PHILCO SERVICE

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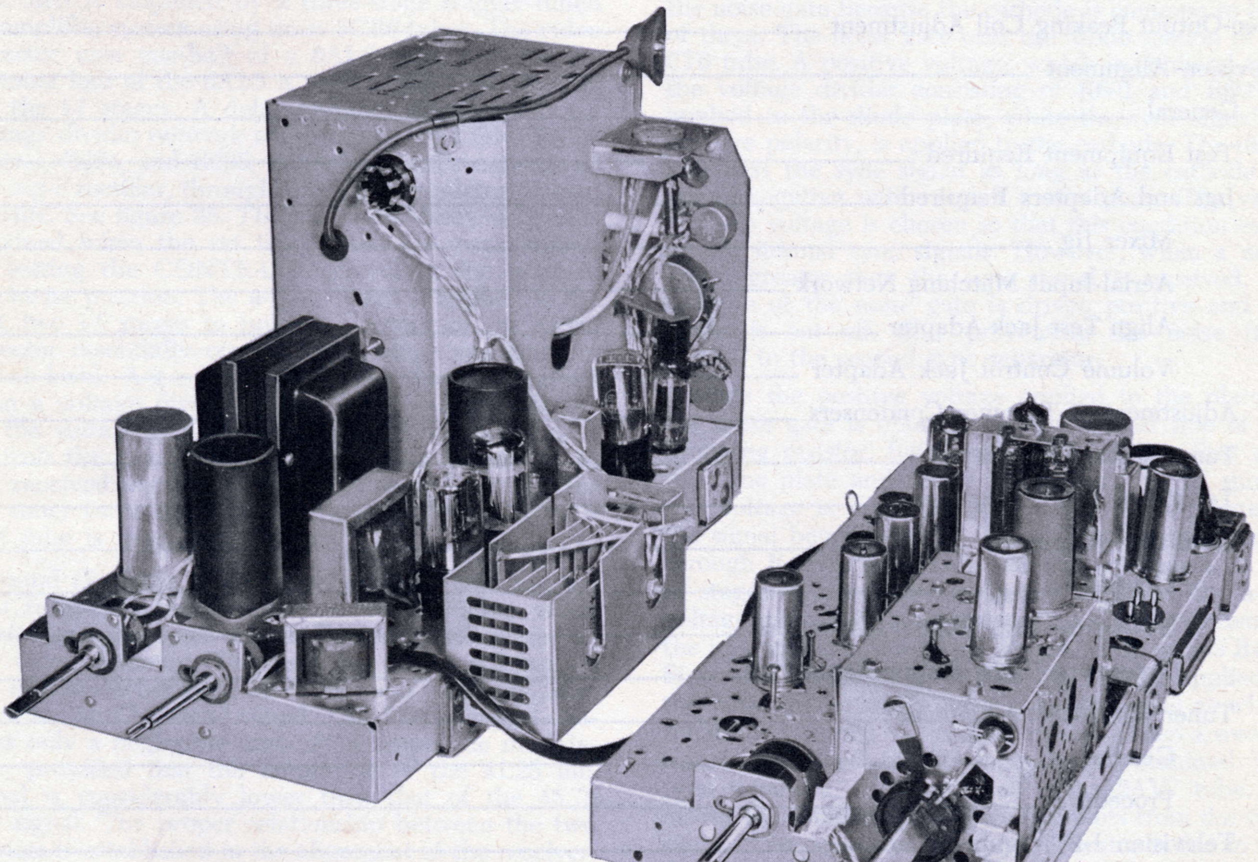
TELEVISION

PHILCO TELEVISION SERVICE INFORMATION FOR
R-F CHASSIS 71 DEFLECTION CHASSIS G-1



PHILCO TELEVISION CHASSIS 71 AND G-1

TP2-347

SERVICE INFORMATION FOR PHILCO CHASSIS TYPES 71 AND G-1 PR 2105

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CIRCUIT DESCRIPTION

The Philco 1952, code 124 television receivers using the r-f chassis 71 and the deflection chassis G-1 are dual chassis models. The r-f chassis 71 contains the r-f, video, audio, and sync circuits, and the G-1 chassis contains the power and deflection circuits.

Since these chassis are not isolated from the 60-cycle power line, all protruding shafts and mounting feet are insulated from the chassis.

CAUTION: See A-C Line Isolation.

The tuner is built on a separate subchassis and contains the r-f amplifier, mixer and oscillator circuits. The r-f amplifier uses a 6BQ7 tube, with one triode section used as a neutralized triode, the other section, as a grounded grid amplifier. Direct coupling is used between the two sections of the r-f amplifier tube. The oscillator and mixer each use one-half of a 6J6 tube. The r-f video-carrier frequency is converted to 45.75 mc. intermediate frequency in the mixer circuit, and then is amplified by a three-stage stagger-tuned i-f amplifier system using three 6CB6 tubes. The video detector uses one-half of a 6AL5 tube, and the remaining half of the 6AL5 is used as the a-g-c rectifier for the i-f stages. A delay voltage, obtained from a voltage divider network consisting of the CONTRAST control, R304, and R305, is applied to the cathode of the a-g-c rectifier, through R215 and the detector load circuits. See figure 35. The maximum delay voltage is obtained when the set is adjusted for weak signals by setting the CONTRAST control in the extreme clockwise position. The a-g-c voltage is applied to the first two i-f stages to hold the output of the video detector essentially constant with large variations in signal level. A-g-c for the r-f amplifier is obtained from a voltage divider in the sync separator circuit. As the voltage is dependent upon signal strength, it controls the gain of the r-f amplifier in proportion to the received signal. To prevent the a-g-c circuit for the tuner from going positive, one diode section of a 6T8 tube is used as a clamp.

Sound i.f. (intercarrier) is obtained by utilizing the beat frequency produced when the 45.75 mc. video carrier and the 41.25 mc. audio carrier are mixed in the video detector. The beat frequency, 4.5 mc., is the difference between 45.75 mc. and 41.25 mc., and contains the FM sound signal. This 4.5 mc. signal contains only a negligible amount of amplitude modulation, provided that the amplitude of the 41.25 mc. signal is considerably lower than that of the 45.75 mc. signal. The proper relationship between the two carriers is established in the alignment of the receiver. Sound output will be obtained only when both the video and audio carriers are present.

The oscillator is tuned primarily to obtain the best picture, since the 4.5 mc. relationship always exists between the two carriers. The 4.5 mc. sound i.f. (intercarrier) is taken from the plate of the first video amplifier and is amplified by a 6AU6 tube. The output of the 6AU6 sound i-f amplifier is fed to the FM detector, which uses two diode sections of a 6T8 tube. The triode section of the 6T8 tube is used as the first audio amplifier. The audio power amplifier uses a 6V6GT tube.

One-half of a 12AV7 tube is used as the first video amplifier, which feeds into a 6AQ5 video output amplifier. The plate load of the first video amplifier consists of two resistors, R303 and R306. To obtain higher voltage for synchronization, the composite signal for the synchronizing circuits is taken from across both R303 and R306, while the composite video for the video output is taken from across R306 only. C303 is used to by-pass high frequency video around R303. The plate load of the video output amplifier consists of L302 and R310. L302 is an adjustable peaking coil, and is adjusted at the factory for best video response.

The sync circuit consists of a cathode follower, variable diode noise gate, and sync separator. The composite video is fed to the cathode follower, which uses the triode section of a 6T6 tube. This stage compresses the video components of the composite signal in relation to the sync components. The output of the cathode follower is applied to the cathode of the noise gate because the cathode is common to both of them. The noise gate uses the diode section of the 6T6 tube. A positive voltage, which is obtained from the voltage divider consisting of R601 and R603, is applied to the diode plate, while the sync signal, of positive polarity, is applied to the cathode. The diode will pass the sync signal as long as the cathode remains negative with respect to the plate. The value of plate voltage is chosen so that this condition exists for all normal sync signals. However, when a noise signal greater than the sync signal is received, the cathode of the noise gate is driven positive and the diode is cut off, thus preventing the noise from getting to the second sync separator.

Since the positive voltage applied to the plate of the noise gate is obtained from the load side of the dropping resistor, R403, in the B plus line that supplies the plate and screen voltages to the i-f stages; this voltage is made proportional to the strength of the signal being received. This is because the current through R403 is principally the current drawn by the i-f stages. When a strong signal is received, the a-g-c voltage increases; this decreases the current drawn by the i-f stages and lowers the voltage drop across R403. Since this results in an increase in voltage applied to the plate of the diode noise gate, the level at which the diode will clip the noise is raised. When a weaker signal is received, the opposite effect is obtained. The sync separator, using one-half of a 12AV7 tube, removes the remaining video components from the sync signal. The output of the sync separator is fed to the deflection chassis through the interconnecting cable and plug (PL100 and J100). A sync inverter, one-half of a 6SN7 tube, amplifies and reverses the polarity of the sync pulses for proper triggering of the sweep oscillators.

The vertical sync pulses are separated from the horizontal pulses in an integrating network and applied to the grid of the vertical blocking oscillator, which uses one-half of a 6SN7 tube. The output of the blocking oscillator is amplified by a 6AH4GT vertical output tube, and is applied to the vertical deflection coils.

The horizontal sync pulses are applied to the grid of a phase comparer, one-half of a 6SN7 tube, through a capacitive voltage divider. Within the lock-in range, the phase relationship of the horizontal sawtooth and the sync pulses at the grid of the phase comparer determines the frequency of the horizontal blocking oscillator. The blocking oscillator employs one-half of a 6SN7 tube. A 6BQ6GT tube is used as the horizontal amplifier. The screen voltage for the horizontal amplifier is supplied through a voltage divider network. R817, the width control, and R308B, the brightness control, are a part of this divider. R817 varies the voltage applied to the screen, thus adjusting for proper picture width. Adjusting R308B for brightness varies the bias on the picture tube. The change in bias causes a change in beam current and would tend to result in a change in picture width and high voltage. However, due to the fact that R308B is also a part of the voltage divider network in the screen circuit of the horizontal amplifier, the screen voltage is automatically altered to compensate for any tendency of beam-current change to affect the width. The output of the horizontal amplifier is fed to the horizontal deflection coils through the horizontal output transformers. A 6V3 tube is used as the horizontal damper tube.

The second anode voltage for the picture tube is supplied by one 1B3GT high voltage rectifier tube. The B-plus voltage for the receiver is supplied by two selenium rectifiers, CR100 and CR101, in a full-wave voltage doubler circuit, operating directly from the power line. Bias voltage is obtained across the speaker field coil (used as filter choke), which is in series with the negative side of the B-plus supply. The B-plus boost voltage derived from the horizontal damper circuit supplies higher B-plus voltage to the horizontal amplifier, the vertical oscillator, and the first anode of the picture tube. Filament current for all the tubes, except the high voltage rectifier is supplied by a step-down transformer.

IMPORTANT

A-C LINE ISOLATION

CAUTION: One side of the a-c line is connected to the chassis through C102 and L100. The other side of the a-c line is connected to the chassis through R102, CR101, and L100, in series. Grounding the chassis will result in a short circuit across one or the other of these two branches in the voltage-doubler circuit. During servicing and alignment, it is desirable that an a-c line isolation transformer capable of handling at least 225 watts (Philco Part No. 45-9600) be used. Failure to use an isolation transformer will greatly increase the shock hazard and may result in damage to the equipment.

SPECIFICATIONS

CHANNEL TUNING
Twelve channel, wafer switch incremental tuner, fine tuning of local oscillator.

FREQUENCY RANGE
Television channels 2 through 13.

INTERMEDIATE FREQUENCIES
Video Carrier .... 45.75 mc.
Sound (Intercarrier) .... 4.5 mc.

TRANSMISSION LINE .... 300 ohm, twin-wire lead.

OPERATING VOLTAGE...110-120 volts, 60 cycles, a.c.

POWER CONSUMPTION .... 195 watts.

TUBE COMPLEMENT

R-F CHASSIS 71

V-NO.	TUBE TYPE	FUNCTION
V1	6BQ7-miniature	R-F amplifier
V2	6J6-miniature	Oscillator, mixer
V3, V4, V5	6CB6-miniature (3)	Video i-f amplifier
V6	6AL5-miniature	Video detector, a-g-c rectifier
V7	12AV7-miniature	First video amplifier, sync separator
V8	6AQ5-miniature	Video output
V9	6AU6-miniature	Sound i-f amplifier
V10	6T8-miniature	FM detector, first audio, tuner a-g-c clamp
V11	6V6GT-octal	Audio output
V12	6AT6-miniature	Cathode follower, noise gate
V19	17JP4, 20DP4A, or 21EP4A	Picture tube

DEFLECTION CHASSIS G-1

V-NO.	TUBE TYPE	FUNCTION
V13	6SN7GT-octal	Sync inverter, vertical oscillator
V14	6AH4GT-octal	Vertical output
V15	6SN7GT-octal	Phase comparer, horizontal oscillator
V16	6BQ6GT-octal	Horizontal output
V17	6V3-miniature	Horizontal damper
V18	1B3GT-octal	High-voltage rectifier

B SUPPLY FUSE REPLACEMENT

The B supply protective fuse, F100, is wired into the low-voltage section, and is in series with the selenium rectifiers. For replacement, use a 1.6 ampere delayed-action type fuse, Philco Part No. 45-2656-23.

CAUTION: Discharge the circuit before replacing the fuse.

HORIZONTAL SWEEP ADJUSTMENT

Adjustment of HORIZONTAL OSCILLATOR FREQUENCY Control and Horizontal-Lock-in Trimmer

The range of the HORIZ. HOLD control potentiometer is sufficient to compensate for normal variations in the frequency of the horizontal oscillator, and no other adjustment is ordinarily required. However, if the tube or other components are replaced in the horizontal oscillator circuit, it may be necessary to reset the HORIZ. FREQ. control and horizontal lock-in trimmer as follows, in order to obtain proper synchronism and deflection: (These controls are located on the back and side of the chassis.)

