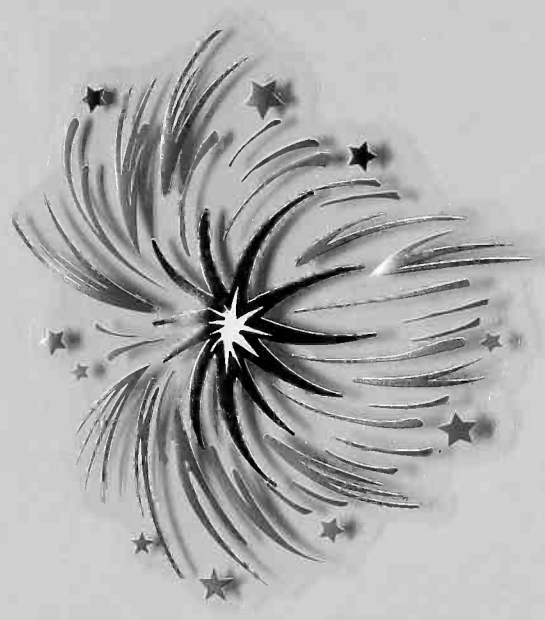
HOME RADIO SECTION



CHASSIS 7N1A • 452
MODELS 462 • 463

SUPPLEMENT No. S810A

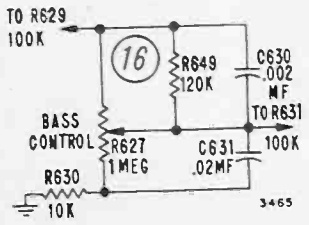
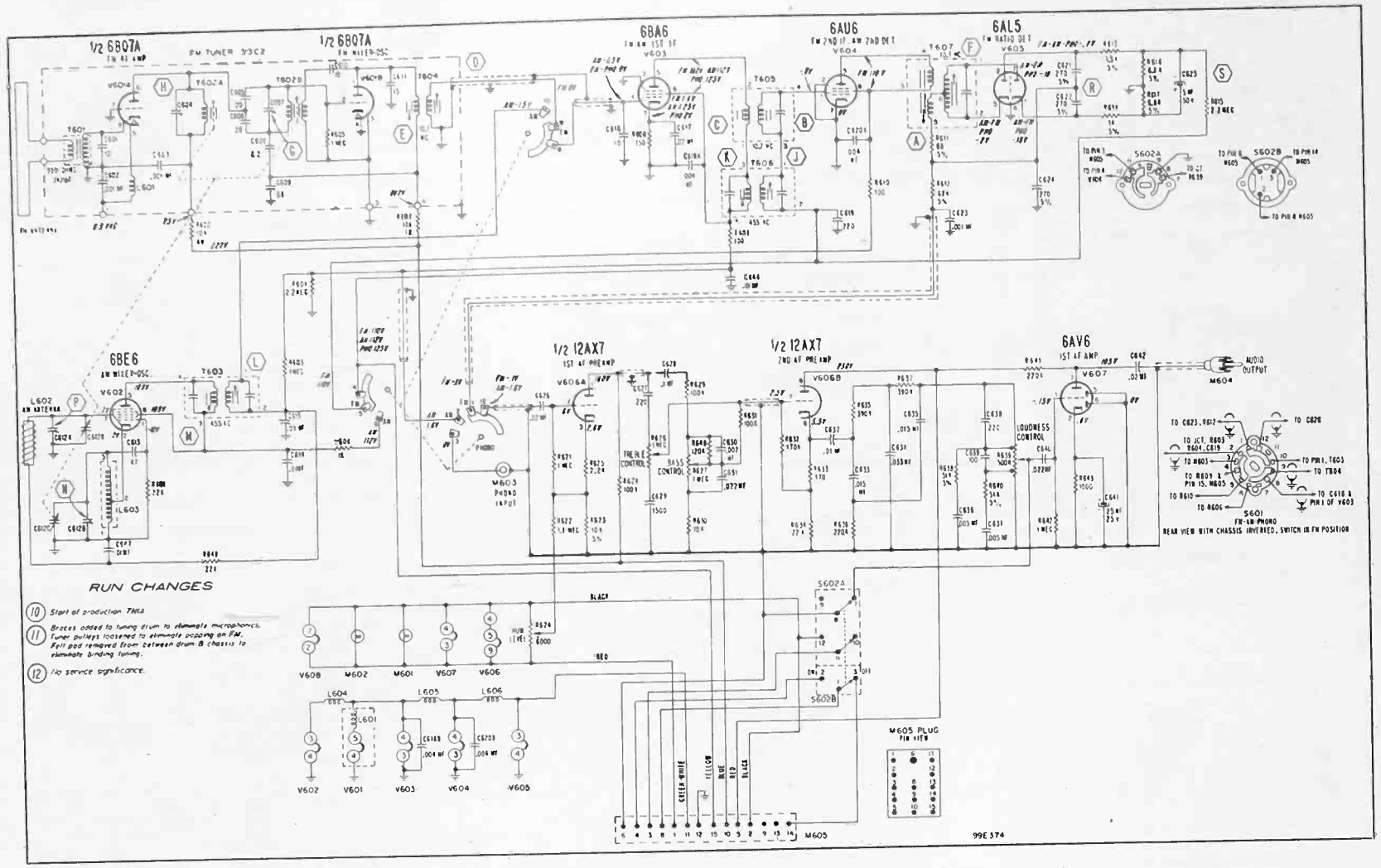


Figure 6. Bass Control Circuit (Chassis 7N1).

RECORD CHANGER PARTS
RC638-1F and RC638-6F

For complete record changer service information, see Service Manuals S800 and S800A.

Sym.	Description	Part No.
M608	Plug, Phono Output	88A 2-3
M609	Cartridge, Pickup (includes needle assembly with twin sapphire-tipped needles; used with RC638-1F)	409B 21-2
M609	Cartridge, Pickup (includes needle assembly with twin sapphire-tipped needles; used with RC638-6F)	409B 24
M610	Motor, Record Changer, 4-speed	407C 24
M611	Plug, Phono Motor AC (4 prong)	88B 5-5
S604	Switch, "REJ-ON-OFF"	408A 1
	Adapter, 45 RPM Record (envelope of 3)	48A 8-2
	Cable, Shielded Pickup, 30" (includes M608)	413A 11-6
	Cable, Tone Arm, Shielded Lead (includes pin jacks; used with RC638-1F)	G400A 685
	Cable, Tone Arm, Shielded Lead (includes pin jacks; used with RC638-6F)	G400A 685-2
	Centerpost Assembly	400B 681
	Control Knob (Coral)	403D 63-3
	Escutcheon, Phono, Gold (fits around turntable)	403D 64-5
	Kit, 50 Cycle Conversion (for 407C24 motor)	98C 15-99
	Needle Assembly (.001" microgroove and .003" standard sapphire-tipped needles; used with 409B21-2 cartridge)	98C 15-62
	Needle Assembly (.001" diamond microgroove and .003" standard sapphire-tipped needles; used with 409B21-2 cartridge	98C 15-63
	Needle Assembly (.001" microgroove and .003" standard sapphire-tipped needles; used with 409B24 cartridge)	98C 15-67
	Plug Button, Record Changer	13B 3-15
	Replacement Parts for Record Changer Motor 407C24	
	Idler Wheel, Molded (includes tire)	98C 15-57
	Idler Spring	98C 15-58
	Drive Belt, 16 and 33 RPM	98C 15-59
	Drive Shaft, 16 and 33 RPM	98C 15-60
	Drive Spring, 78 RPM	98C 15-61
	Spindle, 45 RPM Adapter	G400B 645-2
	Spring, Float (changer mounting)	405A 139-2
	Tone Arm Rest (Coral)	403D 65-3



RUN CHANGES

(10) Start of production 7N1A.

(11) Braces added to tuning drum to eliminate microphonics. Tuner pulleys loosened to eliminate popping on FM. Felt pad removed from between drum & chassis to eliminate binding tuning.

(12) No service significance.

CABINET PARTS LIST
Models 462 and 463

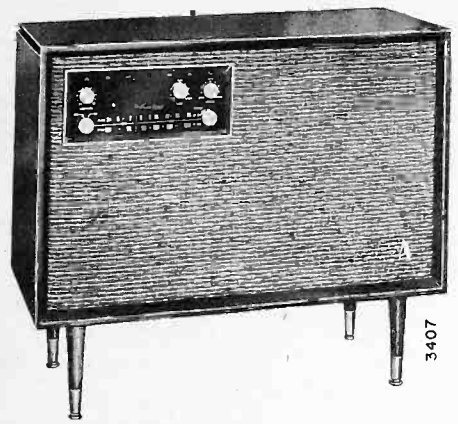
Sym.	Description	Part No.
M614	Terminal Board, External Speaker	10B 13-2
M615	Plug, Speaker, 4 Pin	88B 5-2
M616	Speaker, Woofer, 12" PM (3.2 ohms voice coil impedance)	78B 112-1
M617	Speaker, Mid-Range, 5¼" PM (16 ohms voice coil impedance)	78B 110-1
M618	Speaker, Tweeter, 3½" PM (3.2 ohms voice coil impedance)	78B 91-2
	Bezel, Chrome, with Threaded Studs	23C 299-3
	Bolt, "U" Type, Tuner Mounting	28A 111
	*Cabinet Mahogany (Model 462)	35E 431-2
	Blond (Model 463)	35E 431-3
	Clip, 45 RPM Spindle	11A 20
	Cord, Extension, Phono Motor Power, 12" (includes 4 pin plug and socket)	89A 46-1
	Cover, Speaker Plug (M615)	88B 5-12
	Dial Scale Window, Plastic, White Lettering	21C 108-6
	Grille Cloth for Model 462	36D 86-32
	for Model 463	36D 86-33
	Hinge, Lid	37A 106-2
	Kepsnut, #8-32, Speaker and Tuner Mounting	2A 19-2-71
	Knob, Tuning (Gray)	33C 254-2
	Knob, AM-FM Phono Selector (Aluminum)	33C 254-4
	Knob, On-Off, Treble, Bass and Loudness (Gray and Aluminum)	33C 254-5
	Leg, Molded, with Ferrule and Anchor Bolt Mahogany (for Model 462)	37D 168-2
	Ebony (for Model 463)	37D 168-4
	Lid Support	37C 170-6
	Monogram, Admiral "A"	26C 68-1
	Mounting Plate, Leg (straight leg mounting)	15B 1813-3
	Panel, Cabinet Back (one side covered with acoustical material)	43D 308-1
	Palnut, #6-32 (bezel mounting)	2B 6-38-71
	Screw, #10-32 x 1⅜" WH Phillips (record changer mounting)	1A 153-30-71
	Spacer, Felt (for tuner ¼" control shafts)	5A 12-1
	Spacer, Tuner Shaft	32B 396-1

*Orders for cabinets and certain matching parts will not be filled unless full details are given with the order and the damaged part cannot be repaired economically.

7N1 and 7N1A AM-FM TUNERS and 4S2 HI-FI AMPLIFIER

For complete Record Changer servicing information, see SERVICE MANUALS S800 and S800A.

This Service Manual Supplement is used with Service Manual S810 to service Models 462 and 463.



Front View of Model 462.

HI-FI FM-AM CONSOLE PHONOGRAPH

MODEL	COLOR	CHASSIS	RECORD CHANGER
462	Mahogany	7N1A and 4S2	RC638-1F or RC638-6F
463	Blond		

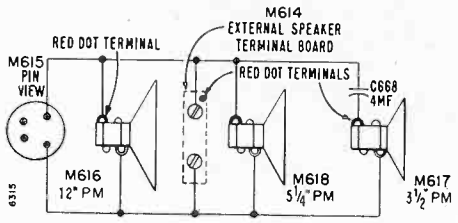


Figure 2. Speaker System, All models.

SPECIFICATIONS

For Models 462 and 463, all "Specifications" remain the same as in S810, except the following:
SPEAKER SYSTEM—Woofer, 12" PM; Mid-Range, 5¼" PM and Tweeter, 3½" PM.

CHASSIS DIFFERENCES
7N1 and 7N1A

The 7N1A FM-AM Tuner is similar to the 7N1 FM-AM Tuner covered in S810. The 7N1A has a new AM converter circuit. All 7N1A chassis are mounted in the inverted position in the cabinet.

4S2

The 4S2 amplifier chassis used in these models is the same as covered in S810.

SERVICING

7N1A—Use the "Parts List" in this supplement with the "Parts List" in Service Manual No. S810 to service the 7N1A chassis. Refer to the schematic diagram in this supplement for 7N1A circuitry.

4S2—Use the "Parts List" and schematic diagram in S810 to service the 4S2 amplifier.

RC638-1F and RC638-6F—The "Parts List" and needle replacement data are covered in this service manual supplement. Refer to Service Manual S800 and S800A for complete record changer service information.

Speaker System—Refer to figure 2 for schematic of speaker system used in models covered by this supplement.

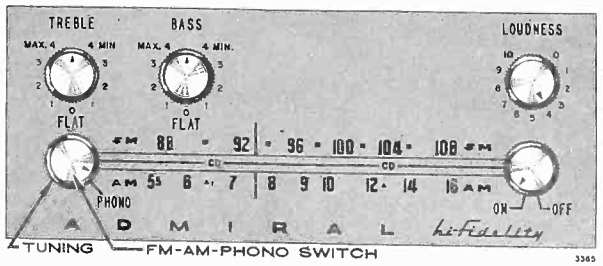


Figure 1. Operating Controls.

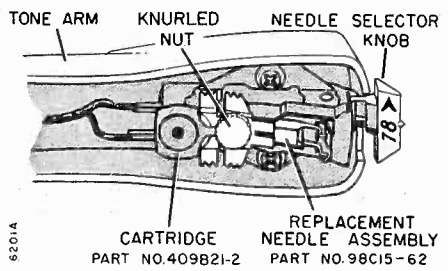


Figure 3. Needle Replacement (RC638-1F).

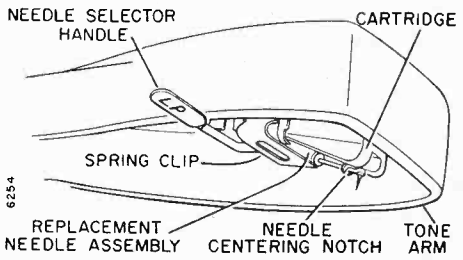


Figure 4. Needle Replacement (RC638-6F).

NEEDLE REPLACEMENT

Two types of cartridges were used on models covered by this supplement.

To replace the needle assembly on models using RC638-1F, refer to figure 3 and loosen the knurled nut on the bottom of the cartridge. Slide old needle assembly out and insert replacement needle assembly in the same position. Insert and tighten knurled nut.

To replace the needle assembly on models using RC638-6F, refer to figure 4 and move the **Needle Selector** handle downward until it is perpendicular with the **Tone Arm.** Open the spring clip slightly and slip the needle assembly out by the **Selector** handle. Make sure the needle shaft clears the needle centering notch. To install a new assembly, reverse the above procedure. Be sure that the needle shaft is centered in the needle centering notch.

Refer to "RECORD CHANGER PARTS", in this supplement, for replacement part numbers of cartridges and needle assemblies.

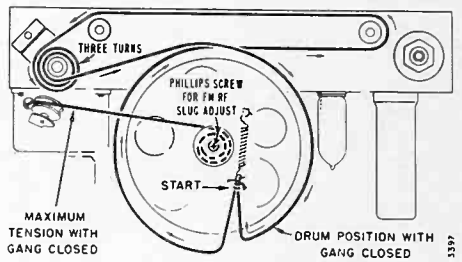


Figure 5. Dial Stringing (Chassis 7N1A).

DIAL STRINGING

The 7N1A chassis dial is strung in accordance with figure 5. If the necessity arises, restring the dial as shown in figure 5.

PARTS LIST

CORRECTIONS TO S810 PARTS LIST

Delete:
Socket, Octal, Magic Eye..... 87A 20-3
Change:
Kit, 50 Cycle Conversion, for 407C24 motor..... 98C 15-72
To read:
Kit, 50 Cycle Conversion, for 407C24 motor..... 98C 15-99

Use the following parts list first and then refer to Parts List in S810 for any parts not listed here:

7N1A
FM-AM TUNER

RESISTORS

Sym.	Description	Part No.
R601	22,000 ohms, ½ watt	60B 8-223
R606	1,000 ohms, ½ watt	60B 8-102
R628	100,000 ohms, ½ watt	60B 8-104
R629	100,000 ohms, ½ watt	60B 8-104
R630	10,000 ohms, ½ watt	60B 8-103
R648	22,000 ohms, ½ watt	60B 8-223
R649	120,000 ohms, ½ watt	60B 8-124

CAPACITORS

Sym.	Description	Part No.
C613	47 mmf, 500 volts, ceramic disc, N750 temp coeff	65D 10-177
C614	.01 mf, 500 volts, GMV, ceramic disc	65D 10-3
C631	.022 mf, 400 volts, molded	64B 8-30
C640	.022 mf, 400 volts, molded	64B 8-30
C647	.01 mf, 500 volts, GMV, ceramic disc	65D 10-3

MISCELLANEOUS CHASSIS PARTS

Description	Part No.
Bracket, Chassis Mtg. (Left)	15B 1731-5
Bracket, Chassis Mtg. (Right)	15B 1731-6
Bracket, Pilot Light Mtg.	15B 1713-2
Dial Background	22C 33-3
Dial Scale Window	See "CABT. PARTS"

8H1B FM-AM TUNER and 6D3B or 6D3C HI-FI AMPLIFIER

For complete Record Changer servicing, see SERVICE MANUALS S800 and S800A.

This Service Manual Supplement is used with Service Manual S813 to service Models 412A, 413A, 414A and 491.

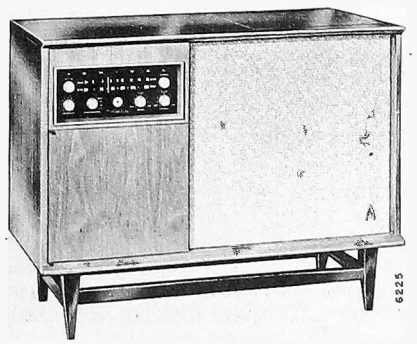


Figure 1. Front View of Model 412A.

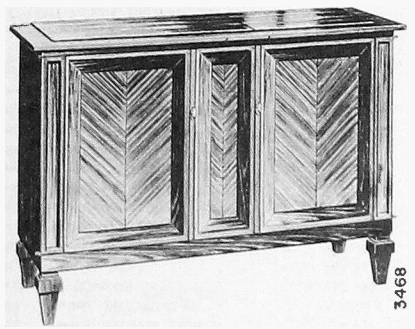


Figure 2. Front View of Model 491.

HI-FI FM-AM CONSOLE PHONOGRAPH

MODEL	COLOR	*CHASSIS	RECORD CHANGER
412A	Mahogany	8H1B and 6D3C	RC 648-3F
413A	Blond		
414A	Sierra		
491	Walnut	8H1B and 6D3B	

*Chassis 6D3B uses pilot light. Chassis 6D3C does not use pilot light.

CORRECTIONS TO S813

On front page, in Model Identification Chart, the information under the heading of "RECORD CHANGER" should read "RC647-3F".

In parts listings, adjacent figures 4 and 5, the title of the last column should read:

"RECORD CHANGER RC647-3F"

CHASSIS DIFFERENCES

8H1-8H1B

All 8H1 chassis use 6AU6 (V602) for AM Mixer-Oscillator. All 8H1B chassis use 6BE6 (V602) AM Mixer-Oscillator. Refer to FM-AM Tuner schematic diagram, in this supplement, for chassis differences.

6D3, 6D3B and 6D3C

The 6D3B and 6D3C chassis differ from the 6D3 chassis in that they do not have remote wiring. Also, chassis 6D3B uses a pilot light. Refer to 6D3B - 6D3C schematic diagram, in this supplement, for chassis differences.

NEEDLE REPLACEMENT

All needle replacement information in S813 covers Record Changers used in Models 412A, 413A, 414A and 491.

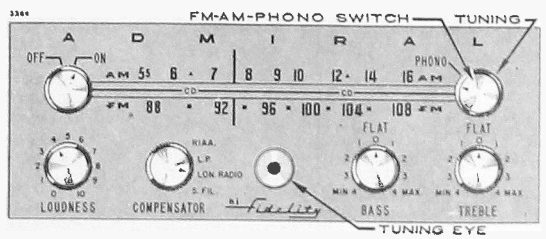


Figure 3. Operating Controls, All Models.

SUPPLEMENT S813A

PARTS LIST 8H1B

NOTE: Some early production of the models covered by this supplement used the 8H1 FM-AM Tuner. To service these tuners, the 8H1-8H1B schematic diagram in this supplement and the "PARTS LIST" in S813 are used.

To service the 8H1B, FM-AM Tuner, use the "PARTS LIST" in S813 with the following changes:

RESISTORS

Symbol	Description	Part No.
Delete:		
R601	2.2 megohms, ½ watt	60B 8-225
R606	15,000 ohms, ½ watt	60B 8-153
Add:		
R601	22,000 ohms, ½ watt	60B 8-223
R606	1,000 ohms, ½ watt	60B 8-102
R648	22,000 ohms, ½ watt	60B 8-223
R649	120,000 ohms, ½ watt	60B 8-124

CAPACITORS

Delete:		
C613	33 mmf, 500 volts, 5%, cer. disc, N1400 temp. coeff.	65D 10-119
C614	.001 mf, 400 volts, GMV, cer. disc	65D 10-6
C647	10 mmf, 500 volts, 10%, cer. disc	65D 6-44
Add:		
C613	47 mmf, 500 volts, 10%, cer. disc, N750 temp. coeff.	65D 10-177
C614	.01 mf, 500 volts, GMV, cer. disc	65D 10-3
C647	.01 mf, 500 volts, GMV, cer. disc	65D 10-3

COILS AND TRANSFORMERS

Delete:		
L603	AM Oscillator Coil	69A 227-1
Add:		
L603	AM Oscillator Coil	69A 52-12

MISCELLANEOUS CHASSIS PARTS

Delete:		
	Dial Background	22C 33-6
	Dial Background	22C 33-2
	Dial Background Extension, Dark Brown	17B 1757
	Dial Scale Window	21C 108-2
	Dial Scale Window	21C 108-4
Add:		
	Bracket, Chassis Mtg. (left)	15B 1731-5
	Bracket, Chassis Mtg. (right)	15B 1731-6
	Dial Background (aluminum)	22C 33-4
	Dial Scale Window	See Cabt. Parts
	Gasket, Spacer (gray chipboard)	43B 307-1
	Grommet, Chassis Mounting	12A 2-10
	Spacer Sleeve (for mtg. chassis assembly to Dial Background)	29A 2-12-71

RETWAP
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HI-FI AMPLIFIERS 6D3B and 6D3C

Refer to the "Parts List" below and then to the "Parts List" in S813 for replacement parts for chassis 6D3B and 6D3C.

RESISTORS

Symbol	Description	Part No.
	"Same as in S813"	

CAPACITORS

C666	330 mmf, 2KV, ceramic disc	65D 10-186

COILS AND TRANSFORMERS

"Same as in S813"

MISCELLANEOUS CHASSIS PARTS

M606	Socket, Tuner Power	88A 20-2
M607	Socket, Amplifier Input	88A 1
M608	Socket, Amplifier Input	88A 1
M612	Socket, Phono Motor Power	88B 8-6
M617	Pilot Lamp, #47 (used on chassis 6D3B only)	81A 1-8
M620	Socket, Audio Output (4 pin)	88B 5-3
CR601	Rectifier, Selenium	93B 1-6
Line Cord, 8 ft. (with plug)		89B 1-1
Socket, Octal		87A 5-1
Socket, 9 Pin Miniature		87A 25-3

CABINET PARTS MODELS 412A, 413A and 414A

Symbol	Description	Part No.
M614	Plug, Output	88A 2-3
M615	Socket, Tape Input	88A 1
M616	Socket, Tape Input	88A 1
M618	Terminal Board, External Speaker	10B 13-2
M619	Plug, Speaker (4 pin)	88B 5-2
M621	Woofer, 15" PM (8 ohm voice coil)	78B 86-3
M622	Mid-Range, 8" PM (16 ohm voice coil)	78B 92-6
M623	Mid-Range, 5¼" PM (3.2 ohm voice coil)	78B 110-5
M624	Tweeter, 3½" PM (3.2 ohm voice coil)	78B 91-2
S605	Switch, External Speaker	77A 81
S606	Switch, RECORD-PLAY	77A 20-3
Bezel, Dial (Chrome finish)		23C 299-3
Bolt, "U" (tuner mtg.)		28A 111
*Cabinet		
	Mahogany, model 412A	35E 413-5
	Blond, model 413A	35E 413-6
	Sierra, model 414A	35E 413-7
Cover (for speaker plug M619)		88B 5-12
Dial Scale Window (white lettering)		21C 108-7
Escutcheon, External Speaker Switch		23A 311
Grille Cloth		
	for Model 412A	36D 86-41
	for Models 413A and 414A	36D 86-42
Hinge, Lid		37C 105-1
Knobs and Associated Parts:		
	Tuning, Gray	33C 254-2
	Selector, AM-FM-Phono, Silver	33C 254-4
	ON-OFF-Volume, Loudness, Bass, Treble or Record Compensator	33C 254-5
	External Speaker (for Ext. Speaker Switch)	33C 254-8
	Compression Ring	18A 5-12
	Monogram "A"	26C 68-1

— Parts List continued on next page —

— *Parts List continued* —

MODEL 491

Symbol	Description	Part No.
M614	Plug, Output	88A 2-3
M615	Socket, Tape Input	88A 1
M616	Socket, Tape Input	88A 1
M618	Terminal Board, External Speaker	10B 13-2
M619	Plug, Speaker (4 pin)	88B 5-2
M621	Woofer, 15" PM (8 ohm voice coil)	78B 86-3
M622	Mid-Range, 8" PM (16 ohm voice coil)	78B 92-6
M623	Mid-Range, 5¼" PM (3.2 ohm voice coil)	78B 110-5
M624	Tweeter, 3½" PM (3.2 ohm voice coil)	78B 91-2
S605	Switch, External Speaker	77A 81
S606	Switch, RECORD-PLAY	77A 20-3
	Bezel, Dial (Chrome)	23C 299-3
	Bolt, "U" (tuner mtg.)	28A 111
*	Cabinet, Walnut	35E 429
	Cover (for speaker plug M619)	88B 5-12
	Dial Scale Window (white lettering)	21C 108-7
	Door Pull (with mtg. screws)	37A 171-2
	Escutcheon, External Speaker Switch	23A 311
	Grille Cloth	36D 86-35
	Hinge, Door (center section of door)	37A 106-2
	Hinge, Lid, ¾" long (Bronze)	37D 173-1
	Jewel, Pilot Light (Green)	82A 10-8
	Knobs and Associated Parts:	
	Tuning, Gray	33C 254-2
	Selector, AM-FM-Phono, Silver	33C 254-4
	ON-OFF-Volume, Loudness, Bass, Treble or Record Compensator	33C 254-5
	External Speaker	33C 254-8
	Compression Ring	18A 5-12
	Lid Support, Bronze (left)	37C 170-6

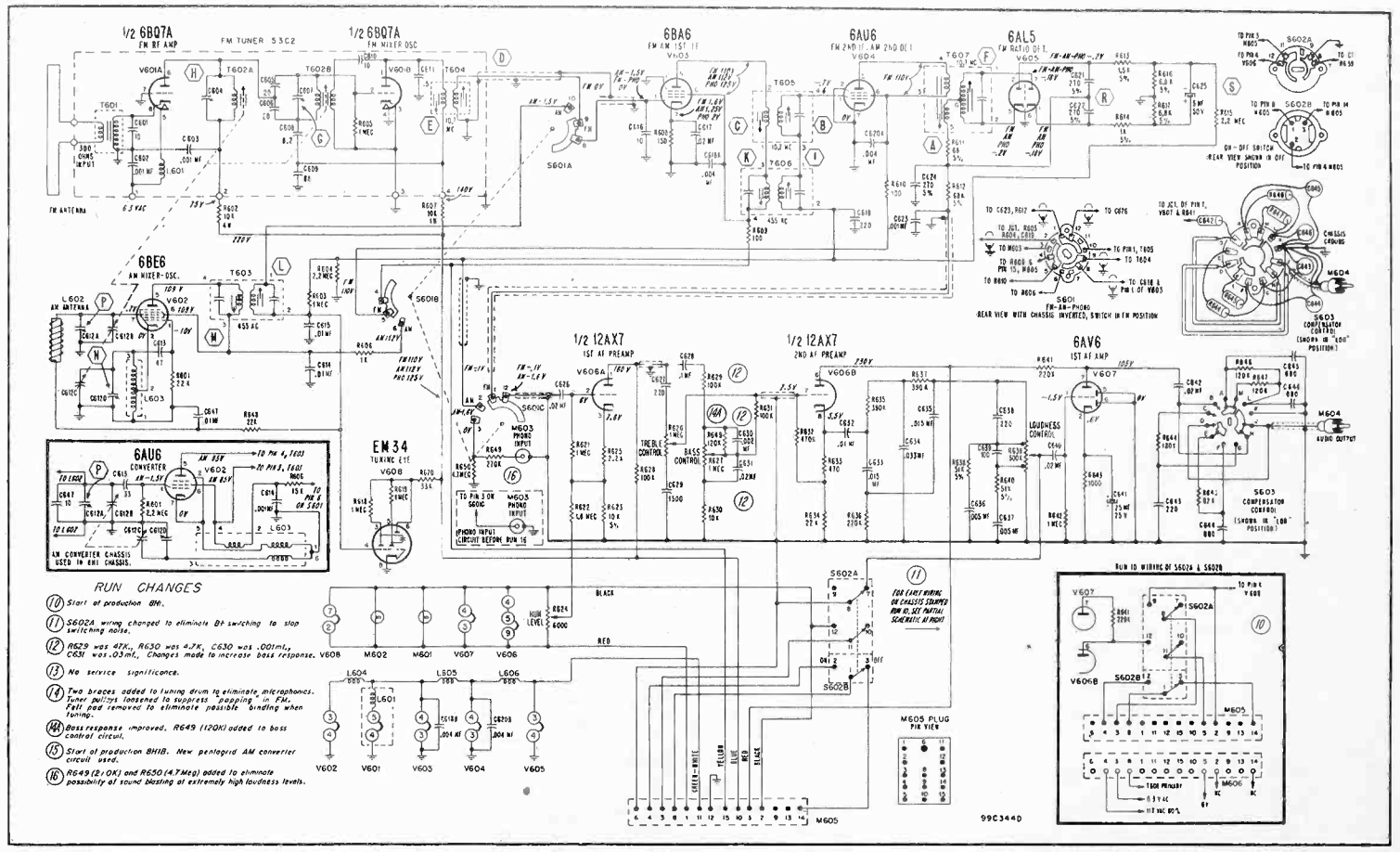
RECORD CHANGER RC648-3F

NOTE: Use "RECORD CHANGER" section of "PARTS LIST" in S813, with the following changes when servicing RC648-3F.

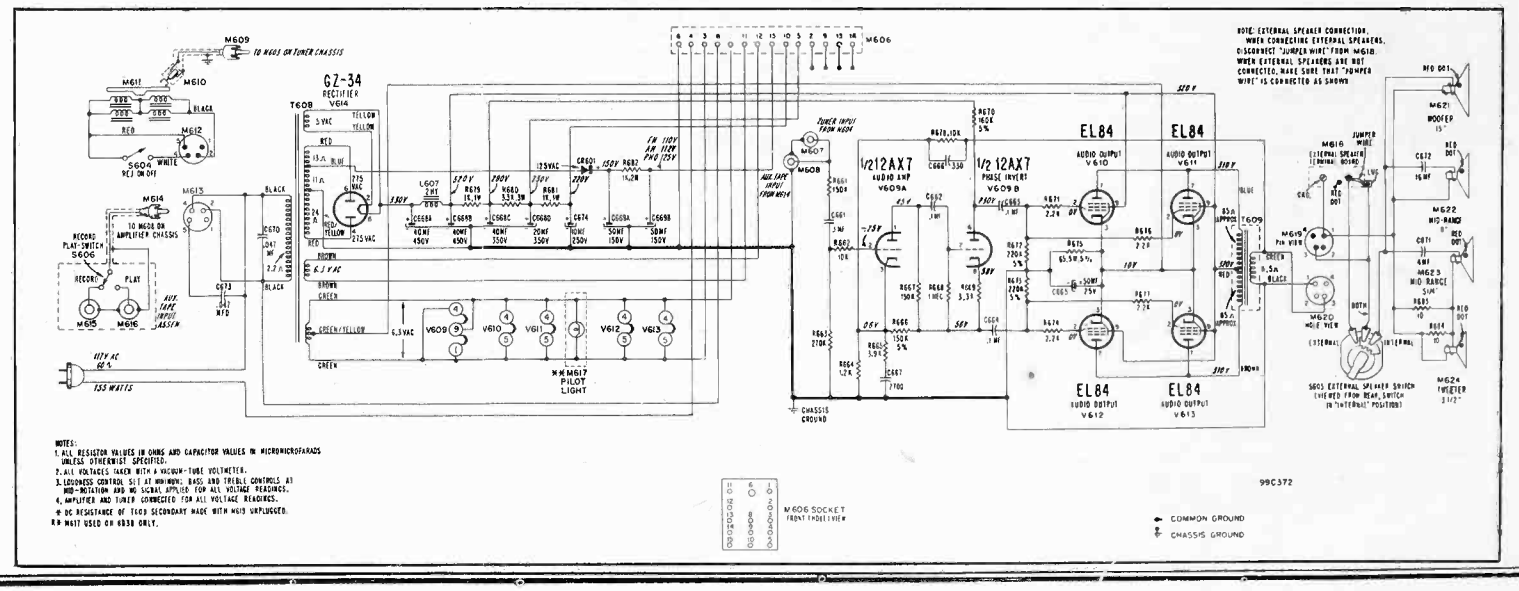
Symbol	Description	Part No.
Delete:		
	Centerpost Assembly	G400B 601
Add:		
	Centerpost Assembly	400B 681

* Orders for cabinets and certain matching parts will not be filled unless the damaged item cannot be repaired economically and full details are given with order.

8H1-8H1B SCHEMATIC DIAGRAM



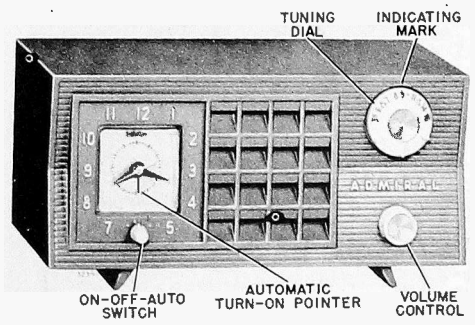
6D3B-6D3C SCHEMATIC DIAGRAM



NOTES:
1. ALL RESISTOR VALUES IN OHMS AND CAPACITOR VALUES IN MICROMICROFARADS UNLESS OTHERWISE SPECIFIED.
2. ALL VOLTAGES TAKEN WITH A VACUUM-TUBE VOLTMETER.
3. LOUDNESS CONTROL SET AT MINIMUM; BASS AND TREBLE CONTROLS AT MID-ROTATION AND NO SIGNAL APPLIED FOR ALL VOLTAGE READINGS.
4. AMPLIFIER AND TUNER CONNECTED FOR ALL VOLTAGE READINGS.
* DC RESISTANCE OF T608 SECONDARY MADE WITH M613 UNPLUGGED.
RX NOT USED ON 6B3B ONLY.

4M2 · 4M2A CHASSIS

**THIS SERVICE MANUAL INCLUDES ALL INFORMATION IN SERVICE MANUAL NO. S585
SERVICE MANUAL S585 MAY THEREFORE BE DESTROYED.**



NOTE: Refer to Admiral Service Manual No. S559 for service information on etched circuit wiring.

CLOCK RADIO

MODEL	COLOR	CHASSIS
4M22	Mahogany	4M2
4M23	Ivory	
4M25	Coral	
4M28	Green	
251	Ebony	4M2A
251A		

SPECIFICATIONS

ANTENNA: Built-in loop.

CIRCUIT: Superheterodyne using 4 miniature tubes.

FREQUENCY RANGE: Standard broadcast band: 535 to 1620 KC.

INTERMEDIATE FREQUENCY: 455 KC.

POWER CONSUMPTION: 30 watts.

POWER SUPPLY: 117 volts, 60 cycles, AC only.

SPEAKER: 4" PM with Alnico V magnet. Voice coil impedance, 3.2 ohms.

GENERAL

This group of small, compact but very efficient AM radios was made possible by using the latest of modern "etched" wiring. This type circuit replaces the old fashioned hook-up wire used in the past. A copper foil is permanently bonded to one side of a phenolic board. The foil is then etched into the desired circuit wiring for the receiver.

All components such as resistors and capacitors, etc. are wired in on the opposite side of the board. All components are of standard design and type. By using the information given in this manual the trouble shooting procedure is the same as in the past, but repairing of this type circuit requires an entirely different technique.

For information on servicing etched wiring circuits, see Service Manual No. S559.

COMPONENT REPLACEMENT

Defective resistors and capacitors should be removed by clipping leads as close to the unit as possible then the new part neatly soldered to the old leads. If any resistor or capacitor is found inconvenient to replace on the top side of board, it is permissible to solder component on the rear of the board.

If a unit such as the oscillator coil or IF transformer is to be replaced, first remove old part by heating the mounting lugs with a pencil type soldering tool (35 watts or less) and straighten with pick and long nose pliers. Brush away any loose solder with a stiff glue type brush. Before inserting new unit make certain all lug holes are free of solder, to prevent damage to wiring or component or both.

An open or damaged section of the etched wiring may be repaired by soldering a short jumper wire across the break.

It is seldom necessary to replace complete tube sockets. Tube socket lugs may be replaced individually. Tube socket lugs may be ordered under part number 87D35-2. NOTE: If a complete socket is replaced, make certain that the center, "shield" connection is securely soldered to the etched board, to prevent possibility of hum or oscillation developing.

TO REMOVE CHASSIS OR CLOCK FROM CABINET

To remove the chassis from the cabinet:

Remove the knobs from the front of the cabinet, and the four hex head screws in the corners of the cabinet back Remove the screw under the Tuning knob and the screw that holds the Volume control bracket to the cabinet. Slide the chassis out of its mounting groove after disconnecting the speaker leads. (The speaker may be removed instead.)

To remove the clock from the cabinet:

Remove the cabinet back, the knob on the front of the clock face and the hex nuts that mount the clock to the cabinet. The clock crystal (front) is a snap-in type. To remove crystal, locate tabs above and below the clock face (from inside cabinet). Push top tab down and bottom tab up and crystal will snap out of position. To remove clock completely, unsolder the clock AC leads from the clock motor or AC interlock.

PARTS AND SERVICE FOR CLOCK

Consult your Admiral distributor for the address of the nearest parts and service station for clocks used in Admiral radios.

VOLTAGE PRECAUTION

The chassis of this receiver is connected directly to one side of the power line. To avoid possibility of damage to test equipment or to etched circuit wiring, do not place the chassis directly on a metal service bench, tools or other metal objects.

When taking voltage readings or making resistance measurements, use test leads with needle point prods to avoid possibility of short circuit between sections of the circuit wiring.

SERVICE HINTS

If set is noisy (squeals, hisses, etc) at high volume levels, check lead dress of output transformer. The blue lead from pin 7 of the 50C5 tube should be routed along the rear of the board and the bottom of the cabinet to the transformer; **not across the board or between the tubes.**

If oscillator drift is encountered (resulting in the stations drifting slightly) check oscillator coil for number of terminals. The early production oscillator coil (L2) had only 5 terminals. Replace with later production coil with 6 terminals. Part No. 69A215-4. Ground terminal No. 6 to frame of gang capacitor.

PARTS LIST

RESISTORS

Sym.	Description	Part No.
R1	2.2 megohms, ½ watt	60B 8-225
R2	6.8 megohms, ½ watt	60B 8-685
R3	470,000 ohms, ½ watt	60B 8-474
R4	2 megohms, Volume control	75C25-7
R5	470,000 ohms, ½ watt	60B 8-474
R6	180 ohms, ½ watt	60B 8-181
R7	3,300 ohms, 1 watt	60B 14-332
R8	33 ohms, 2 watts	60B 20-330

CAPACITORS

Sym.	Description	Part No.
*C1A	354 mmf, max. ant. } tuning	68B 64-3
C1B	89.3 mmf, max. osc. } gang	
C2	.01 mf, ceramic disc	65D 10-3
C3	33 mmf, ceramic disc	65D 10-119
C4	150 mmf, ceramic disc	65D 10-85
C5	2,200 mmf, ceramic disc	65D 10-111
C6	220 mmf, ceramic disc	65D 10-21
C7	2,200 mmf, ceramic disc	65D 10-89
C8A	20 mf, 25 volts }	
C8B	30 mf, 150 volts } electrolytic	67C 39-4
C8C	50 mf, 150 volts }	
C9	.01 mf, ceramic disc	65D 10-3
C10	.047 mf, 400 volts, tubular	64B 17-28
C11	2.2 mmf, ceramic disc, N750 temp. coeff.	65D 10-27
C12	Antenna (RF) Trimmer, 2.5 to 30 mmf.	66A 33-1

COILS, TRANSFORMERS AND MISCELLANEOUS PARTS

L1	Loop Antenna	See Back, Cabinet
L2	Oscillator Coil (with Yellow dot)	69A 215-4
T1	IF Transformer (with Brown dot)	72C 175-1
M1	Speaker, 4" PM (includes output transformer)	78B 94-4
M2	Line Cord and Interlock Socket	89A 22-5
M3	Interlock Plug	88A 33-1
S1	Switch, Off-On	Part of M4
M4	Clock	See Clock Parts
	Socket, Tube, Plain	87D 35-13
	Socket, Tube, with shield contact	87D 35-14
	Lug, for replacement in above sockets	87D 35-2

CABINET PARTS

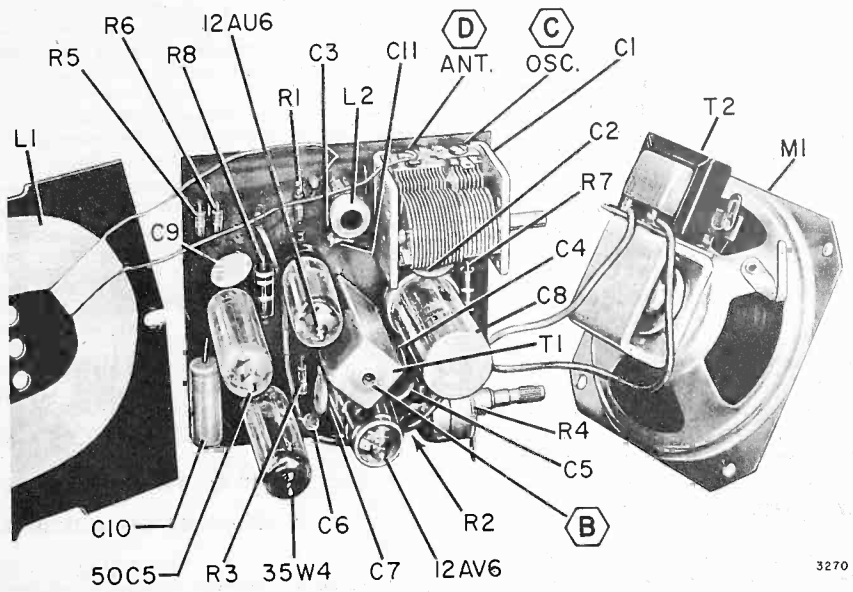
Description	Part No.
*Back, Cabinet (includes loop antenna)	69C 199-4
Cabinet, Plastic	
Coral	34D 78-12
Ebony	34D 106-2
Green	34D 78-14
Ivory	34D 78-6
Mahogany	34D 78-2
Knob, Tuning	
Maroon	33C 197-4
White	33C 197-10
Knob, Volume	
Maroon	33C 197-5
White	33C 197-11
Rivet, Shoulder (mtg. 89A22-5)	6A 4-14-24
Spring, Compression Ring, for tuning knob	19A 31-10
Washer (mtg. 89A22-5)	4B 1-32-24

CLOCK PARTS

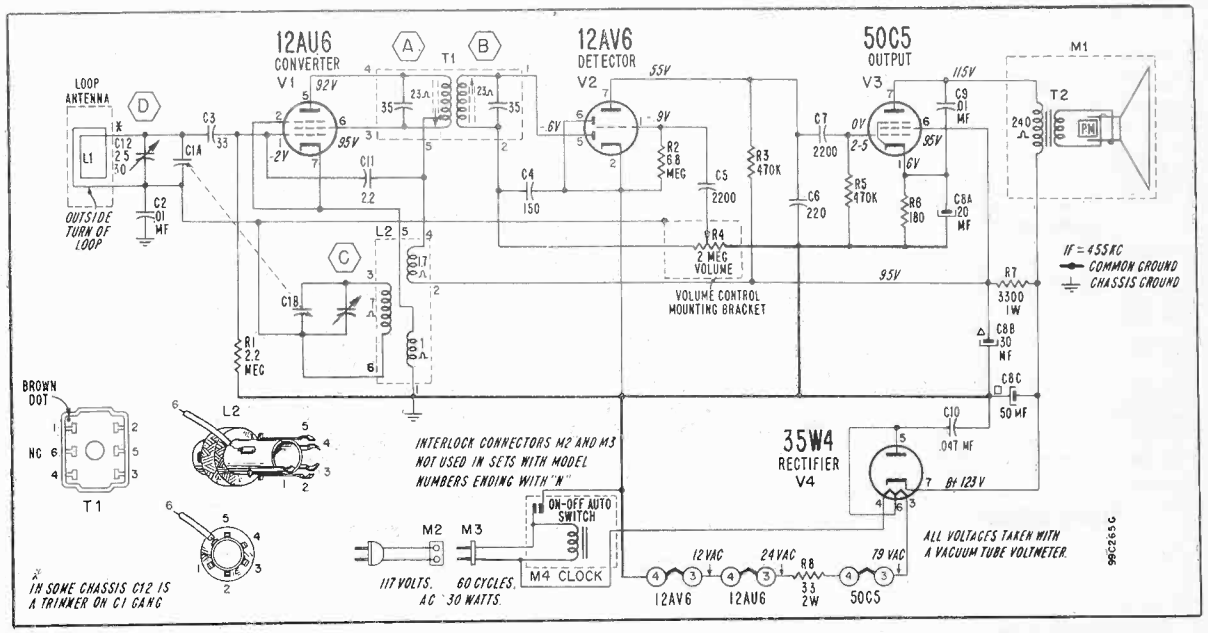
Clock, Complete (for 110 volts, 60 cycles AC only)	91C 33-1
Crystal, Clock Front	24A 20-2
Knob, Clock, Clear	91C 33-10

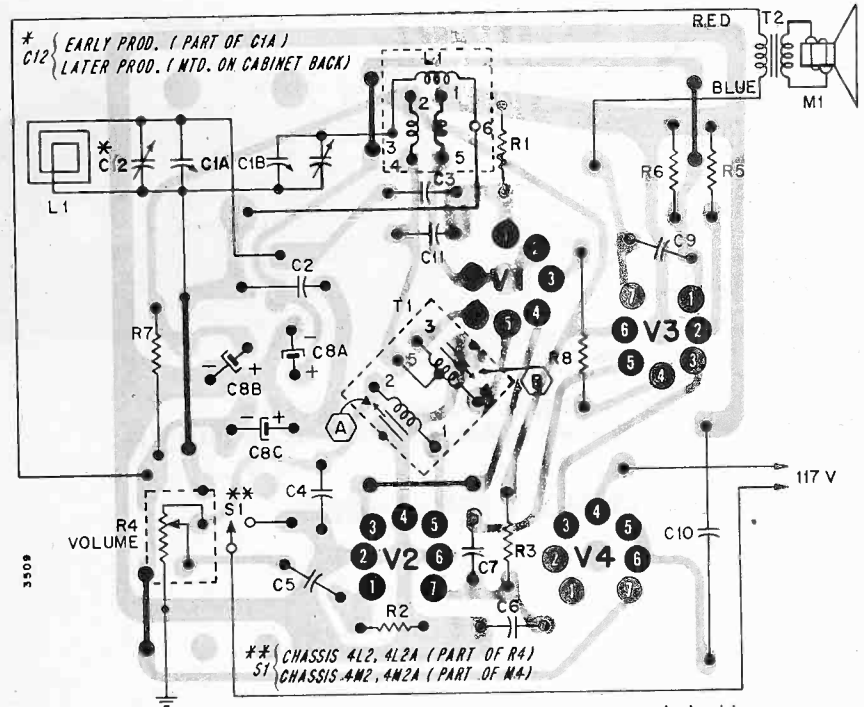
*In early production sets, the tuning gang has two trimmers; one antenna and one oscillator. In some sets, the gang has only one trimmer (osc.) with the antenna trimmer mounted on the cabinet back. In still other sets the trimmer is supplanted by a gimmick (single loop) on the antenna loop. The gang capacitor supplied for replacement is one with two trimmers. If one trimmer is not needed, it should be removed from the gang by bending top plate until it breaks off. The cabinet back supplied for replacement has a gimmick type loop antenna. If gang has two trimmers, the antenna section must be removed.

In other words, if former cabinet back or gang capacitor had trimmer C12 attached, the gimmick will now be tuned per instructions given for trimmer C12 (see adjustment "D" in schematic).



Top View of Chassis Showing Location of Components and Alignment Points.





Rear View of Etched Wiring Board. Gray area represents etched wiring; black symbols and lines represent components on opposite side.

VOLTAGE DATA

- All readings made between tube socket terminals and common ground.
- Dial turned to low frequency end; volume control at minimum.
- All voltages measured with vacuum-tube voltmeter, on 117 Volts AC line.

ALIGNMENT PROCEDURE

a. Use an isolation transformer or connect a .1 mf. capacitor in series with low side of signal generator.
CAUTION: DO NOT CONNECT AN EARTH GROUND WIRE DIRECTLY TO CHASSIS.

b. Set Volume control full on.

c. Connect output meter across speaker voice coil. For best results disconnect speaker and use 3.2 ohm load.

d. Use lowest setting of signal generator capable of producing adequate indication on lowest scale of output meter.

e. Use a non-metallic alignment screwdriver for aligning IF transformers.

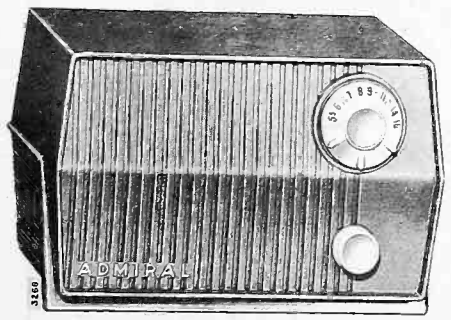
f. Repeat adjustments to insure good results.

Step	Connection of Signal Generator	Signal Gen. Frequency	Receiver Gang Setting	Adjustment Description	Adjustment
1	Through a .1 mf capacitor to pin 1 of the 12AU6 (Converter) tube.	455 KC	Gang fully open	IF Primary IF Secondary	* (A) and (B) for maximum output
2	Same as "STEP 1".	1620 KC	Gang fully open	Oscillator Trimmer	(C) for maximum output
3	Radiated Signal. Loop of several turns of wire, or place generator lead close to receiver loop for adequate signal pickup.	1400 KC	Tune in generator signal	Antenna Trimmer	(D) for maximum output (Rock gang for optimum results)

* Adjustment (A) made from rear of etched board.

4L2 · 4L2A CHASSIS

THIS SERVICE MANUAL INCLUDES ALL INFORMATION GIVEN IN SERVICE MANUAL NO. S579. SERVICE MANUAL S579 MAY THEREFORE BE DESTROYED.



Note: Refer to Admiral Service Manual No. S559 for service information on etched circuit wiring.

TABLE RADIO

MODEL	COLOR	CHASSIS
4L20A	GREY	4L2A
4L21 4L21A	EBONY	4L2 4L2A
4L24 4L24A	PINK	4L2 4L2A
4L25 4L25A	RED	4L2 4L2A
4L26 4L26A	YELLOW	4L2 4L2A
4L28 4L28A	GREEN	4L2 4L2A

SPECIFICATIONS

ANTENNA: Built-in loop.

CIRCUIT: Superheterodyne using 4 miniature tubes.

FREQUENCY RANGE: Standard broadcast band: 535 to 1620 KC.

INTERMEDIATE FREQUENCY: 455 KC.

POWER SUPPLY: 117 volts, 60 cycles, AC or DC.

POWER CONSUMPTION: 30 watts.

SPEAKER: 4" PM with Alnico V magnet. Voice coil impedance, 3.2 ohms.

GENERAL

This group of small, compact but very efficient AM radios was made possible by using the latest form of modern "etched" wiring. This type circuit replaces the old fashioned hook-up wire used in the past. A copper foil is permanently bonded to one side of a phenolic board. The foil is then etched into the desired circuit wiring for the receiver.

All components such as resistors and capacitors, etc. are wired in on the opposite side of the board. All components are of high quality and standard design and type. By using the information given in this manual the trouble shooting procedure is the same as formerly, but repairing of this type circuit requires an entirely different technique.

For information on servicing etched wiring circuits, see Service Manual No. S559.

COMPONENT REPLACEMENT

Defective resistors and capacitors should be removed by clipping leads as close to the unit as possible then the new part neatly soldered to the old leads. If any resistor or capacitor is found inconvenient to replace on the top side of board, it is permissible to solder component on the rear of the board.

If a unit such as the oscillator coil or IF transformer is to be replaced, first remove old part by heating the mounting lugs with a pencil type soldering tool (35 watts or less) and straighten with pick and long nose pliers. Brush away any loose solder with a stiff glue brush. Before inserting new unit make certain all lug holes are free of solder, to prevent damage to wiring or component or both.

An open or damaged section of the etched wiring may be repaired by soldering a short jumper wire across the break.

It is seldom necessary to replace complete tube sockets. Tube socket lugs may be replaced individually. Tube socket lugs may be ordered under part number 87D35-2. NOTE: If a complete socket is replaced, make certain that the center "shield" connection is securely soldered to the etched board, to prevent possibility of hum or oscillation developing.

REMOVING CHASSIS FROM CABINET

Remove the line cord plug from the AC outlet, the knobs from the front of the cabinet, and the three hex head screws in the cabinet back. Remove the screw under the Tuning knob and the screw that holds the Volume control bracket to the inside of the cabinet. Unsolder speaker leads (or remove speaker) then slide the chassis out of its mounting groove.

VOLTAGE PRECAUTION

The chassis of this receiver is connected directly to one side of the power line. To prevent damage to test equipment or to etched wiring, do not place chassis directly on a metal bench, or other metal objects.

When taking voltage or resistance measurements, use test prods with needle points to avoid short circuits between sections of the circuit wiring.

SERVICING THE SET

Useful items for servicing transistor sets.

1. Small (glue type) brush for solder removal.
2. Metal soldering pick.
3. 60-40 low temperature, rosin core solder should be used for all soldering.
4. Pencil type soldering iron with a small tip (35 watts or less).

WARNING: Excessive heat may damage the "etched" wiring during component replacement, if a soldering pencil, iron or gun of higher than 35 watts rating is used.

SERVICE HINTS

If set is noisy (squeals, hisses, etc.) at high volume levels, check lead dress of output transformer. The blue lead from pin 7 of the 50C5 tube should be routed along the rear of the board and the bottom of the cabinet to the transformer; **not across the board or between the tubes.**

If oscillator drift is encountered (resulting in the stations drifting slightly) check oscillator coil for number of terminals. The early production oscillator coil (L2) had only 5 terminals. Replace with later production coil with 6 terminals. Part No. 69A215-4. Ground terminal No. 6 to frame of gang capacitor.

PARTS LIST

RESISTORS

Sym.	Description	Part No.
R1	2.2 megohms, ½ watt	60B 8-225
R2	6.8 megohms, ½ watt	60B 8-685
R3	470,000 ohms, ½ watt	60B 8-474
R4	2 megohms, Volume control (inc. switch S1)	75C 25-6
R5	470,000 ohms, ½ watt	60B 8-474
R6	180 ohms, ½ watt	60B 8-181
R7	3,300 ohms, 1 watt	60B 14-332
R8	33 ohms, 2 watts	60B 20-330

CAPACITORS

Sym.	Description	Part No.
*C1A	354 mmf, max. ant. } tuning	
C1B	89.3 mmf, max. osc. } gang	68B 64-3
C2	.01 mf, ceramic disc	65D 10-3
C3	33 mmf, ceramic disc	65D 10-119
C4	150 mmf, ceramic disc	65D 10-85
C5	2,200 mmf, ceramic disc	65D 10-111
C6	220 mmf, ceramic disc	65D 10-21
C7	2,200 mmf, ceramic disc	65D 10-89
C8A	20 mf, 25 volts }	
C8B	30 mf, 150 volts } electrolytic	67C 39-4
C8C	50 mf, 150 volts }	
C9	.01 mf, ceramic disc	65D 10-3
C10	.047 mf, 400 volts, tubular	64B 17-28
C11	2.2 mmf, ceramic disc, N750 temp. coeff	65D 10-27
C12	Antenna (RF) Trimmer, 2.5 to 30 mmf	66A 33-1

COILS, TRANSFORMERS AND MISCELLANEOUS PARTS

L1	Antenna, Loop	Part Cainet Back
L2	Coil, Oscillator (with Yellow dot)	69A 215-4
T1	IF Transformer (with Brown dot)	72C 175-1
M1	Speaker (4" PM), includes Output Transformer	78B 94-4
M2	Line Cord and Interlock Socket (used in models without suffix letter "N")	89A 22-5
	Line Cord (used in models without suffix letter "N")	89A 2-3
M3	Connector, Interlock (used in models without suffix letter "N")	88A 33-1
S1	Switch, Off-On	Part of R4

Description	Part No.
Shield, for 12AV6 tube	87C 7-19
Socket, Tube, Plain	87D 35-13
Socket, Tube with shield contact	87D 35-14
Lug, for replacement in above socket	87D 35-2

CABINET PARTS

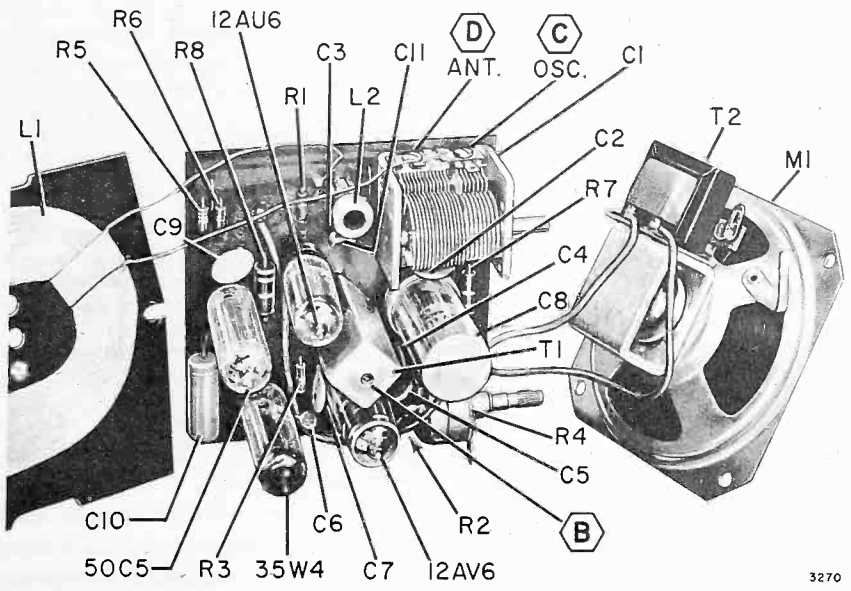
Description	Part No.
*Back, Cabinet (includes loop antenna) for models with suffix letter "N"	69C 212-3
for models without suffix letter "N"	69C 212-4
Cabinet, Plastic Ebony	34D 111-7
Green	34D 111-16
Gray	34D 111-13
Pink	34D 111-14
Red	34D 111-10
Yellow	34D 111-15
Knob, Tuning, White with "Gold" insert	33C 133-19
without insert	33C 133-21
Knob, Volume, White with "Gold" insert	33C 133-20
without insert	33C 133-22

*In early production sets, the tuning gang has two trimmers; one antenna and one oscillator. In others, the gang has one trimmer (osc.) with the antenna trimmer mounted on the cabinet back. In still other sets the trimmer is supplanted by a gimmick (single loop) on the antenna loop.

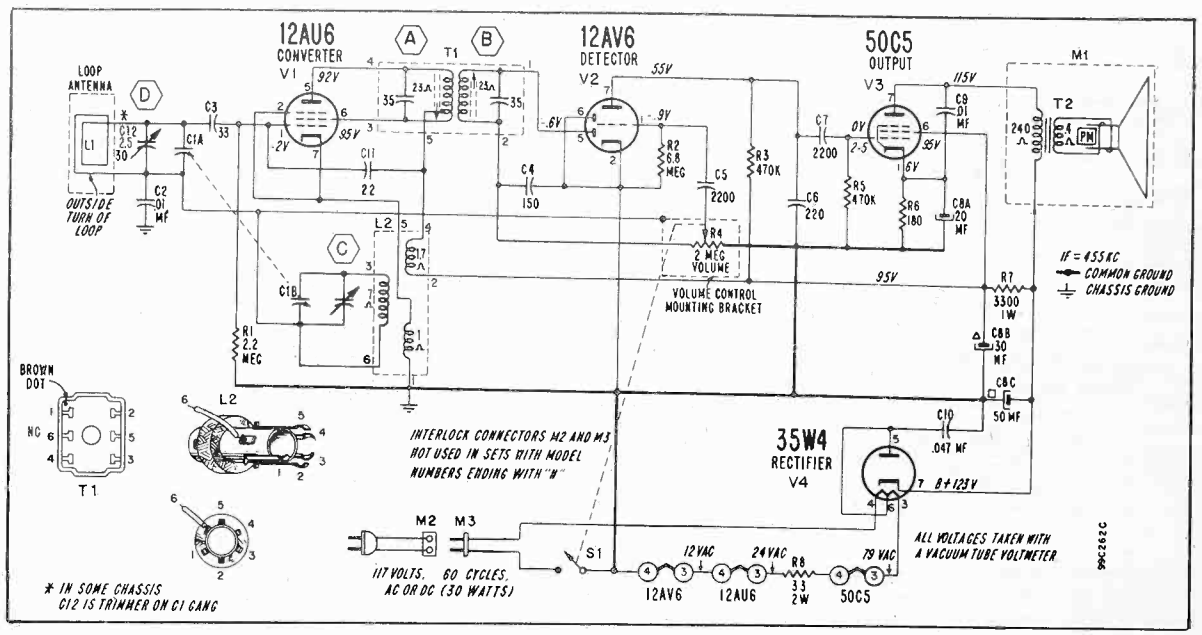
The gang supplied for replacement will be one with two trimmers. If one trimmer is not needed, it should be removed. The cabinet back supplied for replacement will have a gimmick type loop. If gang in use has two trimmers, the antenna section must be removed.

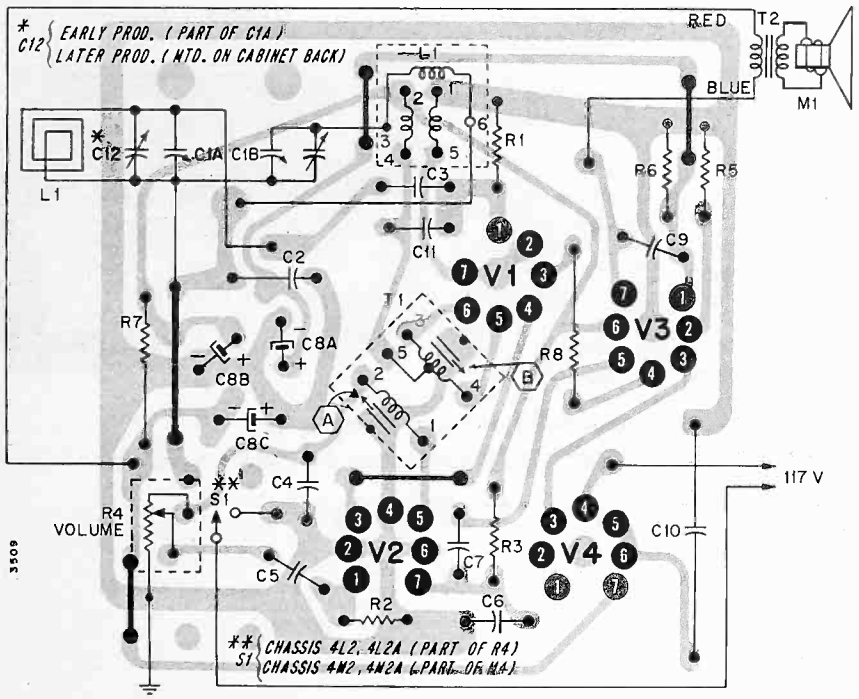
In other words, if former cabinet back or gang had trimmer C12 attached, the gimmick will now be tuned per instructions given for trimmer C12. (See adjustment "D" in schematic.)

CHASSIS 4L2 • 4L2A
MODELS 4L20A • 4L21 • 4L21A • 4L24 • 4L24A
4L25 • 4L25A • 4L26 • 4L26A • 4L28 • 4L28A



Top View of Chassis Showing Location of Components and Alignment Points.





Rear View of Etched Wiring Board. Gray area represents etched wiring; black symbols and lines represent components on opposite side.

VOLTAGE DATA

- All readings made between tube socket terminals and common ground.
- Dial turned to low frequency end; volume control at minimum.
- Line voltage 117 Volts AC.
- All voltages measured with vacuum-tube voltmeter.

ALIGNMENT PROCEDURE

a. Use an isolation transformer or connect a .1 mf. capacitor in series with low side of signal generator.
CAUTION: DO NOT CONNECT AN EARTH GROUND WIRE DIRECTLY TO CHASSIS.

b. Set Volume control full on.

c. Connect output meter across speaker voice coil. For best results disconnect speaker and use 3.2 ohm load.

d. Use lowest setting of signal generator capable of producing adequate indication on lowest scale of output meter.

e. Use a non-metallic alignment screwdriver for aligning IF transformers.

f. Repeat adjustments to insure good results.

Step	Connection of Signal Generator	Signal Gen. Frequency	Receiver Gang Setting	Adjustment Description	Adjustment
1	Through a .1 mf capacitor to pin 1 of the 12AU6 (Converter) tube.	455 KC	Gang fully open	IF Primary IF Secondary	* (A) and (B) for maximum output
2	Same as "STEP 1".	1620 KC	Gang fully open	Oscillator Trimmer	(C) for maximum output
3	Radiated Signal. Loop of several turns of wire, or place generator lead close to receiver loop for adequate signal pickup.	1400 KC	Tune in generator signal	Antenna Trimmer	(D) for maximum output (Rock gang for optimum results)

* Adjustment (A) made from rear of etched board.

SERVICE DATA SUPPLEMENT NO. ST828-2

for models using

12B1-12B1A-5T4A CHASSIS

includes latest

PRODUCTION CHANGES, SERVICE HINTS, SCHEMATIC AND PARTS LIST FOR MODELS USING ABOVE CHASSIS. NOTE: The procedure for balancing the Stereophonic sound outputs is located on page

IMPORTANT

Use this supplement with Service Data No. ST828-1 Rev. 1 when servicing any models using these chassis. This supplement contains necessary service data for the later production chassis.

SERVICING

Note: CORRECTIONS TO SERVICE DATA NO. ST828-1 Rev. 1:

Page 3 — On figure 3, the boxes labeled "LEFT" and "RIGHT" should be labeled "L" and "R" respectively.

Page 4 — The last two lines in the last paragraph should read:
("B". This demonstrates the ability of one groove to selectively reproduce a signal into one amplifier channel.)

— The last three lines of the lower left hand block of text in figure 10 should read:
("B" DEVELOPS A SIGNAL & "A" DOES NOT BECAUSE OF THEIR RELATIVE POSITIONS.)

TUBE COMPLEMENT (12B1-12B1A)

V1	FM RF Amplifier and Mixer	6DT8
V2	1st FM IF Amplifier	6AU6
V3	FM 2nd IF Amplifier and AM 1st IF Amplifier	6BA6
V4	FM 3rd IF Amplifier and Limiter; AM Detector	6AU6
V5	FM Discriminator	6AL5
V6	FM Oscillator and FM Automatic Frequency Control	12AT7
V7	AM Oscillator-Mixer	6BE6
V8	Master Channel Audio Pre-amp and Stereo Channel Audio Pre-amp:	
	Chassis stamped Runs 10 through 13	12AX7
	Chassis stamped Run 14	ECC83
V9	Rectifier	GZ34/5AR4
V10	Audio Amplifier and Phase Inverter	12AX7
V11	Audio Output	EL84/6BQ5
V12	Audio Output	EL84/6BQ5

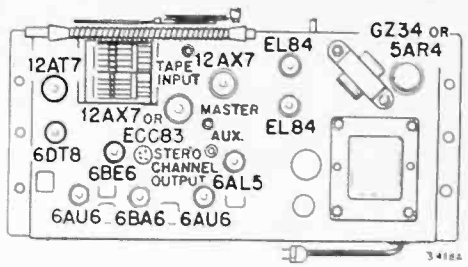


Figure 28. Top View of 12B1-12B1A Chassis. Tube Locations Shown.

TUBE LOCATIONS (12B1-12B1A)

Refer to figure 28 for 12B1-12B1A tube location diagram.

SERVICE HINTS

POSSIBLE SOURCES OF HUM

If hum appears in the output when the set is operated in the "STEREO" position, make note of the hum level. By reversing the AC line cords in wall outlets of either or both chassis, hum can be reduced. Leave the AC line cords connected to the wall outlets in the position giving least hum.

For models having both chassis (12B1 and 5T4A) in one cabinet, AC line cords for each chassis should be tried in various positions in the duplex receptacle. The AC line cord to the wall outlet can be changed. Leave set connected with plugs in position giving least hum.

BALANCING THE STEREOPHONIC SOUND OUTPUTS

For proper stereophonic listening, the audio output from each channel (Master and Auxiliary) should be adjusted so that the reproduced sound appears to originate from each cabinet and the space between cabinets. This effect can be described as a "wall" of sound.

The two cabinets should be placed from 8 to 12 feet apart. The proper listening location is from 8 to 12 feet in front of the cabinets.

To adjust the Loudness and Balance controls for proper listening, proceed as follows:

1. Locate the cabinets in position. Try to maintain proper distance between cabinets as closely as possible. Adjust the Function switch on the FM tuner to "PHONO" position.
2. Play a regular single-channel (monaural) record or Stereophonic record. As the record is playing, adjust the Loudness control on the Master unit for a comfortable over-all listening level. NOTE: The Loudness control consists basically of two ganged potentiometers. These potentiometers control the Loudness level for each channel. Adjust the Balance control on the Auxiliary unit to approximate mid-rotation.
3. A properly balanced system will now give the effect of the sound originating from a point midway between cabinets. An imbalance of audio outputs will reveal itself as one audio output being louder and overriding the balanced output condition. If necessary, adjust the Balance control so that the sound appears to originate from half-way between the cabinets.
4. Play a Stereophonic record with the Function switch set to "STEREO" position. The sound output of the Stereo system should give a genuine effect of depth and direction to reproduced sound. Because of a room's dimensions and furnishings and the position of the Stereophonic system, the Balance control may have to be readjusted slightly for optimum performance.

On models having both channels in one cabinet, the Balance control is also adjusted for depth and direction of sound.

PRODUCTION CHANGES

Production Changes for 12B1-12B1A chassis stamped Runs 10 through 12 are covered in ST828-1 Rev. 1. The following text covers later run changes for the 12B1-2B1A chassis.

CHANGE TO INSURE PROPER OPERATION OF "OFF-ON-POWER" RELAY

Chassis Stamped Run 13

To insure proper operation of OFF-ON-POWER relay at low line voltages, R45 (39K, 2W) removed and R71 (33K, 2W) added in its place.

CHANGE TO IMPROVE FREQUENCY RESPONSE, REDUCE POSSIBILITY OF STRONG SIGNAL AREA REGENERATION AND STANDARDIZE REPLACEMENT PARTS

Chassis Stamped Run 14

To reduce possibility of regeneration in strong signal areas, C18 (.02MF) and C21 (.02MF) removed, R72 (75K, 5%) and R73 (75K, 5%) added to IF section. R65 (160K) connected to B+ 200V.

For standardization of parts, C19A & B (dual .004MF; V2 screen and filament bypass) removed. C19 (.01MF) V2 screen bypass and C72 (.005MF) V2 filament bypass added. C22A & B (dual .004MF; V3 screen and filament bypass) removed. C22 (.01MF) V3 screen bypass and C73 (.005MF) V3 filament bypass added. C24A & B (dual .004MF; V4 screen and filament bypass) removed. C24 (.01MF) V4 screen bypass and C74 (.005MF) V4 filament bypass added. V8 changed to ECC83.

For improved frequency response, C55 changed to .02MF, C64 changed to .02MF, C66 and C67 each changed to .022MF. C75 (.001MF) added from plate to screen of V11. C76 (.001MF) added from plate to screen of V12. To increase AM radio output, R33 changed to 100K and R34 changed to 390K.

R74 (100K, 1W) added.

RESISTOR ADDED TO REDUCE POSSIBILITY OF RF REGENERATION

Chassis Stamped Run 15

Resistor R75 (10 ohms, ½ watt) added between pin 2 of V1B (½ 6DT8) and junction of C2 (47MMF), C3 (220MMF) and R2 (68K) to reduce possibility of RF regeneration. NOTE: V1 (6DT8) may appear to be microphonic without R75 (10 ohms) connected in the circuit.

PARTS LIST

When servicing 12B1-12B1A, refer to the parts listing below and then to the "PARTS LIST" in ST828-1 Rev. 1 for replaceable parts.

RESISTORS

Sym.	Description	Part No.
R33	330,000 ohms, ½ watt (Run 10)	60B 8-334
	390,000 ohms, ½ watt (Runs 11, 12 & 13)	60B 8-394
	100,000 ohms, ½ watt (Run 14)	60B 8-104
R34	220,000 ohms, ½ watt (Run 10)	60B 8-224
	100,000 ohms, ½ watt (Runs 11, 12 & 13)	60B 8-104
	390,000 ohms, ½ watt (Run 14)	60B 8-394
R45	39,000 ohms, 2 watts (Runs 10, 11 & 12)	60B 20-393
R71	33,000 ohms, 2 watts (Run 13 and higher)	60B 20-333
R72	75,000 ohms, ½ watt, 5% (Run 14 and higher)	60B 7-753
R73	75,000 ohms, ½ watt, 5% (Run 14 and higher)	60B 7-753
R74	100,000 ohms, 1 watt (Run 14 and higher)	60B 14-104
R75	10 ohms, ½ watt (Run 15 and higher)	60B 8-100

CAPACITORS

Sym.	Description	Part No.
C19A, C19B	.004 mf, 450 volts dual ceramic disc; .004 mf, 450 volts Runs 10, 11, 12 and 13	65A 17-1
C19	.01 mf, 500 volts, cer. disc (Run 14 and higher)	65D 10-3
C22A, C22B	.004 mf, 450 volts dual ceramic disc; .004 mf, 450 volts Runs 10, 11, 12 and 13	65A 17-1
C22	.01 mf, 500 volts, cer. disc (Run 14 and higher)	65D 10-3
C24A	.004 mf, 450 volts dual ceramic disc;	
C24B	.004 mf, 450 volts Runs 10, 11, 12 and 13	65A 17-1
C24	.01 mf, 500 volts, cer. disc (Run 14 and higher)	65D 10-3

—Parts List continued on next page.—

—Parts List continued.—

C55	.005 mf, 500 volts, cer. disc (Runs 10, 11, 12 and 13)	65D 10-1
	.02 mf, 500 volts, cer. disc (Run 14 and higher)	65D 10-28
C64	.005 mf, 500 volts, cer. disc (Runs 10, 11, 12 and 13)	65D 10-1
	.02 mf, 500 volts, cer. disc (Run 14 and higher)	65D 10-28
C66	.1 mf, 400 volts, molded, mylar dielec. (Runs 10, 11, 12 and 13)	64C 25-32
	.022 mf, 600 volts, molded (Run 14 and higher)	64B 8-11
C67	.1 mf, 400 volts, molded, mylar dielec. (Runs 10, 11, 12 and 13)	64C 25-32
	.022 mf, 600 volts, molded (Run 14 and higher)	64B 8-11
C72	.005 mf, 500 volts, cer. disc	65D 10-1
C73	.005 mf, 500 volts, cer. disc	65D 10-1
C74	.005 mf, 500 volts, cer. disc	65D 10-1
C75	.001 mf, 600 volts, molded (Run 14 and higher)	64B 8-19
C76	.001 mf, 600 volts, molded (Run 14 and higher)	64B 8-19

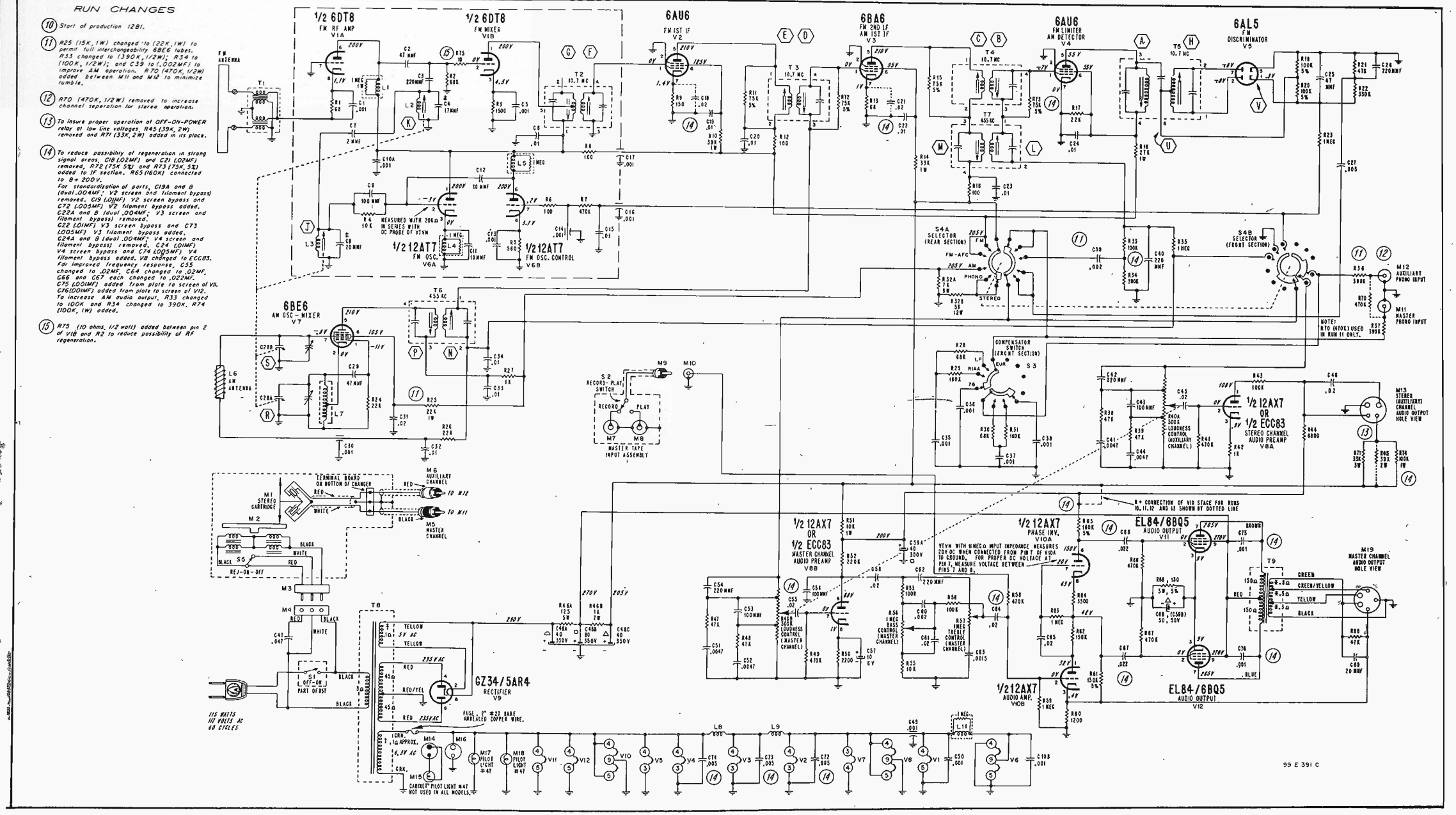
RECORD CHANGER PARTS RC688-16S, -17S and -18S

Kit, 50 Cycle Conversion (for 407D29 motor)	98C 15-109
Replacement Parts for Record Changer Motor 407D29	
Idler Wheel, Molded (including tire)	98C 15-105
Idler Spring	98C 15-58
Drive Belt, 16 and 33 RPM	98C 15-107
Drive Shaft, 16 and 33 RPM	98C 15-108

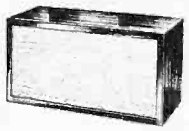
SCHEMATIC DIAGRAMS

The 12B1-12B1A schematic diagram covering Runs 10 through 15, excluding speaker systems, appears at the end of this supplement. Refer to ST828-1 Rev. 1 for speaker systems used in all models covered by this supplement. Also, refer to ST828-1 Rev. 1 for 5T4A schematic and "SCHEMATIC NOTES" and "VOLTAGE DATA" for 12B1-12B1A-5T4A chassis.

Figure 29. Schematic Diagram of 12B1-12B1A Radio Chassis Stamped Runs 10 through 15. Note: Refer to last page of ST828-1 Rev. 1 for speaker systems used on all models.

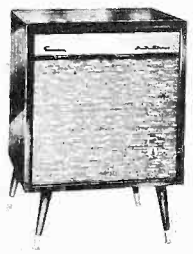


MODEL 896B
CHASSIS 120455B
MODELS 971, 971A, 970

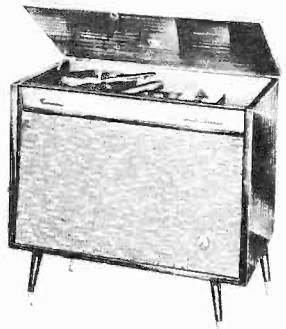


MODEL 970

*MODEL 971A (NOT SHOWN) DIFFERS FROM 971 ONLY IN CABINET DIMENSIONS.



MODEL 971*



MODEL 896B

SPECIFICATIONS

TYPE: Stereophonic High-Fidelity Radio Phonograph Combination (Model 896B).
External Speaker System Enclosures (Models 971, 971A, 970)

FREQUENCY RANGE: 540-1620KC

TUBE TYPES:
V1 – 12AX7 – Dual-Channel Audio Amplifier
V2 – 25EH5 – Beam-Power Output (Right Channel)
V3 – 25EH5 – Beam-Power Output (Left Channel)
V4 – 6BE6 – Converter (AM)
V5 – 6BA6 – I.F. Amplifier (AM)
X1 – Selenium Diode (Detector)
SI-1 – Silicon Rectifier
POWER SUPPLY – 60 Cyc, AC only
VOLTAGE RATING – 115 Volts
POWER CONSUMPTION – AMPL/PHONO-85 watts
POWER CONSUMPTION – Radio Operation-60 watts

A BRIEF DESCRIPTION OF STEREO

Stereophonic sound is to hearing what three-dimensional vision is to seeing. It adds the sensations of "depth" and "presence" to sound by recreating for the listener the spaciousness of the original sound in his own listening area.

Stereophonic sound is recorded simultaneously from two (or more) separate sources and then played back through two (or more) separate but integrated channels and speaker systems with the original sound-source distance approximated by the speakers. Thus, the conditions under which the original recording was made are recreated and the stereophonic effect is produced.

The new "compatible" stereophonic records have two separate sound tracks in each groove. A stereo cartridge picks up individual impulses from both tracks in the record groove and feeds them separately through two single-channel amplifiers (or one stereophonic dual-channel amplifier) each channel of which feeds its own speaker system. Recommended speaker placement distance is from 8 to 15 feet apart, depending upon listening preferences of the user.

GENERAL DESCRIPTION

MODEL 896B is a stereophonic high-fidelity radio-phono combination incorporating a superheterodyne AM radio, dual-channel stereophonic/monaural amplifier, improved automatic 4-speed intermix record changer for stereophonic and monaural recordings, and a speaker system consisting of one 12" woofer, three tweeters, and an electrical crossover network.

Since the Model 896B has a completely self-contained stereo dual-channel amplifier it is only necessary to obtain an external speaker or speaker system for complete stereo reproduction. The external speaker or speaker system should have a voice coil impedance of 6 to 8 ohms. The following external speaker system inclosures were specifically designed to match Model 896B.

Model 971 is a matching console speaker enclosure incorporating a 3-speaker system consisting of one 12" woofer, two tweeters, and an electrical crossover network.

Model 970 is a table model speaker enclosure incorporating a 3-speaker system consisting of one woofer, two tweeters, and an electrical crossover network.

Either model 971 or 970 can also be used as an external (remote) speaker system for existing monaural amplifiers having provisions for an external speaker system which has a voice coil impedance of 6 to 8 ohms.

These external speaker enclosures have incorporated an on-off switch (located on back cover of cabinet) for convenient cut-off of speaker at remote locations.

CAUTION:
Be certain that the external speaker is in "on" position at all times except when used under conditions explained above.

CONTROLS:
The following controls are necessary to secure and maintain optimum stereo performance of this instrument. These are in addition to conventional (AM) selector and on-off-tone controls.

1. The Selector (function) switch has three settings: Stereo – Monaural (standard records) and (AM) radio.
   (a) Stereo (fully counter-clockwise)– divides amplifier (dual-channel) into "right" and "left" channels to feed signals to "right" (internal) and "left" (external) speaker systems for stereophonic application (see schematic, page 3 of this note).
   (b) Monaural – (center position) connects "right" and "left" channels of amplifier in parallel and permits conventional records of *all four speeds* to be played in standard fashion.
   (note: internal/external speaker system connections are independently controlled by speaker switch described below).
   (c) Radio – allows reception of all standard AM broadcasts.

2. Speaker Switch – (located rear of cabinet) has three positions:
   (a) Internal (up) – (using only self-contained speaker system for monaural use).
   (b) External (down) – When two leads from external speaker system (model 971, for example) are connected to the screw terminals on strip provided, and the lever switch is swung to External, only the external (remote) speaker system will function.
   (c) Both – (Level) – Internal, external speaker systems-both used (stereo)* Connect external speaker leads matching color-code notation on strip to lead. If no color code is found, connect speaker leads and check for correct phasing. Speaker phasing for stereo is more critical and speaker polarity may be checked in the following manner if color coding has not been used:
   1. Connect external leads. 2. Place *familiar* record on turntable. 3. Swing lever to "Both" position (activating both speaker systems). 4. While record plays on turntable, transpose external speaker lead connections several times. A crisper, fuller sound indicates correct phasing of speakers.

*NOTE:
Both speaker systems may also be used together or separately for monaural record application.

3. The Dual Loudness Control is used to balance the output of the two separate speaker systems so that neither predominates. When the speaker lever switch is in the "Both" (central) position, the inner knob controls volume of "right-hand" (internal) speakers and outer concentrically-mounted knob controls "left-hand" (external) speakers. The knobs are designed to turn simultaneously as a linked control. If speaker output balancing is required, the individual knob sections may be independently rotated as indicated below:

To balance the output, set the "selector" at "STEREO" and the rear lever-switch at "BOTH", and put a monaural record on the turntable. Turn the outer loudness knob fully counter-clockwise and hold it firmly with one hand to prevent rotation. Turn up the inner loudness knob clockwise, until the sound from the right-hand (internal) speaker is set for the desired volume level. Observe the dial scale number at which the knob indicator is set. Listen for a while to fix in mind the sound level and then turn the inner knob fully counter-clockwise, so that the right-hand speaker is silent. While preventing inner knob movement with one hand, turn the outer knob clockwise until the sound level from the left-hand (auxiliary) speaker seems to be at the same volume level previously set for the right-hand speaker. Restrain the outer knob at this point and turn the inner knob to the previously noted scale number. The output from both speaker systems is now approximately the same. Overall loudness level can be adjusted by turning either knob without restraining the other, since both turn simultaneously normally. Any desired readjustments to compensate for individual listening preferences can be made by restraining one knob and turning the other.

Record Changer 819126 (or 819129), used in Model 896B, is a stereophonic/monaural four-speed intermix record changer. It will play stereo and monaural 33-1/3 RPM, 16, 45, and 78 RPM records automatically or manually.

With the turntable speed control knob in the Speedminder (Changer 819126) or **Auto-Brain (Changer 819129) position and the microgroove stylus set for use, the changer will automatically intermix and play 33-1/3 and 45 RPM records without regard to size or sequence. A total of ten records may be placed on the turntable.

The turntable automatically pauses during the changing cycle in order to eliminate record abrasion. When the changer is shut "off", or turns "off" automatically after the last record has been played, the idler wheel is automatically disengaged to prevent "flats" from developing.

**NOTE: The Auto-Brain (changer 819129) has the following additional features: When Auto-Brain setting is used and the stylus selector lever is turned to the "78" (RPM) side, turntable speed will automatically be switched to 78 RPM and will remain at this speed as long as stylus selector lever is not changed to the L.P. position, even though a record of a different speed (33-1/3 for example) is dropped to the turntable. The resulting speed-distorted sound will indicate to the listener that the wrong stylus is being used and is a method of preventing record wear.

A stereophonic high-fidelity dual-head turnover ceramic cartridge with integrated sapphire-tipped stylii has been incorporated into a damped, acoustically isolated tone arm. This cartridge may also be used for monaural records without adaptation.

In order to play 45 RPM records (with large hole in center), 45 RPM spindle attachment, (part #962330), should be used and can be obtained from your Emerson distributors. This attachment fits over the existing spindle, enlarging its diameter to accommodate this type of record and eliminate the need for separate center hole adaptors.

DISASSEMBLY PROCEDURE

AM Tuner and Amplifier Chassis

NOTE: To replace tubes, only masonite back cover need be removed.

1. Remove all knobs and remove masonite back. Remove fiber support bracket.
2. Remove four Phillips head screws securing AM tuner and amplifier chassis to cabinet. (On top)
3. Slide off pilot light assembly and remove leads for speaker system and loop antenna.
4. Remove two screws securing A.C. interlock and its bracket to base of cabinet. (Unstaple fish paper wire holder).
5. Remove screw holding AC interlock plug to chassis (chassis to record changer AC cord) and remove screws holding three position speaker-switching panel to back of cabinet.
6. Remove five-prong plug from chassis and remove chassis from cabinet. (Top of Cabinet).
7. Remove 4 screws holding masonite mounting board and control panel to chassis. In some isolated cases a metal bracket will protrude thru the bottom of the chassis mounted masonite board. This bracket should be removed by untwisting the protruding portion until it lines up with the slot on the masonite board.
8. Remove masonite board/control panel from chassis.

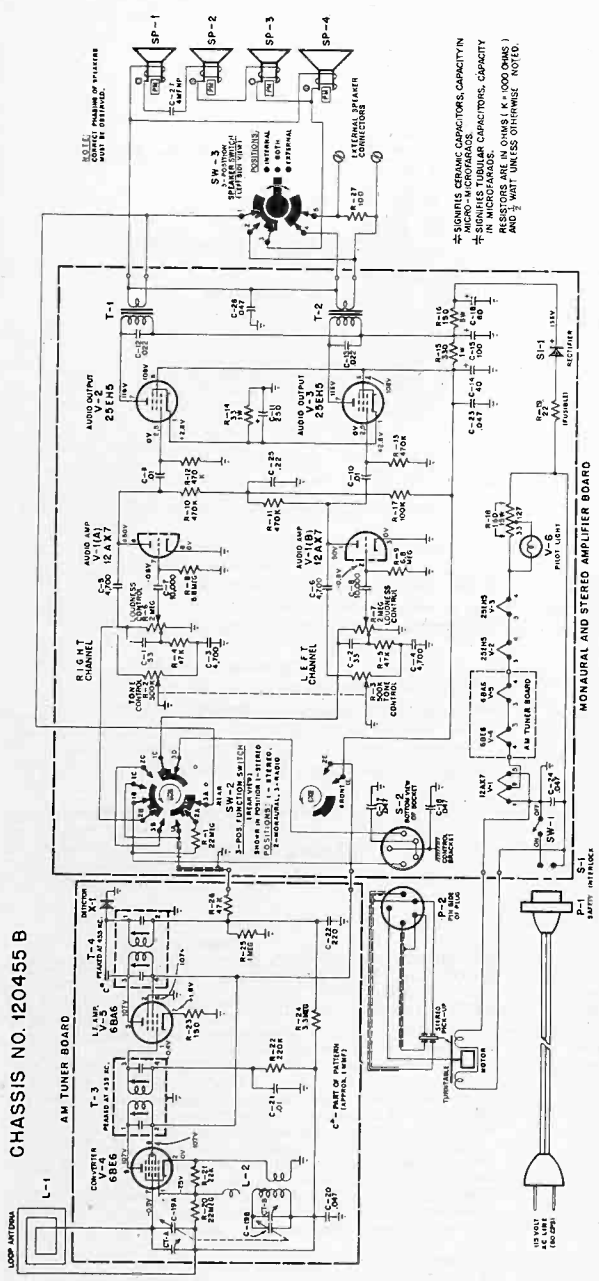
NOTE: The metal bracket should be removed from chassis and discarded. Exercise care in removal of this chassis mtg. bracket piece so that at no time will pressure be applied to etched printed circuit board chassis.

To reassemble, reverse procedure.

TO Remove Changer:

1. Snap two toggle bolt spring clips into a vertical position. These spring clips secure changer hold-down toggle bolts to mounting board (which is part of cabinet).
2. Remove plug (five-prong) from chassis.
3. Remove AC interlock plug from chassis.
4. Remove changer from cabinet.

NOTE: To reassemble, reverse procedure.



SCHEMATIC DIAGRAM, CHASSIS 120455B

CONDITIONS FOR TAKING VOLTAGE AND RESISTANCE READINGS CH 120455B

1. Voltages indicated are positive d.c., resistances in ohms, unless otherwise indicated.
2. Measurements made with voltomyst or equivalent.
3. All measurements taken from pin to B minus unless otherwise indicated.
4. Voltage measurements taken with:
   a) Line voltage maintained at 117 volts a.c.
   b) Loudness control set for minimum volume.
   c) Variable condenser fully closed and no signal applied.
   d) Record changer in OFF position.
   e) Selector switch in radio position.
5. Resistance measurements taken with:
   a) Power line cord disconnected from outlet.
   b) Loudness control set for minimum volume.
   c) Selector switch in radio position.
6. Nominal tolerance on component values makes possible a variation of ±15% in voltage and resistance readings.
7. N.C. denotes no connection, K is kilohms, Meg. is megohms. Resistances marked * are measured to junction R-16, C-16.

RESISTANCE READING, CHASSIS 120455B

Symbol	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V-1	12AX7	*570K	6.8 meg	0Ω	0Ω	0Ω	*570K	6.8 meg	0Ω	4Ω
V-2	25EH5	33Ω	470K	20Ω	30Ω	470K	*500Ω	*320Ω	–	–
V-3	25EH5	33Ω	470K	10Ω	20Ω	470K	*500Ω	*320Ω	–	–
V-4	6BE6	22K	1Ω	7Ω	4Ω	*510Ω	*500Ω	3 meg	–	–
V-5	6BA6	3.5 meg	0Ω	7Ω	10Ω	*510Ω	*500Ω	150Ω	–	–

*Measure to junction of R-16, C-16.

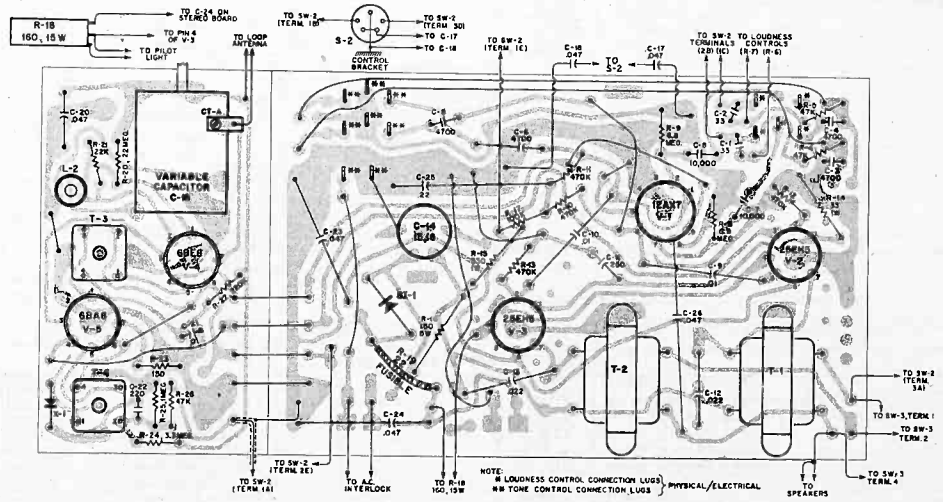


FIGURE 1 – PRINTED CIRCUIT CHASSIS 120455B

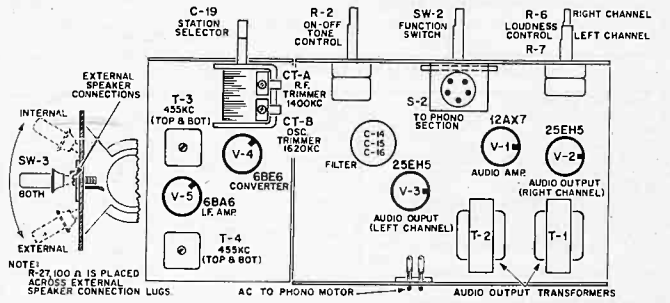


FIGURE 2 – TUBE LOCATIONS AND ALIGNMENT POINTS, CH. 120455B

ALIGNMENT INSTRUCTIONS

1. Use isolation transformer if available. If not, connect a .25 MFD condenser in series with low side of signal generator and B minus.
2. Loudness control should be backed off approximately 20% from maximum volume position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated screw driver for adjustment.
3. Speaker switch SW-3 should be in external position. Connect 6 Ω speaker (load) or resistor 6 Ω, 2 watt across external speaker terminal strip.

STEP	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1	.005 mfd	High side to grid (Pin 7) of V-4 (6BE6). Low side to B minus (See Alignment Note)	455 KC	Variable condenser fully opened	Across External Speaker Terminal Strip	T-4, T-3 Top and Bottom	Adjust for maximum output
2		Form loop of several turns and radiate signal into receiver	1620 KC	Variable condenser fully opened	Across External Speaker Terminal Strip	Trimmer C-TB (osc.)	Adjust for maximum output
3		Form loop of several turns and radiate signal into receiver	1400 KC	Tune for maximum output	Across External Speaker Terminal Strip	Trimmer CT-A (ant.)	Adjust for maximum output

ADDITIONAL SERVICE HINTS

1. No sound or intermittent sound:
   Make certain electrical contacts to cartridge are clean. If any rosin is present on contact strips within cartridge holder, remove with alcohol.
2. This changer automatically disengages the rubber idler wheels when allowed to operate through its normal cycle. To avoid defeating this feature, do not operate the on-off lever when amplifier switch is in "off" position or line cord is disconnected from wall outlet.
3. Do not turn amplifier switch "OFF" or disconnect line cord from wall outlet while changer is operating. Turn changer switch to "off" position first.
   Failure to comply with above might result in damage to idler wheels or cause changer to fail to start when power is again applied.

IF ABOVE IS OVERLOOKED AND CHANGER FAILS TO START WHEN TURNED ON, SEVERAL SLIGHT TAPS ON TURNTABLE SHOULD CAUSE CHANGER TO COMMENCE OPERATION.

STYLUS REMOVAL

To Remove Stylus Cartridge:

1. Lift tone arm and grasp cartridge with fingers.
2. Pull cartridge out (cartridge and stylii are an integrated unit and cannot be removed or replaced separately).
3. Reinsert new cartridge. Keying of cartridge is accomplished by lining up ridge on cartridge shaft to slot on holder (see Fig. 3, Stylus removal).

SERVICING OF PRINTED BOARDS

To remove defective components one of several methods may be used. A recommended method is to cut close to the body of the defective component and solder the new part to the remaining leads. Another method is to apply heat at the junction point of the component wire lead and the printed board and lift out the component. If the wire lead is bent over, first heat and pry lead wire up. A defective component with many terminals may be removed by clipping into several parts and removing a small section at a time.

Use a low wattage (20 to 30 watts) soldering iron. Be careful not to apply excessive heat since this may cause the printed foil to loosen. Broken foil leads may be repaired by soldering a hookup wire across the break.

A small stiff-bristled brush should be used to wipe away melted solder before it has a chance to accumulate or drip on adjacent parts or printed wiring.

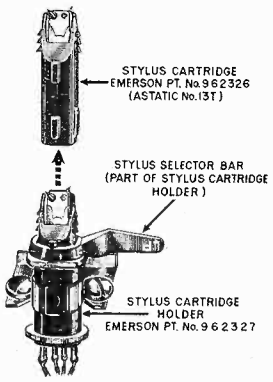


FIGURE 3 – STYLUS REMOVAL

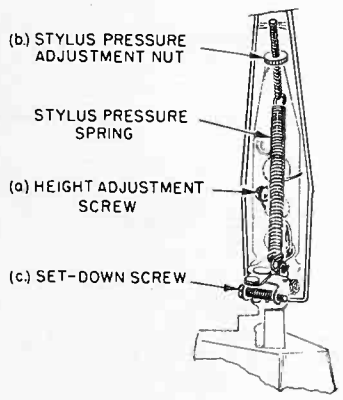


FIGURE 4 – UNDERSIDE VIEW, 819126 (819129) CHANGER TONE ARM, WITH ADJUSTMENT SETTINGS SHOWN

ADJUSTMENTS

Tone Arm Height Adjustment (See Figure 4)

Tone arm height should be set so that the top of tone arm clears the lowest record on the spindle shelf (When changer is in cycle), and the lower edge of tone arm clears the rest post. To lower tone arm, turn height adjustment screw (a) clockwise. To raise tone arm turn height adjustment screw (a) counter clockwise.

Stylus Pressure Adjustment (See Figure 4)

With tone arm in horizontal position, adjust knurled nut (b) clockwise to increase pressure and counter-clockwise to reduce pressure. Stylus pressure should be adjusted for 6 grams.

Needle Set-Down Adjustment (See Figure 4)

Adjust set-down screw (c) so that the stylus comes to rest on the lead in groove of record. Adjust clockwise to move stylus away from center or counter clockwise to move stylus towards center of record.

CHASSIS 120455B PARTS LIST

SYMB.	PART NO.	DESCRIPTION			SYMB.	PART NO.	DESCRIPTION		
R-1	341534	22 MEGOHM–CARB.	±10%	½W	C-17 }	923554	.047 MF–PAPER	±20%	400V
R-2	390582	500,000 OHM–TONE CONTROL–RIGHT CH.			C-18 }				
R-3	Pt. of R-2	500,000 OHM–TONE CONTROL–LEFT CH.			C-19A	900188	VARIABLE CAPACITOR–R.F. SECTION		
R-4	340892	47,000 OHM–CARB.	±10%	½W	C-19B	Pt. of C-19A	VARIABLE CAPACITOR–OSC. SECTION		
R-5	340892	47,000 OHM–CARB.	±10%	½W	C-20	921554	.047 MF–DUREZ	±20%	400V
R-6	390583	2 MEGOHM–LOUDNESS CONTROL–RIGHT CH.			C-21	921514	.01 MF–DUREZ	±20%	400V
R-7	Pt. of R-6	2 MEGOHM–LOUDNESS COHTROL–LEFT CH.			C-22	929914	220 MMF–CERAMIC	±20%	500V
R-8	351412	6.8 MEGOHM–CARB.	±20%	½W	C-23	923554	.047 MF–PAPER	±20%	400V
R-9	351412	6.8 MEGOHM–CARB.	±20%	½W	C-24	922208	.047 MF–MOLDED	±20%	600V
R-10	341132	470,000 OHM–CARB.	±10%	½W	C-25	923325	.22 MF PAPER	±20%	200V
R-11	341132	470,000 OHM–CARB.	±10%	½W	C-26	923554	.047 MF PAPER	±20%	400V
R-12	351032	470,000 OHM–CARB.	±20%	½W					
R-13	351032	470,000 OHM–CARB.	±20%	½W	V-1	800218	VACUUM TUBE – 12AX7		
R-14	370132	33 OHM–CARB.	±10%	1W	V-2	800219	VACUUM TUBE – 25EH5		
R-15	370372	330 OHM–CARB.	±10%	1W	V-3	800219	VACUUM TUBE – 25EH5		
R-16	397132	150 OHM–W.W.	±10%	5W	V-4	800532	VACUUM TUBE – 6BE6		
R-17	350972	100,000 OHM –CARB.	±20%	½W	V-5	800531	VACUUM TUBE – 6BA6		
R-18	397134	160 OHM–TAPPED, WIRE WOUND	5%	15W	V-6	807020	PILOT LIGHT – NO. 44		
R-19	397133	22 OHM FUSE–OHM (400 MA)							
R-20	351532	22 MEGOHM CARB.	±20%	½W	P-1	505014	INTERLOCK PLUG		
R-21	350812	22,000 OHM–CARB.	±20%	½W	P-2	PART OF CHANGER			
R-22	351052	220,000 OHM–CARB.	±20%	½W					
R-23	340292	150 OHM–CARB.	±10%	½W	S-1	550113	INTERLOCK TERMINAL LUG (2 ROD)		
R-24	351332	3.3 MEGOHM–CARB.	±20%	½W	S-2	508024	5-PRONG PHONO SOCKET		
R-25	351212	1 MEGOHM–CARB.	±20%	½W	SW-1	Pt. of R-2	ON-OFF SWITCH ON TONE CONTROL		
R-26	350892	47,000 OHM–CARBON	±20%	½W	SW-2	510145	3 POS. FUNCTION SWITCH		
R-27	350252	100 OHM–CARBON	±20%	½W	SW-3	510146	3-POS. SPEAKER SWITCH		
					T-1 }	734181	AUDIO OUTPUT TRANSFORMER		
CTA	Pt. of C19	TRIMMER R.F. SECTION			T-2 }				
CTB	Pt. of C19	TRIMMER, OSC. SECTION			T-3 }	720259	I.F. TRANSFORMER		
C-1	928894 }	33 MMF CERAMIC N 750		500V	T-4 }				
C-2	928894 }				L-1	700146	LOOP ANTENNA		
C-3	928922 }				L-2	716119	OSCILLATOR COIL		
C-4	928922 }				SI-1	817079	SILICON RECTIFIER		
C-5	928922 }	4,700 MMF CERAMIC	±20%	500V	X-1	817061	CRYSTAL DIODE 1N294		
C-6	928922 }				SP-1 }	180192	SPEAKER, PM, 3½ IN. (TWEETER)		
C-7	928924 }				SP-2 }				
C-8	928924 }	10,000 MMF CERAMIC	±20%	500V	SP-3 }				
C-9 }	923514	.01 MF PAPER	±20%	400V	SP-4	180192	SPEAKER, PM, 12 IN. (WOOFER)		
C-10 }					C-27	925391	4 MF–ELECTROLYTIC, NON POLARIZED		
C-11	925461	250 MF–ELECTROLYTIC		15V		819126(819129)	CHANGER, STEREO, 4 SPEED		
C-12	924524P	.022 MF–MYLAR	±20%	400V		583075	LINE CORD		
C-13	924524P	.022 MF–MYLAR	±20%	400V	SW-3		PT. OF CHANGER (PHONO MOTOR SW.)		
C-14	925462	40 MF–ELECTROLYTIC		160V		507006	SOCKET, PILOT LIGHT		
C-15	Pt. of C14	100 MF–ELECTROLYTIC		160V		411130	BRACKET, INTERLOCK		
C-16	Pt. of C14	80 MF–ELECTROLYTIC		160V		413359	BRACKET, REAR SUPPORT		
						413361	BRACKET, SIDE SUPPORT		
						555037	TERMINAL STRIP, EXTERNAL SPEAKER		
						560646	MASONITE CHASSIS REST		

CABINET PARTS LIST, MODEL 896B

Part No.	Description	Part No.	Description
Specify Color	Cabinet	700146	Loop Antenna
Specify Color	Legs, Plastic	413246	Bracket, Pilot Light
592070	Grille Cloth	560632	Masonite Back
607139	Decal, Bandmaster	583075	Line Cord
604042	Medallion	413375	Control Panel
461055	Emerson Script	461074	Knob, Volume (outer)
461088	Stereo HI-FI (Script)	461075	Knob, Volume (inner)
604062	Name Plate	461082	Knob, Tuning
413348	45 RPM Adapter Holder	461076	Knob, Tone, On-Off (phono – radio)
180191	Speaker 3½"	460935	Knob, Speaker Selector Switch
180192	Speaker 12"	542009	Tinnerman Speednut

CABINET PARTS LIST, MODELS 970, 971, 971A

970	971,971A	Description	970	971,971A	Description
Specify Color		Cabinet	510141	510141	Switch, Slide
Specify Color		Legs	412607A	412607A	Bracket, Switch
	604042	Medallion	180164A	180191	Speaker, 3½" (2)
	460201A‡	Emerson Script	925391	925391	Capacitor, Electrolytic, 4 Mfd, Non-Polarized
	461055**	Emerson Script			
607096		Emerson Script, Decal	180165A		Speaker, 8"
607128		Hi-Fi Script, Decal		180192	Speaker, 12"
560782	560783‡	Back, Masonite	592070	592070	Grille Cloth
	560784**	Back, Masonite		461088**	Script, Stereo Hi-Fi
				461091‡	Script, Stereo Hi-Fi

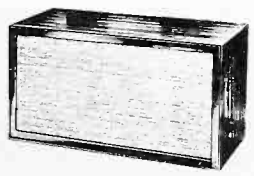
‡ Used, Model 971 only
** Used, Model 971A only

STEREO RECORD CHANGER 819126 (819129) PARTS LIST*

Part No.	Description	Part No.	Description
962326	Cartridge with Stylii (Astatic 13T)	962377	Nut, Adjustment, Stylus Pressure
962327	Cartridge Holder	962378	Screw, Adjustment, Stylus Pressure
962340	Tone Arm	962350	Spindle Assembly
962376	Spring, Stylus Pressure	962330	45 RPM Spindle Attachment (Optional Accessory)

*Refer to Record Changer 819126, 819129 Service Note for additional technical information.

MODEL 898B
CHASSIS 120456B
MODELS 970, 971, 971A



MODEL 970

MODEL 898B

SPECIFICATIONS

TYPE: Stereophonic High-Fidelity Phonograph (Model 898B)
External Speaker System Enclosures (Models 971, 971A, 970)

TUBE TYPES:
V1 – 12AX7 – Dual-Channel Audio Amplifier
V2 – 50EH5 – Beam-Power Output (Right Channel)
V3 – 50EH5 – Beam-Power Output (Left Channel)
SI-1 – Silicon Rectifier

POWER SUPPLY – 60 Cyc. Ac only
VOLTAGE RATING – 115 Volts
POWER CONSUMPTION – 55 Watts

A BRIEF DESCRIPTION OF STEREO

Stereophonic sound is to hearing what three-dimensional vision is to seeing. It adds the sensations of "depth" and "presence" to sound by recreating for the listener the spaciousness of the original sound in his own listening area.

Stereophonic sound is recorded simultaneously from two (or more) separate sources and then played back through two (or more) separate but integrated channels and speaker systems with the original sound-source distance approximated by the speakers. Thus, the conditions under which the original recording was made are recreated and the stereophonic effect is produced.

The new "compatible" stereophonic records have two separate sound tracks in each groove. A stereo cartridge picks up individual impulses from both tracks in the record groove and feeds them separately through two single-channel amplifiers (or one stereophonic dual-channel amplifier) each channel of which feeds its own speaker system. Recommended speaker placement distance is from 8 to 15 feet apart, depending upon listening preferences of the user.

GENERAL DESCRIPTION

MODEL 898B is a stereophonic high-fidelity phonograph incorporating a dual-channel stereophonic/monaural amplifier, improved automatic 4-speed intermix record changer for stereophonic and monaural recordings, and a speaker system consisting of two 4" speakers.

Since the Model 898B has a completely self-contained stereo dual-chonnel amplifier it is only necessary to obtain an external speaker or speaker system for complete stereo reproduction. The external speaker or speaker system should have a voice coil impedance of 6 to 8 ohms. The following external speaker system inclosures were specifically designed to match Model 898B.

Model 970 is a table model speaker enclosure incorporating a 3-speaker system consisting of one woofer, two tweeters, and an electrical crossover network.

Models 971 and 971A are console speaker enclosures incorporating a 3-speaker system consisting of one 12" woofer, two tweeters, and an electrical crossover network. They differ only in cabinet dimensions.

These external speaker enclosures have an on-off switch incorporated (located on back cover of cabinet) for convenient cut-off of speaker ot remote locations.

CAUTION:
For Stereo use be certain that the external speaker is in "on" position.

CONTROLS:
The following controls are necessary to secure and maintain optimum stereo performance of this instrument. These are in addition to conventional on-off and tone controls.

1. Monaural-stereo (M-S on changer, SW-3 on schematic, pg. 3).
   a) Stereo – separates dual-channel amplifier sections into "right" and "left" channels to feed signals to right (internal) and left (external) speaker systems for stereophonic application (see schematic, page 3 of this note).
   b) Monaural – connects "right" and "left" channels of amplifier in parallel and permits conventional records of *all four speeds* to be played in standard fashion.
   (Note: Internal/external speaker system connections are independently controlled by speaker switch described below)

2. Speaker Switch (located, rear of cabinet) has three positions:
   a) Internal – (using only self-contained speaker system for monaural use).
   b) External – When two leads from external speaker system (Model 971, for example) are connected to the screw terminals on strip provided, and the lever switch is swung to External, only the external (remote) speaker system will function.
   c) Both – Internal, external speaker systems – both used (stereo)* Connect external speaker leads matching color-code notation on strip to lead. If no color code is found, connect speaker leads and check for correct phasing. Speaker phasing for stereo is more critical and speaker polarity may be checked in the following monner if color coding has not been used:
   1. Connect external leads. 2. Place *familiar* record on turntable. 3. Swing lever to "Both" position (activating both speaker systems). 4. While record plays on turntable, transpose external speaker lead connections several times. A crisper, fuller sound indicates correct phosing of speakers.

   *NOTE:
   Both speaker systems may also be used together or separately for conventional monaural record application.

3. The Dual Loudness Control is used to balance the output of the two speaker systems so that neither predominates. When the speaker lever switch is in the "Both" (central) position, the inner knob controls volume of "right-hand" (internal) speakers and outer concentrically-mounted knob controls "left-hand" (external) speakers. The knobs are designed to turn simultaneously as a linked control. If speaker output balancing is required, the individual knob sections may be independently rotated as indicated below:

   To balance the output, set the "selector" at "STEREO" and the rear lever-switch at "BOTH", and put a monaural record on the turntable. Turn the outer loudness knob fully counter-clockwise and hold it firmly with one hand to prevent rotation. Turn up the inner loudness knob clockwise, until the sound from the right-hand (internal) speaker is set for the desired volume level. Observe the dial scale number at which the knob indicator is set. Listen for a while to fix in mind the sound level and then turn the inner knob fully counter-clockwise, so that the right-hand speaker is silent. While preventing inner knob movement with one hand, turn the outer knob clockwise until the sound level from the left-hand (auxiliory) speaker seems to be at the same volume level previously set for the right-hand speaker. Restrain the outer knob at this point and turn the inner knob to the previously noted scale number. The output from both speaker systems is now approximately the same. Overall loudness level can be adjusted by turning either knob without restraining the other, since both turn simultaneously normally. Any desired readjustments to compensate for individual listening preferences can be made by restraining one knob and turning the other.

Record Changer 819128, used in Model 898B, is a stereophonic/monaural four-speed intermix record changer. It will play stereo and monaural 33-1/3 RPM, 16, 45, and 78 RPM records automatically or manually.

When the changer is shut "off", or turns "off" automatically after the last record has been played, the idler wheel is automatically disengaged to prevent "flats" from developing.

A stereophonic high-fidelity dual-head turnover ceramic cartridge with integrated sapphire-tipped stylii has been incorporated into a damped, acoustically isolated tone arm. This cartridge may also be used for monaural records without adaptation.

In order to play 45 RPM records (with large hole in center), 45 RPM spindle attachment (Part #960630) should be used and can be obtained from your Emerson distributors. This attachment fits over the existing spindle, enlarging its diameter to accommodate this type of record and eliminate the need for separate center hole adaptors.

DISASSEMBLY INSTRUCTIONS

NOTE: To replace tubes, only masonite back within cabinet need be removed.

Record Changer:

Remove three Phillips head screws holding masonite back to cabinet and remove back.

Remove four Phillips head screws holding changer mounting baard to cabinet.

Tilt mounting board up and back to a stable vertical position.

Remove five-prong plug and AC plug and line cord from amplifier chassis. (Unstaple fishpaper wire holders.)

Remove record changer.

To reassemble, reverse procedure.

Amplifier Chassis:

Remove record changer and remove amplifier front control knobs.

Remove four chassis hold-down screws and washers (underside of cabinet).

Remove screws holding AC socket and its bracket to side of cabinet and remove screws holding three-position speaker-switching assembly to bottom of cabinet. (Unstaple fishpaper wire holder.)

Slide off pilot light assembly and remove leads for speakers.

Remove two screws holding external speaker connector terminal strip to back of cabinet and remove chassis.

To reassemble, reverse procedure.

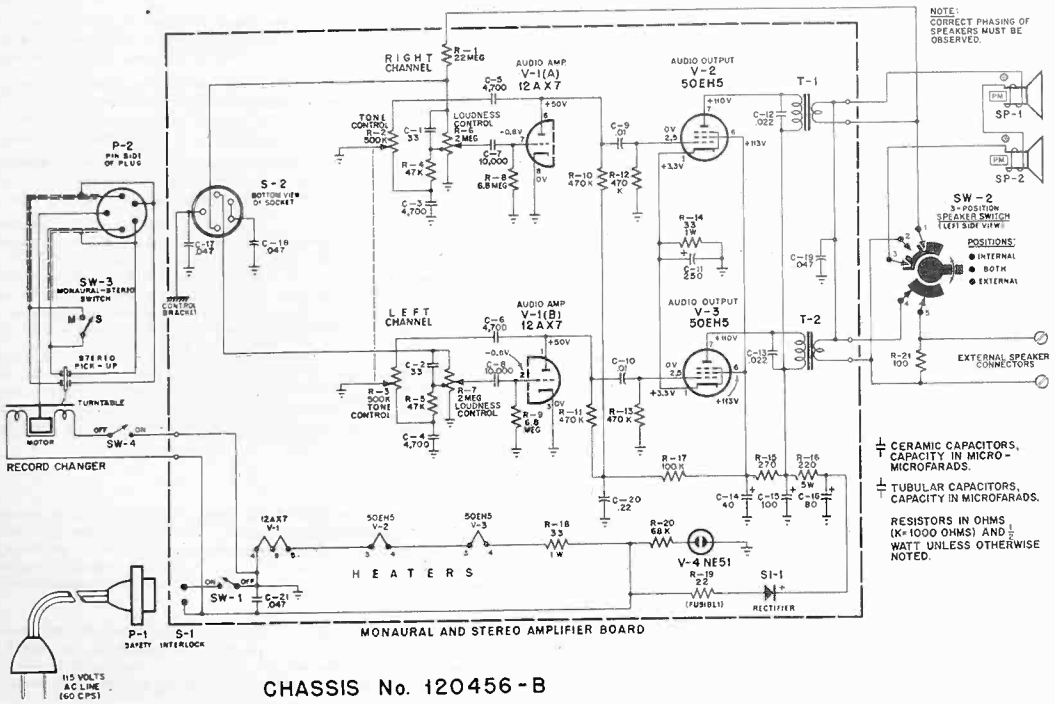
CONDITIONS FOR VOLTAGE AND RESISTANCE READINGS

1. Voltages indicated are positive d.c., resistances in ohms, unless otherwise indicated.
2. Measurements made with voltohmyst or equivalent.
3. All measurements taken from pin to B minus unless otherwise indicated.
4. Voltage measurements taken with:
   A) Line voltage maintained at 117 volts a.c.
   B) Loudness control set for minimum volume.
   C) Record changer in "off" position.
4. Resistance meosurements taken with:
   A) Power line cord disconnected from outlet.
   B) Loudness control set for minimum volume.
6. Nominal tolerance on component values makes possible a variation of ±15% in voltage and resistance readings.
7. N.C. denotes no connection, K is kilohms, Meg. is megohms. (Resistances marked * are measured to Junction of F R-16, C-16.)

RESISTANCE READINGS 120456B CHASSIS

SYMBOL	TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8	PIN 9
V-1	12AX7	*570K	6.8 MEG	0Ω	0Ω	12Ω	*570K	6.8 MEG	0Ω	6Ω
V-2	50EH5	33Ω	470K	12Ω	65Ω	470K	*500Ω	*400Ω	–	–
V-3	50EH5	33Ω	470K	65Ω	115Ω	470K	*500Ω	*400Ω	–	–

*Measured to junction R-16, C-16.



CHASSIS No. 120456-B

SCHEMATIC DIAGRAM, CHASSIS 120456B

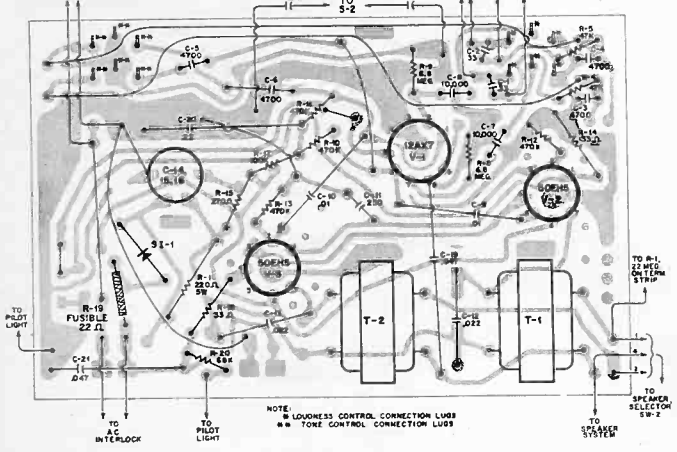


FIGURE 1 – PRINTED CIRCUIT CHASSIS 120456B

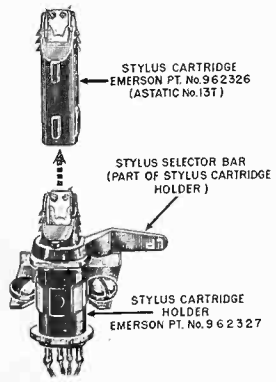


FIGURE 2 – REMOVAL OF STYLUS CARTRIDGE 962326

REMOVAL OF STYLUS CARTRIDGE 962326

To Remove Stylus Cartridge:

Lift tone arm and grasp cartridge with fingers.

Pull cartridge out (cartridge and stylii are an integrated unit and cannot be removed or replaced separately).

When stylus cartridge is reinserted, observe keying of ridge on side of cartridge to slot on cartridge-mounting holder. (See Fig. 2).

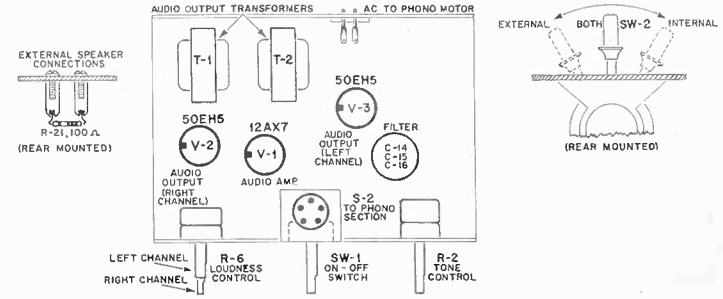


FIGURE 3 – TUBE LOCATIONS AND ALIGNMENT POINTS

CHASSIS PARTS LIST, CH. 120456B

SYMB.	PART NO.	DESCRIPTION		SYMB.	PART NO.	DESCRIPTION	
R-1	341534	22 MEGOHM – CARBON	±10% ½W.	C-12	924524P	.022 MF – MYLAR ±20%	400 V.
R-2	390586	500,000 OHM – TONE CONTROL RIGHT CH.		C-13	924524P	.022 MF – MYLAR ±20%	400 V.
R-3	Pt. of R-2	500,000 OHM – TONE CONTROL, LEFT CH.		C-14	925462	40 MF – ELECTROLYTIC	160 V.
R-4	340892	47,000 OHM – CARBON	±10% ½W.	C-15	Pt. of C-14	100 MF – ELECTROLYTIC	160 V.
R-5	340892	47,000 OHM – CARBON	±10% ½W.	C-16	Pt. of C-14	80 MF – ELECTROLYTIC	160 V.
R-6	390585	2 MEGOHM – LOUDNESS CONTROL, RT. CH.		C-17	923554	.047 MF – PAPER ±20%	400 V.
R-7	Pt. of R-6	2 MEGOHM – LOUDNESS CONTROL, LT. CH.		C-18	923554	.047 MF – PAPER ±20%	400 V.
R-8	351412	6.8 MEGOHM – CARBON	±20% ½W.	C-19	923554	.047 MF – PAPER ±20%	400 V.
R-9	351412	6.8 MEGOHM – CARBON	±20% ½W.	C-20	923325	.22 MF – PAPER ±20%	200 V.
R-10	341032	470,000 OHM – CARBON	±10% ½W.	C-21	922208	.047 MF – MOLDED ±20%	600 V.
R-11	341032	470,000 OHM – CARBON	±10% ½W.	V-1	800218	VACUUM TUBE 12AX7	
R-12	351032	470,000 OHM – CARBON	±20% ½W.	V-2	800221	VACUUM TUBE 50EH5	
R-13	351032	470,000 OHM – CARBON	±20% ½W.	V-3	800221	VACUUM TUBE 50EH5	
R-14	370132	33 OHM – CARBON	±10% 1W.	V-4	807030	NEON LIGHT NE51	
R-15	340352	270 OHM – CARBON	±10% ½W.	P-1	505014	INTERLOCK PLUG	
R-16	397135	220 OHM – WIRE W.	±10% 5W.	P-2	Pt. of Changer		
R-17	350972	100,000 OHM – CARBON	±20% ½W.	S-1	550113	INTERLOCK TERMINAL LUG (2 REQD.)	
R-18	370132	33 OHM – CARBON	±10% 1W.	S-2	508024	5-PRONG PHONO SOCKET	
R-19	397133	22 OHM – FUSE OHM (400 MA)		SW-1	510148	ON – OFF SWITCH	
R-20	340932	68,000 OHM – CARBON	±10% ½W.	SW-2	510146	3-POSITION SPEAKER SWITCH	
R-21	350252	100 OHM – CARBON	±20% ½W.	SW-3	Pt. of Changer	MONAURAL – STEREO SWITCH	
C-1	928894	33 MMF – CERAMIC N750	500 V.	SW-4	Pt. of Changer	PHONO MOTOR SWITCH	
C-2	928894	33 MMF – CERAMIC N750	500 V.	T-1	734181	AUDIO OUTPUT TRANSFORMER	
C-3	928922	4,700 MMF – CERAMIC ±20%	500 V.	T-2	734181	AUDIO OUTPUT TRANSFORMER	
C-4	928922	4,700 MMF – CERAMIC ±20%	500 V.	SI-1	817079	SILICON RECTIFIER	
C-5	928922	4,700 MMF – CERAMIC ±20%	500 V.	SP-1	180155A	SPEAKER PM, 4 IN.	
C-6	928922	4,700 MMF – CERAMIC ±20%	500 V.	SP-2	180155A	SPEAKER PM, 4 IN.	
C-7	928924	10,000 MMF – CERAMIC ±20%	500 V.		819128	4-SPEED STEREO CHANGER	
C-8	928924	10,000 MMF – CERAMIC ±20%	500 V.		583067	LINE CORD	
C-9	923514	.01 MF – PAPER ±20%	400 V.				
C-10	923514	.01 MF – PAPER ±20%	400 V.				
C-11	925461	250 MF – ELECTROLYTIC	15 V.				

CABINET PARTS LIST, MODELS 898B, 970, 971, 971A

898B	970	971/971A	DESCRIPTION	898B	970	971/971A	DESCRIPTION
✓	✓	✓	Cabinet (Specify color)	412726			Clamp – 45 RPM Adapter
		✓	Legs (Specify color)	413162			Bracket – Pilot Light
592065			Grille Cloth (Specify color)	413381			Control Panel
	592070	592070	Grille Cloth	180155A			Speaker 4" (2)
604042		604042	Medallion		180164A		Speaker 3½" (2)
560648			Masonite Back (Specify color)			180191	Speaker 3½" (2)
	560782		Masonite Back		180165		Speaker 8"
		560783**	Masonite Back			180192	Speaker 12"
		560784‡	Masonite Back	461076			Knob – Tone, ON-OFF
620280			Motor Board (Specify color)	461074			Knob – Loudness (Outer)
	510141	510141	Slide Switch	461075			Knob – Loudness (Inner)
	925391	925391	Electrolytic (Non Polarized)	460935			Knob – Speaker Selector Switch

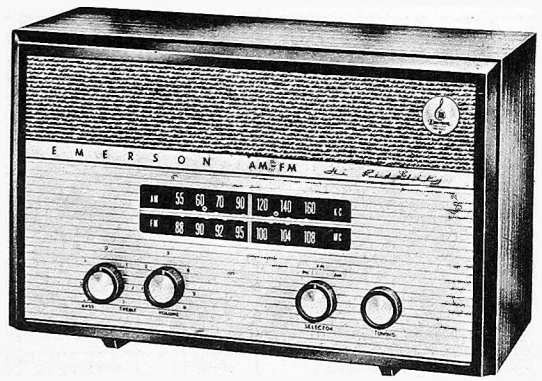
** 971 ONLY ‡ 971A ONLY

STEREO RECORD CHANGER 819128 PARTS LIST*

PART NO.	DESCRIPTION	PART NO.	DESCRIPTION
962326	CARTRIDGE WITH STYLII (ASTATIC #13T)	961872	WEIGHT ADJUST SPRING
962327	CARTRIDGE HOLDER FOR #13T	961873	HINGE PIVOT BUTTON
961868	TONE ARM	961845	ESCUTCHEON (CHANGER)
961869	TONE ARM CLIP	961842	CONTROL KNOB (CHANGER)
961870	LIFT SCREW	962379	MONAURAL-STEREO (M-S) SWITCH
961871	HINGE SPRING		

*REFER TO RECORD CHANGER 819107 SERVICE NOTE FOR ADDITIONAL TECHNICAL INFORMATION.

MODEL 895B
CHASSIS 120431B



MODEL 895

SPECIFICATIONS

Type: AM-FM Radio
Frequency Range: AM: 540 - 1620KC
FM: 88 - 108MC

Power Supply: 105-125 V. AC OR DC.
Voltage Rating: 105 - 125 volts
Power Consumption: AM-FM – 35 watts.

GENERAL INFORMATION

Model 895B is an AM-FM table model radio incorporating one woofer, one tweeter and a continuously variable tone control. Built-in antennas for both AM and FM are provided plus external FM antenna input terminals. A phono input jack that can be actuated by a front panel-mounted function switch is also provided.

In the "AM" position, function switch SW-2 connects B+ to the AM converter tube (V-3) and places the AM detector load network in the detector circuit (Pins 1 and 7 of V-5).

In the "FM" position, B+ is applied to the FM tuner and V-5, (2nd FM I.F. amplifier). In addition, the ratio detector output is coupled to the high side of the volume control.

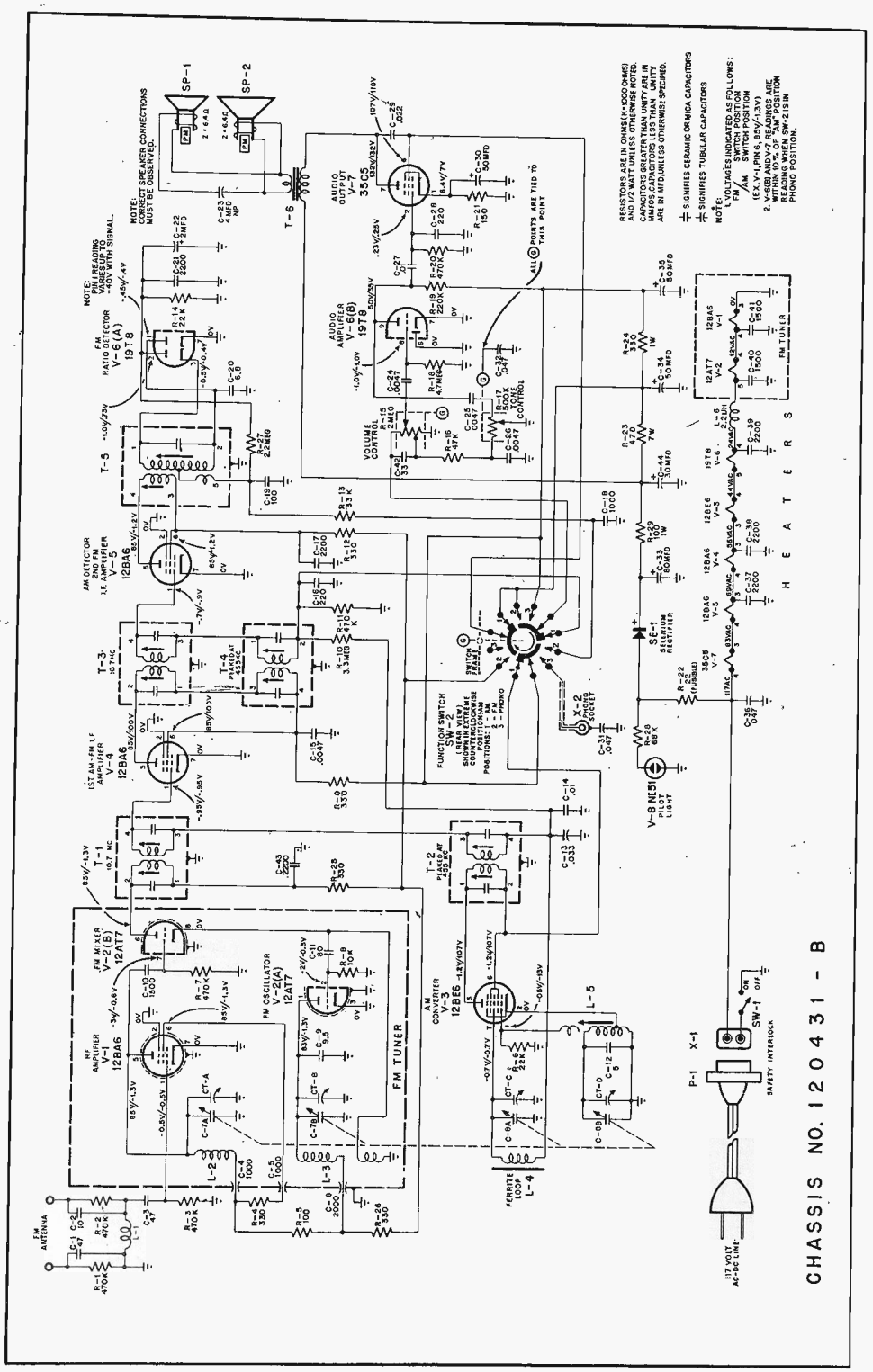
In "Phono" position B+ is removed from both AM and FM I.F. sections and V-5, (2nd FM I.F. amplifier). The screen grid of V-7 (audio output tube) is connected to a different B+ source in this position and the audio input is connected to the phono jack output.

If replacements are made or the wiring disturbed in the R.F. section of the circuit, the receiver should be carefully re-aligned.

DISASSEMBLY INSTRUCTIONS

To Replace Tubes:
1. Remove line plug from wall outlet.
2. Remove screws from cabinet back.
3. Grasp line cord at point where it is connected to back and pull free of interlock. Remove back.

To Remove AM-FM Chassis
4. Steps 1-3 above.
5. Remove 3 control knobs and 1 tuning knob; disconnect built-in FM antenna and remove antenna terminal. Unsolder 2 speaker leads at chassis solder lug strip and unscrew chassis bolts from underside of cabinet. Unclip pilot light.



CONDITIONS FOR VOLTAGE AND RESISTANCE READINGS

1. Voltages indicated are positive d.c., resistances in ohms, unless otherwise indicated.
2. Measurements made with voltohmyst or equivalent.
3. All measurements taken from pin to chassis unless otherwise indicated
4. Voltage measurements taken under the following conditions:
   a) Line voltage maintained at 117 volts a.c. only.
   b) Tuning capacitor fully closed with no signal.
5. Resistance measurements taken with:
   a) Power Line and cord disconnected from outlet.
   b) Loudness control set for maximum volume.
6. Nominal tolerance on component values makes possible a variation of ±15% in voltage and resistance readings.
7. N.C. denotes no connection, K is kilohms, M is megohms.
8. Readings given in FM/AM positions.

