

SERVICING IN THE FIELD

TUNER OSCILLATOR ADJUSTMENTS

For touch-up adjustment of RF tuner oscillator adjustments, it is necessary to remove the chassis from the cabinet. (See disassembly instructions).

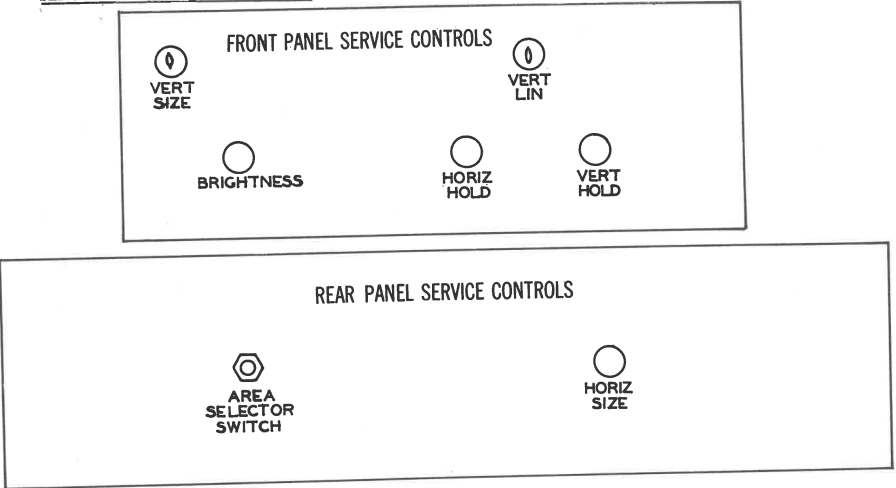
PICTURE TUBE SAFETY GLASS CLEANING

For picture tube safety glass cleaning, it is necessary to remove chassis. (See disassembly instructions).

PICTURE TUBE REMOVAL

For picture tube removal it is necessary to remove chassis. (See disassembly instructions).

SERVICE ADJUSTMENT LOCATION



HORIZONTAL OSCILLATOR FIELD ADJUSTMENT

For adjustment of the horizontal oscillator, it is necessary to remove the rear cover and supply power to set. Adjustment is located on top of chassis. Set the horizontal hold control at the center of its range and adjust the horizontal oscillator slug (L41) until picture synchronizes horizontally. (For location see tube placement chart).

SOUND IF DETECTOR BUZZ ADJUSTMENT

To eliminate sound IF detector buzz, adjust the ratio detector secondary located on bottom of chassis. (See tube placement chart). Removal of chassis is necessary to adjust.

FUSES

Two fuses are used. One fuseable resistor is used for LV power supply protection and one 1" piece of #26 wire-filament transformer protection. (For location, see tube placement chart).

CENTERING

Centering is accomplished mechanically by adjusting two magnetic rings around the neck of the picture tube, located flush against the deflection yoke. Rotate the two rings around the neck of the tube until the picture is properly centered.

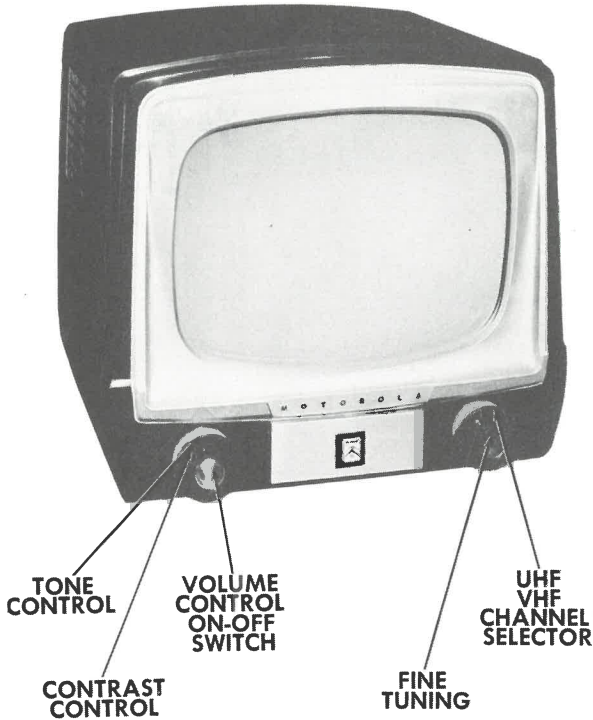
ANTI-PIN CUSHION ADJUSTMENT

Reduce raster size so that the corners are visible. Change the position of the corrector magnets until the sides of the raster are straight and parallel with the corners becoming right angles.

DISASSEMBLY INSTRUCTIONS

1. Remove 8 push on type control knobs from front panel.
2. Disconnect transmission lines and built-in antenna.
3. Remove 1 push on type control knob from rear cover.
4. Remove 5 metal screws. Remove rear cover.
5. Disconnect speaker plug.
6. Remove 4 chassis bolts. Remove chassis.
7. Remove 4 speaker nuts. Remove speaker.

PHOTOFACT\* Folder



MOTOROLA MODEL Y17T15A (Ch. VTS-402YA-04)

TRADE NAME	Motorola	MODELS	CHASSIS	VHF TUNER	UHF TUNER
		17K17, 17K17B, 17T16, 17T16B	TS-402	TT53	
		Y17K17, Y17K17B, Y17T16, Y17T16B	TS-402Y	TT53Y	TT37
		17T15A, 17T15AE	VTS-402	TT61	
		Y17T15A, Y17T15AE	VTS-402Y	TT61Y	TT37
		21C2, B, 21F5, B, 21K13, B, 21K14, B, 21K15, 21K16, W, 21K17	TS-502	TT53	
		Y21C2, B, Y21F5, B, Y21K13, B, Y21K14, B, Y21K15, Y21K16, W, Y21K17	TS-502Y	TT53Y	TT37
		21K12A, 21K12AB, 21K12WA	WTS-502	TT53	
		Y21K12A, Y21K12AB, Y21K12WA	WTS-502Y	TT53Y	
		21T8A, 21T8AE	TTS-502	TT61	
		Y21T8A, Y21T8AE	TTS-502Y	TT61Y	TT37
		21T11, 21T11B, 21T11W	VTS-502	TT53	
		Y21T11, Y21T11B, Y21T11W	VTS-502Y	TT53Y	TT37
MANUFACTURER	Motorola, Inc., 4545 Augusta Blvd., Chicago, Ill.				
TYPE SET	Television Receiver				
TUBES	Nineteen				
POWER SUPPLY	110-120 Volts AC-60 Cycle				
TUNING RANGE	Channels 2 thru 13 VHF, 14 thru 83 UHF, Video IF 45.75MC, Sound IF 41.25MC (Intercarrier)				

MODELS 21F5, Y21F5, 21F5B and Y21F5B USE RADIO (AM-FM) CHASSIS HS-409 AND RECORD CHANGER VM3RC.

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DATE 4-54

SET 237

FOLDER 8

MOTOROLA MODELS

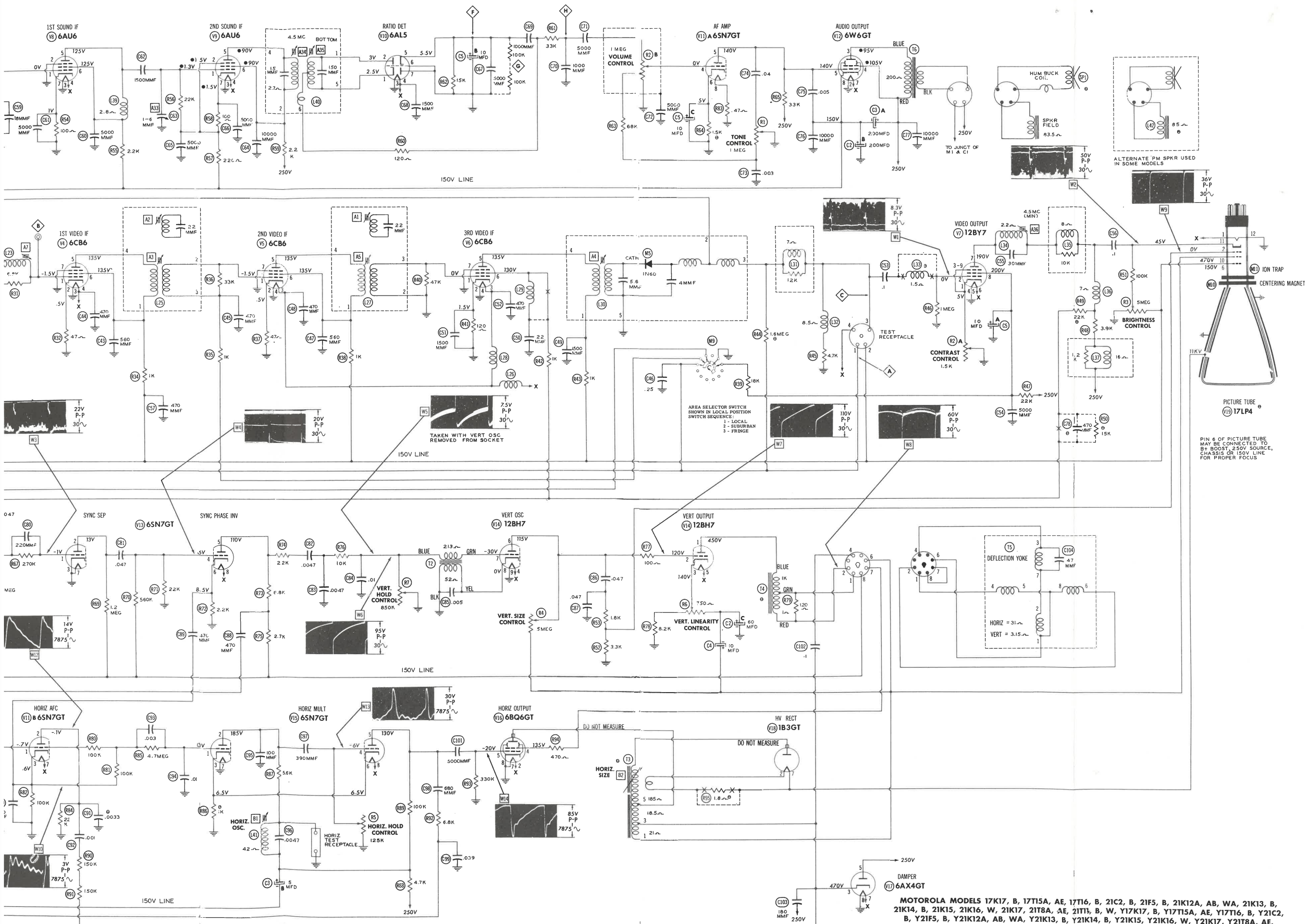
17K17, B, 17T15A, AE, 17T16, B, 21C2, B, 21F5, B, 21K12A, AB, WA, 21K13, B, 21K14, B, 21K15, 21K16, W, 21K17, 21T8A, AE, 21T11, B, W, Y17K17, B, Y17T15A, AE, Y17T16, B, Y21C2, B, Y21F5, B, Y21K12A, AB, WA, Y21K13, B, Y21K14, B, Y21K15, Y21K16, W, Y21K17, Y21T8A, AE, Y21T11, B, W







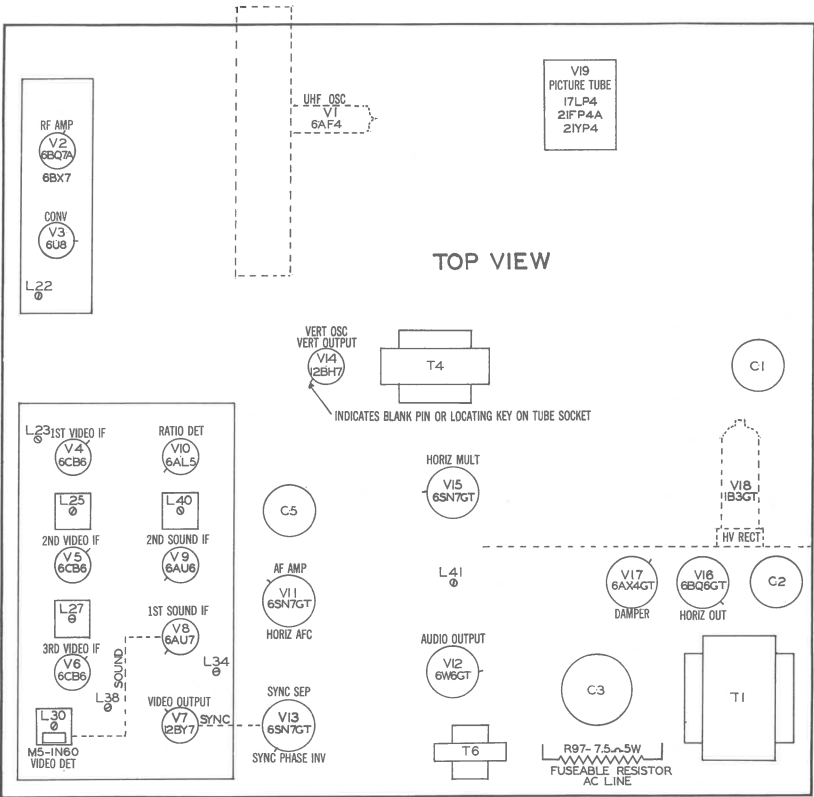




MOTOROLA MODELS 17K17, B, 17T15A, AE, 17T16, B, 21C2, B, 21F5, B, 21K12A, AB, WA, 21K13, B, 21K14, B, 21K15, 21K16, W, 21K17, 21T8A, AE, 21T11, B, W, Y17K17, B, Y17T15A, AE, Y17T16, B, Y21C2, B, Y21F5, B, Y21K12A, AB, WA, Y21K13, B, Y21K14, B, Y21K15, Y21K16, W, Y21K17, Y21T8A, AE, Y21T11, B, W (Ch. TS402, Y, TS502, Y, TTS-502, Y, VTS-402, Y, VTS-502, Y, WTS502, Y)

