RCC TELEVISION Service Manual

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1954 Supplement No. 11

INDEX

ADMIRAL

NOTE: For a complete index of cabinet models using these chassis see page 11.

CANADIAN GENERAL ELECTRIC

CROSLEY

DUMONT

HALLICRAFTERS

NORTHERN ELECTRIC

PHILIPS

RCA-VICTOR

ROGERS-MAJESTIC

STEWART-WARNER

WESTINGHOUSE

NOTE: Above Westinghouse models originally appeared in Supp. #6 but data herein is more complete.

Westinghouse Model 21TV5C,C-M appeared in Supplement #9. It should be observed that the radio section of that model is the same as 6-C-208 in Radio Supplement #27.

HOW TO USE THIS SUPPLEMENT

As in previous supplements, all circuit diagram fold pages must be bound in the middle of the book so that related material on a given model may be widely separated. Always inspect the index first.

Note also that some circuit diagrams are very large. Dumont RA-164, for example, requires two adjacent fold pages. Your attention is drawn to this so that you do not overlook part of a circuit.

R.C.C. TELEVISION Supplement No. 11

TELEVISION CHASSIS NOTES

All 19 series chassis employ the same basic television circuitry. The 19B1X, 19B1Y, 19C1X and the 19A2X, 19F1X, 19K1X chassis are television only models. The 19E1X, 19G1X and 19D2X-19D2Y, 19N1X chassis are used in combination models.

The 19B1X and 19B1Y use a 17" rectangular picture tube (17BP4A). The 19C1X and 19E1X chassis use a 20" rectangular picture tube (20DP4A). The 19F1X and 19G1X chassis use a 21" (spherical faced) rectangular picture tube (21WP4 or 21WP4X), 19A2X-D2Y, 19K1X and 19N1X chassis use a 21ZP4A picture tube. 19D2Y chassis uses a 21ZP4B (Aluminized) picture tube.

A tone control is used in the 19C1X, 19E1X, 19F1X and 19G1X, 19K1X, 19N1X, 19A2X, 19D2X, 19D2Y.

The 19B1X and 19B1Y uses the 94D52 TV tuner having a pentode tube (6BC5) used as an RF amplifier. All other chassis in the 19 series use the 94D46 (cascode) TV tuner using a twin triode tube (6BZ7) as an RF amplifier.

DX RANGE FINDER ADJUSTMENT

Incorrect adjustment of this control in a strong signal area may result in bending of the picture, excessive contrast and poor sync.

In normal signal strength areas, the DX Range Finder Control will generally be set at the "0" position. In intermediate areas, where the TV signal strength is lower and the noise level is higher, the DX Range Finder control will generally be set within the 10 to 150 position. In fringe areas or areas where long distance "DX" reception is possible, the DX Range Finder control will generally be set within the 150 to 300 position. In weak signal and high noise level areas, adjust the DX Range Finder for minimum noise (snow) in the picture.

Adjust the DX Range Finder as follows:

a. Rotate the DX Range Finder control fully to the left (to the "0" setting).

b. Tune in a picture, preferably on the strongest TV channel.

c. Set the Picture (contrast) control fully to the right (clockwise).

d. While observing a test pattern or picture, slowly rotate the DX Range Finder control to the right for best contrast with minimum snow in the picture.

Check for bending of vertical objects (overloading) in the picture. Also check to see that the picture locks in sync properly when switching off and on channel. If necessary, rotate the DX Range Finder control to the left or to the right until the operation is satisfactary.

In some fringe areas where long range reception is possible, TV signals may be subject to excessive fading. This may vary with season and time of day. If the signal in the area concerned is subject to excessive fading and the Range Finder is adjusted during the time the signal is weakest, overloading (picture bending) will take place when the signal is stronger. For this reason be sure that the customer is instructed on the adjustment of this control for periodic variations in signal strength.

INDIVIDUAL CHANNEL SLUG ADJUSTMENT USING A 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. With correct oscillator channel adjustment, best picture will be located at the approximate center of the range of the TUNING control. However, this may not necessarily be maximum sound output.

Channel slug 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 in operation. Set all other controls for a normal picture.

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 1/4" 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 center 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 open end of the coil until the slug slips out. Replace slug and reset retaining spring.)

TOUCH-UP OF RATIO DETECTOR SECONDARY USING TELEVISION SIGNAL (A8, BOTTOM SLUG OF T201)

*This adjustment is accessible through the 1/4" 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 about 15 minutes for warm up.

b. Tune set for normal picture and sound.

c. Carefully insert a non-metallic alignment tool through

* If ratio detector transformer (T201) has hollow hexagonal core slugs, bottom slug adjustment A8 can be made from top of chassis, if you use alignment tool (part number 98A30-7; available at Admiral Distributor). Bottom slug (A8) can be reached through the hole in the core of the upper slug (A10).

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 A8, 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.

ALIGNMENT OF 4.5 MC TRAP A12, USING A TELEVISION SIGNAL

Beat interference (4.5 MC) appears in picture as very fine vertical or diagonal lines, very close together, having a "gauze-like" appearance, the pattern will vary with speech, forming a very fine herringbone pattern.

The trap can be tuned by watching the picture and adjusting the slug for minimum 4.5 MC interference. If greater accuracy is required, the trap should be adjusted as shown on page 8 under "4.5 MC Sound IF and Trap Alignment."

HORIZONTAL OSCILLATOR ALIGNMENT

If the picture will not stay in "horizontal sync" through most of the range of the HORIZONTAL control (on front panel), it will be necessary to make the horizontal oscillator adjustment by following exactly the step-by-step procedure given below. Note that oscillator waveform adjustment in step "b" requires the use of an oscilloscope. Waveform adjustment is made at the factory and generally should not require readjustment in the field. However, waveform adjustment should be checked whenever the receiver is brought into the shop. Step "b" below may be omitted when adjustment is to be made in the customers home. Adjust as follows:

a. Allow the receiver to warm up for a few minutes. Tune in the station, set the front panel controls for normal picture in sync. Important: Before proceeding, be sure that the DX Range Finder control (AGC) is adjusted according to the instructions given in this manual. Adjust the Picture (contrast) control for a normal picture, otherwise it may be difficult to make these adjustments.

If picture cannot be brought into sync with the HORIZONTAL control, alternately adjust the HORIZONTAL control, HORIZ. FREQ. and/or the HORIZ. LOCK adjustments until the picture is brought in sync.

If test pattern is available, examine the picture width and linearity. If necessary, make width, linearity and drive adjustments before proceeding.

b. Connect oscilloscope high side through a 10 mmfd. condenser to terminal "C" or "2" on the horizontal blocking transformer; low side to chassis ground. Set oscilloscope to horizontal frequency (15.75 KC) or a sub-multiple of it. While keeping the picture in sync, adjust the HORIZ. LOCK adjustment L401 (underside of chassis) for oscilloscope waveform pattern as illustrated in figure 1. Adjust for equal height of the rounded and pointed peaks. This adjustment must be accurately made for correct operation of the horizontal oscillator. Disconnect the oscilloscope after adjusting waveform.

c. Turn the HORIZONTAL control fully counterclockwise. Momentarily interrupt the signal by switching the channel selector off channel and then back on. The picture may remain in sync. If so, adjust the HORIZ. FREQ. adjustment until the picture goes out of sync

Figure 1. Horizontal Oscillator Waveform.

and several diagonal bars sloping down to the left are visible, see figure 2. VERY SLOWLY turn the HORIZONTAL control clockwise and note the least number of diagonal bars obtained just before the picture pulls into sync.

If more than 3 diagonal bars are present just before the picture pulls into sync, adjust the HORIZ. LOCK RANGE trimmer slightly clockwise. If less than 3 bars are present, adjust the HORIZ. LOCK RANGE trimmer slightly counterclockwise. Turn the HORIZONTAL control counterclockwise, momentarily interrupt the signal and recheck the number of diagonal bars present just before the picture pulls into sync. Repeat this procedure until only 3 bars are present.

d. With the picture centering lever, shift the picture to the right so that the blanking bar at the left side of the picture is visible.

While observing the left side of the picture, slowly rotate the HORIZ. FREQ. adjustment (in either direction) so as to move the picture to the right until

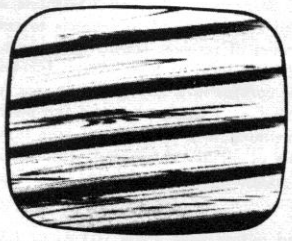


Figure 2. Picture Out of Horizontal Sync.

the blanking bar at the left of the picture just begins to jitter or wobble. Important: Moving the picture

or blanking bar too far to the right may cause the oscillator to go into a spurious mode of oscillation.

Slowly turn the HORIZ. FREQ. adjustment in the opposite direction until the blanking bar moves to the left and the picture just becomes stable.

e. Properly center the picture by readjusting the picture positioning lever.

B+ DISTRIBUTION IN 19 SERIES CHASSIS

The figure below illustrates the basic B+ distribution used in 19 series chassis. Note: There are variations in the B+ circuits of TV and combination models and TV models using a different RF amplifier tube (V101) in the TV tuner. Alternate connections for the RF amplifier tube (V101) is shown in the figure below. See "Television Chassis Notes" on page 2 and "Trouble Shooting" information

SERVICING RADIO TUBES AND DIAL LIGHT IN COMBINATION MODELS

The radio tubes can be serviced without removing the TV chassis from the cabinet. The radio tubes can be reached through the opening in the underside of the chassis shelf.

The dial light can be serviced by removing the tuning knobs and plastic control panel.

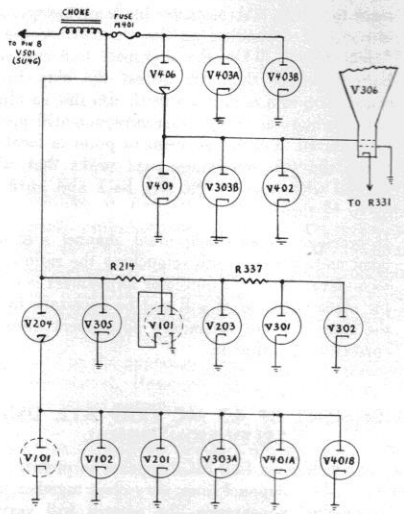


Figure 3. B+ Distribution in 19 Series Chassis.

SERVICE HINTS

Also see Production Changes in this Manual

TROUBLE SHOOTING

The 19 series chassis covered in this Service Manual are newly designed sets incorporating the latest in television circuitry. These chassis are similar to other late Admiral chassis with respect to the sync, sweep and power supply circuits. New features incorporated in the 19 series chassis are outlined in paragraph on "New Features in 19 Series Chassis" on Page 2. Important: Since there are many differences in the 19 series chassis over earlier model Admiral receivers, it is important to remember the following when servicing or installing receivers having the 19 series chassis.

All 19 series chassis have a "DX Range Finder control" (AGC delay circuit). This control is a potentiometer located at the rear of the chassis to enable precision adjustment of receiver sensitivity to suit the signal conditions in any local of fringe area. Incorrect adjustment of this control in a strong signal area, may result in picture bending, excessive contrast and poor sync. Incorrect adjustment in a weak signal area may result in complete loss of picture and sound. Information on the adjustment of the DX Range Finder control is given on page 2 .

The sound output tube V204 (6Y6G or 6AS5) functions as a voltage dropping tube in addition to being a sound output tube. The cathode of the sound output tube operates at approximately 140 volts above chassis ground for TV operation. If the sound output stage becomes defective, B+ voltage to the TV tuner, sync separator and clipper, video amplifier and AGC delay circuit will be affected.

B+ voltage to the first and second IF amplifiers V301 and V302 are effectively in series. The cathode of V302 is operated at approximately 120 volts above chassis ground. If either V301 or V302 become defective, B+ voltage to the other stage will be affected.

