GENERAL DESCRIPTION

Models 8GC70, 8GC70S and 8GT71 are two-way television receivers. These receivers employ twenty-two tubes plus four receiving and six 16AP1 kinescopes. The receivers are identical except for cabinets.

Features of the television unit are:
- Full twelve-channel coverage: 12-channels (all channels 1 through 12).
- P.S. sound system: Improved picture brilliance, picture A.G.C. horizontal hold, subdued vertical hold; two stages of video amplification: nine sections; improved sync separator and clipper: four multi-feed pairs for picture channel and reduced horizontal high voltage supply.

ELECTRICAL AND MECHANICAL SPECIFICATIONS

<table>
<thead>
<tr>
<th>Channel</th>
<th>Channel</th>
<th>Sound</th>
<th>Sound</th>
<th>Focus</th>
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</thead>
<tbody>
<tr>
<td>8GC70</td>
<td>8GC70S</td>
<td>8GT71</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8GA7</td>
<td>8GA7S</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8GA6/8</td>
<td>8GA6/8S</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>8GA6/6</td>
<td>8GA6/6S</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8GA5/5</td>
<td>8GA5/5S</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8GA4/4</td>
<td>8GA4/4S</td>
<td></td>
<td></td>
<td></td>
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<td>8GA3/3</td>
<td>8GA3/3S</td>
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<td></td>
</tr>
<tr>
<td>8GA2/2</td>
<td>8GA2/2S</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

FINE TUNE RANGE
Plus or minus approximately 250 kc on channel 2 and plus and minus approximately 500 kc on channel 12.

POWER SUPPLY RATING
115 volts; 60 cycles; 35 watts.

AUDIO POWER OUTPUT RATING
4 watts max.

LOADSPEAKERS 80W-2
- 8 inch PM Dynamic Voice Coil Impedance 2 ohms at 400 cycles.

DIMENSIONS (inches)
<table>
<thead>
<tr>
<th>Width</th>
<th>Height</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cabinet: 8GC70</td>
<td>27 1/2</td>
<td>24 1/4</td>
</tr>
<tr>
<td>Cabinet: 8GC70S</td>
<td>27 1/2</td>
<td>24 1/4</td>
</tr>
<tr>
<td>Cabinet: 8GT71</td>
<td>25 1/2</td>
<td>24</td>
</tr>
</tbody>
</table>

RECEIVER ANTENNA INPUT IMPEDANCE
200 ohms balanced or 75 ohms unbalanced.

WEIGHT
Class A with tubes in cabinet: 8GC70 = 8 lbs.
8GC70S = 11 lbs.
8GT71 = 11 lbs.

WEIGHT OF COMPLETE UNIT: 8GC70 = 143 lbs.
8GC70S = 143 lbs.
8GT71 = 143 lbs.

RCA TUBE COMPLEMENT

<table>
<thead>
<tr>
<th>Tube</th>
<th>Use</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>8GC70</td>
<td>RCA 6LS</td>
<td>R.F. Amplifier</td>
</tr>
<tr>
<td>8GC70S</td>
<td>RCA 6LS</td>
<td>R.F. Amplifier</td>
</tr>
<tr>
<td>8GT71</td>
<td>RCA 6LS</td>
<td>R.F. Amplifier</td>
</tr>
<tr>
<td>8GC70</td>
<td>RCA 6LO/6</td>
<td>1st Sound F. Amplifier</td>
</tr>
<tr>
<td>8GC70S</td>
<td>RCA 6LO/6</td>
<td>1st Sound F. Amplifier</td>
</tr>
<tr>
<td>8GT71</td>
<td>RCA 6LO/6</td>
<td>1st Sound F. Amplifier</td>
</tr>
<tr>
<td>8GC70</td>
<td>RCA 6AS</td>
<td>2nd Picture F. Amplifier</td>
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<tr>
<td>8GC70S</td>
<td>RCA 6AS</td>
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<td>8GC70</td>
<td>RCA 6AS</td>
<td>4th Picture F. Amplifier</td>
</tr>
<tr>
<td>8GC70S</td>
<td>RCA 6AS</td>
<td>4th Picture F. Amplifier</td>
</tr>
</tbody>
</table>

OPERATING INSTRUCTIONS

1. Turn the receiver "ON" and advance the SOUND VOLUME control to approximately mid-position.

2. Set the STATION SELECTOR to the desired channel.

3. Adjust the FINE TUNE control for best sound fidelity and SOUND VOLUME in suitable volume.

4. Turn the BRIGHTNESS control clockwise until a light beam appears on the screen.

5. Adjust the VERTICAL HOLD control until the picture is stationary.

6. Adjust the HORIZONTAL HOLD control until a picture is obtained.

INSTALLATION INSTRUCTIONS

The Model 8GC70, 8GC70S and 8GT71 television receivers are shipped complete in one except for the 16AP1 kinescope. This kinescope is shipped in a special case and should not be unpacked until ready for installation.

