter-clockwise)	Tune to 600 KC Generator Signal	8	Adjustable core of Broadcast Oscillator Coil.	Adjust for maximum output. Try to increase output by rotating core in and out and retuning receiver dial until maximum output is obtained.
.003 MFD. Condenser	External Antenna Clip on Loop Frame	Repeat adjustments of trimmers 5, 6 and 7 at 1500 Kc. Then re-check adjustment of trimmer 8 at 600 Kc.					
400 OHM Carbon Resistor	External Antenna Clip on Loop Frame	15 MC	Short wave	15 MC	9	S.W. Oscillator	Adjust for maximum output. Check to see if proper peak was obtained by tuning in image at approx. 14.1 MC. If image does not appear, realign at 15 MC, with trimmer screw farther out. Recheck image.
400 OHM Carbon Resistor	External Antenna Clip on Loop Frame	15 MC	Short wave	Tune to 15 MC Generator Signal	10	S.W. Antenna	Adjust for maximum output. Try to increase output by detuning trimmer and retuning receiver dial until maximum output is obtained.
400 OHM Carbon Resistor	External Antenna Clip on Loop Frame	9.5 MC	31 M (Clockwise)	9.5 MC	11	31 M Oscillator	Adjust for maximum output. Check to see if proper peak was obtained by tuning in image at approx. 8.6 MC. If image does not appear, realign at 9.5 MC. with trimmer screw farther out. Recheck image.
400 OHM Carbon Resistor	External Antenna Clip on Loop Frame	9.5 MC	31 M (Clockwise)	Tune to 9.5 MC Generator Signal	12	31 M Antenna	Adjust for maximum output. Try to increase output by detuning trimmer and retuning receiver dial until maximum output is obtained.





AUDIO OSCILLATION

The audio system of this receiver utilizes a two stage type of inverse feed-back arrangement and should it ever be necessary to replace the speaker or output transformer it is important to maintain a definite phase relationship in the feedback circuit. If the connections to the output transformer are reversed or if the feed-back connection is made to the wrong side of the output transformer secondary, the system will become regenerative instead of degenerative. Under those conditions audio oscillation may result. If that occurs, oscillation may be prevented by reversing the connections to the primary of the output transformer.

THE FIRESTONE TIRE & RUBBER CO.

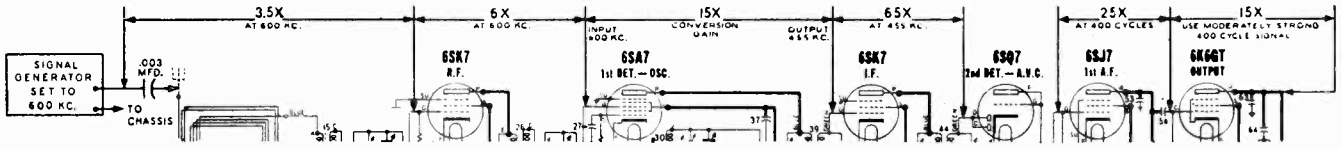
MODEL 4A23, Interceptor

APPROXIMATE STAGE GAIN DATA

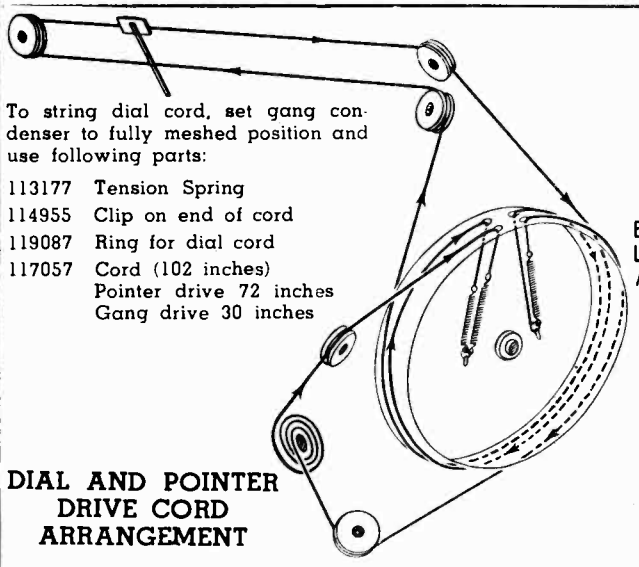
Be sure R.F. and I.F. stages are accurately aligned before measuring gain. R.F. gains can be measured with a "channel" type instrument containing a tuned and calibrated R.F. amplifier. A vacuum tube voltmeter may be used for audio gain measurements. Observe following precautions:

1. For all gain measurements connect signal generator as shown. Use 600 KC. signal with 400 cycle modulation (use nearby frequency if local station interferes.)
2. For R.F. and I.F. measurements connect negative terminal of a 3 volt battery (two 1½ volt cells in series) to A.V.C. lead and positive terminal to chassis. This provides a definite operating point. IMPORTANT: Disconnect battery when measuring audio stage gains.
3. Be sure radio is carefully tuned to generator signal (use weak signal for sharp tuning.)
4. When using a "channel" type instrument carefully tune it for maximum output at desired frequency before making measurements.

The R.F. and I.F. stage gains shown below are less than under normal operating conditions due to the use of 3 volts fixed bias in order to establish a definite operating point. Therefore, these values are not intended to indicate the full capability of a stage.



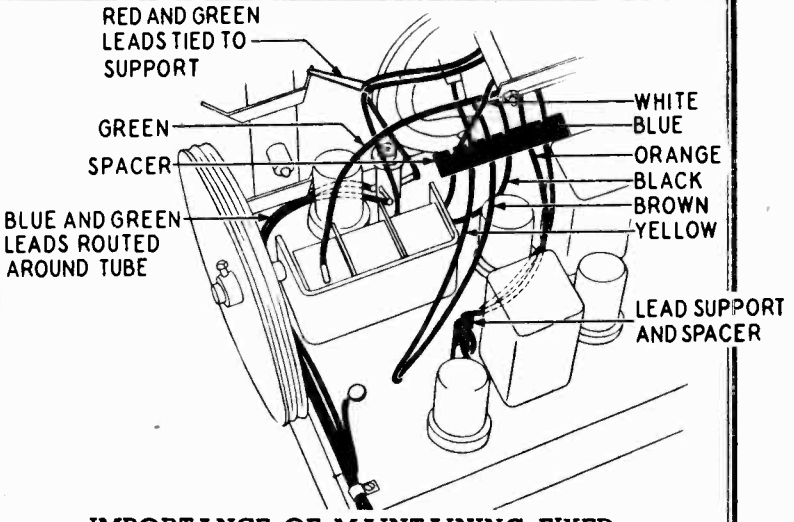
Differences in tube characteristics, tolerance of parts, adjustment of tuned circuits, and variations of line voltage will influence stage gain. Accuracy of measurements is dependent upon careful tuning of receiver to generator signal and experience in using your test equipment. These factors may create considerable variation in gain measurements.



To string dial cord, set gang condenser to fully meshed position and use following parts:

113177 Tension Spring
114955 Clip on end of cord
119087 Ring for dial cord
117057 Cord (102 inches)
Pointer drive 72 inches
Gang drive 30 inches

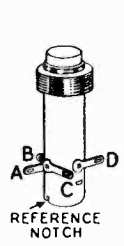
DIAL AND POINTER DRIVE CORD ARRANGEMENT



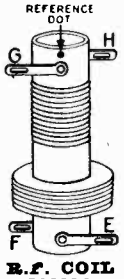
IMPORTANCE OF MAINTAINING FIXED POSITIONS FOR LEADS AT TOP OF CHASSIS

The wires shown in the above illustration are associated with tuned circuits which carry radio frequency currents. Therefore, care must be exercised to insure that they are properly routed and spaced. Anchoring and fixing spacing of wires minimizes freedom of movement and is utilized to maintain a stable arrangement.

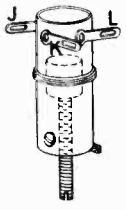
Since the relative positions of these wires may affect tuned circuits it is important to avoid any change in arrangement after the receiver has been aligned. If the position of the wires has been disturbed, it is advisable to re-check alignment



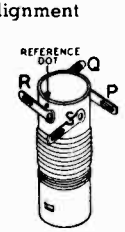
BC. ANTENNA COUPLING COIL 502112



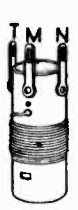
R.F. COIL 502113



BC. OSCILLATOR COIL 502114



S.W. ANTENNA COIL 502110

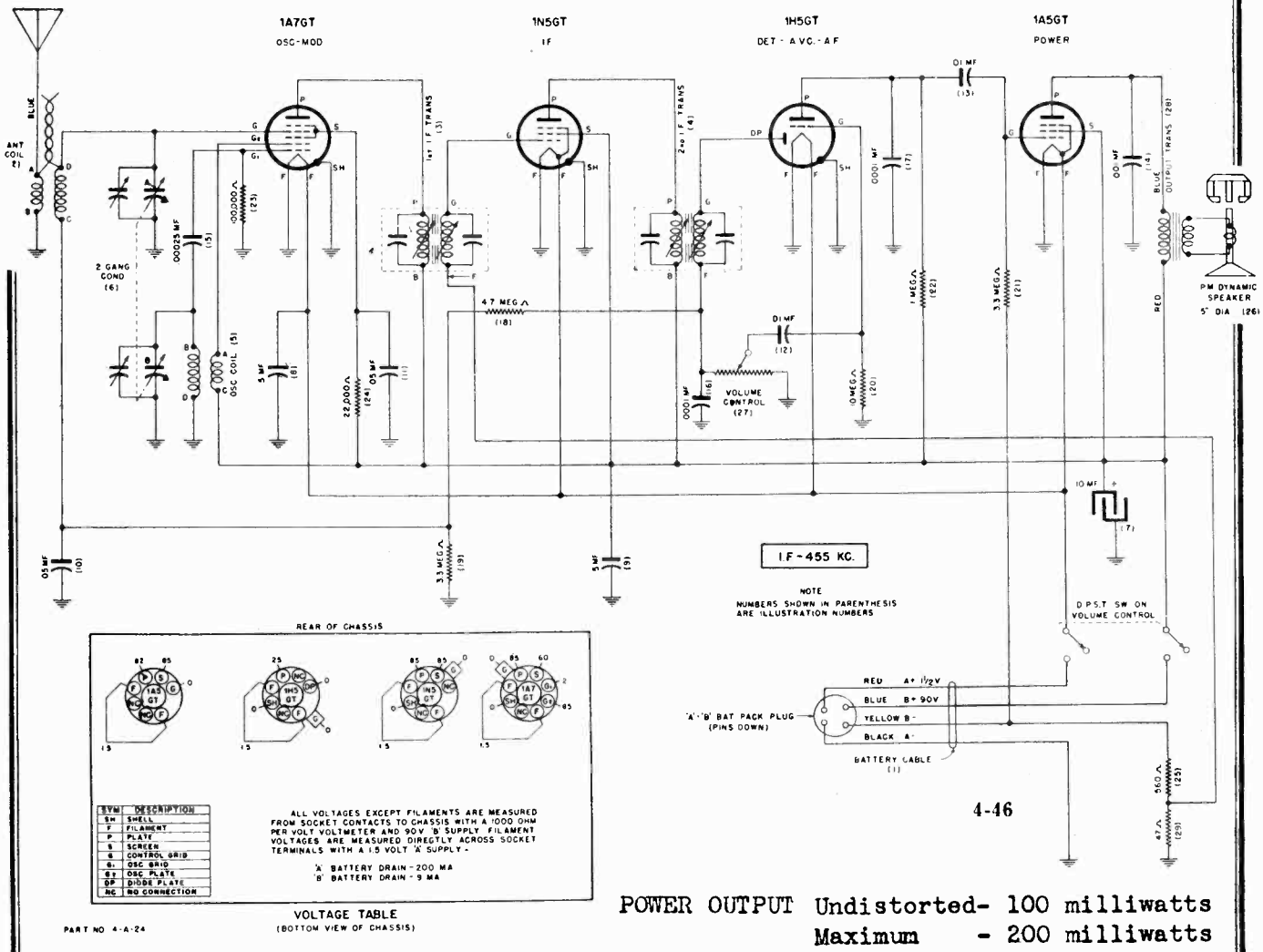


S.W. OSCILLATOR COIL 502111

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

MODEL 4A24

THE FIRESTONE TIRE & RUBBER CO.