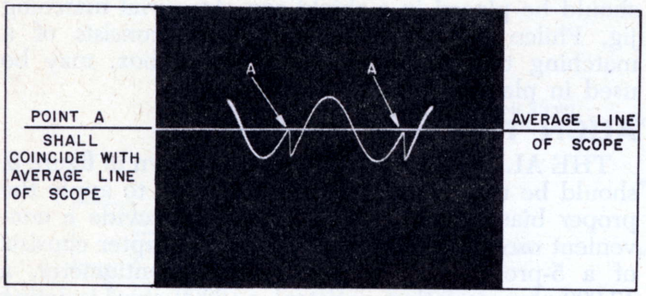

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Figure 1. Horizontal-Oscillator Waveshape, Showing Correct Adjustment of T800

1. Turn the HORIZ. HOLD control fully clockwise.
2. Adjust the HORIZ. FREQ. control until four diagonal black bars appear, sloping to the right.
3. Turn the HORIZ. HOLD control counterclockwise until the picture comes in, then goes out of sync. Then turn the HORIZ. HOLD control slowly clockwise again, counting the number of black (blanking) bars, sloping down to the left, just before the picture pulls into sync. Adjust the horizontal-lock-in trimmer, C804, until there are two or two and one-half bars just before the picture pulls into sync. If the receiver does not lose sync when the HORIZ. HOLD control is fully counterclockwise, remove the signal momentarily to interrupt the sync, then proceed as above.

Adjustment of Horizontal-Oscillator Transformer

> CAUTION: Do not adjust tuning cores TC800 and TC801 in the horizontal-oscillator transformer, T800, unless it is absolutely necessary. These cores are preset at the factory with special equipment. The tuning cores in replacement transformers are also preset, and do not require adjustment after installation in the chassis. Condenser C807 is matched to T800, and must be replaced when T800 is replaced. Horizontal-oscillator transformer T800 and condenser C807 are supplied as a unit.

If for some reason it becomes necessary to adjust TC800 and TC801, proceed as follows:

1. Tune in a station and adjust the HORIZ. HOLD control until the picture is synchronized. If the picture cannot be synchronized, adjust the HORIZ. FREQ. control. If it is impossible to obtain synchronization by adjustment of the HORIZ. HOLD and HORIZ. FREQ. controls, adjust the oscillator core, TC801.
2. Connect an oscilloscope to the cathode (pin 6) of the horizontal oscillator, using a 15-$\mu\mu$f. condenser in series with the scope lead. Adjust the stabilizer core, TC800, until the wave shape resembles that in figure 1. The "average line" in figure 1 is established by shorting the input leads of the scope. Keep the picture synchronized while adjusting TC800.
3. Turn the HORIZ. HOLD control fully clockwise. Adjust the HORIZ. FREQ. control until four diagonal black bars appear, sloping to the right.
4. If four diagonal black bars cannot be obtained by adjusting the HORIZ. FREQ. control with the hold control in the clockwise position, adjust the oscillator core TC801.

VIDEO-OUTPUT PEAKING COIL ADJUSTMENT

The video-output peaking coil, L302, is adjusted at the factory for proper transient response of the video amplifiers. Ordinarily this coil will require no further adjustment by the serviceman. On some stations, where excessive overshoot or excessive smear is present, however, a slight adjustment of L302 may improve the picture quality on that station, but at a possible sacrifice of quality on other channels. If L302 is replaced in servicing, adjustment will be required.

Before adjusting L302, check the tuner alignment and i-f alignment. (Never adjust L302 until the alignment of the receiver is correct.) Then tune in a station and adjust L302 so there are no trailing whites or smear in the picture. Turning TC301 clockwise reduces trailing whites and overshoot; turning TC301 counterclockwise reduces picture smear and increases trailing whites. The proper position is the point where no smear or trailing whites appear in the picture.

The above procedure for adjustment of L302 applies to a particular station exhibiting smear or overshoot. After L302 is adjusted, reception on all the other stations should be checked to make certain that the adjustment has not impaired the picture quality.

TELEVISION ALIGNMENT

General

The alignment consists of tuning each i-f stage to a given frequency by using an AM signal, then feeding in a sweep signal at the aerial terminals and touching up the adjustments to obtain the desired pass band.

After the i-f stages have been aligned, the over-all response curve (r-f, i-f) of the circuits from the aerial terminals to the video detector should appear essentially the same, regardless of the channel under test. If they do not, the tuner should be aligned.

The video-carrier intermediate frequency is 45.75 mc., and the sound intermediate (intercarrier) frequency is 4.5 mc. Alignment of these circuits requires careful workmanship and good equipment. The following precautions must be observed:

1. There must be a good bond between the receiver chassis and the test equipment. This is most easily obtained by working on a metal-topped workbench. The receiver chassis should be placed tuner-side down on the bench. If the bench has no metallic top, the test equipment and chassis can be bonded by a strip of copper about two inches wide. The section of the chassis nearest the tuner should rest on the strip.
2. Do not disconnect the picture tube, picture-tube yoke, or speaker while the receiver is turned on.
3. Allow the receiver and test equipment to warm up for 15 minutes before starting the alignment.
4. The marker (AM) signal generator should be calibrated accurately to the frequencies used and to the sound and video r-f carriers of each channel used during alignment. If the Philco Visual Alignment Generator Model 7008 is used, the built-in crystal calibrator provides an excellent means of calibration.

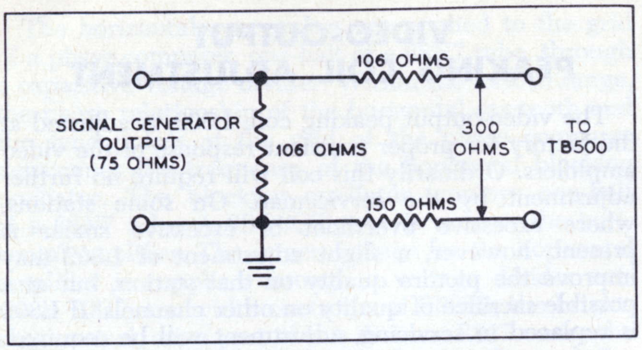

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Figure 2. Aerial Input Matching Network

An alternate method of calibrating the signal generator to the sound and video r-f carrier frequencies is to zero-beat the signal generator with the received signals.

For further information regarding calibration, refer to Philco Lesson PR-1745 (J) entitled "Television Service in the Home."

5. All connecting leads must be kept short, and the equipment must be placed as close as possible to the receiver being aligned.

TEST EQUIPMENT REQUIRED

The following test equipment is recommended for aligning the receiver:

1. Philco Precision Visual Alignment Generator for Television and FM, Model 7008, or equivalent.
2. Vacuum-tube voltmeter, or 20,000 ohms-per-volt voltmeter.
3. R-F probe, Philco Part No. 76-3595 (for use with Model 7008 generator).

JIGS AND ADAPTERS REQUIRED

Mixer Jig

Connections to the grid of the mixer tube can be made through the alignment jack G-1, provided for that purpose. To connect the generator to this point, a mixer-grid jig, Philco Part No. 45-1739, and a connecting cable, Philco Part No. 45-1635, can be used. As an alternate, a Philco alligator-clip adapter, Part No. 45-1636, with as short a ground lead as possible can be connected to the alignment jack. The ground lead should be connected as close as possible to the mixer tube. It is essential that the signal-generator output lead be terminated with a 68-ohm resistor (carbon) so that regeneration, caused by connection of the lead to the mixer, is held to a minimum.

Aerial-Input Matching Network

Figure 2 shows an impedance-matching network for coupling the signal generator to the aerial-input terminals of the receiver. This network, which is designed to have an input impedance of 75 ohms and an output impedance of 300 ohms, is used to match a 75-ohm generator to a 300-ohm aerial-input circuit. The resistors used in this network must be of carbon-composition construction, and should be chosen from a group, to obtain values within 10 percent of those indicated. To prevent variable effects, the resistors should be placed in a shield can. An aerial matching jig, Philco Part No. 45-1736, which consists of a matching transformer and connecting box, may be used in place of the resistor network.

ALIGN TEST Jack Adapter

THE ALIGN TEST jack adapter, shown in figure 3, should be used during the i-f alignment to apply the proper bias to the a-g-c bus, and to provide a convenient oscilloscope connection. This adapter consists of a 5-prong plug, a 10,000-ohm potentiometer, a 47,000-ohm isolating resistor, a 2200-ohm isolating resistor, and a 3-volt battery. A suggested method of fabricating the adapter is also shown. It is suggested that the bias battery and potentiometer be mounted in a metal box of convenient size.

The potentiometer and switch are connected across the 3-volt battery. The switch is used to disconnect the potentiometer and thereby to prevent the discharge of the battery while not in use. The 1000-ohm resistor, in series with the arm of the control, will prevent rapid discharge of the battery if the leads are accidentally shorted. The 47,000-ohm resistor isolates the tuner a.g.c. from the i-f a.g.c.

VOLUME CONTROL Jack Adapter

Figure 4 shows the adapter that should be used to connect the voltmeter and oscilloscope to the FM detector. The test points for the FM detector are connected to the VOLUME CONTROL socket, J400, and the adapter is designed to fit this socket. The volume control cable and plug, PL400, may be inserted into the socket on top of the adapter.

ADJUSTMENT OF TRIMMER CONDENSERS

When adjusting the screws of the trimmer condensers on the tuner and the i-f strip, care should be

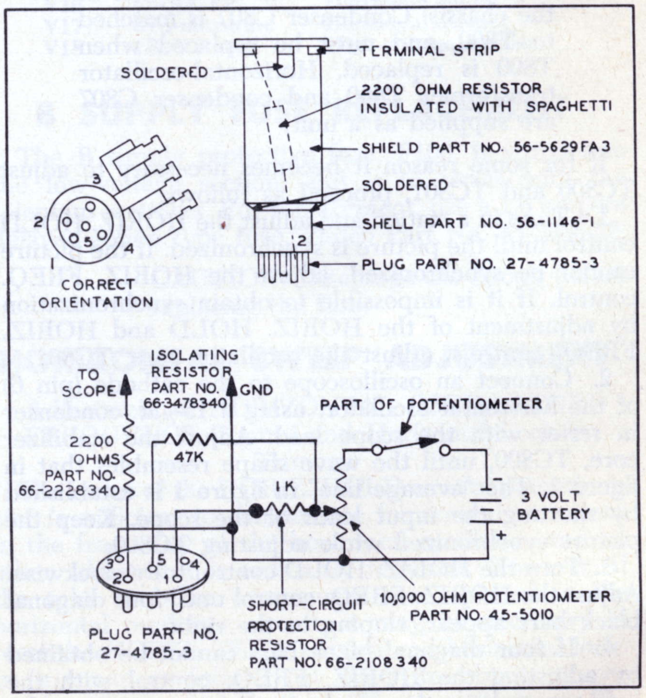

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Figure 3. ALIGN TEST Jack Adapter

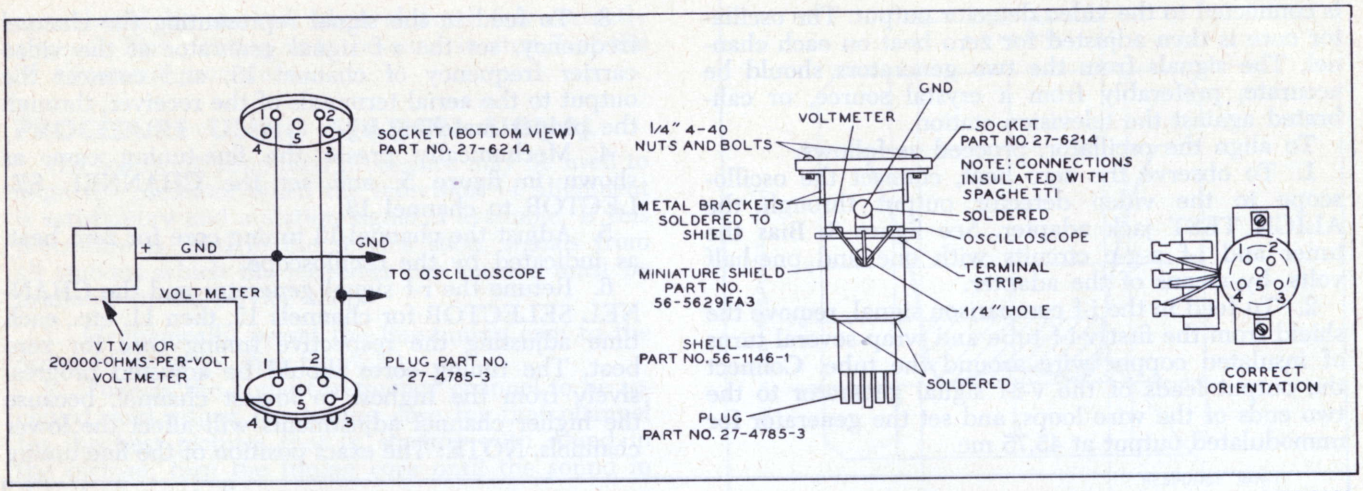


Figure 4. VOLUME CONTROL Jack Adapter

taken to avoid turning the screws so far that the threads become disengaged from the ceramic sleeves. If the screws are turned too far, the condenser will drop away from the chassis and the unit must be reassembled before the alignment can be completed.

TUNER TUBE REPLACEMENT

Whenever a tube is replaced, it is suggested that several be tried, to select a tube which has approximately the same interelectrode capacitance as that of the original tube, to avoid changing the tuner alignment. The picture quality and the oscillator fine-tuning range should be observed while selecting tubes.

TELEVISION TUNER ALIGNMENT

After the tuner is serviced, or if an i-f alignment is required, or if a replacement tube does not exactly meet the requirements described under TUNER TUBE REPLACEMENT, the tuner alignment should be checked. If realignment is necessary, use the procedure given below.

Since the frequency of the local oscillator affects the tuner response, the local oscillator alignment should be made first.

