

# 1954 Supplement No. 11

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"J" Chassis Same as CGE "J" Chassis. NC21, D, DV, V Uses "E" Chassis. NC21DV Uses "E" Chassis. For radio data see CGE C'15 in Radio Supplement #31.

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NC213DV Uses "E" Chassis.

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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 circuity. 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:

- Rotate the DX Range Finder control fully to the left (to the "0" setting).
- Tune in a picture, preferably on the strongest TV channel.
- 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.
- Set the CHANNEL knob for a station in operation.
   Set all other controls for a normal picture.
- Set TUNING control at center of its range by rotating it approximately half-way.
- d. Remove the CHANNEL and TUNING knobs.
- e. Insert a ½" blade, NON-METALLIC screwdriver (kit consisting of one metallic and one non-metallic screwdriver is available under part number 98A30-3) in the ½" 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
- \* 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).

### ADMIRAL 19 BIX Etc.

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 ½ 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.

 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.

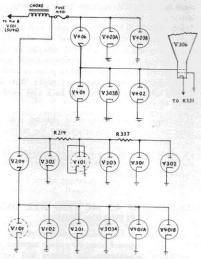


Figure 3. B+ Distribution in 19 Series Chassis.

#### 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 Syne". 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.

- 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.
- 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 com-



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

ponent 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 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 (6SN76T). 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.
- 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: )

with at least

50 to 90 MC range: 170 to 225 MC range:

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",	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.	Al 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.		A2 and A3 for maximum.	
3	23.1 MC			A4 and A5 for maximum.	
4	*27.25 MC			Repeat step 1 above.	
5		rrect IF alignment, make the "IF Resp	other unassigned high channel.		

#### 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 Won Tuner, low side to chassis. Marker frequencies in dicated on IF Response Curve.	Connect to test point "V". See fig- ure 9. Marker pips on scope will be more distinct if a condenser from 100 mmfd. to 1000 mmfd. is connected across the oscillo- scope 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.
21 25 MC MARKER (MAY NOT BE) VISIBLE  AT LEAST 95 %  DIFFERENCE IN HEICHT OF	25.75 MC  25.75 M ARREER  25.76 M ARREER  25.76 M ARREER  25.76 M MARKER  25.76 M MARKER	Figure 7  If it is nece fully adjust sl turn slug A2 r  If the curve shown at left,	ug Å2 (25.3 MC). It sh nore than one turn in eit cannot be made to rest repeat all steps under	ximate equal peaks, care- tould not be necessary to ther direction. emble the response curve "IF Amplifier and Trap
► MEASURED FROM MIGHEST PEAK Figure 6. Ideal	IF Response Curve.	and adjustmen not be obtaine to change IF	ts are carefully made. If d after repeating these s	frequencies are accurate i a satisfactory curve can- teps, it may be necessary k for a defective circuit is operating properly.

<sup>\*</sup> 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.

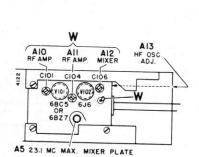


Figure 8. Top View of TV Tuner Showing Adjustment Locations.

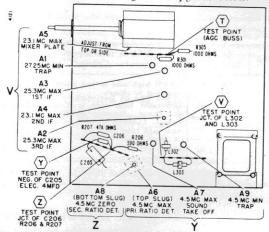


Figure 9. Bottom View of Chassis Showing Test Point Connections and IF Alignment Data.

# 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.
- 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
	IMPORTAN	T: If a signal generator a	The to check it against a crystal calib 4.5 MC. Accuracy required is within and frequency standard are not avail and follow steps 1, 2 and 3 below.	n one kilocycle.
1		High side to test point "Y"; common to chassis.	Use lowest DC scale on VTVM.	A6 and A7 for maximum (kee reducing generator output to keep VTVM at approx. 1 volt).
2	Set to exactly 4.5 MC	High side to test point "Z"; common to chassis.	Use zero center scale on VTVM, if available.	A8 for zero on VTVM (the cor rect zero point is located betweer a positive and a negative maxi- mum). If A6 was far off, re peat 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.
- Jumper from test point 1 to cnassis.

  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 gen-
- erator output at a minimum, marker pips just barely visible. 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.