In sets using the 94D46-2 cascode tuner, B+ voltage to the triode sections of the RF stages (V101) are in series. The cathode of the second triode section is operated at approximately 130 volts above chassis ground. If the tube should become defective or be removed from the socket, there will be no B+ voltage on the plate of the first triode section. See B+ distribution diagram in figure 3.

The horizontal oscillator circuit utilizes pulse width modulation for control of the horizontal oscillator frequency. Information on servicing the horizontal oscillator and horizontal oscillator control circuit are given in paragraph "Service Hints for Horizontal Sync". Note: An oscilloscope is required for adjustment of the horizontal oscillator waveform. Information on adjustment of the horizontal oscillator is given on Page 3.

EXCESSIVE SNOW IN PICTURE

Excessive snow in the picture can be caused by faulty tubes in the receiver. Check receiver as follows:

Short circuit the antenna terminals and turn the picture control (contrast) fully clockwise.

Connect a vacuum tube voltmeter from test point "V" to chassis. Set the channel selector on an unassigned channel. If the voltmeter reading exceeds .6 volt negative, excessive receiver (tube) noise is indicated. This condition can usually be corrected by tube substitution. Substitute tubes in the following order: Video detector tube V304, RF oscillator tube V102, RF amplifier tube V101 and IF amplifier tubes V301, V302 and V303.

Corona or arcing in the second anode supply can also cause a high noise reading at the video detector resulting in excessive snow in weak signal areas.

MISCELLANEOUS TROUBLE DUE TO FAULTY TUBES

Faulty tubes cause the majority of receiver troubles. The list below contains most common troubles which are generally due to faulty tubes.

a. Poor fringe area reception due to low B plus voltage. Check the 5U4G tube.
b. Poor fringe area reception due to low sensitivity. Check the 6BC5 and 6BZ7 tubes, if used in the receiver.
c. Picture and sound separated due to IF oscillation. Check the 6CB6 and 6U8 tubes.
d. Picture bending caused by leakage between tube elements. Check the 6BC5 and 6CB6 tubes.
e. Poor sync stability, usually more noticeable in vertical circuit. Check 12AU7 tube.
f. Washed out picture due to negative grid current. Check 6CB6 tube.

SERVICE HINTS FOR HORIZONTAL SYNC

The horizontal oscillator control circuit controls the horizontal oscillator by a method called "Pulse Width Modulation". This method is so called, because the width of the pulse applied to the grid of the horizontal oscillator control section determines the length of time that current flows through this section. The duration of current flow through the control section determines the DC control voltage applied to the grid of horizontal oscillator, thereby controlling the frequency.

The waveshape applied to the grid of the horizontal oscillator control section is formed by combining a partially integrated pulse from the horizontal oscillator output and the horizontal sync pulse. If these two pulses combine properly, the waveshape shown in Figure 4 will be developed and the horizontal oscillator will be in sync.

With no sync input, the waveform at the horizontal oscillator control grid should appear as shown in Figure 5. Since the horizontal oscillator control voltage is dependent upon a waveshape formed at the horizontal output stages (V404, V405 and V406), a defective component in one of these stages may cause sync trouble. If the waveform shown in Figure 5 can be obtained, this will indicate proper operation of the horizontal sweep circuit.

Figure 4. Waveform on Grid Pin 1 of V403 With Sync Pulse.

Figure 5. Waveform on Grid Pin 1 of V403 Without Sync Pulse.

When the horizontal oscillator is out of sync, it may be difficult to observe this waveform (Figure 5) on an oscilloscope due to the presence of out-of-phase sync pulses. In this case, remove the sync separator and sync clipper tube V401. If the waveshape shown in Figure 5 is obtained, place the sync and separator tube back into its socket. Then, remove the horizontal oscillator and control tube V403 (6SN7GT). Conventional, well-shaped sync pulses should appear at control grid (pin 1) of V403.

If there are no sync pulses, or the pulses are of low or varying amplitude, accompanied with noise, the sync circuits should be checked. However, if the sync pulses are well-shaped and of constant amplitude, the horizontal oscillator may be misaligned. Place V403 back into its socket and make the "Horizontal Oscillator Alignment" given on page 3.

If it is impossible to sync the picture, or obtain the correct waveform at terminal "C", check for a defective component in the following sequence:

a. Check tube V403 (6SN7GT) by substitution.
b. Check C417 by substituting identical condenser (270 mmfd) part number 65B21-271.
c. Check C413 for either open or short.
d. Check condenser C416 for short.
e. Check resistance of R428. It should be 150,000 ohms.
f. Lead dress is critical in the horizontal oscillator circuit. Check to see that lead dress has not been disturbed while servicing.

REMOVABLE PICTURE WINDOW

All models using the 19 series television chassis have

picture windows which can be easily removed from the front of the cabinet for cleaning the inside of the window, picture tube and picture tube mask. Two types of picture window mountings are used. A removable molding in used in wood cabinet models. Removable corner brackets are used in plastic cabinet models. Instructions for removing and cleaning the picture window, picture tube and picture tube mask is given below.

REMOVING PICTURE WINDOW FOR CLEANING

If the picture window has a removable molding (at the top), remove the window by first removing the Phillips head screws and molding at the top of the picture window. Pull the top of the window away from the cabinet slightly and lift it up out of the channel at the bottom.

After cleaning the window, picture tube and picture tube mask as instructed below, install the window by placing the bottom edge in the channel and replace the molding. Use care when tightening screws on molding to prevent stripping.

If the picture window has removable corner brackets, first remove the two brackets at the top of the window. Then, while holding the window, loosen the screws on the bottom brackets. Allow the window to tilt out slightly at the top until it can be grasped and lifted free of the cabinet.

After cleaning, install the window by setting it in position and mounting the corner brackets Use care when tightening bracket mounting screws to prevent stripping or cracking glass.

CLEANING GLASS PICTURE WINDOW

Clean the picture mask using a soft cloth, dampened in mild soapy water. Clean the picture window and the face of the picture tube using a soft cloth, dampened with your favorite window cleaner. Wipe dry using a chamois or soft, lint free cloth. Only use cloths which are just dampened as presence of moisture or water inside the set may cause damage. Install the window as instructed above.

TELEVISION ALIGNMENT PROCEDURE

GENERAL

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

a. IF Amplifier and Trap Alignment.
b. IF Response Curve Check.
c. 4.5 MC Sound IF and Trap Alignment.
d. RF and Mixer Alignment.
e. Over-all 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 Distributor.

Oscilloscope

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

Signal (Marker) 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.

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.

Vacuum Tube Voltmeter

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

ALIGNMENT TOOLS

An alignment tool kit consisting of one metallic and one non-metallic screwdriver is available under part number 98A-30-3. A non-metallic alignment tool with a screwdriver point at one end and hexagonal wrench (for hollow hexagon core slugs) at the other is available under part number 98A-30-7.

IF AMPLIFIER AND TRAP ALIGNMENT

- Connect bias battery; negative to test point "T", see figure 9, positive to chassis. A 3 volt battery is required for steps 1, 2, 3, 4 and 5.
- Disconnect antenna. Connect a jumper wire across the antenna terminals.
- Set Channel selector to channel 12 or other unassigned high channel, to prevent interference during alignment.
- Set the Picture control fully to the left (counterclockwise).
- Allow about 15 minutes for receiver and test equipment to warm up.
- Use lowest DC scale on VTVM.

Step	Signal Gen. Freq.	VTVM and Signal Generator Connections	Instructions	Adjust
1	*27.25 MC	VTVM high side to test point "V", common to chassis. Generator high side to Point W on Tuner; insulate shield from chassis. Connect low side to chassis near 6J6 tube base.	Use 3 volt bias battery. Use lowest DC scale on VTVM. When peaking, keep reducing generator output for VTVM reading of approx. 1 volt or less. Set channel switch to channel 12 or other unassigned high channel.	A1 for minimum.
2	25.3 MC			A2 and A3 for maximum.
3	23.1 MC			A4 and A5 for maximum.
4	*27.25 MC			Repeat step 1 above.
5	To insure correct IF alignment, 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 left. Connect negative of 3 volt bias battery to test point "T"; positive to chassis.	Connect high side to Point W on Tuner, low side to chassis ground. Set sweep frequency to 23MC, and sweep width approximately 7MC.	If an external marker generator is used, loosely couple high side to sweep generator lead on Point W on Tuner, low side to chassis. Marker frequencies indicated on IF Response Curve.	Connect to test point "V". See figure 9. 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. 6. 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 instructed below.

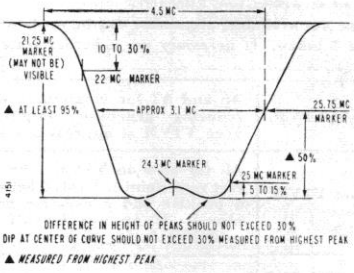


Figure 6. Ideal IF Response Curve.

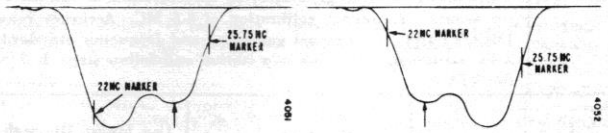


Figure 7. IF Response Curves, Incorrect Shape.

If it is necessary to adjust for approximate equal peaks, carefully adjust slug A2 (25.3 MC). It should not be necessary to turn slug A2 more than one turn in either direction.

If the curve cannot be made to resemble the response curve shown at left, repeat all steps under "IF Amplifier and Trap Alignment" making sure that generator frequencies are accurate and adjustments are carefully made. If a satisfactory curve cannot be obtained after repeating these steps, it may be necessary to change IF amplifier tubes or check for a defective circuit component to be sure that each stage is operating properly.

*** Before proceeding, be sure to check the signal generator used in alignment against a crystal calibrator or other frequency standard for absolute frequency calibration required for this operation.**

ALIGNMENT HINT

After becoming familiar with alignment procedure, some servicemen simplify subsequent alignment of sets by merely using the essential alignment data given in figures below.

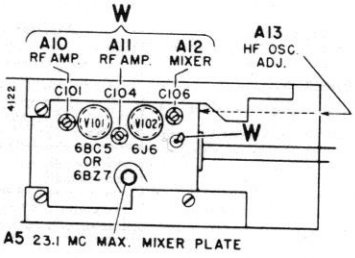


Figure 8. Top View of TV Tuner Showing Adjustment Locations.

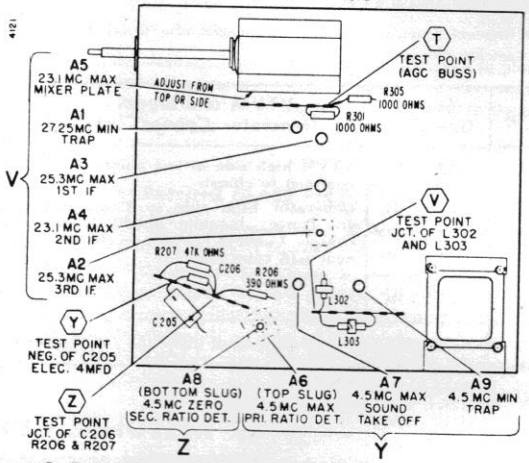


Figure 9. Bottom View of Chassis Showing Test Point Connections and IF Alignment Data.

4.5 MC SOUND IF AND TRAP ALIGNMENT

See page 2 for touch-up of ratio detector using television signal without test equipment.

a. Connect signal generator high side to Pin 2 of V304 (6AL5) 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 left (counterclockwise).

d. Use a NON-METALLIC alignment tool. If Ratio Det. Transformer (T201) has hollow core slugs, bottom slug adjustment A8 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
	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. 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, 2 and 3 below. If necessary use a higher scale on the VTVM.			
1	Set to exactly 4.5 MC	High side to test point "Y"; common to chassis.	Use lowest DC scale on VTVM.	A6 and A7 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.	A8 for zero on VTVM (the correct zero point is located between a positive and a negative maximum). If A6 was far off, repeat step 1.
3		High side to test point "Y"; common to chassis.	Connect a 10 mmfd. condenser from pin 5 of V305 (6CB6) to pin 7 of V201 (6AU6). Use lowest DC scale on VTVM.	A9 for minimum.

