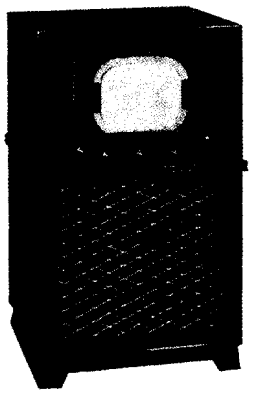

FIG. 1 — CABINET

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.

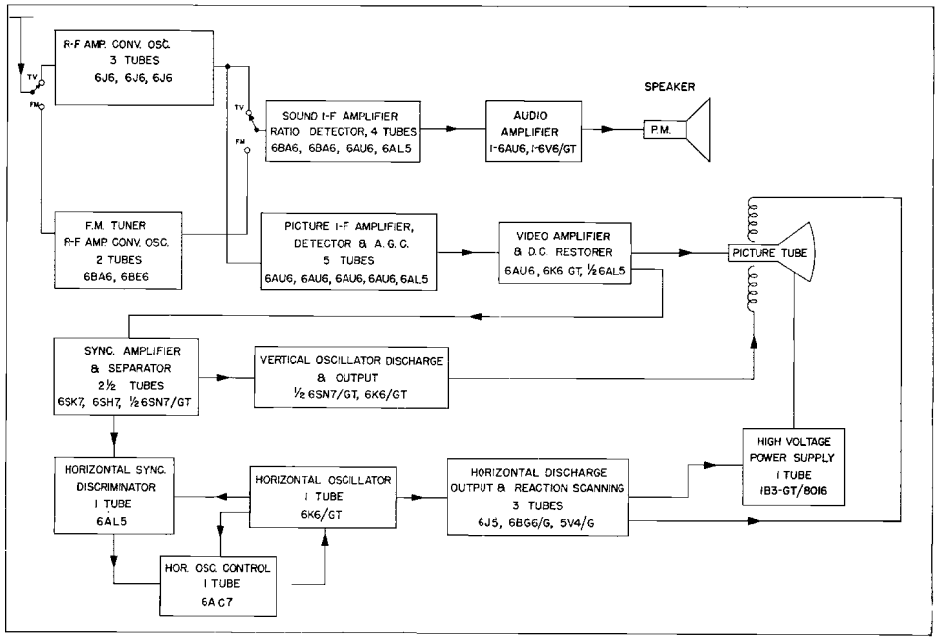

FIG. 2 — BLOCK DIAGRAM

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.

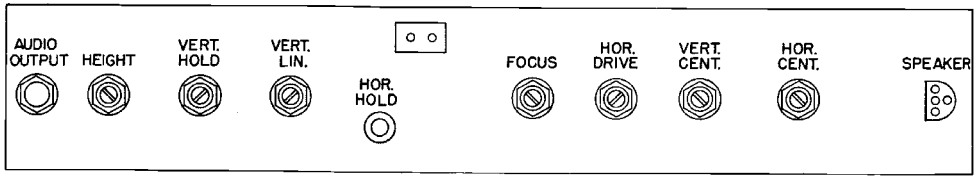

FIG. 3 — NON-OPERATING CONTROLS

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.

