Information on this page applies ONLY to chassis with a 21 MC IF system.

**OVER-ALL VHF AND IF RESPONSE CURVE CHECK**

<table>
<thead>
<tr>
<th>Receiver Controls and Bias Supply</th>
<th>Sweep Generator</th>
<th>Marker Generator</th>
<th>Oscilloscope</th>
<th>Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contrast control fully to the left. Channel Selector on channel 15 or other unused high channel. Connect negative of 3 volt bias supply to test point &quot;+11&quot; and &quot;+1&quot;, positive to chassis.</td>
<td>Connect to antenna terminals. Set generator to sweep channel selected. See frequency table. Keep generator output as low as possible to prevent overloading.</td>
<td>If an external marker generator is used, loosely couple high side to sweep generator load. Marker frequencies are shown in frequency table.</td>
<td>Connect to point &quot;V&quot; through a decoupling filter. See Figures 11 through 14.</td>
<td>Compare the response curve obtained against the ideal curve shown in Figure 2B. If the curve is not within tolerance, touch up the IF stages as instructed below. It should never be necessary to turn dials more than one turn in either direction. If the curve is satisfactory on the channel checked, all other channels should also be satisfactory. <strong>IMPORTANT:</strong> 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.</td>
</tr>
</tbody>
</table>

Note that video marker on the "Overall VHF-IF Response Curve" will appear on the opposite side of the curve as compared to the "Ideal IF Response Curve", Figure 15. This is due to action of the mixer tube.

**VHF OSCILLATOR ADJUSTMENT USING A SIGNAL GENERATOR**

It is always advisable to make VHF oscillator adjustments using a Television Signal. If a Television Signal is not available, VHF oscillator adjustment can be made using a crystal calibrated signal generator. Make adjustments as follows:

<table>
<thead>
<tr>
<th>Receiver Control Settings</th>
<th>Signal Generator</th>
<th>Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set Channel Selector for each channel to be adjusted. Set &quot;Fine Tuning&quot; control at half rotation. Turn Volume control fully to the right (clockwise).</td>
<td>Connect to antenna terminals. Set generator to exact frequency of VHF oscillator. See frequency table.</td>
<td>Connect a wire jumper from test point &quot;W&quot; on the tuner to test point &quot;Z&quot;. Remove the ratio detector tube V202 (6AL5). Carefully adjust the oscillator slug A15 on each channel until a whistle (beat) is heard in the speaker of the receiver.</td>
</tr>
</tbody>
</table>

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Information on this page applies ONLY to chassis with a 41 MC IF system.

SIMPLIFIED ALIGNMENT

After becoming familiar with alignment procedure, some servicemen simplify subsequent alignment of sets by merely using the essential alignment data given in figures 22, 23, 24, 28 and 29.

Figure 22. Rear View of 205Y4B, 205Y4F, 205Y4L, 255Y4H
Showing Test Point Connections and IF Alignment Data. NOTE: Insert shows underside of Sound Sub-Chassis used in 205Y4H Chassis.

Figure 23. Rear View of 205Y4B Chassis Showing Test Point Connections and IF Alignment Data.

Figure 24. Underside View of 41 MC IF Sub-Chassis Showing Test Point Locations.
Information on this page applies ONLY to chassis with a 41 MC IF system.

**41 MC IF AMPLIFIER AND TRAP ALIGNMENT**

*Connect negative of bias supply to test point "V", see figures 22 or 23, positive to chassis. 4 volt supply required for steps 1, 2, 4, 5, 6, 7, and 8.*

*1/8 volt supply may be required for steps 3 and 13.*

*Disconnect antenna. Connect a jumper wire across antenna terminals.*

*Set Channel Selector to Channel 15 or other unassigned high YHF channel to prevent interference during alignment.*

*Set Contrast control fully counterclockwise, and Noise Gate fully clockwise.*

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

*Connect generator high side to top of insulated tube shield for 626 (V903); connect low side to chassis near tube shield. See Figure 9.*

*Connect VTM high side to test point "V" through decoupling filter, common to chassis. See figures 11 and 24. Use lowest DC scale on VTM.*

<table>
<thead>
<tr>
<th>Step</th>
<th>Signal Sel. Pred.</th>
<th>Instructions</th>
<th>Adjust</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>45.3 MC</td>
<td>Use 4 volts bias. When adjusting, keep reducing generator output to prevent VTM reading from exceeding 3 volts.</td>
<td>A1 for maximum.</td>
</tr>
<tr>
<td>2</td>
<td>45.3 MC</td>
<td></td>
<td>A2 for maximum.</td>
</tr>
<tr>
<td>3</td>
<td>41.25 MC</td>
<td>If necessary, increase generator output and/or reduce bias to -15 volts to obtain a definite indication on VTM.</td>
<td>A3 for minimum.</td>
</tr>
<tr>
<td>4</td>
<td>41.5 MC</td>
<td></td>
<td>A4 for maximum.</td>
</tr>
<tr>
<td>5</td>
<td>42.5 MC</td>
<td>Use 4 volts bias. When adjusting, keep reducing generator output to prevent VTM reading from exceeding 3 volts.</td>
<td>A5 for maximum.</td>
</tr>
<tr>
<td>6</td>
<td>43.5 MC</td>
<td></td>
<td>A6 for maximum.</td>
</tr>
<tr>
<td>7</td>
<td>43.5 MC</td>
<td></td>
<td>A7 for maximum.</td>
</tr>
<tr>
<td>8</td>
<td>45.1 MC</td>
<td>Repeat steps 1 and 2.</td>
<td>Readjust A1 and A2 for maximum.</td>
</tr>
<tr>
<td>9</td>
<td>43.5 MC</td>
<td>Repeat steps 6 and 7.</td>
<td>Readjust A6 and A7 for maximum.</td>
</tr>
<tr>
<td>10</td>
<td>40.5 MC</td>
<td>Repeat step 3.</td>
<td>Readjust A5 for maximum.</td>
</tr>
<tr>
<td>11</td>
<td>41.3 MC</td>
<td>Repeat step 4. NOTE: If more than 9 turn of rotation is needed to peak A6 in this step, then it will be necessary to repeat steps 2 and 5.</td>
<td>Readjust A6 for maximum.</td>
</tr>
<tr>
<td>12</td>
<td>45.3 MC</td>
<td>Repeat steps 2, 4, and 5. If A2, A4, and A5 were far off frequency in these steps, repeat steps 5, 4, and 6 once more.</td>
<td>A8 for maximum.</td>
</tr>
<tr>
<td>13</td>
<td>43.3 MC</td>
<td>Disconnect antenna terminals jumper, connect generator high side to antenna terminals. Set Channel Selector to 2 or other low channel. If necessary, increase generator output and/or reduce bias to -15 volts to obtain a definite indication on VTM.</td>
<td>A9 for maximum.</td>
</tr>
<tr>
<td>14</td>
<td>43.5 MC</td>
<td></td>
<td>A10 for maximum.</td>
</tr>
</tbody>
</table>

To insure correct IF alignment, make "IF Response Curve Check".

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Information on this page applies ONLY to chassis with a 41 MC IF system.