MOTOROLA MODELS 17K17, B, 17T15A, AE, 17T16, B, 21C2, B, 21F5, B, 21K12A, AB, WA, 21K13, B, 21K14, B, 21K15, 21K16, W, 21K17, 21T8A, AE, 21T11, B, W, Y17K17, B, Y17T15A, AE, Y17T16, B, Y21C2, B, Y21F5, B, Y21K12A, AB, WA, Y21K13, B, Y21K14, B, Y21K15, Y21K16, W, Y21K17, Y21T8A, AE, Y21T11, B, W

TUBE PLACEMENT CHART



TUBE FAILURE CHECK CHART

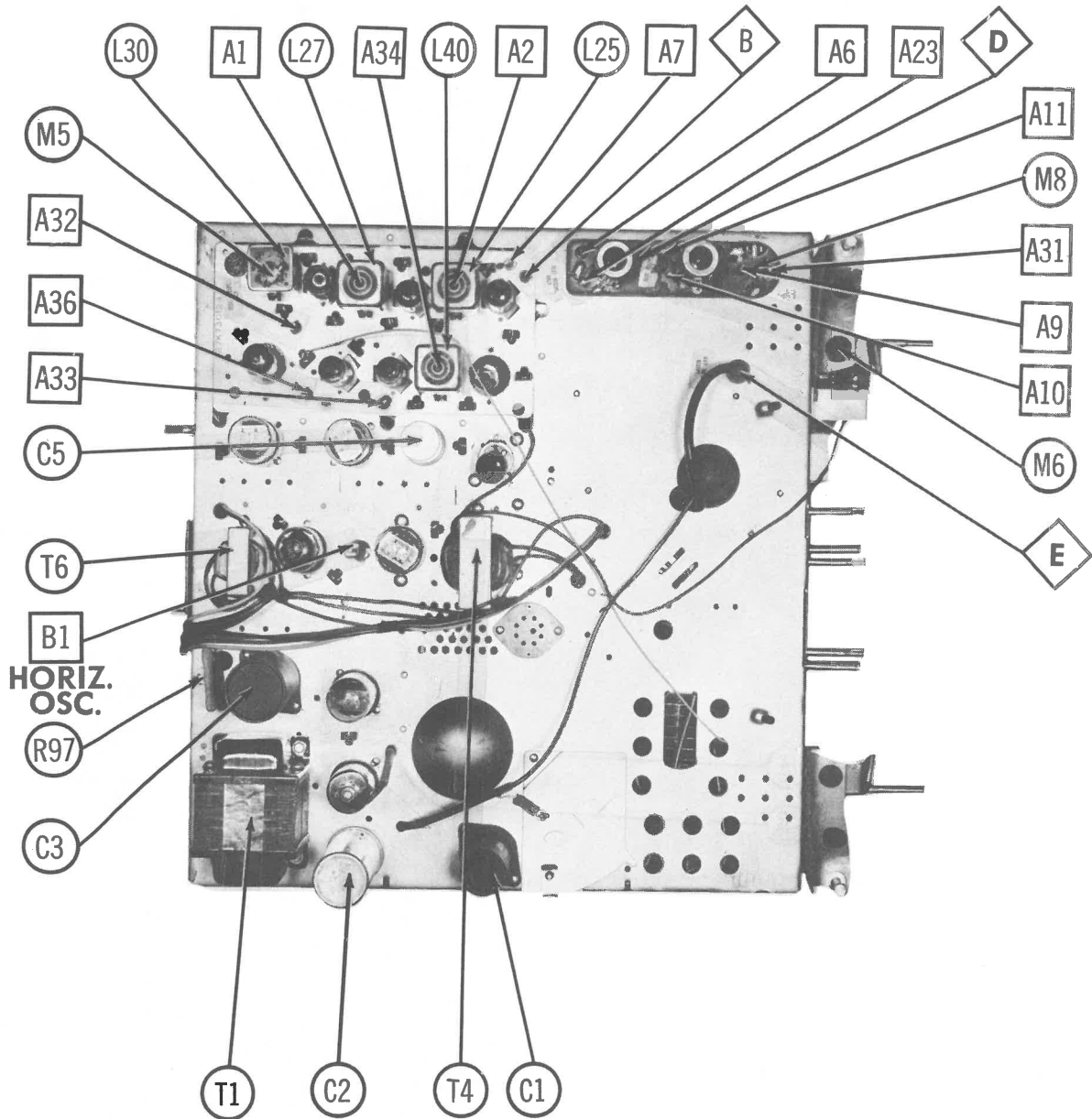
The following chart lists tubes whose failures are most likely to produce the indicated symptoms. Refer to tube placement chart for location and type of tube.

**POWER SUPPLY FAILURE**  
No raster, no sound - Sel Rectifiers (M1 & M2) Fuse (M3)

**LOSS OF PICTURE OR SOUND**  
No pic, no sound, has raster - V3, V4, V5, V6, V12 (V1 UHF only)  
No pic, no sound, has snow - V2, V3, V4  
No pic, has sound, has raster - V7, V19  
Has pic, no sound - V8, V9, V10, V11, V12

**SYNC FAILURE**  
No vert. sync - V13, V14  
No horiz. sync - V11, V13, V15  
No vert. or horiz. sync - V13

**SWEEP FAILURE**  
No raster, has sound - V15, V16, V17, V18, V19  
No vertical deflection - V14  
Poor vert. linearity or foldover - V14  
Poor horiz. linearity or foldover - V15, V16, V17  
Narrow picture - V15, V16, V17, V18, M1, M2  
Vert. off freq. - V13, V14  
Horiz. off freq. - V11, V13, V15

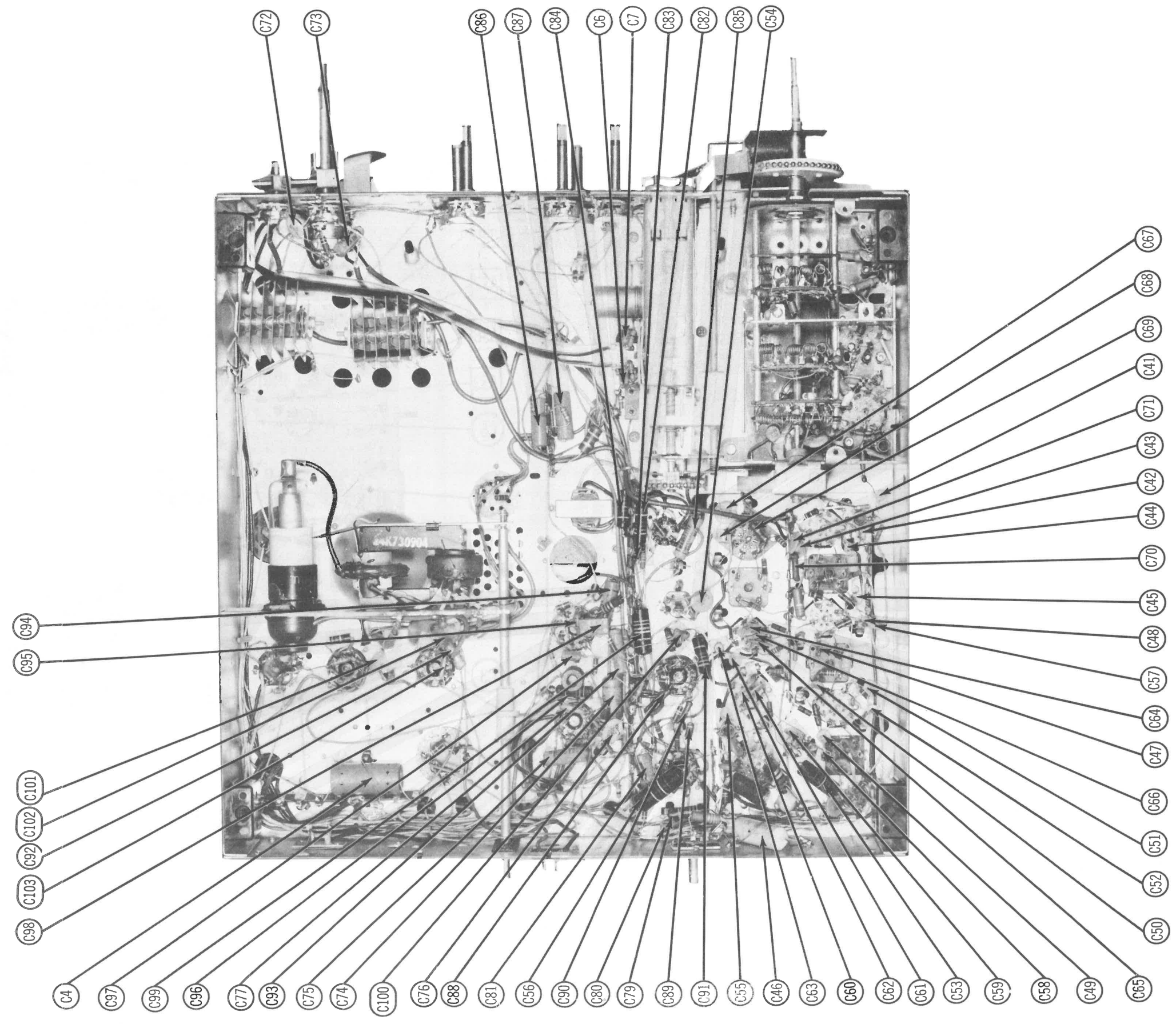


CHASSIS TOP VIEW

SET 237 FOLDER 8

MOTOROLA MODELS 17K17, B, 17T15A, AE, 17T16, B, 21C2, B, 21F5, B, 21K12A, AB, WA, 21K13, B, 21K14, B, 21K15, 21K16, W, 21K17, 21T8A, AE, 21T11, B, W, Y17K17, B, Y17T15A, AE, Y17T16, B, Y21C2, B, Y21F5, B, Y21K12A, AB, WA, Y21K13, B, Y21K14, B, Y21K15, Y21K16, W, Y21K17, Y21T8A, AE, Y21T11, B, W





# ALIGNMENT INSTRUCTIONS (cont)

## OSCILLATOR ALIGNMENT

Remove shorting jumper from pin 9 of V3 to chassis.  
Replace bias supply as under video IF alignment.  
Set "Area Selector" switch to "Local" position.  
Use only enough sweep generator output to produce usable pattern on scope.  
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.  
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.  
Set the fine tuning control to the mid-position of its range. See Fig. 6.

DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
16. Two 120Ω Carbon Resistors	Across antenna terminals (Balun Line) with 120Ω in each lead.	195MC (10MC Swp)	193.25MC	10	Vert. Amp. thru 47KΩ to point C. Low side to chassis.	A23	Adjust to place sound marker SLIGHTLY higher in frequency than the sound trap notch. This allowance must be made due to removal of tuner shield. With shield replaced, the sound marker should move down into the trap notch. Check channels 7 thru 13 noting whether sound marker for each channel falls just above the trap notch. Response should be similar to Fig. 5. If more than a 30 degree rotation of fine tuning control is necessary to place sound marker in proper position on any high band channel adjust A24. If A24 is adjusted it may be necessary to readjust A23 on channel 10.
		213MC (10MC Swp)	211.25MC	13			
		207MC (10MC Swp)	205.25MC	12			
		201MC (10MC Swp)	209.75MC	11			
		189MC (10MC Swp)	187.25MC	9			
		183MC (10MC Swp)	181.25MC	8			
		177MC (10MC Swp)	175.25MC	7			
17. "	"	85MC (10MC Swp)	83.25MC 87.75MC	6	"	A25	Check to see that fine tuning is at mid-capacity as in Fig. 6. Adjust A25 by compressing or expanding coil to place sound marker just above trap notch as in Fig. 5.
18. "	"	79MC (10MC Swp)	77.25MC	5	"	A26	Adjust by compressing or expanding coil to place sound marker just above trap notch (See Fig. 5) with fine tuning within 15 degrees of position shown in Fig. 6.
		81.75MC	81.75MC	4		A27	
		83MC (10MC Swp)	81.75MC	3		A28	
		85.75MC	85.75MC	2		A29	
		59.75MC	59.75MC				

## UHF TUNER ALIGNMENT

This portion of the receiver has been properly aligned at the factory and is very stable. Alignment of this portion of the receiver should not be required in the field.

## CHANNEL 7 INTO 6 INTERFERENCE TRAP AND IF TRAP ALIGNMENT

Instructions same as for oscillator alignment.

DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
19. Two 120Ω Carbon Resistors	Across antenna terminals (Balun Line) with 120Ω in each lead	85MC (10MC Swp)	83.25MC 87.75MC	6	Vert. Amp. thru 47KΩ to point C. Low side to chassis.	A30	This is channel 7 into 6 trap adjustment. Set fine tuning so that sound marker falls into trap notch. Increase sweep generator output to produce visible response on scope. Adjust A30 for MINIMUM response.
20. "	"	44.5MC (10MC Swp)	41.25MC 44.5MC 45.75MC	2	"	A31	Increase sweep generator output to produce visible response on scope. Adjust A31 for MINIMUM response similar to Fig. 7.

