RCC TELEVISION Service Manual

PUBLISHED BY RADIO COLLEGE OF CANADA, TORONTO

1954 Supplement No. 12

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ADMIRAL

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HALLICRAFTERS

MARCONI

MOTOROLA

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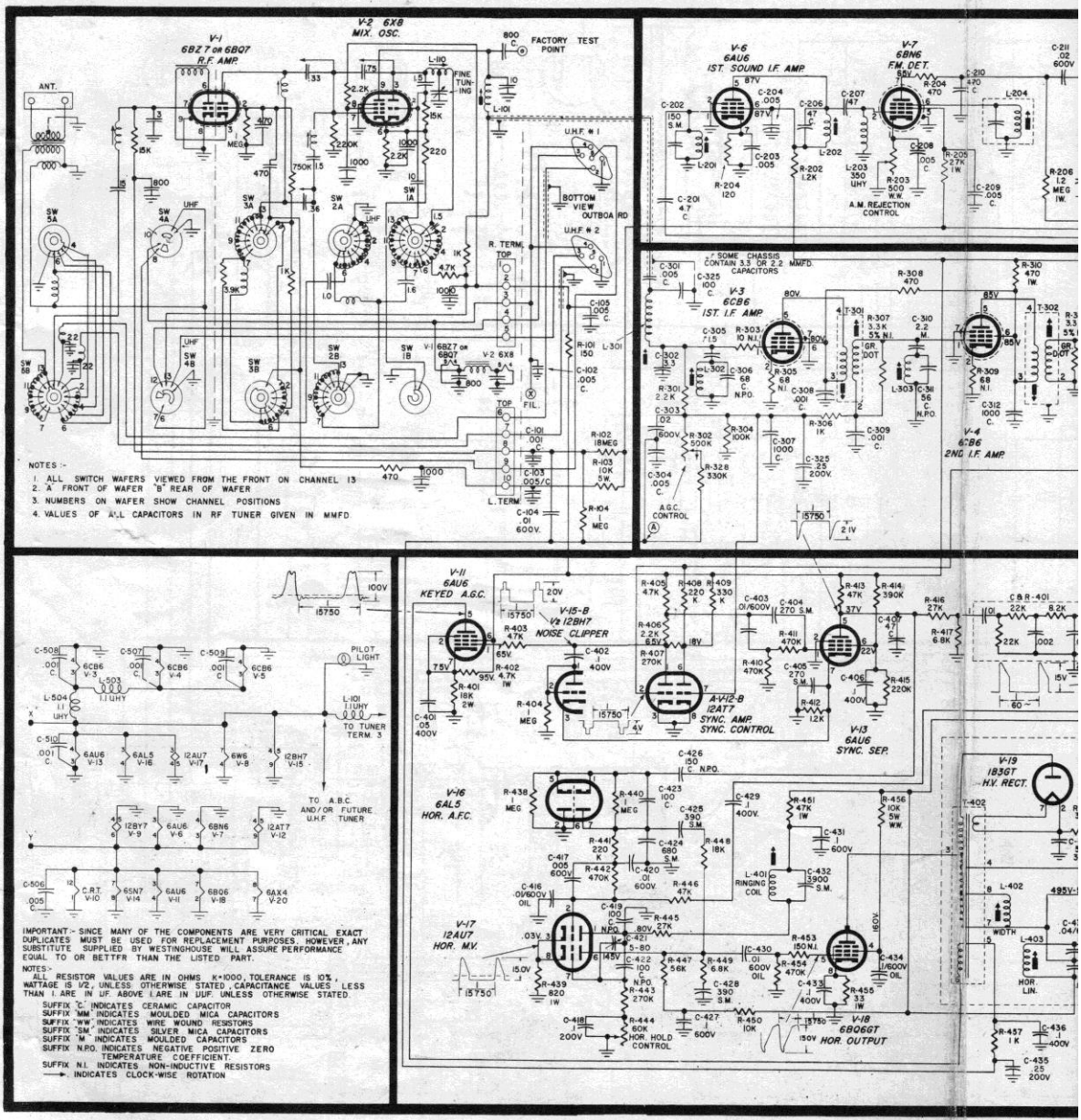
SYLVANIA

VIKING

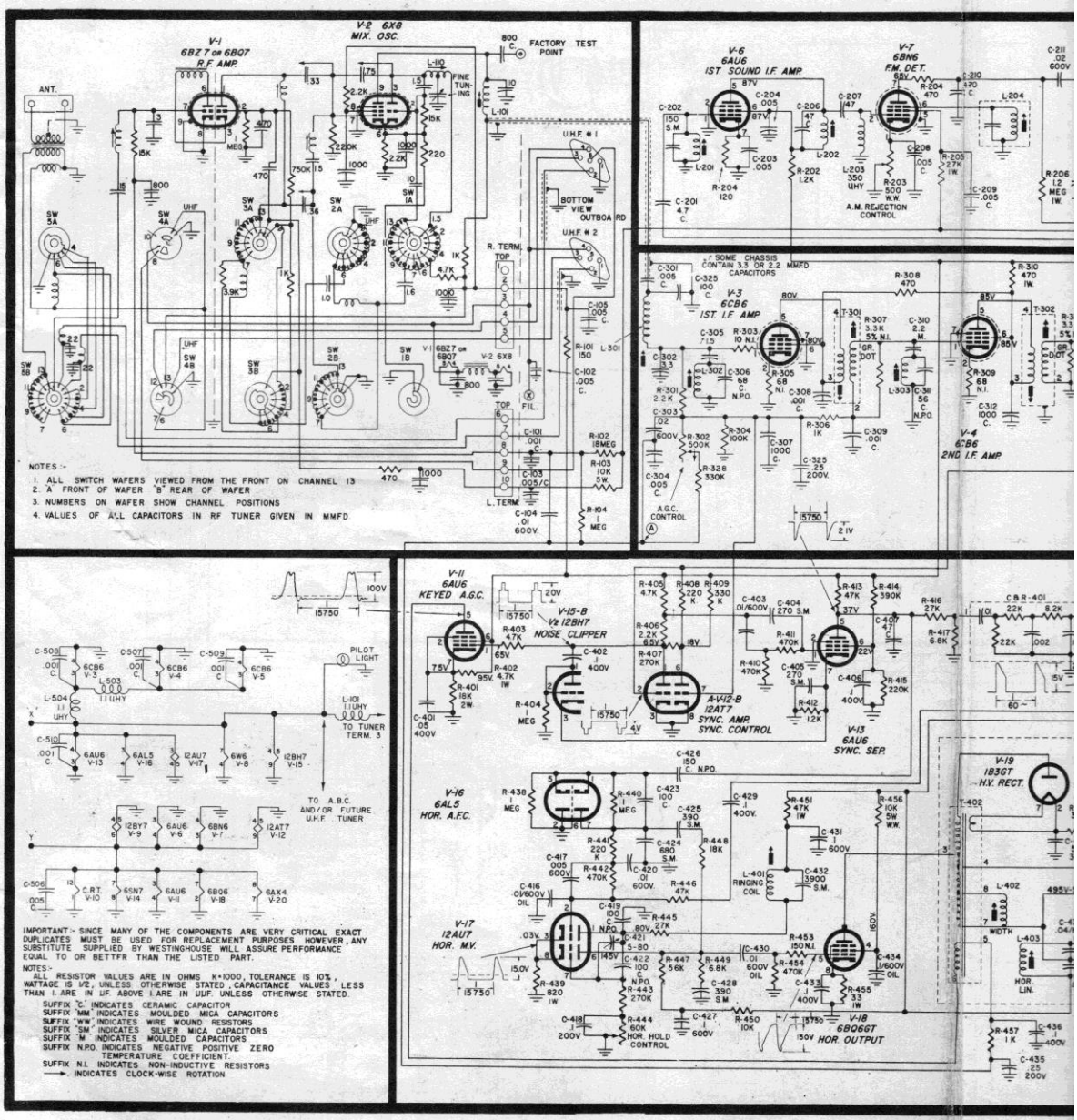
WESTINGHOUSE

RCC TELEVISION Supplement No. 12

21TV9T Etc., 21TV11T Etc.

