MODEL 721TS, Chassis
KCS 26-1, KCS 26-2

RADIO CORP. OF AMERICA

ELECTRICAL AND MECHANICAL SPECIFICATIONS

PICTURE SIZE ..... 6⅜" x 8½"

RADIO FREQUENCY RANGES

Channel Number	Channel Freq. Mc	Picture Carrier Freq. Mc	Sound Carrier Freq. Mc	Receiver R-F Osc. Freq. Mc
1	44-50	45.25	49.75	71
2	54-60	55.25	59.75	81
3	60-66	61.25	65.75	87
4	66-72	67.25	71.75	93
5	76-82	77.25	81.75	103
6	82-88	83.25	87.75	109
7	174-180	175.25	179.75	201
8	180-186	181.25	185.75	207
9	186-192	187.25	191.75	213
10	192-198	193.25	197.75	219
11	198-204	199.25	203.75	225
12	204-210	205.25	209.75	231
13	210-216	211.25	215.75	237

FINE TUNING RANGE

Plus and minus approximately 800 kc on channel 1, and plus and minus approximately 1.9 mc on channel 13.

POWER-SUPPLY RATING

KCS 26-1 ..... 115 volts, 60 cycles, 220 watts
KCS 26-2 ..... 115 volts, 50 cycles, 220 watts

AUDIO POWER-OUTPUT RATING

Undistorted ..... 2 watts
Maximum ..... 3 watts

LOUDSPEAKER (92565-1)

Type ..... 6 x 4 inch Electro Magnet Dynamic
Voice-Coil Impedance ..... 3.2 ohms at 400 cycles

WEIGHT

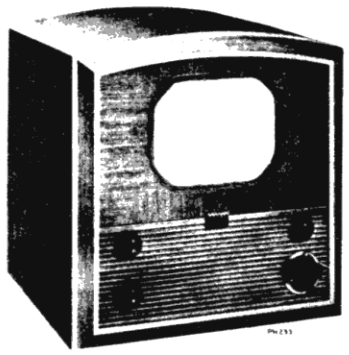
Chassis with Tubes in Cabinet (less kinescope) ..... 67 lbs.
Shipping Weight (less kinescope) ..... 78 lbs.

RECEIVER ANTENNA
INPUT IMPEDANCE ..... 300 ohms balanced

DIMENSIONS (inches)	**Length**	**Height**	**Depth**
Cabinet (Outside)	19	19	19
Chassis Base (Outside)	15⅜	4⅜	14¾
Chassis Overall	15⅝	14½	16¼

RCA TUBE COMPLEMENT

	Tube Used	**Function**
(1)	RCA 6J6	R-F Amplifier
(2)	RCA 6J6	R-F Oscillator
(3)	RCA 6J6	Converter
(4)	RCA 6BA6	1st Sound I-F Amplifier
(5)	RCA 6AU6	2nd Sound I-F Amplifier
(6)	RCA 6AL5	Sound Discriminator
(7)	RCA 6AT6	1st Audio Amplifier and Bias Clamp
(8)	RCA 6K6-GT	Audio Output
(9)	RCA 6AG5	1st Picture I-F Amplifier
(10)	RCA 6AG5	2nd Picture I-F Amplifier
(11)	RCA 6AG5	3rd Picture I-F Amplifier
(12)	RCA 6AL5	Picture 2nd Detector and Sync Limiter
(13)	RCA 12AU7	1st and 2nd Video Amplifier
(14)	RCA 6SN7-GT	Sync Amplifier and Sync Separator
(15)	RCA 6SN7-GT	Vertical Sweep Oscillator, Discharge and Vertical Sweep Output
(16)	RCA 6SN7-GT	Horizontal Sweep Oscillator and Control
(17)	RCA 6BG6-G	Horizontal Sweep Output
(18)	RCA 5V4-G	Damper
(19)	RCA 1B3-GT/8016	High Voltage Rectifier
(20)	RCA 5U4-G	Power Supply Rectifier
(21)	RCA 10BP4	Kinescope



Model 721TS
Walnut or Mahogany

PICTURE INTERMEDIATE FREQUENCIES

Picture Carrier Frequency ..... 25.75 Mc
Accompanying Sound Traps ..... 21.25 Mc

SOUND INTERMEDIATE FREQUENCIES

Sound Carrier Frequency ..... 21.25 Mc
Sound Discriminator Band Width (between peaks) ..... 350 Kc

VIDEO RESPONSE ..... To 3 Mc

FOCUS ..... Magnetic

SWEEP DEFLECTION ..... Magnetic

SCANNING ..... Interlaced, 525 line

HORIZONTAL SCANNING FREQUENCY ..... 15,750 cps

VERTICAL SCANNING FREQUENCY ..... 60 cps

FRAME FREQUENCY (Picture Repetition Rate) ..... 30 cps

OPERATING CONTROLS (front panel)

Station Selector, Fine Tuning ..... Dual Control Knobs
Sound Volume and On-Off Switch ..... Single Control Knob
Horizontal (Picture Horizontal Hold), Vertical (Picture Vertical Hold) ..... Dual Control Knobs
Picture (Contrast), Brightness (Brilliance) ..... Dual Control Knobs

NON-OPERATING CONTROLS (not including r-f and i-f adjustments)

Horizontal Centering ..... rear chassis adjustment
Vertical Centering ..... rear chassis adjustment
Width ..... rear chassis screwdriver adjustment
Height ..... rear chassis adjustment
Horizontal Linearity ..... top chassis screwdriver adjustment
Vertical Linearity ..... rear chassis adjustment
Horizontal Drive ..... rear chassis screwdriver adjustment
Horizontal Frequency (Fine) ..... rear chassis screwdriver adjustment
Horizontal Oscillator Frequency (coarse) ..... bottom chassis screwdriver adjustment
Horizontal Locking Range ..... rear chassis screwdriver adjustment
Focus ..... rear chassis adjustment
Focus Coil ..... top chassis wing screw adjustment
Ion Trap Magnet ..... top chassis thumb screw adjustment
Deflection Coil ..... top chassis wing nut adjustment

RADIO CORP. OF AMERICA

RECEIVER OPERATING INSTRUCTIONS

The following adjustments are necessary when turning the receiver on for the first time:

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. Turn the PICTURE control fully counter-clockwise.

4. Turn the BRIGHTNESS control fully counterclockwise, then clockwise until a faint glow just appears on the screen.

5. Turn the PICTURE control approximately three-fourths clockwise.

6. Adjust the FINE TUNING control for best sound fidelity and the SOUND control for suitable volume.

7. Adjust the VERTICAL hold control until the pattern stops vertical movement.

8. Adjust the HORIZONTAL hold control until the picture appears on the screen.

9. Adjust the PICTURE control for suitable picture contrast.

10. After the receiver has been on for some time, it may be necessary to readjust the FINE TUNING control slightly for improved sound fidelity.

11. In switching from one station to another, it may be necessary to repeat steps number 6 and 9.

12. When the set is turned on again after an idle period, it should not be necessary to repeat the adjustments if the positions of the controls have not been changed. If any adjustment is necessary, step number 6 is generally sufficient.

13. If the positions of the controls have been changed, it may be necessary to repeat steps number 1 through 9.

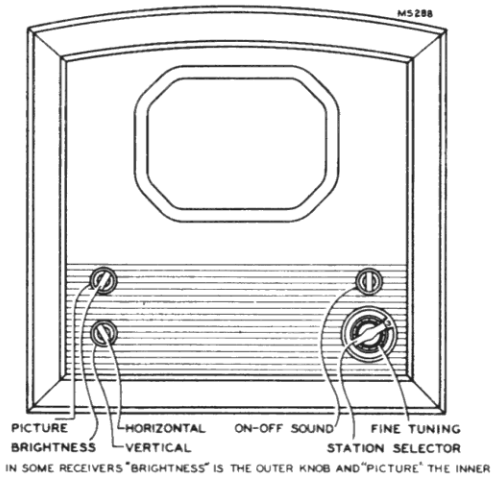


Figure 1—Receiver Operating Controls

CIRCUIT DESCRIPTION

The general design features of the 721TS television receiver are conventional. However, the a-f-c horizontal hold circuit is new and will be described briefly.

Fundamentally the horizontal oscillator is a free running blocking oscillator and discharge circuit. The incoming sync is superimposed on the horizontal oscillator waveform and applied to the control tube grid. If the two voltages are not in the proper frequency and phase relations, the control tube applies a bias to the oscillator to bring it into sync.

A portion of the bias from the blocking oscillator is applied to the grid of the control tube and is sufficient to keep the control tube cut off except when the sync pulse is high on the slope of the grid waveform as shown in Figure 2-A. If the oscillator changes phase so that the pulse slides down the slope, the plate conduction time decreases as shown in Figure 2-B. If the pulse slides up the slope, then the plate conduction time increases as shown in Figure 2-C. When the control tube conducts capacitors C161 and C167 in its cathode circuit charge to a d-c potential proportional to the plate conduction time. This potential is applied as a bias to the oscillator grid thus shifting the oscillator frequency and pulling it into phase with the sync pulses.

The effect of the various controls associated with the circuit are as follows. L121 is tuned with a slug to effect coarse adjustments in oscillator frequency. C136C is provided to effect fine adjustments in frequency. R156 the horizontal hold control is provided on the front panel to permit a 5% variation of frequency by varying the control tube plate voltage. C136A is a variable portion of a capacity voltage divider and is provided to set the amplitude of the waveform on the grid of the control tube so that conduction occurs only on the positive peaks of the waveform. The horizontal drive control C136B is part of a capacity voltage divider and is provided to vary the amount of sawtooth voltage on the V109 grid and hence is a control for picture linearity.

Several components of the oscillator and control circuits have special coefficients or characteristics and in case of failure, should be replaced only by exact replacement. R173 is a special resistor capable of stability of 1% or better. R191 is a high negative coefficient resistor to compensate for warm up drift. It is mounted within about ¼ inch of the power transformer and chassis for good heat transfer. The dress of this component should not be disturbed.

Strains or excessive heat should not be applied to the leads or bodies of the resistors associated with the horizontal oscillator and control circuits. Such conditions may cause excessive changes of resistance with age. See "Critical Lead Dress".

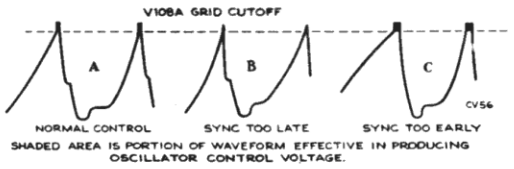


Figure 2—Horizontal Control Waveforms

MODEL 721TS

RADIO CORP. OF AMERICA

INSTALLATION INSTRUCTIONS

The Model 721TS television receiver is shipped complete in one carton except for the 10BP4 kinescope. The kinescope is shipped in a special carton and should not be unpacked until ready for installation.

UNPACKING—To unpack the receiver, tear open the carton flaps, pick the receiver up from under the bottom of the cabinet and lift it out of the shipping carton.

Remove the front panel from the cabinet as indicated in Figure 3. Take the metal grill off the back of the cabinet.

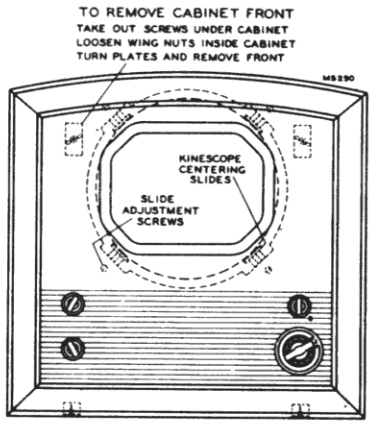


Figure 3—Cabinet, Front View

The operating control knobs are packed in a paper bag which is tied to the focus coil mounting bracket inside the cabinet. Remove the bag.

Remove the protective cardboard shield from the 5U4G rectifier. Make sure all tubes are in place and are firmly seated in their sockets.

Loosen the two kinescope cushion adjustment wing screws and slide the cushion toward the rear of the chassis. Loosen the deflection yoke adjustment, slide the yoke toward the rear of the chassis and tighten. See Figure 4 for the location of the cushion and yoke adjustments.

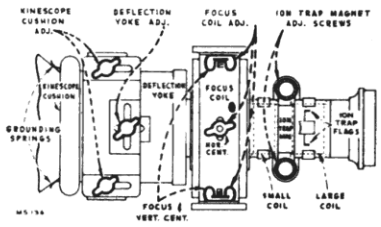


Figure 4—Yoke and Focus Coil Adjustments

From the front of the cabinet, look through the deflection yoke and check the alignment of the focus coil with the yoke. If the focus coil is not in line, loosen the three focus coil adjustment wingnuts and raise, lower, or rotate the coil until alignment is obtained. Tighten the wingnuts with the coil in this position.

Loosen the two lower kinescope face centering slides, and set them at approximately mid position. See Figure 3 for location of the slides and their adjustment screws. Loosen the ion trap magnet adjustment thumb screws.

KINESCOPE HANDLING PRECAUTION—Do not open the kinescope shipping carton, install, remove, or handle the kinescope in any manner, unless shatterproof goggles and heavy gloves are worn. People not so equipped should be kept away while handling the kinescope. Keep the kinescope away from the body while handling. The shipping carton should be kept for use in case of future moves.

INSTALLATION OF KINESCOPE—The kinescope second anode contact is a recessed metal well in the side of the bulb. The tube must be installed so that this contact is approximately on top. The final orientation of the tube will be determined by the position of the ion trap flags. Looking at the kinescope gun structure, it will be observed that the second cylinder from the base inside the glass neck is provided with two small metal flags, as shown in Figure 5. The kinescope must be installed so that when looking down on the chassis, the two flags will be seen as shown in Figure 4.