RESISTANCE CHART CHASSIS 120431B

TUBE	SW-2 POSITION	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8	PIN 9
V1-12BA6	FM/AM	450K/450K	0/0	0/0	12/12	*450/*INF	*800/*INF	0/0	–	–
V2-12AT7	FM/AM	*350/INF	10K/10K	0/0	12/12	24/24	*330/*INF	450K/450K	0/0	–
V3-12BE6	FM/AM	22K/22K	0:3/0:3	58/58	44/44	*INF/*15	*INF/0*	4M/4M	–	–
V4-12BA6	FM/AM	4M/4M	0/0	58/58	70/70	*330/*330	*330/*330	0/0	–	–
V5-12BA6	FM/AM	470K/470K	0/0	70/70	82/82	*330/*INF	*330/*INF	0/0	–	–
V6-19T8	FM/AM	2M/INF	20K/20K	2M/INF	24/24	44/44	0/0	0/0	4.7M/4.7M	*250K/*250K
V7-35C5	FM/AM	150/150	470K/470K	82/82	118/118	–	*300/*300	‡1M/‡1M	–	–

*Measured with low side of VTVM connected to Junction R24, C35 (B+ point)
‡Measured to chassis – wait until meter settles (about 30 seconds)

GENERAL ALIGNMENT INSTRUCTIONS

Set Function Switch (SW-2) as indicated. Output of signal generator should be no higher than necessary to obtain an output reading with a 40% modulated R.F. signal. Use an insulated alignment screwdriver and plastic hex tool (for T-1, T-3). Volume control at maximum CW position.

AM ALIGNMENT INSTRUCTIONS – SW-2 IN "AM" POSITION

Step	Sig. Gen. Coupling	Sig. Gen. Frequency	Radio Dial Setting	Output Meter VTVM or Scope	Adjust	Remarks
1	High side to grid end of L-4 low side to chassis thru 0.25 mfd. cap.	455KC	Tuning Cap fully open (no signal)	Across speaker voice coil	T-2 T-4 top and bottom	Adjust for maximum output
2	Form loop of several turns and radiate signal into receiver	600KC	600KC	Across speaker voice coil	L-5	Adjust for maximum output
3	"	1638KC	Tuning Cap fully open	Across speaker voice coil	CT-D osc. trimmer	Adjust for maximum output
4	"	1420KC	1420KC	Across speaker voice coil	CT-C-R.F. trimmer	Adjust for maximum output

FM ALIGNMENT INSTRUCTIONS – (Using AM GEN. & VTVM) – SW-2 IN "FM" POSITION

Step	Marker Gen. Coupling	Marker Gen. Frequency	Radio Dial Setting	VTVM Placement	Adjust	Remarks
1	Raise 12AT7 (V-2) shield slightly off ground and clip marker gen. high side to shield and low side to chassis thru 0.25 mfd. cap.	10.7 MC (no mod.)	Extreme CCW Position (no signal)	Across C-22 2 mfd. stabilizer capacitor (neg. scale)	T-1, T-3 top and bottom T-5 bottom	Adjust for maximum neg. voltage, keeping gen. output for readings under 2.5V.
2	Raise 12AT7 (V-2) shield slightly off ground and clip marker gen. high side to shield and low side to chassis thru 0.25 mfd. cap.	10.7 MC (no mod.)	Extreme CCW Position (no signal)	Connect two matched 100K ohm, ½ watt resistors in series across C-22. Then place VTVM high side to junction R-13, C-18 and low side to junction of two 100K ohm resistors.	T-5 top	Adjust for 0 volts with ± readings on either side.

FM ALIGNMENT INSTRUCTIONS (USING SWEEP AND MARKER GEN. AND SCOPE)

SW-2 in "FM" position. Sweep generator set for ±300KC frequency deviation and Marker injection level kept below point where distortion of response curve occurs.

Step	Gen. Coupling	Gen. Freq.	Radio Dial Setting	Scope	Adjust	Remarks
1	Raise 12AT7 (V-2) shield off ground and clip high side of sweep and marker gen. to shield low sides to chassis thru 0.25 mfd. cap.	Sweep Center freq. 10.7 MC Marker set at 10.7 MC (no mod.)	Extreme CCW (no signal)	Highside to Pin 2 of V6, low side to chassis (disconnect negative end of C22)	T-1 T-3 top & bot. T-5 bot.	Adjust for max. gain and symmetry
2	Sweep & Marker high sides connected to pin 1 of V-5 – low sides to chassis thru 0.25 mfd. cap.	Sweep center freq. 10.7 MC Marker set at 10.7 MC (no mod.)	Extreme CCW (no signal)	Connect C22 back in circuit. Highside to junct. of R13 and C18, low side to chassis	T-5 Top	Adjust for response as per Fig. #2

AM-FM TUNING-TRACKING

With tuning shaft (drive shaft) completely CCW, AM tuning capacitor should be in maximum capacity position and FM tuning slugs should be in maximum "in" position. In this position, set screw in nylon worm gear is accessible for tightening through hole in plate and spring.

FM TRACKING (ELECTRICAL)

Ordinarily the only FM front end adjustment that might become necessary due to oscillator tube change would be CT-B, FM oscillator trimmer which is accessible through a hole provided in the tuner shield. This trimmer should be adjusted at 108MC with the tuning dial set at that frequency. This should be done only if the oscillator is off proper frequency.

Should components or wiring be changed, a complete FM front-end alignment might be necessary as follows:

Function Switch (SW-2) in "FM" position; tuner shield bent up for tuning purposes, but not removed (use a non-metallic screw driver).

Step	Marker Generator Coupling	Marker Generator Freq.	Radio Dial Setting	VTVM	Adjust	Remarks
1	FM Ant.	108 MC	108 MC (slugs out)	Across C-22	CT-B CT-A	Adjust for max. neg. reading, keeping gen. input level for voltage reading below 2.5V.
2	FM Ant.	88 MC	88 MC (slugs in)	Across C-22	L-3 L-2	Adjust for max. neg. reading by spreading or compressing turns. Caution: Do not alter spacing between L-3 and mixer coupling loop.
3	Repeat Steps 1 and 2.					

PHYSICAL FM TRACKING

This is only possible to perform if and when a new slug assembly is installed. FM osc. slug (C-78) is fixed to a plastic bar, but FM-R.F. slug (C-7A) is on a threaded flexible shaft. For correct physical tracking, both slugs should just cover glass dielectric window section simultaneously. Then, crimp R.F. slug shaft as close to plastic bar as possible on front side (see Fig. 5), and cut all but 1/8" of excess shaft length.

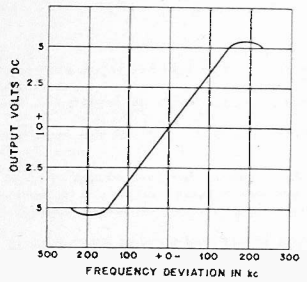
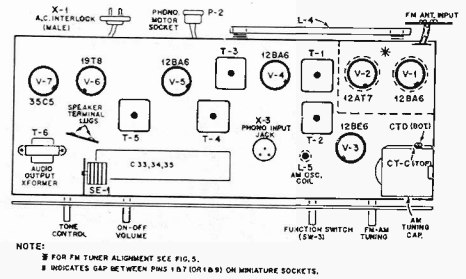
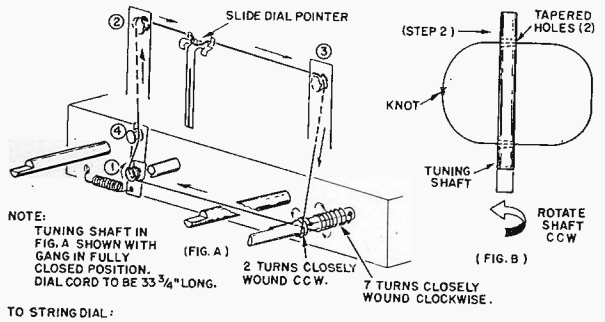


Fig. 2 – *FM RATIO DETECTOR CHARACTERISTICS*



NOTE:
▣ FOR FM TUNER ALIGNMENT SEE FIG. 5.
▣ INDICATES GAP BETWEEN PINS 1 & 7 (OR 1 & 9) ON MINIATURE SOCKETS.

Fig. 3 – *TUBE AND TRIMMER LOCATIONS*



NOTE:
TUNING SHAFT IN FIG. A SHOWN WITH GANG IN FULLY CLOSED POSITION. DIAL CORD TO BE 33 3/4" LONG.

TO STRING DIAL:

1. STRING THROUGH SMALLER DIAMETER OF TAPERED HOLES (FIG.B) AND KNOT.
2. PULL KNOT THROUGH HOLE (FIG.B) AND ROTATE SHAFT COUNTERCLOCKWISE UNTIL GANG IS FULLY CLOSED.
3. WIND 7 REAR TURNS CLOCKWISE.
4. LOOP STRING OVER PULLEY ① AND STUDS ② AND ③ (FIG.A).
5. WIND 2 FRONT TURNS COUNTERCLOCKWISE WORKING TOWARDS FRONT OF SHAFT.
6. STRING LOOPED CORD UNDER PULLEY ④ (FIG.A).

Fig. 4 – *DIAL CORD STRINGING*

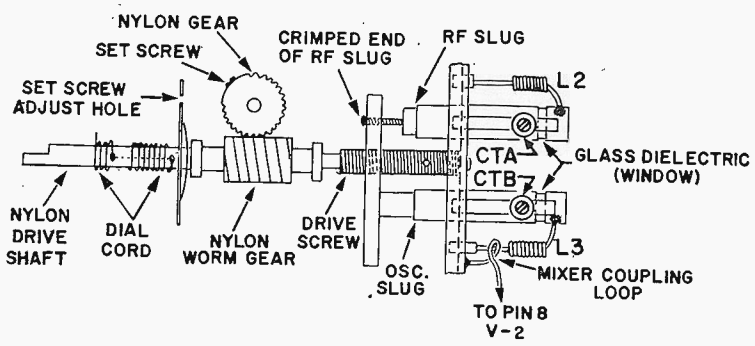


Fig. 5 – *BOTTOM VIEW OF TUNER (IN MAX. CW POSITION WITH SHIELD REMOVED)*

MECHANICAL TUNER PARTS (ELECTRICAL PARTS LISTED IN CHASSIS PARTS LIST)

471066 – Slug Assembly
460961 – Drive Shaft (Nylon)
265112 – Drive Screw
413065 – Shaft Plate
413064 – Flat Spring
460962 – Gear (Nylon) with set screw
275095 – Thrust Washer, Rear
275096 – Thrust Washer, Front

CHASSIS PARTS LIST, CHASSIS 120431B

SYMB.	PT. NO.	DESCRIPTION		LIST PRICE
		RESISTORS		
R-1	351132	470,000 OHM-CARBON	±20% 1/2W.	.14
R-2	351132	470,000 OHM-CARBON	±20% 1/2W.	.14
R-3	PART	470,000 OHM-CARBON	±20% 1/2W.	.14
R-4	OF	330 OHM-CARBON	±10% 1/2W.	.14
R-5	TUNER	100 OHM-CARBON	±10% 1/2W.	.14
R-6	340812	22,000 OHM-CARBON	±10% 1/2W.	.14
R-7	PART OF	470,000 OHM-CARBON	±20% 1/2W.	.14
R-8	TUNER	10,000 OHM-CARBON	± 5% 1/2W.	.14
R-9	350372	330 OHM-CARBON	±20% 1/2W.	.14
R-10	351332	3.3 MEGOHM-CARBON	±20% 1/2W.	.14
R-11	351132	470,000 OHM-CARBON	±20% 1/2W.	.14
R-12	350372	330 OHM-CARBON	±20% 1/2W.	.14
R-13	340852	33,000 OHM-CARBON	±10% 1/2W.	.14
R-14	340812	22,000 OHM-CARBON	±10% 1/2W.	.14
R-15	390537	2 MEGOHM-VOLUME CONTROL		1.00
R-16	350892	47,000 OHM-CARBON	±20% 1/2W.	.14
R-17	390538	500,000 OHM-TONE CONTROL		.65
R-18	351372	4.7 MEGOHM-CARBON	±20% 1/2W.	.14
R-19	351052	220,000 OHM-CARBON	±20% 1/2W.	.14
R-20	351132	470,000 OHM-CARBON	±20% 1/2W.	.14
R-21	394207	150 OHM-FUSE OHM	±10% 1/2W.	
R-22	397121	22 OHM-FUSE OHM	±10%	.80
R-23	394208	470 OHM-WIRE WOUND	±10% 7W.	
R-24	380372	330 OHM-CARBON	±20% 1W.	.16
R-25	350372	330 OHM-CARBON	±20% 1/2W.	.14
R-26	PT. OF TUNER			
R-27	351292	2.2 MEGOHM-CARBON	±20% 1/2W.	.14
R-28	340932	68,000 OHM-CARBON	±10% 1/2W.	
R-29	370252	100 OHM-CARBON	±10% 1W.	
		CAPACITORS		
C-1	928969	47 MMF-CERAMIC U.L.	±20%	.20
C-2	928968	10 MMF-CERAMIC U.L.	±10%	.20
C-3	928860	47 MMF-CERAMIC	±10% 500V.	.20
C-4	962227	1,000 MMF-FEED-THRU		
C-5	962227	1,000 MMF-FEED-THRU		
C-6	962228	2,000 MMF-FEED-THRU		
C-7A	PART OF			
C-7B	TUNER			
C-8A	900175	VARIABLE CAPACITOR-R.F. SECTION		3.05
C-8B	PT. OF C-8A	VARIABLE CAPACITOR-OSC. SECTION		
CT-A	PART OF			
CT-B	TUNER			
CT-C	PT. OF C-8A	TRIMMER-R.F. SECTION		
CT-D	PT. OF C-8A	TRIMMER-OSC. SECTION		
C-9	962229	9.5 MMF-DISC N-80		
C-10	PART OF	1,500 MMF-DISC		
C-11	TUNER	80 MMF-DISC		
C-12	928967	5 MMF-CERAMIC DISK N-1400	±10% 500V.	.20
C-13	923534	.033 MFD-PAPER	±20% 500V.	.25
C-14	928924	.01 MFD-CERAMIC DISK Z5U	500V.	.20
C-15	928922	.0047 MFD-CERAMIC DISK	±20% 500V.	.20
C-16	928914	220 MFD-CERAMIC DISK	±20% 500V.	.20
C-17	928921	.0022 MFD-CERAMIC DISK	±20% 500V.	.20
C-18	928919	.001 MFD-CERAMIC DISK	±20% 500V.	.20
C-19	928912	100 MMF-CERAMIC DISK	±20% 500V.	.20
C-20	928802	6.8 MMF-CERAMIC DISK	± 5% 500V.	.20
C-21	928921	.0022 MFD-CERAMIC DISK	±20% 500V.	.20
C-22	925434	2 MFD-ELECTROLYTIC	50V.	.80
C-23	925391	4 MFD-ELECTROLYTIC NP	50V.	.85
C-24	928922	.0047 MFD-CERAMIC DISK	±20% 500V.	.20
C-25	928922	.0047 MFD-CERAMIC DISK	±20% 500V.	.20
C-26	928922	.0047 MFD-CERAMIC DISK	±20% 500V.	.20
C-27	928924	.01 MFD-CERAMIC DISK Z5U	500V.	.20
C-28	928914	220 MMF-CERAMIC DISK	±20% 500V.	.20
C-29	923524	.022 MFD-PAPER	±20% 400V.	.25
C-30	925433	50 MFD-ELECTROLYTIC	25V.	.95
C-31	923754	.047 MFD-PAPER	±20% 600V.	.25
C-32	923754	.047 MFD-PAPER	±20% 600V.	.25
C-33	925432	80 MFD-ELECTROLYTIC	150V.	1.80
C-34	PT. OF C-33	50 MFD-ELECTROLYTIC	150V.	
C-35	PT. OF C-33	50 MFD-ELECTROLYTIC	150V.	
C-36	922208	.047 MFD-MOLDED (U.L. BYPASS)	600V.	.35
C-37	928921	.0022 MFD-CERAMIC DISK	±20% 500V.	.20
C-38	928921	.0022 MFD-CERAMIC DISK	±20% 500V.	.20
C-39	928921	.0022 MFD-CERAMIC DISK	±20% 500V.	.20
C-40	PART OF	1,500 MFD-CERAMIC DISK	500V.	
C-41	TUNER	1,500 MFD-CERAMIC DISK	500V.	
C-42	928894	33 MMF-CERAMIC DISK	±10% 500V.	.20
C-43	928921	.0022 MFD-CERAMIC DISK	±10% 500V.	.20
C-44	925447*	30 MFD-ELECTROLYTIC	150V.	
*MAY BE PART OF C-33 ON SOME SETS.				
		TUBES		
V-1	800524	VACUUM TUBE 12BA6 (FM TUNER)		
V-2	800047	VACUUM TUBE 12AT7 (FM TUNER)		
V-3	800525	VACUUM TUBE 12BE6		
V-4	800524	VACUUM TUBE 12BA6		
V-5	800524*	VACUUM TUBE 12BA6		
V-6	800029	VACUUM TUBE 19T8		
V-7	800021	VACUUM TUBE 35C5		
SE-1	817072	SELENIUM RECTIFIER		1.80
	471064	FM TUNER ASSEMBLY		21.00
		COILS & TRANSFORMERS		
L-1	710034	FM ANTENNA COIL		.15
L-2	PART OF	RF COIL (FM)		
L-3	TUNER	OSC. COIL (FM)		
L-4	700134	BARLOOP ANTENNA		1.70
L-5	716122	OSCILLATOR COIL		.70
L-6	705029	FILAMENT CHOKE		.15
T-1	720307	1ST FM I.F. TRANSFORMER		1.60
T-2	720075	1ST AM I.F. TRANSFORMER		1.75
T-3	720307	2ND FM I.F. TRANSFORMER		1.60
T-4	720075	2ND AM I.F. TRANSFORMER		1.75
T-5	708341	RATIO DETECTOR TRANSFORMER		2.35
T-6	734164	AUDIO OUTPUT TRANSFORMER		1.60
SP-1	180185	SPEAKER-PM-3-1/2"		
SP-2	180184	SPEAKER-PM-10 X 2-1/2"		
SW-1	PT. OF R-15	ON-OFF SWITCH		
SW-2	510133	FUNCTION SWITCH		
P-1	583075	INTERLOCK SOCKET & LINE CORD		
P-2	585233	SOCKET & CABLE ASSEMBLY		
X-1	505014	INTERLOCK PLUG		
X-2	508100	PHONO SOCKET		
	413067	TUBE SHIELD FOR 12BA6		.10
	413066	TUBE SHIELD FOR 12AT7		.10
	819107	4-SPEED CHANGER		

CABINET PARTS LIST, MODEL 8958

PART NO.	DESCRIPTION
	Cabinet – Specify color
592064A	Grille Cloth
413223	Control Panel
604054	Medallion
562519	Felt Feet
180184	Speaker – 2½" x 10"
180185	Speaker – 3½"
925391	Electrolytic Capacitor, 4 MFD, NP
413162	Pilot light bracket
560612	Masonite back
583075	Line cord
460997A	Knob – Vol. Tone
460999A	Knob – Tuning
460998A	Knob – Switch-Phono-Am-Fm

NOTE: ALL PRICES SUBJECT TO CHANGE WITHOUT NOTICE.

MODELS: 893B, 894B

CHASSIS: 120430B, 432B

GENERAL DESCRIPTION

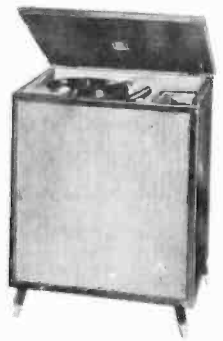
Emerson Models 893B and 894B are phonographs incorporating a four-speed automatic record changer, 3-tube amplifier, continuous tone control and dual speakers. These models operate on 117 volts, 60 cycles, A.C. only with power consumption rated at 50 watts.

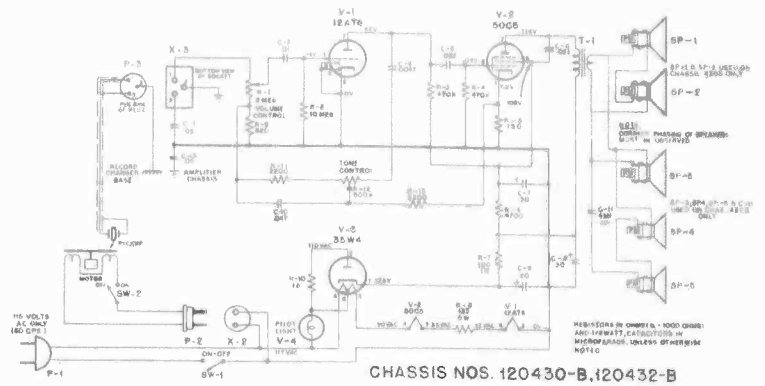
Record changer 819121 used in the models 893B, 894B is a 4 speed automatic changer that plays 33-1/3, 45, and 78 r.p.m. records automatically and 16-2/3 r.p.m. (talking book records) manually. This changer shuts "off" automatically after the last record has been played and will also play an assortment of 12" and 10" records of the same type (speed) intermixed. Ten 12", twelve 10" or fourteen 7" records can be loaded at any one time. A dual head sapphire tipped needle is used for proper tracking of 78 r.p.m. records and 16, 33-1/3, 45 r.p.m. records. When this changer is turned "off" or shuts "off" automatically after the last record has been played, the idler wheel is automatically disengaged to prevent "Flats" from developing.

In order to play 45 r.p.m. records (with large center hole) it will be necessary to either adapt each record with a snap-in center hole adapter or use a 45 r.p.m. spindle attachment (pt. number 960630). A clip holder has been provided in all of these models for convenient storage of the spindle attachment which is available through your Emerson Distributor.

MODEL 893B

MODEL 894B





CHASSIS NOS. 120430-B, 120432-B

DISASSEMBLY INSTRUCTIONS

NOTE: To replace tubes only masonite backs need be removed.

(a) Model 893B Chassis Removal:

1. Remove knobs. Remove masonite back by unscrewing 3 screws.
2. Loosen four changer mounting board screws. Tilt board up and back while disconnecting two 3-prong plugs.
3. Remove two chassis mounting board screws and unclip pilot light. Speaker leads must be unsoldered to remove chassis completely.

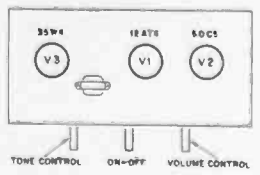


Fig. 1 – TUBE LOCATION DIAGRAM

(b) Model 894B Chassis Removal:

1. Remove knobs and masonite back.
2. Remove 2 "C" washers and 2 standard washers securing changer hold-down bolts to mounting board (which is part of cabinet), remove 2 three-prong plugs and remove changer (unsolple fishpaper wireholders).

NOTE: To reassemble, reverse above procedures.

TO REPLACE STYLUS AND SELECTOR BAR

For best operation and record tracking, it is recommended that the stylus (needle) and selector bar (flip-over arm) be replaced as a single unit. To change this unit, proceed as follows:

1. Lift up tone arm.
2. With one hand, hold spring clip in a direction away from tone arm.
3. With other hand, slide out selector bar and stylus as shown in diagram.
4. To replace new stylus and selector bar, reverse above procedure.

SPEAKER PHASING (MODEL 893B ONLY)

When replacing a speaker use the following method for checking speaker phase:

Place a 3-volt battery across both speakers which are connected in series and note whether or not both cones move in the same direction at the same time. If they do, speakers are properly phased. If not, reverse connections at one speaker only.

Improperly phased speakers will result in a noticeable loss of volume particularly at the lower frequencies.

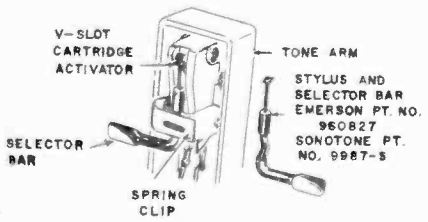


FIG. 2 – REMOVAL OF STYLUS

CONDITIONS FOR VOLTAGE AND RESISTANCE READINGS FOR CHASSIS 120430B

1. Voltages indicated are positive d.c., resistances in ohms, unless otherwise indicated.
2. Measurements made with voltohmyst or equivalent.
3. All measurements taken from pin to B neutral unless otherwise indicated.
4. Voltage measurements taken with:
   a) Line voltage maintained at 117 volts a.c. only.
   b) Volume control set for maximum volume.
   c) Phono plugs disconnected.
5. Resistance measurements taken with:
   a) Power line cord disconnected from outlet.
   b) Volume control set for maximum volume.
   c) Phono plugs disconnected.
6. Nominal tolerance on component values make possible a variation of ± 15% in voltage and resistance readings.
7. N.C. denotes no connection, K is kilohms, Meg. is megohms.

SYMBOL	TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7
V–1	12AT6	10 MEG	0 Ω	0 Ω	12 Ω	0 Ω	0 Ω	*370
V–2	50C5	150	470 K	145 Ω	185 Ω	470 K	*4800 Ω	*300
V–3	35W4	†1 MEG	†1 MEG	185 Ω	205 Ω	205 Ω	200 Ω	1 1

* – *Resistance measured to pin 7 of Rectifier 35W4 (B+)*
† – *Measured with VTVM on R x 10,000 allowing meter to settle for 1 min. (Discharge electrolytic capacitors completely before measuring).*

CHASSIS PARTS LIST, CH-120430B, 432B

SYMBOL	PART NO.	DESCRIPTION		
C–1	923554	.05 MF Paper		400V.
C–2	923514	.01 MF Paper	±20%	400V.
C–3	923554	.05 MF Paper		400V.
C–4	923553	.0047 MF Paper	±20%	400V.
C–5	923524	.022 MF Paper Molded	±20%	400V.
C–6	923524	.022 MF Paper Molded	±20%	400V.
C–7	Pt. of C–9	30 MF Electrolytic		150V.
C–8	Pt. of C–9	30 MF Electrolytic		150V.
C–9	925444	20 MF Electrolytic		150V.
C–10	921554	.047 MF Durez	±20%	400V.
C–11	925391	4 MF Electrolytic – Non-polarized (CH. 432–B only)		
P–1	583079	Plug and Line Cord		
P–2	Pt. of Changer	Plug – Phono Motor		
P–3	Pt. of Changer	Plug – Pickup		
R–1	390543	2 Megohm Volume Control		
R–2	351452	10 Megohm Carbon	±20%	1/2W.
R–3	351132	470,000 Ohm Carbon	±20%	1/2W.
R–4	351132	470,000 Ohm Carbon	±20%	1/2W.
R–5	340292	150 Ohm Carbon	±10%	1/2W.
R–6	350652	4,700 Ohm Carbon	±20%	1/2W.
R–7	370252	100 Ohm Carbon	±10%	1W.
R–8	394144	133 Ohm Wire Wound	±5%	5W.
R–9	340472	820 Ohm Carbon	±10%	1/2W.
R–10	340072	18 Ohm Carbon	±10%	1/2W.
R–11	340572	2,200 Ohm Carbon	±10%	1/2W.
R–12	390556	500,000 Ohm Tone Control		
R–13	340612	3,300 Ohm Carbon	±10%	1/2W.
SP–1	180152	Speaker – PM – 4" (Chassis No. 120430B Only)		
SP–2				
SP–3	180165	Speaker – PM # 8"		
SP–4, SP–5	180164	Speaker – PM # 3½" (Chas. 120432B only)		
SW–1	510135	Switch – ON-OFF		
SW–2	Pt. of Changer	Switch – Motor – ON-OFF		
SW–3	510034	Switch – Tone Control		
T–1	734165	Output Transformer		
V–1	800523	Vacuum Tube – 12AT6		
V–2	800037	Vacuum Tube – 50C5		
V–3	800526	Vacuum Tube – 35W4		
V–4	807000	Pilot Light No. 47		
X–2	500530	Socket – Phono Motor		
X–3	508003	Socket – Pickup		
	819121	Record Changer – 4 Speed		

CABINET PARTS LIST, MODELS 893B, 894B

893B	894B	DESCRIPTION
		Cabinet (Specify Color)
412726	412726	Clamp – 45 RPM Adapter
592065	592068	Grille Cloth (Specify Color)
413162	413246	Bracket – Pilot Light
604042	604042	Medallion
413208	595023	Control Panel
275015	275015	"C" Washer
460930	461011	Knob – Controls
	576221	Removable Back
560608		Masonite Back (Specify Color)
620280		Motor Board (Specify Color)

RECORD CHANGER 819121 PARTS LIST*

PART NO.	DESCRIPTION
961865	Cartridge w/Stylus (Sonotone Pt. #2TS)
960827	Stylus and Selector Bar (Dual Sapphire – tipped stylus Sonotone Pt. #9987-S)
961868	Tone Arm
961869	Tone Arm Clip
961870	Lift Screw
961871	Hinge Spring
961872	Weight Adjust Spring
961873	Hinge Pivot Button
961845	Escutcheon (Changer)
961842	Control Knob (Changer)

**Refer to Record Changer 819107 Service Note for Additional Technical Information.*

AM-FM HIGH FIDELITY RADIO PHONOGRAPH

STOCK No. 4-H-3

CODE NO. 334-8-0A16A/5P10A

SERVICE MANUAL AND PARTS CATALOG

THE FIRESTONE TIRE & RUBBER CO.

AKRON, OHIO

GENERAL DESCRIPTION

This high fidelity AM-FM radio phonograph is a 15 tube (plus 2 rectifiers) AC superheterodyne receiver with a four speed automatic record changer equipped with diamond and sapphire needles. Controls are provided for tuning, bass, treble, contour and level. A six-position switch provides selection of: TAPE, AM, FM, FM-AFC, HI-FI and OLD 78. A four-position switch handles ON-OFF and speaker selection. Special features include built-in antennas for AM and FM, automatic volume control, tuned R-F stages, FM radio with separate automatic frequency control for drift-free tuning, four permanent magnet dynamic speakers and inverse feedback to reduce harmonic distortion, input and output jacks for external tape recorder, output jack for stereophonic reproduction and an external speaker jack. A special automatic spindle is supplied for playing 45 RPM records.

ELECTRICAL SPECIFICATIONS

Power Supply	105-125 volts AC 60 cycles 180 watts, 200 watts record changer operating
Power Output	40 watts peak 28 watts 1% distortion
Frequency Ranges	AM - 535-1620 KC FM - 88-108 MC
Intermediate Freq.	AM - 455 KC FM - 10.7 MC
Selectivity	AM - 40 KC broad at 1000 times signal, measured at 1000 KC. I.F. FM - 200 KC broad at 2 times down.
Sensitivity	50 microvolts per meter (average) for 500 milliwatts output. FM - 10 microvolts per meter (average) for 30 db quieting.

ELECTRICAL SPECIFICATIONS *(Con't.)*

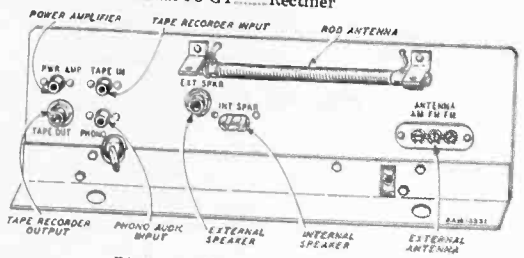
Amplifier Frequency Response	20 to 20,000 cps.
Oscillator Drift	FM - ± 15 KC at center of band. Completely compensated for by AFC.
Noise Level	60 db down from 100% modulation.
Audio Output	Low impedance.
Antenna Input	FM - 300 ohms. AM - ferrite rod plus external antenna connection.
Loud Speakers	One 12" PM dynamic - 9.6 ohm V.C. imp. One 12" PM dynamic - 8.0 ohm V.C. imp. Two 5" PM dynamic - 6.4 ohm V.C. imp.
Record Changer	VM-1200 4 speed stereophonic.
Cartridge & Needle Assembly	EV-0126-D-S

TUBE AND DIAL LAMP COMPLEMENT
AM-FM TUNER

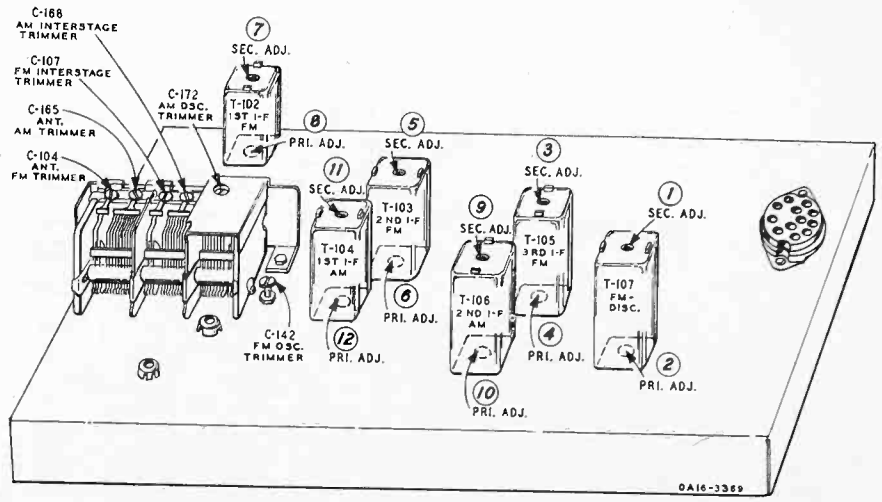
V-1	6CB6	FM - RF Amplifier
V-2A & 2B	12AT7	FM Converter and AFC FM
V-3	6AU6	FM I-F
V-4	6BA6	AM-FM I-F
V-5	6AU6	FM Limiter and AM Diode
V-6A & 6B	6AL5	FM Diodes
V-7	6AB4	FM Oscillator
V-8A & 8B	7025	Audio
V-9	6BA6	AM R-F Amplifier
V-10	6BE6	AM Converter
Four	#47	Dial Lamps

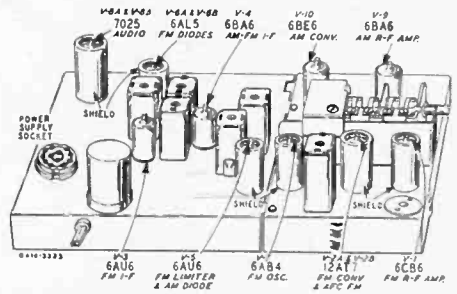
POWER SUPPLY AND POWER AMPLIFIER

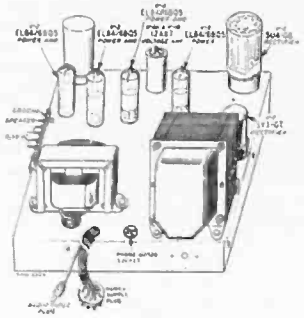
V-1A & 1B	12AX7	Voltage Amplifier
V-2, 3, 4 & 5	EL84/6BQ5	Power Amplifier
V-6	5U4-GB	Rectifier
V-7	5Y3-GT	Rectifier



REAR CHASSIS CONNECTIONS







DRIVE CORD REPLACEMENT

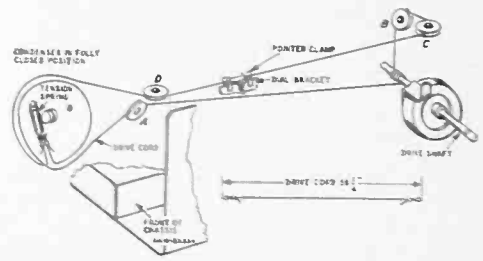
Replacement of the drive cord may be accomplished as shown in the illustration. For this purpose use the drive cord assembly listed in the replacement parts list. Then install the string as shown, winding four turns counter-clockwise around the tuning shaft with the turns progressing toward the rear of the chassis. After the cord is installed rotate the tuning shaft several times in order to take up any slack in the cord.

TUBE SOCKET VOLTAGES

Socket voltages are shown on the Schematic diagram at the tube socket terminals. All voltages are between the socket terminal and chassis ground. Plate, screen and cathode voltages were taken with a 1000 ohm-per volt meter with a 300 volt scale used for plate and screen voltages. Audio grid voltages were read with a vacuum tube volt-meter. Conditions of measurement are:

Line voltage	117 Volts AC
Signal Input	None

A variation of ±10% is usually permissible.



ALIGNMENT PROCEDURE

AM STAGES

The following is required for aligning:
An All Wave Signal Generator Which Will Provide an Accurately Calibrated Signal at the Test Frequencies as Listed.
Output Indicating Meter, Non-Metallic Screwdriver, Dummy Antennas — .1 mf, and Loop.

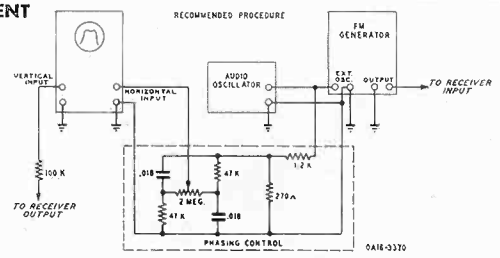
Level, Bass and Treble Controls 50% rotation all Adjustments. Contour Control Maximum rotation.
Connect Chassis to Ground Post of Signal Generator with a Short Heavy Lead.
Allow Chassis and Signal Generator to "Heat Up" for Several Minutes.
Function Switch To AM Position.

SIGNAL GENERATOR						
FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO	THROUGH DUMMY ANTENNA	CONNECT GROUND TO	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
455 KC	Control Grid I-F 6BA6 Pin No. 1	.1 mf	Chassis Base	Rotor Fully Open	2nd I.F. Pri. (9) and Sec. (10)	Maximum Output
455 KC	Control Grid 6BE6 Pin No. 7	.1 mf	Chassis Base	Rotor Fully Open	1st I.F. Pri. (11) and Sec. (12)	Maximum Output
455 KC	Control Grid 6BE6 Pin No. 7	.1 mf	Chassis Base	Rotor Fully Open	2nd I.F. Pri. (9) and Sec. (10)	Maximum Output
1620 KC	Control Grid R-F 6BA6 Pin No. 1	.1 mf	Chassis Base	Rotor Fully Open	Oscillator C-172	Maximum Output
1400 KC	Control Grid R-F 6BA6 Pin No. 1	.1 mf	Chassis Base	Turn Rotor to Max. Output. Set Pointer to 1400 KC See Note A	Interstage C-168 See Note B	Maximum Output
1400 KC	See Note C	See Note C	See Note C	Turn Rotor to Max. Output. Set Pointer to 1400 KC See Note A	Antenna C-165 See Note B	Maximum Output

NOTE A—If the pointer is not at 1400 KC on the dial, reset pointer to the 1400 KC mark on the dial scale.
NOTE B—Turn the rotor back and forth and adjust the trimmer until the peak of greatest intensity is obtained.
NOTE C—Connect generator leads across a 6" diameter loop of wire and place near AM antenna.

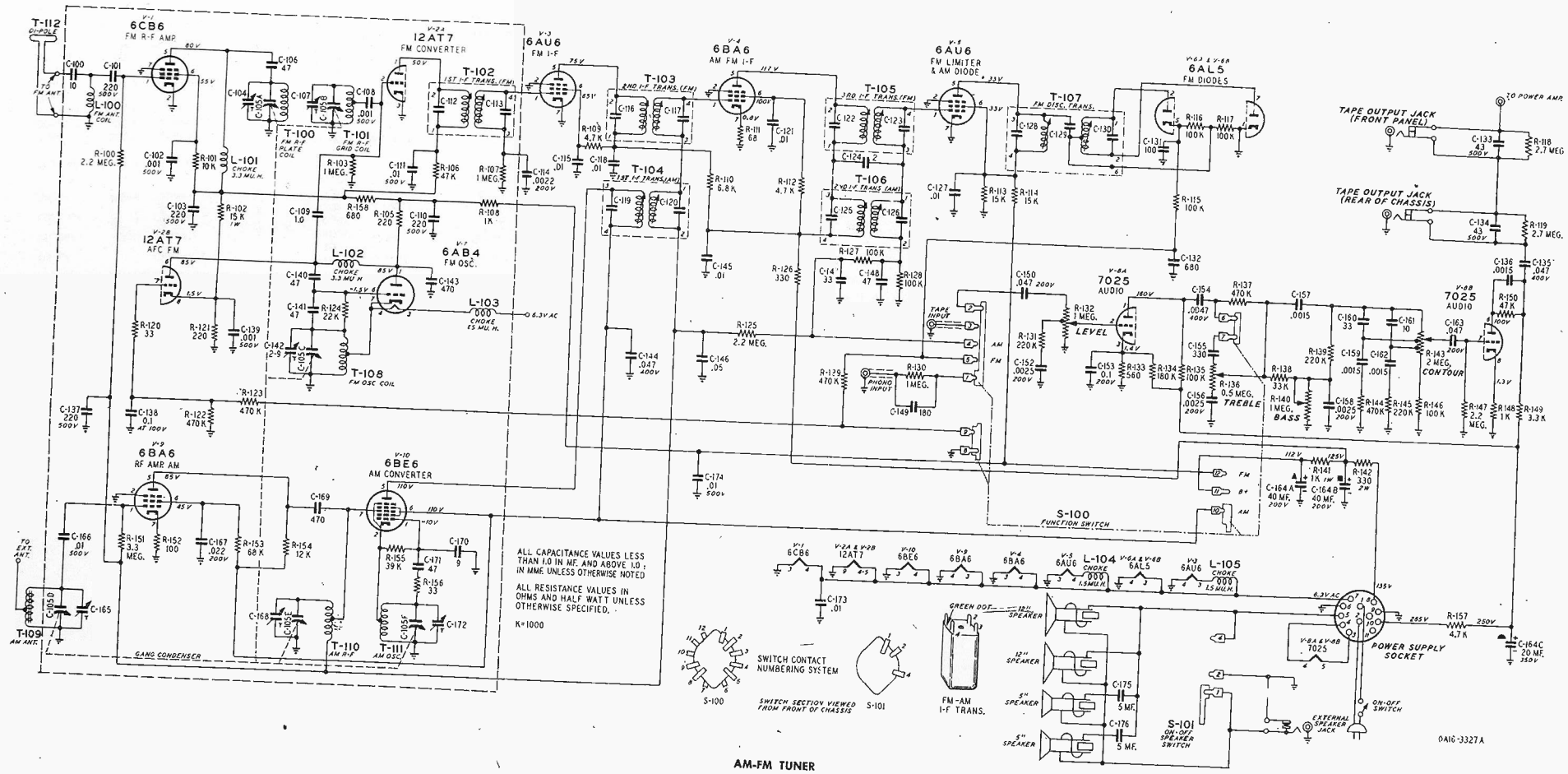
F. M. ALIGNMENT

The following is required for aligning:
An accurately calibrated signal generator with approximately a 250 KC deviation.
VTVM having a range of approximately 5 volts DC.
Oscilloscope.
Audio Oscillator
Dummy antennas, 5000 mmf and 300 ohms.
Recommended procedure:
Set the function switch on the FM receiver to the FM (without AFC) position, and the tuning control as indicated.
Connect scope through 100,000 ohm isolating resistor.
Turn tuning knob to extreme clockwise position (gang condenser fully open), and set dial pointer to the extreme right dial indicating mark.

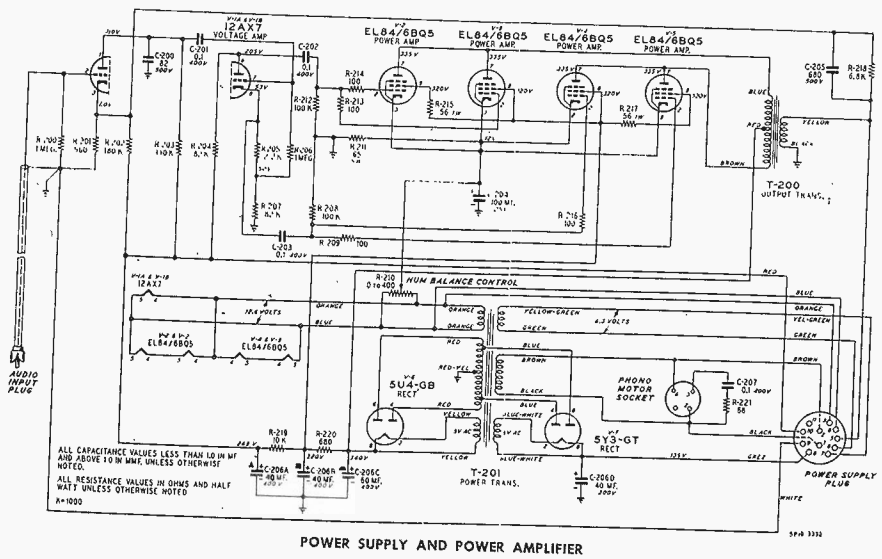


FREQ. SETTING	CONNECT GENERATOR OUTPUT TO	THROUGH DUMMY ANTENNA	CONNECT OSCILLOSCOPE TO	CONNECT VTVM TO	SIGNAL INPUT LEVEL	FREQ. DEVIATION @ 400 CPS	DIAL SETTING	ADJUST	ADJUST FOR	SCOPE PATTERN
10.7 MC	Pin #1 6BA6 V-4	5000 mmf	Junction R127, R128 and C148	Junction R127, R128 and C148	Adjust For—1.25V on VTVM	250 KC	Rotor Fully Open	3rd IF T105 Pri. (4) Sec. (3)	Maximum Amplitude & Symmetrical Curve	
10.7 MC	Pin #1 6AU6 V-3	5000 mmf	Junction R127, R128 and C148	Junction R127, R128 and C148	Adjust For—1.25V on VTVM	250 KC	Rotor Fully Open	2nd IF T103 Pri. (6) Sec. (5)	Maximum Amplitude & Symmetrical Curve	
10.7 MC	Pin #2 12AT7 V-2A	5000 mmf	Junction R127, R128 and C148	Junction R127, R128 and C148	Adjust For—1.25V on VTVM	250 KC	Rotor Fully Open	1st IF T102 Pri. (8) Sec. (7)	Maximum Amplitude & Symmetrical Curve	
10.7 MC	Pin #1 6AU6 V-5	5000 mmf	Junction of R115 and C132	Junction of R115 and C132	100,000 U V/M	75 KC	Rotor Fully Open	Disc. T107 Pri. (2)	Maximum Amplitude & Best Linearity	
10.7 MC	Pin #1 6AU6 V-5	5000 mmf	Junction of R115 and C132	Junction of R115 and C132	100,000 U V/M	None	Rotor Fully Open	Disc. Sec. (1)	O V DC on VTVM	
108 MC	FM Antenna Terminals	300 ohms	Junction of R115 and C132	Junction of R127, R128 & C148	Approx. 100 U V/M	25 KC	108 MC on Dial	C142	Maximum Audio Output	
105 MC	FM Antenna Terminals	300 ohms	Junction of R115 and C132	Junction of R127, R128 & C148	Approx. 10 U V/M	25 KC	105 MC on Dial	C107 and C104 See Note A	Maximum Audio Output	

NOTE A —Rock dial slightly for maximum output while making these adjustments.



AM-FM TUNER



POWER SUPPLY AND POWER AMPLIFIER

FIRESTONE RADIO PAGE 26-3

CODE NO. 334-8-0A16A/5P10A

REPLACEMENT PARTS LIST

AM-FM TUNER

Use only GENUINE factory tested parts to insure service jobs you can depend on and to obtain original set performance.

USE UNIVERSAL PARTS WHERE PART NUMBERS ARE NOT SHOWN.

CAPACITORS

C-100, C-161	47X674	10 mmf	NPO	Ceramic
C-101, C-103, C-110, C-137		220 mmf	500 V	Ceramic
C-102, C-108, C-139		.001 mf	500 V	Ceramic
C-104, C-107, C-165, C-168, C-172	Part of 14A235			Trimmers
C-105A, C-105B, C-105C, C-105D, C-105E, C-105F	14A235	Gang Condenser Assembly		
C-106, C-140, C-141, C-148, C-171	47X670	47 mmf	N-750	Ceramic
C-109	47X588	1 mmf		Molded
C-111, C-166, C-174		.01 mf	500 V	Ceramic
C-112, C-113	Part of T-102			
C-114		.0022 mf	200 V	Tubular
C-115, C-118, C-121, C-127, C-145, C-173		.01 mf	GMV	Ceramic
C-116, C-117	Part of T-103			
C-119, C-120	Part of T-104			
C-122, C-123	Part of T-105			
C-124	47X628	2.0 mmf	±.25 mmf	Ceramic
C-125, C-126, C-128, C-129, C-130	Part of T-106			
C-131		100 mmf		Ceramic
C-132		680 mmf		Ceramic
C-133, C-134		43 mmf	500 V	Ceramic
C-135, C-144, C-136, C-157, C-159, C-162	47X545	1500 mmf		Ceramic
C-138		.1 mf	100 V	
C-142, C-143, C-169	17A273	2-9 mmf	N750	Trimmer
		470 mmf	500 V	Ceramic
C-146		.05 mf		Ceramic
C-147, C-160	80X37	33 mmf	N750	Ceramic
C-149, C-150, C-163	80X40	180 mmf	JF	Ceramic
		.047 mf	400 V	Tubular
C-152, C-156, C-158		.0025 mf	200 V	Tubular
C-153		.1 mf	200 V	Tubular
C-154		.0047 mf	400 V	Tubular
C-155	80X41	330 mmf	JL	Ceramic
C-164A, C-164B, C-164C	45X452	40 mf	200 V	Dry Electrolytic
		20 mf	350 V	
C-167		.022 mf	200 V	Tubular
C-170	47X632	9 mmf	N-4700	Tubular
C-175, C-176	45x426	5 mf	10 V.N.P.	Electrolytic

RESISTORS

		Ohms	Watts	
R-100, R-125, R-147		2.2 Meg	0.5	Carbon
R-101		10 K	0.5	Carbon
R-102		15 K	1.0	Carbon
R-103, R-107, R-130		1.0 Meg	0.5	Carbon
R-105, R-121, R-106		220	0.5	Corbon
R-150, R-108		47 K	0.5	Carbon
R-148, R-109		1 K	0.5	Carbon
R-112, R-157		4.7 K	0.5	Carbon
R-110		6.8 K	0.5	Carbon
R-111		68	0.5	Carbon
R-113, R-114	B85153	15 K	0.5	Carbon
R-115, R-127, R-128, R-135		100 K	0.5	Carbon
R-116, R-117, R-118		100 K	0.5	Carbon
R-119, R-120		2.7 Meg	0.5	Carbon
R-156		33	0.5	Carbon
R-122, R-123, R-129		470 K	0.5	Carbon
R-124		22 K	0.5	Carbon
R-126		330	0.5	Carbon
R-131, R-139, R-145		220 K	0.5	Carbon
R-132	36X404	1.0 Meg		Level Control.
R-133		560	0.5	Carbon
R-134		180 K	0.5	Carbon
R-136	40X451	500 K		Treble Control
R-137, R-144		470 K	0.5	Carbon
R-138		33 K	0.5	Carbon
R-140	40X450	1.0 Meg		Bass Control.
R-141		1 K	1.0	Carbon
R-142		330	1.0	Carbon
R-143	36X405	2.0 Meg		Contour Contr.
R-146		100 K	0.5	Carbon
R-149		3.3 K	0.5	Carbon
R-151		3.3 Meg	0.5	Carbon
R-152		100	0.5	Carbon
R-153		68 K	0.5	Carbon
R-154		12 K	0.5	Carbon
R-155		39 K	0.5	Carbon
R-158		680	0.5	Carbon

TRANSFORMERS AND COILS

L-100	9A2448	FM-Antenna Coil
L-101, L-102	35A8	Choke Coil 3.3 mu.h
L-103, L-104, L-105	35A6	Choke Coil 1.5 mu.h
T-100	9A2445	FM-RF Plate Coil
T-101	9A2446	FM-RF Grid Coil
T-102, T-103, T-105, T-104	9A2440	FM-IF Coil
T-106	9A2443	AM-IF Transformer
T-107	9A2442	Discriminator Coil
T-108	9A2447	FM-Oscillator Coil
T-109	9A2441	Rod Antenna (AM)
T-110	9A2439	AM-RF Coil
T-111	9A2438	AM-Oscillator Coil
T-112	9A2005	Di-Pole Antenna (FM)

REPLACEMENT PARTS LIST *(Continued)*

MISCELLANEOUS

12A561	12" PM Speaker	19x192	"C" Washer
12A562	12" PM Speaker	28X113	Spring—Drive Cord
12A563	5" PM Speaker	26X543	Drive Shaft
2A492	Switch, On-Off Speaker	24X588	Fly Wheel
2A493	Switch, Function	15X286-1	Pointer
3A499	Phone Jack, Speaker	13X839-6	Line Cord
3A522	Phone Jack, Ext. Speaker, Tape Output	30X560	Clamp—Line Cord
3A509	Jack, Stereo, Phono, Tape Input-Power Amp.	7A278	Pilot Light Socket Assembly (Dial)
4A918	Antenna Terminal Strip	7A279	Pilot Light Socket Assembly (Record Compartment)
3A487	Tube Socket, 9 Pin	7A103	#47 Pilot Light Bulb
3A491	Tube Socket, 7 Pin	41X105	Light Reflector
3A521	Socket, Power Supply	32X425-1	Tube Shield (6AB4-6CB6-6AU6-6AL5)
10A947	Knob, Tuning, On-Off Speaker Switch	32X428-1	Tube Shield (12AT7-7025)
10A948	Knob, Bass, Treble, Contour, Level & Function	4x1423-2	Escutcheon, Control
25x2167-1	Dial Plate	41x98-5	Pilot Light Shield
58X808	Dial Glass	75X56	Cabinet Back (Bottom)
28X564	Spring—Dial Glass	75X57	Cabinet Back (Top)
10x95	Drive Cord Assembly	28A226	Record Changer VM 1200 Stereo. Cartridge & Needle Assembly (EV-0126-D-S)

RECORD CHANGER

For complete Service information on VM-1200 Record Changer refer to Firestone Service Manual No. 4-481.

POWER SUPPLY

CAPACITORS

C-200	RCM20B820K	82 mmf		Mica
C-201, C-202, C-203, C-207		.10 mf	400 V	Tubular
C-204	45X449	100 mf	25 V	Dry Electrolytic
C-205		680 mmf		Ceramic
C-206A	45X450	40 mf	400 V	Dry Electrolytic
C-206B		40 mf	400 V	
C-206C		60 mf	400 V	
C-206D		40 mf	200 V	

RESISTORS

	Ohms	Watts	
R-200, R-206	1.0 Meg	0.5	Carbon
R-201	560	0.5	Carbon
R-202	180 K	0.5	Carbon
R-203	330 K	0.5	Carbon
R-204, R-207	82 K	0.5	Carbon
R-205	2.2 K	0.5	Carbon
R-208, R-212	100 K	0.5	Carbon

RESISTORS (Cont.)

R-209, R-213, R-214, R-216		100	0.5	Carbon
R-210	40X452	400		Hum. Balance Control
R-211	43X309	65	5.0	Wirewound
R-215, R-217	C84560	56	1.0	Carbon
R-218		6.8 K	0.5	Carbon
R-219		10 K	2.0	Carbon
R-220	43X338	680	4.0	Pyrex
R-221		68	0.5	Carbon

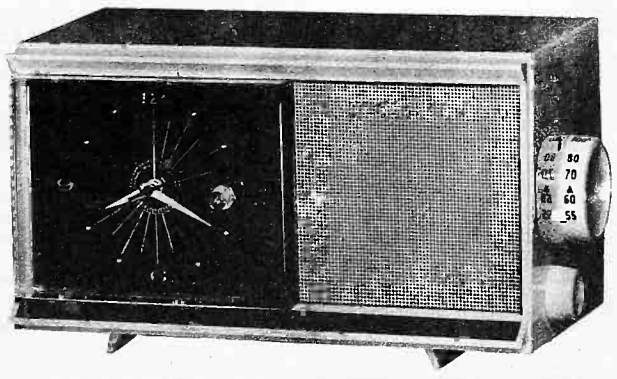
TRANSFORMERS

T-200	51X194	Output Transformer
T-201	53X371	Power Transformer

MISCELLANEOUS

3A455	Tube Socket
3A463	Tube Socket
3A474	Tube Socket, Octal
3A519	Socket, Phono Motor
6A357	Plug

CORONADO RADIO



"TUNE TIME"

RA 50-8187A-TURQUOISE

RA 50-8188A-WHITE

ELECTRICAL SPECIFICATIONS

Power Supply . . . . . .110-120 Volt – 60 cycles Alternating Current only.
Power Consumption . . . . . 40 Watts
Appliance outlet capacity . . . . . 800 Watts
Tuning Range . . . . . 540 KC through 1620 KC
Intermediate Frequency . . . . . 455 KC
Loudspeaker . . . . . 4" PM ALNICO V
Voice Coil Impedance . . . . 3.2 Ohms at 400 cps
Sensitivity (Signal radiated by STD Loop) 300 UV/M at 1400KC for 50 MW output.
Power output (maximum signal) 1.9W.

TUBE COMPLEMENT

12BE6 . . . . . .Pentagrid Converter
12BA6 . . . . . I.F. Amplifier
12AV6 . . . . . 2nd Detector, A.V.C., 1st A.F.
50 C5 . . . . . Power Amplifier
35 W4 . . . . . .Rectifier

MODELS RA 50-8187A-TURQUOISE AND RA 50-8188A-WHITE

GENERAL DESCRIPTION

This Gamble Skogmo clock radio is a five (5) tube AC Superheterodyne receiver with an appliance outlet.
A high gain loop antenna provides excellent pickup without the need for an external antenna.

The Electric Clock starts as soon as you plug the radio cord to any outlet supplying 105 to 120 volts, 60 cycle Alternating Current To set the clock to the correct time, pull out and turn to the right the knurled disc of the time set control in the rear.

To Operate the Radio, turn the clock selector knob to the left so its index points to "on". Wait a few seconds for the tubes to warm up. Turn the small knob (volume control) at the right side of cabinet clockwise.
Turn the calibrated tuning knob (located above the volume control knob) to the desired station, tuning carefully for best & clearest reception.

The tuning knob shows the "CD" Civil Defense Emblem at Conelrad Frequencies 640 and 1240 Kilocycles.
In a Civil Defense emergency, tune to either frequencies to receive defense news, instructions and information.

To turn the radio off, turn the clock switch knob to the center position.

To Operate the Radio as a Musical Wake-Up Alarm during the next eleven hours:

1. Tune in the station which will carry the program desired.
2. Set the volume control at the level you want.
3. Push & lock the knurled disc of the time set control in the rear and turn it to the right until the small white pointer indicates the time you want the radio to go on.
4. Turn clock switch to "auto". The radio will start to play by itself at the time set.

When radio is used as an appliance timer, the switch must be set to the "on" position. Insert the appliance plug into the radio's appliance outlet in the rear of chassis. The "on-off-auto" clock switch will control not only the radio, but the appliance as well.

Clock Removal Information

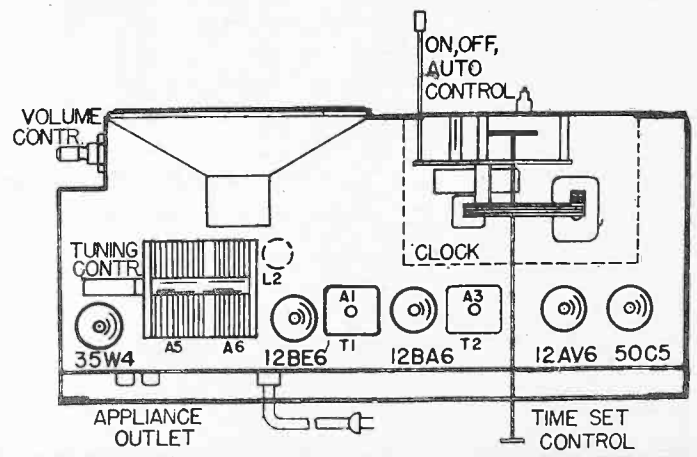
If it is necessary to remove the clock for repairs or replacement, proceed as follows:

1) Remove the clock selector knob.
2) Remove the volume control and the tuning knobs.
3) Remove the three (3) PK screws & washers from bottom of cabinet and pull out chassis.
4) Unscrew the three palnuts & remove clock cover.
5) Slide the clock window four (4) tabs toward the center and push them through the cabinet openings. The window then will come out.
6) Remove all four (4) clock hands.
7) Pull out clock.

To Reassemble the clock or to install a replacement clock, proceed with all above steps in a reverse sequence.

VERY IMPORTANT

Before putting back the four (4) clock hands, make sure that the radio, when used as a musical wake-up alarm, will go on at the right time. For that purpose, set the clock to "Auto". Push and lock the knurled disc in the rear and keep turning it very slowly to the right 'till a click is heard.
Then assemble the small white pointer & the hour hand on six (6) o'clock, the minute & second hands on twelve (12) o'clock.



Chassis Code 570 X

ALIGNMENT PROCEDURE

Read carefully before attempting alignment. Before starting alignment:

1. Volume control should be set at maximum position.
2. Output of signal generator should be kept no higher than necessary to obtain an output reading.
3. Use an insulated alignment screwdriver for adjusting.
4. If available, use isolation transformer to keep power line ground off chassis.

   If isolation transformer is not available, connect a .1 mfd capacitor in series with the low side of signal generator and B-.

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
.05MFD	High side to antenna stator lug on tuning gang. Low side to B-.	455 KC (400~Mod.)	Tuning gang fully open.	Across voice coil.	A2, A4, A1, & A3 Bottom & Top of I.F. Transformers	Adjust for maximum output. If isolation transformer is not used, reduce dummy antenna to .001MFD to reduce hum modulation.
	Loop	1640KC	"	"	A6	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.
	"	1400KC	Tune to 1400 KC signal	"	A5	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.

Check tracking, using slicer or Ferrite stick and Aluminum plate 4" square.

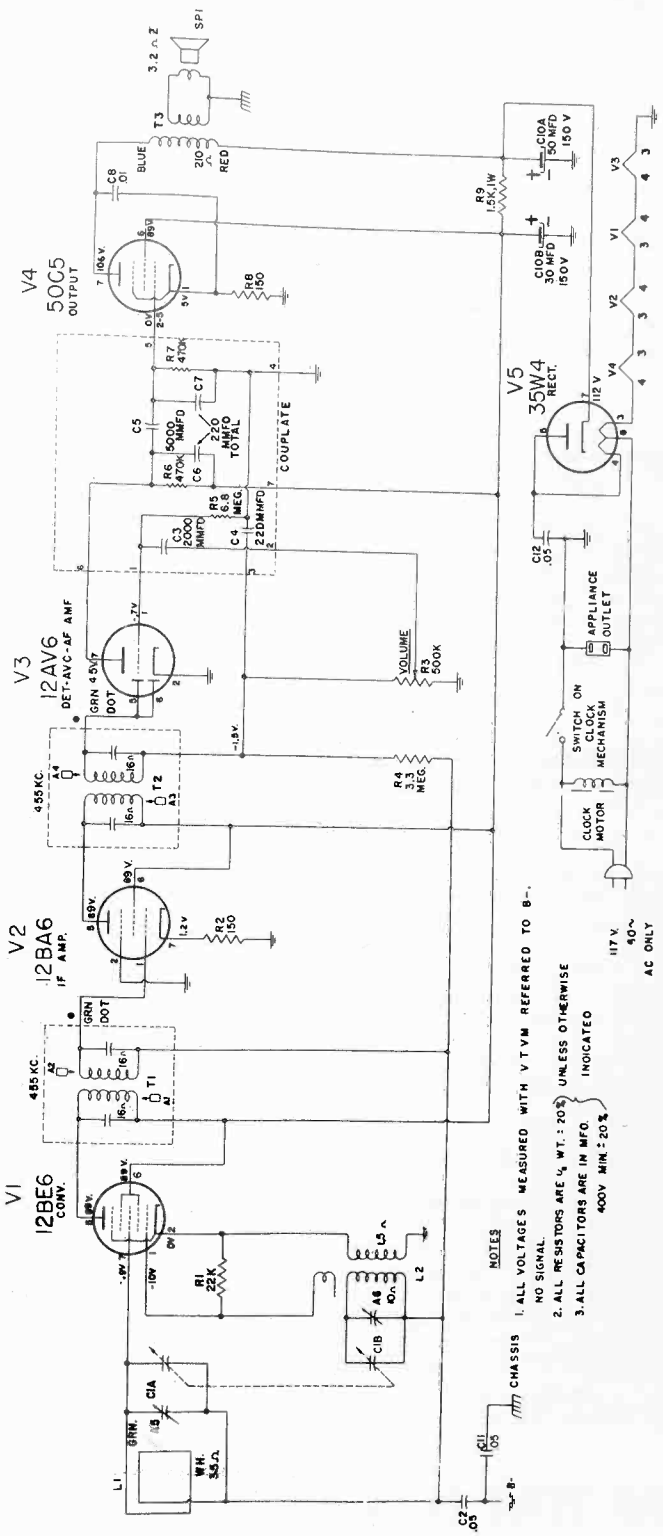
REPLACEMENT PARTS LIST MODEL RA 50-8187A – TURQUOISE
MODEL RA 50-8188A – WHITE

When ordering parts, specify part number, model number and series.

REF. NO.	PART NO.	DESCRIPTION
RESISTORS		
R1		22K Ohm 1/2W, 10% (Part of osc. coil ass'y.)
R2, R8		150 Ohm, 1/2W, 20%
R3	E2521	.5 Megohm Volume Control
R4		3.3 Megohm, 1/2W, 20%
R9		1.5K Ohm, 1 W, 20%
CAPACITORS		
C1A–A5	E3518	Variable condenser
C1B-A6		
C2,C11,C12	E343	.05 MFD, Molded tubul. 400V
C8	E344	.01 MFD, Molded tubul. 400V
C10A,C10B	E3214	50MFD-30MFD, electrolytic block, 150 WVDC
R5		6.8 Megohm } Parts of couplate
R6,R7		470 K Ohm } PC-150 SDT
C3,C6,C7	E3015	220 MMFD }
C4		.002 MFD }
C5		.005 MFD }

REF. NO.	PART NO.	DESCRIPTION
COILS & TRANSFORMERS		
L1	E6030/E6021	Loop Antenna
L2	E6127	Oscillator coil assembly
T1, T2	E6256	I.F. transformer
T3	E1113	Output transformer
MISCELLANEOUS		
	E7043C	Cabinet (Specify Color)
	E5059	Knob, tuning (Specify Color)
	E5061	Knob, volume (Specify Color)
	E1017	Speaker, P.M., 4"
	E137	Clock
	E4318	Shaft, extension-time set
	E161	Face, clock
	E5077	Window, clock
	E7621	Cover, timer
	E5064	Knob, clock
	E1313	Alarm hand
	E1314	Sweep second hand
	E1315	Minute & hour hand
	E5814	Grill

FOR PRICES: SEE CORRESPONDING KEY NUMBER IN PRICE LIST

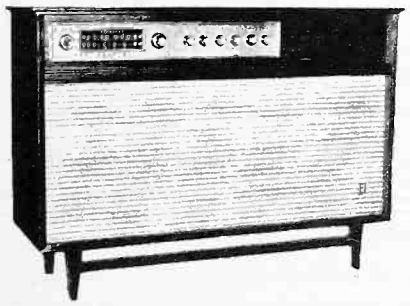


KEY NO. RA1

RADIO SERVICE MANUAL AND PARTS LIST

NO. 603-466

FILE NUMERICALLY IN SERVICE INFORMATION SECTION OF SERVICE REFERENCE FILE



CORONADO MODELS

RA1-9268A (Mahogany)
RA1-9269A (Oak)
RA1-9270A (Walnut)

GENERAL DESCRIPTION

This stereophonic high fidelity phonograph with AM-FM radio is an assembly of three individual chassis units as follows: a 9-tube AM-FM 2-control superheterodyne radio tuner, A 2-tube 6-control dual-channel pre-amplifier, and a 6-tube (plus 2 rectifiers) dual-channel power amplifier and power supply, (total 17 tubes plus 2 rectifiers). It uses a four-speed automatic record changer equipped with a stereophonic cartridge with diamond and sapphire needles. The two controls on the tuner are TUNING and a three-position switch selecting: AM, FM and FM-AFC. On the pre-amplifier, the controls, all of which function for both channels, are BALANCE, BASS, TREBLE, LEVEL, CONTOUR, and a 6-position switch selecting: ON-OFF, HI-FI, HI-FI STEREO, TUNER, TAPE and TAPE STEREO.

Special features of the tuner include built-in antennas for AM and FM, automatic volume control, tuned R.F. stages, and FM automatic frequency control for drift-free reception.

This high-fidelity reproducer is arranged to provide IN-THE-CABINET- STEREOPHONIC - REPRODUCTION. Each channel of the signal from a stereo record drives two of the four permanent magnet dynamic speakers. These speakers are arranged to obtain the best stereophonic effects available in one cabinet. For greater stereophonic effects an external speaker may be added by using the EXTERNAL SPEAKER JACK.

Other extra jacks include a TAPE OUTPUT and two TAPE INPUT jacks for tape recording and playing stereo or monaural tape recordings. A special "45" spindle is supplied for automatic playing of 45 RPM records. The tuner includes an FM MULTIPLEX jack to which a multiplexing converter (when made available) can be attached. It will provide Hi-Fidelity two-channel stereo programs when multiplex FM broadcasting begins.

ELECTRICAL SPECIFICATIONS

Power Supply	105-125 volts AC 60 cycles 180 watts, 200 watts record changer operating
Power Output	40 watts max. 20 watts each channel 30 watts 1% distortion, 15 watts each channel
Frequency Ranges	AM-535-1620 KC FM-88-108 MC
Intermediate Freq.	AM-455 KC FM-10.7 MC
Selectivity	AM-40 KC broad at 1000 times signal, measured at 1000 KC. I.F. FM–200 KC braad at 2 times down.
Sensitivity	50 microvolts per meter (average) for 500 milliwatts output. FM-10 microvolts per meter (average) for 30 db quieting.
Amplifier Frequency Response	20 to 20,000 cps.
Oscillator Drift	AM and FM temperature compensated to minimize drift. AFC on FM
Noise Level	60 db down from 100% modulation
Audio Output	Low impedance.
Antenna Input	FM-300 ohms. AM-ferrite rod plus external antenna connection.
Loud Speakers	Two 12" PM dynamic 8.0 ohm V.C. imp. Two 5" PM dynamic - 6.4 ohm V.C. Imp.
Record Changer	Garrard RC121/II 4 speed stereophonic.
Cartridge & Needle Assembly	Use ASTATIC 13TX

TUBE AND DIAL LAMP COMPLEMENT AM-FM TUNER

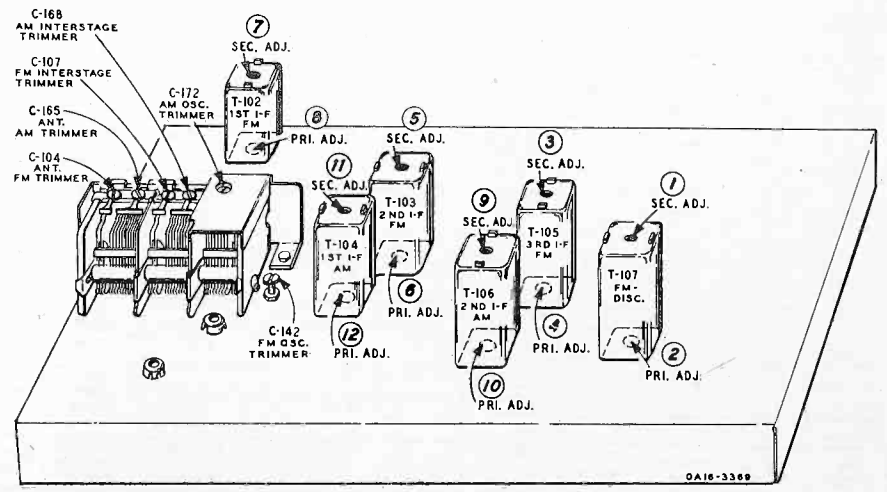
V-1	6CB6	FM-RF Amplifier
V-2A & 2B	12AT7	FM Converter and AFC FM
V-3	6AU6	FM-I-F
V-4	6BA6	AM-FM I-F
V-5	6AU6	FM Limiter and AM Diode
V-6A & 6B	6AL5	FM Diodes
V-7	6AB4	FM Oscillator
V-9	6BA6	AM R-F Amplifier
V-10	6BE6	AM Converter
Three	No. 47	Dial Lamps

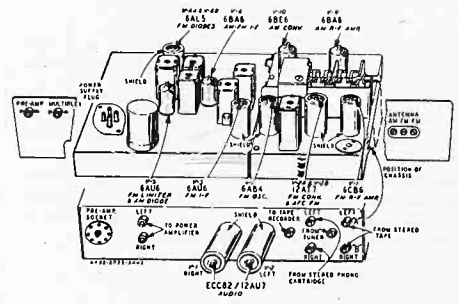
STEREO PRE-AMPLIFIER

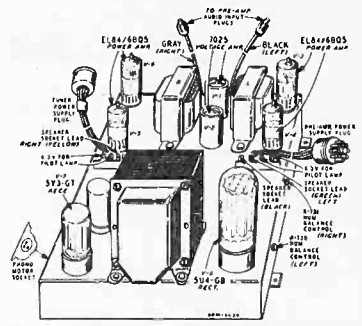
V-1, V-2 ..... ECC82/12AU7. Audio

POWER SUPPLY AND STEREO POWER AMPLIFIER

V-1 & V-2 ..... 7025 ..... Voltage Amplifier
V-3, 4, 5 & 6 ..... EL84/6BQ5 ..... Power Amplifier
V-7 ..... 5Y3-GT ..... Rectifier
V-8 ..... 5U4-GB ..... Rectifier







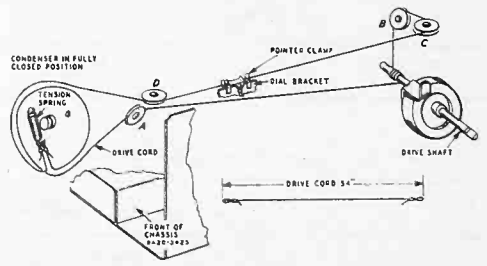
DRIVE CORD REPLACEMENT

Replacement of the drive cord may be accomplished as shown in the illustration. For this purpose use the drive cord assembly listed in the replacement parts list. Then install the string as shown, winding four turns counter-clockwise around the tuning shaft with the turns progressing toward the rear of the chassis. After the cord is installed rotate the tuning shaft several times in order to take up any slack in the cord.

TUBE SOCKET VOLTAGES

Socket voltages are shown on the Schematic diagram at the tube socket terminals. All voltages are between the socket terminal and chassis ground. Plate, screen and cathode voltages were taken with a 1000 ohm-per volt meter with a 300 volt scale used for plate and screen voltages. Audio grid voltages were read with a vacuum tube volt-meter. Conditions of measurement are:

Line voltage ..... 117 Volts AC
Signal Input ..... None
A variation of ±10% is usually permissible.



TECHNICAL INFORMATION

1. Test Equipment required for AM and FM stage gain measurements, signal tracing and alignment.

   A. AM generator covering 455 KC to 1620 KC.

   B. Dummy antennas .1 mfd, 5000 μμfd, 100 μμfd, and 300 ohms.

   C. Audio voltmeter to read .05 to 1.0 volts.

   D. FM generator covering 10.7 mc and 88 to 108 mc.

   E. A d.c. vacuum tube voltmeter.

   F. An Oscilloscope.

   G. A high frequency a.c. vacuum tube voltmeter. (For stage gain only).

   H. An audio oscillator. (Not required if FM signal generator's audio is available for scope horizontal deflection).

   I. Phasing control circuit. Described under FM alignment.

   J. Tools—Non-metallic screw driver.

2. RF and IF STAGE GAINS

   Stage gain measurements may be checked using a high frequency vacuum tube voltmeter or by applying a signal to each grid and computing the gain from the differences in the signal generator levels at the different grids. When making FM rf or i.f. measurements, the signal generator leads (to chassis and the dummy antenna) must be very short (two inches or less). The signal levels must be kept low in order to avoid agc action, or limiting, or overloading a stage. Nominal stage gains are listed below. Normal variations in tubes will cause gain variations up to 30% per stage. The signal level chart shows a typical set of sensitivities at all grids taken at suitable signal levels. Note that when applying a signal to pin 2 of the 12AT7 (V-2A) sensitivity measurements will be incorrect (due to the shunting action of T-101) unless C-108 is disconnected from T-101.

   Individual stage gains are shown below. The connections, dummy antennas, etc. are as indicated in the Signal Level Chart.

STAGE	GAIN
A.M. antenna terminal to V-9 grid	6 at 1000 KC
V-9 grid to V-10 grid	13 at 1000 KC
V-10 grid to V-4 grid	17 at 455 KC
V-4 grid to V-5 grid	36 at 455 KC
FM antenna terminals to V-1 grid	1 at 98 MC
V-1 grid to V-2A grid	8 at 98 MC
V-2A grid to V-3 grid (C-108 removed)	10 at 10.7 MC
V-2A grid to V-3 grid (C-108 connected)	1 at 10.7 MC
V-3 grid to V-4 grid	45 at 10.7 MC
V-4 grid to V-5 grid	20 at 10.7 MC

SIGNAL LEVEL CHART

BAND SWITCH	SIGNAL FREQUENCY	SIGNAL MODULATION	SIGNAL INPUT LEVEL	THROUGH DUMMY ANTENNA	CONNECT SIGNAL TO	AUDIO OUTPUT JACK	DC ON TEST POINT A
AM	455 KC	400 CPS 30%	6000 uv	.1 uf	PIN No. 1 6BA6 V-4	.05 V	—0.7 V
AM	455 KC	400 CPS 30%	350 uv	.1 uf	PIN No. 7 6BE6 V-10	.05 V	—0.7 V
AM	1000 KC SEE NOTE #1	400 CPS 30%	400 uv	.1 uf	PIN No. 7 6BE6 V-10	.05 V	—0.7 V
AM	1000 KC SEE NOTE #1	400 CPS 30%	30 uv	.1 uf	PIN No. 1 6BA6 V-9	.05 V	—0.7 V
AM	1000 KC SEE NOTE #1	400 CPS 30%	5 uv	100 uuf	AM Ext. Ant.	.05 V	—0.7 V
FM	10.7 MC	400 CPS 22.5 KC dev.	0.2 V	5000 mmf	PIN No. 1 6AU6 V-5	0.2 V	—0.7 V
FM	10.7 MC	400 CPS 22.5 KC dev.	11000 uv	5000 mmf	PIN No. 1 6BA6 V-4	0.2 V	—0.7 V
FM	10.7 MC	400 CPS 22.5 KC dev.	250 uv	5000 mmf	PIN No. 1 6AU6 V-3	0.2 V	—0.7 V
FM	10.7 MC	400 CPS 22.5 KC dev.	200 uv	5000 mmf	PIN No. 2 12AT7 V-2A	0.2 V	—0.7 V
FM	10.7 MC	400 CPS 22.5 KC dev.	25 uv	5000 mmf C-108 REMOVED	PIN No. 2 12AT7 V-2A	0.2 V	—0.7 V
FM	98 MC SEE NOTE #1	400 CPS 22.5 KC dev.	30 uv	5000 mmf C-108 REMOVED	PIN No. 2 12AT7 V-2A	0.2 V	—0.7 V
FM	98 MC SEE NOTE #1	400 CPS 22.5 KC dev.	3 uv	5000 mmf	PIN No. 1 6CB6 V-1	0.2 V	—0.7 V
FM	98 MC SEE NOTE #1	400 CPS 22.5 KC dev.	4 uv	300 OHM	ANTENNA TERMINAL	0.2 V	—0.7 V

NOTE No. 1—TUNE SIGNAL IN WITH TUNING KNOB.

ALIGNMENT PROCEDURE

AM ALIGNMENT

Connect the audio voltmeter to the output jack. Turn the selector switch to the AM position. Apply the AM signals (30% modulated with 400 CPS) between the chassis and the points indicated using the specified dummy antennas. Use the signal levels as shown in the signal level chart so that the audio output is approximately .05 volts. Make certain the tuning pointer travel covers both end points on the dial scale.

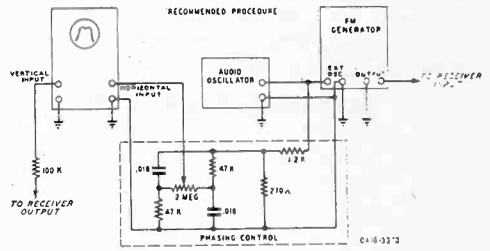
SIGNAL FREQUENCY	THROUGH DUMMY ANTENNA	CONNECT GENERATOR TO	DIAL SETTING	ADJUST	ADJUST FOR
455 KC	.1 mfd.	PIN No. 1 6BA6 V-4	ROTOR FULLY OPEN	2nd AM IF T-106 PRI. (9) SEC. (10)	MAXIMUM OUTPUT
455 KC	.1 mfd.	PIN No. 7 6BE6 V-10	ROTOR FULLY OPEN	1st AM IF T-104 PRI. (12) SEC. (11)	MAXIMUM OUTPUT
1620 KC	.1 mfd.	PIN No. 7 6BE6 V-10	ROTOR FULLY OPEN	OSCILLATOR TRIMMER C-172	MAXIMUM OUTPUT
1400 KC	.1 mfd.	PIN No. 1 6BA6 V-9	POINTER AT 1400 KC SEE NOTE #1	INTERSTAGE TRIMMER C-168	MAXIMUM OUTPUT
1400 KC	100 mmfd.	AM EXTERNAL ANTENNA TERMINAL	POINTER AT 1400 KC SEE NOTE #1	ANTENNA TRIMMER C-165	MAXIMUM OUTPUT

NOTE No. 1—TUNE SIGNAL IN FOR MAXIMUM OUTPUT.

FM ALIGNMENT

Turn the Selector Switch to the FM (without AFC) position. Connect the Audio Voltmeter to the Output jack. Apply the FM signals between the chassis and the points indicated, using the specified dummy antennas. Use the signal levels as indicated. Adjust the oscilloscope phasing control so that the pattern and re-trace form a single figure on the oscilloscope. If a 10.7 mc marker is available, all alignment adjustments should be made so that the 10.7 marker appears in the center of the oscilloscope pattern.

The use of a meter (except as indicated) is not recommended for aligning the FM IF's and discriminator. An oscilloscope must be used.



FREQ. SETTING	CONNECT GENERATOR OUTPUT TO	THROUGH DUMMY ANTENNA	CONNECT OSCILLOSCOPE TO	CONNECT DC VTVM TO	SIGNAL INPUT LEVEL	FREQ. DEVIATION @ 400 CPS	DIAL SETTING	ADJUST	ADJUST FOR	SCOPE PATTERN
10.7 MC	Pin #1 6BA6 V-4	5000 mmf	Test Point "A"	Test Point "A"	Adjust For—1.25V on dc VTVM	250 KC	Rotor Fully Open	3rd IF T105 Pri. (4) Sec. (3)	Maximum Amplitude & Symmetrical Curve	
10.7 MC	Pin #1 6AU6 V-3	5000 mmf	Test Point "A"	Test Point "A"	Adjust For—1.25V on dc VTVM	250 KC	Rotor Fully Open	2nd IF T103 Pri. (6) Sec. (5)	Maximum Amplitude & Symmetrical Curve	
10.7 MC	PIN #2 12AT7 V-2A	5000 mmf	Test Point "A"	Test Point "A"	Adjust For—1.25V on dc VTVM	250 KC	Rotor Fully Open	1st IF T102 Pri. (8) Sec. (7)	Maximum Amplitude & Symmetrical Curve	
10.7 MC	Pin #1 6AU6 V-5	5000 mmf	Test Point "B"	Test Point "B"	100,000 Microvolts	75 KC	Rotor Fully Open	Disc. T107 Pri. (2)	Maximum Amplitude & Best Linearity	
10.7 MC	Pin #1 6AU6 V-5	5000 mmf	Test Point "B"	Test Point "B"	100,000 Microvolts	None	Rotor Fully Open	Disc. Sec. (1)	O V DC on VTVM	
108 MC	FM Antenna Terminals	300 ohms	Test Point "B"	Test Point "A"	Approx. 10 Microvolts	25 KC	108 MC on Dial	C142	Maximum Audio Output	
105 MC	FM Antenna Terminals	300 ohms	Test Point "B"	Test Point "A"	Approx. 10 Microvolts	25 KC	105 MC on Dial	C107 and C104 See Note A	Maximum Audio Output	

NOTE A—ROCK DIAL SLIGHTLY FOR MAXIMUM OUTPUT WHILE MAKING THESE ADJUSTMENTS.

REPLACEMENT PARTS LIST

AM-FM TUNER

Use only GENUINE factory tested parts to insure service jobs you can depend on and to obtain original set performance.

CAPACITORS

C-100	47X674	10 mmf	NPO	Ceramic	
C-101, C-103, C-110, C-137		220 mmf	500 V	Ceramic	
C-102, C-108, C-139		1K mmf	500 V	Ceramic	
C-104, C-107, C-165, C-168, C-172	Part of 14A235	Gang Condenser Ass'y		Trimmers	
C-105A, C-105B, C-105C, C-105D, C-105E, C-105F	14A235	Gang Condenser Assembly			
C-106, C-141, C-148, C-171, C-177	47X670	47 mmf	N-750	Ceramic	
C-109	47X588	1 mmf		Molded	
C-111, C-166, C-174		.01 mf	500 V	Ceramic	
C-112, C-113		Part of T-102			
C-114		.0022 mf	200 V	Tubular	
C-115, C-118, C-121, C-127, C-145, C-176		.01 mf	GMV	Ceramic	
C-116, C-117		Part of T-103			
C-119, C-120		Part of T-104			
C-122, C-123		Part of T-105			
C-124	47X623	2.0 mmf		Ceramic	
C-125, C-126		Part of T-106			
C-128, C-129, C-130		Part of T-107			
C-131	80X8	100 mmf		Ceramic	
C-132		680 mmf		Ceramic	
C-138		.1 mf	100 V	Paper	
C-140A, C-140B	45X454	40 mf 40 mf	200 V 200 V	Electrolytic	
C-142	17A274	1-5 mmf		Trimmer	
C-143, C-169		470 mmf	500 V	Ceramic	
C-144		.047 mf	400 V	Tubular	
C-146		.05 mf		Ceramic	
C-147	80X37	33 mmf		Ceramic	
C-167		.022 mf	200 V	Tubular	
C-170	47X632	9 mmf	N-4700	Ceramic	
C-175	47X635	2.5 mmf		Ceramic	

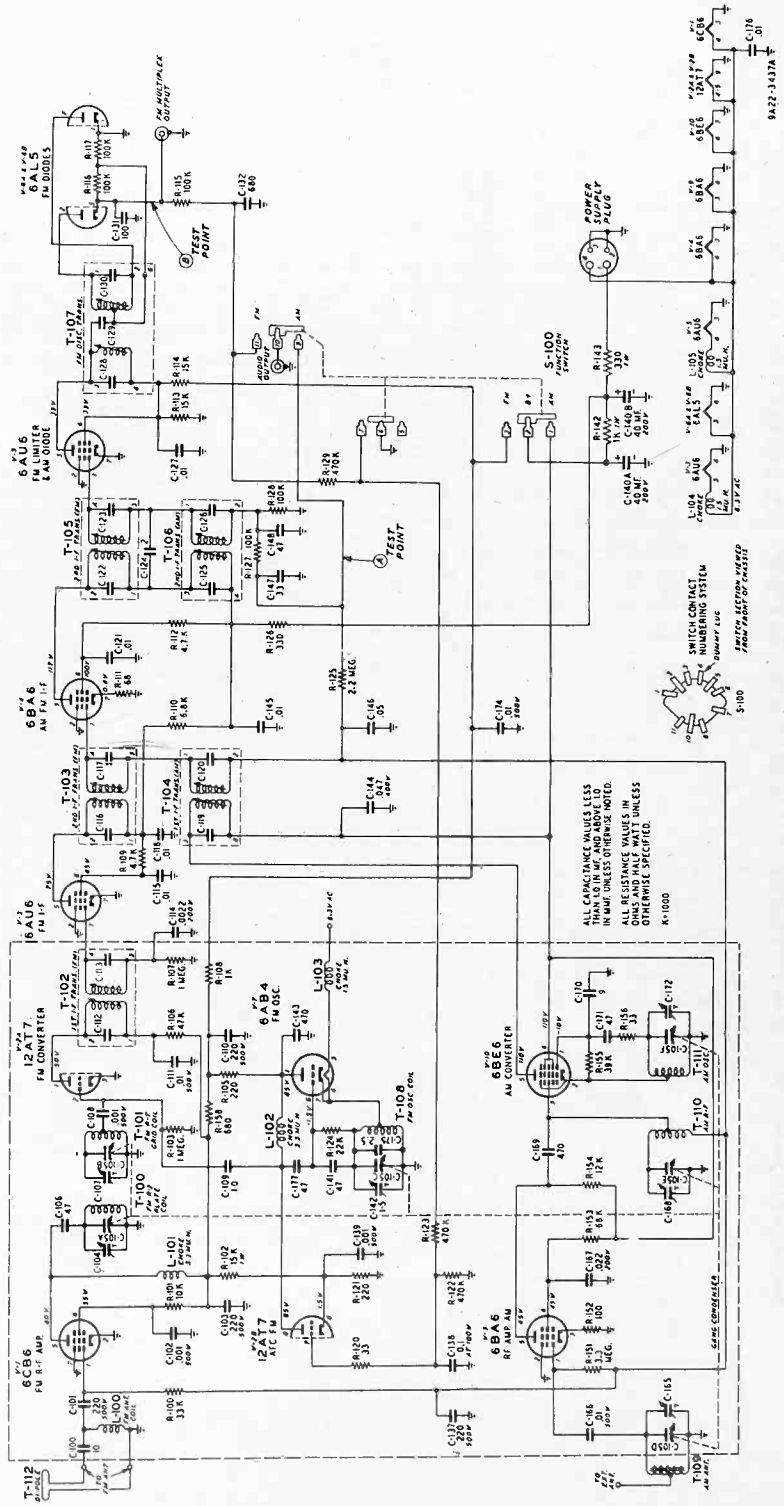
RESISTORS

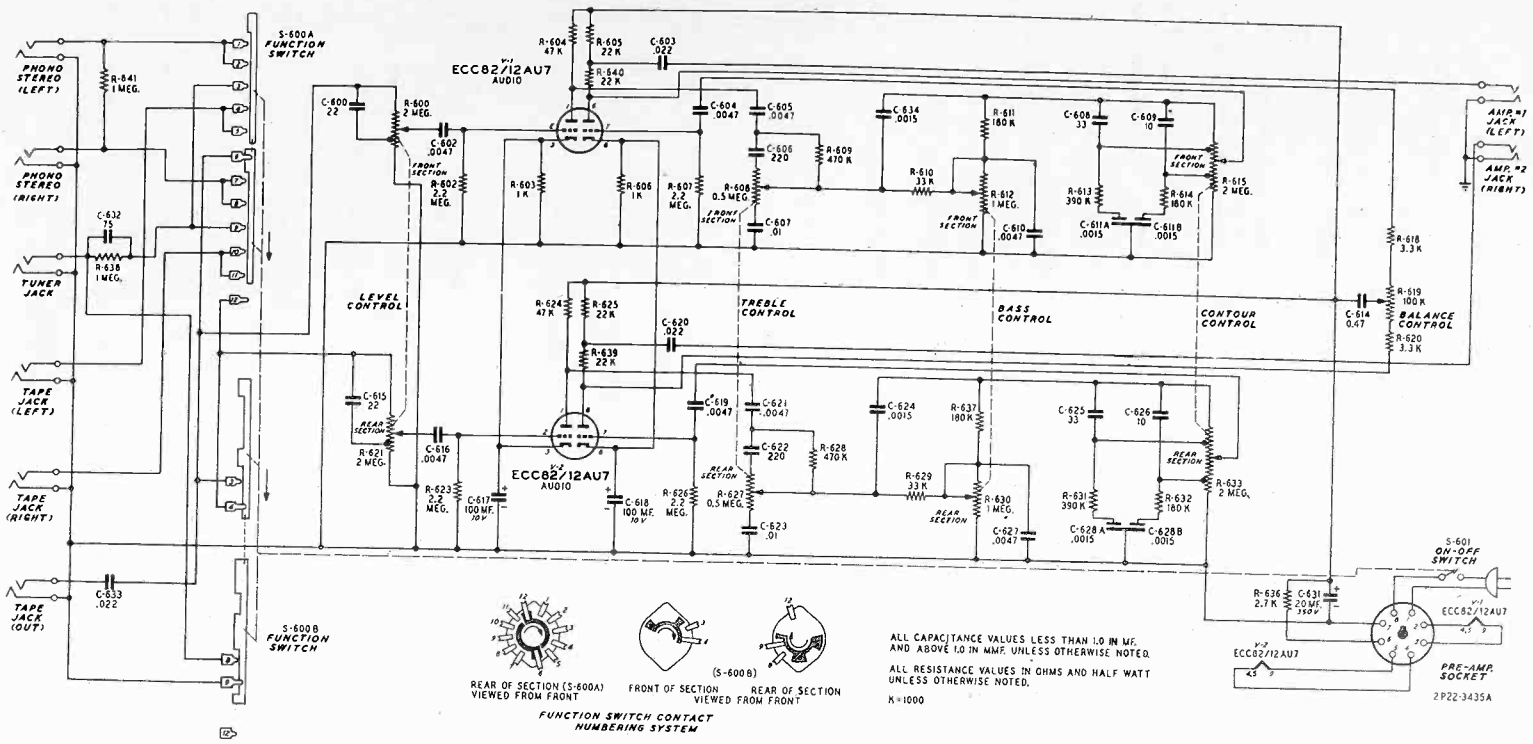
	Ohms	Watts	
R-100	33 K	0.5	Carbon
R-101	10 K	0.5	Carbon
R-102	15 K	1.0	Carbon
R-103, R-107	1.0 Meg	0.5	Carbon
R-105, R-121	220	0.5	Carbon
R-106	47 K	0.5	Carbon
R-108	1 K	0.5	Carbon
R-109, R-112	4.7 K	0.5	Carbon
R-110	6.8 K	0.5	Carbon
R-111	68	0.5	Carbon
R-113, R-114	15 K	0.5	Carbon
R-115, R-127, R-128	100 K	0.5	Carbon
R-116, R-117	100 K	0.5	Carbon
R-120, R-156	33	0.5	Carbon
R-122, R-123, R-129	470 K	0.5	Carbon
R-124	22 K	0.5	Carbon
R-125	2.2 Meg	0.5	Carbon
R-126	330	0.5	Carbon
R-142	1 K	1.0	Carbon
R-143	330	1.0	Carbon
R-151	3.3 Meg	0.5	Carbon
R-152	100	0.5	Carbon
R-153	68 K	0.5	Carbon
R-154	12 K	0.5	Carbon
R-155	39 K	0.5	Carbon
R-158	680	0.5	Carbon

TRANSFORMERS AND COILS

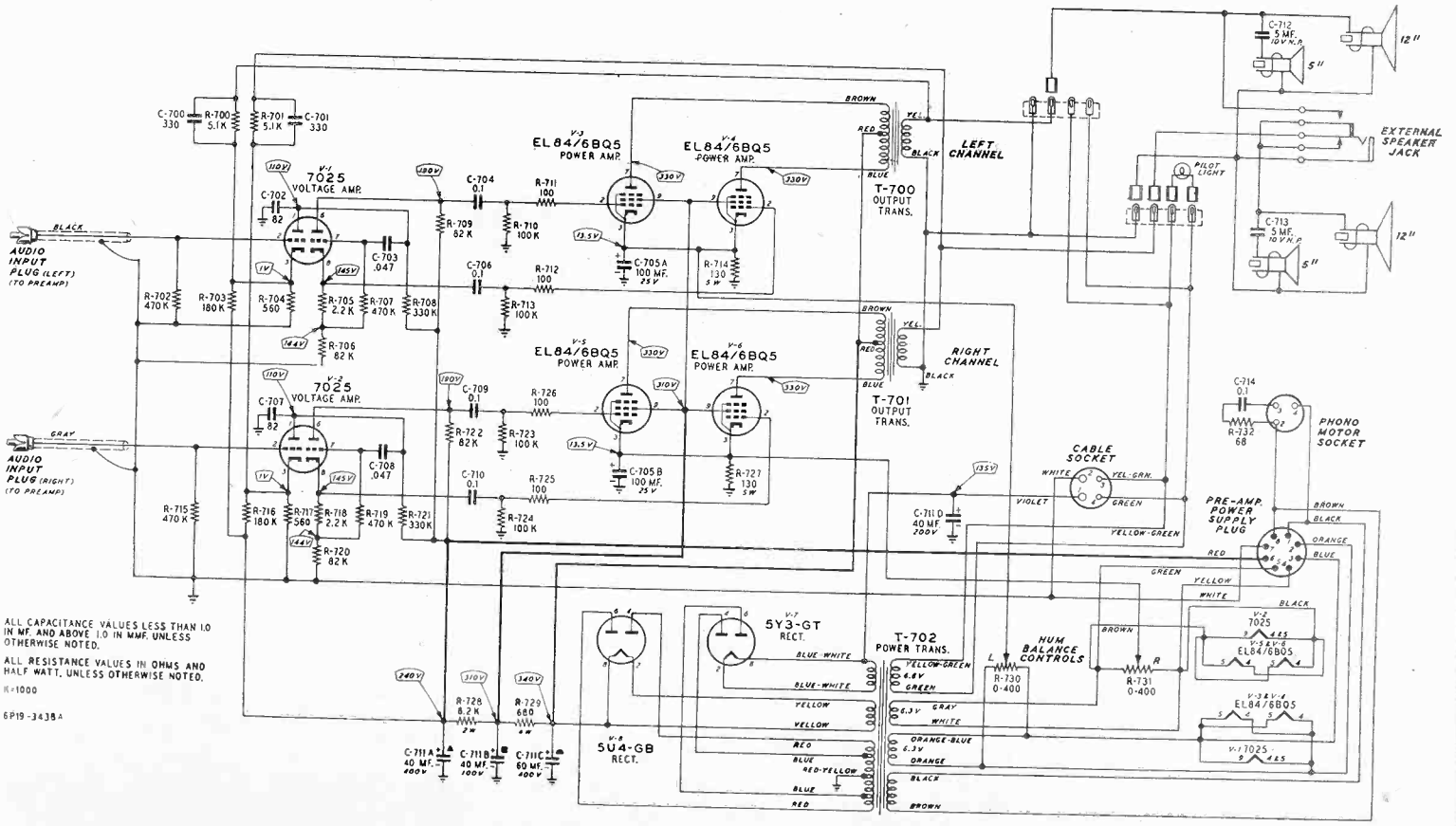
L-100	9A2448	FM Antenna Coil
L-101, L-102	35A8	Choke Coil 3.3 mu.h.
L-103, L-104, L-105	35A6	Choke Coil 1.5 mu.h.
T-100	9A2445	Plate Coil, FM-R-F
T-101	9A2446	Grid Coil, FM-R-F
T-102, T-103, T-105	9A2440	Transformer, FM-I-F
T-104, T-106	9A2443	Transformer, AM-I-F
T-107	9A2442	Discriminator Coil
T-108	9A2447	Oscillator Coil, FM
T-109	9A2441	Rod Antenna
T-110	9A2439	RF Coil, AM
T-111	9A2438	Oscillator Coil, AM
T-112	9A2005	Di-Pole Antenna (FM)

NOTE: Use universal parts where part numbers are not shown.





STEREO PRE-AMPLIFIER



POWER SUPPLY AND STEREO POWER AMPLIFIER

REPLACEMENT PARTS LIST - Con't.
STEREO PRE-AMPLIFIER

CAPACITORS

C-600, C-615	80X32	22 mmf	N075	Ceramic
C-602, C-604, C-605, C-610, C-616, C-619, C-621, C-627	RCP10M4472M	.0047 mf	400 V.	Tubular
C-603, C-620, C-633	RCP10M4223M	.022 mf	400 V.	Tubular
C-606, C-622	80X46	220 mmf	JF	Ceramic
C-607, C-623	RCP10M2103M	.01 mf	200 V.	Tubular
C-608, C-625	80X37	33 mmf		Ceramic
C-609	47X674	10 mmf		Ceramic
C-611A, C-611B, C-628A, C-628B	80X96-2	1500 mmf		Dual Ceramic
C-614	RCP10M2474M	.47 mf	200 V.	Tubular
C-617, C-618	45X459	100 mf	10 V.	Electrolytic
C-624, C-634	80X22	1500 mmf	JF	Ceramic
C-631	45X455	20 mf	350 V.	Electrolytic
C-632	80X48	75 mmf	N220	Ceramic

RESISTORS

		Ohms	Watts	
R-600, R-621	36X411	2.0 Meg		Level
R-602, R-607, R-623, R-626	B84225	2.2 Meg	0.5	Carbon
R-603, R-606	B84102	1 K	0.5	Carbon
R-604, R-624	B84473	47 K	0.5	Carbon
R-605, R-625, R-639, R-640	B84223	22 K	0.5	Carbon
R-608, R-627	40X457	0.5 Meg		Treble
R-609, R-628	B84474	470 K	0.5	Carbon
R-610, R-629	B84333	33 K	0.5	Carbon
R-611, R-614, R-632, R-637	B84184	180 K	0.5	Carbon
R-612, R-630	40X458	1.0 Meg		Bass
R-613, R-631	B84394	390 K	0.5	Carbon
R-615, R-633	36X408	2.0 Meg		Contour
R-618, R-620	B84332	3.3 K	0.5	Carbon
R-619, R-636	40X459, B84272	100 K, 2.7 K	0.5	Balance, Carbon
R-638, R-641	B84105	1.0 Meg	0.5	Carbon

POWER SUPPLY AND STEREO POWER AMPLIFIER

CAPACITORS

C-700, C-701	80X15	680 mmf	JL	Ceramic
C-702, C-707	RCM20B820K	82 mmf		Mica
C-703, C-708	RCP10M4473M	.047 mf	400 V.	Tubular
C-704, C-706, C-709, C-710, C-714	RCP10M4104M	.10 mf	400 V.	Tubular
C-705A	45X457	100 mf	25 V.	Electrolytic
C-705B		100 mf	25 V.	
C-711A	45X450	40 mf	400 V.	Electrolytic
C-711B		40 mf	400 V.	
C-711C		60 mf	400 V.	
C-711D		40 mf	200 V.	
C-712, C-713	45X426	5 mf	100 V.	Electrolytic

RESISTORS

		Ohms	Watts	
R-700, R-701	B83512	5.1 K	0.5	Carbon
R-702, R-707, R-715, R-719	B84474	470 K	0.5	Carbon
R-703, R-716	B84184	180 K	0.5	Carbon
R-704, R-717	B83661	560	0.5	Carbon

RESISTORS (Cont.)

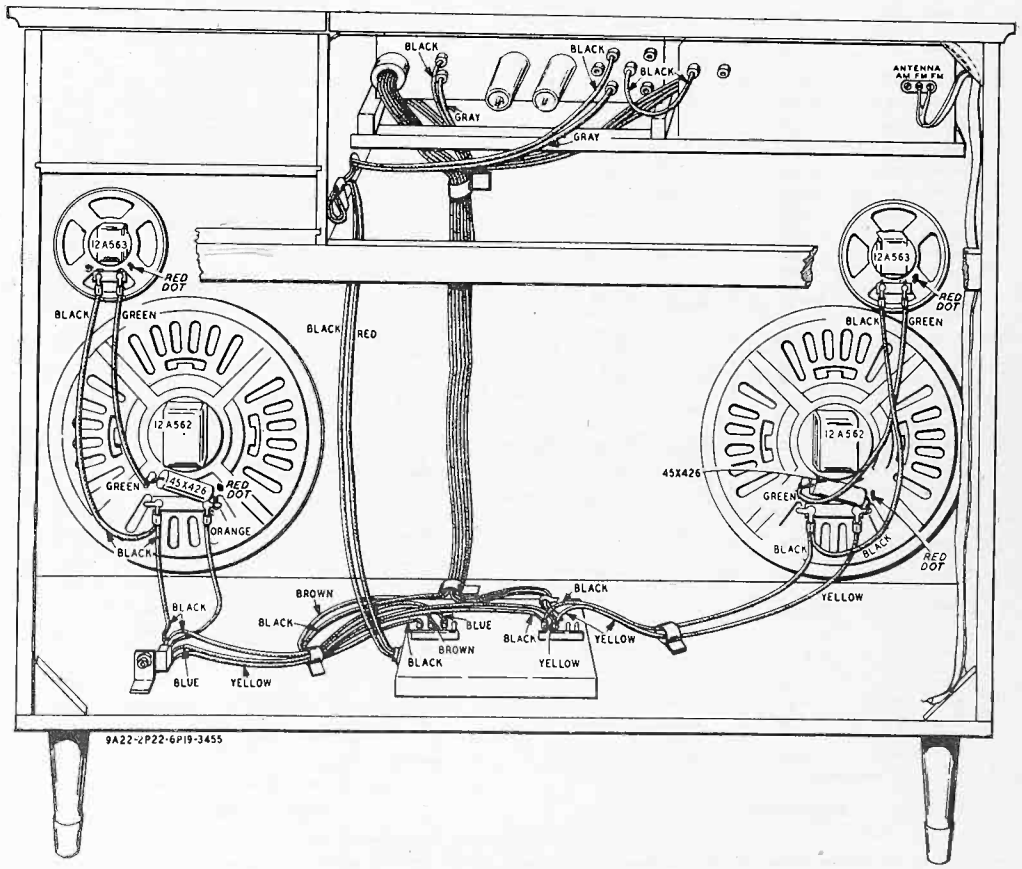
		Ohms	Watts	
R-705, R-718	B84222	2.2 K	0.5	Carbon
R-706, R-709, R-720, R-722	B84823	82 K	0.5	Carbon
R-708, R-721	B84334	330 K	0.5	Carbon
R-710, R-713, R-723, R-724	B84104	100 K	0.5	Carbon
R-711, R-712, R-725, R-726	B85101	100	0.5	Carbon
R-714, R-727	43X396	130	5.0	Wirewound
R-728	D84822	8.2 K	2.0	Carbon
R-729	43X399	680	5.0	Wirewound
R-730	40X452	400		Hum Balance
R-731				
R-732	B85680	68	0.5	Carbon

TRANSFORMERS

T-700, T-701	51X201	Output Transformer
T-702	53X378	Power Transformer

MISCELLANEOUS

12A562	12" P.M. Speaker
12A563	5" P.M. Speaker
3A455	Socket, 9 Pin (Black Phenolic
3A463	Socket, Noval
3A474	Tube Socket, Octal
3A487	Tube Socket, 9 Pin (Wafer)
3A491	Tube Socket, 7 Pin
3A509	Input Jack
3A519	Socket, Phono Motor
3A500	Socket (4 Pin)
3A526	Switching Jack (External Speaker Socket)
4A918	Antenna Terminal Strip
6A348	Plug, Octal 8 Pin
6A349	Plug Cap
6A358	Plug, 3 Pin
32X405	Tube Shield (ECC82/12AU7)
32X425-1	Tube Shield (6AB4-6CB6-6AU6-6AL5)
32X428-1	Tube Shield (12AT7-7025)
2A506	Function Switch (3 Position)
25X2168-1	Dial Plate
58X810	Dial Glass
28X564	Spring, Dial Glass
10X96	Drive Cord Assembly
28X113	Spring, Drive Cord
26X543	Drive Shaft
19X192	"C" Washer, Drive Shaft
24X588	Fly Wheel
15X286-1	Pointer
13X839-6	Line Cord
30X560	Clamp, Line Cord
7A282	Pilot Light Socket Assembly (Dial)
7A284	Pilot Light Socket Assembly (Record Compartment)
7A103	No. 47 Pilot Light Bulb
41X98-5	Pilot Light Shield-Mah. & Wal. Cabinet
41X98-3	Pilot Light-Shield-Oak Cabinet
41X105	Light Reflector
4X1483	Escutcheon Control
75X65	Cabinet Back
10A963	Knob, Tuner
10A960-1	Knob, Pre-Amp
28A222	Record Changer
2A510	Function Switch (6 Position)
6A350	Plug, 4 Prong
Ast.13TX	Cartridge & Needle Assembly



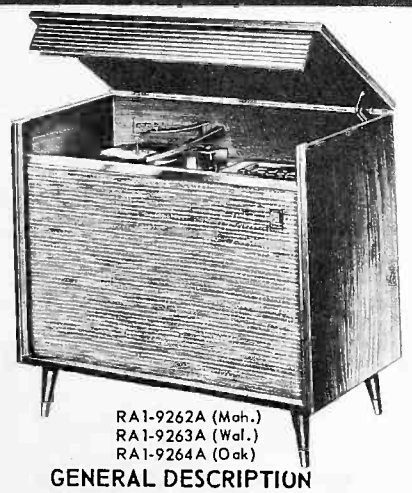
SPEAKER HOOK-UP

KEY NO. RA1

RADIO SERVICE MANUAL AND PARTS LIST

NO. 603-459

FILE NUMERICALLY IN SERVICE INFORMATION SECTION OF SERVICE REFERENCE FILE



RA1-9262A (Mah.)
RA1-9263A (Wal.)
RA1-9264A (Oak)

GENERAL DESCRIPTION

This High Fidelity Radio Phonograph is an assembly of two separate chassis consisting of a two band eleven tube (plus rectifier) AM-FM radio and a two tube (plus rectifier) audio amplifier designed for the reproduction of stereophonic records. It has a four speed record changer equipped with a stereophonic cartridge and sapphire needles. The I-F stages use high gain miniature type tubes. Built-in antennas are provided for the FM and broadcast bands. Features include compensator circuits to prevent oscillator drift, push-pull pentode power output stage, AVC, a two channel loudness control, three permanent magnet dynamic speakers and inverse feedback to reduce harmonic distortion and "speaker hangover". a jack for use with an external speaker and an input jack for a tape recorder. A special automatic spindle is supplied for playing 45 RPM records.

ELECTRICAL SPECIFICATIONS

Power Supply.....105-125 volts AC 60 cycles, 140 watts, 160 watts with record changer.

Frequency Ranges and Band Width.....AM-535-1620 KC-8½ KC, FM-88-108 MC-200 KC

Intermediate Frequency...AM-455 KC
FM-10.7 MC

Antenna Input .....FM-300 OHMS
AM-Ferrite Rod Plus External Ant-Connections.

ELECTRICAL SPECIFICATIONS (Con't).

Selectivity .....AM-43 KC broad at 1000 times signal, measured at 1000 KC
I.F. FM-200 KC broad at 2 times down
I.F. FM-900 KC broad at 100 times down

Sensitivity .....AM-10 microvolts (average) for .5 watt output
FM-10 microvolts (average) for .5 watt output.

Amplifier Frequency Response .....30 to 20,000 CPS

Power Output.....AM-FM Radio 20 watts max. 16 watts watts 10% distortion.
Audio Amp. 3 watts, 4% distortion, 4 watts 10% distortion

Loud Speakers.....one - 12" PM Dynamic (woofer)
one - 6" PM Dynamic (middle range)
one - 3½" PM Dynamic (tweeter)

Record Changer.....VM-1200 (see Manual No. 619-16)

Cartridge & Needle Assembly .....Astatic 13T (Sapphire Needles)

TUBE AND DIAL LAMP COMPLEMENT

AM-FM RADIO CHASSIS

V-1A & B	6BQ7A or Ecc85/6AQ8	FM R-F Amp. & Mixer
V-2	6BA6	FM I-F Amp.
V-3	6AU6	FM I-F Amp.
V-4	6AL5	FM Detector
V-5	6AV6	1st Audio Amp. & AM Diode
V-6	12AX7	Audio Amplifier & Phase Inverter
V-7, V-8	EL84/6BQ5	Push-Pull Power Output
V-9	6BA6	AM R-F Amp.
V-10	6BE6	AM Converter
V-11	6BA6	AM I-F Amp.
V-12	5Y3GT	Rectifier
	2- #47	Dial Lamps
	1- #47	Jewel Indicator Lamp

AUDIO AMPLIFIER

V-1	6AU6	Audio
V-2	EL84/6BQ5	Power Amplifier
V-3	5Y3-GT	Rectifier

GAMBLES
Gamble-Skogmo, Inc.
Minneapolis

REPLACEMENT PARTS LIST

AM-FM RADIO CHASSIS

Use only GENUINE factory tested parts to insure service jobs you can depend on and to obtain original set performance.

NOTE—USE UNIVERSAL PARTS WHERE PART NUMBERS ARE NOT LISTED.

CAPACITORS

Ref. No.	Part No.	Description		
C-1	G-E2981	10 mmf	500 V	Ceramic
C-2, C-3	G-E2983	1000 mmf	500 V	Ceramic
C-4	G-E2974	2-10 mmf		Trimmer
C-5, C-6	G-E2977	20 mmf	500 V	Ceramic
C-7	G-E2975	2-6 mmf		Trimmer
C-8	G-E2978	8.2 mmf	500 V	Ceramic
C-9	G-E2976	68 mmf	500 V	Ceramic
C-10	G-E2980	10 mmf	500 V	Ceramic
C-11	G-E2979	15 mmf	500 V	Ceramic
C-12, C-29		220 mmf	500V	Ceramic
C-13, C-36, C-37, C-38, C-56		.047 mf	400V	Tubular
C-14	Part of T3 FM IF Transformer			
C-15		.0022 mf	400V	Tubular
C-16, C-25, C-49, C-60		47 mmf		Ceramic
C-17, C-20, C-28, C-59		.005 mf		Ceramic
C-18		390 mmf	500V	Ceramic
C-19	Part of T4 Ratio Detector Transformer			
C-21	47X575	2700 mmf		Ceramic
C-22, C-23, C-48	80X4	470 mmf	500V	Ceramic
C-24	45X423	5 mf	50V	Dry Electrolytic
C-26, C-44, C-61		.01 mf	200V	Tubular
C-27, C-47		.047 mf	200V	Tubular
C-30		.0047 mf	400V	Tubular
C-31		330 mmf		Ceramic
C-32, C-35		.0047 mf	200V	Tubular
C-33		100 mmf	500V	Ceramic
C-34		1500 mmf		Ceramic
C-39		680 mmf	500V	Ceramic
C-40A		100 mf	25V	
C-40B	45X441	10 mf	400V	Dry Electrolytic
C-40C		40 mf	400V	
C-40D		40 mf	400V	
C-41	45X426	5 mf	10V	Dry Electrolytic
C-42A, C-42B, C-42C	14A234 Gang Condenser Assembly			
C-43, C-46, C-51	Part of 14A234 Gang Condenser Assembly			
C-45		.022 mf	400V	Tubular
C-50	47X632	9 mmf		Ceramic
C-52, C-53	Part of T7—1st IF Transformer			
C-54, C-55	Part of T8—2nd IF Transformer			
C-57A, C-57B	Part of 76X1 (See Miscellaneous) CRL-BC52			
C-58	RCP10W4104M	.1 mf	400V	

RESISTORS

Ref. No.	Part No.	Description: Ohms	Watts	
R-1		10 K	0.5	Carbon
R-2		1 Meg	0.5	Carbon
R-3		47 K	1.0	Carbon
R-4, R-19		470 K	0.5	Carbon
R-5, R-15, R-16		10.0 Meg	0.5	Carbon
R-6		4.7 K	1.0	Carbon
R-7, R-40		180	0.5	Carbon
R-8, R-30, R-32, R-42		100 K	0.5	Carbon
R-9		270	0.5	Carbon
R-10		470	0.5	Carbon
R-11		27 K	0.5	Carbon
R-12, R-38		22 K	0.5	Carbon
R-13, R-47		82 K	0.5	Carbon
R-14A, R-14B	36X410	2.0 Meg		Loudness
R-17		270 K	0.5	Carbon
R-18	40X433	500 K		Treble
R-20		33 K	0.5	Carbon
R-21		180 K	0.5	Carbon
R-22	40X434	1 Meg		Bass
R-23		220 K	0.5	Carbon
R-24		470	0.5	Carbon
R-25		330 K	0.5	Carbon
R-26		1.0 Meg	0.5	Carbon
R-27		2.2 K	0.5	Carbon
R-28, R-29		82 K	0.5	Carbon
R-31	43X335	130	3.0	Pyrex
R-33		5.1 K	0.5	Carbon
R-34		3.3 Meg	0.5	Carbon
R-35		100	0.5	Carbon
R-36		68 K	0.5	Carbon
R-37		12 K	0.5	Carbon
R-39		33	0.5	Carbon
R-41		2.2 Meg	0.5	Carbon
R-43	Part of 76X1 (See Miscellaneous) CRL-BC52			
R-44	43X334	10 K	4.0	Pyrex
R-45		1 K	2.0	Carbon
R-46		68	0.5	Carbon

REPLACEMENT PARTS LIST *(Cont.)*
AM-FM RADIO CHASSIS

TRANSFORMERS AND COILS

L-1	G-EK2988	Choke
L-2	9A2289	Interstage Coil
L-3	9A2406	Oscillator Coil
T-1	G-EK2987	Antenna Coil
T-2	G-EK2989	FM IF Transformer
T-3	9A2309	FM IF Coil
T-4	9A2260	Ratio Det. Transformer
T-5	51X202	Output Transformer
T-6	9A2437	Rod Antenna AM
T-7	9A2392	1st IF AM Transformer
T-8	9A2393	2nd IF AM Transformer
T-9	53X365	Power Transformer
T-10	9A2007	Di-Pole Antenna FM

DIAL AND DRIVE ASSEMBLY

58x814	Dial Glass
25x2121	Dial Bracket
28X564	Spring, Dial Mtg.
15x285-2	Pointer
10X68	Drive Cord Assembly
28X113	Drive Cord Spring
7A199	Pilot Light Socket Assembly
41X88	Dial Light Reflector
	Dial Light No. 47 (See Lamp Bulb Catalog)
26X542	Drive Shaft
19X192	"C" Washer (Mtg. Drive Shaft)
6X67	Rubber Grommet

MISCELLANEOUS

12A566	3½" PM Speaker
12A567	6" PM Speaker
12A564	12" PM Speaker
76X1	Multiple Resistor-Capacitor Assembly CRL-BC52
3A455	Tube Socket (6BQ5)
3A474	Tube Socket (5Y3GT)
3A486	Tube Socket (6AV6) (6AL5)
3A487	Tube Socket (12AX7)
3A491	Tube Socket (6BA6) (6BE6) (6AU6)
3A509	Jack, Phono Socket, Dual Pin Tip
3A519	Socket, 5 Pin
25A1163	Tuner, FM
2A501	Switch, 5 Position
13X839-6	Line Cord & Plug Assembly
30X560	Clamp
32X425-2	Tube Shield (3A486 Socket)
4A408	Terminal Board
30X623	Clip, FM Tuner String Securing
10A959-1	Knob, Bass-Treble-Tuning-Selector
10A969	Knob, Volume (Large)
10A970	Knob, Volume (Small)
4X1476-1	Escutcheon, Control Plate (Mah. and Walnut)
4X1476-2	Escutcheon, Control Plate (Oak)
75X58	Back, Cabinet
81X24-4	Leg, Mahogany
81X24-5	Leg, Oak
81X24-6	Leg, Walnut
7A272	Jewel, Cabinet
S-38A799	Pilot Light Assembly (Cabinet)
28A235	Record Changer - VM-1200
13T	Astatic Stereo Cartridge
7A281	Pilot Light Socket Ass'y - Record Changer Compartment

AUDIO AMPLIFIER

CAPACITORS

Ref. No.	Part No.	Description		
C-500A, C-500B, C-500C, C-500D	45X441	10 mf 400 V; 40 mf 400 V; 40 mf 400 V; 100 mf 25 V		Dry Electrolytic
C-501	RCP10M4104M	.10 mf	400 V	Tubular
C-502	47X670	47 mmf	N750	Ceramic
C-503	RCP10M4472M	.0047 mf	400 V	Tubular
C-504	80X46	220 mmf	JF	Ceramic
C-505	RCP10M4473M	.047 mf	400 V	Tubular
C-506	RCP10M2473M	.047 mf	200 V	Tubular
C-507	RCP10M4102M	.001 mf	400 V	Tubular

RESISTORS

		Ohms	Watts	
R-500	B84335	3.3 Meg	0.5	Carbon
R-501	B84391	390	0.5	Carbon
R-502	B84184	180 K	0.5	Carbon
R-503	B83564	560 K	0.5	Carbon
R-504	C84332	3.3 K	1.0	Carbon
R-505	C84561	560	1.0	Carbon
R-506	40X461	500 K		Treble

RESISTORS—Continued

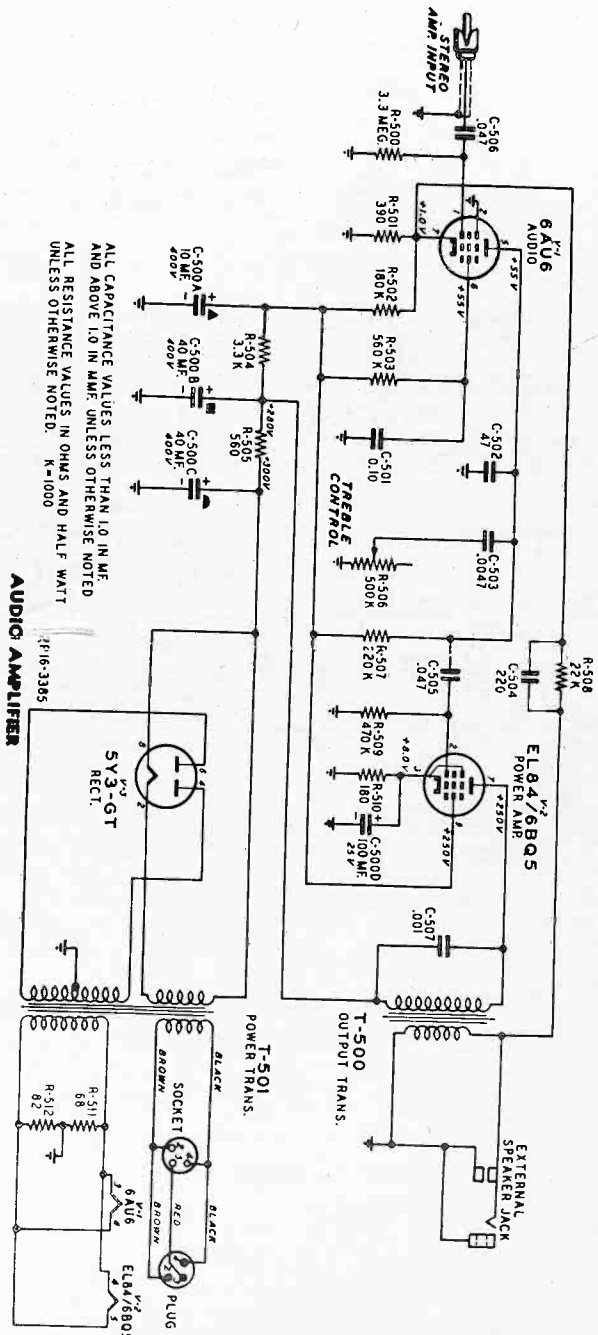
		Ohms	Watts	
R-507	B84224	220 K	0.5	Carbon
R-508	B84223	22 K	0.5	Carbon
R-509	B84474	470 K	0.5	Carbon
R-510	C83181	180	1.0	Carbon
R-511	B84680	68	0.5	Carbon
R-512	B84820	82	0.5	Carbon

TRANSFORMERS

T-500	51X200	Audio Output Trans.
T-501	53X377	Power Trans

MISCELLANEOUS

3A455	Tube Socket—9 Pin
3A525	Socket—7 Pin
3A519	Socket—5 Pin
3A474	Socket, Octal
3A522	Speaker, Jack
6A358	Plug, 3 prong
30X620-3	Cable Clamp

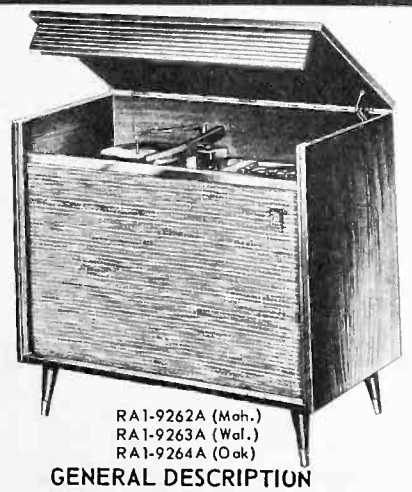


KEY NO. RA1

RADIO SERVICE MANUAL AND PARTS LIST

NO. 603-459

FILE NUMERICALLY IN SERVICE INFORMATION SECTION OF SERVICE REFERENCE FILE



RA1-9262A (Moh.)
RA1-9263A (Wal.)
RA1-9264A (Oak)

GENERAL DESCRIPTION

This High Fidelity Radio Phonograph is an assembly of two separate chassis consisting of a two band eleven tube (plus rectifier) AM-FM radio and a two tube (plus rectifier) audio amplifier designed for the reproduction of stereophonic records. It has a four speed record changer equipped with a stereophonic cartridge and sapphire needles. The I-F stages use high gain miniature type tubes. Built-in antennas are provided for the FM and broadcast bands. Features include compensator circuits to prevent oscillator drift, push-pull pentode power output stage, AVC, a two channel loudness control, three permanent magnet dynamic speakers and inverse feedback to reduce harmonic distortion and "speaker hangover". a jack for use with an external speaker and an input jack for a tape recorder. A special automatic spindle is supplied for playing 45 RPM records.

ELECTRICAL SPECIFICATIONS

Power Supply.....105-125 volts AC 60 cycles, 140 watts, 160 watts with record changer.

Frequency Ranges and Band Width.....AM-535-1620 KC-8½ KC, FM-88-108 MC-200 KC

Intermediate Frequency... AM-455 KC
FM-10.7 MC

Antenna Input ..... FM-300 OHMS
AM-Ferrite Rod Plus External Ant-Connections.

ELECTRICAL SPECIFICATIONS (Con't).

Selectivity .....AM-43 KC broad at 1000 times signal, measured at 1000 KC
I.F. FM-200 KC broad at 2times down
I.F. FM-900 KC broad at 100 times down

Sensitivity .....AM-10 microvolts (average) for .5 watt output
FM-10 microvolts (average) for .5 watt output.

Amplifier Frequency Response .....30 to 20,000 CPS

Power Output.....AM-FM Radio 20 watts max. 16 watts watts 10% distortion.
Audio Amp. 3 watts, 4% distortion, 4 watts 10% distortion

Loud Speakers.....one - 12" PM Dynamic (woofer)
one - 6" PM Dynamic (middle range)
one - 3½" PM Dynamic (tweeter)

Record Changer.....VM-1200 (see Manual No. 619-16)

Cartridge & Needle Assembly .....Astatic 13T (Sapphire Needles)

TUBE AND DIAL LAMP COMPLEMENT

AM-FM RADIO CHASSIS

V-1A & B	6BQ7A or Ecc85/6AQ8	FM R-F Amp. & Mixer
V-2	6BA6	FM I-F Amp.
V-3	6AU6	FM I-F Amp.
V-4	6AL5	FM Detector
V-5	6AV6	1st Audio Amp. & AM Diode
V-6	12AX7	Audio Amplifier & Phase Inverter
V-7, V-8	EL84/6BQ5	Push-Pull Power Output
V-9	6BA6	AM R-F Amp.
V-10	6BE6	AM Converter
V-11	6BA6	AM I-F Amp.
V-12	5Y3GT	Rectifier
	2- #47	Dial Lamps
	1- #47	Jewel Indicator Lamp

AUDIO AMPLIFIER

V-1	6AU6	Audio
V-2	EL84/6BQ5	Power Amplifier
V-3	5Y3-GT	Rectifier

GAMBLES
Gamble-Skogmo, Inc.
Minneapolis

REPLACEMENT PARTS LIST

AM-FM RADIO CHASSIS

Use only GENUINE factory tested parts to insure service jobs you can depend on and to obtain original set performance.

NOTE—USE UNIVERSAL PARTS WHERE PART NUMBERS ARE NOT LISTED.

CAPACITORS

Ref. No.	Part No.	Description		
C-1	G-E2981	10 mmf	500 V	Ceramic
C-2, C-3	G-E2983	1000 mmf	500 V	Ceramic
C-4	G-E2974	2-10 mmf		Trimmer
C-5, C-6	G-E2977	20 mmf	500 V	Ceramic
C-7	G-E2975	2-6 mmf		Trimmer
C-8	G-E2978	8.2 mmf	500 V	Ceramic
C-9	G-E2976	68 mmf	500 V	Ceramic
C-10	G-E2980	10 mmf	500 V	Ceramic
C-11	G-E2979	15 mmf	500 V	Ceramic
C-12, C-29		220 mmf	500V	Ceramic
C-13, C-36, C-37, C-38, C-56		.047 mf	400V	Tubular
C-14	Part of T3 FM IF Transformer			
C-15		.0022 mf	400V	Tubular
C-16, C-25, C-49, C-60		47 mmf		Ceramic
C-17, C-20, C-28, C-59		.005 mf		Ceramic
C-18		390 mmf	500V	Ceramic
C-19	Part of T4 Ratio Detector Transformer			
C-21	47X575	2700 mmf		Ceramic
C-22, C-23, C-48	80X4	470 mmf	500V	Ceramic
C-24	45X423	5 mf	50V	Dry Electrolytic
C-26, C-44, C-61		.01 mf	200V	Tubular
C-27, C-47		.047 mf	200V	Tubular
C-30		.0047 mf	400V	Tubular
C-31		330 mmf		Ceramic
C-32, C-35		.0047 mf	200V	Tubular
C-33		100 mmf	500V	Ceramic
C-34		1500 mmf		Ceramic
C-39		680 mmf	500V	Ceramic
C-40A		100 mf	25V	
C-40B	45X441	10 mf	400V	Dry Electrolytic
C-40C		40 mf	400V	
C-40D		40 mf	400V	
C-41	45X426	5 mf	10V	Dry Electrolytic
C-42A, C-42B, C-42C	14A234 Gang Condenser Assembly			
C-43, C-46, C-51	Part of 14A234 Gang Condenser Assembly			
C-45		.022 mf	400V	Tubular
C-50	47X632	9 mmf		Ceramic
C-52, C-53	Part of T7—1st IF Transformer			
C-54, C-55	Part of T8—2nd IF Transformer			
C-57A, C-57B	Part of 76X1 (See Miscellaneous) CRL-BC52			
C-58	RCP10W4104M	.1 mf	400V	

RESISTORS

Ref. No.	Part No.	Description: Ohms	Watts	
R-1		10 K	0.5	Carbon
R-2		1 Meg	0.5	Carbon
R-3		47 K	1.0	Carbon
R-4, R-19		470 K	0.5	Carbon
R-5, R-15, R-16		10.0 Meg	0.5	Carbon
R-6		4.7 K	1.0	Carbon
R-7, R-40		180	0.5	Carbon
R-8, R-30, R-32, R-42		100 K	0.5	Carbon
R-9		270	0.5	Carbon
R-10		470	0.5	Carbon
R-11		27 K	0.5	Carbon
R-12, R-38		22 K	0.5	Carbon
R-13, R-47		82 K	0.5	Carbon
R-14A, R-14B	36X410	2.0 Meg		Loudness
R-17		270 K	0.5	Carbon
R-18	40X433	500 K		Treble
R-20		33 K	0.5	Carbon
R-21		180 K	0.5	Carbon
R-22	40X434	1 Meg		Bass
R-23		220 K	0.5	Carbon
R-24		470	0.5	Carbon
R-25		330 K	0.5	Carbon
R-26		1.0 Meg	0.5	Carbon
R-27		2.2 K	0.5	Carbon
R-28, R-29		82 K	0.5	Carbon
R-31	43X335	130	3.0	Pyrex
R-33		5.1 K	0.5	Carbon
R-34		3.3 Meg	0.5	Carbon
R-35		100	0.5	Carbon
R-36		68 K	0.5	Carbon
R-37		12 K	0.5	Carbon
R-39		33	0.5	Carbon
R-41		2.2 Meg	0.5	Carbon
R-43	Part of 76X1 (See Miscellaneous) CRL-BC52			
R-44	43X334	10 K	4.0	Pyrex
R-45		1 K	2.0	Carbon
R-46		68	0.5	Carbon

REPLACEMENT PARTS LIST *(Cont.)*

AM-FM RADIO CHASSIS

TRANSFORMERS AND COILS

L-1	G-EK2988	Choke
L-2	9A2289	Interstage Coil
L-3	9A2406	Oscillator Coil
T-1	G-EK2987	Antenna Coil
T-2	G-EK2989	FM IF Transformer
T-3	9A2309	FM IF Coil
T-4	9A2260	Ratio Det. Transformer
T-5	51X202	Output Transformer
T-6	9A2437	Rod Antenna AM
T-7	9A2392	1st IF AM Transformer
T-8	9A2393	2nd IF AM Transformer
T-9	53X365	Power Transformer
T-10	9A2007	Di-Pole Antenna FM

DIAL AND DRIVE ASSEMBLY

58x814	Dial Glass
25x2121	Dial Bracket
28X564	Spring, Dial Mtg.
15x285-2	Pointer
10X68	Drive Cord Assembly
28X113	Drive Cord Spring
7A199	Pilot Light Socket Assembly
41X88	Dial Light Reflector
	Dial Light No. 47 (See Lamp Bulb Catalog)
26X542	Drive Shaft
19X192	"C" Washer (Mtg. Drive Shaft)
6X67	Rubber Grommet

MISCELLANEOUS

12A566	3½" PM Speaker
12A567	6" PM Speaker
12A564	12" PM Speaker
76X1	Multiple Resistor-Capacitor Assembly CRL-BC52
3A455	Tube Socket (6BQ5)
3A474	Tube Socket (5Y3GT)
3A486	Tube Socket (6AV6) (6AL5)
3A487	Tube Socket (12AX7)
3A491	Tube Socket (6BA6) (6BE6) (6AU6)
3A509	Jack, Phono Socket, Dual Pin Tip
3A519	Socket, 5 Pin
25A1163	Tuner, FM
2A501	Switch, 5 Position
13X839-6	Line Cord & Plug Assembly
30X560	Clamp
32X425-2	Tube Shield (3A486 Socket)
4A408	Terminal Board
30X623	Clip, FM Tuner String Securing
10A959-1	Knob, Bass-Treble-Tuning-Selector
10A969	Knob, Volume (Large)
10A970	Knob, Volume (Small)
4X1476-1	Escutcheon, Control Plate (Mah. and Walnut)
4X1476-2	Escutcheon, Control Plate (Oak)
75X58	Back, Cabinet
81X24-4	Leg, Mahogany
81X24-5	Leg, Oak
81X24-6	Leg, Walnut
7A272	Jewel, Cabinet
S-38A799	Pilot Light Assembly (Cabinet)
28A235	Record Changer - VM-1200
13T	Astatic Stereo Cartridge
7A281	Pilot Light Socket Ass'y - Record Changer Compartment

AUDIO AMPLIFIER

CAPACITORS

Ref. No.	Part No.	Description		
C-500A	45X441	10 mf	400 V	Dry Electrolytic
C-500B		40 mf	400 V	
C-500C		40 mf	400 V	
C-500D		100 mf	25 V	
C-501	RCP10M4104M	.10 mf	400 V	Tubular
C-502	47X670	47 mmf	N750	Ceramic
C-503	RCP10M4472M	.0047 mf	400 V	Tubular
C-504	80X46	220 mmf	JF	Ceramic
C-505	RCP10M4473M	.047 mf	400 V	Tubular
C-506	RCP10M2473M	.047 mf	200 V	Tubular
C-507	RCP10M4102M	.001 mf	400 V	Tubular

RESISTORS

		Ohms	Watts	
R-500	B84335	3.3 Meg	0.5	Carbon
R-501	B84391	390	0.5	Carbon
R-502	B84184	180 K	0.5	Carbon
R-503	B83564	560 K	0.5	Carbon
R-504	C84332	3.3 K	1.0	Carbon
R-505	C84561	560	1.0	Carbon
R-506	40X461	500 K		Treble

RESISTORS—Continued

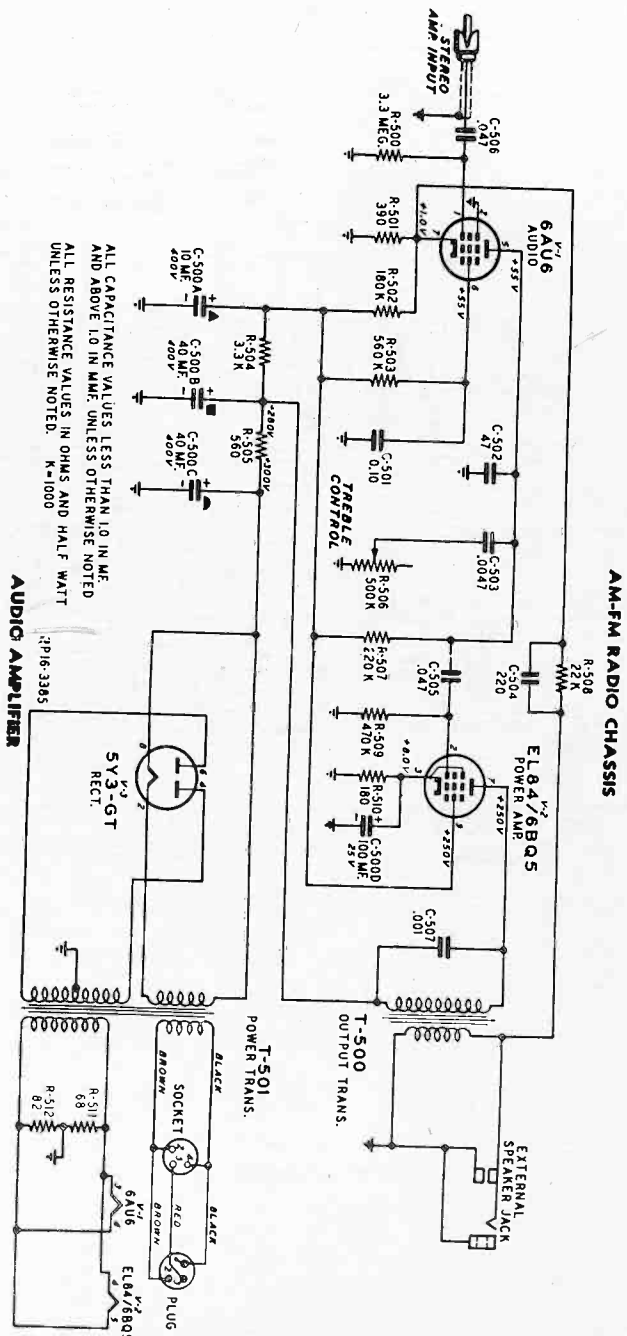
		Ohms	Watts	
R-507	B84224	220 K	0.5	Carbon
R-508	B84223	22 K	0.5	Carbon
R-509	B84474	470 K	0.5	Carbon
R-510	C83181	180	1.0	Carbon
R-511	B84680	68	0.5	Carbon
R-512	B84820	82	0.5	Carbon

TRANSFORMERS

T-500	51X200	Audio Output Trans
T-501	53X377	Power Trans

MISCELLANEOUS

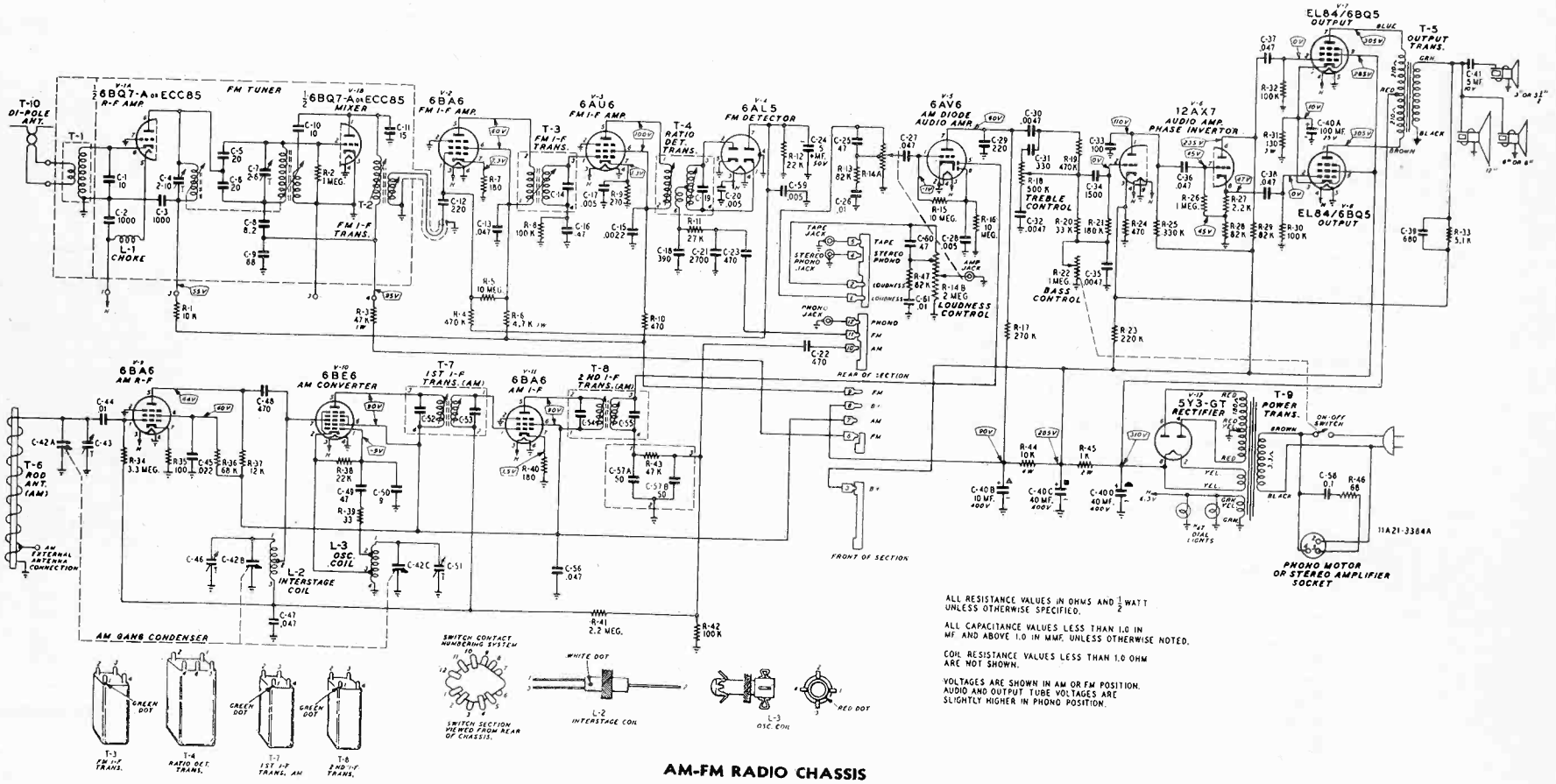
3A455	Tube Socket—9 Pin
3A525	Socket—7 Pin
3A519	Socket—5 Pin
3A474	Socket, Octal
3A522	Speaker, Jack
6A358	Plug, 3 prong
30X620-3	Cable Clamp



TUBE SOCKET VOLTAGES

Socket voltages are shown on the Schematic diagram at the tube socket terminals. All voltages are between the socket terminal and chassis ground. Plate, screen and cathode voltages were taken with a 1000 ohm-per-volt meter with a 300 volt scale used for plate and screen voltages. Audio grid voltages were read with a vacuum tube volt-meter. Conditions of measurement are:

Line voltage ..... 117 Volts AC
Signal Input ..... None
A variation of ±10% is usually permissible.