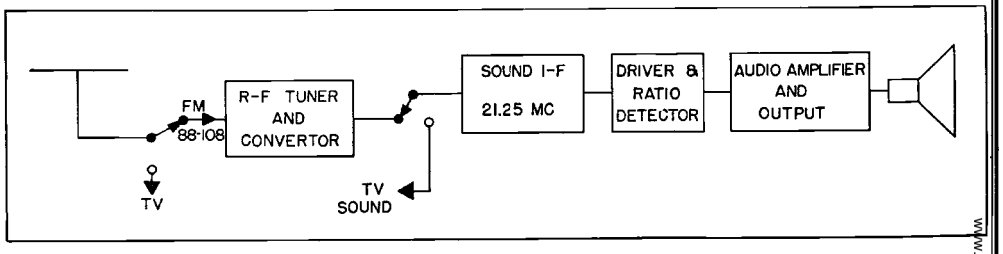

FIG. 4 — F.M. BLOCK DIAGRAM

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 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.	211.25 215.75	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	"	205.25 209.75	"	Channel 12.	"		Receiver on Chan. 12.	Check for same response as. above.	"
4	"	199.25 203.75	"	Channel 11.	"		Receiver on Chan. 11.	"	"
5	"	193.25 197.75	"	Channel 10.	"		Channel 10.	"	"
6	"	187.25 191.75	"	Channel 9.	"		Channel 9.	"	"
7	"	181.25 185.75	"	Channel 8.	"		Channel 8.	"	"
8	"	175.25 179.75	"	Channel 7.	"		Channel 7.	"	"
9	"	83.25 87.75	"	Channel 6.	"		Channel 6.	S16, 17, 22, 23.	"
10	"	77.25 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 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 Fig. 7 Fig. 30
12	"	61.25 65.75	"	Channel 3.	"		Channel 3.	"	"
13	"	55.25 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 Fig. 8 Fig. 29 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 Fig. 7, 8 Fig. 29 Fig. 30
2	Between other Ant. terminal and ground.	"				"		S20 or 21 as above.	"

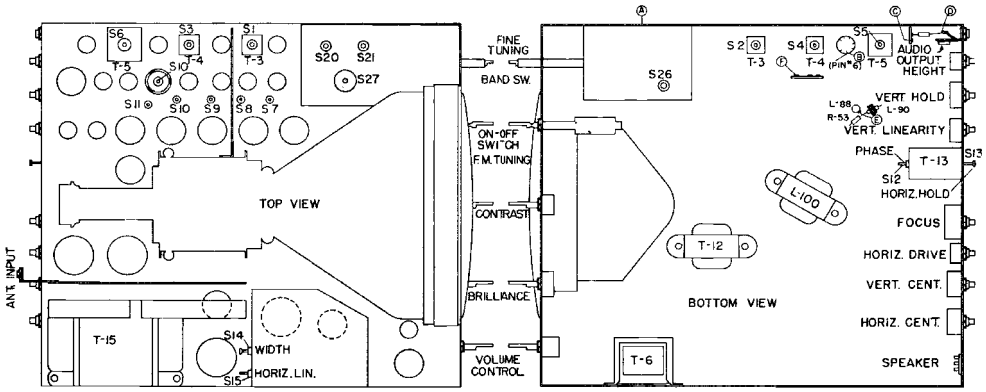

FIG. 6 — TRIMMER LOCATIONS

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.

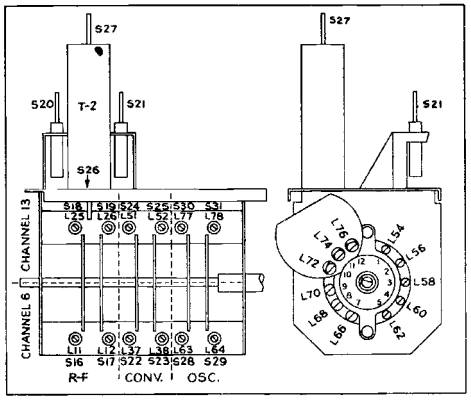

FIG. 7 — TV TUNER (10520)

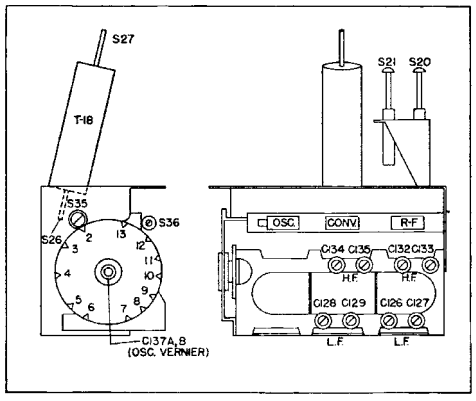

FIG. 8 — TV TUNER (10523)

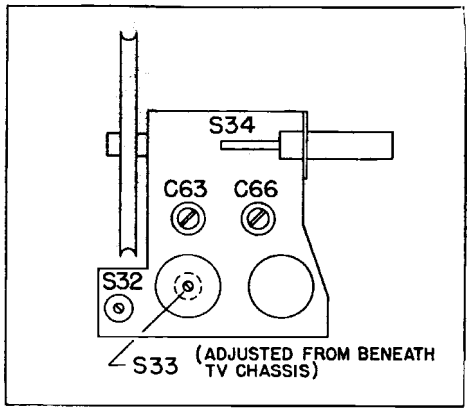

FIG. 9 — FM TUNER

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

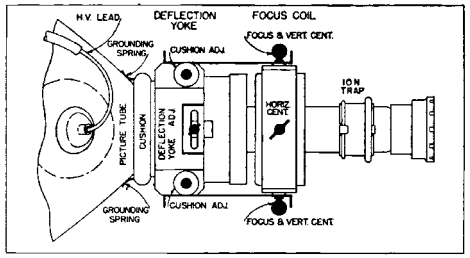

FIG. 10 — PICTURE TUBE YOKE

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.

