RCC TELEVISION Service Manual

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1952-53 Supplement No. 6

INDEX

ADDISON

ADMIRAL

ELECTROHOME

MOTOROLA

NORTHERN ELECTRIC

SPARTON

WESTINGHOUSE

NOTE: RE INDEXING

Since most TV circuits require fold pages for clear reproduction, it is necessary to bind them as a group in the middle of the book. As a result, related data such as alignment, voltages etc., may be widely separated in some cases. This is particularly true in this supplement because some models have as many as four different circuit diagrams which makes the fold section larger than normal. To avoid confusion, use your index to locate ALL data.

R.C.C. TELEVISION Supplement No. 6

INDIVIDUAL CHANNEL SLUG ADJUSTMENT USING TELEVISION SIGNAL

Individual channel oscillator adjustment of every receiver should be checked upon installation or servicing. If this adjustment is properly made, it is possible to tune from one station to another by merely turning the CHANNEL control and, if necessary, slightly readjusting the TUNING control. With correct oscillator channel adjustment, best picture and sound will be located at the approximate center (half rotation) of the range of the Tuning control.

This adjustment can be made without removing the chassis from the cabinet. Adjust as follows:

a. Turn the set on and allow 15 minutes to warm up.
b. Set the CHANNEL knob for a station; set other controls for a normal picture and sound.
c. Set Tuning control at center of its range by rotating it approximately half-way.
d. Remove the CHANNEL and TUNING knobs.
e. Insert a 1/8" blade, NON-METALLIC screwdriver (kit consisting of one metallic and one non-metallic screwdriver is available under part number 98A30-3) in the ¼" hole adjacent to the channel tuning shaft. For each channel in operation, carefully adjust the channel slug for best picture with clear detail. Be sure that the Tuning control is set at the centre of its range before adjusting each channel slug. Only slight rotation of the slug will be required; turning the slug in too far will cause it to fall into the coil. (If the slug falls into the coil remove the coil, move the retaining spring aside, lightly tap the opened end of the coil until the slug slips out. Replace slug and re-set retaining spring.)

If a number of slugs are found to turn all the way in or all the way out, or if the 6J6 oscillator-mixer tube has been replaced, it may be necessary to make the "Overall Oscillator Adjustment" as instructed below.

OVER-ALL OSCILLATOR ADJUSTMENT (A11) USING TELEVISION SIGNAL

Over-all oscillator adjustment should only be necessary when replacing the oscillator-mixer tube (6J6), or when all channel slugs are off in the same direction. When replacing the oscillator-mixer tube (6J6), it is recommended that several tubes be tried to select one which will cause least oscillator frequency shift.

All is generally adjusted so that approximately 3/16" of screw thread is exposed.

Adjust as follows:

a. Follow steps "a", "b" and "c" above.
b. Carefully adjust trimmer A11 (figure 23) for best picture with clear detail.
c. Check and, if necessary, make individual channel adjustments as indicated above.

TOUCH-UP OF RATIO DETECTOR SECONDARY USING TELEVISION SIGNAL (A7, BOTTOM SLUG OF T201)

*This adjustment is accessible through the ¼" hole (just below T201) in bottom of the cabinet or the chassis mounting shelf, located toward the left side facing the rear of the set. Removal of the chassis is therefore not required. Adjustment need be made on one channel only. Proceed as follows:

a. Turn set on and allow 15 minutes for warm up.
b. Tune set for normal picture and sound. Slightly advance the picture and volume controls until the buzz is audible.
c. Carefully insert a non-metallic alignment tool through the opening in cabinet bottom below T201. An alignment tool with a screwdriver blade or hexagonal end is required depending on the transformer used, see * note below. When the alignment tool engages the bottom tuning slug A7, adjust the slug for best sound with minimum buzz level. Do this carefully as only slight rotation in either direction will generally be required. Correct adjustment point is located between the two maximum buzz peaks that will be noticed when turning the slug back and forth about ¼ to ½ turn.
d. If necessary, repeat individual channel slug adjustment and conclude with retouching the ratio detector secondary. Note: If oscillator adjustment is required for other channels, it will not be necessary to repeat the ratio detector secondary adjustment after once correctly adjusting it.

*If ratio detector transformer (T201) has hollow hexagonal core slugs, bottom slug adjustment A7 can be made from top of chassis, if you use alignment tool #98A30-7 (available at Admiral Distributor). Bottom slug (A7) can be reached through the hole in the core of the upper slug (A5).

ION TRAP ADJUSTMENT

To prolong the life of the picture tube, it is important that this adjustment be made on each receiver upon installation, or when servicing.

Set the BRIGHTNESS control (at front of set) for normal brightness (approximately half rotation).

Position the ion trap close to the base on the picture tube neck. Starting from this point close to the tube base, very carefully move the ion trap forward or backward and at the same time, rotate it in either direction until maximum brightness is produced.

Reset the BRIGHTNESS control until normal brightness is obtain. Adjust the FOCUS control for good focus. Readjust the ion trap for maximum brightness.

Care must be exercised in adjustment of the ion trap since there may be two locations on the neck of the tube where maximum brightness can be produced. The second ion trap location, which is further forward on the tube neck, should not be used or the picture tube will be damaged.

IMPORTANT: If the corners of the picture are shaded, be sure the ion trap has been properly adjusted. Do not sacrifice picture brightness when adjusting the ion trap to remove shaded corners. To eliminate shaded corners, see the discussion under "Picture Centering". Be sure to readjust the ion trap after adjusting the picture positioning lever or repositioning the focus coil. Tighten the ion trap mounting screw after adjustment.

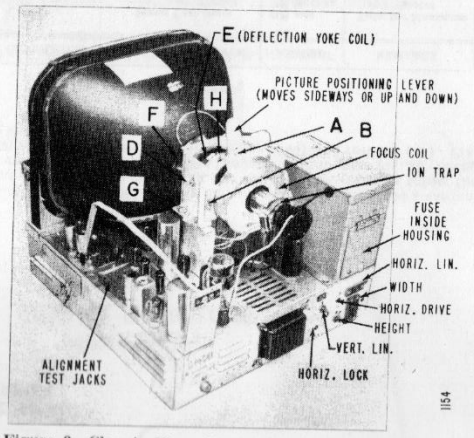


Figure 3. Chassis View showing Adjustment Locations.

When picture is slightly off center, adjust as follows:

a. Adjust ion trap as explained under "Ion Trap Adjustment".
b. Slightly loosen the screw "A" locking the picture positioning lever to the focus coil; adjust the lever for correct picture centering.
c. Readjust ion trap.

When picture is difficult to center, adjust as follows:

a. Adjust ion trap as explained under "Ion Trap Adjustment".
b. Slightly loosen the two screws "B" holding focus coil to the yoke bracket. Center focus coil around the tube neck; tighten screws.

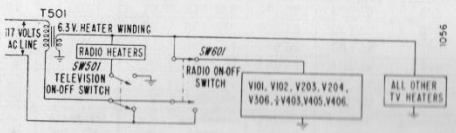


Figure 17. Heater Switching in Combination Models.

TELEVISION ALIGNMENT PROCEDURE

GENERAL

Complete alignment consists of the following individual procedures and should be performed in this sequence.

a. IF Amplifier Alignment.
b. IF Response Curve Check.
c. 4.5 MC Sound IF Alignment.
d. RF and Mixer Alignment.
e. Overall RF and IF Response Curve Check.
f. HF Oscillator Adjustment.

TEST EQUIPMENT

To properly service this receiver, it is recommended that the following test equipment be available:

IMPORTANT: Many service instruments do not meet the requirements given below. A list of recommended equipment is available from Admiral distributors.

Oscilloscope

Standard oscilloscope, preferably one with a wide band vertical deflection, vertical sensitivity at least .5 volt (RMS) per inch.

Signal Generator

4.5 MC frequency.
18 to 30 MC frequency range.
50 to 90 MC frequency range.
170 to 225 MC frequency range.
Must have a built-in calibration crystal for checking dial accuracy.

Vacuum-Tube Voltmeter

Preferably with low range (3 volt) DC zero center scale and a high voltage probe (30,000 volt range).

Sweep Generator

Sweep generator must provide sweep frequencies from

18 to 30 MC range:
50 to 90 MC range:
170 to 225 MC range:
} with at least 10 MC sweep width.

Output: adjustable; at least one-tenth volt maximum.
Output impedance: 300 ohms balanced to ground.

A sweep generator not having constant output voltage over the swept range and linear sweep, will produce curves which are widely different from the ideal curves shown in the following pages. If repeated difficulty is encountered in obtaining these curves, the sweep generator should be checked. A simple check is to observe the response curve for a set that is in alignment.

Before suspecting the generator, be sure the alignment instructions in this manual have been followed carefully.

FREQUENCY TABLE

Channel Number	Channel Freq. MC	Video Carrier, MC	Sound Carrier, MC	HF Osc., MC
2	54- 60	55.25	59.75	81
3	60- 66	61.25	65.75	87
4	66- 72	67.25	71.75	93
5	76- 82	77.25	81.75	103
6	82- 88	83.25	87.75	109
7	174-180	175.25	179.75	201
8	180-186	181.25	185.75	207
9	186-192	187.25	191.75	213
10	192-198	193.25	197.75	219
11	198-204	199.25	203.75	225
12	204-210	205.25	209.75	231
13	210-216	211.25	215.75	237

21B1, 21B1T Etc.

IF AMPLIFIER ALIGNMENT

To service TV chassis with radio disconnected, complete the heater circuit by connecting a jumper from pin "L" to pin "K" of socket M503. See schematic.

a. Before starting alignment, be sure IF cover shield is mounted to the chassis. If the set does not have a cover shield, do not use one.
b. Connect negative terminal of a 3-volt bias battery to test point "T", positive to chassis.
c. Set receiver to channel 12 or an unassigned high channel to prevent signal interference during IF alignment. Set Picture control fully to right (clockwise).
d. Allow about 15 minutes for receiver and test equipment to warm up.

Step	Signal Gen. Freq.	VTVM and Signal Generator Connections	Instructions	Adjust
1	25.3 MC	VTVM high side to test point "V", common to chassis.	Use lowest DC scale on VTVM. When peaking, keep reducing generator output for VTVM reading of approx. 1 volt or less.	A1 and A2 for maximum.
2	23.1 MC	Generator high side to 6J6 (V102) tube shield; insulate shield from chassis. Connect low side to chassis near 6J6 tube base.		A3 and A4 for maximum.
3	Make the "IF Response Curve Check"			

IF RESPONSE CURVE CHECK

(Using sweep generator and oscilloscope)

Receiver Controls and Bias Battery	Sweep Generator	Marker Generator	Oscilloscope	Instructions
Set Channel Selector on channel 12 or an unassigned high channel. Picture control fully to the right. Connect negative of 3 volt bias battery to test point "T"; positive to chassis.	Connect high side to 6J6 mixer-osc. tube shield. Insulate tube shield from chassis, low side to chassis ground. Set sweep frequency to 23MC, and sweep width approximately 7 MC.	If an external marker generator is used, loosely couple high side to sweep generator lead on tube shield, low side to chassis. Marker frequencies indicated on IF Response curve.	Connect to test point "V" through a de-coupling filter. See fig. 18. Marker pips on scope will be more distinct if a condenser from 100 mmfd to 1000 mmfd is connected across the oscilloscope input.	Check curve obtained against ideal response curve in fig. 20. Note tolerances on curve. Keep marker and sweep outputs at very minimum to prevent overloading. A reduction in sweep output should reduce response curve amplitude without altering the shape of the response curve. If the curve is not within tolerance or the markers are not in the proper location on the curve, touch-up with IF slugs as indicated in fig. 21.

4.5 MC SOUND IF ALIGNMENT

a. Connect signal generator high side to point "V" through a .01 mfd. condenser; connect low side to chassis.
b. Allow about 15 minutes for receiver and test equipment to warm up.
c. Set Picture control fully to the right (clockwise).
d. Use a NON-METALLIC alignment tool. If Ratio Det. Transformer (T201) has hollow core slugs, bottom slug adjustment A7 can be made from top of chassis, if you use alignment tool #98A30-7 obtainable from Admiral distributor.

Step	Signal Gen. Freq. (MC)	VTVM Connections	Instructions	Adjust
	IMPORTANT: If a signal generator and frequency standard are not available, alignment can be made using a TV station signal. Tune in a station and follow steps 1 and 2 below. If necessary, use a higher scale on the VTVM. When using a signal generator, be sure to check it against a crystal calibrator or other frequency standard for accurate frequency calibration at 4.5 MC. Accuracy required is within one kilocycle.			
1	Set to exactly 4.5 MC	High side to test point "Y"; common to chassis.	Use lowest DC scale on VTVM.	A5 and A6 for maximum (keep reducing generator output to keep VTVM at approx. 1 volt).
2		High side to test point "Z"; common to chassis.	Use zero center scale on VTVM, if available.	A7 for zero on VTVM (the correct zero point is located between a positive and a negative maximum). If A7 was far off, repeat step 1.

ALIGNMENT HINT

AFTER BECOMING FAMILIAR WITH ALIGNMENT PROCEDURE, SOME SERVICEMEN SIMPLIFY SUBSEQUENT ALIGNMENT OF SETS BY MERELY USING THE ESSENTIAL ALIGNMENT DATA

RF AND MIXER ALIGNMENT

a. Connect negative of 3-volt bias battery to test point "T", positive to chassis. If it is difficult to obtain a curve of sufficient amplitude, remove battery and connect a wire jumper from test point "T" to chassis.
b. Connect sweep generator to antenna terminals. If sweep generator does not have a built-in marker generator, loosely couple a marker generator to the antenna terminals. To avoid distortion of the response curve, keep sweep generator output at a minimum, marker pips just barely visible.
c. Connect oscilloscope through a 10,000 ohm resistor to test point "W" on tuner (Fig. 23). Keep scope leads away from chassis.
d. Set channel selector to Channel 12.
e. Allow about 15 minutes for receiver to warm up and test equipment.

