Motorola® Television

SERVICE MANUAL

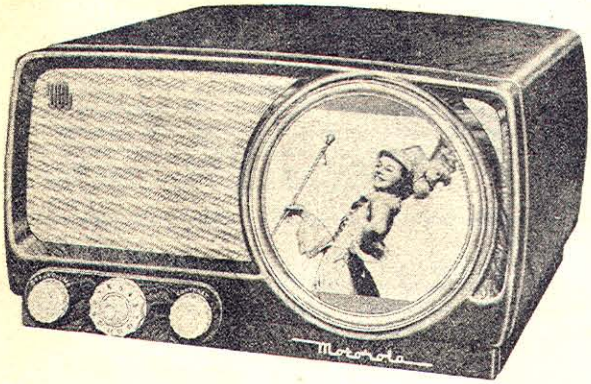
MODELS

7VT1 Series
7VT2 Series
7VT5 Series

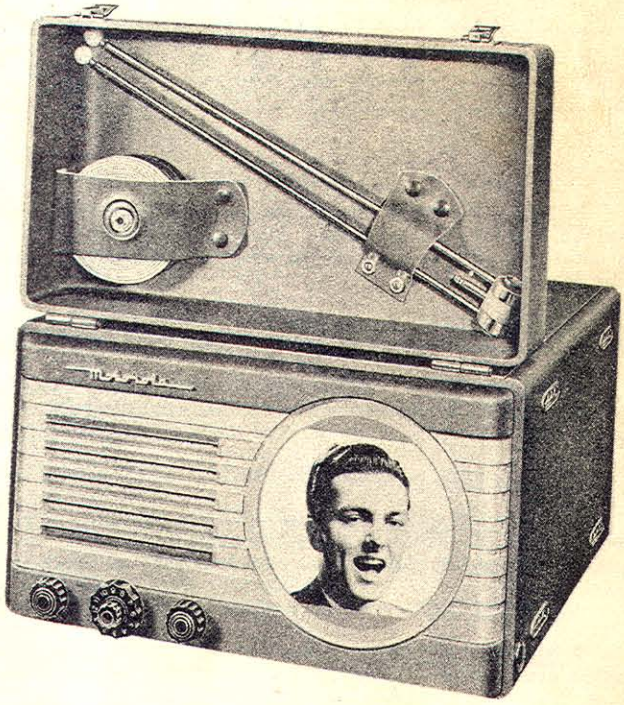
CHASSIS

TS-18

MODEL 7VT1



MODEL 7VT2



MODEL 7VT5

4545 AUGUSTA BOULEVARD — Motorola Inc. — CHICAGO 51, ILLINOIS

PART NO. 54P791294

Price 15 Cents

PRINTED IN U. S. A.

GENERAL INFORMATION

The TS-18 Chassis used in Motorola Models 7VT1, 7VT2 and 7VT5 has 15 tubes plus a 7" picture tube. Features of this receiver include: light weight; high usable sensitivity; and automatic gain, frequency and linearity control.

ANTENNA CONNECTIONS

A three-terminal antenna strip on the rear of the chassis provides for either 75 or 300 ohm input. See Figure 1.

OPERATING CONTROLS

There are four controls on the front panel of the receiver. Note that the center knob is dual controlled, consisting of a small and a large knob. See Figure 2 for a functional description of each front panel control.

SERVICE ADJUSTMENT CONTROLS

The receiver is adjusted at the factory so that normally you need only operate the knobs on the front panel. Adjustments on the rear panel should be made only to correct any misadjustments of these controls due to handling, or to correct difficulties that cannot be remedied by operating the front panel controls. See Figure 3 for location of service adjustment controls.

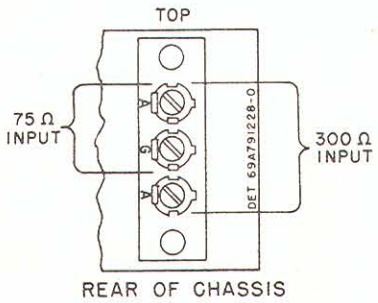
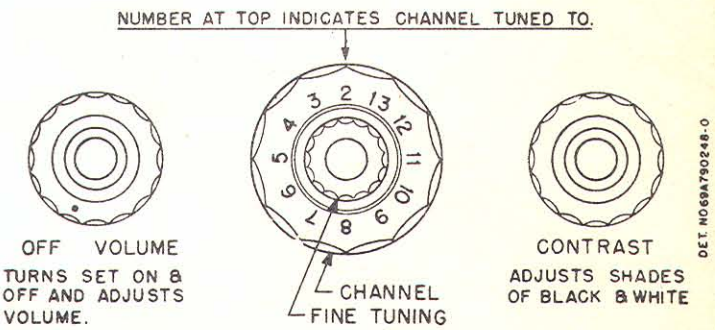


FIGURE 1. ANTENNA CONNECTIONS



LARGE KNOB
CHANNEL SELECTOR AND INDICATOR.

SMALL KNOB
TUNE FOR BEST PICTURE DETAIL.

FIGURE 2. OPERATING CONTROLS

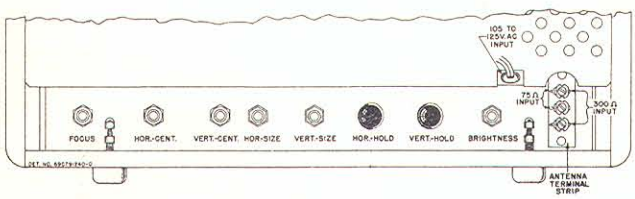


FIGURE 3. SERVICE CONTROLS

FOCUS. - The FOCUS control should be adjusted very carefully until the fine horizontal lines of the raster are clearly visible over the picture area. The control should be turned through the correct point several times so that the optimum focus is obtained. The balance of the service adjustments should be made with a test pattern or a televised picture on the picture tube screen.

VERTICAL HOLD. - Adjust the VERTICAL HOLD control until the pattern stops vertical movement. The control should be approximately centered in its lock-in range after the receiver has warmed up.

HORIZONTAL HOLD. - Adjust the HORIZONTAL HOLD control until a single stationary picture without any sloping lines appears on the picture tube screen. The control should be approximately centered in its lock-in range after the receiver has warmed up.

VERTICAL SIZE. - Adjust the VERTICAL SIZE control until the picture fills the entire picture area vertically.

VERTICAL CENTERING. - While adjusting VERTICAL SIZE control, should it appear that the pattern will not fill the picture area, adjust the VERTICAL CENTERING control until the center of the pattern is in the center of the picture area. Then, if necessary, readjust the VERTICAL SIZE control as given above.

HORIZONTAL SIZE. - Adjust the HORIZONTAL SIZE control until the pattern fills the entire picture area horizontally.

HORIZONTAL CENTERING. - While adjusting the HORIZONTAL SIZE control should it appear that the picture will not fill the entire area, adjust the HORIZONTAL CENTERING control until the center of the pattern is in the center of the picture area.

NOTE: There is a slight interaction between the VERTICAL HOLD and VERTICAL SIZE controls and between the HORIZONTAL HOLD and HORIZONTAL SIZE controls. It, therefore, may be necessary to readjust the controls slightly to provide a symmetrical stationary picture.

After all the above controls are adjusted, carefully inspect the circular pattern for symmetry and correct aspect ratio. If necessary, carefully readjust the HORIZONTAL and VERTICAL SIZE controls to get a correct pattern.

BRIGHTNESS. Adjust the BRIGHTNESS control until the picture has the desirable brightness. It may be necessary to readjust the CONTRAST control slightly. In general, the BRIGHTNESS control should not be set at maximum since the definition may suffer.

ALIGNMENT

SERVICE NOTES

To remove the chassis from the cabinet, remove the back cover, knobs and bottom mounting screws, disconnect the speaker leads and cathode ray tube socket connections and remove the chassis from the back of the cabinet.

The cathode ray picture tube and speaker are mounted securely to the cabinet. Picture adjustments may be made with the chassis out of the cabinet by placing the chassis and cabinet back to back and connecting the socket to the cathode ray tube pins. Speaker checks may be made similarly by using clip leads for speaker connections. This arrangement eliminates the need for removing either speaker or cathode ray tube from the cabinet while servicing the receiver.

NOTE: Whenever the cabinet back is removed, the power cord circuit is broken by the interlock, so it will be necessary to obtain an extra power cord with the female interlock receptacle for making a convenient power connection to the receiver. Order Motorola Part No. 30B470756.

SPECIAL PRECAUTIONS

In performing alignment with the chassis out of the cabinet, it will be necessary to connect together the heater terminals #1 and #14 of the 7JP4 cathode ray picture tube socket to complete the heater circuit.

To eliminate high voltage when it is not needed or used, remove the 25L6GT tube (V-14, high voltage supply oscillator). When this is done, it will be necessary to insert a 75 ohm 10 watt resistor in socket connections #2 and #7 to operate the receiver. Alternatively, clip off the screen and plate pins from a spare 25L6GT, making a dummy tube to plug into V-14 socket. It is recommended that the high voltage be cut off while aligning to eliminate the shock hazard.

It is highly recommended that an isolation transformer be used between this receiver and the AC line when alignment is being performed, or any testing where an oscilloscope is used. This precaution is extremely important if grounded test equipment is used. NEVER GROUND THE RECEIVER CHASSIS DURING TESTING OPERATIONS OR INSTALLATION UNLESS AN ISOLATION TRANSFORMER IS USED. HOWEVER, A GROUNDED COAX LINE MAY BE CONNECTED TO THE ANTENNA TERMINAL BOARD MARKED "G".

ORDER OF ALIGNMENT

A complete receiver alignment can be most conveniently performed in the following order:

1. Audio Take-Off & Ratio Detector
2. IF Coils (1st, 2nd and 3rd IF plate coils)
3. Mixer Transformer
4. Osc. & RF sections

AUDIO TAKE-OFF & RATIO DETECTOR ALIGNMENT

Equipment Required:

Signal Generator: Accurately calibrated at 4.5 mc.

Adjustable output. (It is recommended that the audio section be tuned from a station signal with the trimmer tuned off station to reduce driving voltage below limiting point.

Procedure:

Refer to Figure 4 for location of adjustments.

1. Set the signal generator to 4.5 mc, and the output to approximately 10,000 microvolts. Connect the high side of the signal generator through a 1000 mmf capacitor to video amplifier (V-6) control grid (pin #1) and the low side to B-. From either side of capacitor C-48, connect a decoupling resistor of 10,000 ohms in series with the meter to B-.