SYM	DESCRIPTION
SH	SHELL
F	FILAMENT
P	PLATE
S	SCREEN
G	CONTROL GRID
G1	OSC GRID
G2	OSC PLATE
DP	DIODE PLATE
NC	NO CONNECTION

ALL VOLTAGES EXCEPT FILAMENTS ARE MEASURED FROM SOCKET CONTACTS TO CHASSIS WITH A 1000 OHM PER VOLT VOLTMETER AND 90V 'B' SUPPLY. FILAMENT VOLTAGES ARE MEASURED DIRECTLY ACROSS SOCKET TERMINALS WITH A 1.5 VOLT 'A' SUPPLY.

'A' BATTERY DRAIN - 200 MA
'B' BATTERY DRAIN - 9 MA

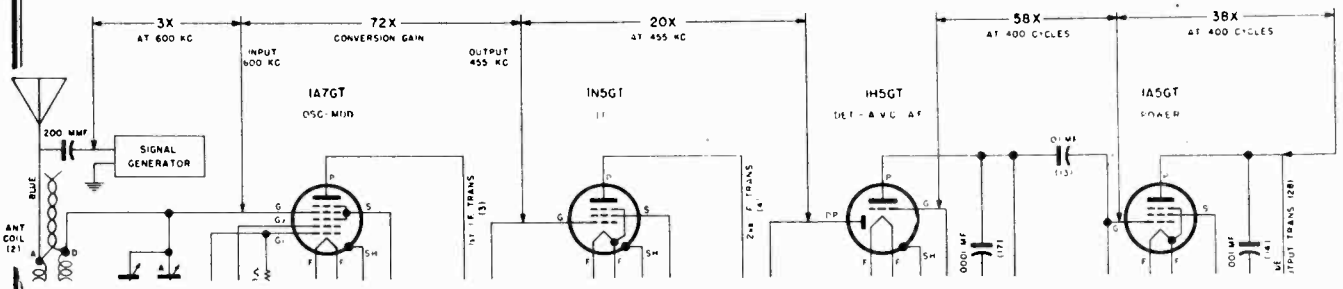
VOLTAGE TABLE
(BOTTOM VIEW OF CHASSIS)

PART NO 4-A-24

POWER OUTPUT Undistorted- 100 milliwatts
Maximum - 200 milliwatts

VOICE COIL IMPEDANCE 3.2 ohm at 400~

TUNING RANGE 528 to 1730 KC



Be sure R. F. and I. F. stages are accurately aligned before measuring gain. R. F. gains can be measured with a "channel" type instrument containing a tuned and calibrated R. F. amplifier. A vacuum tube voltmeter may be used for audio gain measurements. Observe the following precautions:

1. For all gain measurements connect signal generator as shown. Use 600 KC. signal with 400 cycle modulation (use nearby frequency if local station interferes.)
2. Be sure radio is carefully tuned to generator signal (use weak signal for sharp tuning.)
3. When using a "channel" type instrument carefully tune it for maximum output at desired frequency before making measurements.

For Parts List, see P.15-17

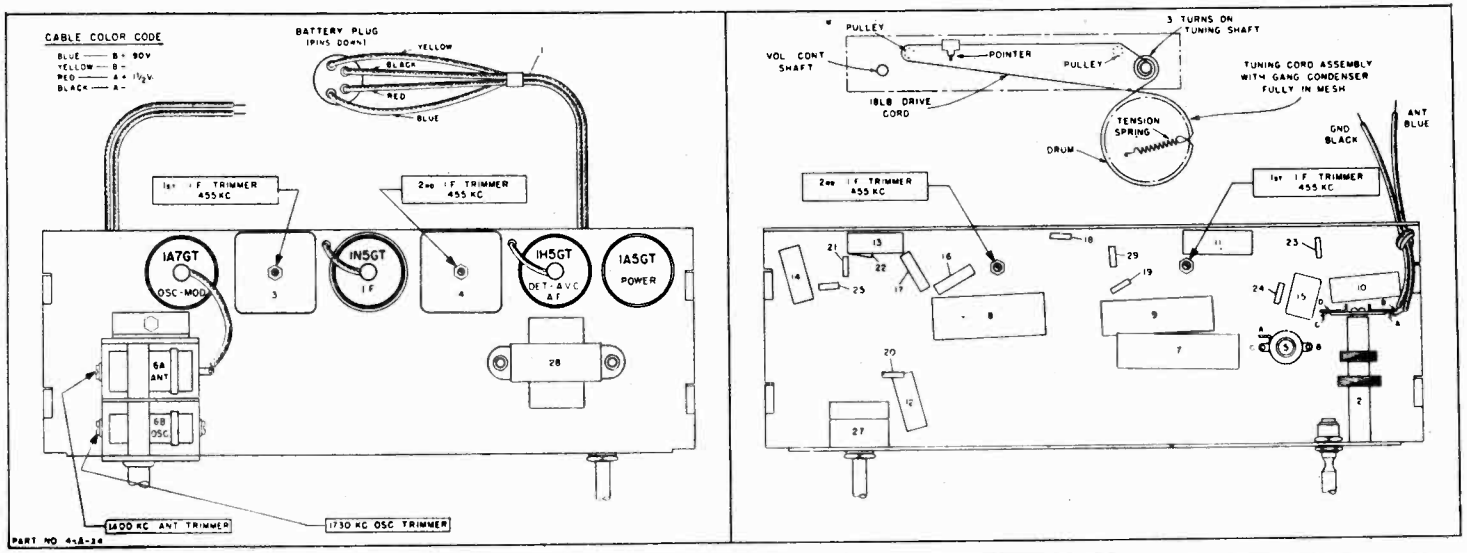
Be sure to follow procedure carefully and in the order given—otherwise the receiver will be insensitive and the dial calibration incorrect. For alignment procedure read tabulations from left to right. Make the adjustment marked (1) first, (2) next, etc.

Before starting alignment:

(a) Check tuning dial adjustment by tuning gang condenser until plates touch maximum capacity stop (completely in mesh) at which point the dial needle must be exactly even with the last line at the low frequency end of the dial calibration. If dial needle does not point exactly to last line move to correct position.

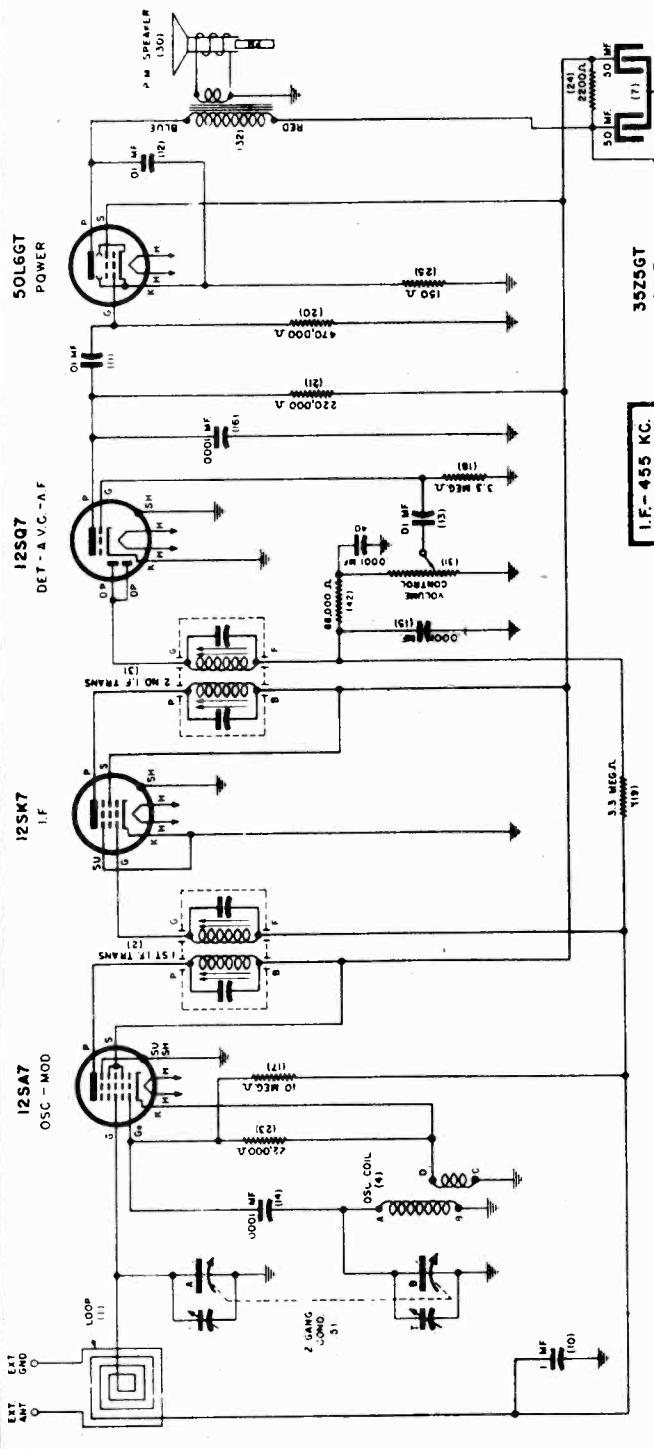
(b) Use an accurately calibrated test oscillator with some type of output measuring device.