Step	Marker Gen. Freq. (MC)	Sweep Gen. Frequency	Instructions
1	205.25 (Video Carrier) 209.75 (Sound Carrier)	Sweeping Channel 12 See frequency table below.	Check for curve shown below. If necessary, adjust A8, A9 and A10 (figure 23 as required. Adjusting A9 will generally shift the center of the response curve relation to the video and sound carrier markers. A8 and A10 should be alternately adjusted for best gain with flat top appearance. Consistent with proper band width and correct marker location, response curve should have maximum amplitude and flat top appearance.
2	Set the sweep generator to sweep the channel to be checked. Set the marker generator for the corresponding video carrier frequency and sound carrier frequency.		Check each channel operating in the service area for curve shown below. In general, the adjustment performed in step 1 is sufficient to give satisfactory response curves on all channels. However, if reasonable alignment is not obtained on a particular channel, (a) check to see that coils have not been intermixed, or (b) try replacing the pair of coils for that particular channel, or (c) repeat step 1 for the weak channel as a compromise adjustment to favor this particular channel. If a compromise adjustment is made, other channels operating in the service area should be checked to make certain that they have not been appreciably affected.

TELEVISION FREQUENCY RANGES

Channel Number	Channel Freq.,MC	Wave Length Meters	Picture Carrier, MC.	Sound Carrier, MC	Het. Osc. Freq.,MC	Length Dipole	Dipole Folded Length	Reflector Length	Director Length	Half Wave Shorted Channel Trap*
2	54- 60	5.55-5.0	55.25	59.75	81	98"	96"	103"	95"	87"
3	60- 66	5.0 -4.55	61.25	65.75	87	90"	88"	94"	86"	79"
4	66- 72	4.55-4.17	67.25	71.75	93	82"	80"	86"	78"	72"
5	76- 82	3.95-3.66	77.25	81.75	103	71"	69"	74"	68"	63"
6	82- 88	3.66-3.41	83.25	87.75	109	66"	64"	69"	64"	58"
7	174-180	1.72-1.66	175.25	179.75	201	32"	30"	33"	30"	28"
8	180-186	1.66-1.61	181.25	185.75	207	31"	29"	32"	29½"	27"
9	186-192	1.61-1.56	187.25	191.75	213	30"	28"	31"	29"	26"
10	192-198	1.56-1.51	193.25	197.75	219	29"	27"	30"	28"	25"
11	198-204	1.51-1.47	199.25	203.75	225	28"	26"	29"	27"	24"
12	204-210	1.47-1.43	205.25	209.75	231	27"	25"	28"	26"	24"
13	210-216	1.43-1.39	211.25	215.75	237	26"	24"	27"	25"	23"

*Constructed from 300 ohm transmission line.

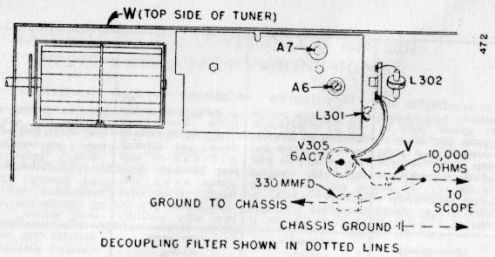


Fig. 18. Bottom View Showing Test Point Connections.

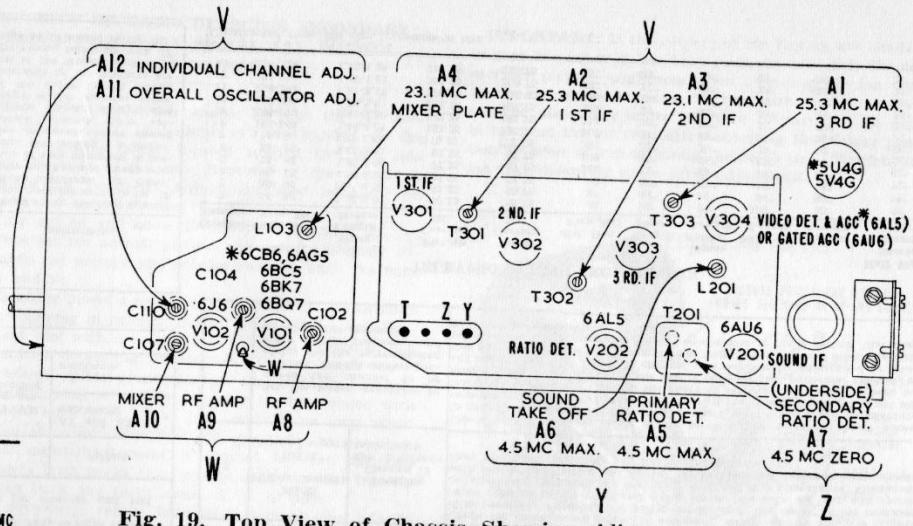


Fig. 19. Top View of Chassis Showing Alignment Data.
* Tubes may not be directly interchangeable. See Schematic.

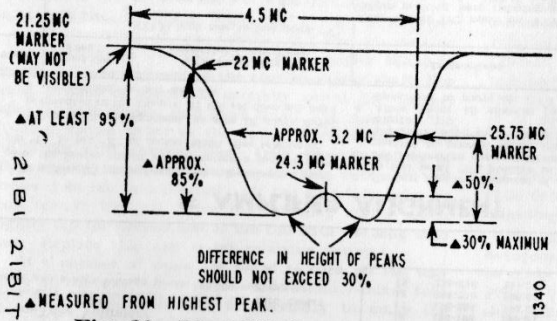
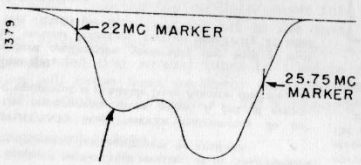
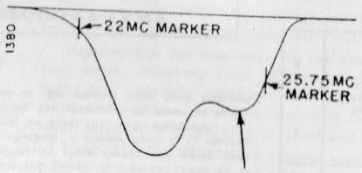


Fig. 20. Ideal IF Response Curve.

21B1 21B1T etc.

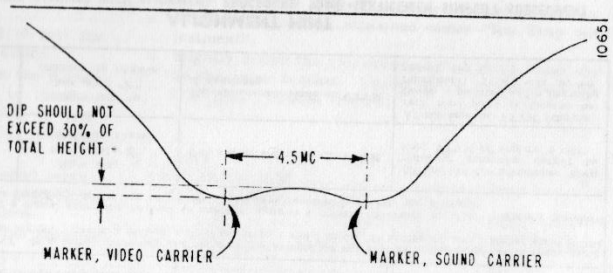


Touch-up of A3 and A4 will generally increase peak. Will also change position of 22MC marker.



Touch-up of A1 and A2 will generally increase peak. Will also change position of 25.75-MC marker.

Fig. 21. I.F. Response Curves, incorrect shape.



Full skirt of curve will generally not be visible.

Figure 22. RF Response Curve.

OVERALL RF AND IF RESPONSE CURVE CHECK

(Using sweep generator and oscilloscope)

Receiver Controls and Bias Battery	Sweep Generator	Marker Generator	Oscilloscope	Instructions
Picture Control fully to the right. Channel selector on Channel 12 or other unassigned high channel. Connect negative of 3 volt bias battery to test point "T", positive to chassis.	Connect to antenna terminals. Set generator to sweep channel selected. Keep generator output as low as possible, to prevent overloading. See frequency table on opposite page.	If an external marker generator is used, loosely couple high side to sweep generator lead. Marker frequencies are shown in frequency table on opposite page.	Connect to point "V" through a decoupling network as shown in fig. 18.	Compare the response curve obtained against the ideal curve shown in figure 25. If the curve is not within tolerance, touch up the IF slugs as instructed below. It should never be necessary to turn slugs more than one turn in either direction. If the curve is satisfactory on the channel checked, all other channels should also be satisfactory. IMPORTANT: When sweep output is reduced, response curve amplitude on scope should also decrease, but curve shape should remain the same. If curve shape changes, reduce sweep output and/or the scope gain until this shape does not change.

HF OSCILLATOR ADJUSTMENT

(Using a signal generator)

21B1, 21B1T etc.

It is always advisable to make HF oscillator adjustments using a Television Signal. If a Television Signal is not available, HF oscillator adjustment can be made using a crystal calibrated signal generator. Note that adjustment "A11" (Fig. 23) is an overall oscillator adjustment and should only be made when the mixer-oscillator tube is replaced. Generally "A11" adjusts with about 3/16" of screw thread exposed. Make adjustments as follows:

Receiver Control Settings	Signal Generator	Instructions
Set channel selector for each channel to be adjusted. Set "Tuning" control at half rotation. Turn volume control fully to the right (clockwise).	Connect to antenna terminals. Set generator to exact frequency of HF oscillator. See frequency table on opporite page. **Set generator for maximum output.**	Connect a wire jumper from test point "V" on the tuner to test jack "Z". See fig. 19. Remove the ratio detector tube V202 (6AL5). Carefully adjust the individual oscillator slug A12 until a whistle (beat) is heard in the speaker of the receiver.

MODEL and CHASSIS IDENTIFICATION CHART

MODEL NUMBERS	TV Chassis	Picture Tube	TV Tuner	Record Changer	Radio
26X12X, 26R25X, 26R26X	21B1	16KP4	Earlier Sets Used 94C18-4 Tuners Stamped Chassis Run 3 and 4 Use Cascode Tuner 94C37-1		
16R11X, 16R12X, 26X45X 26R46X, 26R47X, 26R12X	21B1T	16KP4			
17K12X, 17K22X, 27K12X 27K15X, 27K16X, 27K17X, 27K25X 27K26X, 27K27X, 27K15XB, 27K16XB 27K17XB, 27K25XB, 27K26XB, 27K27XB C27K85X, C27K86X, C27K87X, C27K95X C27K96X, C27K97X.	21F1	17BP4			
37K15X, 37K16X, 37K27X 37K55X, 37K36XB, 37R65X, 37R66X	21G1	17BP4		RC550	4SIG
221K16X, 221K35X	21K1	20CP4 or 20DP4			
121K15X, 121K16X, 121K17X	21M1	20DP4A			

ALIGNMENT PROCEDURE

- Connect output meter across speaker voice coil.
- Turn receiver Volume control fully on; Tone control fully clockwise.
- Band switch in AM position.
- AM antenna must be connected and placed in the same relative position to the chassis as when in the cabinet.
- Use lowest output setting of signal generator that gives a satisfactory reading on meter.
- Use a non-metallic alignment tool for IF adjustments.
- Repeat adjustments to insure good results.

Step	Connect Signal Generator	Dummy Antenna Between Radio and Signal Generator	Signal Generator Frequency	Receiver Dial Setting	Adj. Trimmers in following order to max.
1	Gang condenser antenna stator	.1 mfd.	455 KC.	Tuning gang wide open	*A-B (2nd IF) *C-D (1st IF)
2	Gang condenser antenna stator	.1 mfd.	1620 KC.	Tuning gang wide open	E (oscillator)
3	Place generator lead close to loop of set to obtain adequate signal. No actual connection (signal by radiation).		1400 KC.	Tune in signal	†F (antenna)

*Adjustments A and C made from underside of chassis.
†AM antenna trimmer adjustment "F" in step 3 should be repeated after set and antenna have been installed in cabinet.
IMPORTANT: AM antenna trimmer may not peak if antenna leads are not properly routed or separated.

DIFFERENCES IN PICTURE WINDOW and CONTROL PANEL IN SOME 17" MODELS

Some models using a 17" picture tube have differences in the picture window and/or the control panel. These differences have been indicated by the addition of a suffix letter "B" to the model number. Note that this does not apply to models 17K12X, 27K12X.

The illustrations contain this information. Replacement parts can be ordered by using the part numbers given in the illustrations. Picture window mounting parts, not illustrated, are listed below each drawing.

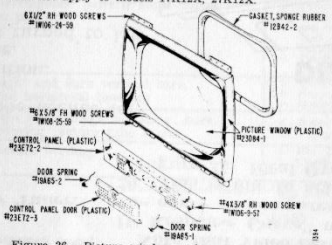


Figure 26. Picture window and control panel parts for 17" sets whose model numbers **do not have suffix letter "B".**

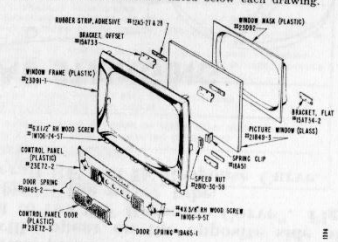
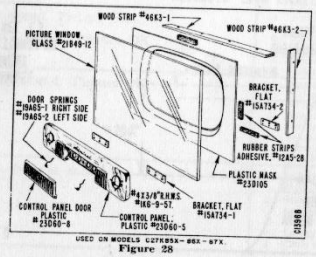
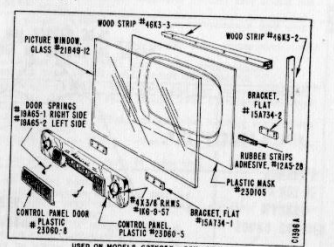


Figure 27. Picture window and control panel parts for 17" sets with model numbers **having the suffix letter "B".**



USED ON MODELS C27K85X - 86X - 87X.

Figure 28



USED ON MODELS C27K**X - 96X - 97X

Figure 29

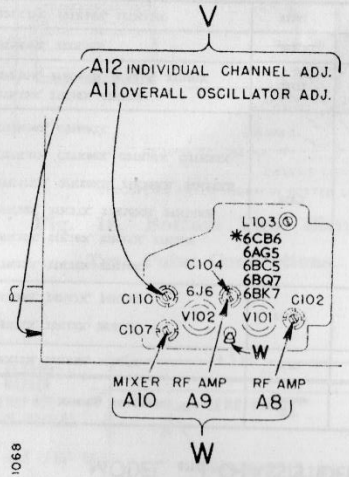


Figure 23. Top of TV Tuner showing Adjustment Location.

