

## GENERAL INFORMATION

TYPE - FM-AM table model receiver

TUNING RANGE - AM 535 to 1620 Kc IF - 455 Kc  
FM 88 to 108 Mc IF - 10.7 Mc

TUBE COMPLEMENT - 12BA6 - FM-AM RF Amplifier  
12BA7 - FM-AM Converter  
12BA6 - FM-AM IF Amplifier  
12BA6 - FM IF Amplifier  
19T8 - FM Ratio Detector, AM Detector  
& 1st Audio Amplifier  
50C5 - Power Amplifier  
Rectifier - Selenium type

POWER SUPPLY - 117V AC or DC, 40 watts

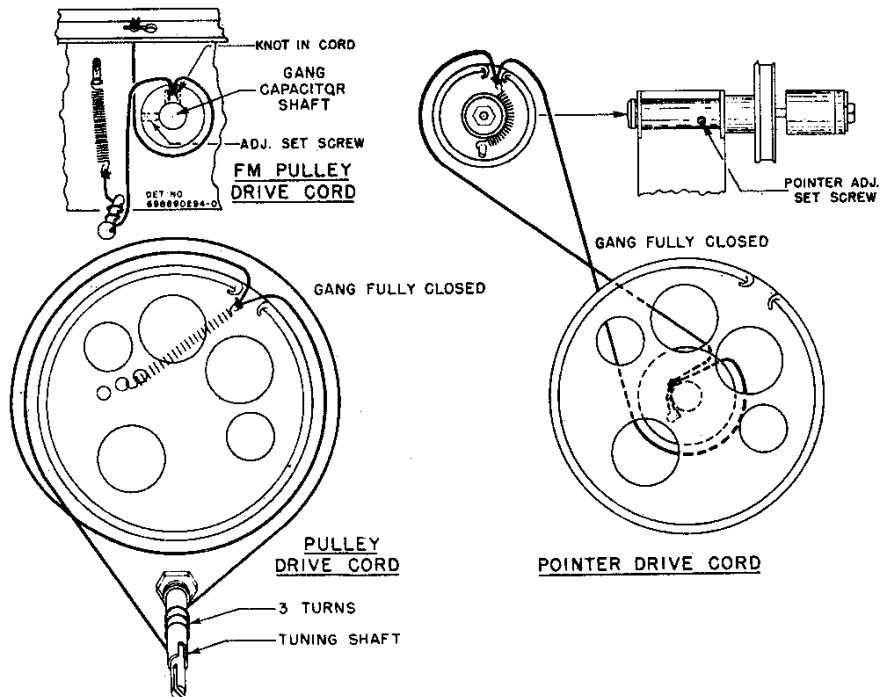
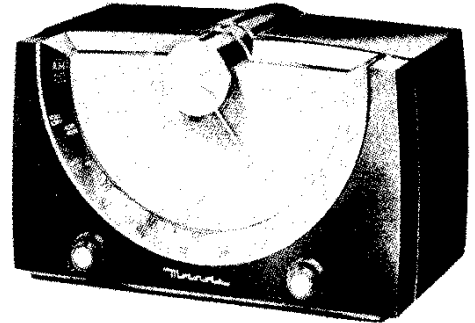


FIGURE 1. STRING DRIVE DETAIL  
**ALIGNMENT**

Maximum performance can only be obtained if extreme care is exercised during alignment.

It is suggested that an isolation transformer be used between receiver and power line. If no isolation transformer is used and hum is encountered during alignment, connect the ground side of the signal generator output through a .1 mf capacitor to receiver chassis.

Refer to Figure 2 for location of all alignment trimmers and cores.

### COMPLETE ALIGNMENT PROCEDURE USING AM SIGNAL GENERATOR

An AM (30% amplitude modulated) signal generator covering the frequencies shown in Alignment Chart I, is used to align the broadcast and FM bands. A low range output meter, connected across the speaker voice coil, is used as an output indicator.