ALL RESISTANCE VALUES IN OHMS AND ½ WATT UNLESS OTHERWISE SPECIFIED.

ALL CAPACITANCE VALUES LESS THAN 1.0 IN MF. AND ABOVE 1.0 IN MMF. UNLESS OTHERWISE NOTED.

COIL RESISTANCE VALUES LESS THAN 1.0 OHM ARE NOT SHOWN.

VOLTAGES ARE SHOWN IN AM OR FM POSITION. AUDIO AND OUTPUT TUBE VOLTAGES ARE SLIGHTLY HIGHER IN PHONO POSITION.

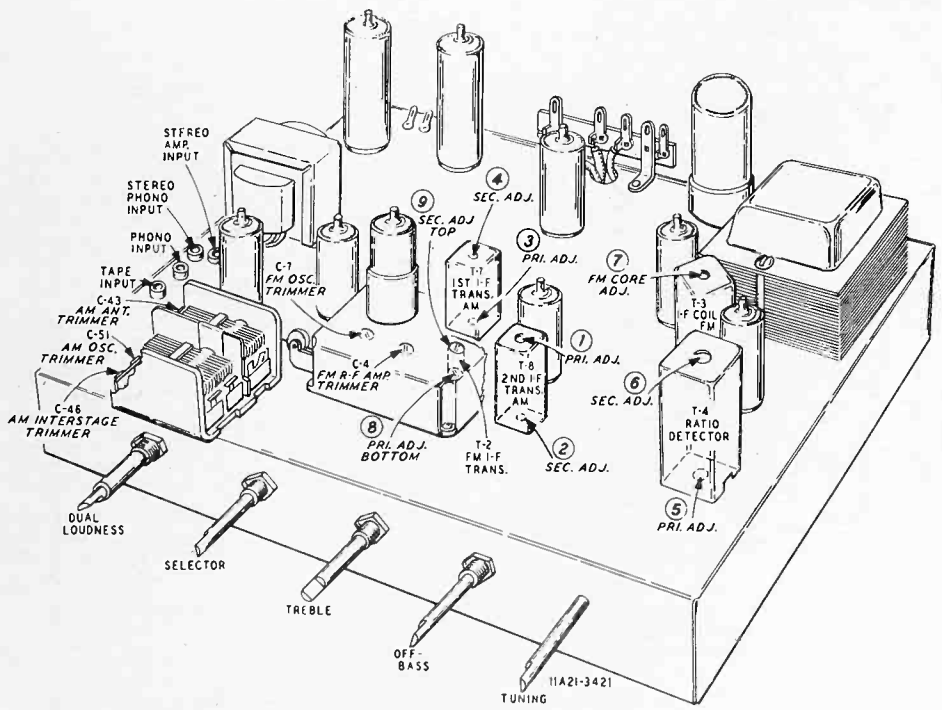
AM-FM RADIO CHASSIS

SPEAKER PHASING

Models RA1-9262A, 9262A & 9264A use three speakers (one 12 inch woofer, one 6 inch mid-range and one 3½ inch tweeter) to give a more uniform audio response. The sound intensity is maximum when the 12 inch woofer and the 6 inch mid-range are "in phase," or when the cones of each speaker move in unison with each other. However, should the speakers be so connected that they are "out of phase," the cone of one speaker will move out when the other moves in. This will cause a cancellation effect and the intensity of the air movement will be reduced. Of even greater importance is the fact that the "out of phase" relationship of the two speakers will often result in distortion as well as cancellation.

Speaker phasing is of the greatest importance when the speakers are positioned closer than a few wavelengths. At 2000 cycles, one wavelength is slightly longer than five inches; at 200 cycles, this is between 50 to 60 inches. In the woofer/tweeter/mid-range system in Coronado hi-fi instruments, it seldom makes much difference whether or not the tweeters are in phase with the woofers or the mid-range. This is due to the fact that the tweeters have little effect below 5,000 cycles.

The polarity of the speakers may be checked by using a single cell (1½ volt) flashlight cell. The battery is connected across the voice coil of either the 12 inch woofer or the 6 inch mid-range and the movement of the cone is noted. When the battery is connected, the cone will be drawn in or pushed out at the instant of contact. When the contact is broken, the cone will move in the opposite direction, to its de-energized position. Considering that the cone has been PUSHED OUT when the contact was made, mark as plus (+) that terminal of the speaker to which the positive battery terminal was connected. The same test is then applied to the other speaker and its terminals similarly marked. These marked terminals are the ones that must be connected together for proper phasing. As previously noted, phasing of tweeters has little or no effect on sound quality.



ALIGNMENT PROCEDURE

AM STAGES

The following is required for aligning:
An All Wave Signal Generator Which Will Provide an Accurately Calibrated Signal at the Test Frequencies as Listed.
Output Indicating Meter, Non-Metallic Screwdriver, Dummy Antennas — .1 mf, and 50 mmf.

Volume Control Maximum all Adjustments.
Connect Chassis to Ground Post of Signal Generator with a Short Heavy Lead.
Allow Chassis and Signal Generator to "Heat Up" for Several Minutes.

SIGNAL GENERATOR						
FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO	THROUGH DUMMY ANTENNA	CONNECT GROUND TO	GANG CONDENSER SETTING	ADJUST	ADJUST FOR
455 KC	Control Grid I-F 6BA6 Pin No. 1	.1 mf	Chassis Base	Rotor Fully Open	2nd I.F. Pri. (1) and Sec. (2)	Maximum Output
455 KC	Control Grid 6BE6 Pin No. 7	.1 mf	Chassis Base	Rotor Fully Open	1st I.F. Pri. (3) and Sec. (4)	Maximum Output
455 KC	Control Grid 6BE6 Pin No. 7	.1 mf	Chassis Base	Rotor Fully Open	2nd I.F. Pri. (1) and Sec. (2)	Maximum Output
1620 KC	Control Grid R-F 6BA6 Pin No. 1	.1 mf	Chassis Base	Rotor Fully Open	Oscillator C-51	Maximum Output
1400 KC	Control Grid R-F 6BA6 Pin No. 1	.1 mf	Chassis Base	Turn Rotor to Max. Output. Set Pointer to 1400 KC See Note A	Interstage C-46 See Note B	Maximum Output
1400 KC	External Antenna Terminal	50 mmf	Chassis Base	Turn Rotor to Max. Output. Set Pointer to 1400 KC See Note A	Antenna C-43 See Note B	Maximum Output

NOTE A—If the pointer is not at 1400 KC on the dial, reset pointer to the 1400 KC mark on the dial scale.
NOTE B—Turn the rotor back and forth and adjust the trimmer until the peak of greatest intensity is obtained.

FM STAGES

The following is required for aligning:
An accurately calibrated signal generator providing unmodulated signals at the test frequencies listed below.
Dummy antennas, 5000 mmf and 300 ohms.
V.T.V.M. having a range of approximately 5 volts.
Allow chassis and signal generator to heat up for several minutes.

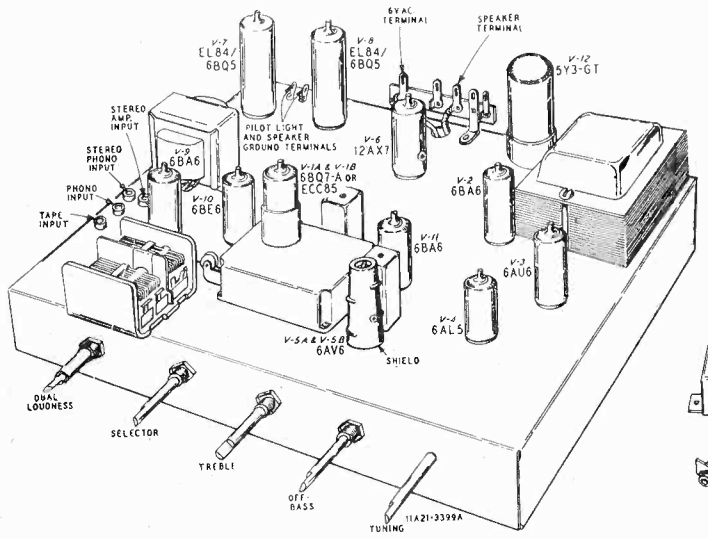
SIGNAL GENERATOR						
FREQUENCY SETTING	CONNECT GENERATOR OUTPUT TO	THROUGH ANTENNA DUMMY	BAND SWITCH SETTING	DIAL SETTING	ADJUST	ADJUST FOR
10.7 MC	Pin 1 of 6AU6	5000 mmf	FM	Extreme Clockwise Rotation	Ratio Det. Pri. (5)	Maximum Deflection (Note 1)
10.7 MC	Pin 1 of 6AU6	5000 mmf	FM	Extreme Clockwise Rotation	Ratio Det. Sec. (6)	(Note 2)
10.7 MC	Pin 1 of 6BA6 (V-2)	5000 mmf	FM	Extreme Clockwise Rotation	2nd I.F. Adj. (at top only) (7)	Maximum Deflection (Note 1)
10.7 MC	FM Antenna Terminals	300 ohms	FM	Extreme Clockwise Rotation	1st I.F. Adj. Pri. (8) and Sec. (9)-2nd I.F. Adj. (7) Ratio Det. Pri. (5) In order Shown	Maximum Deflection (Note 1)
10.7 MC	FM Antenna Terminals	300 ohms	FM	Extreme Clockwise Rotation	Ratio Det. Sec. (6)	(Note 2)
108 MC	FM Antenna Terminals	300 ohms	FM	Pointer to 108 mc. on dial	Osc. Trimmer C-7	Maximum Deflection (Note 1)
98 MC	FM Antenna	300 ohms	FM	Pointer to 98 mc. on dial	R.F. Trimmer C-4	Maximum Deflection (Note 1)

FM ALIGNMENT NOTES

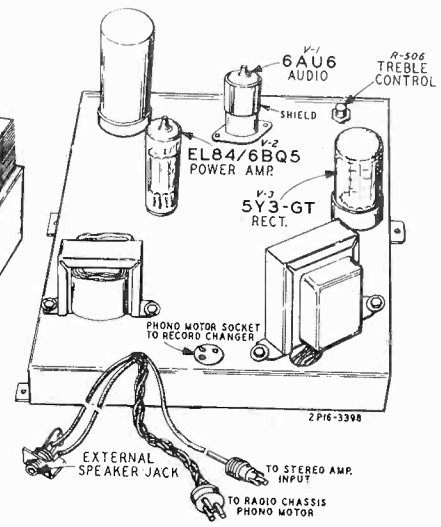
NOTE 1 — Connect V.T.V.M. common lead to chassis.
Connect D.C. probe to Pin 7, of 6AL5.
Input should be adjusted for approximately —4.5V. output.

NOTE 2 — Connect 2 100 K ohms .5 watt resistors in series and connect from pin 7 of 6AL5 to chassis. Connect V.T.V.M. common lead to mid point of above 2 resistors and connect D.C. probe to junction point of C-21 and R-11. Adjust ratio detector secondary for zero voltage.

TUBE LAYOUTS



AM-FM RADIO CHASSIS

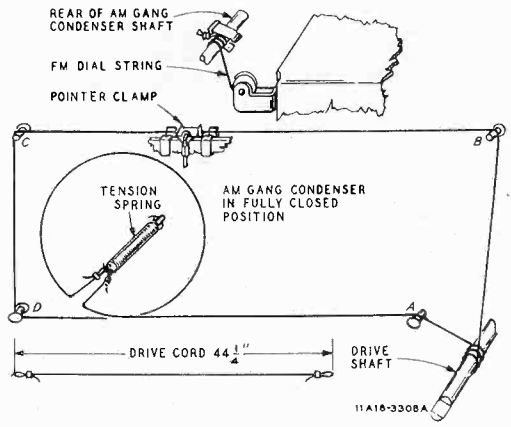


AUDIO AMPLIFIER

DRIVE CORD REPLACEMENT

Replacement of the drive cord may be accomplished as shown in the illustration. For this purpose use the drive cord assembly listed in the replacement parts list. Then install the string as shawn, winding three turns counter-clockwise around the tuning shaft with the turns progressing toward the front of the chassis. After the cord is installed rotate the tuning shaft several times in order to take up any slack in the cord.

The string from the FM tuner to the tuning shaft is wound 2 turns counter-clockwise and then tied to the clip.



PRELIMINARY SERVICE DATA

SUPERSEDES SERVICE NOTE S-C450A

S-C450B
RADIO
MODELS
C-450 A,B
C-451 A,B
C-452 A,B

SPECIFICATIONS			
ELECTRICAL RATING:	105 - 120 volts A.C. 60 cycles 30 Watts		
OPERATING FREQUENCIES:	540-1600 KC 455 KC I.F.		
POWER OUTPUT:	Undistorted: 1 Watt Maximum: 1.5 Watts		
SPEAKERS:	(2) 4", 3.2 ohms @ 400cps		
TUBE COMPLEMENT:	V1	Osc. Conv.	12BE6
	V2	I.F. Amplifier	12BA6
	V3	Det. and Audio Amplifier	12AV6
	V4	Power Output	50C5
	V5	Rectifier	35W4

GENERAL INFORMATION

The "A" and "B" versions of this set differ only in the addition of the sleep-time indicator in the "B" version.

Service on defective clock units (Telechron Catalog Number C127G2) should be referred to the nearest G. E. Servicenter or G. E. Service Station.

Always use an isolation transformer when servicing or aligning this receiver to protect personnel and test equipment.

When aligning, keep the signal input low and volume control set at maximum so the AVC will not affect the output.

TO REMOVE CABINET BACK

1. Remove time-set knob.
2. Remove two screws on bottom fastening cabinet back to cabinet front.
3. Remove screw above appliance outlet.
4. Disengage two snaps on top front of cabinet by exerting forward pressure on top rear of cabinet until bottom of cabinet back comes loose.
5. Pull cabinet back out.

TO REMOVE CHASSIS

1. Follow steps one thru five as above.
2. Pull off knobs.
3. Remove four screws fastening chassis mounting bracket to cabinet front and bottom.
4. Lift chassis back and out.

PRELIMINARY REPLACEMENT PARTS LIST

CAT. NO.	SYMBOL	DESCRIPTION	PRICE
		CAPACITORS	
RS-2175	C1	Tuning Capacitor........	3.80
RS-1785	C2	47mmf., 500V............	.25
	C7	.047mf.,200V	
RS-2045	C10,C11 C12,C13 R4,5,6	Couplate................	1.00
RS-1022	C14	.01mf., 450V............	.30
RS-2151	C15A,B	30mf., 75mf., @150V......	2.10
	C16	.47mf., 600V	
	C17	.001mf., 1000V	
		COILS AND TRANSFORMERS	
RS-2167	L1	Antenna Loop...........	1.25

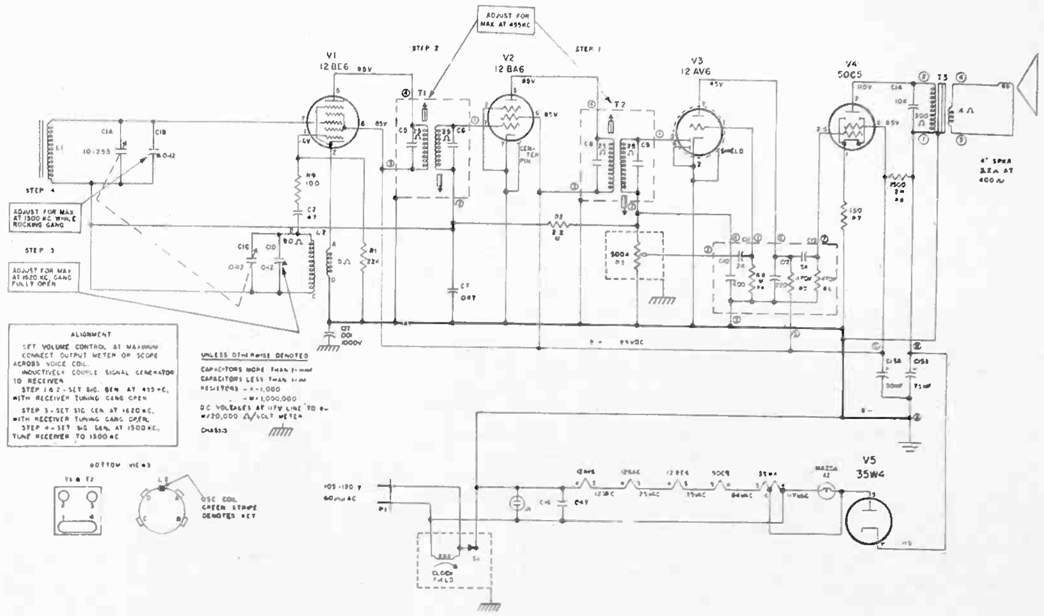
PRELIMINARY REPLACEMENT PARTS LIST (CONT'D.)

CAT. NO.	SYMBOL	DESCRIPTION	PRICE
		COILS AND TRANSFORMERS (CONT'D.)	
RS-1437	L2	Coil, Osc................	.65
RS-1415	T1,2	Transformer, I.F..........	1.55
RS-1416	T3	Transformer, Output.......	2.20
		POTENTIOMETER	
RS-2176	R3,S1	Volume Control, 500K., and switch..........	1.00
		MISCELLANEOUS	
RB-1057		Speaker, 4"......................	5.45
RS-1127		Pulley Idler................Pkg.5	.25
RS-1174		Power Cord Plate............Pkg.5	.25
RS-1323		Pilot Light, #12.................	.25
RS-1418		Interlock Terminals..........Pkg.5	.25
RS-1569		Appliance Receptacle.............	.55
RS-1650		Pilot Light Socket...............	.40
RS-1781		Dial Cord (25 yds. bulk).........	2.50
RS-1791		Socket, 7 pin...............Pkg.2	.30
RS-1792		Socket, 7 pin, with centerpost.....	.25
RS-1809		Tubular Clip................Pkg.3	.30
RS-2155		Spring, (Tuning Cap.).........Pkg.2	.30
RS-2177		Hairpin Cotter, (Snooze Lever)Pkg.5	.25
RS-2178		Spring, (Snooze Lever)........Pkg.5	.25
		CABINET AND APPEARANCE ITEMS	
RB-1119		Cabinet Front....................	2.15
RB-1120		Cabinet Back, White, (C450A,B).....	4.00
RB-1121		Cabinet Back, Turquoise, (C451A,B).	4.00
RB-1122		Cabinet Back, Gray, (C452A,B)......	4.00
RS-2040		Knob, (Vol. and Tuning)............	.35
RS-2160		Tuning Shaft (with bushing)........	.60
RS-2161		Crystal, Clock.....................	.50
RS-2162		Crystal, Dial......................	.65
RS-2163		Dial Backing Plate, Turquoise, (C450A,B; C451A,B).......	.40
RS-2164		Dial Backing Plate, Gray, (C452A,B)	.40
RS-2165		Snooze Lever.......................	.50
RS-2166		Push Button........................	.35
RS-2168		Snooze Lever Shaft............Pkg.2	.30
RS-2169		Clock Face ("A" Version)..........	.85
RS-2170		Pointer............................	.45
RS-2180		Cabinet Clip..................Pkg.5	.25
RS-2171		Alarm Hand....................Pkg.2	.30
RS-2172		Second Hand...................Pkg.2	.30
RS-2173		Minute Hand...................Pkg.2	.30
RS-2174		Hour Hand.....................Pkg.2	.30
*-RS-2345		Clock Face ("B" Version)..........	.85
*-RS-2346		Sleep Indicator Assem..............	.35

*-Denotes Parts Not Previously Cataloged.

All Parts Not Listed by Catalog Numbers Are Common Items, Obtainable From Radio Parts Jobbers.

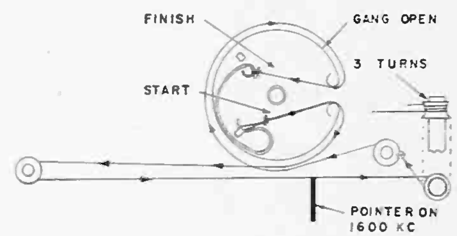
Prices Are Suggested List Prices And Subject To Change Without Notice.

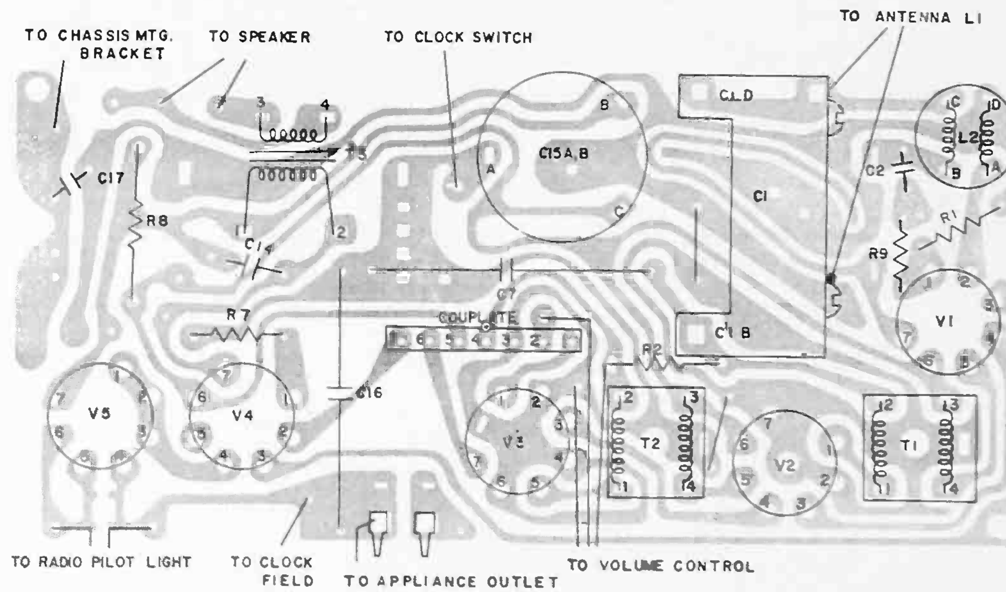


Tube Pin Resistance Chart

Tube	1	2	3	4	5	6	7
12AV6	6.2M	0	15	0	500K	0	*470K
12BA6	2.7M	0	25	15	*1500ohm	*1500ohm	0
12BE6	22K	0	35	25	*1500ohm	*1500ohm	2.7M
50C5	150ohm	470K	35	60	470K	*1500ohm	*300ohm
35W4	TP	TP	60	110	165	135	20. (min.)

TP-Tie Point
* Measured from Pin 7 of V5
Resistances measured with pilot light(Mazda # 12) in socket
All measurements taken with respect to B- unless otherwise designated.

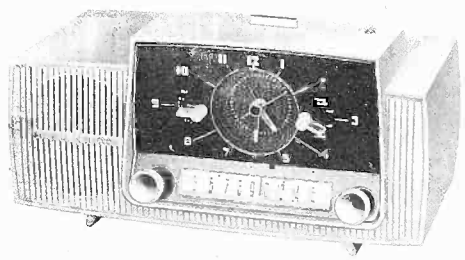




ER-S-C415A
RADIO
MODELS
C415A,C
C416A,C
C417A,C

FOR
CLOCK-RADIO RECEIVERS
(540-1600 KC., 455 KC., I-F.)

SPECIFICATIONS		
CABINETS:	Plastic - C415A,C Ivory C416A,C Pink C417A,C Turquoise	
ELECTRICAL RATING:	Voltage 105-120 Volts, 60 cycles AC Wattage at 117 Volts 30 Watts	
POWER OUTPUT:	Undistorted 1 Watt Maximum 1.75 Watts	
TUBE COMPLEMENT:	V1 Osc. - Conv. "A" Version V1 Osc. - Conv. "C" Version V2 I.F. Amplifier V3 Detector & Audio Amplifier V4 Audio Output V5 Rectifier	12AU6 12BE6 12BA6 12AV6 50C5 35W4



GENERAL INFORMATION

The clock in these models has the unique Snooz-Alarm feature. Service on defective clock units (Telechron Catalog Number C114G2) should be referred to the nearest G. E. Servicenter or G.E. Service Station.

The difference between the "A" and "C" versions is the V1 circuit. V1 in the "A" version is a 12AU6 and V1 in the "C" version is a 12BE6.

TO REPLACE DIAL LIGHT

1. Remove cabinet back.
2. Push in dial light holder and release holder from bracket.
3. Pull holder out from rear of chassis.
4. Replace dial light.
5. Insert holder and snap on bracket.

TO REMOVE CHASSIS FROM CABINET

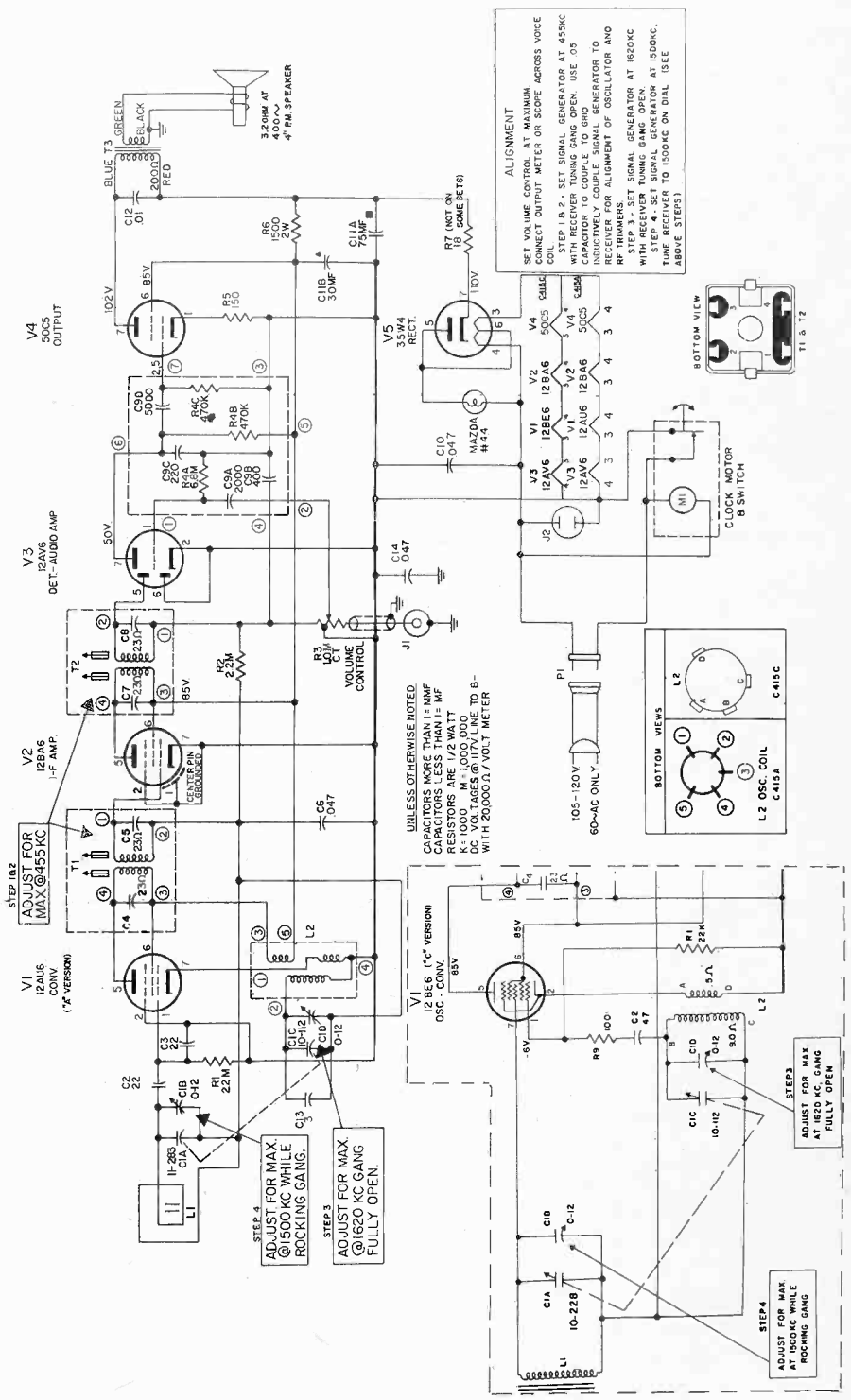
1. Remove tuning, volume and timer knobs.
2. Remove time set knob from shaft at back of cabinet. Hold shaft and turn knob counter clockwise.
3. Remove five hex-head screws on cabinet back.
4. Remove four hex-head screws on bottom of cabinet.
5. Remove timer by unscrewing four Phillips head screws.
6. Unsolder speaker leads from speaker.
7. Pull chassis out slowly. Leave leads from chassis to timer attached for A.C. power while testing.

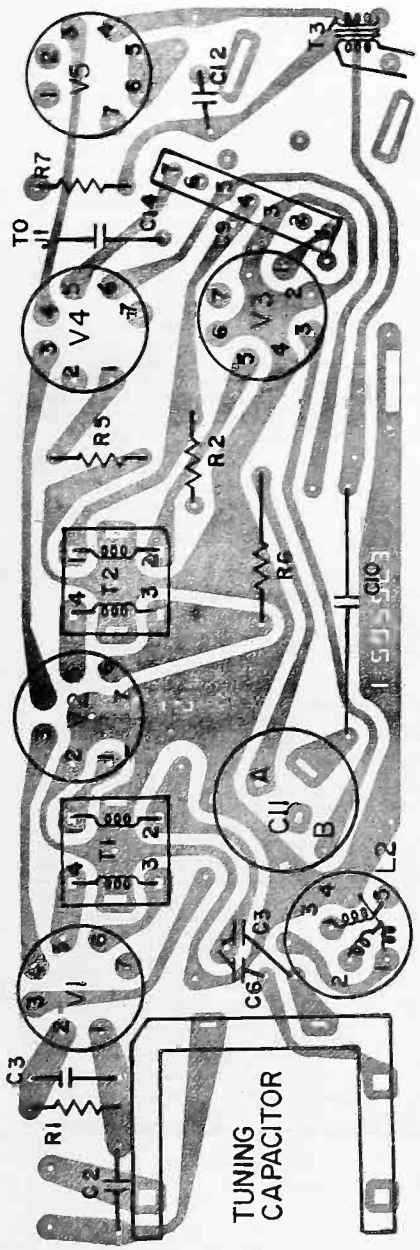
CAUTION

The chassis uses the dip solder copper-plated printed circuit to eliminate most of the interconnecting wiring. When soldering, keep the heat to a minimum to prevent the printed wiring from becoming unbonded. A 35 watt soldering iron is recommended.

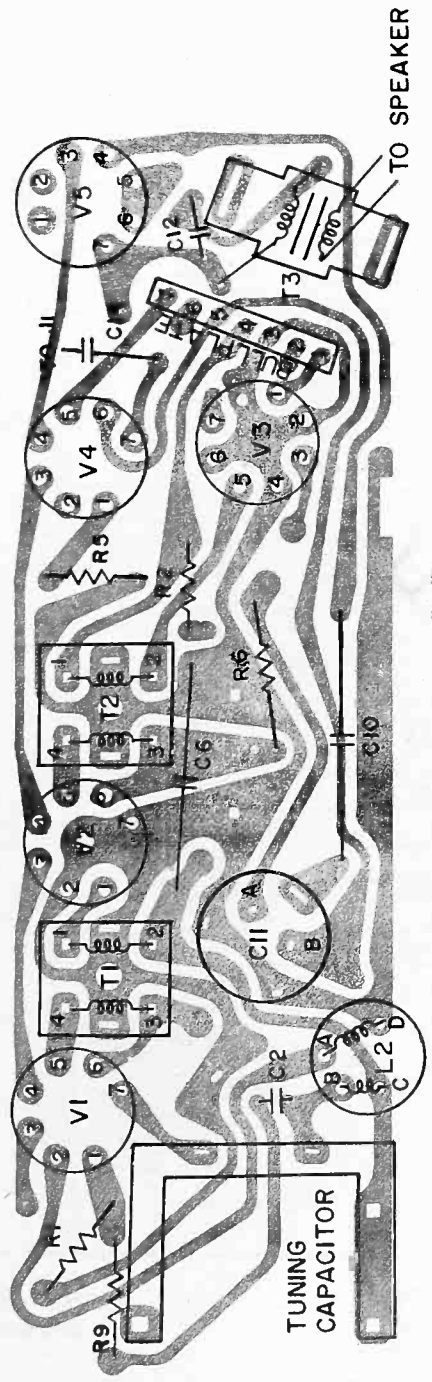
Always use an isolation transformer when servicing this receiver to protect the test equipment and personnel. When aligning, connect the output lead of the signal generator to the grid of an I.F. tube through a .05mf. capacitor. This will prevent the output impedance of the generator from having a loading effect on the circuit.

REPLACEMENT PARTS LIST			
CAT. NO.	SYMBOL	DESCRIPTION	PRICE
CAPACITORS			
RCT-099	C1,A,B, C,D	Tuning Cap."A" version..	3.75
RCW-3216	C13	3mmf.,±20%,500V,ceramic.	1.25
RCW-3266	C2,3	22mmf., "A" version.....	1.25
RS-1022	C12	.01mf., 450V.....	.30
RS-1302	C2	47mmf., "C" version.....	.25
RS-1480	C1A,B, C,D	Tuning Cap."C" version..	3.80
RS-2045	C9A,B, C,D R4A,B,C	Resistor Cap. Network...	1.00
RS-2151	C11A,B C6,10,14	Electrolytic 75-30@ 150V .047mf., 600V.	2.10
COILS AND TRANSFORMERS			
RLC-142	L2	Osc. Coil "A" version...	1.00
RS-1156	L1	Antenna, "A" version...	1.25
RS-1479	L2	Osc. Coil "C" version...	.50
RS-1481	L1	Antenna, "C" version...	1.20
RS-2149	T1,2	I.F. Transformer.....	1.40
RTO-176	T3	Transformer, Output.....	2.05
POTENTIOMETER			
RRC-375	R3	Vol. Cont., 1 Meg.....	1.15
MISCELLANEOUS			
RB-1057		Speaker 4".....	5.45
RS-1168		Rivet, Power Cord.....Pkg.5	.25
RS-1174		Plate, Power Cord.....Pkg.5	.25
RS-1179		Bracket, Antenna.....Pkg.3	.30
RS-1181		Receptacle, Appliance.....	.55
RS-1183		Terminal.....Pkg.3	.30
RS-1781		Dial Cord, Bulk 25 yds.....	2.50
RS-1791		Socket, Tube.....Pkg.2	.30
RS-1792		Socket, Tube w/center pin.....	.25
RS-1809		Clip, Tubular, (Speaker).....Pkg.3	.30
RS-1821		Retaining Ring,Tuning Shaft..Pkg.5	.25
RS-1823		Jack, Phono.....Pkg.2	.30
RS-2065		Receptacle, Power Cord.....Pkg.2	.30
RS-2152		Tuning Shaft Assembly.....	.50
RS-2153		Pulley, Tuning Shaft.....	.05
RS-1184		Screw, clock, #48 x 3/8.....Pkg.5	.25
RS-1183		Clamp, Antenna.....Pkg.2	.30
RS-1193		Gasket, Speaker.....Pkg.5	.25





COMPONENT WIRING DIAGRAM "A" VERSION

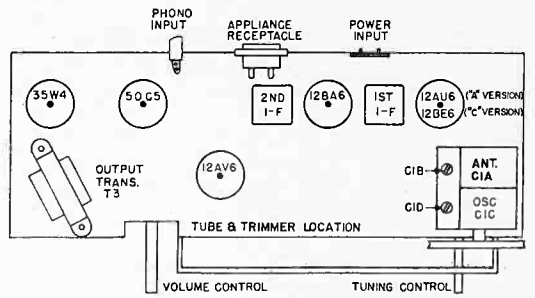


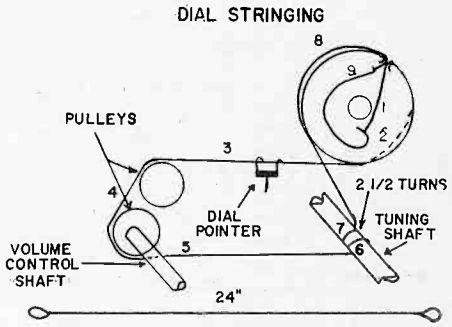
COMPONENT WIRING DIAGRAM "C" VERSION

REPLACEMENT PARTS LIST (CONT'D.)					
CAT. NO.	DESCRIPTION	PRICE	CAT. NO.	DESCRIPTION	PRICE
	MISCELLANEOUS (CONT'D.)			CABINET AND APPEARANCE ITEMS (CONT'D.)	
RS-2154	Pulley, Volume Shaft.....	.10	RB-1028	Cab., Back, Ivory, C415A,C.....	2.15
RS-2155	Spring, Tuning Drum.....	.15	RB-1029	Cab., Back, Pink, C416A,C.....	2.15
RS-2156	Clip, Dial Light.....	.05	RB-1030	Cab., Back, Turquoise, C417A,C...	2.15
RS-2158	Socket, Dial Light.....	.90	RS-1170	Dial Scale & Window.....	3.25
RWL-039	Power Cord.....	.95	RS-1171	Knob, Snooz-Alarm, Turq. C147A,C.	.25
	CABINET AND APPEARANCE ITEMS		RS-1172	Knob, Snooz-Alarm, Pink C416A,C.	.25
			RS-1173	Knob, Snooz-Alarm, Ivory C415A,C.	.25
RB-1025	Cab., Front, Ivory, C415A,C.....	4.85	RS-1096	Knob, Clock (Lever Type)....Pkg.3	.30
RB-1026	Cab., Front, Pink, C416A,C.....	4.85	RS-2040	Knob, Vol. & Tune, Clear & Gold..	.35
RB-1027	Cab., Front, Turq. C417A,C.....	4.85	RS-2157	Dial Back Window-Translucent.....	.40
			RS-2159	Dial Pointer Assembly.....	.70

All Parts Not Listed By Catalog Numbers Are Common Items, Obtainable From Local Radio Parts Jobbers.

Prices Are Suggested List Prices And Subject To Change Without Notice.

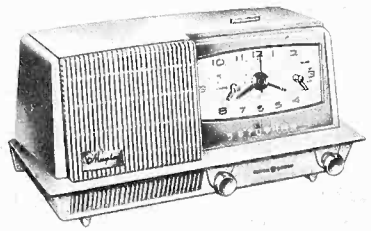




ER-S-C420
RADIO
MODELS
C420A
C421A,B,C
C422B,C

FOR
CLOCK-RADIO RECEIVERS
(540-1600 KC., 455 KC., I-F.)
SUPERSEDES SERVICE NOTE S-C420-1

SPECIFICATIONS		
CABINET:	C420A, Mahogany C421A,B,C, Blue C422B,C, Rose Beige	
ELECTRICAL RATING:	105 - 120 volts A.C. 60 cycles 30 Watts	
POWER OUTPUT:	Undistorted: .75 Watts Maximum: 1.25 Watts	
SPEAKER:	5 1/4" 3.2 ohms @ 400cps.	
TUBE COMPLEMENT:	V1 R. F. Amplifier V2 Osc. - Converter V3 I.F. Amplifier V4 Det. & Audio Amplifier V5 Power Output V6 Rectifier	12BA6 12BE6 12BA6 12AV6 35C5 35W4



NOTE: When servicing or aligning, always use an isolation transformer to protect test equipment and personnel.

Always have the volume control set for maximum and reduce the signal input so AVC will not affect output.

GENERAL INFORMATION

The A,B, and C versions are identical except for the following changes:

"A" clock crystal #RS-1209, clock lever knobs #RS-1096.

"B" clock crystal #RS-1476, clock lever knobs #RS-1096.

"C" clock crystal #RS-2319, clock lever knobs #RS-2200.

The suffix letter following the model number on the tube label identifies the production version as listed above.

The volume control is used for both the radio and phono volume. A switch at the center position of the control eliminates any radio signal from being audible when listening to the phono. A slide switch for tone control is provided on the rear of cabinet.

Service on defective timer units, (Telechron Cat. No. C114G8) should be referred to the nearest G.E. Servicenter or G.E. Service Station.

TO REMOVE CHASSIS

1. Pull off volume and tuning knobs.
2. Unscrew alarm set indicator knob (rear.)
3. Remove cabinet back.
4. Unsolder leads from speaker.
5. Remove cabinet top (leave timer leads attached.)
6. Remove pilot light from pointer bracket.
7. Lift pointer bracket off of dial backing bracket.
8. Remove cabinet bottom (do not remove dial backing from cabinet bottom.)
9. Slide chassis out.

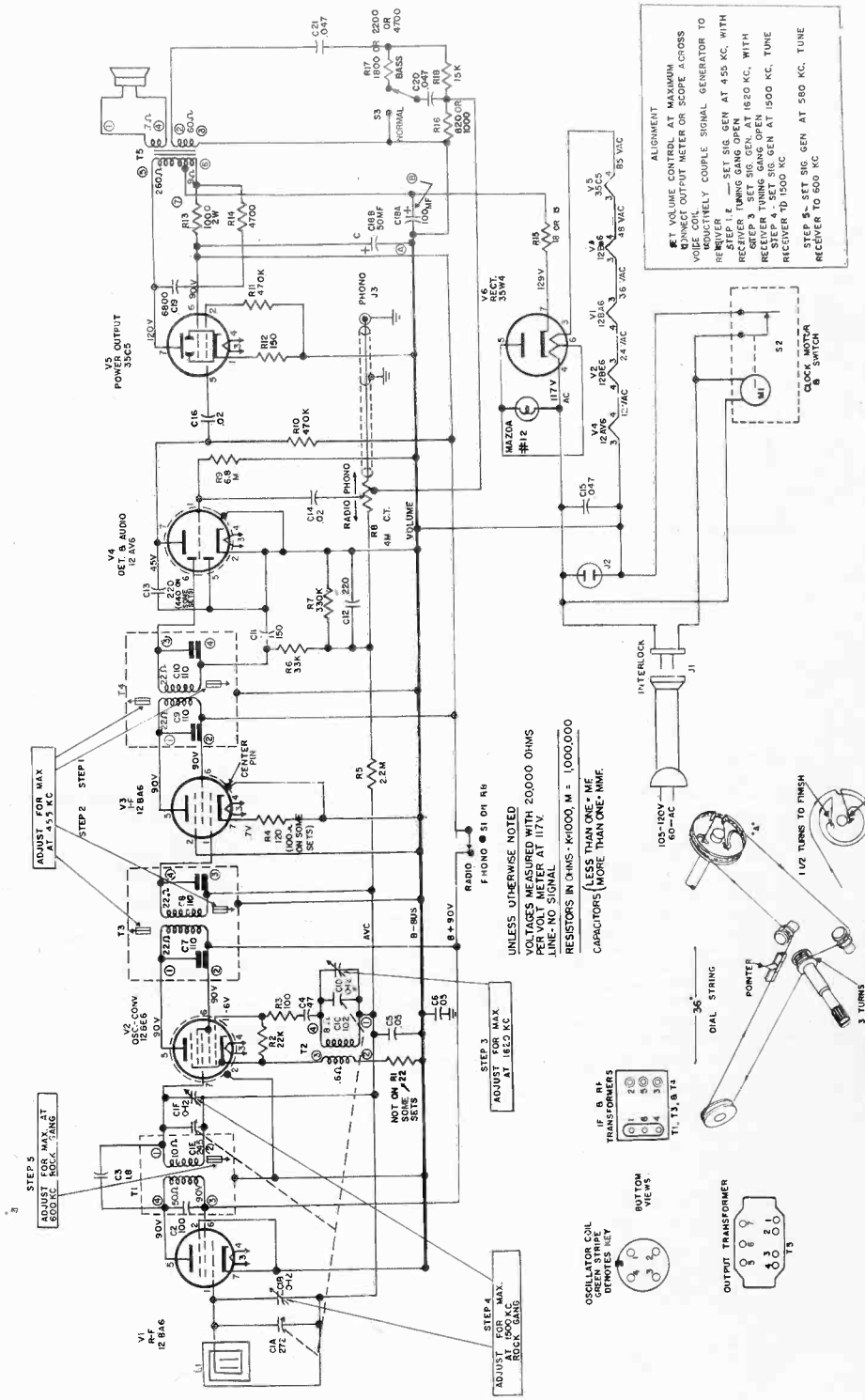
TO REMOVE SPEAKER

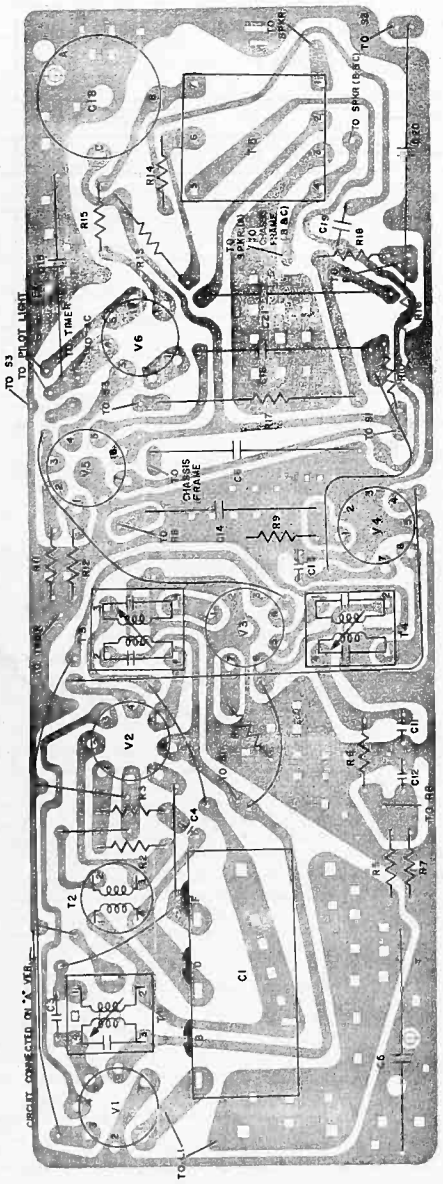
1. Follow steps 1 through 5 as above.
2. Remove four screws from around speaker. (This will remove speaker grille and speaker.)

TO REMOVE TIMER

1. Follow step 1 through 5 as above.
2. Remove four screws from around timer.

REPLACEMENT PARTS LIST			
CAT. NO.	SYMBOL	DESCRIPTION	PRICE
		CAPACITORS	
RS-1134	C18A,B	100-50mf., 150V.....	2.00
RS-1191	C3	1.8mmf., 500V.....Pkg.2	.30
RS-1202	C19	6800mmf., 450V.....	.30
RS-1203	C12,13	220mmf., 450V.....	.25
RS-1204	C11	150mmf., 450V.....	.25
RS-1218	C1A,B,C D,E,F	Tuning Capacitor.....	6.80
RS-1785	C4	47mmf., 500V., Paper....	.25
	C5,6	.05mf., 400V., Paper	
	C14,16	.02mf., 400V., Paper	
	C15,20,21	.047mf.,600V., Paper	
		POTENTIOMETER	
RS-1219	R8	Volume Control, 4 megs..	1.90
		COILS AND TRANSFORMERS	
RS-1142	T2	Oscillator Coil.....	.60
RS-1143	T3,4	I.F. Transformer.....	1.80
RS-1145	T1	R.F. Transformer.....	2.20
RS-1220	L1	Antenna.....	2.10
RS-1222	T5	Output Transformer.....	3.45
		MISCELLANEOUS	
RB-1046		Speaker, 5 1/4".....	6.25
RS-1100		U Type Nut.....Pkg.5	.25
RS-1127		Pulley 1/4".....Pkg.5	.25
RS-1128		Slide Switch (Tone Control).....	.35
RS-1168		Shoulder Rivet (power cord)..Pkg.5	.25
RS-1174		Plate (power cord).....Pkg.5	.25
RS-1183		Terminal.....Pkg.3	.30
RS-1213		Socket, (pilot light).....	.55
RS-1214		Lamp Hood.....Pkg.3	.30
RS-1215		Tuning Shaft Assembly.....	.65
RS-1216		Antenna Holder.....Pkg.3	.30
RS-1223		Appliance Receptacle.....	.60
RS-1323		Pilot Light #12.....	.25
RS-1324		Rubber Grommet.....Pkg.5	.25
RS-1791		Tube Socket.....Pkg.2	.30
RS-1792		Tube Socket w/center pin, (V3)....	.25





PARTS LIST (CONT'D.)					
CAT. NO.	DESCRIPTION	PRICE	CAT. NO.	DESCRIPTION	PRICE
MISCELLANEOUS (CONT'D.)			CABINET AND APPEARANCE ITEMS (CONT'D.)		
RS-1823	Phono Jack.....Pkg.2	.30	RB-1076	Cabinet Bottom, Rose Beige, C422B,C	2.70
RS-2065	Power Cord Receptacle.....Pkg.2	.30	RB-1077	Cabinet Back, Rose Beige, C422B,C..	1.95
RS-2076	Pulley, "11/16".....Pkg.2	.30	RB-1078	Grille, Rose Beige, C422B,C.....	.80
RS-2155	Spring (Tuning Gang).....	.15	RS-1096	Clock Knob (lever type) C420A, C421A,B, C422B.....Pkg.3	.30
RMS-374	Tube Shield Pin.....Pkg.5	.25	RS-1205	Window Dial Backing, C420A.....	.60
RWL-039	Power Cord.....	.95	RS-1206	Window Dial Backing, C421A,B,C.....	.60
CABINET AND APPEARANCE ITEMS			RS-1207	Snooz-Alarm Bar Knob,Blue,C421A,B,C	.25
RB-1037	Cabinet Top, Mahogany, C420A.....	3.15	RS-1208	Snooz-Alarm Bar Knob, Mahogany,C420A	.25
RB-1038	Cabinet Top, Blue, C421A.....	3.15	RS-1209	Clock Crystal, C420A, C421A.....	.95
RB-1039	Cabinet Bottom, Mahogany, C420A...	2.70	RS-1210	Pointer, C420A,C421A,B,C.....	.25
RB-1040	Cabinet Bottom, Blue, C421,B,C....	2.70	RS-1217	Medallion.....	.35
RB-1041	Cabinet Back, Mahogany, C420A.....	2.35	RS-1474	Window Dial Backing, C422B,C.....	.55
RB-1042	Cabinet Back, Blue, C421A,B,C.....	2.35	RS-1475	Snooz-Alarm Bar Knob, C422B,C.....	.25
RB-1043	Grille, Mahogany, C420A.....	.80	RS-1476	Clock Crystal, C421B, C422B.....	1.05
RB-1044	Grille, Blue, C421A,B,C.....	.80	RS-1478	Pointer, C422B,C.....	.25
RB-1074	Cabinet Top, Blue, C421B,C.....	3.15	RS-2040	Tuning & Volume Knob.....	.35
RB-1075	Cabinet Top, Rose Beige, C422B,C..	3.15	*-RS-2200	Clock Lever Knob, "C" ver.....Pkg.2	.30
			*-RS-2319	Clock Crystal, "C" ver.....	.95

*- Denotes Parts Not Previously Cataloged

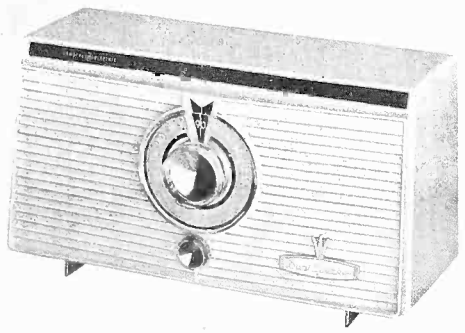
All Parts Not Listed By Cat. Nos. Are Common Items, Obtainable From Radio Parts Jobbers.

Prices Are Suggested List Prices And Subject To Change Without Notice.

ER-S-T105
RADIO MODELS T-105-A T-106-A,B T-107-B

SUPERSEDES S-T105-2

SPECIFICATIONS			
CABINET:	T105A - Mahogany T106A,B - Antique White T107B - Turquoise		
ELECTRICAL RATING:	105 - 120 VAC or VDC 24 Watts @ 117 V		
OUTPUT:	Undistorted 1.0 Watt Maximum 1.6 Watts		
SPEAKER:	(2) 4 inch, 3.2 ohms @ 400 cps.		
TUBE COMPLEMENT:	V1	Osc. - Conv. ("A" Version)	12AU6
	V1	Osc. - Conv. ("B" Version)	12BE6
	V2	I-F Amplifier	12BA6
	V3	Detector, 1st Audio Amplifier	12AV6
	V4	Audio Output	50C5
	V5	Rectifier	35W4



GENERAL INFORMATION

The "A" and "B" versions of this set differ in the oscillator-converter circuitry.

Always use an isolation transformer when servicing or aligning this receiver to protect personnel and equipment.

TO REMOVE CHASSIS

To remove chassis from cabinet, remove cabinet back. Unsolder the output transformer leads from the speaker. Remove the four hex-head screws at each corner of the chassis, and the single hex-head screw below the tuning capacitor. The tuning knob is a captive knob and remains in the cabinet front. After removing volume control knob, close the tuning capacitor to prevent any possible damage to the plates. Remove chassis by holding tuning knob with one hand, while grasping tuning capacitor by the thumb and forefinger of the other hand and pull.

SPEAKERS

To prevent distortion and loss of audio, the speakers must always be kept in phase with each other. Always maintain original polarity of speaker leads for proper phasing.

PARTS LIST

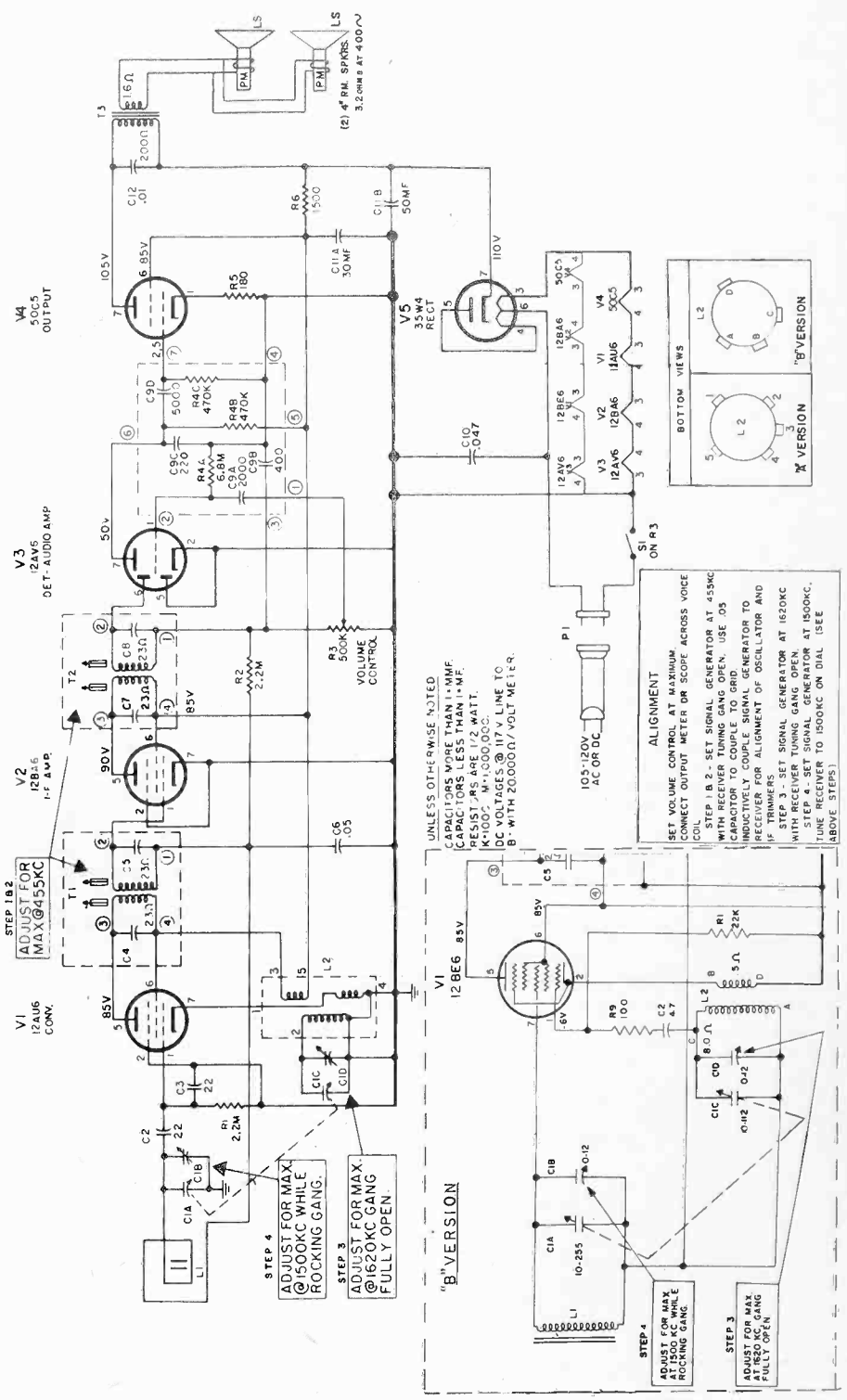
CAT. NO.	SYMBOL	DESCRIPTION	PRICE
CAPACITORS			
RS-1163	C1A,B, C,D	Tun. Cap. ("A" Version).	4.15
RS-1607	C1A,B, C,D	Tun. Cap. ("B" Version).	3.60
RCW-3266	C2,3	22mmf., 500V.....	1.25
RCW-3207	C9A,B C,D R9A,B,C	Couplate.....	1.25
RS-2047	C11A,B	30 - 50mf., @ 150 V.....	1.90
POTENTIOMETER			
RS-1162	R3	Vol. Control (500K) & sw	2.30
COILS AND TRANSFORMERS			
RTL-183	T1,2	I.F. Trans. ("A" Ver.)..	1.65
RS-1415	T1,2	I.F. Trans. ("B" Ver.)..	1.55
RS-1161	T3	Output Transformer.....	2.55
RS-1156	L1	Loop Antenna ("A" Ver.).	1.25
RS-1606	L1	Loop Antenna ("B" Ver.).	1.25
RLC-135	L2	Osc. Coil ("A" Ver.)....	1.00
RS-1523	L2	Osc. Coil ("B" Ver.)....	1.00
MISCELLANEOUS			
RB-1057	Speaker, 4".....		5.45
RHS-161	Eyelet, Shield.....Pkg.3		.30

PARTS LIST (CONT'D.)

CAT. NO.	DESCRIPTION	PRICE
MISCELLANEOUS (CONT'D.)		
RJJ-014	Power Cord Receptacle.....Pkg.2	.30
RMC-061	Plastic Clamp.....	.25
RS-1157	Loop Mtg. Bracket.....Pkg.3	.30
RS-1158	Tube Shield.....Pkg.3	.30
RS-1159	Heat Shield.....Pkg.2	.30
RS-1164	Vol. Control Washer.....Pkg.5	.25
RS-1190	Ground Strap.....Pkg.5	.25
RS-1791	Tube Socket.....Pkg.2	.30
RS-1792	Tube Socket w/center pin.....	.25
RS-1809	Speaker Clip.....Pkg.3	.30
RS-2042	Knob Clip.....Pkg.5	.25
RWL-037	Power Cord.....	1.00
CABINET AND APPEARANCE ITEMS		
RB-1018	Cabinet (Mahogany) w/Trim Strip and Dial Plate, T105A.....	5.70
RB-1019	Cabinet (Antique White w/Trim Strip and Dial Plate, T106A,B....	5.70
RB-1085	Cabinet (Turquoise) w/Trim Strip and Dial Plate, T107B.....	5.85
RS-1139	Trim Strip T105A,T107B, Gold.....	.50
RS-1152	Tuning Knob.....	.85
RS-1153	Trim Strip, T106A,B, Maroon.....	.70
RS-1154	Dial Plate (Triangle).....	.25
RS-1155	Cabinet Back.....	.25
RS-1186	Dial Plate (Circular) w/o Triangle..	.75
RS-2040	Volume Knob.....	.35

*- Denotes Parts Not Previously Cataloged.

PRICES ARE SUGGESTED LIST PRICES AND SUBJECT TO CHANGE WITHOUT NOTICE.



PRELIMINARY SERVICE DATA

S-T150A
RADIO
MODELS
T-150A
T-151A

	SPECIFICATIONS
CABINET:	T150A - Mahogany T151A - Walnut
ELECTRICAL RATING:	105-120 volts AC-DC 40 Watts
TUNING RANGE:	AM 540-1600 KC. FM 88-108 MC.
I. F.	AM 455 KC. FM 10.7 MC.
POWER OUTPUT:	Undistorted: 1 Watt Maximum: 1.5 Watts
TUBE COMPLEMENT:	V1-FM RF Amplifier..... 6BJ6 V2-FM Mixer..... 6AB4 V3-FM Oscillator-AFC..... 12AT7 V4-AM Conv.--1st FM IF..... 12AU6 V5-AM IF--2nd FM IF..... 12BA6 V6-Limiter..... 12AU6 V7-Detector--AVC--Discriminator-- Audio Amplifier..... 19T8 V8-Power Amplifier..... 35C5

GENERAL INFORMATION

A built-in ferrite rod antenna is provided for AM reception.

The power line cord is used as the built-in FM antenna. The clamp on the power line cord is attached to the right hand terminal on the FM antenna terminal board. Keep the power cord leading to the electrical outlet free from other wires and extended to its fullest length; changing the position of the cord slightly may improve reception.

Do not connect ground wires to the FM receiver at any time.

Due to the circuitry of some types of tape recorders, a hum may be heard when it is plugged into the receiver. If reversing the receiver power plug or the tape recorder power plug in the wall outlet does not eliminate the hum, an isolation transformer will be required. The isolation transformer rating should be 105-117 volts, 50 watts, such as a Stancor transformer model P6410 or Chicago transformer model IS50. Plug the isolation transformer into the wall outlet and insert the receiver power cord into the isolation transformer.

TO REMOVE CABINET BACK

1. Loosen FM antenna screws and remove FM antenna.
2. Remove 4 screws fastening back to cabinet.
3. Pull interlock plug until back swings clear of cabinet bottom.
4. Slide back downward in grooves and remove from cabinet.

TO REMOVE CHASSIS

1. Remove cabinet back as detailed above.
2. Remove four hex-head screws on cabinet bottom.
3. Remove hex-nut fastening antenna support to speaker mounting bolt.
4. Remove knobs by releasing captive clips from shaft slots with a long narrow screwdriver.
5. Swing chassis out and to right to troubleshoot.

TROUBLESHOOTING

To test the FM oscillator, check the grid bias voltage. A voltage of -.7 VDC will indicate that the oscillator is operating. With the oscillator operating properly, the RF can be checked by attaching the signal generator to the antenna terminals and checking the output of the RF stage for a deflection on the -3 VDC scale of a VTVM connected to pin 1 of V4.

Correcting trouble in the RF requires care due to the critical values of coils and lead dressings. Caution must be exercised not to rearrange or adjust coils without definitely knowing the trouble, as rearranging leads or components may mean readjusting the circuit and alignment.

CAUTION

Always use an isolation transformer when servicing or aligning this receiver to protect test equipment and personnel.

AM ALIGNMENT

The AM alignment can be accomplished with a VTVM or an oscilloscope as the output monitor. All VTVM output readings will be observed on an AC volt scale. See the alignment chart for the step by step procedure.

Set the band switch to "AM" position.

Turn volume control to maximum volume position and adjust the signal generator output control for alignment signal.

The position of the receiver should not be changed during alignment to prevent possible errors in output readings.

FM ALIGNMENT

The proper method for FM alignment of this receiver requires the use of an oscilloscope, a signal sweep generator, and a marker generator (or crystals may be used for the necessary marker pips of 98 mcs, 108 mcs, and 10.7 mcs. The crystals can be inserted into the crystal marker receptacles on most signal sweep generators.

1. Set band switch to FM position.
2. Set volume control to minimum position.
3. In peak alignment, a 470K resistor is used in series with the positive test lead of the VTVM. (Note: Wire length from resistor to end of lead should not exceed one-half inch.) In aligning the FM, IF and RF sections, the signal input should be reduced so that the VTVM reads approximately -1 VDC.
4. In aligning the discriminator, adjust cores of T6 for maximum DC, keeping the level from 3 to 4 volts.
5. In sweep alignment, set the sweep width control on the sweep generator to 150KC.
6. The marker generator output, when used, may be inductively coupled as near to the sweep input point as possible or inserted into the marker input jack on the signal sweep generator.
7. The frequency setting of the marker generator is the same as the sweep generator setting for each step as shown in the FM alignment chart.

Marker pips should always be kept at minimum amplitude to prevent distortion of the response curve.

The position of the receiver should not be changed during alignment to prevent possible error in output readings.

When replacing FM components in the tuner section, mount replacement part exactly as the original and carefully dress leads to the components.

All non-shielded leads must be kept as short as possible. Test points on dip-soldered side of the circuit board have a looped wire so that test equipment can be directly attached with the shortest leads possible.

FM OSCILLATOR COIL

The FM oscillator coil, L5, may require adjustment if components, other than tubes, are changed in the FM oscillator-mixer section. Check the band and frequencies, if the set tunes through 108 and 88 MC do not touch the coil. If the oscillator frequency is low adjust L5 by spreading the turns slightly. If the oscillator frequency is high adjust L5 by squeezing the turns together slightly (Note: a small change in the space between 2 turns of L5 shifts the frequency approximately 1 MC.)

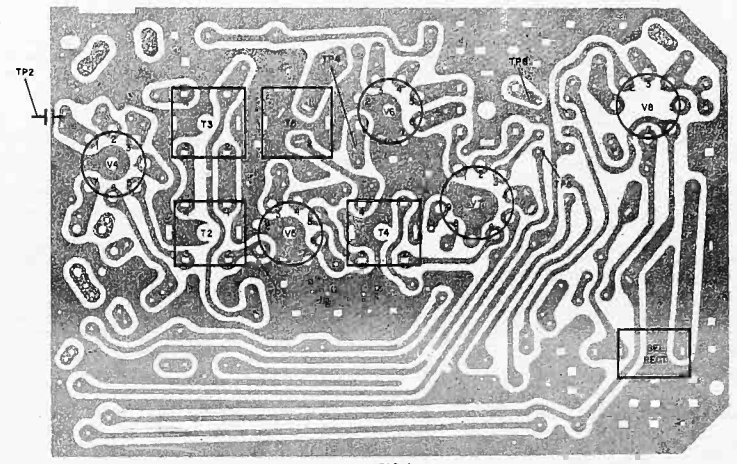
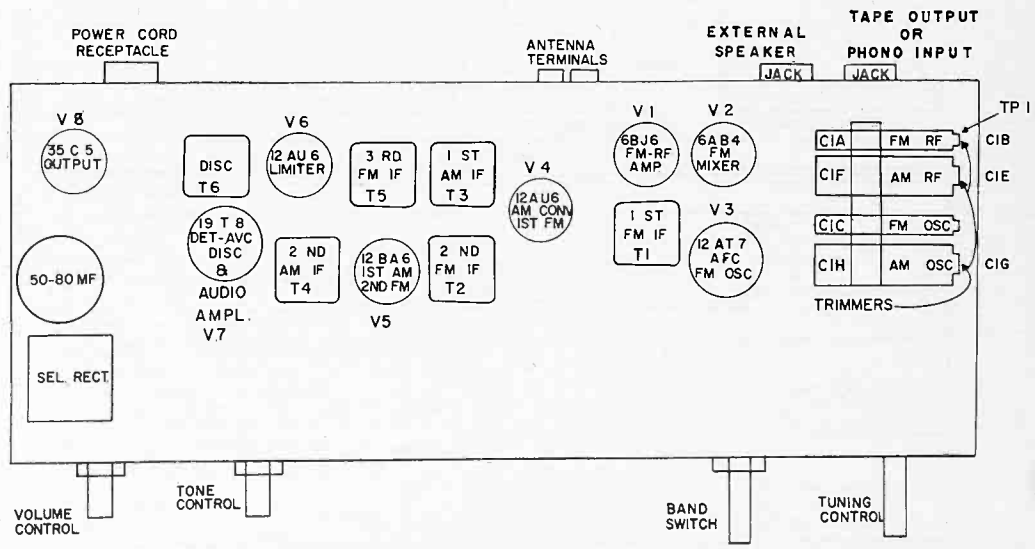


FIG. 1



TUBE & TRIMMER LOCATIONS
TOP VIEW

FIG. 2

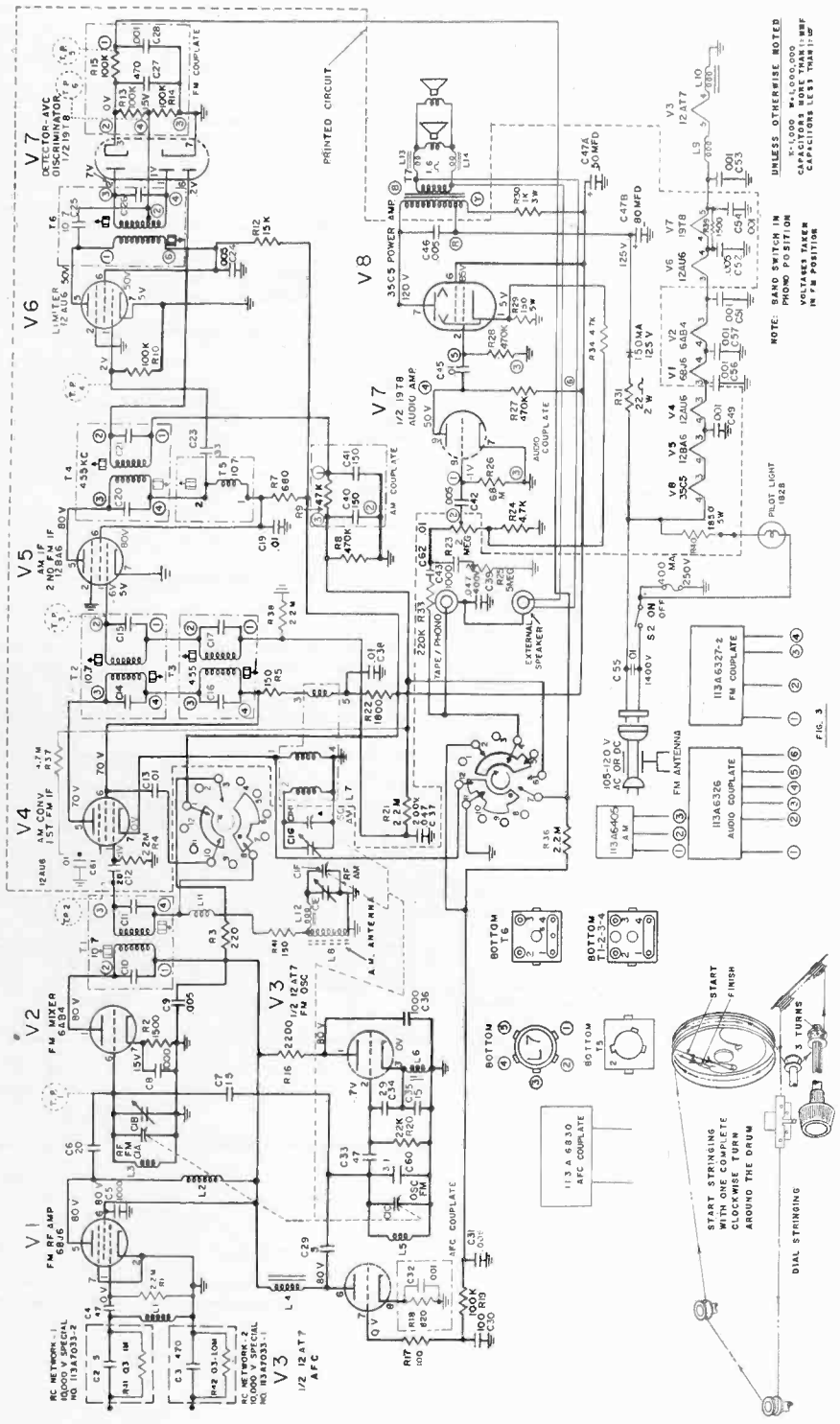


FIG. 3

AM ALIGNMENT CHART

Step	Signal Generator Input Point	Gen. Setting	Receiver Tuning	VTVM OUTPUT: Connect VTVM Across	VTVM OUTPUT: Adjust the following	OSCILLOSCOPE OUTPUT: Connect Scope Across	OSCILLOSCOPE OUTPUT: Adjust the following
1	High side to Test Point 3 in series with a .01mf., low side to chassis.	455 KC 30% Mod. with 400 cycles	Gang	Voice	Top and bottom cores of T4 for max. output	Voice	Top and bottom cores of T4 for max. ampl of curve. See Fig.4
2	High side to Test Point 2 in series with a .01mf., low side to chassis		Closed	Coil	Top and bottom cores of T3 for max. output	Coil	Top and bottom cores of T3 for max. ampl. of curve. See Fig. 4
3	Repeat steps 1 and 2.						
4	Inductively coupled to AM Antenna	1620KC	1620KC	Voice	AM osc (C1G) for max. output	Voice	AM osc (C1G) for max. ampl.
5		1500KC	1500KC	Coil	AM ant (C1E) for max. output	Coil	AM ant (C1E) for max. ampl.
6	Repeat steps 1, 2, 3, and 4.						

FM ALIGNMENT

Step	Sweep Generator Input Point Keep Sweep Output Low	Sweep Generator And Marker Setting	Tuning Condenser Setting	SWEEP ALIGNMENT: Connect Scope To Following In Series with 470K	SWEEP ALIGNMENT: Adjust	PEAK ALIGNMENT: Connect VTVM To Following Test Points In Series With 470K Res.	PEAK ALIGNMENT: Adjust
1	TP3 in series with .01mf. Low side to Chassis	10.7 MC unmodulated	Closed	TP4	T5 for max. (See fig. 5)	TP4	T5 for Max. DC Volts
2	TP3 in series with .01mf Low side to Chassis	10.7 MC unmodulated	Closed	TP5	To Top core for cross-over (Fig.6)	TP5	To Top core for 0 DC Volts
					To Bottom core for Max. Amp. & Symmetry (Fig. 6)	TP6	To Bottom core for Max. DC Volts
3	TP2 in series with .01mf Low side to Chassis	10.7 MC unmodulated	Closed	TP4	T2 for Max. Amp & Sym. (Fig. 5)	TP4	T2 for Max. DC Volts
4	TP1 in series with .01 mf (connect to FM RF stator)(see fig.2)	10.7 MC unmodulated	Closed	TP4	T1-2-5 for Max. Amp. (Fig. 7)	TP4	T1-2-5 for Max. DC Volts
5	TP1 in series with .01mf(connect to FM RF stator)	10.7 Mc unmodulated	Closed	TP5	Same as Step 2	Same as Step 2	Same as Step 2
6	Recheck	Steps 4-5					
	High side to right antenna terminal in series with 270 ohm res. Low side to bottom ant. terminal	108 MC Unmodulated	Open	TP4	FM osc (C1D) for centering of marker on peak (fig.5)	TP4	FM osc (C1D)
7		98 Mc unmodulated	Tune To 98 MC	TP4	FMRF Trimmer C1B For Max. (See fig 5).	TP4	FMRF Trimmer C1B for Max. DC Volts

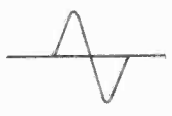


FIG. 4

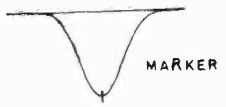


FIG. 5

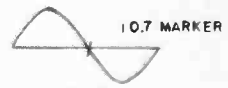


FIG. 6

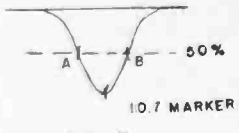


FIG. 7

A - 10.625 MARKER
B - 10.775 MARKER

PRELIMINARY REPLACEMENT PARTS LIST

CAT. NO.	SYMBOL	DESCRIPTION	PRICE
CAPACITORS			
RS-1818	C1	Tuning Capacitor.....	6.25
*-RS-2334	C2,R41	RC Network, 5mmf., .3 - 1 Meg.....	.30
*-RS-2335	C3,R42	RC Network, 470mmf., .3 - 1 Meg.....	.30
RS-1302	C4,33 C5	47mmf., 500V..... .001mf.,500V	.25
RS-1299	C6,12	20mmf., 500V.....	.25
RS-1298	C7	1.5mmf.,500V.....	.25
RS-1051	C8,36,43 51,53,56, 57	.001mf., 450V.....	.25
*-RS-2192	C9	.005mf.,1000V.....	.20
RS-1022	C13,19,38, 61,62	.01mf., 450V.....	.30
RS-1661	C23	33mmf., 150V.....	.25
RS-1023	C24,31,46, 52	.005mf.,450V.....	.25
RS-1297	C29	5mmf., 500V.....	.25
RS-1303	C30	100mmf.,500V.....	.25
RS-1327	C34	29mmf., 500V.....	.25
RS-1305	C35	15mmf., 500V.....	.25
	C37	.047mf.,200V	
	C39	.047mf.,400V	
RS-1325	C47A,B C49,54	50,80mf., 150V..... .001mf.,450V	1.90
RS-1518	C55	.01mf., 400V.....	.40
RS-2119	C60	3.3mmf.,500V.....	.40
COUPLATES			
RS-1315	R9,C40,41	47K, (2) 150mmf.,....	.85
RS-1316	R13,14,15 C27,28	(3) 100K., 470mmf., .001mf.....	.80
RS-1317	C42,45 R26,27,28	.005mf., .01mf., 6.8 meg, (2) 470K....	1.10
RS-1819	C32,R18	.001mf., 820 ohms....	.25
POTENTIOMETERS			
RS-1279	R23,S2	Volume Control, 2 Meg. and switch.....	1.00
RS-1280	R25	Tone Control, 5 Meg..	1.85
RESISTORS			
RS-1441	R29	150 ohms, 5W.....	.50
RS-1440	R31	22 ohms, 1W.,Flexible Resistor.....	.30
RS-1824	R40	1850 ohms, 5W.....	.50
COILS AND TRANSFORMERS			
RS-1289	T1	1st FM I.F. Trans....	2.45
RS-1311	T2	2nd FM I.F. Trans....	2.45
RS-1321	T3	1st AM I.F. Trans....	1.80
RS-1313	T4	2nd AM I.F. Trans....	1.80
RS-1527	T5	3rd FM I.F. Trans....	1.50
RS-1314	T6	Discriminator Trans..	3.35

CAT. NO.	SYMBOL	DESCRIPTION	PRICE
COILS AND TRANSFORMERS (CONT'D.)			
RS-1271	T7	Output Transformer.....	3.20
RS-1293	L1	RF Input Coil.....Pkg.2	.30
RS-1292	L2	FM RF Choke Coil....Pkg.2	.30
RS-1290	L3	FM Mixer Coil.....Pkg.2	.30
RS-1294	L4,6,10, 12,13,14	Osc., Antenna, (2) Output Choke Coils.....	.30
RS-1291	L5	FM Oscillator Coil Pkg.2	.30
RS-1318	L7	AM Osc. Coil.....	.70
RS-1322	L8	AM Antenna.....	1.60
RS-1328	L9	AFC, (2) Fil. Choke Coils Pkg.2	.30
RS-1835	L11	AM RF Choke Coil.....	.50
MISCELLANEOUS			
RB-1054		6" Speaker.....	6.25
RS-1127		Pulley.....Pkg.5	.25
RS-1158		Tube Shield (V1,V2).....Pkg.3	.30
RS-1266		Power Cord.....	1.00
RS-1274		RF Shield.....	3.00
RS-1275		Chassis Mtg. Insulator.....Pkg.3	.30
RS-1276		Spacer.....Pkg.5	.25
RS-1277		Bushing.....Pkg.2	.30
RS-1281		Band Switch.....	2.35
RS-1286		9-Pin Socket (V3).....	.35
RS-1287		7-Pin Socket (V1,V2).....	.30
RS-1308		9-Pin Socket (V7).....	.25
RS-1310		Tube Shield (V3).....Pkg.3	.30
RS-1430		Phono and Antenna Terminal Board..	.45
RS-1442		.4 Amp. Fuse, 150V.....	.70
RS-1482		Interlock.....	.25
RS-1492		FM Line Cord Antenna Clamp...Pkg.5	.25
RS-1671		Pilot Light, Mazda #1828.....	.75
RS-1781		Dial Cord (25yds. Bulk).....	2.50
RS-1791		7-Pin Socket, (V8).....Pkg.2	.30
RS-1792		7-Pin Socket, (V6).....	.25
RS-1817		Tuning Shaft Assembly.....	.45
RS-1820		I.F. Mtg. Clip.....Pkg.5	.25
RS-1821		"C" Washer.....Pkg.5	.25
RS-2064		Pulley Rivet.....Pkg.5	.25
RS-2191		Selenium Rectifier, (150 ma.).....	3.30
RS-2193		Pilot Light Socket.....	.55
*-RS-2194		Pilot Light Hood.....Pkg.3	.30
RS-9019		7-Pin Tube Shield, (V4,V5).....	.25
RS-9020		9-Pin Tube Shield, (V7).....	.25
CABINET AND APPEARANCE ITEMS			
RS-1326		Knob Clip.....Pkg.5	.25
*-RS-2181		Cabinet Back.....	.70
*-RS-2182		Medallion & Holder Assem. (T-150A)	.75
*-RS-2183		Medallion & Holder Assem. (T-151A)	.75
*-RS-2184		Back Plate.....	1.00
*-RS-2185		Crystal.....	3.90
*-RS-2186		Tone Knob Assembly.....	.40
*-RS-2187		Tun. or Vol. Control Knob Assembly	.40
*-RS-2188		Band Switch Knob Assembly.....	.40
*-RS-2189		Pointer.....	.50
*-RS-2190		Medallion.....	.40

*- Denotes Parts Not Previously Cataloged.

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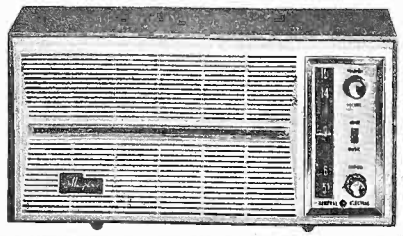
Prices Are Suggested List Prices And Subject To Change Without Notice.

PRELIMINARY SERVICE DATA

S-T155A
RADIO
MODELS
T-155A
T-156A

SPECIFICATIONS			
CABINET:	T155A Cocoa T156A Gray		
ELECTRICAL RATING:	105 - 120 Volts A.C. 60 cycles 30 Watts		
POWER OUTPUT:	Undistorted: .9 Watt Maximum: 1.4 Watts		
SPEAKER:	4", 3.2ohms @ 400 cps		
TUBE COMPLEMENT:	V1	R.F. Amplifier	12BA6
	V2	Osc. - Converter	12BE6
	V3	I.F. Amplifier	12BA6
	V4	Detector and Audio Amplifier	12AV6
	V5	Power Output	35C5
	V6	Rectifier	35W4



GENERAL INFORMATION

Always use an isolation transformer when servicing or aligning this receiver to protect personnel and test equipment.

When aligning, keep the signal input low and volume control set at maximum so the AVC will not affect the output.

TO REMOVE REAR PANEL

Pull down slightly on cabinet bottom with one hand, while lifting bottom of rear panel up and out with other hand. This will release the bottom locking tabs on the panel from the slots on the cabinet bottom. Then pull panel out and down, releasing top locking tabs from top slots.

TO REMOVE CHASSIS FROM CABINET

1. Remove rear panel as detailed above.
2. Pull out volume and tuning control knobs.
3. Remove four screws on cabinet bottom which fasten the chassis down.
4. Remove two hex-head screws fastening control panel to front panel.
5. Unsolder speaker leads.
6. Slide chassis out to rear.

PRELIMINARY REPLACEMENT PARTS LIST			
CAT. NO.	SYMBOL	DESCRIPTION	PRICE
CAPACITORS			
*-RS-2078	C1	Tuning Capacitor.....	5.20
RS-1191	C3	1.8mmf., 500V.....Pkg.2	.30
RS-1785	C4	47mmf., 500V.....	.25
	C5,20,21	.047mf., 200V	
	C6	.01mf., 1000V ♦	
RS-1204	C11	150mmf., 450V.....	.25
RS-1786	C12	220mmf., 450V.....	.25
RS-1638	C13	470mmf., 450V.....	.25
	C14,16	.022mf., 400V	
	C15	.047mf., 600V	
RS-1134	C18A,B	100mf., 50mf.,@150V.....	2.00
RS-1202	C19	6800mmf., 450V.....	.30
COILS AND TRANSFORMERS			
RS-1145	T1	R.F. Transformer.....	2.20
RS-1142	T2	Osc. Coil.....	.60
RS-1143	T3,4	I.F. Transformer.....	1.80
*-RS-2077	T5	Output Transformer.....	3.30

PRELIMINARY REPLACEMENT PARTS LIST (CONT'D.)			
CAT. NO.	SYMBOL	DESCRIPTION	PRICE
COILS AND TRANSFORMERS (CONT'D.)			
*-RS-2121	L1	Antenna Loop.....	2.00
POTENTIOMETER			
*-RS-2066	R8,S1	Vol. Cont., 2M, and On-Off Sw.....	2.20
MISCELLANEOUS			
RB-1054		Speaker, 6".....	6.25
RS-1127		Pulley.....Pkg.5	.25
RS-1213		Pilot Light Socket.....	.55
RS-1221		Tone Switch.....	.35
RS-1323		Pilot Light.....	.25
RS-1455		Power Cord.....	1.00
RS-1781		Dial Cord (25 yds. bulk).....	2.50
RS-1791		Socket, 7 pin.....Pkg.2	.30
RS-1792		Socket, 7 pin w/center post.....	.25
RS-2065		Interlock.....Pkg.2	.30
*-RS-2075		Tuning Shaft Assembly.....	.60
Δ-RS-2076		Pulley (was RMW-038).....Pkg.2	.30
RS-2082		Knob Clip.....Pkg.5	.25
*-RS-2136		Retaining Ring.....Pkg.5	.25
RS-2153		Pulley.....Pkg.5	.25
CABINET AND APPEARANCE ITEMS			
*-RB-1112		Grille Assembly with Medallion, Trim Strip, T155A.....	3.10
*-RB-1113		Cabinet, Cocoa, T155A.....	6.00
*-RB-1123		Grille Assembly with Medallion, Trim Strip, T156A.....	3.10
*-RB-1124		Cabinet, Gray, T156A.....	6.00
*-RS-2068		Medallion.....	.25
*-RS-2069		Trim Strip.....	.50
*-RS-2070		Knob Assembly with insert.....	.35
*-RS-2071		Escutcheon.....	1.80
*-RS-2072		Pointer.....	.40
*-RS-2073		Crystal.....	.70
*-RS-2074		Crystal Back.....	.50
*-RS-2079		Cabinet Back.....	.35

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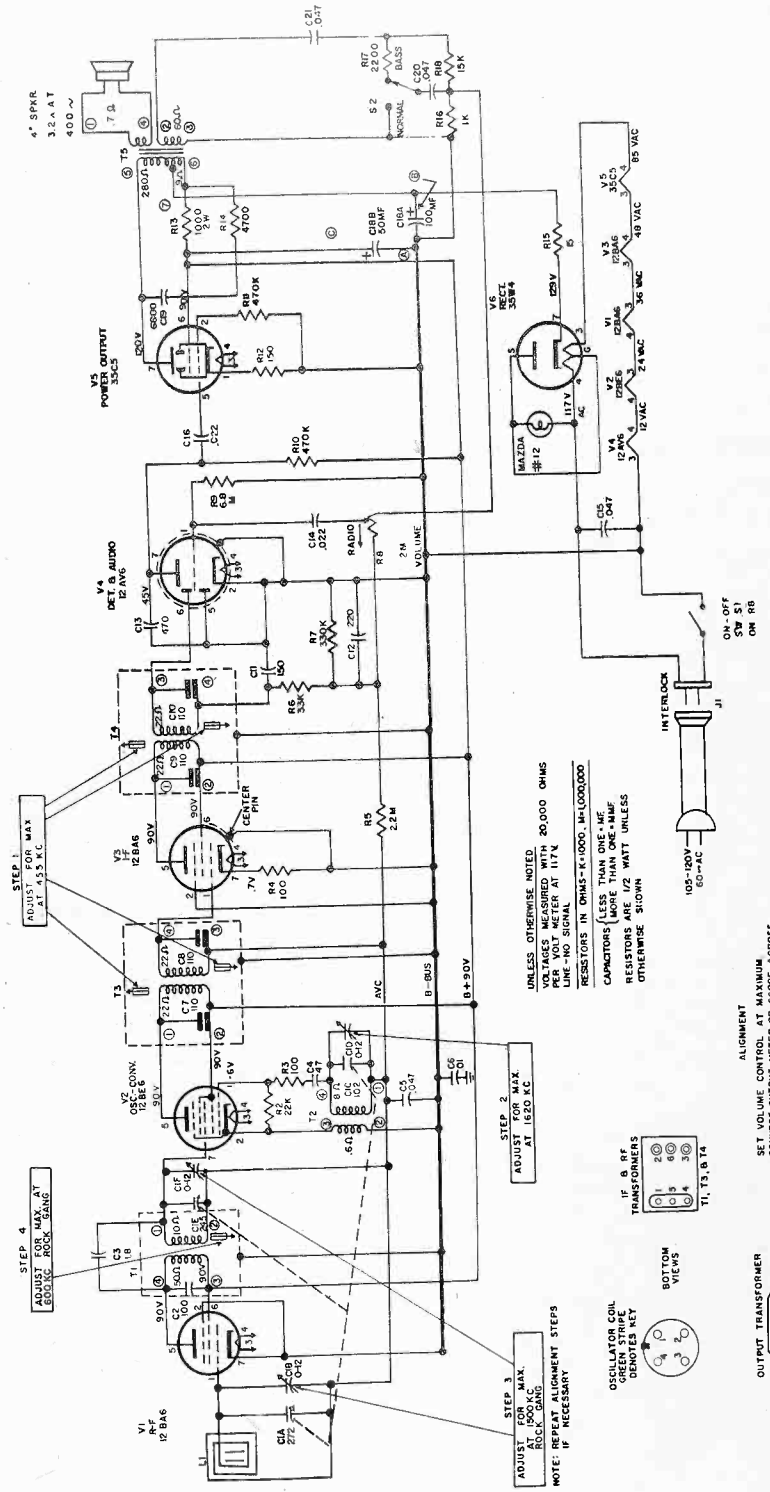
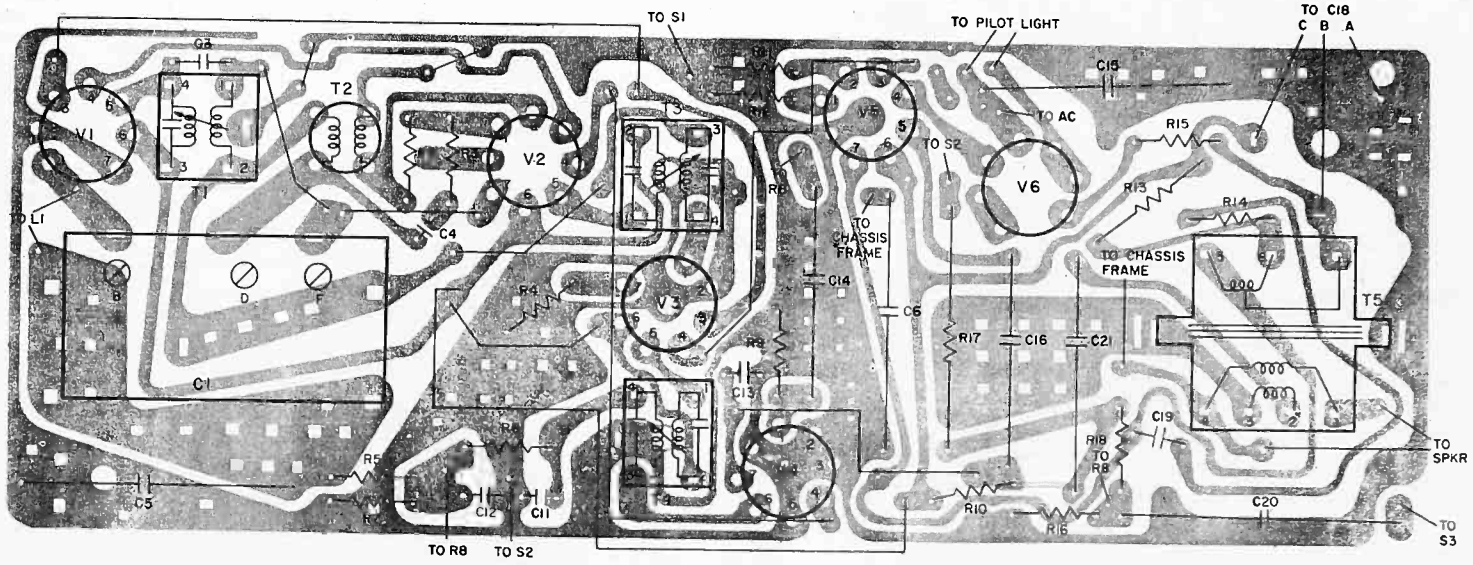


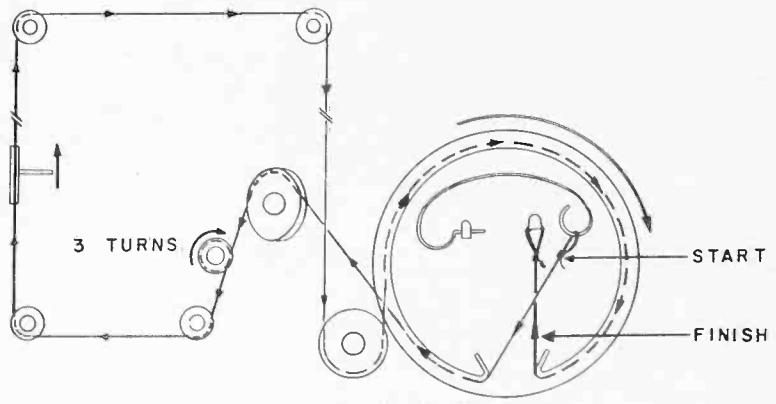


Resistance Chart

Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7
V1-12BA6	2.7M	0	44	30	1250*	1250*	0
V2-12BE6	22K	22	30	17	1250*	1250*	2.7M
V3-12BA6	2.7M	0	44	58	1250*	1250*	100 or 120
V4-12AV6	6.8M	0	0	17	0	363K	420K*
V5-35C5	150	470K	58	85	470k	1250*	260
V6-35W4	0	0	85	125	120	125	20k(min.)

* Measured from pin 7 of V6.
S1 in "off" position.

All measurements taken with respect to B- unless otherwise designated.
Measurements taken with VTVM.



DIAL STRINGING

PRELIMINARY SERVICE DATA

S-C430A
RADIO
MODELS
C-430A
C-431A

SPECIFICATIONS		
CABINET:	C430A Antique White C431A Pink	
ELECTRICAL RATING:	105 - 120 Volts A.C., 60 cycles 30 Watts	
POWER OUTPUT:	Undistorted: 1 Watt Maximum: 1.5 Watts	
SPEAKER:	4", 3.2 ohms @ 400 cps	
TUBE COMPLEMENT:	V1 Osc. Conv. 12BE6 V2 I.F. Amplifier 12BA6 V3 Det. and Audio Amplifier 12AV6 V4 Power Output 50C5 V5 Rectifier 35W4	

GENERAL INFORMATION

Service on defective clock units (Telechron Catalog Number C103G99) should be referred to the nearest G. E. Servicenter or G. E. Service Station.

Always use an isolation transformer when servicing or aligning this receiver to protect personnel and test equipment.

When aligning, keep the signal input low and volume control set at maximum so the AVC will not affect the output.

TO REMOVE CHASSIS

Remove tuning, volume, timer, and time-set knobs. Then remove five hex-head screws on cabinet back, and four hex-head screws on cabinet bottom. Unscrew four Phillips head screws to remove timer. After unsoldering speaker leads, pull chassis out slowly. Leave leads from chassis to timer attached for A.C. power while troubleshooting.

PRELIMINARY REPLACEMENT PARTS LIST

CAT. NO.	SYMBOL	DESCRIPTION	PRICE
CAPACITORS			
RS-1480	C1	Capacitor, Tuning....	3.80
RS-1785	C2 C6	47mmf., 500V..... .047mf.,200V	.25
RS-2045	C9A,B,C,D R4A,B,C C10	Bullplate..... .047mf.,600V	1.00
Δ-RS-2151	C11A,B	Elect. Cap.,75,30mf., 150V (was RCE-231)	2.10
RS-1022	C12	.01mf., 450V.....	.30
RS-2056	C13	.01mf.,1000V.....	1.25
POTENTIOMETER			
*-RS-2150	R3	Vol. Control,500K....	.95
COILS AND TRANSFORMERS			
Δ-RS-2149	T1,T2	I.F. Transformer (was RTL-197).....	1.40
*-RS-2148	T3	Output Transformer...	2.10
RS-1481	L1	Iron Core Antenna....	1.20
RS-1479	L2	Oscillator Coil.....	.50

PRELIMINARY REPLACEMENT PARTS LIST (CONT'D)

CAT. NO.	DESCRIPTION	PRICE
MISCELLANEOUS		
RB-1057	Speaker, 4".....	5.45
RS-1168	Rivet, Power Cord.....Pkg. of 5	.25
RS-1174	Plate, Power Cord.....Pkg. of 5	.25
RS-1179	Bracket, Antenna.....Pkg. of 3	.30
RS-1183	Terminal Lug.....Pkg. of 3	.30
RS-1188	Clamp, Antenna.....Pkg. of 2	.30
RS-1781	Dial Cord (25yds Bulk).....	2.50
RS-1791	Tube Socket.....Pkg. of 2	.30
RS-1792	Tube Socket (with center pin)...	.25
RS-1809	Clip, Tubular (Speaker)Pkg. of 3	.30
RS-1821	Retaining Ring, Tuning Shaft ...Pkg. of 5	.25
RS-2062	Power Cord.....	1.40
RS-2065	Interlock.....Pkg. of 2	.30
Δ-RS-2152	Tuning Shaft Assembly (was RMX-343).....	.50
Δ-RS-2153	Pulley, Tuning Shaft (was RMW-037),Pkg. of 5	.25
Δ-RS-2154	Pulley, Volume Shaft (was RMW-088),Pkg. of 3	.30
Δ-RS-2155	Spring, Tuning Drum (was RMS-130),Pkg. of 2	.30
Δ-RS-2156	Clip, Dial Light (was RHC-111) ...Pkg. of 5	.25
Δ-RS-2158	Socket, Dial Light (was RWX-058)	.90
CABINET AND APPEARANCE ITEMS		
*-RB-1115	Cabinet Front, Antique White, C430A.....	3.60
*-RB-1116	Cabinet Front, Pink C431A.....	3.60
*-RB-1117	Cabinet Back, Antique White, C430A.....	2.00
*-RB-1118	Cabinet Back, Pink C431A.....	2.00
RS-2040	Knob, Volume and Tuning.....	.35
RS-2067	Knob, Time Set.....Pkg. of 5	.25
*-RS-2147	Dial Scale and Window.....	2.30
Δ-RS-2157	Dial Back Window - Translucent (was RDW-112)	.40
Δ-RS-2159	Dial Pointer Assembly (was RDP-090)....	.70
RS-2200	Knob, Clock (Lever Type) ...Pkg. of 2	.30

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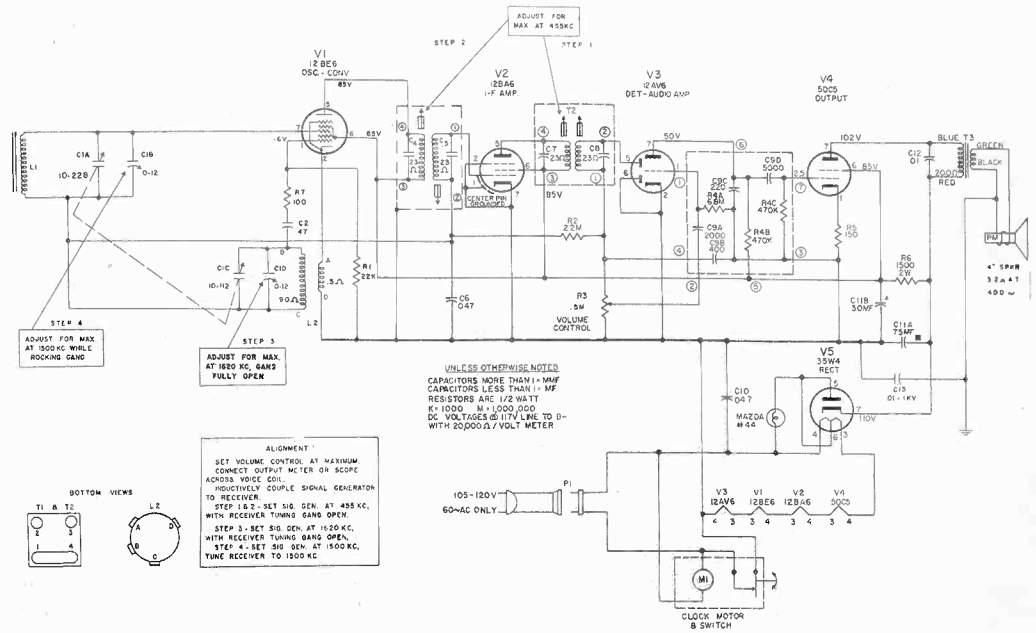


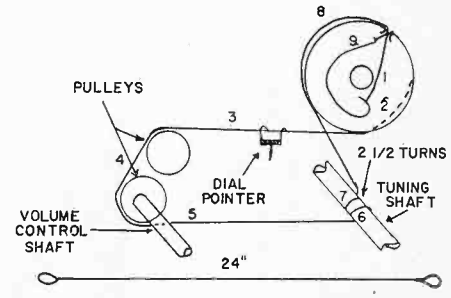
Tube Pin Resistance Chart

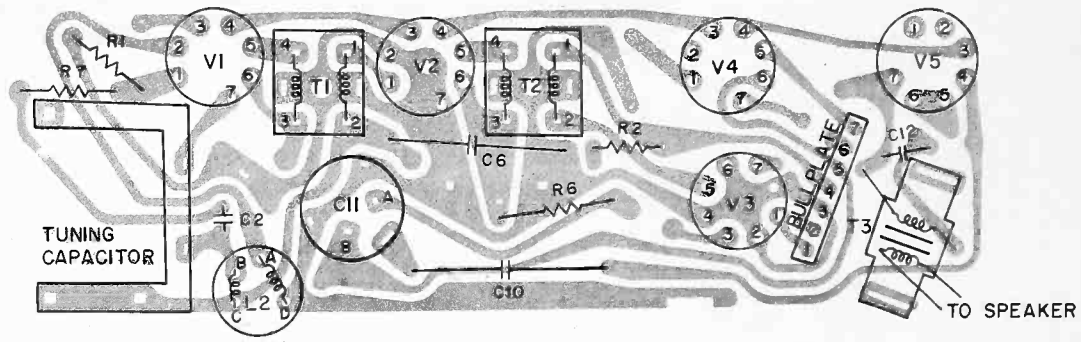
	1	2	3	4	5	6	7
12BE6	22k	0	12	24	1500*	1500*	2.7M
12BA6	2.7M	0	24	36	1500*	1500*	0
12AV6	6.8M	0	12	0	500K	0	470K*
50C5	150	470K	36	75	470K	1500*	200*
35W4	TP	TP	75	103	100	100	20K(Min.)

* Measured from pin 7 of V5.
All readings unless marked are from socket pin to B-

TP Tie Point.

DIAL STRINGING





PRELIMINARY SERVICE DATA

S-RP1160A
RADIO/PHONO
MODEL
RP1160A

SPECIFICATIONS		
CABINET:	RP1160 Grey - Wood, Fabric Covered	
ELECTRICAL RATING:	105-120 volts 60 cycle AC 75 Watts	
POWER OUTPUT:	Undistorted 3.1 Watts Maximum 5.5 Watts	
TUBE COMPLEMENT:	Oscillator-Converter I.F. Amplifier Detector and Audio Amplifier Audio Output Rectifier	6BE6 6BA6 6AV6 6AQ5 5Y3
RECORD CHANGER:	Model Ch14 4 speed automatic changer with 117 volt AC motor.	
PHONOGRAPH PICKUP:	Stereo dual sapphire styli Astatic 13T or equivalent	

The information contained in this service note covers Model RP1160A except for the record changer. Service information and parts list for the record changer are covered in service note publication ER-S-CH10.

TO REPLACE TUBES

1. Open cabinet lid.
2. Remove screws holding vent panel cover and interlock.
3. Remove vent panel cover (interlock is automatically disconnected.)

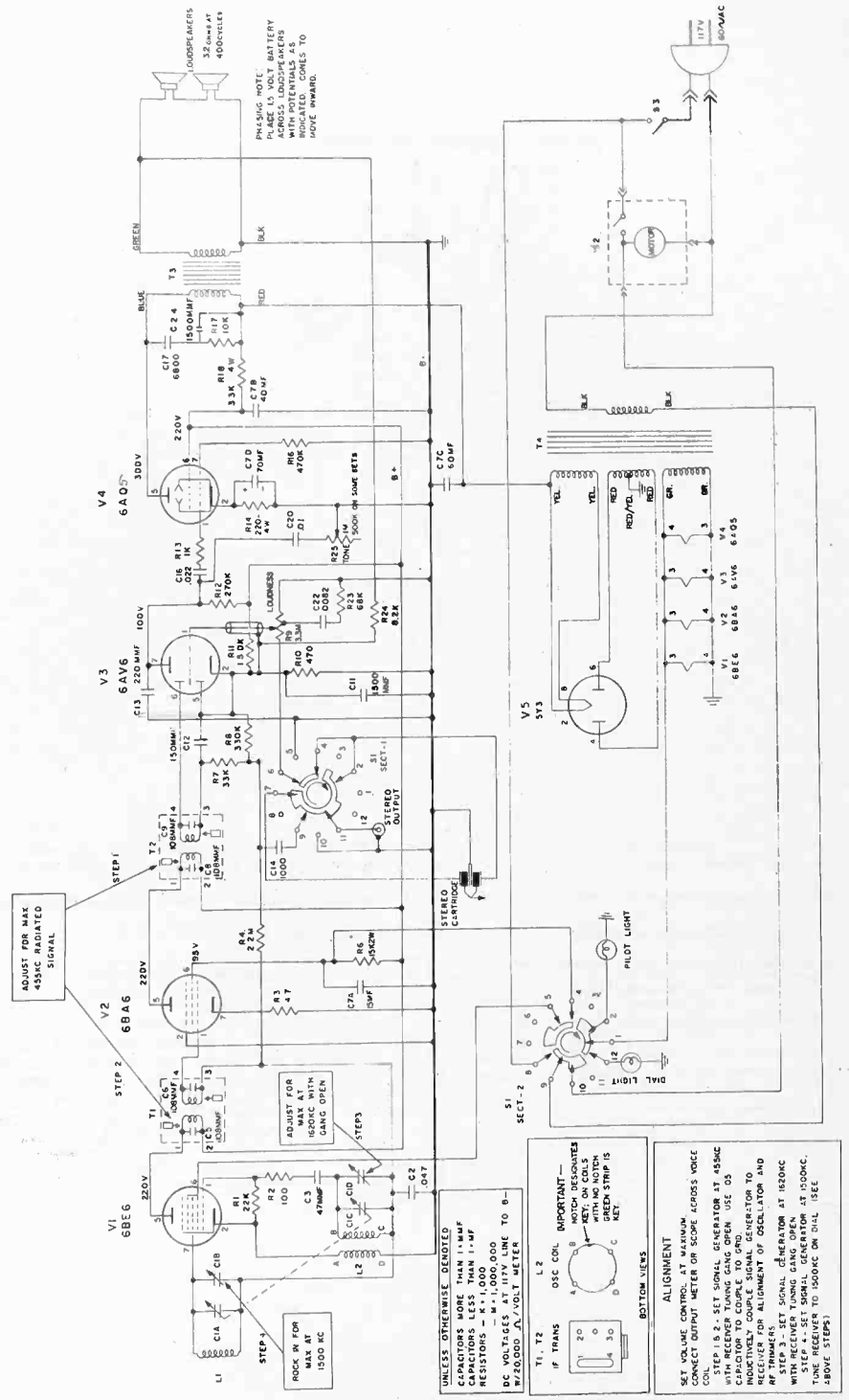
TO REMOVE CHASSIS

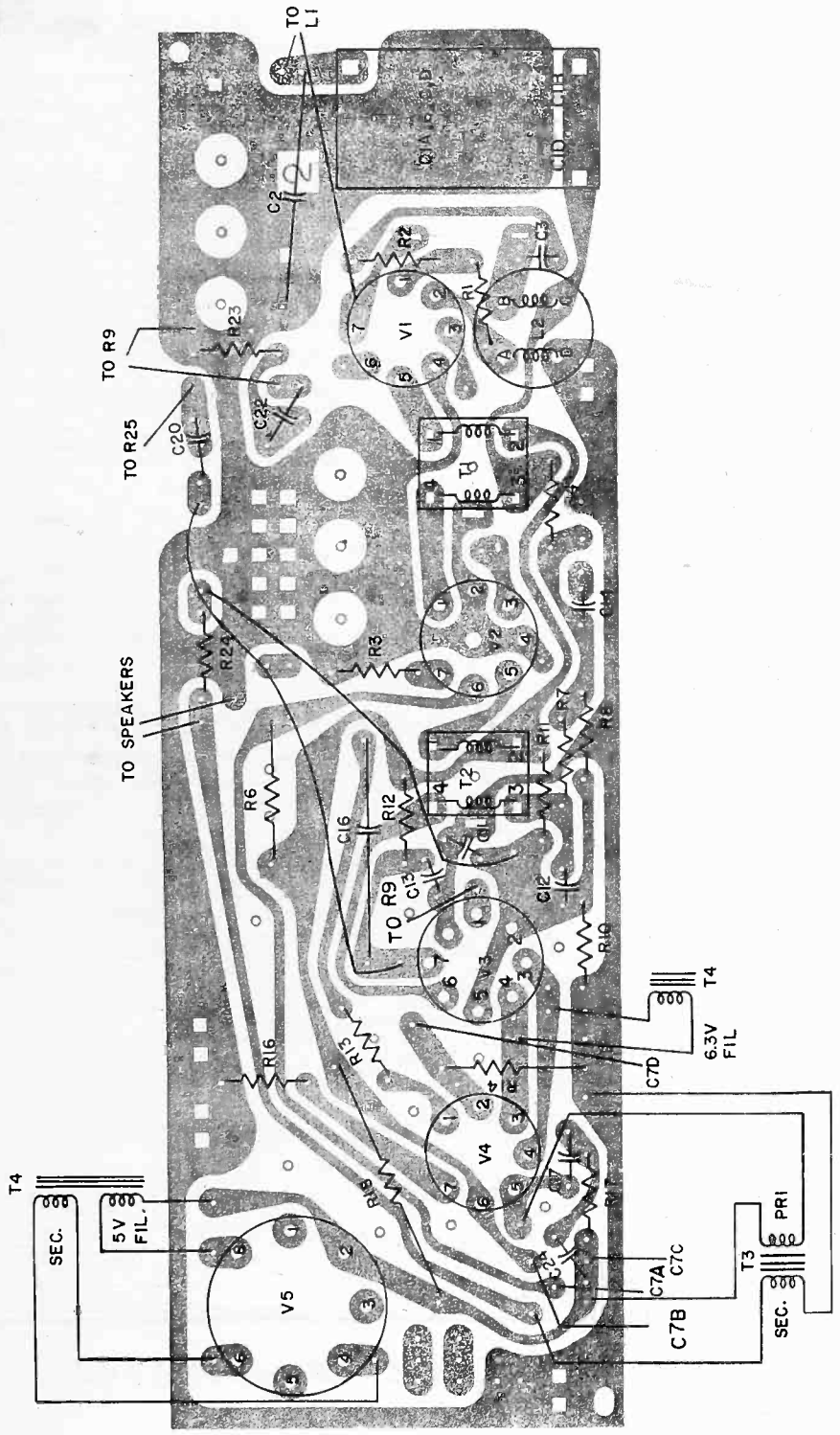
1. Follow steps 1 through 3 as above.
2. Remove knobs.
3. Remove screws holding ventilated speaker compartment panel, remove panel.
4. Remove screws holding interlock connector.
5. Remove screws (holding grille bottom and chassis) from bottom of cabinet.
6. Remove grille by sliding out and down from bottom, be careful not to break speaker and antenna wires.
7. Remove compartment light from antenna bracket.
8. Remove antenna screws from brackets.
9. Remove screws from top and bottom of metal chassis front plate. (It is not necessary to remove plastic dial assembly from chassis front plate.)
10. Turn clips on bottom of the shipping screws parallel to the screws.
11. Lift record changer free of mounting board.
12. Remove screw holding electrolytic.
13. Disconnect plug.
14. Unsolder and label the shielded signal wires (that go to the Stereo-Mono-Radio switch) from the terminal board on bottom of changer.
15. Loosen nuts holding power transformer mounting plate and slide chassis, electrolytic, antenna and compartment light out the front of the cabinet.

TO REMOVE RECORD CHANGER

1. Remove screws (holding grille bottom) from bottom of cabinet, along front edge.
2. Remove grille by sliding out and down from bottom being careful not to break speaker and antenna wires.
3. Slide hand under record changer and turn clips on bottom of shipping screws parallel to the screws.
4. Lift record changer clear of motor board.
5. Unsolder and label the shielded signal wires (that go to the selector switch) from the terminal board on the changer.
6. Unsolder and label shielded signal wires from terminal board to the stereo outlet jack.
7. Disconnect plug.
8. Remove record changer from cabinet.

REPLACEMENT PARTS LIST			
CAT. NO.	SYMBOL	DISCRIPTION	PRICE
		CAPACITORS	
RS-1202	C17	6800mmf	.30
RS-1204	C12	150mmf	.25
*-RS-1785	C3	47mmf	.20
*-RS-1786	C13	220mmf	.20
*-RS-1787	C1A,B,C,D	Tuning Capacitor	3.90
*-RS-1788	C7A,B,C,D	60mf., @400V., 40mf., @300V., 15mf., @150V., 70mf., @25V.	3.75
RS-1022	C20	.01mf	.30
RS-1051	C14	1000mmf	.20
RS-1112	C22	8200mmf	.30
*-RS-2122	C11,24	1500mmf	.30
	C2	.047mf	
	C16	.022mf	
		POTENTIOMETERS	
*-RS-1783	R9	Loudness Cont. 3.3m	1.95
*-RS-1784	R25	Tone Cont. 1m	1.00
		RESISTORS	
*-RS-1782	R18	3.3k Resistor 4 Watt	.50
*-RS-1822	R14	220 ohms 4 Watt	.50
		COILS AND TRANSFORMERS	
RS-1143	T1,2	1st and 2nd I.F. Trans.	1.80
*-RS-1793	T3	Output Transformer	3.40
*-RS-1794	T4	Power Transformer	13.00
*-RS-1796	L2	Osc. Coil	.75
*-RS-1797	L1	Antenna	1.90
		MISCELLANEOUS	
RB-1054		Speaker 6"	6.25
RS-1127		Pulley	.05
RS-1612		Powercord	1.00
RS-1323		Pilot Light Mazda #12	.25
RS-1598		Holder, Cartridge	1.00
RS-1611s		Spindle (45 RPM)	2.95
RS-1647		Socket, Tube (V5)	.25
RS-1650		Socket, Pilot Light	.40
RS-1651s		Cartridge, Stereo	6.95
RS-1658		Fastener, Output Trans. to Mtg. plate	.05
RS-1669		Receptacle, AC	.15
*-RS-1771		Tuning Shaft Assem	.60
*-RS-1779		Fastener, Power Trans. to Mtg. plate	.05
*-RS-1780		Clip, Dial Plate to Grille	.02
Δ-RS-1781		Dial Cord (was RDC032)	2.50





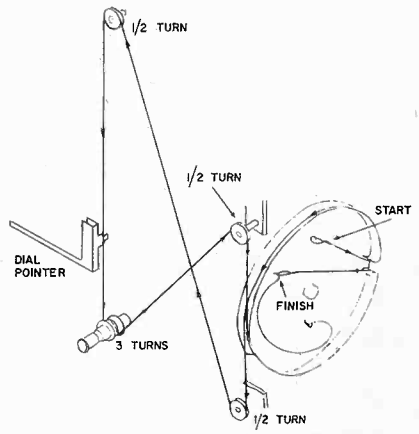
REPLACEMENT PARTS LIST (CONT'D)					
CAT. NO.	DESCRIPTION	PRICE	CAT. NO.	DESCRIPTION	PRICE
	MISCELLANEOUS (cont'd)			APPEARANCE ITEMS	
*-RS-1789	Switch, Selector	4.55	*-RS-1772	Trim Strip	.50
Δ-RS-1791	Socket, Tube V1,V4 (was RJS237)	.15	*-RS-1773	Crystal	.90
Δ-RS-1792	Socket, Tube V2,V3 (was RJS232)	.25	*-RS-1774	Dial Back	.70
*-RS-1795	Gasket, Speaker	.15	*-RS-1775	Pointer	.25
Δ-RS-1823	Connector, Stereo output (was RJS182)	.15	*-RS-1776	Knob, Tone and Loudness	.65
*-RS-2081	Shoulder Rivet	.05	*-RS-1777	Knob, Tuning	.65
*-RS-2082	Compression Ring (Knob)	.05	*-RS-1778	Knob, Stereo, Mono, Radio	.65

"*" Denotes New Items Not Previously Cataloged.

PRICES ARE SUGGESTED LIST PRICES SUBJECT TO CHANGE WITHOUT NOTICE.

All Parts Not Listed By Catalog Number Are Common Items, Obtainable From Radio Parts Jobbers.

Δ - Denotes part used in former radio/phono models. You may have it stocked under number shown in parenthesis. Please change your records to the new number with two-letter prefix.



RADIO DIAL STRINGING DIAGRAM

ER-S-T115A
COVERS
MODELS
T115A
T116A

FOR
TABLE RADIO RECEIVERS
(540-1600 KC., 455 KC., I-F.)

Supersedes Service Note S-T115-1

SPECIFICATIONS			
CABINET:	T115A, Brown; T116A, Ivory		
ELECTRICAL RATING:	Voltage 105-120 Volts AC or DC, 30 Watts		
POWER OUTPUT:	Undistorted .75 Watts Maximum 1.25 Watts		
SPEAKERS	(2) 6 1/2" and 4"; 3.2 ohms @ 400 cps.		
TUBE COMPLEMENT:	V1	R.F. Amplifier	12BA6
	V2	Oscillator-Converter	12BE6
	V3	I.F. Amplifier	12BA6
	V4	Det. & Audio Amplifier	12AV6
	V5	Power Output	35C5
	V6	Rectifier	35W4

GENERAL INFORMATION

The Models T115A and T116A are all-electron-tube radios. The two speakers are connected in series with terminals 1 and 4 of the output transformer. A pull-push, on-off volume control is used on these models.

TO REMOVE CHASSIS FROM CABINET

1. Remove five screws from cabinet back and remove back.
2. Pull off the three knobs.
3. Remove tone control from bracket.
4. Unsolder two leads which connect speakers to chassis.
5. Remove pointer bracket by turning tuning control so that pointer bracket is at extreme right; then remove dial string from pointer bracket and slide pointer bracket further to the right and off of rail.
6. Remove two screws from bottom rail.
7. Remove screws from tuning and volume control brackets.

TO REMOVE SPEAKERS

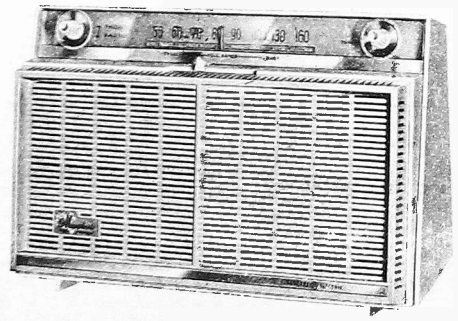
1. Follow steps 1-7 as above.
2. Remove tone control holder bracket by removing two screws.
3. Remove the six screws holding grille to cabinet front.
4. Label and unsolder remaining speaker leads.
5. Remove speaker by unscrewing screws on front of speaker.

Label the speaker leads before unsoldering them from the speakers; incorrectly connecting the leads will cause distorted audio.

NOTE: The radio-phono switch on the rear of the cabinet should be in the "radio" position before starting alignment procedures.

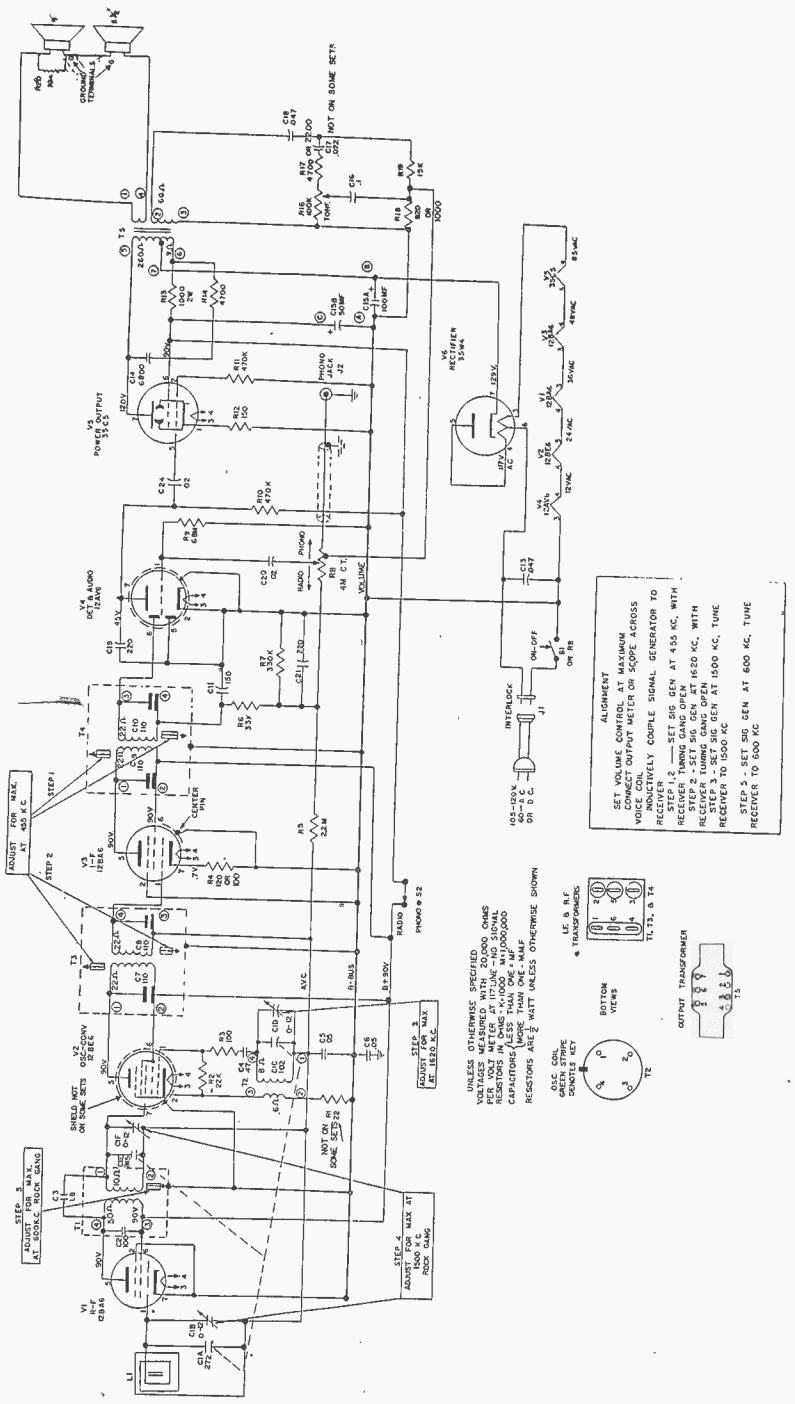
Always have Volume Control set for maximum, and reduce signal input so AVC will not affect output.

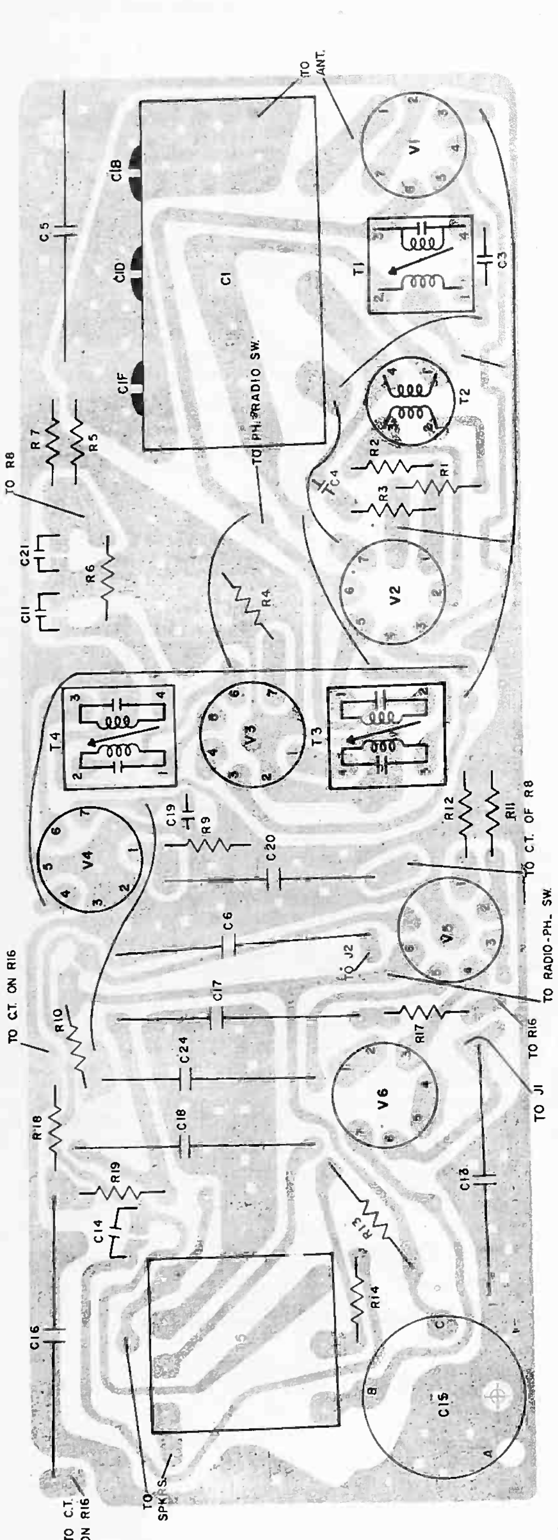
When servicing or aligning this receiver, always use an isolation transformer to protect test equipment and personnel.



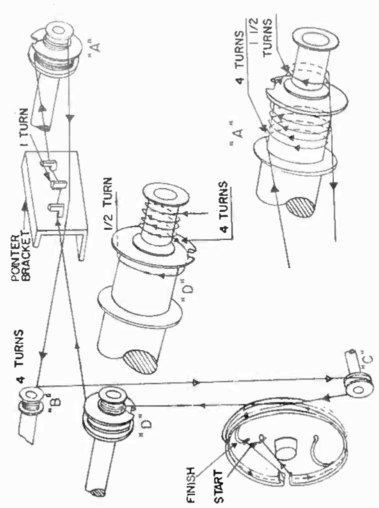
T115A, T116A

REPLACEMENT PARTS LIST			
CAT. NO.	SYMBOL	DESCRIPTION	PRICE
CAPACITORS			
*-RS-1134	C15A,B	100mf.,50mf.,150V.....	2.00
*-RS-1140	C1A,B,C,D,E,F	Tuning Capacitor.....	5.90
*-RS-1191	C3	1.8mmf., 500V.....	.15
*-RS-1202	C14	6800mmf., 450V.....	.30
*-RS-1203	C19,21	220mmf., 450V.....	.25
*-RS-1204	C11	150mmf., 450V.....	.25
RCW-3075	C4	47mmf., 500V.....	1.25
RCN-109	C13, 18	.047mf., 600V.....	.40
	C5, 6	.05mf., 400V.	
	C16	.1mf., 200V.	
	C17	.022mf., 200V.	
	C20,24	.02mf.,400V.	
POTENTIOMETERS			
*-RS-1131	R8	Control, Volume 4 meg.....	2.55
*-RS-1132	R16	Control, Tone 100K.....	1.20
COILS & TRANSFORMERS			
*-RS-1141	L1	Antenna.....	1.85
*-RS-1142	T2	Coil, Oscillator.....	.60
*-RS-1143	T3,4	Transformer, I.F.....	1.80
*-RS-1144	T5	Transformer, Output.....	3.75
*-RS-1145	T1	Transformer, R.F.....	2.20
MISCELLANEOUS ELECTRICAL			
*-RB-1017		Speaker, 6 1/2".....	6.60
*-RB-1036		Speaker, 4".....	4.85
*-RS-1128		Switch, Slide (radio-phono).....	.35





COMPONENT WIRING DIAGRAM



DIAL STRINGING

BEFORE STARTING THE STRINGING OPERATION, THE POINTER SHOULD BE MOVED TO EXTREME RIGHT WITH TUNING GANG IN A CLOSED POSITION. THE NOTCHES IN WINDLASSES MUST BE IN APPROXIMATE POSITIONS AS INDICATED BY "A" AND "D".

Resistance Chart

Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7
V1-12BA6	2.7M	0	44	30	1250*	1250*	0
V2-12BE6	22K	22	30	17	1250*	1250*	2.7M
V3-12BA6	2.7M	0	44	58	1250*	1250*	100 or 120
V4-12AV6	6.8M	0	0	17	0	363K	420K*
V5-35C5	150	470K	58	85	470K	1250*	260
V6-35W4	0	0	85	125	120	125	20K(min.)

* Measured from pin 7 of V6.
S1 in "off" position.
Radio-Phono switch in radio position.
All measurements taken with respect to B- unless otherwise designated.
Measurements taken with VTVM.

REPLACEMENT PARTS LIST (CONT'D.)