Steps	Set receiver dial to:	TEST OSCILLATOR: Adjust test oscillator frequency to:	TEST OSCILLATOR: Use dummy antenna in series with output of test oscillator consisting of:	TEST OSCILLATOR: Attach output of test oscillator to:	Refer to parts layout diagram for location of trimmers mentioned below:
1	I.F. Any point where no interference signal is received	455 K. C.	.02 MFD. condenser	High side to grid terminal of 1A7GT tube DO NOT REMOVE CAP. Low side to receiver black ground lead.	Adjust each of the second I.F. transformer trimmers for maximum output—then adjust each of the first I.F. trimmers for maximum output.
2	Exactly 1730 K. C.	Exactly 1730 K. C.	.00025 MFD. condenser	Receiver blue antenna lead Receiver black ground lead	Adjust 1730 K. C. oscillator trimmer for maximum output.
3	Exactly 1400 K. C.	Exactly 1400 K. C.	.00025 MFD. condenser	Receiver blue antenna lead Receiver black ground lead	While rocking gang condenser adjust 1400 K. C. antenna trimmer for maximum output.



MODEL 4A25

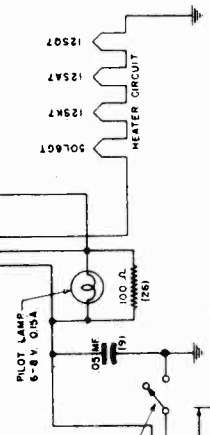
THE FIRESTONE TIRE & RUBBER CO.



LOUD SPEAKER

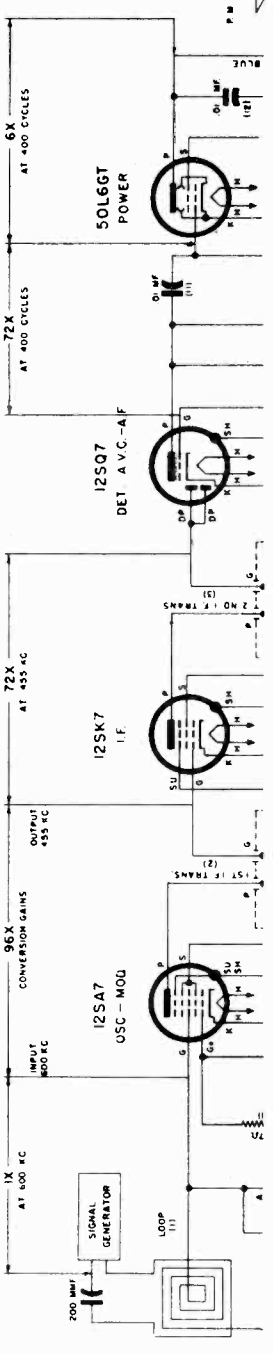
VOICE COIL IMPEDANCE

3.2 OHM at 400 Cycles



POWER OUTPUT

Undistorted - 0.9 Watts
Maximum - - 1.7 Watts



Be sure R.F. and I.F. stages are accurately aligned before measuring gain. R.F. gains can be measured with a "channel" type instrument containing a tuned and calibrated R.F. amplifier. A vacuum tube voltmeter may be used for audio gain measurements. Observe following precautions:

1. For all gain measurements connect signal generator as shown. Use 600 KC. signal with 400 cycle modulation (use nearby frequency if local station interferes.)
2. Be sure radio is carefully tuned to generator signal (use weak signal for sharp tuning.)
3. When using a "channel" type instrument carefully tune it for maximum output at desired frequency before making measurements.

Differences in tube characteristics, tolerance of parts, adjustment of tuned circuits, and variations of line voltage will influence stage gain. Accuracy of measurements is dependent upon careful tuning of receiver to generator signal and experience in using your test equipment. These factors may create considerable variation in gain measurements.

For Voltage and Parts List, see P.15-12

ALIGNMENT PROCEDURE

For alignment procedure read tabulations from left to right, and make the adjustment marked (1) first, (2) next, (3) third.

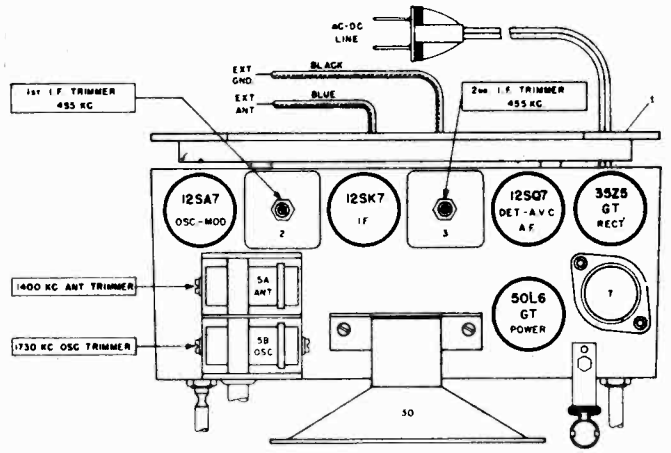
Before starting alignment:

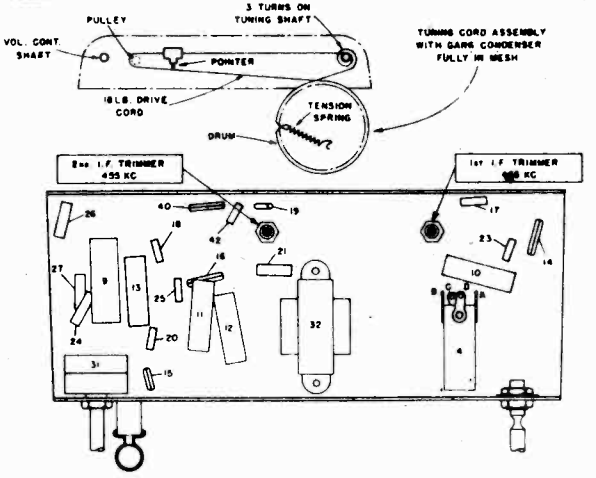
(a) Check tuning dial adjustment by tuning gang condenser until plates touch maximum capacity stop (completely in mesh) at which point the dial needle must be exactly even with the last line at the low frequency end of the dial calibration. If dial needle does not point exactly to last line move to correct position.

(b) Use an accurately calibrated test oscillator with some type of output measuring device.

(c) PLACE LOOP ANTENNA IN THE SAME POSITION IT WILL BE IN WHEN THE SET IS IN THE CABINET.

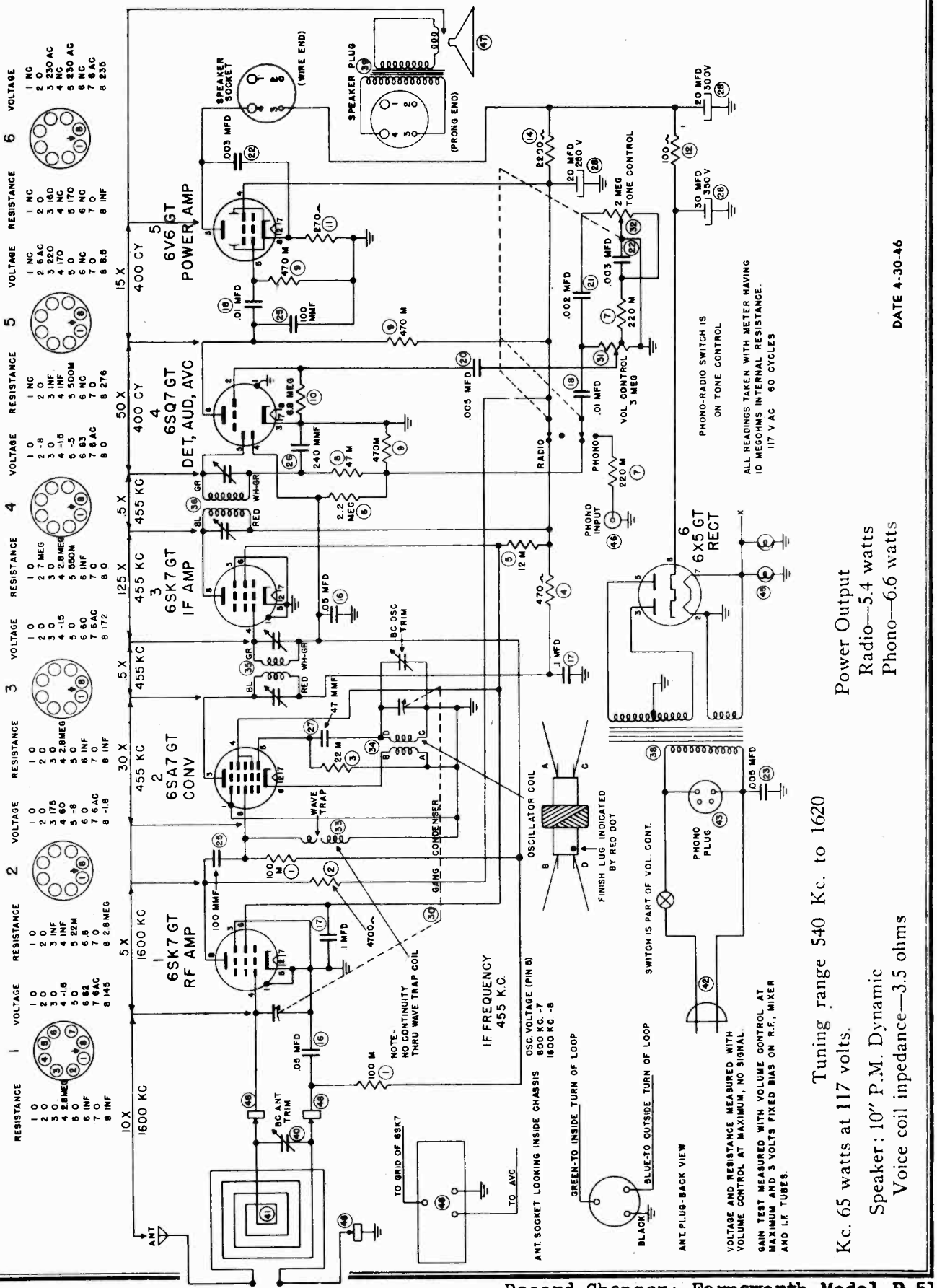
Steps	Set receiver dial to:	TEST OSCILLATOR			Refer to parts layout diagram for location of trimmers mentioned below:
		Adjust test oscillator frequency to:	Use dummy antenna in series with output of test oscillator consisting of:	Attach output of test oscillator to:	
1	Any point where no interfering signal is received.	455 K. C.	.02 MFD. condenser	High side to front stator plates of tuning condenser. Low side to frame of condenser through a .02 Mfd. blocking condenser.	Adjust each of the second I. F. transformer trimmers for maximum output—then adjust each of the first I. F. trimmers for maximum output.
2	Exactly 1730 K. C.	Exactly 1730 K. C.	.00025 MFD. condenser	Receiver blue antenna lead Receiver black ground lead	Adjust 1730 K. C. oscillator trimmer for maximum output.
3	Approx. 1400 K. C.	Approx. 1400 K. C.	.00025 MFD. condenser	Receiver blue antenna lead Receiver black ground lead	While rocking gang condenser adjust 1400 K. C. antenna trimmer for maximum output.





