PHILCO

FAMOUS FOR QUALITY
THE WORLD OVER

RADIO
RADIO-PHONOGRAPH
TELEVISION

1954

PHILCO UHF TUNER-ADAPTOR UT-26 SERVICE MANUAL

PHILCO *Factory-Supervised* Service

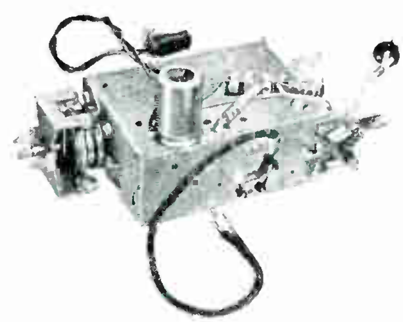
TELEVISION

Introduction

Philco UHF tuner-adaptor UT-26 provides for reception of UHF signals on television channels 14 through 83. It consists of a UHF tuner, adaptor cables and plugs, a planetary tuner driving assembly and mounting hardware.

The UT-26 is designed for installation on Philco "C" line television receivers using either the TV-301, TV-350, TV-354, or TV-400 chassis and is installed on CU models.

The VHF tuners of the above chassis incorporate a VHF-UHF change-over switch as part of the VHF tuner assembly, which places the UHF tuner in operation when the VHF channel selector knob is placed in the UHF position.



PHILCO UHF TUNER ADAPTOR UT-26

Circuit Description

The R-F stage of the tuner selects the desired UHF channel signal, which is fed to the mixer stage, where it heterodynes with the UHF tuner oscillator signal to produce an output signal at the intermediate frequency of the television receiver.

The incoming UHF signal is coupled through the antenna input line and the antenna inductor T-5 to the antenna R-F tank. See figures 6 and 8. The antenna tank is coupled to the mixer tank by the mutual coupling of T-4 and T-3 plus the associated stray capacitance existing between the tank assemblies. The desired signal, selected by tuning the antenna tank and the mixer tank to the correct frequency, is then inductively coupled to the mixer circuit through T-3 and T-2. The local - oscillator signal is generated by a 6AF4 tube, V1, and the associated circuit. The oscillator circuit is coupled to the crystal mixer circuit by the mutual inductance of T-1 and T-2. The R-F signal and the oscillator signal are mixed in the crystal mixer circuit to produce a 45.75 - mc. video i-f carrier signal. This signal, which is the output signal from the mixer stage is coupled to the VHF tuner through X-2, a coaxial cable and the UHF input jack on the VHF tuner.

In UHF operation, the local oscillator of the VHF tuner is rendered inoperative by the switching arrangement, and the r-f amplifier and mixer tubes of the VHF tuner operate as I-F amplifiers.

The two tanks of the UHF tuner, the antenna tank and mixer tank, not only select the desired UHF signal but also are a means to prevent the I-F and oscillator signals from feeding back to the antenna and interfering with other receivers. The two tuned tanks pass incoming signals readily, but do not pass the I-F or oscillator signals.

UHF-VHF Crossover Network Panel

When a single antenna lead-in is employed for both UHF and VHF signal reception, antenna panel, part number 76-9042, should be used, see figure 1. The antenna panel, containing partially printed circuits, consists of a UHF-VHF crossover network with separate contacts to which the leads from the VHF and UHF tuner inputs are connected.

The circuits of the crossover network provide a highpass filter to the UHF tuner-adaptor input for the UHF channel signals and a low-pass filter to the VHF tuner input for the VHF channel signals. The input circuits of both tuners, although isolated from each other, are effectively connected to the antenna lead-in and the need for an antenna UHF-VHF change-over switching arrangement is eliminated.

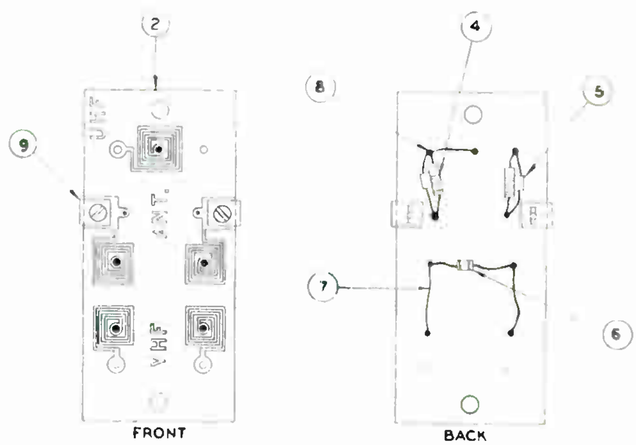


FIGURE 1—Crossover Network Panel—Part No. 76-9042

Operational Check

In view of the extreme simplicity of electrical design of the UT-26 tuner-adaptor, the operational check points are limited to one internal and two external check points. Refer to figure 8.

The operation of the crystal mixer stage can be checked, at the test point TP-2, for the output crystal current. Remove the small metal shield, which covers both the test point and the crystal and which is held in place by two screws in the side of the tuner chassis. Unsolder the lead from the coaxial output cable to the test point symbolized by TP-2, and connect an ammeter in series with the lead and the test point if the tuner is being checked while installed in the television receiver. If the tuner has been removed from the chassis and is being checked with only the necessary power supply connections, the ammeter should be inserted between the test point and ground. The mixer output current should be within a range of .5 to 3.5 miliamperes. Should the crystal be defective, it is easily accessible for removal and replacement.

The B+ supply voltage to the plate of the oscillator tube may be checked on the top of the tuner at the feed-through connection symbolized by C2-2. The voltage reading, from the test point to ground, should be approximately 80 volts.

A third check, internal, can be made in order to determine normal oscillator operation. A vacuum tube voltmeter applied to the grid of the oscillator tube, pins 2 or 6 of the tube socket, should indicate a negative voltage of between —2.5 and —8 volts for normal operation.

Replacing the oscillator tube with a new one may detune the tuner. The service technician, in order to avoid the necessity of realigning the tuner, may try a number of tubes until the most satisfactory substitute for the original is found.

Tuner Alignment Procedures

The UHF tuner should first be given an operational check, before alignment is attempted, to assure that the unit is operating properly. Tuner alignment also requires adequate test equipment. The test equipment described in the following paragraphs or equivalent equipment should be used.

The Philco G-8002 automatic leveling UHF sweep generator provides sweep frequencies in the entire UHF band and has adjustable sweep width.

A UHF marker generator which contains accurate calibration features is required.

An oscilloscope should be employed, which has good band-pass characteristics and stability, such as the Philco Model 7021 oscilloscope.

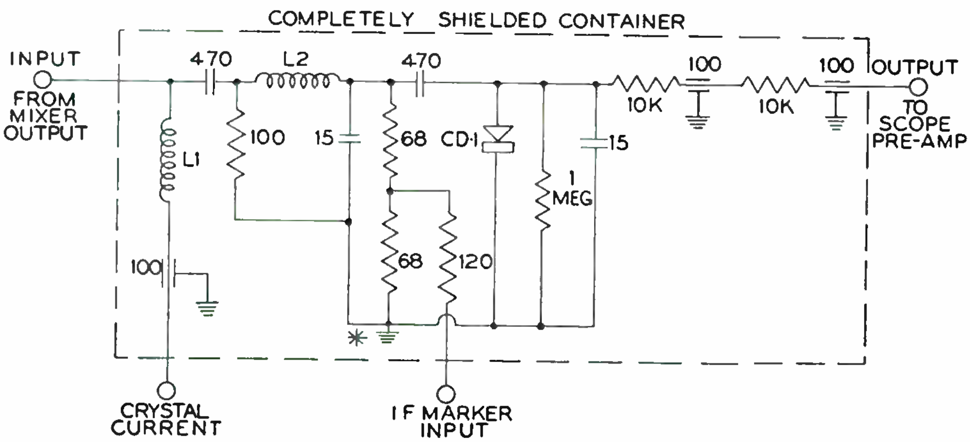
The VHF marker generator employed should be capable of being accurately calibrated, such as the Philco Model 7070 signal generator.

It is necessary to use an oscilloscope preamplifier, when the UHF tuner-adaptor is removed from the TV chassis for service, since very few service oscilloscopes provide sufficient gain.

If the UHF unit is removed from the television chassis, it also will be necessary to provide a power supply source of B+ and filament voltages.

A 72 ohm to 300 ohm matching unit, or Balun, Philco Part No. 45-1983, with built-in external leveling, is required for proper impedance match of the sweep generator output to the UHF tuner-adaptor input.

A detector jig is necessary for detection of the output of the UHF tuner-adaptor to the oscilloscope input through the scope preamplifier. The required detector jig is illustrated in figure 2. The unit is constructed in a small metal



L1—10μh—#36 Enamel Wire—Close Wound on 0.187x¾" General Purpose Phenolic Coil Form
L2—8 Turns—Close Wound on 0.109 coil Form—#22 Formex Wire
CD-1—IN34 CRYSTAL
*Common Ground Point for these components must be used

FIGURE 2—DIAGRAM OF DETECTOR JIG

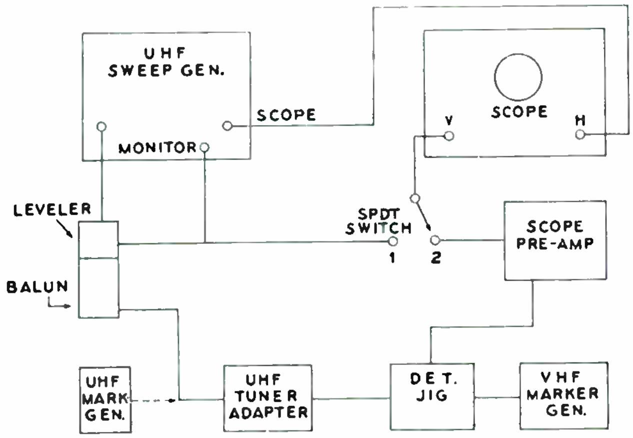


FIGURE 3—Test Equipment Arrangement

case with shielded connectors. The unit further is constructed so that it mounts physically on the UHF tuner output for close proximity.

The method of connecting the various pieces of test equipment to the UHF unit under test is illustrated in figure 3. The UHF output of the UHF sweep generator is fed to the external leveler with a portion of the signal being fed back from the leveler to the monitor jack of the UHF sweep generator. The signal from the output of the leveler is then fed through the Balun or matching unit to the input of the UHF unit being aligned.

The UHF marker generator, necessary for alignment of the oscillator, is connected also to the input of the UHF tuner; and the oscilloscope jack of the UHF sweep generator is connected to the scope horizontal input.

The detector jig is connected to the output of the UHF tuner at the feed-through insulator, and the VHF marker generator, which supplies the i-f markers, is also connected to the detector jig. The output of the detector jig is fed through the scope amplifier to the oscilloscope vertical input, through a SPDT switch. A connection is made from the sweep generator monitor jack to the SPDT switch, the purpose of which is to permit checking of the leveling voltage. The leveling voltage should be relatively flat as the UHF sweep generator is rotated through its entire range. See figure 4.

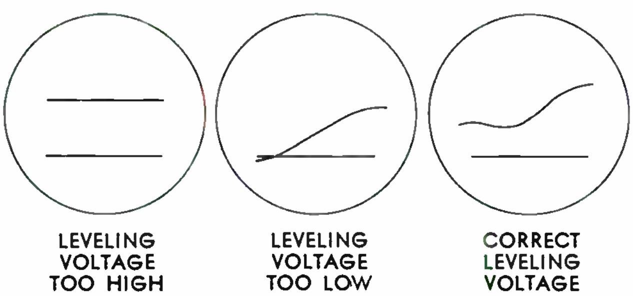


FIGURE 4—Scope View of Leveling Voltage

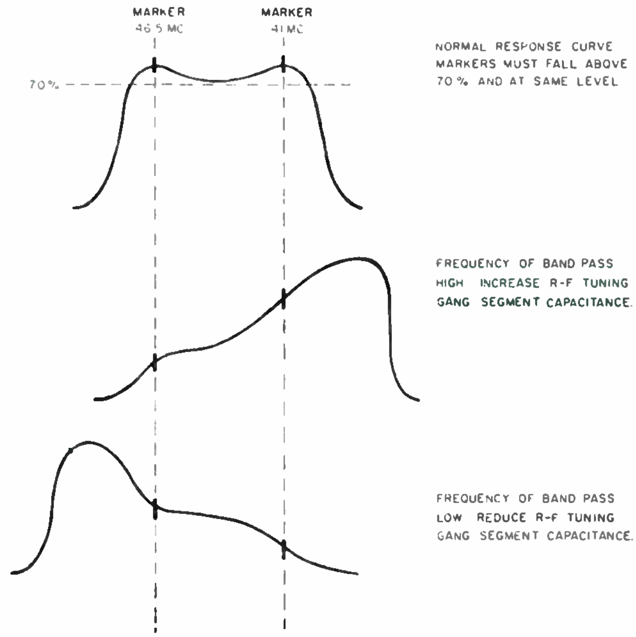


FIGURE 5—R-F Bandpass Response Curve

Alignment chart No. 1 should be followed for alignment of the oscillator. During alignment of the oscillator it is necessary to open the ground connection at the feed through connection TP-1, on the outside of the tuner chassis, in order to obtain an undistorted response curve. After completion of oscillator alignment, and before beginning r-f alignment, restore the ground connection.

Part of the procedure for alignment of the r-f sections of the tuner may require repositioning or "winging" the r-f rotor plates of the tuner. Since this is a critical adjustment, it should be performed carefully to avoid any damage to the plates. Only a slight movement of the rotor plates in either direction is necessary. A metal probe should be used to provide a means of adding capacitance to the r-f tuning gang, and thus indicating in which direction the response curve must be shifted in frequency with respect to the markers. The probe should be laid next to the segments of the rotor in the r-f tuning gang and the effect noted on the response curve. This procedure should be followed for each of the segmented rotor plates in the r-f sections. The plate which shows the most effect on the response curve should be adjusted or winged. Each rotor plate should be checked and the service technician should not attempt to make all of the corrective adjustments with only one rotor plate or rotor plate segment. If the response curve is high with respect to the i-f markers, the capacitance of the gang should be increased, and the slotted rotor plate segment or segments should be moved closer to the stator. If the response curve is low in frequency, with respect to the i-f markers, the capacitance should be decreased and the rotor plate segment or segments should be moved away from the stator. For r-f alignment of the tuner refer to the alignment chart No. 2 and figure 5.

Chart No. 1 - Oscillator Alignment

STEP	UHF TUNER DIAL SETTING	UHF SWEEP GENERATOR	UHF MARKER GENERATOR	I-F MARKER GENERATOR		ADJUST	REMARKS
				#1	#2		
1	Low end of Dial - Plates Fully closed	Approx. 467 mc.	470 mc.	41 mc.	46.5 mc.	P-1	Adjust for zero beat between 470 mc. R-F marker and 41 mc. I-F marker.
2	High end of Dial - 250° Rotation	Approx. 893 mc.	896 mc.	41 mc.	46.5 mc.	P-2	Adjust for zero beat between 896 mc. R-F marker and 41 mc. I-F marker.

Chart No. 2 - R.F. Alignment

STEP	UHF TUNER DIAL SETTING	UHF SWEEP GENERATOR	I-F MARKER GENERATOR		ADJUST	REMARKS
			#1	#2		
1	high end of dial 250° Rotation	approx. 893 mc.	41 mc.	46.5 mc.	P-3 and P-4	Adjust both trimmers for symmetrical band pass with markers in proper position. Figure 5.
2	1st slot - RF Rotor Plates 225° Rotation	approx. 850 mc.	41 mc.	46.5 mc.	*1st segments RF Rotor Plates	Use metal probe - note effect on response curve. Compensate in proper direction.
3	2nd slot - RF Rotor Plates 157.5° Rotation	approx. 735 mc.	41 mc.	46.5 mc.	*2nd segments RF Rotor Plates	Repeat step #2
4	3rd slot - RF Rotor Plates 112.5° Rotation	approx. 658 mc.	41 mc.	46.5 mc.	*3rd segments RF Rotor Plates	Repeat step #2
5	4th slot - RF Rotor Plates 67.5° Rotation	approx. 582 mc.	41 mc.	46.5 mc.	*4th segments RF Rotor Plates	Repeat step #2
6	5th slot - RF Rotor Plates 22.5° Rotation	approx. 505 mc.	41 mc.	46.5 mc.	*5th segments RF Rotor Plates	Repeat step #2
7	Fully closed 0° Rotation	approx. 467 mc.	41 mc.	46.5 mc.	*Last segments RF Rotor Plates	Repeat step #2

* NOTE: The correction of the response curve must be made with both R-F section segments. DO NOT attempt to make ALL the corrections with any ONE section.

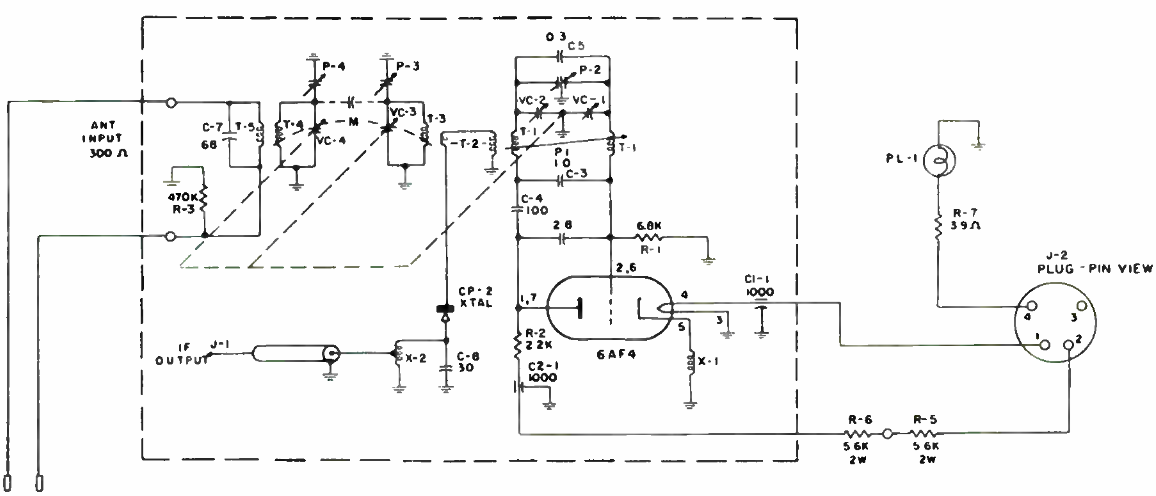


FIGURE 6—Schematic Diagram—Philco UHF Tuner Adaptor UT-26

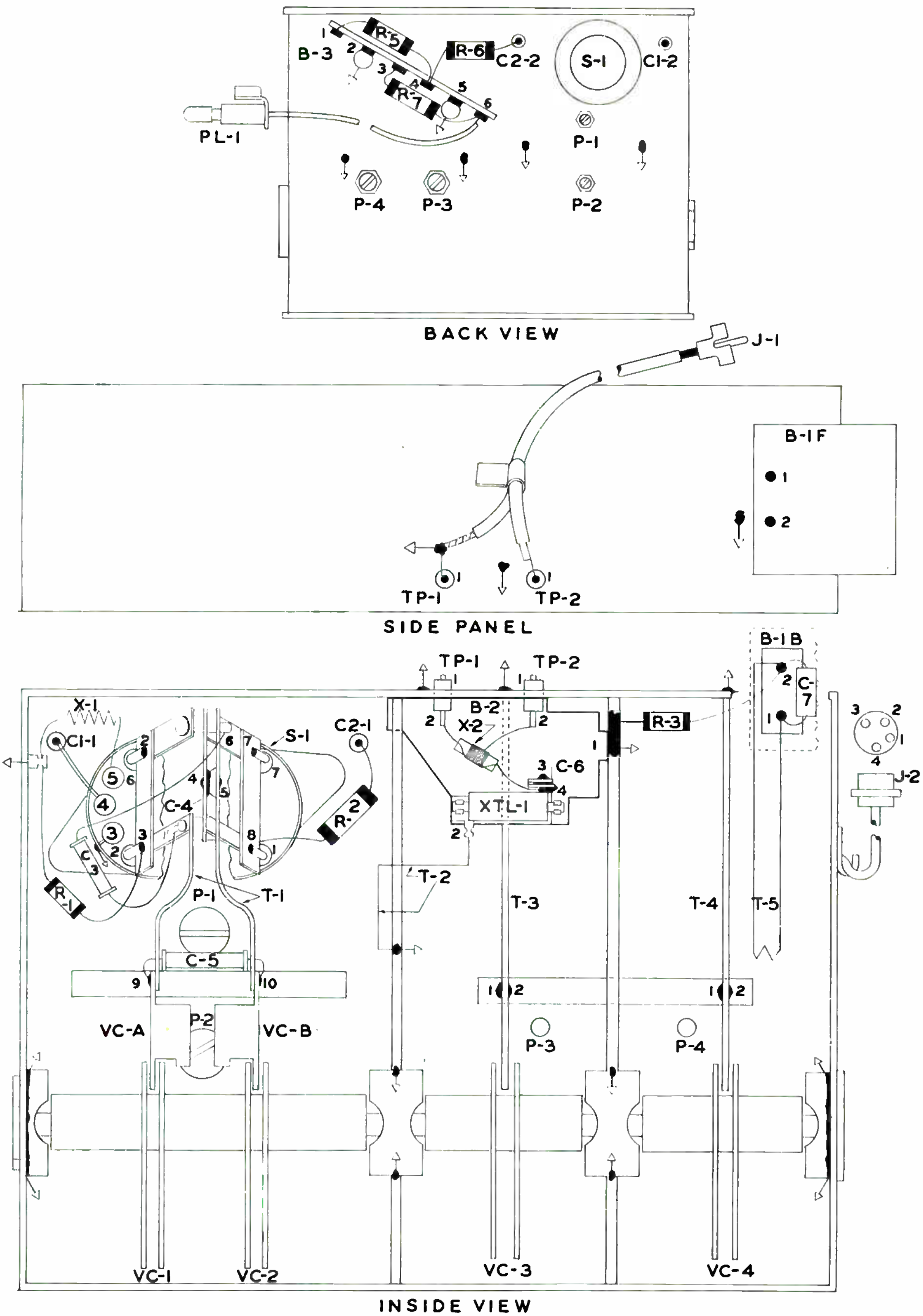
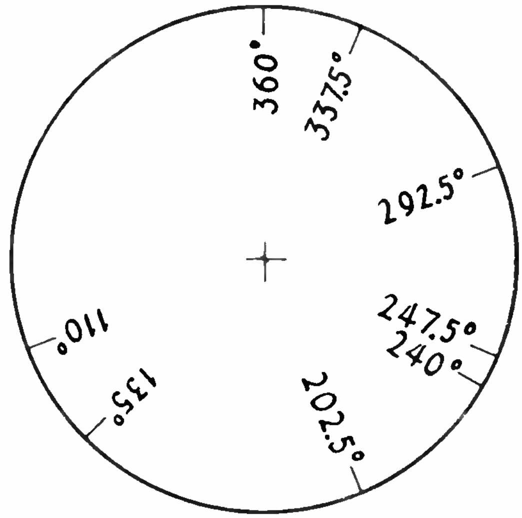


FIGURE 7—Base Layout, UT-26 UHF Tuner Adaptor

Dial Tracking Procedure

A calibrated scale may be used as a means of calibrating the correct degrees of rotation of the tuner rotor with respect to the channel frequencies. Figure 8. A pulley, Philco Part Number 56-9641-1 in addition to an extension shaft with a coupler attached, available through most parts supply houses, is ideal as a means of attaching the calibrated scale to the unit under test. A small piece of wire can be used as a pointer. It is important, when using the scale, that the pointer be set at 360° when the tuning gang is fully closed. The degrees of rotation with respect to the approximate frequency is shown in the following chart.

DEGREES ROTATION	APPROX. FREQUENCY MC.
360	467
337.5	505
292.5	582
247.5	658
240	675
202.5	735
135	850
110	893



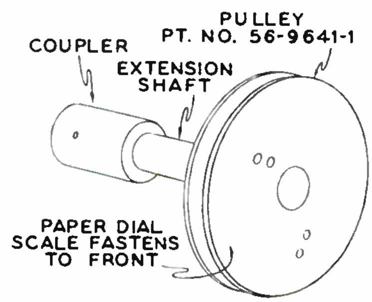


FIGURE 8—Dial Scale

Installation Instructions For UT-26 UHF Tuner Kit, Part No. 43-7146

THE TUNER KIT CAN BE INSTALLED WITHOUT REMOVING THE CHASSIS OR CABINET BACK

To install the UHF tuner, proceed as follows:

1. Lay a soft cloth on the floor; then turn the cabinet so that the bottom is accessible and lay the cabinet on the cloth. Make sure power is turned off to the receiver.

2. Loosen the screws that secure the cover plate to the bottom of the cabinet, slide the cover plate forward, lift up at rear to clear the rear screw heads, and then rotate the plate to provide access to chassis.

3. Preset the UHF dial that is mounted on the chassis by rotating the UHF dial shaft counterclockwise (as viewed from front of receiver) until it stops.

4. Rotate the VHF FINE TUNING knob counterclockwise until the UHF dial pulley stops, and then turn clockwise if necessary, to align the slotted openings on the pulley so that it is in line with the edge of the bracket on which it is mounted. See figure 9.

5. Remove the UHF tuner from the packing in the kit; then rotate the tuner drive assembly by turning the pointed end bracket counterclockwise (as viewed from front) until it stops.

NOTE: If, during rotation, the assembly suddenly seems to require more pressure to turn, this is due to the dual-speed drive action of the UHF tuner.

6. Remove the UHF antenna lead from under the dress lug at the point shown, dress the lead through the slot on the panel at the rear of the UHF tuner as shown in the illustration, and slide the UHF antenna-lead plugs onto the pins on the panel. After removing the UHF antenna lead, make sure that the rest of the leads that were under the dress lug are replaced.

7. Position the tuner for mounting so that the cables will come out through the bottom; then insert the tuner as follows:

A. Tilt the tuner so that the tube and tube shield may be inserted through the chassis opening.

B. Push the tuner through the opening until it is properly centered, then push the tuner toward the rear of the chassis so that the pointed ends of the bracket on the UHF tuner may be lined up with the rubber grommets on the pulley assembly.

C. Push the unit forward until the flats on the shaft are properly seated, see illustration.

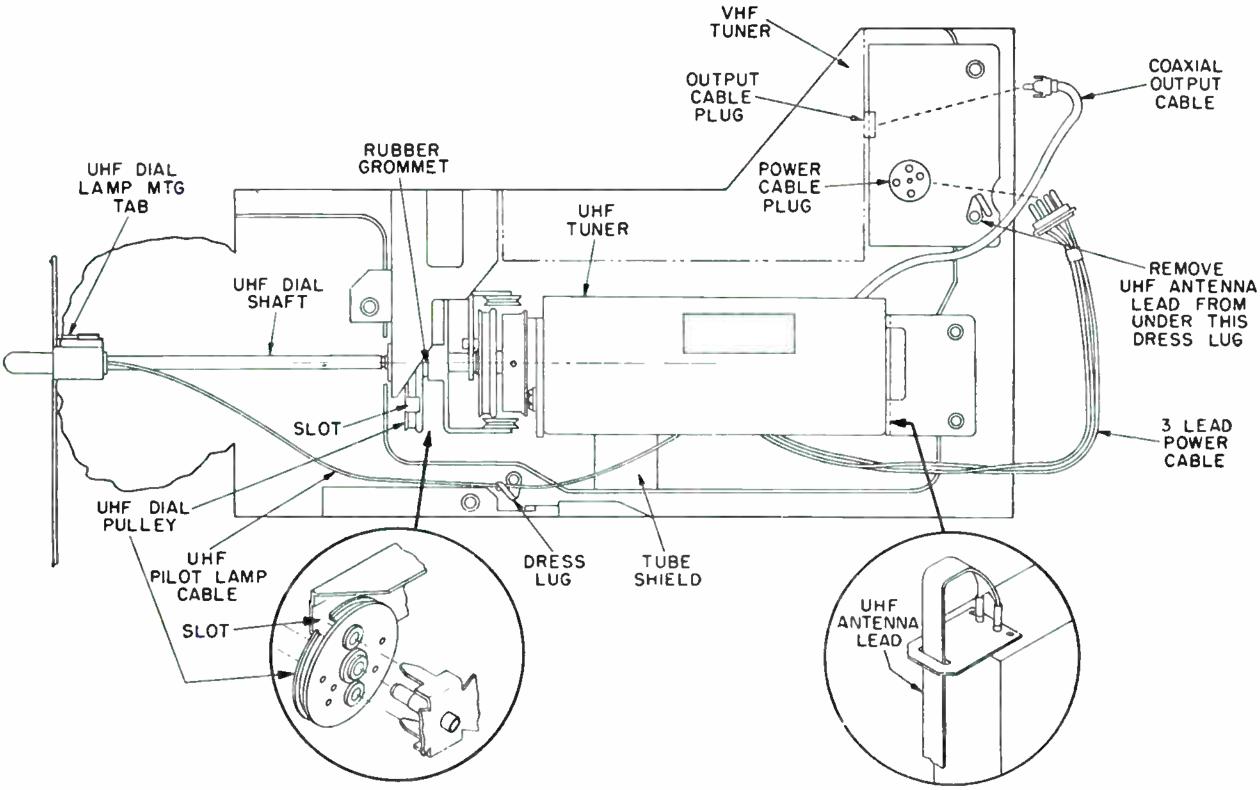


FIGURE 9—UHF Assembly as Viewed through Bottom of Cabinet

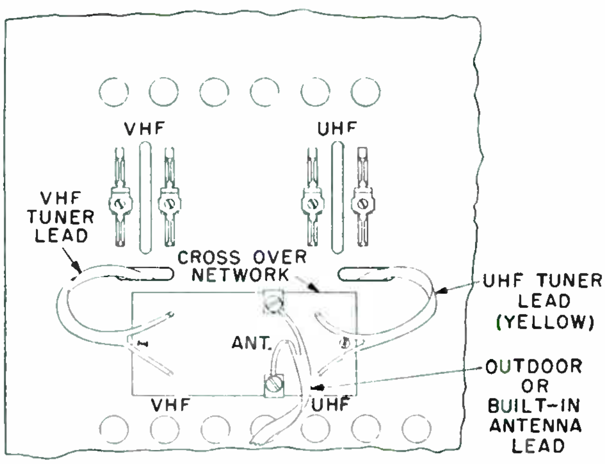


FIGURE 10—Antenna Lead Connections for Common VHF and UHF Operation

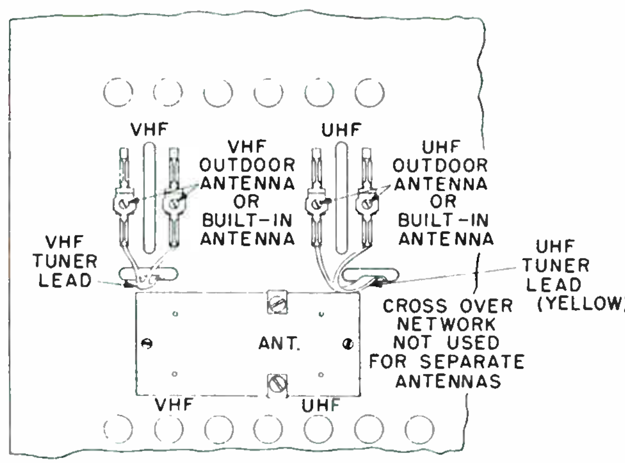


FIGURE 11—Antenna Lead Connections for Separate VHF and UHF Antenna Operation

NOTE: To align the flat on the UHF dial drive shaft with the flat on the UHF tuner shaft, it may be necessary to rotate the dial drive shaft slightly.

8. When the flats on both the pulley assembly and drive assembly are properly seated, secure the rear of the tuner to the chassis with the two self-tapping screws supplied. If the holes on the UHF tuner mounting bracket will not align with the holes in the chassis sub-base, this indicates that the flats are not seated properly.

9. Insert the power cable of the UHF tuner into the socket located on the rear mounting bracket at the bottom of the VHF tuner; then connect the coaxial output cable of the UHF tuner to the jack at the rear of the VHF tuner.

10. Place the UHF dial pilot-lamp assembly on the tab located under the UHF tuner dial, and place the dial-lamp cable under the dress lug, as shown.

11. After making sure that all the cables are connected, turn the receiver on, place the CHANNEL SELECTOR to the UHF position, and adjust the pilot-lamp assembly by pushing the assembly in and out until the dial numbers are properly projected on the center of the UHF dial screen across the complete range. It may be necessary to rotate the housing slightly to obtain the best focus.

CAUTION: While adjusting the pilot-lamp, be careful that no contact is made with high-voltage points on the chassis.

12. Mount the antenna crossover network panel to the cabinet back by proceeding as follows:

Insert the mounting grommets into the square holes provided in the cabinet back; position the grommets so that their long dimensions are vertical. Position the crossover network as shown, and using the screws provided, secure the network to the cabinet back by driving the screws through the mounting holes and into the grommets. The screws, when tightened, will spread the grommets and secure the assembly to the cabinet back.

13. Take up the excess slack in the UHF tuner lead by pulling the lead outward from the outside of the cabinet back.

14. If one antenna is to be used for both VHF and UHF, refer to figure 2 and proceed as follows:

A. Connect the leads of the outside or built-in antenna to the screw lugs on the crossover panel.

B. Connect the antenna lead of the VHF tuner to the pins on the side of the crossover panel marked "VHF".

C. Connect the antenna lead (yellow) of the UHF tuner to the pins on the side of the crossover panel marked "UHF".

If separate antennas are to be used for VHF and UHF, do not make any connections on the crossover panel, see figure 3. Connect the VHF antenna transmission line to the screw terminals on the VHF antenna connector and insert the metal tips of the VHF tuner leads into the metal clips of the VHF antenna connector. Connect the UHF antenna transmission line to the screw terminals on the UHF antenna connector, and insert the metal tips of the UHF tuner leads (yellow) into the metal clips on the UHF tuner antenna connector.

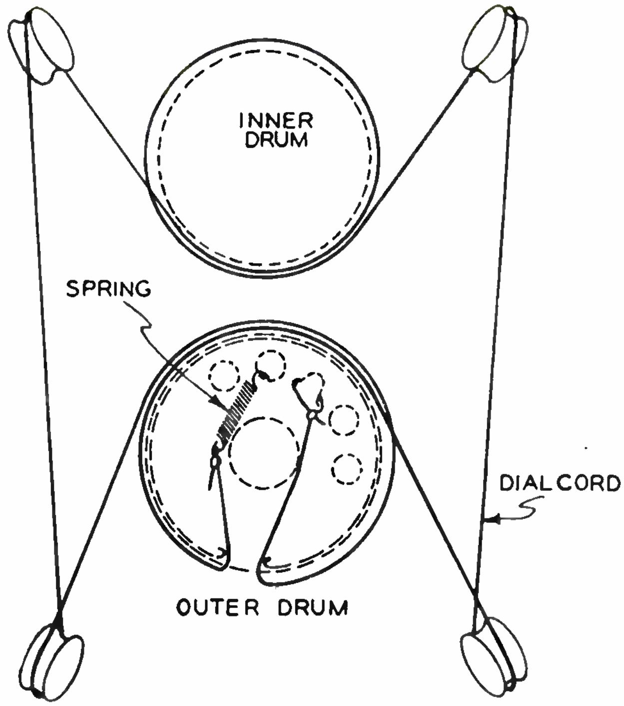


FIGURE 12—An Exploded View of Dial Cord Arrangement. Dial Cord length: 22 inches, from the inside of the two loop knots.

Replacement Parts List

Reference Symbol	Description	Service Part No.
X-2	coil, output, i-f	32-4558-1
X-1	choke, cathode decoupling	32-4550-6
T-2	coil, injector and mixer coupling	32-9668
R-2	resistor, plate feed	66-2224340
R-1	resistor, grid leak	66-2688340
R-5	resistor, B plus dropping	66-2565340
R-6	resistor, B plus dropping	66-2565340
R-7	resistor, pilot dropping	66-9393360
C1-1	capacitor, heater feed through	30-1245-6
C2-1	capacitor, plate feed through	30-1245-6
C-3	capacitor, 1.0 mmfd. temp. comp.	30-1224-107
C-5	capacitor, .3 mmfd. temp. comp.	30-1224-122
P2	padder oscillator high end	56-9601-4
P1	padder oscillator low end	56-9601-3
	MISCELLANEOUS	
Electrical Parts		
	cable, i-f	41-3754-56
B-1F	antenna coil and panel assembly	76-9147
XTL-1	crystal	34-8026
	cable, power	41-4141-8
PL-1	socket assembly, pilot lamp	76-2142-6
PL	pilot lamp	32-2064
	connector, antenna	L3517FA1
	crossover, network	76-9042

Reference Symbol	Description	Service Part No.
Mechanical Parts		
	tuner assembly	76-9017
B-2	panel, crystal mounting	76-8809
	cover, tuner	56-9619-5
	shield tube	56-5629-9
	pulley	76-9036
S1	socket, tube	27-6288
	oscillator stator	28-9933
	oscillator stator opp. hand	28-9933-1
	oscillator tank	76-8899
	spring, ground	28-9947
	spring, ground	28-10136
	bearing, rear	56-9609
	nut, rear lock	56-9599
	bearing plate front	28-9842-1
	ball bearings (9) used	W2510-5
	screw, padding	28-10028
	shield cup, tuner	28-9993
	shaft and rotor assembly	76-9029
	pulley stationary	54-9247
	bracket and pulley assembly	76-9054
	"E" washer, retaining	1W60980FE7
	spring, drive cord	56-3167

Printed in U.S.A.

PRODUCTION CHANGES IN R-194 R-F CHASSIS

REASON FOR CHANGE	DESCRIPTION OF CHANGE	NEW OR ADDED PART NO.	OLD OR REMOVED PART NO.	RUN NO.
To facilitate production.	*1000-ohm, 7-watt resistor, in series with R212, was removed. Resistor R212 was changed from 2K to 3.3K. Note: Early production used a 1000-ohm, 7-watt resistor in series with R212 (2K) to make up the required amount of resistance (approx. 3K) for R212.	33-3446-10	33-3446-8	2
To prevent video oscillation.	B-plus lead to screen grid of 2nd video i-f tube (V4), was dressed outside of i-f shield (away from crystal detector).			3
To prevent video oscillation.	All Run 1 and 2 chassis were reworked to include new lead dress of 2nd video i-f screen-grid B-plus lead, outside of i-f shield.			1X and 2X
To improve sound gain, reduce sync buzz, and improve sync performance.	Resistor R601 was changed from 27K to 15K. Resistor R304 was removed. Condenser C406 was changed from 150 $\mu\mu$f. to 330 $\mu\mu$f. Condenser C401 was changed from 18 $\mu\mu$f. to 10 $\mu\mu$f. Condenser C402 was changed from .01 μf. to .0022 μf. Wiring on lugs of sound take-off coil, L400, were reversed.	66-3158340 62-133001001 62-010409001 30-4650-54	66-3278346 66-3478346 62-115001011 62-018409011 30-4671-41	4

*This change was incorporated into Service Manual PR-2522.

FILE 88 PRODUCTION CHANGES IN R-194 R-F CHASSIS PR-2520-I

Printed in U.S.A.

PRODUCTION CHANGES IN D-204 DEFLECTION CHASSIS

REASON FOR CHANGE	DESCRIPTION OF CHANGE	NEW OR ADDED PART NO.	OLD OR REMOVED PART NO.	RUN NO.
To eliminate picture bend.	Condenser C803 was changed from .001 μf. to .002 μf.	30-1238-12	30-1238-3	2
To prevent burning of 12B4-tube cathode-resistor due to operational tube failure.	Wattage rating of resistor R709 was increased from 1 watt to 2 watts.	66-1475340	66-1474340	

Printed in U.S.A.

PRODUCTION CHANGES IN R-204 R-F CHASSIS

REASON FOR CHANGE	DESCRIPTION OF CHANGE	NEW OR ADDED PART NO.	OLD OR REMOVED PART NO.	RUN NO.
To improve fringe area performance.	Condenser C226 was changed from 18 $\mu\mu$f. to 33 $\mu\mu$f.	62-033409011	62-018409011	2

FILE 9A PRODUCTION CHANGES IN R-204 R-F CHASSIS

PR-2520-J

PRODUCTION CHANGES IN D-208 DEFLECTION CHASSIS

REASON FOR CHANGE	DESCRIPTION OF CHANGE	NEW OR ADDED PART NO.	OLD OR REMOVED PART NO.	RUN NO.
To reduce buzz.	*A 680-ohm damping resistor was added, across secondary of vertical output transformer, T701.	66-1688340		2
To eliminate picture bend.	*Condenser C803 was changed from .001 µf. to .002 µf.	30-1238-12	30-1238-3	3
To increase picture width.	*Condenser C813 was changed from 68 µµf. to 82 µµf.	30-1246-6	30-1246-5	4
To improve vertical retrace suppression.	Condenser C705 was changed from .01 µf. to .033 µf.	30-4650-44	30-4650-41	
To reduce buzz.	Resistor R705 was removed.		66-1688340	
To increase picture width.	All Run 1, 2, and 3 chassis were reworked by changing condenser C813 from 68 µµf. to 82 µµf.	30-1246-6	30-1246-5	1Z, 2Z, and 3Z
To reduce Barkhausen oscillation.	A .002 µf. condenser was added, from screen grid of 6CD6G tube (V19) to ground.	30-1238-12		5
To prevent possible breakdown of B-plus boost condenser.	One lead of condenser C812 was removed from ground and rewired to B plus.			6
To prevent possible breakdown of B-plus boost condenser.	All available Run 1Z, 2Z, and 3Z chassis were reworked by removing one lead of condenser C812 from ground and rewiring to B plus.			1ZY, 2ZY, 3ZY, 4Y, and 5Y
To eliminate Barkhausen oscillation.	An r-f choke was added, in filament circuit of 6CD6G tube (V19).	32-4112-51		7

*These changes were incorporated in Service Manual PR-2527.

PRODUCTION CHANGES IN R-207 R-F CHASSIS

REASON FOR CHANGE	DESCRIPTION OF CHANGE	NEW OR ADDED PART NO.	OLD OR REMOVED PART NO.	RUN NO.
To prevent overload of contrast control.	An 1800-ohm ±10%, 1-watt resistor was added, in series with video output tube (V8) screen supply.	66-2184340		2

FILE 10A & 11A PRODUCTION CHANGES IN R-207 R-F CHASSIS

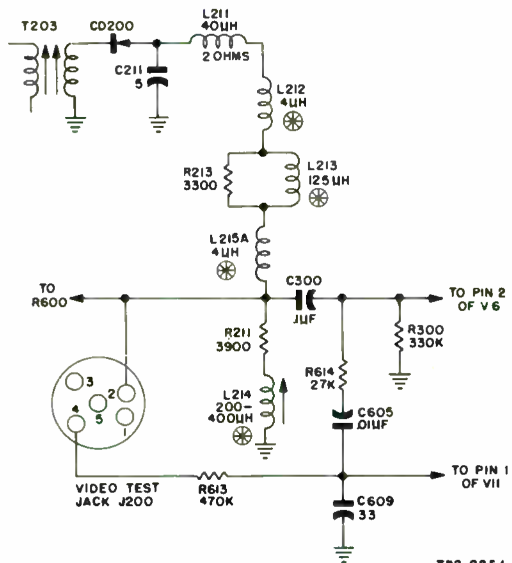
Printed in U.S.A.

PRODUCTION CHANGES IN D-181 DEFLECTION CHASSIS

REASON FOR CHANGE	DESCRIPTION OF CHANGE	NEW OR ADDED PART NO.	OLD OR REMOVED PART NO.	RUN NO.
To improve vertical retrace suppression.	Resistor R720 was changed from 22K to 15K.	66-3158340	66-3228346	5
To improve range of width control.	Width control, R817, was changed from 10K to 12.5K. Resistor R816 was changed from 4200 ohms to 5000 ohms.	33-5546-51 33-1335-118	33-5546-41 33-1335-101	6
To improve range of brightness control.	Resistor R818 was changed from 12K to 8200 ohms.	66-2828340	66-3128346	7
To increase rectifier life.	Selenium rectifiers CR100 and CR101 were changed.	34-8003-7	34-8003-16	8
To eliminate picture bend.	Condenser C802 was changed from .001 μf. to .002 μf.	30-1238-12	30-1238-3	9
To center range of vertical hold control.	Resistor R706 was changed from 510K to 390K.	66-4398340	66-4518240	10
To reduce 1B3GT tube filament voltage.	Resistor R103 was changed from 4.7 ohms to 5.6 ohms.	66-9563240	66-9473340	11
To increase rectifier life.	Selenium rectifiers CR100 and CR101 were changed from 350-ma. to 450-ma. rating.	34-8003-8	34-8003-7	12
To increase range of height control.	Resistor R710 was changed from 270K to 390K.	66-4398340	66-4278340	13

Printed in U.S.A.

PRODUCTION CHANGES IN R-181 R-F CHASSIS

REASON FOR CHANGE	DESCRIPTION OF CHANGE	NEW OR ADDED PART NO.	OLD OR REMOVED PART NO.	RUN NO.
To improve range of contrast control.	Resistor R302 was changed from 390 ohms to 470 ohms.	66-1478340	66-1398346	16
To improve vertical retrace suppression.	Resistor R310 was changed from 10K to 15K.	66-3158340	66-3108346	17
To reduce Channel 5 picture beat.	Terminal board B9 was changed from 2-lug to 3-lug type. Additional series peaking coil (L215A) was added.  TP3-2854 Revised wiring of video detector circuit using additional peaking coil.	324112-50		18
To improve range of brightness control.	Resistor R311 was changed from 22K to 27K.	66-3278340	66-3228346	19

Printed in U.S.A.

PRODUCTION CHANGES IN D-201 DEFLECTION CHASSIS

REASON FOR CHANGE	DESCRIPTION OF CHANGE	NEW OR ADDED PART NO.	OLD OR REMOVED PART NO.	RUN NO.
	First production.			5
To improve operation of vertical oscillator.	Vertical-oscillator (V15) tube socket was rotated 180° in chassis subbase. Tube pins 1, 2, and 3 are now used for phase splitter, and pins 6, 7, and 8 are used for vertical oscillator.			6
To improve range of width control.	Width control, R815, was changed from 10K to 12.5K.	33-5546-51	33-5546-41	
To eliminate possible shorts.	Condensers C705, C706, and C819 were moved from rear to front of chassis subbase.			7
To eliminate picture bend.	Condenser C803 was changed from .001 μf. to .002 μf.	30-1238-12	30-1238-3	8
To reduce 1B3GT tube filament voltage.	Resistor R103 was changed from 4.7 ohms to 5.6 ohms.	66-9563240	66-9473340	9
To prevent burning of 12B4-tube cathode-resistor due to operational tube failure.	Wattage rating of resistor R709 was increased from 1 watt to 2 watts.	66-1475340	66-1494340	10

PRODUCTION CHANGES IN R-201 R-F CHASSIS

REASON FOR CHANGE	DESCRIPTION OF CHANGE	NEW OR ADDED PART NO.	OLD OR REMOVED PART NO.	RUN NO.
To improve operation and to improve video transient response.	*First video i-f transformer, T201, was changed. *Tolerance of C302, .015 μf., was changed from $\pm$20% to $\pm$10%.	32-4598-5 30-4651-21	32-4548-28 30-4650-25	2
To eliminate possibility of video oscillation at minimum contrast.	*A 3300-ohm $\pm$10%, ½-watt resistor was added, across video series peaking coil, L306.	66-2338340		3
To prevent overload of contrast control.	An 1800-ohm $\pm$10%, 1-watt resistor was added, in series with video output tube (V8) screen supply.	66-2184340		4
To improve fringe area performance.	Condenser C206 was changed from 18 $\mu\mu$f. to 33 $\mu\mu$f.	62-033009001	62-018409011	5

*These changes were incorporated in Service Manual PR-2508.

PHILCO TELEVISION SERVICE MANUAL

FOR UHF TUNER SUB-ASSEMBLY T-24 PART NO. 76-8806
USED IN UHF TUNER ADAPTOR UT20B

INTRODUCTION

The T-24 UHF Tuner Sub-assembly, Part No. 78-8806 is used interchangeably with the T-20 Tuner Sub-assembly, Part No. 76-7595, as employed in the UT20B UHF Tuner-Adaptor installed in Philco television receivers with chassis codes 141 or 150. The sub-assembly contains the r-f, oscillator and mixer stages of the UHF Tuner-Adaptor.

CIRCUIT DESCRIPTION

The incoming UHF signal is coupled through the antenna input line, two 12 mmfd. condensers and an antenna coupling inductance L1 to the first r-f tank of the tuner. See figures 5 and 6. The first r-f tank, or antenna tank, is coupled to the mixer tank by means of the mutual coupling of L2 and L3 and the stray capacitance existing between the two tank assemblies. The desired signal is selected by tuning the antenna tank and the mixer tank to the correct frequency, and the signal is then coupled to the crystal mixer circuit by means of the inductive coupling of L3 and L4. A 6AF4 tube, V1, and its associated circuit provide the local oscillator signal. The oscillator circuit is coupled to the crystal mixer circuit by L5 and L6. In the crystal mixer circuit, the r-f signal and the oscillator signal are mixed to produce a 45.75-mc. video i-f carrier signal. The signal is then coupled to the VHF tuner through L8, a coaxial cable and J500 on the VHF tuner. In UHF operation, the local oscillator of the VHF tuner is inoperative, and the r-f amplifier and mixer tubes of the VHF tuner operate as i-f amplifiers.

In order to prevent the i-f and oscillator signals from feeding back to the antenna and interfering with other receivers, two tanks, the antenna and mixer tanks, are employed. The two tanks readily pass incoming signals, but do not pass the i-f or oscillator signal.

The tuning condensers for the antenna, mixer and oscillator tanks are ganged on a single tuning shaft, part of a planetary drive assembly, which permits both fine and coarse tuning by means of a single control knob.

PROCEDURE FOR OSCILLATOR ALIGNMENT OF THE T-24 UHF TUNER SUB-ASSEMBLY

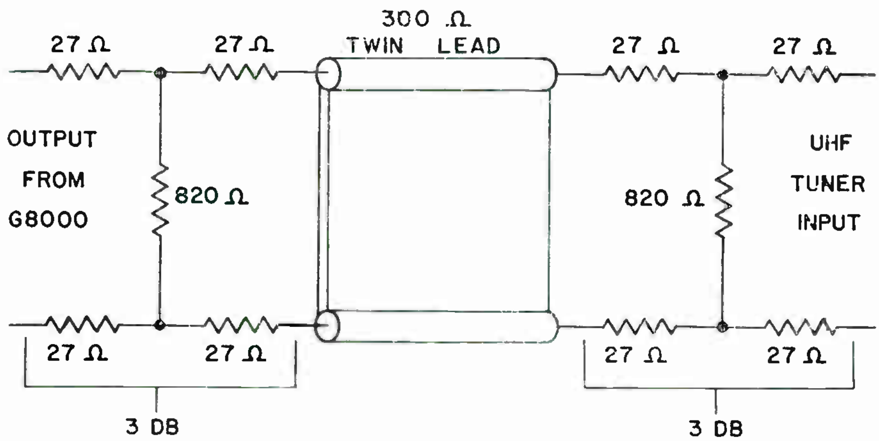


Figure 1—6DB Pad

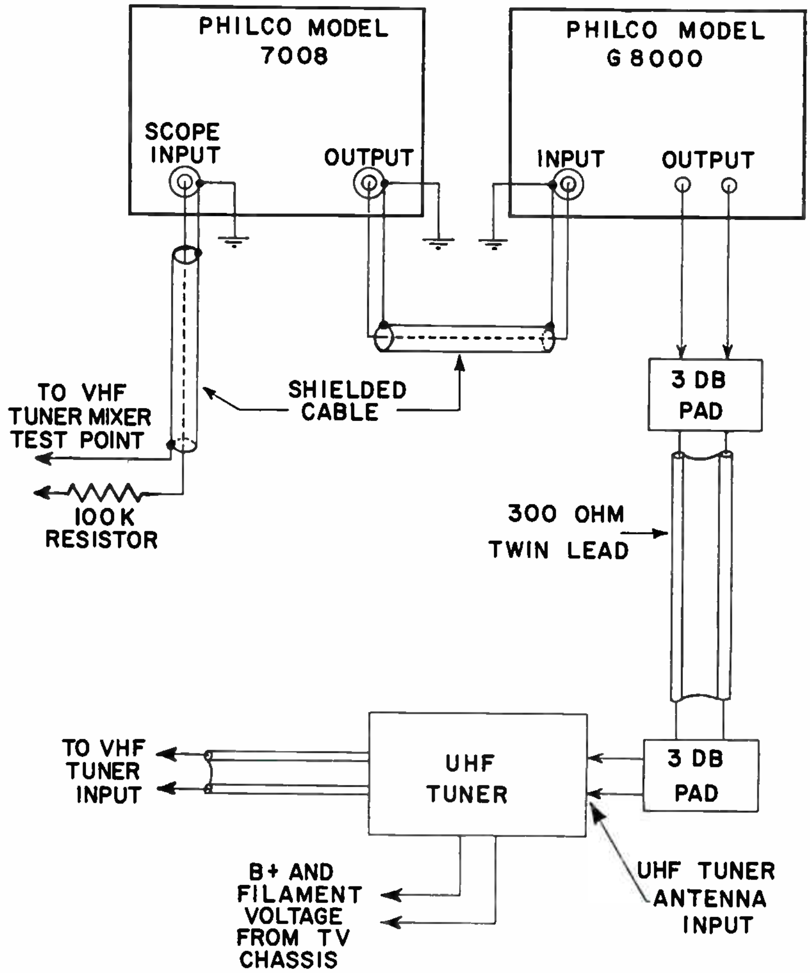


Figure 2—UHF Test Equipment Connections

TEST EQUIPMENT AND PRELIMINARY INFORMATION

Proper alignment of the T-24 UHF Tuner Sub-assembly requires adequate test equipment. The test equipment should include a Philco Model 7008 sweep generator and oscilloscope, a Philco Model G-8000 VHF to UHF signal generator adaptor or an equivalent UHF sweep and marker generator, an oscilloscope, a 6 DB pad, and a television chassis as a source of power for the UHF unit under test.

The output cable of the model 7008 is fed to the model G-8000 with the shortest possible cable in order to reduce standing wave ratio. The output of the Model G-8000 adaptor is fed through a 6 DB pad to the UHF tuner input. The construction of the 6 DB pad is illustrated in figure 1. The oscilloscope input of the Model 7008 is connected to the mixer test point of the VHF tuner on the television chassis through a series isolating resistor of 100,000 ohms. In figure 2 the hook up of the test equipment is illustrated.

Calibration of the test equipment is necessary for accurate check of the UHF units. The response curve of the VHF tuner should be checked

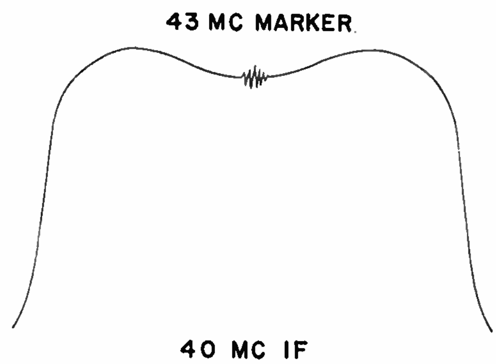


Figure 3—Position of Marker Frequency

first in accordance with alignment specifications to eliminate possible false indications from this source.

In order to calibrate the Model 7008, set the function switch to "Calibrate" position, with the marker band switch to "B" position and calibrate the marker at the 43.333 megacycle crystal check point.

Turn the function switch to "Marker" position. Next, turn the sweep generator portion of the 7008 to the "A" band, with the sweep control to 43 megacycles.

The calibration of the G-8000 can be simply performed by plotting it against a UHF tuner or converter that is known to be good. The G-8000 should be calibrated at both the high and low ends of the UHF band and also at the points where the local UHF stations occur.

This calibration can be performed by either beating the outputs of the G-8000 and the "standard" UHF adaptor together or by feeding the Model G-8000 adaptor output to the standard unit and checking for maximum indication with an oscilloscope or meter at the output of the standard unit.

NOTE: Replacing the oscillator tube with a new one may detune the tuner. If this occurs, a number of tubes should be tried, until the most satisfactory substitute for the original is found.

To proceed with the alignment refer to the oscillator alignment chart.

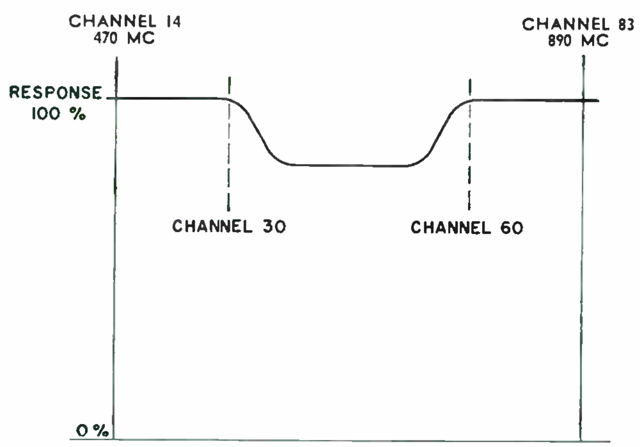


Figure 4—Response Through UHF Channels 14 to 83

OSCILLATOR ALIGNMENT CHART

STEP	VHF TUNER CHANNEL SELECTOR	UHF TUNER DIAL SETTING	G-8000 (or equivalent) DIAL SETTING	7008 (or equiv.)		ADJUST	REMARKS
				Marker	Sweep		
1	UHF	Tuning Gang fully closed	Low Freq. Cal. Point	43.333	Approx. 44 Mc.	TC-4	Center Marker on Response curve (See fig. 3).
2	UHF	Tuning Gang fully open	High Freq. Cal. Point	43.333	Approx. 44 Mc.	TC-3	Center Marker on Response curve (See fig. 3).
3	UHF	Tune Through Entire Range	Tune Through Entire Range	43.333	Approx. 44 Mc.	None	UHF tuner and G-8000 are Tuned through range simultaneously. Marker should not fall below the top 10 percent of the response curve.

NOTE: When tuning through the entire range of UHF channels, a drop in amplitude will be noticed between approximately channel 30 and channel 60. See fig. 4. This effect is due to the characteristics of the test equipment, UHF unit and lead terminating impedances and does not necessarily indicate trouble with the unit under test.

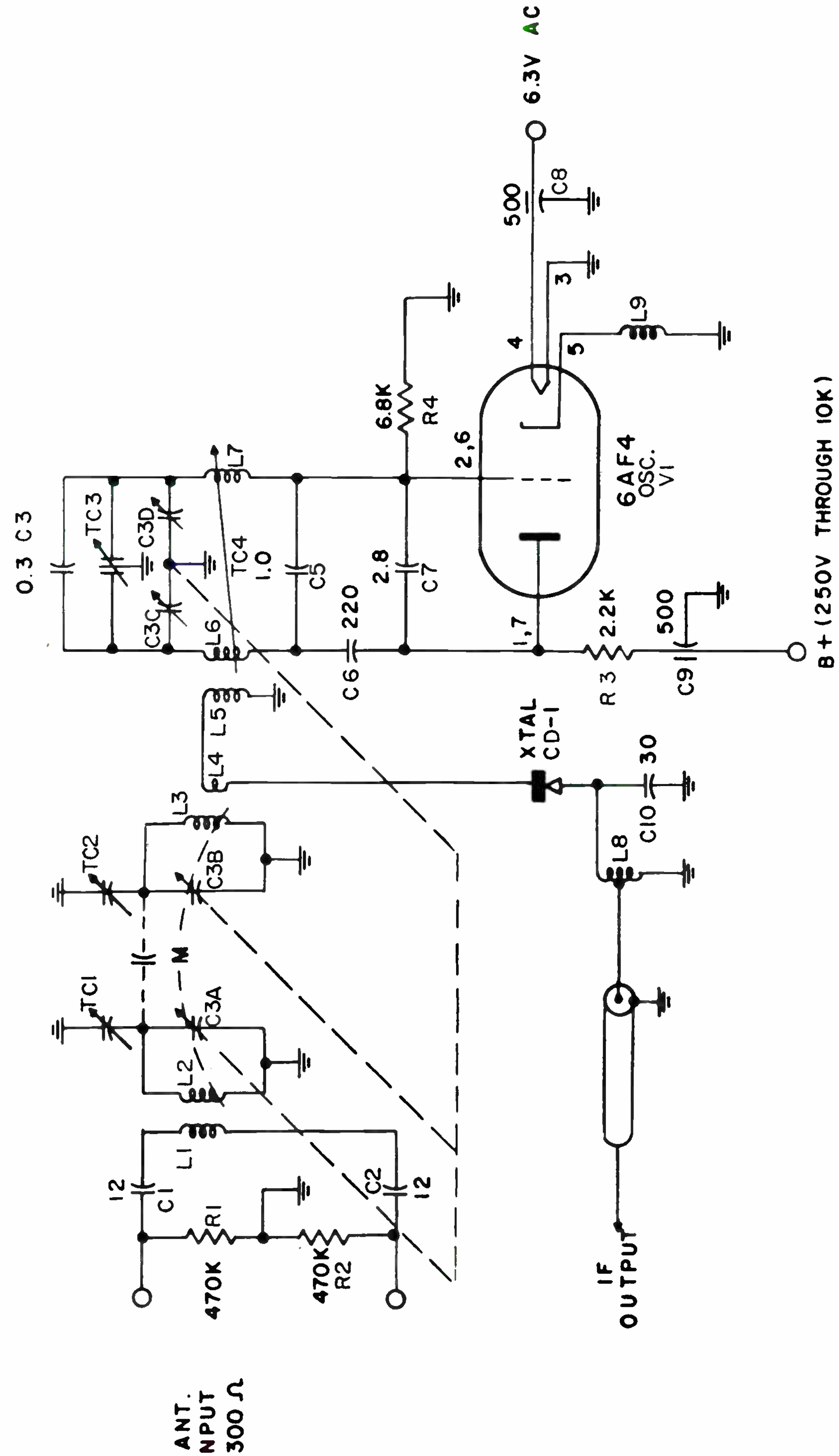


Figure 5—Circuit Diagram

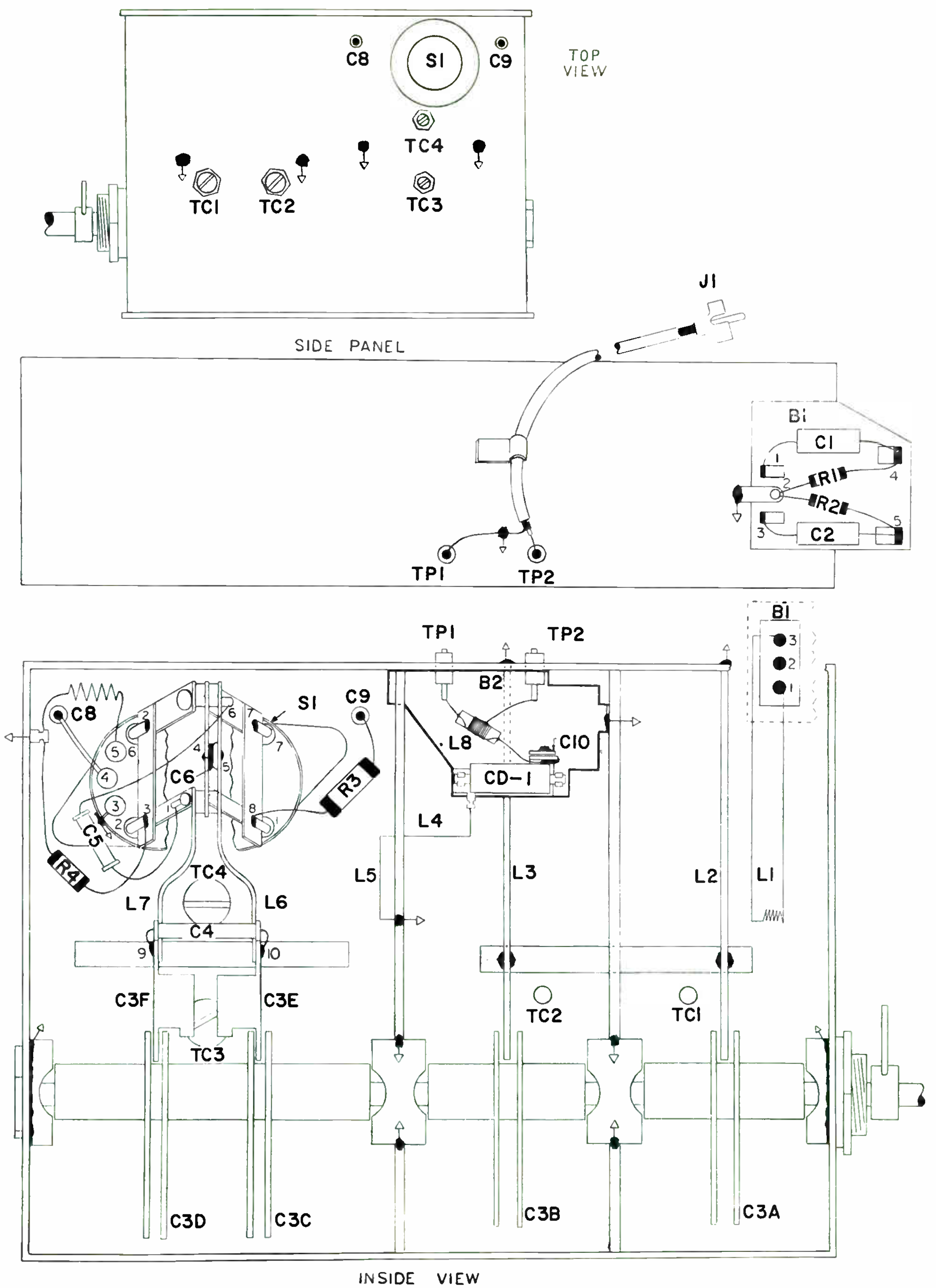


Figure 6—Base Layout

REPLACEMENT PARTS LIST

REFERENCE SYMBOL	DESCRIPTION	SERVICE PART NO.
C1 and C2	Condensers, antenna input, 12uuf.	Part of antenna coil & panel assembly.
C3	Condenser, tuning	
C3A	Rotor, r-f, r.h.	Part of shaft and rotor assembly
C3B	Rotor, r-f, l.h.	Part of shaft and rotor assembly
C3C	Rotor, oscillator, r.h.	Part of shaft and rotor assembly
C3D	Rotor, oscillator, l.h.	Part of shaft and rotor assembly
C3E	Stator, oscillator, r.h.	28-9933
C3F	Stator, oscillator, l.h.	28-9933-1
C4	Condenser, temperature compensating, .3uuf.	30-1224-122
C5	Condenser, temperature compensating, 1uuf.	30-1224-107
C6	Condenser, 220uuf.	Part of oscillator tank assembly
C7	Condenser, capacity between osc. tank halves	Part of oscillator tank assembly
C8	Condenser, filament by-pass, 500uuf.	30-1245-6
C9	Condenser, plate by-pass, 500uuf.	30-1245-6
C10	Condenser, crystal by-pass, 30uuf.	Part of panel assembly crystal mtg.
TC-1	Tuning core, first r-f tank	28-10028
TC-2	Tuning core, second r-f tank	28-10028
TC-3	Tuning core, oscillator, high end	56-9601-4
TC-4	Tuning core, oscillator, low end	56-9601-3
R1 and R2	Resistors, antenna input, 470,000 ohms	Part of antenna coil & panel assembly
R3	Resistor, plate load, 2200 ohms, 1 watt	66-2224340
R4	Resistor, grid leak, 6800 ohms, ½ watt	66-2688340
L1	Inductor, antenna coupling	Part of antenna coil & panel assembly
L2 and L3	Inductors, r-f stage	Part of tuner sub-assembly
L4 and L5	Inductor, injection and mixer coupling	32-9668
L6 and L7	Inductors	Part of oscillator tank assembly
L8	Coil, i-f output	32-4558-1
L9	Choke, cathode decoupling	32-4550-6
CD1	Crystal, mixer	32-8026

MISCELLANEOUS

Electrical Parts

Panel assembly, crystal mounting	76-8809
Tank assembly, oscillator	76-8899
Cable assembly, i-f output	41-3754-56
Antenna coil and panel assembly	76-8803

Mechanical Parts

Tuner shaft and rotor assembly	76-8910
Ball, bearing (9)	W2510-5
Bearing, plate front	28-9842
Nut, rear lock	56-9599
Bearing, rear	56-9609
Spring, rotor shaft grounding	28-9947
Pulley	28-9090-1
Socket, 7 pin miniature	27-6288
Shield, 6AF4 tube	56-5629-9

SERVICE REFERENCE CHART AND CABINET PARTS LIST FOR PHILCO "C" LINE TELEVISION RECEIVERS

PHILCO Factory-Supervised Service

TELEVISION

FILE C-1

SERVICE REFERENCE CHART AND CABINET PARTS LIST FOR "C" LINE TV RECEIVERS

PR 2835

SERVICE REFERENCE CHART FOR PHILCO "C" LINE TELEVISION RECEIVERS

MODEL	CODE	CHASSIS	TUNER PART NO.	PICTURE TUBE	SERVICE MANUAL
22C4010	130	R181, D181, D182	76-7664-2	21WP4	PR-2506
22C4010	131	R181, D182	76-7664-2	21XP4	PR-2506 & PR-2807
22C4010L	130	R181, D181, D182	76-7664-2	21WP4	PR-2506
22C4010L	131	R181, D182	76-7664-2	21XP4	PR-2506 & PR-2807
22C4012	130	R181, D181	76-7664-2	21WP4	PR-2506
22C4012	131	R181, D181, D182	76-7664-2	21XP4	PR-2506 & PR-2807
22C4014	131 130	R181, D182 R181, D181, D182	76-7664-2 76-7664-2	21XP4A 21WP4	PR-2807 PR 2807
22C4016	350	350	76-8946-2	21ZP4B	PR-2808
22C4016L	350	350	76-8946-2	21ZP4B	PR-2808
22C4020	400	400	76-8946-3	21ZP4B	PR-2809
22C4119	300	300	76-8946-1	21XP4	PR-2812
22C4120	300	300	76-8946-1	21YP4A	PR-2812
22C4120L	300	300	76-8946-1	21YP4A	PR-2812
22C4122	130 131	R181, D181, D182 R181, D182	76-7664-2 76-7664-2	21ZP4B 21XP4A	PR-2506 & PR-2807 PR-2506 & PR-2807
22C4123	300	300	76-8946-1	21YP4A	PR-2812
22C4124	300 350	300 350	76-8946-1 76-8946-1	21YP4A 21ZP4B	PR-2812 PR-2808
22C4124L	350 300	350 300	76-8946-1 76-8946-2	21ZP4B 21ZP4B	PR-2808 PR-2812
22C4126	350	350	76-8946-2	21ZP4B	PR-2808
22C4126L	350	350	76-8946-2	21ZP4B	PR-2808
22C4128	400	400	76-8946-3	21ZP4B	PR-2809
22C4132L	400	400	76-8946-3	21ZP4B	PR-2809
22C4310	300	300	76-8946-1	21YP4A	PR-2812
22C4310L	300	300	76-8946-1	21YP4A	PR-2812
22C4312	350	350	76-8946-2	21XP4A	PR-2808
22C4312L	350	350	76-8946-2	21ZP4B	PR-2808
24C6010	354	354	76-8946-2	24VP4A	PR-2808
24C6109	354	354	76-8946-2	24VP4A	PR-2808
24C6109L	354	354	76-8946-2	24VP4A	PR-2808
24C6110	354	354	76-8946-2	24VP4A	PR-2808
24C6110L	354	354	76-8946-2	24VP4A	PR-2808
24C6112	354	354	76-8946-2	24VP4A	PR-2808
24C6310	354	354	76-8946-2	24VP4A	PR-2808
22C4410	...	...	....	....	....
22C4412	...	...	....	....	....

CABINET PARTS LIST FOR PHILCO "C" LINE TELEVISION RECEIVERS

Description:	22C4010 Code 130	22C4012 Code 130	22C4014 Code 131	22C4016 Code 350	22C4122 Code 130	22C4016L Code 350	22C4124 Code 350	22C4124L Code 350
Coil	....	32-4560	32-4560	32-4560	32-4560	32-4560	32-4560	32-4560
Foil (above rear of RF chassis or front of deflection chassis)	....	56-9790	56-9790	56-9790	56-9790	56-9790	56-9790	56-9790
Foil (above rear of deflection chassis or front of RF chassis)	....	56-9790-1	56-9790-1	56-9790-1	56-9790-1	56-9790-1	56-9790-1	56-9790-1
Light (L)	....	....	....	....	....	11052-1	....	11060-1
Mahogany	....	....	....	11052	....	....	11060	....
Mahogany (Masonite and Wood)	....	11059-1	11041-6	....	11053	....	....	....
Ebony (Masonite and Wood)	11059	....	....	....	....	....	....	....
Back	54-9209-9	54-9209-9	54-9209-8	54-9267	54-9209-7	54-9267	54-9267-1	54-9267-1
Bar Ass'y., Over Knobs	....	....	....	76-9148	....	76-9148-1	76-9148	76-9148-1
Bracket and Cord	76-8887-2	76-8887-2	76-8887-1	76-9149	76-8887-2	76-9149	76-9149	76-9149
Cup	54-9187-1	54-9187-1	54-9207	54-9187-2	54-9187-1	54-9187-2	54-9187-2	54-9187-2
Foot	....	....	....	....	....	....	....	....
Dome	27-4911-1	27-4911-1	27-4911-1	27-4911-1	45-6190	27-4911-1	3363-2	3363-2
Knob, Brightness	....	....	....	54-61140-1	....	54-6140-3	54-6140-1	54-6140-3
Knob, Brightness and Vertical	54-4768-2	54-4768	54-4799	....	54-4799	....	....	....
Knob, Channel Selector	76-6863-32	76-6863-30	76-6863-30	76-9118	76-6863-30	76-9118-1	76-9118	76-9118-1
Knob, Contrast	....	....	....	76-6213-6	....	76-6213-6	76-6213-6	76-6213-6
Knob, Contrast and Horizontal	54-4797-9	54-4797	....	....	....	....	....	....
Knob, Fine Tuning	54-4803-3	76-6104	76-6104	76-6104-5	76-6104	76-6104-5	76-6104-5	76-6104-5
Knob, Horizontal Hold	....	....	....	54-6140-1	....	54-6140-3	54-6140-1	....
Knob, Fringe Switch	....	....	....	54-6140	....	54-6140-2	54-6140	54-6140-2
Knob, Vertical Hold	....	....	....	54-6140-1	....	54-6140-3	54-6140-1	54-6140-3
Knob, Vol. OFF-ON (TV)	54-4804-4	54-4804-3	76-6166	54-6137	76-6166	54-6137-1	54-6137	54-6137-1
Mask	28-9931-1	28-9931-5	28-99331-3	28-10075-2	28-9931-4	28-10075-3	28-9376-12	28-9376-13
Nameplate	....	....	76-8536-1	....	....	....	....	....
Window	54-9213-32	54-9213-32	54-9213-33	54-9213-36	54-9213-34	54-9213-36	54-9213-37	54-9213-37
Cable, Speaker	41-4082-7	41-408-7	41-4082-7	41-4208-1	41-408-7	41-4208-1	41-4208-1	41-4208-1
Connector Antenna	L3517FA1	L3517FA1	L3517FA1	L3517FA1	L3517FA1	L3517FA1	L3517FA1	L3517FA1
Screw, Connector Mounting	1W10913FA3	1W10913FA3	1W10913FA3	1W10913FA3	1W10913FA3	1W10913FA3	1W10913FA3	1W10913FA3
Tuner Shaft Insulator	54-6071	54-6071	54-6071	....	54-6071	....	....	....
Tuner Shaft Insulator Spring	56-9181	56-9181	56-9181	....	56-9181	....	....	....
Shield, Light	....	....	54-9234	54-9234	....	54-9234	54-9234	54-9234
Speaker	36-1639-12	36-1639-12	36-1639-12	36-1639-9	36-1651	36-1639-9	36-1651-5	36-1651-5
Bezel and Scale (and prism as required)	....	....	76-8293-2	....	....	....	....	....
Plate, Background	....	....	54-9059	....	....	....	....	....
Knob	54-6073-1	54-6073	76-8292	....	54-6073	....	....	....
Washer, Light	....	....	54-8273	54-8273	54-8273	54-8273	54-8273	54-8273
UHF Vernier Disc	54-6106	54-6106-1	....	....	54-6106-1	....	....	....
Clip, Back Plate	....	....	28-9606	....	....	....	....	....
Crossover Network	....	....	....	76-9042	....	76-9042	76-9042	76-9042
Arm and Magnet, Picture Tube	76-6594	76-6594	76-6594	76-6594	76-6594	76-6594	76-6594	76-6594
Beam, Bender, Picture Tube	76-6077-2	76-6077-2	76-6077-2	76-6077-2	76-6077-2	76-6077-2	76-6077-2	76-6077-2
Cable Deflection	41-4086-25	41-4086-25	41-4086-25	41-4146-23	41-4086-25	41-4146-23	41-4146-23	41-4146-23
Frame Ass'y., Picture Tube	318-3550	318-3550	....	....	318-3550	....	....	....
Focus Assembly	76-6126-4	76-6126-4	....	76-9014	76-6126-4	76-9014	76-9014	76-9014
Lead Assembly, Focus Pin	....	....	41-4099-2	....	....	....	....	....
Magnet, Short, Picture Tube	76-8389	76-8389	76-8389	76-8389	76-8389	76-8389	76-8389	76-8389
Magnet, Centering	....	....	76-8998	....	....	....	....	....
Ring, Picture Tube, Metal	56-7869-2	56-7869-2	56-7869-2	56-7869-2	56-7869-2	56-7869-2	56-7869-2	56-7869-2
Ring, Picture Tube, Plastic	54-4939	54-4939	54-4939	54-4939	54-4939	54-4939	54-4939	54-4939
Yoke, Deflection	32-9648	32-9648	32-9648	32-9670	32-9648	32-9670	32-9670	32-9670

CABINET PARTS LIST FOR PHILCO "C" LINE TELEVISION RECEIVERS (Continued)

Description	22C4120 Code 300	22C4120L Code 300	22C4126 Code 350	22C4126L Code 350	22C4312 Code 350	22C4312L Code 350	24C6012 Code 354
Coil	32-4560	32-4560	32-4560	32-4560	32-4560	32-4560	32-4617
Foil (above rear of RF chassis or front of deflection chassis)	56-9790	56-9790	56-9790	56-9790	56-9790	56-9790	....
Foil (above rear of deflection chassis or front of RF chassis)	56-9790-1	56-9790-1	56-9790-1	56-9790-1	56-9790-1	56-9790-1	....
Light (L)	....	11072-1	....	11098-1	....	11070-1	....
Mahogany	11072	....	11098	....	11070	....	....
Metal	....	....	....	....	....	....	11055
Back	54-9267-12	54-9267-12	54-9267-1	54-9267-1	54-9267-7	54-9267-7	54-9309
Bar Ass'y., Over Knobs	54-6164	54-6164	76-9148	76-9148-1	76-9148	76-9148-1	76-9148-1
Bracket and Cord	76-9149-1	76-9149-1	76-9149	76-9149	76-9149	76-9149	76-9149-2
Cup	54-9187-3	54-9187-3	54-9187-2	54-9187-2	54-9187-2	54-9187-2	54-9187-2
Foot	....	....	....	....	....	....	W2570-1
Bullet Catch	....	....	....	....	45-6002	45-6002	....
Dome	3363	3363	3363-2	3362-2	45-6190	45-6190	....
Doors (Matched Pair)	....	....	....	....	424-0001	424-0001-1	....
Door Pull, L.H. or Top	....	....	....	....	76-9322	76-9322-1	....
Door Pull, R.H. or Middle	....	....	....	....	76-9322	76-9322-1	....
Window, Channel Sel.	....	....	....	....	....	....	54-6161
Clip, Window	....	....	....	....	....	....	28-10312
Hinge, Knife, L.H.	....	....	....	....	56-9922-1	56-9922-3	....
Hinge, Knife, R.H.	....	....	....	....	56-9922	56-9922-2	....
Knob, Brightness	54-6157-1	54-6157-1	54-6140-1	54-6140-3	54-6140-1	54-6140-3	54-6140-3
Knob, Channel Selector	76-9118-1	76-9118-1	76-9118	76-9118-1	76-9118	76-9118-1	76-9118-1
Knob, Contrast	54-6157-1	54-6157-1	76-6213-6	76-6213-6	76-6213-6	76-6213-6	76-6213-6
Knob, Fine Tuning	76-6104-9	76-6104-9	76-6104-9	76-6104-9	76-6104-9	76-6104-9	76-6104-9
Knob, Horizontal Hold	54-6157-1	54-6157-1	54-6140-1	54-6140-3	54-6140-1	54-6140-3	54-6140-3
Knob, Fringe Switch	....	....	54-6140	54-6140-2	54-6140	54-6140-2	54-6140-2
Knob, Vertical Hold	54-6157-1	54-6157-1	54-6140-1	54-6140-3	54-6140-1	54-6140-3	54-6140-3
Knob, Vol. OFF-ON (TV)	76-9237-2	76-9237-2	54-6137	54-6137-1	54-6137	54-6137-1	54-6137-1
Mask	28-10075-4	28-10075-4	28-9376-12	28-9376-13	28-9376-12	28-9376-13	54-9033-7
Strike Plate	....	....	....	....	45-6003	45-6003	....
Window	54-9213-40	54-9213-40	54-9213-37	54-9213-37	54-9213-37	54-9213-37	54-9213-38
Glass Rail Ass'y.	....	....	76-9170-2	76-9170-2	76-9170-2	76-9170-2	....
Cable Speaker	41-4208-1	41-4208-1	41-4208-1	41-4208-1	41-4208-1	41-4208-1	41-4208-1
Connector, Antenna	L3517FA1	L3517FA1	L3517FA1	L3517FA1	L3517FA1	L3517FA1	L3517FA1
Screw, Connector Mounting	1W10913FA3	1W10913FA3	1W10913FA3	1W10913FA3	1W10913FA3	1W10913FA3	1W10913FA3
Line Cord, A.D.	41-3865	41-3865	41-3865	41-3865	41-3865	41-3865	41-3865
Shield, Light	54-9234	54-9234	54-9234	54-9234	54-9234	54-9234	54-9366
Speaker	45-9736	45-9736	36-1651-11	36-1651-11	36-1651-11	36-1651-11	45-9735
Dial and Film Ass'y.	76-9048	76-9048	76-9048	76-9048	76-9048	76-9048	76-9048
Washer, Light	54-8293	54-8273	54-8273	54-8273	54-8273	54-8273	54-8273
Crossover Network	76-9042	76-9042	76-9042	76-9042	76-9042	76-9042	76-9042
UHF Plate	28-10277	28-10277	....	....	....	....	....
UHF Window	54-9330	54-9330	....	....	....	....	....
Arm and Magnet, Picture Tube	....	....	76-6594	76-6594	76-6594	76-6594	76-8474-1
Beam, Bender, Picture Tube	76-6077-2	76-6007-2	76-6077-2	76-6077-2	76-6077-2	76-6077-2	76-6077-4
Cable Deflection	41-4146-23	41-4146-23	41-4146-23	41-4146-23	41-4146-23	41-4146-23	41-4146-23
Focus Assembly	....	....	76-9014	76-9014	76-9014	76-9014	76-9014-1
Lead Assembly, Focus Pin	41-4099-2	41-4099-2	....	....	....	....	....
Magnet, Short, Picture Tube	....	....	76-8389	76-8389	76-8389	76-8389	....
Magnet, Centering	76-8998	76-8998	....	....	....	....	....
Ring, Picture Tube, Metal	56-7869-2	56-7869-2	56-7869-2	56-7869-2	56-7869-2	56-7869-2	....
Ring, Picture Tube, Plastic	54-4939	54-4939	54-4939	54-4939	54-4989	54-4939	....
Yoke, Deflection	32-9680	32-9680	32-9670	32-9670	32-9670	32-9670	32-9663-1
Actuator, Hi-Volt. Door	....	....	....	....	....	....	28-10278
Magnet Ass'y.	....	....	....	....	....	....	76-8897
Magnet Ass'y.	....	....	....	....	....	....	76-8897-1

CABINET PARTS LIST FOR PHILCO "C" LINE TELEVISION RECEIVERS (Continued)

Description	24C6110 Code 354	24C6112 Code 354	22C4128 Code 400	22C4310 Code 350	22C4020 Code 400	22C4119 Code 300	24C6110L Code 354	24C6310 Code 354
Coil	32-4560	32-4560	32-4560	32-4560	32-4560	....	32-4560	32-4560
Foil (above rear of RF chassis or front of deflection chassis)	56-9790	56-9790	56-9790	56-9790	56-9790	....	56-9790	54-9790
Foil (above rear of deflection chassis or front of RF chassis)	56-9790-1	56-9790-1	56-9790-1	56-9790-1	56-9790-1	....	56-9790-1	56-9790-1
Light (L)	....	....	....	....	....	....	11066-1	....
Knob	....	....	76-7710	....	76-7710	....	....	....
Shaft	....	....	54-4974	....	54-5974	....	....	....
Switch	....	....	42-1979	....	42-1979	....	....	....
Mahogany	11066	11069	11068	11077	11057-1	11072-2	....	11078
Back	54-9267-6	54-9267-4	54-9267-5	54-9267-1	54-9267-10	54-9267-12	54-9267-6	54-9267-16
Bar Ass'y., Over Knobs	76-9148-1	76-9148	76-9148-2	54-6164-1	76-9148-2	54-6164-3	76-9148-1	76-9148
Bracket and Cord	76-9149-2	76-9149-2	76-9149	76-9149-1	76-9149	76-9149-1	76-9149-2	76-9149-2
Cup	54-9187-2	54-9187-2	54-9187-2	54-9187-3	54-9187-2	54-9187-2	54-9187-2	54-9187-2
Foot	....	....	....	....	56-7778-1	....	....	....
Bullet Catch	....	....	....	45-6002	....	....	....	....
Dome	45-6190	....	3363-2	3363-3	27-4911-1	3363	45-6190	....
Doors (Matched Pair)	....	....	....	424-0001-2	....	....	....	....
Hinge, Knife, L.H.	....	....	....	56-9922-1	....	....	....	....
Hinge, Knife, R.H.	....	....	....	56-9922	....	....	....	....
Knob, Brightness	54-6140-3	54-6140-1	54-6140-1	54-6157	54-6140-1	54-6157	54-6140-3	54-6140-1
Knob, Channel Selector	76-9118-1	76-9118	76-9118	76-9118	76-9118	76-9118-5	76-9118-1	76-9118
Knob, Contrast	76-6213-6	76-6213-6	76-6213-6	54-6157	76-6213-6	54-6157	76-6213-6	76-6213-6
Knob, Fine Tuning	76-6104-9	76-6104-9	76-6104-9	76-6104-9	76-6104-9	54-4825-6	76-6104-9	76-6104-9
Knob, Horizontal Hold	54-6140-3	54-6140-1	54-6140-1	54-6157	54-6140-1	54-6157	54-6140-3	54-6140-1
Knob, Fringe Switch	54-6140-2	54-6140	....	....	....	....	54-6140-2	54-6140
Knob, Tone	....	....	54-6140-1	....	54-6140-1	....	....	....
Knob, Vertical Hold	54-6140-3	54-6140-1	54-6140-1	54-6157	54-6140-1	54-6157	54-6140-3	54-6140-1
Knob, Vol. OFF-ON (TV)	54-6137-1	54-6137	54-6137	76-9237-1	54-6137	76-9237-3	54-6137-1	54-6137
Mask	54-9033-7	54-9033-8	28-9376-12	28-10075-5	28-10075-1	28-9931-9	54-9033-7	54-9033-8
Strike Plate	....	....	....	45-6003	....	....	....	....
Window	54-9213-38	54-9213-39	54-9213-37	54-9213-40	54-9213-36	54-9213-41	54-9213-38	54-9213-39
Glass Rail Ass'y.	....	76-9170-3	76-9170-4	76-9170-5	76-9170-6	....	....	76-9170-3
Cable, Speaker	44-4208-1	41-4208-1	41-4208-1	41-4208-1	41-4208-1	41-4208-1	41-4208-1	41-4208-1
Connector, Antenna	L3517FA1	L3517FA1	L3517FA1	L3517FA1	L3517FA1	L3517FA1	L3517FA1	....
Screw, Connector Mounting	1W10913FA3	1W10913FA3	1W10913FA3	1W10913FA3	1W10913FA3	1W10913FA3	1W10913FA3	....
Line Cord, A.D.	41-3865	41-3865	41-3865	41-3865	41-3865	41-3865	41-3865	41-3865
Shield, Light	54-9234	54-9234	54-9234	54-9234	54-9234	....	54-9234	54-9234
Speaker	36-1651-11	36-1651-11	36-1651-11	45-9736	45-9733	45-9736	36-1651-11	36-1651-11
Dial and Film Ass'y.	76-9048	76-9048	76-9048	76-9048	76-9048	76-9048	76-9048	76-9048
Washer, Light	54-8273	54-8273	54-8273	54-8273	54-8273	54-8273	54-8273	54-8273
Crossover Network	76-9042	76-9042	76-9042	76-9042	76-9042	76-9042	76-9042	....
UHF Plate	28-10277	....	....	....	....	28-10277-3	28-10277	....
UHF Window	54-9330	....	....	....	....	54-9330	54-9330	....
Arm and Magnet, Picture Tube	76-8474-1	76-8474-1	76-6594	....	76-6594	....	76-8474-1	76-8474-1
Beam, Bender, Picture Tube	76-6077-4	76-6077-4	76-6077-2	76-6077-2	76-6077-2	76-6077-2	76-5088-4	76-6077-4
Cable Deflection	41-4146-23	41-4146-23	41-4146-23	41-4146-23	41-4146-23	41-4146-23	41-4146-23	41-4146-23
Focus Assembly	76-9014-1	76-9014-1	76-9014	....	76-9014	....	76-9014-1	76-9014-1
Lead Assembly, Focus Pin	....	....	....	41-4099-2	....	41-4099-2	....	....
Magnet, Short, Picture Tube	....	....	76-8389	....	76-8389	....	....	....
Magnet, Centering	....	....	....	76-8998	....	76-8998	....	....
Ring, Picture Tube, Metal	....	....	56-7869	56-7869-2	56-7869-2	56-7869-2	....	....
Ring, Picture Tube, Plastic	....	....	54-4339	54-4939	54-4939	54-4939	....	....
Yoke, Deflection	32-9663-1	32-9663-1	32-9670	32-9680	32-9670	32-9680	32-9663-1	32-9663-1
Magnet Ass'y.	76-8897	76-8897	....	....	....	....	76-8897	76-8897
Magnet Ass'y.	76-8897-1	76-8897-1	....	....	....	....	76-8897-1	76-8897-1
Actuator, Hi-Volt. Door	28-10278	28-10278	....	....	....	....	28-10278	28-10278
Metal	....	....	....	....	....	....	....	....
Window, Channel Selector	....	....	....	....	....	....	....	....
Clip, Window	....	....	....	....	....	....	....	....
Dial	....	....	....	....	....	....	76-9048	76-9048

Printed in U.S.A.

SUPPLEMENT TO SERVICE CHART AND CABINET PARTS LIST FOR PHILCO "C" LINE TELEVISION RECEIVERS

PHILCO
Factory-Supervised
Service

TELEVISION

FILE C-1B

SERVICE REFERENCE CHART AND CABINET PARTS LIST FOR "C" LINE TV RECEIVERS

PR-2861

SERVICE REFERENCE CHART FOR PHILCO "C" LINE TELEVISION RECEIVERS
(INCLUDING SPEAKER, PICTURE TUBE AND ASSOCIATED DEFLECTION COMPONENTS)

MODEL	CHASSIS AND CODE	TUNER PART NO.	PICTURE TUBE	SERVICE MANUAL
22C4011	300	76-8946-1	21YP4	PR-2812
22C4011	301	76-8946-1	21ZP4A	PR-2812
22C4013	300	76-8946-1	21YP4A	PR-2812
22C4013L	300	76-8946-1	21YP4A	PR-2812
22C4013X	300	76-8946-1	21YP4A	PR-2812
22C4015	300	76-8946-1	21YP4A	PR-2812
22C4020	400	76-8946-3	21ZP4B	PR-2809
22C4119	301	76-8946-1	21WP4A	PR-2812
22C4119	302	76-8946-1	21YP4	PR-2812
22C4119	303	76-8946-1	21ZP4A	PR-2812
22C4119X	300	76-8946-1	21XP4	PR-2812
22C4124	300	76-8946-1	21YP4A	PR-2812
22C4124L	300	76-8946-1	21YP4A	PR-2812
22C4127	300	76-8946-1	21YP4A	PR-2812
22C4410	350	76-8946-2	21ZP4B	PR-2808
24C6310	354	76-8946-2	24VP4A	PR-2808
22C4129	350	76-8946-2	21ZP4B	PR-2808
22C4118	301	76-8946-1	21ZP4B	PR-2812
22C4120X	300	76-8946-1	21YP4A	PR-2812
22C4121	301	76-8946-1	21ZP4B	PR-2812
22C4121L	301	76-8946-1	21ZP4B	PR-2812
22C4123	300	76-8946-1	21YP4A	PR-2812
22C4124S	300	76-8946-1	21YP4A	PR-2812
22C4125HM	300	76-8946-1	21YP4A	PR-2812
22C4311HM	300	76-8946-1	21YP4A	PR-2812

CABINET PARTS LIST FOR PHILCO "C" LINE TELEVISION RECEIVERS

Description	22C4129 Code 350	22C4118 Code 301	22C4120X Code 300	22C4121 Code 301	22C4121L Code 301	22C4123 Code 300	22C4124S Code 300
Built-in aerial parts:							
Coil	32-4617	....	32-4617	32-4617	32-4617	32-4617	32-4617
Foil (right)	56-9790	....	56-9790	56-9790	56-9790	56-9790	56-9790
Foil (left)	56-9790-1	....	56-9790-1	56-9790-1	56-9790-1	56-9790-1	56-9790-1
Cabinets							
Light (L)	....	....	....	....	11072-10	....	....
Mahogany	....	11072-11	11072-4	11072-9	....	11065-1	11060
Mahogany (Masonite & Wood)	11060-6	....	....	....	....	....	....
Cabinet Hardware and Parts:							
Back	54-9267-1	54-9267-12	54-9267-12	54-9267-12	54-9267-12	54-9267-19	54-9267-18
Bar Ass'y., Over Knobs	76-9148	54-6164-1	54-6164	54-6164	54-6164	54-6164-1	54-6164-1
Bracket and Cord	76-9149	76-9194-1	76-9149-1	76-9149-1	76-9149-1	76-9149-1	76-9149
Cup	54-9187-2	54-9187-3	54-9187-3	54-9187-3	54-9187-3	54-9187-3	54-9187-2
Dome	3363-2	3363	3363	3363	3363	45-6190	3363-2
Roller	....	....	....	28-10500	28-10500	....	
Knob, Brightness	54-6140-1	54-6157	54-6157-1	54-6157-1	54-6157-1	54-6157	54-6157
Knob, Channel Selector	76-9118-7	76-9118-3	76-9118-8	76-9118-8	76-9113-8	76-9118-7	76-9118-7
Knob, Contrast	76-6213-6	54-6157	54-6157-1	54-6157-1	54-6157-1	54-6157	54-6157
Knob, Fine Tuning	76-6104-9	76-6104-7	76-6104-9	76-6104-9	76-6104-9	76-6104-9	76-6104-9
Knob, Horizontal Hold	54-6140-1	54-6157	54-6157-1	54-6157-1	54-6157-1	54-6157	54-6157
Knob, Fringe Switch	54-6140	....	....	....	....	....	....
Knob, Vertical Hold	54-6140-1	54-6157	54-6157-1	54-6157-1	54-6157-1	54-6157	54-6157
Knob, Vol-OFF-ON (TV)	54-6137	76-9273-3	76-9237-2	76-9237-2	76-9237-2	76-9237-1	76-9237-1
Mask	28-9376-12	28-10075-12	28-10075-12	28-10075-12	28-10075-12	28-10075-2	28-9376-12
Window	54-9213-43	54-9213-46	54-9213-46	54-9213-46	54-9213-46	54-9213-47	54-9213-37
Glass rail assembly	76-9170-2	....	....			76-9170	76-9170-2
Cable, Speaker	41-4208-1	41-4208-1	41-4208-1	41-4208-1	41-4208-1	41-4208-1	41-4208-1
Connector, Antenna	L3517FA1	L3517FA1	L3517FA1	L3517FA1	L3517FA1	L3517FA1	L3517FA1
Screw, Connector Mounting	1W10913FA3	1W10913FA3	1W10913FA3	1W10913FA3	1W10913FA3	1W10913FA3	1W10913FA3
Line Cord, A. C.	41-3865	41-3865	41-3865	41-3865	41-3865	41-3865	41-3865
Radio-Tuner Parts:							
Shield, Light	54-9234	....	54-9234	54-9234	54-9234	54-9234	54-9234
Speaker	36-1651-5	36-1641-20	36-1641-20	36-1641-20	36-1641-20	36-1651-5	36-1651-5
UHF Parts:							
Dial and film assembly	76-9048	76-9048	76-9048	76-9048	76-9048	76-9048	76-9048
Washer, Light	54-8273	....	54-8273	54-8273	54-8273	54-8273	54-8273
Crossover Network	76-9042		76-9042	....	....	....	....
UHF plate	....	28-10277-3	28-10277	28-10277	28-10277	....	....
UHF window	....	54-9330	54-9330	54-9330	54-9330	....	....
Cathode Ray Tube Assembly:							
Arm and Magnet, Picture Tube	76-6594	....	....	....	....	....	....
Beam, Bender, Picture Tube	76-6077-2	76-6077-2	76-6077-2	76-6077-2	76-6077-2	76-6077-2	76-6077-2
Cable Deflection	41-4146-23	41-4146-23	41-4146-23	41-4146-23	41-4146-23	41-4146-23	41-4146-23
Frame Ass'y., Picture Tube	318-3550	318-3550	318-3550	318-3550	318-3550	318-3550	318-3550
Focus Assembly	76-9014	76-9014	76-9014	76-9014	76-9014	....	....
Magnet, Short, Picture Tube	76-8389	....	....	....	....	....	....
Magnet, Centering	....	....	....	....	....	76-8998	76-8998
Ring, Picture Tube, Metal	56-7869-2	56-7869-2	56-7869-2	56-7869-2	56-7869-2	56-7869-2	56-7869-2
Ring, Picture Tube, Plastic	54-4939	54-4939	54-4939	54-4939	54-4939	54-4939	54-4939
Yoke, Deflection	32-9670	32-9680	32-9680	32-9680	32-9680	32-9680	36-9680

Description	22C4020 Code 400	22C4011 Code 300	22C4119 Code 301	24C6310 Code 354	22C4124 Code 300	22C4013L Code 300	22C4013 Code 300	22C4015 Code 300
Built-in aerial parts:								
Coil	32-4560	32-4617	....	32-4560	32-4617	32-4617	32-4617	32-4617
Foil (right)	56-9790-2	....	....	56-9790-2	56-9790	....	....	56-9790
Foil (left)	56-9790-3	....	....	56-9790-3	56-9790-1	....	....	56-9790-1
Knob	76-7710	....	....	76-7710	....	....	....	....
Shaft	54-4974	....	....	54-4974	....	....	....	....
Switch	42-1979	....	....	42-1979	....	....	....	....
Cabinets:								
Mahogany	11057-1	....	11072-3	11078	11060	....	....	11091
Metal	....	11085	....	....	....	11085-2	11085-1	....
Cabinet Hardware and Parts:								
Back	54-9267-10	54-9309-2	54-9267-12	54-9267-16	54-9267-18	54-9309-2	54-9309-2	54-9267-8
Bar Ass'y., Over Knobs	76-9148-2	54-6164-3	54-6164-3	76-9148	54-6164-1	54-6164	54-6164	54-6164-1
Bracket and Cord	76-9149	76-9149-1	76-9149-1	76-9149-2	76-9149	76-9149-1	76-9149-1	76-9149-1
Cup	54-9187-2	54-9187-3	54-9187-2	54-9187-2	54-9187-2	54-9187-3	54-9187-3	54-9187-3
Foot	56-7773-2	W2570-1	....		....	W2570-1	W2570-1	....
Bullet Catch	....	....	....	45-6002	....	....	....	....
Dome	27-4911-1	....	3363	3363-2	3363-2	....	....	27-4911-1
Doors (Matched Pair)	....	....	....	424-0001-4	....	....	....	....
Door Pull, L. H. or Top		....	....	28-10371-1	....	....	....	....
Door Pull, R. H. or Middle	....	....	....	28-10371	....	....	....	....
Hinge, Knife, L.H.	....	....	....	56-9922-1	....	....	....	....
Hinge, Knife, R.H.		....	....	56-9922	....	....	....	....
Knob, Brightness	54-6140-1	54-6157	54-6157	54-6140-1	54-6157	54-6157-1	54-6157-1	54-6157

CABINET PARTS LIST FOR PHILCO "C" LINE TELEVISION RECEIVERS (Continued)

Description	22C4020 Code 400	22C4011 Code 300	22C4119 Code 301	24C6310 Code 354	22C4124 Code 300	22C4013L Code 300	22C4013 Code 300	22C4015 Code 300
Knob, Channel Selector	76-9118	76-9118-10	76-9118-5	76-9118	76-9118	76-9118-4	76-9118-4	76-9118-7
Knob, Contrast	76-6213-6	54-6157	54-6157	76-6213-6	54-6157	54-6157-1	54-6157-1	54-6157
Knob, Fine Tuning	76-6104-9	54-4825-6	54-4825-6	76-6104-9	76-6104-9	76-6104-7	76-6104-7	76-6104-9
Knob, Horizontal Hold	54-6140-1	54-6157	54-6157	54-6140-1	54-6157	54-6157-1	54-6157-1	54-6157
Knob, Fringe Switch				54-6140				
Knob, Tone	54-6140-1							
Knob, Vertical Hold	54-6140-1	54-6157	54-6157	54-6140-1	54-6157	54-6157-1	54-6157-1	54-6157
Knob, Vol-OFF-ON (TV)	54-6137	76-9237-3	76-9237-3	54-6137	76-9237-1	76-9237-2	76-9237-2	76-9237-1
Mask	28-10075-2		28-9931-9	28-9033-8	28-9376-12			28-10075-10
Strike Plate				45-6003				
Window	54-9213-47	54-9213-40	54-9213-40	54-9213-45	54-9213-43	54-9213-46	54-9213-46	54-9213-46
Glass rail assembly	76-9170-6			76-9170-3	76-9170-2			76-9170-5
Cable, Speaker	41-4208-1	41-4208-1	41-4208-1	41-4208-1	41-4208-1	41-4208-1	41-4208-1	41-4208-1
Connector, Antenna	L3517FA1	L3517FA1	L3517FA1	L3517FA1	L3517FA1	L3517FA1	L3517FA1	L3517FA1
Screw, Connector Mounting	1W10913FA3	1W10913FA3	1W10913FA3	1W10913FA3	1W10913FA3	1W10913FA3	1W10913FA3	1W10913FA3
Line Cord, A. C.	41-3865	41-3865	41-3865	41-3865	41-3865	41-3865	41-3865	41-3865
Radio-Tuner Parts:								
Shield, Light	54-9234	54-9417		54-9234	54-9234	54-9417	54-9417	54-9234
Speaker	45-9733	36-1639-9	45-9736	36-1651-11	36-1651-5	36-1639-9	36-1639-9	36-1639-9
UHF Parts:								
Dial & Film ass'y.	76-9048	76-9048	76-9048	76-9048	76-9048	76-9048	76-9048	76-9048
Washer, Light	54-8273	54-8273-4	54-8273-4	54-8273	54-8273			54-8273
Crossover Network	76-9042	76-9042	76-9042	76-9042	76-9042	76-9042	76-9042	76-9042
Window, plastic, UHF		54-6161	54-9330			54-6161	54-6161	
Plate, UHF			28-10277-3					
Cathode Ray Tube Assembly:								
Arm and Magnet, Picture Tube	76-6594			76-8474-1				
Beam Bender, Picture Tube	76-6077-2	76-6077-2	76-6077-2	76-6077-4	76-6077-2	76-6077-2	76-6077-2	76-6077-2
Cable Deflection	41-4146-23	41-4146-23	41-4146-23	41-4146-23	41-4146-23	41-4146-23	41-4146-23	41-4146-23
Frame Ass'y., Picture Tube	318-3550	318-3550	318-3550	318-3489	318-3550	318-3550	318-3550	318-3550
Focus Assembly	76-9014		76-9014	76-9014-1				
Magnet, Short, Picture Tube	76-8389							
Magnet, Centering		76-8998			76-8998	76-8998	76-8998	76-8998
Ring, Picture Tube, Metal	56-7869-2	56-7869-2	56-7869-2		56-7869-2	56-7869-2	56-7869-2	56-7869-2
Ring, Picture Tube, Plastic	54-4939	54-4939	54-4939		54-4939	54-4939	54-4939	54-4939
Yoke, Deflection	32-9670	32-9680	32-9680	32-9663-1	32-9680	32-9680	32-9680	32-9680
Magnet assembly				76-8897				
Magnet assembly				76-8897-1				
Actuator				28-10278				

Description	22C4011 Code 301	22C4119 Code 302	22C4127 Code 300	22C4410 Code 300	22C4013X Code 300	22C4119 Code 303	22C4119X Code 300	22C4124L Code 300
Built-in aerial parts:								
Coil	32-4617		32-4617	32-4617	32-4617			32-4617
Foil (right)			56-9790	56-9790	56-9790			56-9790
Foil (left)			56-9790-1	56-9790-1	56-9790-1			56-9790-1
Cabinets:								
Light (L)								11060-1
Mahogany		11072-3	11060-6	11098-4		11072-3	11072-7	
Mahogany (Masonite and Wood)					11071-4			
Metal	11085							
Cabinet Hardware and Parts:								
Back	54-9309-2	54-9267-12	54-9267-18	54-9433	54-9267-8	54-9267-12	54-9267-12	54-9267-18
Bar Ass'y., Over Knobs	54-6164-3	54-6164-3	54-6164-1	54-6164-1	54-6164-1	54-6164-3	54-6164-3	54-6164
Bracket and Cord	76-9149-1	76-9149-1	76-9149	76-9149	76-9149-1	76-9149-1	76-9149-1	76-9149
Cup	54-9187-3	54-9187-3	54-9187-2	54-9187-2	54-9187-3	54-9187-3	54-9187-2	54-9187-2
Foot	W2570-1							
Continuous Hinge, Record Changer				56-3627-21				
Dome		3363	3363-2	3363-2	27-4911-1	3363	3363	3363-2
Knob, Brightness	54-6157	54-6157	54-6157	54-6157	54-6157	54-6157	54-6157	54-6157-1
Knob, Channel Selector	76-9118-10	76-9118-10	76-9118-7	76-9118-7	76-9118-7	76-9118-10	76-9118-10	76-9118-1
Knob, Contrast	54-6157	54-6157	54-6157	54-6157	54-6157	54-6157	54-6157	54-6157-1
Knob, Fine Tuning	54-4825-6	54-4825-6	76-6104-9	76-6104-9	76-6104-9	54-4825-6	54-4825-6	76-6104-9
Knob, Horizontal Hold	54-6157	54-6157	54-6157	54-6157	54-6157	54-6157	54-6157	54-6157-1
Knob, Vertical Hold	54-6157	54-6157	54-6157	54-6157	54-6157	54-6157	54-6157	54-6157-1
Knob, Vol-OFF-ON (TV)	76-9237-3	76-9237-3	76-9237-1	76-9237-1	76-9237-1	76-9237-3	76-9237-3	76-9237-2
Mask		28-10075-12	28-9376-12	28-9376-12	28-10075-12	28-10075-12	28-9931-9	28-9376-13

CABINET PARTS LIST FOR PHILCO "C" LINE TELEVISION RECEIVERS (Continued)

Description	22C4011 Code 301	22C4119 Code 302	22C4127 Code 300	22C4410 Code 300	22C4013X Code 300	22C4119 Code 303	22C4119X Code 300	22C4124L Code 300
Sleeve (Record-Changer Mtg.)	....	....	....	54-7798	....	....	....	....
Tone Arm Clamp Spring	....	....	....	56-8554	....	....	....	....
Window	54-9213-41	54-9213-41	54-9213-43	54-9213-43	54-9213-46	54-9213-40	54-9213-41	54-9213-43
Glass rail ass'y.	....	....	76-9170-2	76-9170-2	....	....	....	76-9170-2
Slide Assembly record changer	....	....	....	76-6742	....	....	....	....
Cable, Speaker	41-4208-1	41-4208-1	41-4208-1	41-4208-1	41-4208-1	41-4208-1	41-4208-1	41-4208-1
Connector, Antenna	L3517FA1	L3517FA1	L3517FA1	L3517FA1	L3517FA1	L3517FA1	L3517FA1	L3517FA1
Screw, Connector Mounting	1W10913FA3	1W10913FA3	1W10913FA3	1W10913FA3	1W10913FA3	1W10913FA3	1W10913FA3	1W10913FA3
Line Cord, A. C.	41-3865	41-3865	41-3865	41-3865	41-3865	41-3865	41-3865	41-3865
Radio-Tuner Parts:								
Knob, Function Switch	....	....	....	54-4773-14	....	....	....	....
Knob, Tuning	....	....	....	54-4978-11	....	....	....	....
Knob, OFF-ON, tone, volume	....	....	....	54-4773-12	....	....	....	....
Scale	....	....	....	28-10481	....	....	....	....
Shield, Light	54-9417	....	54-9234	54-9234	54-9234	....	....	54-9234
Speaker	36-1639-9	45-9736	36-1651-5	36-1651-11	36-1639-9	45-9736	45-9736	36-1651-5
UHF Parts:								
Dial & Film Ass'y.	76-9048	76-9048	76-9048	76-9048	76-9048	76-9048	76-9048	76-9048
Washer, Light	54-8273-4	54-8273-4	54-8273	54-8273	54-8273	54-8273-4	54-8273-4	54-8273
Crossover Network	76-9042	76-9042	76-9042	76-9042	76-9042	76-9042	76-9042	76-9042
Window, UHF	54-6161	54-9330	....	....	54-9330	54-9330	54-9330	....
Plate, UHF	....	28-10277-3	....	....	28-10277-4	28-10277-3	28-10277-3	....
Cathode Ray Tube Assembly:								
Arm and Magnet, Picture Tube	76-6594	....	....	....	....	76-6594	....	....
Beam, Bender, Picture Tube	76-6077-2	76-6077-2	76-6077-2	76-6077-2	76-6077-2	76-6077-2	76-6077-2	76-6077-2
Cable Deflection	41-4146-23	41-4146-23	41-4146-23	41-4146-23	41-4146-23	41-4146-23	41-4146-23	41-4146-23
Frame Ass'y., Picture Tube	318-3482	318-3550	318-3550	318-3550	318-3550	318-3482	318-3550	318-3550
Focus Assembly	76-9014	....	....	....	....	76-9014	....	....
Magnet, Short, Picture Tube	76-8389	....	....	....	....	76-8389	....	....
Magnet, Centering	....	76-8998	76-8998	76-8998	76-8998	....	76-8998	76-8998
Ring, Picture Tube, Metal	56-7869-2	56-7869-2	56-7869-2	56-7869-2	56-7869-2	56-7869-2	56-7869-2	56-7869-2
Ring, Picture Tube, Plastic	54-4939	54-4939	54-4939	54-4939	54-4939	54-4939	54-4939	54-4939
Yoke, Deflection	32-9670	32-9680	32-9680	32-9680	32-9680	32-9670	32-9680	32-9680
Spring, chgr. mtg.	....	....	....	56-7059FA9	....	....	....	....
Spring, chgr. mtg.	....	....	....	56-7059-1FCP	....	....	....	....
Speed nut, chgr. mtg.	....	....	....	W2554	....	....	....	....
Spindle, 45 RPM adaptor	....	....	....	425-0010	....	....	....	....