OSCILLATOR ALIGNMENT

General

It is possible to place each channel exactly on frequency by adjusting the tuning core of each coil. The adjustment procedure should be carried out with the highest channel (13) first, since the alignment of each channel will affect the alignment of the channels below it in frequency. The FINE TUNING control should be preset for all adjustments by placing the stop on the fine-tuning cam at the center of channel 8 oscillator tuning core. See figure 5.

Procedure Using Signal Generators

An r-f signal (unmodulated), at the video carrier frequency of the channel, is fed into the aerial input, and an i-f signal, at the i-f carrier frequency, is fed to the first i-f amplifier. Two AM signal generators are used to supply the above signals. An oscilloscope

TELEVISION-CARRIER, OSCILLATOR, AND CHECK-POINT FREQUENCIES

Channel	Channel Limits (mc.)	Video Carrier Check-Point (c) Frequency	100% Check-Point (B)	Check-Point (A)	Sound Carrier (mc.)	Local Oscillator Frequency (mc.)
2	54–60	55.25	57.35	58.25	59.75	101.00
3	60–66	61.25	63.35	64.25	65.75	107.00
4	66–72	67.25	69.35	70.25	71.75	113.00
5	76–82	77.25	79.35	80.25	81.75	123.00
6	82–88	83.25	85.35	86.25	87.75	129.00
7	174–180	175.25	177.35	178.25	179.75	221.00
8	180–186	181.25	183.35	184.25	185.75	227.00
9	186–192	187.25	189.35	190.25	191.75	233.00
10	192–198	193.25	195.35	196.25	197.75	239.00
11	198–204	199.25	201.35	202.25	203.75	245.00
12	204–210	205.25	207.35	208.25	209.75	251.00
13	210–216	211.25	213.35	213.25	215.75	257.00

is connected to the video detector output. The oscillator core is then adjusted for zero beat on each channel. The signals from the two generators should be accurate, preferably from a crystal source, or calibrated against the television station.

To align the oscillator, proceed as follows:

1. To observe the zero beat, connect the oscilloscope to the video detector output through the ALIGN TEST jack adapter. See figure 3. Bias the tuner and i-f a-g-c circuits with one and one-half volts, by means of the adapter.

2. To feed in the i-f comparison signal, remove the shield from the first v-i-f tube and wrap several turns of insulated copper wire around the tube. Connect the output leads of the v-i-f signal generator to the two ends of the wire loops, and set the generator for unmodulated output at 45.75 mc.

3. To feed in the signal representing the channel frequency, set the r-f signal generator at the video carrier frequency of channel 13, and connect the output to the aerial terminals of the receiver, through the proper matching jig.

4. Mechanically preset the fine-tuning cam, as shown in figure 5, and set the CHANNEL SELECTOR to channel 13.

5. Adjust the channel-13 tuning core for zero beat, as indicated by the oscilloscope.

6. Retune the r-f signal generator and the CHANNEL SELECTOR for channels 12, then 11, etc., each time adjusting the respective tuning core for zero beat. The tuning cores should be adjusted progressively from the highest to lowest channel, because the higher channel adjustments will affect the lower channels. NOTE: The exact position of the fine tuning

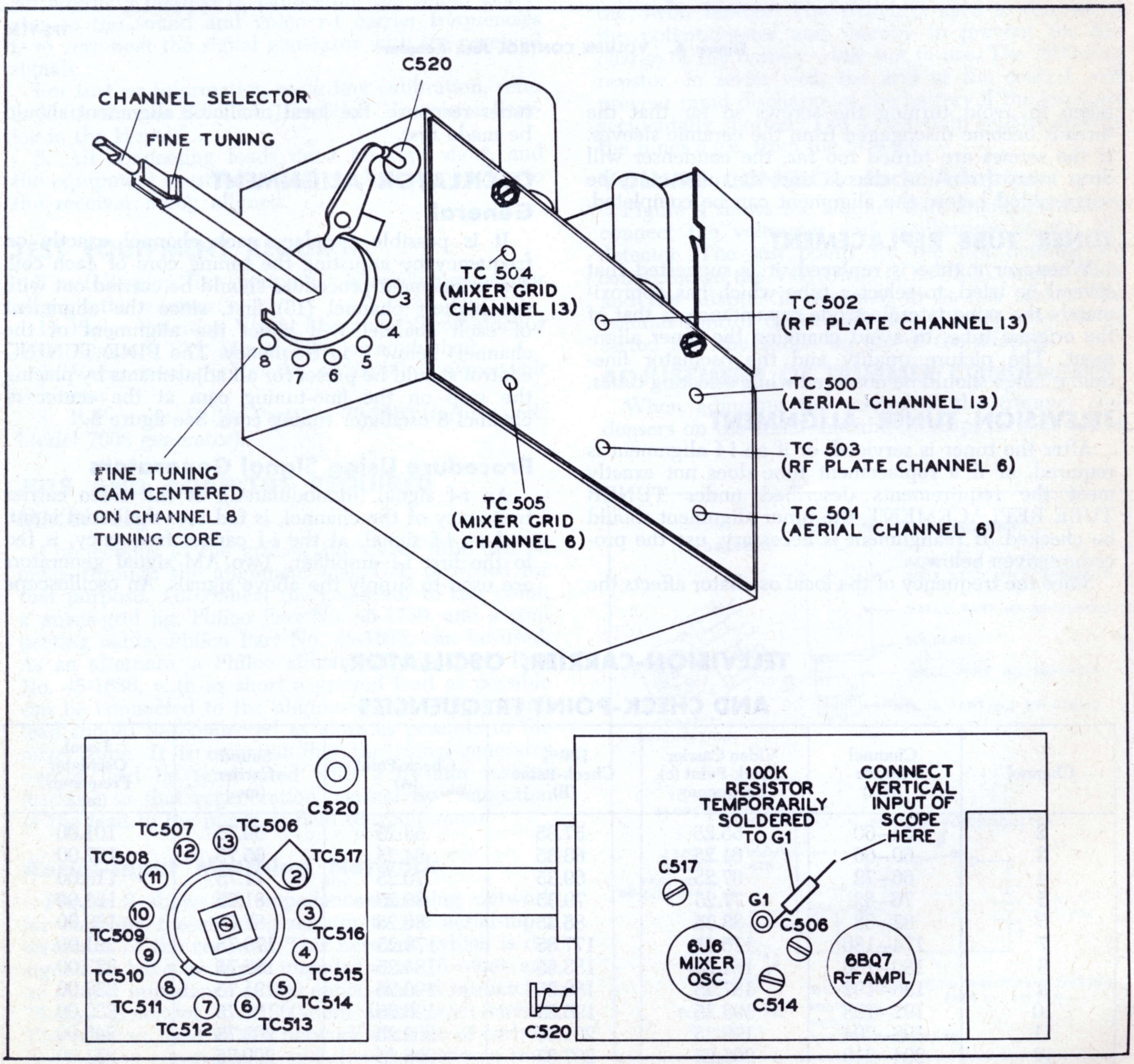


Figure 5. Television Tuner, Showing Location of Adjustments

cam should be marked when channel 4 is correctly aligned. This position is to be used in step 7 of the i-f alignment procedure.

PROCEDURE USING STATION SIGNAL

The following simplified procedure may be used to align the oscillator when the television i-f alignment is satisfactory and a station signal is available. If this procedure is used in the service shop, signals from all stations which the customer can receive must be available in the service shop.

1. Mechanically preset the fine-tuning cam to the center of its range. (See figure 5.)
2. Tune in the highest-frequency channel to be received, and adjust the tuning core for that channel for the best picture; that is, starting with sound in the picture; turn the tuning core until the sound in the picture just disappears.
3. Repeat step 2 for each channel received in the area, starting with the highest channel and finishing with the lowest channel.

TUNER BAND-PASS ALIGNMENT

General

The band-pass alignment consists of aligning the tuner at channels 13 and 6 and then making it track properly.

During the alignment, a fixed bias of 1.5 volts is applied to the r-f amplifier tube through the ALIGN TEST jack adapter. See figure 3.

An FM (sweep) signal is applied to the aerial-input circuit through the proper matching jig, and an oscilloscope is connected through a 100,000-ohm resistor to the mixer grid test point. The oscilloscope gain should be as high as possible, consistent with hum level and "bounce" conditions. Hum conditions will cause distortion of the time base and response. Bounce conditions will cause the response and time base to jump up and down, and is caused by poor line regulation. The use of too high an oscilloscope gain aggravates these conditions, whereas the use of too low a gain necessitates increasing the generator output to a point where the tuner may be overloaded. Overload may be checked by changing the generator output while observing the shape of the response curve; any change in the shape of the curve indicates overload, in which case a lower generator output and higher oscilloscope gain must be used.

The signal generator output must be properly matched to the aerial input of the tuner. The Aerial Input Matching Network, shown in figure 2, or Philco Aerial Matching Jig, Part No. 45-1637, may be used for this purpose. To check for mismatch of the generator output, move the hand along the generator cable after all equipment is connected, and observe the response curve on the oscilloscope screen. If the response curve on the oscilloscope changes as the hand is moved along the cable, mismatch is indicated. A check for mismatch may also be made by adjusting the volume control until the noise in the speaker can be heard. If the level of the noise changes as the hand is moved along the generator cable, mismatch is indicated. The symptoms which indicate mismatch may also be caused by improper grounding or placement of equipment.

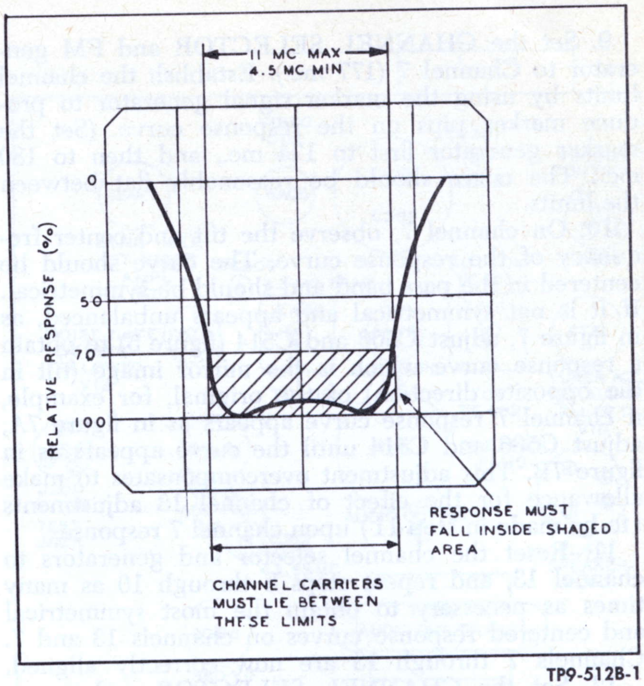


Figure 6. Television Tuner Response Curve, Showing Band-Pass Limits

Procedure

1. Connect the FM (sweep) and AM marker generators to the 300-ohm aerial input through an aerial-input matching jig.
2. Connect the oscilloscope to the mixer-grid test point through a 100,000-ohm, one-half-watt resistor, as shown in figure 5. Connect the ground lead of the oscilloscope as close to the mixer tube as possible.
3. Apply 1.5 volts bias to the tuner a.g.c. and i-f a.g.c., using the ALIGN TEST jack adapter shown in figure 3.
4. Disconnect the tuner coupling link at wiring panel B-11 terminals 5 and 6, and solder a 68-ohm, one-half-watt carbon resistor to the open link coming from the tuner. See figure 34. Remove the first i-f tube from its socket.
5. Set the CHANNEL SELECTOR and FM (sweep) generator to Channel 13 (213 mc.) Adjust the generator for sufficient sweep width to show the complete response curve.
6. Establish Channel limits (see figure 6) by using the marker (AM r-f) signal generator to produce marker pips on the response curve. (Set the marker generator first to 210 mc., then 216 mc.) The response curve should be reasonably flat between the limits.
7. Adjust TC502 and TC504 (figure 5) for a symmetrical, approximately centered pass band. Set marker generator to 213 mc. Detune TC504 counterclockwise until a single peak appears. Adjust TC502 until the peak falls on the 213 mc. marker. It may be necessary to increase the output of the generator during this adjustment. Then adjust TC500 for maximum curve height and symmetry of the single peak. The aerial circuit is now tuned for the high band channels.
8. Readjust TC502 and TC504 for a symmetrical response, centered about 213 mc. and falling within the specifications as shown in figure 6.

9. Set the CHANNEL SELECTOR and FM generator to Channel 7 (177 mc.). Establish the channel limits by using the marker signal generator to produce marker pips on the response curve. (Set the marker generator first to 174 mc., and then to 180 mc.) The curve should be reasonably flat between the limits.

10. On channel 7, observe the tilt and center frequency of the response curve. The curve should be centered in the pass band and should be symmetrical. If it is not symmetrical and appears unbalanced, as in figure 7, adjust C506 and C514 (figure 5) to obtain a response curve which is the mirror image (tilt in the opposite direction) of the original; for example, if channel 7 response curve appears as in figure 7A, adjust C506 and C514 until the curve appears as in figure 7B. This adjustment overcompensates to make allowance for the effect of channel 13 adjustments (to be made in step 11) upon channel 7 response.

11. Reset the channel selector and generators to channel 13, and repeat steps 8 through 10 as many times as necessary to obtain the most symmetrical and centered response curves on channels 13 and 7. Channels 7 through 13 are now correctly aligned.

12. Set the CHANNEL SELECTOR and sweep generator to channel 6 (85 mc.).

13. Establish the channel limits, using the marker generator to produce marker pips on the response curve. (Set the marker generator first to 82 mc., then to 88 mc.)

14. Adjust TC503 and TC505 for a symmetrical, approximately centered pass band. Set the marker generator to 85 mc. Detune TC505 counterclockwise until a single peak appears. Adjust TC503 until the peak falls on the 85-mc. marker. It may be necessary to increase the output of the generator during this adjustment. Then adjust TC501 for maximum curve height and symmetry of the single peak. The aerial circuit is now tuned for channels 2 through 6.

15. Readjust TC503 and TC506 for a symmetrical response, centered about 85 mc. and falling within the specifications as shown in figure 6. Channels 2 through 6 are now correctly aligned.