2. With the contrast control set for maximum gain (fully clockwise), peak L-18 for maximum reading on meter.

3. Peak T-2 primary (top core) for maximum reading on meter.

4. Move the meter and decoupling resistor from C-48 to junction of R-33 and lead to volume control.

5. Adjust T-2 secondary (bottom core) for zero response on 2.5V scale of meter. This corresponds to the cross-over point on the FM detector curve. If desired, the symmetry of the curve may be checked by tuning the secondary to both sides of zero and noting the maximum voltage produced, reversing the meter connections as necessary. For proper balance of the ratio detector system, the maximum voltages in each direction should be approximately equal. If not, L-18 and T-2 primary should be retuned.

NOTE: As the adjustments are brought to resonance, it is advisable to reduce signal generator output to prevent overloading.

NO	TYPE	FUNCTION
V-1	6AG5	RF AMP.
V-2	12AT7	MIXER OSC.
V-3	6AU6	1 ST. IF AMP.
V-4	6AU6	2 ND. IF AMP.
V-5	6AU6	3 RD. IF AMP.
V-6	6AU6	VIDEO AMP.
V-7	6AU6	AUDIO DRIVER-LIMITER
V-8	6AL5	RATIO DETECTOR
V-9	12SN7	1ST. AUDIO AMP. & VERT SWEEP OSC.
V-10	25L6	AUDIO OUTPUT
V-11	12SN7	1 ST. & 2 ND. CLIPPER
V-12	12SN7	HORIZ. OSC. & AFC DIODE
V-13	6SL7	VERT. SWEEP OUTPUT
V-14	25L6	H.V. OSCILLATOR
V-15	1B3	H.V. RECTIFIER

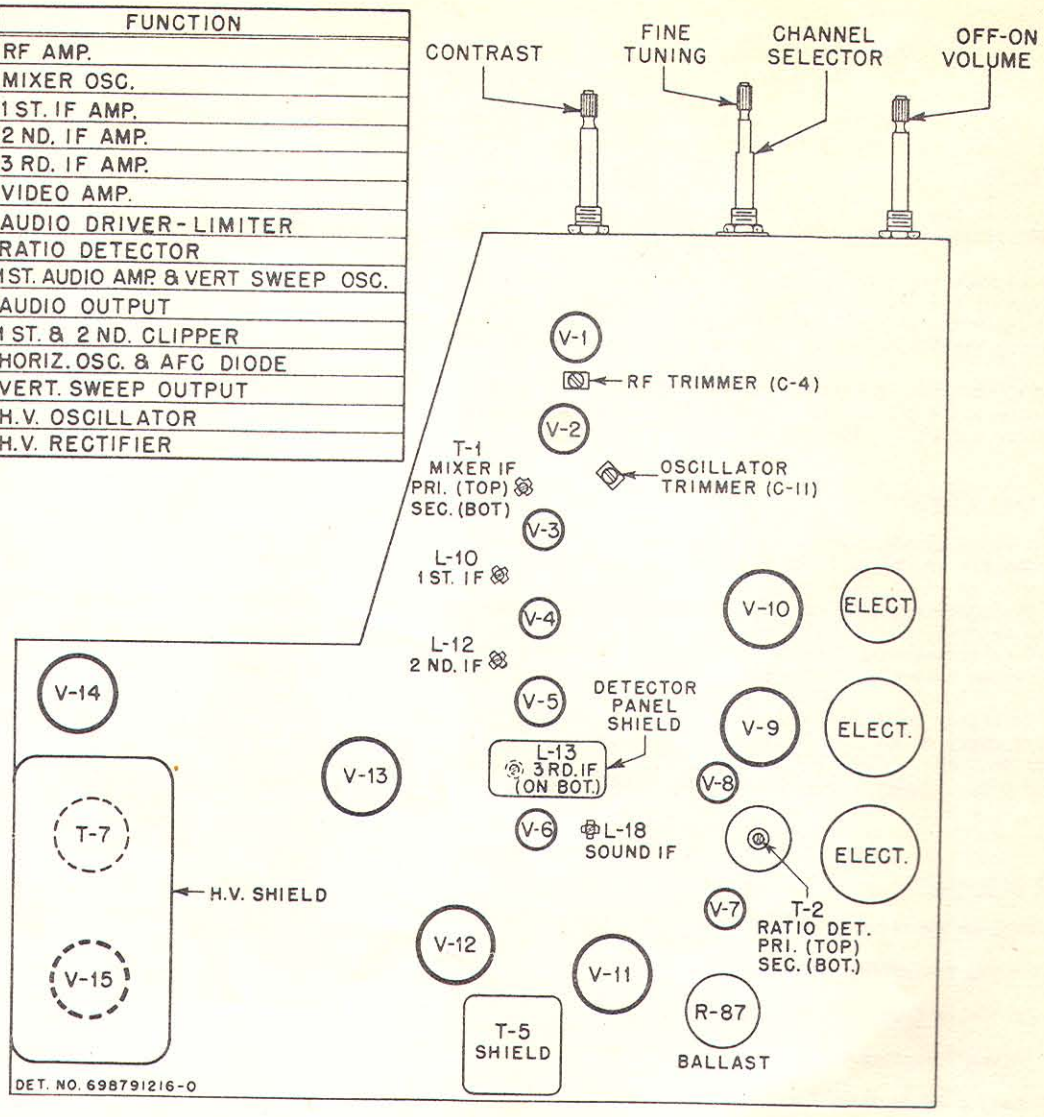


FIGURE 4. TUBE & ALIGNMENT ADJUSTMENTS LOCATIONS

IF AMPLIFIER ALIGNMENT

Equipment Required:

IF Sweep Generator meeting the following requirements:

18 to 30 mc., approximately 12 mc sweep width. Output constant and adjustable to at least one volt maximum with adjustable markers.

5" Cathode-Ray Oscilloscope: preferably one with a calibrated input attenuator.

NOTE: If a wide band scope is used, the marker will be more distinct if a capacitor of 100 to 1000 mmf is placed across the scope input. Use the smallest size possible, since too large a value will affect the shape of the curve.

1. By means of an external battery, apply a negative 3 volt bias between the bottom of the 1st IF grid resistor (R-9, 5600) & B-. The lead to the grid resistor should be decoupled through a 4700 to 10K resistor.

2. Connect the sweep generator across 1st IF grid resistor (R-9, 5600). Set the center frequency of the sweep generator to about 24.6 mc and adjust the sweep for a deviation of approximately 12 mc. Connect the oscilloscope between the top of the 2nd detector load resistor R-21 and the bottom of the video amplifier grid resistor R-24. If a stronger output is required, connect the scope from the cathode of the picture tube to B-. The curve observed will be of reversed polarity however. Contrast control should be set at slightly less than maximum.

NOTE: If a distorted or unstable picture is seen on the oscilloscope during alignment, it may be necessary to stop the oscillator tube by placing a 1000 mmf capacitor between grid (pin #7) of V-2B and B-, or by unsoldering one side of cathode choke L-7 from B-.

CAUTION: Do not reduce the oscilloscope gain and increase signal input so that the top of the curve is flattened by limiting the video or scope amplifiers.

3. Peak the 1st IF coil, L-10, initially, for maximum response at about 26.0 mc.

4. Tune the 2nd IF coil, L-12, initially, for peak response at about 24.6 mc.

5. Adjust the 3rd IF coil, L-13, to place a 22.9 mc marker signal 50% (1/2) the way up the low side of the response waveform.

6. Adjust the 1st IF coil, L-10, to place a 26.3 mc marker signal 50% (1/2) the way up the high side of the response waveform. Refer to Figure 5 for marker positions on waveform obtained.

7. Then adjust plate coil, L-12, to provide a flat top or a symmetrical curve to the response waveform obtained.

NOTE: It may be necessary to repeat procedure to obtain proper waveform; see Figure 5.

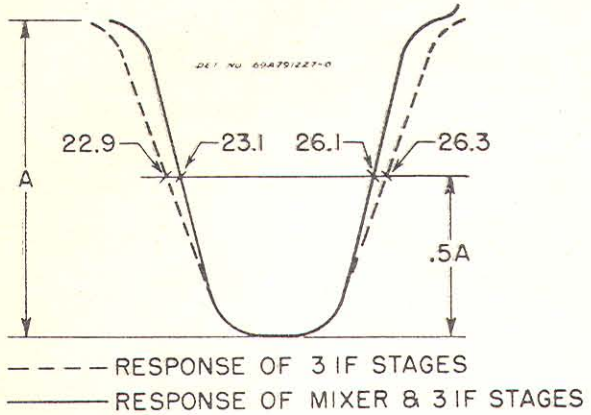


FIGURE 5. MIXER & IF WAVEFORM

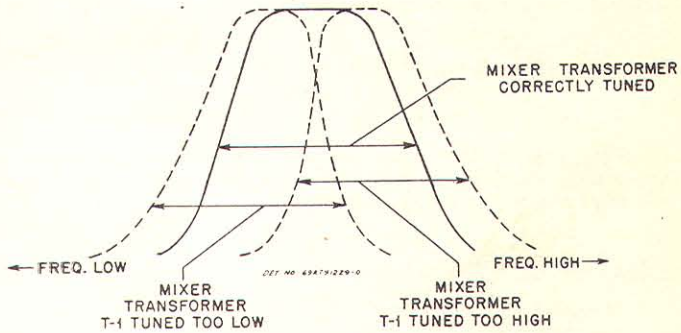


FIGURE 6. MIXER TRANSFORMER TUNING CURVES

MIXER TRANSFORMER ALIGNMENT

With the battery bias still applied to the 1st IF, move the sweep generator to the grid of V-2A mixer tube. Connect it across resistor R-5 (33K). Set contrast control at slightly less than maximum gain. Bring both cores simultaneously from extreme outside positions toward the center until the 26.1 mc marker is 50% (1/2) way up the high frequency slope, and the 23.1 mc marker is 50% (1/2) way up the low frequency slope. Correct waveform is shown in Figure 5.

In aligning the three IF coils, each coil is adjusted individually, but when adjusting the primary and secondary of the mixer transformer T-1, the adjustments should be made simultaneously. The important point to keep in mind is to obtain as flat and as wide a response curve as possible with as much gain as possible. Simultaneous adjustment of the primary and secondary is the easiest way to obtain this result. The transformer by itself is, in effect, tuned for the same pass band as the three staggered circuits. See Figure 6. The only difference in the overall waveform should be that the sides of the overall curve (Figure 5) should be steeper. Constant use of the 50% response marker signals to show the bandwidth of the response curve should be resorted to, since it is absolutely necessary to obtain the proper curve. A slight dip (not exceeding 10%) is permissible in the mixer transformer response curve.

OVERALL IF SENSITIVITY MEASUREMENTS

Comparative measures of sensitivity for the entire IF section, including the mixer transformer, are as follows:

1. Remove negative bias from 1st IF.

2. A signal generator set at 24.6 mc is connected to the grid of V-2A (pin #2) and B-.

A low range electronic voltmeter is connected between top of 2nd detector load resistor R-21, and bottom of video amp grid resistor R-24.

The signal required to produce a 1 volt rise (negative) above the contact potential should be less than 150 microvolts.