MODEL 4A31,
Rhapsody

THE FIRESTONE TIRE & RUBBER CO.



Power Output
Radio—5.4 watts
Phono—6.6 watts

Tuning range 540 Kc. to 1620 Kc. 65 watts at 117 volts.

Speaker: 10" P.M. Dynamic
Voice coil inpedance—3.5 ohms

Record Changer: Farnsworth Model P-51

PARTS PRICE LIST

STOCK No. 4-A-31. CODE No. 177-5-4A31

Refer. No.	Part No.	DESCRIPTION	List Price
1	77214	100 M Ohms	$ .15
2	77211	4700 Ohms	.15
3	77266	22 M Ohms	.15
4	77261	470 Ohms	.15
5	77155	12 M Ohms 2 Watt	.25
6	77270	2.2 Megohms	.15
7	77216	220 M Ohms	.15
8	77213	47 M Ohms	.15
9	77217	470 M Ohms	.15
10	77273	6.8 Megohms	.15
11	77174	270 Ohms 1 Watt	.15
12	77258	100 Ohms	.15
14	77301	2200 Ohms 2 Watt	.20
16	25196	.05 Mfd. Tubular 600 V.	.20
17	25215	.1 Mfd. Tubular 600 V.	.20
18	25194	.01 Mfd. Tubular 600 V.	.20
20	25183	.005 Mfd. Tubular 600 V.	.15
21	25185	.002 Mfd. Tubular 600 V.	.15
22	25184	.003 Mfd. Tubular 600 V.	.20
23	25031	.005 Mfd. Line Buffer 600 V.	.30
25	25188	100 Mmf. Mica	.25
26	25187	240 Mmf. Mica	.30
27	25193	47 Mmf. Mica	.30
28	25180	Electrolytic Cap. 30 Mf. 350 V.—20 Mf. 300 V.—20 Mf. 250 V.	1.95
30	15154	Gang Condenser and Drive Drum	4.35
31	78119	Volume Control	1.20
32	90148	Tone Control and Phono Switch	1.05
33	38484	Wave Trap	.55
34	38483	Oscillator Coil	.60
35	38536	1st. I. F. Transformer	1.70
36	38537	2nd. I. F. Transformer	1.70
38	94025	Power Transformer	4.75
39	94199	Output Transformer	3.45
40	26032	Antenna Trimmer	.20
41	38652	Loop Antenna	3.35
42	27118	Line Cord	.70
43	11274	Phono A. C. Cable and Plug	.75
45	42185	Dial Lamp (Mazda 44) 6.3 V. 250 Ma. (Two required)	.15
46	80030	Phono Input Socket	.10
47	81124	Speaker	13.25
48	80256	Antenna Socket	.10
	80230	Speaker Socket	.10
	80252	Antenna Plug	.10
	80139	Molded Octal Tube Socket	.15
	11259	Dial Pointer Assembly	.85
	05090	Drive Cord Assembly	.20
	31287	Dial Glass	1.05
	04038	Dial Background	.40
	59264	Knob	.25
	71223	Phono Needle	1.20
	22147	P. U. Cable	1.00

Prices subject to change without notice

EQUIPMENT AND PROCEDURE FOR ALIGNMENT

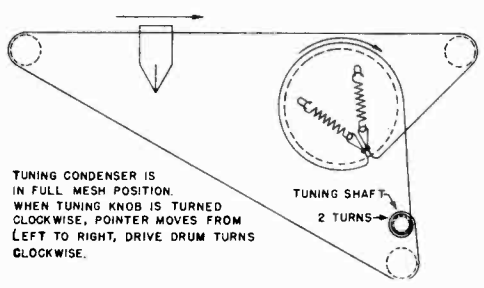
A Signal Generator calibrated at 455 Kc., 600 Kc. and 1500 Kc., and an output indicator are necessary to properly align this set. All adjustments should be made with the volume control set for maximum and the tone control for maximum treble, keeping the signal generator output as low as possible to prevent A.V.C. action and false settings.

The low side of the signal generator is connected to the chassis.

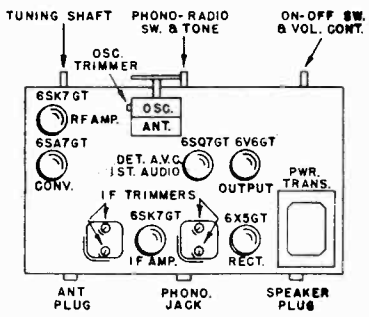
Steps	Connect High Side of Generator to	Set Generator At	Set Gang At	Adjust	Located	To Obtain
1	Set Volume Control at Maximum and Tone Control at Maximum Treble.					
2	Stator of Ant. Section of Gang with .1 Mf. In Series	455 Kc.	Minimum	2nd. I.F. Trimmers	Top of 2nd. I.F. Transformer	Maximum Output
3				1st. I.F. Trimmers	Top of 1st. I.F. Transformer	
4	Ant. Lead With 250 Mmf. In Series*	1500 Kc.	1500 Kc.	Osc. Trimmer	On Gang	
5		1500 Kc.	1500 Kc.	Ant. Trimmer	On Loop	
6	Check Pointer Calibration on 600 Kc.					

*Antenna wire protrudes from loop.

DIAL STRINGING

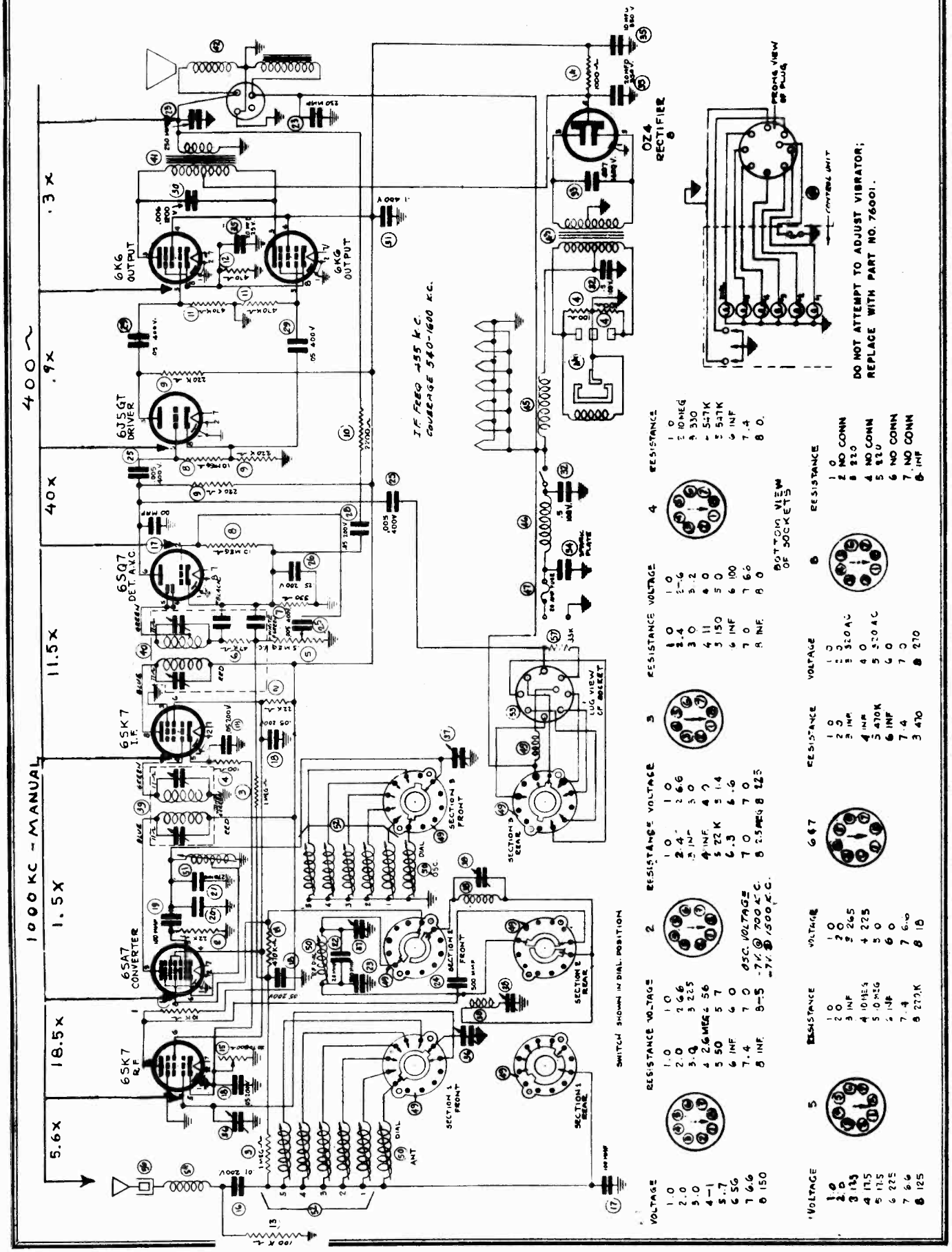


CHASSIS LAYOUT



MODEL 4B1, Supreme

THE FIRESTONE TIRE & RUBBER CO.



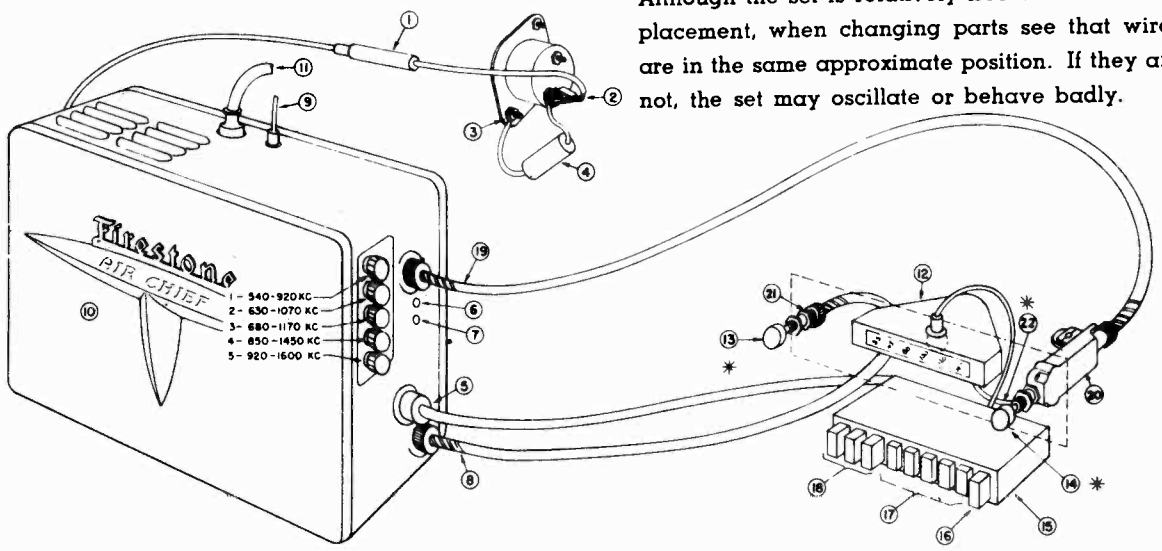


Fig. 3

1. Fuse Holder } Part No. 11160
2. "A" Power Lead }
3. Ground Connection
4. Ignition Interference Capacitor, Part No. 25120
5. Plug for Monomatic Tuner, Part of Part No. 15536
6. Antenna Trimmer, Manual Tuning
7. Antenna Trimmer, Automatic Tuning
8. Volume Control Flexible Cable, Part No. 15057
9. Antenna Lead (Part of Antenna)
10. Receiver PM-15
11. Speaker Cable, Part No. 27178
12. Slide Rule Dial, Part No. 13428
13. Volume Control Knob } Part No. 59314
14. Manual Control Knob }
15. Monomatic Tuner, Part No. 15536
16. Push Button Station Selector, Part of Part No. 15536
17. Station Indicators, Part of Part No. 15536
18. Tone Control Push Buttons, Part of Part No. 15536
19. Manual Tuning Control Cable, Part No. 15057
20. Tuning Control "Worm Reduction", Part No. 13538
21. Volume Control Shaft Bushing, Part No. 13537
22. Dial Drive Flexible Cable, Part No. 27298

All items except 13, 14, and 22 are packed with the receiver, other items are packed with the control kit.