The FM band alignment can be satisfactorily performed by following the instructions in the chart. When properly aligned, the ratio detector does not respond to amplitude modulation and since an AM type signal generator is used for aligning the FM circuits, it is necessary to detune the ratio detector transformer secondary before aligning the FM circuits. After completing the alignment of FM circuits, proceed to align the ratio detector transformer secondary by applying a 10.7 Mc AM signal to the control grid (pin 7) of the FM converter tube (V-2) and adjust the ratio detector transformer secondary core for minimum audio output. No adjustment of the FM circuits should be attempted with AM after the ratio detector transformer secondary has been properly aligned.

Keep output of signal generator low so as not to overload stages and obtain false output indications. Keep receiver volume control at maximum; reduce generator output, as stages are brought into alignment, so output meter never reads more than .40 volts (.05 watts).

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CHART I. ALIGNMENT PROCEDURE WHEN USING AN AM  
MODULATED SIGNAL GENERATOR AND STANDARD OUTPUT METER

STEP	BAND	DUMMY ANTENNA	GENERATOR CONNECTION	GENERATOR FREQUENCY	TUNER SET TO	ADJUST	REMARKS
1.	455 Kc AM	IF Alignment .1 mf	12BA7 (V-2) Conv Grid Pin #7	455 Kc	Gang opened	1, 2, 3 & 4	Adjust for maximum
2.	AM	RF Alignment .1 mf	12BA7 (V-2) Conv Grid Pin #7	1620 Kc	Gang fully opened	5	Adjust for maximum
3.	AM	.1 mf	12BA7 (V-2) Conv Grid Pin #7	538 Kc	Gang fully closed	7	Adjust for maximum
4.	-	-	-	-	-	-	Repeat steps 2 & 3 several times since one adj affects the other slightly; the osc trimmer (7) should be the last adj made. Steps 2 & 3 set osc range and calibrate osc to dial scale.
5.	AM	-	Radiation loop*	1400 Kc	Tune in signal	6	Adjust for maximum
6.	10.7 Mc FM	IF Alignment	-	-	-	8	Detune ratio detector transformer secondary core by screwing core (8) out several turns.
7.	FM	.001 mf	12BA7 (V-2) Conv Grid Pin #7	10.7 Mc	Extreme high freq end	9, 10, 11, 12 & 13	Adjust for maximum
8.	FM	RF Alignment	Radiation loop*	1320 Kc	Tune in signal	-	This is for FM calibration purposes. Leave gang in this position for step 9.
9.	FM	300 ohms	12BA7 (V-2) Conv Grid Pin #7	105 Mc	Leave gang at same setting as in step 8.	14	Adjust osc core adjustment nut (14) until maximum signal output is obtained.
10.	-	-	-	-	-	15	Close gang fully and turn RF core adjustment nut (15) counterclockwise until core is at bottom of pipe, then turn nut (15) four turns clockwise.
11.	FM	300 ohms	FM Ant terminal #2 on loop back (open jumper between terminals)	90 Mc	Tune in signal	16	Adjust for maximum.
12.	FM	300 ohms	FM Ant terminal #2 on loop back (open jumper between terminals)	105 Mc	Tune in signal	15	Adjust for maximum.
13.	-	-	-	-	-	-	Repeat steps 11 & 12 until no further gain can be obtained. Make tuning plug (16) the last adjustment.
14.	FM	Ratio Detector Secondary Alignment .001 mf	12BA7 (V-2) Conv Grid Pin #7	10.7 Mc	High freq end	8	Adjust for minimum response between two peaks