NOTE: It will be necessary to kill the oscillator during this measurement. This may be done by disconnecting choke L-7 from cathode of osc.

3. The band width will decrease with bias removed but should not fall below 2.3 mc.

REGENERATION CHECK

After the above IF and mixer transformer alignment has been made, a check for regeneration in the IF amplifier strip should be made This is done by observing the output response curve on the oscilloscope, as taken across the cathode of the CR tube and B-. Set the contrast control to maximum gain. Decrease the input signal until the output signal shows a marked decrease Any regeneration present will be indicated by sharp peaks on the overall response curve. The oscillator should be killed during this procedure.

OSCILLATOR, ANTENNA AND RF ALIGNMENT

Equipment required:

Sweep Generator:	Frequency range 40-220 mc; 10 mc sweep. Output constant and adjustable. Adjustable markers (markers should be calibrated occasionally by checking against an accurate signal generator).
Oscilloscope:	Preferably one with a calibrated input attenuator.

Signal Generator: Frequency range 40 to 225 mc.
Accurately calibrated.
AM modulated, 400 cycle.

The tuner of the TS-18 departs from the conventional type in that the individually tuned coils are replaced with a pre-tuned, tapped inductance. Channel selection is effected by switching in various values of inductance which combine with stray and tube capacitance to produce a given resonant frequency. Trimmers are provided in the oscillator and RF sections to compensate for the variable stray capacitances.

Assuming the trimmers to be properly set, the only cause of misalignment would be the distortion of the coil sections due to shipping, handling, etc The coils are neither delicate nor critical, and must be bent considerably before detuning will occur It follows, however, that should this be the case for a given coil section, all channels of lower frequency will be detuned to varying degrees For this reason, the high channels are checked first and channel 2 last.

If, for any reason, it becomes advisable to replace a certain section or sections of coil, it is recommended that the entire coil be replaced This is easily accomplished since the switch soldering lugs are slotted to receive the coil.

CAUTION: Switch lugs should be clean before new coil is installed.

It is possible, though not recommended, to replace individual sections. The section may be clipped from a new coil, or in an emergency, wound from #18 solid AWG, double nylon enamel (or similar) wire. Care should be taken to avoid overheating the wire and melting the insulation.

OSCILLATOR ADJUSTMENT

Proceed as follows:

1. If the oscillator has been disconnected during the IF alignment, put it back into circuit.

2. Connect the signal generator to the antenna terminal (see Figure 1) that best matches the generator's output impedance.

3. Connect the vertical input terminals of the oscilloscope from cathode of V-2A (pin #3) to B- through a shielded lead. Decouple this lead with 4.7 K to 10K resistor. Set the vertical gain control at maximum. Synchronize the oscilloscope to 60 cycles or a harmonic of 60 cycles.

4. Set Fine Tuner to mid-capacity.

5. Set the generator to the oscillator frequency of channel 10 (170.35 mc) and adjust the oscillator trimmer (C-11) for zero beat viewed on the oscilloscope. Zero beat is indicated by the sharply defined trace that appears between the two wide traces as the trimmer is tuned through resonance. (See Figure 8 for oscillator frequencies.) Check all high channels (7-13) to determine if zero beat occurs with fine tuner within 22-1/2 degrees of mid-setting. It may be necessary to adjust coil L-5 (high band oscillator coil, Figure 7) to bring channel 13 within this range. Adjustment is made by compressing or spreading the coil with an insulated screwdriver. If L-5 is adjusted, it may be necessary to retune trimmer to channel 10 to bring channels 7 to 10 within the 22-1/2° range.

6. The low channels (2-6) are adjusted by starting at channel 6 and progressing through channel 2.

7. Touching up a particular coil section is accomplished by spreading or compressing the individual coils. (See Figure 7 for location of various coil sections.

CAUTION: Before checking a given channel, make certain the station selector switch is in the proper position.

To make certain that the trimmer is adjusted correctly, tune through the zero beat point and then back again to obtain the exact setting. Also, it is advisable when close to the zero beat setting, to vary the signal generator input voltage so as to obtain maximum response on the oscilloscope. However, before making the final trimmer setting, reduce the generator input as low as possible so as to reduce the lock-in range and obtain a sharp zero beat setting.

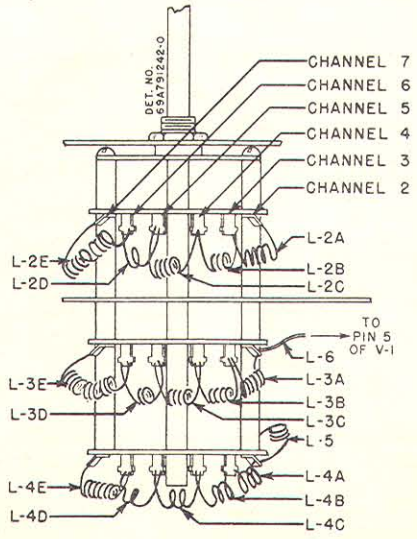


FIGURE 7. ANTENNA, RF & OSCILLATOR COILS

ANTENNA & RF ALIGNMENT PROCEDURE

1. Connect the sweep generator to the antenna terminal that best matches the generator's output impedance.

2. Disconnect choke L-7 from cathode of oscillator tube V-2B.

3. Connect oscilloscope, thru a decoupling resistor, across R-7 in cathode circuit of mixer tube V-2A.

4. Turn the station selector switch to channel 10. Set the center frequency of the sweep generator to the center frequency of channel 10 (195 mc). Adjust the RF trimmer (Figure 4) to place a 195 mc marker at maximum amplitude of curve. This is the only RF adjustment and the RF stage of all high channels (7-13) should be properly tuned. Conversely, if channel 10 is not tuned properly, all high channels will be misaligned.

5. Check channels 7 and 13, noting whether the mid-frequencies of these channels produce maximum amplitude on curve. The RF coil for channel 13 (L-6) is a straight piece of wire (Figure 7). As its position with respect to the adjacent lead affects the tuning of the high channels, moving it is a simple means of touching up the curve. A slight readjustment of the RF trimmer may be necessary if L-6 is moved.

NOTE: As the bandwidth of the high channels is very broad, the mid-frequency marker may not fall exactly at peak of curves for channels 7 and 13. A slight variation is permissible.

6. Check the low channels starting at channel 6 and moving downward to channel 2.

NOTE: If channel 6 is not tuned properly, all low channels will be misaligned. Therefore, it is important that a good response curve be obtained from this channel.

In each case, with the center frequency of sweep at the channel center frequency, introduce markers corresponding to sound and picture carriers (see Figure 8) and compare with curve in Figure 9. It is permissible for the markers to appear slightly down on the skirt, but if they are too low (more than 6 db down), the curve may be changed by spreading or compressing the particular coil section with an insulated screwdriver.

NOTE: The RF coil is tuned to sound carrier. The antenna coil is tuned to video carrier.

CAUTION: Be sure to turn station selector switch to correct channel before checking band pass of that channel.

ALTERNATE ANTENNA & RF ALIGNMENT

Whenever possible, the preceding antenna & RF alignment procedure should be used, since the exact response curve may be observed on the oscilloscope. However, if no sweep generator is available, the following method, using an AM signal generator, will suffice. The oscillator must be in operation for this method.

1. Connect the signal generator, with no modulation, to antenna terminals giving best match with generator output.

2. Connect the electronic voltmeter between the top of the 2nd detector load resistor (R-21) and the bottom of the video amp grid resistor R-24.

Channel	Frequency	Picture	Sound	Oscillator
2	54-60	55.25	59.75	81.45
3	60-66	61.25	65.75	87.45
4	66-72	67.25	71.75	93.45
5	76-82	77.25	81.75	103.45
6	82-88	83.25	87.75	109.45
7	174-180	175.25	179.75	152.35
8	180-186	181.25	185.75	158.35
9	186-192	187.25	191.75	164.35
10	192-198	193.25	197.75	170.35
11	198-204	199.25	203.75	176.35
12	204-210	205.25	209.75	182.35
13	210-216	211.25	215.75	188.35

FIGURE 8. FREQUENCY CHART

3. With the channel selector switch at channel 10 and the signal generator at 195 mc, adjust RF trimmer for maximum response on the voltmeter.

4. All channels should now be aligned, but channels 7 & 13 should be checked. The mid-frequencies of each channel should produce maximum or near maximum reading on the voltmeter.

5. Check the low channels starting with 6 and moving downward. The picture and sound carrier frequencies should produce maximum or near maximum deflection of the voltmeter. If either carrier is too low, adjust the particular coil section by spreading or compressing the individual coils.

NOTE: The RF coil is tuned to the sound carrier. The antenna coil is tuned to the picture carrier.

OVERALL RECEIVER SENSITIVITY MEASUREMENT

Comparative measures of sensitivity for the overall receiver are as follows:

1. A signal generator, set to the center frequency of the channel under test, is connected to the 75 ohm input terminals on the rear of the chassis.

2. A low range electronic voltmeter is connected between the top of the second detector load resistor R-21 (from green lead of 2nd detector assembly) and the bottom of the video amp grid resistor (R-24).

3. The signal required to produce a 1 volt (negative) reading should be less than 200 microvolts on the high channels and less than 150 microvolts on the low channels with the contrast control set for maximum sensitivity.