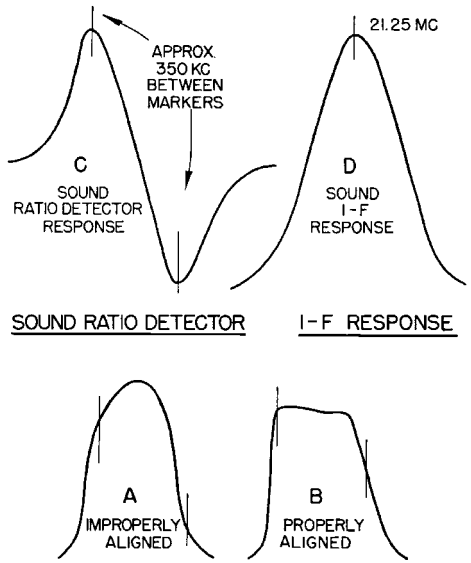

FIG. 23 — WAVEFORMS

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.

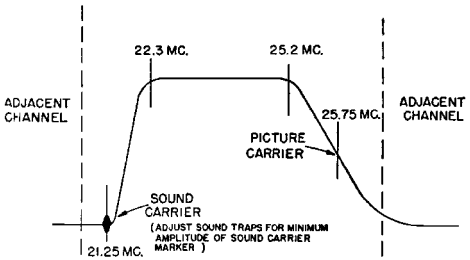

FIG. 24 — I-F RESPONSE CURVE

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.

Poor Vertical Linearity:

1. If adjustments do not correct, change V-24.
2. Vertical Output Transformer defective.
3. V-23B inoperative. Check voltages and waveforms on grid and plate.

Poor Horizontal Linearity:

1. If adjustments do not correct, change V-29 or V-31.
2. T-14 or L-102 defective.
3. C106, C107, or R138 defective.
4. C101, R131, or R132 defective.

Dark Vertical Lines On Left Of Picture:

1. Reduce Horizontal Drive and readjust Width and Horizontal Linearity.
2. Replace V-29.

Light Vertical Lines On Left Of Picture:

1. C210 defective.
2. V-31 defective.

Wrinkles On Left Side Of Raster:

1. R217, R218, or C109 defective.
2. Defective Yoke.

Trapezoidal or Non-Symmetrical Raster:

1. Improper adjustment of Focus Coil.
2. Defective Yoke.

Picture Smear:

1. Video Amplifier overloaded by excessive input. Reduce Contrast Control setting.
2. Insufficient bias on V-15 and V-16, resulting in grid current on video signal. Check bias and possible grid current.
3. Defective coupling condenser or grid loading resistor. Check all grid circuit components in video amplifier.

Occasional Loss of Horizontal Sync.

1. Check voltage at pin #1 of V-17 (6AL5, D.C. Restorer).
2. Remove socket from base of TV tube. Recheck voltage at pin #1. A change in reading indicates grid current. Picture tube is defective.

Horizontal Oscillator—Complete Alignment Instructions:

Simple alignment adjustment instructions of the Horizontal Oscillator are given under "Further Installation Instructions." If complete realignment of this circuit becomes necessary, the procedure as outlined below, should be followed. It will be necessary to remove the chassis from the cabinet and turn it upon one side in order to make these adjustments.

Procedure:

(a) Obtain either a picture or test pattern on the picture tube.
(b) Adjust the Fine Tuning Control for best sound quality.
(c) Turn Horizontal Hold adjustment (rear apron) until picture is in sync.
(d) If picture falls to sync vertically, adjust the Vertical Hold Control.
(e) Adjust Contrast Control until picture is slightly below average contrast level.
(f) Turn the Horizontal Phase adjustment (S-12) until the blanking bar which may appear in the picture moves to the right and off the raster.
(g) The range of this adjustment is such that it is possible to hit an unstable condition, as indicated by a ripple in the raster. Turn screw clockwise from the unstable condition.
(h) Turn the Horizontal Hold adjustment clockwise until picture falls out of sync.
(i) Turn this adjustment counter-clockwise to the point where the picture falls into sync again.
(j) Reset the Phase adjustment (S-12) so that the left side of the picture is close to the left side of the raster but does not begin to fold over.
(k) The right side of the picture should be near the right edge of the raster but should not fold over.
(l) If picture folds over, readjust the Phase Control (S-12).
(m) Momentarily remove picture by throwing band switch.
(n) When picture is restored, it should fall into sync.
(o) If it does not, turn the Horizontal Hold adjustment counter-clockwise until picture falls into sync.
(p) Remove picture momentarily.
(q) When signal is restored, picture should fall into sync.

