## GENERAL INFORMATION

Models 3193TV and 3194TV are table model receivers covering all 12 television channels. Both employ 27 tubes plus three rectifier tubes and an electro-magnetic type television picture tube. A 12½" picture tube is used in the 3194TV while the 3193TV utilizes a 10" picture tube. Other than this, both models are identical.

SPECIAL NOTICE: These models have been designed with virtually the same circuit as the 3381TV Telecaster. In view of this, it is recommended that reference be made to the service notes covering the latter for a detailed outline of the following:

**CIRCUIT DESCRIPTION:**
Block diagram with a description of the function of the various sections of the circuit.

**INSTALLATION INSTRUCTIONS:**
Instructions concerning installation of the receiver in the customer's home.
Teletube installation instructions.

**SERVICING EQUIPMENT:**
Equipment required for aligning, servicing, etc., Packard-Bell Television Receivers.

**SERVICING INSTRUCTIONS—GENERAL:**
General service notes and suggestions.

**ALIGNMENT PROCEDURE:**
Step by step alignment charts.

**SERVICE INSTRUCTIONS BASED ON PICTURE TUBE OBSERVATION:**
Photographic reproductions of television test patterns with various circuit deficiencies present.
Identification of "trouble" by indications noted in picture tube observation.
Waveforms and response curves.

NOTE: It will be noted that the Service Instructions for Model 3381TV contain alignment instructions for Nos. 10520 and 10523 TV R-F Tuners only. Inasmuch as Models 3193TV and 3194TV were produced employing the 10527 Tuner almost exclusively, reference should be made to a supplement sheet titled: SERVICE DATA (SUPPLEMENT) TELEVISION R-F TUNER, PACKARD-BELL PART NO. 10527. This supplement contains alignment instructions, schematic diagram and general information concerning the 10527 Tuner.

Identification of the type tuner being used may be accomplished by examining the unit for its distinct features as follows:

10520 — Wafer Switch Type
10523 — Capacity Inductance Type
10527 — Turret Type

Since the 3381TV contained an FM Tuner, a portion of the Sound I-F and Ratio Detector Alignment was done with the FM Tuner in operation. It will be noted that Step 3 calls for a loose coupling of a signal and sweep generator to the converter grid of the FM Tuner. Inasmuch as Models 3193TV and 3194TV do not contain an FM Tuner, this step should be done with the signal and sweep generators connected (loosely coupled) to the converter grid of the TV R-F Tuner.

## SPECIFICATIONS

**Electrical Rating:**
Line Voltage . . . . . 110-120 volts, 60 cycle AC only
Power Consumption . . . . 280 watts

**Tuning Frequency Range:**
All 12 television channels

**Intermediate Frequency:**
Picture Carrier Frequency . . . . 25.75 MC
Accompanying Sound Traps . . . 21.25 MC

**Electrical Power Output:**
Maximum . . . . . 5 watts
Undistorted . . . . . 2.5 watts

**Loudspeaker:**
Type . . . . . Permanent Magnet
Outside Cone Diameter . . . . . 5"
Voice Coil Impedance . . . . . 3.2 ohms at 400 cycles
Magnet Rating . . . . . 1.0 Oz. Alnicq V

**R-F Frequency Ranges:**

| Channel Number | Channel Freq. MC | Picture Carrier Freq. MC | Sound Carrier Freq. MC | Receiver R-F Osc. Freq. MC |
|---|---|---|---|---|
| 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 |

## TUBE COMPLEMENT:

Tubes V-1, V-2 & V-3 are contained in the R-F Tuner Unit. The 10520 & 10523 contain three 6J6's which function as follows:
V-1 — R-F Amplifier
V-2 — Converter
V-3 — Oscillator

The 10527 R-F Tuner utilizes a 6AG5 and a 6J6 which function as follows:
V-1 — 6AG5 — R-F Amplifier
V-2 — 6J6 — Converter

| Tube | No. | Function |
|---|---|---|
| 6BA6 | V-4 | 1st Sound I-F |
| 6BA6 | V-5 | 2nd Sound I-F |
| 6AU6 | V-6 | Driver |
| 6AL5 | V-7 | Ratio Detector |
| 6AU6 | V-8 | 1st Audio |
| 6V6-GT | V-9 | Audio Output |
| 6AU6 | V-10 | 1st Pix I-F |
| 6AU6 | V-11 | 2nd Pix I-F |
| 6AU6 | V-12 | 3rd Pix I-F |
| 6AU6 | V-13 | 4th Pix I-F |
| 6AL5 | V-14 | Pix 2nd Detector, A.G.C. |
| 6AU6 | V-15 | 1st Video |
| 6K6-GT | V-16 | 2nd Video |
| 6AL5 | V-17 | D.C. Restorer |
| 12QP4 or 12KP4 | V-18 | Picture Tube (Dumont), 3194TV |
| 10BP4 or 10FP4 | V-18 | Picture Tube (Rauland), 3194TV |
| 6SK7 | V-21 | Picture Tube (RCA), 3193TV |
| 6SH7 | V-22 | Picture Tube (Rauland), 3193TV |
| 6SN7-GT | V-23 | Sync. Amplifier |
| 6K6-GT | V-24 | Sync. Separator |
| 6AL5 | V-25 | 2nd Sync. Amplifier & Vertical Oscillator Discharge |
| 6AC7 | V-26 | Vertical Output |
| 6K6-GT | V-27 | Horizontal Sync. Discriminator |
| 6J5 | V-28 | Horizontal Oscillator Control |
| 6BG6-G | V-29 | Horizontal Oscillator |
| 1B3-8016 | V-30 | Horizontal Dischange |
| 5V4-G | V-31 | Horizontal Output. |
| 5U4-G | V-32 | High Voltage Rectifier |
| 5U4-G | V-33 | Reaction Scanning |
| | | Power Rectifier |
| | | Power Rectifier |

**Picture Size:**
3194TV . . . . . Maximum Diameter 10¾"
Minimum Diameter 8½"
3193TV . . . . . Maximum Diameter 8½"
Minimum Diameter 6¾"

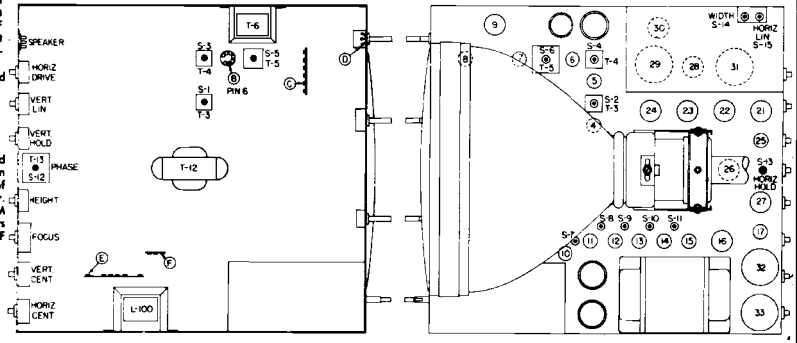


FIGURE 2 — Trimmer Location

S-1 — 1st Sound I-F Secondary
S-2 — 1st Sound I-F Primary
S-3 — 2nd Sound I-F Secondary
S-4 — 2nd Sound I-F Primary
S-5 — Ratio Detector Primary
S-6 — Ratio Detector Secondary
S-7 — 1st Pix I-F, 25.3 MC
S-8 — 2nd Pix I-F, 22.3 MC
S-9 — 3rd Pix I-F, 25.2 MC
S-10 — Pix I-F Cathode Trap, 21.25 MC
S-11 — 4th Pix I-F, 23.4 MC
S-12 — Horizontal Phase Control
S-13 — Horizontal Hold
S-14 — Width
S-15 — Horizontal Linearity

Receiving Antenna Input Impedance . . . . . 300 ohms balanced
Video Response . . . . . 4 MC band width
Focus . . . . . Magnetic
Sweep Deflection . . . . . Magnetic
Scanning . . . . . 525 lines, interlaced
Horizontal Scanning Frequency 15,750 C.P.S.
Vertical Scanning Frequency . . . 60 C.P.S.
Picture Repitition Rate . . . . . 30 C.P.S.


FIGURE 3 — Non-Operating Controls

**Socket Voltages:**
Measurements taken with:
1. No Signal
2. Brightness & Contrast Controls Minimum

All voltage readings are subject to approximately a 20% variation.

Voltage readings on V-25 (6AL5) and V-23 (6SN7-GT) are subject to a wide variation: the former is dependent on the position of the Phasing Adjustment, and the latter on the position of the Vertical Hold Control.

All voltages measured from tube pin to chassis unless otherwise noted.

**Picture Tube Voltages:**

| Pin No. | Lead Color | Voltage |
|---|---|---|
| 2 | Green | —100 to 0* |
| 10 | Orange | 300 |
| Cap | Red | 8 to 10 KV |

*Grid Bias voltage will be maximum for minimum brightness.