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

<table>
<thead>
<tr>
<th>Receiver Controls and Bias Battery</th>
<th>Sweep Generator</th>
<th>Marker Generator</th>
<th>Oscilloscope</th>
<th>Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set Channel Selector on channel 12 or on unstrained high channel. Contrast control fully to the left. Connect negative of 4½ volt bias supply to test point &quot;T&quot; and positive to chassis.</td>
<td>Connect high side to 9VU mixer-cap, insulated tube shield, see Figure 9. Connect low side to chassis near tube shield. Set sweep frequency to 64.5 KC, and sweep width approximately 7MC.</td>
<td>If an external marker generator is used, loosely couple high side to sweep generator lead on tube shield, low side to chassis. Marker frequencies indicated on IF Response Curve.</td>
<td>Connect high side to test point &quot;V&quot; through a decoupling filter, see figs. 11 and 24.</td>
<td>Check curve obtained against ideal response curve in fig. 25. 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, touchup with IF slugs as instructed below. Important: If curve changes shape with hand capacity, see section 1 of &quot;Important Alignment Notes.&quot;</td>
</tr>
</tbody>
</table>

Figure 25. Ideal IF Response Curve.

Figure 26. IF Response Curve, Incorrect Shape.

If it is necessary to adjust for incorrect response curve tilt or for excessive peak to valley ratio, carefully adjust alignment slugs as instructed under the above figures.

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. Note: When aligning A3, A4 and A7, interaction between these tuned circuits is present. Repeat adjustment of these tuned circuits several times at the correct frequency until a minimum of touch up is required for each stage.

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.
**4.5 MC SOUND IF AND TRAP ALIGNMENT**

Instructions for touch-up of ratio detector secondary A10 and alignment of trap A11 using television signal without test equipment are given below.

It is preferable to use a TV signal rather than a signal generator for this alignment. However, if a TV signal is not available, a signal generator which has been checked against a crystal calibrator or other frequency standard may be used. Accuracy required is within one kilocycle.

- If a television signal is to be used, connect antenna, set Channel Selector to the strongest TV signal available and tune in a picture.
- If no signal generator is to be used, disconnect antenna and short terminals together. Connect high side of generator to junction of L304 and L305 through a .01 mF capacitor.
- Allow about 15 minutes for receiver and test equipment to warm up.

<table>
<thead>
<tr>
<th>Step</th>
<th>Signal Gen. Freq. (MC)</th>
<th>VTVM Connections</th>
<th>Instructions</th>
<th>Adjust</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Tune in TV Signal or Set Signal Generator to exactly 4.5 MC</td>
<td>High side to test point &quot;Y&quot;, common to chassis.</td>
<td>Use lowest DC scale on VTVM.</td>
<td>A8 and A9 for maximum (keep reducing generator output to keep VTVM at approx. 1 volt).</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>High side to test point &quot;Z&quot;, common to chassis.</td>
<td>Use zero center scale on VTVM, if available.</td>
<td>A10 for zero on VTVM (the correct zero point is located between a positive and a negative maximum). If A10 was for off, repeat step 1.</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>High side to test point &quot;V&quot;, common to chassis.</td>
<td>Connect a wire jumper across L305. Use lowest DC scale possible on VTVM.</td>
<td>A11 for minimum.</td>
</tr>
</tbody>
</table>

**TOUCH-UP OF RATIO DETECTOR SECONDARY (A10) USING TELEVISION SIGNAL**

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 adjust the secondary slug (A10) of the Ratio Detector Transformer using a non-metallic alignment tool with a hexagonal end (part number 98A30-12). Both slugs (A9 and A10) have hollow cores. Either slug may be adjusted from the top or bottom of the chassis by passing the alignment tool through the core of the first slug encountered. A10 is the slug closest to the chassis.

Adjust A10 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 A11, USING A TELEVISION SIGNAL**

Best interference (4.5 MC) appears in picture as very fine vertical or diagonal lines, very close together, having a "glare-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 A11 for minimum 4.5 MC interference. If greater accuracy is required, the trap should be adjusted as instructed in step 3 under "4.5 MC Sound IF and Trap Alignment".
Information on this page applies ONLY to chassis with a 41 MC IF system.

**VHF AMPLIFIER AND MIXER ALIGNMENT**

See VHF Amplifier and Mixer Alignment for 21 MC Chassis.

- Connect negative of 3 volt bias supply to AGC buss (test point "X"), positive to chassis.
- Connect sweep generator 300 ohm output to VHF 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 pins just barely visible.
- Connect oscilloscope to test point "W" on tuner (fig 28). Keep scope leads away from chassis.
- Connect a jumper wire from test point "U" to chassis.
- Allow about 15 minutes for receiver and test equipment to warm up.

<table>
<thead>
<tr>
<th>Step</th>
<th>Marker Gen. Freq. (MC)</th>
<th>Sweep Gen. Frequency</th>
<th>Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>192.25 MC (Video Carrier)</td>
<td>Sweeping Channel 10. See &quot;Frequency Table&quot;.</td>
<td>Check for VHF response curve below. Alternately adjust A12 and A13 (figure 28) as required to obtain equal peak amplitudes and symmetry consistent with proper bandwidth and correct marker location.</td>
</tr>
<tr>
<td></td>
<td>197.75 MC (Sound Carrier)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>83.25 MC (Video Carrier)</td>
<td>Sweeping Channel 6. See &quot;Frequency Table&quot;.</td>
<td>Check for VHF response curve below. Adjust A14 as required to obtain curve having maximum amplitude and flat top appearance consistent with proper bandwidth and correct marker location. After completing adjustment, recheck adjustment of step 1.</td>
</tr>
<tr>
<td></td>
<td>87.506 (Sound Carrier)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>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.</td>
<td>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 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.</td>
</tr>
</tbody>
</table>

**Figure 27.** Ideal VHF Response Curve.  
*Note: Full skirt of curve will not be visible unless generator sweep width extends beyond 10 MC.*

**Figure 28.** Top of VHF-UHF TUNER, Showing Adjustment Location.  
**Figure 29.** Front View of Tuner.
Information on this page applies ONLY to chassis with a 41 MC IF system.

OVER-ALL VHF AND IF RESPONSE CURVE CHECK

<table>
<thead>
<tr>
<th>Receiver Controls and Bias Supply</th>
<th>Sweep Generator</th>
<th>Marker Generator</th>
<th>Oscilloscope</th>
<th>Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connect control fully to the left. Channel Selector on channel 12 or other unassigned high channel. Connect negative of 3 volt bias supply to test point &quot;Y&quot; and &quot;X&quot;, positive to chassis.</td>
<td>Connect to antenna terminals. Set generator to sweep channel selected. See frequency table.</td>
<td>If an external marker generator is used, loosely couple high side to sweep generator lead. Marker frequencies are shown in frequency table.</td>
<td>Connect to point &quot;Y&quot; through a decoupling filter; see Figures 11 and 22 through 24.</td>
<td>Compare the response curve obtained against the ideal curve shown in figures 30. If the curve is not within tolerance, touch up the IF slugs as instructed below. It should never be necessary to turn slugs more than one turn in either direction. If the curve is satisfactory on the channel checked, all other channels should also be satisfactory. IMPORTANT: When sweep output is reduced, response curve amplitude on scope should also decrease, but curve shape should remain the same. If curve shape changes, reduce sweep output and/or scope gain until the shape does not change.</td>
</tr>
</tbody>
</table>

Note that video marker on the "Overall VHF-IF Response Curve" will appear on the opposite side of the curve as compared to the "Ideal IF Response Curve" Figure 25. This is due to action of the mixer tube.

Figure 30. Ideal Over-all VHF and IF Response Curve.

Figure 31. Over-all VHF and IF Response Curves, Incorrect Shape.