CAT. NO.	DESCRIPTION	PRICE
	MISCELLANEOUS ELECTRICAL	
RJJ-010	Plug, Interlock	.10
RJS-182	Jack, Phono	.15
RJS-232	Socket, Tube w/center pin, (V3)	.25
RJS-237	Socket, Tube	.15
RWL-039	Cord, Power	.95
	MISCELLANEOUS MECHANICAL	
*-RS-1122	Pointer Slide	.10
*-RS-1125	Tuning Shaft, Bushing & Windlass	.25
*-RS-1127	Pulley, Dial Cord	.05
*-RS-1146	Rivet, Shoulder, .650" Length	.05
*-RS-1147	Rivet, Shoulder, .470" Length	.05
RS-1168	Rivet, Shoulder, .778" Length	.05
*-RS-1149	Rivet, Shoulder, .203" Length	.05
*-RS-1150	Washer, Spring	.05
*-RS-1151	Screw, #4-40x1/8"	.03
RS-1174	Plate Fish Paper	.03
RS-1183	Clamp	.10

CAT. NO.	DESCRIPTION	PRICE
	MISCELLANEOUS MECHANICAL	
RS-1188	Clamp, Cable	.15
*-RS-1230	Clip	.03
RDC-032	Cord, Dial (bulk 25 yards)	2.50
RHM-043	Washer, "C"	.01
RMS-130	Spring, Dial Cord Tension	.15
	CABINET & APPEARANCE ITEMS	
*-RB-1012	Grille	3.60
*-RB-1013	Cabinet Front, (Brown), Dial Plate, and crystal, T115A	4.35
*-RB-1014	Cabinet Front, (Ivory), Dial Plate, and crystal, T116A	4.35
*-RB-1015	Cabinet Back, (Brown) T115A	5.15
*-RB-1016	Cabinet Back, (Ivory) T116A	5.15
*-RS-1116	Plate, Dial	.35
*-RS-1117	Crystal	1.25
*-RS-1118	Knob, Volume & Tuning	.60
*-RS-1119	Knob, Tone Control	.10
*-RS-1120	Medallion	.30
*-RS-1123	Pointer	.15

* - Denotes Parts Not Previously Cataloged.

All Parts Not Listed By Cat. Nos. Are Common Items, Obtainable From Radio Parts Jobbers.

Prices Are Suggested List Prices And Subject To Change Without Notice.

PRELIMINARY SERVICE DATA

S-T120-1
COVERS
MODELS
T120A,B

SPECIFICATIONS	
CABINET:	Brown - T120A,B
ELECTRICAL RATING:	105-120 volts AC-DC 40 Watts
TUNING RANGE:	AM 540-1600 KC. FM 88-108 MC.
I. F.	AM 455 KC. FM 10.7 MC.
POWER OUTPUT:	Undistorted: 1 Watt Maximum: 1.5 Watts
SPEAKERS:	(2) 6" PM 3.2 ohms @ 400 cps.
TUBE COMPLEMENT:	V1-FM RF Amplifier..... 6BJ6 V2-FM Mixer..... 6AB4 V3-FM Oscillator-AFC..... 12AT7 V4-AM Conv.--1st FM IF..... 12AU6 V5-AM IF--2nd FM IF..... 12BA6 V6-Limiter..... 12AU6 V7-Detector--AVC--Discriminator-- Audio Amplifier..... 19T8 V8-Power Amplifier..... 35C5

GENERAL INFORMATION

The Models T120A and T120B are AM-FM superheterodyne radio receivers. The circuit employs the latest engineering designs for AM-FM reception.

The difference between the T120A and T120B is the type of capacitor used for the FM oscillator(C1D). The T120A employs a slug-tuned trimmer capacitor and the T120B uses a fixed 1.5mmf ceramic disc capacitor.

One of the distinct differences between AM and FM is the method of signal modulation. The AM radio frequency carrier wave is amplitude modulated and the FM carrier wave is frequency modulated. This results in several FM advantages over AM which are:higher fidelity, noise-free reception, and little or no interference between stations.

A built-in ferrite rod antenna is provided for AM reception.

The power line cord is used as the built-in FM antenna. The clamp on the power line cord is attached to the right hand terminal on the FM antenna terminal board. Keep the power cord leading to the electrical outlet free from other wires and extended to its fullest length; changing the position of the cord slightly may improve reception.

Do not connect ground wires to the FM receiver at any time.

Due to the circuitry of some types of tape recorders, a hum may be heard when it is plugged into the receiver. If reversing the receiver power plug and the tape recorder power plug in the wall outlet does not eliminate the hum, an isolation transformer will be required. The isolation transformer rating should be 105-117 volts, 50 watts, such as a Stancor transformer model P6410 or Chicago transformer model IS50. Plug the isolation transformer into the wall outlet and insert the receiver power cord into the isolation transformer.

TROUBLESHOOTING

Troubleshooting or repairing a defective FM set is generally similar to servicing an AM receiver.

The power supply and audio output stages are common to both AM and FM. These two stages can be eliminated immediately in the receiver as a cause for defective FM performance as long as the AM is satisfactory. The circuits in which FM defects may occur are the RF, oscillator, IF, limiter, or discriminator stages.

To test the FM oscillator, check the grid bias voltage. A voltage of -.7V.D.C. will indicate that the oscillator is operating. With the oscillator operating properly, the RF can be checked by attaching the signal generator to the antenna terminals and checking the output of the RF stage for a deflection on a 3 VDC VTVM connected to terminal 1 of V4.

Correcting trouble in the RF requires care due to the critical values of coils and lead dressings. Caution must be exercised not to rearrange or adjust coils without definitely knowing the trouble, as rearranging leads or components may mean readjusting the circuit and alignment.

No AM on the low frequency portion of the AM band may be caused by the AM oscillator becoming inoperative. The oscillation can usually be restored by:

1. Replace C12 with a 33mmf. 500V. ceramic disc capacitor.
2. Replace L11 with a 10uh choke(catalog number RS-1473.)

If proper operation of the AM does not result, make routine checks of other AM oscillator circuit components.

The following is a brief resume of the various stages in the receiver:

POWER SUPPLY

The power supply consists of a 100 mil selenium rectifier and a 80mf.-50mf. electrolytic capacitor. It is common to both AM and FM. An inoperative power supply will affect both AM and FM operation.

AUDIO AMPLIFIERS

The audio amplifier sections, V7 and V8, are also common to AM and FM. To check for operation, turn volume control to maximum and apply an audio signal to the high side of volume control.

DISCRIMINATOR

The discriminator (V7) is used to demodulate the IF signal. The frequency variations are changed back to voltage variations that vary in accordance with the audio or modulating voltage. The discriminator performs a function somewhat similar to the 2nd detector in an AM superheterodyne receiver.

LIMITER

The limiter (V6) receives the amplitude modulation and provides at its output a constant amplitude for the discriminator. The variations in amplitude, such as atomospheric interference and man-made noises are cut off and a constant level of amplitude is continuously produced at the limiter output. This results in considerable reduction of unwanted noise.

I. F.

The IF transformers are T3 and T4 for the AM; and T1, T2, and T5 for the FM. The IF can be checked as described in the alignment chart.

RF SECTION

The RF section consists of the RF amplifier (V1) mixer (V2) and FM oscillator (V3). A separate mixer and oscillator are used to prevent interaction between the two stages. These three stages are designed to operate at higher frequencies than required for AM.

AFC

AFC is a unique feature which allows drift-free tuning on FM signals. The oscillator frequency will automatically shift with the incoming signals to maintain an exact difference between the incoming signal and oscillator at all times, thereby, compensating for drift or slight errors in manual tuning. This shift in oscillator frequency automatically tunes in the incoming signal for clearest reception. The output voltage variations from V7 are fed into grid 7 of V3(AFC section) which varies the inductance across the oscillator grid circuit thereby stabilizing the oscillator exactly on frequency.

TO REMOVE CABINET

1. Remove 2 cab. rear screws & separate front & back.
2. Chassis can remain on cabinet front for troubleshooting and alignment.

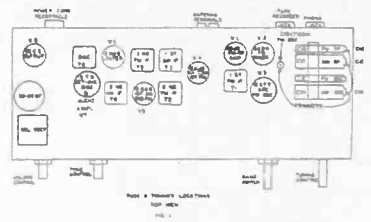
(Knobs are removed by releasing captive clips with a screwdriver.)

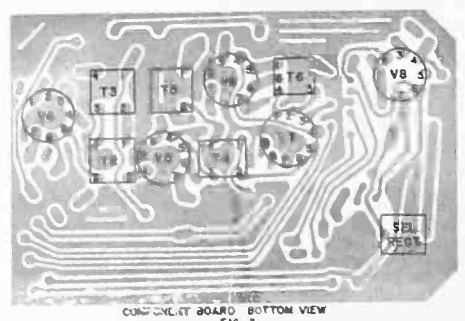
TO REMOVE A SPEAKER

1. Same as No. 1 above.
2. Unscrew the six hex-head screws holding the grille to the cabinet front.
3. Label and unsolder speaker leads from speaker terminals. Reversed speaker leads will cause distorted audio.
4. Unscrew the four screws around front of speaker and remove the speaker from cabinet front.

Alignment Equipment:

1. Isolation Transformer.
2. Oscilloscope.
3. AM-FM signal generator with sweep.
4. Marker generator (or 10.7mc,98mc, 108mc crystals)
5. VTVM.
6. .05 mf., 400V. paper capacitor.
7. 1/2 meg. 1/2 W. carbon resistor.
8. 270 ohm 1/2 W. carbon resistor.
9. Alligator clips.





CONSOLIDATED BOARD BOTTOM VIEW
FIG. 2

CAUTION

Always use an isolation transformer when servicing or aligning this receiver to protect test equipment and personnel.

ALIGNMENT NOTES

Read carefully all instruction and operating manuals for each piece of test equipment. A complete understanding of all test equipment will be a valuable assistance before starting alignment procedures on a receiver.

Before the test equipment is turned on, be sure ground connections are secure between all test equipment and receiver.

The AM alignment should always be checked before proceeding with the FM alignment.

AM

The AM alignment can be accomplished with a VTVM or an oscilloscope as the output monitor. All VTVM output readings will be observed on an AC volt scale. See the alignment chart for the step by step procedure.

Set the band switch to "AM" position.

Turn volume control to maximum volume position and adjust the signal generator output control for alignment signal.

The position of the receiver should not be changed during alignment to prevent possible errors in output readings.

FM

The proper method for FM alignment of this receiver is by using an oscilloscope, signal-sweep generator, and a marker generator (or crystals may be used for the necessary marker pips of 98 mcs, 108 mcs, and 10.7 mcs. The crystals can be inserted into the crystal marker receptacles on most signal sweep generators.

Set band switch to FM position.

Set volume control to minimum position.

Set sweep width control on sweep generator to 150KC.

A marker is needed to properly align the receiver for sweep, band width, and sensitivity.

The receiver may be aligned without the use of the markers, but accuracy in obtaining the proper side bands and sensitivity is greatly reduced due to the inability of establishing correct limits for the response curve.

The marker generator output may be inductively coupled as near to the sweep input point as possible or inserted into the marker input jack on the signal sweep generator.

The frequency setting of the marker generator if used, is the same as the sweep generator setting for each step as shown in the FM alignment chart.

Marker pips should always be kept to a minimum amplitude to prevent distortion of the response curve.

The position of the receiver should not be changed during alignment to prevent possible error in output readings.

When replacing FM components in the tuner section, mount replacement part exactly as the original and carefully dress leads to the components.

A 1/2" piece of bus wire can be soldered to each test point on the dip-soldered side of chassis board, so that the test equipment can be attached more readily to the test point with an alligator clip.

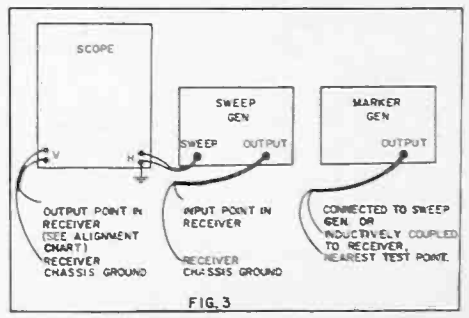


FIG. 3

AM ALIGNMENT CHART

Step	Signal Generator Input Point	Gen. Setting	Receiver Tuning	VTVM OUTPUT: Connect VTVM Across	VTVM OUTPUT: Adjust the following	OSCILLOSCOPE OUTPUT: Connect Scope Across	OSCILLOSCOPE OUTPUT: Adjust the following
1	High side to Test Point 3 in series with a .05mf., low side to chassis.	455 KC 30 % Mod. with 400 cycles	Gang	Voice	Top and bottom cores of T4 for max. output	Voice	Top and bottom cores of T4 for max. ampl of curve. See fig. 4.
2	High side to Test Point 2 in series with a .05 mf., low side to chassis		Closed	Coil	Top and bottom cores of T3 for max. output	Coil	Top and bottom cores of T3 for max. ampl. of curve. See Fig. 4.
3	Repeat steps 1 and 2.						
4	Inductively coupled to AM Antenna	1620KC	1620KC	Voice Coil	AM osc (C1G) for max. output	Voice Coil	AM osc (C1G) for max. ampl.
5		1500KC	1500KC		AM ant (C1E) for max. output		AM ant (C1E) for max. ampl.
6	Repeat steps 1, 2, 3, and 4.						

FM ALIGNMENT CHART

Step	Signal Sweep Gen. Input Point. (Keep Sweep Gain Low)	Gen. Setting	Rec'r. Tuning	Connect Scope To	Adjust the following
1	High side to Test Point 3 in series with a .05mf. Low side to chassis	10.7 MC Unmodulated	Gang Closed	Test Point 4 in series with a 1/2 meg res.	T5 for max. ampl. of curve. See fig. 5A.
2	Test Point 2 in series with a .05 mf. Low side to chassis.	10.7 MC Unmodulated	Gang Closed	Test Point 4 in series with a 1/2 meg. res.	T2 cores for max. ampl. of curve. See fig. 5A.
3	Repeak T5				
4	Test Point 1 (Stator Lug on C1A.)	10.7 MC Unmodulated	Gang Closed	Test Point 4 in series with a 1/2 meg. res.	T1 cores for max. ampl. See Fig. 5A.
5	High side to right FM Ant. Term. in series with a 270 ohm resistor. Low side to left FM Ant. Term.	10.7 MC Unmodulated	Gang Closed	Test Point 5 (high side of Vol. Cont.) series with a 1/2 meg. res.	Top core of T6 for centering curve on reference line. Bottom core for max. ampl. See Fig. 5B.
6	Repeak T1, T2, and T5.				
7	Repeat steps 5 and 6				
8 (T120A only)	High side to right FM Ant. Term. in series with a 270 ohm res. Low side to left FM Ant. Term.	108 MC Unmodulated	Gang Open	Test Point 4 in series with a 1/2 meg. res.	Peak FM Osc. trimmer (C1D) for centering of marker on peak. (See fig. 5A)
8 (T120B only)					Adjust spacing of FM Osc. coil (L5) by "knifing" coil with insulated screwdriver or aligning tool. Center marker on peak. (See fig. 5A)
9	Same as 8	98 MC Unmodulated	Tune to 98MC	Test Point 4 in series with a 1/2 meg. res.	Peak FM RF trimmer (C1B) for max. ampl. (See fig. 5A)
10	Recheck all steps				

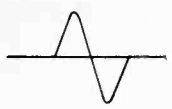


FIG. 4

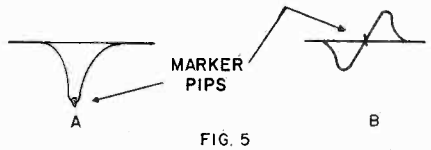
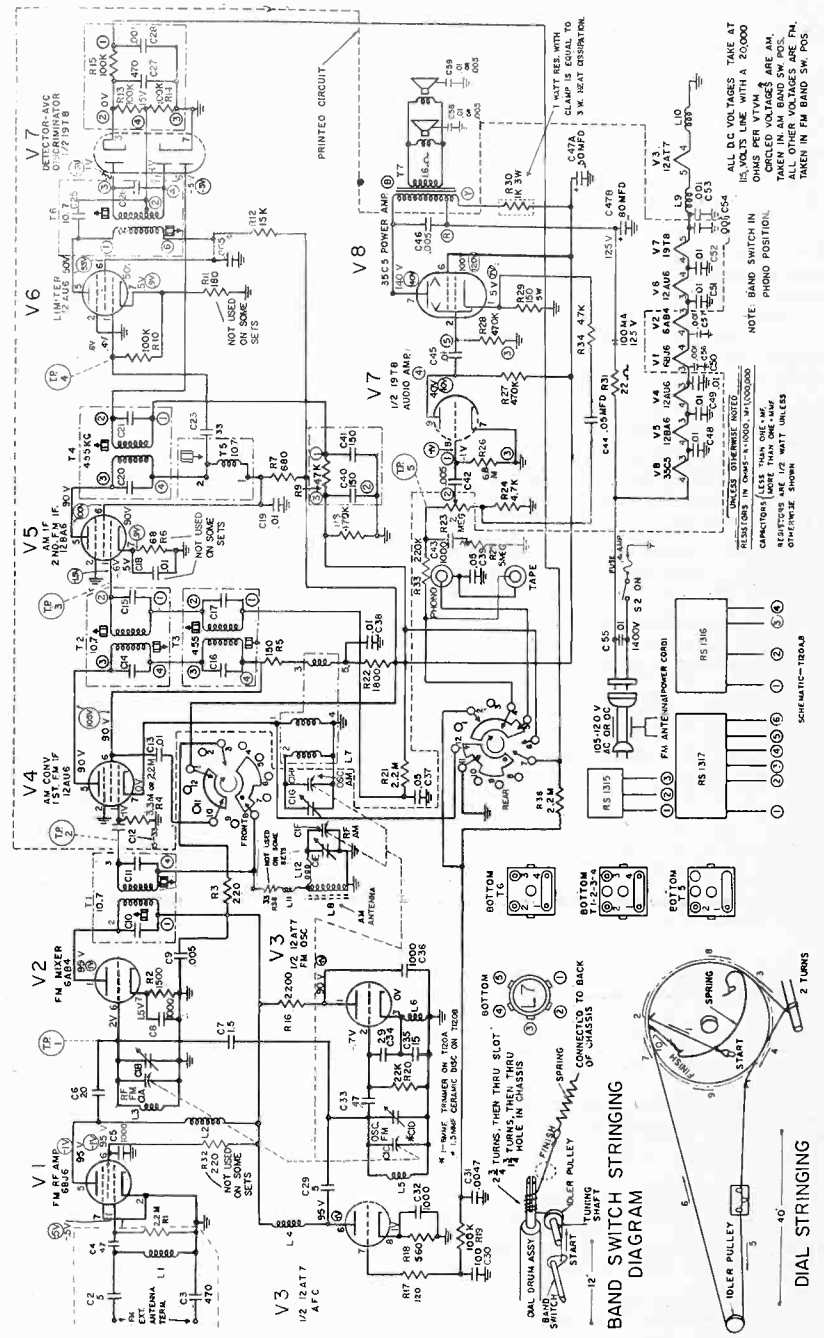


FIG. 5



PRELIMINARY REPLACEMENT PARTS LIST MODEL T120A, B

CAT. NO.	SYMBOL	DESCRIPTION	PRICE
CAPACITORS			
n-RS-1023	C9,24,46,42	.005mf.,+150-0%,450V..	20
RS-1051	C8,32,54,56 53,36,43,57	.001mf.,450V.....	.20
n-RS-1285	C1	Tuning Capacitor.....	6.20
n-RS-1296	C2	5mmf.,±10%,1000V.	.25
n-RS-1297	C29	5mmf.,500V.....	.20
n-RS-1298	C7	1.5mmf.,500V.....	.25
n-RS-1299	C6,12	20 mmf.,±20%,500V.....	.20
n-RS-1301	C3	470mmf.,1000V.....	.25
n-RS-1302	C4,33	47mmf.,±10%,500V.....	.20
n-RS-1303	C30	100mmf.,±20%,500V.....	.20
n-RS-1305	C35, 12	15mmf.,±10%,500V.....	.20
n-RS-1325	C47A,B	50-80mf.,150V.....	1.90
n-RS-1327	C34	29mmf.,±20%,500V.....	.20
n-RS-1387	C1D(T120A)	Trimmer Cap.,1-8mmf...	.80
	C1D(T120B)	1.5mmf., ceramic disc.	
	C5	.001mf.,500V.Tubular	
	C12,23	33mmf.,±20%,500V..	
	C13,18,19 38,45,48,49 50,51,52	.01mf.,+150-0%,450V	
	C37,39,44	.05mf.,±20%,500V.	
	C58,59	.01mf., 1400V. or .005mf., 1400V	
	C55	.001mf.,1400V	
	C31	.0047mf.	
COUPLATES			
n-RS-1315	R9,C40,41	47K,(2) 150mmf.....	.85
n-RS-1316	R13,14,15 C27,28	(3) 100K,470mmf. and 1000mmf.....	.80
n-RS-1317	C42,45 R26,27,28	.005mf.,.01mf.,6.8meg. (2) 470K.....	1.10
POTENTIOMETERS			
n-RS-1279	R23	Volume Control,2 meg. and Sw.....	1.00
n-RS-1280	R25	Tone Control, 5 meg...	1.85
RESISTORS			
n-RS-1440	R31	22 ohms. 1W., W.W.....	.30
n-RS-1441	R29	150ohms. 5W., W.W.....	.50
COILS AND TRANSFORMERS			
n-RS-1271	T7	Output Transformer....	3.20
n-RS-1289	T1	1st. I.F. Trans.,FM...	2.45
n-RS-1290	L3	Coil, Converter.....	.15
n-RS-1291	L5	Coil, Oscillator, FM..	.15
n-RS-1292	L2	Coil, Choke, RF.....	.15

CAT. NO.	SYMBOL	DESCRIPTION	PRICE
COILS & TRANSFORMERS (CONT'D.)			
n-RS-1293	L1	Coil, RF Input.....	.15
n-RS-1294	L4, 6, 9,10,12	Coil, AFC, V3 Cathode, Fil. and AM.....	.30
n-RS-1311	T2	2nd I.F. Transformer, FM...	2.45
n-RS-1312	T5	3rd I.F. Transformer, FM...	2.45
n-RS-1313	T4	2nd I.F. Transformer, AM...	1.80
n-RS-1314	T6	Discriminator Transformer..	3.35
n-RS-1318	L7	Coil, Oscillator, AM.....	.70
n-RS-1321	T3	1st I.F. Transformer, AM...	1.80
n-RS-1322	L8	Antenna, AM.....	1.60
n-RS-1473	L11	Choke, AM. R.F.....	.45
MISCELLANEOUS			
n-RB-1054		Speaker 6".....	6.25
RDC-032		Dial & Band Sw. cord (25 yds.bulk)	2.50
RHC-053		I.F. Mtg. Clip.....	.04
RHM-043		"C"Washer.....	.01
RS-1482		Interlock.....	.10
RJS-232		Tube Socket (V5,V6,V8).....	.25
RJS-237		Tube Socket (V4).....	.15
RS-1158		Tube Shield,(V1,V2,V4,V5,V6).....	.10
n-RS-1266		Power Cord.....	1.00
n-RS-1275		Chassis Mtg. Insulator.....	.10
n-RS-1276		Spacer.....	.02
n-RS-1277		Bushing.....	.15
n-RS-1281		Band Switch.....	2.35
n-RS-1284		Dial Drum Assembly.....	3.00
n-RS-1286		Tube Socket, (V3).....	.35
n-RS-1287		Tube Socket, (V1,V2).....	.30
n-RS-1288		Ground Lug.....	.04
n-RS-1295		Grommet.....	.05
n-RS-1308		Tube Socket (V7)	.25
n-RS-1310		Tube Shield (V3,V7).....	.10
n-RS-1319		Selenium Rectifier, (100 mil.).....	3.65
n-RS-1320		Ground Strap.....	.05
n-RS-1430		Phono and Antenna Board.....	.45
n-RS-1431		Tuning Shaft.....	.25
n-RS-1432		Lever and Rivet Assem.....	.10
n-RS-1442		Fuse, .4 Amp., 150V.....	.70
CABINET AND APPEARANCE ITEMS			
n-RB-1051		Cabinet Back.....	5.80
n-RB-1052		Baffle, Nameplate & Crystal (Assem.)	5.50
n-RB-1053		Grille and Medallion (Assem.).....	3.75
RS-1120		Medallion (only).....	.30
n-RS-1268		Crystal (only).....	.50
n-RS-1270		Nameplate (only).....	1.50
n-RS-1272		Knob & Clip, (Tune and Vol.).....	.45
n-RS-1273		Knob & Clip, (Band).....	.45
n-RS-1283		Pointer Assembly.....	.50
n-RS-1326		Knob Clip.....	.02
n-RS-1399		Knob & Clip (Tone Control).....	.45

"N" Denotes New Items Not Previously Cataloged.

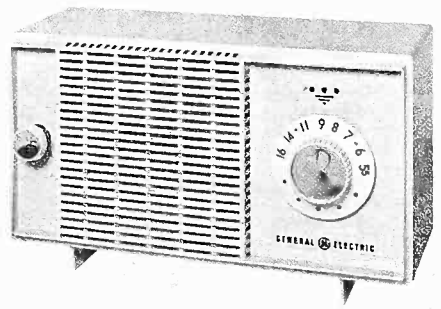
PRICES ARE SUGGESTED LIST PRICES SUBJECT TO CHANGE WITHOUT NOTICE.

All parts not listed by catalog number are common items, obtainable from radio parts jobbers.

S-T125
COVERS
MODELS
T 125A
T 126A
T 127A

PRELIMINARY SERVICE DATA

SPECIFICATIONS	
CABINET:	T125A Pink T126A Beige T127A Antique White
OUTPUT:	Undistorted: 1 Watt Maximum: 1.5 Watt
OPERATING FREQUENCIES:	540 - 1600 KC 455 KC I.F.



TO REMOVE CABINET BACK:

Place cabinet on volume control end using a soft cloth to protect the finish. Insert a screw driver between cabinet bottom and cabinet back midway between slots in cabinet bottom. Turn screw driver, forcing tabs on bottom of cabinet back out of slots in cabinet bottom. Slide out and down from top of cabinet to free tabs on top of cabinet back from top of cabinet.

TO REMOVE CHASSIS FROM CABINET:

After removing cabinet back remove the screw on the cabinet bottom that holds the chassis board support. The tuning knob is a captive knob and remains in the cabinet front. Close the tuning gang to prevent any possible damage to the plates. Slide one hand under the printed chassis board placing the fingers over the front edge. Slide the board back out of the grooves on either end simultaneously removing the tuning gang shaft from the tuning knob.

When replacing the chassis, close the tuning gang and line the flat side of the tuning gang shaft up with the flat in the tuning knob. Place the ends of the board in the grooves and push on the edge of the board, not on the components. The tuning shaft will enter the tuning knob and the front edge of the board will seat itself in the grooved bosses inside the cabinet front. Replace the board support and self-tapping screw.

TO REMOVE VOLUME CONTROL:

The volume control is attached to the cabinet and may be removed by pulling the volume knob off of the shaft, remove the palnut from the volume control shaft, then remove the control from the inside of the cabinet.

When replacing the volume control place the tab on the control in the groove provided on the boss.

TO REMOVE THE SPEAKER:

The speaker is riveted to a baffle. After removing the chassis remove the four tubular clips holding the speaker baffle to the cabinet front.

REPLACEMENT PARTS LIST			
CAT. NO.	SYMBOL	DESCRIPTION	PRICE
		COILS & TRANSFORMERS	
RS-1437	L2	Oscillator Coil.....	.65
n-RS-1457	L1	Antenna Loop..... (Iron Core)	1.20
RS-1415	T1,2	I.F. Trans. 1st, 2nd...	1.55
RS-1416	T3	Output Transformer.....	2.20

REPLACEMENT PARTS LIST			
CAT. NO.	SYMBOL	DESCRIPTION	PRICE
		CAPACITORS	
REK-011	C2 C7 C10,11,12,13 C14	47MMF. .05MF. Bullplate..... 10K MMF	.80
RCE-207	C15A,B	30-50MF.....	1.90
n-RS-1436	C16 C1A,C1B,C1D,C1C	.047MF. Tuning Capacitor.....	3.65
		POTENTIOMETER	
n-RS-1435	R3	Volume Control 500K.... & Push-Pull Switch	1.85
		MISCELLANEOUS	
n-RS-1439		Baffle, Speaker.....	.25
RHC-095		Tubular Clip, Speaker Baffle	.05
RB-1057		Speaker 4".....	5.45
RWL-037		Power Cord.....	1.00
RS-1418		Interlock Term.....	.03
RS-1331		Clip, Captive, Tun. Knob.	.05
RHC-060		Loop Clamp.....	.15
RS-1309		Socket, 7Pin W/Center Pin.....	.15
RS-1307		Socket, 7Pin.....	.10
		CABINET & APPEARANCE ITEMS	
n-RB-1065		Cabinet, Pink T125A.....	3.45
n-RB-1066		Cabinet, Beige T126A....	3.45
RS-1263		Knob, Tuning W/Insert...	.85
RS-1264		Knob, Volume.....	.35
n-RS-1438		Back, Masonite.....	.25
n-RB-1072		Cabinet, Ant. White T127A....	3.45
n-RS-1466		Knob, Tuning W/Insert T127A....	.85
n-RS-1467		Knob, Volume T127A.....	.35

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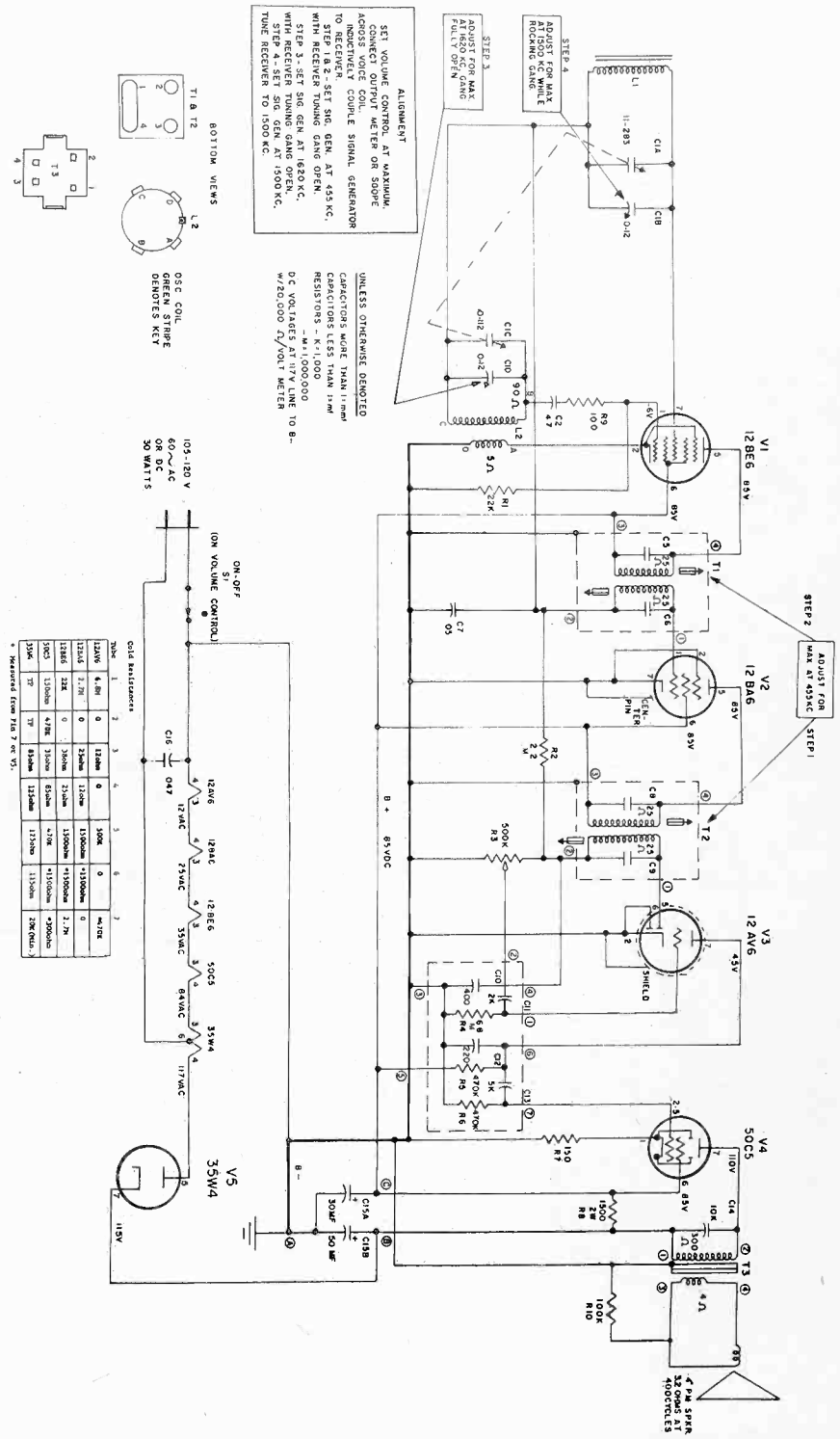
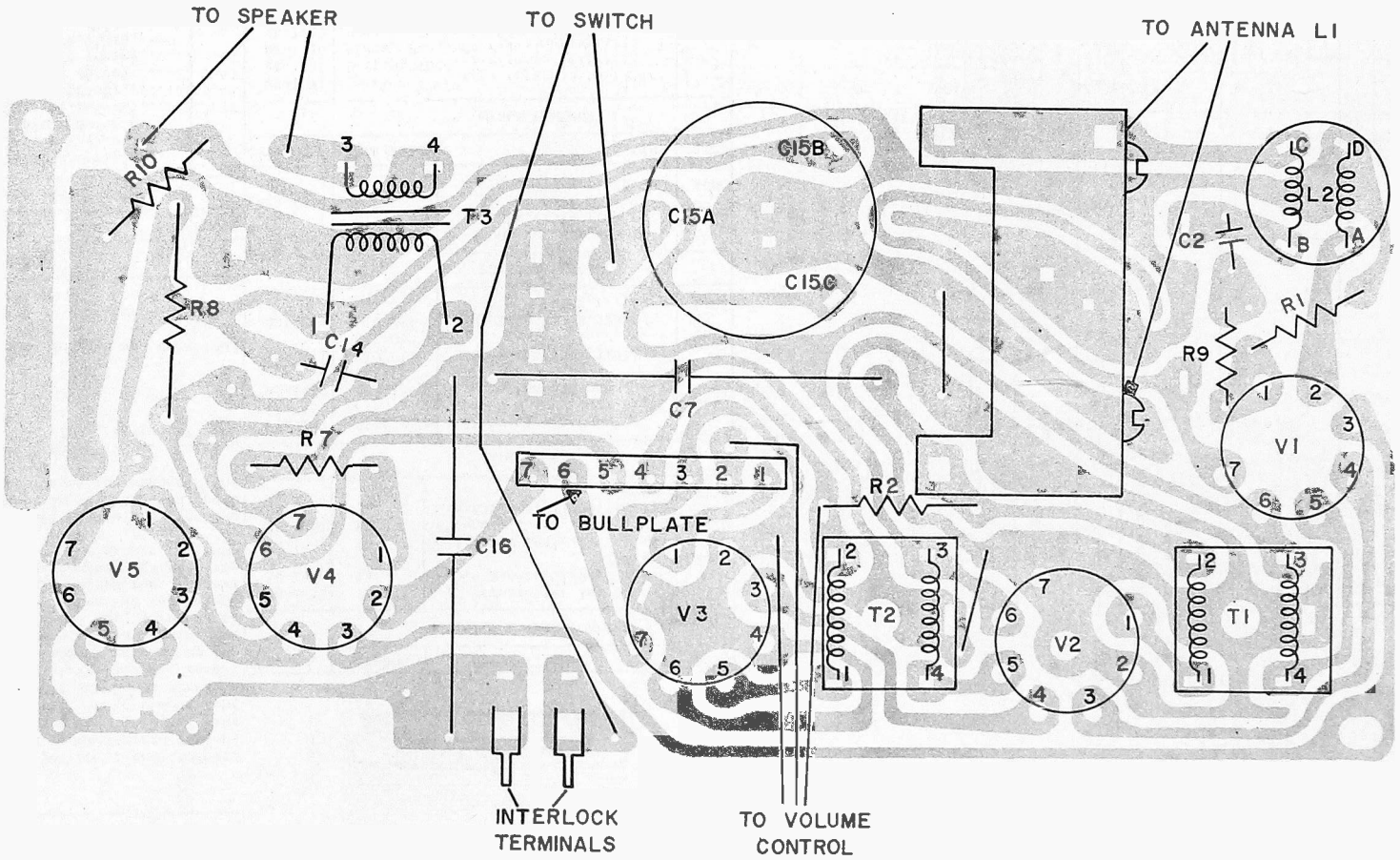


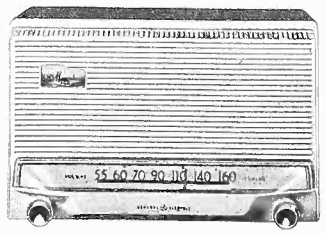

TO SPEAKER
TO SWITCH
TO ANTENNA L1
R10
R8
R7
T3
3
4
1
2
C14
C15B
C15A
C15C
C7
C16
C2
L2
C
D
B
A
R1
R9
R2
7 6 5 4 3 2 1
TO BULLPLATE
V5
V4
V3
V2
V1
T2
T1
INTERLOCK TERMINALS
TO VOLUME CONTROL

S-T130-1
COVERS
MODELS
T130A,B
T131A,B
T132A,B

PRELIMINARY SERVICE DATA

SUPERSEDES S-T130

SPECIFICATIONS	
OUTPUT:	1 Watt Undistorted 1.5 Watts Maximum
OPERATING FREQUENCIES:	540-1600 KC 455 KC I.F.



TO REMOVE CHASSIS FROM CABINET:

Remove the 3 screws from the bottom of the cabinet. Pull the bottom of the cabinet front forward disconnecting the interlock and releasing the locking tabs on the top of the cabinet front. To remove the chassis from the cabinet front pull the knobs straight off. Pull out on the top of the crystal to remove from the cabinet. Pull the pointer straight up out of the holder. Remove the two screws holding the chassis frame to the cabinet front. One screw is at the dial control end and the other at the volume control end of the chassis frame. Remove the 3 screws holding the speaker baffle in the cabinet. Slide the speaker and speaker baffle out of the groove on the cabinet.

When reassembling the cabinet place the locking tabs on top of the cabinet front in position and push in on the bottom of the cabinet front to engage the interlock.

When replacing the crystal place the locking tabs in the slots and push in on the bottom of the crystal to snap in position.

TO REPLACE PILOT LAMP

Remove cabinet front and chassis as described previously. Turn tuning dial until pointer is at 55 on the dial. Slide pilot lamp holder toward volume control to remove from pointer frame.

REPLACEMENT PARTS LIST

CAT. NO.	DESCRIPTION	PRICE
	CABINET & APPEARANCE ITEMS	
RB-1067	Cabinet, Front W/Insert & Strip T130A, T131A, T132A	3.70
*-RB-1068	Cabinet, Front W/O Insert & Strip T130B, T131B, T132B	2.50
RB-1069	Cabinet, Back T130A, T130B (Pink)	3.45
RB-1070	Cabinet, Back T131A, T131B (Blue)	3.45
RB-1073	Cabinet, Back T132A, T132B (Grey)	3.45
RS-1444	Crystal T130A, T131A, T132A, T131B, T132B	.70
*-RS-1762	Crystal T130B	.70
RS-1445	Insert Assem. W/Strip T130A, T131A, T132A	1.30
*-RS-1446	Insert T130B	.50
RS-1447	Insert Strip T130A, T131A, T132A	.50
RS-1470	Medallion	.25
RS-1471	Medallion	.25
RS-1472	Medallion	.25
*-RS-1763	Insert T131B	.50
*-RS-1764	Insert T132B	.50
RDK-425	Knob, Volume & Tuning	.35

CAT. NO.	SYMBOL	DESCRIPTION	PRICE
		COILS & TRANSFORMERS	
RS-1415	T1-T2	I.F. Transformer 1st & 2nd	1.55
RS-1416	T3	Output Trans. T130A, T131A, T132A	2.20
RS-1437	L2	Oscillator Coil	.45
RS-1461	L1	Antenna	1.20
*-RS-1767	T3	Output Trans. T130B, T131B, T132B	2.20
		CAPACITORS	
RCE-207	C15A, C15B	Electrolytic Cap. 50-30 @ 150V	1.90
RS-1449	C1A, 1B 1C, 1D	Tuning Capacitor	3.95
REK-011	C10, C11 C12, C13	Bulplate T130A, T131A, T132A,	.80
*-RS-1766	C10, C11 C12, C13	Bulplate T130B, T131B, T132B,	1.05
		POTENTIOMETERS	
RS-1450	R3	500K Vol.Cont. & SW. T130A, T131A, T132A	1.80
*-RS-1768	R3	3M Vol Cont & Sw. T130B, T131B, T132B	1.80
		MISCELLANEOUS	
RB-1071		Speaker 5"x7"	7.65
RS-1128		Switch, Tone	.35
RS-1174		Plate, Power Cord	.03
RS-1213		Socket, Pilot Light	.55
RS-1307		Socket, Tube 7 Pin	.10
RS-1309		Socket, Tube 7 Pin W/Center Pin	.15
RS-1323		Pilot Light #12	.80
RS-1418		Terminal, A.C.	.03
RS-1443		Tuning Shaft & Windlass Assem.	.40
RS-1451		Rivet, (AC Cord)	.05
RS-1452		Bracket, Pointer	.45
RS-1453		Pin, Pointer	.10
RS-1454		Lamp Hood T130A, T131A, T132A	.15
*-RS-1765		Lamp, Hood T130B, T131B, T132B	.15
RHM-025		"C" Washer	.01
RWL-039		Power Cord	.95

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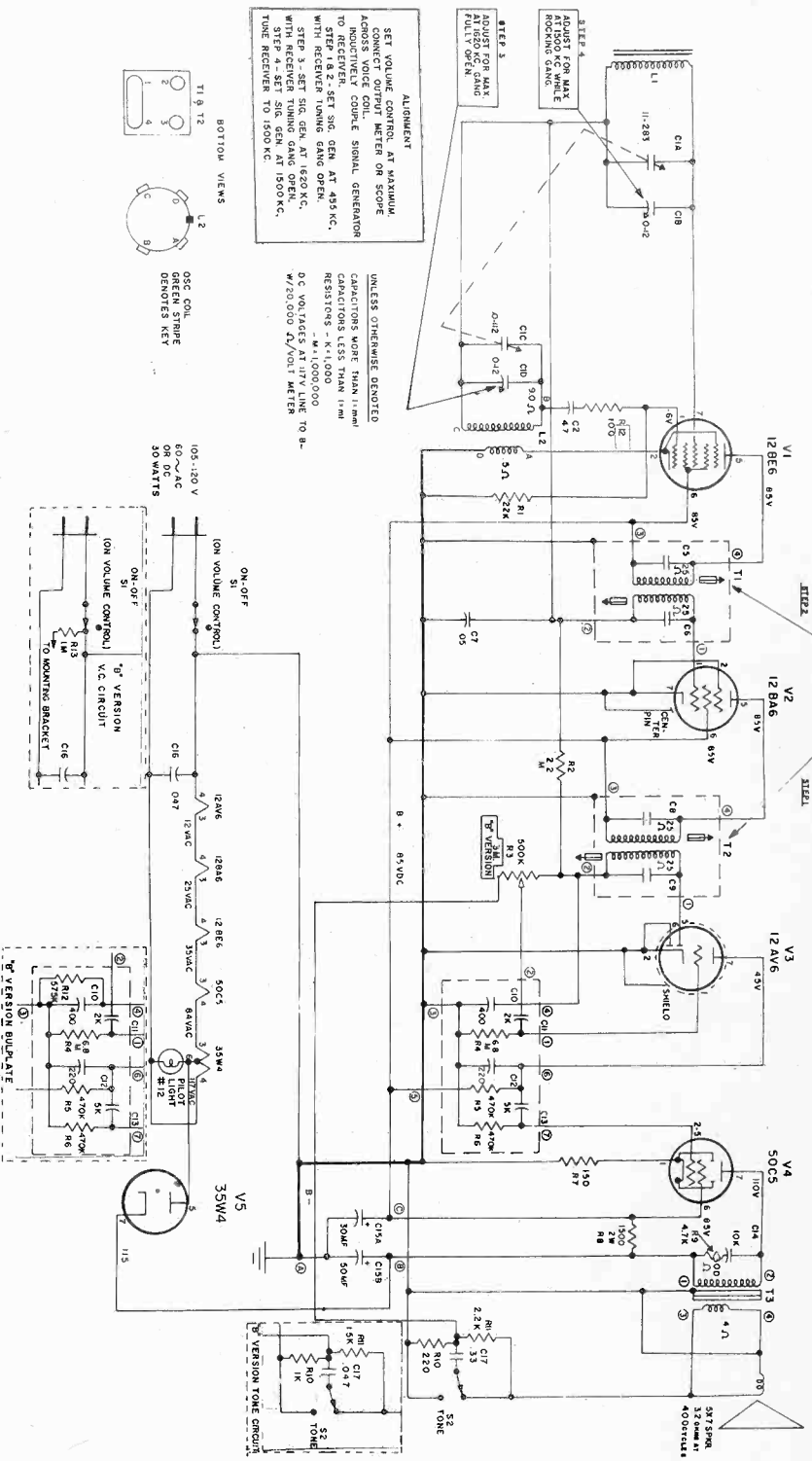
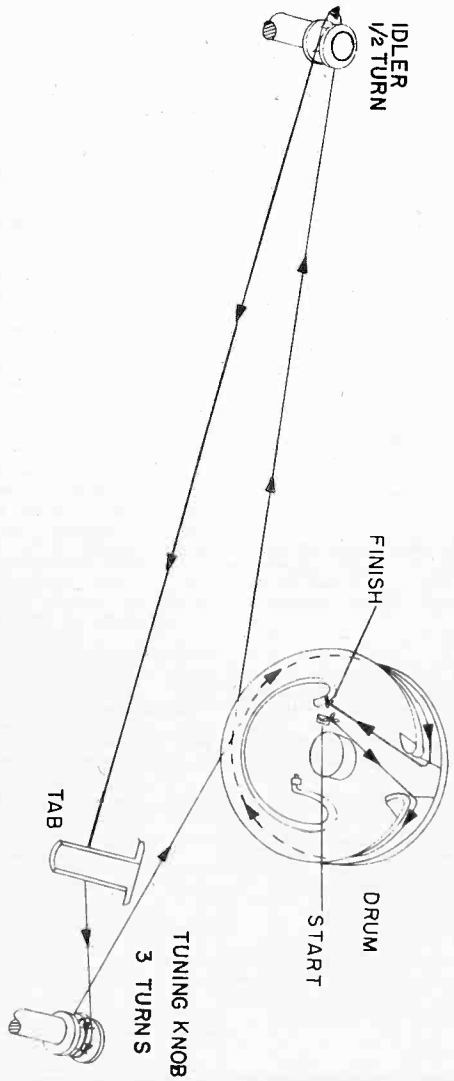
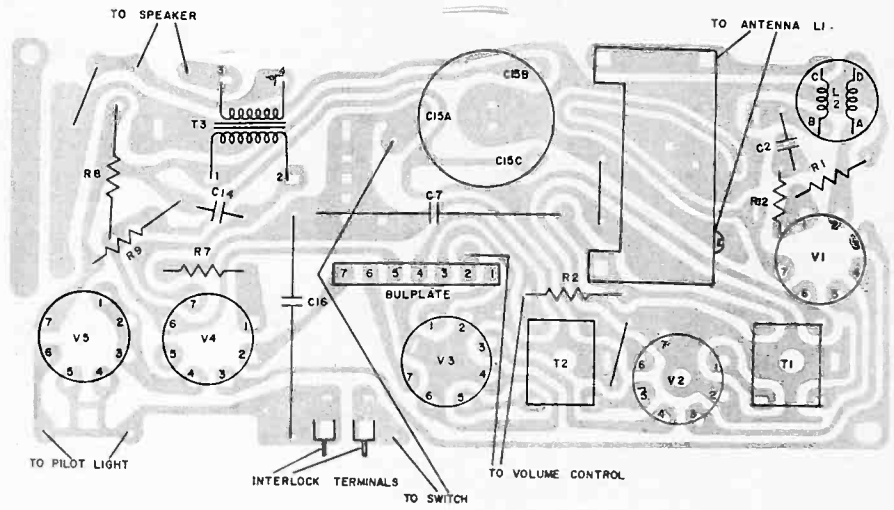




Cold Resistances

Tube	1	2	3	4	5	6	7
12AV6	6.8M	0	12ohm	0	500K**	0	*470K
12BA6	2.7M	0	25ohm	12ohm	*1500ohm	*1500ohm	0
12BE6	22K	0	38ohm	25ohm	*1500ohm	*1500ohm	2.7M
50C5	150ohm	470K	38ohm	85ohm	470K	*1500ohm	*300ohm
35W4	TP	TP	85ohm	115ohm	115ohm	115ohm	20K(Min)

* Measured from Pin 7 of V5
TP Tie Point
Filaments measured with pilot lamp in socket.
** 575K in "B" versions



S-T135-1
COVERS
MODEL
T135A

PRELIMINARY SERVICE DATA

SUPERSEDES S-T135

SPECIFICATIONS	
ELECTRICAL RATING:	105-120 volts AC DC @ 60 cycle 40 watts
TUNING RANGE:	AM 540-1600 KC FM 88-108 MC
IF FREQUENCY:	AM 455 KC FM 10.7 MC
POWER OUTPUT:	.9 Watts Undistorted 1.4 Watts Maximum

GENERAL INFORMATION

A built-in ferrite rod antenna is provided for AM reception. The power line cord is used as the built-in FM antenna. The clamp on the power line cord is attached to the top terminal on the FM antenna terminal board. Keep the power cord leading to the electrical outlet free from other wires and extended to its fullest length. Changing the position of the cord slightly may improve the reception.

A FM outdoor dipole antenna may be installed for distant station reception. The dipole should be placed as high as possible and free from all obstructions. The elements of the antenna should be in a horizontal position and at right angles to the direction of the FM signal. The antenna leads (300 ohm twin line) from the antenna should be broughtdown the side of the building by stand-off insulators. At the point where the antenna line enters the house, an approved lightning arrestor should be used. The arrestor must have three terminals. The center terminal should be connected by a number 14 wire directly to a ground pipe in the ground immediately below the arrestor. The dipole antenna mast may also be grounded. The antenna leads from the antenna are connected to the two outside terminals of the arrestor and then into the building to the two FM terminals on the FM set. Disconnect the line cord clamp from the antenna terminal when connecting the outside antenna.

Do not connect ground wires to the FM receiver at any time.

TROUBLE SHOOTING

The power supply and audio output stages are common to both AM and FM. These two stages can be eliminated immediately in the receiver as a cause for defective FM performance as long as the AM is satisfactory. The circuits in which FM defects may occur are the R. F., oscillator, IF, limiter or discriminator stages.

To test the FM oscillator, with a VTVM check the grid bias voltage by measuring between grid and ground. A voltage of -.7V.D.C. will indicate that the oscillator is operating. With the oscillator operating properly, the RF can be checked by attaching the signal generator to the antenna terminals and checking the output of the RF stage for a deflection on the -3V.D.C. scale of VTVM connected to pin 1 of V3.

When troubleshooting the FM-RF section, extreme caution must be exercised. Component positioning and lead dressing is very critical in the RF stage.

POWER SUPPLY

The power supply consists of a 100 mil selenium rectifier and a 80mf.-50mf. electrolytic capacitor. An inoperative power supply will affect both AM and FM operation.

AUDIO AMPLIFIERS

The audio amplifier tubes V6 and V7, are also common to AM and FM. To check for operation, turn volume control to maximum and apply an audio signal to T. P. 5.

DISCRIMINATOR

The discriminator (V6) is used to demodulate the I. F. signal. The frequency variations are changed back to voltage variations that vary in accordance with the audio or modulating voltage. The discriminator performs a function somewhat similar to the 2nd. detector in an AM superheterodyne receiver.

LIMITER

The limiter (V5) removes any amplitude modulation, such as atmospheric and man-made noises, and provides a constant signal to the discriminator. This results in considerable reduction in unwanted noise.

I. F.

The IF transformers are T3 and T4 for the AM; and T1, T2, and T5 for the FM. The I. F. can be checked as described in the alignment chart.

RF SECTION

The RF section consists of the RF amplifier (V1), mixer and FM oscillator (V2). These two stages are designed to operate at higher frequencies than required for AM.

TO REMOVE CHASSIS

1. Pull volume and tone knobs straight off.
2. Turn AM FM band switch knob 90° counter-clockwise and slide to center of slot.
3. Remove two screws from cabinet back and pull back off.
4. Remove three screws from cabinet bottom.
5. Tuning knobs are captive knobs and remain in cabinet front.
6. Close tuning gang to prevent damage to plates; place one hand under circuit board with finger tips over front edge, and pull chassis out of cabinet.

TO REPLACE CHASSIS

1. When replacing chassis in cabinet, set the AM FM band switch knob in the 90° position so that it will slide through the slot in the cabinet front.
2. Line the flats in the tuning knobs up with the flats on the tuning gang shafts and push in on the edge of the circuit board; do not push on the components.

CAUTION

Always use an isolation transformer when servicing or aligning this receiver to protect test equipment and personnel.

AM ALIGNMENT

The AM alignment can be accomplished with a VTVM or an oscilloscope as the output monitor. All VTVM output readings will be observed on an AC volt scale. See the alignment chart for the step-by-step procedure.

Set the band switch to AM position.

Turn volume control to maximum volume position and adjust the signal generator output control using the minimum amount of signal necessary to get proper indication in output.

The position of the receiver should not be changed during alignment to prevent possible errors in output readings.

FM ALIGNMENT

The proper method of FM alignment is by using an oscilloscope, signal-sweep generator, and marker generator.

Only with sweep equipment can satisfactory alignment of high-quality FM receivers, such as the model T135, be assured. However, for partial "touch-up" alignment or temporary tests, we are also describing alignment without sweep equipment.

The following is the proper sequence used to set up for either type of alignment:

1. Set band switch to FM position.
2. Set volume control to minimum position. The position of the receiver should not be changed during alignment to prevent possible error in outputreadings.
3. A 1/2" piece of bus wire can be lightly soldered to each test point on the dip-soldered side of the chassis board, so that the test equipment can be attached more readily to the test point.
4. In peak alignment, a 470K resistor is used in series with the positive test lead of the VTVM. In aligning the FM IF and RF sections the signal input should be reduced so that the VTVM reads approximately -1V.D.C.
5. In aligning the discriminator adjust cores of T6 for maximum DC keeping the level from 3 to 4 volts.
6. In sweep alignment set the sweep width control on the sweep generator to 150KC.
7. The marker generator output, when used, may be inductively coupled as near to the sweep input point as possible or inserted into the marker input jack on the signal sweep generator.
8. The frequency setting of the marker generator is the same as the sweep generator setting for each step as shown in the FM alignment chart.

Marker pips should always be kept at a minimum amplitude to prevent distortion of the response curve.

FM OSCILLATOR COIL

The FM oscillator coil L5 may require adjustment if components, other than tubes, are changed in the FM oscillator-mixer section. Check the band end frequencies; if the set tunes through 108 and 88 MC do not touch the coil. If the oscillator frequency is low adjust L5 by spreading the turns slightly. If the oscillator frequency is high adjust L5 by squeezing the turns together slightly (Note: a small change in the space between 2 turns of L5 shifts the frequency approximately 1 MC.)

TO REMOVE RADIATION SHIELD CAN

If it becomes necessary to remove the shield can, remove the screw between the shield can and the end bracket, place long nose pliers on the bottom half of the rubber grommet and squeeze to compress fastener. To remove from the bracket, bend the end plate up so that it is away from the shield can. Unsolder the ground straps from the shield can, straighten the twist tabs, and unsolder the shield can from the board.

PRELIMINARY REPLACEMENT PARTS LIST MODEL T135

CAT. NO.	DESCRIPTION	PRICE
	CABINET AND APPEARANCE ITEMS	
n-RB-1079	Cabinet Assem. (Control Plate, Dial Plate, Medallion)	8.45
n-RS-1483	Control Plate	1.00
n-RS-1484	Dial Plate	.95
n-RS-1485	Medallion	.25
n-RS-1486	Pointer, Dial Clear W/White Lines	.95
n-RS-1487	Knob, Tuning	.40
RDK-425	Knob (Tone & Volume)	.35
n-RS-1490	Back	.45
n-RS-1500	Knob (AM FM Band Sw.)	.15
	MISCELLANEOUS	
n-RS-1488	Hair Pin Cotter (Tuning Knob)	.03
n-RS-1489	Compression Ring	.05
RS-1332	Compression Ring	.04
RS-1266	Power Cord	1.00
RJJ-014	Interlock	.15
n-RS-1495	Term Board (Ant.)	.20
n-RS-1496	Tri Mount	.02
RB-1017	Speaker	6.60
n-RS-1497	Antenna	1.70
n-RS-1498	Switch Arm	.15
n-RS-1499	Spring (Band Sw.)	.05
RS-1308	Tube Socket (9 Pin)	.25
RJS-232	Tube Socket (7 Pin)	.25
RS-1319	Rectifier, Selenium	3.65
n-RS-1508	Switch (AM FM Band)	1.75
RJS-237	Tube Socket (7 Pin)	.15
RS-1320	Ground Strap (IF Can)	.04
RJS-182	Phono Jack	.15
n-RS-1519	Slide Switch (Ph. Radio)	.45
RS-1442	Fuse	.70
n-RS-1520	Hair Pin Cotter (Band Sw.)	.02
n-RS-1492	Line Cord Ant. Clamp	.04
n-RS-1660	Clip, Band Switch	.05

CAT. NO.	SYMBOL	DESCRIPTION	PRICE
		CAPACITORS	
n-RS-1654	C4	Cap. 47MMF 1000V. N750	.30
RS-1315	C36,37,R17	Couplate	.85
RS-1316	C27,28, R10,11, 27,	Couplate	.80
RS-1317	C40,41 R21,22, 23	Couplate	1.10
n-RS-1661	C13	Cap. 33MMF (N1500)	.20
RS-1305	C31	Cap.15MMF ±10% NPO	.20
n-RS-1514	C29	Cap. .0033MFD	.25
RS-1022	C10,19, 20,24,34, 35,47,45, 46,48	Cap. .01 MFD	.30
RS-1024	C42	Cap. .05MFD	.50

AM ALIGNMENT CHART

Step	Signal Generator Input Point	Generator Setting	Tuning Gang Setting	VTVM OUTPUT: Connect VTVM Across	VTVM OUTPUT: Adjust The Following	Oscilloscope Output: Connect Scope Across	Oscilloscope Output: Adjust the Following
1	High side to TP3 in series with a .05mf. low side to ground	455 KC 30% Mod. with 400 cycles	Gang Closed	Voice Coil	Top and Bottom Cores of T4 for Maximum Output	Voice Coil	Top and Bottom Cores of T4 for Maximum Amplitude of Curve (see fig. 1)
2	High Side to TP2 in Series with a .05mf. Low side to ground				Top and Bottom Cores of T3 for Maximum Output		Top and Bottom Cores of T3 for Maximum Amplitude of Curve. (see fig. 1)
3	Repeat Steps 1 and 2						
4	Inductively Coupled to AM Antenna	1620KC	Gang Open	Voice Coil	AM Osc. (C1D) For Max. Output	Voice Coil	AM Osc. (C1D) For Max. Amplitude
5		1500KC	1500KC on Dial		AM Ant. (C1F) For Max. Output		AM Ant. (C1F) For Max. Amplitude
6	Repeat Steps 1, 2, 3 and 4						

Step	FM SWEEP ALIGNMENT: Sweep Generator Input Point Keep Sweep Output Low	Sweep Generator And Marker Setting	Tuning Condenser Setting	Connect Scope To Following In Series With 1/2 M.	Adjust	PEAK ALIGNMENT: Connect VTVM To Following Test Points In Series With 1/2 Meg.	Adjust
1	TP3 in series with .01 cap.	10.7 MC unmodulated	Closed	TP4	T5 for max. (See fig. 1.)	TP4	T5 for Max. DC Volts
2	TP3 in series with .01 cap.	10.7 MC unmodulated	Closed	TP5	T6 Top core for cross-over (Fig. 2) T6 Bottom Core for Max. Amp. & Symmetry (Fig. 2)	TP5	T6 Top Core for 0 DC Volts
						TP6	T6 Bottom for Max. DC Volts
3	TP2 in series with .01 cap.	10.7 MC unmodulated	Closed	TP4	T2 for Max. Amplitude (Fig. 1)	TP4	T2 for Max. DC Volts
4	TP1 in series with .01 cap.	10.7 MC unmodulated	Closed	TP4	T1-2-5 for Max. Amp. (Fig. 3)	TP4	T1-2-5 for Max. DC Volts
5	TP1 in series with .01 cap.	10.7 MC unmodulated	Closed	TP5	Same as Step 2	Same as Step 2	Same as Step 2
6	Recheck	Steps 4-5					
7	High side to top antenna terminal in series with 270 ohm res. Low side to bottom ant. terminal	98 MC unmodulated	Tune To 98 MC	TP4	FMRF Trimmer C1B For Max. (See fig.1)	TP4	FMRF Trimmer C1B for Max. DC Volts

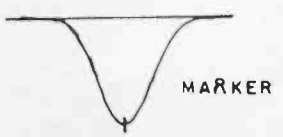


FIG. 1

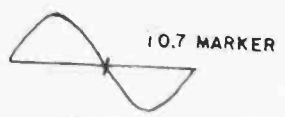


FIG. 2

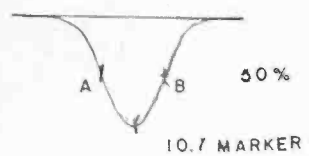
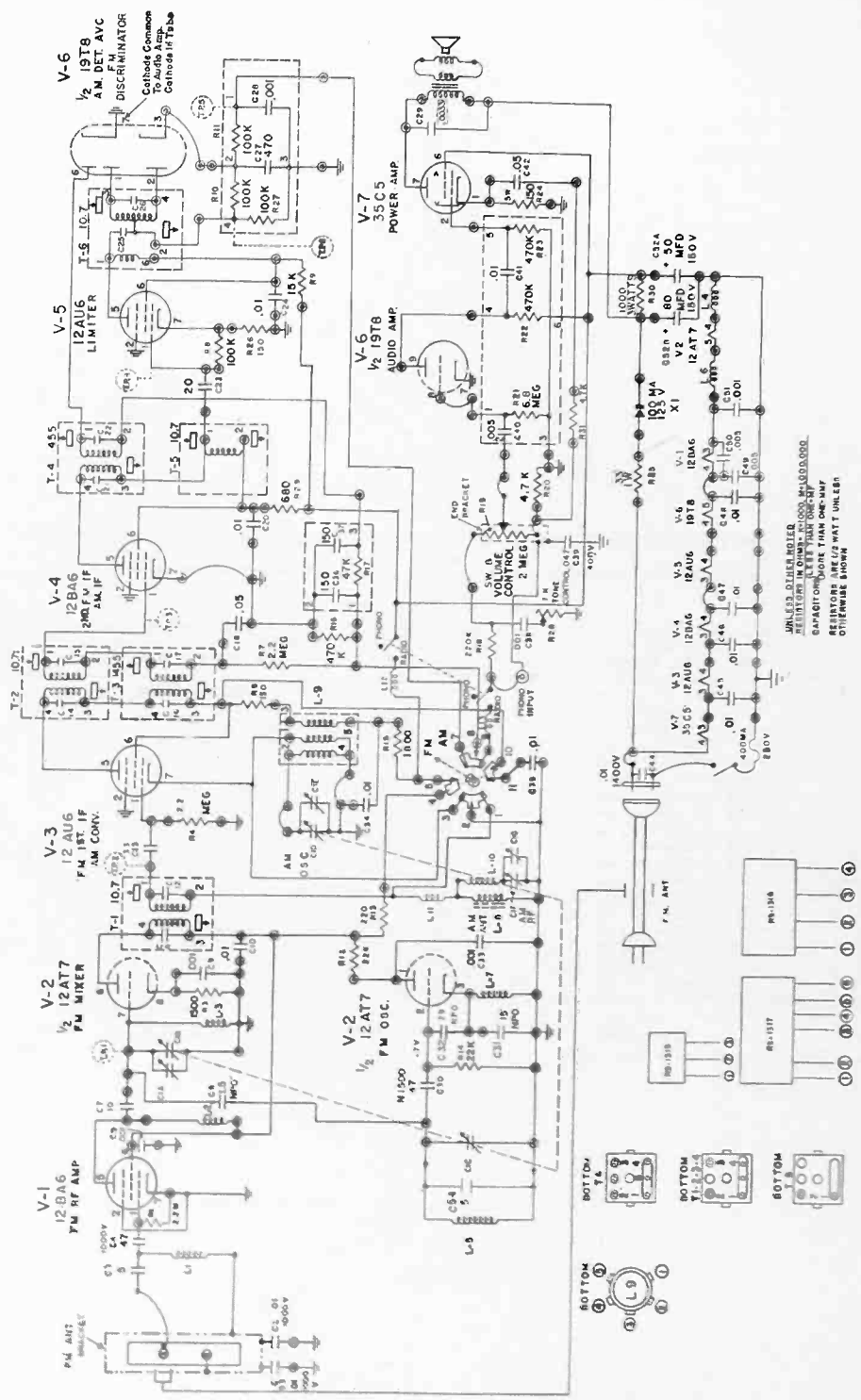
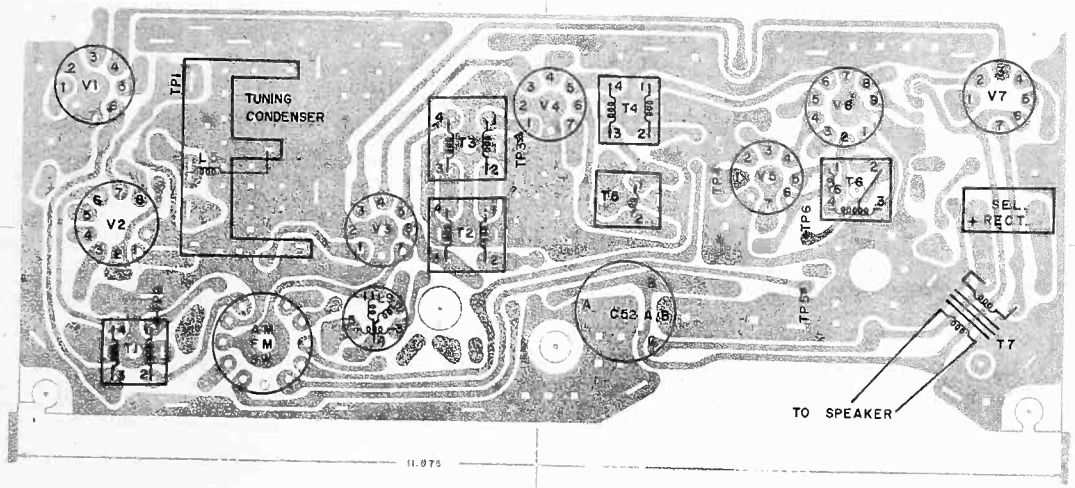


FIG. 3

A- 10.625 MARKER
B- 10.775 MARKER





	V1		V2		V3		V4		V5		V6		V7	
	12BA6		12AT7		12AU6		12BA6		12AU6		19T8		35C5	
Pin	AM	FM	AM	FM	AM	FM	AM	FM	AM	FM	AM	FM	AM	FM
1	-1.0	-.9	-1.4	55	2.3	-.7	-1.0	-1.0			-.6	-2.5	7	6
2											-1.7	.4		
3	9	9			69	69	57	57	50	50			69	69
4	19	19			57	57	50	50	39	39	39	39	115	115
5	-1.4	100	9	9	110	90	110	110	56	50	19	19		
6	-1.4	100	-1.4	100	110	90	95	95	56	50	-.7	-.7	120	105
7									.5	.4			140	140
8				2.1							-.7	-.7		
9											55	50		

Set Line Voltage @115V
Voltages taken with VTVM
Tuning Gang-Closed
Volume Control-Minimum

PRELIMINARY REPLACEMENT PARTS LIST (Cont'd.)

CAT. NO.	SYMBOL	DESCRIPTION	PRICE
		CAPACITORS	
n-RS-1572	C52A,B	Electrolytic Cap.50-80MFD	1.90
RS-1023	C49, 50	Cap. .005MFD	.25
RCW-3250	C2,53	Cap. .01MFD	1.25
RS-1051	C5,6,9 33,38 49,50,51	Cap. .001MFD	.20
RS-1299	C23	Cap. 20MMF	.20
n-RS-1516	C7	Cap. 10MMF	.20
n-RS-1517	C32	Cap. 29MMF NPO	.25
RS-1298	C8	Cap. 1.5MMF NPO	.25
n-RS-1518	C44	Cap. .01 1400V	.40
n-RS-1515	C3	Cap. 5MMF	.25
n-RS-1501	C1	Tuning Capacitor (Gang)	7.15
RS-1302	C30	Cap. 47MMF±10% N1500	.20
RS-1297	C54	Cap. 5MMF±5% N750	.20
		POTENTIOMETERS	
n-RS-1493	R28	Tone Control 2 MEG	.95
n-RS-1494	R19	Vol. Cont. 2 MEG & Sw	1.90

CAT. NO.	SYMBOL	DESCRIPTION	PRICE
RS-1294	L7,12,13	FM.OSC.& Radiation Choke	.30
RS-1318	L9	AM. Oscillator Coil	.70
n-RS-1509	L3	RF-FM Choke	.10
n-RS-1510	L5	FM Oscillator Coil	.10
RS-1292	L2	RF Plate Coil	.15
n-RS-1655	L1	RF Input Coil	.15
n-RS-1328	L4,L6	Filament Choke	.15
n-RS-1511	L10	AM RF Choke	.20
n-RS-1502	T1	FM Transformer 1st IF	2.25
n-RS-1505	T2	FM Transformer 2nd IF	2.25
n-RS-1527	T5	FM Transformer 3rd IF	1.50
n-RS-1504	T3	AM Transformer 1st IF	1.75
n-RS-1503	T4	AM Transformer 2nd.IF	1.75
n-RS-1506	T6	FM Disc. Transformer	2.60
n-RS-1507	T7	Output Transformer	2.00
RS-1473	L11	AM ANT Choke	.45
		RESISTORS	
RS-1441	R24	150 OHMS 5 Watts	.50
n-RS-1521	R25	33 OHMS (Glass Ohm)	.30
n-RS-1566	R30	1000 OHMS 3 Watt W.W.	.50

"n" - Denotes Items Not Previously Cataloged.

Prices Are Suggested List Prices And Are Subject To Change Without Notice.

Items Not Listed By Catalog No. Are Common Items; Available From Local Radio Parts Jobber.

GENERAL ELECTRIC COMPANY

PRODUCT SERVICE, RADIO RECEIVER DEPARTMENT

869 BROAD ST., UTICA, NEW YORK

PRELIMINARY SERVICE DATA

SUPERSEDES SERVICE NOTE S-P671-1

S-P671-2
COVERS
MODELS
P671A,B
P672A,B
P673A,B
P674B

SPECIFICATIONS		
CABINETS: (Plastic)	Models P671A,B - Black and White Models P672A,B - White and Terra Cotta Models P673A,B - Turquoise and White Model P674B - Green	
ELECTRICAL RATING:	105-120 Volts A-C (50 to 60 cycles) or DC 1 "A" battery — 7 1/2 volt Eveready No. 717 or equivalent 1 "B" Battery — 90 Volt Eveready No. 479 or equivalent	
OPERATING FREQUENCIES:	Tuning range ..... 540-1600 KC I-F ..... 455 KC	
AUDIO POWER OUTPUT:	150 Milliwatts at 10% distortion. 250 - 300 Milliwatts - maximum	
TUBE COMPLEMENT:	V1	Oscillator-Converter..... 1R5
	V2	I-F Amplifier..... 1U4
	V3	Detector - Audio Amplifier.... 1U5
	V4	Power Amplifier..... 3V4

GENERAL INFORMATION

The Models P671A,B, P672A,B, P673A,B, and P674B are four-tube superheterodyne portable radio receivers which operate either on self-contained batteries or from a power line source of 105 to 120 volts A.C. or D.C.

These models are very compactly made and incorporate two plated circuit chassis; the smaller of which contains the power supply components. The front of the cabinet swings down and open, providing easy accessibility to tubes and batteries.

CHASSIS REMOVAL:

The chassis is easily removed by means of the following procedure:

1. Swing down cabinet front by grasping front at top edge under handle.
2. Remove tuning and volume control knobs by pulling straight off their shafts.
3. Remove the two small Phillips-head screws from the top rear edge of the metal chassis mounting bracket.
4. Slide chassis and bracket out of cabinet.
5. Remove bracket from chassis by unscrewing the 1/4" mounting screw from the bracket.

The power supply chassis is removed from the cabinet by removing the four small hex-head mounting screws.

The speaker is mounted on the cabinet front and may be removed by taking off the four speaker mounting clips which secure the speaker to the four bosses on the inside of the cabinet front.

IMPORTANT: Use care when replacing defective parts. Apply as little heat to terminals and connections as possible to remove parts, as excessive heat will damage the plated wiring on the chassis boards.

When replacing knobs, do not force them on, as too much pressure may cause circuit board to bend and crack.

VOLUME CONTROL REPLACEMENT:

The chassis must first be removed from the cabinet as described under CHASSIS REMOVAL, then replace volume control as follows:

1. Cut off the three control lugs and the four on-off lugs.
2. Heat the remaining part of the lugs on the circuit board and pull out with long-nose pliers.
3. Clean all mounting holes of all excess solder.
4. The volume control on-off switch (catalog no. RRC-367) is used as the replacement. This control has a combined mounting bracket which can be mounted with the control on the circuit board. There are four holes on the board in which the mounting bracket can be inserted and soldered on the dip-soldered side of the circuit board.

TO REPLACE A TUBE SOCKET:

Cut the socket free by cutting all of the socket terminals at the chassis. One socket (V2) has a center terminal which must be unsoldered. Now, heat the pieces of terminals remaining in the board only enough so they may be pushed out. The new socket can now be inserted into the holes left by the old one and soldered into place.

BATTERY INSTALLATION:

Insert batteries in place as shown in the Tube and Battery location illustration. Make sure the battery connections are well seated.

PRELIMINARY REPLACEMENT PARTS LIST

CAT. NO.	SYMBOL	DESCRIPTION	PRICE
		CAPACITORS	
RCE-230	C15A,B,C	400mf.,40mf.,90mf., P671A,P672A,P673A.....	2.95
*-RS-1525	C15A,B,C	600mf.,60mf.,100mf., P671B,P672B,P673B.....	3.45
RCT-098	C1	Tuning Capacitor.....	3.50
	C17	100mmf. "B" version only	
RCW-3118	C7	.003mf.,±20%,100V.....	1.25
RCW-3119	C14	.002mf.,+100-0%,450V..	1.25
RCW-3250	C10	.01mf.,+150-0%,1000V..	1.25
REK-010		Capacitor-Resistor Network,P671A,P672A,P673A.	1.40
*-RS-1526		Capacitor-Resistor Network,P671B,P672B,P673B.	1.35
RS-1023	C4	.005mf.,+150-0%,450V.....	.20
	C16	.047mf.,±20%,600V,	
	C9	.33mf.,±20%,100V."A" ver. .22mf.,±20%,100V."B" ver.	
	C3	.05mf. or .047mf., 400V.	

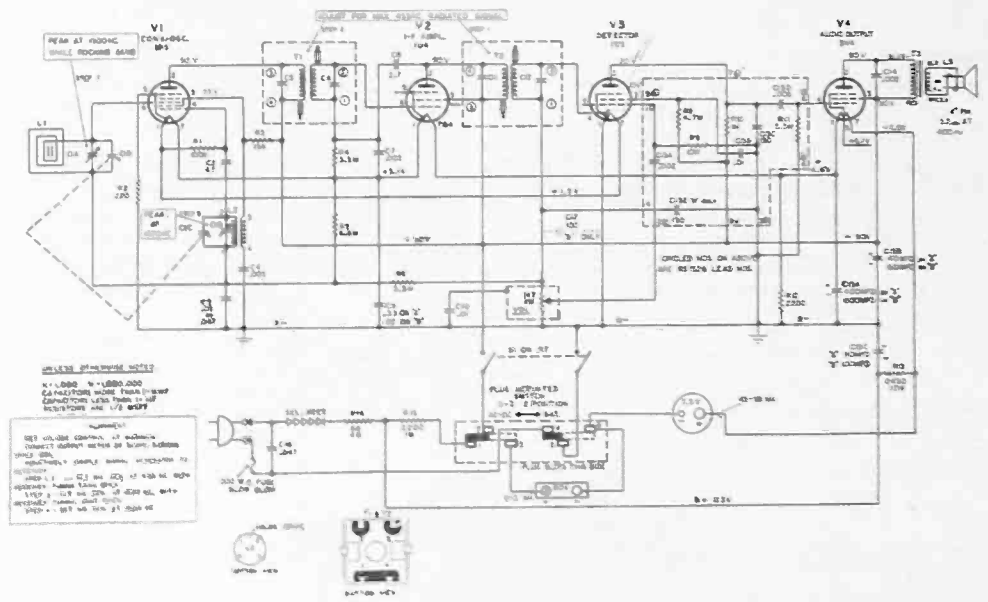
PRELIMINARY REPLACEMENT PARTS LIST (Cont'd.)

CAT. NO.	SYMBOL	DESCRIPTION	PRICE
		CAPACITORS (Cont'd.)	
	C2	47mmf.,±20%,500V.ceramic	
	C8	2.7mmf.,±10%,500V.ceramic	
		RESISTORS	
RRW-143	R14	68 ohms,4 watt,wire-wound	.40
RRW-144	R13	2450 ohms, 10 watt,w.w....	1.05
		POTENTIOMETER	
RRC-367	R7	Volume Control and Switch 1 megohm.....	1.75
		COILS AND TRANSFORMERS	
RLC-139	L2	Coil,Oscillator.....	.75
RLL-069	L1	Antenna.....	1.60
RTL-193	T1,2	Transformer, I.F.....	1.70
RTO-186	T3	Transformer, Output.....	2.40
		MISCELLANEOUS	
REF-026		Fuse,Slo-blo, 2/10 amp.....	.60
RER-020		Rectifier, Selenium 65MA.....	2.60
RJC-035		Connector, For "B" Battery.....	.50
RJP-033		Connector, For "A" Battery.....	.15
RJS-232		Socket,7 Pin Tube Socket With Center Shield.....	.25
RJS-237		Socket 7 Pin Tube Socket.....	.15
RSW-114		Switch,AC DC Battery, With Mounting Bracket.....	1.40
RWL-027		Cord,Power Cord And Plug, Brown.....	1.20
RB-1057		Speaker, 4 inch, PM.....	5.45
RHC-089		Clip, For Handle Bail.....	.04
RHC-095		Clip, Tubular Speaker Mounting.....	.10
RHC-110		Clamp, Plastic, Antenna Mounting....	.10
RHG-018		Grommet.....	.05

CAT. NO.	DESCRIPTION	PRICE
	MISCELLANEOUS	
RHI-017	Strain Relief,For Power Cord.....	.15
RHJ-007	Spacer, For Power Cord.....	.05
RMC-070	Catch, For Power Cord Compartment Door..	.05
RMS-272	Ring, Compression,Tuning and Volume Knobs.....	.05
RS-1183	Clamp, I.F. Can.....	.10
RS-1193	Gasket, Speaker.....	.05
RS-1246	Insulator.....	.10
	CABINET & APPEARANCE ITEMS	
RAD-202	Door, For Cord Compartment, Terra Cotta, P672A,B.....	.30
*-RS-1107	Door, For Cord Compartment Turquoise, P673A,B.....	.30
RAD-204	Door, For Cord Compartment, Black P671A,B.....	.30
RAU-465	Cabinet,White & Terra Cotta, P672A,B.....	6.25
RAU-468	Cabinet,Black & White,P671A,B....	6.25
*-RB-1010	Cabinet,Turquoise,P673A,B.....	6.25
RDK-579	Knob,Tuning,Terra Cotta,P672A,B..	.85
RDK-580	Knob,Tuning,Black,P671A,B,P673A,B	.85
RDK-582	Knob,Volume,Terra Cotta,P672A,B...	.85
RDK-583	Knob,Volume,Black,P671A,B,P673A,B.	.85
RHY-081	Handle,Terra Cotta,P672A,B.....	.50
RHY-083	Handle,Black,P671A,B.....	.50
*-RS-1106	Handle,Turquoise, P673A,B.....	.50
* RYN-033	Medallion.....	.30
*-RS-1029	Frame,Grille,Upper	.95
*-RS-1030	Frame,Grille, W/Monogram.....	1.10
*-RB-1090	Cabinet, Green, P674B.....	6.25
*-RS-1798	Handle, Green, P674B.....	.50
*-RS-1799	Door, Cord Compartment, Green,P674B	.30
*-RS-1800	Knob, Tuning, Green, P674B.....	.85
*-RS-1801	Knob, Volume, Green, P674B.....	.85

* Denotes Items Not Previously Cataloged.

All Parts Not Listed By Catalog Numbers Are Common Items, Obtainable From Radio Parts Jobbers.
Prices are suggested list prices subject to change without notice.



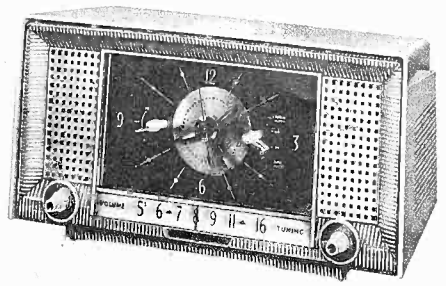
S-P671-2

12-58

PRELIMINARY SERVICE DATA

S-C460A
RADIO
MODEL
C-460A

SPECIFICATIONS			
ELECTRICAL RATING:	105 - 120 volts A.C. 60 cycles 30 Watts		
OPERATING FREQUENCIES:	540 - 1600 KC 455 KC. IF.		
POWER OUTPUT:	Undistorted: 1 Watt Maximum: 1.5 Watts		
TUBE COMPLEMENT:	V1	Osc. Conv.	12BE6
	V2	I.F. Amplifier	12BA6
	V3	Det. and Audio Amplifier	12AV6
	V4	Power Output	50C5
	V5	Rectifier	35W4



GENERAL INFORMATION

Service on defective clock units (Telechron Catalog Number C114G17) should be referred to the nearest G.E. Servicenter or G.E. Service Station.

Always use an isolation transformer when servicing or aligning this receiver to protect personnel and test equipment.

When aligning, keep the signal input low and volume control set at maximum so the AVC will not affect the output.

TO REMOVE FRONT PANEL

1. Pull off clock control levers.
2. Remove volume and tuning control knobs.
3. Remove screws fastening front panel to bottom of cabinet.
4. Lift panel out carefully to prevent scratching crystal on control shafts.

TO REMOVE CHASSIS

1. Follow steps one through four as above.
2. Remove two screws from top of masonite board and third screw beside line cord interlock.
3. Unscrew clock-set knob.
4. Unsolder speaker leads.

PRELIMINARY REPLACEMENT PARTS LIST			
CAT. NO.	SYMBOL	DESCRIPTION	PRICE
CAPACITORS			
*-RS-2058	C1	Capacitor, Tuning.....	3.95
Δ-RS-2060	C15A,B	30mf., 75mf., @150V. (was RCE215).....	1.75
Δ-RS-2045	R4,5,6 C10,11,12,13 C2 C7 C14 C16 C17	Couplate (was REK011).....	1.00
		47mmf., 500V .047mf.,200V .01mf., 450V .047mf.,600V .01mf.,1000V	
POTENTIOMETER			
*-RS-2059	R3	Volume Control 500K.....	1.00
COILS AND TRANSFORMERS			
RS-1415	T1,2	Transformer, I.F.....	1.55
RS-1437	L2	Coil, Oscillator.....	.65

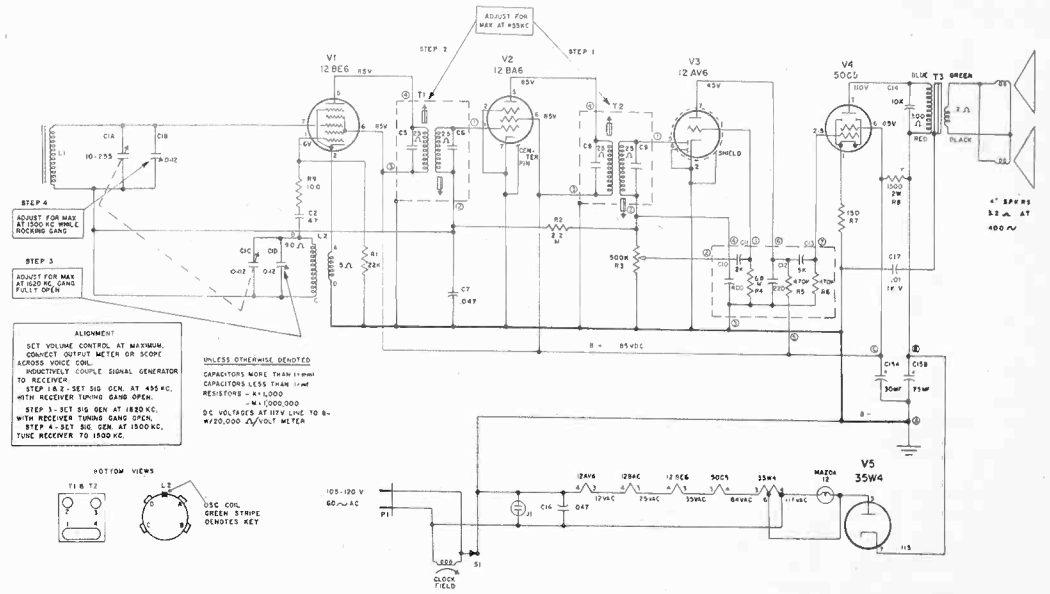
PRELIMINARY REPLACEMENT PARTS LIST (CONT'D.)			
CAT. NO.	SYMBOL	DESCRIPTION	PRICE
COILS AND TRANSFORMERS (CONT'D.)			
*-RS-2055	L1	Antenna.....	1.90
*-RS-2057	T3	Transformer, Output.....	2.25
MISCELLANEOUS			
RB-1057		Speaker.....	5.45
RS-1323		Light, Pilot.....	.25
RS-1650		Socket, Pilot Light.....	.40
RS-1454		Hood, Pilot Light.....	.15
*-RS-2049		Tuning Shaft Assembly.....	.55
RS-1174		Plate (Power Cord).....	.03
RS-1569		Receptacle (Appliance).....	.55
*-RS-2062		Power Cord (Ant. White).....	1.40
Δ-RS-2065		Interlock (was RJJ010).....	.15
RS-1594		Clip (U Type).....	.05
RS-1781		Dial Cord (25 yds bulk).....	2.50
RS-1792		Tube Socket (with center pin).....	.20
RS-1791		Tube Socket (with/out center pin)...	.15
*-RS-2061		Spring (Snooze).....	.15
RS-1127		Pulley, Idler.....	.05
*-RS-2063		Rivet (Idler Pulley).....	.05
*-RS-2064		Rivet (Idler Pulleys).....	.05
CABINET AND APPEARANCE ITEMS			
*-RB-1111		Cabinet.....	3.60
*-RS-2050		Crystal.....	4.65
*-RS-2051		Dial Backing Window.....	.41
*-RS-2052		Knob (Snooze).....	.70
*-RS-2053		Knob (Vol. and Tuning).....	.40
*-RS-2200		Knob, Clock (lever type).....	.10
*-RS-2067		Knob, Time set.....	.05
*-RS-2054		Pointer, Dial.....	.30

*- Denotes Parts Not Previously Cataloged.

All Parts Not Listed By Catalog Numbers Are Common Items, Obtainable From Radio Parts Jobbers.

Δ- Denotes part used in former radio/phono models. You may have it stocked under number shown in parenthesis. Please change your records to the new number with two-letter prefix.

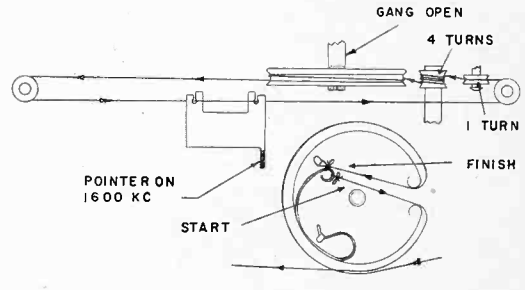
Prices Are Suggested List Prices And Subject To Change Without Notice.

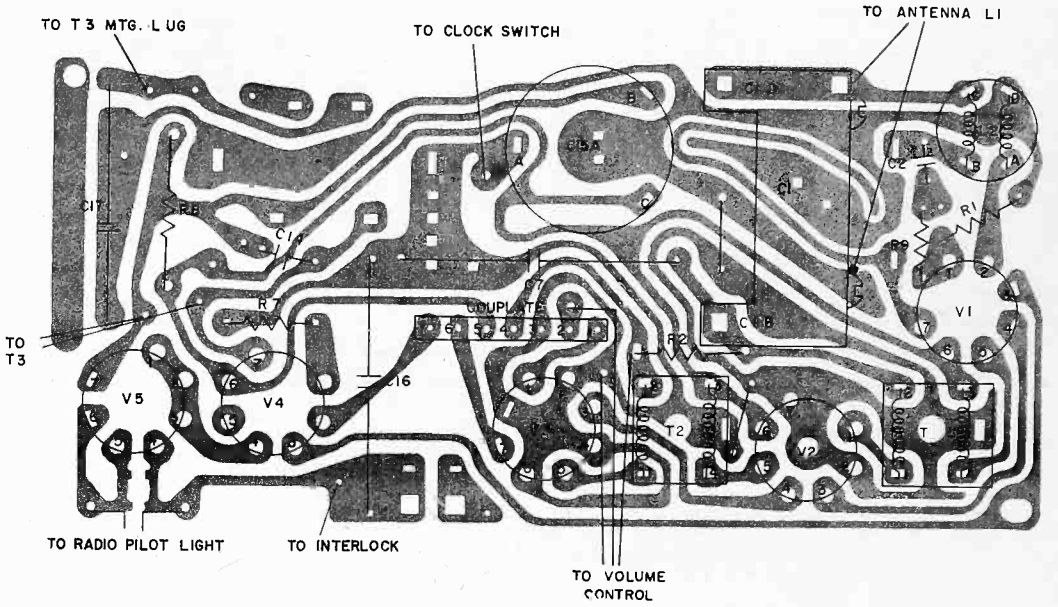


Tube Pin Resistance Chart

Tube	1	2	3	4	5	6	7
12AV6	6.8M	0	15	0	500K	0	*470K
12BA6	2.7M	0	25	15	*1500ohm	*1500ohm	0
12BE6	22K	0	35	25	*1500ohm	*1500ohm	2.7M
50C5	150ohm	470K	35	80	470K	*1500ohm	*300ohm
35W4	TP	TP	80	110	105	105	20k (min.)

TP-Tie Point
* Measured from Pin 7 of V5
Resistances measured with pilot light(Mazda # 12) in socket
All measurements taken with respect to B- unless otherwise designated.



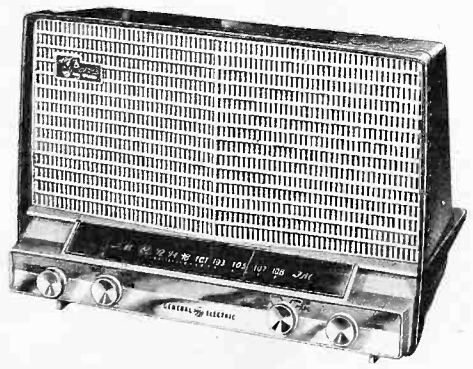


ER-S-T120A
COVERS
MODELS
T120A
T120B

FOR
AM-FM RADIO RECEIVERS

SUPERSEDES SERVICE NOTE S-T120-1

SPECIFICATIONS	
CABINET:	Brown - T120A,B
ELECTRICAL RATING:	105-120 volts AC-DC 40 Watts
TUNING RANGE:	AM 540-1600 KC. FM 88-108 MC.
I. F.	AM 455 KC. FM 10.7 MC.
POWER OUTPUT:	Undistorted: 1 Watt Maximum: 1.5 Watts
TUBE COMPLEMENT:	V1-FM RF Amplifier..... 6BJ6 V2-FM Mixer..... 6AB4 V3-FM Oscillator-AFC..... 12AT7 V4-AM Conv.--1st FM IF..... 12AU6 V5-AM IF--2nd FM IF..... 12BA6 V6-Limiter..... 12AU6 V7-Detector--AVC--Discriminator-Audio Amplifier..... 19T8 V8-Power Amplifier..... 35C5



T120A,B

GENERAL INFORMATION

The Models T120A and T120B are AM-FM superheterodyne radio receivers. The circuit employs the latest engineering designs for AM-FM reception.

The difference between the T120A and T120B is the type of capacitor used for the FM oscillator (C1D). The T120A employs a slug-tuned trimmer capacitor and the T120B uses a fixed 1.5mmf ceramic disc capacitor.

One of the distinct differences between AM and FM is the method of signal modulation. The AM radio frequency carrier wave is amplitude modulated and the FM carrier wave is frequency modulated. This results in several FM advantages over AM which are: higher fidelity, noise-free reception, and little or no interference between stations.

A built-in ferrite rod antenna is provided for AM reception.

The power line cord is used as the built-in FM antenna. The clamp on the power line cord is attached to the right hand terminal on the FM antenna terminal board. Keep the power cord leading to the electrical outlet free from other wires and extended to its fullest length; changing the position of the cord slightly may improve reception.

Do not connect ground wires to the FM receiver at any time.

Due to the circuitry of some types of tape recorders, a hum may be heard when it is plugged into the receiver. If reversing the receiver power plug and the tape recorder power plug in the wall outlet does not elminate the hum, an isolation transformer will be required. The isolation transformer rating should be 105-117 volts, 50 watts, such as a Stancor transformer model P6410 or Chicago transformer model IS50. Plug the isolation transformer into the wall outlet and insert the receiver power cord into the isolation transformer.

The following is a brief resume of the various stages in the receiver:

POWER SUPPLY

The power supply consists of a 100 mil selenium rectifier and a 80mf.-50mf. electrolytic capacitor. It is common to both AM and FM. An inoperative power supply will affect both AM and FM operation.

AUDIO AMPLIFIERS

The audio amplifier sections, V7 and V8, are also common to AM and FM. To check for operation, turn volume control to maximum and apply an audio signal to the high side of volume control.

DISCRIMINATOR

The discriminator (V7) is used to demodulate the IF signal. The frequency variations are changed back to voltage variations that vary in accordance with the audio or modulating voltage. The discriminator performs a function somewhat similar to the 2nd detector in an AM superheterodyne receiver.

LIMITER

The limiter (V6) receives the amplitude modulation and provides at its output a constant amplitude for the discriminator. The variations in amplitude, such as atmospheric interference and man made noises are cut off and a constant level of amplitude is continuously produced at the limiter output. This results in considerable reduction of unwanted noise.

I. F.

The IF transformers are T3 and T4 for the AM; and T1, T2, and T5 for the FM. The IF can be checked as described in the alignment chart.

RF SECTION

The RF section consists of the RF Amplifier (V1), mixer (V2), and FM oscillator (V3). A separate mixer and oscillator are used to prevent interaction between the two stages. These three stages are designed to operate at higher frequencies than required for AM.

AFC

AFC is a unique feature which allows drift-free tuning on FM signals. The oscillator frequency will automatically shift with the incoming signals to maintain an exact difference between the incoming signal and oscillator at all times, thereby, compensating for drift or slight errors in manual tuning. This shift in oscillator frequency automatically tunes in the incoming signal for clearest reception. The output voltage variations from V7 are fed into grid 7 of V3 (AFC section) which varies the inductance across the oscillator grid circuit thereby stabilizing the oscillator exactly on frequency.

TO REMOVE CABINET

1. Remove 2 cab. rear screws & separate front & back. (Remove line cord antenna clamp, if attached)
2. Chassis can remain on cabinet front for troubleshooting and alignment.
   (Knobs are removed by releasing captive clips with a screwdriver.)

TO REMOVE A SPEAKER

1. Same as No. 1 above.
2. Unscrew the six hex-head screws holding the grille to the cabinet front.
3. Label and unsolder speaker leads from speaker terminals. Reversed speaker leads will cause distorted audio.
4. Unscrew the four screws around front of speaker and remove the speaker from cabinet front.

Alignment Equipment:

1. Isolation Transformer.
2. Oscilloscope.
3. AM-FM signal generator with sweep.
4. Marker generator (or 10.7mc, 98mc, 108mc crystals)
5. VTVM.
6. .01mf., 400V. capacitor.
7. 470K 1/2 W. carbon resistor.
8. 270 ohm 1/2 w. carbon resistor.

CAUTION

Always use an isolation transformer when servicing or aligning this receiver to protect test equipment and personnel.

TROUBLESHOOTING

Troubleshooting or repairing a defective FM set is generally similar to servicing an AM receiver.

The power supply and audio output stages are common to both AM and FM. These two stages can be eliminated immediately in the receiver as a cause for defective FM performance as long as the AM is satisfactory. The circuits in which FM defects may occur are the RF, oscillator, IF, limiter, or discriminator stages.

To test the FM oscillator, check the grid bias voltage. A voltage of -.7V.D.C. will indicate that the oscillator is operating. With the oscillator operating properly, the RF can be checked by attaching the signal generator to the antenna terminals and checking the output of the RF stage for a deflection on the - 3V.D.C. scale of a VTVM connected to pin 1 of V4.

Correcting trouble in the RF requires care due to the critical values of coils and lead dressings. Caution must be exercised not to rearrange or adjust coils without definitely knowing the trouble, as rearranging leads or components may mean readjusting the circuit and alignment.

No AM on the low frequency portion of the AM band may be caused by the AM oscillator becoming inoperative. The oscillation can usually be restored by:

1. Replace C12 with a 33mmf. 500V. capacitor.
2. Replace L11 with a 20uh choke (catalog number RS-1835.)

If proper operation of the AM does not result, make routine checks of other AM oscillator circuit components.

AM ALIGNMENT

The AM alignment can be accomplished with a VTVM or an oscilloscope as the output monitor. All VTVM output readings will be observed on an AC volt scale. See the alignment chart for the step by step procedure.

Set the band switch to "AM" position.

Turn volume control to maximum volume position and adjust the signal generator output control for alignment signal.

The position of the receiver should not be changed during alignment to prevent possible errors in output readings.

FM ALIGNMENT

The proper method for FM alignment of this receiver is by using an oscilloscope, signal-sweep generator, and a marker generator (or crystals may be used for the necessary marker pips of 98 mcs, 108 mcs, and 10.7 mcs. The crystals can be inserted into the crystal marker receptacles on most signal sweep generators.

1. Set bank switch to FM position.
2. Set volume control to minimum position.
3. In peak alignment, a 470K resistor is used in series with the positive test lead of the VTVM. In aligning the FM IF and RF sections the signal input should be reduced so that the VTVM reads approximately - 1V.D.C.
4. In aligning the discriminator adjust cores of T6 for maximum DC keeping the level from 3 to 4 volts.
5. In sweep alignment set the sweep width control on the sweep generator to 150KC.
6. The marker generator output, when used, may be inductively coupled as near to the sweep input point as possible or inserted into the marker input jack on the signal sweep generator.
7. The frequency setting of the marker generator is the same as the sweep generator setting for each step as shown in the FM alignment chart.

Marker pips should always be kept at a minimum amplitude to prevent distortion of the response curve.

The position of the receiver should not be changed during alignment to prevent possible error in output readings.

When replacing FM components in the tuner section, mount replacement part exactly as the original and carefully dress leads to the components.

All non-shielded leads must be kept as short as possible. Test points on dip-soldered side of the circuit board have a looped wire so that test equipment can be directly attached with the shortest leads possible.

FM OSCILLATOR COIL (T120B only)

The FM oscillator coil, L5, may require adjustment if components, other than tubes, are changed in the FM oscillator-mixer section. Check the band end frequencies, if the set tunes through 108 and 88 MC do not touch the coil. If the oscillator frequency is low adjust L5 by spreading the turns slightly. If the oscillator frequency is high, adjust L5 by squeezing the turns together slightly. (Note: a small change in the space between 2 turns of L5 shifts the frequency approximately 1 MC.)

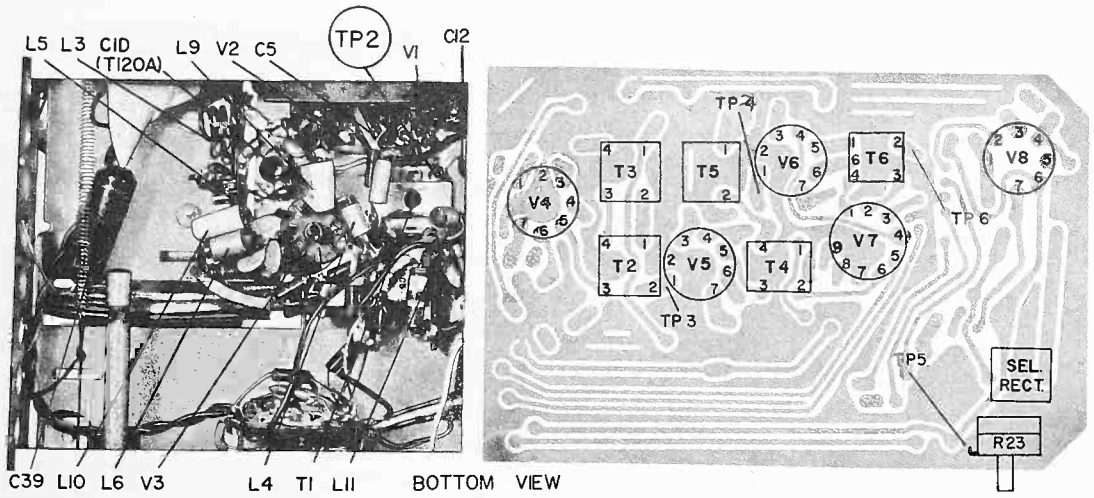
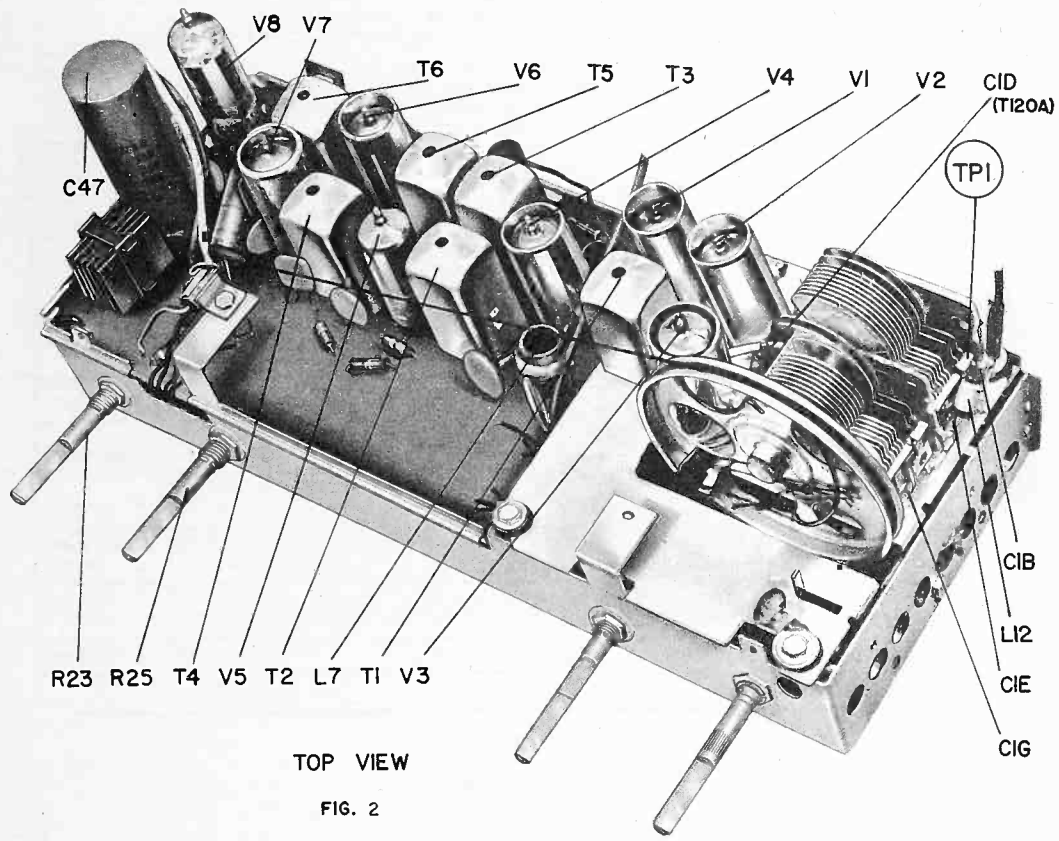


FIG. 1



TOP VIEW

FIG. 2

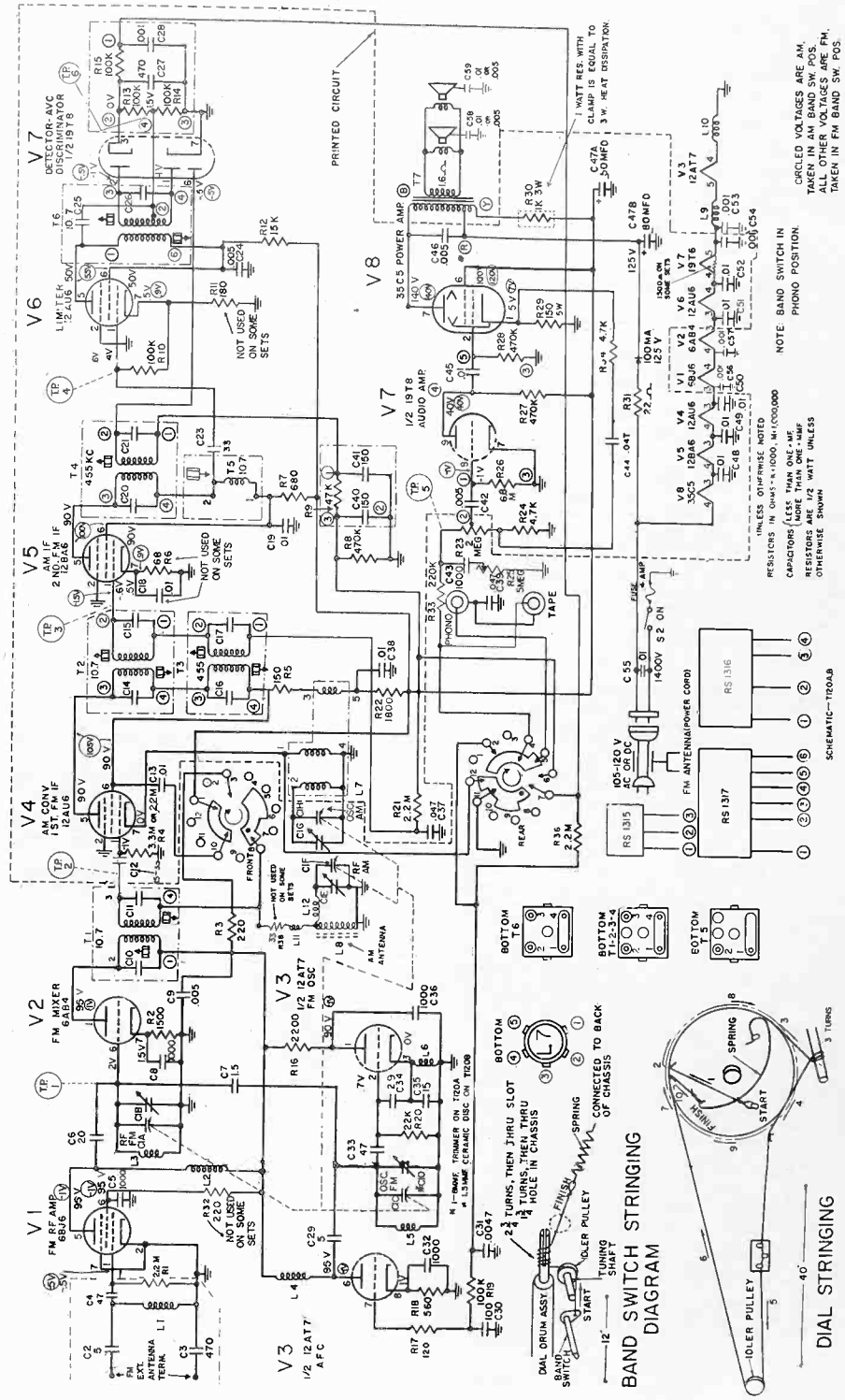


FIG. 3

AM ALIGNMENT CHART

Step	Signal Generator Input Point	Gen. Setting	Receiver Tuning	VTVM OUTPUT: Connect VTVM Across	VTVM OUTPUT: Adjust the following	OSCILLOSCOPE OUTPUT: Connect Scope Across	OSCILLOSCOPE OUTPUT: Adjust the following
1	High side to Test Point 3 in series with a .01mf., low side to chassis.	455 KC 30% Mod. with 400 cycles	Gang	Voice	Top and bottom cores of T4 for max. output	Voice	Top and bottom cores of T4 for max. ampl of curve. See Fig.4
2	High side to Test Point 2 in series with a .01mf., low side to chassis		Closed	Coil	Top and bottom cores of T3 for max. output	Coil	Top and bottom cores of T3 for max. ampl. of curve. See Fig. 4
3	Repeat steps 1 and 2.						
4	Inductively coupled to AM Antenna	1620KC	1620KC	Voice	AM osc (C1G) for max. output	Voice	AM osc (C1G) for max. ampl.
5		1500KC	1500KC	Coil	AM ant (C1E) for max. output	Coil	AM ant (C1E) for max. ampl.
6	Repeat steps 1, 2, 3, and 4.						

FM ALIGNMENT

Step	Sweep Generator Input Point Keep Sweep Output Low	Sweep Generator And Marker Setting	Tuning Condenser Setting	SWEEP ALIGNMENT: Connect Scope To Following In Series with 470K	SWEEP ALIGNMENT: Adjust	PEAK ALIGNMENT: Connect VTVM To Following Test Points In Series With 470K Res.	PEAK ALIGNMENT: Adjust
1	TP3 in series with .01mf. Low side to Chassis	10.7 MC unmodulated	Closed	TP4	T5 for max. (See fig. 5)	TP4	T5 for Max. DC Volts
2	TP3 in series with .01mf Low side to Chassis	10.7 MC unmodulated	Closed	TP5 (high side of Vol. Cont.)	T6 Top core for cross-over (Fig.6)	TP5 (high side of Vol. Cont.)	T6 Top core for 0 DC Volts
					T6 Bottom core for Max. Amp. & Symmetry (Fig. 6)	TP5	T6 Bottom core for Max. DC Volts
3	TP2 in series with .01mf Low side to Chassis	10.7 MC unmodulated	Closed	TP4	T2 for Max. Amp & Sym. (Fig. 5)	TP4	T2 for Max. DC Volts
4	TP1 in series with .01 mf (connect to FM RF stator)(see fig.2)	10.7 MC unmodulated	Closed	TP4	T1-2-5 for Max. Amp. (Fig. 7)	TP4	T1-2-5 for Max. DC Volts
5	TP1 in series with .01mf(connect to FM RF stator)	10.7 Mc unmodulated	Closed	TP5	Same as Step 2	Same as Step 2	Same as Step 2
6	Recheck	Steps 4-5					
7A (T120A only)	High side to right antenna terminal in series with 270 ohm res. Low side to bottom ant. terminal	108 MC Unmodulated	Open	TP4	FM osc (C1D) for centering of marker on peak(fig.5)	TP4	FM osc (C1D)
7B (T120A & T120B)		98 Mc unmodulated	Tune To 98 MC	TP4	FMRF Trimmer C1B For Max. (See fig 5).	TP4	FMRF Trimmer C1B for Max. DC Volts

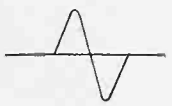


FIG. 4

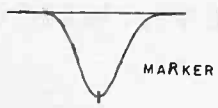


FIG. 5

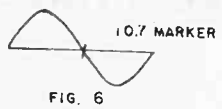


FIG. 6

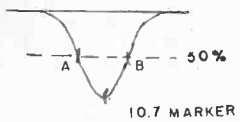


FIG. 7

A - 10.625 MARKER

B - 10.775 MARKER

REPLACEMENT PARTS LIST-MODELS T120A, B

CAT. NO.	SYMBOL	DESCRIPTION	PRICE
		CAPACITORS	
*-RS-1023	C9,24,42,46	.005mf.,+150-0%,450...	.20
RS-1051	C8,32,36,43, 53,54,56,57	.001mf.,450V.....	.20
*-RS-1285	C1	Tuning Capacitor.....	6.20
*-RS-1296	C2	5mmf.,±10%,1000V.....	.25
*-RS-1297	C29	5mmf.,500V.....	.20
*-RS-1298	C7	1.5mmf.,500V.....	.25
*-RS-1299	C6,12	20mmf.,±20%,500V.....	.20
*-RS-1301	C3	470mmf.,1000V.....	.25
*-RS-1302	C4,33	47mmf.,±10%,500V.....	.20
*-RS-1303	C30	100mmf.,±20%,500V.....	.20
*-RS-1305	C12,35	15mmf.,±10%,500V.....	.20
*-RS-1325	C47A,B	50-80mf.,150V.....	1.90
*-RS-1327	C34	29mmf.,±20%,500V.....	.20
*-RS-1387	C1D(T120A)	Trimmer Cap.,1-8mmf...	.80
	C1D(T120B)	1.5mmf., ceramic disc.	
	C5	.001mf.,500V.Tubular	
RS-1661	C12,23	33mmf.,±20%,500V.....	.20
RS-1022	C13,18,19 38,45,48,49 50,51,52	.01mf.,+150-0%,450V	.30
	C31	.0047mf.	
	C37,39,44	.047mf.,±20%,500V.	
	C55	.01mf., 1400V	
	C58,59	.01mf.,1400V. or .005mf.,1400V.	
		COUPLATES	
*-RS-1315	R9,C40,41	47K,(2) 150mmf.....	.85
*-RS-1316	R13,14,15 C27,28	(3) 100K,470mmf. and 1000mmf.....	.80
*-RS-1317	C42,45 R26,27,28	.005mf.,.01mf.,6.8meg. (2) 470K.....	1.10
		POTENTIOMETERS	
*-RS-1279	R23	Volume Control,2meg. and Sw.....	1.00
*-RS-1280	R25	Tone Control, 5 meg...	1.85
		RESISTORS	
*-RS-1440	R31	22 ohms. 1W., W.W....	.30
*-RS-1441	R29	150ohms. 5W., W.W.....	.50
		COILS AND TRANSFORMERS	
*-RS-1271	T7	Output Transformer....	3.20
*-RS-1289	T1	1st. I.F. Trans.,F.M..	2.45
*-RS-1290	L3	Coil, Converter, F.M..	.15
*-RS-1291	L5	Coil, Oscillator,F.M..	.15
*-RS-1292	L2	Coil, Choke, RF.,F.M..	.15

CAT. NO.	SYMBOL	DESCRIPTION	PRICE
		COILS & TRANSFORMERS (CONT'D.)	
*-RS-1293	L1	Coil, RF Input	.15
*-RS-1294	L4,6, 9,10,12	Coil, AFC, V3 Cathode,(2)Fil. and AM Antenna Choke...	.30
*-RS-1311	T2	2nd I.F. Transformer,FM.....	2.45
*-RS-1312	T5	3rd I.F. Transformer,FM.....	2.45
*-RS-1313	T4	2nd I.F. Transformer,AM.....	1.80
*-RS-1314	T6	Discriminator Transformer....	3.35
*-RS-1318	L7	Coil. Oscillator. AM.....	.70
*-RS-1321	T3	1st I.F. Transformer, AM.....	1.80
*-RS-1322	L8	Antenna, AM.....	1.60
RS-1835	L11	Choke,AM. R.F.....	.45
		MISCELLANEOUS	
*-RB-1054		Speaker.....	6.25
RDC-032		Dial & Bank Sw. cord (25 yds. bulk)	2.50
RHC-053		L.F. Mtg. Clip.....	.02
RHM-043		"C" Washer.....	.01
RJS-232		Tube Socket (V5,V6,V8).....	.25
RJS-237		Tube Socket (V4).....	.15
RS-1158		Tube Shield,(V1,V2,V4,V5,V6).....	.10
*-RS-1266		Power Cord.....	1.00
*-RS-1275		Chassis Mtg. Insulator.....	.10
*-RS-1276		Spacer.....	.02
*-RS-1277		Bushing.....	.15
*-RS-1281		Band Switch.....	2.35
*-RS-1286		Tube Socket, (V3).....	.35
*-RS-1287		Tube Socket, (V1,V2).....	.30
*-RS-1288		Ground Lug.....	.04
*-RS-1295		Grommet.....	.05
*-RS-1308		Tube Socket (V7).....	.25
*-RS-1310		Tube Shield (V3,V7).....	.10
*-RS-1319		Rectifier, (100 Mil.).....	3.65
*-RS-1320		Ground Strap.....	.04
*-RS-1430		Phono and Antenna Board.....	.45
*-RS-1431		Tuning Shaft.....	.25
*-RS-1432		Lever and Rivet Assem.....	.10
*-RS-1442		Fuse, .4 Amp., 150V.....	.70
*-RS-1482		Interlock.....	.20
*-RS-1676		Spring Dial Drum.....	.05
*-RS-1770		Dial Drum Assembly.....	1.95
		CABINET AND APPEARANCE ITEMS	
*-RB-1051		Cabinet Back.....	5.80
*-RB-1052		Baffle, Nameplate & Crystal (Assem.)	5.50
*-RB-1053		Grille and Medallion (Assem.).....	3.75
RS-1120		Medallion (only).....	.30
*-RS-1268		Crystal (only).....	.50
*-RS-1270		Nameplate (only).....	1.50
*-RS-1272		Knob & Clip, (Tune and Vol.).....	.45
*-RS-1273		Knob & Clip, (Band Sel. Sw.).....	.45
*-RS-1283		Pointer Assembly.....	.50
*-RS-1326		Knob Clip.....	.02
*-RS-1399		Knob & Clip (Tone Control).....	.45

"*" Denotes New Items Not Previously Cataloged.

PRICES ARE SUGGESTED LIST PRICES SUBJECT TO CHANGE WITHOUT NOTICE.

All parts not listed by catalog number are common items, obtainable from radio parts jobbers.

PRELIMINARY SERVICE DATA

S-C450A
RADIO
MODELS
C-450A
C-451A
C-452A

SPECIFICATIONS			
ELECTRICAL RATING:	105 - 120 volts A.C. 60 cycles 30 Watts		
OPERATING FREQUENCIES:	540-1600 KC 455 KC I.F.		
POWER OUTPUT:	Undistorted: 1 Watt Maximum: 1.5 Watts		
SPEAKERS:	(2) 4", 3.2 ohms @ 400cps		
TUBE COMPLEMENT:	V1	Osc. Conv.	12BE6
	V2	I.F. Amplifier	12BA6
	V3	Det. and Audio Amplifier	12AV6
	V4	Power Output	50C5
	V5	Rectifier	35W4

GENERAL INFORMATION

Service on defective clock units (Telechron Catalog Number C127G2) should be referred to the nearest G. E. Servicenter or G. E. Service Station.

Always use an isolation transformer when servicing or aligning this receiver to protect personnel and test equipment.

When aligning, keep the signal input low and volume control set at maximum so the AVC will not effect the output.

TO REMOVE CABINET BACK

1. Remove time-set knob.
2. Remove two screws on bottom fastening cabinet back to cabinet front.
3. Remove screw above appliance outlet.
4. Disengage two snaps on top front of cabinet by exerting forward pressure on top rear of cabinet until bottom of cabinet back comes loose.
5. Pull cabinet back out.

TO REMOVE CHASSIS

1. Follow steps one thru five as above.
2. Pull off knobs.
3. Remove four screws fastening chassis mounting bracket to cabinet front and bottom.
4. Lift chassis back and out.

PRELIMINARY REPLACEMENT PARTS LIST			
CAT. NO.	SYMBOL	DESCRIPTION	PRICE
CAPACITORS			
*-RS-2175	C1	Tuning Capacitor.....	3.80
RS-1785	C2	47mmf., 500V.....	.25
	C7	.047mf.,200V	
RS-2045	C10,C11		
	C12,C13	Couplate.....	1.00
	R4,5,6		
RS-1022	C14	.01mf.,450V.....	.30
RS-2151	C15A,B	30mf., 75mf., @150V....	2.10
	C16	.47mf., 600V	
	C17	.001mf.,1000V	
COILS AND TRANSFORMERS			
*-RS-2167	L1	Antenna Loop.....	1.25
RS-1437	L2	Coil, Osc.....	.65

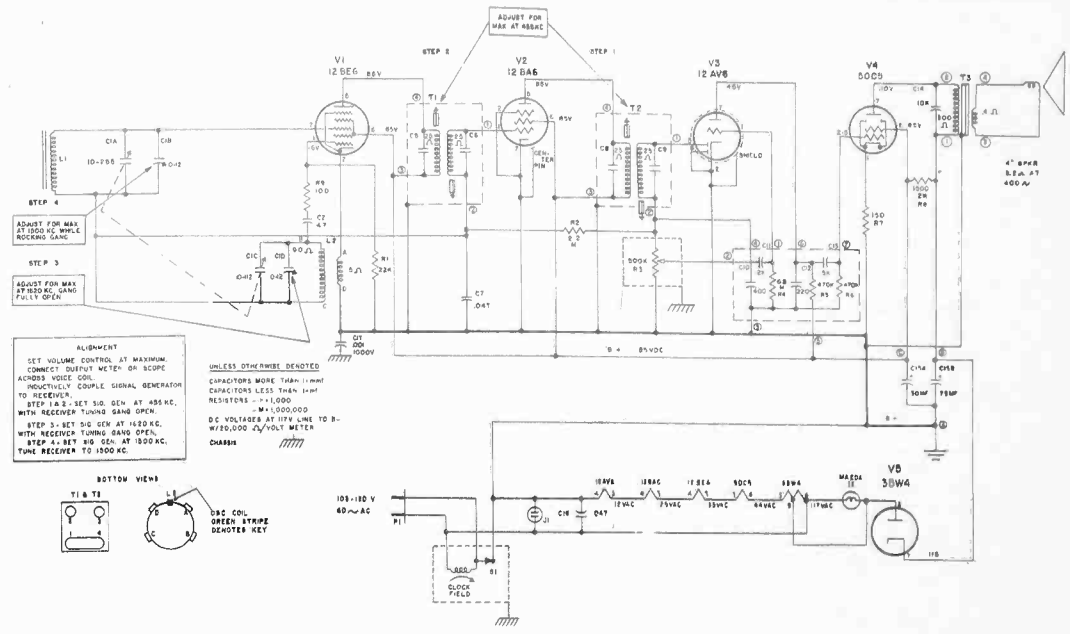
PRELIMINARY REPLACEMENT PARTS LIST (CONT'D)			
CAT. NO.	SYMBOL	DESCRIPTION	PRICE
COILS AND TRANSFORMERS (CONT'D)			
RS-1415	T1,2	Transformer, I.F.....	1.55
RS-1416	T3	Transformer, Output...	2.20
POTENTIOMETER			
*-RS-2176	R3,S1	Volume Control, 500K., and switch....	1.00
MISCELLANEOUS			
RB-1057		Speaker.....	5.45
RS-1127		Pulley Euler.....	.05
RS-1174		Power Cord Plate.....	.05
RS-1323		Pilot Light, #12.....	.25
RS-1418		Interlock Terminals.....	.05
RS-1509		Appliance Receptacle.....	.55
RS-1650		Pilot Light Socket.....	.40
RS-1781		Dial Cord (25 yds. bulk).....	2.50
RS-1791		Socket, 7 pin.....	.15
RS-1792		Socket, 7 pin, with centerpost..	.25
RS-1809		Tubular Clip.....	.10
RS-2155		Spring, (Tuning Cap.).....	.15
*-RS-2177		Hairpin Cotter, (Snooze Lever)..	.05
*-RS-2178		Spring, (Snooze Lever).....	.05
CABINET AND APPEARANCE ITEMS			
*-RB-1119		Cabinet Front.....	2.15
*-RB-1120		Cabinet Back, White, (C450A)....	4.00
*-RB-1121		Cabinet Back, Turquoise, (451A)..	4.00
*-RB-1122		Cabinet Back, Gray, (452A).....	4.00
RS-2040		Knob, (Vol. and Tuning).....	.35
*-RS-2160		Tuning Shaft (with bushing).....	.60
*-RS-2161		Crystal, Clock.....	.50
*-RS-2162		Crystal, Dial.....	.65
*-RS-2163		Dial Backing Plate, Turquoise, (C450A, C451A).....	.40
*-RS-2164		Dial Backing Plate, Gray, (C452A)	.40
*-RS-2165		Snooze Lever.....	.50
*-RS-2166		Push Button.....	.35
*-RS-2168		Snooze Lever Shaft.....	.15
*-RS-2169		Clock Face.....	.85
*-RS-2170		Pointer.....	.45
*-RS-2150		Cabinet Clip.....	.05
*-RS-2171		Alarm Hand.....	.15
*-RS-2172		Second Hand.....	.15
*-RS-2173		Minute Hand.....	.15
*-RS-2174		Hour Hand.....	.15

*-Denotes Parts Not Previously Cataloged.

All Parts Not Listed By Catalog Numbers Are Common Items, Obtainable From Radio Parts Jobbers.

Δ-Denotes part used in former radio/phono models. You may have it stocked under number shown in parenthesis. Please change your records to the new number with two-letter prefix.

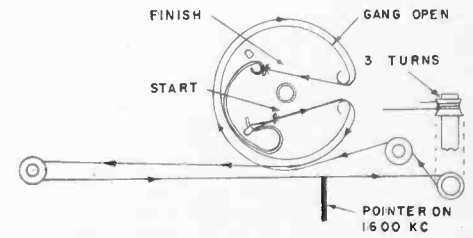
Prices Are Suggested List Prices And Subject To Change Without Notice.

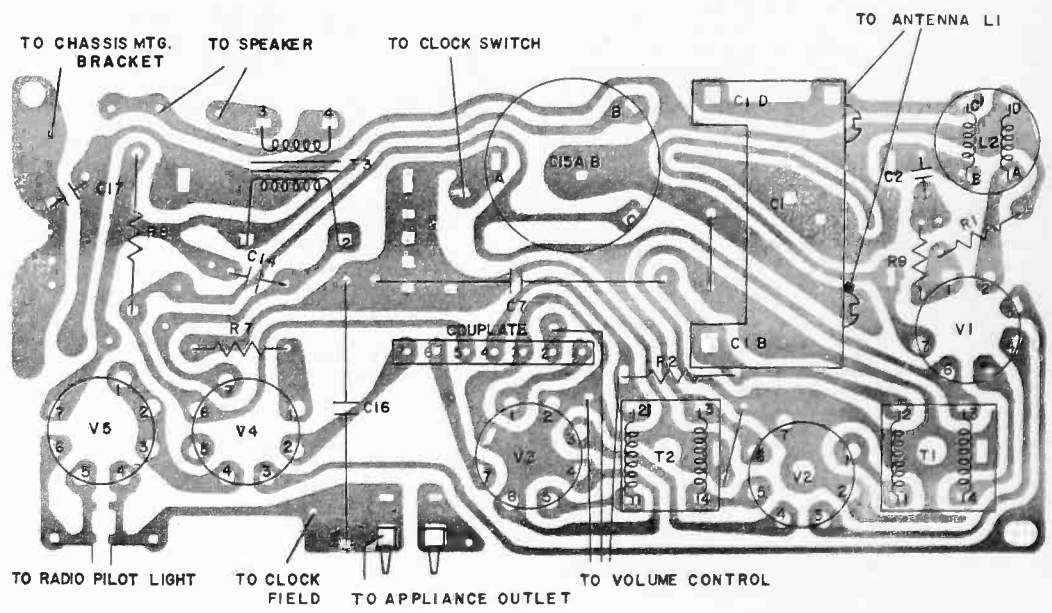


Tube Pin Resistance Chart

Tube	1	2	3	4	5	6	7
12AV6	6.8M	0	15	0	500K	0	*470K
12BA6	2.7M	0	25	15	*1500ohm	*1500ohm	0
12BE6	22K	0	35	25	*1500ohm	*1500ohm	2.7M
50C5	150ohm	470K	35	80	470K	*1500ohm	*300ohm
35W4	TP	TP	80	110	105	105	20Ω (min.)

TP-Tie Point
* Measures from Pin 7 of V5
Resistances measured with pilot light(Mazda # 12) in socket
All measurements taken with respect to B- unless otherwise designated.





57 SERIES RADIO CHASSIS

GENERAL

This manual contains service information on the 57 series radio chassis. The 57 series chassis are AM-FM tuners which require an external power amplifier. This power amplifier may be the new stereo (split) amplifier, such as the Amp 175, or it may be a single channel amplifier.

Dual controls are used throughout which enable the chassis to be readily adapted for reproduction of the new stereo records.

Additional input sockets are available on the rear apron of the chassis which will permit the operation of a monaural tape recorder in conjunction with instruments using either of these chassis.

Provisions are provided for the connection of an external AM or FM antenna. A terminal board having two connections marked FM, a connection marked AM and three other connections marked G, 1 and 2 are located on a fibre board fastened to the rear of the chassis. To connect an external FM antenna to these chassis merely connect it to the designated terminals. To connect an AM antenna use the designated terminal for the connection, however, the antenna should also be grounded to the chassis by connecting it to terminal "G". Terminals 1 and 2 are not used.

SPECIFICATIONS

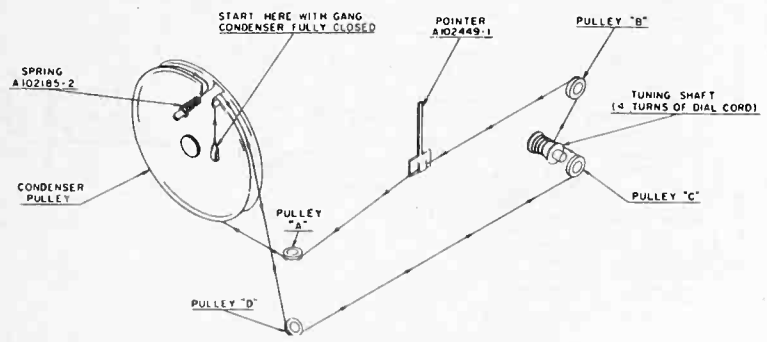
Power Source Rating	
Frequency	60 cycles
Voltage	117 volts AC
Wattage (with AMP 175)	175 watts
Tuning Frequency Range	
Broadcast Band	540-1620KC
FM Band	88-108MC
IF Frequency	10.7MC/455KC

TUBE COMPLEMENT

Ref.	Function	Type
V101	FM RF Amplifier	6CY5
V102	FM Mixer	6U8
V103	AM RF Amplifier	6BZ6
V104	AM Converter	6BE6
V201	IF Amplifier	6BA6
V202	Driver	6BA6
V203	Ratio Detector	6AL5
V301	Audio Amplifier	12AX7

DIAL STRINGING GUIDE

Select a 64 inch length of dial cord and tie a small loop at each end. Turn the tuning gang fully out of mesh and hook one end of the cord over the metal hook on the condenser pulley nearest the front of the chassis and proceed with the stringing as shown in the drawing below.



ALIGNMENT

AM ALIGNMENT

Set band switch to AM position. Check dial pointer positioning.

SIGNAL CENERATOR		SET RECEIVER	ADJUSTMENTS	CONNECT OUTPUT METER	REMARKS
COUPLE TO:	FREQUENCY	DIAL TO:			
6BE6 (pin 7) thru .01 mfd	455 kc (modulated)	Near 1000 kc (free of interference)	T202, T106, top and bottom slugs	Across voice coil	Adjust for max. output
AM ant. term. thru 10 mmf	1400 kc (modulated	1400 kc	C101F C101D C101B	"	"
"	600 kc (modulated)	600 kc	T105, T104	"	Adjust for max. output.
"	-----	-----	-----	"	Repeat steps 2 and 3.

FM ALIGNMENT (Using AM Signal Generator and VTVM)

Set band switch to FM position. Note: Place a 1 megohm resistor in series with hot side of VTVM.

SIGNAL GENERATOR		SET RECEIVER	ADJUSTMENTS	CONNECT OUTPUT METER	REMARKS
COUPLE TO:	FREQUENCY	DIAL TO:			
6CY5 (pin 5) thru .01 mfd	10.7 mc unmodulated	Low end of dial	T201, T102 top & bottom slugs and T203 bottom slug	From (pin 5) to pin 4 of PC202	Adjust for max. neg. reading on VTVM.
"	"	Low end of dial	T203 top slug	Across C203	Tune for zero VTVM. (Point where voltage swings pos. or neg.)
"	"	Low end of dial	Repeat steps 1 & 2	Repeat steps 1 & 2	Repeat steps 1 & 2
FM ant. terms in series with: 120 ohms (high side) 150 ohms (low side)	107 mc	107 mc	C109 C101A C101C	From pin 5 to pin 4 of PC202	Adjust for max. neg. reading on VTVM.
"	89 mc	89 mc	L104 (osc. coil)	"	"
"	-----	-----	-----	-----	Repeat two preceding steps.

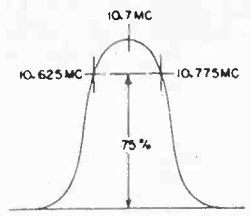


FIG 1
F. M. IF SELECTIVITY CURVE

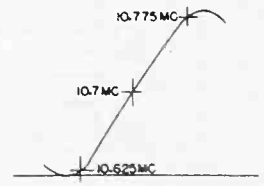
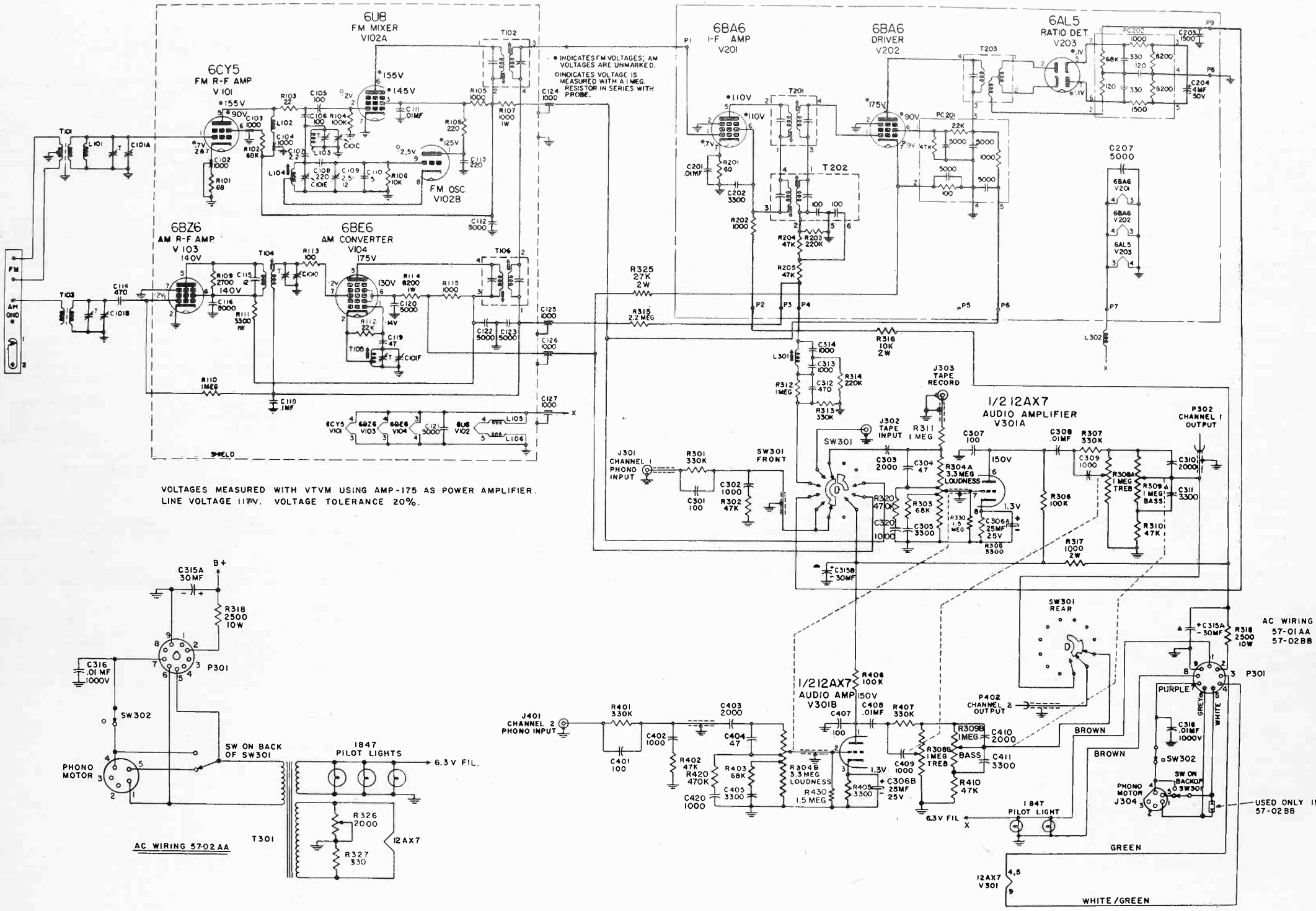


FIG 2
RATIO DETECTOR RESPONSE CURVE

SCHEMATIC DIAGRAM



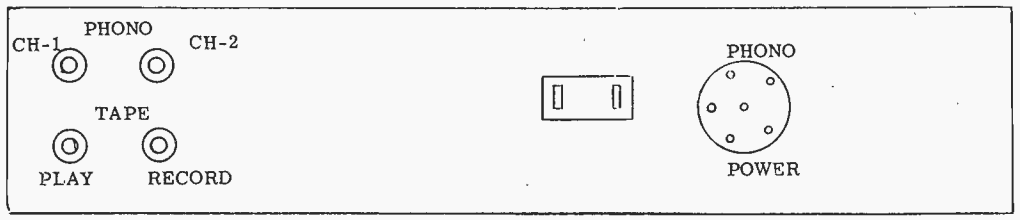
VOLTAGES MEASURED WITH VTVM USING AMP-175 AS POWER AMPLIFIER. LINE VOLTAGE 117V. VOLTAGE TOLERANCE 20%.

