Motorola® Television

MODELS
10VT3 Series
10VK9 Series

CHASSIS
TS-9D1
TS-9E

SERVICE MANUAL SUPPLEMENT

SUPPLEMENT TO TELEVISION SERVICE MANUAL #54P780232-A

INTRODUCTION

This manual is a supplement to Service Manual #54P780232-A and it includes alignment information, replacement parts list, voltage charts and circuit diagrams for television chassis TS-9D1 and TS-9E, used in 10VT3 and 10VK9 cabinets.

DESCRIPTION OF CHASSIS

Chassis TS-9D1. Same as Chassis TS-9D, except 3rd video IF tube, V-5 (6BA6), replaced with a 6AG5 tube for greater IF gain. The plate voltages on the video amplifier and pulse amplifier tubes are increased to improve horizontal holding at high contrast levels. This chassis has 23 tubes plus a 10" picture tube.

Chassis TS-9E. Same as Chassis TS-9D1, except that a new RF tuner with variable antenna trimmers and new antenna coils is used, to improve overall sensitivity.

ANTENNA CONNECTIONS
OPERATING CONTROLS
SERVICE ADJUSTMENT CONTROLS

Same as for Chassis TS-9D.

ALIGNMENT

The alignment procedure for Chassis TS-9D1 is the same as for Chassis TS-9D. Since the TS-9E tuner contains a new antenna coil and additional trimmers, its complete alignment is as follows:

1. Refer to Figure 1 for the coil and trimmer locations and for the alignment frequencies of each channel.

2. Connect the AM signal generator output cable to the antenna terminals of the receiver. Match the generator to the 300 ohm input impedance of the receiver by using a 100 ohm resistor in series with the output terminal of the generator cable and a 150 ohm resistor in series with the ground terminal. This arrangement is for a 50 ohm generator. If the generator impedance is 30 ohms, use a 120 ohm resistor on the output terminal and 150 ohms in series with the ground terminal.

3. Set the contrast control for -5 volts bias. (Measured from arm of contrast control to chassis).

4545 AUGUSTA BOULEVARD Motorola Inc. CHICAGO 51, ILLINOIS

PART NO. 54P791208

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4. Connect the electronic voltmeter across the volume control.

5. Turn the channel selector to the channel to be aligned.

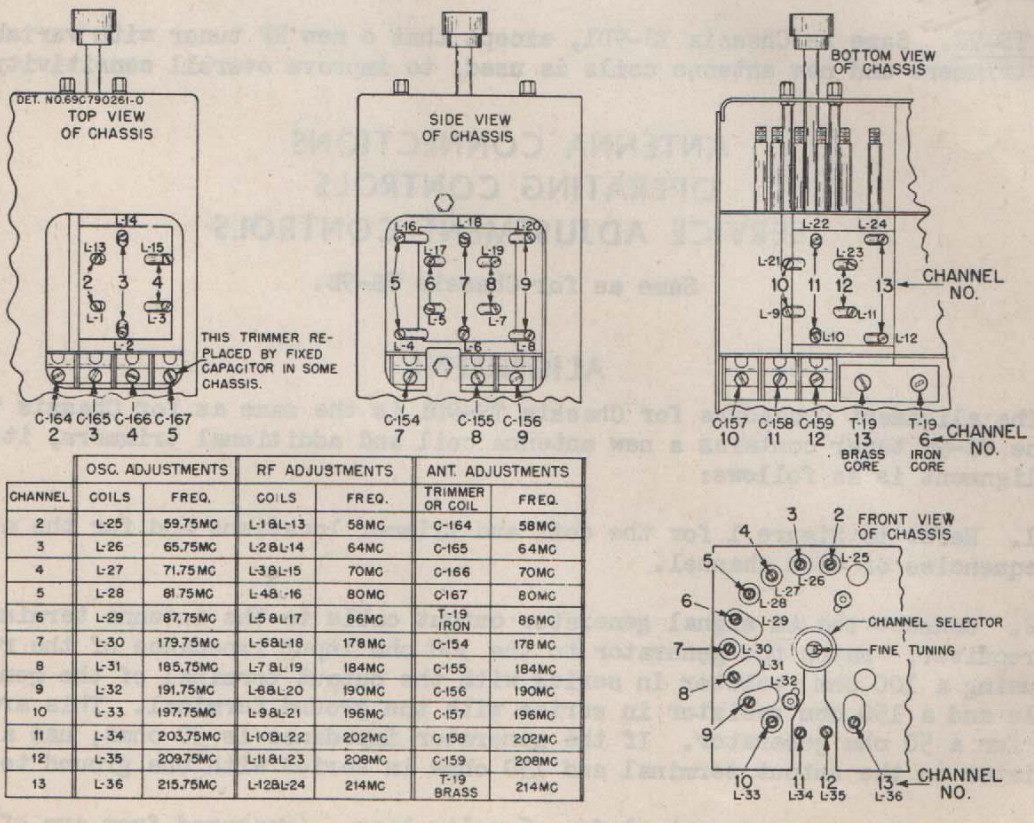
6. Set the fine tuning capacitor C-13 to the half-capacity position.