TELEVISION I-F ALIGNMENT

Since the i-f system operates at a relatively high frequency, some extra precautions are necessary when i-f alignment is attempted. Bonding of the signal generator to the chassis is extremely important at these frequencies. Insufficient bonding will cause instability, and make it difficult to align the system. Bias during alignment of this new i-f system is of particular importance in order to prevent instability. The bias can be readily applied by means of the jig shown in figure 3.

I-F Alignment (Preliminary)

Before proceeding with the i-f alignment, observe the following instructions:

1. Connect the test oscilloscope to the 2200-ohm resistor from the ALIGN TEST jack adapter, as shown in figure 3.

2. If additional attenuation of the marker signal during sweep alignment is required when using Visual Alignment Generator Model 7008, insert a 10,000-ohm resistor in series with the output lead, or use a second harmonic of band B which will give a marker of low amplitude.

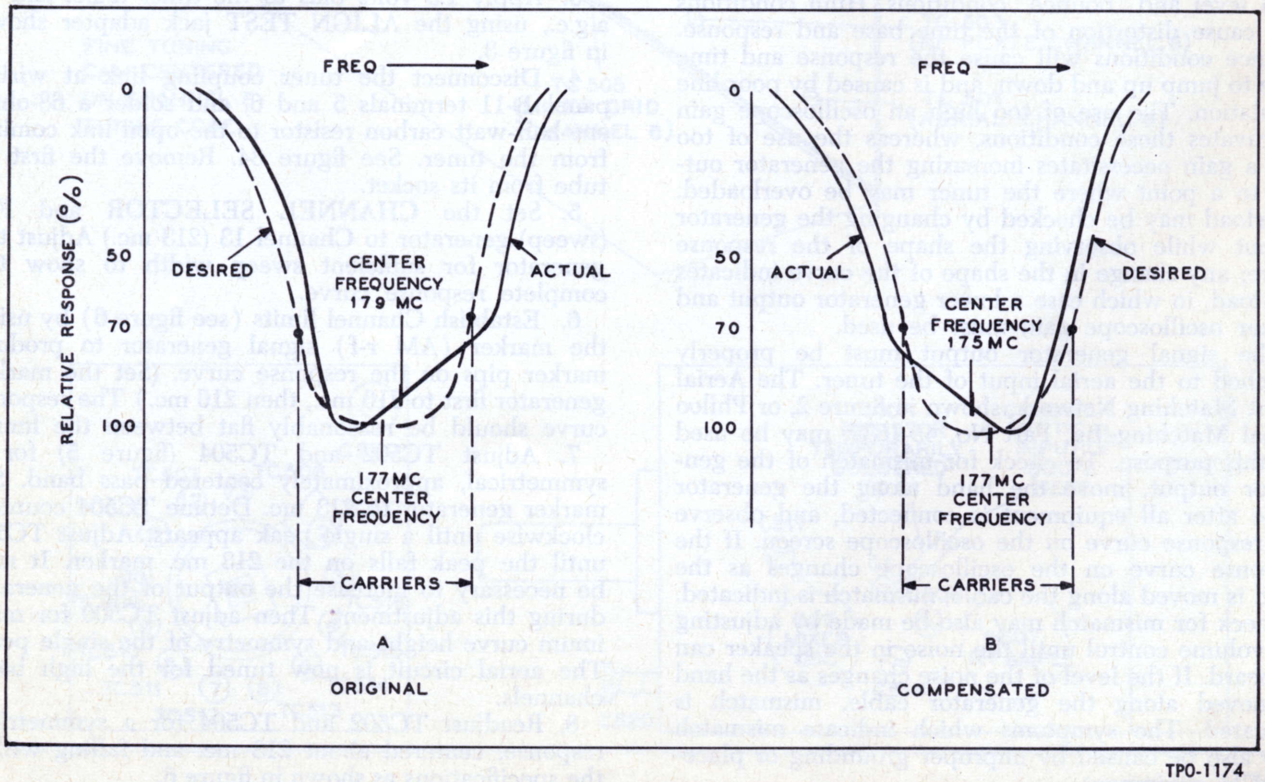


Figure 7. Television Tuner Response Curve, Showing Tracking Compensation

3. Preset the television controls as follows:
   a. CONTRAST control fully counterclockwise.
   b. BRIGHTNESS control to give a dim raster.
4. Insert the ALIGN TEST jack adapter into the ALIGN TEST jack (J200).
5. Connect an AM generator to the mixer grid test point, G-1, through the mixer jig, Philco Part Number 45-1739, or equivalent.

> NOTE: The output of the generator (with 30 percent amplitude modulation) must not be permitted to exceed the level that will give .6 volts peak-to-peak output from the video detector as measured at the ALIGN TEST jack with the scope; otherwise overloading will occur.

Procedure

1. Adjust the r-f and i-f a-g-c bias jig for 3 volts.
2. Set the AM generator for 47.25-mc. modulated output, and adjust C203 for minimum indication on the scope. (See figure 8.)
3. Set the AM generator for 43.65-mc. modulated output, and adjust C212 for maximum indication on the scope.
4. Set the AM generator for 45.4-mc. modulated output, and adjust C208 for maximum indication on the scope.
5. Set the AM generator for 42.85-mc. modulated output, and adjust C205 for maximum indication on the scope.
6. Set the AM generator for 44.4-mc. modulated output, and adjust C517 for maximum indication on the scope.
7. Recheck the adjustment of C203, as made in step 2 (above).
8. If it is desired to check the over-all response of the receiver, an r-f sweep generator signal may be injected through the proper matching jig into the aerial terminals, and the over-all response observed on the oscilloscope. Set the CHANNEL SELECTOR and sweep generator to channel 4. Set the FINE TUNING cam to the mark as indicated in step 6 of Procedure Using Signal Generators (under OSCILLATOR ALIGNMENT). The response should fall within the limits shown in figure 9.

If the response curve does not fall within the limits shown in figure 9, the tuning adjustments may be retouched slightly to bring the curve within the limits. Do not turn any of the adjustments excessively after their positions have been set by the procedure in steps 1 through 7 above.

> NOTE: C212 and C515 control the top of curve. C205 controls the slope at sound side of curve. C208 controls the video carrier level. Do not disturb the setting of C203 from that obtained in step 2 and 7 above.

S-I-F ALIGNMENT

1. Insert the VOLUME CONTROL jack adapter into the volume control socket, J400. Connect the

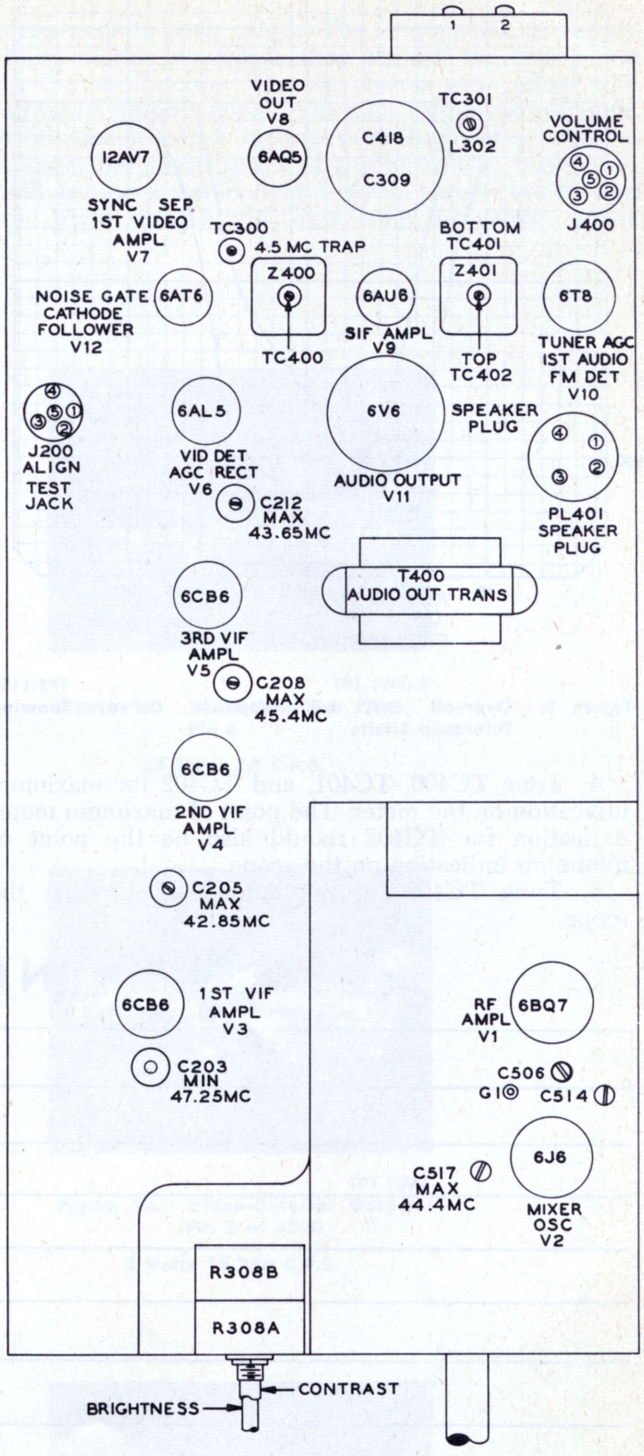


Figure 8. Top View of RF Chassis 71, Showing Location of Adjustments

vacuum-tube voltmeter and oscilloscope to the adapter, as shown in figure 4.

2. Remove the first i-f amplifier (V3).
3. Connect the output of an accurately calibrated AM signal generator to the 2200-ohm resistor of the VIDEO TEST jack adapter (figure 3). Adjust the generator for 30 percent amplitude modulated output at 4.5 mc.

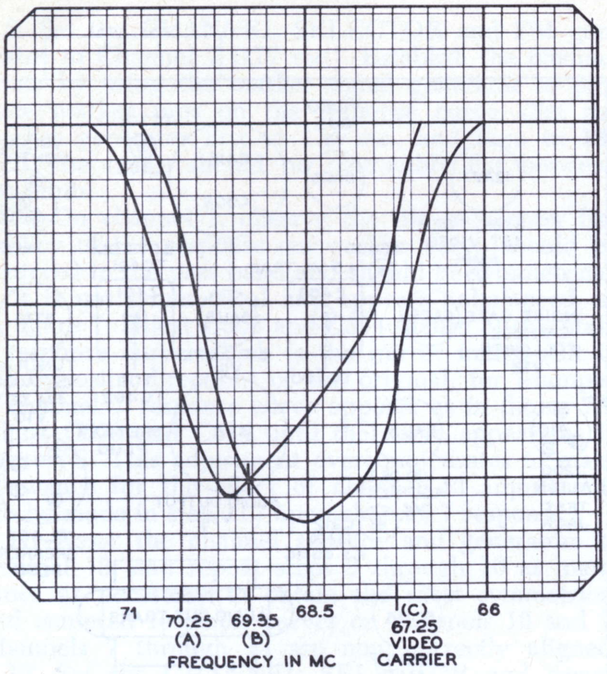


Figure 9. Over-all R-F, I-F Response Curve, Showing Tolerance Limits

4. Tune TC400, TC401, and TC402 for maximum indication on the meter. The point of maximum meter indication for TC402 should also be the point of minimum indication on the scope.

5. Tune TC402 for minimum indication on the scope.

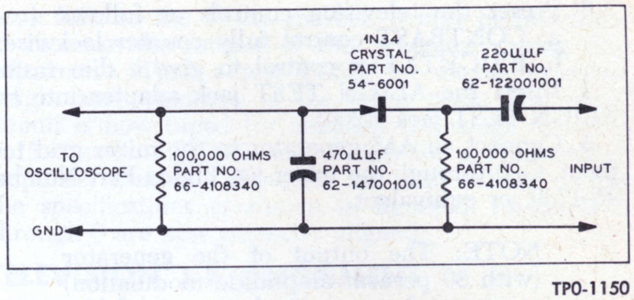


Figure 10. Wiring Diagram of Crystal Detector

6. Connect an r-f probe or crystal detector (see figure 10) to the grid, pin 2, of the picture tube. Connect the oscilloscope to the output of the r-f probe.

7. Tune TC300 for minimum indication on the scope.

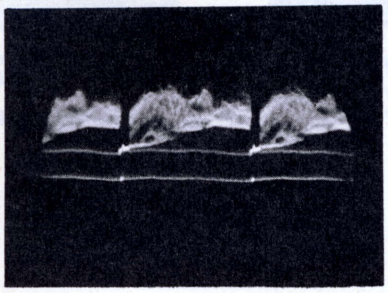
8. Replace the first i-f tube, and tune in a station on the receiver. Using the speaker output as an indication, turn the FINE TUNING control to obtain a slightly fuzzy picture, and tune TC402 for minimum AM noise.

> NOTE: If an r-f probe or crystal detector is not available when performing steps 6 and 7, the adjustment of TC300 may be made as follows:
>
> Tune in a station signal and adjust TC300 for minimum sound interference in the picture. The sound interference will appear as a fine wavy pattern in the picture.

NOTES

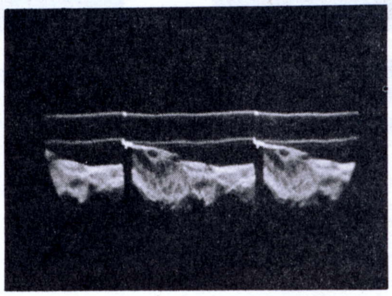
OSCILLOSCOPE WAVEFORM PATTERNS

The following waveforms were taken with the receiver adjusted for normal picture and an approximate peak-to-peak output of 2 volts at the video detector. The voltages given with the waveforms are approximate peak-to-peak values. The frequencies shown are those of the waveform—they are not the sweep rate of the oscilloscope. The waveforms were taken with an oscilloscope having good high frequency response. With oscilloscopes having poor high frequency response, the sharp peaks of the horizontal waveforms will be more rounded than those shown below, and the peak voltages will differ from the values shown.