UNPACKING — Model 8GT71 is shipped in a cardboard carton. To open, remove the carton top flaps on the top open the cardboard side packaging material and with a saw, on sides of the cabinet. Lift it out of the carton. Models 8GC70 and 8GC70S are also shipped in cardboard cartons. To unpack, turn the cabinet on its side and lift the cardboard side packaging material and with a saw, on sides of the cabinet. Lift it out of the carton.

Model 8GC70 and 8GC70S are also shipped in cardboard cartons. To unpack, turn the cabinet on its side and lift the cardboard side packaging material and with a saw, on sides of the cabinet. Lift it out of the carton.

Loosen the two self-tapping screws from the front panel to remove the front panel. Once the front panel is removed, the two locking plates to the vertical position as shown in Figure 2. In Models 8GC70 and 8GT71, the panel may then be removed by loosening the panel screws and pulling out on the top edge. In Model 8GC70S, it will be necessary to remove two screws under the bottom of the cabinet.

Figure 3 — Video and Focus Control Adjustments

From the front of the cabinet, look through the deflection yoke, find the adjusting spot for the focus control. Loosen the adjusting screw and turn it clockwise until the focus is sharply defined. Tighten the mounting screws with the coil in this position.

Loosen the two lower locking screws on the center slides, and set them at approximately mid-position. See Figure 4 for location of these slides and their adjustment screws. Loosen the two upper slides (toward inside of the cabinet) and slip them up as far as possible and tighten.

Check the centering slides. There should be a small wire clip on the center of each of these slides, and the lower left corner should be connected to the high voltage lead.

Figure 2 — Cabinet, Front View

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INSTALLATION INSTRUCTIONS

KINESCOPE HANDLING PRECAUTIONS. — Do not open the kinescope housing, install, remove, or handle the kinescope in any manner, unless shutter-proof goggles and heavy gloves are worn. The kinescope must also be handled with extreme care while handling the kinescope. Keep the kinescope away from the body while handling. The shipping cartons should be kept for use in case of future moves.

Handle this tube by the metal rim at the edges of the screen. Do not cover the glass ball of the tube with fingerprints, or you will produce leak paths which may interfere with reception. If the portion of the tube has inadvertently been handled, wipe it clean with a soft cloth moistened with "dry" ethyl alcohol chloride.

KINESCOPE INSTALLATION. — Slip the Vinyl boots over the metal cone of the kinescope, turn the tube so that the cone on the base of the tube will be down and insert the neck of the kinescope through the deflection focus and focus coils as shown in Figure 4. If the tube sticks, or fails to slip into place smoothly, investigate and remove the cause of the trouble. Do not turn the tube.

The tin trap rear magnet poles should be approximately over the tin trap flanges. Starting from this position adjust the magnet by moving it forward or backward at the same time rotating it slightly around the neck of the kinescope for the brightest raster on the screen. Reduce the brightness control setting until the raster is slightly above average brilliance. Adjust the focus control (R21) on the chassis rear- protractor until the line structure of the raster is clearly visible. Readjust the tin trap magnet for maximum raster brilliance. The final touches on this adjustment should be made with the brightness control at the maximum position with which good focus can be maintained.

The four sliders should be adjusted so that the four corner of the raster in the center of the cabinet opening. Tighten the four sliders securely.

Wipe the kinescope screen surface and front panel surface with a clean cloth dampened with a solution of ethyl alcohol and water before the kinescope opening and push the top in. Tack the two bars back of the panel and tighten the wingnuts. Slip the kinescope as far forward as possible. Slide the tin trap housing firmly up against the face of the tube and tighten the adjustment wing screws. Slide the deflection yoke as far forward as possible. If this is done, difficulty will be encountered in maintaining the horizontal and vertical focus coil because of shadows on the corner of the raster.

The antenna and power connections should now be made and install the front panel control knobs.

WARNING. — The high voltage supply in this receiver delivers 15,000 volts. It is necessary to remove the kinescope after the receiver has been operating, short the kinescope cone to the chassis before connecting the deflection and focus elements to the kinescope, A.C. interlocks are provided at the base of the set so that when the back is removed — so is the power.

Turn the power switch to the "on" position, the brightness control fully clockwise, and picture control counterclockwise.

ION TRAP MAGNET ADJUSTMENT. — Lookking at the kinescope screen structure, it will be observed that the second cylinder from the base inside the glass neck is provided with two small metal flaps, as shown in Figure 5.

The tin trap rear magnet poles should be approximately over the tin trap flanges. Starting from this position adjust the magnet by moving it forward or backward at the same time rotating it slightly around the neck of the kinescope for the brightest raster on the screen. Reduce the brightness control setting until the raster is slightly above average brilliance. Adjust the focus control (R21) on the chassis rear-protractor until the line structure of the raster is clearly visible. Readjust the tin trap magnet for maximum raster brilliance. The final touches on this adjustment should be made with the brightness control at the maximum position with which good focus can be maintained.