VHF OSCILLATOR ADJUSTMENT USING A SIGNAL GENERATOR

It is always advisable to make VHF oscillator adjustments using a Television Signal. If a Television Signal is not available, VHF oscillator adjustment can be made using a crystal calibrated signal generator. Make adjustments as follows:

<table>
<thead>
<tr>
<th>Receiver Control Settings</th>
<th>Signal Generator</th>
<th>Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set Channel Selector for each channel to be adjusted. Set &quot;Fine Tuning&quot; control at half rotation, Turn Volume control fully to the right (clockwise).</td>
<td>Connect to antenna terminals. Set generator to exact frequency of VHF oscillator. See frequency table.</td>
<td>Connect a wire jumper from test point &quot;W&quot; on the tuner to test point &quot;2&quot;. See Figures 20 and 22. Remove the radio detector tube V202 (6AL5). Carefully adjust the oscillator slug A13 on each channel until a whistling sound is heard in the speaker of the receiver.</td>
</tr>
</tbody>
</table>

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IF PRE-AMPLIFIER RESPONSE CURVE CHECK AND ALIGNMENT

Important: This alignment is seldom required. It should be made only if UHF reception is poor and after usual causes of poor reception have been checked. This alignment should be made after completing the preceding alignments.

- Set VHF Channel Selector to UHF position, which is when opening in knob (between channels 2 and 13) is at top.
- Connect negative of 3 volt bias supply to tuner AGC bus (test point "X"), positive to chassis.
- Remove IF input cable (M301) from tuner IF output socket (M902); insert IF input cable for step 2.
- Remove CR901 (mixer crystal) from holder. Connect sweep generator high side through 100 ohm resistor to negative clip of mixer crystal socket, see figure 28.

If sweep generator does not have a built-in marker generator, loosely couple a marker generator to the high side of sweep generator. To avoid distortion of the response curve, keep sweep generator output at a minimum, marker pips (just barely visible).
- Connect oscilloscope to test point "W" on VHF section of tuner (figure 28). Keep scope leads away from chassis.
- Connect a wire jumper from test point "U" to chassis.
- Allow about 1.5 minutes for receiver and test equipment to warm up.
- Use a non-magnetic alignment tool, part number 98A30-19.

<table>
<thead>
<tr>
<th>Step</th>
<th>Marker Generator Freq. (MHz)</th>
<th>Sweep Generator Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>45.75 MHz (Video Carrier)</td>
<td>41.23 MHz (Sound Carrier)</td>
</tr>
<tr>
<td></td>
<td>Set sweep at 43.5 MHz, sweep width 12 MHz</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Same as Above</td>
<td>Same as Above</td>
</tr>
</tbody>
</table>

In all cases, connect oscilloscope to test point "W" through a decoupling filter, see figure 11. Keep scope leads away from chassis. Increase bias voltage to 6 volts. Check response curve. If curve does not resemble figure 30, repeat step 1, making minor adjustments. If curve cannot be made to resemble response curve, figure 30, check to be sure all instructions have been followed. Check tubes VR91 and VR92 and repeat alignment. Important: After replacing tubes, it may be necessary to check "VHF and Mixer Alignment".

Figure 30. View of VHF-IF Tuner Showing Method of Aligning (Knifing) Rotor Blades in UHF Section.

Figure 32. IF Pre-amplifier Response Curve.
SERVICING 3D1B, 3D1C RADIO CHASSIS
The 3D1B or 3D1C Radio is used with the 20Y4H and 20S4H Chassis only.

DRIVE CORD STRINGING
Drive cord stringing for the Tuning capacitor is shown below.

ALIGMENT OF 3D1B, 3D1C RADIO CHASSIS
The 3D1B and 3D1C radio chassis should be aligned as instructed below.
Radio alignment adjustments are accessible without disassembly of the radio from the housing. Remove the radio bottom for adjustments D and F. Adjustments D and F are accessible through holes in chassis housing. Location of alignment adjustments is shown in figure 3B.

3D1B, 3D1C RADIO ALIGNMENT PROCEDURE
- Connect output meter across speaker voice coil.
- Turn receiver Volume and Tone controls fully clockwise.
- TV-Reg-Pha switch in "Reg" position.
- Antenna must be connected and placed in the same relative position to the chassis as when in the cabinet.
- Use lowest output setting of signal generator that gives a satisfactory reading on meter.
- Use a non-metallic alignment tool.
- Repeat adjustments to insure good results.

<table>
<thead>
<tr>
<th>Step</th>
<th>Connect</th>
<th>Signal Generator</th>
<th>Dummy Antenna Between Radio and Signal Generator</th>
<th>Signal Generator Frequency</th>
<th>Receiver Dial Setting</th>
<th>Adj. Trimmers In Following Order to Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Tuning Capacitor antenna meter</td>
<td>.1 mf</td>
<td>455 KC</td>
<td>Tuning Capacitor wide open</td>
<td>.2  .5  .7</td>
<td>D  C</td>
</tr>
<tr>
<td>2</td>
<td>-</td>
<td>-</td>
<td>1620 KC</td>
<td>-</td>
<td>-</td>
<td>B</td>
</tr>
<tr>
<td>3</td>
<td>Place generator lead close to loop of set to obtain adequate signal. No actual connection.</td>
<td>1400 KC</td>
<td>At 1400 on dial scale</td>
<td>5 A</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Adjustments C and D are made from underside of chassis.
Antenna trimmer adjustment A in step 3 should be repeated after set and antenna have been installed in cabinet. Important: Antenna trimmer may not peak if antenna leads are not properly routed or secured.
Information on this page applies ONLY to chassis with a 41 MC IF system.

**UHF ALIGNMENT**

Alignment of the UHF section of the tuner should seldom be required. The UHF oscillator tube V901 (6A4P) and the mixer crystal CV04 (1N4162) may generally be replaced without the need for alignment. Tube selection is recommended for best reception and to avoid the need for realignment.

Do not attempt alignment of the UHF section of the tuner unless the required specialized test equipment is available. See test equipment note.

- Connect UHF Sweep Generator to UHF antenna terminals; set sweep width at 12 MC. If sweep generator does not have a built-in marker generator, loosely couple a UHF Marker Generator to the transmission line between antenna terminals and UHF tuner.
- Connect VHF Marker Generator high side to AC CB (V902) insulated tube shield. Connect low side to chassis near the tube shield. Set marker generator frequency to 45.3 MC for all steps below.
- Connect oscilloscope to test point “W” on VHF sec- tion of tuner (figure 28).
- Connect negative terminal of 1½ volt bias supply to test point “X”, positive to chassis.
- Connect a wire jumper from test point “U” to chassis.
- Allow about 15 minutes for receiver and test equipment to warm up.

To obtain the accuracy required for this alignment, two marker generators should be used. A UHF Marker Generator is coupled to the antenna circuit of the UHF tuner and serves as a calibration check for the UHF Sweep Generator. A VHF Marker Generator is coupled to a special tube shield over V902 and is used to be certain that the proper band of frequencies is being selected by the UHF tuner and UHF IF preamplifier.