7. Set the signal generator at the sound carrier frequency of the channel (See Figure 1) and adjust the signal generator output until a voltage reading is obtained on the electronic voltmeter, connected as in Step 4.

8. Locate the oscillator tuning adjustment belonging to the channel being aligned. See Figure 1. With a non-metallic screwdriver, adjust the oscillator frequency until the reading on the meter is zero. The meter reading will change rapidly from one polarity, through zero, to the opposite polarity as the oscillator frequency is adjusted to produce the correct sound IF of 21.7 Mc.

9. Proceed as above for each channel; and, if the fine frequency trimmer is left in the same position for each channel when the oscillator adjustments are made, very little retuning of the fine tuning control will be required in changing from one television station to the next.

10. With the oscillator correctly set, the next step is the alignment of the RF and antenna sections. The RF coils and the antenna trimmers are tuned at a frequency 1 Mc higher than the center frequency of the channel under test; that is, 4 Mc above the lower channel limit, or 2 Mc below the upper limit. See Fig-



CHANNEL	OSC. ADJUSTMENTS		RF ADJUSTMENTS		ANT. ADJUSTMENTS	
	COILS	FREQ.	COILS	FREQ.	TRIMMER OR COIL	FREQ.
2	L-25	59.75MC	L-18L-13	58MC	C-164	58MC
3	L-26	65.75MC	L-28L-14	64MC	C-165	64MC
4	L-27	71.75MC	L-38L-15	70MC	C-166	70MC
5	L-28	81.75MC	L-48L-16	80MC	C-167	80MC
6	L-29	87.75MC	L-58L17	86MC	T-19 IRON	86MC
7	L-30	179.75MC	L-68L-18	178MC	C-154	178MC
8	L-31	185.75MC	L-78L19	184MC	C-155	184MC
9	L-32	191.75MC	L-88L20	190MC	C-156	190MC
10	L-33	197.75MC	L-98L21	196MC	C-157	196MC
11	L-34	203.75MC	L-108L22	202MC	C 158	202MC
12	L-35	209.75MC	L-118L23	208MC	C-159	208MC
13	L-36	215.75MC	L-128L-24	214MC	T-19 BRASS	214MC

FIGURE 1. CHASSIS TS-9E OSCILLATOR, RF AND ANTENNA ADJUSTMENT LOCATIONS.

ure 1 for coil and trimmer locations and alignment frequencies.

11. Connect the electronic voltmeter directly across the video detector load resistor R-48.

12. Set the signal generator to 86 Mc, the RF alignment frequency for Channel 6 and adjust the output for a reading on the voltmeter.

13. There are two coils for each RF channel. Using a non-metallic screwdriver, detune one core considerably in a counterclockwise direction. Then tune the other for maximum output on the meter at 86 Mc. Now, retune the first coil for maximum output, and the RF amplifier is aligned. Do not retune the other coil again for maximum, as this will not give a proper bandpass characteristic. Always keep the generator output low enough to prevent saturation.

14. Peak the low frequency antenna coil (iron core) at 86 Mc.

15. Repeat steps 12 and 13 on Channels 2 to 5, peaking the antenna trimmers to the same frequencies as the RF coils.

16. Tune the Channel 13 RF coils and antenna coil (brass core) at 214 Mc.

17. Repeat step 16 on Channels 7 to 12, peaking the antenna trimmers at the same time.

Because of changes in the tuner and the video and sound IF systems, the sensitivity readings for the TS-9D1 and TS-9E chassis are different from the TS-9D. New readings are listed below.

