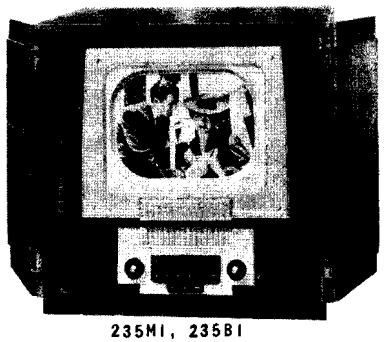
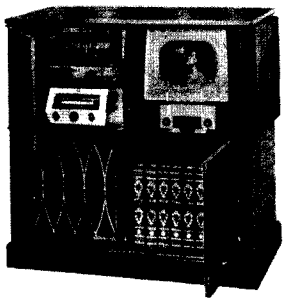


235M1, 235B1



325M8

235M1, Mahogany; 235B1, Blonde; and 325M8

SPECIFICATIONS

Power Requirements: 105-120 Volts, 60 cycles AC

Power Consumption: Television Chassis only: 180 watts

Tuning Frequency Range

Chan. No.	Chan. Freq.	Picture Carrier	Sound Carrier	RF Osc. Freq.	Chan. No.	Chan. Freq.	Picture Carrier	Sound Carrier	RF Osc. Freq.
2	54-60	55.25	59.75	91.375	8	180-186	181.25	185.75	217.375
3	60-66	61.25	65.75	97.375	9	186-192	187.25	191.75	223.375
4	66-72	67.25	71.75	103.375	10	192-198	193.25	197.75	229.375
5	76-82	77.25	81.75	109.375	11	198-204	199.25	203.75	235.375
6	82-88	83.25	87.75	115.375	12	204-210	205.25	209.75	241.375
7	174-180	175.25	179.75	211.375	13	210-216	211.25	215.75	247.375

IF Frequencies: Television picture carrier 36.125MC
Television sound carrier 31.625MC

TUBE COMPLEMENT

Tube	Type	Function	Tube	Type	Function
V1	6J6	RF Amplifier	V14	6SN7GT	Sync sep. & amplifier
V2	6J6	Oscillator	V15	6SN7GT	Sync clipper & AGC ampl.
V3	6J6	Mixer	V16	6SN7GT	Vert. sweep osc., discharge and output
V4	6AG5	Sound IF			
V5	6AU6	Sound Limiter	V17	6SN7GT	Sync phase and Horiz. osc. discharge
V6	6T8	Disc. 1st audio & AGC Delay	*V18	7A5	Horiz. output
V7	6Y6G	Audio output	*V19	7A5 or 6BG6G	Horiz. output
V8	6AG5	1st pic. IF amplifier			
V9	6AG5	2nd pic. IF amplifier	V20	1B3GT/8016	HV Rectifier
V10	6AG5	3rd pic. IF amplifier	V21	6W4GT	Regenerative damper
V11	6AG5	4th pic. IF amplifier	V22	6W4GT	LV Rectifier
V12	6AC7	Video amplifier	V23	6W4GT	LV Rectifier
V13	10BP4	Picture CRT	* See Code Changes		

Fine Tuning
Plus and minus 350 KC on channel 2
Plus and minus 1.5 MC on channel 13

Pushbuttons
12 mechanical type for any TV station on either the low or high frequency band

Loudspeaker
Table models 4 x 6 inch electro-dynamic

Audio Power Output
Table models 3 watts

Band Width
Video Amplifier 3.5 MC
Picture IF Amplifier 3.25 MC
Ant. input to picture tube 3.25 MC
Sound Disc., peak to peak 400 KC

Deflection
Horiz. & Vert. Magnetic

Focus Magnetic

Scanning Interlaced, 525 lines

Horiz. Freq. 15750 CPS
Vert. Freq. 60 CPS
Frame Freq. 30 CPS

Dimensions: Table Models; Width 18-1/8"; Height 17-3/4"; Depth 20-7/8"

Weight: Table model with picture tube installed 87 lbs. less packing

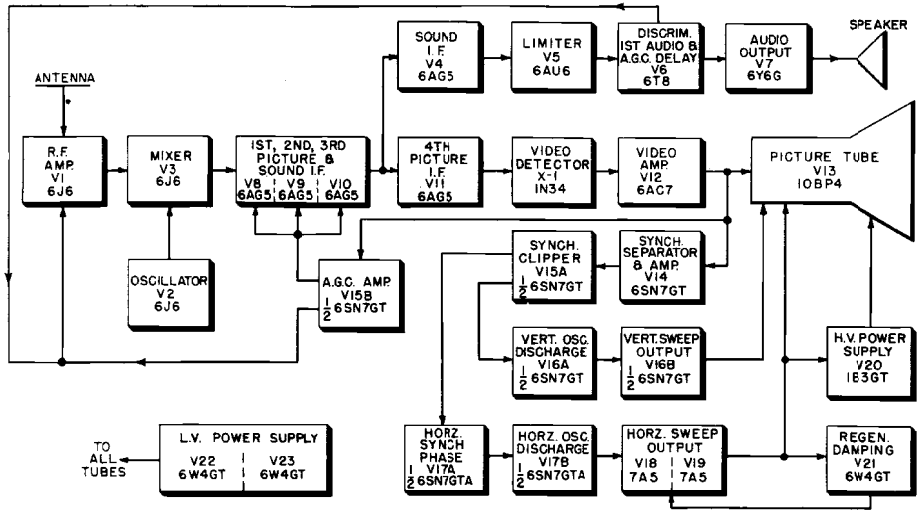


FIG. 1 - BLOCK DIAGRAM

Chassis coded A, B, C, D and E use 7A5's for V18 and V19; all other coded chassis use a 6BG6G for V19, and V18 is deleted.

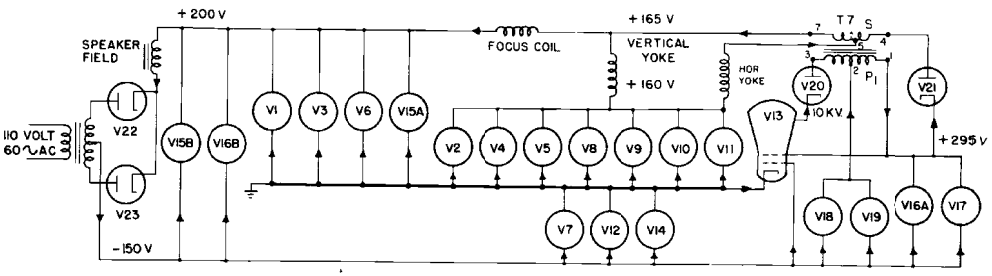


FIG. 2 - VOLTAGE BLOCK DIAGRAM

Chassis coded A, B, C, D and E use 7A5's for V18 and V19; all other coded chassis use a 6BG6G for V19. and V18 is deleted.

MODELS 235B1, 235M1, 325M8; Codes A, B, C, D, E, F, G, H, I, J, K, L, M, MA, MB, MC, MD

CHASSIS CODES

Both RF and main chassis are coded by a large block letter within a square stamped in ink on each chassis. The IF-RF chassis code is usually found near V12, and on the main chassis the code letter is stamped on the rear apron. The component revisions effected by various changes are listed in the second left hand column. Under the right hand columns headed A, B, C, D, E, F, G, H, J, K, L, and M, are listed the revisions as applied to each chassis code.

Chassis	Description (Chassis Differences)	Main Chassis & IF-RF Chassis Codes											
		A	B	C	D	E	F	G	H	J	K	L	M
IF-RF	Value in ohm (±10% ½W) of Resistors R42, 45, and 50	27	68	68	68	68	68	68	68	68	68	68	68
IF-RF	Contains either Resistor R41 or RF choke L53	R41	L53	L53	L53	L53	L53	L53	L53	L53	L53	L53	L53
IF-RF	Alignment Frequency in Megacycles of Coil L14	35.9	33.1	33.1	32.9	32.9	32.9	32.9	32.9	32.9	32.9	32.9	32.9
IF-RF	Alignment Frequency in Megacycles of Coil L20	33.1	35.9	35.9	35.7	35.7	35.7	35.7	35.7	35.7	35.7	35.7	35.7
IF-RF	Chassis includes C141, C142, L50, & L51 connected at Antenna input	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Main	Value of Capacitor C35: a. Paper .25 mfd b. Electrolytic 10 mfd	a	a	a	b	b	b	b	b	b	b	b	b
Main	Chassis includes R138, 3.3 meg	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No
Main	Value of Resistor R124	1.8K	1.8K	1.8K	8.2K	8.2K	8.2K	8.2K	8.2K	8.2K	8.2K	8.2K	8.2K
Main	Junction of C131 and R131 connected to: a. Chassis ground b. 150V minus bus	b	b	b	a	a	a	a	a	a	a	a	a
Main	Resistor R76 connected to: a. Pin #2 of V15A Tube b. Junction of R65 and R74	b	b	b	a	a	a	b	a	b	b	b	b
IF-RF	Alignment Frequency in Megacycles of Coil L24	33.1	33.1	33.1	32.9	32.9	32.9	32.9	32.9	32.9	32.9	32.9	32.9
IF-RF	Alignment Frequency in Megacycles of Coil L23	35.9	35.9	35.9	35.7	35.7	35.7	35.7	35.7	35.7	35.7	35.7	35.7
Main	Chassis includes Resistor R139, 33K ±10% ½W, between pins #5 and #6 of Tube V14	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Main	Chassis includes a Resistor, 27 ohms ½W, connected to junction of terminals #1 and #2 of Horizontal Centering Pot, and terminal #1 of Vertical Centering Pot.	No	No	No	No	Yes	Yes	No	No	Yes	No	No	No
Main	Chassis includes a .25 ampere fuse connected between L46 and junction of R60 and C113, and pin #3 of Tube V21	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Main	Value of Resistor R109 is either 27K 2W, or 3.3K 1W	27K	27K	27K	27K	27K	3.3K	3.3K	3.3K	3.3K	3.3K	3.3K	3.3K
Main	Chassis includes Resistor R140, Wirewound 7.5K 5W, connected between ground connection and B- terminal of C46B	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Main	Chassis includes Resistor R141, Wirewound 7.5K 10W, connected between ground connection at C46B and B+ (160V) connection at C96A	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Main	Chassis includes Resistors R142 and R143 (each 27K 2W) connected in series between terminals #5 and #7 of Horizontal Output Transformer	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Main	Value of Capacitor C112 in mfd	.035	.035	.035	.035	.035	.05	.05	.05	.05	.05	.05	.05
Main	Value of Resistor R104 (±10% ½W)	120K	120K	120K	120K	120K	150K	150K	150k	150k	150K	150K	150K
Main	Chassis includes either Resistor R144, 1000 ohms ½W, or Coil L25	L25	L25	L25	L25	L25	R144	R144	R144	R144	R144	R144	R144
Main	Value in ohms of Horizontal Centering Potentiometer R87.	100	100	100	100	100	100	200	200	100	200	200	200
Main	Value in ohms of Vertical Centering Potentiometer R86	20	20	20	20	20	20	100	100	20	100	100	100
Main	Chassis includes Resistor R105, 47 ohms ½W	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No
Main	Value in mmf of Capacitor C88	220	220	220	220	220	220	680	220	680	680	680	680
Main	Resistor R125 (5.6 meg ½W) is connected to pin #6 of tube V14 and junction of R127 and R126 instead of Resistor R125 (10 meg ½W) connected in parallel with capacitor C88	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	No	No	No
Main	Chassis includes Resistors R126 and R127 connected in series between pin #6 of tube V14 and ground	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	No	No	No
Main	Value of Resistor R135 is either 3.3K 1W, or 1.5K 2W	3.3K	3.3K	3.3K	3.3K	3.3K	1.5K	1.5K	1.5K	1.5K	1.5K	1.5K	1.5K
Main	Transformer T7 is: a. Bendix Stock No. TS0H01 used with 6BG6G tube b. Bendix Stock No. TS0H00 used with two 7A5 tubes	b	b	b	b	b	a	a	a	a	a	a	a
Main	Wattage of Resistor R111, 68 ohms in watts	1	1	1	1	1	2	2	2	2	2	2	2
IF-RF	Chassis includes Capacitor C7, 100 mmf	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No	No
IF-RF	Value of Resistor R9 in ohms	220	220	220	220	220	220	220	4700	220	4700	4700	4700
IF-RF	Chassis includes Resistor R34, 4.7K ±10% 1W	No	No	No	No	No	No	No	Yes	No	Yes	Yes	Yes
IF-RF	Chassis includes Resistor R4, 180 ohms ±10% ½W	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	No	No
IF-RF	Wattage of Resistor R5, 680 ohms in watts	½	½	½	½	½	½	½	1	½	1	1	1
Main	Chassis includes Resistor R61, 33K ±10% 1W	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Main	Value of Resistor R62, ±10% ½W	82K	82K	82K	82K	82K	82K	82K	82K	82K	82K	120K	120K
Main	Chassis includes Resistor, 8.2K ±10% 1W connected in series with coil L45	No	No	No	No	No	No	No	No	No	No	Yes	No
Main	Chassis includes a 6BG6G (V19) tube in lieu of two 7A5 (V18 and V19) tubes	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes

MA, MB, MC, AND MD CHASSIS CODES

The following chart provides the chassis differences between the four chassis codes MA, MB, MC, and MD. Refer to the Schematic Diagram, Fig. 6, which is based on the code MD chassis. Both RF and main chassis are coded by a large block letter within a square stamped in ink on each chassis. The IF-RF chassis code is usually found near V12, and on the main chassis the code letter is stamped on the rear apron. The component revisions effected by the various changes are listed in the second left hand column. Under the right hand columns headed MA, MB, MC, and MD are listed the revisions as applied to each chassis code. Refer to Preliminary Service Manual for chassis codes A, B, C, D, E, F, G, H, J, K, L, and M.

Chassis	Description (Chassis Differences)	Main Chassis & IF-RF Chassis Codes			
		MA	MB	MC	MD
Main	Chassis includes Resistor R74, 1.8K 1W, connected in plate circuit of V15A.	Yes	No	No	No
Main	Value of Resistor R65, ±10% 1W, in plate circuit of V15A.	1.8K	3.3K	3.3K	3.3K
Main	Chassis includes Capacitor C135, .02 mfd 400V, connected in plate circuit of V15A.	No	Yes	Yes	Yes
Main	Chassis includes Resistor R95, 22K ±10% 1/2W, connected in plate circuit of V15A.	No	Yes	Yes	Yes
IF-RF	Chassis includes Coil L21 connected to pins #5 and #6 of V9.	Yes	Yes	No	No
IF-RF	Chassis includes Coil L26 connected to pins #5 and #6 of tube	V10	V10	V9	V9
IF-RF	Chassis includes Coil L19 connected to pins #5 and #6 of tube	V4	V4	V10,	V10
IF-RF	Chassis includes Resistor R66, 100 ohms 1/2W, connected to terminal 2 of Transformer T3 and pin #1 of V4.	Yes	Yes	No	No
IF-RF	Chassis includes transformer T3 connected to plate circuit of tube a. Grid circuit of V11. b. Plate circuit of V4.	a	a	b	b
IF-RF	Chassis includes Capacitor C50 a. 10 mmf 500V, connected to pin #5 of V4. b. 27 mmf ±10% 500V, connected to terminal 1 of T3 and ground.	a	a	b	b
IF-RF	Chassis includes Resistor R22, 56K ±10% 1/2W a. Connected to pin #1 of V5 and ground. b. Connected to terminal 1 of T3 and ground.	a	a	b	b
IF-RF	Chassis includes Capacitor C133, 2.7 mmf connected between pins #5 and #6 of V4.	No	No	Yes	Yes
IF-RF	Chassis includes Coil L22 connected in grid circuit of tube	V10	V10	V11	V11
IF-RF	Chassis includes sound take-off Transformer T9 in grid circuit of V10.	No	No	Yes	Yes
IF-RF	Chassis includes Resistor R38, 1000 ohms 1/2W, connected to pin #6 of V11.	Yes	Yes	No	No
IF-RF	Value of Resistor R46 connected in IF circuit (ohms 1/2W).	1000	1000	220	220
IF-RF	Chassis includes Resistor R35, 220 ohms 1/2W, connected to: a. Junction of C120 and R37. b. Between pin #6 of V10 and pin #6 of V11.	a	a	b	b
IF-RF	Chassis includes Capacitors C63, 2700 mmf, and C61, 680 mmf, connected to pin #6 of V11 and ground.	Yes	Yes	No	No
IF-RF	Chassis includes Capacitor C120, .001 mmf, connected to: a. Junction of R35 and R37 to ground. b. Pin #6 of V11 to ground.	a	a	b	b
IF-RF	Chassis includes Resistor R33, 220 ohms 1/2W, connected to: a. Pin #6 of V9. b. Pin #6 of V11 and junction of R39 and B+.	a	a	b	b
IF-RF	Chassis includes Resistor R37, 220 ohms 1/2W, connected to: a. Pin #6 of V10 and junction of C120 and R35. b. Pin #6 of V9 and pin #6 of V10.	a	a	b	b
IF-RF	Chassis includes Resistor R32, 220 ohms 1/2W, connected: a. To pin #6 of V8 and R33. b. To pin #6 of V8 and pin #6 of V9.	a	a	b	b
IF-RF	Value of Resistor R43 connected in IF bias circuit (ohms 1/2W).	220	220	10K	10K