Description	22C4125HM Code 300	22C4311HM Code 300
Built-in aerial parts:		
Coil	32-4617	32-4617
Foil (right)	56-9790	56-9790
Foil	56-9790-1	56-9790-1
Cabinets:		
Honey-Maple (HM)	11065-2	11095
Cabinet Hardware and Parts:		
Back	54-9267-19	54-9267-13
Bar Ass'y., Over Knobs	54-6164	54-6164
Bracket and Cord	76-9149-1	76-9149-1
Cup	54-9187-3	54-9187-3
Bullet Catch	....	45-6002
Dome	45-6190	3363-3
Doors (Matched Pair)	....	424-0001-7
Door Pull, L. H.	....	56-9850
Door Pull, R. H.	....	56-9851
Door Pull	....	56-9852
Hinge Knife, L. H.	....	28-10489-1
Hinge, Knife, R. H.	....	28-10489
Knob, Brightness	54-6157-1	54-6157-1
Knob, Channel Selector	76-9118-8	76-9118-8
Knob, Contrast	54-6157-1	54-6157-1
Knob, Fine Tuning	76-6104-9	76-6104-9
Knob, Horizontal Hold	54-6157-1	54-6157-1

Description	22C4125HM Code 300	22C4311HM Code 300
Knob, Vertical Hold	54-6157-1	54-6157-1
Knob, Vol-OFF-ON (TV)	76-9237-2	76-9237-2
Mask	28-10075-11	28-10075-12
Strike Plate	....	45-6003
Window	54-9213-47	54-9213-46
Glass rail assembly	76-9170	76-9170-5
Cable, Speaker	41-4208-1	41-4208-1
Connector, Antenna	L3517FA1	L3517FA1
Screw, Connector Mounting	1W10913FA3	1W10913FA3
Line Cord, A. C.	41-3865	41-3865
Radio-Tuner Parts:		
Shield, Light	54-9234	54-9234
Speaker	36-1651-5	36-1641-20
UHF Parts:		
Dial & film assembly	76-9048	76-9048
Washer, Light	54-8273	54-8273
Cathode Ray Tube Assembly:		
Beam, Bender, Picture Tube	76-6077-2	76-6077-2
Cable Deflection	41-4146-23	41-4146-23
Frame Ass'y., Picture Tube	318-3550	318-3550
Magnet, Centering	76-8998	76-8998
Ring, Picture Tube, Metal	56-7869-2	56-7869-2
Ring, Picture Tube, Plastic	54-4939	54-4939
Yoke, Deflection	32-9680	32-9680

PR-2861—1-55 Printed in U.S.A.

PHILCO **PHILCO Factory-Supervised Service** SERVICE

TELEVISION

PHILCO TELEVISION REMOTE CONTROL UNIT RC-3

INTRODUCTION

Philco Television Remote Control Unit RC-3 is standard equipment with certain models of Philco Television Receivers and Television-Radio-Phonograph combinations. This Unit makes it possible for the viewer to tune and adjust the Television Receiver from any point up to a distance of thirty feet. The adjustments are made by operating switch levers on a simple control box that fits the hand. The control box is connected to the control mechanism in the Receiver through an eight-conductor flat cable.

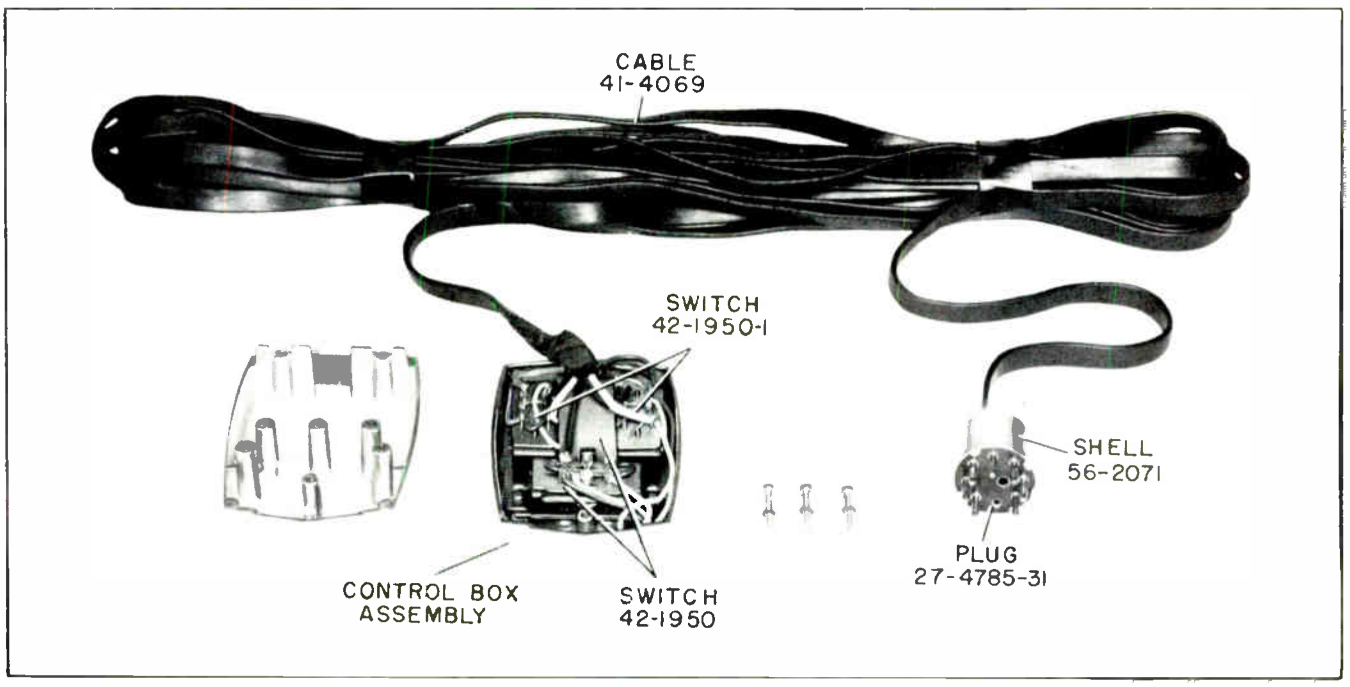
Philco Television Remote Control Unit RC-3 is similar to Philco Remote Control Unit RC-1. Improvements in the RC-3 permit the servicing of either chassis of the dual-chassis receiver without removing both chassis. The volume control drive system in the RC-3 is composed of a drive rack and pinion, which is a part of the RC-3 unit, and a VOLUME control rack and pinion, which is a part of the deflection chassis. These two racks are coupled by means of a machine screw and washer combination. Removing the machine screw and washer permits the uncoupling and removal of either chassis from the cabinet independently of the other chassis. When the VOLUME control is in the OFF position, the machine screw, which is located at the front, between the two television chassis, is accessible from the back of the cabinet.

The RC-3 Philco Television Remote Control Unit is composed of three major components:

Control Box and Cable Assembly.
Clutch and Gear Assembly, with Solenoid Coils.
Motor Assembly.

DESCRIPTION OF MAJOR COMPONENTS

Brief descriptions of the major components of the Remote Control Unit are given below, to aid in understanding the operation of the Unit.



TP2-698

Figure 1. Control Box and Cable Assembly

PHILCO TELEVISION REMOTE CONTROL UNIT RC-3

PR-2378

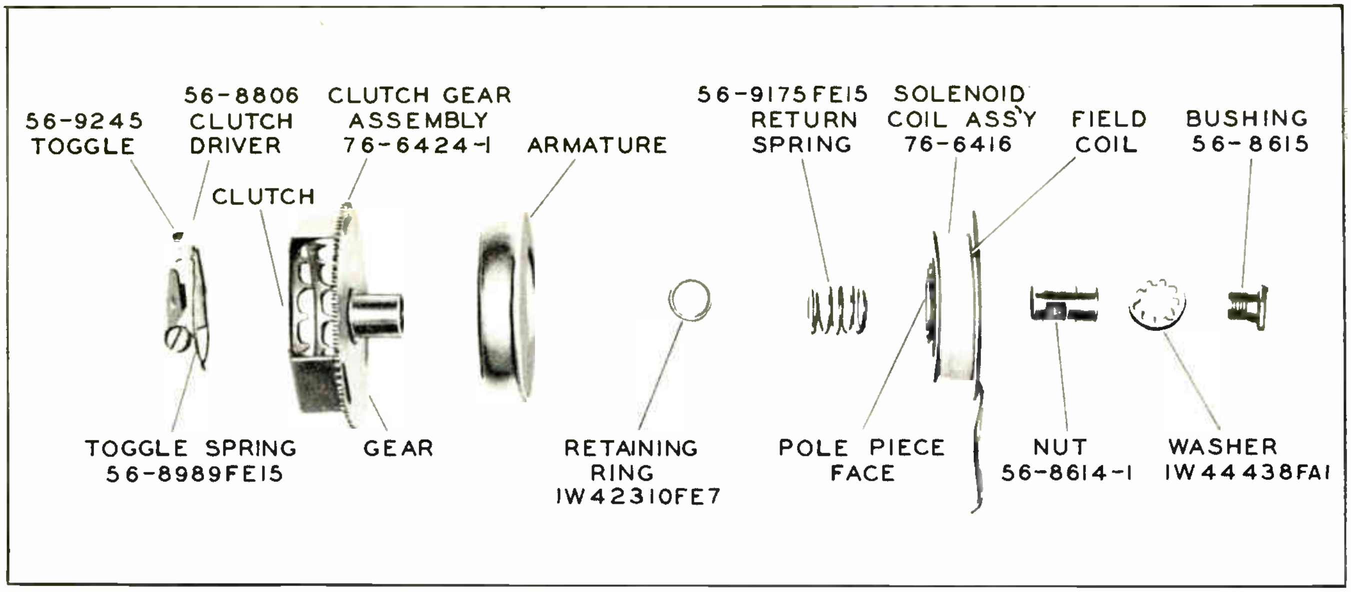


Figure 2. Exploded View of Clutch Assembly

Control Box and Cable Assembly

Thirty feet of eight-conductor flat cable, Part No. 41-4148, is used to connect the Control Box to the Remote Assembly. A plug is provided on the end of the cable, for insertion into the remote control socket in the back of the cabinet. A wooden cable holder and a metal housing are provided, to receive the cable and Control Box when it is desired to store them at the cabinet. The Control Box contains four self-centering switches (d.p.d.t.), two Part No. 42-1950 and two Part No. 42-1950-1. These switches control the following Receiver controls: DARK-LIGHT, VOL-OFF, FINE TUNING, and STATION (channel) selector.

Clutch and Gear Assembly

This assembly comprises the various gears, driving mechanisms, and associated parts that are used, in conjunction with the Motor Assembly, to perform the mechanical functions of turning the Television Receiver controls in accordance with the setting of the switches on the Control Box. It includes three Clutch-Gear Assemblies, Part No. 76-6424-2, one for each Receiver control except the CHANNEL SELECTOR. The CHANNEL SELECTOR uses one Clutch-Gear Assembly, Part No. 76-6424-3. The CHANNEL SELECTOR clutch-gear operates the double-pole, single-throw, cut-off switch, Part No. 42-1953. The Clutch and Gear Assembly also includes the Driving-Gear Assembly, Part No. 76-6413, the Intermediate Pulley and Gear, Part No. 56-8736-1, the Shaft and Gear Assembly, Part No. 76-7687, and six pinions (see parts list for part numbers). In addition, there is a Driver Assembly for each Receiver control. Two types of Driver Assemblies are used. One type used for direct driving, Part No. 76-6475, is used for only the CHANNEL SELECTOR. The other type, the Safety Driver, Part No. 76-6585, is used for all controls except the CHANNEL SELECTOR. The Clutch-Gear Assembly also includes four Solenoid Coil Assemblies, Part No. 76-6416, one for each control.

Motor Assembly

The Motor Assembly, Part No. 35-1465-1 or 35-1485-1, is driven from a 24-volt, a-c source. In conjunction with the motor, a belt, Part No. 54-8318, is used to transmit rotary power to the gears. A capacitor, Part No. 30-2355-3, is also used with the motor, to control the direction of motor rotation.

DESCRIPTION OF OPERATION

Motor Assembly

The shaft of the motor turns in either a clockwise or a counterclockwise direction, depending upon which of the two field windings is placed in series with the capacitor. The voltage is applied and the motor direction is determined by moving any one of the switch levers on the Control Box to either of the two off-center positions.

Gear Assembly

The motor belt drives the Intermediate Pulley and Gear Assembly, which, in turn, moves the Driving-Gear Assembly. See figure 6. This gear transmits the rotary motion for the whole system of gears. It turns the gear on the VOLUME Control Shaft and Gear Assembly, which, in turn, moves the pinion gears. The pinion gears pass on the rotary motion to the other gear assemblies.

Clutch and Driver Assembly

The individual Clutch and Gear Assemblies and their associated bushings are one-piece units, and will

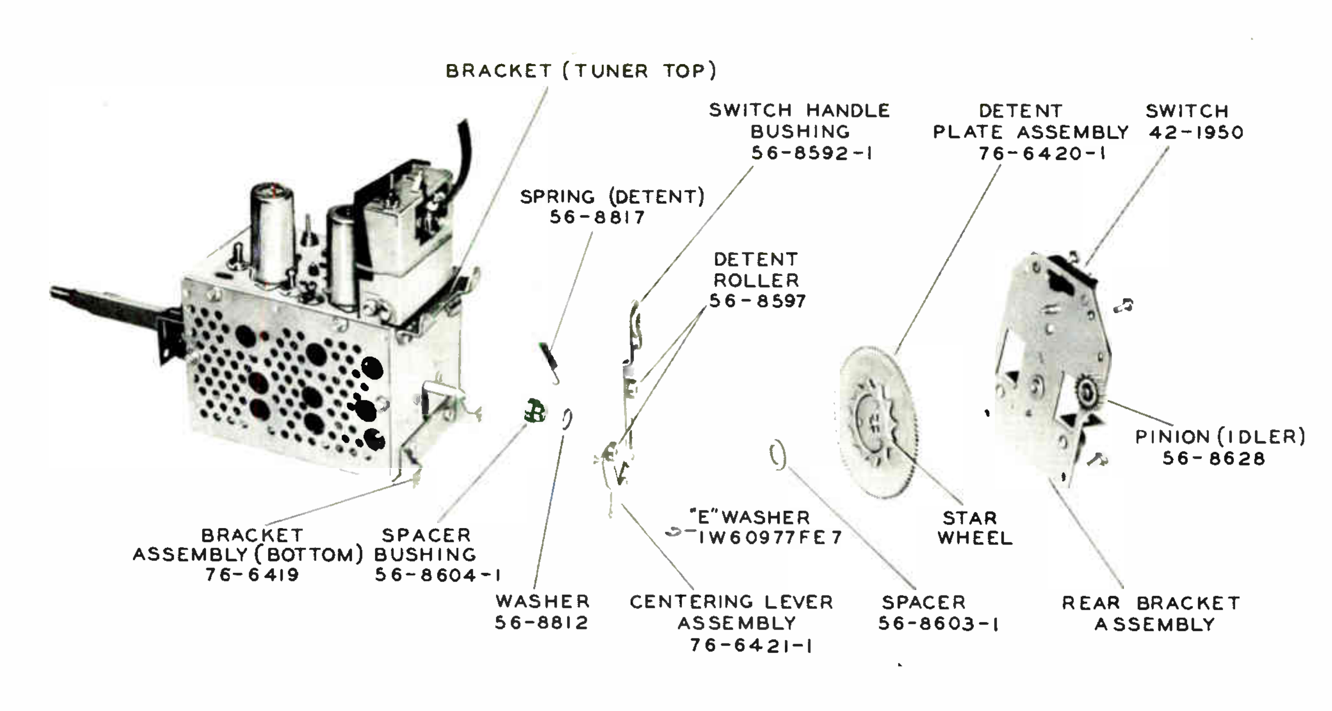


Figure 3. Exploded View of Tuner

TPO-1883-B

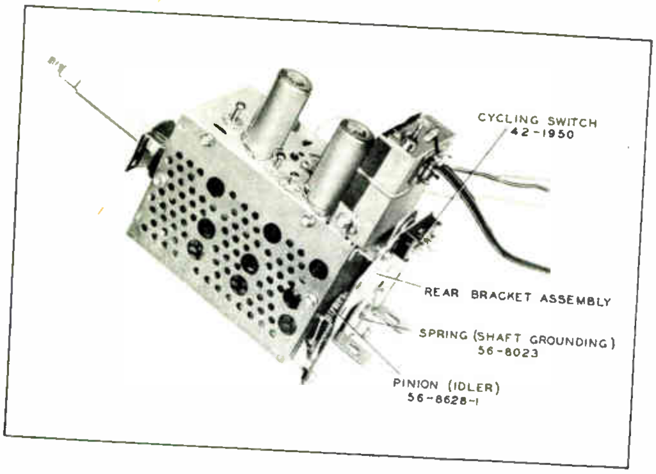
revolve as long as the motor shaft is turning. Figure 2 shows the Clutch-Gear Assembly without the washer that operates the cut-off switch. This washer is required only on the CHANNEL SELECTOR drive, although it is furnished with all replacement clutches. When a solenoid coil is energized, the armature in the assembly is attracted by the magnetic force, and is pulled against the pole face of the solenoid. The magnetic force overcomes the pressure supplied by a return spring. When the armature is attracted, the Clutch, which is a part of the assembly, moves forward and engages the Driver, causing the control shaft to rotate. A Safety Driver is attached to all controls except the CHANNEL SELECTOR. This safety feature prevents the gears from locking and causing damage when a control is rotated to its extreme clockwise or counterclockwise position. The Driver tooth is equipped with a toggle spring, which maintains enough pressure to make the Driver turn the control in normal operation; when the control is rotated to the end of its range, the spring tension is overcome, and the Driver slips off the Clutch tooth, with an accompanying clicking noise, until the voltage is removed from the solenoid or until the control is made to turn in the opposite direction. This safety feature is unnecessary for the Driver used by the CHANNEL SELECTOR, since this control can be rotated continuously.

Clutch and Switch Assembly (CHANNEL SELECTOR)

The Clutch Assembly for the CHANNEL SELECTOR works in conjunction with a series CHANNEL SELECTOR "cut-off" switch, Part No. 42-1953, which uses one section of the double-pole, single-throw switch in the Solenoid Switch Assembly. The cut-off switch is open when remote control is not being used, and thus prevents the application of voltage to the motor when the Receiver CHANNEL SELECTOR is turned manually. It is closed by the motion of the armature when the solenoid is energized.

Cycling Switch and Detent Assembly

When the STATION selector switch is operated, the CHANNEL SELECTOR solenoid and the motor are energized; thus, the CHANNEL SELECTOR Driver is engaged, and the tuner shaft starts to rotate. The roller fastened on the centering lever is subjected to an upward force as well as a lateral force by the star wheel. The centering pin prevents any upward motion until the centering lever has traveled a certain distance sideways. This action closes the cycling switch. See figures 3, 4, and 5. The cycling switch is in series with the CHANNEL SELECTOR cut-off switch, which is activated by the CHANNEL SELECTOR Clutch Assembly, and these switches together parallel the STATION selector switch in the Remote Control Box; therefore, during the time the roller is riding on the star wheel and the cycling switch is connected, the drive shaft continues to turn, even though the STATION selector switch on the Control Box is released. This cycling action continues until the roller dips into the bottom of the next star wheel depression; this takes the pressure off the detent spring, returning the centering lever to the center of the cycling switch, and opening the switch. When the cycling switch opens, all voltage is removed from the solenoid and motor, and the armature then returns to the free position, disengaging the CHANNEL SELECTOR clutch and gear and opening the CHANNEL SELECTOR cut-off switch.



TPO-1573-B

Figure 4. Oblique View of Tuner

ELECTRIC WIRING

If the STATION selector switch on the Control Box is moved either to the left or right, the hot side of the 24-volt a-c supply circuit is connected to the solenoid winding and to the motor. See figure 7. The armature is drawn forward, and closes the CHANNEL SELECTOR cut-off switch. As the tuner shaft starts to rotate, the centering lever is thrown off center, closing the cycling switch. Now, even though finger pressure is released from the STATION selector switch on the Control Box, voltage is still supplied to the solenoid through the cycling switch, in series with the CHANNEL SELECTOR cut-off switch. Voltage is applied until the cycle is completed, at which time the detent roller falls into a depression in the star wheel, returning the centering lever to center and opening the cycling switch. This cuts off voltage to the solenoid and motor, which, in turn, causes the armature to spring back and disengage the clutch from the driver on the control shaft, and open the CHANNEL SELECTOR cut-off switch. During manual operation, the cycling switch is closed by the rotation of the tuner shaft, but no voltage is applied to the motor or solenoid, since the CHANNEL SELECTOR cut-off switch, in series with the cycling switch, remains open.

In order to mute the Receiver sound while the CHANNEL SELECTOR is being rotated through the channels by remote control, the other section of the double-pole, single-throw switch on the Solenoid Switch Assembly is used as a muting switch. When closed, this switch shorts out the speaker voice coil. It is closed only during the time that the CHANNEL SELECTOR solenoid is energized, since the switch is closed by the pressure of the armature when it is attracted by the solenoid.

ADJUSTMENTS (See Figure 6)

Clutch Teeth

The clutch teeth should be free from the engaging portion of the driver by 1/32″ when the coil is not energized. This proper spacing may be obtained by bending the driver.

Solenoid Switch

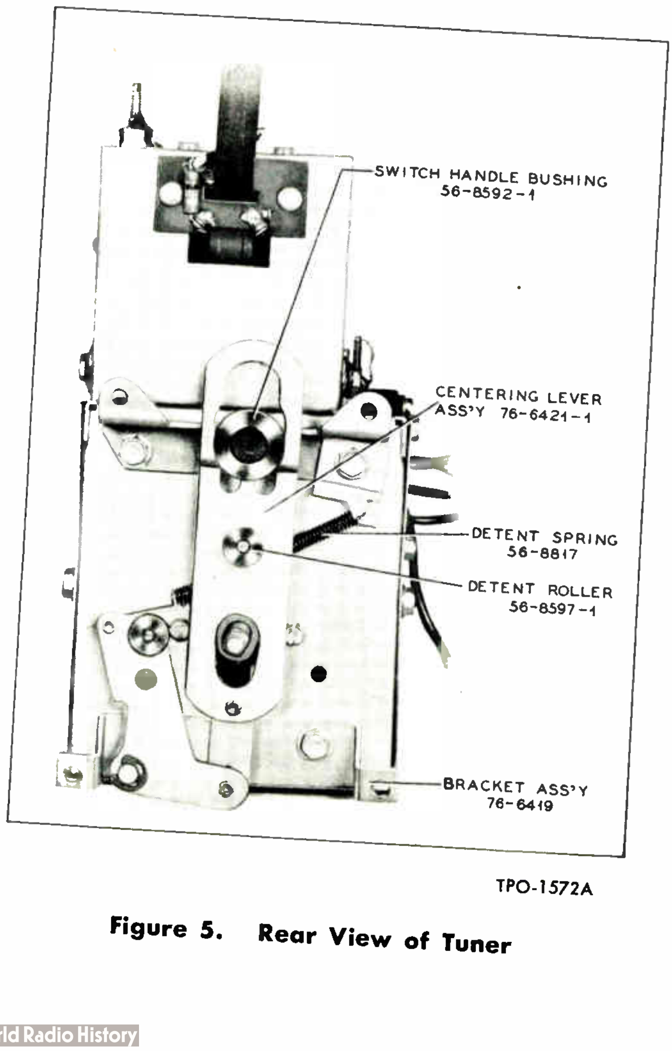
The solenoid switch should not be fully closed until the last 1/64″ of movement of the armature assembly. The switch may be adjusted for this condition by positioning the switch bracket.

Driving-Gear Assembly

To disassemble the driving-gear assembly and driving pinion, use a knock-out pin of a diameter smaller than the hole in the driving pinion; insert the pin into the hole, and strike it sharply with a small hammer.

Motor Belt

The motor-belt tension should be so adjusted that, when the large pulley (which is driven by the belt) is held stationary, the motor shaft is slowed down until it is barely turning (approximately 15 r.p.m.). The belt must be kept absolutely free of oil and grease.



TPO-1572A

Figure 5. Rear View of Tuner

Shaft Assembly (Side of Tuner)

The shaft along the side of the tuner must be so aligned that it is completely free to rotate, and has end play of not more than 1/32″ to the CHANNEL SELECTOR clutch shaft. The CHANNEL SELECTOR clutch shaft must also be completely free to rotate, with .005″ to .015″ end play. The same alignment and end play conditions also apply to the FINE TUNING gear shaft and the shaft and gear driving the VOLUME control rack.

Idler Gear—FINE TUNING Shaft

The idler gear driving the FINE TUNING shaft must be so adjusted that there is no binding between the gear train and the gear on the FINE TUNING shaft, through the entire range of rotation of the FINE TUNING shaft.

VOLUME Control Racks

The VOLUME control rack and gear assembly must be so positioned that, when the VOLUME control OFF-On switch is OFF, the Switch Actuator cannot be turned more than 1/16″ (with a tolerance of plus 1/32″ and minus 1/64″) before the switch actuator contacts the OFF-On switch. The rack and gear must be so positioned that the entire volume range can be covered when the control is actuated by the rack and gear.

To connect the free ends of the racks, first join the racks by lifting the free ends upward and feeding the guide ears on the drive rack into the guide slots in the VOLUME control rack. Then position the racks, by sliding them, so that the VOLUME control rack is in the off position and the drive rack is pulled out to the extreme end position toward the On-Off switch. Fasten the racks together with the clamping screw, and check to see that the entire volume range is covered.

Wire Dressing and Repair

All wiring must be dressed clear of moving parts. When the flat conductor cable is replaced, the ends of the new cable should be cut diagonally, to aid in individual wire identification. There is an extra wire in the cable which can be used as a replacement when one of the wires breaks.

When repairing the conductor, skin the cable insulation by cutting it on an angle with a razor blade; cut down to the wires on both sides of the cable, taking care to avoid damaging the fine wires. Strip the insulation from the cable with the fingernails or a pair of side cutters.

SERVICE HINTS

Failure of Gear Teeth on Clutch Assembly To Slide Freely on Bearings

Burrs or lack of lubrication may cause this trouble.

Buzzing

Buzzing is caused by the armature seating improperly on the pole-piece face. A pole piece which has burrs on it, or which is not mounted squarely with relation to the fastening nut, or which has foreign matter between the armature and the pole piece, will cause buzzing. Buzzing may also be caused by an uneven surface on the inside of the armature, or by engagement of the CHANNEL SELECTOR solenoid switch before the last 1/64″ movement of the armature.

Binding of Armature on Clutch Assembly

Foreign matter or burrs may cause the armature to bind on its bearing when the solenoid coil is energized.

Failure To Rotate Tuner

Failure to rotate tuner may be caused by low line voltage. For satisfactory operation, the line voltage should be at least 105 volts. Failure may also be caused by a faulty motor capacitor, transformer, or motor.

Inoperative Solenoids

In cases where a solenoid fails to operate, the trouble may be due to loosening of the ground contact in the solenoid winding. Check for continuity with an ohmmeter, and replace the faulty solenoid.

Gear Noise

Gear noise can be reduced to a minimum by adjusting the mesh between the driving-gear assembly and the driving pinion. This can be done by adjusting the eccentric stud. See figure 6. After this adjustment, belt tension must be checked, and readjusted if necessary. (The test for correct belt tension is given under Motor Belt.)

Defective Cable

The red and brown leads of the 8-conductor cable are connected in parallel to the same points. One of these leads may be disconnected and used as a replacement lead if any of the other leads are broken within the cable.

Removing Detent Plate Assembly

When removing this assembly, it is necessary to depress the centering lever link upward, to disengage the indexing roller from the star wheel.

LUBRICATION

Lubricants

OIL—Philco Part No. 60320-1, SAE-20.
GREASE—Texaco Motor Cup Grease, or equivalent.

Parts Not To Be Lubricated

Motor belt.
Motor-belt-pulley driving surfaces.

Parts To Be Greased

Intermediate pulley and gear stud.
Shaft to driving gear assembly.
All gear teeth.
Engaging tooth and bearing surface of safety-clutch toggle.
Teeth of clutch assembly.
Drive racks.

Parts To Be Oiled

Bearing surface and threads of the four solenoid bushings.
Motor bearings.
Idler-pinion studs.
Shaft of VOLUME control pulley assembly.
Shaft of FINE TUNING drive assembly.
Studs of FINE TUNING drive links.
Bearings of tuner drive shaft.

REPLACEMENT PARTS LIST

Description	Service Part No.
Control Box and Cable Assembly	76-7707
Cable complete (eight-conductor, flat)	41-4069
Spring	56-8581
Switch, station	42-1950
Switch, DARK-LIGHT	42-1950
Switch, VOL-OFF	42-1950-1
Switch, FINE TUNING	42-1950-1
Remote Assembly	
Belt	54-8318
Bushing, steel	56-8615
Cable assembly (transformer to remote unit)	41-4095
Capacitor, 30 μf., 60v (30v, a.c.)	30-2355-3
Clutch-gear assembly (3 req.)	76-6424-2
Clutch-gear assembly (1 req.)	76-6424-3
Collar	56-8661
Condensers (5 req.), damping, .1 μf., 200v	30-4586
Driving-gear assembly	76-6413
Intermediate pulley and gear	56-8736-1
Link assembly	76-6525
Link-drive	56-8758FA3
Motor assembly	35-1465-1 or 35-1485-1
Pinion (3 req.)	56-8628
Pinion, idler (2 req.)	56-8628-1
Resistor, variable, BRIGHTNESS and CONTRAST	33-5563-52
Shaft and gear assembly, VOLUME control driver	76-7687
Shaft and pinion assembly, FINE TUNING driver	76-6526-1
Jack shaft assembly (side of tuner)	76-6979
Shaft (couples to jack shaft)	56-9176
Coupler	54-4912-1
Socket, bracket and cable assembly	41-4145
Solenoid coil assembly	76-6416
Volume Control Gear and Bushing Assembly	
Gear, VOLUME control	56-9751
Actuator, switch	56-9753
Switch	42-1867
Bracket, switch	56-9756
Washer, flat	1W52904FA1
Rack, VOLUME control	56-9748
Screw, adjusting	1W51648FA1
Washer	1W52219FA1
CHANNEL SELECTOR "cut-off" switch	42-1953
Nut	56-8614-1
Lock washer	1W44438
Spring	56-9175FE15
Stud, adjustable	56-8753
Driver assembly	76-6475
Driver assembly (safety)	76-6585
Clutch, driver	56-8806
Screw	1W15843FA1
Nut	56-7042FA3
Spring, toggle	56-8989FE15
Toggle	56-9245
Resistor 1.7 ohms, 10 watts	33-3448-1

MECHANICAL PARTS FOR REMOTE CONTROL TUNER (PART NO. 76-7830)

Description	Service Part No.
Bracket assembly, bottom	76-6419
Centering-lever assembly	76-6421
Detent plate assembly	76-6420
Pinion, idler (1 req.)	56-8628
Roller, detent	56-8597
Spring, detent	56-8817
Spacer, bushing, centering lever	56-8604
Spring, shaft grounding	56-8023
Switch, cycling	42-1950
Switch-handle bushing	56-8592
Washer, "E," pinion mounting	1W60977FE7
Washer, brass, centering lever	56-8603
Washer, steel, detent assembly	56-8812
Coupler	54-4912-1

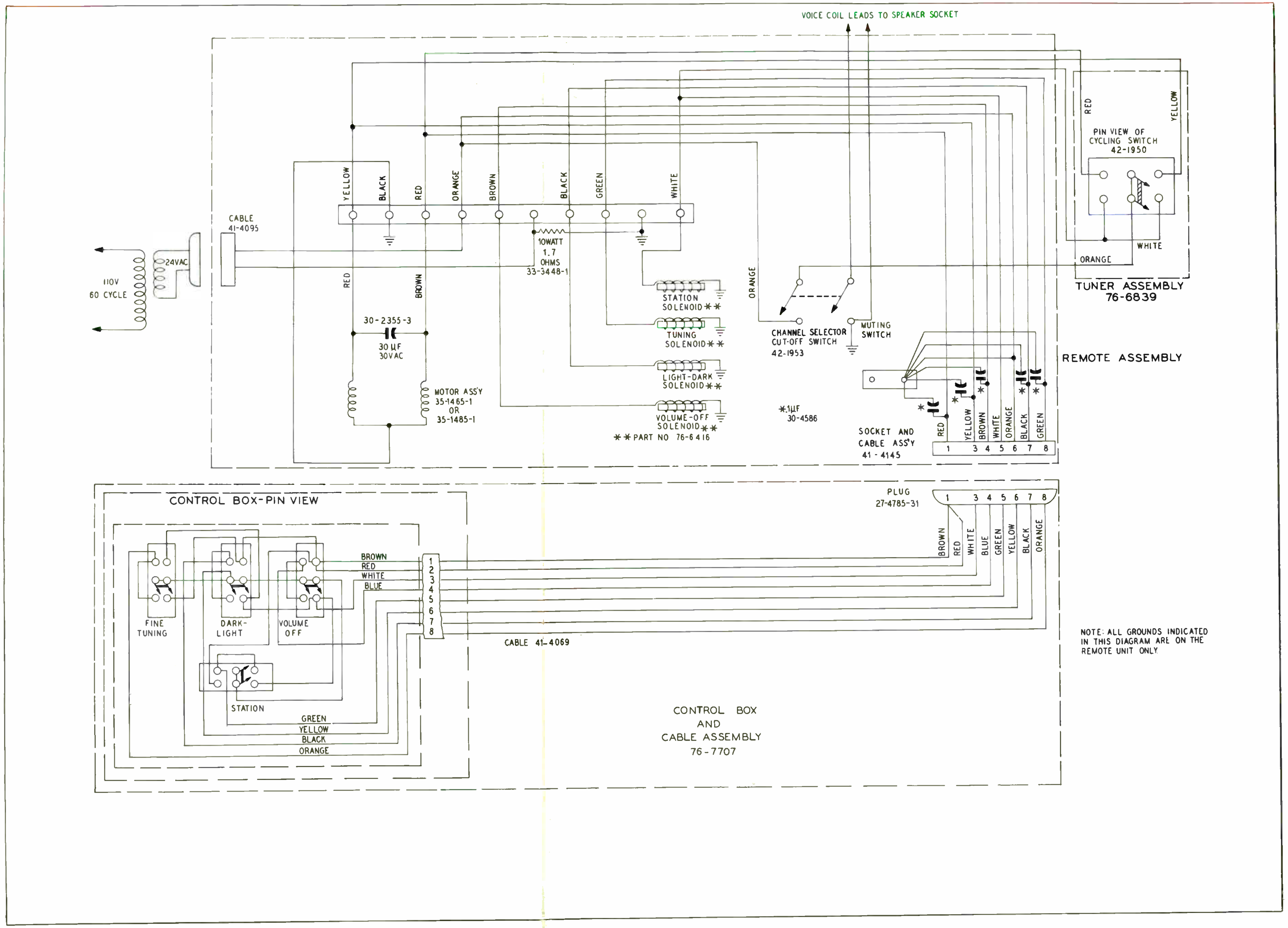
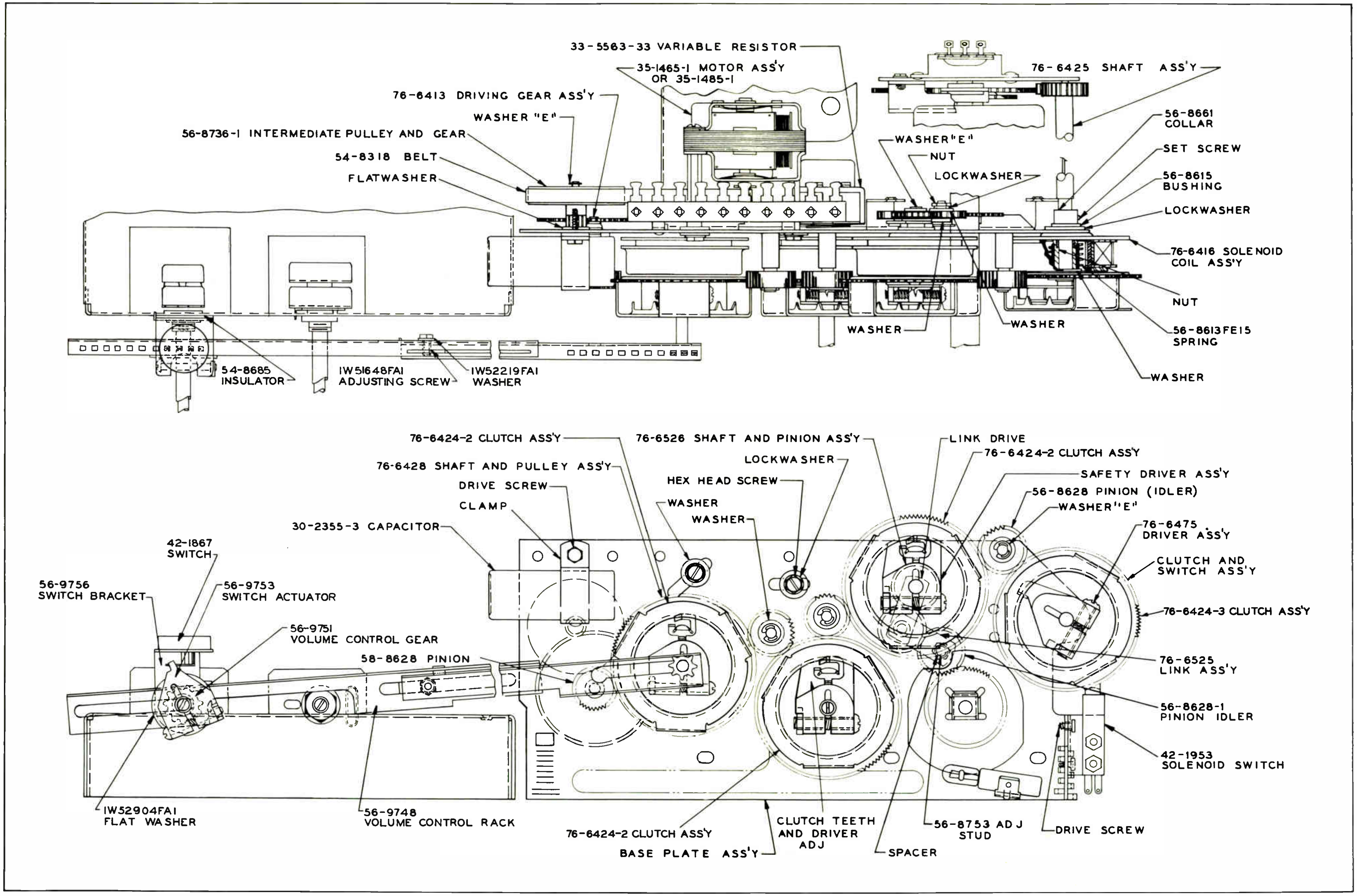


Figure 7. Electrical Wiring Diagram of Philco Television Remote Control Unit RC-3



TP2-1505

Figure 6. Details of Remote Assembly

PHILCO TELEVISION SERVICE MANUAL FOR CUSTOM 400 CHASSIS

PHILCO
Factory-Supervised
Service

TELEVISION

SPECIFICATIONS — TV-400 CHASSIS

VHF TUNING	Twelve channel, 13 position incremental tuner, covering VHF television channels 2 through 13; plus UHF position, and fine tuning of local oscillator.
UHF TUNING (if provided)	Continuous tuning, covering UHF television channels 14 through 83.
INTERMEDIATE FREQUENCIES	
Video Carrier	45.75 mc.
Sound (intercarrier)	4.5 mc.
TRANSMISSION LINE	300-ohm, twin-wire lead.
OPERATING VOLTAGE	100 to 120 volts, 60 cycle, A.C.
POWER CONSUMPTION	Without UHF, 240 w. With UHF, 245 w.

TUBE COMPLEMENT — TV-400 CHASSIS

Reference Symbol	Tube Type	Function
S1	6AT6	first audio and tuner a-g-c delay
S2	6AL5	ratio detector
S3	6AU6	2nd sound i-f amplifier
S4	6BA6	1st sound i-f amplifier
S5	6CU6	horizontal output
S6	6V6GT	audio output
S7	6AX8	video amplifier, sync separator
S8	6AX4GT	damper
S9	6CB6	video, i-f amplifier
S10	6CB6	video, i-f amplifier
S11	12AU7	cathode follower & noise inverter
S12	6AU6	AGC gate
S13	6CB6	video i-f amplifier
S14	6AQ5	video output
S15	12AU7	vertical oscillator
S16	12B4	vertical output
S17	6BC6	video i-f amplifier
S18	6AL5	phase comparer
S19	12AU7A	horizontal oscillator
S20	1B3GT	high voltage rectifier
S21	5U4G	low voltage rectifier
S22	5U4G	low voltage rectifier
S23	6BZ7	RF amplifier
S24	6X8	oscillator-mixer
	21ZP4B	picture tube

CONTENTS

CIRCUIT DESCRIPTION

The TV-400 is the deluxe receiver of the new line employing a single chassis. The VHF tuner used is a 12 channel, 13 position tuner mounted on a separate sub-chassis. The thirteenth position is used for the reception of UHF signals in conjunction with a UT-26 UHF tuner. The R.F. amplifier is a 6BZ7 tube, while the local oscillator and mixer stages use a type 6X8 tube. The pentode section of the 6X8 is used for mixing, while the triode is used as a local oscillator.

The output of the mixer, a 40-MC signal, is link coupled to four stagger tuned video I-F stages employing four 6CB6 tubes. This I-F system is an improved I-F, in that it contains additional trapping to improve the adjacent channel interference. In the grid circuit of the first I-F, we have the 47.25-MC adjacent channel sound trap and the 41.25-MC accompanying sound trap. In the grid circuit of the third Video I-F, we have an additional 47.25-MC adjacent sound trap along with a 39.75-MC adjacent channel picture trap. This 39.75-MC adjacent channel picture trap is something we have not used in quite a long period of time, and the adjustment of this trap along with the other traps is of primary importance in achieving the top performance built into our TV-400 chassis.

A 1N64 crystal diode is used as a video detector. Following the video detector is a video amplifier consisting of two stages. The first stage uses the pentode section of the 6AX8 and the output stage uses a 6AQ5 which drives the grid of the picture tube.

Sound I-F (intercarrier) is obtained by utilizing the beat frequency produced when the 45.75-MC video carrier and the 41.25-MC sound 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 the video AM 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 relative amplitude of the two carriers is established in the alignment of the receivers. There is sound output only when both the video and sound carriers are present.

A-G-C voltage for the video I-F system and the R-F amplifier is obtained from a keyed a-g-c system which uses a 6AU6 tube, as the a-g-c gate. Composite video from the video-amplifier plate circuit through a cathode follower, is fed to the grid of the a-g-c gate tube, while a gating or keying pulse, obtained from a winding on the horizontal-output transformer, is applied to the plate. The sync-pulse polarity applied to the grid of S12 is positive; therefore, the a-g-c gate can conduct in proportion to the amplitude of the sync-pulse tips if the gating or keying pulse occurs at the same time as the sync. Because the keying or gate pulse is a constant amplitude, approximately 500 volts peak, the amplitude of the sync pulse will determine the amount of conduction in the gate tube. The plate current of the keyed a-g-c gate tube flows through a resistor network, developing a voltage which is negative with respect to the chassis and whose amplitude is proportional to the plate current. This negative voltage is used to control the gain of the receiver. Since conduction cannot occur in the a-g-c gate tube unless the sync pulse and gating pulse occur at the same time, noise disturbances that occur between sync-pulse intervals cannot affect the a-g-c voltage.

Composite video for the sync circuits is taken from the plate of the first video amplifier. The output is fed to a cathode follower which delivers the information into the noise inverter circuit. The noise inverter is operated with a low value of plate voltage and high bias which keeps the tube beyond cut-off. When the composite video signal is applied to the grid of the noise inverter the sync appears as positive pulses: noise which could affect the sweep circuits also appears as positive pulses. Harmful noise pulses usually have amplitudes far greater than the sync pulses, and therefore, drive the grid of the noise inverter positive sufficiently to allow conduction in the noise-inverter plate circuit.

The output of the noise inverter consists of negative-going noise pulses. It should be noted that the noise pulses which exceed the sync level have been passed and their polarity reversed by the noise inverter. The output of the noise inverter is now mixed with the composite video and fed to the grid of the sync separator, the triode section of the 6AX8 tube. Since the composite video fed to the grid of the sync separator has positive sync polarity, the positive noise pulses carried with the composite video would be passed by the sync separator; however, the output of the noise inverter consists of these same noise pulses, but they are of opposite polarity; thus, the noise pulses are cancelled. The output of the sync separator contains only the sync pulses which are fed to the vertical and horizontal circuits. The vertical pulses are fed from the plate of the sync separator to the vertical oscillator through an integrator circuit. The vertical oscillator employs a 12AU7 tube as a cathode coupled multivibrator. A variable resistor in the grid circuit of the second triode adjusts the oscillator frequency and serves as the hold control. A variable resistor in the plate circuit of the same tube provides vertical height adjustment. The vertical output stage employs a 12B4 tube. A variable resistor in the cathode circuit provides adjustment of the vertical linearity. A vertical retrace suppression circuit is connected from one side of the vertical output transformer to the picture tube cathode. The vertical sync is separated from the horizontal sync by the integrator circuit, and is fed to the grid of the vertical oscillator. The output of the vertical oscillator is amplified by the vertical-output amplifier, using a 12B4 tube, and the output of the amplifier is applied to the vertical-deflection coils through the vertical-output transformer.

Horizontal sync information is fed into the phase comparer circuit which controls the frequency of the horizontal oscillator. A 6AL5 tube is employed as the phase comparer in the horizontal circuits. The plate of one diode is grounded, the cathodes of both diodes are tied together and, from a winding on the horizontal output transformer, a pulse is fed, through a shaping network to the plate to the other diode. The horizontal sync pulses from the sync separator are fed to the cathodes. If the incoming sync pulse is not in phase with the pulse from the horizontal output transformer, a difference voltage occurs in the output of the phase comparer which is fed to the horizontal oscillator and is used to control its frequency. A cathode coupled multivibrator using a 12AU7A tube provides the horizontal oscillator signal. Two variable resistors in series to the grid of the second triode section of the oscillator are employed as the horizontal hold control and horizontal hold centering control. With these controls, the horizontal oscillator frequency is adjusted within the range of the phase comparer control voltage.

When the voltage is delivered to the horizontal oscillator grid by the phase comparers circuit is positive, it increases the frequency of the oscillator; when the voltage is negative, it reduces the frequency of the oscillator. This control voltage holds the horizontal oscillator in phase with the sync signal. The HORIZ. HOLD control, adjusts the horizontal oscillator to the proper frequency, so that it may be controlled by the phase comparer. The output of the horizontal oscillator is fed to the horizontal-output amplifier, which uses a 6CU6 tube, V19.

The second anode voltage for the picture tube is furnished by a high-voltage winding of the horizontal-output transformer, and is rectified by a 1B3GT high-voltage rectifier tube.

VIDEO PEAKING-COIL ADJUSTMENT — TV-400

The peaking coil, T5, is adjusted at the factory for proper transient response of the video circuits. Ordinarily, this coil will require no further adjustment by the serviceman. On any station where excessive overshoot or excessive smear is present, a slight adjustment of T5 may improve the picture quality on that station; however, this adjustment may sacrifice the quality on other channels. If T5 is replaced in servicing, adjustment will be required.

Before adjusting T5, check the tuner alignment and I-F alignment. (Never adjust T5 until the alignment of a receiver is correct.) Then tune in a station and adjust T5 until there are no trailing whites or smear in the picture. Turning T5 clockwise reduces trailing whites and overshoot; turning T5 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 T5 applies to a particular station exhibiting smear or overshoot. After T5 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 procedure follows the general pattern of first checking the tuner response with an FM sweep generator and oscilloscope, comparing the response curve with that given in the manual, and aligning the tuner if necessary. After it is established that the tuner is in correct alignment, the video I-F channel is aligned by tuning each coil to its assigned pole frequency, using an AM signal, and then feeding in a sweep signal at the antenna terminals and retouching the I-F adjustments to obtain the desired pass band. Finally, the sound channel is aligned, using an AM signal, by tuning the sound take-off coil and the I-F and ratio-detector transformers.

The over-all response curve (r-f, i-f) of the circuits from the antenna terminals to the video detector, after the I-F stages have been aligned, should appear essentially the same, regardless of the channel under test. If 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 having the top of the workbench metallic. 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 2 inches wide. The section of the chassis nearest the tuner should rest on the strip.
2. Do not disconnect the picture tube yoke 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 model 7008 is used, the built-in crystal calibrator provides an excellent means of calibration. An alternate method for 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."

HORIZONTAL-OSCILLATOR ADJUSTMENT — TV-400

To adjust the horizontal-oscillator circuit, tune in a station and proceed as follows:

1. Decenter the picture until blanking can be observed at the right-hand side.
2. Increase the BRIGHTNESS control setting until the blanking becomes visible This will appear as a dark vertical bar on each side of the picture.
3. Connect a .1 mf condenser from the test point, to ground. (The plate side of the horizontal ringing coil, T6, is connected to the test point.)
4. Set the HORIZONTAL HOLD control to the approximate center of its mechanical rotation.
5. Adjust the HORIZONTAL HOLD CENTERING control until equal portions of the blanking bar appear on both sides of the picture.
6. Remove the .1 mf condenser from the test point.
7. Adjust the horizontal ringing coil until equal portions of the blanking bar again appear on both sides of the picture.
8. Rotate the HORIZONTAL HOLD control through its range. The picture should fall out of sync on both sides of the center of its rotation. If the picture does not fall out of sync on both sides, readjust the HORIZONTAL HOLD CENTERING control.
9. Rotate the HORIZONTAL HOLD control through its range, and observe the number of diagonal blanking bars that appear just before the picture pulls into sync. The pull-in should occur with from 1 to 2 diagonal bars when the sync position is approached from either direction. If proper pull-in is not obtained, repeat the above procedure.

JIGS AND ADAPTERS REQUIRED — TV-400

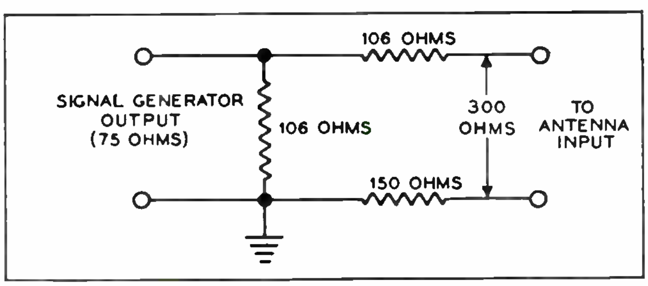


Fig. 1. Antenna-Input matching network.

Mixer Jig

Connections to the grid of the mixer tube may be made through the test point provided for this 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, may be used. As an alternate, a Philco alligator-clip adapter, Part No. 45-1636, with as short a ground lead as possible, may be used to connect 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.

Antenna-Input Matching Network

An impedance-matching network for coupling the signal generator to the antenna input terminals of the receiver is shown in figure 1. 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 antenna-input circuit. The resistors used in this network should be of carbon-composition construction, and should be chosen from a group, to obtain values within ten percent of those indicated. The resistors should be placed in a shield can, to prevent variable effects. An antenna-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.

Video I-F Alignment Jig

(Video Test Jack Adapter No. 1)

The alignment jig used at TS1 and shown in figure 2, 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 five-pin plug, two 10,000 ohms resistors, and a 1500 mmf condenser for isolation of the bias supply. To isolate the oscilloscope from the receiver circuits, a 15,000-ohm resistor, by-passed by a 1500 mmf. condenser, is used. A suggested method of fabricating the jig is also shown in figure 2. This jig should not be used to observe the composite video from the video detector output.

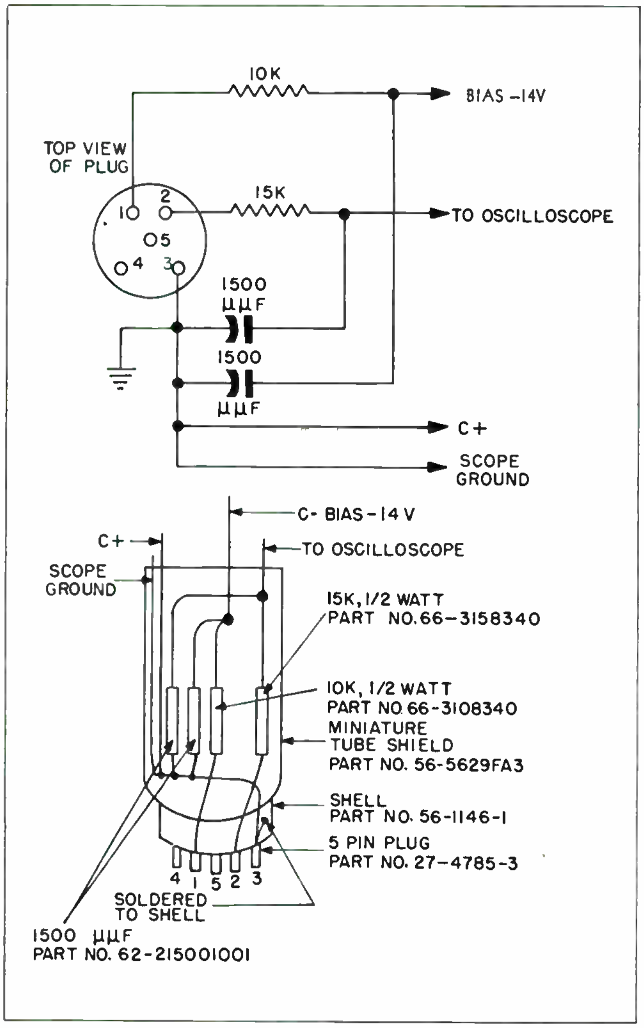


Fig. 2. Video I-F Alignment Jig (Video Test Jack Adapter No. 1).

JIGS AND ADAPTERS REQUIRED (Continued)

Sound I-F Input Alignment Jig

(Video Test Jack Adapter No. 2)

To observe the composite video, at TS1, a jig may be made with a five-pin plug and a 2200 ohm resistor. (See figure 3.) The 2200 ohm resistor should be connected to pin 2 of the plug. A ground lead should be connected to pin 3. To observe the composite video, connect the oscilloscope to the 2200 ohm resistor and the ground lead. This jig is also used for injection of the 4.5 mc. signal during s-i-f alignment.

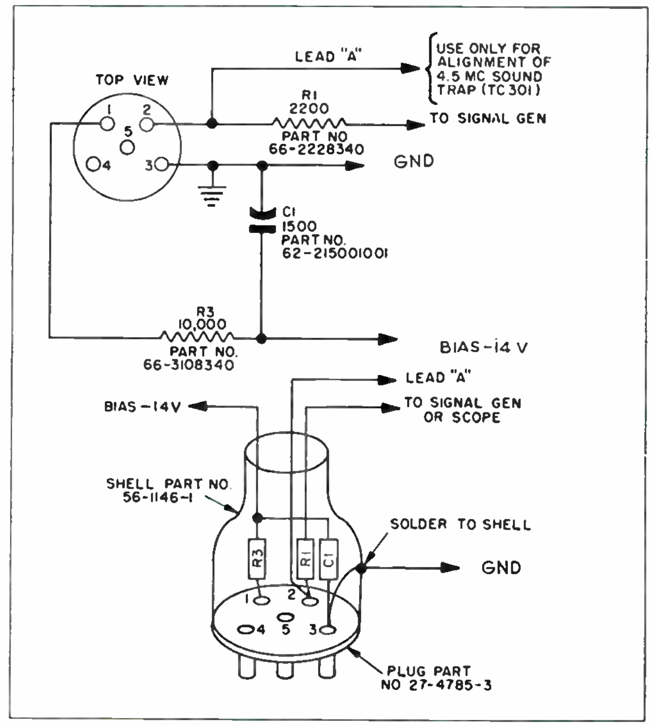


Fig. 3. Sound I-F Input Alignment Jig (Video Test Jack Adapter No. 2).

TUNER BAND PASS ALIGNMENT

(See Table No. 2 on Page 6)

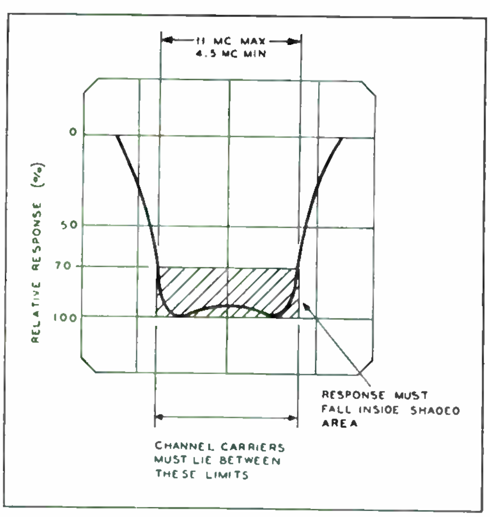


Fig. 4. Television tuner response curve, showing bandpass limits.

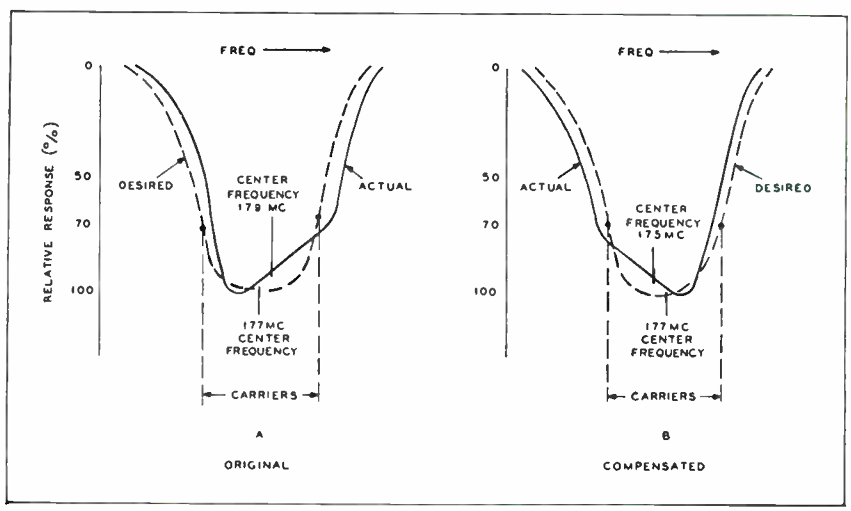


Fig. 5. Television tuner response curve, showing tracking compensation.

TUNER OSCILLATOR ALIGNMENT
TABLE NO. 1

AM GENERATOR: Connect to receiver antenna-input terminals. (No matching network is required.) Use unmodulated r-f output.

OSCILLOSCOPE: Connect the vertical-input lead, in series with a 1000-ohm resistor, to the mixer grid test point. Connect the scope ground lead to the chassis, near the test point.

RECEIVER CIRCUIT ALTERATIONS: Disconnect tuner a-g-c (pink tracer) lead from main chassis, and connect a 1.5 volt bias battery, with negative terminal to white lead from tuner, and positive terminal to chassis.

STEP	AM GENERATOR DIAL SETTING	RECEIVER TUNING	ADJUST	REMARKS
1	257 mc.	channel 13	T2 for zero beat on scope.	a. If regeneration occurs, inject bias; bias may be increased up to 3 volts, if necessary at pin 1 video test jack — TS1. b. Preset fine tuning adjustment so that it is in the middle of its range.
2	251 mc.	channel 12	VC8 for zero beat on scope.	
3	245 mc.	channel 11	VC7 for zero beat on scope.	
4	239 mc.	channel 10	VC6 for zero beat on scope.	
5	233 mc.	channel 9	VC5 for zero beat on scope.	
6	221 mc.	channel 7	VC4 for zero beat on scope.	
7	64.5 mc.	channel 6	T7 for zero beat on scope.	2nd harmonic gives 129 mc.
8	113 mc.	channel 4	T5 for zero beat on scope.	
9	101 mc.	channel 2	T3 for zero beat on scope.	

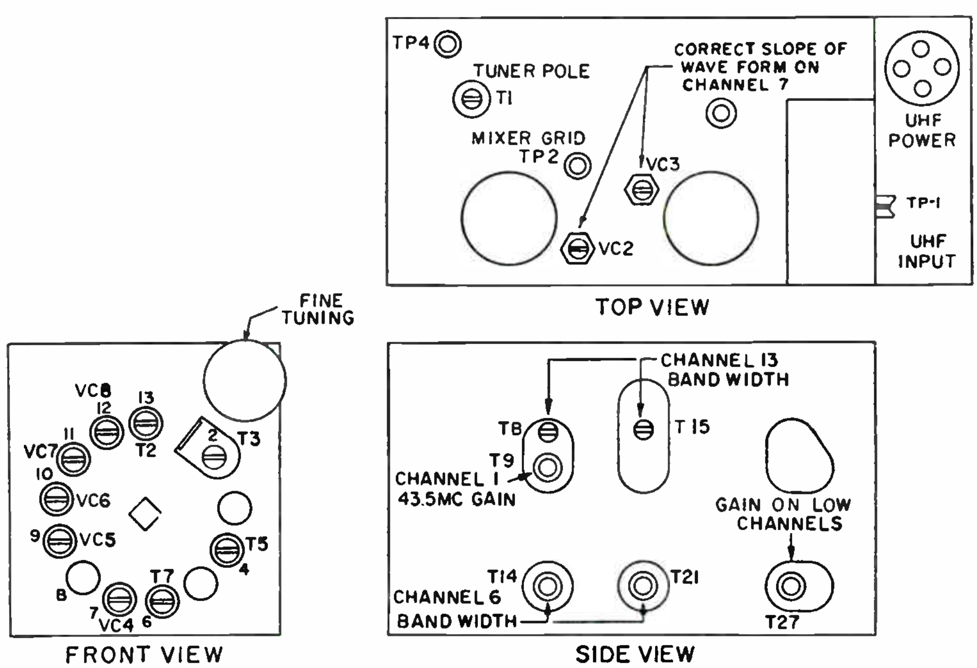


Fig. 6. Tuner Layout.

TUNER BANDPASS ALIGNMENT — TABLE 2

SWEEP (FM) GENERATOR: Connect to receiver antenna-input through Antenna-input Matching Network. (See figure 1.)
OSCILLOSCOPE: Connect the oscilloscope to the junction of R518(15K,1W) and the tuner red lead. Clip ground lead of scope to chassis.

RECEIVER CIRCUIT ALTERATIONS: Disconnect tuner a-g-c (white) lead from main chassis and connect a 1.5-volt bias battery; negative terminal to white lead from tuner, and positive terminal to chassis. Disconnect tuner coupling link leads, and connect a 40- to 70-ohm carbon resistor across the open end of the lead, from the tuner.

STEP	SWEEP (FM) GENERATOR Sweep Dial Setting	SWEEP (FM) GENERATOR Marker Dial Setting	RECEIVER TUNING	ADJUST	REMARKS
1	Channel 13 (213 mc., with 10-mc. sweep width.)	Set first to 210 mc. and note position of marker on response curve. Set to 216 mc. and note position of marker on response curve.	Channel 13		Oscilloscope gain as high as possible with respect to hum level and "bounce". Pips fix channel limits on curve. Response curve to be flat between limits (see figure 4). If not, proceed with step 2.
2	Channel 13	213 mc.	Channel 13	T8 counterclockwise until single peak appears.	CAUTION: Care must be taken not to unscrew core far enough to make it drop out of the coil.
3	Channel 13	213 mc.	Channel 13	T15 until peak falls on 213 mc. marker.	Sweep Generator output may have to be increased.
4	Channel 7 (177 mc., with 10-mc. sweep width.)	Set first to 174 mc. and note position of marker on response curve. Set to 180 mc. and note position of marker on response curve.	Channel 7		Note curve with respect to tilt and center frequency. Curve should be centered in pass-band and symmetrical. If not, proceed with step 5.
5	Channel 7	174 mc. and 180 mc.	Channel 7	VC3 and VC2 to get correct tilt on top of curve.	VC3 and VC2 compensate for the tuning effect of Channel 13 adjustment upon Channel 7. (See figure 5.)
6	Channel 13	213 mc.	Channel 13	Retouch T15 and T8 for symmetrical response centered about 213 mc. marker.	To retouch, only turn cores slightly.
7	Channel 7	117 mc.	Channel 7	Repeat step 5.	Check response curve for correct center frequency and symmetry.
8				Repeat steps 6 and 7.	Repeat Channel 13 and Channel 7 adjustments, alternately, until favorable curves are obtained on both.
9	Channel 6 (85 mc. with 10-mc. sweep width.)	Set first to 82 mc. and note position of marker on response curve. Set to 88 mc. and note position of marker on response curve.	Channel 6		Curve should be symmetrical and centered in pass-band. If not, proceed with step 10.
10	Channel 6	85 mc.	Channel 6	T14 counterclockwise until single peak appears.	CAUTION: Care must be taken not to unscrew core far enough to make it drop out of the coil.
11	Channel 6	85 mc.	Channel 6	T21 until peak falls on 85-mc. marker.	Sweep Generator output may have to be increased.
12	Channel 6	85 mc.	Channel 6	T27 for maximum curve height and symmetry of single peak.	After adjusting T27 recheck as in step 9. If necessary, reduce Sweep Generator output to avoid overloading.
13	Channel 6	85 mc.	Channel 6	Retouch T21 and T14 for symmetrical response centered about 85-mc. marker.	To retouch, only turn cores slightly.
14	43.5 mc. (with 10-mc. sweep width.)	Set first to 45.75 mc. and note position of marker on response curve. Set to 41.25 mc. and note position of marker on response curve.	UHF (Channel 1 position.)		Disconnect sweep (FM) generator from antenna-input terminals and connect to 40-mc. input jack TP1, using a matching network. Curve should be symmetrical and flat-topped. Markers should fall along flat-topped portion of curve. If not, proceed with step 15.
15	43.5 mc. (with 10-mc. sweep width.)	43.5 mc.	UHF (Channel 1 position.)	T9 for most symmetrical flat-topped response curve, centered about 43.5 mc. marker.	Recheck band-pass as in step 14, and repeat adjustment if necessary.

VIDEO I-F ALIGNMENT

AM GENERATOR: Connect to mixer test point, TP-2, through a mixer jig, and adjust the generator for approximately 30 percent modulation at 400 cycles. Adjust the output of the generator during alignment, to keep the output at the second detector below 4 volts peak to peak.

SWEEP (FM) GENERATOR: After step 9, connect to antenna-input circuit through antenna-input matching network. (See figure 1).

OSCILLOSCOPE: Connect the vertical-input lead to the 15,000-ohm resistor of the video i-f alignment jig. Connect scope ground lead to the ground lead of the jig. (See figure 2). Plug jig into TS-1.

PRESET: Contrast and Brightness controls fully counterclockwise, and channel selector to channel 4.

BIAS: Apply 10 volts of negative bias, through 10,000-ohm resistor, to pin 1 of video I-F alignment jig; ground positive side of bias supply to pin 3 of jig. (See figure 2).

NOTE: If the i-f shield has been removed fro repairs, it must be replaced before proceeding with the alignment.

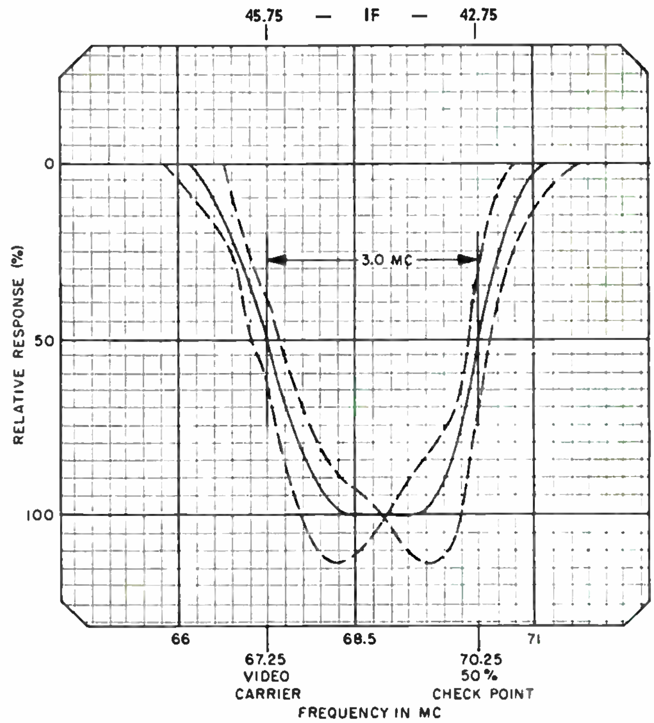


Fig. 7. Over-all R-F, I-F response curve, showing tolerance limits.

STEP	AM GENERATOR DIAL SETTING	SWEEP (FM) GENERATOR Sweep Dial Setting	Marker Dial Setting	ADJUST	REMARKS
1	47.25 mc.	not used	not used	VC3 and VC8 for minimum indication on scope.	
2	41.25 mc.	not used	not used	VC9 for minimum indication on scope.	
3	39.75 mc.	not used	not used	VC4 for minimum indication on scope.	It is necessary to keep the generator output sufficiently high that a null indication may be observed on the oscilloscope; however, avoid overloading of the receiver by excessive signal.
4	42.7 mc.	not used	not used	T1 for maximum indication on scope.	T1 located on tuner. Adjust the output of the AM generator when necessary, to keep the output at the second detector below 4 volt, peak to peak. (For convenience, the oscilloscope may be calibrated for this purpose beforehand.)
5	43.1 mc.	not used	not used	VC1 for maximum indication on scope.	
6	44.4 mc.	not used	not used	VC2 for maximum indication on scope.	
7	42.0 mc.	not used	not used	VC6 for maximum indication on scope.	
8	45.0 mc.	not used	not used	VC5 for maximum indication on scope.	
9	45.7 mc.	not used	not used	VC7 for maximum indication on scope.	
10	not used	Channel 4 (69 mc., with 6 mc., width.)	Run marker along curve checking against the curve limits given in figure 8.	If necessary, retouch T1, VC6, VC7, VC5 and VC1 as directed in REMARKS column. CAUTION: Do not touch the setting 1, 2 and 3.	Set fine tuning cam to middle of range. If response curve does not fall within limits shown in figure 7, retouch VC5 and VC1 alternately. T1, VC5 and VC1 affect dip of curve and VC2 affects tilt of curve. Adjust VC6 for proper slope at 42.0 mc., side of curve, and VC7 for proper level of curve, at video carrier frequency. If curve still does not fall within the limits, a slight readjustment of VC1 is permissible. CAUTION: To retouch, only turn the adjustments slightly.

OSCILLOSCOPE WAVEFORM PATTERNS

These waveforms were taken with the receiver adjusted for an approximate peak-to-peak output of 3.5 volts at the video detector. The voltages given with the waveforms are approximate peak-to-peak values. The frequencies shown are those of the waveforms — 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, and the peak-to-peak voltages will differ from those shown.

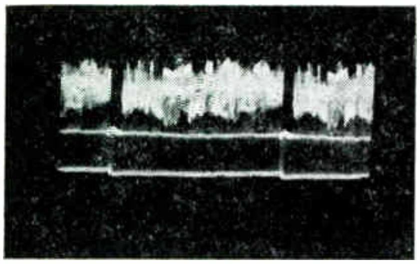


Fig. 8. Video Detector Output, Pin 2 of TS1. 3.5 volts, 60 c.p.s.

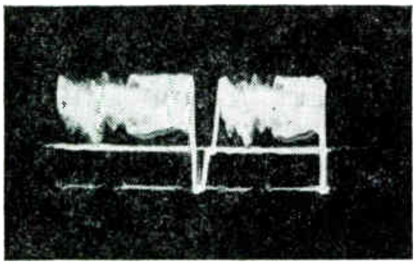


Fig. 9. Video Detector Output, Pin 2 of TS1. 3.5 volts, 15,750 c.p.s.

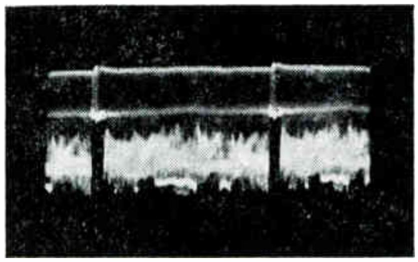


Fig. 10. Video Amplifier Plate, Pin 6, 40 volts, 60 c.p.s.

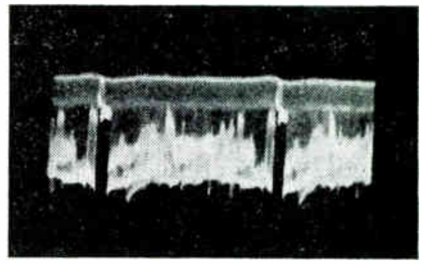


Fig. 11. Sync Separator Grid, Pin 9, 30 volts, 60 c.p.s.

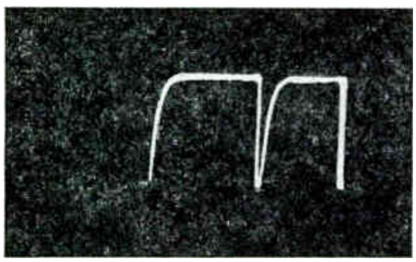


Fig. 12. Sync Separator Plate, Pin 1, 20 volts, 15,750 c.p.s.

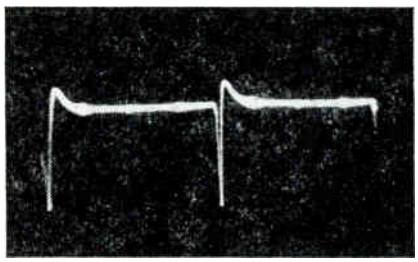


Fig. 13. Vertical-Oscillator Grid, Pin 2, .34 volts, 60 c.p.s.

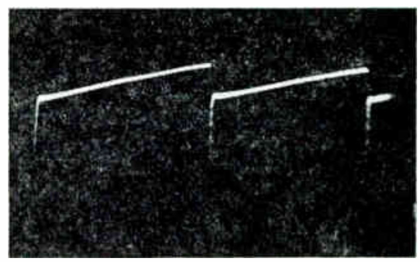


Fig. 14. Vertical-Output Grid, Pin 2, 140 volts, 60 c.p.s.

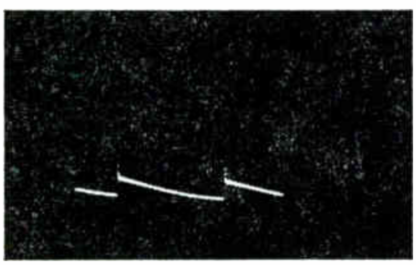


Fig. 15. Vertical-Output Plate, Pin 9, 1100 volts, 60 c.p.s.

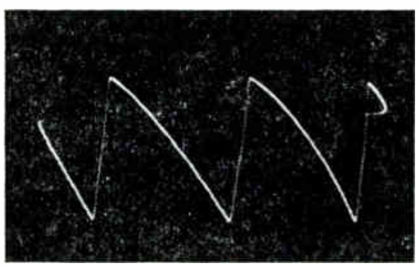


Fig. 16. Phase Comparer, Pin 2, 11 volts, 15,750 c.p.s.

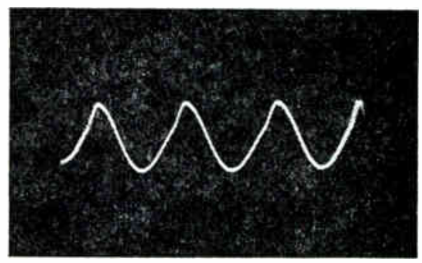


Fig. 17. Horizontal Oscillator, 40 volts, 15,750 c.p.s. test point.

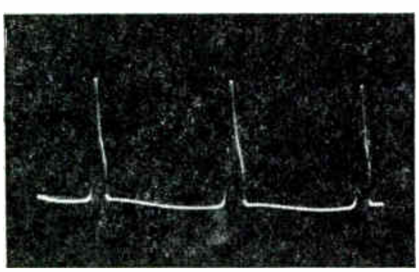


Fig. 18. Horizontal-Oscillator Cathode, Pins 3 and 8, 15 volts, 15,750 c.p.s.

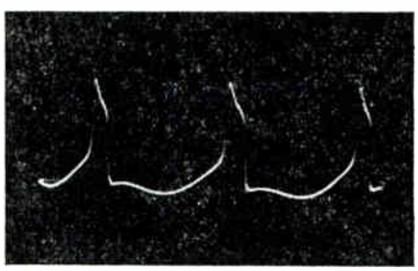


Fig. 19. Horizontal-Oscillator Grid, Pin 2, 60 volts, 15,750 c.p.s.

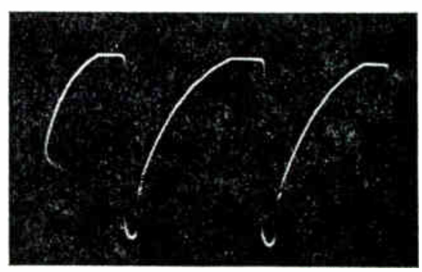


Fig. 20. Horizontal-Output Grid, Pin 5, 160 volts, 15,750 c.p.s.

SOUND I-F ALIGNMENT
TABLE 4

AM GENERATOR: Connect "hot" lead through a 2200-ohm resistor to pin 2 of TS1, using the sound i-f alignment jig. (Figure 3.) Connect ground lead of generator to ground lead of jig.

VOLTMETER: Use v.t.v.m. or 20,000 ohms-per-volt voltmeter. Connect to sound test point and ground.
OSCILLOSCOPE: Connect through crystal probe to grid (pin 2) of picture tube.
BIAS: —15V into AGC system.

STEP	AM GENERATOR DIAL SETTING	ADJUST	REMARKS
1	4.5 mc.	T1 primary (bottom of T-1) for maximum indication on voltmeter.	Remove 1st video i-f tube, and adjust the Volume control for moderate speaker output.
2	4.5 mc.	T2 secondary (top of T2) for maximum indication on voltmeter.	
3	4.5 mc.	T2 primary (bottom) for maximum indication on voltmeter.	
4	4.5 mc.	T3 for maximum indication on voltmeter and minimum speaker output.	
5	4.5 mc.	T4 for minimum indication on oscilloscope.	If scope and crystal probe are not available, T4 may be adjusted for minimum beat pattern on picture tube, using station signal.
6	Use Station Signal	T1 top (secondary) for minimum AM (noise or buzz), using speaker output for indication.	Replace 1st video i-f tube, and tune in a station, setting fine tuning control to obtain a crisp picture, with a small amount of beat.

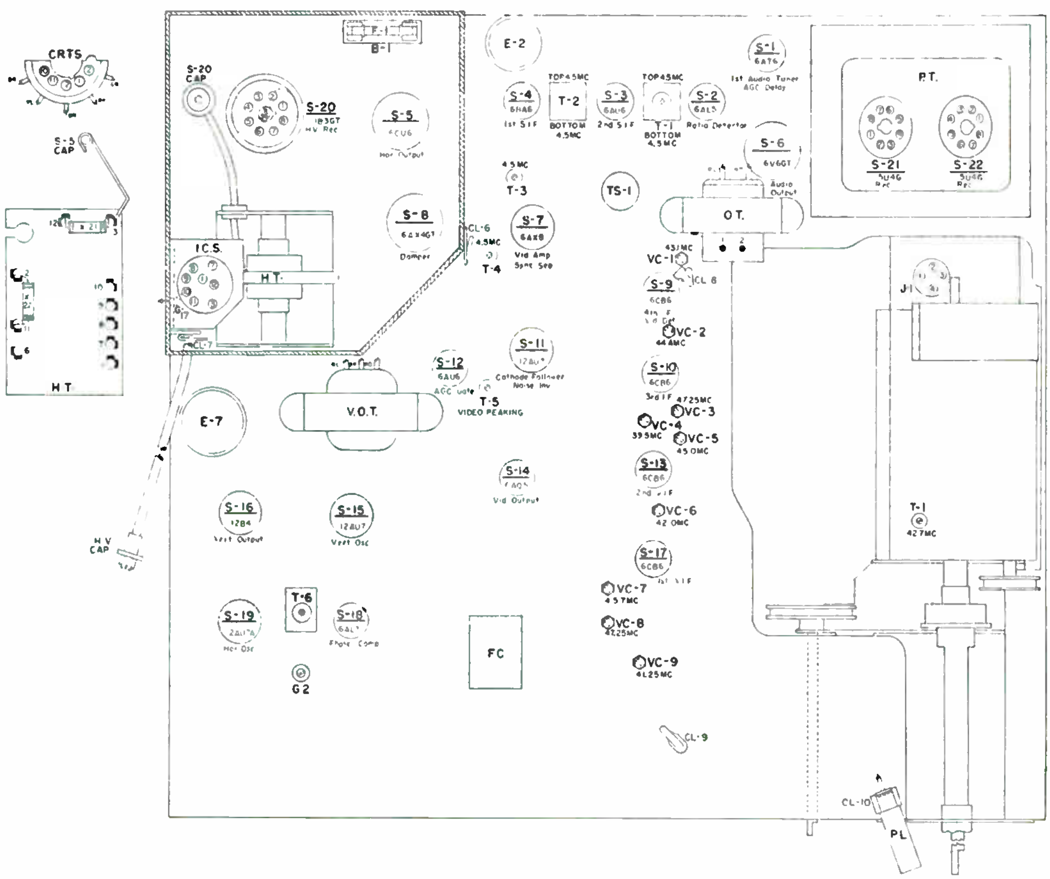


Fig. 21. Base Layout, Top view—TV-400.

Fig. 22. *Wiring Diagram, Bottom view—TV-400.*

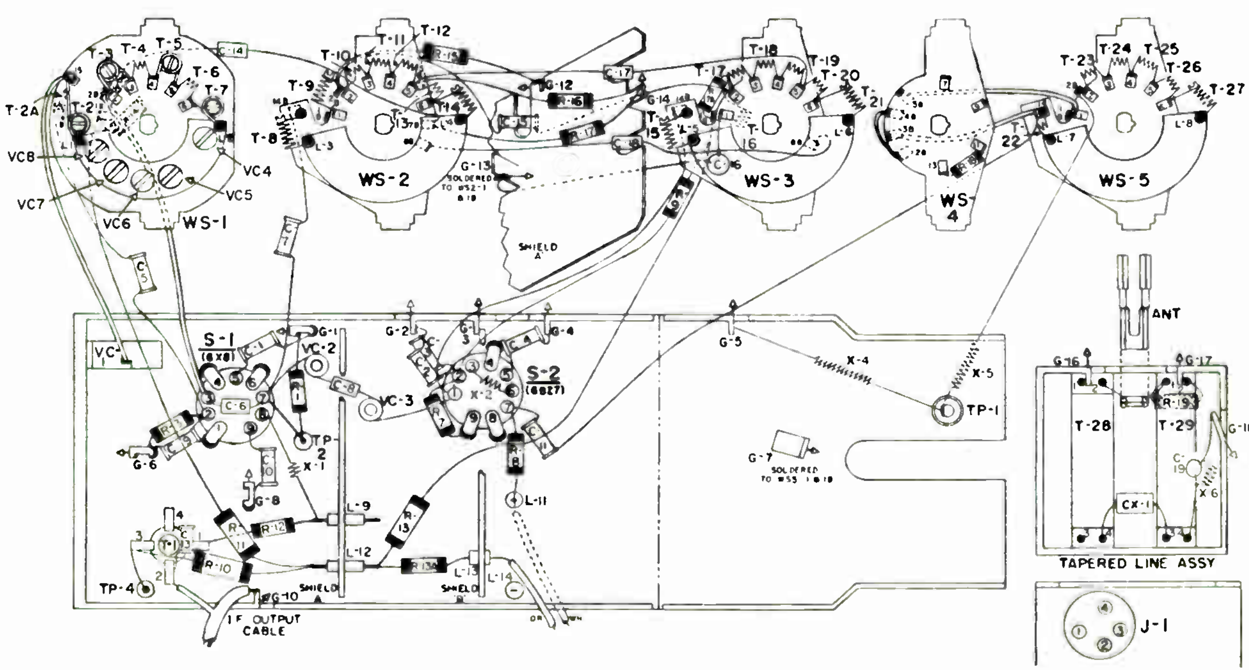
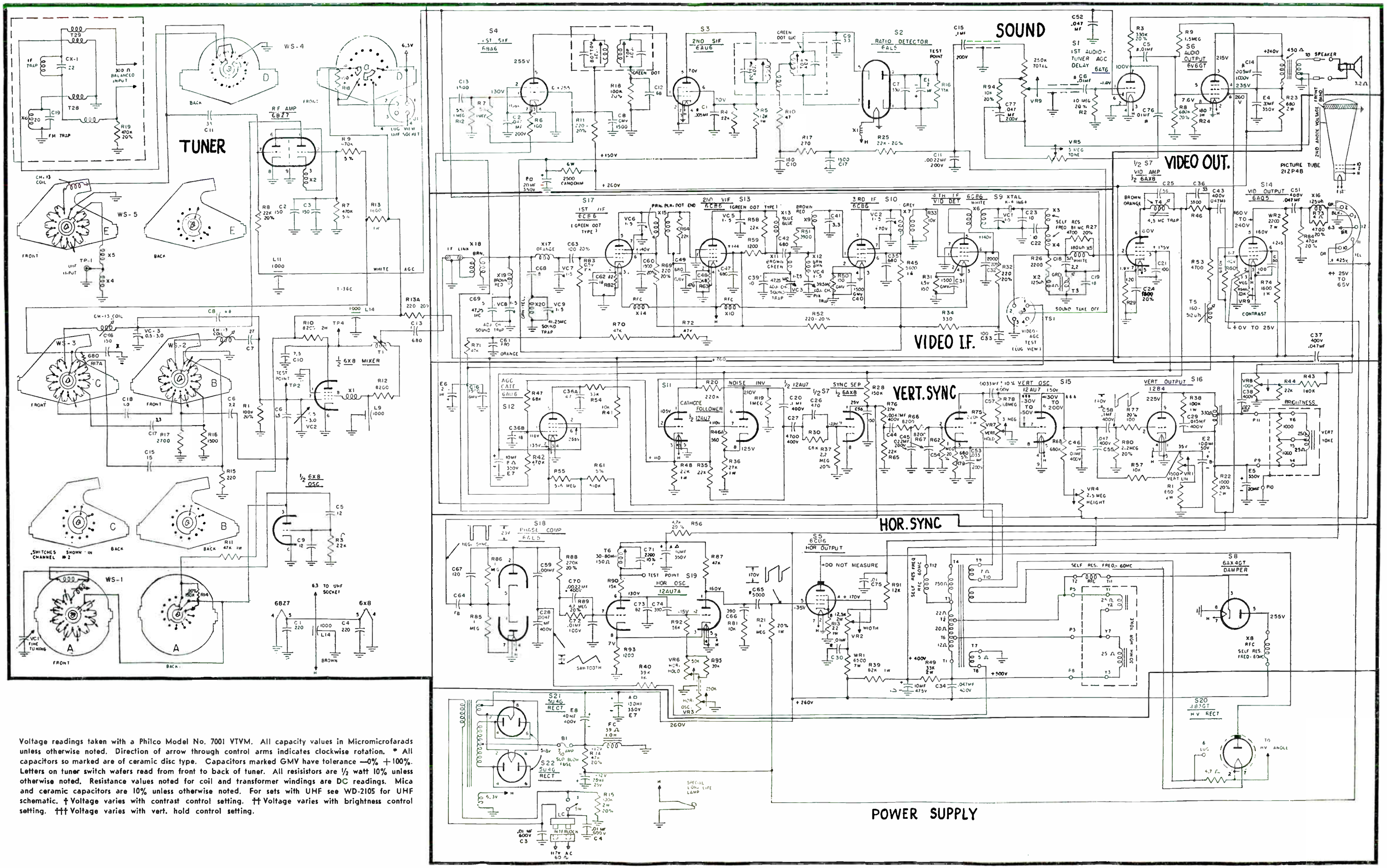


Fig. 23. *Tuner Apparatus Layout Drawing.*



Voltage readings taken with a Philco Model No. 7001 VTVM. All capacity values in Micromicrofarads unless otherwise noted. Direction of arrow through control arms indicates clockwise rotation. * All capacitors so marked are of ceramic disc type. Capacitors marked GMV have tolerance —0% +100%. Letters on tuner switch wafers read from front to back of tuner. All resisistors are 1/2 watt 10% unless otherwise noted. Resistance values noted for coil and transformer windings are DC readings. Mica and ceramic capacitors are 10% unless otherwise noted. For sets with UHF see WD-2105 for UHF schematic. † Voltage varies with contrast control setting. †† Voltage varies with brightness control setting. ††† Voltage varies with vert. hold control setting.

Fig. 24. Schematic Diagram—TV-400 Chassis.

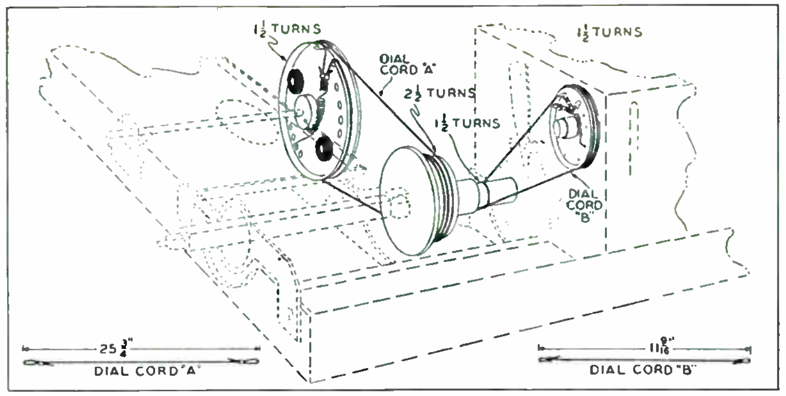


Fig. 25. Dial Cord Stringing Arrangement.

REPLACEMENT PARTS LIST
TV-400 CHASSIS

CHASSIS — MECHANICAL

Reference Symbol	Description	Service Part No.
	Socket (2 used)	76-6115-1
	Socket (2 used)	27-6174
	Socket	27-6174-7
	Socket (4 used)	27-6203-12
	Socket (2 used)	27-6203
	Socket (2 used)	27-6203-14
	Socket (2 used)	27-6203-16
	Fuse	AD2246-15
	Socket, hi-voltage	27-6290-1
	Shield, corona	56-9684
	Anode Lead	AD2631
	Socket, yoke	27-6274-11
	Pulley assembly and bushing	76-9037
	Grommet	27-4099-3
	Shaft, dial	28-10011
	Dial and film assembly	76-9048
	Spring, dial cord	28-10029
	Antenna wiring assembly, tuner	76-9245
	Connector, test	27-6273-8
	Connector, interlock	27-6240-3
	Clip, pilot lamp	56-3545-5

CHASSIS — ELECTRICAL

Reference Symbol	Description	Service Part No.
	Transformer, horizontal output	32-8662
OT	Transformer, audio output	32-8685
VOT	Transformer, vertical output	32-8625
FC	Filter choke	32-8654
B1	Fuse holder	76-4519-2
PT	Transformer, power	32-8661
X1	Filter choke	
X2	Detector peak, coil	32-4480-8
X3	Detector peak, coil	32-4480-9
X4	Detector, coil	32-4112-52
X5	180MH VID peak	
X6	Coil, 4th VIF plate	32-4598-9
X7	Coil, 3rd VIF plate	32-4598-8
X8	Coil, damper	32-4112-50
X9	Coil, 3rd VIF grid	32-4548-12
X10	Coil, heater	32-4112-49
X11	Coil 47.25 trap	32-4597-15
X12	ADJ CH pix trap	
X13	2nd VIF plate	32-4112-31
X14	Coil, heater	32-4112-49
X15	Coil, 1st VIF plate	32-4598-10
X16	Coil, CRT grid	32-4480-8
X17	Coil, 1st VIF grid	32-4597-3
X18	Coil, link	32-4599-1
X19	Coil, 47.25 trap	32-4597-12
X20	Coil, 41.25 trap	32-4112-54
T1	Transformer, discriminator	32-4450-6A
T2	Transformer, SIF	32-4497A
T3	Coil, var., sound takeoff	32-4463-9
T4	Coil, var., 4.5 trap	32-4463-13
T5	Coil, var., 1st VID plate	32-4467-23
T6	Coil, hor. ringing	32-4557-3
VR-1	Control, vertical linearity	33-5546-44
VR-2	Control, width	33-5574
VR-3	Control, horizontal hold aux.	33-5565-17
VR-4	Control, height	33-5572-1
VR-5	Control, tone	33-5572-12
VR-6	Control, horizontal hold	33-5572-8
VR-7	Control, vertical hold	33-5572-14
VR-8	Control, bright	33-5572-9
VR-9	Control, off-on, volume	33-5573-1
WR-1	Resistor, horizontal out. screen	33-1335-125
WR-3	Resistor, candohm	33-3435-36
	Resistor, 1B3 heater	66-9478340

CHASSIS — ELECTRICAL (Continued)

Reference Symbol	Description	Service Part No.
	Cable, CRT socket	41-3964-20
	Cable, pilot light	27-6233-4
	Cable, volume control	41-4202
WR-2	Resistor, 2nd VID. plate	33-1335-97
R1	Cathode, vert. output 680Ω	66-1685340
R2	1st audio grid (10 meg.)	66-6108340
R3	1st audio plate	66-4338340
R4	2nd SIF screen (22 K)	66-3228340
R5	2nd SIF plate (12 K)	66-3124340
R6	1st SIF cathode (100)	66-1108340
R7	1 Meg. (grid 6BA6)	66-5104340
R8	Audio output grid (680 K)	66-4688340
R9	Audio output grid (1.5 meg.)	66-5158340
R10	47Ω disc	66-0474340
R11	1st SIF plate (220)	66-1228340
R12	1 meg., 1st sound I-F grid	66-5104340
R13	22Ω 1w. 6CU6 K Bias	66-0224240
R14	C filter (47 K)	66-3478340
R15	Line to chassis (100 K)	66-4105340
R16	Disc. output (33 K)	66-3338340
R17	Disc., resistor (270)	66-1278340
R18	2nd SIF grid (100 K)	66-4108340
R19	Noise inv. plate (1.0 meg.)	66-5108340
R20	Cathode foll. plate (220 K)	66-4228340
R21	Horizontal output grid (1.0 meg.)	66-5108340
R22	1000Ω, 2w.	66-2105340
R23	680Ω, 2w.	66-0685340
R24	Audio output cathode (180)	66-1184340
R25	Disc. filter (22 K)	66-3228340
R26	Detect. load (2200)	66-2228340
R27	1st VID grid (4700)	66-2478340
R28	SS plate (150 K)	66-4158340
R29	120Ω, Cath. res. of 6X8	66-1124340
R30	SS grid (AGC gate)	66-3688340
R31	4th VIF cathode (150)	66-1158340
R32	4th VIF plate (220)	66-1228340
R33	4th VIF grid (10K)	66-3108340
R34	4th VIF decoupling (330)	66-1338340
R35	Noise inv. grid (22 K)	66-3228340
R36	27K., 1w.	66-3274340
R37	SS grid (2.2 meg.)	66-5228340
R38	Vertical decoupler (1000)	66-2105340
R39	Boost div. (82 K)	66-3824340
R40	Horizontal feed (39 K)	66-3394340
R41	AGC gate screen (10 K)	66-3108340
R42	AGC gate grid (470 K)	66-4478340
R43	CRT cathode (180 K)	66-4188340
R44	CRT cathode (22 K)	66-3228340
R45	3rd VIF plate (5600)	66-2564340
R46	1st VID plate (3300)	66-2338340
R47	68 K	
R48	Cathode foil (22 K)	66-3228340
R49	Boost div. (33 K)	66-3335340
R50	3rd VIF cathode (150)	66-1158340
R51	2nd VIF trap (3900)	66-2398340
R52	2nd VIF plate (220)	66-1228340
R53	1st VID plate (4700)	66-2478340
R54	AGC gate plate (33 K)	66-3338340
R55	AGC gate cathode (5.6 meg.)	66-5568340
R56	Horizontal oscillator decoupling (4700)	66-2478340
R57	Vertical peak (10 K)	66-3108340
R58	3rd VIF grid (22 K)	66-3228340
R59	2nd VIF plate (1200)	66-2128340
R60	2nd VID grid (680 K)	66-4688340
R61	AGC gate cathode (510 K)	66-4518340
R62	Vertical output grid (22 meg.)	66-5228340
R63	2nd VIF cathode (68)	66-0688340
R64	22K damping 2 VIF grid	66-3228340
R65	Vertical sync. div. (22 K)	66-3228340
R66	Vertical int. (8200)	66-2828340
R67	Vertical int. (8200)	66-2828340
R68		

REPLACEMENT PARTS LIST — Continued
TV-400 CHASSIS

CHASSIS — ELECTRICAL (Continued)

Reference Symbol	Description	Service Part No.
R69	1st VIF plate (220)	66-1228340
R70	AGC div. (47 K)	66-3478340
R71	AGC div. (47 K)	66-3478340
R72	AGC div. (47 K)	66-3478340
R73		
R74	Vid. out. screen (1800)	66-2184340
R74A	Vid. out. grid (3.3 meg.)	66-5338340
R75	Vertical oscillator plate (220 K)	66-4224340
R76	Vertical sync. div. (27 K)	66-3278340
R77	Vertical output grid (100)	66-1108340
R78	Vertical oscillator grid (1.8 meg.)	66-5188340
R79	Vertical oscillator cathode (680)	66-1688340
R80	2.2 meg. 12B4 grid rep.	66-5228340
R81	Horizontal oscillator plate (10 K)	66-3108340
R82	1st VIF cathode (82)	66-0828340
R83	1st video grid (15 K)	66-3158340
R84	CRT grid (470 K)	66-4478340
R85	Phase comp. (1.0 meg.)	66-5108340
R86	Phase comp. (1.0 meg.)	66-5108340
R87	Horizontal oscillator plate (47 K)	66-3478340
R88	Phase comp. output (220 K)	66-4228340
R89	AFC filter (4.7 meg.)	66-5478340
R90	Horizontal oscillator plate (15 K)	66-3158340
R91	Horizontal screen div. (12 K)	66-3128340
R92	Horizontal oscillator grid (56 K)	66-3568340
R93	Horizontal oscillator cathode (1200)	66-2128340
R94	Bass comp. (10 K)	66-3108340
R95	Horizontal hold	66-3398340
	Cathode inverter (560)	66-0828340
	Vid amp. screen (27 K)	66-3274340
C1	2nd SIF screen (.005)	30-1238-1
C2	1st SIF cathode (.047)	30-4650-45
C3	Line bypass (.01)	30-4650-58
C4	Line bypass (.01)	30-4650-58
C5	Audio output grid	30-1238-2
C6	1st audio plate	30-1238-2
C7	Discriminator output (330)	62-133001001
C8	1st SIF screen (1500)	30-1238-15
C9	3.3 by-pass	
C10	SS plate disc. tert. (150)	62-115001001
C11	.0022 mf. aud. filter	
C12	2nd SIF grid	62-068409011
C13	1st SIF grid (1500)	30-1238-15
C14	Audio output plate (.005)	30-1252-1
C15	Volume cont. input (.01)	30-4650-47
C16	AGC (1500)	30-1238-15
C17	Disc. filter (1500)	30-1238-15
C18	Sound takeoff (2.2)	30-1221-6
C19	Sound takeoff (18)	62-018400021
C20	Noise inv. plate (.01)	30-4650-47
C21	1st video screen (100)	62-110001021
C22	Detect. lead (10)	62-010409001
C23	Detect. lead (10)	62-010409001
C24	.1500K. by-pass, 1st VID amp.	
C25	4.5 mc. trap (56)	62-056409001
C26	SS grid (470)	30-1225-18
C27	Noise inv. plate (.0047)	30-4650-56
C28	Horizontal feedback (.0047)	30-4650-56
C29	Vert. output damp. (.015)	30-4650-42
C30	Horizontal screen bypass (.01)	30-1238-2
C31	4th VIF cathode (1500)	30-1238-15
C32	4th VIF screen (.002)	30-1225-6
C33	4th VIF decoupler (100)	62-110001021
C35	3rd VIF screen (680)	62-168001011
C36	1st VID plate (33)	62-033009001
C36A	47mmf.	62-047009001
C36B	18 mmf.	
C37	Retrace supp. (.047)	30-4650-45
C38	Retrace supp. (.022)	30-4650-43
C39	2nd VIF trap (10)	62-010409001
C40	3rd VIF cathode (1500)	30-1238-15
C41	3.3 3rd VIF grid	
C42	680 coupling	
C43	1st VID plate (.047)	30-4650-45
C44	Vert. int. (.0047)	30-4650-56
C45	Vert. inv. (.022)	30-4650-43
C46	Vert. charge (.01)	30-4650-41
C47	2nd VIF screen (680)	62-168001011
C48	2nd VIF cathode (680)	62-168001011
C49	2nd VIF grid (680)	62-168001011
C50	VID output screen (100)	62-110001021
C51	2nd VID plate (.047)	30-4650-45
C52	AGC (.047)	30-4650-45
C53	Vertical oscillator cathode (.033)	30-4650-44
C54	Vertical inv. (.022)	30-4650-43
C55	Vertical charge (.047)	30-4650-45
C56	SS plate disc. tert. (150)	62-115001001
C57	Vert. oscillator grid (.0033)	30-4650-55
C58	Vert. output grid (0.1)	30-4650-47
C59	Phase comp. output (.001)	30-4650-52
C60	1st VIF screen (1500)	62-215001011
C61	AGC (680)	62-168001011
C62	18 mmf. K. bypass, 1st UHF	
C63	1st VIF grid (100)	62-110001021
C64	Sync coupling (68)	62-068409011
C65	Horizontal output grid (.005)	30-1238-1
C66	Horizontal charge (390)	60-10395417
C67	Phase comp. (120)	60-10125237
C68	41.25 trap (8)	30-1224-112
C69	47.25 trap (5)	30-1224-28

CHASSIS — ELECTRICAL (Continued)

Reference Symbol	Description	Service Part No.
C70	.0022 filter, PH comp. output	30-4650-54
C71	Horizontal ringing (2200)	60-20225434
C72	AFC filter (.01)	30-1238-2
C73	Horizontal MV (82)	60-00825437
C74	Horizontal MV (390)	60-10395437
C75	Horizontal screen div. (.01)	30-1238-2
C34	Horizontal boost (.047)	30-4650-62
X15, X13 etc.	Adj. VIF — (0.5 to 5.0)	31-6520-9
	Elect., C filter	45-3035-6
E1	Sound disc.	45-3035-4
E7	AGC	45-3035-4
	Elect., input	30-2568-62
	Elect., 1⅜" can	30-2584-42
	Elect., 1" can	30-2584-43
	Crystal	34-8022
	Pilot lamp (later prod.)	3463-4

TUNER — MECHANICAL

Reference Symbol	Description	Service Part No.
	Tuner, T36C	76-8946-3
	Spring, detent, tuner	56-9158
	Washer, springgrip, tuner	W2556-5
	Tube cap, tuner	54-9242
	Sleeve cap, tuner	28-10283
	Washer, tuner	56-9351
	"E" washer, tuner (2 used)	1W60980FE5
	Retaining ring	1W61043
	Hairpin, tuner	56-9858
	Ball, detent	56-8020
	Spring, shaft (2 used)	56-8023
	Shaft	76-6914-6
	Oscillator wiring assembly	76-9231
	Shaft extension	56-8358-7
	Auxiliary antenna wiring assembly	76-8965
	Coupling insulator	54-4912
	Drive pulley and fine tuning shaft	76-9026
	Bearing	54-9244
	Spring	28-9088
	Rotor and fine tuning shaft	76-9025
	R-F wiring assembly	76-9349
	Grid wiring assembly	76-9327
	Socket, tube (2 used)	27-6203-21
	Connector, UHF input	57-0590-2
	Tube shield (2 used)	56-5629-5
	Stud, trimount (5 used)	W2235-7FA9
	Connector	27-6273-11

TUNER — ELECTRICAL

Reference Symbol	Description	Service Part No.
R1	100K mixer grid	66-4108340
R3	22K oscillator grid leak	66-3228340
R7	470K R-F grid section II	66-4478240
R8	22K AGC decoupling	66-3228240
R9	470K R-F grid section II	66-4478240
R10	8200 mixer decoupling	66-2825340
R11	12K oscillator plate feed	66-3124340
R12	8200 mixer screen	66-2828340
R13	1800 ohm, 1 watt	66-2184340
R13A	220 ohm decoupling	66-1224340
R14	150K on WS-1	66-4158340
R15	220 ohm on WS-2	66-1228340
R16	1500 ohm on WS-2	66-2158240
R17	2700 ohm on WS-2	66-2278340
R17A	680 ohm on WS-3	66-1688240
R18	150K on WS-4	66-4154240
R19	470K discharge resistor	66-4478340
C1	220 mmf. R-F heater	62-122001001
C2	150 mmf. R-F grid by-pass	62-115001001
C3	150 mmf. R-F grid by-pass	62-115001001
C4	220 mmf. oscillator heater	62-122001001
C5	12 mmf. oscillator grid tank	30-1224-128
C6	2.2 mmf. injection coupling	30-1224-127
C8	.68 mmf. mixer grid coupling	30-1224-126
C9	12.0 mmf. oscillator grid block	30-1224-128
C10	7.5 mmf. I-F primary	30-115001001
C11	33 mmf. R-F grid coupling	62-033409011
C13	680 mmf. I-F coupling	62-168001011
C19	20 mmf. FM trap	62-020309011
VC2	.5 to 5.0 mmf. mixer grid	31-6520-3
VC3	.5 to 5.0 mmf. R-F plate	31-6520-3
X2	Plate-cathode coil, tuner	32-4623-50
X4	UHF channel, ground side coil, tuner	32-4623-55
X5	UHF channel coil, tuner	32-4623-56
X6	FM trap, coil, antenna coil assembly	32-4550-3
T1	Coil, I-F primary	32-4597-14
T28	Antenna Coil	32-4432-3
T29	Antenna Coil	32-4432-3
L11	Capacitor, AGC decoupling	30-1245-6
	8200 damping I-F, resistor	66-2828340
	I-F padding, capacitor, var. tuner	31-6520-9
	Interstage coupling, capacitor	30-1253-1
	R-F heater, oscillator heater, choke	32-4550-11
X2	Cathode tuning, coil	32-4597-13
	Antenna coil assembly, tuner	318-5348
	I-F trap, coil, antenna coil assembly	32-4552-1

SUPPLEMENT TO PHILCO TELEVISION SERVICE MANUAL FOR TV-300 AND TV-301 CHASSIS

PHILCO Factory-Supervised Service

TELEVISION

CONTENTS

REVISIONS AND ADDITIONS TO THE TV-300 and TV-301 SERVICE MANUAL

1. On page three under tuner oscillator alignment the reference symbols under the adjustment column, are in error. These reference symbols should read as follows: Step 1, VC4; step 2, VC5; step 3, VC6; step 4, VC7; step 5, VC8; step 6, VC10; step 7, VC11; step 8, VC12; and step 9, VC13.
2. Under tuner oscillator alignment section on page 3, starting with oscilloscope; the mixer test point is referred to as TP2 and it should be TP4.
3. On page four, table two, under sweep (FM) generator; the antenna-input matching network is illustrated in figure one.
4. On page five, table three, tuner bandpass alignment, the adjustment column, refer to the tuner wiring diagram rather than the tuner adjustment layout diagram. A cross reference of these adjusting points are as follows:

FIGURE 5 Tuner Wiring Diagram	FIGURE 4 Location of Adjustment
T8	TC504
T15	TC502
VC3	507
VC2	512
T14	TC505
T21	TC503
T27	TC501

5. On page six, figure four, channel eight is shown as having a local oscillator adjustment. This adjusting screw has been removed.
6. On page seven, figure seven, showing base layout top view of the TV-300 chassis, S-12, the 12AZ7 tube is listed as a Horizontal Sweep and Sync separator tube. Remove horizontal sweep.
7. Add I-F frequencies to figure six: sound 41.25 mc: video 45.75 mc.
8. On page eight, figure seventeen, horizontal oscillator, junction of L800 and R806, 43 volts, 15,750 c.p.s., should read horizontal oscillator, junction of T1 and R17.
9. On page ten, replacement parts list, VR4 in the horizontal hold control. VR6 in the brightness control.
10. Figure 21, schematic—the vertical hold control improperly labeled UR5 . . . should be VR5.
11. Figure seven, base layout, top view, tube S3 should be labeled vertical oscillator and vertical output.