Chassis	Mixer Bias	Contrast Bias	Sig. Gen. Conn. to	Gen. Freq.	Voltmeter Conn. to	Voltage Reading	Microvolts Sens.	
				Video IF				
TS-9D1 & TS-9E	-3V	0	Grid of 6J6 Mixer	24.5Mc	Across R-48	1V inc.	200	
				Sound IF				
TS-9D1 & TS-9E	-3V	0	Grid of 6J6 Mixer	21.7 Mc	Term #1 of T-17	1V	200	
				Overall Video			Chan 2-6	Chan 7-13
TS-9D1	-	0	Ant term	Center of chan	Across R-48	1V inc	50	150
TS-9E	-	0	Ant term	Center of chan	Across R-48	1V inc	40	75
				Overall Sound				
TS-9D1	-	0	Ant term	Center of chan	Term #1 of T-17	1V	50	150
TS-9E	-	0	Ant term	Center of chan	Term #1 of T-17	1V	40	75

CHASSIS TS-9D1 VOLTAGE MEASUREMENTS

Ref. No.	Tube	Function	Tube Socket Pin								
			1	2	3	4	5	6	7	8	9
V-1	6AG5	RF Amp	-1.0	0	6.3AC	0	160	120	0		
V-2	6J6	Mixer-Osc	150	80	0	6.3AC	-6.0	-12	0		
V-3	6BA6	1st Video IF Amp	-3.0	0	6.3AC	0	110	110	0.60		
V-4	6BA6	2nd Video IF Amp	-3.0	0	6.3AC	0	110	110	0.60		
V-6	6AU6	2nd Sound IF Amp	0	0	6.3AC	0	110	110	0.95		
V-7	6AU6	3rd Sound IF Amp	-0.50	0	6.3AC	0	50	50	0		
V-8	6T8	Disc. & 1st AF Amp	-0.90**	-0.90**	0**	0	6.3AC	-0.50	0	-1.0	55
V-9	6V6GT	Audio Amp	NC	6.3AC	265	275	0	NC	0	12.5	
V-10	6AG5	4th Video IF Amp	0	2.0	6.3AC	0	250	130	2.0		
V-11	6AL5	Video Det. & Noise Limiter	0#	0#	6.3AC	0	0.50#	NC	-0.20#		
V-12	12AU7	1st & 2nd Video Amp	75#	0.50#	6.0#	0	0	210	-0.75	2.0	6.3AC
V-14	6SN7GT	Vert Blkg Osc & Vert Output Amp.	0#*	370#*	13#*	-50#*	150#*	0#	0	6.3AC	
V-15	6SN7GT	Horizontal Oscillator	-4.0#*	140#	11.5#	0.60#*	300#	12#	0	6.3AC	
V-16	6BG6G	Horiz. Output Amp & HV Gen.	NC	0	8.5#	NC	-14#	NC	6.3AC	280#	
V-18	5V4G	Damping Diode	NC	380	NC	300	NC	300	NC	380	
V-24	6AU6	1st Sound IF Amp	0	0	6.3AC	0	100	100	0.80		
V-25	5U4G	LV Rectifier	NC	330	NC	440AC	NC	440AC	NC	330	
V-26	5Y3GT	LV Rectifier	NC	175	NC	320AC	NC	320AC	NC	175	
V-27	12AU7	1st Stripper	195	-0.75	11.0	0	0	-5.0	0	0	6.3AC
V-28	12AU7	2nd Stripper & Pulse Amp.	200	-5.0	5.0	0	0	115#	-1.5#	0#	6.3AC
V-29	6AL5	Phase Detector	4.0#	-2.5#	6.3AC	0	0#	NC	0#		
V-30	6AG5	3rd Video IF Amp	0	1.4	6.3AC	0	110	110	1.4		

NOTES:
1. Measurements taken with RCA Volt Ohmyst Junior Electronic Voltmeter
2. No signal input
3. 117V AC input to set
4. Contrast control set for -3.0 volts bias
5. Other controls in normal operating positions
6. Readings DC unless otherwise specified
7. # Measurement taken between tube pin and B-
8. All other measurements made to chassis
9. * Varies with setting of hold control
10. ** Taken with V-7 removed from socket