## FM IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

Connect two matched 100KΩ (1%) resistors in series from point F to chassis. The junction of these two resistors is alignment point G as shown on the schematic.

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
21. Direct	High side to point C. Low side to chassis.	4.5MC (Unmod)	Any non-interfering channel	DC probe thru 10KΩ to point F. Common A34 to chassis.	A32, A33, A34	Adjust for maximum deflection.
22. "	"	"	"	DC probe to point G. Common to point F.	A35	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting. For best accuracy repeat steps 21 & 22.

## SOUND IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Use frequency modulated signal with 60% modulation and 450KC sweep. Use 120V sawtooth voltage in scope for horizontal deflection.

DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
21. Direct	High side to point C. Low side to chassis.	4.5MC (450KC Swp)	4.5MC	Any non-interfering channel	Vert. Amp. thru 10KΩ to point F. Low side to chassis.	A32, A33, A34	Disconnect stabilizing capacitor C5B. Adjust for curve of maximum amplitude and symmetry similar to Fig. 8.
22. "	"	"	"	"	Vert. Amp. to point D. Low side to chassis.	A35	Reconnect stabilizing capacitor C5B. Adjust so that 4.5MC occurs at center of crossover lines as in Fig. 9. SLIGHTLY re-touch A34 for maximum amplitude and straightness of crossover lines.

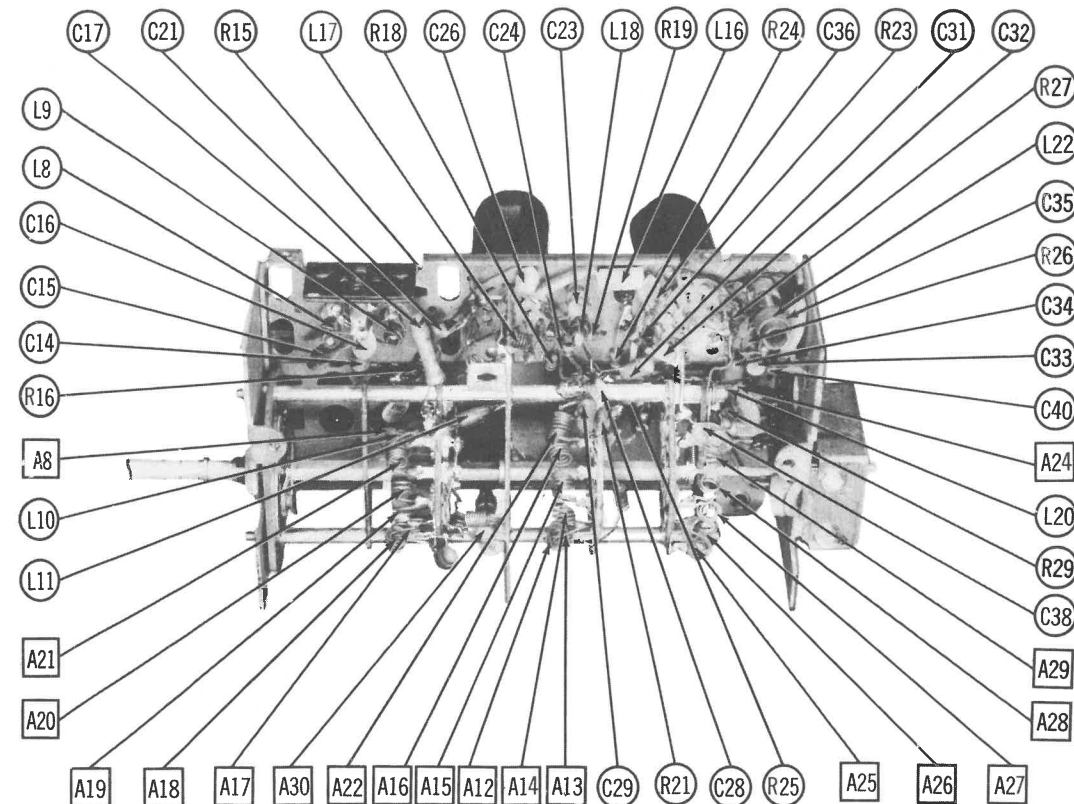
## SOUND IF ALIGNMENT USING TV SIGNAL AND VTVM

This method provides an accurate signal source. Tune in a TV station. See steps 21 and 22 of "Sound If Alignment Using AM Signal Generator and VTVM" for VTVM connections and adjustment of A32 thru A35 for sharp alignment, turn fine tuning slightly off station so that VTVM reads 6 to 8 volts from point F to chassis.

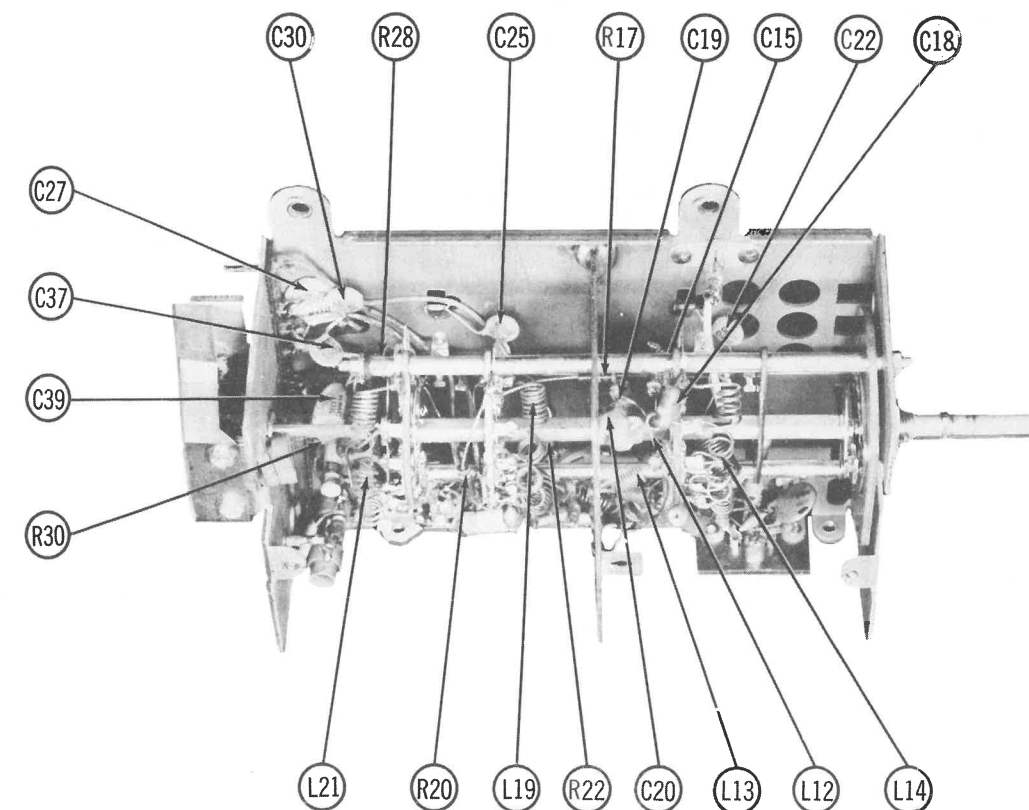
## 4.5MC TRAP ALIGNMENT

Set contrast control fully clockwise.

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
23. Direct	High side to point C. Low side to chassis.	4.5MC (Unmod)	Any non-interfering channel.	DC probe thru detector (Fig. 10) to pin 11 of picture tube. Low side to chassis.	A36	Adjust for MINIMUM deflection. Remove 5000Ω, 10 watt resistor from pin 5 of V17. Replace V16 on its socket.



VHF TUNER-RIGHT SIDE



VHF TUNER-LEFT SIDE

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

The high voltage lead should be securely taped and kept away from the chassis. Do not remove the horizontal oscillator tube (V15) from its socket. Use an isolation transformer to protect the test equipment.

VIDEO IF ALIGNMENT

Attenuate the sweep generator to maintain 3 to 5 volts peak to peak on scope at point  $\diamond$ . If the sweep generator has no built-in markers, loosely couple the output of an accurately calibrated AM signal generator to the video IF strip. The IF coils and traps have two points of resonance. The correct settings are with the cores away from the center of the coil form so as not to affect coupling between coil and trap windings. Set "Area Selector" switch to "Local" position. Connect the negative side of a 3 volt bias supply thru 47K $\Omega$  to point  $\diamond$ . Connect positive lead to chassis. Disable local oscillator by shorting pin 9 (grid) of 6U8 (V3) to chassis with short lead. Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.

DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
1. .001MFD	High side to point $\diamond$ . Low side to chassis. Use very short leads.	44MC (10MC Swp)	41.25MC	13	Vert. Amp. thru 47K $\Omega$ to point $\diamond$ . Low side to chassis.	A1	Adjust so that trap notch falls at 41.25MC. Use sufficient generator output so that trap notch is clearly defined (Fig.1).
2. "	"	"	47.25MC	"	"	A2	Adjust so that trap notch falls at 47.25MC. Temporarily remove the -3 volts bias to provide better trap notch definition (Fig.1).
3. "	"	"	45.75MC	"	"	A3, A4	Adjust A3 to place 45.75MC marker at 60% on high side of response curve. Simultaneously adjust A4 for flat top and symmetrical response similar to Fig. 1.
4. "	"	"	42.25MC	"	"	A5	Adjust to place 42.25MC marker at 50% on response curve. Simultaneously retouch A4 to obtain response similar to Fig. 1.
5. "	High side to point $\diamond$ . Low side to chassis. Use very short leads.	"	41.25MC 42.25MC 45.25MC 47.25MC	"	"	A6, A7	Simultaneously adjust A6 and A7 for response similar to Fig.2. A6 positions curve and A7 has levelling effect. To check the 41.25MC and 47.25MC trap attenuation connect the DC probe of VTVM to point $\diamond$ . Common to chassis. Take readings with marker generator set to 41.25MC, 44.0MC and 47.25MC. The voltage ratio between 41.25MC and 44.0MC should be between 30 and 65 and the voltage ratio between 47.25MC and 44.0MC should be between 100 and 200.

REGENERATION CHECK

Leave pin 9 of V3 shorted to chassis but remove 3 volt bias supply. With generator and scope connected as in step 5 observe response curve. Any regeneration will be indicated by sharp peaks on the response curve.

IF SENSITIVITY MEASUREMENT

Connect the high side of an AM signal generator to point  $\diamond$ . Low side to chassis. Set signal generator to 44.0MC. Remove bias supply from point  $\diamond$ . Set "Area Selector" switch to "fringe" position. Connect the DC probe of VTVM to point  $\diamond$ . Common to chassis. A signal of less than 750 microvolts from generator should produce one volt on VTVM.

MIXER SENSITIVITY MEASUREMENTS

Connect the high side of an AM signal generator thru .001MFD capacitor to point  $\diamond$ . Low side to chassis. Set signal generator to 44.0MC. Short out R23 (4700 $\Omega$ ). Remove bias supply from point  $\diamond$ . Set "Area Selector" switch to "fringe" position. Switch channel selector to UHF (channel 1) position. A signal of less than 100 microvolts from generator should produce one volt at VTVM.

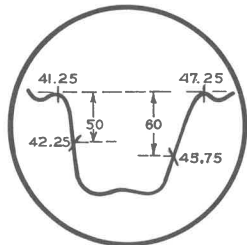


FIG. 1

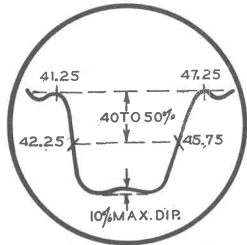


FIG. 2

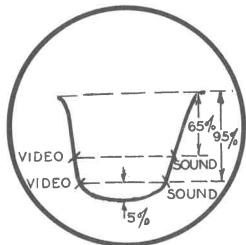


FIG. 3

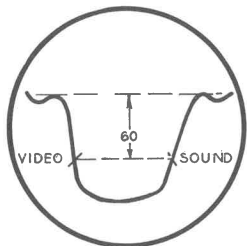


FIG. 4

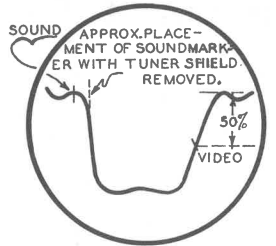


FIG. 5

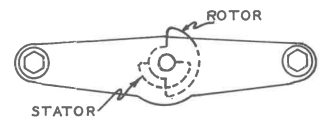


FIG. 6

ALIGNMENT INSTRUCTIONS (cont)

RF AND MIXER ALIGNMENT

Set the "Area Selector" switch to "Suburban" or "fringe" position. This grounds the tuner AGC line. Preset A8 and A9 fully into coil. Preset A10 midway into coil. Remove tuner shield. Remove horizontal output tube (V16) and connect a 5000 $\Omega$ , 10 watt resistor from B++ (pin 5 of damper tube or center lug of video testjack) to ground. Connect the synchronized sweep voltage from the signal generator to the horizontal input of the oscilloscope for horizontal deflection. The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.

DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
6. Two 120 $\Omega$ Carbon Resistors	Across antenna terminals (Balun line) with 120 $\Omega$ in each lead.	177MC (20MC Swp)	175.25MC 179.75MC	7	Vert. Amp. thru 47K $\Omega$ to point $\diamond$ . Low side to chassis.	A11, A8	Adjust A-11 so that sound and video markers fall within limits shown in Fig.3. Adjust A8 until side of channel 7 is affected, then back off A8 so it just stops affecting channel 7. (Turning core in too far may affect channel 6).
7. "	"	213MC (20MC Swp)	211.25MC 215.75MC	13	"	A10	Adjust for response curve similar to Fig.3. Be sure markers fall within limits shown. Recheck channel 7. If necessary, retouch A-11 (make no further adjustment of A8)
8. "	"	207MC (20MC Swp) 201MC (20MC Swp) 195MC (20MC Swp) 189MC (20MC Swp) 185MC (20MC Swp) 177MC (20MC Swp)	205.25MC 209.75MC 199.25MC 203.75MC 193.25MC 197.75MC 187.25MC 191.75MC 181.25MC 185.75MC 175.25MC 179.75MC	12 11 10 9 8 7	"		Check for response curve similar to Fig.3. (If response is checked with tuner shield cover in place, the video marker will move up the curve a short distance, but markers should be within tolerance)
9. "	"	85MC (20MC Swp)	83.25MC 87.75MC	6	"	A12, A17	Adjust A12 by compressing or expanding coil turns to obtain response similar to Fig. 4 with markers not falling below 60%. Usually the antenna coils A17 thru A21 are not to be adjusted. If the antenna coils have been distorted they may be adjusted by compressing or expanding coil turns for maximum response in conjunction with the RF coils (A12 thru A16). If it is necessary to adjust any antenna coil in following steps then the UHF coil adjustment of A8 must be repeated as in step 6.
10. Two 120 $\Omega$ Carbon Resistors	Across antenna terminals (Balun Line) with 120 $\Omega$ in each lead.	85MC (20MC Swp)	83.25MC 89.75MC	6	Vert. Amp. thru 47K $\Omega$ to point $\diamond$ . Low side to chassis.	A9	Adjust FM trap core, A9 until a SLIGHT effect is noted on sound side of response curve (Fig.4).
11. "	"	79MC (20MC Swp)	77.25MC 81.75MC	5	"	A13, A18	Adjust A13 by compressing or expanding coil turns for response similar to Fig.4. For A18 see remarks step 9.
12. "	"	69MC (20MC Swp)	67.25MC 71.75MC	4	"	A14, A19	Adjust A14 for response similar to Fig.4. For A19 see remarks step 9.
13. "	"	63MC (20MC Swp)	61.25MC 55.75MC	3	"	A15, A20	Adjust for response similar to Fig. 4. For A20 see remarks step 9.
14. "	"	57MC (20MC Swp)	55.25MC 59.75MC	2	"	A16, A21	Adjust for response similar to Fig. 4. For A21 see remarks step 9. Replace tuner shield and recheck channels 13 thru 2. Response of channel 13 thru 7 must be within limits shown in Fig. 3. Response on channels 6 thru 2 must be similar to Fig.4 with markers not falling below 60% on response curve.
15. Direct	High side to point $\diamond$ . Low side to chassis.	44MC (20MC Swp)	42.25MC 46.75MC	UHF (Channel 1)	"	A22	Remove tuner shield. Adjust A22 by compressing or expanding coil for response curve similar to Fig. 4. Replace tuner shield.



FIG. 7

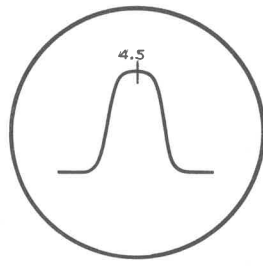


FIG. 8

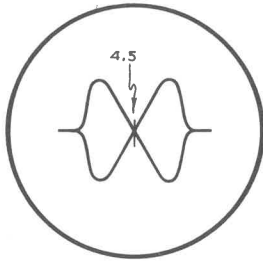


FIG. 9

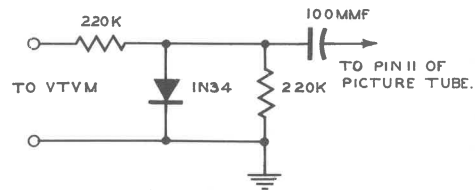
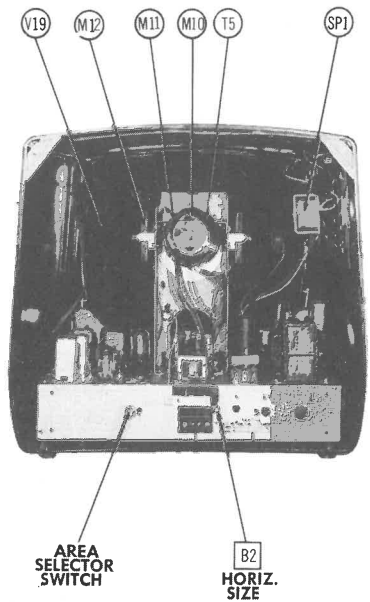


FIG. 10

MOTOROLA MODELS 17K17, B, 17T15A, AE, 17T16, B, 21C2, B, 21F5, B, 21K12A, AB, WA, 21K13, B, 21K14, B, 21K15, 21K16, W, 21K17, 21T8A, AE, 21T11, B, W, 17T17, B, 17T17A, AE, 17T17T, B, W, 17T18A, AE, 17T18T, B, W, 17T19A, AE, 17T19T, B, W, 17T20A, AE, 17T20T, B, W, 17T21A, AE, 17T21T, B, W, 17T22A, AE, 17T22T, B, W, 17T23A, AE, 17T23T, B, W, 17T24A, AE, 17T24T, B, W, 17T25A, AE, 17T25T, B, W, 17T26A, AE, 17T26T, B, W, 17T27A, AE, 17T27T, B, W, 17T28A, AE, 17T28T, B, W, 17T29A, AE, 17T29T, B, W, 17T30A, AE, 17T30T, B, W, 17T31A, AE, 17T31T, B, W, 17T32A, AE, 17T32T, B, W, 17T33A, AE, 17T33T, B, W, 17T34A, AE, 17T34T, B, W, 17T35A, AE, 17T35T, B, W, 17T36A, AE, 17T36T, B, W, 17T37A, AE, 17T37T, B, W, 17T38A, AE, 17T38T, B, W, 17T39A, AE, 17T39T, B, W, 17T40A, AE, 17T40T, B, W, 17T41A, AE, 17T41T, B, W, 17T42A, AE, 17T42T, B, W, 17T43A, AE, 17T43T, B, W, 17T44A, AE, 17T44T, B, W, 17T45A, AE, 17T45T, B, W, 17T46A, AE, 17T46T, B, W, 17T47A, AE, 17T47T, B, W, 17T48A, AE, 17T48T, B, W, 17T49A, AE, 17T49T, B, W, 17T50A, AE, 17T50T, B, W, 17T51A, AE, 17T51T, B, W, 17T52A, AE, 17T52T, B, W, 17T53A, AE, 17T53T, B, W, 17T54A, AE, 17T54T, B, W, 17T55A, AE, 17T55T, B, W, 17T56A, AE, 17T56T, B, W, 17T57A, AE, 17T57T, B, W, 17T58A, AE, 17T58T, B, W, 17T59A, AE, 17T59T, B, W, 17T60A, AE, 17T60T, B, W, 17T61A, AE, 17T61T, B, W, 17T62A, AE, 17T62T, B, W, 17T63A, AE, 17T63T, B, W, 17T64A, AE, 17T64T, B, W, 17T65A, AE, 17T65T, B, W, 17T66A, AE, 17T66T, B, W, 17T67A, AE, 17T67T, B, W, 17T68A, AE, 17T68T, B, W, 17T69A, AE, 17T69T, B, W, 17T70A, AE, 17T70T, B, W, 17T71A, AE, 17T71T, B, W, 17T72A, AE, 17T72T, B, W, 17T73A, AE, 17T73T, B, W, 17T74A, AE, 17T74T, B, W, 17T75A, AE, 17T75T, B, W, 17T76A, AE, 17T76T, B, W, 17T77A, AE, 17T77T, B, W, 17T78A, AE, 17T78T, B, W, 17T79A, AE, 17T79T, B, W, 17T80A, AE, 17T80T, B, W, 17T81A, AE, 17T81T, B, W, 17T82A, AE, 17T82T, B, W, 17T83A, AE, 17T83T, B, W, 17T84A, AE, 17T84T, B, W, 17T85A, AE, 17T85T, B, W, 17T86A, AE, 17T86T, B, W, 17T87A, AE, 17T87T, B, W, 17T88A, AE, 17T88T, B, W, 17T89A, AE, 17T89T, B, W, 17T90A, AE, 17T90T, B, W, 17T91A, AE, 17T91T, B, W, 17T92A, AE, 17T92T, B, W, 17T93A, AE, 17T93T, B, W, 17T94A, AE, 17T94T, B, W, 17T95A, AE, 17T95T, B, W, 17T96A, AE, 17T96T, B, W, 17T97A, AE, 17T97T, B, W, 17T98A, AE, 17T98T, B, W, 17T99A, AE, 17T99T, B, W, 17T100A, AE, 17T100T, B, W, 17T101A, AE, 17T101T, B, W, 17T102A, AE, 17T102T, B, W, 17T103A, AE, 17T103T, B, W, 17T104A, AE, 17T104T, B, W, 17T105A, AE, 17T105T, B, W, 17T106A, AE, 17T106T, B, W, 17T107A, AE, 17T107T, B, W, 17T108A, AE, 17T108T, B, W, 17T109A, AE, 17T109T, B, W, 17T110A, AE, 17T110T, B, W, 17T111A, AE, 17T111T, B, W, 17T112A, AE, 17T112T, B, W, 17T113A, AE, 17T113T, B, W, 17T114A, AE, 17T114T, B, W, 17T115A, AE, 17T115T, B, W, 17T116A, AE, 17T116T, B, W, 17T117A, AE, 17T117T, B, W, 17T118A, AE, 17T118T, B, W, 17T119A, AE, 17T119T, B, W, 17T120A, AE, 17T120T, B, W, 17T121A, AE, 17T121T, B, W, 17T122A, AE, 17T122T, B, W, 17T123A, AE, 17T123T, B, W, 17T124A, AE, 17T124T, B, W, 17T125A, AE, 17T125T, B, W, 17T126A, AE, 17T126T, B, W, 17T127A, AE, 17T127T, B, W, 17T128A, AE, 17T128T, B, W, 17T129A, AE, 17T129T, B, W, 17T130A, AE, 17T130T, B, W, 17T131A, AE, 17T131T, B, W, 17T132A, AE, 17T132T, B, W, 17T133A, AE, 17T133T, B, W, 17T134A, AE, 17T134T, B, W, 17T135A, AE, 17T135T, B, W, 17T136A, AE, 17T136T, B, W, 17T137A, AE, 17T137T, B, W, 17T138A, AE, 17T138T, B, W, 17T139A, AE, 17T139T, B, W, 17T140A, AE, 17T140T, B, W, 17T141A, AE, 17T141T, B, W, 17T142A, AE, 17T142T, B, W, 17T143A, AE, 17T143T, B, W, 17T144A, AE, 17T144T, B, W, 17T145A, AE, 17T145T, B, W, 17T146A, AE, 17T146T, B, W, 17T147A, AE, 17T147T, B, W, 17T148A, AE, 17T148T, B, W, 17T149A, AE, 17T149T, B, W, 17T150A, AE, 17T150T, B, W, 17T151A, AE, 17T151T, B, W, 17T152A, AE, 17T152T, B, W, 17T153A, AE, 17T153T, B, W, 17T154A, AE, 17T154T, B, W, 17T155A, AE, 17T155T, B, W, 17T156A, AE, 17T156T, B, W, 17T157A, AE, 17T157T, B, W, 17T158A, AE, 17T158T, B, W, 17T159A, AE, 17T159T, B, W, 17T160A, AE, 17T160T, B, W, 17T161A, AE, 17T161T, B, W, 17T162A, AE, 17T162T, B, W, 17T163A, AE, 17T163T, B, W, 17T164A, AE, 17T164T, B, W, 17T165A, AE, 17T165T, B, W, 17T166A, AE, 17T166T, B, W, 17T167A, AE, 17T167T, B, W, 17T168A, AE, 17T168T, B, W, 17T169A, AE, 17T169T, B, W, 17T170A, AE, 17T170T, B, W, 17T171A, AE, 17T171T, B, W, 17T172A, AE, 17T172T, B, W, 17T173A, AE, 17T173T, B, W, 17T174A, AE, 17T174T, B, W, 17T175A, AE, 17T175T, B, W, 17T176A, AE, 17T176T, B, W, 17T177A, AE, 17T177T, B, W, 17T178A, AE, 17T178T, B, W, 17T179A, AE, 17T179T, B, W, 17T180A, AE, 17T180T, B, W, 17T181A, AE, 17T181T, B, W, 17T182A, AE, 17T182T, B, W, 17T183A, AE, 17T183T, B, W, 17T184A, AE, 17T184T, B, W, 17T185A, AE, 17T185T, B, W, 17T186A, AE, 17T186T, B, W, 17T187A, AE, 17T187T, B, W, 17T188A, AE, 17T188T, B, W, 17T189A, AE, 17T189T, B, W, 17T190A, AE, 17T190T, B, W, 17T191A, AE, 17T191T, B, W, 17T192A, AE, 17T192T, B, W, 17T193A, AE, 17T193T, B, W, 17T194A, AE, 17T194T, B, W, 17T195A, AE, 17T195T, B, W, 17T196A, AE, 17T196T, B, W, 17T197A, AE, 17T197T, B, W, 17T198A, AE, 17T198T, B, W, 17T199A, AE, 17T199T, B, W, 17T200A, AE, 17T200T, B, W, 17T201A, AE, 17T201T, B, W, 17T202A, AE, 17T202T, B, W, 17T203A, AE, 17T203T, B, W, 17T204A, AE, 17T204T, B, W, 17T205A, AE, 17T205T, B, W, 17T206A, AE, 17T206T, B, W, 17T207A, AE, 17T207T, B, W, 17T208A, AE, 17T208T, B, W, 17T209A, AE, 17T209T, B, W, 17T210A, AE, 17T210T, B, W, 17T211A, AE, 17T211T, B, W, 17T212A, AE, 17T212T, B, W, 17T213A, AE, 17T213T, B, W, 17T214A, AE, 17T214T, B, W, 17T215A, AE, 17T215T, B, W, 17T216A, AE, 17T216T, B, W, 17T217A, AE, 17T217T, B, W, 17T218A, AE, 17T218T, B, W, 17T219A, AE, 17T219T, B, W, 17T220A, AE, 17T220T, B, W, 17T221A, AE, 17T221T, B, W, 17T222A, AE, 17T222T, B, W, 17T223A, AE, 17T223T, B, W, 17T224A, AE, 17T224T, B, W, 17T225A, AE, 17T225T, B, W, 17T226A, AE, 17T226T, B, W, 17T227A, AE, 17T227T, B, W, 17T228A, AE, 17T228T, B, W, 17T229A, AE, 17T229T, B, W, 17T230A, AE, 17T230T, B, W, 17T231A, AE, 17T231T, B, W, 17T232A, AE, 17T232T, B, W, 17T233A, AE, 17T233T, B, W, 17T234A, AE, 17T234T, B, W, 17T235A, AE, 17T235T, B, W, 17T236A, AE, 17T236T, B, W, 17T237A, AE, 17T237T, B, W, 17T238A, AE, 17T238T, B, W, 17T239A, AE, 17T239T, B, W, 17T240A, AE, 17T240T, B, W, 17T241A, AE, 17T241T, B, W, 17T242A, AE, 17T242T, B, W, 17T243A, AE, 17T243T, B, W, 17T244A, AE, 17T244T, B, W, 17T245A, AE, 17T245T, B, W, 17T246A, AE, 17T246T, B, W, 17T247A, AE, 17T247T, B, W, 17T248A, AE, 17T248T, B, W, 17T249A, AE, 17T249T, B, W, 17T250A, AE, 17T250T, B, W, 17T251A, AE, 17T251T, B, W, 17T252A, AE, 17T252T, B, W, 17T253A, AE, 17T253T, B, W, 17T254A, AE, 17T254T, B, W, 17T255A, AE, 17T255T, B, W, 17T256A, AE, 17T256T, B, W, 17T257A, AE, 17T257T, B, W, 17T258A, AE, 17T258T, B, W, 17T259A, AE, 17T259T, B, W, 17T260A, AE, 17T260T, B, W, 17T261A, AE, 17T261T, B, W, 17T262A, AE, 17T262T, B, W, 17T263A, AE, 17T263T, B, W, 17T264A, AE, 17T264T, B, W, 17T265A, AE, 17T265T, B, W, 17T266A, AE, 17T266T, B, W, 17T267A, AE, 17T267T, B, W, 17T268A, AE, 17T268T, B, W, 17T269A, AE, 17T269T, B, W, 17T270A, AE, 17T270T, B, W, 17T271A, AE, 17T271T, B, W, 17T272A, AE, 17T272T, B, W, 17T273A, AE, 17T273T, B, W, 17T274A, AE, 17T274T, B, W, 17T275A, AE, 17T275T, B, W, 17T276A, AE, 17T276T, B, W, 17T277A, AE, 17T277T, B, W, 17T278A, AE, 17T278T, B, W, 17T279A, AE, 17T279T, B, W, 17T280A, AE, 17T280T, B, W, 17T281A, AE, 17T281T, B, W, 17T282A, AE, 17T282T, B, W, 17T283A, AE, 17T283T, B, W, 17T284A, AE, 17T284T, B, W, 17T285A, AE, 17T285T, B, W, 17T286A, AE, 17T286T, B, W, 17T287A, AE, 17T287T, B, W, 17T288A, AE, 17T288T, B, W, 17T289A, AE, 17T289T, B, W, 17T290A, AE, 17T290T, B, W, 17T291A, AE, 17T291T, B, W, 17T292A, AE, 17T292T, B, W, 17T293A, AE, 17T293T, B, W, 17T294A, AE, 17T294T, B, W, 17T295A, AE, 17T295T, B, W, 17T296A, AE, 17T296T, B, W, 17T297A, AE, 17T297T, B, W, 17T298A, AE, 17T298T, B, W, 17T299A, AE, 17T299T, B, W, 17T300A, AE, 17T300T, B, W, 17T301A, AE, 17T301T, B, W, 17T302A, AE, 17T302T, B, W, 17T303A, AE, 17T303T, B, W, 17T304A, AE, 17T304T, B, W, 17T305A, AE, 17T305T, B, W, 17T306A, AE, 17T306T, B, W, 17T307A, AE, 17T307T, B, W, 17T308A, AE, 17T308T, B, W, 17T309A, AE, 17T309T, B, W, 17T310A, AE, 17T310T, B, W, 17T311A, AE, 17T311T, B, W, 17T312A, AE, 17T312T, B, W, 17T313A, AE, 17T313T, B, W, 17T314A, AE, 17T314T, B, W, 17T315A, AE, 17T315T, B, W, 17T316A, AE, 17T316T, B, W, 17T317A, AE, 17T317T, B, W, 17T318A, AE, 17T318T, B, W, 17T319A, AE, 17T319T, B, W, 17T320A, AE, 17T320T, B, W, 17T321A, AE, 17T321T, B, W, 17T322A, AE, 17T322T, B, W, 17T323A, AE, 17T323T, B, W, 17T324A, AE, 17T324T, B, W, 17T325A, AE, 17T325T, B, W, 17T326A, AE, 17T326T, B, W, 17T327A, AE, 17T327T, B, W, 17T328A, AE, 17T328T, B, W, 17T329A, AE, 17T329T, B, W, 17T330A, AE, 17T330T, B, W, 17T331A, AE, 17T331T, B, W, 17T