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JOHN F. RIDER

INSTALLATION INSTRUCTIONS

MODELS ST270, STC270, STC271
CH. KCS29, KCS29A

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ALIGNMENT OF HORIZONTAL OSCILLATOR. — If on the above checks the receiver held to hold sync with the hold control adjusted, then hold the external counterweight position or fail to hold sync over 60 degrees of clockwise rotation of the control. If the hold pull in point, it will be necessary to make the following adjustments.

Horizontal Frequency Adjustment. — Tune the horizontal hold control to the extreme clockwise position. Turn on the television receiver and adjust the T1150 horizontal frequency adjustment (under the chassis) until the picture is just out of sync and the horizontal blanking appears as a vertical or diagonal block bar in the raster.

Horizontal Lock in Range Adjustment. — Set the horizontal hold control to the full counter clockwise position. Momentarily remove the signal by switching off channel then back. Slowly turn the horizontal hold control clockwise and note the least number of diagonal bars obtained just before the picture pulls in sync.

If more than 3 bars are present just before the picture pulls in sync, adjust the horizontal lock control trimmer C1132A slightly clockwise. If 3 bars are present, adjust C1132A slightly counterclockwise. Turn the picture control clockwise by a few degrees to remove the bars and check the number of bars present with the pull in point. Repeat this procedure until 3 bars are present.

The adjustments under "Horizontal Frequency Adjustment" and "Horizontal Lock in Range Adjust" until the conditions specified under each are fulfilled. When the horizontal hold control operates under "Check on Horizontal Oscillator Adjustment" the oscillator is properly adjusted.

If it is impossible to sync the picture at this point and the All Store system is operating properly it will be necessary to adjust the Horizontal Oscillator by the method outlined in the alignment procedure paragraph "A" under Oscillator Waveform Adjustment may be omitted.

CENTERING ADJUSTMENTS. — Centering is obtained by adjusting the electronic controls and by mechanically centering the focus coil with these adjustment screws shown in Figure 6. The focus coil should be concentric around the neck of the kinescope to prevent misregistration of the raster.

Adjust the focus coil until it is at right angles to the neck of the kinescope. Center the picture with the electrical centering controls. If a shadow appears on a corner of the picture, adjust the focus coil centering screws to eliminate the shadow and center the picture with the electrical centering controls.

FOCUS COIL ADJUSTMENTS. — If, after making the centering adjustments in the above paragraphs, a corner of the picture is shadowed, it will be necessary to loosen the focus and mounting screws (shown in Figure 3) and change the position of the coil to center the picture. Pull in picture by adjusting the electrical centering controls and the focus coil centering adjustments.

Recheck the position of the tin trap magnet to insure that maximum brilliance is obtained.

HEIGHT AND VERTICAL LINEARITY ADJUSTMENTS. — Adjust the vertical hold control to maximum down position until the picture fills the mask vertically. Adjust vertical linearity in a similar manner to the horizontal linearity control. If any of these adjustments are not obtainable, the picture fills the mask vertically. Adjust vertical linearity in a similar manner to the horizontal linearity control. If any of these adjustments are not obtainable, the picture fills the mask vertically. Adjust vertical linearity in a similar manner to the horizontal linearity control. If any of these adjustments are not obtainable, the picture fills the mask vertically. Adjust vertical linearity in a similar manner to the horizontal linearity control. If any of these adjustments are not obtainable, the picture fills the mask vertically. Adjust vertical linearity in a similar manner to the horizontal linearity control. If any of these adjustments are not obtainable, the picture fills the mask vertically. Adjust vertical linearity in a similar manner to the horizontal linearity control. If any of these adjustments are not obtainable, the picture fills the mask vertically. Adjust vertical linearity in a similar manner to the horizontal linearity control. If any of these adjustments are not obtainable, the picture fills the mask vertically. Adjust vertical linearity in a similar manner to the horizontal linearity control. If any of these adjustments are not obtainable, the picture fills the mask vertically. Adjust vertical linearity in a similar manner to the horizontal linearity control. If any of these adjustments are not obtainable, the picture fills the mask vertically. Adjust vertical linearity in a similar manner to the horizontal linearity control. If any of these adjustments are not obtainable, the picture fills the mask vertically.
ALIGNMENT PROCEDURE

**EQUIPMENT** — To properly service the television receiver, it is recommended that the following test equipment be available:

- **R.F. Sweep Generator** meeting the following requirements:
  - Output adjustable with at least .1 volt maximum.
  - Voltage constant on all waveforms.
  - Output on all waveform positions.
  - Cathode Ray Oscilloscope, preferably one with a wide band width and deflection, an input calibrated source, and a low input probe.