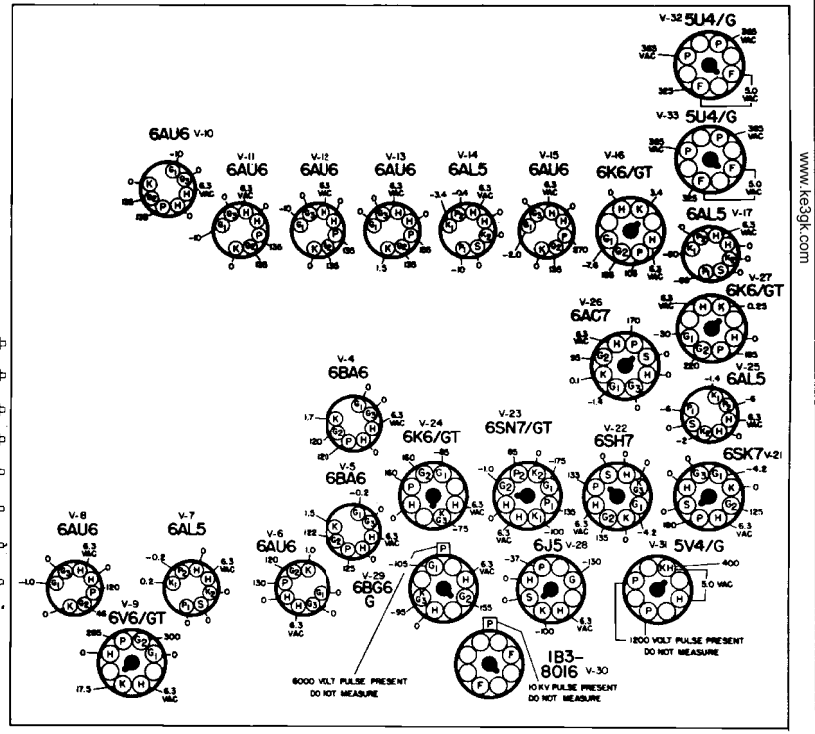


FIGURE 4 — Socket Voltages

**CRITICAL LEAD DRESS:**
1 — Dress leads of Ratio Detector Transformer, T-5 to V-7, approximately 3/16" above chassis.
2 — Dress video peaking coils up and away from chassis.
3 — Dress video capacitors C-55, C-57 & C-58 up and away from chassis.
4 — Contact between the R-F Oscillator Frequency Adjustment screws and the oscillator coils or channel switch eyelets must be avoided.
5 — Dress T-14 winding leads away from chassis and other components.
6 — If replacement of parts in the high voltage supply becomes necessary, watch lead dress and take extreme care in soldering joints. Keep them all rounded and free from sharp corners.

## HUM IN PICTURE

We have had a few reports from the field on these models where the test pattern seems to expand and contract at a very slow rate of speed. This has been traced to the AC field of the power transformer affecting the deflection yoke. This can be corrected by first loosening the bolts holding the transformer together. In some cases, it has been found it can be corrected by removing the bells from the transformer and putting a wrap of copper shielding approximately 2" wide over the coil and core, being sure to have a well soldered connection between the ends of the wrap, to make one shorted turn.

## HIGH FREQUFNCY OSCILLATOR DRIFT

Some cases of drift in the high frequency oscillator have been reported on Models 3193 and 3194 which are using our new type turret tuner. This can be corrected by replacing the 10 MMFD ceramic condenser located near the front end of the tuner with a ceramic N 600, 10 MMFD temperature compensated type. This condenser is connected between contact #2 on the turret tuner, the oscillator coil for each channel is slug tuned, making it possible to set the sound on each channel in the middle of the fine tuning control range.

## NOISY VOLUME CONTROLS

On Models 3381, 3091, and 1291, where noise has developed in the volume control, the following engineering change is recommended. At present there is a small DC voltage appearing across the volume control. This should be isolated from the volume control by inserting a .01 200V condenser between the high side of the volume control and the 22K resistor in the out-put of the 6AL5 radio detector.

## ADJACENT CHANNEL TRAPS

In some areas interference from commercial radio services above 50 megacycles has been experienced. It is possible in some cases to trap this out by series or parallel traps in the transmission line. However, in most cases this causes quite a loss in signal strength on the affected TV signal. A recent case in a nearby area where a small transmitter on 75.5 megacycles blanketed channel 5 was corrected by installing adjacent channel traps in the IF strip. It is necessary to remove the present first and fourth IF coil, substituting a type which includes a parallel trap, one operating at 19.75 MCS and the other operating at 27.25 MCS. When lining up the traps in the shop, it is suggested your signal generator be set to the frequency which the interfering signal is operating on and adjusting these two traps for minimum response of that frequency. This method has proved quite successful in several applications.

## HORIZONTAL OSCILLATOR FEEDBACK

We have experienced a few cases in the table models of horizontal oscillator feedback getting into the picture IF strip, causing a jagged black vertical line of varying widths to appear on the left side of the picture when operating on the high channels. This has been remedied by a redressing of the long red covered wire which runs from the left to the right side of the chassis connecting the B supply filter condensers together. This lead passes quite close to the first IF transformer coil. It should be dressed as far away from the coil and as near the chassis as possible.