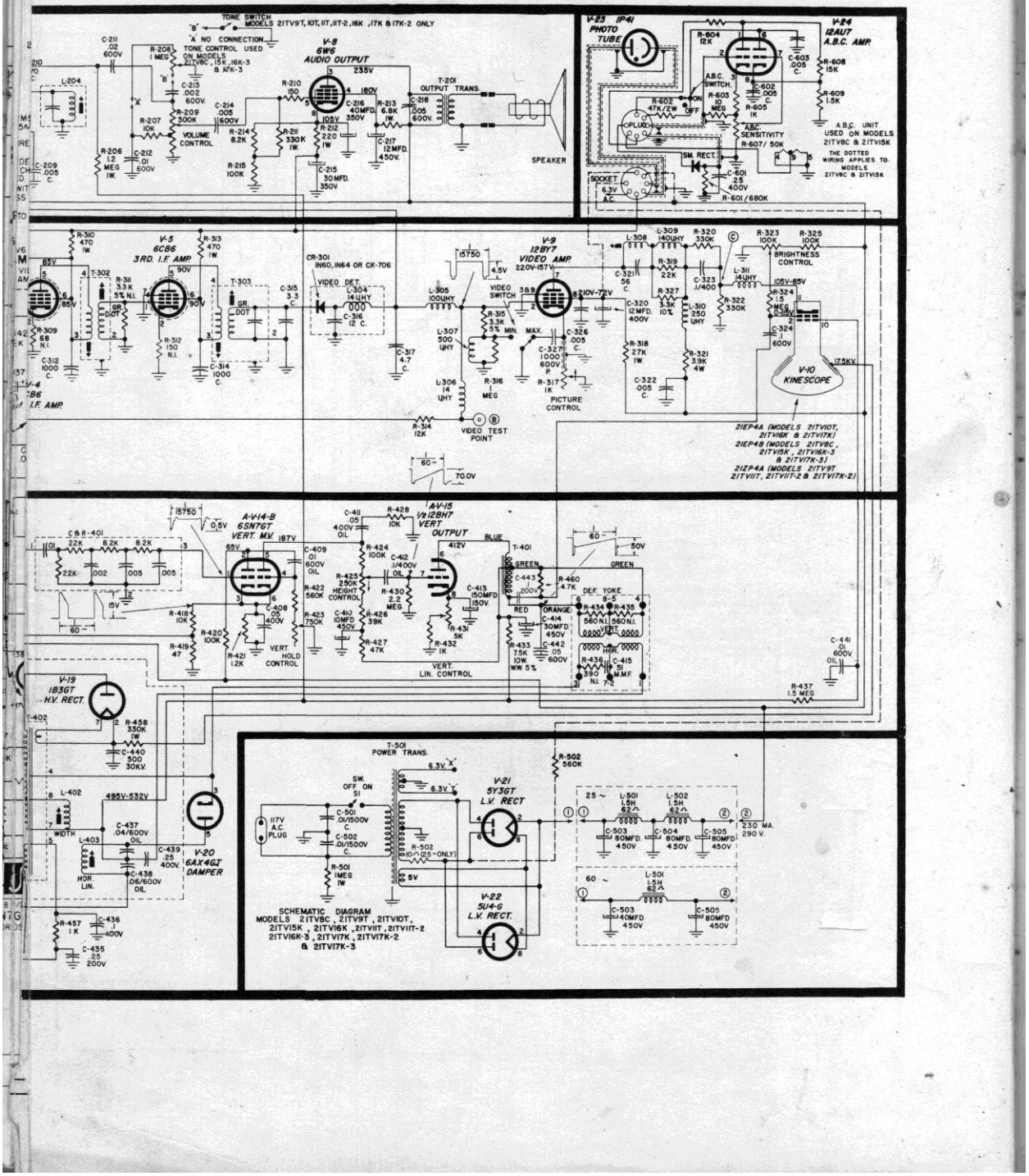


21TV9T Etc., 21TV11T Etc.



WESTINGHOUSE

21TV9T Etc., 21TV11T Etc.



PRODUCTION CHANGES

The changes that follow are incorporated in later production chassis and are not included in the schematic diagram. We would therefore suggest you make note of these changes and indicate where possible on the schematic diagram.

Improved Vertical Blanking - To prevent vertical picture shading with improved blanking, R-459 connected between the bottom end of the vertical output transformer winding and the junction of R-460, C-324 is replaced with a .1/600V capacitor.

Brightness Control Range - As a result of variations in picture tube characteristics, some early production chassis have a 150K resistor rather than a 330K resistor in the bottom half of the video DC divider of the picture tube cathode, (R-322). If the brightness cannot be reduced to a satisfactory level in these receivers, increase R-322 to 330K 1/2W.

Resistor Change-To insure maximum RF amplifier performance R-102 in the RF AGC delay circuit is changed from an 18 meg. 1/2W metalized resistor to a 15 meg. 1/2W carbon resistor. Some early production receivers exhibited excessively snowy pictures even under good signal conditions due to the 18 meg. resistor increasing in value or open circuiting.

AGC Circuit - To eliminate white horizontal streaking following long duration noise pulses the AGC time constant is now increased by reducing R-306 from 10K to 1K and adding a .25 mfd/200V capacitor in parallel with C-307.

Hum Elimination - To reduce hum in 25 cycle receivers only, a 10 ohm, 1/2W resistor is added to one side of the power transformer high-voltage winding. This resistor provided a balanced output and is located between pins 3 and 4 on the 5Y3GT (V-21) socket.

Increased Sound - To improve the sound sensitivity and output C-305 (3.3 mmfd.) is reduced to 1.5 mmfd. Early production 21TV9T receivers only, incorporated a damping resistor across the quadrature coil L-204. This resistor was later removed as shown in schematic diagram to provide more sound output.

Increased Signal-To-Noise-Ratio - To improve the signal-to-noise ratio at low signal levels R-103 (2.2K) 2W is increased to 10K 5W.

Width Control - To improve the width control range when operating the receiver at high line voltage V-11791-1 control is now superseded by 110M-422-2. This new control is similar to V-11791-1 but has 80 less turns on the windings and can be identified by a red or yellow paint mark.

Crystal Detector - To improve the video detector performance, 1N87 is superseded by 1N64. Faulty crystal performance is characterized by picture phase reversal (negative picture), intermodulation hum, poor vertical sync, picture gamma compression.

FOCOMAG & DEFLECTION YOKE POSITIONING

It is imperative that the Focomag & Deflection Yoke assemblies be aligned concentric with the C.R.T. neck. If this is not done, the deflection spot will be distorted at the screen of the C.R.T. The effect is characterized by: (a) Smeary picture. (b) Irregular areas of focus. (c) Horizontal and vertical line focus do not coincide.

This can be checked readily by viewing a test pattern, rotating the focus control, (located at the rear and to the left of the Focomag assembly) until the horizontal lines are in focus. Now check the vertical wedges on the test pattern. These vertical lines should also be in focus. If a different setting of the focus control is needed here, the Focomag assembly will have to be repositioned.

To reposition the Focomag assembly, it is first necessary to loosen the two screws on the "L" mounting brackets located on either side of the C.R.T. neck under the superstructure. After aligning Focomag concentrically with the C.R.T. neck, tighten the aformentioned screws.