Chassis	Description (Chassis Differences)	Main Chassis & IF-RF Chassis Codes			
		MA	MB	MC	MD
IF-RF	Value of Resistor R48 connected in grid circuit of V11 (ohms 1/2W).	39K	39K	12K	12K
IF-RF	Chassis includes Resistor R67, 8.2K ±10% 1/2W, connected to pins #5 and #6 of V11.	No	No	Yes	Yes
IF-RF	Value of Resistor R51 connected to pin #1 of V11 (ohms 1/2W).	12K	12K	39K	39K
IF-RF	Alignment frequency of Coils L20 and L24 (megacycles).	35.7	35.7	35.9	35.9
IF-RF	Value of Resistor R44 connected to pin #1 of V9 (ohms ±5% 1/2W).	8.2K	8.2K	5.1K	5.1K
IF-RF	Chassis includes IF test point and accompanying Resistor R129, 100K 1/2W, connected to plate circuit of V3.	No	No	Yes	Yes
IF-RF	Value of Resistor R56 connected to pin #4 of V12 (ohms 1/2W).	220K	220K	47K	47K
Main	Chassis includes socket and tube V18 (6AL5) with the accompanying components: Resistor R68, 2.2 meg ±10% 1/2W, and Capacitor C134, .05 mfd 600V.	No	No	Yes	Yes
Main	Value of Capacitor C88 connected to terminal "N".	680 mmf	680 mmf	.05 mfd	.05 mfd
Main	Chassis includes Capacitor C134, .05 mfd 600V, connected between terminal 7 of Transformer T7 and pin #7 of tube V18 (6AL5).	No	No	Yes	Yes
Main	Value of Resistor R120 (ohms 1/2W)	12K	12K	22K	22K
IF-RF	Chassis includes Resistor R16, 100 ohms 1/2W, connected to terminal "R".	Yes	Yes	Yes	No
IF-RF	Chassis includes Resistor R10: a. 33K 1/2W, connected to pin #5 of V2. b. 220K 1/2W, connected to ground and junction of R12 and R13.	a	a	a	b
IF-RF	Chassis includes Resistor R3, 6.2K ±5% 1/2W, connected: a. In parallel with Coil L2 and C9. b. To Switches S1 and S2 moveable arm terminals.	a	a	a	b
IF-RF	Chassis includes Resistor R4, 47 ohms 1/2W, connected between pin #7 of V1 and ground.	No	No	No	Yes

RF & IF ALIGNMENT CHECK

1. Disable AGC circuit by placing a jumper from AGC amplifier grid (pin 4 of V15B) to junction of R28P (contrast control) and R122.

2. Set contrast control to produce -3.5 volts IF bias measured from terminal 'Q' to chassis and maintain this voltage between -3.5 to -4.0 volts after signal is applied.

3. Connect sweep generator to antenna input and vertical oscilloscope input to terminals 'G' and 'E'. CAUTION: This places the oscilloscope chassis at -150 volts.

4. Push channel #5 button and set sweep generator to cover channel 5 frequencies (76 to 82 MC).

5. Set up a CW marker at 81.75 MC and connect to antenna input. (The sweeping generator and CW generator must be isolated from each other by 50 to 200 ohms.) The CW signal may be loosely connected to the RF tube instead of the antenna by connecting the 'hot' side of the CW generator to a miniature tube shield which is then placed over the RF tube, V1, but not pressed down far enough to contact the chassis. The ground lead from the CW generator is, of course, connected to the receiver chassis.

6. Adjust channel button set screw until the 81.75 MC marker coincides with the dip in the sound trap.

7. Set marker at 77.25 MC. It should fall between .4 and .6 of the peak amplitude on the response curve.

8. Set marker at 80.55 MC. It should fall between .4 and .7 of the peak amplitude on the response curve.

9. Check through channels 3, 5, 8, and 12 for a flat top response of the overall curve.

10. Check discriminator band width by connecting VTVM from terminal 'B' to chassis and a 31.625 MC CW signal to antenna input. Voltage peaks (one positive and one negative) should occur as the CW signal is manually varied above and below the 31.625 MC center. These peaks should occur a minimum of 150 KC plus and minus of the center frequency. It is very important that the crossover point of the discriminator occurs at exactly the same frequency to which the sound trap L28 is dipped. (This frequency is 31.625 MC.)

11. Check discriminator linearity by applying a sweep frequency approximately 200 KC wide (31.625 MC center) to antenna input and connecting oscilloscope from terminal 'B' to chassis. If a sweep greater than 200 KC in width is used it is necessary to disconnect C41 to prevent overloading of the discriminator circuit, but this is not recommended.

ALIGNMENT PROCEDURE

Preliminary

In order to better understand the following detailed alignment procedure it is necessary to explain why this procedure has been prepared in the way it has. Any receiver alignment problem may be classified either as minor or major. In other words, it is either only slightly out of adjustment and therefore requires minor adjustments of one or more of the coils; or, some of the coil cores have been removed, or are badly out of adjustment, which will necessitate a thorough check through the entire circuit. The following procedure is given for a set that is badly out of alignment and which must be aligned without the aid of a screen room with only a CW signal generator and a vacuum tube voltmeter as an indicating instrument. In the absence of a screen room, external noise and signals may be very troublesome during alignment. Therefore a stage-by-stage procedure is recommended, in which the signal is injected just preceeding the stage under alignment. If it is known that the set is not badly out of alignment, it may be possible and practical to abbreviate the following procedure considerably by applying the input signal directly to the antenna input during the entire alignment procedure, instead of applying it to the different tubes as each individual stage is aligned.

One important point should be kept in mind when making all adjustments. That is to align all the individual coils at the same frequency setting of the generator rather than changing the generator setting and having to go back and try to reset the generator at the same frequency. For example, when you start making adjustments at 31.625 MC, do not change the generator setting from the time you start these adjustments until you have completed all adjustments on all coils that are to be aligned at this particular frequency. The exact frequency to which the coils are aligned is not as important as it is to be sure that all coils of identical frequency be aligned at exactly the same frequency. The frequency tolerance of ±1% in signal generator frequency can be tolerated if the coils are aligned at the same relative frequencies.

Before attempting to make any alignment and adjustments, check the physical position of all of the iron core slugs in the different IF transformers and wavetraps. Refer to the chart given below for their approximate correct positions. This, of course, is not necessary if the receiver is not badly out of line, or if none of the transformers or cores have been replaced. In making any adjustments, be very careful not to turn the cores in too far, since the threads in the coil forms will be disengaged and the core will drop to the bottom of the transformer can. If this occurs, the metal cover on the bottom of the RF and IF sub-chassis must be removed and a small wire inserted through the bottom of the chassis into the coil form to force the iron core slug back up to the point where it will engage the threads as it is turned back out.

Symbol No.	*Color Dot*	*Position of iron core referenced to top edge of coil form*
L14	Brown	3/32" out
T1 (L16 Primary		1-1/4" in
T1 (L17 Secondary		flush
L19	Red	1/16" in
L20	Orange	1/16" out
L21	Yellow	1/32" in
L22	Green	1/16" in
L23	Blue	1/64" in
L24	Purple	3/32" out
L26	Slate	1/4" in
T3 (L27 Secondary		1/4" out
T3 (L28 Primary		5/8" in
L29	White	1/64" in

During the alignment of all the IF stages the antenna should be shorted to prevent pick-up of extranious noises. If any local station still causes interference, another pushbutton should be pressed.

Short out the AGC by connecting a clip lead jumper from pin 4, V15 to terminal 1, R28P. This latter point may be found on a terminal board under the chassis just back of the speaker. Adjust the contrast control, R28P, to produce -3.5 to -4.0 volts from terminal 'Q' to chassis and maintain this voltage throughout the entire alignment procedure.

IF SECTION

Briefly, the detailed procedure may be analyzed as follows: the tube shield on V10 is removed far enough to disengage the grounding clips on the tube socket and the high side of the signal generator lead connected to this tube shield with the low or grounded side of the generator connected directly to chassis ground. (There is enough capacitive coupling between the tube shield and the plate of the tube to feed the signal through at these frequencies.) The first adjustment is made at 34.5 megacycles, adjusting L29 for maximum output with the vacuum tube voltmeter connected between terminals 'G' and 'E' on the terminal strip of the IF sub-chassis assembly. The input signal should be adjusted to produce a 1-1/2 to 2-1/2 volt reading on the VTVM. The signal generator is then adjusted to 32.9 MC and L24 adjusted to produce the maximum output voltage. This adjustment is not critical for it will be repeated and checked later when the signal generator input is moved farther back towards the RF end of the receiver.

The signal generator is then adjusted to 31.625 MC and L26 adjusted to produce a maximum voltage at 'G' and 'E'. If L28 is adjusted near the minimum point, it may be very difficult to obtain a satisfactory reading between 'G' and 'E' when adjusting L26. This again is not important, for L26 will be rechecked and adjusted when the voltmeter is connected to the output of the sound discriminator. With L26 peaked roughly to 31.625 MC, adjust L28 to produce a *minimum* voltage between terminals 'G' and 'E'. Then connect the VTVM from terminal 'A' to chassis and peak L26, L27, L19 and L16 to 31.625 MC. The signal input level should be adjusted to maintain a maximum of 4 volts from 'A' to chassis at all times, to prevent limiting. These adjustments should be repeated several times to be sure that all coils are peaked at exactly the same frequency. If they are badly out of adjustment, it is advisable to return the VTVM to terminals 'G' and 'E' and check L28 to be sure that it is adjusted to produce a *minimum* voltage at exactly this same frequency. Notice that L26 is still not accurately aligned since the input signal is being applied to the plate circuit of V10. Therefore the plate-to-ground capacity, or loading, does not correspond to actual conditions with the tube shield permanently in place over the tube. Since L26 is a very critical adjustment and may cause the set to oscillate if the iron core is very far out of position, it is important that this coil be peaked as accurately as possible before the signal input is removed from V10. Oscillation within the receiver circuits may be detected by an excessive and unstable voltage output at terminals 'G' and 'E' exceeding 5 or 6 volts as a minimum and very often exceeding 10 volts. To be sure the set is not oscillating and adjustments made to produce this oscillation rather than eliminate it, vary the signal generator input and notice if the voltage output varies correspondingly with the signal input. If it does not, some circuit must be oscillating.

After L29, L24, L26, L28, L27, L19, and L16 have all been adjusted as outlined above, change the VTVM to terminal 'B' and chassis and turn signal generator completely off. Note reading on VTVM. (Antenna input should be shorted to prevent any signal pickup through the RF stage.) Turn signal generator on and adjust L17 to produce the same voltage on the VTVM noted when no signal was applied. This point should occur approximately in the center (zero voltage) of the voltmeter reading, as it passes sharply from a positive to a negative voltage. Adjustment of L17 to this zero voltage should also produce a minimum of background noise and best tone quality from an FM signal of 31.625 MC center frequency.

With the circuits following V10 properly aligned, except L26, the signal generator output may be removed from the tube shield on V10 and connected in a similar manner to V9. Be sure not to change the signal generator frequency setting from 31.625 MC, because L26 must be rechecked with a signal applied to V9 because of the loading effect on V10 when the signal generator was connected to this stage. The VTVM should be connected from 'A' to ground when making the final adjustment on L26, since L28 has been adjusted to minimum response with the VTVM connected from 'G' to 'E'. If L26 requires considerable adjustment in order to peak it, check L28 again with the VTVM connected between 'G' and 'E'. This voltage should be a minimum after L26 is peaked to a maximum. Now adjust the signal generator to 35.7 MC, and adjust L23 for maximum output with the VTVM connected from 'G' to 'E'. Change the signal generator frequency to 37.625 MC and adjust L21 for maximum voltage between 'G' and 'E'. If L22 is correctly adjusted for minimum response, it may be impossible to obtain a satisfactory reading at 'G' and 'E' for adjustment of L21. Therefore, L22 should be detuned slightly, but be very careful not to detune it any great amount, for it must be adjusted finally to an absolute minimum, and if its adjustment is changed greatly after L21 is adjusted, the initial adjustment of L21 will be altered. In other words, adjust L21 for maximum output with L22 adjusted to as near a minimum output as is possible to obtain a satisfactory reading between 'G' and 'E'

The signal generator input now may be moved back to V8, and L21 may be rechecked to be sure that it is at maximum response and L22 at minimum.

Alignment of the mixer output stage L14 may be accomplished roughly by applying the signal to the mixer tube V3. But since access to this tube is rather difficult with the picture tube in place, it is suggested that the signal be applied to the antenna input directly. However, if any difficulty is encountered in adjustments, indicating that it is badly out of adjustment or that oscillation is taking place in the RF stage, then go back to V3 and apply the signal generator output to the tube shield of this tube in a similar manner as was done throughout the previous IF alignment. Erratic meter readings may be caused by the signal generator not being firmly grounded to the TV chassis especially when the generator is connected to the antenna input terminals. A good ground connection must be maintained between the signal generator and the TV chassis at all times. With the signal generator applied to the antenna output, adjust its frequency to 32.9 MC and adjust L14 and recheck L24 for maximum voltage output on VTVM connected from 'G' to 'E' Return the signal generator setting to 35.7 MC and recheck L23 and L20 for maximum output. Normally no difficulty should be encountered in feeding an IF signal through from the antenna terminals into the IF; but in case the antenna wavetraps (C141, C142 and L50 and L51) are tuned to the particular frequency one is attempting to apply to the IF, a very strong signal may be necessary unless the antenna plug is pulled out of the RF chassis and the signal generator input applied directly to the chassis jack. Even though the signal generator output is unbalanced to ground, this will make no difference as far as IF alignment is concerned, but it should be balanced when making RF alignments which will be discussed in the next section.

RF SECTION

In aligning the RF and oscillator section, the signal generator output must be applied to the antenna input, and should be applied directly to the antenna terminals with the IF sound traps connected into the circuit, for these traps have some effect on the RF tuning characteristics. If the signal generator output is unbalanced to ground, a balanced-to-ground network should be connected between the signal generator and the antenna terminals. A suggested method of making this network is shown in the sketch below. The resistors used must be non-inductive at the TV carrier frequencies.

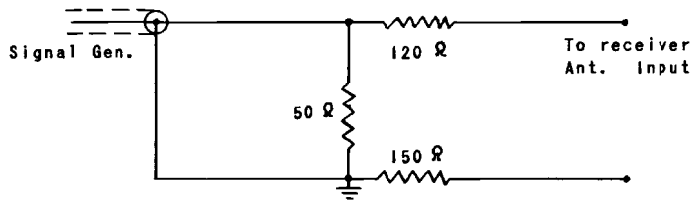


FIG. 4 - SIGNAL GENERATOR MATCHING NETWORK

The fine tuning control C22 is set at its mid-position and left at this position throughout all RF oscillator and pushbutton alignment. The AGC amplifier is still shorted out as for IF alignment and the RF bias adjusted to -3.5 to -4.0 volts measured from terminal 'S' to chassis. Connect the VTVM from terminal 'B' to chassis and remove the cover plate over the focus and hold controls just above the pushbuttons and note 6 trimmers back of these controls. A thin non-metalic screwdriver is required for adjusting these trimmers. Press channel number 2 pushbutton and then retrip it to be sure that all of the tuning sleeves are in the lowest frequency position on the low frequency band. This adjustment is a check to be sure that the oscillator will tune to the low frequency limit that is necessary. Set the signal generator to 54 MC and adjust C25 to produce zero voltage on the VTVM at the sharp cross-over point of the meter. In other words, the oscillator is adjusted until the meter passes sharply from either a positive or negative voltage to a voltage of the opposite polarity. Then C25 is adjusted until the meter is in the center of this cross over point. Channel number 5 is now adjusted with the signal generator set at 81.75 MC. The RF bias measured from terminal 'S' to chassis should be -3.5 to -4 volts with the AGC shorted out. Now adjust this pushbutton adjustment screw to zero voltage at the sharp cross-over point. (VTVM connected from 'B' to chassis.) Change the signal generator output to 79 MC and adjust RF trimmers C9 and C23 for maxinum voltage with the VTVM connected between terminals 'G' and 'E'. The signal input should be adjusted to produce 2 volts or less between these terminals. (C9 and C23 are accessible with a small non-metallic screwdriver through the opening over the focus and hold controls. C9 is the 3rd trimmer from the left and C23 is the 5th from the left.)

The high frequency channels are adjusted in the same manner as the low frequency channels were adjusted, except that different buttons are used and different frequencies. Channel number 7 pushbutton is pressed to operate the band switch (S1, S2, S3, S4, S5 and S6) and then one of the other high frequency pushbuttons is pushed slightly to trip number 7. This is to be sure that this switch is in the high frequency position and the tuning sleeves are in the lowest frequency position on this high frequency band. The VTVM is again connected from terminal 'B' to chassis, and 174 MC signal is applied. The RF bias still remains at approximately -4 volts. C24 (2nd trimmer from left) is then adjusted to produce zero signal at the sharp cross-over point on the VTVM. This is a very critical adjustment and considerable care must be exercised in making it to be sure the setting is not disrupted when the screwdriver is removed from the trimmer.