**TABLE OF REPLACEABLE PARTS**

| PART NO. | REF. SYMBOL | DESCRIPTION |
|---|---|---|
| 10520 | | TV R-F Tuner (RCA) |
| 10523 | | TV R-F Tuner (GI) |
| 10527 | | TV R-F Tuner (Std. Coil) |
| 21082 | | Cabinet |
| | | ***Capacitor, tubular,*** |
| 23001 | C-102 | .001 Mfd., 600 V |
| 23002 | C-79 | .002 Mfd., 600 V |
| 23004 | C-37, 77, 78 | .005 Mfd., 600 V |
| 23007 | C-35 | .02 Mfd., 600 V |
| 23010 | C-55, 57, 58, 70, 74, 83, 104, 107, 119 | .05 Mfd., 600 V |
| 23011 | C-71, 82, 103 | .1 Mfd., 400 V |
| 23016 | C-32 | .003 Mfd., 600 V |
| 23017 | C-23, 33, 92, 97, 98 | .05 Mfd., 200 V |
| 23021 | C-45, 49, 59 | .25 Mfd., 200 V |
| 23023 | C-24, 76, 100 | .01 Mfd., 500 V |
| 23024 | C-95 | .004 Mfd., 1200 V |
| 23025 | C-93, 144 | .015 Mfd., 400 V |
| | | ***Capacitor, mica,*** |
| 23207 | C-80 | 4900Mmf, 500 V, 10% |
| | | ***Capacitor, ceramic,*** |
| 23909 | C-53 | 10 Mmf, 500 V, 20% |
| 23911 | C-29, 30 | 22 Mmf, 500 V, 20% |
| 23914 | C-40, 43, 47, 51 | 100 Mmf, 500 V, 20% |
| 23922 | C-109 | 56 Mmf, 500 V, 10% |
| 23925 | C-94 | 1200 Mmf, 500 V, 20% |
| 23931 | C-50 | .005 Mfd. 500 V, 10% (disc) |
| 23932 | C-110, 111 | .01 Mfd. 125 VAC |
| 23935 | C-69 | 82 Mmf, 500 V, 20% |
| 23936 | C-22, 25, 26, 27, 28, 38, 39, 41, 42, 44, 46, 48 | 1500 Mmf, 500 V, 20% |
| 23938 | C-105 | 500 Mmf, 10 Kilovolt |
| 23943 | C-72, 73 | 270 Mmf., 500 V, 20% |
| 23944 | C-52, 54 | 330 Mmf, 500 V, 20% |
| 23945 | C-99 | 390 Mmf, 500 V, 20% |
| 23946 | C-101 | 680 Mmf, 500 V, 20% |
| 23947 | C-91, 96 | 4000 Mmf, 500 V, 20% HI-KAP |
| | | ***Capacitor; electrolytic,*** |
| 24002 | C-56, 75 | 10 Mfd., 450 V |
| 24004 | C-88, 90 | 40 Mfd., 350 V |
| 24006 | C-36 | 25 Mfd., 25 V |
| 24030 | C-89 | 40 Mfd., 450 V |
| 24038 | C-31 | 5 Mfd., 50 V |
| 24044 | C-87 | 250 Mfd., 10 V |
| 24045 | C-86 | 1000 Mfd., 6 V |
| 24048 | C-81A, B, C | 10 X 40 X 40 Mfd., 450 V |
| 24049 | C-85A, B, C | 10 X 40 X 450 V, 80 Mfd., 150 V |
| 24050 | C-84A, B | 50 Mfd., 50 V, 80 Mfd., 450 V |
| | | ***Controls,*** |
| 25804A | R-95 | Vertical Hold, 1 megohm |
| 25805A | R-100 | Height, 3 megohm |
| 25807 | R-103 | Vertical Linearity, 5000 ohms |
| 25808 | R-109 | Vertical Centering, 20 ohm C.T. |
| 25809C | R-131 | Horizontal Drive, 25,000 ohms |
| 25812 | R-115 | Focus, 1500 ohms |
| 25815 | R-72 | Contrast, 5000 ohms |
| 25816 | R-64 | Brightness, 50,000 ohms |
| 25817 | R-108 | Horizontal Centering, 20 ohms |
| 25022 | R-29 | Volume, 500,000 ohms |
| | | ***Coils,*** |
| 27005 | L-100 | Choke, filter, 1 Hy. at 320 M.A.-37 ohms |
| 29025 | T-3, 4 | I-F Sound |
| 29028 | L-83, 84, 86, 88 | I-F Picture |
| 29030 | T-13 | Sync. Discrimirator |
| 29031 | T-5 | Ratio Detector |
| 29115 | L-85, 87 | R-F Choke, 55 uh |
| 29501 | C-97, 98, 103 | Yoke |
| 29503 | L-102 | Width Control |
| 29504 | L-102 | Horizontal Linearity |
| 29505 | L-99 | Focus |
| 29506 | L-91, 93 | Video, 120 uh — Blue |
| 29507 | L-92, 94 | Video, 93 uh — Red |
| 29508 | L-89 | Video, 180 uh — White |
| 29509 | L-90 | Video, 250 uh — Green |
| 29511 | T-14 | Horizontal Output |
| 29516 | T-7 | Cathode Trap |
| 32021 | | Cord, A.C. 6' |
| 41027 | | Escutcheon, teletube — 10" |
| 41028 | | Escutcheon, teletube — 12½" |
| 45003 | | Fuse, ¼ Amp., 250 V. 3AG |
| 45011 | | Fuseholder |
| | | ***Resistor, carbon,*** |
| 73001 | R-31, 76 | 10 ohms, ½ watt, 10% |
| 73008 | R-31, 76 | 39 ohms, ½ watt, 10% |
| 73012 | R-37, 42, 46 | 82 ohms, ½ watt, 10% |
| 73013 | R-16, 18, 38, 40, 44, 48 | 100 ohms, ½ watt, 10% |
| 73014 | R-21, 39, 43, 47 | 120 ohms, ½ watt, 10% |
| 73016 | R-48 | 180 ohms, ½ watt, 10% |
| 73019 | R-61 | 330 ohms, ½ watt, 10% |
| 73021 | R-24 | 470 ohms, ½ watt, 10% |
| 73022 | R-106, 107, 121 | 560 ohms, ½ watt, 10% |
| 73025 | R-17, 20, 23, 89 | 1,000 ohms, ½ watt, 10% |
| 73028 | R-104 | 1,800 ohms, ½ watt, 10% |
| 73029 | R-139 | 2,200 ohms, ½ watt, 10% |
| 73030 | R-73, 74 | 2,700 ohms, ½ watt, 10% |
| 73031 | R-19, 58 | 3,300 ohms, ½ watt, 10% |
| 73032 | R-53 | 3,900 ohms, ½ watt, 10% |
| 73033 | R-83, 84, 90 | 4,700 ohms, ½ watt, 10% |
| 73034 | R-22 | 5,600 ohms, ½ watt, 10% |
| 73035 | R-56, 87, 93, 140 | 6,800 ohms, ½ watt, 10% |
| 73036 | R-36, 41, 45, 50, 92, 102, 132 | 8,200 ohms, ½ watt, 10% |
| 73037 | R-17, 20, 23, 89 | 10,000 ohms, ½ watt, 10% |
| 73041 | R-28, 62, 91, 94 | 22,000 ohms, ½ watt, 10% |
| 73042 | R-123 | 27,000 ohms, ½ watt, 10% |
| 73045 | R-67 | 47,000 ohms, ½ watt, 10% |
| 73046 | R-141 | 56,000 ohms, ½ watt, 10% |
| 73056 | R-133 | 390,000 ohms, ½ watt, 10% |
| 73058 | R-51 | 560,000 ohms, ½ watt, 10% |
| 73121 | R-35 | 68,000 ohms, ½ watt, 20% |
| 73147 | R-125 | 680 ohms, 1 watt, 10% |
| 73149 | R-25, 69, 97 | 100,000 ohms, ½ watt, 20% |
| 73151 | R-66 | 150,000 ohms, ½ watt, 20% |
| 73153 | R-101, 129, 75 | 222,000 ohms, ½ watt, 20% |
| 73157 | R-33, 34, 54, 117, 118, 119 | 470,000 ohms, ½ watt, 20% |
| 73159 | R-60, 82, 130 | 680,000 ohms, ½ watt, 20% |
| 73161 | R-59, 68, 85, 88, 120 | 1 megohm, ½ watt, 20% |
| 73163 | R-96 | 1.5 megohm, ½ watt, 20% |
| 73165 | R-32, 98, 99 | 2.2 megohm, ½ watt, 20% |
| 73169 | R-30, 81, 86 | 4.7 megohm, ½ watt, 20% |
| 73213 | R-116 | 100 ohms, 1 watt, 10% |
| 73231 | R-19 | 3,300 ohms, 1 watt, 10% |
| 73237 | R-127 | 10,000 ohms, 1 watt, 10% |
| 73241 | R-124 | 22,000 ohms, 1 watt, 10% |
| 73243 | R-71 | 33,000 ohms, 1 watt, 10% |
| 73244 | R-126 | 39,000 ohms, 1 watt, 10% |
| 73260 | R-136 | 820,000 ohms, 1 watt, 10% |
| 73279-2 | R-137 | 3.3 ohms, 1 watt, 10% |
| 73431 | R-63 | 3,300 ohms, 2 watt, 10% |
| 73437 | R-105 | 10,000 ohms, 2 watt, 10% |
| 73439-1 | R-135 | 15,000 ohms, 2 watt, 10% |
| | | ***Resistor, wire wound,*** |
| 73639 | R-128 | 5,000 ohms, 10 watt, 10% |
| 73661 | R-110, 114 | 1360/25 W — 250/20 W, 10% |
| 73664 | R-111, 112, 113 | 6750/5 W — 12/1 W — 93/5 W, 10% |
| 79002 | | Socket, tube, octal (Standard) |
| 79051 | | Socket, tube, miniature |
| 79057 | | Socket, tube, octal, 1½" Mtg. centers |
| 79059C | | Socket, teletube |
| 79064 | | Socket, filter capacitor |
| 79004 | | Socket, speaker, 3 prong |
| 83202 | | Speaker, 5" P.M. |
| 89027A | T-15 | Transformer, power |
| 89031 | T-11 | Transformer, vertical oscillator |
| 89405 | T-6 | Transformer, output, 5000 to 3.2 ohms |
| 89422 | T-12 | Transformer, vertical output |

NOTE: THE R-F TUNER SHOWN (10520) WILL NOT BE FOUND IN ALL RECEIVERS. REFER TO TELEVISION R-F TUNER SUPPLEMENT SHEET TO DETERMINE R-F TUNER USED.

TO PRESENT THESE SERVICE INSTRUCTIONS AT THE EARLIEST POSSIBLE TIME, THIS SCHEMATIC DIAGRAM WAS MODIFIED FROM THE MODEL 3381 TV. SINCE THIS RECEIVER HAS NO FM BAND, SOME REFERENCE SYMBOLS HAVE BEEN OMITTED

**FIGURE 1 — Cabinet**

**Production Modifications:**

1. In many cases the grid resistors in the Pix I-F Circuit, R-36, R-41 & R-45 (8200 ohms), were changed to 4700 ohms. This was done to improve the I-F response curve.
2. Capacitor C-80 (4900 Mmf.) which runs from the grid of V-23B to T-11 may also be a 5100 or 5700 Mmf. This capacitor was originally ceramic. In later production runs, however, it was changed to mica. This was because of an unfavorable reaction to heat, by the ceramic capacitor, which in turn caused vertical instability.
3. It will be noted that the Schematic Diagram shows an external audio jack which provides for the use of the audio system of another receiver or amplifier if desired. This audio jack was installed in only a very few receivers of an early production run.