<table>
<thead>
<tr>
<th>Step</th>
<th>UHF Sweep Gen. Center Frequency</th>
<th>UHF Marker Gen. Frequency</th>
<th>Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>887 MC</td>
<td>887.5 MC</td>
<td>Tune UHF tuner to channel 83, or until response curve is observed on oscilloscope. Adjust A17 (figure 28) until mark is located in the center of the response curve. <strong>See note 3 below.</strong></td>
</tr>
<tr>
<td>2</td>
<td>473.5 MC</td>
<td>473.5 MC</td>
<td>Tune UHF tuner to channel 14, or until response curve is observed on oscilloscope. Note the location of marker. If it is not centered on the response curve, move the segment of the oscillator rotor blade adjacent to the rotor as shown in figure 35, until the marker becomes centered on the response curve. <strong>See note 3 below.</strong></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td>Set the sweep generator to sweep the channel to be checked. Set the marker generator to the mid-frequency of the channel to be checked. (The channel’s mid-frequency is determined by dividing 2.25 MC by the lower frequency limit of the channel.) See frequency table.</td>
</tr>
<tr>
<td>4</td>
<td>887 MC</td>
<td>887.5 MC</td>
<td>Check response curve for each channel operating in the service area. Marker location should be as shown in figure 36. In general, the adjustments performed in steps 1 and 2 are suf- ficient to provide satisfactory curves and correct marker location for all channels. However, if reasonable alignment is not obtained on a particular channel, see instructions given in steps 4 and 5 below.</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td>Tune UHF tuner to channel 83. Carefully adjust both UHF preselector trimmer tabs (figure 34), by moving them back and forth, in order to attain maximum amplitude and proper shape of response curve at test point “W”. Adjustment of the trimmer tabs is made from the bottom of the UHF section of the tuner by means of a test with a thin knife blade. Use care when moving the tabs, since only slight movement of the tabs should be required to obtain the proper response curve.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Successively sweep channels 83 to 14, inserting the appropriate mid-channel frequency marker determined as instructed in step 3. See frequency table.</td>
</tr>
</tbody>
</table>

To track both UHF preselector sections to each other and to the oscillator section from channel 83 to channel 14, by bending or knifing the preselector rotor blade segments (figure 35), to obtain the desired response curve, see figure 36. To avoid affecting the tracking above the point of knifing, always strike the plates while tuning lower in frequency. Check which sections require knifing by bringing a finger close to either of the lines. If added capacity is introduced by the finger improves the RF response, more capacity must be added than the rotor and start bending the rotor plates closer to the rotor. Conversely, if added capacity makes the response worse, capacity must be reduced by bending the rotor plates away from the stator line. Generally, one preselector section or the other must be adjusted to remove tilt from the RF response curve. When correcting for a tilted condition, always adjust the preselector section that removes the tilt and of the same time improves the position of the marker. In some cases, it will be necessary to adjust both preselector sections to remove tilt and obtain correct marker location. Plates should always be adjusted evenly on both sides of the same preselector section and only on that portion which last meshed with the stator. Use caution when knifing the preselector blades so as not to disturb the position of the stator line.

*NOTE 1*: If UHF tuner is in a mount of alignment, the response curve may be too low in amplitude to be readily observed, or it may be very distorted in shape. In this case, it will be necessary to roughly align the preselector before completing final oscillator adjustment. This is done by knifing the preselector rotor blade segments (figure 35) adjacent to the stator at dial setting for the affected channel.

*NOTE 2*: If the dial calibration reads within 3 channels of the frequency to which the UHF Sweep Generator is tuned, the oscillator rotor blades do not require adjustment. If the dial calibration is more than 3 channels off in frequency, carefully strike the segmented portion of the oscillator rotor blade that last meshed with the stator until the dial calibration accuracy is within ±3 channels.

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Figure 42. View of Printed Wiring Side of Sound Board used in all VHF and VHF-UHF "TV only" models with "Tap Tuning". Gray area represents printed wiring; black symbols and lines represent components and connections on opposite side.

Figure 43. View of Printed Wiring Side of Sound Board used in models with "Bottom Tuning". Gray area represents printed wiring; black symbols and lines represent components and connections on opposite side.

Figure 44. View of Printed Wiring Side of Sync Board used in all models having a 21" or 24" Picture Tube. Gray area represents printed wiring; black symbols and lines represent components and connections on opposite side.
SERVICING PRINTED WIRING

A major portion of the circuit wiring of these receivers is contained in two or three printed wiring assemblies.

Trouble shooting of printed wiring is similar to that of conventionally wired circuits. Complete instructions on the service and repair of printed wiring is given in Service Manual Bo. 5599, available at no charge from Admiral distributors.

To simplify circuit tracing, identifying tube socket connections, locating component connection points, and making voltage and waveform measurements on the printed wiring assembly, figures 40 through 47 have been included in this manual.

All views are of the wiring side of the printed wiring assemblies. Figures 40 through 47 show the exact location and connection points of each component and voltages on the IF and Sound Boards. Except that the components are shown schematically instead of pictorially, this figure illustrates what would be seen if it were possible to look "through" the printed wiring board and actually see the various components on the board.

Figures 46 and 47 are views of the wiring side of the sync boards showing all the necessary voltages and waveforms taken from the wiring side of the printed wiring assemblies. The control settings and other conditions for measuring voltages and waveforms are given on schematic pages.

As an added convenience and time saver for servicing Admiral printed wiring, a printed wiring repair kit (part number 50379) is available from Admiral distributors. This kit contains the specialized tools, special solder, lacquer and lacquer solvents required for making a perfect repair job. A manual on the Service and Repair of Printed Wiring, Form No. 5599 is also included with the kit.

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To illustrate the basic difference in circuitry, B+ distribution diagrams are given in Figures 49 through 52.

When servicing, it is important to note that when chassis with a 2L 2C IF system, B+ voltage is applied to the 1st and 2nd IF amplifiers V101 and V102 respectively in series; see B+ distribution on figures 49, 49 and 51.

The power supply provides approximately 270 volts of D.C. voltage for application to the rear circuits. The distribution of this voltage to the various stages is a series-parallel arrangement. The horizontal and vertical deflection circuits, sound amplifier, sync inverter, and AGC tube screen grid, 1st and 2nd IF amplifiers (in UHF models only) and VHF amplifier stages are approximately 270 volts and thus are acted directly across the 270 volt line, of the other circuits require approximately half of this voltage and obtain it from the one of the source output tube V204 which functions as a series voltage regulator. All the current drawn by these circuits passes through V204, hence the B+ voltage (270 volts) is divided nearly equally between V204 and the stages connected to its cathode. To prevent abnormal current flow through V204, some low voltage stages are connected to 270 volts B+ through a voltage dropping resistor.

The control grid of V204 is connected to a voltage dividing network consisting of R212 and R215, resulting in a fixed potential of approximately 140 volts being applied to the control grid. A change in the cathode voltage of V204 due to AGC fluctuations, tube current variations, etc., will cause a change in the grid to cathode voltage of V204. The resulting change in cathode current tends to maintain the 150 volt supply nearly constant. High value capacitors (C214 and C215a) are necessary in the cathode circuit of V204 to reduce any fluctuations in current due to the audio current components flowing in this stage.

Figure 45. View of Printed Wiring Side of Sync Board used in models having a 27" Picture Tube. Gray area represents printed wiring; black symbols and lines represent components and connections on opposite side.

Figure 46. View of Printed Wiring Side of Sync Board used in models having a 21" or 24" Picture Tube showing Valatges and Waveforms. Conditions for measurements given on schematic pages.
Figure 51. Simplified B+ Distribution Diagram for VHF TV-Radio-Phase Combination models.

Figure 52. Simplified B+ Distribution Diagram for VHF-UHF TV-Radio-Phase Combination models.
Figure 48. Simplified B- Distribution Diagram for all VHF "TV-only" models having a 21" or 24" Picture Tube.

Figure 49. Simplified B- Distribution Diagram for all VHF-UHF "TV-only" models having a 21" or 24" Picture Tube.