PUSH BUTTON ADJUSTMENT

It is advisable to adjust the push buttons while set is still on the bench. With set operating and connected to the antenna, make a list of the five stations for which you desire Monomatic tuning. The stations chosen must be such that each will come within a different frequency range, as indicated by the following list. For example, it would not be possible to choose both a 550 kc station and a 600 kc station, since 600 kc does not come within the range of position #2. Arrange the stations in order of their frequency; that is, the station of lowest frequency will be #1; of next higher frequency, #2, next.

STATION	FREQUENCY RANGE
#1	540 to 920 kc
#2	680 to 1170 kc
#3	850 to 1450 kc
#4	850 to 1450 kc
#5	920 to 1570 kc

Operate the Monomatic button (marked Push) until the dial becomes illuminated, indicating that the receiver is adjusted for Dial Tuning. Then tune your #5 station, using the Station Selector knob. Operate the Monomatic button until the #5 station indicator (furthest right of the station indicators) becomes illuminated.

Turn the knob, located on the side of the set, which has the range 920-1570 kc indicated below it, until the desired station is heard at maximum volume.

After setting button #5, the antenna should be matched by adjusting the screw marked P. B. Antenna Trimmer in Figure 3, as #7. This screw is covered by a snap button. Slowly turn this screw until maximum volume is secured.

Return to Manual then tune in until your #1 indicator becomes illuminated. Then proceed to adjust the knob for this station until maximum signal is heard.

Assuming the lid is removed, place a $\frac{5}{16}$ open end wrench on adjusting nut immediately ahead of heavy compression spring and adjust for further increase in signal, then readjust red knob for maximum signal. This is actually a tracking operation and will give optimum performance. This operating should be repeated for each button position.

After the car installation is made, it is recommended that all the red buttons be rechecked for maximum response.

After this re-check is completed, it is necessary to adjust the manual antenna trimmer, see #6. The adjusting screw for this is accessible after removing the snap button.

Return the set to dial tuning, turn the manual tuning control until a station near 1400 kc is heard, then adjust this screw for maximum volume. Now with set in car, depress monomatic button until #5 station is again illuminated. Check #7 trimmer for maximum signal.

MODEL 4-B-1 CODE 7-C-PM15

	Part No.	Name of Part		Part No.	Name of Part
1.	77180	10 K. Ohms	37.	26114	Trimmer Ass'y
2.	77169	22 K. Ohms	38.	38276	R. F. Coil Ass'y
3.	77181	1 Meg. Ohms	39.	38274	1st I. F. Ass'y
4.	77176	100 Ohms	40.	38275	2nd I. F. Ass'y
5.	78042	.5 Meg. Vol. Control	41.	94111	Output Transformer
6.	77172	47 K. Ohms	42.	11163	Speaker & Cable Ass'y
7.	77179	330 Ohms	43.	94078	Power Transformer
8.	77182	10 Meg. Ohms	44.	76001	Vibrator
9.	77178	220 K. Ohms	45.	38277	Vibrator Choke
10.	77194	2200 Ohms	46.	38278	A. Choke
11.	77173	470 K. Ohms	47.	48007	Fuse, 20 Amp.
12.	77125	470 Ohms, 1 Watt	48.	41100	Control Unit
13.	77167	100 K. Ohms	49.	90070	Switch & Stepper Ass'y
14.	77123	1000 Ohms, W. W., 1 W.	50.	38273	Permeability Tuner
15.	78031	Sensitivity Control	51.	38280	Shunt Tracking Coil
16.	25112	.01-200 V.	52.	38311	P. B. Coil Ass'y
17.	25188	100 MMF.	53.	80136	Control Socket
18.	25111	.05-200	54.	38279	Ant. Spark Choke
19.	25106	100 MMF., XM-262	56.	561367	Ant. Cable Recp.
20.	25117	Compensating Cap		41084	Monomatic Tuner with Extra Length Cable
21.	25190	270 MMF., Sil. Mica Cap		41083	Extra Length Control Cable Kit
22.	25121	20 MMF.		15100	Extra Length Control Cable
23.	25187	250 MMF.	57.	77183	33 K. Ohms
24.	25189	500 MMF.	58.	11160	Fuse Holder
25.	25105	.005-400 V.	59.	11160	"A" Power Lead
26.	25114	.25-200 V.	60.	25120	Ignition Interference Capacitor
27.	25116	.005-400 V.	61.	15057	Volume Control Flexible Cable
28.	25102	.05-200	62.	27178	Speaker Cable
29.	25105	.05-400	63.	13428	Slide Rule Dial
30.	25110	.006-1200 V.	64.	59314	Volume Control Knob
31.	25103	.1-400 V.	65.	59314	Manual Control Knob
32.	25118	.5-100 V.	66.	15536	Monomatic Tuner
33.	25109	.007-1600 V.	67.	15057	Manual Tuning Control Cable
34.	25100	Spark Plate	68.	13538	Tuning Control "Worm Reduction"
35.	25099	Electrolytic	69.	13537	Volume Control Shaft Bushing
36.	26113	Trimmer	70.	27298	Dial Drive Flexible Cable

MODEL 4-B-2 CODE 7-6-PM14

	Part No.	Name of Part		Part No.	Name of Part
1.	77180	10 M Ohm	29.	25112	.01-200 V.
2.	78031	Sensitivity C	30.	25189	500 MMF.
3.	77181	1 Meg.	31.	561367	Antenna Cable Recp.
4.	77069	22 M Ohm, ½ W.	32.	38279	Antenna Spark Choke
5.	77172	47 M Ohm	33.	38281	Permeability Tuner
6.	78042	.5 Meg. Vol. Control	34.	38280	Shunt Tracking Coil
7.	77182	10 Meg.	35.	26116	Trimmer Assembly
8.	77178	220 M Ohm	36.	26115	Antenna Trimmer
9.	77173	470 M Ohm	37.	38274	1st I. F. Assembly
10.	77179	330 Ohm	38.	38275	2nd I. F. Assembly
11.	77123	1000 Ohm	39.	94080	Output Transformer
12.	77176	100 Ohm	40.	11164	Speaker & Cable
13.	77183	33 M Ohm	41.	94078	Power Transformer
14.	77069	22 M Ohm, 1 W	42.	76001	Vibrator
15.	25111	.05-200 V.	43.	38277	Vibrator Choke
16.	25102	.05-200 V.	44.	38278	A. Choke
17.	25188	100 MMF.	45.	48007	Fuse, 20 Amp.
18.	25104	.005-400 V.	46.	25124	Silver Mica Cond., 420 MMF.
19.	25116	.005-400 V.	47.	41083	Extra Length Control Cable
20.	25113	.01-400 V.	48.	11160	Fuse Holder
21.	25119	.002-200 V.	49.	11160	"A" Lead Assembly
22.	25103	.1-400 V.	50.	25120	Capacitor
23.	25099	Electrolytic	51.	15057	Flexible Shaft Tuning
24.	25110	.006-1200 V.	52.	15057	Flexible Shaft Volume Control
25.	25109	.007-1600 V.	53.	11172	Pilot Light and Cable Assembly
26.	25118	.5-100 V.	54.	13428	Slide Rule Dial
27.	25100	Spark Plate	55.	13538	Tuning Control Worm Reduction
28.	25121	20 MMF.	56.	13537	Volume Control Shaft Bushing

Volume control full on, tone control on speech position. Keep generator input low except as noted (*) below.

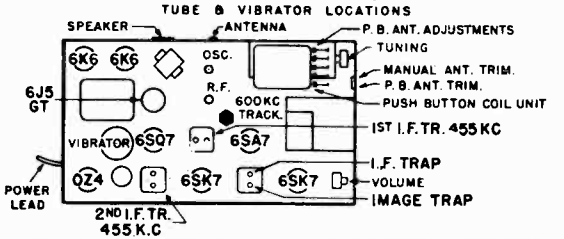
Connect output meter across voice coil of speaker.