RF AND MIXER ALIGNMENT FOR SETS USING TV TUNER 94D52

(This tuner uses a 6BC5 tube for RF amplifier V101.)

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. 11). Keep scope leads away from chassis.

d. Set channel selector to Channel 10.

e. Allow about 15 minutes for receiver to warm up and test equipment.

Step	Marker Gen. Freq. (MC)	Sweep Gen. Frequency	Instructions
1	193.25 MC (Video Carrier) 197.75 MC (Sound Carrier)	Sweeping Channel 10. See frequency table below.	Check for curve shown below. If necessary, adjust A10, A11 and A12 (figure 11) as required. Adjusting A11 will generally shift the center of the response curve in relation to the video and sound carrier markers. A10 and A12 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.

RF AND MIXER ALIGNMENT FOR SETS USING TV TUNER 94D46

(This tuner uses a 6BZ7 tube for RF amplifier V101.)

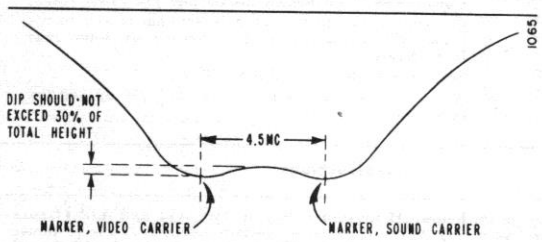
a. Connect negative of 3 volt bias battery to AGC buss (test point "T"), positive to chassis. If it is difficult to obtain a curve of sufficient amplitude, remove battery and connect a wire jumper from test point "T" to chassis.

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 (figure 11). Keep scope leads away from chassis.

d. Allow about 15 minutes for receiver and test equipment to warm up.

Step	Marker Gen. Freq. (MC)	Sweep Gen. Frequency	Instructions
1	193.25 MC (Video Carrier) 197.75 MC (Sound Carrier)	Sweeping Channel 10. See frequency table below.	Check for curve below. If necessary, alternately adjust A11 and A12 (figure 11) as required to obtain equal peak amplitudes and symmetry, consistent with flat top appearance, proper band width and correct marker location.
2	83.25 MC (Video Carrier) 87.75 MC (Sound Carrier)	Sweeping Channel 6. See frequency table below.	Check for curve below. If necessary, adjust A10 as required to obtain curve having maximum amplitude and flat top appearance consistent with proper band width and correct marker location. After completing adjustment, recheck adjustment of step 1.
3	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 steps 1 and 2 are 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 a weak high channel as a compromise adjustment to favor the particular channel. Repeat step 2 for the weak low channel to favor the particular low 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.



Full skirt of curve will not be visible unless generator sweep width extends beyond 10 MC.
Figure 10. RF Response Curve.

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

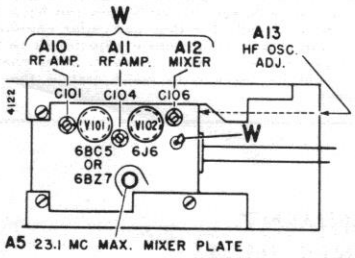


Figure 11. Top of TV Tuner, Showing Adjustment Location.

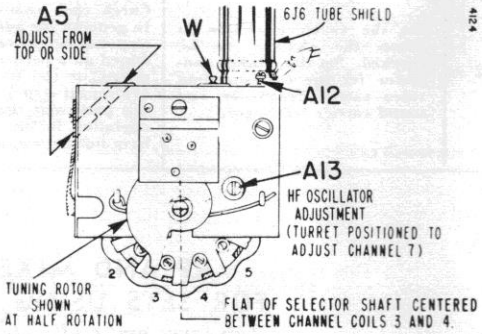


Figure 12. Front View of TV Tuner.

HF OSCILLATOR ADJUSTMENT

(Using a signal generator)

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. 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 above. See frequency table *Set generator for maximum output.*	Connect a wire jumper from test point "W" on the tuner to test point "Z". See figure 9. Remove the ratio detector tube V202 (6AL5). Carefully adjust the oscillator slug A13 on each channel until a whistle (beat) is heard in the speaker of the receiver.

OVER-ALL 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 left. Channel selector on channel 10 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 page 10	If an external marker generator is used, loosely couple high side to sweep generator lead. Marker frequencies are shown in frequency table on page 10	Connect to point "V". See figure 9.	Compare the response curve obtained against the ideal curve shown in figure 13. If the curve is not within tolerance, touch up the IF slug 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 the shape does not change.

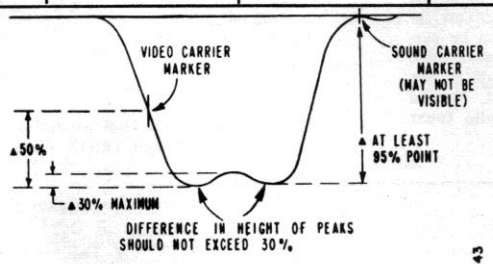


Figure 13. Ideal Over-all RF and IF Response Curve.

Note that video carrier (marker) on the "Over-all RF-IF Response Curve" will appear on the opposite side of the curve as compared to the "IF Response Curve" figure 6. This is due to action of the mixer tube.

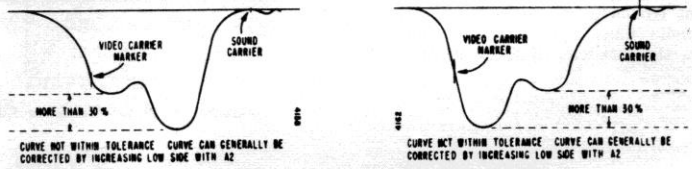


Figure 14. Over-all RF and IF Response Curves, Incorrect Shape.

Model Numbers	TV Chassis	Picture Tube	TV Tuner	Record Changer	Radio	Tone Control
17C12X	19B1Y	17BP4A	94D52-1	—	—	—
17DX12X	19B1X	17BP4A	94D52-1	—	—	—
121DX12X, 15X-16X-17X	19F1X	21WP4 or 21WP4X	94D46-2	—	—	Yes
121DX15X-16X-17X	19C1X	20DP4A	94D46-2	—	—	Yes
*121DX15LX-16LX-17LX	19K1X	21ZP4A	94D46-2	—	—	Yes
221DX15X-16X-17X	19C1X	20DP4A	94D46-2	—	—	Yes
221DX15X-16X-17X	19F1X	21WP4 or 21WP4X	94D46-2	—	—	Yes
*221DX15LX-16LX-17LX	19K1X	21ZP4A	94D46-2	—	—	Yes
*221DX25LX-26LX-27LX	19K1X	21ZP4A	94D46-2	—	—	Yes
321DX15X-16X-17X	19G1X	21WP4 or 21WP4X	94D46-2	RC600	Built-in AM	Yes
321DX15X-16X-17X	19E1X	20DP4A	94D46-2	RC600	Built-in AM	Yes
*321DX15LX-16LX-17LX	19N1X	21ZP4A	94D46-2	RC600	Built-in AM	Yes
321DX25X-26X-27X	19E1X	20DP4A	94D46-2	RC600	Built-in AM	Yes
321DX25XB-26XB-27XB	19G1X	21WP4 or 21WP4X	94D46-2	RC600	Built-in AM	Yes
T2215X-16X-17X	19A2X	21ZP4A	94D46	—	—	Yes
C2215X-16X-17X	19A2X	21ZP4A	94D46	—	—	Yes
H2215X-16X-17X	19A2X	21ZP4A	94D46	—	—	Yes
K2215X-16X-17X	19D2X	21ZP4A	94D46	RC600	Built-in AM	Yes
L2215X-16X-17X	19D2Y	21ZP4B	94D46	RC600	Built-in AM	Yes
T1822X	19B1X	17BP4A	94D52	—	—	No
T2222X-11X-22Y	19F1X	17BP4A	94D52	—	—	No
C1815X-16X-17X	19B1Z	17BP4A	94D46	—	—	No

NOTE: Some of the above models may have either of two chassis.

SERVICING RADIO TUNER IN 19E1X, 19G1X AND 19N1X MODELS

SERVICING RADIO TUBES AND DIAL LIGHT

The radio tubes and radio dial light can be serviced without removing the TV chassis from the cabinet. The radio tubes can be reached through the opening cut in the underside of the chassis shelf.

The dial light can be serviced by removing the tuning knobs and plastic control panel.

REMOVING RADIO TUNER

The radio tuner is mounted at the front apron of the chassis. Alignment, taking voltage readings or an inspection of the underside of the radio tuner can be performed without complete removal of the radio tuner from the TV chassis. To gain access to the underside of the radio tuner, disconnect the tuning drive cord, remove the self-tapping screws at the rear of the radio tuner and at the front (4 screws).

DIAL STRINGING

Dial stringing for the gang tuning control is shown below.

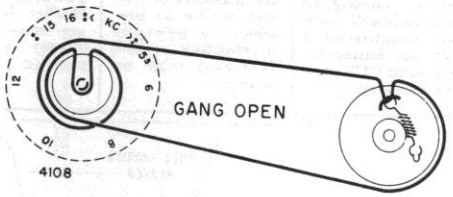


Figure 15. Dial Stringing for 19E1X and 19G1X Chassis.

ALIGNMENT OF RADIO TUNER

The radio tuner in television and radio chassis should be aligned as instructed under "Radio Alignment Procedure" below.

The radio alignment trimmers are accessible without disassembly of the radio tuner from the TV chassis. Figure at right shows the locations of radio alignment trimmers.

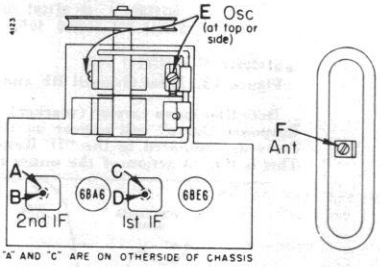


Figure 16. Radio Trimmer Locations.

RADIO ALIGNMENT PROCEDURE

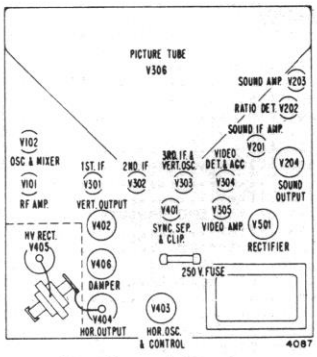
- Connect output meter across speaker voice coil.
- Turn receiver Volume control fully on.
- Function switch in "Radio" position.
- Use lowest output setting of signal generator that gives a satisfactory reading on meter.
- Use a NON-METALLIC alignment tool for IF adjustments.
- Repeat adjustments to 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	"	"	1620 KC	"	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)

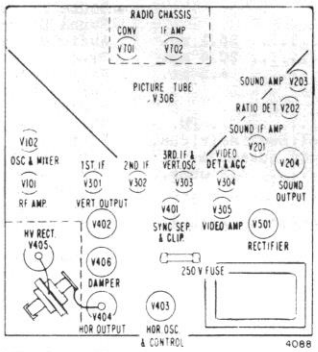
* Adjustments A and C made from underside of chassis. See figure 16 for trimmer locations.

§ AM antenna trimmer may not peak if antenna leads are not properly routed or separated.