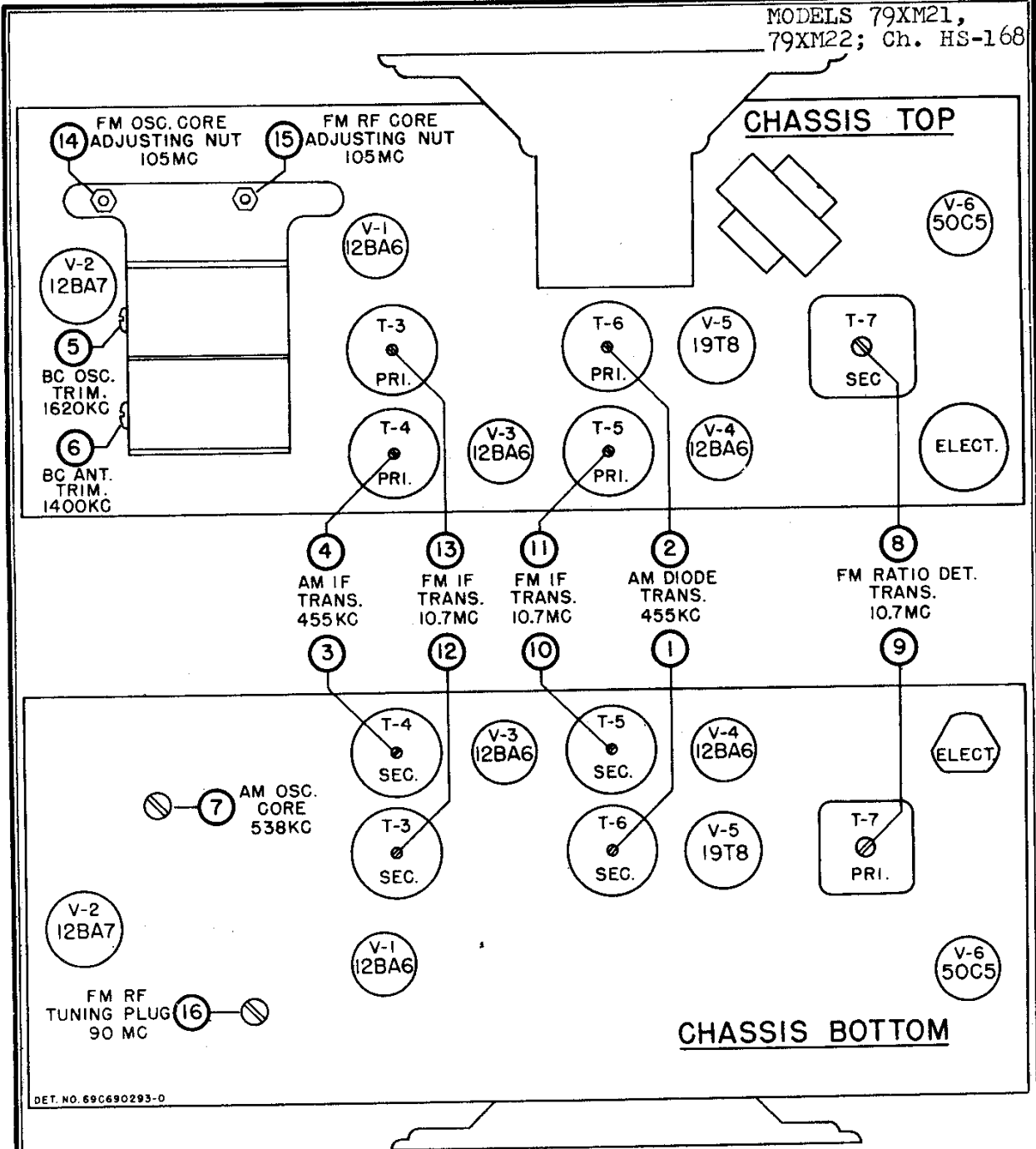
\*Connect generator output to a 5" diameter 3 turn loop and couple to receiver loop. Keep loops at least 12" apart.

**SERVICE NOTES**

The chassis of this receiver is connected directly to the power line. When operating the chassis (from AC line) outside of its cabinet, use an isolation transformer between power line and receiver to reduce the possibility of electrical

shock. If an isolation transformer is not available, check the AC voltage between chassis and bench ground, if there is any indication of voltage, reverse line plug before handling the set.

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DET. NO. 69C690293-D

FIGURE 2. TUBE AND TRIMMER LOCATIONS  
TO REMOVE CHASSIS FROM CABINET

1. Remove the pointer by setting it to either end of the dial scale and then lift the tip slightly above top of the cabinet. Now grasp the pointer tip with the fingers and screw it out of the pointer shaft (similar to removing a screw).
2. Remove the control knobs; they pull off.