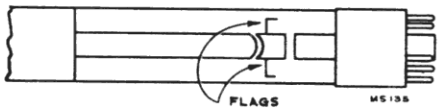


Figure 5—Ion Trap Flags

Insert the neck of the kinescope through the deflection and focus coils as shown in Figure 6 until the base of the tube protrudes approximately two inches beyond the focus coil. **If the tube sticks, or fails to slip into place smoothly, investigate and remove the cause of the trouble. Do not force the tube.**

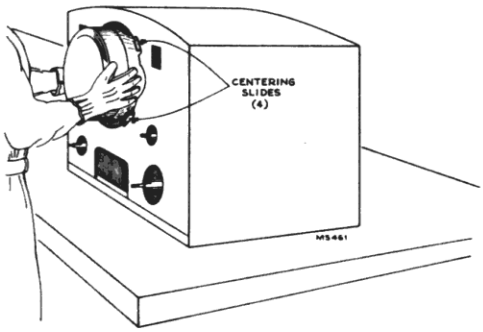


Figure 6—Kinescope Insertion

Slip the ion trap magnet on the neck of the kinescope with the large coil toward the base of the tube as shown in Figure 4. Connect the kinescope socket to the tube base. Insert the kinescope until the face of the tube protrudes approximately one-eighth of an inch outside the front of the cabinet.

Adjust the four centering slides until the face of the kinescope is in the center of the cabinet opening. Tighten the four slides securely.

Wipe the kinescope screen surface and front panel safety glass clean of all dust and finger marks with a soft cloth moistened with the Drackett Co.'s "Windex" or similar cleaning agent.

Install the cabinet front panel by reversal of the removing process as shown in Figure 3. Install the control knobs on the proper control shafts.

Slip the kinescope as far forward as possible. Slide the kinescope cushion firmly up against the flare of the tube and tighten the adjustment wing screws. Slide the deflection yoke as far forward as possible. Connect the high voltage lead to the kinescope second anode socket.

The antenna and power connections should now be made. Turn the power switch to the "on" position, the brightness control fully clockwise, and picture control counter-clockwise.

ION TRAP MAGNET ADJUSTMENT—The ion trap rear magnet poles should be placed over the ion trap flags as shown in Figure 4. 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. Tighten the magnet adjustment thumb screws sufficiently to hold it in this position but still free enough to permit further adjustment. Reduce the brightness control setting until the raster is slightly above average brilliance. Adjust the focus control (R129 on the chassis rear apron) until the line structure of the raster is clearly visible. Readjust the ion 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 line focus can be maintained.

FOCUS COIL ADJUSTMENTS—Turn the centering controls R152 and R166 to mid position. See Figure 7 for location of these rear apron controls.

If a corner of the raster is shadowed, it indicates that the electron beam is striking the neck of the tube. Loosen the focus coil adjustment wing nuts and rotate the coil about its vertical and horizontal axes until the entire raster is visible, approximately centered and with no shadowed corners. Tighten the focus coil adjustment wing nuts with the coil in this position.

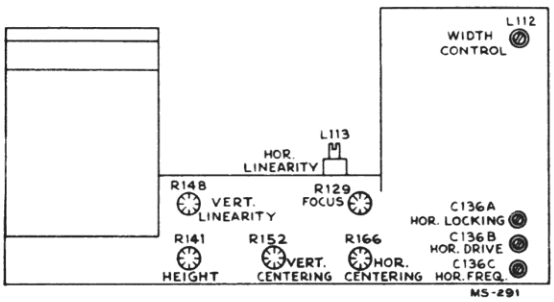


Figure 7—Rear Chassis Adjustments

DEFLECTION YOKE ADJUSTMENT—If the lines of the raster are not horizontal or squared with the picture mask, rotate the deflection yoke until this condition is obtained. Tighten the yoke adjustment wing screw.

PICTURE ADJUSTMENTS—It will now be necessary to obtain a test pattern picture in order to make further adjustments. See steps 2 through 9, of the receiver operating instructions on page 3.

CHECK OF HORIZONTAL OSCILLATOR ALIGNMENT—Turn the horizontal hold control to the extreme counter-clockwise position. The picture should remain in horizontal sync. Momentarily remove the signal by switching off channel and then back. Normally the picture will be out of sync. Turn the control clockwise slowly. The number of diagonal bars will be gradually reduced and when only 3½ to 4½ bars sloping downward to the left are obtained, the picture will pull into sync upon slight additional clockwise rotation of the control. Pull in should occur when the control is approximately 90 degrees from the extreme counterclockwise position. The picture should remain in sync for approximately 90 degrees of additional clockwise rotation of the control. At the extreme clockwise position, the picture should be out of sync and should show from $3\frac{1}{2}$ to $4\frac{1}{2}$ bars sloping downward to the right.

If the receiver passes the above checks and the picture is normal and stable, the horizontal oscillator is properly aligned. Skip "Alignment of Horizontal Oscillator" and proceed with "Focus" adjustment.

ALIGNMENT OF HORIZONTAL OSCILLATOR—If in the above check the receiver failed to hold sync with the hold control at the extreme counterclockwise position or failed to hold sync at least 60 degrees of clockwise rotation of the control from the pull in point, it will be necessary to make the following adjustments.

Horizontal Frequency Adjustment—Turn the horizontal hold control to the extreme clockwise position. Tune in a television station and adjust the rear apron horizontal frequency trimmer C136C until the picture is out of sync and shows $3\frac{1}{2}$ to $4\frac{1}{2}$ bars sloping downward to the right. If the trimmer has insufficient range, set the trimmer to mid-position (1 turn out from max. capacity) and adjust the L121 horizontal frequency adjustment until this condition is obtained. See figure 22 for the location of L121.

Horizontal Locking Range Adjustment—Set the horizontal hold control to the full counter-clockwise position. Momentarily remove the signal by switching off channel and 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 $4\frac{1}{2}$ bars are present just before the picture pulls into sync, adjust the horizontal locking range trimmer C136A slightly clockwise. If less than $3\frac{1}{2}$ bars are present, adjust C136A slightly counterclockwise. Turn the picture control counterclockwise, momentarily remove the signal and recheck the number of bars present at the pull in point. Repeat this procedure until $3\frac{1}{2}$ to $4\frac{1}{2}$ bars are present.

Repeat the adjustments under "Horizontal Frequency Adjustment" and "Horizontal Locking Range Adjustment" until the conditions specified under each are fulfilled. When the horizontal hold operates as outlined under "Check of Horizontal Oscillator Alignment" the oscillator is properly adjusted.

HEIGHT AND VERTICAL LINEARITY ADJUSTMENTS—Adjust the height control (R141 on chassis rear apron) until the picture fills the mask vertically ($6\frac{3}{8}$ inches). Adjust vertical linearity (R148 on rear apron), until the test pattern is symmetrical from top to bottom. Adjustment of either control will require a readjustment of the other. Adjust vertical centering to align the picture with the mask.

WIDTH, DRIVE AND HORIZONTAL LINEARITY ADJUSTMENTS—Turn the width control L112 to the maximum clockwise position. Vary the horizontal drive trimmer C136B to yield the best compromise between brightness and linearity. Adjust the horizontal linearity control L113 for best linearity of the right half of the picture. Readjust the width control until the picture just fills the mask. Adjust horizontal centering to align the picture with the mask.

FOCUS—Adjust the focus control R129 for maximum definition of the vertical wedge of the test pattern.

Check to see that all cushion, yoke, focus coil and ion trap magnet thumb screws are tight. Replace the cabinet back grille. Make sure that the back is on tight, otherwise it may rattle at high volume.

CHECK OF R-F OSCILLATOR ADJUSTMENTS—With a crystal calibrated test oscillator or heterodyne frequency meter, check to see if the receiver r-f oscillator is adjusted to the proper frequency on all channels. If adjustments are required, these should be made by the method outlined in the alignment procedure. The adjustments for channels 1 through 5 and 7 through 12 are available from the front of the cabinet by removing the station selector escutcheon as shown in Figure 8. Adjustments for channels 6 and 13 are under the chassis.

Tune in all available Television Stations. Observe the picture for detail, for proper interlacing and for the presence of interference or reflections. If these are encountered, see the section on antennas on

For test patterns see back of Manual

MODEL 721TS

RADIO CORP. OF AMERICA

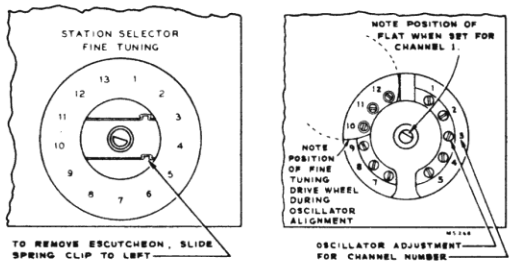


Figure 8—R-F Oscillator Adjustments

RECEIVER LOCATION—The owner should be advised of the importance of placing the receiver in the proper location in the room.

The location should be chosen—

—Away from bright windows and so that no bright light will fall directly on the screen. (Some illumination in the room is desirable, however.)

—To give easy access for operation and comfortable viewing.

—To permit convenient connection to the antenna.

Convenient to an electrical outlet.

—To allow adequate ventilation.

VENTILATION CAUTION—The receiver is provided with adequate ventilation holes in the bottom and back of the cabinet. Care should be taken not to allow these holes to be covered or ventilation to be impeded in any way.

RECEIVER SUPPORT CAUTION—The complete receiver weighs approximately 80 pounds. This represents a considerably greater load than can usually be placed on the average small table. Only a very sturdy table should be used to support the receiver.

Due to the weight of the receiver, the cabinet should not be dragged or slid across the supporting table as damage to the table finish may result.

ANTENNAS—The finest television receiver built may be said to be only as good as the antenna design and installation. It is therefore important to use a correctly designed antenna, and to use care in its installation.

RCA Television Antennas, stock No. 225 and No. 226, are designed for reception on all thirteen television channels. These antennas use the 300-ohm RCA "Bright Picture" television transmission line. Installation personnel are cautioned not to make any changes in the antenna or to substitute other types of transmission line as such changes may result in unsatisfactory picture reproduction.

The stock #226 antenna is bi-directional on channels one through six (44 to 88 Mc). When used on these channels, the maximum signal is obtained when the antenna rods are broadside toward the transmitting antenna.

The stock #225 antenna with reflector is uni-directional on channels one through six. When used on these channels, the maximum signal is obtained when the antenna rods are broadside toward the transmitting antenna, with the antenna element between the reflector and the transmitting antenna.

When operated on channels seven through thirteen, (174 to 216 Mc), both types of antennas have side lobes. On these channels, the maximum signal will be obtained when the antenna is rotated approximately 35 degrees in either direction from its broadside position toward the transmitting antenna.

In general, the stock #225 antenna should be used if reflections are encountered, if the signal strength is weak, or if the receiving location is noisy. If these conditions are not encountered, the stock #226 antenna will probably be satisfactory.

In most cases, the antenna should not be installed permanently until the quality of the picture reception has been observed on a television receiver. A temporary transmission line can be run between receiver and the antenna, allowing sufficient slack to permit moving the antenna. Then, with a telephone system connecting an observer at the receiver and an assistant at the antenna, the antenna can be positioned to give the most satisfactory results on the received signal. A shift of direction or a few feet in antenna position may effect a tremendous difference in picture reception.

REFLECTIONS—Multiple images sometimes known as echoes or ghosts, are caused by the signal arriving at the antenna by two or more routes. The second or subsequent image occurs when a signal arrives at the antenna after being reflected off a building, a hill or other object. In severe cases of reflections, even the sound may be distorted. In less severe cases, reflections may occur that are not noticeable as reflections but that will instead cause a loss of definition in the picture.

Depending upon the circumstances, it may be possible to eliminate the reflections by rotating the antenna or by moving it to a new location. In extreme cases, it may be impossible to eliminate the reflection.

Under certain extremely unusual conditions, it may be possible to rotate or position the antenna so that it receives the cleanest picture over a reflected path. If such is the case, the antenna should be so positioned. However, such a position may give variable results as the nature of reflecting surfaces may vary with weather conditions. Wet surfaces have been known to have different reflecting characteristics than dry surfaces.

INTERFERENCE—Auto ignition, street cars, electrical machinery and diathermy apparatus may cause interference which spoils the picture. Whenever possible, the antenna location should be removed as far as possible from highways, hospitals, doctors' offices, and similar sources of interference. In mounting the antenna, care must be taken to keep the antenna rods at least ¼ wave length (at least 6 feet) away from other antennas, metal roofs, gutters, or other metal objects.

Short-wave radio transmitting and receiving equipment may cause interference in the picture in the form of moving ripples. In some instances it may be possible to eliminate the interference by the use of a trap in the antenna transmission line. However, if the interfering signal is on the same frequency as the television station, a trap will provide no improvement.

WEAK PICTURE—When the installation is near the limit of the area served by the transmitting station, the picture may be speckled, having a "snow" effect, and may not hold steady on the screen. This condition is due to lack of signal strength from the transmitter.

INFORMATION REFERENCES—In short, a television receiving antenna and its installation must conform to much higher standards than an antenna for reception of International Short Wave and Standard Broadcast signals.

RADIO CORP. OF AMERICA

SERVICE SUGGESTIONS

Some of the possible troubles that may be encountered, with their effects and causes, are listed below:

NO RASTER ON KINESCOPE—The effect of no raster can be caused by the following:

(1) Incorrect adjustment of ion trap magnet. Open coil; negative bleeder open; coils reversed.

(2) No high voltage. Check V109 (6BG6-G) and V110 (8016) tubes and circuits. If the horizontal-deflection circuits are operating, as evidenced by the correct waveform measured on terminal 4 of horizontal output transformer T105, the trouble can be isolated to the high-voltage rectifier (V110) circuit. Either the high-voltage winding (points 2 to 3 on T105) is open; the 8016 tube is defective; its filament circuit is open; or the high-voltage filter capacitor C142 is shorted.

