WHILE EACH RECEIVER IS CORRECTLY ALIGNED:

AT THE FACTORY, DURING HANDLING IN TRANSIT, MAILING, DRIFT, ETC., MAY THROW THE RECEIVER OFF, OR WORSE, MAY THROW THE RECEIVER OFF ONCE PROPERLY ADJUSTED. CHECK FOR PROPER CHANNEL SELECTION OR CHANNEL ADJUSTMENT BY TUNING THE RECEIVER FOR THE APPROPRIATE CHANNEL AND ADJUSTING THE SELECTOR SWITCH TO THE DESIRED CHANNEL. THE SELECTOR SWITCH IS LOCATED ON THE FRONT PANEL OF THE RECEIVER. THE SELECTOR SWITCH IS USED TO SELECT THE DESIRED CHANNEL FOR RECEPTION.

TO CHECK OSCILLATOR TRIMMER ADJUSTMENTS:

(A) Turn receiver ON and adjust the trimmer controls for best reception. The trimmer controls consist of a potentiometer and a variable capacitor. The potentiometer is used to adjust the gain of the circuit, while the variable capacitor is used to adjust the frequency of the oscillator. The trimmer controls are adjusted by turning the knobs on the front panel of the receiver. The knobs are labeled with numbers and letters, such as V1, V2, and C1, C2. Adjust the knobs until the picture is clear and the sound is audible.

(B) Turn receiver off and adjust the trimmer controls for best reception. Repeat the above steps until the picture and sound are clear.

(C) Turn on the receiver and adjust the trimmer controls for best reception. Repeat the above steps until the picture and sound are clear.

POWER SUPPLY—This television receiver must be operated on a power source of 110-120 volts AC, 60 cycles only.

TUBES—All the tubes, including the picture tube, are properly mounted in their sockets when the receiver is shipped. There is a possibility, however, that the tubes have been damaged during shipment. The tubes are accessible through the back of the cabinet. Press the tube socket firmly into the socket.

ANTENNA—The wire of the antenna lead-in must be connected to the front panel marked "A" on the tuner chassis. When the installation is close to sources of man-made interference, a reduction in this interference may be made by attaching a ground to the post marked "G" on the chassis.

TELEVISION ANTENNA

A portable antenna which is in many locations will eliminate the need for a permanent television antenna. The antenna is available for use with this receiver. Slot the antenna in and/or the antenna is not able to be seen when the antenna is not in use. The antenna is mounted on the top of the television set. The antenna is adjustable and can be bent to the desired position. The antenna is extended by loosening a screw on the antenna base. The antenna can be extended by loosening the screw on the antenna base. The antenna can be extended by loosening the screw on the antenna base.

Place the antenna near a window for the best reception, although sometimes better results will be obtained when it is in the center of the room, using one wall as a reflector. The antenna can be extended by loosening the screw on the antenna base. The antenna can be extended by loosening the screw on the antenna base. The antenna can be extended by loosening the screw on the antenna base. The antenna can be extended by loosening the screw on the antenna base. The antenna can be extended by loosening the screw on the antenna base. The antenna can be extended by loosening the screw on the antenna base.
ALIGNMENT INFORMATION

ALIGNMENT DATA

ALTERNATE ALIGNMENT

PROCEDURE FOR VIDEO I.F. ALIGNMENT

PROCEDURE FOR SOUN D I.F. ALIGNMENT

PROCEDURE FOR OSCILLOSCOPE ALIGNMENT

PROCEDURE FOR VIDEO I.F. ALIGNMENT

PROCEDURE FOR OSCILLOSCOPE ALIGNMENT

PROCEDURE FOR SOUND I.F. ALIGNMENT
VOLTAGE TABLE
(BOTTOM VIEW OF CHASSIS)

PICTURE PIP
50% DOWN
SOUND PIP
95% DOWN

PICTURE OVERALL RESPONSE CURVE WITH PICTURE AND SOUND CARRIER MARKER PIPS.

FIG. 2

FIG. 3

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If the receiver is located near the edge of the area served by the television station or is being operated with an inadequate aerial, the picture will be very light with a snow effect and may not hold steady on the screen. No adjustment of the rear panel controls can correct this condition.