Press channel number 13 pushbutton and apply a 218 MC signal. Adjust pushbutton set screw to produce zero output at the cross-over point. This is only to check the high band coverage. Press channel number 8 pushbutton and apply 185.75 MC signal adjusting the pushbutton set screw for zero output at the cross-over point. Change the VTVM from terminal 'B' and chassis back to terminals 'G' and 'E', and apply 183 MC signal. Adjust antenna trimmers C8 and C12 for maximum output keeping the signal input at a value that will produce approximately one volt. C8 is the fourth trimmer from the left above the pushbuttons, and C12 is the sixth trimmer. The individual pushbuttons may best be set to their proper channels by tuning in a test pattern from a local television broadcast station, and adjusting the set screw to produce best tone quality rather than adjusting it for maximum picture brilliance. In fact, maximum picture brilliance should not occur at the exact position of best tone. It is difficult for the average service technician to properly adjust these pushbuttons without a test pattern from a TV broadcast station because of the lack of an accurate frequency source. If a signal generator must be used it should be crystal controlled at the exact sound carrier frequency of the individual channels. (See SOUND CARRIER frequencies under SPECIFICATIONS on cover page.)

In making all of the preceding adjustments, a point of caution must be emphasized Be very careful not to make adjustments with the set in oscillation, thus mistaking the output indication as an output obtained from the signal source when it is actually produced from oscillation within the receiver. If oscillation still occurs when the slugs are positioned approximately to their correct location as shown in the preceeding chart, oscillation often may be stopped by increasing the IF and RF

bias above the specified three or four volts. The bias should be returned to the lower value as soon as oscillation can be stopped, and the circuits aligned to prevent it from recurring with the lower bias. The signal source should be maintained as low as possible throughout the entire alignment. A good general rule to follow is to keep the signal source at such a value that not greater than two volts are produced between terminals 'G' and 'E'. It is very important to maintain a good ground connection between the signal generator and TV chassis.

Again it is emphasized that although the procedure outlined above is rather long, it normally will not be necessary to go through it in this same step-by-step manner. In fact, in many cases, the signal generator may be connected directly to the antenna input and all adjustments at one particular frequency made without changing the signal generator setting from this particular frequency once it is made. The step-by-step procedure given above is recommended only when it is necessary to use this procedure in order to obtain sufficient signal input, to overcome oscillation, or in areas of high noise level.

SWEEP OSCILLATOR ADJUSTMENTS

The following adjustments are best performed with a received RF signal and test pattern but can be made with any received program signal.

1. Turn Off-Volume control on and Contrast control clockwise until a picture modulates on the raster, generally out of sync until the following adjustments are complete. (Line voltage should be 117V 60 cycle AC.)

2. Adjust Height control (R75) on front panel to produce a pattern that exceeds the height of the picture tube mask by approximately 1/8" top and bottom. Linearity control R82 must be adjusted after step 12.

3. Set the Vertical Hold control (R71) (behind the removable panel over the push-buttons) to eliminate in the picture any horizontal gray or black bands (vertical blanking) which may be several in number when not vertically synchronized. At vertical synchronism, the horizontal bands will decrease in number to a single, approximately half-inch high strip, which will move up or down when the control is displaced slightly from its correct setting.

4 The remaining break-up of the picture as a unit is characterized by diagonal parallel streaks inclined toward the horizontal axis as the horizontal sweep is farthest from synchronism with the transmitter. Turn the 'horizontal hold' control, (behind the removable panel over the pushbuttons) and observe the changing slope of the diagonal streaks.

5. Set the Horizontal Hold control at approximately mid-position.

6. Starting with maximum clockwise position set Horizontal Drive trimmer (C108C) to produce at the high voltage terminal on picture tube:

   a. 9.2KV to 10.2KV for chassis using two 7A5 tubes for V18 and V19.

   b. 9.3KV to 9.6 KV for chassis using one 6BG6G for V19.

   This will usually occur at a trimmer position one to two turns out from maximum capacitance. Line voltage when making this adjustment is 117 volts.

   When an electrostatic or low current (draws less than 25 microamperes) high voltage voltmeter is not available, adjust Horizontal Drive trimmer (C108C) until picture fills mask, or provides picture width of 8-7/8" if chassis is out of cabinet. The focus control R91 should then provide proper focusing when the control is in normal operating position. This normal position is within approximately 100° either side of the mid-position. To arrive at this setting the focus coil may have to be physically adjusted (see section headed PICTURE TUBE COMPONENT ADJUSTMENT).

7. Adjust Horizontal Frequency (C108A) to approximately mid-range (about one turn out from the maximum clockwise position which gives maximum capacitance). Also set Horizontal Lock Range (C108B) to 1/2 turn out from maximum clockwise position.

8. With a small screwdriver, turn the Horizontal Oscillator core (T6) adjustment on the top of the chassis below the picture tube socket. This is a coarse oscillator frequency adjustment and will pass through a setting where the diagonal streaks on the screen decrease in number and become erect, finally producing a single picture which slides sidewise to a stop when properly synchronized.

9. With the picture synchronized as in step 7, drop synchronism by turning the Horizontal Hold control fully counterclockwise. If this does not drop synchronism, push a different station selector button, then return to the original station button.

10. Slowly turn the Horizontal Hold control clockwise and note the least number of diagonal bars obtained just before the picture pulls into sync.

11. If more than 6-1/2 bars appear just before picture synchronism, adjust the trimmer on the rear chassis apron marked Horizontal Lock Range slightly clockwise (toward higher capacitance). If fewer than 4 bars appear just before sync, turn the trimmer slightly counterclockwise.

12. Increase picture Contrast (clockwise), momentarily remove the signal by detuning and recheck the number of bars present at the pull-in point. Repeat the Lock adjustment until 4 to 6-1/2 bars are present at pull-in.

13. Check the range of the front panel horizontal hold control, starting at full counterclockwise position. Interrupt the signal momentarily by detuning or by turning contrast control to minimum and then back to half clockwise position. Normally the picture will then be out of sync horizontally. Turn the hold control clockwise slowly until 6-1/2 to 4 diagonal bars (sloping downward to the left) appear on the screen. A slight additional clockwise rotation of the hold control should produce full synchronization. This should occur at about 90° from the counterclockwise end and hold for at least 120° more clockwise rotation of the control. As the picture passes out of sync with further clockwise rotation, a diagonal bar or bars (downward to the right) will immediately appear. This is an optimum adjustment of the oscillator. Recheck previous steps if Step 12 is not fulfilled.

14. Check interlace by observing interspacing of alternate field lines. Over at least half of the Vertical Hold range of sync lock-in, the interlace shall be sufficiently good so that the alternate lines appear generally evenly spaced. The spacing between alternate lines shall differ by no more than 50%, that is, the larger spacing shall be no more than 50% greater than the smaller spacing. This may be more easily checked by temporarily expanding the vertical sweep by turning the Vertical Line-

arity control full clockwise and observing the expanded portion of the sweep. Since many factors, including faults in the transmitted signal, may upset interlace of the receiver, considerable care and judgement are required in this test.

REMOVAL & INSTALLATION OF PICTURE TUBE

CAUTION: Be sure power cord is removed from wall receptacle and wear goggles.

1. Remove the high voltage lead and plug (M10) from the socket on top of the picture tube.
2. Remove the tube socket (M50) from the base of the picture tube.
3. * Remove the ion trap from the neck of the picture tube, just above the tube base.
4. Remove spring and 'J' clamps from either side of picture tube. Be very careful not to strike the tube when removing these springs for they are quite strong and could easily break the tube if allowed to snap as they are unhooked.
5. Loosen the machine screw on the right side (viewed from the front) of the picture tube front clamp (M33).
6. Grasp rim of picture tube face and gently pull the tube foreward from its mounting. Do not allow the tube to rest on its neck or base and do not attempt to carry or handle the tube holding it only by the neck.
7. To replace the tube reverse the above procedure noting ion trap installation instructions that follow.

* Ion Trap Magnet Installation

1. Before placing the socket on the tube base, slide the permanent magnet ion trap on the tube neck with the blackened magnet nearest the tube base, or with the indicator arrow pointing toward the screen end of the tube. The poles of the magnet nearest the base should be aligned with the 'L' shaped 'flags' welded on the side of the cathode ray gun. When the second anode contact in the tube's glass cone is directly on top, the ion trap magnet will generally be suspended below the tube neck. On a few picture tubes, the magnet will be correctly mounted *above* the neck. These few tubes were made before standardization of tube construction and no raster will appear if the magnet is placed in the conventional position below the neck.
2. Tighten the magnet clamps partially and place the socket on the tube base.
3. Make sure that the two springs riveted on the side of the yoke mounting hood (M17) are in contact with the external paint coating of the picture tube cone.

PICTURE TUBE COMPONENT ADJUSTMENTS

To adjust the picture tube yoke, focus coil, and ion trap magnet it is desirable to have a test pattern signal available from a television transmitter. Most adjustments can be approximated with the receiver not connected to an antenna, however, with a raster of unmodulated trace lines appearing on the screen.

1. Before turning on power, set the two centering controls on the rear chassis apron, and the focus control on the front chassis apron (behind the removable panel above the pushbuttons) at mid-position. Also set the Brilliance and Contrast front panel controls at mid-position.
2. Turn on power with the Off-Volume control knob turned clockwise.
3. Allow approximately a half-minute for the receiver warm-up and look for the development of a raster on the picture tube screen.
4. If no raster appears: (a) Make sure that the high voltage rectifier tube (V-20) in the shield compartment is lit, indicating sweep amplifier activity. (b) If the rectifier filament is lit, grasp the ion trap magnet and slide it *along* the tube neck slightly. Sliding the magnet *around* the neck may also be necessary to produce a raster. The position of the magnet giving the brightest raster will be optimum. (c) The two previous checks may fail to produce a raster unless the Brilliance control is rotated farther clockwise to less than picture tube grid-cutoff bias. Repeat (b) if raster appears upon advancing Brilliance control setting.
5. Tighten clamp on ion trap magnet with brightest raster visible.
6. Loosen deflection yoke mounting wing nut and rotate yoke on the tube neck to produce raster edges parallel to the picture mask edges. Tighten the wing nut again.
7. Slide the focus coil forward and backward along the neck of the tube until the *best* compromise is reached between picture center and edge focus, adjusting the 'Focus' control at the same time, at the desired setting of the Brilliance control.
8. Tighten the focus coil mountings if no corner of the raster is in shadow.

   If a corner or edge shadow appears: (a) Make sure deflection yoke is mounted as far forward on the picture tube neck as possible. (b) Loosen all focus coil mountings and move the coil sideways and vertically with some tilt if needed, to direct the beam over the interference in the tube neck which caused the shadow.
9. Tighten all focus coil adjustments after repeating Step 7.

SERVICE NOTES

The speaker is now mounted to the chassis on 4 rubber shockmounts which will eliminate speaker rattle experienced with some receivers on which the speaker is mounted rigidily to the chassis. In order to shock mount the speaker, the mounting holes in the speaker frame must be enlarged to accommodate rubber grommets.

In case the brilliance control R117 will not blank out the raster when turned completely counterclockwise, place a jumper across R112. Do not remove R112 as the jumper may have to be removed if the picture tube is changed at some later date.

In some sets the high voltage rectifier tube V20 has pin #5 soldered in the socket. This must, of course, be un-soldered before the tube can be removed.

Extreme care must be exercised in making any of the repairs on this receiver for an excessive amount of heat, for instance, may ruin the ceramic capacitors causing them to open or short circuit. For example, if C37, which is connected across

terminals 2 and 3 of the discriminator transformer, T1, is replaced, an excessive amount of heat from the soldering iron may cause C36 (6.8 mmf) inside the transformer can to open. Indication of this trouble will be that no audio will be available and the secondary of T1 (L17) will not tune properly. The same precaution applies to C100 which is a 68 mmf ceramic capacitor connecting the horizontal sync. pulse from the junction of R136 and R74 to C101 at sync. phase tube V17A.

In trouble shooting this receiver, too much emphasis can not be placed upon the need for checking both positive and negative B supplies before making any actual component tests, because a low B- supply, down around say -90V, will introduce troubles into the picture circuit and high voltage supply that in many cases will not be evident directly from the visible or audio symtoms. It is impossible in this space to list all of the probable causes of low or high voltage on either the positive or negative supply for most any of the by-pass or coupling capacitors may be at fault. For example, if C40 connected from the audio output lead from the 6T8 to ground is shorted, the -150V bus will vary considerably as the volume control is changed from a minimum to maximum position. In the minimum position, the grid is at cathode potential but as the volume control is advanced the grid becomes more positive causing the audio output tube V7 to draw excessive current thus dropping the -150 volt line, in many cases, to below -100 volts.

A rapid check on the current drain of the B supply may be made by measuring the voltage drop across the speaker field (Choke L47 in the console models). As noted on the schematic diagram, the resistance of this coil is approximately 98 ohms and the voltage drop should be about 22-1/2 volts. If the voltage drop is up around 30 volts, one may be reasonably certain that a short exists some place in the system.

A question may arise as to what changes listed under Code Changes are absolutely necessary to obtain optimum performance from the receiver. The following is a list of the changes which should be incorporated in every receiver. They are given in detail in the code changes preceeding the alignment procedure. In order to improve both vertical and horizontal sync., C88 should be 680 mmf paralleled by R125 which is a 10 meg resistor. R127 and R126 connecting the cathode, pin 6, of V14 to the grid resistor of the same section of this tube to chassis ground should be deleted. In all cases, R124 should be 8200 ohms and R139 from pin 3 to pin 6 of V14 should be installed. The connection from R76 should be made to the junction of R74 and R65 instead of directly to the plate of the sync. clipper tube. The AGC amplifier circuit should be modified to conform to the schematic given with these notes. Considerable flutter on the picture may occur in receivers in which the AGC amplifier V15B has not been connected as shown. The two bleeder resistors: R140, 7500 ohms, 5 watts; and R141, 7500 ohms, 10 watts, stabilize both B+ and B- voltage supplies. It is very important that these two resistors be added at the same time that the shunt resistor, R135 connected across the focus coil, is changed from 3300 ohms, 1 watt, to 1500 ohms, 2 watts. Otherwise it may be impossible to obtain proper focusing.

It is not recommended that any of the changes shown in the RF section, deleting R4 in the cathode of V1 and changing R5 and R9 and adding R34, be made unless the receiver is operating in fringe areas of low signal strength and trouble with excessive snow on the screen is encountered. These changes will minimize the amount of snow on the screen but are rather difficult to make, for L8 may be damaged while removing R5. If these changes are made, only Allen Bradley resistors must be used. On receivers in which the high voltage output transformer T7 is identified with a blue dot, an 8200 ohm resistor is connected between terminal 6 of the transformer and the width control L45. These blue dot transformers are not stocked for replacement and therefore this resistor should not be used when the transformer is replaced.

Pushbutton and RF-IF Sub-assemblies

Removal of assemblies

The removal of the pushbutton and RF-IF assembly is a relatively easy matter if the following instructions are adhered to. The pushbutton, RF, and IF units are mounted as one assembly and should be removed as such.

1. Remove picture tube. Follow precautions and instructions given under INSTALLATION OF PICTURE TUBE.

2. Tone controls may be swung out of way by removing one screw of its bracket and pushing it aside.

3. Carefully unsolder and remove all wiring connected to the IF sub-assembly. Make note of the wire positions.

4. Unbolt and remove bottom IF plate cover.

5. Remove screw located in the front center of the main chassis. Be sure to support the assembly to prevent dropping.

6. Allow IF assembly to drop down and slowly slide unit in a back and down movement, until it is clear of the chassis.

RESISTANCE CHART
For Code F Chassis

All measurements to chassis ground.
All tubes in socket except 10BP4.
All potentiometers set to maximum clockwise position.
N.C. - No connection

Tube & No.	1	2	3	4	5	6	7	8	9	10	11	12
V1 6J6	7.9K	7.9K	0	0	29K	29K	190					
V2 6J6	7.3K	7.3K	0	0	22K	22K	0					
V3 6J6	7.8K	7.8K	0	0	65K	65K	0					
V4 6AG5	100	N.C.	0	0	6.8K	6.8K	220.					
V5 6AU6	56K	0	0	0	11.5K	11.5K	27.					
V6 6T8	500K	500K	1 M	0	0	28K	0	10 M	195K			
V7 6Y6	N.C.	5.0K	370.	220.	550K	N.C.	5.0K	5.3K				
V8 6AG5	6.8K	N.C.	0	0	7K	7K	68.					
V9 6AG5	15K	N.C.	0	0	7K	7K	68.					
V10 6AG5	6.4K	N.C.	0	0	7K	7K	68.					
V11 6AG5	0	N.C.	0	0	7.6K	7.6K	150					
V12 6AC7	0	5.0K	5.0K	6.0K	5.0K	18K	5.0K	6.4K				
V13 10BP4	0	370K	N.C.	N.C.	N.C.	N.C.	N.C.	N.C.	N.C.	600K	6.4K	0
V14 6SN7	5.6M	9K	14.2K	6.2M	14.2K	5.0K	5.0K	5.0K				
V15 6SN7	9K	12.5K	0	1 M	15.5K	4.3K	0	0				
V16 6SN7	1 M	1.5 M	5.0K	5 M	11.5K	5.5K	5.0K	5.0K				
V17 6SN7	280K	680K	5.0K	800K	210K	300K	5.0K	5.0K				
V19 6BG6	N.C.	5.0K	5.0K	N.C.	1 M	N.C.	5.0K	10K	Cap. 510K			
V20 1B3	N.C.	Inf.	N.C.	N.C.	N.C.	N.C.	Inf.	N.C.	Cap. 510K			
V21 6W4	N.C.	N.C.	510K	N.C.	6.5K	N.C.	0	0				
V22 6W4	N.C.	N.C.	6.8K	N.C.	5K	N.C.	0	0				
V23 6W4	N.C.	N.C.	6.8K	N.C.	5K	N.C.	0	0				

VOLTAGE CHART

All measurements made with Vacuum Tube Voltmeter from tube socket to chassis ground.
No signal - All tubes in socket
AGC in operation
Antenna shorted at ant. jack
Line voltage 117 V 60 cycles AC

Max. brightness except where noted.
Where two voltages are given the first is taken with minimum contrast and the second one with maximum contrast.