Figure 50. Simplified B- Distribution Diagrams for models having a 27" Picture Tube.
CONDITIONS FOR OBSERVING WAVEFORMS

Waveforms - Typical high voltage test probe of the type at V465 and V467 and at pin 3 of V468. Do not attempt to observe waveforms at these points unless suitable test equipment is used. Waveforms at these points may be taken with a repetitive voltage divider probe. The waveform at pin 3 of V467 may also be taken by clipping the test probe to a point between pin 3 and the nearest ground connection. If the waveform is taken as shown in this manner, its shape will be the same, but the peak-to-peak voltage will be lower, depending on the degree of coupling between the clippingscope and the lead connecting to pin 3 of V468.

• Waveforms should resemble those shown on the schematic.

• Waveforms are taken with a transmitted signal input to the receiver channel.

• Set all controls for normal picture. Set Noise Gate control fully counterclockwise. After the receiver is set for a normal picture, turn the Noise Gate control fully clockwise.

• On/Off sweep is set at 30 cycles for vertical waveform and at 1200 cycles for horizontal waveform, in normal 1 composite cycle to be observed.

• Peak-to-peak voltages will vary from those shown on the schematic, depending on the test equipment employed and chassis parts tolerance.

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Form No. ST566-1
FEATURES

The Admiral 2074 series of television receivers is completely different electrically and mechanically from any previous Admiral sets. In designing these new models ease of service was a most important factor. As a result of Admiral's engineering skill, this line of receivers is much easier to service than many competitive sets.

These chassis have been electrically designed to provide superior performance under all signal conditions. Up to 75 per cent of the wiring is included in three printed wiring boards (in many models which eliminate chances for human error and assure absolute uniform quality and dependability.

A few of the electrical and mechanical design features which provide better performance and make simpler servicing possible are listed below:

VERTICAL CHASSIS

All 2074 series chassis are mounted vertically with the neck of the picture tube protruding through a hole in the center of the chassis. Mounting the chassis in a vertical plane permits more compact, simplified design and makes tubes and control components more readily accessible for service or replacement. Although the chassis is mounted vertically, the chassis have been designed so that the main operating controls are at the front of the set for customer convenience, and do not inconveniently extend from the side or top of the cabinet.

CHASSIS AND PICTURE TUBE SEPARATELY REMOVABLE

An entirely new method is used for mounting the chassis and picture tube in these receivers. The picture tube can be removed without having to loosen or remove the chassis; likewise, the chassis can be removed without loosening or removing the picture tube.

The picture tube is rigidly mounted to brackets from the top of the set. It is accessible for replacement by merely removing the two screws holding the picture tube retaining strip at the top of the window and then removing the device and mask. Detailed picture tube replacement instructions are included in the Installation and Service Notes which are packed with each receiver and are also included in this manual.

The chassis is easily removed from the back of the set. Detailed instructions for removing the chassis are fastened to the inside wall of the cabinet for ready reference.

EASY TO TRANSPORT CHASSIS

On those occasions when it is necessary to remove the chassis from the cabinet for shop service, the lightweight, compact design of these chassis will be appreciated. The brackets used to mount the chassis in the cabinet and to mount the tuner have been specially designed so that the chassis may be transported in either a vertical or horizontal position.

PLUG AND SOCKET CONNECTIONS

These chassis have been designed with enough plug and socket connections to simplify testing and carrying since there is no need for parts dangling from the chassis. The deflection yoke, speaker, volume and contrast controls, auxiliary controls, pilot light (if used), anamorphic radio (in combination models), are all connected to the chassis by plug and socket arrangement. Note: When removing the chassis for shop service, the control cable assembly (Off-On-Volume, Contrast, Brightness, Vertical, and Tone controls) and deflection yoke should be removed from the cabinet and also taken to the shop. It should not be necessary to remove the picture tube since the universal type 5AF2-4 or the proper type will be available in the shop.

FILTER CHOKER MOUNTED ON CHASSIS

The power supply filter choke is mounted on the chassis instead of on the speaker as has been done previously. This should eliminate the necessity of removing the speaker from the cabinet when shop repairs are required, since most shops have a universal type speaker with output transformer.

UNIVERSAL TUNERS USED

All 2074 series chassis use the same VHF tuner, part number 9420-2-7. All VHF-UHF 2074 series chassis use the same VHF-UHF tuner, part number 9427-49. The chassis have been designed so that it is not necessary to use tuners with different shaft lengths for various cabinet designs. This lessens stock problems and makes replacement parts more readily available.

REMOVABLE COVER ON HIGH VOLTAGE COMPARTMENT

All 20-series chassis have been provided with a removable cover on the high voltage compartment. The cover can be removed with a coin or
screwdriver for easy replacement of the high voltage rectifier and inspecting or testing the horizontal output transformer. To prevent loss, displacement, or failure to replace it, the cover is securely fastened (with braided wire) to the compartment.

ALL ALIGNMENT TEST POINTS ACCESSIBLE WITH CHASSIS IN CABINET (most models)

To make alignment of these chassis easier, whether it is done with the chassis in the cabinet or on the service bench, all the alignment test points are available on the rear side (with tubes).

6C56 VARIABLE-MU CASCODE AMPLIFIER

Admiral engineers, cooperating with receiving tube manufacturers, have developed a new cascode amplifier tube, the 6C56.

This twin-triode is a variable-mu type having a semi-remote cut-off characteristic. Since it has a greater range of linear amplification, it can handle greater variations in incoming signal strengths (and the resulting changes in AGC bias voltage) without introducing cross modulation.

Cross modulation is the modulation of the desired carrier by an undesired signal which shows up as interference in the picture. It occurs when the bias applied to a stage is high enough to operate it very near to plate current cut-off. When operated under such conditions, the positive portion of a modulation envelope which is passing through this stage, is amplified much more than the negative portion. This non-linearity in amplification is equivalent to detection, which is actually taking place. The detected signal can then modulate another undesired signal which may also be present in this stage.

Although the 6C56 is directly interchangeable and can be used as a replacement, it is recommended that the 6C56 be used unless it is impossible to obtain, in your locality.

6C56 VARIABLE-MU HIGH GAIN IF AMPLIFIER

An improved pentode IF amplifier is used in the 1st and 2nd IF stage of all chassis using the printed wiring IF board.

The semi-remote cut-off characteristic of this tube enables Admiral receivers to handle stronger incoming signals without overloading. Distortion such as "cross modulation" or "non-linearity in amplification", due to high signal levels, is minimized or completely eliminated. See paragraph 3 under "6C56 Variable-Mu Cascode Amplifier".

These advantages are obtained without any sacrifice in IF amplification in weak signal areas.

SPECIFICATIONS

Picture Tube: Direct view Electromagnetic deflection. Electrostatic Focus in 21-inch and 24-inch models. PM Focus in 27-inch models.

Operating Voltage: 110-120 volts, 60 cycles, A.C.

Voltage:
205 volts for all straight television VHF models.
210 volts for all combination TV, Radio, Mono VHF models.
215 volts for all straight television VHF-JHF models.
220 volts for all combination TV, Radio, Mono VHF-JHF models.

Input Impedance and Transmission Line: 300 ohm balanced (between antenna terminals) for either VHF or UHF inputs.

Antenna: All models are equipped with built-in antennas.

Intermediate Frequencies:

HIGH VOLTAGE WARNING

High voltages are present throughout the horizontal output, damper and second audio supply circuits. No attempt should be made to make measurements from high voltage points in these circuits with ordinary test equipment.

Caution: Operation of the set outside of the cabinet or with cabinet back removed involves shock hazard. Exercise normal high voltage precautions.