CHASSIS TS-9E VOLTAGE MEASUREMENTS

Ref. No.	Tube	Function	Tube Socket Pin								
			1	2	3	4	5	6	7	8	9
V-1	6AG5	RF Amp	-1.0	0	6.3AC	0	160	120	0		
V-2	6J6	Mixer-Osc	150	80	0	6.3AC	-6.0	-12	0		
V-3	6BA6	1st Video IF Amp	-3.0	0	6.3AC	0	110	110	0.60		
V-4	6BA6	2nd Video IF Amp	-3.0	0	6.3AC	0	110	110	0.60		
V-6	6AU6	2nd Sound IF Amp	0	0	6.3AC	0	110	110	0.95		
V-7	6AU6	3rd Sound IF Amp	-0.50	0	6.3AC	0	50	50	0		
V-8	6T8	Disc. & 1st AF Amp	-0.90**	-0.90**	0**	0	6.3AC	-0.50	0	-1.0	55
V-9	6V6GT	Audio Amp	NC	6.3AC	265	275	0	NC	0	18	
V-10	6AG5	4th Video IF Amp	0	2.0	6.3AC	0	250	130	2.0		
V-11	6AL5	Video Det & Noise Limiter	0#	0#	6.3AC	0	0.50#	NC	-0.20#		
V-12	12AU7	1st & 2nd Video Amp	116#	0.35#	7.3#	0	0	230	45	46	6.3AC
V-14	6SN7GT	Vert Blkg Osc & Vert Output Amp.	0#*	370#*	13#*	-50#*	150#*	0#	0	6.3AC	
V-15	6SN7GT	Horizontal Oscillator	-4.0#*	140#	13.5#	0.60#*	300#	12#	0	6.3AC	
V-16	6BG6G	Horiz. Output Amp & HV Gen.	NC	0	8.5#	NC	-14#	NC	6.3AC	280#	
V-18	5V4G	Damping Diode	NC	380	NC	300	NC	300	NC	380	
V-24	6AU6	1st Sound IF Amp.	0	0	6.3AC	0	100	100	0.80		
V-25	5U4G	LV Rectifier	NC	330	NC	440AC	NC	440AC	NC	330	
V-26	5Y3GT	LV Rectifier	NC	175	NC	320AC	NC	320AC	NC	175	
V-27	12AU7	1st Stripper	205	45	55	0	0	-2.0	0	0	6.3AC
V-28	12AU7	2nd Stripper & Pulse Amp.	210	-2.0	6.0	0	0	115#	-1.5#	0#	6.3AC
V-29	6AL5	Phase Detector	4.0#	-2.5#	6.3AC	0	0#	NC	0#		
V-30	6AG5	3rd Video IF Amp.	0	1.4	6.3AC	0	110	110	1.4		

NOTES:
1. Measurements taken with RCA Volt Ohmyst Junior Electronic Voltmeter
2. No signal input
3. 117V AC input to set
4. Contrast control set for -3.0 volts bias
5. Other controls in normal operating positions
6. Readings DC unless otherwise specified
7. # Measurement taken between tube pin and B-
8. All other measurements made to chassis
9. * Varies with setting of hold control
10. ** Taken with V-7 removed from socket