(3) Damper tube (V111, 5V4-G) inoperative. Plate voltage supply for 6BG6-G horizontal output tube is obtained through the damper tube. Check tube, and heater winding on T106. If tube is O.K., check L113 (horizontal linearity coil) for continuity, and capacitors C139 and C140 for short circuit.

(4) Defective kinescope. Heater open; cathode "return" circuit open.

(5) No plate voltage. Shorted electrolytic capacitor; open speaker field coil. All +B measurements are accessible for measurement by removing cover from bleeder box.

(6) Horizontal osc. and control tube (V108, 6SN7-GT) inoperative. Check for sawtooth on grid of horizontal output tube (V109, 6BG6-G). If not present, check waveforms, voltages, and components in V108 circuits.

HORIZONTAL DEFLECTION ONLY—If horizontal deflection only is obtained, evidenced by a "straight line" across the face of the kinescope, it can be caused by the following:

(1) Vertical oscillator and output tube (V107, 6SN7-GT) inoperative. Check waveforms and voltages on grid and plate.

(2) Vertical output transformer (T103) open.

(3) Yoke vertical coils open.

POOR VERTICAL LINEARITY If adjustment of the vertical height and linearity controls will not correct this condition, any of the following may be the cause:

(1) Vertical output transformer (T103) defective.

(2) Capacitors C128-C or C127-B defective.

(3) V107 (6SN7-GT) defective. Check waveforms and voltages.

(4) Excess leakage or incorrect value in capacitor C130.

(5) Low plate and bias voltages. Check rectifier tube and capacitors in +B supply circuits.

(6) Capacitor C129 defective.

POOR HORIZONTAL LINEARITY If adjustment of controls does not correct this condition, check the following:

(1) Check or replace horizontal output tube (V109, 6BG6-G).

(2) Check or replace damper tube (V111; 5V4-G).

(3) Check waveform on grid of V109.

(4) Check linearity coil L113 for short circuit.

(5) Check capacitors C139 and C140 for defects.

TRAPEZOIDAL OR NON-SYMMETRICAL RASTER This condition can be caused by:

Defective yoke.

WRINKLES ON LEFT SIDE OF RASTER—This condition can be caused by:

Defective yoke due to R101, R151, or C141 (internal in yoke assembly) being wrong value or open. These components are mounted in rear of yoke assembly.

SMALL RASTER This condition can be caused by:

(1) Low + B or line voltage.

(2) Insufficient output from horizontal output tube V109 (6BG6-G). Replace tube.

RASTER—NO IMAGE, BUT ACCOMPANYING SOUND—This condition can be caused by:

(1) No signal on kinescope grid. Check picture i-f amplifier tubes V101 (6AG5), V102 (6AG5), V103 (6AG5), second detector V104 (6AL5), and video amplifier V105 (12AU7).

(2) Bad contact to kinescope grid. (Lead to socket broken.)

SIGNAL APPEARS ON KINESCOPE GRID BUT IMPOSSIBLE TO SYNCHRONIZE THE PICTURE VERTICALLY AND HORIZONTALLY A condition of this nature can be caused by:

(1) Defective sync amplifier and separator (V106, 6SN7-GT).

(2) If tube is O.K., check voltages, waveforms and associated circuits.

SIGNAL ON KINESCOPE GRID AND HORIZONTAL SYNC ONLY—If this condition is encountered, check:

Vertical integrating network capacitors C164, C123, C124, C125, and resistors R136, R137, R138.

PICTURE STABLE BUT WITH POOR RESOLUTION—If the picture resolution is not up to standard, it may be caused by any of the following:

(1) Defective picture detector (V104, 6AL5) or video amplifier (V105, 12AU7).

(2) Open video peaking coil. Check all peaking coils (L104, L105, L106, L107) for continuity. Note that L105 and L106 have shunting resistors.

(3) Leakage in V105 grid capacitor C115.

If above components are not found to be defective, check the following:

(1) Check all potentials in video circuits.

(2) Check kinescope grid circuit for poor or dirty contact.

(3) Check adjustment of focus control (R129). It should be effective on either side of proper focus.

(4) Check and realign, if necessary, the picture i-f and r-f circuits.

PICTURE SMEAR—

(1) Normally, smear can be attributed to phase shift at the low-frequency end of the video characteristic. This can be caused by improper values of R and C in the video circuits. Check for grid current on video amplifier tube V105.

(2) This trouble can originate in either the transmitter or the receiver. Check reception from another station.

PICTURE JITTER—

(1) If regular sections at the left of the picture are displaced, replace the horizontal output tube (V109, 6BG6-G).

(2) Vertical instability may be due to loose connections or "noise" received with the signal.

(3) Horizontal instability may be due to unstable transmitted sync, or to "noise."

MODEL 721TS

RADIO CORP. OF AMERICA

ALIGNMENT PROCEDURE

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

R-F Sweep Generator meeting the following requirements:

(a) Frequency ranges:

18 to 30 mc, 1 mc sweep width
40 to 90 mc, 10 mc sweep width
170 to 225 mc, 10 mc sweep width

(b) Output adjustable with at least 1 volt maximum.

(c) Output constant on all ranges.

(d) "Flat" output in all attenuator positions.

Cathode-ray Oscilloscope, preferably one with a wide band vertical deflection and an input calibrating source.

Signal Generator to provide the following frequencies: (Output on these ranges should be adjustable and at least 1 volt maximum.)

(a) Intermediate frequencies:

21.25 mc sound i-f and sound traps
22.8 mc converter transformer
23.9 mc first picture i-f coil
24.5 mc third picture i-f coil
26.0 mc second picture i-f coil

(b) Radio frequencies:

Channel Number	Picture Carrier Freq. Mc	Sound Carrier Freq. Mc
1	45.25	49.75
2	55.25	59.75
3	61.25	65.75
4	67.25	71.75
5	77.25	81.75
6	83.25	87.75
7	175.25	179.75
8	181.25	185.75
9	187.25	191.75
10	193.25	197.75
11	199.25	203.75
12	205.25	209.75
13	211.25	215.75

Heterodyne Frequency Meter with crystal calibrator if the signal generator is not crystal controlled.

Electronic Voltmeter of "Junior VoltOhmyst type" and a high voltage probe for use with this meter to permit measurements up to 10 kv.

SERVICE PRECAUTIONS Cutouts in the bottom of the cabinet make it possible to do some of the servicing of the receiver without removing the chassis. If the receiver is serviced in the cabinet, a soft pad should be placed under the cabinet when it is inverted, in order to avoid scratching the surface. In manufacture, the cabinet receives a Class 1 rub finish and every effort should be made to preserve that finish.

If necessary to remove the chassis from cabinet, the kinescope must first be removed. See Figures 3, 4 and 6. If possible, the chassis should then be serviced without the kinescope. However, if it is necessary to view the raster during servicing, the kinescope should be inserted only after the chassis is turned on end. The kinescope should never be allowed to support its weight by resting in the deflecting yoke. A bracket should be used to support the tube at its viewing screen.

By turning the chassis on end with the power transformer "up," all adjustments will be made conveniently available. Since this is the only safe position in which the chassis will rest and still leave adjustments accessible, the trimmer location drawings are oriented similarly for ease of use.

CAUTION: Do not permit the kinescope second-anode lead to become "shorted" to the chassis. To do so will cause a considerable overload on the high-voltage filter resistor R167.

ADJUSTMENTS REQUIRED Normally, only the r-f oscillator line will require the attention of the service technician. All other circuits are either broad or very stable and hence will seldom require readjustment.

Due to the high frequencies at which the receiver operates, the r-f oscillator-line adjustment is critical and may be affected by a tube change. The line can be adjusted to the proper frequency on channel 13 with practically any 6J6 tube in the socket. However, it may not then be possible to adjust the line to frequency on all of channels 7, 8, 9, 10, 11, and 12. For an oscillator tube to be satisfactory, it should be possible to adjust the line to proper frequency with the fine-tuning control in the middle of its range. It may therefore be necessary to select a tube for the oscillator socket. In replacing, if the old tube can be matched for frequency by trying several new ones, this practice is recommended. At best, however, it will probably be necessary to realign the oscillator line completely after changing the tube.

Tubes which cannot be used as an oscillator may work satisfactorily as an r-f amplifier or a converter.

The detailed alignment procedure which follows is intended primarily as a discussion of the method used, precautions to be taken, and the reasons for these precautions. Then, for more convenient reference during alignment, a tabulation of the method is given. All the information necessary for alignment is given in the tables; however, alignment by the tables should not be attempted before reading the detailed instructions.

RADIO CORP. OF AMERICA

MODEL 721TS

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

Sound discriminator
Sound i-f transformers
Picture i-f traps
Picture i-f coils
R-F and converter lines
R-F oscillator line
Retouch picture i-f transformers
Sensitivity check

SOUND DISCRIMINATOR ALIGNMENT—

Set the signal generator for approximately 1 volt output at 21.25 mc. and connect it to the second sound i-f grid.

Detune T108 secondary (bottom).

Set the "VoltOhmyst" on the 10 volt scale.

Connect the meter in series with a one megohm resistor to the junction of diode resistors R181 and R182.

Adjust the primary of T108 (top) for maximum output on the meter.

Connect the "VoltOhmyst" to pin 1 of V116 and set on the 3 volt scale.

Adjust T108 secondary (bottom). It will be found that it is possible to produce a positive or negative voltage on the meter dependent upon this adjustment. Obviously to pass from a positive to a negative voltage, the voltage must go through zero. T108 (bottom) should be adjusted so that the meter indicates zero output as the voltage swings from positive to negative. This point will be called discriminator zero output.

Connect the sweep oscillator to the grid of the second sound i-f amplifier.

Adjust the sweep band width to approximately 1 mc. with the center frequency at approximately 21.25 and with an output of approximately 1 volt.

Connect the oscilloscope to pin 1 of V116.

The pattern obtained should be similar to that shown in Figure 13A. If it is not, adjust the T108 (top) until the wave form is symmetrical.

The peak to peak bandwidth of the discriminator should be approximately 350 kc. and should be linear from 21.175 mc. to 21.325 mc.

SOUND I-F ALIGNMENT—

Connect the sweep and signal generator to the top end of the trap winding of T3 (on top of the chassis).

Connect the oscilloscope to the second sound i-f grid return (terminal A T107) in series with a 33,000 ohm isolating resistor.

Connect a 5600 ohm resistor from terminal A T107 to ground. Insert a 21.25 mc. marker signal from the signal generator into the first sound i-f grid.

Adjust T107 (top and bottom) for maximum gain and symmetry about the 21.25 mc. marker. The pattern obtained should be similar to that shown in Figure 13B. The band width at 80% response from the first sound i-f grid to the second i-f grid should be approximately 250 kc.

The output level from the sweep should be set to produce approximately .3 volt peak-to-peak at the second sound i-f grid return when the final touches on the above adjustment are made. It is necessary that the sweep output voltage should not exceed the specified values otherwise the response curve will be broadened, permitting slight misadjustment to pass unnoticed and possibly causing distortion on weak signals.

PICTURE I-F TRAP ADJUSTMENT—

Connect the "VoltOhmyst" to the junction of R106 and R107 and adjust the picture control for –3 volts on the meter.

Set the channel switch to channel 13.

Connect the "VoltOhmyst" across the picture second detector load resistor R118 and set it on the 3 volt scale.

Connect the output of the signal generator to the junction of C14 and R6. This connection is available on a terminal lug through a hole in the side apron of the chassis, beside the r-f unit.

Set the generator to 21.25 mc. and check it against a crystal calibrator to insure that the generator is exactly on frequency.

Adjust T3 (top) and T101 for minimum indication on the "VoltOhmyst."

PICTURE I-F COIL ADJUSTMENTS—

Set the signal generator to each of the following frequencies and peak the specified adjustment for maximum indication on the "VoltOhmyst."

22.8 mc—T3 (bottom)
23.9 mc. L101 (top of chassis)
26.0 mc.—L102 (top of chassis)
24.5 mc.—L103 (top of chassis)

Picture I-F Oscillation—If the receiver is badly misaligned and two or more of the i-f coils are tuned to the same frequency, the receiver may fall into i-f oscillation. I-F oscillation shows up as a voltage in excess of 3 volts at the picture detector load resistor. This voltage is unaffected by r-f signal input and sometimes is independent of picture control setting.

If such a condition is encountered, it is sometimes possible to stop oscillation by adjusting the coils approximately to frequency by setting the adjustment stud extensions of T3, L101, L102 and L103 to be approximately equal to those of another receiver known to be in proper alignment. If this does not have the desired effect, it may now be possible to stop oscillation by increasing the grid bias. If so, it should then be possible to align the coils by the usual method. Once aligned in this manner, the i-f should be stable with reduced bias.

If the oscillation cannot be stopped in the above manner, shunt the grids of the first two i-f amplifiers to ground with 1000 mmf. capacitors.

Connect the signal generator to the third i-f grid and adjust L103 to frequency.

Remove the shunting capacitor from the second i-f grid, connect the signal generator to this grid and align L102.

Remove the shunting capacitor from the first i-f grid, connect the signal generator and align L101.

Connect the signal generator to the junction of C14 and R6 (in the r-f tuning unit) and align T3 to frequency.

If this does not stop the oscillation, the difficulty is not due to i-f misalignment as the i-f section is very stable when properly aligned. Check all i-f by-pass condensers, coil loading resistors, tubes, socket voltages, etc.

RADIO CORP. OF AMERICA

R-F AND CONVERTER LINE ADJUSTMENT—

Connect the r-f sweep oscillator to the receiver antenna terminals. If the sweep oscillator has a 50 ohm single-ended output, it will be necessary to obtain balanced output by connecting as shown in Figure 9.