<table>
<thead>
<tr>
<th>Tube Code</th>
<th>Description</th>
<th>Chassis Models</th>
<th>Notes</th>
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<tbody>
<tr>
<td>V601</td>
<td>6G6</td>
<td>20Y4B, 20Y4C</td>
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<td>6J6</td>
<td>20Y4D, 20Y4E</td>
<td>VHF Oscillator and Mixer</td>
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<td>6AL5</td>
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<td>IF Detector</td>
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<td>Horizontal Discriminator</td>
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<td>Rectifier</td>
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<td>6AF4</td>
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<td>VHF IF Amplifier</td>
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<td>V802</td>
<td>6AC8</td>
<td>20Y4D, 20Y4E</td>
<td>VHF 1st IF Pre-amp</td>
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<td>20Y4D, 20Y4E</td>
<td>VHF 2nd IF Pre-amp</td>
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<td>20Y4D, 20Y4E</td>
<td>Sound IF Amplifier</td>
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<td>20Y4D, 20Y4E</td>
<td>Ratio Detector</td>
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<td>V806</td>
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<td>V807</td>
<td>6GF5</td>
<td>20Y4D, 20Y4E</td>
<td>Sound Output in TV</td>
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</tbody>
</table>

### DIFFERENCES BETWEEN CHASSIS

The 20Y4 series chassis covered in this manual employ the same basic circuitry with differences which are described in the following paragraphs.

The 20Y4B chassis is a 20 tube VHF receiver having a 21 NC IF system and a 21-inch electrostatically focused picture tube. The chassis has three printed wiring boards; the IF Board, Sound Board and Sync Board. The IF Board is mounted at the bottom of the chassis, adjacent to the tuner and the Sound Board is mounted at the top of the chassis. The chassis is mounted vertically with the neck of the picture tube protruding through a hole in the center of the chassis. The tuner is mounted to the side of the chassis at the bottom.

The 20Y4A chassis is similar to the 20Y4A chassis except that the tuner is mounted to the side of the chassis at the top. This tube input leads must be as short as possible, the positions of the IF Board and Sound Board are interchanged and both boards are inverted end for end.

The 20Y4B chassis is similar to the 20Y4B chassis except that a 24-inch electrostatically focused picture tube is used.

The 20Y4B chassis is similar to the 20Y4B chassis with the following differences. Due to dimensional differences of the 27-inch tube, this chassis is mounted on end (rotated 90°) as compared to all other 20Y4 series chassis. This chassis uses a 27-inch picture tube with a FM focus assembly. Width and horizontal linearity adjustments are also used. A different printed wiring Sync Board is used because a different vertical output tube V607 (647SW) is required. This tube is mounted on a metal extension located in the lower corner of the chassis.

The 20Y4A chassis is used in combination model. A VOA Dynamic radio is used in conjunction with the television chassis. The 20Y4B
chassis is similar to the 2048 chassis with the
following differences. Two printed wiring boards
are used instead of three. The IF Board and Sync
Board are similar to those used in the 2048
chassis. The sound stages are conventionally
wired on a metal sub-chassis which is mounted to
the main chassis.

The 2048 chassis is a 21 tube VHF-UHF re-
ceiver having a 4C MC IF system. It is very sim-
lar to the 2048 chassis except that a 3 tube
VHF-UHF tuner is used and the IF system is not
on a printed wiring board, but is conventionally
wired on a metal sub-chassis.

The 2044 chassis and 2044A chassis are sim-
lar to the 2048 chassis and 2044 chassis with
exception of the IF system and VHF-UHF tuner.

The 2044A chassis is similar to the 2044A
chassis with exception of the IF system and VHF-
UHF tuner.

The 2044A chassis is similar to the 2044A
chassis with exception of the IF system and VHF-
UHF tuner.

INSTALLATION ADJUSTMENTS

Make all checks or adjustments given here to insure best performance and ease in tuning. It is especially
important that the Channel Slugs and Ion Trap be
adjusted upon installation and at every service call.

Removal of cabinet back disconnects interlock. Use a separate line cord (part number 03422-1) when servicing.

ADJUST VHF CHANNEL SLUGS

VHF channel slug adjustment can be made with-
out removing chassis from the cabinet.

Check individual channel slug adjustment for
each VHF station received. If this adjustment
is properly made, it is possible to tune from
one station to another by turning the VHF Chan-
nel Selector only.

Adjust as follows:
a. Turn the set on and allow 15 minutes to warm
up.
b. Set the VHF Channel Selector for VHF Channel
to be adjusted; set the UHF Channel Selector
[VHF-UHF sets only] between channels 50 and
60. Set other controls for normal picture
and sound.
c. Remove the VHF Channel Selector knob.
d. Set the Fine Tuning control (UHF Channel
Selector in VHF-UHF sets) to the center of
its VHF tuning range.

To do this for VHF models, rotate the knob
approximately half-way between its stops. Then
remove knob.

To do this for VHF-UHF models, rotate the
UHF Channel Selector knob two or more full turns
in either direction. Then rotate the knob be-
tween 1/2 and 3/4 of a turn in the opposite
direction. Remove the knob. If the VHF chan-
nel slug holds is not exposed, repeat the above
procedure.
e. Insert a 1/8" blade, 10° long, flexible non-
metallic alignment tool in the hole adjacent
to the channel tuning shaft (see figures 1,
2, and 3). WARNING: In VHF-UHF models, in-
sert tool very carefully, since it may strike the
UHF rotor or stator plate and cause tuner
misalignment. Be sure to engage the VHF chan-
nel slug and not the UHF oscillator adjustment.

For each VHF channel in operation, care-
fully adjust the channel slug for best pic-
ture. (Note that this may not be at the point
at which the sound is loudest.) IMPORTANT:
Always turn slug out (counterclockwise) first;

then turn in. Only slight rotation of the
slug will be required; turning the slug in
too far will cause it to fall into the coil.

Figure 1. Channel Slug Location
for Top Tuning VHF Models. View
through hole in glass and mask
with Channel Selector and Fine
Tuning Knobs Removed.

Figure 2. Channel Slug Location
for Bottom Tuning VHF Models.
View through hole in glass and
mask with Channel Selector and
Fine Tuning Knobs removed.

Figure 3. Channel Slug Location
for Top Tuning VHF-UHF Models.
View through hole in glass and
mask with Channel Selector and
Fine Tuning Knobs removed.

NOISE GATE ADJUSTMENT

The Noise Gate control is used to improve
sync stability in fringe and noisy areas.

Set the Noise Gate fully to the left (counter-
clockwise). Set the Channel Selector for the
strongest TV station. (Be sure that the Verti-
cal and Horizontal adjustments are correct.) If
the picture is unstable (jitters or rolls), slow-
ly turn the Noise Gate control to the right un-
til the picture just becomes stable. Check ad-
justment on other TV stations, and if necessary,
readjust control.

Caution: If the Noise Gate is turned too far
clockwise for a strong signal, the picture may
roll vertically, tear horizontally or disappear.
Figure 7. Rear View of 2074H Chassis Showing Adjustment Locations.

Figure 8. Rear View of 2074H, 2054H Chassis Showing Adjustment Locations.

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TELEVISION ALIGNMENT

The following alignment pages are marked at the top to indicate whether the information applies to both 21 MC and 41 MC sets or applies to only one. Be sure you are following the correct procedure for the chassis being aligned.

GENERAL

Complete alignment consists of the following individual checks and should be performed in this sequence:
1. IF Amplifier and Trap Alignment.
2. IF Response Curve Check.
3. 6 MC Soud IF and Trap Alignment.
4. VHF and Mixer Alignment.
5. Over-all VHF and IF Response Curve Check.
6. VHF Oscillator Adjustment.
7. IF Pre-amplifier Response Curve Check and Alignment.
8. UHF Tuner Alignment.