**Test Frequencies** to provide the following test cues:

<table>
<thead>
<tr>
<th>Channel Number</th>
<th>Picture Carrier</th>
<th>Sound Carrier</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>55.25</td>
<td>59.75</td>
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<tr>
<td>3</td>
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<td>87.75</td>
</tr>
<tr>
<td>7</td>
<td>175.25</td>
<td>179.75</td>
</tr>
<tr>
<td>9</td>
<td>181.25</td>
<td>185.75</td>
</tr>
<tr>
<td>10</td>
<td>197.25</td>
<td>191.75</td>
</tr>
<tr>
<td>12</td>
<td>205.25</td>
<td>209.75</td>
</tr>
<tr>
<td>13</td>
<td>211.25</td>
<td>215.75</td>
</tr>
</tbody>
</table>

**CAUTION:** Do not short the oscilloscope secondary anode lead.

**Adjustments Required** — Normally, the 40-oscillator line will require the attention of the service technician. All other circuits are either broad or very stable and hence will seldom require re-adjustment.

- Oscillator line is relatively non-critical. When oscillator tubes are changed, in all probability it will be necessary to adjust only Cap D in order to bring the entire line into adjustment.

**ORDER OF ALIGNMENT** — When a complete receiver alignment is necessary, it can be most conveniently performed in the following order:

1. **Sound discriminator**
2. **R.F. and converter line**
3. **Picture f filters**
4. **Picture f transformers**

**SOUND DISCRIMINATOR ALIGNMENT** — Set the signal generator for approximately 1 volt output at 21.25 mc and connect it to the second sound f grid.

- Detune T115 secondary (bottom).
- Connect the sweep oscillator to the grid of the second sound f amplifier.

- Adjust the primary of T115 for maximum output on the oscilloscope.

- Connect the sweep oscillator to the junction of C183 and R215. Adjust T113 secondary (bottom) until the wave form is symmetrical.

**SOUND f GRID ALIGNMENT** — Connect the sweep oscillator to the first sound f grid amplifier.

- Connect the oscilloscope to the second sound f grid return grid (terminal "A" of T115) in series with a 33,000 ohm isolating resistor.

- Insert a 21.25 mc marker signal from the signal generator into the first sound f grid.

- Adjust T112 and bottom for maximum output and symmetry about the 21.25 mc marker. The pattern obtained should be similar to that shown in Figure 16.

- The peak-to-peak band width of the discriminator should be approximately 500 mc and it should be linear from 21.175 mc to 21.225 mc.

John F. Rider
ALIGNMENT PROCEDURE

The band width at 70% response from the first sound 11 grid to the second grid should be approximately 160 kc.

PICTURE 1 F TRAP ADJUSTMENT. - Connect the "Voll-Omhy" to the junction of B135 and B136. Connect a 250,000 ohm potentiometer between pins 5 and 6 of the V109 socket and connect a 305 ohm resistor to the V109 socket. Connect the "Voll-Omhy" needs approximately 45 volts.

Set the channel switch to the blank position between channel numbers 1 and 12.

Connect the "Voll-Omhy" across the picture detector load resistor R120. Under this condition, both leads of the meter are approximately 123 volts. In making this measurement, care should be taken not to touch the case of the meter or to permit any static charge to build up.

Connect the output of the signal generator to the grid of the converter tube V2. To do this, remove the tube from the socket and fashion a clip with a clip and one end of a short piece of wire around pin number 1. Replace the tube in the socket leaving the lead to the converter tube placed under the tube. Connect the signal generator to this wire through a 1,600 mmf capacitor keeping the leads as short as possible.

Set the generator to each of the following frequencies and with a thin fiber screwdriver tune the specified adjustment for maximum indication as on the "Voll-Omhy". In each instance the generator should be checked against a crystal calibrator to insure that the generator is actually on frequency.

1. 21.25 mc - T103 (top)
2. 21.25 mc - T103 (top)
3. 27.25 mc - T102 (top)
4. 27.25 mc - T104 (top)
5. 19.75 mc - T106 (top)
6. 19.75 mc - T106 (top)

In the above transformers using threaded cores, it is possible to run the core completely through the coils and secure two pieces of wire around the core in which case the core is grounded at the outside ends of the coils. If the cores are not in the correct position with respect to the core former and it will be impossible to secure the correct response.

PICTURE 1 F TRANSFORMER ADJUSTMENTS. - Set the diode gate back to each of the following frequencies and peak the specified adjustment for maximum indication on the "Voll-Omhy". During alignment, reduce the input signal if necessary to prevent overload.

1. 22.5 mc - T106 (bottom)
2. 24.5 mc - T106 (bottom)
3. 22.5 mc - T103 (bottom)
4. 25.9 mc - T107 (bottom)

T1 and T107 are coupled by a link and in combination constitute the amplifier stage of the "Voll-Omhy". The change in coupling of each transformer is such as it is impossible to adjust it to a single value.