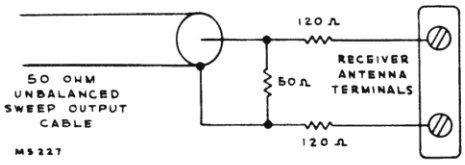


Figure 9—Unbalanced Sweep Cable Termination

Connect the oscilloscope to the junction of C14 and R6 (in the r-f tuning unit) through a 10,000 ohm resistor.

•By-pass the first picture i-f grid to ground through a 1000 mmfd. capacitor. Keep the leads to this by-pass as short as possible. If this is not done, lead resonance may fall in the r-f range and cause an incorrect picture of the r-f response.

Connect the "VoltOhmyst" to the junction of R170 and R171 and adjust the picture control for −3 volts on the meter.

Connect the signal generator loosely to the receiver antenna terminals.

Since channel 7 has the narrowest response of any of the high frequency channels, it should be adjusted first.

Set the receiver channel switch to channel 7 (see Figure 18 for switch shaft flat location versus channel).

Set the sweep oscillator to cover channel 7.

Insert markers of channel 7 picture carrier and sound carrier 175.25 mc. and 179.75 mc.

Adjust L25, L26, L51 and L52 (see Figure 16) for an approximately flat topped response curve located symmetrically between the markers. Normally this curve appears somewhat overcoupled or double humped with a 10 or 15% peak to valley excursion and the markers occur at approximately 90% response. See Figure 17, channel 7. In making these adjustments, the stud extension of all cores should be kept approximately equal.

Check the response of channels 8 through 13 by switching the receiver channel switch, sweep oscillator and marker oscillator to each of these channels and observe the response obtained. See Figure 17 for typical response curves. It should be found that all these channels have the proper shaped response with the markers above 70% response. If the markers do not fall within this requirement on one or more high frequency channels, since there are no individual channel adjustments, it will be necessary to readjust L25, L26, L51 and L52, and possibly compromise some channel slightly in order to get the markers up on other channels. Normally however, no difficulty of this type should be experienced since the higher frequency channels become comparatively broad and the markers easily fall within the required range.

Channel 6 is next aligned in the same manner.

Set the receiver to channel 6.

Set the sweep oscillator to cover channel 6.

Set the marker oscillator to channel 6 picture and sound carrier frequencies.

Adjust L11, L12, L37 and L38, for an approximately flat-topped response curve located symmetrically between the markers.

Check channels 5 down through channel 1 by switching the receiver, sweep oscillator and marker oscillator to each channel and observing the response obtained. In all cases, the markers should be above the 70% response point. If this is not the case, L11, L12, L37 and L38 should be retouched. On final adjustment, all channels must be within the 70% specification.

Coupling between r-f and converter lines is augmented by a link between L12 and L37. This link is adjusted in the factory and should not require adjustment in the field. On channel 6 with the link in the minimum coupling position, the response is slightly overcoupled with approximately a 10% excursion from peak-to-valley. With the coupling at maximum, the response is somewhat broader and the peak-to-valley excursion is approximately 40%. The amount of coupling permissible is limited by the peak-to-valley excursion which should not be greater than 30% on any channel.

Remove the 1000 mmf capacitor from the first picture i-f grid.

R-F OSCILLATOR LINE ADJUSTMENT—

The r-f oscillator line may be aligned by adjusting it to beat with a crystal calibrated heterodyne frequency meter, or by feeding a signal into the receiver at the r-f sound carrier frequency and adjusting the oscillator for zero output from the sound discriminator. In this latter case the sound discriminator must first have been aligned to exact frequency. Either method of adjustment will produce the same results. The method used will depend upon the type of test equipment available.

Regardless of which method of oscillator alignment is used, the frequency standard must be crystal controlled or calibrated.

If the receiver oscillator is to be adjusted by the heterodyne frequency meter method, the frequencies listed under "R-F Osc. Freq." in the table must be available.

If the receiver oscillator is adjusted by feeding in the r-f sound carrier signal, the frequencies listed under "R-F Sound Carrier" must be available.

Channel Number	Receiver R-F Osc. Freq. Mc.	R-F Sound Carrier Freq. Mc.
1	71	49.75
2	81	59.75
3	87	65.75
4	93	71.75
5	103	81.75
6	109	87.75
7	201	179.75
8	207	185.75
9	213	191.75
10	219	197.75
11	225	203.75
12	231	209.75
13	237	215.75

If the heterodyne frequency meter method is used, couple the meter probe loosely to the receiver oscillator.

If the r-f sound carrier method is used, connect the "VoltOhmyst" to pin 1 of V116.

Connect the signal generator to the receiver antenna terminals.

The order of alignment remains the same regardless of which method is used.

Since lower frequencies are obtained by adding steps of inductance, it is necessary to align channel 13 first and continue in reverse numerical order.

Set the receiver channel switch to channel 13.

Adjust the frequency standard to the correct frequency (237 mc. for heterodyne frequency meter or 215.75 mc. for the signal generator).

Set the fine tuning control to the middle of its range while making the adjustment.

Adjust L77 and L78 for an audible beat on the heterodyne frequency meter or zero voltage from sound discriminator. The core stud extensions should be maintained equal by visual inspection.

Switch the receiver to channel 12.

Set the frequency standard to the proper frequency as listed in the alignment table.

Adjust L76 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 adjust the oscillator to the correct frequency on all channels with the fine tuning control in the middle third of its range.

After the oscillator has been set on all channels, start back at channel 13 and recheck to make sure that all adjustments are correct.

RETOUCHING OF PICTURE I-F ADJUSTMENTS—

The picture i-f response curve varies somewhat with change of bias and for this reason it should be aligned with approximately the same signal input as it will receive in operation.

If the receiver is located at the edge of the service area, it should be aligned with approximately –1 volt i-f grid bias. However, for normal conditions, (signals of 1000 microvolts or greater), it is recommended that the picture i-f be aligned with a grid bias of –3 volts. Set the picture control for –3 volts at the junction of R106 and R107.

Connect the r-f sweep generator to the receiver antenna terminals.

Connect the signal generator to the antenna terminals and feed in the 25.75 mc. i-f picture carrier marker and a 23 mc. marker.

Connect the oscilloscope across the picture detector load resistor, R118.

Set the channel switch to channel (between 1 and 6) found to have the best response during the r-f and converter line adjustment.

Set the sweep output to produce approximately .3 volt peak-to-peak across the picture detector load resistor.

Observe and analyze the response curve obtained. The response will not be ideal and the i-f adjustments must be retouched in order to obtain the desired curve. In making these adjustments, care should be taken that no two transformers are tuned to the same frequency as i-f oscillation may result.

On final adjustment the picture carrier marker must be at approximately 50% response. The curve must be approximately flat topped and with the 23 mc. marker at approximately 90% response.

The most important consideration in making the i-f adjustments is to get the picture carrier at the 50% response point. If the picture carrier operates too low on the response curve, loss of low frequency video response, of picture brilliance, of blanking, and of sync may occur. If the picture carrier operates too high on the response curve, the picture definition is impaired by loss of high frequency video response.

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 weak signal can be obtained by connecting the shop antenna to the receiver through an attenuator pad of the type shown in Figure 10. The number of stages in the pad depends upon the signal strength available at the antenna. A sufficient number of stages should be inserted so that a somewhat less than normal contrast picture is obtained when the picture control is at the maximum clockwise position.

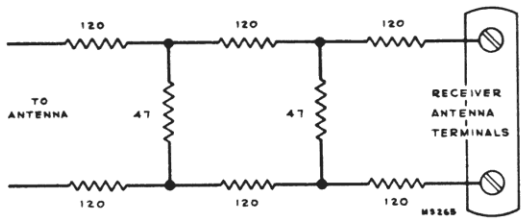


Figure 10—Attenuator Pad

Only carbon type resistors should be used to construct the attenuator pad. Since many of the low value moulded resistors generally available are of wire wound construction, it is advisable to break and examine one of each type of resistor used in order to determine its construction.

RESPONSE CURVES—The response curves shown on pages 12, 14 and 15 and referred to throughout the alignment procedure were taken from a production set. Although these curves are typical, some variations can be expected. Channel 2 r-f response (not shown) is similar to that of channel 3.

The response curves are shown in the classical manner of presentation, that is with "response up" and low frequency to the left. The manner in which they will be seen in a given test set-up will depend upon the characteristics of the oscilloscope and the sweep generator. The curves may be seen inverted and/or switched from left to right depending on the deflection polarity of the oscilloscope and the phasing of the sweep generator.

ALIGNMENT TABLE—Both methods of oscillator alignment are presented in the alignment table. The service technician may thereby choose the method to suit his test equipment. If it is found that the dual listing is confusing, the unwanted listing can be easily erased.

MODEL 721TS

RADIO CORP. OF AMERICA

ALIGNMENT TABLE

THE DETAILED ALIGNMENT PROCEDURE SHOULD BE READ BEFORE ALIGNMENT BY USE OF THE TABLES IS ATTEMPTED.

DISCRIMINATOR AND SOUND I-F ALIGNMENT

STEP No.	CONNECT SIGNAL GENERATOR TO	SIGNAL GEN. FREQ. MC.	CONNECT SWEEP GENERATOR TO	SWEEP GEN. FREQ. MC.	CONNECT OSCILLOSCOPE TO	CONNECT "VOLTOHMYST" TO	MISCELLANEOUS CONNECTIONS AND INSTRUCTIONS	ADJUST	REFER TO
1	2nd sound i-f grid (pin 1, V115)	21.25 1 volt output	Not used		Not used	In series with 1 meg. to junction of R181 and R182	Meter on 10 volt scale	Detune T108 (bottom). Adjust T108 (top) for max. on meter.	Fig. 11 Fig. 12
2	"	"	"		"	Discriminator output (pin 1 of V116)	Meter on 3 volt scale	T108 (bottom) for zero on meter	Fig. 12
3	"	"	2nd sound i-f grid (pin 1, V115)	21.25. center 1 mc. 1 volt output	Discriminator output (pin 1 of V116)	Not used	Check for symmetrical response waveform (positive and negative). If not equal adjust T108 (top) until they are equal. See Note 1.		Fig. 11 Fig. 12 Fig. 13 A
4	Trap winding on T3 (top of chassis)	21.25 reduced output	Trap winding on T3	21.25 reduced output	Terminal A, T107 in series with 33,000 ohms. See Note 2.	"	Sweep output reduced to provide .3 volt p-to-p on scope. See Note 3.	T107 (top and bottom) for max. gain and symmetry at 21.25 mc.	Fig. 11 Fig. 12 Fig. 13 B

NOTE 1: The peak-to-peak bandwidth of the discriminator should be approximately 350 kc. and should be linear from 21.175 mc., to 21.325 mc.

NOTE 2: If a 60 cycle sweep rate is used, it will be necessary to reduce the time constant in the 2nd sound i-f grid circuit in order to reproduce the desired response curve. To do this, shunt R176 (Terminal "A" of T107 to chassis) with 5600 ohms.

NOTE 3: The sweep generator output should be set to produce approximately 0.3 volt peak-to-peak at the second sound i-f grid return (Terminal "A" of T107) for final touch-up on this adjustment. Signal voltage in excess of 0.3 volt will tend to broaden the response curve—permitting misadjustment to pass unnoticed.

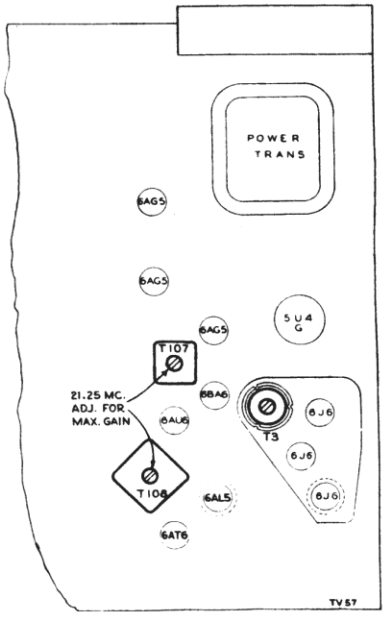


Figure 11—Top Chassis Sound I-F Adjustments

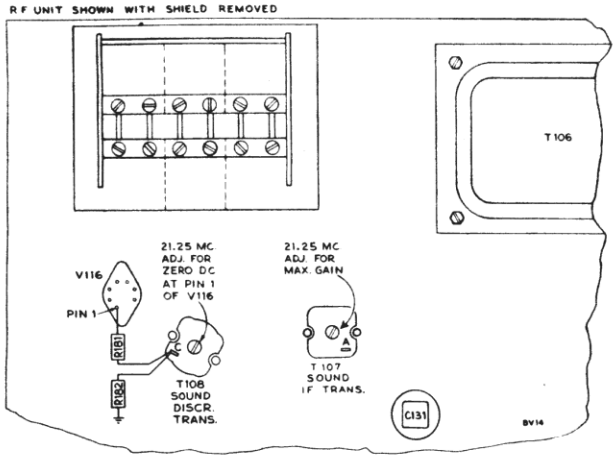


Figure 12—Bottom Chassis Sound I-F and Discriminator Adjustments

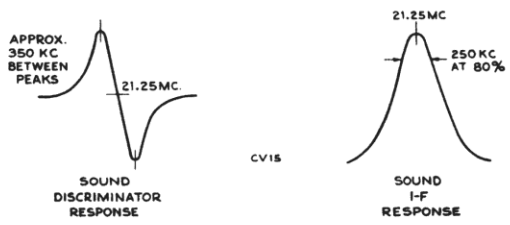


Figure 13—Sound Discriminator and I-F Response

RADIO CORP. OF AMERICA

ALIGNMENT TABLE (Continued)

THE DETAILED ALIGNMENT PROCEDURE SHOULD BE READ BEFORE ALIGNMENT BY USE OF THE TABLES IS ATTEMPTED.