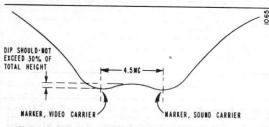
Step	Marker Gen. Freq. (MC)	Sweep Gen. Frequency	Instructions
1	193.25 MC (Video Carrier) 197.75 MC (Sound Carrier)	Sweeping Channel 10. See frequency table below.	Check for curve shown below. If necessary, adjust A10, A11 and A12 (figure 11) as required. Adjusting A11 will generally shift the center 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 gen- erator 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.
- 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 All and Al2 (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 Al0 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		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.

	FREQU	JENCY T	ABLE	
Channel Number	Channel Freq., MC	Video Carrier, MC	Sound Carrier, MC	HF Osc.
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

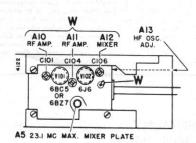


Figure 11. Top of TV Tuner, Showing Adjustment Location.

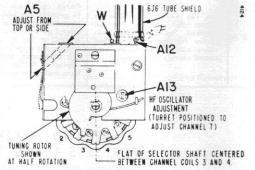


Figure 12. Front View of TV Tuner.

### HF OSCILLATOR ADJUSTMENT

(Using a signal generator)

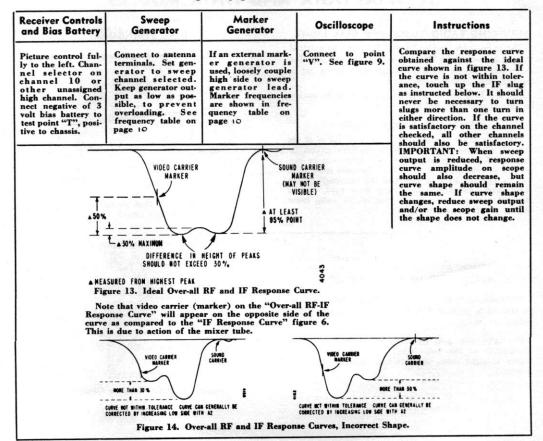
It is always advisable to make HF oscillator adjustments using a Television Signal

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 chan- nel to be adjusted. Set "Tuning" control at half rotation. Turn vol- ume 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)



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		Company of the second	Yes
*221DX15LX-16LX-17LX	19K1X	21ZP4A	94D46-2	_	The state of the state of	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		and the same of the	Yes
H2215X-16X-17X	19A2X	21ZP4A	94D46	_	100 mm - 200 mm	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	E 22 22 22 22 22 22 22 22 22 22 22 22 22		No
	19B1Z	17BP4A	94D46	시리, 그런 네.		
C1815X-16X-17X		of the above models ma			· A Total Control	No

# 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.

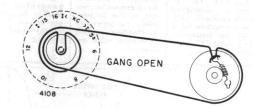


Figure 15. Dial Stringing for 19E1X and 19G1X Chassis.

#### 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.

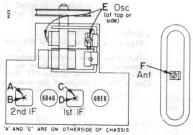


Figure 16. Radio Trimmer Locations.

#### RADIO ALIGNMENT PROCEDURE

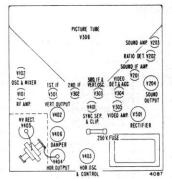
- Connect output meter across speaker voice coil.
- Turn receiver Volume control fully on.
- · Function switch in "Radio" position.
- Use lowest output setting of signal generator that gives a satisfactory reading on meter.
- Use a NON-METALLIC alignment tool for IF adjustments.
- Repeat adjustments 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	**************************************	<b>"</b>	1620 KC	"	E (oscillator)
3	Place generator lead clos adequate signal. No actual connection (sign	1400 KC	Tune in signal	§F (antenna)	

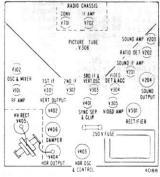
<sup>\*</sup> Adjustments A and C made from underside of chassis. See figure 16 for trimmer locations.

<sup>§</sup> AM antenna trimmer may not peak if antenna leads are not properly routed or separated.

#### TUBE LOCATIONS



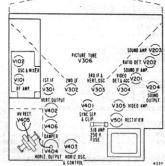
Top View of Chassis 19B1X—19B1Y—19C1X—19F1X—19K1X Use 3/8 Amp. 250 Volt Fuse



Use 36 Amp. 250 Volt Fuse

L101

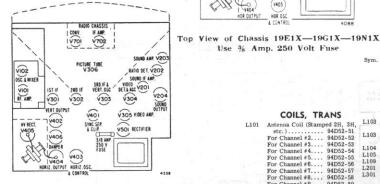
**TUBE LOCATIONS** 



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

COILS, TRANSFORMERS (Cont.)