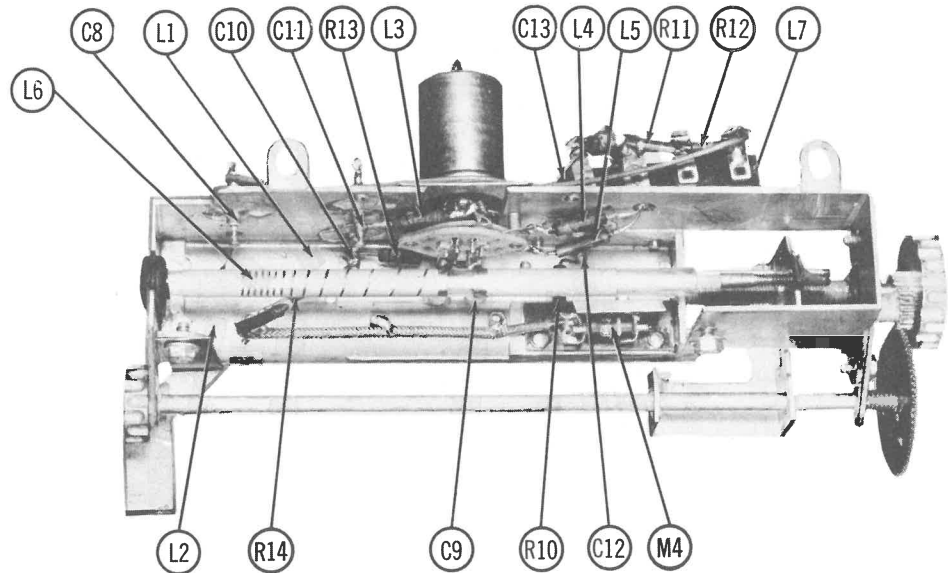
CABINET-REAR VIEW

### HORIZONTAL SWEEP CIRCUIT ADJUSTMENTS

Turn the set on and tune in a TV station, preferably a test pattern.

Normally the horizontal hold control will have a sync range of approximately 30 degrees. If the controls is too critical adjust as follows:

1. Shunt the horizontal oscillator coil (L41) to ground with a .25MFD, 400 volt capacitor. This may be done with the chassis in the cabinet by placing the capacitor across the 2 pin receptacle on rear of chassis.
2. With the horizontal centering lever move the picture to the right so the left edge of the raster can be seen. Adjust the horizontal hold control until no blanking pulse appears and the picture just starts to fold on the left (the blanking pulse is the gray bar just to the left edge of the raster). It may be necessary to adjust the contrast and brightness controls to make the pulse visible.
3. Remove the .25MFD capacitor across L41.
4. Adjust the horizontal oscillator coil slug (B1) until no sync pulse can be seen as in step 2. Recenter picture. Adjust the horizontal size adjustment (B2) for a picture slightly wider than necessary to fill the picture mask horizontally. Since this adjustment also affects the vertical size it may be necessary to adjust the vertical size control.

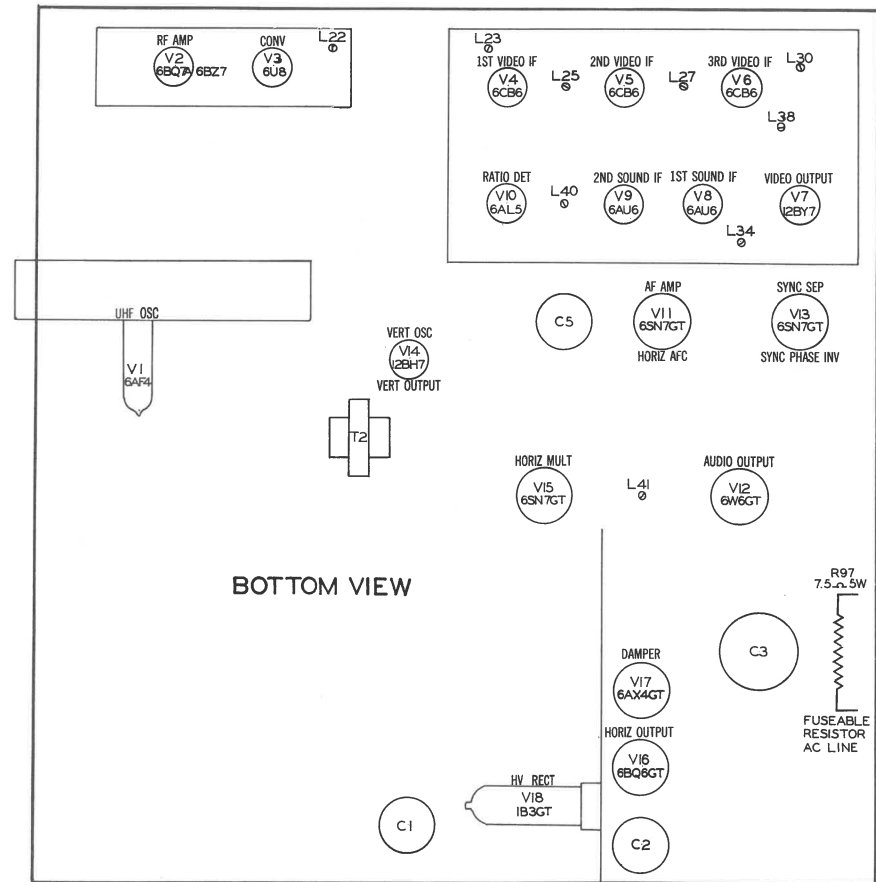


UHF TUNER

### RESISTANCE MEASUREMENTS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6AF4	±2.7KΩ	21KΩ	.1Ω	0Ω	0Ω	21KΩ	±2.7KΩ		
V 2	6BQ7A	INF	2Meg	0Ω	0Ω	.1Ω	±3.8KΩ	±250KΩ	INF	0Ω
V 3	6U8	±2KΩ	1.8Meg	±330KΩ	.1Ω	0Ω	±16KΩ	0Ω	0Ω	15KΩ
V 4	6CB6	1.6Meg	47Ω	0Ω	.1Ω	±1KΩ	±1KΩ	0Ω		
V 5	6CB6	1.6 Meg	47Ω	.1Ω	0Ω	±1KΩ	±1KΩ	0Ω		
V 6	6CB6	.1Ω	120Ω	.1Ω	0Ω	±1KΩ	±27KΩ	0Ω		
V 7	12BY7	270Ω	1 Meg	270Ω	0Ω	0Ω	.1Ω	±4KΩ	±22KΩ	270Ω
V 8	6AU6	2.3Ω	0Ω	0Ω	.1Ω	±2.2KΩ	±2.2KΩ	100Ω		
V 9	6AU6	±22KΩ	±220Ω	0Ω	.1Ω	±2.2KΩ	±2.2KΩ	±320Ω		
V 10	6AL5	INF	INF	0Ω	.1Ω	15KΩ	0Ω	0Ω		
V 11	6SN7GT	300KΩ	22KΩ	100KΩ	300KΩ	±33KΩ	1.2KΩ	.1Ω	0Ω	
V 12	6W6GT	INF	0Ω	±200Ω	±0Ω	±33KΩ	INF	.1Ω	100KΩ	
V 13	6SN7GT	1.8 Meg	±1.2Meg	0Ω	22KΩ	±9.5KΩ	2.2KΩ	0Ω	.1Ω	
V 14	12BH7	±1K	±2.9Meg	8.5KΩ	.1Ω	.1Ω	±2.9Meg	650KΩ	50Ω	0Ω
V 15	6SN7GT	4.9Meg	±10.4KΩ	1KΩ	100KΩ	±100KΩ	1KΩ	0Ω	.1Ω	
V 16	6BQ6GT	INF	.1Ω	±0Ω	±470Ω	330KΩ	±100KΩ	0Ω	0Ω	TOP CAP ±18.5Ω
V 17	6AX4GT	±300KΩ	±52Ω	10 Meg	22KΩ	±0Ω	INF	.1Ω	0Ω	
V 18	1B3GT									TOP CAP ±200Ω
V 19	17LP4	.1Ω	3.3KΩ	PIN 6 ±0Ω	PIN 10 ±21Ω	PIN 11 ±300KΩ	PIN 12 0Ω			

♦ MEASURED FROM PIN 8 OF V12.  
 ■ MEASURED IN UHF POSITION.  
 † MEASURED FROM OUTPUT OF M1.  
 ▲ MEASURED FROM PIN 3 OF V17.