REPLACEMENT PARTS LIST

ADDITIONAL PARTS FOR TS-9D1 AND TS-9E CHASSIS

Ref. No.	Part Number	Description	List Price
CHASSIS PARTS - ELECTRICAL			
Capacitors			
C-148	21K478410	Ceramic: 1000 mmf 500V	.25
C-149	21K478410	Ceramic: 1000 mmf 500V	.25
C-150	21K478410	Ceramic: 1000 mmf 500V	.25
C-151	21K470789	Ceramic: 5000 mmf 450V	.30
C-152	8A471356	Paper: .25 mf 200V	.35
C-153	21R6663	Mica: 1000 mmf 10% 500V	.40
C-154	20A470148	Trimmer, mica: 6-30 mmf	.25
C-155	20A18355	Trimmer, mica: 1.3-15 mmf	.25
C-156	20A18355	Trimmer, mica: 1.3-15 mmf	.25
C-157	20A18355	Trimmer, mica: 1.3-15 mmf	.25
C-158	20A18355	Trimmer, mica: 1.3-15 mmf	.25
C-159	20A18355	Trimmer, mica: 1.3-15 mmf	.25
C-160	21A489052	Ceramic: 3.3 mmf	.15
C-161	21K790454	Ceramic: 7.5 mmf	.20
C-162	21K790454	Ceramic: 7.5 mmf	.20
C-163	21K790651	Ceramic: 200 mmf	.25
C-164	20A470148	Trimmer, mica: 6-30 mmf	.25
C-165	20A18355	Trimmer, mica: 1.3-15 mmf	.25
C-166	20A18355	Trimmer, mica: 1.3-15 mmf	.25
C-167	21A489052	Ceramic: 3.3 mmf	.15
C-168	21K790455	Ceramic: 10 mmf	.20
C-169	8A471151	Paper: .05 mf 600V	.25
C-170	8A471151	Paper: .05 mf 600V	.25
C-171	8A471151	Paper: .05 mf 600V	.25
C-172	21A470789	Ceramic: 5000 mmf 450V	.30
C-173	8A471151	Paper: .05 mf 600V	.25
C-174	21K478410	Ceramic: 1000 mmf 500V	.25
Coils			
L-62	24K780388	Compensating coil: orange-orange dot.	.50
L-63	24K780388	Compensating coil: orange-orange dot.	.50
L-64	24K780388	Compensating coil: orange-orange dot.	.50
L-65	24K780386	Compensating coil: blue-blue dot	.50
L-66	24K780388	Compensating coil: orange-orange dot.	.50
L-67	24K790689	Horizontal Size coil: complete with iron core	1.15
Resistors			
R-185	6R2010	470 10% 2W	.20
R-186	6R6018	100 20% 1/2W ..... doz	1.00
R-187	6R6031	100,000 10% 1/2W ..... doz	1.00
R-188	6R6048	47,000 10% 1/2W ..... doz	1.00
R-189	6R5594	680 10% 1W ..... each	.15
		doz	1.45
R-190	6R476004	1000 20% 2W	.20
R-191	6R476004	1000 20% 2W	.20
R-192	6R476004	1000 20% 2W	.20
R-193	6R5598	390 10% 1W ..... each	.15
		doz	1.45
R-194	6R6407	220,000 10% 1/2W ..... doz	1.00
R-195	6R6229	1000 10% 1/2W ..... doz	1.00
R-196	6R[illegible]93	1200 10% 1/2W ..... doz	1.00
R-197	6R[illegible]004	1000 20% 2W	.20
R-198	6R[illegible]004	1000 20% 2W	.20
R-199	6R5581	3300 10% 1/2W ..... doz	1.00
R-200	6R6320	10,000 10% 1/2W ..... doz	1.00
R-201	-	1 meg 10% 1/2W (Part of L-62)	-
R-202	-	1 meg 10% 1/2W (Part of L-63)	-
R-203	-	1 meg 10% 1/2W (Part of L-64)	-
R-204	-	1 meg 10% 1/2W (Part of L-65)	-
R-205	-	1 meg 10% 1/2W (Part of L-66)	-
R-206	6R488036	560 10% 2W	.20
R-207	6R6022	330 10% 1/2W ..... doz	1.00
R-208	6R2089	1800 10% 1/2W (1500 on some schematics. Replace with 1800) ... doz	1.00
R-209	6R2089	1800 10% 1/2W (1500 on some schematics. Replace with 1800) ... doz	1.00
R-210	6R6407	220,000 10% 1/2W ..... doz	1.00
R-211	6R6022	330 10% 1/2W ..... doz	1.00
R-212	6R2010	470 10% 2W	.20
Transformers			
T-18	25B790015	Vertical Output Transformer	3.75
T-19	1X790492	Antenna Transformer: complete with C-161, C-162, C-163, C-168 and tuning cores	3.45