It is always a good idea to check the position of the Deflection Yoke assembly when repositioning the Focomag. This assembly should also be positioned concentric with the C.R.T. neck. The adjustment is a wing screw mounted below and just ahead of the superstructure. Loosen the wing screw and slide the Deflection coil forward to rest as close as possible to the flare of the C.R.T. making sure the coil is centered properly to assure the raster being square with the picture tube mask. If the deflection coil is now concentric with the C.R.T. neck, tighten the wing screw, and adjust centering control lever to position the picture horizontally and vertically.

REPLACING TUNERS

Replacement tuners are shipped, less the U.H.F. Dial sleeve assembly, therefore, it will be necessary to remove this assembly before returning the tuner for replacement. To remove this shaft, it will be necessary to remove the U.H.F. drive belt, then remove the two screws securing the dial sleeve stabilizer, remove "C" washer and pull sleeve forward. Use the reverse procedure to re-install. In the event the original tuner is returned with this assembly attached a new dial sleeve assembly may be ordered under Part Number 11-M-257-501.

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INDEX

ADMIRAL

NOTE: For an index of model and chassis numbers see Page 2.

CANADIAN GENERAL ELECTRIC

FLEETWOOD

MOTOROLA

NORTHERN ELECTRIC

PHILIPS

ROGERS-MAJESTIC

SPARTON

TV2150, TV2151, TV2152, TV2252, TV2452 — Complete data on these receivers has already appeared in Supplements #2 and #6. Additional information on typical faults will be found on Page - 81 of this supplement.