* Readings cannot be taken at these points due to circuit upset caused by Voltmeter.
Δ Minimum brightness
= Circuit upset may be experienced at these points due to regeneration caused by Voltmeter.
× Designates pins 10-11-12 on cathode ray tube.
° In later models V18 deleted and V19 becomes 6BG6.

Sym.	Type	1	2	3	4	5	6	7	8	9
V1	6J6	+220 to +250 +160 to +195	+220 to +250 +160 to +195	0 0	6.3 AC 6.3 AC	-14 to -20 0 to -1	-14 to -20 0 to -1	0 +2 to +2.9		
V2	6J6	+150 to +195 +115 to +140	+150 to +195 +115 to +140	0 0	6.3 AC 6.3 AC	-4 to -10 -3.5 to -8	-4 to -10 -3.5 to -8.0	0 0		
V3	6J6	+205 to +240 +170 to +205	+205 to +240 +170 to +205	0 0	6.3 AC 6.3 AC	-5 to -12 -4.5 to -8	-5 to -12 -4.5 to -8	0 0		
V4	6AG5	0 0	NC NC	6.3 AC 6.3 AC	0 0	+170 to +205 +135 to +165	+170 to +205 +135 to +165	+1.9 to +3.6 +1.9 to +3.0		
V5	6AU6	* *	0 0	6.3 AC 6.3 AC	0 0	+30 to +45 +25 to +40	+30 to +45 +25 to +40	+.06 to +.01 +0.02 to +0.1		
V6	6T8	* *	* *	0 to =0.1 -0.3 to +0.6	0 0	6.3 AC 6.3 AC	-14 to -21 0 to -1.3	0 0	0 to -1.2 -0.7 to -1.6	+80 to +112 +70 to +105
V7	6Y6G	NC	-110 to -145 -145 to -180	-12 to -18 -18 to -27	-6 to -12 -11 to -20	* *	NC	-110 to -145 -145 to -180	-100 to -135 -135 to -170	
V8	6AG5	* *	NC	6.3 AC 6.3 AC	0 0	+185 to +210 +130 to +170	+185 to +210 +130 to +170	0 +0.2 to +0.4		
V9	6AG5	* *	NC	6.3 AC 6.3 AC	0 0	+185 to +210 +130 to +170	+185 to +210 +130 to +170	0 +0.2 to +0.4		
V10	6AG5	* *	NC	6.3 AC 6.3 AC	0 0	+185 to +210 +130 to +170	+185 to +210 +130 to +170	0 +0.2 to +0.4		
V11	6AG5	* *	NC	6.3 AC 6.3 AC	0 0	+175 to +195 +115 to +140	+175 to +195 +115 to +140	+1.6 to +2.1 +1.0 to +1.5		
V12	6AC7	0 0	-110 to -145 -145 to -180	-110 to -145 -145 to -180	-110 to -145 -145 to -180	-110 to -145 -145 to -180	-40 to -55 -45 to -75	-110 to -145 -145 to -180	-42 to -65 -60 to -80	

Sym.	Type	1	2	3	4	5	6	7	8	9
V13	10BP4	0 0	Δ -80 to -110 Δ -110 to -145	×+260 to +295 ×+195 to +245	×-42 to -65 ×-60 to -85	×6.3 AC	Δ9.5KV to 10.2KV 9.2 to 10.0	No connections on Pins 3 to 9 inclusive		
V14	6SN7	-55 to -70 -70 to -85	-20 to -30 -1.5 to -3	-55 to -75 -60 to -80	-110 to -125 -155 to -185	-55 to -75 -60 to -80	-110 to -145 -145 to -180	-110 to -145 -145 to -180	-110 to -145 -145 to -180	
V15	6SN7	-20 to -30 -1.5 to -3	+205 to +250 +105 to +130	0 0	-45 to -75 -60 to -80	-15 to -35 0 to -1	-45 to -65 -35 to -55	0 0	6.3 AC 6.3 AC	
V16	6SN7	=-130 to -160 =-170 to -205	-30 to -55 -80 to -110	-110 to -145 -145 to -180	=-100 to -130 =-150 to -180	+160 to +195 +115 to +140	-100 to -125 -145 to -170	-110 to -145 -145 to -180	-110 to -145 -145 to -180	
V17	6SN7 GTA	* *	=+25 to +50 =-10 to -40	-110 to -145 -145 to -180	-120 to -140 -155 to -185	-10 to -50 -50 to -115	-100 to -130 -155 to -180	-110 to -145 -145 to -180	-110 to -145 -145 to -180	
V18	7A5	-110 to -145 -145 to -180	HV HV	+25 to +55 -5 to +35	NC	NC	=-110 to -135 =-135 to -180	-100 to -135 -135 to -170	-110 to -145 -145 to -180	
V19	7A5	-110 to -145 -145 to -180	HV HV	+25 to +55 -5 to +35	NC	NC	=-110 to -135 =-135 to -180	-100 to -135 -135 to -170	-110 to -145 -145 to -180	
°	6BG6	NC	-110 to -145 -145 to -180	-102 to -137 -137 to -172	NC NC	-120 to -155 -155 to -190	NC	-110 to -145 -145 to -180	+140 to +175 +85 to +120	
V20	1B3	NC	HV	NC	NC	NC	NC	HV	NC	Cap. HV
V21	6W4	NC	NC	+275 to +325 +190 to +265	NC	+185 to +205 +125 to +145	NC	0 0	6.3 AC	
V22	6W4	NC	NC	+240 to +275 +185 to +245	NC	-110 to -145 -145 to -180	NC	0	6.3 AC	
V23	6W4	NC	NC	+240 to +275 +185 to +245	NC	-110 to -145 -145 to -180	NC	0	6.3 AC	

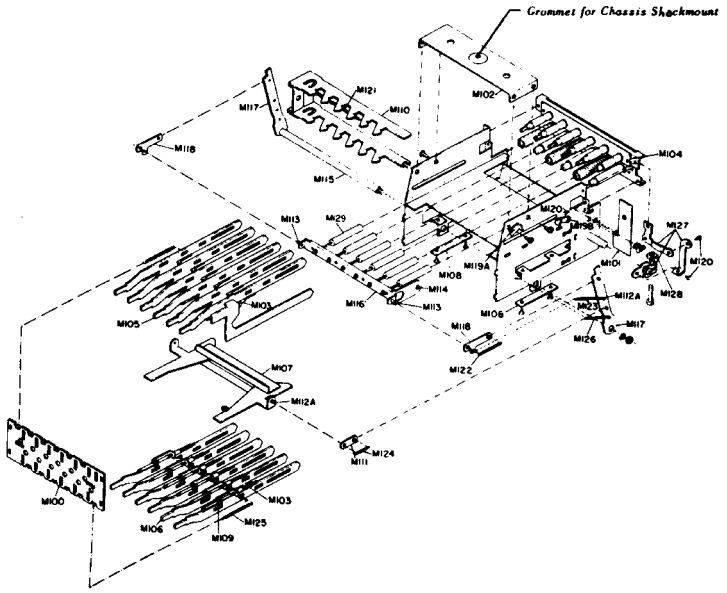


FIG. 5 - TV TUNER

PARTS LIST FOR TV TUNER

Stock No.	Symbol	Description	Stock No.	Symbol	Description
HR0P11		RIVET - Tubular .187 x 7/32	AM0L16	M115	ASSY - Lever & Shaft
PM0B00	M100	PLATE - Mtg., Pushbutton Shanks	AB0M00	M116	ASSY - Bar, Tuning Sleeve Mtg.
HB1M22	M101	BRACKET - Mtg., Right	ML0A01	M117	LEVER - Actuating, Tuning Sleeve (with studs)
HB1M23		BRACKET - Mtg., Left	AM0L18	M118	ASSY - Long Lever Link & Stud (Right)
HB1M24	M102	BRACKET - Mtg., Top	AM0L19		ASSY - Long Lever Link & Stud (Left)
HS0S22	M103	SCREW - Special, Pushbutton Adjusting	HB0S07	M119A	BRACKET - Stop (Front)
HS0S23	M104	STUD - Special Pivot, Slide Switch .125 x .090 x 5/32	HB0S08	M119B	BRACKET - Stop (Rear)
			HR0S18	M120	RIVET - Shoulder 7/32 x .073 x 13/64
AM0S21	M105	ASSY - Pushbutton Shank (Top)	HS1C10	M121	SPRING - Coil, Latch Bar
AM0S22	M106	ASSY - Pushbutton Shank (Bottom)	HS1C11	M122	SPRING - Coil, Long Link
AB0P00	M107	ASSY- Bar, Pushbutton Positioning	HS1C12	M123	SPRING - Coil, Tuning Sleeve
X50M02	M108	STRIP - Metal, Bearing Strap	HS1C13	M124	SPRING - Coil, Short Link
W19R00	M109	WASHER - Flat Rubber 1/4 x 5/32 x .050	HS1C14	M125	SPRING - Coil, Pushbutton Shank
AB0P01	M110	ASSY - Bar, Pushbutton Latch	HS1C15	M126	SPRING - Coil, Tuning Sleeve Return
ML0L01	M111	LINK - Lever (Short)	AM0L17	M127	ASSY - Link & Crank
HS0P32	M112A	STUD - Plain, Lever .078 shank	HN8S01	M128	NUT - Special #8-32
HS0S24	M113	STUD - Shoulder, Tuning Sleeve	HS0C91	M129	SLEEVE - Cover, Tuner Coil
HS0P34	M114	STUD - Plain, Tuning Sleeve Guide			

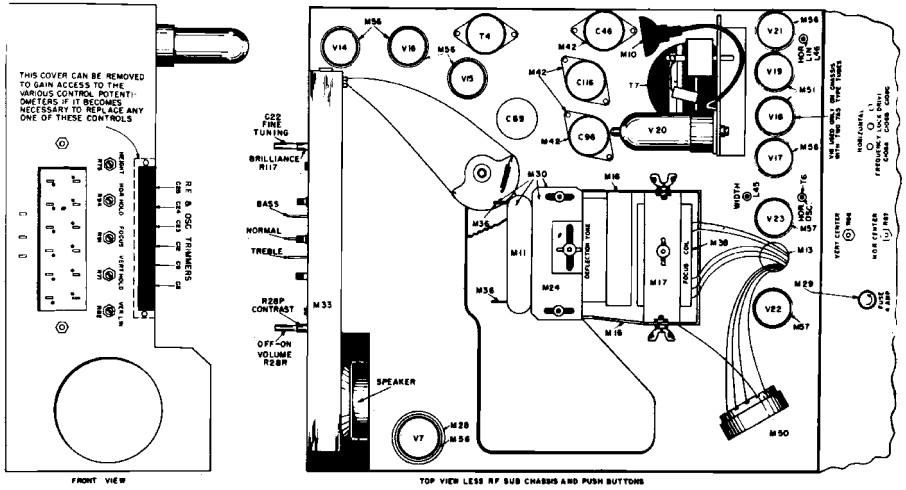


FIG. 6 - COMPONENT DIAGRAM - TOP VIEW OF MAIN CHASSIS

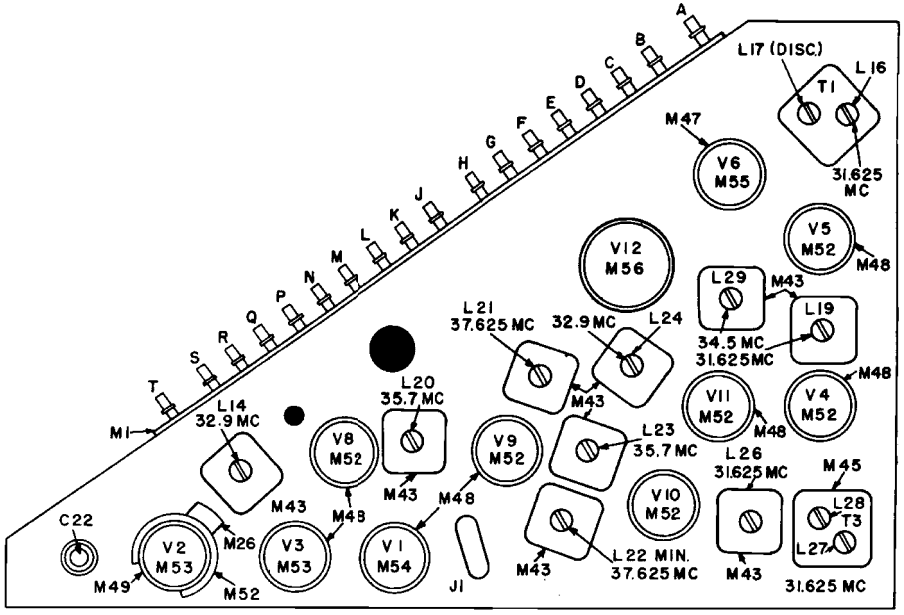


FIG. 7 - COMPONENT DIAGRAM - TOP VIEW RF CHASSIS

ANTENNA WAVETRAP ADJUSTMENT

A wavetrap consisting of a series resonant circuit for each side of the balanced antenna line is mounted near the chassis antenna receptacle for the purpose of eliminating any undesired signal in the IF band (30 to 40 MC). To avoid blocking any signal in the low television band, this trap is usually set for the FM band (88 to 108 MC) when there is no interfering IF signal. It is possible for the wavetrap to be adjusted to block the audio signal of one of the low band television channels, which results in obtaining a good picture but no sound. If such a condition exists, adjust trimmers to a position 4 to 5 turns out from maximum clockwise position. This is the point of minimum capacitance and the trap is then harmlessly set in the FM band.

When a signal, such as a police call, causes interference in the IF band, adjust trimmers C141 and C142 of the wavetrap as follows:

a. Set both trimmers fully clockwise (maximum capacitance).

b. Turn capacitor C141 counterclockwise 1/4 turn, and then turn capacitor C142 counterclockwise 1/4 turn.

c. Follow procedure of "b" until interference disappears.

CAUTION: Often an interfering signal, such as a police call, operates intermittently; and, therefore, it is necessary to make sure the signal is present when attempting to block it with the antenna wavetrap.

After making adjustments, check all low and all high channels for proper picture quality and correct sound.

REMOVAL OR REPLACEMENT OF PUSHBUTTON TUNER

A. Removal

1. See "Pushbutton and RF-IF Sub-assemblies," pages 15 and 16 of Preliminary Service Manual for removal from main chassis.

2. Referring to diagram of tuner switch positions, Fig. 8, remove the following components in the order designated.

   a. Remove C143 and C1 from center arm of S2.

   b. Remove C4 and C144 from center arm of S1.

   c. Remove C20 and bus wire from center arm of S3.

   d. Remove C14 and bus wire from center arm of S4.

   e. Remove C16 from center arms of S5 and S6.

   f. Remove copper strap from center arm of S5.

   g. Remove copper strap from center arm of S6.

3. Remove six mounting screws.

4. Remove R8 from center arms of S3 and S4.

5. Remove R3 from Low Frequency arms of S1 and S2.

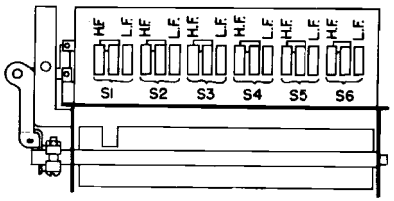


Fig. 8 - PUSHBUTTON TUNER SWITCH HIGH FREQ. - LOW FREQ. (AS VIEWED FROM REAR)

B. Replacement in IF-RF Chassis

a. Replace pushbutton tuner in IF-RF chassis in reverse of the order of removal under A.

C. Disassembly of Pushbutton Tuner.

1. Remove latch bar spring M121. See Figure 5 of Preliminary Service Manual.
2. Remove latch bar M110 and notice that the flange of the lance has to be straightened before removal can be accomplished.
3. Loosen mounting plate M100 by pinching or filing staking burrs that secure it at four points to the frame.
4. Pull forward mounting plate M100 with top, M105, and bottom, M106, shanks.
5. Disconnect springs M123 and M122 and link M118 from tuning sleeve mounting bar M116.
6. Remove four mounting screws of the high and low band switch assembly, noticing that the upper right mounting screw makes use of a washer or spacer to keep screw from interfering with movable switch arm.
7. Remove switch assembly with accompanying coils and trimmers.
8. Push and fasten tuning sleeve mounting bar actuating lever M117 (both) towards rear and fasten in this position.
9. Remove tuning sleeve mounting bar M116 by rotating it within the slide groves in the frame.