3. Remove the four screws and washers that hold the back cover to the cabinet and remove the back cover.
4. Remove the two screws that hold the chassis to cabinet and slide the chassis from the cabinet.

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CHART II. FM ALIGNMENT PROCEDURE WHEN USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

1. 10.7 Mc FM IF Channel Alignment (Use FM Signal Generator & Oscilloscope)

(A) Ratio Detector Alignment

1. Connect the input terminals of the oscilloscope vertical amplifier to the high side of the receiver volume control and chassis.
2. Connect the FM generator synchronizing voltage output terminals to a phase shifting network consisting of a variable 1/2 megohm resistor in series with a .002 mf capacitor. The input to the oscilloscope horizontal amplifier is connected across the .002 mf capacitor. See Figure 3. (This phase shifting network may not work with every oscilloscope. Different values of R & C may be required).
3. Apply an FM 10.7 Mc signal (200 Kc deviation) through a .001 mf capacitor to the control grid (pin 1) of the tube V-4 (12BA6) in the second FM IF amplifier stage
4. Back out ratio detector transformer secondary core (8) several turns and then adjust ratio detector transformer primary (9) for maximum amplitude. The phase shifting network resistor is adjusted to give only one trace.
5. Adjust ratio detector transformer secondary (8) until a symmetrical pattern is obtained, with peaks occurring at about 190 Kc above and below 10.7 Mc and is substantially linear between peaks. The trace should pass through the intersection of the vertical and horizontal axis. The phase shifting network should be adjusted to give only a single pattern at all times. See Figure 4. It will be necessary to go over ratio detector transformer primary (9) and secondary (8) adjustments several times before a pattern of maximum amplitude and correct symmetry is obtained.

(B) 10.7 Mc IF Alignment

1. Apply an FM 10.7 Mc signal (160 Kc deviation) to the control grid (pin 7) of tube V-3 (12BA6) in the first FM IF amplifier stage, through a .001 mf capacitor and adjust both primary and secondary cores (10 & 11) to get a symmetrical pattern as before, with peaks occurring at a slightly lower deviation.
2. Move signal generator lead from tube V-3 to control grid (pin 7) of tube V-2 (12BA7) in the converter stage, and adjust both primary and secondary cores (12 & 13) until a symmetrical pattern substantially linear between peaks is obtained.

2. RF Alignment (Use FM Signal Generator & Output Meter)

The FM signal generator may now be used to align the FM RF and oscillator channels. Merely follow steps 8 through 13, inclusive, in Chart I.