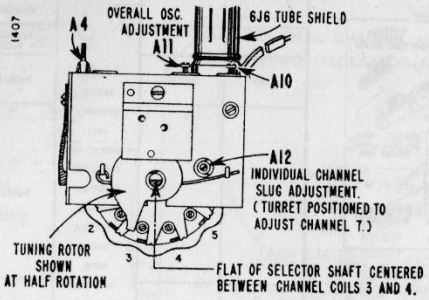
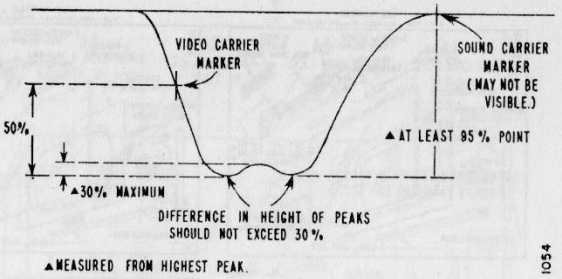


Figure 24. Front View of TV Tuner.



Note that video carrier (marker) on the "Overall RF-IF Response Curve" will appear on the opposite side of the curve as compared to the "IF Response Curve". Fig 20. This is due to action of the mixer tube.

Figure 25. Ideal Overall RF and IF Response Curve.

VOLTAGE DATA

- All readings made between tube socket terminals and B minus (chassis).
- Range Switch in "Radio" position.
- Measured on 117 Volt AC line.
- Volume control minimum; dial turned to low end.
- Voltages measured with vacuum tube Voltmeter.

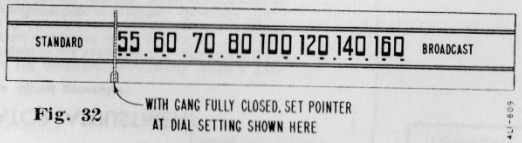


Fig. 32

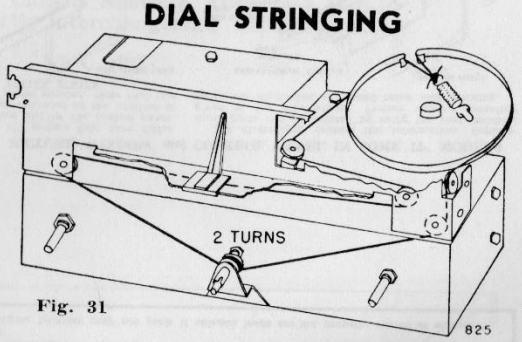
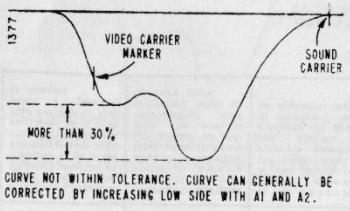


Fig. 31



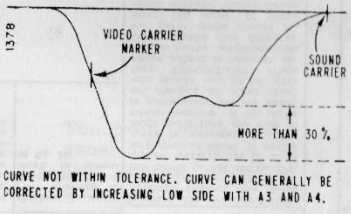


Figure 25A. Overall RF and IF Response Curves, Incorrect Shape.

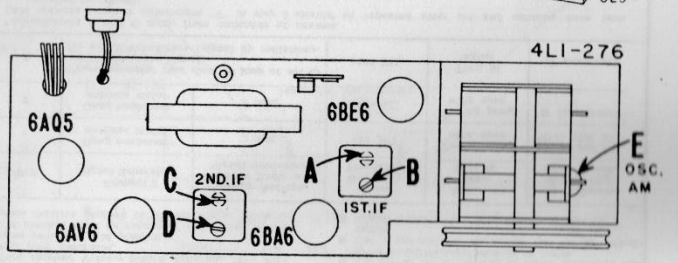


Fig. 30

21B1
21B1T Etc.

WAVEFORM ANALYSIS

WAVEFORMS ARE GIVEN ON SCHEMATIC

SERVICING BY WAVEFORM ANALYSIS

WARNING

Waveform analysis of high voltage sections of the receiver is not recommended. extreme care should be taken to avoid contact with these circuits. Care should be exercised when taking measurements on the horizontal output stage. No connections should be made to the plate cap of the horizontal output tube or to any connections on the high voltage rectifier tube as the high voltages at these points are dangerous.

After a circuit defect has been localized to the video or sweep sections of a television receiver, localization to a single stage can be accomplished by use of the waveforms shown on schematic. Voltage or resistance measurements can then be used to locate the defective part in a conventional manner.

Two separate waveforms are shown at points where both horizontal and vertical pulses appear. Two different oscilloscope sweep frequencies are used in order to show up the vertical and horizontal pulses at each test point (both cannot be locked in at the same sweep frequency due to the great difference in, and non-integral relationship of, the vertical and horizontal pulse frequencies).

The oscilloscope sweep is adjusted for 30 cycles (which is $\frac{1}{2}$ of the vertical frequency), or for 7875 cycles (which is $\frac{1}{2}$ of the horizontal frequency) so that 2 pulses appear on the screen.

The peak-to-peak (PP) voltages indicated for the various waveforms can be used to determine the voltage gain per state. If a peak-to-peak meter is not available for these measurements, the oscilloscope can be calibrated with a known voltage and used as a reference for comparison. If the known voltage is a sine wave, multiply the RMS value by 2.83 to find the peak value obtained on scope.

Turn Picture control fully to the right. Varying this control will produce corresponding variations in peak-to-peak voltages.

A change in waveform may be noticed at the video amplifier when the receiver is switched to a different television station. This is true since some variations in the transmitted waveform are tolerated at the television transmitter. All waveforms and peak-to-peak voltage readings are subject to modification due to the response of the oscilloscope used for test. Due to parts and manufacturing tolerances, variations in peak-to-peak voltages between television receivers are a normal condition. Hence, when using waveforms and peak-to-peak voltage readings for quick trouble shooting, these variations should be kept in mind to avoid erroneous conclusions.

CONTROL SETTINGS AND CONNECTIONS

Waveforms taken with picture control set fully to the right, all other controls set for normal picture (in sync).

Waveforms at video and sync stages obtained with transmitted picture signal input to receiver.

The oscilloscope sweep is adjusted for 30 cycles (which is $\frac{1}{2}$ of the vertical frequency), or for 7875 cycles (which is $\frac{1}{2}$ of the horizontal frequency) so that 2 pulses appear on the screen.

TROUBLE SHOOTING CHART

When trouble shooting it is important to remember the circuit differences between early production sets and later production sets. Early sets use conventional AGC and late 21B1 and 21F1 sets use gated AGC and a type 1N64 germanium diode as a video detector. See block diagrams figure 15 and figure 16

Note that identical symptoms in an early set and a late production set does not necessarily indicate trouble in same circuits. Troubles or symptoms in the trouble shooting chart which are preceded with a dagger "‡" apply only to later production 21B1 and 21F1 sets with gated AGC (using a 6AU6 tube for V304).

For additional information, see "Service Hints Index" and "Production Changes"

DEAD SET

Symptoms	CHECK
Dead receiver (no sound, no raster).	a. Radio on-off switch may be turned on (in combination set). See "Switching in Combination Models page". b. Power line circuit (interlocking connector). c. Rectifier circuit (V501).

PICTURE

Symptoms	Check
No picture, or intermittent picture. Raster and sound OK.	a. Video amplifier circuit (V305) for defective tube or other component. Check R208B for open. b. Waveform at V305. ‡c. Gated AGC tube V304 (6AU6).
Weak picture (insufficient contrast). Sound and raster OK.	‡a. Alignment of individual channel slugs. b. RF tuner circuit (V101, V102) for weak tubes, components, or alignment. c. IF amplifier stages (V301, V302, V303) for weak tubes, components, or alignment. d. Video Detector circuit for defective component. e. Video amplifier circuit (V305) for weak tube or open peaking coil.
Poor horizontal linearity. Insufficient width. Insufficient brightness.	a. Horizontal drive setting (C423). b. Horizontal output tube (V406) by substitution. c. Damper tube (V408) by substitution.
Picture jitter (sideways).	a. Picture control may be advanced too far. b. Horizontal hold and/or lock adjustment. c. Change horizontal output tube (V406) if sections of the picture are displaced. d. For noisy or microphonic tube(s) or poor connections in the RF, IF, video and sweep sections of the receiver. Check horizontal output tube (V406) by substitution. e. Noise pick-up in antenna or transmission line. f. Horizontal lock (L401) improperly adjusted.
Picture jitter (up or down) and high sync buzz level .	a. Defective vertical output transformer T002.
Smeared effect in picture (too low frequency response).	‡a. Setting of Tuning control. b. Trouble may be at transmitter. Check on another station. c. Video detector and circuit components. d. Video amplifier tube (V305) or open peaking coil. e. Alignment of RF Tuner and IF stages.
Poor picture detail (poor definition).	‡a. Setting of Tuning control. b. Antenna and transmission line for reflections (fine ghosts), possibly due to incorrect termination or routing. c. RF and IF alignment. d. Video detector and circuit components. e. Video amplifier tube (V305) and circuit components.
Sound bars in picture.	‡a. Setting of Tuning control. b. Microphonic tube (V102 most probable) in RF or IF circuits. c. Oscillation in IF system; check for open by-pass condenser. d. Alignment of RF and IF stages.
"Snow" in picture background.	a. Antenna and transmission line; may be due to incorrect termination, routing or orientation. b. For weak signal input by comparison to set known to be good. Location may be beyond normal service area of station. See "Fringe Area Service Suggestions" c. Noisy tubes in RF tuner; V102 most probable cause. d. Second anode power supply for corona discharge. e. Corona from tube retaining band to rim of picture tube (at top at ends of plastic insulating band). If necessary, add insulating polyethylene tubing or sheeting.
Horizontal non-linearity.	a. Horizontal drive setting (C423). b. Horizontal linearity setting (L403). c. Horizontal output tube (V406) and circuit components. d. Damper tube (V408) and circuit components. e. Waveforms at V404, V405, V406.
Vertical non-linearity.	a. Vertical linearity setting (R410). b. Vertical oscillator tube (V401A) by substitution. c. Vertical output tube (V402) by substitution. d. Vertical output transformer (T402). e. For leaky condenser C406. f. Waveforms at V401A, V402.
Engraved effect in picture.	‡a. Setting of Tuning control. b. Picture control may be advanced too far. c. Video amplifier tube (V305) and circuit components. d Video detector and circuit components. e. Peaking coils. f. Video output load and coupling circuit is common source of this difficulty.
Vertical bars on right side of picture.	a. Horizontal oscillator tube (V405) by substitution. b. Horizontal output tube (V406) by substitution. c. Damper tube (V408) by substitution.
Herringbone pattern super-imposed on picture.	a. Adjacent channel interference. b. FM, diathermy equipment or other forms of RF interference; can best be cured at the source, although traps may also be used at the receiver. c. Oscillation in IF system, caused by open by-pass condenser. d. Feedback through antenna if built-in antenna is used; re-route transmission line from antenna terminals to tuner.
Light and dark vertical bars. Bad horizontal linearity.	a. Damper tube (V408) by substitution. b. Horizontal output tube (V406) by substitution. c. Horizontal drive C423 and adjust.
Two heavy black horizontal bars covering picture tube screen.	a. Power supply circuit for open or leaky filter condenser. b. Voltage in B+ circuit for shorted condenser.
Picture bending	a. Hor. Lock adjustment L401. b. Check C417.

‡Individual channel oscillator slug may be misaligned.

SOUND

Distorted sound.	‡a. Setting of tuning control. b. Radio detector tube (V402) and circuit alignment. See "Distorted Sound" under "Service Hints" c. Tube or components in sound amplifier (V203) and sound output (V204) circuit.
‡No sound. Picture OK. ‡Weak sound. Picture OK.	a. Sound IF stage (V201); check tube, components and alignment. b. Ratio detector circuit (V202); check tube, components and alignment. c. Sound amplifier tube (V203) and circuit components. d. Sound output tube (V204) and circuit components.
Noisy sound. Picture OK.	a. sound IF stage (V201); check tube and for loose connection. b. Ratio detector circuit (V202); check tube, C206 and for loose connection. c. Sound amplifier circuit (V203); check tube, volume control and for loose connection. d. Sound output circuit (V204); check tube and for loose connection. e. Speaker for intermittent open in voice coil.
Sync buzz in sound.	‡a. Setting of Tuning control. b. Picture control may be advanced too far. c. Strong TV signal may cause overloading, requiring attenuator network in antenna input. d. Ratio detector and IF stage alignment. e. Leaky or shorted condenser C201. f. C205 may be wrong value.

Symptoms	Check
Intermittent sound. Picture OK.	a. Sound IF stage (V201); check tube and components. b. Ratio detector circuit (V202); check tube and components. c. Sound amplifier tube (V203) and circuit components. d. Sound output tube (V204) and circuit components. e. Speaker for intermittent open in voice coil.

21BI, 21BIT Etc.

*Individual channel oscillator slug may be misaligned.

SOUND AND PICTURE

Symptoms	Check
*No sound or picture. Raster OK.	a. RF tuner circuit (V101, V102); check tubes and coil contacts. b. IF stages (V301, V302, V303); check tubes and components. c. Check video detector and peaking coils L301, L302. d. Waveforms at video detector and V305.
Intermittent picture and sound. Raster OK.	a. Antenna and transmission line for loose connections. b. RF tuner circuit (V101, V102); check tubes and for poor coil contact. See "Television Tuner Service." c. IF amplifiers (V301, V302, V303); check tubes and for poor connections. d. Video detector; check combinations and components.
Weak or no picture; sound weak. Raster OK.	*a. Setting of Tuning control. b. RF tuner circuit (V101, V102); check tubes and alignment. c. IF stages (V301, V302, V303); check tubes and alignment. d. Video detector; check connections and components.

SYNC

Symptoms	Check
No vertical sync. Horizontal sync OK.	a. Integrator network for defective components. b. Waveform at pin 1 of V401.
No horizontal or vertical sync. Picture signal OK.	a. Tubes V403 and V401B by substitution. b. Sync separator and clipper tube (V403) by substitution. c. Sync inverter tube (V401B) by substitution. d. Waveforms at sync circuits.
No horizontal sync; vertical sync OK.	a. HOR. LOCK L401 adjustment. b. Sync inverter tube (V401B) and circuit components. c. Sync discriminator tube (V404) and circuit components. d. Horizontal oscillator tube (V405) and circuit components. e. Waveforms at V401B, V404, V405.
Picture "locks in" only at center of Hor. Hold control. Falls out on both sides.	a. Sync discriminator tube (V404) and circuit components. Check tolerance of condensers and resistors; R426 or R427 is common cause.