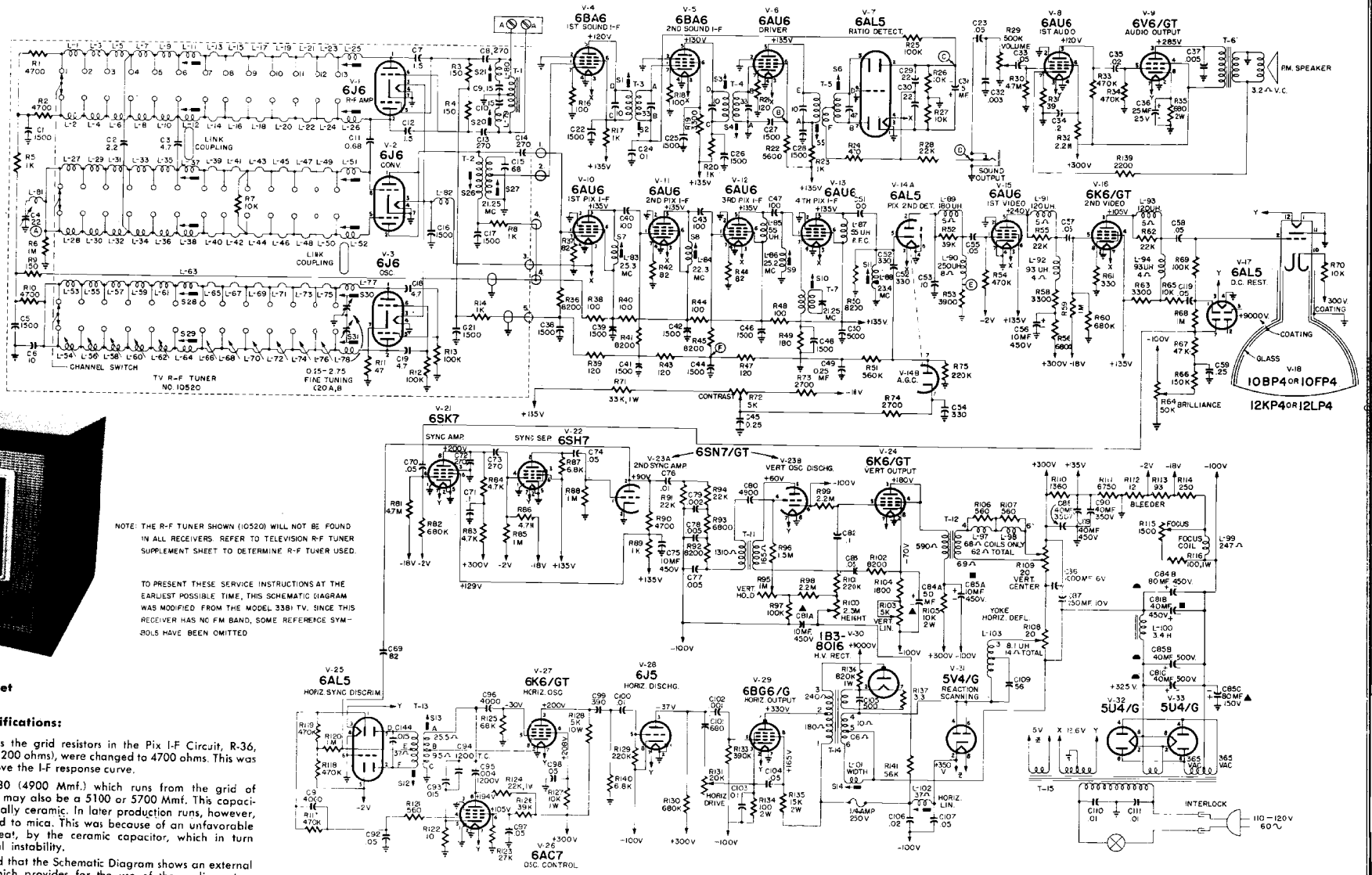


**FIGURE 5 — Schematic Diagram**

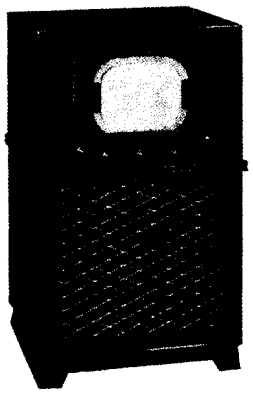

FIG. 1 — CABINET

## GENERAL DESCRIPTION

The Model 3381 TV is a combination television receiver, covering all television channels, and an FM band receiver, complete with sound system. An audio jack is provided so that the sound system of another receiver or amplifier may be used if desired.

Mode. 3381 TV has 29 tubes plus a 10" electro-magnetic type television picture tube, and three rectifier tubes.

Some of the outstanding features are:

1. Large casters on the underside of the cabinet which permits moving the instrument for convenient viewing.
2. Switching from TV to FM by push-button operation of FM tuning control.
3. Ratio type detector for FM reception; both FM and Television sound.

## SPECIFICATIONS

**Overall Dimensions:**

Height . . . . 36¾" Shipping Weight . 144 lbs.
Width . . . . . 22" Depth . . . . . 21½"

**Electrical Rating:**

Line Voltage . . . . . 110-120 volts, 60 cycle AC
Power Consumption . . . . . 280 watts

**Tuning Frequency Range:**

Frequency Modulation . . . . . 87.5 to 108.5 MC.
Television . . . . . All 12 channels

**Intermediate Frequency:**

Picture I-F Frequencies:
Picture Carrier Frequency . . . 25.75 MC.
Accompanying Sound Traps . . 21.25 MC.
Sound I-F Frequencies:
Sound Carrier & FM I-F Frequency 21.25 MC.
Video Sound & FM Ratio Detector Band Width . . 350 KCS.

**Loudspeaker:**

Type . . . . . Permanent Magnet
Outside Cone Diameter . . . . . 6½"
Voice Coil Impedance . . . . . 3.2 ohms at 400 cycles

**Electrical Power Output:**

Maximum . . . . . 5.0 watts
Undistorted . . . . . 2.5 watts

**Tube Complement:**

| Tube | | Function |
|---|---|---|
| 6J6 | V-1 | R-F Amplifier |
| 6J6 | V-2 | Converter |
| 6J6 | V-3 | Oscillator |
| 6BA6 | V-4 | 1st Sound I-F |
| 6BA6 | V-5 | 2nd Sound I-F |
| 6AU6 | V-6 | Driver |
| 6AL5 | V-7 | Ratio Detector |
| 6AU6 | V-8 | 1st Audio |
| 6V6-GT | V-9 | Audio Output |
| 6AU6 | V-10 | 1st Pix I-F |
| 6AU6 | V-11 | 2nd Pix I-F |
| 6AU6 | V-12 | 3rd Pix I-F |
| 6AU6 | V-13 | 4th Pix I-F |
| 6AL5 | V-14 | Pix 2nd Detector, A.G.C. |
| 6AU6 | V-15 | 1st Video |
| 6K6-GT | V-16 | 2nd Video |
| 6AL5 | V-17 | D.C. Restorer |
| 10FP4 | V-18 | Picture Tube (Rcuiand) |
| or | | |
| 10BP4 | V-18 | Picture Tube (RCA) |
| 6BA6 | V-19 | R-F Amplifier—FM |
| 6BE6 | V-20 | Converter Oscillator—FM |
| 6SK7 | V-21 | Sync Amplifier |
| 6SH7 | V-22 | Sync Separator |
| 6SN7-GT | V-23 | 2nd Sync Amp. & Vert. Osc. Discharge |
| 6K6-GT | V-24 | Vertical Output |
| 6AL5 | V-25 | Horiz. Sync Discriminator |
| 6AC7 | V-26 | Horiz. Osc. Control |
| 6K6-GT | V-27 | Horiz. Oscillator |
| 6J5 | V-28 | Horiz. Discharge |
| 6BG6-G | V-29 | Horiz. Output |
| 1B3-8016 | V-30 | H.V. Rectifier |
| 5V4-G | V-31 | Reaction Scanning |
| 5U4-G | V-32 | Power Rectifier |
| 5U4-G | V-33 | Power Rectifier |

**Picture Size . . . . . 6¾" x 8½" less 2" radius at corners**

**R-F Frequency Ranges:**

| Channel Number | Channel Freq. MC. | Picture Carrier Freq. MC. | Sound Carrier Freq. MC. | Receiver R-F Osc. Freq. MC. |
|---|---|---|---|---|
| 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 |

**Receiving Antenna Input Impedance . 300 ohms balanced**
**Video Response . . . . . 4 MC. Band Width**
**Focus . . . . . Magnetic**
**Sweep Deflection . . . . . Magnetic**
**Scanning . . . . . 525 lines, interlaced**
**Horizontal Scanning Frequency . . . 15,750 C.P.S.**
**Vertical Scanning Frequency . . . 60 C.P.S.**
**Picture Repetition Rate . . . . . 30 C.P.S.**

## CIRCUIT DESCRIPTION

The Television portion of the Model 3381 TV may be divided into ten basic sections. These are:

1. R-F Amplifier, Converter, and Oscillator.
2. Picture I-F Amplifier, Detector, and Automatic Gain Control.
3. Sound I-F and Ratio Detector.
4. Video Amplifier, D.C. Restorer and Picture Tube.
5. Sync Amplifier and Separator.
6. Vertical Sweep.
7. Horizontal Sweep.
8. High Voltage.
9. Audio Amplifier and Speaker.
10. FM Band—R-F Amplifier and Converter.

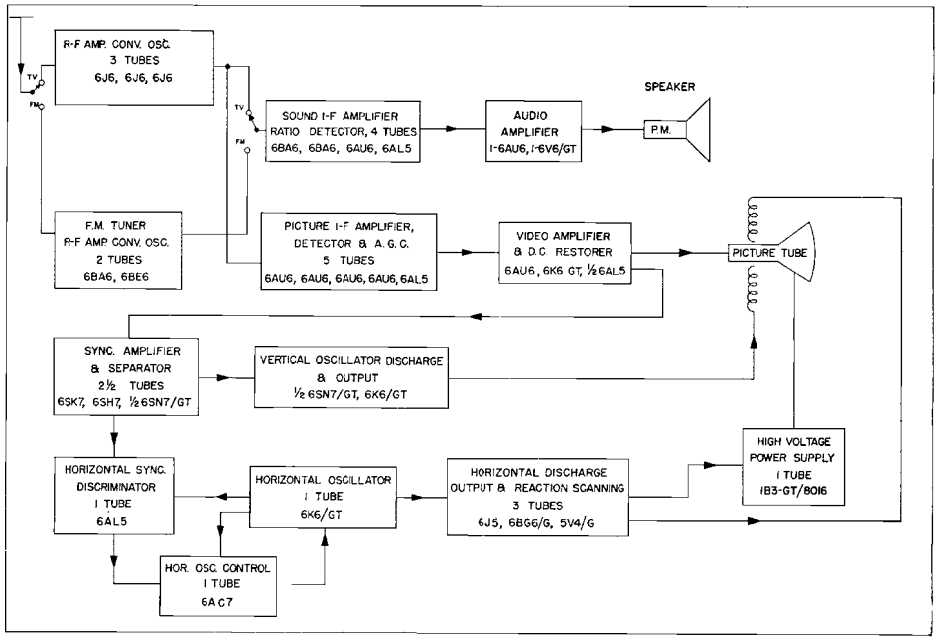


FIG. 2 — BLOCK DIAGRAM

**1. R-F Amplifier and Converter:**

This section is made up as a separate sub-chassis and utilizes three (3) 6J6 triode tubes connected in push-pull. This arrangement permits gain and conversion for the desired TV signal while tending to cancel noise and undesirable signals.

Switching is accomplished by means of shorting bars across the inductances, which when properly adjusted, tune the circuit to the desired frequency band. The oscillator is on such frequency so as to give a picture I-F of 25.75 MC. and sound I-F of 21.25 MC.

An alternate TV tuner which may be used, accomplishes the desired band switching by varying a ganged capacitor.

**2. Picture I-F Amplifier and Automatic Gain Control:**

The picture I-F Amplifier consists of four stages, each tuned to a specific frequency to give the desired band pass characteristics. An Automatic Gain Control circuit accomplishes much the same results as automatic volume control does for conventional Amplitude Modulation broadcasting. This permits tuning to different channels with only slight readjustment of the controls. The effects of "fading" are also greatly reduced.