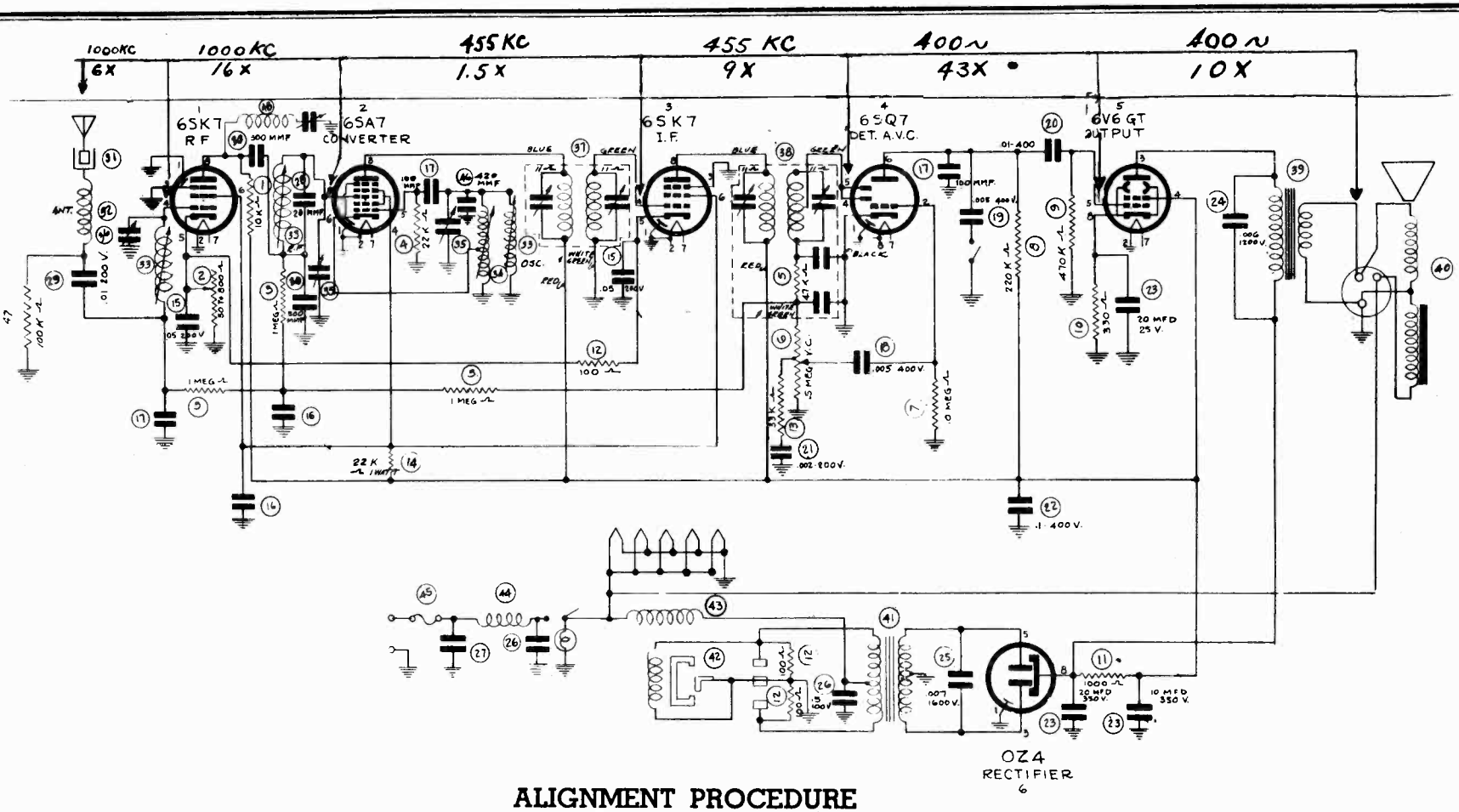
Connect signal generator ground lead to receiver chassis.

Connect signal generator output lead to antenna.

To adjust image rejector, return set to button #5. Set generator to 1500 kc. Adjust button for maximum signal at 1500 kc. Then set generator to image frequency 24100 and adjust image rejector for minimum signal. Use high generator output.

Dial	Generator Frequency	Dummy Antenna	Adjustments
540 kc	455 kc	.1 Mfd	1st & 2nd IF
*540 kc	455 kc	.1 Mfd	IF Trap
Highest Frequency	1600 kc	.0001 Mfd	Osc., RF, Antenna
600 kc	600 kc	.0001 Mfd	600 kc Track





ALIGNMENT PROCEDURE

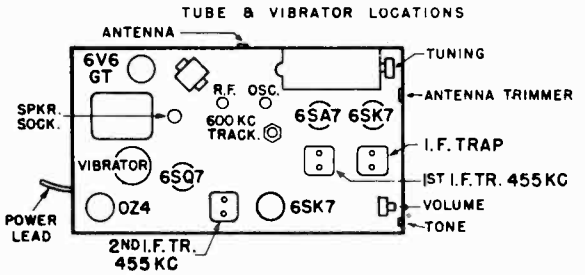
1. Volume control full on, tone control on speech position. Keep generator input low except as noted by (*) below.
2. Connect output meter across voice coil of speaker.
3. Connect signal generator ground lead to receiver chassis.
4. Connect signal generator output lead to antenna.

Dial	*Generator Frequency*	*Dummy Antenna*	*Adjustments*
540 kc	455 kc	.1 Mfd.	1st & 2nd IF
*540 kc	455 kc	.1 Mfd.	IF Trap
Highest Frequency	1600 kc	.0001 Mfd.	Osc., RF, Antenna
600 kc	600 kc	.0001 Mfd.	600 kc Track

Repeat Alignment procedure to insure accuracy.

* Keep generator input low except as noted by (*).

DO NOT ATTEMPT TO ADJUST VIBRATOR; REPLACE WITH PART NO. 76001.



For Parts List, see P.15-32

MODEL 4B2, DeLuxe

THE FIRESTONE TIRE & RUBBER CO.

CONNECTING THE RECEIVER

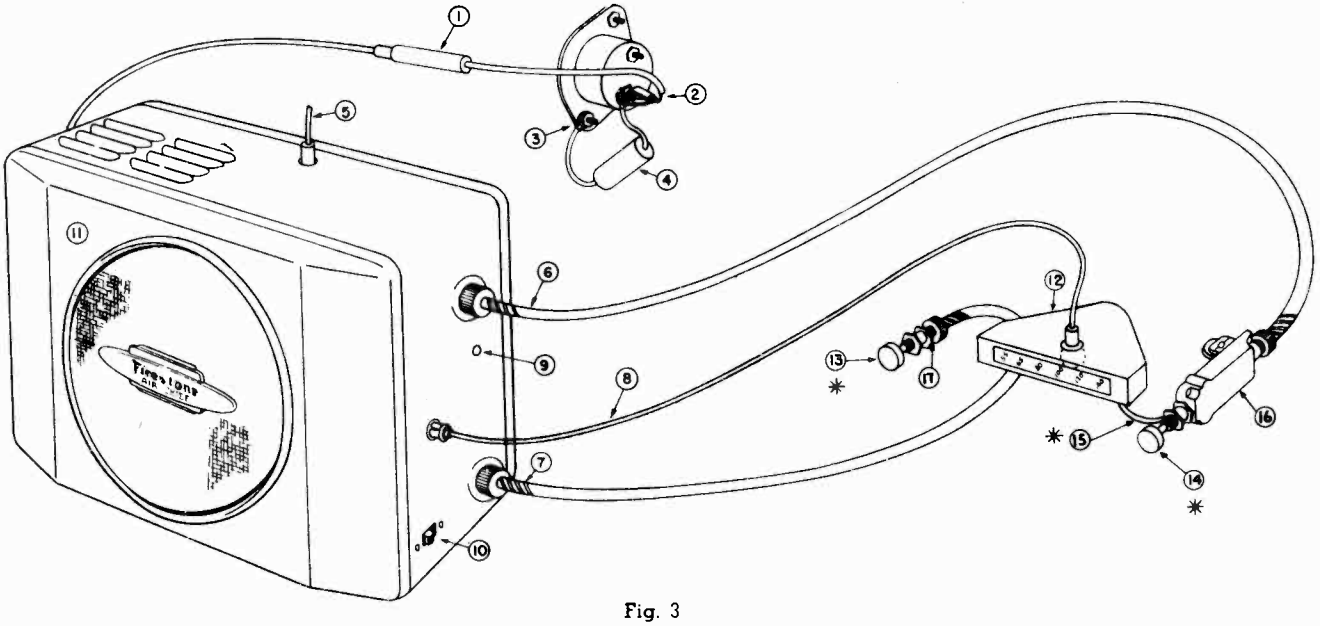


Fig. 3

	Name	Part No.
1.	Fuseholder	11160
2.	Ammeter Connector	36621
3.	Ground Connection	64270
4.	Capacitor	25120
5.	Antenna Lead	——
6.	Flexible Tuning Shaft	15057
7.	Flexible Volume Control Shaft	15057
8.	Pilot Light Lead	11172
9.	Antenna Trimmer Adjustment Hole	——
10.	Tone Control	90071
11.	Receiver	PM-14
12.	Slide Dial Assembly	13428

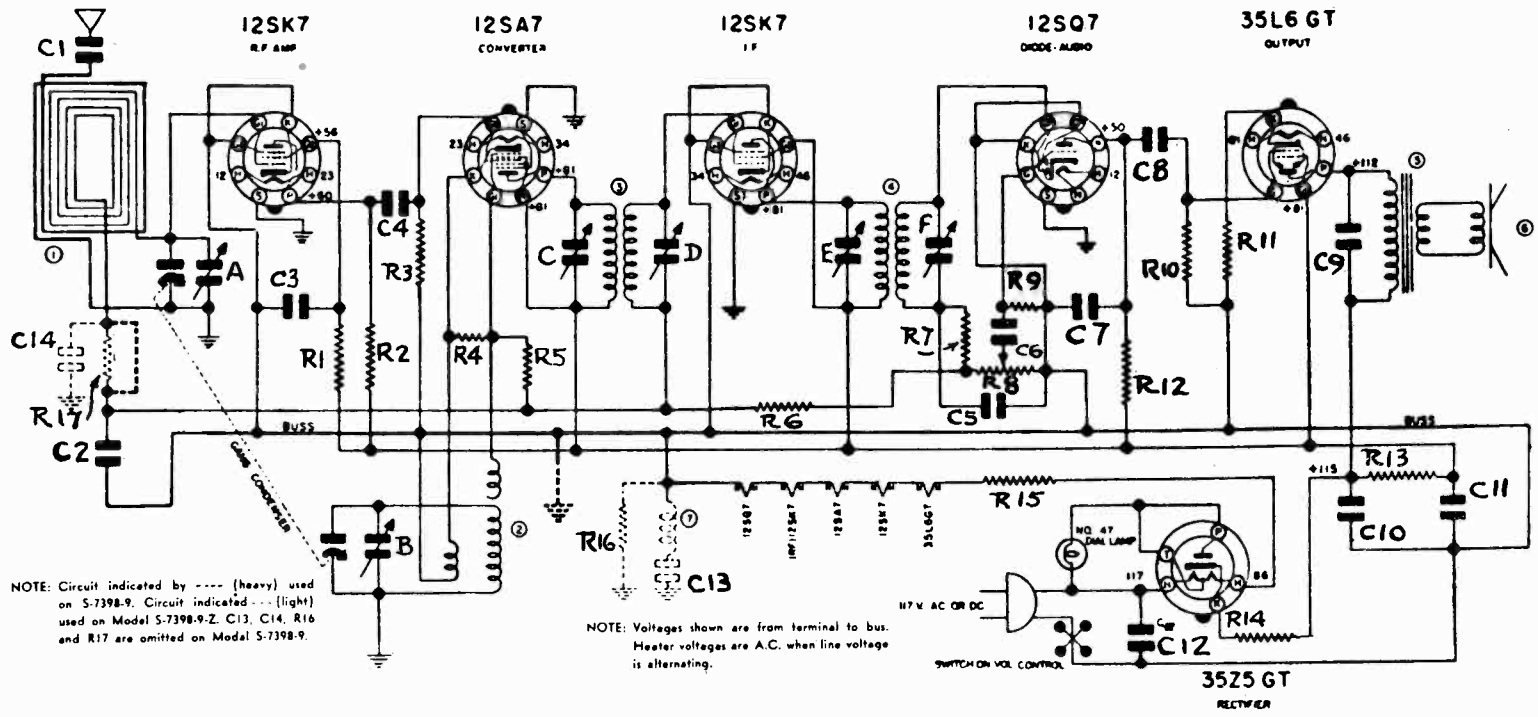
The following items are supplied by Crowe Nameplate:

13.	Volume Control Knob	Included in Crowe
14.	Tuning Control Knob	Assy. #A-11540-C
15.	Flexible Dial Coupling Shaft	
16.	Dial Drive Tuning Assembly	Assy. #A-11827

SOCKET VOLTAGES

	VOLTAGE	RESISTANCE
1	1. 0	1. 0
	2. 0	2. 0
	3. 0	3. 0
	4. -1	4. 2.6 MEG.
	5. .7	5. 50 Ω
	6. 58	6. INF.
	7. 6.6	7. .4 Ω
	8. 150	8. INF.
2	1. 0	1. 0
	2. 0	2. 0
	3. 224	3. 0
	4. 58	4. 2.6 MEG.
	5. 0	5. 50 Ω
	6. 0	6. INF.
	7. 6.6	7. .4 Ω
	8. -.5	8. INF.
3	1. 0	1. 0
	2. 0	2. 0
	3. 0	3. 0
	4. 0	4. 11 Ω
	5. 1.4	5. 150 Ω
	6. .6	6. INF.
	7. 6.6	7. .4
	8. 224	8. INF.
4	1. 0	1. 0
	2. -6	2. 10 MEG.
	3. 0	3. 0
	4. 0	4. 550K Ω
	5. 0	5. 550K Ω
	6. 100	6. INF.
	7. 6.6	7. .4
	8. 0	8. 0
5	1. 0	1. 0
	2. 0	2. 0
	3. 265	3. 265
	4. 225	4. 225
	5. 0	5. 0
	6. 0	6. INF.
	7. 6.6	7. .4
	8. 12	8. 330 Ω
6	1. 0	1. 0
	2. 0	2. 0
	3. 320 A.C.	3. 220 Ω
	4. 0	4. NO CONN.
	5. 320 A.C.	5. 220 Ω
	6. 0	6. NO CONN.
	7. 0	7. NO CONN.
	8. 270	8. INF.

BOTTOM VIEW OF SOCKETS



Diag. No.	Part No.	Description		List Price
C-1	N-1344	.01 mfd. 400 V.	20%	$ 0.35
C-2	N-1345	.05 mfd. 200 V.	20%	.40
C-3	N-1345	.05 mfd. 200 V.	20%	.40
C-4	N-2383	150 mmfd. Mica	20%	.35
C-5	N-1374	100 mmfd. Mica	20%	.35
C-6	N-1344	.01 mfd. 400 V.	20%	.35
C-7	N-1447	.0005 mfd. 400 V.	20%	.40
C-8	N-1344	.01 mfd. 400 V.	20%	$ 0.35
C-9	N-1376	.02 mfd. 400 V.	20%	.35
C-10 } C-11 }	N-3658	{ 40 mfd. 150 W.V. } { 40 mfd. 150 W.V. }	Electrolytic	1.10
C-12	N-1346	.05 mfd. 400 V.	20%	.40
C-13	N-3080	.22 mfd. 200 V.	10%	.70
C-14	N-1345	.05 mfd. 200 V.	20%	.40

Prices subject to change without notice.

DECEMBER 8, 1941

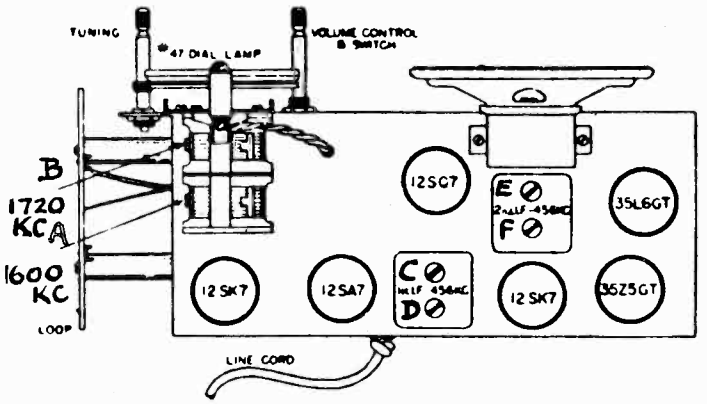
R-1	N-3814	15,000 Ohm .5 W.	20%	$ 0.20
R-2	N-3964	2,000 Ohm .5 W.	10%	.20
R-3	N-1260	50,000 Ohm .5 W.	20%	.20
R-4	N-1627	20,000 Ohm .5 W.	20%	.20
R-5	N-1263	10 Megohm .5 W.	20%	.20
R-6	N-1682	3 Megohm .5 W.	20%	.20
R-7	N-1460	30,000 Ohm .5 W.	20%	.20
R-8	N-4076	0.5 Megohm Volume Control		2.25
R-9	N-2189	4 Megohm .5 W.	20%	.20
R-10	N-1264	500,000 Ohm .5 W.	20%	.20
R-11	N-3663	150 Ohm .5 W.	10%	.20
R-12	N-1377	200,000 Ohm .5 W.	20%	.20
R-13	N-3819	1,200 Ohm 1 W.	10%	.30
R-14	N-1742	25 Ohm .5 W.	20%	.20
R-15	N-3869	30 Ohm 1 W.	10%	.30
R-16	N-1377	200,000 Ohm .5 W.	20%	.20
R-17	N-1262	1 Megohm .5 W.	20%	.20
1	N-3784	Antenna Loop Coil		.90
2	N-3298	Oscillator Coil		.70
3	N-3816	1st I.F. Transformer		1.20
4	N-3804	2nd I.F. Transformer		1.20
5	N-3782	Output Transformer		$1.00
6	N-3781	5" P. M. Speaker		3.75
	N-4052	2 Gang Condenser		3.00

MISCELLANEOUS PARTS

Part No.	Description	List Price
N-4054	Dial scale (glass)	$ 0.80
N-4055	Dial background plate	.80
N-4053	Dial pointer	.50
N-3787	Dial drive shaft	.50
N-3238	Dial drive shaft bushing	.40
N-3243	"C" Washer—dial drive shaft retainer	.07
N-2655	Dial drive string	.10
N-3925	Dial drive spring	.10
N-4075	Dial lamp socket	.50
N-1958	Rubber line cord	.45
N-3812	Wood dowel spacers—loop mounting	.10
N-3795	Screw—6-32x2¼" round head	.12
N-3642	Washer—fibre—chassis mounting	.10
N-4687	Cabinet back	.65
N-4688	Knobs	.20
N-4386	Clips—dial scale fastening	.10
N-4696	Speaker baffle	.16
N-4697	Grille cloth	.22

MODELS 7398-9, 7398-9Z, 7403-1

THE FIRESTONE TIRE & RUBBER CO.



TUBE AND TRIMMER LOCATIONS

ALIGNMENT DATA AND SERVICING

Lack of sensitivity and poor tone quality may be due to any one or a combination of causes such as weak or defective tubes or speaker, open or grounded bias resistor, bypass condenser, etc. Never attempt to realign set until all other possible sources of trouble have been first thoroughly investigated and definitely proved not to be the cause.

NOTE: IT IS ABSOLUTELY NECESSARY THAT AN ACCURATELY CALIBRATED TEST OSCILLATOR WITH SOME TYPE OF OUTPUT MEASURING DEVICE BE USED WHEN ALIGNING THE RECEIVER AND THAT THE PROCEDURE BE CAREFULLY FOLLOWED, OTHERWISE THE RECEIVER WILL BE INSENSITIVE AND THE DIAL CALIBRATION WILL BE INCORRECT. THE TRIMMERS WILL BE REFERRED TO BY THEIR FUNCTION AS INDICATED ON THE PARTS DIAGRAM.

ALIGNMENT PROCEDURE

GENERAL DATA

The alignment of this receiver requires the use of a test oscillator that will cover the frequencies of 456, 600, 1400 and 1720 KC and an output meter to be connected across the primary and secondary of the output transformer. If possible, all alignments should be made with the volume control on maximum and the test oscillator output as low as possible to prevent the AVC from operating and giving false readings.

CORRECT ALIGNMENT PROCEDURE

The intermediate frequency (I. F.) stages should be aligned properly as the first step. After the I. F. transformers have been properly adjusted and peaked, the broadcast band should be adjusted.

I. F. ALIGNMENT

With the gang condenser set at minimum, adjust the test oscillator to 456 KC and connect the output to the grid of the first detector tube (12SA7) through a .05 or .1 mfd. condenser. The ground on the test oscillator should be connected to the ground bus, indicated in circuit diagram. Align all four I. F. trimmers to peak or maximum reading on the output meter.

BROADCAST BAND ALIGNMENT

Remove the chassis from the cabinet and set on a bench, taking care that no metal is near the loop. Do not make this setup on a metal bench. Connect the test oscillator to the antenna of the set through a 200 mmfd. (.0002) condenser. With the gang condenser set at minimum capacity, set the test oscillator at 1720 KC, and adjust the oscillator (or 1720 KC trimmer) on gang condenser. Next—set the test oscillator at 1400 KC, and tune in the signal on the gang condenser. Adjust the antenna trimmer (or 1400 KC trimmer) for maximum signal. Next set the test oscillator at 600 KC, and tune in signal on condenser to check alignment of coils.