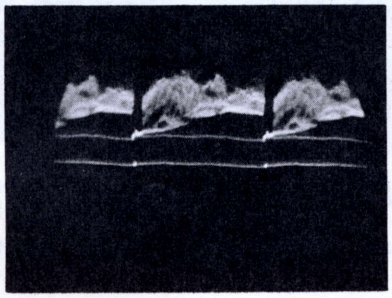
TP1-1200-A
Figure 11. Video-Detector Output, Pin 2 of J200

2 Volts 60 C.P.S.



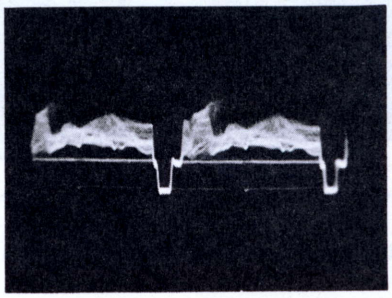
TP1-1200-B
Figure 12. Video-Amplifier Plate, Pin 6

28 Volts 60 C.P.S.



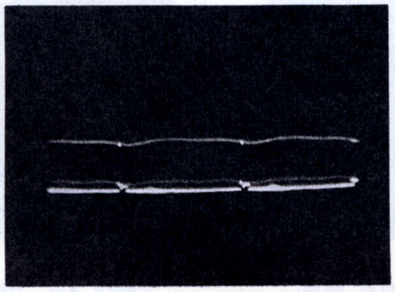
TP1-1200-A
Figure 13. CRT Grid, Pin 2

118 Volts 60 C.P.S.



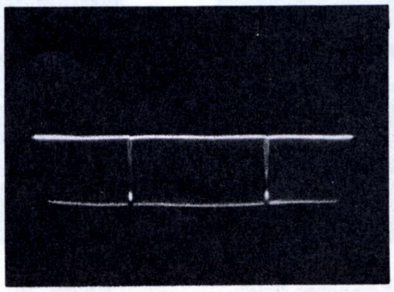
TP1-1092
Figure 14. Video-Detector Output, Pin 2 of J200

2 Volts 15,750 C.P.S.



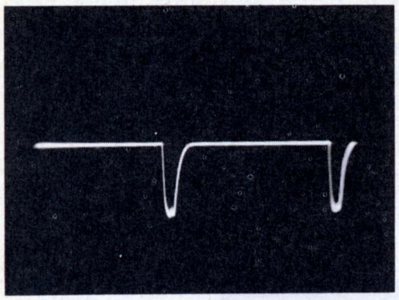
TP1-1203
Figure 15. Cathode-Follower Cathode, Pin 2

10 Volts 60 C.P.S.



TP1-1090
Figure 16. Sync-Separator Plate, Pin 1

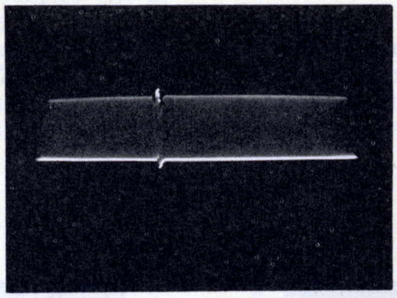
10 Volts 60 C.P.S.



TP1-1091

Figure 17. Sync-Separator Plate, Pin 1

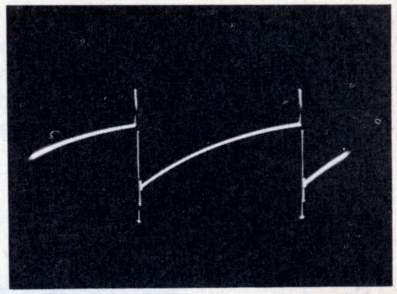
10 Volts 15,750 C.P.S.



TP1-1087

Figure 18. Sync-Inverter Plate, Pin 5

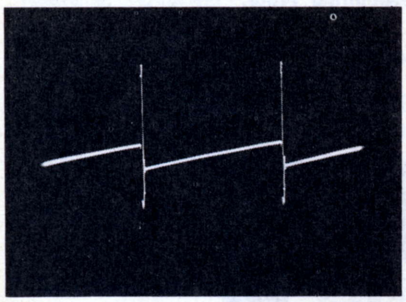
30 Volts 60 C.P.S.



TP1-1202

Figure 19. Vertical-Oscillator Grid, Pin 4

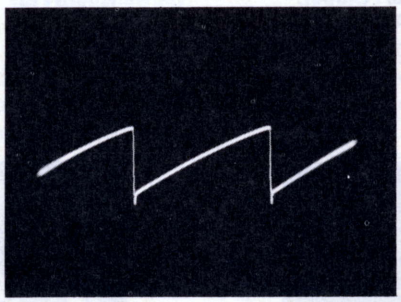
90 Volts 60 C.P.S.



TP1-1097

Figure 20. Vertical-Oscillator Plate, Pin 2

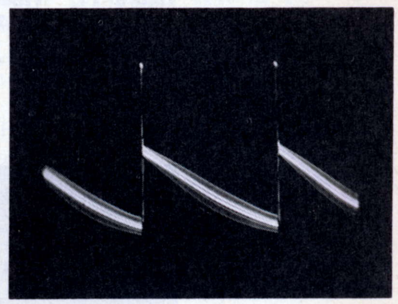
130 Volts 60 C.P.S.



TP1-1100

Figure 21. Vertical-Amplifier Grid, Pin 1

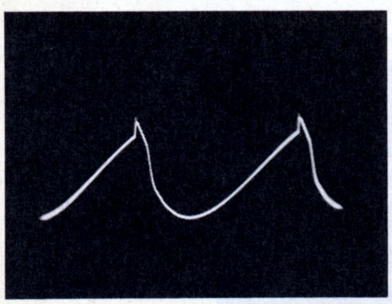
125 Volts 60 C.P.S.



TP1-1099

Figure 22. Vertical-Amplifier Plate, Pin 5

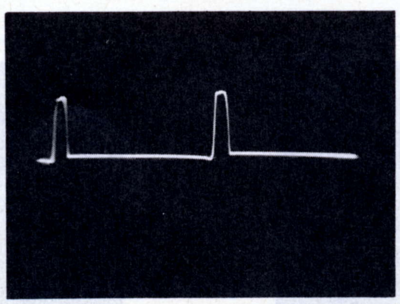
750 Volts 60 C.P.S.



TP1-1088

Figure 23. Phase-Comparer Grid, Pin 1

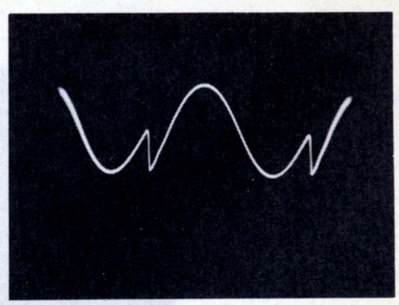
20 Volts 15,750 C.P.S.



TP1-1094

Figure 24. Phase-Comparer Grid, Pin 1 with Pin 4 Grounded

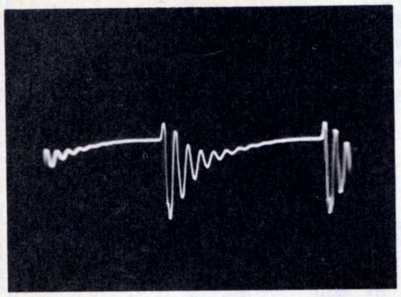
6 Volts 15,750 C.P.S.



TP1-1089-A

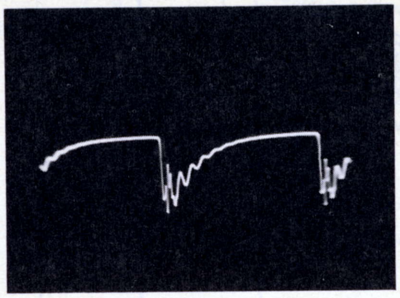
Figure 25. Horizontal-Oscillator Cathode, Pin 6

20 Volts 15,750 C.P.S.



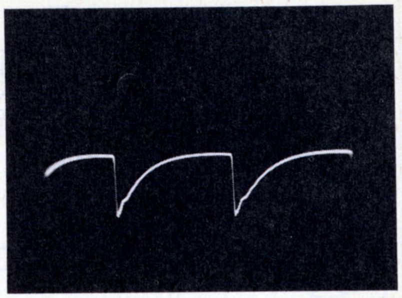
TP1-1205

Figure 26. Horizontal-OscillatorGrid, Pin 4*
190 Volts 15,750 C.P.S.



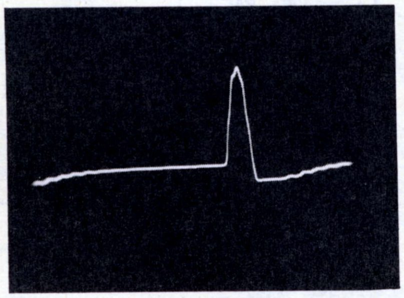
TP1-1098

Figure 27. Horizontal-Oscillator Plate, Pin 5*
140 Volts 15,750 C.P.S.



TP1-1095

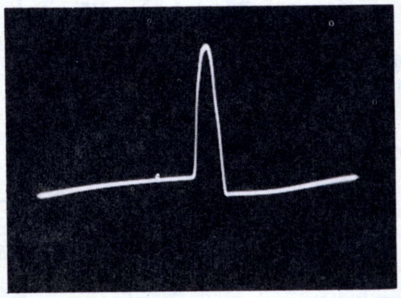
Figure 28. Horizontal-Amplifier Grid, Pin 5*
110 Volts 15,750 C.P.S.



TP1-1201

Figure 29. Horizontal-Amplifier Plate, See CAUTION**

5000 Volts 15,750 C.P.S.



TP1-1206

Figure 30. Horizontal-Damper Cathode, See CAUTION**

3500 Volts 15,750 C.P.S.

*Connect a 15-$\mu\mu$f. condenser in series with the oscilloscope lead. The oscilloscope should be calibrated with the 15-uuf. condenser in the circuit.

**CAUTION: High voltage pulses are present at these points. Do not connect the oscilloscope directly to these tubes. The waveforms may be taken with the alligator clip of the oscilloscope lead clipped over the insulation of the tube-cap leads. (To prevent puncture of the insulation of the cap leads, wrap friction tape around the leads and file the teeth of the clip.) The peak-to-peak voltage shown is the actual voltage present; however, the amplitude of the scope presentation depends upon the degree of coupling.