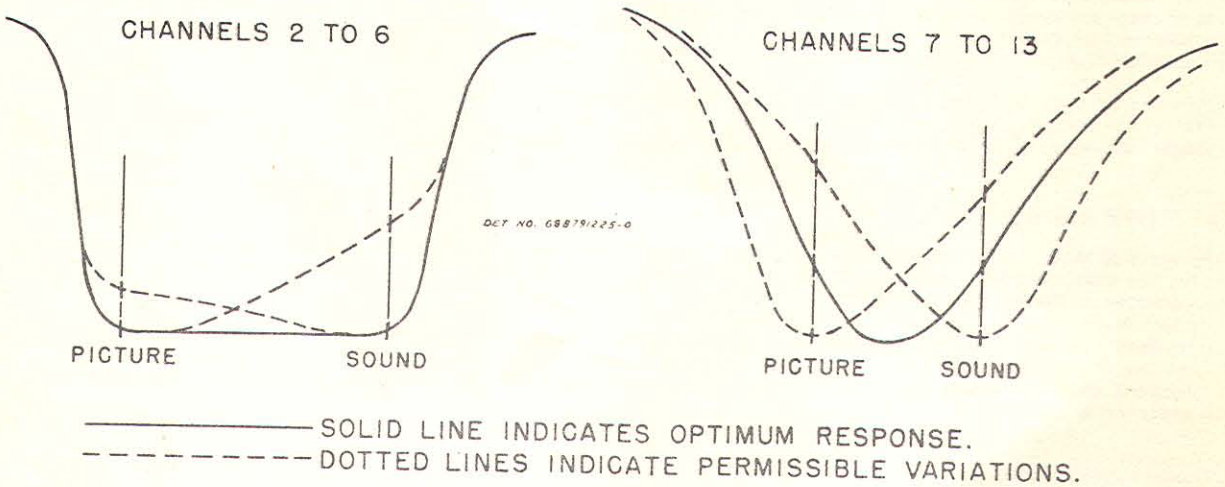


FIGURE 9. RF RESPONSE CURVES

REPLACEMENT PARTS LIST

Ref. No.	Part Number	Description	List Price
CHASSIS PARTS - ELECTRICAL			
Capacitors			
C-1	21R6631	Mica: 100 mmf 300V	.25
C-2	21K470329	Molded: 30 mmf 500V	.30
C-3	21B77286	Ceramic: 100 mmf 500V	.20
C-4	1X790189	Trimmer, ceramic: .5-3 mmf; with screw & nut	.20
C-5	21K478410	Ceramic: 1,000 mmf 500V	.25
C-6	21K478410	Ceramic: 1,000 mmf 500V	.25
C-7	21K478410	Ceramic: 1,000 mmf 500V	.25
C-8	21K478410	Ceramic: 1,000 mmf 500V	.25
C-9	21K482726	Ceramic: 10,000 mmf; disc	.30
C-10	-	Fine tuning trimmer (part of station selector switch)	-
C-11	1X790189	Trimmer, ceramic: .5-3 mmf; with screw & nut	.20
C-12	21K470324	Molded: 6 mmf 500V	.25
C-13	21K790541	Ceramic: 15 mmf	.30
C-14	21K478280	Molded: 2 mmf 500V	.25
C-15	21A470789	Ceramic: 5,000 mmf 450V ;disc	.30
C-16	21K478280	Molded: 2 mmf 500V	.25
C-17	21K478410	Ceramic: 1,000 mmf 500V	.25
C-18	8R9810	Paper: .25 mf 100V	.25
C-19	21K478410	Ceramic: 1,000 mmf 500V	.25
C-20	21A470789	Ceramic: 5,000 mmf 450V; disc	.30
C-21	8A484814	Paper: .05 mf 200V	.45
C-22	21A470789	Ceramic: 5,000 mmf 450V; disc	.30
C-23	21A470789	Ceramic: 5,000 mmf 450V; disc	.30
C-24	21K478410	Ceramic: 1,000 mmf 500V	.25
C-25	21K478410	Ceramic: 1,000 mmf 500V	.25
C-26	21K478410	Ceramic: 1,000 mmf 500V	.25
C-27	21K478410	Ceramic: 1,000 mmf 500V	.25
C-28	21K478410	Ceramic: 1,000 mmf 500V	.25
C-29	21A470789	Ceramic: 5,000 mmf 450V; disc	.30
C-30	21A470789	Ceramic: 5,000 mmf 450V; disc	.30
C-31	21A470790	Ceramic: 1,500 mmf 500V	.30
C-32	21K478234	Molded: 8 mmf 500V	.25
C-33	21K470323	Molded: 15 mmf 500V	.25
C-34	8R9814	Paper: .1 mf 100V	.25
C-35	21A470789	Ceramic: 5,000 mmf 450V; disc	.30
C-36	21K77375	Ceramic: 250 mmf 500V	.20
C-37	21K780598	Ceramic: 750 mmf 500V	.25
C-38	21K780599	Ceramic: 1,000 mmf 500V	.25
C-39 A & B	23B90134	Electrolytic: 120-20 mf 300V	2.15
C-40	8R9873	Paper: .05 mf 600V	.25
C-41	21A478274	Molded: 2.2 mmf 500V	.25
C-42	21K470328	Molded: 70 mmf 500V	.25
C-43	21A470789	Ceramic: 5,000 mmf 450V; disc	.30
C-44	21A470789	Ceramic: 5,000 mmf 450V; disc	.30
C-45	-	Silver mica: 15 mmf (Part of base of T-2)	-
C-46	21A790131	Ceramic: 150 mmf (in ratio detector shield)	.35
C-47	21R6590	Mica: 500 mmf 500V	.25
C-48	23A90205	Electrolytic: 10 mf 50V	.45
C-49	21K478410	Ceramic: 1,000 mmf 500V	.25
C-50	21K482726	Ceramic: 10,000 mmf; disc	.30
C-51	21A470789	Ceramic: 5,000 mmf 450V; disc	.30
C-52	8R9819	Paper: .05 mf 600V	.25
C-53	8R9840	Paper: .02 mf 600V	.25
C-54A, B & C	23B90136	Electrolytic: 20 mf 25V, 100 mf 300V & 60 mf 150V	2.30
C-55	8R9873	Paper: .05 mf 600V	.25
C-56	8R9873	Paper: .05 mf 600V	.25
C-57	21B77286	Ceramic: 100 mmf 500V	.20
C-58	8R9860	Paper: .03 mf 400V	.25
C-59	8R9822	Paper: .5 mf 200V	.45
C-60	21K470322	Molded: 20 mmf 500V	.25
C-61	21K790477	Mica: 200 mmf 2,000V	.40
C-62	21K790476	Mica: 680 mmf 2,000V	.40
C-63	21A790475	Mica: 900 mmf 2,000V	.40
C-64	8A480255	Paper: .001 mf 6,000V; oil impregnated	.55
C-65	8A480255	Paper: .001 mf 6,000V; oil impregnated	.55
C-66	8R9834	Paper: .01 mf 600V	.25
C-67	8R9834	Paper: .01 mf 600V	.25
C-68	21K77375	Ceramic: 250 mmf 500V	.20
C-69	21R6663	Mica: 1,000 mmf 500V	.40
C-70	21K77375	Ceramic: 250 mmf 500V	.20
C-71	8R9874	Paper: .1 mf 600V	.35
C-72	8R9873	Paper: .05 mf 600V	.25
C-73	8R471156	Paper: .004 mf 600V	.20
C-74	21B77286	Ceramic: 100 mmf 500V	.20
C-75	8A471348	Paper: .005 mf 6,000V; oil impregnated	.80
C-76	8A471348	Paper: .005 mf 6,000V; oil impregnated	.80
C-77	21K77375	Ceramic: 250 mmf 500V	.20
C-78	8A471348	Paper: .005 mf 6,000V; oil impregnated	.80
C-79	8R9819	Paper: .05 mf 600V	.25
C-80	21R2742	Mica: 1,250 mmf 500V	.40
C-81	21K478410	Ceramic: 1,000 mmf 500V	.25
C-82	21K77375	Ceramic: 250 mmf 500V	.20
C-83	21K77375	Ceramic: 250 mmf 500V	.20
C-84	21K77375	Ceramic: 250 mmf 500V	.20
C-85	21K77375	Ceramic: 250 mmf 500V	.20
C-86	21K77375	Ceramic: 250 mmf 500V	.20
C-87	21K77375	Ceramic: 250 mmf 500V	.20
C-88	8R9819	Paper: .05 mf 600V	.25
C-89	21K478410	Ceramic: 1,000 mmf 500V	.25
C-90	23B484097	Electrolytic: 1 section; 140 mf 150V	1.70
C-91	8K471169	Paper: .1 mf 400V	.25
C-92	21A470789	Ceramic: 5000 mmf 450V; disc	.30
Rectifiers			
E-1	48A90173	1N34 Germanium crystal	1.75
E-2	48B470395	Selenium type: half-wave	2.25
E-3	48B470395	Selenium type: half-wave	2.25
Coils			
L-1	24A790033	Antenna Input Impedance Matching Coil	.50
L-2	24C790535	Antenna Coil (includes L-2A to L-2E inclusive which are sections of one coil; L-2F to L-2L are part of switch wafer)	.20
L-3	24C790536	R.F. coil (includes L-3A to L-3F inclusive (which are sections of one coil; L-3F to L-3L are part of switch wafer)	.20
L-4	24C790537	Oscillator Coil (includes L-4A to L-4E inclusive which are sections of one coil; L-4F to L-4L are part of switch wafer)	.20
L-5	24K790604	High Band oscillator coil	.05
L-6	24K790605	High Band R.F. coil (consists of wire lead from switch deck to plate of RF amp)	.05
L-7	24K780128	R.F.choke:molded; 2 microhenries	.20
L-8	24A780127	R.F.choke:molded; 1 microhenry	.20
L-9	24K790035	R.F.choke:molded; 5.6 microhenries	.30
L-10	24A790176	1st IF: (less tuning core)	.35
L-11	24K790035	R.F.choke:molded; 5.6 microhenries	.30
L-12	24A790176	2nd IF: (less tuning core)	.35
L-13	24A790175	3rd IF: (less tuning core)	.35
L-14	24B790129	R.F. choke (in detector panel)	.30
L-15	24K790130	R.F. choke (in detector panel)	.30
L-16	24A780602	Compensating coil: green dot (wound on 18 K resistor)	.50
L-17	24A780601	Compensating coil: black dot	.50
L-18	24A470159	Audio Take-off (less tuning core)	.35
L-19	24A780127	Filament choke: molded; 1 micro-henry	.20
L-20	24A780127	Filament choke: molded; 1 micro-henry	.20

Ref. No.	Part Number	Description	List Price
L-21	24A780127	Filament choke: molded; 1 micro-henry	.20
L-22	24A780127	Filament choke: molded; 1 micro-henry	.20
L-23	24A780127	Filament choke: molded; 1 micro-henry	.20

Speaker

LS-1	50B471322	Speaker: 6½"; PM; 3.2 ohm voice coil	4.90
			Exch. 3.70

Resistors

NOTE: All resistors are 10%, 1/2W insulated carbon type unless otherwise specified.