Part No.

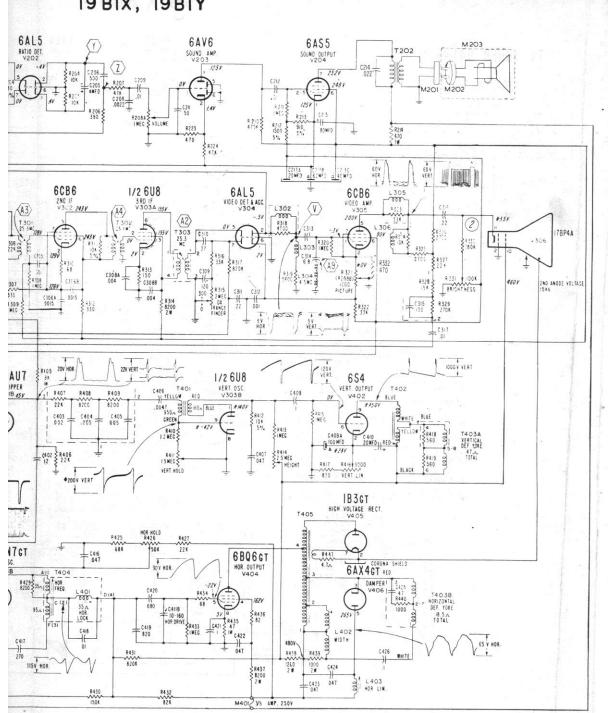


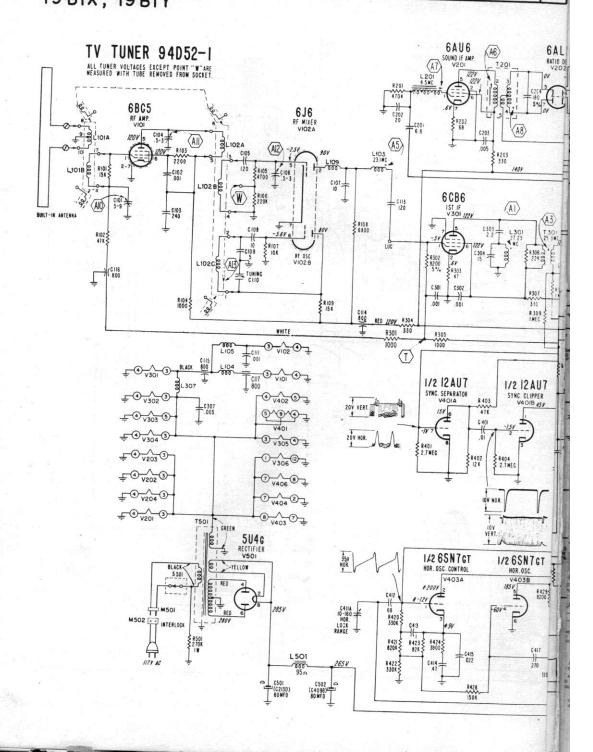
Top View of Chassis 19D2X Use 3/8 Amp. 250 Volt Fuse