D. Assembly of Pushbutton Tuner

1. To reassemble this tuner, follow the procedure in reverse order for disassembly as given in section C. Use the following additions in procedure.

a. After tuning sleeve mounting bar M116 is replaced in the groove make sure tuning sleeve mounting bar actuating lever M117 is fastened in rear position to allow M116 to have full length of travel.

b. To replace switch assembly, slide sleeve bar M116 to rear position and carefully replace tuning sleeves of bar M116 in coils of switch assembly. This can be done by working carefully from one end, replacing one sleeve at a time.

DESCRIPTION OF TUNING SLUGS

BENDIX STOCK NUMBER	DESCRIPTION
ST0I01	SLUG - Tuning Discriminator Transformer. Identified by a green dot. Characteristics: a. Low permeability - high frequency (30-100 MC) - high Q.
ST0I02	SLUG - Tuning, IF Coils and 4.5 MC Trap. Identified by a red dot. Characteristics: a. Higher permeability - lower frequency (up to 30 MC) - lower Q required.
ST0I03	SLUG - Tuning for Sync, Width, and Horizontal Linearity. Has screw but not color coded.

TROUBLE SHOOTING PROCEDURES

CAUTION: *DO NOT REMOVE ANY OF THE FOLLOWING TUBES UNDER ANY CIRCUMSTANCES WHILE THE TELEVISION RECEIVER IS TURNED ON.*

V2 - 6J6 -------- RF Oscillator
V13 - 10BP4 ------ Picture Tube
V15 - 6SN7-GT ---- AGC Amplifier and Sync Clipper
V16 - 6SN7-GT ---- Vertical Osc. & Disch. and Vert. Output
V17 - 6SN7-GT ---- Hor. Osc. & Disch. and Sync Phase
V19 - 6BG6G ------ Hor. Output
V22 - 6W4-GT ----- Rectifier
V23 - 6W4-GT ----- Rectifier

Serious damage to the television receiver will result when any of these tubes are pulled from the socket while the power is turned on. By referring to Fig. 2 (Voltage Block Diagram) of the Preliminary Service Manual, it can readily be seen that all voltages are obtained from a series and parallel arrangement of the tubes. Removing one of the listed tubes will overload and burn-out components in these circuits.

I. Receiver Dead

A. Be sure the plug and receptacle of the AC power cord cover interlock are making contact.

B. Examine fuse 4A.

C. Check low voltage rectifier tubes V22 and V23. *Do not remove tubes with power on.*

D. Check for shorts in 105-120 volts AC power line. Be certain wires are not caught under IF-RF strip.

E. Check all tube filament wiring for shorts.

F. If fuse is not blown, check all power transformer voltages.

Caution: Plate to plate voltage of rectifier tubes is approximately 500 volts AC.

G. Check for shorts all electrolytic capacitors in low voltage power supply (transformer T8 and associated circuits).

H. Check all B+ and B- voltages. See step 18 of "Practical Trouble Shooting Hints,"

II. Sound but no Raster

A. Check all B+ and B- voltages. See step 18 of "Practical Trouble Shooting Hints,"

B. Examine Ion trap. See "Ion Trap Installation," Manual.

C. Be certain filament of high voltage rectifier V20 is lit. This is an indication that the horizontal sweep circuits are properly operating.

D. If scope of at least one megacycle bandwidth is available, determine if there is at least 55 volts peak to peak present at pin #5 of tube V19 (6BG6G).

E. Check adjustments of horizontal oscillator coil T6, horizontal drive trimmer C108C, horizontal lock range trimmer C108B, and horizontal frequency trimmer C108A. See "Sweep Oscillator Adjustments," page 11 of Preliminary Service Manual. T6 should tune with the core adjusting screw one-half to three-quarters of an inch exposed. If this coil tunes with the screw less than one-half inch exposed, there is definitly trouble in some other part of the circuit.

F. Check the following tubes:

V17 --- 6SN7-GT
V19 --- 6BG6G
} CAUTION: *Do not remove these tubes with power on.*
V20 --- 1B3-GT
V21 --- 6W4-GT

G. Check voltage drop across R111 (cathode of V19). It should be 6 to 8 volts.

H. Check T6 for continuity. Be certain that one end of R102 is lifted when making this check.

I. Check C100 in horizontal sync input circuit for leakage which is indicated by a weak and drifting horizontal sync.

J. An open in T6 between start and tap terminals would cause the horizontal oscillator to appear weak, and the slug would tune all the way in, if at all.

K. Leaky C110, across terminals 4 and 9 of T7 would cause the horizontal oscillator to run off frequency or jerk. CAUTION: *High Voltage.*

L. If C112 attached to junction of L46 and terminal 1 of T7 is open, resistor R116 connected to pin #3 of V21 would burn out after a few hours of operation.

M. If C107 mounted on high voltage transformer board is open, it would cause a reduction in high voltage. CAUTION: Check by substitution and *be careful of high voltage.* If the plate of V19, 6BG6G, shows too much current, R106 and R114 will burn out although the fuse will not blow. If the screen draws too much current, R109 will burn out. The voltage drop across the screen resistor R109 should be 100-120 volts and across the cathode resistor R111 should be 6-8 volts.

Under no circumstances operate the receiver with tubes V17 or V19 removed. Serious damage to the unit will result.

Check plate caps of tubes V19 (6BG6G) and V20 (1B3) for tight connection.

III. Picture but no Sound

A. Check audio output tube V7 (6Y6G).

B. Check continuity of speaker voice coil. (Disconnect output transformer T2.)

C. Check continuity of audio output transformer T2.

D. Check audio output circuit components R31, R30, R64, and R28R.

E. Examine audio circuit wiring for shorts.

F. Check tube V6 (6T8) and examine tube socket for poor contact.

G. Check tubes V5 (6AU6) and V4 (6AG5).

H. Check discriminator cross over. See "IF Alignment," page 7 of Preliminary Service Manual.

I. Check tuned circuit of 1st sound IF (V4) and the sound takeoff transformer for continuity.

J. Examine contacts on RF oscillator switches S5 and S6.

K. Replace coil L18 of discriminator circuit.

IV. Raster and Sound but no Picture

A. Check video amplifier components L31, L32, L49, L52, and R59.

B. Check tube V12 (6AC7) by substitution.

C. Check video detector circuit components L30, L48, R54, and crystal X1 (IN34).
NOTE: Check crystal X1 front to back ratio with ohmmeter.
Front - 50 to 125 ohms
Back - 300K to 5 meg
(Be sure cyrstal is disconnected from circuit.)

D. Check operation of RF oscillator by measuring voltage (-5 to -9 volts) across C26 in the mixer grid bias circuit.

E. Turn receiver off and check for continuity in the RF and IF circuits.

V. High Voltage but no Sound, no Raster

This indication immediately tells us the trouble is either in the low voltage supply or ahead of 2nd IF, V9.

A. Check all plus and minus voltages at tube sockets (before V9 circuits). See Voltage Chart pages 17 and 18 of Preliminary Service Manual.

B. Check RF and IF bias at terminals "S" and "Q" of IF-RF terminal strip:

APPROX. VALUES (VTVM)

RF Bias = .2V
IF Bias = 1.5V } @ Max. Contrast

RF Bias = 25V
IF Bias = 9V } @ Min. Contrast

C. Be sure RF oscillator is operating. See step 4, paragraph 4, of Preliminary Service Information.

D. Check for open screen by-pass capacitors on first four IF stages.

E. Be certain the sound takeoff transformer is not oscillating. See 2nd paragraph of "IF Alignment," pages 7 and 8 of Preliminary Service Manual.

F. Be certain that one side of L9, oscillator (V2) plate choke coil, is not open.

NOTE: When checking L9, disconnect from C22.

G. Check L10 and L11 in mixer (V3) grid circuit. Resonance should occur at 34.5 MC with a 13 mmf capacitor across each coil. Check by substitution if proper equipment is not available.

H. Check Fine Tuning, C22, for shorts.

I. Check the following tubes: V1, V2, V3, V8, and V9.

CAUTION: *Do not remove tubes while power is on.*

VI. No Vertical Sweep

A. Check Vertical Oscillator Discharge and Output tube V16.

B. Check all V16 voltages. Refer to Voltage Chart on pages 17 and 18 of Preliminary Service Manual.

C. Check continuity of T4, T5, and vertical yoke.

D. Check for open wiring at all potentiometers on front panel.

E. Check C94 and C95 by substitution.

F. Check R79 and R80 for value.

G. Check knife disconnects on vertical yoke leads.

H. Check R83 connected to junction of T5 and C46A for value.

VII. Excessive Vertical Size

A. Check value of vertical oscillator circuit components R70, R71, R72 R75, R81, and R82.

B. Check all voltages of vertical sync circuit. See Voltage Chart pages 17 and 18 of Preliminary Service Manual.

C. Check tube V16. See step 1, paragraph V, of this section.

D. Check R83. See step 8, paragraph V, of this section.

VIII. Deficiency in Vertical Size

A. Make same examination as in preceding paragraph VII, "Excessive Vertical Size."

IX. Hum in Video and Sound

A. Check to see if C143 or C144 is shorting to pin #4 of RF amplifier V1.

B. Check by substitution for filament to cathode leakage in all tubes.
CAUTION: *Do not remove tubes while power is on.*

C. Check for open electrolytic capacitors.

D. Examine RF and IF bias circuit for short to filament wiring or components.

E. Examine for open capacitor C112.

X. Smear

A. Check crystal X1 front to back ratio with ohmmeter. See step 3, paragraph IV, of this section.

B. Check continuity of RF and Oscillator circuit components L7, L8, L10, L11, L12, and L13.

C. Check by substitution C47 connected to pin #1 of tube V8.

D. Check RF and IF alignment. See pages 7 to 10 of Preliminary Service Manual.

E. Check tube V12 (6AC7) by substitution.

F. Check value of R59 connected to terminal "L" of IF-RF terminal board.

G. Check continuity of video amplifier circuit components L52, L49, L32, L31, L30, and L48.

XI. Lace and Gnats (Crosshatch and 4.5 MC beat)

A. Realign RF and IF circuits. See page 7 to 10 of Preliminary Service Manual.

XII. Noise in Picture

A. High Voltage breakdown.

1. Check for arcing and corona in high voltage compartment and also in the neck of picture tube (V13).
2. Check by substitution C107.

CAUTION: *Discharge capacitor - HIGH VOLTAGE.*

B. Check for intermittent tubes.

CAUTION: *Do not remove tubes while power is on.*

C. Examine antenna plug to check for looseness.

XIII. Weak Video

A. Realign RF and IF circuits. See pages 7 to 10 of Preliminary Service Manual

B. Check crystal X1 front to back ratio. See step 3, paragraph IV, of this section.

C. Check tube V12 (6AC7) by substitution.

D. Check RF amplifier V1 and all IF tubes.

CAUTION: *Do not remove tubes while power is on.*

E. Check all coupling capacitors in the IF circuit.

XIV. Negative Picture

A. Check tube V12 (6AC7) by substitution.

B. Examine crystal X1 to determine if it is reversed.

PRACTICAL TROUBLE SHOOTING HINTS

1. If R16 and R17, plate circuit of mixer tube V2, are burned, check RF oscillator (see step D of paragraph IV of "Trouble Shooting Procedures," for proper operation before replacing these resistors.

2. If response is peaked on high frequency side, as viewed with an oscilloscope, check coils L10 and L11 (see step G of paragraph V of "Trouble Shooting Procedures," page 8).

3. If container of electrolytic capacitor C46 shows disfiguration, look for B+ (+200 volts) to be shorted at some point to the chassis before attempting to replace this capacitor.

4. If the picture indicates a non-linear vertical sweep, examine the lugs on electrolytic capacitor C69 to be sure of good contact.

5. If IF tubes keep burning out, check IF bias with VTVM to determine if its potential is not more positive than -1.5 volts. If bias is more positive, examine all bias circuit components and IF coupling capacitors. Check also voltage from chassis ground to B- to determine if it is less negative than -115 volts, which would cause the IF bias to be more positive.

6. If the center tap of the volume control is shorted to chassis, the sound and picture will be distorted and the picture may, possibly, be eliminated when the volume control is rotated.

7. If the sound is weak and distorted, check V7 cathode by-pass electrolytic capacitor C45.

8. If there is evidence of speaker rattle, the cause may be the shielded audio lead touching speaker cone.

9. Hum in picture and sound may be caused by the lead of coil L39 (filament choke) shorting to pin #6, tube V6 (RF bias).

10. Insufficient vertical size could be caused by R83, plate circuit of V16B, increasing in value.

11. Lack of vertical sweep could be caused by:

a. Loose or broken knife disconnects in vertical yoke leads.

b. Defective V16 tube (6SN7GT).

c. Defective transformer T4 or T5.

d. Defective vertical yoke winding.

e. Open wiring to potentiometers located on front panel.

12. No Raster: Examine tube V20 (1B3). If the filament is lit, then it is safe to assume the horizontal sweep circuits are functioning and the trouble can be in the picture tube, picture tube circuits, video amplifier, or AGC circuit. Examine the above circuits as outlined in "Trouble Shooting Procedures."

13. If capacitor C112, connected to junction of terminal 1 of high voltage transformer and L46, becomes open then resistor R116, connected to pin #3 of V21, will slowly burn.

14. A picture tube (V13) that draws too much 2nd anode current will cause a reduction of the high voltage (10KV). The voltage difference between cathode, pin #11 of V13, and grid, pin #2 of V13, should not be less than 15 volts

when Brilliance control is set at maximum, or there will be a reduction in the high voltage.

15. If the raster fails to disappear when the Brilliance control is in the minimum (counterclockwise) position, check:

    a. The voltage between grid, pin #2, and cathode, pin #11, of V13 should be approximately 70 volts. If the reading is less, then examine the associated circuit and B- (-150 volts).

    b. If B- and B+ voltages appear normal, then shorting out resistor R112 connected to Brilliance potentiometer may correct the voltage condition between grid and cathode of V13.

    c. If the grid to cathode voltage is above 70 volts, the picture tube should be replaced.

16. If C108C (horizontal drive trimmer) is turned so far clockwise that it is extremely tight (maximum capacity point) and left in this position, the horizontal output tube or tubes and associated plate circuits will slowly burn.

17. If unstable sync is noted:

    a. Turn C108A and C108B (horizontal frequency and lock range trimmers) counterclockwise one half turn to a full turn.

    b. Use substitution method to check for leakage in capacitor C110 connected between terminals 4 and 9 of the high voltage transformer.

18. The following are the voltages that can be expected at the various test points listed.

    Note: All voltage readings are taken at minimum contrast which occurs at full counterclockwise position of control.

	TEST POINT	VOLTAGE	REMARKS
Boosted B+	pin #3, V21	+ 275 to + 325 V	DC
	pin #3, V23	+ 230 to + 290 V	DC
+ 165V Bus	lug 3, R87	+ 140 to + 190 V	DC
B-	Hor. Center terminal "E"	- 115 to - 145 V	DC
RF Bias	terminal "S"	- 18 to - 25 V	DC
IF Bias	terminal "Q"	- 7 to - 9 V	DC
Hor. Drive	pin #5, V19 (6BG6) or pin #6 of V18 or V19 (7A5)	55 to 75 V Peak to Peak	Use Scope
Vert. Drive	junction C94 & C95	20 to 25 V Peak to Peak	Use Scope

19. If sound cuts on and off or takes 3 to 15 minutes to reach proper level, replace coil L18 connected to terminal 5 of discriminator transformer T1.

20. If receiver blows fuses, check for arcing in tubes V22 and V23. A short in the filament circuits can also cause the fuse to blow.

IF ALIGNMENT PROCEDURE

FOR CODE MC AND MD CHASSIS

Briefly, the detailed procedure may be analyzed as follows: connect the high side of the signal generator to IF Test Input (see Fig. 5) and the grounded side of the generator is connected directly to receiver chassis ground. The first adjustment is made at 34.5 megacycles, adjusting L29 for maximum output with the vacuum tube voltmeter connected between terminals "G" and "E" on the terminal strip of the IF sub-chassis assembly. The input signal should be adjusted to produce a 1-1/2 to 2-1/2 volt reading on the VTVM. The signal generator is then adjusted to 32.9 MC and L14, and L23 adjusted to produce the maximum output voltage.

The signal generator is then adjusted to 31.625 MC and L26 adjusted to produce a maximum voltage at "G" and "E". If L54 is adjusted near the minimum point, it may be very difficult to obtain a satisfactory reading between "G" and "E" when adjusting L26. This again is not important, for L26 will be rechecked and adjusted when the voltmeter is connected to the output of the sound discriminator. With L26 peaked roughly to 31.625 MC, adjust L54 to produce a minimum voltage between terminals "G" and "E". Then connect the VTVM from terminal "A" to chassis and peak L26, L54, L28, L27 and L16 to 31.625 MC. The signal input level should be adjusted to maintain a maximum of 4 volts from "A" to chassis at all times, to prevent limiting. These adjustments should be repeated several times to be sure that all coils are peaked at exactly the same frequency. If they are badly out of adjustment, it is advisable to return the VTVM to terminals "G" and "E" and check L54 to be sure that it is adjusted to produce a minimum voltage at exactly this same frequency.