Ref. No.	Part Number	Description	List Price
Tubes			
V-30	6AG5	3rd Video IF Amplifier	
CHASSIS PARTS - MECHANICAL			
	39A28036	Clip, chassis grounding (grounds front of chassis to bottom cover) ..... doz	.15
	1A790661	Insulator, shield (2nd anode lead dress) ..... doz	.20
	2A780608	Nut, coil tuning (soldered on L-61 tuning core) ..... per/c	.50
	3S488242	Screw, sheet metal: #8 x 1/4 PKZ plain washer hex head; cad pl (tuner tube shield mounting) ..... doz	.15
	3S7512	Screw, sheet metal: #8 x 1/2 PKZ plain hex head; cad pl (V-2 shield grounding clip) ..... doz	.15
	31A780091	Strip, terminal: 6 insulated lugs, #5 ground, 3/8" spacing	.10
	31K26235	Strip, terminal: 3 insulated lugs, #1 ground, 3/8" spacing	.05
TT-5 TUNER PARTS			
	1X790460	Tuner TT-5 (Complete)	55.00
		Exchange	41.50
NOTE:		Replaceable electrical parts are included in Television Chassis [illegible] Replacement Parts List. It is recommended that entire tuner be returned for exchange if trouble develops in any of its major components.	
	46A790456	Core, coil adjusting screw: iron (low freq. ant coil)	.10
	35A790647	Pad, rubber (inside low freq. ant. coil) doz	.15
	1X790493	Receptacle & Bracket Assembly: antenna; with lead	.65

CABINET PARTS ADDITIONS FOR MODELS 10VT3 AND 10VK9

Cabinet Parts			
	1X790096	Back Gover (fibre), Line Cord & Shield Assembly (10VK9)	5.05
	16K790047	Cabinet, table model: red mahogany (10VT3R)	-
	16K790051	Cabinet, table model: limed oak (10VT3B)	-
	16F790048	Cabinet, console: red mahogany (10VK9R)	-
	16K790411	Cabinet, console: limed oak (10VK9B)	-
	13K780048	Cloth, grille (10VT3R)	.35
	13K77256	Cloth, grille (10VT3B)	.25
	11M490102	Cloth, grille (10VK9R)	-
	11M3452	Cloth, grille (10VK9B)	-
	32C790101	Gasket, picture tube: rubber (on window)	2.45
	36A790050	Knob, control: mahogany plastic; small (Brightness, Horizontal Hold & Off-tone) (10VT3R, 10VK9R)	.30
	36K790433	Knob, control: tan plastic; small (Brightness, Horizontal Hold & Off-tone) (10VT3B, 10VK9B)	.30
	36A790005	Knob, control: mahogany plastic; small (Fine Tuning) (10VT3R, 10VK9R)	.30
	36K790432	Knob, control: tan plastic; small (Fine Tuning) (10VT3B, 10VK9B)	.30
	5S2848	Rivet: .140 x 5/32; steel; statuary bronze finish (mounts high voltage shield to metal cabinet back) ..... doz	.15
	3K489009	Screw, decorative head: brass (spkr board mtg) (10VT3B) ..... doz	.30
	3S476106	Screw, sheet metal: #8 x 1" PKA plain hex head; cad pl (front rail mtg)(10VT3, 10VK9) ..... doz	.15
	35A790461	Strip, rubber: 10" (on window)(10VT3, 10VK9)	.05
	35K790462	Strip, rubber: 15-15/16" (on window)(10VK9)	.10
	35K790463	Strip, rubber: 16-23/32" (on window)(10VT3)	.10
	1X790009	Window & Gasket Assembly (10VT3)	13.80
	1X790095	Window & Gasket Assembly (10VK9)	11.50