### Description For Channel #6.... 94D46-76 For Channel #7.... 94D46-77 For Channel #8.... 94D46-78

			For Chamber #6 34D40=10	
			For Channel #9 94D46-79	
			For Channel #10 94D46-80	
			For Channel #11 94D46-81	
			For Channel #12 94D46-82	
	COILS, TRANS		For Channel #13 94D46-83	
	Antenna Coil (Stamped 2H, 3H	L103	Mixer Plate Coil in 94D52-1	
	etc.) 94D52-51		tuner	94D52-85
	For Channel #2 94D52-52	L103	Mixer Plate Coil in 94D46-2	
	For Channel #3 94D52-52		& -3 tuners	94D46-85
	For Channel #4 94D52-54	L104	Heater RF Choke	98A45-13
	For Channel #5 94D52-55	L105	Heater RF Choke	98A45-14
	For Channel #6 94D52-56	L109	Mixer Plate Choke	94D46-86
	For Channel #7 94D52-57	L201	Sound Take-Off Coil	72B99-7
		L301	Trap Coil (includes C303 &	
	For Channel #8 94D52-58		C304)	72C96-23
	For Channel #9 94D52-59	L302	Video Peaking Coil (Wound	
	For Channel #10 94D52-60		on R318)	73A5-15
	For Channel #11 94D52-61	L303	Video Peaking Coil	73A5-7
	For Channel #12 94D52-62	L304	Trap Coil	72B99-6
	For Channel #13 94D52-63	L305	Video Peaking Coil (Wound on	
	Mixer - Soc. Coil (Stamped	2000	R323)	73A5-13
	2H, 3H, etc.)	L306	Video Peaking Coil (Wound on	10710 10
	For Channel #2 94D52-72	F200		73A5-9
	For Channel #3 94D52-73	T 0.07	R324) Heater RF Choke	73A2-5
	For Channel #4 94D52-74	L307	Horizontal Lock Coil	Part of T404
	For Channel #5 94D52-75	L401	Width Control Coil	94A49-1
	For Channel #6 94D52-76	L402		94A50-1
	For Channel #7 94D52-77	L403	Horizontal Linearity Control.	74K18-2
	For Channel #8 94D52-78	L501	Choke, Filter (60 cycle)	74K6-1
	For Channel #9 94D52-79	* 700	(25 cycle)	69A52-4
	For Channel #10 94D52-80	L702	Oscillator Coil	
	For Channel #11 94D52-81	L704	A. M. Antenna Coil	69C155-2
	For Channel #12 94D52-82	T201	Ratio Detector Trans	72B68-1
	For Channel #13 94D52-83	T202	Speaker Output Trans	79Y33-3
	Antenna Coil (Stamped 2Q, 3Q,	T301		
	etc.)	T301	1st I. F. Transformer	72C96-25
	For Channel #2 94D46-52	T302	2nd I. F. Transformer	72C96-22
	For Channel #3 94D46-53	T303	3rd L.F. Transformer	72B107-1
	For Channel #4 94D46-54	T401	Vert. Blocking Osc.	20110 4
	For Channel #5 94D46-55		Transformer	79A18-4
	For Channel #6 94D46-56	T402	Vert. Output Transformer	79B40-2
	For Channel #7 94D46-57	T403	Deflection Yoke	94C51-1
	For Channel #8 94D46-58	T404	Horiz. Blocking Osc. Trans.	000110
	For Channel #9 94D46-59		(Includes L401)	69B110
	For Channel #10 94D46-60	T405	Horizontal Output Trans-	
à	For Channel #11 94D46-61	100		79D41-1
	For Channel #12 94D46-62	T501	Power Transformer (60	
	For Channel #13 94D46-63		cycle)	80M10-1
	Mixer - Osc. Coil (Stamped		Power Transformer (25	
	2Q, 3Q, etc.)		cycle)	80M11-1
	For Channel #2 94D46-72	· T701	1st IF Transformer - (60	2012/197
	For Channel #3 94D46-73		cycle)	72B28-7
	For Channel #4 94D46-74	T702	2nd IF Transformer - (25	
	For Channel #5 94D46-75		cycle)	72B28-7

PICTURE POSITIONING LEVER MOVES SIDEWAYS OR	H E	F	P	
UP AND DOWN				
ION TRAP	A /	/ /	K	
FOCUS	VIII			
ADJUSTMENT		1	0	
ANTENNA TERMINALS			G L101	
			4	
	Lavie II	a III	En PHONO	
WIDTH_		W. all	INPUT	
VERT. LIN.			For 94D46-2	
HORIZ. LIN.	4		A Tuners	
HORIZ. DRIVE	10	1	CONTROL ON FRONT PANEL	
CHORIZ. LOCK RANGE	HEIGHT	FÚSE	PHONO MOTOR	
B HORIZ. FRE	EQ. DX R	ANGE FINDER	SOCKET	