RASTER

Symptoms	Check
No raster. Sound OK.	a. Fuse M401. b. Ion trap adjustment. c. Tubes V306, V404, V405, V406, V408. d. Horizontal oscillator circuit (V405). e. Horizontal output transformer (open). f. Horizontal output circuit (V406). g. Damper circuit (V408). h. Leaky or shorted coupling condenser C419, C420, C421. i. 2nd anode power supply (V407, V408. 2nd anode voltage rectified by 1B3GT rectifier, is obtained by the auto transformer action of the primary circuit of the horizontal output transformer. Failure of the horizontal oscillator (V405) or horizontal output tube (V406) will cause no voltage to be developed in the 2nd anode supply circuit, since no sweep voltage is introduced in the primary of the horizontal output transformer. Waveforms at V404, V405, V406, V408.
Intermittent raster. Sound OK.	a. Tubes V306, V404, V405, V406, V407, V408. b. 2nd anode power supply (V407, 408) for arc-over or corona discharge. c. Horizontal oscillator circuit (V405). d. Horizontal output circuit (V406). e. Damper circuit (V408). f. Picture tube (V306) circuit. g. Waveforms at V404, V405, V406, V408.
Raster "blooms" (gets larger) as contrast is increased.	a. 2nd anode filter resistor R444. b. Horizontal output tube V406. c. HV rectifier V407 (1B3GT).
Insufficient raster brilliance.	a. Ion trap adjustment. b. Horizontal drive adjustment C423. c. 2nd anode power supply voltage. d. Low AC line voltage. e. Low B+ voltage. f. Picture tube (V306) by substitution. Look for blue haze in picture tube.
Rounded corners on raster. Brilliance OK.	a. Deflection yoke (too far back on picture tube neck). b. Picture positioning adjustment. c. Ion trap adjustment. See instructions on Picture Centering
Rounded corners on raster. Insufficient brilliance.	a. Ion trap adjustment. b. Deflection yoke too far back on picture tube neck. c. Picture positioning adjustment.
Tilted raster.	a. Position adjustment of deflection yoke.
Raster not centered.	a. Picture positioning lever. See instructions on Picture Centering.
Excessive raster size (too large a picture for the picture tube mask.	a. Height and width adjustments (R408 and L402). b. Second anode power supply, since low second anode potential increases deflection sensitivity of picture tube. Check tube V407 by substitution.
Trapezoidal or "Keystoned" raster.	a. Deflection yoke (T403) for shorted coil turns. a. Horizontal drive (C414B) adjustment. b. Width adjustment (L402). c. Tubes V406, V501, by substitution. d. Horizontal oscillator tube (V405) and circuit components. e. Horizontal output tube (V406) and circuit components. Check condenser C433.
Insufficient raster width.	a. Height adjustment (R408). b. Vertical output tube (V402) and circuit components. c. Vertical oscillator tube (V401A) and circuit components. d. Condenser C405 may be leaky. e. Waveforms at V401A, V402.
Insufficient raster height. Bright horizontal line. No vertical deflection, no raster.	a. Vertical oscillator tube (V401A) and circuit components. b. Vertical output tube (V402) and circuit components. c. Condensers C406, C407A may be leaky or shorted. d. Deflection coil for open circuit; make resistance check. e. Waveforms at V401A, V402.
Foldover of vertical sweep (appearing as a horizontal bar at bottom of picture).	a. Vertical oscillator (V401A) circuit for bad tube or components. b. Vertical output (V402) circuit for bad tube or components. c. Waveforms at V401A, V402.
Bunching of several trace lines appearing as a white band across raster.	a. Vertical output tube (V402) by substitution. b. Leaky condenser C405.
Bright vertical line. No horizontal deflection, no raster.	a. Open deflection yoke (T403B). b. Open condenser (C431).
Raster too small (insufficient height and width).	a. Height and width adjustments (R408 and L402). b. Tubes V306 and V501. c. Power supply voltage (V501); check for open filter condenser. d. Low AC line voltage. e. Gas contents will decrease the deflection sensitivity of the picture tube (improper focus will also result).
Excessive raster brilliance. Brightness control has no effect.	a. Picture tube (V306) by substitution. b. Picture tube circuit; R327 open.
No raster, fuse M401 blows when set seems to be operating OK.	a. Damper tube V408. b. V406, V408 circuit for shorted condenser. c. High voltage arc-over; check V407 tube socket.
Vertical lines or "wrinkles" on left side of raster.	a. Spurious oscillations in horizontal output (V406, V408); replace tubes. b. Deflection yoke; check C430, R445. c. Horizontal drive (C423) setting.
Improper focus (best at extreme control position).	a. Focus coil for open or shorted turns. b. Focus control circuit for short or open. c. For circuit defect causing either excessive or low current drain from power supply.
Improper focus (control has no effect).	a. Focus coil for open or shorted turns. b. Focus control circuit for circuit defect causing excessive or low current drain. c. Picture tube may be gassy. d. Defective focus control R446 for short or open.
Long warm-up time.	See paragraph 5 on page 11.

SERVICING VIDEO DETECTOR (M301)

The 1N64 germanium diode used as the video detector will generally require very little attention. The diode is located on the underside of the chassis connected between the 3rd IF transformer T303 and the 4.5 MC sound take-off coil L201. This germanium diode functions with excellent stability, has long life expectancy and ability to withstand severe mechanical shock without damage. However, the diode may be permanently damaged by application of excessive heat to the connecting leads. To avoid damage when replacing, the connecting leads should not be cut short. When soldering, grip the wire leads between the body of the diode and the solder point with a pair of long nose pliers to conduct some of the heat which would normally be absorbed by the diode.

A rough check to determine if the diode is open can be made using an ohmmeter. Check as follows: Disconnect one end of the diode from the circuit and connect an ohmmeter across the diode terminals. A relatively low resistance (several hundred ohms or less) should be noted in one direction and a relatively high reading (many thousand ohms) should be noted in the other direction as the ohmmeter leads are reversed.

A defective 1N64 diode (M301) will cause a weak picture or no picture with either weak or normal sound, in which case an oscilloscope will indicate low video output. If the diode is suspected as being at fault, disconnect one end of the original diode and try a substitute diode. Important: Note polarity when connecting the diode.

SERVICE HINTS

1. VERTICAL FOLDOVER

Vertical foldover appears as a bright horizontal bar, at the bottom of the picture, after the height and linearity controls are adjusted for correct picture size and linearity. Low line voltage (below 105 volts) can often be the cause of foldover in a set which is otherwise normal. Always check the line voltage first if this trouble appears. However, if foldover occurs at normal line voltage, it may be corrected by making one or more of the following changes in the order shown below:

a. TUBES. A weak vertical output tube (V402) can be the cause of foldover and a number of new tubes should be tried. This has been a source of trouble in sets using a 6S4 tube for a vertical output tube. Some brands of 6S4 give a greater output thus making it possible to obtain sufficient height without causing foldover. Low B+ voltage caused by a weak 5V4G rectifier tube (V501) will also cause foldover; try other rectifier tubes.

b. Additional Condenser Across Width Control. (Do not make this change in sets with gated AGC). An additional condenser (.002 to .005 mfd.) connected across width control L402 will increase the sweep width and also provide increased vertical sweep without causing foldover. The second anode supply voltage will be decreased by several hundred volts but the decrease in brightness is not noticeable.

c. Deflection Yoke. The cores of the deflection yokes used in these sets consists of two pieces of powdered iron, each semi-circular in shape. For maximum efficiency, these two core pieces should fit closely together with the air gaps as small as possible. Inspect the iron cores in the yoke to see if the air gap is at a minimum. If the air gap is greater than 1/32", tighten the collar. If this does not reduce the gap, remove the collar and the iron cores, and smooth over the insulation between the cores so that the gap will be at a minimum.

Some yokes are made so that the fibre sleeve must be clipped away with a pair of diagonal cutters before the collar and iron cores can be removed.

2. BUZZ CAUSED BY PICKUP THROUGH SHIELDED AUDIO CABLE

High buzz level can be caused by pickup through components in the audio circuit which are spaced too close to components in the vertical sweep circuits. A common cause of high sync buzz level is that the shielded audio cable (connecting to the volume control R208A) is too close to the vertical output tube (V402). The shielded audio cable should be dressed so that it will not come close to the vertical output tube. Also be sure that one end of the shield is soldered to the chassis.

3. PICTURE BENDING

Horizontal sync instability as indicated by "tearing" or "bending" of the picture may be caused by the loss of sync pulses at the video amplifier. This may be the result of improper AGC action. Check the RF amplifier and the IF amplifier tubes for leakage between control grid and other elements. Try other tubes by substitution. A high resistance leak between control grid and screen or cathode of these tubes will shunt the AGC voltage resulting in overloading of the video amplifier.

Bending near the top of the picture can be caused by a defective Sync. Separator and Clipper tube V403 (12AU7). If picture bending remains after tube replacement, check resistor R417 (18,000 ohms, and resistor R418 (82,000 ohms).

4. REMOVING RETRACE LINES

In early models without vertical retrace blanking, several bright lines may appear on the picture when the brightness control is advanced and picture control setting reduced. The vertical retrace blanking circuit may be added to these sets by changing R407 from 8200 to 6800 ohms, adding R450 (1500 ohms ½w) in series, and wiring C316 (.047 mfd.) and R331 (1meg ½w) into circuit as shown in schematic.

5. LONG WARM-UP TIME

A poor connection between the plate cap lead and the plate cap connecting to the horizontal output tube (V406) may cause an excessively long "warm-up" period before the raster appears. Touching a hot soldering iron to the solder joint inside the plate cap will often correct the trouble.

6. DISTORTED SOUND

Distorted sound can be caused by misalignment of the ratio detector transformer T201. Refer to "Touch-up of Ratio Detector" on page 5.

7. SYNC BUZZ DUE TO WRONG VALUE OF CONDENSER C205

If sync buzz is not eliminated after following the suggestions given in the trouble chart, page 41, check to see that ceramic condenser C205 is 500 mmfd. and not 50 mmfd. Sets having a 50 mmfd. condenser may produce a sync buzz on certain stations. Replacing the 50 mmfd. condenser with a 500 mmfd. ceramic condenser, part number 65C6-6, may remove the buzz.

8. PICTURE JITTER (UP AND DOWN) AND HIGH SYNC BUZZ LEVEL

Picture jitter with high sync buzz level may be due to breakdown between windings of the vertical output transformer T402. This trouble can be identified by change in pitch of the sync buzz with rotation of the vertical hold control. Replacement of the vertical output transformer T402 should remedy this trouble.

9. PICTURE FLICKER AS PICTURE CONTROL IS OPERATED

Picture flicker (noticeable as the "Picture" control is rotated) is generally due to intermittent contact between the shaft and bushing of the Volume and Picture control, part number 75B11-16.

To minimize this trouble, an improved control with a longer bushing is supplied as a service replacement under the original part number. This control, part number 75B11-16 will also be supplied as a sub for control, part number 75B11-18.

SERVICING GATED AGC CIRCUIT

Late production sets use a gated type AGC circuit to develop the AGC bias which is applied to the control grids of the RF amplifier and the 1st and 2nd IF amplifiers. This AGC voltage will change with any sudden change in the sync level input to the receiver. Since the gated AGC tube V304 (6AU6) is dependent upon other circuits for its operation, it will be affected by defective components in the video amplifier and horizontal output circuits. If the video amplifier V305 becomes defective, the AGC system will develop enough negative bias to cut-off the AGC controlled tubes. This will result in loss of both sound and picture or in some cases lack of raster brightness or no raster at all.

Since the AGC circuit in these late production sets differs greatly from the AGC circuit used in earlier sets (with the same chassis number but different run numbers), it is important to remember that identical trouble symptoms in an early and a late production chassis does not necessarily indicate trouble in the same circuits.

21BI
21BIT etc.

The most positive way to check for proper operation of the AGC circuit is to measure the bias voltage at test point "T" with and without a TV signal. Bias voltage should measure from -.25 volt to -6 volts depending on the strength of the TV signal. Also check waveforms at pins 1 and 5 of AGC tube V304 with an oscilloscope. See waveforms on schematic.

FRINGE AREA SERVICE SUGGESTIONS

Best performance from a television receiver can be realized only after considerable care and thought has been given to the selection and installation of the proper type of antenna dependent on the TV signals in the area. This is especially important in fringe or weak signal areas. Before proceeding with the suggestions below, it is recommended that the installation be checked. The Admiral Distributor nearest the area can be of help in the selection and installation of the proper antenna system.

The following service hints will be of help in improving reception in fringe or weak signal areas. It is possible to apply more than one of these service hints to a chassis to obtain better reception. Generally tubes should be checked and realignment should always be made before making any major circuit changes to increase sensitivity.

Check Line Voltage; it should be at least 117 volts. If the voltage is known to vary greatly, it is recommended that the set be operated from a constant voltage transformer with a power rating of at least 300 watts.

Check Rectifier Tube. Check the rectifier tube (5V4G) by substitution as the voltage output of some tubes may be slightly higher. An increase in B+ voltage will increase sensitivity.

Check RF, Mixer-Osc. and IF Tubes. Check the IF stages to see that the correct tube types are used according to chassis wiring. Use of an incorrect tube type may cause decreased sensitivity.

For complete information on the use of these tubes see schematics. Note that the different tubes used in the IF stage are not directly interchangeable, since they differ in pin numbering, in use of tube shields, and in use of resistor R330.

When replacing an original tube, try a number of tubes to select a tube which will give the highest gain possible. Realignment of the particular stage involved should always be made after each tube replacement in order to realize the maximum gain possible. See special alignment instructions below.

Check Video Amplifier Tube. Check the video amplifier tube (V305) by substitution. Increased contrast is sometimes obtained with tube replacement.