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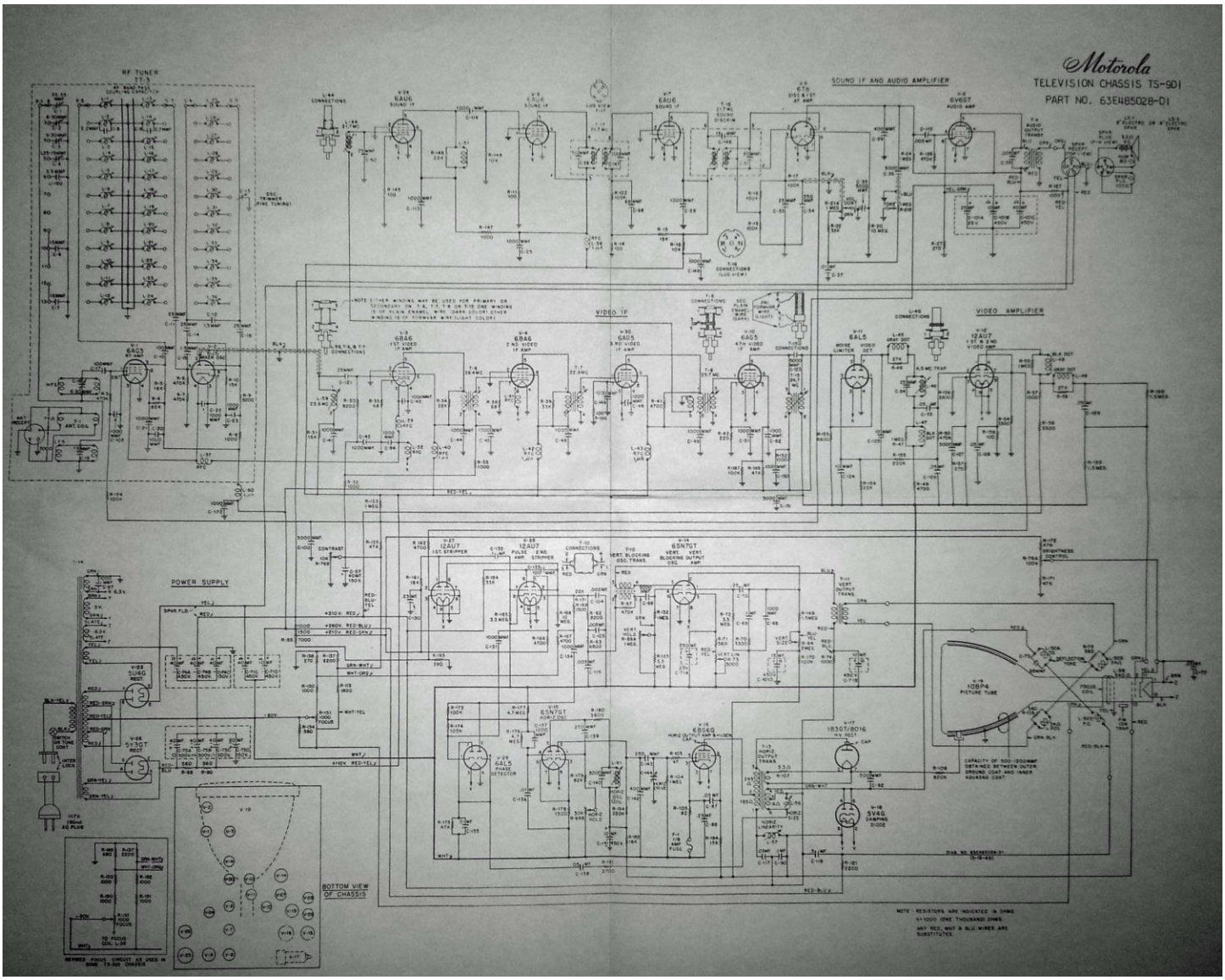
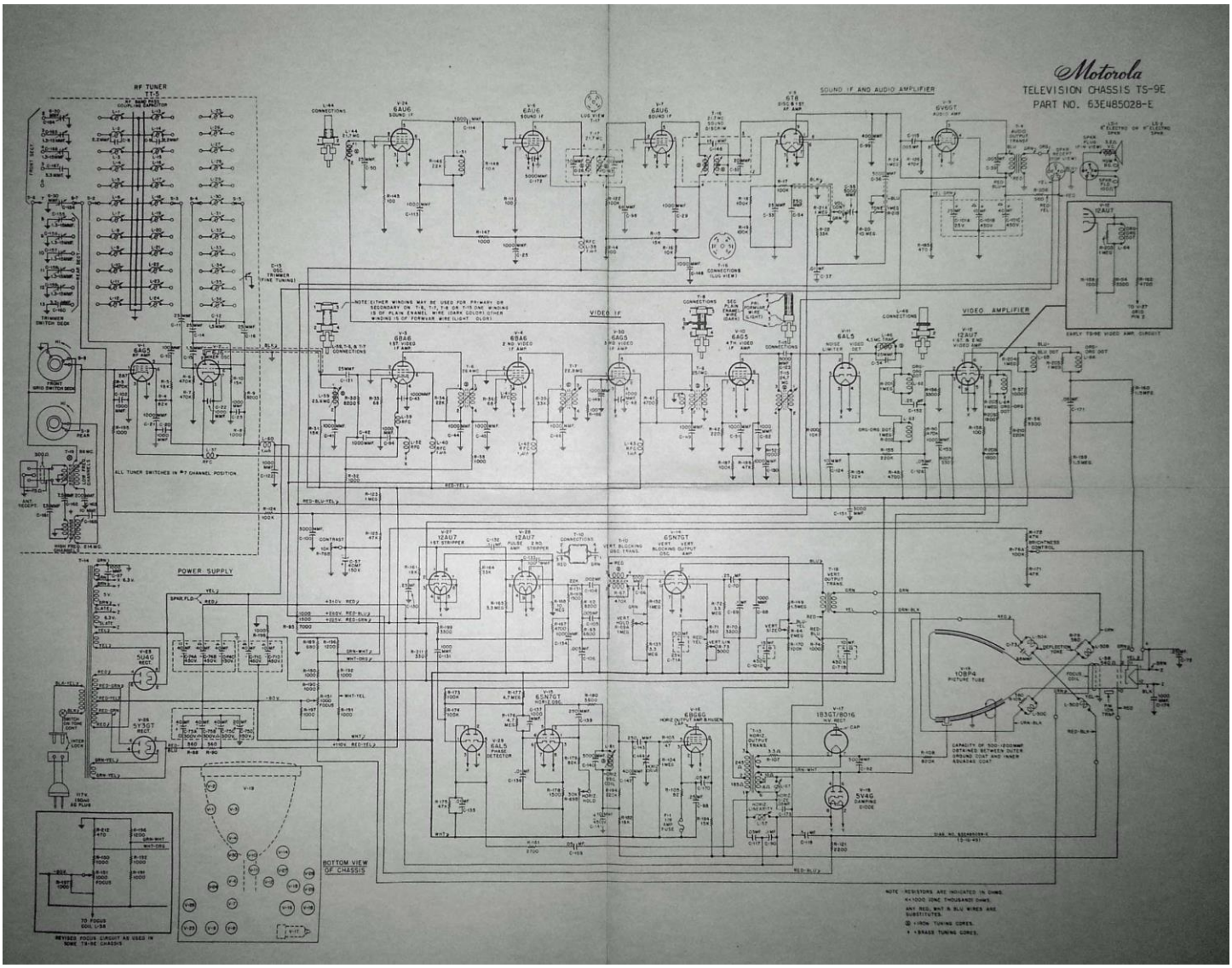