TUBE LOCATIONS

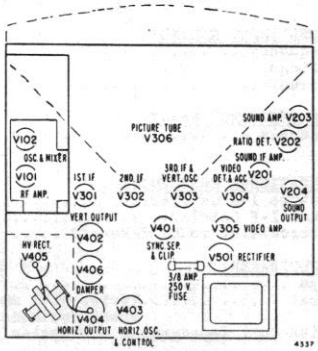


Top View of Chassis
19B1X—19B1Y—19C1X—19F1X—19K1X
Use 3/8 Amp. 250 Volt Fuse

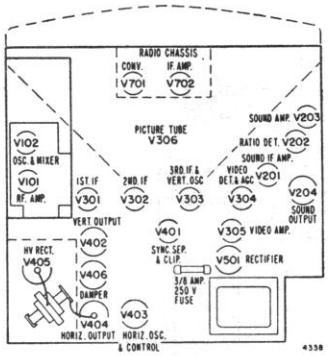


Top View of Chassis 19E1X—19G1X—19N1X
Use 3/8 Amp. 250 Volt Fuse

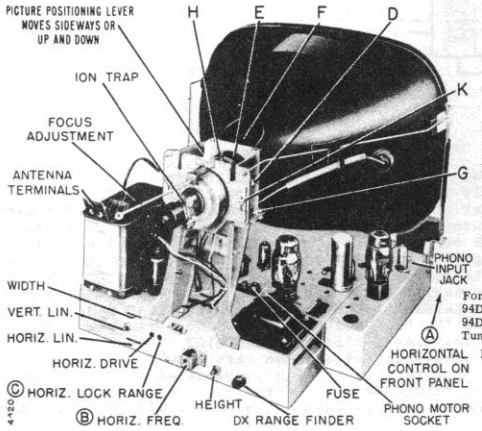
TUBE LOCATIONS



Top View of Chassis 19A2X
Use 3/8 Amp. 250 Volt Fuse



Top View of Chassis 19D2X
Use 3/8 Amp. 250 Volt Fuse



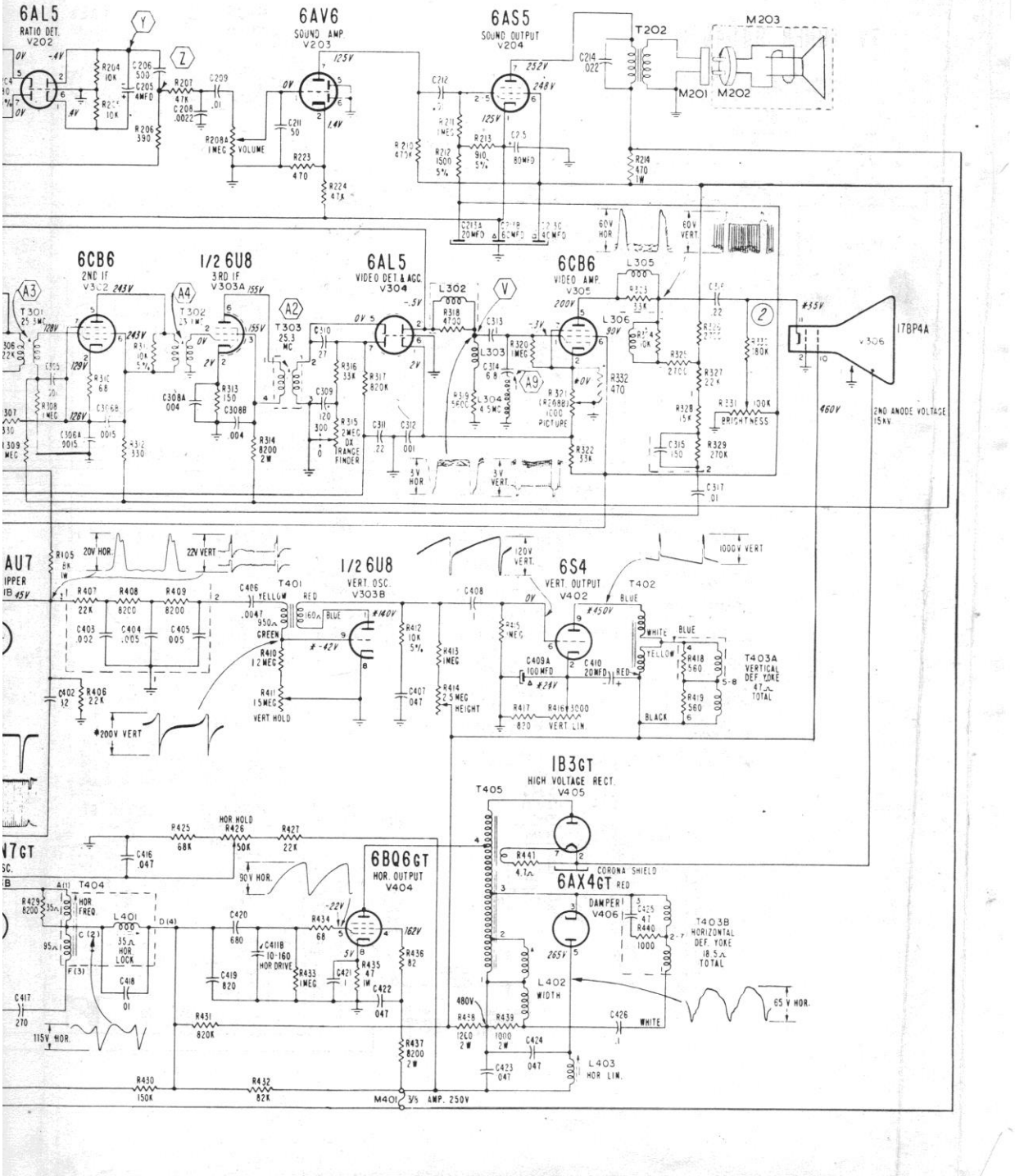
COILS, TRANS

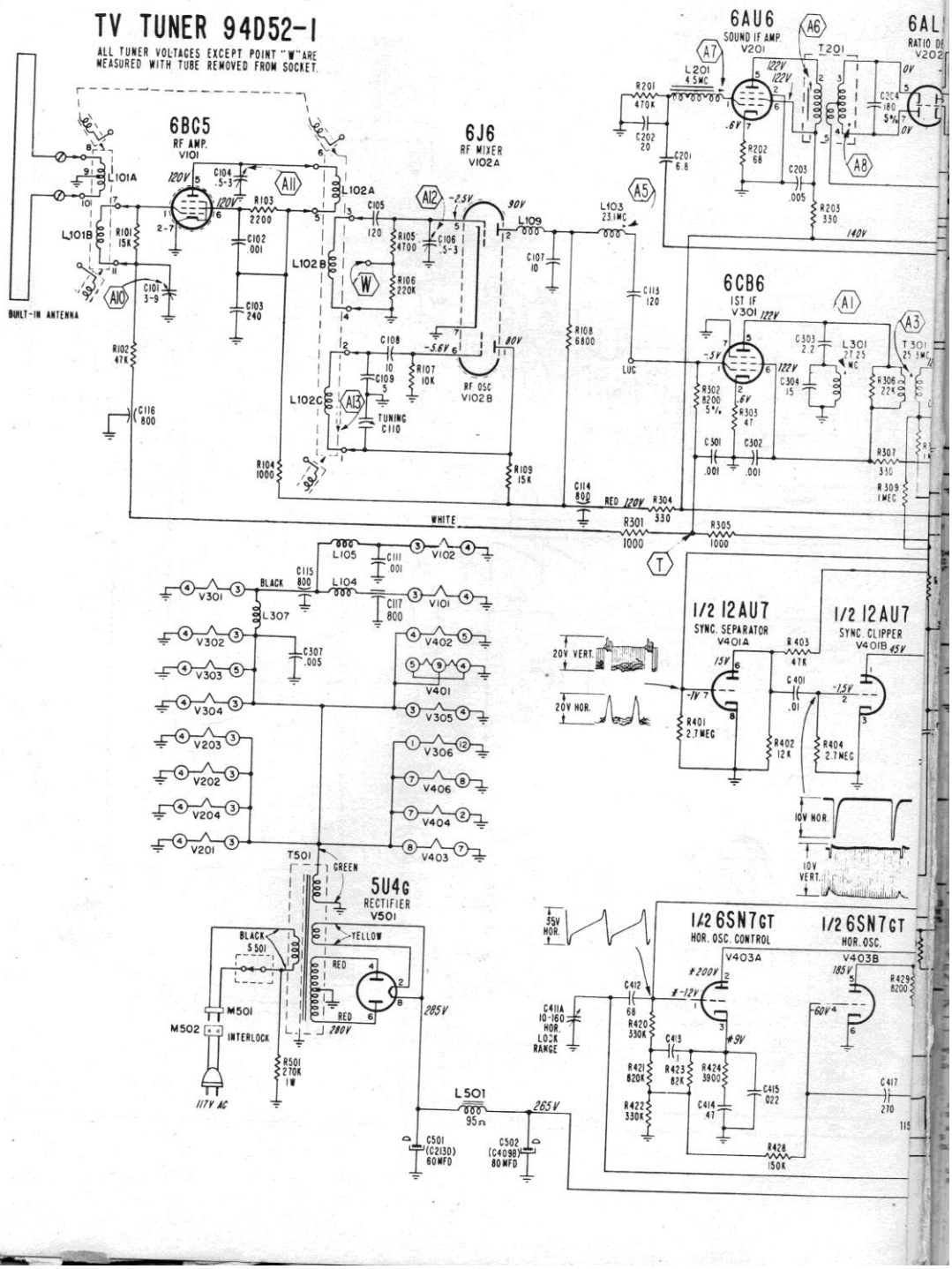
L101	Antenna Coil (Stamped 2H, 3H, etc.)	94D52-51
	For Channel #2	94D52-52
	For Channel #3	94D52-53
	For Channel #4	94D52-54
	For Channel #5	94D52-55
	For Channel #6	94D52-56
	For Channel #7	94D52-57
	For Channel #8	94D52-58
	For Channel #9	94D52-59
	For Channel #10	94D52-60
	For Channel #11	94D52-61
	For Channel #12	94D52-62
	For Channel #13	94D52-63
L102	Mixer - Osc. Coil (Stamped 2H, 3H, etc.)	
	For Channel #2	94D52-72
	For Channel #3	94D52-73
	For Channel #4	94D52-74
	For Channel #5	94D52-75
	For Channel #6	94D52-76
	For Channel #7	94D52-77
	For Channel #8	94D52-78
	For Channel #9	94D52-79
	For Channel #10	94D52-80
	For Channel #11	94D52-81
	For Channel #12	94D52-82
	For Channel #13	94D52-83
L101	Antenna Coil (Stamped 2Q, 3Q, etc.)	
	For Channel #2	94D46-52
	For Channel #3	94D46-53
	For Channel #4	94D46-54
	For Channel #5	94D46-55
	For Channel #6	94D46-56
	For Channel #7	94D46-57
	For Channel #8	94D46-58
	For Channel #9	94D46-59
	For Channel #10	94D46-60
	For Channel #11	94D46-61
	For Channel #12	94D46-62
	For Channel #13	94D46-63
L102	Mixer - Osc. Coil (Stamped 2Q, 3Q, etc.)	
	For Channel #2	94D46-72
	For Channel #3	94D46-73
	For Channel #4	94D46-74
	For Channel #5	94D46-75
	For Channel #6	94D46-76
	For Channel #7	94D46-77
	For Channel #8	94D46-78
	For Channel #9	94D46-79
	For Channel #10	94D46-80
	For Channel #11	94D46-81
	For Channel #12	94D46-82
	For Channel #13	94D46-83
L103	Mixer Plate Coil in 94D52-1 tuner	94D52-85
L103	Mixer Plate Coil in 94D46-2 & -3 tuners	94D46-85
L104	Heater RF Choke	98A45-13
L105	Heater RF Choke	98A45-14
L109	Mixer Plate Choke	94D46-86
L201	Sound Take-Off Coil	72B99-7
L301	Trap Coil (includes C303 & C304)	72C96-23
L302	Video Peaking Coil (Wound on R318)	73A5-15
L303	Video Peaking Coil	73A5-7
L304	Trap Coil	72B99-6
L305	Video Peaking Coil (Wound on R323)	73A5-13
L306	Video Peaking Coil (Wound on R324)	73A5-9
L307	Heater RF Choke	73A2-5
L401	Horizontal Lock Coil	Part of T404
L402	Width Control Coil	94A49-1
L403	Horizontal Linearity Control	94A50-1
L501	Choke, Filter (60 cycle)	74K18-2
	(25 cycle)	74K6-1
L702	Oscillator Coil	69A52-4
L704	A. M. Antenna Coil	69C155-2
T201	Ratio Detector Trans	72B68-1
T202	Speaker Output Trans	79Y33-3
T301	1st I. F. Transformer (19B1X)	72C96-21
T301	1st I. F. Transformer	72C96-25
T302	2nd I. F. Transformer	72C96-22
T303	3rd I. F. Transformer	72B107-1
T401	Vert. Blocking Osc. Transformer	79A18-4
T402	Vert. Output Transformer	79B40-2
T403	Deflection Yoke	94C51-1
T404	Horiz. Blocking Osc. Trans. (Includes L401)	69B110
T405	Horizontal Output Transformer	79D41-1
T501	Power Transformer (60 cycle)	80M10-1
	Power Transformer (25 cycle)	80M11-1
T701	1st IF Transformer - (60 cycle)	72B28-7
T702	2nd IF Transformer - (25 cycle)	72B28-7

COILS, TRANSFORMERS (Cont.)