TEST EQUIPMENT

It is strongly recommended that the following test equipment be available.

A. Generator

Sweep generator must provide sweep frequencies from
- 0 to 50 MC range: 500 to 1000 Hz with at least
- 225 MC range: 1000 Hz sweep width
- 890 MC range: Output: adjustable; at least 2 volt maximum output.
Input impedance: 300 ohms balanced to ground.
Sweep generator must not have constant output voltage linear sweep over the sweep range, will produce curves which are widely different from the ideal curves shown on following pages. If repeated difficulty is encountered in tuning these curves, the sweep generator should be checked. A simple check is to observe the response curve that is in alignment.

B. Oscilloscope

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

C. Vacuum-Tube Voltmeter

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

D. Bias Supply

0 to 45 volts (battery or electronic).

ALIGNMENT TOOLS

The following alignment tools are required. They can be obtained from the Admiral distributor under the part numbers listed below:

Metal alignment screwdriver part number 98A30-9.
Non-metallic (fiber) alignment screwdriver (16" long, ½" diameter) part number 98A30-19.
Non-metallic alignment wrench (9" long, for hexagonal core IF slugs) part number 98A30-12.
Non-metallic alignment wrench (9" long, for small hexagonal core IF slugs) part number 98A30-14.
Non-metallic alignment wrench (12" long, for hexagonal core UHF IF Pre-amplifier slugs), part number 98A30-18.

IMPORTANT ALIGNMENT HINTS

(For all 204-series chassis.)

The following suggestions should be performed if difficulty is experienced during the alignment procedure.

1. Circuit Instability: When spot frequency tuning the IF amplifiers, the VTVM pointer may swing a distance too near the IF transformers.
   When viewing the IF response curve on an oscilloscope, the curve may change shape with hand capacity, especially when using the IF transformers T301, T204. To correct either of these conditions, the following alignment hints should be followed:
   (a) Check the generator output leads to be certain that the unshielded portion (especially the grounded lead) is as short as practicable.
   (b) Be sure that a decoupling network is used at the video detector output and that the leads on the network are kept as short as possible; see figure 11.
   (c) The use of a nine inch hexagonal alignment tool will permit adjustment without encountering hand capacity effects. See "Alignment Tools" above.

2. Receiver Overloading When Checking the Over-all Response Curve: Due to the inherent high sensitivity of these receivers, it is very easy to cause over-
loading of the third IF amplifier stage. In some cases, generator leakage alone is enough to produce a response curve on the oscilloscope. To prevent overloading, the following things should be done:

(a) Be certain that the generator output attenuators are set for a minimum output.
(b) Some generators have a built-in pad in the output cable. Be sure that the pad in the cable is properly connected in the circuit. Refer to the generator instruction manual for details.
(c) If a pad is not built in, the 12 db pad shown below in figure 10 can be constructed and connected between the generator and the antenna terminals.

3. SPECIAL TUBE SHIELD: For injecting 21MC or 41MC IF signals, use an insulated tube shield over the VHF Oscillator-Mixer tube. Insulate bottom of tube shield with masking tape, see figure 9.

4. CONNECT SPEAKER AND DEFLECTION YOKE: Speaker and deflection yoke must be connected to chassis during alignment.

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**FREQUENCY TABLE FOR CHASSIS WITH 41 MC IF SYSTEM**

For chassis with 21 MC IF system, see footnote 1

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<td>82-100</td>
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*For oscillator frequencies from channels 2 to 13, frequency indicated is that of YHF oscillator. For oscillator frequencies higher than channel 13, frequency indicated is that of YHF oscillator with a YHF oscillator input.

1. For channels 2 through 13, subtract 20 MC from Oscillator Frequency for chassis with a 21 MC IF system.
Information on this page applies ONLY to chassis with a 21 MC IF system.

SIMPLIFIED ALIGNMENT

After becoming familiar with alignment procedure, some servicemen simplify subsequent alignment of sets by merely using the essential alignment data given in figures 12, 13, 14, 18 and 19.

A7---
22.6MC MAX.
MIXER PLATE

A2---
27.2MC MIN.
TRAP

A4---
26.5MC MAX.
INPUT I.F. IF

A5---
25.3MC MAX.
1ST. I.F

A1---
21.2MC MIN.
TRAP

A6---
22.3MC MAX.
2ND I.F

A7---
23.7MC MAX.
3RD I.F

A8---
4.5MC MAX.
SOUND COUPLING

(450MC ZERO)
PHR. RATIO DET.

A9---
(50MC ZERO)
SEC. RATIO DET.

A10--
(450MC ZERO)
PHR. RATIO DET.

A11--
4.5MC MIN.
TRAP

Figure 12. Rear View of 20Y4E, 20Y4F, 20Y4L, 20Y4H Chassis Showing Test Point Connections and IF Alignment Data. NOTE: Insert shows underside of Sound Sub-Chassis used in 20Y4H Chassis.

Figure 14. Rear View of 20Y4D Chassis Showing Test Point Connections and IF Alignment Data.
Information on this page applies ONLY to chassis with a 21 MC IF system.

21 MC IF AMPLIFIER AND TRAP ALIGNMENT

- Connect negative of bias supply to test point "C", see figures 12 through 14, positive to chassis. -1 volt supply required for steps 3, 4, 5, 6, 7 and 8. +1 volt supply may be required for steps 1 and 2.
- Disconnect antenna. Connect a jumper wire across antenna terminals.
- Set Channel Selector to Channel 3 or other unassigned channel to prevent interference during alignment.
- Adjust about 15 minutes for receiver and test equipment to warm up.

Step | Signal | Instructions | Adjust
---|---|---|---
1 | 21.25 MC | If necessary, increase generator output and/or reduce bias to -10 volts to obtain a definite indication on VTM. | A1 for minimum.
2 | 21.25 MC | | A2 for minimum.
3 | 22.25 MC | Use 1 volt bias. When adjusting, keep reducing generator output to prevent VTM reading from exceeding 5 volts. | A3 for maximum.
4 | 22.5 MC | | A4 for maximum.
5 | 23.5 MC | Use 2 volts bias. When adjusting, keep reducing generator output to prevent VTM reading from exceeding 10 volts. | A5 for maximum.
6 | 23.25 MC | | A6 for maximum.
7 | 23.75 MC | | A7 for maximum.
8 | | To insure correct IF alignment, make "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 5 or on unassigned low channel. Contrast control fully to the left. Connect negative of 1 volt bias supply to test point "Y" positive to chassis. | Connect high side to dab mixer-out. Insulate tube shield, see fig. 9. Connect low side to chassis near tube shield. 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 tube shield, low side to chassis. Marker frequencies indicated on IF Response Curve. | Connect high side to test point "Y" through a decoupling filter, see figs. 11 through 14. | Check curve obtained against ideal response curve in fig. 15. 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 the markers are not in the proper location on the curve, touch-up with IF slugs as instructed below. Important: If curve changes shape with hand capacity, see section 1 of "Important Alignment Hints."

![Figure 13. Ideal IF Response Curve.](image)

![Figure 16. IF Response Curves, Incorrect Shape.](image)

If it is necessary to adjust for approximate equal peaks and marker location, carefully adjust alignment slugs as instructed under the above figures. It should not be necessary to turn the slugs 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.

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Information on this page applies ONLY to chassis with a 21 MC IF system.