RUN CHANGE INFORMATION ON THE TV-300 — TV-301 CHASSIS

Run 2: Change 470K (66-4478540) (R13) in grid of vertical oscillator to 680K (66-4688340).
Reason: To improve vertical centering.

Run 3: The AVC filter condenser 30-4651-31 (C3) .15 mfd. was replaced by 30-4650-32 .22 mfd. The AVC resistor 66-4568340 (R34) 560K was replaced by 66-4478340 470K. Resistor 66-5158240 1.5 megohm (R59) was replaced by 66-5108340 1 megohm.
Reason: To increase overload level.

SUPPLEMENT TO REPLACEMENT PARTS LIST ON TV-300 and TV-301 CHASSIS

Tuner Mechanical

	Reference Symbol	Description	Part No.
Change	56-9859	Hairpin, switch assembly to	56-9858

Chassis Mechanical

	Reference Symbol	Description	Part No.
Add:		Socket, tube (6W6)	27-6174
		Socket, tube (6AX4GT)	27-6174-7
		Socket, tube (12AU7)	27-6203-16
		Socket, tube (12BH7)	27-6203-17
		Socket and base, tube (6CB6)	27-6203-14
		Socket, tube (6AU6)	27-6203
		Socket and base, tube (6T8)	27-6203-18
		Connector, interlock	27-6240-3
		Holder (5U4)	56-4125FA3
		Clip (pilot lamp)	56-3545-5
		Tube shield (3) (6CB6)	56-5629FA3
		Dial and film ass'y. (UHF)	76-9048

SUPPLEMENT TO REPLACEMENT PARTS LIST ON TV-300 CHASSIS

Tuner Electrical

Change	76-8956	RF wiring assy. switch assy. to	76-9349
Change	76-8955	Grid wiring assy. switch assy. to	76-9327
Add		Connector, tuner	57-0590-2
Add	C-10	Capacitor 5mmf. I-F primary	30-1224-28
Add	C-7	Capacitor 27mmf. mixer grid coup.	30-1224-126
Change	T1 32-4629	Coil I-F primary to	32-4629-1
Add	X5	Coil UHF channel, grid side	32-4623-55
Add	X4	Coil UHF channel	32-4623-56

Chassis Electrical

Add	OT	Transformer (audio output)	32-8674
Add	VOT	Transformer vertical output	32-8658
Add	FC	Choke (filter)	32-8675
Add	VOST	Transformer vertical oscillator	32-8676
Change	VR-1	Vertical lin. from 67-0025 to	67-0025-6
Change	33-5572-16	To Read Brightness control	
Add	VR-4	Horizontal hold	33-5572-8
Add	PT	Power transformer	32-8673
Add	X6	Video grid coil	32-4480-4
Change	T4 32-4463-10	Sound take off to	32-4463-14
Change	T7 32-4463-2	4.5 MC trap to	32-4463-11
Add		Cable, CRT socket	41-4147-1
Add		Cable, pilot lamp	27-6233-4
Add	R55	Resistor, 15K sync coupling	66-3158340
Add	R40	Resistor, 27K SIF screen	66-3278340
Add	R46	Resistor, 1 meg. audio output grid	66-5108340
Add	R1	Resistor, 560 ohm yoke damper	66-1568340
Add	R22	Resistor, 4.7 meg. SS coupling	66-5478340
Add	R24	Resistor, 47K 2nd VIF damping	66-3478340
Add	R3	Resistor, 56K retrace suppression	66-3568340
Add	R4	Resistor, 56K retrace suppression	66-3568340
Add	R45	Resistor, 220 audio output cathode	66-1224340
Add	R15	Resistor, 8200 vertical integrator	66-2828340
Add	R56	Resistor, 6800 CRT cathode damper	66-2688340
Add	R38	Resistor, 6800 video grid damping	66-2688340
Add	R19	Resistor, 180K horizontal osc. plate	66-4188340

Condensers

Add	C5	Capacitor, .003 vert. oscillator	30-4650-44
Change	C6	Capacitor, from 30-1238-2 to	30-4650-44
Add	C45	Condenser, .01 AGC bypass	30-1238-2
Add	C13	Condenser, dual 2500-300 vert. osc.	30-1239-9
Add	C21	Condenser, .002 AGC filter	30-1238-12
Add	C4	Condenser, dual .007-470 retrace suppression	30-1239-10
Add	C20	Condenser, dual 330-1500 disc.	30-1239-8
Add	E-2	Condenser elect. sound disc.	45-3035-4

VOLTAGES ON THE TV-300 —TV-301 TELEVISION CHASSIS

LINE VOLTAGE — 115V

VOLTMETER — VTVM

	1	2	3	4	5	6	7	8	9
S-1 (5U4)	....	280	....	280	...	280	....	....	....
S-2 (6AX4)	...	....	*	360	260	....	....	....	....
S-3 (12BH7)	*	0/-3	10/35	F	F	70/260	-30/-100	0	F
S-4 (12AU7A)	140	-10/-17	8	F	F	160	2	8	....
S-5 (6BQ6)	....	F	135	120/140	-30	....	F	Gnd.	....
S-6 (6CB6)	....	1	F	F	110	110	Gnd.	...	....
S-7 (6CB6)	....	1	F	F	115	115	Gnd.	....	....
S-8 (6CB6)	....	1.5	F	F	120	120	Gnd.	....	....
S-9 (6AU6)	.	....	F	F	58	58	Gnd.	....	....
S-10 (6T8)	....	....	....	....	...	....	Gnd.	....	90
S-11 (6W6)	140	F	255	260	140	230	F	150	....
S-12 (12AZ7)	50	....	....	F	F	2.2	...	2.4	....
S-13 (12BY7)	1.6	....	Gnd.	F	F	Gnd.	200	90	....
6BQ7A	230	110	115	Gnd.	Fil.	115	...	Gnd.	Gnd.
6X8	Gnd.	-1.5/-3.0	80V UHF 30V	Gnd.	Fil.	Gnd.	-1.5/-3.0	150 UHF 130	170

* DO NOT MEASURE

S-3-2	Varies with V hold — Lin — Height setting
S-3-3	Varies with V hold — Lin — Height setting
S-3-6	Varies with V hold — Lin — Height setting
S-3-7	Varies with V hold — Lin — Height setting
S-4-2	Varies with H hold setting
S-5-4	Varies with Width setting
S-6-5 and 6	Taken with 1 meg. isolating resistor in series with probe
S-7-5 and 6	Taken with 1 meg. isolating resistor in series with probe
S-8-5 and 6	Taken with 1 meg. isolating resistor in series with probe
S-9-5 and 6	Taken with 1 meg. isolating resistor in series with probe
6X8-2	Taken with 1 meg. isolating resistor in series with probe
6X8-7	Taken with 1 meg. isolating resistor in series with probe

PR-2841—10-54

Printed in U.S.A.

PHILCO TELEVISION SERVICE MANUAL FOR TV-300 AND TV-301 CHASSIS

PHILCO
Factory-Supervised
Service

TELEVISION

FILE C2 PHILCO TELEVISION SERVICE MANUAL FOR TV-300 & TV-301 CHASSIS PR 2812

THE TV-300 AND TV-301 DIFFERENCE

The TV-301 is similar to the TV-300, the difference being in the picture tube used and the shorting out of one resistor in the TV-300 to make the TV-301 chassis.

The TV-300 chassis uses a 21XP4A picture tube which is an electrostatic focus tube. When this tube is used the 27 ohm resistor in the high voltage transformer is necessary for proper electrical centering of the picture.

The TV-301 chassis uses a 21WP4A picture tube which is an electromagnetic focus picture tube. When this picture tube is used the 27 ohm resistor is shorted out and the chassis is called the 301.

This is the only difference between these two chassis.

CONTENTS

TUBE COMPLEMENT — TV-300 CHASSIS

Reference Symbol	Tube Type	Function
	6BQ7A	R.F. amplifier
	6X8	Oscillator mixer
S1	5U4G	Low Voltage rectifier
S2	6AX4G	Horizontal damper
S3	12BH7	Vertical oscillator
S4	12AU7A	Horizontal oscillator
S5	6BQ6GT or GTA	Horizontal output
S6	6CB6	1st V.I.F.
S7	6CB6	2nd V.I.F.
S8	6CB6	3rd V.I.F.
S9	6AU6	Sound I.F.
S10	6T8	Ratio detector - 1st audio
S11	6W6GT	Audio output
S12	12AZ7	Sync sep - phase comp.
S13	12BY7	Video output
S14	1B3GT	High voltage rectifier
	21XP4	
	21XP4A	Picture tube
	21WP4A	Picture tube
	21YP4A	Picture tube

SPECIFICATIONS — TV-300 CHASSIS

VHF TUNER	Twelve channel, 13 position incremental tuner, covering VHF television channels 2 through 13; fine tuning of local oscillator.
UHF TUNING	Continuous tuning, covering UHF channels 14 through 83; fine and coarse tuning.
INTERMEDIATE FREQUENCIES	
VIDEO CARRIER	45.75 Mc.
SOUND CARRIER	4.5 Mc.
TRANSMISSION LINE	300 ohm, twin wire lead
OPERATING VOLTAGE	110 to 120 volts, 60 cycles, AC
POWER CONSUMPTION	Without UHF — 170 watts With UHF — 175 watts

CIRCUIT DESCRIPTION — TV-300

The TV-300 receiver contains a 13 position incremental type VHF tuner, covering VHF channels 2 through 13 with a UHF position. Power and filament voltage for the UHF tuner-adapter are supplied through a switch built into the rear of the VHF tuner. The output of the VHF tuner is a 40 Mc., IF signal which is inductively coupled to three stagger tuned IF stages. A 1N64 crystal serves as the diode detector for the output of the IF stages.

The output of the video detector, a negative phase, composite-video detected signal, is fed through a single video amplifier to the cathode ray tube. Since a single output amplifier is employed a positive going signal is being applied to the picture tube and therefore, is fed to the picture tube cathode.

AGC voltage is developed in the output stages of the video detector and through the bias on the grid of the sync separator. A delay voltage applied to the tuner AGC is effectively clamped by the diode portion of the 6T8 first audio amplifier stage, to prevent the RF grid being driven too far positive under weak signal conditions.

The 4.5 Mc., intercarrier IF sound is taken from the output circuit of the crystal video detector. The 4.5 Mc., sound signal is the resulting difference signal from the beat between the video carrier, 45.75 Mc., and the 41.25 Mc., sound carrier when they are mixed in the video detector. In order for the 4.5 Mc., resultant signal to contain the FM sound with only a negligible amount of video modulation, the sound carrier must be considerably lower than the video. The proper ratio of the two signals is established during alignment of the receiver.

The intercarrier sound IF signal is fed through a sound IF amplifier stage to the ratio detector. A 6AU6 tube is employed in the sound IF stage. The ratio detector employs the duo-diode section of a 6T8 tube and the detected signal is fed to the triode section of the same tube as the first audio amplifier. A 6W6GT tube serves as the audio output stage which drives the speaker. B plus voltage, approximately 260 volts, is fed to the screen grid and plate circuits of the 6W6GT, while a second B plus voltage through a resistor divider network is applied to the grid. The cathode of this tube is connected through the cathode resistor and through decoupling circuits to the plates and screen grids of all of the IF stages and to the screen grids of the video output tube and the horizontal output tube. Thus, the 6W6GT tube is effectively in series with the tubes mentioned and the necessary B plus voltage for these tubes develops due to the current flow through the 6W6GT cathode circuit. The 6W6GT tube since it is in series with the IF tubes, and screen grids of the video output and horizontal output stages, from B plus to ground, forms a large voltage divider network across the power supply, and acts as a voltage regulator for these stages. The voltage drop across the 6W6GT remains approximately 120 volts.

A portion of the composite video signal is taken from the video output circuits to the grid of the sync separator, one half of a 12AZ7 duo-triode tube. The bias of this tube is such that negative going composite sync pulses appear at the plate. The vertical integrator circuit feeds the vertical sync pulses to the vertical blocking oscillator, a 12BH7 tube.

The vertical blocking oscillator requires a positive pulse for triggering purposes and the incoming sync pulse is negative. consequently, the incoming pulse is fed into the cathode lead tap of the oscillator transformer. The action of the transformer circuit causes a large positive overshoot to occur on the sync pulse at the cathode and grid. The grid pulse being larger than that at the cathode, will cause this positive overshoot to trigger the oscillator.

The second half of the 12BH7 duo-triode is used as the vertical output amplifier and the vertical signal is fed to the deflection coils through the vertical output transformer. A retrace suppression circuit from the vertical output transformer to the grid of the picture tube effectively removes vertical retrace lines.

From the plate of the sync separator the horizontal pulses are fed to the cathode circuit of the phase comparer, one-half of a 12AZ7 tube. At the same time, a pulse is taken from a winding on the horizontal output transformer, and fed to the phase comparer plate through a shaping network. The grid of the phase comparer is grounded and the circuits of this stage are such that if the incoming signal and the signal taken from the horizontal output transformer are not in phase a difference voltage results in the plate circuit which is fed to the grid of the horizontal oscillator and controls its frequency.

The horizontal oscillator is a conventional multivibrator type employing a duo-triode 12AU7A tube. The horizontal hold control is placed in the grid circuit of the second triode section of the multivibrator and provides the means of manually adjusting the frequency of the oscillator so that its frequency is within the control range of the phase comparer.

A 6BQ6GT tube is employed as the horizontal output tube. Horizontal width is adjustable by means of a variable resistor in the screen grid circuit. The horizontal output transformer contains a 27 ohm resistor inserted in the center windings to provide electrical centering of the raster. High voltage rectification is performed by a 1B3GT tube, while a 6AX4G tube serves as a damper tube.

A transformer power supply provides B plus voltage. A 5U4G tube is employed in full wave rectification of the B plus voltage. A .7 ampere slow-blow fuse is inserted in the B minus center tap lead of the transformer and is located in the high voltage cage on top of the chassis for easy access.

The picture tube employed with the TV-300 chassis is either the electrostatic fixed focus type with the focus anode returned to ground or the electromagnetic type. The electrostatic employs ring type permanent magnets for centering of the raster.

TELEVISION ALIGNMENT

General

The alignment procedure follows the general pattern of first checking the tuner response with an FM sweep generator and oscilloscope, comparing the response curve with that given in the manual, and aligning the tuner if necessary. After it is established that the tuner is in correct alignment, the video I-F channel is aligned by tuning each coil to its assigned pole frequency, using an AM signal, and then feeding in a sweep signal at the antenna terminals and retouching the I-F adjustments to obtain the desired pass band. Finally, the sound channel is aligned, using an AM signal, by tuning the sound take-off coil and the I-F and ratio-detector transformers.

The over-all response curve (r-f, i-f) of the circuits from the antenna terminals to the video detector, after the I-F stages have been aligned, should appear essentially the same, regardless of the channel under test. If 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 having the top of the workbench metallic. 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 2 inches wide. The section of the chassis nearest the tuner should rest on the strip.
2. Do not disconnect the 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 model 7008 is used, the built-in crystal calibrator provides an excellent means of calibration. An alternate method for 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."

HORIZONTAL OSCILLATOR ADJUSTMENT

1. Center horizontal hold control.
2. Adjust T-1 until the picture comes into sync.

JIGS AND ADAPTERS REQUIRED

Mixer Jig

Connections to the grid of the mixer tube may be made through the alignment jack provided for this 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, may be used. As an alternate, a Philco alligator-clip adapter, Part No. 45-1636, with as short a ground lead as possible, may be used to connect 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.

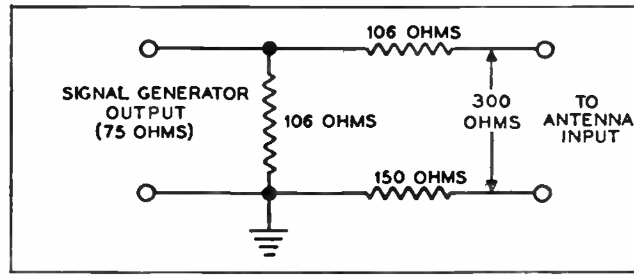


Fig. 1. Antenna-Input Matching Network.

Antenna-Input Matching Network

An impedance-matching network for coupling the signal generator to the antenna input terminals of the receiver is shown in figure 1. 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 antenna-input circuit. The resistors used in this network should be of carbon-composition construction, and should be chosen from a group, to obtain values within ten percent of those indicated. The resistors should be placed in a shield can, to prevent variable effects. An antenna-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.

TUNER OSCILLATOR ALIGNMENT

TABLE 1

AM GENERATOR: Connect to the receiver antenna-input terminals. (No matching network is required.) Use in modulated R-F output.

OSCILLOSCOPE: Connect the vertical-input lead, in series with a 1000-ohm resistor, to the mixer plate test point, TP-2. Connect the scope ground lead to the chassis, near TP-4.

RECEIVER CIRCUIT ALTERATIONS: Disconnect tuner AGC (white) lead from main chassis, and connect a 1.5-volt bias battery, with negative terminal to white lead from tuner, and positive terminal to chassis.

STEP	AM GENERATOR DIAL SETTING	RECEIVER TUNING	ADJUST	REMARKS
1	257 mc.	channel 13	TC-506 for zero beat on scope.	a. If regeneration occurs, increase bias; bias may be increased up to 4 or 5 volts, if necessary. b. Preset fine tuning control to center of its range.
2	251 mc.	channel 12	TC-507 for zero beat on scope.	
3	245 mc.	channel 11	TC-508 for zero beat on scope.	
4	239 mc.	channel 10	TC-509 for zero beat on scope.	
5	233 mc.	channel 9	TC-510 for zero beat on scope.	a. To adjust channel 8 use channel 9 tuning core, then recheck channel 9.
6	221 mc.	channel 7	TC-511 for zero beat on scope.	a. Repeat steps 1 thru 6 and readjust if necessary until channels are within 500 kc. of proper frequency.
7	129 mc.	channel 6	TC-512 for zero beat on scope.	
8	113 mc.	channel 4	TC-513 for zero beat on scope.	
9	101 mc.	channel 2	TC-514 for zero beat on scope.	

VIDEO I-F ALIGNMENT
TABLE 2

A.M. GENERATOR: Connect to mixer test point, TP-2, through a mixer jig, and adjust the generator for approximately 30% modulation at 400 cycles. Adjust the output of the generator during alignment to keep the output at the CRT cathode below 40 volts peak to peak.

SWEEP (FM) GENERATOR: After step 5 connect to antenna-input circuit through antenna-input matching network (see figure ?)

OSCILLOSCOPE: Connect vertical-input lead to pin No. 11 at the cathode ray tube.

PRESET: Contrast control full on. Channel selector to channel position No. 1.

BIAS: Apply 5.0 volts of negative bias into TP-1 (AGC system).

NOTE: I-F shield must be in place.

STEP	AM GENERATOR DIAL SETTING	SWEEP (FM) GENERATOR		ADJUST	REMARKS
		SWEEP DIAL SETTING	MARKER DIAL SETTING		
1	45.5 mc.			TT for maximum indication on scope.	The scope level must not be permitted to exceed 40 volts peak to peak or overloading will occur.
2	43.1 mc.			VC-1 for maximum indication on scope.	
3	42.7 mc.			T-2-IF for maximum indication on scope.	
4	45.0 mc.			T6-IF for maximum indication on scope.	
5	44.4 mc.			T3-IF for maximum indication on scope.	
6		Channel 4 (69 mc. with 6 mc. sweep width).	Run marker along curve checking against curve limits given in figure 6.	If necessary retouch TT, VC1, T2-IF, T6-IF, T3-IF.	Adjust carrier level with TT and T6 level curve with T-3. Position 42.5 mc. slope with VC-1 and T-2. CAUTION: Retouch only slightly.

TUNER BANDPASS ALIGNMENT — *See Table 3 on Page Five*

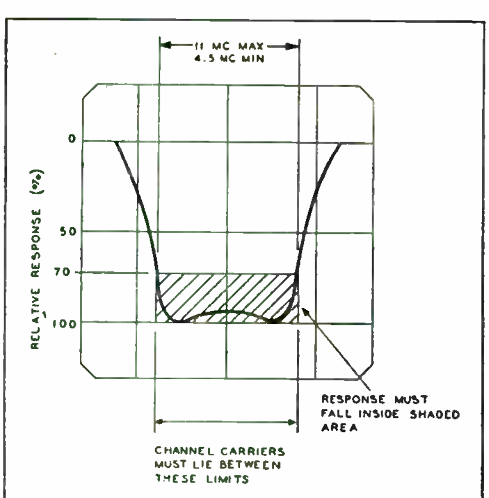


Fig. 2. Television tuner response curve, showing bandpass limits.

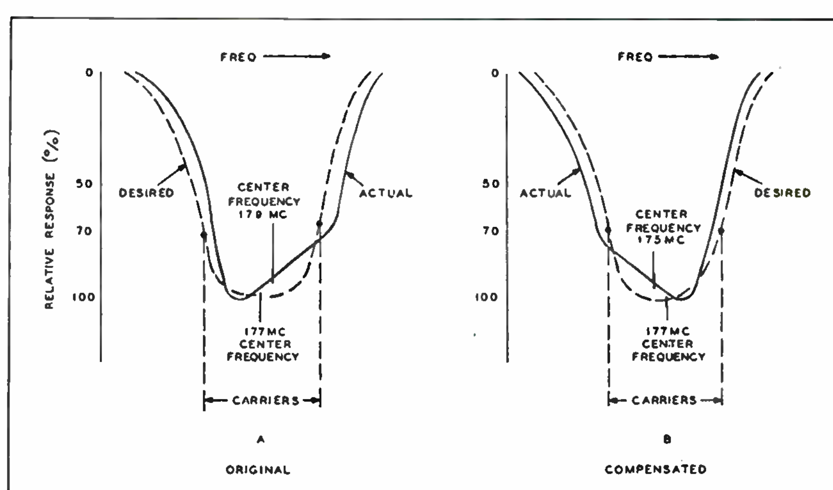


Fig. 3. Television tuner response curve, showing tracking compensation.

TUNER BANDPASS ALIGNMENT
TABLE 3

SWEEP (FM) GENERATOR: Connect to receiver antenna-input circuit through antenna-input matching network (see figure 1).

OSCILLOSCOPE: Same as in Chart 1.

RECEIVER CIRCUIT ALTERATIONS: Bias same as Chart 1. Disconnect the tuner coupling link leads and connect a 40- to 70-ohm carbon resistor across the open end of the lead from the tuner.

STEP	SWEEP (FM) GENERATOR: SWEEP DIAL SETTING	SWEEP (FM) GENERATOR: MARKER DIAL SETTING	RECEIVER TUNING	ADJUST	REMARKS
1	Channel 13 (213 mc., with 10-mc. sweep width.)	Set first to 210 mc. and not position of marker on response curve. Then set to 216 mc. and note position of marker on response curve.	Channel 13		Use oscilloscope gain as high as possible with respect to hum level and "bounce". Pips fix channel limits on curve. Response curve should be flat between limits (see figure 2). If not, proceed with step 2.
2	Channel 13	213 mc.	Channel 13	T-8 — WS2 counter-clockwise until single peak appears.	CAUTION: Care must be taken not to un screw core far enough to make it drop out of the coil.
3	Channel 13	213 mc.	Channel 13	T-15—WS3 until peak falls on 213-mc. marker.	It may be necessary to increase sweep-generator output.
4	Channel 7 (177 mc., with 10-mc. sweep width.)	Set first to 174 mc. and note position of marker on response curve. Set to 180 mc. and note position of marker on response curve.	Channel 7		Note curve with respect to tilt and center frequency. Curve should be centered in pass band and symmetrical. If not, proceed with step 5.
5	Channel 7	174 mc. & 180 mc.	Channel 7	VC-3 and VC-2 to obtain correct tilt on top of curve.	VC3 and VC2 compensate for the tuning effect of Channel 13 adjustment upon Channel 7. (See figure 3.)
6	Channel 13	213 mc.	Channel 13	Retouch T-15 of WS3 and T-8 — WS2 for symmetrical response, centered about 213-mc. marker.	To retouch, only turn cores slightly.
7	Channel 7	117 mc.	Channel 7	Repeat step 5.	Check response curve for correct center frequency and symmetry.
8				Repeat steps 6 and 7.	Repeat Channel 13 and Channel 7 adjustments, alternately, until favorable curves are obtained on both.
9	Channel 6 (85 mc., with 10-mc. sweep width.)	Set first to 82 mc. and note position of marker on response curve. Then set to 88 mc. and note position of marker on response curve.	Channel 6		Curve should be symmetrical and centered in pass band. If not, proceed with step 10.
10	Channel 6	85 mc.	Channel 6	T-14 of WS2 counter-clockwise until single peak appears.	CAUTION: Care must be taken not to un-screw core far enough to make it drop out of the coil.
11	Channel 6	85 mc.	Channel 6	T-21—WS3 until peak falls on 85-mc. marker.	It may be necessary to increase sweep-generator output.
12	Channel 6	85 mc.	Channel 6	T-27 — WS5 for maximum curve height and symmetry of single peak.	After adjusting TC501, recheck as in step 9. If necessary, reduce sweep-generator output to avoid overloading.
13	Channel 6	85 mc.	Channel 6	Retouch T-21 — WS3 and T-14 — WS2 for symmetrical response, centered about 85-mc. marker.	To retouch, only turn cores slightly.

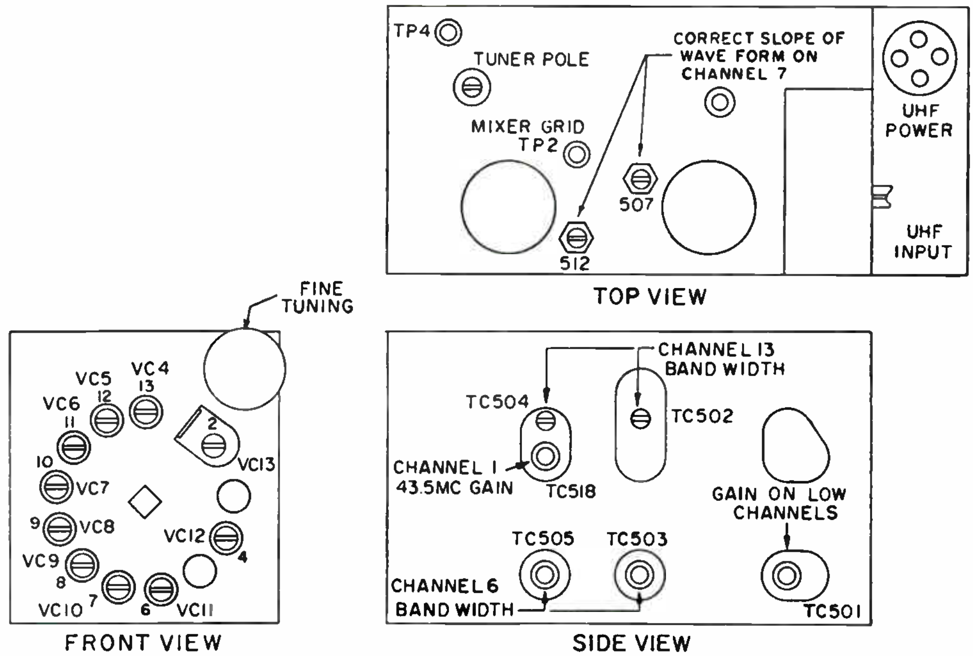


Fig. 4. Tuner layout showing locations of adjustments.

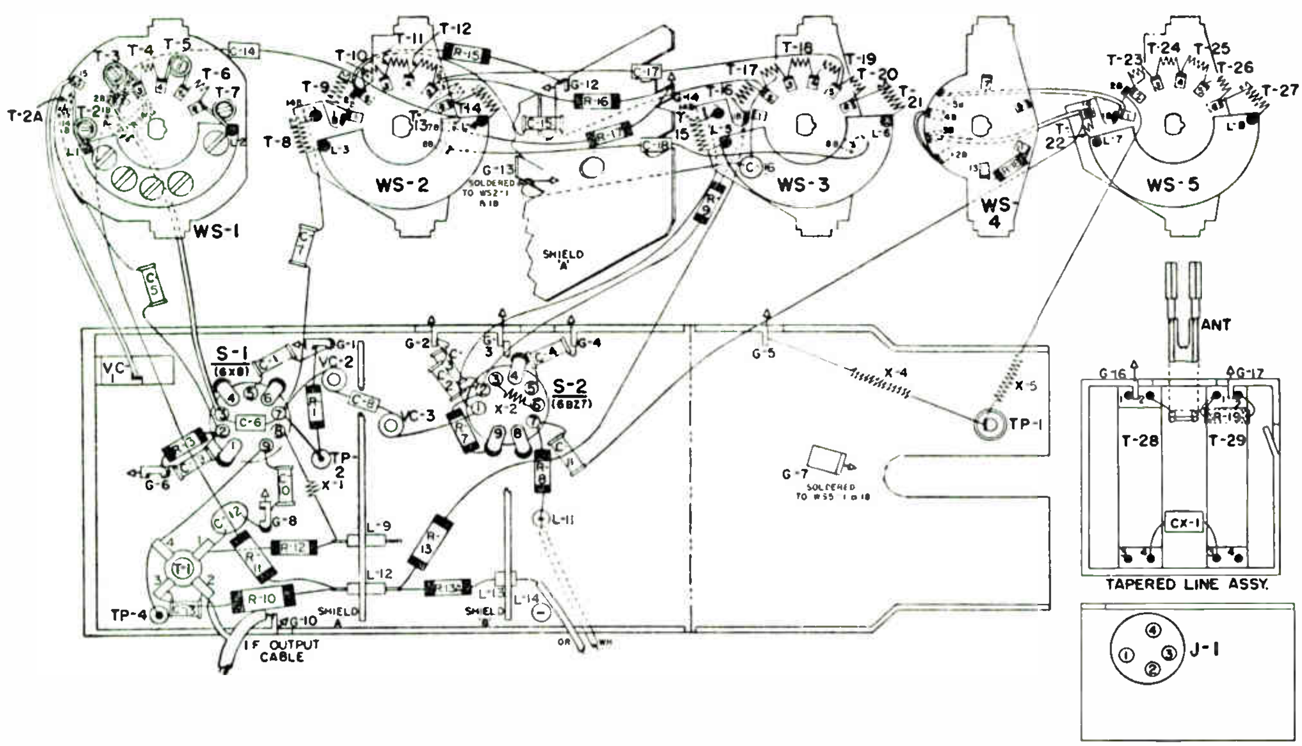


Fig. 5. Tuner Wiring Diagram.

SOUND ALIGNMENT
TABLE 4

A.M. GENERATOR: Connect the "hot" lead through a 2200 ohm resistor to the junction of C-24, X3 and the xtal det. Adjust generator for 400v. modulation at approximately 30% modulation.

VOLTMETER: Use V.T.V.M. on 20,000-ohms-per-volt voltmeter. Connect through a crystal probe to pin No. 11 of the picture tube in step 1 and to pin No. 3 of the 6W6 audio output tube in the remainder of the steps.

STEP	AM GENERATOR DIAL SETTING	ADJUST	REMARKS
1	4.5 mc. modulated	T7-IF for minimum indication.	Voltmeter through xtal probe. Plate of video amplifier.
2	4.5 mc. modulated	T5 top for maximum indication.	a. Volume control full on. b. Voltmeter thru xtal probe to 6W6 pin No. 3.
3	4.5 mc. modulated	T5 bottom for maximum indication.	c. Keep generator level low to prevent overload.
4	4.5 mc. modulated	T4-IF for maximum indication.	

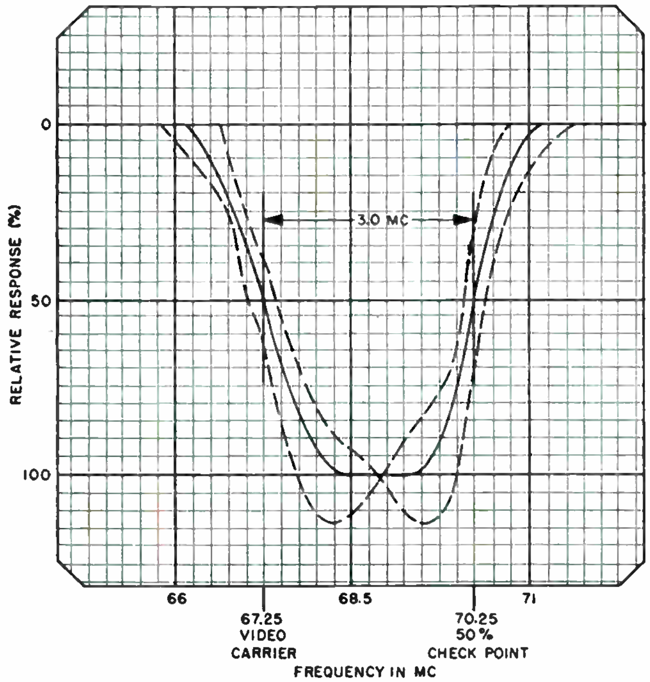


Fig. 6. Over-all R-F, I-F response curve, showing tolerance limits.

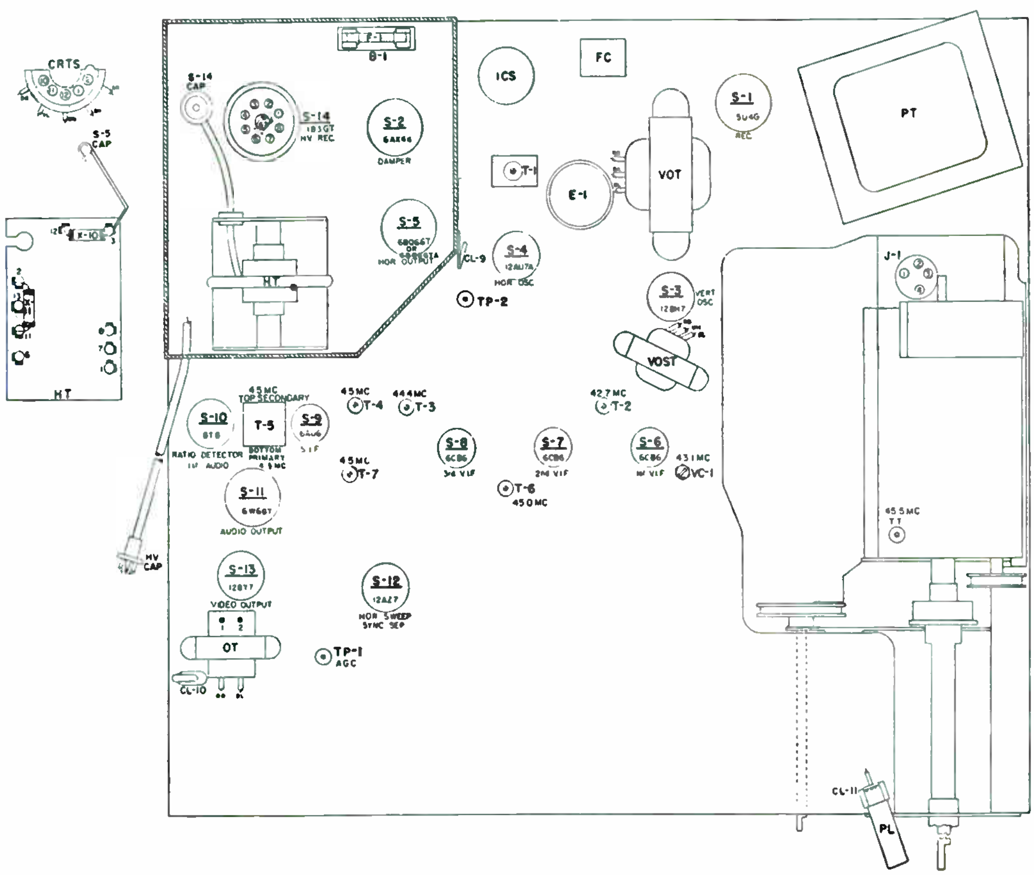


Fig. 7. Base Layout — Top View — TV-300 Chassis.

OSCILLOSCOPE WAVEFORM PATTERN — TV-300

These waveforms were taken with the receiver adjusted for an approximate peak-to-peak output of 6 volts at the video detector. The voltages given with the waveforms are approximate peak-to-peak values. The frequencies shown are those of the waveforms — 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, and the peak-to-peak voltages will differ from those shown.

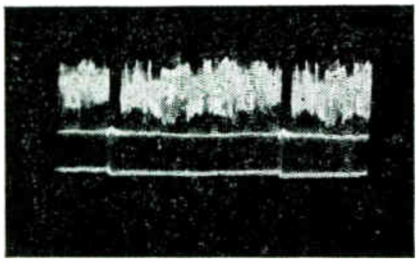


Fig. 8. Composite Signal, Pin 2 of 12BY7, 6 volts, 60 c.p.s.

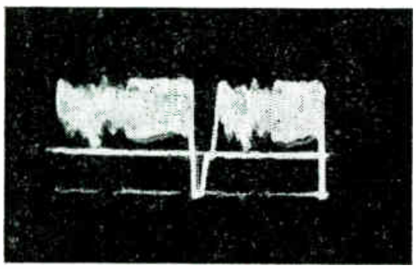


Fig. 9. Composite Signal, Pin 2 of 12BY7, 6 volts, 15,750 c.p.s.

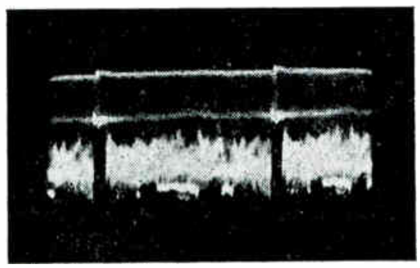


Fig. 10. Video Amplifier Plate, 83 volts, 60 c.p.s.

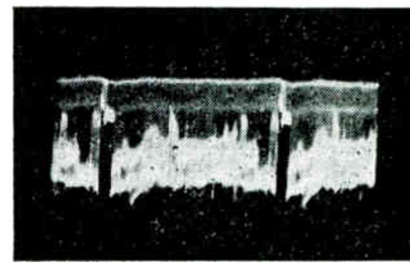


Fig. 11. Sync Separator Grid, Pin 2, 90 volts, 60 c.p.s.

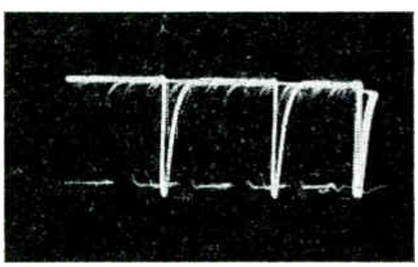


Fig. 12. Sync Separator Plate, Pin 1, 30 volts, 15,750 c.p.s.

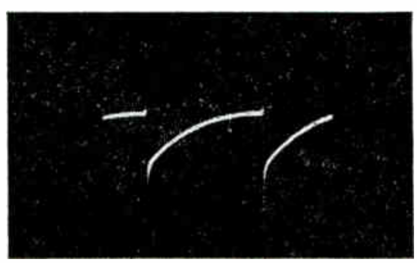


Fig. 13. Vertical-Oscillator Grid, Pin 7, 140 volts, 60 c.p.s.

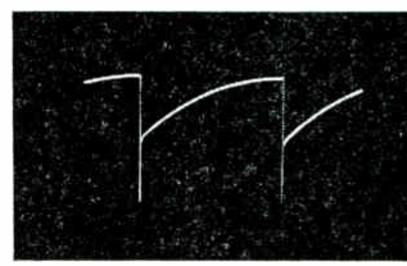


Fig. 14. Vertical-Output Grid, Pin 2, 72 volts, 60 c.p.s.

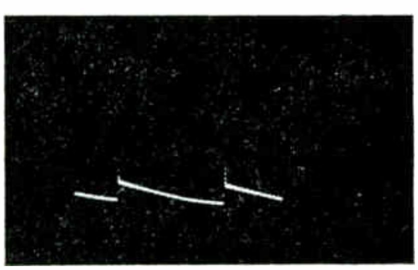


Fig. 15. Vertical-Output Plate, Pin 9, 900 volts, 60 c.p.s.

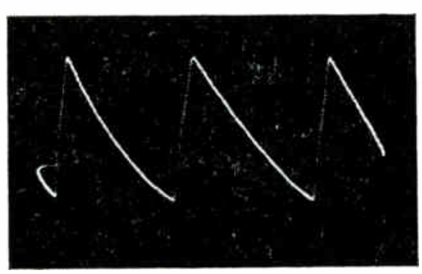


Fig. 16. Phase Comparer, Pin 6, 7 volts, 15,750 c.p.s.

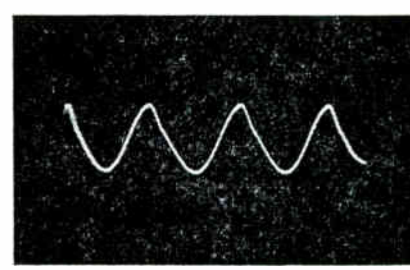


Fig. 17. Horizontal Oscillator, junction of L800 and R806, 43 volts, 15,750 c.p.s.

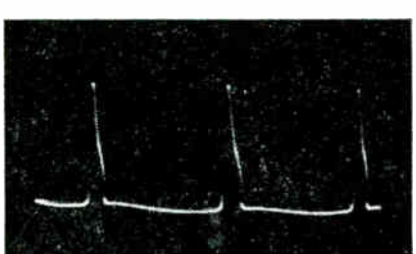


Fig. 18. Horizontal-Oscillator Cathode, Pins 3 and 8, 18 volts, 15,750 c.p.s.

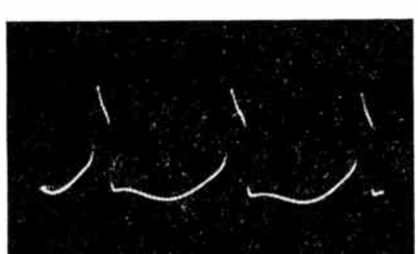


Fig. 19. Horizontal-Oscillator Grid, Pin 2, 40 volts, 15,750 c.p.s.

Fig. 20. Horizontal-Output Grid, Pin 5, 120 volts, 15,750 c.p.s.

REPLACEMENT PARTS LIST
TV-300 CHASSIS

TUNER — MECHANICAL

Reference Symbol	Description	Service Part No.
	Tuner (T36A)	76-8946-1
	Tube shield	56-5629-5
	Stud	W2235-7FA9
	Connector	27-6273-11
	Antenna coil box assembly	76-9204
	Washer, switch assembly	56-9351
	Washer, switch assembly	1W60980FE5
	Retaining ring, switch assembly	1W61043
	Hairpin, switch assembly	56-9859
	Ball, detent, switch assembly	56-8020
	Spring, shaft, switch assembly	56-8023
	Pulley & shaft, switch assembly	76-9026
	Bearing, switch assembly	54-9244
	Spring, switch assembly	28-9088
	Rotor & shaft, switch assembly	76-9025
	Spring, detent, switch assembly	56-9158
	Washer, switch assembly	W2556-5
	Tube cap, switch assembly	54-9242
	Sleeve cap, switch assembly	28-10283
	Shaft assembly, switch assembly	76-6914-6
	Shaft extension, switch assembly	56-8358-7
	Coupling, shaft, switch assembly	54-4912
S1-S2	socket, tube	27-6203-21

TUNER — ELECTRICAL

Reference Symbol	Description	Service Part No.
C1	capacitor, r.f. heater; oscillator heater	62-122001001
C2	capacitor, r.f. grid by-pass	62-115001001
C3	capacitor, r.f. grid by-pass	62-115001001
C4	capacitor, r.f heater; oscillator heater	62-122001001
C5	capacitor, oscillator grid block; oscillator grid tank (12 mmf.)	30-1224-128
C6	capacitor, injection coupler	30-1224-127
C8	capacitor, interstage coupler	30-1253-1
C9	capacitor, oscillator grid block; oscillator grid tank (12 mmf.)	30-1224-28
C11	capacitor, r.f. grid coup.	62-033409011
C12	capacitor, IF by-pass	30-1238-2
C14	capacitor, mixer grid coup.	30-1224-126
CX-1	IF trap coil, antenna assembly	32-4552-1
L11	capacitor, feed thru, heater by-pass AGC decoupling	30-1245-6
L14	capacitor, feed thru, heater by-pass AGC decoupling	30-1245-6
R1	resistor, mixer grid (100K)	66-4108340
R3	resistor, oscillator grid leak; AGC decoupling (22K)	66-3228340
R7	resistor, r.f. grid	66-4478240
R8	resistor, oscillator grid leak; AGC decoupling (22K)	66-3228340
R9	resistor, r.f. grid section II (470K)	66-4478240
R10	resistor, mixer decoupling (8200)	66-2825340

TUNER — ELECTRICAL (Continued)

Reference Symbol	Description	Service Part No.
R12	resistor, mixer screen (8200)	66-2828340
R14	resistor, damper (680)	
R19	resistor, antenna assembly (470K)	66-4478340
T1	coil, IF primary	32-4629
T28	antenna coils (ant. assy.)	32-4432-3
T29	antenna coils (ant. assy.)	32-4432-3
VC2	capacitor, var., r.f. plate; mixer grid (.5 to 3.0 mmf.)	31-6520-3
VC3	capacitor, var., r.f. plate; mixer grid (.5 to 3.0 mmf.)	31-6520-3
WS1	oscillator wiring assembly, switch assy.	76-9231
WS2	ant. wafer wiring assy., switch assy.	76-9245
WS3	grid wiring assembly, switch assy.	76-8955
WS4	RF wiring assembly, switch assy.	76-8956
WS5	auxiliary antenna wiring assy., switch assy.	76-8965
X1	coil, mixer screen	32-4623-57
X2	coil, plate-cathode	32-4623-50

CHASSIS — MECHANICAL

Reference Symbol	Description	Service Part No.
CRTS	CRT socket	41-4147-1
PL	pilot lamp	27-6233-4
	tube shield	56-5629-5
S14	socket, hi-voltage	27-6290-1

CHASSIS — ELECTRICAL

Reference Symbol	Description	Service Part No.
C1	line by-pass —2 (0.01)	30-4650-58
C2	line by-pass —2 (0.01)	30-4650-58
C3	AGC (0.15)	30-4650-48
C5	sawtooth form (0.0033)	30-4650-55
C6	vertical oscillator plate (0.01)	30-1238-2
C7	horizontal oscillator (82 mmf.)	60-00825347
C8	horizontal oscillator (0.01)	30-1238-2
C9	horizontal output grid (0.001)	30-1238-3
C10	boost voltage filter (0.47)	30-4650-45
C11	vertical oscillator coupling (0.01)	30-4650-47
C12	vertical oscillator grid (0.0068)	30-4650-57
C15	sawtooth coupling (0.001)	30-1238-3
C16	horizontal oscillator (390 mmf.)	60-10395437
C17	horizontal oscillator (390 mmf.)	60-10395417
C19	horizontal ringing (2200 mmf.)	60-20225434
C22	sound take off (18 mmf.)	62-018300001
C23	2nd V.I.F. (0.002)	30-1238-12
C24	detector (10 mmf.)	62-010409001
C25	1st audio grid (0.005)	30-1238-1
C26	1st V.I.F. screen by-pass (680 mmf.)	62-168001011
C27	3rd V.I.F. screen by-pass (680 mmf.)	62-168001011
C28	1st V.I.F. by-pass (0.002)	30-1238-12
C29	2nd V.I.F. screen by-pass (680 mmf.)	62-168001011

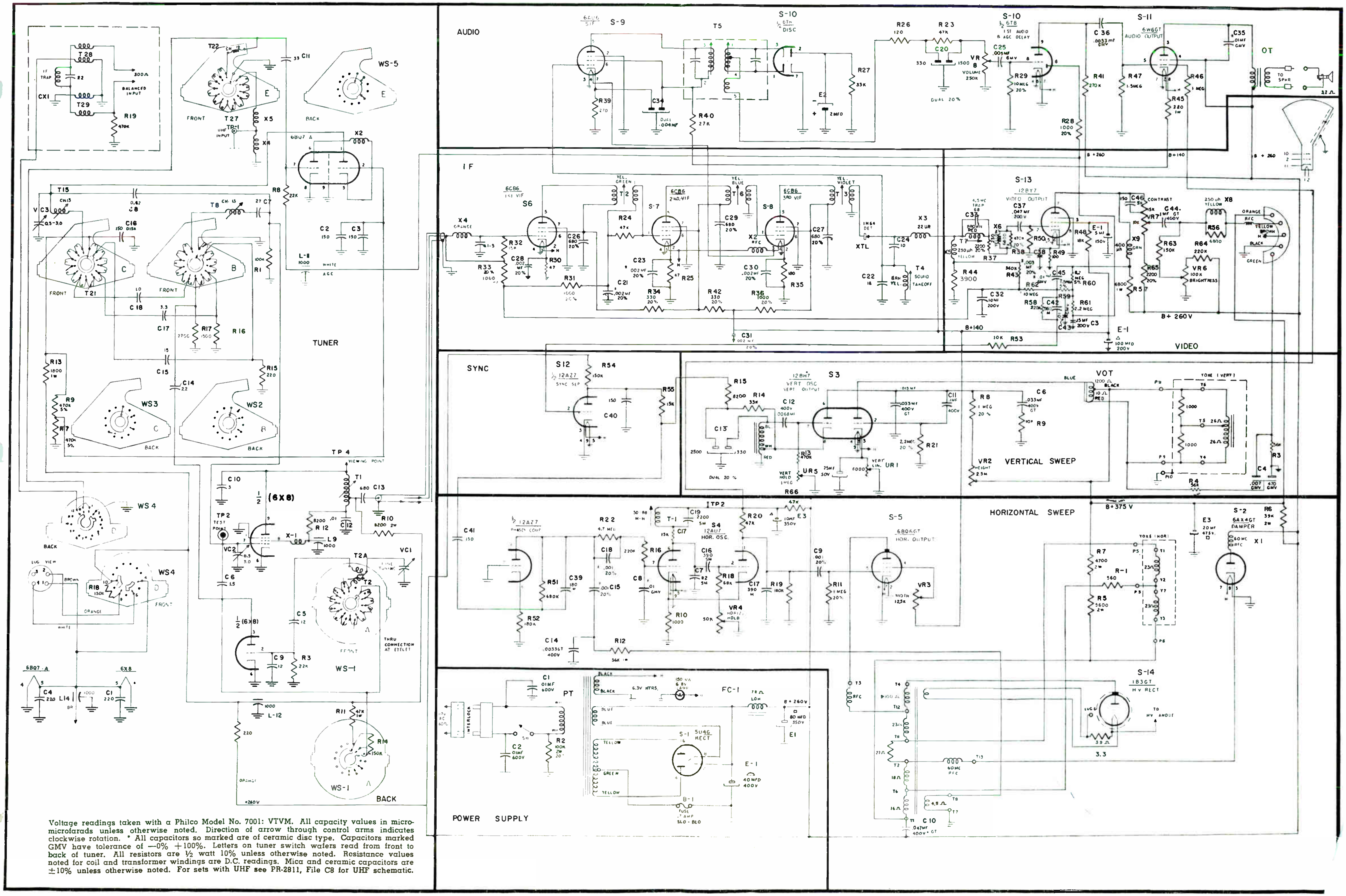
REPLACEMENT PARTS LIST — Continued
TV-300 CHASSIS

CHASSIS — ELECTRICAL (Continued)

Reference Symbol	Description	Service Part No.
C30	3rd V.I.F. by-pass (0.002)	30-1238-12
C31	video by-pass (0.002)	30-1238-12
C32	AGC (0.1)	30-4650-47
C33	4.5 mc., trap (68 mmf.)	62-068409011
C34	SIF (0.004)	30-1239
C35	audio output plate (0.01)	30-1238-2
C36	audio coupler (0.002)	30-1238-2
C37	video coupling (0.47)	30-4650-45
C38	video output cathode by-pass	30-1238-16
C39	phase comp. cathode (180 mmf.)	60-10185417
C40	SS plate (150 mmf.)	62-115001001
C41	SS output (150 mmf.)	62-115001001
C42	SS coupling (560 mmf.)	60-10565307
C43	AGC by-pass (0.01)	30-1238-2
C44	contrast (0.1)	30-4650-47
C46	cont. tap (150 mmf.)	62-115001001
	adj., 1-5 mmf. V.I.F.	31-6520-9
E3	20 mf. @ 475V. 10 mf. @ 350V. 5 mf. @ 150V.	30-2584-50
E1	80 mf. @ 350V. 40 mf. @ 400V. 100 mf. @ 200V. 25 mf. @ 50V.	30-2584-47
	crystal 1N64	34-8022
	pilot lamp	3463-4
F1	fuse	AD-2246-15
HT	transformer, horizontal output	32-8677
	shield corona	58-9684
	anode lead assy.	AD-2631
	pulley assy., driving	76-9037
	shaft, dial	28-10011
	spring, dial cord	28-10029
R2	line to chassis (100K.)	66-4105340
R5	boost (5600)	66-2565340
R6	boost (38K.)	66-3395340
R7	boost (4700)	66-2465340
R8	height (1 meg.)	66-5108340
R10	horizontal oscillator cathode (1000)	66-2108340
R11	horizontal output grid (1 meg.)	66-5108340
R12	sawtooth form (56K.)	66-3564340
R13	vertical oscillator grid (820K.)	66-4828340
R14	vertical integrator (33K.)	66-3338340
R16	horizontal oscillator grid (220K.)	66-4228340
R17	horizontal oscillator plate (15K.)	66-3158340
R18	horizontal oscillator grid (56K.)	66-3568340
R20	horizontal oscillator plate (47K.)	86-3478340
R21	vertical oscillator grid (2.2 meg.)	66-5228340
R23	de-emph (47K.)	66-3478340
R25	2nd V.I.F. cathode (47 ohms)	66-0478340
R26	discriminator (120 ohms)	66-1128340
R27	diode plate (33K.)	66-3338340
R28	AGC (1000)	66-2108340

CHASSIS — ELECTRICAL (Continued)

Reference Symbol	Description	Service Part No.
R29	1st audio grid (10 meg.)	66-6108340
R30	1st V.I.F. cathode (47 ohms)	66-0478340
R31	1st V.I.F. —2 (1000)	66-2108340
R32	1st V.I.F. grid (15K.)	66-3158340
R33	1st V.I.F. —2 (1000)	66-2108340
R34	1st V.I.F. decoupler (330)	66-1338340
R35	3rd V.I.F. cathode (180 ohms)	66-1188340
R36	3rd V.I.F. decoupler (1000)	66-2108340
R37	video grid (2200)	66-2228340
R39	SIF cathode (270 ohms)	66-1278340
R41	vertical integrator (33K)	66-4278340
R42	3rd V.I.F. decoupler (330)	66-1338340
R43	AGC filter (680K.)	66-4688340
R44	diode load (3900)	66-2398340
R47	audio output grid (1.5 meg)	66-5158340
R48	video screen drop (18K.)	66-3188340
R49	video output cathode (100)	66-1108340
R50	video output grid (470K.)	66-4478340
R51	phase comp. grid (680K.)	66-4688340
R52	phase comp. cathode (180K.)	66-4188340
R53	SS grid (10K.)	66-3108340
R54	SS plate (150K.)	66-4158340
R57	video B+ (6800)	66-2684340
R58	SS grid (220K.)	66-4228340
R59	AGC filter (1 meg.)	66-5108340
R60	AGC filter (8.2 meg.)	66-5828340
R61	AGC filter (2.2 meg.)	66-5228340
R62	AGC filter (10 meg.)	66-6108340
R63	bright lim. (150K.)	66-4158340
R64	CRT cathode (270K.)	66-4278340
R65	cont. lim. (2200)	66-2228340
T1	horizontal ringing	32-4557-4
T2	1st V.I.F. plate	32-4486-45
T3	3rd V.I.F. plate	32-4486-47
T4	sound takeoff	32-4463-10
T5	trans. disc.	32-4631A
T6	2nd V.I.F. plate	32-4486-46
T7	4.5 mc., trap	32-4463-2
VR1	vertical lin.	67-0025
VR2	height	33-5572-1
VR3	width	33-5574
VR4	bright, horizontal hold	33-5572-16
VR5	vertical hold	33-5572-10
VR6	bright, horizontal hold	33-5572-16
VR7	contrast	33-5572-15
VR8	off-on, volume	33-5566-61
X1	damper	32-4112-50
X2	heater	32-4112-49
X3	detector series	32-4630
X4	1st V.I.F. grid	32-4597-3
X5	detector shunt	32-4480-5
X8	video output peak	32-4480-5
X9	video plate peak	32-4480-9
R66	MV filter (4700 ohms)	66-2478340
R22	S.S. coup. (4.7 meg.)	66-5478340
R56	video plate damper (4700 ohms)	66-2478340
	vertical oscillator peak (6800 ohms)	66-2688340
R9	1B3 heater	66-9393360
R15	vertical integrator (8200 ohms)	66-2828340
	SSTC (560 mmf.)	60-10565307



Voltage readings taken with a Philco Model No. 7001: VTVM. All capacity values in micro-microfarads unless otherwise noted. Direction of arrow through control arms indicates clockwise rotation. * All capacitors so marked are of ceramic disc type. Capacitors marked GMV have tolerance of —0% +100%. Letters on tuner switch wafers read from front to back of tuner. All resistors are ½ watt 10% unless otherwise noted. Resistance values noted for coil and transformer windings are D.C. readings. Mica and ceramic capacitors are ±10% unless otherwise noted. For sets with UHF see PR-2811, File C8 for UHF schematic.

Fig. 21. Schematic Diagram — TV-300 Chassis.

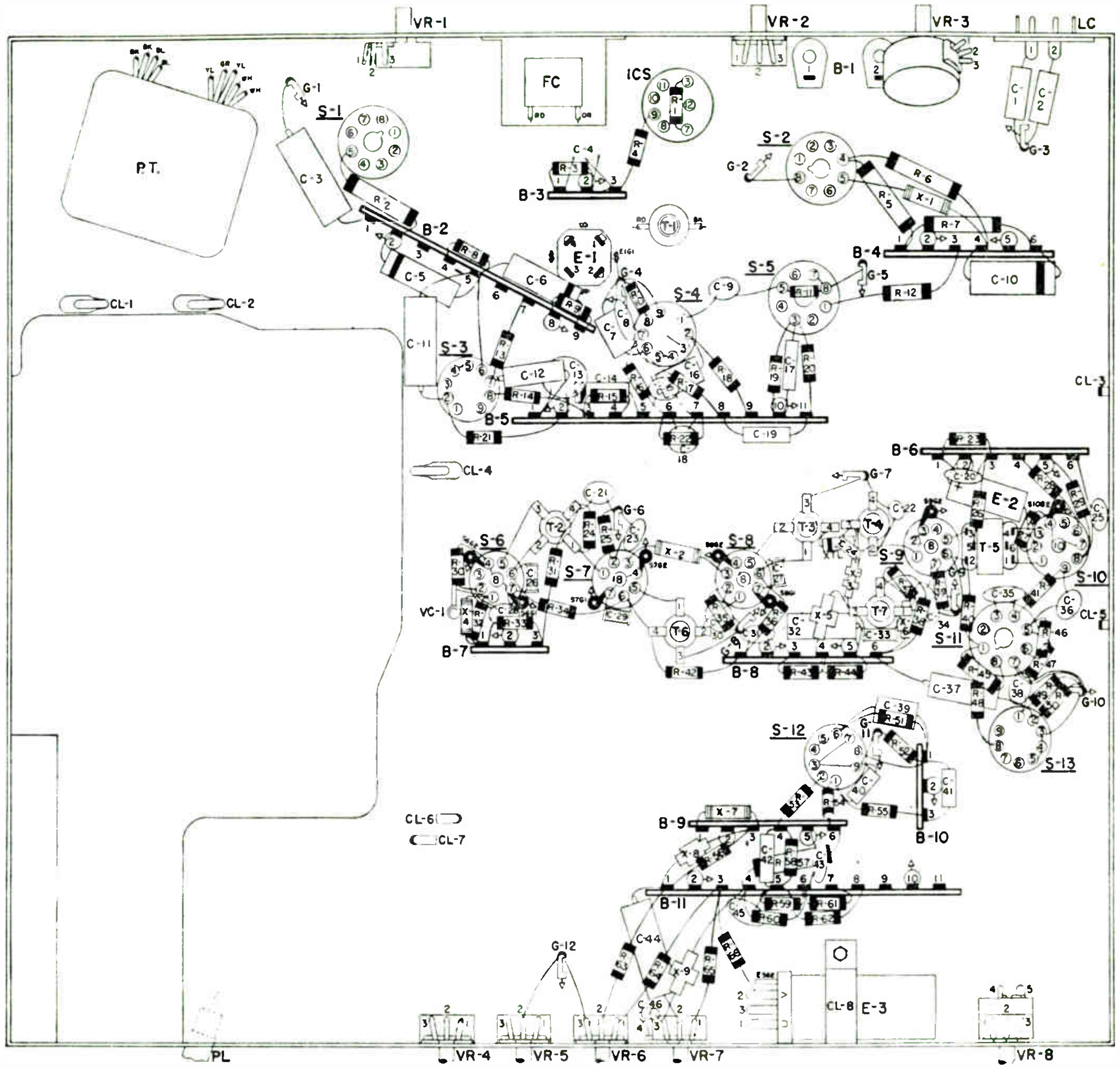


Fig. 22. Wiring Diagram, Bottom View — TV-300.

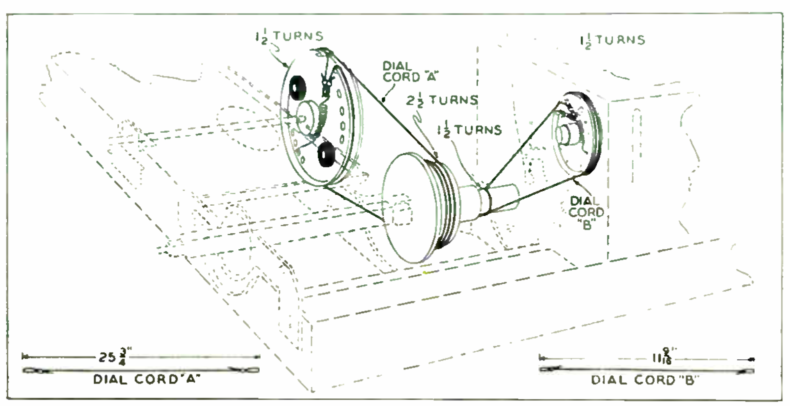


Fig. 23. Dial Cord Stringing Arrangement.

PHILCO
Factory-Supervised
Service

PR-2812—8-54

Printed in U.S.A.

PHILCO TELEVISION SERVICE MANUAL FOR TV-350 AND TV-354 CHASSIS

PHILCO Factory-Supervised Service

TELEVISION

FILE C-3 PHILCO TELEVISION SERVICE MANUAL FOR TV-350 & TV-354 CHASSIS PR-2808

SPECIFICATIONS — TV-350 CHASSIS

VHF TUNING	Twelve channel, 13-position incremental tuner, covering VHF Television channels 2 through 13; plus UHF position, and fine tuning of local oscillator.
UHF TUNING (if provided)	Continuous tuning, covering UHF Television Channels 14 through 83.
INTERMEDIATE FREQUENCIES	
Video Carrier	45.75 mc.
Sound (intercarrier)	4.5 mc.
TRANSMISSION LINE	300-ohm, twin-wire lead
OPERATING VOLTAGE	110 to 120 volts, 60 cycles, a.c.
POWER CONSUMPTION	without UHF, 185 w. with UHF, 190 w.

TUBE COMPLEMENT — TV-350 CHASSIS

Reference Symbol	Tube Type	Function
S2	6BZ7	RF Amplifier
S1	6X8	Oscillator-mixer
S10, S11	6DE6	Video I-F amplifiers
S12	6CB6	Video I-F amplifiers
S15	12BY7	Video output
S13	6AU6	Sound Amplifier
S9	6AL5	Ratio Detector
S8	6AT6	First Audio and AGC Delay
S1	6V6 GT/G	Audio Output
S14	6CS6	Sync Separator
S7	12AU7	Vertical Oscillator
S6	6S4	Vertical Output
S4	6AL5	Phase Comparer
S2	12AU7A	Horizontal Oscillator
S3	6CU6, 6BQ6GT, or 6BQ6GTA	Horizontal Output
S5	6AX4GT	Horizontal Damper
S16	1B3GT	High Voltage Rectifier
S17	5AW4, or 5U4GB	Low Voltage Rectifier
S18	21ZP4B	Picture tube

CONTENTS

CIRCUIT DESCRIPTION — TV-350 CHASSIS

The RF amplifier, oscillator and mixer are contained in a separate tuner sub chassis. The RF amplifier uses a twin triode type 6BZ7 tube. The oscillator is ½ 6X8 and uses the triode side of the tube. The other side of the 6X8, the pentode side, is used for mixing.

The VHF tuner when placed in UHF position is tuned automatically to i-f frequency in the RF amplifier stage as well as the mixer stage. Thus, when this set is used in UHF position it has five I-F stages. The VHF oscillator is made inoperative in the UHF position.

The output of the mixer stage is inductively coupled to the i-f amplifier system. The I-F system consists of three stages, and is stagger tuned, and 40 megacycles, using two 6DE6 tubes and one 6CB6 tube. A type IN64 crystal diode is used for the video detector. The output of the video detector is amplified by a single stage video amplifier using a type 12BY7 tube. The picture tube is cathode driven due to the single video amplifier stage. The grid of the picture tube is returned to ground through a 470 K resistor R 32. A blanking pulse, taken from the vertical output stage is applied to the grid of the picture tube for suppression of the vertical retrace.

Sound I-F (intercarrier) is obtained by utilizing the beat frequency produced when the 45.75 mc. video carrier and the 41.25 mc sound carrier are mixed in the video detector. The 4.5 mc difference signal contains the FM sound. This 4.5 mc signal contains only a negligible amount of video amplitude modulation, provided that the amplitude of the 41.75 mc. signal is considerably lower than that of the 45.75 mc. signal. The proper ratio of the two signals is established during the alignment of the receiver. Sound is present only when the video and sound carriers are transmitted.

The oscillator is tuned primarily to receive the best picture, since the 4.5 mc difference signal is established at the transmitter. The 4.5 mc sound I-F signal is taken from the plate of the video tube and is further amplified in a 4.5 mc tuned amplifier, type 6AU6. The signal is then applied to a ratio detector using a tube type 6AL5. The output of this ratio detector is applied to the triode section of a 6AT6. The output of the 6AT6 drives a 6V6GT which is the power output tube.

A portion of the video signal appearing at the output of the video amplifier is applied to grid 3 (pin 7) of the 6CS6 sync separator. Since grid leak bias is used on grid 3, the tips of

CIRCUIT DESCRIPTION (Continued)

the sync pulses are clamped to zero, and the video components swing in a negative direction from zero. Because of the cut-off characteristics of grid 3, the video components are eliminated, and only negative-going sync pulses appear in the plate circuit of the sync separator. At the same time, however, a signal is taken from the video detector and applied to grid 1 (pin 1) of the 6CS6 tube. This grid leak is returned to B plus, and the bias is maintained close to zero, because of a small grid-current flow. Since the signal applied to grid 1 is composite video with negative-going sync, any noise modulation present in the signal appears in the form of sharp spikes, driving in a negative direction. The circuit constants are chosen to allow grid 1 to cut off plate current whenever the signal goes more negative than the sync pulses. The series grid resistance and low grid impedance when the tube is drawing current greatly reduces the amount of video appearing at the grid and therefore the plate of the sync separator. A-G-C voltage is also developed in the sync separator circuit in the following manner: on tips of the sync pulses, grid 3 (pin 7) of the 6CS6 tube draws current which flows downward through the network R64, R62, R76 and R79, causing capacitors C50, C51, and C52, to assume negative charges proportional to the amount of peak signal applied to grid 3. The tuner a-g-c voltage is delayed by means of a resistor divider network which applies a small positive voltage to the tuner a-g-c circuit. This positive voltage prevents a-g-c action from lowering the tuner gain on weak signals. To prevent the delay voltage from driving the tuner a-g-c voltage positive on weak signals, a diode clamp (part of 6AT6) is connected across C52.

The I-F strip also has an A-G-C delay network which allows the i-f strip to operate more efficiently under conditions of weak signals. To prevent the delay voltage from driving the I-F grids positive a diode clamp (part of 6AT6) is connected across C61.

This receiver is equipped with a three position range switch. These positions are referred to as strong signal, normal signal and fringe signal. Under conditions of strong signal, G1 of the 6CS6 sync separator tube is grounded. When this grid is grounded G3 to K looks like a good diode with the result that a maximum A-G-C is developed by grid leak action at G3.

In the normal signal position a slight bias is applied to G1 of this tube and noise will not disturb the bias developed. G3 to K then looks like a rectifier of less efficiency. Under conditions of fringe signal, G1 of the 6CS6 is operating on grid leak bias and the efficiency of rectification is very poor with the result that very little, if any, grid leak bias is developed at G3.

The range switch also changes the tuner and I-F delay.

Proper triggering of the vertical oscillator requires negative synchronizing pulses. The vertical sync signal is separated from the horizontal sync signal by the integrator circuit, and is fed to the grid of the vertical oscillator, a cathode-coupled multivibrator. The output of the vertical oscillator is amplified by a type 6S4 tube which is employed as the vertical output amplifier. The output of the amplifier is applied to the vertical-deflection coils through the vertical-output transformer.

The horizontal sweep circuits require both posiitve and negative sync pulses. The phase-comparer circuit uses a 6AL5 tube. Positive sync pulses are applied to the plate of S4, and negative sync pulses are applied to the cathode of S4. A saw-tooth voltage is fed to the plate of S4 and to the cathode of S4, for comparison of the sync and horizontal sweep voltages. When the saw-tooth and sync signals are exactly in phase, no voltage is developed across R16, but when the two signals are out of phase, either a positive or a negative voltage is developed, depending upon whether the horizontal-oscillator frequency is lower or higher than the sync-pulse frequency. The grid circuit of the horizontal oscillator, a 12AU7 (S-2) cathode-coupled multivibrator, is connected to R17 through a filter network; when the voltage at this point goes in a positive direction, the frequency of the horizontal oscillator is increased, and when the voltage swings negative, the frequency of the oscillator is decreased. In this manner the frequency of the horizontal oscillator is controlled over the lock-in range of the circuit. The horizontal oscillator hold control adjusts the horizontal-oscillator frequency so that it is within the control range of the phase comparer. The output of the horizontal oscillator is fed to the horizontal output amplifier, which makes use of a 6CU6 tube. The screen voltage for the horizontal amplifier is supplied from a voltage-divider network. The horizontal amplifier feeds the deflection coils through the horizontal output transformer. A 6AX4GT tube is used as the horizontal damper.

The second-anode voltage for the picture tube is supplied by a 1B3GT high-voltage rectifier. The B plus voltage is supplied by a power transformer and a full wave rectifier, type 5AW4. All of the filament voltage is supplied from a filament winding on the transformer with the exception of the high voltage rectifier which is supplied by a winding on the horizontal output transformer.

Bias voltage is supplied by isolating the center tap of the secondary of the power transformer away from ground by means of a 1.2 henry choke.

HORIZONTAL-OSCILLATOR ADJUSTMENT

To adjust the horizontal-oscillator circuit, tune in a station and proceed as follows:

1. Reduce the width of the picture until approximately 1 inch of blank screen appears at the right-hand and left-hand sides of the picture.
2. Increase the BRIGHTNESS control setting until the blanking becomes visible. This will appear as a dark vertical bar on each side of the picture.
3. Connect a .1 mf condenser from the test point to ground. (The plate side of the horizontal ringing coil, T1, is connected to the test point.)
4. Set the HORIZONTAL HOLD control to the approximate center of its mechanical rotation.
5. Adjust the HORIZONTAL HOLD CENTERING control until equal portions of the blanking bar appear on both sides of the picture.
6. Remove the .1 mf condenser from the test point.
7. Adjust the horizontal ringing coil, T1, until equal portions of the blanking bar again appear on both sides of the picture.
8. Rotate the HORIZONTAL HOLD control through its range. The picture should fall out of sync on both sides of the center of its rotation. If the picture does not fall out of sync on both sides, readjust the HORIZONTAL HOLD CENTERING control.
9. Rotate the HORIZONTAL HOLD control through its range, and observe the number of diagonal blanking bars that appear just before the picture pulls into sync. The pull-in should occur with from 1 to 2 diagonal bars when the sync position is approached from either direction. If proper pull-in is not obtained, repea the above procedure.

VIDEO PEAKING-COIL ADJUSTMENT

The peaking coil, T6, is adjusted at the factory for proper transient response of the video circuits. Ordinarily, this coil will require no further adjustment by the serviceman. On any station where excessive overshoot or excessive smear is present, a slight adjustment of T6 may improve the picture quality on that station; however, this adjustment may sacrifice the quality on other channels. If T6 is replaced in servicing, adjustment will be required.

Before adjusting T6, check the tuner alignment and I-F alignment. (Never adjust T6 until the alignment of a receiver is correct.) Then tune in a station and adjust T6 until there are no trailing whites or smear in the picture. Turning T6 clockwise reduces trailing whites and overshoot; turning T6 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 T6 applies to a particular station exhibiting smear or overshoot. After T6 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 procedure follows the general pattern of first checking the tuner response with an FM sweep generator and oscilloscope, comparing the response curve with that given in the manual, and aligning the tuner if necessary. After it is established that the tuner is in correct alignment, the video I-F channel is aligned by tuning each coil to its assigned pole frequency, using an AM signal, and then feeding in a sweep signal at the antenna terminals and retouching the I-F adjustments to obtain the desired pass band. Finally, the sound channel is aligned, using an AM signal, by tuning the sound take-off coil and the I-F and ratio-detector transformers.

The over-all response curve (r-f, i-f) of the circuits from the antenna terminals to the video detector, after the I-F stages have been aligned, should appear essentially the same, regardless of the channel under test. If 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 having the top of the workbench metallic. 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 2 inches wide. The section of the chassis nearest the tuner should rest on the strip.

2. Do not disconnect the 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 Philco Alignment Generator Model 7008 is used, the built-in crystal calibrator provides an excellent means of calibration. An alternate method for calibrating the signal generator to the sound and video i-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."

JIGS AND ADAPTERS REQUIRED

Mixer Jig

Connections to the grid of the mixer tube may be made through the test point provided for this 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, may be used. As an alternate, a Philco alligator-clip adaptor, Part No. 45-1636, with as short a ground lead as possible, may be ued to connect 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.

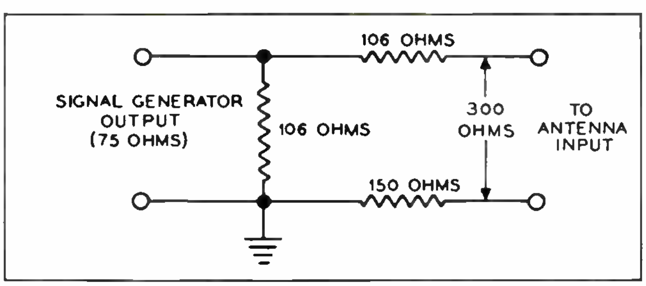


Fig. 1. Antenna-Input matching network.

Antenna-Input Matching Network

An impedance-matching network for coupling the signal generator to the antenna input terminals of the receiver is shown in figure 1. 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 antenna-input circuit. The resistors used in this network should be of carbon-composition construction, and should be chosen from a group, to obtain values within ten percent of those indicated. The resistors should be placed in a shield can, to prevent variable effects. An antenna-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.

Video I-F Alignment Jig

(Video Test Jack Adapter No. 1)

The alignment jig used at TS1 and shown in figure 2, 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 five-pin plug, two 10,000 ohm resistors, and a 1500 mmf condenser for isolation of the bias supply. To isolate the oscilloscope from the receiver circuits, a 15,000-ohm resistor, by-passed by a 1500 mmf. condenser, is used. A suggested method of fabricating the jig is also shown in figure 2. This jig should not be used to observe the composite video from the video detector output.

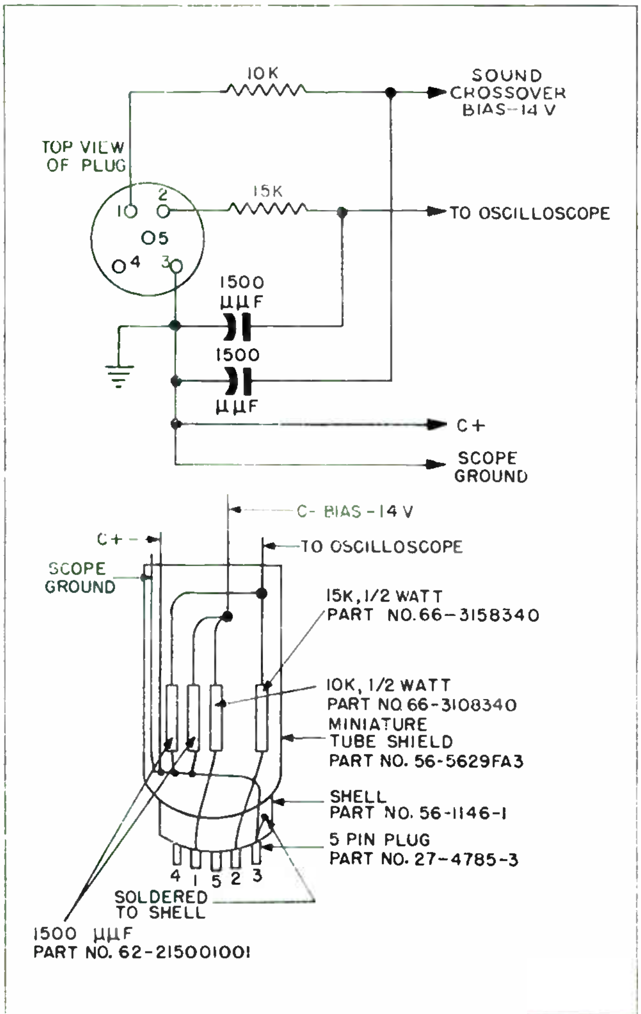


Fig. 2. Video I-F Alignment Jig (Video Test Jack Adapter No. 1).

JIGS AND ADAPTORS REQUIRED (Continued)

Sound I-F Input Alignment Jig

(Video Test Jack Adapter No. 2)

To observe the composite video, at TS1, a jig may be made with a five-pin plug and a 2200 ohm resistor. (See figure 3.) The 2200 ohm resistor should be connected to pin 2 of the plug. A ground lead should be connected to pin 3. To observe the composite video, connect the oscilloscope to the 2200 ohm resistor and the ground lead. This jig is also used for injection of the 4.5 mc. signal during s-i-f alignment.

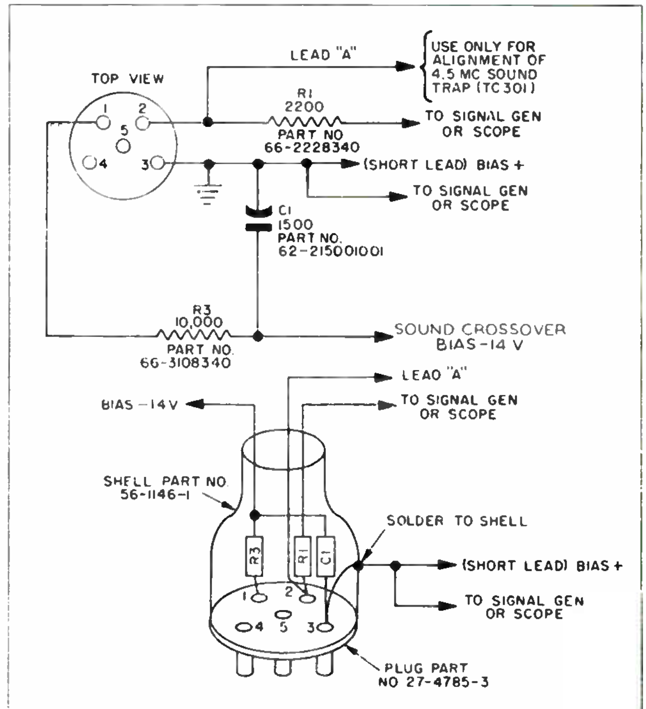


Fig. 3. Sound I-F Input Alignment Jig (Video Test Jack Adapter No. 2).

TUNER BAND PASS ALIGNMENT

(See Table No. 2 on Page 6)

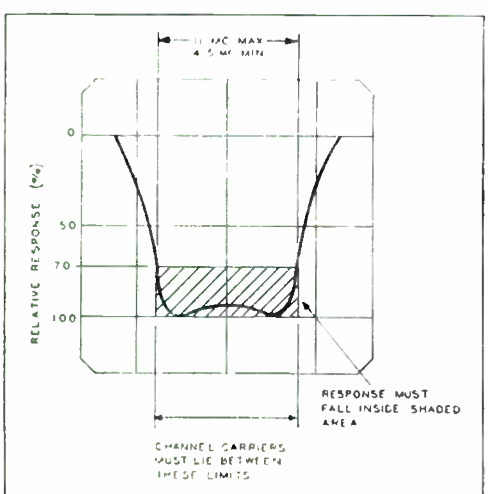


Fig. 4. Television tuner response curve, showing bandpass limits.

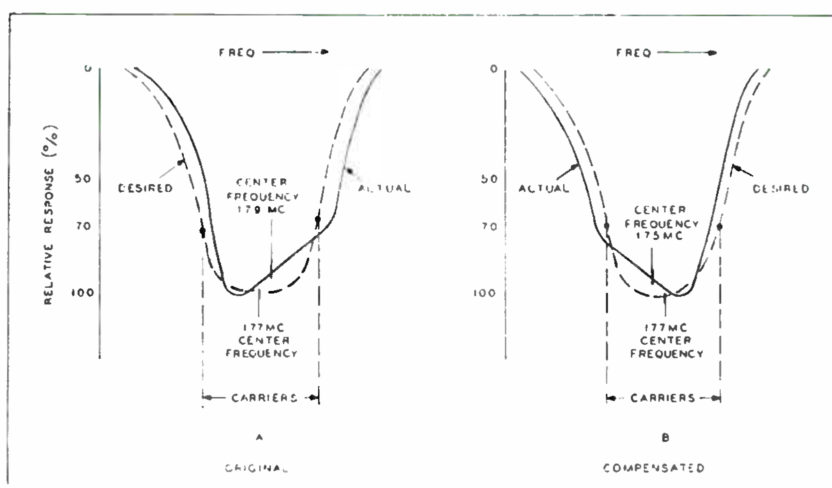


Fig. 5. Television tuner response curve, showing tracking compensation.

TUNER OSCILLATOR ALIGNMENT
TABLE NO. 1

AM GENERATOR: Connect to receiver antenna-input terminals. (No matching network is required.) Use unmodulated r-f output.

OSCILLOSCOPE: Connect the vertical-input lead, in series with a 1000-ohm resistor, to the mixer grid test point. Connect the scope ground lead to the chassis, near the test point.

RECEIVER CIRCUIT ALTERATIONS: Disconnect tuner a-g-c (white) lead from main chassis, and connect a 1.5 volt bias battery, with negative terminal to white lead from tuner, and positive terminal to chassis.

STEP	AM GENERATOR DIAL SETTING	RECEIVER TUNING	ADJUST	REMARKS
1	257 mc.	channel 13	VC4 for zero beat on scope.	a. If regeneration occurs, inject bias; bias may be increased up to 3 volts, if necessary at pin 1 video test jack — TS1. b. Preset fine tuning adjustment so that it is in the middle of its range.
2	251 mc.	channel 12	VC5 for zero beat on scope.	
3	245 mc.	channel 11	VC6 for zero beat on scope.	
4	239 mc.	channel 10	VC7 for zero beat on scope.	
5	233 mc.	channel 9	VC8 for zero beat on scope.	
6	227 mc.	channel 8	VC9 for zero beat on scope.	
7	221 mc.	channel 7	VC10 for zero beat on scope.	
8	64.5 mc.	channel 6	VC11 for zero beat on scope.	2nd harmonic gives 129 mc.
9	113 mc.	channel 4	VC12 for zero beat on scope.	
10	101 mc.	channel 2	VC13 for zero beat on scope.	

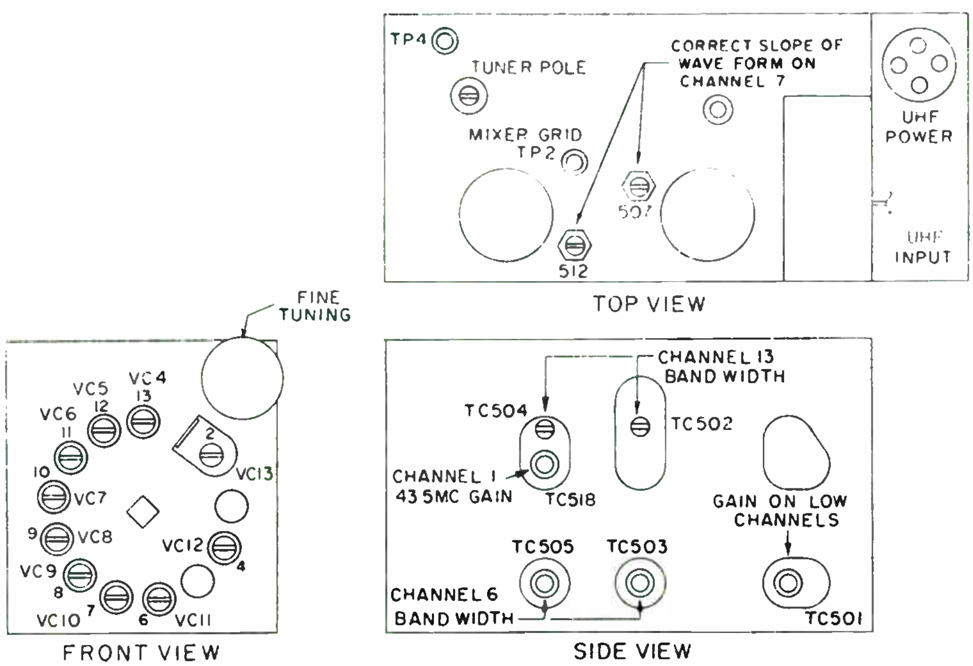


Fig. 6. Tuner Layout.

TUNER BANDPASS ALIGNMENT
TABLE NO. 2

SWEEP (FM) GENERATOR: Connect to antenna-input circuit through antenna-input matching network (See figure 1).

OSCILLOSCOPE: Connect the vertical-input lead, in series with a 1000-ohm resistor, to the mixer plate test point, TP4. Connect scope ground lead to the chassis, near TP4.

RECEIVER CIRCUIT ALTERATIONS: Disconnect tuner a-g-c (white) lead from main chassis, and connect a 1.5 volt bias battery, with negative terminal to white lead from tuner, and positive terminal to chassis. Disconnect tuner link from terminal board, B-9, and connect a 40 to 70-ohm carbon resistor across the link.

STEP	SWEEP (FM) GENERATOR		RECEIVER TUNING	ADJUST	REMARKS
	SWEEP DIAL SETTING	MARKER DIAL SETTING			
1	channel 13 (213 mc. with 10-mc. sweep width.)	Set first to 210 mc. and note position of marker on response curve. Then set to 216 mc. and note position of marker on response curve.	channel 13		Use oscilloscope gain as high as possible with respect to hum level and "bounce". Pips fix channel limits on curve. Response curve should be flat between limits (see fig. 5). If not, proceed with step 2.
2	channel 13	213 mc.	channel 13	TC502 counterclockwise until single peak appears.	CAUTION: Care must be taken not to unscrew core far enough to make it drop out of the coil.
3	channel 13	213 mc.	channel 13	TC504 until peak falls on 213 mc. marker.	It may be necessary to increase sweep-generator output.
4	channel 6 (85 mc. with 10-mc. sweep width.)	Set first to 82 mc. and note position of marker on response curve. Then set to 88 mc. and note position of marker on response curve.	channel 6		Curve should be symmetrical and centered in pass band. If not, proceed with step 5.
5	channel 6	85 mc.	channel 6	TC503 counterclockwise until single peak appears.	CAUTION: Care must be taken not to unscrew core far enough to make it drop out of the coil.
6	channel 6	85 mc.	channel 6	TC505 until peak falls on 85 mc. marker.	It may be necessary to increase sweep-generator output.
7	channel 6	85 mc.	channel 6	TC503 for maximum curve height and symmetry of single peak.	After adjusting TC503, recheck as in step 4. If necessary, reduce sweep-generator output to avoid overloading.
8	channel 6	85 mc.	channel 6	Retouch TC503 and TC505 for symmetrical response, centered about 85 mc. marker.	To retouch, only turn cores slightly.
9	channel 1 (UHF)	44 mc.	channel 1 (UHF)	Retouch TC503 and TC505 for symmetrical response centered about 44 mc.	After this adjustment recheck channel 6 and be sure it is within limits.

NOTE: On channel 7, observe the tilt and center frequency of the response curve. The curve should be centered on the pass band and should be symmetrical. If it is not symmetrical, and appears unbalanced, as in figure 6, adjust C507 and C512 (figure 5) to obtain a response curve which is in the mirror image (tilt in the opposite direction) of the original: for example, if channel 7 response curve appears as in figure 6A, adjust C507 and C512 until the curve appears as in figure 7B. This adjustment over-compensates to make allowance for the effect of channel 13 adjustments upon channel 7 response.

VIDEO I-F ALIGNMENT

AM GENERATOR: Connect to mixer test point, TP2, through a mixer jig, and adjust the generator for approximately 30 percent modulation at 400 cycles. Adjust the output of the generator during alignment, to keep the output at the second detector below 4 volt, peak to peak.

SWEEP (FM) GENERATOR: After step 7, connect to antenna-input circuit through antenna input matching network. (See figure 1.)

OSCILLOSCOPE: Connect the vertical-input lead to the 15K resistor of the video i-f alignment jig. Connect scope ground lead to the ground lead of the jig. Plug jig into TS1.

PRESET: Contrast and Brightness controls fully counterclockwise, and channel selector to channel 4. Adjust AGC switch to normal position.

BIAS: Apply —14 volts of negative bias to pin 1 of video i-f alignment jig; ground positive side of bias supply to pin 3 of jig. (See figure 2.)

NOTE: If the i-f shield has been removed for repairs, it must be replaced before proceeding with the alignment.

VIDEO I-F ALIGNMENT (Continued)
TABLE NO. 3

STEP	AM GENERATOR DIAL SETTING	SWEEP (FM) GENERATOR SWEEP DIAL SETTING	SWEEP (FM) GENERATOR MARKER DIAL SETTING	ADJUST	REMARKS
1	47.25	not used	not used	VC1 for minimum indication on scope.	It is necessary to keep the generator output sufficiently high that a null indication may be observed on the oscilloscope; however, avoid overloading of the receiver by excessive signal.
2	41.25	not used	not used	VC2 for minimum indication on scope.	
3	45.4	not used	not used	TT for maximum indication on scope.	Adjust the output of the AM generator, to keep the output at the second detector below 4 volt, peak to peak. (For convenience, the oscilloscope may be calibrated for this purpose beforehand.)
4	45.4	not used	not used	T2 for maximum indication on scope.	
5	43.0	not used	not used	VC3 for maximum indication on scope.	
6	42.7	not used	not used	T3 for maximum indication on scope.	
7	44.4	not used	not used	T4 for maximum indication on scope.	
8	not used	channel 4 (69 mc., with 6-mc. sweep width)	Run marker along curve, checking against the curve limits given in fig. 7.	If necessary, retouch T1, T2, T3, & T4 as directed in REMARKS column. CAUTION: Do not touch settings of VC1 and VC2.	Set Fine Tuning Cam to reference point previously made in step 1 of Table 1. If response curve does not fall within limits shown in fig. 7, retouch T1 & T2 for proper level of curve at video carrier frequency; adjust T4 to level top of curve and T3 for proper slope of low-frequency side of curve. CAUTION: To retouch, only turn the adjustments slightly, particularly T2.

SOUND IF ALIGNMENT

AM GENERATOR: Connect "hot" lead through a 2200 ohm resistor to pin 2 of TS1, using the video i-f alignment jig. Connect ground lead of generator to ground lead of jig.

VOLTMETER: Use v.t.v.m. or 20,000 ohms-per-volt voltmeter. Connect to sound test point.

OSCILLOSCOPE: Connect through crystal probe to cathode (pin 11) of picture tube.

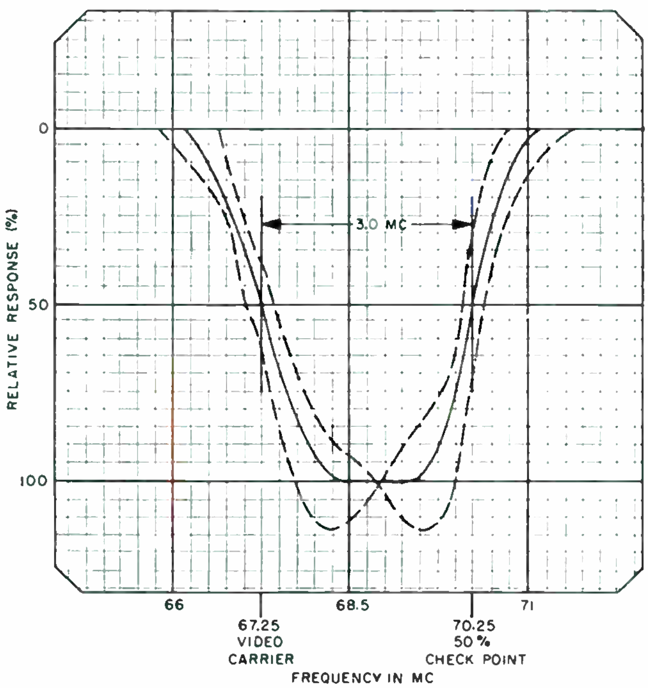


Fig. 7. Over-all R-F, I-F response curve, showing tolerance limits.

STEP	AM GENERATOR DIAL SETTING	ADJUST	REMARKS
1	4.5 mc.	T7 for maximum indication on voltmeter.	Remove 1st video i-f tube, and adjust the volume control for moderate speaker output.
2	4.5 mc.	T5 primary (bottom of T5) for maximum indication on voltmeter.	
3	4.5 mc.	T5 secondary (top of T5) for maximum indication on voltmeter and minimum speaker output.	The point of maximum meter indication for TC5 should also be the point of minimum speaker output.
4	4.5 mc.	T8 for minimum indication as view on the oscilloscope.	
5	use station signal	T5 primary (bottom of T5) for minimum AM (noise or buzz), using speaker output for indication.	Replace 1st video i-f tube, and tune in a station, setting fine tuning control to obtain a crisp picture, with a small amount of beat.

OSCILLOSCOPE WAVEFORM PATTERNS

These waveforms were taken with the receiver adjusted for an approximate peak-to-peak output of 3.5 volts at the video detector. The voltages given with the waveforms are approximate peak-to-peak values. The frequencies shown are those of the waveforms — 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, and the peak-to-peak voltages will differ from those shown.

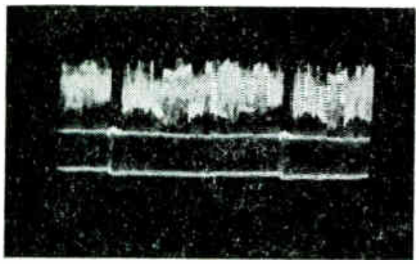


Fig. 8. Video Detector Output, Pin 2 of TS1, 3.5 volts, 60 c.p.s.

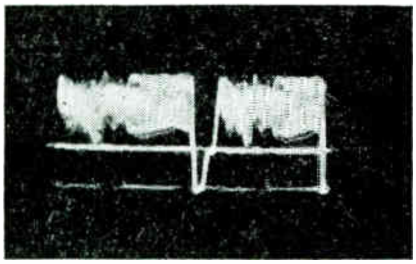


Fig. 9. Video Detector Output, Pin 2 of TS1, 3.5 volts, 15,750 c.p.s.

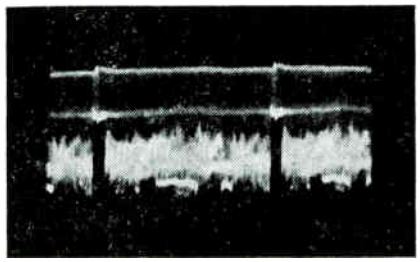


Fig. 10. Video Amplifier Plate, Pin 7, 83 volts, 60 c.p.s.

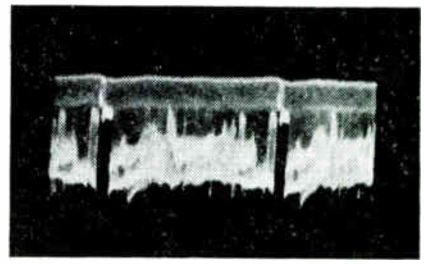


Fig. 11. Sync Separator Grid, Pin 7, 38 volts, 60 c.p.s.

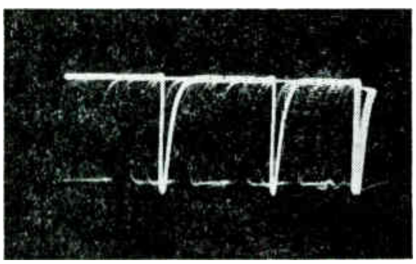


Fig. 12. Sync Separator Plate, Pin 5, 41 volts, 15,750 c.p.s.

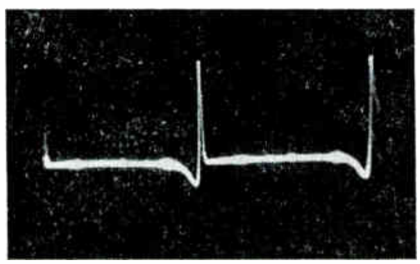


Fig. 13. Vertical-Oscillator Grid, Pin 2, .34 volts, 60 c.p.s.

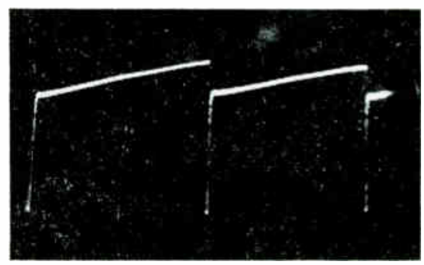


Fig. 14. Vertical-Output Grid, Pin 6, 80 volts, 60 c.p.s.

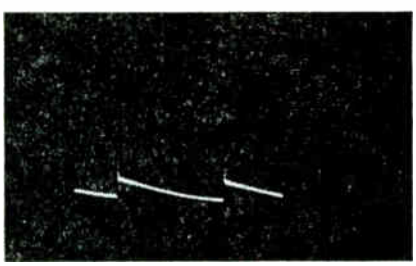


Fig. 15. Vertical Output Plate, Pin 9, 1100 volts, 60 c.p.s.

Fig. 16. Phase Comparer, Pin 2, 11 volts, 15,750 c.p.s.

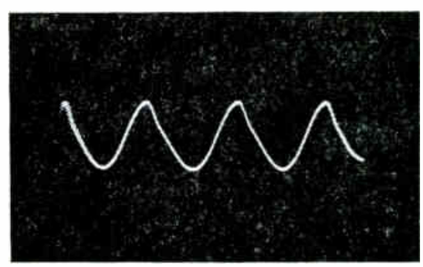


Fig. 17. Horizontal Oscillator, 43 volts, 15,750 c.p.s. test point.

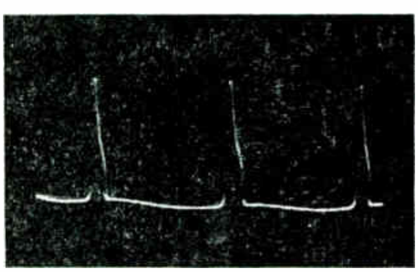


Fig. 18. Horizontal-Oscillator Cathode, Pins 3 and 8, 18 volts, 15,750 c.p.s.

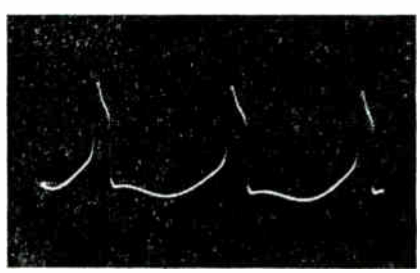


Fig. 19. Horizontal-Oscillator Grid, Pin 2, 65 volts, 15,750 c.p.s.