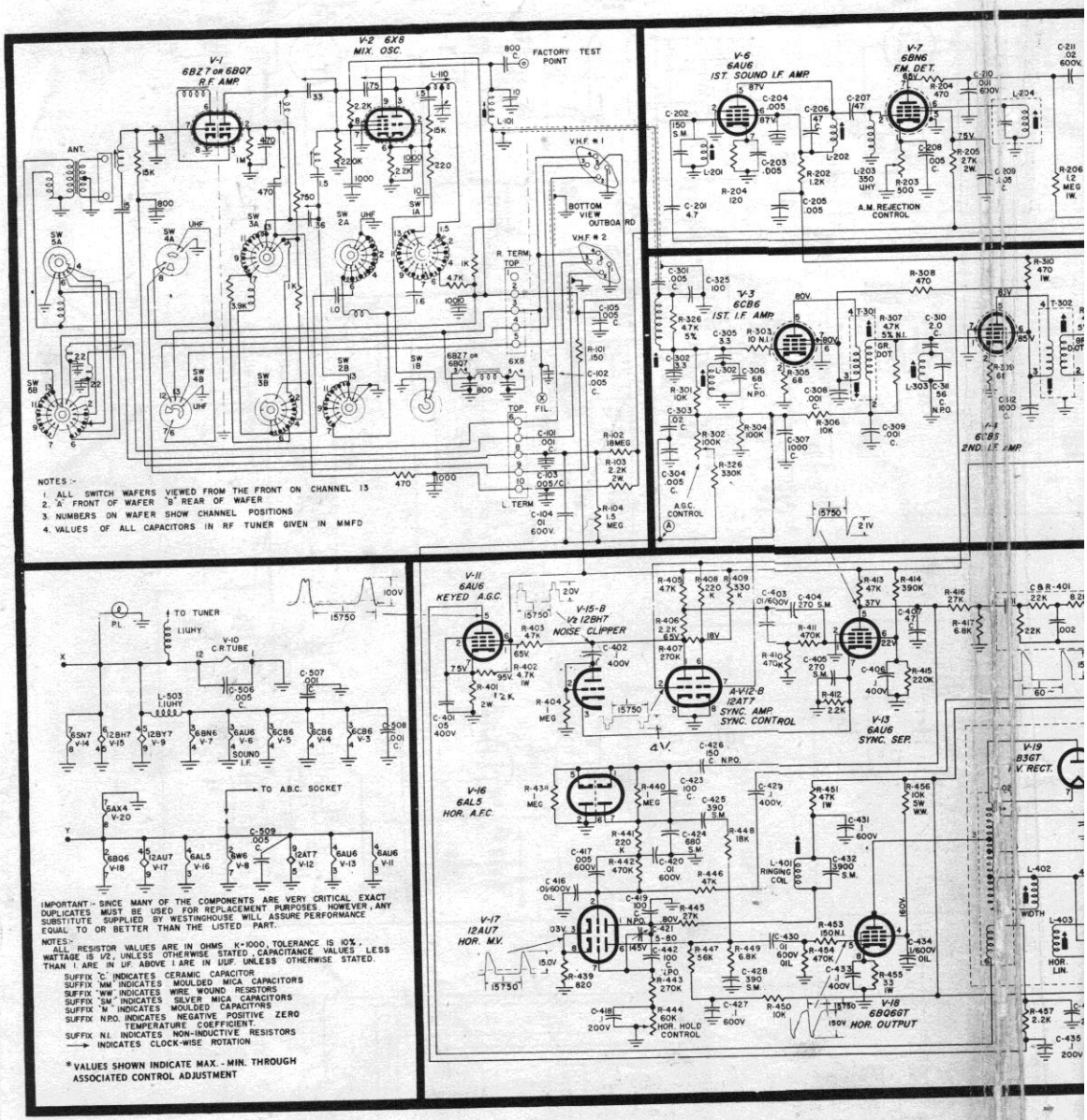
STEWART-WARNER

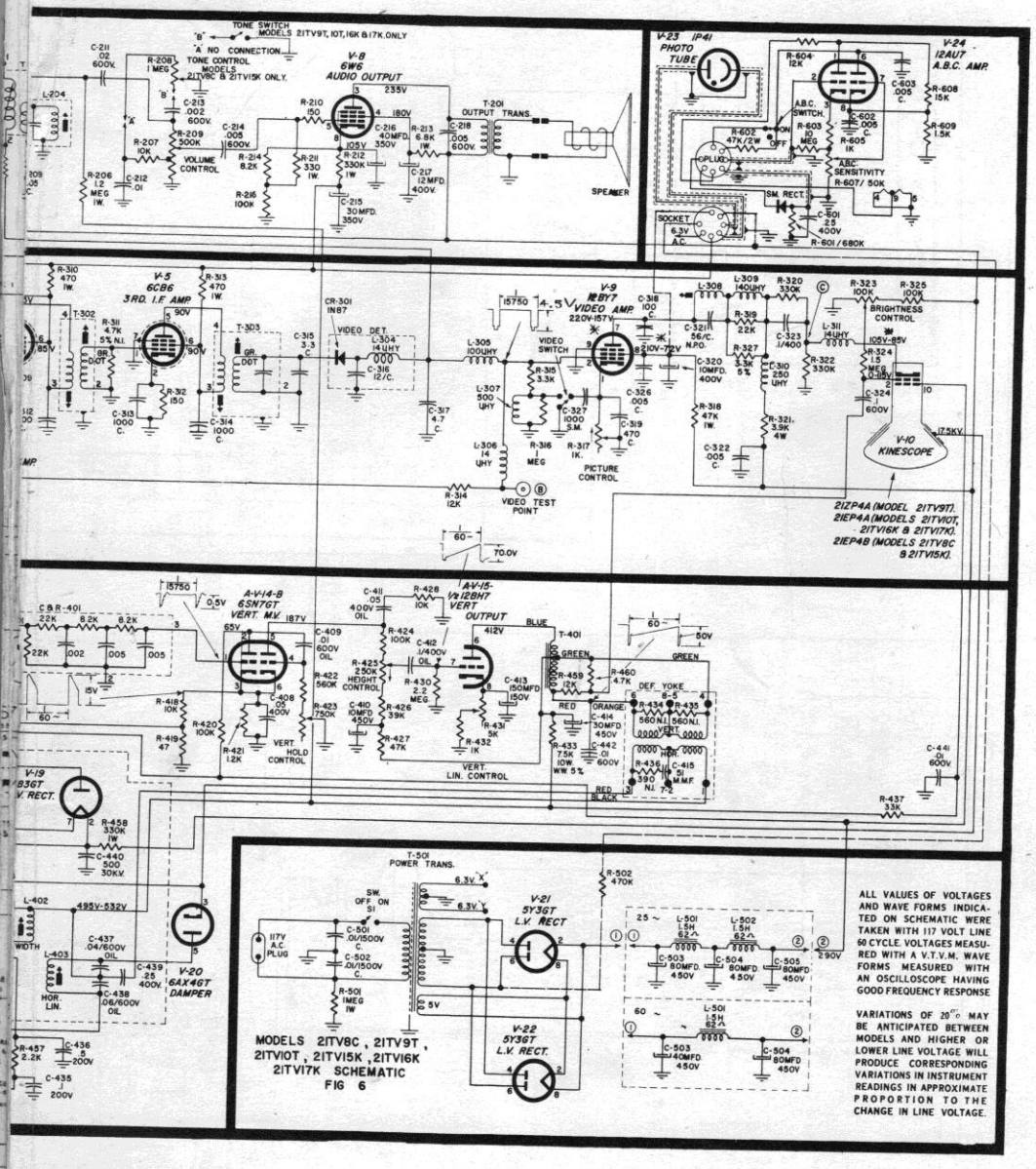
RCA-VICTOR

VIKING

WESTINGHOUSE

R.C.C. TELEVISION Supplement No. 10


V-1 6BZ7 or 6BQ7 R.F. AMP.
V-2 6X8 MIX. OSC.
FACTORY TEST POINT
ANT.
UHF
V.H.F. # 1
V.H.F. # 2
BOTTOM VIEW OUTBOARD
R. TERM. TOP
L. TERM.
TOP FIL.
NOTES :-
1. ALL SWITCH WAFERS VIEWED FROM THE FRONT ON CHANNEL 13
2. 'A' FRONT OF WAFER 'B' REAR OF WAFER
3. NUMBERS ON WAFER SHOW CHANNEL POSITIONS
4. VALUES OF ALL CAPACITORS IN RF TUNER GIVEN IN MMFD
V-6 6AU6 IST. SOUND I.F. AMP.
V-7 6BN6 FM. DET.
A.M. REJECTION CONTROL
V-3 6CB6 IST. I.F. AMP.
A.G.C. CONTROL
V-4 6CB6 2ND. I.F. AMP.
TO TUNER
P.L.
V-10 C.R. TUBE
L-503 1.1UHY
SOUND I.F.
TO A.B.C. SOCKET
V-11 6AU6 KEYED A.G.C.
V-15-B V-2 12BH7 NOISE CLIPPER
A-V12-B 12AT7 SYNC. AMP. SYNC. CONTROL
V-13 6AU6 SYNC. SEP.
V-16 6AL5 HOR. A.F.C.
V-17 12AU7 HOR. M.V.
V-18 6BQ6GT 150V HOR. OUTPUT
HOR. HOLD CONTROL
V-19 83GT H.V. RECT.
WIDTH
HOR. LIN.
RINGING COIL
IMPORTANT - SINCE MANY OF THE COMPONENTS ARE VERY CRITICAL, EXACT DUPLICATES MUST BE USED FOR REPLACEMENT PURPOSES. HOWEVER, ANY SUBSTITUTE SUPPLIED BY WESTINGHOUSE WILL ASSURE PERFORMANCE EQUAL TO OR BETTER THAN THE LISTED PART.
NOTES:-
ALL RESISTOR VALUES ARE IN OHMS. K=1000, TOLERANCE IS 10%, WATTAGE IS 1/2, UNLESS OTHERWISE STATED, CAPACITANCE VALUES LESS THAN 1 ARE IN UF. ABOVE 1 ARE IN UUF. UNLESS OTHERWISE STATED.
SUFFIX 'C' INDICATES CERAMIC CAPACITOR
SUFFIX 'MM' INDICATES MOULDED MICA CAPACITORS
SUFFIX 'WW' INDICATES WIRE WOUND RESISTORS
SUFFIX 'SM' INDICATES SILVER MICA CAPACITORS
SUFFIX 'M' INDICATES MOULDED CAPACITORS
SUFFIX N.P.O. INDICATES NEGATIVE POSITIVE ZERO TEMPERATURE COEFFICIENT.
SUFFIX N.I. INDICATES NON-INDUCTIVE RESISTORS
→ INDICATES CLOCK-WISE ROTATION
* VALUES SHOWN INDICATE MAX. - MIN. THROUGH ASSOCIATED CONTROL ADJUSTMENT


MODELS 21TV8C, 21TV9T, 21TV10T, 21TV15K, 21TV16K 21TV17K SCHEMATIC
FIG 6
ALL VALUES OF VOLTAGES AND WAVE FORMS INDICATED ON SCHEMATIC WERE TAKEN WITH 117 VOLT LINE 60 CYCLE. VOLTAGES MEASURED WITH A V.T.V.M. WAVE FORMS MEASURED WITH AN OSCILLOSCOPE HAVING GOOD FREQUENCY RESPONSE.
VARIATIONS OF 20% MAY BE ANTICIPATED BETWEEN MODELS AND HIGHER OR LOWER LINE VOLTAGE WILL PRODUCE CORRESPONDING VARIATIONS IN INSTRUMENT READINGS IN APPROXIMATE PROPORTION TO THE CHANGE IN LINE VOLTAGE.
V-8 6W6 AUDIO OUTPUT
V-9 12BY7 VIDEO AMP.
V-10 KINESCOPE
V-19 1B3GT V. RECT.
V-20 6AX4GT DAMPER
V-21 5Y3GT L.V. RECT
V-22 5Y3GT L.V. RECT.
V-23 1P41 PHOTO TUBE
V-24 12AU7 A.B.C. AMP.
T-501 POWER TRANS.
T-201 OUTPUT TRANS.
SPEAKER
2IZP4A (MODEL 21TV9T).
2IEP4A (MODELS 21TV10T, 21TV16K & 21TV17K).
2IEP4B (MODELS 21TV8C & 21TV15K).

FINE TUNING

1 Mc/s. minimum
2 Mc/s. maximum

POWER CONSUMPTION

200 V.A.

LOUDSPEAKER

Models	Size and Type
21TV9T & 21TV10T	5 inch P. M.
21TV16K & 21TV17K	12 inch P. M.
21TV8C (TV) Dual	8 inch P. M.
21TV15K	12 inch P. M.
21TV8C (Radio)	6 inch P. M.

RECEIVER ANTENNA INPUT IMPEDANCE

300 Ohms balanced or 72 Ohms unbalanced

POWER SUPPLY RATING

Operating voltages 105 - 125 volts
25 and 60 cycle A.C.

AUDIO POWER OUTPUT

Undistorted	1.5 Watts
Maximum	2.5 Watts

FOCUS Magnetic

INTERMEDIATE FREQUENCIES

Sound Trap	41.25 Mc/s.
Sound Carrier	4.5 Mc/s.
Sound Discriminator band width (between peaks)	265 Kc/s.