**4.5 MC SOUND IF AND TRAP ALIGNMENT**

This procedure is identical for 21 MC and 41 MC IF Chassis.

### VHF AMPLIFIER AND MIXER ALIGNMENT

See page 18 for VHF Amplifier and Mixer Alignment for 41 MC Chassis.

- Connect negative of 2 volt bias supply to test point "X", positive to chassis.
- Connect sweep generator 300 ohm output 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.
- Connect oscilloscope through a 15,000 ohm resistor to test point "W" on tuner (figure 18). Keep scope leads away from chassis.
- Allow about 15 minutes for receiver and test equipment to warm up.

<table>
<thead>
<tr>
<th>Step</th>
<th>Marker Gen. Freq. (Mc)</th>
<th>Sweep Gen. Frequency</th>
<th>Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>192.25 (Video Carrier)</td>
<td>Sweeping Channel 10.</td>
<td>Set Channel Selector to channel 10. Check response obtained with VHF response curve shown in figure 17. Alternately adjust A12 and A13 (figure 18) as required to obtain equal peak amplitudes and symmetry consistent with proper bandwidth and correct marker location.</td>
</tr>
<tr>
<td></td>
<td>197.75 (Sound Carrier)</td>
<td>See &quot;Frequency Table&quot;</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>82.25 (Video Carrier)</td>
<td>Sweeping Channel 6.</td>
<td>Set Channel Selector to channel 6. Check response obtained with VHF response curve shown in figure 17. Adjust A14 as required to obtain curve having maximum amplitude and flat top appearance consistent with proper bandwidth and correct marker location. After completing adjustment, recheck adjustment of step 3.</td>
</tr>
<tr>
<td></td>
<td>87.75 (Sound Carrier)</td>
<td>See &quot;Frequency Table&quot;</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td>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 coil 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 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.</td>
</tr>
</tbody>
</table>

---

Figure 17. Ideal VHF Response Curve. 
Note: Full skirt of curve will not be visible unless generator sweep width extends beyond 10 MC.

Figure 18. Top of VHF Tuner 94092-7. 
Showing Adjustment Locations.

Figure 19. Front View of VHF Tuner 94092-7. 
Bottom Cover Removed.
Information on this page applies ONLY to chassis with a 41 MC IF system.

SIMPLIFIED ALIGNMENT

After becoming familiar with alignment procedure, some servicemen simplify subsequent alignment of sets by merely using the essential alignment data given in figures 22, 23, 24, 25 and 29.

Figure 22. Rear View of 205Y4B, 205Y4F, 203Y4L, 265Y4M Showing Test Point Connections and IF Alignment Data. NOTE: Insert shown underside of Sound Sub-Chassis used in 203Y4H Chassis.

Figure 23. Rear View of 205Y4B Chassis Showing Test Point Connections and IF Alignment Data.

Figure 24. Underside View of 41 MC IF Sub-Chassis Showing Test Point Locations.

**41 MC IF AMPLIFIER AND TRAP ALIGNMENT**

*Connect negative of bias supply to test point "V", see figures 22 or 23, positive to chassis. 4 volt supply required for steps 1, 2, 3, 5, 6, 7 and 8.*

-.12 volt supply may be required for steps 1 and 3.

*Disconnect antenna. Connect a jumper wire across antenna terminals.*

*Set Channel Selector to Channel 10 or other unassigned high VHF channel to prevent interference during alignment.*

*Set Contrast control fully counterclockwise, and Noise Gate fully clockwise.*

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

*Connect generator high side to top of insulated tube shield for 628 (V903); connect low side to chassis near tube shield. See figure 9.*

*Connect VTM high side to test point "K" through a decoupling filter, common to chassis. See figures 11 and 24. Use lowest DC scale on VTM.*

<table>
<thead>
<tr>
<th>Step</th>
<th>Signal</th>
<th>Dec, Pref.</th>
<th>Instructions</th>
<th>Adjust</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>45.5 MC</td>
<td>Use 4 volts bias. When adjusting, keep reducing generator output to prevent VTM reading from exceeding 3 volts.</td>
<td>A1 for maximum.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>45.3 MC</td>
<td>Use 4 volts bias. When adjusting, keep reducing generator output to prevent VTM reading from exceeding 3 volts.</td>
<td>A2 for maximum.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>41.25 MC</td>
<td>If necessary, increase generator output and/or reduce bias to -.15 volts to obtain a definite indication on VTM.</td>
<td>A3 for minimum.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>41.5 MC</td>
<td>Use 4 volts bias. When adjusting, keep reducing generator output to prevent VTM reading from exceeding 3 volts.</td>
<td>A4 for maximum.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>42.5 MC</td>
<td>Repeat steps 1 and 2.</td>
<td>Readjust A1 and A2 for maximum.</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>43.5 MC</td>
<td>Repeat steps 6 and 7.</td>
<td>Readjust A6 and A7 for maximum.</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>43.5 MC</td>
<td>Repeat step 5.</td>
<td>Readjust A5 for maximum.</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>41.5 MC</td>
<td>Repeat step 4. <strong>NOTE:</strong> If more than 1 turn of rotation is needed to peak A6 in this step, then it will be necessary to repeat steps 2 and 6.</td>
<td>Readjust A6 for maximum.</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>45.3 MC</td>
<td>Repeat steps 2, 4 and 6. If A6, A4 and A5 were far off frequency in these steps, repeat steps 8, 4 and 6 once more.</td>
<td>A6 for maximum.</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>43.5 MC</td>
<td>Disconnect antenna terminals jumper, connect generator high side to antenna terminals. Set Channel Selector to 2 or other low channel. If necessary, increase generator output and/or reduce bias to -.15 volts to obtain a definite indication on VTM.</td>
<td>A16 for minimum.</td>
<td></td>
</tr>
</tbody>
</table>

*To insure correct IF alignment, make "IF Response Curve Check".*

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Information on this page applies ONLY to chassis with a 41 MC IF system.

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

<table>
<thead>
<tr>
<th>Receiver Controls and Bias Battery</th>
<th>Sweep Generator</th>
<th>Marker Generator</th>
<th>Oscilloscope</th>
<th>Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set Channel Selector on channel 12 or an unassigned high channel. Connect control fully to the left. Connect negative of 4.5 volt bias supply to test point &quot;I&quot;, positive to chassis.</td>
<td>Connect high side to 608 mixer-ac, isolated tube shield, see Figure 9. Connect low side to chassis near tube shield. Set sweep frequency to 44.5 MC, and sweep width approximately 7 MC.</td>
<td>If an external marker generator is used, loosely couple high side to sweep generator lead on tube shield, low side to chassis. Marker frequencies indicated on IF Response Curve.</td>
<td>Connect high side to test point &quot;V&quot; through a decoupling filter, see figs. 11 and 24.</td>
<td>Check curve obtained against ideal response curve in fig. 25. Note tolerances on curve. Keep marker and sweep outputs at minimum to prevent overloading. A reduction in sweep output should reduce response curve amplitudes 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, touchup with IF slugs as instructed below. Important: IF curve changes shape with hand capacity, see section 1 of &quot;Important Alignment Notes.&quot;</td>
</tr>
</tbody>
</table>

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**Figure 25. Ideal IF Response Curve.**

If it is necessary to adjust for incorrect response curve tilt or for excessive peak to valley ratio, carefully adjust alignment slugs as instructed under the above figures.

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. Note: When aligning A1, A4, and A7, interaction between these tuned circuits is present. Repeat adjustment of these tuned circuits several times at the correct frequency until a minimum of touch up is required for each stage.

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.