Critical Lead Dress:

1. Dress leads on 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 C55, C57 and C58 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 from chassis and other components.

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.

Socket Voltages:

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

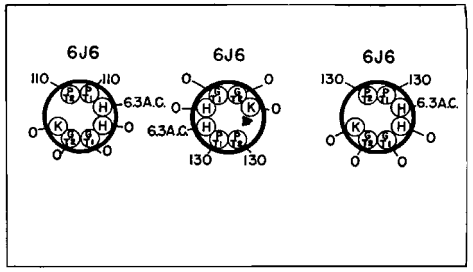

FIG. 25 — SOCKET VOLTAGES TV TUNER 10523

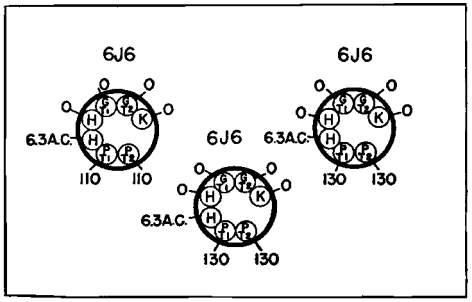

FIG. 26 — SOCKET VOLTAGES TV TUNER 10520

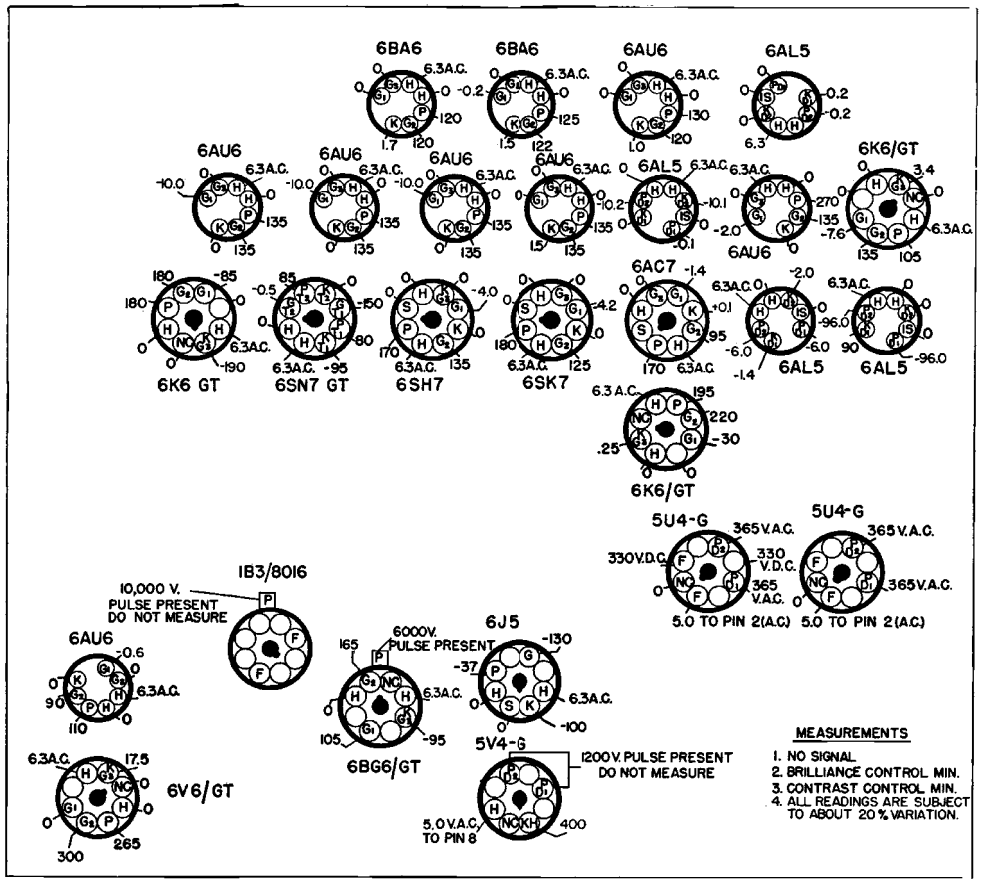

FIG. 27 — SOCKET VOLTAGES

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.