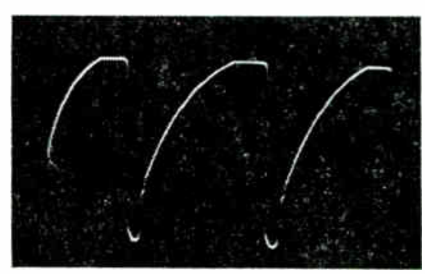


Fig. 20. Horizontal-Output Grid, Pin 5, 160 volts, 15,750 c.p.s.

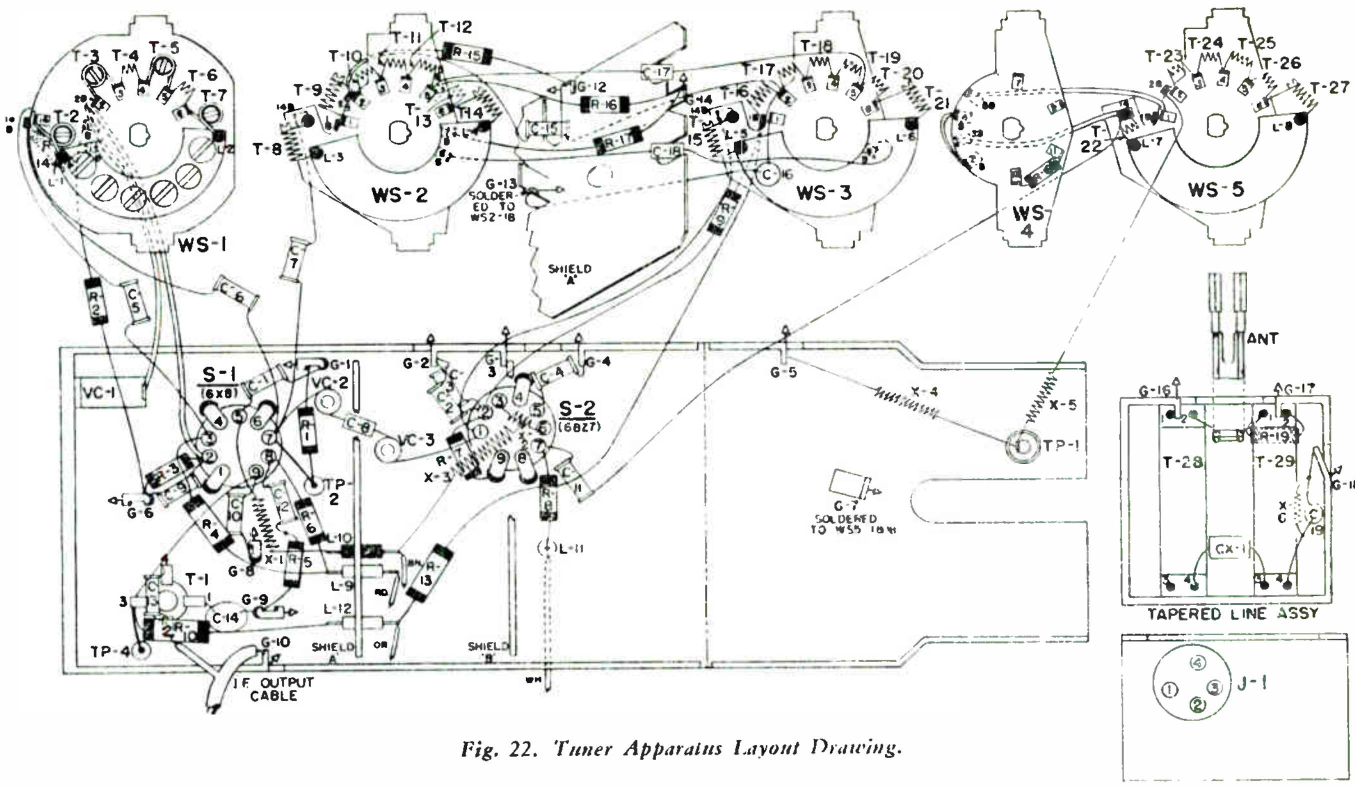


Fig. 22. Tuner Apparatus Layout Drawing.

TV-350
REPLACEMENT PARTS LIST

TUNER — MECHANICAL

Description	Service Part No.
Tuner, T36	76-8946
Spring, detent	56-9158
Washer, spring up	W2556-5
Tube cap	54-9242
Sleeve cap	28-9990
Washer	56-9351
"E" washer (2 used)	1W60980FE5
Hairpin	56-9858
Ball, detent	56-8020
Spring, shaft	56-8023
Shaft assembly	76-8953
R.F. wiring assembly	76-8956
Grid wiring assembly	76-8955
Oscillator wiring assembly	76-8960
Auxiliary antenna assembly	76-8965
Antenna wiring assembly	76-9000
Drive pulley and fine tuning shaft	76-9026
Bearing	54-9244
Spring	28-9088
Rotor and fine tuning shaft	76-9025
Socket, 9 pin miniature (2 used)	27-6203-21
Connector, UHF input	57-0590-2
Connector, UHF power	27-6273-11
Studs	W2235-7FA9
Tube shield (2 used)	56-5629-5

TUNER — ELECTRICAL

Reference Symbol	Description	Service Part No.
R1	100K mixer grid	66-4108340
R2	10 oscillator disabling	66-0108340
R3	22K oscillator grid leak	66-3228340
R4	12K oscillator plate feed	66-3124340
R5	10 parasitic suppression	66-0108340
R6	8200 mixer screen	66-2828340
R7	470K RF grid section II	66-4478240
R8	22K AGC decoupling	66-3228340
R9	470K RF grid section II	66-4478240
R10	8200 mixer decoupling	66-2825340
R19	470K discharge resistor	66-4478340
C1	220 mmf. osc. heater by-pass	62-122001001
C2	150 mmf. RF grid by-pass	62-115001011
C3	150 mmf. RF grid by-pass	62-115001011
C4	220 mmf. RF heater by-pass	62-122001001
C5	2.7 mmf. oscillator grid tank	30-1224-125
C6	2.2 mmf. injection coupling	30-1221-6
C8	.68 mmf. mixer grid coupling	30-1224-126
C9	2.7 mmf. oscillator grid blocking	30-1224-102
C10	7.5 mmf. I-F primary	30-1224-37
C11	33 mmf. RF grid coupling	62-033009001

TUNER — ELECTRICAL (Continued)

Reference Symbol	Description	Service Part No.
C12	680 mmf. mixer screen	62-168001011
C13	680 mmf. interstage coupling	62-168001011
C14	.01 mf. I-F by-pass	30-1238-2
C19	20 mmf. FM trap	62-020309011
VC2	0.5 to 3.0 mmf. mixer grid	31-6520-3
VC3	0.5 to 3.0 mmf. RF plate	31-6520-3
X1	Choke, RF heater	32-4550-1
X2	Plate-cathode coil, tuner 6BZ7	312-5124-7
X3	Choke, oscillator heater	32-4550-11
T-T	Coil, IF primary	32-4359-16
L11	Capacitor, feed thru, AGC decoupling	30-1245-6

REPLACEMENT PARTS LIST — (Chassis Mechanical)

Reference Symbol	Description	Service Part No.
	Socket (2 used)	76-6115-1
	Socket (2 used)	27-6174
	Socket	27-6174-7
	Socket (3 used)	27-6203-12
	Socket	27-6203
	Socket (4 used)	27-6203-14
	Socket (2 used)	27-6203-16
TS-1	Connector (test)	27-6273-8
LC	Connector (interlock)	27-6240-3
B-1	Fuse holder	76-4519-2
CL-7	Clip, pilot lamp	56-3545-5
S16	Socket, hi-voltage	27-6290-1
	Shield, corona	56-9685
	Anode lead	AD-2631
	Socket, yoke	27-6274-11
	Pulley assembly, driving	76-9037
	Shaft, dial	28-10011
	Dial and film assembly	76-9048
	Spring, dial cord	28-10029

REPLACEMENT PARTS LIST — (Chassis Electrical)

Reference Symbol	Description	Service Part No.
OT	Transformer, audio output	32-8656
VOT	Transformer, vertical output	32-8658
FC	Filter choke	32-8655
PT	Transformer, power	32-8657
X1 X1	Coil damper circuit	32-4112-50
X2	Coil 47.25 mc	32-4597-11
X3	Coil 39.75 mc	32-4597-11
X4	Coil 1st VIF grid	32-4597-3
X5	Coil, heater	32-4112-49
X6	Choke, detector	32-4422-27
X8	Coil, detector	32-4112-52

REPLACEMENT PARTS LIST — TV-350 (Continued)

Reference Symbol	Description	Service Part No.
X9	Coil, 2nd detector peak	32-4467-22
X10	Coil, video shunt peak	32-4480-4
X11	Coil, CRT grid	32-4480-9
T-1	Coil, horizontal ringing	32-4557-3
T-2	Coil, 1st VIF plate	32-4486-41
T-3	Coil, 2nd VIF plate	32-4486-42
T-4	Coil, 3rd VIF plate	32-4486-43
T-6	Coil, detector peak	32-4480-8
T-7	Coil, 1st sound I-F grid	32-4463-10
T-8	Coil, 4.5 mc trap	32-4463-2
T-9	Transformer, discriminator	32-4450-6A
	Cable, CRT socket	41-4147-1
	Cable, pilot light	27-6233-4
VR-1	Width control	33-5574
VR-2	Horizontal hold aux. control	33-5565-17
VR-3	Vertical linearity control	33-5572-1
VR-4	Height linearity control	33-5572-1
VR-5	Horizontal hold control	33-5572-8
VR-6	Vertical hold control	33-5572-14
VR-7	Brightness control	33-5572-9
VR-8	Off-on, volume	33-5573
WS-1	Switch, fringe	42-2035
WR-1		
WR-3	Horizontal out. screen; IF b+ vid. plate load (3 used)	33-1335-95
WR-4	Boost	33-1335-119
R1	Audio output grid resistor (470K)	66-4478340
R2	Horizontal oscillator plate (10K)	66-3108340
R3	Horizontal oscillator grid (39K)	66-3395340
R4	Vertical output grid divider (820K)	66-4828340
R5	C— filter resistor (1 meg.)	66-5108340
R6	Audio output cathode (820 ohms)	66-1824340
R7	1st audio plate (220K)	66-4228340
R8	Horizontal oscillator plate (47K)	66-3478340
R9	Horizontal oscillator cathode (1200K)	66-2128340
R10	Vertical output grid divider (120K)	66-4128340
R11	Horizontal output grid (1 meg.)	66-4108340
R12	Line to chassis (100K)	66-4105340
R13	Tuner B+	66-3158340
R14	Horizontal oscillator decoupling (4700 ohms)	66-2478340
R15	Horizontal oscillator plate	66-3158340
R16	Vertical oscillator plate (1 meg.)	66-5108340
R17	Phase comp. (1 meg.)	66-5108340
R18	Phase comp. (1 meg.)	66-5108340
R19	Phase comp. out. (220K)	66-4228340
R20	Phase comp. filter (4.7 meg.)	66-5478340
R22	Vertical sync divider (27K)	66-3278340
R23	Vertical oscillator cathode (680 ohms)	66-1688240
R24	Boost (39K)	66-3395340
R26	Vertical output grid (1 meg.)	66-5108340
R27	Vertical oscillator grid (1.8 meg.)	66-5188340
R28	Vertical oscillator plate (150K)	66-4158340
R29	Vertical Int. (8200 ohms)	66-2828340
R30	Vertical peak (8200 ohms)	66-2828340
R31	Vertical oscillator grid (1 meg.)	66-5108340
R32	CRT grid (470K)	66-4478340
R33	SS plate divider (8200 ohms)	66-2828340
R34	Vertical Int. (8200 ohms)	66-2828340
R35	1st audio grid (10 meg.)	66-6108240
R36	Disc. output (33K)	66-3338340
R37	AGC (1000 ohms)	66-2108340
R38	2nd video IF AGC (1000 ohms)	66-2108340
R39	2nd video IF cathode (68 ohms)	66-0689340
R40	3rd video IF cathode (220 ohms)	66-1228340
R41	Discriminator (270K)	66-1278340
R42	Discriminator (47 ohms)	66-0478340
R43	1st video IF grid (12K)	66-3128340
R44	1st video IF cathode	66-0478340
R45	2nd video IF grid (12K)	66-3128340
R46	1st video IF plate (220 ohms)	66-1228340
R47	2nd video IF plate (220 ohms)	66-1228340
R48	3rd video IF plate (220 ohms)	66-1228340
R49	Discriminator Filter (22K)	66-3228340
R50	2nd IF plate (12K)	66-3125340
R51	B+ decoup. (220 ohms)	66-1228340
R52	Detector damper (6800 ohms)	66-2688340
R53	Fringe switch (470K)	66-4478340
R54	Sound IF cathode (330K)	66-1338340
R55	SS grid (27K)	66-3278340
R56	Detector load (3900 ohms)	66-2398340
R57	Sound IF drop (8200 ohms)	66-2828340
R58	SS grid (150K)	66-4158340
R59	SS grid (390K)	66-4398340
R60	SS grid (680K)	66-4688340
R61	AGC (1 meg.)	66-5108340
R62	AGC (1 meg.)	66-5108340
R63	SS screen (8200 ohms)	66-2828340
R64	SS grid (680K)	66-4688340
R65	SS plate (220K)	66-4228340
R67	Tuner AGC (1000 ohms)	66-2108340

Reference Symbol	Description	Service Part No.
R68	SS screen (12K)	66-3125340
R70	Video cathode (22 ohms)	66-0228340
R71	Video grid (1 meg.)	66-5108340
R72	Video plate divider (39K)	66-3398340
R73	Video plate divider (47K)	66-3478340
R74	Video screen 2W (33K)	66-3335340
R75	AGC tuner delay (10 meg.)	66-6108240
R76	Fringe switch (10 meg.)	66-6108340
R77	Fringe switch (510K)	66-4518240
R79	Fringe switch (220K)	66-4228340
R81	CRT cathode (220K)	66-4228340
R82	CRT cathode (150K)	66-4158340
R83	CRT grid (5600)	66-2568340
R84	Bass compression (10K)	66-3108340
R85	Cont. divider (2200 ohms)	66-2228340
R86	1B3 heater (4.7 ohms)	66-9478340
	Horizontal feed (47K)	66-3474340
C1	Audio plate (.022)	30-4650-60
C2	Audio grid (.01)	30-1238-2
C3	Horizontal charge (390 mmf.)	60-10395437
C5	Horizontal charge (390 mmf.)	60-10395437
C6	Horizontal mv. (82 mmf.)	60-00825437
C7	C— filter (.47)	30-4671-68
C8	Line by-pass (.01)	30-4650-58
C9	Line by-pass (.01)	30-4650-58
C10	Output grid (.1 mf.)	30-4650-47
C11	Horizontal ringing (2200 mmf.)	60-20225434
C12	Sync coupling (68 mmf.)	62-068409011
C13	Phase compensation (120 mmf.)	60-10125237
C14	Horizontal feed (1000 mmf.)	62-02209001
C15	Horizontal output grid (.005)	30-1238-1
C16	Horizontal boost (.047)	30-4650-45
C17	Horizontal screen (.01)	30-1238-2
C18	Vertical output grid (.1 mf.)	30-4650-47
C19	Vertical oscillator cathode (.033)	30-4650-44
C20	Vertical oscillator grid (.0033)	30-4650-55
C21	AFC filter (.001 mmf.)	62-210001011
C22	Retrace suppression (.047)	30-4650-45
C23	Retrace suppression (.022)	30-4650-43
C25	Vertical charge (.01)	30-4650-41
C26	Vertical integrator (.022)	30-4650-43
C27	Vertical integrator (.022)	30-4650-43
C28	Horizontal feed (.0047)	30-4650-56
C29	Vertical output grid (.047)	30-4650-45
C30	Vertical integrator (.0047)	30-4650-56
C31	1st audio grid (.01)	30-1238-2
C32	Discriminator (330 mmf.)	62-133001001
C33	1st video grid (1500 mmf.)	30-1238-15
C34	2nd video grid (1500 mmf.)	30-1238-15
C35	2nd video IF cathode (33 mmf.)	62-033009001
C36	3rd video IF cathode (1500 mmf.)	30-1238-15
C37	Discriminator (2 used) (3.3 mmf.)	31-1221-9
C38	1st video IF screen (680 mmf.)	30-1238-7
C39	2nd video IF screen (680 mmf.)	30-1238-7
C40	3rd video IF screen (680 mmf.)	30-1238-7
C41	Detector by-pass (5.0 mmf.)	30-1224-28
C42	Audio coupling (.1 mf.)	30-4650-47
C43	Discriminator filter (1500 mmf.)	30-1224-28
C44	Discriminator (150 mmf.)	62-115001001
C45	B+ decoupling (1500 mmf.)	30-1238-15
C46	Sound IF cathode (.005)	30-1238-1
C47	Sound IF screen (.0022)	30-4650-54
C48	SS grid (.047)	30-4650-45
C49	Sound takeoff (18 mmf.)	62-018300001
C50	AGC (.1 mf.)	30-4650-47
C51	AGC (.01)	30-4650-41
C52	AFC output (.001)	30-4650-53
C53	SS screen (.1 mf.)	30-4650-47
C54	SS grid (.022)	30-4650-43
C55	Video grid (.047)	30-4650-45
C56	Sound IF grid (3.3 mmf.)	31-1221-9
C57	Video screen (680 mmf.)	30-1238-7
C58	SS grid (330 mmf.)	62-133001001
C59	Video cathode (.01)	30-4650-41
C60	4.5 trap (68 mmf.)	62-068409011
C61	AGC (.047)	30-4650-45
C62	Bass comp. (.047)	30-4650-45
C64	Contrast control (39 mmf.)	62-039409011
	SS plate (39 mmf.)	62-039409011
VC1	Video IF	31-6520-9
VC2	Video IF	31-6520-9
VC3	Video IF	31-6520-9
E2	Electrolytic capacitor (sound discriminator)	45-3035-4
E3	Electrolytic capacitor (input)	30-2568-62
E1	Electrolytic capacitor (4 section)	30-2584-1
XTL	Crystal (1N64) (detector)	34-8022
PL	Pilot lamp	3463-4
F1	Fuse (.7 amp.)	AD-2246-15
H.T.	Transformer, horizontal output	32-8653

SPECIFICATIONS — TV-354

VHF TUNING — Twelve channel, 13-position incremental tuner, covering VHF Television channels 2 through 13; plus UHF position, and fine tuning of local oscillator.

UHF TUNING (if provided) — Continuous tuning, covering UHF television channels 14 through 83.

INTERMEDIATE FREQUENCIES
- Video Carrier — 45.75 mc.
- Sound (intercarrier) — 4.5 mc.

TRANSMISSION LINE — 300-ohm, twin-wire lead

OPERATING VOLTAGE — 110 to 120 volts, 60 cycles, a.c.

POWER CONSUMPTION — without UHF, 240 w.; with UHF, 245 w.

CIRCUIT DESCRIPTION OF TV-354

The TV-354 is the same as the TV-350 with the following exceptions. The vertical output tube has been changed from a 6S4 to a 6CM6. The horizontal output tube from a 6BQ6 to a 6CD6. The damper tube in the TV-350 is a 6AX4, while the damper tube in the TV-354 is a 6AU4GT. The power supply in the TV-354 contains two 5U4G rectifiers. These changes have been made in the TV-354 to accommodate the larger picture tube.

TUBE COMPLEMENT — TV-354

S1	6V6GT/G	audio output
S2	12AU7A	horizontal oscillator
S3	6CD6G	horizontal output
S4	6AL5	phase comparer
S5	6AU4GT	horizontal damper
S6	6CM6	vertical output
S7	12AU7	vertical oscillator
S8	6AT6	1st audio and A.G.C. delay
S9	6AL5	ratio detector
S10	6DE6	1st video I.F.
S11	6DE6	2nd video I.F.
S12	6CB6	3rd video I.F.
S13	6AU6	sound I.F.
S14	6CS6	sync separator
S15	12BY7	video amplifier
S16	1B3GT	high voltage rectifier
S17	5U4G	low voltage rectifier
S18	5U4G	low voltage rectifier
S19	24VP4A	picture tube
S20	6BZ7	R.F. amplifier
S21	6X8	osc.-mixer

TV-354
REPLACEMENT PARTS LIST

TUNER — MECHANICAL

Description	Service Part No.
tuner assembly (T36)	76-8946
Spring, detent, tuner	56-9158
Washer, spring grip, tuner	W2556-5
Tube cap., tuner	54-9242
Sleeve cap., tuner	28-9990
Washer, tuner	56-9351
"E" washer, tuner (2 used)	1W60980FE5
Hairpin, tuner	56-9858
Ball, detent, tuner	56-8020
Spring, shaft, tuner (2 used)	56-8023
Shaft assembly, tuner	76-8953
RF wiring assembly, tuner	76-8956
Grid wiring assembly, tuner	76-8955
Oscillating wiring assembly, tuner	76-8960
Aux. antenna wiring assembly, tuner	76-8965
Antenna wiring assembly, tuner	76-9000
Drive pulley and fine tuning shaft assembly, tuner	76-9026
Bearing, tuner	54-9244
Spring, tuner	28-9088
Rotor and fine tuning shaft assembly, tuner	76-9025
Socket, tube, tuner (2 used)	27-6203-21
Connector, UHF input, tuner	57-0590-2

TUNER — ELECTRICAL

Reference Symbol	Description	Service Part No.
R	100K mixer grid	66-4108540
R2	10 oscillator disabling	66-0108340
R3	22K oscillator grid leak	66-3228340
R4	12K oscillator plate feed	66-3124340
R5	10 parasitic suppression	66-0108340
R6	8200 mixer screen	66-2828340
R7	470K RF grid section 11	66-4478240
R8	22K AGC decoup.	66-3228340
R9	470K RF grid section 11	66-4478240
R10	8200 mixer decoupling	66-2825340
R19	470K discharge	66-4478540
C1	220 R.F. capacitor	62-122001001
C2	150 R.F. grid bypass capacitor	62-115001001
C3	150 R.F. grid bypass capacitor	62-115001001
C4	220 oscillator heater capacitor	62-122001001
C5	2.7 oscillator grid tank	30-1224-125
C6	2.2 injection coupling	30-1221-6
C8	0.56 interstage coupling	30-1221-11
C9	12 oscillator grid block capacitor	30-1224-102
C10	7.5 IF primary	30-1224-37
C11	33 mmf. R.F. grid coupling	62-033409011
C12	680 mixer screen	62-168001011
C19	22 FM trap	62-020309011
	27 mixer grid coupling	30-1224-126
	.01 IF bypass capacitor	30-1238-2

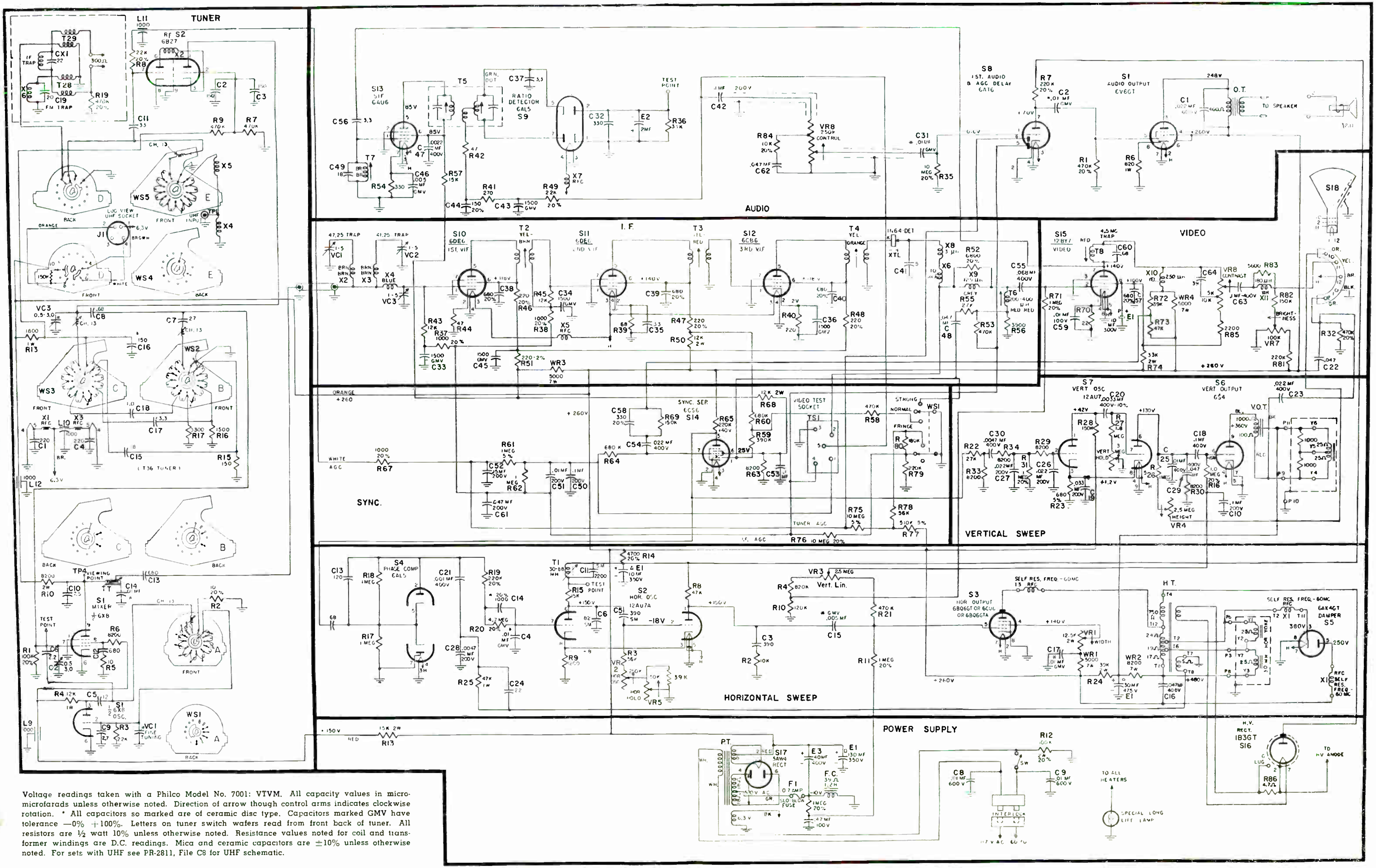
Reference Symbol	Description	Service Part No.
VC2	.05 to 3.0 mixer-grid	31-6520-3
VC3	.05 to 3.0 RF plate	31-6520-3
X1	RF heater	32-4550-1
X2	plate-cathode (6BZ7)	312-5124-7
X3	oscillator heater	32-4550-11
X4	UHF channel, gnd. side	32-4550-11
X5	UHF channel	312-5133-3
X6	FM trap	32-4550-3
L11	AGC decoupling	30-1245-6
	shield, tube tuner (2 used)	56-5629-5
	stud, trimount, tuner (5 used)	W2235-7FA9
	connector, tuner	27-6273-11
TT	IF primary	32-4359-16
T28	antenna coils	32-4432-3
T29	antenna coils	32-4432-3
CX1	IF trap	32-4552-1
	antenna coil assy.	76-8957

REPLACEMENT PARTS LIST — (Mechanical)

Reference Symbol	Description	Service Part No.
	12AU7A socket assembly	76-6115-1
	6CM6 socket assembly	76-6115-2
	6CD6, 6V6G socket	27-6174
	6AU4 socket	27-6174-8
	6AL5 socket	27-6203-12
	6AT6 socket	27-6203-12
	6CS6 socket	27-6203-12
	6AU6 socket	27-6203
	6CB6 socket	27-6203-14
	6AL5 socket	27-6203-14
	6DE6 socket (2 used)	27-6203-14
	12AU7 socket	27-6203-16
	12BY7 socket	27-6203-16
TS-1	test connector	27-6273-8
LC	interlock connector	27-6240-3
OT	audio output transformer	32-8684
V	vertical output transformer	32-8667
F.C.	choke, filter	32-8654
B1	fuse holder	76-4519-2
CL-11	clip, pilot lamp	56-3545-5
	fuse	AD2246-15
	transformer, horizontal output	32-8666
	socket, hi-volt	27-6290-3
	shield, corona	56-9684
	anode, lead	AD2631
	socket, yoke	27-6274-11
	82mmf. capacitor, horizontal yoke bal.	30-1246-4
	12K resistor, horizontal yoke bal.	66-3128340
	pulley assy., driving	76-9037
	grommet (2 used)	27-4099-3
	shaft, dial	28-10011
	spring, dial cord	28-10029

REPLACEMENT PARTS LIST — TV-354 (Continued)

Reference Symbol	Description	Service Part No.
R1	audio output grid (470K)	66-4478340
R3	horizontal oscillator grid (56K)	66-3568340
R4	resistor, vertical output cathode (330)	66-1334340
R5	C filter (1 meg.)	66-5108340
R6	audio output cathode (270 ohms)	66-1274340
R7	1st audio plate (220K)	66-4228340
R8	horizontal oscillator plate (47K)	66-3478340
R9	horizontal oscillator cathode (1200)	66-2128340
R11	horizontal output grid (1 meg.)	66-5108340
R12	vertical damp.	66-3274340
R12A	line to chassis (100K)	66-4105340
R13	resistor, tuner B plus (15K)	66-3155340
R14	horizontal oscillator decoupling (4700)	66-2478340
R15	horizontal oscillator plate (15K)	66-3158340
R17	phase comparer (1 meg.)	66-5108340
R18	phase comparer (1 meg.)	66-5108340
R19	phase comparer output (220K)	66-4228340
R20	phase comparer filter (4.7 meg.)	66-5478340
R21	bias divider (4.7 meg.)	66-5478340
R23	vertical oscillator cathode (680)	66-1688240
R24	boost divider (47K)	66-3475340
R24A	horizontal feed (47K)	66-3474340
R24B	bias divider (180K)	66-4188340
R26	vertical oscillator plate (1 meg.)	66-5108340
R27	vertical oscillator grid (1.8 meg.)	66-5188340
R28	vertical oscillator plate (180K)	68-4184340
R29	vertical integrator (8200)	66-2828340
R30	vertical output grid (3.3 meg.)	66-5338340
R31	vertical oscillator grid (1 meg.)	66-5108340
R31A	boost divider (100K)	66-4104340
R32	CRT grid (470K)	66-4478340
R34	vertical integrator (8200)	66-2828340
R35	1st audio grid (10 meg.)	66-6108340
R36	discriminator output (33K)	66-3338340
R37	AGC (1000)	66-2108340
R38	2nd VIF AGC (1000)	66-2108340
R39	2nd VIF cathode (68)	66-0688340
R40	3rd VIF cathode (220)	66-1228340
R41	discriminator (270)	66-1278340
R42	discriminator (47)	66-0478340
R43	1st VIF grid (12K)	66-3128340
R44	1st VIF cathode (47)	68-0478340
R45	2nd VIF grid (12K)	66-3128340
R46	1st VIF plate (220)	66-1228340
R47	2nd VIF plate (220)	66-1228340
R47A	2nd video IF screen (220)	66-1228340
R48	3rd VIF plate (220)	66-1228340
R49	discriminator filter (22K)	66-3228340
R50	2nd IF plate (12K)	66-3125340
R51	B plus decoupling (220)	66-1228340
R52	detector damping (6800)	66-2688340
R54	SIF cathode (330)	66-1338340
R55	SS grid (27K)	66-3278340
R56	detector load (3900 ohms)	66-2398340
R57	SIF drop (15K)	66-3158340
R58	fringe switch (470K)	66-4478340
R59	SS grid	66-4398340
R60	SS grid (680K)	66-4688340
R61	AGC tuner delay (1 meg.)	66-5108240
R62	AGC (1 meg.)	66-5108340
R63	SS screen (8200)	66-2828340
R64	SS grid (680K)	66-4688340
R65	SS plate (220K)	66-4228340
R67	tuner AGC (1000)	66-2108340
R68	SS screen (12K)	66-3125340
R69	SS grid (150K)	66-4158340
R70	video cathode (22)	66-0228340
R71	video grid (1 meg.)	66-5108340
R72	video plate divider (39K)	66-3398340
R73	video plate divider (47K)	66-3478340
R74	video screen (33K)	66-3335340
R75	AGC tuner delay (10 meg.)	66-6108240
R76	fringe switch (10 meg.)	66-6108340
R77	fringe switch (510K)	66-4518240
R78	fringe switch (56K)	66-3568340
R79	fringe switch (220K)	66-4228340
R80	fringe switch (180K)	66-4188340
R81	brightness comp. (8200)	66-2828340
R81A	brightness comp. (22K)	66-3228340
R82	CRT cathode (150K)	66-4158340
R83	CRT cathode (5600)	66-2568340
R84	bass comp. (10K)	66-3108340
R85	cont. div. (2200)	66-2228340
	1B3 heater (1.0 ohms)	66-9108340
C1	audio plate (.022)	30-4650-60
C2	audio coupling (.005)	30-1238-1
C3	vertical damp. (.047)	30-4650-45
C4	AFC filter (.01)	30-1238-2
C5	horizontal m.v (390)	60-10395437
C6	horizontal m.v.	60-00825437
C7	C filter (.47)	30-4671-68
C8	line bypass (.01)	30-4650-58
C9	line bypass (.01)	30-4650-58
C10	horizontal charge (390)	60-10395417
C11	horizontal ringing (2200)	60-20225434
C12	sync coupling (68)	62-068409011
C13	phase comp. (120 mmf.)	60-01025237
C14	horizontal feed (1000 mf.)	62-022009001
C15	horizontal output grid (.005)	30-1238-1
C15A	AFC output (.001)	30-4650-52
C16	horizontal feed (.0047)	30-4650-56
C17	video bias filter (.01)	30-1238-2
C17A	horizontal boost (.033)	30-4650-61
C18	vertical charge (.1)	30-4650-47
C20	vertical oscillator grid (.0022)	30-4650-54
C22	retrace suppression (.047)	30-4650-45
C23	retrace suppression (.022)	30-4650-43
C26	vertical integrator (.022)	30-4650-43
C27	vertical integrator (.022)	30-4650-43
C29	vertical output grid (.22)	30-4650-49
C30	vertical integrator (.0047)	30-4650-56
C31	1st audio grid (.01)	30-1238-2
C32	discriminator	62-133001001
C33	1st VIF grid (1500 mmf.)	30-1238-15
C34	2nd VIF grid (1500 mmf.)	30-1238-15
C35	2nd VIF cathode (33)	62-033009001
C36	3rd VIF cathode (1500 mmf.)	30-1238-15
C37	discriminator (3.3)	30-1221-9
C38	1st VIF screen (680 mmf.)	62-168001011
C39	2nd VIF screen (680 mmf.)	62-168001011
C39A	2nd VIF screen (680 mmf.)	62-168001011
C40	3rd VIF screen (680 mmf.)	62-168001011
C41	detector bypass (5.0 mmf.)	30-1224-28
C43	discriminator filter (1500 mmf.)	30-1238-15
C44	discriminator (150)	62-115001001
C45	B plus decoupling (1500 mmf.)	30-1238-15
C46	SIF cathode (.005)	30-1238-1
C47	SIF screen (.0022)	30-4650-54
C48	SS grid (.047)	30-4650-45
C49	sound takeoff (18 mmf.)	62-018300001
C50	AGC (.1)	30-4750-47
C50A	AGC (.15)	30-4650-48
C52	AGC (.047)	30-4650-45
C53	SS screen (.1)	30-4650-47
C54	SS grid (.022)	30-4650-43
C55	video grid (.047)	30-4650-45
C56	sound IF grid (3.3)	30-1221-9
C57	video screen (680 mmf.)	62-168001011
C58	SS grid	62-133001001
C59	video cathode (.01)	30-4650-41
C60	4.5 trap (68)	62-068409011
C61	brightness compensator (.01)	30-1238-2
C62	bass comp. (.033)	30-4650-44
C63	CRT cathode (.1)	30-4650-47
C64	contrast cont. (390)	62-039409011
VR-2	control, horizontal hold aux.	33-5565-17
VR-3	control, vertical lin.	33-5572-13
VR-4	control, height	33-5572-1
VR-5	control, horizontal hold	33-5572-8
VR-6	control, vertical hold	33-5572-14
VR-7	control, brightness	33-5572-9
VR-8	control, off-on volume	33-5573
VR-9	control, width	33-5546-56
WS-1	switch, fringe	42-2035
T1	coil, horizontal ringing	32-4557-3
T2	coil, 1st VIF plate	32-4486-41
T3	coil, 2nd VIF plate	32-4486-42
T4	coil, 3rd VIF plate	32-4486-43
T5	transformer, discriminator	32-4450-6A
T7	coil, 1st SIF grid	32-4463-10
T8	coil, 4.5 trap	32-4463-2
X1	coil, damper	32-4112-50
X2	47.25 trap	32-4597-11
X3	41.25 trap	32-4597-11
X4	coil, 1st VIF grid	32-4597-3
X5	1st video I.F.	32-4112-49
X6	choke, detector	32-4422-27
X7	discriminator	32-4112-49
X8	coil, detector	32-4112-52
X9	coil, 2nd detector peak	32-4467-22
X10	coil, Video shunt peak	32-4480-4
X11	coil, CRT cathode	32-4480-9
WR-2	res., horizontal output screen	33-1335-125
WR-3	IF B plus	33-1335-95
WR-4	video plate load	33-1335-95
VC1	VIF (0.5 to 5.0)	31-6520-9
VC2	VIF (0.5 to 5.0)	31-6520-9
VC3	VIF (0.5 to 5.0)	31-6520-9
E-1	capacitor, 1 3/8" cam	30-2584-42
E-1A	capacitor, 1" cam	30-2584-43
E-2	sound discriminator (2 mf.)	45-3035-4
E-3	input	30-2568-62
xtal	crystal 1N64	34-8022
	transformer, power	32-8661
	cable, CRT socket	41-4147-1
	cable, pilot lamp	27-6233-4
	pilot lamp	3463-4



Voltage readings taken with a Philco Model No. 7001: VTVM. All capacity values in micro-microfarads unless otherwise noted. Direction of arrow though control arms indicates clockwise rotation. * All capacitors so marked are of ceramic disc type. Capacitors marked GMV have tolerance —0% +100%. Letters on tuner switch wafers read from front back of tuner. All resistors are ½ watt 10% unless otherwise noted. Resistance values noted for coil and transformer windings are D.C. readings. Mica and ceramic capacitors are ±10% unless otherwise noted. For sets with UHF see PR-2811, File C8 for UHF schematic.

Fig. 25. Schematic Diagram — TV-350 Chassis.

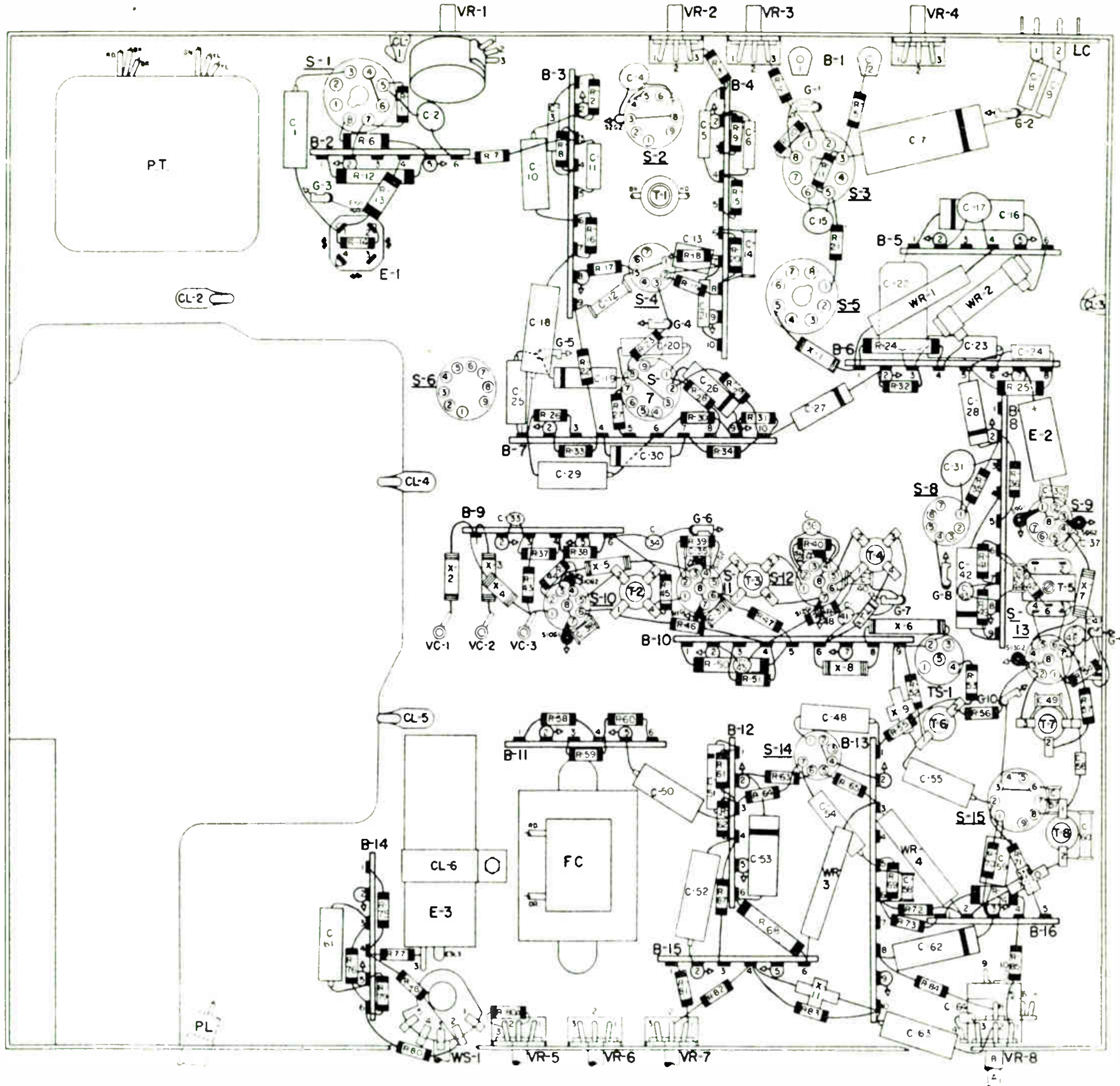


Fig. 23. Wiring diagram, bottom view — TV-350 chassis.

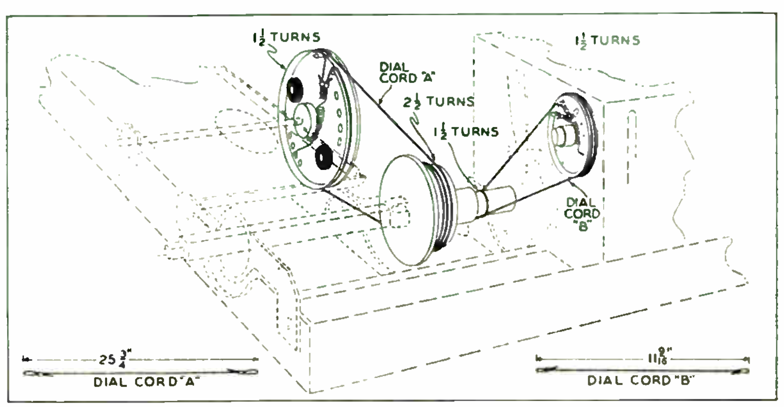


Fig. 24. Dial cord stringing arrangement (TV-350 & TV-354).

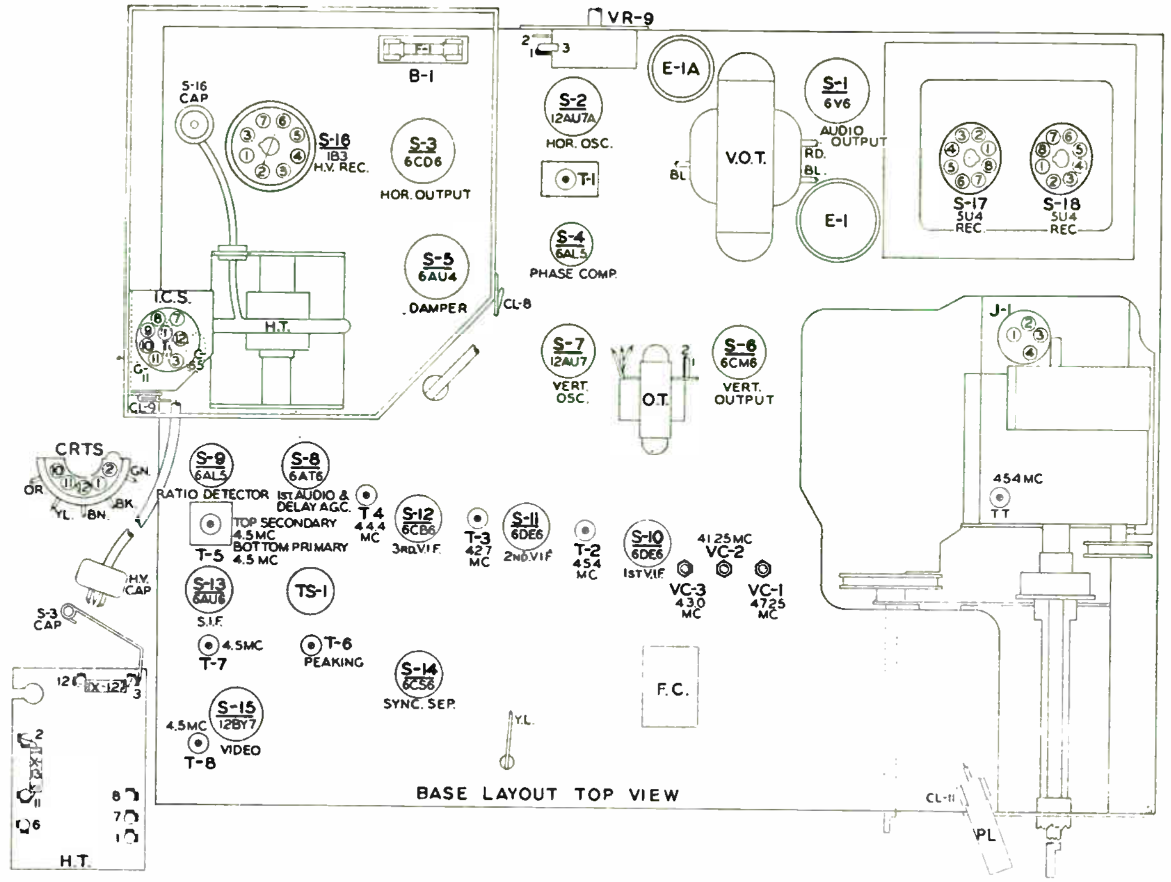


Fig. 26. Base layout, top view — TV-354.

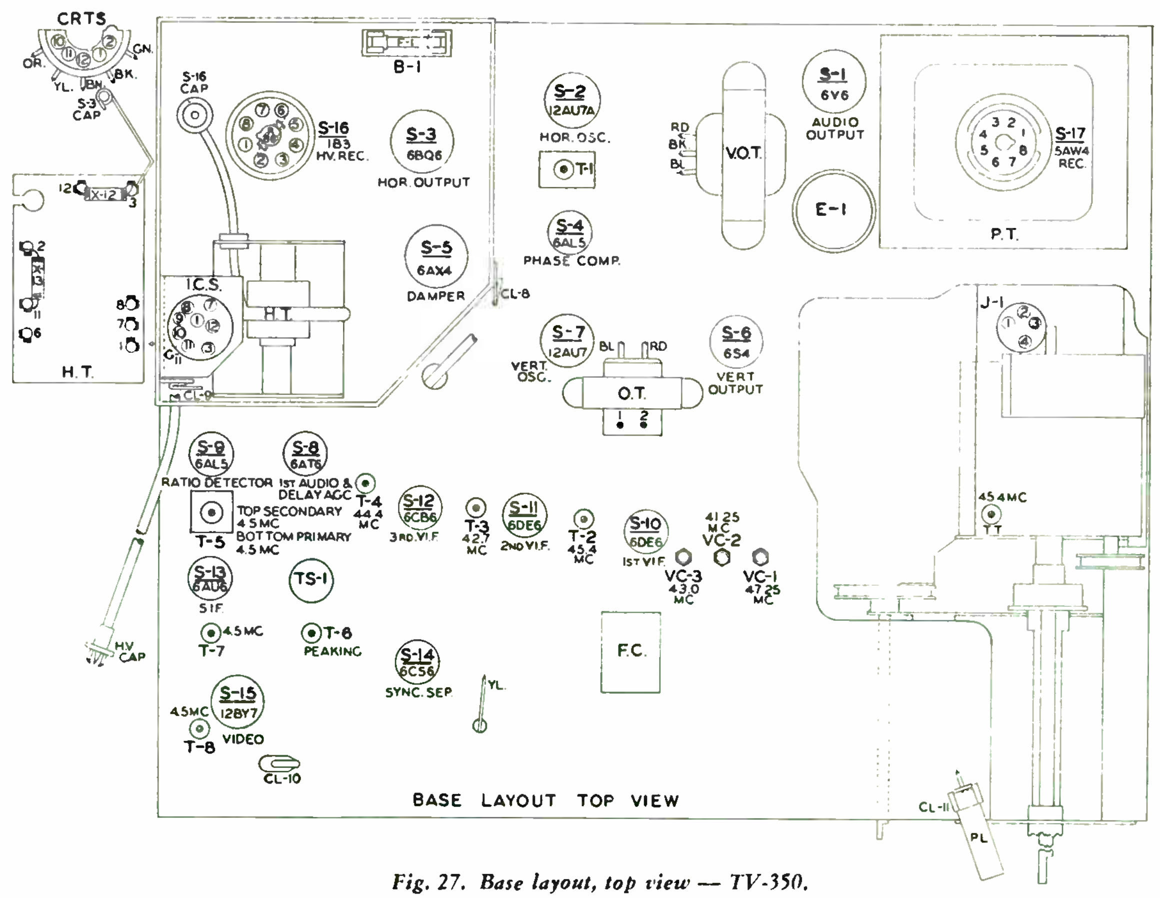
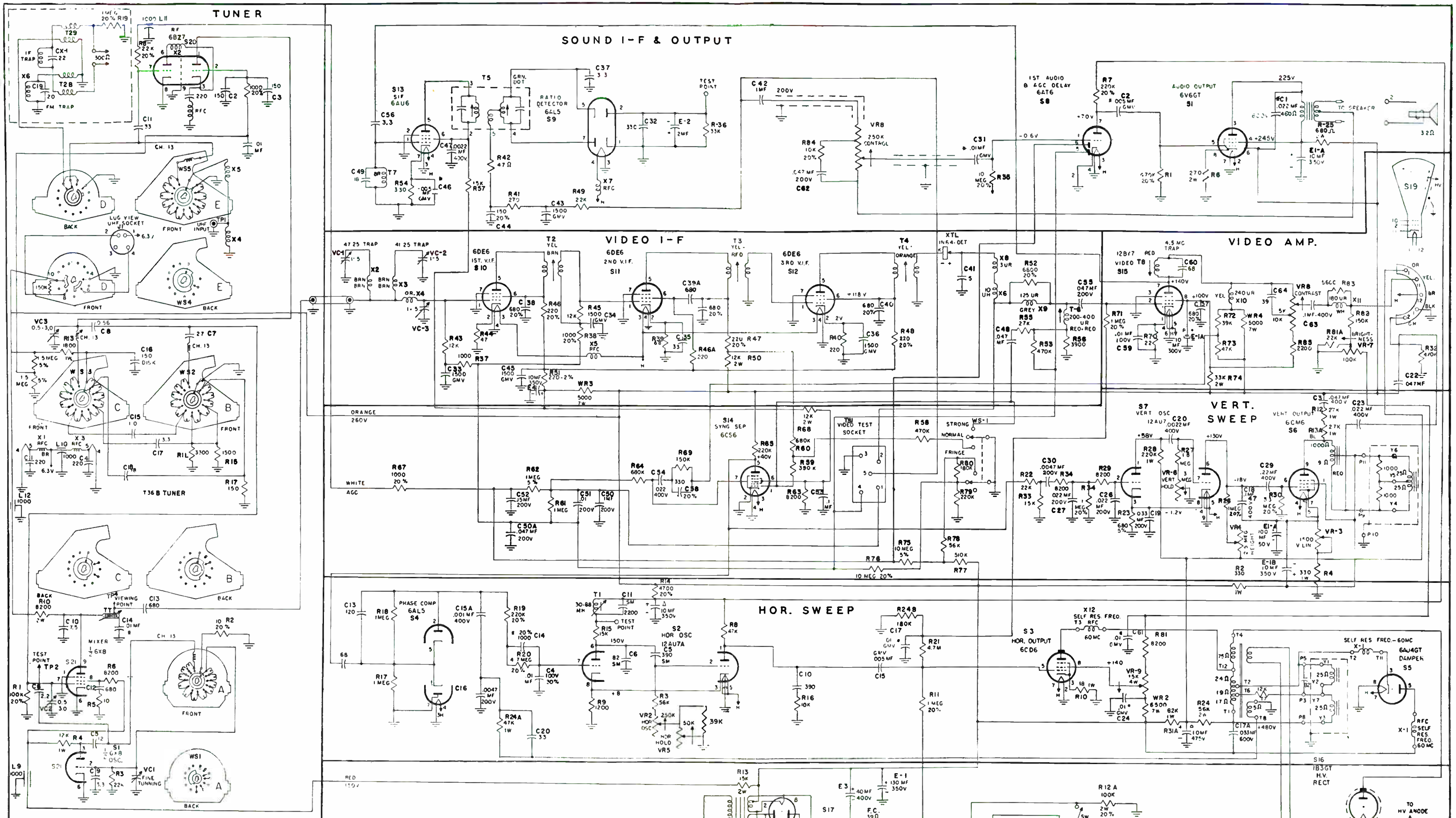


Fig. 27. Base layout, top view — TV-350.



Voltage readings taken with a Philco Model No. 7001: VTVM. All capacity values in micromicrofarads unless otherwise noted. Direction of arrow through control arms indidates clockwise rotation. * All capacitors so marked are of ceramic disc type. Capacitors marked GMV have tolerance of —0% +100%. Letters on tuner switch wafers read from front to back of tuner. All resistors are ½ watt 10% unless otherwise noted. Resistance values noted for coil and transformer windings are D.C. readings. Mica and ceramic capacitors are ±10% unless otherwise noted. For sets with UHF see PR-2811, File C8 for UHF schematic.

Fig. 29. Schematic diagram — TV-354 chassis.

Fig. 28. Wiring Diagram, bottom view — TV-354 chassis.

PHILCO
Factory-Supervised
Service

PR-2808—8-54

Printed in U.S.A.

PALMER RADIO and T V
J. A. (Jack) & R. D. (Bob) PALMER, Partners
359 Hughson Avenue - Phone Hughson 113
Hughson, California
P. O. Box 427

Focus Improvement "FIX" on 300 Chassis (poor Focus)

1. Remove connector at base of picture tube (Pin 6); do not cut wire.

2. Disconnect wire from yoke housing and splice on a 24" section.

3. Reconnect connector to pin (6) on Picture tube socket, and hook the new long wire tot the B-buss of the Television set. This can be done by running the wire through the Chassis witht the CRT cable and hooking it to the filter condenser Kl-1, which is 80 mfd.

- - - - - - - - - - - - - - -

Temporary "FIX" for poor linearity of 24" 354 Chassis Set.

1. Disconnect wire at Pin 1 of 6CM_ tube.

2. Insert ½ watt 330 ohm resistor in series with the lead and pin 1.

3. By pass pin 1 to ground through a 20mfd 300 volt electrolytic.

4. Temporary fix as per factory wire.

Run 9 has this fix incorporated.

DEVLIN-DREW CO.

Note:

The slightest similiarity, of the above, to professional work is merely coninciidental.

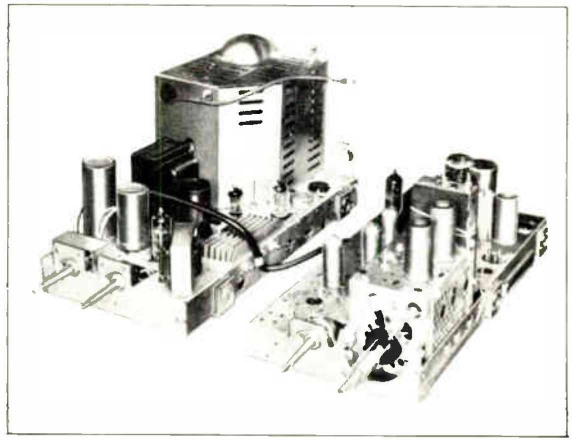
RDP

PHILCO SERVICE

PHILCO Factory-Supervised Service

TELEVISION

PHILCO TELEVISION SERVICE MANUAL FOR R-F CHASSIS 84 AND DEFLECTION CHASSIS H-4



TP2-1969

SERVICE INFORMATION FOR PHILCO CHASSIS TYPES 84 AND H-4

PR-2402

TABLE OF CONTENTS

CIRCUIT DESCRIPTION

The Philco 1953, Code 123 television receivers make use of a dual chassis arrangement, one chassis containing the r-f, i-f, video, and sync circuits, and the other chassis containing 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.

A separate subchassis contains the r-f amplifier, the oscillator, and the mixer. The r-f amplifier uses a 6BZ7 or a 6BQ7 tube, V1. The oscillator and mixer each use one-half of a 12AZ7 tube, V2. The output of the mixer is fed to a three-stage, stagger-tuned, i-f amplifier system employing three 6CB6 tubes, V3, V4, and V5. A type 1N64 crystal diode is used for the video detector, the output of which is amplified by a single-stage video amplifier utilizing a type 12BY7 tube, V6. The connections at the detector are such as to produce a composite video signal with negative-going sync pulses. The signal, which is subjected to a 180-degree phase shift through the video amplifier, is applied to the cathode of the picture tube; therefore, the sync pulses at this point are positive-going. The grid of the picture tube is returned to ground through a resistor (R309). A blanking pulse, taken from the vertical-output stage, is applied across R309, for suppression of the vertical retrace.

Sound i-f (intercarrier) is obtained by utilizing the beat frequency produced when the 26.6-mc. video carrier and the 22.1-mc. sound carrier are mixed in the video detector. The 4.5-mc. beat frequency is the difference between 26.6-mc. and 22.1-mc., and contains the FM sound signal. This 4.5-mc. signal contains only a negligible amount of video amplitude modulation, provided that the amplitude of the 22.1-mc. signal is considerably lower than that of the 26.6-mc. signal. The proper relationship between the two carriers is established during the alignment of the receiver. There is sound output only when both the video and sound 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), which is taken from the plate circuit of the video amplifier, is passed through a 4.5-mc. sound i-f stage using a 6AU6 tube, V7, and then applied to the FM detector, which utilizes two diode sections of a 6T8 tube, V8. The triode section of the 6T8 is used as the first audio amplifier. The power amplifier uses a 6L6GA tube, V9.

A portion of the video signal appearing at the grid of the video amplifier is applied to the pentode section of a 6U8 tube, V10A, which operates as a sync amplifier. The output of this stage is composite video with positive-going sync, and is applied to grid 3 (pin 7) of the 6BE6 sync separator, V11. Since grid-leak bias is used on grid 3, the tips of the sync pulses are clamped to zero, and the video components swing in a negative direction from zero. Because of the cutoff characteristics of grid 3, the video components are eliminated, and only negative-going sync pulses appear in the plate circuit of the sync separator. At the same time, however, composite video signal is taken from the video detector and applied to grid 1 (pin 1) of the 6BE6 tube. This grid is returned to B plus, and the bias is maintained close to zero, because of a small grid-current flow. Since the signal applied to grid 1 is composite video with negative-going sync, any noise modulation present in the signal appears in the form of sharp spikes, driving in a negative direction. The circuit constants are so chosen that grid 1 cuts off plate current whenever the signal goes more negative than the sync pulses. A series grid-limiting resistor (R614) is also incorporated, to prevent the video components from appearing in the plate circuit of the sync separator. A-G-C voltage is also developed in the sync separator circuit, in the following manner: On the tips of the sync pulses, grid 3 (pin 7) of the 6BE6 tube, draws current, which flows downward through the network consisting of R609, R610, R611, R211, and L214, causing condensers C604, C602, and C603 to assume negative charges proportionate to the amount of peak signal applied to grid 3. The tuner a-g-c voltage is delayed by means of a resistor divider network, which applies a small positive voltage to the tuner a-g-c circuit. This positive voltage prevents a-g-c action from lowering the tuner gain on weak signals. To prevent the delay voltage from driving the tuner a-g-c voltage positive on weak signals, a diode clamp (part of V8B) is connected across C602.

The negative-going sync pulses appearing in the plate circuit of the sync separator are fed to the sync inverter stage, V10B (triode section of the 6U8 tube). This stage acts as a phase splitter circuit; positive sync pulses appear in the plate circuit, and negative sync pulses are taken from the cathode. Both positive and negative sync pulses are fed through the inter-chassis cable into the deflection chassis.

Proper triggering of the vertical oscillator requires positive synchronizing pulses. The vertical sync signal is separated from the horizontal sync signal by the integrator circuit, and is fed to the grid of the vertical blocking oscillator tube, which uses one half of a 12BH7, V12. The output of the vertical blocking oscillator is amplified by the other half of the 12BH7 tube, which is employed as the vertical-output amplifier. The output of the amplifier is applied to the vertical-deflection coils through the vertical-output transformer.

The horizontal-sweep circuits require both positive and negative sync pulses. The phase comparer circuit uses a 6AL5 tube, V13. Positive sync pulses are applied to the plate of V13A, and negative sync pulses are applied to the cathode of V13B. A saw-tooth voltage is fed to the plate of V13B and to the cathode of V13A, for comparison of the sync and horizontal sweep voltages. When the saw-tooth and sync signals are exactly in phase, no voltage is developed across R800, but when the two signals are out of phase, either a positive or a negative voltage is developed, depending upon whether the oscillator frequency is lower or higher than the sync-pulse frequency. The grid circuit of the horizontal oscillator, a 12AU7 tube, V14, operating as a cathode-coupled multivibrator, is connected to R800 through a filter network; when the voltage at this point goes in a positive direction, the frequency of the horizontal oscillator is increased, and when the voltage swings negative, the frequency of the oscillator is decreased. In this manner the frequency of the horizontal oscillator is controlled over the lock-in range of the circuit. The horizontal hold control (R811) adjusts the horizontal-oscillator frequency so that it is within the control range of the phase comparer. The output of the horizontal oscillator is fed to the horizontal-output amplifier, which makes use of a 6BQ6 tube, V15. This amplifier feeds the deflection coils through the horizontal-output transformer. A 6AX4GT tube, V16, is used as the horizontal damper.

The second-anode voltage for the picture tube is supplied by one 1B3GT high-voltage rectifier tube, V17. 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 from across the filter choke, which is in series with the negative side of the B plus supply. When a p-m speaker is used, the filter choke is mounted on the speaker; with an e-m speaker, the field coil is used as the filter choke. The B plus boost voltage, derived from the horizontal-damper circuit, supplies higher B plus voltage to the vertical amplifier, the vertical oscillator, and the first anode of the picture tube. Filament voltage for all the tubes except the high-voltage rectifier is supplied by a step-down transformer. Filament voltage for the high-voltage rectifier is supplied by a winding on the horizontal-output transformer.

IMPORTANT
A-C LINE ISOLATION

CAUTION: One side of the a-c line is connected to the chassis through C101 and L100. The other side of the a-c line is connected to the chassis through R100, CR100, and C103, 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 test equipment or receiver, or both.

SPECIFICATIONS

CHANNEL TUNING .... Twelve-channel, 12-position incremental tuner; fine tuning of local oscillator

FREQUENCY RANGE .... Television Channels 2 through 13

INTERMEDIATE FREQUENCIES

Video Carrier .... 26.6 mc.

Sound .... 4.5 mc.

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

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

POWER CONSUMPTION .... 190 watts

TUBE COMPLEMENT
RF-84 CHASSIS

REFERENCE SYMBOL	TUBE TYPE	FUNCTION
V1	6BZ7 miniature	R-F Amplifier
V2	12AZ7 miniature	Oscillator, Mixer
V3, V4, V5	6CB6 miniature	Video I-F Amplifiers
V6	12BY7 miniature	Video-Output Amplifier
V7	6AU6 miniature	Sound I-F Amplifier
V8	6T8 miniature	Ratio Detector, First Audio, and Tuner A-G-C Clamp
V9	6L6GA octal	Audio Output
V10	6U8 miniature	Sync Amplifier, Sync Inverter
V11	6BE6 miniature	Sync Separator, A.G.C.
V18	17YP4, 20DP4A, or 21EP4A	Picture Tube

H-4 DEFLECTION CHASSIS

REFERENCE SYMBOL	TUBE TYPE	FUNCTION
V12	12BH7 miniature	Vertical Oscillator, Vertical Amplifier
V13	6AL5 miniature	Horizontal Phase Comparer
V14	12AU7 miniature	Horizontal Oscillator
V15	6BQ6GT	Horizontal Amplifier
V16	6AX4GT	Horizontal Damper
V17	1B3GT	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-OSCILLATOR ADJUSTMENT

To adjust the horizontal oscillator, tune in a station and proceed as follows:

1. Reduce the width of the picture until approximately 1 inch of blank screen appears at the right-hand and left-hand sides of the picture.
2. Increase the BRIGHTNESS control setting until the blanking becomes visible. This will appear as a dark, vertical bar on each side of the picture.
3. Connect a .1-μf. condenser from pin 9 of the chassis-connecting power socket, J101, to ground. (The plate side of the horizontal ringing coil, L800, is connected to pin 9 of J101.)
4. Set the HORIZONTAL HOLD control to the approximate center of its mechanical rotation.
5. Adjust the HORIZ HOLD CENTERING control until equal portions of the blanking bar appear on both sides of the picture.
6. Remove the .1-μf. condenser from the chassis-connecting socket.
7. Adjust the horizontal ringing coil, L800, until equal portions of the blanking bar again appear on both sides of the picture.
8. Rotate the HORIZONTAL HOLD control through its range. The picture should fall out of sync on both sides of the center of rotation. If the picture does not fall out of sync on both sides, readjust the HORIZ HOLD CENTERING control.
9. Rotate the HORIZONTAL HOLD control through its range, and observe the number of diagonal blanking bars that appear just before the picture pulls into sync. The pull-in should occur with from 1 to 2 diagonal bars when the sync position is approached from either direction. If proper pull-in is not obtained, repeat the above procedure.

VIDEO-DETECTOR PEAKING-COIL ADJUSTMENT

The video-detector peaking coil, L214, is adjusted at the factory for proper transient response of the video circuit. Ordinarily, this coil will require no further adjustment by the serviceman. On any station where excessive overshoot or excessive smear is present, a slight adjustment of L214 may improve the picture quality on that station; however, this adjustment may sacrifice the quality on other channels. If L214 is replaced in servicing, adjustment will be required.

Before adjusting L214, check the tuner alignment and i-f alignment. (Never adjust L214 until the alignment of the receiver is correct.) Then tune in a station and adjust L214 until there are no trailing whites or smear in the picture. Turning TC206 clockwise reduces trailing whites and overshoot; turning TC206 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 TC206 applies to a particular station exhibiting smear or overshoot. After TC206 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 coil to a given frequency, using an AM signal, then feeding in a sweep signal at the antenna terminals and touching up the adjustments to obtain the desired pass band.

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

The video-carrier intermediate frequency is 26.6 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 having the top of the workbench metallic. 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 2 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 Model 7008 is used, the built-in crystal calibrator provides an excellent means of calibration. An alternate method for 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."

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 may be made through the alignment jack provided for that purpose. To connect the generator to this point, a mixer-jig, Philco Part No. 45-1739, and a connecting cable, Philco Part No. 45-1635, may be used. As an alternate, a Philco alligator-clip adapter, Part No. 45-1636, with as short a ground lead as possible, may

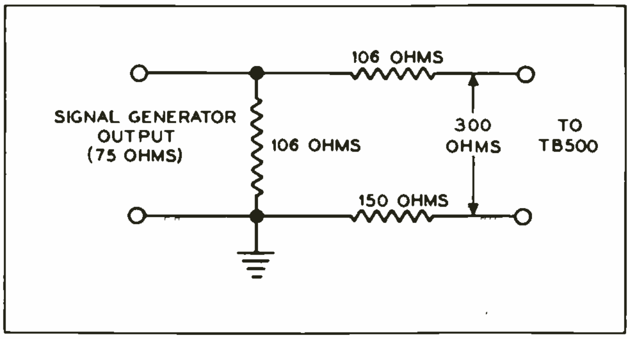


Figure 1. Antenna-Input Matching Network

be used to connect 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.

Antenna-Input Matching Network

Figure 1 shows an impedance-matching network for coupling the signal generator to the antenna-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 antenna-input circuit. The resistors used in this network should be of carbon-composition construction, and should be chosen from a group, to obtain values within 10% of those indicated. The resistors should be placed in a shield can, to prevent variable effects. An antenna 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.

Video I-F Alignment Jig (VIDEO TEST Jack Adapter)

The alignment jig shown in figure 2 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 jig consists of a 5-prong plug, a 10,000-ohm potentiometer, a 2200-ohm isolating resistor, and 7½-volt battery. A suggested method of fabricating the jig 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 7½-volt battery. The switch is used to disconnect the potentiometer, to prevent the discharge of the battery while not in use. The 10,000-ohm resistor in series with the arm of the control will prevent rapid discharge of the battery if the leads are accidentally shorted.

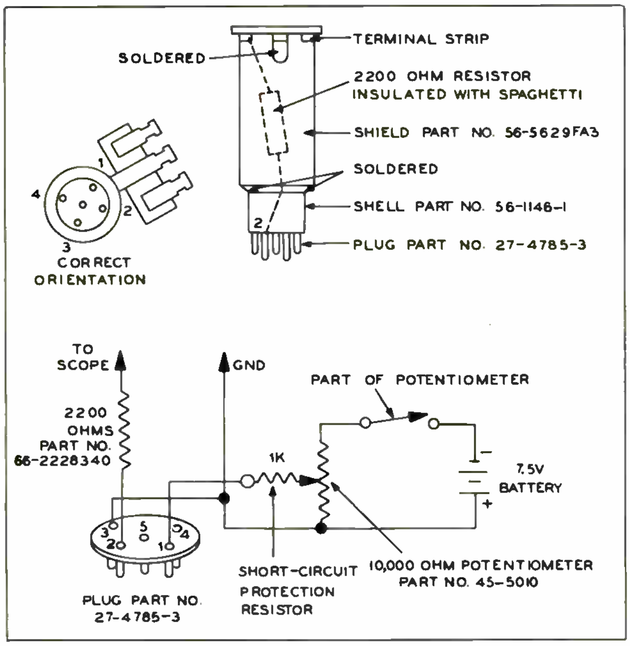


Figure 2. Video I-F Alignment Jig

Sound I-F Alignment Jig (FM TEST Jack Adapter)

Figure 3 shows the jig that should be used to connect the voltmeter and oscilloscope to the FM TEST socket, J402. A suggested method of fabricating the jig is also shown.

TELEVISION TUNER ALIGNMENT

After the tuner is serviced, or if an i-f alignment is required, the tuner alignment should be checked by observing the tuner response curve, as given under Bandpass Alignment. If the response curve does not fall within the limits shown in figure 5, the tuner should be realigned. 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

Tuning cores are provided in the oscillator coils at channels 13, 11, 9, 7, 6 and 4. By adjusting these tuning cores, all channels may be placed on frequency. This procedure should be carried out with the highest-frequency channel first, since the alignment of each channel affects the alignment of all the channels below it in frequency. The channel adjustments are so arranged that, with one exception, each adjustment corrects the tuning of more than one channel. The coverage of the various adjustments is as follows:

Channel Adjustment	Channels Corrected by Adjustment
13	13 and 12
11	11 and 10
9	9 and 8
7	7 only
6	6 and 5
4	4, 3, and 2

The FINE TUNING cam should be preset for all adjustments by placing the stop on the FINE TUNING cam between Channel 7 and 8 holes on the front plate of the tuner. See figure 4.

Procedure Using Signal Generator

An r-f signal (unmodulated), at the oscillator frequency, is fed into the antenna input from an AM signal generator, and the oscillator tuning cores are adjusted for zero beat. The r-f signal frequency should be accurately determined. It is preferable that the signal be taken from a crystal-controlled source; if this is not available, the signal generator may be calibrated against the television station.

1. Connect the hot lead of the oscilloscope to the mixer plate test point, G2, through a 1000-ohm resistor, and connect the ground lead of the oscilloscope to the chassis, near the test point. (High oscilloscope gain may be necessary to obtain a visual beat. In this instance, base-line hum may be ignored.)
2. Connect the AM (marker) generator to the 300-ohm antenna-input terminals. For this purpose the antenna-input matching network is not required.
3. Disconnect the white lead from the tuner, and connect it to the negative terminal of a 1.5-volt battery. Ground the positive terminal. If regeneration is observed, the bias may be increased to 4 or 5 volts, to reduce the regeneration.
4. Mechanically preset the fine-tuning cam as shown in figure 4.
5. Feed in an r-f signal (unmodulated), at the oscil-

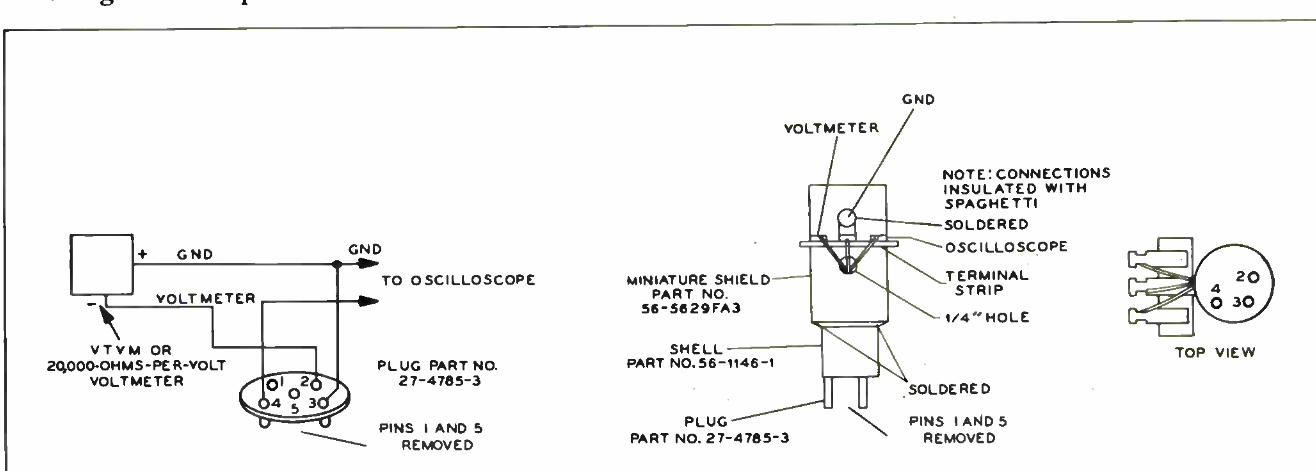
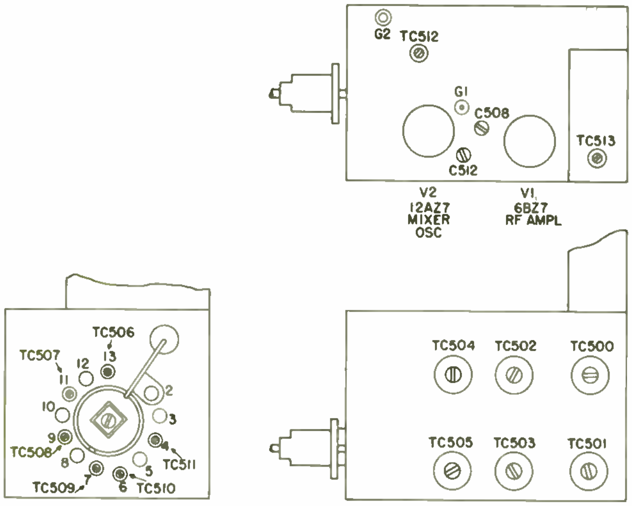


Figure 3. Sound I-F Alignment Jig



TP2-2201-1

Figure 4. Television Tuner, Showing Locations of Adjustments

lator frequency for Channel 13, with the CHANNEL SELECTOR set for Channel 13.

6. Adjust the tuning core for Channel 13 (see figure 4).

7. Reset the signal-generator frequency and the CHANNEL SELECTOR, and adjust the tuning cores for Channels 11 and 9, respectively.

8. Repeat steps 5, 6, and 7 until Channels 13, 11, and 9 are within plus or minus 500 kc. of the correct frequency.

9. Feed in r-f (unmodulated) signals, at the oscillator frequencies for Channels 7, 6, and 4, consecutively (see NOTE below), and adjust the respective tuning cores (see figure 4).

> NOTE: The exact position of the FINE TUNING cam should be marked when Channel 4 is correctly aligned. This position is to be used in step 4 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:

1. Mechanically preset the FINE-TUNING cam to the center of its range (see figure 4).
2. Tune in the highest-frequency channel to be received.
3. Adjust the tuning core for that channel, or the next highest channel for the best picture; that is, starting with sound in the picture, turn the tuning core until the sound disappears. Repeat for each channel received in the area.

Bandpass Alignment

General

The bandpass alignment consists of aligning the tuner at Channels 13 and 6 and then making it track down to Channels 7 and 2, respectively.

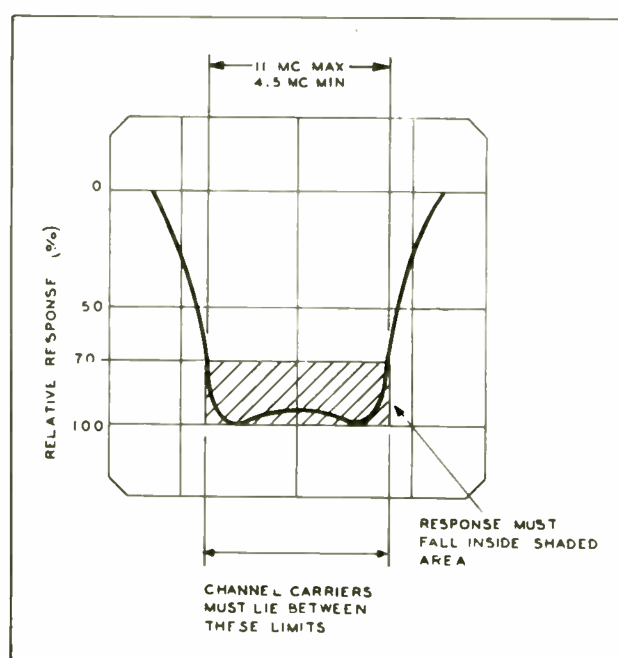
During the alignment, a fixed bias of 1.5 volts is applied to the r-f amplifier tube.

An FM (sweep) signal is applied to the antenna-input circuit, and an oscilloscope is connected to the mixer plate circuit. 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, which are caused by poor line regulation, will cause the response and time base to jump up and down. 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 tuner coupling link should be disconnected from the i-f section and a 40- to 70-ohm resistor connected across the open end of the link, to eliminate the absorption effect of this coil on the response curve.

1. Disconnect the white (a-g-c) lead from the tuner, and connect it to the negative terminal of a 1.5-volt battery. Ground the positive terminal.
2. Disconnect the tuner link at terminal board B11-7 and B11-8 (see figure 34), and connect a 40- to 70-ohm carbon resistor to the two leads of the link.
3. Connect a 1000-ohm resistor in series with the hot lead of the oscilloscope. Connect the other end of the resistor to the mixer plate test point, G2, and connect the ground lead of the oscilloscope to the chassis, near the test point.
4. Connect the FM (sweep) generator to the 300-ohm antenna input through an antenna-input matching network. See figure 1.

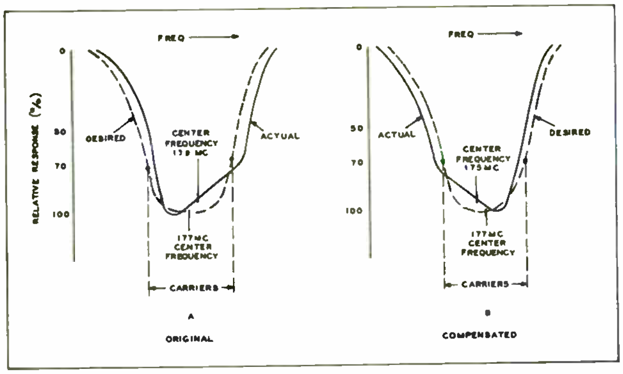
Procedure

1. Set the CHANNEL SELECTOR and FM (sweep) generator to Channel 13 (213 mc.). Adjust the generator for sufficient sweep to show the complete response curve.
2. Establish the channel limits (see figure 5) 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 to 216 mc.)



TP9-512B-1

Figure 5. Television Tuner Response Curve, Showing Bandpass



TPO-1174

Figure 6. Television Tuner Response Curve, Showing Tracking Compensation

The curve should be reasonably flat between the limits shown in figure 5.

3. Adjust TC502 and TC504 (figure 4) for a symmetrical, approximately centered pass band. Set the 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 antenna circuit is now tuned for the high-frequency channels.

4. Readjust TC502 and TC504 for a symmetrical response, centered about 213 mc., and falling within the limits shown in figure 5.

5. Set the CHANNEL SELECTOR and FM generator to Channel 7 (177 mc.).

6. Establish the channel limits by using the marker generator to produce marker pips on the response curve. (Set the generator first to 174 mc., then to 180 mc.) The curve should be reasonably flat between the limits.

7. On Channel 7, note the response curve, with respect to tilt and center frequency. The curve should be centered in the pass band, and should be symmetrical.

8. If the curve is not symmetrical, and appears unbalanced, as shown in figure 6, leave the generator and tuner set to Channel 7 and adjust C507 and C512 (see figure 4) to obtain a response curve which is the mirror image (tilt in the opposite direction) of the original. This is a form of overcompensation, to allow for the effect of Channel 13 adjustment on Channel 7. For example, if the Channel 7 response appears as in figure 6A, then the trimmer should be adjusted to obtain the response shown in figure 6B.

9. Reset the CHANNEL SELECTOR and generators to Channel 13. Readjust TC502 and TC504 for a symmetrical and centered band pass. See step 4.

10. Set the CHANNEL SELECTOR and generators to Channel 7, and check the response for center frequency and symmetry. Repeat steps 8 and 9 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.

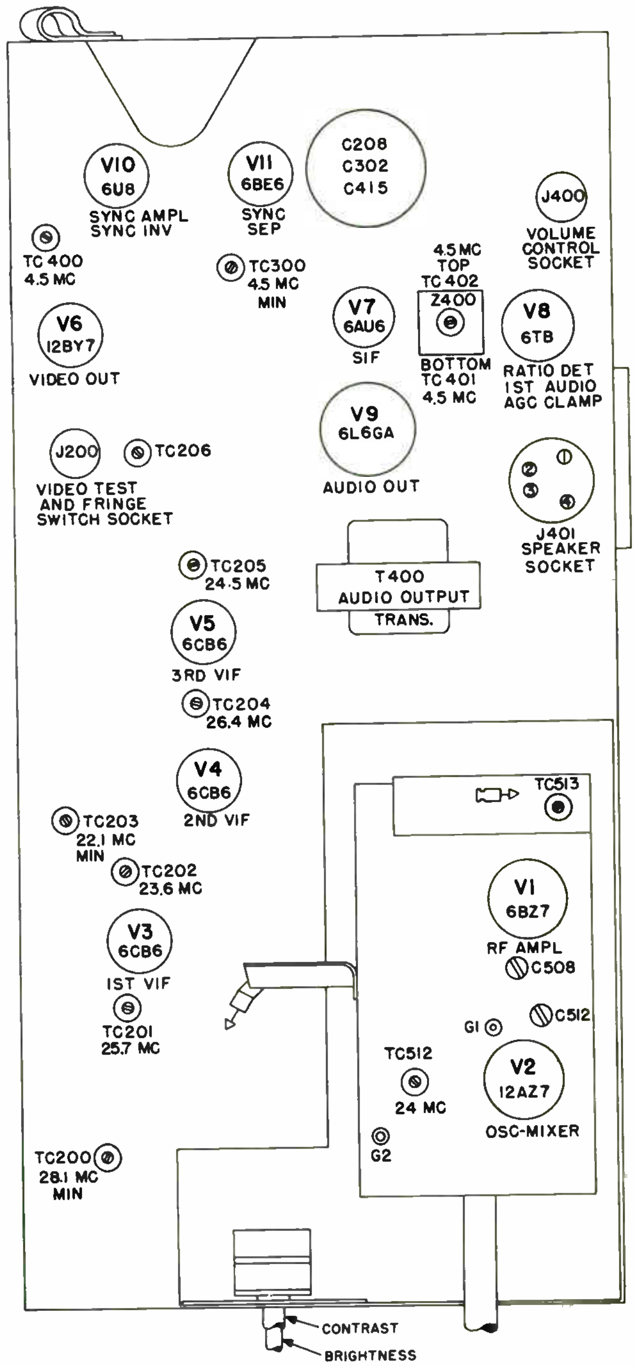
11. Set the CHANNEL SELECTOR and sweep generator to Channel 6 (85 mc.).

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

13. Adjust TC503 and TC505 for a symmetrical, approximately centered pass band. Set the marker generator to 85 mc. Detune TC505 counterclockwise until a signal peak appears.

> CAUTION: Do not turn TC505 excessively, or it will fall out of the coil.

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 antenna circuit is now tuned for



TP2-2241

Figure 7. R-F Chassis 84, Top View, Showing Alignment Points

Channels 2 through 6. To prevent overloading, the output of the generator should be reduced after this adjustment is completed.

14. Readjust TC503 and TC506 for a symmetrical response, centered about 85 mc.

VIDEO I-F ALIGNMENT

PRELIMINARY

Before proceeding with the alignment or making an alignment check, observe the following preliminary instructions:

1. Preset the CONTRAST and BRIGHTNESS controls to the maximum counterclockwise position.
2. Preset the CHANNEL SELECTOR to Channel 4.
3. Insert the video i-f alignment jig into J200.
4. Connect the oscilloscope to the 2200-ohm resistor from the video i-f alignment jig. Connect the ground lead of the oscilloscope to the ground lead of the jig.
5. Connect a 5-volt bias, by means of the video i-f alignment jig; connect the negative terminal of the bias battery to the bias lead of the jig, and the positive terminal to the ground lead.
6. Connect the AM generator to the mixer test point, G-1, through a mixer jig, and adjust the generator for approximately 30 percent modulation at 400 cycles. Adjust the output of the generator during alignment, to keep the output at the second detector below .6 volt, peak to peak.

NOTE: If the i-f shield has been removed for repairs, it must be replaced before proceeding with the alignment.

PROCEDURE

1. Tune the AM generator to 28.1 mc., and adjust TC200 (see figure 7) for minimum output, as observed on the oscilloscope.
2. Tune the AM generator to 22.1 mc., and adjust

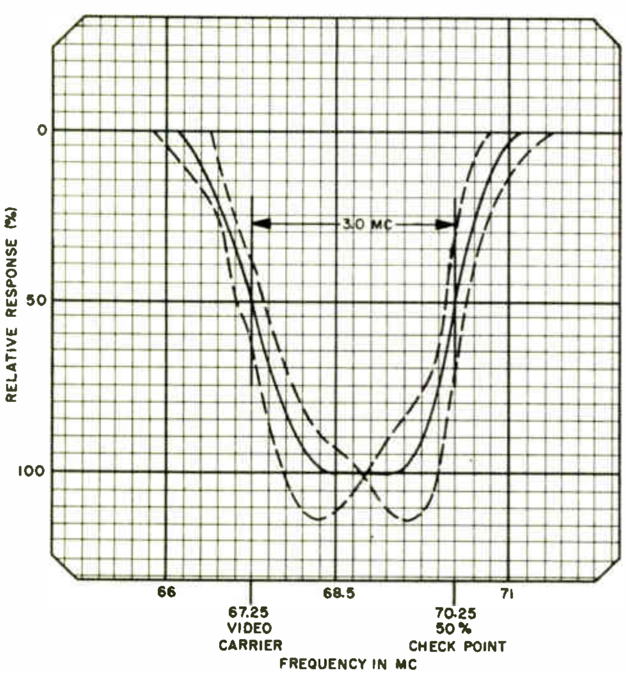


Figure 8. Over-all R-F, I-F Response Curve, Showing Tolerance Limits

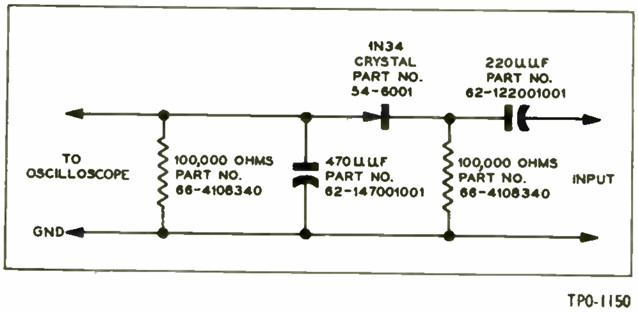


Figure 9. Wiring Diagram of Crystal Detector

TC203 for minimum output, as observed on the oscilloscope.

NOTE: In steps 1 and 2 it is necessary to keep the generator output sufficiently high that a null indication may be observed on the oscilloscope; however, avoid overloading of the receiver by excessive signal.

3. Tune the AM generator to the frequencies indicated below, and adjust the tuning cores for maximum output.
   a. 24.0 mc., adjust TC512.
   b. 25.7 mc., adjust TC201.
   c. 23.6 mc., adjust TC202.
   d. 26.4 mc., adjust TC204.
   e. 24.5 mc., adjust TC205.
4. Connect the sweep generator and r-f marker generator to the antenna terminals through a matching jig. (If a separate oscilloscope is used, connect the sweep output of the generator to the horizontal input of the oscilloscope.) Set the CHANNEL SELECTOR to Channel 4, and tune the sweep generator for output on Channel 4. After the equipment is properly connected, adjust the FINE TUNING control to the mark previously made (see NOTE under Oscillator Alignment).
5. If the response curve does not fall within the limits shown in figure 8, the adjustment of the tuning cores may be touched up slightly while observing the response curve with the sweep generator. Do not touch the setting of TC200 and TC203. To adjust the curve, adjust TC201 and TC204 for proper video carrier level. The top of the curve may be leveled by adjusting TC205, and the low-frequency side of the curve may be adjusted by adjusting TC202. By means of these adjustments the response curve should be brought within the limits shown in figure 8.

CAUTION: Do not turn any of the tuning cores excessively. To retouch, only turn the tuning cores slightly. This caution applies particularly to TC202.

SOUND I-F ALIGNMENT

1. Remove the 1st v-i-f tube, and connect a v.t.v.m. or a 20,000-ohms-per-volt voltmeter to the sound i-f alignment jig. Adjust the VOLUME control for moderate speaker output.
2. Feed in an accurately calibrated 4.5-mc. AM signal through the 2200-ohm resistor in the Video I-F Alignment Jig, to pin 2 of J200.
3. Tune TC400, TC401, and TC402 for maximum indications on the meter. The point of maximum meter indication for TC402 should also be the point of minimum speaker output.

4. Tune TC402 for minimum speaker output.

5. Connect an r-f probe or crystal detector to the grid (pin 2) of the picture tube. See NOTE below.

6. Tune TC300 for minimum indication on oscilloscope. (If a crystal detector is not available, TC300 may be adjusted for minimum beat pattern, as observed on the picture tube, with a station picture present.)

7. Replace the 1st v-i-f tube. Tune in a station and use the speaker output as an indication.

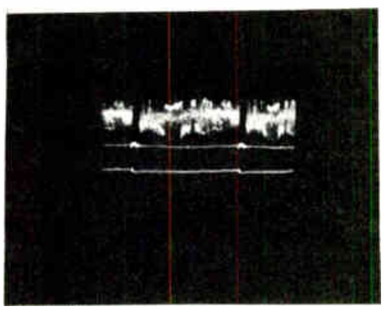
8. Turn the FINE TUNING control clockwise to obtain a slightly fuzzy picture.

9. Tune TC402 for minimum AM (noise) output.

NOTE: The R-F Probe, Part No. 76-3595, is used as a detector of the 4.5-mc. signal, and the oscilloscope is used as an indicating device. An alternate crystal detector may be made up as shown in figure 9.

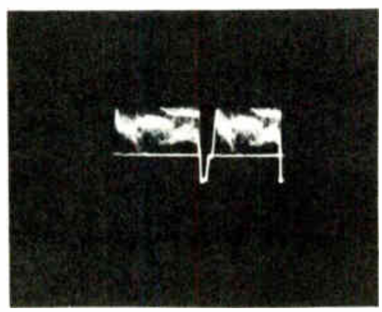
OSCILLOSCOPE WAVEFORM PATTERNS

These waveforms were taken with the receiver adjusted for an approximate peak-to-peak output of 3 volts at the video detector. The voltage given with the waveforms are approximate peak-to-peak values. The frequencies shown are those of the waveforms—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 are more rounded than those shown, and the peak voltages differ from those shown.



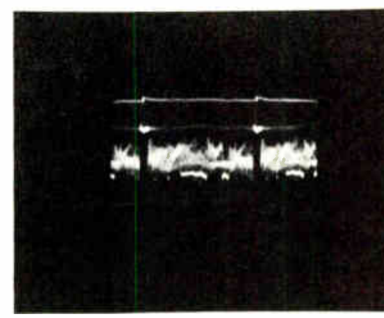
TP2-787

Figure 10. Video Detector Output, Pin 2 of J200 3 volts, 60 c.p.s.



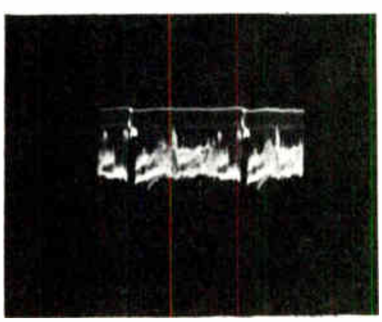
TP2-786

Figure 11. Video Detector Output, Pin 2 of J200 3 volts, 15,750 c.p.s.



TP2-788

Figure 12. Video Amplifier Plate, Pin 7 66 volts, 60 c.p.s.

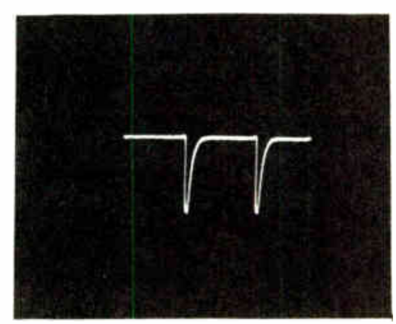


TP2-790

Figure 13. Sync Amplifier Plate, Pin 6 66 volts, 60 c.p.s.

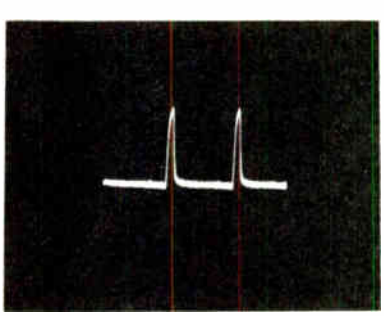
TP2-790

Figure 14. Sync Separator Grid, Pin 7 50 volts, 60 c.p.s.



TP2-792

Figure 15. Sync Separator Plate, Pin 5 19.8 volts, 15,750 c.p.s.

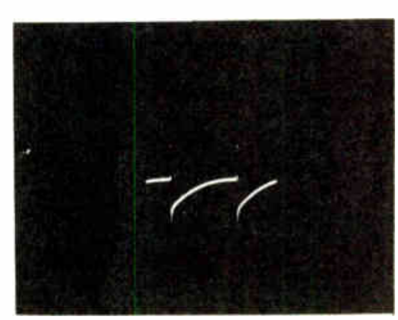


TP2-791

Figure 16. Sync Inverter Plate, Pin 1 20 volts, 15,750 c.p.s.

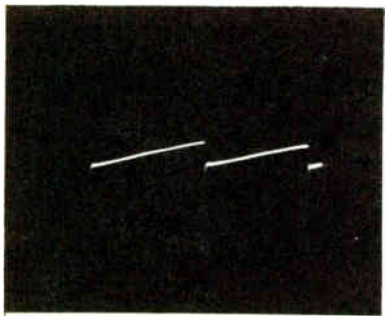
TP2-793

Figure 17. Sync Inverter Cathode, Pin 8 6.8 volts, 15,750 c.p.s.



TP2-643

Figure 18. Vertical-Oscillator Grid, Pin 2 165 volts, 60 c.p.s.

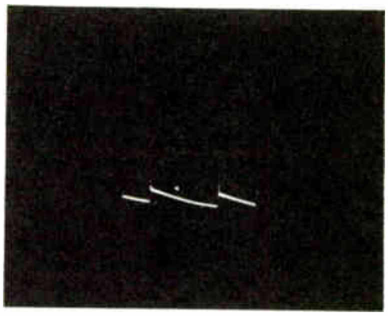


TP2-697

Figure 19. Vertical-Oscillator Plate, Pin 1
130 volts, 60 c.p.s.

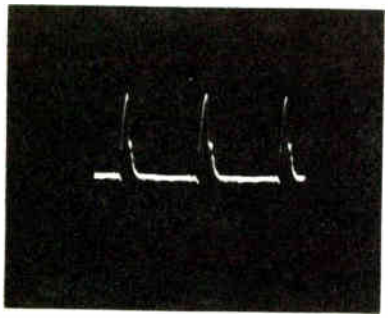
TP2-644

Figure 20. Vertical-Output Grid, Pin 7
120 volts, 60 c.p.s.



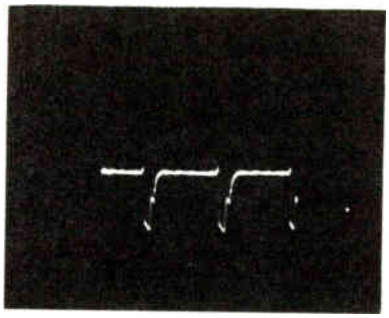
TP2-645

Figure 21. Vertical-Output Plate, Pin 6
450 volts, 60 c.p.s.



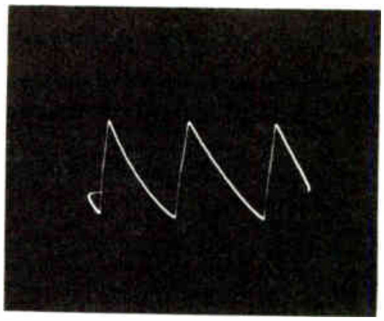
TP2-641

Figure 22. Phase Comparer Plate, Pin 2
10 volts, 15,750 c.p.s.



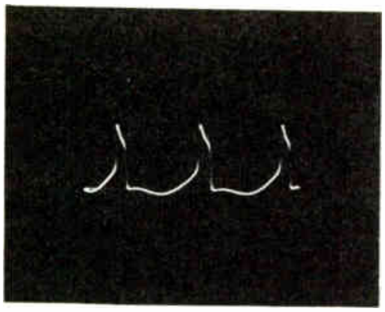
TP2-642

Figure 23. Phase Comparer Cathode, Pin 1
10 volts, 15,750 c.p.s.



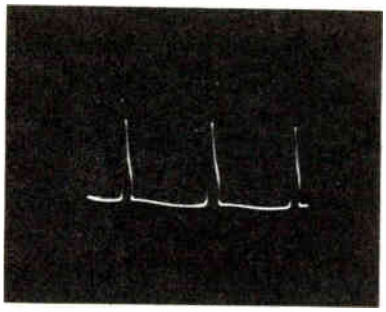
TP2-652

Figure 24. Phase Comparer, Pins 5 and 6
6 volts, 15,750 c.p.s.



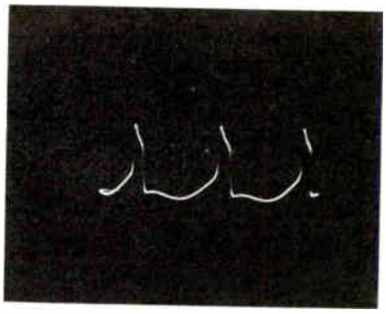
TP2-646

Figure 25. Horizontal Oscillator, Junction of L800, R806, and C806
35 volts, 15,750 c.p.s.



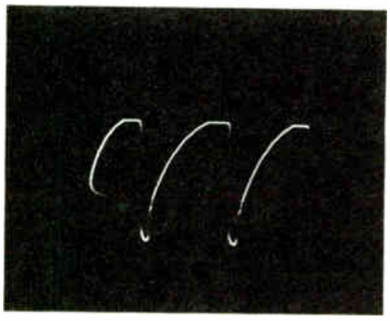
TP2-647

Figure 26. Horizontal-Oscillator Cathode, Pins 8 and 3
16 volts, 15,750 c.p.s.



TP2-648

Figure 27. Horizontal-Oscillator Grid, Pin 2
38 volts, 15,750 c.p.s.



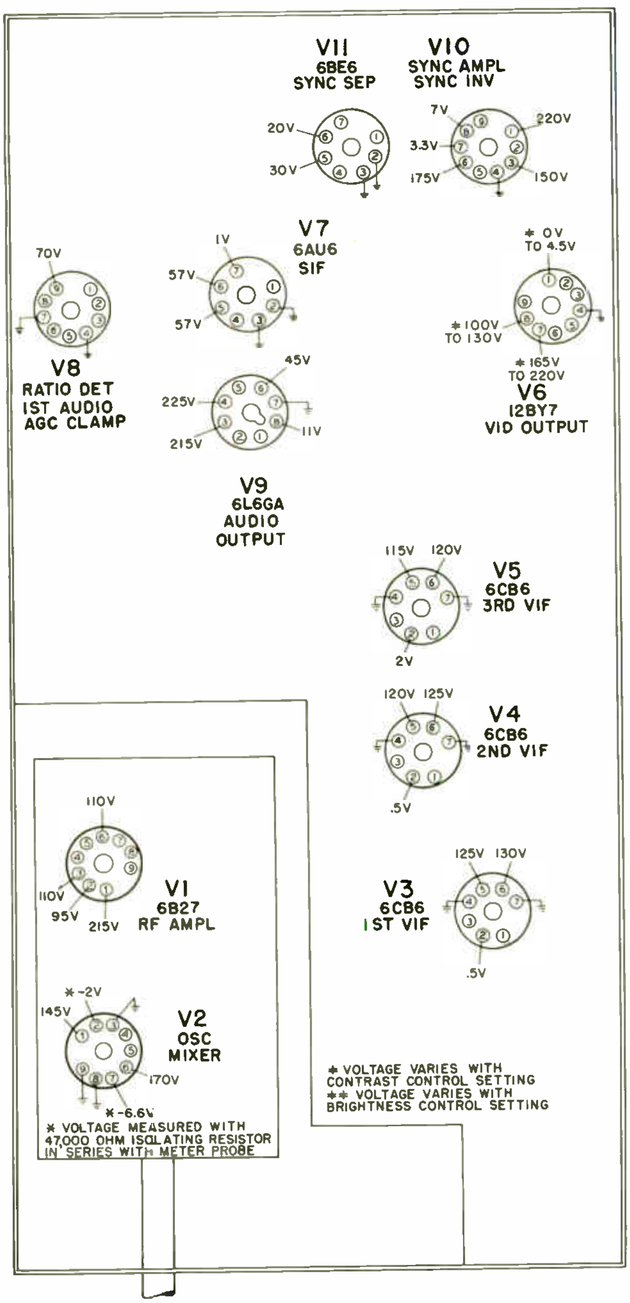
TP2-649

Figure 28. Horizontal-Output Grid, Pin 5
130 volts, 15,750 c.p.s.

TP2-650

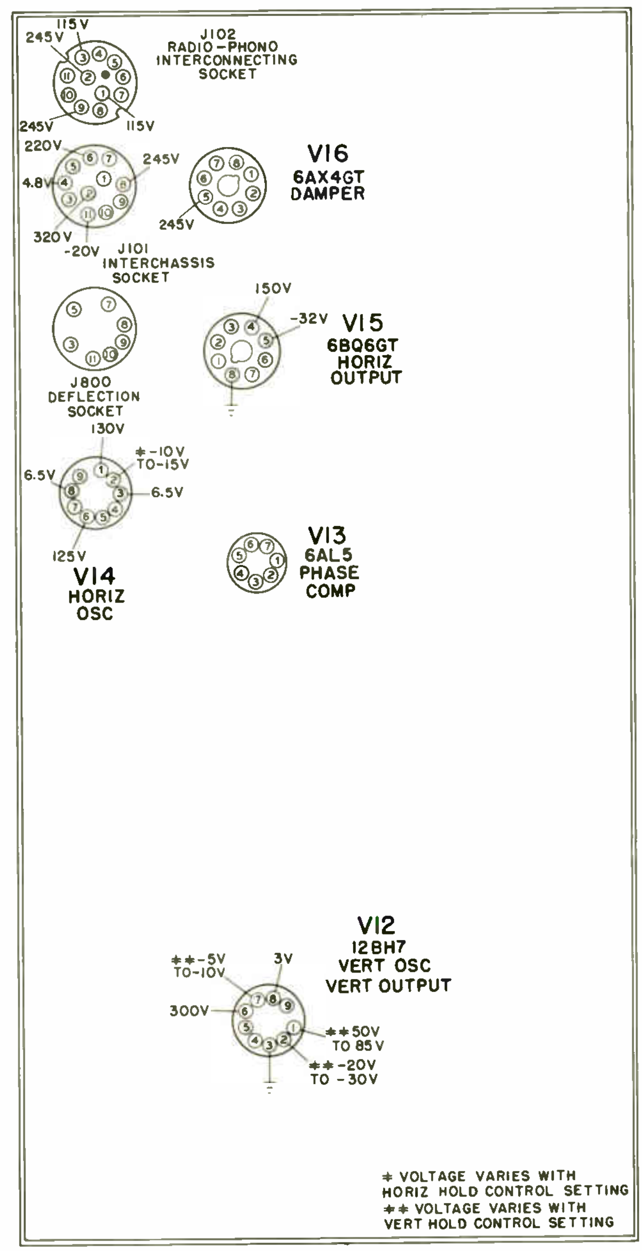
Figure 29. Horizontal-Deflection Yoke, *Pin 7 of J800
3000 volts, 15,750 c.p.s.
***See CAUTION note below.** →

*CAUTION: High-voltage pulses are present in the horizontal-output circuit. The waveform in figure 29 was taken with the alligator clip of the oscilloscope lead clipped over the insulation of the lead connected to pin 7 of J800. (To prevent puncture of the insulation of the lead, file off the teeth of the alligator clip, and wrap friction tape around the clip.) Connection to other points in the horizontal-output circuit is dangerous, because of the high voltages present. The peak-to-peak voltage shown for figure 29 is the actual voltage present; however, the amplitude of the scope presentation depends upon the degree of coupling.