Sym.	Description	Part No.
	For Channel #6	94D46-76
	For Channel #7	94D46-77
	For Channel #8	94D46-78
	For Channel #9	94D46-79
	For Channel #10	94D46-80
	For Channel #11	94D46-81
	For Channel #12	94D46-82
	For Channel #13	94D46-83
L103	Mixer Plate Coil in 94D52-1 tuner	94D52-85
L103	Mixer Plate Coil in 94D46-2 & -3 tuners	94D46-85
L104	Heater RF Choke	98A45-13
L105	Heater RF Choke	98A45-14
L109	Mixer Plate Choke	94D46-86
L201	Sound Take-Off Coil	72B99-7
L301	Trap Coil (includes C303 & C304)	72C96-23
L302	Video Peaking Coil (Wound on R318)	73A5-15
L303	Video Peaking Coil	73A5-7
L304	Trap Coil	72B99-6
L305	Video Peaking Coil (Wound on R323)	73A5-13
L306	Video Peaking Coil (Wound on R324)	73A5-9
L307	Heater RF Choke	73A2-5
L401	Horizontal Lock Coil	Part of T404
L402	Width Control Coil	94A49-1
L403	Horizontal Linearity Control	94A50-1
L501	Choke, Filter (60 cycle)	74K18-2
	(25 cycle)	74K6-1
L702	Oscillator Coil	69A52-4
L704	A. M. Antenna Coil	69C155-2
T201	Ratio Detector Trans	72B68-1
T202	Speaker Output Trans	79Y33-3
T301	1st I. F. Transformer (19B1X)	72C96-21
T301	1st I. F. Transformer	72C96-25
T302	2nd I. F. Transformer	72C96-22
T303	3rd I. F. Transformer	72B107-1
T401	Vert. Blocking Osc. Transformer	79A18-4
T402	Vert. Output Transformer	79B40-2
T403	Deflection Yoke	94C51-1
T404	Horiz. Blocking Osc. Trans. (Includes L401)	69B110
T405	Horizontal Output Transformer	79D41-1
T501	Power Transformer (60 cycle)	80M10-1
	Power Transformer (25 cycle)	80M11-1
T701	1st IF Transformer - (60 cycle)	72B28-7
T702	2nd IF Transformer - (25 cycle)	72B28-7

ADMIRAL
19BIX, 19BIY




TV TUNER 94D52-1
ALL TUNER VOLTAGES EXCEPT POINT "W" ARE MEASURED WITH TUBE REMOVED FROM SOCKET.
6BC5
RF AMP.
V101
6J6
RF MIXER
V102A
RF OSC
V102B
6AU6
SOUND IF AMP.
V201
6CB6
1ST IF
V301
1/2 12AU7
SYNC. SEPARATOR
V401A
1/2 12AU7
SYNC. CLIPPER
V401B
1/2 6SN7GT
HOR. OSC. CONTROL
V403A
1/2 6SN7GT
HOR. OSC.
V403B
5U4G
RECTIFIER
V501
BUILT-IN ANTENNA
TUNING C110
INTERLOCK
117V AC
20V VERT.
20V HOR.
10V HOR.
10V VERT.
35V HOR.
WHITE
BLACK
RED
YELLOW
GREEN
L501
95Ω
T501
T201
T301

RCC TELEVISION Service Manual

PUBLISHED BY RADIO COLLEGE OF CANADA, TORONTO

1953 Supplement No. 7

INDEX

ADMIRAL

ELECTROHOME

MARCONI

MOTOROLA

NORTHERN ELECTRIC

PHILCO

Philco Cont'd.

VIKING

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 three different circuit diagrams which makes the fold section larger than normal. To avoid confusion, use your index to locate ALL data.

Gordon Oliver

RCC TELEVISION Supplement No. 7

DX RANGE FINDER ADJUSTMENT

Incorrect adjustment of this control in a strong signal area may result in bending of the picture, excessive contrast and poor sync.

In normal signal strength areas, the DX Range Finder Control will generally be set at the "0" position. In intermediate areas, where the TV signal strength is lower and the noise level is higher, the DX Range Finder control will generally be set within the 10 to 150 position. In fringe areas or areas where long distance "DX" reception is possible, the DX Range Finder control will generally be set within the 150 to 300 position. In weak signal and high noise level areas, adjust the DX Range Finder for minimum noise (snow) in the picture.

Adjust the DX Range Finder as follows:

a. Rotate the DX Range Finder control fully to the left (to the "0" setting).

b. Tune in a picture, preferably on the strongest TV channel.

c. Set the Picture (contrast) control fully to the right (clockwise).

d. While observing a test pattern or picture, slowly rotate the DX Range Finder control to the right for best contrast with minimum snow in the picture.

Check for bending of vertical objects (overloading) in the picture. Also check to see that the picture locks in sync properly when switching off and on channel. If necessary, rotate the DX Range Finder control to the left or to the right until the operation is satisfactory.

In some fringe areas where long range reception is possible, TV signals may be subject to excessive fading. This may vary with season and time of day. If the signal in the area concerned is subject to excessive fading and the Range Finder is adjusted during the time the signal is weakest, overloading (picture bending) will take place when the signal is stronger. For this reason be sure that the customer is instructed on the adjustment of this control for periodic variations in signal strength.

INDIVIDUAL CHANNEL SLUG ADJUSTMENT USING A 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.

With correct oscillator channel adjustment, best picture will be located at the approximate center of the range of the TUNING control. However, this may not necessarily be maximum sound output.

Channel slug 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 in operation. Set all other controls for a normal picture.

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 ⅛" 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 center 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 open end of the coil until the slug slips out. Replace slug and reset retaining spring.)

TOUCH-UP OF RATIO DETECTOR SECONDARY USING TELEVISION SIGNAL (A8, 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 about 15 minutes for warm up.

b. Tune set for normal picture and sound.

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 A8, 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 A8 can be made from top of chassis, if you use alignment tool (part number 98A30-7; available at Admiral Distributor). Bottom slug (A8) can be reached through the hole in the core of the upper slug (A10).

ALIGNMENT OF 4.5 MC TRAP A12, USING A TELEVISION SIGNAL

Beat interference (4.5 MC) appears in picture as very fine vertical or diagonal lines, very close together, having a "gauze-like" appearance, the pattern will vary with speech, forming a very fine herringbone pattern.

The trap can be tuned by watching the picture and adjusting the slug for minimum 4.5 MC interference. If greater accuracy is required, the trap should be adjusted as shown on page 10 under "4.5 MC Sound IF and Trap Alignment."

HORIZONTAL OSCILLATOR ALIGNMENT

If the picture will not stay in "horizontal sync" through most of the range of the HORIZONTAL control (on front panel), it will be necessary to make the horizontal oscillator adjustment by following exactly the step-by-step procedure given below. Note that oscillator waveform adjustment in step "b" requires the use of an oscilloscope. Waveform adjustment is made at the factory and generally should not require readjustment in the field. However, waveform adjustment should be checked whenever the receiver is brought into the shop. Step "b" below may be omitted when adjustment is to be made in the customers home. Adjust as follows:

a. Allow the receiver to warm up for a few minutes. Tune in the station, set the front panel controls for normal picture in sync. Important: Before proceeding, be sure that the DX Range Finder control (AGC) is adjusted according to the instructions given in this manual. Adjust the Picture (contrast) control for a normal picture, otherwise it may be difficult to make these adjustments.

If picture cannot be brought into sync with the HORIZONTAL control, alternately adjust the HORIZONTAL control, HORIZ. FREQ. and/or the HORIZ. LOCK adjustments until the picture is brought in sync.

If test pattern is available, examine the picture width and linearity. If necessary, make width, line-

arity and drive adjustments before proceeding.

b. Connect oscilloscope high side through a 10 mmfd. condenser to terminal "C" or "2" on the horizontal blocking transformer; low side to chassis ground. Set oscilloscope to horizontal frequency (15.75 KC) or a sub-multiple of it. While keeping the picture in sync, adjust the HORIZ. LOCK adjustment L401 (underside of chassis) for oscilloscope waveform pattern as illustrated in figure 1. Adjust for equal height of the rounded and pointed peaks. This adjustment must be accurately made for correct operation of the horizontal oscillator. Disconnect the oscilloscope after adjusting waveform.

c. Turn the HORIZONTAL control fully counterclockwise. Momentarily interrupt the signal by switching the channel selector off channel and then back on. The picture may remain in sync. If so, adjust the HORIZ. FREQ. adjustment until the picture goes out of sync

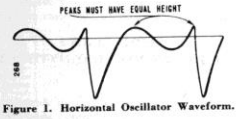


Figure 1. Horizontal Oscillator Waveform.

and several diagonal bars sloping down to the left are visible, see figure 2. VERY SLOWLY turn the HORIZONTAL control clockwise and note the least number of diagonal bars obtained just before the picture pulls into sync.

If more than 3 diagonal bars are present just before the picture pulls into sync, adjust the HORIZ. LOCK RANGE trimmer slightly clockwise. If less than 3 bars are present, adjust the HORIZ. LOCK RANGE trimmer slightly counterclockwise. Turn the HORIZONTAL control counterclockwise, momentarily interrupt the signal and recheck the number of diagonal bars present just before the picture pulls into sync. Repeat this procedure until only 3 bars are present.

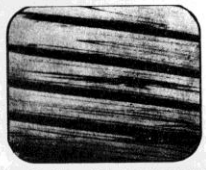


Figure 2. Picture Out of Horizontal Sync.

d. With the picture centering lever, shift the picture to the right so that the blanking bar at the left side of the picture is visible.

While observing the left side of the picture, slowly rotate the HORIZ. FREQ. adjustment (in either direction) so as to move the picture to the right until the blanking bar at the left of the picture just begins to jitter or wobble. Important: Moving the picture or blanking bar too far to the right may cause the oscillator to go into a spurious mode of oscillation.

Slowly turn the HORIZ. FREQ. adjustment in the opposite direction until the blanking bar moves to the left and the picture just becomes stable.

e. Properly center the picture by readjusting the picture positioning lever.