R-1	6R6377	470,000	doz.	1.00
R-2	6R6477	15,000	doz.	1.00
R-3	6R2039	68 (Allen-Bradley only)	doz.	1.00
R-4	6R6229	1,000	doz.	1.00
R-5	6R6410	33,000	doz.	1.00
R-6	6R6320	10,000	doz.	1.00
R-7	6R6393	1,200	doz.	1.00
R-8	6R6229	1,000	doz.	1.00
R-9	6R6117	5,600	doz.	1.00
R-10	6R6229	1,000	doz.	1.00
R-11	6R2035	82 (Allen-Bradley only)	doz.	1.00
R-12	6R6270	220	doz.	1.00
R-13	6R6446	4.7 meg (Allen-Bradley only)	doz.	1.00
R-14	6R6397	22,000	doz.	1.00
R-15	6R2035	82 (Allen-Bradley only)	doz.	1.00
R-16	6R490110	3.9 meg	doz.	1.00
R-17	6R6326	100	doz.	1.00
R-18	6R6326	100	doz.	1.00
R-19	6R2035	82 (Allen-Bradley only)	doz.	1.00
R-20	6R6270	220	doz.	1.00
R-21	6R2004	8,200	doz.	1.00
R-22	6R6022	330	doz.	1.00
R-23	6R6460	1.5 meg	doz.	1.00
R-24	6R6046	1 meg	doz.	1.00
R-25	6R5660	180	doz.	1.00
R-26	18A780359	Contrast control: 2,000; tapped		.95
R-27	6R5671	4,700 2W		.20
R-28	6R5690	6,800 2W		.20
R-29	-	18,000: Not replaceable (part of L-15)		-
R-30	6R6373	150	doz.	1.00
R-31	6R6229	1,000	doz.	1.00
R-32	6R5660	180	doz.	1.00
R-33	6R6410	33,000	doz.	1.00
R-34	18A90142	Volume Control: 1 meg; with SPST switch		1.00
R-35	6R6428	6,800	doz.	1.00
R-36	6R6428	6,800	doz.	1.00
R-37	6R6446	4.7 meg (Allen-Bradley only)	doz.	1.00
R-38	6R6407	220,000	doz.	1.00
R-39	6R6407	220,000	doz.	1.00
R-40	6R6377	470,000	doz.	1.00
R-41	6R6022	330	doz.	1.00
R-42	6R6046	1 meg	doz.	1.00
R-43	6R6320	10,000	doz.	1.00
R-44	6R6046	1 meg	doz.	1.00
R-45	6R6320	10,000	doz.	1.00
R-46	6R5691	6,800	doz.	1.00
R-47	6R6477	15,000	doz.	1.00
R-48	6R5610	8,200 1W (IRC only)	each	.15
			doz.	1.45
R-49	18A780098	Horiz. Hold Control: 10,000		.80
R-50	6R6080	4,700	doz.	1.00
R-51	6R6477	15,000	doz.	1.00
R-52	6R5581	3,300	doz.	1.00
R-53	18A90144	Horiz. Size Control: 20,000		.80
R-54	6R6048	47,000	doz.	1.00
R-55	6R6320	10,000	doz.	1.00
R-56	6R6031	100,000	doz.	1.00
R-57	18A90145	Vertical Hold Control: 5 meg		.80
R-58	6R6497	3.3 meg (IRC only)	doz.	1.00
R-59	6R6433	2.2 meg	doz.	1.00
R-60	18A90145	Vertical Size Control: 5 meg		.80
R-61	6R488252	22 meg 1W	each	.15
			doz.	1.45
R-62	6R5622	10 meg	doz.	1.00
R-63	6R5622	10 meg	doz.	1.00
R-64	6R6031	100,000	doz.	1.00
R-65	6R6407	220,000	doz.	1.00
R-66	6R488157	6.8 meg 1W	each	.15
			doz.	1.45
R-67	6R488157	6.8 meg 1W	each	.15
			doz.	1.45
R-68	18A90148	Focus control: 2.5 meg		.80
R-69	6R2011	2.2 meg 1W (Allen-Bradley only)	each	.15
			doz.	1.45
R-70	6R2011	2.2 meg 1W (Allen-Bradley only)	each	.15
			doz.	1.45
R-71	6R488057	2.7 meg 1W (Allen-Bradley only)	each	.15
			doz.	1.45
R-72	6R6446	4.7 meg (Allen-Bradley only)	doz.	1.00
R-73	6R488057	2.7 meg 1W (Allen-Bradley only)	each	.15
			doz.	1.45
R-74	6R6446	4.7 meg (Allen-Bradley only)	doz.	1.00
R-75	6R6446	4.7 meg (Allen-Bradley only)	doz.	1.00
R-76	6R6446	4.7 meg (Allen-Bradley only)	doz.	1.00
R-77	18A484192	Horizontal Centering: 2 meg		1.15
R-78	18A478285	Vertical Centering: 2 meg		1.00
R-79	6R6031	100,000	doz.	1.00
R-80	6R6377	470,000	doz.	1.00
R-81	18A90147	Brightness Control: 1 meg		.80
R-82	6R6398	150,000	doz.	1.00
R-83	6R6415	100 1W	each	.15
			doz.	1.45
R-84	6R6415	100 1W	each	.15
			doz.	1.45
R-85	6R2036	33	doz.	1.00
R-86	6R6377	470,000	doz.	1.00
R-87	17A485459	Ballast Tube		2.25
R-88	6R6434	27,000	doz.	1.00
R-89	6R5659	3,900	doz.	1.00

Switches

S-1	1X790534	Station Selector Switch, Fine Tuning Trimmer & Coils Assembly	10.00
S-2	-	Power switch (part of volume control R-34)	-

Transformers

T-1	24B90192	Mixer IF: less tuning cores	.35
T-2	24B790125	Ratio Detector: complete with cores & capacitors C-45 & C-46; less shield	2.00
T-3	25K470392	Audio Output	1.35
T-4	24B480209	AFC coupling	2.35
T-5	24B480209	Horizontal Blocking Oscillator	2.35
T-6	25B90138	Horizontal Sweep Output	2.80
T-7	1X471212	High Voltage (complete with leads & C-80)	6.25

Tubes

V-1	6AG5	RF Amplifier	-
V-2	12AT7	Mixer-Osc	-
V-3	6AU6	1st IF Amplifier	-
V-4	6AU6	2nd IF Amplifier	-
V-5	6AU6	3rd IF Amplifier	-
V-6	6AU6	Video Amplifier	-
V-7	6AU6	Audio Driver Limiter	-
V-8	6AL5	Ratio Detector	-
V-9	12SN7	Audio Amp & Vertical Sweep Oscillator	-
V-10	25L6GT	Audio Output	-
V-11	12SN7GT	1st & 2nd Clipper	-
V-12	12SN7GT	Horizontal Sweep Oscillator & AFC Diode	-
V-13	6SL7GT	Vertical Sweep Output	-
V-14	25L6GT	H.V. Oscillator	-
V-15	1B3GT/8016	H.V. Rectifier	-
V-16	7JP4	Picture Tube	-

Part Number	Description	List Price
MECHANICAL PARTS		
42K13135	Clamp, Cable (ant. lead) .....doz.	.15
42B70721	Clip, coil mounting (T-2 secondary) ...doz.	.25
42K471342	Clip, grid (HV rect)	.05
42A72609	Clip, Tube Shield grounding (V-9)	.05
46A470310	Core, iron & screw (T-1 primary, L-18)	.15
46K480256	Core, iron & screw (T-1 secondary)	.15
46A70023	Core, iron & screw (T-2 primary)	.15
46A470302	Core, iron & screw (T-2 secondary)	.20
46A478242	Core, tuning: brass (L-10, L-12 & L-13) ...	.15
45A470708	Coupling, insulated shaft (for focus & centering pots)	.20
15K471329	Cover, bottom (HV shield)	.20
5K471253	Grommet, insulating: 5/16 hole; black rubber .....doz.	.50
5K471264	Grommet, insulating: 1/2" hole; black rubber .....doz.	.50
14K87179	Insulator, coil (T-2) .....doz.	.25
9A484098	Insulator, electrolytic mtg: 3 lug ....doz.	.50
9K471267	Insulator, electrolytic mtg: 4 lug ....doz.	.35
14A489024	Insulator, shield (Blocking osc) .....doz.	.35
14A482132	Insulator, shield (2nd detector panel)	.05
14A470050	Insulator, socket mounting (HV rect.)	.20
3S7247	Lockscrew: 6-32 x 3/16 slotted hex head (detector panel) .....doz.	.15
4S7650	Lockwasher: #6 int. steel; cad pl .....per/c	.50
4S7655	Lockwasher: 3/8 int; steel; cad pl ....per/c	.50
4S2635	Lockwasher: 1/2 int; cad pl (insulated shaft coupling) .....doz.	.15
29R5378	Lug, soldering: #5 hole (tube socket gnd) .....doz.	.15
29R5248	Lug, soldering: #6 hole (in HV supply compartment) .....doz.	.15
29R5318	Lug, soldering: #6 hole (electrolytic mtg rivet) .....doz.	.15
29R3024	Lug, soldering (miniature tube socket gnd) .....doz.	.15
29R3009	Lug, soldering: bent; #2 hole (tube socket gnd) .....doz.	.15
2S7005	Nut, hex: 6/32 x 1/4; steel; cad pl (sel. rect.) .....per/c	.50
2S7004	Nut, hex: 3/8-32 x 9/16; cad pl .....doz.	.20
2S7050	Nut, hex palnut; 6-32 x 5/16; cad pl (detector panel mtg) .....per/c	.50
2S7051	Nut: hex palnut; 3/8-32 x 9/16; cad pl (rear control shafts) .....doz.	.15
2A470049	Nut, mounting (coil & core mtg., T-1, L-10, L-12, L-13 & L-18) .....doz.	.50
2B70703	Nut: special palnut (T-2 primary) .....doz.	.30
2S8397	Nut: 1/2-28 x 5/8; zinc plated (ins. shafts) .....doz.	.25
28K471323	Plug, line cord: 2-pin	.20
42K471274	Ring, socket retainer (HV rect)	.05
5S7771	Rivet: .088 x 3/16 steel; nickel plated (mixer-osc. socket mtg.) .....per/c	.50
5S7774	Rivet: .088 x 1/4 steel; nickel plated (min. tube socket mtg) .....per/c	.50
5S7706	Rivet: .122 x 1/8 steel; nickel plated.per/c	.50
5S7707	Rivet: .122 x 5/32 steel; nickel plated (octal tube socket mtg, terminal strip mtg) .....per/c	.50
5S7701	Rivet: .122 x 3/16 steel; nickel plated .....per/c	.50
5S7703	Rivet: .122 x 7/32 steel; nickel plated (electrolytic insulator mtg.)..per/c	.50
5S7700	Rivet: .122 x 1/4 steel; nickel plated (H.V. shield bottom cover) ....per/c	.50
3S490336	Screw, machine: 6-32 x 1-3/4 plain hex head; cad pl (sel. rect.) .....doz.	.20
3S7506	Screw, sheet metal: #6 x 1/4 PKZ plain hex head; cad pl (HV Shield) .....per/c	.50
47K470709	Shaft, insulated (focus & centering pots)	.10
1X489026	Shield & bolts assembly (blocking osc)	.30
1X470742	Shield & bolts assembly (2nd detector panel)	.25
26B485936	Shield, coil (ratio det)	.20
26K471331	Shield, high voltage	2.20
26A26283	Shield, tube (for V-9, 12SN7)	.05
26A90301	Shield, tube (miniature)	.15
1X790531	Socket, tube: diheptal; includes leads (picture tube socket)	
9K780442	Socket, tube: miniature; tan molded bakelite	.20
9A471343	Socket, tube: miniature; tan molded bakelite; includes tube shield base	.35
9K484816	Socket, tube: noval (mixer-osc)	.40
9K471270	Socket, tube: octal; black molded bakelite	.20
9A471273	Socket, tube: octal; tan molded bakelite (HV rect.)	.35
43A471241	Spacer, rectifier stand-off (sel. rect.) ..	.05
41A70705	Spring, coil (T-2) .....doz.	.15
41A471257	Spring, tension (around H.V. rectifier) ...	.15
31A90167	Strip, antenna terminal	.15
31A471254	Strip, terminal (in detector panel)	.25
31K51251	Strip, terminal: 1 ins, #1 gnd; 3/8 spacing	.05
31A470162	Strip, terminal: 2 ins.,#2 high mtg; 1/2" spacing	.05
31K31223	Strip, terminal: 2 ins., end mtg; 1/2" spacing	.05
31K51511	Strip, terminal: 3 ins.,#3 gnd; 3/8" spacing	.05
31K37494	Strip, terminal: 4 ins.,#3 gnd; 3/8" spacing	.10
31A489139	Strip, terminal: 4 ins.,#3 high mtg; 1/2" spacing	.10
31A470387	Strip, terminal: 4 ins.,#3 mtg; 1/2" spacing	.10
31K90046	Strip, terminal: 5 ins.,#4 gnd; 3/8" spacing	.10
31K471562	Strip, terminal: 5 ins.,#4 mtg.; 3/8" spacing	.10
31A780123	Strip, terminal: 5 ins.,#3 mtg.; 3/8" spacing	.10
31A470164	Strip, terminal: 8 ins.,#2 & 7 gnd; 3/8" spacing	.20
14K482195	Washer, extruded: bakelite (HV shield bottom cover) .....doz.	.20
4K470939	Washer, ins.: 3/8 x .136 x .062 (electrolytic insulator mtg) .....per/c	.50
4A7625	Washer: 1/4 x .128 x .018; cad pl (HV shield bottom cover) .....per/c	.50
4S7555	Washer: 1/4 x .128 x .033 steel; cad pl .....per/c	.50
4S1720	Washer: 3/8 x .156 x .030; cad pl (sel. rect.) .....per/c	.50
CABINET PARTS - MODELS 7VT1, 7VT2 & 7VT5		
1X790502	Back Cover & Line Cord Assembly: fibre (7VT1)	3.50
1X790581	Back Cover & Line Cord Assembly: fibre (7VT2)	3.50
1X790494	Back Cover & Line Cord Assembly: fibre (7VT5)	3.50
57B790584	Block, spacer: wood (picture tube clamp) (7VT2)	.70
31A12748	Bumper, rubber (cabinet foot) (7VT1)	.05
35A790557	Bumper, rubber & bushing (cabinet foot) (7VT2)	.05
35A790097	Bumper, rubber & bushing (cabinet bottom foot) (7VT5)	.15
35A780453	Bumper, rubber (cabinet back foot) (7VT5) .	.05
38K790403	Button, snap: polished brass (over socket on antenna strap) (7VT5) .....doz.	.25
16F790428	Cabinet, table model: brown mahogany (7VT1)	-
16K790429	Cabinet, table model: red mahogany (7VT1R).	-
16K791108	Cabinet, table model: molded bakelite; black (7VT2)	-
16E790106	Cabinet, table model: molded bakelite; walnut (7VT2W)	-
16K790632	Cabinet, portable: red leatherette (7VT5R).	-
16F790194	Cabinet, portable: blonde leatherette (7VT5B)	-
30K780512	Cable & Lug Assembly, antenna: 20" 300 ohm line, with spade lugs on one end (7VT5) ..	.40