***Check B Plus Voltage.** Check B plus voltages at pin 5 of the 2nd IF stage with no signal input. If the B plus voltage is below 90 volts, check R317 and R318, and if necessary, replace with resistors having the correct value.

Improved Reception Obtained by Correct Alignment. Correct receiver alignment is an important factor when a receiver is to be operated in a low signal strength area. It is possible for a receiver to have a good overall (RF - IF) response curve even though the RF and IF stages are not properly aligned. This type of curve is obtained when the RF alignment is off in one direction and the IF alignment is off in the other direction. This incorrect alignment may cause excessive snow in the picture when weak signals are received.

The RF tuner should always be aligned to produce a response curve of maximum amplitude, consistent with flat top appearance and correct marker location. Carefully align the RF and IF stages following the instructions given in this service manual. If the RF and IF curves are similar to those shown in the manual, the receiver signal-to-noise ratio will be good and there will be a minimum amount of snow in the picture.

Checking tubes (by substitution) in the RF amplifier, oscillator-mixer, IF stages, and video detector while aligning will often give considerable increase in gain. The increase in gain may be observed by an increase in the amplitude of the response curve. Realignment of the particular stage should always be made after each tube replacement, in order to realize the maximum gain possible.

***Increased Sensitivity by Adding Resistor in AGC Circuit.** Sensitivity may be increased by connecting a resistor between test jack "T" and "chassis ground". Starting with a one megohm resistor, try lower resistance values until the correct size resistor is determined which will give satisfactory results for the particular location. Removal of the chassis from the cabinet is not required for installation of this resistor. Solder one end of the resistor to a banana plug and insert the banana plug into test jack "T"; ground the other end of the resistor. Test jack "T" (in early sets with conventional AGC) is the socket hole nearest the front of the chassis, see figure 19.

Important: This change should not be made in an area where strong signals can be received as overloading (bending or poor quality picture) will result. To prevent overloading, a switch may be installed in the ground end of the resistor to remove the resistor from the circuit when a strong station is being received.

* Does not apply to sets with gated AGC.

Increased Sensitivity Obtained by Removing AGC Bias From RF Tuner. Remove RF tuner AGC lead (white) from the AGC connecting lug and ground the lead to chassis. This change should not be made where strong signals may be received since overloading will result. A changeover switch SPDT can be installed to apply bias to the RF tuner when strong signals are to be received. Oscillation of the RF stage may also occur if the set is used with an RF booster.

INCREASING SENSITIVITY FOR EXTENDED FRINGE AREA RECEPTION

This change should not be applied to later production sets (starting with Run 2) having a 1N64 germanium diode (M301) used as a video detector and a 6AU6 tube (V304) used in a "gated" AGC stage.

In weak signal areas where noise level is high, the AGC voltage developed is proportional to the noise peaks instead of the sync pulse level. This increased AGC voltage will reduce the gain of the controlled stages and thereby lower the sensitivity of the receiver. This condition may also cause momentary loss of sync, poor contrast and weak sound. The circuit modifications shown in figures 35, 36, and 37 will greatly improve the operation of a receiver which is to be operated in an extended fringe area. A receiver with these modifications will also operate satisfactory in areas where strong TV signals can be received, since a **Local-Distant** switch is used to prevent circuit overload (picture bending) caused by a strong signal.

PRODUCTION CHANGES

21B1T, 21F1, 21G1, and 21K1 T.V. Chassis

RUN 1—R449 (470 ohm 2w) added to improve focus control action. May be 820 ohms in 21K1.
R442 (6.8K ohm 2w) increased to 10K ohm 2w to reduce 6BQ6 screen voltage.
C433 (.0022 mfd. 600v) was increased to .01 mfd. in some sets to increase width.
Tinned braid strap and springs added over 16" and 17" picture tubes to decrease horizontal radiation from aquedag coating.
R331 and C316 added to provide vertical retrace blanking.
R330 (4.7K ohm 2w) decreased to 470 ohms to improve contrast and brightness control action.
C215 (.0022 mfd. 600v) added from 6AV6 plate to ground to reduce background noise in audio.

RUN 2—V304 (6AL5 video detector and AGC) replaced by 1N64 germanium crystal diode detector and 6AU6 gating tube to provide gated A.G.C. This necessitated several other changes in chassis circuit and layout, especially in the I.F. strip.
R450 (1500 ohm ½w) added, R407 (8200 ohm ½w) changed to 6800 ohms, C316 changed to .047 mfd. 400v. to improve vertical retrace blanking circuit.

RUN 3—Incorporated Cascode Tuner which uses 6BQ7 or 6BK7 as R.F. amplifier. Further change in I.F. strip B+ circuits.

RUN 4—R423 (1000 ohms ½w), R425 (12K 2w). R447 (1000 ohms 1w), C435 (4 mfd. 150v), C503 A, B, C (30-30-20 mfd. 350v) removed from circuit.
C437 (.002 mfd. 600v) added across vertical oscillator transformer primary.
R404 (1.2 meg. ½w) increased to 1.8 megohms. (May be 1.5 megohms in some sets.)
R406, (1 meg. ½w) increased to 1.5 megohm.
The above Run 4 modification was made to improve vertical deflection operation and minimize vertical output transformer failures.
C434 (20 mfd. 450v) moved to new position C216 in circuit.
C216 (20 mfd. 450v) removed from circuit and R216 (470 ohm 2w) relocated.
C307 electrolytic: type changed. C307A (60 mfd.) changed to 30 mfd. C307C (20 mfd.) changed to 30 mfd.

Before making the modifications given below, it should be determined that the receiver has normal sensitivity by comparison with a receiver of the same type which is known to have normal sensitivity. Poor operation in fringe areas may be due to low sensitivity caused by one or more of the common troubles discussed in the previous paragraphs and a major circuit modification may not be necessary.

The parts below will be required for making this modification:

2—560,000 ohms, ½ watt resistors (part number 60B8-564)
1—22,000 ohms, ½ watt resistor (part number 60B8-223)
1—Toggle switch (SPDT)
3—26" lengths of #28 or #30 insulated (stranded) wire (use 1 black and 2 red wires)

TEST EQUIPMENT

The test equipment listed under "Television Alignment Procedure" should be available to make proper alignment checks.

ADDING CHANGES

To add the circuit modifications to a receiver, see figures 35 and 36 and proceed as follows:

Step 1. Remove the IF cover shield from below the IF sub-chassis.

Step 2. Remove resistor R313 (560,000 ohms) and connect a new 560,000 ohm, ½ watt resistor from pin 7 of V304 (6AL5) socket, to pin 1 of V501 (5V4G) socket.

Step 3. Connect a 560,000 ohm, ½ watt resistor from junction of L302 and R315, to pin 3 of V501 (5U4G) socket.

Step 4. Connect each of the three (26" long) wires to a terminal of the SPDT toggle switch. Connect the other end of each wire to connection points shown in figure 36; note color of wires.

Step 5. Remove tuner inspection plate from the side of the chassis and remove resistor R101 (3,900 ohms) from across contact terminals 7 and 11 of the RF tuner. Replace R101 with 22,000 ohm, ½ watt resistor. See figure 37.

Step 6. Realign the IF stages and check the IF response curve according to the instructions given Make all alignment adjustments and checks with the Local-Distant switch in the "Distant" position.

Step 7. Make the RF and Mixer Alignment" as described with the exception that alignment is made on the weakest high channel in operation for the area concerned. Be sure to adjust RF trimmers for maximum amplitude on the response curve.

Step 8. After the above changes have been made, set the Local-Distant switch on the most sensitive position and check the receiver for relative sensitivity by comparison with the receiver used previously to determine whether the receiver to be modified was of normal sensitivity. If another receiver is not available for a sensitivity check, then air check reception on the weakest TV signals available. If the modification and alignment were made properly, there should be a very noticeable improvement in sensitivity with the Local-Distant switch on distant position. Sensitivity can sometimes be further improved by making the checks given under the service hint on "Improving Sensitivity".

Step 9. Mount switch on the cabinet back near the top so it can be easily reached over the top of the cabinet. IMPORTANT: Be sure to instruct the customer on proper use of the switch. One position of the switch makes the set extra-sensitive for best reception when receiving weak or distant TV stations. The other position of the switch will prevent possible picture "bending when receiving strong stations.

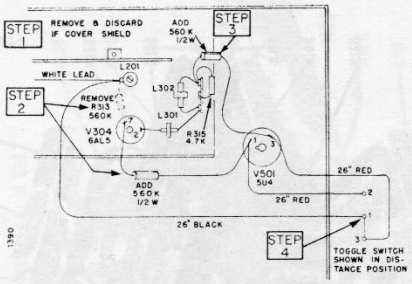


Figure 36. Diagram Showing AGC and B+ Wiring Changes

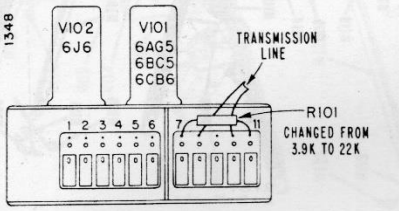


Figure 37. Side View of TV Tuner Showing R101 Resistor Change.

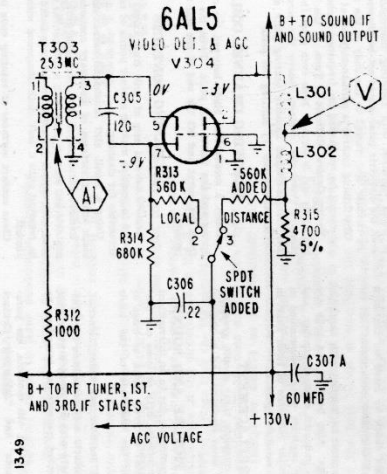


Figure 35. Partial Schematic Showing AGC and B plus Circuit Changes

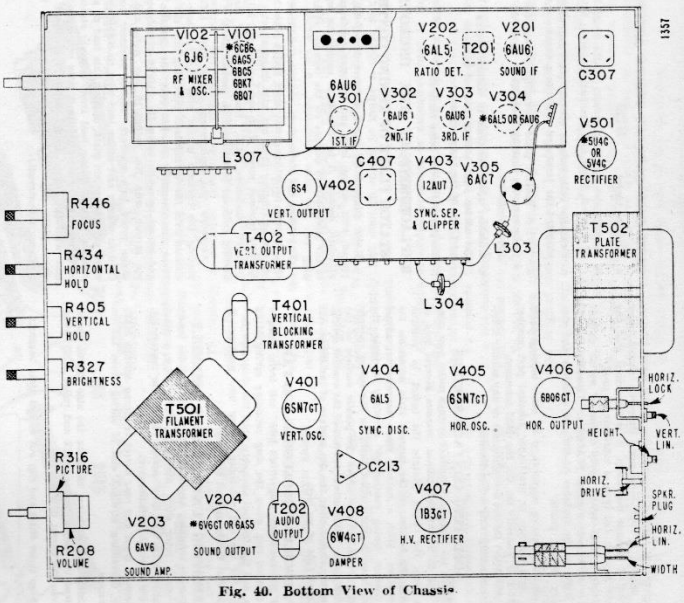


Fig. 40. Bottom View of Chassis.

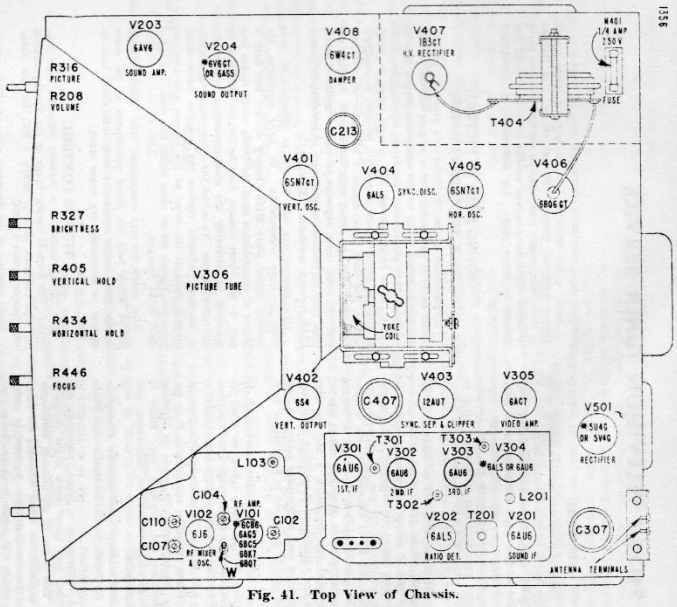


Fig. 41. Top View of Chassis.

21B1, 21BIT etc.

94C18-4 TELEVISION TUNER SERVICE

GENERAL

The 94C18-4 tuner is a sub-chassis consisting of an RF amplifier stage and a mixer-oscillator stage.

Three different RF amplifier tubes, either 6AG5, 6BC5, or 6CB6, are used in this tuner. Although these tubes have similar characteristics and are generally interchangeable, it is advisable to check the RF amplifier curve with a sweep generator and oscilloscope after replacement. A dual triode 6J6 tube is used in the mixer-oscillator stage.

Channel selection is accomplished by rotation of the tuner turret assembly, which has a separate set of two coils for each of the 12 television channels. Each set consists of an antenna coil in one assembly, and a mixer-oscillator coil in another. Coils are the snap-in type. Coils can be identified as to channel by the number stamped on the outside of the coil assembly. A Tuning control, having a tuning range of plus or minus 1.5 MC for low channels, and plus or minus 3 MC for high channels, permits fine adjustment of oscillator frequency.

The high frequencies used in television make it necessary that extreme care be exercised in handling or servicing tuners.

Location and lead dress of components and wiring are usually very critical. Wiring leads, acting as small inductances or capacities, may appreciably alter electrical characteristics of critical circuits at high frequencies.

Parts location and ground connections should be as originally made. When replacing components, **it is important that they be replaced with parts of identical electrical characteristics and physical size.** Refer to parts list for temperature coefficients, tolerances, and other essential description.

Note resemblance between some ceramic condensers and resistors. If in doubt, check Schematic and Parts List.