TP2-2235

Figure 30. R-F Chassis 84, Bottom View, Showing Voltages at Socket Pins



TP2-2236

Figure 31. Deflection Chassis H-4, Bottom View, Showing Voltages at Socket Pins

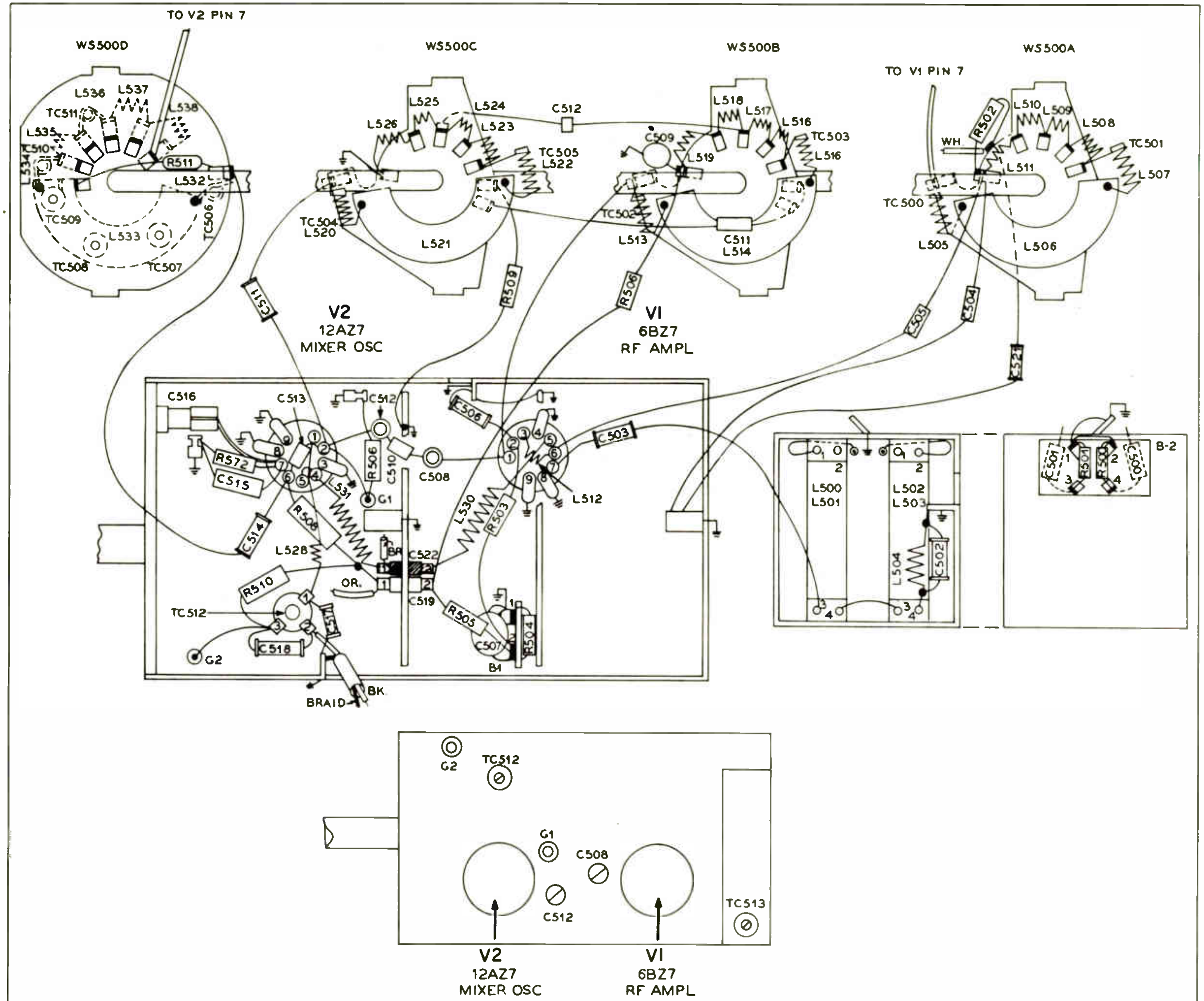
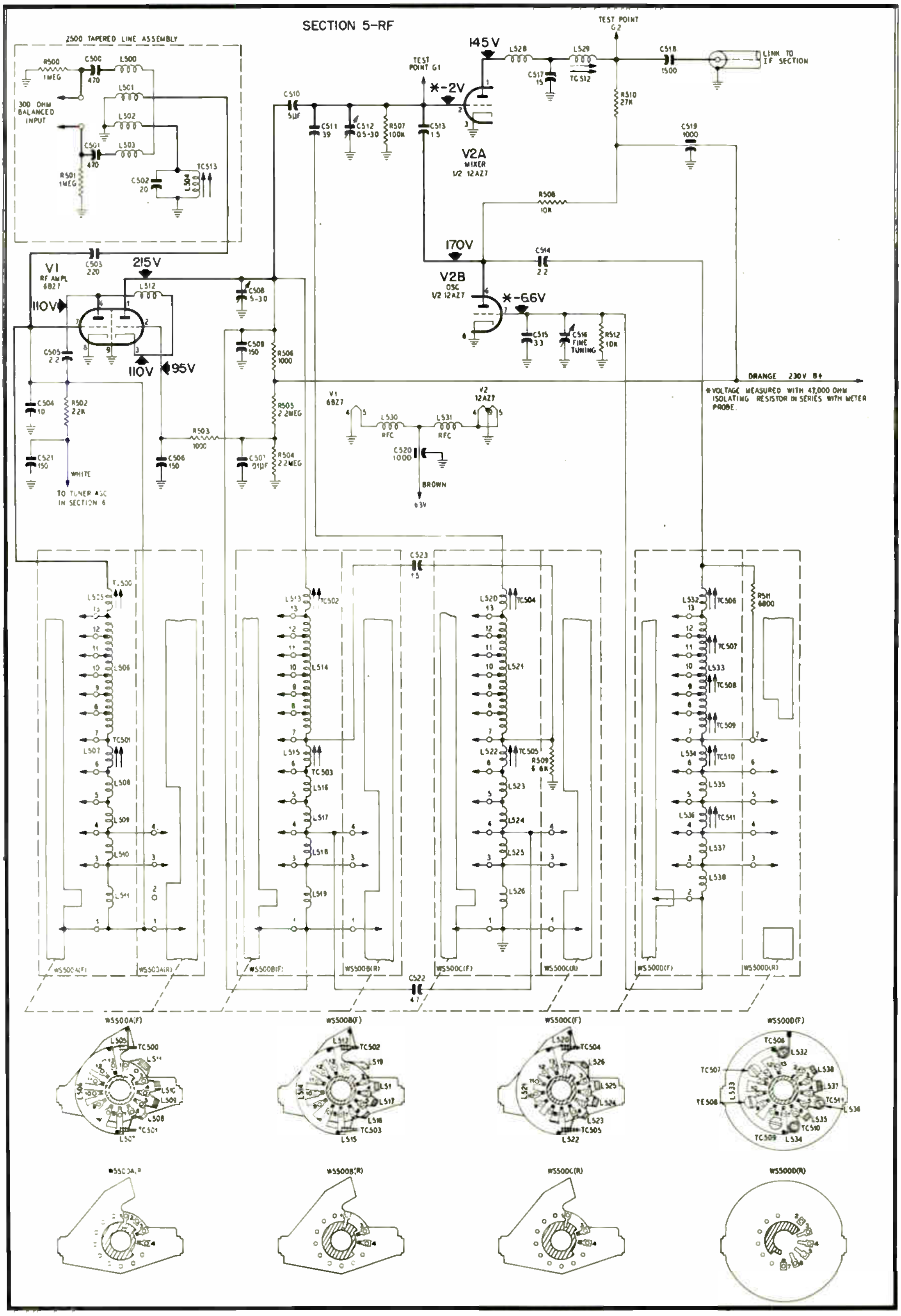


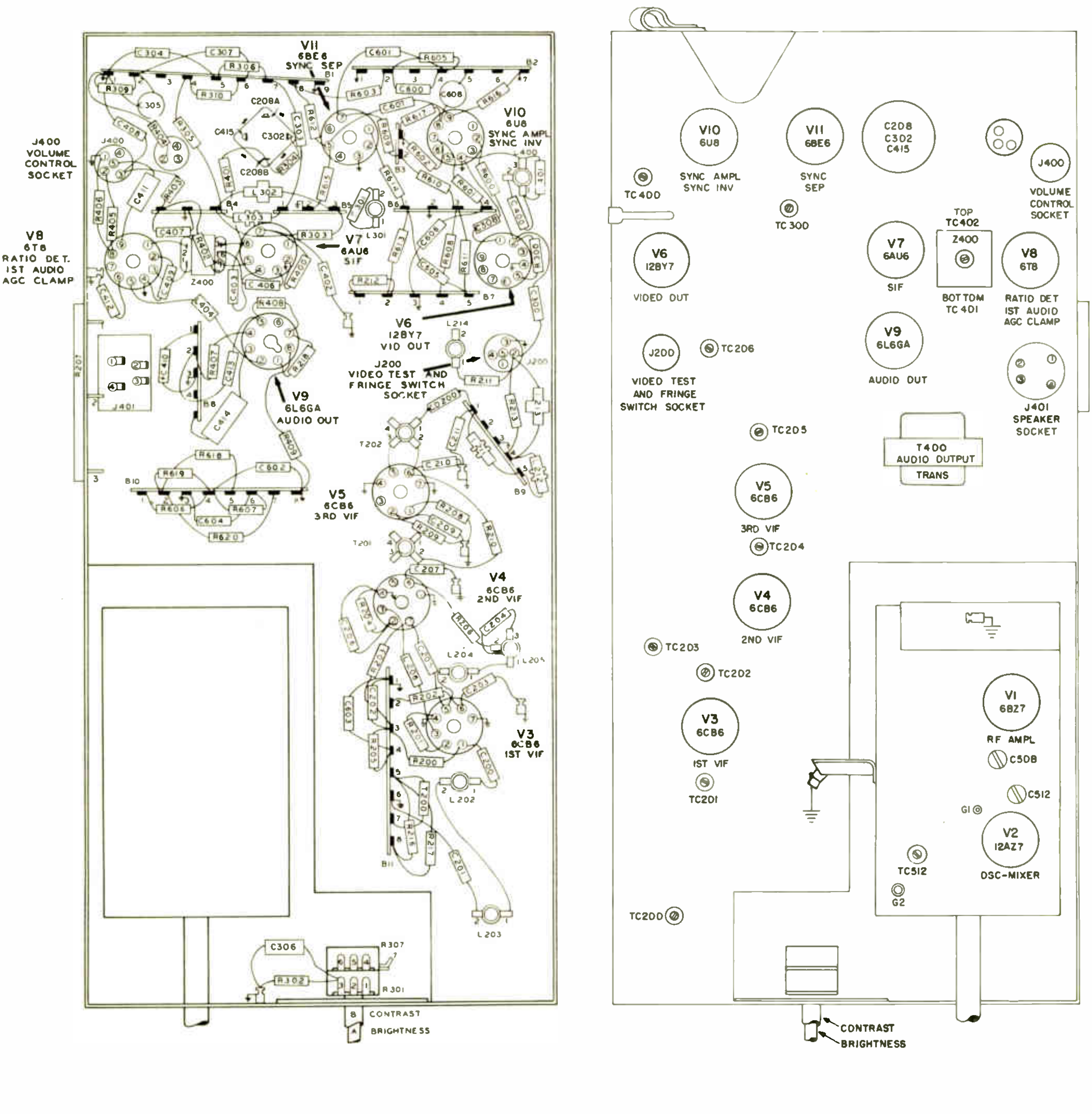
Figure 32. Television Tuner, Part No. 76-7664, Base Layout

TP2-2205-1



TP2-2206-1

Figure 33. Television Tuner, Part No. 76-7664, Schematic Diagram



TP2-2237

Figure 34. R-F Chassis 84, Base Layout

REPLACEMENT PARTS LIST (Cont.)

R-F CHASSIS 84 (Cont.)

SECTION 4—SOUND (Cont.)

Reference Symbol	Description	Service Part No.
C410	Condenser, filter, 2 µf.	30-2417-7
C414	Condenser, plate by-pass, 3300 µµf., 1000v	45-3505-89
C415	Condenser, filter, 60 µf.	Part of C208
J400	Socket, volume control	27-6273*
J401	Socket, speaker	27-4785-22
J402	Socket, discriminator test	27-6273*
L400	Coil, audio take-off	32-4463-10
L401, L402, and L403	Coils, discriminator	Part of Z400
L404	Coil, filament choke	32-4112-15
PL400	Plug, volume control	Part of cable and plug ass'y. (See Misc. A)
PL401	Plug, speaker	Part of speaker cable ass'y (See cabinet parts)
R401	Resistor, screen dropping, 27,000 ohms, 1 watt	66-3274340*
R409	Resistor, cathode bias, 180 ohms, 2 watts	66-1185340*
R412	Potentiometer, VOLUME and TONE CONTROLS	33-5563-44
R412A	Potentiometer, VOLUME CONTROL, 2 megohms	Part of R412
R412B	Potentiometer, TONE CONTROL, 5 megohms	Part of R412
Z400	Transformer, ratio detector	32-4450-5
T400	Transformer, audio output	32-8579

SECTION 6—SYNC

Reference Symbol	Description	Service Part No.
C600	Condenser, by-pass, 330 µµf.	62-133001001
R603	Resistor, voltage dropping, 22,000 ohms, 2 watts	66-3225340*
R618	Resistor, voltage divider, 8200 ohms, 1 watt	66-2824340*
R620	Resistor, decoupling, 18,000 ohms, 2 watts	66-3185340*

MISCELLANEOUS B

Description	Service Part No.
Cable and plug ass'y., chassis connecting	41-4146-3
Cable and socket ass'y., picture tube	41-4147
Cable and socket ass'y., pilot light	27-6233-6*
Shield, tube, 6T8	56-5629-5
Shield, tube, 6CB6	56-5629FA3
Shield, pilot light	56-9074-2FA3
Socket and base ass'y., 6CB6	27-6203-14
Socket and base ass'y., 6T8	26-6203-18
Socket, tube, 7-pin miniature	27-6203
Socket, tube, 9-pin miniature	27-6203-6*
Socket, octal	27-6174

TV TUNER, PART No. 76-7664

SECTION 5—R.F.

Reference Symbol	Description	Service Part No.
C500 and C501	Condenser, antenna isolating, 470 µµf.	30-1225-18
C502	Condenser, F-M trap, 20 µµf.	62-020309011
C503	Condenser, coupling, 220 µµf.	62-122001001
C504	Condenser, by-pass, 10 µµf.	62-010409001
C505	Condenser, neutralizing, 2.2 µµf.	30-1221-6
C506	Condenser, grid by-pass, 150 µµf.	62-115001011
C507	Condenser, decoupling, .01 µf.	30-1238-2
C508	Condenser, trimmer, r-f plate, .5 to 3 µµf.	31-6520-3
C509	Condenser, by-pass, 150 µµf.	62-115001011
C510	Condenser, coupling, .5 µµf.	30-1221-15
C511	Condenser, coupling, 39 µµf.	62-039409011
C512	Condenser, trimmer, mixer grid, .5 to 3 µµf.	31-6520-3
C513	Condenser, oscillator coupling, 1.5 µµf.	30-1221-8
C514	Condenser, grid blocking, 22 µµf.	62-022009001
C515	Condenser, fixed trimmer, 3.3 µµf.	30-1224-30
C516	Condenser, fine tuning (ceramic tube)	76-6935-1
C517	Condenser, fixed trimmer, 15 µµf.	62-015409011
C519	Condenser, feed-through, 1000 µµf.	30-1245-1
C520	Condenser, feed-through, 1000 µµf.	30-1245-1
C521	Condenser, by-pass, 150 µµf.	62-115001011
C522	Condenser, coupling, 3.9 µµf.	30-1221-14
C523	Condenser, coupling, 1.2 µµf.	30-1221-7
L500, L501, L502, and L503	Coils, tapered line	32-4432-2
L504	Coil, FM trap	32-4438-2
L505 to L511 incl.	Coils, antenna tuning	Part of WS500A
L512	Coil, r-f coupling	32-4550-10
L513 to L519 incl.	Coils, r-f plate tuning	Part of WS500B
L520 to L526 incl.	Coils, mixer grid tuning	Part of WS500C
L528	Coil, mixer plate	32-4550-7
L529	Coil, i-f primary	32-4359-13
L530 and L531	Coils, r-f choke	32-4500-1
L532 to L538 incl.	Coils, oscillator tuning	Part of WS500D
R508	Resistor, oscillator feed, 10,000 ohms, 1 watt	66-3104340
R510	Resistor, mixer plate feed, 27,000 ohms, 1 watt	66-3274340
WS500A(F) and WS500A(R)	Switch, wafer, antenna	76-7654

REPLACEMENT PARTS LIST (Cont.)

TV TUNER, PART No. 76-7664 (Cont.)

SECTION 5—R.F. (Cont.)

Reference Symbol	Description	Service Part No.
WS500B(F) and WS500B(R)	Switch, wafer, r-f plate	76-7656
WS500C(F) and WS500C(R)	Switch, wafer, mixer grid	76-7658
WS500D(F) and WS500D(R)	Switch, wafer, oscillator	76-7660
Z500	Tapered line assembly	76-7661

MISCELLANEOUS C

Description	Service Part No.
Cam and shaft, fine tuning	76-6936
Coupling, fine tuning shaft	54-4912
Detent, ball	56-8020
Front panel ass'y.	76-6928-2
Hairpin, plunger grounding	1W42704FA3
Hairpin, plunger	56-9858
Pivot pin, lever	56-9149
Lever, plunger	56-9148
Plunger	56-8034-1
Retaining ring	1W61043
Shaft	76-6914-3
Shaft, extension	56-8358
Shield, tube, 9-pin miniature	56-5629-5
Socket, tube, 9-pin miniature	27-6203-21
Spring, shaft	56-8023
Spring, plunger	56-9628

MISCELLANEOUS C (Cont.)

Description	Service Part No.
Spring, rotor index, detent	56-9158
Terminal panel, antenna	76-5504-2
Washer	56-9351
Washer, fiber	27-4109-13
"E" washer	1W60980FE5
Washer, spring	56-9157

CONNECTING CABLES, PLUGS AND SOCKETS

Reference Symbol	Description	Service Part No.
J100	Socket, chassis connecting	27-6274-1
J101	Socket, a-c line	27-6240-3
J102	Socket, radio-phono connecting	27-6274-4
J200	Socket, video test and fringe switch	27-6273
J400	Socket, volume control	27-6273
J401	Socket, speaker	27-4785-22
J402	Socket, discriminator test	27-6273
J800	Socket, deflection yoke connector	27-6274-7
PL100	Plug and cable ass'y., chassis connecting	41-4146-3
PL101	Plug and line-cord ass'y.	41-3865
PL400	Plug and cable ass'y., volume control	41-4136-2
PL401	Plug and cable ass'y., speaker	**See cabinet parts list
PL800	Plug and cable ass'y., deflection	41-4086-25
	Cable ass'y., high voltage	41-4064-6
	Cable and socket ass'y., picture tube	41-4160
	Cable and socket ass'y., pilot light	27-6233-6*

**NOTE: The length of this cable varies with cabinet model and speaker size. For Service Part No. refer to cabinet parts list in Philco Service Bulletins.

Printed in U. S. A.

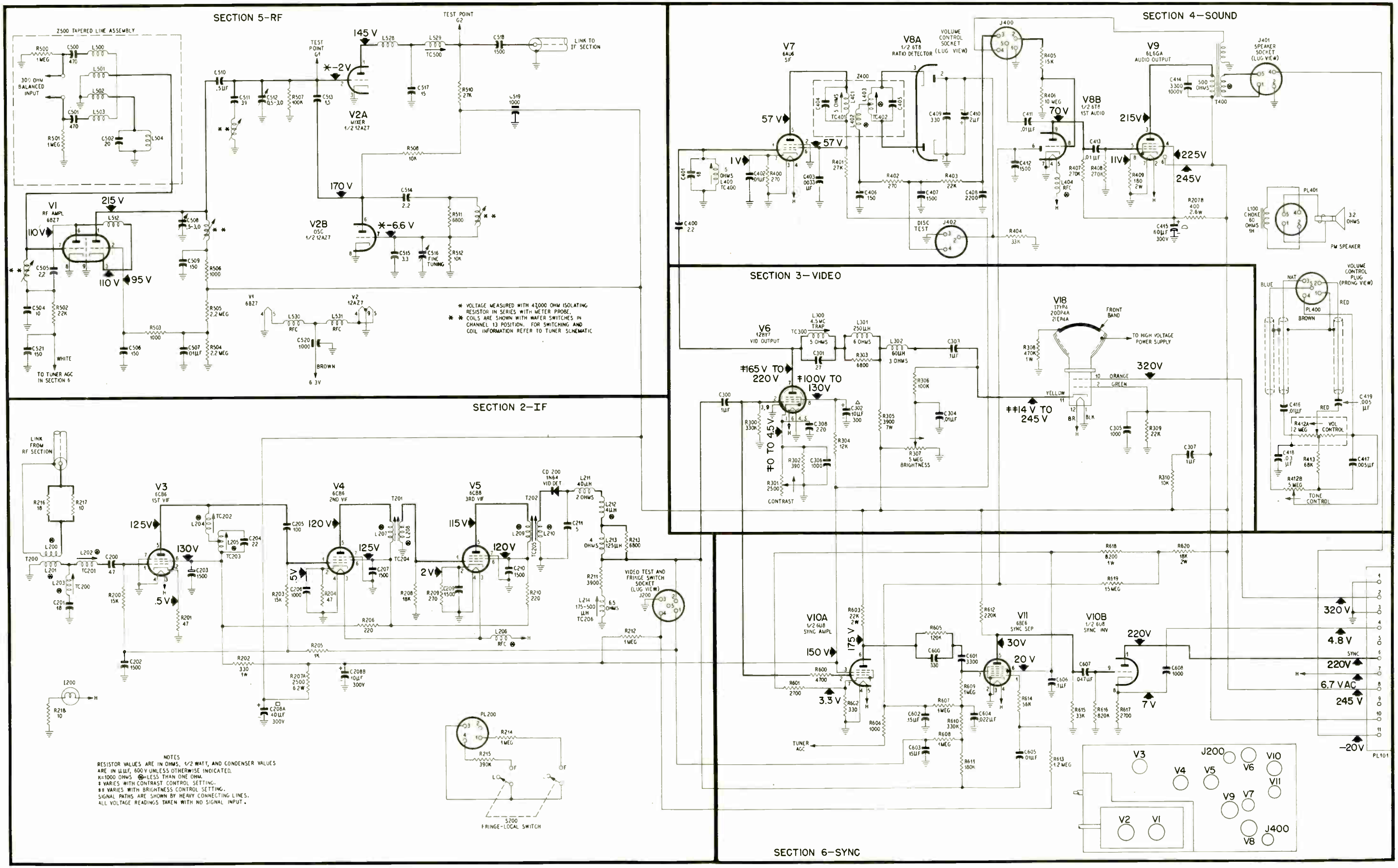


Figure 35. R-F Chassis 84, Schematic Diagram

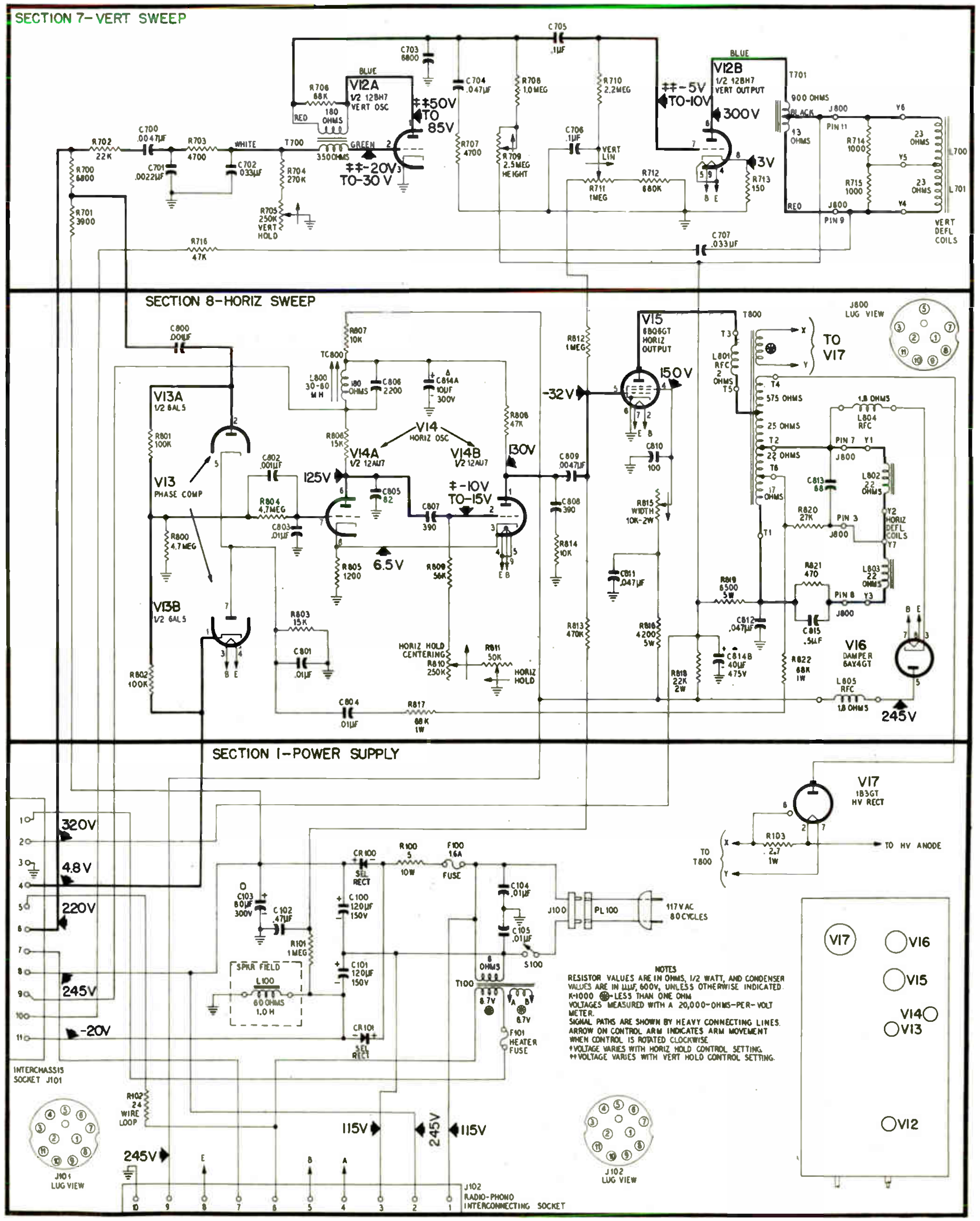


Figure 36. Deflection Chassis H-4, Schematic Diagram

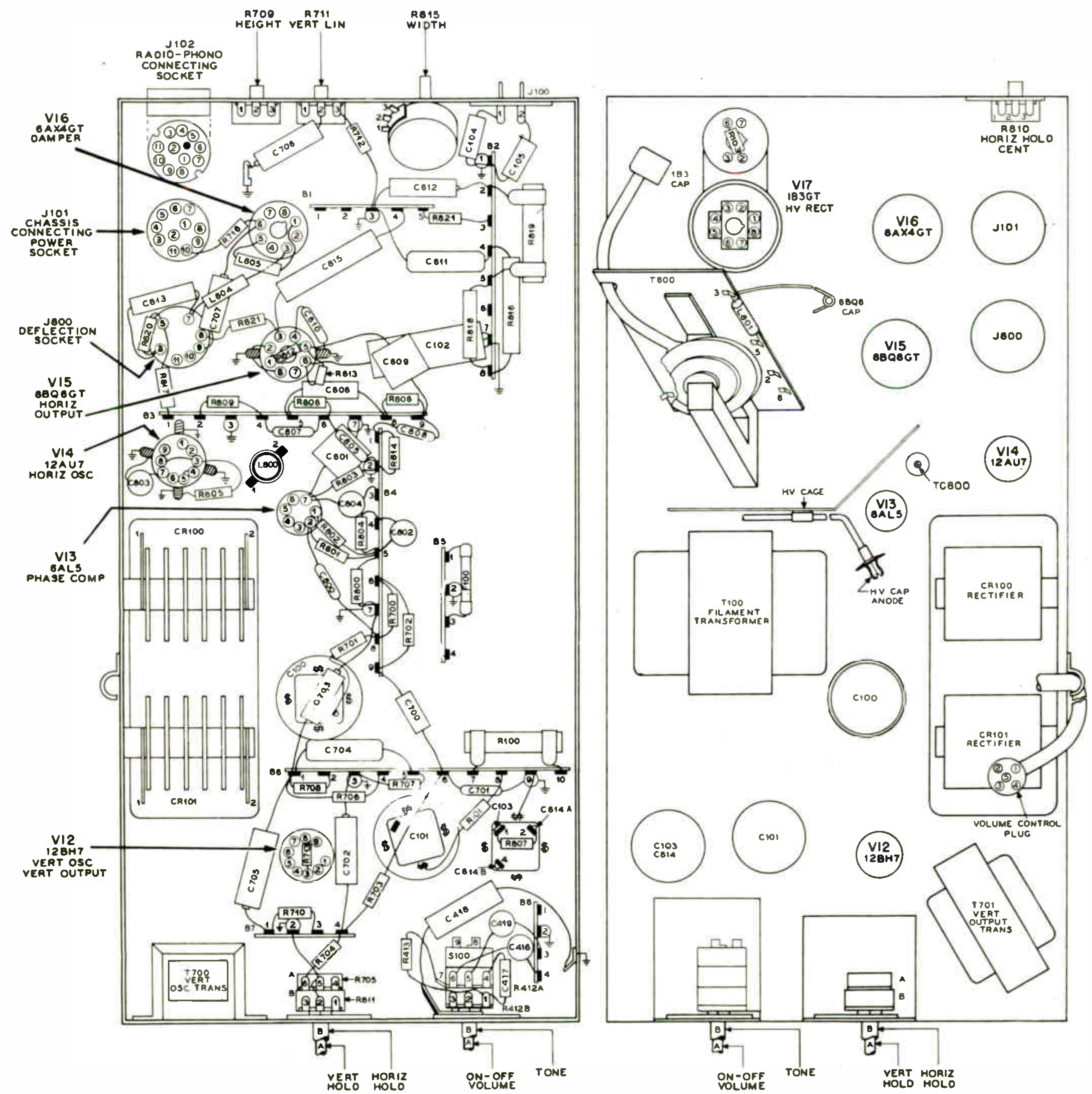


Figure 37. Deflection Chassis H-4, Base Layout

REPLACEMENT PARTS LIST

IMPORTANT

General replacement items commonly stocked by the serviceman are omitted from this parts list. All condensers 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 should be ordered in this way rather than by model number. A list of miscellaneous parts is given at the end of the parts list for each chassis type. All parts are symbolized in the schematic diagram and base layout, for identification purposes.

NOTE: Part numbers identified by an asterisk (*) are general replacement items. These numbers may not be identical with those on factory parts. Also, the electrical values of some replacement items may differ from the values indicated in the schematic diagram and parts list. The values substituted in any case are so chosen that the operation will either be unchanged or improved. When ordering replacements, use only the "Service Part No."

DEFLECTION CHASSIS H-4

SECTION 1—POWER SUPPLY

Reference Symbol	*Description*	*Service Part No.*
C100 and C101	Condensers, electrolytic filter, 120 µf., 150v	30-2568-51
C103	Condenser, electrolytic filter, 80 µf., 300v	30-2584-20
CR100 and CR101	Rectifiers, selenium, 300 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
J102	Socket, radio-phono inter-connecting	27-6274-4
L100	Choke, 60 ohms	Speaker field
PL100	Plug and cable ass'y., chassis connecting	(See Misc. B)
PL101	Plug, a-c line	Part of a-c line cord ass'y. (See Misc. A)
R100	Resistor, current limiting, 5 ohms, 10 watts	33-3448-5
R102	Resistor, voltage dropping	41-4149
R103	Resistor, voltage dropping, 2.7 ohms, 1 watt	66-9274360
S100	Switch, off-on	Part of R412
T100	Transformer, filament	32-8586

SECTION 7—VERT. SWEEP

Reference Symbol	*Description*	*Service Part No.*
L700 and L701	Coils, vertical deflection	Part of deflection yoke (See Misc. A)
R705	Potentiometer, VERT HOLD control, 250,000 ohms	Part of R811

SECTION 7—VERT. SWEEP—Cont.

Reference Symbol	*Description*	*Service Part No.*
R709	Potentiometer, HEIGHT control, 2.5 megohms	33-5565-31
R711	Potentiometer, VERT LIN control, 1 megohm	33-5565-42
T700	Transformer, vertical oscillator	32-8431-2*
T701	Transformer, vertical output	32-8577-1

SECTION 8—HORIZONTAL SWEEP

Reference Symbol	*Description*	*Service Part No.*
C805	Condenser, by-pass, 82 µµf.	60-00825317
C807	Condenser, coupling, 390 µµf.	60-10395417
C808	Condenser, saw-tooth forming, 390 µµf.	60-10395417
C810	Condenser, by-pass, 100 µµf.	60-10105417
C813	Condenser, damping, 68 µµf.	30-1246-1*
C814A	Condenser, electrolytic, 10 µf., 300v	Part of C103
C814B	Condenser, electrolytic, 40 µf., 475v	Part of C103
J800	Socket, deflection yoke connector	27-6274-7
L800	Coil, horizontal stabilizing, 30 to 80 mh.	32-4557
L801	Coil, r-f choke, horiz. output plate	Part of T800
L802 and L803	Coils, horizontal deflection	Part of deflection yoke (See Misc. A)
L804	Coil, r-f choke, damper cathode	32-4112-24
L805	Coil, r-f choke, damper plate	32-4112-24
R810	Potentiometer, HORIZ HOLD CENTERING control, 250,000 ohms	33-5565-17
R811	Potentiometer, HORIZ HOLD control, 50,000 ohms	33-5563-50

REPLACEMENT PARTS LIST (Cont.)

DEFLECTION CHASSIS H-4 (Cont.)

SECTION 8—HORIZONTAL SWEEP (Cont.)

Reference Symbol	*Description*	*Service Part No.*
R815	Potentiometer, WIDTH control	33-5546-41
R816	Resistor, screen supply divider, 4200 ohms, 5 watts	33-1335-101
R817	Resistor, feedback coupling, 68,000 ohms, 1 watt	66-3684340
R818	Resistor, voltage dropping, 22,000 ohms, 2 watts	66-3225340
R819	Resistor, volting dropping, 6500 ohms, 5 watts	33-1335-99
R822	Resistor, feedback coupling, 68,000 ohms, 1 watt	66-3684340
T800	Transformer, horiz. output	32-8572

MISCELLANEOUS A

Description	*Service Part No.*
Arm and magnet ass'y., picture tube	76-6594
Beam bender	76-6077-2
Cable ass'y., volume control	41-4136-2
Cable ass'y., high voltage	41-4064-6*
Cable and plug ass'y., deflection	41-4086-25
Cord, a-c line	41-3865
Deflection yoke ass'y.	32-9648
Focus ass'y., p-m	76-6126-4
Insulator, condenser mounting	27-9508-1
Shock-mount, 9-pin miniature, and spring	76-6115-2
Socket, octal	27-6174
Socket, 7-pin miniature	27-6203-12
Socket, 1B3GT	27-6290-1
Socket, 6AX4GT	27-6174-7
Socket, spring, picture-tube ass'y.	56-9733

R-F CHASSIS 84

SECTION 2—I.F.

Reference Symbol	*Description*	*Service Part No.*
C200	Condenser, d-c blocking, 47 µµf.	62-00475317
C201	Condenser, trap, 18 µµf.	62-018400021
C204	Condenser, fixed trimmer, 22 µµf.	62-022009001
C205	Condenser, d-c blocking, 100 µµf.	62-110409001
C208	Condenser, electrolytic	30-2584-24
C208A	Condenser, filter, 40 µf.	Part of C208
C208B	Condenser, decoupling filter, 10 µf.	Part of C208
C211	Condenser, detector by-pass, 5 µµf.	30-1224-5
CD200	Crystal, video detector, 1N64	34-8022
I200	Pilot light	34-2068
J200	Socket, video test and fringe switch	27-6273*
L200 and L201	Coils, tuner coupling	Part of T200
L202	Coil, 1st i-f grid	32-4486-32
L203	Coil, 28.1-mc. trap	32-4486-27
L204	Coil, 1st i-f plate	32-4486-30
L205	Coil, 22.1-mc. trap	32-4496
L206	Coil, filament choke	32-4112-15
L207 and L208	Coils, coupling	Part of T201
L209 and L210	Coils, coupling	Part of T202
L211	Coil, series peaking, 40 µh.	32-4143-16
L212	Coil, series peaking, 4 µh.	32-4143-23
L213	Coil, shunt peaking, 125 µh.	32-4480-8
L214	Coil, variable, video peaking, 175 to 500 µh.	32-4467-13
R202	Resistor, filter, 330 ohms, 1 watt	66-1334340*
R207	Resistor, voltage dropping	33-3446-5
R207A	Resistor, voltage dropping, 2500 ohms, 6.2 watts	Part of R207

SECTION 2—I.F. (Cont.)

Reference Symbol	*Description*	*Service Part No.*
R207B	Resistor, voltage dropping, 400 ohms, 2.6 watts	Part of R207
T200	Transformer, video i-f input	32-4548-29
T201	Transformer, 2nd video i-f	32-4486-29
T202	Transformer, 3rd video i-f	32-4486-33

SECTION 3—VIDEO

Reference Symbol	*Description*	*Service Part No.*
C301	Condenser, 4.5-mc. trap, 27 µµf.	62-027409011
C302	Condenser, filter, 10 µf., 300v	Part of C208
L300	Coil, 4.5-mc. trap	32-4463-7
L301	Coil, series peaking, 250 µh.	32-4480-4
L302	Coil, series peaking, 60 µh.	32-4480-11
R301	Potentiometer, CONTRAST control, 2500 ohms	Part of R307
R305	Resistor, plate load, 3900 ohms, 7 watts	33-1335-116
R307	Potentiometer, BRIGHTNESS control, 5 megohms	33-5563-53

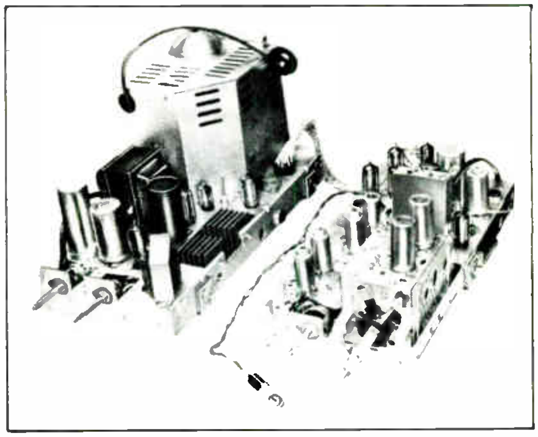
SECTION 4—SOUND

Reference Symbol	*Description*	*Service Part No.*
C400	Condenser, coupling, 2.2 µµf.	30-1221-6
C401	Condenser, fixed trimmer, 18 µµf.	62-018400021
C404	Condenser, fixed trimmer	Part of Z400
C405	Condenser, fixed trimmer	Part of Z400
C406	Condenser, detector balancing, 150 µµf.	62-115001011
C409	Condenser, r-f by-pass, 330 µµf.	62-133001001

PHILCO — PHILCO Factory-Supervised Service — SERVICE

TELEVISION

PHILCO TELEVISION SERVICE MANUAL FOR R-F CHASSIS 94 AND DEFLECTION CHASSIS J-4



TP2-520

TABLE OF CONTENTS

SERVICE INFORMATION FOR PHILCO CHASSIS TYPES 94 AND J-4 PR-2395

CIRCUIT DESCRIPTION

The Philco 1953, Code 126, Television Receivers use two chassis—the r-f chassis, containing the r-f, video, audio, and sync circuits, and the deflection chassis, containing the power and deflection circuits. Radio-television, phono-television and radio-phono-television combination models use r-f chassis 94 and deflection chassis J-4, while television only models use r-f chassis 91 and deflection chassis J-1. Service information for the 91 and J-1 chassis is given in Service Manual PR-2200, and service information for the 94 and J-4 chassis is given in this manual.

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 r-f amplifier, oscillator, and mixer section is built on a separate subchassis. The r-f amplifier uses a 6BZ7 or 6BQ7 tube, V1. The oscillator and mixer each use one half of a 12AZ7 tube, V2. The output of the mixer is fed to a four-stage i-f amplifier system employing four 6CB6 tubes, V3, V4, V5, and V6. A 1N64 crystal diode is used for the video detector. One half of a 6U8 tube, V7A, is used as the first video amplifier, which feeds into a 6AQ5 video output amplifier, V8.

Sound i-f (intercarrier) is obtained by utilizing the beat frequency produced when the 45.75-mc. video carrier and the 41.25-mc. sound 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 the video 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 relative amplitude of the two carriers is established in the alignment of the receiver. There is sound output only when both the video and sound 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), which is taken from the video detector, is amplified by a 6BA6 tube, V9, and a 6AU6 tube, V10, and is fed to the FM detector, which utilizes two diode sections of a 6T8 tube, V11A. The triode section of the 6T8 tube, V11B, is used as the first audio amplifier. The power amplifier uses a 6L6GA tube, V12.

A-G-C voltage for the video i-f system and the r-f amplifier is obtained from a keyed a-g-c system which uses a 6AU6 tube, V13, as the a-g-c gate. Composite video from the video amplifier plate circuit, V7A, is fed to the grid of the a-g-c gate tube, while a gating or keying pulse, obtained from a winding on the horizontal output transformer located on the deflection chassis, is applied to the plate. The sync-pulse polarity applied to the grid of V13 is positive; therefore, the a-g-c gate can conduct in proportion to the amplitude of the sync-pulse tips if the gating or keying pulse occurs at the same time as the sync. Because the keying or gate pulse is of constant amplitude, approximately 500 volts peak, the amplitude of the sync pulse determines the amount of conduction in the gate tube. The plate current of the keyed a-g-c gate tube flows through R220, R219, and R218, developing a voltage which is negative in respect to chassis and proportional to the plate current. This negative voltage is used to control the gain of the receiver. Since conduction cannot occur in the a-g-c gate tube unless the sync pulse and gating pulse occur at the same time, noise disturbances that occur between sync-pulse intervals cannot affect the a-g-c voltage.

Composite video for the sync circuits is taken from the plate circuit of the video amplifier, V7A. The plate load of the video amplifier consists of two equal sections, R302 and R303. The full output of the amplifier is fed to the grid of the noise inverter, one half of a 12AU7 tube, V14B, and the output developed across R303 only is fed to the grid of the sync separator, one half of a 6U8 tube, V7B. The noise inverter is operated with a low value of plate voltage and with high bias (applied to the cathode by a voltage-divider network), which keeps the tube beyond cutoff. When the composite video signal is applied to the grid of the noise inverter through C601, the sync appears as positive pulses, and noise which could affect the sweep circuits also appears as positive pulses. Harmful noise pulses usually have amplitudes far greater than the sync pulses and, therefore, drive the grid of the noise inverter positive sufficiently to allow conduction in the noise inverter plate circuit. To prevent the noise inverter from conducting during the sync pulse interval the gated leveler, using one half of a 12AU7 tube, V14A, is used to clamp the sync pulses below the conduction level of the noise inverter. The gated leveler conducts only when the sync pulses and gating pulse occur at the same time, thus leveling the noise inverter input to the sync-pulse level.

The output of the noise inverter consists of negative-going noise pulses. It should be noted that the noise pulses which exceed the sync level have been passed and their polarity reversed by the noise inverter. The output of the noise inverter is now mixed with the composite video and fed to the grid of the sync separator. Since the composite video fed to the grid of the sync separator has positive sync polarity, the positive noise pulses carried with the composite video would be passed by the sync separator; however, the output of the noise inverter consists of these same noise pulses, but of opposite polarity. Thus, cancellation of the noise pulses is effected. The output of the sync separator contains only the sync pulses, which are fed to the deflection chassis through the connecting cable.

The phase splitter, using one half of a 12AU7 tube, V15A, inverts the sync polarity for proper triggering of the vertical oscillator. The vertical sync is separated from the horizontal sync by the integrator circuits and fed to the grid of the vertical blocking oscillator, using one half of a 12AU7 tube, V15B. The output of the vertical oscillator is amplified by the vertical-output amplifier, using a 12BH7 tube, V16. The output of this amplifier is applied to the vertical-deflection coils through the vertical-output transformer.

In addition to the vertical sync output, two horizontal sync outputs are taken from the phase splitter, one from the cathode, and the other from the plate circuit. These two outputs are of opposite polarity, and are fed to the two diodes of the phase comparer, a 6AL5 tube, V17. The negative pulses are fed to the cathode of V17B, and the positive pulses are fed to the plate of V17A. A portion of the horizontal sweep output voltage is taken from the horizontal-output transformer, and is fed to the plate of V17B and the cathode of V17A, for comparison of the horizontal sync and horizontal sweep voltages. When the sweep and sync are in phase, no voltage is developed across R800, but when the two signals are out of phase a voltage is developed across R800. This voltage will increase the frequency of the horizontal oscillator (a 12AU7 tube V18) if it is positive, and will reduce the frequency of the oscillator if it is negative, thus acting to hold the horizontal oscillator in phase with the sync signal. The horizontal hold control, R811, adjusts the horizontal oscillator frequency so that it may be controlled by the phase comparer. The output of the horizontal oscillator is fed to the horizontal-output amplifier, which uses a 6BQ6GT tube, V19. The horizontal-output tube feeds the deflection coils through the horizontal-output transformer. A 6AX4GT tube, V20, is used as the horizontal damper.

The second-anode voltage for the picture tube is supplied by a 1B3GT high-voltage rectifier tube, V20. 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 a 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 vertical amplifier, 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 117-volt, 60-cycle step-down transformer. Filament current for the high-voltage rectifier is supplied by a winding on the horizontal-output 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, CR100, and C103, 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 test equipment or receiver, or both.

SPECIFICATIONS

CHANNEL TUNING .... Twelve-channel, 13-position, wafer-switch incremental tuner; fine tuning of local oscillator

FREQUENCY RANGE .... Television Channels 2 through 13 and U-H-F position

INTERMEDIATE FREQUENCIES

Video carrier .... 45.75 mc.

Sound (intercarrier) .... 4.5 mc.

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

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

POWER CONSUMPTION .... 215 watts

TUBE COMPLEMENT

R-F CHASSIS 94

Reference Symbol	*Tube Type*	*Function*
V1	6BQ7 or 6BZ7—miniature	R-F amplifier
V2	12AZ7—miniature	Oscillator, mixer
V3, V4, V5, V6	6CB6—miniature	Video i-f amplifiers
V7	6U8—miniature	Video amplifier, sync separator
V8	6AQ5—miniature	Video output
V9	6BA6—miniature	First sound i-f amplifier
V10	6AU6—miniature	Second sound i-f amplifier
V11	6T8—miniature	FM detector, first audio amplifier
V12	6L6GA—octal	Audio output
V13	6AU6—miniature	A-G-C gate
V14	12AU7—miniature	Gated leveler, noise inverter
V22	21EP4A	Picture tube

DEFLECTION CHASSIS J-4

Reference Symbol	*Tube Type*	*Function*
V15	12AU7—miniature	Phase splitter, vertical oscillator
V16	12BH7—miniature	Vertical output
V17	6AL5—miniature	Phase comparer
V18	12AU7—miniature	Horizontal oscillator
V19	6BQ6GT—octal	Horizontal output
V20	6AX4GT—octal	Damper
V21	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-OSCILLATOR ADJUSTMENT

To adjust the horizontal-oscillator circuit, tune in a station and proceed as follows:

1. Reduce the width of the picture so that approximately one inch of blank screen appears at the right-hand and left-hand sides of the picture.

2. Increase BRIGHTNESS control setting so that the blanking time becomes visible. This appears as a dark, vertical bar at the right-hand and left-hand sides of the picture.

3. Connect a .1-μf. condenser from pin 2 of the gate pulse socket, J801, to ground.

4. Set the HORIZ. HOLD control to the center of its mechanical rotation.

5. Adjust the HORIZ. HOLD CENTERING control to bring the picture into the center of the blanking bars. When the picture is centered in the blanking bars, the bars at the left-hand and right-hand sides of the picture will be of equal width.

6. Remove the .1-μf. condenser from the gate pulse socket. (See step 3.)

7. Adjust the horizontal ringing coil, L800, until the picture is again centered in the blanking bar.

8. Rotate the HORIZ. HOLD control through its range. The picture should fall out of sync to both sides of the center of its rotation. If the picture does not fall out of sync to both sides, readjust the HORIZ. HOLD CENTERING control to obtain fall-out to either side of sync.

9. Rotate the HORIZ. HOLD control through its range, and observe the number of diagonal blanking bars just before the picture pulls into sync. The pull-in should occur with from 1 to 2 diagonal bars when the sync position is approached from either direction. If proper pull-in is not obtained, repeat the above procedure.

VIDEO PEAKING-COIL ADJUSTMENT

The video peaking coils, L305 and L307, are adjusted at the factory for proper transient response of the video amplifiers. Ordinarily these coils will require no further adjustment by the serviceman except if tampered with, or if their replacement becomes necessary. Under normal circumstances, when just alignment of the tuner or i-f stages is undertaken, the video peaking coils should not require adjustment.

Before adjusting L305 and L307, check both the tuner and i-f alignment. (Never adjust L305 and L307 until the alignment of the receiver is correct.) Then tune in a station and adjust the receiver to give a picture of best obtainable quality with medium contrast. Turn the fine-tuning control clockwise until a very slight beat appears in the picture. Carefully observe the appearance of the picture regarding smear or overshoot (trailing whites).

A small amount of overshoot may be desirable to produce a sharper picture. Conversely, in weak-signal areas, a small amount of smear may be desirable to reduce the harsh appearance of "snow". The adjustments of L305 and L307, and their effects on the picture, are as follows:

1. The amount of overshoot may be reduced by turning both TC302 and TC303 counterclockwise.

2. The amount of smear may be reduced by turning both TC302 and TC303 clockwise.

Normally the point of proper adjustment is where minimum smear and trailing whites appear in the picture; however, a compromise adjustment may be made to suit prevailing conditions. As a rule, when properly adjusted, the adjustment screws (TC302 and TC303) should protrude approximately ½ inch to ¾ inch from the chassis.

TELEVISION ALIGNMENT PROCEDURE

General

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

The over-all response curve (r-f, i-f) of the circuits from the antenna terminals to the video detector, after the i-f stages have been aligned, should appear essentially the same, regardless of the channel under test. If not, the tuner should be aligned. Before aligning the tuner, refer to the CAUTION given under TUNER BANDPASS ALIGNMENT.

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 having the top of the workbench metallic. 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 2 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 Model 7008 is used, the built-in crystal calibrator provides an excellent means of calibration. 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 concerning calibration, refer to Philco Lesson PR-1745(J) entitled "Television Service in the Home."

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 may be made through the alignment jack 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, may be used. As an alternate, a Philco alligator-clip adapter, Part No. 45-1636, with as short a ground lead as possible, may be used to connect 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 any regeneration caused by connection of the lead to the mixer is held to a minimum.

Antenna-Input Matching Network

An impedance-matching network for coupling the signal generator to the antenna-input terminals of the receiver is shown in figure 2 on page 5 of PR-2170. 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 antenna-input circuit. The resistors used in this network should be of carbon-composition construction, and should be chosen from a group, to obtain values within 10% of those indicated. The resistors should be placed in a shield can, to prevent variable effects. An antenna 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.

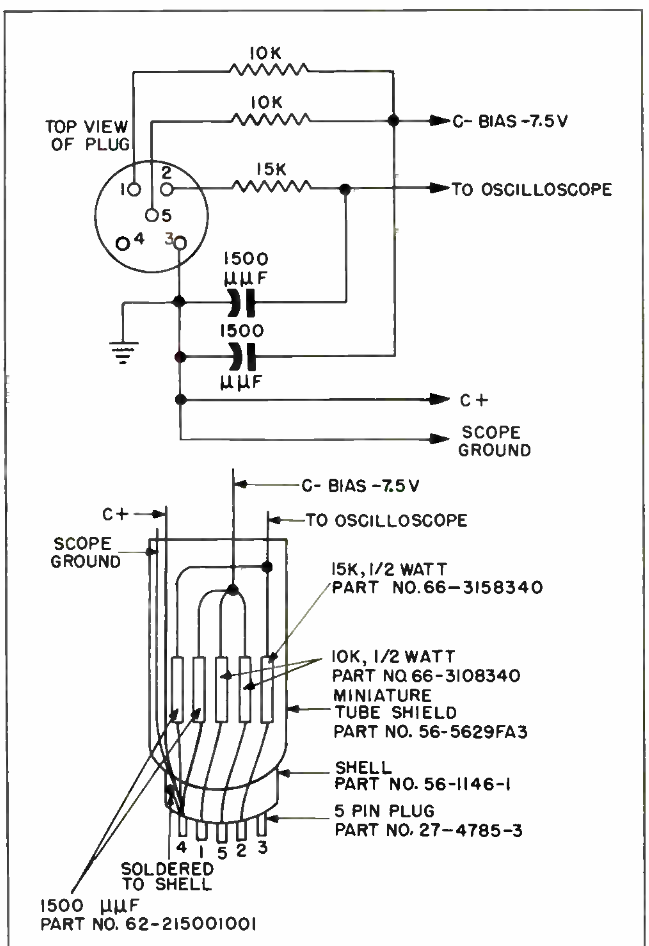


Figure 1. Video I-F Alignment Jig

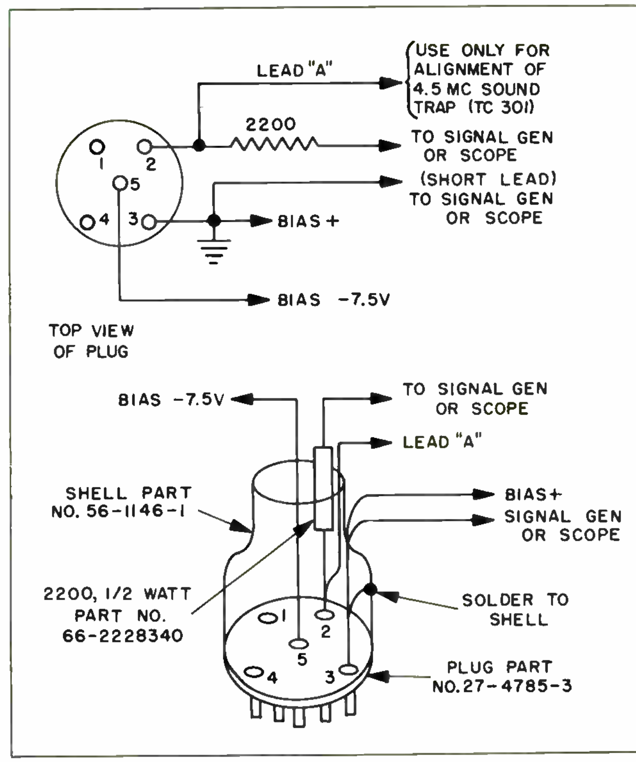


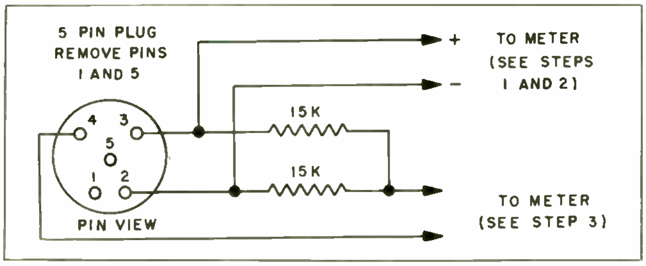
Figure 2. Sound I-F Input Alignment Jig

Video I-F Alignment Jig (VIDEO TEST Jack Adapter)

The alignment jig shown in figure 1 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, two 10,000-ohm resistors, and a 1500-μμf. condenser for isolation of the bias supply. To isolate the oscilloscope from the receiver circuits, a 15,000-ohm resistor, by-passed by a 1500-μμf. condenser, is used. A suggested method of fabricating the jig is also shown in figure 1. This jig should not be used to observe the composite video from the video-detector output.

Sound I-F Input Alignment Jig (VIDEO TEST Jack Adapter)

To observe the composite video, a jig may be made with a 5-pin plug and a 2200-ohm resistor. (See figure 2.) The 2200-ohm resistor should be connected to pin 2. A ground lead should be connected to pin 3. For convenience in applying bias to the a-g-c circuits, a lead should be connected to pin 5. To observe the composite video, connect the oscilloscope to the 2200-



TP2-1508

Figure 3. Sound I-F Output Alignment Jig

ohm resistor and the ground lead. This jig is also used for injection of the 4.5-mc. signal during sound i-f alignment.

Sound I-F Output Alignment Jig (FM TEST Jack Adapter)

Figure 3 shows the adapter that should be used to connect the voltmeter to the FM detector test socket, J402. Pins 1 and 5 are removed from a 5-pin plug, Part No. 27-4785-3, because a 3-pin plug with proper spacing is not readily available. The two 15,000-ohm resistors should be of 5% tolerance. They should be selected to be as nearly equal in resistance as possible, and connected to pins 2 and 3 on the plug. The free ends of the resistors are joined, so as to form a voltage divider across the discriminator tank condenser, C413. Leads should be brought out from pins 2 and 4, as shown in figure 3.

TELEVISION TUNER ALIGNMENT

After the tuner is serviced, or if an i-f alignment is required, 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-frequency 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 Channel 8 oscillator tuning core. See figure 4.

Procedure Using Signal Generators

An r-f signal (unmodulated), at the video carrier frequency of the channel, is fed into the antenna 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 is connected to the video detector output. The oscillator core is then adjusted for zero beat on each channel. The two generators should be accurately calibrated, as described in Philco Lesson PR-1745(J).

To align the oscillator, proceed as follows:

1. To observe the zero beat, connect the oscilloscope to the video-detector output through the video i-f alignment jig. See figure 1. Bias the tuner and i-f a-g-c circuits with 1.5 volts, and remove the Gate Pulse Plug, PL801, from the socket, J801. To apply bias to the tuner, connect the battery to the white lead which comes out of the top of the tuner. On later runs of this tuner, the white a-g-c lead connects to a feed-through condenser on top of the tuner. To make certain that good connection is made to the tuner a-g-c circuit, remove the glyptol coating on this condenser terminal before connecting the bias battery.

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 loop, 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 to the video carrier frequency of Channel 13, and connect the output to the antenna terminals of the receiver, through the proper matching jig.

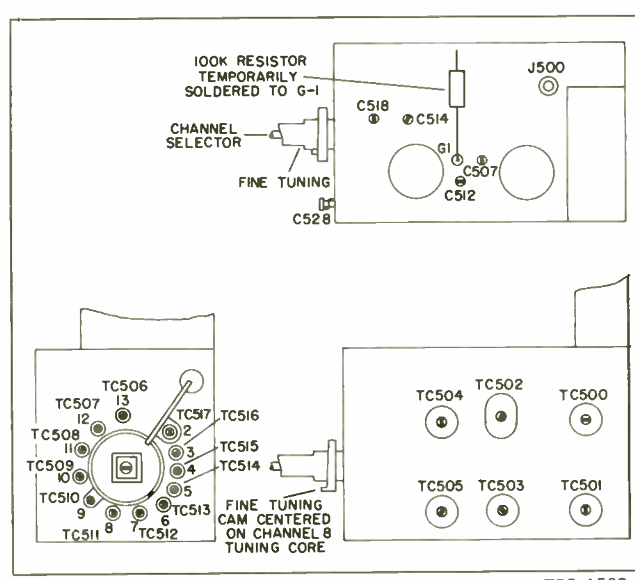
4. Mechanically preset the fine-tuning cam, as shown in figure 4, and set the CHANNEL SELECTOR to Channel 13.

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-frequency channel to the lowest, because the higher channel adjustments will affect the lower channels.

Procedure Using Stotion 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



TP2-1509

Figure 4. Television Tuner, Showing Locations of Adjustments

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 4.)

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-frequency channel and finishing with the lowest.

Tuner Bandpass Alignment

General

The bandpass alignment consists of aligning the tuner at Channel 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 white a-g-c lead.

An FM (sweep) signal is applied to the antenna 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 the 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. The scope controls should be adjusted so that the width of the presentation is 2 times the height. Overload may then be checked by changing the generator output while observing the shape of the response curve. When the generator output is changed the vertical gain of the oscilloscope should be readjusted to keep the scope presentation amplitude the same. Do not readjust the horizontal gain control. 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 antenna input of the tuner. The antenna input matching network shown in figure 2 of PR-2170 or the Philco Antenna Matching Jig, Part No. 45-1637, may be used for this purpose. Correct alignment cannot be obtained without the use of a suitable matching jig.

Regeneration in the test setup will also make it impossible to obtain correct alignment. To check for regeneration, 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 changes as the hand is moved along the cable, regeneration is indicated. A check for regeneration may also be made by adjusting the volume control until noise can be heard from the speaker. If the level of the noise changes as the hand is moved along the generator cable, regeneration is indicated. The symptoms which indicate regeneration may also be caused by failure to use the proper matching jig, as described above.

> CAUTION: When comparing the response curves from channel to channel, maintain the 2-to-1 width-to-height relationship in the oscilloscope presentation, as described above.

Procedure

1. Connect the FM (sweep) and AM marker generators to the 300-ohm antenna input through an antenna-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 7. Connect the ground lead of the oscilloscope as close to the mixer tube as possible.

3. Apply 1.5 volts bias to the white tuner a-g-c lead.

4. Disconnect the tuner coupling link at wiring panel B-13 terminals 1 and 4, and solder a 68-ohm, one-half watt carbon resistor to the open link coming from the tuner. See figure 7. Remove the first i-f tube from the socket.

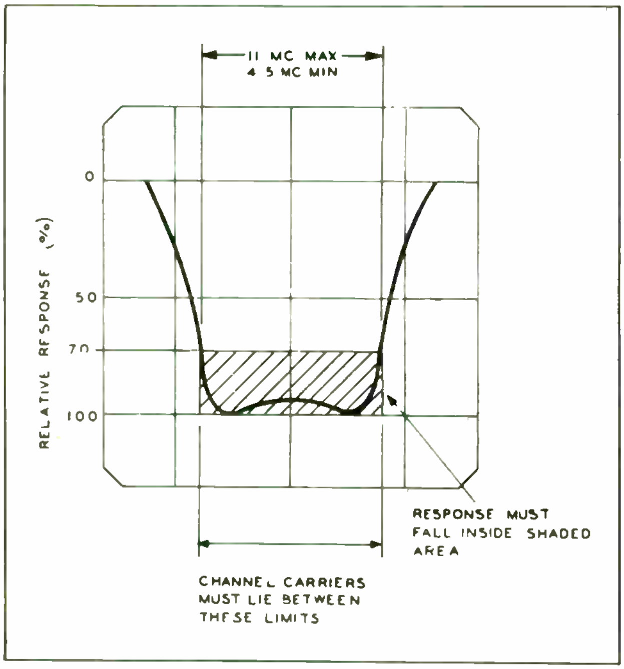
5. Set the CHANNEL SELECTOR and FM (sweep) generator to Channel 13 (213 mc.). Adjust the generator for sufficient sweep width to show the complete response curve.

6. Establish the channel limits (see figure 5) 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 should be reasonably flat between the limits.

7. Adjust TC502 and TC504 (figure 4) 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 antenna circuit is now tuned for the high band channels.

> NOTE: On later runs of the tuner, L506 is not tunable and TC500 is omitted; therefore the adjustments in step 7 should be confined to TC502 and TC504 when later run tuners are encountered.

8. Readjust TC502 and TC504 for a symmetrical response, centered about 213 mc., and falling within the specifications, as shown in figure 5.



TP9-512B-1

Figure 5. Television Tuner Response Curve, Showing Bandpass Limits

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., 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 6, adjust C507 and C512 (figure 4) 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 6A, adjust C506 and C514 until the curve appears as in figure 6B. 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 antenna 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 5. Channels 2 through 6 are now correctly aligned.

VIDEO I-F ALIGNMENT

Preliminary

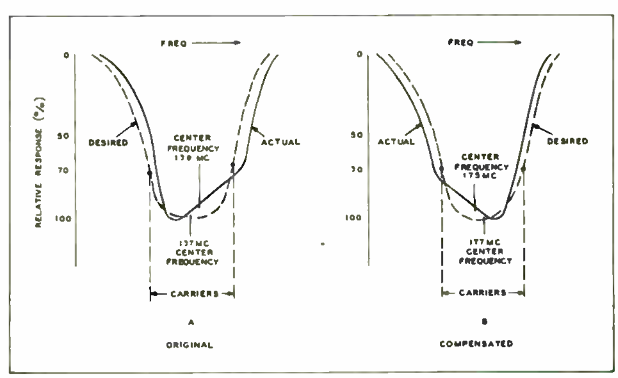
Before proceeding with the i-f alignment or making an alignment check, observe the following preliminary instructions:

1. Preset the CONTRAST and BRIGHTNESS controls to the maximum counterclockwise position.
2. Preset the CHANNEL SELECTOR to Channel 4.
3. Insert the VIDEO TEST jack adapter into J200.
4. Connect the oscilloscope to the 15,000-ohm resistor from the video i-f alignment jig. Connect the ground lead of the oscilloscope to the ground lead from the jig.
5. Connect a 7.5-volt battery to the a-g-c test jack, with the negative terminal to the bias lead and the positive terminal to the ground lead.
6. Connect the AM generator to the mixer test point, G1, through a mixer jig, and adjust the generator for approximately 30 percent modulation at 400 cycles.

> NOTE: If the i-f shield has been removed for repairs it must be replaced before proceeding with alignment.

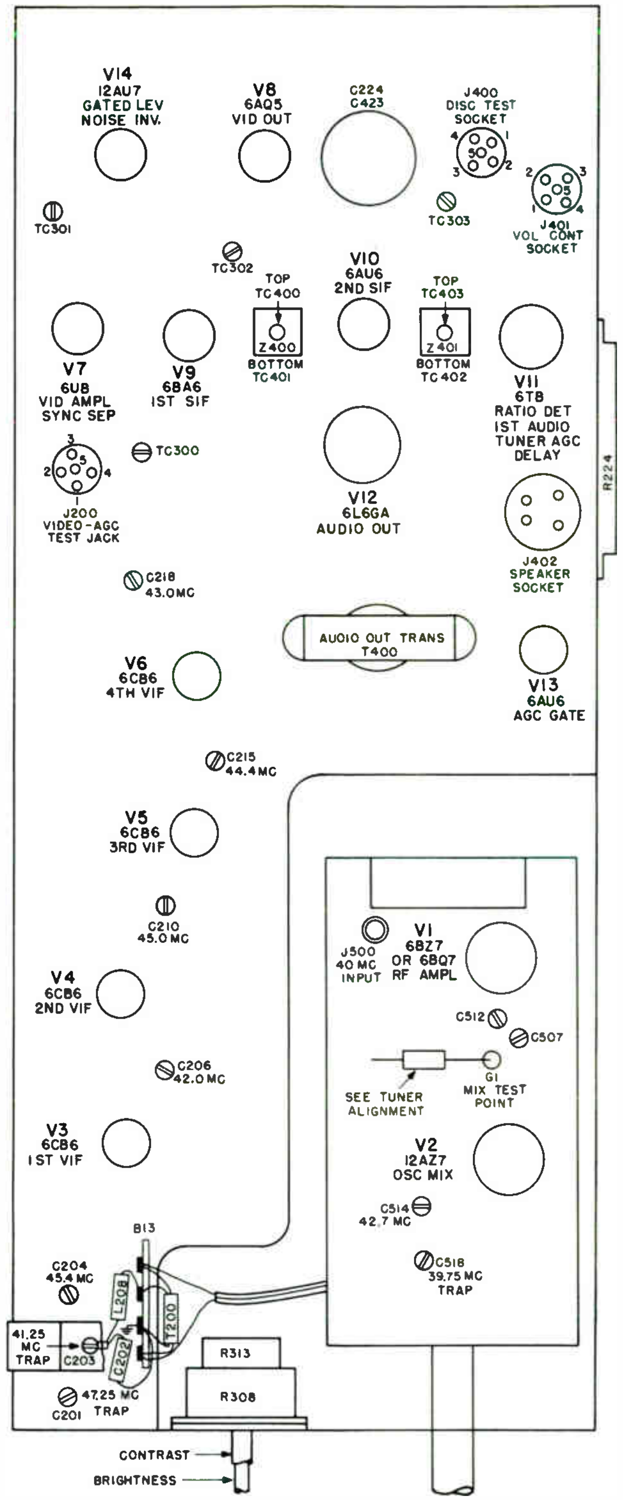
Procedure

1. Tune the AM generator to 39.75 mc., and adjust C518 (see figure 7) for minimum output, as observed on the oscilloscope.
2. Tune the AM generator to 47.25 mc., and adjust C201 for minimum output, as observed on the oscilloscope.
3. Tune the AM generator to 41.25 mc., and adjust C203 for minimum output, as observed on the oscilloscope.



TPO-1174

Figure 6. Television Tuner Response Curve, Showing Tracking Compensation



TP2-2242

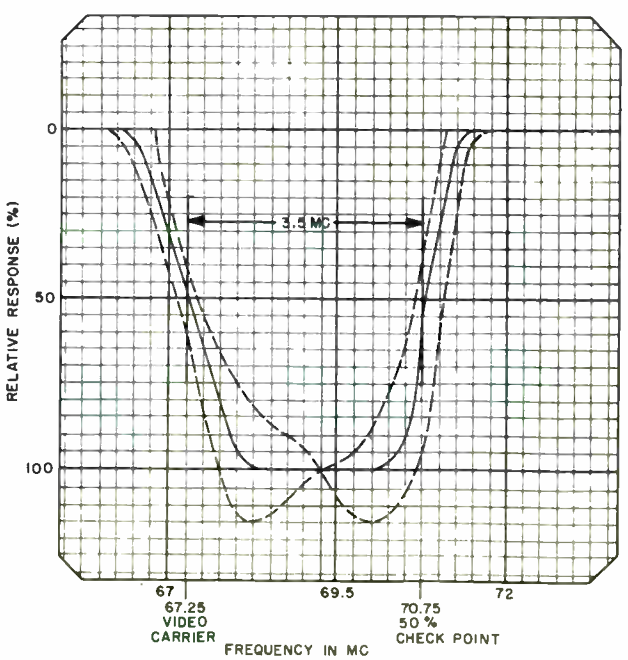
Figure 7. R-F Chassis 94, Top View, Showing Locations of Adjustments

NOTE: In steps 1, 2, and 3 it is necessary to keep the generator output sufficiently high so that a null indication may be observed on the oscilloscope. However avoid overloading of the receiver by excessive signal.

4. Tune the AM generator to the frequencies indicated below, and adjust the trimmers for maximum output.

   a. 42.7 mc.—adjust C514
   b. 45.4 mc.—adjust C204
   c. 42.0 mc.—adjust C206
   d. 45.0 mc.—adjust C210
   e. 44.4 mc.—adjust C215
   f. 43.0 mc.—adjust C218

5. Connect the sweep generator and r-f marker generator to the antenna terminals through a matching jig. (If a separate oscilloscope is used, connect the sweep output of the generator to the horizontal input of the oscilloscope.) Set the CHANNEL SELECTOR to Channel 4, and tune the sweep generator for output on Channel 4. Tune the r-f marker generator for the video-carrier frequency of Channel 4 (67.25 mc.), and tune the i-f marker generator (connected to mixer grid) to 45.75 mc. Note that two marker generators are used for this procedure. The r-f marker generator is connected to the antenna terminals, while the i-f marker generator is connected to the mixer grid test point, G1. A jig constructed from a piece of fiber tubing, with 3/16 inch inside diameter, and a brass machine screw which fits tightly into the tubing, is used to connect the generator to the test point. The screw is adjusted so that it clears the test point by approximately 1/64 inch. The output cable of the marker generator is connected to the head of the brass screw in the jig and to chassis near the mixer tube. Both marker generators should be adjusted for the minimum output required to make the markers barely visible. Failure to observe this precaution, or the use of excessive output from the sweep generator, will cause misleading results. After the equipment is properly connected, adjust the FINE



TP2-1511

Figure 8. Overall R-F, I-F Response Curve

TUNING control for zero-beat of the two markers, as observed on the oscilloscope. When zero beat is obtained remove the i-f marker.

6. If the response curve does not fall within the limits, as shown in figure 8, the adjustment of the trimmers may be touched up slightly, while observing the response curve with the sweep generator. Do not retouch the setting of C518, C201, C203, or C206. To adjust the curve, first adjust C215 and C218 alternately until maximum improvement has been obtained. C215 affects the tilt of the curve and C218 affects the dip of the curve. After C215 and C218 have been adjusted, adjust C514 for proper slope at the 42.25-mc. side of the curve, then adjust C204 and C210 for proper level at the video carrier (45.75 mc.).

CAUTION: Do not turn any of the trimmers excessively. To retouch, only turn the trimmers slightly.

SOUND I-F ALIGNMENT

The sound i-f system may be aligned by means of the station signal or by using an accurately calibrated signal generator as the signal source. If the station signal is used, tune the fine-tuning control for the best picture, regardless of sound. It will be necessary to reduce the signal input to the receiver so that the d-c output at the sound detector, as measured between pins 2 and 3 of J400, is kept below 10 volts maximum, and preferably below 5 volts. In strong-signal areas this may require shorting of the antenna terminals and the application of bias to the a-g-c circuit. The signal input to the receiver may be adjusted by varying the length of the shorting lead. The bias may be applied to the a-g-c circuit by means of the jig shown in figure 2. The sound i-f output alignment jig shown in figure 3 should be used, for convenient connection of the meter to the sound detector output.

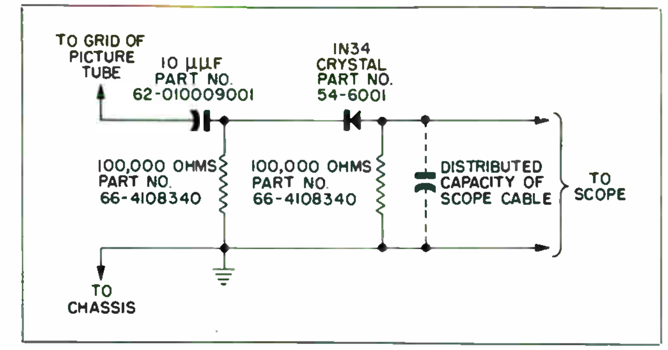
When a signal generator is used, bias should be applied to the a-g-c circuit, to aid in the reduction of circuit noises from the i-f system. The receiver should be adjusted to a channel on which no station can be received. The generator should be connected to pin 2 of J200 through the 2200-ohm resistor in the sound i-f input alignment jig. The generator should be adjusted for unmodulated output at 4.5 mc.

After the above conditions have been met, proceed as follows:

1. Connect the 20,000-ohms-per-volt meter to the leads from pins 2 and 3 of the sound i-f output alignment jig, negative terminal to pin 2 and positive terminal to pin 3.

2. Adjust TC300, TC400, TC401, and TC402 for maximum output, as indicated on the meter. If the output exceeds 10 volts, reduce the signal input to the receiver.

3. Connect the meter to the junction of the two 15,000-ohm resistors in the sound i-f output alignment jig and to pin 3. Adjust TC403 for zero crossover. Zero crossover is indicated by a zero indication on the meter; when TC403 is turned in one direction from this zero point, the meter will swing positive, and when it is turned in the opposite direction, the meter will swing negative. (To aid in reading a positive and negative swing of the meter, set the pointer, by means of the zero-adjust screw, to a convenient calibration mark on the scale before connecting to the circuit.)



TP2-2670

Figure 9. R-F Probe for Sound-Trap Adjustment

ADJUSTMENT OF 4.5-MC. TRAP

To adjust the 4.5-mc. trap in the plate circuit of the first video amplifier, proceed as follows:

1. Connect the output of an AM r-f signal generator to the lead from pin 2 (lead "A") of the sound i-f input alignment jig (see figure 2). Adjust the generator for 4.5-mc., 400-cycle modulated output. Set the output attenuator for maximum output from the generator.

2. Connect the input of r-f probe, shown in figure 9, to the grid of the picture tube, and connect the output of the probe to the vertical input of the oscilloscope. Adjust the vertical gain of the oscilloscope to maximum. Adjust the horizontal sweep of the oscilloscope for 400 cycles.

3. Adjust TC301 for minimum indication on the oscilloscope. (The normal setting for TC301 is with the screw approximately ⅝ inch out from the chassis.)

An alternate method for adjustment of TC301 may be used if a 4.5-mc. generator is not available. To adjust TC301 without the generator, proceed as follows:

1. Tune in a strong station signal.

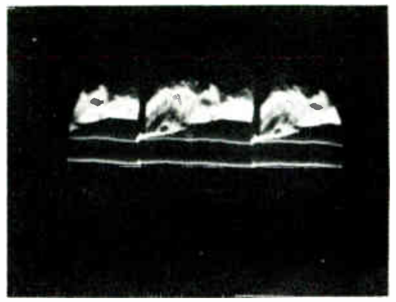
2. Turn the FINE TUNING control in the clockwise direction until a fine beat pattern appears in the picture.

3. Adjust TC301 until the beat disappears or is at a minimum. When correctly adjusted, the screw will be out from the chassis approximately ⅝ inch.

4. If more than one station is available, check the setting of TC301 on all stations.

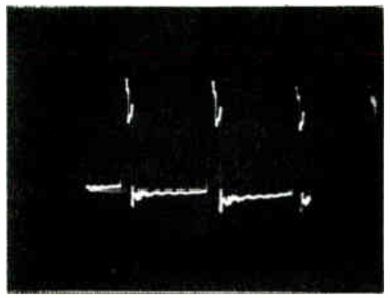
OSCILLOSCOPE WAVEFORM PATTERNS

The waveforms were taken with the receiver adjusted for 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 waveforms—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, and the peak voltages will differ from those shown.



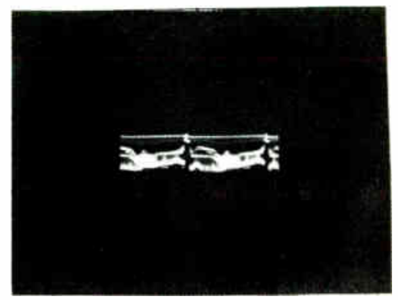
TP1-1200-A

Figure 10. Video Detector Output, Pin 2 of J200
2 volts, 60 c.p.s.



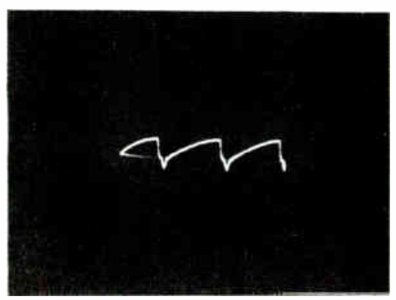
TP2-651

Figure 11. Gate Pulse Plug, Pin 4
500 volts, 15,750 c.p.s.



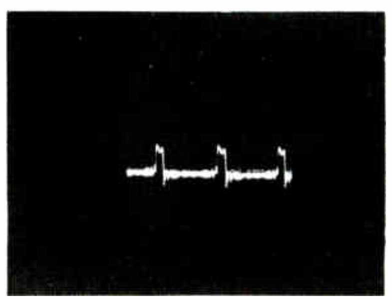
TP2-653

Figure 12. A-G-C Gate Grid, Pin 1
22 volts, 60 c.p.s.



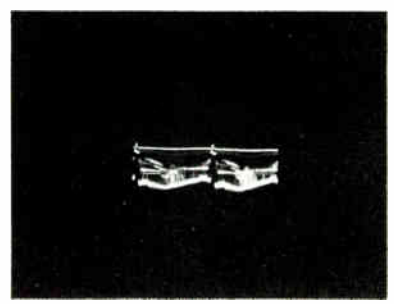
TP2-656

Figure 13. Gate Pulse Plug, Pin 3
10 volts, 15,750 c.p.s.



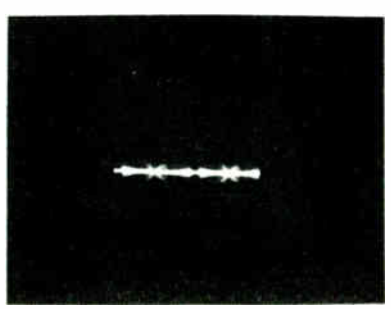
TP2-655

Figure 14. Gated Leveler Grid, Pin 2
2.5 volts, 15,750 c.p.s.



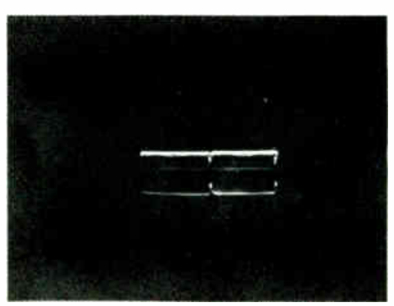
TP2-657

Figure 15. Noise Inverter Plate, Junction of R605, C602, and C603
23 volts, 15,750 c.p.s.



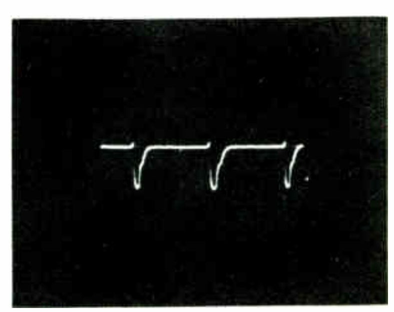
TP2-658

Figure 16. Noise Inverter Cathode, Pin 8
Wave shape and amplitude vary with noise



TP2-659

Figure 17. Sync Separator Plate, Pin 1
17 volts, 60 c.p.s.

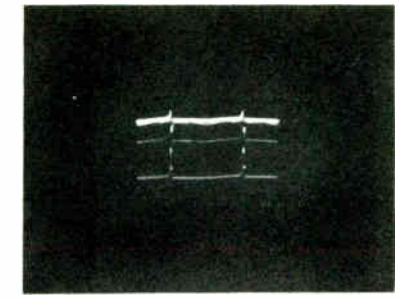


TP2-660

Figure 18. Sync Separator Plate, Pin 1
17 volts, 15,750 c.p.s.

TP2-639

Figure 19. Phase Splitter Grid, Pin 7
14 volts, 60 c.p.s.

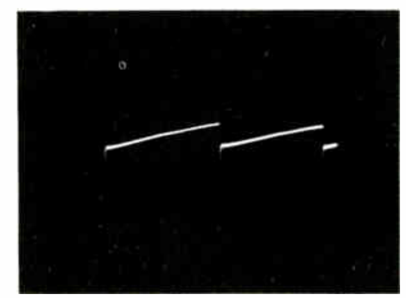


TP2-640

Figure 20. Phase Splitter Plate, Pin 6
30 volts, 60 c.p.s.

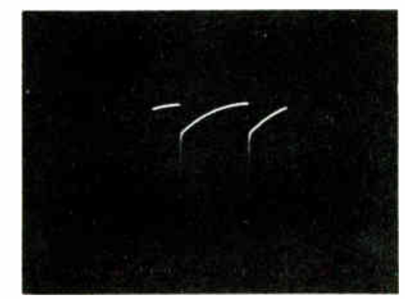
TP2-643

Figure 21. Vertical Oscillator Grid, Pin 2
165 volts, 60 c.p.s.



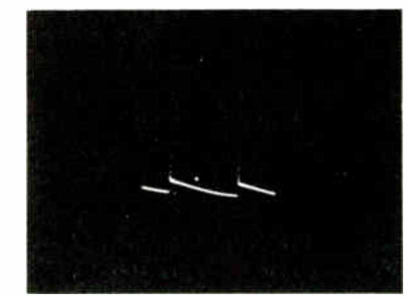
TP2-697

Figure 22. Vertical Oscillator Plate, Pin 1
130 volts, 60 c.p.s.



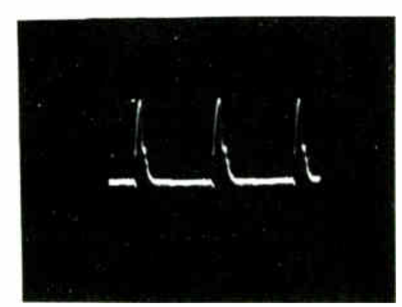
TP2-644

Figure 23. Vertical Output Grid, Pins 2 and 7
120 volts, 60 c.p.s.



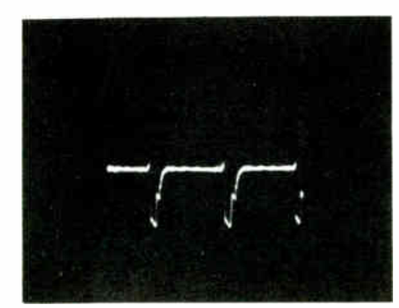
TP2 645

Figure 24. Vertical Output Plate, Pins 6 and 1
450 volts, 60 c.p.s.



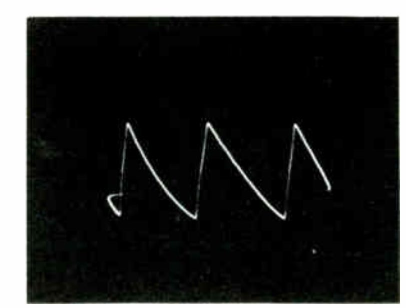
TP2-641

Figure 25. Phase Splitter Plate, Junction of R614, R615, and C800
10 volts, 15,750 c.p.s.



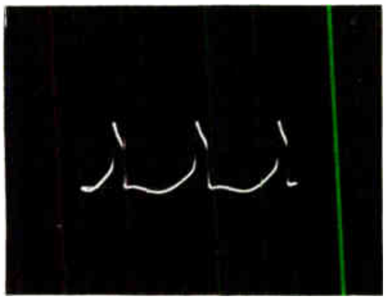
TP2-642

Figure 26. Phase Splitter Cathode, Pin 8
10 volts, 15,750 c.p.s.



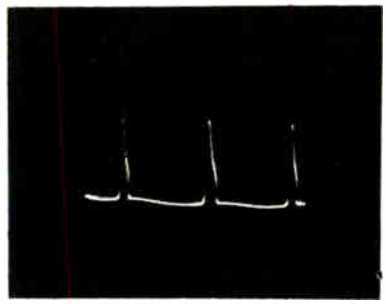
TP2-652

Figure 27. Phase Comparer, Pins 5 and 6
6 volts, 15,750 c.p.s.



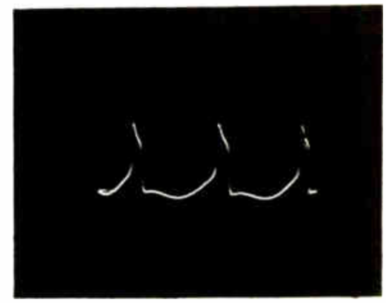
TP2-646

Figure 28. Horizontal Oscillator, Junction of L800, R806, and C806
35 volts, 15,750 c.p.s.



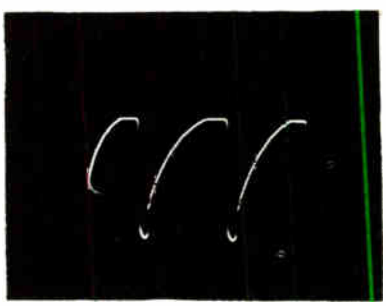
TP2-647

Figure 29. Horizontal Oscillator Cathode, Pins 8 and 3
16 volts, 15,750 c.p.s.



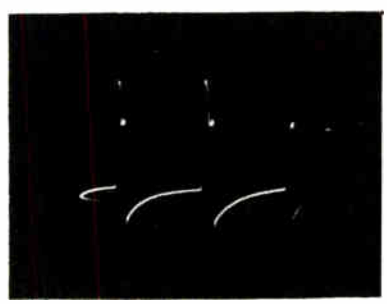
TP2-648

Figure 30. Horizontal Oscillator Grid, Pin 2
38 volts, 15,750 c.p.s.



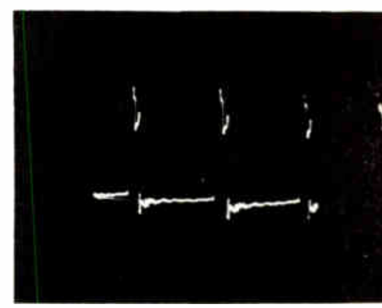
TP2-649

Figure 31. Horizontal Output Grid, Pin 5
130 volts, 15,750 c.p.s.



TP2-650

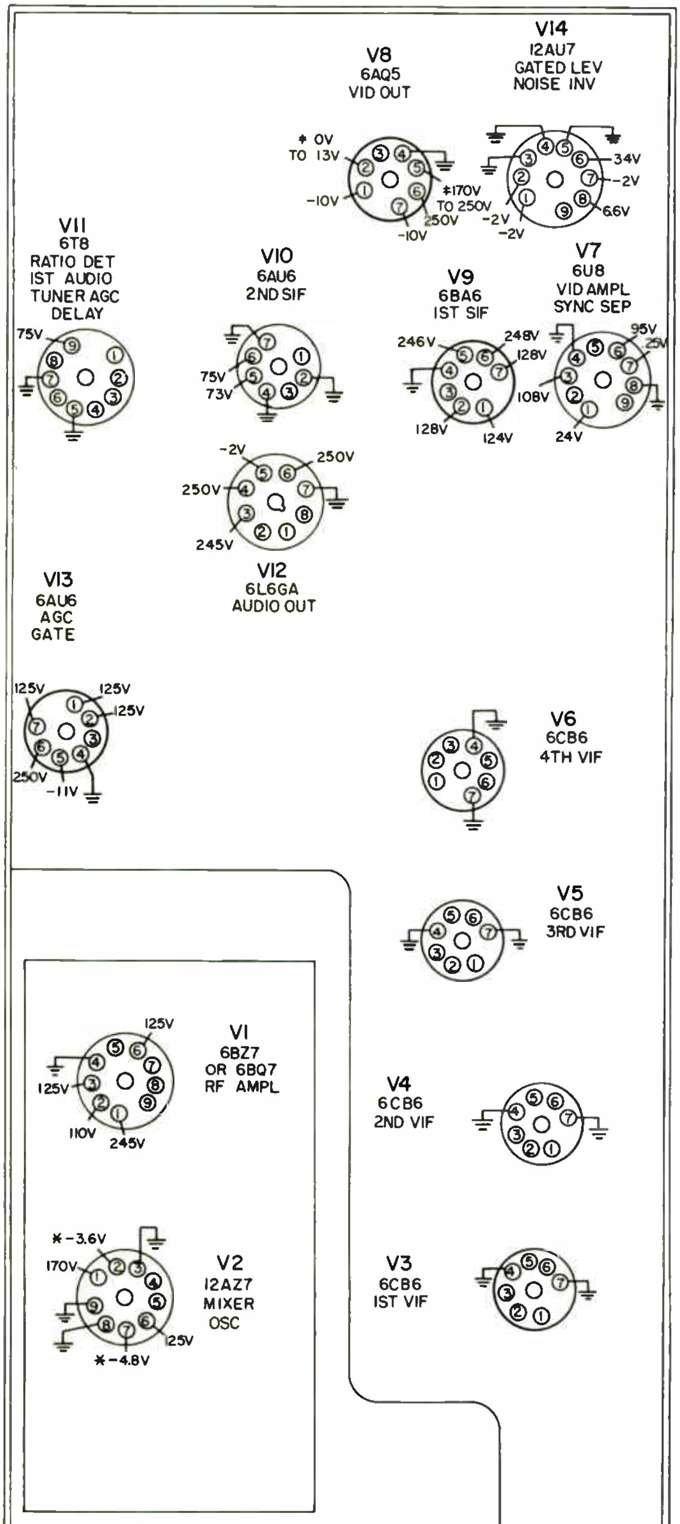
Figure 32. Horizontal Deflection Yoke. *Pin 7 of J800
3000 volts, 15,750 c.p.s.
***SEE CAUTION below.**



TP2-651

Figure 33. Gate Pulse Socket, Pin 4 of J801
500 volts, 15,750 c.p.s.

*CAUTION: High-voltage pulses are present in the horizontal-output circuit. The waveform in figure 32 was taken with the alligator clip of the oscilloscope lead clipped over the insulation of the lead connected to pin 7 of J800. (To prevent puncture of the insulation of the lead, file off the teeth of the alligator clip and wrap friction tape around the clip.) Connection to other points in the horizontal-output circuit is dangerous, due to the high voltages present. The peak-to-peak voltage shown for figure 32 is the actual voltage present, however the amplitude of the scope presentation depends upon the degree of coupling.

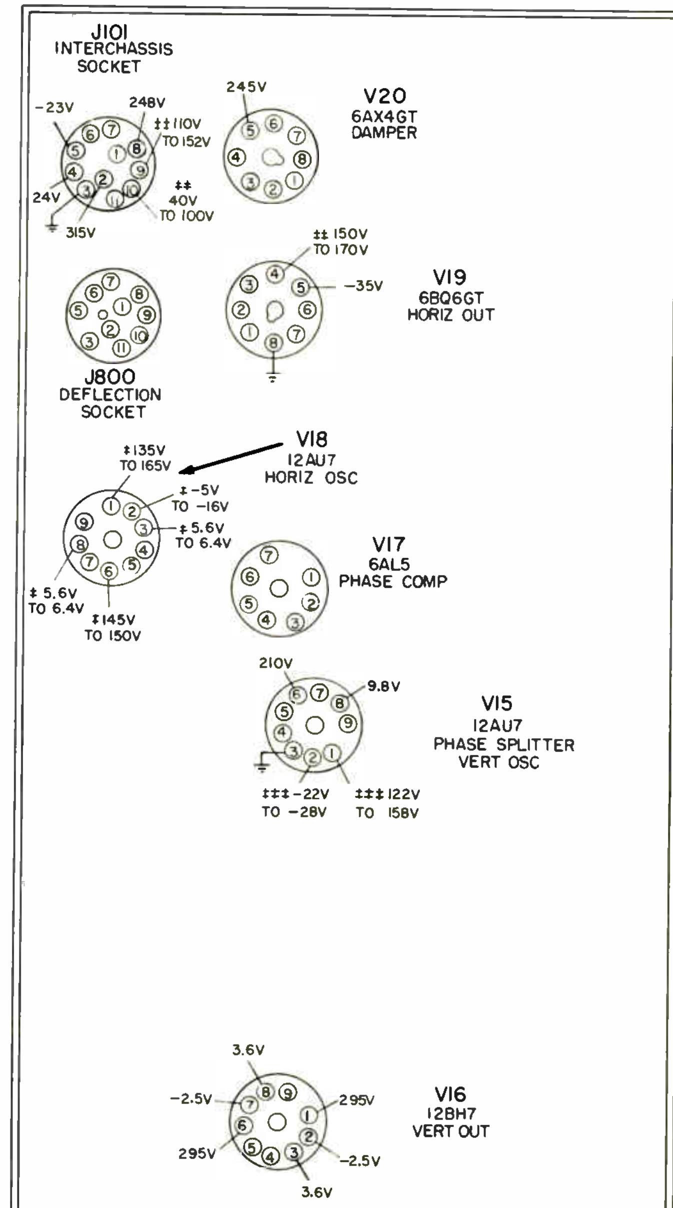


*VOLTAGE MEASURED WITH A 10,000 OHM RESISTOR IN SERIES WITH METER PROBE

‡ VOLTAGE VARIES WITH CONTRAST CONTROL SETTING

TP2-2243

Figure 34. R-F Chassis 94, Bottom View, Showing Voltages at Socket Pins



‡ VARIES WITH HORIZ HOLD AND HORIZ HOLD CENTERING CONTROL SETTING

‡‡ VARIES WITH BRIGHTNESS CONTROL SETTING

‡‡‡ VARIES WITH VERT HOLD CONTROL SETTING

TP2-2244

Figure 35. Deflection Chassis J-4, Bottom View, Showing Voltages at Socket Pins

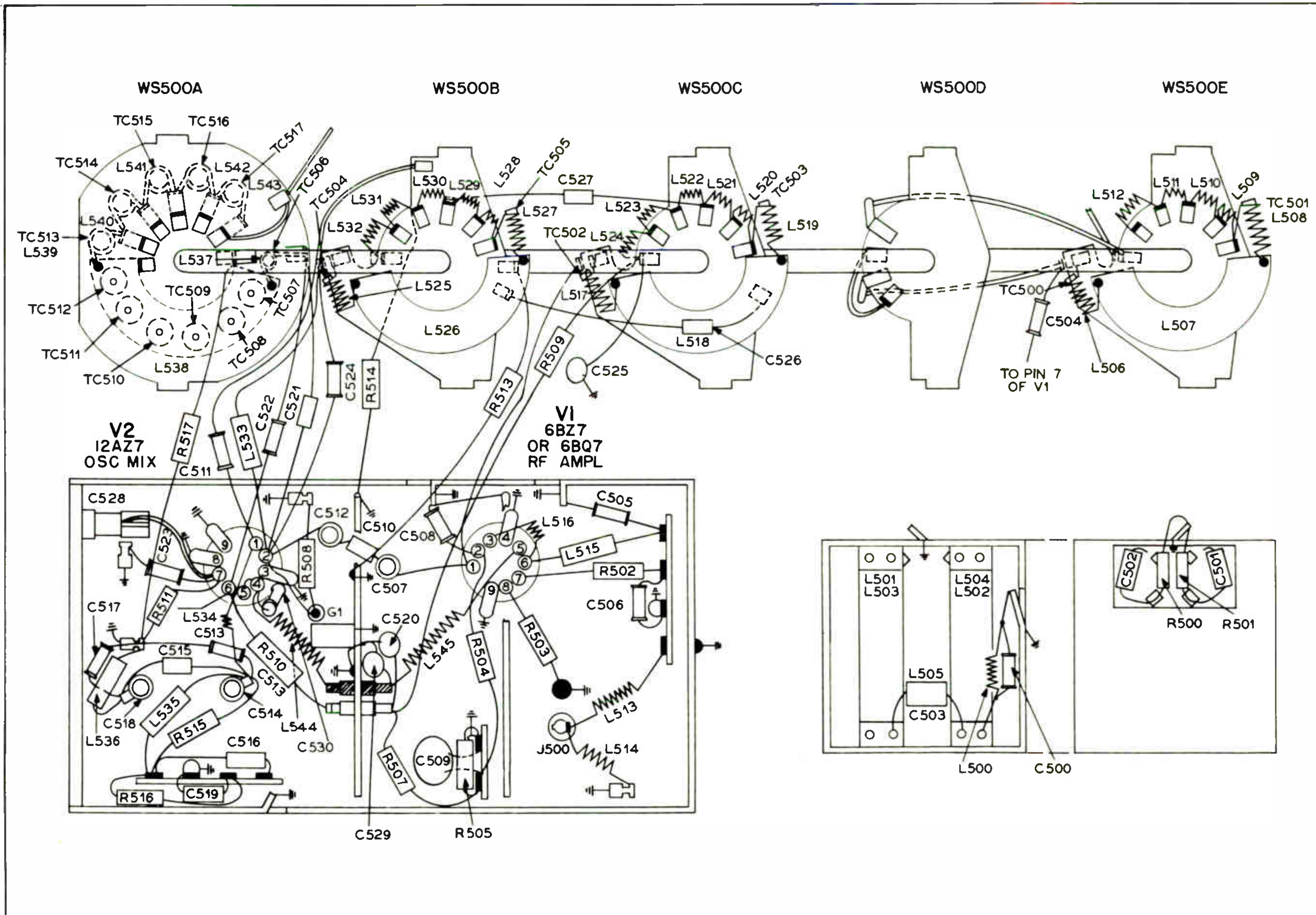
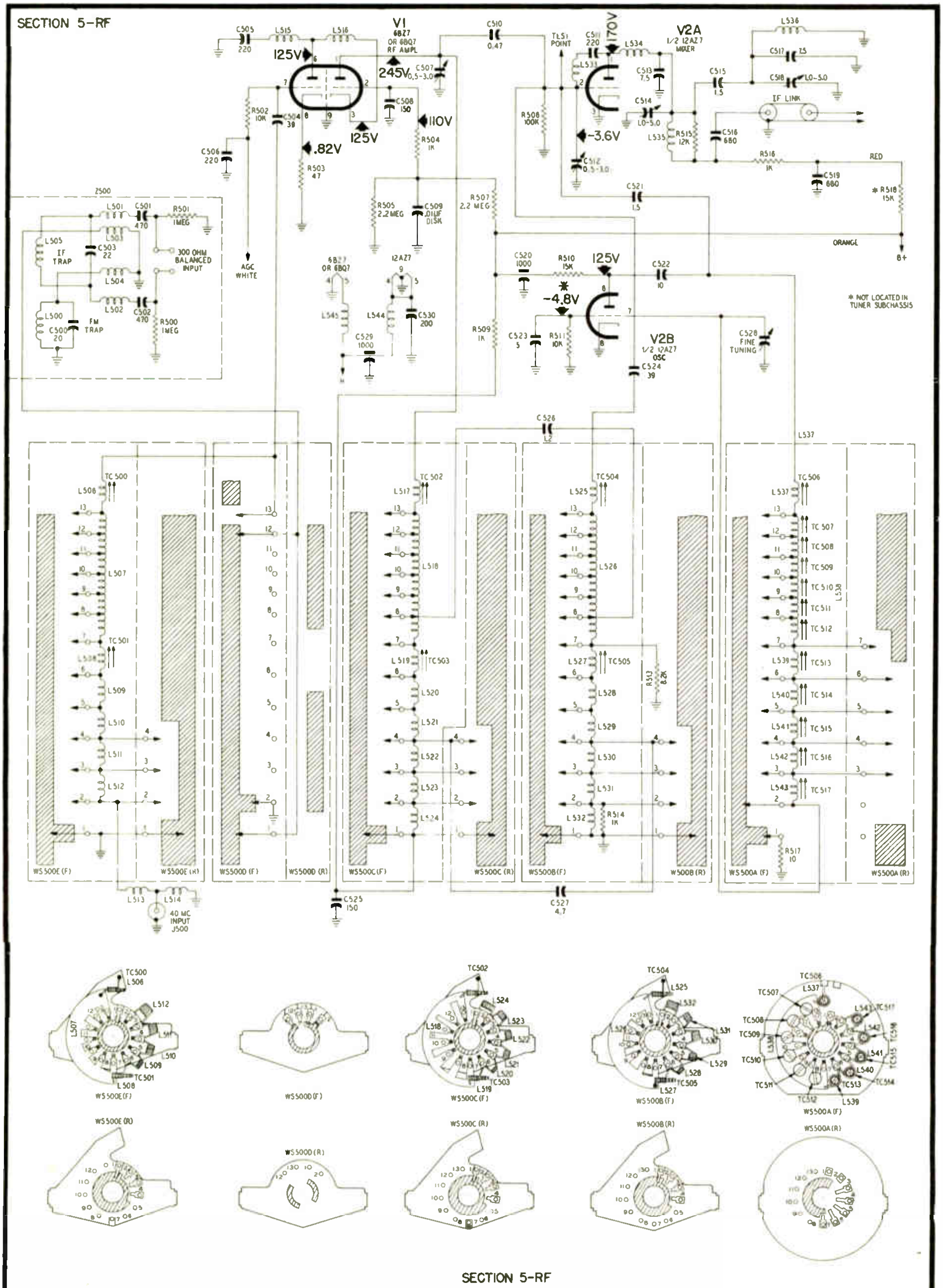


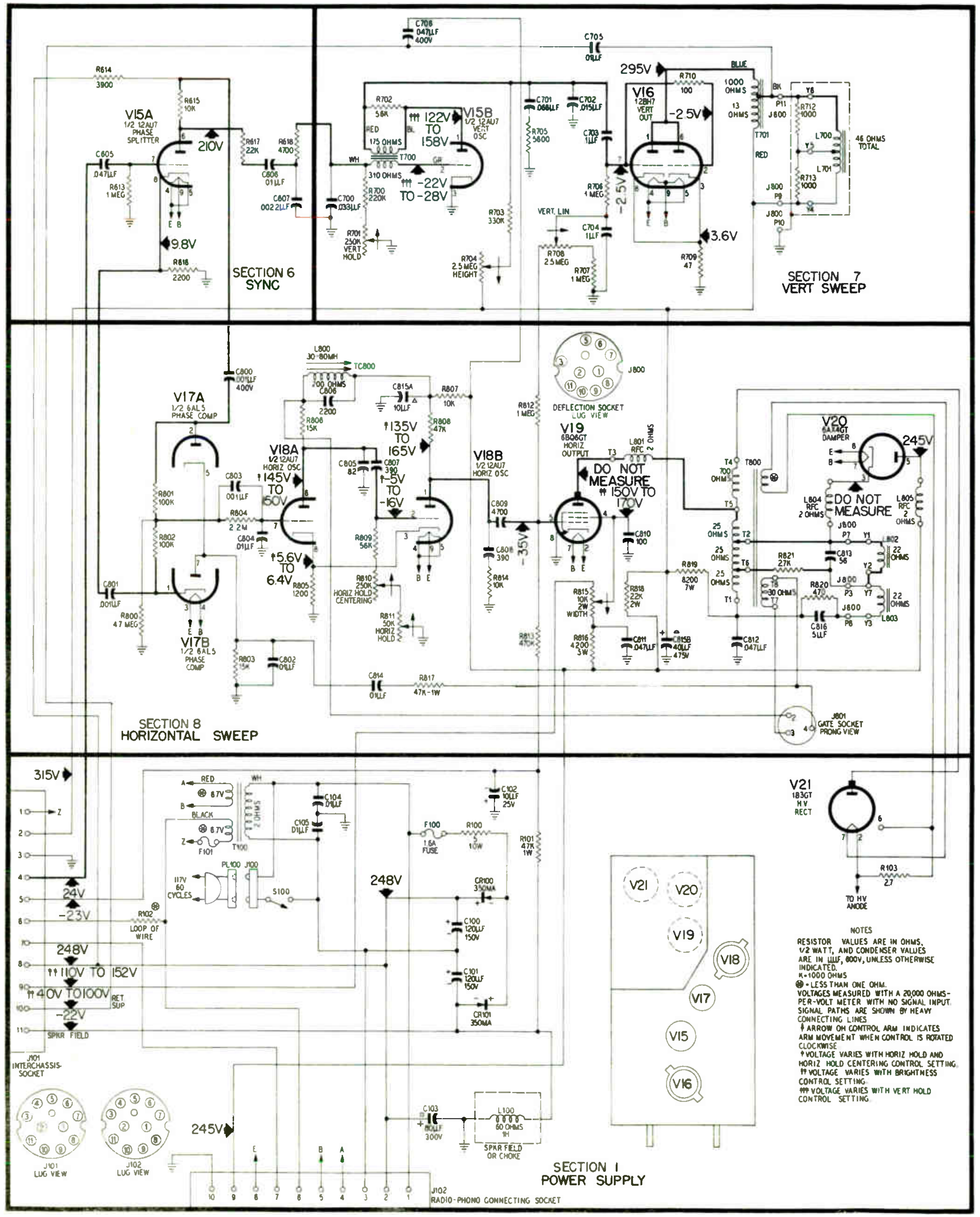
Figure 36. Television Tuner, Part No. 76-7600, Base Layout

TP2-1518



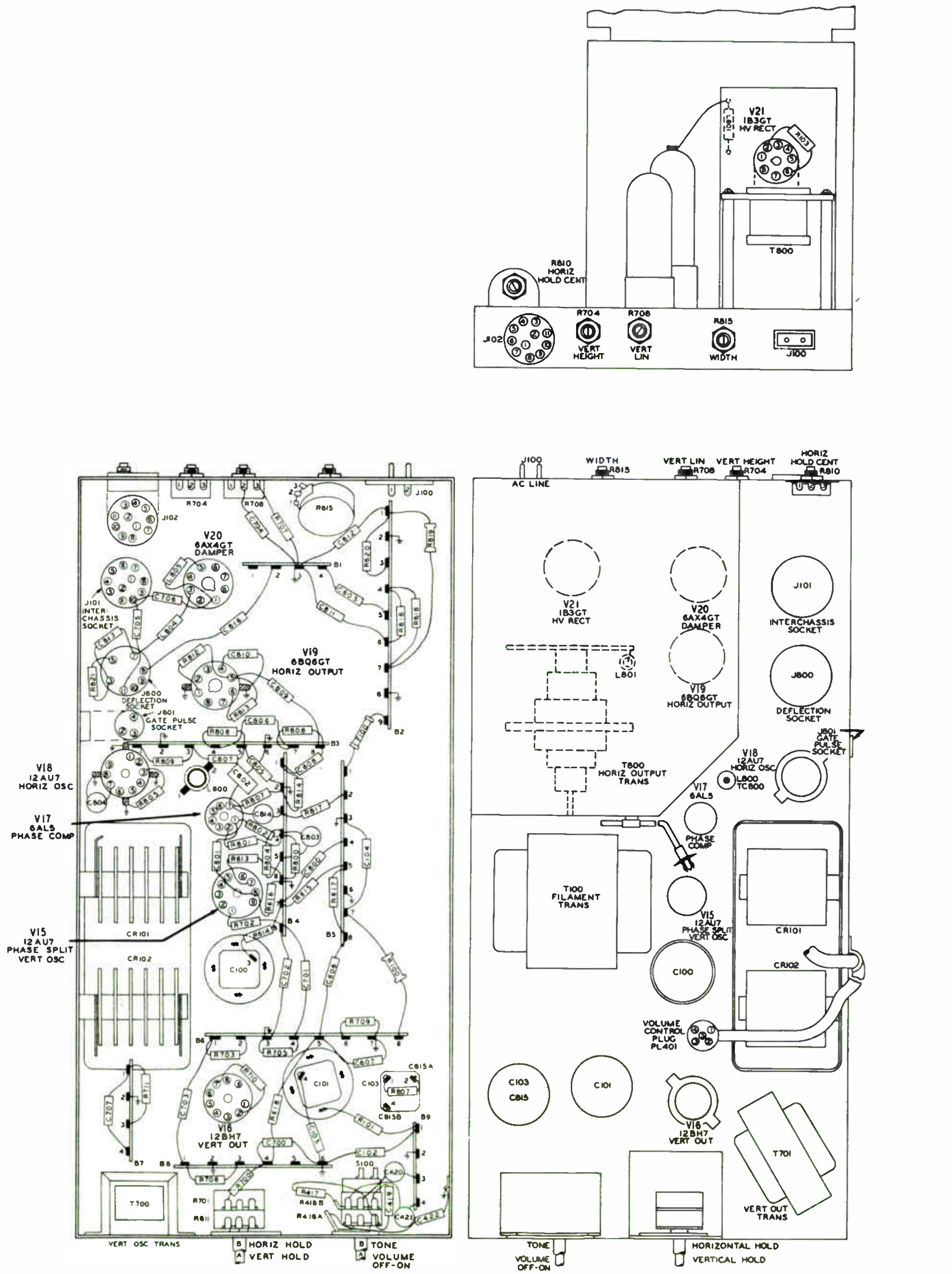
TP2-2245

Figure 37. Television Tuner, Part No. 76-7600, Schematic Diagram



TP2-2248

Figure 40. Deflection Chassis J-4, Schematic Diagram



TP2-2249

Figure 41. Deflection Chassis J-4, Base Layout

REPLACEMENT PARTS LIST

IMPORTANT

General replacement items commonly stocked by the serviceman are omitted from this parts list. All condensers 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 should be ordered in this way rather than by model number. A list of miscellaneous parts is given at the end of the parts list for each chassis type. All parts are symbolized in the schematic diagram and base layout, for identification purposes.