ALIGNMENT

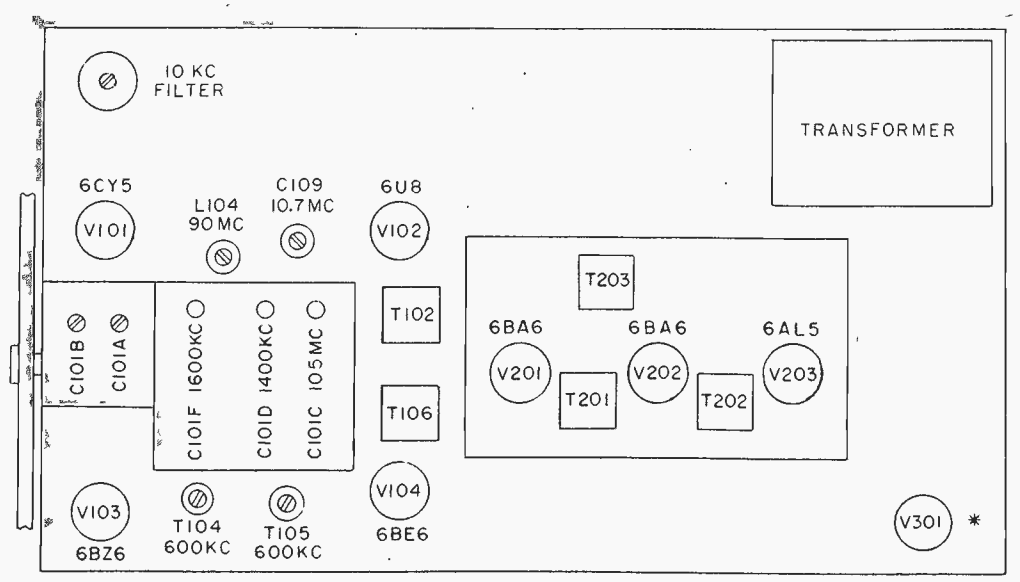
FM I-F AND RATIO DETECTOR ALIGNMENT (Using Sweep Generator and Oscilloscope).
Note: Place 1 megohm resistor in series with hot scope lead.

SWEEP GENERATOR		SET RECEIVER	ADJUSTMENTS	CONNECT	REMARKS
COUPLE TO:	FREQUENCY	DIAL TO:		SCOPE TO	
6CY5 (pin 5) thru .01 mfd and 1000 ohms in series	10.7 mc (.3 mc sweep) couple a marker sig. to 6CY5pin 5	Low end of dial	T201, T102 top and bottom slugs T203 bottom slug	From pin 5 to pin 4 of PC202	Open one end of C204. Adjust for max. amplitude and symmetry. See fig. 1
"	"	Low end of dial	T203 top slug	Across C203	Adjust for best amplitude and straightest slope. See fig. 2.
"	"	Low end of dial	T203 bottom slug	"	Adjust for best symmetry about 10.7 mc. See fig. 2.
"	"	-----	-----	-----	Repeat steps 1, 2 and 3.

CHASSIS REAR PANEL



CHASSIS LAYOUT



REPLACEMENT PARTS LIST

SYMBOL	DESCRIPTION	PART NO.
	TRANSFORMERS & COILS	
T101	FM Input Transformer	360491-4
T102	1st FM I-F Transformer	360626-1
T103	Rod Antenna Assembly	360746-1
T104	AM RF Transformer	360753-1
T105	AM Oscillator Transformer	360752-1
T106	1st AM IF Transformer	360611-1
T201	2nd FM IF Transformer	360747-1
T202	2nd AM IF Transformer	360781-1
T203	Ratio Detector Transformer	360748-1
T301	Filament Transformer (57-02)	320076-1
L101	FM Antenna Coil	360750-1
L102	RF Choke	360522-9
L103	FM RF Coil	360751-1
L104	FM Oscillator Coil	360628-1
L105	RF Choke	360522-9
L106	RF Choke	360522-9
L301	10KC Filter	360621-1
L302	RF Choke	360522-9
	RESISTORS All resistors are 10%, 1/2W unless specified otherwise	
R101	68	230104-48
R102	68K	230104-84
R103	22	230104-42
R104	100K	230104-86
R105	1000	230104-62
R106	220	230104-54
R107	1000, 1W	230105-62
R108	10K	230104-74
R109	2700	230104-67
R110	1 meg	230104-98
R111	3300, 1W	230105-68
R112	22K	230104-78
R113	100	230104-50
R114	8200, 1W	230105-73
R115	1000	230104-62
R201	68	230104-48
R202	1000	230104-62
R203	220K	230104-90
R204	47K	230104-82
R205	47K	230104-82
R301	330K	230104-92
R302	47K	230104-82
R303	68K	230104-84
R304	3.3 meg Dual Loudness	220151-10
R305	3300	230104-68
R306	100K	230104-86
R307	330K	230104-92
R308	1 meg Dual Treble	220151-11
R309	1 meg Dual Bass	220151-11
R310	47K	230104-82
R311	1 meg	230104-98
R312	1 meg	230104-98
R313	330K	230104-92
R314	220K	230104-90
R315	2.2 meg	230104-102
R316	10K, 2W	230106-1074
R317	1000, 2W	230106-1062
R318	2500, 10W	240076-26
R320	470K	230104-94
R325	27K, 2W	230106-79
R326	2000 Hum Balance (57-02)	220120-4
R327	330 (57-02)	230104-56
R330	1.5 meg	230104-100
R401	330K	230104-92
R402	47K	230104-82
R403	68K	230104-84
R405	3300	230104-67
R406	100K	230104-86
R407	330K	230104-92
R410	47K	230104-82
R420	420K	230104-82
R430	1.5 meg	230104-100

SYMBOL	DESCRIPTION	PART NO.
	CAPACITORS All capacitors are 20%, 500V unless specified otherwise	
C101	Tuning Capacitor	260147-1
C102	Feed Thru, 1000 mmf	250276-2
C103	Feed Thru, 1000 mmf	250276-2
C104	Feed Thru, 1000 mmf	250276-1
C105	Mica, 100 mmf	250187-53
C106	Mica, 100 mmf	250187-53
C107	Mica, 2.2 mmf	250211-118
C108	Mica, 220 mmf	250187-57
C109	Cer., 2.5 - 12mmf (Trimmer)	250188-9
C110	Cer., 5 mmf, 5%	250088-138
C111	Paper, .01 mfd, 400V	250211-7
C112	Cer., 5000 mmf	250175-30
C113	Mica, 220 mmf	250187-57
C114	Mica, 470 mmf	250159-102
C115	Cer., 12 mmf, 5%	250088-179
C116	Cer., 5000 mmf	250175-30
C118	Mylar, .1 mfd, 100V	250261-125
C119	Cer., 47 mmf	250218-17
C120	Cer., 5000 mmf	250175-30
C121	Cer., 5000 mmf	250175-30
C122	Cer., 5000 mmf	250175-30
C123	Cer., 5000 mmf	250175-30
C124	Feed Thru, 1000 mmf	250276-1
C125	Feed Thru, 1000 mmf	250276-1
C126	Feed Thru, 1000 mmf	250276-1
C127	Feed Thru, 1000 mmf	250276-1
C201	Cer., .01 mfd	250234-66
C202	Cer., 3300 mmf	250234-154
C203	Cer., 1500 mmf	250234-146
C204	Elect. 4 mfd, 50V	270021-71
C207	Cer., 5800 mmf	250236-1
C301	Cer., 100 mmf	250218-22
C302	Cer., 1000 mmf	250218-8
C303	Cer., 2000 mmf	250218-20
C304	Cer., 47 mmf	250218-17
C305	Cer., 3300 mmf, 10%	250175-28
C306	Electro. 25-25 mfd, 25V	270043-1
C307	Cer., 100 mmf	250218-22
C308	Cer., .01 mfd	220218-19
C309	Cer., 1000 mmf	250218-8
C310	Cer., 2000 mmf	250218-20
C311	Cer., 3300 mmf, 10%	250175-28
C312	Cer., 470 mmf	250218-6
C313	Cer., 1000 mmf, 5%	250228-354
C314	Cer., 1000 mmf, 5%	250228-354
C315	Electro., 30-30 mfd, 450V	270021-58
C316	Cer., .01 mfd, 1000V	250219-2
C320	Cer., 1000 mmf	250218-8
C401	Cer., 100 mmf	250218-22
C402	Cer., 1000 mmf	250218-8
C403	Cer., 2000 mmf	250218-20
C404	Cer., 47 mmf	250218-17
C405	Cer., 3300 mmf, 10%	250175-28
C407	Cer., 100 mmf	250218-22
C408	Cer., .01 mfd	250218-19
C409	Cer., 1000 mmf	250218-8
C410	Cer., 2000 mmf	250218-20
C411	Cer., 3300 mmf, 10%	250175-28
C420	Cer., 1000 mmf	250175-28
	MISCELLANEOUS	
SW301	Band Switch	160293-1
SW302	Off-On Switch	160301-1
J301	CH-1 Input	180631-2
J302	Tape Input	180631-2
J303	Tape Record	180631-2
J304	Phono Power	180520-4
P301	Power Plug	180511-15
P302	CH-1 output	180559-1
J401	CH-2 Input	180631-2
J402	CH-2 Output	180559-1
	Dial Pointer	635321-1
	Dial Glass	150334-1

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55 SERIES RADIO CHASSIS

SPECIFICATIONS

Power Source Rating		FM Band	88-108MC
Frequency	60 cycles	IF Frequency (AM)	455KC
Voltage	117 volts AC	(FM)	10.7MC
Wattage (55-01)	100 watts	Audio System	
(55-02) with AMP 175	175 watts	Output Trans. Impedance (55-01)	
Tuning Frequency Range		Pri - 8000 ohms	Sec. - 3.2 ohms
Broadcast Band	540-1620KC	Power Output (55-01)	6 watts

TUBE COMPLEMENT

Ref.	Function	Type	Ref.	Function	Type
V101	FM RF Amplifier	6CY5	V203	Ratio Detector	6AL5
V102	FM Mixer	6U8	V301	Audio Amp & Phase Inverter (55-01)	6U8
V103	AM RF Amplifier	6BZ6	V301	Audio Amplifier (55-02)	12AX7
V104	AM Converter	6BE6	V302	Audio Output (55-01)	6AQ5
V201	IF Amplifier	6BA6	V303	Audio Output (55-01)	6AQ5
V202	Driver	6BA6	V304	Rectifier (55-01)	5Y3GT

GENERAL

This manual contains service information on the 55-01 and 55-02 chassis. The 55-01 is an AM-FM unit having a self-contained 6 watt amplifier and the 55-02 is an AM-FM tuner which requires an external amplifier for voltages and output. Both chassis, however, are designed for use with record changers which have been designed for reproduction of stereo records. Dual Treble and Loudness controls are used which will vary the Treble and Volume equally and simultaneously. The Bass control will only vary Bass response from channel one.

On the 55-01 an additional amplifier is required which will reproduce channel 2 of the stereo system. The built-in amplifier will reproduce the channel 1 portion. On the 55-02 a stereo amplifier or two single channel amplifiers are required to reproduce the two channels.

Additional input sockets are available on the rear apron of the chassis which will permit the operation of a monaural tape recorder in conjunction with instruments using either of these chassis.

Provisions are provided for the connection of an external AM or FM antenna. A terminal board having two connections marked FM, a connection marked AM and three other connections marked G, 1 and 2 are located on a fibre board fastened to the rear of the chassis. To connect an external FM antenna to these chassis merely connect it to the designated terminals. To connect an AM antenna use the designated terminal for the connection, however, the antenna should also be grounded to the chassis by connecting it to terminal "G".

Terminals 1 and 2 are used for speaker connections. External speakers can be connected across G and 1, whereas the internal speakers are connected across G and 2. When the link is closed, both sets of speakers will play and when the link is open only the external speakers will play. This only applies to speakers which have been connected as extension speakers on the 55-01 and not those which have been connected as stereo speakers. Neither does it apply to the 55-02 chassis nor to those instruments which have an extension speaker switch used in conjunction with these chassis.

ALIGNMENT

AM ALIGNMENT

Set band switch to AM position. Check dial pointer positioning.

SIGNAL GENERATOR		SET RECEIVER	ADJUSTMENTS	CONNECT OUTPUT METER	REMARKS
COUPLE TO:	FREQUENCY	DIAL TO:			
6BE6 (pin 7) thru .01 mfd	455 kc (modulated)	Near 1000 kc (free of interference)	T202, T106, top and bottom slugs	Across voice coil	Adjust for max. output
AM ant. term. thru 10 mmf	1400 kc (modulated	1400 kc	C101F C101D C101B	"	"
"	600 kc (modulated)	600 kc	T105, T104	"	Adjust for max. output.
"	-----	-----	-----	"	Repeat steps 2 and 3.

FM ALIGNMENT (Using AM Signal Generator and VTVM)

Set band switch to FM position. Note: Place a 1 megohm resistor in series with hot side of VTVM.

SIGNAL GENERATOR		SET RECEIVER	ADJUSTMENTS	CONNECT OUTPUT METER	REMARKS
COUPLE TO:	FREQUENCY	DIAL TO:			
6CY5 (pin 5) thru .01 mfd	10.7 mc unmodulated	Low end of dial	T201, T102 top & bottom slugs and T203 bottom slug	From (pin 5) to pin 4 of PC202	Adjust for max. neg. reading on VTVM.
"	"	Low end of dial	T203 top slug	Across C203	Tune for zero VTVM. (Point where voltage swings pos. or neg.)
"	"	Low end of dial	Repeat steps 1 & 2	Repeat steps 1 & 2	Repeat steps 1 & 2
FM ant. terms in series with: 120 ohms (high side) 150 ohms (low side)	107 mc	107 mc	C109 C101A C101C	From pin 5 to pin 4 of PC202	Adjust for max. neg. reading on VTVM.
"	89 mc	89 mc	L104 (osc. coil)	"	"
"	-----	-----	-----	-----	Repeat two preceding steps.

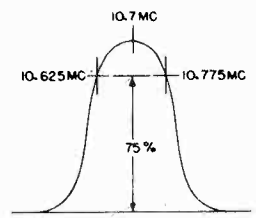


FIG 1
F. M. I.F. SELECTIVITY CURVE

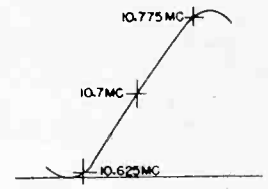


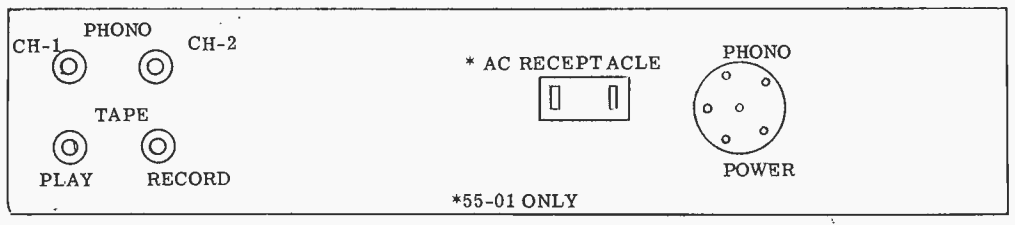
FIG 2
RATIO DETECTOR RESPONSE CURVE

ALIGNMENT

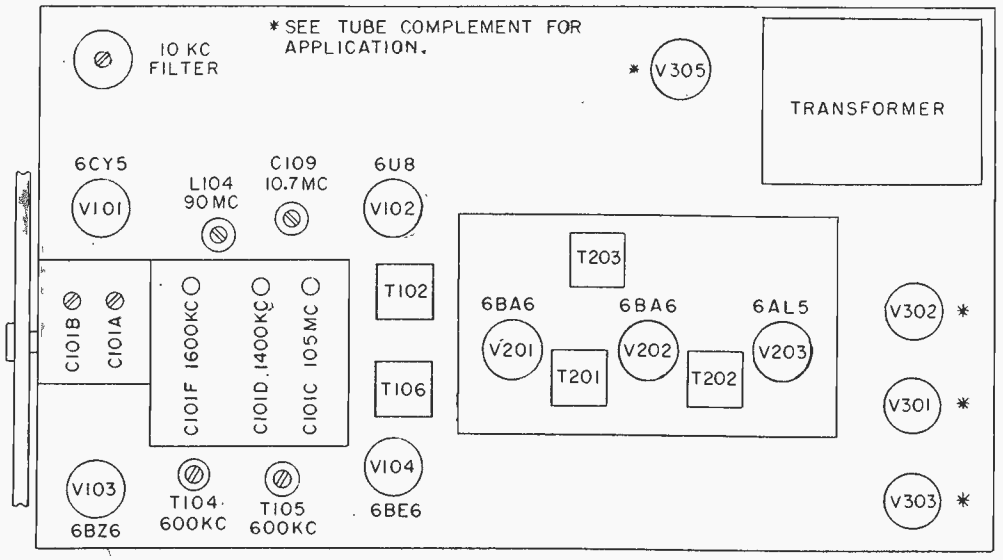
FM I-F AND RATIO DETECTOR ALIGNMENT (Using Sweep Generator and Oscilloscope).
Note: Place 1 megohm resistor in series with hot scope lead.

SWEEP GENERATOR		SET RECEIVER	ADJUSTMENTS	CONNECT	REMARKS
COUPLE TO:	FREQUENCY	DIAL TO:		SCOPE TO	
6CY5 (pin 5) thru .01 mfd and 1000 ohms in series	10.7 mc (.3 mc sweep) couple a marker sig. to 6CY5 pin 5	Low end of dial	T201, T102 top and bottom slugs T203 bottom slug	From pin 5 to pin 4 of PC202	Open one end of C204. Adjust for max. amplitude and symmetry. See fig. 1
"	"	Low end of dial	T203 top slug	Across C203	Adjust for best amplitude and straightest slope. See fig. 2.
"	"	Low end of dial	T203 bottom slug	"	Adjust for best symmetry about 10.7 mc. See fig. 2.
"	"	-----	-----	-----	Repeat steps 1, 2 and 3.

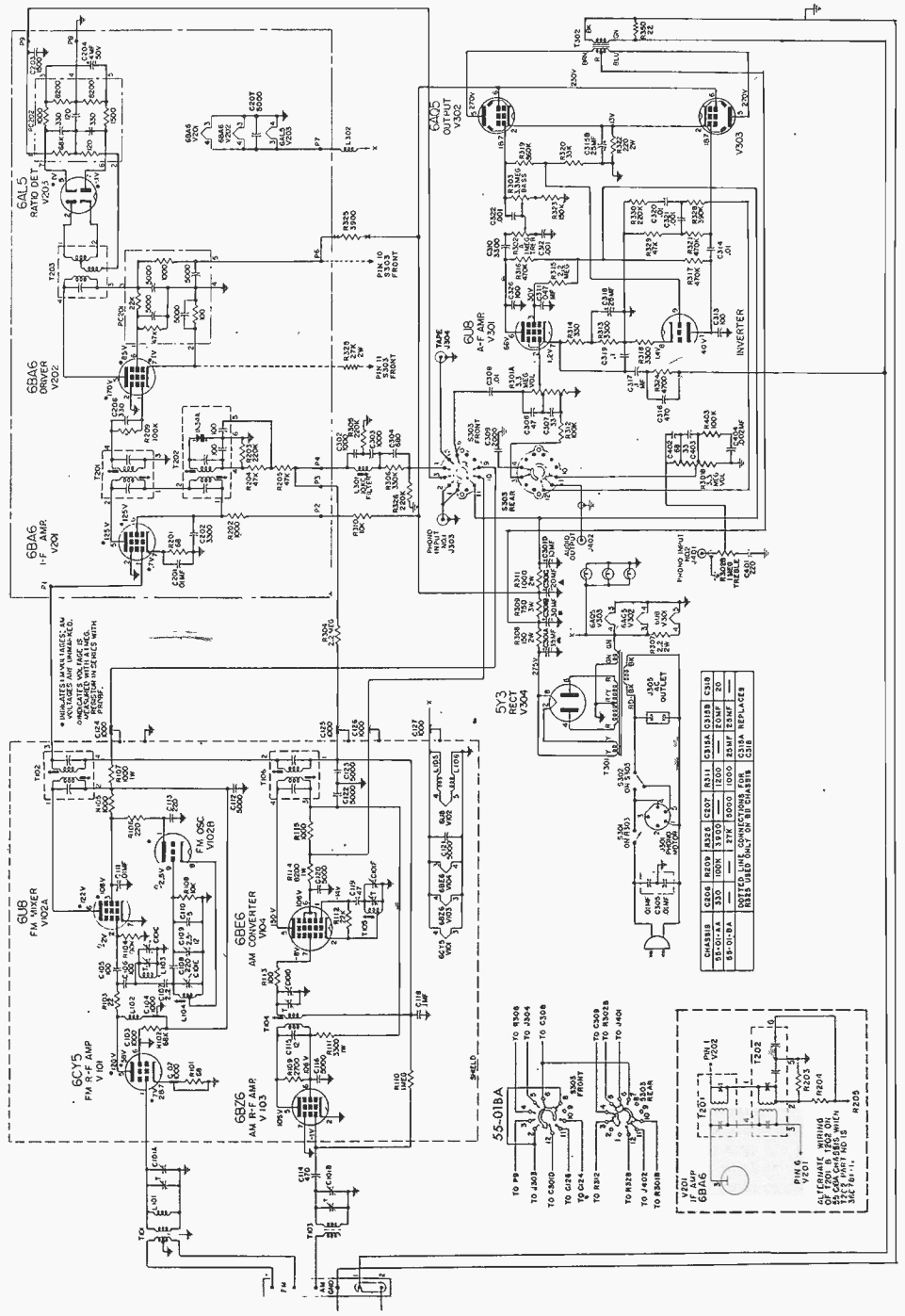
CHASSIS REAR PANEL



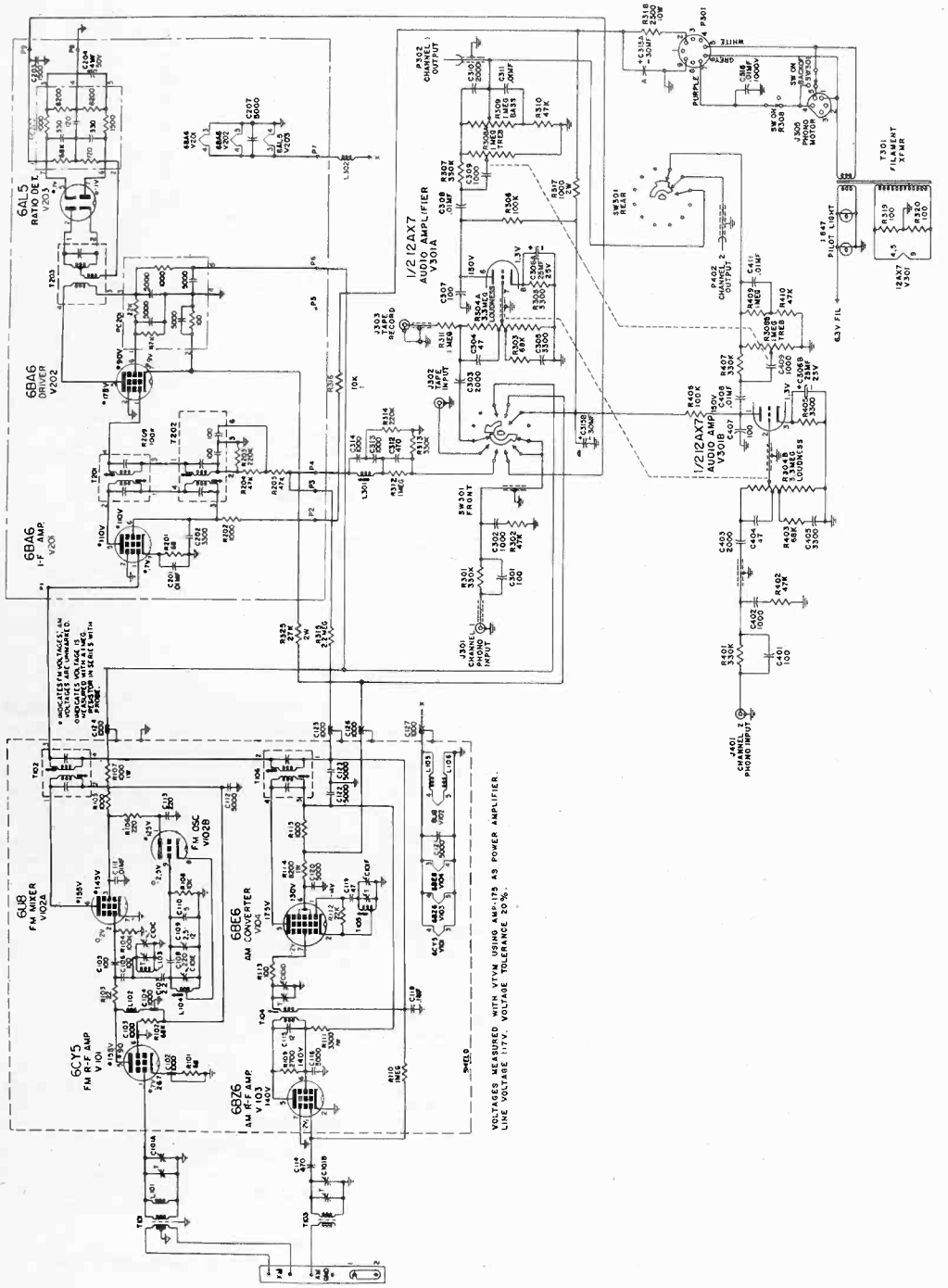
CHASSIS LAYOUT



SCHEMATIC DIAGRAM (55-01)



SCHEMATIC DIAGRAM (55-02)



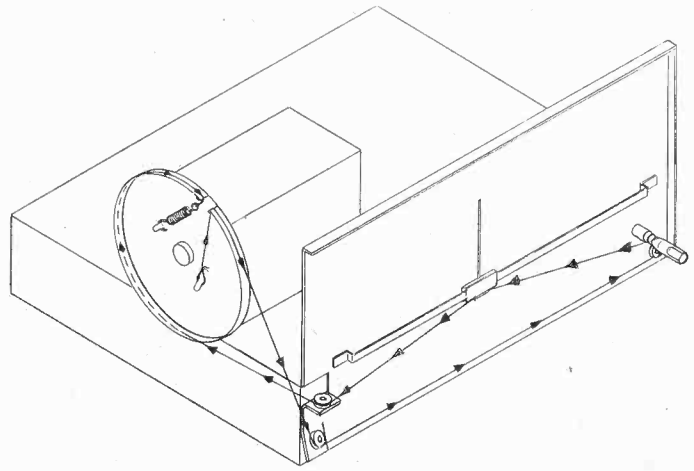
DIAL STRINGING INSTRUCTIONS

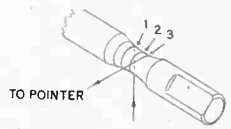
DIAL CORD PLACEMENT

Select a 46-inch length of dial cord and tie a small loop at each end. Turn the tuning gang fully out of mesh and hook one end of the cord over the metal hook on the condenser pulley nearest the front of the chassis and proceed with the stringing as shown in the drawing below.

DIAL POINTER PLACEMENT

Place the dial pointer onto the pointer slide and turn the tuning gang completely in mesh. Lace the dial cord around the three hooks on the front of the pointer and with the tuning condenser still fully in mesh, slide the pointer over until it lines up with the last dial calibration mark at the low frequency end of the broadcast band. This completes the assembly.





REPLACEMENT PARTS LIST

SYMBOL	DESCRIPTION	PART NO.
	TRANSFORMERS-COILS-CHOKES	
T101	FM Input Transformer	360491-4
T102	1st FM IF Transformer	360626-1
T103	Rod Antenna Assembly	360746-1
T104	AM RF Transformer	360753-1
T105	AM Oscillator Transformer	360752-1
T106	1st AM IF Transformer	360611-1
T201	2nd FM IF Transformer	360747-1
T202	2nd AM IF Transformer	360749-1
T202	2nd AM IF Transformer (55-01BA)	360781-1
T203	Ratio Detector Transformer	360748-1
T301	Power Transformer (55-01)	300165-1
T301	Filament Transformer (55-02)	320277-1
T302	Output Transformer (55-01)	320077-1
L101	FM Antenna	360750-1
L102	RF Choke	360522-9
L103	FM RF Coil	360751-1
L104	FM Oscillator Coil	360628-1
L105	RF Choke	360522-9
L106	RF Choke	360522-9
L301	10KC Filter	360621-1
L302	RF Choke	360522-9
	RESISTORS All resistors are 10%, 1/2W unless specified otherwise	
R101	68	230104-48
R102	68K	230104-84
R103	22	230104-42
R104	100K	230104-86
R105	1000	230104-62
R106	220	230104-54
R107	1000, 1W	230105-62
R108	10K	230104-74
R109	2700	230104-67
R110	1 meg	230104-98

SYMBOL	DESCRIPTION	PART NO.
R111	3300, 1W	230105-68
R112	22K	230104-78
R113	100	230104-50
R114	8200-1W	230105-73
R115	1000	230104-62
R201	68	230104-48
R202	1000	230104-62
R203	220K	230104-90
R204	47K	230104-82
R205	47K	230104-82
R209	100K	230104-86
R301	Dual 3.3 meg, Loudness (55-01)	220151-3
R301	330K (55-02)	230104-92
R302	Dual 1 meg, Treble (55-01)	220150-1
R302	47K (55-02)	230104-82
R303	3.3 meg, Bass (55-01)	220072-39
R303	68K (55-02)	230104-84
R304	2.2 meg (55-01)	230104-102
R304	Dual 3.3 meg, Loudness (55-02)	220151-3
R305	220K (55-01)	230104-90
R305	3300 (55-02)	230104-68
R306	330K (55-01)	230104-92
R306	100K (55-02)	230104-86
R307	2.2, 2W (55-01)	230109-2
R307	330K (55-02)	230104-92
R308	150, 2W (55-01)	230106-1052
R308	Dual 1 meg, Treble (55-02)	220150-1
R309	750, 3W, (55-01)	230150-315
R309	1 meg, Bass (55-02)	220072-40
R310	10K, 2W (55-01)	230106-1074
R310	47K (55-02)	230104-82
R311	1200, 2W (55-01)	230106-1063
R311	1 meg (55-02)	230104-98
R312	100K (55-01)	230104-86
R312	1 meg (55-02)	230104-98
R313	3300 (55-01)	230104-68
R313	330K (55-02)	230104-92
R314	330 (55-01)	230104-62
R314	220K (55-02)	230104-90

REPLACEMENT PARTS LIST (CON'T)

SYMBOL	DESCRIPTION	PART NO.
R315	2.2 meg	230104-102
R316	470K (55-01)	230104-94
R316	10K, 2W (55-02)	230106-1074
R317	470K (55-01)	230104-94
R317	1200, 2W (55-02)	230106-1063
R318	3300, (55-01)	230104-68
R318	2500, 10W (55-02)	240076-28
R319	560K (55-01)	230104-95
R319	100 (55-02)	230104-50
R320	33K (55-01)	230104-80
R320	100 (55-02)	230104-50
R321	470K (55-01)	230104-94
R322	220, 2W (55-01)	230106-1054
R323	150K (55-01)	230104-88
R324	4700 (55-01)	230104-70
R325	3900, 1W	230105-69
R326	220K (55-01)	230104-90
R328	390K (55-01)	230104-93
R329	47K (55-01)	230104-82
R330	220K (55-01)	230104-90
R401	330K (55-02)	230104-92
R402	47K (55-02)	230104-82
R403	100K (55-01)	230104-86
R403	68K (55-02)	230104-84
R405	3300 (55-02)	230104-67
R406	100K (55-02)	230104-86
R407	330K (55-02)	230104-92
R409	1 meg (55-02)	230104-98
R410	47K (55-02)	230104-82
	CAPACITORS All capacitors are 500V, 20% unless specified otherwise	
C101	Tuning Capacitor	260147-1
C102	Feed Thru, 1000 mmf	250276-2
C103	Feed Thru, 1000 mmf	250276-2
C104	Feed Thru, 1000 mmf	250276-1
C105	Mica, 100 mmf	250187-53
C106	Mica, 100 mmf	250187-53
C107	Mica, 2.2 mmf	250221-118
C108	Mica, 220 mmf	250187-57
C109	Cer., 2.5-12-0 mmf (Trimmer)	250188-9
C110	Cer., 5 mmf, 5%	250088-138
C111	Paper, .01 mfd, 400V	250211-7
C112	Cer., 5000 mmf	250175-30
C113	Mica, 200 mmf	250187-57
C114	Mica, 470 mmf	250159-102
C115	Cer., 12 mmf, 5%	250088-179
C116	Cer., 5000 mmf	250175-30
C118	Mylar, .1 mfd, 100V	250261-125
C119	Cer., 47 mmf	250218-17
C120	Cer., 5000 mmf	250175-30
C121	Cer., 5000 mmf	250175-30
C122	Cer., 5000 mmf	250175-30
C123	Cer., 5000 mmf	250175-30
C124	Cer., Feed Thru, 1000 mmf	250276-1
C125	Cer., Feed Thru 1000 mmf	250276-1
C126	Cer., Feed Thru, 1000 mmf	250276-1
C127	Cer., Feed Thru, 1000 mmf	250276-1
C201	Cer., .01 mfd	250234-66
C202	Cer., 3300 mmf	250234-154
C203	Cer., 1500 mmf	250234-146
C204	Elect. 4 mfd, 50V	270021-71
C206	Cer., 330 mmf	250234-30
C301	Elect. 35-30-20-10 mfd, 350V (55-01)	270021-71
C301	Cer., 100 mmf (55-02)	250218-22

SYMBOL	DESCRIPTION	PART NO.
C302	Cer., 1000 mmf (55-01)	250218-18
C303	Cer., 1000 mmf (55-01)	250218-18
C303	Cer., 2000 mmf (55-02)	250218-20
C304	Cer., 680 mmf (55-01)	250218-4
C304	Cer., 47 mmf (55-02)	250218-17
C305	Cer., 2X10K mmf, 1000V (55-01)	250219-3
C305	Cer., 3300 mmf (55-02)	250175-28
C306	Cer., 47 mmf (55-01)	250218-17
C306	Elect. 25-25 mfd, 25V (55-02)	270043-1
C307	Cer., 33 mmf (55-01)	250218-21
C307	Cer., 100 mmf (55-02)	250218-22
C308	Cer., .01 mfd	250218-19
C309	Cer., 2000 mmf (55-01)	250218-20
C309	Cer., 1000 mmf (55-02)	250218-18
C310	Cer., 3300 mmf (55-01)	250175-28
C310	Cer., 2000 mmf (55-02)	250218-20
C311	Paper, .047 mfd, 200V (55-01)	250202-11
C311	Cer., .01 mfd, (55-02)	250218-19
C312	Cer., 1000 mmf (55-01)	250218-18
C312	Cer., 470 mmf (55-02)	250218-6
C313	Cer., 100 mmf (55-01)	250218-22
C314	Cer., 1000 mmf (55-02)	250218-18
C315	Elect. 20 mfd, 25V (55-01)	270042-1
C315	Elect. 30-30 mfd, 450V (55-02)	270021-58
C316	Cer., 470 mmf (55-01)	250218-6
C316	Cer., .01 mfd, 1000V (55-02)	250219-2
C317	Mylar .1 mfd, 100V (55-01)	250261-125
C316	Elect. 20 mfd, 25V (55-01)	270042-1
C319	Mylar .1 mfd, 100V (55-01)	250261-125
C320	Cer., .01 mfd, (55-01)	250218-19
C321	Cer., 1000 mmf (55-01)	250218-18
C322	Cer., 1000 mmf (55-01)	250218-18
C322	Cer., 100 mmf (55-01)	250218-22
C401	Cer., 220 mmf (55-01)	250218-5
C401	Cer., 100 mmf (55-02)	250218-22
C402	Cer., 68 mmf (55-01)	250218-7
C402	Cer., 1000 mmf (55-02)	250218-18
C403	Cer., 33 mmf (55-01)	250218-21
C403	Cer., 2000 mmf (55-02)	250218-20
C404	Cer., 2000 mmf (55-01)	250218-20
C404	Cer., 47 mmf (55-02)	250218-17
C405	Cer., 3300 mmf (55-02)	250175-28
C407	Cer., 100 mmf	250218-22
C408	Cer., .01 mfd	250218-19
C409	Cer., 1000 mmf	250218-18
C411	Cer., .01 mfd	250218-19
	MISCELLANEOUS	
SW301	Band Switch (55-01)	160293-2
SW301	Band Switch (55-01BA)	160293-4
SW301	Band Switch (55-02)	160293-5
J301	Phono Power (55-01)	180520-4
J301	CH-1 Phono Input (55-02)	180631-2
J302	Tape Play (55-02)	180631-2
J303	CH-1 Phono Input (55-01)	180631-2
J303	Tape Record (55-02)	180631-2
J304	Tape Play (55-01)	180631-2
J305	AC Outlet (55-01)	180555-1
J305	Phono Power (55-02)	180520-4
J401	CH-2 Phono Input	180631-1
J402	Tape Record (55-01)	180631-2
P301	Power Plug (55-02)	180511-15
P302	CH-1 Output (55-02)	180559-1
P402	CH-2 Output (55-02)	180559-1
	Dial Pointer	102448-2
	Dial Glass	150572-1

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59 SERIES RADIO CHASSIS

GENERAL

The 59 Series Radio Tuner is an AM-FM tuner designed to work in conjunction with an external amplifier such as the Amp-196. All voltages are obtained from the external amplifier.

Provisions are provided for the connection of an external AM and FM antenna. A terminal board located on a fibre board mounted to the rear of the chassis has the necessary terminals for making these connections. Before connecting an external FM antenna, however, make sure the built-in FM antenna is disconnected.

The chassis is used with record changers and amplifiers which have been designed for reproduction of stereo records. Dual controls are used through-out which vary the output and the response of each channel simultaneously.

The chassis are identified by a production code which is stenciled on the chassis pan. The first two digits of this code identify the basic chassis series number (59). Following this are the two digits which identify the different versions within the series. The last two digits of the code are used to identify production changes, 00 being the original production code. A change in the first number will indicate an electrical change and a change in the second number will indicate a mechanical change. Minor changes are not identified.

SPECIFICATIONS

Power Supply	
Frequency	60 cps.
Voltage	117 volts
Tuning Frequency Range	
Broadcast Band	540-1620KC
FM Band	88-108MC
IF Frequency	10.7MC/455KC

TUBE COMPLEMENT

Ref.	Function	Type
V1	FM RF Amplifier	6DT8
V2	AM-RF Amplifier	6BE6
V3	CH-1 & CH-2 Audio Amp.	12AX7
V201	IF Amplifier	6BA6
V202	IF Amplifier	6BA6
V203	Ratio Detector	6AL5

ALIGNMENT INSTRUCTIONS

1. Before proceeding with the alignment, loosen the two set screws on the tuning shaft collar. Set the AM tuning gang wide open and rotate this collar counter-clockwise until the cord from the FM tuner is snug but no extra tension is applied. Tighten the set screws on the collar.
2. Use an isolation transformer when aligning the set.
3. Allow 10-20 minute warm-up time.
4. Place a 9-pin tube shield over the 6DT8. Check this shield to make sure it isn't grounded.

AM ALIGNMENT
Set band switch to AM position.

SIGNAL GENERATOR		SET RECEIVER	ADJUSTMENTS	CONNECT	REMARKS
COUPLE TO:	FREQUENCY	DIAL TO:		VTVM	
6BE6 (pin 7) thru .01 mfd.	455KC (modulated)	Near 1000 KC (free of interference)	T202, T4, top and bottom slugs	Across voice coil	Adjust for max. output.
AM ant. term. thru 10 mmf	1400KC (modulated)	1400KC	C12A C12C	"	"
"	600KC (modulated)	600KC	L6	"	Adjust for max. output.
"	-----	-----	-----	"	Repeat steps 2 and 3.

ALIGNMENT INSTRUCTIONS (CONT.)

FM ALIGNMENT (Using AM Signal Generator and VTVM)
Set band switch to FM position. Note: Place a 1 megohm resistor in series with hot side of VTVM.

SIGNAL GENERATOR		SET RECEIVER	ADJUSTMENTS	CONNECT	REMARKS
COUPLE TO:	FREQUENCY	DIAL TO:		VTVM	
6DT8 Tube Shield	10.7MC unmodulated	High end of dial	T201, T2 top and bottom slugs and T203 bottom slug	From pin 5 to pin 4 of PC202	Adjust for max. neg. reading on VTVM.
"	"	High end of dial	T203 top slug	Across C203	Tune for zero VTVM. (Point where voltage swings pos or neg.)
"	"	High end of dial	Repeat steps 1 & 2	Repeat steps 1 & 2	Repeat steps 1 & 2
FM ant. terms in series with: 120 ohms (high side) 150 ohms (low side)	106MC	106MC	C9	From pin 5 to pin 4 of PC202	Adjust for max. neg. reading on VTVM.
"	90MC	90MC	C3	"	"
"	-----	-----	-----	-----	Repeat two preceding steps.

FM I-F AND RATIO DETECTOR ALIGNMENT (Using Sweep Generator and Oscilloscope).
Note: Place 1 megohm resistor in series with hot scope lead.

SWEEP GENERATOR		SET RECEIVER	ADJUSTMENTS	CONNECT	REMARKS
COUPLE TO:	FREQUENCY	DIAL TO:		SCOPE TO:	
6DT8 Tube Shield	10.7MC (.3MC sweep) couple a marker sig. to 6DT8 tube shield	High end of dial	T201, T2 top and bottom slugs T203 bottom slug	From pin 5 to pin 4 of PC202	Open one end of C204. Adjust for max. amplitude and symmetry. See Fig. 1
"	"	High end of dial	T203 top slug	Across C203	Adjust for best amplitude and straightest slope. See Fig. 2.
"	"	High end of dial	T203 bottom slug	"	Adjust for best symmetry about 10.7 MC See Fig. 2.
"	"	-----	-----	-----	Repeat steps 1, 2 & 3.

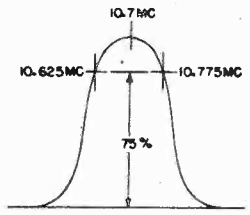


FIG 1
F.M. IF SELECTIVITY CURVE

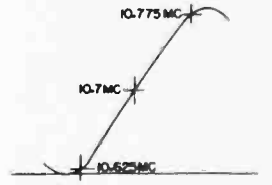
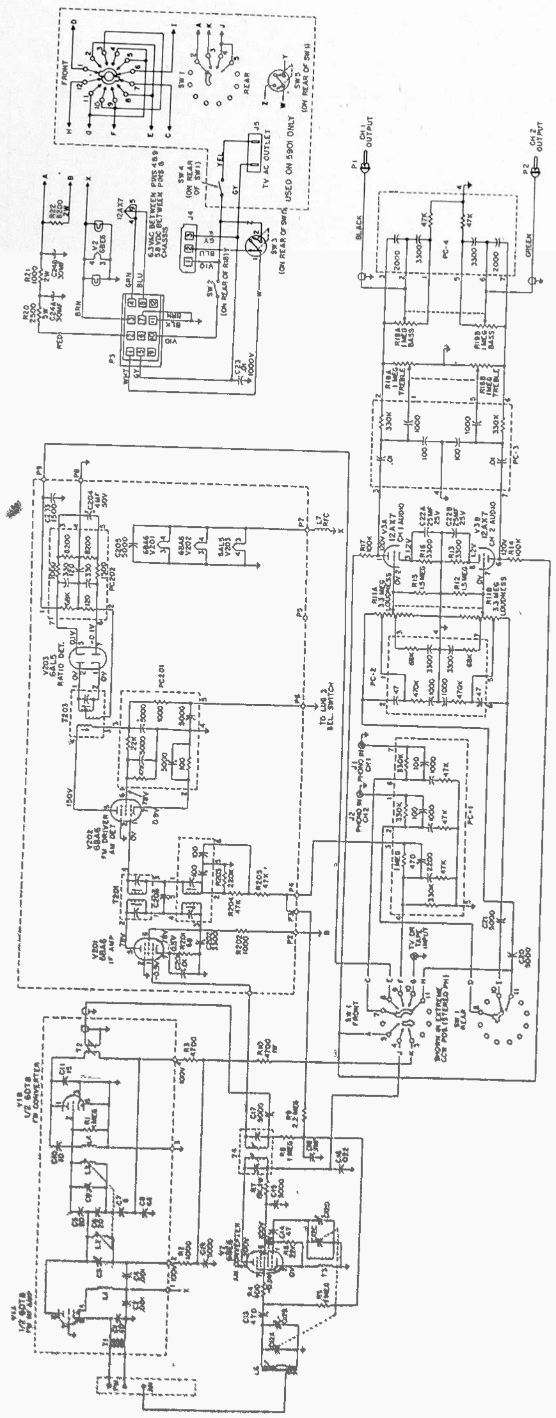


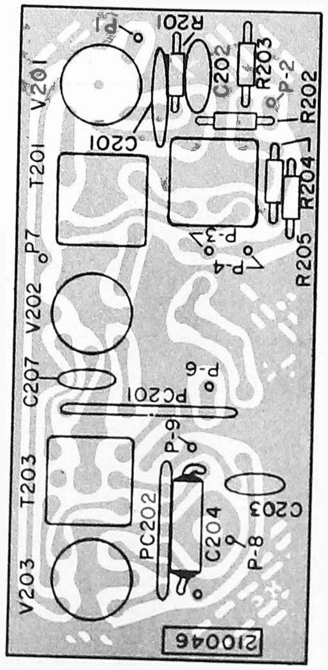
FIG 2
RATIO DETECTOR RESPONSE CURVE

SCHEMATIC DIAGRAM

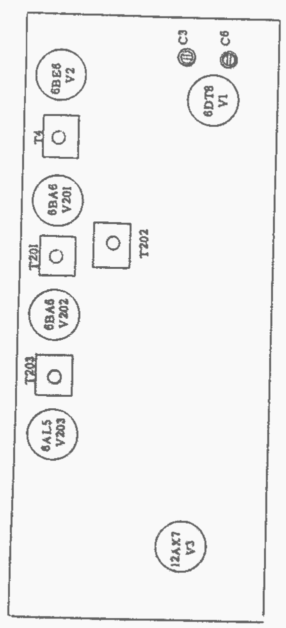


VOLTAGE MEASUREMENTS WERE MADE TO CHASSIS GROUND WITH VACUUM TUBE VOLTMETER NO SIGNAL, BASS, TREBLE, & LOUDNESS CONTROL IN MAXIMUM CCW POSITION. 6BE6 MEASUREMENTS WITH SELECTOR IN "AM" POSITION; ALL OTHER MEASUREMENTS IN "FM" POSITION.

PRINTED WIRING CIRCUIT



CHASSIS LAYOUT



REPLACEMENT PARTS LIST

SYMBOL	DESCRIPTION	PART NO.
	TRANSFORMERS-COILS-CHOKES	
L1*	RF Choke	•
L2*	FM RF Coil Assembly	360791-1
L3*	Part of L2 Assembly	-----
L4*	Part of L2 Assembly	-----
L6	Rod Antenna Assembly	360782-2
L7	RF Choke	360522-9
T1*	FM Input Transformer	360789-1
T2*	FM IF Transformer	360790-1
T3	AM Oscillator Transformer	360702-1
T4	AM IF Transformer	350611-1
T201	2nd FM IF Transformer	360747-1
T202	2nd AM IF Transformer	360781-1
T203	Ratio Detector Transformer	360748-1
• The lead inductance plus a small Ferrite Bead forms this choke.		
	RESISTORS All resistors are 1/2W, 10% unless specified otherwise.	
R1*	1 meg	250153-1
R2	1000	230104-62
R3	4700	230104-70
R4	100	230104-50
R5	1 meg	230104-98
R6	22K	230104-78
R7	15K, 1W	230145-20
R8	1 meg	230104-98
R9	2.2 meg	230104-102
R10	4700, 1W	230145-17
R11	3.3 meg, Loudness	220151-17
R12	1.5 meg	230104-100
R13	3300	230104-68
R14	100K	230104-86
R15	1.5 meg	230104-100
R16	3300	230104-68
R17	100K	230104-86
R18	1 meg, Treble w/switch	220150-6
R19	1 meg, Bass	220151-16
R20	2500, 5W, W.W.	240071-43
R21	1000, 2W	230146-13
R22	8200, 2W	230146-73
R201	68	230104-48
R202	1000	230104-62
R203	220K	230104-90
R204	47K	230104-82
R205	47K	230104-82
R206	1.5 meg	230104-100
	CAPACITORS All capacitors are 20%, 500V unless specified otherwise	
C1*	10 mmf, 10%, N750	250313-1
C2*	1000 mmf	250314-1

SYMBOL	DESCRIPTION	PART NO.
C3*	Trimmer 2-10 mmf	250306-1
C4*	1000 mmf	250314-1
C5*	20 mmf, 5%, NPO	250309-1
C6*	20 mmf, 5%, NPO	250309-1
C7*	8.2 mmf, 0%, P100	250310-1
C8*	68 mmf, 5%, N750	250308-1
C9*	Trimmer 2-6 mmf	250307-1
C10*	10 mmf, 10%, N470	250312-1
C11*	15 mmf, 10%, NPO	250311-1
C12	AM Tuning Gang (59-01 & 03)	260154-1
C12	AM Tuning Gang (59-02)	260139-3
C13	Cer., 470 mmf	250218-6
C14	Cer., 47 mmf	250218-17
C15	Cer., 5000 mmf	250175-30
C16	Paper, .022 mfd, 400V	250211-9
C17	Cer., 5000 mmf	250175-30
C16	Mylar, .1 mfd, 100V	250261-125
C19	Cer., 5000 mmf	250175-30
C20	Cer., 5000 mmf	250175-30
C21	Cer., 5000 mmf	250175-30
C22	Elect. 25-25 mfd, 25V	270043-1
C23	Cer., .01 mfd, 1000V	250219-2
C24	Elect. 30-30 mfd, 450V	270021-56
C201	Cer., .01 mfd	250234-66
C202	Cer., 3300 mmf	250234-154
C203	Cer., 1500 mmf	250234-145
C204	Elect. 4 mfd, 50V	270559-9
C205	Paper, .1 mfd, 200V	250240-13
C207	Cer., 5000 mmf	250236-1
	MISCELLANEOUS	
PC1	Printed Circuit	250315-1
PC2	Printed Circuit	250316-1
PC3	Printed Circuit	250318-1
PC4	Printed Circuit	250317-1
PC201	Printed Circuit	250255-2
PC202	Printed Circuit	250254-2
SW1	Band Switch Assem. (59-03)	160306-1
SW1	Band Switch Assem. (59-02)	160306-2
SW1	Band Switch Assem. (59-01)	160307-1
J1	Channel 1 Phono Input	180566-3
J2	Channel 2 Phono Input	Part of J1
J3	TV or Tape Input	Part of J1
J4	Phono Power	180626-1
J5	AC Receptacle (59-01)	180555-1
P1	CH-1 Output	180559-1
P2	CH-2 Output	180559-1
P3	Tuner Power	180639-3
	Dial Pointer	636180-2
	Dial Glass (59-01)	150586-2
	Dial Glass (59-03)	150586-10
	Dial Scale (59-02)	140320-1
	FM Tuner Assembly	700771-2

* Part of Assembly 700771-2

58 SERIES RADIO CHASSIS

GENERAL

The 58 series radio chassis is a series filament wired chassis containing a 50EH5 type tube as the output tube. This tube is designed to provide slightly higher output than the conventional 50C5 normally used in this circuit.

Provisions are provided for the connection of an external AM or FM antenna. A terminal board located on a fibre board mounted to the rear of the chassis has the necessary terminals for these antenna connections.

Before connecting an external FM antenna make sure the built in antenna is disconnected.

Also provisions are provided for the connection of extension speakers on this terminal board. These speakers should be connected across the terminal marked 1 and 2. When the bar between terminals 2 and 3 is open only the extension speakers will play. When the shorting bar is in place both sets of speakers will operate simultaneously.

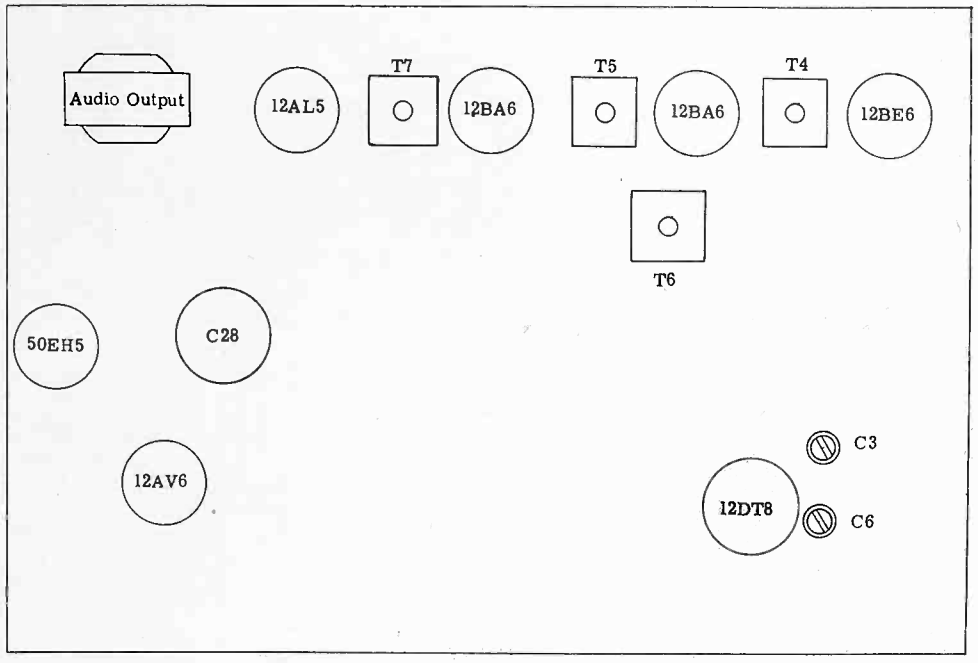
SPECIFICATIONS

Power Supply	
Frequency	60 cycles
Voltage	117 volts
Wattage	60 watts
Audio System	
Power Output	1.5 watts
Output Trans. Impedance	
Pri. 5000 ohms	Sec. 3.2 ohms

TUBE COMPLEMENT

Ref.	Function	Type
V1	FM RF Amp & Converter	12DT8
V2	AM Converter	12BE6
V3	IF Amplifier	12BA6
V4	IF Amplifier	12BA6
V5	Ratio Detector	12AL5
V6	1st Audio Amp.	12AV6
V7	Power Output	50EH5

CHASSIS LAYOUT



ALIGNMENT INSTRUCTIONS

1. Before proceeding with the alignment, loosen the two set screws on the tuning shaft collar. Set the AM tuning gang wide open and rotate this collar counter-clockwise until the cord from the FM tuner is snug but no extra tension is applied. Tighten the set screws on the collar.
2. Use an isolation transformer when aligning the set.
3. Allow 10-20 minute warm-up time.
4. Place a 9-pin tube shield over the 12DT8. Check this shield to make sure it isn't grounded.

AM ALIGNMENT
Set band switch to AM position.

SIGNAL GENERATOR		SET RECEIVER	ADJUSTMENTS	CONNECT	REMARKS
COUPLE TO:	FREQUENCY	DIAL TO:		VTVM	
12BE6 (pin 7) thru .01 mfd.	455KC (modulated)	Near 1000 KC (free of interference)	T6, T4, top and bottom slugs	Across voice coil	Adjust for max. output.
AM ant. term. thru 10 mmf	1400KC (modulated)	1400KC	C13A C13C	"	"
"	600KC (modulated)	600KC	L6	"	Adjust for max. output.
"	-----	-----	-----	"	Repeat steps 2 and 3.

FM ALIGNMENT (Using AM Signal Generator and VTVM)
Set band switch to FM position. Note: Place a 1 megohm resistor in series with hot side of VTVM.

SIGNAL GENERATOR		SET RECEIVER	ADJUSTMENTS	CONNECT	REMARKS
COUPLE TO:	FREQUENCY	DIAL TO:		VTVM	
12DT8 Tube Shield	10.7MC unmodulated	High end of dial	T5, T2 top and bottom slugs and T7 bottom slug	From pin 5 to pin 4 of PC4	Adjust for max. neg. reading on VTVM.
"	"	High end of dial	T7 top slug	Across C21	Tune for zero VTVM. (Point where voltage swings pos or neg.)
"	"	High end of dial	Repeat steps 1 & 2	Repeat steps 1 & 2	Repeat steps 1 & 2
FM ant. terms in series with: 120 ohms (high side) 150 ohms (low side)	106MC	106MC	C9	From pin 5 to pin 4 of PC4.	Adjust for max. neg. reading on VTVM.
"	90MC	90MC	C3	"	"
"	-----	-----	-----	-----	Repeat two preceding steps.

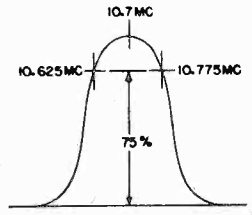


FIG 1
F. & I. F SELECTIVITY CURVE

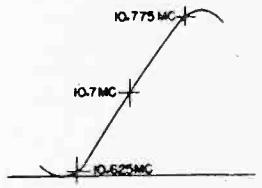
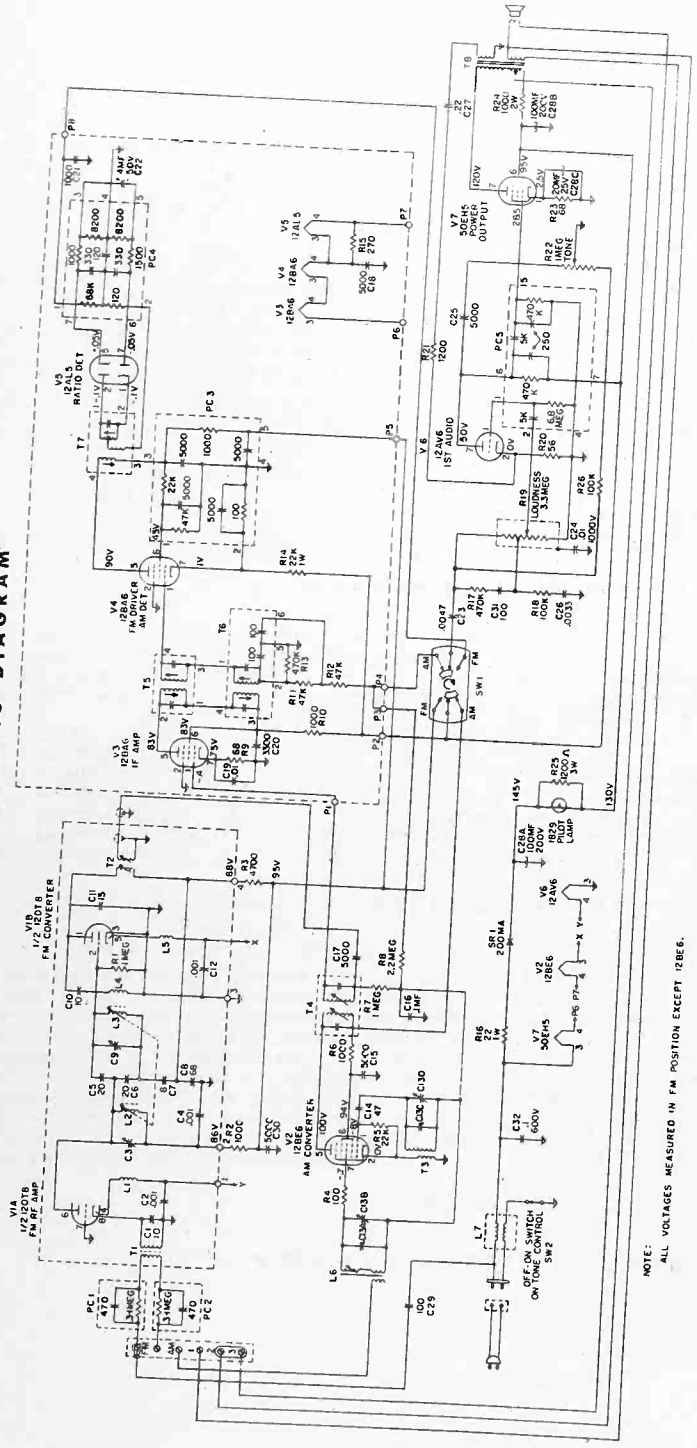


FIG 2
RATIO DETECTOR RESPONSE CURVE

SCHEMATIC DIAGRAM



NOTE: ALL VOLTAGES MEASURED IN FM POSITION EXCEPT 12BE6.

ALIGNMENT INSTRUCTIONS (Cont.)

FM I-F AND RATIO DETECTOR ALIGNMENT (Using Sweep Generator and Oscilloscope).
Note: Place 1 megohm resistor in series with hot scope lead.

SWEEP GENERATOR		SET RECEIVER	ADJUSTMENTS	CONNECT	REMARKS
COUPLE TO:	FREQUENCY	DIAL TO:		SCOPE TO:	
12DT8 Tube Shield	10.7MC (.3MC sweep) couple a marker sig. to 12DT8 tube shield	High end of dial	T5, T2 top and bottom slugs T7 bottom slug	From pin 5 to pin 4 of PC4	Open one end of C22. Adjust for max. amplitude and symmetry. See Fig. 1
"	"	High end of dial	T7 top slug	Across C21	Adjust for best amplitude and straightest slope. See Fig. 2.
"	"	High end of dial	T7 bottom slug	"	Adjust for best symmetry about 10.7 MC See Fig. 2.
"	"	-----	-----	-----	Repeat steps 1, 2 & 3.

REPLACEMENT PARTS LIST

SYMBOL	DESCRIPTION	PART NO.
	TRANSFORMERS & COILS	
L1*	R-F Choke	•
L2*	FM, RF Coil Assembly	360791-1
L3*	Part of L2 Assembly	----------
L4*	Part of L2 Assembly	----------
L5*	R-F Choke	•
L6	Rod Antenna Assembly	360782-1
L7	AC Choke	360653-1
T1*	FM Input Transformer	360789-1
T2*	FM IF Transformers	360790-1
T3	AM Oscillator Coil	360702-1
T4	AM IF Transformer	360611-1
T5	2nd FM IF Transformer	360747-1
T6	2nd AM IF Transformer	360781-1
T7	Ratio Detector	360748-1
T8	Output Transformer	320288-2

* The lead inductance plus a small Ferrite Bead forms this choke.

	RESISTORS All resistors are 10%, 1/2W unless specified otherwise	
R1*	1 meg	250153-1
R2	1000	230104-62
R3	4700	230104-70
R4	100	230104-50
R5	22K	230104-78
R6	1000	230104-62
R7	1 meg	230104-98
R8	2.2 meg	230104-102
R9	68	230104-48
R10	1000	230104-62
R11	47K	230104-82
R12	47K	230104-82
R13	470K	230104-94
R14	22K, 1W	230105-78
R15	270	230104-55
R16	22, 1W	230105-78
R17	470K	230104-94
R18	100K	230104-86
R19	3.3 meg (Loudness)	220131-16
R20	56	230104-47
R21	1200	230104-63
R22	1 meg (Tone)	220073-30
R23	68	230104-48
R24	1000, 2W	230106-62
R25	1200, 3W	230150-320
R26	100K	230104-86

SYMBOL	DESCRIPTION	PART NO.
	CAPACITORS All capacitors are 20%, 500V unless specified otherwise	
C1*	10 mmf., 10%, N750	250313-1
C2*	.001 mfd,	250314-1
C3*	Trimmer 2-10 mmf	250306-1
C4*	.001 mfd,	250314-1
C5*	20 mmf, 5%, NPO	250309-1
C6*	20 mmf, 5%, NPO	250309-1
C7*	8.2 mmf, 0%, P100	250310-1
C8*	68 mmf, 5%, N750	250308-1
C9*	Trimmer, 2-6 mmf	250307-1
C10*	10 mmf, 10%, 500V, N470	250312-1
C11*	15 mmf, 10%, 500V, NPO	250311-1
C12*	.001 mfd,	250314-1
C13	AM Tuning Capacitor	260139-3
C14	Cer., 47 mmf	250218-17
C15	Cer., 5000 mmf	250175-30
C16	Paper, .1 mfd, 600V	250201-13
C17	Cer., 5000 mmf	250175-30
C18	Cer., 5000 mmf	250175-30
C19	Cer., .01 mfd	250234-66
C20	Cer., 3300 mmf	250234-154
C21	Cer., 1000 mmf	250234-142
C22	Elect. 4 mfd-50V	270559-9
C23	Mylar, .0047 mfd, 100V	250261-9
C24	Cer., .01 mfd, 1000V	250219-2
C25	Cer., 5000 mmf	250175-30
C26	Cer., 3300 mmf	250218-24
C27	Mylar, .22 mfd, 100V	250261-29
C28	Elect. 100-100 mfd, 200V & 25mfd-25V	270021-79
C29	Mica, 100 mmf	250159-98
C30	Cer., 5000 mmf	250175-30
C31	Cer., 100 mmf	250218-22
C32	Paper, .1 mfd, 600V	250201-13
	MISCELLANEOUS	
	FM Tuner Assembly	700771-1
SR-1	Silicon Rectifier	530058-1
SW-1	Band Switch	160169-10
PC-1	Printed Circuit	250233-1
PC-2	Printed Circuit	250233-1
PC-3	FM Driver Printed Circuit	250255-1
PC-4	Ratio Detector Printed Circuit	250254-1
PC-5	Printed Circuit	250301-1
	Pilot Light	180161-20

*Part of Assembly -- 700771-1

4296

AMP 175 AMPLIFIER CHASSIS

GENERAL

The Amp-175 amplifier chassis is a self-contained split 20-watt amplifier designed to meet the requirements for reproduction of present day stereophonic records. When the Speaker Selector Switch on an instrument which utilizes this amplifier is in the STEREO position, 10-watt output is provided for each set of speakers. When this switch is in the INT or EXT position, as may be the case when sometimes reproducing conventional records, 20 watts output is available for the individual set of speakers operating.

As an equal output must be maintained between both channels after stereo speakers have been attached, a Channel 2 Balance Control is provided in the amplifier. This control should be set to provide an output from Channel 2 equal to that from Channel 1.

This amplifier may be used in conjunction with an AM-FM Radio Tuner or with a Control Amplifier unit depending on the instrument in which it is used.

SPECIFICATIONS

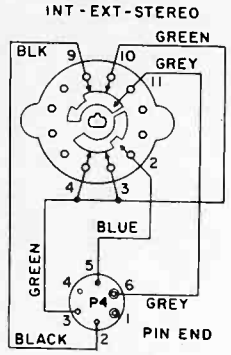
Power Source Rating		
Frequency		60 cycles
Voltage		117 volts-
Wattage (with 57 series radio)		175 watts
Power Output		
Monaural		20 watts
Stereo	CH-1	10 watts
	CH-2	10 watts
Frequency Response		20-20,000 cps.
Output Transformer Impedance		
CH-1	Pri. -- 8000 ohms	Sec. -- 4 ohms
CH-2	Pri. -- 8000 ohms	Sec. -- 4 ohms

Tubes:

Power Output	
CH-1	(2) 6V6GT
CH-2	(2) 6V6GT
Audio Amp & Phase Inverter	
CH-1	12AX7
CH-2	12AX7
Rectifier	
AA & CC versions	(2) 5Y3GT
All Others	5U4GB

SPEAKER SWITCH WIRING

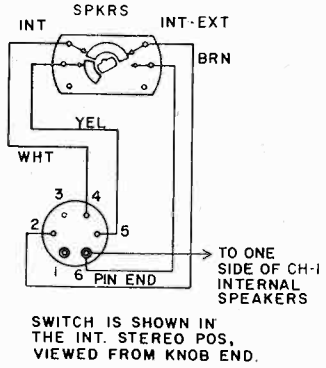
SPEAKER SWITCH USED WITH UNITS THAT PROVIDE STEREO ONLY WHEN EXTERNAL SPEAKER BOX IS USED.



SWITCH IS SHOWN IN INT POSITION, VIEWED FROM THE KNOB END.

FIG. A

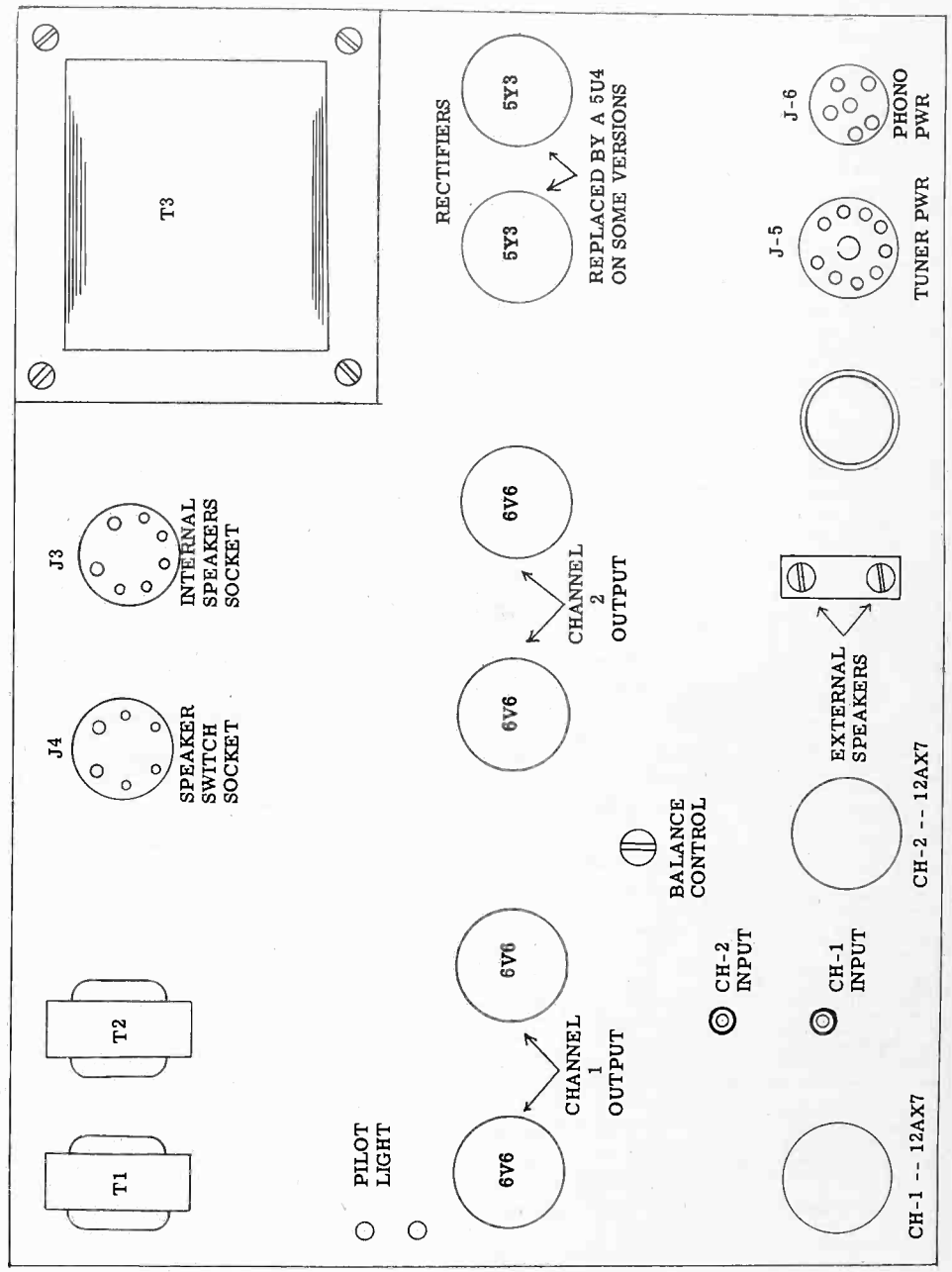
SPEAKER SWITCH USED WITH UNITS THAT PROVIDE STEREO WITHIN ONE CABINET.



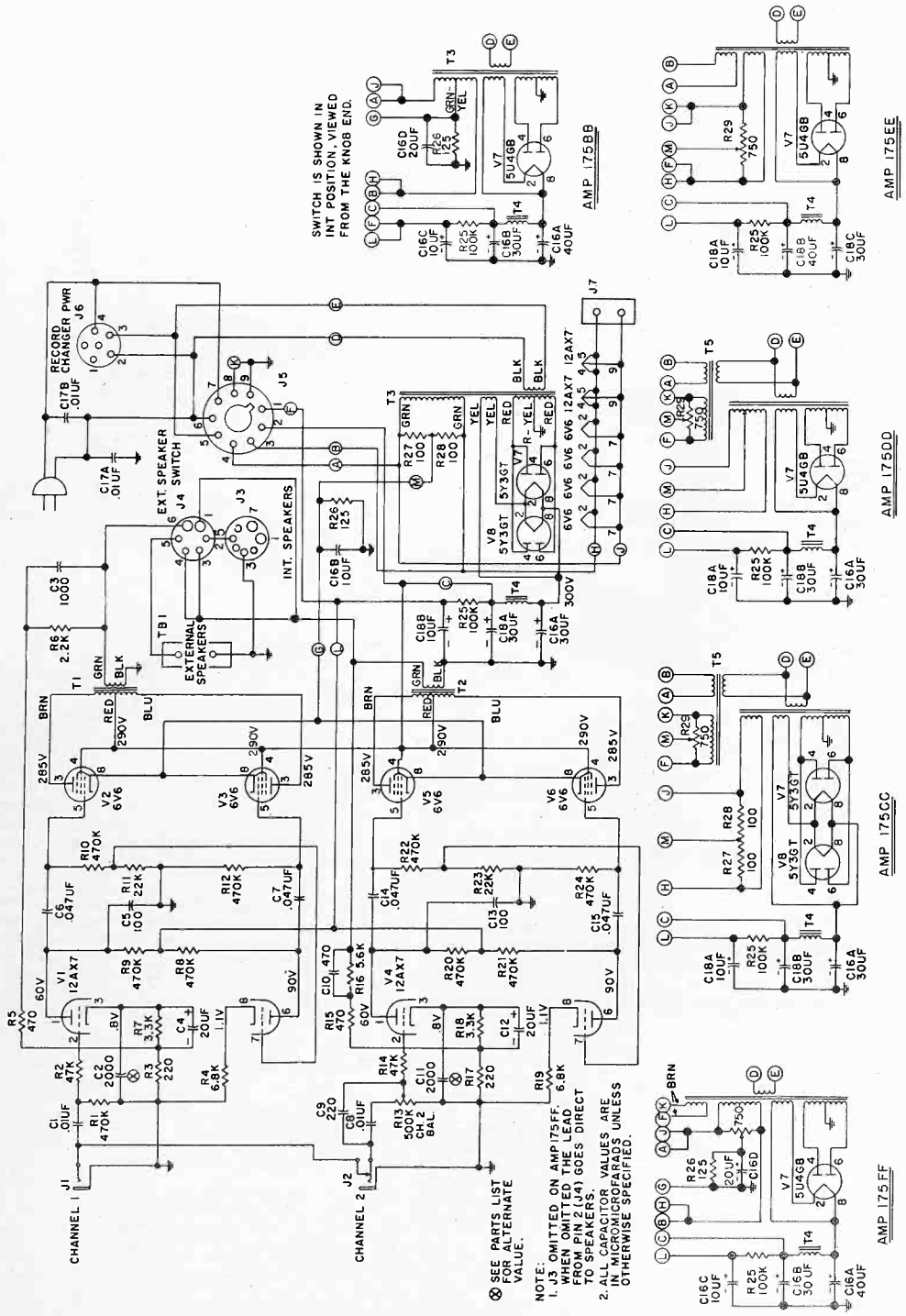
SWITCH IS SHOWN IN THE INT. STEREO POS, VIEWED FROM KNOB END.

FIG. B

CHASSIS LAYOUT



SCHEMATIC DIAGRAM



REPLACEMENT PARTS LIST

SYMBOL	DESCRIPTION	PART NO.
	TRANSFORMERS	
T1	Channel 1 Output	320819-1
T2	Channel 2 Output	320819-1
T3	Power (AA-CC)	300071-1
T3	Power (BB-DD)	300154-1
T3	Power (EE)	300174-1
T3	Power (FF)	300173-1
T4	Filter Choke	320041-2
T5	Filament (DD)	320074-1
T5	Filemant (CC)	320277-2
	CAPACITORS All capacitors are 20%, 500V unless specified otherwise	
C1	Cer., .01 mfd	250218-19
C2	Cer., 2000 mmf	250218-20
C2	Cer., 1000 mmf (FF)	250218-28
C3	Cer., 1000 mmf, 10%	250218-12
C4	Elect. 20 mfd, 25V	270027-28
C5	Cer., 100 mmf	250218-22
C6	Paper, .047 mfd, 400V	250211-11
C7	Paper, .047 mfd, 400V	250211-11
C8	Cer., .01 mfd	250218-19
C9	Cer., 220 mmf	250218-5
C10	Cer., 470 mmf, 10%	250218-15
C11	Cer., 2000 mmf	250218-20
C11	Cer., 1000 mmf (FF)	250218-28
C12	Elect. 20 mfd, 25V	270027-28
C13	Cer., 100 mmf	250218-22
C14	Paper, .047 mfd, 400V	250211-11
C15	Paper, .047 mfd, 400V	250211-11
C16	Elect. 30, 10 mfd-475V(AA-CC-DD)	270023-2
C16	Elect. 40-30-10mfd-450V 20mfd-25V (BB-EE-FF)	270021-56
C17	Cer., 2x.01 mfd, 1000V	250219-3
C16	Elect. 30-10mfd, 475V (AA-CC-DD)	270023-2

SYMBOL	DESCRIPTION	PART NO.
	RESISTORS All resistors are 10%, 1/2W unless specified otherwise	
R1	470K	230104-94
R2	47K	230104-82
R3	220	230104-54
R4	6800	230104-72
R5	470	230104-58
R6	2200	230104-66
R7	3300	230104-68
R8	470K	230104-94
R9	470K	230104-94
R10	470K	230104-94
R11	22K	230104-78
R12	470K	230104-94
R13	500K (Balance)	220132-17
R14	47K	230104-82
R15	470	230104-58
R16	5600	230104-71
R17	220	230104-54
R18	3300	230104-68
R19	6800	230104-72
R20	470K	230104-94
R21	470K	230104-94
R22	470K	230104-94
R23	22K	230104-78
R24	470K	230104-94
R25	100K, 1W	230105-86
R26	125, 10W, W.W.	240071-6
R27	100	230094-7
R28	100	230094-7
R29	750 Hum Balance	220654-2
	MISCELLANEOUS	
J1	CH-1 Phono Input	180466-1
J2	CH-2 Phono Input	180619-1
J3	Internal Speaker Socket	180612-4
J4	Speaker Switch Socket	180612-3
J5	Power Socket	180393-9
J6	Phono Power	180520-4
J7	Pilot light power	460917-6

4303

194 AMPLIFIER CHASSIS

GENERAL

The Amp-194 is a stereo (split) amplifier designed to provide reproduction of the new stereophonic records. The amplifier is used in the small portable phonographs. Each channel of this amplifier provides approximately 1-watt output to each set of speakers if stereo speakers have been connected. If they haven't been connected then 2-watt output is provided for the internal speakers only.

As it is necessary to be able to balance the output between the two channels for each set of speakers, a balance control is used in these amplifiers. This balance control is connected into the grid circuits of the output tubes to obtain a balanced condition.

SPECIFICATIONS

Power Supply		
Frequency		60 cps.
Voltage		117V AC
Wattage		75 watts
Audio System		
Power Output	CH-1	1 watt
	CH-2	1 watt
Output Trans. Impedance		
CH-1	Pri. 5000 ohms	Sec. 3.2 ohms
CH-2	Pri. 5000 ohms	Sec. 3.2 ohms

TUBE COMPLEMENT

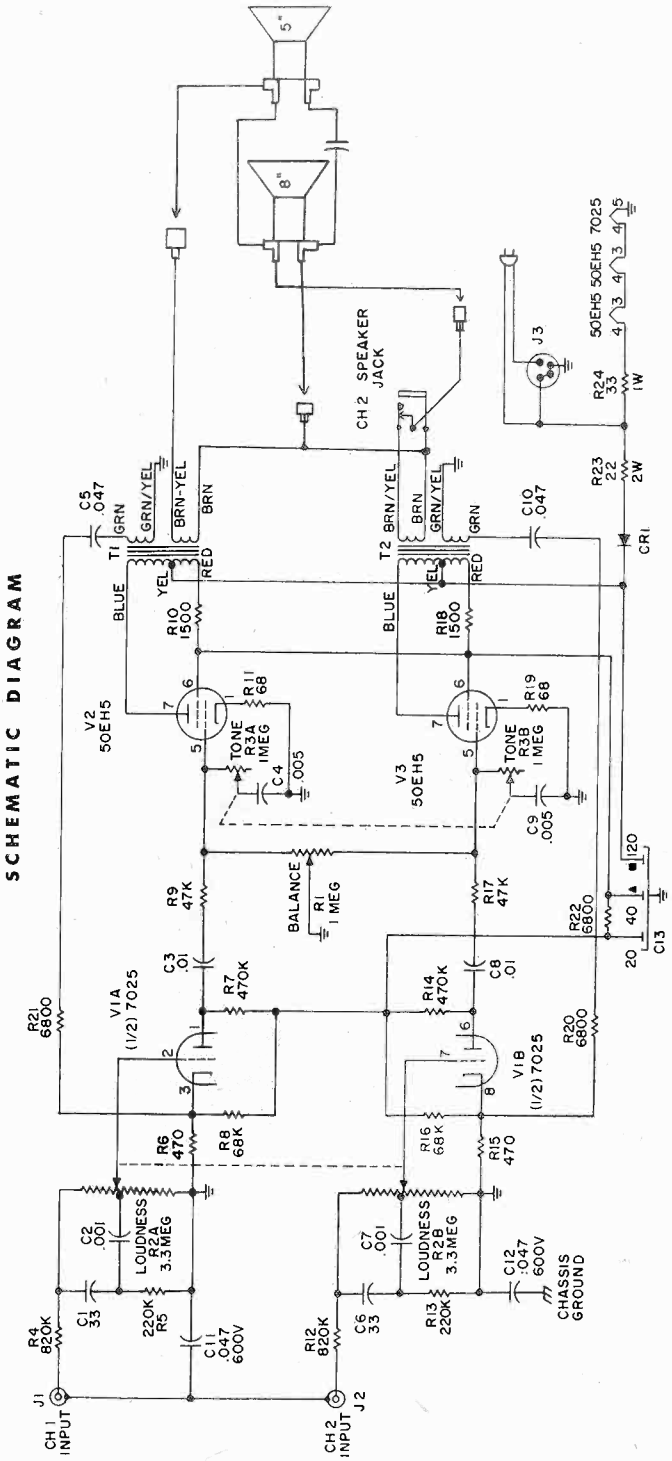
Ref.	Function		Type
V1A	CH-1 1st Audio	1/2	7025
V2	CH-1 Output		50EH5
V1B	CH-2 1st Audio	1/2	7025
V3	CH-2 Output		50EH5

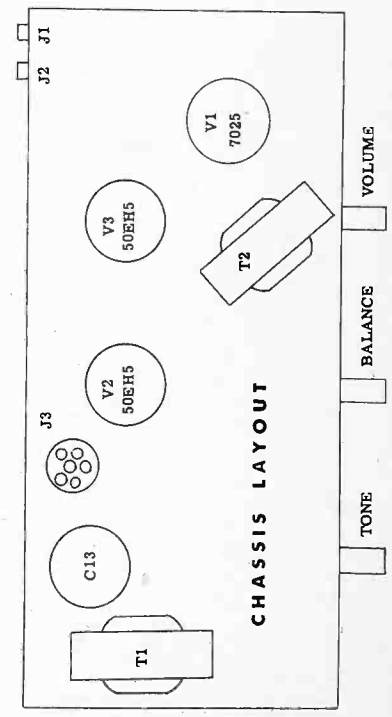
REPLACEMENT PARTS LIST

SYMBOL	DESCRIPTION	PART NO.
	TRANSFORMERS	
T1	Channel 1 Output	320288-2
T2	Channel 2 Output	320288-2
	RESISTORS All resistors are 10%, 1/2W unless specified otherwise	
R1	1 meg Balance	220072-41
R2	3.3 meg Dual Volume	220151-14
R3	1 meg Dual Tone	220151-15
R4	820K	230104-97
R5	220K	230104-90
R6	470	230104-58
R7	470K	230104-94
R8	68K	230104-84
R9	47K	230104-82
R10	1500	230104-64
R11	68	230104-48
R12	820K	230104-97
R13	220K	230104-90
R14	470K	230104-94
R15	470	230104-58
R16	68K	230104-84
R17	47K	230104-82
R18	1500	230104-64
R19	68	230104-48
R20	6800	230104-72
R21	6800	230104-72

SYMBOL	DESCRIPTION	PART NO.
R22	6800	230104-72
R23	22, 2W	230106-42
R24	33, 1W	230105-44
	CAPACITORS All capacitors are 20%, 500V unless specified otherwise	
C1	Mica, 33 mmf	250187-66
C2	Cer., 1000 mmf	250218-28
C3	Cer., .01 mfd	250175-2
C4	Cer., 5000 mmf	250175-30
C5	Mylar, .047 mfd	250261-21
C6	Mica, 33 mmf	250187-66
C7	Cer., 1000 mmf	250218-28
C8	Cer., .01 mfd	250175-2
C9	Cer., 5000 mmf	250175-30
C10	Mylar, .047 mfd	250261-21
C11	Paper, .047 mfd, 600V	250201-11
C12	Paper, .047 mfd, 600V	250201-11
C13	Elect. 20/20/40mfd	270023-31
	MISCELLANEOUS	
CR-1	Silicon Rectifier	530058-1
J-1	Channel 1 Input	180586-1
J-2	Channel 2 Input	(Part of J1)
J-3	Phono Power Socket	180520-4
	Extension Speaker Socket	180619-1

SCHEMATIC DIAGRAM





MANUAL 603A

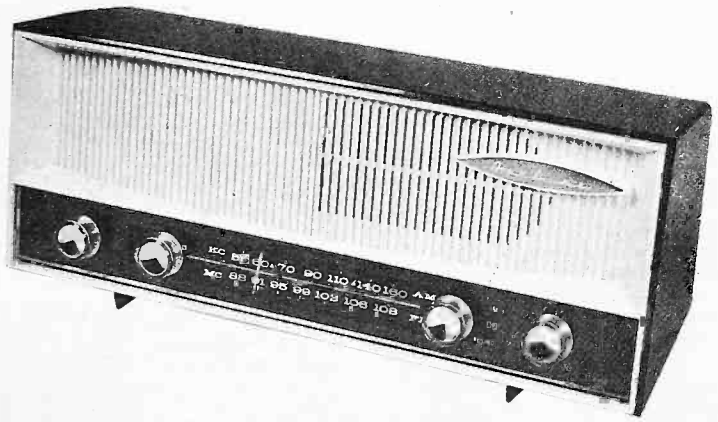
Airline

AM-FM RADIO

MODEL

GTM 1666A

Form No. 62Z-5208B*



MODEL GTM 1666A

BROWN AND WHITE

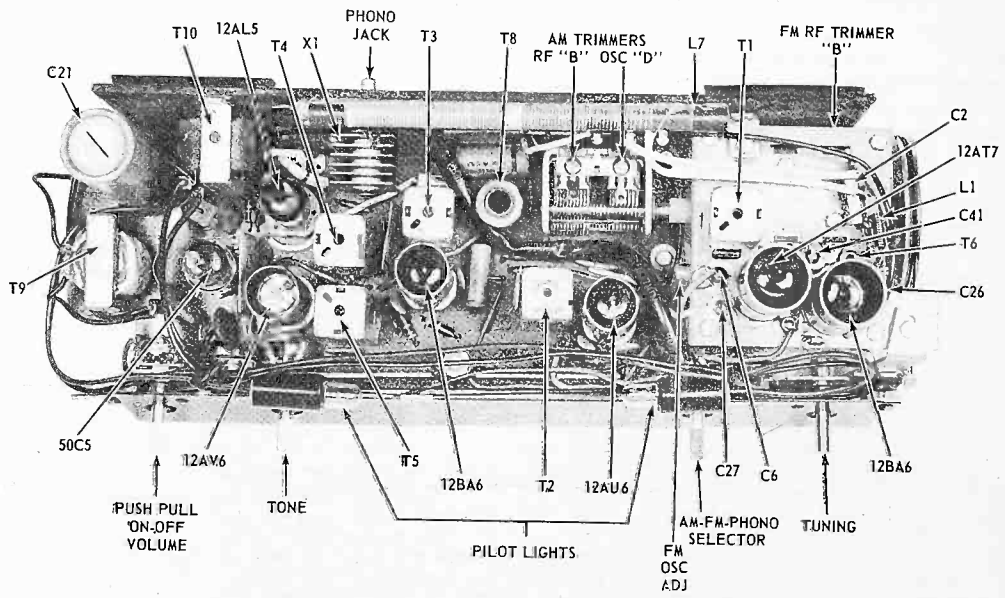


FIGURE 1 – TOP VIEW OF CHASSIS

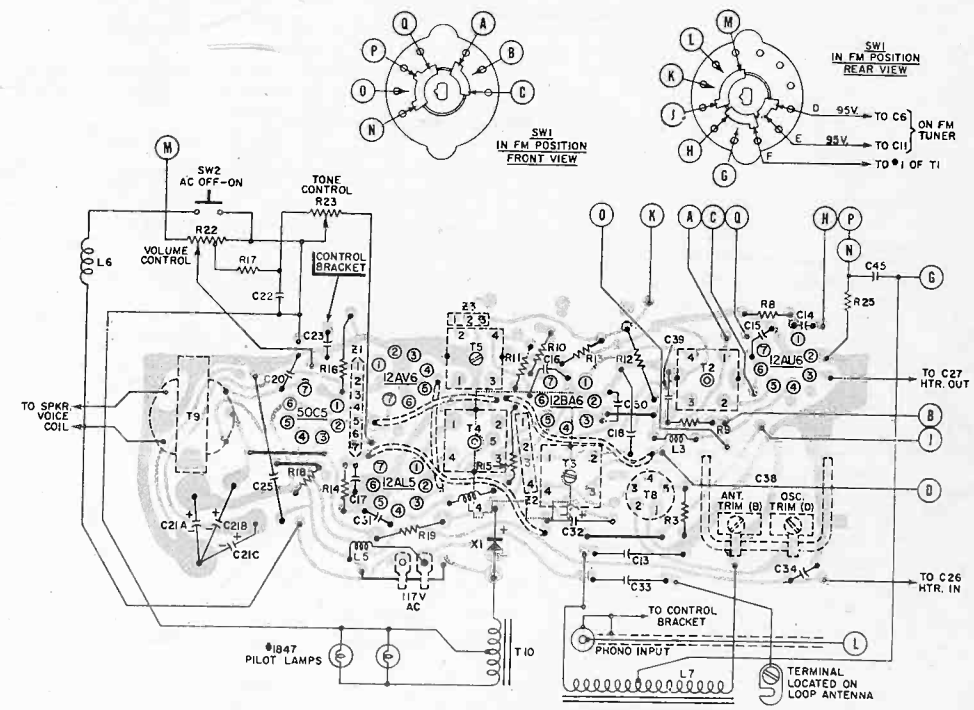


FIGURE 2 – BOTTOM VIEW OF CHASSIS

GENERAL DESCRIPTION

This Airline radio is a seven (7) tube AC-DC, AM-FM superheterodyne receiver. The FM section features a tuner type front-end, physically separated from the radio chassis. This section contains a separate FM RF amplifier, mixer and oscillator. An internal FM antenna connection is provided which utilizes the AC Power line as an FM antenna. FM tuning is accomplished by a 2 section variable gang capacitor. Two stages of FM-IF amplification, using double tuned transformers, provide greater sensitivity and noise rejection. A ratio detector is used as the FM demodulator.

The AM section contains a high gain ferrite core antenna for excellent signal pickup without the need for an external antenna. In AM operation, the 1st FM-IF amplifier is operated as the AM converter and the 2nd FM-IF amplifier as the AM-IF amplifier. The AM and FM IF transformers are connected in series. Because the AM coils operate at 455KC and the FM coils at 10.7MC, the AM coils have many more turns and higher inductance than the FM coils. Hence, in AM operation, the IF signal at 455KC encounters little impedance from the small FM coils. The 455KC AM-IF signal acts as though the FM coils were shorted out. In FM operation, the capacitor across the AM coils offers virtually no impedance to the FM-IF signal, in effect shorting out the AM-IF transformers.

A 2 5/8" x 10" speaker provides greater speaker cone area within a limited table model size cabinet. The greater cone area extends the audio frequency range of the receiver. All components, with the exceptions of the speaker, controls and FM front-end, are mounted on one printed circuit board. The etched wiring on the board is protected by a "solder-resist" plastic coating.

SPECIFICATIONS

Frequency Ranges:	
AM	540 to 1600KC.
FM	88 to 108MC.
Intermediate Frequencies:	
AM	455KC.
FM	10.7MC.
Tube Complement:	
1 12BA6	FM RF Amplifier
1 12AT7	FM Mixer-Oscillator
1 12AU6	1st FM IF Amp.-AM Converter
1 12BA6	2nd FM IF Amp.-AM IF Amp.
1 12AL5	FM Detector
1 12AV6	AM Detector-1st Audio Amp.
1 50C5	Audio Output Amp.
Power Output:	
Undistorted	1.5 watts
Maximum	2.5 watts
Loudspeaker	10" x 2 5/8" PM
Operating Voltage	105 to 120 volts, 50-60 cycle AC or DC
Power Consumption	37 watts
Sensitivity:	
AM	140 uv per meter, 50 mw output approx.
FM	20 uv, 50 mw output approx.
Selectivity:	
AM	8KC at 6 db bandwidth
FM	190KC at 6 db bandwidth

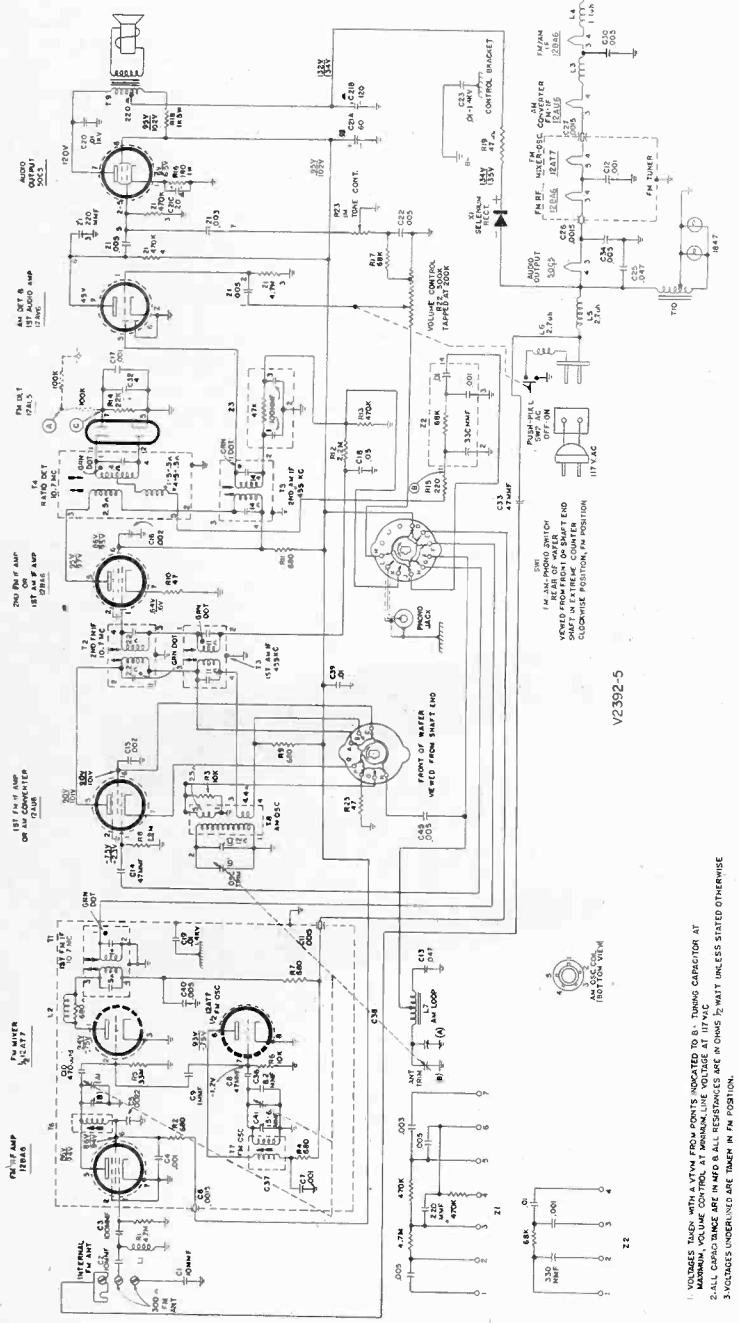


FIGURE 3 – SCHEMATIC DIAGRAM

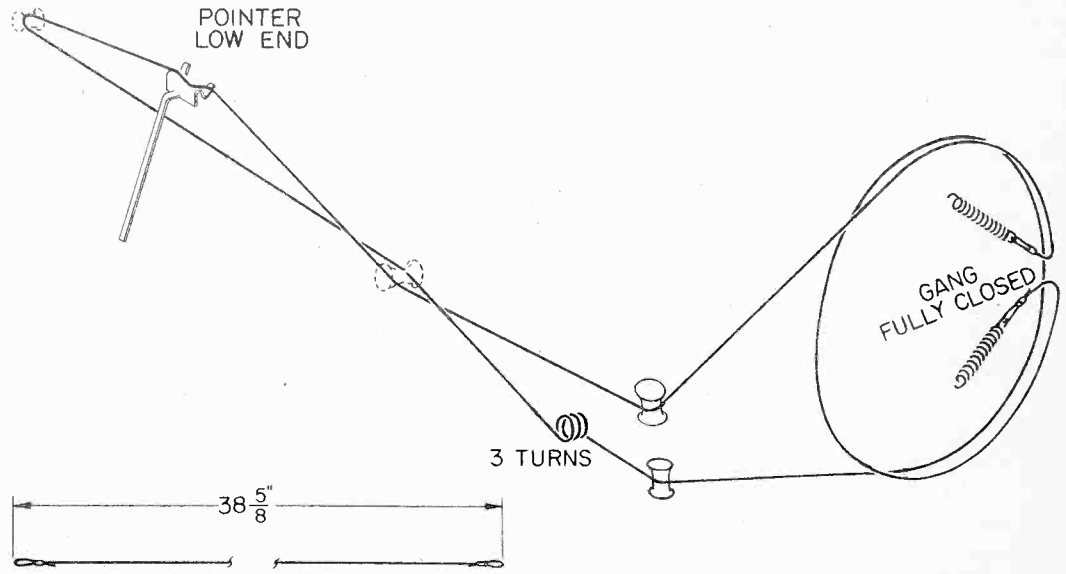


FIGURE 4 – DIAL STRING ARRANGEMENT

AM ALIGNMENT

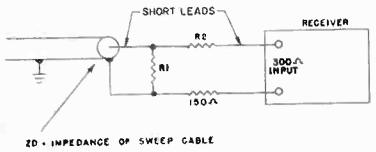
AM ALIGNMENT

1. Connect V.T.V.M. as indicated in the AM alignment chart.
2. Use signal generator covering 455 kc to 1700 kc, AM modulated, with adjustable output attenuator.
3. Set the volume control R22 at maximum.
4. Set switch SW1 at AM.
5. Keep the signal generator output voltage level low to avoid AVC action.
6. Set C38 (tuning capacitor) to minimum.

AM ALIGNMENT CHART

Step	*Connect Signal Generator to:*	*Signal Generator Frequency*	*C38 Setting*	*V.T.V.M. Connection*	*Adjustment*
1	High side thru .1 mfd to stator "A" of C38. Low side to tuning capacitor frame (B-)	455 kc modulated	min.	Across spkr. voice coil	Primary and secondary of T5 and T3 for maximum output
2	"	1625 kc modulated	"	"	C38 "D" for maximum output
3	Radiated signal	1400 kc modulated	Tune for signal	"	C38 "B" Rock in for maximum output

FM ALIGNMENT



ZO	R1	R2
52 Ω	56 Ω	120 Ω
72 Ω	85 Ω	110 Ω

FIGURE 5 – IMPEDANCE MATCHING NETWORK

FM ALIGNMENT

1. Don't attempt FM alignment until the AM alignment has been completed.
2. Connect two 100k ohm resistors from test point "C" (pin No. 7 12AL5) to ground as shown in schematic.
3. Use V.T.V.M. connected as indicated in the FM alignment chart.
4. Use a signal generator with output frequencies of 10.7 mc and 80 to 110mc. Generator should have an adjustable output attenuator.
5. Set the volume control R22 at maximum.
6. Set the switch SW1 to the FM position.
7. Keep the signal generator output voltage level low to avoid overload.

FM ALIGNMENT CHART

Step	*Connect Signal Generator to:*	*Signal Generator Frequency*	*C37 Setting*	*V.T.V.M. Connection*	*Adjustment*
1	High side of generator to lug F or H of SW1	10.7 mc unmodulated	Min.	Between points "A" and "B" see fig. 3	Secondary of T4 (top adj.) for zero voltage
2	"	"	"	Between point "C" and ground	Primary of T4 (bottom adj.) and primary and secondary of T2 for maximum negative voltage
3	"	10.7 mc unmodulated input increased 10X	"	Between points "A" and "B"	Recheck T4 secondary and adjust for zero voltage if necessary
4	"	"	"	Between point "C" and ground	Recheck T4 primary and adjust for maximum negative voltage if necessary
5	REMOVE THE TWO 100K OHM RESISTORS				
6	Across FM antenna with proper termination see fig. 5	98 mc unmodulated	98 mc	Between point "C" and ground	T7 for maximum negative voltage
7	"	"	"	"	T1 primary and secondary for maximum negative voltage
8	"	108.5 mc unmodulated	Min.	"	C41 for maximum negative voltage
9	"	87.5 mc unmodulated	Max.	"	T7 for maximum negative voltage
10	REPEAT STEPS 8 AND 9 UNTIL NO FURTHER CHANGE				
11	ACROSS FM antenna with proper termination	106 mc unmodulated	Tune for signal	Between point "C" and ground	C37 "B" for maximum negative voltage (rock in)
12	"	90 mc unmodulated	"	"	T6 for maximum negative voltage (rock in)
13	CHECK STEPS 8 AND 9 AND TOUCH UP IF NECESSARY				

PARTS LIST

CAPACITORS

Ref. No.	*Part Number*	*Description*
C1		10 mmf., 500V, mica
C2		10 mmf., 500V, mica
C3		100 mmf., 500V, ceramic
C4		.001 mf., 500V, ceramic
C5		.0022 mf., 500V, ceramic
C6	219V025H02	.0015 mf., 500V, feedthrough
C7		.001 mf., 500V, ceramic
C8		44 mmf., 500V, ceramic
C9		1 mmf., 500V, ceramic
C10		470 mmf., 500V, ceramic
C11	219V025H02	.0015 mf., 500V, feedthrough
C12		.001 mf., 500V, ceramic
C13		.047 mf., 600V, tubular
C14		47 mmf., 500V, ceramic
C15		.002 mf., 500V, ceramic
C16		.002 mf., 500V, ceramic
C17		.001 mf., 500V, ceramic
C18		.05 mf., 200V, tubular
C19	215V306H03	.01 mf., 1.4KV, ceramic
C20	215V300H03	.01 mf., 1KV, ceramic
C21A	218V033H02	60 mf., 150V, electrolytic
C21B		120 mf., 150V, electrolytic
C21C		20 mf., 150V, electrolytic
C22		.005 mf., 500V, ceramic
C23	215V306H03	.01 mf., 1.4KV, ceramic
C25		.047 mf., 600V, molded
C26	219V025H02	.0015 mf., 500V, feedthrough
C27	219V025H02	.0015 mf., 500V, feedthrough
C30		.005 mf., 500V, ceramic
C31		.005 mf., 500V, ceramic
C32	218V012H13	4 mf., 50V, electrolytic
C33		47 mmf., 500V, mica
C34		.005 mf., 500V, ceramic
C36	215V300H46	8.2 mmf., 500V, N470 ceramic
C37	330V016H02	AM gang capacitor
C38	330V015H06	FM gang capacitor
C39		.01 mf., 500V, ceramic
C40		.005 mf., 500V, ceramic
C41	215V307H01	1.5 to 6 mmf. trimmer
C45		.005 mf., 500V, ceramic

RESISTORS

Ref. No.	*Part Number*	*Ohms*	*Watts*
R1		4.7 meg.	0.5 Carbon
R2		680	0.5 Carbon
R3		10K	0.5 Carbon
R4		680	0.5 Carbon
R5		3.3 meg.	0.5 Carbon
R6		10K	0.5 Carbon
R7		680	0.5 Carbon
R8		1.2 meg.	0.5 Carbon
R9		680	0.5 Carbon
R10		47	0.5 Carbon
R11		680	0.5 Carbon
R12		2.2 meg.	0.5 Carbon
R13		470K	0.5 Carbon
R14		22K	0.5 Carbon
R15		220	0.5 Carbon
R16		180	1.0 Carbon
R17		68K	0.5 Carbon
R18	251V020H15	1K	5.0 Wirewound
R19	251V023H23	47	3.0 Glassohm
R22	270V039H09	500K	Volume Control (includes SW2 on-off)
R23	270V039H10	1 meg.	Tone Control
R25		47	0.5 Carbon

COILS AND TRANSFORMERS

Ref. No.	*Part Number*	*Description*
L1	230V065H01	Antenna coil (FM)
L2	230V056H18	Coil, RF (includes 680 ohm resistor)
L3	230V056H02	Filament choke
L4	230V056H02	Filament choke
L5	V-9099-5	RF choke
L6	V-9099-5	RF choke
L7	787V161H01	Ferrite loop assembly (AM)
T1	235V039H01	1st FM, IF transformer
T2	235V037H02	2nd FM, IF transformer
T3	235V044H01	1st AM, IF transformer
T4	235V035H01	Ratio detector transformer
T5	235V038H02	2nd AM, IF transformer
T6	230V045H01	RF, FM plate coil
T7	230V045H02	FM oscillator coil
T8	230V044H01	AM oscillator coil
T9	430V062H01	Audio output transformer
T10	430V075H01	Pilot light transformer

PARTS LIST – Continued

MISCELLANEOUS

Part Number	*Description*
559V036H02	Background bracket assy. (includes AM-FM scale)
558V147H03	Background, dial (paper)
513V017H19	Cabinet, shell (back) brown
770V415H01	Contact, male, AC power
781V061H01	Coupling, connects tuning gangs
751V000A01	Cord, AC power
787V092H05	Cord assy, dial drive,
558V118H02	Dial, plastic crystal
558V145H01	Front, cabinet, white
783V061H01	Insert, mounts cabinet front
550V082H01	Knob, AM-FM tuning, volume, tone
550V082H05	Knob, AM-FM-Phono selector
*	Lamp, pilot light, #47
558V146H02	Nameplate
219V019H01	Couplate, audio (Z1) (Centralab YDM468-001AX)
219V020H01	Couplate, de-emphasis Z2 (YDF010-01E3A4)

MISCELLANEOUS – Continued

Part Number	*Description*
219V022H01	Couplate, filter Z3 (Centralab YD105-013A)
558V089H01	Pointer
295V012H01	Rectifier, selenium (X1)
783V055H12	Shaft, tuning
751V561H01	Socket, dial light
751V513H05	Socket, 7 pin, 12AL5
751V503H03	Socket, 7 pin, shielded. 50C5
751V546H01	Socket, 7 pin, shielded, 12AV6, 12AU6, 12BA6
751V549H01	Socket, shielded, 7 pin, 12BA6
751V549H02	Socket, shielded, 9 pin, 12AT7
770V250H03	Spring, dial drive
570V024H01	Speaker 10" x 2 5/8" PM
270V039H09	Switch (SW2), On-Off (part of R22)
756V027H02	Switch (SW1), selector
781V164H01	Washer, special, mounting front to cabinet

NOTE: USE UNIVERSAL PARTS WHERE PART NUMBERS ARE NOT LISTED. ORDER FROM (LRS)

* SEE PARTS CATALOG – LAMP BULBS

CHASSIS REMOVAL

1. Remove the two 3½" long screws located at either end of the cabinet rear.
2. Remove the short screw located in the center of the cabinet rear and the screw on the bottom of the cabinet.
3. Separate the cabinet front from the cabinet back to expose the radio chassis. (The two 3½" screws can be used to do this by pushing on both at same time).
4. Use a conventional TV AC interlock line cord to power the radio while servicing. It is recommended that the chassis be isolated from the power line by means of an isolation transformer.

FM ANTENNA INFORMATION

The receiver is shipped from the factory with the FM antenna connection in the internal position. The FM antenna connections are located on the back of the AM loop antenna and are accessible through a hole in the rear cover. When the captivated shorting bar connects the center and right hand terminals the FM input is connected to the AC power line through capacitor C33. The AC power line hence serves as the FM antenna.

When using an external FM antenna, disconnect the captivated shorting bar from the center terminal. Connect a 300 ohm antenna across the center and left hand terminals.

PHONOGRAPH INPUT INFORMATION

The audio amplifier section of the receiver can be used as a phonograph amplifier by inserting the plug from the phonograph output into the receptacle on the rear of the receiver. The AM-FM-PHONO switch should be set to the PHONO position.

The phonograph should employ either a crystal or ceramic type cartridge for best results. If hum is being picked up by the phonograph, try reversing the AC plug of the phonograph in the AC power outlet, and/or the radio power plug.

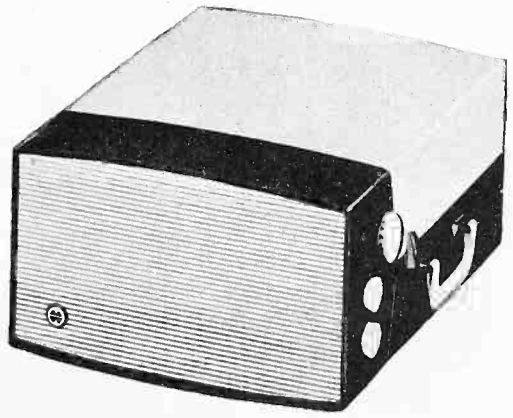
Manual 602A

Airline

PORTABLE AUTOMATIC RADIO PHONOGRAPH

MODEL GAA-1015A

FORM NO. 62Z-5216B*



MODEL GAA-1015A TAN AND WHITE

ELECTRICAL SPECIFICATIONS

POWER SUPPLY - 105 to 125 Volts AC 60 cycles,
50 Watts with record changer operating

FREQUENCY RANGE - 535 to 1620 KC

INTERMEDIATE FREQUENCY - 455 KC

SELECTIVITY - 40 KC broad at 1000 times signal, 1000 KC

SENSITIVITY - (.05 Watt output with Hazeltine test loop)
350 Microvolt per meter average

POWER OUTPUT - .7 Watts maximum, 1% distortion
1.1 Watts maximum, 10% distortion

RECORD CHANGER - VM #1210 (Manuals 5124A and 5131A)

NOTE: The VM-1210 changer uses Universal Part Number 60-48 Crystal Cartridge. The needles on this cartridge are not replaceable, as the cartridge and needles are in one unit. It will be necessary, therefore, when a needle is worn, to replace the complete cartridge.

TUBE COMPLEMENT

1 - 12BE6 Mixer
1 - 12BA6 I.F. Amplifier
1 - 12AT6 Detector, AVC, Audio
1 - 50C5 Audio Output
1 - 35W4 Rectifier

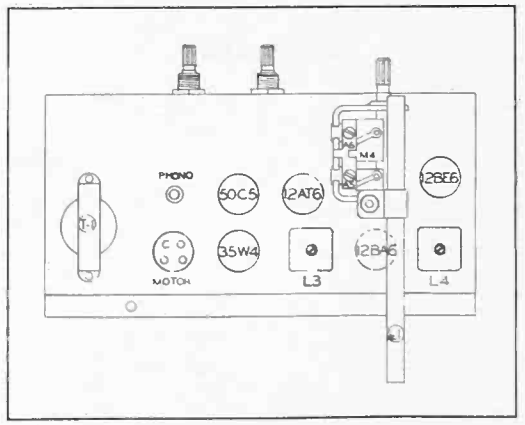
ALIGNMENT PROCEDURE

The following equipment is required for aligning A signal generator which will provide an accurately calibrated signal at the indicated test frequencies; an output indicating meter; a non-metallic screwdriver.

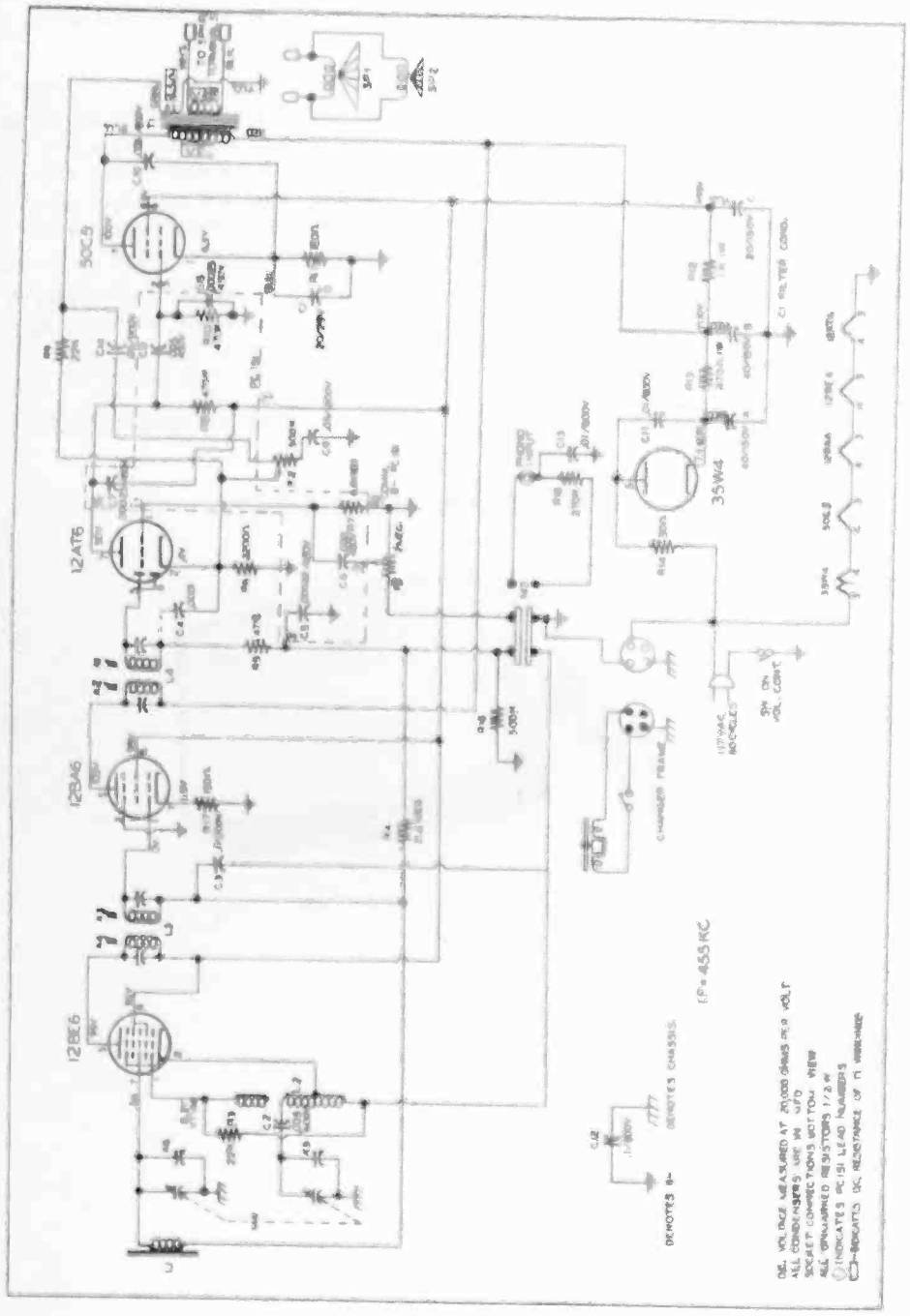
Radiation Loop: 2-turn loop, 6 inches in diameter.
Conditions for Alignment:
Tone - Treble
Volume - Maximum
Selector Switch - "Radio" position
Test loop coupled loosely to receiver by spacing - receiver loop in same position as it will be with chassis in cabinet.

SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	REMARKS	ADJUST FOR MAXIMUM OUTPUT
LOOP	455 KC	Low End of Band	Across Voice Coil	Short out osc. tuning gang section A5; compress A6	L3, L4; top & bottom screws
LOOP	1620 KC	High End of Band	"	Remove short across A5	M4 Full Open
LOOP	1400 KC		"	Set pointer to 140 on dial	A5
LOOP	600 KC		"	Check for tracking on low end of band	
LOOP	1400 KC	1400	"	Recheck Alignment	A6 if necessary

TUBE LAYOUT



SCHEMATIC DIAGRAM



MODEL GAA-1015A

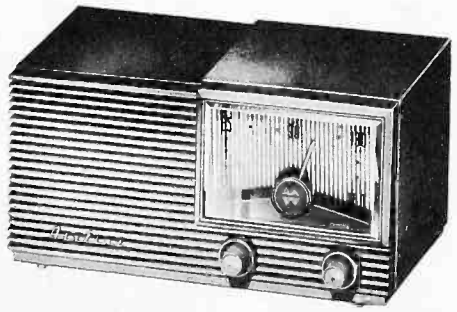
PARTS LIST

REF. NO.	PART NO.	DESCRIPTION
		RESISTORS
R1, SW	412A	Volume Control and Switch (2 Meg)
R2, M3	411A	Tone Control and Radio-Phono. Switch (500K ohm)
R3, R9		22K Ohm 1/2 Watt
R4		2.2 Meg 1/2 Watt
R5		47K Ohm 1/2 Watt
R6		2.2K Ohm 1/2 Watt
R7, R8, R10	827	Couplate (Centralab PC-151)
R11, R17		150 Ohm 1/2 Watt
R12		1K Ohm 2 Watt
R13		470 Ohm 2 Watt
R14	542	27 Ohm Fuse Type
R15		270K Ohm 1/2 Watt
R16		470K Ohm 1/2 Watt
		CONDENSERS
M4, A5, A6	1017	Tuning Gang and Trimmers
C1A, B, C, D	1019	40/40/20 MFD-150V, 20 MFD-25V Electrolytic
C2, C10		.005 MFD 600 Volt
C3		.1 MFD 200 Volt

REF. NO.	PART NO.	DESCRIPTION
		CONDENSERS
C4		Contained in L4
C5, C6, C7, C8,	827	Couplate (Centralab PC-151)
C15		
C9, C14		.05 MFD 200 Volt
C11, C13		.01 MFD 600 Volt
C12		.1 MFD 600 Volt
		COILS and TRANSFORMERS
L1	1509A	Ferrite-Core Antenna
L2	1408A	Oscillator Coil
L3	1405	First I.F. Transformer
L4	1406A	Second I.F. Transformer
T1	1209C	Output Transformer
		MISCELLANEOUS
SP1	2627	6" P.M. Speaker
SP2	2633	3-1/2" P.M. Speaker
	2451	Knob (Tuning)
	2452	Knob (Tone-Radio-Phono.)
	2453	Knob (Volume-Off-On)
	2376	Grill
		Cartridge-Electro Voice
		Power Point #56 (use 60×48)
	104A	Single Prong Phono. Socket

NOTE: USE UNIVERSAL PARTS WHERE PART NUMBERS ARE NOT SHOWN. ORDER FROM (LRS).

MANUAL 573A
TABLE MODEL
RADIO
MODELS
HA-1645A
HA-1646A
SERIAL NO. 75X
FORM NO. 622-575B



HA-1645A LIGHT GREEN
HA-1646A COCOA BROWN

ELECTRICAL SPECIFICATIONS

POWER SUPPLY	VOLTAGE: 110-120 Volt Direct Current or 110-120 Volt 50-60 cycle Alternating Current. 35 Watts.
TUNING RANGE	540 to 1620 K.C.
INTERMEDIATE FREQ.	455 K.C.
I.F. STAGES	One
LOUD SPEAKER	5" P.M.
VOICE COIL IMPEDANCE	3.2 OHM
POWER OUTPUT	Undistorted 1 Watt Maximum 1.5 Watts

TUBE COMPLEMENT

1	12BA6	R.F. AMPLIFIER
1	12BE6	MODULATOR:OSCILLATOR
1	12BA6	I.F. AMPLIFIER
1	12AV6	DETECTOR, AVC, 1ST AUDIO
1	35C5	POWER OUTPUT
1	35W4	RECTIFIER

SERVICE LETTER REMINDER

Record number of Service Letters below that apply to models listed in this manual.

THE FOLLOWING ALIGNMENT CHART, WIRING DIAGRAM AND PARTS LIST ARE INTENDED FOR USE BY PROFESSIONAL SERVICE MEN

ALIGNMENT PROCEDURE

For alignment procedure read tabulations from left to right, and make the adjustment marked (1) first, (2) second, (3) third, and (4) fourth.

Before starting alignment:

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

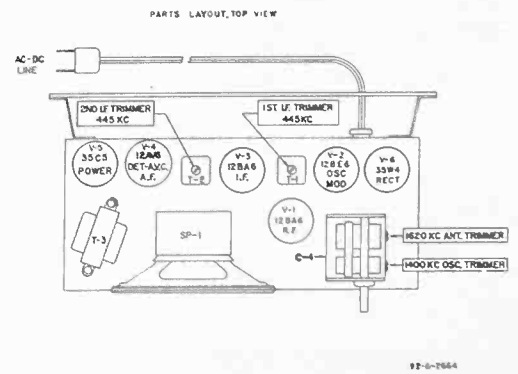
When aligning the I. F. slugs, use a non-metallic screwdriver.

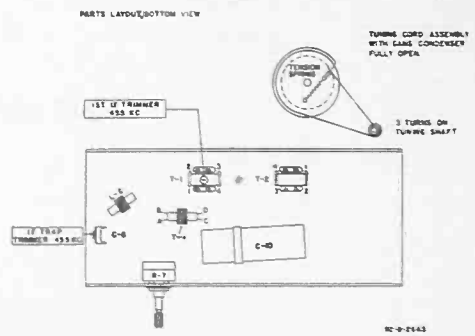
When the chassis is removed from the cabinet, the loop must be mounted on the loop mounting brackets, and the two wires connected to the loop.

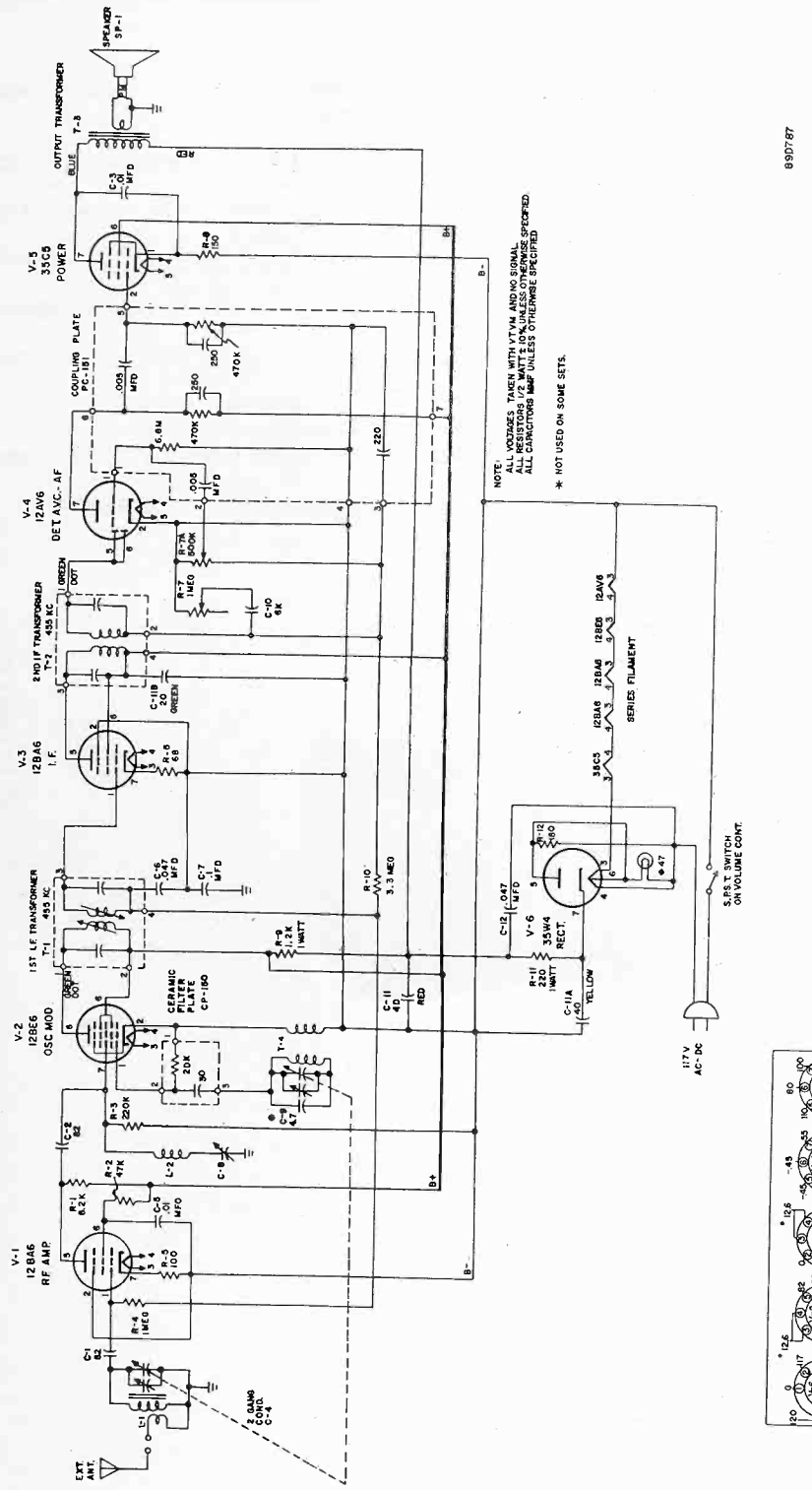
(A) When aligning the 1620 KC OSCILLATOR TRIMMER or the 1400 KC ANTENNA TRIMMER, couple test oscillator to receiver antenna by: (1) make loop consisting of five to ten turns of NO. 20 to NO. 30 size wire, wound on a 2" to 3" form; (2)connect this loop across output of test oscillator; (3) place test oscillator loop near radio antenna. BE SURE THAT NEITHER LOOP NOR RADIO ANTENNA MOVES WHILE ALIGNING.

(B) When adjusting the I. F. wavetrap trimmer (C-8), (1) connect a short length of wire to the output of the signal oscillator, (2) hold the wire near enough to the R. F. choke (L-2) to radiate a signal into the coil.

		TEST OSCILLATOR			
Steps	Set receiver dial to:	Adjust test oscillator frequency to:	Use dummy antenna in series with output of test oscillator consisting of:	Attach output of test oscillator to:	Refer to parts layout diagram for location of trimmers mentioned below:
1	Any point where no interfering signal is received.	455 K.C.	.02 MFD. condenser	High side to rear stator plates of tuning condenser. Low side to common negative.	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 1620 K.C.	Exactly 1620 K.C.	See paragraph (A) above.	See paragraph (A) above.	Adjust 1620 K.C. oscillator trimmer for maximum output.
3	Approx. 1400 K.C.	Approx. 1400 K.C.	See paragraph (A) above.	See paragraph (A) above.	Adjust 1400 K.C. antenna trimmer for maximum output.
4	Same as Step 1	455 K.C.	See paragraph (B) above.	See paragraph (B) above.	Adjust the I.F. trimmer (C-8) for minimum output.







PARTS LIST

Ref. No.	Description	Part Number
	CAPACITORS	
PC-150	Filter Plate (Centralab PC-150)	49B076
PC-151	Couplate (Centralab PC-151)	49B075
C-1, C-2	Capacitor, 82 mmf, 10%, 500V.	47CA20A820K
C-3	Capacitor, 01 mfd, GMV 500V.	
C-4	Capacitor, Variable	B8A-27684
C-5	Capacitor, .01 mmf. +80% -20%	
C-6	Capacitor, .047 mfd, 200V.	
C-7	Capacitor, .1 mfd, 400V, 20%	
C-8	Capacitor, Trimmer 4-70 mmf	44B485
C-9	Capacitor, 4.7 mmf, ± 1/2 mmf, N-1500	
C-10	Capacitor, 5K mmf, GMV 500V	
C-11,C-11A, C-11B	Capacitor, Electrolytic 40-40-20 mfd, 150V.	45C430
C-12	Capacitor, .047 mfd, 400V	
	RESISTORS	
R-1	Resistor, 8200 ohm, 10%, 1/2W	
R-2	Resistor, 47K ohm, 10%, 1/2W	
R-3	Resistor, 220K ohm, 20%, 1W	
R-4	Resistor, 1 meg ohm, 20%, 1/2W	
R-5	Resistor, 100 ohm, 10%, 1/2W	
R-6	Resistor, 68 ohm, 10%, 1/2W	
R-7 & R-7A	Resistor, Variable Tone 1 meg Vol. 500K	25B1446
R-8	Resistor, 150 ohm, 10%, 1/2W	
R-9	Resistor, 1200 ohm, 10%, 1W	
R-10	Resistor, 3.3 meg ohm, 20%, 1/2W	
R-11	Resistor, 220 ohm, 10%, 1W	
R-12	Resistor, 180 ohm, 10%, 1/2W	
	COILS & TRANSFORMERS	
*T-1	Transformer, I.F.	50C242
T-2	Transformer, 2nd I.F.	50C249
T-3	Transformer, Output	55C319
* - Alternate replacement		
T-1	Transformer, I.F.	50C250

Ref. No.	Description	Part Number
	COILS & TRANSFORMERS (Cont.)	
T-4	Coil, Oscillator	51B2261
L-1	Antenna, (Ferrite Rod)	57B238
L-2	Choke, R.F.	53B438
	MISCELLANEOUS	
SP-1	Speaker 5" P.M.	C18A-27692
	Socket, 7 pin min.	6A730
	Socket, 7 pin min.	6A729
	Line Cord with Plug	87A1669
	Hub & Pointer Ass'y.	B-200-27682
	Dial Scale, (Coco Brown)	22C549
	Dial Scale, (Light Green)	22C550
	Knob, Tuning (Light Green)	15B1101
	Knob, Tuning (Coco Brown)	15B1102
	Knob, Vol. On-Off (Light Green)	15B1103
	Knob, Vol. On-Off, (Coco Brown)	15B1104
	Knob, Tone Control (Light Brown)	15B1105
	Knob, Tone Control (Coco Brown)	15B1106
	Cord, Dial Drive	38A026
	Cabinet Back, Assembly	41A40024
	Lock, Line Cord	76A397
	Cabinet (Light Green)	116R079
	Cabinet (Coco Brown)	116R080
	Spring, Drive Shaft	75A527
	Spring, Cord Tension	A49A-27669
	Chassis Mounting Bracket, Rear	A2D-27672
	Drive Shaft	A3A-27668
	Back Plate (Dial)	B2C-27681
	Stud, Trimount	B2M-10383
	Pilot Light Socket	B47A-27680
	Shield, Bottom Plate	CTB-27690
	Pilot Light	#47
	Tube Shield	69-306
	Tube Shield Base	69-308
	Mounting Bracket for Dial Back Plate	ATD-27674
	Shield, Pilot Light	8-1249
	Bracket Assembly for Mounting Condenser (Gang and Drive Shaft)	41A40025

Use Universal Parts Where Part Numbers Are Not Listed.
Order From (LRS)

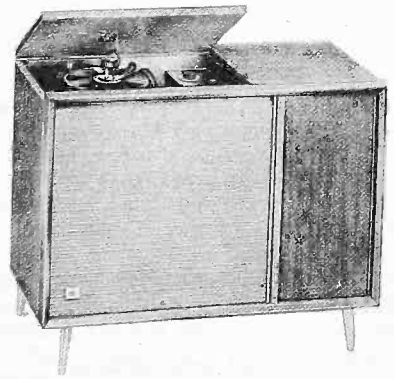
MANUAL 598A

Airline

HI-FI CONSOLE
AM-FM RADIO-PHONO.

MODELS GAA-2675A
GAA-2676A
GAA-2675B
GAA-2676B
GAA-2675B-ST
GAA-2676B-ST

FORM NO. 62Z-5197B*



MODELS GAA-2675A MAHOGANY
MODELS GAA-2675B MAHOGANY
MODELS GAA-2675BST MAHOGANY

GAA-2676A WALNUT
GAA-2676B WALNUT
GAA-2676BST WALNUT

ELECTRICAL SPECIFICATIONS

POWER SUPPLY - 105-125 Volts AC 60 Cycles, 120 Watts with record changer.

FREQUENCY RANGES - AM-540-1600KC
FM-88-108MC

I.F. FREQUENCY - AM-455KC
FM-10.7MC

AMPLIFIER FREQUENCY RESPONSE - 25 to 20,000 CPS

POWER OUTPUT - 20 Watts maximum. 13 Watts at less than 1% distortion.

LOUDSPEAKERS - 1-12" and 1-10" Alnico V P.M.
2-5" Alnico V P.M.

RECORD CHANGER - VM 1200A-165 (used in Models 2675A & 2676A) covered in Manuals 5124A & 5124B

RECORD CHANGER - VM 1210-207 (used in Models 2675B, 2676B, 2675B-fl5, 2676B-fl5) covered in Manuals 5124A & 5131A.

CARTRIDGE - Model Nos. 2675A & 76A use Astatic No. 89TX (use 60-58)

CARTRIDGE - Model Nos. 2675B & 76B and 2675B-ST & 76B-ST use Astatic No. 13TX (use 60-61)

NOTE: The needles on this cartridge are not replaceable, as the cartridge and needle are on one unit. It will be necessary, therefore, to replace the complete cartridge when a needle is worn.

TUBE, DIODE, AND DIAL LAMP COMPLEMENT -
1--6AB4 FM Mixer
1--6CB6 FM R.F. Amplifier
1--12AT7 FM Osc. and Mixer
3--6AU6 FM IF Amplifiers
2--IN636 FM Detector
1--6BA6 AM R.F. Amplifier
1-6BE6 AM Osc. and Mixer
1--6BA6 AM IF Amplifier
1--IN64 AM Detector
1--12AU7 Audio Amplifier
1--6AU6 Cathode Follower
1--6SN7GTB Audio Amplifier & Phase Inverter
2--EL84/6BQ5 Audio Output
1--5U4GB Rectifier
2--#12 Dial Lamps
1--#47 Indicator Lamp

ALIGNMENT PROCEDURE

AM STAGES

The following is required for aligning:

An All Wave Signal Generator which will provide an accurately calibrated signal at the test frequencies as listed.

Output indicating Meter, Non-Metallic Screwdriver, Dummy Antenna--.1 mf. Volume Control Maximum all Adjustments.

Connect Radio Chassis to ground post of Signal Generator with a short heavy lead.

Allow Chassis and Signal Generator to "heat up" for 15 minutes.