Video Carrier Intermediate Frequency

45.75 Mc/s.

Ref. No.	Description	Part No.
L-201	1st. SOUND I. F.	15-L-502-2
L-202	SOUND I. F.	15-L-502-3
L-203	350 UHY PEAKING	V-9915-2
L-204	QUADRATURE	15-L-517-1
L-301	PICTURE INPUT	15-L-502-1
L-302	SOUND TRAP	15-L-502-4
L-303	SOUND TRAP	15-L-502-4
L-304	R. F. REACTOR 14 UHY	V-4886-1
L-305	100 UHY VIDEO PEAKING REACTOR (BLACK)	6-M-415-501
L-306	R. F. REACTOR 14 UHY	V-4886-1
L-307	500 UHY (YELLOW)	6-M-415-503
L-308	I. F. REACTOR	15-L-502-3
L-309	VIDEO PEAKING REACTOR 140 UHY (BLUE)	6-M-415-506
L-310	VIDEO PEAKING REACTOR 250 UHY (VIOLET)	6-M-415-507
L-311	R. F. REACTOR 14 UHY	V-4886-1
L-401	RINGING COIL	8-M-839-1
L-402	WIDTH COIL SEE PRODUCTION CHANGE #3	V-11791-1
L-403	LINEARITY COIL	V-11789-1
L-501	FILTER CHOKE 1.5 HY. 62 OHMS., 25 CYCLE and 60 CYCLE	6-M-424-7
L-502	FILTER CHOKE 1.5 HY., 25 CYCLE ONLY	6-M-424-7
L-503	R. F. REACTOR 1.1 UHY	V-4886-2
L-504	R. F. REACTOR 1.1 UHY	V-4886-2
T-201	AUDIO OUTPUT TRANSFORMER	9-L-852-2
T-301	1st. PICTURE I. F.	V-9879-1
T-302	2nd. PICTURE I. F.	V-9879-1
T-303	3rd. PICTURE I. F.	V-9880-1
T-401	VERTICAL OUTPUT	LH-31753
T-402	HORIZONTAL OUTPUT	14-K-95-1
T-501	POWER TRANSFORMER 25 CYCLE	14-K-75-2
T-501	POWER TRANSFORMER 60 CYCLE	12-K-357-7

LATER PRODUCTION CHANGES MODELS 21TV9T, 10T, 16K, 17K and 8C

The changes that follow are incorporated in some chassis of the above mentioned models.

CHANGE #1

(18meg. ½ W. 5%) was replaced with resistor R-102 18 meg. - 0% + 20% 1 watt. part number H-84926.

CHANGE #2

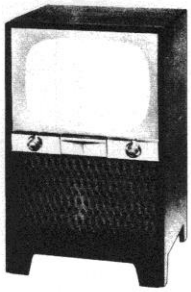
Resistor R-103 (2.2K 2 watt) was replaced with resistor. R-103 10K 5 watt part number 1-N-733-35.

CHANGE #3

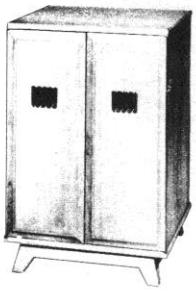
Width coil V-11791-1 was superseded by 11-M-422-2 may readily be identified by a red or yellow paint mark.

CHANGE #4

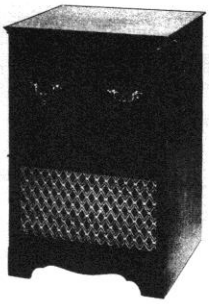
Crystal diode 1N87 was replaced with Crystal 1N64.



21TV17K



21TV15K



21TV16K

21TV8C

CATHODE RAY TUBE CUSHION

The CRT cushion must fit snugly against the flare of the CRT in order that the rear of the tube will be supported firmly. If this condition is not obtained, loosen the CRT cushion adjustment screws and the deflection yoke adjustment screw, slide the CRT cushion forward as far as possible, and re-tighten the screws. See Fig. 1.

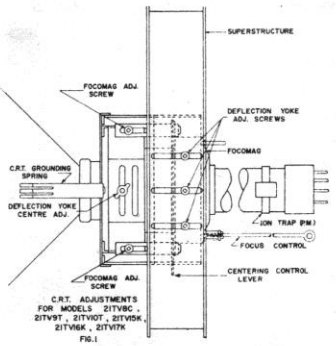
DEFLECTION YOKE

The deflection yoke must be positioned as close as possible to the flare in the CRT. If adjustment is required, loosen the deflection yoke adjustment screw, slide the deflection yoke forward as far as possible, and re-tighten the screw. Note that the CRT cushion must fit snugly against the CRT flare as described previously.

The deflection yoke adjustment screw also permits the picture to be rotated to make it square with respect to the mask. To rotate the picture, loosen the deflection yoke adjustment screw and move it to the left or right. The picture will tilt to the left or right with the movement. Tighten the screw when the picture is squared in the mask. See Fig. 1.

A.M. REJECTION CONTROL

The A.M. rejection control is located on the back of the receiver and is adjusted by means of a screwdriver inserted through the hole in the back cover, This control, which determines the A.M. rejection characteristics of the sound system, is normally adjusted during alignment of the sound system as described under SOUND ALIGNMENT PROCEDURE and will not ordinarily require further adjustment. In very weak signal areas, however, a reduction in noise or hiss on the sound may be obtained by slightly re-adjusting the control.



C.R.T. ADJUSTMENTS FOR MODELS 21TV8C, 21TV9T, 21TV10T, 21TV15K, 21TV16K, 21TV17K

FIG. 1

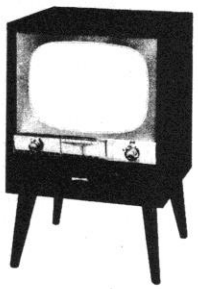
AUTOMATIC BRIGHTNESS CONTROL

The Automatic Brightness Control (ABC) circuit maintains the desired picture brightness and contrast when changes occur in the ambient lighting. If the room is made brighter by turning on a lamp or admitting more natural light, the picture automatically becomes brighter and vise versa.

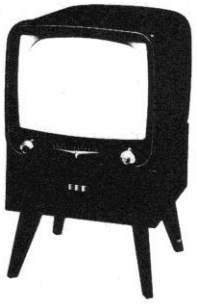
The desired relationship between picture brightness and room lighting is established by adjusting the picture, and brightness controls in the normal manner. When adjusting the controls, the hand or body must not be allowed to obstruct light from reaching the ABC photo tube which is located in the centre of the control panel on the front of the receiver. Otherwise the picture brightness will change when the obstruction is withdrawn. Once the relationship between picture brightness and room lighting has been established, it is maintained by the ABC circuit.

A small gas photo tube in conjunction with a two stage DC amplifier serves to control both contrast and brightness levels automatically. An operating potential of —85 volts for the cathode of the A.B.C. photo tube is developed from a half wave selenium rectifier circuit as shown in Fig. 6. Current flowing through the photo tube is determined by the amount of light reaching the light sensitive cathode, the greater the light intensity, the greater the current flow. This current flows through the load resistor R-603 developing a voltage that is negative at the top of the resistor. With variations in current through R-603 resulting from changes in ambient light reaching the photo tube, a changing voltage is applied to the 12AU7 amplifier. As the light intensity increases the voltage at pin #2 Grid changes in a negative direction and vise versa. An increase in negative voltage on pin #2 Grid results in less cathode current through R-607. A portion of the voltage developed across R-607 is applied to pin #7 Grid. This reduced positive voltage applied to pin #7 Grid results in a substantial reduction of plate current through the second amplifier stage. With less current flowing through R-602 and R-318 (in parallel), the voltage drop across the resistor is less, and the voltage applied to the video amplifier screen is greater. The higher screen voltage increases the gain of video amplifier, thus increasing the picture contrast. At the same time, the larger current flow in the video amplifier resulting from increased screen voltage increases the voltage drop across the video amplifier plate resistor, reducing the voltage at the plate of the video amplifier. Since the video amplifier is direct coupled to the cathode of the CRT and 1/2 of the video amplifier plate voltage appears at the CRT cathode, the positive potential at the CRT cathode is reduced resulting in an increase in picture brightness. The opposite of these conditions result when light reaching the photo tube is decreased.