NOTE: Part numbers identified by an asterisk (*) are general replacement items. These numbers may not be identical with those on factory parts. Also, the electrical values of some replacement items may differ from the values indicated in the schematic diagram and parts list. The values substituted in any case are so chosen that the operation will either be unchanged or improved. When ordering replacements, use only the "Service Part No."

DEFLECTION CHASSIS J-4

SECTION 1—POWER SUPPLY

Reference Symbol	*Description*	*Service Part No.*
C100 and C101	Condenser, filter, electrolytic, 120 µf, 150v	30-2568-51*
C102	Condenser, filter, electrolytic, 10 µf, 25v	30-2417-3
C103	Condenser, filter, electrolytic, 80 µf, 300v	30-2584-20
CR100 and CR101	Rectifier, selenium, 350 ma.	34-8003-7
F100	Fuse, line, 1.6 amperes	45-2656-23
J100	Socket, a-c line	27-6240-3
J101	Socket, television chassis connecting	27-6274-1
J102	Socket, radio chassis connecting	27-6274-4
L100	Choke, 1 henry (part of EM speaker)	Speaker field
L100	Choke, 1 henry (used with PM speaker)	32-8605
PL100	Plug, a-c line	Part of line cord ass'y. (See Misc. "A")
PL101	Plug and cable ass'y., television chassis connecting	(See Misc. "B")
PL102	Plug and cable ass'y., radio chassis connecting	See parts list of radio tuner used
R100	Resistor, current limiting, 5 ohms, 10 watts	33-3448-5
R101	Resistor, filter, 47,000 ohms, 1 watt	66-3474340
R102	Resistor, voltage dropping .24 ohm	41-4149
R103	Resistor, voltage dropping, 2.7 ohms, 1 watt	66-9274360
S100	Switch, off-on	Part of volume control
T100	Transformer, filament	32-8575

SECTION 7—VERTICAL SWEEP

Reference Symbol	*Description*	*Service Part No.*
L700 and L701	Coils, vertical deflection	Part of deflection yoke (See Misc. "A")
R701	Potentiometer, VERT. HOLD control, 250,000 ohms	Part of R811
R704	Potentiometer, HEIGHT control, 2.5 megohms	33-5565-31
R708	Potentiometer, VERT. LIN. control, 2.5 megohms	33-5565-31
T700	Transformer, vertical oscillator	32-8431-2*
T701	Transformer, vertical output	32-8577-1*

SECTION 8—HORIZONTAL SWEEP

Reference Symbol	*Description*	*Service Part No.*
C803	Condenser, by-pass, .005 µf.	30-1238-1
C804	Condenser, grid blocking, .01 µf.	30-1238-2
C805	Condenser, by-pass, 100 µµf., ±5%	60-10105417*
C807	Condenser, d-c blocking, 390 µµf., ±5%	60-10395417
C808	Condenser, charging, 390 µµf.	60-10395417
C810	Condenser, screen by-pass, 100 µµf.	60-00825317
C813	Condenser, anti-ringing, 56 µµf.	30-1243-5
C815	Condenser, electrolytic	Part of C103
C815A	Condenser, by-pass, 10 µf.	Part of C103
C815B	Condenser, by-pass, 40 µf., 475v	Part of C103
J800	Socket, deflection	27-6274-7
J801	Socket, gate pulse	27-6273
L800	Coil, stabilizing, 30—80 mh.	32-4557
L801	Coil, r-f choke, horizontal-output plate	Part of T800
L802 and L803	Coils, horizontal deflection	Part of deflection yoke (See Misc. "A")
L804	Coil, r-f choke, damper cathode	32-4112-24
L805	Coil, r-f choke, damper plate	32-4112-24
PL800	Plug, gate pulse	Part of cable ass'y. (See Misc. "B")
PL801	Plug, deflection	Part of cable ass'y. (See Misc. "A")
R810	Potentiometer, HORIZ. HOLD CENTERING	33-5565-17
R811	Potentiometer, HORIZ. HOLD control, 200,000 ohms	33-5563-50
R815	Potentiometer, WIDTH control, 10,000 ohms, 2 watts	33-5546-41
R816	Resistor, screen voltage dropping, 3900 ohms, 2 watts	66-2395340
R817	Resistor, feedback, 47,000 ohms, 1 watt	66-3474340
R818	Resistor, voltage divider, 22,000 ohms, 2 watts	66-3225340
R819	Resistor, voltage divider, 3900 ohms, 2 watts	66-2395340
T800	Transformer, horizontal output	32-8565

REPLACEMENT PARTS LIST (Cont.)

DEFLECTION CHASSIS J-4 (Cont.)

MISCELLANEOUS "A"

Description	*Service Part No.*
Arm and magnet ass'y., picture tube	76-6594
Beam bender	76-6077-2
Cable assembly, high voltage, picture tube	41-4664-6*
Cable and plug assembly, deflection	41-4086-25
Cable and plug assembly, volume control	41-4136-2
Cord, line	41-3865
Focus assembly	76-6126-4
Insulator, electrolytic condenser mounting	27-9508-1

MISCELLANEOUS "A" (Cont.)

Description	*Service Part No.*
Shield, corona	56-9684
Socket, damper tube	27-6174-7
Socket, high-voltage rectifier	27-6290-1
Socket, miniature, 7 pin	27-6203*
Socket, miniature, 9 pin	27-6203-6*
Socket, octal	27-6174
Socket, 12BH7 and 12AU7 tubes	76-6115
Yoke, deflection	32-9648

R-F CHASSIS 94

SECTION 2—VIDEO I.F.

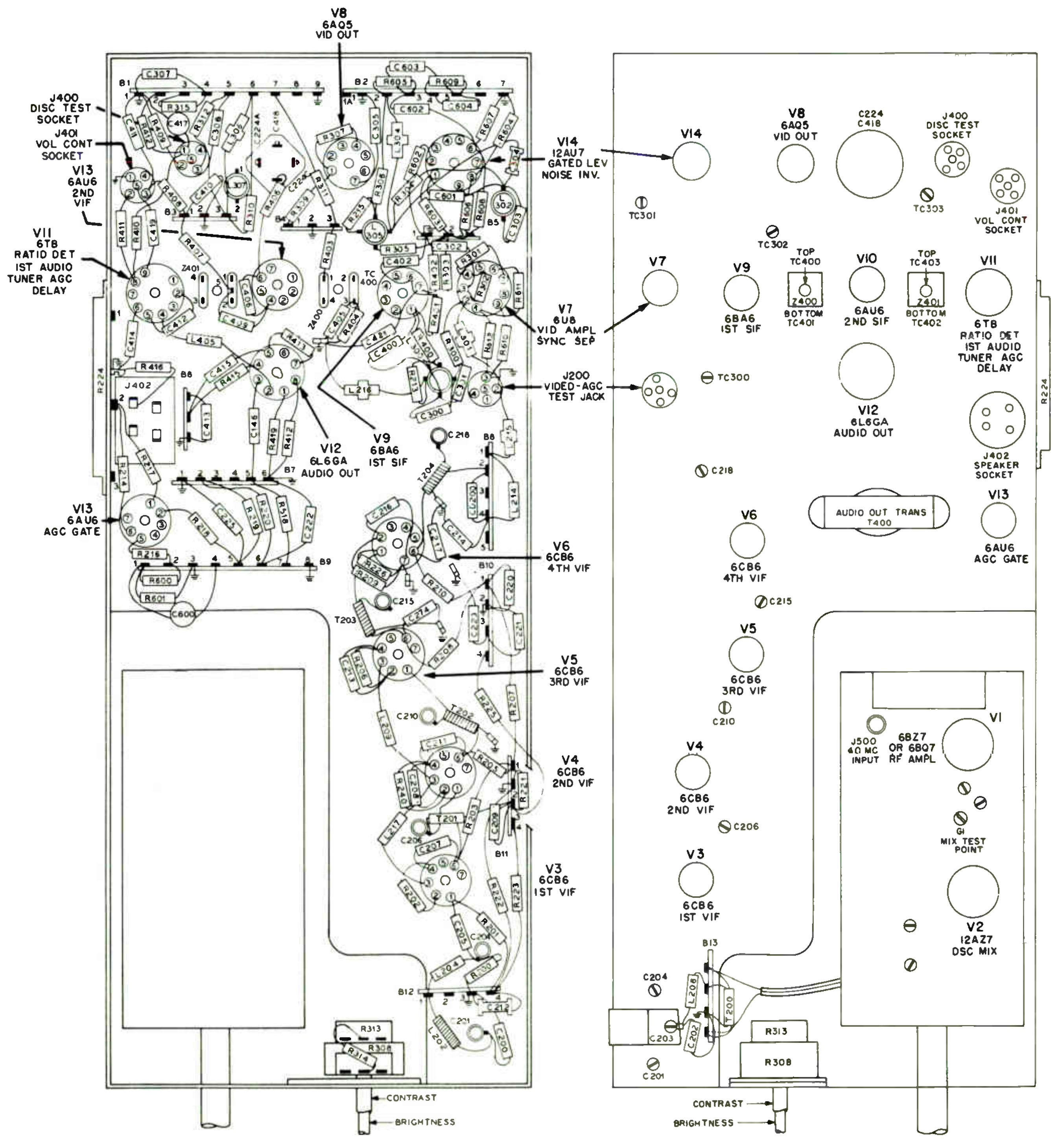
Reference Symbol	*Description*	*Service Part No.*
C200	Condenser, 47.25-mc. trap, 10 µµf.	60-00105417
C201	Condenser, trimmer, 47.25-mc. trap, 1 to 5 µµf.	31-6520-9
C202	Condenser, 41.25-mc. trap, 5 µµf.	30-1224-28
C203	Condenser, trimmer, 41.25-mc. trap, 1 to 5 µµf.	31-6520-9
C204	Condenser, trimmer, 1 to 5 µµf.	31-6520-9
C205	Condenser, d-c blocking, 12 µµf.	31-6520-9
C206	Condenser, trimmer, 1 to 5 µµf.	31-6520-9
C209	Condenser, a-g-c by-pass, 680 µµf.	62-168001001*
C210	Condenser, trimmer, 1 to 5 µµf.	31-6520-9
C211	Condenser, screen by-pass, 680 µµf.	62-168001001*
C212	Condenser, by-pass, 680 µµf.	62-168001001*
C215	Condenser, trimmer, 1 to 5 µµf.	31-6520-9
C217	Condenser, screen by-pass, 200 µµf.	31-6520-9
C218	Condenser, trimmer, 1 to 5 µµf.	31-6520-9
C219	Condenser, detector by-pass, 5 µµf.	30-1224-28
C220	Condenser, by-pass, 680 µµf.	62-168001001
C221	Condenser, by-pass, 680 µµf.	62-168001001
C223	Condenser, a-g-c filter, 2 µf.	30-2417-7
C224	Condenser, electrolytic	30-2584-24
C224A	Condenser, filter, 40 µf.	Part of C224
C224B	Condenser, filter, 10µf.	Part of C224
C224C	Condenser, filter, 10 µf.	Part of C224
CD200	Crystal, video detector, 1N64	34-8022
J200	Socket, video test	27-6273*
L200 and L201	Coils, tuner coupling	Part of T200
L202	Coil, 47.25 mc. trap	32-4548-15
L203	Coil, 41.25-mc. trap	32-4112-31
L204	Coil, 1st i-f grid	32-4112-31
L205 and L206	Coils, coupling	Part of T201
L207 and L208	Coils, coupling	Part of T202
L209	Coils, filament choke	32-4112-15
L210 and L211	Coils, coupling	Part of T203
L212 and L213	Coils, coupling	Part of T204

SECTION 2—VIDEO I.F. (Cont.)

Reference Symbol	*Description*	*Service Part No.*
L214	Coil, series peaking, 10 µh.	32-4422-27
L215	Coil, series peaking, 3 µh.	32-4143-22
L216	Coil, shunt peaking, 400 µh.	32-4480-5
L217	Coil, filament choke	32-4112-15
R224	Resistor, voltage dropping	33-3446-8
R224A	Resistor, 2000 ohms, 7 watts	Part of R224
R224B	Resistor, 400 ohms, 26 watts	Part of R224
T200	Transformer, video i-f input	32-4548-23
T201	Transformer, first video i-f	32-4548-24
T202	Transformer, second video i-f	32-4548-25
T203	Transformer, third video i-f	32-4548-26
T204	Transformer, fourth video i-f	32-4548-18

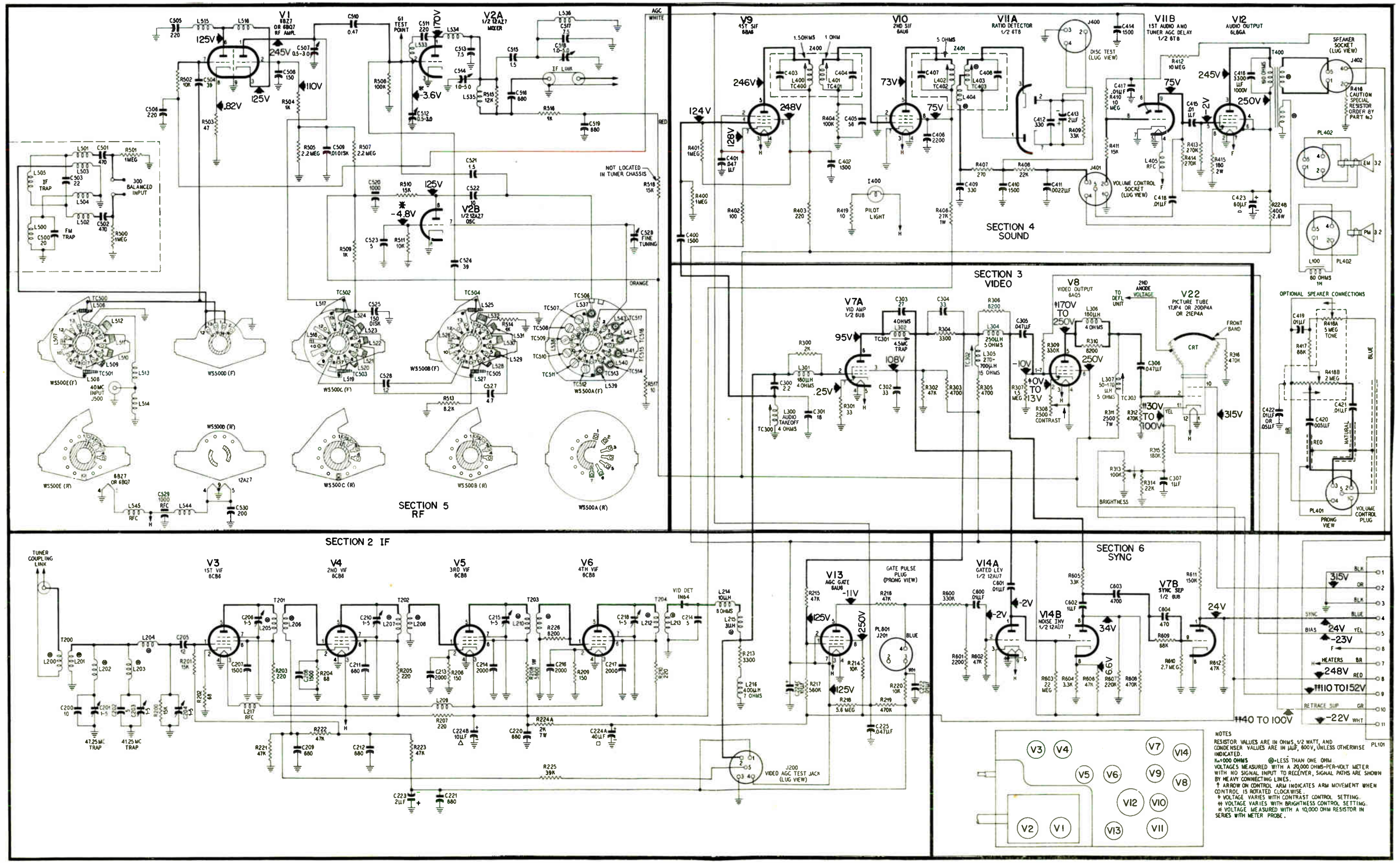
SECTION 3—VIDEO

Reference Symbol	*Description*	*Service Part No.*
C300	Condenser, audio take-off, 2.2 µµf.	30-1221-6
C301	Condenser, by-pass, 18 µµf.	62-018400021
C302	Condenser, screen by-pass, 33 µµf.	62-033009001
C303	Condenser, by-pass, 27 µµf.	66-027409001
C304	Condenser, by-pass, 33 µµf.	32-4463-7
L301	Coil, peaking, video amplifier grid, 180 µh.	32-4480-9
L302	Coil, 4.5-mc. trap	32-4463-9
L303	Coil, series peaking, 250 µh.	32-4480-4
L304	Coil, shunt peaking, 170 to 700 µh.	32-4467-11
L305	Coil, series peaking, 180 µh.	32-4480-9
L306	Coil, shunt peaking, 50 to 170 µh.	32-4467-7
R308	Potentiometer, CONTRAST control, 2000 ohms	33-5563-51
R311	Resistor, plate load, 2500 ohms, 7 watts	33-1335-93
R313	Potentiometer, BRIGHTNESS control, 100,000 ohms	Part of R308
R316	Resistor, grounding, 470,000 ohms, 1 watt	66-4474340



TP2-2246

Figure 38. R-F Chassis 94, Base Layout



TP2-2247

Figure 39. R-F Chassis 94, Schematic Diagram

REPLACEMENT PARTS LIST (Cont.)

R-F CHASSIS 94 (Cont.)

SECTION 4—AUDIO

Reference Symbol	Description	Service Part No.
C405	Condenser, by-pass, 56 μμf.	30-1224-25
C409	Condenser, detector, balancing, 330 μμf.	62-133001001
C412	Condenser, r-f by-pass, 330 μμf.	62-133001001
C413	Condenser, filter, 2 μf.	30-2417-7
C416	Condenser, plate by-pass, 6800 μμf., 1000 volts	45-3505-91
C418	Condenser, filter, 20 μf.	Part of C222
C423	Condenser, electrolytic filter, 60 μf.	Part of C224
J400	Socket, discriminator test	27-6273*
J401	Socket, volume control	27-6273*
J402	Socket, speaker	27-4785-22
L405	Coil, filament choke	32-4112-15
PL402	Plug and cable ass'y, speaker	**See Cabinet Parts List
R406	Resistor, voltage divider, 27,000 ohms, 1 watt	66-3274340
R416	Resistor, audio bias	33-1354
R417	Resistor, cathode bias, 180 ohms, 2 watts	66-1185340
R418	Potentiometer, dual	33-5563-44
R418A	Potentiometer, volume control, 2 megohms	Part of R418
R418B	Potentiometer, tone control, 5 megohms	Part of R418
T400	Transformer, audio output	32-8579
Z400	Transformer, first sound i-f	32-4449A*
Z401	Transformer, FM detector	32-4450-5

SECTION 6—SYNC

Reference Symbol	Description	Service Part No.
C604	Condenser, by-pass, 470 μμf.	30-1225-7

MISCELLANEOUS "B"

Description	Service Part No.
Cable and plug assembly, television chassis connecting	41-4146-5
Cable and plug assembly, gate pulse	41-4141
Cable and socket assembly, picture tube	41-3964-19
Cable and socket assembly, pilot light	27-6233-5*
Shield, 6CB6 tube	56-5629FA3
Shield, 6T8 tube	56-5629-5
Socket and base assembly, 6CB6 tube	27-6203-14
Socket and base assembly, 6T8 tube	27-6203-18
Socket, miniature, 6AU6, 6AQ5, and 6BA6 tubes	27-6203
Socket, miniature, 9 pin	27-6203-6*
Socket, octal	27-6174

TV TUNER, PART NO. 76-7600

SECTION 5—R.F.

Reference Symbol	Description	Service Part No.
C500	Condenser, FM trap, 20 μμf., ±5%	62-020309011
C501 and C502	Condensers, antenna isolating, 470 μμf.	30-1225-18
C503	Condenser, i-f trap, 22 μμf.	Part of L505
C504	Condenser, r-f coupling, 39 μμf. ±10%	62-03949101
C505	Condenser, neutralizing, 220 μμf.	62-122001001
C506	Condenser, a-g-c decoupling, 220 μμf.	62-122001001
C507	Condenser, r-f trimmer, .5 to 3 μμf.	31-6520-3
C508	Condenser, r-f by-pass, 150 μμf.	62-115001011
C509	Condenser, grid by-pass, .01 μμf.	30-1238-2
C510	Condenser, coupling, .47 μμf.	30-1221-15
C511	Condenser, neutralizing, 220 μμf.	62-122001001
C512	Condenser, trimmer, mixer grid, .5 to 3 μμf.	31-6520-7
C513	Condenser, by-pass, 7.5 μμf.	30-1224-8
C514	Condenser, trimmer, 1 to 5 μμf.	31-6520-11
C515	Condenser, i-f trap coupling, 1.5 μμf.	30-1221-8
C516	Condenser, i-f link coupling, 680 μμf.	62-168001001
C517	Condenser, i-f trap, 7.5 μμf.	30-1224-8
C518	Condenser, i-f trap trimmer, 1 to 5 μμf.	31-6520-11
C519	Condenser, by-pass, 680 μμf.	62-168001001
C520	Condenser, by-pass, 1000 μμf.	30-1245-1
C521	Condenser, oscillator injection, 1.5 μμf.	30-1221-8
C522	Condenser, oscillator plate, 12μμf.	62-012300001
C523	Condenser, grid blocking, 5 μμf.	30-1224-5
C524	Condenser, mixer grid blocking, 39 μμf.	62-039409011
C525	Condenser, by-pass, 150 μμf.	62-115001011
C528	Condenser, fine tuning	76-6935-1
C529	Condenser, filament by-pass, 1000 μμf.	30-1245-1
J500	Connector, 40-mc. input	57-0590-2
L500	Coil, FM trap	32-4550-3
L501, L502, L503, and L504	Coils, tapered line assembly	32-4432-1
L505	Coil, i-f trap (44.75 mc.)	32-4552-1
L506 to L512, inclusive	Coils, r-f grid tuning	Part of WS500B
L513	Coil, 40-mc. channel	32-4550-5
L514	Coil, 40-mc. channel	32-4550-6

REPLACEMENT PARTS LIST (Cont.)

TV TUNER, PART NO. 76-7600 (Cont.)

SECTION 5—R.F. (Cont.)

Reference Symbol	Description	Service Part No.
L515	Coil, r-f amplifier neutralizing	32-4551-1
L516	Coil, r-f coupling	32-4550-9
L517 to L524, inclusive	Coil, r-f plate tuning	Part of WS500C
L525 to L532, inclusive	Coil, mixer grid	Part of WS500B
L533	Coil, mixer neutralizing	32-4551-1
L534	Coil, mixer plate	32-4550-4
L535	Coil, i-f primary	312-5151-6
L536	Coil, i-f trap	312-5151-5
L537 to L543, inclusive	Coil, oscillator tuning	Part of WS500A
L544 and L545	Coil, r-f choke	32-4550-1
R518	Resistor, B+ dropping, 15,000 ohms, 1 watt	66-3154340
WS500A (F) and WS500A (R)	Switch wafer, oscillator	76-7604
WS500B (F) and WS500B (R)	Switch wafer, mixer grid	76-7606
WS500C (F) and WS500C (R)	Switch wafer, r-f plate	76-7608
WS500D (F) and WS500D (R)	Switch wafer, r-f grid	76-7612
WS500E (F) and WS500E (R)	Switch wafer, r-f grid	76-7610

MISCELLANEOUS "C"

Description	Service Part No.
Coupling, fine tuning shaft	54-4912
Detent, ball	56-8020
Front panel ass'y.	76-6928-2
Hairpin, plunger grounding	1W42704FA3

MISCELLANEOUS "C" (Cont.)

Description	Service Part No.
Hairpin, plunger	56-9858
Plunger	56-8034-1
Retaining ring	1W61043
Shaft	76-6914
Shaft, extension	56-8358
Cam and shaft, fine tuning	76-6936
Shaft, spring	56-8023
Shield, tube, 9 pin miniature	56-5629-5
Socket, tube, 9 pin miniature	27-6203-21
Spring, plunger	56-9628
Tapered line ass'y.	76-7602
Terminal panel (antenna)	76-5504-2
Washer	56-9351
Washer, fiber	27-4109-13
"E" Washer	1W60980FE5

CONNECTING CABLES, PLUGS, AND SOCKETS

Reference Symbol	Description	Service Part No.
J100	Socket, a-c line	27-6240-3
J101	Socket, television chassis connecting	27-6274-1
J102	Socket, radio chassis connecting	27-6274-4
J200	Socket, VIDEO TEST	27-6273*
J400	Socket, discriminator test	27-6273*
J401	Socket, volume control	27-6273*
J402	Socket, speaker	27-4785-22
J500	Connector, 40-mc. input	57-0590-2
J800	Socket, deflection	27-6274-7
J801	Socket, gate pulse	27-6273
PL100	Plug and line cord ass'y.	41-3865
PL101	Plug and cable ass'y., television chassis connecting	41-4146-5
PL102	Plug and cable ass'y., radio chassis connecting	See parts list of radio tuner used
PL401	Plug and cable ass'y., volume control	41-4136-2
PL402	Plug and cable ass'y., speaker	**See Cabinet Parts List
PL800	Plug and cable ass'y., deflection	41-4086-25
PL801	Plug and cable ass'y., gate pulse	41-4141
	Cable ass'y., high voltage, picture tube	41-4664-6*
	Cable and socket ass'y., picture tube	41-3964-19
	Cable and socket ass'y., pilot light	27-6233-5*

** NOTE: The length of this cable varies with cabinet model and speaker size. For Service Part No. refer to cabinet parts list in Philco Service Bulletins.

PHILCO
Factory-Supervised
Service

PR-2395

Printed in U. S. A.

PHILCO **PHILCO Factory-Supervised Service** SERVICE

TELEVISION

PHILCO
TELEVISION SERVICE MANUAL
FOR
R-F CHASSIS 44
DEFLECTION CHASSIS G-4

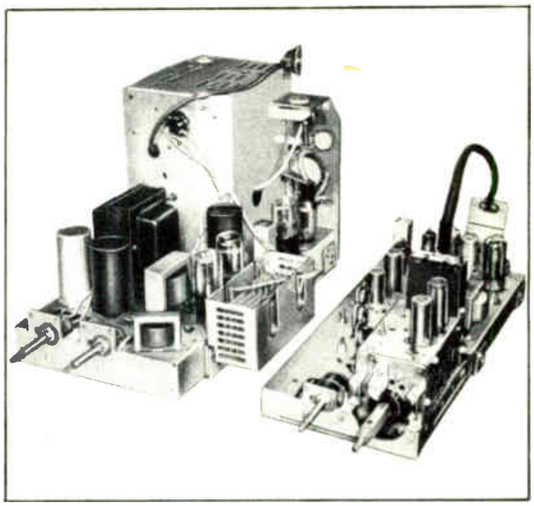


TABLE OF CONTENTS

SERVICE INFORMATION FOR PHILCO CHASSIS TYPES 44 AND G-4

PR-2199

CIRCUIT DESCRIPTION

The Philco 1953, Code 125, television receivers use two chassis—one containing the r-f, video, audio, and sync circuits, the other containing the power and deflection circuits.

Since these chassis are not isolated from the 60-cycle power line, all protruding shafts and mounting feet are isolated from the chassis. CAUTION: See A-C Line Isolation.

A separate subchassis contains the r-f amplifier, the oscillator, and the mixer. The r-f amplifier uses a 6BZ7 or a 6BQ7 tube. The oscillator and mixer each use one-half of a 12AV7 tube. The output of the mixer is fed to a four-stage, stagger-tuned, i-f amplifier system employing three 6AU6 tubes and one 6CB6. One-half of a 12AU7 is used as a video detector and a-g-c rectifier; the cathode and grid are used for the video detection, and the cathode and plate for the a-g-c rectification. A delay voltage, obtained from a voltage divider consisting of CONTRAST control R305 and resistor R408, is applied to the cathode to prevent a-g-c action on weak signals, where maximum gain is required. The maximum delay voltage is obtained when the CONTRAST control is in a fully clockwise position, as is the case when the receiver is adjusted for weak signals. The a-g-c voltage is applied to the first three i-f stages, to hold the output of the video detector essentially constant in spite of large variations in input signal levels. The a-g-c voltage for the r-f amplifier is obtained from the 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 of 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 26.6-mc. video carrier and the 22.1-mc. sound carrier are mixed in the video detector. The 4.5-mc. beat frequency is the difference between 26.6 mc. and 22.1 mc., and contains the FM sound signal. This 4.5-mc. signal contains only a negligible amount of the video amplitude modulation, provided that the amplitude of the 22.1-mc. signal is considerably lower than that of the 22.6-mc. signal. The proper relationship between the two carriers is established during the alignment of the receiver. There is sound output only when both the video and sound 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), which is taken from the video detector, is amplified by one-half of a 12AU7 and a 6AU6, and is fed to the FM detector, which utilizes two diode sections of a 6T8 tube. The triode section of the 6T8 is used as the first audio amplifier. The power amplifier uses a 6Y6G 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 is made up of two resistors, R302 and R303. To obtain higher voltage for synchronization, the composite signal used for sync purposes is taken from across both R302 and R303, but the composite video for the video output stage is taken across R303 only. C302 is used to by-pass high-frequency video around R302. The plate load of the video output amplifier consists of L302 and R309. L302 is an adjustable peaking coil, and is set at the factory for best video response.

The sync circuit consists of a first sync separator, a variable diode noise gate, a second sync separator, and a sync inverter. The composite video is fed to the first sync separator, one-half of a 12AV7 tube, and the output from the cathode is applied to the cathode of the noise gate, one-half of a 12AU7 tube. A positive voltage, obtained from a voltage divider made up of R606 and R607, is applied to the diode plate, and 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, and the value of plate voltage is chosen so that this condition obtains for all normal sync signals. However, when a noise signal greater than the sync signal is received, the cathode of the diode is driven positive with respect to the plate, the diode is cut off in consequence, and the noise is not permitted to pass to the second sync separator.

The positive voltage applied to the plate of the diode is made proportional to the strength of the signal being received by obtaining it from the load side of a dropping resistor, R419, in the B+ line that supplies plate and screen voltages to the i-f stages. The current through R419, therefore, depends upon the amount of current drawn by the i-f stages. When a stronger signal is received, the a-g-c voltage increases; this decreases the current drawn by the i-f stages, and decreases the voltage drop across R419. Since the result is an increase in the voltage applied to the plate of the noise-gate diode, the level at which the diode will gate out the noise is raised. When a weaker signal is received, the opposite effect is obtained. The second sync separator, one-half of a 12AU7 tube, removes all remaining video information from the composite signal. The output of the second sync separator is fed to the deflection chassis through the power connecting cable. A sync inverter, one-half of a 6SN7GT tube, 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 are applied to the grid of the vertical blocking oscillator, which uses one-half of a 6SN7GT tube. The output of the blocking oscillator is amplified by the 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 6SN7GT tube, through a capacitive voltage divider. Within the lock-in range, the phase relationship between 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 6SN7GT 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 R303B, the BRIGHTNESS control, are parts 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 variation in the second-anode voltage. However, because 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 high B plus to the horizontal amplifier, vertical oscillator, and first anode of the picture tube. Filament current for all the tubes except the high-voltage rectifier is supplied by a 60-cycle step-down transformer. The filament current for the high-voltage rectifier is supplied by the horizontal output 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, CR100, and C103, 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 .... 26.6 mc.
Sound (Intercarrier) .... 4.5 mc.
TRANSMISSION LINE..... 300 ohm, twin-wire lead
OPERATING VOLTAGE. 110-120 volts, 60 cycles, a.c.
POWER CONSUMPTION................ 230 watts

TUBE COMPLEMENT
R-F CHASSIS 42

V No.	TUBE TYPE	FUNCTION
V1	6BQ7—miniature or 6BZ7	R-F amplifier
V2	12AV7—miniature	Oscillator, mixer
V3, V4, V5	6AU6—miniature (3)	Video i-f amplifier
V6	6CB6—miniature	Video i-f amplifier
V7	12AU7—miniature	Video detector, a-g-c rectifier, first sound i-f amplifier
V8	6AU6—miniature	Second sound i-f amplifier
V9	6T8—miniature	FM detector, first audio amplifier, a-g-c clamp
V10	6Y6GT—octal	Audio output
V11	12AV7—miniature	First video amplifier, first sync separator

TUBE COMPLEMENT (Continued)
R-F CHASSIS 42 (Cont.)

V No.	TUBE TYPE	FUNCTION
V12	12AU7—miniature	Noise gate, second sync separator
V13	6AQ5—miniature	Video output
V20	17YP4, 20DP4A, or 21EP4A	Picture tube

DEFLECTION CHASSIS G-4

V No.	TUBE TYPE	FUNCTION
V14	6SN7GT—octal	Sync inverter, vertical oscillator
V15	6AH4GT—octal	Vertical output
V16	6SN7GT—octal	Phase comparer, horizontal oscillator
V17	6BQ6GT—octal	Horizontal output
V18	6V3—miniature	Horizontal damper
V19	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 HORIZONTAL OSCILLATOR FREQUENCY control and horizontal lock-in trimmer as directed below, in order to obtain proper synchronism and deflection. (These controls are located on the back and side of the chassis.)

1. Turn the HORIZ. HOLD control fully clockwise.
2. Adjust the HORIZ. OSC. 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 absolute-

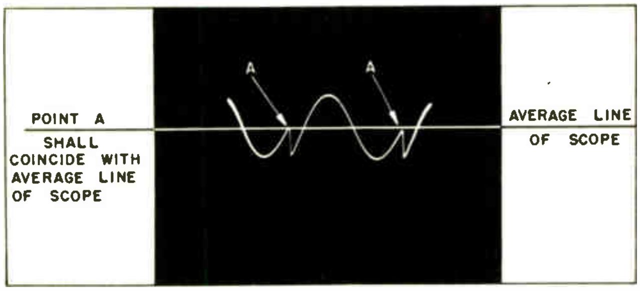


Figure 1. Horizontal-Oscillator Waveshape, Showing Correct Adjustment of T800

ly 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 HORIZ. 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, however, where excessive overshoot or excessive smear is present, 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 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 TC301 applies to a particular station exhibiting smear or overshoot. After TC301 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 adjusting each tuned circuit to a given frequency, using an AM signal, then feeding in a sweep signal at the antenna terminals and touching up the adjustments to obtain the desired pass band.

The over-all response curve (r-f, i-f) of the circuits from the antenna terminals to the video detector, after the i-f stages have been aligned, should appear essentially the same regardless of the channel under test. If not, the tuner may require alignment. Before aligning the tuner, check the receiver and test equipment to make certain that the variation in response is not due to regeneration or improper matching of connecting leads, and that the a-g-c bias is the same on each channel.

The video-carrier intermediate frequency is 26.6 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 having the top of the workbench metallic. The receiver chassis should be placed on its side with the tuner side down on the bench. If the bench does not have a metallic top, the test equipment and chassis can be bonded by a strip of copper about 2 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 Model 7008 is used, the built-in crystal calibrator provides an excellent means of calibration. An alternate method for 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."

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 may be made through the alignment jack 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, may be used. As an alternate, a Philco alligator-clip adapter, Part No. 45-1636, with as short a ground lead as possible, may be used to connect 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.

Antenna-Input Matching Network

An impedance-matching network for coupling the signal generator to the aerial-input terminals of the receiver is shown in figure 2 of PR2170. 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 antenna input circuit. The resistors used in this network should be of carbon-composition construction, and should be chosen from a group, to obtain values within 10% of those indicated. The resistors should be placed in a shield can, to prevent variable effects. An antenna 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 of PR2170, 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 2200-ohm isolating resistor, and 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, 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.

FM TEST Jack Adapter

The FM TEST jack adapter that should be used to connect the voltmeter and oscilloscope to the FM detector test socket, J402, is shown in figure 4 of PR2170. A suggested method of fabricating the adapter is also shown. Pins 1 and 5 are removed from a five-pin plug, 27-4785-3, because a three-pin plug with proper spacing is not readily available.

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

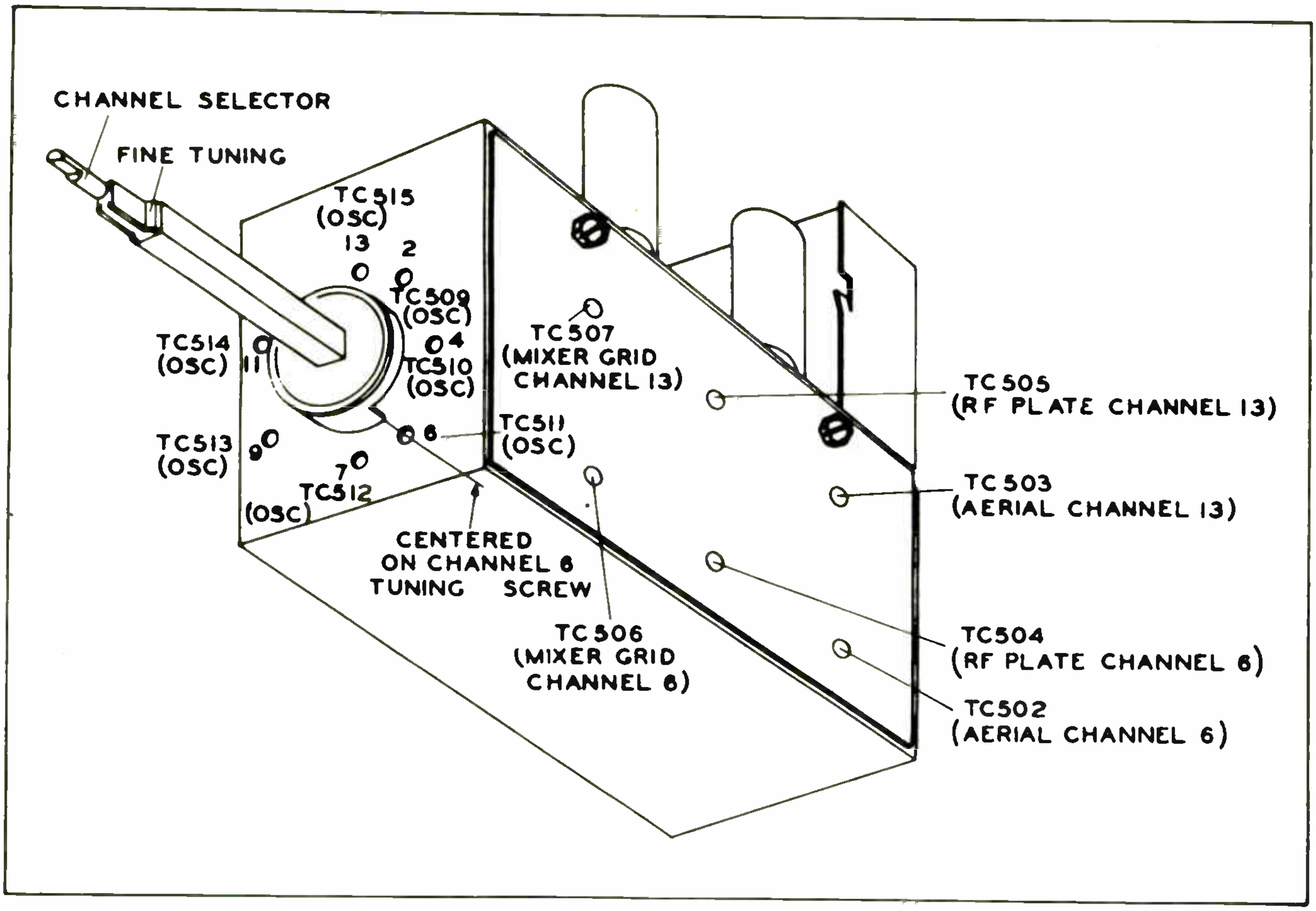
General

Beginning with channel 13, every other coil is tunable, so that by adjusting the tuning cores, it is possible to place either of two adjacent channels exactly on frequency; that is, either channels 13 or 12, 11 or 10, 9 or 8, etc. The foregoing is based on the assumption that the oscillator has previously been tracked, and that it is desired to compensate for small tracking errors on several different channels. This adjustment procedure should be carried out with the highest channel 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 the channel 6 oscillator tuning core. See figure 2.

Procedure Using Signal Generator

An r-f signal (unmodulated), at the oscillator frequency, is fed into the antenna input from an AM signal generator, and the oscillator tuning cores are adjusted for zero beat. The r-f signal should be accurate, preferably from a crystal source, or calibrated against the television station. Proceed as follows:

1. Connect a 3300-ohm resistor in series with the red lead from the tuner. Connect the "hot" lead of the oscilloscope to the junction of the red lead and the 3300-ohm resistor, and connect the ground lead to chassis. High oscilloscope gain may be necessary to obtain a visual beat. In this instance, base-line hum may be ignored.
2. Connect the AM (marker) generator to the 300-ohm antenna input terminals. For this purpose the aerial-input matching network is not required.
3. If the tuner has been removed from the chassis and is being aligned outside the chassis, connect the white lead to the negative terminal of a 1.5-volt battery. Ground the positive terminal.
4. Mechanically preset the fine-tuning cam as shown in figure 2.
5. Feed in an r-f signal (unmodulated) at the oscillator frequency for channel 13 (237.85 mc.), with CHANNEL SELECTOR set for channel 13.
6. Adjust the tuning core for channel 13 (see figure 2).
7. Adjust the tuning cores for channels 11 and 9, in the order given with the channel selector set for channels 11 and 9, respectively.
8. Check the channel 8 oscillator frequency with CHANNEL SELECTOR set for channel 8. If it is too high, turn C527 several turns clockwise; if the frequency is too low, turn the trimmer counterclockwise (see figure 5).
9. Repeat steps 5, 6, 7, and 8 until channels 13, 11, 9, and 8 are within ±500 kc. of the correct frequency.
10. Feed in an r-f (unmodulated) signal, at the oscillator frequency for channels 7, 6, 4, and 2, consecutively (see NOTE below), and adjust the respective tuning cores with CHANNEL SELECTOR set for the appropriate channel (see figure 2).



TPI-2217

Figure 2. Television Tuner, Oblique View, Showing Location of Adjustments

NOTE: The exact position of the FINE TUNING shaft should be marked when channel 2 is correctly aligned. This position is to be used in step 6 of the i-f alignment procedure.

Procedure Using Station Signal

The following simplified procedures may be used to align the oscillator when the television i-f alignment is satisfactory and a station signal is available.

1. Mechanically preset the fine-tuning cam to the center of its range (see figure 2).
2. Tune in the highest-frequency channel to be received.
3. Adjust the tuning core in that channel, or in next highest channel, for the best picture; that is, starting with sound in the picture, turn the tuning core until the sound disappears. Repeat for each channel received in the area.

Band-Pass Alignment

General

The band-pass alignment consists of aligning the tuner at channels 13 and 6, and then making it track down to channels 7 and 2 respectively.

During the alignment, a fixed bias of 1.5 volts is applied to the r-f amplifier tube.

An FM (sweep) signal is applied to the antenna-input circuit, and an oscilloscope is connected to the mixer plate circuit. The oscilloscope gain should be as high as possible, consistent with hum level and "bounce" conditions. Hum conditions cause distortion of the base and response. Bounce conditions cause the response and time base to jump up and down, and are 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 event a lower generator output and higher oscilloscope gain must be used.

A 330-ohm resistor is shunted across the first i-f coil, to eliminate the absorption effect of this coil on the response curve. Proceed as follows:

1. Disconnect the white (a-g-c) lead from the tuner, and connect it to the negative terminal of a 1.5-volt battery. Ground the positive terminal of the battery.
2. Connect a 3300-ohm resistor in series with the red lead from the tuner. Connect the "hot" lead of the oscilloscope to the junction of the red lead and the 3300-ohm resistor.
3. Connect a 330-ohm resistor from the green lead to ground.
4. Connect the FM (sweep) generator to the 300-ohm aerial input through an aerial-input matching network.

Procedure

1. Set CHANNEL SELECTOR and the FM (sweep) generator on channel 13 (213 mc.). Adjust the generator for sufficient sweep to show the complete response curve.
2. Establish the channel limits (see figure 3) by using the marker (AM r-f) signal generator to produce marker pips on the response curve. (Set the generator first on 210 mc., then on 216 mc.) The curve should be reasonably flat between the limits shown in figure 3.
3. Adjust TC505 and TC507 (figure 2) for a symmetrical, approximately centered pass band. Set marker generator to 213 mc. Detune TC507 counterclockwise until a single peak appears. Adjust TC505 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 TC503 for maximum curve height and symmetry of the single peak. The antenna circuit is now tuned for the high channels. Be sure to reduce the generator output upon completion of this step.
4. Readjust TC505 and TC507 for a symmetrical response, centered about 213 mc. and falling within the limits shown in figure 3.
5. Set CHANNEL SELECTOR and the FM generator on channel 7 (177 mc.).
6. Establish the channel limits by using the marker signal generator to produce marker pips on the response curve. (Set the generator first on 174 mc., then on 180 mc.) The curve should be reasonably flat between the limits.
7. On channel 7 note the response curve, with respect to tilt and center frequency. The curve should be centered in the pass band, and should be symmetrical.

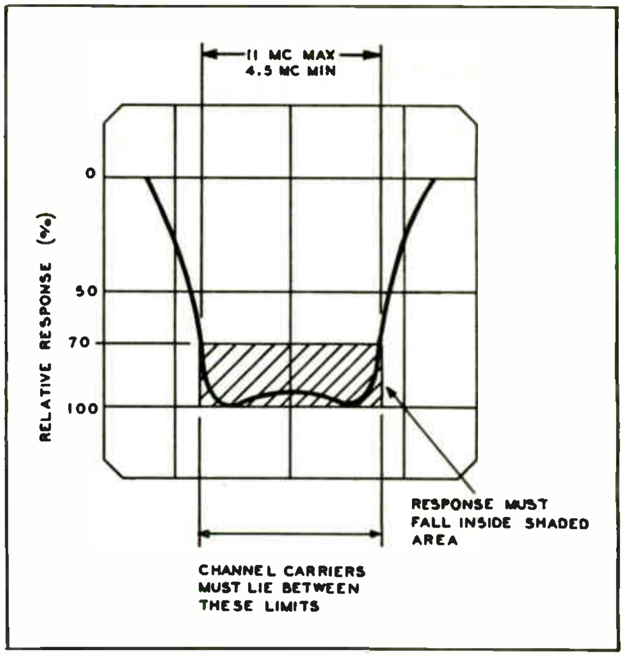


Figure 3. Television Tuner Response Curve, Showing Band-Pass Limits

8. If the curve is not symmetrical, and appears unbalanced as shown in figure 4, leave the generator and tuner set on channel 7 and adjust C506 and C515 (see figure 5) to obtain a response curve which is the mirror image (tilt in the opposite direction) of the original. This is a form of overcompensation to

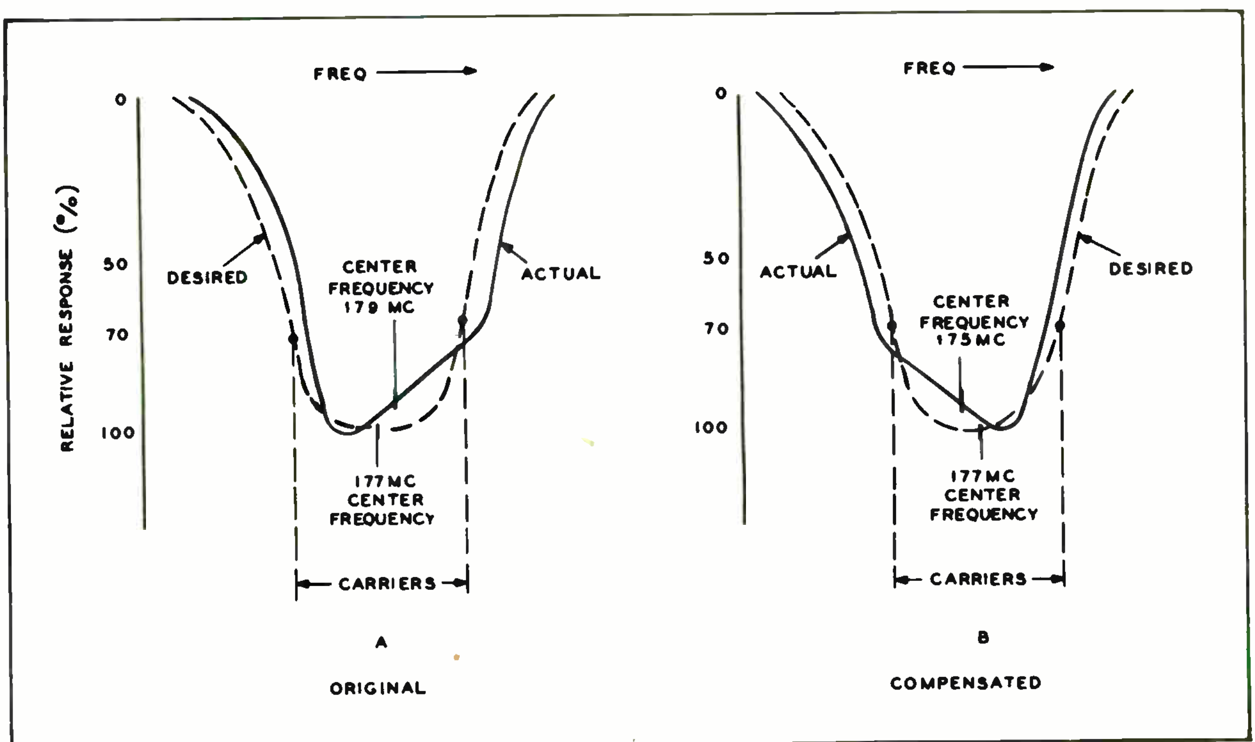


Figure 4. Television Tuner Response Curve, Showing Tracking Compensation

allow for the effect of channel 13 adjustment on channel 7. For example, if the channel 7 response appears as in figure 4A, then the trimmer should be adjusted to obtain the response shown in figure 4B.

9. Reset CHANNEL SELECTOR and generators on channel 13. Readjust TC505 and TC507 for a symmetrical, centered pass band. (See step 4.)

10. Set CHANNEL SELECTOR and the generators on channel 7, and check the response for center frequency and symmetry. Repeat steps 8 and 9 as many times as necessary to obtain the most symmetrical, best-centered response curves on channels 13 and 7. Channels 7 through 13 are now correctly aligned.

11. Set CHANNEL SELECTOR and the sweep generator on channel 6 (85 mc.).

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

13. Adjust TC504 and TC506 for a symmetrical, approximately centered pass band. Set the marker generator for 85 mc. Detune TC506 counterclockwise until a single peak appears.

> CAUTION: Do not turn TC506 excessively, or it will fall out of the coil.

Adjust TC504 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 TC502 for maximum curve height and symmetry of the single peak. The antenna circuit is now tuned for channels 2 through 6.

14. Readjust TC504 and TC506 for a symmetrical response, centered about 85 mc.

VIDEO I-F ALIGNMENT

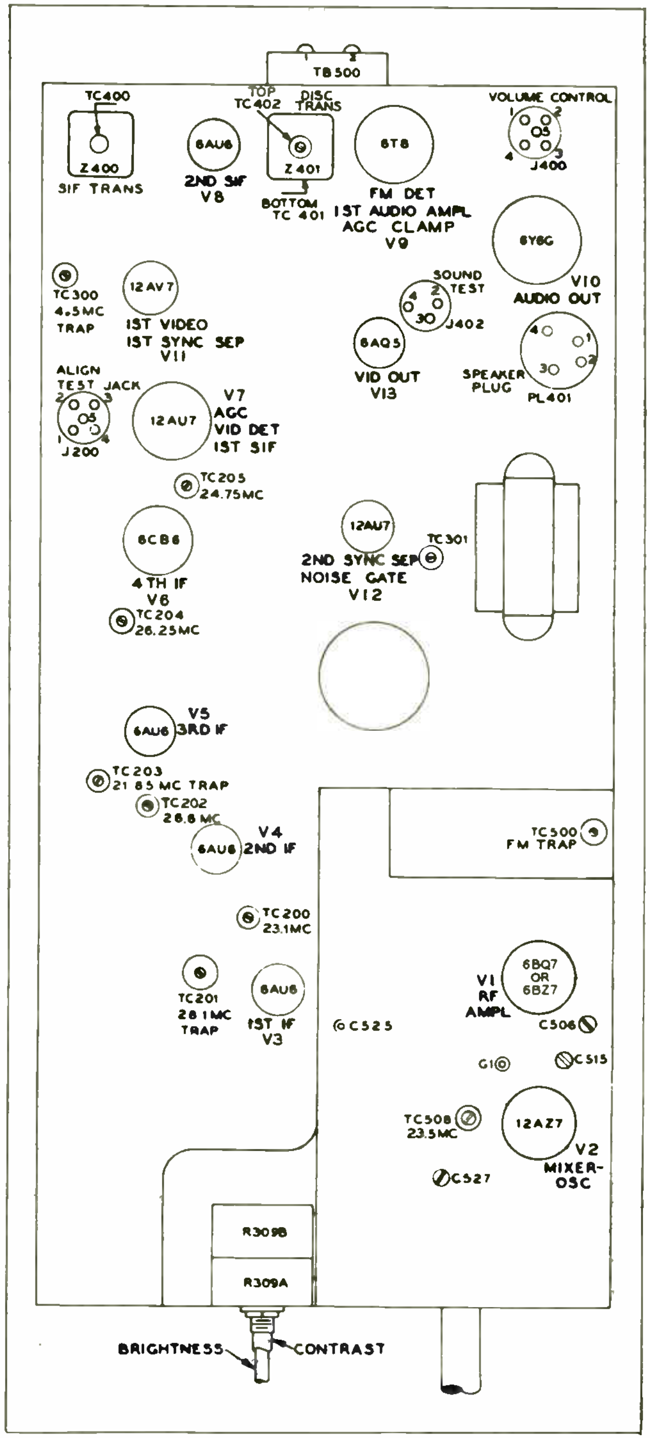
Preliminary

Before proceeding with the i-f alignment or making an alignment check, observe the following preliminary instructions:

1. Connect the oscilloscope to the 2200-ohm resistor from the ALIGN TEST jack adapter.
2. If additional attenuation of the marker signal 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 A, which will give a marker of lower amplitude.
3. Preset the television controls as follows:
    a. CONTRAST control fully counterclockwise.
    b. BRIGHTNESS control to give a dim raster.
    c. Function switch to TV position.
4. Insert the FM TEST jack adapter into J402.
5. Insert the ALIGN TEST jack adapter into J200.

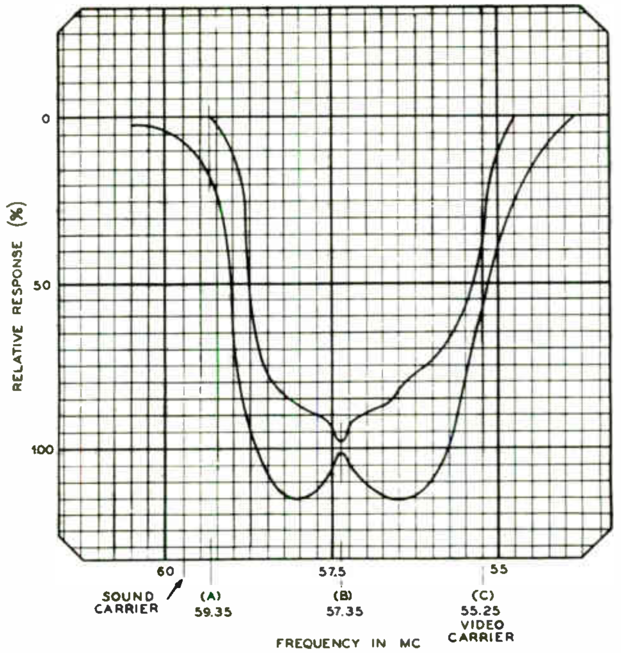
Procedure

1. Preset TC201 and TC203 fully counterclockwise. (See figure 5.) Preset TC200 and TC202 to the center of their ranges.
2. Connect the oscilloscope to J200, pin 2, through the 2200-ohm resistor from the ALIGN TEST jack adapter, and connect the AM generator to G1 (mixer grid on tuner).
3. Feed in a 28.1-mc. AM signal, and tune TC201 for minimum output (use first minimum). Use zero bias during this adjustment.
4. Feed in a 21.85-mc. AM signal, and tune TC203 for minimum output (use first minimum). Use zero bias during this adjustment.
5. Tune TC205, TC204, TC202, TC200, and TC507 for maximum output at the frequencies indicated in figure 5. Use 3 volts of bias, and attenuate the generator to keep the output below the level that will give 0.6 volt output at the video detector with 30% amplitude modulation.
6. Feed in sweep and marker signals to channel 2 through the antenna-input terminals. The tuner pass band should be checked, and the tuner aligned, if



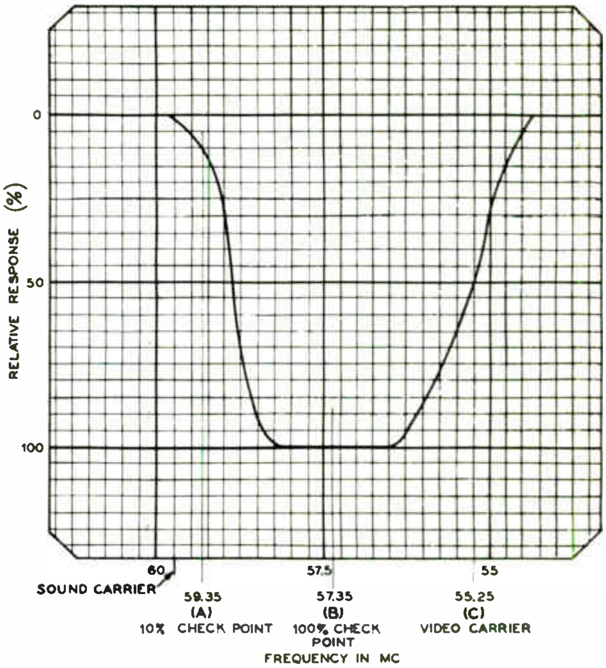
TP2-1328

Figure 5. Top View of R-F Chassis, Showing Location of Adjustments



TP1-734

Figure 6. Over-all R-F, I-F Response Curve, Showing Tolerance Limits



TP1-735

Figure 7. Ideal Over-all R-F, I-F Response Curve

necessary; the local oscillator should be set at its correct frequency (81.85 mc. for channel 2). Refer to step 10 of Procedure Using Signal Generator, under *Oscillator Alignment.* The response should fall within the limits shown in figure 6. The ideal response curve is shown in figure 7. The frequencies shown in figures 6 and 7 are for channel 2. To convert these response curves for channels 3 through 13, refer to the chart of Television-Carrier, Oscillator, and Check-Point Frequencies, on page 4 of PR2170, and substitute the proper frequencies at points A, B, and C. Touch up TC205, TC204, TC202, TC200, and TC507. See NOTE below.

IMPORTANT: Do not turn any of the i-f tuning cores excessively after they have been set in approximate position by the use of the AM signal generators; to do so may cause poor transient or phase response, resulting in trailing whites or smear. If a response within the limits shown cannot be obtained by a slight adjustment, carefully repeat the AM adjustments, and, if necessary, troubleshoot the i-f system. It is preferable to get a response curve within the tolerance range *without* touching the adjustments made with the AM signals at the specified frequencies, rather than to attempt to obtain the ideal curve.

NOTE: TC205 rocks top of curve. TC202 controls level of carrier. TC204 controls dip or peak on carrier side. TC200 controls dip or peak on sound side.

S-I-F ALIGNMENT

1. Remove the first i-f tube, and connect a v.t.v.m. or a 20,000-ohms-per-volt voltmeter to the FM TEST jack adapter. Adjust the VOLUME control for moderate speaker output.

2. Feed in an accurately calibrated 4.5-mc. AM signal through the 2200-ohm resistor in the ALIGN TEST jack adapter to pin 2 of J200.

3. Tune TC300, TC400, TC401, and TC402 for maximum indications on the meter. The point of maximum meter indication for TC402 should also be the point of minimum speaker output.

4. Tune TC402 for minimum speaker output.

5. Connect an r-f probe or crystal detector to the grid (pin 2) of the picture tube. See NOTE below.

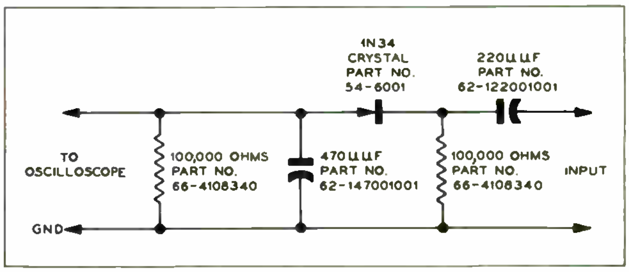
6. Tune TC300 for minimum indication on oscilloscope. If a crystal detector is not available, TC300 may be adjusted for minimum beat pattern, observed on the picture tube, with a station picture present.

7. Replace the first i-f tube. Tune in a station and use the speaker output as the indicator for step 9.

8. Turn the FINE TUNING control clockwise to obtain a slightly fuzzy picture.

9. Tune TC402 for minimum AM (noise) output.

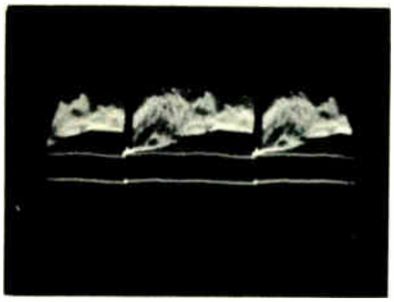
NOTE: The r-f probe, Part No. 76-3595, is used as a detector of the 4.5-mc. signal, and the oscilloscope as an indicating device. An alternate crystal detector may be made up as shown in figure 8.



TPO-1150

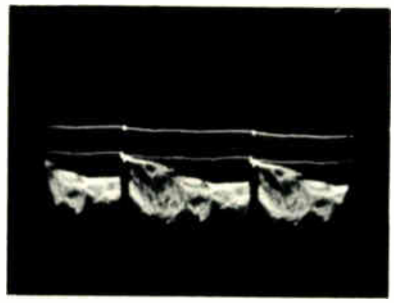
Figure 8. Wiring Diagram of Crystal Detector

OSCILLOSCOPE WAVEFORM PATTERNS



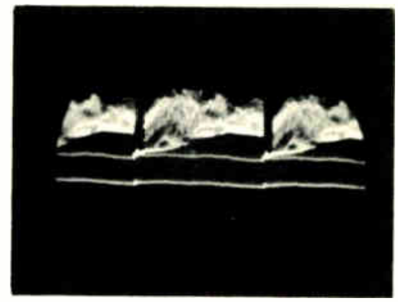
TPI-1200-A

Figure 9. Video-Detector Output
Pin 2 of J200
2 Volts 60 C.P.S.



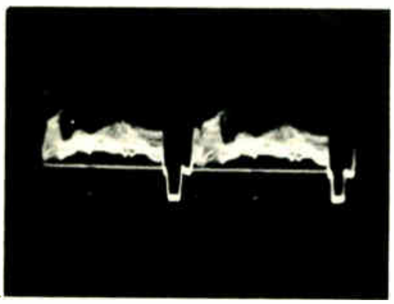
TPI-1200-B

Figure 10. Video-Amplifier Plate
Pin 6
28 Volts 60 C.P.S.



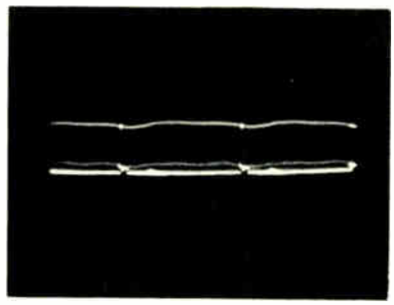
TPI-1200-A

Figure 11. CRT Grid, Pin 2
118 Volts 60 C.P.S.



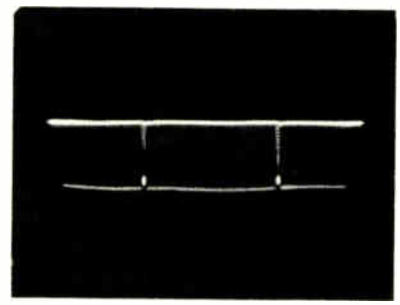
TPI-1092

Figure 12. Video-Detector Output
Pin 2 of J200
2 Volts 15,750 C.P.S.



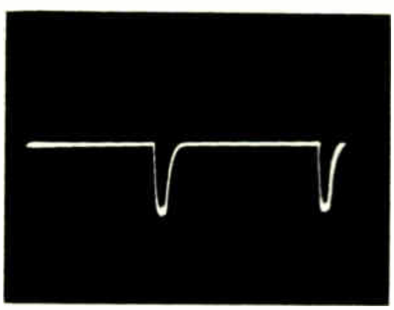
TPI-1203

Figure 13. First Sync-Separator
Cathode, Pin 3
10 Volts 60 C.P.S.



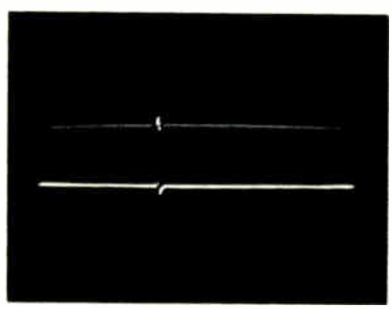
TPI-1090

Figure 14. Second Sync-Separator
Plate, Pin 6
10 Volts 60 C.P.S.



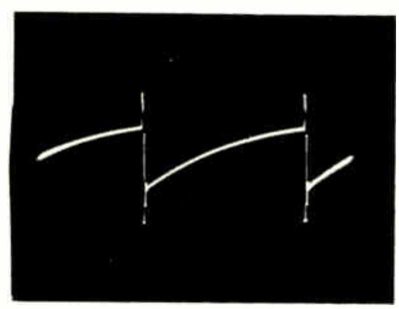
TPI-1091

Figure 15. Second Sync-Separator
Plate, Pin 6
10 Volts 15,750 C.P.S.



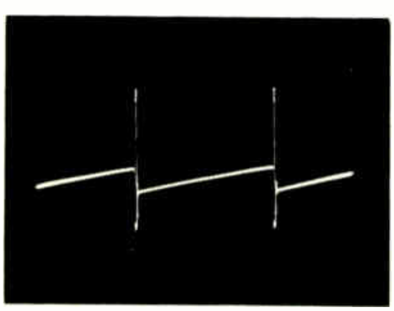
TPI-1087

Figure 16. Sync-Inverter Plate
Pin 5
30 Volts 60 C.P.S.



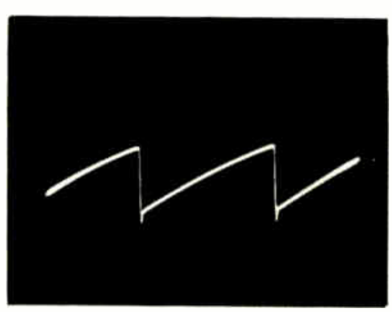
TPI-1202

Figure 17. Vertical-Oscillator Grid
Pin 1
90 Volts 60 C.P.S.



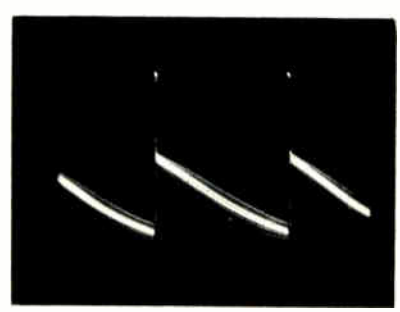
TPI-1097

Figure 18. Vertical-Oscillator Plate
Pin 2
130 Volts 60 C.P.S.



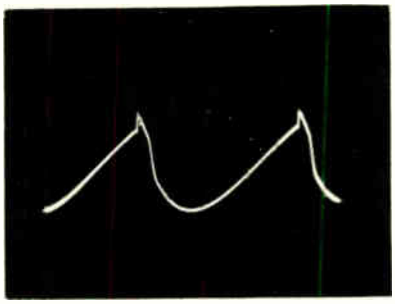
TPI-1100

Figure 19. Vertical-Amplifier Grid
Pin 1
125 Volts 60 C.P.S.



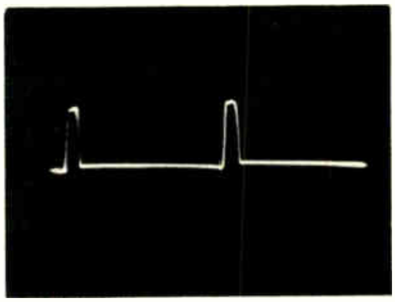
TPI-1099

Figure 20. Vertical-Amplifier Plate
Pin 5
750 Volts 60 C.P.S.



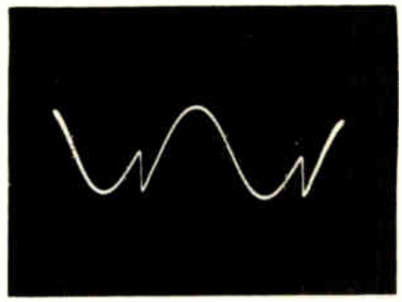
TPI-1088

Figure 21. Phase-Comparer Grid Pin 1
20 Volts 15,750 C.P.S.



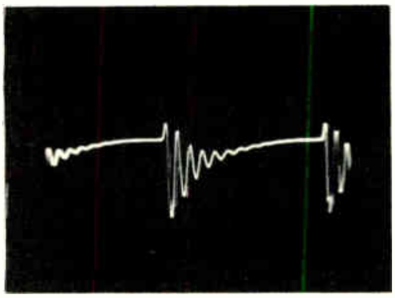
TPI-1094

Figure 22. Phase-Comparer Grid Pin 1, with Pin 4 Grounded
6 Volts 15,750 C.P.S.



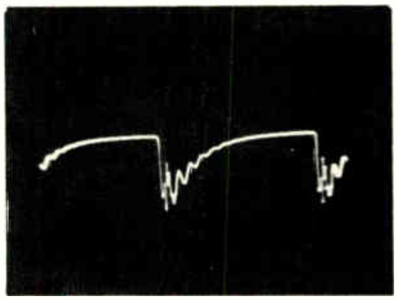
TPI-1089-A

Figure 23. Horizontal-Oscillator Cathode, Pin 6*
20 Volts 15,750 C.P.S.



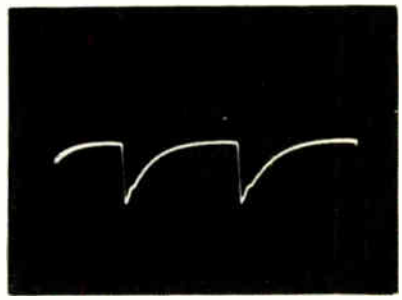
TPI-1205

Figure 24. Horizontal-Oscillator Grid, Pin 4*
190 Volts 15,750 C.P.S.



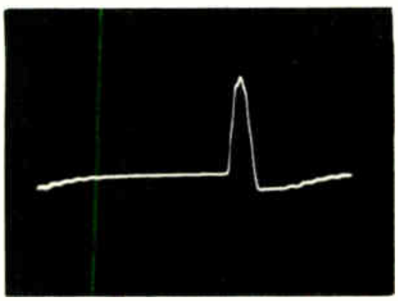
TPI-1098

Figure 25. Horizontal-Oscillator Plate, Pin 5*
140 Volts 15,750 C.P.S.



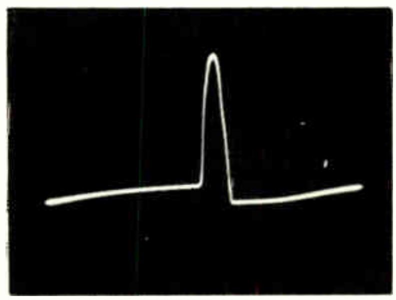
TPI-1095

Figure 26. Horizontal-Amplifier Grid, Pin 5*
110 Volts 15,750 C.P.S.



TPI-1201

Figure 27. Horizontal-Amplifier Plate, See CAUTION**
5000 Volts 15,750 C.P.S.



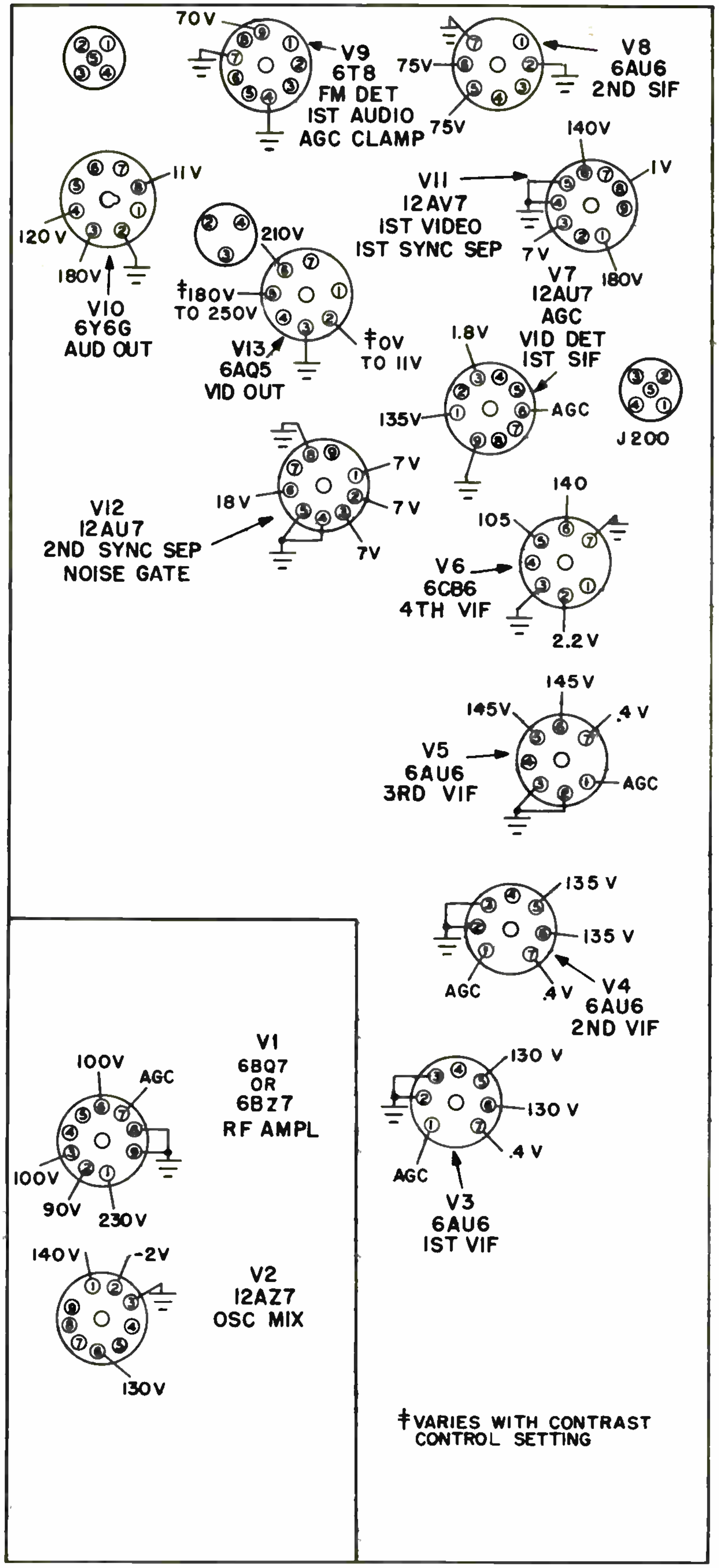
TPI-1206

Figure 28. Horizontal-Damper Cathode, See CAUTION**
3500 Volts 15,750 C.P.S.

The waveforms were taken with the receiver adjusted for normal picture and an approximate peak-to-peak output of 2 volts of composite video signal at the video detector. The voltages given with the waveforms are approximate peak-to-peak values. The frequencies shown are those of the waveform—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.

*Connect a 15-$\mu\mu$f condenser in series with the oscilloscope lead. The oscilloscope should be calibrated with the 15-$\mu\mu$f 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 off the teeth of the alligator 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.



TP2-1329

Figure 29. R-F Chassis 44, Bottom View, Showing Voltages of Socket Pins

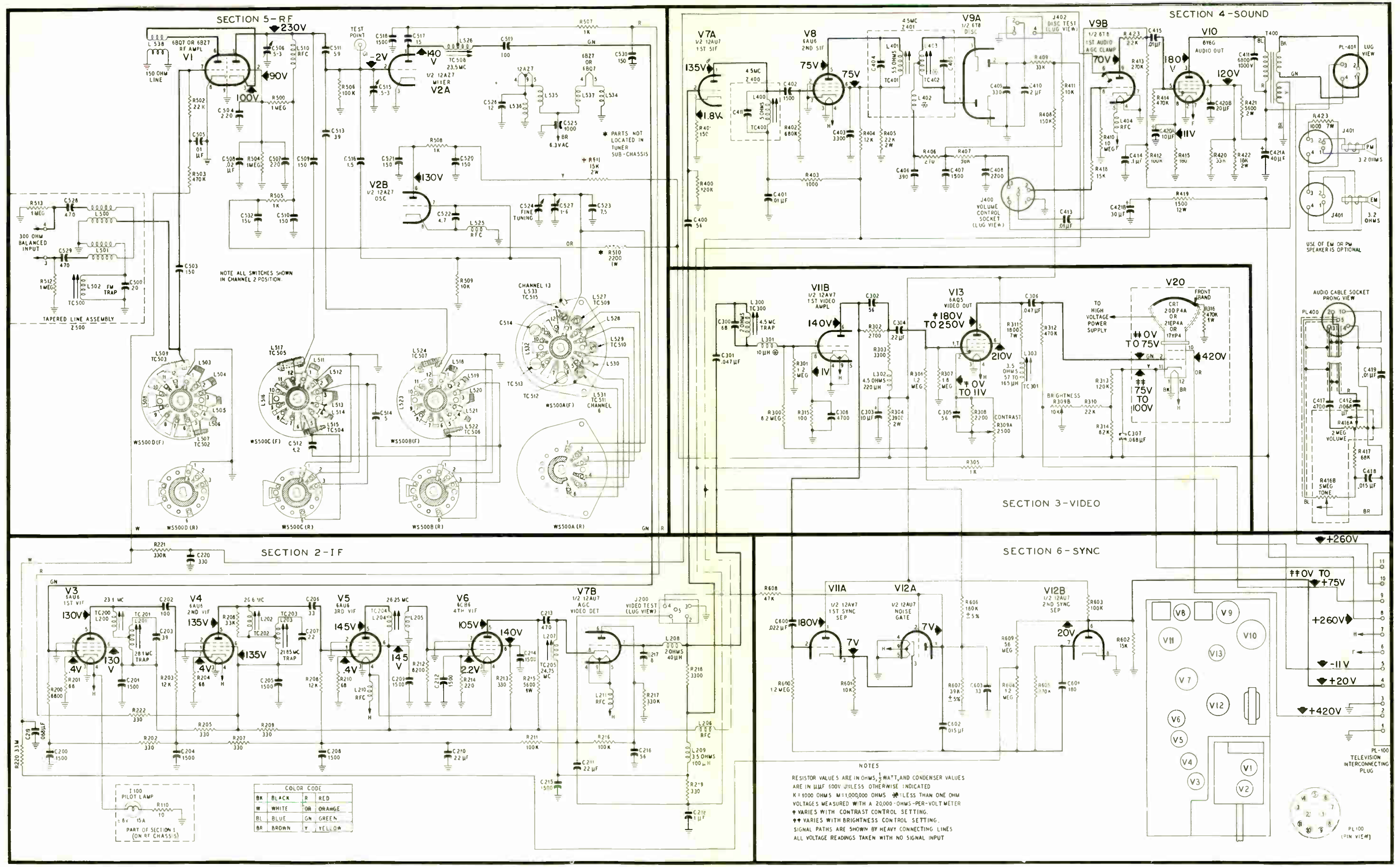


Figure 34. R-F Chassis 44, Schematic Diagram

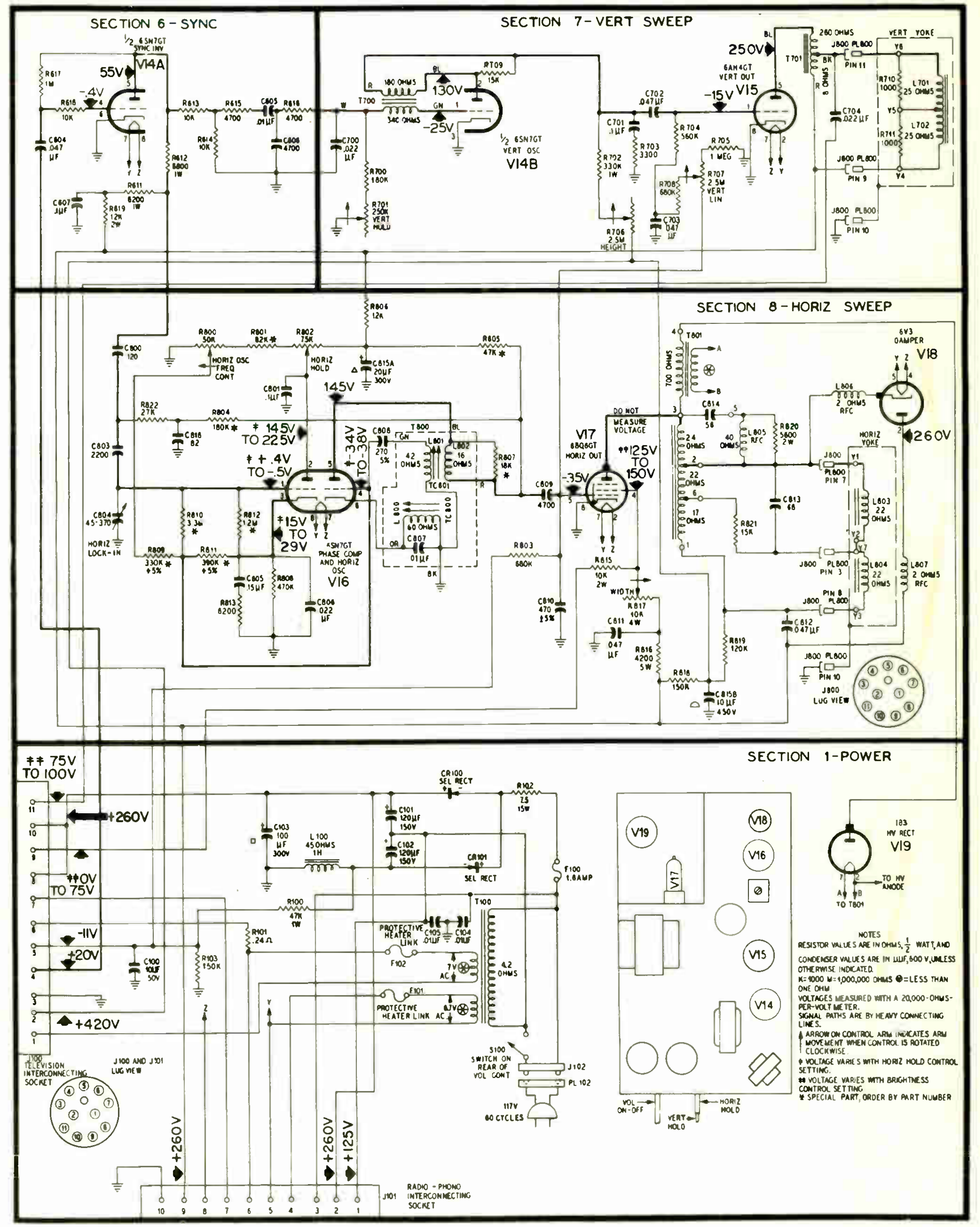


Figure 35. Deflection Chassis G-4, Schematic Diagram

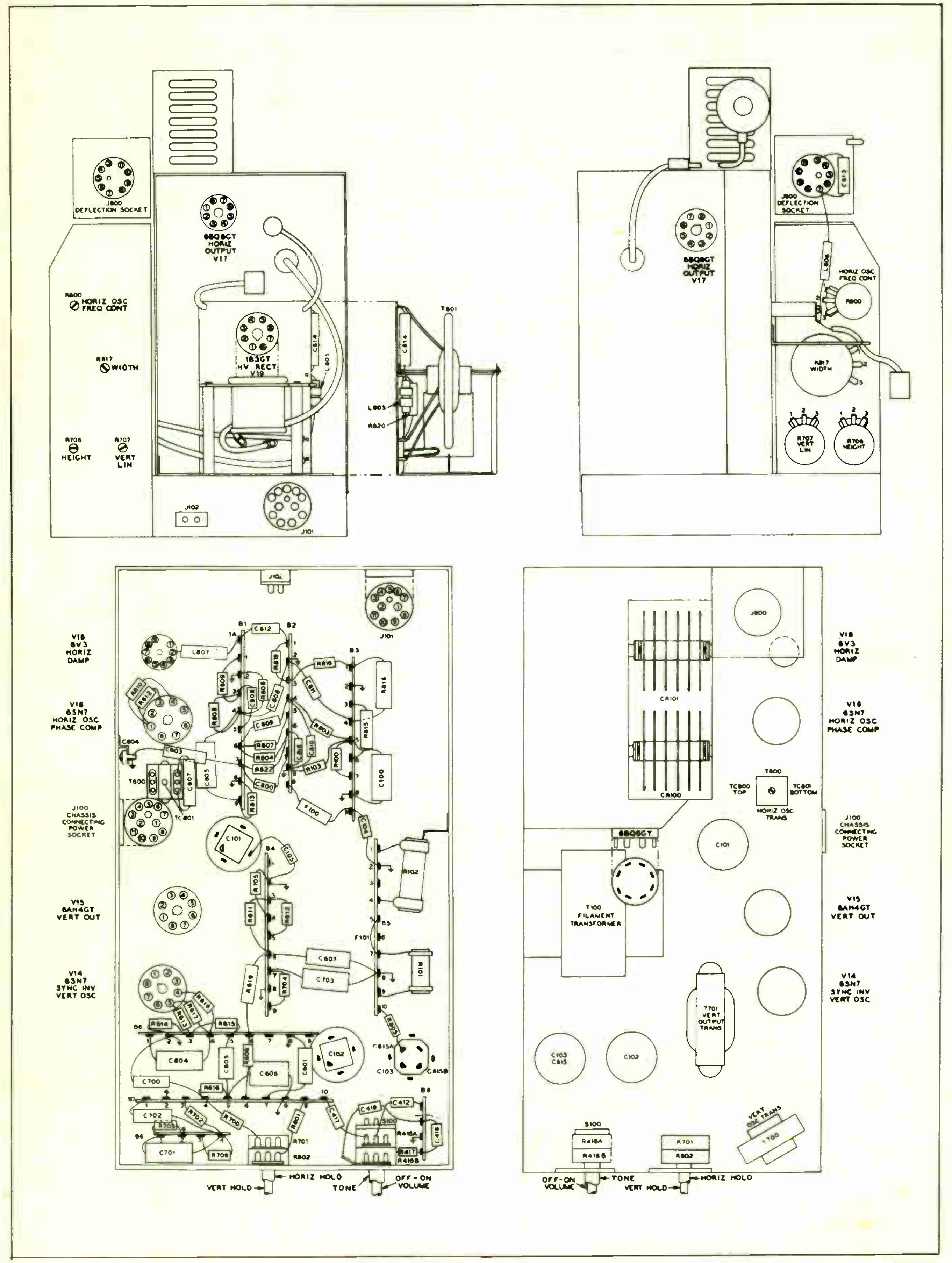


Figure 36. Deflection Chassis G-4, Base Layout

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 should be ordered in this way rather than by model number; in addition a miscellaneous listing will be found at the end of each chassis type. All parts are symbolized in the schematic diagram and base layouts, for identification purposes.

DEFLECTION CHASSIS G-4

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, 120μf., 150v	30-2570-66
C103	Condenser, electrolytic filter, 100μf., 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	
F102	Fuse, heater protective link, Piece of No. 26 wire	
J100	Socket, chassis connecting	27-6274-1
J101	Socket, radio chassis connecting	27-6274-4
J102	Socket, a-c line	27-6240-3
L100	Choke, filter, 45 ohms	Part of speaker ass'y.
PL100	Plug and cable assembly, chassis connecting	(See Misc. B)
PL102	Plug, a-c line	Part of a-c line cord ass'y. (see Misc. A)
R100	Resistor, filter, 47,000 ohms, 1 watt	66-3474340
R101	Resistor, voltage dropping, 0.24 ohm, 5 watts	33-3448-17
R102	Resistor, current limiting, 7.5 ohms, 15 watts	33-3448
R103	Resistor, filter, 150,000 ohms, 1 watt	66-4158340
S100	Switch, off-on	Part of volume control
T100	Transformer, filament	32-8576

SECTION 6—SYNC

Reference Symbol	Description	Service Part No.
*C601	Condenser, d-c blocking, 180 μμf.	60-10185417
*C603	Condenser, by-pass, 33 μμf.	62-033009001
R611	Resistor, voltage divider, 8200 ohms, 1 watt	66-28246340
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)

Reference Symbol	Description	Service Part No.
R701	Potentiometer, VERT HOLD control, 250,000 ohms	Part of R802
R702	Resistor, voltage dropping, 330,000 ohms, 1 watt	66-4338340
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 μμf.	60-10125237
C804	Condenser, horizontal lock-in padder	31-6473-22
C808	Condenser, d-c blocking, 270 μμf., 5%	60-10275337
C810	Condenser, horizontal drive, 470 μμf., ±5%	60-10475411
C813	Condenser, damping, 68 μμf.	30-1246-1
C814	Condenser, anti-ringing, 56 μμf.	30-1243-5
C815	Condenser, electrolytic filter	Part of C103
C815A	Condenser, filter, 20 μf., 300v	Part of C103
C815B	Condenser, filter, 10μf., 450v	Part of C103
C816	Condenser, by-pass, 82 μμf.	60-00825337
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 millihenrys	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. OSC. FREQ. control, 50,000 ohms	33-5565-30
R801	Resistor, voltage divider, 82,000 ohms, ½ watt	66-3828344
R802	Potentiometer, HORIZ. HOLD control, 75,000 ohms	33-5563-43
R804	Resistor, feedback, 180,000 ohms, ½ watt	66-4188344
R805	Resistor, charging, 47,000 ohms, ½ watt	66-3478344
R807	Resistor, damping, 18,000 ohms, ½ watt	66-3188344

*This part is located on R-F chassis.

Reference Symbol	Description	Service Part No.
R809	Resistor, voltage divider, 330,000 ohms, +5%, ½ watt	66-4338244
R810	Resistor, voltage divider, 3.3 megohms, ½ watt	66-5338344
R811	Resistor, voltage divider, 390,000 ohms, +5%, ½ watt	66-4398244
R812	Resistor, grid leak, 1.2 megohms, ½ watt	66-5128344
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, 10,000 ohms, 4 watts	33-5546-49
R820	Resistor, anti-ringing, 5600 ohms, 2 watts	66-2565340
T800	Transformer, horizontal oscillator	32-8551
T801	Transformer, horizontal output	32-8555

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 assembly, deflection	41-4086-18
Cap and lead assembly, 6BQ6 plate	76-5664-7
Cap and lead assembly, 6V3 plate	76-5664
Cord, line	41-3865
Deflection-yoke assembly	32-9648
Focus assembly, p.m.	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 44

SECTION 2—VIDEO I-F

Reference Symbol	Description	Service Part No.
C202	Condenser, d-c blocking, 100 μμf.	62-110009001
C203	Condenser, fixed trimmer, 39 μμf.	30-1224-63
C206	Condenser, d-c blocking, 33 μμf.	62-033009001
C207	Condenser, fixed trimmer, 22 μμf.	62-022009001
C213	Condenser, d-c blocking, 470 μμf.	62-147001021
C216	Condenser, r-f by-pass, 56 μμf.	62-056409011
C217	Condenser, i-f by-pass, 8 μμf.	30-1224-13
J200	Socket, alignment test	27-6273
L200	Coil, 1st i-f plate tank	32-4486
L201	Coil, 28.1-mc. trap	32-4303-3
L202	Coil, 2nd i-f plate tank	32-4486
L203	Coil, 21.85-mc. trap	32-4496
L204	Coil, 3rd i-f primary	Part of T200
L205	Coil, 3rd i-f secondary	Part of T200
L206	Coil, i-f isolation	32-4112-15
L207	Coil, 4th i-f plate	32-4486
L208	Coil, series peaking, 40 μh.	32-4143-16
L209	Coil, shunt peaking, 100 μh.	32-4143-17
L210	Coil, filament choke	32-4112-15
L211	Coil, filament choke	32-4112-15
R215	Resistor, plate feed, 5600 ohms, 1 watt	66-2564340
T200	Transformer, 3rd i-f	32-4486-6

SECTION 3—VIDEO

Reference Symbol	Description	Service Part No.
C300	Condenser, 4.5-mc. trap, 68 μμf.	62-068409011
C302	Condenser, compensating, 56 μμf.	62-056409011
C303	Condenser, low-frequency compensating, 10 μf., 300v	30-2584-6
C305	Condenser, cathode by-pass	62-056409011
L300	Coil, 4.5-mc. trap	32-4463-2
L301	Coil, first video grid, 10 μh.	32-4143-18
L302	Coil, shunt peaking, 220 μh.	32-4480-15

Reference Symbol	Description	Service Part No.
L303	Coil, shunt peaking, video-output plate	32-4467-7
R304	Resistor, low-frequency compensating, 3900 ohms, 2 watts	66-2395340
R309	Potentiometer, dual CONTRAST and BRIGHTNESS control, 2500 ohms, and 10,000 ohms	33-5563-42
R309A	Potentiometer, CONTRAST control	Part of R309
R309B	Potentiometer, BRIGHTNESS control	Part of R309
R311	Resistor, video-output plate load, 1800 ohms, 7 watts	33-1335-102
R316	Resistor, grounding, 470,000 ohms, 1 watt	66-4474340

SECTION 4—AUDIO

Reference Symbol	Description	Service Part No.
C400	Condenser, d-c blocking, 56 μμf.	62-056409011
C406	Condenser, detector, balancing, 390 μμf.	60-10395417
C409	Condenser, r-f by-pass, 330 μμf.	62-133001001
C410	Condenser, filter, 2 μf., 50v	30-2417-7
C414	Condenser, plate by-pass, 0.0068 μf., 1000v.	45-3505-93
C420	Condenser, electrolytic	30-2584-10
C420A	Condenser, cathode by-pass, 10 μf., 50v	Part of C420
C420B	Condenser, screen by-pass, 20 μf., 300v.	Part of C420
C421	Condenser, electrolytic	30-2584-9
C421A	Condenser, filter, 40 μf., 300v	Part of C421
C421B	Condenser, filter, 30 μf., 300v	Part of C421
J400	Socket, volume control	27-6273
J401	Socket, speaker	27-4785-22
J402	Socket, discriminator test	27-6273
L404	Choke, filament	32-4112-15

Reference Symbol	Description	Service Part No.
PL400	Plug, audio control	Part of audio cable ass'y. (see Misc. A)
PL401	Plug, speaker cable	Part of speaker cable (see cabinet parts)
R404	Resistor, screen dropping, 12,000 ohms, 1 watt	66-3124340
R405	Resistor, voltage divider, 22,000 ohms, 1 watt	66-3225340
R415	Resistor, cathode bias, 180 ohms, 1 watt	66-1184340
R416	Potentiometer, dual, 1 megohm and 5 megohms	
R416A	Potentiometer, volume control, 1 megohm	Part of R416
R416B	Potentiometer, tone control, 5 megohms	Part of R416
R419	Resistor, voltage dropping, 1550 ohms, 12 watts	33-3435-34
R420	Resistor, voltage divider, 33,000 ohms, 2 watts	66-3335340
R421	Resistor, voltage divider, 5600 ohms, 2 watts	66-2565340
R422	Resistor, voltage divider, 18,000 ohms, 2 watts	66-3185340
R423	Resistor, speaker field, 1000 ohms, 7 watts (P-M speaker only)	33-1335-89
T400	Transformer, audio output	32-8522
Z400	Transformer, 1st sound i-f assembly	32-4449A
Z401	Transformer, FM detector	32-4450-5

MISCELLANEOUS B

Description	Service Part No.
Cable assembly, chassis connection, power	41-4086-2
Cable assembly, c-r-t socket	41-3964-15
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	56-5629-5FA3
Socket and base 6CB6	29-6203-14
Socket, loktal	27-6207
Socket, miniature tube, 7-pin	27-6265
Socket, miniature tube, 9-pin	27-6203-5

TV TUNER, PART No. 76-7070
SECTION 5

Reference Symbol	Description	Service Part No.
C500	Condenser, fixed trimmer, 20 μμf.	62-020309011
C503	Condenser, d-c blocking, 150 μμf.	62-115001011
C504	Condenser, grid by-pass, 220 μμf.	30-1225-11
C505	Condenser, a-g-c decoupling, 0.01 μf.	Part of R503
C507	Condenser, grid by-pass, 220 μμf.	30-1225-11
C508	Condenser, grid by-pass, 0.02 μf.	30-1238-5
C509	Condenser, d-c blocking, 150 μμf.	62-115001011
C510	Condenser, plate decoupling, 150 μμf.	62-115001011
C512	Condenser, coupling, 1.2 μμf.	30-1221-7
C513	Condenser, d-c blocking, 39 μμf.	62-039409011
C514	Condenser, coupling, 5 μμf.	30-1221-13

Reference Symbol	Description	Service Part No.
C515	Condenser, trimmer, mixer grid, 0.5 to 3 μμf.	31-6520-3
C516	Condenser, oscillator injection, 1.5 μμf.	30-1224-59
C517	Condenser, fixed trimmer, 15 μμf.	62-015409011
C519	Condenser, d-c blocking, 470 μμf.	62-147001001
C520	Condenser, plate decoupling, 150 μμf.	62-115001011
C521	Condenser, plate by-pass, 150 μμf.	62-115001011
C522	Condenser, d-c blocking, 4.7 μμf. ±5%	30-1224-85
C523	Condenser, fixed trimmer, 7.5 μμf. ±10%	30-1224-84
C524	Condenser, fine tuning	76-5755
C525	Condenser, filament decoupling, 1000 μμf.	30-1245-1
C527	Condenser, trimmer, 1 to 6 μμf.	31-6520-2
C528	Condenser, coupling, 470 μμf.	62-147001001
C529	Condenser, coupling, 470 μμf.	62-147001001
C530	Condenser, decoupling, 150 μμf.	62-115001001
C531	Condenser, a-g-c decoupling, 1000 μμf.	30-1245-1
L500 and L501	Coil, tapered line	Part of Z500
L503 through L509	Coil, r-f grid (channels 2 through 13, respectively)	Part of WS500D
L510	Coil, r-f choke, plate feed	32-4112-22
L511 through L517	Coil, r-f plate (channels 2 through 13, respectively)	Part of WS500C
L518 through L524	Coil, mixer grid (channels 2 through 13, respectively)	Part of WS500B
L525	Coil, r-f choke	32-4112-25
L526	Coil, mixer plate (1st r-f)	32-4359-12
L527 through L533	Coil, oscillator (channels 2 through 13, respectively)	Part of WS500A
L534	Coil, r-f choke, filament decoupling	312-5132
L535, L536 and L537	Coil, r-f choke, filament decoupling	32-4112-2
L538	Coiled line, 150 ohms	32-4527
R510	Resistor, B-plus dropping, 2200 ohms, 1 watt	66-2224340
R511	Resistor, B-plus dropping, 15,000 ohms, 2 watts	66-3155340
TB500	Terminal board (aerial)	38-8689
TC500	Tuning core, FM trap	Part of L502
TC502 and TC503	Tuning core, r-f grid (channels 6 and 13)	Part of WS500D
TC504 and TC505	Tuning core, r-f plate (channels 6 and 13)	Part of WS500C
TC506 and TC507	Tuning core, mixer grid (channels 6 and 13)	Part of WS500B
TC508	Tuning core, 1st i-f	Part of L526
TC509 through TC515	Tuning core, oscillator (channels 2 through 13, respectively)	Part of WS500A
WS500	Wafer switch assembly	Not supplied as an assembly
WS500A (F) and WS500A (R)	Switch wafer section (oscillator) with coils	76-6784
WS500B (F) and WS500B (R)	Switch wafer section (mixer grid) with coils	76-7098
WS500C (F) and WS500C (R)	Switch wafer section (r-f plate) with coils	76-6895
WS500D (F) and WS500D (R)	Switch wafer section (r-f grid) with coils	76-7077
Z500	Tapered-line assembly	76-7071

MISCELLANEOUS C

Description	Service Part No.
Ball bearing (2 used)	56-8020
Cam-and-shaft assembly (FINE TUNING)	76-5846-4
Insulator, tuner shaft	54-4912
Lock washer, trimmer-condenser mtg.	W-1775-3
Plate-and-bracket assembly, front	76-5924-3
Plunger, FINE TUNING condenser	56-8034
Screw, trimmer-condenser core	2W10617
Shaft	56-8018-6
Shield, tube	56-5629-5
Spring, cam shaft	56-8254
Spring detent	56-8019-1
Spring-and-bracket assembly, FINE TUNING condenser grounding	76-5961-1
Spring, plunger (FINE TUNING condenser)	56-8035-1
Spring, tuner-shaft insulator	56-9181
Washer, "C," shaft retaining	56-8061

CONNECTING CABLES, PLUGS AND SOCKETS

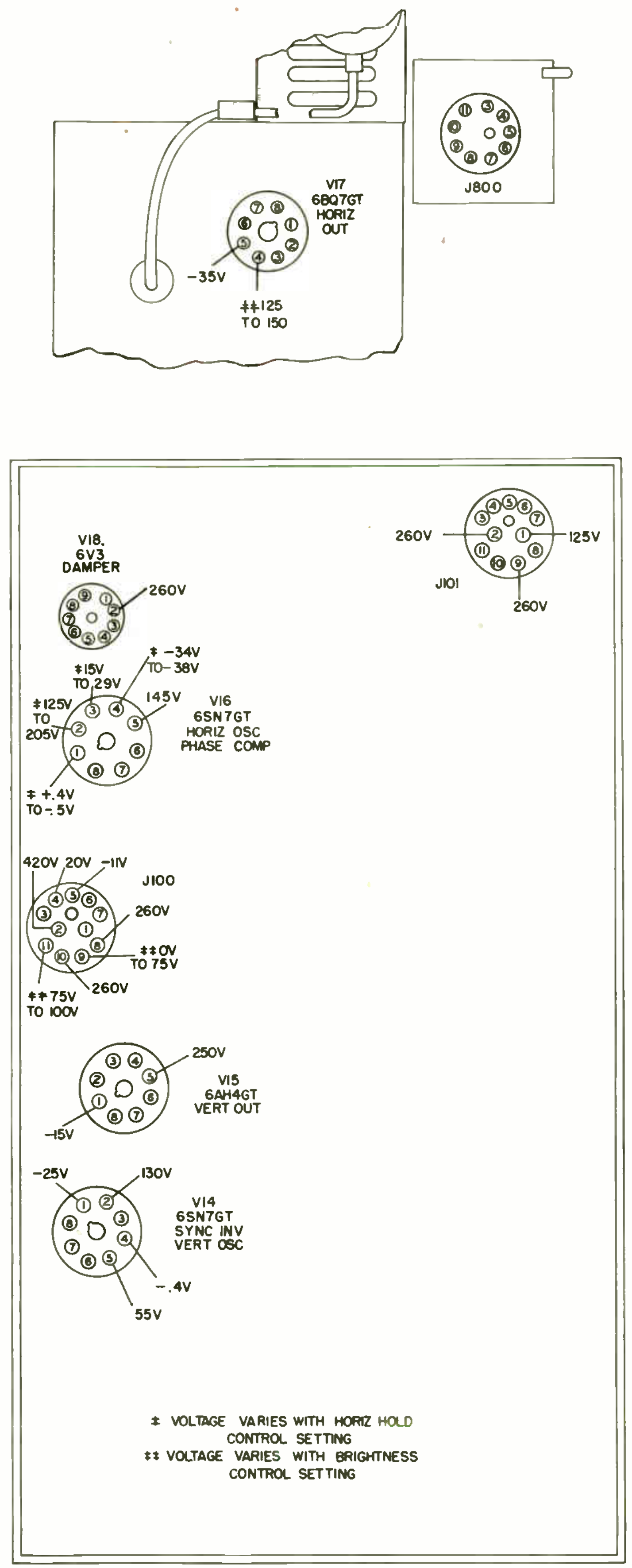
Reference Symbol	Description	Service Part No.
J100	Socket, chassis connecting	27-6274-1
J101	Socket, radio chassis connecting	27-6274-4
J102	Socket, a-c line	27-6240-3
J200	Socket, alignment test	27-6273
J400	Socket, volume control	27-6273
J401	Socket, speaker	27-4785-22
J402	Socket, discriminator test	27-6273
J800	Socket, deflection yoke connector	27-6274-6
PL100	Plug and cable assembly, TV chassis connecting	41-4086-2
PL101	Plug and cable assembly, radio chassis connecting	See Parts List of radio tuner used
PL102	Plug and line cord assembly	41-3865
PL400	Plug and cable assembly, audio control	41-3974
PL401	Plug and cable assembly, speaker,	**See Cabinet Parts List
PL800	Plug and cable assembly deflection	41-4086-18
	Cable assembly, high voltage, c-r-t	41-4064-6
	Cable assembly, c-r-t socket	41-3964-15
	Cable assembly, pilot light	27-6233-6
	Cap and lead assembly, 6BQ6GT plate	76-5664-7
	Cap and lead assembly, 6V3 plate	76-5664

**NOTE: Length of this cable varies with cabinet model and speaker size. For replacement part number refer to cabinet parts list in Philco Service Bulletins.