To sweep align T1 and T107, connect a 300 ohm composition resistor across the primary coils of T102, T103, T104 and T105.

Connect the "Voll-Omhy" to the junction of B135 and B136. Connect the 250,000 ohm potentiometer for 2 volts on the meter.

Connect the oscilloscope to the plate of the first video amplifier. Set the switch to T105.

Connect a sweep generator to the converter grid through a 1,500 mmf capacitor. Set the generator to sweep from 20.0 mc. to 30.0 mc. and adjust the output to provide a 4 volt peak-to-peak signal on the scope.

Connect the signal generator loosely to the converter grid and adjust to provide a signal of 21.50 mc. and 24.4 mc.

Adjust T1 (top) and T101 (bottom) to obtain the response shown in Figure 1. The response should be such that it must measure to the terminal board and the coil is in order to obtain the correct response.
ALIGNMENT PROCEDURE

Set the receiver channel switch to 13.
Adjust the frequency standard to the nearest frequency 0.075 mc. for oscillation frequency at 4.575 mc. for the signal generator.
Set the frequency control to the middle of its range while making the adjustment.
Adjust C6 for an audible beat on the heterodyne frequency meter. Readjust C6 for the retrace frequency at 4.575 mc. for the signal generator.
Switch the receiver to channel 13.
Set the frequency standard to the proper frequency as listed in the alignment table.
Adjust L14 for indications as above.
Adjust the oscillator to frequency on all channels by switching the receiver and the frequency standard to each channel and adjusting the appropriate oscillator trimmer for the specified indication. It should be possible to obtain the correct frequency on all channels with the line tuning control in the middle third of its range.
After the oscillator has been set on all channels, check back at channel 13 and recheck to make sure that all adjustments are correct.

HORIZONTAL OSCILLATOR ADJUSTMENT.—Necessarily the adjustment of the horizontal oscillator, but considered to be a part of the alignment procedure, since the oscillator wave- form adjustment requires the use of an oscilloscope. It can be done conveniently in the field. The waveform adjustment is made at the factory and normally should not require readjustment in the field. However, the waveform adjustment should be checked whenever the receiver is off or whenever the horizontal oscillator operation is improper.

Horizontal Frequency Adjustment.—With a clip lead, short circuit the grid of terminals C1 and D of the horizontal output transformer T109. Tune in a television station and synch the picture if possible.

A. Turn the horizontal hold control R133 to the extreme clockwise position. Adjust the T109 Frequency Adjustment knob (Ch. K6629) to center the channel 13 waveform picture on the vertical bar. The position of the bar is unimportant.

B. Turn the hold control approximately one quarter of a turn from the horizontal hold control at the extreme clockwise position and examine the waveform and linearity of the picture. If picture width or linearity is insufficient, adjust the horizontal drive control C130 with the horizontal hold control R133 to the center of the waveform and linearity of the picture. Repeat step A above.

Horizontal Locking Range Adjustment.—Turn the horizontal hold control one quarter of a turn from the horizontal hold control and center the waveform and linearity of the picture at the extreme clockwise position. If more than 9 bars are present just before the picture fails into sync, adjust the horizontal locking range trimmer (H13) slightly clockwise. If less than 7 bars are present just before the picture fails into sync, adjust the horizontal locking range trimmer (H13) slightly counterclockwise. Tune the horizontal hold control counter-clockwise, momentarily remove the signal and recheck the number of bars present at the pull-in point. Repeat this procedure until 7 to 9 bars are present.

Horizontal Oscillator Waveform Adjustment.—Remove the chopper clip from terminals C2 of the horizontal hold control to the horizontal extreme clockwise position. With a short-sweep oscilloscope, adjust the Oscillator Waveform Adjustment Cap of T109 for the outside of the channel, or use the horizontal locking holding appear in the raster.
A. Connect the low capacity probe of an oscilloscope to terminals C and T109. Turn the horizontal hold control one quarter turn from the clockwise position so that the picture is in sync. The picture on the oscilloscope should be as shown in Fig. 12. Adjust the Oscillator Waveform Adjustment Cap of T109 until the two peaks are of the same height. During this adjustment, the picture must be kept in sync by rephasing the hold control.

This adjustment is very important for correct operation of the circuit. If the second peak of the wave on the oscilloscope is lower than the sync peak, the noise immunity is reduced, and the effect of the noise is more severe. On the other hand, if the second peak is higher than the sync peak, the oscilloscope is overdriven, the pulsation may increase, and the broad peak can cause double triggering of the oscillator when the hold control approaches the clockwise position.

Remove the oscilloscope upon completion of this adjustment.

CHECK OF HORIZONTAL OSCILLATOR.—Set the horizontal hold control to the half counter-clockwise position. Momentarily remove the signal by switching off channel, then back. Slowly turn the horizontal hold control clockwise and note the least number of diagonal bars obtained just before the picture pulls into sync.
If more than 3 bars are present just before the picture pulls into sync, or the horizontal locking range trimmer C130 is not adjusted to the proper value, the horizontal hold control counter-clockwise, momentarily remove the signal and recheck the number of bars present at the pull-in point. Repeat this procedure until 3 bars are present.