The ABC sensitivity control should be adjusted as described on page 100 It should be noted that the photo tube employed is sensitive to infra-red rays. Therefore, fluorescent lights are less effective than incandescent or natural light in actuating the photo tube.



21TV10T



21TV9T

ION TRAP MAGNET

It is extremely important that the ion trap magnet is correctly adjusted immediately after the set is first turned on during installation. This is true even though the set appears to be operating satisfactorily. When the magnet is not correctly oriented, the electron beam strikes the edge of the aperture in the anode top disc instead of moving cleanly through the hole. The resultant heat vaporizes the metal of the disc, thus releasing gas which has a harmful effect on the tube. Some of the vaporized material may be deposited on the screen of the tube and be apparent as darkened area. An excessively high setting of the brightness control will aggravate this condition. From this it is apparent that the brightness control should never be turned up to compensate for an incorrectly adjusted ion trap magnet. The tube can be ruined in a very short time under this condition.

To adjust the ion trap magnet, position the magnet approximately as shown in Fig. 1 with the color code mark facing upward, then rotate the magnet and move it forward and backward until the position is found where the picture is brightest. If the brightness peaks at two positions of the magnet, the position nearer the base of the tube is the correct one. Never move the ion trap magnet to remove a shadow from the raster if the brightness is decreased by so doing. Shadows should be removed by adjusting the position of the centering control as described under centering. The ion trap magnet must always be adjusted for maximum picture brightness.

CENTERING

Centering is accomplished by varying the position of the centering leveler horizontally and vertically until the picture is centered and there are no neck shadows.

If correct centering is not obtained through a normal adjustment of the centering control, the following adjustment should be made:

1. Adjust the ion trap as previously described. Loosen the two screws which hold the focus assembly to the yoke bracket. Adjust focus assembly so that it is concentric with the tube neck and tighten the screws.

2. Again adjust the centering leveler horizontally and vertically until the picture is centered.

3. Re-adjust the ion trap for maximum brightness as previously described.

If difficulty is experienced in centering the picture or eliminating "neck shadows", make certain the CRT cushion is right against the flare in the CRT. Also make certain that the deflection yoke is as far foward as possible. See Fig. 1

HEIGHT AND VERTICAL LINEARITY

The height adjustment on the back of the chassis controls the overall height of the picture, and the vertical linearity adjustment controls the relationship between the vertical dimensions of the upper and the lower sections of the picture. A balance between the two controls is necessary to make the picture symmetrical and fill the mask vertically.

WIDTH AND HORIZONTAL LINEARITY

The width adjustment on the back of the chassis controls the overall width of the picture, and the horizontal linearity adjustment controls the relationship between the horizontal dimensions of the left and the right sections of the picture. A balance between the two controls is necessary to make the picture symmetrical with correct horizontal dimensions. These controls are sliding type adjustments.

VERTICAL HOLD

The vertical synchronization is controlled by the vertical hold adjustment. To adjust, rotate the control clockwise or counterclockwise until the picture is stabilized vertically. The adjustment should preferably be made on the weakest signal that is available, and a check should be made to see that the receiver pulls into sync on all channels.

HORIZONTAL RINGING COIL

The horizontal ringing coil (L-401) should be adjusted as follows:

1. Short out the ringing coil with a short jumper wire.

2. Set the horizontal hold control to the middle of its range, and leave it in this position during the steps that follow.

3. Connect a VTVM to the pin #2 grid circuit of the horizontal multivibrator, so as to measure the DC voltage between this point and ground.

4. With the receiver tuned to a TV station, adjust C-421 for zero voltage on the meter. If zero voltage can be approached, but not quite reached at one extreme of the C-421 adjustment, it may be necessary to set the horizontal hold control slightly to one side of mid-position to obtain zero voltage.

5. Remove the jumper from across the ringing coil.

6. Adjust the ringing coil for zero voltage on the meter, and check the adjustment by switching to another channel and then back again. The receiver should pull into horizontal synchronization on all channels.

A.G.C. CONTROL

Allow the receiver to warm up for at least five minutes before adjusting the AGC control. With the receiver tuned to the strongest signal in the area, rotate the AGC control clockwise until the receiver begins to overload or, if the signal is weak, until snow on the picture becomes more pronounced. Then rotate the control counterclockwise to the position where best picture with minimum snow and no sign of overload is obtained. Make certain that overload does not occur on any channel. If evidence of overload is noticed, readjust the AGC control. If a weak signal is used during the adjustment, the control may be set too far in a clockwise direction to permit reception of a strong signal without overload.

COMMON I-F ALIGNMENT PROCEDURE

The common I-F system uses over-coupled I-F transformers to obtain the required band width. In the alignment of this type system, the visual method of stage-by-stage alignment is used. A sweep generator is used to develop the I-F response curve on the oscilloscope, and an unmodulated signal generator (marked) is used to provide spot frequency indications on the curve.

With some of the I-F transformers, peaks may be obtained at two positions of the adjustment slugs. If a transformer is badly out of adjustment, it is advisable to turn the slug out (counterclockwise) as far as possible before beginning alignment. Then turn the slug clockwise until the first peak is reached. This procedure is recommended to obtain the correct peak rather than an undesired second peak which is sometimes obtained when the slug is turned farther clockwise.

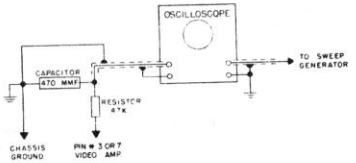


FIG. 2 — OSCILLOSCOPE CONNECTIONS

The alignment procedure to be used is given in the following steps:

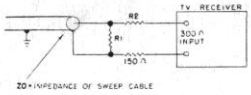
1. To avoid undesirable beat response during alignment, remove the 6BZ7 R-F amplifier tube from its socket and rotate the channel selector to channel 13. The channel selector is on channel 13 when the flat of the shaft is facing straight up.

2. Connect the vertical input of the oscilloscope to the video test terminal (point "B" on Fig. 6) through the decoupling network shown in Fig. 2. The oscillos-

cope horizontal input should be connected to the sweep (synchronizing) output from the sweep generator through well shielded leads. Turn the sweep control on the oscilloscope to the "x" or "off" position.

3. Connect the negative terminal of a 9 volt bias battery to the AGC line (point "A" on Fig. 6), and connect the positive terminal to chassis ground.

4. Couple the marker generator output to the sweep generator output so that the two signals are applied together to the points specified in the steps that follow. Some sweep generators have facilities for connecting the marker output directly into the sweep generator. With other sweep generators, the marker can be coupled to the sweep by wrapping a few turns of insolated wire around the center conductor of the sweep generator output cable and connecting the marker generator to this wire. The loose coupling obtained in this manner is desirable because excessive marker signal injection will distort the response curve.



ZO	R1	R2
50Ω	56Ω	120Ω
72Ω	82Ω	110Ω

FIG. 3 — IMPEDANCE MATCHING NETWORK

5. Adjust the sweep generator for a center frequency of 44 mc. with a sweep deviation of 10 mc.

6. Connect the high side of the sweep generator output cable directly to the control grid of the 3rd I-F amplifier, and connect the ground side of the cable to the chassis partition as close as possible to the ground point for the 3rd I-F amplifier tube. Keep the leads from the cable as short as possible.