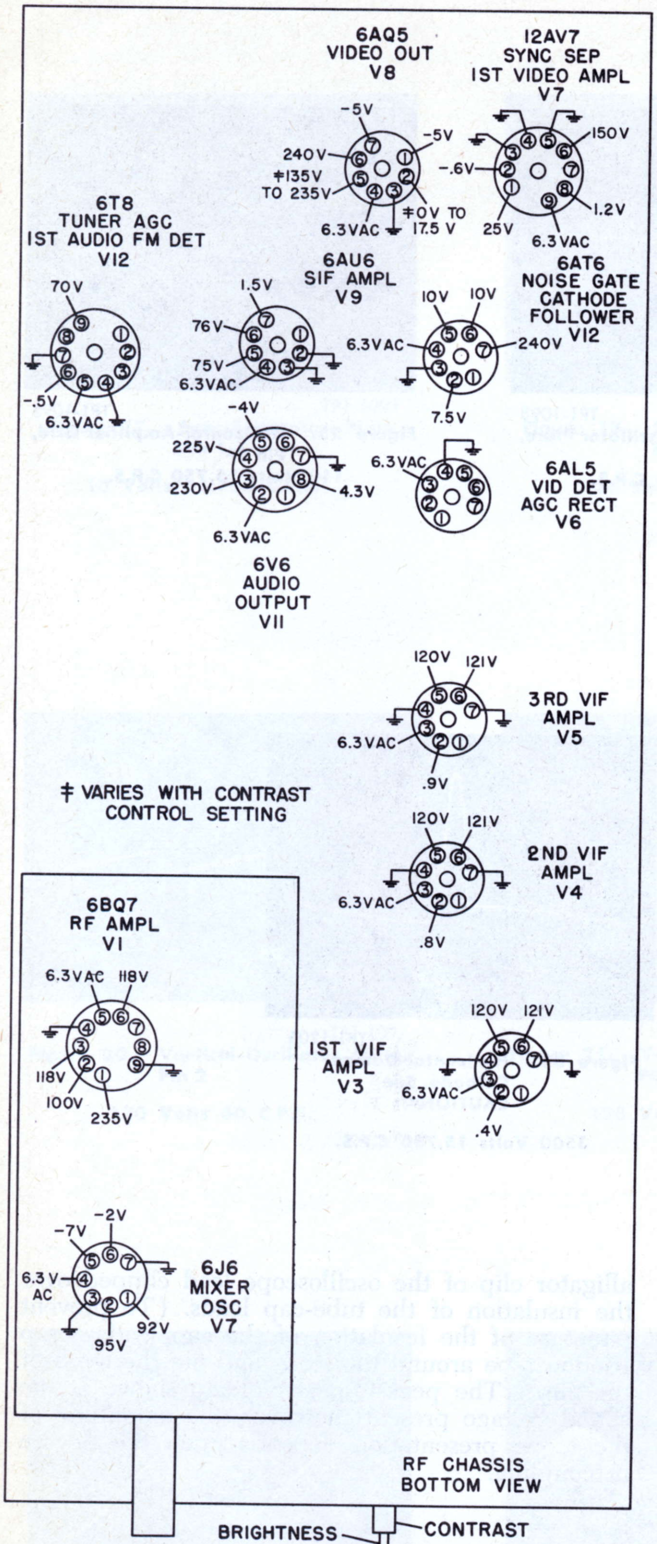


Figure 31. RF Chassis 71, Bottom View, Showing Voltages at Socket Pins

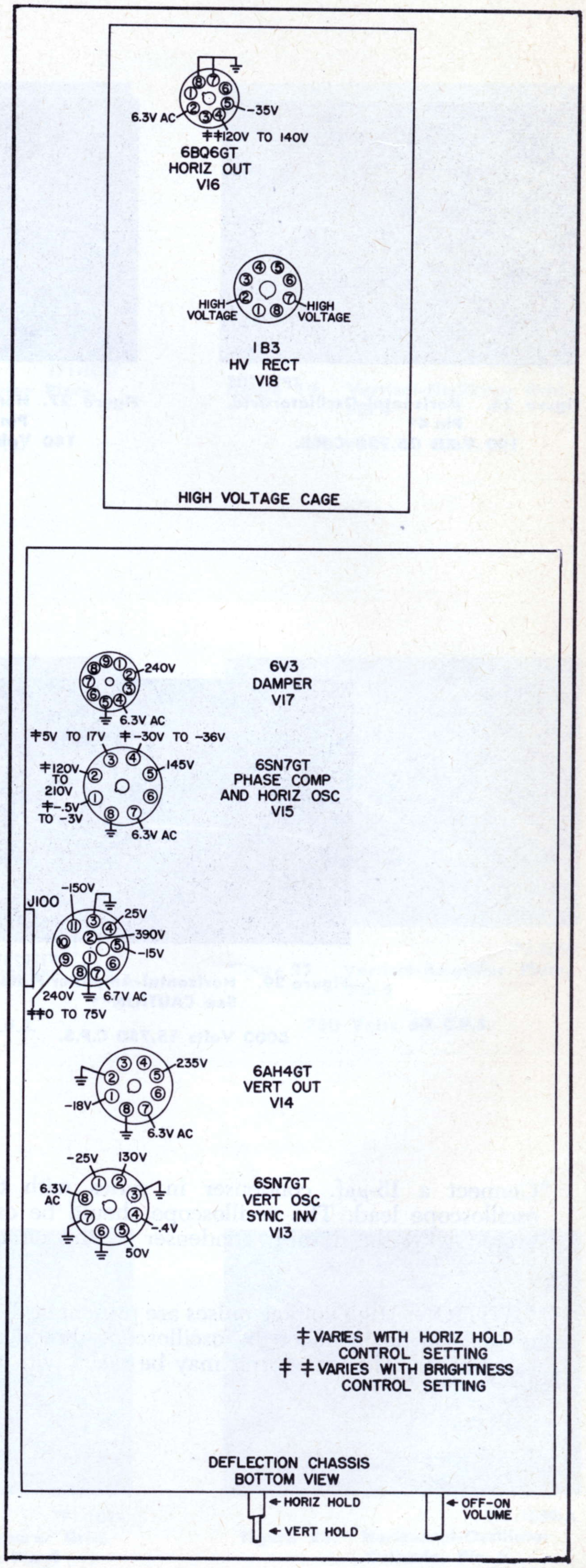
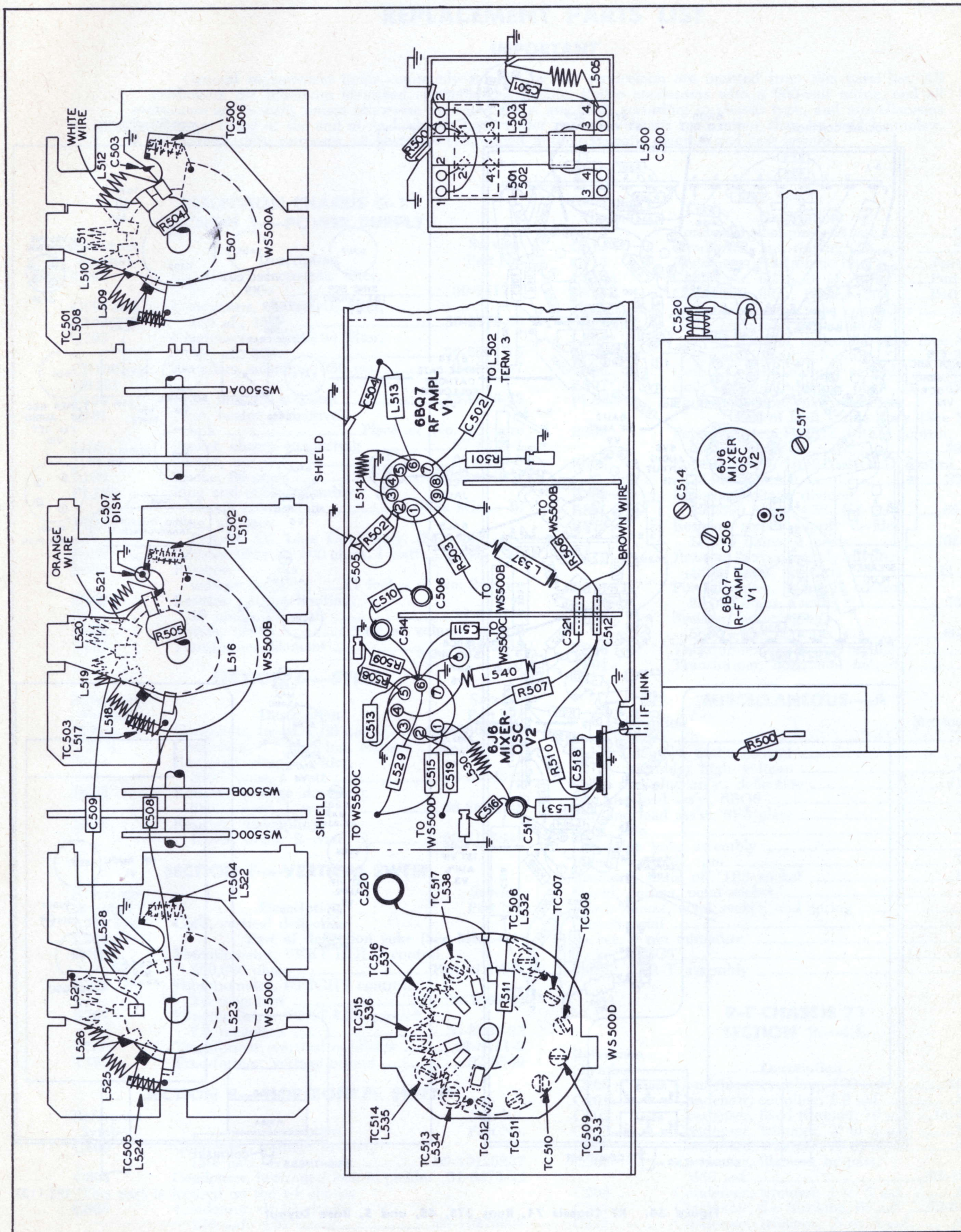