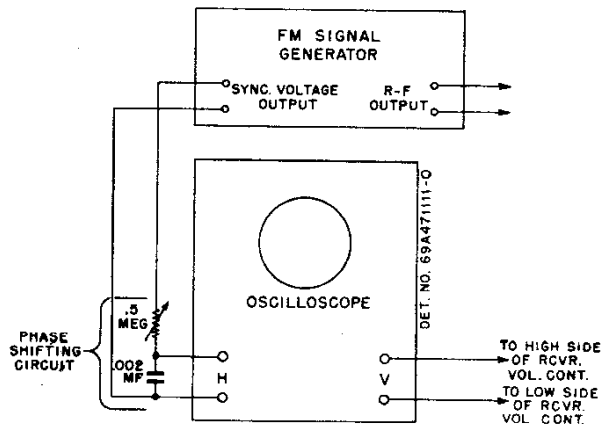


FIGURE 3. SIGNAL GENERATOR & OSCILLOSCOPE HOOKUP

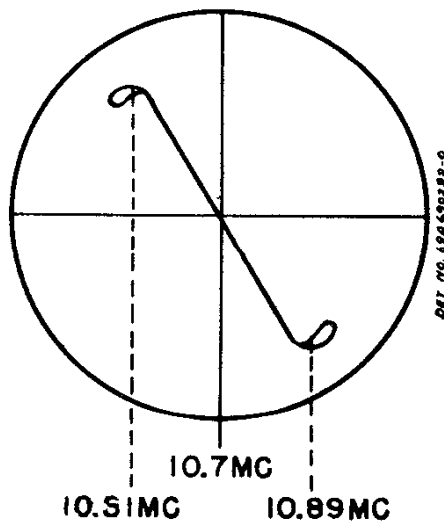
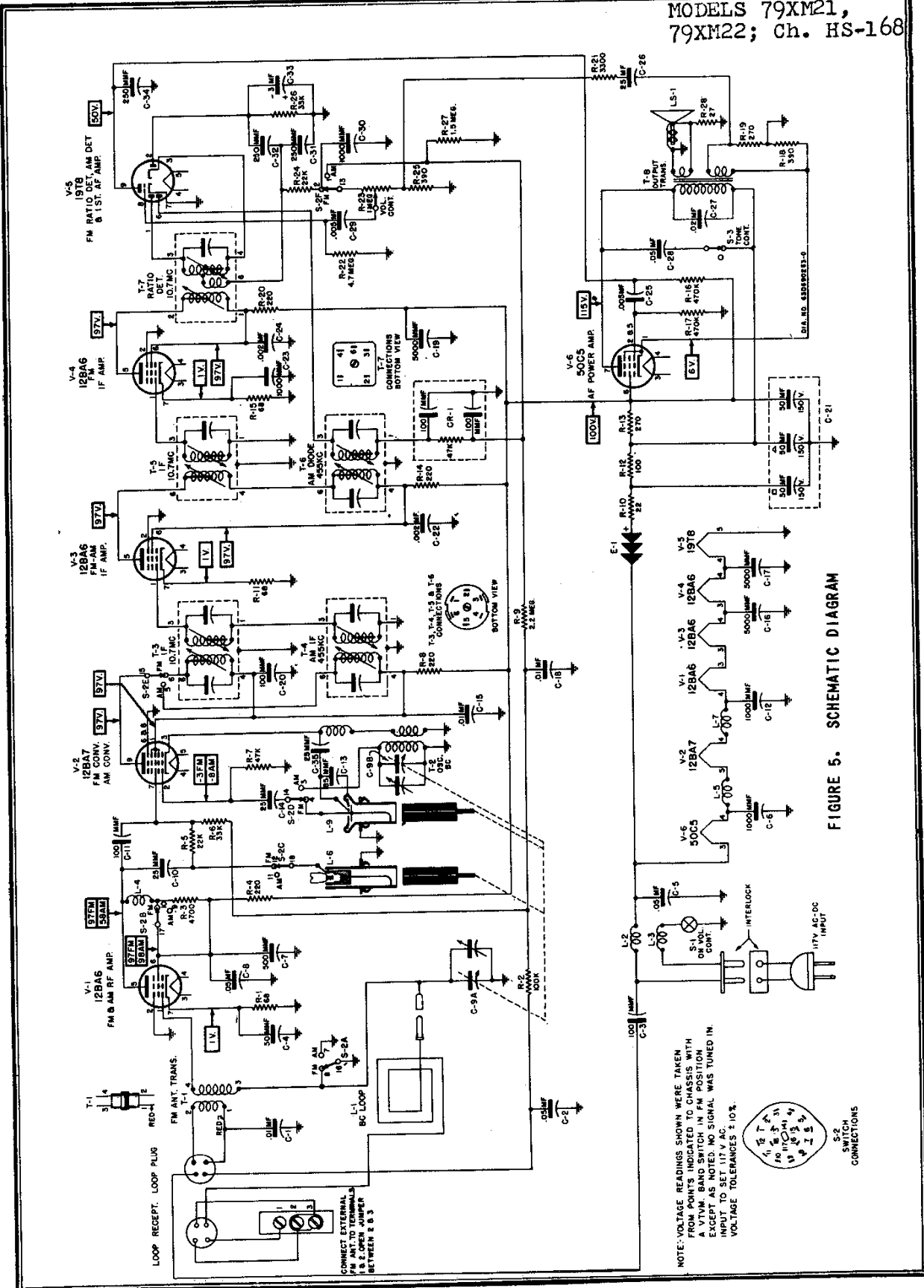