PHILCO CORPORATION
PHILADELPHIA, PA.

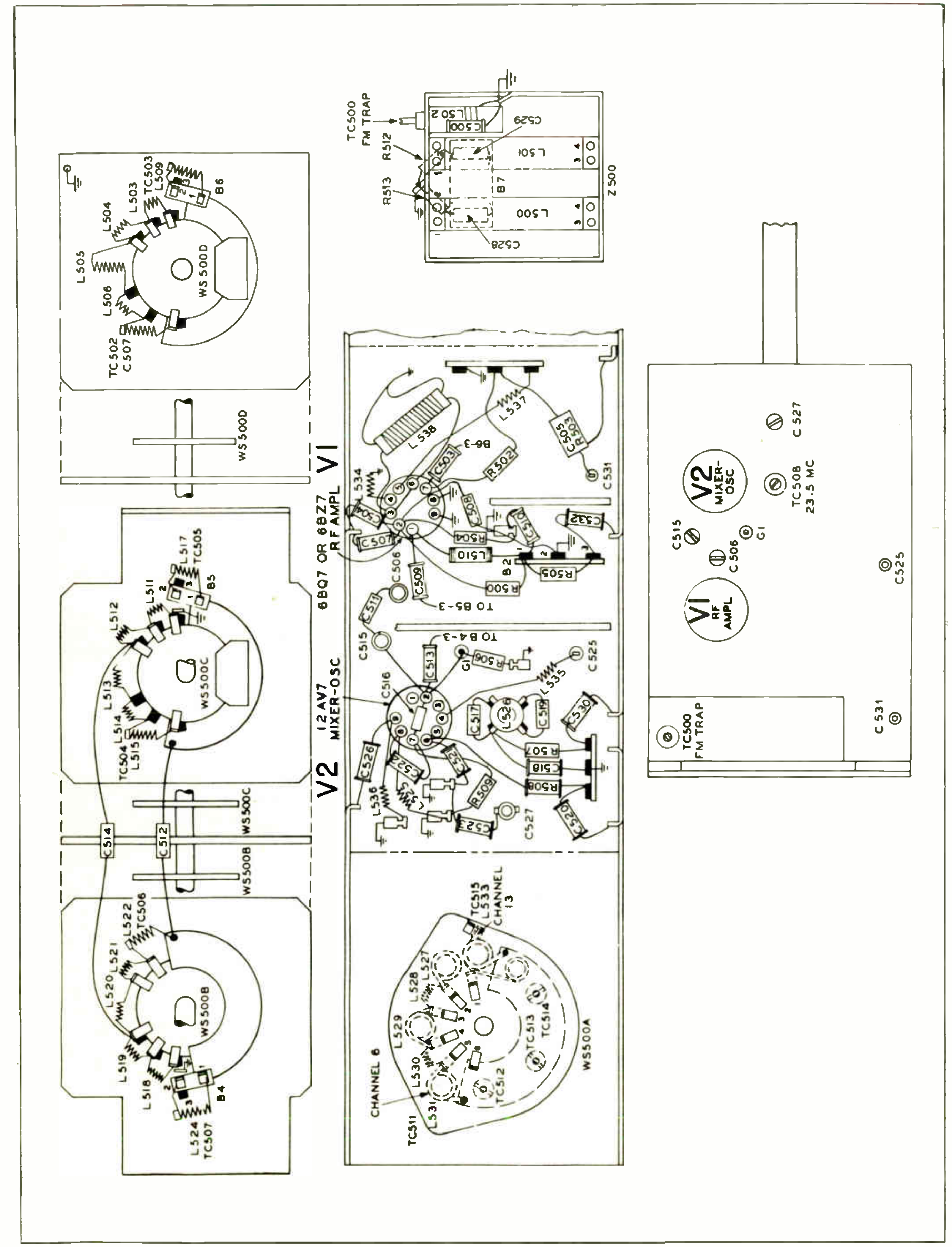
PR-2199

Printed in U. S. A.



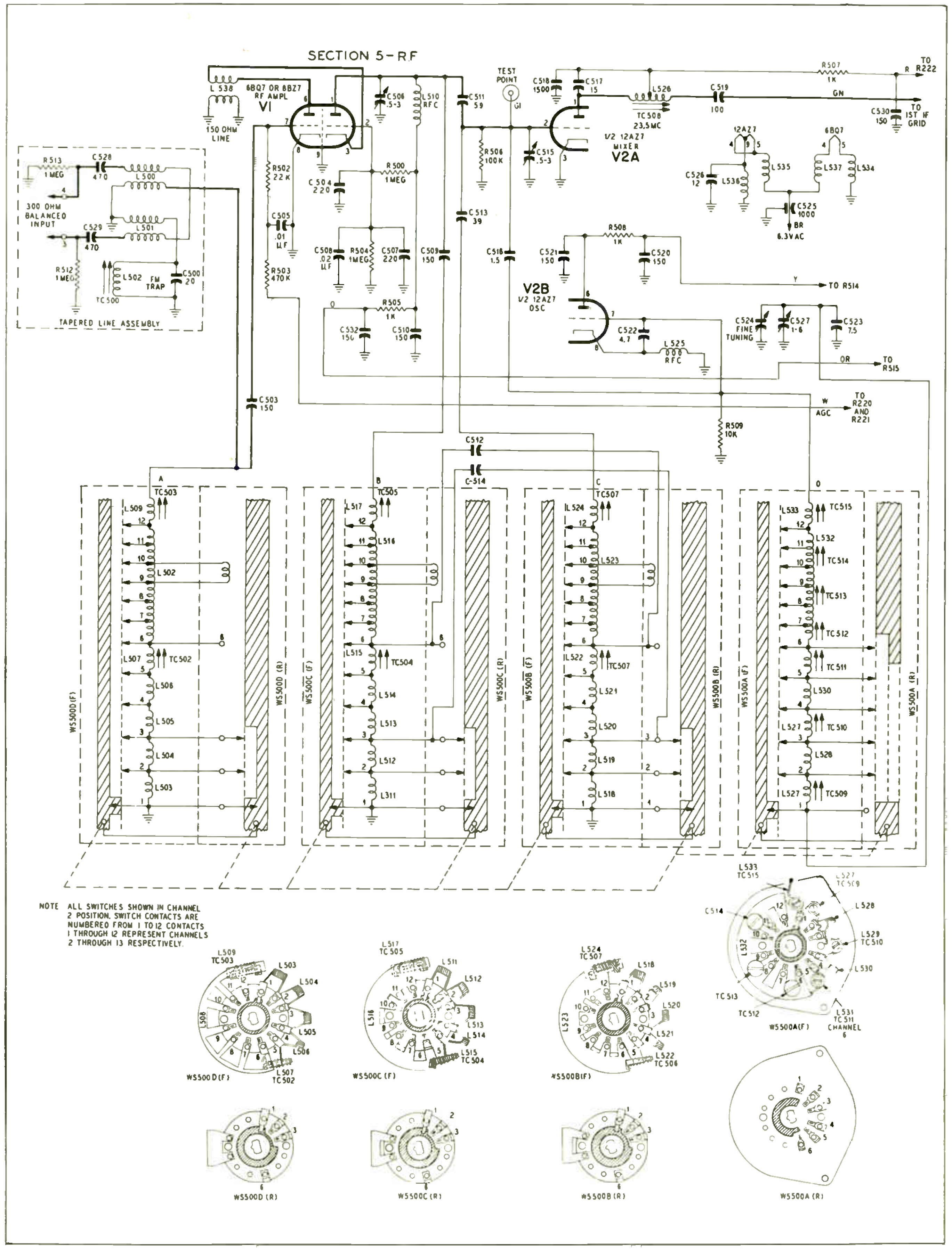
TP2-1330

Figure 30. Deflection Chassis G-4, Bottom View, Showing Voltages at Socket Pins



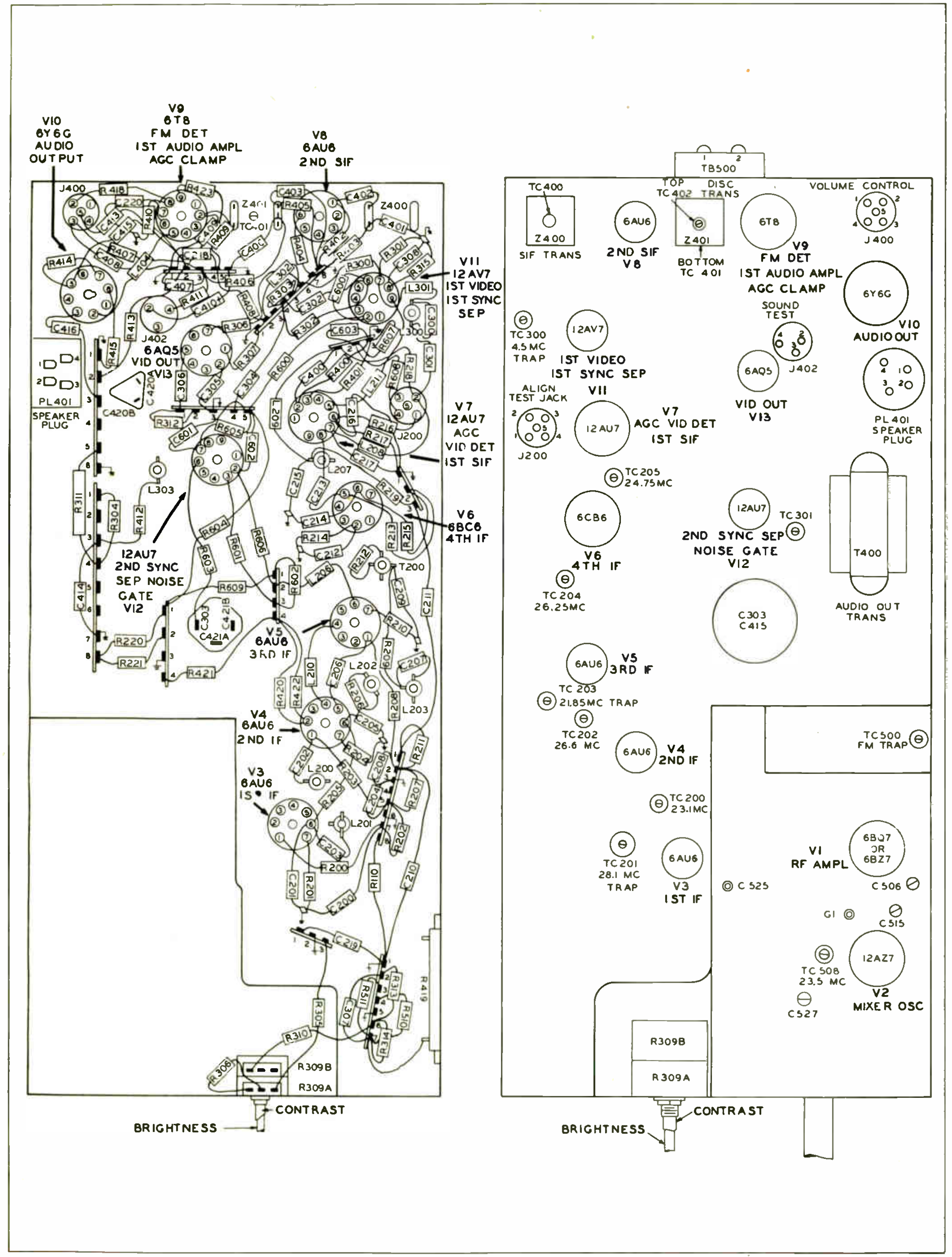
TP1-2218

Figure 31. Television Tuner, Base Layout



TP2-1367

Figure 32. Television Tuner, Schematic Diagram



TP2-1331

Figure 33. R-F Chassis 44, Base Layout

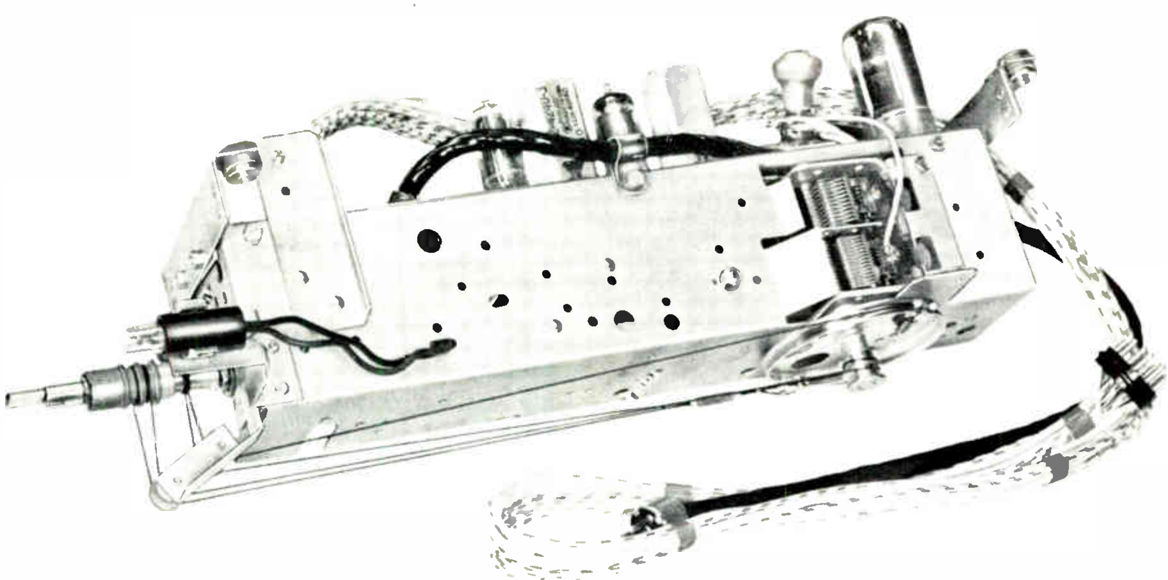
PHILCO SERVICE

PHILCO Factory-Supervised Service

TELEVISION

PHILCO TELEVISION SERVICE MANUAL FOR AM RADIO TUNER RT-9 AND TV-PHONO SWITCH UNIT USED IN 1953 PHILCO TELEVISION RECEIVERS

Service Manual for AM Tuner RT-9 and TV-Phono Switch



PHILCO AM RADIO TUNER RT-9

TP2-522

PR-2377

RADIO ALIGNMENT

GENERAL

Remove the receiver from the cabinet by disconnecting all receiver cables and removing the securing bolts. After the receiver has been removed from the cabinet, reconnect all cables. (On those sets incorporating a phonograph, the phono connection need not be made during alignment.) Before starting the radio alignment, allow the receiver to warm up for 15 minutes.

TEST EQUIPMENT REQUIRED

The following equipment is recommended for aligning the radio section:

1. Philco Signal Generator Model 7170, or equivalent.
2. Output indicator (either a 20,000-ohms-per-volt voltmeter or an oscilloscope).

RADIO ALIGNMENT PROCEDURE

Follow the procedure in the alignment chart, and also observe the following instructions:

1. Set the function switch to the AM position.
2. Set the volume control for maximum output.
3. During the alignment, set the signal-generator output at such a level as to keep the output at the speaker below 1 volt, peak-to-peak.

RADIO ALIGNMENT CHART (AM RADIO TUNER RT-9)

STEP	SIGNAL-GENERATOR CONNECTION	OUTPUT-INDICATOR CONNECTION	SIGNAL-GENERATOR SETTING	RADIO-DIAL SETTING	ADJUSTMENT INSTRUCTIONS
1	Connect signal generator through .1-μf. condenser to grid (pin 6) of converter tube. Connect low side of generator to B -	Connect vertical input of oscilloscope (or meter leads) to voice-coil terminals of speaker.	Set signal generator (modulated) to 455 kc.	Condenser fully meshed.	Adjust TC902, TC901, TC903, and TC900 (see figure 1) respectively, for maximum output indication.
2	Same as step 1.	Same as step 1.	Set signal generator (modulated) to 1630 kc.	1630 kc.* (See figure 1.)	Adjust C901 for maximum output indication.
3	Coupling loop. (See NOTE below)	Same as step 1.	Set signal generator (modulated) to 1500 kc.	Tune receiver to generator signal (1500 kc.).	Adjust C902 for maximum output indication.
4	Same as step 3.	Same as step 1.	Set signal generator (modulated) to 580 kc.	Tune receiver to generator signal (580 kc.).	Adjust TC904 for maximum output indication.
5	Repeat steps 3 and 4 until maximum output is obtained at the high and low ends of the band.				

For proper adjustment of the oscillator trimmer, fully open the tuning gang and insert a .006-inch, non-metallic shim between the heel of the rotor and the top of the stator plates. Close the tuning gang sufficiently to hold the shim in place, and then remove the shim without disturbing the gang setting.

COIL REPLACEMENT: If it should ever become necessary to replace oscillator transformer T901 or antenna transformer T900, the adjustments given in steps 2 through 5 should be made.

NOTE

The adjustment of C902 and TC 904 should be made with the loop aerial connected. The signal generator should be coupled to the receiver by means of a radiating loop. This loop should be about 6 inches in diameter, made up of 6 or 8 turns of insulated wire. Connect the radiating loop to the signal generator, and place the loop a minimum distance of 1 foot from the loop aerial of the receiver.

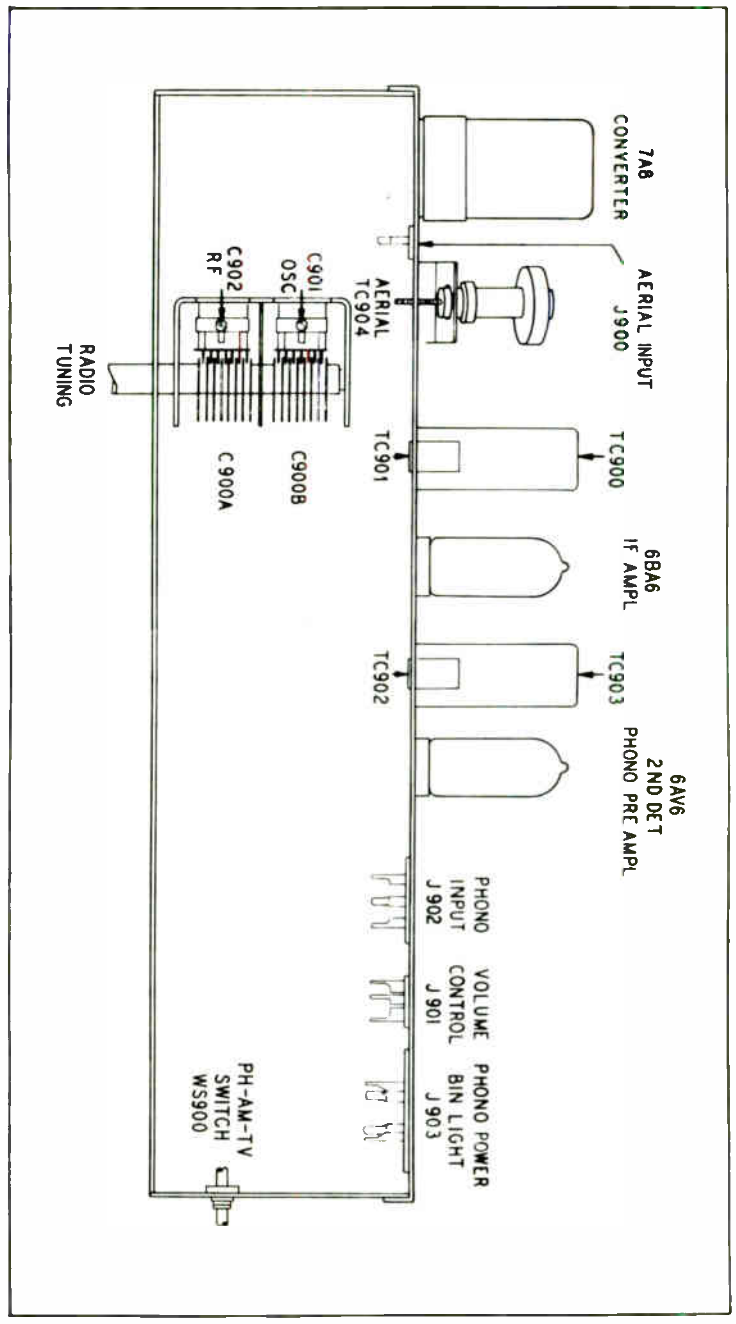


Figure 1. AM Radio Tuner RT-9, Bottom View, Showing Location of Adjustments

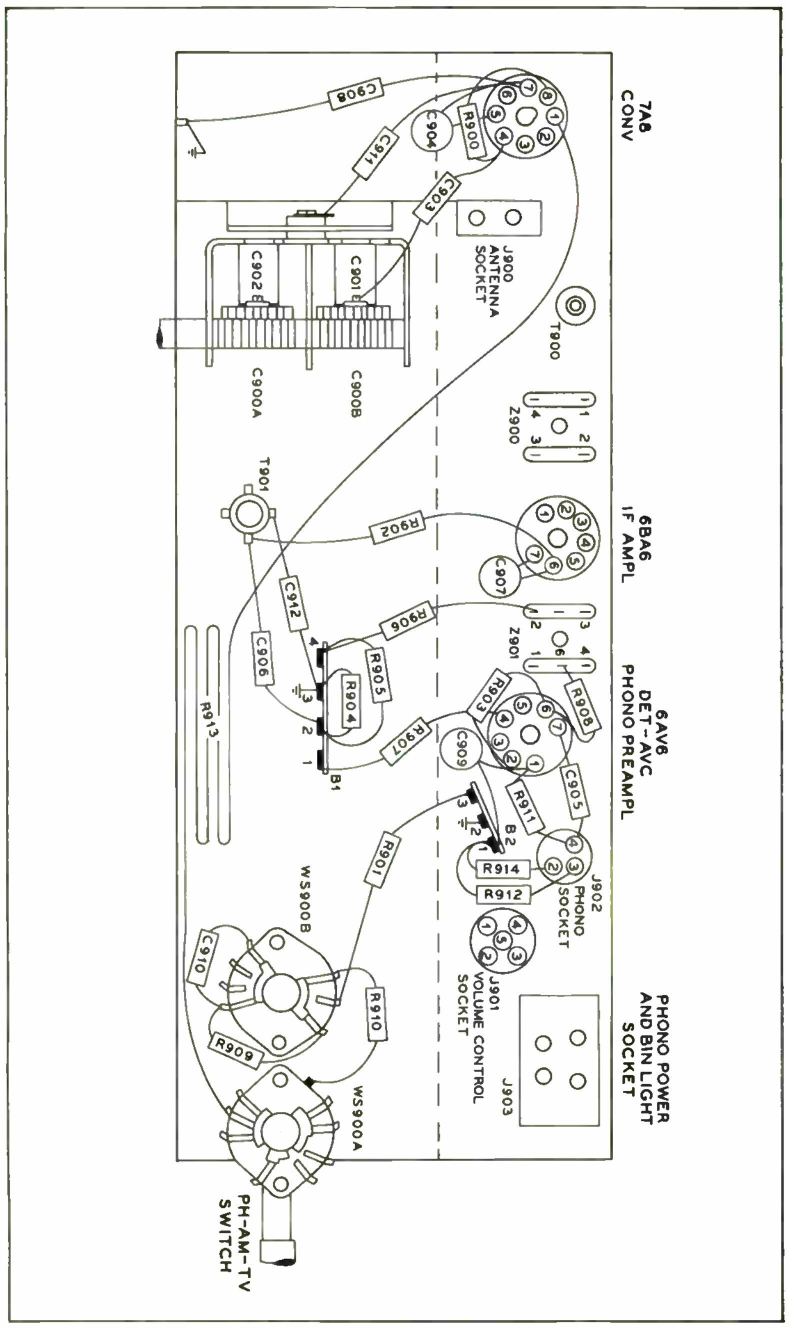


Figure 2. AM Radio Tuner RT-9, Base Layout

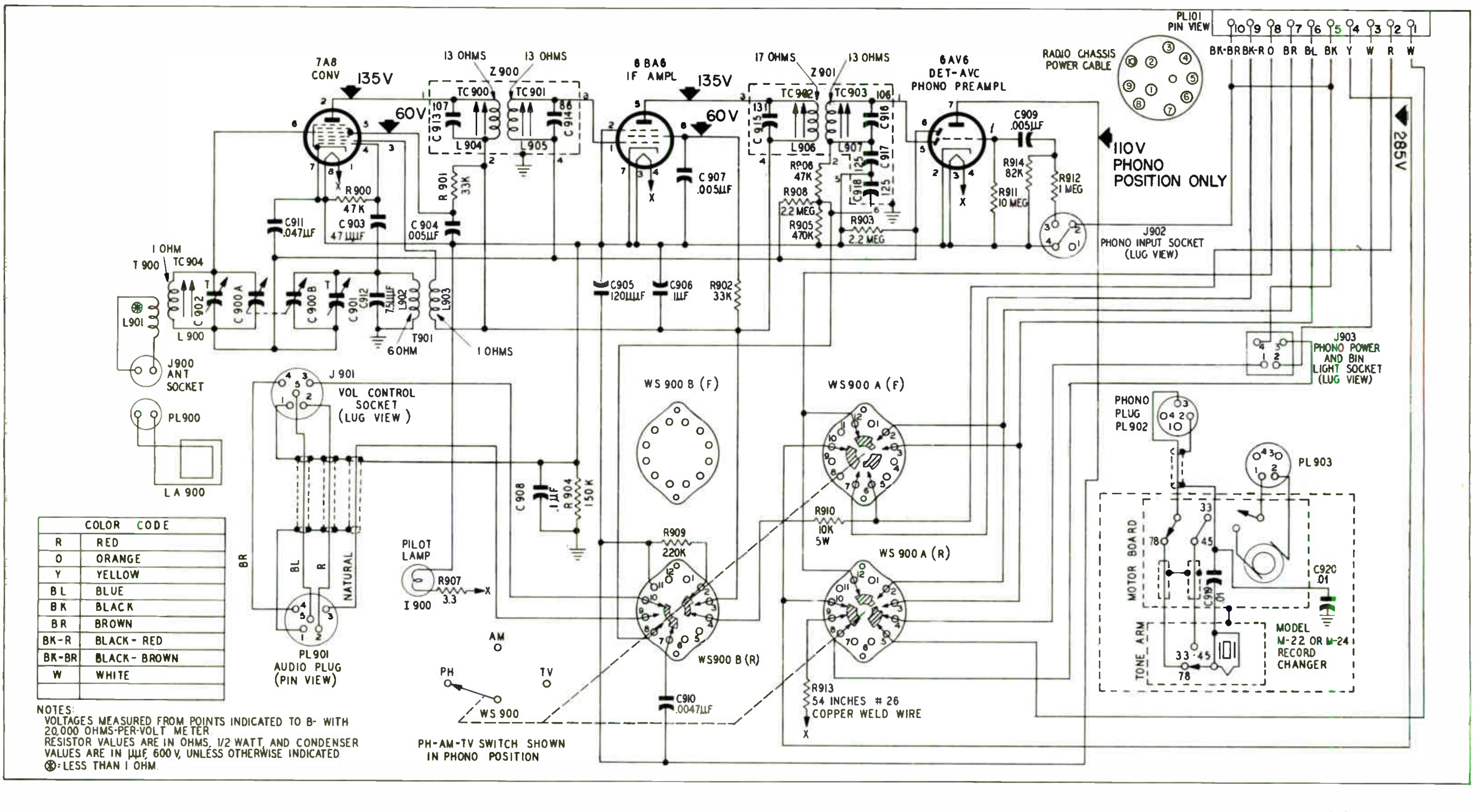


Figure 3. AM Radio Tuner RT-9, Schematic Diagram

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. All parts are symbolized in the schematic diagram and base layouts, for identification purposes.

Reference Symbol	Description	Service Part No.
C900A and C900B	Condenser, tuning gang, 2-section	31-2770
C901	Condenser, trimmer, oscillator	Part of C900B
C902	Condenser, trimmer, r-f grid	Part of C900A
C903	Condenser, oscillator grid, 47 μμf.	60-00475420
C904	Condenser, screen by-pass, .005 μf.	30-1238-1
C905	Condenser, compensating, 120 μμf.	60-10125237
C907	Condenser, screen by-pass, .005 μf.	30-1238-1
C909	Condenser, phono coupling, .005 μμf.	30-1238-1
C912	Condenser, i-f trimmer, fixed, 7.5 μμf.	30-1224-65
C913	Condenser, i-f trimmer, fixed	Part of Z900
C914	Condenser, i-f trimmer, fixed	Part of Z900
C915	Condenser, i-f trimmer, fixed	Part of Z901
C916	Condenser, i-f trimmer, fixed	Part of Z901
C917	Condenser, i-f by-pass	Part of Z901
C918	Condenser, i-f by-pass	Part of Z901
I900	Lamp, pilot	34-2064
J900	Socket, antenna	27-6252-3
J901	Socket, volume control	27-6273
J902	Socket, phono input	27-6273
J903	Socket, phono power and bin lamp	27-6182
L900 and L901	Coil, antenna	Part of T900
L902 and L903	Coil, oscillator	Part of T901
R910	Resistor, voltage dropping, 10,000 ohms, 5 watts	33-1335-21
R913	Resistor, filament voltage-dropping 54 inches of No. 26 copper-weld wire	
T900	Transformer, antenna	32-4519
T901	Transformer, oscillator	32-4453-4
Z900	Transformer, first i-f	32-4161A
Z901	Transformer, second i-f	32-4240-3A
WS900	Wafer-switch assembly	42-1980

MISCELLANEOUS

Description	Service Part No.
Cable-and-plug ass'y., audio	41-3974-6
Cable-and-plug ass'y., power	41-4086-24
Mount, rubber	27-4596
Pilot-lamp ass'y.	27-6233-6
Shaft, tuning	56-9795
Socket, Loktal	27-6207
Socket, miniature	27-6265
Socket, miniature	27-6265-2
Spring, tension	28-8751-2
Spring, condenser drive	56-2617
Spring, hairpin	56-9868

PR-2377

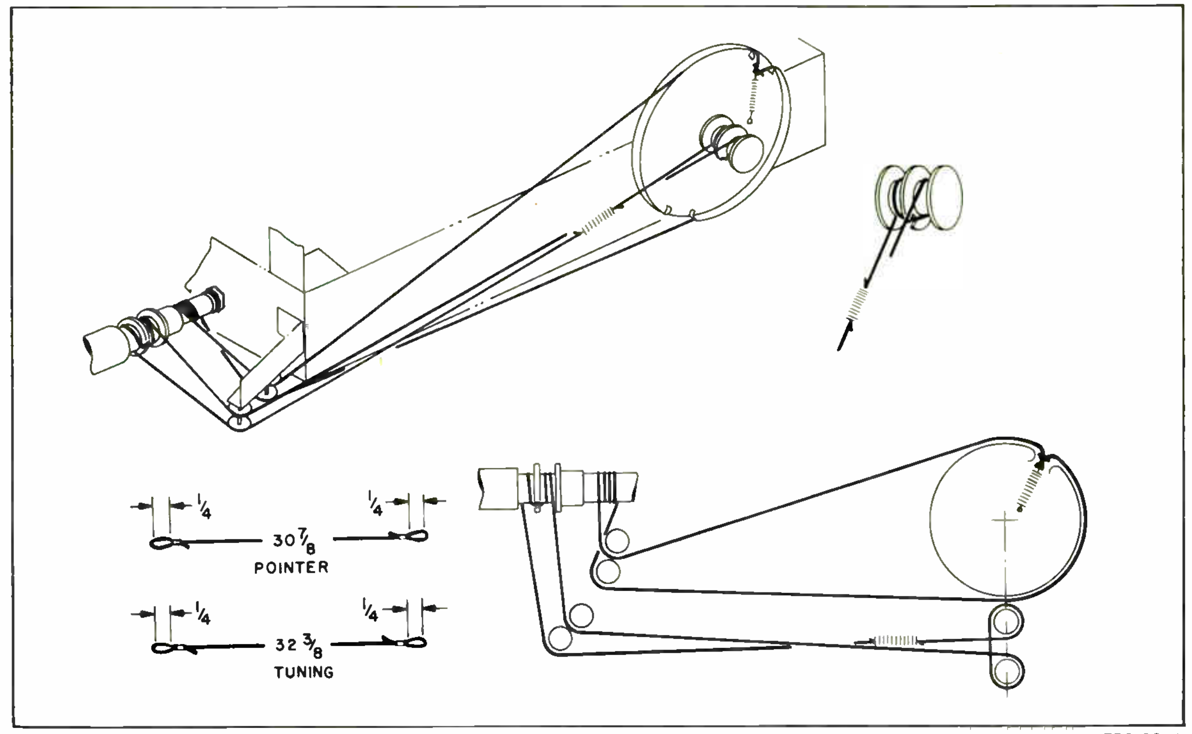


Figure 4. Drive Cord Installation Details for AM Radio Tuner RT-9

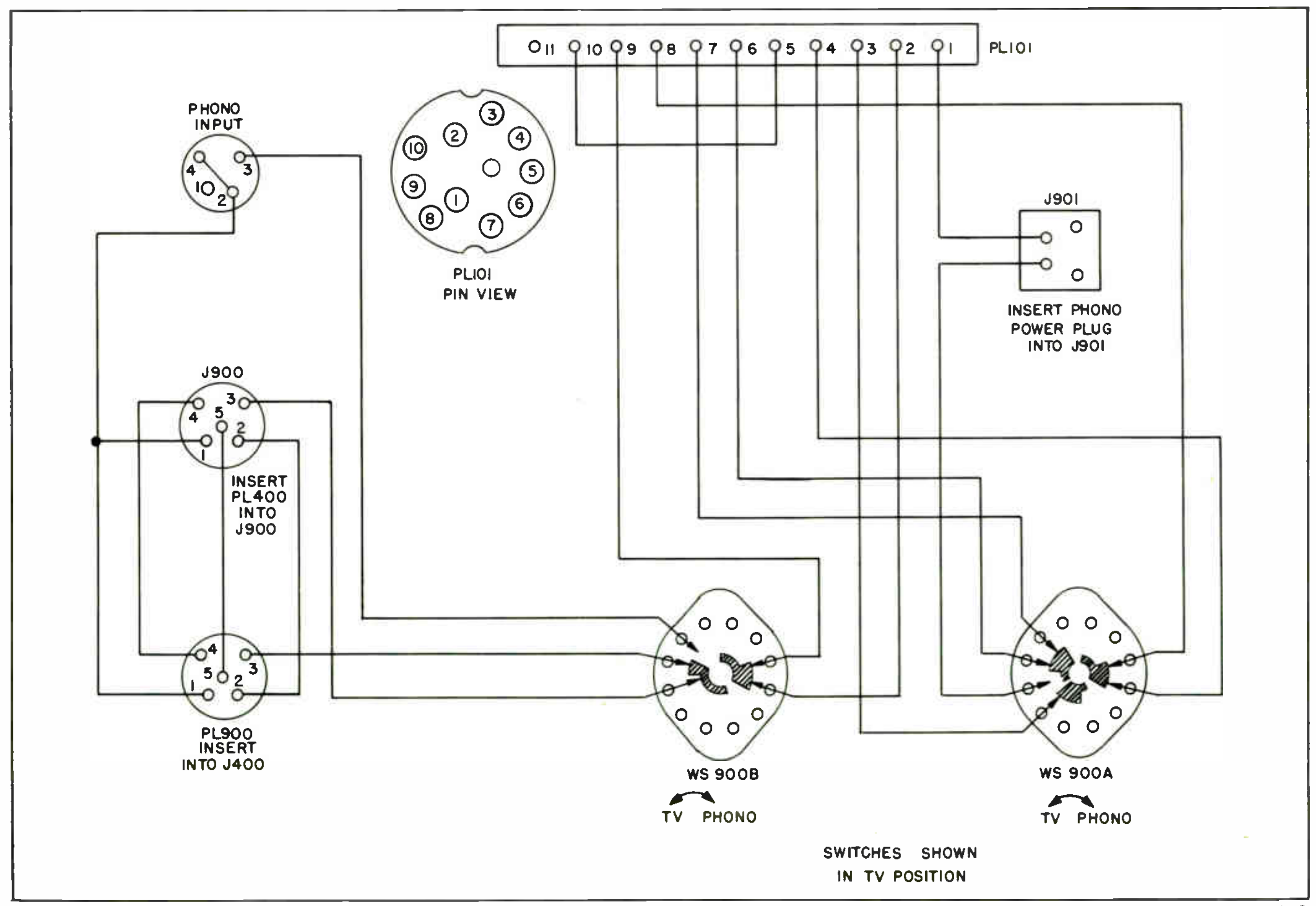


Figure 5. Schematic Diagram of TV-Phono Switch, Used in Television-Phonograph Combinations

PHILCO SERVICE

PHILCO
Factory-Supervised
Service

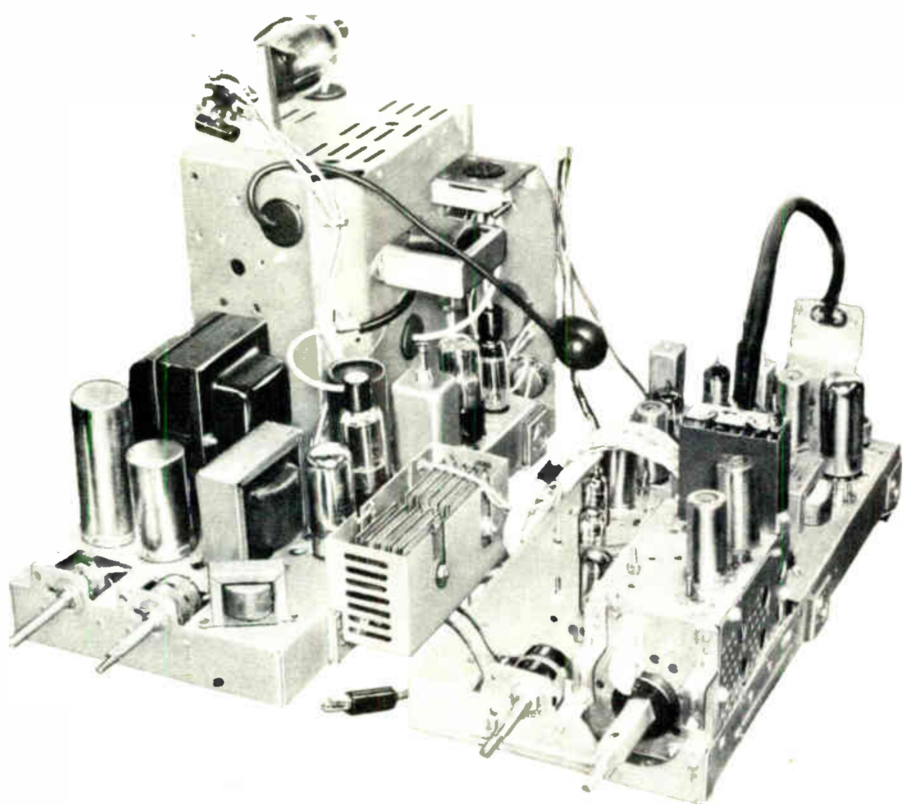
TELEVISION

PHILCO TELEVISION SERVICE INFORMATION FOR

R-F CHASSIS 41 44 DEFLECTION CHASSIS D-1 D-4

CABINET PARTS LIST FOR MODELS

52-T2110, 52-T2144, 52-T2182, 52-T2182L, ALL CODE 121; 52-T2145X, CODE 125

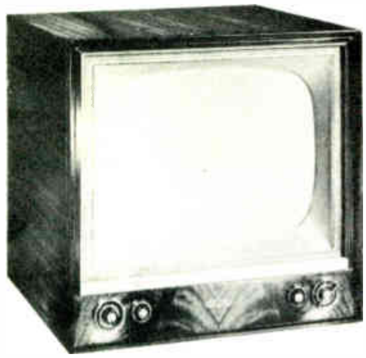


DUAL TV CHASSIS FOR
1952 MODELS, CODES 121 AND 125

TP1-904

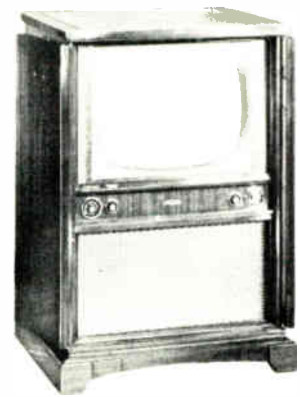
SERVICE INFORMATION FOR PHILCO CHASSIS TYPES 41, 44, D-1, D-4

PR-1941



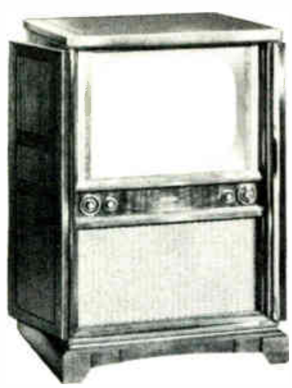
TP1-2323

MODEL 52-T2110
CODE 121



TP1-1824

MODEL 52-T2144
CODE 121



TP1-1825

MODEL 52-T2145X
CODE 125

TP1-1826

MODEL 52-T2182
CODE 121

CIRCUIT DESCRIPTION

The Philco 1952, Codes 121 and 125, television receivers use two chassis—one chassis containing the r-f, video, audio, and sync circuits, the other chassis containing the power and deflection circuits. The 41 and 44 r-f chassis are similar except for audio power output. The D-1 and D-4 chassis are similar except for AM radio provisions in the D-4 chassis.

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

The r-f amplifier, oscillator, and mixer section is built on a separate subchassis. The r-f amplifier uses a 6BQ7 tube. The oscillator and mixer each use one-half of a 12AZ7 tube. The output of the mixer is fed to a four-stage i-f amplifier, employing three 6AU6 tubes and one 6CB6 tube. One-half of a 12AU7 is used as a video detector, a-g-c rectifier. The cathode and grid are used for video detection, while the cathode and plate are used for a-g-c rectification. A delay voltage obtained from a voltage divider, consisting of the CONTRAST control, R305 and R408, is applied to the cathode to prevent a-g-c action on weak signals, where maximum gain is required. The maximum delay voltage is obtained when the CONTRAST control is in the fully clockwise position, as is the case when the Receiver is adjusted for weak signals. The a-g-c voltage is applied to the r-f amplifier and the first three i-f stages, to hold the output of the video detector essentially constant with large variations in input signal levels.

Sound i-f (intercarrier) is obtained by utilizing the beat frequency produced when the 26.6-mc. video carrier and the 22.1-mc. sound carrier are mixed in the video detector. The beat frequency, 4.5 mc., is the difference between 26.6 mc. and 22.1 mc., and contains the FM sound signal. This 4.5-mc. signal contains only a negligible amount of the video amplitude modulation, provided that the amplitude of the 22.1-mc. signal is considerably lower than that of the 22.6-mc. signal. The proper relationship between the two carriers is established in the alignment of the Receiver. There is sound output only when both the video and sound 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), which is taken from the video detector, is amplified by one-half of a 12AU7 and a 6AU6, and are fed to the FM detector, which utilizes two diode sections of a 6T8 tube. The triode section of the 6T8 is used as the first audio amplifier. The power amplifier uses a 7C5 tube in the 41 chassis, and a 6Y6G tube in the 44 chassis.

One-half of a 12AV7 tube is used as the first video amplifier, which works into a 6AQ5 video output amplifier. The plate load of the first video amplifier is made up of two resistors. R302 and R303. To obtain higher voltage for synchronization, the composite signal for sync purposes is taken from across both R302 and R303, while the composite video for the video output is taken from across R303 only. C302 is used to by-pass high-frequency video around R302. The plate load of the video output amplier consists of L302 and R309. L302 is an adjustable peaking coil, and is adjusted at the factory for best video response.

The sync circuit consists of a first sync separator, a variable diode noise gate, a second sync separator, and a sync inverter. The composite video is fed to the first sync separator, one-half of a 12AV7 tube. The output of the first sync separator is taken from the cathode and applied to the cathode of the noise gate, one-half of a 12AU7 tube. A positive voltage, which is obtained from a voltage divider made up of R606 and R607, 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 diode is driven positive with respect to the plate, and the diode is cut off, thus preventing the noise from passing on to the second sync separator.

The positive voltage applied to the plate of the diode is made proportional to the strength of the signal being received by obtaining it from the load side of a dropping resistor, R419, in the B+ line that supplies plate and screen voltages to the i-f stages. The current through B419, therefore, depends upon the amount of current drawn by the i-f stages. When a stronger signal is received, the a-g-c voltage increases; this decreases the current drawn by the i-f stages, and decreases the voltage drop across R419. Since this results in an increase in the voltage applied to the plate of the noise-gate diode, the level at which the diode will gate out the noise is raised. When a weaker signal is received, the opposite effect is obtained. The second sync separator, one-half of a 12AU7 tube, removes all remaining video information from the composite signal. The output of the second sync separator is fed to the deflection chassis through the power connecting cable. A sync inverter, one-half of a 7N7 tube, 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 7N7 tube. The output of the blocking oscillator is amplified by the 6BQ6GT 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 6SN7GT 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 horizontal blocking oscillator employs one-half of a 6SN7GT tube. A 6CD6G tube is used as the horizontal amplifier, and a 6V3 is used as the horizontal damper.

The high voltage for the picture tube is supplied by one 1B3 and one 1X2 rectifier. The B-plus voltage is developed by two selenium rectifiers in a full-wave voltage-doubler circuit, operating from the power line. Bias voltage is supplied by a selenium rectifier which rectifies the output of one of the secondaries of the power transformer. The other secondaries of the transformer supply the heater currents.

SPECIFICATIONS

MODEL	DESCRIPTION	R-F CHASSIS	DEFLECTION CHASSIS	PICTURE TUBE	RADIO TUNER	PHONO	AUDIO OUTPUT (WATTS)	POWER CONSUMPTION (WATTS)
52-T2110 Code 121	Table Model	41	D-1	20DP4A			3	215
52-T2144 Code 121	Console	41	D-1	20DP4A			3	215
52-T2145X Code 125	Console	44	D-4	21EP4A			5	225
52-T2182 Code 121	Combination Console	44	D-4	20DP4A	RT-6	M-22	5	225
52-T2182L Code 121	Combination Console	44	D-4	20DP4A	RT-6	M-22	5	225

SPECIFICATIONS COMMON TO ALL MODELS

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

FREQUENCY RANGE ...... Television Channels 2 through 13.

INTERMEDIATE FREQUENCIES
- Video carrier ...... 26.6 mc.
- Sound (intercarrier) ...... 4.5 mc.

AERIAL ...... Built-in broad-band dipole; provisions for external aerial, if necessary.

TRANSMISSION LINE (TELEVISION) ...... 300-ohm, twin-wire lead.

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

SPECIFICATIONS, AM RADIO TUNER RT-6

FREQUENCY RANGE ...... 540 to 1620 kc.

INTERMEDIATE FREQUENCY ...... 455 kc.

AERIAL ...... Built-in loop aerial

TUBE COMPLEMENT

41 CHASSIS AND 47 CHASSIS

TUBE TYPE	FUNCTION
6BQ7—miniature	R-F amplifier
12AZ7—miniature	Oscillator, mixer
6AU6—miniature (3)	Video i-f amplifier
6CB6—miniature	Video i-f amplifier
12AU7—miniature	Video detector, a-g-c rectifier, first sound i-f amplifier

TUBE COMPLEMENT (Cont.)

41 CHASSIS AND 47 CHASSIS (Cont.)

TUBE TYPE	FUNCTION
6AU6—miniature	Second sound i-f amplifier
6T8—miniature	FM detector, first audio amplifier
7C5—loktal	Audio output (41 chassis)
6Y6G—octal	Audio output (44 chassis)
12AV7—miniature	First video amplifier, first sync separator
12AU7—miniature	Noise gate, second sync separator
6AQ5—miniature	Video output

D-1 CHASSIS AND D-4 CHASSIS

TUBE TYPE	FUNCTION
7N7—loktal	Sync inverter, vertical oscillator
6BQ6GT—octal	Vertical output
6SN7GT—octal	Phase comparer, horizontal oscillator
6CD6G—octal	Horizontal output
6V3—miniature	Horizontal damper
1B3—octal	High-voltage rectifier
1X2—miniature	High-voltage doubler

AM RADIO TUNER RT-6

TUBE TYPE	FUNCTION
7A8—loktal	Converter
6BA6—miniature	I-F amplifier
6AV6—miniature	Second detector, phono preamplifier

B SUPPLY FUSE REPLACEMENT

The B supply protective fuse 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.

TUNER TUBE REPLACEMENT

Whenever a tube is replaced, it is suggested that, if possible, several be tried, to obtain 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 oscillator fine-tuning range should be observed while selecting tubes.

IMPORTANT

A-C LINE ISOLATION

CAUTION: One side of the a-c line is connected to the chassis through C102, and the other side of the a-c line is connected to the chassis through R102 and CR101, 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.

HORIZONTAL SWEEP ADJUSTMENT

Adjustment of Horizontal 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 horizontal frequency control and horizontal lock-in trimmer as follows, in order to obtain proper synchronism and deflection:

1. Turn the HORIZ. HOLD control fully clockwise.

2. Adjust the horizontal frequency 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 controls slowly clockwise again, counting the number of black (blanking) bars, sloping down to the left, just before the picture pulls into sync. Adjust C804 until there are three 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

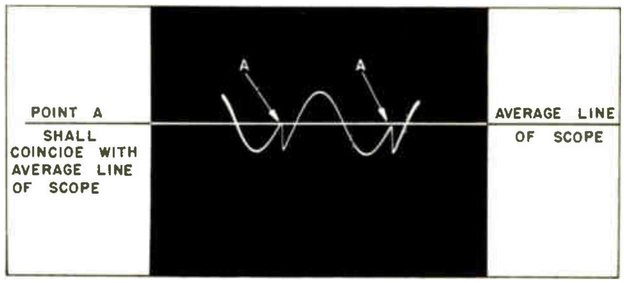


Figure 1. Horizontal-Oscillator Waveshape, Showing Correct Adjustment of T800

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, however, where excessive overshoot or excessive smear is present, 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 TC301 applies to a particular station exhibiting smear or overshoot. After TC301 is adjusted, reception on all the other stations should be checked, to make certain that the adjustment has not impaired the picture quality.

CHECKING AND ADJUSTING THE BUILT-IN AERIAL TUNING NETWORK

By adjusting the AERIAL TUNING control, it should be possible to tune the built-in aerial system to resonance at the video-carrier frequency of each channel.

To check the built-in aerial system, follow the procedure given below:

1. Connect a dipole through a 72-ohm coaxial cable to the output of a signal generator which has a band range covering the television channels.

2. Connect a 20,000-ohms-per-volt voltmeter to pin 3 of the ALIGN TEST jack, J200.

3. Set the CHANNEL SELECTOR to Channel 2, and the FINE TUNING control to the middle of its range.

4. Place the dipole near the back of the Receiver, and set the signal generator to the video-carrier frequency of Channel 2. Adjust the signal-generator attenuator for an output that just gives an indication on the meter.

5. Adjust the AERIAL TUNING control for a maximum reading on the voltmeter. The peak reading should be obtained with the AERIAL TUNING control well within its range (not in either its maximum clockwise or maximum counterclockwise position).

6. Repeat the steps above for Channels 3 through 13. For all channels, the peak readings should be well within the range of the AERIAL TUNING control.

If a satisfactory peak reading cannot be obtained on each channel in the low-frequency band, the long section of the loop assembly, to which the 300-ohm line is attached, may be pushed together or bowed out, to obtain peaking. If a satisfactory peak cannot be obtained on each channel in the high-frequency band, the two loops adjacent to the AERIAL TUNING condenser may be pushed toward each other or fanned out, to obtain peaking. If these adjustments do not give peaking on all channels, well within the range of the AERIAL TUNING control, the AERIAL TUNING condenser should be replaced.

FM TRAP ADJUSTMENT

The FM trap is adjusted at the factory to resonate at 100 mc., and normally requires no further adjustment unless an FM station with a frequency other than 100 mc. causes interference. In such cases, the interference may be reduced by tuning in the television station on which the interference occurs, and adjusting TC500 for minimum interference. See figure 36 or 40.

If the FM station is not on the air, the FM trap may be adjusted as follows:

1. Connect the output of the AM signal generator, through the aerial-input-matching network (figure 2) to TB500. Make sure that the tuner is wired for 300-ohm input.

2. Connect the input of an r-f probe or crystal detector (figure 3) to the lead from the tapered line, Z500, to the wafer switch, WS500D(F). Connect the output of the r-f probe or crystal detector to the vertical input of an oscilloscope. Use the highest possible oscilloscope gain.

3. Turn the CHANNEL SELECTOR to the channel with which the FM station is interfering.

4. Set the signal generator (modulated) to the station carrier frequency of the FM station causing the interference.

5. Adjust TC500 until the indication on the oscilloscope is at minimum.

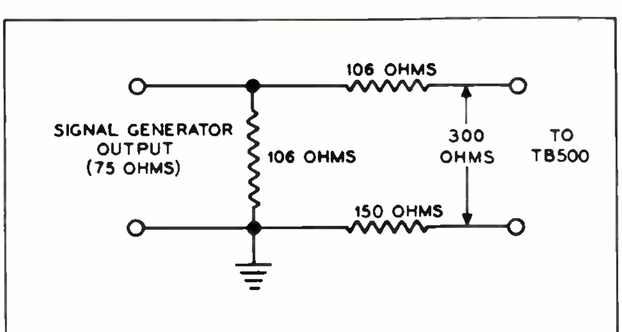


Figure 2. Aerial-Input Matching Network

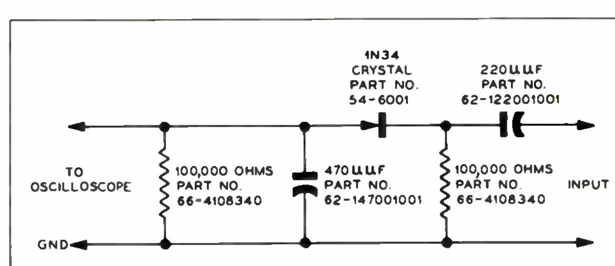


Figure 3. Wiring Diagram of Crystal Detector

TELEVISION ALIGNMENT

TELEVISION-CARRIER, OSCILLATOR, AND CHECK-POINT FREQUENCIES

CHAN-NEL	CHANNEL LIMITS (mc.)	VIDEO-CARRIER CHECK-POINT (A) FREQUENCY (mc.)	100% CHECK-POINT (B) FREQUENCY (mc.)	10% CHECK-POINT (C) FREQUENCY (mc.)	SOUND-CARRIER FREQUENCY (mc.)	LOCAL-OSCILLATOR FREQUENCY (mc.)
2	54—60	55.25	57.35	59.35	59.75	81.85
3	60—66	61.25	63.35	65.35	65.75	87.85
4	66—72	67.25	69.35	71.35	71.75	93.85
5	76—82	77.25	79.35	81.35	81.75	103.85
6	82—88	83.25	85.35	87.35	87.75	109.85
7	174—180	175.25	177.35	179.35	179.75	201.85
8	180—186	181.25	183.35	185.35	185.75	207.85
9	186—192	187.25	189.35	191.35	191.75	213.85
10	192—198	193.25	195.35	197.35	197.75	219.85
11	198—204	199.25	201.35	203.35	203.75	225.85
12	204—210	205.25	207.35	209.35	209.75	231.85
13	210—216	211.25	213.35	215.35	215.75	237.85

GENERAL

The alignment consists of tuning each i-f coil to a given frequency, 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.

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

The video-carrier intermediate frequency is 26.6 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 having the top of the workbench metallic. The Receiver chassis should be placed tuner-end 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 2″ 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 Model 7008 is used, the built-in crystal calibrator provides an excellent means of calibration. An alternate method for 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."

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 may be made through the alignment jack 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, may be used. As an alternate, a Philco alligator-clip adapter, Part No. 45-1636, with as short a ground lead as possible may be used to connect 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 should be of carbon-composition construction, and should be chosen from a group, to obtain values close to those indicated. The resistors should be placed in a shield can, to prevent variable effects. 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 4, 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 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, 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. See NOTE below.

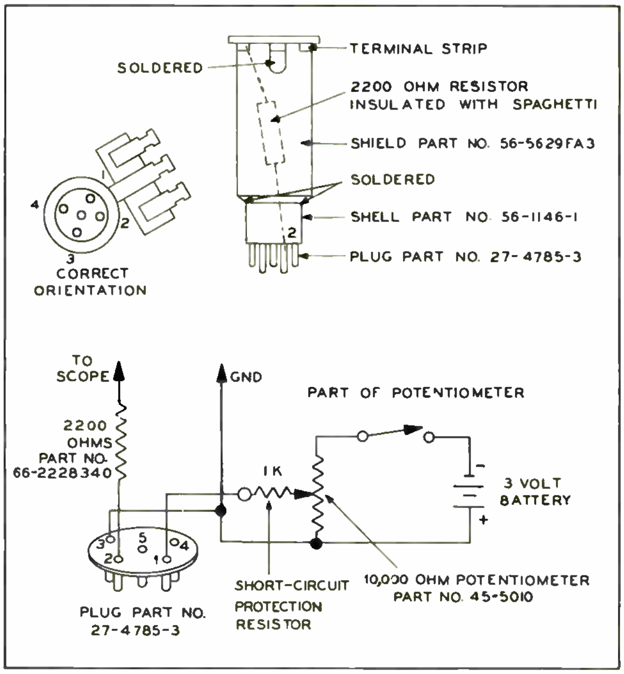


Figure 4. ALIGN TEST Jack Adapter

FM TEST Jack Adapter

Figure 5 shows the adapter that should be used to connect the voltmeter and oscilloscope to the FM detector test socket, J402. A suggested method of fabricating the adapter is also shown. Pins 1 and 5 are removed from a five-pin plug, 27-4785-3, because a three-pin plug with proper spacing is not readily available. SEE NOTE below.

NOTE: The test jacks are numbered COUNTER-CLOCKWISE as viewed from the lug end. This differs from the system used in previous models, where numbering was in the clockwise direction.

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

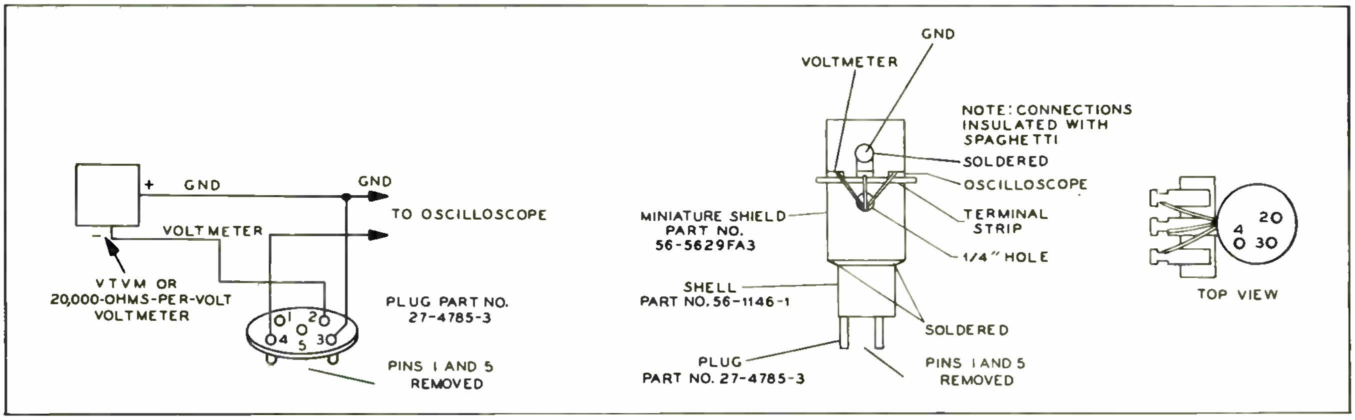


Figure 5. FM TEST Jack Adapter

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

Beginning with Channel 13, every other coil is tunable, so that by adjusting the tuning cores, it is possible to place either of two adjacent channels exactly on frequency; that is, either Channels 13 or 12, 11 or 10, 9 or 8, etc. The foregoing is based on the assumption that the oscillator has previously been tracked, and that it is desired to compensate for small tracking errors on several different channels. This adjustment procedure should be carried out with the highest channel 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 the Channel 6 oscillator tuning core. See figure 6.

Procedure Using Signal Generator

An r-f signal (unmodulated), at the oscillator frequency, is fed into the aerial input from an AM signal generator, and the oscillator tuning cores are adjusted for zero beat. The r-f signal should be accurate, preferably from a crystal source, or calibrated against the television station.

1. Connect a 3300-ohm resistor in series with the red lead from the tuner. Connect the "hot" lead of the oscilloscope to the junction of the red lead and the 3300-ohm resistor. (High oscilloscope gain may be necessary to obtain a visual beat. In this instance, base-line hum may be ignored.)

2. Connect the AM (marker) generator to the 300-ohm aerial-input terminals. For this purpose the aerial-input matching network is not required.

3. If the tuner is being aligned out of the chassis, connect the white lead to the negative terminal of a 1.5-volt battery. Ground the positive terminal.

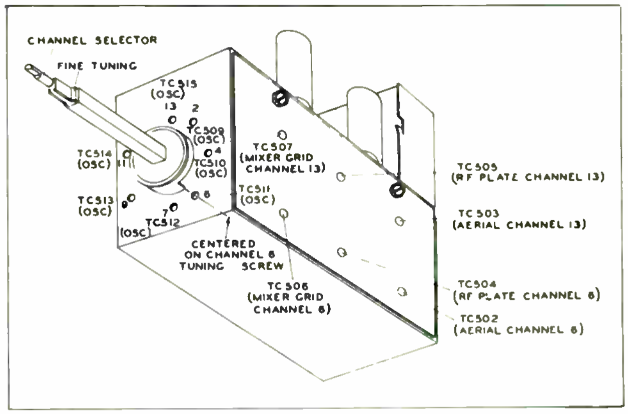
4. Mechanically preset the fine-tuning cam as shown in figure 6.

5. Feed in an r-f signal (unmodulated), at the oscillator frequency for Channel 13 (237.85 mc.), with the CHANNEL SELECTOR set for Channel 13.

6. Adjust the tuning core for Channel 13 (see figure 6).

7. Adjust the tuning cores for Channels 11 and 9, in the order given.

8. Check the Channel 8 oscillator frequency. If it is too high, turn C527 several turns clockwise; if the frequency is too low, turn the trimmer counter-clockwise (see figure 36 or 40).



TPO-2217

Figure 6. Television Tuner, Oblique View, Showing Location of Adjustments

9. Repeat steps 5, 6, 7, and 8 until Channels 13, 11, 9, and 8 are within plus or minus 500 kc. of the correct frequency.

10. Feed in an r-f (unmodulated) signal, at the oscillator frequency for Channels 7, 6, 4, and 2, consecutively (see NOTE below), and adjust the respective tuning cores. (See figure 6.)

NOTE: The exact position of the FINE TUNING shaft should be marked when Channel 2 is correctly aligned. This position is to be used in step 6 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.

1. Mechanically preset the fine-tuning cam to the center of its range (see figure 6).

2. Tune in the highest-frequency channel to be received.

3. Adjust the tuning core for that channel, or the next highest, for the best picture; that is, starting with sound in the picture, turn the tuning core until the sound disappears. Repeat for each channel received in the area.

BAND-PASS ALIGNMENT

General

The band-pass alignment consists of aligning the tuner at Channels 13, 6, and 4 and then making it track down to Channels 7 and 2, respectively.

During the alignment, a fixed bias of 1.5 volts is applied to the r-f amplifier tube.

An FM (sweep) signal is applied to the aerial-input circuit, and an oscilloscope is connected to the mixer plate circuit. 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. A 330-ohm resistor is shunted across the 1st i-f coil, to eliminate the absorption effect of this coil on the response curve.

1. Disconnect the white (a-g-c) lead from the tuner, and connect it to the negative terminal of a 1.5-volt battery. Ground the positive terminal.

2. Connect a 3300-ohm resistor in series with the red lead from the tuner. Connect the "hot" lead of the oscilloscope to the junction of the red lead and the 3300-ohm resistor.

3. Connect a 330-ohm resistor from the green lead to ground.

4. Connect the FM (sweep) generator to the 300-ohm aerial input through an aerial-input matching network. See figure 2.

PROCEDURE

1. Set the CHANNEL SELECTOR and FM (sweep) generator to Channel 12 (213 mc.). Adjust the generator for sufficient sweep to show the complete response curve.

2. Establish the channel limits (see figure 7) by using the marker (AM r-f) signal generator to produce marker pips on the response curve; set the generator first to 210 mc., then to 216 mc.

3. Adjust TC505 and TC507 (figure 6) for a symmetrical, approximately centered pass band. Set marker generator to 213 mc. Detune TC507 counterclockwise until a single peak appears. Adjust TC505 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 TC503 for maximum curve height and symmetry of the single peak. The aerial circuit is now tuned for the high channels.

4. Readjust TC505 and TC507 for a symmetrical response, centered about 213 mc.

5. Set the CHANNEL SELECTOR and FM generator to Channel 7 (177 mc.).

6. Establish the channel limits by using the marker signal generator to produce marker pips on the response curve; set the generator first to 174 mc., then to 180 mc.

7. Note the response curve, with respect to tilt and center frequency. The curve should be centered in the pass band, and should be symmetrical. If not, it will be necessary to make the adjustments given in step 8. However, when making these adjustments, the effect of Channel 13 adjustments on Channel 7 must be taken into consideration. This is done by over-compensating with the trimmers, so that, when Channel 13 is adjusted, Channel 7 is nearly correct.

8. Adjust C506 and C515 (see figure 36 or 40) to obtain a response curve which is the mirror image (tilt in the opposite direction) of the original. This is the overcompensation mentioned in step 7. For example, if the Channel 7 response appears as in figure 8A, then the trimmer should be adjusted to obtain the response shown in figure 8B.

9. Set the CHANNEL SELECTOR to Channel 13, and retune the generators. Readjust TC505 and TC507 for a symmetrical and centered band pass.

10. Set the CHANNEL SELECTOR and generators to Channel 7, and check the response for center frequency and symmetry. Repeat steps 8 and 9 as many times as necessary to obtain the most symmetrical and centered response curves on Channels 13 and 7. Channels 8 through 12 are now correctly aligned.

11. Set the CHANNEL SELECTOR and sweep generator to Channel 6 (85 mc.).

12. Establish the channel limits, using the marker generator to produce marker pips on the response curve; set the generator first to 82 mc., then to 88 mc.

13. Adjust TC504 and TC506 for a symmetrical, approximately centered pass band. Set the marker generator to 85 mc. Detune TC506 counterclockwise until a single peak appears.

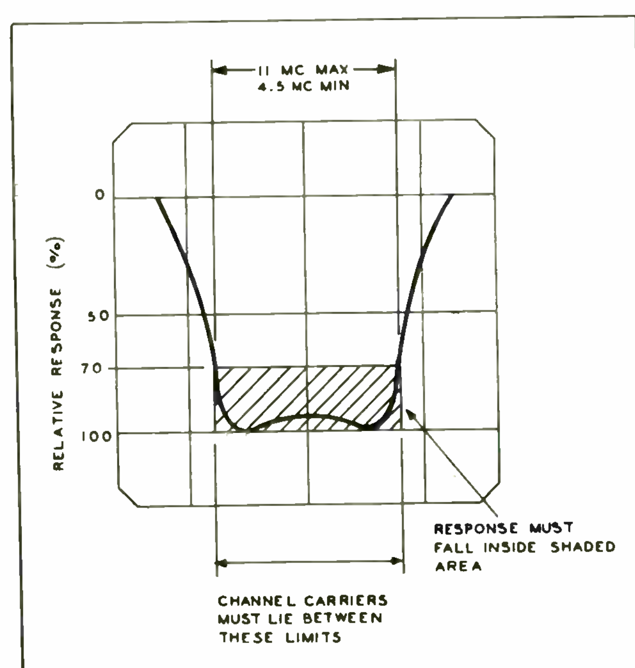


Figure 7. Television-Tuner Response Curve, Showing Band-Pass Limits

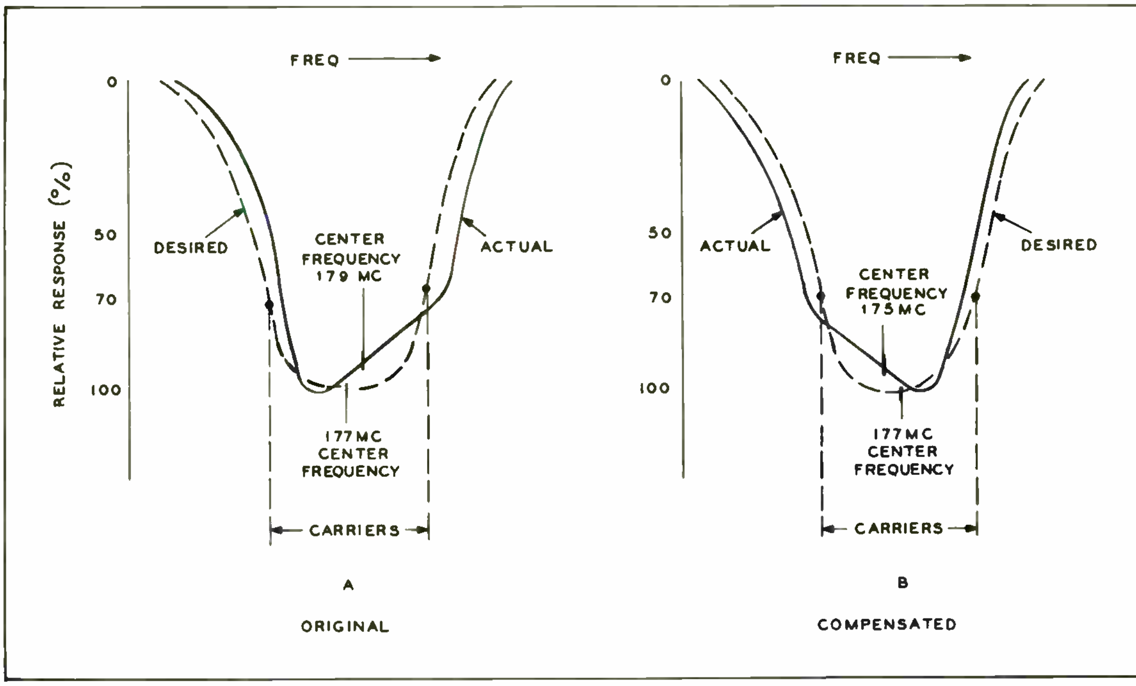


Figure 8. Television-Tuner Response Curve, Showing Tracking Compensation

CAUTION: Do not turn TC506 excessively, or it will fall out of the coil.

Adjust TC504 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 TC502 for maximum curve height and symmetry of the single peak. The aerial circuit is now tuned for Channels 5 and 6.

14. Readjust TC504 and TC506 for a symmetrical response, centered about 85 mc.

TELEVISION I-F ALIGNMENT

PRELIMINARY

Before proceeding with the i-f alignment or making an alignment check, observe the following preliminary instructions:

1. Connect the oscilloscope to the 2200-ohm resistor from the ALIGN TEST jack adapter.

2. If additional attenuation of the marker signal is required when using Visual Alignment Generator Model 7008, insert a 10,000-ohm resistor in series with the output lead, or use a 2nd harmonic of Band A, which will give a marker of lower amplitude.

3. Preset the television controls as follows:
   a. CONTRAST control fully counterclockwise.
   b. BRIGHTNESS control to give a dim raster.
   c. Function switch to TV position.

4. Insert the FM TEST jack adapter into J402.

5. Insert the ALIGN TEST jack adapter into J200.

I-F ALIGNMENT PROCEDURE

1. Preset TC201 and TC203 fully counterclockwise. See figure 36 or 40. Preset TC200 and TC202 to the center of their ranges.

2. Connect the oscilloscope to J200, pin 2, through the 2200-ohm resistor from the ALIGN TEST jack adapter, and connect the AM generator to G1 (mixer grid on tuner).

3. Feed in a 28.1-mc. AM signal, and tune TC201 for minimum output (use first minimum). Use zero bias during this adjustment.

4. Feed in a 21.85-mc. AM signal, and tune TC203 for minimum output (use first minimum). Use zero bias during this adjustment.

5. Tune TC205, TC204, TC202, TC200, and TC507 for maximum output at the frequencies indicated in figure 36 or 40. Use 3 volts of bias, and attenuate the generator to keep the output below 2 volts, peak to peak.

6. Feed in sweep and marker signals to Channel 2 through the aerial-input terminals. The tuner pass band should be checked, and the tuner aligned, if necessary; the local oscillator should be set to its correct frequency (81.85 mc. for Channel 2). Refer to step 10 of Procedure Using Signal Generator, under OSCILLATOR ALIGNMENT. The response should fall within the limits shown in figure 9. The ideal response curve is shown in figure 10. The frequencies shown in figures 9 and 10 are for Channel 2. To convert these response curves for Channels 3 through 13, refer to the chart of Television-Carrier, Oscillator,

and Check-Point Frequencies and substitute the proper frequencies at points A, B, and C. Touch up TC205, TC204, TC202, TC200, and TC507. See NOTE below.

IMPORTANT: Do not turn any of the i-f tuning cores excessively after they have been set to the approximate position by the use of the AM signal generators; to do so may cause poor transient or phase response, resulting in trailing whites or smear. If a response within the limits shown cannot be obtained by a slight adjustment, carefully repeat the AM adjustments, and, if necessary, trouble-shoot the i-f system. It is preferable to get a response curve within the tolerance range WITHOUT touching the adjustments made with the AM signals at the specified frequencies, rather than to attempt to obtain the ideal curve.

NOTE: TC205 rocks top of curve.
TC202 controls level of carrier.
TC204 controls dip or peak on carrier side.
TC200 controls bandwidth (sound side).
TC507 controls dip or peak on sound side.

S-I-F ALIGNMENT PROCEDURE

1. Remove the first i-f tube, and connect a v.t.v.m. or a 20,000-ohms-per volt voltmeter to the FM TEST jack adapter. Adjust the VOLUME control for moderate speaker output.

2. Feed in an accurately calibrated 4.5-mc. AM signal through the 2200-ohm resistor in the ALIGN TEST jack adapter to pin 2 of J200.

3. Tune TC400 and TC402 for maximum indications on the meter. The point of maximum meter indication for TC402 should also be the point of minimum speaker output.

4. Tune TC402 for minimum speaker output.

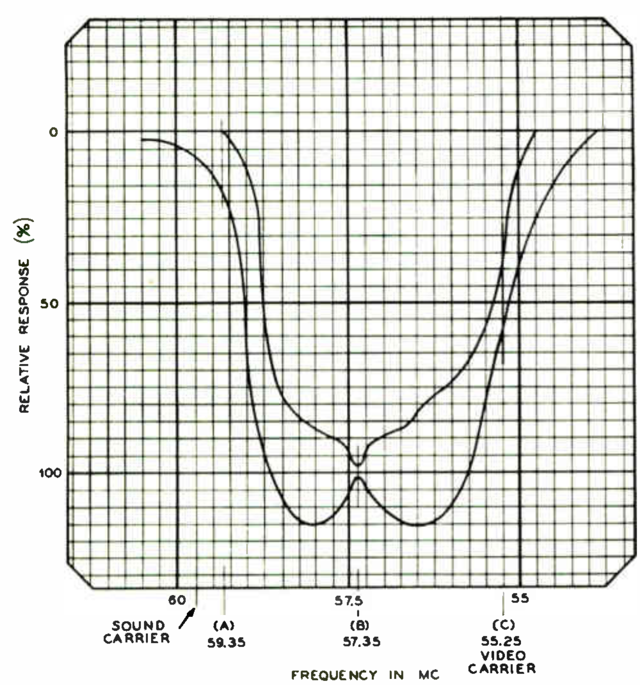
5. Connect an r-f probe or crystal detector to the grid (pin 2) of the picture tube. See NOTE below.

6. Tune TC300 for minimum indication on oscilloscope. If a crystal detector is not available, TC300 may be adjusted for minimum beat pattern, observed on the picture tube, with a station picture present.

7. Replace the 1st i-f tube. Tune in a station and use the speaker output as an indication.

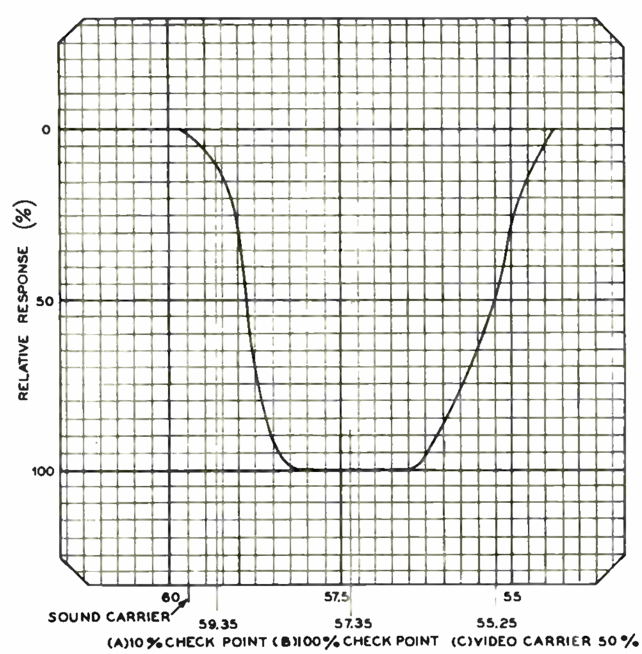
8. Turn the FINE TUNING control clockwise to obtain a slightly fuzzy picture.

9. Tune TC402 for minimum AM (noise) output.
NOTE: The r-f probe, Part No. 76-3595, is used as a detector of the 4.5-mc. signal, and the oscilloscope as an indicating device. An alternate crystal detector may be made up as shown in figure 3.



TP1-734

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



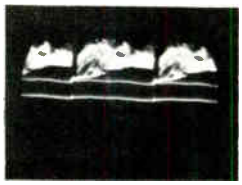
TP1-735

Figure 10. Ideal Over-all R-F, I-F Response Curve

OSCILLOSCOPE WAVEFORM PATTERNS

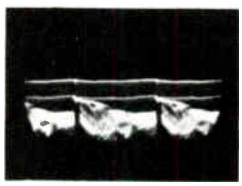
The following waveforms were taken with the Receiver adjusted for normal picture and an approximate peak-to-peak output of 3 volts at the video detector. The voltages given with the waveforms are approximate peak-to-peak values. The frequencies shown are those of the waveform—not the sweep rate of the oscilloscope. The waveforms were taken with an oscilloscope having good high-frequency response and an input impedance of 1 megohm, shunted by a capacitance of 40 $\mu\mu f$. 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-to-peak voltages will differ from the values shown.

Figure 11
Video-Detector Output
Pin 2 of J200



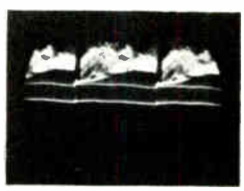
TP1 1200-A
3 VOLTS 60 C.P.S.

Figure 12
Video-Amplifier Plate
Pin 6



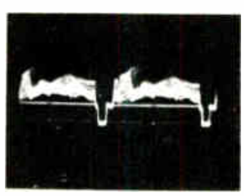
TP1-1200-B
30 VOLTS 60 C.P.S.

Figure 13
CRT Grid
Pin 2



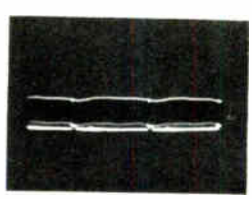
TP1-1200-A
80 VOLTS 60 C.P.S.

Figure 14
Video-Detector Output
Pin 2 of J200



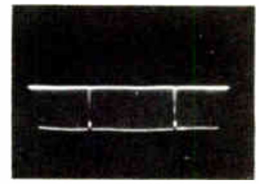
TP1-1092
3 VOLTS
15,750 C.P.S.

Figure 15
First-Sync-Separator Cathode
Pin 3



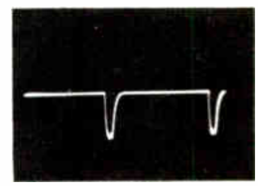
TP1-1203
10 VOLTS 60 C.P.S.

Figure 16
Second-Sync-Separator Plate
Pin 6



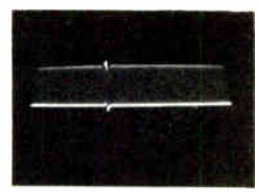
TP1-1090
10 VOLTS 60 C.P.S.

Figure 17
Second-Sync-Separator Plate
Pin 6



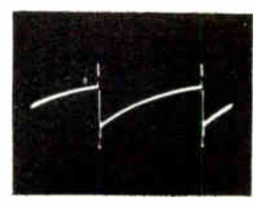
TP1-1091
10 VOLTS
15,750 C.P.S.

Figure 18
Sync-Inverter Plate
Pin 6



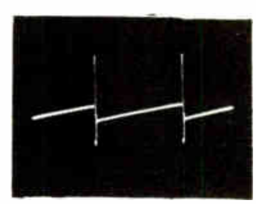
TP1 1087
30 VOLTS 60 C.P.S.

Figure 19
Vertical-Oscillator Grid
Pin 4



TP1-1202
50 VOLTS 60 C.P.S.

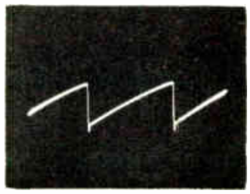
Figure 20
Vertical-Oscillator Plate
Pin 3



TP1-1097
100 VOLTS 60 C.P.S.

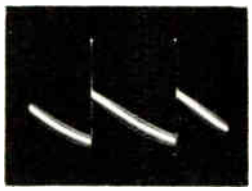
OSCILLOSCOPE WAVEFORM PATTERNS (Cont.)

Figure 21
Vertical-Amplifier Grid
Pin 5



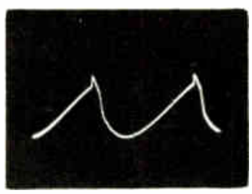
TP1-1100
30 VOLTS 60 C.P.S.

Figure 22
Vertical-Amplifier Plate
Plate Cap



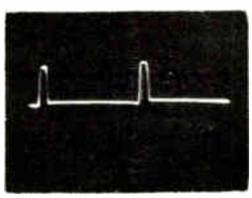
TP1-1099
250 VOLTS 60 C.P.S.

Figure 23
Phase-Comparer Grid
Pin 1



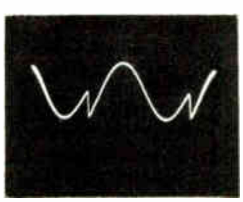
TP1-1088
20 VOLTS
15,750 C.P.S.

Figure 24
Phase-Comparer Grid
Pin 1 with Pin 4 grounded



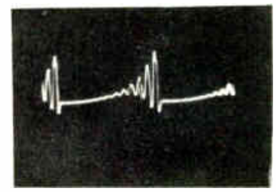
TP1-1094
6 VOLTS
15,750 C.P.S.

Figure 25
Horizontal-Oscillator Cathode
Pin 6



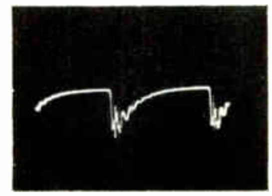
TP1-1089-A
25 VOLTS
15,750 C.P.S.

Figure 26
Horizontal-Oscillator Grid
Pin 4 *



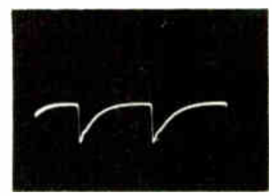
TP1-1205
25 VOLTS
15,750 C.P.S.

Figure 27
Horizontal-Oscillator Plate
Pin 5 *



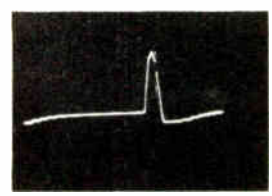
TP1-1098
25 VOLTS
15,750 C.P.S.

Figure 28
Horizontal-Amplifier Grid
Pin 5 *



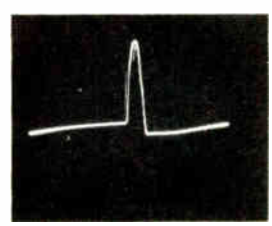
TP1-1095
25 VOLTS
15,750 C.P.S.

Figure 29
Horizontal-Amplifier Plate
See CAUTION **



TP1-1201
100 VOLTS
15,750 C.P.S.

Figure 30
Horizontal-Damper Cathode
See CAUTION **



TP1-1206
100 VOLTS
15,750 C.P.S.

* Connect a 15-μμf. condenser in series with the oscilloscope lead.

** 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 leads.)

RADIO ALIGNMENT

GENERAL

Before starting the radio alignment, allow the Receiver and test equipment to warm up for 15 minutes.

TEST EQUIPMENT REQUIRED

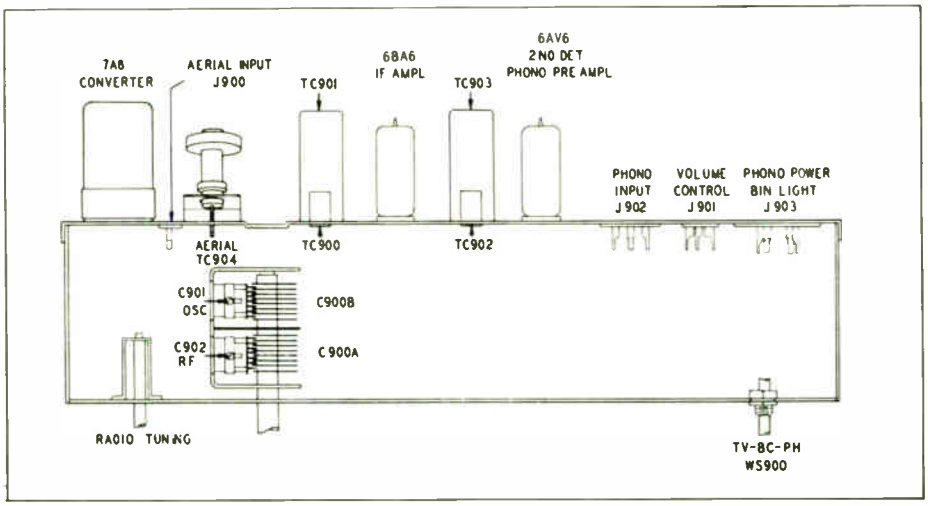
The following equipment is recommended for aligning the radio section:

1. Philco Signal Generator, Model 7170, or equivalent.
2. Output indicator (either a 20,000-ohms-per-volt voltmeter or an oscilloscope).

RADIO ALIGNMENT PROCEDURE

Follow the procedure in the alignment chart. Also observe the following instructions:

1. Insert a .1-μf. condenser in series with the signal-generator lead.
2. Set the VOLUME control to obtain suitable volume level from speaker. Set the function switch to the correct position.
3. During the alignment, attenuate the signal generator to hold the output at the speaker jack below 1 volt, peak to peak.



TP1-1814

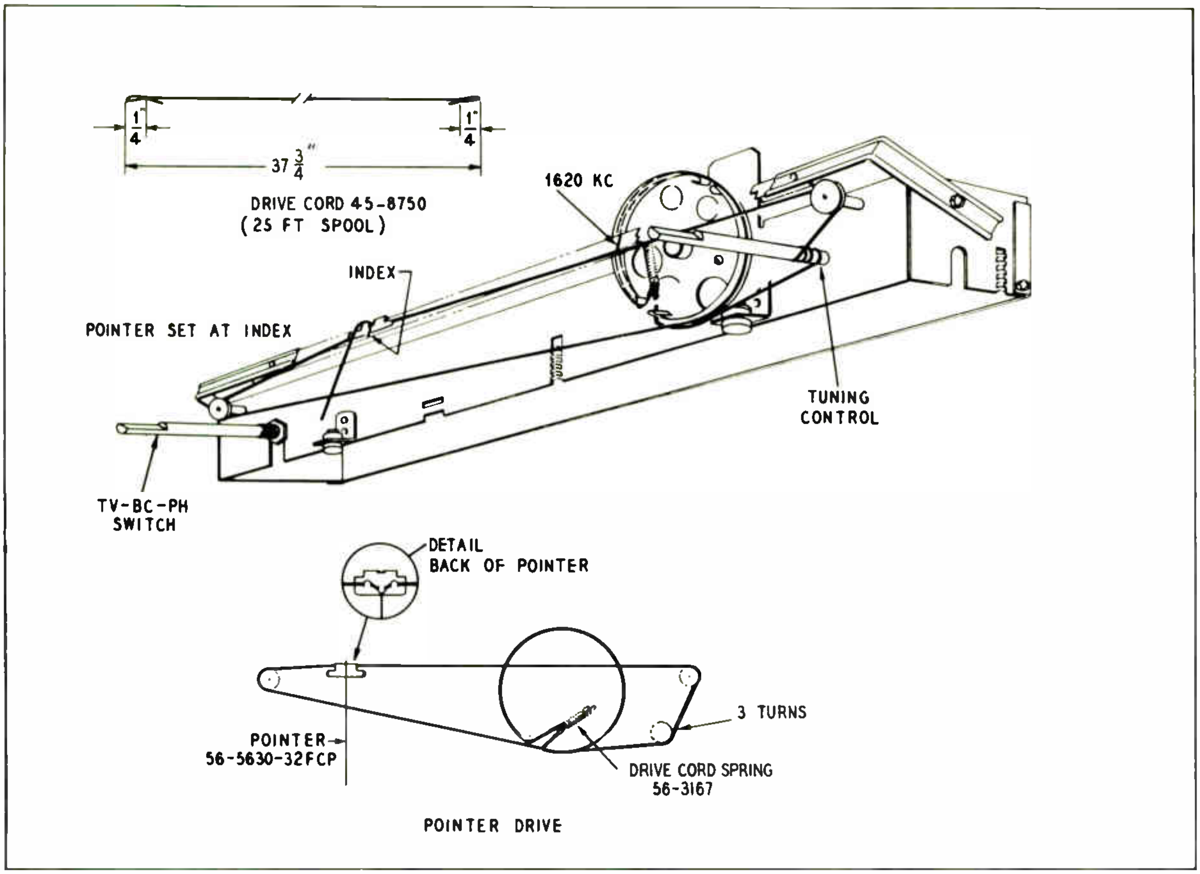
Figure 31. AM Radio Tuner RT-6, Bottom View, Showing Location of Adjustments

RADIO ALIGNMENT CHART (AM RADIO TUNER RT-6)

STEP	SIGNAL-GENERATOR CONNECTION	OUTPUT-INDICATOR CONNECTION	SIGNAL-GENERATOR SETTING	RADIO-DIAL SETTING	ADJUSTMENT INSTRUCTIONS
1	Connect signal generator through .1-μf. condenser to grid (pin 6) of converter tube.	Connect vertical input of oscilloscope (or meter leads) to voice-coil terminals of speaker socket J401.	Set signal generator (modulated) to 455 kc.	Condensers fully meshed.	Adjust TC900, TC901, TC902, and TC903 (see figure 32) for maximum output indication.
2	Connect signal generator through .1-μf. condenser to pin 1 of antenna socket, J900.	Same as step 1.	Set signal generator (modulated) to 1620 kc.	1620 kc. (See figure 33.)	Adjust C901 for maximum output indication.
3	Same as step 2. (See NOTE below.)	Same as step 1.	Set signal generator (modulated) to 1500 kc.	Tune receiver to generator signal (1500 kc.)	Adjust C902 for maximum output indication.
Steps 4 and 5 should be performed only if the antenna coil, T900, is replaced.					
4	Same as step 2.	Same as step 1.	580 kc.	Tune receiver to generator signal.	Adjust TC904 for maximum output indication. Rock tuning gang.
5	Repeat steps 3 and 4 until maximum output is obtained at the high and low ends of the band.				

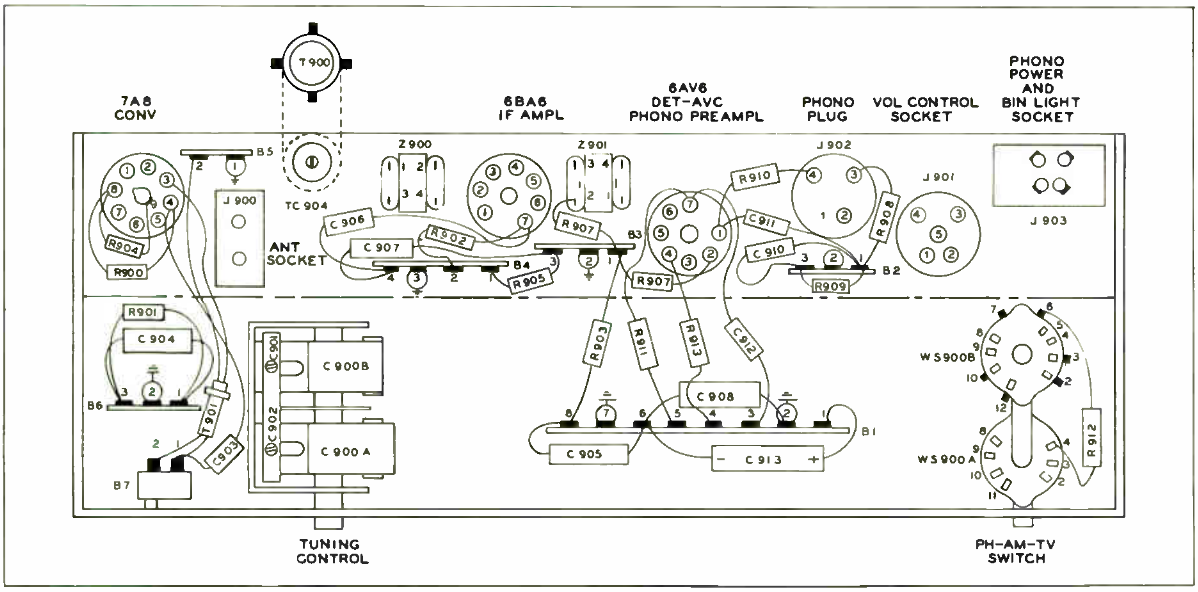
RADIO ANTENNA COIL (T900) REPLACEMENT—If it should ever become necessary to replace the antenna coil, T900, the adjustment given in steps 4 and 5 of the RADIO ALIGNMENT CHART above should be made.

NOTE: The final adjustment of C902 should be made with the chassis in the cabinet and the loop aerial connected. The signal generator should be coupled to the Receiver by means of a radiating loop. This loop should be made up of six to eight turns of insulated wire in a 6-inch-diameter loop. Connect the signal generator to the radiating loop, and place the radiating loop near the loop aerial of the Receiver.



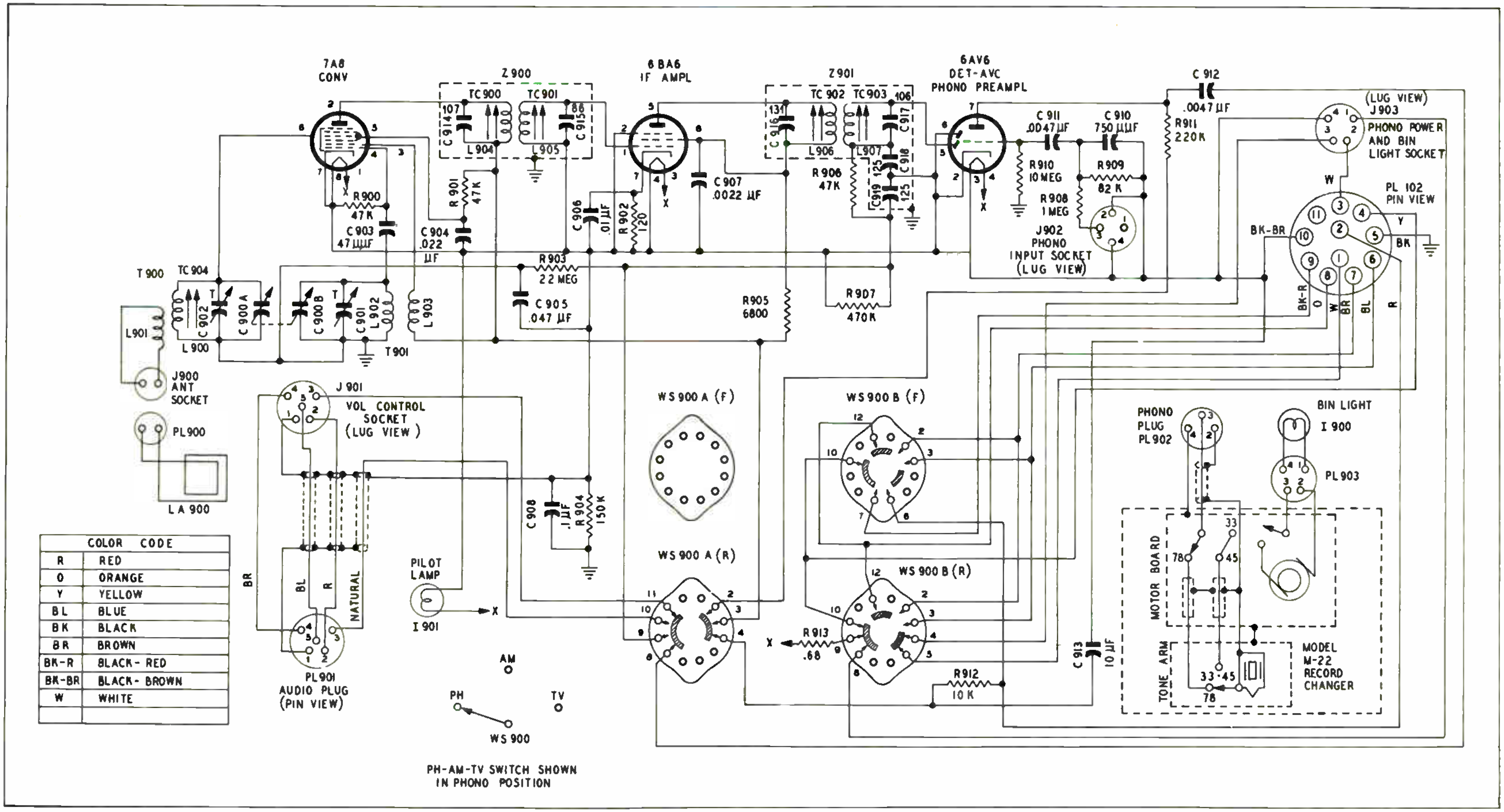
TP1-1834

Figure 32. Drive-Cord Installation Details for AM Radio Tuner RT-6



TP1-1856

Figure 33. AM Radio Tuner RT-6, Base Layout



COLOR CODE	
R	RED
O	ORANGE
Y	YELLOW
BL	BLUE
BK	BLACK
BR	BROWN
BK-R	BLACK-RED
BK-BR	BLACK-BROWN
W	WHITE

Figure 34. AM Radio Tuner RT-6, Schematic Diagram

TP1-1855

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. All parts are symbolized, as usual, in the schematic diagram and base layouts, for identification purposes.

DEFLECTION CHASSIS D-1 AND D-4

SECTION 1—POWER SUPPLY

Reference Symbol	Description	Service Part No.
C100A	Condenser, electrolytic, filter, 10 μf., 50v	45-3018-19
C100B	Condenser, electrolytic, filter, 10 μf., 50v	Part of C100
C101 and C102	Condenser, electrolytic, filter, 120 μf., 150v	30-2570-66
C103	Condenser, electrolytic, filter, 100 μf., 300v	30-2584-7
C104 and C105	Condenser, high voltage filter, 500 μμf.	30-1229-4
CR100 and CR101	Rectifier, selenium, 450 ma.	30-8003-8
CR102	Rectifier, selenium, bias, 5 ma.	34-8003-9
F100	Fuse, 1.6 amp.	45-2656-23
F101 and F102	Fuse, heater protective link	Piece of No. 26 wire
J100	Socket, chassis connecting	27-6274-1
J101	Socket, a-c line	27-6240-3
J102	Socket, power connecting, radio chassis	27-6274-4
J103	Socket, remote control power connecting	27-6214-5
L100	Choke, power-supply filter, 2.5 h., 450 ma.	32-8514
R102	Resistor, 7.5 ohms, 7 watts	33-3448
R106 and R107	Resistor, high-voltage return, 2 megohms (17" picture tube)	76-6751
R106 and R107	Resistor, high-voltage return, 2 megohms (20" picture tube)	33-1351-7
T100	Transformer, filament, D-1 chassis	32-8512
T100	Transformer, filament, D-4 chassis	32-8519

SECTION 6—SYNC

Reference Symbol	Description	Service Part No.
C601	Condenser, d-c blocking, 180 μμf. (on r-f chassis)	60-10185417
C603	Condenser, by-pass, 33 μμf. (on r-f chassis)	62-033009001
R610	Resistor, B+ filter, 12,000 ohms, 2 watts	66-3125340
R611	Resistor, voltage dropping, 8200 ohms, 1 watt	66-2824340
R612	Resistor, plate load, 22,000 ohms, 1 watt	66-3225351

SECTION 7—VERTICAL SWEEP

Reference Symbol	Description	Service Part No.
C704	Condenser, electrolytic, screen by-pass, 20 μf., 200v	Part of C103
L700 and L701	Vertical-deflection coils	Part of deflection yoke
R701	Potentiometer, VERT. HOLD, 250,000 ohms	33-5563-43

DEFLECTION CHASSIS D-1 AND D-4 (Cont.)

SECTION 7—VERTICAL SWEEP (Cont.)

Reference Symbol	Description	Service Part No.
R702	Resistor, 1.5 megohms, 1 watt	66-5154340
R706	Potentiometer, height control, 5 megohms	33-5565-31
R707	Potentiometer, linearity control, .5 megohms	33-5565-2
R708	Resistor, screen voltage divider, 18,000 ohms	66-3185340
R709	Resistor, screen dropping, 22,000 ohms, 1 watt	66-3224340
T700	Transformer, vertical oscillator	32-8431-2
T701	Transformer, vertical output	32-8515

SECTION 8—HORIZONTAL SWEEP

Reference Symbol	Description	Service Part No.
C800	Condenser, voltage divider, 120 μμf.	60-10125237
C804	Condenser, horizontal lock-in, 45 to 370 μμf.	31-6473-32
C808	Condenser, d-c blocking, 270 μμf. ±5%	60-10275337
C810	Condenser, drive, 330 μμf. ±5%	60-10335417
C813	Condenser, damping, 68 μμf.	30-1243-4
C816	Condenser, filter, electrolytic, 10 μf., 450v	Part of C103
C817	Condenser, filter, electrolytic, 20 μf., 300v	Part of C103
L803 and L804	Horizontal-deflection coils	Part of deflection yoke
L805	Choke, antiringing, 180 μh	32-4480
L806	R-f choke, damper cathode	32-4112-24
L807	R-f choke, damper plate	32-4112-24
R800	Potentiometer, horizontal frequency adjustment, 50,000 ohms	33-5565-30
R802	Potentiometer, HORIZ. HOLD, 75,000 ohms	33-5563-43
R806	Resistor, horizontal-oscillator filter, 12,000 ohms, 2 watts	66-3125340
R815	Resistor, horizontal output screen, voltage divider, 10,000 ohms, 2 watts	66-3105340
R816	Resistor, horizontal output screen, voltage divider, 5100 ohms, 5 watts	33-1335-18
R817	Potentiometer, horizontal width, 20,000 ohms, 4 watts	33-5546-43
R819	Resistor, voltage divider, 68,000 ohms, 1 watt	66-3684340
R821	Resistor, antiringing, 27,000 ohms, 2 watts	66-3275340
T800	Transformer, horizontal oscillator	32-8551
T801	Transformer, horizontal output	32-8533

MISCELLANEOUS

Description	Service Part No.
Arm-and-magnet assembly (20" picture tube)	76-6594
Beam bender	76-6077-2

REPLACEMENT PARTS LIST (Cont.)

DEFLECTION CHASSIS D-1 AND D-4 (Cont.)

MISCELLANEOUS (Cont.)