Figure 32. Deflection Chassis G-1, Bottom View, Showing Voltages at Socket Pins



TP2-1139

Figure 33. Television Tuner Part No. 76-7427, Base Layout

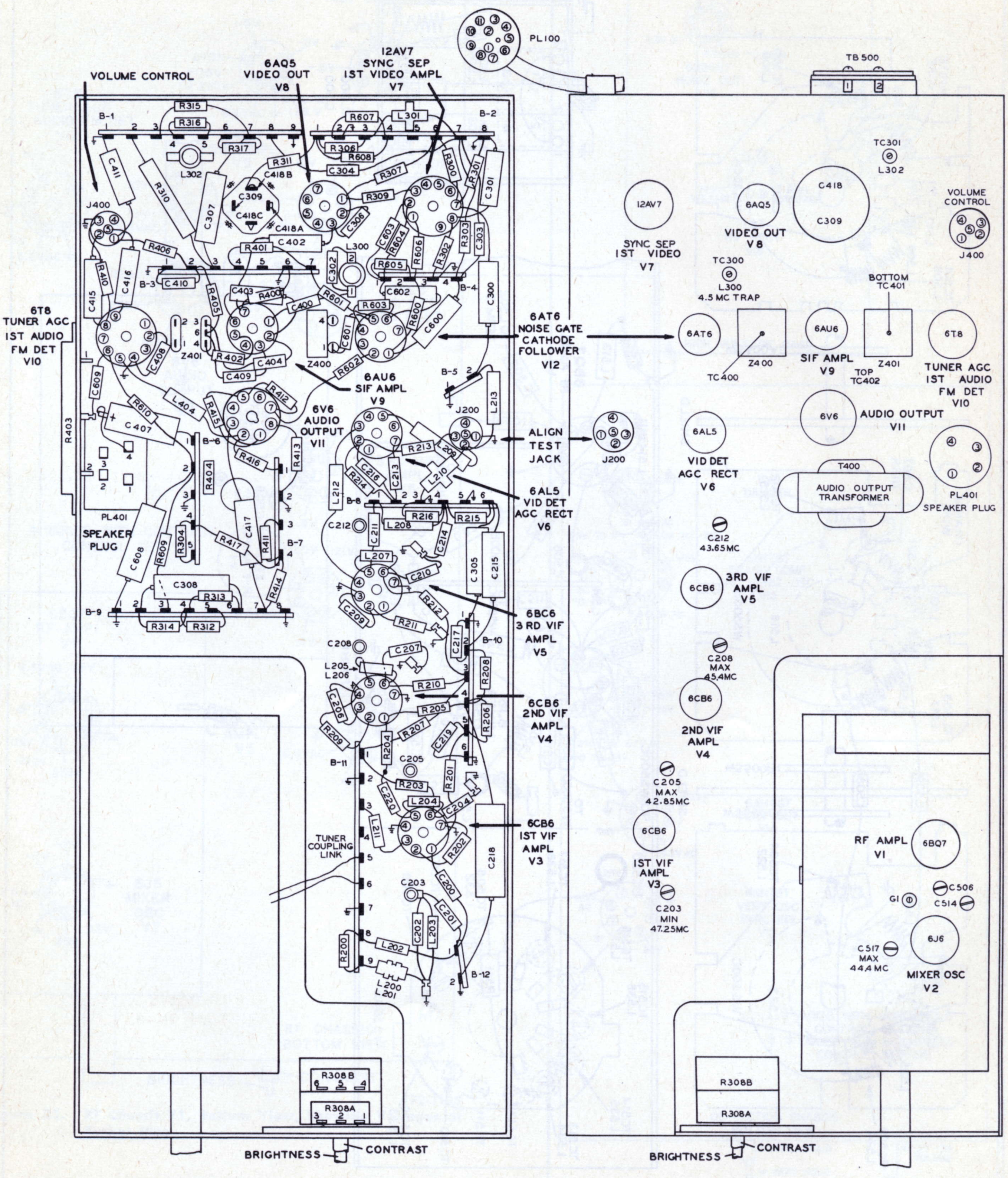


Figure 34. RF Chassis 71, Runs 3TS, 4S, and 5, Base Layout

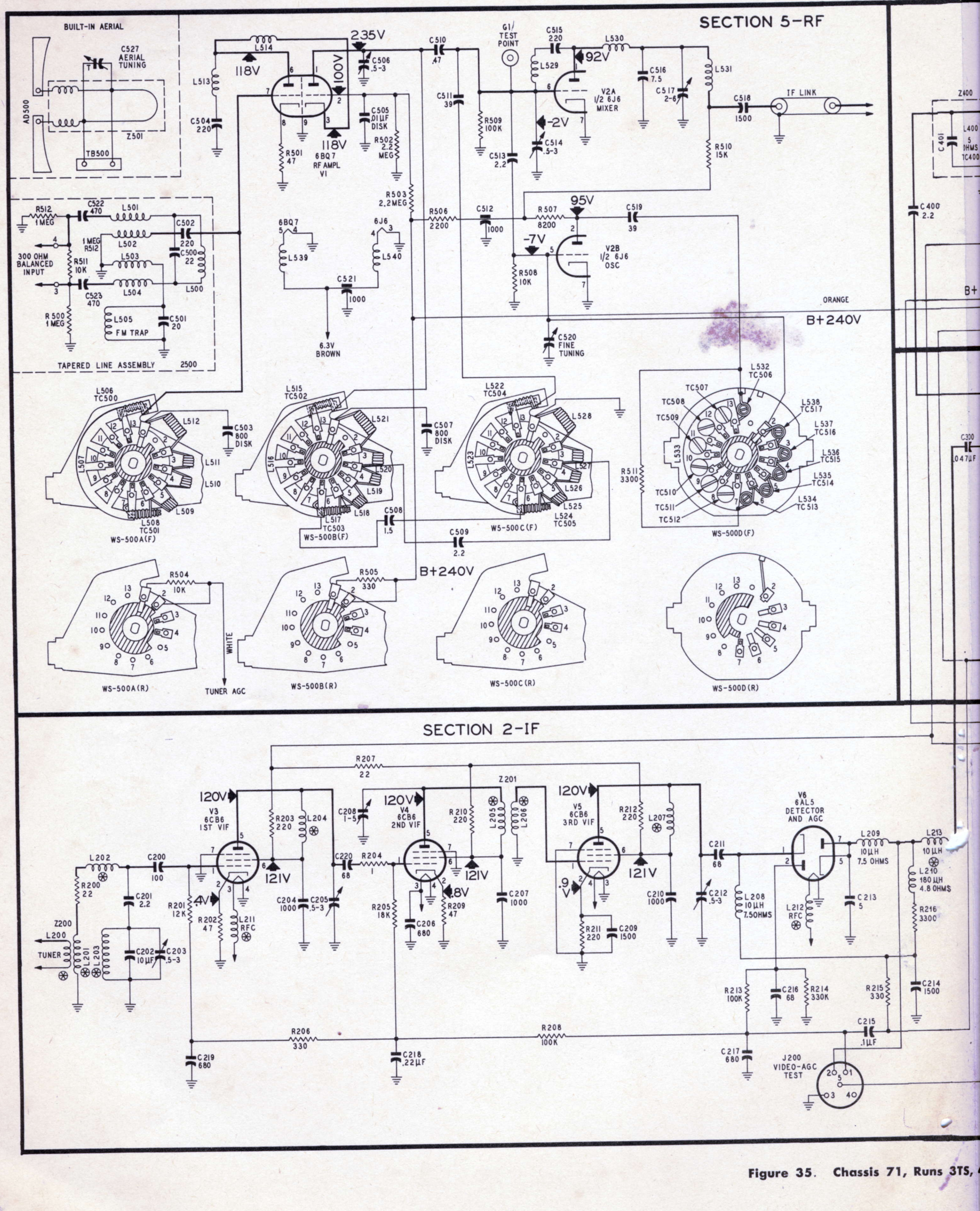
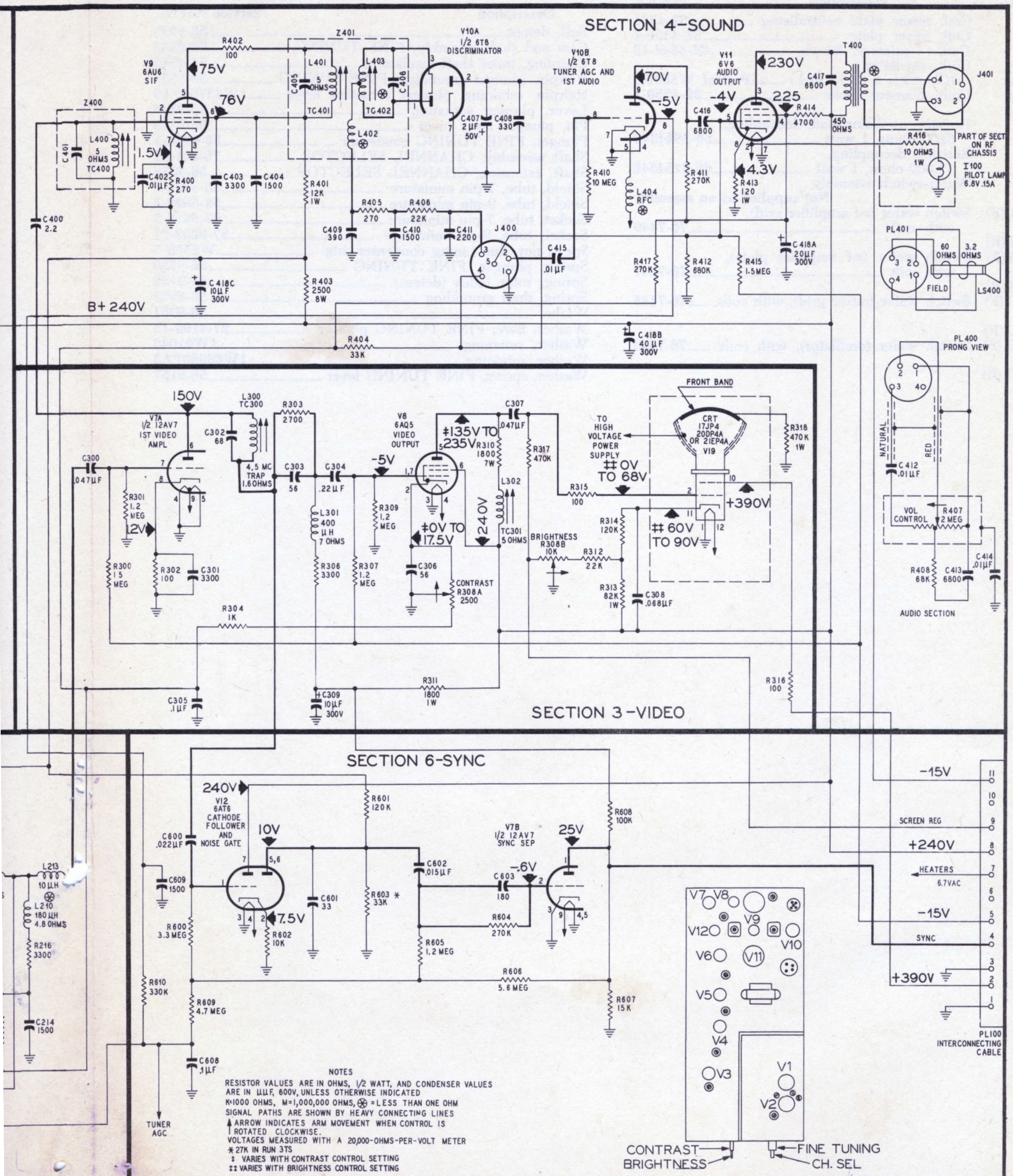
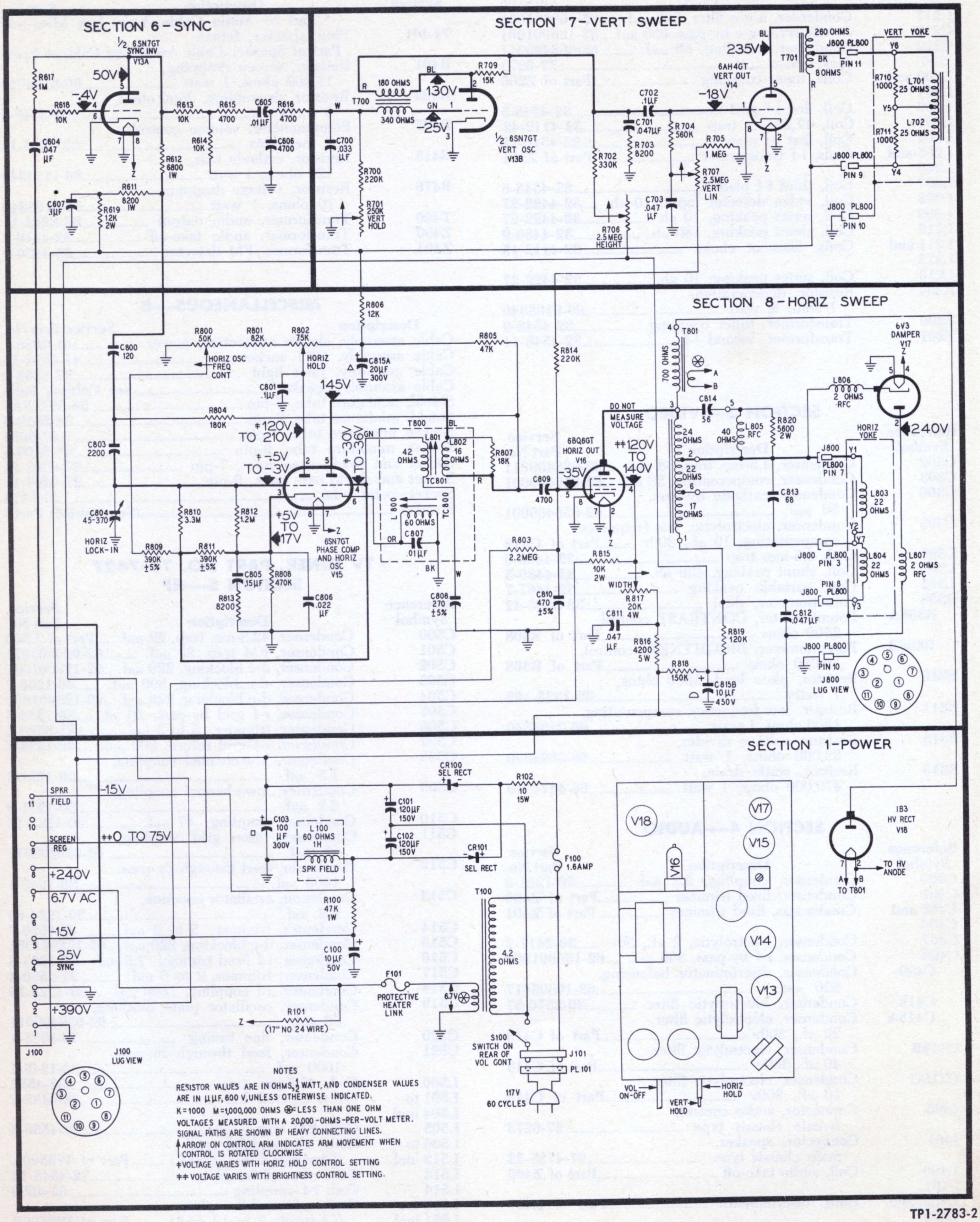


Figure 35. Chassis 71, Runs 3TS,



TP1-2784-2

/1, Runs 3TS, 4S, and 5, Schematic Diagram



TP1-2783-2

Figure 36. Deflection Chassis G-1, Runs 1V, 2V, and 3 Schematic Diagram

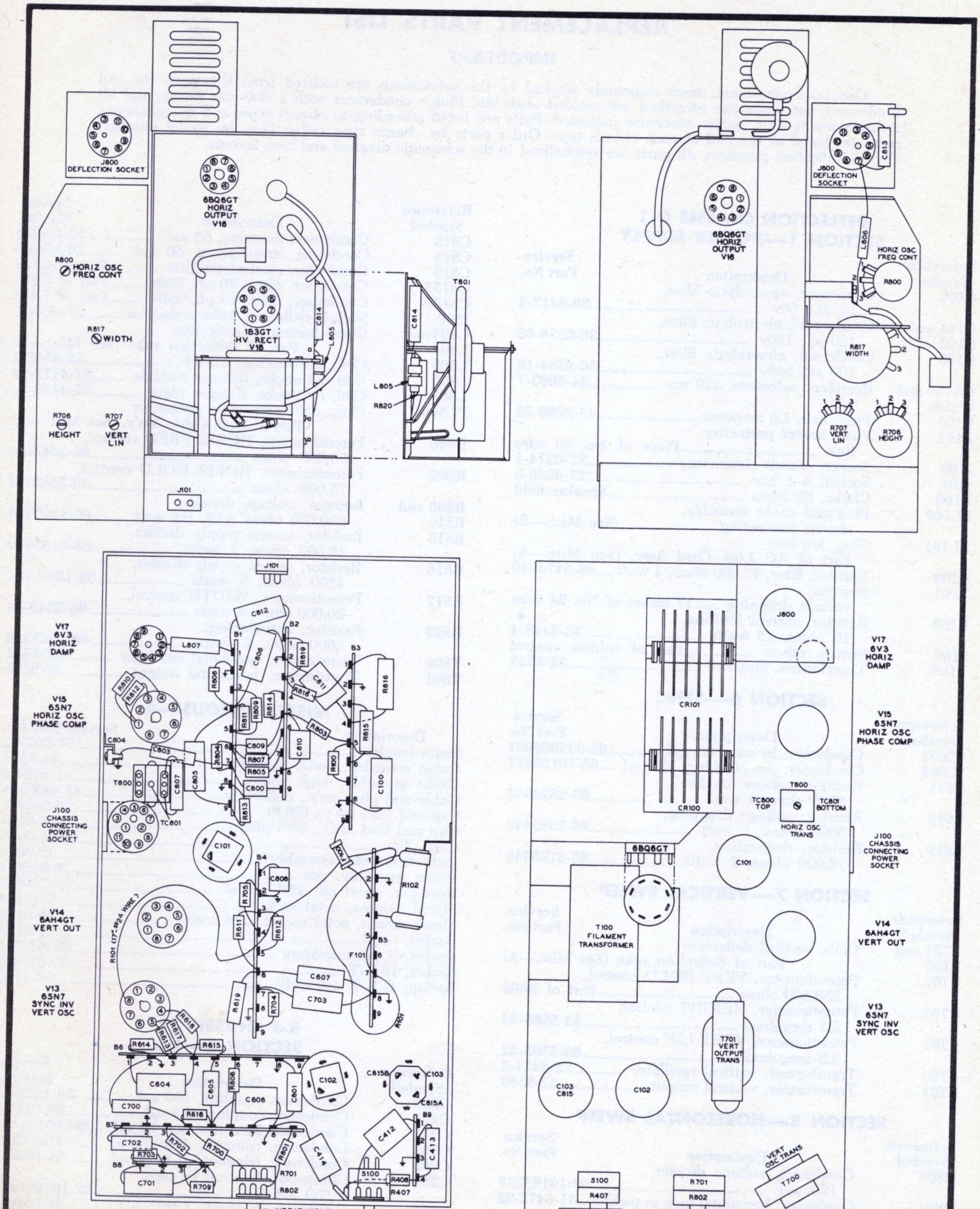


Figure 37. Deflection Chassis G-1, Runs 1V, 2V, and 3 Base Layout

REPLACEMENT PARTS LIST

IMPORTANT

General replacement items commonly stocked by the serviceman are omitted from this parts list. All condensers not otherwise identified are molded—bakelite, Philco condensers with a 600-volt rating, and all resistors are ½-watt, unless otherwise indicated. Parts are listed according to chassis type, and miscellaneous parts are listed at the end of each chassis type. Order parts by chassis type rather than by model number. For identification purposes, all parts are symbolized in the schematic diagram and base layouts.