FIGURE 4. OSCILLOSCOPE PATTERN



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REPLACEMENT PARTS LIST

Ref. Part  
No. Number Description

CHASSIS PARTS - ELECTRICAL

Capacitors

C-1	889809	Paper: .01 mf 400V
C-2	8A470606	Paper: .05 mf 400V
C-3	21B77286	Ceramic: 100 mmf 500V
C-4	21K77373	Ceramic: 50 mmf 500V
C-5	8K471635	Paper: .05 mf 400V
C-6	21K478410	Ceramic: 1000 mmf 500V
C-7	21K481377	Ceramic: 500 mmf 500V
C-8	889821	Paper: .05 mf 200V
C-9	19B690747	Variable: 2 gang
C-10	21K28816	Ceramic: 25 mmf 100V
C-11	21B77286	Ceramic: 100 mmf 500V
C-12	21K478410	Ceramic: 1000 mmf 500V
C-13	21B690688	Ceramic: 85 mmf 5% 350V
C-14	21K28816	Ceramic: 25 mmf 100V
C-15	889809	Paper: .01 mf 400V
C-16	21A470789	Ceramic, disc: 5000 mmf
C-17	21A470789	Ceramic, disc: 5000 mmf
C-18	889801	Paper: .01 mf 100V
C-19	21A470789	Ceramic, disc: 5000 mmf 450V
C-20	21B77286	Ceramic: 100 mmf 500V
C-21	23B690539	Electrolytic: 50-50-50 mf/150V
C-22	889824	Paper: .002 mf 400V
C-23	21K471761	Ceramic: 1000 mmf 350V
C-24	889824	Paper: .002 mf 400V
C-25	8A24966	Paper: .005 mf 100V
C-26	889810	Paper: .25 mf 100V
C-27	889802	Paper: .02 mf 400V
C-28	889821	Paper: .05 mf 200V
C-29	8A24966	Paper: .005 mf 100V
C-30	21K478410	Ceramic: 1000 mmf 500V
C-31	21K77375	Ceramic: 250 mmf 500V
C-32	21K77375	Ceramic: 250 mmf 500V
C-33	21K690543	Electrolytic: 3 mf/50V
C-34	21K77375	Ceramic: 250 mmf 500V
C-35	21K28816	Ceramic: 25 mmf 100V

Capacitor-Resistor

CR-1	21A473040	Capacitor-Resistor: two 100 mmf capacitors & one 47,000 resistor in one unit
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Rectifier

E-1	48B482807	Rectifier, selenium
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Coils

L-1	1X690709	Loop Antenna Assembly, BC: complete including line cord, power and antenna input plugs
L-2	24B580540	Choke, RF
L-3	24B580540	Choke, RF
L-4	24A90064	Choke, RF
L-5	24K780128	Choke, RF
L-6	24C690584	Inductor and Capacitor Assembly, FM RF
L-7	24K780128	Choke, RF
L-8	24K780128	Choke, RF
L-9	24C690580	Inductor and Capacitor Assembly, FM oscillator

Speaker

LS-1	50B690537	Speaker, PM: 5"
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Resistors

Note: All resistors are insulated carbon type unless otherwise specified.

R-1	6R2039	68 10% 1/2W
R-2	6R6075	100,000 20% 1/2W
R-3	6R6039	4700 20% 1/2W
R-4	6R3933	220 20% 1/2W
R-5	6R6028	22,000 20% 1/2W
R-6	6R6075	100,000 20% 1/2W

Ref. Part  
No. Number Description

R-7	6R6056	47,000 20% 1/2W
R-8	6R3933	220 20% 1/2W
R-9	6R3927	2.2 meg 20% 1/2W
R-10	17A690578	Wirewound: 22 10% 1.5W
R-11	6R2039	68 10% 1/2W
R-12	6R3963	100 10% 2W
	or 6R490401	100 10% 1W N.I.
R-13	6R476116	270 10% 2W
	or 6R6035	270 10% 1W N.I.
R-14	6R3933	220 20% 1/2W
R-15	6R2039	68 10% 1/2W
R-16	6R6032	470,000 20% 1/2W
R-17	6R6032	470,000 20% 1/2W
R-18	6R5554	390 10% 1/2W
R-19	6R6432	270 10% 1/2W
R-20	6R3933	220 20% 1/2W
R-21	6R6036	3300 20% 1/2W
R-22	6R2122	4.7 meg 20% 1/2W
R-23	18A690549	Volume Control: 1 meg; includes ON-OFF switch
R-24	6R6028	22,000 20% 1/2W
R-25	6R5554	390 10% 1/2W
R-26	6R6012	33,000 20% 1/2W
R-27	6R3966	1.5 meg 20% 1/2W
R-28	6R5683	27 10% 1/2W