B+ DISTRIBUTION IN 19 SERIES CHASSIS

The figure below illustrates the basic B+ distribution used in 19 series chassis. Note: There are variations in the B+ circuits of TV and combination models and TV models using a different RF amplifier tube (V101) in the TV tuner. Alternate connections for the RF amplifier tube (V101) is shown in the figure below. See "Television Chassis Notes" on page 4 and "Trouble Shooting" information on page 3

SERVICING RADIO TUBES AND DIAL LIGHT IN COMBINATION MODELS

The radio tubes can be serviced without removing the TV chassis from the cabinet. The radio tubes can be reached through the opening in the underside of the chassis shelf.

The dial light can be serviced by removing the tuning knobs and plastic control panel.

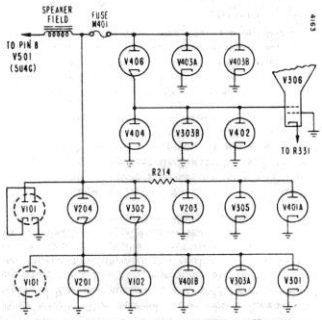


Figure 3. B+ Distribution in 19 Series Chassis.

SERVICE HINTS

TROUBLE SHOOTING

The 19 series chassis covered in this Service Manual are newly designed sets incorporating the latest in television circuitry. These chassis are similar to other late Admiral chassis with respect to the sync, sweep and power supply circuits.

Since there are many differences in the 19 series chassis over earlier model Admiral receivers, it is important to remember the following when servicing or installing receivers having the 19 series chassis.

All 19 series chassis have a "DX Range Finder control" (AGC delay circuit). This control is a potentiometer located at the rear of the chassis to enable precision adjustment of receiver sensitivity to suit the signal conditions in any local of fringe area. Incorrect adjustment of this control in a strong signal area, may result in picture bending, excessive contrast and poor sync. Incorrect adjustment in a weak signal area may result in complete loss of picture and sound. Information on the adjustment of the DX Range Finder control is given on page 2

The sound output tube V204 (6Y6G or 6AS5) functions as a voltage dropping tube in addition to being a sound output tube. The cathode of the sound output tube operates at approximately 140 volts above chassis ground for TV operation. If the sound output stage becomes defective, B+ voltage to the TV tuner, sync separator and clipper, video amplifier and AGC delay circuit will be affected.

B+ voltage to the first and second IF amplifiers V301 and V302 are effectively in series. The cathode of V302 is operated at approximately 120 volts above chassis ground. If either V301, or V302 become defective, B+ voltage to the other stage will be affected.

In sets using the 94D46-2 cascode tuner, B+ voltage to the triode sections of the RF stages (V101) are in series. The cathode of the second triode section is operated at approximately 130 volts above chassis ground. If the tube should become defective or be removed from the socket, there will be no B+ voltage on the plate of the first triode section. See B+ distribution diagram in figure 3.

The horizontal oscillator circuit utilizes pulse width modulation for control of the horizontal oscillator frequency. Information on servicing the horizontal oscillator and horizontal oscillator control circuit are given in paragraph "Service Hints for Horizontal Sync". Note: An oscilloscope is required for adjustment of the horizontal oscillator waveform. Information on adjustment of the horizontal oscillator is given on Page 2

EXCESSIVE SNOW IN PICTURE

Excessive snow in the picture can be caused by faulty tubes in the receiver. Check receiver as follows:

Short circuit the antenna terminals and turn the picture control (contrast) fully clockwise.

Connect a vacuum tube voltmeter from test point "V" to chassis. Set the channel selector on an unassigned channel. If the voltmeter reading exceeds .6 volt negative, excessive receiver (tube) noise is indicated. This condition can usually be corrected by tube substitution. Substitute tubes in the following order: Video detector tube V304, RF oscillator tube V102, RF amplifier tube V101 and IF amplifier tubes V301, V302 and V303.

Corona or arcing in the second anode supply can also cause a high noise reading at the video detector resulting in excessive snow in weak signal areas.

MISCELLANEOUS TROUBLE DUE TO FAULTY TUBES

Faulty tubes cause the majority of receiver troubles. The list below contains most common troubles which are generally due to faulty tubes.

a. Poor fringe area reception due to low B plus voltage. Check the 5U4G tube.
b. Poor fringe area reception due to low sensitivity. Check the 6BC5 and 6BZ7 tubes, if used in the receiver.
c. Picture and sound separated due to IF oscillation. Check the 6CB6 and 6U8 tubes.
d. Picture bending caused by leakage between tube elements. Check the 6BC5 and 6CB6 tubes.
e. Poor sync stability, usually more noticeable in vertical circuit. Check 12AU7 tube.
f. Washed out picture due to negative grid current. Check 6CB6 tube.

SERVICE HINTS FOR HORIZONTAL SYNC

The horizontal oscillator control circuit controls the horizontal oscillator by a method called "Pulse Width Modulation". This method is so called, because the width of the pulse applied to the grid of the horizontal oscillator control section determines the length of time that current flows through this section. The duration of current flow through the control section determines the DC control voltage applied to the grid of horizontal oscillator, thereby controlling the frequency.

The waveshape applied to the grid of the horizontal oscillator control section is formed by combining a partially integrated pulse from the horizontal oscillator output and the horizontal sync pulse. If these two pulses combine properly, the waveshape shown in Figure 4 will be developed and the horizontal oscillator will be in sync.

With no sync input, the waveform at the horizontal oscillator control grid should appear as shown in Figure 5. Since the horizontal oscillator control voltage is dependent upon a waveshape formed at the horizontal output stages (V404, V405 and V406), a defective component in one of these stages may cause sync trouble. If the waveform shown in Figure 5 can be obtained, this will indicate proper operation of the horizontal sweep circuit.

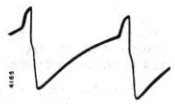


Figure 4. Waveform on Grid Pin 1 of V403 With Sync Pulse.

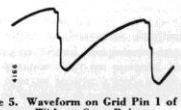


Figure 5. Waveform on Grid Pin 1 of V403 Without Sync Pulse.

When the horizontal oscillator is out of sync, it may be difficult to observe this waveform (Figure 5) on an oscilloscope due to the presence of out-of-phase sync pulses. In this case, remove the sync separator and sync clipper tube V401. If the waveshape shown in Figure 5 is obtained, place the sync and separator tube back into its socket. Then, remove the horizontal oscillator and control tube V403 (6SN7GT). Conventional, well-shaped sync pulses should appear at control grid (pin 1) of V403.

If there are no sync pulses, or the pulses are of low or varying amplitude, accompanied with noise, the sync circuits should be checked. However, if the sync pulses are well-shaped and of constant amplitude, the horizontal oscillator may be misaligned. Place V403 back into its socket and make the "Horizontal Oscillator Alignment" given on page 2

If it is impossible to sync the picture, or obtain the correct waveform at terminal "C", check for a defective component in the following sequence:

a. Check tube V403 (6SN7GT) by substitution.
b. Check C417 by substituting identical condenser (270 mmfd) part number 65B21-271.
c. Check C413 for either open or short.
d. Check condenser C416 for short.
e. Check resistance of R428. It should be 150,000 ohms.
f. Lead dress is critical in the horizontal oscillator circuit. Check to see that lead dress has not been disturbed while servicing.

TELEVISION CHASSIS NOTES

All 19 series chassis employ the same basic television circuitry. The 19B1X, 19B1Y, 19C1X and the 19F1X chassis are television only models. The 19E1X and 19G1X chassis are used in combination models.

The 19B1X and 19B1Y use a 17" rectangular picture tube (17BP4A). The 19C1X and 19E1X chassis use a 20" rectangular picture tube (20DP4A). The 19F1X and 19G1X chassis use a 21" (spherical faced) rectangular picture tube (21WP4 or 21WP4X).

A tone control is used in the 19C1X, 19E1X, 19F1X and 19G1X.

The 19B1X and 19B1Y uses the 94D52-1 TV tuner having a pentode tube (6BC5) used as an RF amplifier. All other chassis in the 19 series use the 94D46-2 (cascode) TV tuner using a twin triode tube (6B77) as an RF amplifier.

IF AMPLIFIER AND TRAP ALIGNMENT

- Connect bias battery; negative to test point "T", see figure 9, positive to chassis. A 3 volt battery is required for steps 1, 2, 3, 4 and 5.
- Disconnect antenna. Connect a jumper wire across the antenna terminals.
- Set Channel selector to channel 12 or other unassigned high channel, to prevent interference during alignment.
- Set the Picture control fully to the left (counterclockwise).
- Allow about 15 minutes for receiver and test equipment to warm up.
- Use lowest DC scale on VTVM.

Step	Signal Gen. Freq.	VTVM and Signal Generator Connections	Instructions	Adjust
1	*27.25 MC	VTVM high side to test point "V", common to chassis.	Use 3 volt bias battery. Use lowest DC scale on VTVM.	A1 for minimum.
2	25.3 MC	Generator high side to Point W on Tuner; Insulate shield from chassis. Connect low side to chassis near 6J6 tube base.	When peaking, keep reducing generator output for VTVM reading of approx. 1 volt or less.	A2 and A3 for maximum.
3	23.1 MC			A4 and A5 for maximum.
4	*27.25 MC		Set channel switch to channel 12 or other unassigned high channel.	Repeat step 1 above.
5	To insure correct IF alignment, 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 left. Connect negative of 3 volt bias battery to test point "T"; positive to chassis.	Connect high side to Point W on Tuner, low side to chassis ground. Set sweep frequency to 25MC, and sweep width approximately 7MC.	If an external marker generator is used, loosely couple high side to sweep generator lead on Point W on Tuner, low side to chassis. Marker frequencies indicated on IF Response Curve.	Connect to test point "V". See figure 9. 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. 6. Note tolerances on curve. Keep marker and sweep output 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 instructed

* Before proceeding, be sure to check the signal generator used in alignment against a crystal calibrator or other frequency standard for absolute frequency calibration required for this operation.

4.5 MC SOUND IF AND TRAP ALIGNMENT

See page 4 for touch-up of ratio detector using television signal without test equipment.

a. Connect signal generator high side to Pin 2 of V304 (6AL5) 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 left (counterclockwise).
d. Use a NON-METALLIC alignment tool. If Ratio Det. Transformer (T201) has hollow core slugs, bottom slug adjustment A8 can be made from top of chassis, if you use alignment tool #9BA30-7 obtainable from Admiral Distributor.

Step	Signal Gen. Freq. (MC)	VTVM Connections	Instructions	Adjust
	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. 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, 2 and 3 below. If necessary use a higher scale on the VTVM.			
1	Set to exactly 4.5 MC	High side to test point "Y"; common to chassis.	Use lowest DC scale on VTVM.	A6 and A7 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.	A8 for zero on VTVM (the correct zero point is located between a positive and a negative maximum). If A6 was far off, repeat step 1.
3		High side to test point "Y"; common to chassis.	Connect a 10 mmfd. condenser from pin 5 of V305 (6CB6) to pin 7 of V201 (6AL6). Use lowest DC scale on VTVM.	A9 for minimum.

RF AND MIXER ALIGNMENT FOR SETS USING TV TUNER 94D52-1

(This tuner uses a 6BC5 tube for RF amplifier V101.)

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. 11). Keep scope leads away from chassis.
d. Set channel selector to Channel 10.
e. Allow about 15 minutes for receiver to warm up and test equipment.

Step	Marker Gen. Freq. (MC)	Sweep Gen. Frequency	Instructions
1	193.25 MC (Video Carrier) 197.75 MC (Sound Carrier)	Sweeping Channel 10. See frequency table	Check for curve shown Fig 10 If necessary, adjust A10, A11 and A12 (figure 11) as required. Adjusting A11 will generally shift the center of the response curve in relation to the video and sound carrier markers. A10 and A12 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 Fig 10 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.