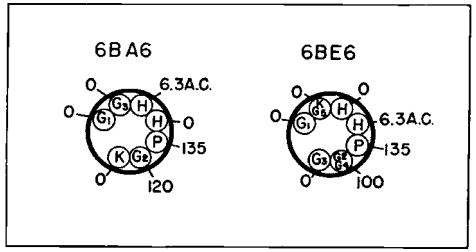

FIG. 28 — SOCKET VOLTAGES F.M. TUNER

VERTICAL ROLL — TELEVISION MODELS

Recently a few cases of vertical jitter in the picture have been reported in Models 3381 and 1291-TV. It has been found in most cases that a redressing of the white lead which runs from the deflection yoke to the plates of the 5V4 damper tube will remedy this effect. Dress this lead as far as possible from the vertical blocking oscillator transformer which is located between the tube support brackets and directly beneath the deflection yoke.

Where it is found necessary to make adjustments to the vertical hold control during the first hour of operation, this condition can usually be rectified by rerouting the long green wire which runs from the center tap of the vertical hold control, to a tie point, located near the center of the chassis. During the warm-up period this drift is due to a high resistance leak developing between ground and the wax impregnated insulation covering this wire. We suggest replacing this wire or routing straight from the control to the tie point without touching any of the other circuit components or chassis.

Where sync difficulties are encountered which affect both the vertical and the horizontal circuits, this is usually caused by a change in capacity or leakage in the 270 mmfd plate by-pass or the 270 mmfd coupling condenser between the 6SK7 sync amplifier and the 6SH7 sync separator.

On the two speed LP model of the "GI" changer, occasionally some slippage of the turntable has taken place in the 78 RPM position. In most cases this has been traced to the 78RPM idler wheel being slightly undersized. By selecting from your stock a wheel slightly larger this condition can be corrected.

The drop in output level when playing micro-groove records is a normal condition due to the recording level being 4 DB lower on this type record.

Sometimes an occasional case of vertical instability resulting in a continuous roll of the picture.- - - - -- occurs after the television receiver has been on for a period of one or two hours. The condition is traceable to the 4900 mmf ceramic condenser in the control grid circuit of the 6SH7 vertical oscillator tube and apparently is the result of a change in capacity as the temperature increases in the chassis. TO CORRECT THIS the 4900 mmf ceramic should be replaced with a mica condenser between the values of 4900/5700 mmf. A mica condenser is required to correct the condition, however the value is not critical. Mounting the condenser on full length leads in a position approximately one inch from the metal chassis pan will probably make for best results.

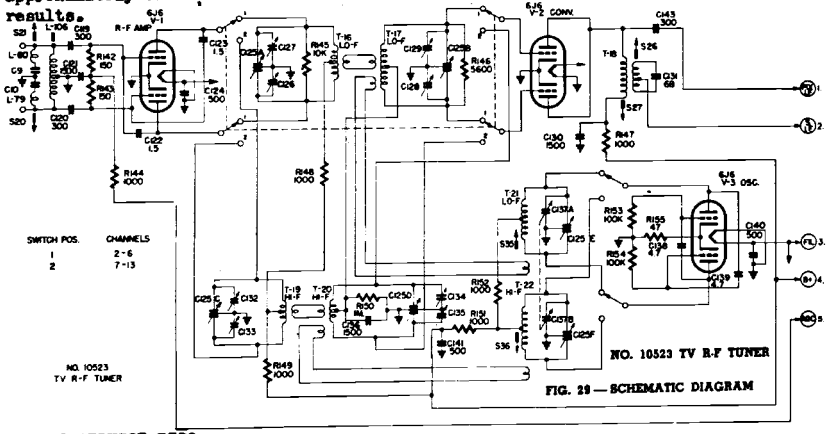

FIG. 28 — SCHEMATIC DIAGRAM

RADIO SERVICE TIPS

condensers of the .01-500V Good-All type, as used in Model 1273, have been shorting out following recent heavy rains. Apparently this type of condenser is inclined to absorb moisture and is not particularly adaptable for use in climates where unusually heavy rainfall occurs. , removing this condenser and replacing with the .01-500 V Sprague type at all places where B plus voltage is applied, or wherever they are used as bypass or coupling condensers, is the most satisfactory corrective measure.