# 1953 Supplement No.7

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GORDON OLIVER TELEVISION T. V. RADIO SERVICE	N MOTOROLA	Philoo Cont'd.
T. V. RADIO SERVICE		
NO 4815 923 CALVERHALL	Nodel Page	
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Model Page	MLK17T9 Chassis Layouts37 to 39 MLK17T9 Coil Identification37	6285L Def. Chassis Bottom View 100 6285L RF Chassis Base Layout 99
Note: For a complete cross-index of Admiral model and chassis num- bers, see pages 5 and 12.	MLK1779E Same as MLK17T9. MLK17T10 Same as MLK17T9. MLK17T10B,W Same as MLK17T9. MK17T15 (Chassis TK-712) Basically the same as Chassis TS-702.	6285L RF Chassis Bottom View 100 6285L Voltages 100 6285L All other data same as 5726. 6286 Same as 6285L.
19BIX Circuit	the same as chassis 15-702.	
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22YIX Service Hints	NT21 Same as NC21.	TV53-359 Voltages 26
22YIX Alignment	NOTE: The foregoing is preliminary data. Alignment information notyet available from manufacturer.	
	avarrage from mandrage and it.	NOTE: RE INDEXING
ELECTROHOME		
	PHILCO	Since most TV circuits require fold pages for clear reproduction, it is
Model Page		necessary to bind them as a group in the middle of the book. As a re-
Chippendale T-21 Circuit63,64 Chippendale T-21 Circuit Revision 20	Model Page	sult, related data such as align- ment, voltages etc., may be widely
Chippendale T-21 Service Data21.22	5726 RF Chassis 81 Circuit71,72 Deflection Chassis H-1 Cct 73	separated in some cases. This is
Chippendale T-21 Alignment 22 Chippendale T-21 Chassis Layouts. 23	5726 Def. Chassis Base Layout 74	particularly true in this supple- ment because some models have as many as three different circuit dia-
Chippendale T-21 Voltages 23 Classic Same as Chippendale T-21.	5726 Def. Chassis Bottom View 89 5726 RF Chassis Base Layout 90	grams which makes the fold section
Regency Same as Chippendale T-21. CHT231-512 Same as Chippendale T-21.	5726 RF Chassis Bottom View 89 5726 Voltages 89	grams which makes the fold section larger than normal. To avoid con- fusion, use your index to locate
CHDT227-513 Same as Chippendale T-21.	5726 Power Supply Circuit 93 5726 Alignment	ALL data.
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TV-103 Voltages	6260,A Same as 5726. 6262,A Same as 5726.	TELEVICION
TV-103 Waveforms	6232, A Same as 5726. 6279M Same as 5726.	RCC. TELEVISION
		Supplement
		Supplement
- 4	1	No. 7
1. 1. (0)	/	710.1

#### 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:

- Rotate the DX Range Finder control fully to the left (to the "0" setting).
   Tune in a picture, preferably on the strongest TV
- c. Set the Picture (contrast) control fully to the right

(clockwise).

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 installa-tion 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 maximum sound output.

Channel slug adjustment can be made without remov-ing the chassis from the cabinet. Adjust as follows:

- a. Turn the set on and allow 15 minutes to warm up.
- Set the CHANNEL knob for a station in operation. Set all other controls for a normal picture.
- 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 Insert a ½" blade, NON-METALLIC screwdriver (kit consisting of one metallic and one non-metallic screw-driver is available under part number 984.30-3) in the ½" 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 ½" hole (just below T201) in bottom of the cabinet or the chassis mounting shel, 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.

If ratio detector transformer (T201) has hollow hexagonal core aluga, 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).

Carefully insert a non-metalic alignment tool through the opening in cabinet bottom below T201. An align-ment tool with a screwdriver blade or hexagonal en-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 be-tween the two maximum buzz peaks that will be noticed when turning the slug back and forth about 1/4 to 1/2 turn.

If necessary, repeat individual channel slug adjust-ment 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 10 under "4.5 MC Sound IF and Trap Alignment."

#### HORIZONTAL OSCILLATOR ALIGNMENT

HORIZONTAL OSCILLATOR ALIGNMENT

If the picture will not stay in "horizontal syne" 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-bystep 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.

the customers home. Adjust as follows:

a. Allow the receiver to warm up for a few minutes.

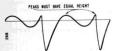
Tune in the station, set the front panel controls for normal picture in sync. Important: Before proceeding, be sure that the DX Range Finder control 1ACO; is adjusted according to the instructions given in this manual. Adjust the Picture (contrast) control for a normal picture, otherwise it may be difficult to make these adjustments. 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

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

- b. Connect oscilloscope high side through a 10 mmfd. Connect oscilloscope high side through a 10 mmld. 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 LAOI (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. adjusting waveform
- adjusting waveform.

  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



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 least han 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



Figure 2. Picture Out of Horizo

into sync. Repeat this procedure until only 3 bars are present.

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.

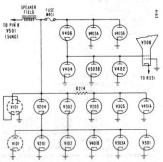
Slowly turn the HORIZ. FREQ. adjustment in the opposite direction until the blanking bar moves to the left and the picture just becomes stable. Properly center the picture by readjusting the pic-

Properly center the picture by readjusting the picture positioning lever.