Turn the horizontal hold control to the maximum clockwise position. The diagonal bars should be just out of sync to the extent that the horizontal blanking bar appears at a single vertical or diagonal line above the picture center. Adjust the T109 Oscillator Frequency Adjustment until this condition is fulfilled.

4.5 MC. VIDEO TRAP.—Tune in a strong station. With a very slow sweep rate and short circuit the trap winding of C103. Observe the picture for the appearance of a 4.5 mc. beat. If the beat appears in the picture, adjust R104 until the beat is eliminated. Remove the clip lead.

SENSITIVITY CHECK.—A comparative sensitivity check can be made by operating the receiver on a weak signal from a television station and comparing the picture and sound obtained to that obtained on other receivers under the same conditions.

This week signal can be obtained by connecting the shop antenna to the receiver through a ladder type attenuator pot. The number of ohms in the pot depends upon the signal strength available at the antenna. A sufficient number of ohms should be inserted so that a somewhat less than normal contrast picture is obtained when the picture control is at the maximum clockwise position. Only certain type resistors should be used to connect the pot.

RESPONSE CURVES.—The response curves referred to throughout the alignment procedure were taken from a production test. Although these curves are typical some variations can be expected.

The response curves are shown in the class A807 oscilloscope, that is from 500 mc. to 50 mc. and very little frequency to the left. The manner in which they will be seen in a green test setup will vary with the characteristics of the oscilloscope and the sweep generator. The curves may be seen inverted and with a bias from left to right depending on the deflection polarity of the oscilloscope and the setting of the sweep.

ALIGNMENT TABLE.—Both methods of oscilloscope alignment are presented in the alignment table. The service technician may thereby choose the method to suit his test equipment.
### Alignment Table

<table>
<thead>
<tr>
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<td>Antenna terminals</td>
<td>112.25 MHz</td>
<td>Antenna terminals</td>
<td>112.25 MHz</td>
<td>Channel 10</td>
<td>Text Connection R13</td>
<td>Receiver on channel 10</td>
<td>Check to see that response is as illustrated in Fig. 19 (10)</td>
<td></td>
</tr>
<tr>
<td>26</td>
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<td>&quot;</td>
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<td>Fig. 19 (11)</td>
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<td>Receiver on channel 14</td>
<td>Fig. 19 (14)</td>
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<td>Antenna terminals</td>
<td>97.25 MHz</td>
<td>Channel 5</td>
<td>Text Connection R10</td>
<td>Receiver on channel 5</td>
<td>Check to see that response is as illustrated in Fig. 19 (6)</td>
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<td>Receiver on channel 9</td>
<td>Fig. 19 (9)</td>
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### R.F. Oscillator Alignment

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<td>35</td>
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<td>Antenna terminals</td>
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<td>CS for zero cross or beat on channel 10</td>
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<td>CS = 1 cm above 115 kHz</td>
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<td>CS = 1 cm above 117 kHz</td>
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<td>CS = 1 cm above 119 kHz</td>
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<td>CS = 1 cm above 121 kHz</td>
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<td>Fig. 13 (18)</td>
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<td>&quot;</td>
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<td>CS = 1 cm above 125 kHz</td>
<td>Fig. 13 (19)</td>
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<td>CS = 1 cm above 127 kHz</td>
<td>Fig. 13 (20)</td>
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<td>CS = 1 cm above 129 kHz</td>
<td>Fig. 13 (21)</td>
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<td>&quot;</td>
<td>Receiver on channel 21</td>
<td>CS = 1 cm above 135 kHz</td>
<td>Fig. 13 (24)</td>
</tr>
</tbody>
</table>

### Horizontal Oscillator Adjustment

45. Solder circuit terminals C and D of T109. Turn in a station.

50. Turn circuit terminals C and D of T109. Turn in a station.

51. Turn hold control clockwise. Adjust T109 Frequency Adjustment until horizontal blending bar appears in the picture.

52. Turn hold control clockwise. Adjust T109 Frequency Adjustment until horizontal blending bar appears in the picture.

53. Turn hold control clockwise. Adjust T109 Frequency Adjustment until horizontal blending bar appears in the picture.

54. Turn hold control clockwise. Adjust T109 Frequency Adjustment until horizontal blending bar appears in the picture.

55. Turn hold control clockwise. Adjust T109 Frequency Adjustment until horizontal blending bar appears in the picture.

56. Adjust hold control clockwise. Adjust T109 Frequency Adjustment until horizontal blending bar appears in the picture.

57. Turn in a strong station. Short trap winding of T109 with a short lead. Adjust hold control until crossbar is eliminated.