SIGNAL GENERATOR			GANG SETTING	ADJUST	ADJUST FOR	NOTES
FREQUENCY SETTING	CONNECT TO	DUMMY ANTENNA				
455KC	PIN 7 (CONTROL GRID) OF V-8	.1 MFD	OPEN	A15-A16 A17-A18	MAXIMUM OUTPUT	
1620KC	YELLOW WIRE ON L10	1. MMF*	OPEN	A-14	MAXIMUM OUTPUT	*2 TURNS INSULATED WIRE MAY BE USED.
1400KC	YELLOW WIRE ON L10	1. MMF*	MAX. OUTPUT--1400KC	A-13 A-12	MAXIMUM OUTPUT	

FM STAGES

The following is required for aligning:

An accurately calibrated Signal Generator providing unmodulated signals at the test frequencies listed below.

Non-Metallic Screwdriver.

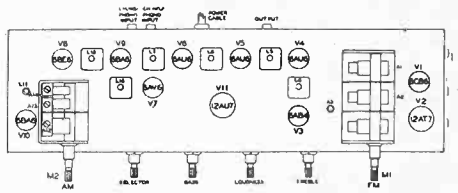
Dummy Antennas and 1-F Loading Resistor--5000 mmf, 300 ohms.

Zero center scale DC vacuum tube voltmeter having a range of approximately 3 volts.

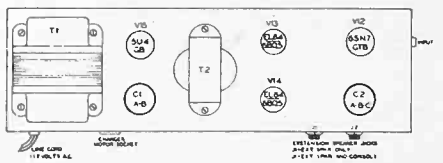
Allow Chassis and Signal Generator to "heat up" for 15 minutes.

SIGNAL GENERATOR			GANG SETTING	CONNECT VTVM TO	ADJUST	ADJUST FOR	NOTE
FREQ.	OUTPUT TO	THROUGH DUMMY					
10.7 MC.	PIN 1 V-6	5000 MMF.	OPEN	JUNCTION OF R19 & R20	A-10 (TOP-L7)	MAX. (+ OR -)	A-11 SHOULD BE DETUNED WHILE MAKING THIS ADJUSTMENT
10.7 MC.	PIN 1 V-6	5000 MMF.	OPEN	JUNCTION OF R19 & R20	A-11 (BOTTOM L7)	0. VOLTS (BALANCE)	
10.7 MC	PIN 6 V-3	5000 MMF.	OPEN	JUNCTION OF R15 & C20	A-9, A-8, A-7, A-6, A-5, A-4	MAXIMUM VOLTAGE	ADJUST INPUT SIGNAL FOR 1.5 TO 3. VOLTS DEFLECTION
108.5 MC.	ANT. TERMINAL	300 OHM	OPEN	JUNCTION OF R15 & C20	A-3	MAXIMUM VOLTAGE	
105. MC	ANT. TERMINAL	300 OHM	TUNE FOR 105. MC.	JUNCTION OF R15 & C20	A-2	MAXIMUM VOLTAGE	ROCK GANG WHILE MAKING THIS ADJUSTMENT
105. MC.	ANT. TERMINAL	300 OHM	TUNE FOR 105. MC.	JUNCTION OF R15 & C20	A-1	MAXIMUM VOLTAGE	

R.F. CHASSIS
TUBE AND TRIMMER LOCATION



AUDIO CHASSIS
TUBE LOCATION



VOLTAGE CHART

	ITEM	TUBE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8	PIN 9
*	V1	6CB6	-.7	0	6.3 AC	0	+85	+65	0		
*	V2	12AT7	+120	-.2	0	0	0	+120	0	+1.5	6.3 AC
*	V3	6AB4	+120	0	0	6.3 AC	0	-.9	0		
*	V4	6AU6	0	0	6.3 AC	0	+130	+130	+.8		
*	V5	6AU6	0	0	0	6.3 AC	130	130	+.6		
*	V6	6AU6	-.6	0	0	6.3 AC	+50	+50	0		
*	V7	6AV6	+13	+85	6.3 AC	0	0	0	-.3		
△	V8	6BE6	-5	0	0	6.3 AC	+70	+70	-.4		
△	V9	6BA6	-.3	0	0	6.3 AC	+80	+80	+1.7		
△	V10	6BA6	-1	0	6.3 AC	0	+60	+60	0		
□	V11	12AU7	+200	0	10+	3.1 AC	3.1 AC	+100	0	+4	
□	V12	6SN7	0	+70	2.5+	70+	190+	+75	3.1 AC	3.1 AC	
□	V13	6BQ5	0	0	12	3.1 AC	3.1 AC	0	+320	0	+290
□	V14	6BQ5	0	0	12	3.1 AC	3.1 AC	0	+320	+330	+290
□	V15	5U4GB	0	+330	0	310 AC	0	310 AC	0	+330	

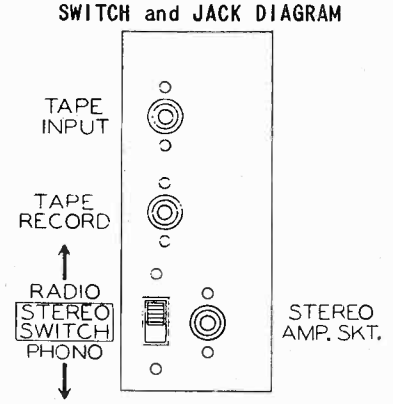
* MEASURED IN FM-AFC POSTION
△ MEASURED IN AM POSITION
□ MEASURED IN PHONO POSITION
ALL MEASUREMENTS MADE WITH V.T.V.M.
ALL MEASUREMENTS WITH NO SIGNAL

MODELS GAA-2675A and GAA-2676A
GAA-2675B and GAA-2676B
GAA-2675B-ST and GAA-2676B-ST

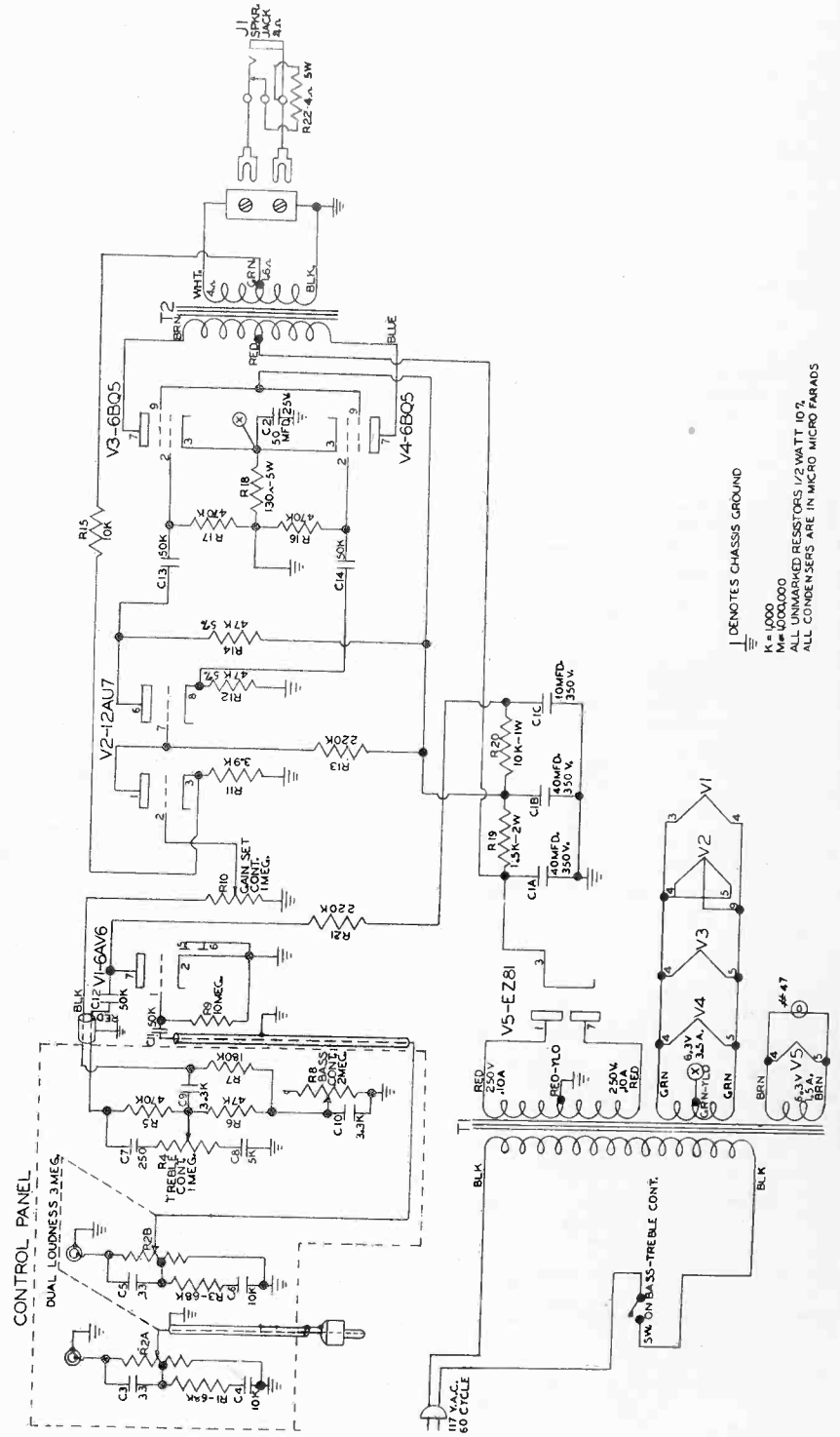
SPEAKER PHASING

The models covered in this manual all use one (1) 12 inch woofer and one (1) 10 inch woofer and two (2) 5 inch tweeters to give a more uniform audio response. The sound intensity is maximum when the two "woofers" are "in phase", or when the cones of each speaker move in unison with each other. However, should the speakers be so connected that they are "out of phase", the cone of one speaker will move out when the other moves in. This will cause a cancellation effect and the intensity of the air movement will be reduced. Of even greater importance is the fact the "out of phase" relationship of the two speakers will often result in distortion as well as cancellation. Speaker phasing is of the greatest importance when the speakers are positioned closer than a few wavelengths. At 1000 cycles, one wavelength is slightly longer than five inches; at 200 cycles, this is between 50 to 60 inches. The polarity of the speakers may be checked by using a single cell (1-1/2 volt) flashlight cell. The battery is connected across the voice coil of either "woofer" and the movement of the cone is noted. When the battery is connected, the cone will be drawn in or pushed out at the instant of contact. When the contact is broken, the cone will move in the opposite direction, to its de-energized position. Considering that the cone has been PUSHED OUT when the contact was made, mark as Plus (+) that terminal of the speaker to which the positive battery terminal was connected. The same test is then applied to the other speaker and its terminals similarly marked. These marked terminals are the ones that must be connected together for proper phasing. As previously noted, phasing of tweeters has little or no effect on sound quality.

SWITCH and JACK DIAGRAM



2nd CHANNEL AMPLIFIER MODELS GAA-2675BST and GAA-2676BST



PARTS LIST
of
2nd CHANNEL AMPLIFIER
MODELS GAA-2675B-ST and GAA-2676B-ST

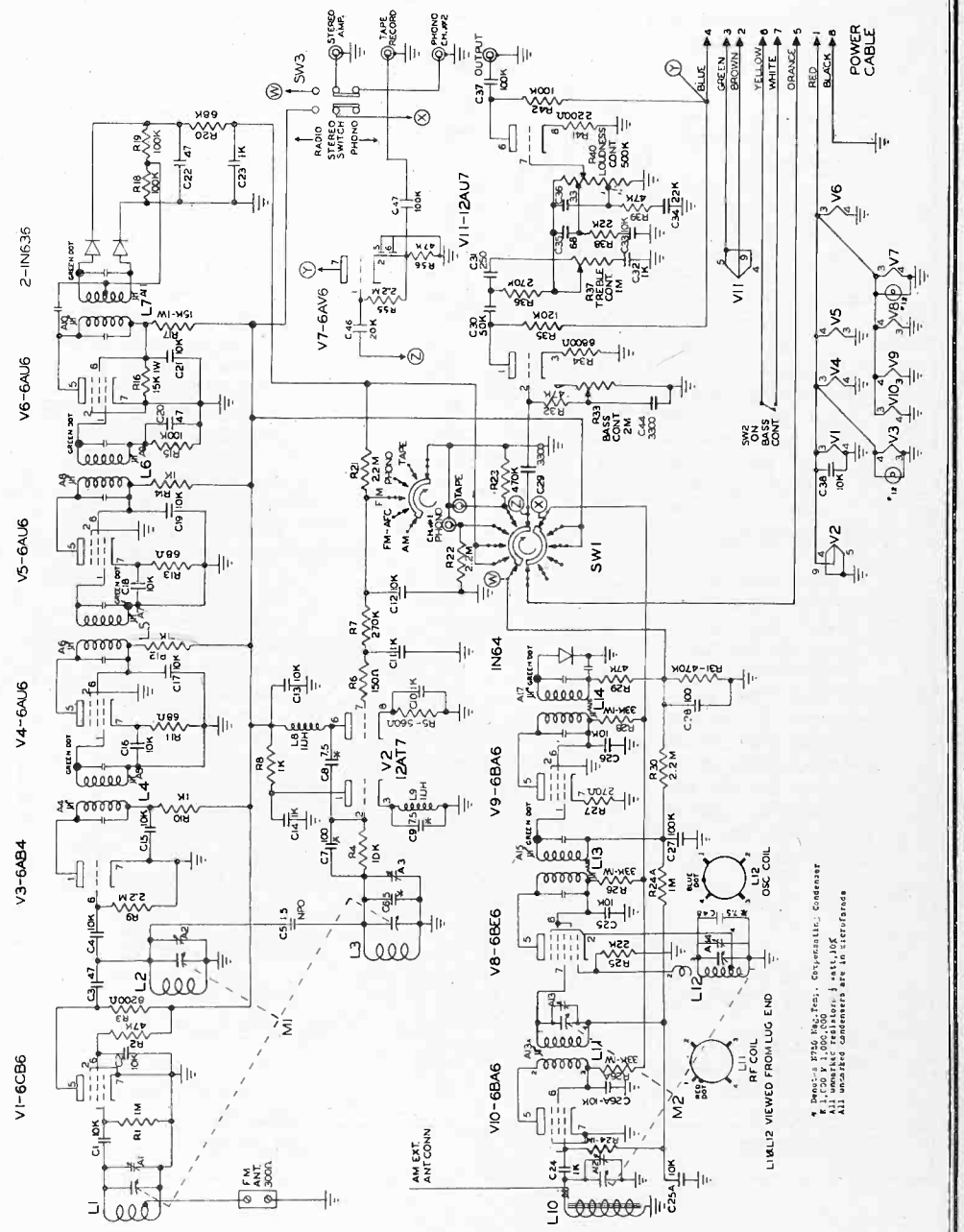
REF. NO.	PART NO.	DESCRIPTION
		RESISTORS
R18	643	130 Ohm 5 Watt 10%
R19		1500 Ohm 2 Watt 20%
R20		10K Ohm 1 Watt 20%
R9		10 Meg 1/2 Watt 20%
R5, R16, R17		470K Ohm 1/2 Watt 10%
R21		220K Ohm 1/2 Watt 10%
R13, R14	523B	47K Ohm 1/2 Watt 5%
R15		10K Ohm 1/2 Watt 20%
R11		3900 Ohm 1/2 Watt
R22	650	4 Ohm 5 Watt
R7		180K Ohm 1/2 Watt
R1, R3		68K Ohm 1/2 Watt
R6		47K Ohm 1/2 Watt
		CONDENSERS
C1A-B-C	1020	40-40 MFD 350V Filter Condenser
C2	918	50 MFD 25V Tubular Filter
C11, C12, C13, C14		.05-400V Tubular Ceramic
C9	910	.0033 Discap
C8		.005 Discap
C4, C6		.01 Discap
C7		.250 Discap
C3, C5	908	33 Discap

REF. NO.	PART NO.	DESCRIPTION
		MISCELLANEOUS
T1	1108	Power Transformer
T2	1212	Output Transformer
R10	421	Gain Control 1 Meg
R2A-B	425	3 Meg Dual Loudness Control
R8, R4	426	Bass 2 Meg & Treble 1 Meg w/ switch
	1656	Escutcheon Plate
	2460	Knob -- loudness
	2460A	Knob -- bass
	2460B	Knob -- treble
	*	#47 Pilot Light Lamp
	3936	Wooden Bottom Enclosure (with #3501 kit only)
		Astatic 13TX Stereo Cartridge (use 60-61)
		4 Contact Holder for Cartridge (use 60-62)
	1591	18" Green Wire Lead (attached to above - use with #3501 kit only)

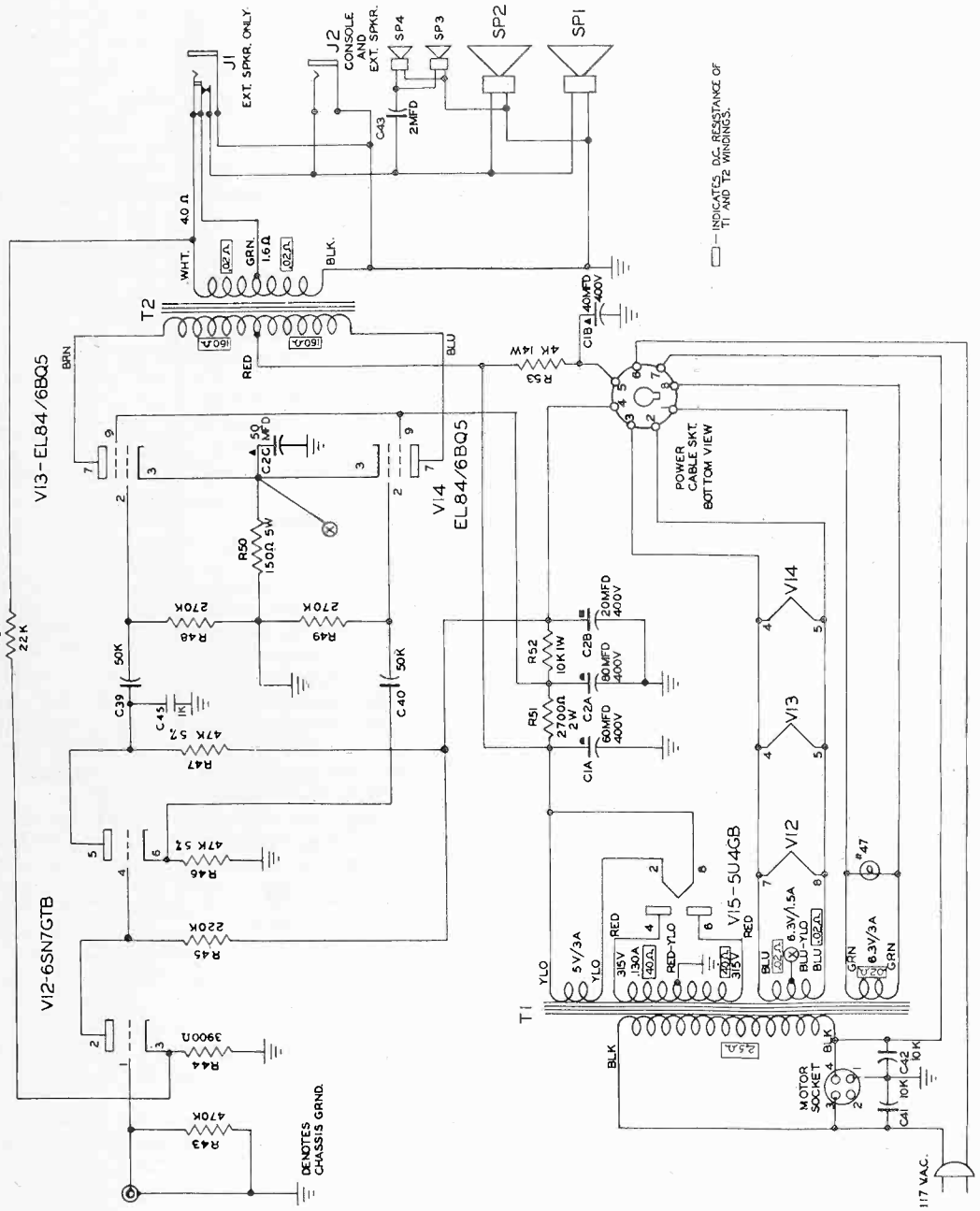
* See Lamp Catalog

NOTE: Use Universal Parts where part numbers are not shown. Order from (LRS)

R.F. CHASSIS SCHEMATIC MODELS GAA-2675A - 2676A - 2675B - 2676B - 2675BST - 2676BST



AUDIO CHASSIS SCHEMATIC MODELS GAA-2675A - 2676A - 2675B - 2676B - 2675BST - 2676BST



REPAIR PARTS

REF. NO.	PART NO.	DESCRIPTION
		RESISTORS
R1, R24, R24A		1 Meg. 1/2 Watt
R2, R29, R32, R39, R56		47K Ohm 1/2 Watt
R3		8.2K Ohm 1/2 Watt
R4		10K Ohm 1/2 Watt
R5		560 Ohm 1/2 Watt
R6		150 Ohm 1/2 Watt
R7, R36		270K Ohm 1/2 Watt
R8		1K Ohm 1 Watt
R9, R21, R22, R30, R55		2.2 Meg 1/2 Watt
R10, R12, R14		1K Ohm 1/2 Watt
R11, R13		68 Ohm 1/2 Watt
R15, R18, R19, R42		100K Ohm 1/2 Watt
R16, R17		15K Ohm 1 Watt
R20		68K Ohm 1/2 Watt
R23, R31, R43		470K Ohm 1/2 Watt
R25, R38		22K Ohm 1/2 Watt
R33, SW2	412A	2 Meg. Control with Switch
R34		6.8K Ohm 1/2 Watt
R35		120K Ohm 1/2 Watt
R37	421	1 Meg Control
R40	422	500K Control with dual tap
R41		2.2K Ohm 1/2 Watt
R44		3.9K Ohm 1/2 Watt
R45		220K Ohm 1/2 Watt
R46, R47		47K Ohm 1 Watt
R48, R49		270K Ohm 1/2 Watt
R50	641	150 Ohm 5 Watt
R51		2.7K Ohm 2 Watt
R52		10K Ohm 1 Watt
R53	635	4K Ohm 14 Watt
R26, R26A, R28		33K Ohm 1 Watt
R27		270 Ohm 1/2 Watt
R54		22K Ohm 1/2 Watt
		CONDENSERS
C1, C4		.01 MFD 600 Volt Tubular
C1A, B	1002	60/40 MFD 400 Volt Electrolytic
C2		.01 MFD Discap
C2A, B, C	1003	80/20/50 MFD 400/400/50 Volt Electrolytic
C3		47 Mmf. 600 Volt Tubular Ceramic
C5	836	1.5 Mmf. NPO 600 Volt
C6	836	5 Mmf. N750 600 Volt
C7	835	100 Mmf. N750 600 Volt
C8, C9, C10, C11, C14	913	7.5 Mmf. N750 5% Discap
C23, C32		.001 MFD 20% Discap
C12, C13, C15, C16, C17, C18, C19, C21, C25, C25A, C26, C26A, C33, C38		.01 MFD Z250 Discap
C20, C22, C24		47 Mmf. NPO 10% Discap
C27, C47		.1 MFD 200 Volt
C28		100 Mmf. 20% Discap
C29, C44		3300 Mmf. 20% Discap
C30, C39, C40		.05 MFD 400 Volt Molded
C31		250 Mmf. 20% Discap
C34		.022 MFD 400 Volt Paper
C35		68 Mmf. 20% Discap
C36	908	33 Mmf. 20% Discap
C37		.1 MFD 600 Volt Paper
C41, C42		.01 MFD Heavy Duty Discap
C43	830	2 MFD 50 Volt Electrolytic
C46		.02 MFD Paper Type
		TRANSFORMERS & COILS
T1	1107	Power Transformer
T2	1212	Output Transformer
L1	1411B	Antenna Coil, FM
L2	1411A	Mixer Coil, FM
L3	1411	Oscillator Coil, FM
L4, L5, L6	1409	10.7 MC IF Transformer
L7	1410	10.7 MC Discriminator Transformer
L8, L9	1303	1 micro henry choke
L10	1512E	Rod Antenna with lugs, AM
L11	1412	R.F. Coil, AM
L12	1401B	Oscillator Coil, AM
L13	1405	455 KC IF Transformer
L14	1406A	455 KC Output IF Transformer
		MISCELLANEOUS
SW1	420A	4 Pole, 5 Position Switch
SP1	2635	Speaker, 12" P.M. 6.8 oz. Magnet
SP2	2639	Speaker, 10" P.M. 4.64 oz. Magnet
SW3	1892A	Radio-Phono-Stereo Switch

REPAIR PARTS

REF. NO.	PART NO.	DESCRIPTION
		MISCELLANEOUS (Cont.)
SP3, SP4	2637	Speaker, 5" P.M. 1.47 oz. Magnet
	107A	4 Prong socket with ring
	118	8 Prong molded octal sockets
	104A	Single prong phono. socket
	1601A	Line Cord, 8 ft.
	115	7 Pin molded sockets
	116	9 Pin molded sockets
	117	7 Pin tube shield base
	1802C	Special control nuts
	120	Octal Plug
	2751	Diode (IN64)
	2756	Diode (IN636)
	317	Antenna Terminal with mounting strap
	1546	24" White wire with amplifier connector
	1546A	22" Yellow wire with amplifier connector
	119	7 Pin Tube Shield
	119A	9 Pin Tube Shield
	318	Tube Holder
	2438	Aux. Dial Knob
	2439	AM Tuning Knob

REF. NO.	PART NO.	DESCRIPTION
		MISCELLANEOUS (Cont.)
	2440	FM Tuning Knob
	2441	AM Tuning Knob Skirt
	2442	FM Tuning Knob Skirt
	1585	Lamp Holder, Left
	1586	Lamp Holder, Right
	1515B	Pilot Light Bracket with 2 - 12" leads
	2208A	Plastic Pilot Light Jewel
	1796	Escutcheon Plate
	2516	45 RPM Adapter
	1931	Adapter Clip
		Changer VM 1210-207
		Cartridge Pivot for (60-61) (use 60-62)
		Cartridge, Astatic 13TX (use 60-61)
		Changer VM 1200A-165
	4003A	Cartridge Pivot for (60-58)
		Cartridge, Astatic 89TX (use 60-58)
	1951	Self Balancing Lid Support
	2367	Cabinet Back Board
	*	#12 Dial Lamp
	*	#47 Indicator Lamp
	121	Tuning Gang Shield
	*	See Lamp Catalog

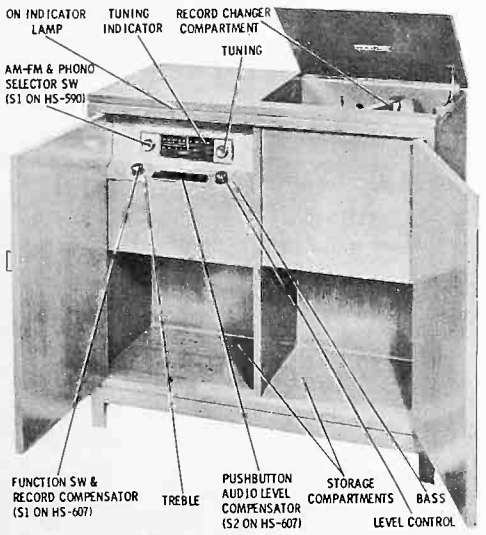
NOTE: Use Universal Parts where part numbers are not shown. Order from (LRS)

MOTOROLA Service Manual

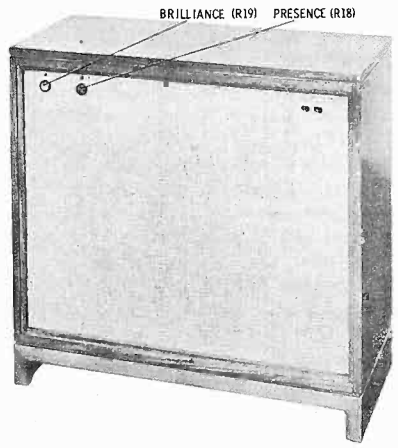
HOME RADIO

MODELS	CHASSIS	RECORD CH.
15KT25B-1	HS-607, HS-590	VM12 OR 13RC
15KT25B-1S	HS-607, HS-590	VM16RC
15KT25M-1	HS-607, HS-590	VM12 OR 13RC
15KT25M-1S	HS-607, HS-590	VM16RC
15KT25MC-1	HS-607, HS-590	VM12 OR 13RC
15KT25MC-1S	HS-607, HS-590	VM16RC
15KT25MCH-1	HS-607, HS-590	VM12 OR 13RC
15KT25MCH-1S	HS-607, HS-590	VM16RC

SUPERSEDES SERVICE MANUAL PART NO. 68P639051



EQUIPMENT ENCLOSURE



SPEAKER ENCLOSURE

GENERAL INFORMATION

TYPE - Console Hi-Fi radio-phono combinations containing the HS-590 AM-FM tuner, four-speed record changers and multiple speaker systems. All models are identical except for cabinet color. See HS-590 Service Manual Part No. 68P639082 for AM-FM tuner service information. Refer to VM12RC-VM13RC Service Manual Part No. 68P639038 and VM16RC Service Manual Part No. 68P640457 for record changer service information.

TUBE COMPLEMENT -

PRE-AMP		POWER-AMP	
12AU7	1st & 2nd AF Amps	12AX7	3rd AF amp & phase splitter
12AU7	1st & 2nd Tone amps	EL34/6CA7	Pwr amp
		EL34/6CA7	Pwr amp
		5U4GB	Rect

ELECTRICAL SPECIFICATIONS -

Frequency Response - ±1DB, 30CPS to 20KC.
Power Output - 25 watts at less than 1% distortion (50 watts peak)
Tone Controls - Bass ±15DB @ 30CPS.
Treble ±15DB @ 20KC.
Power Supply - 120 volts, 60 cycle AC only.
Power Consumption - 220 watts
Speaker System - One 15 inch woofer, one mid-range horn and one high range tweeter.

SERVICE NOTES

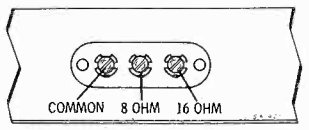
TV-TAPE INPUT

An audio signal from any external source, such as a tape play-back head (after amplification and compensation thru a separate pre-amp), TV set, etc., is suitable for feeding into the TV-TAPE input jack of this unit. Other audio signals are suitable if the magnitude is 0.5 RMS volts or more. Use a shielded cable to minimize hum pick-up.

IMPORTANT: Caution should be exercised when making connections to transformerless type equipment. When in doubt, suitable tests should be employed to prevent dangerous electrical shock and damage to equipment.

SPEAKER SYSTEM CONNECTIONS

Connect one end of the dual conductor wire to the two screw terminals on back of speaker cabinet. Connect the other end to the COMMON and 16 OHM terminals on back of power amplifier chassis.



POWER AMPLIFIER OUTPUT TERMINALS

REMOTE EXTERNAL SPEAKER: Two taps are provided on the output transformer for either separate or simultaneous operation of this unit with an external speaker. When making connections to the remote speaker, cable lengths are limited by the power loss due to the conductor resistance. For line lengths up to 25 feet, use No. 18 wire, and No. 12 wire for lines up to about 50 feet. Smaller size wire should be avoided as this would reduce the available power output as well as impair speaker matching, thereby increasing the overall distortion. Refer to speaker hook-up illustrations for method of connecting external or additional speakers.

SPEAKER PHASING

THE CABINET SPEAKERS MUST BE IN PHASE OR LOSS OF LOWER FREQUENCIES WILL RESULT.

Proper phasing of the woofer speaker only can be checked since the other two are of the horn type. This can be done by connecting a 1-1/2 volt battery across the woofer voice coil and noting the lead polarity which causes the cone to swing out. The positive speaker lead then should be wired to the LO terminal on crossover network, and remaining lead to the COM terminal. For proper phasing of horn types observe color phasing dots and leads.

EXTERNAL SPEAKER PHASING: Phasing of an external speaker system is relatively impractical due to the complexity of many uncontrollable factors, such as room acoustics, speaker location, number of speakers, distances between speakers, etc. Therefore, the only feasible solution to this problem is more or less one of personal taste. In other words, a listening test should be conducted with phasing accomplished in such a manner as to provide the tonal balance or effect desired.

DISASSEMBLY INSTRUCTIONS

FOLLOW IN SEQUENCE

To Remove Power Amp Chassis

1. Remove cabinet back cover.
2. Remove three mounting screws.
3. Unplug all associated leads and slip pilot lamp off mounting bracket.
4. Remove chassis from cabinet.

To Remove Pre-Amp Chassis

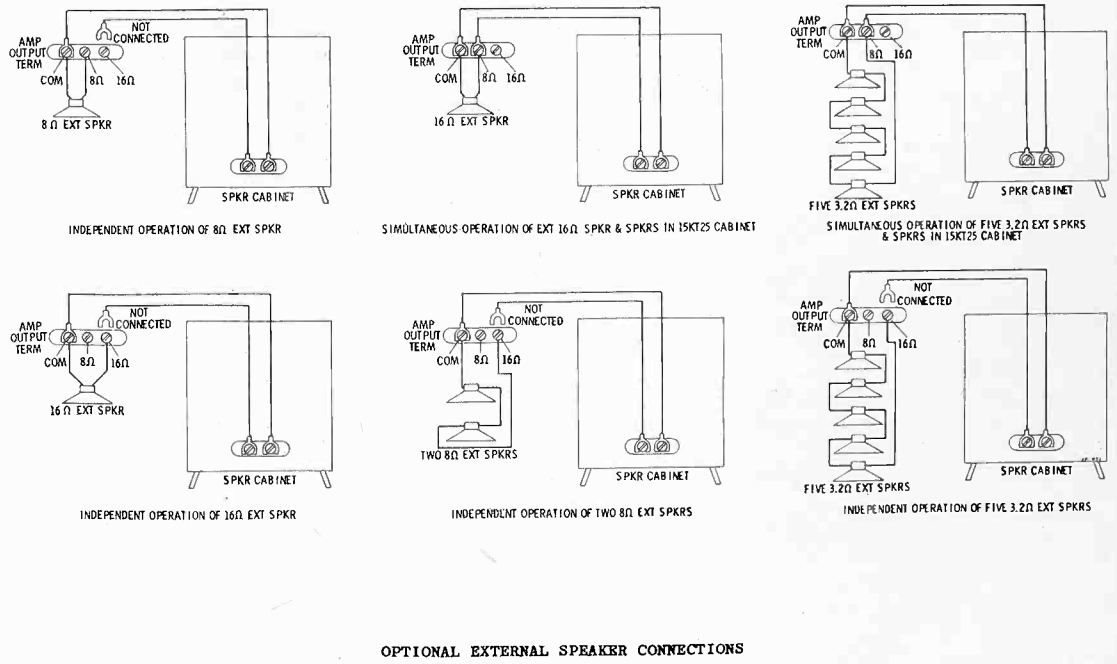
1. Remove operating knobs.
2. Unplug all associated leads.
3. Remove two mounting screws.
4. Remove chassis from cabinet.

To Remove HS-590 Tuner Chassis

1. Remove operating knobs.
2. Remove four mounting screws.
3. Remove chassis from cabinet.

To Remove Record Changer

1. Turn two record changer mounting screws fully clockwise.
2. From bottom of changer, turn the two tinnerman nuts, located at the ends of the mounting screws so they are parallel with the screws.
3. Grasp record changer by the base and lift up.



INDEPENDENT OPERATION OF 8Ω EXT SPKR

SIMULTANEOUS OPERATION OF EXT 16Ω SPKR & SPKRS IN 15KT25 CABINET

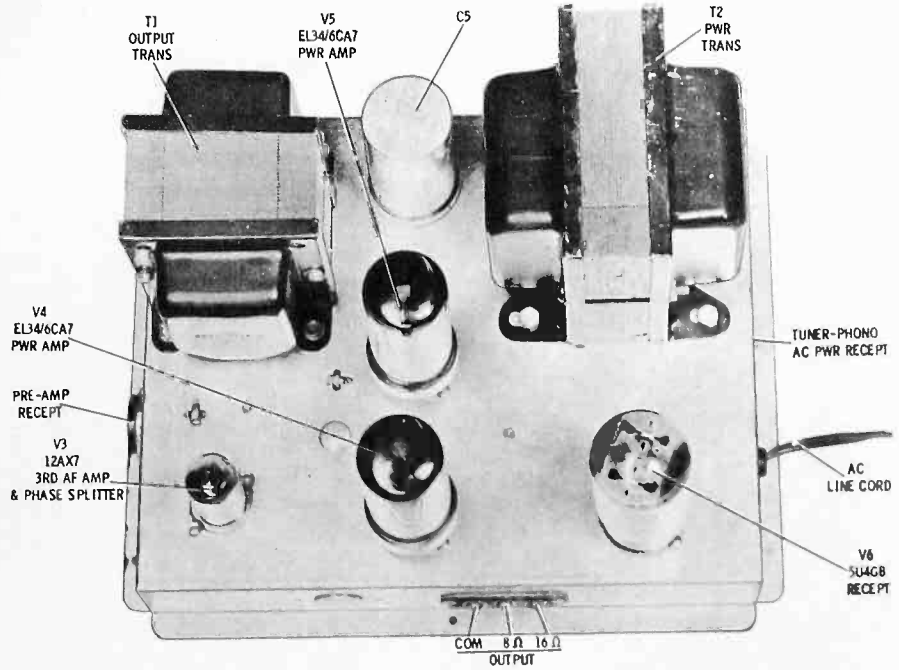
SIMULTANEOUS OPERATION OF FIVE 3.2Ω EXT SPKRS & SPKRS IN 15KT25 CABINET

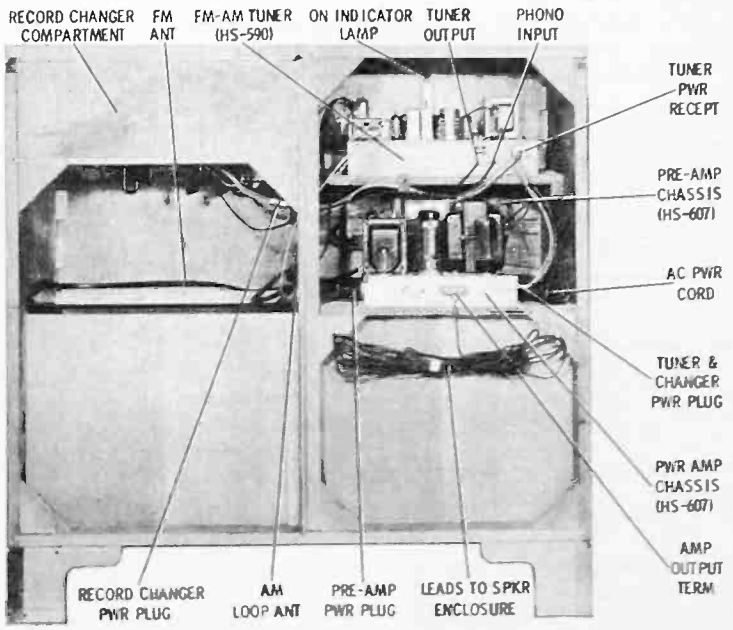
INDEPENDENT OPERATION OF 16Ω EXT SPKR

INDEPENDENT OPERATION OF TWO 8Ω EXT SPKRS

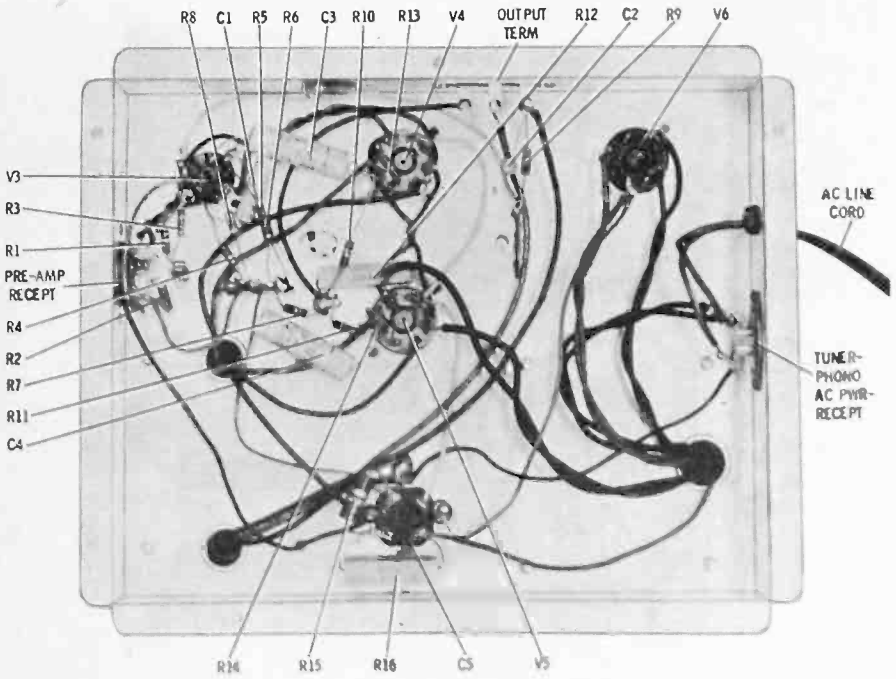
INDEPENDENT OPERATION OF FIVE 3.2Ω EXT SPKRS

OPTIONAL EXTERNAL SPEAKER CONNECTIONS

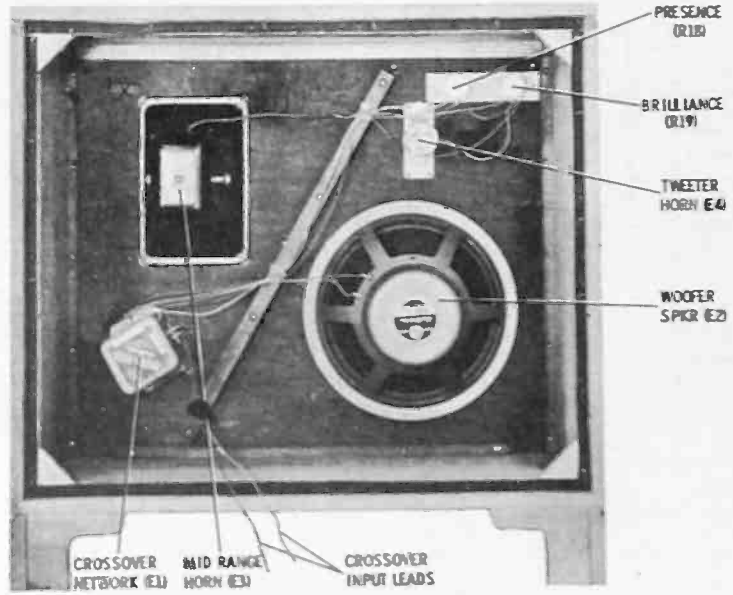




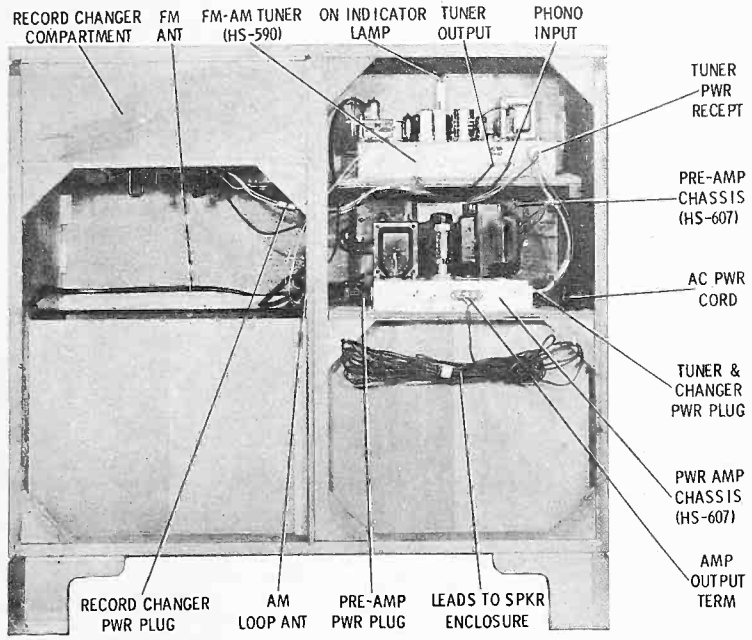
EQUIPMENT ENCLOSURE REAR VIEW



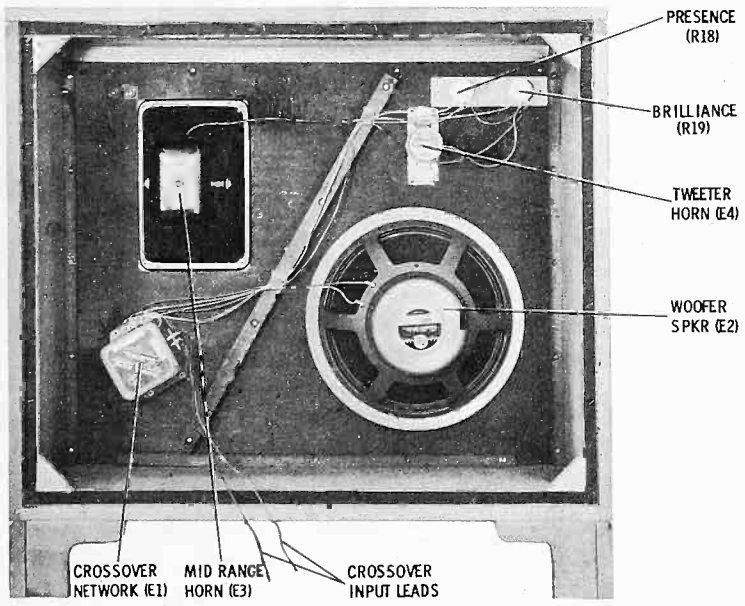
RS-607 POWER AMPLIFIER PARTS LOCATIONS



SPEAKER ENCLOSURE REAR VIEW

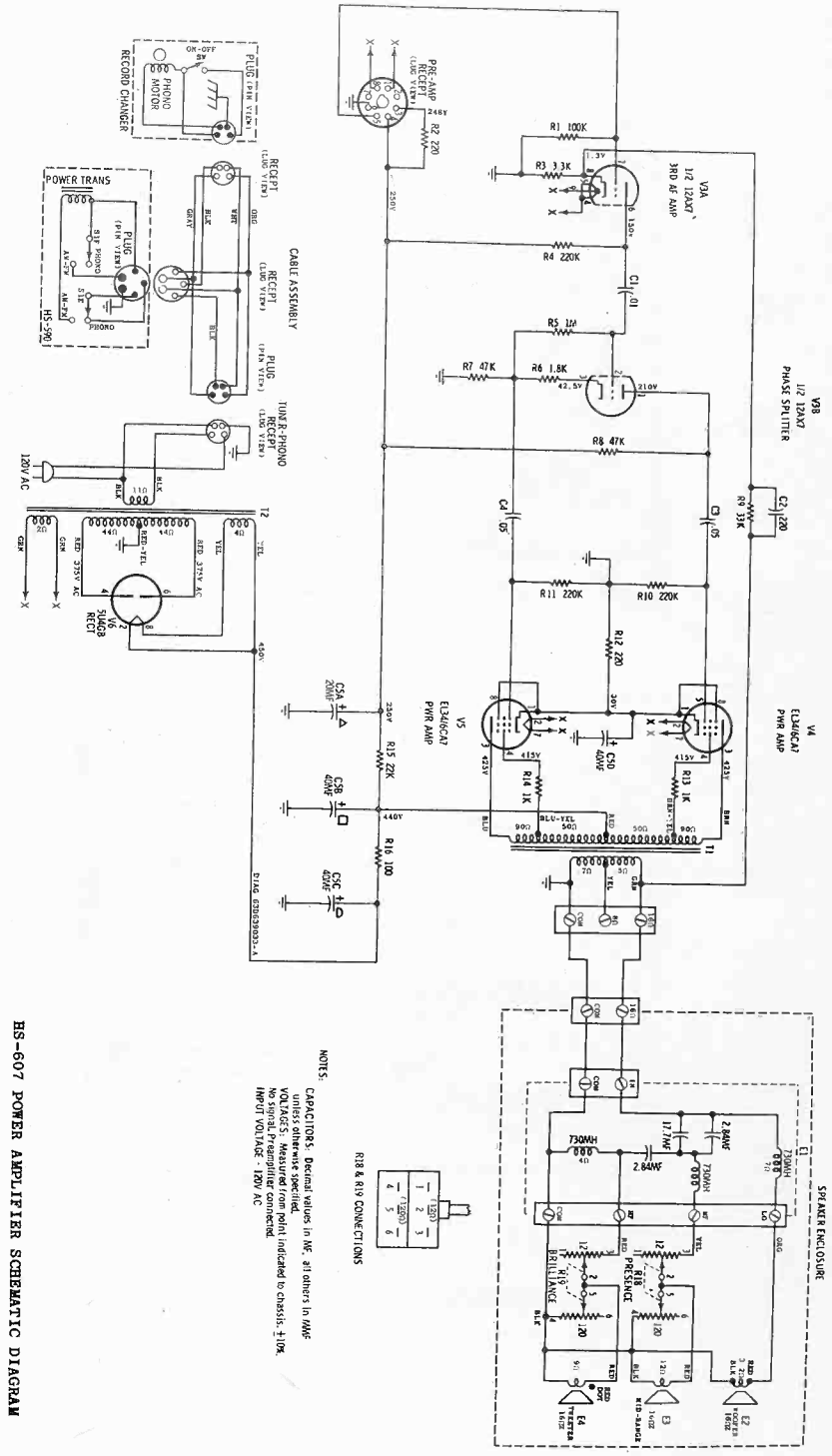


EQUIPMENT ENCLOSURE REAR VIEW



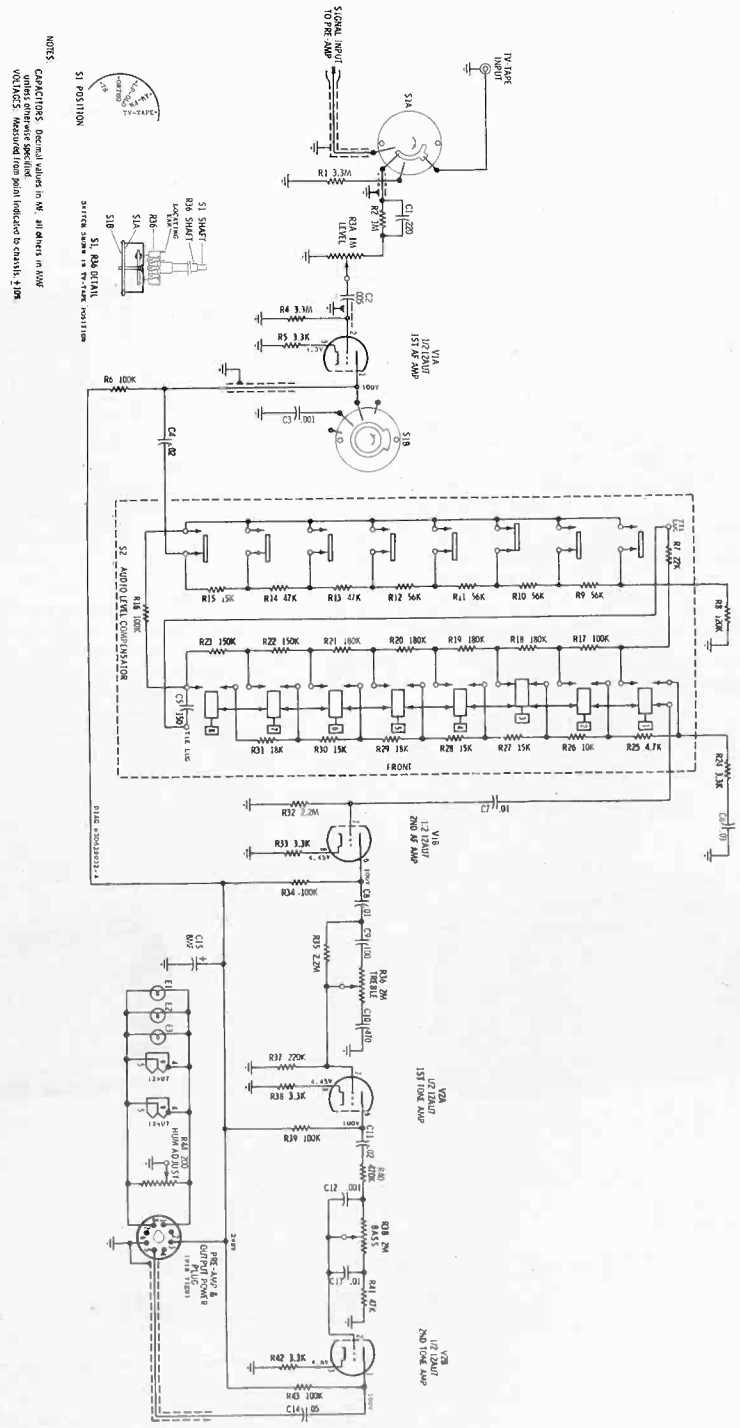
SPEAKER ENCLOSURE REAR VIEW

HS-607 POWER AMPLIFIER SCHEMATIC DIAGRAM



NOTES:
CAPACITORS: Decimal values in MF, all others in MMF unless otherwise specified.
VOLTAGES: Measured from point indicated to chassis ±10%. No Signal, Preamplifier connected.
INPUT VOLTAGE - 120V AC

R18 & R19 CONNECTIONS



HS-607 PRE-AMPLIFIER SCHEMATIC DIAGRAM

REPLACEMENT PARTS LIST

NOTE: When ordering parts, specify model number of set in addition to part number and description of part.

Electronic parts of equivalent rating are not necessarily of equivalent standards. The components listed in this Service Manual have been chosen for reliability and applicability to the specific circuits involved. For maximum customer satisfaction and minimized call-backs, use the exact Motorola parts replacement.

Ref. No.	Part Number	Description
CHASSIS HS-607 PRE-AMP ELECTRICAL PARTS		
C-1	21R127537	Capacitor, cer disc: 220 mmf 500V
C-2	21R115312	Capacitor, cer disc: .005 mf 500V
C-3	21A121678	Capacitor, cer disc: .001 mf 500V
C-4	*8R121556	Capacitor, paper tub: .02 mf 400V
C-5	21R121228	Capacitor, cer disc: 150 mmf 500V
C-6	8R121574	Capacitor, paper tub: .03 mf 400V
C-7	8K734633	Capacitor, paper tub: .01 mf 400V
C-8	8K734633	Capacitor, paper tub: .01 mf 400V
C-9	21R400537	Capacitor, cer disc: 100 mmf 500V
C-10	21K121797	Capacitor, cer disc: 470 mmf 500V
C-11	8R121566	Capacitor, paper tub: .02 mf 400V
C-12	21A121678	Capacitor, cer disc: .001 mf 500V
C-13	21R121946	Capacitor, cer disc: .01 mf 500V
C-14	8R121567	Capacitor, paper tub: .05 mf 400V
C-15	23B639396	Capacitor, electrolytic: 8 mf 450V
E-1, 2 & 3	65R11854	Bulb, pilot: 6V; #47
Resistors - Note:		All resistors are insulated carbon type unless otherwise specified.
R-1	6K121278	3.3 meg 10% 1/2W
R-2	6K124494	1 meg 10% 1/2W
R-3	18B639390	Level & Bass Control: level 1 meg; bass 2 meg
R-4	6K121278	3.3 meg 10% 1/2W
R-5	6K121725	3300 10% 1/2W
R-6	6R6328	100,000 10% 1W
R-7	6K119935	22,000 10% 1/2W
R-8	6K125538	120,000 10% 1/2W
R-9	6K127541	56,000 10% 1/2W
R-10	6K127541	56,000 10% 1/2W
R-11	6K127541	56,000 10% 1/2W
R-12	6K127541	56,000 10% 1/2W
R-13	6K121299	47,000 10% 1/2W
R-14	6K121299	47,000 10% 1/2W
R-15	6K119934	15,000 10% 1/2W
R-16	6K125534	100,000 10% 1/2W
R-17	6K125534	100,000 10% 1/2W
R-18	6K125531	180,000 10% 1/2W
R-19	6K125531	180,000 10% 1/2W
R-20	6K125531	180,000 10% 1/2W
R-21	6K125531	180,000 10% 1/2W
R-22	6K122323	150,000 10% 1/2W
R-23	6K122323	150,000 10% 1/2W
R-24	6K121725	3300 10% 1/2W
R-25	6K121847	4700 10% 1/2W
R-26	6K119932	10,000 10% 1/2W
R-27	6K119934	15,000 10% 1/2W
R-28	6K119934	15,000 10% 1/2W
R-29	6K122848	18,000 10% 1/2W
R-30	6K119934	15,000 10% 1/2W
R-31	6K122848	18,000 10% 1/2W
R-32	6K127001	2.2 meg 10% 1/2W
R-33	6K121725	3300 10% 1/2W
R-34	6R6328	100,000 10% 1W
R-35	6K127001	2.2 meg 10% 1/2W
R-36	-	Treble Control: 2 meg; part of S-1
R-37	6K122322	220,000 10% 1/2W
R-38	6K121725	3300 10% 1/2W
R-39	6R6328	100,000 10% 1W
R-40	6K121279	470,000 10% 1/2W
R-41	6K121299	47,000 10% 1/2W
R-42	6K121725	3300 10% 1/2W
R-43	6R6328	100,000 10% 1W
R-44	18K639394	Wirewound: 200 10% 1W (hum balance cont)
S-1	40C639389	Compensator Switch & Treble Cont: R36 2 meg; SW 5-position
S-2	*1V639403	Loudness Control Switch: 8-button; incl C5, resistors R7 thru R23 & R25 thru R31

CHASSIS HS-607 PRE-AMP MECHANICAL PARTS

38B639423	Button, push: #1
38K639424	Button, push: #2
38K639425	Button, push: #3
38K639426	Button, push: #4
38K639427	Button, push: #5
38K639428	Button, push: #6
38K639429	Button, push: #7
38K639430	Button, push: #8
7C639335	Channel, rail (color slide rail)
44B639332	Gear, nylon (color slide rail)
2S7051	Palnut: 3/8-32 (control stg)
28K639662	Plug, 1 pin phono
28A732701	Plug, 8 pin (pre-amp pwr)
9A702469	Receptacle, 1 pin: TV-TAPE input
3S124432	Screw, machine: 4-40 x 1/4 (rail channel mtg)
15A741368	Shell (for 28A732701 plug)
26A639731	Shield, tube
64B639333	Slide, color (tone indicator)
9K639467	Socket, pilot light
*9B639733	Socket, tube: 9 pin min

CHASSIS HS-607 PWR AMP ELECTRICAL PARTS

C-1	8R121002	Capacitor, paper tub: .01 mf 400V

Ref. No.	Part Number	Description
C-2	21R127537	Capacitor, cer disc: 220 mmf 500V
C-3	8R122175	Capacitor, paper tub: .05 mf 400V
C-4	8R122175	Capacitor, paper tub: .05 mf 400V
C-5	23B639395	Capacitor, electrolytic: 40-40-20mf/450V, 40mf/50V
E-1	25C639561	Crossover network
E-2	50C639471	Speaker, PM: 15" woofer; 16Ω VC
E-3	50C639472	Horn, mid-range; 16Ω VC
E-4	50C639473	Horn, tweeter: 16Ω VC
Resistors - Note:		All resistors are insulated carbon type unless otherwise specified.
R-1	6K125534	100,000 10% 1/2W
R-2	6R6270	220 10% 1/2W
R-3	6K121725	3300 10% 1/2W
R-4	6K122322	220,000 10% 1/2W
R-5	6K124494	1 meg 10% 1/2W
R-6	6K122445	1800 10% 1/2W
R-7	6K121299	47,000 10% 1/2W
R-8	6K121299	47,000 10% 1/2W
R-9	6K127632	33,000 10% 1/2W
R-10	6K122322	220,000 10% 1/2W
R-11	6K122322	220,000 10% 1/2W
R-12	17K632247	Wirewound: 220 10% 5W
R-13	6K121301	1000 10% 1/2W
R-14	6K121301	1000 10% 1/2W
R-15	6K120474	22,000 10% 2W
R-16	*17K639433	Wirewound: 100 10% 5W
R-18	18B639521	Presence Control
R-19	18B639521	Brilliance Control
T-1	25C639392	Transformer, output
T-2	25C639391	Transformer, power

CHASSIS HS-607 PWR AMP MECHANICAL PARTS

43A692012	Bushing, line cord (use with 43K692013 ret)
30K632089	Line Cord
*9A590475	Receptacle, 4 pin (phono pwr)
43K692013	Retainer, line cord (use with 43A692012 bushing)
*9B639732	Socket, tube: octal
9K702360	Socket, tube: 9 pin min

CABINET PARTS

24C639492	AM Antenna & Panel
13K639880	Bezel, tuner
38K639757	Button, plug (on spkr cab)
*16K639744	Cabinet, equipment: Blonde Oak (15KT25B-1&-1S)
16K639220	Cabinet, equipment: Candlelight Mahogany (15KT25M-1 & -1S)
*16K639730	Cabinet, equipment: California Mahogany (15KT25MC-1 & -1S)
*16K639221	Cabinet, equipment: Champagne Mahogany (15KT25MCB-1 & -1S)
*16K639743	Cabinet, spkr: Blonde Oak (15KT25B-1 & -1S)
16K639260	Cabinet, spkr: Candlelight Mahogany (15KT25M-1 & -1S)
*16K639729	Cabinet, spkr: California Mahogany (15KT25MC-1 & -1S)
16K639261	Cabinet, spkr: Champagne Mahogany (15KT25MCB-1 & -1S)
42A638434	Clip, speed (medallion mtg)
*35K640273	Cloth, grille (spkr cab)
*1V639879	Color-Slide Tone Indicator Assembly
13D639372	Escutcheon
55K639224	Handle, door
36C639474	Knob, compensator
36C639495	Knob, spkr level
36B639331	Knob, tone
36K639340	Knob, tuner
36K639477	Knob, volume
29K730154	Lug, spade (spkr connector)
13C638398	Medallion
33B638467	Nameplate
2S7051	Palnut: 3/8-32 (brilliance & presence cont stg)
22S121830	Pin, nameplate stg
28K639662	Plug, 1 pin
28B743781	Plug, 4 pin (pwr cable)
9K690618	Receptacle, 4 pin (pwr cable)
9A638342	Receptacle, 5 pin (pwr cable)
42B638899	Retainer, 45RPM spindle
47B639431	Rod, light conducting
34C638680	Scale, dial (tuner)
15A639660	Shell, 4 pin recept & plug
15K638348	Shell, 5 pin recept
2K638061	Speednut (bezel mtg)
2K637444	Speednut (dial scale stg)
2K633252	Speednut (45RPM spindle brkt stg)
55K638638	Support, lid
2A72610	"T" Nut: 8-32
29A76230	Terminal (tuner to ant)

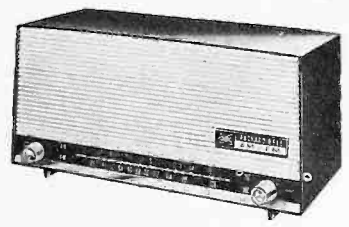
*New Item, Appears in any List for First Time

PACKARD BELL

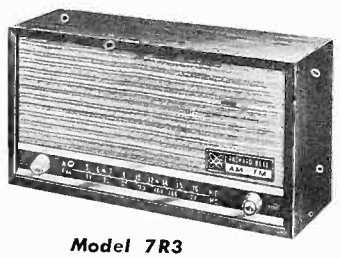
SERVICE MANUAL
MODELS 7R2 & 7R3
(CHASSIS 7R2)

12333 W. Olympic Blvd.
Los Angeles 64

MANUAL BC-65
Dec. 6, 1958



Model 7R2



Model 7R3

DESCRIPTION:

The subject models are the same except that the 7R2 has a plastic cabinet and the 7R3 has a wood cabinet. Chassis 7R2 is used. This is a seven tube, three diode, AM-FM receiver with automatic frequency control. The AM-FM switch is at rear of set. Heaters are in series for AC-DC operation. The AC cord acts as an FM antenna unless an external one is used, in which case the jumper from the terminal screw is disconnected from its FM antenna terminal.

SPECIFICATIONS:

CABINET DIMENSIONS (not incl knobs):
7R2 (plastic): 12½" w by 6½" h by 6" dp
7R3 (wood): 13¼" w by 7" h by 6⅛" dp

ELECTRICAL RATINGS:

Line voltage 110-120 v AC or DC
Power consumption 33 watts

TUNING FREQUENCIES:

AM radio 530 to 1620 kc; I-F 455 kc
FM radio 88 to 108 mc; I-F 10.70 mc

SHIPPING WEIGHT:

7R2 (plastic): 8 lb
7R3 (wood): 10 lb

ALIGNMENT:

Alignment is accomplished by following the steps in the chart. Align the AM section first, as indicated. Use isolation transformer between radio and power line to reduce shock hazard.

REPLACEABLE PARTS
CHASSIS 7R2

CAPACITORS

REFERENCE SYMBOL	DESCRIPTION	PACKARD-BELL PART NUMBER
C-1	Ceramic, 1000 mmf, GMV	23860
C-2	Same as C-1	
C-3	Same as C-1	
C-4	Ceramic, 47 mmf, 20%	23912
C-5	Ceramic, 330 mmf, 20%	23944
C-6	Variable, 2-gang Sections A & B: FM RF & trimmer Section C: FM osc, trimmed by C-16 Sections E & F: AM RF & trimmer Sections G & H: AM osc & trimmer	23558C
C-7	Ceramic, 1.5 mmf, 10%	23866
C-8	Same as C-1	
C-9	Ceramic, 5000 mmf, GMV	23931
C-10	Not used	
C-11	Same as C-9	
C-12	Same as C-9	
C-13	Same as C-9	
C-14	Network, ratio detector	23627A
C-15	Electrolytic, 5 mfd/50v	24164
C-16	Trimmer, 1.5 to 10 mmf	23430
C-17	Ceramic, 10 mmf, 5%, NPO	23927
C-18	Ceramic, 68 mmf, 10%, NPO	23992
C-19	Same as C-4	
C-20	Not used	
C-21	Same as C-7	
C-22	Ceramic, 10,000 mmf, 25 v min.	23612
C-23	Same as C-22	
C-24	Ceramic, 50,000 mmf, 25 v min.	23614
C-25	Ceramic, 220 mmf, 20%	23915
C-26	Same as C-22	
C-27	Same as C-22	
C-28	Same as C-4	
C-29	Same as C-1	
C-30	Same as C-9 **(C-30 added as a production modification)**	
C-31	Same as C-22	
C-32	Same as C-25	
C-33	Ceramic, 10,000 mmf, 500 v	23632
C-34	Same as C-9	
C-35	Same as C-4	
C-36	Same as C-9	
C-37	(A & B) Electrolytic, 50-50 mfd/150 v	24171
C-38	Same as C-9	
C-39	Same as C-9	
C-40	Ceramic, 100 mmf, 20%	23914
C-41	Same as C-9	
C-42	Same as C-33	

CONTROLS

R-17	500,000 ohms, vol, w/sw	25073A

COILS

L-1	Antenna coil, FM	29426
L-2	Choke, 1 microhenry	29124
L-3	RF, FM	29165
L-4	1st I-F, FM (Alternate: 29148)	29164
L-5	2nd I-F, FM (Alternate: 29152)	29167
L-6	Ratio detector	29084
L-7	2nd I-F, AM	29078
L-8	Oscillator coil, FM	29243
L-9	Same as L-2	
L-10	Loop antenna	29360A
L-11	Oscillator coil, AM	29244
L-12	1st I-F, AM	29077
L-13	Filament RF coil	29169
L-14	Same as L-13	

RESISTORS

(10%, ½ watt unless specified)

R-1	1 megohm, 20%	73161
R-2	68 ohms	73011
R-3	1000 ohms	73025
R-4	3.3 megohms, 20%	73167
R-5	470 ohms	73021
R-6	Same as R-5	
R-7	Same as R-5	
R-8	22,000 ohms	73041
R-9	Same as R-5	
R-10	Not used	
R-11	2.2 megohms, 20%	73165
R-12	470,000 ohms, 20%	73157
R-13	Same as R-1	
R-14	2200 ohms	73029
R-15	27 ohms	73006
R-16	Same as R-2	
R-17	See CONTROLS	
R-18	4.7 megohms, 20%	73169
R-19	220,000 ohms, 20%	73153
R-20	Not used	
R-21	Same as R-12	
R-22	Same as R-2	
R-23	Same as R-8	
R-24	Same as R-3	
R-25	Wirewound, 1000 ohms, 5 watts	73621
R-26	100 ohms	73013
R-27	22 ohms	73005

SW-1	Switch, slide, DPDT	86712
T-1	Transformer, output 2500 to 3.2 ohms	89417A

CRYSTALS

X-1	Germanium diode, 1N541 } matched pr.	72027
X-2	Germanium diode, 1N541 }	
X-3	Germanium diode, 1N295	72028
X-4	Selenium rectifier, 100 ma	72047

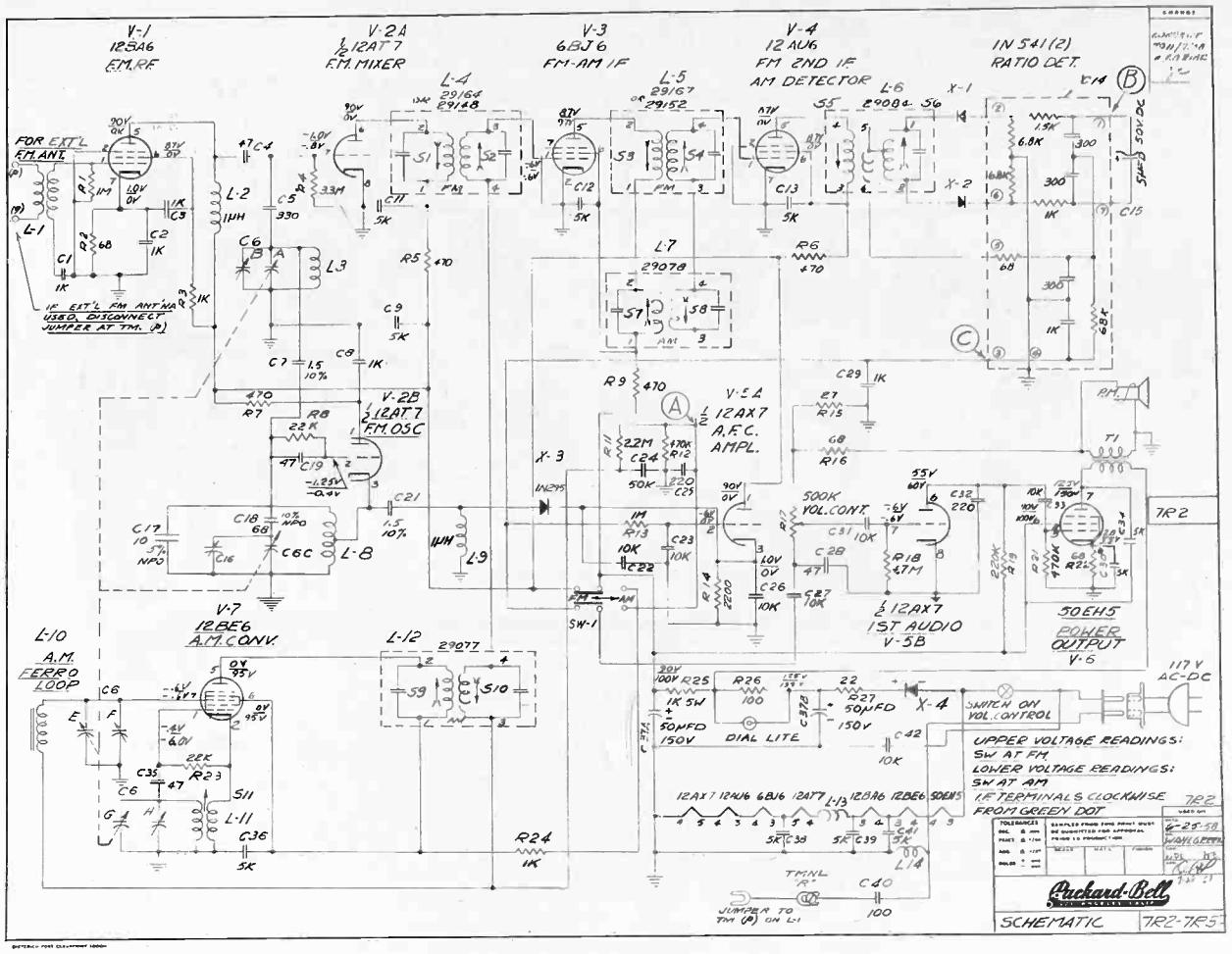
ELECTRON TUBES

V-1	Amplifier, RF, FM	12BA6
V-2	Oscillator & mixer, FM	12AT7
V-3	I-F amplifier, AM & FM	6BJ6
V-4	FM 2nd I-F; AM detector	12AU6
V-5	1st audio; AFC	12AX7
V-6	Audio output	50EH5
V-7	Converter, AM	12BE6

MISCELLANY

(Item listed is on models 7R2 & 7R3 both unless noted)

DESCRIPTION	PACKARD-BELL PART NUMBER
Cabinet: Order by model number; specify color or finish	
Cord, AC power	32029
Dial 7R2: 38173 7R3: 38181	
Drive cord, 40"	40003
Knobs, volume w/sw & tuning	52227
Lamp, dial, T-49	54013
Plug, AC interlock	66047
Pointer	67045B
Speaker, 6" oval, 3.2 ohms	83122



Schematic Diagram, Chassis 7R2

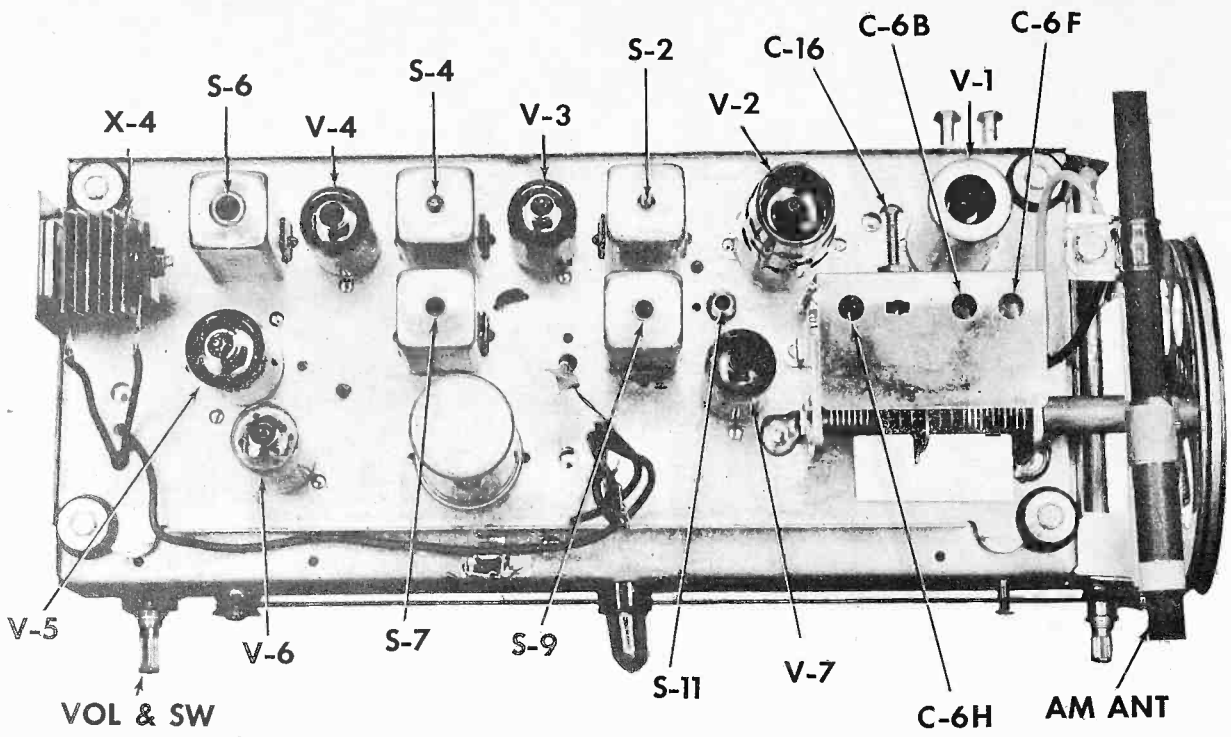
**Capacitor C-30 added as a production modification.*

BE SURE TO ALIGN AM SECTION FIRST

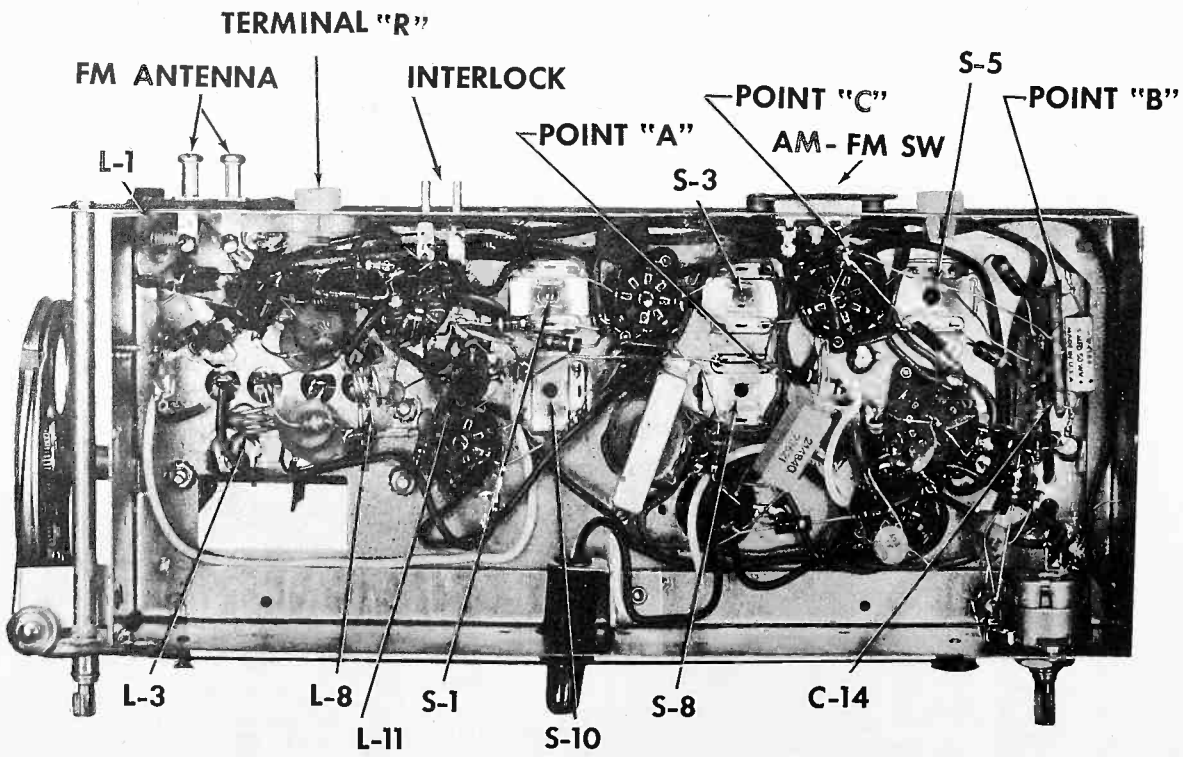
DUMMY ANTENNA	SIGNAL GENERATOR CONNECTION	SIGNAL GENERATOR FREQUENCY	RADIO RECEIVER DIAL SETTING	VTVM CONNECTION	ADJUST	NOTES
ALIGNMENT OF I-F, AM SECTION						
1. .01 mfd in series with gen. output	Pin 7 of V-7 (grid 3, 12BE6)	455 kc, modulated with 400 cps	Low frequency end point	Negative to point "A", positive to ground	S-7, S-8, S-9, & S-10 for MAXIMUM	Reduce signal generator output to lowest usable level
ALIGNMENT OF R-F, AM SECTION						
2. None	Loose couple to loop	1620 kc, modulated with 400 cps	High frequency end point	Ditto	C-6H for MAXIMUM	None
3. None	Ditto	530 kc, modulated with 400 cps	Low frequency end point	Ditto	S-11 for MAXIMUM	Repeat 2 & 3 till no increase in maximums
4. None	Ditto	1500 kc, modulated with 400 cps	Tune in signal	Ditto	C-6F for MAXIMUM	None
ALIGNMENT OF I-F, FM SECTION						
5. .01 mfd. in series with gen. output	Pin 7 of V-2A (grid, FM mixer, ½12AT7)	10.7 mc, unmodulated	Low frequency end point	Ditto	S-1, S-2, S-3, & S-4 for MAXIMUM	Reduce signal generator output to less than one volt at pt. "A"
6. Ditto	Ditto	Ditto	Ditto	Negative to point "B", positive to ground	S-5 for MAXIMUM	None
7. Ditto	Ditto	Ditto	Ditto	Negative to point "C", positive to ground	S-6 for ZERO	Equal plus & minus readings will be obtained on opposite sides of zero
ALIGNMENT OF R-F, FM SECTION						
8. 150 ohms in each lead	FM antenna terminal	106 mc, unmodulated	106 mc	Negative to point "B", positive to ground	C-16 for MAXIMUM	None
9. Ditto	Ditto	Ditto	Ditto	Ditto	C-6B for MAXIMUM	None
10. Ditto	Ditto	92 mc, unmodulated	92 mc	Ditto	Compress or expand L-8 for MAXIMUM	None
11. Ditto	Ditto	Ditto	Ditto	Ditto	Compress or expand L-3 for MAXIMUM	None
12. REPEAT STEPS 8 THRU 11 UNTIL NO FURTHER INCREASE IN VTVM READING OCCURS.						

ALIGNMENT CHART, CHASSIS 7R2

Equipment Required: Signal generator, AM; two 150 ohm ½ watt resistors; one .01 mfd, 600 volt paper capacitor.



Chassis, 7R2, Top View



Chassis 7R2, Bottom View

PACKARD BELL

12333 W. Olympic Blvd.
Los Angeles 64

SERVICE MANUAL

Manual BC-70
May 2, 1959

TABLE MODEL RADIO 5R6

CLOCK RADIO MODEL 5RC7

GENERAL

The circuit used in both models is a five tube superheterodyne receiver circuit with standard miniature tubes connected for AC-DC operation. Sixty cycle AC is required for clock operation.

The schematic diagram is the same for both models except for the addition of the timer (clock) and nite-lite to model 5RC7.

The nite-lite in the 5RC7 is turned on by the push-pull switch on the volume control. In the 5R6 this switch is the radio ON-OFF control.

CLOCK OPERATING INSTRUCTIONS

Operating instructions are attached to the bottom of the clock radio and are repeated here.

Radio knobs:
Left is volume control and switch (pull out) for nite-lite. Right is tuning.

Clock knobs:
Left is sleep switch, for 0 to 60 min. Right is control knob.

STEP FOR	PROCEDURE
1. Radio only	Set control knob to ON and adjust tuning and volume.
2. Radio with shut-off	Turn set on with sleep switch, tune station and set sleep switch to interval desired before shut-off. (60 min = 180°)
3. Automatic turn-on	After step 1, set alarm and turn control knob to AUTO.
4. Automatic turn-on with buzzer	After step 3, turn control knob to ALARM. Buzzer will follow radio turn-on by 10 minutes.
5. Automatic shut-off and turn-on	After step 2, set control knob to either AUTO or ALARM.

To service tubes, remove two hex head screws at rear of cabinet, and slide entire chassis and front panel out of cabinet.

SPECIFICATIONS: (both models unless noted)

CABINET DIMENSIONS (to nearest ¼ in.):
6 in. h by 12½ in. w by 6 in. d

SHIPPING WEIGHT:
6 lb.

ELECTRICAL RATINGS:
Line voltage 110-120 volts AC or DC (must be 60 cycle AC for clock radio)
Power consumption, 32 watts for radio, 34 watts for clock radio.

TUNING FREQUENCY RANGE:
540 to 1620 kc.

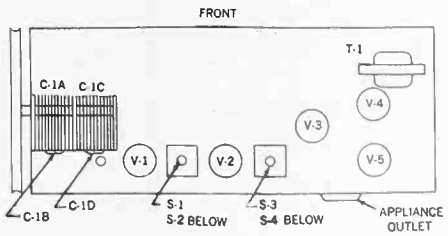
SPECIAL SERVICING INFORMATION:
OSCILLATOR GRID VOLTAGES, Pin 1, V-1:
(Measured using a VTVM with input impedance of more than 10 megohms. Line voltage 117 volts AC.)

1500 kc	—5.5 volts DC
1000 kc	—5.5 volts
750 kc	—5.0 volts
540 kc	—4.8 volts

ALIGNMENT PROCEDURE:

The alignment of the set is accomplished by following the steps in the chart below. Connect output meter to speaker voice coil. Use isolation transformer between radio and power line to reduce shock hazard.

Each adjustment should be made using a minimum input signal. Connect test oscillator through a .01 mfd capacitor to the point indicated below. Ground lead of oscillator is connected to B minus bus.



Adjustments

Step	Connect Test Oscillator to	Test Oscillator Frequency	Radio Dial Setting	Adjust
1.	Pin 7, V-1 (12BE6)	455 kc	1620 kc	S-1, S-2, S-3, & S-4 for MAXIMUM
2.	Loose-couple to antenna	1620 kc	1620 kc	C1-D for MAXIMUM
3.	ditto	1500 kc	Tune to oscillator	C1-B for MAXIMUM

REPLACEABLE PARTS

MODELS 5R6 & 5RC7

Parts are common to both models unless noted.

CAPACITORS

REFERENCE SYMBOL	DESCRIPTION	PACKARD-BELL PART NUMBER
C-1 (A & B)	Variable, section I, RF tuning and trimmer	23550A
C-1 (C & D)	Variable, section II, Osc tuning and trimmer	23550A
C-2	Ceramic, 47 mmf, 20%	23912
C-3	Paper, .047 mfd, 220 v, molded case	23705
C-4	Paper, .1 mfd, 200 v, molded case	23707
C-5	Ceramic, 220 mmf, 20%	23915
C-6	Ceramic, .005 mfd, GMV	23931
C-7	Ceramic, 470 mmf, 20%	23916
C-8	Ceramic, .01 mfd, GMV	23939
C-9	Ceramic, .01 mfd, GMV Connection of C-9 differs for the two models; see note ** on schematic.	23939
C-10 (A & B)	Electrolytic, dual 50 mfd/150 v	24073
C-11	Paper, .047 mfd, 200 v, molded case	23705

COILS

L-1	Antenna, ferrite loop	29358
L-2	Oscillator coil	29229B
L-3	1st I-F	29077
L-4	2nd I-F	29078

RESISTORS
(Rating ½ watt unless noted)

REFERENCE SYMBOL	DESCRIPTION	PACKARD-BELL PART NUMBER
R-1	22,000 ohms, 10%	73041
R-2	68 ohms, 10%	73011
R-3	2.2 megohms, 20%	73165
R-4	Control, volume, 500,000 ohms with switch. Switch is ON-OFF in model 5R6 and controls Nite-Lite in clock radio 5RC7.	25047
R-5	4.7 megohms, 20%	73169
R-6	220,000 ohms, 20%	73153
R-7	470,000 ohms, 20%	73157
R-8	150 ohms, 10%	73015
R-9	1000 ohms, 20%, 1 watt	73225
R-10	68 ohms, 10%	73011

TRANSFORMER

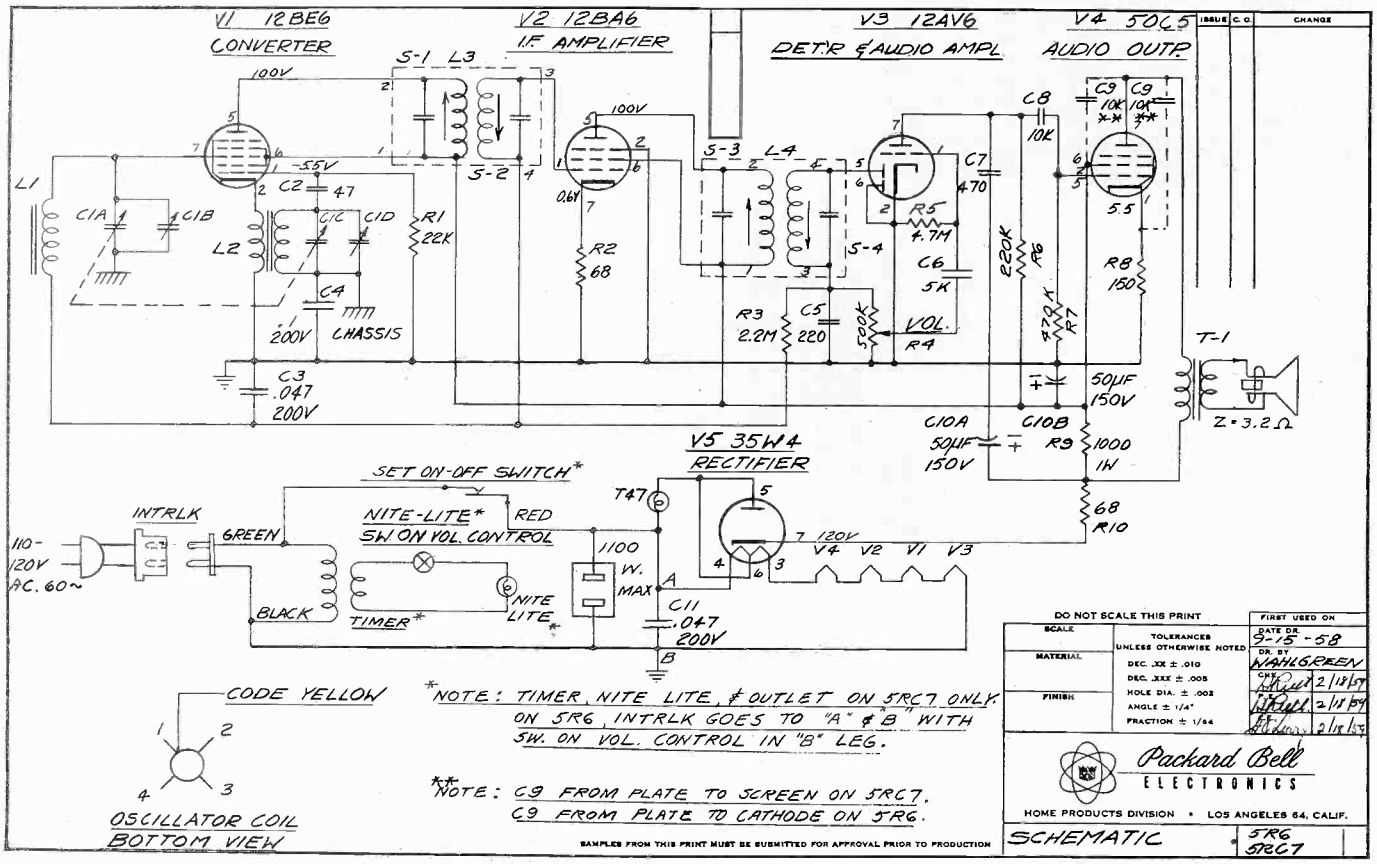
T-1	Output, 2500 to 3.2 ohms	89417A

ELECTRON TUBES

V-1	Converter	12BE6
V-2	I-F amplifier	12BA6
V-3	Detector & 1st audio	12AV6
V-4	Audio output	50C5
V-5	Rectifier	35W4

MISCELLANY

DESCRIPTION	PACKARD-BELL PART NUMBER
Cord, AC power	
5R6	32029A
5RC7	32028A
Drive cord, 40 in.	40003
Knob, tuning or volume	52227
Knob, control or sleep switch (on clock radio 5RC7 only)	52226B
Lamp, dial, T-47	54002
Lamp, nite-lite, T-43 (on 5RC7 only)	54007
Timer (clock) (on 5RC7 only)	58064C
Plate, AC cord	65228
Plug, AC	66047A
Pointer	67045
Speaker (3.2 ohms impedance)	
5R6 (4 in. cone dia)	83014
5RC7 (3 in. cone dia)	83120



Schematic, 5R6 & 5RC7.

DC RESISTANCE MEASUREMENTS:

1st I-F Coil (29077):
Primary, 12 ohms
Secondary, 13 ohms

2nd I-F Coil (29078)
Primary, 13 ohms
Secondary, 13 ohms

Oscillator Coil (29229B)
Primary, 1 ohm
Secondary, 5.5 ohms

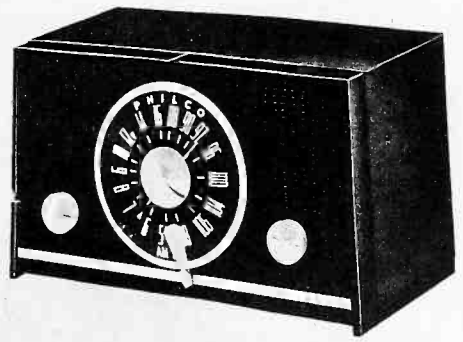
Loop antenna:
Resistance, 0.3 ohms

PHILCO HOME RADIO

SERVICE MANUAL

PHILCO *Factory-Supervised* Service

AM/FM MODEL G-974



Model G-974

SPECIFICATIONS

Cabinet — Plastic table model — Ebony or Maroon.

Circuit — Seven-tube superheterodyne plus selenium rectifier.

Frequency Ranges — Tuning drive ratio 12:1
Broadcast — 540-1620 KC
FM — 88-108 MC

Audio Output — 1 watt

Operating Voltage — 105 - 120 volts, a.c./d.c.

Power Consumption — 40 watts

Antennas — AM — Built in high impedance, pancake loop
FM — Line cord with provision for connecting external antenna.

Intermediate Frequency — AM 455 KC
FM 10.7 MC

Philco Tubes — 12AT7 FM R-F and converter, 12BA6 FM IF amplifier, 12BE6 AM converter-oscillator, 12BA6 FM-AM IF amplifier, 12AU6 FM limiter, 19T8 FM discriminator - AM detector — AVC — 1st audio, 35C5 audio output.

AM ALIGNMENT PROCEDURE

The AM alignment should be completed before the FM alignment is made. Before beginning the alignment, allow the receiver and test equipment to warm up for fifteen minutes.

DIAL POINTER — With the gang fully closed, adjust the pointer to be vertical.

RADIO CONTROLS — Set the volume control to maximum, set the function switch to AM and the tuning control as indicated.

OUTPUT INDICATOR — Connect either an a-c voltmeter or an oscilloscope across the voice coil terminals.

SIGNAL GENERATOR — Use an AM r-f signal generator with modulated output.

OUTPUT LEVEL — During alignment, maintain the output below .4 volts a-c.

CAUTION — To avoid shock hazard, the receiver should be connected to the a-c line through an isolation transformer.

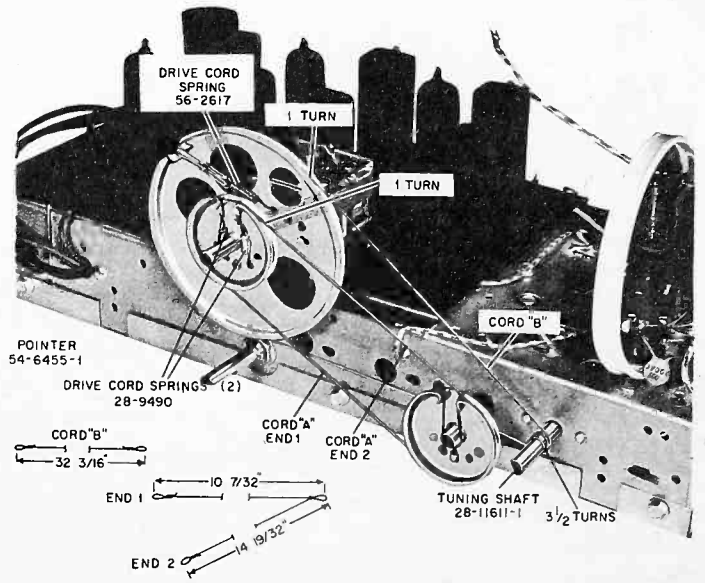
1. Connect generator, through a .05 mfd condenser, to grid, pin 7, of the AM converter, S-3. Connect ground lead to chassis.
2. Set generator to 455 kc, tuning gang fully closed and adjust, in order given, TC14, TC13, TC12 and TC11 for maximum output. Repeat until no further gain is indicated.
3. Connect generator to radiating loop. Set generator to 1600 kc. Set receiver to 1600 kc as indicated by pointer. Adjust VC-2B for maximum.
4. Set generator to 1400 kc. Tune receiver to signal and adjust VC-2A for maximum.

FM ALIGNMENT PROCEDURE

AM Broadcast Section should be aligned first

1. Calibrate the scope for 2 volts P/P.
2. Connect the scope, through a 100,000 ohm isolating resistor, to junction of R12 and C26. Scope ground lead to chassis.
3. Connect the signal generator to bottom of T1 secondary (junction of T1 with R1 and C5). Generator ground lead to chassis.
4. Inject marker signal, 10.7 mc (unmodulated).
5. Inject sweep signal, 10.7 mc, approximately 150 kc total deviation (do not over sweep).
6. Adjust cores TC8, TC7, TC6, TC5, TC4 and TC3 for maximum amplitude, symmetrical curve with the 10.7 mc marker at top of curve.
   Adjust input signal to maintain output, as shown on scope, below 2 volts peak during alignment.
   Repeat step 6 until no further gain is obtained.
7. Calibrate the scope for 5 volts P/P.
8. Change the scope connections to L10 (FM audio output to function switch).
9. Remove sweep signal. Inject 10.7 mc, 30% AM modulated signal. Adjust TC10 for minimum indication between peaks. See note below.
10. Inject 10.7 mc sweep signal and adjust TC9 for maximum symmetrical output.
11. Touch up cores as in Step 6 plus TC9 for a symmetrical, maximum amplitude, discriminator curve. To check alignment, discriminator curve should not shift in frequency with an increase in signal input (below overload). If a shift does occur, the I-F is not properly aligned, particularly the first stage, TC3 and TC4.
12. Inject 108.5 mc, 30% AM modulated signal, through an antenna matching network to the receiver antenna terminals.
13. Open tuning condenser. Insert a 6 mil, non-metallic, shim between stator and rotor of the FM gang and close gang against shim.
    Adjust VC3 for minimum indicating between peaks.
14. With tuning condenser fully closed, inject 87.75 mc, 30% AM modulated, signal and adjust TC2 for minimum indication between peaks. See note below.
15. Inject 91 mc, sweep signal and with tuning gang tuned to 91 mc, adjust TC1 for maximum output. See note below.

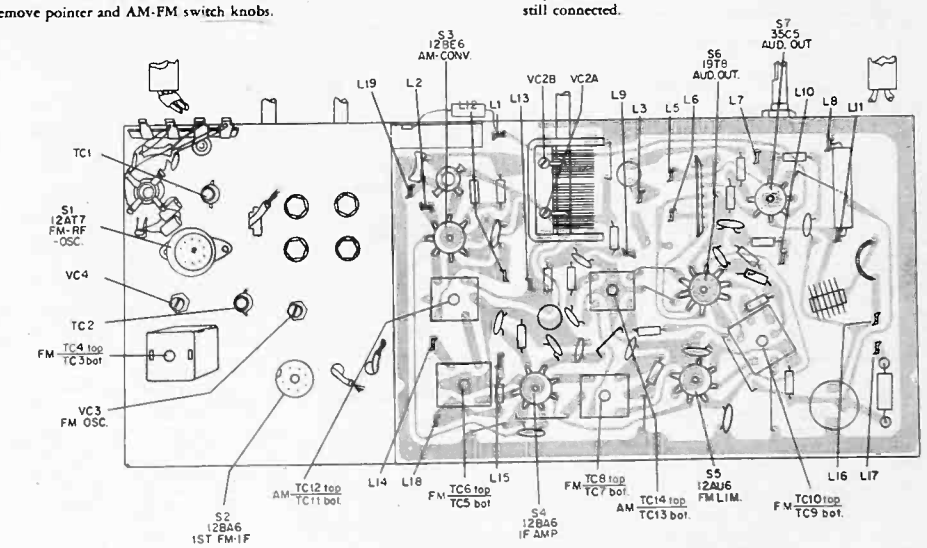
    NOTE: Signal input must be as low as possible in order to obtain a sharp indication. In some cases it may be necessary to set signal generator to the first sub-harmonic.



Drive Cord Installation Details

CHASSIS REMOVAL

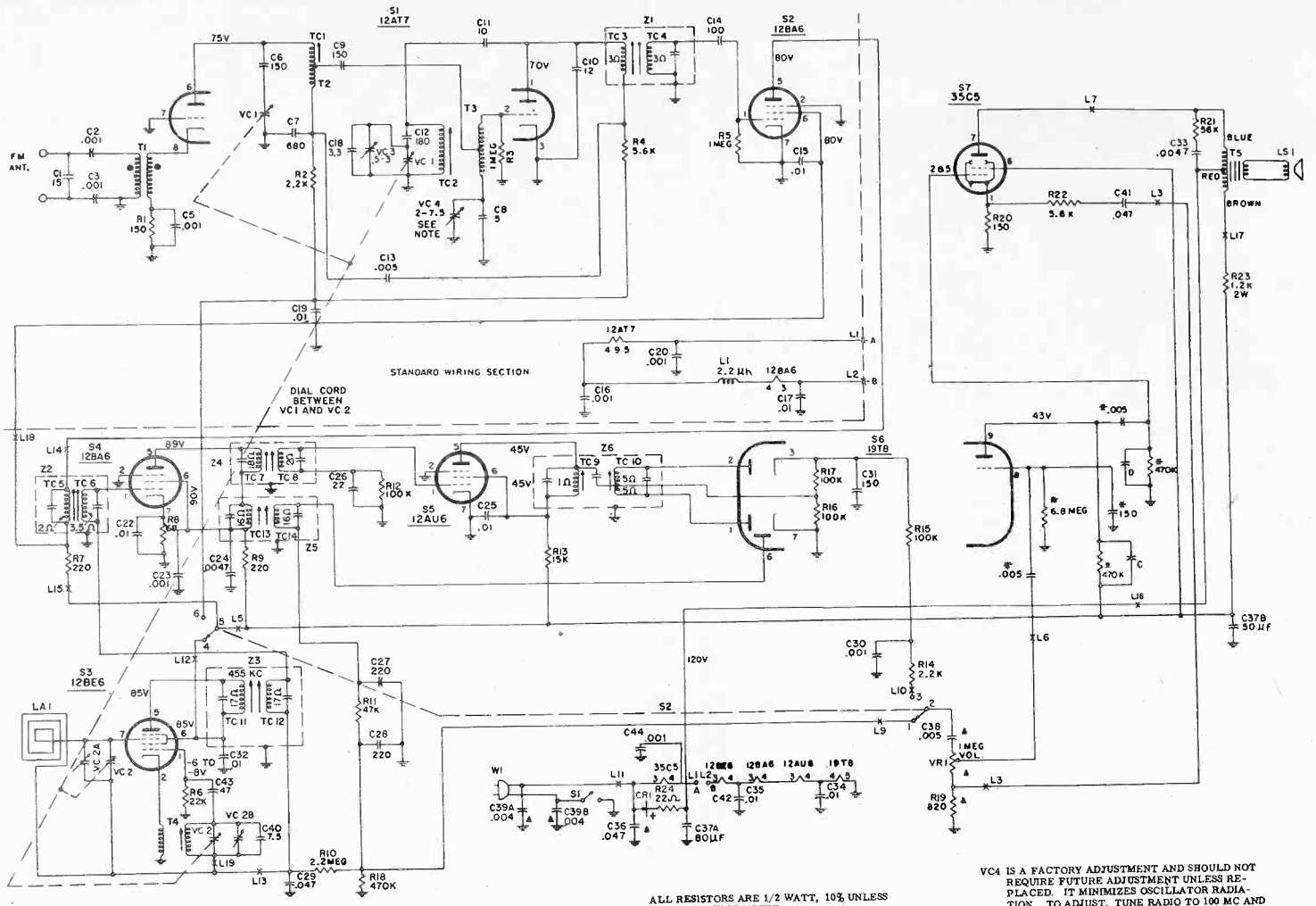
1. Remove back by removing the two ¼" drive screws from bottom edge of back, releasing AC interlock and dropping back down and out to release from top retaining slot.
2. Remove 3/16" drive screw from inside, top, center of cabinet front. This will free the dial scale so that it may be removed from the front.
3. Remove pointer and AM-FM switch knobs.
4. Disengage the tuning and volume knobs. These knobs are captivated and will not come free of cabinet.
5. Remove the three 5/16" drive screws from cabinet bottom.
6. Free wires from dress lug at volume control end of chassis. Chassis may now be removed from cabinet for service. Caution—speaker is still connected.



Top View — Showing Alignment Points, Tube Locations and Tie Lugs

IDENTIFICATION OF PRINTED PANEL TIE LUGS

L1	Filament lead from pin 4 of S-7 (35C5) to pin 5 of S-1 (12AT7)	L7	Blue lead from audio output, T-5, to plate, pin 7 of S-7	L13	Loop antenna return to A.V.C.
L2	Filament lead from pin 3 of S-2 (12BA6) to pin 3 of S-3 (12BE6)	L8	Bare wire from panel ground to chassis ground	L14	Blue lead from plate, pin 5 of S2, to 2nd FM I-F transformer, Z2
L3	Green lead to bottom of VR1 from C41	L9	Yellow lead, AM audio to lug 1 of S2 from junction of R11, C28, R10 and R18	L15	Red lead (B+) from lug 5 of S2 to R7
L5	Red lead (B+) from lug 5 of S-2 to screen of S-7 and terminal 6 of N1	L10	Orange lead, FM audio to lug 3 of S2	L16	Red lead from junction of R24 and C27A to audio output, T5
L6	Yellow lead from arm of VR1 to terminal 2 of N1	L11	Brown lead from AC interlock to C36	L17	Brown lead from audio output, T5, to R23
		L12	Red lead (B+) from lug 4 of S2 to AM converter screen, pin 6, and Z3	L18	Orange lead (B+) to pin 6 of S2
				L19	Blue lead to L13

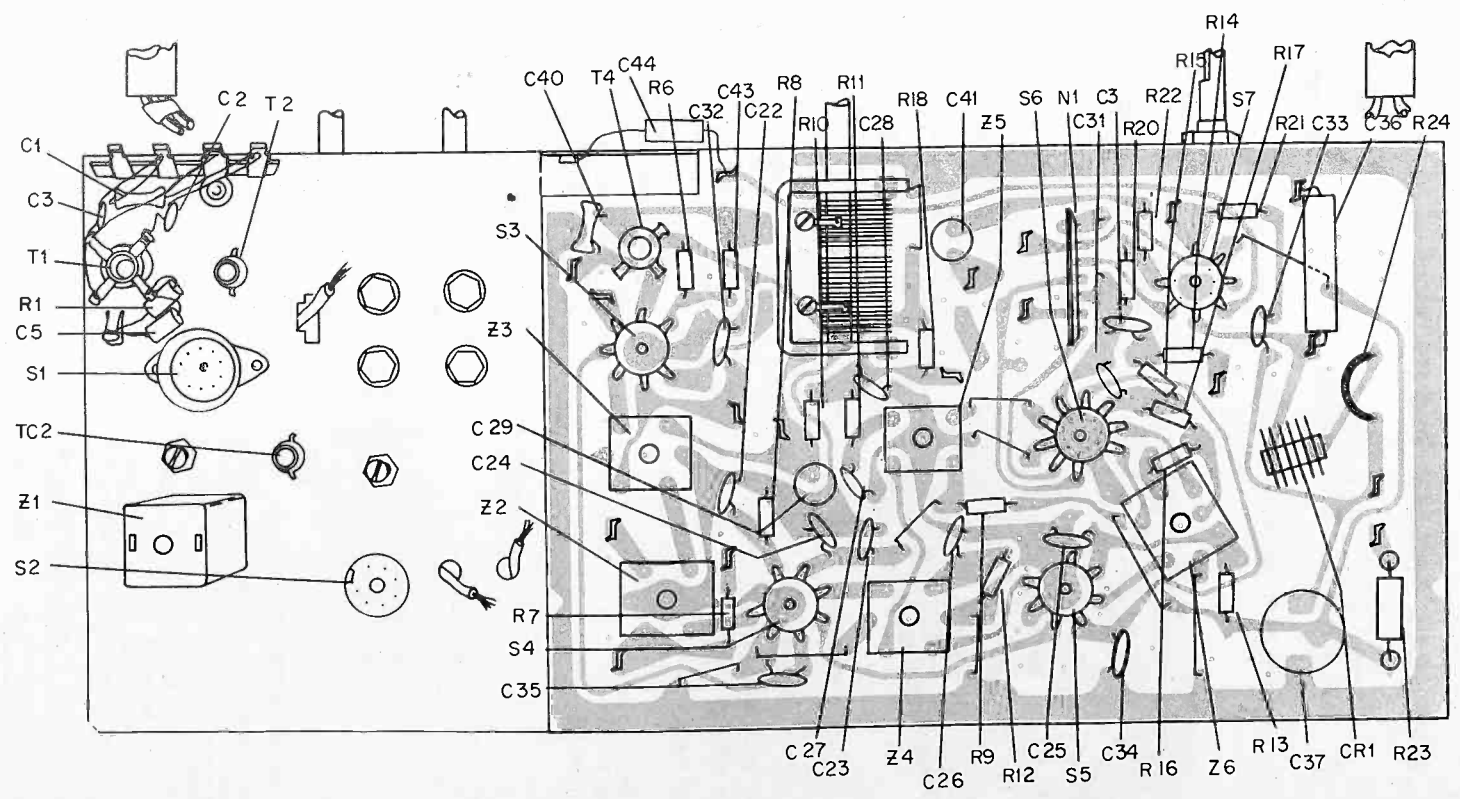


* COUPLATE N1
▲ PART OF STANDARD WIRING
● INDICATES LESS THAN 1 OHM
CONDENSERS C + D = 250 µµf

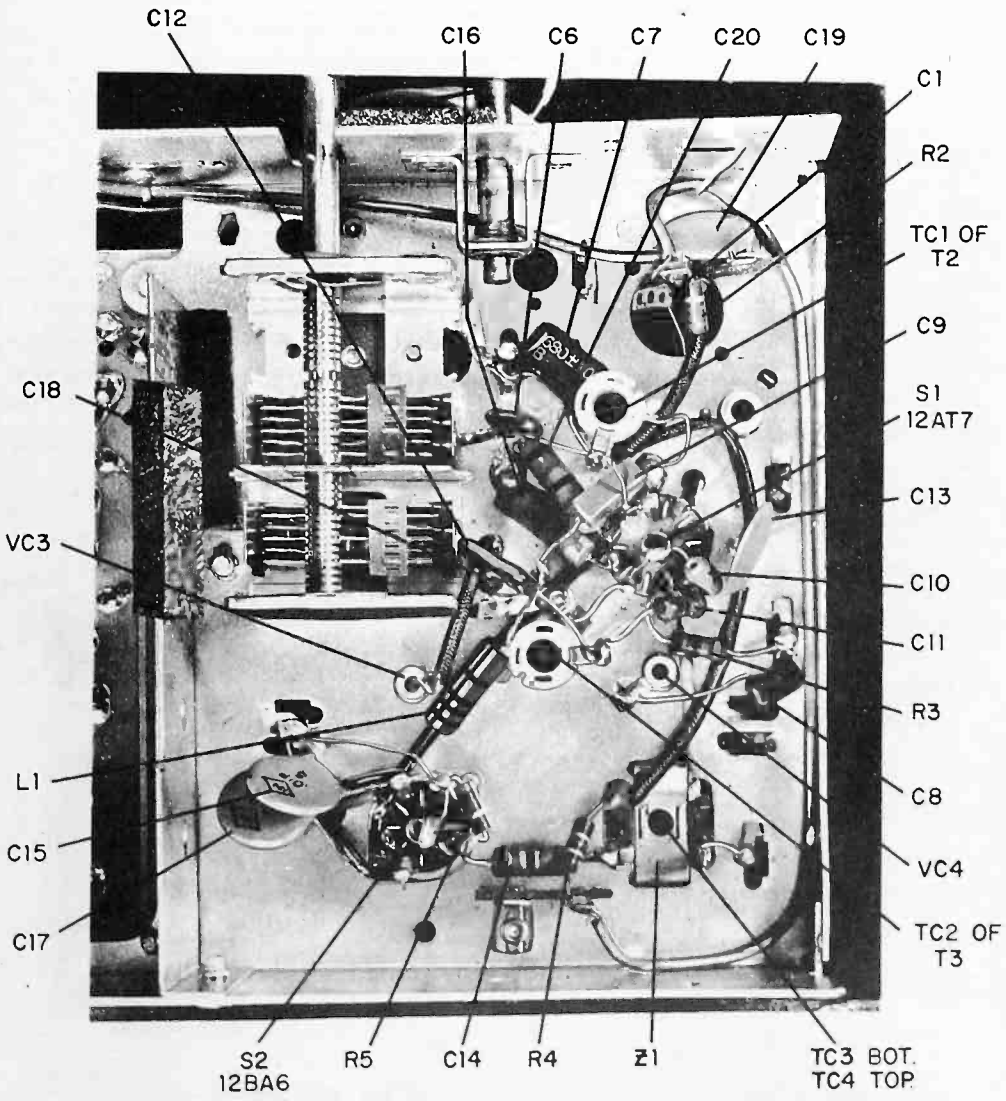
ALL RESISTORS ARE 1/2 WATT, 10% UNLESS OTHERWISE NOTED.
ALL CAPACITORS ABOVE 1 ARE IN µµf UNLESS OTHERWISE NOTED, ALL CAPACITORS BELOW 1 ARE µf.

VC4 IS A FACTORY ADJUSTMENT AND SHOULD NOT REQUIRE FUTURE ADJUSTMENT UNLESS REPLACED. IT MINIMIZES OSCILLATOR RADIATION. TO ADJUST, TUNE RADIO TO 100 MC AND ADJUST VC4 FOR MINIMUM INDICATION ON A FIELD STRENGTH METER TUNED TO THE OSC FREQ.

Schematic Diagram—Model G-974



Chassis and Printed Panel Component Layout View



Bottom View—Model G-974, FM Chassis Components

REPLACEMENT PARTS LIST

Reference Symbol	Description	Service Part No.
C1	Condenser, FM antenna, 15 mmf, ceramic	62-015409011
C2	Condenser, FM antenna coupling, .001 mfd, ceramic	30-1267-4
C3	Condenser, FM antenna coupling, .001 mfd, ceramic	30-1267-4
C5	Condenser, input cathode by-pass, .001 mfd, ceramic	62-210001011
C6	Condenser, gang DC isolation, 150 mmf, mica	30-1257-13
C7	Condenser, r-f coil signal return, 680 mmf, mica	60-10685411
C8	Condenser, mixer coil signal return, 5 mmf, ceramic	30-1257-14
C9	Condenser, interstage coupling, 150 mmf, mica	30-1257-13
C10	Condenser, mixer plate by-pass, 12 mmf, ceramic	62-012300001
C11	Condenser, osc. coupling, 10 mmf, ceramic	62-010409001
C12	Condenser, gang DC isolation, 180 mmf, 5%, special mica	30-1257-8
C13	Condenser, B+ neutralization, .005 mfd, disk	30-1238-1
C14	Condenser, I-F grid coupling, 100 mmf, ceramic	62-110009001
C15	Condenser, I-F screen by-pass, .01 mfd	30-1238-2
C16	Condenser, filament by-pass, .001 mfd, ceramic	62-210001011
C17	Condenser, filament by-pass, .01 mfd, disk	30-1238-2
C18	Condenser, FM temperature compensating, 3.3 mfd, disk	30-1224-114
C19	Condenser, B+ by-pass, .01 mfd	30-1238-2
C20	Condenser, filament by-pass, .001 mfd	30-1267-4
C22	Condenser, 2nd I-F cathode by-pass, .01 mfd, disk	30-1262
C23	Condenser, 2nd I-F screen de-coupling, .001 mfd disk	30-1262-12
C24	Condenser, 2nd I-F B+ de-coupling, .0047 mfd, disk	30-1262-3
C25	Condenser, 3rd I-F screen de-coupling, .01 mfd, disk	30-1262
C26	Condenser, 3rd I-F grid by-pass, 22 mmf, disk	30-1263-19
C27	Condenser, AM I-F filter, 220 mmf, disk	30-1262-23
C28	Condenser, AM I-F filter, 220 mmf, disk	30-1262-23
C29	Condenser, A.V.C. by-pass, .047 mfd, moulded	30-4685-28
C30	Condenser, de-emphasis, .001 mfd, disk	30-1262-12
C31	Condenser, de-emphasis, 150 mmf, disk	30-1263-24
C32	Condenser, AM mixer screen de-coupling, .01 mfd, disk	30-1262
C33	Condenser, tone compensation, .0047 mfd, disk	30-1262-3
C34	Condenser, filament by-pass, .01 mfd, disk	30-1262
C35	Condenser, filament by-pass, .01 mfd, disk	30-1262
C36	Condenser, AC by-pass, .047 mfd, tubular	30-4650-45
C37	Condenser, electrolytic, 2 section filter, 80/50, 150 WVDC	30-2585-9
C38	Condenser, audio coupling, .005 mfd, disk	30-1238-1
C39	Condenser, line by-pass, .004/.004 mfd, dual disk	30-1266-1
C40	Condenser, Osc. temp. compensating, 7.5 mmf, ceramic	30-1224-83
C41	Condenser, tone control, .047 mfd, moulded	30-4685-45
C43	Condenser, AM osc. coupling, 47 mmf, ceramic	30-1230-4
C44	Condenser, filament by-pass, .001 mfd.	62-210001011

Reference Symbol	Description	Service Part No.
CR1	Selenium rectifier, 100 ma	34-8040-4
L1	Choke, filament de-coupling, 2.2 mh	32-4422-8
LA1	Loop antenna, Am	76-11304
L.C.	Interlock connector, AC	27-6240-10
LS1	Speaker, 5" pm, 3.2 ohm V.C. impedance	45-9723
N1	Resistor-condenser network, audio stage	30-6027
R1	Resistor, FM R-F cathode, 150 ohms	66-1158340
R2	Resistor, FM R-F B— de-coupling, 2200 ohms	66-2228340
R3	Resistor, FM R-F B— de-coupling, 2200 ohms	66-5108340
R4	Resistor, mixer B+ de-coupling, 5600 ohms	66-2568340
R5	Resistor, FM I-F grid return, 1 megohm	66-5108340
R6	Resistor, AM Osc. grid return, 22,000 ohms	66-3228340
R7	Resistor, FM I-F B+ de-coupling, 220 ohms	66-1228340
R8	Resistor, I-F cathode bias, 68 ohms	66-0688340
R9	Resistor, I-F B— de-coupling, 220 ohms	66-1228340
R10	Resistor, AVC filter, 2.2 megohms	66-5228340
R11	Resistor, AM I-F filter, 47,000 ohms	66-3478340
R12	Resistor, 3rd FM I-F grid return, 100,000 ohms	66-4108340
R13	Resistor, 3rd FM I-F B+ de-coupling, 15,000 ohms	66-3158340
R14	Resistor, de-emphasis, 2200 ohms	66-2228340
R15	Resistor, de-emphasis, 100,000 ohms	66-4108340
R16	Resistor, discriminator, 100,000 ohms	66-4108340
R17	Resistor, discriminator, 100,000 ohms	66-4108340
R18	Resistor, AM detector load, 470,000 ohms	66-4478340
R19	Resistor, audio feedback, 820 ohms	66-1828340
R20	Resistor, output cathode bias, 150 ohms	66-1158340
R21	Resistor, tone compensation, 56,000 ohms	66-3568340
R22	Resistor, feed-back, tone circuit 5600 ohms	66-2568340
R23	Resistor, B+ filter, 1200 ohms, 2 watts	66-2125340
R24	Resistor, rectifier current limiting, 22 ohms	33-1334-21
S1	Switch, on-off	Part of VR1
S2	Switch, AM-FM	42-2058-3
T1	Transformer, FM antenna	32-4718-1
T2	Transformer, FM r-f	32-4717-1
T3	Transformer, FM osc.	32-4716-1
T4	Transformer, AM osc.	32-4683-8
T5	Transformer, audio output	32-4784-1
VC1	Tuning gang, 2 section, FM	37-2789-2
VC2	Tuning gang, 2 section, AM	31-2783-7
VC3	Variable condenser, FM osc., 5-3.0 mmf	31-6529-18
VC4	Variable condenser, osc. bridge capacitor, 2-7.5 mmf	31-6520-22
VR1	Volume control, 1 meg	33-5583-9
W1	Line cord	41-4230
Z1	Transformer, 1st FM	32-4715-1
Z2	Transformer, 2nd FM	32-4712-1
Z3	Transformer, 1st AM	32-4583-17
Z4	Transformer, 3rd FM	32-4712-2
Z5	Transformer, 2nd AM	32-4583-17
Z6	Transformer, 4th FM, discriminator	32-4714-2
	Printed Panel	56-9961-3

CABINET MISCELLANEOUS PARTS

Description	Service Part No.
Cabinet, Ebony	11294
Maroon	11294-1
Cabinet back and loop assy.	96-10263-1
FM antenna assy.	41-3791-4
Knobs, 2 used, volume and tuning, ebony	54-6093-16
2 used, volume and tuning, maroon	54-6093-21
Knob, AM-FM switch, ebony	54-6456-1
maroon	54-6456-2
Pointer	54-6455-1
Ring, retaining	1W60978FA3

Description	Service Part No.
Scale	54-6457-1
Shield, tube 12AT7	56-5629-5
Shield, tube 12BE6	56-5629-12
Socket, 9 pin min., 12AT7, chassis mtg.	27-6283-18
7 pin min., 12BA6, chassis mtg.	27-6283
7 pin min., panel mtg., 4 used	27-6309-1
9 pin min., panel mtg., 1978	27-6309-2
Spring, drive cord tension, 2 used	28-5430
Spring, drive cord tension, 1 used	56-2817
Shaft tuning	28-11611-1
Trim Strip, cabinet front	28-12075

PHILCO HOME RADIO

SERVICE MANUAL

AM/FM MODEL G-978

PHILCO Factory-Supervised Service

Model G-978

SPECIFICATIONS

Cabinet—Wood table model—Mahogany or Fruitwood. Dual slide-rule dial.

Circuit—Seven-tube superheterodyne plus selenium rectifier.

Frequency Ranges—Tuning drive ratio 12:1
Broadcast—540-1620 KC
FM—88-108 MC

Audio Output—1 watt
Variable bass boost or treble cut tone control.

Operating Voltage—105-125 volts, a.c./d.c.

Power Consumption—40 watts.

Antennas—AM Magnacore antenna.
FM-Line cord with provision for connecting external antenna.

Intermediate Frequency—AM 455 KC.
FM 10.7 MC.

Philco Tubes—12AT7 FM R-F and converter, 12BA6 FM I-F amplifier, 12BE6 AM converter-oscillator, 12BA6 FM-AM I-F amplifier, 12AU6 FM limiter, 19T8 FM discriminator AM detector—AVC—1st audio, 35C5 audio output.

AM ALIGNMENT PROCEDURE

The AM alignment should be completed before the FM alignment is made. Before beginning the alignment, allow the receiver and test equipment to warm up for fifteen minutes.

DIAL POINTER—With the gang fully closed, adjust the pointer to coincide with the index mark at the left-hand end of the scale, over the "5".

RADIO CONTROLS—Set the volume control to maximum, set the function switch to AM, tone control fully CCW and the tuning control as indicated.

OUTPUT INDICATOR—Connect either an a-c voltmeter or an oscilloscope across the voice coil terminals.

SIGNAL GENERATOR—Use an AM r-f signal generator with modulated output.

OUTPUT LEVEL—During alignment, maintain the output below .4 volts a-c.

CAUTION—To avoid shock hazard, the receiver should be connected to the a-c line through an isolation transformer.

1. Connect generator, through a .05 mfd condenser, to grid, pin 7, of the AM converter, S-3. Connect ground lead to chassis.
2. Set generator to 455 kc, tuning gang fully closed and adjust, in order given, TC14, TC13, TC12 and TC11 for maximum output. Repeat until no further gain is indicated.
3. Connect generator to radiating loop. Set generator to 1600 kc. Set receiver to 1600 kc as indicated by pointer. Adjust VC-2B for maximum.
4. Set generator to 1400 kc. Tune receiver to signal and adjust VC-2A for maximum.

FM ALIGNMENT PROCEDURE

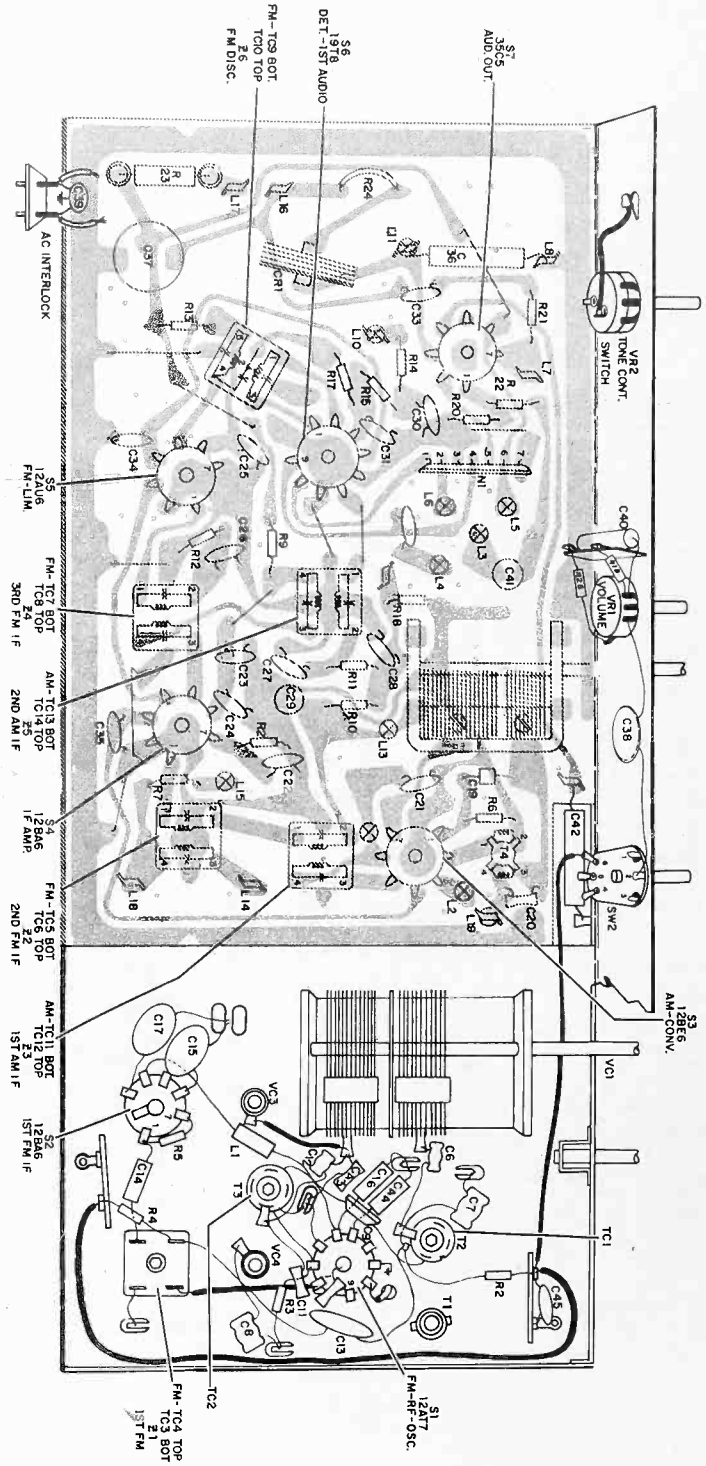
AM Broadcast Section should be aligned first

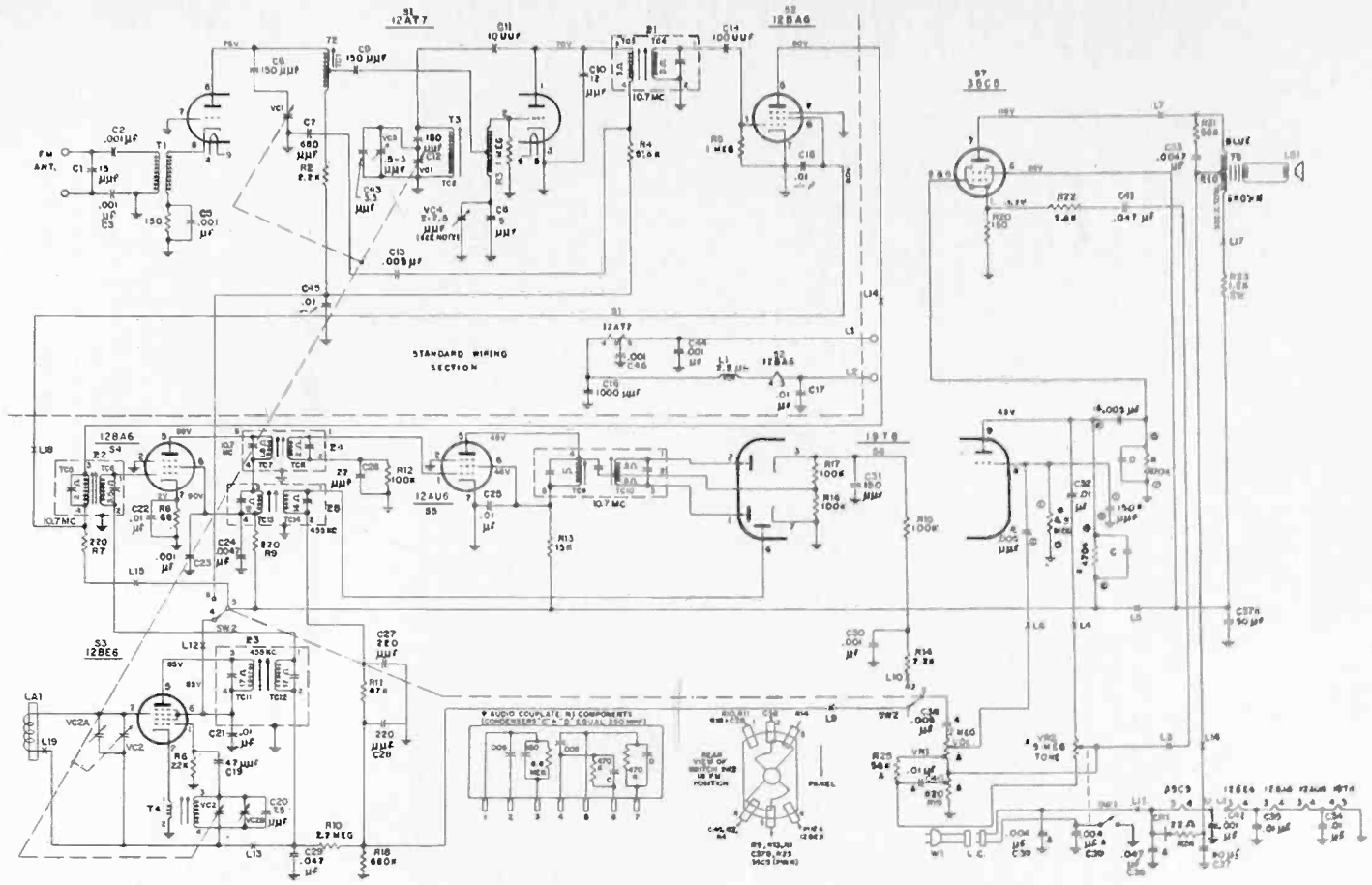
1. Calibrate the scope for 2 volts P/P.
2. Connect the scope, through a 100,000 ohm isolating resistor, to junction of R12 and C26. Scope ground lead to chassis.
3. Connect the signal generator to bottom of T1 secondary (junction of T1 with R1 and C5). Generator ground lead to chassis.
4. Inject marker signal, 10.7 mc (unmodulated).
5. Inject sweep signal, 1.7 mc, approximately 150 kc total deviation (do not over sweep).
6. Adjust cores TC8, TC7, TC6, TC5, TC4 and TC3 for maximum amplitude, symmetrical curve with the 10.7 mc marker at top of curve.
   Adjust input signal to maintain output, as shown on scope, below 2 volts peak during alignment.
   Repeat step 6 until no further gain is obtained.
7. Calibrate the scope for 5 volts P/P.
8. Change the scope connections to L10 (FM audio output to function switch).
9. Remove sweep signal. Inject 10.7 mc, 30% AM modulated signal. Adjust TC10 for minimum indication between peaks. See note below.
10. Inject 10.7 mc sweep signal and adjust TC9 for maximum symmetrical output.
11. Touch up cores as in Step 6 plus TC9 for a symmetrical, maximum amplitude, discriminator curve. To check alignment, discriminator curve should not shift in frequency with an increase in signal input (below overload). If a shift does occur, the I-F is not properly aligned, particularly the first stage, TC3 and TC4.
12. Inject 108.5 mc, 30% AM modulated signal, through an antenna matching network to the receiver antenna terminals.
13. Open tuning condenser. Insert a 6 mil, non-metallic, shim between stator and rotor of the FM gang and close gang against shim.
    Adjust VC3 for minimum indicating between peaks.
14. With tuning condenser fully closed, inject 87.75 mc, 30% AM modulated signal, and adjust TC2 for minimum indication between peaks. See note below.
15. Inject 91 mc, sweep signal and with tuning gang tuned to 91 mc, adjust TC1 for maximum output. See note below.

NOTE: Signal input must be as low as possible in order to obtain a sharp indication. In some cases it may be necessary to set signal generator to the first subharmonic.

KNOB REMOVAL—The control knobs of the Model G-978 are mounted on the notched control shafts with spring clips which lock the knobs in position. To remove the knobs, release the spring clip with a screw driver blade before pulling the knob from the shaft.

Bottom View—Showing Components, Tube Locations and Tie Lugs

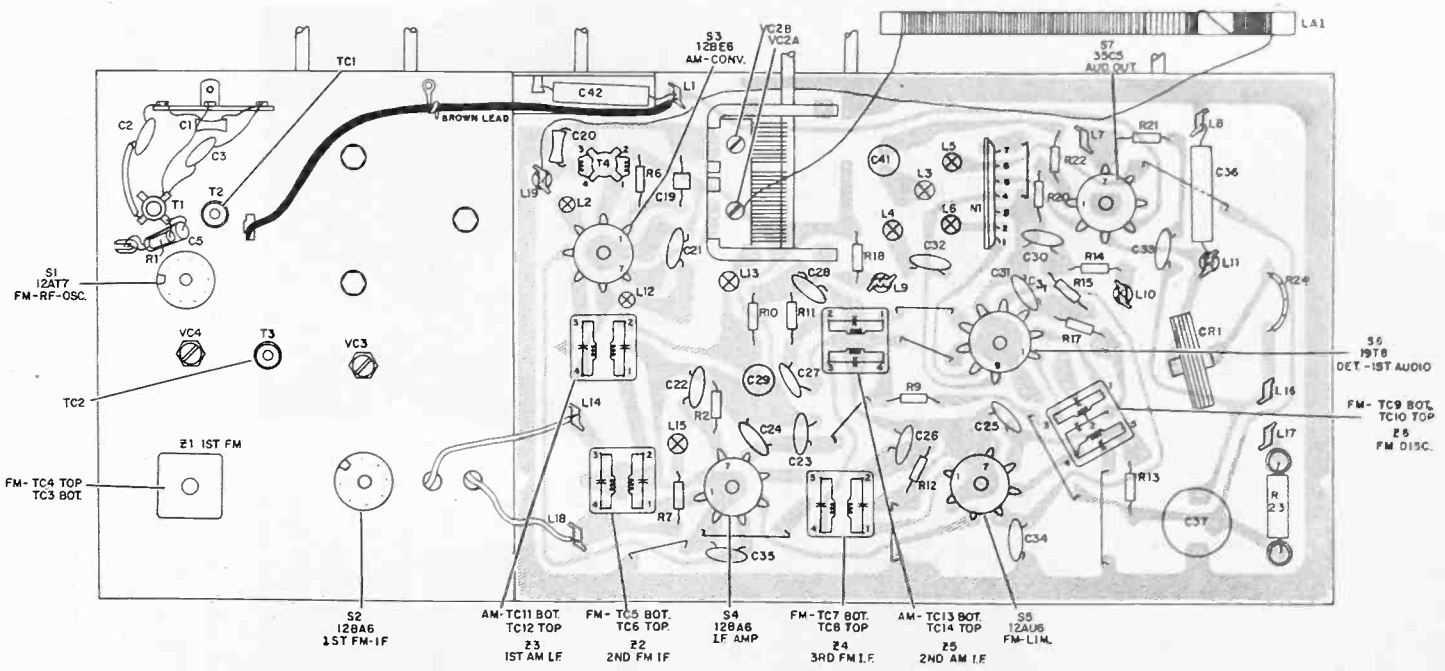




Components marked ▲ are part of chassis wiring.
● inaicotes less thon 1 ohm.
All resistors are ½ watt, 10% unless otherwise noted.