A few cases of microphonics have been reported in Model 1273. In these cases the FM oscillator trimmer (part #23023) has been found to be microphonic, characterized by an audio howl when the receiver is tuned to an FM station and the volume increased. Replacing this trimmer with the newer type Packard-Bell part #23412 has eliminated the condition.

REPLACEABLE PARTS LIST

Part No.	Ref. Symbol	Description
10520		TV Tuner (RCA)
10523		TV Tuner (GI)
21074		Cabinet
23001	C102	Capacitor, tubular, .001 Mf. 600 V.
23002	C79	.002 Mf. 600 V.
23004	C37, 77, 78	.005 Mf. 600 V.
23007	C35	.02 Mf. 600 V.
23010	C55, 57, 58, 70, 74, 83, 104, 107, 119	.05 Mf. 600 V.
23011	C33, 71, 82, 103	.1 Mf. 400 V.
23016	C32	.003 Mf. 600 V.
23017	C92, 97, 98	.05 Mf. 200 V.
23020	C34	.2 Mf. 400 V.
23021	C45, 49, 59	.25 Mf. 200 V.
23023	C24, 76, 100, 118	.01 Mf. 500 V.
23024	C91, 95	.004 Mf. 1200 V.
23025	C93	.015 Mf. 400 V.
23026	C106	.033 Mf. 400 V.
23207A	C80	Capacitor, mica, 4900 Mmf. 500 V.
23208	C96	4000 Mmf. 500 V.
23211	C72, 73	270 Mmf. 500 V.
23212	C99	390 Mmf. 500 V.
23213	C101	680 Mmf. 500 V.
23214	C52, 54	320 Mmf. 500 V.
23215	C109	56 Mmf. 500 V.
23412	C63, 66	Capacitor, trimmer, 3-12 Mmf.
23519	C62A, B	Capacitor, variable (FM)
23909	C53	Capacitor, ceramic, 10 Mmf. 500 V.
23911	C29, 30, 61, 67	22 Mmf. 500 V.
23912	C64	47 Mmf. 500 V.
23914	C40, 43, 47, 51	100 Mmf. 500 V.
23917	C119	5 Mmf. 10% N1400
23925	C94	1200 Mmf. 500 V. N1400
23932	C110, 111	.01 Mf. 125 VAC
23935	C69	82 Mmf. 500 V.
23936	C22, 23, 25, 26, 27, 28, 38, 39, 41, 42, 44, 46, 48	1500 Mmf. 500 V.
23938	C105	500 Mmf. 10 KV.
23921	C68, 50	.005 Mf. 500 V. Hi-Kap
23939	C60, 65	.01 Mf. 500 V. Hi-Kap
24002	C56, 75, 81, 85	Capacitor, electrolytic, 10 Mf. 450 V.
24004B-1	C88, 90	40 Mf. 350 V.
24006	C36	25 Mf. 25 V.
24014	C112, 113, 114, 115, 116	40 Mf. 450 V. (can type)
24030-1	C89	40 Mf. 450 V.
24038	C31	5 Mf. 50 V.
24042	C84	50 Mf. 50 V.
24043	C117	80 Mf. 150 V.
24044	C87	250 Mf. 10 V.
24045	C86	1000 Mf. 6 V.
25018	R29	Control, volume, 0.5 Megohm
25804A	R95	Control, Vert. Hold, 1 Megohm
25805A	R100	Control, Height, 3 Megohm
25807	R103	Control, Vert. Linearity, 5000 ohm
25808	R109	Control, Vert. Centering, 20 ohms C.T
25809C	R131	Control, Horiz. Drive, 25,000 ohm
25812	R115	Control, Focus, 1500 ohm
25813C	R72	Control, Contrast, 500 ohm
25814C	R64	Control, Brilliance, 50,000 ohm
25817	R108	Control, Horiz. Centering, 20 ohm
27005	L-100	Choke, filter
29025	T-3, 4	Coil, I-F sound
29028	L-83, 84, 86, 88	Coil, I-F picture
29030	T-13	Coil, Sync discriminator
29031	T-5	Coil, ratio detector
29036B	L-105	Coil, I-F FM tuner
29104	L-95, 96, 104	Coil, R-F choke
29115	L-85, 87	Coil, R-F choke, 55 uh.
29116	T-9	Coil, R-F
29215A	T-10	Coil, oscillator