#### B+ DISTRIBUTION IN 19 SERIES CHASSIS

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 (VI01)
in the TV tuner. Alternate connections for the RF amplifier tube (VI01) 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.

#### SERVICE HINTS

#### TROUBLE SHOOTING

The 19 series chassis covered in this Service Manual are newly designed sets incorporating the latest in tele-vision 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.

cewers 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 180 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 oper-ated 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

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 natur and norzonato seemator country friends 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

#### 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.

ture control (contrast) tully 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 ause a high noise reading at the video detector resulting a 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.

- 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 re-
- ceiver.

  c. Picture and sound separated due to IF oscillation.

  Check the 6CB6 and 6U8 tubes.

  d. Picture hending 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 com-



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

ponent 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



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

When the horizontal oscillator is out of sync, it may When the horizontal oscillator is out of syne, it may be difficult to observe this waveform (Figure 5) on an oscilloscope due to the presence of out-of-phase syne pulses. In this case, remove the syne separator and syne clipper tube V401. If the waveshape shown in Figure 5 is obtained, place the syne and separator tube back into its socket. Then, remove the horizontal oscillator and control tube V403 (6SN7GT). Conventional, well-shaped syne 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.
- Check C417 by substituting identical condenser (270 mmfd) part number 65B21-271.
- Check C413 for either open or short.
- d. Check condenser C416 for short.
- Check resistance of R428. It should be 150,000 ohms.
- Lead dress is critical in the horizontal oscillator cir-cuit. Check to see that lead dress has not been dis-turbed while servicing.

#### TELEVISION CHASSIS NOTES

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

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.

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 V, positive to chaose. A 3 solt battery in required high chance, be greated as a secure of the second of the control of the second of

warm	up.				
Lam b	mest	DC	scale on	MATA	

Step	Signal Gen. Freq.	VTVM and Signal Generator Connections	Instructions	Adjust
1	*27.25 MC	VTVM high side to test point "V",	Use 3 volt bias battery.	Al for minimum.
2	25.3 MC	common to chassis. Generator high side to Point W	Use lowest DC scale on VTVM.  When peaking, keep reducing gen-	A2 and A3 for maximum.
3	23.1 MC	chassis. Connect low side to chassis	erator output for VTVM reading of approx. I volt or less.	A4 and A5 for maximum.
4			Set channel switch to channel 12 or other unassigned high channel.	Repeat step I

## IF RESPONSE CURVE CHECK (Using sweep generator and oscilloscope)

Receiver Controls and Bias Buttery	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 blas. hattery to test point "\text{T}"; positive to chassis.	Connect high side to Point W on Tuner, low side to chassis ground, Set sweep frequency to 23MC, and sweep widt h approxi- mately 7MC.	If an external marker generator is us e d, loosely couple high side to sweep generator lead on Point W on Tuner, low side to chassis. Marker frequencies in dicate d 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. to connected across the oscilloscope input.	Check curve obtained against feed response curve in fig. 6. Note tolerances on curve Keep marker and sweep out put; at very minimum to pre- tice to the curve and the curve of the curve ampli- tude without altering the fif the curve is not within tolerance or the markers are not in the proper footsion on the curve, tunch-up with III.

Before proceeding, he sure to check the signal generator used in alignment against a crystal calibrator or other fr quency 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 1304 d. Use a NONMETALLIC alignment shall. If Ratio Detailed high showard a 20 stdl. condenser, connect has side to the side of the state of the state

Step	Signal Gen. Freq. (MC)	VTVM Connections	Instructions	Adjust
	for accurate	frequency calibration at 4.5	MC. Accuracy required is with frequency standard are not avail	brator or other frequency standar in one kilocycle. lable, alignment can be made usin If necessary use a higher seale o

	the VTVM.			
1		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	Set to exactly 4.5 MC	High side to test point "Z"; common to chassis,	Use zero center scale on VTVM, if available.	A8 for zero on VTVM (the cor- rect zero point is located between a positive and a negative maxi- mum). If A6 was far off, re- peat 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). lise lowest DC scale on VTVM.	A9 for minimum.