Motorola
TELEVISION CHASSIS TS-901
PART NO. 63E485028-01
RF TUNER TT-1
SOUND IF AND AUDIO AMPLIFIER
VIDEO IF
VIDEO AMPLIFIER
POWER SUPPLY
BOTTOM VIEW OF CHASSIS
6AU6
6BA6
6AL5
6AQ5
12AU7
12AT7
6SN7GT
6BK7A
6V6GT
6CG8
6CS6
6EM5
6SL6GT
5U4G
5Y3GT
1B3GT/8016
5V4G
10BP4
PICTURE TUBE


Motorola
TELEVISION CHASSIS TS-9E
PART NO. 63E485028-E
RF TUNER
TT-5
SOUND IF AND AUDIO AMPLIFIER
VIDEO IF
VIDEO AMPLIFIER
POWER SUPPLY
ALL TUNER SWITCHES IN #7 CHANNEL POSITION.
BOTTOM VIEW OF CHASSIS
TO FOCUS COIL L-56
REVISED FOCUS CIRCUIT AS USED IN NONE TS-9E CHASSIS
EARLY TS-9E VIDEO AMP. CIRCUIT
NOTE: RESISTORS ARE INDICATED IN OHMS.
K=1000 (ONE THOUSAND) OHMS.
ANY RED, WHT & BLU WIRES ARE SUBSTITUTES.
@ =IRON TUNING CORES.
+ =BRASS TUNING CORES.