7. Detune the plate circuits of the 1st and 2nd I-F amplifiers by attaching alligator or similar type clips to pin #5 of the 6CB6 1st and 2nd I-F amplifier tubes. Use care to avoid shock. This step is necessary to avoid absorption of the signal that is applied to the 3rd I-F grid

8. Adjust the oscilloscope vertical gain and the sweep generator output level to obtain a curve on the oscilloscope. To avoid a distorted curve, the recommended practice is to use maximum oscilloscope vertical gain and only enough sweep signal amplitude to obtain a good curve.

9. Set the marker generator to 44 mc. with the output attenuated until the marker pip is barely visible on the curve, and adjust the primary of the 3rd common I-F transformer, T303, until the 44 mc. marker pip is at the highest point on the response curve.

10. Adjust the secondary of T303 to make the top of the response curve symmetrical.

11. Make certain that the response curve coincides with Fig. 5A, using the marker to check at the appropriate frequencies. The 44 mc. pip must strike the center of flat response region, the 42.25 mc. and 45.75 mc. points must be at equal heights, and the 43 mc. and 45 mc. points must be at equal heights. Readjust the primary and secondary of T303 if necessary to obtain these conditions.

12. Remove the detuning clips that were attached in step 7.

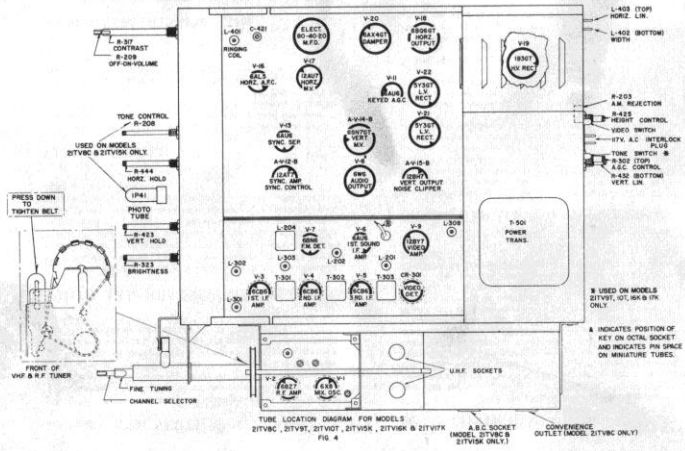
13. Disconnect the sweep generator from the grid of the 3rd I-F amplifier.

14. Connect a signal generator that has an output of .02 volt or higher to the grid of the 1st IF amplifier, "high" side to the grid and ground side to the chassis. Adjust the signal generator to 47.25 mc. amplitude modulated, and increase the output until a sign wave response is visible on the oscilloscope.

15. Adjust the adjacent channel sound trap, L303, for minimum response on the oscilloscope.

NOTE: If a signal generator is not available and the receiver is located in a strong signal area where adjacent channel sound interference occurs, L303 can be adjusted by tuning the receiver to the channel on which the adjacent channel interference occurs, carefully adjusting the fine tuning control to its correct setting, and adjusting L303 to the position where the adjacent channel sound interference is eliminated.

16. Attach a detuning clip to the plate of the 1st IF amplifier tube, and remove the amplitude modulated signal generator connections.



TUBE LOCATION DIAGRAM FOR MODELS 21TV8C, 21TV9T, 21TV10T, 21TV15K, 21TV16K & 21TV17K
FIG. 4

17. Connect the high side of the sweep generator output cable directly to the control grid of the 2nd IF amplifier. Connect the ground side of the cable to the chassis partition as close as possible to the ground point of the 2nd IF amplifier tube.

18. Adjust the primary of the 2nd common I-F transformer T302 for maximum height of the response curve at 44 mc., and adjust the secondary of T302 to make the top of the curve symmertrical.

19. Make certain that the curve corresponds to Fig. 5B. The 44 mc. pip must strike the center of the flat response region, the 42.25 mc. and 45.75 mc. points must have equal heights, and the 43 mc. and 45 mc. points must have equal heights. Re-adjust the primary and secondary of T302 if necessary.

20. Remove the detuning clip from the plate of the 1st I-F amplifier.

21. Move the sweep ouput connection from the grid of the 2nd I-F amplifier to the grid of the 1st I-F amplifier, and connect the ground side of the cable as close as possible to the ground point for the 1st I-F amplifier tube.

22. Detune L101 located on the tuner by rotating it several turns counterclockwise. Otherwise, the setting of L101 will affect the waveshape in the following step.

23. Adjust the primary of the 1st common I-F transformers T301, for maximum height of the response curve at 44 mc., and adjust the secondary of T301 to make the top of the curve symmetrical.

24. Adjust L101 so that the dip or "suck-out" which it produces on the response curve is at 44 mc. (center of curve).

25. Make certain that the curve corresponds to Fig. 5C. If the marker frequencies fall at the correct points. no transformer re-adjustments are required.

26. Remove the sweep output connection from the grid of the 1st IF amplifier.

27. Replace the RF amplifier tube which was removed in step 1.

28. Adjust the sweep generator to channel 13 (210 to 216 mc.), and connect its output cable to the receiver antenna terminals through the impedance matching network shown in Fig. 3. Keep the leads as short as possible.

When working with very high frequencies, the impedance matching network is required because response curves are of no value unless the sweep generator output cable is terminated in its characteristic impedance. Any mis-match present results in standing waves which may seriously affect the observed waveform depending upon the amount of mis-match.

29. Couple the marker generator output to the sweep generator output by using the loose capacitive coupling provided by a one turn loop, or connect both the high side and the ground side of the marker generator cable to the receiver chassis. Loose coupling between the marker generator and the receiver is desirable to avoid distortion of the response curve.

30. Set the channel selector to channel 13 and the fine tuning control to the middle of its range.

31. Adjust the sweep generator output to the lowest level that provides a usable response curve on the oscilloscope, and adjust the marker output so that the marker pip is barely visible.

32. Adjust the 1st IF coil, L301 for a symmetrical response curve.

33. Set the marker generator to 41.25 mc., and adjust the 41.25 mc. sound trap, L302 to minimize the amplitude of the marker pip.

34. Using the marker generator at 41.25 mc., 42.25 mc., 43 mc., 44 mc., 45.75 mc., and 45.25 mc., see that the marker pips fall as indicated on Fig. 5D. If the curve is satisfactory on channel 13, all other channels should also be satisfactory.

4.5 Mc. TRAP ALIGNMENT PROCEDURE

1. Connect the high side of the signal generator to the video test terminal (point "B" on Fig. 6) through a .001 mfd mica capacitor, and ground the low side to the chassis.

2. Adjust the signal generator to 4.5 mc. (unmodulated). The accuracy of this frequency is very important. If a crystal controlled signal generator is not available, the frequency should be checked with an accurate frequency meter.

3. Connect the common lead from the VTVM to the chassis, and connect the R-F probe from the VTVM to the cathode of the CRT. This point is shown as point "C" on Fig. 6. Note that this point is above ground potential and, therefore, the R-F probe must contain a blocking capacitor.

4. Using a strong 4.5 mc. signal, adjust the 4.5 mc. trap, L308 for minimum indication on the meter.

SOUND I-F ALIGNMENT PROCEDURE

The sound system can be aligned using either locally generated signals or a received TV signal. Since the latter method does not require signal generating equipment, it will be described first and will be followed by the procedure using locally generated signals.

To use an "air" signal for alignment:

1. Tune the receiver to a TV station and connect an attenuator between the receiver and the antenna so that the strength of the signal can be varied from weak to strong.

2. Set the A.M. rejection control R203 located on the back of the chassis approximately to its mid-position.

3. Adjust the 4.5 mc. I-F slugs L201 and L202 for maximum program sound. If peaks occur at two different positions of the slug, use the peak that occurs when the slug is farthest counterclockwise. Reduce the signal to its lowest usable level and recheck the adjustments.