PICTURE I-F AND TRAP ADJUSTMENT

STEP No.	CONNECT SIGNAL GENERATOR TO	SIGNAL GEN. FREQ. MC.	CONNECT SWEEP GENERATOR TO	SWEEP GEN. FREQ. MC.	CONNECT OSCILLOSCOPE TO	CONNECT "VOLTOHMYST" TO	MISCELLANEOUS CONNECTIONS AND INSTRUCTIONS	ADJUST	REFER TO
5	Not used		Not used		Not used	Junction R106 and R107	Set "Station Selector" switch to channel 13	Adjust "Picture" control for -3 volts reading on "VoltOhmyst"	Fig. 15
6	Junction C14 and R6	21.25	"		"	Junction of L104 and R118	Meter on 3 volt scale	T3 (top) for min. on meter	Fig. 14 Fig. 15
7	"	21.25	"		"	"	"	T101 for min.	Fig. 14
8	"	22.8	"		"	"		T3 (bottom) for max.	Fig. 15
9	"	23.9	"		"	"		L101 (top chassis) for max.	Fig. 14
10	"	26.0	"		"	"		L102 (top chassis) for max.	Fig. 14
11	"	24.5	"		"	"		L103 (top chassis) for max.	Fig. 14

NOTE: Oscillation may occur if the i-f section is badly out of alignment. This will be evidenced by a meter reading in excess of 3 volts and is caused by the "staggered" i-f stages being tuned to approximately the same frequency. If this condition is encountered, adjust the core studs of T3 (bottom) L101, L102, and L103 until oscillation ceases. Oscillation may not be encountered until proceeding with steps 9, 10, or 11. (See "Picture I-F Oscillation," page 9.)

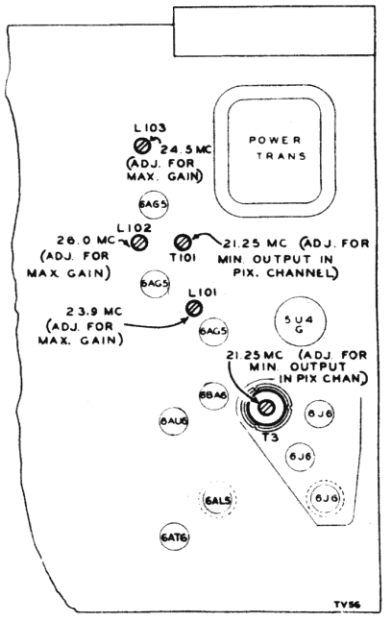


Figure 14—Top Chassis Pix I-F and Trap Adjustments

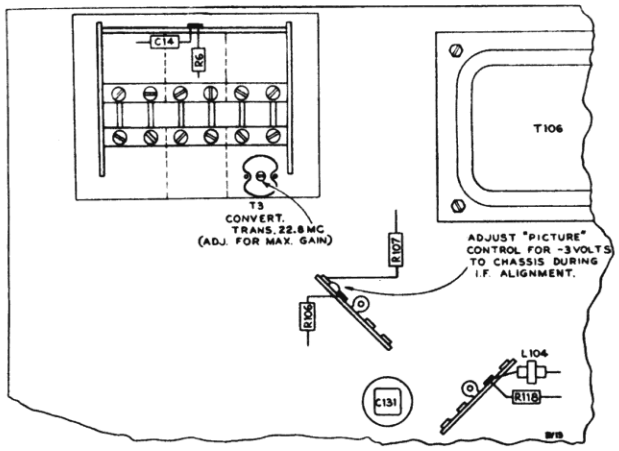


Figure 15—Bottom Chassis Pix I-F Adjustments

MODEL 721TS

RADIO CORP. OF AMERICA

ALIGNMENT TABLE (Continued)

THE DETAILED ALIGNMENT PROCEDURE SHOULD BE READ BEFORE ALIGNMENT BY USE OF THE TABLES IS ATTEMPTED.

R-F AND CONVERTER LINE ALIGNMENT

STEP No.	CONNECT SIGNAL GENERATOR TO	SIGNAL GEN. FREQ. MC.	CONNECT SWEEP GENERATOR TO	SWEEP GEN. FREQ. MC.	CONNECT OSCILLOSCOPE TO	CONNECT "VOLTOHMYST" TO	MISCELLANEOUS CONNECTIONS AND INSTRUCTIONS	ADJUST	REFER TO
12	Not used		Not used		Not used	Junction of R170 and R171		Picture control for -3 volts on meter	Fig. 16
13	Antenna terminal (loosely)	175.25 and 179.75	Antenna terminals (see note for precaution)	Sweeping channel 7	Junction C14 and R6 through 10,000 ohm series resistor	Not used	1st i-f grid bypass to gnd. with 1000 mmf. Receiver on channel 7	L25, L26, L51 and L52 for approx. flat top response between markers. Markers above 70%	Fig. 16 Fig. 17 (7)
14	"	181.25 185.75	"	channel 8	"	"	Receiver on channel 8	Check to see that response is as above	Fig. 17 (8)
15	"	187.25 191.75	"	channel 9	"	"	Receiver on channel 9	"	Fig. 17 (9)
16	"	193.25 197.75	"	channel 10	"	"	Receiver on channel 10	"	Fig. 17 (10)
17	"	199.25 203.75	"	channel 11	"	"	Receiver on channel 11	"	Fig. 17 (11)
18	"	205.25 209.75	"	channel 12	"	"	Receiver on channel 12	"	Fig. 17 (12)
19	"	211.25 215.75	"	channel 13	"	"	Receiver on channel 13	"	Fig. 17 (13)
20	If the response on any channel (steps 14 through 19) is below 70% at either marker, switch to that channel and adjust L25, L26, L51 and L52 to pull response up on that channel. Then recheck steps 13 through 19.								
21	Antenna terminal (loosely)	83.25 87.75	Antenna terminals (see note for precaution)	Sweeping channel 6	Junction C14 and R6 through 10,000 ohm series resistor	Not used	Receiver on channel 6	L11, L12, L37 and L38 for response as above	Fig. 17 (6)
22	"	77.25 81.75	"	channel 5	"	"	Receiver on channel 5	Check to see that response is as above	Fig. 17 (5)
23	"	67.25 71.75	"	channel 4	"	"	Receiver on channel 4	"	Fig. 17 (4)
24	"	61.25 65.75	"	channel 3	"	"	Receiver on channel 3	"	Fig. 17 (3)
25	"	55.25 59.75	"	channel 2	"	"	Receiver on channel 2	"	
26	"	45.25 49.75	"	channel 1	"	"	Receiver on channel 1	"	Fig. 17 (1)
27	If the response on any channel (steps 22 through 26) is below 70% at either marker, switch to that channel and adjust L11, L12, L37 and L38 to pull response up on that channel. Then, recheck steps 21 through 26. Remove 1000 mmf. capacitor from 1st pix i-f grid upon completion.								

NOTE: If sweep generator has "single ended" output, it will be necessary to use the terminating arrangement shown in Figure 9, page 10.

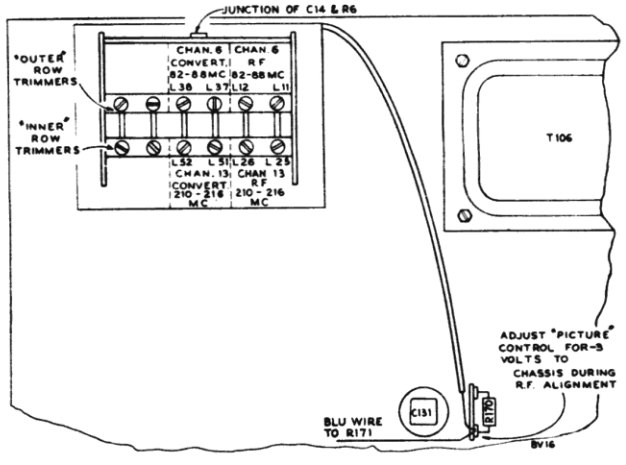


Figure 16—Bottom Chassis R-F and Converter Adjustments

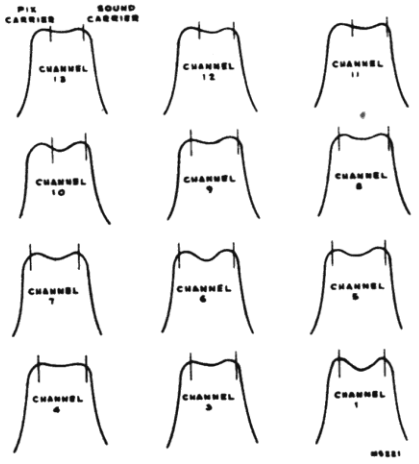


Figure 17—Typical R-F Response Curves

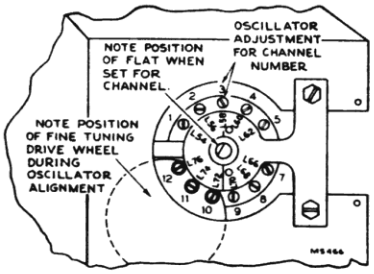
MODEL 721TS

RADIO CORP. OF AMERICA

ALIGNMENT TABLE (Continued)

R-F OSCILLATOR ALIGNMENT

STEP No.	CONNECT SIGNAL GENERATOR TO	SIGNAL GEN. FREQ. MC.	CONNECT HETERODYNE FREQ. METER TO	HET. METER FREQ. MC.	CONNECT OSCILLOSCOPE TO	CONNECT "VOLTOHMYST" TO	MISCELLANEOUS CONNECTIONS AND INSTRUCTIONS	ADJUST	REFER TO
28	Antenna terminals	215.75	Loosely coupled to r-f osc.	237	Not used	Pin 1 of V116 for sig. gen. method only	Fine tuning centered for all adjustments Receiver on channel 13	L77 and L78 for zero on meter or beat on het. freq. meter	Fig. 19
29	"	209.75	"	231	"	"	Receiver on channel 12	L76 as above	Fig. 18
30	"	203.75	"	225	"	"	Receiver on channel 11	L74 as above	"
31	"	197.75	"	219	"	"	Receiver on channel 10	L72 as above	"
32	"	191.75	"	213	"	"	Receiver on chan nel 9	L70 as above	"
33	"	185.75	"	207	"	"	Receiver on channel 8	L68 as above	"
34	"	179.75	"	201	"	"	Receiver on channel 7	L66 as above	"
35	"	87.75	"	109	"	"	Receiver on channel 6	L63 and L64 as above	Fig. 19
36	"	81.75	"	103	"	"	Receiver on channel 5	L62 as above	Fig. 18
37	"	71.75	"	93	"	"	Receiver on channel 4	L60 as above	"
38	"	65.75	"	87	"	"	Receiver on channel 3	L58 as above	"
39	"	59.75	"	81	"	"	Receiver on channel 2	L56 as above	"
40	"	49.75	"	71	"	"	Receiver on channel 1	L54 as above	"
41	Repeat steps 28 through 40 as a check.								



OSCILLATOR ADJUSTMENTS FOR CHANNELS 6 AND 13 ARE ON SIDE OF R-F UNIT

Figure 18—Front Chassis Oscillator Adjustments

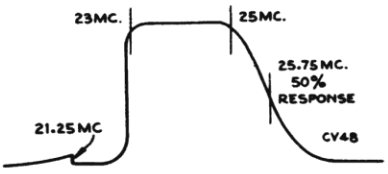
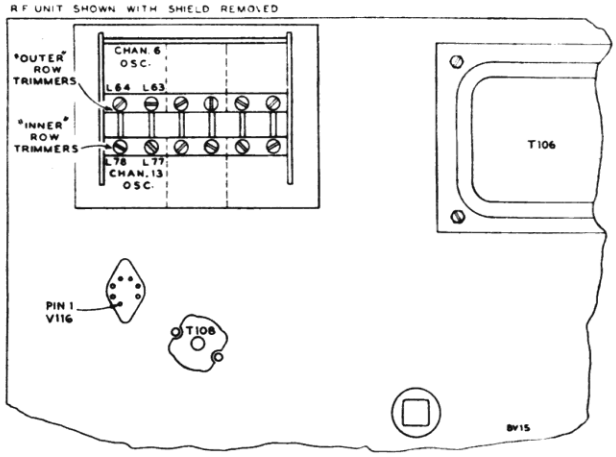


Figure 20—Typical Overall Response Curve



BOTTOM CHASSIS OSCILLATOR ADJUSTMENTS 721TS 10" TABLE TELEVISION

Figure 19—Bottom Chassis Oscillator Adjustments

RETOUCHING PICTURE I-F TRANSFORMERS

STEP No.	CONNECT SIGNAL GENERATOR TO	SIGNAL GEN. FREQ. MC.	CONNECT SWEEP GENERATOR TO	HET. METER FREQ. MC.	CONNECT OSCILLOSCOPE TO	CONNECT "VOLTOHMYST" TO	MISCELLANEOUS CONNECTIONS AND INSTRUCTIONS	ADJUST	REFER TO
42			Not used		Not used	Junction of R106 and R107		Picture control for -3 volts on meter	Fig. 19
43	Antenna terminals (loosely)	23.0 25.75	Antenna terminals		Junction L104 and R118	Not used	Retouch pix i-f adjustments (T3, bottom, L101, L102 and L103) as necessary to provide proper response		Fig. 15 Fig. 14 Fig. 20
	SENSITIVITY CHECK								
44	Connect antenna to the receiver through the attenuator pad to provide a weak signal. Compare the picture and sound obtained to that obtained on other receivers under the same conditions.								