58. Adjust antenna gain through attenuator pad to provide weak signal. Compare the picture and sound obtained to that obtained on other receivers under the same conditions.

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*John F. Rider*
**SERVICE SUGGESTIONS**

Following is a list of symptoms of possible failure and an indication of some of the possible faults.

**NO RASTER ON KINESCOPE:**
1. Incorrect adjustment of lens trap magnet. Magnets reversed either to back or to bottom, front magnet incorrectly aligned.
2. V118, V114 or V115 inoperative—check voltage and waveform on grids and plates.
3. No high voltage—hi horizontal deflection is operating as evidenced by the correct waveform on terminal 4 of hi horizontal output transformer, trouble can be isolated to the B12B circuit. Either the T119 high voltage winding is open (points 1 to 9), or the B100 tube is defective. In the element circuit B100, B160 and C118 are shorted or B106, R150, R191, R192 or R193 is open.
4. V112 circuit inoperative—refer to schematic and waveform chart.
5. Damper tube (V118) inoperative.
6. Detectoic linescope.
8. No receiver plate voltage—filter capacitor or filter choke shorted. Blunders or filter choke open.

**NO VERTICAL DEFLECTION:**
1. V108 or V109 inoperative—check voltage and waveform on grids and plates.
2. T107 or T108 open.
3. Vertical deflection coils open.

**SMALL RASTER:**
1. Low Pix B or low line voltage.
2. V113 defective.

**POOR VERTICAL LINEARITY:**
1. If adjustment cannot correct, change V111.
2. Vertical output transformer defective.
4. C147, R145, C143B or C150B defective.
5. Low bias or plate voltage—check rectifiers and capacitors in syncy circuits.

**POOR HORIZONTAL LINEARITY:**
1. If adjustments do not correct, change V113 or V116.
2. T110 or L113 defective.
3. C164 or C165 defective.

**WRINKLES ON LEFT SIDE OF RASTER:**
1. R168, R167 or C169 defective.
2. Detectoic yoke.

**PICTURE OUT OF SYNC HORIZONTALLY:**
1. T109 incorrectly tuned.
2. B172, B173, B174, B176 or B178 defective.

**RAPEDEOAL OR NON-SYMMETRICAL RASTER:**
1. Improper adjustment of focus coil or ion trap magnet.
2. Detecor yoke.

**RASTER AND SIGNAL ON KINESCOPE BUT NO SOUND:**
1. R.F. oscillator off frequency.
2. Sound 1, discriminator or radio amplifier inoperative—check V119, V120, V121, V122, V123 and their socket voltages.
3. T114 or C114 defective.
4. Speaker defective.

**SIGNALL AT KINESCOPE GRID BUT NO SYNC:**
2. Check V104, try another tube.

**SIGNALL ON KINESCOPE GRID BUT NO VERTICAL SYNC:**
1. Check V108B and associated circuit—C140, T107, etc.
2. Integrating network inoperative—check.
3. R154, R155, R157, R158 or R159 defective.

**SIGNALL ON KINESCOPE GRID BUT NO HORIZONTAL SYNC:**
1. T109 misadjusted—readjust as instructed.
2. V112 inoperative—check socket voltages and waveform.
3. T109 defective.
4. C140, C143A, C154, C155, C157 or C166 defective.
5. If horizontal spread is completely off and cannot be adjusted check C158, C159, R172, R173, R174, R175, R176.

**SOUND AND RASTER BUT NO PICTURE OR SYNC:**
1. Picture 1, detector or video amplifier inoperative—check V103, V104, V105, V106, and V107 socket voltages.
2. B6 contact to linescope grid.

**PICTURE STABLE BUT POOR RESOLUTION:**
2. Peaking coils defective—check for specified resistance.
3. Make sure that the focus control remains on both sides of proper focus.
4. R.F. and IF circuits misaligned.

**PICTURE SMEAR:**
1. R.F. or IF circuits misaligned.
2. Open peaking coil.
3. Take trouble out originating at the transmitter—check on another station.

**PICTURE JITTER:**
1. Check for proper operation of hold controls.
2. If regular sections at the left picture are displaced change V119.
WAVEFORM PHOTOGRAPHS

Video Signal Input to 1st Video Amplifier (Pin 1 of V106) (.7%)

Figure 38—Vertical (Oscilloscope Synchronous 1/2 of Vertical Sweep Rate) (2.1 Volts PP)

Figure 39—Horizontal (Oscilloscope Synchronous 1/2 of Horizontal Sweep Rate) (2.1 Volts PP)

Input to 2nd Video Amplifier (Pin 5 of V107) (.8KQGT)

Figure 40—Vertical (15 Volts PP)
Figure 41—Horizontal (15 Volts PP)

Output of 2nd Video Amplifier (Pin 1 of V107) (.8KQGT) (Picture Max.)