VC4 is a factory adjustment and should not require future adjustment unless replaced. It minimizes oscillator radiation. To adjust, tune radio to 100 MC and adjust VC4 for minimum indication on a field strength meter tuned to the oscillator frequency.

Schematic Diagram Model G-978

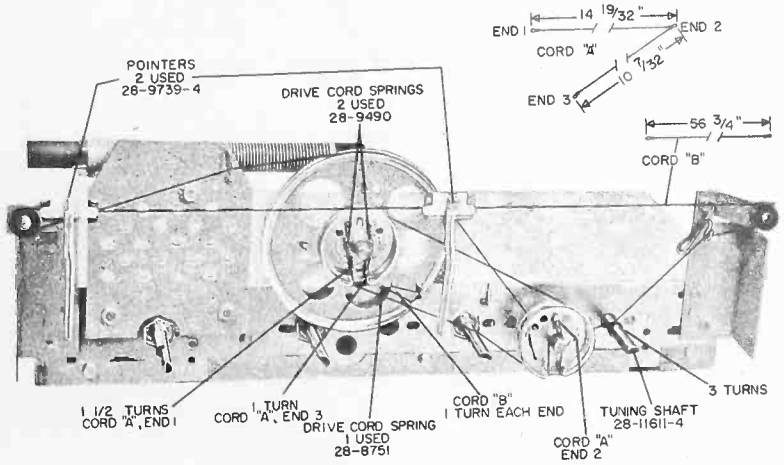


Top View—Showing Alignment Points, Tube Locations, Tie Lugs and Components

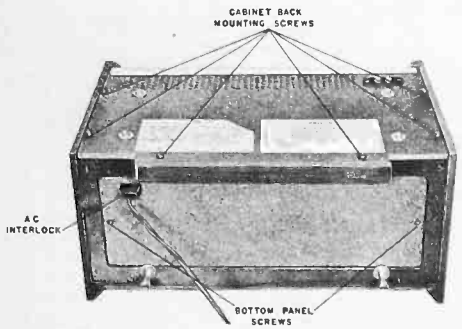
IDENTIFICATION OF PRINTED PANEL TIE LUGS

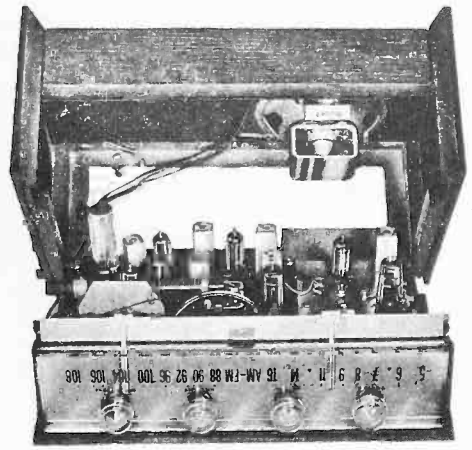
⊗ on above panel indicates connection on printed-wire side of panel.

L1 Filament lead from pin 4 of S7 (35C5) to pin 5 of S1 (12AT7)
L2⊗ Filament lead from pin 3 of S2 (12BA6) to pin 3 of S3 (12BE6).
L3⊗ Green lead from C41 to arm of VR2.
L4⊗ Red lead from top of VR2 to C32.
L5⊗ Red lead from lug 5 of switch SW2 to pin 6 of couplate N1 and pin 6 of S7 (35C5).
L6⊗ Green lead from pin 2 of couplate N1 to arm of VR1 (vol. control).
L7 Blue lead from output trans. T5 to plate, pin 7 of S7.
L8 Black lead from chassis ground to panel ground.
L9 Yellow lead from junction of R18, C28, R11 and R10 to lug 1 of switch SW2.
L10⊗ Orange lead (FM audio) from R14 to lug 3 of switch SW2.
L11⊗ Orange lead from AC interlock to C36, CR1 (sel. rect.) and pin 3 of S7 (35C5).
L12⊗ Red lead (B+) from lug 4 of switch SW2 to pin 6 of S3 (12BE6), C21 and Z3.
L13⊗ Green lead (AVC-ant. return) from VC2, C29, R10 and Z3 to lug L19.
L14 Blue lead from plate, pin 5 of S2, to 2nd FM I-F trans. Z2.
L15⊗ Red lead (B+) from lug 5 of switch SW2 to R7.
L16 Red lead (B+) from R24 and C37A to audio output trans. T5.
L17 Brown lead from audio output trans. T5 to R23.
L18 Black lead (B+) from Z2 and R7 to pin 6 of S2 (12BA6) and C15.
L19⊗ Green lead from L13 to antenna return lead and AVC.



Drive Cord Installation Details





PROCEDURE FOR CHASSIS REMOVAL

1. Disconnect ac interlock by removing bottom panel.
2. Remove cabinet back mounting screws (do not remove chassis mounting bolts).
3. Stand cabinet upright and slide chassis and back out rear of cabinet.
4. Remove chassis mounting bolts to free chassis from cabinet back.

Chassis Removal—Model G-978

REPLACEMENT PARTS LIST

Reference Symbol	Description	Service Part No.
C1	Condenser, FM antenna, 15 mmf, ceramic	62-015409011
C2	Condenser, FM antenna coupling, .001 mfd	30-1267-4
C3	Condenser, FM antenna coupling, .001mfd	30-1267-4
C5	Condenser, input cathode by-pass, .001 mfd	62-210001011
C6	Condenser, gang DC isolation, 150 mmf, mica	60-10155417
C7	Condenser, r-f coil signal return, 680 mmf, disk	30-1238-23
C8	Condenser, mixer coil signal return, 5 mmf	30-1257-14
C9	Condenser, interstage coupling, 150 mmf, mica	60-10155417
C10	Condenser, mixer plate by-pass, 12 mmf, ceramic	62-012300001
C11	Condenser, osc. coupling, 10 mmf, ceramic	62-010409001
C12	Condenser, gang DC isolation, 180 mmf, 5% special mica	30-1257-8
C13	Condenser, B+ neutralization, .005 mfd, disk	30-1238-1
C14	Condenser, I-F grid coupling, 100 mmf, ceramic	62-110009001
C15	Condenser, I-F screen by-pass, .01 mfd	30-1238-2
C16	Condenser, filament by-pass, .001 mfd, ceramic	62-210001011
C17	Condenser, filament by-pass, .01 mfd disk	30-1238-2
C19	Condenser, AM osc. coupling, 47 mmf, ceramic	30-1230-4
C20	Condenser, osc. temp. compensating, 7.5 mmf, ceramic	30-1224-83
C21	Condenser, AM mixer screen de-coupling, .01 mfd, disk	30-1262
C22	Condenser, 2nd I-F cathode by-pass, .01 mfd, disk	30-1262
C23	Condenser, 2nd I-F screen de-coupling, .001 mfd, disk	30-1262-12
C24	Condenser, 2nd I-F B+ de-coupling, .0047 mfd, disk	30-1262-3
C25	Condenser, 3rd I-F screen de-coupling, .01 mfd, disk	30-1262
C26	Condenser, 3rd I-F grid by-pass, 22 mmf, disk	30-1263-19
C27	Condenser, AM I-F filter, 220 mmf	30-1262-41
C28	Condenser, AM I-F filter, 220 mmf	30-1262-41
C29	Condenser, A.V.C. by-pass, .047 mfd, moulded	30-4684-28
C30	Condenser, de-emphasis, .001 mfd, disk	30-1262-13
C31	Condenser, de-emphasis, 150 mmf, disk	30-1262-28
C32	Condenser, tone control, .01 mfd, disk	30-1262
C33	Condenser, tone compensation, .0047 mfd, disk	30-1262-3
C34	Condenser, filament by-pass, .01 mfd, disk	30-1262
C35	Condenser, filament by-pass, .01 mfd, disk	30-1262
C36	Condenser, AC by-pass, .047 mfd, tubular	30-4650-45
C37	Condenser, electrolytic, 2 section filter, 80/50, 150 WVDC	30-2585-9
C38	Condenser, audio coupling, .005 mfd, disk	30-1238-1
C39	Condenser, line by-pass, .004/.004 mfd, dual disk	30-1266-1
C40	Condenser, tone control, .01 mfd, tubular	30-4650-58
C41	Condenser, tone control, .047 mfd, moulded	30-4684-28
C42	Condenser, filament by-pass, .001 mfd, ceramic	62-210001011
C43	Condenser, FM tempertaure compensating, 3.3 mfd, disk	30-1224-114
C44	Condenser, filament by-pass, .001 mfd, ceramic	62-210001011
C45	Condenser, FM B+ de-coupling, .01 mfd	30-1238-2
C46	Condenser, filament by-pass, .001 mfd, ceramic	62-210001011
CR1	Selenium rectifier, 100 ma	34-8040-1
L1	Choke, filament de-coupling, 2.2 mh	32-4422-8
LA1	Magnacore antenna	32-4692-5
L.C.	Interlock connector, AC	27-6240-10
LS1	Speaker, 5" pm, 3.2 ohm V.C. impedance	36-1668-12
N1	Resistor-condenser network, audio stage	30-6027
R1	Resistor, FM R-F cathode, 150 ohms	66-1158340
R2	Resistor, FM R-F B+ de-coupling, 2200 ohms	66-2228340
R3	Resistor, mixer grid return, 1 megohm	66-5108340
R4	Resistor, mixer B+ de-coupling, 5600 ohms	66-2568340
R5	Resistor, FM I-F grid return, 1 megohm	66-5108340
R6	Resistor, AM osc. grid return, 22,000 ohms	66-3228340
R7	Resistor, FM I-F B+ de-coupling, 220 ohms	66-1228340
R8	Resistor, I-F cathode bias, 68 ohms	66-0688340
R9	Resistor, I-F B+ de-coupling, 220 ohms	66-1228340
R10	Resistor, AVC filter, 2.2 megohms	66-5228340
R11	Resistor, AM I-F filter, 47,000 ohms	66-3478340
R12	Resistor, 3rd FM I-F grid return, 100,000 ohms	66-4108340
R13	Resistor, 3rd FM I-F B+ de-coupling, 15,000 ohms	66-3158340
R14	Resistor, de-emphasis, 2200 ohms	66-2228340
R15	Resistor, de-emphasis, 100,000 ohms	66-4108340
R16	Resistor, discriminator, 100,000 ohms	66-4108340
R17	Resistor, discriminator, 100,000 ohms	66-4108340
R18	Resistor, AM detector load, 680,000 ohms	66-4688340
R19	Resistor, tone circuit return, 820 ohms	66-1828340
R20	Resistor, output cathode bias, 150 ohms	66-1158340
R21	Resistor, tone compensation, 56,000 ohms	66-3568340
R22	Resistor, feed-back, tone circuit, 5600 ohms	66-2568340
R23	Resistor, B+ filter, 1200 ohms, 2 watts	66-2125340
R24	Resistor, rectifier current limiting, 22 ohms	33-1334-21
R25	Resistor, tone compensation, 56,000 ohms	66-3568340
SW1	Switch, on-off	Part of VR2
SW2	Switch, AM-FM	42-2058-5
T1	Transformer, FM antenna	32-4718-1
T2	Transformer, FM r-f	32-4717-1
T3	Transformer, FM osc.	32-4716-1
T4	Transformer, AM osc.	32-4693-9
T5	Transformer, audio output	32-8764
VC1	Tuning gang, 2 section FM	31-2789-2
VC2	Tuning gang, 2 section AM	31-2783-17
VC3	Variable condenser, FM osc., .5-3.0 mmf	31-6520-16
VC4	Variable condenser, FM osc.	31-6520-15
VR1	Volume control, 2 megohms tapped at 1 meg.	33-5535-48
VR2	Tone control, 5 megohms, with switch	33-5588-13
W1	Line cord	41-4230
Z1	Transformer, 1st FM	32-4715-1
Z2	Transformer, 2nd FM	32-4712-1
Z3	Transformer, 1st AM	32-4583-17
Z4	Transformer, 3rd FM	32-4712-2
Z5	Transformer, 2nd AM	32-4583-17
Z6	Transformer, 4th FM, discriminator	32-4714-2
	Printed Panel	54-9961-3

CABINET MISCELLANEOUS PARTS

Description	Service Part No.
Antenna assy, FM	41-3791-4
Antenna panel	38-9906-4
Cabinet,	
Fruitwood	51-0049-2
Mahogany	51-0049
Feet, 2 used	28-12666
Knobs, 4 used	54-6888-1
Scale	54-6330-3
Pointer, 2 used	28-9739-4

Description	Service Part No.
Shaft, tuning	28-11611-4
Shield, tube	56-5629
Shield, tube, 12BE6	56-5628-12
Socket, 9 pin min., 12AT7, chassis mtg.	27-6203-18
7 pin min., 12BA6, chassis mtg.	27-6203
7 pin min., panel mtg., 4 used	27-6309-1
9 pin min., panel mtg., 19T8	27-6309-2
Spring, drive cord tension, 2 used	28-9490
Spring, drive cord tension, 1 used	28-8751

PHILCO PORTABLE RADIO

SERVICE MANUAL

PHILCO Factory-Supervised Service

MODEL H-691, CODE 124

SPECIFICATIONS

Circuit — Four-tube superheterodyne (plus selenium rectifier).

Frequency Coverage — 540 to 1620 KC.

Intermediate Frequency — 455 KC.

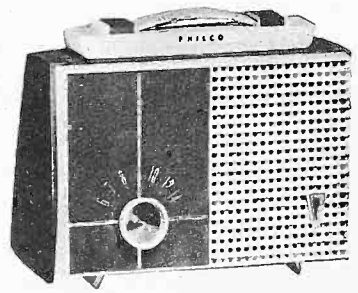
Antenna — Magnecor, high-impedance loop, mounted in "Scan-tenna" handle.

Supply Voltage — 117 volts, AC or DC, 7.5 volt "A" supply and 90 volt "B" battery.

Power Consumption — AC or DC operation, 15 watts; battery operation, 12 MA from "B," 50 MA from "A."

Philco Tubes — 1R5 Converter, 1U4 I-F amplifier, 1U5 detector—A.V.C.—1st audio, 3V4 output.

Battery Types — (1)P-31 "A" Battery, P-176 "B" Battery.



MODEL H-691

ALIGNMENT PROCEDURE

General — Allow set and test equipment to warm up for fifteen minutes before starting the alignment.

Output Indicator — Connect a 1000-ohms-per-volt a-c voltmeter or an oscilloscope across the voice-coil terminals.

Signal Generator — Use an AM r-f signal generator. Connect the ground lead to B—, and connect the output lead as indicated in the alignment chart.

Output Level — Attenuate the signal-generator output throughout the alignment so as to maintain the output below .4 volt.

Radio Controls — Set the volume control to maximum. Set the tuning control as indicated in the alignment chart. It is recommended that a-c power be used when aligning the radio.

Note: Insulated shield around 1U4 must be in place to eliminate oscillation.

ALIGNMENT CHART

STEP	SIGNAL GENERATOR		RADIO		ADJUST
	CONNECTION TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	
1	Connect signal generator through a .1 mfd condenser to pin 6 (converter grid) of 1R5.	455 kc.	Tuning gang fully open	Adjust for maximum output in order given.	2nd I-F sec. 1st I-F sec. (top Z1) 1st I-F pri. (bot. Z1)
2	Use radiating loop (see note one below).	1620 kc.	1620 kc. (See note 2 below)	Adjust for maximum.	C1B-osc. trimmer
3 (See Note 3)	Use radiating loop	535 kc.	Tuning gang fully closed.	Adjust for maximum.	T1-osc. core. See note 3.
4	Use radiating loop			Repeat steps 2 and 3 until no further improvement is noted. End with step 2.	
5	Use radiating loop	1400 kc.	1400 kc. (tune for signal).	Adjust for maximum.	C1A-ant. trimmer.
6 (See Note 3)	Use radiating loop	580 kc.	580 kc. (tune for signal).	Adjust for maximum. Moving adjustable section closer to main winding increases the antenna inductance and lowers the resonant frequency.	LA1-adjustable section of magnecore antenna. See note 3.
7	Use radiating loop			Repeat steps 5 and 6 until no further improvement is noted. End with step 5.	

NOTE 1: Use a 6 to 8-turn, 6-inch diameter loop made up of insulated wire. Connect to generator terminals, and place about one foot from radio loop.

NOTE 2: The tuning condenser can be set to the proper frequency for the oscillator adjustment as follows: Fully open the tuning gang and insert a .006 non-metallic shim between the heel of the rotor and the top of the stator plates. Close the gang sufficiently to hold the shim in place, and then remove the shim without disturbing the gang setting.

NOTE 3: Steps 3 and 6 should NOT normally be required. These adjustments should only be necessary when that component is replaced (the osc. trans., T1 or the magnecore antenna, LA1).

CRITICAL LEAD DRESS

1. Brown and black wires, from wiring panel on bracket, must be dressed below and away from R9 and in front of the tuning condenser, C1.

2. Brown and black "A" battery leads must be dressed over the output transformer, T2, and through the dress lug.

3. Red and yellow "B" battery leads must be dressed up through the AC interlock mounting bosses.

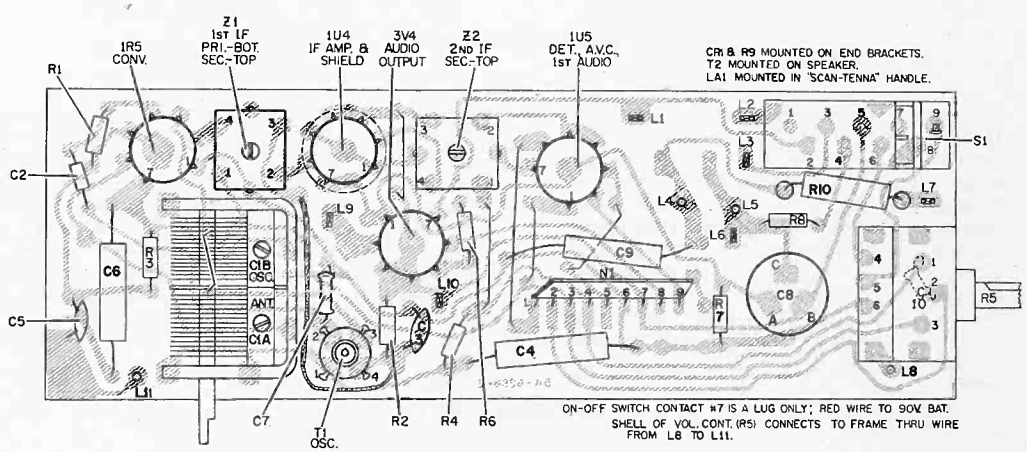
4. White AC interlock leads must be dressed toward the front panel.

5. All wires must be dressed clear of the current limiting resistor, R10.

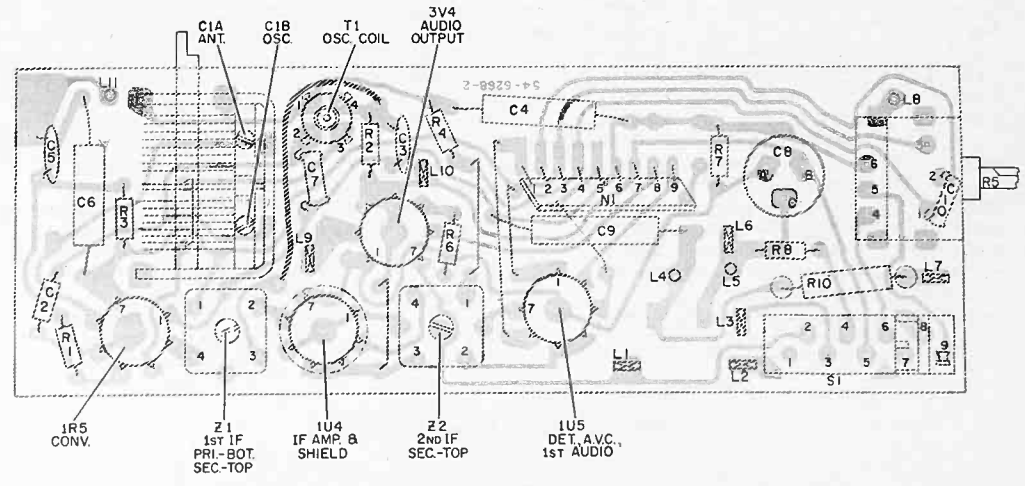
6. C6, the filament condenser, must be dressed toward the bracket, away from C1, the tuning gang.

TERMINAL LUG IDENTIFICATION

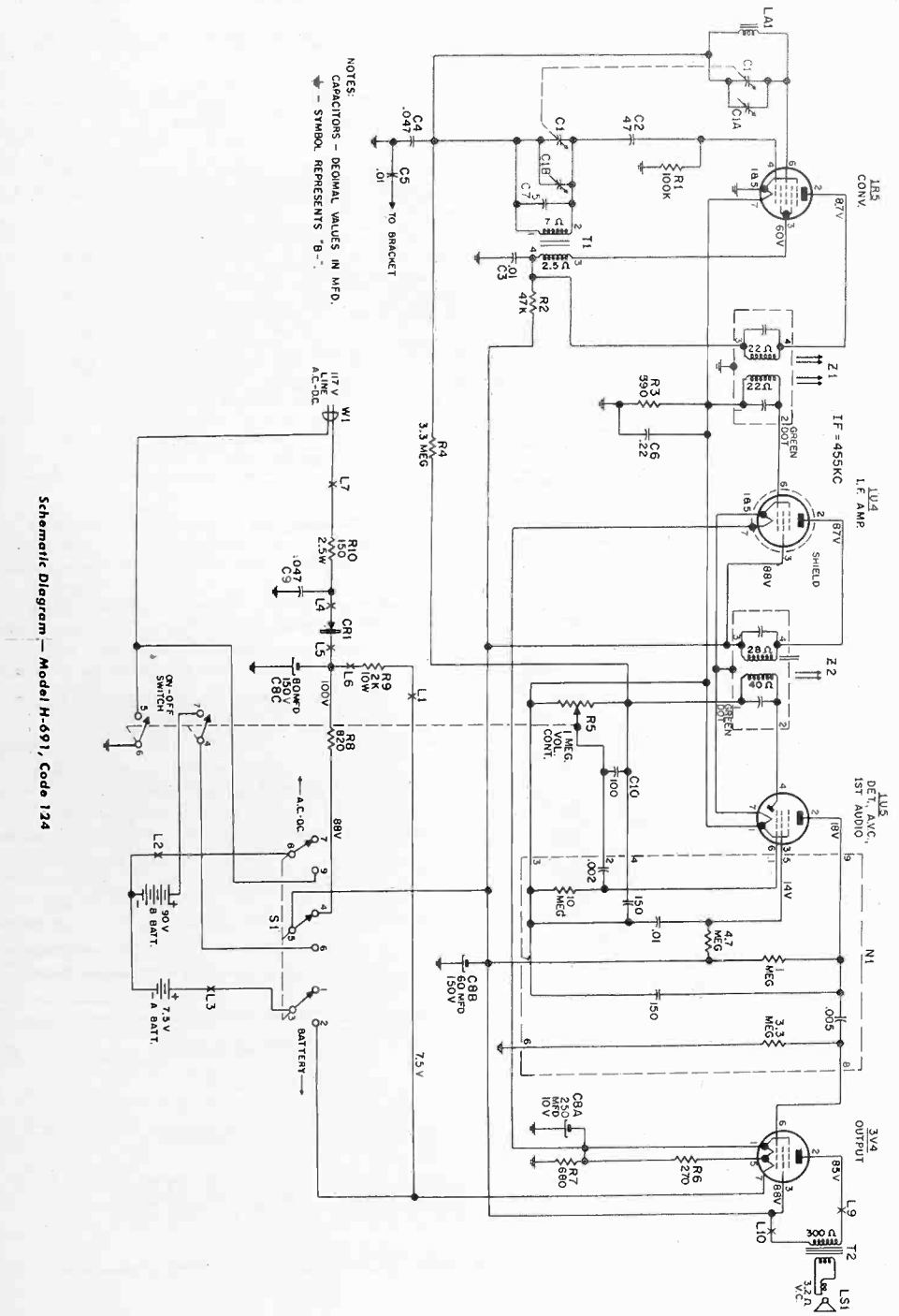
L1 Black lead from R9, filament dropping resistor.
L2 B—, black lead from "A" battery and yellow lead from "B" battery.
L3 A+, brown lead from "A" battery.
L4 Black lead to selenium rectifier, CR1.
L5 B+, red lead from CR1.
L6 Brown lead to filament dropping resistor, R9.
L7 White lead from AC interlock to R10.
L8 Blue lead to L11, ground.
L9 Blue lead from 3V4 plate to output trans., T2.
L10 Red lead to output transformer, T2.
L11 Blue lead to L8, ground.
White lead from AC interlock to lug 5 of ON-OFF switch.
Red lead from "B" battery to lug 7 of ON-OFF switch.



Top View, PW Panel



Bottom View, PW Panel



Schematic Diagram — Model H-691, Code 124

REPLACEMENT PARTS LIST

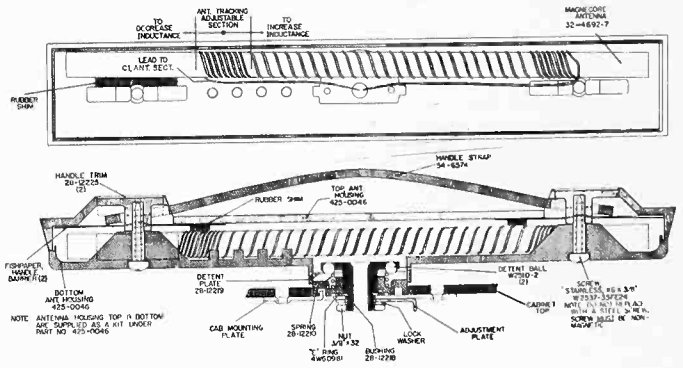
Reference Symbol	Description	Service Part No.
C1	Condenser, tuning gang	31-2783-10
C2	Condenser, osc. grid coupling, 47 mmf.	30-1230-4
C3	Condenser, converter screen decoupling, .01 mfd, ceramic disk	30-1262
C4	Condenser, a-v-c by-pass, .047 mfd, moulded	30-4650-45
C5	Condenser, grounding, .01 mfd, 1500V.	30-1269-1
C6	Condenser, filament by-pass, .22 mfd	30-4656-1
C7	Condenser, temp. compensating, 5 mmf, N5600, ceramic	30-1224-135
C8	Condenser, electrolytic, 3 section	30-2585-7
C9	Condenser, line by-pass, .047 mfd.	30-4650-45
C10	Condenser, treble boost, 100 mmf, ceramic	62-110009001
CR1	Selenium rectifier, 65 ma	34-8046-3
LA1	Loop antenna, magnecore	32-4692-7
LS1	Speaker	36-1654-10
N1	Audio network, condenser-resistor	30-6014
R1	Resistor, oscillator grid return, 100,000 ohms	66-4108340
R2	Resistor, converter dropping, 47,000 ohms	66-3478340
R3	Resistor, 1R5 filament, 390 ohms	66-1398340
R4	Resistor, a-v-c filter, 3.3 megohms	66-5338340
R5	Volume control, 1 megohm with switch	33-5575-6
R6	Resistor, 3V4 filament, 270 ohms	66-1278340
R7	Resistor, 1U4 filament, 680 ohms	66-1688340
R8	Resistor, filter, 820 ohms	66-1828340
R9	Resistor, filament dropping, 2000 ohms, 10 watts, fusible	33-1362-5
R10	Resistor, surge limiting, 150 ohms, 2.5 watts	33-1366-1
S1	Switch, battery change-over	42-2061-1
T1	Transformer, oscillator	32-4618-3
T2	Transformer, audio output	32-8434-1
W1	Line Cord	41-3865
Z1	Transformer, 1st I-F	32-4583-8
Z2	Transformer, 2nd I-F	32-4583-9
	Printed Panel	54-6268-2

CABINET PARTS LIST

Description	Service Part No.
Cabinet, ivory and gold	11306-4
Back, ivory and gold	54-6565-5
Dial face, ivory and gold	54-6978-1
Cabinet, ivory and turquoise	11306-3
Back, ivory and turquoise	54-6565-4
Dial face, ivory and turquoise	54-6978
Clip, cabinet back, 2 used	28-9783
Hinge, wire, 2 used	56-7968
Knob, tuning	54-6093-25
Knob, volume	54-6427-3
Medallion, "P"	28-12252
Scan-tenna assembly:	
Ball bearing, 2 used	W2510-2
Bushing	28-12218
Coil, antenna	32-4692-7
Detent plate	28-12219
Handle kit, top and bottom shells	425-0046
Retaining ring	4W60981
Screw, No. 6 x ¾", 2 used	W2537-35FE24
Spring	28-12210
Strap	54-6574
Trim, strap end caps, 2 used	28-12225

MISCELLANEOUS PARTS

Description	Service Part No.
Cable, B+ battery	41-3988-4
Cable, A+ battery	41-3477-4
Connector, AC interlock	27-6240-12
Grounding spring, 1U4 shield	28-11233
Shield, 1U4	27-2234-3
Socket, tube, 4 used	27-6309-1



Assembly and Identification of "Scan-Tenna" Components

SERVICE MANUAL

PHILCO Factory-Supervised Service

MODEL G-749X

SPECIFICATIONS

Cabinet—Plastic, table models.

Circuit—5 tube superheterodyne (including rectifier).

Frequency Range—540 KC to 1620 KC.

Intermediate Frequency—455 KC.

Audio Output—.9 watt.

Power Consumption—30 watts.

Operating Voltage—105 to 120 volts, 60 cycles.

Aerial—High impedance loop mounted on inside of cabinet.

Philco Tubes—12BE6, oscillator converter; 12BA6, I-F amplifier; 12AV6, 2nd detector; AVC, 1st audio; 50C5, audio output and 35W4, rectifier.

Timer—Telechron J2.

Speaker—4-in., 3.2 ohm V.C., pm speaker.

Model G-749X

ALIGNMENT PROCEDURE

Radio Controls—Set volume control to maximum. Set tuning control as indicated in chart.

Output Meter—Connect across voice coil terminals.

Signal Generator—Connect generator and set frequency as indicated in chart. Use modulated output, 30%.

Output Level—During alignment, adjust signal-generator output to hold output-meter reading below .5 volts.

ALIGNMENT CHART

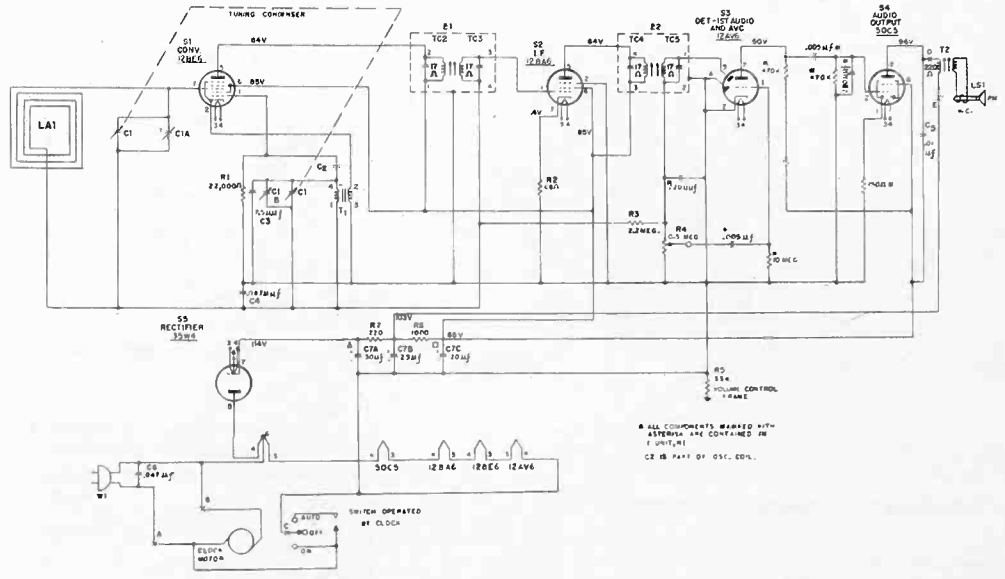
STEP	SIGNAL GENERATOR		RADIO		ADJUST
	CONNECTION TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	
1.	Ground lead to B—; output lead through a .1 mf condenser to grid (pin 7) of 12BE6 or top of r-f tuning condenser.	455 kc.	Tuning gang fully open.	Adjust tuning cores, in order given, for maximum output. TC3 and TC5 are located on top of transformers.	TC5—2nd i-f sec. TC4—2nd i-f pri. TC3—1st i-f sec. TC2—1st i-f pri.
2.	Radiating loop	1620 kc.	1620 kc.	Adjust for maximum output.	C1-B—osc.
3.	Same as step 2.	1500 kc.	1500 kc.	Adjust for maximum output.	C1-A—aerial

REPLACEMENT PARTS LIST

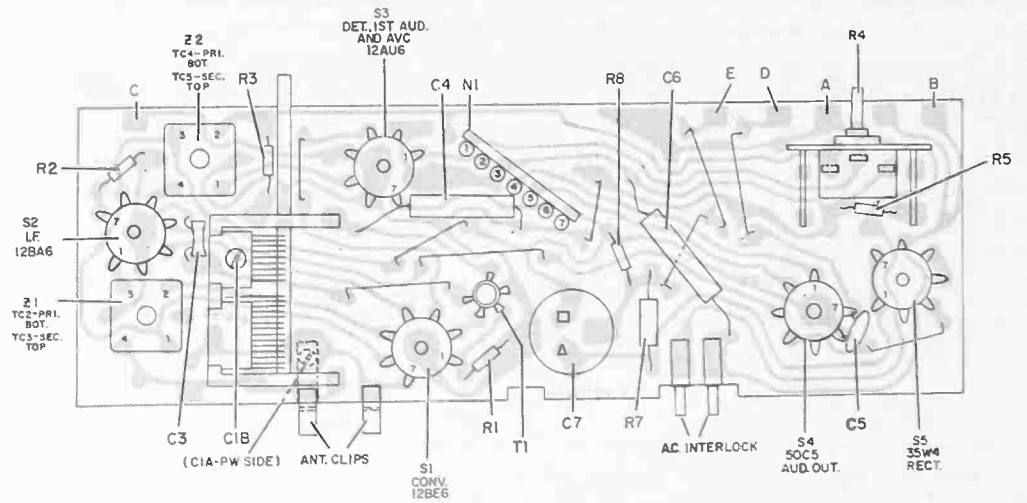
Reference Symbol	Description	Service Part No.
C1	Condenser, tuning	31-2783-15
C2	Condenser, oscillator grid	Part of osc. coil
C3	Condenser, osc. temp. compensating, 7.5 mmf, N2200	30-1224-83
C4	Condenser, AVC by-pass, .047 mf, moulded	30-4650-45
C5	Condenser, output plate, .01 mf	30-1262
C6	Condenser, line by-pass, .047 mf, moulded	30-4650-45
C7	Condenser, electrolytic filter, 3 section	30-2585-11
LA1	Antenna	32-4768-1
LS1	Speaker and transformer	36-1675-9
N1	RC Network, audio circuit	30-6500-1
R1	Resistor, oscillaor grid, 22,000 ohms	66-3228340
R2	Resistor, I-F cathode bias, 68 ohms	66-0688340
R3	Resistor, AVC, 2.2 megohms	66-5228340
R4	Resistor, volume control 500,000 ohms	33-5575-5
R5	Resistor, leakage, 33,000 ohms	66-3338340
R7	Resistor, B+ filter, 220 ohms, 1 watt	66-1224340
R8	Resistor, B+ filter, 1000 ohms	66-2108340
T1	Transformer, oscillator	32-4756-1
T2	Transformer, audio output	32-8384-2
W1	Line Cord (G-749 and G-751)	41-4270-5
	Line Cord (G-753 and G-755)	41-4270-4
Z1	Transformer, 1st I-F	32-4583-20
Z2	Transformer, 2nd I-F	32-4583-21
	Printed Panel	54-6585-3
	Socket, tube, 5 used	27-6309-1
	Contact, panel	28-12282
	Contact, panel	28-12282-1
	Tube shield	56-5629-12

CABINET PARTS

Cabinet, Model G-749, Lustre Ivory	51-0017	Hand, sweep	28-11374-19
Crystal, clock	54-6713-2	Hand, alarm set	28-11374-20
Clock	41-2068	Shaft, rear time set	28-11985-4
Dial, clock	54-5379-2	Knob tuning	54-6624-13
Hand, hour	28-11374-27	Knob, volume	54-6624-14
Hand, minute	28-11374-28	Knob, clock	54-6436-2



Printed Panel Component Layout



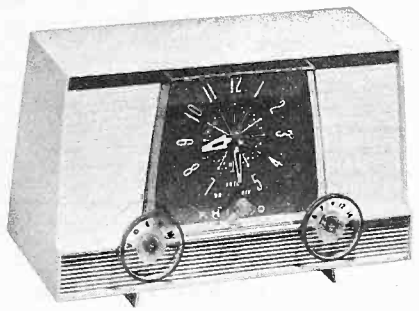
Schematic Diagram

— PHILCO HOME RADIO —

SERVICE MANUAL

PHILCO Factory-Supervised Service

— MODEL G-747 —



MODEL G-747

SPECIFICATIONS

CABINET—Plastic table model.
CIRCUIT—4 tube superheterodyne (including rectifier).
FREQUENCY RANGE—540 KC to 1620 KC.
INTERMEDIATE FREQUENCY—455 KC.
AUDIA OUTPUT—.9 watt.
POWER CONSUMPTION—35 watts.
OPERATING VOLTAGE—105 to 120 volts, 60 cycles.

AERIAL—High impedance loop mounted on inside of cabinet.

PHILCO TUBES—12AU6, oscillator converter; 12AV6, 2nd detector; 1st audio; 50EH5, audio output and 35W4, rectifier.

TIMER—Telechron J2.

SPEAKER—4-in., 3.2 ohm V.C., pm speaker.

ALIGNMENT PROCEDURE

SIGNAL GENERATOR—Connect generator and set frequency as indicated in chart. Use modulated output, 30%.

OUTPUT LEVEL—During alignment, adjust signal-generator output to hold output-meter reading below .5 volts.

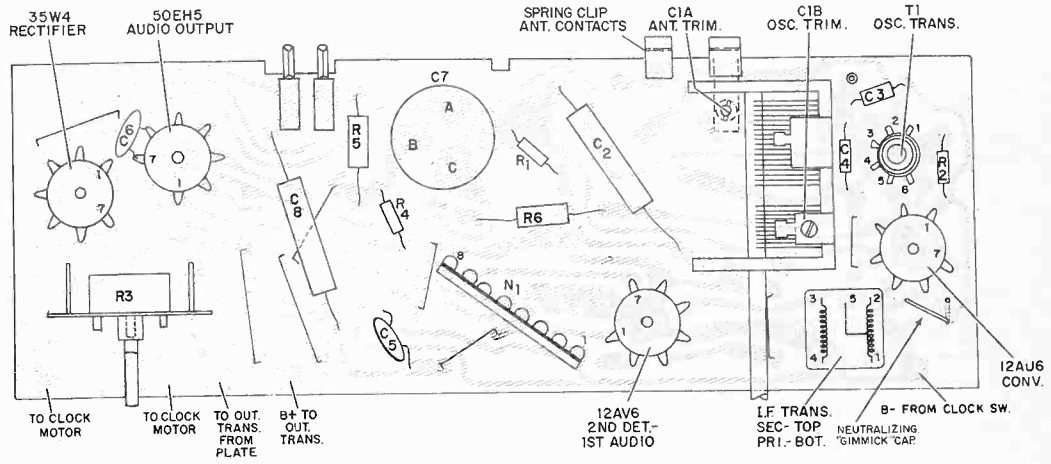
RADIO CONTROLS—Set volume control to maximum. Set tuning control as indicated in chart.

OUTPUT METER—Connect across voice coil terminals.

NEUTRALIZING "GIMMICK" CAPACITOR—To prevent oscillation, push "Gimmick" wire toward tube socket. To increase gain, move "Gimmick" wire away from tube socket.

ALIGNMENT CHART

STEP	SIGNAL GENERATOR		RADIO		ADJUST
	CONNECTION TO RADIO	DIAL SETTING	DIAL SETTING	SPECIAL INSTRUCTIONS	
1.	Ground lead to B—; output lead through a .1 mf condenser to grid (pin 1) of 12AU6 or top of r-f tuning condenser.	455 kc.	Tuning gang fully open.	Adjust tuning cores, in order given, for maximum output. Secondary core is located on top of transformer.	Z1—i-f sec. Z1—i-f pri.
2.	Radiating loop	1620 kc.	Tuning gang fully open.	Adjust for maximum output.	C1-B—osc.
3.	Same as step 2.	1400 kc.	1400 kc.	Adjust for maximum output.	C1-A—aerial



Perma-Circuit Panel, Component Side, Showing Layout and Alignment Points

TO REMOVE PERMA-CIRCUIT ASSY.

1. Remove the four drive screws from back. Be careful of the speaker leads, the speaker is mounted on the back.
2. Unsolder the two antenna leads.
3. Remove the knobs.
4. Remove the rear mounting bracket by removing screw.
5. The Perma-Circuit is now free to slide out.

TO REMOVE THE CLOCK

1. Remove clock knobs. Remove clock crystal by gently prying from top. (When replacing put bottom in first and snap in top).
2. Carefully remove hands by pulling straight off shaft.
3. Remove back and Perma-Circuit as above.
4. Unsolder the three clock leads.
5. Remove the four clock mounting fasteners. Care must be taken not to break the plastic bosses.
6. Tilt top of clock back and slide upward to clear the bottom clips.

NOTE: The clock motor may be replaced without removing the clock by removing the two magnet mounting screws.

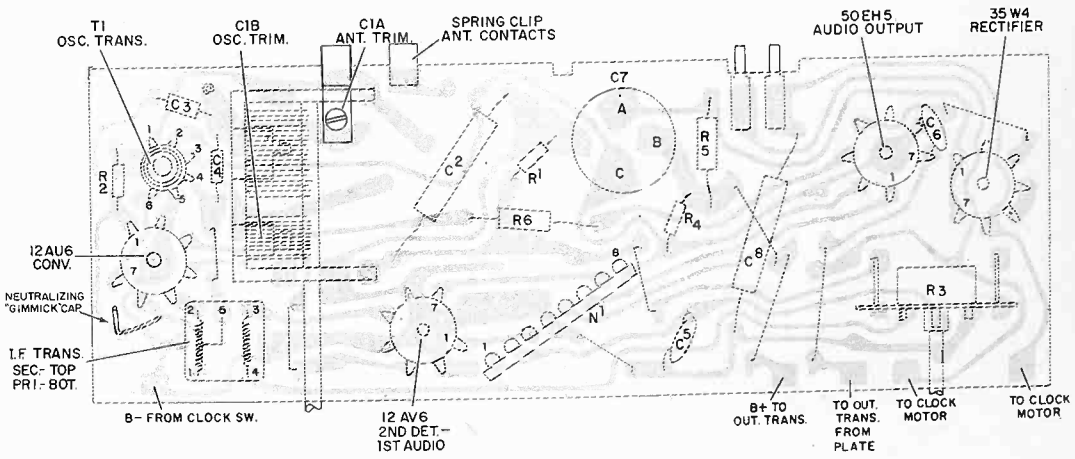
TO REPLACE HANDS

1. Set the clock to "Auto" position.
2. Push the alarm set shaft in and turn until switch just closes. An ohmeter across the switch will make a good indicator.
3. Put all hands on shaft at 12 o'clock.

NEUTRALIZING "GIMMICK" CAPACITOR

To prevent oscillation, push "Gimmick" wire toward tube socket. To increase gain, move "Gimmick" wire away from tube socket.

To prevent oscillation, push "Gimmick" wire toward tube socket. To increase gain, move "Gimmick" wire away from tube socket.



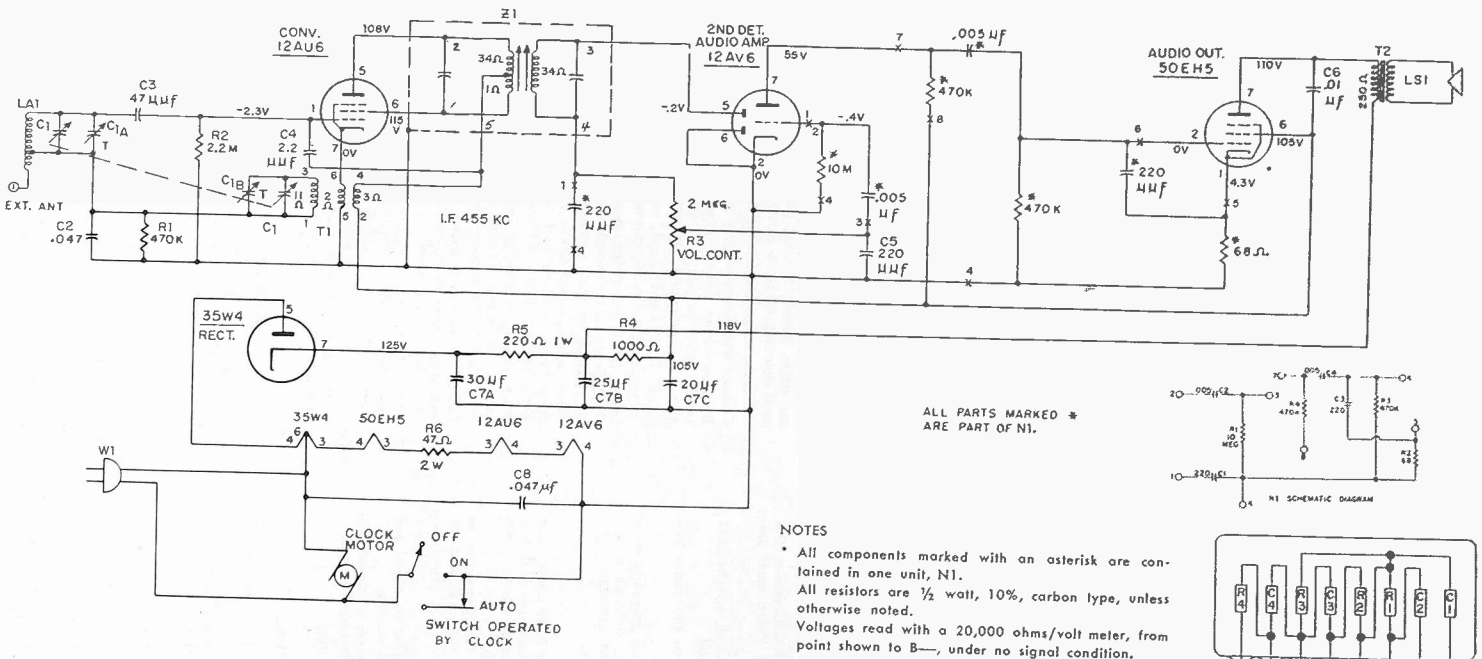
Perma-Circuit Panel, Under Side, Showing Component Layout

REPLACEMENT PARTS LIST

Reference Symbol	Description	Service Part No.
C1	Condenser, tuning	31-2790-3
C2	Condenser, gang return, .047 mfd	30-4650-45
C3	Condenser, converter grid coupling, 47 mmf, ceramic	30-1230-4
C4	Condenser, neutralizing, 2.2 mmf, ceramic	30-1221-6
C5	Condenser, IF filter and hi-cut, 220 mmf	62-122001001
C6	Condenser, tone compensation, .01 mfd, 500V, disk	30-1262
C7	Condenser, electrolytic, filter, 3 section, 30/25/20 mfd, 150V	30-2585-11
C8	Condenser, line by-pass, .047 mfd	30-4650-45
LA1	Antenna	32-4768-2
LS1	Speaker	36-1675-9
N1	Network, resistor-condenser	30-6500-2
R1	Resistor, gang return, 470,000 ohms	66-4478340
R2	Resistor, converter grid return, 2.2 megohms	66-5228340
R3	Volume control, 2 megohms	33-5575-18
R4	Resistor, B+ filter, 1000 ohms	66-2108340
R5	Resistor, B+ filter, 220 ohms, 1 watt	66-1224340
R6	Resistor, filament dropping, 47 ohms, 2 watts	66-0475340
T1	Transformer, oscillator	32-4776-1
T2	Transformer, audio output	32-8384-2
W1	Line Cord	41-4270-5
Z1	Transformer, IF	32-4627-3
	Printed Panel	54-6585-4

MISCELLANEOUS PARTS

Cabinet	51-0017
Contact, panel	28-12282
Contact, panel	28-12282-1
Clock	41-2068
Crystal	54-6713-2
Dial	54-5379-3
Hand, alarm set	28-11374-20
Hand, hour	28-11374-34
Hand, minute	28-11374-35
Hand, sweep second	28-11374-19
Knob, clock	54-6436-2
Shaft, rear time set	28-11985-4
Knob, tuning	54-6624-11
Knob, volume	54-6624-12
Socket, tube, 4 used	27-6309-1



ALL PARTS MARKED * ARE PART OF N1.

NOTES

* All components marked with an asterisk are contained in one unit, N1.
All resistors are ½ watt, 10%, carbon type, unless otherwise noted.
Voltages read with a 20,000 ohms/volt meter, from point shown to B—, under no signal condition.

N1 BACK VIEW, SHOWING INTERNAL CONNECTIONS.

Schematic Diagram — Model G-747

— PHILCO HOME RADIO —

SERVICE MANUAL

AM/FM TUNER — TYPE RT-202

PHILCO Factory-Supervised Service

SPECIFICATIONS

AM/FM Tuner Type RT-202 is used in the "G" line Philco High-Fidelity Radio-Phonographs.

Circuit—Eight-tube superheterodyne circuit.

Frequency Range—Broadcast (AM) 540KC-1620KC, FM 88MC-108MC.

Tuning Drive Ratio—10:1.

Operating Voltage—B+ and filament voltages are supplied by its associated amplifier.

Intermediate Frequencies—AM-455KC. FM-10.7MC.

Philco Tubes—6BZ6, FM r-f amplifier; 6AB4, FM converter; 6BA6, 1st FM i-f; 6BA6, AM r-f; 6BE6, AM converter; 6BA6, AM/FM i-f; 6BY8, FM i-f and limiter; 6BJ7, Armstrong type FM detector, AM detector and AVC.

Antennas—AM-built-in magnecor or loop.
FM-Line cord with provisions for connecting external antenna.

AM ALIGNMENT PROCEDURE

The AM alignment should be completed before the FM alignment is performed. Before beginning the alignment, allow the receiver and test equipment to warm up for fifteen minutes.

DIAL POINTER—With the gang fully closed, adjust the pointer to coincide with the first small index mark before the "5" (540 kc.) on the scale.

TUNER CONTROLS—Set the function switch to the AM band, and the tuning control as indicated.

OUTPUT INDICATOR—Place a scope across the audio output, J1 to ground.

SIGNAL GENERATOR—Use an AM r-f signal generator with modulated output. Connect generator, through a .05-ufd condenser, to grid, pin 7 of AM converter, V8 (6BE6). Connect ground lead to chassis.

PROCEDURE—

1. Set generator to 455 kc. (tuning gang fully open) and adjust, in order given, top of T7, bottom of T11, bottom of T7, and top of T11, for maximum output. Repeat until no further gain is indicated.
2. Connect generator to radiating loop. Set generator to 1600 kc. Set receiver to 1600 kc. as indicated by pointer. Adjust VC4B (osc. trimmer) for maximum output.
3. Set generator to 1400 kc. Tune receiver to signal and adjust VC4A and VC4C for maximum output.
4. Set generator to 580 kc. and tune receiver to signal; adjust core in r-f transformer T9 for maximum output.
5. Repeat steps 4 and 5 for maximum output.

FM ALIGNMENT PROCEDURE

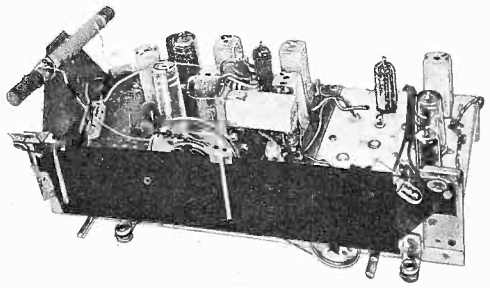
The AM alignment should be completed before the FM alignment is performed.

DIAL POINTER—With the gang fully closed, adjust the pointer to coincide with the first small index mark before the "88" (88MC) on the scale.

TUNER CONTROLS—Set the function switch to the FM position, and the tuning control as indicated.

OUTPUT INDICATOR—As given below. Calibrate scope for 2 volts P/P. Connect scope, through a 100,000-ohm isolating resistor, to junction of R18, R20 and C30 (ground lead of scope to chassis).

SIGNAL GENERATOR—Use FM r-f signal generator. Connect the signal generator to pin 1 of V1 (6BZ6) (ground lead of generator to chassis).



AM/FM Tuner — Type RT-202

PROCEDURE—

1. Inject 10.7 mc. (unmodulated) marker signal.
2. Inject 10.7 mc. sweep signal, approximately 150 kc. total deviation (do not over sweep).
3. Adjust cores at top and bottom of T6, top and bottom T5, and top and bottom of T4 for maximum-amplitude, symmetrical curve with the 10.7 mc. marker at top of curve. Adjust input signal to maintain output as shown on scope, below 2 volts peak during alignment. Repeat this step until no further gain is obtained.
4. Calibrate scope for 5 volts P/P.
5. Change scope connections to J1 (output cable).
6. Remove sweep signal. Inject 10.7 mc. 30% AM modulated, signal to pin 1 of 6BY8. Adjust top of T8 for minimum indication between peaks. See NOTE below.
7. Inject 10.7 sweep signal, and adjust bottom of T8 for maximum-amplitude, symmetrical output.
8. Inject 108.5 mc. sweep signal (approximately 150 KC. total deviation) through an antenna matching network, to receiver antenna terminals.
9. Open tuning condenser. Insert a 6 mil, non-metallic shim between stator and rotor of FM gang, and close gang against shim. Adjust VC3 for maximum output.
10. With tuning condenser fully closed, inject 87.75 mc. sweep (as in step 8) and adjust T3 for maximum output. See NOTE below.
11. Inject 91 mc. sweep signal (as in step 8) and with tuning gang tuned to 91 mc., adjust T2 for maximum output. See NOTE below.
12. Inject 105 mc. sweep signal (as in step 8), and with tuning gang tuned to 105 mc., adjust VC2 for maximum output. See NOTE below.

NOTE: The signal input must be as low as possible in order to obtain a sharp indication. In some cases it may be necessary to set the signal generator to the first sub harmonic.

CHASSIS VARIATIONS

Variations of the RT-202 chassis will be found as follows, RT-202-1, RT-202-2, RT-202-3, RT-202-4. The variations consist primarily of varying lengths of the connecting cables and leads, different dial pointers and AM antennas used (see parts list) and varying methods of mounting the pilot lights.

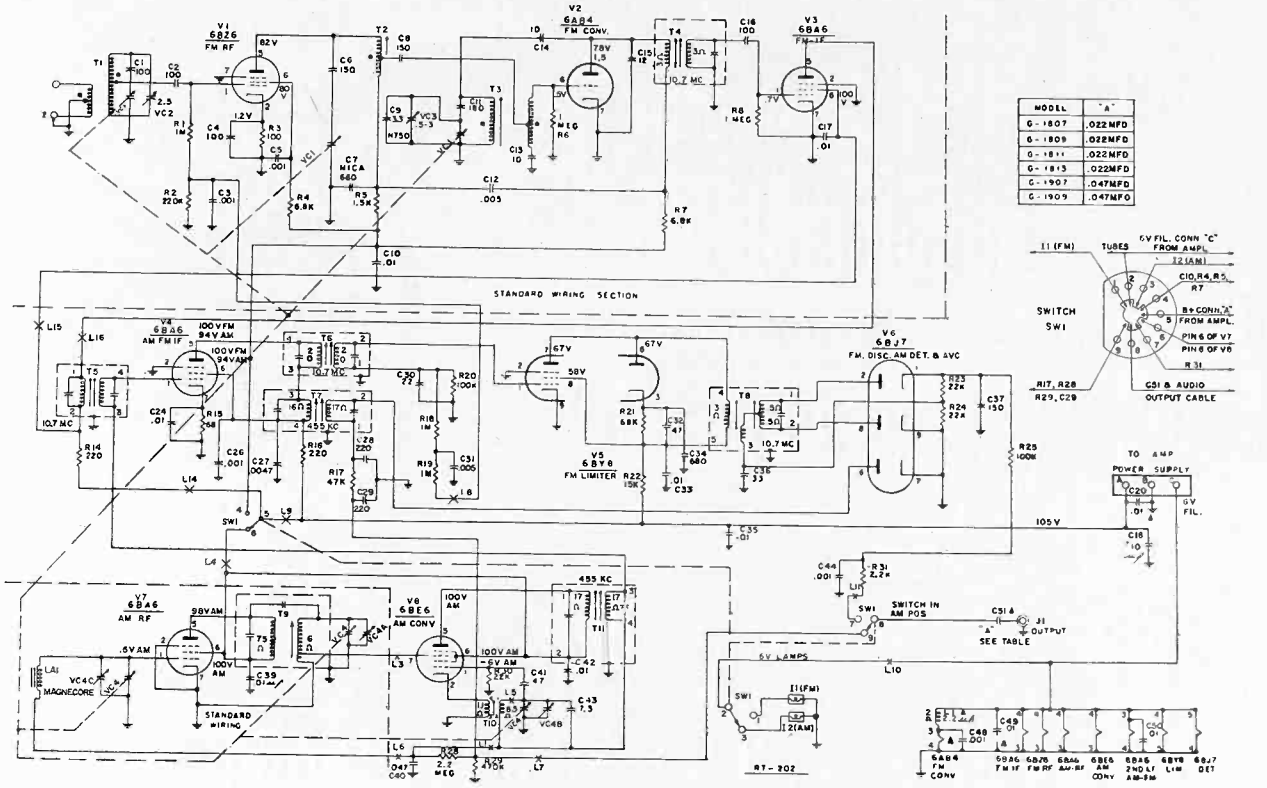
Electrically all chassis are identical except the RT-202-2 and the RT-202-4. The RT-202-4 chassis contains a 560 ohm resistor and .01 mfd capacitor from the cathode of the AM-RF amplifier (V7) to ground. Lug L1 on the printed wire panel of the RT-202-4 chassis is grounded, thus returning the secondary of T10 and condenser C43 to ground instead of the AVC circuit. The RT-202-2 chassis uses an AM antenna coil while the remaining chassis use a magnecore antenna (see parts list).

Top View — Showing Alignment Points, Tube Locations and Tie Lugs

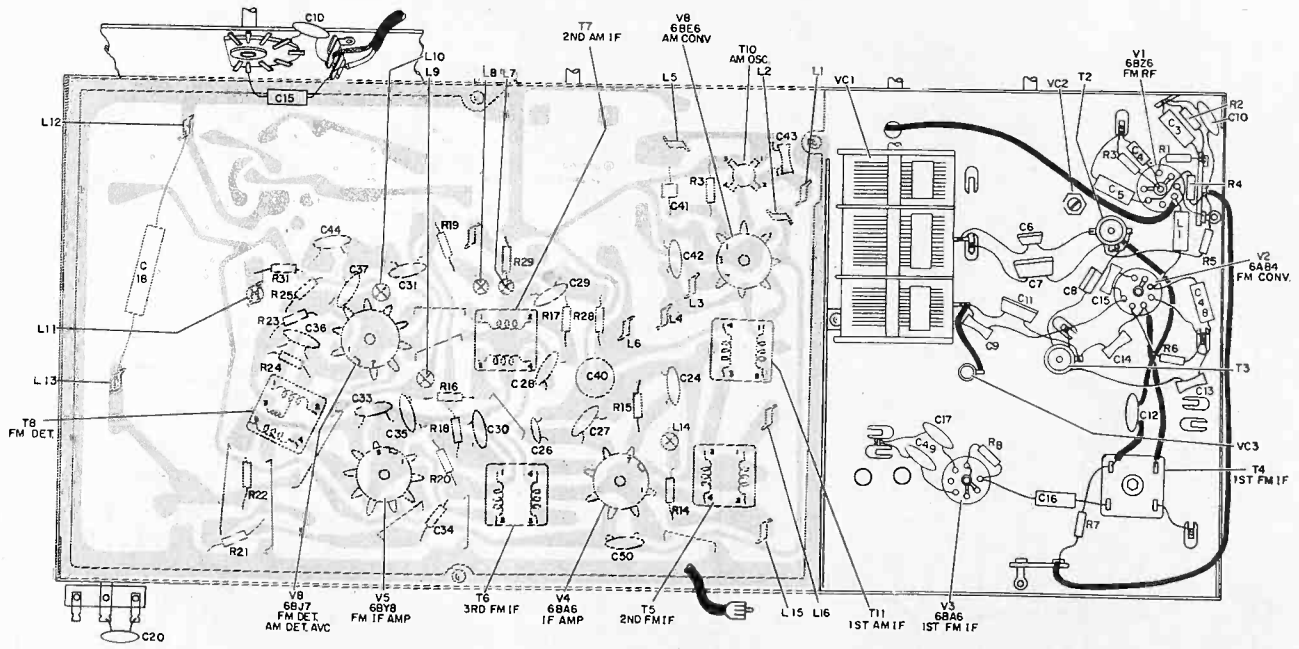
IDENTIFICATION OF PRINTED PANEL TIE LUGS

⊗ on above panel indicates connection on printed-wire side

L1 Black lead from L6.
L2 Brown leads (fil.) from pin 4, 6BA6 (V7), pin 4, 6BZ6 (V1) and pin 4, 6BA6 (V3).
L3 Green lead from transformer T9 to pin 7, 6BE6 (V8).
L4 Red leads from pin 6, 6BA6 (V7) and terminal 6 on switch SW1.
L5 Green lead from VC4B.
L6 Antenna return—ave lead.
L7⊗ Black lead (AM audio) from terminal 9 of switch SW1.
L8⊗ Yellow lead from R19 to R1, R2 and C3.
L9⊗ Red lead from terminal 5 of switch SW1 to R16 and C35.
L10⊗ Brown lead (fil.) from terminal 2 of switch SW1 to pin 5 6BJ7 (V6).
L11⊗ Orange lead from terminal 7 of switch SW1 to R31.
L12 Lead from panel ground to chassis ground, pilot light and C18 ground connection.
L13 Orange lead (B+) from amplifier power supply connection terminal "A", C18.
L14⊗ Red lead (B+) from terminal 5 of switch SW1 to R14.
L15 Black lead (B+) to pin 6 of 6BA6 (V3) and C17.
L16 Blue lead (B+) to pin 5 of 6BA6 (V3).

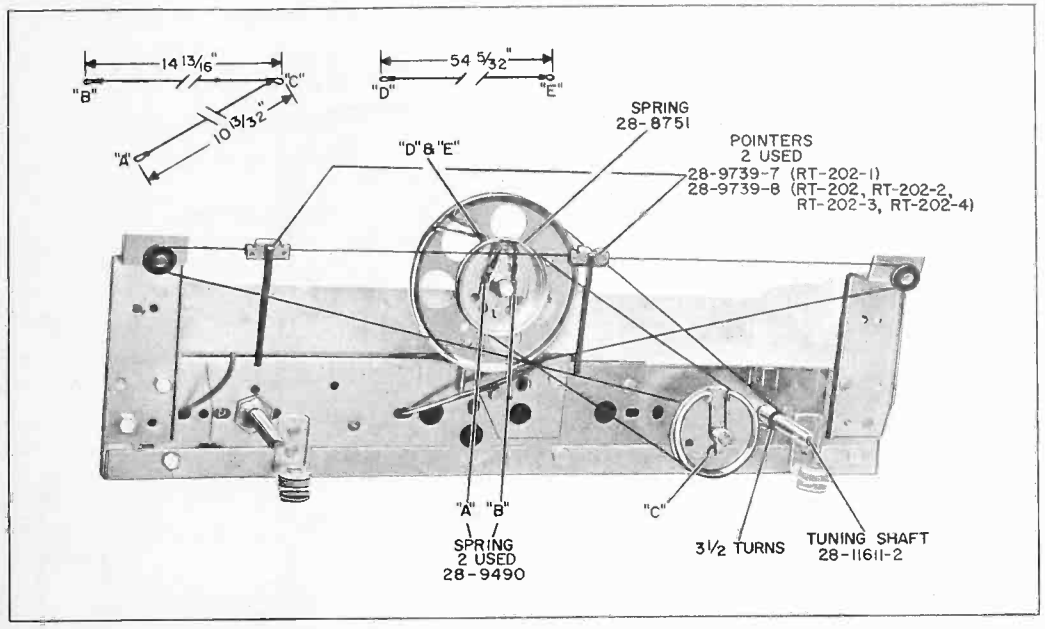


Schematic Diagram of RT-202 AM/FM Tuner

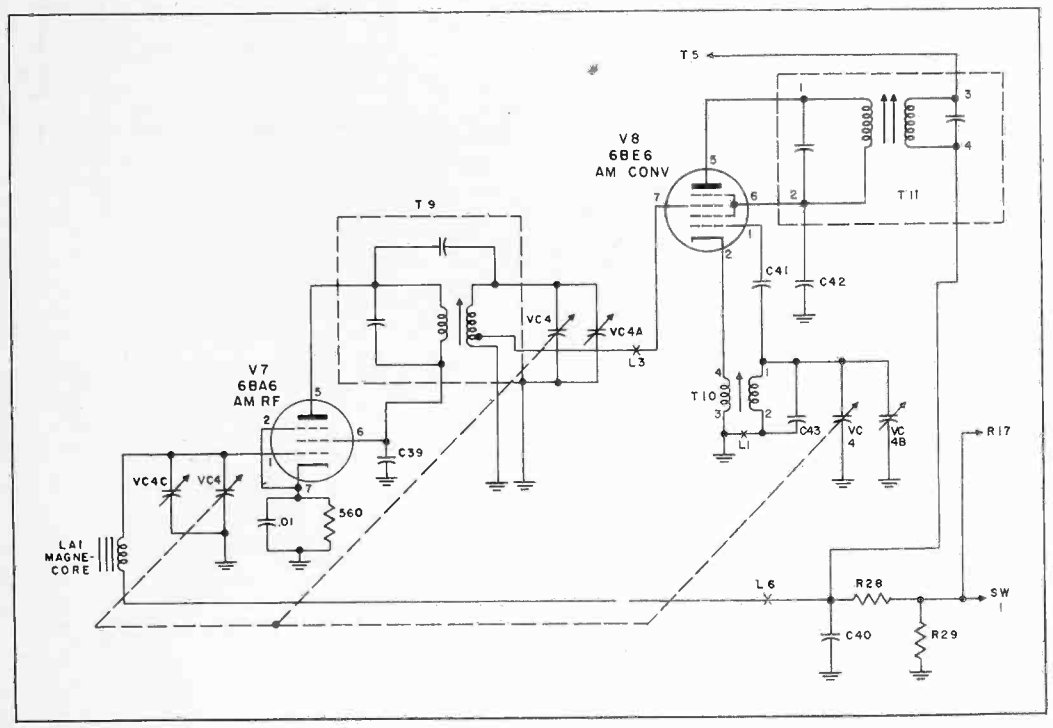


Bottom View — Showing Location of Components, Tubes and Tie Lugs

⊛ on above panel indicates connection on printed-wire side



Drive Cord Installation Details



RT-202-4 AM RF and Converter Circuits

REPLACEMENT PARTS LIST FOR TUNER RT-202

Reference Symbol	Description	Service Part No.
C1	Capacitor, antenna tracking, 100 μμf	30-1257-12
C2	Capacitor, i-f coupling, 100 μμf	Part of T1
C3	Capacitor, a-v-c by-pass, .001 μf	62-210001011
C4	Capacitor, 6BZ6 cathode, 100 μμf	62-110009001
C5	Capacitor, screen by-pass, .001 μf	62-210001011
C6	Capacitor, r-f tracking, 150 μμf	30-1257-13
C7	Capacitor, plate by-pass, 680 μμf	30-1257-15
C8	Capacitor, i-f coupling, 150 μμf	Part of T2
C9	Capacitor, osc. drift, 3.3 μμf	30-1224-114
C10	Capacitor, B+ by-pass, .01 μμf	30-1238-2
C11	Capacitor, osc. tracking, 180 μμf	30-1257-8
C12	Capacitor, i-f neutral, .005 μf	30-1238-20
C13	Capacitor, FM osc. neutral, 10 μμf	62-010009001
C14	Capacitor, osc. coupling, 10 μμf	62-010009001
C15	Capacitor, conv. plate, 12 μμf	62-012300001
C16	Capacitor, i-f coupling, 100 μμf	62-110009001
C17	Capacitor, screen by-pass, .01 μf	30-1238-2
C18	Capacitor, electrolytic, B+ filter 10 mfd, 150 V	30-2596-1
C20	Capacitor, B+ by-pass, .01 μf	30-1238-2
C24	Capacitor, 6BA6 cath., .01 μf	30-1262
C26	Capacitor, 6BA6 screen, .001 μf	30-1262-11
C27	Capacitor, 6BA6 screen, .0047 μf	30-1262-3
C28	Capacitor, diode filter, 220 μμf	30-1262-41
C29	Capacitor, diode filter, 220 μμf	30-1262-41
C30	Capacitor, 6BY8 grid, 22 μμf	30-1263-19
C31	Capacitor, a-v-c, .0047 μf	30-1262-3
C32	Capacitor, dyn. lim. cath., .47 μf., 200 V	30-4685-34
C33	Capacitor, 6BY8 screen, .01 μf	30-1262
C34	Capacitor, dyn. lim. cath., 680 μμf	62-168001011
C35	Capacitor, B+ by-pass, .01 μf	30-1262
C36	Capacitor, r-f by-pass, 33 μμf	30-1263-35
C37	Capacitor, 6BJ7 cathode, 150 μμf	30-1262-28
C39	Capacitor, am r-f screen by-pass, .01 μf	30-1262-2
C40	Capacitor, a-v-c, .047 μf, 200 V	30-4685-45
C41	Capacitor, osc. grid, 47 μμf	30-1230-4
C42	Capacitor, 6BE6 B+, .01 μf	30-1262
C43	Capacitor, comp. 7.5 μμf	30-1224-83
C44	Capacitor, 6BJ7 cathode, .001 μf	62-210001011
C48	Capacitor, fil. by-pass, .001 μf	62-210001011
C49	Capacitor, fil. by-pass, .01 μf	30-1262
C50	Capacitor, fil. by-pass, .01 μf	30-1262
C51	Capacitor, audio coupling, .022 μf	30-4651-23
	Capacitor, audio coupling, .047 μf	30-4650-45
I1	Pilot lamp	34-2031-13
I2	Pilot lamp	34-2031-13

Reference Symbol	Description	Service Part No.
L1	Choke, filament, 2.2 μh	32-4422-8
LA1	Antenna, coil (RT-202-2 only)	32-4682-6
	Antenna, magnecore	32-4682-4
R1	Resistor, 6BZ6 grid, 1 megohm	66-5108340
R2	Resistor, a-v-c, 220,000 ohms	66-4228340
R3	Resistor, r-f cathode, 100 ohms	66-1108340
R4	Resistor, r-f screen, 6800 ohms	66-2688340
R5	Resistor, r-f plate, 1500 ohms	66-2158340
R6	Resistor, osc. grid, 1 megohm	66-5108340
R7	Resistor, i-f plate, 6800 ohms	66-2688340
R8	Resistor, i-f grid,1 megohm	66-5108340
R14	Resistor, B+, 220 ohms	66-1228340
R15	Resistor, 6BA6 cathode, 68 ohms	66-0688340
R16	Resistor, B+, 220 ohms	66-1228340
R17	Resistor, diode filter, 47,000 ohms	66-3478340
R18	Resistor, a-v-c, 1 megohm	66-5108340
R19	Resistor, a-v-c, 1 megohm	66-5108340
R20	Resistor, 6BY6 grid, 100,000 ohms	66-4108340
R21	Resistor, dyn. lim. cath., 68,000 ohms	66-3688340
R22	Resistor, B+, 15,000 ohms	66-3158340
R23	Resistor, 6BJ7 cath., 22,000 ohms	66-3228340
R24	Resistor, 6BJ7 cath., 22,000 ohms	66-3228340
R25	Resistor, 6BJ7 cath., 100,000 ohms	66-4108340
R28	Resistor, a-v-c, 2.2 megohms	66-5228340
R29	Resistor, diode load, 470,000 ohms	66-4478340
R30	Resistor, osc. grid, 22,000 ohms	66-3228340
R31	Resistor, 6BJ7 cath., 2,200 ohms	66-2228340
SW1	Switch, AM and FM	42-2065-1
T1	Transformer, FM antenna	32-4751-1
T2	Transformer, FM r-f	32-4717-2
T3	Transformer, FM osc.	32-4716-1
T4	Transformer, 1st i-f, FM	32-4715-1
T5	Transformer, 2nd i-f, FM	32-4712-1
T6	Transformer, 3rd i-f, FM	32-4712-2
T7	Transformer, 2nd i-f, AM	32-4583-17
T8	Transformer, discriminator	32-4752-1
T9	Transformer, r-f	32-4389-8
T10	Transformer, oscillator, AM	32-4693-9
T11	Transformer, 1st i-f, AM	32-4583-17
VC1	Tuning gang, FM	31-2789-1
VC2	Variable capacitor, padder, 1-5 μμf	31-6520-14
VC3	Variable capacitor, padder, 5-3 μμf	31-6520-18
VC4	Tuning gang, AM	31-2787-4
	Printed Panel	54-9961-6

MISCELLANEOUS PARTS

Description	Service Part No.
Clip, transformer mtg. (2)	56-7057
Grounding finger ,PW Mtg. tube shield	82-11233
Pointer, 2 used RT-202-1	28-9739-7
Pointer, 2 used RT-202, RT-202-2, RT-202-3, RT-202-4	28-9739-8
Shaft tuning	28-11611-2
Shield, tube, 6BJ7	56-5629-13
Shield, tube, 6BY8	56-5629-13
Shield, tube, 6BE6	56-5629-12
Shield, tube, 6BZ6	56-5629-20
Socket, assy. pilot lamp, 2 used	28-6233-153
Socket, tube, 6BZ6	27-6203-14
Socket, tube, 6BA6, 2 used	27-6203
Socket, tube 7 pin min., PW panel mtg.	27-6309-1
Socket, tube, 9 pin min., PW panel mtg.	27-6309-2
Spring, FM drive, 2 used	28-9490
Spring, tuning drive	28-8751

—PHILCO HI-FIDELITY PHONOGRAPHS—

SERVICE MANUAL

MODELS G-1706, G-1706S, G-1707, G-1707S, SA-1500 and RT-150

PHILCO Factory-Supervised Service

SPECIFICATIONS

NOTE: The G-1706 contains a three-tube-plus rectifier amplifier and a type M-41 record changer. The G-1706S is similar to the G-1706 except the function switch has a stereo position and the M-41 record changer has a stereo cartridge. The G-1707 is a G-1706 with changes to accept a radio tuner. The G-1707 includes an RT-150 AM-FM tuner. The G-1707S is similar to the G-1707 except the function switch has a stereo position and the M-41 record changer has a stereo cartridge. The SA-1500 is the slave amplifier used with the G-1706S or the G-1707S for stereo. Its amplifier is similar to the G-1706 with a different function switch and a-c wiring changes necessitated by the absence of a record changer.

Cabinet — Wood console, mahogany, blond or walnut.

Circuit — Three-tube audio amplifier plus a rectifier. The amplifier includes bass, treble and loudness controls and a selector switch. Inputs are provided for phono stereo, (G-1706S and G-1707S only) phono monaural, tuner and tape recorder. Models G-1707 and G-1707S use the RT-150 AM-FM tuner. This tuner contains a six-tube superheterodyne circuit. Its operating voltages, B+ and filament, are supplied by the amplifier.

Audio Output — 15 watts

Operating voltage — 105-120 volts, 60 cycle, ac.

Power Consumption — Models G-1706, G-1706S and SA-1500, 85 watts. Models G-1707 and G-1707S, 100 watts.

Record Changer — A Philco 4-speed automatic record changer, Model M-41. A stereo cartridge is included in the changer used in Models G-1706S and G-1707S. For record changer service information refer to PR-3279.

Amplifier Tubes — 12AX7, tone and audio amp; 6V6 (2), push-pull audio output and 5Y3 rectifier.

Tuner Tubes — 12AT7, FM-RF and converter; 6BA6, FM IF; 6BE6, AM converter; 6BA6 AM-FM IF; 6AU6, limiter; 6BJ7, FM discriminator, AM detector and AVC.

Speakers — 10" woofer and a type "S" electrostatic.

Frequency Range — AM, 540KC to 1620KC. FM, 88MC to 108MC.

Tuning Drive Ratio — 10:1

Antennas — AM, pancake loop. FM, line cord with provisions for external antenna.

AM ALIGNMENT PROCEDURE

The AM alignment should be completed before the FM alignment. Before aligning the receiver, allow the receiver and test equipment to warm up for a least fifteen minutes.

1. Rotate the tuning capacitor to its fully closed position and then adjust the pointer to 540 KC on the scale.
2. Set the function switch to the RADIO position and the AM-FM switch to the AM position.
3. Connect an oscilloscope across the audio output.
4. Connect a signal generator, through a .05 mfd capacitor, to the grid of the AM converter, pin 7 of V6. Connect the ground lead to the chassis. Set the tuning capacitor to its full-open position. Set the signal generator to a 455 KC, modulated signal. Adjust, in the order given, top of T7, bottom of T9, bottom of T7 and top of T9 for maximum indication on the scope. Repeat until no further gain is indicated.
5. Connect the signal generator to a radiating loop. Set generator to 1600 KC. Set receiver pointer to 1600 KC. Adjust VC4B (osc. trimmer) for maximum indication on the scope.
6. Set generator to 1400 KC. Tune receiver to signal and adjust VC4A for maximum indication on the scope.

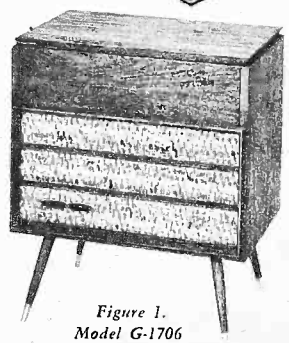


Figure 1. Model G-1706

FM ALIGNMENT PROCEDURE

The AM alignment should be completed before the FM alignment is performed.

1. Rotate the tuning capacitor to its fully closed position and then adjust the pointer to 88 MC on the scale.
2. Set the function switch to the RADIO position and the AM-FM switch to the FM position.
3. Connect an oscilloscope, through a 100,000-ohm isolating resistor, to junction of R9 and C19. Connect the oscilloscope ground lead to the chassis.
4. Connect the signal generator to the cathode of the FM, RF amplifier, pin 8 of V1. Connect the ground lead to the chassis.
5. Inject a 10.7 MC marker signal and a 10.7 MC sweep signal, approximately 150 KC total deviation (do not over sweep). Adjust cores in top and bottom of T6, T5 and T4 for maximum-amplitude, symmetrical curve with the 10.7 MC marker at the top of the curve. Adjust input signal to maintain output, as indicated on scope, below 2 volts peak during alignment. Repeat this step until no further gain is obtained.
6. Change scope connections to the output connector J1. Inject a 10.7 MC, 30% AM modulated signal to the grid of the 6AU6, pin 1 of V4. Adjust top of T8 for minimum indication between peaks and then adjust bottom of T8 for maximum-amplitude, symmetrical output. Adjust input signal to maintain output, as indicated on scope, below 5 volts peak during alignment. (See NOTE below.)
7. Open tuning capacitor. Insert a 6-mil, non-metallic shim between stator and rotor of the FM gang and then close the capacitor against the shim. Inject 108.5 MC sweep signal (approx. 150 KC total deviation), through an antenna matching network, to the receiver antenna terminals. Adjust VC2 for maximum output.
8. Close (mesh) the tuning capacitor. Inject 87.75 MC sweep signal (Approx. 150 KC total deviation) through an antenna matching network, to the receiver antenna terminals, and adjust T3 for maximum output (See NOTE below).
9. Set pointer to 91 MC and inject a 91 MC sweep signal. Adjust T2 for maximum output. (See NOTE below)
10. VC3 is the oscillator bridge capacitor used to minimize oscillator radiation. This is a factory adjustment and should not require further adjustment in the field.

NOTE: The signal input must be as low as possible in order to obtain a sharp indication. In some cases it may be necessary to set the signal generator to the first sub-harmonic.

PRODUCTION CHANGE

In later models, C7, C8, C9, C10, R7 and R8 of the amplifier are replaced by network, Philco part no. 58-1893. The physical location of C4 and R10 are changed to accommodate the network.

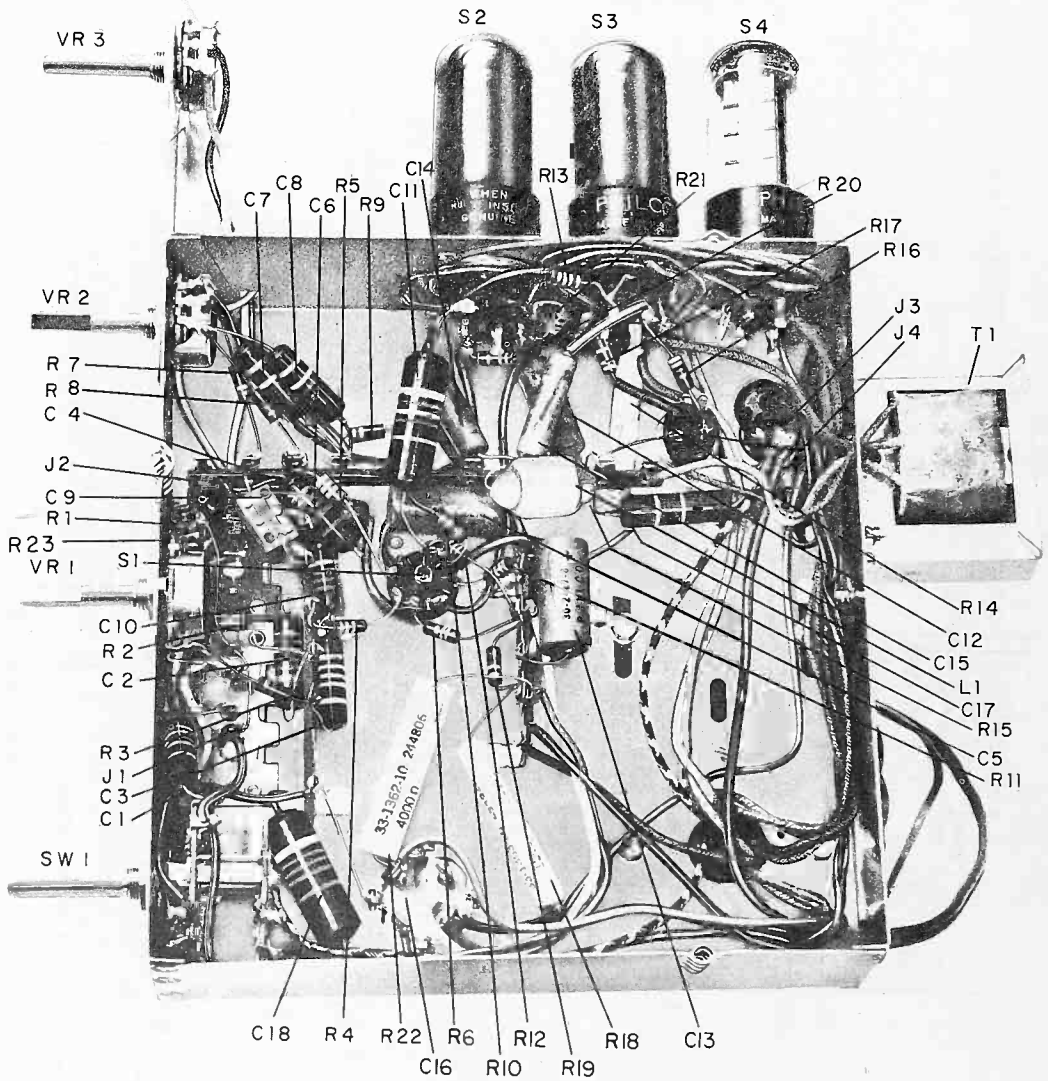


Figure 2. Bottom View of Amplifier

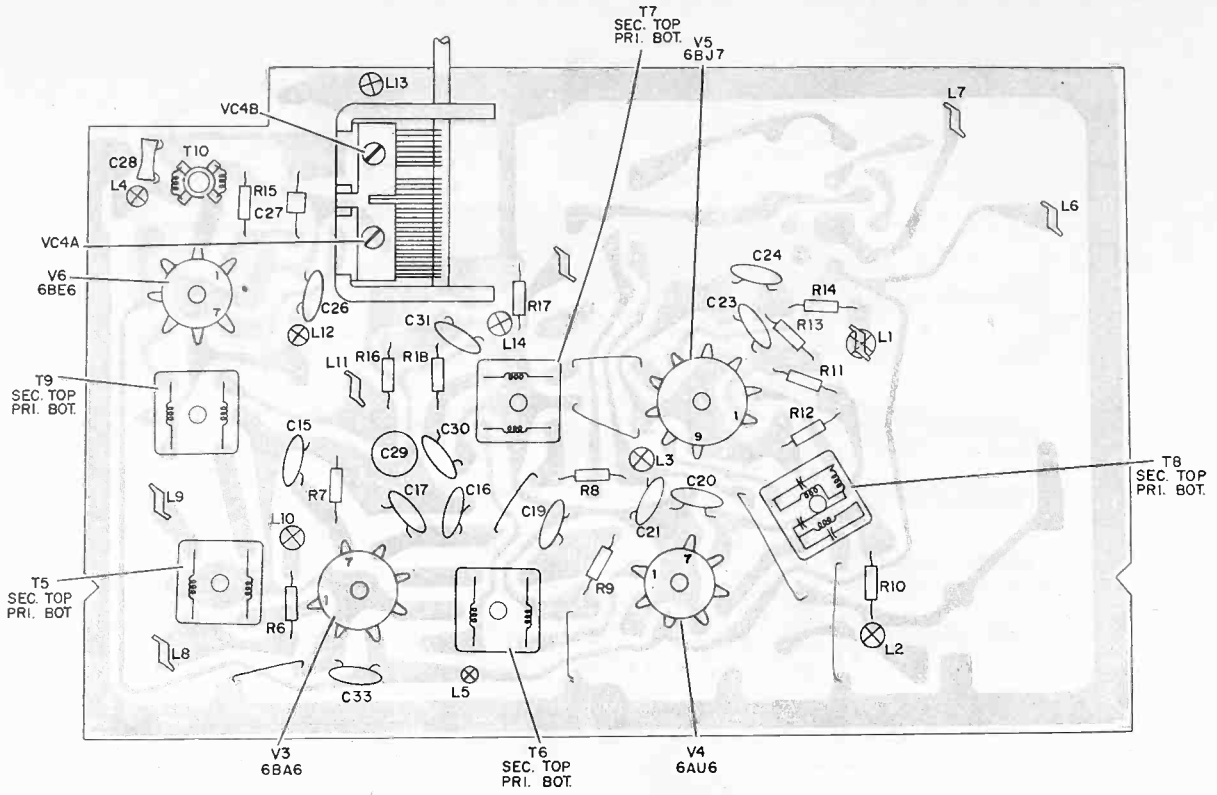


Figure 4. PW Panel of RT-150

IDENTIFICATION OF PRINTED PANEL TIE LUGS

NOTE: Symbol ⊗ indicates connection on bottom of panel.

L1	Connected to terminal 7 of AM-FM switch.	L6	Connected to filament terminal of power terminal strip and terminal 2 of AM-FM switch.	L10	Connected to terminal 5 of AM-FM switch.
L2	Connected to B+ terminal of power terminal strip.	L7	Connected to chassis ground.	L11	Connected to loop antenna.
L3	Connected to terminal 5 of AM-FM switch.	L8	Connected to pin 6 of V2 (screen grid of 6BA6).	L12	Connected to terminal 6 of AM-FM switch.
L4	Connected to L13 (ground).	L9	Connected to pin 5 of V2 (plate of 6BA6).	L13	Connected to L4.
L5	Connected to pin 4 of V2 (fil. of 6BA6).			L14	Connected to terminal 9 of AM-FM switch.

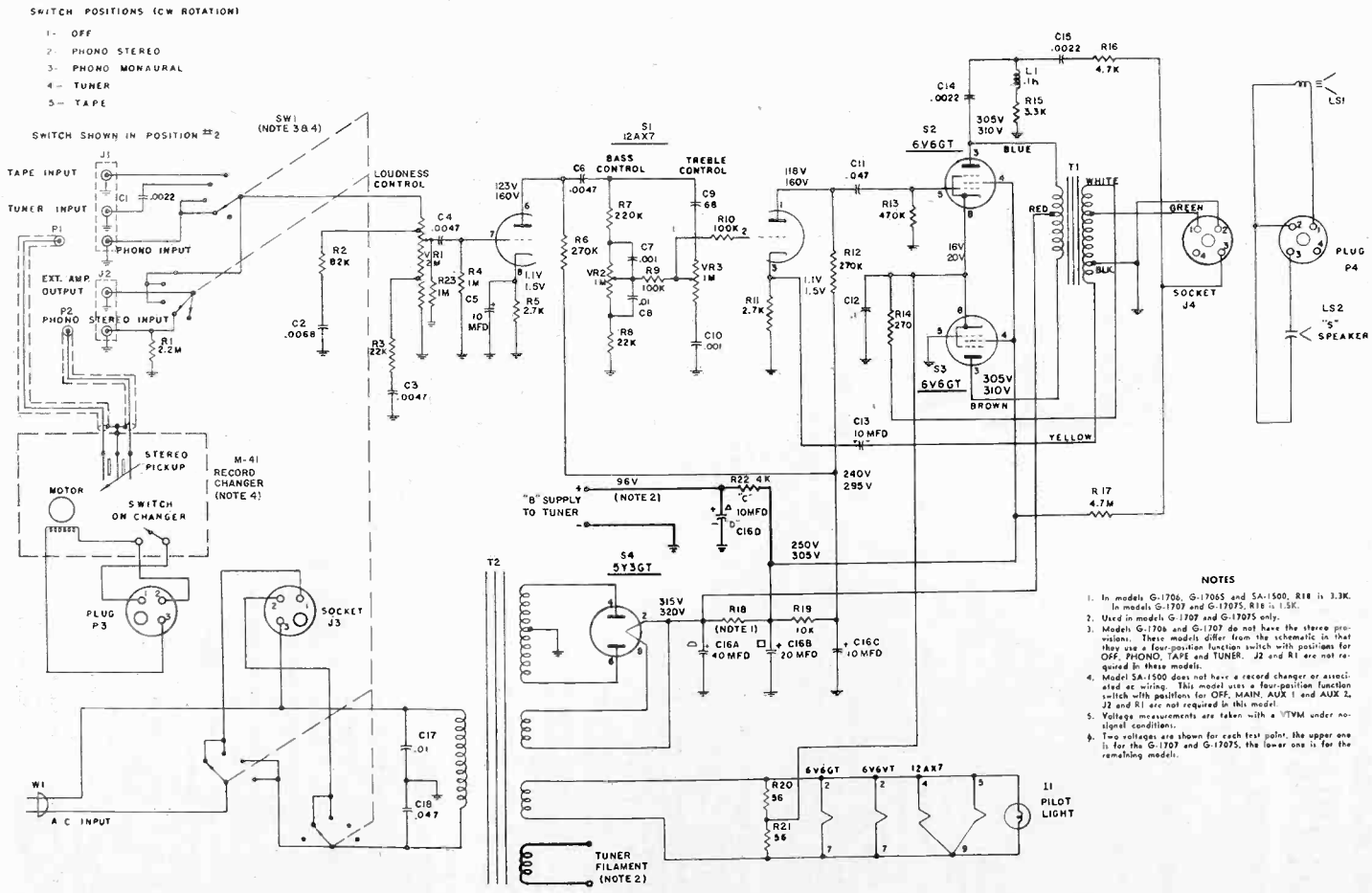


Figure 3. Schematic Diagram of Amplifier

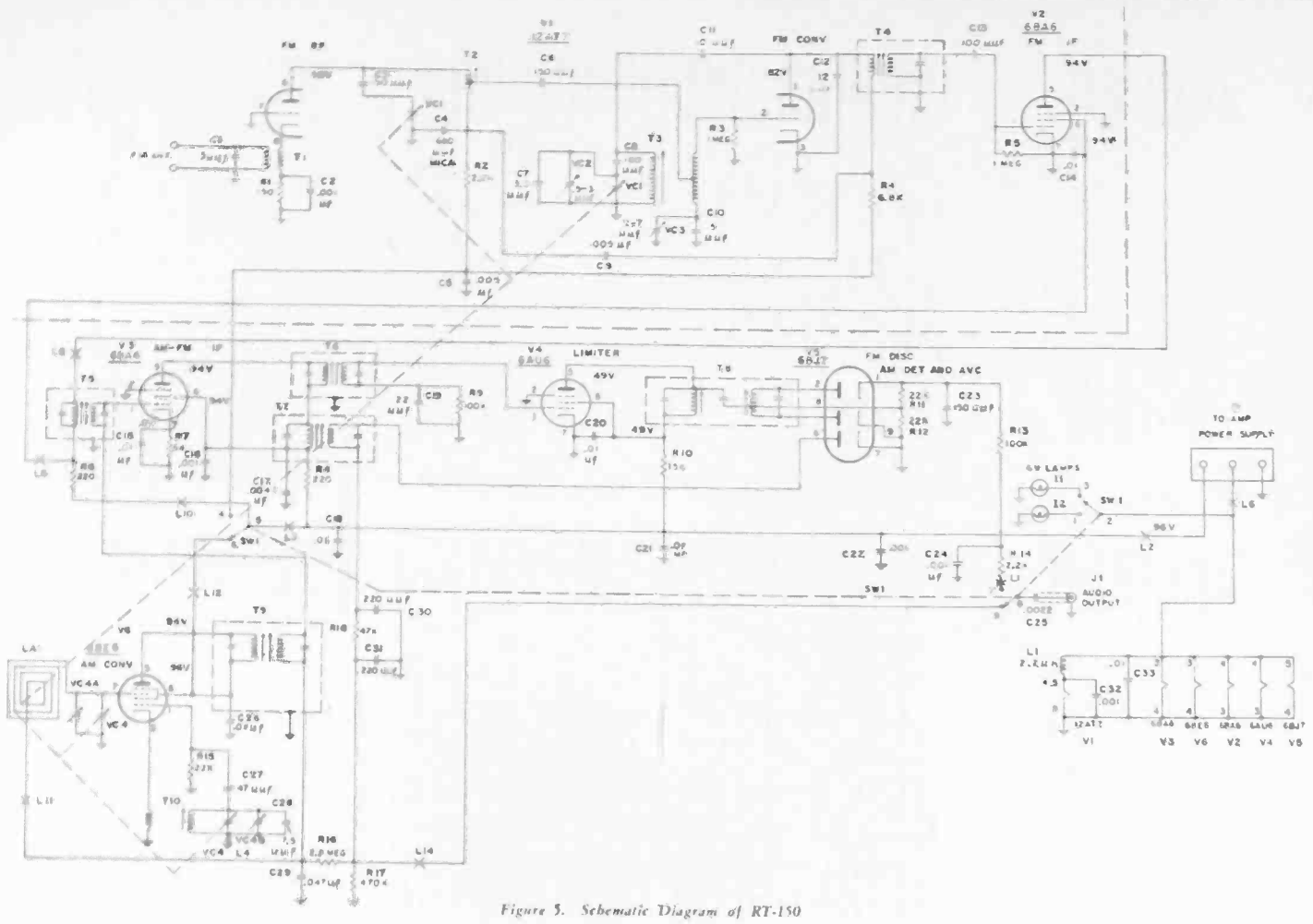
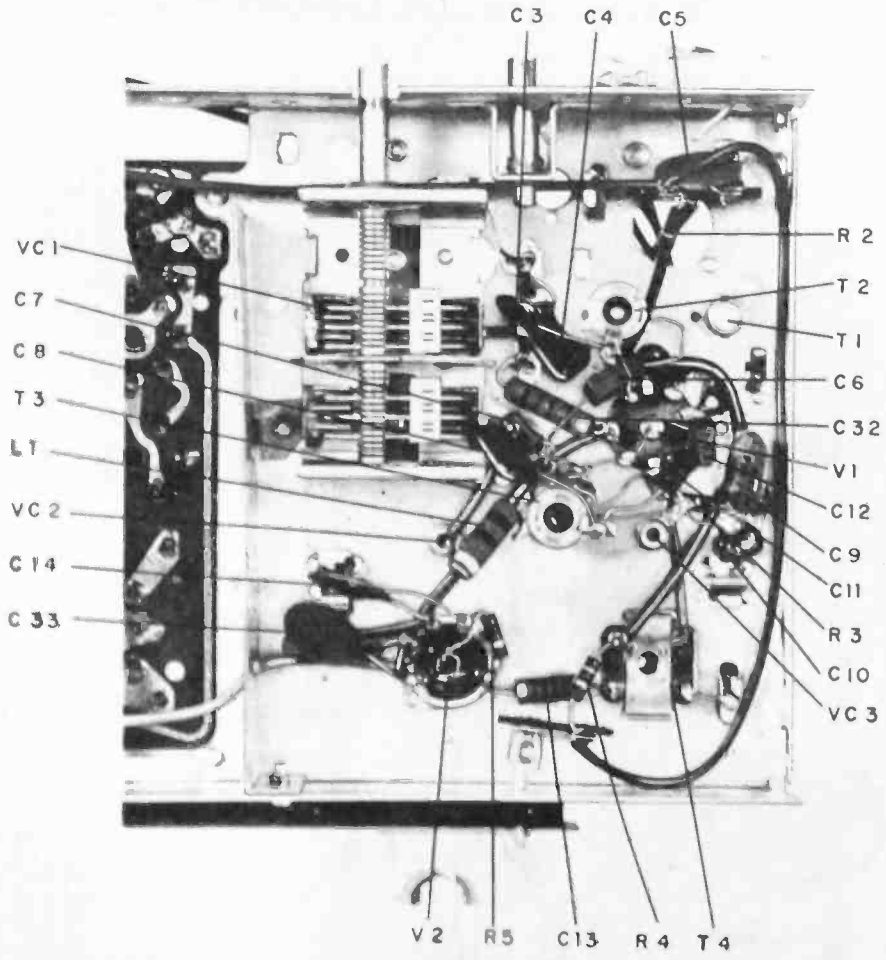


Figure 5. Schematic Diagram of RT-150



NOTE: C1, C2 AND R1 ARE LOCATED ON TOP OF THE CHASSIS.

Figure 6. Parts Location, FM Section of RT-150

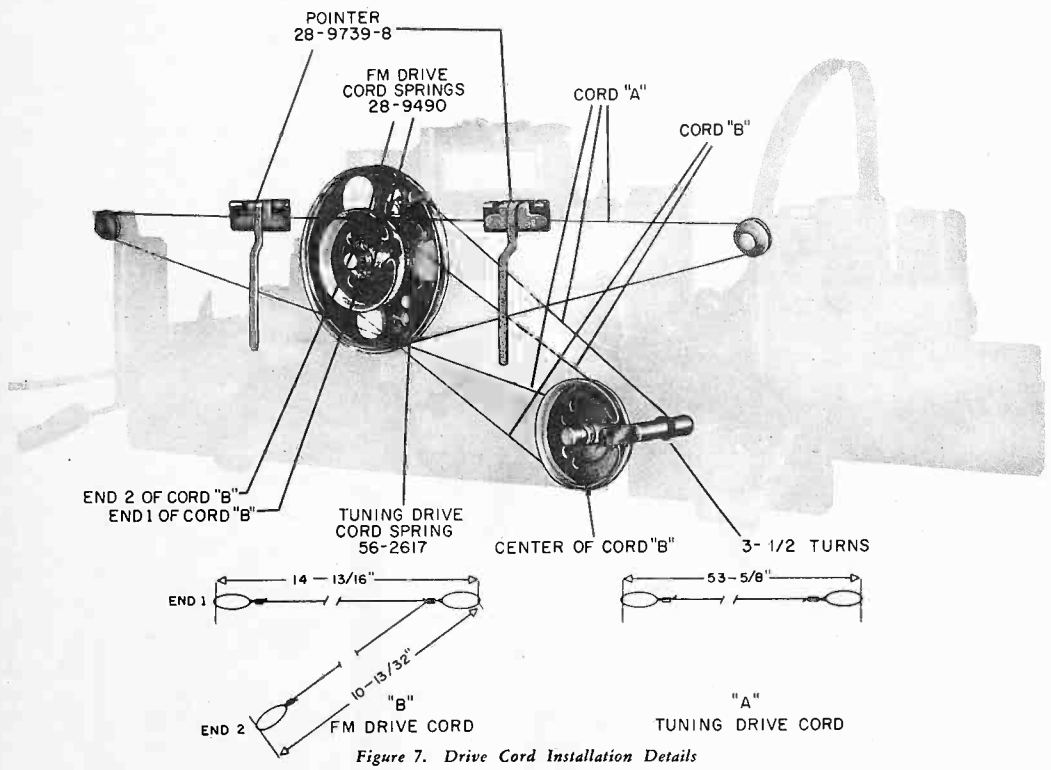


Figure 7. Drive Cord Installation Details

REPLACEMENT PARTS LIST

AMPLIFIER

Reference Symbol	Description	Service Part No.
C1	Capacitor, tuner input, .0022 mfd	30-4651-23
C2	Capacitor, tone comp, .0068 mfd	30-4651-31
C3	Capacitor, tone comp, .0047 mfd	30-4651-6
C4	Capacitor, audio coupling, .0047 mfd	30-4650-56
C5	Capacitor, electrolytic, cathode bypass 10 mfd	30-2417-8
C6	Capacitor, audio coupling, .0047 mfd	30-4650-56
C7	Capacitor, bass control, .001 mfd	30-4651-4
C8	Capacitor, bass control, .01 mfd	30-4651-28
C9	Capacitor, treble control, 68 mmf	60-00685417
C10	Capacitor, treble control, .001 mfd	30-4651-4
C11	Capacitor, audio coupling, .047 mfd	30-4650-62
C12	Capacitor, cathode by-pass, .1 mfd	30-4656-6
C13	Capacitor, electrolytic feedback, 10 mfd	30-2417-8
C14	Capacitor, output plate, .0022 mfd	30-4650-88
C15	Capacitor, output plate, .0022 mfd	30-4650-88
C16	Capacitor, electrolytic, B+ filter 40/20/10/10 mfd	30-2590-33
C17	Capacitor, line bypass, .01 mfd	30-4650-58
C18	Capacitor, line bypass, .047 mfd	30-4650-62
I1	Jewel light, No. 47	34-2068
J1	Jack, phono, tape and tuner input	27-6149-6
J2	Jack, stereo input and ext. amp. output	27-6149-4
J3	Socket, phono AC	27-6273-11
J4	Socket, speaker	27-6273-26
L1	Choke, crossover network	32-4628
LS1	Speaker, 10" pm	36-1653-6
LS2	Speaker, electrostatic, type "S"	36-1656-1
P2	Plug, phono	Part of changer
P1	Plug, stereo	Part of changer
P3	Plug, phono AC	Part of changer
P4	Plug, speaker	27-6302-2
R1	Resistor, stereo input, 2.2 megohms	66-5228340
R2	Resistor, tone comp, 82K	66-3828340
R3	Resistor, tone comp, 22K	66-3228340
R4	Resistor, 12AX7 grid, 1 megohm	66-5108340
R5	Resistor, 12AX7 cathode 2.7K	66-2728340
R6	Resistor, 12AX7 plate, 270K	66-4278340
R7	Resistor, bass comp, 220K	66-4228340
R8	Resistor, bass comp, 22K	66-3228340
R9	Resistor, 12AX7 grid, 100K	66-4108340
R10	Resistor, 12AX7 grid, 100K	66-4108340
R11	Resistor, 12AX7 cathode, 2.7K	66-2278340
R12	Resistor, 12AX7 plate, 270K	66-4278340
R13	Resistor, 6V6 grid, 470K	66-4478340
R14	Resistor, 6V6 cathode, 270 ohms	33-1363-27
R15	Resistor, "S" speaker network, 3.3K	66-2338340
R16	Resistor, "S" speaker network, 4.7K	66-2478340
R17	Resistor, B+ to "S" speaker 4.7 meghoms	66-5478340
R18	Resistor, B+ filter, 3.3K (G-1706S and SA-1500 only)	66-2335340
	Resistor, B+ filter, 1.5K, 7W (G-1707S only)	33-1363-26

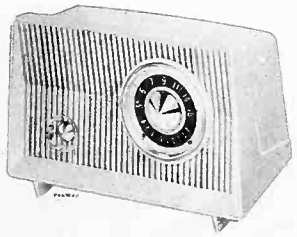
Reference Symbol	Description	Service Part No.
R19	Resistor, B+ filter, 10K	66-3108340
R20	Resistor, filament, 56 ohms	66-0568340
R21	Resistor, filament, 56 ohms	66-0568340
R22	Resistor, tuner B+, 4K	33-1362-10
R23	Resistor, loudness control circuit, 1 megohm	66-5108340
SW1	Switch, function, G-1707 only	42-2085-1
	Switch, function, G-1707S only	42-2093-1
	Switch, function, G-1706 only	42-2080-1
	Switch, function, SA-1500 only	42-2099-2
T1	Transformer, audio output	32-8791-1
T2	Transformer, power (G-1707S only)	32-8844-1
	Transformer, power (G-1706, 1706S)	32-8790
	Transformer, power (SA-1500 only)	32-C790-4
VR1	Volume control, 2 megohms	33-5535-47
VR2	Bass control, 1 megohm	33-5587-29
VR3	Treble control, 1 megohm	33-5587-29
W1	Line cord	L-2183
	Shield, tube 12AX7	56-5629-22
	Socket, 9 pin, 12AX7	27-6203-19
	Socket, octal (3 used)	27-6174
	Socket, and assy. pilot light	27-6233-28

RADIO TUNER RT-150

Reference Symbol	Description	Service Part No.
C1	Capacitor, FM antenna, 5 uuf.	30-1257-14
C2	Capacitor, FM, r-f cathode bypass, .001 mfd	62-210001011
C3	Capacitor, r-f tracking, 150 uuf.	30-1257-13
C4	Capacitor, RM, r-f plate bypass, 680 uuf.	30-1257-15
C5	Capacitor, B+ bypass, .005 mfd	30-1238-20
C6	Capacitor, coupling, 150 uuf.	30-1257-13
C7	Capacitor, osc. comp., 3.3 uuf.	30-1224-114
C8	Capacitor, osc. tracking, 180 uuf.	30-1257-8
C9	Capacitor, I.F. neut., .005 mfd	30-1238-20
C10	Capacitor, conv. grid, 5 uuf.	30-1257-14
C11	Capacitor, osc. coupling, 10 uuf.	62-010009001
C12	Capacitor, conv. plate 12 uuf.	62-012300001
C13	Capacitor, IF coupling, 100 uuf.	62-110009001
C14	Capacitor, IF screen bypass, .01 mfd	30-1238-2
C15	Capacitor, 6BA6 cathode, .01 mfd	30-1262
C16	Capacitor, 6BA6 screen, .001 mfd	30-1262-11
C17	Capacitor, 6BA6 screen, .0047 mfd	30-1262-3
C18	Capacitor, B+ bypass, .01 mfd	30-1238-2
C19	Capacitor, 6AU6 grid, 22 uuf.	30-1263-19
C20	Capacitor, 6AU6 screen, .01 mfd	30-1262
C21	Capacitor, B+ bypass, .01 mfd	30-1238-2
C22	Capacitor, B+ bypass, .001 mfd	62-210001011
C23	Capacitor, 6BJ7 r-f bypass, 150 uuf.	30-1262-24
C24	Capacitor, de-emphasis, .001 mfd	30-1262-45
C25	Capacitor, audio coupling, .0022 mfd	30-4651-23
C26	Capacitor, 6BE6 screen, .01 mfd	30-1262
C27	Capacitor, osc. grid, 47 uuf.	30-1230-4
C28	Capacitor, osc. bridge, 7.5 uuf.	30-1257-16
C29	Capacitor, AVC filter, .047 mfd	30-4685-45
C30	Capacitor, diode filter, 220 uuf.	30-1262-41
C31	Capacitor, diode filter, 220 uuf.	30-1262-41
C32	Capacitor, filter bypass, .001 mfd	62-210001011
C33	Capacitor, filter bypass, .01 mfd	30-1238-2
I1	Pilot light, No. 50	34-2031-13
I2	Pilot light, No. 50	34-2031-13
L1	Choke, filter 2.2 uh.	32-4422-8
LA1	Antenna, loop and panel	76-10507-1
R1	Resistor, r-f cathode, 150 ohms	66-1158340
R2	Resistor, r-f plate, 2200 ohms	66-2228340
R3	Resistor, osc. grid, 1 megohm	66-5108340
R4	Resistor, B+, 6800 ohms	66-2688340
R5	Resistor, i-f grid, 1 megohm	66-5108340
R6	Resistor, B+ 220 ohms	66-1228340
R7	Resistor, 6BA6 cathode	66-0688340
R8	Resistor, B+, 220 ohms	66-1228340
R9	Resistor, 6AV6 grid, 100K	66-4108340
R10	Resistor, 6AV6 screen, 15K	66-3158340
R11	Resistor, disc output, 22K	66-3228340
R12	Resistor, disc. output, 22K	66-3228340
R13	Resistor, de-emphasis, 100K	66-4108340
R14	Resistor, discriminator output 2200 ohms	66-2228340
R15	Resistor, osc. grid, 22K	66-3228340
R16	Resistor, AVC, 2.2 megohms	66-5228340
R17	Resistor, diode load, 470K	66-4478340
R18	Resistor, diode filter, 47K	66-3478340
SW1	Switch, am-fm	42-2065-1
T1	Transformer, FM ant.	32-4718-2
T2	Transformer, FM r-f	32-4717-1
T3	Transformer, FM osc.	32-4716-1
T4	Transformer, 1st FM, i-f	32-4715-1
T5	Transformer, 2nd FM i-f	32-4712-1
T6	Transformer, 3rd FM i-f	32-4712-2
T7	Transformer, 2nd AM i-f	32-4583-17
T8	Transformer, discriminator	32-4714-2
T9	Transformer, 1st AM i-f	32-4583-17
T10	Transformer, AM osc.	32-4693-10
VC1	Tuning gang, FM	31-2789-2
VC2	Variable capacitor, .5-3 uuf.	31-6520-18
VC3	Variable capacitor, 2-7 uuf.	31-6520-15
VC4	Tuning gang AM	31-2783-14
	Printed Panel	54-9961-5

MISCELLANEOUS PARTS

Description	Service Part No.
Cabinet	Order by description and Model No.
Antenna, FM	41-3791-4
Bezel, ampl.	28-12232-5
Bezel, RT-150	28-12234-2
Bezel, SA-1500	28-12232-6
Cup, mtg. spring, 3 used, changer	35-8053-113
Finger, grounding, tube shield	28-11233
Hinge, lid	45-6067-1FA21
Interlock, ac	27-6240-3
Knob, amplifier, 4 used	54-6271-4
Knob, selector	54-6035-13
Knob, RT-150	54-6035-2
Leg, light, 4 used	424-0022-25
Leg, mahogany, 4 used	424-0022-24
Leg, walnut, 4 used	424-0022-26
Lid, support	28-10423-3
Light clip	56-3545-5
Nameplate	76-10781
Pointer, 2 used, RT-150	28-9739-8
Scale, tuner	56-5390-1
Shaft, tuning, RT-150	28-11611-2
Shield, tube, 12AT7	56-5629-22
Socket assy., RT-150 pilot light	27-6233-4
Socket, 7 pin, RT-150	27-6203
Socket, 7 pin, 3 used, RT-150	27-6309-1
Socket, octal, 3 used	27-6174
Socket, 9 pin	27-6203-19
Socket, 9 pin, PW	27-6398-2
Socket, pilot light	27-6233-28
Spindle, 45 RPM adapter	76-10205-1
Stud, spindle	28-11263
Spring, dial cord, 2 used	28-9490
Spring, tuning drive cord	56-2617



X-2 Series—The "Signet"
Model X-2JE—Charcoal/Champagne White
Model X-2EF—Champagne White/Bonbon Pink
Model X-2HE—Bermuda Turquoise/Champagne White

Model X-1—The "Monogram"
Moonmist Gray

RCA VICTOR

AC-DC Radio Receiver

X-1, X-2 SERIES

Chassis No. RC-1188

SERVICE DATA

— 1959 No. 1 —

PREPARED BY COMMERCIAL SERVICE
RCA SERVICE COMPANY
A DIVISION OF
RADIO CORPORATION OF AMERICA
CAMDEN 8, N. J.

SPECIFICATIONS

TUNING RANGE ..... 540-1,600 kc

INTERMEDIATE FREQUENCY ..... 455 kc

TUBE COMPLEMENT

(1) RCA 12BE6 ..... Converter
(2) RCA 12BA6 ..... I.F. Amplifier
(3) RCA 12AV6 ..... Det.-AVC-A.F. Amp.
(4) RCA 50C5 ..... Output
(5) RCA 35W4 ..... Rectifier

POWER SUPPLY RATING

115 volts d. c. or 50 to 60 cycles a. c. ..... 30 watts

TUNING DRIVE RATIO ..... 1:1 (direct drive)

LOUDSPEAKER

Size and type ..... 4 in. P.M.
Voice coil impedance ..... 3.2 ohms at 400 cycles

POWER OUTPUT

Undistorted ..... 1.0 watts
Maximum ..... 1.3 watts

WEIGHT ..... Approximately 2¾ lbs.

CABINET DIMENSIONS

Height ..... 6⅞" Width ..... 10½" Depth ..... 5⅝"

DESCRIPTION

Model X-1 and models of the X-2 Series are five-tube (including rectifier) table model radio receivers designed for operation on 115 volts AC or DC power supply. The cabinet completely encloses the radio chassis, using a molded hood instead of a conventional back cover. The chassis, ferrite rod antenna, and speaker are attached to the molded plastic cabinet front.

The chassis is of the "printed wiring" type in which all electrical components, except loop antenna and speaker, are mounted on an insulation plate. All wiring is "printed" on the underside of the insulation plate. A conventional superheterodyne circuit is employed using 150-milliampere series-string miniature tubes.

The power supply attachment cord is fastened to the cabinet back and becomes disconnected from the chassis when the back is removed.

Alignment Procedure

Test-Oscillator—For all alignment operations, connect the low side of the test-oscillator through an isolating capacitor to the "common negative wiring." Keep the oscillator output as low as possible to avoid a-v-c action.

An isolation transformer (115 v./ 115 v.) may be necessary for the receiver if the test-oscillator is also a.c. operated.

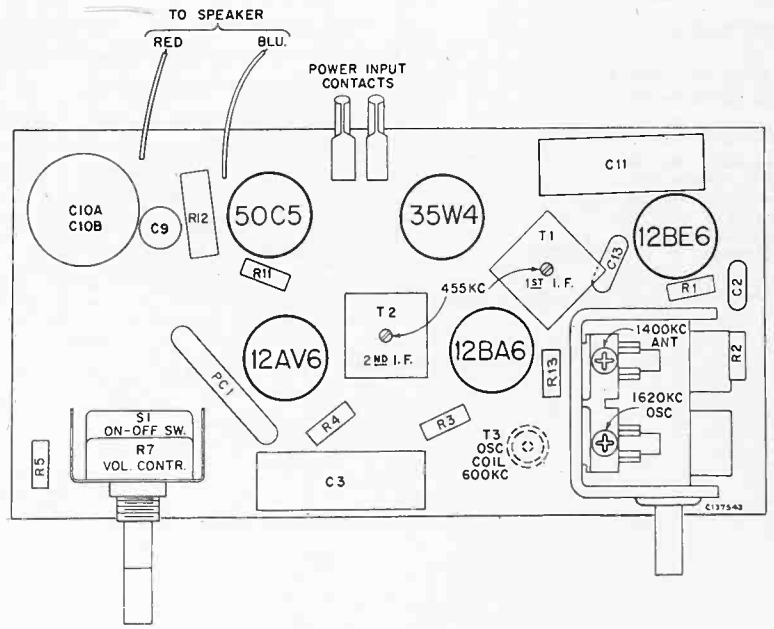
CHASSIS REMOVAL

1. Remove three cabinet holding screws; two at back of top lip and one at bottom front.
2. Grip cabinet with two hands allowing fingers to extend over edges of cabinet front.
3. Hold cabinet, front down, and shake in a vertical direction. Cabinet assembly will separate and the fingers will limit the separation.
4. The cabinet front and chassis assembly may now be separated completely.

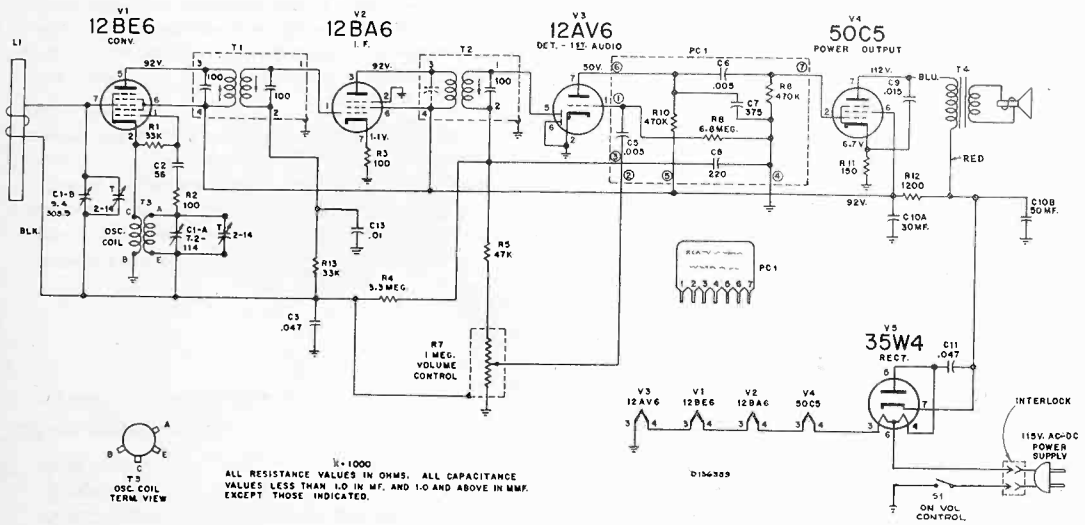
CABINET REASSEMBLY

1. Place chassis front and chassis assembly on the cabinet back so that the ribs of the cabinet front rest on the bottom — inside of the cabinet back.
2. Push cabinet sections together firmly.
3. Insert three holding screws; two at back of top lip and one at bottom front.

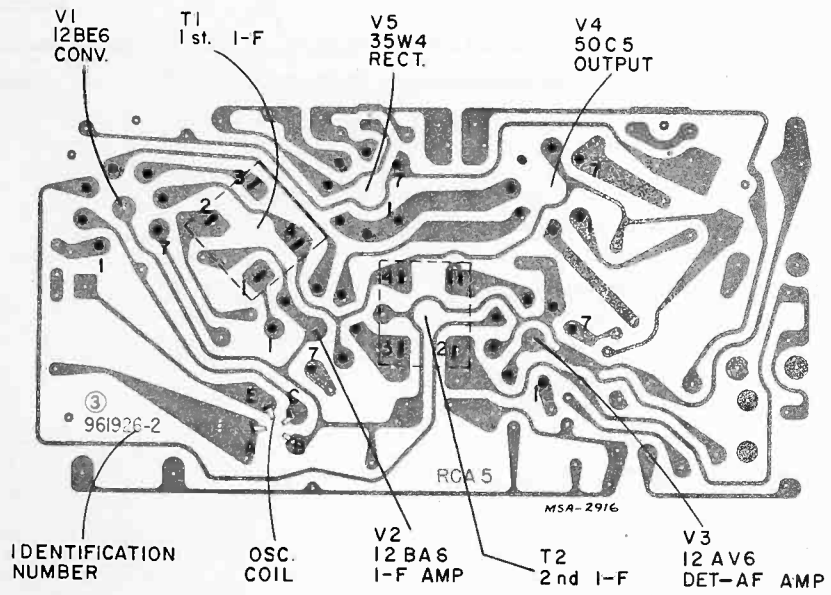
Step	Connect the high side of test-oscillator to—	Tune test-osc. to—	Turn radio dial to—	Adjust the following for max. output
1	12BA6 I-F grid through .01 mfd. capacitor	455 kc	Quiet-point 1,600 kc end of dial	T2 (top) 2nd I-F trans.
2	Stator of C1-B through .01 mfd.			T1 (top and bottom) 1st I-F trans.
3	Short wire placed near loop to radiate signal	1,620 kc	Gang fully open	osc. trimmer C1-A
4		1,400 kc	1,400 kc signal	ant. trimmer C1-B
5		600 kc	600 kc signal	osc. coil T-3 (rock gang)
6		Repeat steps 3, 4, and 5		



Tube and Trimmer Locations



Schematic Diagram



The assembly represented above is viewed from the wiring side of the board.

The printed wiring, on the near side of the board, is presented in "phantom" view superimposed on the component layout of the reverse side.

Component replacement, when necessary, should be made following the techniques outlined in "RCA Radio and Victrola Service Tips" Volume VI — Issue 6 — Dated August 25, 1955.

Chassis Wiring and Components — View from Wiring Side

X-1, X-2 Series

REPLACEMENT PARTS

SYMBOL NO.	STOCK NO.	DESCRIPTION
		CHASSIS ASSEMBLY RC-1188
		CAPACITORS:
C1A, C1B	107162	Variable, tuning
C2	106986	Ceramic, 56 mmf., ±20%, 500 v.
C3	73553	Paper, 0.047 mf., ±20%, 400 v.
C5, C6, C7, C8		Part of PC1
C9	79252	Paper, 0.015 mf., ±10%, 400 v.
C10A C10B	106987	Electrolytic, 30/50 mf., 150/150 v.
C11	73553	Paper, 0.047 mf., ±20%, 400 v.
C13	73960	Ceramic, 0.01 mf., +100% —0%, 500 v.
PC1	106989	Circuit—Audio coupling (includes C5, C6, C7, C8, R8, R9 and R10)
		RESISTORS: Fixed, composition, unless otherwise specified:
R1	—	33,000 ohms, ±20%, ½ w.
R2	—	100 ohms, ±20%, ½ w.
R3	—	100 ohms, ±20%, ½ w.
R4	—	3.3 megohms, ±20%, ½ w.
R5	—	47,000 ohms, ±20%, ½ w.
R7	108009	Control — Volume with "on-off" switch (S1)
R8, R9, R10		Part of PC1
R11	—	150 ohms, ±10%, ½ w.
R12	—	1200 ohms, ±10%, 1 w.
R13	—	33,000 ohms, ±20%, ½ w.
S1		Part of R7
T1	108007	Transformer—1st IF
T2	108008	Transformer—2nd IF
T3	103204	Transformer—Oscillator

SYMBOL NO.	STOCK NO.	DESCRIPTION
	107012	Circuit — Printed chassis assembly complete with fixed capacitors and resistors, IF transformers, oscillator coil, printed audio circuit and tube sockets—less tuning capacitor and volume control
	103236	Connector—Single contact male for line cord
	103201	Socket—7 pin for V1, V2 and V3
	103200	Socket—7 pin for V4 and V5
		SPEAKER ASSEMBLY
T4	79283	Transformer—Output
	104099	Speaker—4" PM
		MISCELLANEOUS
L1	107158	Antenna—Ferrite rod
	Y7042	Cabinet—Bermuda turquoise/champagne white for Model X2HE
	Y7041	Cabinet—Champagne white/bonbon pink for Model X2EF
	Y7043	Cabinet—Charcoal/champagne white for Model X2JE
	Y7040	Cabinet—Moonmist gray for Model X1
	103620	Cable—Line cord
	107156	Dial—Tuning, for Model X1
	107157	Dial—Tuning, for Models X2EF, X2HE and X2JE
	107164	Grommet—Antenna mounting
	107160	Knob—Tuning and volume (1 set of 2)
	107163	Nut—Cabinet assembly retaining nut
	102546	Nut—Speaker mounting
	101069	Spring—Knob retaining
	79954	Washer—Felt, for tuning knob

RCA VICTOR

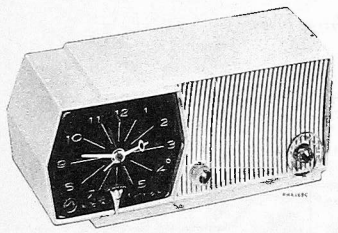
A-C Operated Clock-Radio

C-1 SERIES

Chassis No. RC-1188A

SERVICE DATA

— 1959 No. 2 —



C-1 Series—The "Newscaster"
Model C-1E—Champagne White
Model C-1D—Black
Model C-1F—Pink
Model C-1L—Dresden Blue

PREPARED BY COMMERCIAL SERVICE
RCA SERVICE COMPANY
A DIVISION OF
RADIO CORPORATION OF AMERICA
CAMDEN 8, N. J.

SPECIFICATIONS

TUNING RANGE ..... 540-1,600 kc

INTERMEDIATE FREQUENCY ..... 455 kc

TUBE COMPLEMENT
(1) RCA 12BE6 ..... Converter
(2) RCA 12BA6 ..... I.F. Amplifier
(3) RCA 12AV6 ..... Det.-AVC-A.F. Amp.
(4) RCA 50C5 ..... Output
(5) RCA 35W4 ..... Rectifier

POWER SUPPLY RATING
115 volts, 60 cycles, a. c. ..... 35 watts
Caution: Do not connect to a d. c. power supply.

LOUD SPEAKER
Size and type ..... 4 in. P.M.
Voice coil impedance ..... 3.2 ohms at 400 cycles

POWER OUTPUT
Undistorted ..... 1.0 watts
Maximum ..... 1.3 watts

TUNING DRIVE RATIO ..... 1:1 (direct drive)

WEIGHT ..... Approximately 4¼ lbs.

CABINET DIMENSIONS
Height ..... 5 13/16"
Width ..... 13"
Depth ..... 5¼"

DESCRIPTION

Instruments of the "C-1 Series" are five-tube (including rectifier) table model clock-radios designed for operation on a 115 volt 60 cycle power supply. The cabinet is a one-piece polystyrene molding with a speaker grille located at the center. A conventional superheterodyne circuit is employed using 150-milliampere series-string miniature tubes.

The chassis is of the "printed wiring" type in which all components, except loop antenna and speaker, are mounted on an insulation plate. All wiring, except for short jumpers, is "printed" on the underside of the insulation plate.

The clock operates continuously when connected to a source of 105 to 125 volts, 60 cycle electric power. A moving sweep-second hand indicates that the clock is in operation.

The clock-timer features not only the commonly accepted self-starting type of clock with sweep-second hand but also a clock-controlled switch which will turn the radio on at a time predetermined up to 11 hours in advance.

A feature is a calibrated volume control knob which will permit accurate presetting of volume level when the instrument is used to provide "wake-up" music.

The power supply attachment cord is fastened to the cabinet back cover and becomes disconnected from the chassis when the back cover is removed. The chassis fits into two grooves molded into the cabinet and is held in position by two screws.

OPERATING INSTRUCTIONS

To Set Clock Time—Pull out and turn TIME SET knob (at back of cabinet).

To Set Wake-up Time—Push in and turn TIME SET knob (at back of cabinet).

To Play the Radio—Turn SERVICE knob to "ON." Turn TUNING knob to select desired station and adjust VOLUME as desired. Turn SERVICE knob to "OFF" when through listening.

For "Radio Wake-up" Operation — With SERVICE knob turned to "ON," tune in the desired station and adjust volume level. Turn SERVICE knob to "AUTO." The radio will turn on automatically at the time for which the time has been set.

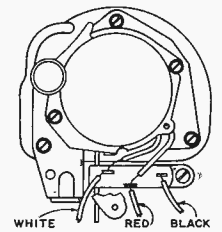
IMPORTANT—KEEP SERVICE KNOB AT "OFF" POSITION WHEN INSTRUMENT IS NOT IN USE.

Alignment Procedure

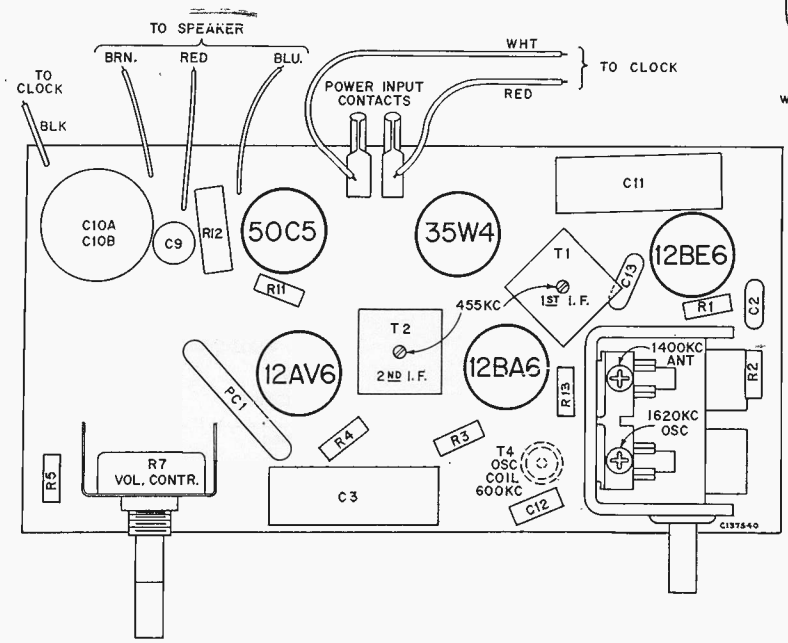
Test-Oscillator—For all alignment operations, connect the low side of the test-oscillator through an isolating capacitor to the "common negative wiring." Keep the oscillator output as low as possible to avoid a-v-c action.

An isolation transformer (115v./115v.) may be necessary for the receiver if the test-oscillator is also a.c. operated.

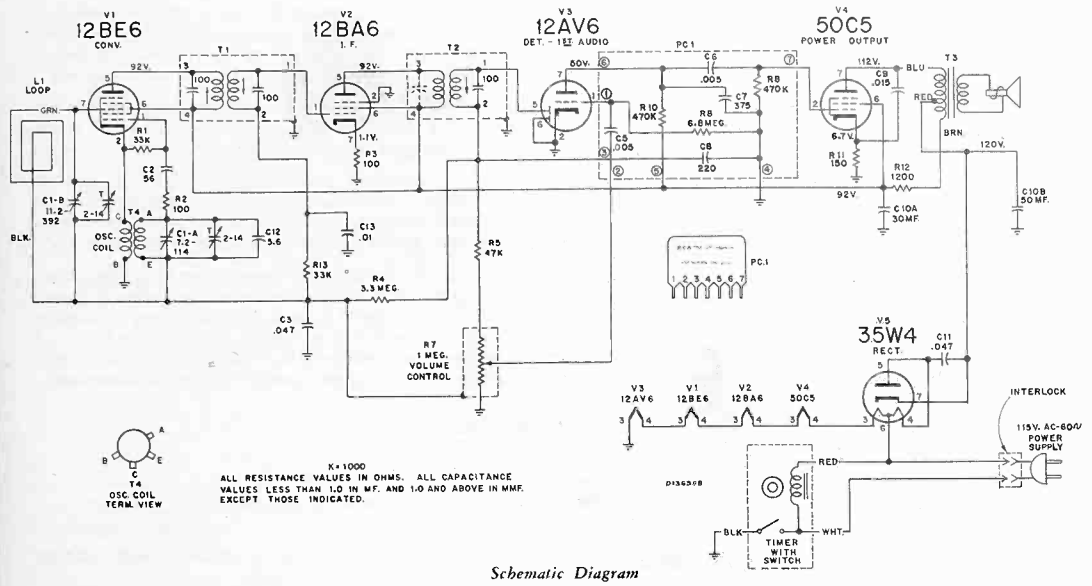
Step	Connect the high side of test-oscillator to—	Tune test-osc. to—	Turn radio dial to—	Adjust the following for max. output
1	12BA6 I-F grid through .01 mfd. capacitor	455 kc	Quiet-point 1,600 kc end of dial	T2 (top) 2nd I-F trans.
2	Stator of C1-B through .01 mfd.			T1 (top and bottom) 1st I-F trans.
3	Short wire placed near loop to radiate signal	1,620 kc	Gang fully open	osc. trimmer C1-A
4		1,400 kc	1,400 kc signal	ant. trimmer C1-B
5		600 kc	600 kc signal	osc. coil T-4 (rock gang)
6		Repeat steps 3, 4, and 5		



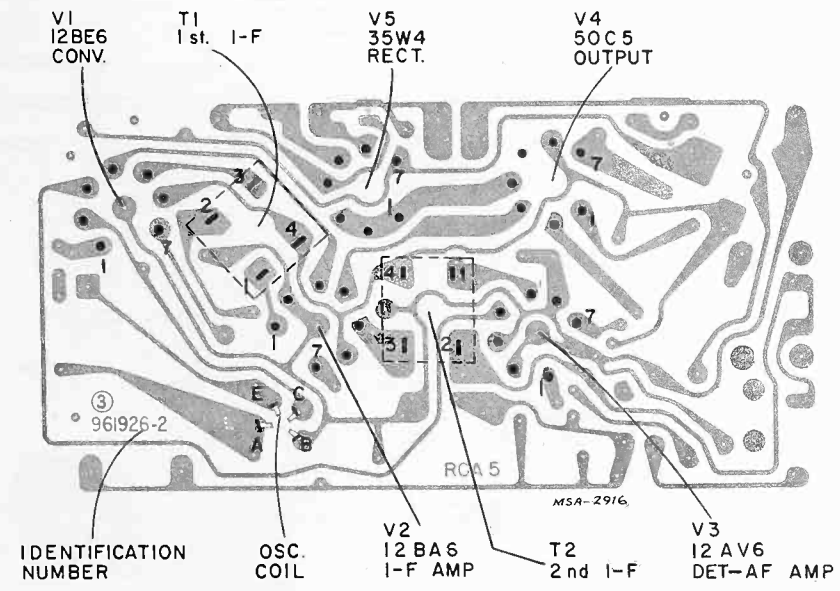
Clock Connections



Complete Chassis Assembly — View from Component Side



Schematic Diagram



Chassis Wiring and Components — View from Wiring Side

The assembly represented above is viewed from the wiring side of the board.

The printed wiring, on the near side of the board, is presented in "phantom" view superimposed on the component layout of the reverse side.

Component replacement, when necessary, should be made following the techniques outlined in "RCA Radio and Victrola Service Tips" Volume VI — Issue 6 — Dated August 25, 1955.

REPLACEMENT PARTS

SYMBOL NO.	STOCK NO.	DESCRIPTION
		CHASSIS ASSEMBLY RC-1188A
		CAPACITORS:
C1A, C1B	103209	Variable, tuning
C2	106986	Ceramic, 56 mmf., ±20%, 500 v.
C3	73553	Paper, 0.047 mf., ±20%, 400 v.
C5 to C8		Part of PC1
C9	79252	Paper, 0.015 mf., ±10%, 400 v.
C10A, C10B	106987	Electrolytic, 30/50 mf., 150/150 v.
C11	73553	Paper, 0.047 mf., ±20%, 400 v.
C12	103440	Ceramic, 5.6 mmf., ±0.05 mmf., 500 v., coeff. N-3300
C13	73960	Ceramic, 0.01 mf., +100% —0%, 500 v.
L1	103606	Antenna—AM loop and back cover assembly
PC1	106989	Circuit—Audio coupling (includes C5, C6, C7, C8, R8, R9 and R10)
		RESISTORS: **Fixed, composition, unless otherwise specified:**
R1	—	33,000 ohms, ±20%, ½ w.
R2	—	100 ohms, ±20%, ½ w.
R3	—	100 ohms, ±20%, ½ w.
R4	—	3.3 megohms, ±20%, ½ w.
R5	—	47,000 ohms, ±20%, ½ w.
R7	106988	Control—Volume
R8 to R10		Part of PC1
R11	—	150 ohms, ±10%, ½ w.
R12	—	1200 ohms, ±10%, 1 w.
R13	—	33,000 ohms, ±20%, ½ w.
T1	108007	Transformer—1st IF
T2	108008	Transformer—2nd IF
T3	—	Part of speaker assembly
T4	103204	Transformer—Oscillator
	106992	Cable—AC power cable and plug with retainer
	107012	Circuit — Printed chassis assembly complete with fixed capacitors and resistors, IF transformers, oscillator coil, printed audio circuit and tube sockets—less tuning capacitor and volume control
	103236	Contact—Single contact male for AC leads
	106993	Retainer—For power cable — RCA 106992
	103201	Socket—7 pin miniature for V1, V2 and V3
	103200	Socket—7 pin miniature for V4 and V5
		SPEAKER ASSEMBLY
T3	79283	Transformer—Output
	103669	Speaker—4" PM
		MISCELLANEOUS
	Y7033	Cabinet—Champagne white
	Y7049	Cabinet—Black
	Y7050	Cabinet—Pink
	Y7051	Cabinet—Dresden blue
	106999	Fastener—For clock timer or speaker
	107000	Hands—Clock timer (1 set of 4)—for Models C-1E, C-1F and C-1L
	108171	Hands—Clock timer (1 set of 4)—for Model C-1D
	106995	Knob—Clock timer function—Moonmist grey only carried in stock for replacement
	106996	Knob—Time set
	106994	Knob—Volume and tuning (1 set of 2)—Charcoal grey only carried in stock for replacement
	106997	Retainer—For clock window
	101069	Spring—Retainer for volume or tuning knob
	103598	Window—Clock timer

CLOCK MECHANISM

If clock mechanism repair becomes necessary, remove the clock from the radio. The RCA Victor Distributor in your area will advise you of the address of the nearest authorized service station for clock mechanisms. Repair facilities and replacement parts are available at these authorized service stations.