Oscillation within the receiver circuits may be detected by an excessive and unstable voltage output at terminals "G" and "E" exceeding 5 or 6 volts as a minimum and very often exceeding 10 volts. To be sure the set is not oscillating and adjustments made to produce this oscillation rather than eliminate it, vary the signal generator input and notice if the voltage output varies correspondingly with the signal input. If it does not, some circuit must be oscillating.

After L29, L14, L23, L26, L54, L27, L28, and L16 have all been adjusted as outlined above, change the VTVM to terminal "B" and chassis and turn signal generator completely off. Note reading on VTVM. (Antenna input should be shorted to prevent any signal pickup through the RF stage.) Turn signal generator on and adjust L17 to produce the same voltage on the VTVM noted when no signal was applied. This point should occur approximately in the center (zero voltage) of the voltmeter reading, as it passes sharply from a positive to a negative voltage. Adjustment of L17 to this zero voltage should also produce a minimum of background noise and best tone quality from an FM signal of 31.625 MC center frequency.

The VTVM should be connected from "A" to ground when making the final adjustment on L26, since L54 has been adjusted to minimum response with the VTVM connected from "G" to "E". If L26 requires considerable adjustment in order to peak it, check L54 again with the VTVM connected between "G" and "E". This voltage should be a minimum after L26 is peaked to a maximum. Now adjust the signal generator to 35.9 MC, and adjust L24 for maximum output with the VTVM connected from "G" to "E".

Change the signal generator frequency to 37.625 MC and adjust L19 for maximum voltage between "G" and "E". If L22 is correctly adjusted for minimum response, it may be impossible to obtain a satisfactory reading at "G" and "E" for adjustment of L19. Therefore, L22 should be detuned slightly, but be very careful not to detune it any great amount, for it must be tuned finally to an absolute minimum, and if its adjustment is changed greatly after L19 is peaked, the initial adjustment of L19 will be altered. In other words, adjust L19 for maximum output with L22 adjusted to as near a minimum output as is possible to obtain a satisfactory reading between "G" and "E"

L19 should be rechecked to be sure that it is at maximum response and L22 at minimum.

Alignment of the mixer output stage L14 may be accomplished roughly by applying the signal to the mixer tube V3. But since access to this tube is rather difficult with the picture tube in place, it is suggested that the signal be applied to the antenna input directly. However, if any difficulty is encountered in adjustments, indicating that it is badly out of adjustment or that oscillation is taking place in the RF stage, then go back to V3 and apply the signal generator output to the tube shield of this tube in a similar manner as was done throughout the previous IF alignment. Erratic meter readings may be caused by the signal generator not being firmly grounded to the TV chassis especially when the generator is connected to the antenna input terminals. A good ground connection must be maintained between the signal generator and the TV chassis at all times. With the signal generator applied to the antenna output, adjust its frequency to 32.9 MC and adjust L14 and recheck L23 for maximum voltage output on VTVM connected from "G" to "E". Return the signal generator setting to 35.9 MC and recheck L24 and L20 for maximum output. Normally no difficulty should be encountered in feeding an IF signal through from the antenna terminals into the IF; but in case the antenna wavetraps (C141, C142, L50 and L51) are turned to the particular frequency one is attempting to apply to the IF, a very strong signal may be necessary unless the antenna plug is pulled out of the RF chassis and the signal generator input applied directly to the chassis jack. Even though the signal generator output is unbalanced to ground, this will make no difference as far as IF alignment is concerned, but it should be balanced when making RF adjustments.

FM ANTENNA

The FM antenna used in Models 235M1, 235B1, and 325M8 will not be found in the Replacement Parts List since the service man, by following the specifications in the drawing, Fig. 9, can very easily and inexpensively make the antenna himself.

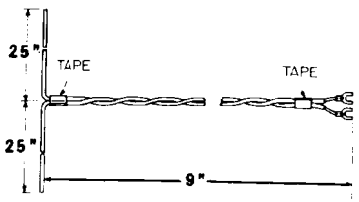


Fig. 9 - FM ANTENNA

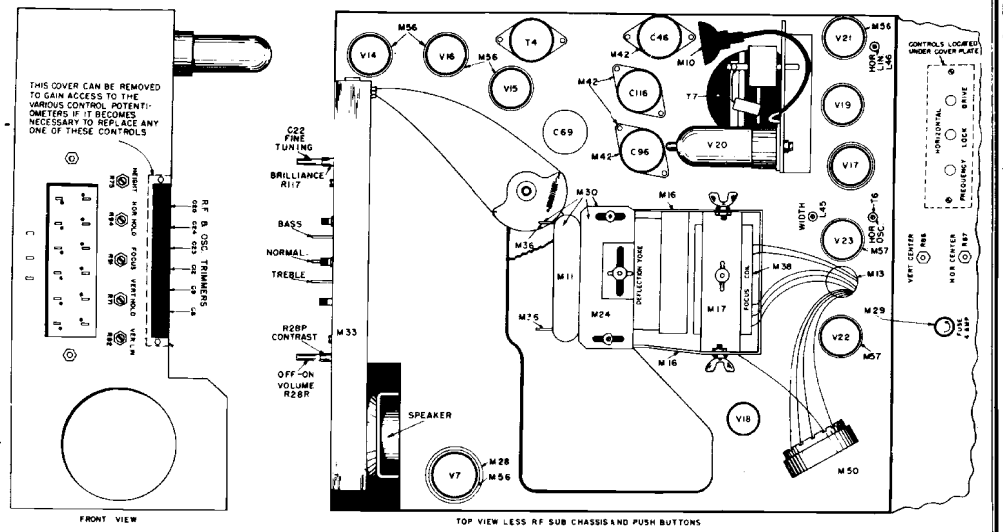


Fig. 10 - COMPONENT DIAGRAM - TOP VIEW OF MAIN CHASSIS, CODES MC AND MD

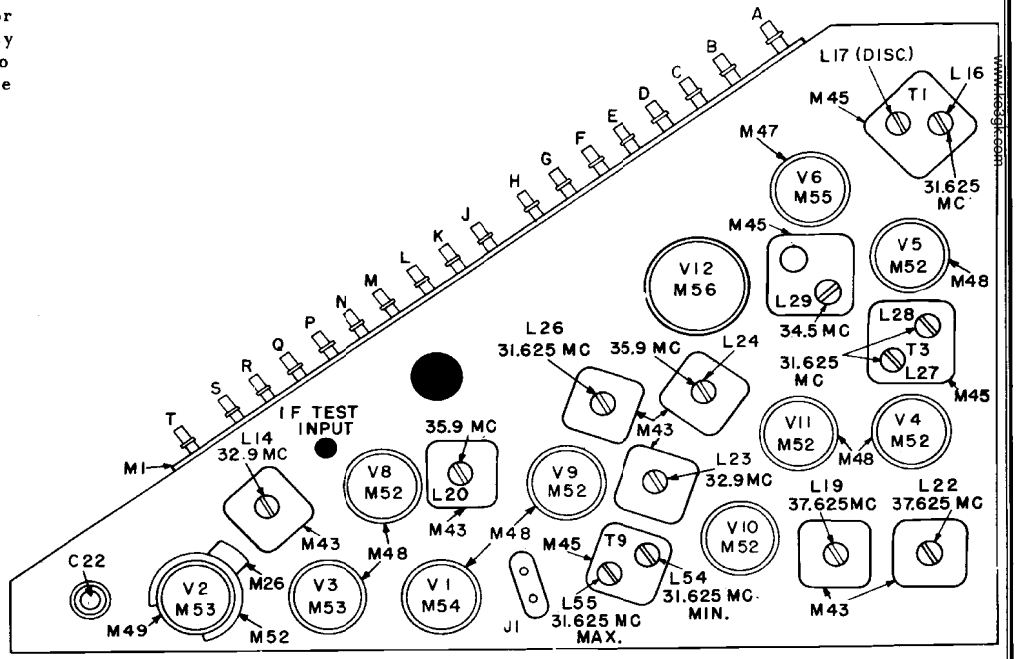


Fig. 11 - COMPONENT DIAGRAM - TOP VIEW RF CHASSIS, CODES MC AND MD

REPLACEMENT PARTS LIST

TV RECEIVER MODELS 235M1, 235B1 & 325M8

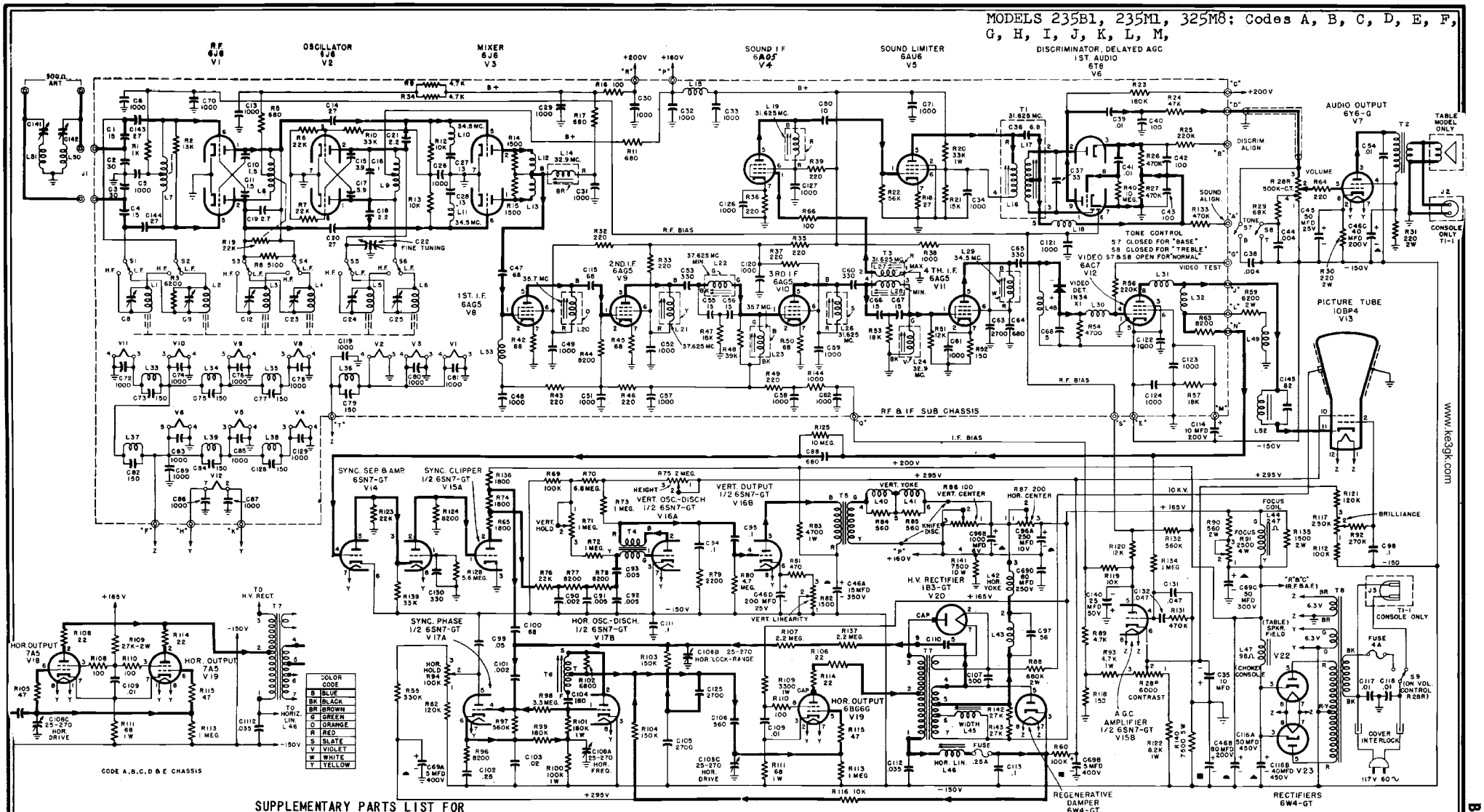
Used On Chassis Code	Bendix Stock No.	Symbol	Description
		ELECTRICAL COMPONENTS	
ALL	CC6B24	C1,4,55,56,66,67	CAPACITOR-Ceramic 15 mmf ±10% 500V
ALL	CC6B04	C2,3	CAPACITOR-Ceramic 30 mmf ±10% 500V
ALL	CC9M50	C5,6,13,26,28,30, 31,32,33,34,48,49, 51,52,57,58,59,61, 62,70,71,72,74,76, 78,80,81,83,85,86, 87,89,119,120,121, 122, 123, 124, 126, 127,129	CAPACITOR-Ceramic .001 mfd Min. Value 500V
ALL	CC9A34	C7,40,42,43	CAPACITOR-Ceramic 100 mmf 500V
ALL	AR0T00	C8,9,12,23,24,25, L1,2,3,4,5,6; S1, 2,3,4,5,6	ASSEMBLY-Coil and Pushbutton RF Tuner
ALL	CC9B12	C10,11	CAPACITOR-Ceramic 1.5 mmf ±10% 500V
ALL	CC6B27	C14,20,143,144	CAPACITOR-Ceramic 27 mmf ±10% 500V
ALL	CC8C17	C15,17	CAPACITOR-Ceramic 3.9 mmf ±.25 mmf 500V
ALL	CC8A10	C16	CAPACITOR-Ceramic 1 mmf ±25% 500V
ALL	CC8B14	C18,21	CAPACITOR-Ceramic 2.2 mmf ±.25 mmf 500V
ALL	CC6B15	C19	CAPACITOR-Ceramic 2.7 mmf ±.25 mmf 500V
ALL	CT1B04	C22	CAPACITOR-Fine Tuning Trimmer .8-1.1 mmf
ALL	CC6C02	C27,28	CAPACITOR-Ceramic 13 mmf ±5% 500V
A,B,C	CP2S60	C35	CAPACITOR-Paper .25 mfd +20% -10% 400V
D,E,F,G, H,J,K,L,M	CE1T08	C35	CAPACITOR-Electrolytic 10 mfd +100% -10% 200V
ALL	CC6B20	C36	CAPACITOR-Ceramic 6.8 mmf ±10% 500V
ALL	TI0D22	C36,L16,17(T1)	ASSEMBLY-Discriminator Transformer
ALL	CC0C28	C37	CAPACITOR-Ceramic 33 mmf ±10% 500V
ALL	CP2S16	C38,44	CAPACITOR-Paper .004 mfd ±10% 400V
ALL	CP3S31	C39,41,54,109	CAPACITOR-Paper .01 mfd 400V
ALL	CE1T07	C45	CAPACITOR-Electrolytic 50 mfd 25V
ALL	CE4A01	C46	CAPACITOR-Electrolytic 15 mfd 350V 80-40 mfd 200V 200 mfd 25V
ALL	CC6A32	C47,100,115	CAPACITOR-Ceramic 68 mmf 500V
ALL	CC6A27	C50	CAPACITOR-Ceramic 10 mmf 500V
ALL	CC9A40	C53,60,65,130	CAPACITOR-Ceramic 330 mmf 500V
ALL	CC9M55	C63	CAPACITOR-Ceramic 2700 mmf Min. Value 500V
ALL	CC9K44	C64	CAPACITOR-Ceramic 680 mmf 500V
ALL	CC8B08	C68	CAPACITOR-Ceramic 5 mmf ±10% 500V
ALL	CE4A02	C69	CAPACITOR-Electrolytic 5-5 mfd 400V 30 mfd 300V 80 mfd 250V
ALL	LF0C01	C73&L33,C75&L34, C77&L35,C79&L36, C82&L37,C84&L39, C128&L38	ASSEMBLY-Filament RF Choke
A,B,C,D,E, F,H	CC9A38	C88	CAPACITOR-Ceramic 220 mmf 500V
G,J,K,L,M	CC9K44	C88	CAPACITOR-Ceramic 680 mmf 500V
ALL	CP3S12	C90,101	CAPACITOR-Paper .002 mfd +40% -20% 600V
ALL	CP3S18	C91	CAPACITOR-Paper .005 mfd +40% -20% 600V
ALL	CP2S18	C92,93	CAPACITOR-Paper .003 mfd ±10% 400V
ALL	CP2S51	C94	CAPACITOR-Paper .1 mfd ±10% 400V
ALL	CP3S51	C95,98,111	CAPACITOR-Paper .1 mfd 400V
ALL	CE2A04	C96	CAPACITOR-Electrolytic 250 mfd 10V 1000 mfd 6V
ALL	LC0D00	C97; R84,85; L40, 41, 42, 43	ASSEMBLY-Deflection Yoke
ALL	CP3S40	C99	CAPACITOR-Paper .05 mfd 400V
ALL	CP2S60	C102	CAPACITOR-Paper .25 mfd +20% -10% 400V
ALL	CP3S34	C103	CAPACITOR-Paper .02 mfd 400V
ALL	CM6S40	C104	CAPACITOR-Silvered Mica 180 mmf ±10% 500V
ALL	CM6K67	C105,125	CAPACITOR-Mica 2700 mmf ±10% 500V
ALL	CC9M43	C106	CAPACITOR-Ceramic 560 mmf Min. Value 500V
ALL	CC9N45	C107	CAPACITOR-Ceramic 500 mmf +50% -20% 15KV
ALL	CT3A02	C108a, b, c	CAPACITOR-Trimmer
ALL	CC6A00	C110	CAPACITOR-Ceramic 5 mmf 500V
A,B,C,D,E	CP7S37	C112	CAPACITOR-Paper .035 mfd ±5% 600V
F,G,H,J,K,L,M	CP9S40	C112	CAPACITOR-Paper .05 mfd 600V
ALL	CP9S51	C113	CAPACITOR-Paper .1 mfd 600V
ALL	CE1T08	C114	CAPACITOR-Electrolytic 10 mfd +100% -10% 200V
ALL	CE2A03	C116	CAPACITOR-Electrolytic 50-40 mfd 425V
ALL	CP9S31	C117, 118	CAPACITOR-Paper .01 mfd 600V
ALL	CP3S39	C131, 132	CAPACITOR-Paper .047 mfd 400V
ALL	CE1T09	C140	CAPACITOR-Electrolytic 25 mfd 50V
ALL	TV0P01	C145, L52	ASSEMBLY-4.5 MC Trap
ALL	RC2T19	R1, 38	RESISTOR-Comp. 1000 ohms 1/2W
ALL	LI0T09	R2, L7	ASSEMBLY-RF Choke Coil
ALL	RC2R81	R3	RESISTOR-Comp. 6.2K ±5% 1/2W
		ELECTRICAL COMPONENTS—Continued	
ALL	RC2S10	R4	RESISTOR-Comp. 180 ohms ±10% 1/2W
ALL	RC2T17	R5, 17	RESISTOR-Comp. 680 ohms 1/2W
ALL	RC2T34	R6, 7, 76	RESISTOR-Comp. 22K 1/2W
ALL	RC2R80	R8	RESISTOR-Comp. 5.1K ±5% 1/2W
ALL	RC2T11	R9,32,33,35,36,37, 39,43,46,49,64	RESISTOR-Comp. 220 ohms 1/2W
ALL	RC2T36	R10	RESISTOR-Comp. 33K 1/2W
ALL	RC2T17	R11	RESISTOR-Comp. 680 ohms 1/2W
ALL	RC2R30	R12, 13	RESISTOR-Comp. 10K ±5% 1/2W
ALL	LF0R00	R14,15; L12,13	ASSEMBLY-Mixer Plate RF Choke
ALL	RC2T07	R16, 66, 110	RESISTOR-Comp. 100 ohms 1/2W
ALL	RC2S80	R18	RESISTOR-Comp. 27 ohms ±10% 1/2W
ALL	LI0T10	R19; L8	ASSEMBLY-RF Choke
ALL	RC3S36	R20, 61	RESISTOR-Comp. 33K ±10% 1W
ALL	RC2S32	R21	RESISTOR-Comp. 15K ±10% 1/2W
ALL	RC2S39	R22	RESISTOR-Comp. 56K ±10% 1/2W
ALL	RC2S45	R23, 99	RESISTOR-Comp. 180K ±10% 1/2W
ALL	RC2T38	R24	RESISTOR-Comp. 47K 1/2W
ALL	RC2T46	R25, 56	RESISTOR-Comp. 220K 1/2W
ALL	RC2T50	R26, 27, 133	RESISTOR-Comp. 470K 1/2W
ALL	RV0D00	R28 & S9	ASSEMBLY-With Switch 6K-R28P, 500K-R28R
ALL	RC2T52	R29	RESISTOR-Comp. 68K 1/2W
ALL	RC4S11	R30, 31	RESISTOR-Comp. 220 ohms ±10% 2W
ALL	RC2T66	R40	RESISTOR-Comp. 10 meg. 1/2W
A	RC2R31	R41	RESISTOR-Comp. 12K ±5% 1/2W
A	RC2S80	R42, 45, 50	RESISTOR-Comp. 27 ohms ±10% 1/2W
B Thru M	RC2S05	R42, 45, 50	RESISTOR-Comp. 68 ohms ±10% 1/2W
ALL	RC2R29	R44	RESISTOR-Comp. 8.2K ±5% 1/2W
ALL	RC2S33	R47, 53, 57	RESISTOR-Comp. 18K ±10% 1/2W
ALL	RC2S37	R48	RESISTOR-Comp. 39K ±10% 1/2W
ALL	RC2R31	R51	RESISTOR-Comp. 12K ±5% 1/2W
ALL	RC2S09	R52, 118	RESISTOR-Comp. 150 ohms ±10% 1/2W
ALL	RC2R26	R54	RESISTOR-Comp. 4.7K ±5% 1/2W
ALL	RC2S48	R55	RESISTOR-Comp. 330K ±10% 1/2W
ALL	RC4R67	R59	RESISTOR-Comp. 6.2K ±5% 2W
ALL	RC2T42	R60	RESISTOR-Comp. 100K 1/2W
A Thru K	RC2S41	R62	RESISTOR-Comp. 82K ±10% 1/2W
L, M	RC2S43	R62	RESISTOR-Comp. 120K ±10% 1/2W
ALL	RC2S29	R63, 77, 78, 96	RESISTOR-Comp. 8.2K ±10% 1/2W
ALL	RC3S21	R65, 74, 136	RESISTOR-Comp. 1.8K ±10% 1W
ALL	RC2S42	R69, 112	RESISTOR-Comp. 100K ±10% 1/2W
ALL	RC2S64	R70	RESISTOR-Comp. 6.8 meg ±10% 1/2W
ALL	RV4C04	R71	RESISTOR-Pot. 1 meg
ALL	RC2T34	R72, 113, 134	RESISTOR-Comp. 1 meg 1/2W
ALL	RC2S54	R73	RESISTOR-Comp. 1 meg ±10% 1/2W
ALL	RV4C05	R75	RESISTOR-Pot. 2 meg
ALL	RC2S32	R79	RESISTOR-Comp. 2.2K ±10% 1/2W
ALL	RC2T62	R80	RESISTOR-Comp. 4.7 meg 1/2W
ALL	RC2T15	R81	RESISTOR-Comp. 470 ohms 1/2W
ALL	RV0C08	R82	RESISTOR-Pot. 1.5K
ALL	RC3T26	R83	RESISTOR-Comp. 4.7K 1W
ALL	LC0D00	R84, 85; C97; L40, 41, 42, 43	ASSEMBLY-Deflection Yoke
A,B,C,D,E, F,G,J	RV0C05	R86	RESISTOR-Pot. 20 ohms