**3. Sound I-F Ratio Detector:**

The Ratio type Detector permits the use of lower gain I-F stages and makes limiter tubes and circuits unnecessary. Consequently, only four tubes are used in this circuit: two I-F tubes, a Driver, and a Detector. The Amplifier is aligned by means of a sweep generator, set at a center frequency of 21.25 MC., and an oscilloscope.

**4. Video Amplifier and Picture Tube:**

After the picture signal has been amplified sufficiently, it is rectified, and the radio frequency component eliminated. The resulting signal which contains picture information, blanking, and sync pulses, is further amplified by a two stage video amplifier which has a flat frequency response to 4.0 MC. Inasmuch as these various amplifier stages respond only to A.C. variations, the D.C. component of the video signal, which corresponds to the average lighting of the picture, will not be present. A D.C. restorer is used at this point to change the picture tube grid bias in a manner proportional to the average illumination of the picture. This is accomplished by rectifying a portion of the composite video signal

**INTER-CHANNEL INTERFERENCE -- TELEVISION MODELS**

**In extremely strong signal areas some inter-channel interference has been encountered. Where this condition exists it can usually be corrected by removing the AGC voltage on the RF stage of the tuner. This is to be accomplished by grounding the AGC lead from the TV tuner directly to the chassis. This change applies to both RCA and GI tuners.**

and applying the resultant D.C. voltage with correct polarity to the picture tube grid.

**5. Sync Amplifier and Separator:**

As the picture signal contains pulses which control the horizontal and vertical sweeps, and blanking, it is necessary to separate these pulses from the picture and from each other. It is the purpose of the Sync Amplifier to amplify the vertical, horizontal, and blanking pulses, and to reduce the effect of extraneous pulses. The Sync Separator serves to remove the video and blanking pulses from the horizontal and vertical pulses. The Sync pulses are then further amplified and separated by means of integrating and differentiating networks.

**6. Vertical Sweep Circuit:**

Vertical Scanning of a magnetically controlled picture tube requires a saw-tooth waveform of current through the vertical deflection coil. A voltage of the proper waveform and frequency is obtained in the vertical oscillator and discharge tube.

**7. Horizontal Sweep Circuit:**

This portion of the Model 3381 TV is more complex than the Vertical Sweep Circuit and is made up of the following inter-related circuits:

1. Horizontal Sync Discriminator.
2. Horizontal Oscillator.
3. Horizontal Oscillator Control.
4. Horizontal Discharge Output.
5. Horizontal Output.
6. Reaction Scanning.

The Horizontal Oscillator is a 6K6-GT connected in a very stable Hartley oscillator circuit. In order to maintain the proper frequency (15,750 C.P.S.) and phase relations between this oscillator and the transmitted picture signal, a reactance tube (6AC7) is connected across the oscillator circuit and controlled by means of the Horizontal Sync Discriminator (6AL5) which produces a D.C. voltage proportional to the phase displacement between the oscillator sine wave output and the horizontal sync pulses.

The Horizontal Discharge, Output, and Reaction Scanning circuits convert the sine wave output of the controlled Horizontal Oscillator into a "saw-tooth" of current in the Horizontal Deflection coils to provide horizontal scanning for the picture tube.

**8. High Voltage:**

The picture tube requires between eight and ten kilovolts on its 2nd anode to give proper picture brilliance. Use is made of the return, or "sweep-back" portion of the horizontal trace voltage. The output of the Horizontal Output tube (6BG6-G) is connected through a transformer to both a high voltage rectifier and to the Reaction Scanning tube. The high voltage winding of the transformer steps up the voltage to the required value. The resultant voltage is then rectified by the 8016 tube and applied to the 2nd anode of the picture tube. Because of the magnitude, and frequency, very little capacitance filtering is necessary to sufficiently "smooth" out this voltage.

The small amount of capacitance in the high voltage circuits does not allow the storage of much energy, thus making this circuit less dangerous than conventional high voltage circuits.

**9. Audio Amplifier and Speaker:**

A high gain audio stage (6AU6) is coupled to a 6V6-GT type output tube, which in turn is connected to a permanent magnet dynamic speaker. A "feedback" circuit from the voice coil to the cathode of the audio tube assures excellent fidelity of frequency response and negligible distortion.

**10. FM Band Tuner:**

In addition to receiving Television signals, the Model 3381 TV also permits reception of the FM band. This is done by means of a tuner consisting of an R-F Amplifier, and a Converter-Oscillator which amplifies and converts the incoming FM signal to 21.25 MC. This signal then passes through the same I-F channel as would the picture sound.

A plug is located on the rear of the chassis which permits connecting the audio output of the Ratio Detector to an external amplifier and speaker system.

## HIGH VOLTAGE WARNING

**OPERATION OF THIS RECEIVER OUTSIDE THE CABINET OR WITH THE COVER REMOVED INVOLVES A SHOCK HAZARD FROM THE RECEIVER POWER SUPPLIES . WORK ON THE RECEIVER SHOULD NOT BE ATTEMPTED BY ANYONE WHO IS NOT THOROUGHLY FAMILIAR WITH THE PRECAUTIONS NECESSARY WHEN WORKING ON HIGH VOLTAGE EQUIPMENT. DO NOT OPERATE THE RECEIVER WITH THE HIGH VOLTAGE COMPARTMENT SHIELD REMOVED.**

**Non-operating Controls:**

Alignment and trap circuit adjustments are not included in this list.

1. Height (rear, extreme left).
2. Vertical Hold (rear).
3. Vertical Linearity (rear).
4. Horizontal Hold (rear).
5. Focus (rear).
6. Horizontal Drive (rear).
7. Vertical Centering (rear).
8. Horizontal Centering (rear).
9. Horizontal Phase (rear, inside chassis).
10. Horizontal Linearity (high voltage cover).
11. Width (high voltage cover).
12. Focus Coil (neck of picture tube; wing nut adjustment).
13. Deflection Coil (neck of picture tube; wing nut adjustment).

*14. Ion Trap (neck of picture tube).

*NOTE: No ion trap is used on Rauland, type 10FP4.

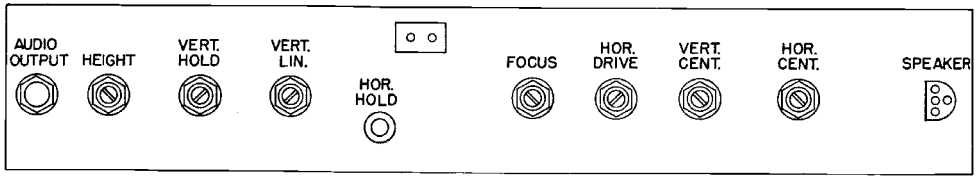


FIG. 3 — NON-OPERATING CONTROLS

## TELEVISION TUBE INSTALLATION

The Model .. is delivered with the picture tube ready for operation. If, for any reason, it becomes necessary to remove this tube, the following procedure is recommended:

1. Remove chassis from cabinet and place on a bench or table so that the face of the tube and the control apron of the chassis overhang the table edge by about three inches. PRECAUTION! Make certain that the bench or table is sufficiently solid to support the load.
2. Loosen and remove the two 3/8" nuts that fasten the tube supporting strap with a "spin-tite" wrench from beneath the chassis.
3. Remove strap and sponge rubber protecting piece.
4. Remove socket from the tube base. Also remove the high voltage lead from plug.
5. Remove the picture tube, observing these precautions: **USE GOGGLES OR A MASK, AND GLOVES TO HANDLE TUBE. DO NOT SCRATCH, STRIKE, OR EXERT MORE THAN MODERATE PRESSURE ON TUBE.**
6. To replace tube, reverse the above procedure, taking care to see that the sponge rubber pads are properly positioned. This prevents the tube from touching the metal surface of the chassis.

## INSTALLATION INSTRUCTIONS

Before this receiver is installed in a customer's home, the following precautions should be observed:

1. The Model should be so located that light does not fall directly on the picture tube face, thus causing annoying reflections from the safety glass panel.
2. The cabinet should not be closer than two inches from the wall, to permit proper ventilation.
3. Care should be taken in the type, location, and orientation of the antenna so that the best possible results are obtained.

## ANTENNA

To insure the best in FM and Television reception, an antenna system has been designed for use with this instrument. This unit will give good signal pickup on all bands and may be purchased from any Packard-Bell dealer.

## FM OPERATING INSTRUCTIONS

The FM tuner permits reception of stations within the 88 to 108 MC band.

To receive these stations, push the FM Tuning Control until the engagement of the switch causes the FM tuning dial to light up. The receiver can now be tuned in the usual manner by means of the tuning control and the volume control for desired station and sound level.

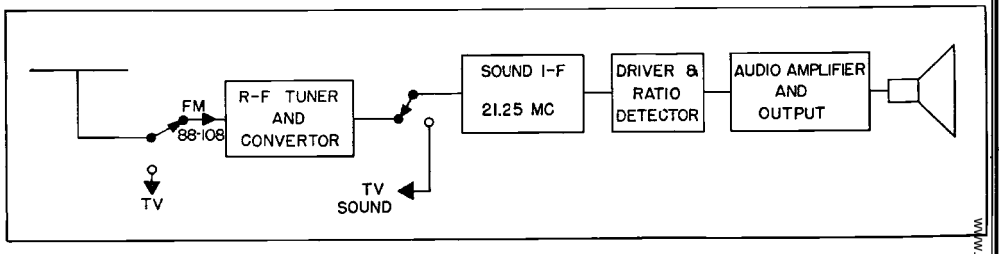


FIG. 4 — F.M. BLOCK DIAGRAM

## TELEVISION OPERATING INSTRUCTIONS

The operation of the Television section of the Model 3381 TV is accomplished by means of the controls listed and shown below.