528.53340

MODEL NUMBERS

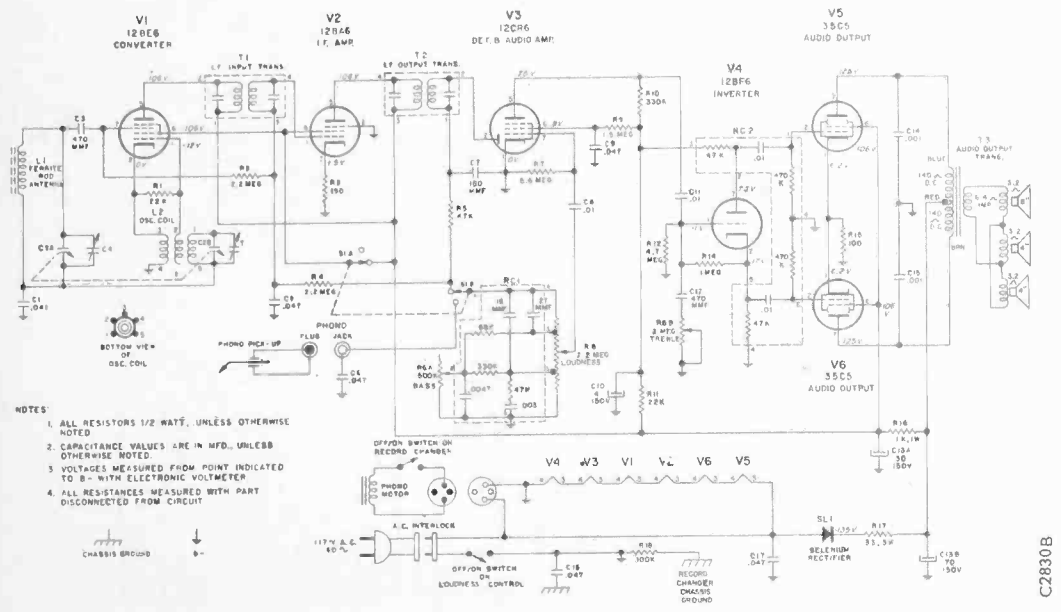
9053
9054

PARTS LIST for Silvertone

RADIO-RECORD CHANGER

SCHEMATIC LOCATION	PART NUMBER	DESCRIPTION
		CAPACITORS
C1, C6, C16	20-44-1	Tubular, .047 mfd., 400 v.
C2A & B	19-61-2	Variable Tuning
C3, C12	15-47111	Disc., 470 mmfd., 500 v., 10%
C4	19-180-0	Trimmer, Antenna (Part of L1)
C5, C9	20-47-1	Tubular, .047 mfd., 200 v.
C7	15-151164	Disc., 150 mmfd., 500 v., N750
C8, C11	15-10316	Disc., .01 mfd., 500 v.
C10	18-62-5	Electrolytic, 4 mfd., 150 v.
C13A & B	18-58-5	Electrolytic, 30 mfd., 150 v. (A); 70 mfd., 150 v. (B)
C14 & C15	15-10216	Disc., .001 mfd., 500 v.
C17	20-55-1	Tubular, .047 mfd., 400 v.
		RESISTORS (All resistors 1/2 w., 10% unless otherwise stated)
R1, R11	60-22301	22K ohm
R2, R4	60-22502	2.2 megohm, 20%
R3	60-15101	150 ohm
R5	60-47302	47K ohm, 20%
R6A & B	24-168-2	Tone Control, 500K ohm, BASS (a); 3 megohm TREBLE (b)
R7	60-56501	5.6 megohm
R8	24-329-0	1 megohm, VOLUME and OFF/ON Sw.
R9	60-15501	1.5 megohm
R10	60-33401	330K ohm
R12	60-47501	4.7 megohm
R14	60-10501	1 megohm
R15	60-10101	100 ohm
R16	60-10211	1K ohm, 1w.
R17	61-10-0	33 ohm, 3 w.
R18	60-10401	100K ohm
RC1	13-18-3	Couplate, Tone Compensator
RC2	13-16-3	Couplate, Push Pull
		TRANSFOMERS AND COILS
T1	10-81-2	Transformer, I.F. Input
T2	10-71-2	Transformer, I.F. Output
T3	80-16-1	Transformer, Audio Output
L1	82-126-0	Coil, Antenna, Ferrite Rod Type (Inc. C4)
L2	10-34-4	Coil, Oscillator
		MISCELLANEOUS CHASSIS PARTS
	11-1245	Bracket, Dial Plate Mtg. (L.H.)
	11-1244	Bracket, Dial Plate Mtg. (R.H.)
	22-60-1	Spring, Tuning Shaft Retainer
	31-486-0	Plate, Dial Background
	39-9-1	Pulley, Idler (2)
	39-35-1	Tuning Shaft w/pulley
	45-7-3	Receptacle, AC Line
	45-8-3	Socket, Phono Audio
	45-17-2	Socket, 7 Pin Miniature
	45-18-2	Socket, 7 Pin Miniature Shield (3) (V1, V2 & V3)
	45-116-0	Socket, 7 Pin Miniature
	45-52-2	Socket, Phono Motor
	45-115-0	Socket, 7 Pin Miniature
	51-105	Dial Cord (45 3/16")
	52-58-1	Pointer
S1A & B	69-265-0	Switch, RADIO-PHONO
	70-269-0	Spring, Dial Cord Tension
	71-121-0	Tube Shield (2)
SL1	83-1146	Selenium Rectifier (100MA)

SILVERTONE RADIO RECEIVER CHASSIS NUMBER 528.53340



C2830B

Fig. 1. Schematic Diagram Chassis

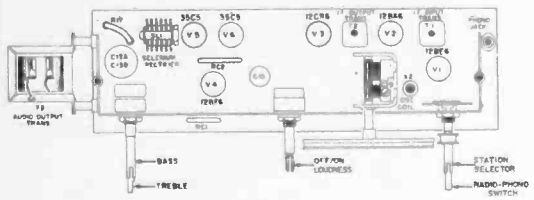


Fig. 2. Top View Chassis

B2822

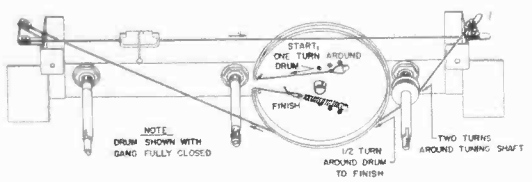


Fig. 3. Dial Stringing Diagram

For parts information concerning the record changer used in this model, locate the chassis number, which appears on a metal plate under the turntable, and refer to the corresponding Parts List.

SILVERTONE RADIO RECEIVER CHASSIS NUMBER 528.53340

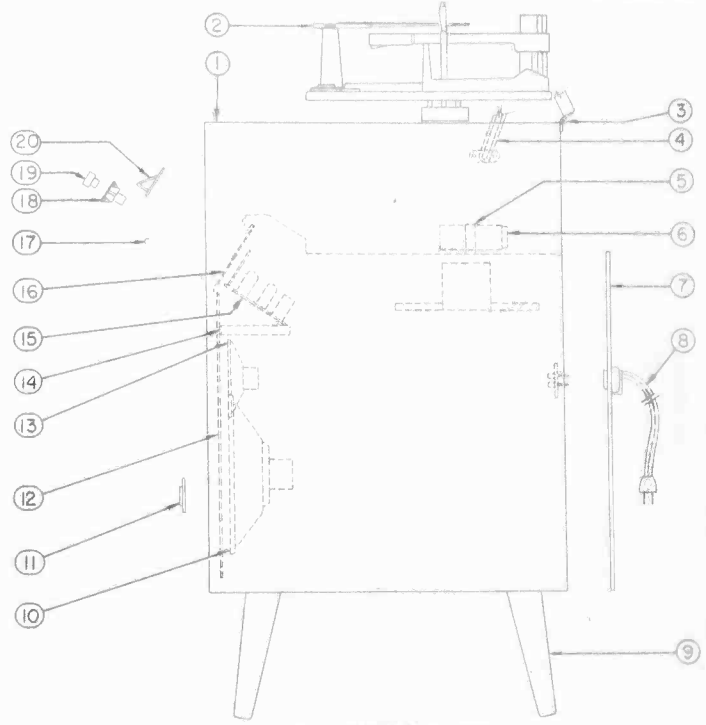


Fig. 4 Cabinet Parts Diagram

CABINET PARTS LIST

Key No.	Description	Model No. 9053 Mahogany Part No.	Model No. 9054 Limed Oak Part No.
1	Cabinet	42-60-3	42-61-3
2	Record Changer	***	***
3	Hinge (2)	49-289	49-289
4	Lid Support	49-300	49-300
5	Clamp, 45 RPM Spindle Adaptor	22-66-3	22-66-3
6	45 RPM Spindle Adaptor	84-6197	84-6197
	Assembly, Interlock Back	84-6370	84-6370
7	Cover, Back	21-316-0	21-316-0
8	Line Cord & Plug	23-44-0	23-44-0
9	Legs (4)	49-301	49-302
10	Speaker, 8" PM, 3.2 ohm	33-254-4	33-254-4
11	Logo, "SILVERTONE"	40-348-2	40-348-2
12	Grill Cloth	38-135-0	38-135-0
13	Speaker, 4" PM, 3.2 ohm (2)	33-281-4	33-281-4
14	Bracket, Chassis Support (2)	11-1395	11-1395
15	Radio Chassis (complete)	***	***
16	Escutcheon Panel	40-122-0	40-122-0
17	Trim Strip (2)	40-58-3	40-58-3
18	Knob, Rear (2)	52-837-0	52-837-0
19	Knob, Front (2)	52-839-0	52-839-0
	Knob, OFF/ON-Loudness	52-840-0	52-840-0
20	Window, Dial Scale	48-154-1	48-154-1
	Phono Plug 3/8"	45-18-0	45-18-0
	Pin Receptacle	45-195-3	45-195-3
	Plug, Phono Motor (2 Prong)	45-1-0	45-1-0
	Rubber, Grommet 3/8"	37-12-3	37-12-3
	Plug, Speaker Lead (1/8" Dia.)	45-129-0	45-129-0
	Service Data Sheet	38-2481-0	38-2481-0

*** See Service Data Sheet for Repair Parts.

528.53330
528.53331

MODEL NUMBERS
9055
9056

PARTS LIST for

Silvertone

RADIO-PHONOGRAPH

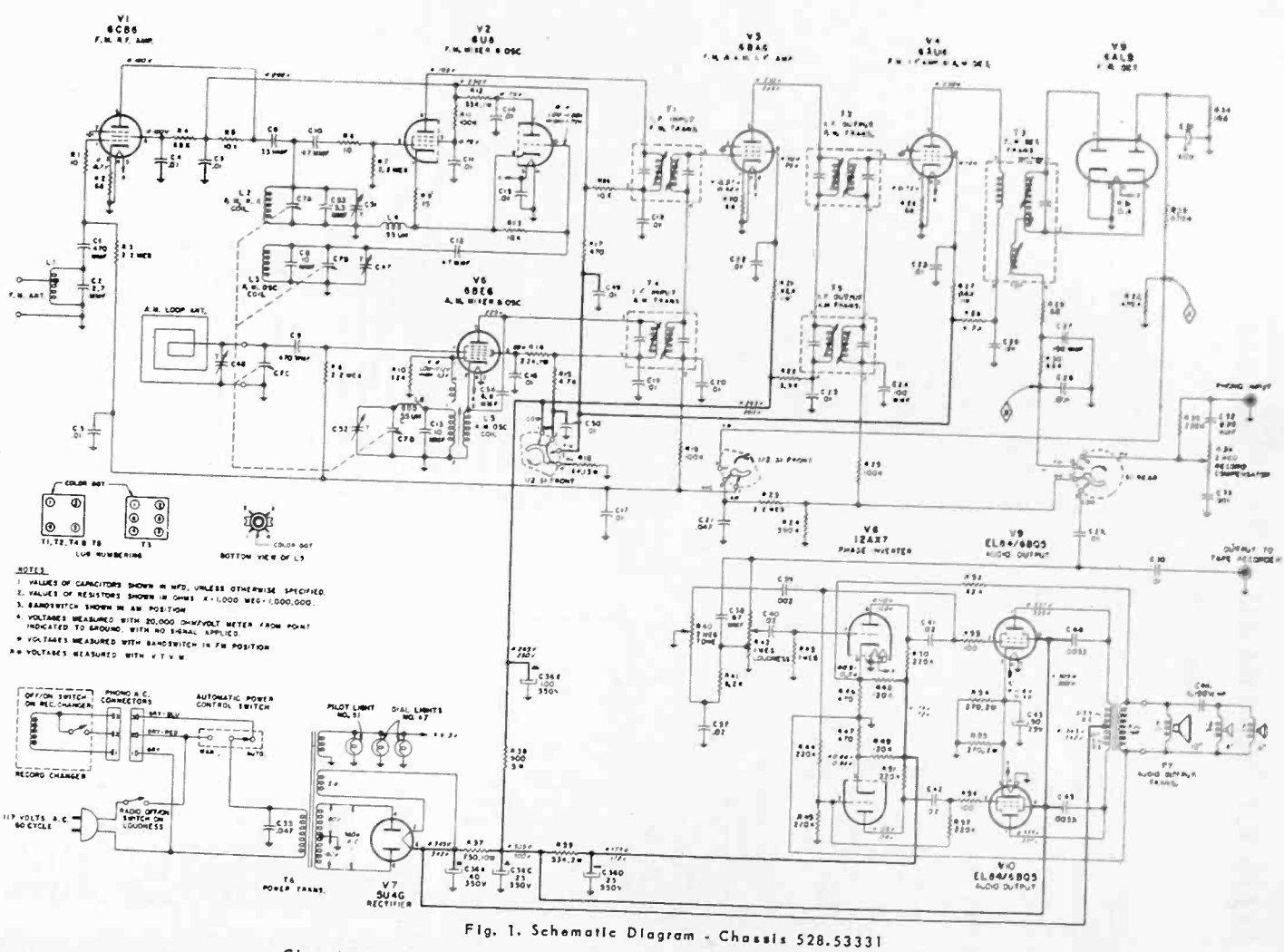


Fig. 1. Schematic Diagram - Chassis 528.53331

Chassis 528.53330 is the same as Chassis 528.53331 except that C35 is .1 mfd.

SILVERTONE RADIO RECEIVER CHASSIS NUMBER 528.53330 528.53331

PARTS LIST

Schematic Location	Part Number	Description
	CAPACITORS	
(All capacitors 500 v., 10% unless otherwise noted)		
C1,C9	15-47111	Disc, 470 mmfd., GP
C2	15-279121	Disc, 2.7 mmfd., ± .25 mmfd., NPO
C3,C4,C5,C11, C14,C15,C16, C17,C18,C19, C20,C22,C23, C25,C26,C29, C30,C49,C50	15-10317	Disc, .01 mfd., 500 v., GMV
C6	15-330611	Tubular, 33 mmfd., NPO
C7A,B,C,&D	19-4-4	Variable Tuning
C8	20-121-0	Tubular, 10 mmfd., N220
C10	15-470611	Tubular, 47 mmfd., NPO
C12	15-470115	Disc, 47 mmfd., N1400
C13	15-100614	Tubular, 10 mmfd., N750
C21	16-47328	Tubular, .047 mfd., 200 v., 20%
C24	15-10116	Disc, 100 mmfd., 20%, GP
C27	15-15111	Disc, 150 mmfd., GP
C28	15-10261	Tubular, .001 mfd., GP
C31	18-25-0	Electrolytic, 4 mfd., 50 v.
C32	15-82111	Disc, 820 mmfd., GP
C33	15-10211	Disc, .001 mfd., GP
C34	15-689131	Disc, 6.8 mmfd., ± .5 mmfd., NPO
C35	20-647-1	Tubular, .047 mfd., 600 v., 20% (Chassis 528.53331 only)
C35	20-611-1	Tubular, .1 mfd., 600 v. (Chassis 528.53330 only)
C36A,B,C,&D	18-35-3	Electrolytic, 40 mfd., 350 v., (A); 100 mfd., 350 v., (B); 25 mfd., 350 v., (C & D)
C37,C40	15-20317	Disc, .02 mfd., GMV
C38	15-47011	Disc, 47 mmfd., GP
C39	15-20211	Disc, .002 mfd., GP
C41,C42	15-20316	Disc, .02 mfd., 20%, GP
C43	18-23-0	Electrolytic, 50 mfd., 25 V.
C44,C45	16-33268	Tubular, .0033 mfd., 1Kv, 20%
C46	18-9-5	Electrolytic, 4 mfd., 150 v., NP
C47	19-2-5	Trimmer, 1.5-10 mmfd.
C48	19-165-0	Trimmer, (Part of L1)
C53	15-339131	Disc, 3.3 mmfd., ± .5 mmfd., NPO
	RESISTORS	
(All resistor ½ w., 10% unless otherwise noted)		
R1,R6	60-10001	10 ohm
R2	60-68001	68 ohm
R3,R7,R8	60-22502	2.2 megohm, 20%
R4	60-68301	68K ohm
R5,R16	60-10301	10K ohm
R9	60-15001	15 ohm
R10	60-22301	22K ohm
R11,R19,R25	60-10401	100K ohm
R12	60-33311	33K ohm, 1 w.
R13	60-18301	18K ohm
R14	60-22311	22K ohm, 1 w.
R15,R28	60-47201	4.7K ohm
R17,R46,R47	60-47101	470 ohm
R18	61-136-0	8K ohm, 15 w., w.w.
R20,R26,R29	60-68001	68 ohm
R21	60-82311	82K ohm, 1 w.
R22	60-39201	3.9K ohm
R23	60-22502	2.2 megohm, 20%
R24	60-39401	390K ohm
R27	60-56311	56K ohm, 1 w.
R30	60-68301	68K ohm
R31	60-56901	5.6 ohm
R32,R33	60-47401	470K ohm
R34	60-15301	15K ohm
R35,R44,R45, R50,R51,R57	60-22401	220K ohm
R36	24-6-3	2 megohm, Record Compensator
R37	61-128-0	750 ohm, 10 w., w.w.
R38	61-17-0	900 ohm, 5 w., w.w.
R39	60-33321	33K ohm, 2 w.
R40	24-172-2	2 megohm, Tone
R41	60-82201	8.2K ohm
R42	24-315-0	1 megohm, OFF/ON-Loudness
R43	60-10501	1 megohm
R48,R49	60-12401	120K ohm
R52	60-82301	82K ohm
R53,R56	60-10101	100 ohm
R54,R55	60-27121	270 ohm, 2 w.
	TRANSFORMERS & COILS	
T1,T2	10-44-2	Transformer, 1st & 2nd I.F. FM (2)
T3	10-15-0	Transformer, FM Det.
T4	10-101-2	Transformer, 1st I.F. AM
T5	10-45-2	Transformer, 2nd I.F. AM
T6	80-23-0	Transformer, Power
T7	80-65-1	Transformer, Audio Output
L1	10-144-1	Coil, FM Antenna
L2	10-145-1	Coil, FM R.F.
L3	10-3-3	Coil, FM Osc.
L4	10-129-1	Coil, .55 uh RF Choke
L5	10-46-4	Coil, AM Osc.
	MISCELLANEOUS CHASSIS PARTS	
	71-69-0	Shield, Tube (2)
	71-13-2	Shield, Tuner Top
	69-269-0	Switch, Slide (S.P.D.T.)
	71-12-2	Shield, Switch
	26-17-2	Bushing, Tuning Shaft
	39-2-1	Pulley, Idler
	69-268-0	Switch, Selector
	39-131-3	Shaft, Tuning
	22-32-1	Clip, I.F. Mounting
	23-18-0	Line Cord (9 ft.)
	22-40-5	Bushing, Strain Relief (Line Cord)
	45-11-2	Socket, 9 Pin Min (2)
	45-123-2	Socket, 7 Pin Min
	45-203-2	Socket, 7 Pin Min (2)
	45-12-3	Socket, Phono Connector Dual
	45-4-2	Socket, Octal Molded
	45-33-2	Socket, 9 Pin Min (2)
	45-12-2	Socket, 7 Pin Min (2)
	45-54-4	Socket, Pilot Light (Dial R.H.)
	45-53-4	Socket, Pilot Light (Dial L.H.)
	45-55-4	Socket, Pilot Light (Cabinet)
	71-80-0	Shield, Tube (2)
	45-7-0	Plug, Phono
	89-7	Pilot Light, #47 Bayonet (2)
	89-16	Pilot Light (Cabinet)
	44-43-1	Shield, Pilot Light (2)
	84-6415	Connector Receptacle
	37-112-3	Grommet, Rubber (4)
	84-1751	Assembly Pulley & Hub
	11-1287	Bracket, Dial Plate Mounting (R.H.)
	11-1288	Bracket, Dial Plate Mounting (L.H.)
	51-105	Dial Cord (54-½")
	70-269-0	Spring, Tension (Dial Cord)
	31-493-0	Plate, Dial Background
	67-648-0	Dial Scale
	62-95-1	Channel, Dial Glass
	62-96-1	Channel, Dial Glass (2)
	52-60-1	Pointer
	11-1289	Bracket, Variable Capacitor Mtg.
	11-1290	Bracket, Shield Mtg.
	71-11-2	Shield R.F.
	31-322-0	Plate, Shield Cover

SILVERTONE RADIO RECEIVER CHASSIS NUMBER 528.53330 528.53331

CABINET PARTS LIST

Key No.	Model 9055 (Mahogany) Part No.	Description	Model 9056 (Limed Oak) Part No.
1	49-324	Leg, Cabinet (4)	49-325
2	42-66-3	Cabinet	42-67-3
3	98-146-0	Grill Cloth	98-146-0
4	21-366-0	Back, Cabinet	21-366-0
5	82-7-1	Antenna, Loop (AM)	82-7-1
6	33-362-4	Speaker, 4" PM (2)	33-362-4
7	21-345-0	Cover, Pilot Light	21-354-0
9A	44-62-1	Shield, Pilot Light	44-62-1
9B	48-83-2	Jewel, Pilot Light	48-83-2
9C	40-91-3	Disc, Light Diffusing (Jewel)	40-91-3
	89-16	Pilot Light	89-16
	45-55-4	Socket, Pilot Light	45-55-4
10	49-289	Hinge (3)	49-289
11	**	Record Changer	**
12	40-132-0	Escutcheon (Power Control)	40-132-0
13	40-134-0	Escutcheon (Control)	40-134-0
14	52-1083-0	Knob, Indicating (4)	52-1083-0
	52-738-0	Knob, Tuning	52-738-0
15	49-375	Lid Support	49-375
16	69-269-0	Slide Switch (Power Control)	69-269-0
17	22-66-0	Clamp, 45 RPM Spindle Adaptor	22-66-0
18	40-90-3	Trim Strip	40-90-3
19	**	Tuner, Chassis (FM-AM)	**
20	62-108-0	Bumper, Plug (2)	62-108-0
21	11-1189	Bracket, Support	11-1189
22	18-9-5	Capacitor, Electrolytic	18-9-5
23	22-20-1	Clip, Capacitor	22-20-1
24	33-378-4	Speaker, 12" PM	33-378-4
25	40-348-2	Logo, "Silvertone"	40-348-2
	45-7-0	Plug, Phono Connector	45-7-0
	84-6416	Plug, Phono Motor Assem.	84-6416
	84-6197	Spindle Adaptor Assem. (45 RPM)	84-6179
	45-67-5	Plug, Speaker (5/32" Dia.)	45-67-5
	45-81-5	Plug, Speaker (1/8" Dia.)	45-81-5
	84-1785	Antenna, FM Assem.	84-1785

** Not Supplied As A Repair Part

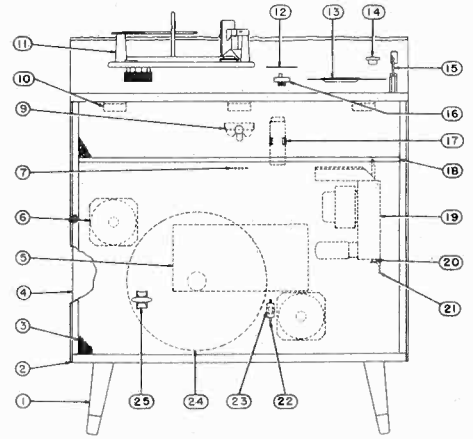


Fig. 2 Exploded View of Cabinet

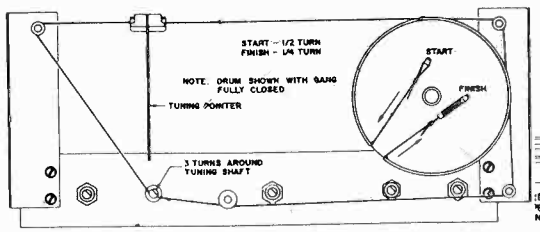


Fig.4. Dial Stringing Diagram

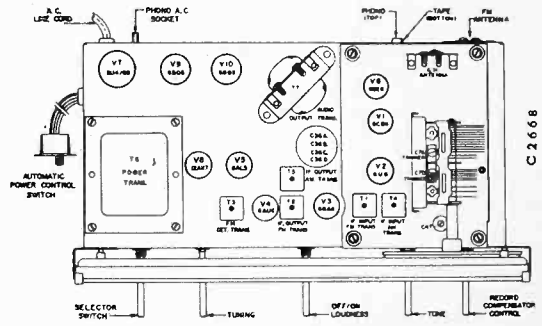


Fig.3. Top View of Chassis

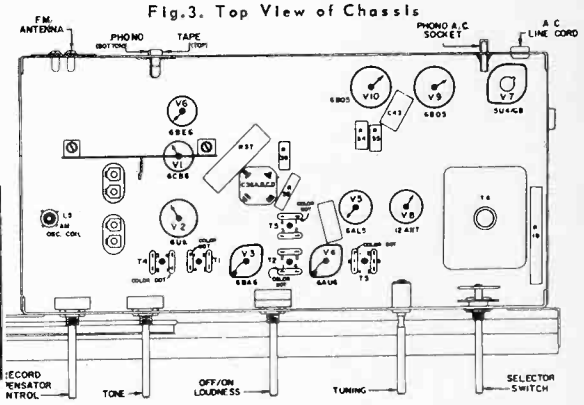


Fig.5. Bottom View of Chassis

528.53310

MODEL NUMBERS
9019
9020

PARTS LIST
for
Silvertone
REG. U. S. PAT. OFF.

CLOCK RADIO

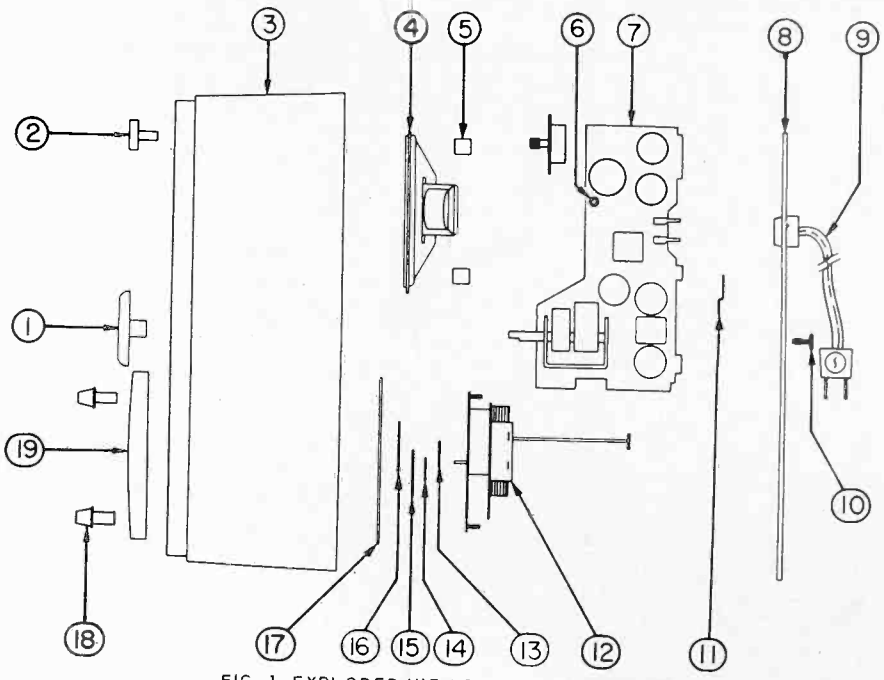


FIG. 1. EXPLODED VIEW OF CABINET (TOP VIEW)

CABINET PARTS LIST

Key No.	Description	Model No. 9019 BROWN Part No.	Model No. 9020 IVORY Part No.
1.	Knob, Tuning	52-1058-0	52-1059-0
2.	Knob, Volume	52-1060-0	52-1125-0
3.	Cabinet	42-54-1	42-55-1
4.	Speaker (Inc. T3)	33-327-4	33-327-4
5.	Spacer, Speaker Mounting (3)	77-27-0	77-27-0
6.	Insulator	37-9-0	37-9-0
7.	Chassis	*	*
8.	Back, Antenna Loop (L1)	82-3-1	82-3-1
9.	Line Cord and Plug	23-43-0	23-43-0
10.	Clip, Cabinet Back Retainer	22-2-5	22-2-5
11.	Bracket, Chassis Retaining	11-1246	11-1246
12.	Timer Mechanism (Inc. 13, 14, 15 & 16)	59-132	59-132
13.	Hand, Alarm Set	52-66-1	52-66-1
14.	Hand, Hour	52-77-1	52-77-1
15.	Hand, Minute	52-76-1	52-76-1
16.	Hand, Second	52-75-1	52-75-1
17.	Overlay, Timer	40-84-3	40-84-3
18.	Knob, Clock (2)	52-895-0	52-895-0
19.	Window, Timer	48-155-1	48-155-1

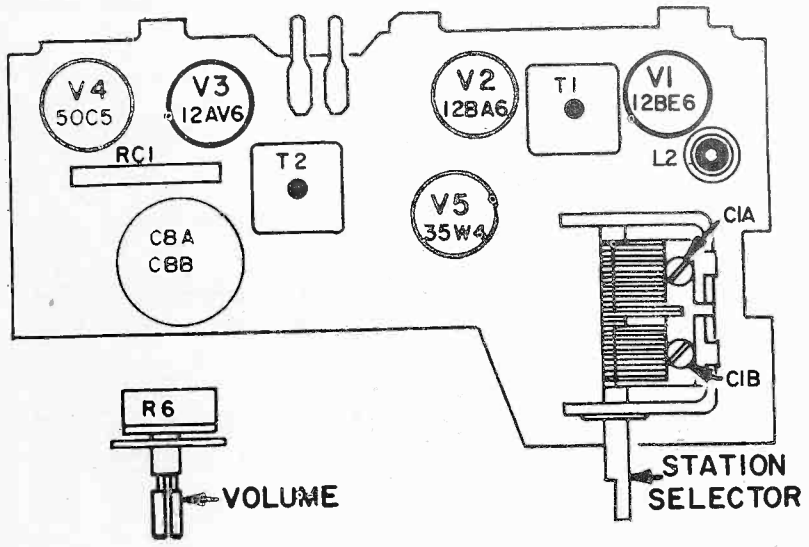


FIG. 2. TOP VIEW OF CHASSIS

CHASSIS PARTS LIST

Schematic Location	Part No.	Description
		CAPACITORS
C1 A & B	19-70-2	Variable, Tuning
C2	16-47328	Tubular, .047 mfd., 200 v.
C3	15-10217	Disc, .001 mfd., 500 v., GMV
C4	15-22111	Disc, 220 mmfd., 500 v., 10%, GP
C5	15-50217	Disc, .005 mfd., 500 v., GMV
C6	15-20317	Disc, .02 mfd., 500 v.
C7	20-85-0	Disc, .006 mfd., 500 v. (Special No Substitute)
C8 A & B	18-49-5	Electrolytic, 30 mfd., 150 v. (A); 50 mfd., 150 v.(B)
		RESISTORS
		(All resistors ½ w., 10% unless otherwise noted)
R1	60-22301	22K ohm
R2	60-10401	100K ohm
R3	60-47001	47 ohm
R4	60-22501	2.2 megohm
R5	60-47301	47K ohm
R6	24-288-0	1 megohm, VOLUME
R7	60-12101	120 ohm
R8	60-10211	1K ohm, 1 w.
RC1	13-14-3	Couplate
		TRANSFORMERS AND COILS
T1	10-73-2	Transformer, I.F. Input
T2	10-72-2	Transformer, I.F. Output
T3	80-36-1	Transformer, Audio Output (Mounted on Speaker)
L2	10-30-4	Coil, Oscillator
		MISCELLANEOUS CHASSIS PARTS
	11-1247	Bracket, Volume Control Mtg.
	45-22-2	Socket, Tube (V1, V2)
	45-23-2	Socket, Tube (V4, V5)
	45-49-2	Socket, Tube (V3)
	71-121-0	Shield, Tube
	45-194-0	Plug, Connector, AC Interlock

NOTES:
1. VALUES OF CAPACITORS IN MFD. UNLESS OTHERWISE NOTED.
2. ALL RESISTORS 1/2 WATT, UNLESS OTHERWISE NOTED.
3. VOLTAGE MEASURED FROM POINT INDICATED TO GROUND WITH 20,000 OHM/VOLT METER ON 117 V.A.C. LINE.
4. ☒ MEASURED WITH ELECTRONIC VOLT METER.

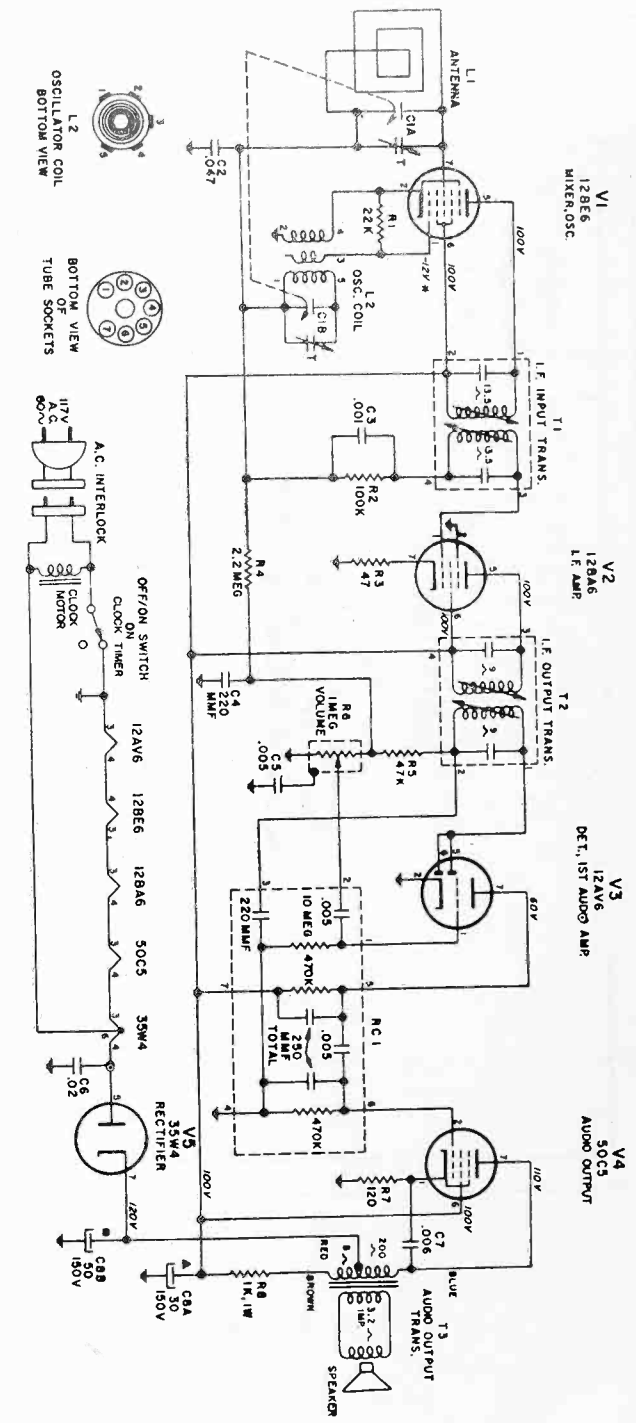


FIG. 3. SCHEMATIC DIAGRAM FOR SILVERTONE CHASSIS 528.53310

528.53300

MODEL NUMBERS
9021
9022
9023
90235

PARTS LIST
for
Silvertone
REG. U.S. PAT. OFF.

CLOCK RADIO

SILVERTONE CLOCK-RADIO RECEIVER CHASSIS NUMBER 528.53300

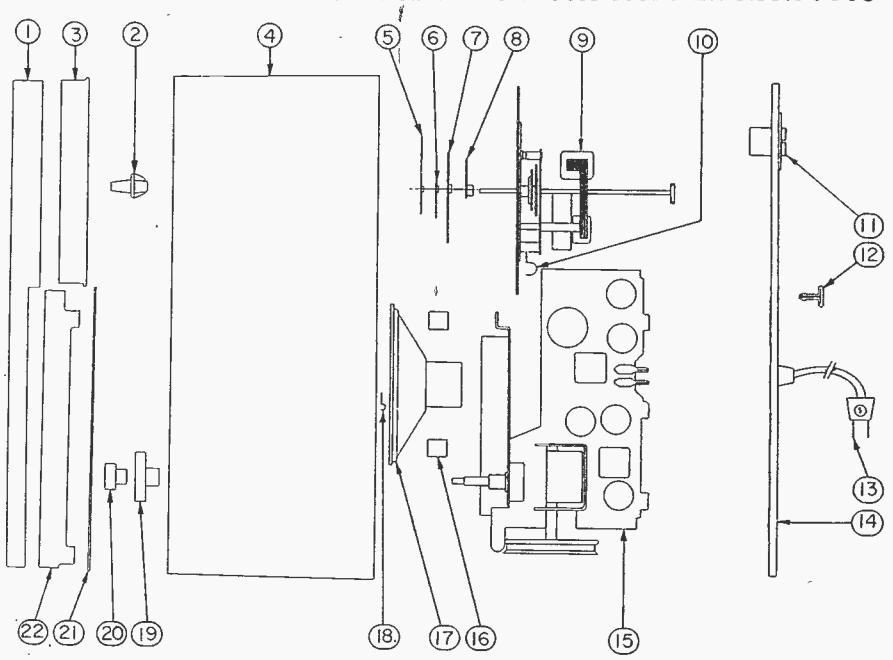


FIG. 1. EXPLODED VIEW OF CABINET (TOP VIEW)

CABINET PARTS LIST

KEY NO.	PART NO.	DESCRIPTION
1.	67-647-0	Dial Scale and Trim Strip
2.	52-1057-0	Knob, Clock Timer (2)
3.	48-152-1	Window, Clock Timer
4.	42-48-1	Cabinet, Brown, Model No. 9021
	42-49-1	Cabinet, Ivory, Model No. 9022
	42-50-1	Cabinet, Green, Model No. 9023
	42-65-1	Cabinet, Pink, Model No. 90235
5.	52-87-1	Hand, Second
6.	52-86-1	Hand, Minute
7.	52-73-1	Hand, Hour
8.	52-66-1	Hand, Alarm Set
9.	59-129	Timer, Clock (Inc. 5, 6, 7 and 8)
10.	22-65-3	Clamp, Cable
11.	45-17-3	Receptacle, Power
12.	22-2-5	Clip, Cabinet Back Retainer
13.	23-42-0	Line Cord and Plug
14.	82-5-1	Antenna Loop and Cabinet Back
15.	*	Chassis, Radio
16.	77-27-0	Spacer, Speaker Mounting (4)
17.	33-327-4	Speaker (Inc. T3)
18.	11-1243	Bracket, Chassis Retainer
19.	52-1054-0	Knob, Tuning
20.	52-1056-0	Knob, Volume
21.	67-9-1	Background, Pointer
22.	48-153-1	Window, Dial Scale

* Not supplied as a Repair Part.

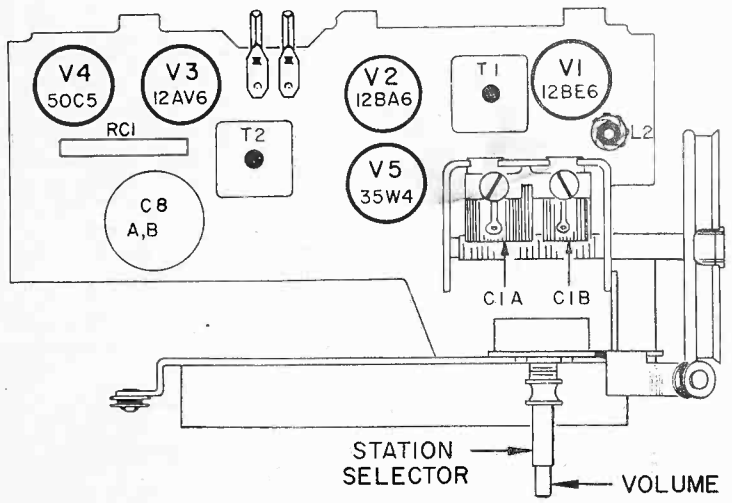


FIG. 2. TOP VIEW OF CHASSIS

CHASSIS PARTS LIST

Schematic Location	Part No.	Description
		CAPACITORS
C1 A&B	19-69-2	Variable, Tuning
C2	16-47328	Tubular, .047 mfd., 200 v.
C3	15-10217	Disc, .001 mfd., 500 v., GMV
C4	15-22111	Disc, 220 mmfd., 500 v., 10%, GP
C5	15-50217	Disc, .005 mfd., 500v., GMV
C6	15-20317	Disc, .02 mfd., 500 v.
C7	20-85-0	Disc, .006 mfd., 500 v. (Special No Substitute)
C8 A&B	18-49-5	Electrolytic, 30 mfd., 150 v. (A); 50 mfd., 150 v. (B)
		RESISTORS
		(All resistors ½ w., 10% unless noted)
R1	60-22301	22K ohm
R2	60-10401	100K ohm
R3	60-47001	47 ohm
R4	60-22501	2.2 megohm
R5	60-47301	47K ohm
R6	24-307-0	1 megohm, VOLUME
R7	60-12101	120 ohm
R8	60-10211	1K ohm, 1 w.
RC1	13-14-3	Couplate
		TRANSFORMERS AND COILS
T1	10-73-2	Transformer, I.F. Input
T2	10-72-2	Transformer, I.F. Output
T3	80-36-1	Transformer, Audio Output (Mounted on Speaker)
L2	10-30-4	Coil, Oscillator
		MISCELLANEOUS CHASSIS PARTS
	45-22-2	Socket, Tube (V1, V2)
	45-23-2	Socket, Tube (V4, V5)
	45-49-2	Socket, Tube (V3)
	71-121-0	Shield, Tube
	45-10-0	Connector, AC Interlock
	84-6242	Assembly, Pointer Track, Bracket and Pulley
	52-56-1	Pointer
	51-109	Cord, Dial
	39-34-1	Pulley, Tuning Shaft
	22-60-1	Spring, Tuning Shaft Retainer
	70-295-0	Spring, Extension
	84-6196	Assembly, Pulley and Bushing

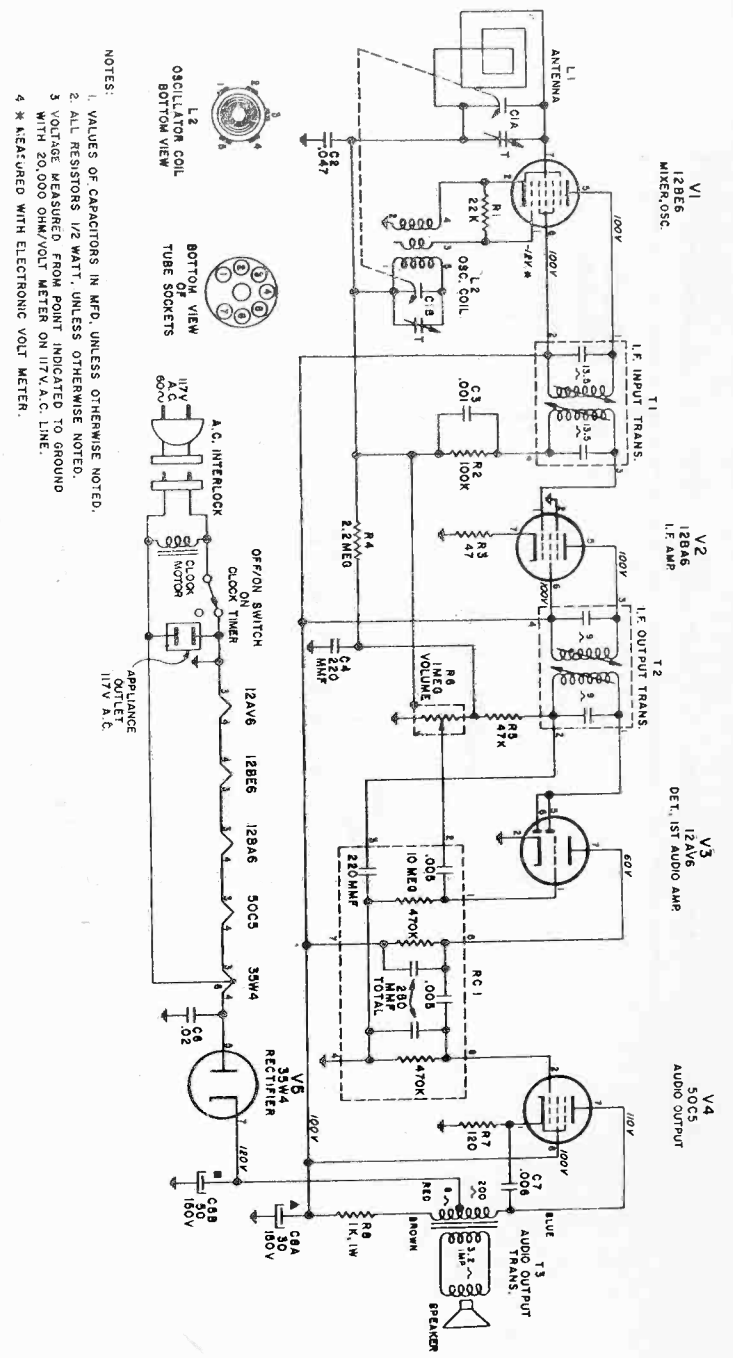


FIG. 3. SCHEMATIC DIAGRAM FOR SILVERTONE CHASSIS 528.53300.

528.53171

PARTS LIST for Silvertone® AM-FM RADIO TUNER

MODEL NUMBERS

9065
9067
9068

Schematic Location	Part Number	Description
	CAPACITORS	
C1A,B,C,D,E & F	19-1-6	Variable Tuning
C2	19-3-5	Trimmer, Antenna (Located on L2)
C3,C9,C36	15-470611	Ceramic Tubular, 47 mmfd., 500 v., 10%, NPO
C4,C15,C20,C30 C31,C41,C71	15-20317	Disc, .02 mfd., 500 v., GMV
C5,C11,C12,C17, C19,C21,C46,C68, C69,C70,C73,C74,C75	15-10317	Disc, .01 mfd., 500 v., GMV
C6	15-330611	Ceramic Tubular, 33 mmfd., 500 v., 10%, NPO
C7	15-33111	Disc, 330 mmfd., 500 v., 10%, GP
C8	20-23-0	Ceramic Tubular, 4.7 mmfd., 500 v., 10%
C10	15-120611	Ceramic Tubular, 12 mmfd., 500 v., 10%, NPO
C13,C14,C16,C18	20-7-2	Mica, 470 mmfd., 500 v., 5%
C22,C23,C32,C59	15-10111	Disc, 100 mmfd., 500 v., 10%, GP
C24,C40	15-47011	Disc, 47 mmfd., 500 v., 10%, GP
C25,C49,C53	16-22348	Tubular, .022 mfd., 400 v.
C26,C27,C28,C34, C37	15-50217	Disc, .005 mfd., 500 v., GMV
C29	15-22111	Disc, 220 mmfd., 500 v., 10%, GP
C33	15-80111	Disc, 800 mmfd., 500 v., 10%, GP
C35	16-47347	Tubular, .047 mfd., 400 v., 10%
C38	20-45-0	Ceramic Tubular, 3.3 mmfd., 500 v., 10%
C39	20-14-0	Tubular, 10 mmfd., 500 v., 10%
C42	15-100614	Ceramic Tubular, 10 mmfd., 500 v., 10%, N750
C43	19-3-5	Trimmer, FM Oscillator
C44	15-10318	Disc, Dual, .01 mfd., 500 v., GMV
C45	15-470115	Disc, 47 mmfd., 500 v., 10%, N1400
C47	15-82111	Disc, 820 mmfd., 500 v., 10%, GP
C48,C50,C55, C56,C64,C65	16-33348	Tubular, .033 mfd., 400 v.
C51,C66	16-22347	Tubular, .022 mfd., 400 v., 10%
C52	16-50247	Tubular, .005 mfd., 400 v., 10%
C54A,B,C & D	18-15-3	Electrolytic, 100 mfd., 300 v., (A); 20 mfd., 300 v., (B,C, & D)
C57	15-20211	Disc, .002 mfd., 500 v., 10%, GP
C58	18-22-0	Electrolytic, 20 mfd., 300 v.
C60	15-10211	Disc, .001 mfd., 500 v., 10%, GP
C61	15-12211	Disc, .0012 mfd., 500 v., 10%
C63	16-10347	Tubular, .01 mfd., 400 v., 10%
C64,C65	16-33327	Tubular, .033 mfd., 200 v., 10%
C62,C72	16-47348	Tubular, .047 mfd., 400 v.
C67	16-10448	Tubular, .1 mfd., 400 v.
	RESISTORS	
(All resistors ½ w., 10%, unless otherwise noted)		
R1	60-33901	3.3 ohm
R2,R7,R43,R93, R95,R96	60-22501	2.2 megohm
R3,R8	60-10001	10 ohm
R4,R14,R18	60-68001	68 ohm
R5,R13,R17,R59	60-68301	68K ohm
R6,R11,R34,R74	60-10301	10K ohm
R9	60-15001	15 ohm
R10,R12,R19,R23, R36,R37,R47,R71, R82,R90	60-10401	100K ohm
R15,R20	60-27321	27K ohm, 2 w.
R16,R21,R41,R73	60-10201	1K ohm
R22,R33	60-33301	33K ohm
R24,R28,R29,R40	60-47401	470K ohm
R25,R30,R42,R43,R94	60-10501	1 megohm
R26,R70,R89,R92	60-33401	330K ohm
R31,R65,R77,R81	60-22401	220K ohm
R32	60-15301	15K ohm
R35	60-47301	47K ohm
R38	60-56905	5.6 ohm, 5%
R39	60-15401	150K ohm
R44	60-56101	560 ohm
R45,R49	60-47101	470 ohm
R46,R48	60-68311	68K ohm, 1 w.
R50	60-15311	15K ohm, 1 w.
R51	60-18301	18K ohm
R52,R60,R69 R83,R91	60-33201	3.3K ohm
R53,R72	60-47501	4.7 megohm
R54	60-82301	82K ohm
R55,R63	60-10405	100K ohm, 5%
R56,R84	60-68305	68K ohm, 5%
R57	60-39305	39K ohm, 5%
R58	60-33405	330K ohm, 5%
R61	60-10505	1 megohm, 5%
R62	60-82205	8.2K ohm, 5%
R64	60-82305	82K ohm, 5%
R66	61-82	800 ohm, 5 w., w.w.
R67	61-83	2.7K ohm, 5 w., w.w.
R68	60-22201	2.2K ohm
R75	60-18401	180K ohm
R76,R79	24-139-2	5 megohm, TREBLE & BASS (2)
R78	60-56401	560K ohm
R80	60-47205	4.7K ohm, 5%
R85	60-18405	180K ohm, 5%
R86	60-22305	22K ohm, 5%
R87	60-91305	91K ohm, 5%
R88	24-256-0	1 megohm, with taps VOLUME & OFF/ON SW.
	TRANSFORMERS & COILS	
T1	10-56-2	Transformer, I.F. Input (FM)
T2	10-56-2	Transformer, 1st I.F. (FM)
T3	10-55-2	Transformer, 2nd I.F. (FM)
T4	10-57-2	Transformer, I.F. Input (AM)
T5	10-57-2	Transformer, 1st I.F. (AM)
T6	10-54-2	Transformer, 2nd I.F. (AM)
T7	10-18-0	Transformer, Discriminator (FM)
T8	10-1-1	Transformer, R.F. (AM)
L1	10-3-1	Coil, Ant. (FM)
L2	See Cabt. Parts List	Coil, Ferrite Rod Antenna (AM)(Inc.C2)
L3	10-24-1	Coil, RF (FM)
L4	10-6-5	Coil, Limiter, (FM)
L5	10-22-4	Coil, Osc. (FM)
L6	10-2-4	Coil, Osc. (AM)

MISCELLANEOUS CHASSIS PARTS

Part No.	Description
11-965	Bracket, Dial Plate Support (L.H.)
11-966	Bracket, Dial Plate Support (R.H.)
11-960	Bracket, Dial Plate Tie (2)
11-968	Bracket, Tuning Meter Mtg.
11-961	Bracket, Tuning Shaft Bearing
22-32-1	Clip, I.F. Transformer Mtg.
67-3-1	Dial Background Plate
51-105	Dial Cord (Specify Length) (see stringing diagram)
39-12-0	Flywheel, Tuning
37-112-3	Rubber Grommet (Tuner Mtg.)
89-7	Lamp, Pilot Light (Dial) No.47 Bayonet (2)
89-16	Lamp, Meter Pilot Light
23-29-0	Line Cord (9 ft.)
83-1026	Meter, Tuning, Indicator
28-170-1	Pad, Meter Cushion (2)
52-21-1	Pointer, Tone (2)
52-22-1	Pointer, Dial
45-4-3	Power Receptacle (2)
45-12-2	Socket, 7 Pin Min.
45-36-2	Socket, 9 Pin Min.
45-12-3	Socket, Double Phono Connector
45-3-3	Socket, Phono Connector
45-37-2	Socket, Recessed Octal (Pwr. Inp. from Amp. Chassis)
45-38-2	Socket, Clock
45-15-4	Socket, Pilot Light (R.H.)
45-16-4	Socket, Pilot Light (L.H.)
45-17-4	Socket, Meter Pilot Light
45-11-2	Socket, (V2)
71-69-0	Shield, 7 Pin Tube (8)
71-80-0	Shield, 9 Pin Tube (4)
69-223-0	Switch, Compensator (SW2)
69-227-0	Switch, Compensator (SW1)
70-269-0	Spring, Dial Cord Tension (Tuning)
70-217-0	Spring, Dial Cord Tension (4) (Bass & Treble)
39-43-3	Tuning Shaft

R.F. Tuner 528.53171 is combined with Radio Amplifier 528.53270 in Models 9065, 9067, 9068. For Chassis Parts List, Schematic Diagram, Top and Rear Views of the Radio Amplifier and for Cabinet Parts Lists for Models 9065, 9067, 9068 refer to Parts List 528.53270.

SILVERTONE RADIO R. F. TUNER CHASSIS NUMBER 528.53171

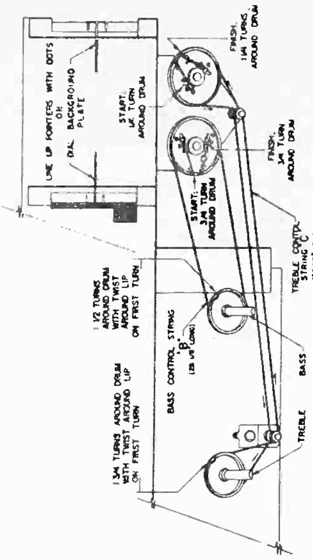


Fig. 3. Stringing of Bass and Treble Controls

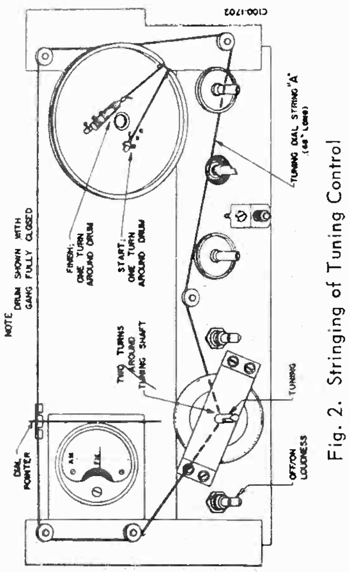


Fig. 2. Stringing of Tuning Control

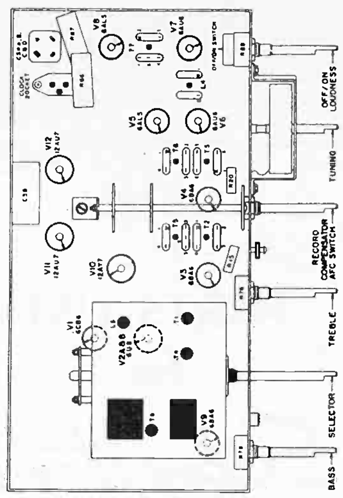


Fig. 5. Bottom View - Chassis 528.53171

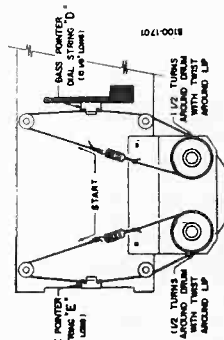


Fig. 4. Stringing of Bass & Treble Pointers

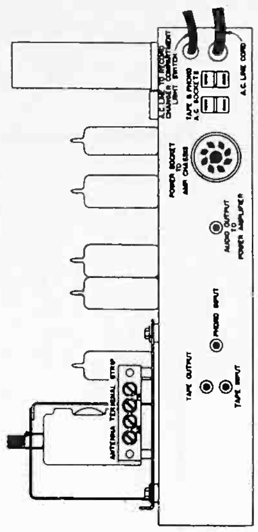


Fig. 7. Rear View - Chassis 528.53171

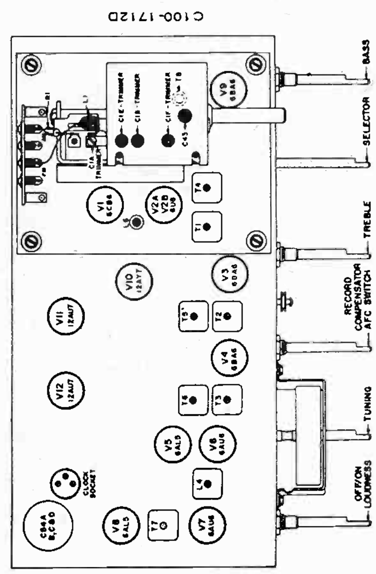


Fig. 6. Top View - Chassis 528.53171

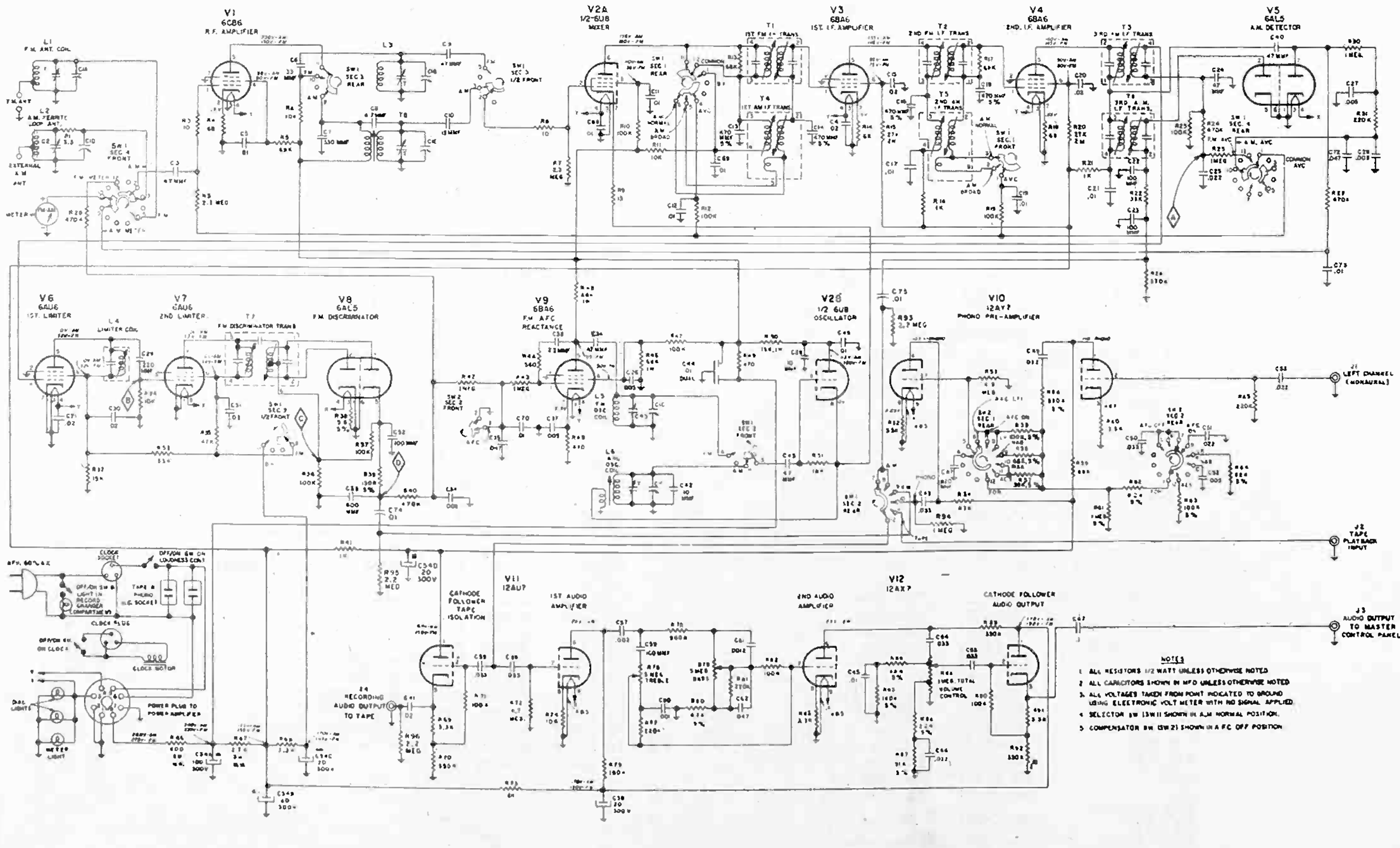
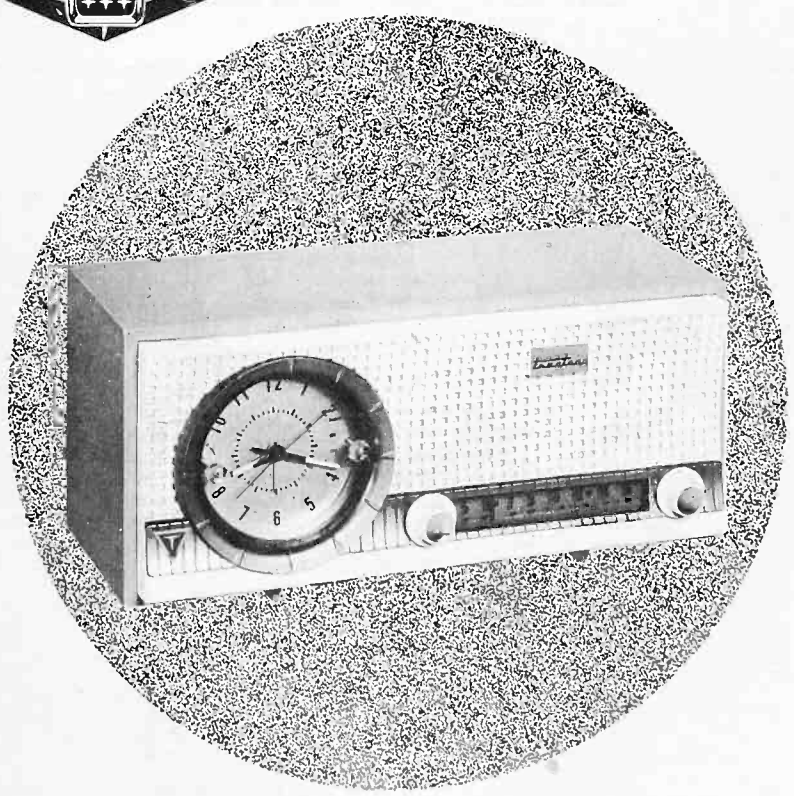


Fig. 1. Schematic Diagram of Radio Tuner Circuit - 528.53171

truetone
CLOCK RADIO

INSTALLATION, OPERATING and SERVICE INSTRUCTIONS



MODELS DC2000 & DC2001

WESTERN AUTO SUPPLY CO.

SPECIFICATIONS

AC Superheterodyne Radio and Self-Starting Electric Clock Combination. Frequency Coverage 535 to 1620 Kilocycles with Conelrad Civil Defense symbols at 640 and 1240 Kilocycles. Operates on 117 volt, 60 cycle alternating current (AC) only (connection to DC will damage the clock). Power consumption: 35 watts. Features a 117-volt, 60-cycle AC appliancetimer outlet, on back of radio. Maximum appliance load: 1100 Watts CONTROLS: Auto-Control switch, Time and Alarm Set knob, and Sleep switch, on clock; Volume and Tuning on right side of cabinet.

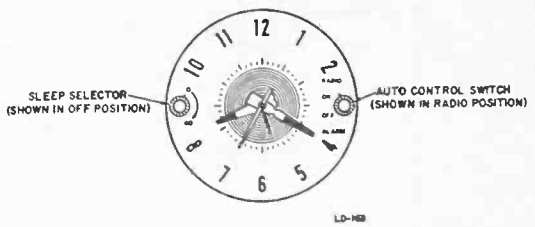
INSTALLATION

Simply insert the power plug into a 117-volt 60-cycle AC outlet and set the clock hands to the correct time. The clock operates continously whether or not the radio is in use. An appliance (percolator, toaster, etc.) may be plugged into the outlet on the back of the set. If the switch on the appliance is turned on, the appliance will turn on and off with the radio. Your radio is equipped with a sensitive built-in antenna that eliminates the need for an external antenna.

OPERATION

TO SET THE CLOCK: Pull out Time and Alarm Set knob on back of receiver and turn it clockwise to set hands.
NON-AUTOMATIC RADIO OPERATION: To operate radio and appliance independently of the clock:

1. Turn Auto Control switch to ON position and allow 30 second for warm-up.
2. Adjust Tuning and Volume controls for desired station and loudness. To turn set off, turn Auto Control switch to the OFF position.



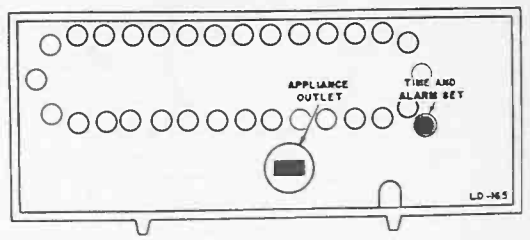
AUTOMATIC RADIO-OPERATION

1. Push in Time and Alarm Set knob on back of receiver and turn it until Gold hand on clock indicates time you wish radio to turn on automatically.
2. Turn Auto Control switch to ON position and allow 30 second for warm-up.
3. Adjust Tuning and Volume controls for desired station and loudness.
4. Turn Auto Control switch to Radio position. The radio and appliance will turn on automatically at the pre-set time. If the buzzer alarm is also desired turn the Auto Control to the Alarm position.
5. The radio and appliance will turn on at the pre-set time and the buzzer alarm will sound approximately 10 minutes later. To turn off the radio and buzzer, turn the Auto Control switch to the OFF position. To turn off the buzzer and keep the radio playing, turn the Auto Control switch to the ON position.

NOTE: If the clock is set for automatic radio operation more than 10 hours in advance, the radio will turn on immediately and automatic operation will not be obtained.

SLEEP SELECTOR: Permits radio to be turned off automatically after operating for up to 60 minutes. Turn the Auto Control switch to OFF. Turn Sleep Selector knob clockwise to period of time you wish radio to remain on. Set Tuning and Volume for desired station and loudness. The radio will play for desired period, then turn off automatically.

The Sleep selector may also be used with automatic operation. Set radio for Automatic Operation. Turn Sleep knob clockwise to period of time you wish radio to remain on. The radio will play for desired time, turn off automatically, and turn on again at time indicated by Gold hand on clock.



PARTS PRICE LIST FOR DC2000 & DC2001

Symbol	Part No.	Description	Approximate Selling Price
R-1	IR-4	47 ohm resistor 1/2 w - 20%	.06
R-2	IR-45	22,000 ohm resistor 1/2 w - 10%	.06
R-3	IR-20	220,000 ohm resistor 1/2 w - 20%	.06
R-4	IR-23	3.3 meg resistor 1/2 w - 20%	.06
R-5	IR-155	120 ohm resistor 1/2 w - 10%	.06
R-6	VC-101	1 Meg Volume Control	.82
R-7, 8	MC-19	Couplate 6.8 Meg - 470M ohm 220 Mfd - .002 Mfd. 250 Mfd.	.84
R-9	IR-98	150 ohm resistor 1/2 w - 10%	.10
R-10	IR-42	1000 ohm resistor 1 w - 10%	.16
R-11	IR-12	1 Meg resistor 1/2 w - 20%	.06
T-1, T-2	LI-19	I.F. transformer	2.47
C-1	CC-12	47MMFD Ceramic Condenser	.25
C-2	PC-8	.1 MFD Condenser 400 V	.24
C-3	CC-33	220 MMFD-500V-20% Ceramic condenser	.20
C-4	PC-5	.05MFD condenser 400V	.22
C-9, 10	EC-68	70MFD) 40MFD) 150W.V.-D.C. electrolytic	1.58
C-11	PC-47	.02MFD Condenser 400V	.20
G-1, 2	GC-24	Tuning Condenser	2.90
S	SPK-55	4" x 6" P.M. Speaker	5.15
T-3	AT-24	Output transformer	1.90
L-1	LL-48	Loop Antenna	2.25
L-2	LO-27	Oscillator Coil	1.06
SO	SO-54	Appliance outlet socket	.35
M, SW	CK-7	Electric Clock	13.70
	CA245	Cabinet (State Color)	5.70
		Bezel	
	K228	Clock Knobs	.07
	K229	Control Knobs (State Color)	.25

Prices Shown are Approximate and Subject to Change Without Notice

HOW AND WHERE TO ORDER REPLACEMENT PARTS

To eliminate error and to speed delivery of replacement parts, always include the following information on your order.

1. Complete identification of the Radio for which the part is wanted.
   (a) Name Item- Clock Radio
   (b) Model Number DC2000 & DC2001
   (c) Serial Number
2. Best possible identification of the part itself.
   (a) Part Number
   (b) Part Name
   (c) If necessary return the old part as sample.

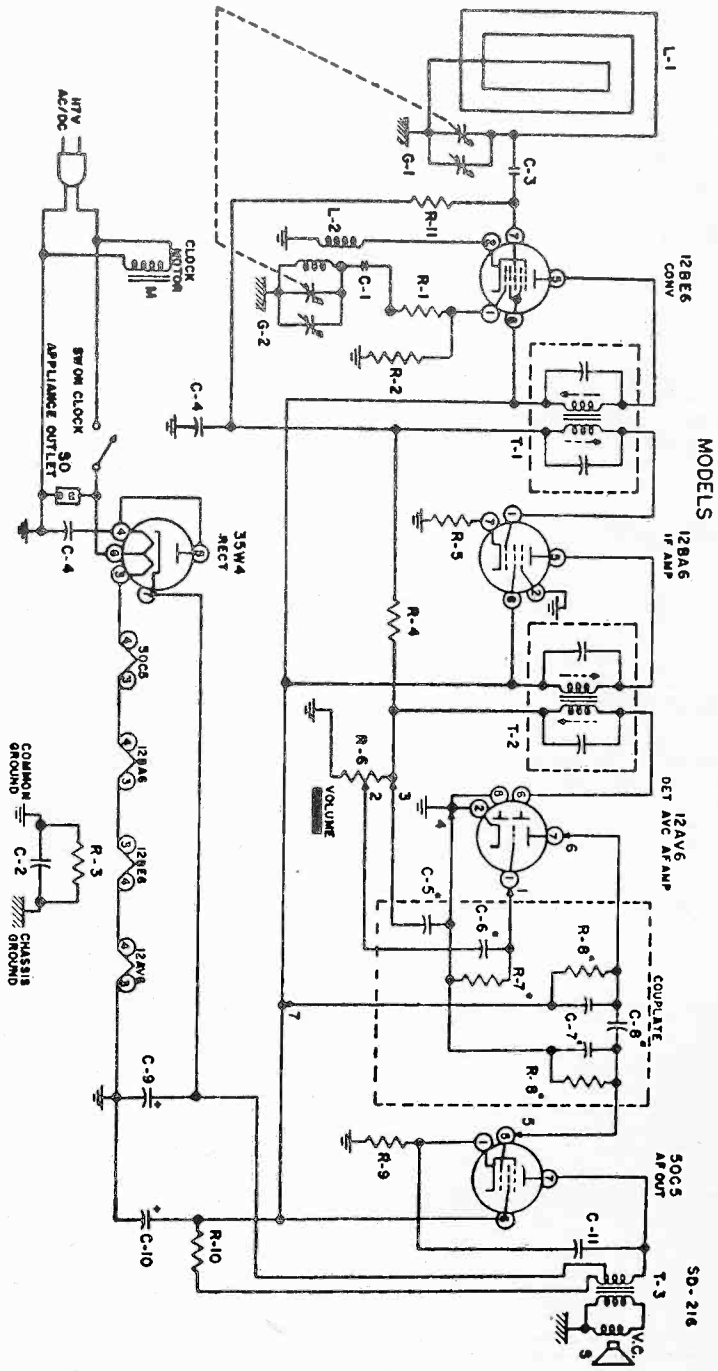
1. CUSTOMERS may order all replacement parts from any Western Auto Store or Associate Store. Each store has an up-to-date price list on replacement parts.
2. Company and Associate Stores may order any part shown in any Western Auto Replacement Parts and Price Lists from these Special Merchandise Warehouse:

Western Auto Special Merchandise Warehouse
2610 Grand Avenue
Kansas City 8, Missouri

Western Auto Special Merchandise Warehouse
1227-29 First Avenue South
Birmingham, Alabama

Western Auto Special Merchandise Warehouse
1217 Alhambra Avenue
Sacramento, California

Western Auto Special Merchandise Warehouse
3142-44 West Liberty
Pittsburgh, Pennsylvania



Westinghouse

RADIO

SERVICE MANUAL

SERVICE DEPARTMENT
RADIO-TELEVISION DIVISION
WESTINGHOUSE ELECTRIC CORP.
METUCHEN, N. J.

A Tech-Lit Publication

MODELS

H-704T5
(Chestnut Brown)

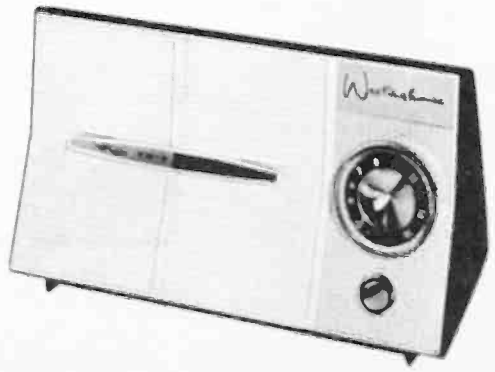
H-705T5
(Turquoise)

H-706T5
(Ivory)

CHASSIS V-2398-1

SPECIFICATIONS

Frequency Range	540 to 1600 KC.
Intermediate Frequency	455 KC.
Tube Complement:	
1 12BE6	Converter
1 12BA6	IF Amp.
1 12AV6	Det., AVC and 1st AF Amp.
1 50C5	Output Amp.
1 35W4	Rectifier
Power Output:	
Undistorted	0.9 watts
Maximum	1.5 watts
Speaker	Two 4" PM
Operating Voltage	105 to 120 volts, 50-60 cycle AC or 105 to 120 volts DC
Power Consumption	30 watts



CHASSIS REMOVAL

1. Remove three screws, two from top corners on cabinet back and one from cabinet bottom.
2. Slide cabinet-front and attached chassis out from cabinet.

CHASSIS REPLACEMENT

1. Slide chassis and attached cabinet-front into cabinet, making sure that etched circuit board enters the groove provided in the cabinet.
2. Replace screws removed in "Chassis Removal".

NOTE: It is recommended that the chassis be isolated from the power line during servicing, by means of an isolation transformer.

ALIGNMENT

While making the following adjustments, keep the volume control set for maximum output and the signal generator output attenuated to weakest usable signal level.

Step	Connect Signal Generator to —	Signal Gen. Frequency	Radio Dial	Connect VTVM Across Voice Coil and Adjust for Maximum Output —
1	Stator of ant. tuning capacitor (A) through a 200 mmf capacitor.	455KC 400 Cps. 30% Mod.	Minimum capacity	Top and bottom slugs of T2 and T1. *
2	Radiated signal	1625 KC	Minimum capacity	Oscillator trimmer (D)
3	Radiated signal	1400 KC	1400 KC	Antenna trimmer (B)

* It is recommended that a fiber aligning tool that snugly fits the slot in the powdered iron core be used to prevent chipping of the slot.

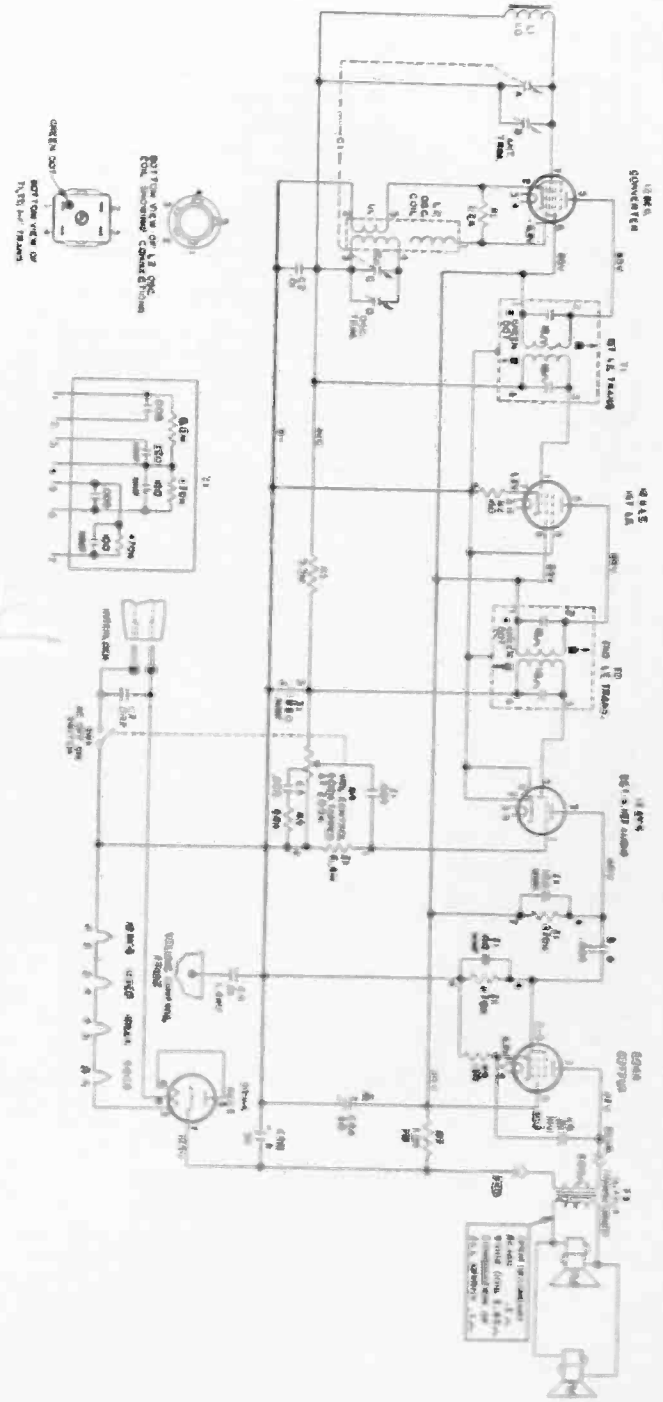


Figure 1 – Schematic diagram.

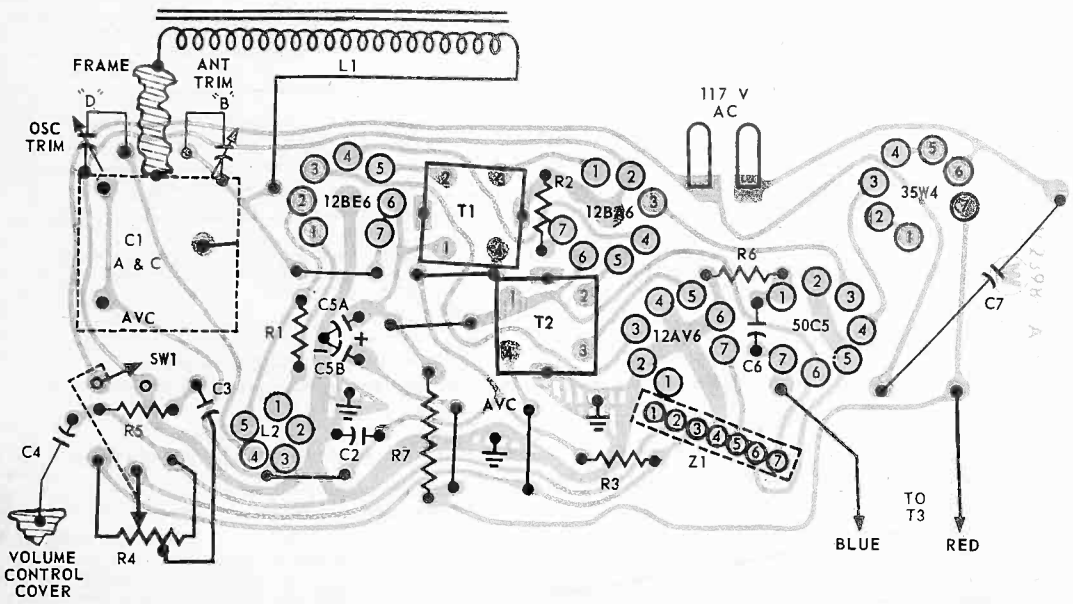


Figure 2 – Bottom view of chassis.

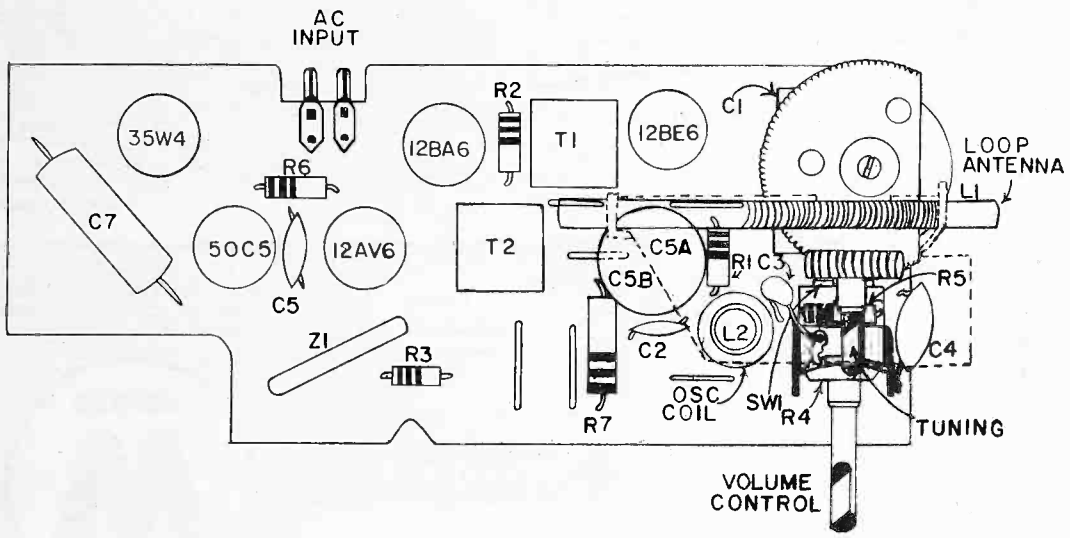


Figure 3 – Top view of chassis.

PARTS LIST

When ordering parts, specify part number, description of part and model number. *Do not order by model number alone.* Where applicable, prices include Federal Excise Tax. Prices are subject to change without notice.

CABINET AND MISCELLANEOUS PARTS

Ref. No.	*Part No.*	*Description*	*List Price*
†	787V172H01	Bracket assy	.50
†	513V043H01	Cabinet, H-704T5	5.50
†	513V043H02	Cabinet, H-705T5	5.50
†	513V043H03	Cabinet, H-706T5	5.50
	770V415H01	Contack, male (interlock)	.10
	751V006H01	Cord, AC power	.85
†	555V044H01	Escutcheon	1.25
†	558V236H01	Front, cabinet	2.50
†	783V092H01	Gear & shaft, molded	.20
	783V061H01	Insert	.35
†	550V101H06	Knob, off-on-volume	.40
†	558V238H01	Nameplate	.50
	761V815H03	Screw, special, front to cabinet	.10
	751V503H03	Socket, 7 pin (50C5, 35W4)	.17
	751V503H06	Socket, 7 pin	.15
	781V011H01	Spacer, rubber, speaker mtg.	.10
†	570V026H03	Speaker, 4" PM	4.25
†L1	310V050H01	Loop, antenna	2.00
†L2	230V040H05	Coil, oscillator	.95
†SW1	270V027H14	Switch, AC off-on (incl R4)	1.00
T1	235V023H11	Transformer, 1st IF	1.57
T2	235V023H11	Transformer, 2nd IF	1.57
T3	430V065H01	Transformer, audio	1.85
Z1	219V001H01	Couplate, audio det	.95

CHASSIS PARTS

Ref. No.	*Part No.*	*Description*	*List Price*
†C1	330V029H01	Capacitor, variable (incl crown gear)	3.75
C2	R2CC63Z5Z103P	Capacitor, .01 mf	.20
C3	215V308H04	Capacitor, .005 mf	.20
C4	215V160A01	Capacitor, .01 mf, 1.4KV, cer	.25
C5A, C5B	218V025H07	Capacitor, elec { 50 mf, 150V / 50 mf, 150V }	1.97
C6	215V300H03	Capacitor, .01 mf, 1KV, cer	.22
C7	210V214A73	Capacitor, .047 mf, 600V	.35
R1	RC20AE223K	Resistor, 22K ohms	.07
R2	RC20AE151K	Resistor, 150 ohms	.05
R3	RC20AE335K	Resistor, 3.3 megohms	.09
R4	270V071H02	Control, volume, tapped (see SW1)	
R5	RC20AE683K	Resistor, 68K ohms	.05
R6	RC20AE181K	Resistor, 180 ohms	.10
R7	RC30AE152M	Resistor, 1.5K ohms, 1W	.10

Resistors are ½ watt, 10% unless otherwise specified.
† New part listed for the first time in Westinghouse Television or Radio service information.
* Price furnished on request.

ZENITH RADIO CORPORATION
MODEL C835R,E,H CHASSIS 8C01

TO THE SERVICEMAN:

The 8C01 chassis incorporates a superheterodyne circuit with two stages of IF, on the FM and AM Bands. There is one stage of RF amplification on all Bands.

This receiver features an Automatic Frequency Control which keeps your receiver on the exact station frequency when you are tuned to an FM station. Turn the band switch to (FM AFC) position and tune the receiver.

When the desired FM station is a weak station, adjacent in frequency to a strong station, the AFC may pull the tuning into the stronger station. Under these conditions, place the band switch in FM position and tune the receiver.

When adjustments are made on the 8C01 or any AC-DC chassis, a line isolation transformer (110-V input to 110-V output) is recommended in order to avoid a ''hot'' chassis. If an isolation transformer is not available check the AC voltage between chassis and bench ground, and if there is any indication of voltage, reverse the plug before handling the set.

The IF transformers and the discriminator transformer are the new permeability tuned type. The advantage of an IF transformer of this type is its extreme stability under various humidity and temperature conditions. The upper coil is the secondary and the lower the primary. When adjusting these IF and discriminator transformers, tuning wrench 68-19 can be inserted into the top slug, rotated until maximum output is obtained and then dropped down to the lower slug and the same operation repeated. The tuning wrench is so designed that turning one slug does not affect the adjustment of the other.

Alignment of this chassis will, in most cases, be unnecessary unless an IF or RF transformer is replaced or the adjustments have been tampered with.

FM Discriminator Alignment: When the secondary of the discriminator is aligned (operation 5) use sufficient signal input to get a good positive and negative indication before setting the slug for zero reading. A center zero indicating meter is recommended for this adjustment, but is not absolutely necessary. Reversing the leads of a non-zero center meter, or observing closely when the meter starts to go to the left (negative) of zero will give the same results.

FM IF Alignment: Because of the wide band pass, it is desirable to use a FM signal generator and a cathode ray oscilloscope when aligning the FM IF channel. The instruction book for the Zenith Model 800 Signal Generator (Form Z8001) covers complete FM alignment procedure. If visual alignment equipment is unavailable, reasonably accurate alignment can be made by following the procedure outlined in this service note.

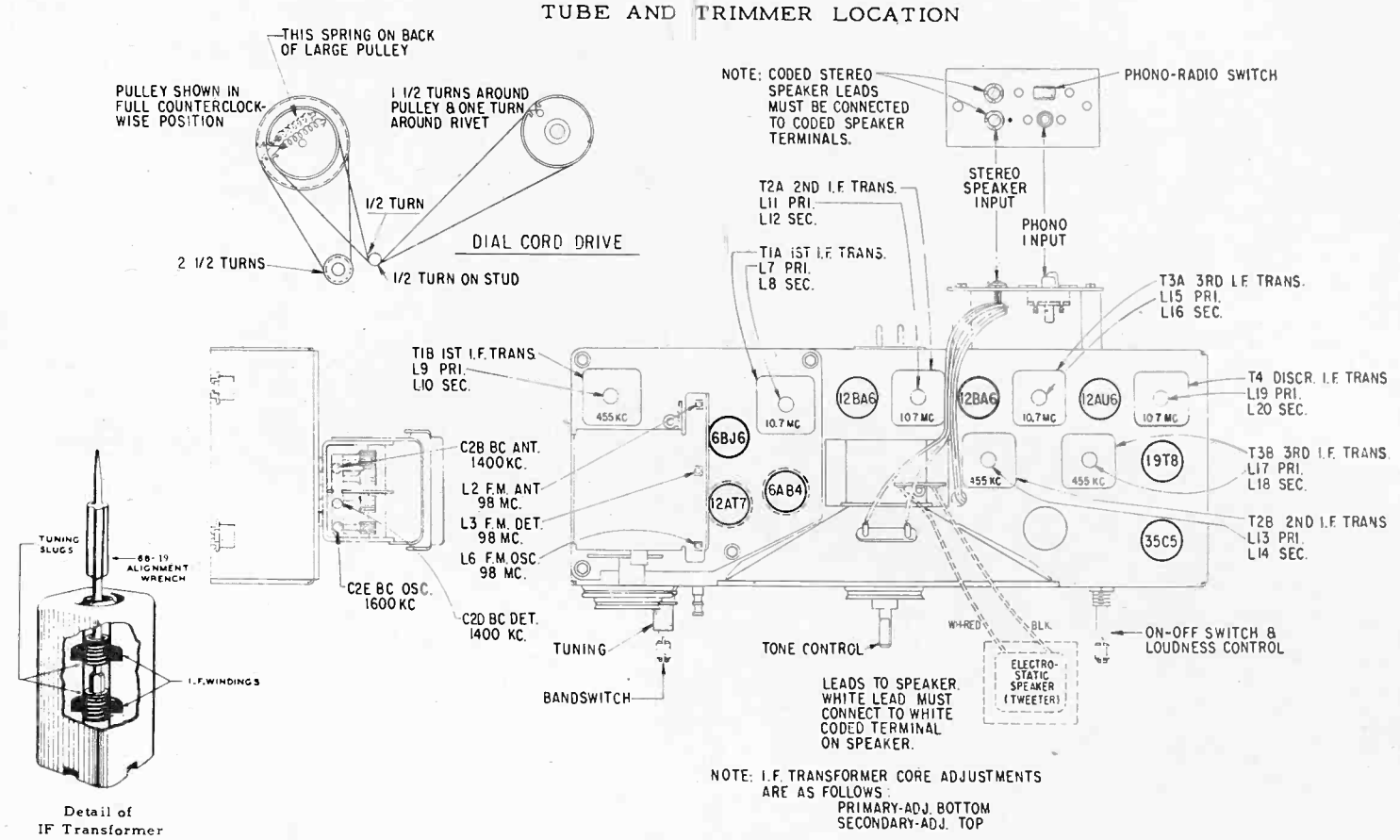
Correct alignment can only be made if the following procedure is followed:

A vacuum tube voltmeter with an isolation resistor of 2,000,000 ohms in series with the hot lead will serve for FM adjustments. This lead should be shielded.

The signal generator output should be kept just high enough to get an indication on the meter.
(a) Vacuum Tube Voltmeter Lug 7 on discriminator transformer to chassis (half discriminator load).
(b) Vacuum Tube Voltmeter Lug 5 on discriminator transformer to chassis (full discriminator load).
(c) Vacuum Tube Voltmeter from Limiter Grid to Chassis.
(d) Loosen Slugs by applying a hot iron to the cement.

An AC output meter connected across the primary or secondary of the output transformer will be satisfactory for all AM adjustments.

TUBE AND TRIMMER LOCATION

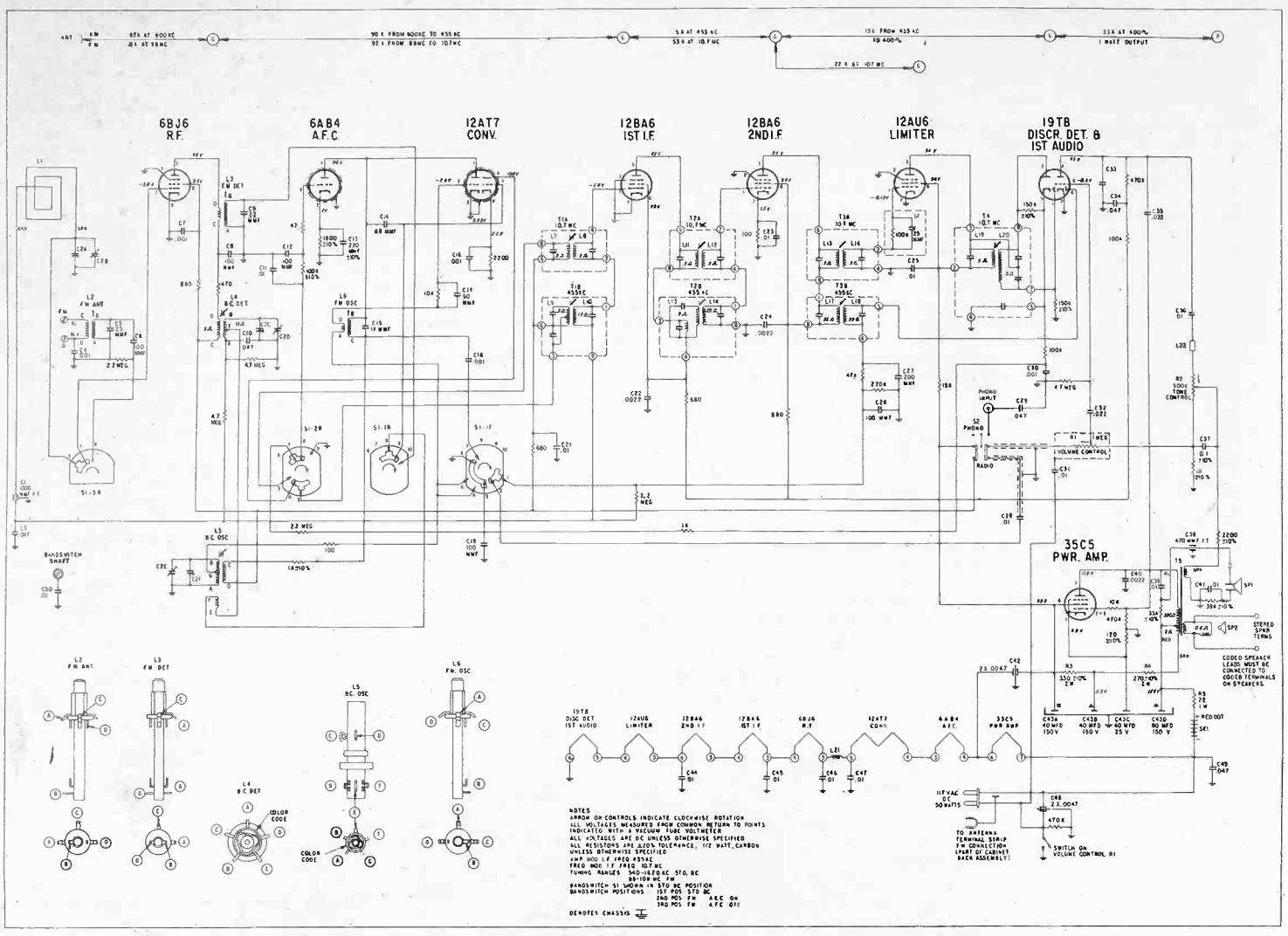


Detail of IF Transformer

NOTE: I.F. TRANSFORMER CORE ADJUSTMENTS ARE AS FOLLOWS:
PRIMARY-ADJ. BOTTOM
SECONDARY-ADJ. TOP

ALIGNMENT PROCEDURE

OPERATION	CONNECT OSCILLATOR TO	DUMMY ANTENNA	INPUT SIGNAL FREQUENCY	BAND	SET DIAL TO	ADJUST TRIMMERS	PURPOSE
1	Pin 7 12AT7 converter	.05 Mfd.	455 Kc., 400 Cycle Modulated	BC	600 Kc.	L18,17,14,13, 10,9	Align IF channel for maximum output.
2	2 turns loosely coupled to wavemagnet		1600 Kc., 400 Cycle Modulated	BC	1600 Kc.	C2E	Set oscillator to dial scale.
3	2 turns loosely coupled to wavemagnet		1400 Kc., 400 Cycle Modulated	BC	1400 Kc.	C2D, C2B	Align detector and antenna stages.
4(a)	Pin 1 (grid) on 12AU6 limiter	.05 Mfd.	10.7 Mc. Unmodulated	FM		L19	Align primary of discriminator for maximum reading.
5(b)	Pin 1 (grid) on 12AU6 limiter	.05 Mfd.	10.7 Mc. Unmodulated	FM		L20	Adjust secondary of discriminator for zero reading.
6(c)	Pin 1 (grid) on 12BA6 2nd IF	.05 Mfd.	10.7 Mc. Unmodulated	FM		L16,15	Align 3rd IF transformer for maximum reading.
7(c)	Pin 1 (grid) on 12BA6 1st IF	.05 Mfd.	10.7 Mc. Unmodulated	FM		L12,11	Align 2nd IF transformer for maximum reading.
8(c)	Pin 7 (grid) on 12AT7 converter tube socket	.05 Mfd.	10.7 Mc. Unmodulated	FM		L8,7	Align 1st IF transformer for maximum reading.
9(c)	Antenna Post FM (Remove line ant.)	270 Ohms	98 Mc. Unmodulated	FM	98 Mc.	L6	Set oscillator to dial scale.
10(c) (d)		270 Ohms	98 Mc. Unmodulated	FM	98 Mc.	L3,2	Align detector and antenna stages for maximum reading.



PARTS LIST

CHASSIS PARTS
Chassis 8C01

PART NO.	DIA. NO.	DESCRIPTION	PRICE
12-1406		Tuner arm pivot bracket	.05
19-249		Coil mtg. clip (2 used)	.05
22-3	C11,21,23,25,28,36,39,41,44,45,46,47	.01 mfd. ceramic disc (14 used)	.30
22-5	C6,8,19,26	100 mmf. ceramic disc (4 used)	.25
22-9	C12	100 mmf. ceramic disc - 500 V.	.25
22-17	C30	.001 mfd. ceramic disc - 1 K V	.25
22-18	C22,24,33,10	.0022 mfd. ceramic disc (4 used)	.25
22-24	C42,48	2 x .0047 mfd. ceramic disc (2 used)	.40
22-1367	C17	50 mmf. ceramic - 500 V.	.45
22-1506	C9	22 mmf. ceramic - 500 V.	.25
22-1661	C43A, B,C,D	Electrolytic - 80/150 40/150 40/150 40/150 40/25	3.50
22-1668	C27	200 mmf. ceramic - 500 V.	.25
22-1677	C2A,B, C,D,E, F	3 section variable	5.00
22-1766	C14	.68 mmf. gimmick - 500 V.	.20
22-1888	C4,7, 16,18	.001 mfd. ceramic (4 used)	.25
22-2060	C5	25 mmf. ceramic - 500 V.	.25
22-2321	C13	220 mmf. ceramic - 500 V.	.25
22-2569	C49	.047 mfd. molded - 600 V.	.40
22-2630	C15	19 mmf. ceramic - 500 V.	.25
22-2655	C31,50	.01 mfd. ceramic disc - 1400 V. (2 used)	.50
22-2732	C1	Feed thru - 1000 mmf. - 500 V.	.30
22-2780	C37	.1 mfd. paper - 200 V.	.30
22-2792	C3,10, 34	.047 mfd. paper - 200 V. (3 used)	.30
22-2793	C29	.047 mfd. paper - 400 V.	.25
22-2805	C32	.022 mfd. paper - 400 V.	.25
22-2806	C35	.022 mfd. paper - 600 V.	.30
22-2806	C36	.022 mfd. paper - 600 V.	.30
22-2900	C38	Feed thru - 470 mmf. - 500 V.	.30
49-608	SP2	7 1/2" P.M. speaker	8.75
54-139		3/8-32 x 9/16 palnut (mts. 63-4615)	.03
54-140		3/8-32 x 9/16 x 3/32 hex. nut	.03
54-269		8-32 x 11/32 palnut (2 used on S-47151)	.03
54-271		6-32 x 1/4 palnut (1 mts. ea. S-17789, 95-1150, 95-1153, 95-1201, 95-1248, 95-1249 & 95-1254)	.03
58-200		2 prong plug	.10
63-1622	R3	330 ohm 2W Ins. 10%	.17
63-1730		47 ohm 1/2W Ins. 20%	.17
63-1744		100 ohm 1/2W Ins. 20% (2 used)	.17
63-1747		120 ohm 1/2W Ins. 10%	.17
63-1772		470 ohm 1/2W Ins. 20%	.17
63-1779		680 ohm 1/2W Ins. 20% (4 used)	.17
63-1785		1000 ohm 1/2W Ins. 10% (2 used)	.17
63-1786		1000 ohm 1/2W Ins. 20%	.17
63-1796		1800 ohm 1/2W Ins. 10%	.17
63-1799		2200 ohm 1/2W Ins. 10%	.17
63-1800		2200 ohm 1/2W Ins. 20%	.17
63-1828		10 K ohm 1/2W Ins. 20% (2 used)	.17
63-1835		15 K ohm 1/2W Ins. 20%	.17
63-1848		33 K ohm 1/2W Ins. 10%	.17
63-1852		39 K ohm 1/2W Ins. 10%	.17
63-1856		47 K ohm 1/2W Ins. 20%	.17
63-1869		100 K ohm 1/2W Ins. 10%	.17
63-1870		100 K ohm 1/2W Ins. 20% (2 used)	.17
63-1876		150 K ohm 1/2W Ins. 10% (2 used)	.17
63-1884		220 K ohm 1/2W Ins. 20%	.17
63-1898		470 K ohm 1/2W Ins. 20% (3 used)	.17
63-1926		2.2 megohm 1/2W Ins. 20% (3 used)	.17
63-1940		4.7 megohm 1/2W Ins. 20% (3 used)	.17
63-3197	R5	22 ohm 1W Ins. 20%	.25
63-3232	R4	270 ohm 2W Ins. 10%	.34
63-4614	R2	Tone control	1.40
63-4615	R1	Volume control & switch	2.05
73-131		6-32 x 3/8 slab hd. set screw - cuppoint (2 part of S-13945)	.04
78-644		Connector socket	.15
78-806		7 contact wafer tube socket	.15
78-850		9 contact molded tube socket	.40
78-869		9 contact wafer tube socket	.25
78-870		7 contact wafer tube socket (3 used)	.15
78-871		7 contact wafer tube socket	.15
78-905		7 contact wafer tube socket	.30
80-69		Dial cord spring	.15
80-209		Dial cord spring	.03
80-444		Tuner arm tension spring	.05
80-580		Tuner arm stop spring	.10
80-817		Tuner spring	.10
80-818		Tuner arm pressure spring	.15
80-865		Ground spring	.05
80-868		Ground spring	.15
83-1090		Insulating strip (AC plug)	.05
83-1479		Insulating strip (band switch)	.05
83-1480		Volume control insulating strip (outer)	.05
83-1520		Rectifier insulating strip	.05
83-1635		Volume control insulating strip (inner)	.03
83-1640		I.F. transformer support strip (5 used)	.05
83-2135		4 lug terminal strip	.10
83-2383		3 lug terminal strip	.05
83-2628		1 lug terminal strip	.05
83-2638		3 lug terminal strip	.05
83-2639		3 lug terminal strip	.05
83-2642		5 lug terminal strip	.10
83-2673		6 lug terminal strip	.10
83-3109		Phono-radio control strip	.25
85-495	S2	Radio-phono switch	.60
85-630	S1	Band switch	5.75
93-755		Lockwasher (used on 83-2383)	.03
93-811		Brass washer (used on S-17151)	.03
93-961		Insulating shoulder washer (used on S-47151)	.03
93-993		Insulating washer (used on S-47151)	.03
93-1043		Spring washer (used on S-47151)	.10
93-1047		Lockwasher (used on S-47151)	.03
94-334		Speaker mtg. bushing (3 used)	.03
94-598		R.F. plate mtg. bushing (4 used)	.03
94-613		Iron core insulating bushing (3 used)	.10
94-1018		Wood spacer (2 used on 83-3109)	.10
95-1150	T2A, 3A	2nd & 3rd I.F. transformer - FM (2 used)	3.50
95-1153	T4	Discriminator transformer - FM	3.50
95-1201	T1A	1st I.F. transformer - FM	3.00
95-1248	T1B	1st I.F. transformer - BC	3.00
95-1249	T2B	2nd I.F. transformer - BC	3.00
95-1254	T3B	3rd I.F. transformer - BC	3.00
95-1662	T5	Audio output transformer	
97-284		Dial cord guide stud	.20
97-293		Chassis mtg. stud	.20
105-42	U1	R/C network	.50
113-8		6-32 x 1/4 x 1/4 hex. hd. mach. screw - lockwasher att. (2 used on ea. 22-1677 & 85-630)	.03
113-9		8-32 x 1/4 x 1/4 hex. hd. mach. screw - lockwasher att. (used on 83-2383)	.03
113-10		6-32 x 3/16 x 1/4 hex. hd. mach. screw - lockwasher att. (2 used on ea. 12-1406 & 80-818)	.03
114-199		6-32 x 3/16 x 1/4 hex. hd. self-tap. screw (2 mt. S-17789)	.03
114-200		6-32 x 5/16 x 1/4 hex. hd. self-tap. screw (used on 80-817)	.03
114-292		6-32 x 5/8 x 1/4 hex. hd. self-tap. screw (8 used)	.03
114-398		6-32 x 1 3/8 x 1/4 hex. hd. self-tap. screw (1 mts. 212-13 & 2 used on 83-3109)	.03
114-691		8-32 x 5/8 hex. hd. mach. screw - flatwasher att. (2 used on S-47151)	.03
125-17		Rubber grommet (4 used on 49-608)	.03
125-62		Rubber grommet (4 used)	.03
125-85		Rubber grommet (1 used on ea. S-14182, S-15743 & S-15691)	.05
126-554		Tube shield (used on 6AB4)	.05
126-618		Tube shield (used on 12AT7)	.03
149-64		Tuning core (1 used on ea. 94-613)	.40
149-171	L22	Iron core sleeve	.10
149-211		Iron core (1 part of ea. S-41088 & S-43475)	.10
188-34		Retaining ring (used on S-47151)	.03
188-221		Retaining ring (used on S-21974)	.04
199-198		Shielded paper sleeve (used on 83-3109)	.05
199-265		Shielded paper sleeve (used on 83-3109)	.03
212-23 or 212-13	SE1	Selenium rectifier Selenium rectifier	1.80 2.25
S-13945		Cam, pulley & bushing assembly	.70
S-13997	L21	Filament choke coil	.50
S-14192	L2	FM antenna coil	.90
S-14429		Tuner arm	1.00
S-15691	L6	FM oscillator coil	.50
S-15743	L3	FM detector coil	.80
S-17159		Dial cord & eyelet assembly	.10
S-17789		Shield & lug assembly	
S-18993		Dial cord & eyelet assembly	.15
S-21974		Tuning shaft & pulley assembly	
S-41088	L4	BC detector coil	1.00
S-43475	L5	BC oscillator coil	1.00
S-46975		Pulley & bushing assembly	
S-47151		Tone control bracket	

CABINET PARTS
Models C835,E,H & R

11-85		Line cord & plug (part of S-45918)	.75
14-2752		Table cabinet - Model C835	
14-2752E		Table cabinet - Model C835E	
14-2752H		Table cabinet - Model C835H	
14-2752R		Table cabinet - Model C835R	
16-1585		Packing carton	
19-9		Line cord retaining clip (part of S-46918)	.05
24-590		Line cord plug cover (part of S-46918)	.20
26-646		Dial scale	
46-2082		Knob (volume control & band switch)	
54-469		Speed nut (part of cabinet)	.10
57-2498		Emblem plate	.35
57-2769		Name plate (part of cabinet)	
78-787		2 contact socket (part of S-46918)	.10
80-1003		Knob retaining spring (part of S-46937)	.10
83-3191		Insulating strip	
86-30		Terminal (part of S-46918)	.03
86-254		Connector terminal (1 part of ea. S-23921 & S-23922)	.05
86-255		Spade terminal	.03
93-297		1/32 x .136 x 3/8 steel washer (2 part of S-46918)	.03
93-1188		Lockwasher (1 used on ea. 114-128)	.03
114-39		8-32 x 1/4 x 1/4 hex. hd. self-tap. screw (2 mt. S-17771)	.03
114-128		10-16 x 1 1/16 hex. hd. self-tap. screw - flatwasher att. (4 mt. 8C01)	.05
114-180		6-20 x 1/4 x 1/4 hex. hd. self-tap. screw (2 part of S-46918)	.03
114-630		6-16 x 5/8 x 1/4 slot. hex. washer hd. self-tap. screw (6 mt. S-46918)	.03
166-86		Rubber bumper (4 part of cabinet)	.05
188-54		Knob clamping ring (part of S-46356)	.03
188-169		Pointer clamping ring (part of S-46938)	.10
196-271		Speaker gasket	.80
199-213		Paper sleeve (part of S-46918)	.03
202-697		FM instruction book	.10
202-1498		Instruction book	
S-17771		Chassis bottom plate	.70
S-23829	SP1	Tweeter speaker	1.10
S-23921		Wire & terminal assembly	.15
S-23922		Wire & terminal assembly	.15
S-46356		Tuning knob & ring assembly	
S-46918		Wavemagnet antenna	
S-46919		Speaker grille & cloth assembly	
S-46937		Knob & spring assembly (tone)	
S-46938		Dial pointer & ring assembly	

TO THE SERVICEMAN:

The 8C02 chassis incorporates a superheterodyne circuit with two stages of IF, on the FM and AM Bands. There is one stage of RF amplification on all Bands.

This receiver features an Automatic Frequency Control which keeps your receiver on the exact station frequency when you are tuned to an FM station. Turn the band switch to (FM AFC) position and tune the receiver.

When the desired FM station is a weak station, adjacent in frequency to a strong station, the AFC may pull the tuning into the stronger station. Under these conditions, place the band switch in FM position and tune the receiver.

When adjustments are made on the 8C02 or any AC-DC chassis, a line isolation transformer (110-V input to 110-V output) is recommended in order to avoid a ''hot'' chassis. If an isolation transformer is not available check the AC voltage between chassis and bench ground, and if there is any indication of voltage, reverse the plug before handling the set.

The IF transformers and the discriminator transformer are the new permeability tuned type. The advantage of an IF transformer of this type is its extreme stability under various humidity and temperature conditions. The upper coil is the secondary and the lower the primary. When adjusting these IF and discriminator transformers, tuning wrench 68-19 can be inserted into the top slug, rotated until maximum output is obtained and then dropped down to the lower slug and the same operation repeated. The tuning wrench is so designed that turning one slug does not affect the adjustment of the other.

Alignment of this chassis will, in most cases, be unnecessary unless an IF or RF transformer is replaced or the adjustments have been tampered with.

FM Discriminator Alignment: When the secondary of the discriminator is aligned (operation 5) use sufficient signal input to get a good positive and negative indication before setting the slug for zero reading. A center zero indicating meter is recommended for this adjustment, but is not absolutely necessary. Reversing the leads of a non-zero center meter, or observing closely when the meter starts to go to the left (negative) of zero will give the same results.

FM IF Alignment: Because of the wide band pass, it is desirable to use a FM signal generator and a cathode ray oscilloscope when aligning the FM IF channel. The instruction book for the Zenith Model 800 Signal Generator (Form Z8001) covers complete FM alignment procedure. If visual alignment equipment is unavailable, reasonably accurate alignment can be made by following the procedure outlined in this service note.

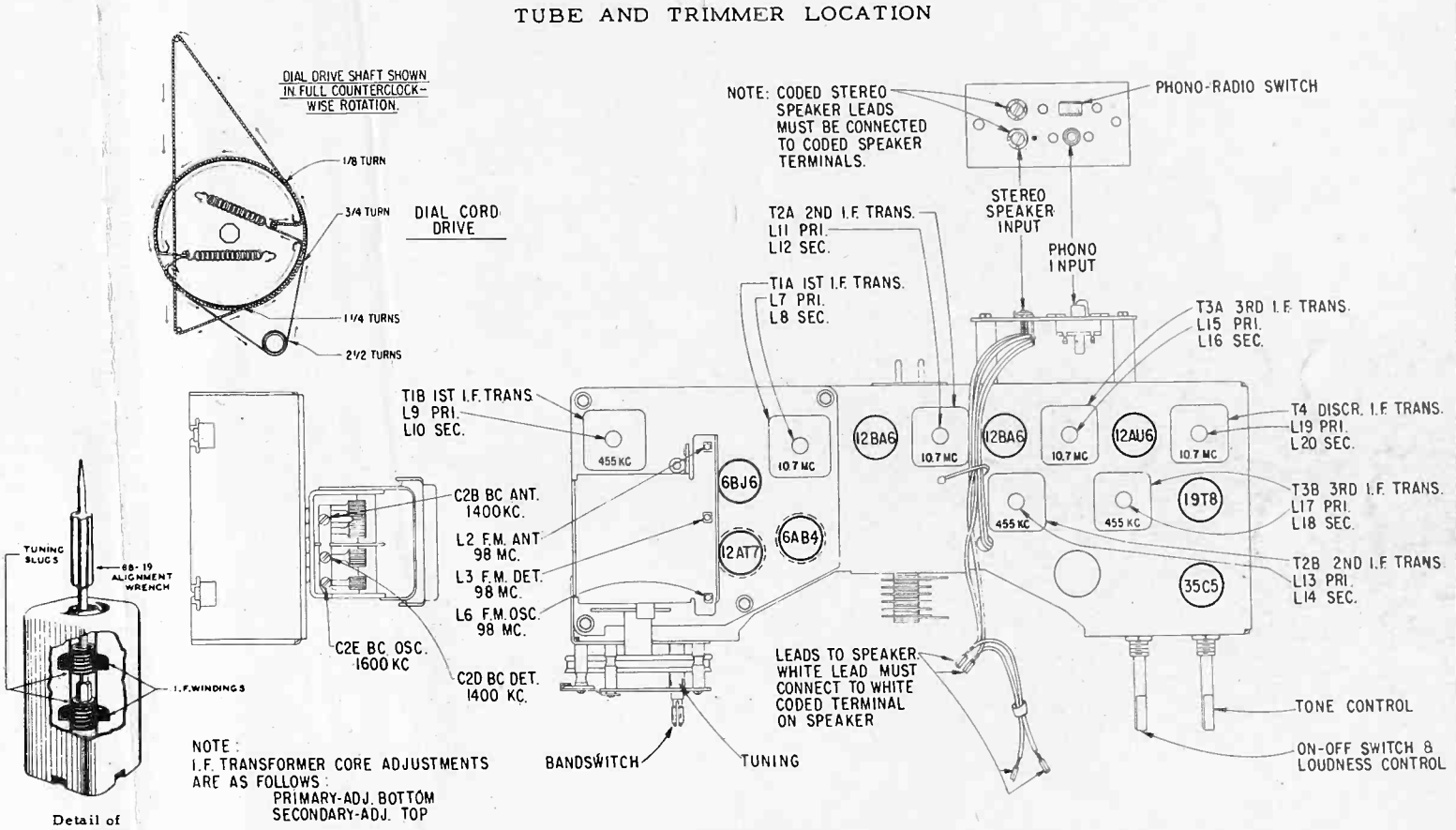
Correct alignment can only be made if the following procedure is followed:

A vacuum tube voltmeter with an isolation resistor of 2,000,000 ohms in series with the hot lead will serve for FM adjustments. This lead should be shielded.

The signal generator output should be kept just high enough to get an indication on the meter.
(a) Vacuum Tube Voltmeter Lug 7 on discriminator transformer to chassis (half discriminator load).
(b) Vacuum Tube Voltmeter Lug 5 on discriminator transformer to chassis (full discriminator load).
(c) Vacuum Tube Voltmeter from Limiter Grid to Chassis.
(d) Loosen Slugs by applying a hot iron to the cement.

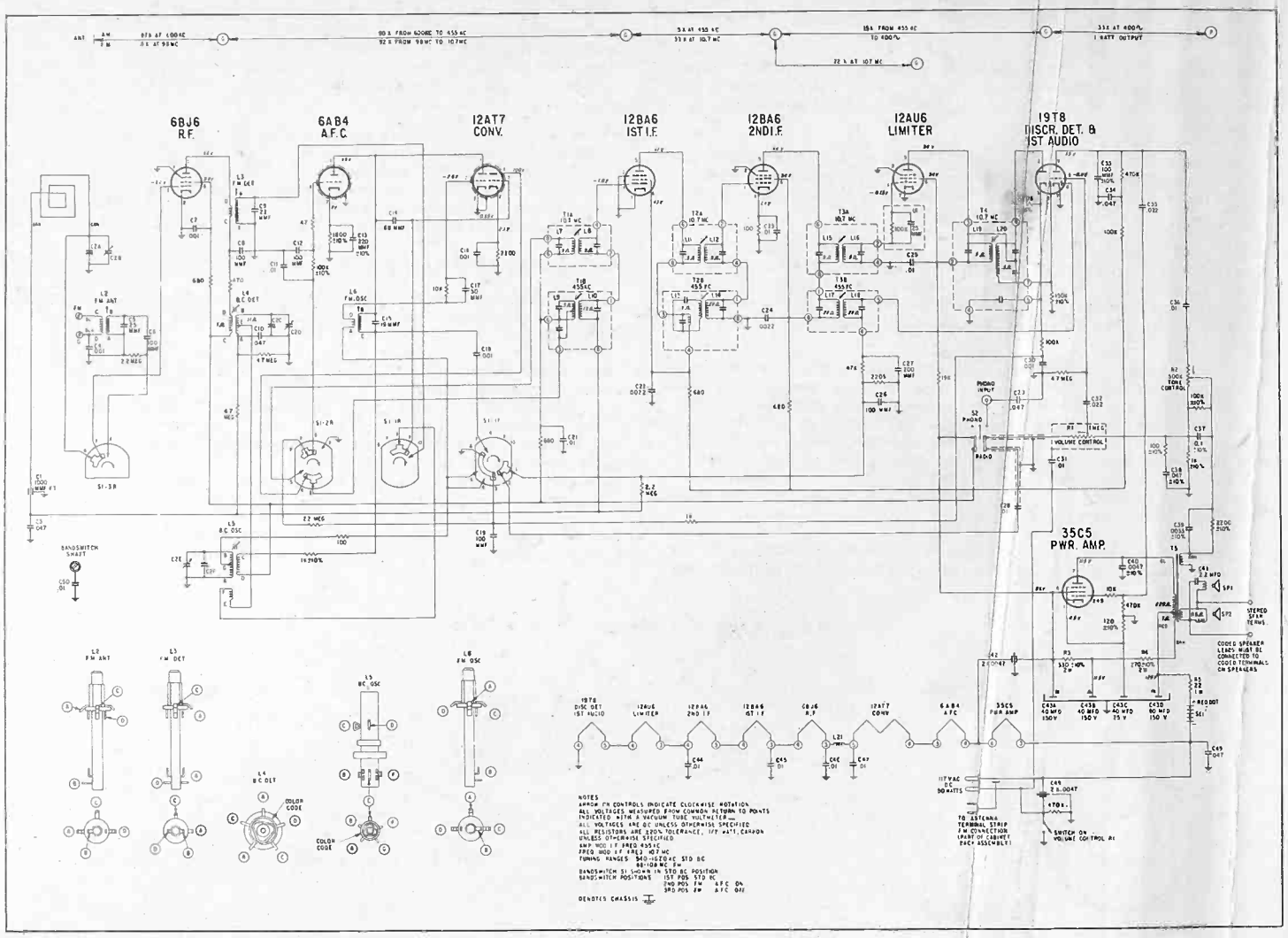
An AC output meter connected across the primary or secondary of the output transformer will be satisfactory for all AM adjustments.

TUBE AND TRIMMER LOCATION



ALIGNMENT PROCEDURE

OPERATION	CONNECT OSCILLATOR TO	DUMMY ANTENNA	INPUT SIGNAL FREQUENCY	BAND	SET DIAL TO	ADJUST TRIMMERS	PURPOSE
1	Pin 7 12AT7 converter	.05 Mfd.	455 Kc., 400 Cycle Modulated	BC	600 Kc.	L18,17,14,13, 10,9	Align IF channel for maximum output.
2	2 turns loosely coupled to wavemagnet		1600 Kc., 400 Cycle Modulated	BC	1600 Kc.	C2E	Set oscillator to dial scale.
3	2 turns loosely coupled to wavemagnet		1400 Kc., 400 Cycle Modulated	BC	1400 Kc.	C2D, C2B	Align detector and antenna stages.
4(a)	Pin 1 (grid) on 12AU6 limiter	.05 Mfd.	10.7 Mc. Unmodulated	FM		L19	Align primary of discriminator for maximum reading.
5(b)	Pin 1 (grid) on 12AU6 limiter	.05 Mfd.	10.7 Mc. Unmodulated	FM		L20	Adjust secondary of discriminator for zero reading.
6(c)	Pin 1 (grid) on 12BA6 2nd IF	.05 Mfd.	10.7 Mc. Unmodulated	FM		L16,15	Align 3rd IF transformer for maximum reading.
7(c)	Pin 1 (grid) on 12BA6 1st IF	.05 Mfd.	10.7 Mc. Unmodulated	FM		L12,11	Align 2nd IF transformer for maximum reading.
8(c)	Pin 7 (grid) on 12AT7 converter tube socket	.05 Mfd.	10.7 Mc. Unmodulated	FM		L8,7	Align 1st IF transformer for maximum reading.
9(c)	Antenna Post FM (Remove line ant.)	270 Ohms	98 Mc. Unmodulated	FM	98 Mc.	L6	Set oscillator to dial scale.
10(c) (d)		270 Ohms	98 Mc. Unmodulated	FM	98 Mc.	L3,2	Align detector and antenna stages for maximum reading.



PARTS LIST

CHASSIS PARTS
Chassis 8C02

PART NO.	DIA. NO.	DESCRIPTION	PRICE
12-1406		Tuner arm pivot bracket	.05
19-249		Coil mtg. clip (2 used)	.05
22-3	C11,21, 23,25, 28,36, 44,45, 46,47	.01 mfd. ceramic disc - 1 K V (12 used)	.30
22-5	C6,8, 19,26	100 mmf. ceramic disc - 1 K V (4 used)	.25
22-9	C12	100 mmf. ceramic disc - 500 V.	.25
22-17	C30	.001 mfd. ceramic disc - 1 K V	.25
22-18	C22,24	.0022 mfd. ceramic disc - 500 V. (2 used)	.25
22-24	C42,48	2 x .0047 mfd. ceramic disc - 1 K V (2 used)	.40
22-1367	C17	50 mmf. ceramic - 500 V.	.45
22-1506	C9	22 mmf. ceramic - 500 V.	.25
22-1661	C43A, B,C,D	Electrolytic 40/150 80/150	3.50
22-1668	C27	200 mmf. ceramic - 500 V.	.25
22-1677	C2C, D,E,F	3 section variable	5.00
22-1766	C14	.68 mmf. gimmick - 500 V.	.20
22-1888	C4,7, 16,18	.001 mfd. ceramic - 500 V. (4 used)	.25
22-2060	C5	25 mmf. ceramic - 500 V.	.25
22-2321	C13	220 mmf. ceramic - 500 V. (2 used)	.25
22-2397	C33	100 mmf. ceramic disc - 500 V.	.30
22-2569	C49	.047 mfd. paper - 600 V.	.40
22-2630	C15	19 mmf. ceramic - 500 V.	.25
22-2655	C31,50	.01 mfd. ceramic disc - 1400 V. (2 used)	.50
22-2732	C1,2A, B	Feed thru - .001 mfd. - 500 V.	.30
22-2783	C37	.1 mfd. paper - 600 V.	.30
22-2792	C3,10, 34	.047 mfd. paper - 200 V. (3 used)	.30
22-2793	C29	.047 mfd. paper - 400 V.	.25
22-2795	C38	.047 mfd. paper - 200 V.	.25
22-2805	C32	.022 mfd. paper - 400 V.	.25
22-2806	C35	.022 mfd. paper - 600 V.	.30
22-2827	C40	.0047 mfd. paper - 600 V.	.25
22-2831	C39	.0033 mfd. paper - 200 V.	.25
54-139		3/8-32 x 9/16 palnut (1 mts. ea. 63-4479 & 63-4480)	.03
54-271		6-32 x 1/4 palnut (1 mts. ea. 95-1150, 95-1153, 95-1249 & 95-1254)	.03
57-2690		Background plate	.60
58-200		2 prong plug (A.C.)	.10
59-351		Dial pointer	.60
63-1622	R3	330 ohm 2W Ins. 10%	.34
63-1730		47 ohm 1/2W Ins. 20%	.17
63-1743		100 ohm 1/2W Ins. 10%	.17
63-1744		100 ohm 1/2W Ins. 20% (2 used)	.17
63-1747		120 ohm 1/2W Ins. 10%	.17
63-1772		470 ohm 1/2W Ins. 20%	.17
63-1779		680 ohm 1/2W Ins. 20% (4 used)	.17
63-1785		1000 ohm 1/2W Ins. 10% (2 used)	.17
63-1786		1000 ohm 1/2W Ins. 20%	.17
63-1796		1800 ohm 1/2W Ins. 10%	.17
63-1799		2200 ohm 1/2W Ins. 10%	.17
63-1800		2200 ohm 1/2W Ins. 20%	.17
63-1828		10 K ohm 1/2W Ins. 20% (2 used)	.17
63-1835		15 K ohm 1/2W Ins. 20%	.17
63-1856		47 K ohm 1/2W Ins. 20%	.17
63-1869		100 K ohm 1/2W Ins. 10% (2 used)	.17
63-1870		100 K ohm 1/2W Ins. 20% (2 used)	.17
63-1876		150 K ohm 1/2W Ins. 10% (2 used)	.17
63-1884		220 K ohm 1/2W Ins. 20%	.17
63-1898		470 K ohm 1/2W Ins. 20% (3 used)	.17
63-1926		2.2 megohm 1/2W Ins. 20% (3 used)	.17
63-1940		4.7 megohm 1/2W Ins. 20% (4 used)	.17
63-3197	R5	22 ohm 1W Ins. 20%	.25
63-3232	R4	270 ohm 2W Ins. 10%	.34
63-4479	R1	Volume control & switch	2.05
63-4480	R2	Tone control	1.40
73-131		6-32 x 3/8 slab hd. set screw - cuppoint (2 part of S-46186)	.04
78-644		Connector socket (phono)	.15
78-806		7 contact miniature wafer tube socket	.15
78-850		Miniature noval molded tube socket	.40
78-869		Miniature noval wafer tube socket	.25
78-870		7 contact miniature wafer tube socket (3 used)	.15
78-871		7 contact miniature wafer tube socket	.15
78-905		7 contact miniature wafer tube socket	.30
80-69		Drive cord spring (tuning)	.15
80-444		Tuner arm tension spring	.05
80-580		Tuner arm stop spring	.10
80-817		Tuner spring	.10
80-818		Tuner arm pressure spring	.15
80-868		Ground spring	.15
80-1091		Drive cord spring (pointer)	.08
80-1090		Insulating strip	.05
83-1520		Rectifier Insulating strip	.05
83-1640		I.F. transformer support strip (5 used)	.05
83-2135		4 lug terminal strip	.10
83-2638		3 lug terminal strip	.05
83-2639		3 lug terminal strip	.05
83-2642		5 lug terminal strip	.10
83-2673		6 lug terminal strip	.10
83-3109		Phono-radio control strip	.25
83-3114		Volume & tone control insulating strip (outside)	.05
83-3115		Insulating strip (tuning control)	.10
83-3116		Pointer guide	
83-3117		Volume & tone control insulating strip (inside)	.03
85-495	S2	Radio-phono switch (used on 83-3109)	.60
85-622	S1	Band switch	5.75
86-237		Connector terminal (4 used)	
93-1367		Insulating shoulder washer (1 used on ea. 114-683)	.03
94-598		R.F. plate mtg. bushing (1 used on ea. 114-292)	.03
94-613		Iron core insulating bushing (1 used on ea. 149-64)	.10
94-1018		Wood spacer (2 used)	.10
95-1150	T2A,3A	2nd & 3rd I.F. transformer - 10.7 Mc. (2 used)	3.50
95-1153	T4	Discriminator transformer - 10.7 Mc.	3.50
95-1201	T1A	1st I.F. transformer - 10.7 Mc.	3.00
95-1248	T1B	1st I.F. transformer - 455 Kc.	3.00
95-1249	T2B	2nd I.F. transformer - 455 Kc.	3.00
95-1254	T3B	3rd I.F. transformer - 455 Kc.	3.00
95-1662	T5	Audio output transformer	
97-293		Chassis mtg. stud (4 used)	.20
105-42	U1	R/C network	.50
112-1231		6-32 x 1/4 phils. pan hd. mach. screw (4 used on 57-2690)	.03
113-8		6-32 x 1/4 x 1/4 hex. hd. mach. screw - lockwasher att. (4 used)	.03
113-10		6-32 x 3/16 x 1/4 hex. hd. mach. screw - lockwasher att. (4 used)	.03
113-113		6-32 x 9/32 phils. pan hd. mach. screw - lockwasher att. (2 used on 83-3116)	
114-199		6-32 x 3/16 x 1/4 hex. hd. self-tap. screw (2 used)	.03
114-200		6-32 x 5/16 x 1/4 hex. hd. self-tap. screw	.03
114-292		6-32 x 5/8 x 1/4 hex. hd. self-tap. screw (4 used)	.03
114-398		6-32 x 1 3/8 x 1/4 hex. hd. self-tap. screw (1 mts. 212-23 & 2 mt. 83-3109)	.03
114-683		8-18 hex. hd. self-tap. screw (3 mt. S-46537)	.03
125-62		Rubber grommet (4 used)	.03
125-85		Rubber grommet (3 used)	.05
126-554		Tube shield (covers 6AB4)	.05
126-618		Tube shield (covers 12AT7)	.03
149-64		Tuning core (3 used)	.60
149-211		Iron core (1 part of ea. S-41088 & S-43475)	.10
188-221		Retaining ring (used on S-46530)	.04
199-198		Shielded paper sleeve (used on 83-3109)	.05
199-265		Shielded paper sleeve (used on 83-3109)	.03
212-23 or 212-13	SE1	Selenium rectifier / Selenium rectifier	2.25 / 1.80
S-13997	L21	Filter choke coil	.50
S-14192	L2	FM antenna coil	.90
S-14429		Tuner arm	1.00
S-15691	L6	FM oscillator coil	.50
S-15743	L3	FM detector coil	.80
S-41088	L4	B.C. detector coil	1.00
S-43475	L5	B.C. oscillator coil	1.00
S-46186		Cam, pulley & bushing assembly	
S-46530		Tuning shaft & pulley assembly	
S-46534		Drive cord & eyelet assembly (tuning)	
S-46535		Drive cord & eyelet assembly (pointer)	
S-46537		Support bracket	

CABINET PARTS
Models C845,L,M & Y

PART NO.	DIA. NO.	DESCRIPTION	PRICE
11-85		Line cord & plug (part of S-46279, S-46494 & S-46496)	.75
14-2671		Table cabinet - Model C845	
14-2671L		Table cabinet - Model C845L	
14-2671M		Table cabinet - Model C845M	
14-2671Y		Table cabinet - Model C845Y	
16-1571		Packing carton	
19-9		Line cord retaining clip (part of S-46279, S-46494 & S-46496)	.05
19-347		Tubular clip - tinnerman (4 mt. 188-235)	.05
22-3085	C41	2.2 mfd. ceramic disc - 3 V. (part of 49-884)	.75
24-590		Line cord plug cover (part of S-46279, S-46494 & S-46496)	.20
46-2080		Switch selector knob	.75
49-883	SP2	7 1/2" P.M. speaker	
49-884	SP1	3 1/2" P.M. speaker	5.50
54-10		8-32 x 1/4 hex. nut (4 part of 14-2671,L,M & Y)	.03
54-12		6-32 x 5/16 hex. nut (1 used on 8C02 & 2 mt. 49-884)	.03
54-30		8-32 x 5/16 hex. nut (4 mt. 49-883)	.03
54-34		6-32 x 1/4 hex. nut (3 part of 14-2671,L,M & Y)	.03
57-2700		Emblem plate (used on S-46275, S-46487, S-46488 & S-46489)	
78-787		2 contact socket (A.C.) (part of S-46279, S-46494 & S-46496)	.10
80-1003		Knob retaining spring (1 part of ea. S-44167)	.10
83-3151		Felt strip	
86-30		Terminal (part of S-46279, S-46494 & S-46496)	.03
86-255		Spade terminal	.03
93-297		1/32 x .136 x 3/8 steel washer (part of S-46279, S-46494 & S-46496)	.03
112-788		8-32 x 1 1/8 swedge hd. mach. screw (4 part of cabinet)	.03
112-1227		6-32 x 3/4 swedge hd. mach. screw (3 part of cabinet)	.03
112-1241		Chassis mtg. screw (4 used)	.10
114-39		8-32 x 1/4 x 1/4 hex. hd. self-tap. screw (2 mt. S-17771)	.03
114-180		6-20 x 1/4 x 1/4 hex. hd. self-tap. screw (2 part of S-46279, S-46494 & S-46496)	.03
114-630		6-16 x 5/8 x 1/4 slot. hex. washer hd. self-tap. screw (6 mt. S-46279, S-46494 & S-46496)	.03
114-694		8-18 x 13/16 hex. hd. self-tap. screw - flatwasher att. (2 used on S-46275, S-46487, S-46488 & S-46489)	.05
114-695		6-20 x 13/16 hex. hd. self-tap. screw - lockwasher att. (8 used on S-46275, S-46487, S-46488 & S-46489)	.05
166-86		Rubber bumper (4 part of 14-2671,L,M & Y)	.05
188-212		Knob clamping ring (part of S-46356)	
188-235		Speaker trim ring	1.75
199-213		Paper sleeve (part of S-46279, S-46494 & S-46496)	.03
202-697		FM instruction book	.10
202-1455		Instruction book	.20
S-17771		Chassis bottom plate	.70
S-44167		Knob & retaining spring assembly - volume & tone (2 used)	.75
S-46275		Grille, dial scale & plate assembly - Model C845	
S-46279		Cabinet back - Models C845 & L	
S-46356		Knob & clamping ring assembly (tuning)	
S-46487		Grille, dial scale & plate assembly - Models C845L,M & Y)	
S-46494		Cabinet back - Model C845M	
S-46496		Cabinet back - Model C845Y	