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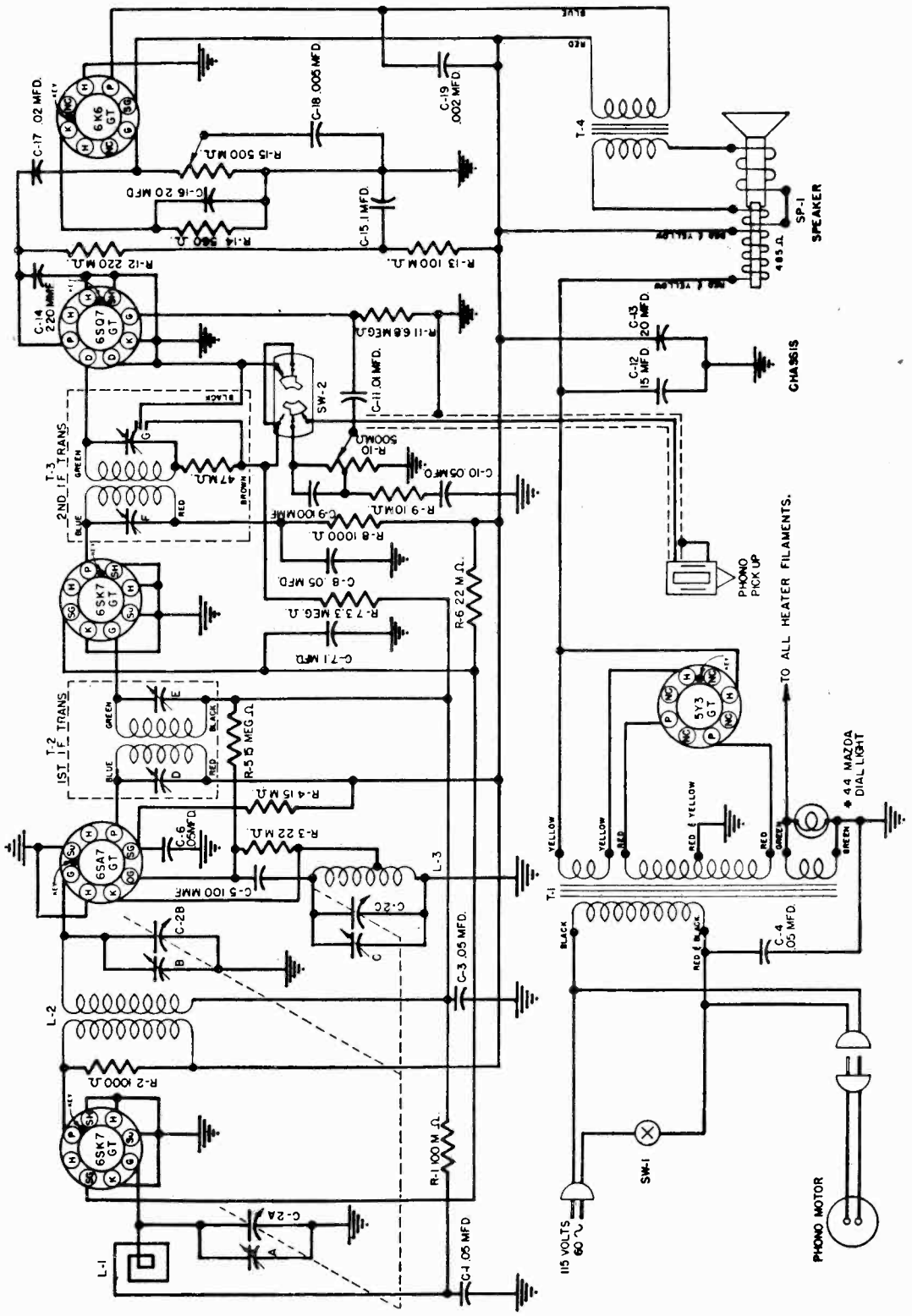


Record Changer: Detrola Model 550

MODEL 4A43

THE FIRESTONE TIRE & RUBBER CO.

Electrical and Mechanical Specifications

Frequency Range	540-1600 kc.	V.C. Impedance	3.5 ohms at 400 cycles
Intermediate Frequency	455 kc.	Power Output (Undistorted)	1 watt
Power Supply	105-125 volts, 60 cycle A.C.	Power Output (Maximum)	4 watts
Loudspeaker	Electrodynamic	Tuning Drive Ratio	4¾ to 1

TUBE COMPLEMENT

1—6SK7GT	RF Amplifier tube	1—6SQ7GT	Detector—AVC—1st Audio tube
1—6SA7GT	Converter tube	1—6K6GT	Power Output tube
1—6SK7GT	IF Amplifier tube	1—5Y3GT	Rectifier tube

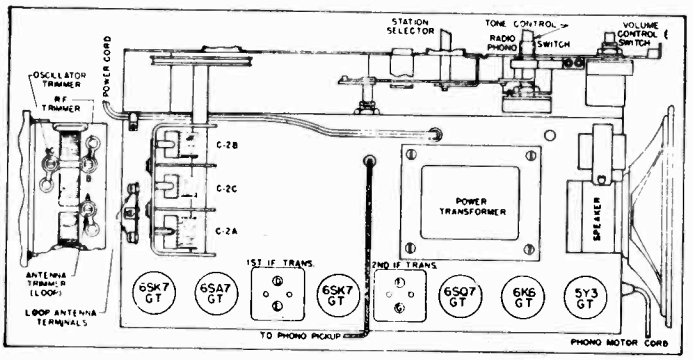
NOTE: The above glass tubes are interchangeable with their metal equivalent.

ALIGNMENT PROCEDURE

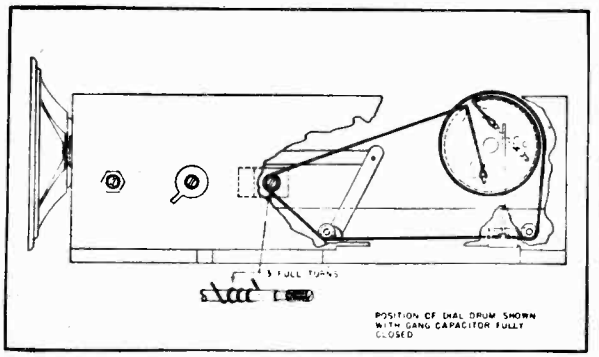
The following equipment is necessary to properly align this chassis:

1. A signal generator which will provide an accurately calibrated signal at the frequencies listed.
2. An output meter.
3. A non-metallic screwdriver.
4. Dummy antenna: — .1 mfd. — RMA loop.

CONNECT GENERATOR TO	DUMMY ANTENNA	INPUT SIGNAL FREQUENCY	BAND	SET DIAL AT	TRIMMERS	PURPOSE
6SA7GT grid	.1 mfd	455 kc.	Broadcast	HF end	D E F G	Align IF
6SK7GT RF grid	.1 mfd	1620 kc.	Broadcast	HF end	C	Set limit of band
6SK7GT RF grid	.1 mfd	1400 kc.	Broadcast	1400 kc.	B	Align RF
RMA loop	Through loop	1400 kc.	Broadcast	1400 kc.	A	Align antenna



Tube Layout



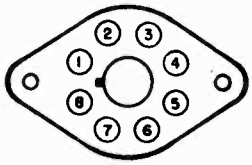
Dial Mechanism

MODEL 4A43

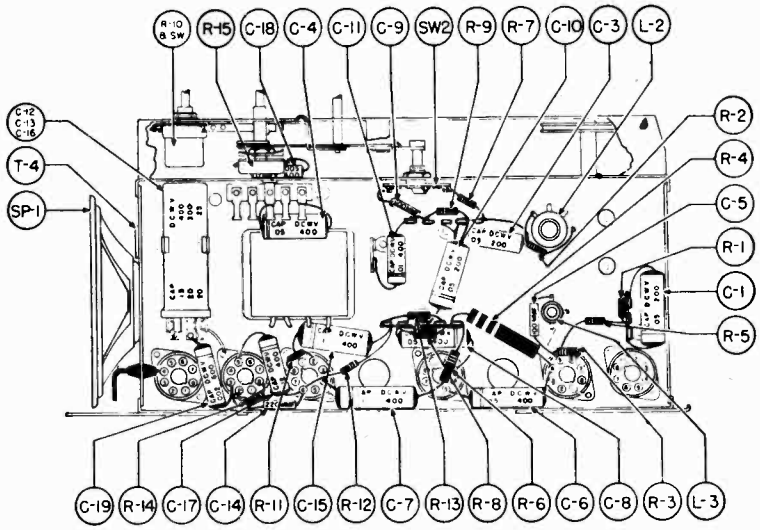
THE FIRESTONE TIRE & RUBBER CO.

SOCKET VOLTAGES

TUBE	POSITION	1	2	3	4	5	6	7	8
6SK7GT	RF Amplifier	0	0	0	0	0	93	6.3 AC	270
6SA7GT	Converter	0	6.3 AC	270	113	-7.5	0	0	0
6SK7GT	IF Amplifier	0	0	0	0	0	93	6.3 AC	260
6SQ7GT	Detector—AVC—1st Audio	0	0	0	0	0	88	6.3 AC	0
6K6GT	Power Output	0	0	250	270	0	0	6.3 AC	19
5Y3GT	Rectifier	0	310	0	290 AC	0	290 AC	0	310



NOTE: All voltages measured from chassis to socket contact indicated.
DC voltages measured with a 1000 ohm-per-volt meter.
All voltages are positive DC unless otherwise marked.
Volume control full on. No signal.
Tone Control in clockwise position.
Line Voltage 117 volts AC.



Parts Layout

SERVICE PARTS LIST

Symbol	Part No.	Description
C-1, 3, 10	BD210503	Cap., Paper, .05 mfd., 200 v.
C-11	BD410103	Cap., Paper, .01 mfd., 400 v.
C-7, 15	BD410104	Cap., Paper, .1 mfd., 400 v.
C-17	BD410203	Cap., Paper, .02 mfd., 400 v.
C-6, 8, 4	BD410503	Cap., Paper, .05 mfd., 400 v.
C-19	BD610202	Cap., Paper, .002 mfd., 600 v.
C-18	BD610502	Cap., Paper, .005 mfd., 600 v.
C-5, 9	BM78A101	Cap., Mica, 100 mmf.
C-14	BM78A221	Cap., Mica, 220 mmf.
R-14	BR16E561	Resistor, 560 ohm, 1 w.
R-2, 8	BR17B102	Resistor, 1000 ohm, ⅓ w.
R-9	BR17B103	Resistor, 10M ohm, ⅓ w.
R-1, 13	BR17B104	Resistor, 100M ohm, ⅓ w.
R-5	BR17B156	Resistor, 15 meg., ⅓ w.
R-3	BR17B223	Resistor, 22M ohm, ⅓ w.
R-12	BR17B224	Resistor, 220M ohm, ⅓ w.
R-7	BR17B335	Resistor, 3.3 meg., ⅓ w.
R-11	BR17B685	Resistor, 6.8 meg., ⅓ w.
R-6	BR17E223	Resistor, 22M ohm, 1 w.
R-4	BR17G153	Resistor, 15M ohm, 2 w.

Symbol	Part No.	Description
	A-2163	Cable, Dial
	A-3123	Clamp, Cable
	A-9285	Lamp, Pilot, Mazda No. 44
	A-51160-3	Cord, Power, 6 ft.
	A-51163	Clip, Spring
C-12, 13	A-51356	Cap., Electro., 15-20-20 mfd.
C-2	C-51501-1	Capacitor, Variable, 3-section
T-1	C-51502	Transformer, Power
L-2	B-51511	Coil, Assembly, RF
SP-1	C-51512	Speaker, 5" Dynamic, 485 ohm
L-3	B-51522	Coil Assembly, Osc.
	A-51531	Shaft, Drive
T-2	B-51416-2	Trans. Assembly, 1st IF
T-3	B-51417-2	Trans. Assembly, 2nd IF
	B-51591	Spring, Dial Bracket
	A-51787	Spring, Cable
	A-51801	Rivet, Pronged, 3/32 x 1/8
	B-55300-1	Channel, Rubber
SW-2	B-55500-1	Switch (Radio-Phono)
R-15	B-55550-1	Potentiometer, 500M ohm
R-10	B-55575-1	Potentiometer & Switch, 500M ohm

Order parts not listed by specifying (1) Part Name, (2) Model Number (include number following dash and (3) Run No.