RF AND MIXER ALIGNMENT FOR SETS USING TV TUNER 94D46-2

(This tuner uses a 6BZ7 tube for RF amplifier V101.)

a. Connect negative of 3 volt bias battery to AGC buss (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 (figure 11). Keep scope leads away from chassis.
d. Allow about 15 minutes for receiver and test equipment to warm up.

Step	Marker Gen. Freq. (MC)	Sweep Gen. Frequency	Instructions
1	193.25 MC (Video Carrier) 197.75 MC (Sound Carrier)	Sweeping Channel 10. See frequency table	Check for curve Fig 10 If necessary, alternately adjust A11 and A12 (figure 11) as required to obtain equal peak amplitudes and symmetry, consistent with flat top appearance, proper band width and correct marker location.
2	83.25 MC (Video Carrier) 87.75 MC (Sound Carrier)	Sweeping Channel 6. See frequency table	Check for curve Fig 10 If necessary, adjust A10 as required to obtain curve having maximum amplitude and flat top appearance consistent with proper band width and correct marker location. After completing adjustment, recheck adjustment of step 1.
3	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 Fig 10 In general, the adjustment performed in steps 1 and 2 are 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 a weak high channel as a compromise adjustment to favor the particular channel. Repeat step 2 for the weak low channel to favor the particular low 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.

MODEL IDENTIFICATION CHART

Model Numbers	TV Chassis	Picture Tube	TV Tuner	Record Changer	Radio	Tone Control
17C12X	19B1Y	17BP4A	94D52-1	—	—	—
17DX12X	19B1X	17BP4A	94D52-1	—	—	—
121DX12X, 121DX15X, 121DX16X, 121DX17X	19F1X	21WP4 or 21WP4X	94D46-2	—	—	Yes
121DX15X-16X-17X	19C1X	20DP4A	94D46-2	—	—	Yes
221DX15X-16X-17X	19C1X	20DP4A	94D46-2	—	—	Yes
221DX15X-16X-17X	19F1X	21WP4 or 21WP4X	94D46-2	—	—	Yes
321DX15X-16X-17X	19G1X	21WP4 or 21WP4X	94D46-2	RC600	Built-in AM	Yes
321DX15X-16X-17X	19E1X	20DP4A	94D46-2	RC600	Built-in AM	Yes
321DX25X-26X-27X	19E1X	20DP4A	94D46-2	RC600	Built-in AM	Yes
321DX25XA-26XA-27XA	19G1X	21WP4 or 21WP4X	94D46-2	RC600	Built-in AM	Yes

NOTE: Some of the above models may have either of two chassis.

HF OSCILLATOR ADJUSTMENT

(Using a signal generator)

It is always advisable to make HF oscillator adjustments using a Television Signal as instructed on page 2. If a Television Signal is not available, HF oscillator adjustment can be made using a crystal calibrated signal generator. 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 above. See frequency table on page 7 . *Set generator for maximum output.*	Connect a wire jumper from test point "W" on the tuner to test point "Z". See figure 9. Remove the ratio detector tube V202 (6AL5). Carefully adjust the oscillator slug A13 on each channel until a whistle (beat) is heard in the speaker of the receiver.

OVER-ALL 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 left. Channel selector on channel 10 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 page 7 .	If an external marker generator is used, loosely couple high side to sweep generator lead. Marker frequencies are shown in frequency table on page 7 .	Connect to point "V". See figure 9.	Compare the response curve obtained against the ideal curve shown in figure 13. If the curve is not within tolerance, touch up the IF slug 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 the shape does not change.

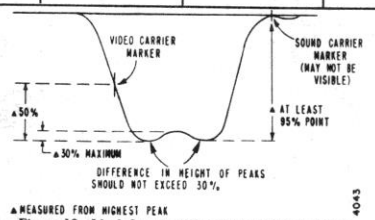


Figure 13. Ideal Over-all RF and IF Response Curve.

Note that video carrier (marker) on the "Over-all RF-IF Response Curve" will appear on the opposite side of the curve as compared to the "IF Response Curve" figure 6. This is due to action of the mixer tube.

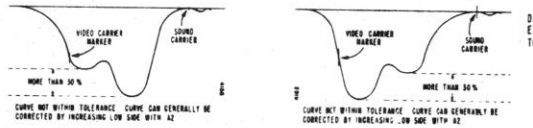
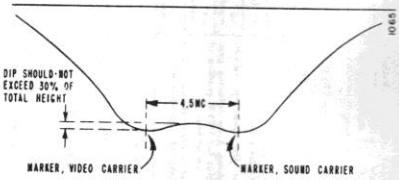


Figure 14. Over-all RF and IF Response Curves, Incorrect Shape.



Full skirt of curve will not be visible unless generator sweep width extends beyond 10 MC.

Figure 10. RF Response Curve.

COILS, TRANSFORMERS

Sym.	Description	Part No.
L102	Mixer - Osc. Coil (Stamped 2Q, 3Q, etc.) For the 94D46-2 T.V. Tuner only.	
	For Channel #2	94D46-72
L101	Antenna Coil (Stamped 2Q, 3Q, etc.)	
	For Channel #2	94D46-52
	For Channel #3	94D46-53
L102	Mixer - Osc. Coil (Stamped 2H, 3H, etc.)	
	For Channel #2	94D52-72
L103	Mixer Plate Coil in 94D52-1 tuner	94D52-85
L103	Mixer plate coil in 94D46-2 tuner	94D46-85
L104	Heater RF Choke	98A45-13
L105	Heater RF Choke	98A45-14
L109	Mixer Plate Choke	94D46-86
L201	Sound take-off coil	72B99-7
L301	Trap Coil (includes C303 &C304)	72C96-23
L302	Video peaking coil (wound on R318)	73A5-15
L304	Trap coil	72B99-6
L305	Video peaking coil (wound on R323)	73A5-13
L306	Video peaking coil (wound on R324)	73A5-9
L307	Heater RF Choke	73A2-5
L401	Horizontal Lock Coil	Part of T404
L402	Width Control Coil	94A49-1
L403	Horizontal Linearity Coil	94A50-1
T301	Ratio Detector Trans.	72B68-2
T301	1st. I. F. Transformer (19B1X)	72C96-21
T301	1st. I. F. Transformer	72C96-25
T302	2nd. I. F. Transformer	72C96-22
T303	3rd. I. F. Transformer	72B107-1
T401	Blocking Osc. Transformer	79A18-4
	A. F. Output Transformer (in 121DX12X models)	79A8
T402	Vertical output Transformer	79B40-2
T403	Deflection yoke	94C51-1
T404	Horiz. blocking osc. Trans. (includes L401)	69B110
T405	Horiz. output transformer	79D41-1
T501	Power Transformer (60 cycle)	80M10-1
	Power Transformer (25 cycle)	80M11-1

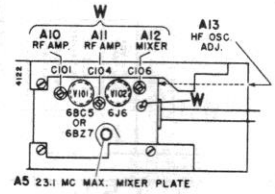


Figure 11. Top of TV Tuner, Showing Adjustment Location.

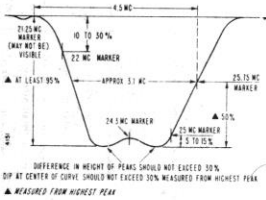


Figure 6. Ideal IF Response Curve.

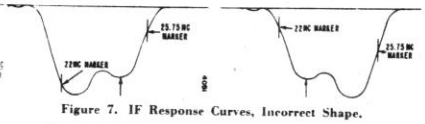


Figure 7. IF Response Curves, Incorrect Shape.

If it is necessary to adjust for approximate equal peaks, carefully adjust slug A2 (25.3 MC). It should not be necessary to turn slug A2 more than one turn in either direction.

If the curve cannot be made to resemble the response curve shown at left, repeat all steps under "IF Amplifier and Trap Alignment" making sure that generator frequencies are accurate and adjustments are carefully made. If a satisfactory curve cannot be obtained after repeating these steps, it may be necessary to change IF amplifier tubes or check for a defective circuit component to be sure that each stage is operating properly.

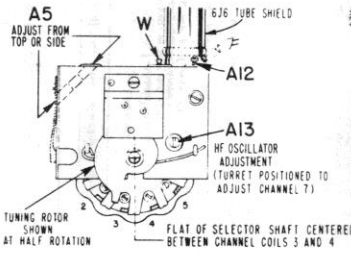


Figure 12. Front View of TV Tuner.

WAVEFORM DATA
(Waveforms given on schematic)

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 signal input to receiver.

The oscilloscope sweep is adjusted for 30 cycles (which is one-half of the vertical frequency), or for 7875 cycles (which is one-half of the horizontal frequency) so that two pulses appear on the screen.

The peak-to-peak voltage readings shown are subject to some variations due to response of the oscilloscope and parts tolerances.

TV VOLTAGE DATA
(Voltages given on schematic)

- PICTURE control turned fully clockwise. CHANNEL control set on an unused channel. Other front controls set at approximately half rotation. Vert. Lin. and Height set at approximately half rotation DX Range Finder control set fully to the left (at "O" position).
- Antenna disconnected from set with Terminals shorted.
- Voltages marked with an asterisk * will vary widely with control setting.
- Line voltage 117 volts AC.
- Voltages measured with a vacuum tube voltmeter between tube socket terminals and chassis, unless otherwise indicated.

  Voltages at V306 measured from top of socket with tube removed.

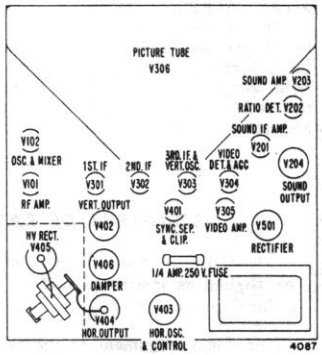
CAUTION

Pulsed high voltages are present on the cap of V406, and on the filament terminals and cap of the 1B3GT tube. NO ATTEMPT SHOULD BE MADE TO TAKE MEASUREMENTS FROM THESE POINTS WITHOUT SUITABLE TEST EQUIPMENT.

Picture tube 2nd anode voltage can be measured from the 2nd anode connector and should be taken only with a high voltage instrument such as a kilovoltmeter. 2nd anode voltage is approximately 16 KV. Proper filament voltage check of the 1B3GT tube may made by observing filament brilliancy as compared with that obtained with a 1.5 volt dry cell battery.

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



Top View of Chassis.

ALIGNMENT HINT

After becoming familiar with alignment procedure, some servicemen simplify subsequent alignment of sets by merely using the essential alignment data given in figures below.

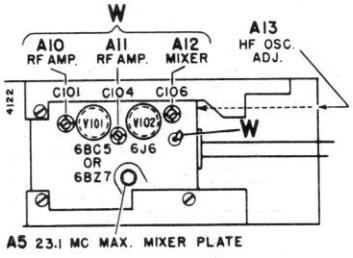


Figure 8. Top View of TV Tuner Showing Adjustment Locations.

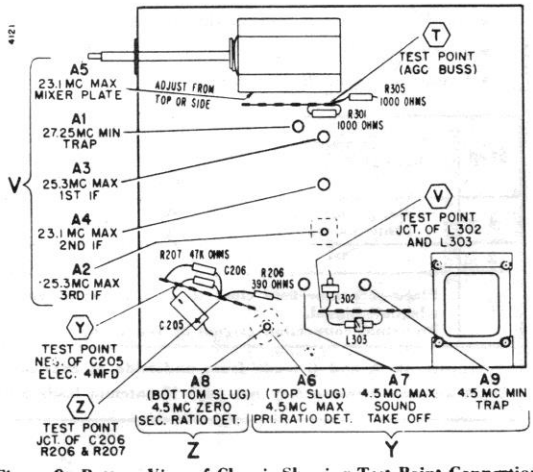


Figure 9. Bottom View of Chassis Showing Test Point Connections and IF Alignment Data.