MODELS 235B1, 235M1, 325M8; Codes A, B, C, D, E, F, G, H, I, J, K, L, M

H,K,L,M	RV0C06	R86	RESISTOR-Pot. 100 ohms
A,B,C,D,E, F,G,J	RV0C06	R87	RESISTOR-Pot. 100 ohms
H,K,L,M	RV0W00	R87	RESISTOR-Pot. 200 ohms
ALL	RC4T52	R88	RESISTOR-Comp. 680K 2W
ALL	RC2S26	R89	RESISTOR-Comp. 4.7K ±10% 1/2W
ALL	RC4S16	R90	RESISTOR-Comp. 560 ohms ±10% 2W
ALL	RV0C07	R91	RESISTOR-Pot. 2.5K
ALL	RC2S47	R92	RESISTOR-Comp. 270K ±10% 1/2W
ALL	RC3S26	R93	RESISTOR-Comp. 4.7K ±10% 1W
ALL	RV0C10	R94	RESISTOR-Pot. 100K
ALL	RC2S51	R97, 132	RESISTOR-Comp. 360K ±10% 1/2W
ALL	RC2T60	R98	RESISTOR-Comp. 3.3 meg 1/2W
ALL	RC3S42	R100	RESISTOR-Comp. 100K ±10% 1W
ALL	RC3R45	R101	RESISTOR-Comp. 180K ±5% 1W
ALL	RC2S28	R102	RESISTOR-Comp. 6.8K ±10% 1/2W
ALL	RC2S44	R103	RESISTOR-Comp. 150K ±10% 1/2W
A,B,C,D,E	RC2S43	R104	RESISTOR-Comp. 120K ±10% 1/2W
F Thru M	RC2S44	R104	RESISTOR-Comp. 150K ±10% 1/2W
A,B,C,D,E	RC2T04	R105	RESISTOR-Comp. 47 ohms 1/2W
ALL	RC2T02	R106, 114	RESISTOR-Comp. 22 ohms 1/2W
ALL	RC2S58	R107, 137	RESISTOR-Comp. 2.2 meg ±10% 1/2W
A,B,C,D,E	RC2T07	R108	RESISTOR-Comp. 100 ohms 1/2W
A,B,C,D,E	RC4S35	R109	RESISTOR-Comp. 27K ±10% 2W
F Thru M	RC3S24	R109	RESISTOR-Comp. 3.3K ±10% 1W
ALL	RC4S05	R111	RESISTOR-Comp. 68 ohms ±10% 2W
ALL	RC2T04	R115	RESISTOR-Comp. 47 ohms 1/2W
ALL	RC2T30	R116	RESISTOR-Comp. 10K 1/2W
ALL	RV0C11	R117	RESISTOR-Pot. 250K
ALL	RC2S30	R119	RESISTOR-Comp. 10K ±10% 1/2W
ALL	RC2S31	R120	RESISTOR-Comp. 12K ±10% 1/2W
ALL	RC2S43	R121	RESISTOR-Comp. 120K ±10% 1/2W
ALL	RC3S29	R122	RESISTOR-Comp. 8.2K ±10% 1W
ALL	RC2S34	R123	RESISTOR-Comp. 22K ±10% 1/2W
A,B,C	RC2S21	R124	RESISTOR-Comp. 1.8K ±10% 1/2W
D Thru M	RC2S29	R124	RESISTOR-Comp. 8.2K ±10% 1/2W
A,B,C,D,E,F,H	RC2S63	R125	RESISTOR-Comp. 5.6 meg ±10% 1/2W
G,J,K,L,M	RC2T66	R125	RESISTOR-Comp. 10 meg 1/2W
A,B,C,D,E,F,H	RC2S36	R126	RESISTOR-Comp. 1.5 meg ±10% 1/2W
A,B,C,D,E,F,H	RC2S46	R127	RESISTOR-Comp. 220K ±10% 1/2W
ALL	RC2S63	R128	RESISTOR-Comp. 5.6 meg ±10% 1/2W
ALL	RC2S50	R131	RESISTOR-Comp. 470K ±10% 1/2W
A,B,C,D,E	RC3S24	R135	RESISTOR-Comp. 3.3K ±10% 1W
F Thru M	RC4S20	R135	RESISTOR-Comp. 1.5K ±10% 2W
A,B,C	RC2S60	R138	RESISTOR-Comp. 3.3 meg ±10% 1/2W
D Thru M	RC2S36	R139	RESISTOR-Comp. 33K ±10% 1/2W
F Thru M	RW5B35	R140	RESISTOR-Wirewound 7.5K ±10% 5W
F Thru M	RW0B35	R141	RESISTOR-Wirewound 7.5K ±10% 10W
F Thru M	RC4S35	R142, 143	RESISTOR-Comp. 27K ±10% 2W
F Thru M	RC2T19	R144	RESISTOR-Comp. 1000 ohms 1/2W
ALL	AR0T00	L1, 2, 3, 4, 5, 6; C8, 9, 12, 23, 24, 25; S1, 2, 3, 4, 5, 6	ASSEMBLY-Coil and Pushbutton RF Tuner
ALL	LI0T09	L7; R2	ASSEMBLY-RF Choke
ALL	LI0T10	L8, R19	ASSEMBLY-RF Choke
ALL	LI0T13	L9	COIL-RF Choke
ALL	LI0T12	L10, 11	COIL-IF Choke 34.5 MC
ALL	LF0R00	L12, 13; R14, 15	ASSEMBLY-Mixer Plate RF Choke
ALL	LI0T00	L14	COIL-IF Choke 35.9 MC
ALL	LF0A06	L15, 18, 48	COIL-Decoupling Choke
ALL	TI0D22	L16, 17; C36 (T1)	ASSEMBLY-Discriminator Transformer
ALL	LI0T01	L19	COIL-IF 31.625 MC
ALL	LI0T02	L20	COIL-IF 33.1 MC