FIG. 5 — OPERATING CONTROLS

**Volume Control**—For adjusting the sound level, both on Television and FM.

**Brilliance Control**—For varying the brightness level of the picture.

**Contrast Control**—For varying the contrast of the picture; gradations of black and white.

**FM Tuning and FM-TV Switch**—Turning this control tunes the FM section. Pushing the control so as to cause a "catch" to engage, permits switching from TV to FM position. Pushing this control again, releases the catch and operation returns to TV position.

**Channel Selector**—For selecting desired Television station.

**Fine Tuning Control**—For obtaining the best sound and picture quality.

## SERVICING EQUIPMENT

In order to properly service the following equipment is required:

1. An R-F Signal Generator with the following ranges:
   (a) 21.25 MC. Sound I-F and Sound Traps.
   (b) 21.8 MC. Converter Transformer.
   (c) 22.3 MC. Second Picture I-F Transformer.
   (d) 23.4 MC. Fourth Picture I-F Coil.
   (e) 25.2 MC. Third Picture I-F Coil.
   (f) 25.3 MC. First Picture I-F Transformer.
   (g) 25.75 MC. Picture Carrier.
   (h) The following R-F frequencies:

| Channel Number | Picture Carrier | Sound Carrier |
|---|---|---|
| 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 |

2. R-F Sweep Generator with the following ranges:
   (a) 18 to 30 MC., 10 MC. sweep width.
   (b) 40 to 90 MC., 10 MC. sweep width.
   (c) 170 to 225 MC., 10 MC. sweep width.
   The output must be adjustable with at least 1.0 volt output. The output must remain constant on all ranges and all attenuator positions. The sweep width should be variable.
3. Cathode-Ray Oscilloscope with, if possible, the following characteristics:
   (a) Wide range vertical deflection.
   (b) An input calibrating source.
   (c) A low capacitance probe.
4. Heterodyne Frequency Meter with a crystal calibrator if the signal generator is not crystal controlled.
5. Electronic Voltmeter, similar to either the RCA "Voltohmyst" or the Sylvania "Polymeter."
6. FM Signal Generator.

The servicing of the FM portion of the Model 3381 TV will require a signal generator which has the following ranges:
(a) 21.25 MC., I-F frequency.
(b) 88 to 108 MC., entire FM band.
It is not necessary that these frequencies be modulated. The alignment procedure requires no modulation except to identify the desired signal. Amplitude Modulation is quite satisfactory for this purpose.

## SERVICING INSTRUCTIONS—GENERAL

Most service failures of a Television receiver are from component breakdown rather than misalignment difficulties. Before attempting to align the receiver, the service technician should:
1. Check all voltages.
2. Observe the appearance of the raster.

Only after it has definitely been established that all the tubes are functioning properly, and at correct operating voltages, should alignment be undertaken.

## HIGH VOLTAGE MEASUREMENT

The potential applied to the 2nd anode of the picture tube should be in the order of 10 kilovolts. This is well outside the range of any voltmeter used by the average radio technician. The range of a Polymeter or similar type meter can readily be extended. Voltage multipliers are commercially available for this purpose. In measuring this voltage, all the precautions of high voltage handling should be observed.

## PRODUCTION MODIFICATIONS

Several modifications have been made since the first unit was produced. The schematic diagram incorporates all of these changes. In order that the service technician may reconcile any variations between the chassis he is servicing and the schematic diagram, a list of these modifications is included with these notes. It is not advised that these changes be made unless there is an apparent justification for so doing.

1. An 8200 ohm resistor was added across L-88, the 4th Pix I-F transformer.
2. R-49, the 4th Pix I-F cathode resistor was 82 ohms and changed to 180 ohms.
3. Early versions of this model incorporated no delay in the Automatic Gain Control circuit. Because of the poor sensitivity resulting in weak signal areas, it was deemed advisable to add delay so that the AGC would not be operative until a certain minimum signal was received. One side of the Contrast Control which formerly went to ground has been connected to a positive voltage source as indicated in the schematic diagram.
4. The 4th Pix I-F screen by-pass condenser which was, originally, 1500 MMF., has been changed to 5000 MMF.
5. A certain number of receivers were built with the polarity of the secondary of the 1st Sound I-F reversed. Terminal "A," instead of being connected to the grid, is connected to AVC. For these receivers, this method of connections is correct.
6. A 1500 MMF. condenser was added to the 135 volt buss to the Sound IF.
7. The limiting resistor in series with the Horizontal Drive Control may be any one of several values, 10,000 ohms, 6800 ohms, or 8200 ohms.

## ALIGNMENT PROCEDURE

For convenience, the alignment procedure is given in the form of a chart.

In the alignment of the Picture I-F Amplifier, care must be taken to prevent the input circuit of one tube becoming tuned to the same frequency as its output circuit. Violent oscillations will occur which manifest themselves in an abnormally high bias voltage. This voltage will drive subsequent amplifier tubes to cut-off and no signal will appear on the oscilloscope screen. The technician should observe both oscilloscope and voltmeter, detuning each I-F slug until a signal appears on the oscilloscope screen and (or) the bias volts become lower value (as read at point F). The alignment procedure as outlined in (2) and (3) can then be followed.

**Loosely Couple Generator to Tube:**

The alignment procedure recommends, in several instances, that the Signal or Sweep Generator be loosely coupled to either the Converter or R-F tube. This is accomplished most readily by wrapping several turns of fairly heavy insulated wire (#14 or #16 copper) around the glass envelope of the tube and connecting the generator to one end

## ALIGNMENT CHART

### (1) SOUND I-F AND RATIO DETECTOR ALIGNMENT

| Step No. | Connect Signal Generator To | Signal Gen. Freq. MC. | Connect Sweep Generator To | Sweep Gen. Frequency MC. | Connect Oscilloscope To | Connect Voltmeter To | Miscellaneous Connection and Instructions | Adjust | Refer To |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Driver tube grid. (V-6, pin No. 1.) | 21.25 | | | | Junc. R26 and C31. Point C. | Meter on —3.0 volt scale | S5 Max. Out | Fig. 6 Fig. 30 |
| 2 | " | " | | | | Junc. R24 and R28. Point D. | " | S6 for zero center on meter. | " |
| 3 | Loosely couple to FM Converter Grid V-20. | " | Loosely couple to FM Converter Grid V-20. | 21.25 MC I-F centering frequency. | Junc. of C27 and R22 thru a 3300 ohm resistor. Point B. (V-6, screen.) | | Switch in FM position. | S1, 2, 3, 4 for peaking and symmetry around marker. | Fig. 6 Fig. 9 Fig. 23 C, D Fig. 30 |
| 4 | Couple to antenna terminals. | " | | | " | Junc. R26 and C31. Point C. | | S34 for Max. Output. | Fig. 6, 9 Fig. 30 |

### (2) PRELIMINARY PICTURE I-F AND TRAP ADJUSTMENT

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | | Junc. R45 and C44. Point F. | | Adjust contrast control for —3.0 volts. | Fig. 6 Fig. 30 |
| 2 | Loosely couple to Picture Converter tube V-2. | 21.25 | | | | Junc. L-90 and R53. Point E. | Voltmeter on —3.0 volt scale. | Adjust S10, 27 for min. output. | " |
| 3 | " | 25.3 | | | | " | " | S7 (L-83) for max. output. | ? |
| 4 | " | 22.3 | | | | " | " | S8 (L-84) for Max. output. | " |
| 5 | " | 25.2 | | | | " | " | S9 (L-86) for Max. output. | " |
| 6 | " | 23.4 | | | | " | " | S11 (L-88) for max. output. | " |
| 7 | " | 21.8 | | | | " | " | S26 (T-2) for max. output. | " |

### (3) FINAL PICTURE AND I-F CURVE SHAPING ADJUSTMENT

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | " | 25.75 | Loosely couple to Pic. Conv. Tube V-2. | Pic. I-F center 10 MC Sweep. | Junc. L-90 and R53. Point E. | Junc. R45 and C44. Point F. | Watch voltmeter for indications of oscillat'n, should read —3.0 volts. | S7 (L-83) place marker 50% up side of curve. | Fig. 6 Fig. 24 Fig. 30 |
| 2 | " | 22.3 | " | " | " | " | " | S8 (L-84) place marker on top edge. Curve should fall immediately on low side. | " |
| 3 | " | 22.3 | " | " | " | " | " | S26 (T-2 Bottom) to swell curve on low side. | " |
| 4 | " | 25.2 | " | " | " | " | " | S9 (L-86) to build up or round off curve near 25.2 MC. | " |
| 5 | " | 22.3<br>25.2 | " | " | " | " | " | S11 (L-88) to level top of curve. | " |

### (4) R-F AND CONVERTER ADJUSTMENT TUNER No. 10520

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | | Junc R45 and C44. Point F. | 1st I-F grid to ground thru 1000 mmf. | —3.0 volts on meter as in (2) —1 above. | Fig. 6 Fig. 7 Fig. 30 |
| 2 | Antenna terminals loosely. | 211.25<br>215.75 | Antenna loosely | Sweep Chan. 13 | Junc. L-81 and R6 thru 10,000 ohms. Point A. | | Receiver on Chan. 13. | S18, 19, 24, 25 Approx. flat top response, markers above 70%. | " |
| 3 | " | 205.25<br>209.75 | " | Channel 12. | " | | Receiver on Chan. 12. | Check for same response as. above. | " |
| 4 | " | 199.25<br>203.75 | " | Channel 11. | " | | Receiver on Chan. 11. | " | " |
| 5 | " | 193.25<br>197.75 | " | Channel 10. | " | | Channel 10. | " | " |
| 6 | " | 187.25<br>191.75 | " | Channel 9. | " | | Channel 9. | " | " |
| 7 | " | 181.25<br>185.75 | " | Channel 8. | " | | Channel 8. | " | " |
| 8 | " | 175.25<br>179.75 | " | Channel 7. | " | | Channel 7. | " | " |
| 9 | " | 83.25<br>87.75 | " | Channel 6. | " | | Channel 6. | S16, 17, 22, 23. | " |
| 10 | " | 77.25<br>81.75 | " | Channel 5. | " | | Channel 5. | Check for some response as above. | " |