### REAR PANEL CONTROL ADJUSTMENTS

**DON'T FOOL WITH THE REAR PANEL CONTROLS UNNECESSARILY—IF THE PICTURE IS GOOD, LEAVE THEM ALONE.**

Normally, after the receiver has been properly installed, only the front panel controls need be adjusted by the owner. **ONLY when the picture is too high or too low or does not stay locked in the center of the screen, or is egg-shaped or very fuzzy, will it be necessary to adjust one of the controls mounted on back of picture chassis.**

**IMPORTANT:** Interference caused by electrical equipment, flash lighting signs, auto ignition systems, electric razors and medical short-wave diathermy machines may cause white streaks or bars on the picture. Aircraft in the immediate vicinity can cause fluctuation in sound volume and picture brightness. Double images on the screen can be caused by reflections from buildings, mountains, etc. **NONE OF THESE DISTURBANCES CAN BE ELIMINATED BY ADJUSTMENT OF THE FRONT OR REAR CONTROLS.** Illustrations of these types of disturbances are shown in "Interference Patterns" on the following pages. If you experience a poor quality television picture, do not immediately assume that the difficulty is in your receiver. **The cause may be due to temporary station transmitter difficulties.**

If a poor picture is noticed when a motion picture is being telecast, the difficulty may be due to the quality of the film being used by the station. Turn the "Channel Selector" knob to a different television station or wait until the end of the movie program. If there is no noticeable improvement in the picture, then adjustment of one or more of the controls on back of picture chassis may be necessary.

Before adjusting any of the rear controls, study the picture you are receiving and compare it with one of the illustrative patterns below having similar characteristics. If you find one similar to the picture you are receiving, **ADJUST ONLY THE CONTROL INDICATED AS THIS ONE TO BE USED TO CORRECT THAT PARTICULAR TYPE OF DISTURBANCE.**

By having someone hold a mirror in front of screen or by placing the arm around the cabinet it is possible to adjust the required control and still look at the screen while making the adjustment. Turn the proper control slowly to the right or left until the picture is centered on the screen, stop rolling, becomes clear, etc.

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TV-106

SERVICE HINTS ON MODELS 401, 402, 406 AND 411 TV

1. WHEN VERTICAL RASTER IS SMALL OR VERTICAL LINEARITY IS VERY BAD, check for:
   (a) Weak 6S77 Vertical Oscillator Tube on picture chassis.
   (b) Weak 6S77 Vertical Amplifier Tube on picture chassis.
   (c) Improperly adjusted Height Control on picture chassis.
   (d) Improperly adjusted Linearity Control on picture chassis.
   (e) Shorted 1000 mfd. cathode filter condenser C-17 in vertical amplifier located in picture chassis.

2. WHEN HORIZONTAL RASTER IS TOO SMALL, check for:
   (a) Width Control improperly adjusted. (This control is located inside the H.V. Shield compartment on the picture chassis and is accessible through the hole in the back of the shield.)
   (b) Open 125 mfd condenser (C33) located inside the Deflection Yoke Assembly (looking at the back of the yoke, C33 is connected to the left side top and bottom lugs) on the picture chassis. In early production run sets, this condenser was located inside the picture chassis under the 6806 tube socket.
   (c) Defective 6806 Horizontal Output Tube inside the shield compartment on the picture chassis.
   (d) Defective 6010/1307 H.V. Rectifier tube inside the shield compartment on the picture chassis.
   (e) Open .05 mfd. condenser (C28) located in picture chassis.
   (f) Open .1 mfd. condenser (C29) located in picture chassis.
   (g) Weak 5W4 Damper Rectifier Tube located inside shield compartment on the picture chassis.
   (h) Improper adjustment of Drive Control. CAUTION: DO NOT TOUCH THIS CONTROL without first reading the service manual instructions for adjustment of the Horizontal Drive Control given on the same page with Deflection, Focus and Ion Trap Adjustments.

3. WHEN HORIZONTAL RASTER IS TOO SMALL WITH RIGHT HAND SIDE OF PICTURE EITHER CUTTING OFF OR FLATTENING OUT, check for:
   (a) Defective 6806 Horizontal output tube.

4. WHEN HORIZONTAL RASTER FOLDS OVER ON LEFT HAND SIDE, check for:
   (a) Shorted .05 mfd. 400 Volt Condenser (C-28) located in picture chassis.