MODEL 721TS

RADIO CORP. OF AMERICA

CHASSIS VIEWS

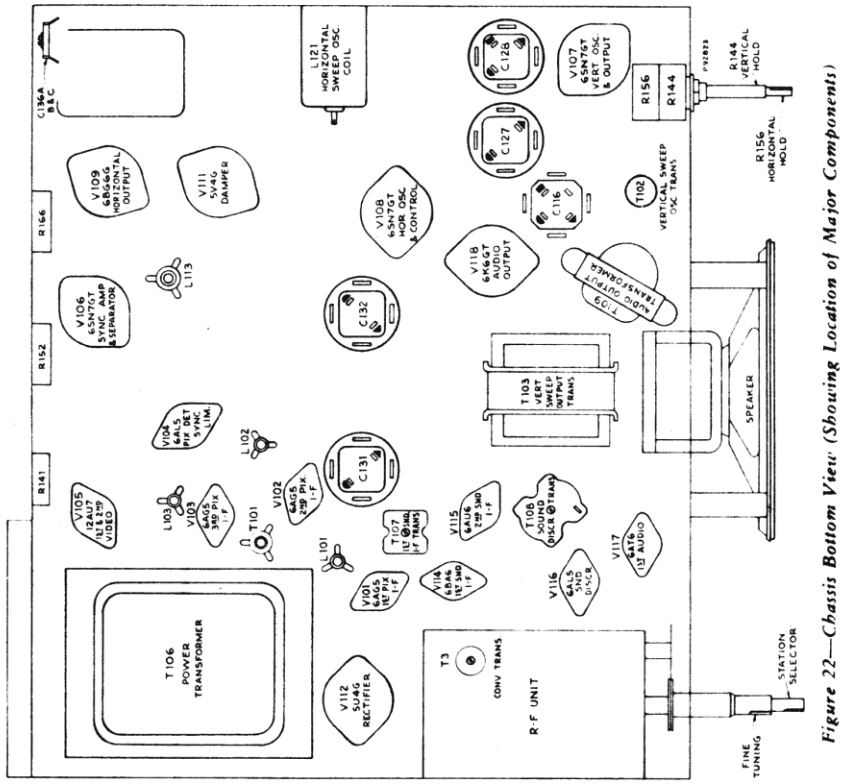


Figure 21—Chassis Top View (Showing Location of Major Components)

Figure 22—Chassis Bottom View (Showing Location of Major Components)

WAVEFORM PHOTOGRAPHS

Peak to peak voltages shown are nominal when 1 volt peak to peak video signal is applied to 1st video amplifier (V105).

Figure 23—Vertical (1.0 Volts, P to P)

Video Signal Input to 1st Video Amplifier (At Pin 2 of V105)

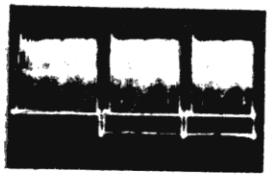


Figure 24—Horizontal (1.0 Volts, P to P)

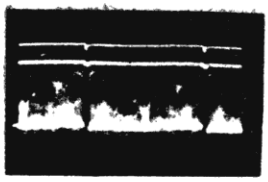


Figure 25—Vertical (5.0 Volts, P to P)

Output of 1st Video Amplifier (Pin 1 of V105)

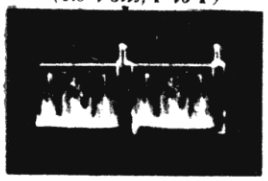


Figure 26—Horizontal (5.0 Volts, P to P)

Figure 27—Vertical (32 Volts, P to P)

Input to Kinescope Grid (Junction of L106 and Green Lead to Kinescope Socket)

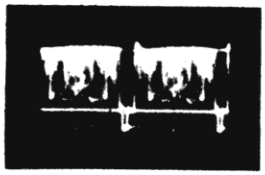


Figure 28—Horizontal (32 Volts, P to P)

Figure 29—Vertical (8 Volts, P to P)

Input to Grid Sync Amplifier (Pin 1 of V106)

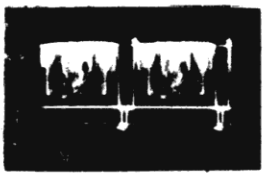


Figure 30—Horizontal (8 Volts, P to P)

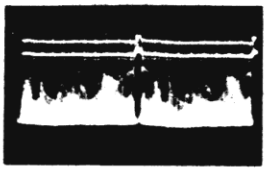


Figure 31—Vertical (90 Volts, P to P)

Input to Sync Separator (Pin 2 of V106)

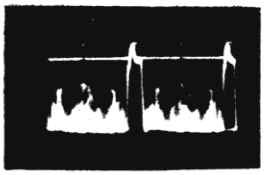


Figure 32—Horizontal (90 Volts, P to P)

Figure 33—Vertical (10 Volts, P to P)

Output of Sync Separator (Pin 6 of V106)

Figure 34—Horizontal (10 Volts, P to P)

MODEL 721TS

RADIO CORP. OF AMERICA

WAVEFORM PHOTOGRAPHS (Continued)

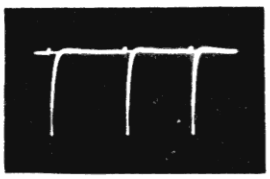


Figure 35—Vertical (25 Volts, P to P) Output of Integrating Network (Junction of R138 and C125)

Figure 36—Grid of Vertical Oscillator Tube (175 Volts, P to P) (Pin 1 of V107)

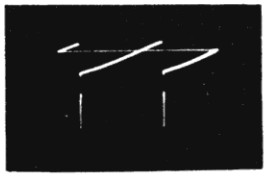


Figure 37—Input to Vertical Output Tube (65 Volts, P to P) (Junction of C129 and C130)

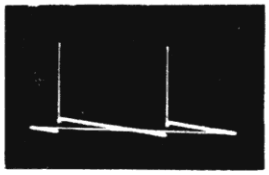


Figure 38—Plate of Vertical Output Tube (750 Volts, P to P) (Pin 5 of V107)

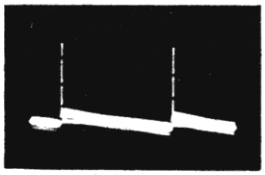


Figure 39—Voltage Across Vertical Deflection Coils (L108, L109) (90 Volts, P to P) (At Green Lead of T103 to Ground)

Figure 40—Horizontal Oscillator Waveforms and Sync Pulse (20 Volts, P to P) (Junction of C122 and C133)

Figure 41—Horizontal Oscillator Control (45 Volts, P to P) (Junction R158 and R164)

Figure 42—Grid of Horizontal Oscillator (400 Volts, P to P) (Pin 4 of V108)

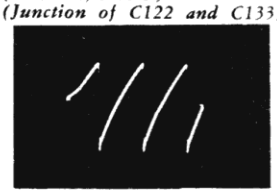


Figure 43—Horizontal Oscillator Output (60 Volts, P to P) (Junction of C135 and C163)

Figure 44—Grid of Horizontal Output (40 Volts, P to P) (Pin 5 of V109)

Figure 45—Plate of Horizontal Output (Approx. 5000 Volts, P to P) (Measured Through a Capacity Divider Connected from Plate to Ground)

Figure 46—Voltage Across Horizontal Deflection Coils (Approx. 1100 Volts, P to P) (Pin 4 or 6 of V111 to Ground)

Figure 47—Test Pattern Showing Out of Sync Condition When Horizontal Hold Control Is in a Counterclockwise Position—Just Before Pulling Into Sync

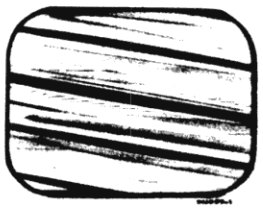


Figure 48—Test Pattern Showing Out Of Sync Condition When Horizontal Hold Control Is at the Maximum Clockwise Position.

CRITICAL LEAD DRESS

1. Do not permit any strains to be placed on the leads of R126, R157, R158, R164, R165, R173, R188 and R191. Do not permit these resistors to be exposed to the heat of a soldering iron any more than is absolutely necessary.
2. Dress the temperature compensating resistor R191 approximately one-quarter inch from the power transformer and the chassis.
3. Dress all video coupling capacitors and peaking coils up and away from the chassis.
4. Contact between the r-f oscillator frequency adjustment screws and the oscillator coils or channel switch eyelets must be avoided.

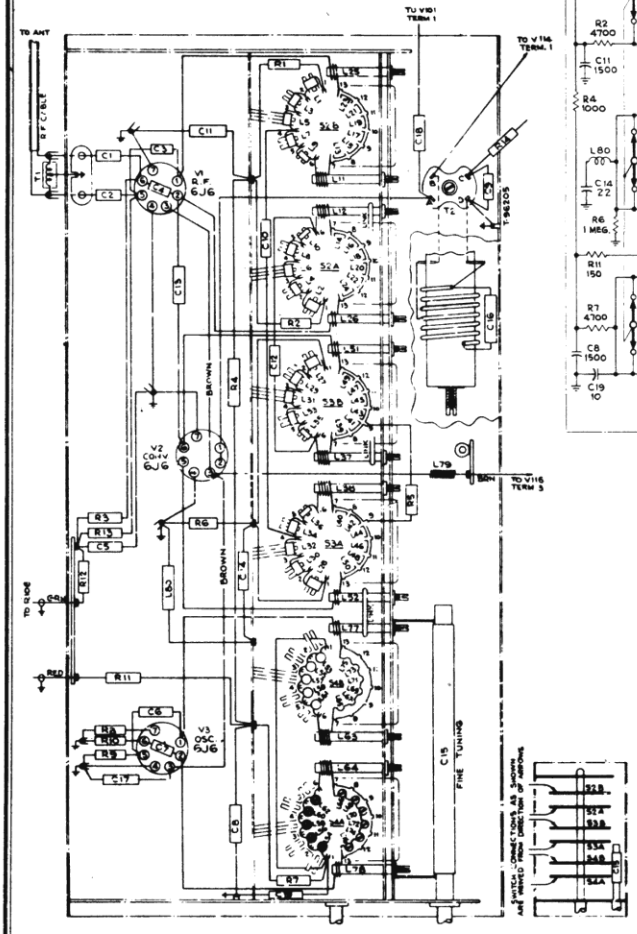
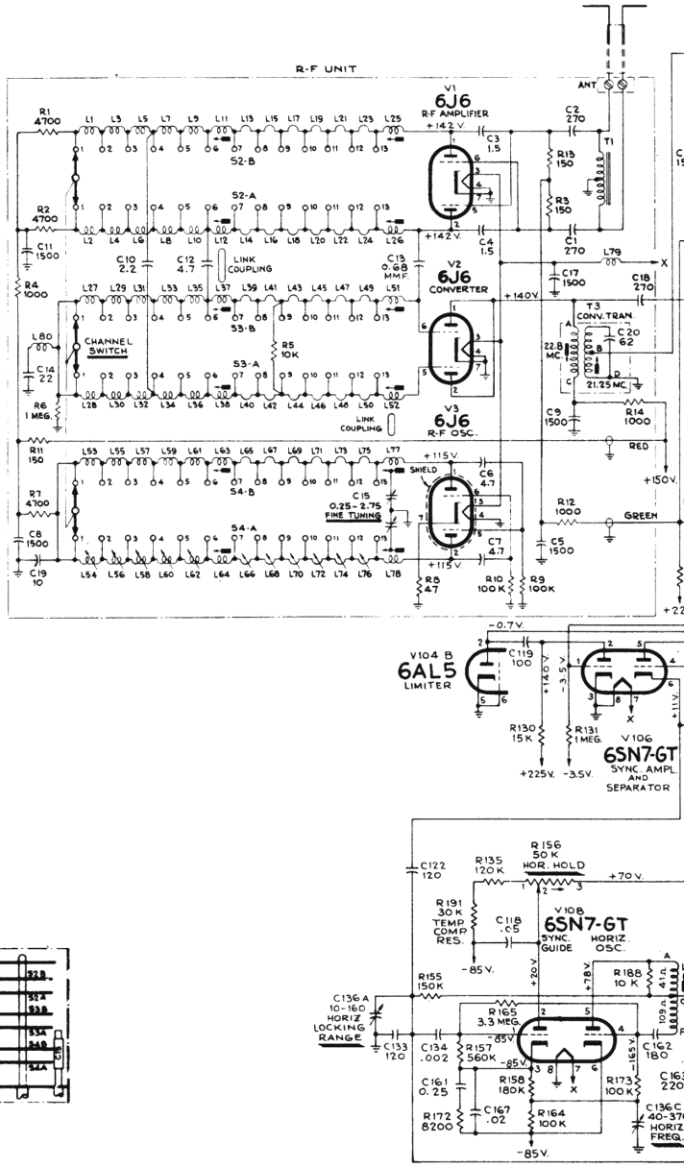


Figure 50—R-F Unit Wiring Diagram



K = 1000
All resistance values in ohms.

All capacitance values less than 1 and above 1 in MMF unless ot noted.