Switch

S-1	-	ON-OFF: part of volume control
S-2	40B690538	Bandswitch
S-3	40A690546	Tone Control

Transformers

T-1	24A690544	FM Antenna input
T-2	24B690563	BC Oscillator coil
T-3	24B690540	1st IF, 10.7 Mc: complete; including padding capacitors and tuning cores but less shield
T-4	24B482863	IF, 455 Kc: complete; including padding capacitors and tuning cores but less shield
T-5	24B690541	2nd IF, 10.7 Mc: complete; including padding capacitors and tuning cores but less shield
T-6	24B482865	Diode, 455 Kc: complete; including padding capacitors and tuning cores but less shield
T-7	24B690542	Discriminator, 10.7 Mc: complete; including padding capacitors, tuning cores and shield
T-8	25B690536	Output Transformer

CHASSIS PARTS - MECHANICAL

43A4326	Ball, steel: 1/8" diameter
1X691198	Brackets Assembly, pointer mtg: includes small and large bracket
1X690717	Bracket Assembly, tuning core mtg: includes shoulder rivet and anti-rattle clip
7C690567	Bracket, tuner mtg
42A690560	Clip, anti-backlash: double
42K690561	Clip, anti-backlash: single
43A690730	Collar, pointer detent
11M488137	Cord, dial: core drive
11M8944	Cord dial: pointer drive
46A690127	Core, iron and screw (for L-6 and L-9)
46K680318	Core, iron: threaded (for T-4 and T-6)
5A70098	Eyelet (speaker mtg)
587866	Eyelet: .125 x .091; brass; nkl pl (core drive cord retainer)
5A70404	Grommet, rubber (speaker mtg)
14A690545	Insulator, armite (pointer bracket mtg)