## ALIGNMENT CHART

| Step No. | Connect Signal Generator To | Signal Gen. Freq. MC. | Connect Sweep Generator To | Sweep Gen. Frequency MC. | Connect Oscilloscope To | Connect Voltmeter To | Miscellaneous Connection and Instructions | Adjust | Refer To |
|---|---|---|---|---|---|---|---|---|---|
| 11 | Antenna terminals loosely | 67.25<br>71.75 | Antenna loosely | Channel 4. | Junc. L-81 and R6 thru 10,000 ohms. point A | | Channel 4. | Check for same response as above. | Fig. 6<br>Fig. 7<br>Fig. 30 |
| 12 | " | 61.25<br>65.75 | " | Channel 3. | " | | Channel 3. | " | " |
| 13 | " | 55.25<br>59.75 | " | Channel 2. | " | | Channel 2. | " | " |

### (5) R-F OSCILLATOR ALIGNMENT TUNER No. 10520

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Antenna terminals. | 215.75 | | | | Junc. R24 and R28. Point D. | Fine tuning centered for all adjustments Receiver on Chan. 13. | S30, 31 for zero center on voltmeter. | " |
| 2 | " | 209.75 | | | | " | Channel 12. | L-76 as above. | " |
| 3 | " | 203.75 | | | | " | Channel 11. | L-74. | " |
| 4 | " | 197.75 | | | | " | Channel 10. | L-72. | " |
| 5 | " | 191.75 | | | | " | Channel 9. | L-70. | " |
| 6 | " | 185.75 | | | | " | Channel 8. | L-68. | " |
| 7 | " | 179.75 | | | | " | Channel 7. | L-66. | " |
| 8 | " | 87.75 | | | | " | Channel 6. | L-64. | " |
| 9 | " | 81.75 | | | | " | Channel 5. | L-62. | " |
| 10 | " | 71.75 | | | | " | Channel 4. | L-60. | " |
| 11 | " | 65.75 | | | | " | Channel 3. | L-58. | " |
| 12 | " | 59.75 | | | | " | Channel 2. | L-56. | " |

### (6) R-F OSCILLATOR ALIGNMENT TUNER No. 10523

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 (See note before proceeding) | Antenna terminals. | 87.75 | | | | Junc. R24 and R28. Point D. | As first approximation, center fine tuning control, Receiver on Chan. 6. | S35 for zero center on voltmeter. | Fig. 6<br>Fig. 8<br>Fig. 29<br>Fig. 30 |
| 2 | " | 59.75 | **RECEIVER ON CHANNEL 2**—Adjust fine tuning control for zero center on voltmeter. If zero center cannot be obtained repeat Step 1, setting fine tuning control slightly off center position. Try Step 2 again and repeat procedure until it is possible to zero center the voltmeter on either channel. | | | | | | |
| 3 | " | 81.75 | | | | Junc. R24 and R28. Point D. | Receiver on Channel 5. | Check fine tuning. | " |
| 4 | " | 71.75 | | | | " | Channel 4. | " | " |
| 5 | " | 65.75 | | | | " | Channel 3. | " | " |
| 6 | " | 215.75 | | | | " | As first approximation, center fine tuning control, Receiver on Chan. 13. | S36 for zero center on voltmeter. | " |
| 7 | " | 179.75 | | | | " | Receiver on Chan. 7. Proceed as in step 2. | | " |
| 8 | " | 209.75 | | | | " | Receiver on Chan. 12. | Check fine tuning. | " |
| 9 | " | 203.75 | | | | " | Channel 11. | " | " |
| 10 | " | 197.75 | | | | " | Channel 10. | " | " |
| 11 | " | 191.75 | | | | " | Channel 9. | " | " |
| 12 | " | 185.75 | | | | " | Channel 8. | " | " |

NOTE: The oscillator alignment for Tuner 10523 should not be attempted if all stations fall within range of the Fine Tuning Control. There are no oscillator adjustments for each channel, hence the adjustment is a compromise. The foregoing procedure is only recommended when some station or stations fall outside the range of the Fine Tuning Control.

### (7) FM TRAP ADJUSTMENT

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Between one ant. terminal and ground thru 300 ohm resistor. | The interfering FM Freq. | | | | Junc. R26 and C31. Point E. | | S20 or 21, for minimum output, whichever is the more effective. | Fig. 6<br>Fig. 7, 8<br>Fig. 29<br>Fig. 30 |
| 2 | Between other Ant. terminal and ground. | " | | | | " | | S20 or 21 as above. | " |

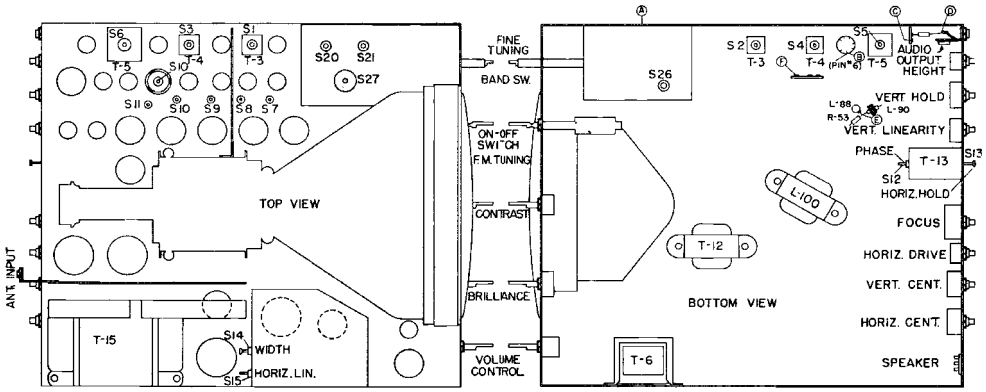


FIG. 6 — TRIMMER LOCATIONS

S- 1—1st Sound I-F Primary.
S- 2—1st Sound I-F Secondary.
S- 3—2nd Sound I-F Primary.
S- 4—2nd Sound I-F Secondary.
S- 5—Ratio Detector (sound) Primary.
S- 6—Ratio Detector (sound) Secondary.
S- 7—1st Picture I-F.
S- 8—2nd Picture I-F.
S- 9—3rd Picture I-F.
S-10—Sound Trap (may be either of two shown).
S-11—4th Picture I-F.
S-12—Horizontal Disc. Coil, Phase Control.
S-13—Horizontal Disc. Coil, Hold Control (frequency).
S-14—Width Control.
S-15—Horizontal Linearity Control.
S-16—TV Tuner—R-F Adjustment.
S-17—TV Tuner—R-F Adjustment.
S-18—TV Tuner—R-F Adjustment.
S-19—TV Tuner—R-F Adjustment.
S-20—FM (interference) Antenna Trap.
S-21—FM (interference) Antenna Trap.
S-22—TV Tuner—Converter Adjustment.
S-23—TV Tuner—Converter Adjustment.
S-24—TV Tuner—Converter Adjustment.
S-25—TV Tuner—Converter Adjustment.
S-26—Picture I-F.
S-27—Sound Trap and Takeoff.
S-28—TV Tuner—Oscillator Adjustment.
S-29—TV Tuner—Oscillator Adjustment.
S-30—TV Tuner—Oscillator Adjustment.
S-31—TV Tuner—Oscillator Adjustment.
S-32—FM Tuner—Antenna Coil.
S-33—FM Tuner—Converter Coil.
S-34—FM Tuner—I-F Coil.

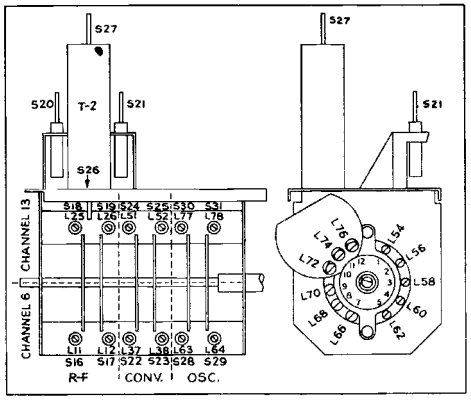


FIG. 7 — TV TUNER (10520)

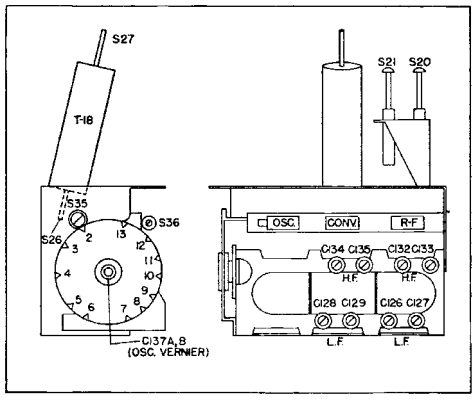


FIG. 8 — TV TUNER (10523)

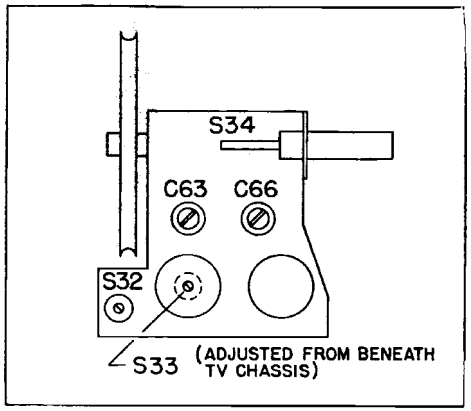


FIG. 9 — FM TUNER

## FM ALIGNMENT PROCEDURE

When the Model is operating as an FM receiver, the TV sound channel is being used as the I-F Amplifier and Detector. The alignment of this portion of the receiver is covered in the TV alignment instructions.