Also note that replacement of tubes (especially 6J6 oscillator-mixer tube) may cause some slight detuning of tuner circuits. This is due to the inherent differences of inter-electrode capacitances. When replacing 6J6 tube, it is recommended that several tubes be tried in order to select a tube which will cause least oscillator frequency shift. This is easily checked by noting whether the Tuning control will tune in the television signal. It is recommended that this check be made on the high channels. Make "Overall Oscillator Adjustment" as instructed

Channel snap-in coils must be handled with care. Do not disturb coil windings. Also be sure the coils are properly paired for the indicated channel number, and that coils follow proper sequence when reassembled in the turret drum. For proper reference of tuner shaft in relation to coil position, refer to figure 24.

TUNER REPLACEMENT

Replacement of the complete tuner should generally never become necessary since electrical and mechanical parts are easily replaceable.

INTERMITTENT PICTURE AND SOUND

This trouble is most commonly due to an intermittent tube, loose tube socket contacts, dirty or loose coil contacts, loose or cold (rosin) soldered joints, or loose or vibrating components in the underside of the tuner chassis.

When replacing tubes, see tube note under "General".

Loose tube socket contacts may sometimes be tightened by depressing contacts with an ice pick or a large needle. Defective tube socket contacts can sometimes be replaced individually.

For cleaning and adjusting coil contacts, see paragraphs "Cleaning Contacts" and "Adjusting Contact Springs".

Loose or intermittent connections can be found by tapping components or rotating the channel selector and watching the pattern on an oscilloscope. A visual inspection or a continuity check will also be helpful.

Apply a hot soldering iron to soldered joints which appear doubtful. Caution: Do not change lead lengths or move components other than to slightly separate parts or leads which have caused trouble by contact with the chassis or other parts. See discussion in paragraph "General".

SOUND BARS IN PICTURE (DUE TO MICROPHONICS)

Microphonics in the TV Tuner will generally produce sound bars in the picture or a ringing sound as the volume is turned up or as the cabinet is tapped lightly.

Check for microphonic oscillator mixer tube, V102 (6J6). It is recommended that several tubes be tried, in order to select a tube which will be least microphonic and at the same time, causes a minimum of oscillator frequency shift, as noted with rotation of Tuning control. In some cases, replacement of the oscillator mixer tube, may necessitate readjustment of trimmer condenser C110 (overall oscillator adjustment).

Microphonics can also be due to vibration of loose wires or loose components. In some instances, the ceramic stator plate M118 (tuning stator) has been a source of microphonics since the rivets which fasten this part to the tuner chassis may be loose. This can be remedied by soldering the plate mounting bracket to the tuner chassis. To solder the plate mounting bracket to the tuner chassis, remove the bakelite tuner shaft bearing plate at the front of the chassis and also the grounded Tuning stator plate M107, and move the tuner shaft M104 forward.

Also, check for any mechanical "rub" such as loose screws which hold the tuner sub-chassis to the main chassis, loose solder connection from tube shield base to chassis, or extremely dry tuner shaft.

TUNING CONTROL

The Tuning control is a variable dielectric type condenser. The normal tuning range of the Tuning control for high channels plus or minus 3 MC, for low channels plus or minus 1.5 MC.

Slight rubbing of the dielectric rotor of M104 against the grounded stator plate M107 is intentional, in order to avoid vibration with resulting microphonics. However, the dielectric rotor should not be allowed to contact the circular disc riveted to the body of the tuner.

The Tuning control is permanently set at the factory and cannot be readjusted for frequency tuning range.

Tuning Control Difficult to Turn. If the Tuning control binds and is hard to turn even after the chassis is removed from the cabinet, loosen the screws holding the triangle-shaped bakelite bearing plate at the front of the chassis and try shifting the plate.

REMOVING CHANNEL COILS

Insert a screwdriver blade between the coil retainer spring and the turret end plate. Twist the blade away from the turret and lift the end of the coil upward and remove.

CLEANING CONTACTS

Remove several sets of coils from turret and rotate turret to position making contact points of contact plate accessible for cleaning.

Using a small, stiff brush and carbon tetrachloride, clean contact surfaces of stationary contacts.

Remove accumulated dust or grease from stationary contacts and contact plate with a soft canvas cloth dampened with carbon tetrachloride. Accumulated rosin may be removed with a soft cloth dampened with denatured alcohol.

Clean contact surfaces of rotating coils in the same manner.

TUNER LUBRICATION

In general the lubrication applied to points of wear or friction at time of manufacture should make lubrication seldom, if ever necessary. However, should tuner lubrication become necessary, it is important that the correct amount and type of lubricant be used.

Using a clean brush, apply a film of switch contact oil (Admiral part number 98A64-1 or Viscosity Oil Co. No. 7069) to the surfaces of the coil contacts and stationary contact points.

Lubricate bearing surfaces of all other moving parts with light vaseline or preferably Admiral part number 98A64-2 or Viscosity Oil Co. No. 8857 lubricant.

CAUTION: Do not use lubriplate or any similar lubricant containing zinc or cadmium.

ADJUSTING CONTACT SPRINGS

Should the stationary contact springs make poor contact due to insufficient tension, remove several sets of coils from the turret. Rotate the turret to position making the bottom of the contact strip accessible for observation. With a narrow blade screwdriver, adjust the contact spring tension by carefully bending the spring inward until highest point on the spring extends about 9/64 of an inch above the plastic surface of the contact plate. With correct tension of the contact spring, the spring should clear the flat surface of the turret coil by about 1/64 of an inch.

OSCILLATOR SLUGS IN TOO FAR

If HF oscillator slugs "fall into" coil form, remove the channel coil, move the slug retaining spring M112 aside, and tap the coil assembly until the slug slips forward. Set the coil retaining spring into position; it should rest firmly against the slug.

REMOVING TUNER TURRET ASSEMBLY

a. Remove retaining bracket M107 in front of the tuner.
b. Remove rotor shaft assembly M104, rotor contact spring M124 and fibre washer M113. For reassembly, note order of parts removal.
c. Remove front and rear turret retaining springs M125 by depressing straight end of spring from tab on chassis.
d. Using a screwdriver blade at the side of the tuner, press the detent spring M122 and roller M121 away from the turret detent plate.
e. Grasp tuner shaft and slip out of end plate bearings.

REMOVING CONTACT PLATE ASSEMBLY

a. Remove turret. **M123**
b. Remove the mounting screws at the front and rear of Contact Plate and Bracket Assembly M123.
c. Unsolder both ends of contact plate assembly. Press outward the front and rear tuner chassis end plates.
d. To free contact plate assembly, release the contact plate tabs by pushing them away from the slots in the end plates.
e. Unsolder all connections to contact plates. Unsolder the solder joint holding contact plate to the center partition of the tuner chassis.
f. Reassemble in the same manner.

REPLACEMENT OF THE UNGROUNDED STATOR PLATE OF TUNING CONTROL

Stator plate M118 (part number 94A45-86) is replaced with wiring lead and trimmer condenser C110 attached, because it is difficult to solder the wire lead to the silver-plated surface on the ceramic stator plate disc.

To replace the stator plate, remove the turret assembly. Remove mounting rivets from stator plate by drilling out or clipping them out with diagonal wire cutters. Remove trimmer screw M115 and locking nut M114 from trimmer condenser C110. Unsolder wiring lead connecting trimmer to terminal on contact plate.

Assemble the replacement stator plate (M118) by placing the ceramic button over the 5/8" hole in the chassis with the wiring lead extending into the chassis. Place the mounting bracket over the ceramic button and mount securely, using No. 4x3/16 round head machine screws with No. 4-40x3/16 hex nuts and No. 4 shake proof lock washers. Mount trimmer condenser C110 in chassis and solder lead wire to its original terminal on the contact plate, making this lead as short as possible. Dress wiring lead from ceramic stator plate to trimmer condenser C110 so it does not come in contact with the turret drum. After replacement of the stator plate, adjust trimmer condenser C110 (overall oscillator adjustment).

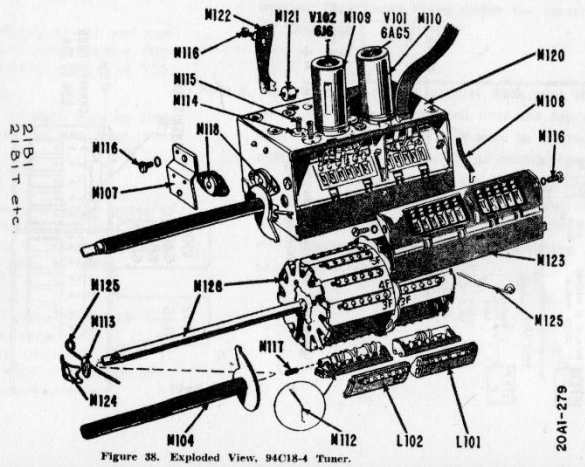


Figure 38. Exploded View, 94C18-4 Tuner.

94C37-1 TELEVISION TUNER

GENERAL

TV tuner 94C37-1 (used in later production 21-series TV Chassis) incorporates the latest developments in the design of TV tuners. Most outstanding in the design of this new tuner are the improved signal to noise ratio, increased gain, improved stability, and reduced level of local oscillator radiation.

The schematic shows the circuit for latest production 21-series chassis using the 94C37-1 tuner. In comparing the circuit of the 94C37-1 tuner with the circuit for the 94C18-4 tuner (used in earlier 21-series chassis), the most prominent difference in the circuitry is in the RF amplifier circuit (V101). Note that the RF oscillator and mixer circuits (V102) are basically the same.

The RF amplifier V101 uses a miniature type dual triode tube (6BQ7 or 6BK7) as a (Modified) cascode RF amplifier. The first triode section operates as a conventional grid driven neutralized RF amplifier. The second triode section operates as a grounded grid RF amplifier, the grid (Pin 7) being grounded to chassis through condenser C116. Direct coupling is used between the plate of the first triode section and the cathode of the second triode section. For this reason the voltage at the cathode (Pin 8) of RF amplifier V101 is approximately 125 volts above chassis ground, and the voltage at the plate (pin 6) of V101 is approximately 250 volts above chassis ground. Since 250 volts is required for the RF amplifier as compared to 125 volts required for the oscillator and mixer sections, a separate lead is brought out from the tuner. Resistors R111 and R112 (220,000 ohms) function as a voltage divider network to apply the required operating voltages.

Note that if the tubes used at V101 (6BQ7 or 6BK7) are interchanged when replacing, it will be necessary to completely re-align the tuner.

The channel coils for the 94C37-1 tuner differ from the channel coils in other Admiral turret coils for the 94C37-1 tuner are identified by the letter "K" which is stamped on the channel coils adjacent to the channel number ("2K", "3K", "4K", etc).

ALIGNMENT OF 94C37-1 TUNER

Alignment for the 94C37-1 tuner is similar to that of the 94C18-4 tuner (used in earlier 21- series TV chassis). Make all alignment adjustments as instructed with the following exceptions:

1. While making the "RF and Mixer Alignment" and the "Overall RF and IF Response Curve Check", connect the negative terminal of a 3 volt bias battery to test point "T", positive terminal to chassis.
2. In step 1 of the "RF and Mixer Alignment", adjust A8 to bring up (spike up) the video carrier side of the RF Response Curve. Adjusting A9 will generally shift the centre of the response curve in relation to the video and sound carrier markers. Alternately adjust A9 and A10 for maximum amplitude with flat top appearance. Consistent with proper band width and correct marker location, the response curve should have maximum amplitude and flat top appearance. Adjustment A8 (antenna trimmer) is aligned to the video carrier side of the response curve for the purpose of maintaining a low noise figure (high signal to noise ratio). A slight sacrifice in amplitude of the response curve may be apparent in doing so; however, the increased gain made available by the new circuit design more than compensates for this loss.

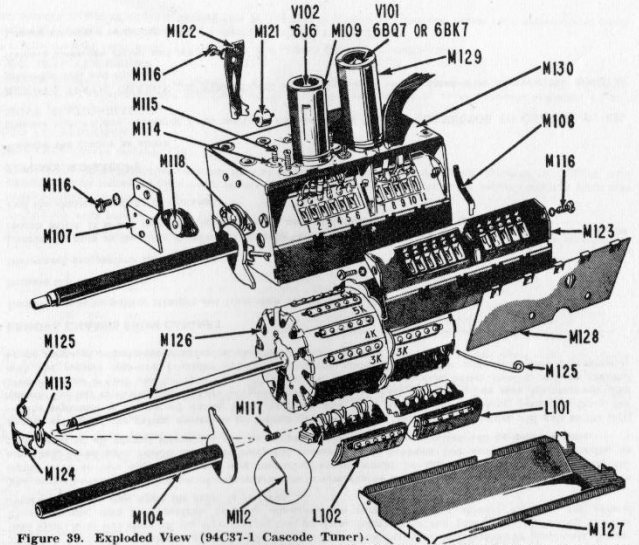


Figure 39. Exploded View (94C37-1 Cascode Tuner).

SERVICING THE 94C37-1 TUNER

The 94C37-1 tuner is similar mechanically to the 94C18-4 tuner used in earlier sets using the 21-series chassis.

In general the servicing of the 94C37-1 tuner will be identical to servicing the 94C18-4 tuner. The additional service information required is given in the paragraphs below.

Except for the channel coils, the mechanical parts for both tuners are interchangeable. The 94C37-1 tuner uses a bottom cover shield (M127) and a side cover shield (M128). The RF amplifier and RF mixer-RF oscillator sections of the tuner are separated by a metal plate which also mounts the silver ceramic feed-through condensers (C115, C117, C118, C119) and a silver ceramic disc. condenser (C116).

Use the parts list in this supplement to order replacement parts for the 94C37-1 tuner.

Replacement of Ceramic Feed—Through Condensers:

The ceramic feed-through condensers are mounted on the metal plate (shield) which separates the RF amplifier and RF mixer-oscillator sections. Replacement of the ceramic feed-through condensers should seldom be required unless they are damaged by rough handling.

CAUTION

Application of undue pressure or excessive heat to the surface or terminals of the ceramic feed-through condenser will cause it to crack or cause the terminals (centre conductor) to loosen up.