TUBE PLACEMENT CHART  
 SET 237 FOLDER 8

MOTOROLA MODELS 17K17, B, 17T15A, AE, 17T16, B, 21C2, B, 21F5, B, 21K12A, AB, WA, 21K13, B, 21K14, B, 21K15, 21K16, W, 21K17, 21T8A, AE, 21T11, B, W, Y17K17, B, Y17T15A, AE, Y17T16, B, Y21C2, B, Y21F5, B, Y21K12A, AB, WA, Y21K13, B, Y21K14, B, Y21K15, Y21K16, W, Y21K17, Y21T8A, AE, Y21T11, B, W

TROUBLE SHOOTING AIDS

CAUTION

Use an isolation transformer to remove shock hazzard and prevent damage to receiver and/or test equipment.

SWEEP

HORIZONTAL	VERTICAL								
<p><u>LOSS OF SWEEP</u></p> <p>Follow procedure outlined under "Loss of High Voltage".</p> <p><u>INSUFFICIENT SWEEP</u></p> <p>Check by substitution V15, V16 and V17. Check waveform W14.</p> <table> <tr> <td>If Satisfactory</td><td>If Unsatisfactory</td></tr> <tr> <td>Check T3, T5A, C102 and other associated circuit components.</td><td>Check C97, C101, R89, R93, and other associated components.</td></tr> </table> <p><u>DRIVE LINES</u></p> <p>Check by substitution V15, V16 and V17. Check C98, C99, C101, T3, T5A and other associated components for failure or change of value.</p> <p><u>COMPRESSED LEFT SIDE</u></p> <p>Check by substitution V15, V16 and V17. Check components associated with the horizontal output and damper stages especially T3 and T5A.</p> <p><u>FOLDS</u></p> <p>Follow procedure outlined under Drive Lines.</p> <p><u>PIE CRUST EFFECT</u></p> <p>Check by substitution V15, V16 and V17. Check T3, T5A and other associated components for high voltage arc over. Check C94 for open.</p> <p><u>XMAS TREE EFFECT</u></p> <p>Substitute V15. Check C95, C96, C97, L41 and other associated circuit components.</p>	If Satisfactory	If Unsatisfactory	Check T3, T5A, C102 and other associated circuit components.	Check C97, C101, R89, R93, and other associated components.	<p><u>LOSS OF SWEEP</u></p> <p>Substitute V14. Check waveform W7.</p> <table> <tr> <td>If Satisfactory</td><td>If Unsatisfactory</td></tr> <tr> <td>Check T4, T5B and other associated components.</td><td>Check C86, C87, R4, R77, T2 and other associated components.</td></tr> </table> <p><u>INSUFFICIENT SWEEP</u></p> <p>Check adjustment of height and vertical linearity controls. Proceed as outlined under "Loss of Sweep".</p> <p><u>COMPRESSED AT BOTTOM</u></p> <p>Substitute V14. Check T4, T5B, C2C and other associated circuit components.</p> <p><u>COMPRESSED AT TOP</u></p> <p>Substitute V14. Check C86, C87 and other associated components.</p> <p><u>FOLDS</u></p> <p>Substitute V14. Check associated components for failure or change of value.</p>	If Satisfactory	If Unsatisfactory	Check T4, T5B and other associated components.	Check C86, C87, R4, R77, T2 and other associated components.
If Satisfactory	If Unsatisfactory								
Check T3, T5A, C102 and other associated circuit components.	Check C97, C101, R89, R93, and other associated components.								
If Satisfactory	If Unsatisfactory								
Check T4, T5B and other associated components.	Check C86, C87, R4, R77, T2 and other associated components.								

SYNC

<p><u>LOSS OF VERTICAL AND HORIZONTAL SYNC</u></p> <p>Substitute V13. Check associated circuit components especially C79, C81, R68 and R69.</p> <p><u>LOSS OF VERTICAL SYNC-HORIZONTAL SYNC SATISFACTORY</u></p> <p>Check by substitution V13 amd V14. Check waveform W5.</p> <table> <tr> <td>If Satisfactory</td><td>If Unsatisfactory</td></tr> <tr> <td>Check components associated with V14A.</td><td>Check vertical integrator network and other associated components.</td></tr> </table>	If Satisfactory	If Unsatisfactory	Check components associated with V14A.	Check vertical integrator network and other associated components.	<p><u>LOSS OF HORIZONTAL SYNC-VERTICAL SYNC SATISFACTORY</u></p> <p>Check by substitution V11 and V15. Check associated components especially C95, C96, C97, L41 and R89.</p> <p><u>HORIZONTAL BENDING</u></p> <p>Check by substitution V11, V15 and V16. Check horizontal AFC filter network for component failure.</p>
If Satisfactory	If Unsatisfactory				
Check components associated with V14A.	Check vertical integrator network and other associated components.				

VIDEO

<p><u>LOSS OF VIDEO</u></p> <p>Substitute V7. Check C56, R51, R48, L35, L37, picture tube and other associated components.</p> <p><u>SOUND BARS (4.5MC BEAT)</u></p> <p>Adjust tuner fine tuning for best picture and sound. Check adjustment A36. Check video IF alignment.</p> <p><u>POOR CONTRAST</u></p> <p>Substitute V7. Check contrast control picture tube and other associated circuit components.</p>	<p><u>NEGATIVE PICTURE</u></p> <p>Substitute V7. Check video detector crystal and assembly. Check AGC network for component failure. Check picture tube and other associated components.</p> <p><u>SMEAR</u></p> <p>Substitute V7. Check video detector assembly. Check C53, C56, R48, R51, L31, L35, L37, picture tube and other associated components for failure or change of value.</p> <p><u>WIDE BLACK BAR ACROSS PICTURE</u></p> <p>Check V2, V3, V4, V5, V6, and V7 for heater to cathode leakage. In case of UHF check V1.</p>
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AUDIO

<p><u>WEAK OR NO SOUND</u></p> <p>Check by substitution V8, V9, V10, V11 and V12. Check stages V11A and V12 using audio signal generator. Apply audio signal across R2B.</p> <table> <tr> <td>If Satisfactory</td><td>If Unsatisfactory</td></tr> <tr> <td>Check ratio detector and audio IF alignment and components.</td><td>Check components associated with V11A and V12 especially T6 and SP1.</td></tr> </table>	If Satisfactory	If Unsatisfactory	Check ratio detector and audio IF alignment and components.	Check components associated with V11A and V12 especially T6 and SP1.	<p><u>BUZZ</u></p> <p>Adjust tuner fine tuning for best picture and sound. Adjust A35 for minimum buzz. If still unsatisfactory, substitute V10 and realign ratio detector and Audio IF stages. Check C5B for leakage.</p> <p><u>DISTORTED</u></p> <p>Follow procedure outlined under "Weak or No Sound".</p>
If Satisfactory	If Unsatisfactory				
Check ratio detector and audio IF alignment and components.	Check components associated with V11A and V12 especially T6 and SP1.				

TROUBLE SHOOTING AIDS (cont)

POWER

<p><u>DEAD SET</u></p> <p>If filaments fall to light, check fuse M3, A.C. interlock assembly, switch on volume control and T1. If filaments lght, check M1, M2, C1, C2A and other associated B+ filter components.</p>	<p><u>SMALL AND/OR DIM PICTURE</u></p> <p>Measure B+ at 270 volt point.</p> <table> <tr> <td>If Satisfactory</td><td>If Unsatisfactory</td></tr> <tr> <td>Follow procedure outlined under horizontal "Insufficient Sweep".</td><td>Check M1, M2 and other associated B+ filter and decoupling components.</td></tr> </table>	If Satisfactory	If Unsatisfactory	Follow procedure outlined under horizontal "Insufficient Sweep".	Check M1, M2 and other associated B+ filter and decoupling components.
If Satisfactory	If Unsatisfactory				
Follow procedure outlined under horizontal "Insufficient Sweep".	Check M1, M2 and other associated B+ filter and decoupling components.				

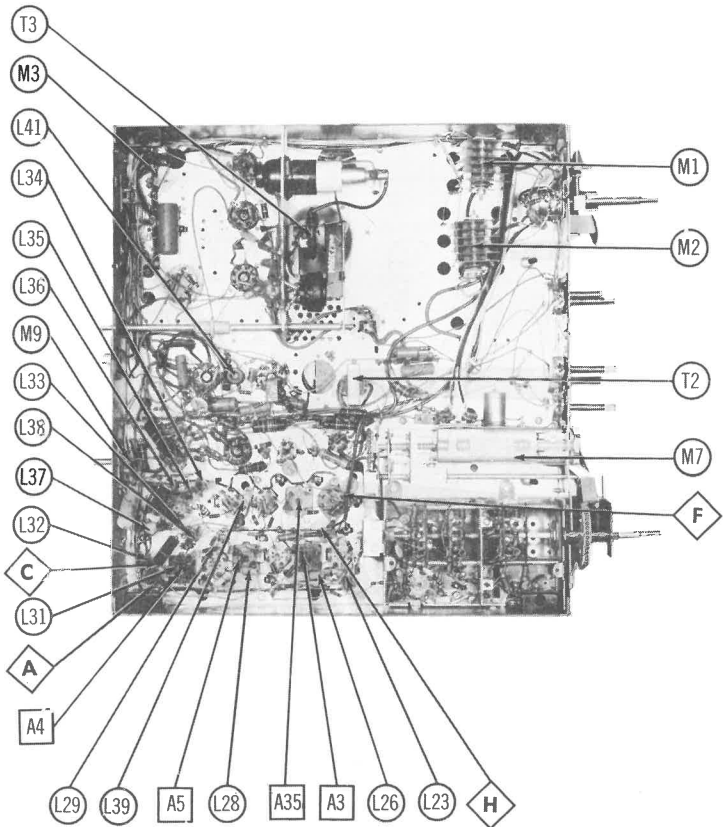
HIGH VOLTAGE

<p><u>LOSS OF HIGH VOLTAGE</u></p> <p>Check by substitution V15, V16, V17 and V18. Check waveform W14.</p> <table> <tr> <td>If Satisfactory</td><td>If Unsatisfactory</td></tr> <tr> <td>Check T3, T5A, R95 and other associated components.</td><td>Check C97, C98, C101, R89, R93 and other components.</td></tr> </table>	If Satisfactory	If Unsatisfactory	Check T3, T5A, R95 and other associated components.	Check C97, C98, C101, R89, R93 and other components.	<p><u>INSUFFICIENT HIGH VOLTAGE</u></p> <p>Check by substitution V15, V16, V17 and V18. Measure B+.</p> <table> <tr> <td>If Satisfactory</td><td>If Unsatisfactory</td></tr> <tr> <td>See "Loss of High Voltage".</td><td>See "Small and/or Dim Picture".</td></tr> </table> <p><u>BLOOMING</u></p> <p>Substitute V15, V16, V17 and V18. Check R95, T3, T5A, picture tube and other associated components.</p>	If Satisfactory	If Unsatisfactory	See "Loss of High Voltage".	See "Small and/or Dim Picture".
If Satisfactory	If Unsatisfactory								
Check T3, T5A, R95 and other associated components.	Check C97, C98, C101, R89, R93 and other components.								
If Satisfactory	If Unsatisfactory								
See "Loss of High Voltage".	See "Small and/or Dim Picture".								

GENERAL

<p><u>RASTER SOUND NO PICTURE</u></p> <p>Follow procedure outlined under "Loss of Video".</p> <p><u>RASTER PICTURE NO SOUND</u></p> <p>Follow procedure outlined under "Weak or No Sound".</p> <p><u>RASTER NO PICTURE NO SOUND</u></p> <p>Check by substitution V2, V3, V4, V5, and V6. Check associated components. Check audio detector crystal and assembly. In case of UHF check V1.</p>	<p><u>NO RASTER NO SOUND</u></p> <p>Follow procedure outlined under "Dead Set".</p> <p><u>INTERMITTENT STREAKS</u></p> <p>Check video signal for interference pulses. Check high voltage section for corona discharge and arcing.</p>
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Symptoms shown are assumed and are not indicative of the quality and workmanship of this equipment.



CHASSIS BOTTOM VIEW-TRANS., INDUCTOR & ALIGN. IDENTIFICATION

MOTOROLA MODELS 17K17, B, 17T15A, AE, 17T16, B, 21C2, B, 21F5, B, 21K12A, AB, WA, 21K13, B, 21K14, B, 21K15, 21K16, W, 21K17, 21T8A, AE, 21T11, B, W, 17K17, B, 17T15A, AE, 17T16, B, Y21C2, B, Y21F5, B, Y21K12A, AB, WA, Y21K13, B, Y21K14, B, Y21K15, Y21K16, W, Y21K17, Y21T8A, AE, Y21T11, B, W



PARTS LIST AND DESCRIPTIONS (Continued)  
FILTER CHOKE

ITEM No.	RATINGS		REPLACEMENT DATA					
	TOTAL DIRECT CURRENT	D. C. RESISTANCE	INDUCTANCE (0 CURRENT 1000 $\mu$ .)	MOTOROLA PART No.	Stancor PART No.	Merit PART No.	Triad PART No.	Halldorson PART No.
L42	.220A	85 $\Omega$		25B730204 ①				

① Used with PM speakers only.