29413A	T-8	Coil, antenna
29501	C-97, 98, 103	Coil, yoke
29502	T-7	Coil, cathode trap
29503	L-101	Coil, Width control
29504	L-102	Coil, Horiz. Lin. control
29505	L-99	Coil, focus
29506	L-91, 93	Coil, video, 120 uh. (blue)
29507	L-92, 94	Coil, video, 93 uh. (red)
29508	L-89	Coil, video, 180 uh. (white)
29509	L-90	Coil, video, 250 uh. (green)
29515	T-11	Coil, Vert. Osc. transformer
38103		Dial, FM
40003		Drive cord
45003		Fuse, ¼ amp. 250 V. 3AG
45011		Fuseholder
54001		Lamp, dial
67032		Pointer, dial
69001		Pulley
51001		Jack
73001	R122	Resistor, 10 ohm, ½ W. 10%
73008	R31, 76	39 ohm, ½ W. 10%
73012	R37, 42, 46	82 ohm, ½ W. 10%
73013	R16, 18, 38, 40, 44, 48	100 ohm, ½ W. 10%
73014	R21, 39, 43, 47	120 ohm, ½ W. 10%
73016	R48	180 ohm, ½ W. 10%
73019	R61	330 ohm, ½ W. 10%
73021	R24	470 ohm, ½ W. 10%
73022	R106, 107, 121	560 ohm, ½ W. 10%
73025	R17, 20, 23, 89	1000 ohm, ½ W. 10%
73029	R139	2200 ohm, ½ W. 10%
73030	R77, 104, 73, 74	2700 ohm, ½ W. 10%
73031	R19, 58, 63	3300 ohm, ½ W. 10%
73032	R53	3900 ohm, ½ W. 10%
73033	R83, 84, 90	4700 ohm, ½ W. 10%
73034	R22	5600 ohm, ½ W. 10%
73035	R56, 87, 93 140, 80	6800 ohm, ½ W. 10%
73036	R36, 41, 45, 50, 92, 102, 132	8200 ohm, ½ W. 10%
73037	R26, 27, 65, 70	10,000 ohm, ½ W. 10%
73041	R28, 62, 79, 91, 94	22,000 ohm, ½ W. 10%
73042	R123	27,000 ohm, ½ W. 10%
73045	R67	47,000 ohm, ½ W. 10%
73047	R15, 25, 69, 97	100,000 ohm, ½ W. 20%
73048	R66	150,000 ohm, ½ W. 20%
73049	R101, 129, 75	220,000 ohm, ½ W. 20%
73051	R33, 34, 54, 117, 118, 119, 133	470,000 ohm, ½ W. 20%
73052	R60, 82, 130	680,000 ohm, ½ W. 20%
73053	R59, 68, 85, 88, 120	1 Megohm, ½ W. 20%
73054	R96	1.5 Megohm, ½ W. 20%
73055	R32, 98, 99	2.2 Megohm, ½ W. 20%
73057	R30, 81, 86	4.7 Megohm, ½ W. 20%
73060	R141	56,000 ohm, ½ W. 10%
73067	R51	560,000 ohm, ½ W. 20%
73073	R127	10,000 ohm, 1 W. 10%
73082	R116	100 ohm, 1 W. 10%
73091	R55, 124	22,000 ohm, 1 W. 10%
73093	R52, 126	39,000 ohm, 1 W. 10%
73095	R136	820,000 ohm, 1 W. 10%
73096-1	R78, 137	3.3 ohm, 1 W. 10%
73099	R71	33,000 ohm, 1 W. 10%
73121	R35	680 ohm, 2 W. 10%
73125	R135, 105	10,000 ohm, 2 W. 10%
73134	R134	100 ohm, 2 W. 10%
73921	R110, 114	1360/25 W.—250/20 W. W.W.
73922	R138	5300/25 W.—500/3 W.— 500/3 W. W.W.
73923	R128	5000 ohm, 10 W. W.W.
73924	R111, 112, 113	6750/5W—12/1W—93/5 W. W.W.
79002-2		Socket, 8 prong octal
79004		Socket, speaker
79013		Socket, filter condenser
79051		Socket, miniature
79057		Socket, octal--1½" mounting centers
79059		Socket, duo-ductal (Teletube)
79062		Socket, dial lamp
83302		Speaker, 6½" P.M.
84002		Spring, switch
84023		Spring, dial
84036		Spring, hairpin
86305		Switch, FM
89027A	T-15	Transformer, power
89405	T-6	Transformer, output, 5000 to 3.2 ohms
89422	T-12	Transformer, Vert. Output