5. WHEN HORIZONTAL RASTER IS TOO LARGE, check for:
   (a) Shorted 1 Megohm Resistor (R17) H.V. filter located inside H.V. shield compartment on picture chassis.
   (b) Open Width Control (55) located inside shield compartment on picture chassis.
   (c) Improper adjustment of Width Control (55).
   (d) Improper adjustment of Drive Control. CAUTION: DO NOT TOUCH THIS CONTROL without first reading the service manual instructions for adjustment of the Horizontal Drive Control given on the same page with Deflection, Focus and Ion Trap Adjustments.

6. RASTER JUMPS HORIZONTALLY (does not seem to lock in steady), check for:
   (a) Open .003 mfd. condenser (C12) located in cathode circuit of the 6H55 Phase Detector Tube in the picture chassis.
   (b) Shorted .05 mfd. Condenser (D15) located in the grid circuit of the the 6S77 Horizontal Oscillator Tube in the picture chassis.
   (c) Defective 6H55 Phase Detector Tube on picture chassis.

7. RASTER BALLOONS WHEN ADJUSTING BRILLIANCE CONTROL (acts like Vertical and Horizontal Size Controls were being adjusted at the same time), check for:
   (a) Open 1 Megohm Resistor (R17) H.V. filter located inside H.V. shield compartment on the picture chassis.

8. RASTER ASSUMES KEYSTONE EFFECT, WITH RIGHT AND LEFT SIDES SLOPING TO THE TOP, THE TOP OF THE RASTER BEING SMALLER THAN THE BOTTOM, check for:
   (a) Shorted 50 mfd. condenser (C32) located across lugs 1 and 2 on horizontal winding inside of Deflection Yoke (with back cover off, lugs 1 and 2 are the top and middle lugs on the left side when looking at the back of the Deflection Yoke) on the picture chassis.

9. NO RASTER BUT SOUND NORMAL, check for:
   (a) Open Fuse (F1) located in H.V. shield compartment on picture chassis.
   (b) Defective picture tube.
   (c) Defective 6S77 Horizontal Oscillator tube in shield compartment on picture chassis.
   (d) Defective 6806 Horizontal Output Tube in shield compartment on picture chassis.
   (e) Defective 6016/1307 H.V. Rectifier Tube located in shield compartment on picture chassis.
   (f) Defective 5W4 Damper Rectifier Tube in shield compartment on picture chassis.
   (g) Open Horizontal Lock Coil (L-1) located in picture chassis.
   (h) Shorted 250 MFD Condenser (C-21) coupling condenser to Horizontal output tube in picture chassis.
   (i) Shorted 400 MFD Horizontal discharge condenser (C-22) in picture chassis.
   (j) Open winding on Horizontal Output Transformer (T-3) between lugs 1 and 2, or 4 and 5, or between 3 and 2, or between 4 and 5, located in shield compartment on picture chassis.
   (k) Defective Horizontal Output transformer (T-3) located inside H.V. shield compartment on picture chassis. (Wave form appears as ripple instead of sawtooth at Focus Control.)
   (l) Shorted 500 MFD condenser (C-33) located in shield compartment on picture chassis.
   (m) An open resistor in the Horizontal Oscillator and Output circuits.
   (n) A shorted condenser in the Horizontal Oscillator and Output circuits.
   (o) An open resistor in the Horizontal Oscillator and Output circuits.
   (p) Open or high resistance 6,800 ohm resistor (R-9) in screen of 6806 located in picture chassis.

10. NO RASTER BUT THIN VERTICAL LINE IS VISIBLE ON SCREEN, check for:
    (a) Shorted or open Deflection Yoke (T-5) located on picture chassis.
    (b) Shorted 126 mfd. condenser (C-33) located across lugs 1 and 3 on horizontal winding inside of Deflection Yoke (with back cover off, lugs 1 and 3 are the top and bottom lugs on the left hand side when looking at the back of the Deflection Yoke) located on top of the Picture chassis.