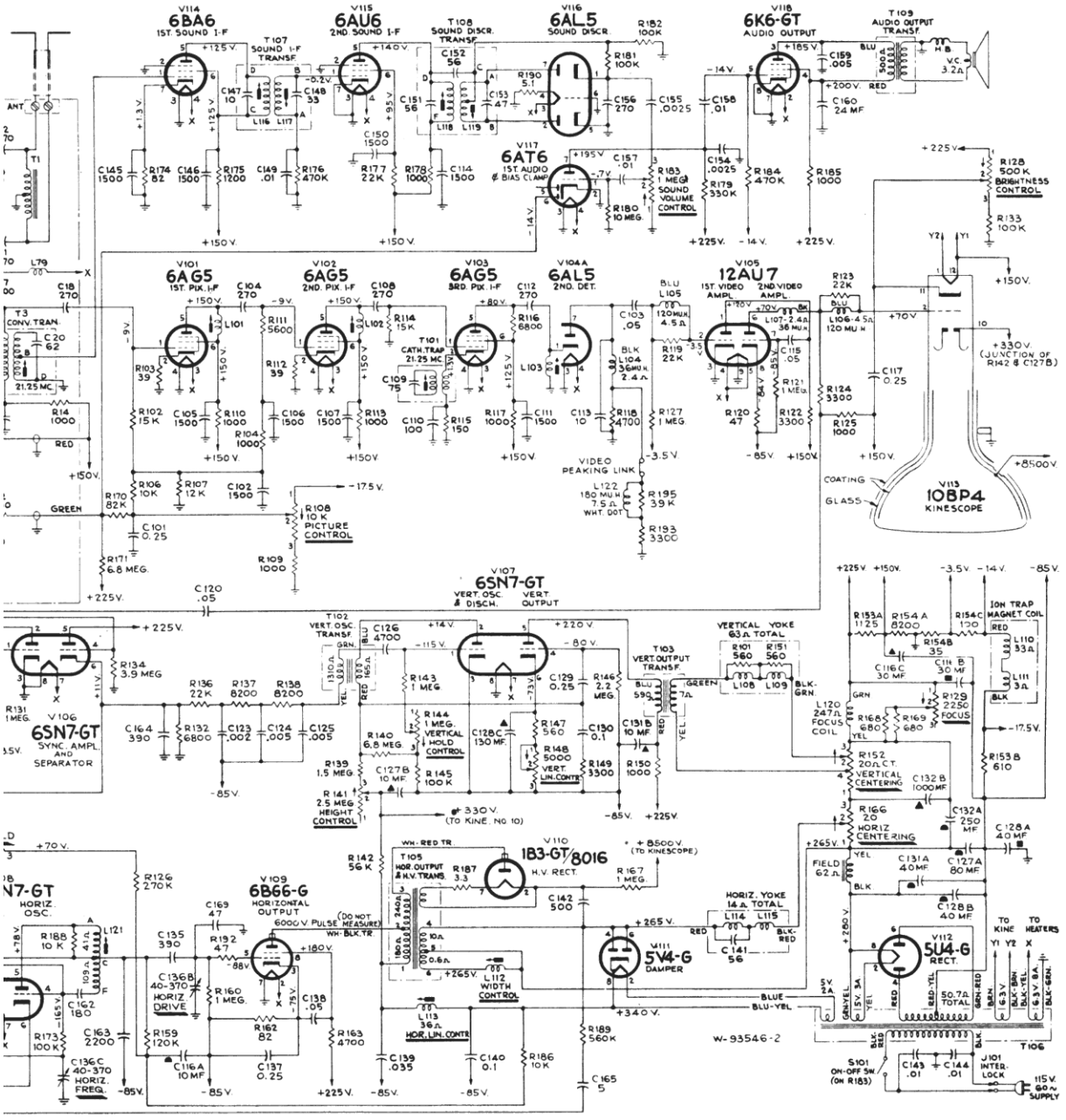
Direction of arrows at controls ir clockwise rotation.

All voltages measured with "VoltO and with picture control countercl Voltages should hold within ±209 117 v. a-c supply.

Coil resistance values less than are not shown.

ORP. OF AMERICA

MODEL 721TS



1000
es in ohms.

lues less than 1 in MF
MF unless otherwise

s at controls indicates

red with "VoltOhmyst"
ntrol counterclockwise.
d within ±20% with

ues less than 1 ohm

In some receivers, substitutions have caused changes in component lead color codes, in electrolytic capacitor values and their lug identification markings.

In some sets R108 is connected to −14V.

In some sets, L122, R195 and R193 are omitted.

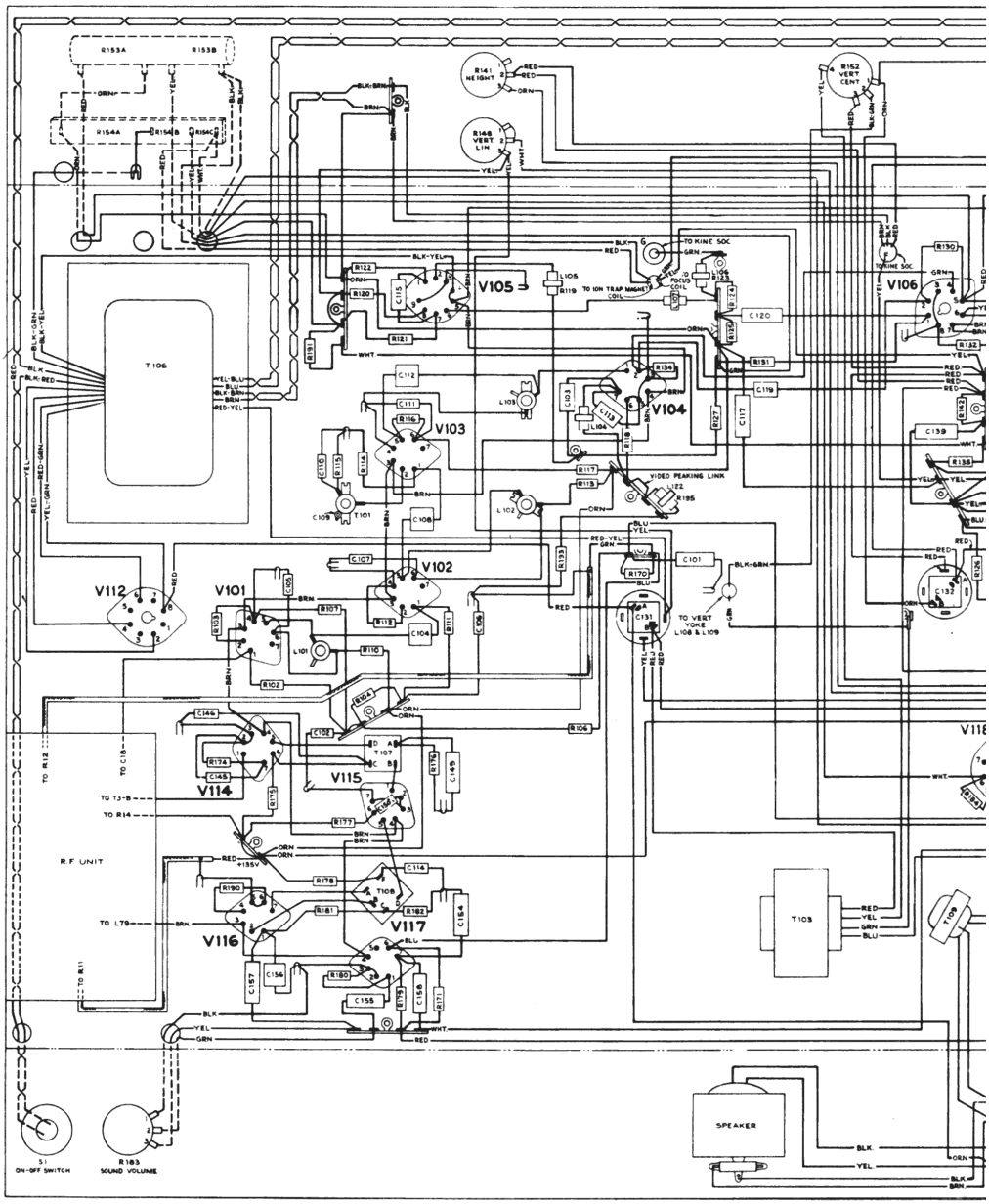
"RCA Victor Division of Radio Corporation of America, through its Home Instrument Department, has made these Service Notes available to the trade for the development of television and as an information medium to the Service fraternity."

Optional video peaking is provided by the video peaking link. Normally the link is connected in place. However, if transients are produced on high contrast pictures, the link should be opened. See figure 49 for location of the link.

Figure 51—Overall Circuit Schematic Diagram

MODEL 721TS

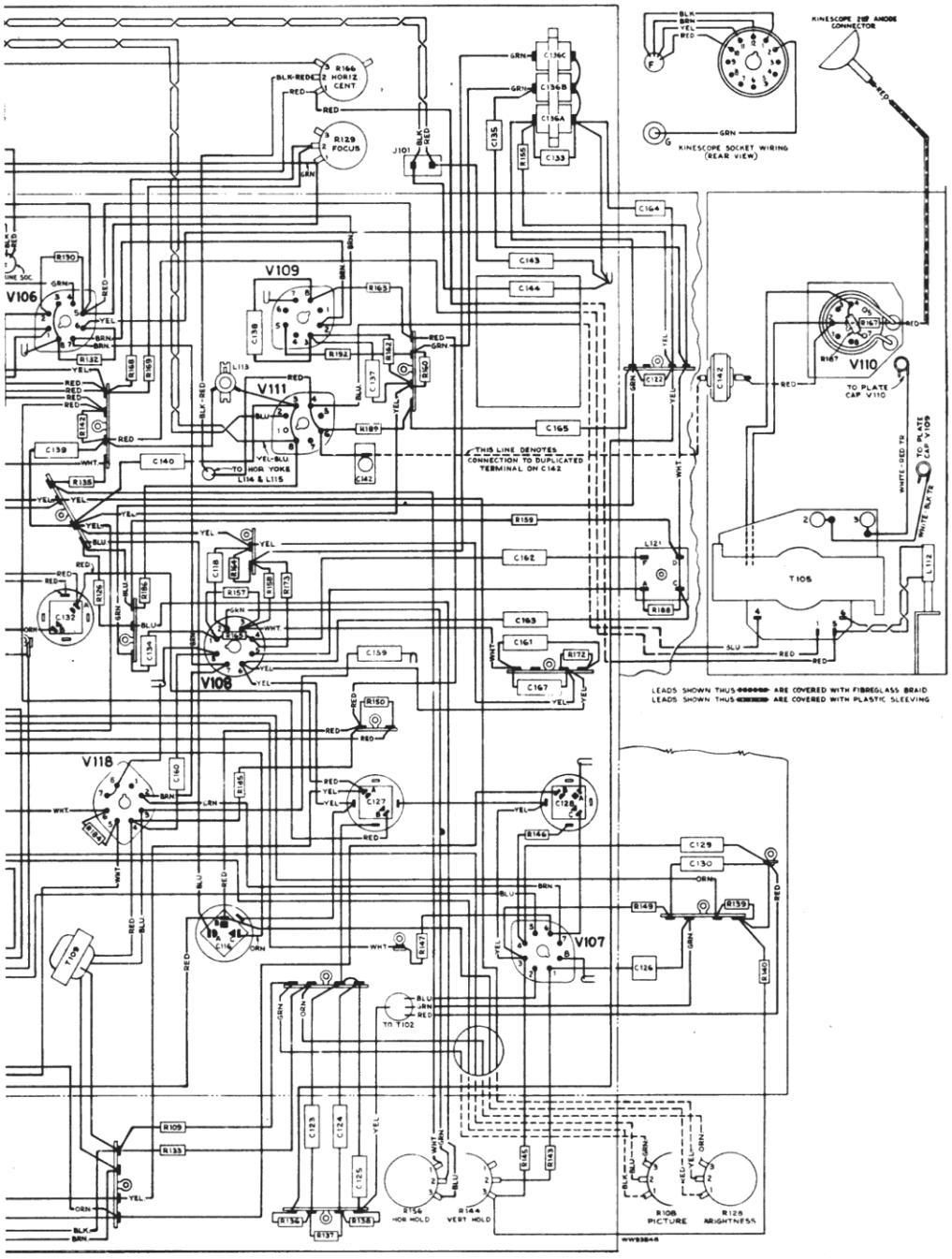
RADIO CORP. OF AMERICA



Early production sets employed brightness and picture control #71784 in which the brightness is the outer knob and picture, the center knob. Late production, shown in the above wiring diagram employs control #73193 in which picture is the outer knob and brightness the center.

The front panel control decals are affected by the control changes. Decal #72805 is for control #71784. Decal #73194 is for control #73193.