## FM ALIGNMENT CHART

| Step | Connect Test Osc. To | Test Osc. Setting | Pointer Setting | Adjust For Max. Output* |
|---|---|---|---|---|
| 1 | Antenna term. thru 300 ohms | 21.25 | ——— | S34 |
| 2 | " | 108 MC. | 108 MC. | C63 & C66 |
| 3 | " | 88 MC. | 88 MC. | S33 |
| 4 | Repeat Step No. 2 until no change is noted. | | | |
| 5 | Antenna term. thru 300 ohms | 98 MC. | 98 MC. | S32 |

*Connect a "Voltohmyst" or equivalent to point "C" on schematic.

NOTE: Steps 2 and 4. When adjusting R-F trimmer C66, rock the variable condenser.

## SERVICE INSTRUCTIONS—FM

The Model may be used for the reception of FM stations on the FM band which extends from 88 to 108 MC. A block diagram shows how this is accomplished.

This unit consists of an R-F Amplifier (6BA6) and a Converter (6BE6) which changes the FM signal from its original frequency (88 to 108 MC.) to the I-F frequency (21.25 MC.). The I-F frequency is the same as used for the Picture sound and the same I-F channel is used in both cases. A two-gang variable capacitor serves to tune the R-F Amplifier and Oscillator across the band. The antenna circuit is not tuned. The antenna coil is resonated at the middle of the band and is designed to perform across the entire band with uniform gain.

**1. Focus Coil Adjustment:**

Turn the Vertical and Horizontal Centering Controls to approximately their mid-position, observing the appearance of the raster. If a corner appears dark, this indicates that the electron beam is striking the neck of the tube. Adjust the Ion Trap for maximum

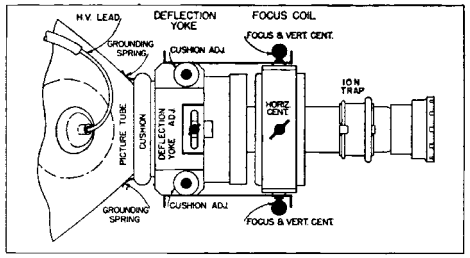


FIG. 10 — PICTURE TUBE YOKE

brightness. Loosen the Focus Coil wing nuts and rotate the coil around the horizontal and vertical axis until the entire raster is visible on the face of the tube. The raster should be centered and there should be no dark corners visible. Tighten Focus Coil wing nuts with coil in this position.

**2. Deflection Yoke Adjustment:**

If the lines of the raster are not straight and square with the picture frame, the deflection yoke must be reset.

Loosen Yoke wing nut and rotate yoke until desired condition is observed. Tighten wing nut.

**3. Horizontal Oscillator Alignment:**

(a) Obtain either a picture or test pattern on the picture tube.
(b) Adjust Fine Tuning Control for best sound quality.
(c) Turn Horizontal Hold adjustment (rear apron) until picture is in sync.
(d) If picture fails to sync vertically, adjust the Vertical Hold Control.
(e) Adjust Contrast Control until picture is slightly below average contrast level.

**4. Height and Vertical Linearity Adjustment:**

(a) Adjust the Height Control (rear apron) until picture fills frame vertically.
(b) Adjust the Vertical Linearity Control (rear apron) until picture is symmetrical from top to bottom. Any adjustment of either control requires a readjustment of the other.
(c) Adjust the Vertical Centering Control (rear apron) to align the picture in the frame.

**5. Width and Horizontal Linearity Adjustment:**

(a) Turn the Horizontal Drive Control (rear apron) clockwise as far as possible without crowding right side of picture. This position provides maximum voltage to the picture tube.
(b) Adjust the Width Control (rear of high voltage cover) until picture just fills the frame horizontally.
(c) Adjust the Horizontal Linearity Control (rear of high voltage cover) and Horizontal Drive Control until pattern is symmetrical from left to right.
(d) Adjust the Horizontal Centering Control (rear apron) to center picture in frame.

**6. R-F Oscillator Adjustment:**

(a) Check all bands for oscillator adjustment, preferably by the method outlined under Alignment Instructions.

**7. Picture Observation:**

(a) Tune in all available Television stations and observe:
1. Picture detail.
2. Proper interlace.
3. Interference.
4. Reflections.

## SERVICE SUGGESTIONS BASED ON PICTURE TUBE OBSERVATION

**No Raster on Picture Tube:**

1. V-29 or V-30 inoperative. Check voltages at fuse, and continuity of T-14.
2. No high voltage. If horizontal deflection is operating, the trouble can be isolated to the 8016 circuit. Check:
(a) The 8016 tube (V-30).
(b) C105 for short circuit.
(c) R136 and R137 for open circuit.
3. V-27 or V-27 circuits inoperative. Check:
(a) For sine wave on terminal 5 (grid) of V-27 (6K6-GT, Horiz. Osc.).
(b) For pulse on terminal 5 (grid) of V-28 (6J5, Horiz. Discharge).
(c) For saw-tooth on terminal 5 (grid) of V-29 (6BG6-G, Horiz. Output).
See Schematic Diagram, Figure 30.
4. Reaction scanning tube inoperative (V-31, 5V4-G).
5. Defective picture tube.
6. Brilliance control open (R64).
7. No receiver plate voltage. Check filter condenser for short circuit.

**No Vertical Deflection:**

1. V-23 or V-24 inoperative. Check:
(a) Voltages and waveforms on grids (terminals 4, 6SN7-GT and 6K6-GT) and plates (terminals 5 and 3) of tubes V-23B and V-24.
(b) Vertical Output Transformer (T-11) open.
(c) Vertical Deflection Coils (L-97 and L-98) open.

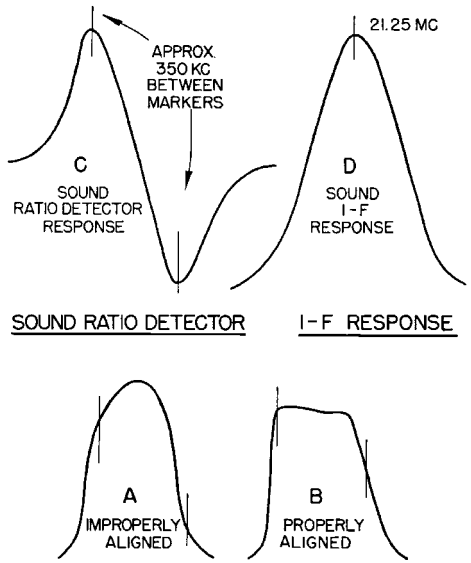


FIG. 23 — WAVEFORMS

**No Horizontal Deflection:**

1. Horizontal Deflection Coil (L-103) open. Any other failure in the Horizontal Oscillator circuits will cause loss of high voltage with consequent loss of picture tube beam.

**Raster and Signal on Picture Tube, But No Sound:**

1. R-F Oscillator off frequency.
2. Sound I-F, Ratio Detector, or Audio Amplifier inoperative. Check voltages on all tubes in these circuits.
3. T-6 or C37 defective.
4. Speaker defective.

**Sound and Raster, But No Picture or Sync.:**

1. Picture I-F, Detector, or Video Amplifier inoperative. Check voltages on all tubes in these circuits.
2. Bad contact to picture tube grid.

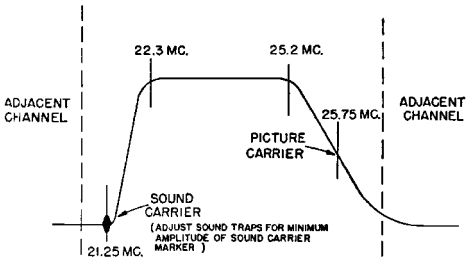


FIG. 24 — I-F RESPONSE CURVE

**Raster, But No Sound, Picture, or Sync.:**

1. Defective antenna, or transmission line.
2. R-F Oscillator off frequency.
3. R-F unit inoperative. Check tubes and their voltages.

**Small Raster:**

1. Low plus B or low line voltage.

**Picture Jitter:**

1. Contrast Control operated at excessive level.
2. If regular sections on left side of picture are displaced, change V-29.
3. Vertical instability may be due to loose connections or noise.

**Picture Stable, But Poor Resolution:**

1. V-14A, V-15, or V-16 defective.
2. Peaking Coils defective. Check for specified resistance.
3. C55, C57, C58, or C142 defective.
4. Check Focus adjustment for proper action.
5. R-F or I-F circuits misaligned.

**Signal At Picture Tube Grid, But No Sync.:**

1. Contrast Control advanced too far.
2. V-17, V-21, V-22, or V-23A inoperative. Check voltages and waveforms at their respective grids and plates.
3. C142 defective.

**Signal On Picture Tube Grid, But No Vertical Sync.:**

1. Check V-23B and associated circuits.
2. Integrating network inoperative. Check C76, C77, C78, C79, R91, R92, R93, R94.

**Signal On Picture Tube Grid, But No Horizontal Sync.:**

1. T-13 misaligned.
2. V-25 or V-26 inoperative. Check socket voltages and waveforms.