DEFLECTION CHASSIS G-1
SECTION 1—POWER SUPPLY

Reference Symbol	Description	Service Part No.
C100	Condenser, electrolytic filter, 10 μf., 50v	30-2417-3
C101 and C102	Condensers, electrolytic filter, 120 μf., 150v	30-2570-66
C103	Condenser, electrolytic filter, 100 μf., 300v	30-2584-15
CR100 and CR101	Rectifiers, selenium, 350 ma.	34-8003-7
F100	Fuse, line, 1.6 amperes	45-2656-23
F101	Fuse, heater protective link	Piece of No. 26 wire
J100	Socket, chassis connecting	27-6274-1
J101	Socket, a-c line	27-6240-3
L100	Choke, 60 ohms	Speaker field
PL100	Plug and cable assembly, chassis connecting	(See Misc.—B)
PL101	Plug, a-c line	Part of AC Line Cord Assy. (See Misc.—A)
R100	Resistor, filter, 47,000 ohms, 1 watt	66-3474340
R101	Resistor, voltage dropping	17 inches of No. 24 wire
R102	Resistor, current limiting, 10 ohms, 15 watts	33-3448-4
S100	Switch, off-on	Part of volume control
T100	Transformer, filament	32-8538

SECTION 6—SYNC

Reference Symbol	Description	Service Part No.
*C601	Condenser, by-pass, 33 $\mu\mu$f	62-033009001
*C603	Condenser, d-c blocking, 180 $\mu\mu$f	60-10185417
R611	Resistor, voltage divider, 8200 ohms, 1 watt	66-2824340
R612	Resistor, voltage dropping, 6800 ohms, 1 watt	66-2685340
R619	Resistor, decoupling, 12,000 ohms, 2 watts	66-3125340

SECTION 7—VERTICAL SWEEP

Reference Symbol	Description	Service Part No.
L701 and L702	Coils, vertical deflection	Part of deflection yoke (See Misc.—A)
R701	Potentiometer, VERT HOLD control, 250,000 ohms	Part of R802
R706	Potentiometer, HEIGHT control, 2.5 megohms	33-5565-32
R707	Potentiometer, VERT LIN control, 2.5 megohms	33-5565-32
T700	Transformer, vertical oscillator	32-8431-2
T701	Transformer, vertical output	32-8539

SECTION 8—HORIZONTAL SWEEP

Reference Symbol	Description	Service Part No.
C800	Condenser, voltage divider, 120 $\mu\mu$f.	60-10125237
C804	Condenser, horizontal lock-in padder	31-6473-22
C808	Condenser, dc blocking, 270 $\mu\mu$f. $\pm$5%	60-10275337
C810	Condenser, horizontal drive, 470 $\mu\mu$f. $\pm$5%	60-10475411
C813	Condenser, damping, 68 $\mu\mu$f.	30-1246-1
C814	Condenser, anti-ringing, 56 $\mu\mu$f.	30-1243-5
C815	Condenser, electrolytic filter	Part of C103
C815A	Condenser, filter, 20 μf., 300v	Part of C103
C815B	Condenser, filter, 10 μf., 450v	Part of C103
J800	Socket, deflection yoke connector	27-6274-6
L803 and L804	Coils, horizontal deflection	Part of deflection yoke (See Misc.—A)
L805	Coil, anti-ringing, 2.5 mh.	32-4542-2
L806	Coil, r-f choke, damper cathode	32-4112-24
L807	Coil, r-f choke, damper plate	32-4112-24
PL800	Plug, deflection yoke connector	Part of Defl. Cable Ass'y. (See Misc.—A)
R800	Potentiometer, HORIZ. FREQ control, 50,000 ohms	33-5565-30
R802	Potentiometer, HORIZ. HOLD control, 75,000 ohms	33-5563-43
R809 and R811	Resistor, voltage divider, 390,000 ohms $\pm$5%, ½% watt	66-4398240
R815	Resistor, screen supply divider, 10,000 ohms, 2 watts	66-3105340
R816	Resistor, screen supply divider, 4200 ohms, 5 watts	33-1335-101
R817	Potentiometer, WIDTH control, 20,000 ohms, 4 watts	33-5546-43
R820	Resistor, anti-ringing, 5600 ohms, 2 watts	66-2565340
T800	Transformer, horizontal oscillator	32-8551
T801	Transformer, horizontal output	32-8555

*This part is located on the r-f chassis

MISCELLANEOUS—A

Description	Service Part No.
Beam bender	76-6077-2
Cable assembly, audio control	41-3974
Cable assembly, high voltage	41-4064-6
Cable and plug ass'y., deflection	41-4086-18
Cap and lead ass'y., 6BQ6	76-5664-7
Cap and lead ass'y., 6V3 plate	76-5664
Cord, line	41-3865
Deflection yoke assembly	32-9648
Focus assembly, pm	76-6126-4
Insulator, stand off, 1B3 socket	54-7309-2
Shield, corona, octal socket	76-7436
Shock mount, octal socket, and spring	76-6119
Socket, octal	27-6174
Socket, 9 pin miniature	27-6203-5
Socket, 1B3GT	27-6174-5
Spring, C-R-T assembly	56-9733

R-F CHASSIS 71
SECTION 2—I.F.

Reference Symbol	Description	Service Part No.
C200	Condenser, coupling, 100 $\mu\mu$f.	30-1224-18
C201	Condenser, coupling, 2.2 $\mu\mu$f.	30-1221-6
C202	Condenser, fixed trimmer, 10 $\mu\mu$f.	60-00105417
C203	Condenser, trimmer, .5 to 3 $\mu\mu$f.	31-6520-5
C205	Condenser, trimmer, .5 to 3 $\mu\mu$f.	31-6520-5
C206	Condenser, filament by-pass, 680 $\mu\mu$f.	62-168001001
C208	Condenser, trimmer, 1 to 5 $\mu\mu$f.	31-6520-9
C211	Condenser, d-c blocking, 68 $\mu\mu$f.	62-068409011
C212	Condenser, trimmer, .5 to 3 $\mu\mu$f.	31-6520-3
C213	Condenser, i-f by-pass, 5 $\mu\mu$f.	30-1224-28
C216	Condenser, a-g-c filter, 68 $\mu\mu$f.	62-068409011

Reference Symbol	Description	Service Part No.
C217	Condenser, a-g-c filter, 680 μμf.	62-168001001
C219	Condenser, a-g-c by-pass, 680 μμf.	62-168001001
C220	Condenser, coupling, 68 μμf.	62-068409011
J200	Jack, video test	27-6273
L200 and L201	Coils, tuner coupling	Part of Z200
L202	Coil, first i-f grid	32-4548-5
L203	Coil, 47.25-mc. trap	32-4112-42
L204	Coil, first i-f plate	32-4548-12
L205 and L206	Coils, i-f transformer	Part of Z201
L207	Coil, third i-f plate	32-4548-6
L208	Coil, video detector input, 10 μh.	32-4422-27
L209	Coil, series peaking, 10 μh.	32-4422-27
L210	Coil, shunt peaking, 180 μh.	32-4480-9
L211 and L212	Coils, filament choke	32-4112-15
L213	Coil, series peaking, 10 μh.	32-4422-27
R204	Resistor, degenerative, 1-ohm, ½ watt	66-9108340
Z200	Transformer, tuner coupling	32-4548-9
Z201	Transformer, second i-f	32-4548-11

SECTION 3—VIDEO

Reference Symbol	Description	Service Part No.
C302	Condenser, 4.5-mc. trap, 68 μμf.	62-068409011
C303	Condenser, compensating, 56 μμf.	62-056409001
C306	Condenser, cathode by-pass, 56 μμf.	62-056409001
C309	Condenser, electrolytic, low-frequency compensating, 10 μf., 300v	Part of C418
L300	Coil, 4.5-mc. trap	32-4463-6
L301	Coil, shunt peaking, 400 μh.	32-4480-5
L302	Coil, variable peaking	32-4467-7
R308	Potentiometer, dual	33-5563-42
R308A	Potentiometer, CONTRAST control, 2500 ohms	Part of R308
R308B	Potentiometer, BRIGHTNESS control, 10,000 ohms	Part of R308
R310	Resistor, plate load, 1800 ohms, 7 watts	32-1335-102
R311	Resistor, low-frequency compensating, 1800 ohms, 1 watt	66-2184340
R313	Resistor, voltage divider, 82,000 ohms, 1 watt	66-3824340
R318	Resistor, static drain, 470,000 ohms, 1 watt	66-4474340

SECTION 4—AUDIO

Reference Symbol	Description	Service Part No.
C400	Condenser, coupling, 2.2 μμf.	30-1221-6
C401	Condenser, fixed trimmer	Part of Z400
C405 and C406	Condensers, fixed trimmer	Part of Z401
C407	Condenser, electrolytic, 2 μf., 50v	30-2417-7
C408	Condenser, r-f by-pass, 330 μμf.	62-133001001
C409	Condenser, discriminator balancing, 390 μμf.	62-10395417
C418	Condenser, electrolytic filter	30-2570-57
C418A	Condenser, electrolytic filter, 20 μf., 300v	Part of C418
C418B	Condenser, electrolytic filter, 40 μf., 300v	Part of C418
C418C	Condenser, electrolytic filter, 10 μf., 300v	Part of C418
J400	Connector, audio control, female chassis type	27-6273
J401	Connector, speaker, male chassis type	27-4785-22
L400	Coil, audio take-off	Part of Z400
L401, L402, and L403	Coils, discriminator	Part of Z401
L404	Coil, filament choke	32-4480-5
PL400	Plug, audio control, male Part of Audio Cable Ass'y. (see Misc.—A)	
PL401	Plug, speaker, female Part of Speaker Cable Ass'y. (see Cabinet Parts)	
R401	Resistor, screen dropping, 12,000 ohms, 1 watt	66-3124340
R403	Resistor, decoupling, 2500 ohms, 8 watts	33-3446-5
R407	Potentiometer, volume control, 2 megohms	33-5564-14
R413	Resistor, cathode bias, 120 ohms, 1 watt	66-1124340
R416	Resistor, voltage dropping, 10 ohms, 1 watt	66-0108340
T400	Transformer, audio output	32-8242-11
Z400	Transformer, audio take-off	32-4449-2
Z401	Transformer, FM detector	32-4450-5

MISCELLANEOUS—B

Description	Service Part No.
Cable assembly, chassis connection, power	41-4086-1
Cable assembly, CRT socket	41-3964-18
Cable assembly, pilot light	27-6233-6
Cable assembly, speaker	See Cabinet Parts
Shield, miniature tube, 7-pin	56-5629FA3
Shield, miniature tube, 9-pin	56-5629-5
Socket, miniature tube, 7-pin	27-6203
Socket, miniature tube, 9-pin	27-6203-5
Socket and shield base ass'y., 7-pin	27-6203-14
Socket and shield base ass'y., 9-pin	27-6203-18
Socket, octal tube	27-6174
Speaker	(See Cabinet Parts)

TV TUNER, PART NO. 76-7427
SECTION 5—RF

Reference Symbol	Description	Service Part No.
C500	Condenser, 42.5-mc. trap, 22 μμf.	Part of L500
C501	Condenser, FM trap, 20 μμf.	62-020309011
C502	Condenser, d-c blocking, 220 μμf.	62-122001001
C503	Condenser, d-c blocking, 800 μμf.	30-1238-7
C504	Condenser, d-c blocking, 220 μμf.	62-122001001
C505	Condenser, r-f grid by-pass, .01 μf.	30-1238-2
C506	Condenser, trimmer, .5 to 3 μμf.	31-6520-3
C507	Condenser, r-f grid return, 800 μμf.	30-1238-7
C508	Condenser, low-channel coupling, 1.5 μμf.	30-1221-8
C509	Condenser, low-channel coupling, 2.2 μμf.	30-1221-6
C510	Condenser, coupling, .47 μμf.	30-1221-15
C511	Condenser, mixer grid coupling, 39 μμf.	62-039409011
C512	Condenser, feed through by-pass, 1000 μμf.	30-1245-1
C513	Condenser, oscillator injection, 2.2 μμf.	30-1224-66
C514	Condenser, trimmer, .5 to 3 μμf.	31-6520-7
C515	Condenser, d-c blocking, 220 μμf.	62-122001001
C516	Condenser, i-f fixed trimmer, 7.5 μμf.	30-1224-8
C517	Condenser, trimmer, 2 to 6 μμf.	31-6520-4
C518	Condenser, i-f coupling, 1500 μμf.	30-1225-19
C519	Condenser, oscillator plate blocking, 39 μμf.	62-039409011
C520	Condenser, fine tuning	76-6935-1
C521	Condenser, feed through by-pass, 1000 μμf.	30-1245-1
L500	Coil, 42.5-mc. trap	32-4552
L501 to L504 incl.	Coils, tapered line	32-4432-2
L505	Coil, FM trap	32-4550-3
L506 to L512 incl.	Coils, r-f amplifier grid (Channels 2 to 13 incl.)	Part of WS500A
L513	Coil, r-f amplifier plate	32-4548-13
L514	Coil, r-f coupling	32-4550
L515 to L521 incl.	Coils, r-f amplifier plate (Channels 2 to 13 incl.)	Part of WS500B
L522 to L528 incl.	Coils, mixer grid (Channels 2 to 13 incl.)	Part of WS500C

Reference Symbol	Description	Service Part No.
L529	Coil, mixer plate neutralizing	32-4551
L530	Coil, mixer plate	32-4550-2
L531	Coil, i-f primary, .81 μh.	32-4548-13
L532 to L538 incl.	Coils, oscillator (Channels 2 to 13 incl.)	Part of WS500D
L539 and L540	Coils, filament choke	32-4550-1
R507	Resistor, oscillator plate decoupling, 8200 ohms, 1 watt	66-2824340
R510	Resistor, decoupling, 15,000 ohms, 1 watt	66-3154340
WS500	Wafer-switch assembly	Not supplied as an assembly
WS500A (F) and WS500A (R)	Switch wafer (r-f amplifier grid), with coils	76-7449
WS500B (F) and WS500B (R)	Switch wafer (r-f amplifier plate), with coils	76-7447
WS500C (F) and WS500C (R)	Switch wafer (mixer grid), with coils	76-7445
WS500D (F) and WS500D (R)	Switch wafer (oscillator), with coils	76-7443

MISCELLANEOUS—C

Description	Service Part No.
Ball, detent	56-8020
Cam and shaft assembly, FINE TUNING	76-6936
Coupling, tuner shaft insulator	54-4912
Hairpin, plunger grounding, FINE TUNING	56-9633
Hairpin, retaining, plunger actuating lever	1W42704FA3
Lever, plunger actuating	56-9148
Pin, plunger lever pivot	56-9149
Plunger, FINE TUNING condenser	56-8034-1
Shaft assembly, CHANNEL SELECTOR	76-6914-2
Shaft, extension, CHANNEL SELECTOR	56-8358
Shield, tube, 7-pin miniature	56-3979-7
Shield, tube, 9-pin miniature	56-5629-5
Socket, tube, 7-pin miniature	27-6276-3
Socket, tube, 9-pin miniature	27-6203-21
Speed nut, fine tuning condenser mtg.	W2556-5
Spring, plunger, FINE TUNING	56-9628
Spring, rotor index (detent)	56-9158
Spring, shaft grounding	56-8023
Washer	56-9351
Washer, fibre, FINE TUNING plunger	27-4109-13
Washer, retaining	1W61043
Washer, retaining	1W60980FA3
Washer, spring, FINE TUNING lever	56-9157