The ceramic condensers should be replaced if the silvered surface is cracked or if the terminals (centre conductor) have worked loose. To remove a ceramic condenser, apply the tip of a hot soldering iron to the condenser mounting plate, applying the heat to the surface immediately surrounding the condenser. Using a pair of long nose pliers, grasp the condenser by a terminal and pull it away from the metal partition.

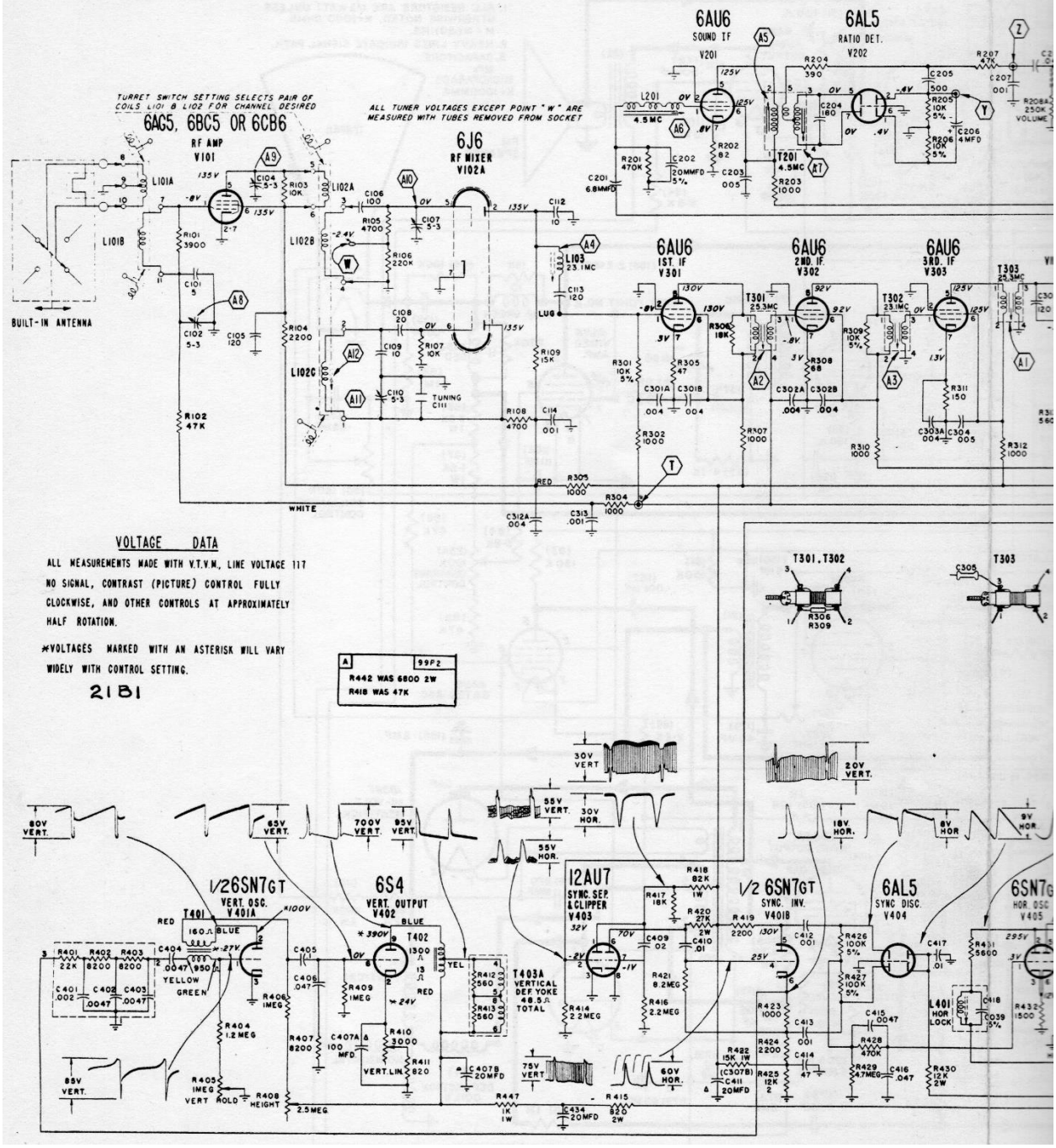
To replace a ceramic condenser, remove the excess solder from around the mounting hole. This can be done by using a twist drill of same diameter as the condenser. Insert the twist drill through one of the holes in the back of the TV tuner. Using finger pressure rotate the drill until the hole in the plate is reamed out large enough for the new condenser to fit snugly. Insert the replacement condenser. Apply the tip of a hot soldering iron to the metal surface surrounding the condenser. When the surface of the plate is heated sufficiently apply just enough solder to make a clean, neat soldered joint.

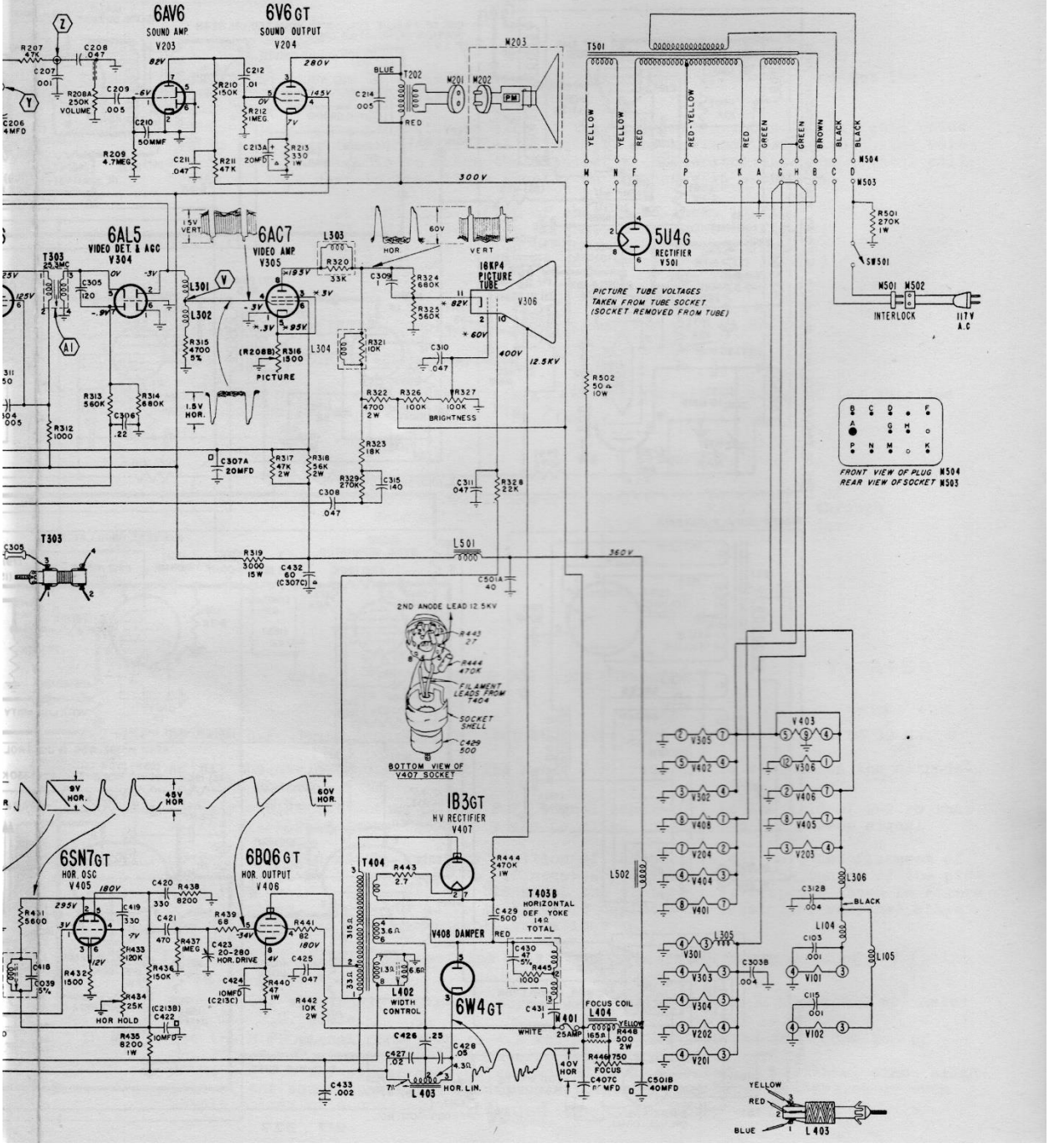
CAUTION

Application of undue pressure or excessive heat to the ceramic disc condenser will fracture the surface or cause the silver-plated surface to loosen up or peel off.

To remove the ceramic disc condenser apply the tip of a hot soldering iron to the surface of the metal plate, just behind the condenser.

To mount the replacement condenser, place it on the metal plate over the exact spot (tinned surface) where the original condenser was located. Apply the top of a hot soldering iron to the surface of the metal plate just behind the spot where the condenser is placed. When the metal plate is heated sufficiently, and the solder at the centre of the condenser has melted, remove the soldering iron. Allow the metal plate and the condenser to cool off before soldering the tube socket pin (pin 9 of V101) to the other side of the condenser.


TURRET SWITCH SETTING SELECTS PAIR OF COILS L101 & L102 FOR CHANNEL DESIRED
6AC5, 6BC5 OR 6CB6
RF AMP V101
ALL TUNER VOLTAGES EXCEPT POINT "W" ARE MEASURED WITH TUBES REMOVED FROM SOCKET
6J6
RF MIXER V102A
6AU6
SOUND IF
V201
6AL5
RATIO DET.
V202
6AU6
1ST. IF
V301
6AU6
2ND. IF
V302
6AU6
3RD. IF
V303
BUILT-IN ANTENNA
L101A
L101B
L102A
L102B
L102C
L103
23.1MC
T201
4.5MC
T301
23.1MC
T302
23.1MC
T303
25.3MC
LUG
TUNING
WHITE
RED
VOLTAGE DATA
ALL MEASUREMENTS MADE WITH V.T.V.M., LINE VOLTAGE 117
NO SIGNAL, CONTRAST (PICTURE) CONTROL FULLY CLOCKWISE, AND OTHER CONTROLS AT APPROXIMATELY HALF ROTATION.
*VOLTAGES MARKED WITH AN ASTERISK WILL VARY WIDELY WITH CONTROL SETTING.
21B1
A 99P2
R442 WAS 6800 2W
R418 WAS 47K
T301, T302
R306
R309
T303
C305
1/2 6SN7GT
VERT. OSC.
V401A
6S4
VERT. OUTPUT
V402
12AU7
SYNC. SEP. & CLIPPER
V403
1/2 6SN7GT
SYNC. INV.
V401B
6AL5
SYNC DISC.
V404
6SN7G
HOR. OSC
V405
T401
T402
T403A
VERTICAL DEF. YOKE
46.5Ω TOTAL
L401
HOR. LOCK
VERT. HOLD
VERT. HEIGHT
VERT. LIN.
80V VERT.
65V VERT.
700V VERT.
95V VERT.
30V VERT.
55V VERT.
55V HOR.
20V VERT.
18V HOR.
8V HOR.
9V HOR.
75V VERT.
60V HOR.
85V VERT.


6AV6
SOUND AMP.
V203
6V6GT
SOUND OUTPUT
V204
6AL5
VIDEO DET. & AGC
V304
6AC7
VIDEO AMP.
V305
18KP4
PICTURE TUBE
V306
5U4G
RECTIFIER
V501
6SN7GT
HOR. OSC
V405
6BQ6GT
HOR. OUTPUT
V406
1B3GT
HV RECTIFIER
V407
6W4GT
T303
T501
T202
T404
T403B
HORIZONTAL DEF. YOKE 140 TOTAL
L402
WIDTH CONTROL
L403
HOR. LIN.
L404
FOCUS COIL
L501
L502
V408 DAMPER
PICTURE TUBE VOLTAGES TAKEN FROM TUBE SOCKET (SOCKET REMOVED FROM TUBE)
INTERLOCK
117V A.C
FRONT VIEW OF PLUG M504
REAR VIEW OF SOCKET M503
2ND ANODE LEAD 12.5KV
FILAMENT LEADS FROM T404
SOCKET SHELL
BOTTOM VIEW OF V407 SOCKET
PICTURE
BRIGHTNESS
HOR. HOLD
HOR. DRIVE
WIDTH CONTROL
FOCUS
BLUE
RED
YELLOW
WHITE
BLACK
GREEN
BROWN
RED-YELLOW

RCC TELEVISION Service Manual

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1954-55 Supplement No. 13

INDEX

ADDISON

ADMIRAL

CBS-COLUMBIA - See Addison

ELECTROHOME

T-144 Same as Broadview in Supplement #12.