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11. NO RASTER BUT THIN HORIZONTAL LINE IS VISIBLE ON SCREEN, check for:
(a) Defective 6SN7 Vertical Oscillator Tube on picture chassis.
(b) Defective 6SN7 Vertical Amplifier Tube on picture chassis.
(c) Defective blocking oscillator transformer (T-1) on picture chassis.
(d) Open vertical output transformer (T-4) located in H.V. shield compartment on picture chassis.
(e) Open Deflection Yoke (T-5) on top of the picture chassis.
(f) Shorted 1000 Mfd. condenser (C-17) cathode filter in Vertical Amplifier circuit on picture chassis.
(g) Shorted .2 Mfd. condenser (C-1) vertical oscillator plate filter in picture chassis.
(h) Open .1 Mfd. coupling condenser (C-13) in vertical amplifier grid in picture chassis.

12. NO PICTURE, SOUND WEAK, OR NO SOUND, check for:
(a) Weak 12AT7 or 6CU Oscillator Tube on tuner chassis.
(b) Weak or dead 6805 R.F. Amplifier tube on tuner chassis.
(c) Weak or dead 6AG5 Modulator tube on tuner chassis.
(d) Weak or dead 6AL5 Video Detector tube on tuner chassis.
(e) Intermittent contact between eyelet holding switch contact to wafer and switch contact of Channel Switch assembly in R.F. Tuner unit. NOTE: Eyelet should be soldered to contact cautiously -- too much applied heat may damage switch assembly.

13. NO PICTURE OR SOUND AND SET SPEAKS, or PICTURE AND SOUND INTERMITTENT, check for:
(a) Unused ground contact, at the third I.F. amplifier socket under the I.F. plate choke (L-3) on tuner chassis, cutting into the choke.
(b) Shorted .005 Mfd. condenser (C-26) in Modulator tube plate circuit in tuner chassis.
(c) Shorted tube in tuner or picture chassis.
(d) Shorted .005 Mfd. or 660 Mfd. condenser in R.F. tuner unit.

14. WHEN PICTURE WILL NOT LOCK EITHER HORIZONTALLY OR VERTICALLY, OR LOCKING IS VERY CRITICAL, check for:
(a) Defective 6AU6 Sync Separator tube on tuner chassis.
(b) Defective 6SN7 Sync Amplifier and phase splitter tube located on picture chassis.
(c) An open resistor in Sync Amplifier, Phase Splitter or Phase Detector circuit in picture chassis.
(d) A shorted condenser in Sync Amplifier, Phase Splitter or Phase Detector circuit in picture chassis.

15. WHEN PICTURE WILL NOT LOCK HORIZONTALLY, check for:
(a) Defective 6AL5 Phase Detector tube on picture chassis.
(b) Horizontal Lock Control on picture chassis improperly adjusted.
(c) Open winding in Horizontal Output Transformer (T-3) between lugs 5 and 6 located in shield compartment on picture chassis.
(d) Defective 6SN7 Horizontal Oscillator tube located in shield compartment on picture chassis.
(e) Shorted .003 Mfd. (.01 Mfd., in early models) cathode bypass condenser (C-12) in phase detector circuit in picture chassis. Replace with .003 Mfd. condenser only.

16. WHEN PICTURE WILL NOT LOCK VERTICALLY, or PICTURE LOCKS VERTICALLY BUT TWO SEPARATE PICTURES ARE VISIBLE (LOOKING AT 120 CYCLES), or TOP HALF OF PICTURE AND BOTTOM HALF ARE SUPER-IMPOSED UPON EACH OTHER (LOOKING AT 30 CYCLES), check for:
(a) Defective 6SN7 Vertical Oscillator tube in picture chassis.
(b) Open 1000 Mfd. condenser (C-17) cathode filter in vertical amplifier in picture chassis.
(c) Vertical Hold Control (R-3) shorted by filings or solder, located on back of picture chassis.
(d) The .005 Mfd. coupling condenser (C-5) to vertical oscillator in picture chassis has changed value.
(e) The 660,000 ohm resistor (R-6) in series with Vertical Hold Control in picture chassis has changed value.

17. BAND SWITCH STICKS ON ANY CHANNEL, check for:
(a) One of the oscillator trimmer adjustment screws on the Channel Selector Switch in the tuner unit at the front of the tuner chassis may be out too far and may be hitting the stop arm on the Channel Switch.