4. Apply a strong signal to the receiver, and adjust the quadrature coil L204 for maximum program sound. If peaks occur at two different positions that are widely separated, use the one that occurs with the slug farthest counterclockwise. If two peaks occur within a narrow range of adjustment, sufficient signal is not being applied to the receiver or the A.M. rejection control is not set at the desired position.

5. Apply a very weak signal that allows noise to be heard and adjust the A.M. rejection control R203 for minimum noise. The position at which the noise is minimized depends on the strength of the signal; therefore, the weakest usable station in the area should be used for this adjustment. This control determines the A.M. rejection characteristics of the sound system, and its correct setting is normally about mid-position. Do not leave the A.M. rejection control set at its maxium counterclockwise position.

To use locally generated signals for alignment:

1. Connect an oscilloscope or an AC voltmeter across the volume control for use as an indicator.

2. Apply a 4.5 mc. FM signal (deviation approximately 7.5 Kc.) to the video test point (B on Fig. 6).

3. Using the lowest signal level that will produce an indication, adjust L201 and L202 for maximum output.

4. Using a strong signal, adjust L204 for maximum output.

5. Apply a 4.5 mc. A.M. signal (modulated approximately 30 percent) to the video test point.

6. Beginning with a very low signal level, increase the generator output, while rotating the A.M. rejection control back and forth, until the signal level is such that the A.M. output across the volume control dips to zero with a rise on each side as the A.M. rejection control is rotated. Set the A.M. rejection control for zero output at this level.

H-F OSCILLATOR ALIGNMENT PROCEDURE

If the 6X8 oscillator tube is replaced, the different inter-electrode capacitance of the new tube may change the oscillator frequency enough to necessitate re-alignment of the oscillator.

Alignment of the oscillator on the high band is accomplished by adjusting the brass slug located adjacent to the vernier drive wheel on the front of the tuner. Alignment of the oscillator on the low band is accomplished by adjusting the brass slug on the lower front of the tuner. These slugs can be adjusted from the front of the receiver without removing the chassis from the cabinet. A nonmetalic screw driver should be used to make these adjustments. The adjustment procedure is as follows:

1. Set the fine tuning control to the middle of its range by rotating it until the little hole near the edge of the fine tuning drive wheel is straight up, and keep it in this position during the following adjustments.

2. Set the channel selector to the highest of the low band (channels 2 through 6) stations operating in your vicinity.

3. Peak the low band adjustment slug L109 for the best picture detail.

4. Set the channel selector to the highest of the high band (channels 7 through 13) stations operating in your vicinity.

5. Peak the high band adjustment slug L110 for the best picture detail.

6. Check the previously made low band adjustment, and if the tuning has changed repeat steps 2 and 3.

CRITICAL LEAD DRESS

All leads located near the horizontal multivibrator trimmer capacitor, C421, must be dressed away from the capacitor and close to the chassis.

All resistors rated above one watt must be dressed away from each other and clear of other wires and components.

Video peaking coils should be dressed away from the chassis and clear of adjacent parts.

All leads in the high voltage unit must be dressed away from the high voltage transformer to prevent arcing.

Keep all leads in the IF and video circuits as short as possible.

REFLECTION ELIMINATION

Light reflection from the pilot lamp can appear on the lower right hand corner of the CRT and the safety glass unless preventive measures are taken. To eliminate the reflections, one piece of electrical tape (1 1/4" x 10") is applied to the lower, right edge of the CRT face, and another piece of tape (1" x 8") is applied to the lower, right edge of the front glass plate.

When replacing a CRT, the electrical tape must be applied to the new tube in the same manner as it was applied to the old tube.

ABC SENSITIVITY

To adjust the ABC sensitivity:

1. Set ABC Switch to "off" position.

2. Adjust brightness and contrast for normal picture contrast and brightness with average room lighting.

3. Set ABC switch to "on" position.

4. Place an incandescent lamp approximately five feet in front of the receiver, positioned so that the front of the receiver is illuminated.

5. Beginning with the ABC sensitivity control in its counterclockwise position, rotate the control clockwise while turning the lamp on and off, until a control setting is found where the picture brightness and contrast changes in proportion to the changes in lighting.

PICTURE SWITCH

A picture switch is included on the rear of the chassis.

With this switch in the R.H. position a Peaking Coil L-307 and a Cathode Capacitor C-327 are incorporated into the video amplifier circuit thus changing the response to provide a crispening effect in the picture.

The effects and degree of crispening will depend upon the type of program material and the station through which it is viewed. With the switch in the L.H. position the Peaking Coil L-307 and Capacitor C-327 are removed from the circuit providing a normal video response.

ALIGNMENT CHARTS

The information in these charts is condensed from the foregoing detailed information as a convenience to the service technician. It is recommended that the detailed information be studied before using the charts.

COMMON I-F ALIGNMENT PROCEDURE

Rotate the channel selector to channel 13.

Connect the oscilloscope to the video test terminal, point "B" on Fig. 6, through the decoupling network shown in Fig. 2.

Connect a 9 volt bias battery to the AGC line, point "A" on Fig. 6.

Couple the marker generator output to the sweep generator output. In the steps that follow, use the marker to check the response curve at the frequencies indicated on Fig. 5.

Step	Alignment Signal	Remarks	Adjust -
1.	Remove the 6BZ7 RF amplifier tube.		
2.	44 mc. sweep to 3rd. IF grid	Connect detuning clips to 1st. & 2nd. IF plates	Pri. of T303 for max. response and sec. of T303 for symmetrical curve shown in Fig. 5A
3.	47.25 mc. amplitude modulated to 1st IF grid	Use sufficient signal to produce sign wave response on oscilloscope	L303 for min. response
4.	44 mc. sweep to 2nd IF grid	Connect detuning clip to 1st IF plate	Pri. of T302 for max. response and sec. of T302 for symmetrical curve shown in Fig. 5B
5.	44 mc. sweep to 1st IF grid	Detune L101 before adjusting T301	Pri. of T301 for max. response and sec. of T301 for symmetrical curve
6.	44 mc. sweep to 1st IF grid		L101 for "suck-out" at 44 mc. (center of curve) See Fig. 5C
7.	Replace the 6BZ7 RF amplifier tube		
8.	213 mc. sweep to antenna terminals through network	Fine tuning set to mid-range	L301 for symmetrical curve and L302 for min. 41.25 mc. marker amplitude, See Fig. 5D.

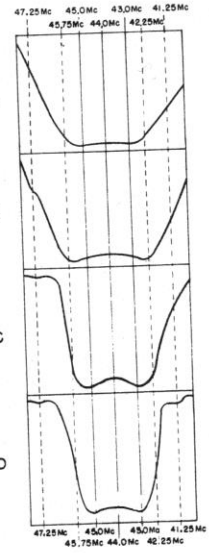


FIG. 5 — RESPONSE CURVES AT VARIOUS STAGES OF ALIGNMENT

4.5 Mc. TRAP ALIGNMENT PROCEDURE

Connect the signal generator to the video test terminal (point "B" on Fig. 6 through a .001 mfd capacitor.

Step	Signal Gen. Frequency	VTVM Connections	Remarks	Adjust -
1.	4.5 mc. unmodulated	RF probe to point "C" (See Fig. 6) and common lead to chassis.	Use strong signal from generator	L308 for minimum voltage.

SOUND SECTION

Refer to SOUND ALIGNMENT PROCEDURE Using a weak signal, adjust L201 and L202 for maximum response to a 4.5 mc. FM signal. Using a strong signal, adjust L204 for maximum response on a 4.5 mc. FM signal. Using a weak signal, adjust the A.M. rejection control for minimum A.M. noise.