MODELS 235B1, 235M1, 325M8; Codes A, B, C, D, E, F, G, H, I, J, K, L, M

		ELECTRICAL COMPONENTS—Continued	
ALL	L10T03	L21	COIL-IF 37.625 MC
ALL	L10T04	L22	COIL-IF 37.625 MC
ALL	L10T05	L23	COIL-IF 35.9 MC
ALL	L10T06	L24	COIL-IF 33.1 MC
A, B, C, D, E	LF0A86	L25	COIL-Decoupling Choke
ALL	L10T07	L26	COIL-IF 31.625 MC
ALL	T30U2	L27, 28 (T3)	ASSEMBLY-Sound Trap
ALL	L10T08	L29	COIL-IF 34.5 MC
ALL	LC0V00	L30	COIL-Video Grid Peaking
ALL	LC0V02	L31	COIL-Video Peaking
ALL	LC0V01	L32	COIL-Video Peaking
ALL	LF0C01	L33 & C73, L34 & C74, L35 & C77, L36 & C79, L37 & C82, L38 & C128, L39 & C84	ASSEMBLY-Filament RF Choke
ALL	LC0D00	L40, 41, 42, 43; C97; R84, 85	ASSEMBLY-Deflection Yoke
ALL	LC0F00	L44	COIL-Focus
ALL	LC0W00	L46	COIL-Width Control
ALL	LC0L00	L48	COIL-Hor. Linearity
ALL	LC0V03	L49	COIL-Video Peaking
ALL	T30U01	L50, 51	ASSEMBLY-Wave Trap
ALL	TV0F01	L52; C145	ASSEMBLY-4.5 MC Trap
B Thru M	LF0A06	L53	COIL-Decoupling Choke
ALL	T30U22	T1 (L16, 17; C36)	ASSEMBLY-Discriminator Transformer
ALL	TA0O18	T2	TRANSFORMER-Audio Output
ALL	T30U02	T3 (L27, 28)	ASSEMBLY-Sound Trap
ALL	TC0V00	T4	TRANSFORMER-Vertical Oscillator
ALL	TS0V00	T5	TRANSFORMER-Vertical Output
ALL	TA0S00	T6	TRANSFORMER-Synchroguide
A, B, C, D, E	TS0H00	T7	TRANSFORMER-Hor. Output & High Voltage
F, G, H, J, K, L, M	TS0H01	T7	TRANSFORMER-Hor. Output & High Voltage
ALL	TP0V00	T8	TRANSFORMER-Power
ALL	T30P00		TRAP-Ion, Picture Tube Magnet
ALL	AR0T00	S1, 2, 3, 4, 5, 6; C8, 9, 12, 23, 24, 25; L1, 2, 3, 4, 5, 6	ASSEMBLY-Coil and Pushbutton RF Tuner
ALL	SS3P00	S7, 8	SWITCH-3 Pushbutton Tone Control
ALL	RV0H00	S9 & R28	ASSEMBLY-Pot. With Switch
ALL	SP4O00		SPEAKER-E.D. 4" x 6"
		ELECTRICAL COMPONENTS—Continued	
ALL	IN34	X1	CRYSTAL
ALL	FC0W00		FUSE-Type 3AG 6 Amperes
F Thru M	FC0M01		FUSE-Type 3AG .25 Amperes
		MECHANICAL COMPONENTS	
ALL	BT0S00	M1	BOARD-Terminal 18 Lug 3 Mtg.
ALL	BT1S01	M2	BOARD-Terminal 1 Lug 1 Mtg.
ALL	BT1S03	M8	BOARD-Terminal 1 Lug 1 Mtg.
ALL	BT2S01	M4	BOARD-Terminal 2 Lug 1 Mtg.
ALL	BT3S06	M5	BOARD-Terminal 3 Lug 1 Mtg.
ALL	BT4S05	M6	BOARD-Terminal 4 Lug 1 Mtg.
ALL	BT4S06	M7	BOARD-Terminal 4 Lug 1 Mtg.
ALL	BT8S00	M8	BOARD-Terminal 8 Lug 2 Mtg.
ALL	CD0N03	M9	CABLE-Dial
ALL	CH0A00	M10	CONNECTOR-High Voltage Anode
ALL	CR0S00	M11A	CUSHION-Rubber Lower Yoke
ALL	CR0S01	M11B	CUSHION-Rubber Upper Yoke
ALL	CS0M08		COVER-Efficiency Controls, Rear Shield
D Thru M	GR0S01		GROMMET-Pushbutton Actuator Mtg.
F Thru M	GR0S15		GROMMET-Tube V17 Shockmount
ALL	GR0S20	M12	GROMMET-Rubber Kinescope Cathode Lead-in Insulator
ALL	GR0S21	M13	GROMMET-Rubber Kinescope Lead-in Insulator
ALL	GR0S22	M14	GASKET-Rubber 33-1/4" x 3" x 3/16"
F Thru M	GR0S24		GROMMET-Rubber Kinescope Lead-in Insulator
ALL	HR1W00	M15	BRACKET-Pulley Mtg.
ALL	HR1W01	M16	BRACKET-Focus Coil & Tube Yoke Mtg.
ALL	HR1W02	M17	BRACKET-Tube Yoke Mtg.
ALL	HR1W03	M18	BRACKET-Tone Control Mtg.
ALL	HR1W04	M19	BRACKET-Fine Tuning Shaft Mtg. Stop
ALL	HR1W06	M20	BRACKET-Pulley Mtg.
D Thru M	HR1W15		BRACKET-Tuner Mtg. (Left)
D Thru M	HR1W16		BRACKET-Tuner Mtg. (Right)
ALL	HC0W07	M21	CLAMP-Tube Shield Base 1" Mtg. Dimen.
ALL	HC0W08	M22	CLAMP-Tube Shield Base 1.125" Mtg. Dimen.
ALL	HC0W09	M23	CLAMP-Tube Shield Base 1" Mtg. Dimen.
ALL	HC0N00	M24	CLAMP-Focus Coil Nut
ALL	HC0S12	M25	CLIP-Tube Shield Retainer Spring
ALL	HC0S13	M26	CLIP-Tube Shield Retainer Spring
ALL	HC0N71	M27	CLIP-Retainer Kinescope Mtg.
ALL	HC0T01	M28	CLAMP-Tube
ALL	HH0F00	M29	HOLDER-Fuse
ALL	HH0W00	M30	HOOD-Kinescope Tube Mtg.
ALL	HP0P13	M31	PLATE-Perforated, Front
ALL	HR0W00	M32	RING-Lower Kinescope Mtg. Section
ALL	HR0W02	M33	RING-Upper Kinescope Mtg. Section
ALL	HR0S14		RIVET-Shoulder (.375 x .118)
ALL	HR0S15		RIVET-Shoulder (.068 x .258)
ALL	HR0S16		RIVET-Shoulder (.25 x .083)
ALL	HS0C75	M34	SPRING-Fine Tuning Drive
ALL	HS0C79	M35	SPRING-Tube Mtg. Tension
D Thru M	HN0F25		SPACER-Pushbutton Actuator Mtg.
ALL	HS0P27		SPACER-Power Trans. Mtg.
ALL	HS0P28		SPACER-Plain IF Chassis Mtg.
ALL	HN0S18		SCREW-Shoulder #8-32 x 9/64
ALL	HS0X11	M36	SPRING-Kinescope Ground
ALL	HW0S00		WASHER-Spring O.D. 1/2", I.D. 7/32"
ALL	IF0P00	M37	INSULATOR-Bakelite High Voltage Shield
ALL	IN0R00	M38	INSULATOR-Focus Coil Rubber Liner
ALL	JP2O08	J1	PLUG-2 Contact
ALL	JR2O13	J1	RECEPTACLE-2 Contact
ALL	MP0D05	M39	PULLEY-Drive (Fine Tuning Shaft)
ALL	MP0D06	M40	PULLEY-Drive (Fine Tuning Capacitor)
ALL	MP0I00	M41	PULLEY-Idler
ALL	PB0C01	M42	PLATE-Mtg.
F Thru M	PM0T00		PLATE-Tube Mtg. (V17)
ALL	SM0C07		SHIELD-Brass (Corona)
ALL	SM0C08	M43	SHIELD-Metal, Small Coil
ALL	SM0P00	M44	SHIELD-Perforated Metal, Hor. Sweep
ALL	SM0P01	M45	SHIELD-Metal, IF & RF
ALL	SM0P02	M46	SHIELD-Metal Plate
ALL	SM0T06	M47	SHIELD-Miniature Tube
ALL	SM0T08	M48	SHIELD-Miniature Tube
ALL	SM0T09	M49	SHIELD-Tube (With Damper)
ALL	SO2K00	M50	SOCKET-Kinescope Tube, 12 Pin
ALL	SO0L06	M51	SOCKET-Tube, Molded Loktal
ALL	SO7M08	M52	SOCKET-Min. Tube, Lam., 7 Prong
ALL	SO7M12	M53	SOCKET-Min. Tube, Lam. Special, 7 Prong
ALL	SO7M13	M54	SOCKET-Min. Tube, Lam. Special, 7 Prong
D Thru M	SO7M14		SOCKET-Miniature Tube 7 Prong
ALL	SO9M00	M55	SOCKET-Min. Tube, Lam., 9 Prong
ALL	SO8S04	M56	SOCKET-Tube, Molded Octal 8 Pin 4 Gnd. Lug
ALL	SO8S05	M57	SOCKET-Tube, Molded Octal 8 Pin 3 Gnd. Lug
		CABINET COMPONENTS	
ALL	BP0B04		BUTTON-Push Tone Control
ALL	BP0B05		BUTTON-Push Channel
ALL	BZ0A03		BASE-Cabinet
ALL	BZ0B21		BACK-Cabinet
ALL	BZ0M00		BUMPER-Cabinet, Metal (Model 235M1)
ALL	BZ0M01		BUMPER-Cabinet, Metal (Model 235B1)
ALL	BZ0R07		BUMPER-Rubber
ALL	EC0P03		ESCUTCHEON-Control Plastic
ALL	EP0P00		ESCUTCHEON-Picture Plastic
ALL	EX0C00		COVER-Control Escutcheon Plastic
ALL	FM0P00		FRAME-Metal (Picture Tube)
ALL	GZ0M27		GRILLE-Perforated Metal (Model 235M1)
ALL	GZ0M31		GRILLE-Perforated Metal (Model 235B1)
ALL	GZ0M00		GLASS-Safety
ALL	HC0S74		CLIP-Picture Frame Retainer Spring
A, B, C, D, E	HC0S75		CLIP-Removable Cover Retainer
F Thru M	HC0S85		CLIP-Removable Cover Retainer
ALL	HK0R00		RING-Knob Retainer
ALL	HK0R13		KNOB-Brass Door
ALL	HZ0C11		CATCH-Bullet
ALL	HZ0H12		HINGE-Door (Model 235M1) Lower Right & Upper Left
ALL	HZ0H13		HINGE-Door (Model 235M1) Upper Right & Lower Left
ALL	HZ0H18		HINGE-Door (Model 235B1) Upper Right & Lower Left
ALL	HZ0H19		HINGE-Door (Model 235B1) Lower Right & Upper Left
ALL	KC0B18		KNOB-Outer Concentric Control
ALL	KC0B19		KNOB-Inner Concentric Control
ALL	PF0S00		PAD-Felt (Speaker Baffle)
ALL	ZD1A00		DOOR-Cabinet, Pair (Model 235M1)
ALL	ZD1A01		DOOR-Cabinet, Pair (Model 235B1)
ALL	ZW0T00		CABINET-Model 235M1
ALL	ZW0T01		CABINET-Model 235B1
		PARTS COMMON TO CONSOLE MODEL 325M8	
	AL0Z15		ANTENNA-AM Loop
	LF0I01	L47	COIL-Filter Reactor
	SP1R92		SPEAKER-PM 12"
	AJ2P00		ASSY-Plate Cover With AC & Phono Receptacles
	HB1M01		BRACKET-Focus Coil & Tube Yoke Mtg.
	JR2O11		RECEPTACLE-2 Contact AC Power
	JR1S00		RECEPTACLE-Single Contact Spk. Voice Coil
		CABINET COMPONENTS	
	BT3S00		BOARD-Terminal 3 Lug 2 Mtg.
	BZ0B25		BACK-Television Cabinet Cover
	BZ0B28		BACK-Radio Cabinet Cover
	BZ0D43		BAFFLE-Cardboard & Cloth (No Cut-out)
	BZ0D44		BAFFLE-Cardboard & Cloth (With Cut-out)
	D00C00		DIAL-AM - FM Scale
	ED0P00		ESCUTCHEON-Plastic Dial & Control
	GB0S15		GROMMET-Shockmount 5/16 I.D. x 7/8 O.D.
	GZ0M28		GRILLE-Metal
	HB0M00		BRACKET-Radio Chassis Front Shockmount
	HB0M03		BRACKET-Radio Chassis Rear Shockmount
	HC0R00		CLIP-Runner Stop
	HC0S10		CLIP-Knob Retainer Spring
	HC0S68		CLIP-Concentric Knob Retainer Spring
	HC0S00		CLIP-Dial Retainer
	HK0K00		KNOB-Key Pull
	HK0T00		KNOB-Tray Pull
	HS0S14		STUD-Escutcheon Retainer
	HT0T00		TRACK-Record Changer
	HZ0C07		CATCH-Bullet
	HZ0G01		GLIDE-Metal
	HZ0H14		HANDLE-Door
	HZ0H15		HINGE-Lower R.H.
	HZ0H16		HINGE-Upper
	HZ0H17		HINGE-Lower L.H.
	JP1O02		PLUG-Phono, Single Contact
	JP2O07		PLUG-2 Contact
	KC0S16		KNOB-Radio Control
	KY0S02		KNOB-Radio Concentric
	MS0F01		RUNNER-Plain, Record Changer
	MS0G01		RUNNER-Guide, Record Changer
	SC0T03		SHIELD-Composition, Tray
	WF0F17		WASHER-Brown Felt 5/8 x 1-3/16 x 1/16
	ZW1G03		CABINET-Console

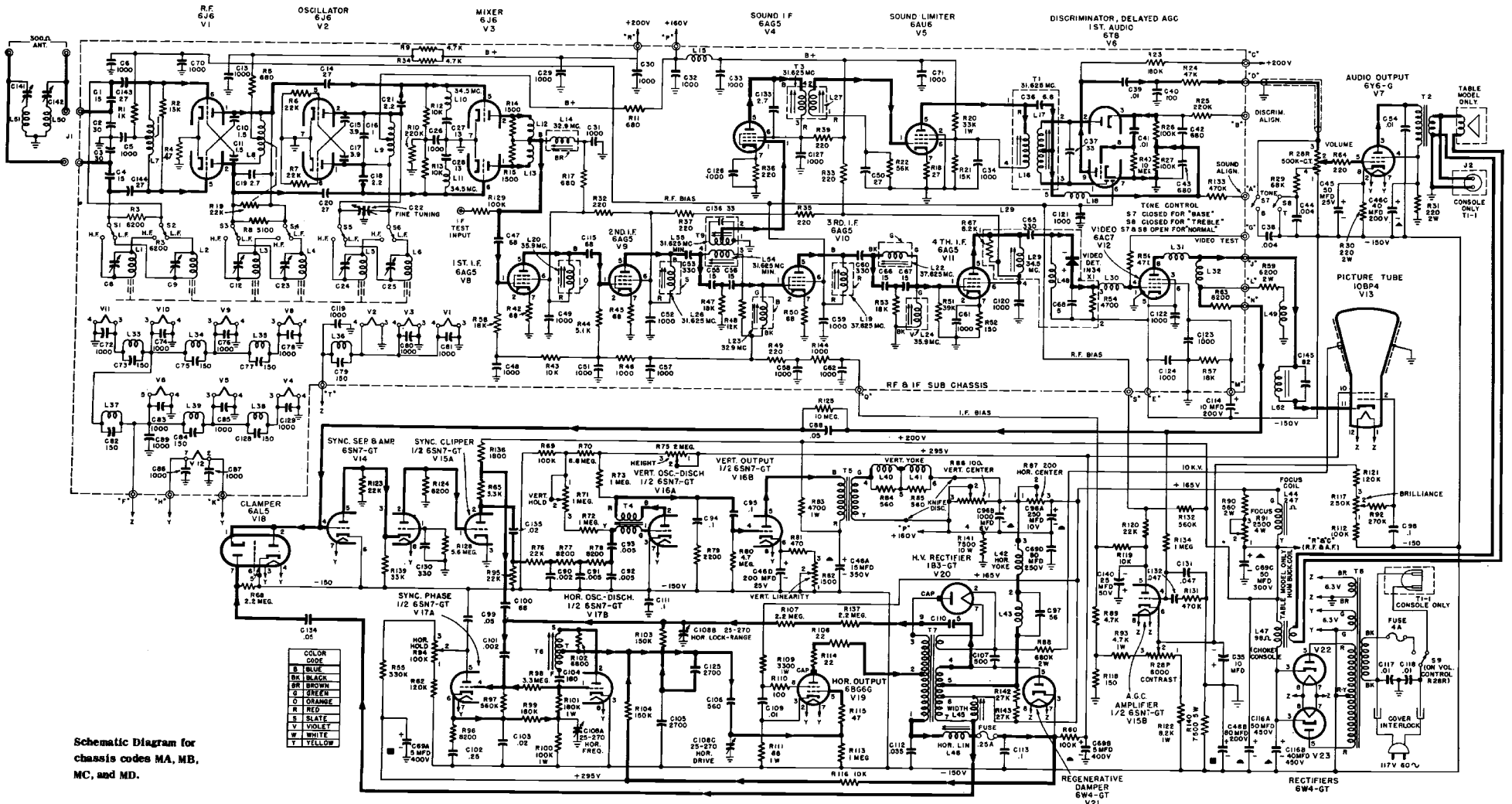


COLOR CODE	
B	BLUE
BK	BLACK
BR	BROWN
G	GREEN
O	ORANGE
R	RED
S	SLATE
V	VIOLET
W	WHITE
Y	YELLOW

SUPPLEMENTARY PARTS LIST FOR CHASSIS CODES MA, MB, MC, AND MD

USED ON CHASSIS CODE(S)	STOCK NO.	SYMBOL NO.	DESCRIPTION
MA, MB, MC, MD	CC9K44	C42, 43	CAPACITOR—Ceramic 680 mmf 300V
MA, MB	CC6A22	C50	CAPACITOR—Ceramic 10 mmf 500V
MC, MD	CC6B27	C50	CAPACITOR—Ceramic 27 mmf ±10% 500V
MA, MB	CC9M55	C63	CAPACITOR—Ceramic 2700 mmf Min. Value 500V
MA, MB	CC9K44	C64, 88	CAPACITOR—Ceramic 680 mmf 500V
MC, MD	CP3S40	C88	CAPACITOR—Paper .05 mfd 400V
MC, MD	CC6B15	C133	CAPACITOR—Ceramic 2.7 mmf 500V
MC, MD	CP9S40	C134	CAPACITOR—Paper .05 mfd 600V
MB, MC, MD	CP3S34	C135	CAPACITOR—Paper .02 mfd 400V
MD	RC2S04	B4	RESISTOR—Comp. 47 ohms ±10% 1/2W
MA, MB, MC	RC2T36	R10	RESISTOR—Comp. 33K 1/2W
MD	RC2S46	R10	RESISTOR—Comp. 220K ±10% 1/2W
MA, MB, MC	RC2T07	R16	RESISTOR—Comp. 100 ohms 1/2W
MA, MB, MC, MD	RC2S42	R26, 27	RESISTOR—Comp. 100K ±10% 1/2W
MA, MB	RC2T19	R38	RESISTOR—Comp. 100 ohms 1/2W
MA, MB	RC2T11	R43	RESISTOR—Comp. 220 ohms 1/2W
MC, MD	RC2T30	R43	RESISTOR—Comp. 10K 1/2W
MA, MB	RC2R29	R44	RESISTOR—Comp. 8.2K +5% 1/2W

MODELS 235B1, 235M1, 325M8; Codes MA, MB, MC, MD



Schematic Diagram for chassis codes MA, MB, MC, and MD.

COLOR CODE	
B	BLUE
BK	BLACK
BR	BROWN
G	GREEN
O	ORANGE
R	RED
S	SLATE
V	VIOLET
W	WHITE
Y	YELLOW

MC, MD	RC2R80	R44	RESISTOR—Comp. 5.1K ±5% 1/2W
MA, MB	RC2T11	R46	RESISTOR—Comp. 220 ohms 1/2W
MC, MD	RC2T19	R46	RESISTOR—Comp. 1000 ohms 1/2W
MA, MB	RC2S37	R48	RESISTOR—Comp. 39K ±10% 1/2W
MC, MD	RC2R31	R48	RESISTOR—Comp. 12K ±5% 1/2W
MA, MB	RC2R31	R51	RESISTOR—Comp. 12K ±5% 1/2W
MC, MD	RC2S37	R51	RESISTOR—Comp. 39K ±10% 1/2W
MA, MB	RC2T46	R56	RESISTOR—Comp. 220K 1/2W
MC, MD	RC2T38	R56	RESISTOR—Comp. 47K 1/2W
MA, MB, MC, MD	RC2S33	R58	RESISTOR—Comp. 18K ±10% 1/2W
MA	RC3S21	R65	RESISTOR—Comp. 1.8K ±10% 1W
MB, MC, MD	RC3S24	R65	RESISTOR—Comp. 3.3K ±10% 1W
MA, MB	RC2T07	R66	RESISTOR—Comp. 100 ohms 1/2W
MC, MD	RC2829	R67	RESISTOR—Comp. 8.2K ±10% 1/2W
MC, MD	RC2858	R68	RESISTOR—Comp. 2.2 meg ±10% 1/2W
MA	RC3821	R74	RESISTOR—Comp. 1.8K ±10% 1W
MB, MC, MD	RC2834	R95	RESISTOR—Comp. 22K ±10% 1/2W
MA, MB	RC2S31	R120	RESISTOR—Comp. 12K ±10% 1/2W
MC, MD	RC2S33	R120	RESISTOR—Comp. 22K ±10% 1/2W
MC, MD	RC2T42	R129	RESISTOR—Comp. 100K 1/2W
MA, MB	L10T03	L21	COIL—IF 37.625MC
MA, MB	T10I02	T3 (L27, 28)	ASSEMBLY—Sound Trap & Takeoff
MC, MD	T10I02	T3 (L27, 28)	TRANSFORMER—1st Sound IF Interstage
MC, MD	T10I03	T9 (L54, 55)	ASSEMBLY—Sound Trap & Takeoff
MC, MD	SOTM07		SOCKET—Miniature Octal Tube