HALLICRAFTERS

MOTOROLA

OLYMPIC - See Racine

RACINE

RCA-VICTOR

SPARTON

SYLVANIA NORTHERN ELECTRIC

VIKING

RCC TELEVISION Supplement No. 13

COILS AND TRANSFORMERS

L101	Antenna Coil	
	For Channel #2	94C37-52
	For Channel #3	94C37-53
	For Channel #4	94C37-54
	For Channel #5	94C37-55
	For Channel #6	94C37-56
	For Channel #7	94C37-57
	For Channel #8	94C37-58
	For Channel #9	94C37-59
	For Channel #10	94C37-60
	For Channel #11	94C37-61
	For Channel #12	94C37-62
	For Channel #13	94C37-63
L102	Mixer - Oscillator Coil	
	For Channel #2	94C37-72
	For Channel #3	94C37-73
	For Channel #4	94C37-74
	For Channel #5	94C37-75
	For Channel #6	94C37-76
	For Channel #7	94C37-77
	For Channel #8	94C37-78
	For Channel #9	94C37-79
	For Channel #10	94C37-80
	For Channel #11	94C37-81
	For Channel #12	94C37-82
	For Channel #13	94C37-83
L103	Mixer Plate Coil	98A45-77
L104	Heater R.F. Choke	98A45-13
L105	Heater Oscillator Choke	98A45-14
L106	Peaking Coil	94C37-89
L201	Sound Take-off Coil (Includes R201, C201, C202)	72B99-1
L301	Video Peaking Coil	73A5-12
L302	Video Peaking Coil	73A5-7
L303	Video Peaking Coil (wound on R320)	73A11-1
L304	Video Peaking Coil (wound on R321)	73A5-14
L305	Heater R.F. Choke	73A2-5
L306	Heater R.F. Choke	73A2-5
L401	Horizontal Lock Coil (includes C418 and R431)	94W17
L402	Width Control	94A29-1
L403	Horizontal Linearity Control	94A28
L404	Focus Coil (22Z1X)	69Y117-1
L404	Focus Coil (22A2X)	69Y117-2
L501	Filter Choke (25 cycle)	74K4
L702	Oscillator Coil A.M.	69A52-1
L704	A.M. Antenna	69C116-2
T201	Ratio Detector Transformer	72B68
T202	Audio Output Transformer	79C33-2
T301	1st I.F. Transformer	72Y96-6
T302	2nd I.F. Transformer	72C96-7
T303	3rd I.F. Transformer	72C96-8
T401	Blocking Oscillator Transformer	79W18-2
T402	Vertical Output Transformer	79B29-1
T403	Deflection Yoke (22Z1X)	94C25-3
T403	Deflection Yoke (22A2X)	94C30-1
T404	Horizontal Output Transformer Coil & Terminal Strip	79C30-2
T501	Power Transformer (Filament) (25 cycle)	80L5
T501	Power Transformer (Filament) (60 cycle)	80L6
T701	1st I.F. Transformer	72B28-7
T702	2nd I.F. Transformer	72B28-7

ALIGNMENT PROCEDURE FOR 2AIX RADIO

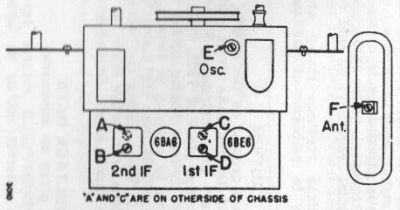
*Connect output meter across speaker voice coil.
*Turn receiver Volume control fully on; Tone Control fully clockwise.
*Selector switch in radio position
*AM antenna must be connected and mounted on the T. V. Chassis.
*Remove Tone Control drive cord.
*Remove 4 screws securing radio chassis and withdraw from the TV chassis to expose the I. F. Transformers. Replace after Step 1.
*Use lowest output setting of signal generator that gives a satisfactory reading on meter.
*Use a non-metallic alignment tool for I. F. adjustments.
*Repeat adjustments to insure good results.

Step	Connect Signal Generator	Dummy Antenna Between Radio and Signal Generator	Signal Generator Frequency	Receiver Dial Setting	Adj. Trimmers in following order to max.
1	Gang Condenser Antenna Stator	. 1 mfd.	455 KC.	Tuning Gang wide open	A-B* (1stIF) C-D*(2nd IF)
2	Gang Condenser Antenna Stator	. 1 mfd.	1620 KC	Tuning Gang wide open	E (Oscillator)
3	Place generator lead close to loop of set to obtain adequate signal. No actual connection (signal of radiation)		1400 KC	Tune in Signal	F (Antenna)

*Adjustments B and D made from underside of chassis. "Not necessary if picture tube has separate mounting. IMPORTANT: AM antenna trimmer may not peak if antenna leads are not properly routed or separated.

VOLTAGE DATA

All readings made between tube socket terminals and B minus (chassis.)
Range Switch in "Radio" position.
Measured on 117 Volt AC line.
Volume control minimum; dial turned to low end.
Voltages measured with vacuum tube Voltmeter.



TUBE AND TRIMMER LOCATION

Gang Condenser shown in dotted line located underneath chassis.

Above drawing, as seen from underside of TV Chassis.

ADMIRAL
22 W1X, Z1X, A2X RUN 1

SCHEMATIC FOR 22W1X, 22Z1X, 22A2X TV-RADIO CHASSIS

RUN 1 GATED A.G.C. CASCODE TUNER

(ALL SETS USING THIS CIRCUIT WILL HAVE "RUN 1" STAMPED ON REAR OF CHASSIS)

VOLTAGE DATA

D.C. MEASUREMENTS MADE WITH V.T.V.M., LINE VOLTAGE 117, NO SIGNAL, CONTRAST CONTROL (PICTURE) FULLY CLOCKWISE, AND OTHER CONTROLS AT APPROXIMATELY HALF ROTATION.

* VOLTAGES MARKED WITH AN ASTERISK WILL VARY WIDELY WITH CONTROL SETTING.

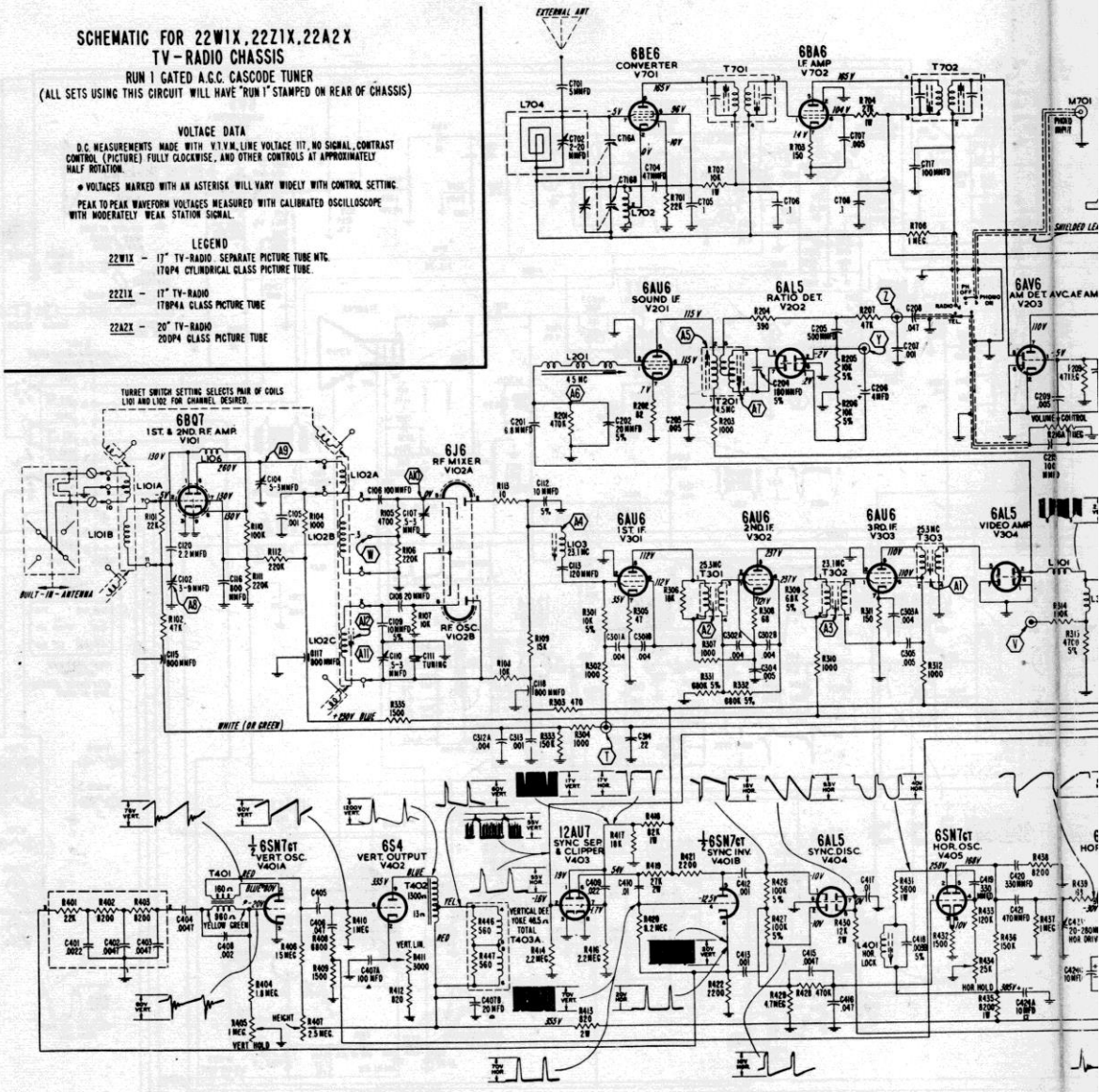
PEAK TO PEAK WAVEFORM VOLTAGES MEASURED WITH CALIBRATED OSCILLOSCOPE WITH MODERATELY WEAK STATION SIGNAL.

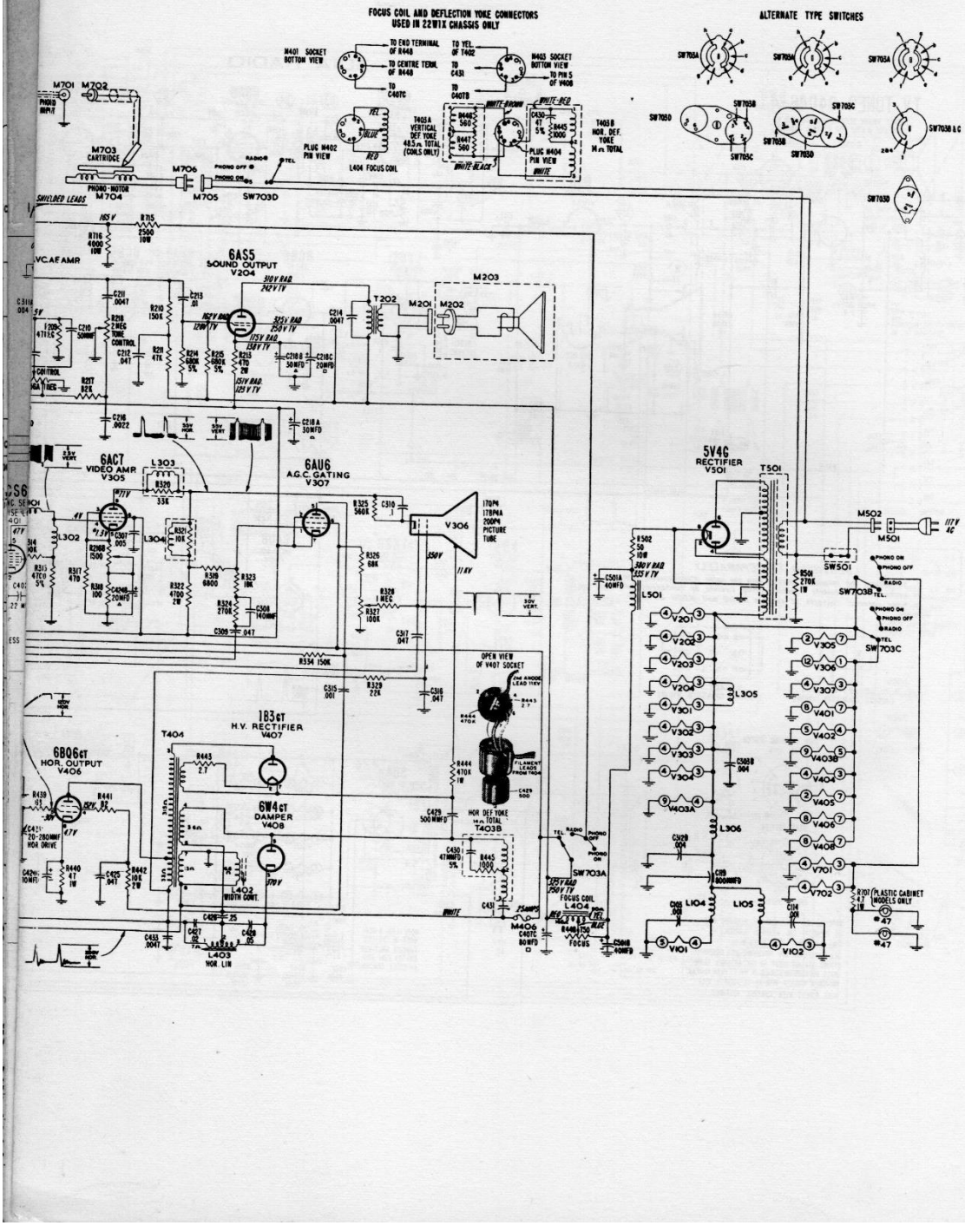
LEGEND

22W1X – 17" TV-RADIO. SEPARATE PICTURE TUBE MTG. 17QP4 CYLINDRICAL GLASS PICTURE TUBE.

22Z1X – 17" TV-RADIO 17BP4A GLASS PICTURE TUBE

22A2X – 20" TV-RADIO 20DP4 GLASS PICTURE TUBE




FOCUS COIL AND DEFLECTION YOKE CONNECTORS USED IN 22WIX CHASSIS ONLY
ALTERNATE TYPE SWITCHES
M701
M702
M703 CARTRIDGE
M704 PHONO-MOTOR
M705
M706
SW703D
SHIELDED LEADS
VC.A.F.AMP
6AS5 SOUND OUTPUT V204
M203
M201
M202
T202
6AC7 VIDEO AMP V305
L303
6AU6 A.G.C. GATING V307
V306 170M 170MA 200M PICTURE TUBE
6BQ6GT HOR. OUTPUT V406
1B3GT H.V. RECTIFIER V407
6W4GT DAMPER V408
T404
L402 WIDTH CONT.
L403 HOR. LIN
OPEN VIEW OF V407 SOCKET
HOR. DEF. YOKE T403B
T403A VERTICAL DEF. YOKE
T403B HOR. DEF. YOKE
L404 FOCUS COIL
FOCUS
5V4G RECTIFIER V501
T501
M501
M502
SW501
SW703A
SW703B
SW703C
L501
L302
L304
L305
L306
L104
L105
V101
V102
V201
V202
V203
V204
V301
V302
V303
V304
V401
V402
V403A
V403B
V404
V405
V406
V701
V702
PLASTIC CABINET MODELS ONLY