Part Number	Description	List Price
3K790197	Catch Assembly: polished brass (cover latch) (7VT5)	.50
42A780491	Clamp, line cord: brass plated (on back cover) (7VT5)	.20
7B471294	Clamp, picture tube (7VT1 & 7VT5)	.30
7A790583	Clamp, picture tube (7VT2) ....doz.	.15
42A790418	Clip, retainer (speaker mtg. panel) (7VT2) ....doz.	.25
13K791117	Cloth, grille (7VT1 & 7VT5)	.30
30B470756	Cord, line: with plug & receptacle: 9 ft. long	1.50
13K791409	Escutcheon & Grille: plastic (7VT1)	7.10
13D790192	Escutcheon & Grille: plastic (7VT5)	7.10
5S3139	Eyelet: .202 x .475; brass; antique copper finish (back cover) ....doz.	.15
5A780439	Eyelet, cabinet: brass (vents on sides of cabinet) (7VT5)	.15
32B790435	Gasket, picture tube seal: rubber (7VT2)	.65
32C790193	Gasket, picture tube seal: rubber (7VT1 & 7VT5)	.65
69C790421	Grille, speaker: sprayed gold finish (7VT2)	1.55
36K791475	Handle, cabinet: plastic; rust color (7VT5R)	.75
36K790199	Handle, cabinet: leather; tan color (7VT5B)	1.55
36K790198	Handle loop: brass (cabinet cover) (7VT5)	.25
55K790401	Hinge, cabinet cover: complete; polished brass (7VT5)	.35
14K780534	Insulator (fish paper) (7VT5) ....doz.	.20
9A780457	Jack, antenna plug (7VT5)	.60
36K791438	Knob, control: wal-mahog plastic (Selector Switch) (7VT1, 7VT1R & 7VT5R)	.35
36B790437	Knob, control: gold plastic (Selector Switch) (7VT2 & 7VT2W)	.35
36K791439	Knob, control: tan plastic (Selector Switch) (7VT5B)	.35
36K791441	Knob, control: wal-mahog plastic (Volume & Contrast) (7VT1, 7VT1R & 7VT5R)	.20
36K790427	Knob, control: gold plastic (Volume & Contrast) (7VT2 & 7VT2W)	.20
36K791442	Knob, control: tan plastic (Volume & Contrast) (7VT5B)	.20
36K791436	Knob, control: wal-mahog plastic (Fine Tuning) (7VT1, 7VT1R & 7VT5R)	.15
36K790426	Knob, control: gold plastic (Fine Tuning) (7VT2 & 7VT2W)	.15
36K791437	Knob, control: tan plastic (Fine Tuning) (7VT5B)	.15
4S7657	Lockwasher, external: #8; cad pl (speaker mtg.) ....per/c	.50
29R5220	Lug, soldering: #8 (grounding lead)....doz.	.30
29A790117	Lug, spade (on antenna cable) (7VT5)	.10
13A791096	Medallion (on speaker grille) (7VT2)	.30
2S7003	Nut, hex: 8-32 x 5/16; cad pl (spkr. mtg.) ....per/c	.50
2A780465	Nut, knurled (antenna jack) (7VT5)	.05
62K70581	Overlay, logotype (7VT1 & 7VT5)	.40
35K471282	Pad, asbestos (in cabinet)	.05
35A780119	Pad, tube neck	.15
64C790425	Panel, speaker mtg: chipboard (7VT2)	.25
64A790436	Panel, strip backing: chipboard (behind ornamental plate) (7VT2)	.10
64A780440	Plate, jack mtg; cad pl (7VT5)	.10
64K790423	Plate, ornamental: sprayed gold finish (in front corner of cabinet) (7VT2)	.25
5S7721	Rivet: .122 x 1/4; brass (line cord clamp mtg) (7VT5) ....per/c	.50
5K790196	Rivet: bi-furcated: 1/2" long; pol brass (hinges & catches) (7VT5) ....doz.	.15
5K790482	Rivet, shoulder: 1/2" long (line cord mtg).	.05
3S490358	Screw, machine: 8-32 x 7/16 plain acorn head; statuary bronze finish (back cover mtg) (7VT2) ....per/c	.50
3K15608	Screw, machine: 8-32 x 7/8; copper oxide finish (spkr. mtg) (7VT1 & 7VT5) ....doz.	.15
3K780432	Screw, machine: 8-32 x 1-1/8; copper oxide finish (pict. tube clamp, 7VT1) (spkr. mtg, 7VT2) ....doz.	.20
3K780454	Screw, machine: 8-32 x 1-1/2; copper oxide finish (pict. tube clamp) (7VT5) ....doz.	.15
3S490355	Screw, machine: 10-32 x 1-7/8 plain hex head; cad pl (pict. tube spacer block (7VT2) ....doz.	.15
3S490333	Screw, sheet metal: #4 x 5/8 PKA slotted acorn head; statuary bronze finish (back cover mtg.) (7VT1 & 7VT5) ....per/c	.50
3S7509	Screw, sheet metal: #6 x 5/8 PKA slotted acorn head; antique copper finish (picture tube clamp) (7VT2) ....doz.	.15
3S490332	Screw, sheet metal: #6 x 7/8 PKA plain hex head; statuary bronze finish (back cover mtg.) ....per/c	.50
3S7455	Screw, sheet metal: #8 x 3/8 PKA slotted acorn head; antique copper finish ....doz.	.15
3S7453	Screw, sheet metal: #8 x 1" PKZ plain hex head; cad pl (chassis mtg) (7VT1 7VT5) ....doz.	.15
3S490357	Screw, sheet metal: #8 x 1-1/8 PKZ plain hex head; cad pl (chassis mtg) (7VT2).doz.	.15
3S490356	Screw, sheet metal: #8 x 1-1/4 PKA slotted hex head; cad pl (picture tube clamp) (7VT2) ....doz.	.15
3S7534	Screw, sheet metal: #8 x 1-3/8 PKA plain hex head; cad pl (chassis mtg) (7VT5).doz.	.15
26A471293	Shield, picture tube neck	.25
1K471435	Shield, picture tube: aluminum	.70
26B471393	Shield, picture tube: fish paper	.10
9K790405	Socket, snap button: brass (on antenna strap) (7VT5) ....doz.	.20
2S7985	Speed nut: #8; black Parkerized finish (for cabinet foot) (7VT2) ....doz.	.35
2S490359	Speed nut: #8 (spkr mtg screws) (7VT5).doz.	.15
2S7053	Speed nut: 1/8"; black Parkerized finish (for medallion) (7VT2) ....doz.	.15
2S490346	Speed nut: 1/4"; black Parkerized finish (spkr. panel mtg) (7VT2) ....doz.	.15
42K791474	Strap, antenna: leather; rust color (in cover) (7VT5R)	.25
42K791473	Strap, antenna: leather; tan color (in cover) (7VT5B)	.25
42K791472	Strap, antenna base: leather; rust color (in cover) (7VT5R)	.35
42K791471	Strap, antenna base: leather; tan color (in cover) (7VT5B)	.35
46K790404	Stud, snap button: brass (for antenna strap) (7VT5) ....doz.	.15
4K484155	Washer, felt (control knobs) ....doz.	.40
4K790402	Washer, finishing: brass (antenna holding strap) (7VT5) ....doz.	.15
4S1706	Washer, flat: 3/8 x .203 x .033 steel; cad pl (picture tube spacker block) (7VT2) ....per/c	.50
4S488317	Washer, flat: 5/8 x .390 x .020; bright brass (antenna jack) (7VT5) ....doz.	.25
4S8204	Washer, flat: 1" x .203 x .067 steel; cad pl (chassis mtg) (7VT1) ....doz.	.25
4A780458	Washer, insulating (antenna jack) (7VT2) ....doz.	.30
61C790434	Window, picture tube: plastic (7VT2)	4.40

PRICES SUBJECT TO CHANGE WITHOUT NOTICE

Motorola® Television

CHASSIS
TS-18

SERVICE MANUAL SUPPLEMENT

REVISED IF ALIGNMENT INSTRUCTIONS

(Replace IF Alignment Instructions found on Pages 4 & 5 of TS-18 Service Manual, Part No. 54P791294).