18. RASTER AND PICTURE NORMAL, NO SOUND, check for:
(a) Defective 6AG5 Audio Output tube on tuner chassis.
(b) Defective 6SN7 Audio Amplifier tube on tuner chassis.
(c) Defective 6AL5 Sound Detector tube on tuner chassis.
(d) Defective 6AV6 Sound I.F. Amplifier tube on tuner chassis.
(e) Defective component in sound section in tuner chassis.

SERVICE BULLETIN TV-106-A

WHEN PICTURE CANNOT BE BROUGHT INTO FOCUS WITH FOCUS CONTROL BUT RASTER, PICTURE AND SOUND APPEAR NORMAL, check for:
(a) Defective 240 Ohm Resistor (R-40) used in early models or 120 Ohm Resistor (R-40) used in later production, in series with the Focus Control.

Always replace the 240 Ohm Resistor with a 120 Ohm Resistor and remove one of the 1000 Ohm Resistors (R-37) in parallel connected between C-24b and C-31A, located in the picture chassis.
## Parts List

### Tuner Chassis

<table>
<thead>
<tr>
<th>Cap No.</th>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C-1</td>
<td>28640</td>
<td>Tuner, .023 MF 400 V.</td>
</tr>
<tr>
<td>C-2</td>
<td>28641</td>
<td>Tuner, .015 MF 400 V.</td>
</tr>
<tr>
<td>C-3</td>
<td>28642</td>
<td>Tuner, .005 MF 400 V.</td>
</tr>
<tr>
<td>C-4</td>
<td>28643</td>
<td>Tuner, .002 MF 400 V.</td>
</tr>
</tbody>
</table>

### Capacitors

<table>
<thead>
<tr>
<th>Cap No.</th>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C-1</td>
<td>28640</td>
<td>Carbon, .023 MF 400 V.</td>
</tr>
<tr>
<td>C-2</td>
<td>28641</td>
<td>Carbon, .015 MF 400 V.</td>
</tr>
<tr>
<td>C-3</td>
<td>28642</td>
<td>Carbon, .005 MF 400 V.</td>
</tr>
<tr>
<td>C-4</td>
<td>28643</td>
<td>Carbon, .002 MF 400 V.</td>
</tr>
</tbody>
</table>

### Controls

<table>
<thead>
<tr>
<th>Control No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>28644</td>
<td>Vertical Hold, 1.5 Megohm</td>
</tr>
<tr>
<td>28645</td>
<td>Vertical Linearity</td>
</tr>
<tr>
<td>28646</td>
<td>Horizontal Idc, 50,000 Ohm</td>
</tr>
<tr>
<td>28647</td>
<td>Height, 250,000 Ohm</td>
</tr>
<tr>
<td>28648</td>
<td>Focus, 150,000 Ohm</td>
</tr>
<tr>
<td>28649</td>
<td>Centering, 25 Ohm</td>
</tr>
</tbody>
</table>

## Miscellaneous Parts

### Speaker, 8" P.M. for 402 Series

- Speaker, 24" P" M for 401 and 406 Series
- Tension, for I.U. Switch and Multiple Receptacle-Assembly
- Diode Plate Assembly, 200 Series
- Diode Plate Assembly, 400 Series
- I.F. Plate Choke Assembly, 200 Series
- I.F. Plate Choke Assembly, 400 Series
- Loading Chokes, 200 Series
- Loading Chokes, 400 Series

### Resistors

- Carbon, 1000 Ohm
- Carbon, 1 K Ohm
- Carbon, 500 Ohm
- Carbon, 100 Ohm
- Carbon, 10,000 Ohm
- Carbon, 30,000 Ohm
- Carbon, 50,000 Ohm
- Carbon, 100,000 Ohm
- Carbon, 1 Meg Ohm
- Carbon, 10 Meg Ohm
- Carbon, 100 Meg Ohm
- Carbon, 1,000 Meg Ohm
- Carbon, 10,000 Meg Ohm
- Carbon, 100,000 Meg Ohm
- Carbon, 1,000,000 Meg Ohm

### Coils and Transformers

- Coil, Choke Chassis Assembly
- Transformer, 1st I.F.
- Transformer, 2nd I.F.
- Transformer, Discriminator Coil
- Transformer, Output for Speaker
- Transformer, Power

### Models

- 401, 402, 406 Series

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