Figure 49—Chassis Wiring



sis · Wiring Diagram

MODEL 721TS

RADIO CORP. OF AMERICA

REPLACEMENT PARTS

STOCK No.	DESCRIPTION
	R-F UNIT ASSEMBLY KRK2B-1
71504	Capacitor—Ceramic, 0.68 mmf. (C13)
71500	Capacitor—Ceramic, 1.5 mmf. (C3, C4)
71502	Capacitor—Ceramic, 2.2 mmf. (C10)
71520	Capacitor—Ceramic, 4.7 mmf. (C6, C7, C12)
45466	Capacitor—Ceramic, 10 mmf. (C19)
33101	Capacitor—Ceramic, 22 mmf. (C14)
65401	Capacitor—Mica, 270 mmf. (C18)
71540	Capacitor—Ceramic, 270 mmf. (C1, C2)
71501	Capacitor—Ceramic, 1500 mmf. (C5, C8, C9, C11, C17)
72122	Coil—Channel #1 r-f amplifier plate coil—front or rear section or channel #1 converter grid coil—front or rear section (L1, L2, L27, L28)
71469	Coil—Channel #1 oscillator coil—front or rear section (L53, L54)
71479	Coil—Channel #2 and #3 r-f amplifier plate coil—front or rear section or Channel #2 and #4 converter grid coil—front or rear section (L3, L4, L5, L6, L29, L30, L33, L34)
71470	Coil—Channel #2 and #3 and #4 oscillator coil—front section (L56, L58, L60)
*72597	Coil—Channel #3 converter grid coil—front or rear section (L31, L32)
*72552	Coil—Channel #3 oscillator coil—rear section (L57)
71480	Coil—Channel #4 r-f amplifier plate coil—front or rear section (L7, L8)
*72553	Coil—Channel #4 oscillator coil—rear section (L59)
71481	Coil—Channel #5 r-f amplifier plate coil—front or rear section or channel #5 converter grid coil—front or rear section (L9, L10, L35, L36)
71472	Coil—Channel #5 oscillator coil—rear section (L61)
71471	Coil—Channel #5 oscillator coil—front section or channel #2 oscillator coil—rear section (L55, L62)
71492	Coil—Channel #6 oscillator, converter grid or r-f amplifier plate coil—front or rear section (L11, L12, L37, L38, L63, L64)
71491	Coil—Channel #13 converter grid or r-f amplifier plate coil—rear section (L25, L51)
71490	Coil—Channel #13 converter grid or r-f amplifier plate coil—front section (L26, L52)
71489	Coil—Channel #13 oscillator coil—rear section (L77)
71488	Coil—Channel #13 oscillator coil—front section (L78)
71506	Coil—Converter grid i-f choke coil (L80)
71505	Coil—Heater choke coil (L79)
71493	Connector—Segment connector
71497	Core—Channel #6 front and rear oscillator coils adjustable core and stud
71498	Core—Channel #6 front and rear converter grid coils or front and rear r-f amplifier plate coils adjustable core and stud or channel #13 front and rear converter grid coils or front and rear r-f amplifier plate coils adjustable core and stud
71597	Core—Channel #13 front and rear oscillator coils adjustable core and stud
*72743	Detent—Detent mechanism and fiber shaft
71465	Disc—Rotor disc for fine tuning control (Part of C15)
*72744	Drive—Fine tuning drive
71487	Form—Coil form only for channels #6 and #13 coils—less winding
71462	Loop—Oscillator to converter grid coupling loop
30732	Resistor—47 ohms, ½ watt (R8)
30880	Resistor—150 ohms, ½ watt (R3, R11, R13)
34766	Resistor—1000 ohms, ½ watt (R4, R12, R14)
30494	Resistor—4700 ohms, ½ watt (R1, R2, R7)
3078	Resistor—10,000 ohms, ½ watt (R5)
3252	Resistor—100,000 ohms, ½ watt (R9, R10)
30652	Resistor—1 megohm, ½ watt (R6)
14343	Ring—Retaining ring for drive
71475	Screw—#4-40 x 15/32" adjusting screw for coils L54, L56, L58, L60, L62
71476	Screw—#4-40 x 1¼" binder head screw for adjusting coils L66, L68, L70, L72, L74, L76
71474	Segment—Converter grid section rear segment less coils or r-f amplifier plate section rear segment less coils (Part of S2, S3)
71473	Segment—Converter grid section front segment less coils or r-f amplifier plate section front segment less coils (Part of S2, S3)
71467	Segment—Oscillator section front segment less coils (Part of S4)
71468	Segment—Oscillator section rear segment less coils (Part of S4)
72951	Shield—Lead tube shield for V3
71494	Socket—Tube socket miniature
71461	Spring—Snap spring to hold fine tuning shaft
71466	Stator—Oscillator fine tuning stator and bushing (Part of C15)
71507	Transformer—Antenna transformer (T1)
72811	Transformer—Converter transformer (T3, C20)
	TELEVISION CHASSIS KCS 26-1
71894	Bearing—R-F shaft bearing assembly
*72857	Board—"Antenna" board—two contact—solders to r-f cable
*72809	Capacitor—Mica, 5 mmf., 1500 volts (C165)
72615	Capacitor—Mica, 10 mmf. (C113)
39628	Capacitor—Mica, 100 mmf. (C119)
45469	Capacitor—Ceramic, 100 mmf. (C110)
39630	Capacitor—Mica, 120 mmf. (C122, C133)
73102	Capacitor—Mica, 180 mmf., 1000 volts (C162)
73091	Capacitor—Mica, 270 mmf., 1000 volts (C104, C108, C112, C156)
73094	Capacitor—Mica, 390 mmf., 1000 volts (C135, C164)
71450	Capacitor—High-voltage capacitor, 500 mmf. (C142)
71501	Capacitor—Ceramic, 1500 mmf. (C102, C105, C106, C107, C111, C114, C145, C146, C150)
39660	Capacitor—Mica, 2200 mmf. (C163)
72524	Capacitor—Mica, 4700 mmf. (C126)
*72771	Capacitor—Mica trimmer, consisting of 1 section of 10-160 mmf. and 2 sections of 40-370 mmf. (C136A, C136B, C136C)
70602	Capacitor—Tubular, .0025 mfd., 400 volts (C154, C155)
70601	Capacitor—Tubular, .002 mfd., 400 volts (C123)
70622	Capacitor—Tubular, .002 mfd., 600 volts (C134)
70606	Capacitor—Tubular, .005 mfd., 400 volts (C124, C125)
70627	Capacitor—Tubular, .005 mfd., 600 volts (C159)
71518	Capacitor—Tubular, oil impregnated, .035 mfd., 600 volts (C139)
70610	Capacitor—Tubular, .01 mfd., 400 volts (C149, C157, C158)
71770	Capacitor—Molded paper, .01 mfd., 400 volts (C143, C144)
70611	Capacitor—Tubular, .02 mfd., 400 volts (C167)
70615	Capacitor—Tubular, .05 mfd., 400 volts (C103, C115, C118, C120)
70636	Capacitor—Tubular, .05 mfd., 600 volts (C138)
73101	Capacitor—Tubular, oil impregnated, 0.1 md., 1000 volts (C130, C140)
70618	Capacitor—Tubular, 0.25 mfd., 400 volts (C101, C117, C129, C137, C161)
*72740	Capacitor—Electrolytic, dry, 24 mfd., 300 volts (C160)
71780	Capacitor—Electrolytic, comprising 1 section of 80 mfd., 450 volts, and 1 section of 10 mfd., 450 volts (C127A, C127B)
71436	Capacitor—Electrolytic, comprising 1 section of 250 mfd., 10 volts, and 1 section of 1000 mfd., 6 volts (C132A, C132B)
*72736	Capacitor—Electrolytic, dry, comprising 1 section of 10 mfd., 400 volts; 1 section of 30 mfd., 350 volts; and 1 section of 30 mfd., 250 volts (C116A, C116B, C116C)
71782	Capacitor—Electrolytic, comprising 1 section of 40 mfd., 450 volts; and 1 section of 10 mfd., 350 volts (C131A, C131B)
71781	Capacitor—Electrolytic, comprising 1 section of 40 mfd., 450 volts; 1 section of 40 mfd., 150 volts; and 1 section of 130 mfd., 50 volts (C128A, C128B, C128C)
71426	Coil—First, second or third pix i-f coils (L101, L102, L103)
71529	Coil—Peaking coil (L105, R119, L106, R123)
71793	Coil—Peaking coil (L104, L107)
71528	Coil—Peaking coil (L122, R195)
71429	Coil—Width control coil (L112)
71449	Coil—Horizontal linearity control coil (L113)

MODEL 721TS

RADIO CORP. OF AMERICA

REPLACEMENT PARTS (Continued)

STOCK No.	DESCRIPTION
71421	Coil—Focus coil (L120)
71789	Connector—Kinescope anode connector
71521	Connector—High-voltage capacitor lead connector
71784	Control—Brightness and picture control (R108, R128) (use with decal #72805)
*73193	Control—Brightness and picture control (R108, R128) (use with decal #73194)
*72735	Control—Focus control (R129)
71440	Control—Height control (R141)
71443	Control—Horizontal or vertical centering control (R152, R166)
*72734	Control—Vertical and horizontal hold control (R144, R156)
71441	Control—Vertical linearity control (R148)
71785	Control—Volume control and power switch (R183, S101)
71457	Cord—Power cord complete with plug
71437	Cover—Insulating cover for electrolytics, RCA #71780 and #71781
71783	Cover—Insulating cover for electrolytics, RCA #71436 and #71782
*72772	Cover—Insulating cover for electrolytic, RCA #72736
71510	Cushion—Rubber cushion—lower—for deflection yoke hood
71509	Cushion—Rubber cushion—upper—for deflection yoke hood
71792	Magnet—Ion trap magnet (L110, L111)
*72737	Nut—#8-32 speed nut for r-f unit shield (2 required)
71455	Nut—#8-32 wing nut for mounting focus coil (3 required)
18469	Plate—Bakelite mounting plate for electrolytic capacitor
71448	Plug—2-prong male plug for power cord
71513	Resistor—3.3 ohms, ½ watt (R187)
72067	Resistor—5.1 ohms, ½ watt (R190)
11956	Resistor—39 ohms, ½ watt (R103, R112)
30732	Resistor—47 ohms, ½ watt (R120, R192)
31959	Resistor—82 ohms, 1 watt (R162)
13961	Resistor—82 ohms, ½ watt (R174)
30880	Resistor—150 ohms, ½ watt (R115)
5164	Resistor—560 ohms, ½ watt (R147)
19233	Resistor—680 ohms, 1 watt (R168, R169)
71916	Resistor—1000 ohms, 1 watt (R185)
34766	Resistor—1000 ohms, ½ watt (R104, R109, R110, R113, R117, R125, R150, R178)
30731	Resistor—1200 ohms, ½ watt (R175)
30733	Resistor—3300 ohms, ½ watt (R122, R149, R193)
71986	Resistor—3300 ohms, 1 watt (R124)
30494	Resistor—4700 ohms, ½ watt (R118)
71987	Resistor—4700 ohms, 1 watt (R163)
30734	Resistor—5600 ohms, ½ watt (R111)
14659	Resistor—6800 ohms, ½ watt (R116, R132)
14250	Resistor—8200 ohms, ½ watt (R137, R138, R172)
3078	Resistor—10,000 ohms, ½ watt (R106, R186, R188)
30436	Resistor—12,000 ohms, ½ watt (R107)
36714	Resistor—15,000 ohms, ½ watt (R102, R114)
70723	Resistor—15,000 ohms, 1 watt (R130)
30492	Resistor—22,000 ohms, ½ watt (R136, R177)
*72928	Resistor—Temperature compensating, 30,000 ohms, ¼ watt (R191)
30650	Resistor—56,000 ohms, ½ watt (R142)
8064	Resistor—82,000 ohms, ½ watt (R170)
3252	Resistor—100,000 ohms, ½ watt (R133, R145, R181, R182)
*72893	Resistor—100,000 ohms, ½ watt (R173)
*72892	Resistor—100,000 ohms, 1 watt (R164)
30180	Resistor—120,000 ohms, ½ watt (R135)
*72891	Resistor—120,000 ohms, 1 watt (R159)
30493	Resistor—150,000 ohms, ½ watt (R155)
11959	Resistor—180,000 ohms, ½ watt (R158)
19232	Resistor—270,000 ohms, 1 watt (R126)
14983	Resistor—330,000 ohms, ½ watt (R179)
30648	Resistor—470,000 ohms, ½ watt (R176, R184)
30653	Resistor—560,000 ohms, ½ watt (R157, R189)
*72738	Resistor—Wire wound, comprising 1 section of 1125 ohms, 20 watts, and 1 section of 610 ohms, 20 watts (R153A, R153B)
*72739	Resistor—Voltage divider, comprising 1 section of 8200 ohms, 5 watts; 1 section of 35 ohms, 0.8 watt; and 1 section of 100 ohms, 2 watts (R154A, R154B, R154C)
30652	Resistor—1 megohm, ½ watt (R121, R127, R131, R143, R160)
71993	Resistor—1 megohm, 1 watt (R167)
31449	Resistor—1.5 megohms, ½ watt (R139)
30649	Resistor—2.2 megohms, ½ watt (R146)
*72632	Resistor—3.3 megohms, 1 watt (R165)
70249	Resistor—3.9 megohms, ½ watt (R134)
31071	Resistor—6.8 megohms, ½ watt (R140, R171)
30992	Resistor—10 megohms, ½ watt (R180)
71456	Screw—#8-32 wing screw for deflection yoke (3 required)
71452	Sleeve—Rubber sleeve for focus coil
*72741	Socket—Kinescope socket
72773	Socket—Single contact female socket for C142
71508	Socket—Tube socket for 8016 tube
9914	Socket—Tube socket, miniature
72516	Socket—Tube socket, miniature (with shield attached)
*72927	Socket—Tube socket, noval wafer type
31251	Socket—Tube socket, octal
72627	Socket—Tube socket, octal, ceramic, saddle mounted
71453	Stud—Mounting stud for focus coil (2 required)
71775	Transformer—Vertical oscillator transformer (T102)
71774	Transformer—Vertical output transformer (T103)
71416	Transformer—Horizontal output and high-voltage transformer (T105)
71772	Transformer—Power transformer, 115 volt, 60 cycle (T106)
73150	Transformer—Power transformer, 115 volt, 50 cycle (T106)
71424	Transformer—Sound i-f transformer T107 (C147, C148, L116, L117)
71427	Transformer—Sound discriminator transformer T108, (C151, C152, C153, L118, L119)
71776	Transformer—Audio output transformer (T109)
*72770	Transformer—Horizontal oscillator transformer (L121)
71778	Trap—Sound trap (T101, C109)
71777	Yoke—Deflection yoke (L108, L109, L114, L115, C141, R101, R151)
	SPEAKER ASSEMBLY
	92565-1W
71797	Speaker—4" x 6" elliptical E.M. speaker complete with cone and voice coil
	MISCELLANEOUS
*72786	Back—Cabinet back
X1648	Board—Baffle board
*72819	Bracket—Decorative bracket for front panel
*72805	Decal—Control marker decal (use with control #71784)
*73194	Decal—Control marker decal (use with control #73193)
71984	Decal—Trade mark decal
71598	Escutcheon—Channel marker escutcheon
72113	Feet—Rubber feet for cabinet (4 required)
*72818	Glass—Safety glass
71539	Slide—Kinescope centering slide with rubber cushion (4 required)
71534	Knob—Channel selector knob
71533	Knob—Fine tuning knob
71536	Knob—Horizontal hold or picture control knob
71537	Knob—Volume control and power switch knob
71535	Knob—Volume control and power switch, vertical hold or brightness control knob
*72817	Plate—Retaining plate complete with wing nut and spring for top section of cabinet front (2 required)
14270	Spring—Retaining spring for knobs, #71535, #71537 and #71534
30330	Spring—Retaining spring for knob #71536
4982	Spring—Retaining spring for knob #71533
71538	Spring—Spring clip for escutcheon

* This is the first time this Stock No. has appeared in Service Data.