IF AMPLIFIER ALIGNMENT

Equipment Required:

IF Sweep Generator meeting the following requirements:

18 to 30 mc., approximately 12 mc sweep width. Output constant and adjustable to at least .1 volt maximum with adjustable markers.

5" Cathode-Ray Oscilloscope: preferably one with a calibrated input attenuator.

NOTE: If a wide band scope is used, the marker will be more distinct if a capacitor of 100 to 1000 mmf is placed across the scope input. Use the smallest size possible, since too large a value will affect the shape of the curve.

1. By means of an external battery, apply a negative 3 volt bias between the bottom of the 1st IF grid resistor (R-9, 5600) & B-. The lead to the grid resistor should be decoupled through a 4700 to 10K resistor.

2. Using as short leads as possible, connect the hot side of the sweep generator to the 1st IF grid through a 5000 mmf condenser (do not use the loose or "spraying" method of coupling). The low side is connected to B-. Set the center frequency of the sweep to about 24.6 mc and adjust initially for a sweep deviation of approximately 12 mc. However, a sweep of from 8 to 10 mc may be found better for overall alignment.

3. Through a 10K decoupling resistor, connect the scope between the top of the detector load resistor (R-21, 8200) and B-. If a stronger output is required, connect the scope between the picture tube cathode and B-. The curve seen at this position will be of reversed polarity as in Figure 6.

4. Set the contrast control at minimum.

NOTE: If a distorted or unstable picture is seen on the oscilloscope during alignment, it may be necessary to stop the oscillator tube by placing a 1000 mmf capacitor between grid (pin #7) of V-2B and B-, or by unsoldering one side of cathode choke L-7 from B-.

CAUTIONS: 1. Do not reduce the oscilloscope gain and increase signal input so that the top of the curve is flattened by limiting the video or scope amplifiers.

2. If the AGC filter condenser (C-18, .25 mf) has been replaced, make certain the leads are short to avoid regeneration on weak signals.

3. As the plate chokes (L-9 & L-11) are parts of tuned circuits, their placement is critical. Do not move them indiscriminately.

5. Peak the 1st IF coil, L-10, initially, for maximum response at about 26.0 mc.

6. Tune the 2nd IF coil, L-12, initially, for peak response at about 24.6 mc.

7. Adjust the 3rd IF coil, L-13, to place a 22.9 mc marker signal 50% (1/2) the way up the low side of the response waveform.

8. Adjust the 1st IF coil, L-10, to place a 26.3 mc marker signal 50% (1/2) the way up the high side of the response waveform. Refer to Figure 5 for marker positions on waveform obtained.

9. Then adjust the 2nd IF plate coil, L-12, to provide a flat top or a symmetrical curve to the response waveform obtained.

NOTE: It may be necessary to repeat procedure to obtain proper waveform; see Figure 5.

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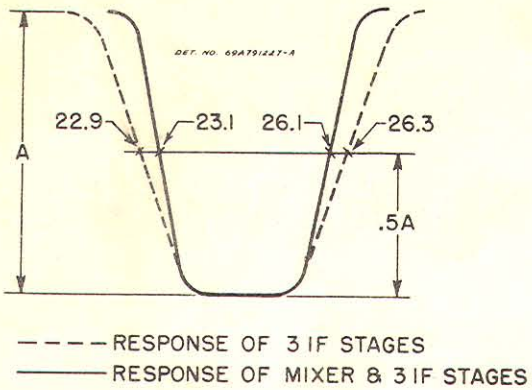


FIGURE 5. MIXER & IF WAVEFORM

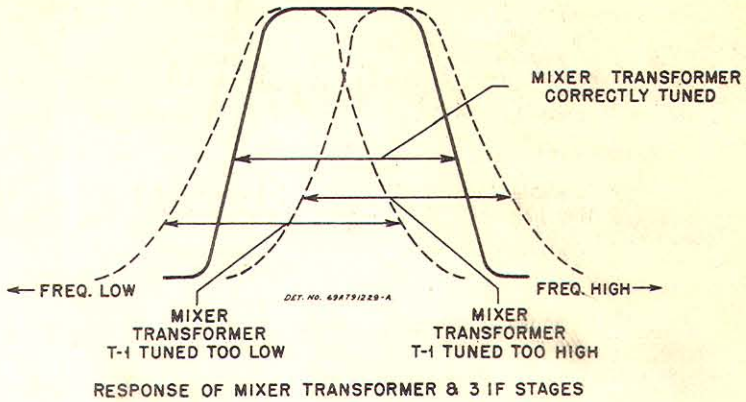


FIGURE 6. MIXER TRANSFORMER TUNING CURVE

MIXER TRANSFORMER ALIGNMENT

With the battery bias still applied to the 1st IF, move the sweep generator to the grid of V-2A mixer tube. Connect it across resistor R-5 (33K). Set contrast control at minimum. Bring both cores simultaneously from extreme outside positions toward the center until the 26.1 mc marker is 50% (1/2) way up the high frequency slope, and the 23.1 mc marker is 50% (1/2) way up the low frequency slope. Correct waveform is shown in Figure 5.

In aligning the three IF coils, each coil is adjusted individually, but when adjusting the primary and secondary of the mixer transformer T-1, the adjustments should be made simultaneously. The important point to keep in mind is to obtain a flat response curve with as much gain as possible. The sides of the curve should be straight and as steep as possible with a sharp break at the base line. Simultaneous adjustment of the primary and secondary is the easiest way to obtain this result. The transformer by itself is, in effect, tuned for the same pass band as the three staggered circuits. See Figure 6. The only difference in the overall waveform should be that the sides of the overall curve (Figure 5) should be steeper. Constant use of the 50% response marker signals to show the bandwidth of the response curve should be resorted to, since it is absolutely necessary to obtain the proper curve. A slight dip (not exceeding 10%) is permissible in the mixer transformer response curve.

REGENERATION CHECK

After the above IF and mixer transformer alignment has been made, a check for regeneration in the IF amplifier strip should be made. This is done by removing the battery bias and observing the output response curve on the oscilloscope, as taken across the cathode of the CR tube and B-. The band width will decrease with bias removed but should not fall below 2.3 mc. Set the contrast control to maximum gain. Decrease the input signal until the output signal shows a marked decrease. Any regeneration present will be indicated by sharp peaks on the overall response curve. The oscillator should be killed during this procedure.

CAUTION: Do not inject too much marker signal.

BANDWIDTH

The bandwidth may be determined with an AM generator by doubling the input required to produce 1 volt at the video detector and tuning to each side of 24.6 mc. until the meter again reads 1 volt. These frequencies correspond to the 6 db (50%) points on the skirts of the curve. The bandwidth will decrease from that shown in Figure 6 because the battery bias on the 1st IF tube has been removed, but the two 6 db points should be at least 2.3 mc apart. By making a plot of frequency versus voltage, the actual IF response curve may be traced out.

OVERALL IF SENSITIVITY MEASUREMENTS

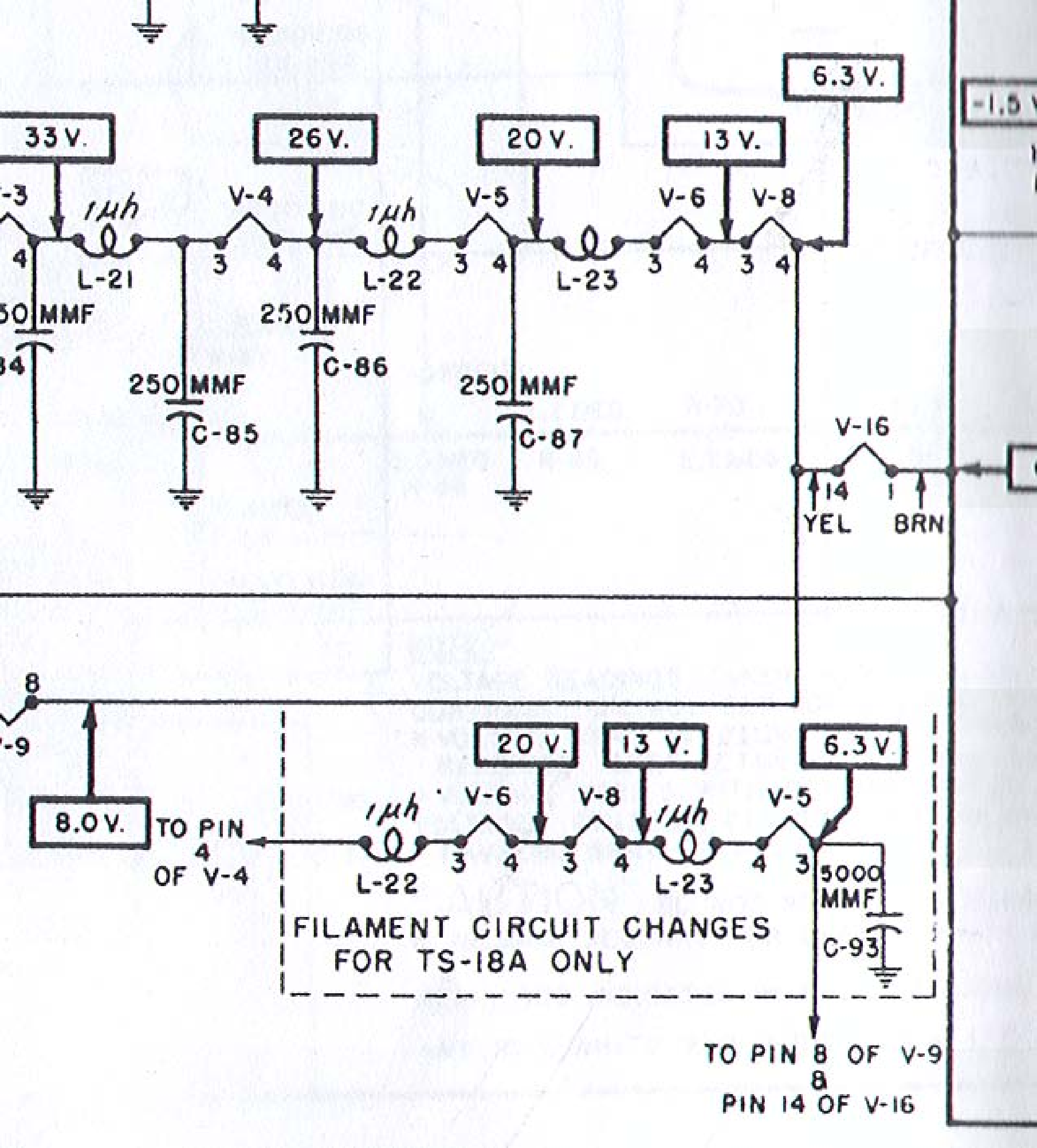
Comparative measures of sensitivity for the entire IF section, including the mixer transformer, are as follows:

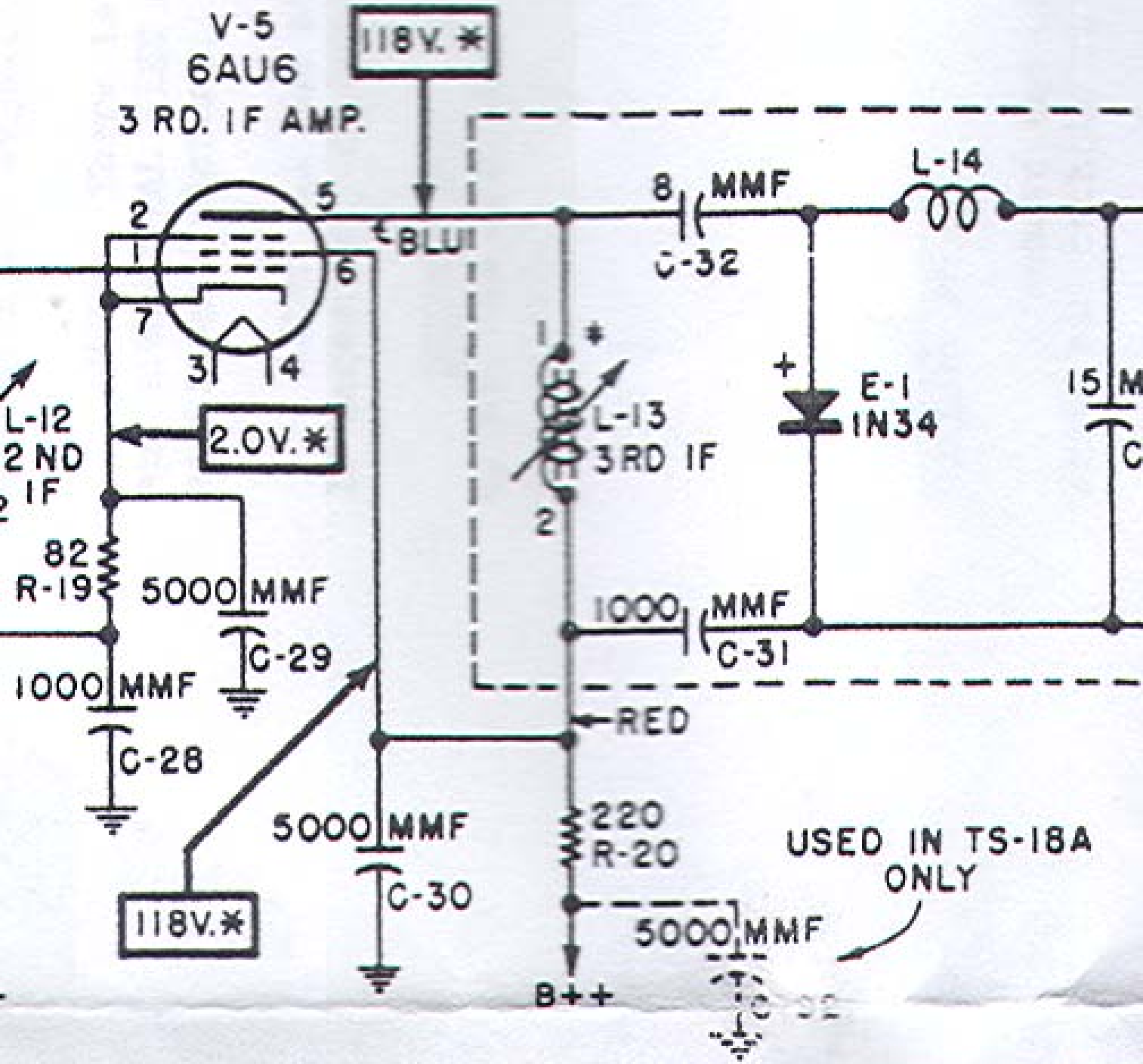
1. A low range electronic voltmeter is connected between top of 2nd detector load resistor R-21, and bottom of video amp grid resistor R-24.

2. A signal generator set at 24.6 mc is connected to the grid of V-2A (pin #2) and B-.

The signal required to produce a 1 volt rise (negative) above the contact potential should be less than 150 microvolts.

NOTE: It will be necessary to kill the oscillator during this measurement. This may be done by disconnecting choke L-7 from cathode of osc.


6.3 V.
33 V.
26 V.
20 V.
13 V.
1 μh
L-21
L-22
L-23
V-4
V-5
V-6
V-8
250 MMF
C-85
C-86
C-87
V-16
14
1
YEL
BRN
8
8.0 V.
TO PIN 4 OF V-4
20 V.
13 V.
6.3 V.
V-6
V-8
V-5
5000 MMF
C-93
FILAMENT CIRCUIT CHANGES FOR TS-18A ONLY
TO PIN 8 OF V-9
8
PIN 14 OF V-16


V-5
6AU6
3 RD. IF AMP.
118V.*
2
1
5
6
7
3
4
BLU
8 MMF
C-32
L-14
L-12
2 ND
IF
2.0V.*
82
R-19
5000 MMF
C-29
1000 MMF
C-28
L-13
3RD IF
E-1
IN34
15 M
C
1000 MMF
C-31
RED
220
R-20
5000 MMF
C-30
118V.*
B++
USED IN TS-18A
ONLY
5000 MMF

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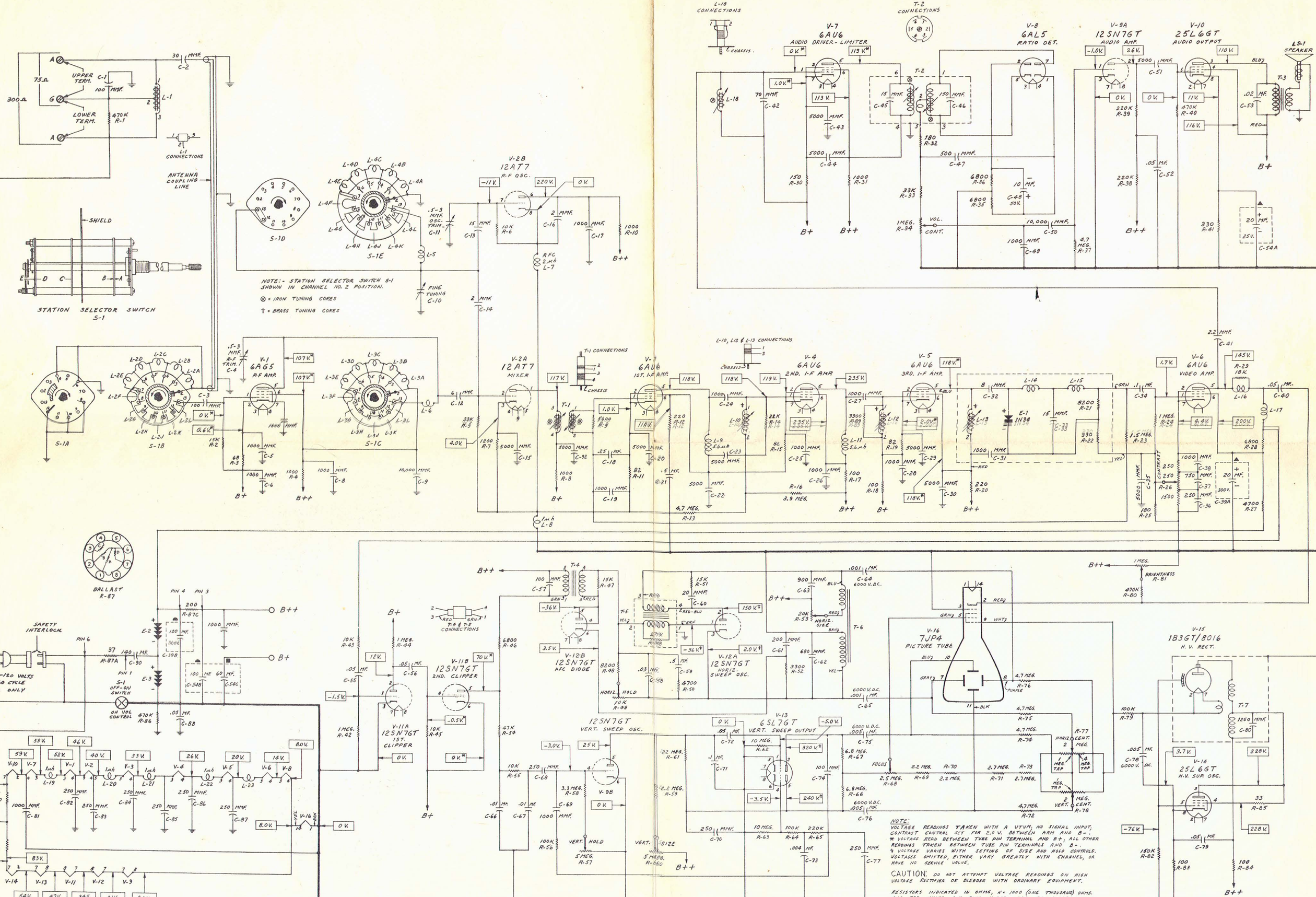

NOTE:
VOLTAGE READINGS TAKEN WITH A UTVM; NO SIGNAL INPUT, CONTRAST CONTROL SET FOR 2.0 V. BETWEEN ARM AND B−.
* VOLTAGE READ BETWEEN TUBE PIN TERMINAL AND B+, ALL OTHER READINGS TAKEN BETWEEN TUBE PIN TERMINALS AND B−.
‡ VOLTAGE VARIES WITH SETTING OF SIZE AND HOLD CONTROLS. VOLTAGES OMITTED, EITHER VARY GREATLY WITH CHANNEL, OR HAVE NO SERVICE VALUE.

CAUTION: DO NOT ATTEMPT VOLTAGE READINGS ON HIGH VOLTAGE RECTIFIER OR BLEEDER WITH ORDINARY EQUIPMENT.

RESISTORS INDICATED IN OHMS, K= 1000 (ONE THOUSAND) OHMS. ANY RED, WHITE AND BLUE WIRES ARE SUBSTITUTES.

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