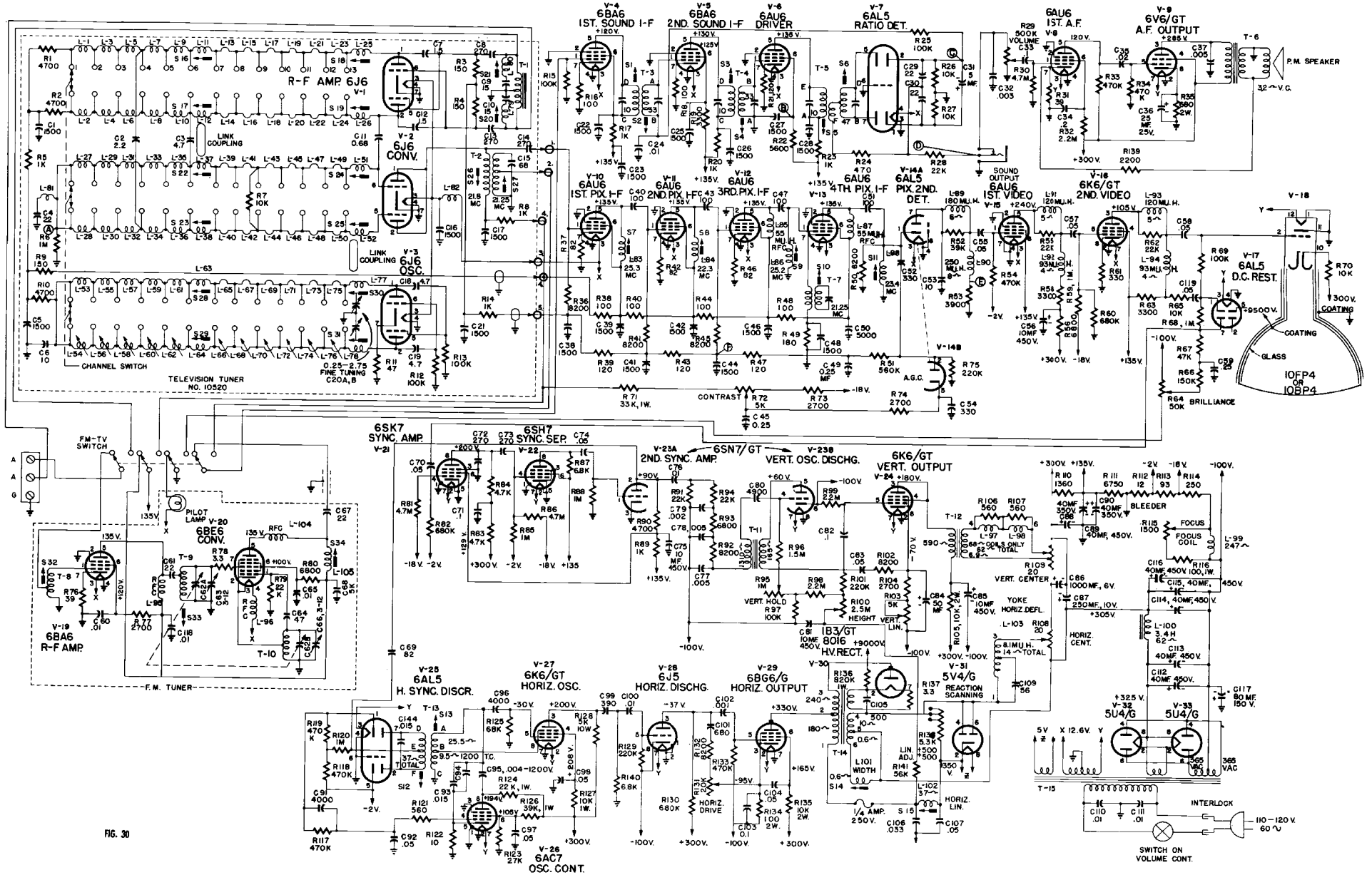

FIG. 30