SELENIUM RECTIFIER

ITEM No.	RATING	REPLACEMENT DATA					NOTES
	CURRENT	MOTOROLA PART No.	SELETRON PART No.	FEDERAL PART No.	MALLORY PART No.	SARKES TARZIAN PART No.	
M1	.220A	48B700555	6Q4	1090A	6S300	300	
M2	.220A	48B700555	6Q4	1090A	6S300	300	

FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA					
			MOTOROLA PART No.		LITTELFUSE PART No.		BUSS PART No.	
			FUSE	HOLDER	FUSE	HOLDER	FUSE	HOLDER
M3			1" piece of # 26 wire					

CRYSTAL DIODES

ITEM No.	ORIG. TYPE	REPLACEMENT DATA		NOTES
		MOTOROLA PART No.	SYLVANIA PART No.	
M4		48K731312 or 48K731313 or 48K731314	1N82 or A	UHF mixer (clip mounting)
M5	1N60	48C711052 or 48K711077 or 48K722720 or 48K712199	1N60	Video detector (plgtail)

MISCELLANEOUS

ITEM No.	PART NAME	MOTOROLA PART No.	NOTES
M6	Dial light	65X10867	# 47 bayonet
M7	Tuner	1U730825	UHF TT-37 (used in Y chassis only)
M8A	Tuner	1U731299	VHF TT53 (used in chassis TS402, TS502, VTS502, WTS502)
B	Tuner	1U731299	VHF TT53Y (used in chassis TS402Y, TS502Y, VTS502Y, WTS502Y)
C	Tuner	1U730939	VHF TT61 (used in chassis VTS402, TTS502)
D	Tuner	1U731301	VHF TT61Y (used in chassis VTS402Y, TTS502Y)
M9	Switch	40A730389	Area selector (AGC)
M10	Centering magnet	48A721145	
M11	Ion trap	24K711843	
M12A	Correction magnet	48B721914	
B	Correction magnet	48B720968 or 48B721915 or 48K720969	Right hand
	Cabinet	16F730723	Left hand
	Cabinet	16K730724	Console-red-brown mahog. models 17K17 & Y17K17
	Cabinet	16K730172	Table-red-brown mahog. plastic 17T15A & Y17T15A
	Cabinet	16E730378	Table-red-brown mahog. 17T16 & Y17T16
	Cabinet	16K730379	Table-limed oak 17T16B & Y17T16B
	Cabinet	16K730605	Table-red-brn mahog. with legs 21C2 & Y21C2
	Cabinet	16K730606	Table-limed oak with legs 21C2B & Y21C2B
	Cabinet	16K730930	Console-red-brown mahog. 21K12A & Y21K12A
	Cabinet	16K730931	Console-limed oak 21K12AB & Y21K12AB
	Cabinet	16F730382	Console-red-brown mahog. 21K13 & Y21K13
	Cabinet	16K730383	Console-limed oak 21K13B & Y21K13B
	Cabinet	16F730635	Console-red, brown mahog. 21K14 & Y21K14
	Cabinet	16K730636	Console-limed oak 21K14B & Y21K14B
	Cabinet	16F730796	Console- walnut 21K15 & Y21K15
	Cabinet	16F730792	Console-white birch-models 21K16 & Y21K16
	Cabinet	16F730829	Console-white birch-models 21K17 & Y21K17
	Cabinet	16K730200	Table-molded plastic models 21T8A & Y21T8A
	Knob	36K730174	Channel selector VHF models
	Knob	36B730171	VHF chan. selector UHF models (Y prefix)
	Knob	36B730158	(2) fine tuning and off-on volume
	Knob	36C730162	Contrast
	Knob	36C730167	Tone
	Knob	36B712294	Area selector
	Knob	36B730229	(3) horizontal, vertical and brightness
	Dial scale	34C730165	UHF indicator for "Y" models only
	Safety glass	61K730370	All 17K17 and 17K16 models
	Safety glass	61D720245	17T15 models
	Safety glass	61K730274	All 21C2, 21K12, 21K14, 21K15, 21K16 and 21K17 models
	Safety glass	61K730656	21T8 models

PARTS LIST AND DESCRIPTIONS  
TUBES (SYLVANIA, GENERAL ELECTRIC, WESTINGHOUSE)

ITEM No.	USE	REPLACEMENT DATA		RETMA BASE TYPE	NOTES
		MOTOROLA PART No.	STANDARD REPLACEMENT		
V1	UHF Oscillator	6AF4	6AF4	7DK	
V2A	RF Amplifier	6BQ7A	6BQ7A	9AJ	
B	RF Amplifier	6BZ7	6BZ7	9AJ	
V3	Converter	6U8	6U8	9AE	
V4	1st Video IF Amp.	6CB6	6CB6	7CM	
V5	2nd Video IF Amp.	6CB6	6CB6	7CM	
V6	3rd Video IF Amp.	6CB6	6CB6	7CM	
V7	Video Output	12BY7	12BY7	9BF	
V8	1st Sound IF	6AU6	6AU6	7BK	
V9	2nd Sound IF	6AU6	6AU6	7BK	
V10	Ratio Detector	6AL5	6AL5	6BT	
V11	AF Amplifier - Horiz. AFC	6SN7GT	6SN7GT	8BD	
V12	Audio Output	6W6GT	6W6GT	7S	
V13	Sync Separator	6SN7GT	6SN7GT	8BD	
V14	Vert. Oscillator - Vert. Output	12BH7	12BH7	9A	
V15	Horiz. Mult	6SN7GT	6SN7GT	8BD	
V16	Horiz. Output	6BQ6GT	6BQ6GT	6AM	
V17	Damper	6AX4GT	6AX4GT	4CG	
V18	HV Rectifier	1B3GT	1B3GT	3C	

CATHODE-RAY TUBE

ITEM No.	MOTOROLA PART No.	REPLACEMENT DATA			RETMA BASE TYPE	NOTES
		SYLVANIA PART No.	GENERAL ELECTRIC PART No.	WESTINGHOUSE PART No.		
V19A	17LP4	17LP4	17LP4	17LP4	12L	① Circuit changes necessary
B	21FP4A	17VP4	17VP4	17VP4	12L	
		21FP4A	21FP4A	21FP4A	12L	
		21FP4C			12M	
		21FP4 ①			12L	
C	21YP4	21YP4	21YP4	21YP4	12L	
		21YP4A			12L	
		21AFP4 ①			12M	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA							NOTES
	CAP.	VOLT	MOTOROLA PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	
C1	100	150	23B730108	AFHS1-69		KA003		FP116	TVL-1423	
C2A	100	150	23B730094			D-110		FP419.4	TVL-3450	
B	200	150						TC45		
C	60	150								
C3A	200	150	23B710941	AFHS2-109		B078		FP216.1	TVL-2444	
B	5	150								
C4	10	450	23A702450	PR8450/10		BR1045		TC72	TVA-1705	
C5A	10	300	23B730205	AFH3-22		C021		FP330.5	TVL-3776	
B	10	50								
C	10	50								
C6	470			SI470	D6-471	TP46	GP2K-471	UC-5347	5GA-T47	
C7	470			SI470	D6-471	TP46	GP2K-471	UC-5347	5GA-T47	
C8	100									
C9	27			SI27	D6-270	TP26	GPIK-270	UC-5427	5GA-Q27	
C10	100									
C11	100									
C12	10									
C13	470			BPD-00047	D6-471	K046	GP2K-471	UC-5347	5GA-T47	
C14	470			SI470	D6-471	TP46	GP2K-471	UC-5347	5GA-T47	
C15	150			SI150	D6-151	G046	GP2K-151	UC-5315	5GA-T15	
C16	47			SI47N750	TCN-47	N033	N750-801-471	NT-5447	5TCU-Q47	
C17	470			SI470	D6-471	TP46	GP2K-471	UC-5347	5GA-T47	
C18	6.8					N013	N750A-6R8	UC-5347	5GA-T47	
C19	1-6				829-6		3139-01-10			
C20	10			SI10N750	TCN-10	N018	N750A-100	NT-541	5TCU-Q1	
C21	470			SI470	D6-471	TP46	GP2K-471	UC-5347	5GA-T47	
C22	1500			BPD-0015	D6-152	K071	801-0015	DC-5215	5HK-D15	
C23	.5-3				829-3			CT565A		
C24	470									
C25	1500			BPD-0015	DD-152	K071	801-0015	DC-5215	5HK-D15	
C26	1000			BPD-001	DD-102	K069	801-001	DC-521	5HK-D1	
C27	10000			BPD-01	DD-103	K082	811-01	DC-511	5HK-S1	
C28	1500			BPD-0015	D6-152	K071	801-0015	DC-5215	5HK-D15	
C29	18			SI18	D6-180	TP12	GPIK-180	UC-5418	5GA-Q18	
C30	1500			BPD-0015	D6-152	K071	801-0015	DC-5215	5HK-D15	
C31	22						N150A-220			
C32	1									
C33	.5-3				829-3		3115-01-0R5	CT565A		
C34	12						N150A-120			
C35	10000			BPD-01	DD-103	K082	811-01	DC-511	5HK-S1	
C36A	800			BPD-008	DD-801	K069	801-001	DC-521	5GA-T8	
B	800			BPD-006	DD-801	K069	801-001	DC-521	5GA-T8	
C37	1500			BPD-0015	DD-152	K071	801-0015	DC-5215	5HK-D15	
C38	1500			BPD-0015	DD-152	K071	801-0015	DC-5215	5HK-D15	
C39	10000			BPD-01	DD-103	K082	811-01	DC-511	5HK-S1	
C40	100									
C41	470		21R114554	BPD-00047	D6-471	K060	GP2K-471	UC-5347	5GA-T47	
C42	470		21R114554	BPD-00047	D6-471	K060	GP2K-471	UC-5347	5GA-T47	
C43	560		21R120936	SI560	D6-561	TP48	GP2K-561	UC-5356	5GA-T56	
C44	470		21R114554	BPD-00047	D6-471	K060	GP2K-471	UC-5347	5GA-T47	
C45	470		21R114554	BPD-00047	D6-471	K060	GP2K-471	UC-5347	5GA-T47	
C46	.25	200	8R9856	P288-25		P12P25		PT4025	2TM-P25	
C47	560		21R120936	SI560	D6-561	TP48	GP2K-561	UC-5356	5GA-T56	
C48	470		21R114554	BPD-00047	D6-471	K060	GP2K-471	UC-5347	5GA-T47	
C49	1500		21R120100	BPD-0015	DD-152	K071	801-0015	DC-5215	5HK-D15	
C50	22		21R120539				N150A-220			
C51	1500		21R120100	BPD-0015	DD-152	K071	801-0015	DC-5215	5HK-D15	
C52	470		21R114554	BPD-00047	D6-471	K060	GP2K-471	UC-5347	5GA-T47	

MOTOROLA MODELS 17K17, B, 17T15A, AE, 17T16, B, 21C2, B, 21F5, B, 21F5, B, 21K12A, AB, WA, 21K13, B, 21K14, B, 21K15, 21K16, W, 21K17, 21T8A, AE, 21T11, B, W, Y17K17, B, Y17T15A, AE, Y17T16, B, Y21C2, B, Y21F5, B, Y21K12A, AB, WA, Y21K13, B, Y21K14, B, Y21K15, Y21K16, W, Y21K17, Y21T8A, AE, Y21T11, B, W

MOTOROLA MODELS 17K17, B, 17T15A, AE, 17T16, B, 21C2, B, 21F5, B, 21K12A, AB, WA, 21K13, B, 21K14, B, 21K15, 21K16, W, 21K17, B, 21T11, B, W, Y17K17, B, Y17T15A, AE, Y17T16, B, Y21F5, B, Y21K12A, AB, WA, Y21K13, B, Y21K14, B, Y21K15, Y21K16, W, Y21K17, Y21T8A, AE, Y21T11, B, W