Figure 42—Vertical (130 Volts PP)
Figure 43—Horizontal (130 Volts PP)

Input to Kinescope (Junction of R131 and R132) (Figure 44)

Figure 44—Vertical (65 Volts PP)
Figure 45—Horizontal (65 Volts PP)

Input to 1st Sync Separator (Pin 3 of V109) (.8KQGT)

Figure 46—Vertical (24 Volts PP)
Figure 47—Horizontal (24 Volts PP)

Output of 1st Sync Separator (Pin 2 of V109) (.8KQGT)

Figure 48—Vertical (44 Volts PP)
Figure 49—Horizontal (18 Volts PP)

Input to Sync Amplifier (Junction of C137, C139 and R144)

Figure 50—Vertical (30 Volts PP)
Figure 51—Horizontal (17 Volts PP)

Output of AGC Rectifier (Pin 5 of V109) (.8KQGT)

Figure 52—Vertical (13 Volts PP)
Figure 53—Horizontal (19 Volts PP)

Cathode of 1st Sync Separator (Pin 3 of V109) (.8KQGT)

Figure 54—Vertical (41 Volts PP)
Figure 55—Horizontal (18 Volts PP)

Output of AGC Rectifier Cathode (Pin 6 of V109) (.8KQGT)

Figure 56—Vertical (43 Volts PP)
Figure 57—Horizontal (23 Volts PP)
WAVEFORM PHOTOGRAPHS

Output of Sync Amplifier (Pin 2 of V110) (SSM77T)

Figure 56—Vertical (150 Volts PP)
Figure 57—Horizontal (145 Volts PP)

Cathode of 2nd Sync Separator (Pin 6 of V110) (SSM77T)

Figure 60—Vertical (17 Volts PP)
Figure 61—Horizontal (11 Volts PP)

Figure 62—Output of Integrating Network (Function of C344, C315 and R133) (58 Volts PP)

Figure 63—Grid of Vertical Oscillator (180 Volts PP) (Pin 1 of V110) (SSM77T)

Figure 64—Grid of Vertical Output (140 Volts PP) (Pin 5 of V111) (SSM77T)

Figure 65—Plate of Vertical Output (925 Volts PP) (Pin 3 of V111) (SSM77T)

Figure 66—Input of Vertical Deflection Coils (75 Volts PP) (Function of Grid of T110 and Grid Lead of Tube)

Figure 67—Input to Horizontal Oscillator (35 Volts PP) (Function of C133A and C154)

WAVEFORM PHOTOGRAPHS

Figure 68—Junction of R108, R176 and R178 (140 Volts PP)

Figure 69—Grid of Horizontal Oscillator (500 Volts PP) (Pin 4 of V112) (SNN7T)

Figure 70—Plate of Horizontal Oscillator (280 Volts PP) (Pin 5 of V112) (SNN7T)

Figure 71—Terminal "C" of T100 (155 Volts PP)

Figure 72—Input to Horizontal Output Tube (75 Volts PP) (Function of C160, R161 and C155B)

Figure 73—Plate of Horizontal Output (Approx. 6,300 Volts PP) (Measured Through a Capacitor Voltage Divider Connected from Top Cap of V113 to Ground)

Figure 74—Junction of C164, L113 and Terminal 1 of T10 (60 Volts PP)

Figure 75—Cathode of Damper (50 Volts PP) (Pin 3 of V110) (SSM77T)

Figure 76—Input to Horizontal Deflection Coils (2,500 Volts PP) (Pin 4 of V116) (SSM77T)

Figure 77—Horizontal Deflection Coil Current (200 ma PP) (Calculated Value from PP Voltage across R119)
### VOLTAGE CHART

The following measurements represent two sets of conditions. In the first condition a 2200 microvolt test pattern signal was fed into the receiver, the picture synced and the AGC threshold control properly adjusted. The second condition was obtained by removing the antenna leads and short-circuiting the receiver antenna terminals. Voltages shown are as read with "Jr. Volt/Ohmmeter" between the indicated terminal and chassis ground with the receiver operating on 147 volts 60 cycles a-c.

<table>
<thead>
<tr>
<th>Tube No.</th>
<th>Tube Type</th>
<th>Function</th>
<th>Operating Condition</th>
<th>E. Plate</th>
<th>E. Screen</th>
<th>E. Cathode</th>
<th>E. Grid</th>
<th>I Plate (ms)</th>
<th>I Screen (ms)</th>
<th>Notes on Measurements</th>
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<td>V1 6AG5</td>
<td>R-F Amplifier</td>
<td>2200 mV V. Signal</td>
<td>Pin No. Volts</td>
<td>Pin No. Volts</td>
<td>Pin No. Volts</td>
<td>Pin No. Volts</td>
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<td>Pin No. Volts</td>
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<th>I Plate (ms)</th>
<th>I Screen (ms)</th>
<th>Notes on Measurements</th>
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<td>Power Supply</td>
<td>2200 mV V. Signal</td>
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