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Part Number	Description	Ref. No.	Part Number	Description
14A690534	Insulator, armite (tone switch mtg) .....		41A690598	Spring, coil (L-6 and L-9 core mtg) .....
14A690535	Insulator, armite (volume control and bandswitch mtgl) .....		41A690732	Spring, compression (pointer detent) .....
14A690548	Insulator, bakelite (volume control and bandswitch mtg) .....		41A14244	Spring, tension (core drive, cord tension and cord compression) .
4S9751	Lockwasher, int-ext; #8; stl; cad pl (pulley assembly mtg).....		31K85348	Strip, terminal: 1 insulated lug, #2 mtg .....
2S7005	Nut, hex: 6-32 x 1/4; stl; nkl pl (L-6 and L-9 core mtg and pointer detent) .....		31K86126	Strip, terminal: 2 insulated lugs, #2 mtg .....
2S7051	Nut, hex: 3/8-32 x 9/16; Palmnut; stl; cad pl (volume control and bandswitch mtg) .....		31K470746	Strip, terminal: 3 insulated lugs, #2 mtg .....
28A690552	Plug, 2-prong (power input) .....		31K470747	Strip, terminal: 5 insulated lugs, #3 mtg .....
28A690615	Plug, 4-pin (antenna input) .....		4A21941	Washer, "C" (shaft and pulley assembly retainer).....
1X691184	Pulley Assembly, pointer drive; includes large and small pulley spot-welded together .....		4A73639	Washer, "C" (tuning shaft and tone control shaft & arm retainer).
49A690562	Pulley, cord drive: brass .....		4A691006	Washer, double "D": copper pl (pulley assembly mtg).....
9A470980	Receptacle, loop lead .....		4S7578	Washer, flat: 5/16 x .130 x .025 thick; brass (pointer brkt mtg)
5S8497	Rivet: .088 x 1/8; stl; nkl pl (single anti-rattle clip mtg).		4S1765	Washer, flat: 1/2 x .147 x .015 thick; stl; cad pl (pointer detent) .....
5S7771	Rivet: .088 x 3/16; stl; nkl pl (7-prong tube socket mtg)....		4K690572	Washer, shoulder: fibre (pointer bracket mtg) .....
5S7774	Rivet: .088 x 1/4 stl; nkl pl (9-prong tube socket mtg) ...		2K690571	Washer, shoulder: fibre (volume control & bandswitch mtg) .....
5S7701	Rivet: .122 x 3/16 stl; nkl pl (tone switch insulator, antenna input receptacle and power input receptacle mounting) .....		4A690729	Washer, spring: phosphor bronze (pointer detent) .....
5S7707	Rivet: .122 x 5/32; stl; nkl pl (terminal strip and tube shield mtg) .....			
5K13896	Rivet, shoulder .....			
3S7205	Screw, machine: 8-32 x 1/4 slotted hex head; locking type; stl; cad pl (gang mtg) .....		16E690503	Cabinet, table model: molded; green (79XM21).....
3S7163	Screw, machine: 8-32 x 1/4 plain hex head; stl; cad pl (pulley assembly mtg) .....		or 16K691189	Cabinet, table model: molded; walnut-mahogany (79XM22) .....
3S488011	Screw, machine: 8-32 x 5/8 slotted hex head; locking type; stl; cad pl (speaker mtg) .....		13C690581	Cloth, grille .....
3S2695	Screw, sheet metal: #6 x 3/16 PKZ plain hex head; stl; cad pl (tuner bracket mtg) .....		30K21859	Cord, line & plug: 9 ft long .....
3S3398	Screw, sheet metal: #6 x 3/8 PKZ plain hex head; stl; cad pl (pointer brackets assembly mtg) .....		15A690556	Cover, power receptacle .....
3S490325	Screw, sheet metal: #6 x 1-1/8 PKZ plain hex head; stl; cad pl (rectifier mtg) .....		34D690590	Escutcheon and dial scale .....
3S9700	Set screw: 6-32 x 3/16 Allenhead; stl; cad pl (core drive pulley mtg)		36K690586	Knob, tone and tuning control: green (79XM21) .....
3S7103	Set screw: 8-32 x 1/8 Allenhead; stl; cad pl (pointer shaft adj) .....		or 36K691190	Knob, tone and tuning control: walnut-mahogany (79XM22) .....
1X690722	Shaft and Arm Assembly, tone control.		36K690585	Knob, on-off and band selector: green and brass (79XM21) .....
1X690739	Shaft and Pulley Assembly, pointer drive .....		or 36K690668	Knob, on-off and band selector: walnut-mahogany (79XM22) .....
1A690738	Shaft and Sleeve Assembly, pointer detent .....		52A690553	Pointer, dial .....
47K690573	Shaft, tuning .....		9A15907	Receptacle, 2-prong (power input)...
26K485936	Shield, coil (for T-3, T-4, T-5 & T-6) .....		9K690618	Receptacle, 4-pin (antenna input)...
26A481521	Shield, tube: spring .....		5S7703	Rivet: .122 x 7/32; stl; nkl pl (cover mtg) .....
9K484167	Socket, tube: 7-prong .....		3S3375	Screw, sheet metal: #6 x 5/16 PKZ plain hex head; stl; cad pl (power receptacle mtg).....
9A485495	Socket, tube: 9-prong .....		3S488098	Screw, sheet metal: #8 x 3/8; type 25; plain hex head; stl; cad pl (chassis and back mtg).....
			15A690616	Shell, antenna receptacle and insulator .....
			2A580844	Speednut: 1/8" diameter (escutcheon mtg) .....
			31A470403	Strip, terminal: 3 screw; with shorting bar .....
			4S1771	Washer, flat: 5/16 x .203 x .016 thick; stl; cad pl (back mtg)

CABINET PARTS