SERVICING RADIO TUNER IN 19E1X AND 19G1X MODELS

SERVICING RADIO TUBES AND DIAL LIGHT

The radio tubes and radio dial light can be serviced without removing the TV chassis from the cabinet. The radio tubes can be reached through the opening cut in the underside of the chassis shelf.

The dial light can be serviced by removing the tuning knobs and plastic control panel.

REMOVING RADIO TUNER

The radio tuner is mounted at the front apron of the chassis. Alignment, taking voltage readings or an inspection of the underside of the radio tuner can be performed without complete removal of the radio tuner from the TV chassis. To gain access to the underside of the radio tuner, disconnect the tuning drive cord, remove the self-tapping screws at the rear of the radio tuner and at the front (4 screws).

ALIGNMENT OF RADIO TUNER

The radio tuner in television and radio chassis should be aligned as instructed under "Radio Alignment Procedure" below.

The radio alignment trimmers are accessible without disassembly of the radio tuner from the TV chassis. Figure at right shows the locations of radio alignment trimmers.

DIAL STRINGING

Dial stringing for the gang tuning control is shown below.

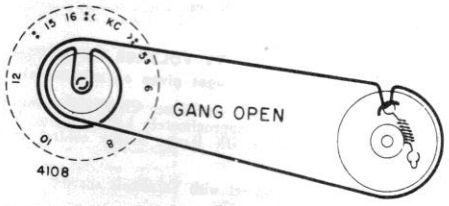


Figure 15. Dial Stringing for 19E1X and 19G1X Chassis.

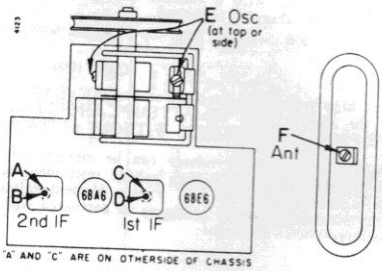


Figure 16. Radio Trimmer Locations.

RADIO ALIGNMENT PROCEDURE

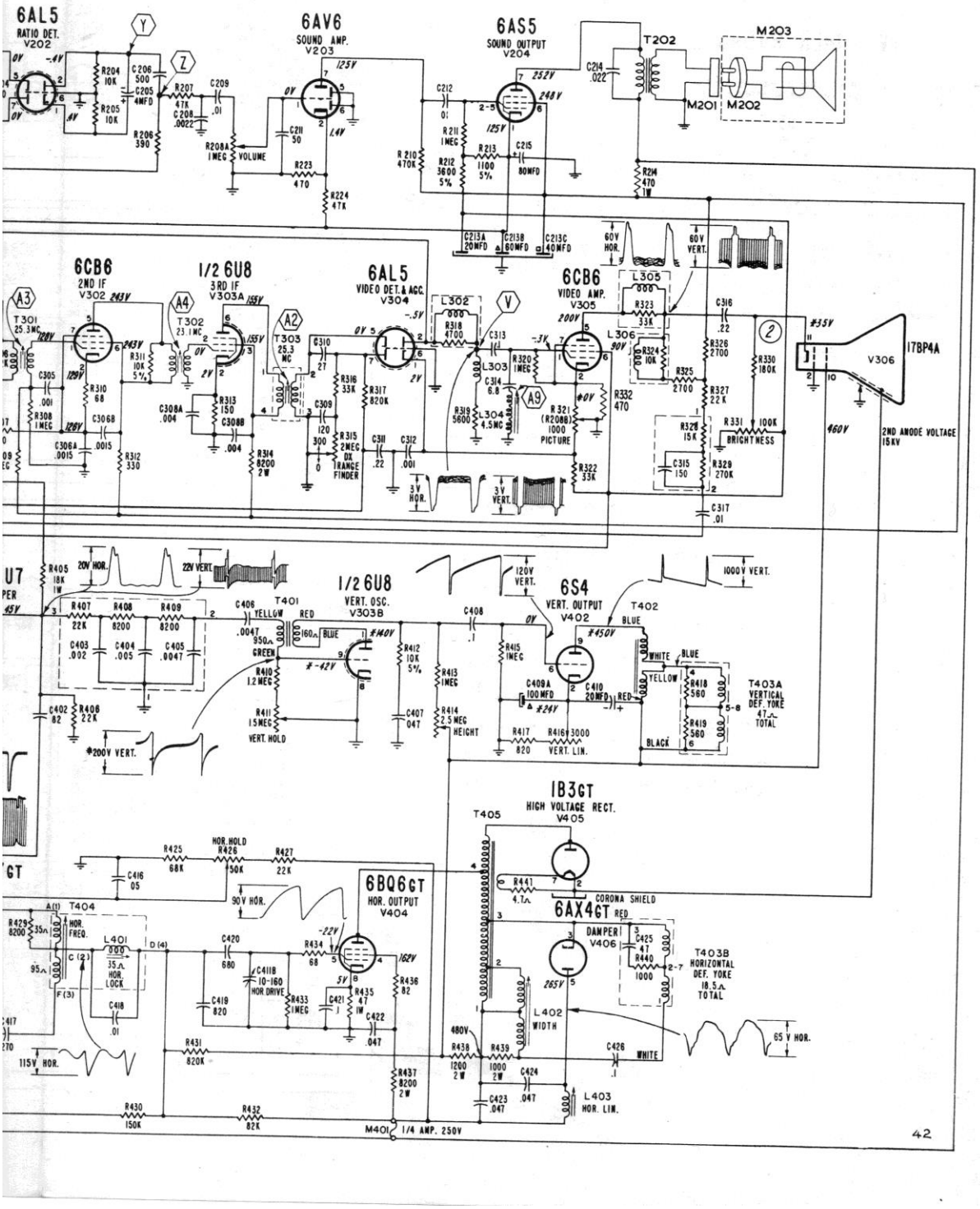
- Connect output meter across speaker voice coil.
- Turn receiver Volume control fully on.
- Function switch in "Radio" position.
- Use lowest output setting of signal generator that gives a satisfactory reading on meter.
- Use a NON-METALLIC alignment tool for IF adjustments.
- Repeat adjustments to insure good results.

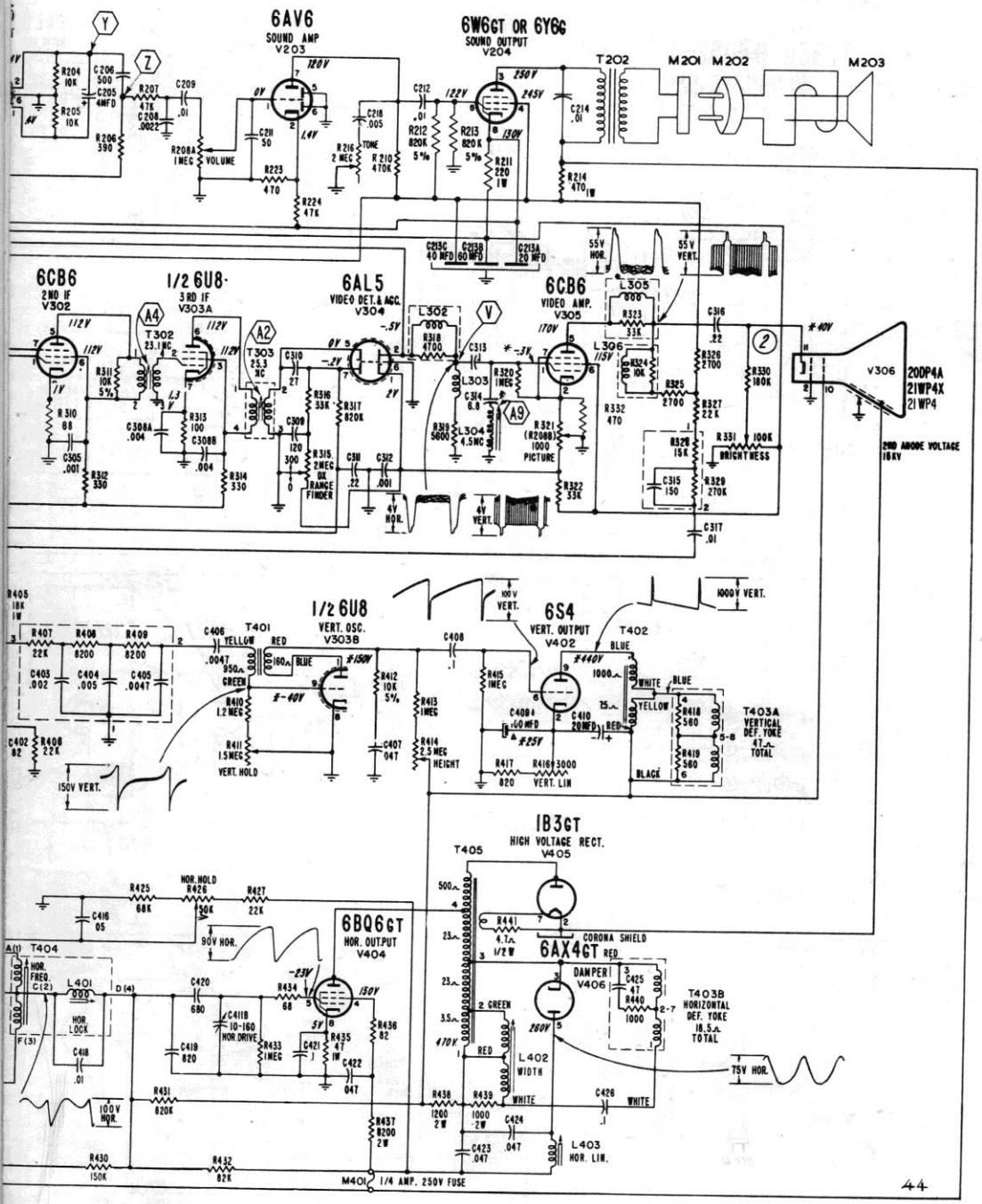
Step	Connect Signal Generator	Dummy Antenna Between Radio and Signal Generator	Signal Generator Frequency	Receiver Dial Setting	Adj. Trimmers in Following Order to Max.
1	Gang condenser antenna stator	.1 MFD	455 KC	Tuning gang wide open	*A-B (2nd IF) *C-D (1st IF)
2	"	"	1620 KC	"	E (oscillator)
3	Place 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. See figure 16 for trimmer locations.

§ AM antenna trimmer may not peak if antenna leads are not properly routed or separated.

ADMIRAL
19BIX, BIY




6AV6
SOUND AMP
V203
6W6GT OR 6Y6G
SOUND OUTPUT
V204
T202
M201
M202
M203
6CB6
2ND IF
V302
1/2 6U8
3RD IF
V303A
6AL5
VIDEO DET. & AGC.
V304
6CB6
VIDEO AMP.
V305
V306
200P4A
21WP4X
21WP4
2ND ANODE VOLTAGE
18KV
1/2 6U8
VERT. OSC.
V303B
6S4
VERT. OUTPUT
V402
T403A
VERTICAL
DEF. YOKE
47Ω
TOTAL
1B3GT
HIGH VOLTAGE RECT.
V405
6BQ6GT
HOR. OUTPUT
V404
6AX4GT
DAMPER
V406
T403B
HORIZONTAL
DEF. YOKE
18.5Ω
TOTAL
L401
HOR. LOCK
L402
WIDTH
L403
HOR. LIN.
M401 1/4 AMP. 250V FUSE
CORONA SHIELD
VOLUME
TONE
HOR. HOLD
VERT. HOLD
HEIGHT
VERT. LIN
BRIGHTNESS
RANGE FINDER
PICTURE
HOR. DRIVE
T401
T402
T405
T404
55V HOR.
55V VERT.
4V HOR.
4V VERT.
100V VERT.
1000V VERT.
150V VERT.
90V HOR.
100V HOR.
75V HOR.