# RF\_AND MIXER ALIGNMENT FOR SETS USING TV TUNER 94D52-1 (This tuner uses a 6BCS tube for RF amplifier V101.)

■ Connect energives of 3 with bias hashers to tem point "T" entering the control of the control

Step	Marker Gen. Freq. (MC)	Sweep Gen. Frequency	Instructions
ì	193.25 MC (Video Carrier) 197.75 MC (Sound Carrier)	Sweeping Channel 10. See frequency table	Check for curve shown Yo yo If necessary, adjust AlO, All and Al2 (Figure 1) as required. Adjusting Al I will generally shift the center of the response curve in relation to the video and sound carrier markers. AlO and Al2 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 gen- erator for the corresponding video carrier frequency and sound carrier frequency.		Davis such channel operating in the service area for curve shown Feigl to general, the significant per percentaged in teg 1 is sufficient to give antiferation of the service of the servi

RF AND MIXER ALIGNMENT
FOR SETS USING TV TUNER 94D46-2.
(This tuner uses a 6927 tube for RF emplifier V101-2.)

a. Connect insgative of 2 with bias hattery in AGC hass used institutes of the response curve, here seeps generated or sufficient simplified, remove battery, and cannot a wire jumper from the joint "The chasin.

b. Connect severa generates to assert asserts are consistent of the properties of the asserts (arrivals.)

conjular angles generates to the asserts to remove a complex angles generates to the asserts (arrivals.)

conjular angles generates to the asserts to remove a complex angles generates to the asserts (arrivals.)

conjular angles generates to the asserts to remove a complex angles generates to the asserts (arrivals.)

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 Pig 10 If necessary, alternately adjust A11 and A12 (figur 11) as required to obtain equal peak amplitudes and symmetry, consisten 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 $Fig.60$ 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, necket adjustment of step 1.	
3	Set the aweep generator to aweep the channel to be checked. Set the marker gen- erator for the corresponding video carrier frequency and asound carrier frequency.		Cach such shamml operating in the service area for curve shown $F_{ij}$ (0 in general, the adjustment performed in rape 1 and 2 are refliction to give satisfactory response curves on all channels. However, if reasonable align statisfactory response curves on all channels. On the city is to see that coils have a service of the control	

#### MODEL IDENTIFICATION CHART

Model Numbers	TV	Picture Tube	Tuner	Record	Radio	Tone Control
17C12X	1981Y	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	-	1 -	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	<b>Built-in AM</b>	Yes
321DX15X-16X-17X	19E1X	20DP4A	94D46-2	RC600	<b>Built-in AM</b>	Yes
321DX25X-26X-27X	19E1X	20DP4A	94D46-2	RC600	<b>Built-in AM</b>	Yes
321DX25XA-26XA-27XA	19G1X	21WP4 or 21WP4X	94D46-2	RC600	<b>Built-in AM</b>	Yes
NOTE: Some of the	above mo	dels may have either	of two chassis.			

O

#### 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 chan- nel to be adjusted. Set "Taning" control at half rotation. Turn vol- ume 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" of the tuner to test point "Z". See figure 9. Remove the ratio detector tube V202 (6AL5). Carefully adjust the oscillator slug Al3 on each channel until a whistle (beat) is heard in the speaker of the receiver.
OVER-ALL R	F AND IF RESPONSE	CURVE CHECK

Receiver Controls	Sweep	Marker	Oscilloscope
and Bias Battery	Generator	Generator	
Picture control ful- ly to the left. Chan- nel selector on channel 10 or other unassigned high channel. Con- nect negative of 3 volt bias battery to test point "T", posi- tive to chassis.	Connect to antenna terminals. Set gen- erator to sweep channel selected. Keep generator out- put as low as pos- sible, to prevent overloading. See frequency table on page 7.	If an external mark- er generator is used, loosely couple high side to sweep generator lead. Marker frequencies are shown in fre- quency 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 channel should also be satisfactory. IMPORTANT When sweep curve implicated, response should also decrease, but turve shape should remain the same. If curve shape should remain the same. If curve shape changes, reduce sweep output and/or the scope gain until the shape does not change.