PARTS LIST AND DESCRIPTIONS (Continued)  
RESISTORS

CAPACITORS (cont)										
ITEM No.	RATING		REPLACEMENT DATA							
	CAP.	VOLT	MOTOROLA PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C53	.1	200	8R490210	P288-1	DF-104	PJ2P1	801-005	PT401	2TM-P1	
C54	5000		21R115312	BPD-005	DD-502	K080	801-005	DC-525	5HK-D5	
C55	30		21R115312				N150A-30			
C56	.1	400	8K490236	P488-1	DF-104	CUB4P1	NP0A-2R2	PT401	4TM-P1	
C57	470		21R114554	BPD-00047	D6-471	K060	GP2K-471	UC-5347	5GA-T47	
C58	2.2		21R115949		TCZ-2.2	Z006	NP0A-2R2		5TCCB-V22	
C59	18		21R120578				N150A-180			
C60	5000		21R115312	BPD-005	DD-502	K080	801-005	DC-525	5HK-D5	
C61	5000		21R115312	BPD-005	DD-502	K080	801-005	DC-525	5HK-D5	
C62	1500		21R120100	BPD-0015	DD-152	K071	801-0015	DC-5215	5HK-D15	
C63	1-6		21K730630				3139-01-10			
C64	10000		21R492726	BPD-01	DD-103	K082	811-01	DC-511	5HK-S1	
C65	5000		21R115312	BPD-005	DD-502	K080	801-005	DC-525	5HK-D5	
C66	5000		21R115312	BPD-005	DD-502	K080	801-005	DC-525	5HK-D5	
C67	5000		21R115312	BPD-005	DD-502	K080	801-005	DC-525	5HK-D5	
C68	1500		21R120100	BPD-0015	DD-152	K071	801-0015	DC-5215	5HK-D15	
C69	1000		21R118749	SI1000	D6-102	TP52	GP2L-102	UC-521	5GA-D1	
C70	1000		21R118749	SI1000	D6-102	TP52	GP2L-102	UC-521	5GA-D1	
C71	5000		21R115312	BPD-005	DD-502	K080	801-005	DC-525	5HK-D5	
C72	5000		21R115312	BPD-005	DD-502	K080	801-005	DC-525	5HK-D5	
C73	.003	200	8K9820	P288-003	D6-302	CUB6D3	GP2-333-302	PT423	2TM-D3	
C74	.04	600	8K400028	P688-04		CUB6D4		PT614	6TM-S4	
C75	.005	600	8R9869	P688-005	D6-502	CUB6D5	GP2-333-502	PT625	6TM-D5	
C76	10000		21R492726	BPD-01	DD-103	K082	811-01	DC-511	5HK-S1	
C77	10000		21R492726	BPD-01	DD-103	K082	811-01	DC-511	5HK-S1	
C78	470		21R115856							
C79	.0047	400	8R490222	P488-0047	D6-472	CUB4D47	GP2-333-472	PT4247	4TM-D47	
C80	220		21R115905	SI220	D6-221	TP39	GP2K-221	UC-5322	5GA-T22	
C81	.047	400	8K490232	P488-047	DF-503	CUB4S47		PT4147	4TM-S47	
C82	.0047	400	8R490222	P488-0047	D6-472	CUB4D47	GP2-333-472	PT4247	4TM-D47	
C83	.0047	400	8R490222	P488-0047	D6-472	CUB4D47	GP2-333-472	PT4247	4TM-D47	
C84	.01	400	8R490226	P488-01	D6-103	CUB4S1	GP2-333-103	PT411	4TM-S1	
C85	.005	600	8R9869	P688-005	D6-502	CUB6D5	GP2-333-502	PT625	6TM-D5	
C86	.047	400	8K490232	P488-047	DF-503	CUB4S47		PT4147	4TM-S47	
C87	.047	400	8K490232	P488-047	DF-503	CUB4S47		PT4147	4TM-S47	
C88	470		21R115856	SI470	D6-471	TP46	GP2K-471	UC-5347	5GA-T47	
C89	470		21R115856	SI470	D6-471	TP46	GP2K-471	UC-5347	5GA-T47	
C90	1000		21R118749	SI1000	D6-102	TP52	GP2L-102	UC-521	5GA-D1	
C91	.0033	600	8K490268	P1088-001	D6-302	CUB6D3	GP2-333-302	PT6233	6TM-D33	
C92	.001	1000	8R9868	P688-003	D6-302	CUB6D3	GP2-333-302	PT6233	6TM-D33	
C93	.003	600	8R9868	P688-003	D6-302	CUB6D3	GP2-333-302	PT6233	6TM-D33	
C94	.01	600	8R9868	P688-01	DD-103	CUB6S1	GP2-333-103	PT611	6TM-S1	
C95	100		21R115900	SI100	D6-101	TP33	GP2K-101	UC-531	5GA-T1	
C96	.0047	400	8R490222	P488-0047	D6-472	CUB4D47	GP2-333-472	PT4247	4TM-D47	
C97	390	500	21K114740	1469-0004		5W5T39	MS-34	MS-34		
C98	680	500	21R114781			1W5T68				
C99	.039	400	8K490231							
C100	470		21R115312	SI470	D6-471	TP46	GP2K-471	UC-5347	5GA-T47	
C101	5000		8K1200875	BPD-005	DD-502	K080	801-005	DC-525	5HK-D5	
C102	.1	200	8K1200875	P288-1	DF-104	CUB2P1		PT401	2TM-P1	
C103	180	3000	21R120092	HVD30-180					30GA-T18	
C104	47	3000	HVD30-47						30GA-Q47	

Note 1. Some Models use a .0047 in this application.  
Note 2. Some Models use a 1000MMF in this application.

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESIST-ANCE	WATTS	MOTOROLA PART No.	IRC PART No.	CLAROSTAT PART No.	CENTRALAB PART No.	MALLORY PART No.	
R1A	1 Meg	1/2	18A711999	Q11-137	AG-61-S	AB-697	U-54	Tone
R2A	Shaft	1/2	Not Req.	Not Req.	KSS-3	AK-4	Not Req.	Attach to R1A
	1500Ω		18K730150	* QJ-511		UF152R	Contrast -Panel	
B	1 Meg		Not Req.				Volume tapped at 300K -Rear	
R3	Switch	1/2	Not Req.	Q17-141			UR16-T35	Attach to R2B
	5 Meg		18K730144	Q11-141	AG-85-S	B-87	U-87	Brightness
R4A	5 Meg		18K730221					Vert. size-Note 1
	with 1 Meg							
	Stop							
B	Shaft		Not Req.	Not Req.	KSS-3	Not Req.	Not Req.	Attach to R4A
R5A	50KΩ	1/2	18K730148	Q11-228	AG-44-S	B-31	U-35	Horiz. Hold - Note 2
	with 40K							
B	Stop							
B	Shaft		Not Req.	Not Req.	KSS-3	Not Req.	Not Req.	Attach to R5A
R6A	750Ω	1/2	18K730219	Q11-105	AG-9-S		U-4	Vert. Linearity
B	Shaft		Not Req.	Not Req.	KSS-3		Not Req.	Attach to R6A
R7A	650KΩ	1/2	18K730146	Q11-133	AG-61-S	BTSK-72	U-54	Vert. Hold- Note 3
	with 300K Ω							
B	S top							
B	Shaft		Not Req.	Not Req.	KSS-3	Not Req.	Not Req.	Attach to R7A

Note 1. Connect a 1 MegΩ resistor in series with right hand terminal of the control and the lead connecting to the same terminal of the original control. (Control viewed from shaft end, terminals down.)  
Note 2. Connect a 40KΩ resistor in series with right hand terminal of the control and the lead connecting to the same terminal of the original control. (Control viewed from shaft end, terminals down.)  
Note 3. Connect a 300KΩ resistor in series with left hand terminal of the control and the lead connecting to the same terminal of the original control. (Control viewed from shaft end, terminals down.)  
† Universal replacement (Mallory exact duplicate Part No. UE1968).  
\* CONCENTRIKIT EQUIVALENT KIT K-4 BASE ELEMENTS & SHAFTS B17-109 & P10-225 (Panel) B13-137X & R13-316 (Rear) & SWITCH 76-1.

ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	MOTOROLA PART No.	IRC PART No.	
R8	1 Meg			BTS-1 Meg	
R9	1 Meg			BTS-1 Meg	
R10	56Ω			BTS-56	
R11	220Ω			BTS-220	
R12	56KΩ			BTS-56K	
R13	18KΩ			BTS-18K	
R14	2700Ω			BTS-2700	
R15	1 Meg		6R6004	BTS-1 Meg	
R16	22KΩ		6R6397	BTS-22K	
R17	470KΩ		6R6032	BTS-470K	
R18	390KΩ		6R5646	BTS-390K	
R19	470KΩ		6R6377	BTS-470K	
R20	3300Ω		6R6036	BTS-3300	
R21	560Ω		6R6291	BTS-560	
R22	1000Ω		6R6301	BTS-1000	
R23	4700Ω		6R6039	BTS-4700	
R24	100KΩ		6R6075	BTS-100K	
R25	330KΩ		6R6014	BTS-330K	
R26	4700Ω		6R6039	BTS-4700	
R27	15KΩ		6R2119	BTS-15K	
R28	1000Ω		6R6301	BTS-1000	
R29	1000Ω		6R6301	BTS-1000	
R30	10KΩ		6R6054	BTS-10K	
R31	6800Ω		6R6428	BTS-6800	
R32	47Ω		6R5550	BTS-47	
R33	1000Ω		6R6301	BTS-1000	
R34	1000Ω		6R6301	BTS-1000	
R35	1000Ω		6R6301	BTS-1000	
R36	33KΩ		6R6410	BTS-33K	
R37	47Ω		6R5550	BTS-47	
R38	1000Ω		6R6301	BTS-1000	
R39	18KΩ		6R5734	BTA-18K	
R40	47KΩ		6R5550	BTS-47K	
R41	120Ω		6R5551	BTS-120	
R42	1000Ω		6R6301	BTS-1000	
R43	1000Ω		6R6301	BTS-1000	
R44	1.6Meg 5%				Note 5
R45	4700Ω		6R6080	BTS-4700	
R46	1 Meg		6R6004	BTS-1 Meg	
R47	22KΩ		6R2098	BTS-22K	
R48	3900Ω		17R120400		
R49	22KΩ			BTS-22K	Note 1
R50	15KΩ			BTS-15K	Note 2
R51	100KΩ		6R6075	BTS-100K	
R52	3300Ω		6R5581	BTS-3300	
R53	1800Ω		6R2089	BTS-1800	

Note 1. Some models may use a 10KΩ resistor in this application.  
Note 2. Not used in all models.  
Note 3. Some models may use a 1200Ω resistor in this application.  
Note 4. Used in 502 series only.  
Note 5. Some models may use a 1.5 Meg resistor in this application.

TRANSFORMER (FILAMENT)

ITEM No.	RATING			REPLACEMENT DATA						
	PRI.	SEC. 1	SEC. 2	MOTOROLA PART No.	Stancor PART No.	Merit PART No.	Triad PART No.	RCA TYPE No.	Halldorsen PART No.	Thordarson PART No.
T1	117VAC @ 7.2A	6.3VAC @ 10.3A		25B730139	P-6308①②	A-2948①②	F-21A①②		F5516①②	T-21F12①②

① Drill new mounting holes.  
② Tape 6.3V center tap.  
③ Replacements made for TS-402 chassis.

TRANSFORMERS (SWEEP CIRCUITS)

ITEM No.	USE	REPLACEMENT DATA						
		MOTOROLA PART No.	Stancor PART No.	Merit PART No.	Triad PART No.	RCA TYPE No.	Halldorsen PART No.	
T2	Vert. Osc. Trans.	25B730179	A-8125①	A-3003①	A-97X①		B6702①	
T3	Horiz. Output Trans.	24K730904						
		24C730902 ②						
T4	Vert. Output Trans.	25K731058	A-8140④	A-3081⑤	A-103X⑤		Z1805④⑤	
		25B730138 ③	⑤	⑦	⑤			
T5A	Yoke - Horiz. (23MH)	24C730633 ⑤	DY-10A⑩	MDF-74⑦	Y-20⑩⑪⑫	214D⑩	DF603⑩	
		24C730634 ⑥	⑪⑫	⑪⑫⑬	⑬	⑪⑫	⑪⑫	
B	Yoke - Vert. (3.1MH)	24C730632 ⑨						

① Connect blue lead to cathode, red lead to ground, green lead to integrator network, yellow lead to grid.  
② Alternate horiz. output trans. used in chassis #TS-502.  
③ Alternate vert. output trans.  
④ Drill new mounting holes.  
⑤ Connect as auto transformer.  
⑥ Drill one new mounting hole.  
⑦ Use 50 to 1 turns ratio.  
⑧ Does not include rear cover or positioning device.  
⑨ Alternate yoke.  
⑩ Use original vert. deflection coil resistor.  
⑪ Connect terminal #1 to either terminal #5 or #8.  
⑫ Use original cover and positioning device.  
⑬ Use original deflection coil network.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA						NOTES
	PRI.	SEC.	MOTOROLA PART No.	Stancor PART No.	Merit PART No.	Triad PART No.	Halldorsen PART No.	Thordarson PART No.	
T6	2.4KΩ	3.2Ω	25K730140	A-3876	A-2928	S-IX	Z1005	TS-24S50A	

SPEAKER

ITEM No.	RATINGS			REPLACEMENT DATA			NOTES
	SIZE	FIELD	V. C. IMP.	MOTOROLA PART No.	JENSEN PART No.	QUAM PART No.	
SPIA	6"	83.5Ω	3.2Ω	50K722077 50C703061 ① 50K722079 ① 50C710802 ① 50C730061 ① 50C711976 ① 50C489002 ① 50C711061 ① 50C731262 ① 50C701615 ① 50K730364 ②	ST-108 Mod. P6-X	6E85S	① Alternate 6" EM speakers
B	6"	PM	3.2Ω	50K70338 ③ 50K703084 ④ 50C721467 ⑤ 50C722535 ⑥		6A1	② 6" PM speaker used on all table models. Filter choke mounted on speaker
C	8"	85Ω	3.2Ω			8E85S	③ 8" EM speaker used on 17K17 & 21K12A series
D	6 X 9"	85Ω	3.2Ω			69E85S	④ Alternate 8" EM speaker
E	10"	85Ω	3.2Ω	50K721296 ⑦ 50K721431 ⑧ 50K721432 ⑧ 50K721295 ⑧		10E85S	⑤ 6 x 9" EM speaker used on 21K16 series ⑥ Alternate 6 x 9" EM speaker ⑦ 10" EM speaker used on 21K13, 21K14, & 21K15 series ⑧ Alternate 10" EM speakers