Instructions

#### 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,	te )
	For Channel #2	94D46-52
	For Channel #3	94D46-53
L102	Mixer - Osc. Coil (Stamped 2H, 3H, etc.)	01010 33
	For Channel #2- Mixer Plate Coil in 94D52-1	94D52-72
L103	Mixer Plate Coil in 94D52-1	
	tuner	94D52-85
L103	Mixer plate coil in 94D46-2	
L104	tuner Heater RF Choke	94D46-85
L105	Heater RF Choke	98A45-13
L109	Heater RF Choke	98A45-14
L201	Mixer Plate Choke	94D46-86
	Sound take-off coll	72B99-7
L301	Trap Coil (includes C303 &C304)	72C96-23
L302	Video peaking coil (wound on R318)	****
1.304	Trap coil	73A5-15 72B99-6
L305	Video peaking coil (wound on	15Baa-0
_ L303	R323)	73A5-13
L306	Video peaking coil (wound on	1383-13
	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
T201	Ratio Detector Trans	72B68-2
T301	1st. I.F. Transformer (1991 V)	72C96-21
T301	1st. I. F. Transformer	72C96-25
T302	2nd. I. F. Transformer	72C96-25
T303	3rd. I. F. Transformer	
T401	Blocking Osc. Transformer	72B107-1
1401	A. F. Output Transformer (in	79A18-4
	121DX12X models)	
T402	Vertical output Transformer	79A8
T403	vertical output Transformer	79B40-2
T404	Deflection yoke	94C51-1
1404	Horiz. blocking osc. Trans. (includes L401)	69B110
T405	Horiz. output transformer	
T501	Power Transformer (60 cycle).	79D41-1
1301	Power Transformer (60 cycle) Power Transformer (25 cycle)	80M10-1
	rower iranstormer (25 cycle)	80M11-1

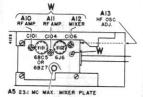
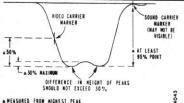


Figure 11. Top of TV Tuner, Showing Adjustment Location.



A NEASURED FROM MIGHEST PEAK
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.

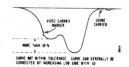
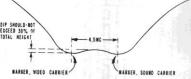


Figure 14. Over-all RF and IF Response Curves, Incorrect Shape



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

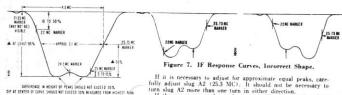


Figure 6. Ideal IF Response Curve.

If it is necessary to adjust for approximate equal peaks, carefully adjust slog A2 (25.3 MC). It should not be necessary to form slog A2 (25.3 MC). It should not be necessary to turn slog A2 one that one time in either direction.

If the curve cannot be made in either direction.

If the curve cannot be made in either direction. If the curve cannot be a state of the curve cannot be a state of the 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.

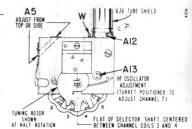


Figure 12. Front View of TV Tuner.

#### WAVEFORM DATA (Waveforms given on schematic)

Waveforms taken with PICTURE control set fully to the right, all other controls set for

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.

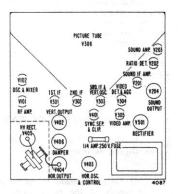
#### CAUTION

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 call better. cell battery.

#### FREQUENCY TABLE

hannel umber	Channel Freq., MC	Video Carrier, MC	Sound Carrier, MC	HF Osc.,
2	54- 60	55.25	59.75	81
3	60- 66	61.25	65.75	87
	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.

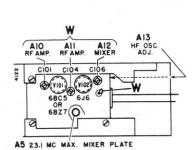


Figure 8. Top View of TV Tuner Showing Adjustment Locations.

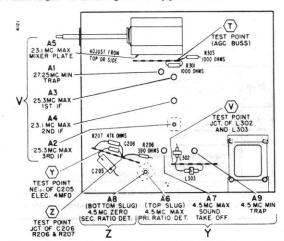


Figure 9. Bottom View of Chassis Showing Test Point Connections and IF Alignment Data.

8

# SERVICING RADIO TUNER IN 19EIX AND 19GIX 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

#### DIAL STRINGING

Dial stringing for the gang tuning control is shown

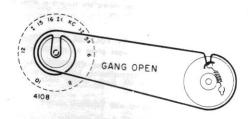


Figure 15. Dial Stringing for 19E1X and 19G1X Chassis.

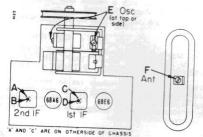


Figure 16. Radio Trimmer Locations.

## 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	Adj. Trimmers
1	Gang condenser		requency	Setting	Order to Max.
_	antenna stator	.1 MFD	455 KC	Tuning gang	*A-B (2nd IF)
2	,,	"		wide open	*C-D (1st IF)
	Plan		1620 KC	"	E (oscillator)
3	adequate signal.  No actual connection (signal)	e to loop of set to obtain	1400 KC	Tune in	§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.