Description	Service Part No.
Cable and plug assembly, deflection (20" picture tube)	41-4086-13
Cable assembly, high voltage	41-4064
Cable assembly, pilot light	27-6233-6
Cable, volume control, D-1 chassis	41-3974
Cable, volume control, D-4 chassis	41-3974-9
Cap and lead assembly, 1B3 plate	76-5664-6
Cap and lead assembly, 6V3 plate	76-5664
Cord, line	41-3865
Deflection-yoke assembly (20" picture tube)	76-7188
Focus assembly, PM	76-6126-4
Insulator, stand-off, 1B3 socket	54-7309-6
Insulator, stand-off, 1X2 socket	54-7309-8
Insulator, stand-off, R106 and R107	54-7309-5
Shell, remote control power socket	56-1146
Shield, corona, 9-pin socket	56-7877FA1
Shock mount, 6SN7 socket and spring	76-6119
Shock mount, 6BQ6GT socket and spring	76-6119
Socket, deflection	27-6274-6
Socket, loktal	27-6207
Socket, octal	27-6174
Socket, 1B3GT	27-6174-5
Socket, 1X2	27- 6254-2
Spring, CRT assembly	56-9115

R-F CHASSIS 41 AND 44

SECTION 2—VIDEO I-F

Reference Symbol	Description	Service Part No.
C202	Condenser, d-c blocking, 100 μμf.	62-110009001
C203	Condenser, fixed trimmer, 39 μμf.	30-1224-63
C206	Condenser, d-c blocking, 33 μμf	62-033009001
C207	Condenser, fixed trimmer, 22 μμf.	62-022009001
C213	Condenser, d-c blocking, 470 μμf.	62-147001021
C216	Condenser, r-f by-pass, 56 μμf	62-056409011
C217	Condenser, i-f by-pass, 8 μμf.	30-1224-13
J200	Socket, alignment test	27-6273
L200	Coil, 1st i-f plate tank	32-4486
L201	Coil, 28.1-mc. trap	32-4303-3
L202	Coil, 2nd i-f plate tank	32-4486
L203	Coil, 21.85-mc. trap	32-4496
L204	Coil, 3rd i-f primary	Part of T200
L205	Coil, 3rd i-f secondary	Part of T200
L206	Coil, i-f isolation	32-4112-15
L207	Coil, 4th i-f plate	32-4486
L208	Coil, series peaking, 40 μh.	32-4143-16
L209	Coil, shunt peaking, 100 μh.	32-4143-17
L210	Coil, filament choke	32-4112-15
L211	Coil, filament choke	32-4112-15
R215	Resistor, plate feed, 5600 ohms, 1 watt	66-2564340
T200	Transformer, 3rd i-f	32-4486-6

R-F CHASSIS 41 AND 44 (Cont.)

SECTION 3—VIDEO

Reference Symbol	Description	Service Part No.
C300	Condenser, 4.5-mc. trap, 68 μμf.	62-068409011
C302	Condenser, compensating, 56 μμf.	62-056409011
C303	Condenser, low-frequency compensating, 10 μf., 300v (41 chassis)	30-2584-6
C303	Condenser, low-frequency compensating, 10 μf., 300v (44 chassis)	Part of C421
C305	Condenser, cathode by-pass	62-056409011
L300	Coil, 4.5 mc. trap	32-4463-2
L301	Coil, first video grid, 10 μh.	32-4143-18
L302	Coil, shunt breaking, 220 μh.	32-4480-15
L303	Coil, shunt peaking, video-output plate	32-4467-7
R304	Resistor, low-frequency compensating, 3900 ohms, 2 watts	66-2395340
R309	Potentiometer, dual CONTRAST and BRIGHTNESS control, 2000 ohms, and 10,000 ohms	33-5563-42
R309A	Potentiometer, CONTRAST control	Part of R309
R309B	Potentiometer, BRIGHTNESS control	Part of R309
R311	Resistor, video-output plate load, 1800 ohms, 9 watts	33-1335-102
R316	Resistor, grounding, 470,00 ohms, 1 watt	66-4474340

SECTION 4—AUDIO

Reference Symbol	Description	Service Part No.
C400	Condenser, d-c blocking, 56 μμf.	62-056409011
C406	Condenser, detector, balancing, 390 μμf.	60-10395417
C409	Condenser, r-f by-pass, 330 μμf.	62-133001001
C410	Condenser, filter, 2 μf., 50v	30-2417-7
C414	Condenser, plate by-pass, .0068 μf., 1000v	45-3505-93
C415A	Condenser, screen by-pass, 10 μf., 300v (41 chassis)	Part of C303
C415B	Condenser, filter, 30 μf., 300v (41 chassis)	Part of C303
C420	Condenser, electrolytic (44 chassis)	30-2584-10
C420A	Condenser, cathode by-pass, 10 μf., 50v	Part of C420
C420B	Condenser, screen by-pass, 20 μf., 300v)	Part of C420
C421	Condenser, electrolytic (44 chassis)	30-2584-9
C421A	Condenser, filter, 40 μf., 300v	Part of C421
C421B	Condenser, filter, 30 μf., 300v	Part of C421
J400	Socket, volume control	27-6273
J401	Socket, speaker	27-4785-22
J402	Socket, discriminator test	27-6273
L404	Choke, filament	32-4112-15
R404	Resistor, screen dropping, 12,000 ohms, 1 watt	66-3124340
R405	Resistor, voltage divider, 22,000 ohms, 2 watts	66-3225340
R414	Resistor, cathode bias, 270 ohms, 1 watt (41 chassis)	66-1274340

REPLACEMENT PARTS LIST (Cont.)

R-F CHASSIS 41 AND 44 (Cont.)

SECTION 4—AUDIO (Cont.)

Reference Symbol	Description	Service Part No.
R415	Resistor, cathode bias, 180 ohms, 1 watt (44 chassis)	66-1184340
R416	Potentiometer, volume control, 2 megohms (41 chassis)	33-5564-14
R416	Potentiometer, dual, 2 megohms and 5 megohms (44 chassis)	33-5563-44
R416A	Potentiometer, volume control, 2 megohms	Part of R416
R416B	Potentiometer, tone control, 5 megohms	Part of R416
R419	Resistor, voltage dropping, 1550 ohms, 12 watts	33-3435-34
R420	Resistor, voltage divider, 33,000 ohms, 2 watts	66-3335340
R421	Resistor, voltage divider, 5600 ohms, 2 watts	66-2565340
R422	Resistor, voltage divider, 18,000 ohms, 2 watts	66-3185340
R423	Resistor, speaker field, 1000 ohms, 7 watts (PM speaker only)	33-1335-89
T400	Transformer, audio output (41 chassis)	32-8242-11
T400	Transformer, audio output (44 chassis)	32-8522
Z400	Transformer, 1st sound i-f assembly	32-4449A
Z401	Transformer, FM detector	32-4450-5

MISCELLANEOUS

Description	Service Part No.
Cable assembly, chassis connection, power (41 chassis)	41-4086-1
Cable assembly, chassis connection, power (44 chassis)	41-4086-2
Cable assembly, CRT socket	41-3964-15
Cable assembly, pilot light	27-6233-6
Shield, miniature tube, 7-pin	56-5629FA3
Shield, miniature tube, 9-pin	56-5629-5FA3
Socket and base 6CB6	29-6203-14
Socket, loktal	27-6207
Socket, miniature tube, 7-pin	27-6265
Socket, miniature tube, 9-pin	27-6203-5

TV TUNER, PART NO. 76-7070

SECTION 5

Reference Symbol	Description	Service Part No.
AD500	Aerial element (built-in broad-band dipole)	56-7635
C500	Condenser, fixed trimmer, 20μμf.	62-020309011
C503	Condenser, d-c blocking, 150 μμf.	62-115001011
C504	Condenser, grid by-pass, 220 μμf.	30-1225-11
C505	Condenser, a-g-c decoupling, .01 μf.	Part of R503
C507	Condenser, grid by-pass, 220 μμf.	30-1225-11
C508	Condenser, grid by-pass, .02 μf.	30-1238-5
C509	Condenser, d-c blocking, 150 μμf.	62-115001011
C510	Condenser, plate decoupling, 150 μμf.	62-115001011
C512	Condenser, coupling, 1.2 μμf.	30-1221-7

TV TUNER, PART NO. 76-7070 (Cont.)

SECTION 5 (Cont.)

Reference Symbol	Description	Service Part No.
C513	Condenser, d-c blocking, 39 μμf.	62-039409011
C514	Condenser, coupling, 5 μμf.	30-1221-13
C515	Condenser, trimmer, mixer grid, .5 to 3 μμf.	31-6520-3
C516	Condenser, oscillator injection, 1.5 μμf.	30-1224-59
C517	Condenser, fixed trimmer, 15 μμf.	62-015409011
C519	Condenser, d-c blocking, 470 μμf.	62-147001001
C520	Condenser, plate decoupling, 150 μμf.	62-115001011
C521	Condenser, plate by-pass, 150 μμf.	62-115001011
C522	Condenser, d-c blocking, 4.7 μμf. ±5%	30-1224-85
C523	Condenser, fixed trimmer, 7.5 μμf· ±10%	30-1224-84
C524	Condenser, fine tuning	76-5755
C525	Condenser, filament decoupling, 1000 μμf.	30-1245-1
C527	Condenser, trimmer, 1 to 6 μμf.	31-6520-2
C528	Condenser, coupling, 470 μμf.	62-147001001
C529	Condenser, coupling, 470 μμf.	62-147001001
C530	Condenser, decoupling, 150 μμf.	62-115001001
C531	Condenser, a-g-c decoupling, 1000 μμf.	30-1245-1
L500 and L501	Coil, tapered line	Part of Z500
L503 through L509	Coil, r-f grid (Channels 2 through 13, respectively)	Part of WS500D
L510	Coil, r-f choke, plate feed	32-4112-22
L511 through L517	Coil, r-f plate (Channels 2 through 13, respectively)	Part of WS500C
L518 through L524	Coil, mixer grid (Channels 2 through 13, respectively)	Part of WS500B
L525	Coil, r-f choke	32-4112-25
L526	Coil, mixer plate (1st i-f)	32-4359-12
L527 through L533	Coil, oscillator (Channels 2 through 13, respectively)	Part of WS500A
L534	Coil, r-f choke, filament decoupling	312-5132
L535, L536 and L537	Coil, r-f choke, filament decoupling	32-4112-2
L538	Coiled line, 150 ohms	32-4527
R510	Resistor, B plus dropping, 2200 ohms, 1 watt	66-2224340
R511	Resistor, B plus dropping, 15,000 ohms, 2 watts)	66-3155340
TB500	Terminal board (aerial)	38-8689
TC500	Tuning core, FM trap	Part of L502
TC502 and TC503	Tuning core, r-f grid (Channels 6 and 13)	Part of WS500D
TC504 and TC505	Tuning core, r-f plate (Channels 6 and 13)	Part of WS500C
TC506 and TC507	Tuning core, mixer grid (Channels 6 and 13)	Part of WS500B
TC508	Tuning core, 1st i-f	Part of L526
TC509 through TC515	Tuning core, oscillator (Channels 2 through 13, respectively)	Part of WS500A
WS500	Wafer switch assembly	Not supplied as an assembly
WS500A(F) and WS500A(R)	Switch wafer section (oscillator) with coils	76-6784

REPLACEMENT PARTS LIST (Cont.)

TV TUNER, PART NO. 76-7070 (Cont.)
SECTION 5 (Cont.)

Reference Symbol	Description	Service Part No.
WS500B(F) and WS500B(R)	Switch wafer section (mixer grid) with coils	76-7098
WS500C(F) and WS500C(R)	Switch wafer section (r-f plate) with coils	76-6895
WS500D(F) and WS500D(R)	Switch wafer section (r-f grid) with coils	76-7077
Z500	Tapered-line assembly	76-7071

MISCELLANEOUS

Description	Service Part No.
Ball bearing (2 used)	56-8020
Cam-and-shaft assembly (FINE TUNING)	76-5846-4
Insulator, tuner shaft	54-4912
Lock washer, trimmer-condenser mtg.	W-1775-3
Plate-and-bracket assembly, front	76-5924-3
Plunger, FINE TUNING condenser	56-8034
Screw, trimmer-condenser core	2W10617
Shaft	56-8018-6
Shield, tube	56-5629-5
Spring, cam shaft	56-8254
Spring detent	56-8019-1
Spring-and-bracket assembly, FINE TUNING condenser grounding	76-5961-1
Spring, plunger (FINE TUNING condenser)	56-8035-1
Spring, tuner-shaft insulator	56-9181
Washer, 'C", shaft retaining	56-8061

AM RADIO TUNER RT-6
SECTION 9

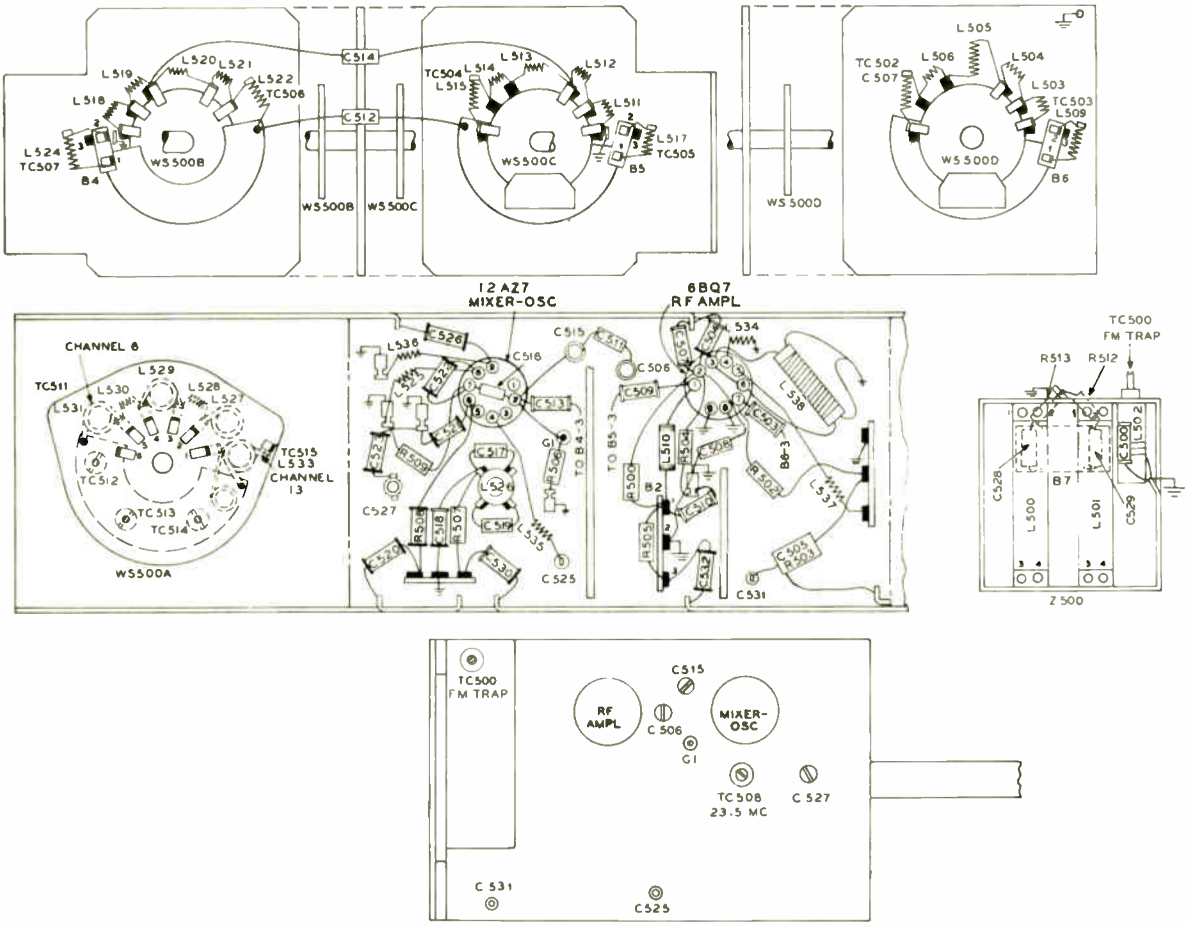
Reference Symbol	Description	Service Part No.
C900 and C900B	Condenser, tuning gang, 2-section	31-2751-9
C901	Condenser, trimmer, oscillator	Part of C900B
C902	Condenser, trimmer, r-f grid	Part of C900A
C903	Condenser, oscillator grid, 47 μμf.	60-00475417
C910	Condenser, tone compensating, 750 μμf	60-10753417

AM RADIO TUNER RT-6 (Cont.)
SECTION 9 (Cont.)

Reference Symbol	Description	Service Part No.
C913	Condenser, filter, 10 μf., 300v	30-2417-11
C914	Condenser, i-f trimmer, fixed	Part of Z900
C915	Condenser, i-f trimmer, fixed	Part of Z900
C916	Condenser, i-f trimmer, fixed	Part of Z901
C917	Condenser, i-f trimmer, fixed	Part of Z901
C918	Condenser, i-f by-pass	Part of Z901
C919	Condenser, i-f by-pass	Part of Z901
I900	Lamp, bin	34-2064
I901	Lamp, pilot	34-2068
J900	Socket, antenna	27-6252-3
J901	Socket, volume control	27-6273
J902	Socket, phono input	27-6273
J903	Socket, phono power and bin lamp	27-6182
L900 and L901	Coil, antenna	Part of T900
L902 and L903	Coil, oscillator	Part of T901
R910	Resistor, voltage dropping, 10,000 ohms, 5 watts	33-1335-21
R913	Resistor, filament voltage dropping, .68 ohms, 1 watt	66-8684340
T900	Transformer, antenna	32-4519
T901	Transformer, oscillator	32-4263
Z900	Transformer, first i-f	32-4160A
Z901	Transformer, second i-f	32-4240-3A
WS900	Wafer-switch assembly	42-1964

MISCELLANEOUS

Description	Service Part No.
Backplate assembly, dial	76-6325
Cable and plug assembly, audio	41-3974-6
Cable and plug assembly, power	41-4086
Mount, rubber	27-4596
Pilot-lamp assembly	27-6233-4
Shaft, tuning	56-7931-2
Socket, loktal	27-6207
Socket, miniature	27-6265
Spring, condenser drive	56-2617



TP1-741

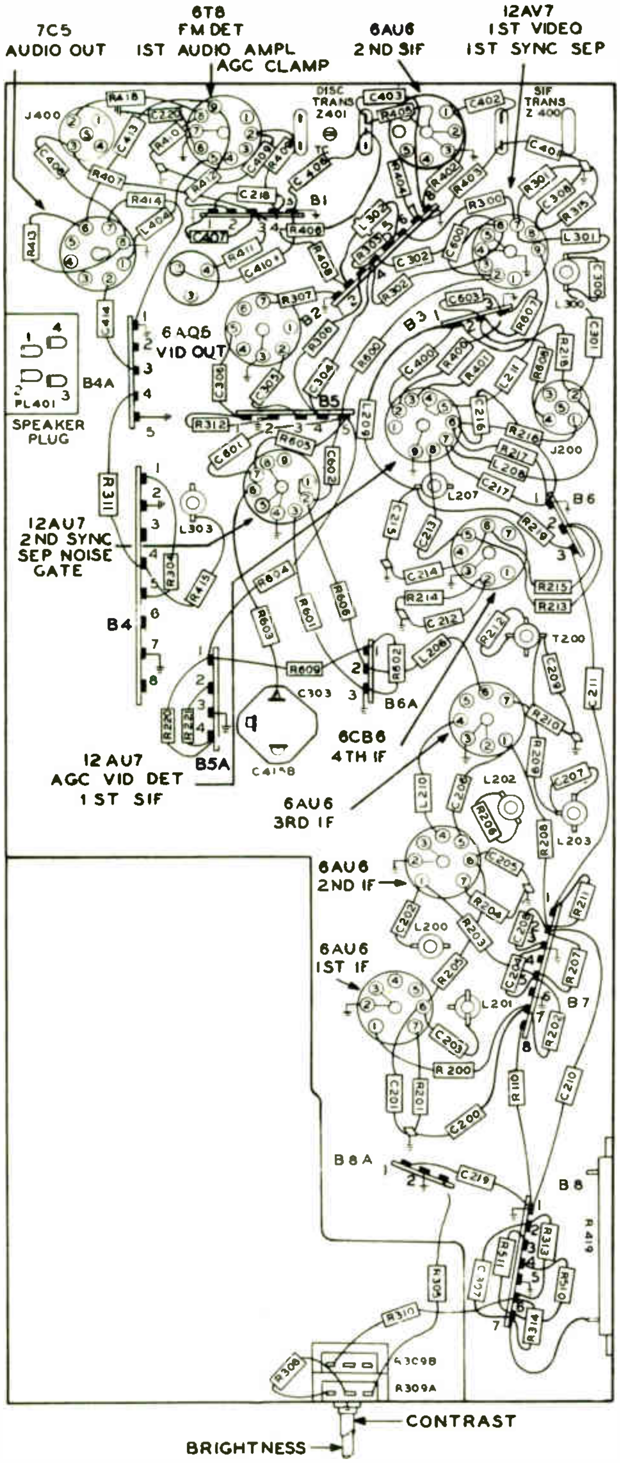
Figure 35. Television Tuner, Base Layout

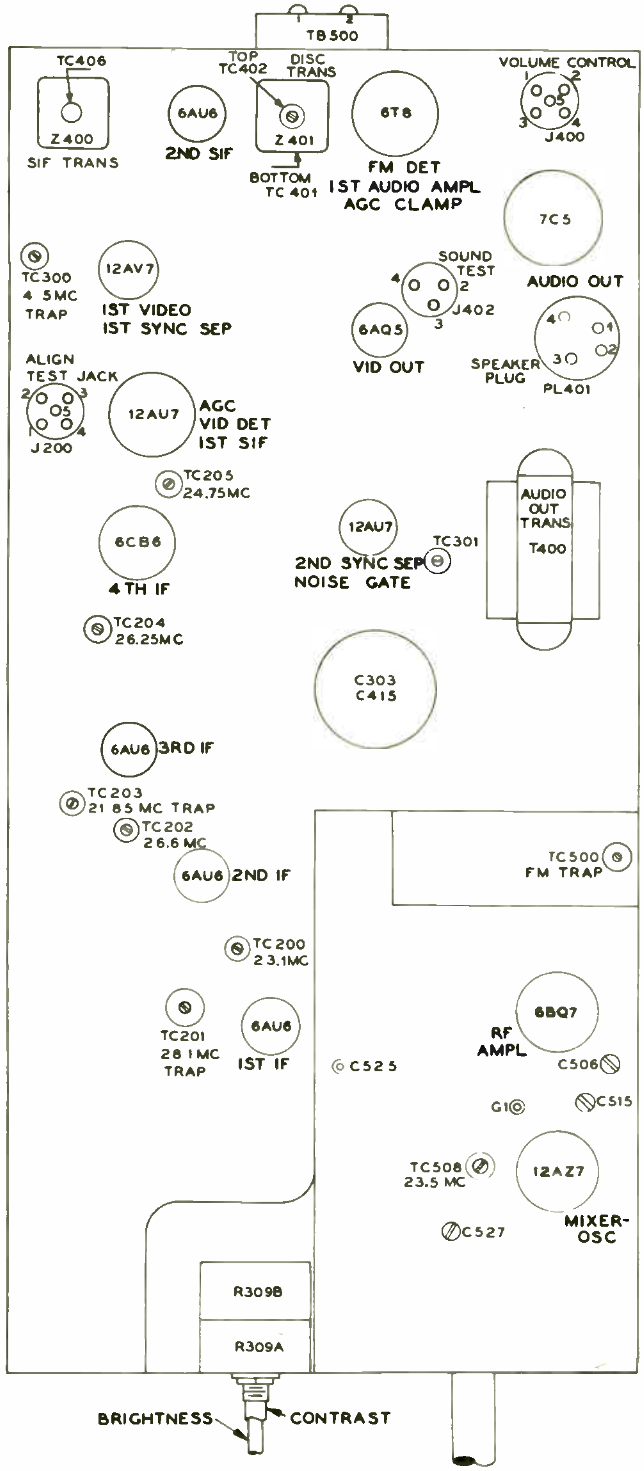
CABINETS AND CABINET PARTS

DESCRIPTION	MODEL				
	52-T2110 CODE 121	52-T2144 CODE 121	52-T2145X CODE 125	52-T2182 CODE 121	52-T2182L CODE 121
Cabinet	10869-2	10882	10882-8	10885	10885-1
Cabinet Hardware and Parts					
Bullet catch		45-6002	45-6002	45-6002	45-6002-1
Cable and plug assembly, phono power				41-4079-1	41-4079-1
Cable and plug assembly, speaker	41-4082-8	41-4082-8	41-4082-13	41-4082-13	41-4082-13
Coupler, aerial tuning	54-4748	54-4748	54-4748	54-4748	54-4748

CABINETS AND CABINET PARTS (Cont.)

DESCRIPTION	MODEL				
	52-T2110 CODE 121	52-T2144 CODE 121	52-T2145X CODE 125	52-T2182 CODE 121	52-T2182L CODE 121
Dome	27-4911-1	45-6190	45-6190	45-6190	45-6190
Doors, matched pair		45-6701	45-6702	45-6704	45-6710
Hinge, knife, r. h.		56-7873-2	56-7873-2	56-7873-2 and 56-8479-1	56-7873-6 and 56-8479-3
Hinge, knife, l. h.		56-7873-3	56-7873-3	56-7873-2 and 56-8479	56-7873-7 and 56-8479-2
Knob, AERIAL TUNING	54-4750	54-4750	54-4750	54-4750	54-4750-3
Knob, BRIGHTNESS	54-4799	54-4799	54-4799	54-4799	54-4799
Knob, CHANNEL SELECTOR	76-6046	76-6046	76-6046	76-6046	76-6046-1
Knob, CONTRAST	76-6048	76-6048	76-6048	76-6048	76-6048-1
Knob, FINE TUNING	76-6104	76-6104	76-6104	76-6104	76-6104
Knob, HORIZONTAL HOLD	76-6048	76-6048	76-6048	76-6048	76-6048-1
Knob, TV.-BC.-PH.				54-4798-4	54-4798-5
Knob, TONE			76-6213	76-6213	76-6213-3
Knob, TUNING RADIO				54-4798	54-4798-1
Knob, VERTICAL HOLD	54-4799	54-4799	54-4799	54-4799	54-4799
Knob, VOLUME-ON-OFF, TV.	76-6581-1	76-6581-1	54-4799	54-4799	54-4799
Mask	56-8578-9	56-8578-8	54-8573-1	56-8578-11	56-8578-11
Pull, door		56-9281	54-4901	56-9164	56-9164-1
Shaft, aerial tuning	54-4747-19	54-4747-1	54-4747-1	54-4747-1	54-4747-1
Shield, pilot light		54-8228	54-8228-1	54-8228	54-8228
Speaker	36-1641-1	36-1610-9	36-1610-9	36-1610-9	36-1610-9
Strike plate		45-6003	45-6003	45-6003	45-6003-1
Window	54-7943-40	54-7943-49	54-7943-49	54-7943-51	54-7943-51





TP1-1853-A

Figure 36. R-F Chassis 41, Base Layout

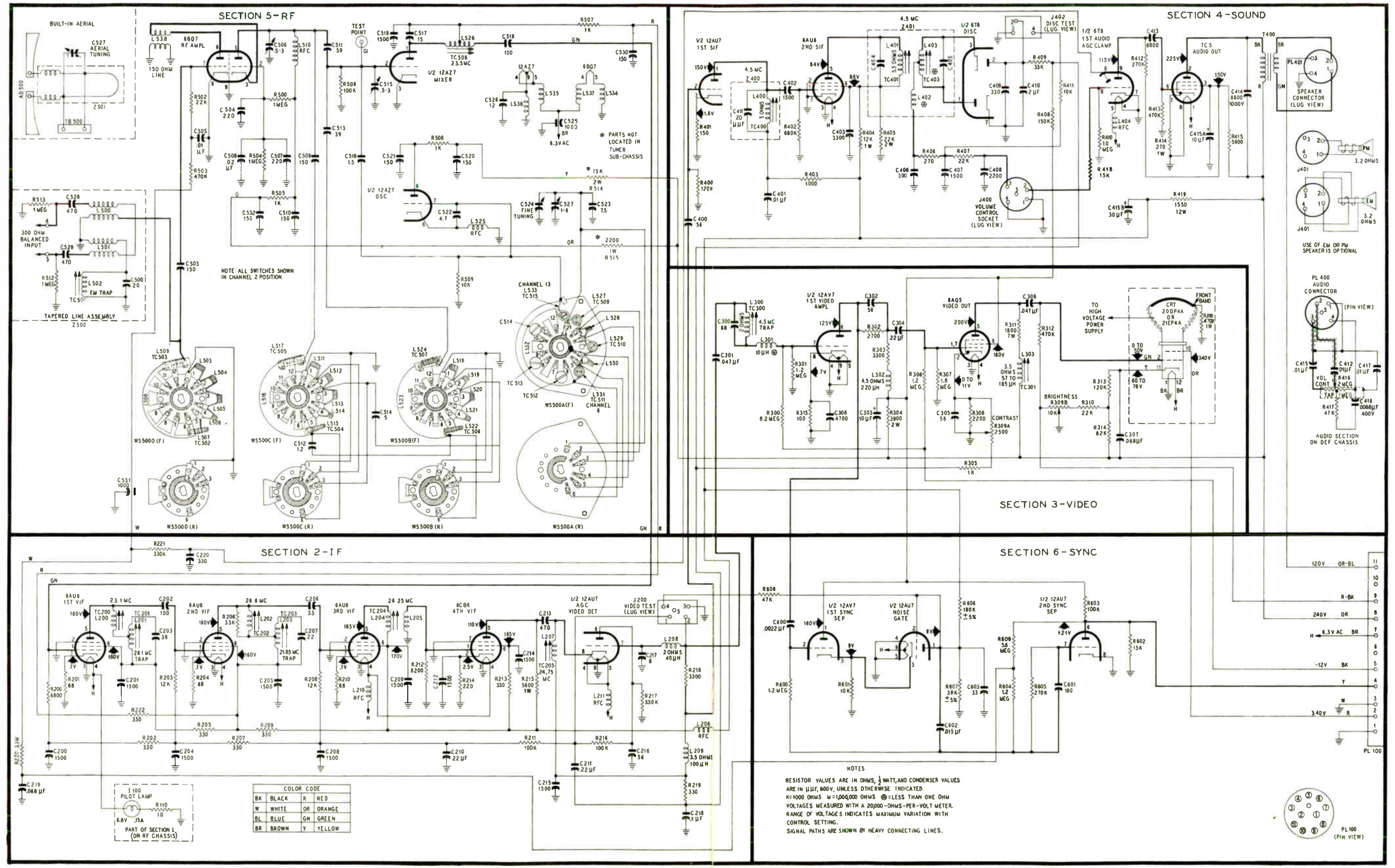


Figure 37. R-F Chassis 41, Schematic Diagram

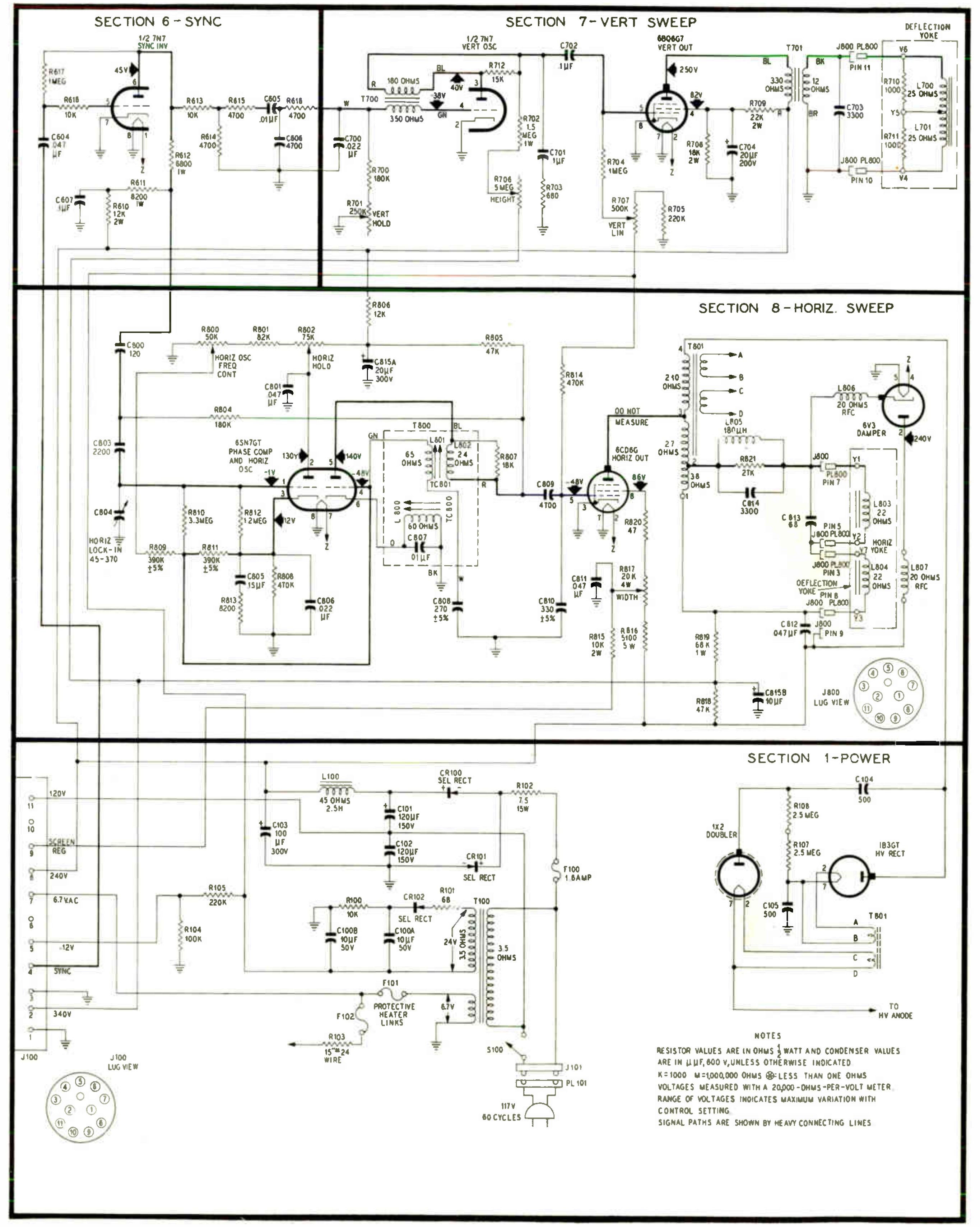


Figure 38. Deflection Chassis D-1, Schematic Diagram

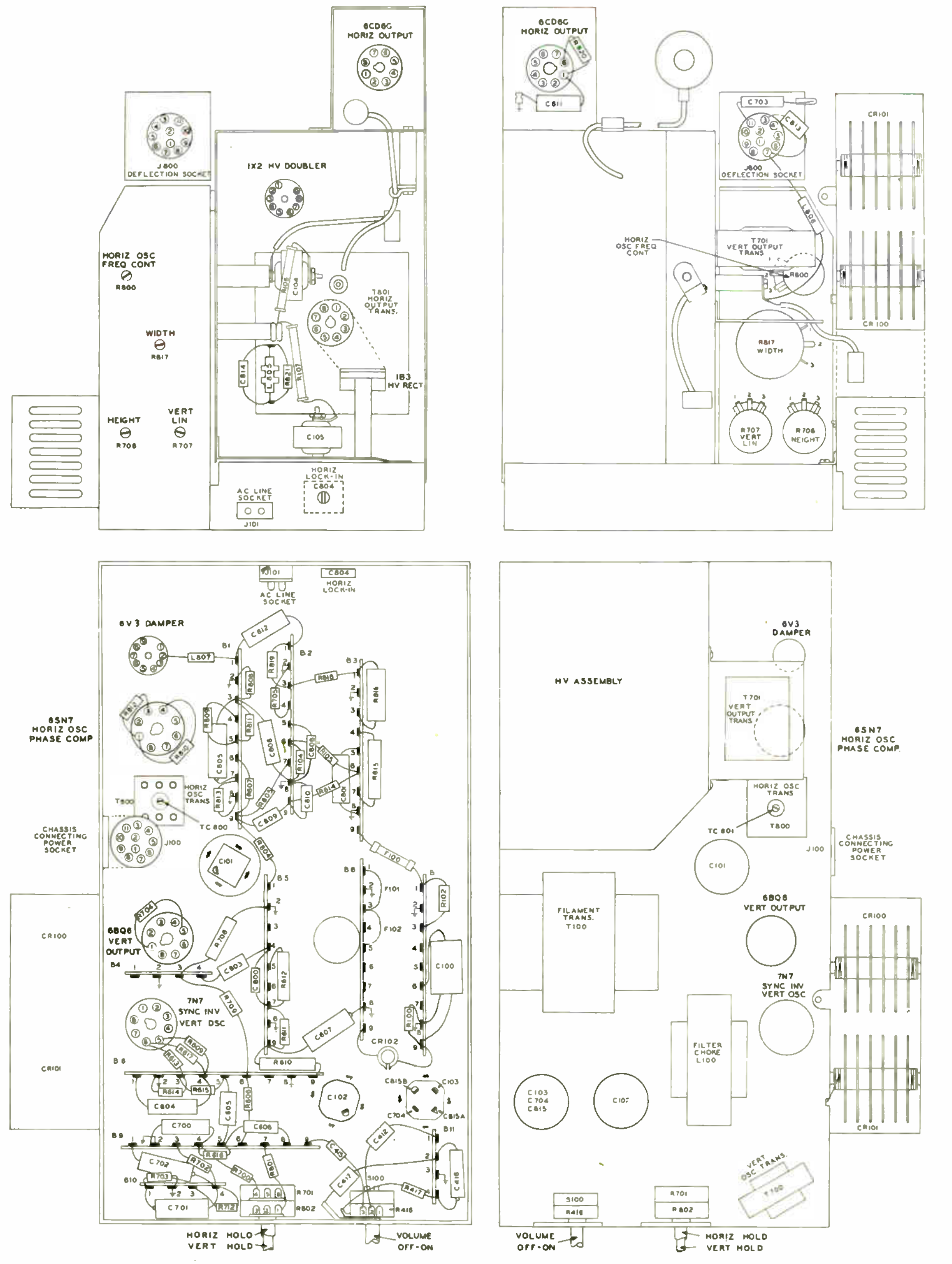
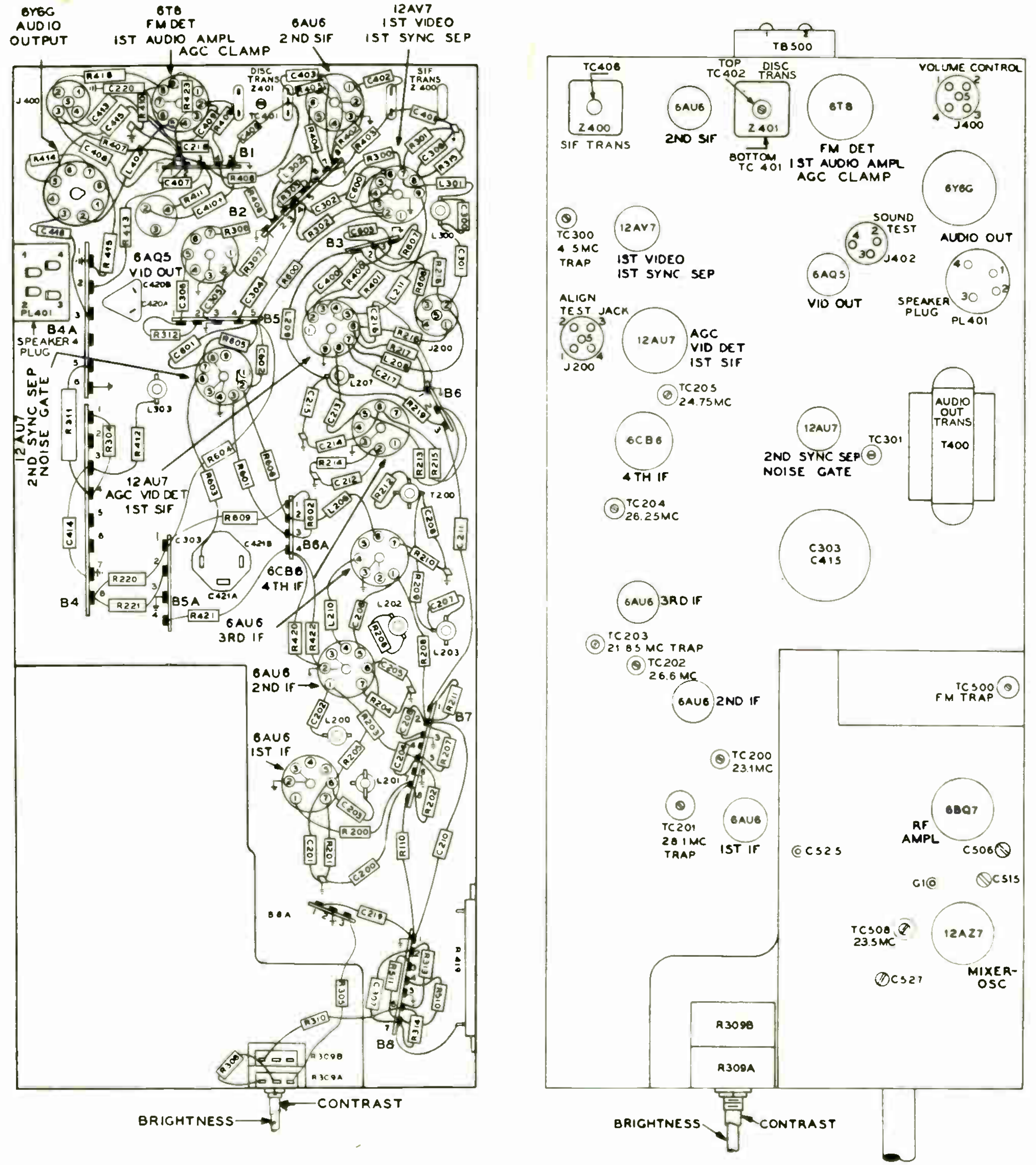


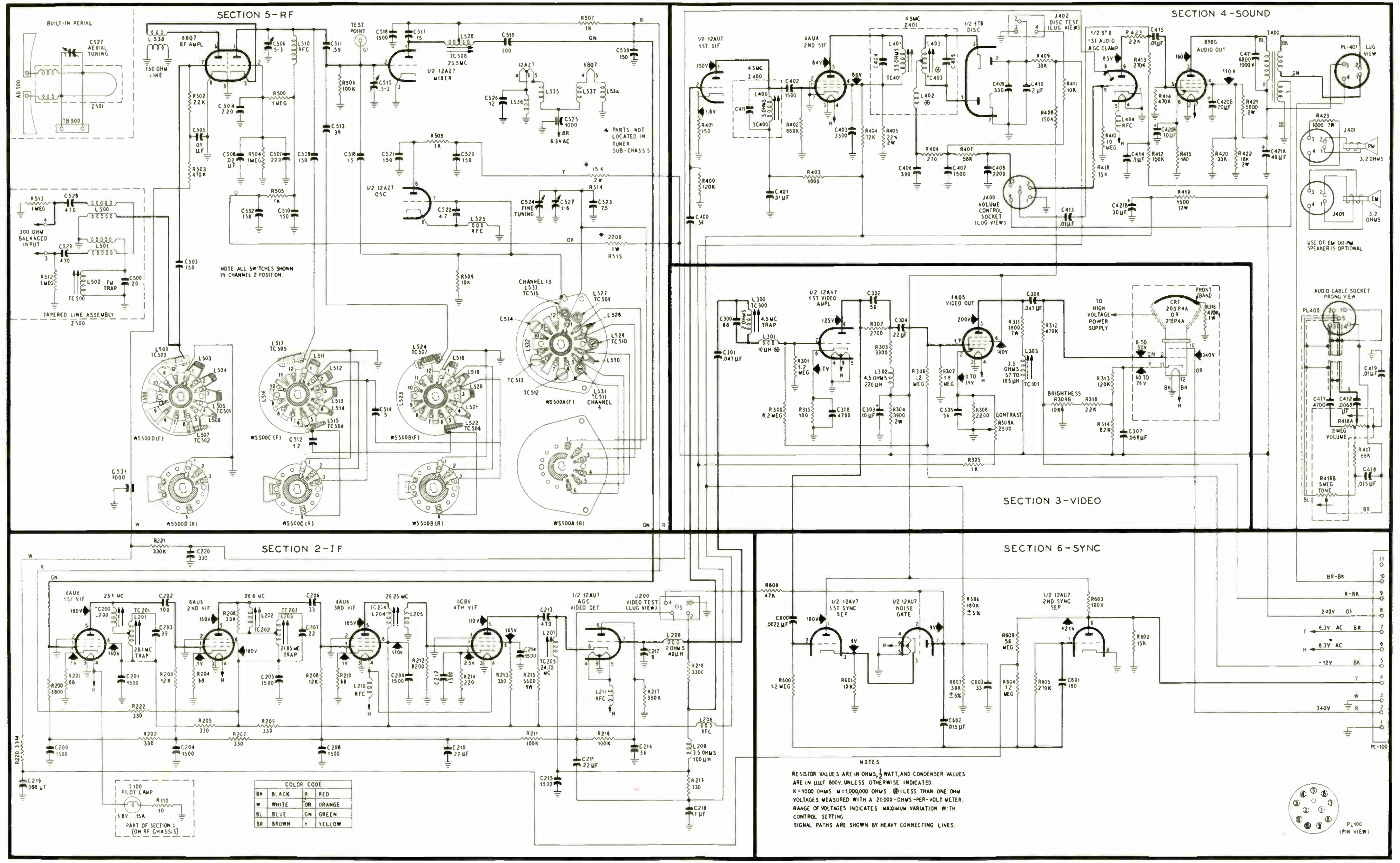
Figure 39. Deflection Chassis D-1, Base Layout

FOLD OUT



TP1-1901-A

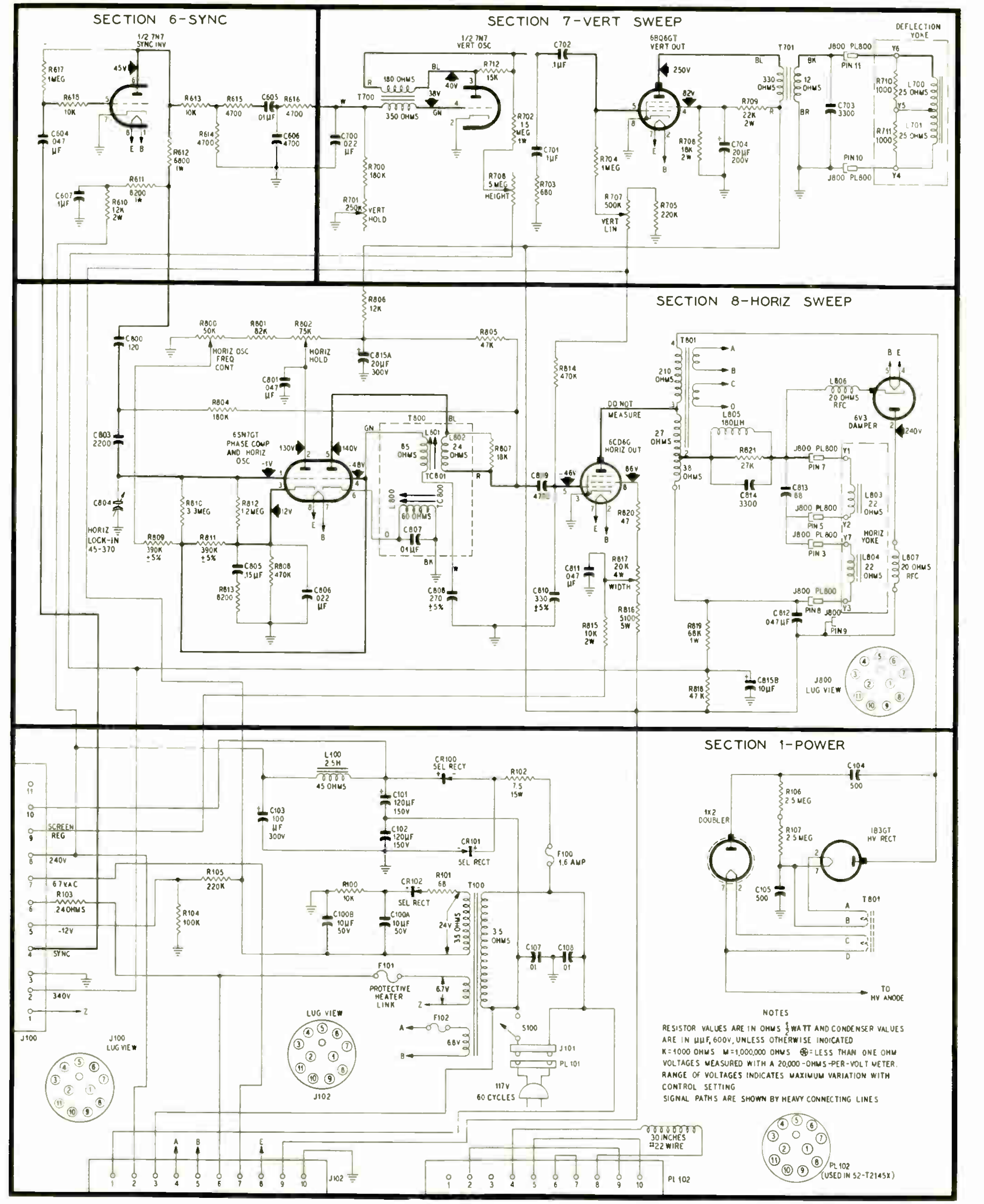
Figure 40. R-F Chassis 44, Base Layout



TP1-1902-A

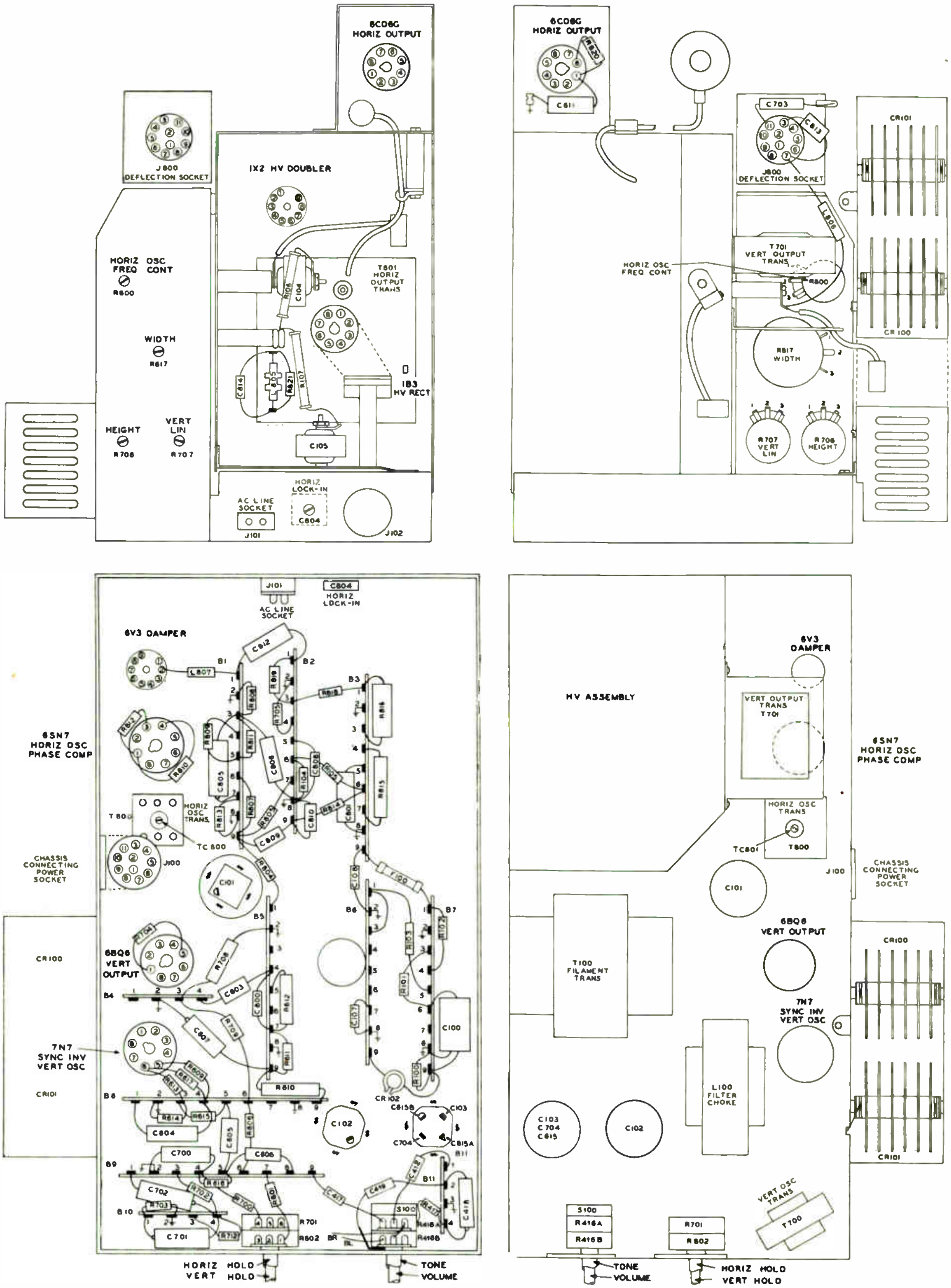
Figure 41. R-F Chassis 44, Schematic Diagram

FOLD OUT



TP1-1903-A

Figure 42. Deflection Chassis D-4, Schematic Diagram



TP1-1904-A

Figure 43. Deflection Chassis D-4, Base Layout


PHILCO
Factory-Supervised
Service

PHILCO SERVICE

PHILCO Factory-Supervised Service

TELEVISION

PHILCO TELEVISION SERVICE MANUAL FOR R-F CHASSIS 42 DEFLECTION CHASSIS G-2

TABLE OF CONTENTS

CIRCUIT DESCRIPTION

The Philco 1952, Code 125 television receivers use two chassis. One chassis contains the r-f, video, audio, and sync circuits; the other 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 isolated from the chassis. CAUTION: See A-C Line Isolation.

The r-f amplifier, oscillator, and mixer section is built on a separate sub-chassis. The r-f amplifier uses a 6BZ7 or a 6BQ7 tube. The oscillator and mixer each use one half of a 12AV7 tube. The output of the mixer is fed to a four-stage, stagger-tuned i-f amplifier system employing three 6AU6 tubes and one 6CB6 tube. One half of a 12AU7 is used as a video detector, a-g-c rectifier. The cathode and grid are used for video detection, while the cathode and plate are used for a-g-c rectification. A delay voltage, obtained from a voltage divider consisting of the CONTRAST control, R305 and R408, is applied to the cathode to prevent a-g-c action on weak signals, where maximum gain is required. The maximum delay voltage is obtained when the CONTRAST control is in the fully clockwise position, as is the case when the receiver is adjusted for weak signals. The a-g-c voltage is applied to the first three i-f stages to hold the output of the video detector essentially constant with large variations in input signal levels. A-G-C voltage for the r-f amplifier is obtained from the voltage divider in the sync-separator circuit. Because 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 of 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 26.6-mc. video carrier and the 22.1-mc. sound carrier are mixed in the video detector. The 4.5-mc. beat frequency is the difference between 26.6 mc. and 22.1 mc., and contains the FM sound signal. This 4.5-mc. signal contains only a negligible amount of the video-amplitude modulation, provided that the amplitude of the 22.1-mc. signal is considerably lower than that of the 22.6-mc. signal. The proper relationship between the two carriers is established in the alignment of the receiver. There is sound output only when both the video and sound 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), which is taken from the video detector, is amplified by one half of a 12AU7 and a 6AU6, and is fed to the FM detector, which utilizes two diode sections of a 6T8 tube. The triode section of the 6T8 is used as the first audio amplifier. The power amplifier uses a 7C5 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 is made up of two resistors, R302 and R303. To obtain higher voltage for synchronization, the composite signal for sync purposes is taken from across both R302 and R303, while the composite video for the video output is taken from across R303 only. C302 is used to by-pass high-frequency video around R302. The plate load of the video-output amplifier consists of L302 and R309. L302 is an adjustable peaking coil, and is adjusted at the factory for best video response.

The sync circuit consists of a first sync separator, a variable diode noise gate, a second sync separator, and a sync inverter. The composite video is fed to the first sync separator, one half of a 12AV7 tube. The output of the first sync separator is taken from the cathode and applied to the cathode of the noise gate, one half of a 12AU7 tube. A positive voltage, which is obtained from a voltage divider made up of R606 and R607, 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 diode is driven positive with respect to the plate, and the diode is cut off, thus preventing the noise from passing on to the second sync separator.

The positive voltage applied to the plate of the diode is made proportional to the strength of the signal being received by obtaining it from the load side of a dropping resistor, R419, in the B+ line that supplies plate and screen voltages to the i-f stages. The current through R419, therefore, depends upon the amount of current drawn by the i-f stages. When a stronger signal is received, the a-g-c voltage increases; this decreases the current drawn by the i-f stages, and decreases the voltage drop across R419. Since this results in an increase in the voltage applied to the plate of the noise-gate diode, the level at which the diode will gate out the noise is raised. When a weaker signal is received, the opposite effect is obtained. The second sync separator, one half of a 12AU7 tube, removes all remaining video information from the composite signal. The output of the second sync separator is fed to the deflection chassis through the power-connecting cable. A sync inverter, one half of a 6SN7GT tube, 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 6SN7GT tube. The output of the blocking oscillator is amplified by the 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 6SN7GT tube, through a capactive 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 6SN7GT 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. This change in bias causes a change in beam current which would tend to result in a change in picture width and high voltage. However, because 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 a beam-current change to affect the picture width. The output of the horizontal amplifier is fed to the horizontal deflection coils through the horizontal-output transformer. 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 to the horizontal amplifier, vertical oscillator, and 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 is connected to the chassis through R102, CR100, and C103 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 .... 26.6 mc.
Sound (intercarrier) .... 4.5 mc.

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

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

POWER CONSUMPTION .... 200 watts

TUBE COMPLEMENT

42 R-F CHASSIS

REF. SYMBOL	TUBE TYPE	FUNCTION
V1	6BQ7—miniature	R-F amplifier
V2	12AV7—miniature	Oscillator, mixer
V3, V4, V5	6AU6—miniature (3)	Video i-f amplifier
V6	6CB6—miniature	Video i-f amplifier
V7	12AU7—miniature	Video detector, a-g-c rectifier, first sound i-f amplifier
V8	6AU6—miniature	Second sound i-f amplifier
V9	6T8—miniature	FM detector, first audio amplifier, a-g-c clamp
V10	7C5—Loktal	Audio output
V11	12AV7—miniature	First video amplifier, first sync separator
V12	12AU7—miniature	Noise gate, second sync separator
V13	6AQ5—miniature	Video output
V20	17JP4, 20DP4A, or 20EP4A	Picture tube

G-2 DEFLECTION CHASSIS

REF. SYMBOL	TUBE TYPE	FUNCTION
V14	6SN7GT—octal	Sync inverter, vertical oscillator
V15	6AH4GT—octal	Vertical output
V16	6SN7GT—octal	Phase comparer, horizontal oscillator
V17	6BQ6GT—octal	Horizontal output
V18	6V3—miniature	Horizontal damper
V19	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

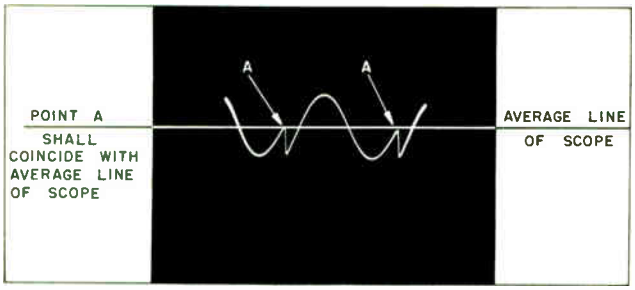
ADJUSTMENT OF HORIZ. OSC. FREQ. CONTROL AND HORIZONTAL LOCK-IN TRIMMER

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 necesssary to reset the HORIZ. OSC. 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):

1. Turn the HORIZ. HOLD control fully clockwise.

2. Adjust the HORIZ. OSC. 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-



TP1-1089-B

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

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. OSC. FREQ. control. If it is impossible to obtain synchronization by adjustment of the HORIZ. HOLD and HORIZ. OSC. 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. OSC. 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. OSC. 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, however, where excessive overshoot or excessive smear is present, 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 TC301 applies to a particular station exhibiting smear or overshoot. After TC301 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
TELEVISION-CARRIER, OSCILLATOR, AND CHECK-POINT FREQUENCIES

CHANNEL	CHANNEL LIMITS (mc.)	VIDEO-CARRIER CHECK-POINT (A) FREQUENCY (mc.)	100% CHECK-POINT (B) FREQUENCY (mc.)	10% CHECK-POINT (C) FREQUENCY (mc.)	SOUND-CARRIER FREQUENCY (mc.)	LOCAL-OSCILLATOR FREQUENCY (mc.)
2	54—60	55.25	57.35	59.35	59.75	81.85
3	60—66	61.25	63.35	65.35	65.75	87.85
4	66—72	67.25	69.35	71.35	71.75	93.85
5	76—82	77.25	79.35	81.35	81.75	103.85
6	82—88	83.25	83.35	87.35	87.75	109.85
7	174—180	175.25	177.35	179.35	179.75	201.85
8	180—186	181.25	183.35	185.35	185.75	207.85
9	186—192	187.25	189.35	191.35	191.75	213.85
10	192—198	193.25	195.35	197.35	197.75	219.85
11	198—204	199.25	201.35	203.35	203.75	225.85
12	204—210	205.25	207.35	209.35	209.75	231.85
13	210—216	211.25	213.35	215.35	215.75	237.85

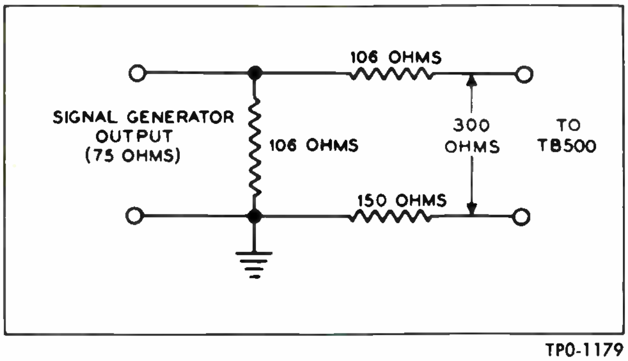


Figure 2. Aerial-Input Matching Network

GENERAL

The alignment consists of tuning each i-f coil to a given frequency, 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.

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

The video-carrier intermediate frequency is 26.6 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 having the top of the workbench metallic. 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 2 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 equipmnet 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 Model 7008 is used, the built-in crystal calibrator provides an excellent means of calibration. An alternate method for 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."

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 may be made through the alignment jack 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, may be used. As an alternate, a Philco alligator-clip adapter, Part No. 45-1636, with as short a ground lead as possible, may be used to connect 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 should be of carbon-composition construction, and should be chosen from a group, to obtain values within 10% of those indicated. The resistors should be placed in a shield can, to prevent variable effects. 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

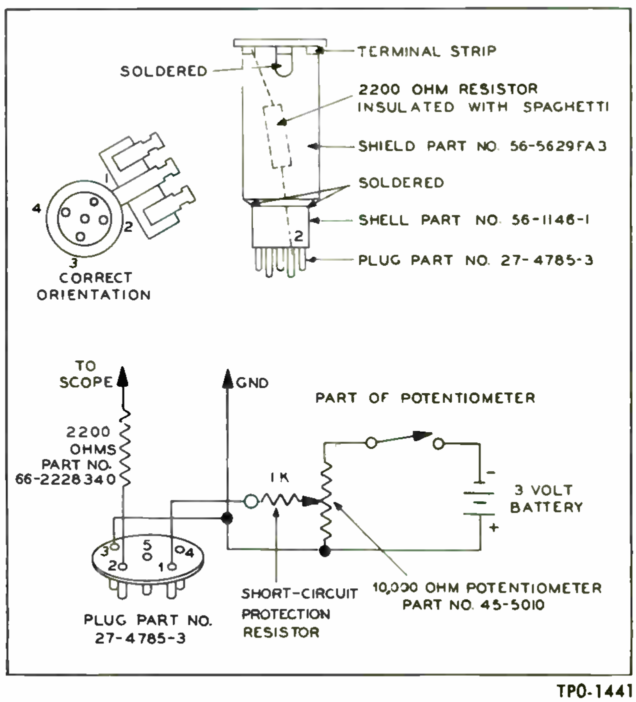


Figure 3. ALIGN TEST Jack Adapter

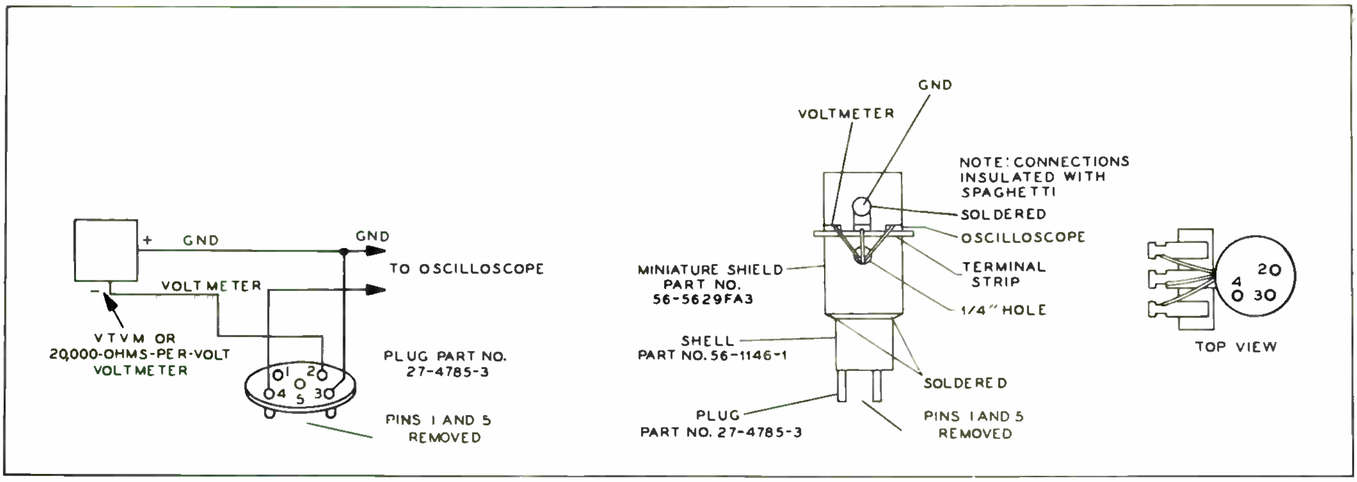


Figure 4. FM TEST Jack Adapter

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, 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.

FM TEST Jack Adapter

Figure 4 shows the adapter that should be used to connect the voltmeter and oscilloscope to the FM detector test socket, J402. A suggested method of fabricating the adapter is also shown. Pins 1 and 5 are removed from a five-pin plug, 27-4785-3, because a three-pin plug with proper spacing is not readily available.

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

Beginning with Channel 13, every other coil is tunable, so that by adjusting the tuning cores, it is possible to place either of two adjacent channels exactly on frequency; that is, either Channels 13 or 12, 11 or 10, 9 or 8, etc. The foregoing is based on the assumption that the oscillator has previously been tracked, and that it is desired to compensate for small tracking errors on several different channels. This adjustment procedure should be carried out with the highest channel 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 the Channel 6 oscillator tuning core. See figure 5.

Procedure Using Signal Generator

An r-f signal (unmodulated), at the oscillator frequency, is fed into the aerial input from an AM signal generator, and the oscillator tuning cores are adjusted for zero beat. The r-f signal should be accurate, preferably from a crystal source, or calibrated against the television station.

1. Connect a 3300-ohm resistor in series with the red lead from the tuner. Connect the "hot" lead of the oscilloscope to the junction of the red lead and the 3300-ohm resistor. (High oscilloscope gain may be necessary to obtain a visual beat. In this instance, base-line hum may be ignored.)
2. Connect the AM (marker) generator to the 300-ohm aerial-input terminals. For this purpose the aerial-input matching network is not required.
3. If the tuner is being aligned out of the chassis, connect the white lead to the negative terminal of a 1.5-volt battery. Ground the positive terminal.
4. Mechanically preset the fine-tuning cam as shown in figure 5.
5. Feed in an r-f signal (unmodulated), at the oscillator frequency for Channel 13 (237.85 mc.), with the CHANNEL SELECTOR set for Channel 13.
6. Adjust the tuning core for Channel 13 (see figure 5).
7. Adjust the tuning cores for Channels 11 and 9, in the order given.
8. Check the Channel 8 oscillator frequency. If it is too high, turn C527 several turns clockwise; if the frequency is too low, turn the trimmer counterclockwise (see figure 32).
9. Repeat steps 5, 6, 7, and 8 until Channels 13, 11, 9, and 8 are within plus or minus 500 kc. of the correct frequency.
10. Feed in an r-f (unmodulated) signal, at the oscillator frequency for Channels 7, 6, 4, and 2, consecutively (see NOTE below), and adjust the respective tuning cores. (See figure 5.)

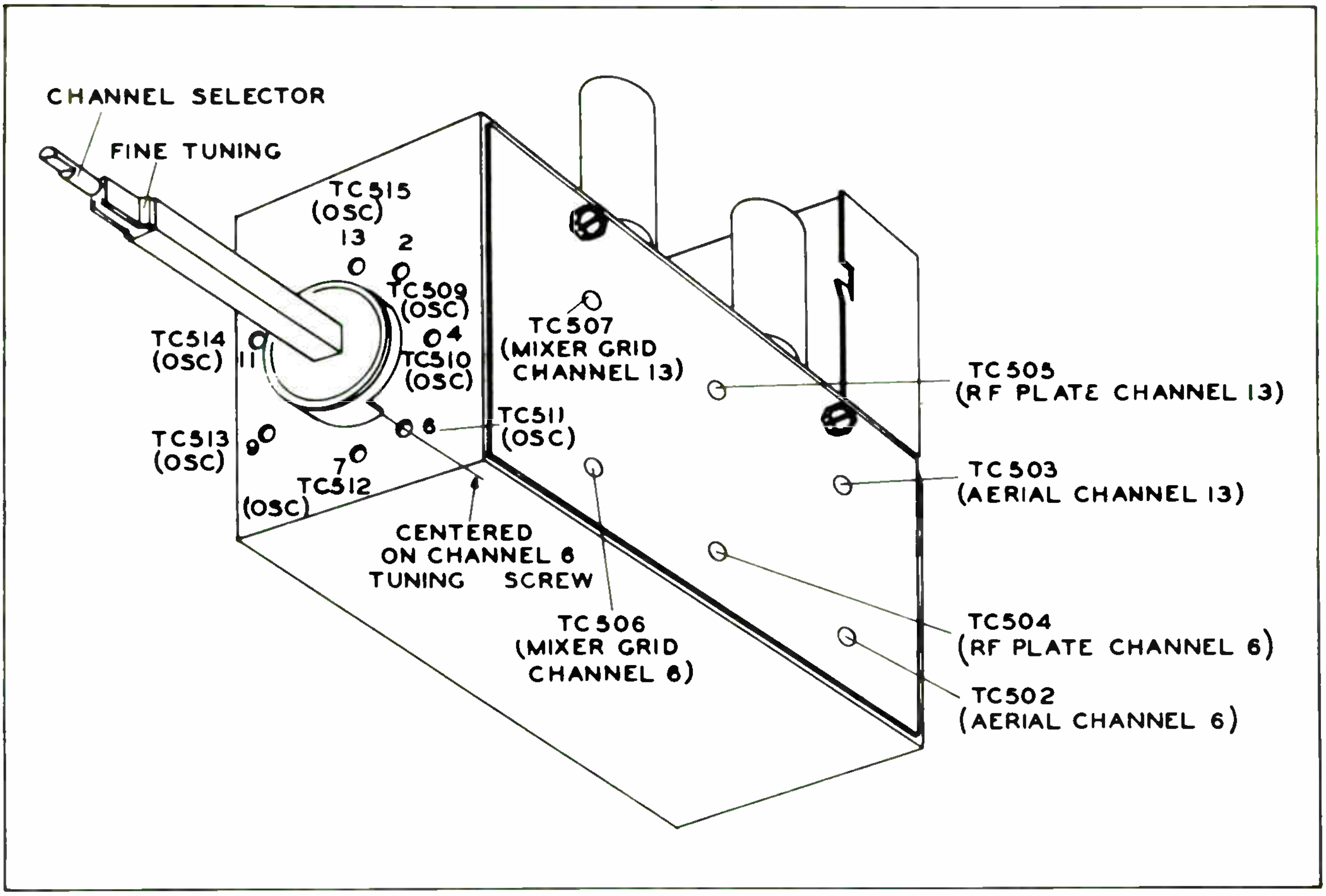


Figure 5. Television-Tuner, Oblique View, Showing Location of Adjustments

NOTE: The exact position of the FINE TUNING shaft should be marked when Channel 2 is correctly aligned. This position is to be used in step 6 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:

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.
3. Adjust the tuning core for that channel, or the next highest, for the best picture; that is, starting with sound in the picture, turn the tuning core until the sound disappears. Repeat for each channel received in the area.

BANDPASS ALIGNMENT

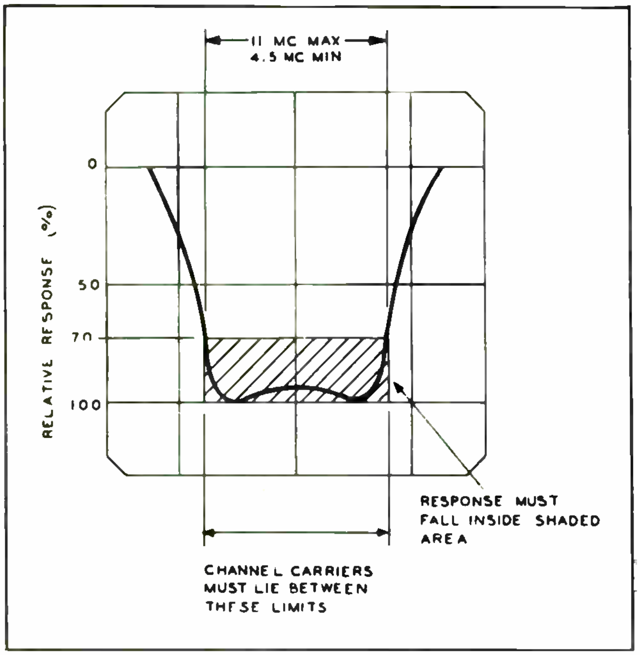
General

The bandpass alignment consists of aligning the tuner at Channels 13 and 6 and then making it track down to Channels 7 and 2, respectively.

During the alignment, a fixed bias of 1.5 volts is applied to the r-f amplifier tube.

An FM (sweep) signal is applied to the aerial-input circuit, and an oscilloscope is connected to the mixer plate circuit. 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, which are caused by poor line regulation, will cause the response and time base to jump up and down. 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. A 330-ohm resistor is shunted across the 1st i-f coil, to eliminate the absorption effect of this coil on the response curve.

1. Disconnect the white (a-g-c) lead from the tuner, and connect it to the negative terminal of a 1.5-volt battery. Ground the positive terminal.
2. Connect a 3300-ohm resistor in series with the red lead from the tuner. Connect the "hot" lead of the oscilloscope to the junction of the red lead and the 3300-ohm resistor.
3. Connect a 330-ohm resistor from the green lead to ground.
4. Connect the FM (sweep) generator to the 300-ohm aerial input through an aerial-input matching network. See figure 2.



TP9-521B-1

Figure 6. Television-Tuner Response Curve, Showing Bandpass Limits

Procedure

1. Set the CHANNEL SELECTOR and FM (sweep) generator to Channel 13 (213 mc.). Adjust the generator for sufficient sweep to show the complete response curve.

2. Establish the channel limits (see figure 6) by using the marker (AM r-f) signal generator to produce marker pips on the response curve. (Set the generator first to 210 mc., then to 216 mc.) The curve should be reasonably flat between the limits shown in figure 6.

3. Adjust TC505 and TC507 (figure 5) for a symmetrical, approximately centered pass band. Set marker generator to 213 mc. Detune TC507 counterclockwise until a single peak appears. Adjust TC505 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 TC503 for maximum curve height and symmetry of the single peak. The aerial circuit is now tuned for the high channels.

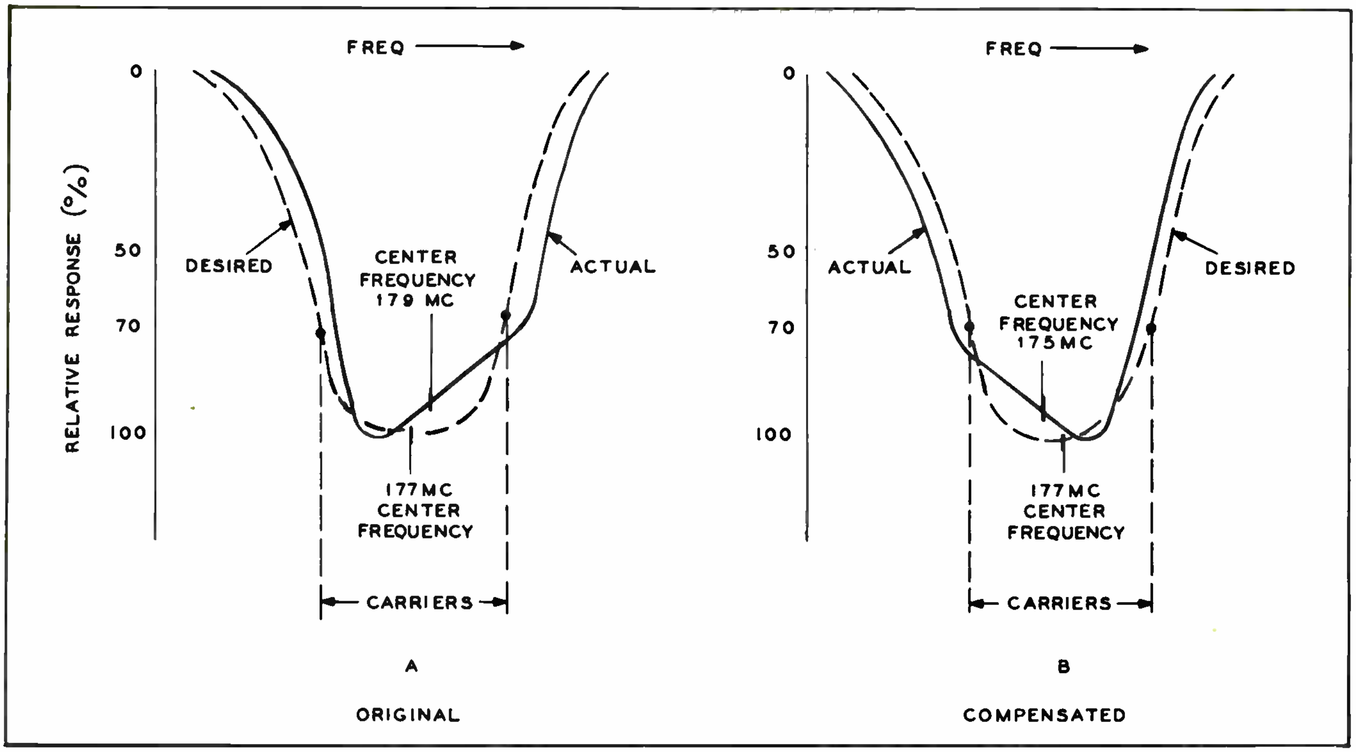
4. Readjust TC505 and TC507 for a symmetrical response, centered about 213 mc. and falling within the limits as shown in figure 6.

5. Set the CHANNEL SELECTOR and FM generator to Channel 7 (177 mc.).

6. Establish the Channel limits by using the marker-signal generator to produce marker pips on the response curve. (Set the generator first to 174 mc., then to 180 mc.) The curve should be reasonably flat between the limits.

7. On Channel 7, note the response curve, with respect to tilt and center frequency. The curve should be centered in the pass band, and should be symmetrical.

8. If the curve is not symmetrical and appears unbalanced as shown in figure 7 leave the generator and tuner set to Channel 7 and adjust C506 and C515 (see figure 32) to obtain a response curve which is the mirror image (tilt in the opposite direction) of the original. This is a form of overcompensation to allow for the effect of Channel 13 adjustment on Channel 7. For example, if the Channel 7 response



TPO-1174

Figure 7. Television-Tuner Response Curve, Showing Tracking Compensation

appears as in figure 7A, then the trimmer should be adjusted to obtain the response shown in figure 7B.

9. Reset the CHANNEL SELECTOR and generators to Channel 13. Readjust TC505 and TC507 for a symmetrical and centered band pass. (See step 4.)

10. Set the CHANNEL SELECTOR and generators to Channel 7, and check the response for center frequency and symmetry. Repeat steps 8 and 9 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.

11. Set the CHANNEL SELECTOR and sweep generator to Channel 6 (85 mc.).

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

13. Adjust TC504 and TC506 for a symmetrical, approximately centered pass band. Set the marker generator to 85 mc. Detune TC506 counterclockwise until a single peak appears.

CAUTION: Do not turn TC506 excessively, or it will fall out of the coil.

Adjust TC504 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 TC502 for maximum curve height and symmetry of the single peak. The aerial circuit is now tuned for Channels 2 through 6.

14. Readjust TC504 and TC506 for a symmetrical response, centered about 85 mc.

VIDEO I-F ALIGNMENT

PRELIMINARY

Before proceeding with the i-f alignment or making an alignment check, observe the following preliminary instructions:

1. Connect the oscilloscope to the 2200-ohm resistor from the ALIGN TEST jack adapter.
2. If additional attenuation of the marker signal is required when using Visual Alignment Generator Model 7008, insert a 10,000-ohm resistor in series with the output lead, or use a 2nd harmonic of Band A, which will give a marker of lower amplitude.
3. Preset the television controls as follows:
   a. CONTRAST control fully counterclockwise.
   b. BRIGHTNESS control to give a dim raster.
4. Insert the FM TEST jack adapter into J402.
5. Insert the ALIGN TEST jack adapter into J200.

PROCEDURE

1. Preset TC201 and TC203 fully counterclockwise. See figure 32. Preset TC200 and TC202 to the center of their ranges.

2. Connect the oscilloscope to J200, pin 2, through the 2200-ohm resistor from the ALIGN TEST jack adapter, and connect the AM generator to G1 (mixer grid on tuner).

3. Feed in a 28.1-mc. AM signal, and tune TC201 for minimum output (use first minimum). Use zero bias during this adjustment.

4. Feed in a 21.85-mc. AM signal, and tune TC203 for minimum output (use first minimum). Use zero bias during this adjustment.

5. Tune TC205, TC204, TC202, TC200, and TC507 for maximum output at the frequencies indicated in figures 32 and 33. Use 3 volts of bias, and attenuate the generator to keep the output below the level that will give a .6-volt output at the video detector with 30% amplitude modulation.

6. Feed in sweep and marker signals to Channel 2 through the aerial-input terminals. The tuner pass band should be checked, and the tuner aligned, if necessary. The local oscillator should be set to its correct frequency (81.85 mc. for Channel 2). Refer to step 10 of Procedure Using Signal Generator, under OSCILLATOR ALIGNMENT. The response should fall within the limits shown in figure 8. The ideal response curve is shown in figure 9. The frequencies shown in figures 8 and 9 are for Channel 2. To convert these response curves for Channels 3 through 13, refer to the chart of Television-Carrier, Oscillator, and Check-Point Frequencies and substitute the proper frequencies at points A, B, and C. Touch up TC205, TC204, TC202, TC200, and TC507. See NOTE below.

IMPORTANT: Do not turn any of the i-f tuning cores excessively after they have been set to the approximate position by the use of the AM signal generators; to do so may cause poor transient or phase response, resulting in trailing whites or smear. If a response within the limits shown cannot be obtained by a slight adjustment, carefully repeat the AM adjustments, and, if necessary, troubleshoot the i-f system. It is preferable to get a response curve within the tolerance range WITHOUT touching the adjustments made with the AM signals at the specified frequencies, rather than to attempt to obtain the ideal curve.

NOTE: TC205 rocks top of curve.
TC202 controls level of carrier.
TC204 controls dip or peak on carrier side.
TC200 controls dip or peak on sound side.

SOUND I-F ALIGNMENT

1. Remove the first i-f tube, and connect a v.t.v.m. or a 20,000-ohms-per volt voltmeter to the FM TEST jack adapter. Adjust the VOLUME control for moderate speaker output.

2. Feed in an accurately calibrated 4.5-mc. AM signal through the 2200-ohm resistor in the ALIGN TEST jack adapter to pin 2 of J200.

3. Tune TC400 and TC402 for maximum indications on the meter. The point of maximum meter indication for TC402 should also be the point of minimum speaker output.

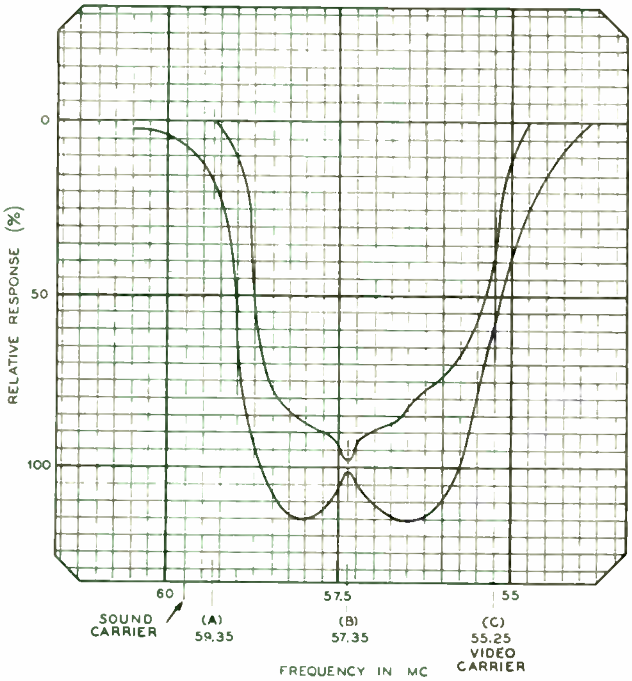
4. Tune TC402 for minimum speaker output.

5. Connect an r-f probe or crystal detector to the grid (pin 2) of the picture tube. See NOTE below.

6. Tune TC300 for minimum indication on oscilloscope. If a crystal detector is not available, TC300 may be adjusted for minimum beat pattern, observed on the picture tube, with a station picture present.

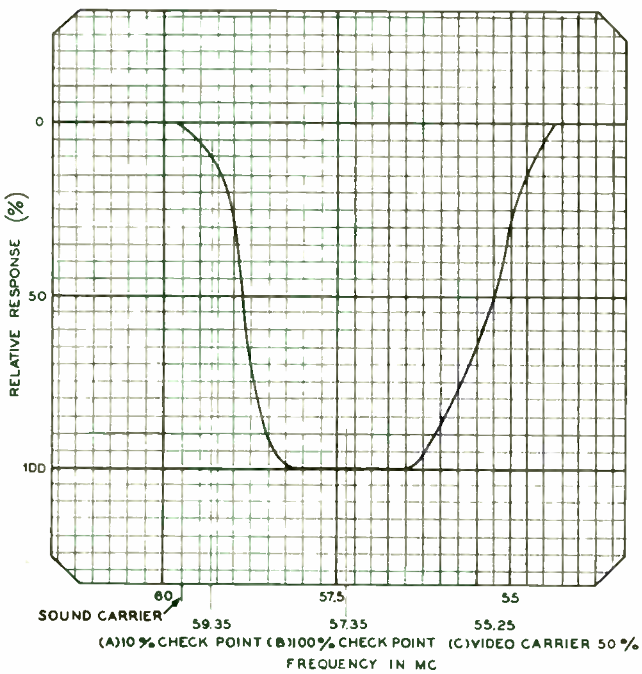
7. Replace the 1st i-f tube. Tune in a station and use the speaker output as an indication.

8. Turn the FINE TUNING control clockwise to obtain a slightly fuzzy picture.



TP1-734

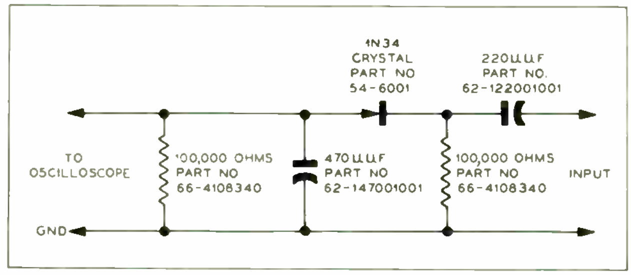
Figure 8. Over-all R-F, I-F Response Curve, Showing Tolerance Limits



TP1-735

Figure 9. Ideal Over-all R-F, I-F Response Curve

9. Tune TC402 for minimum AM (noise) output. NOTE: The R-F Probe, Part No. 76-3595, is used as a detector of the 4.5-mc. signal, and the oscilloscope as an indicating device. An alternate crystal detector may be made up as shown in figure 10.

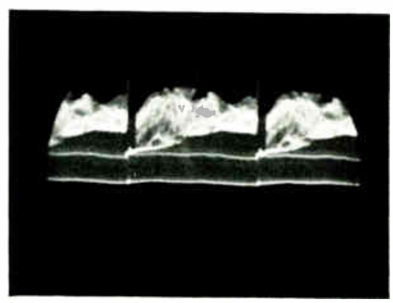


TP0-1150

Figure 10. Wiring Diagram of Crystal Detector

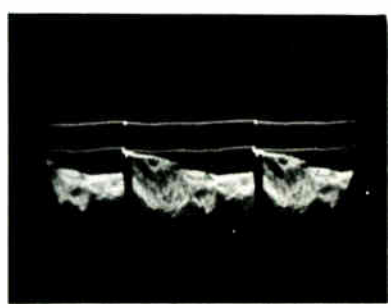
OSCILLOSCOPE WAVEFORM PATTERNS

The 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—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, and the peak voltages will differ from the values shown.



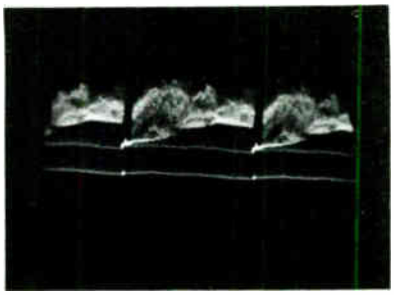
TP1-1200-A

Figure 11. Video-Detector Output
Pin 2 of J200
2 Volts, 60 C.P.S.



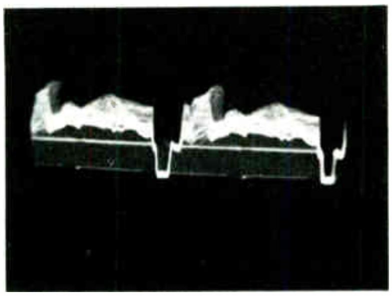
TP1-1200-B

Figure 12. Video-Amplifier Plate
Pin 6
28 Volts, 60 C.P.S.



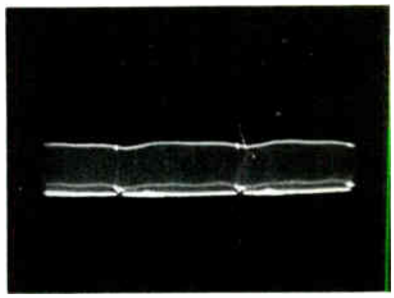
TP1-1200-A

Figure 13. CRT Grid Pin 2
118 Volts, 60 C.P.S.



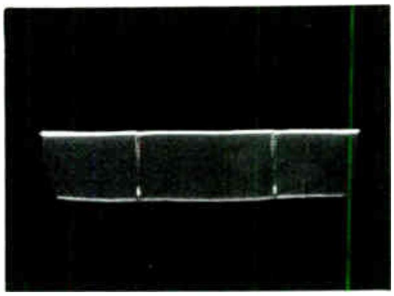
TP1-1092

Figure 14. Video Detector Output Pin 2 of J200
2 Volts, 15,750 C.P.S.



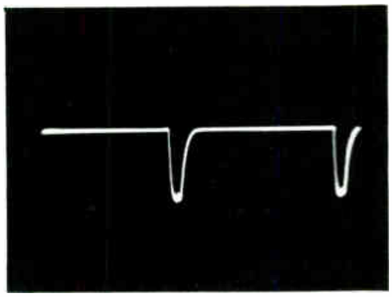
TP1-1203

Figure 15. First-Sync-Separator Cathode Pin 2
10 Volts, 60 C.P.S.



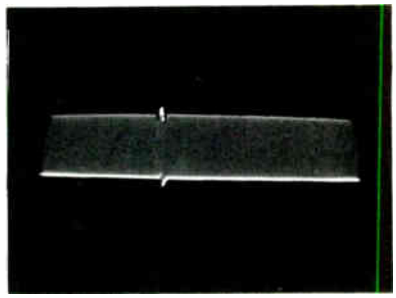
TP1-1090

Figure 16. Second-Sync-Separator Plate Pin 1
10 Volts, 60 C.P.S.



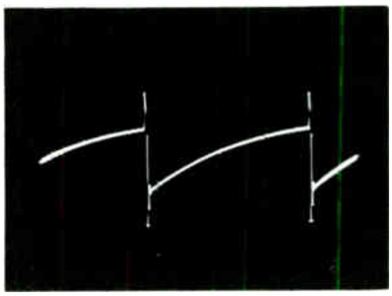
TP1-1091

Figure 17. Second-Sync-Separator Plate Pin 1
10 Volts, 15,750 C.P.S.



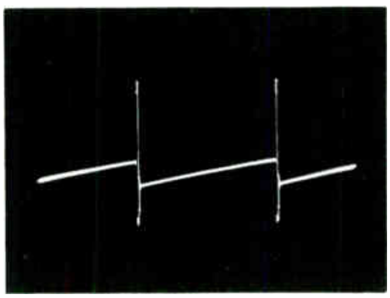
TP1-1087

Figure 18. Sync-Inverter Plate Pin 5
30 Volts, 60 C.P.S.



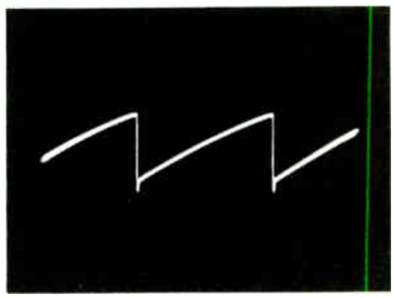
TP1-1202

Figure 19. Vertical-Oscillator Grid Pin 4
90 Volts, 60 C.P.S.



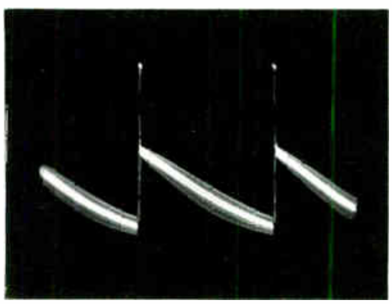
TP1-1097

Figure 20. Vertical-Oscillator Plate Pin 2
130 Volts, 60 C.P.S.



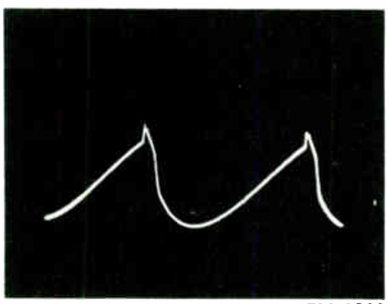
TP1-1100

Figure 21. Vertical-Amplifier Grid Pin 1
125 Volts, 60 C.P.S.



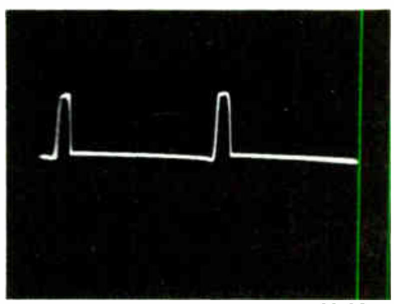
TP1-1099

Figure 22. Vertical-Amplifier Plate Pin 5
750 Volts, 60 C.P.S.



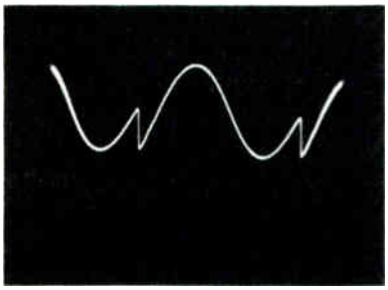
TP1-1088

Figure 23. Phase-Comparer Grid Pin 1
20 Volts, 15,750 C.P.S.

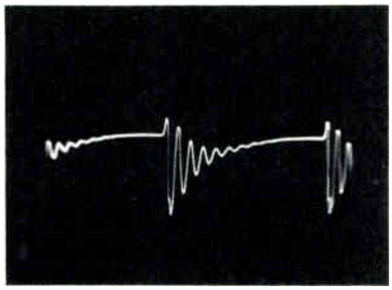


TP1-1094

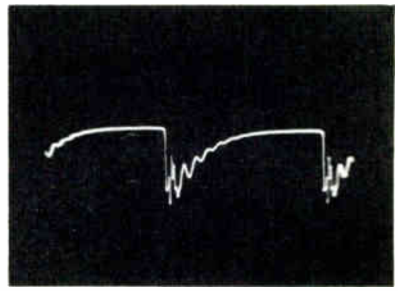
Figure 24. Phase-Comparer Grid Pin 1 with Pin 4 Grounded
6 Volts, 15,750 C.P.S.



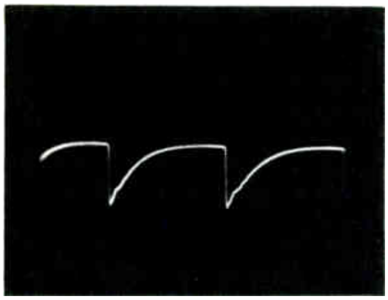
TP1-1089-A
Figure 25. Horizontal-Oscillator Cathode Pin 6*
20 Volts, 15,750 C.P.S.



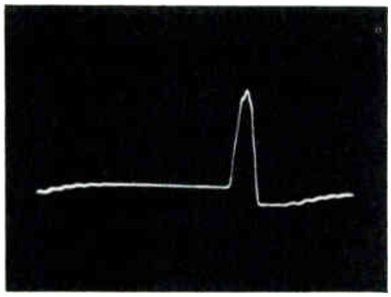
TP1-1205
Figure 26. Horizontal-Oscillator Grid Pin 4*
190 Volts, 15,750 C.P.S.



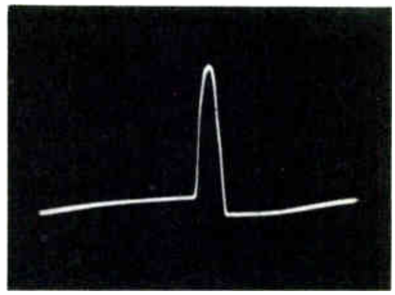
TP1-1098
Figure 27. Horizontal-Oscillator Plate Pin 5*
140 Volts, 15,750 C.P.S.



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-$\mu\mu$f. 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 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 off the teeth of the alligator 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.

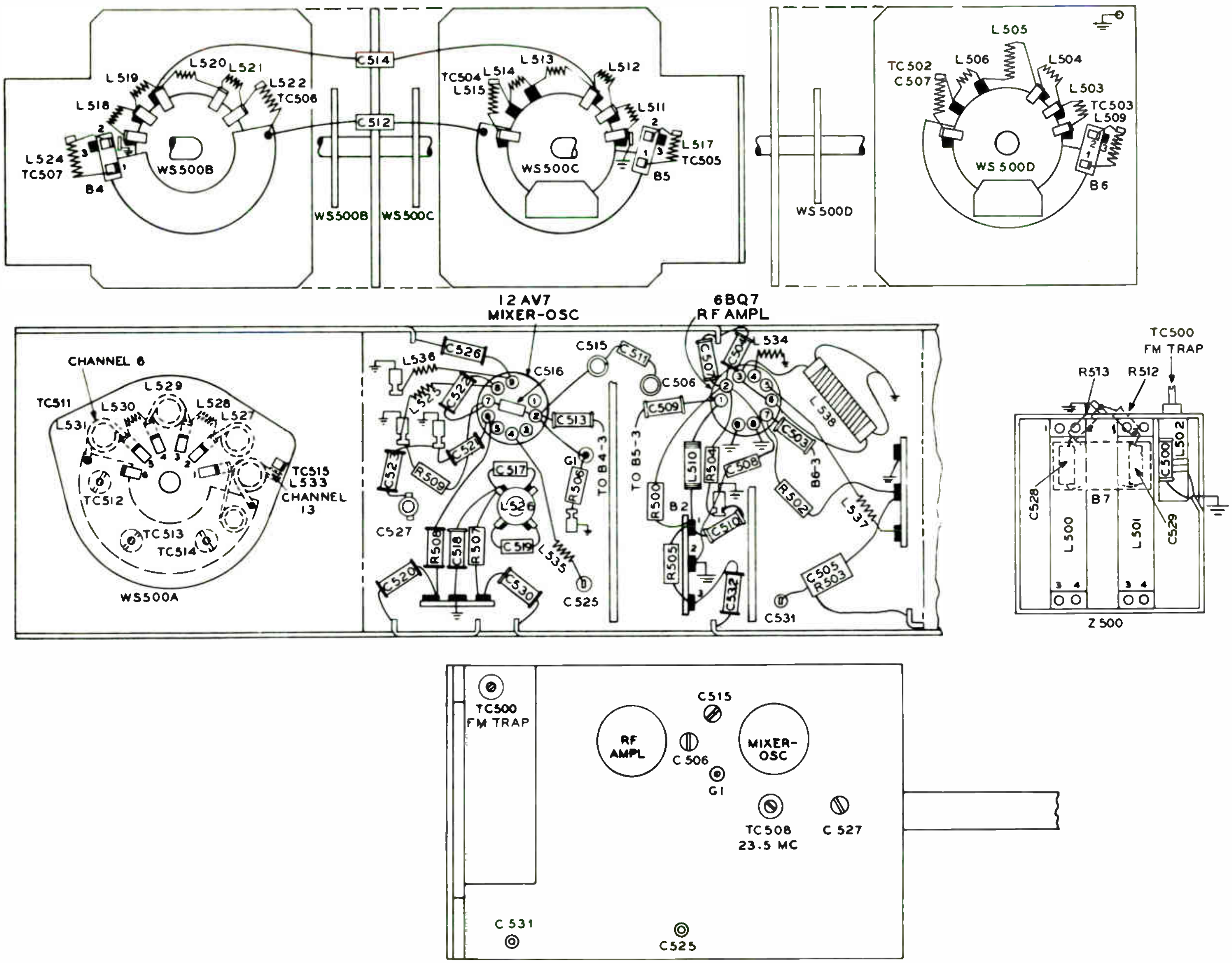
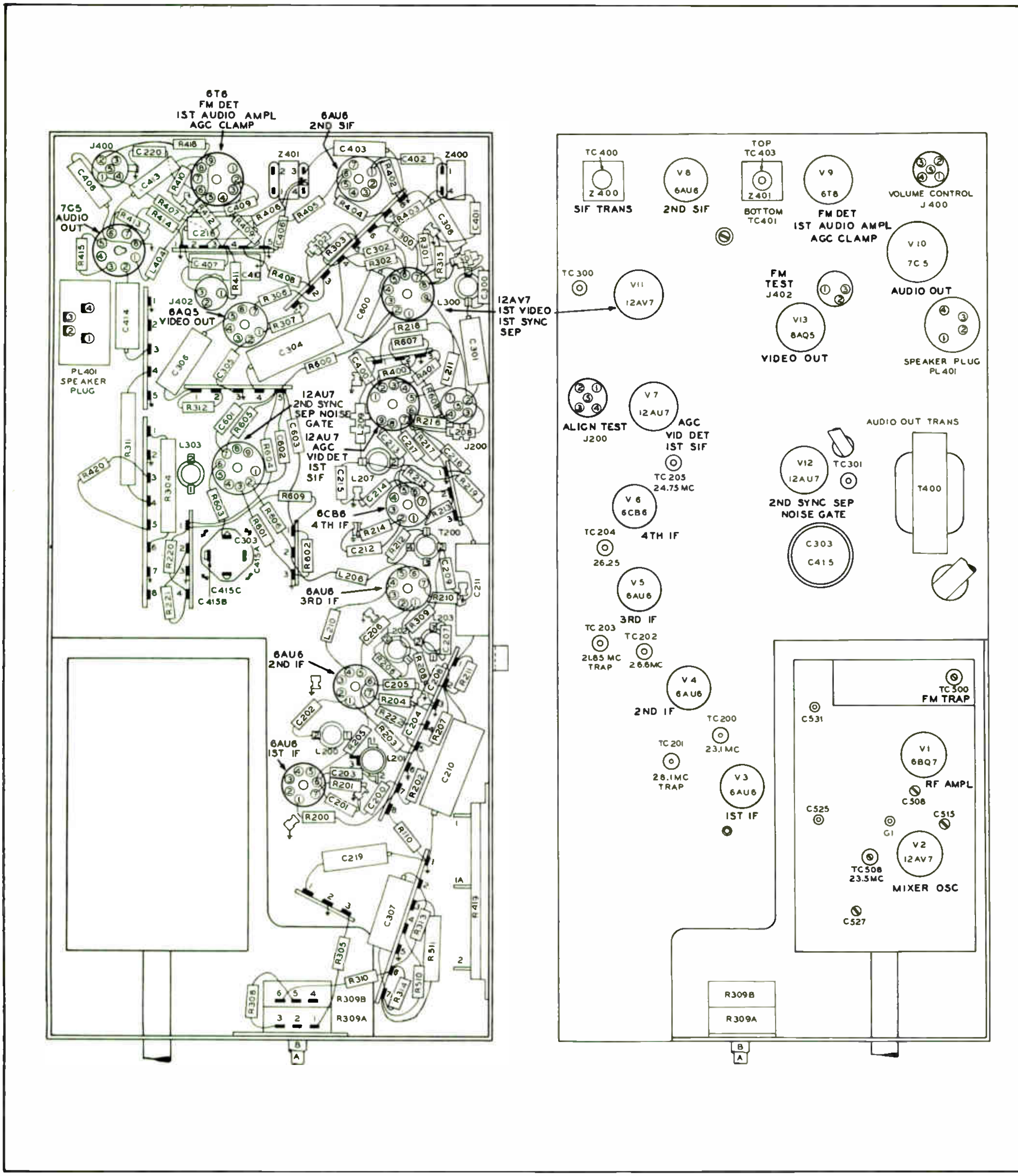


Figure 31. Television Tuner, Base Layout

TP1-2218



TP2-1196

Figure 32. R-F Chassis 42, Base Layout

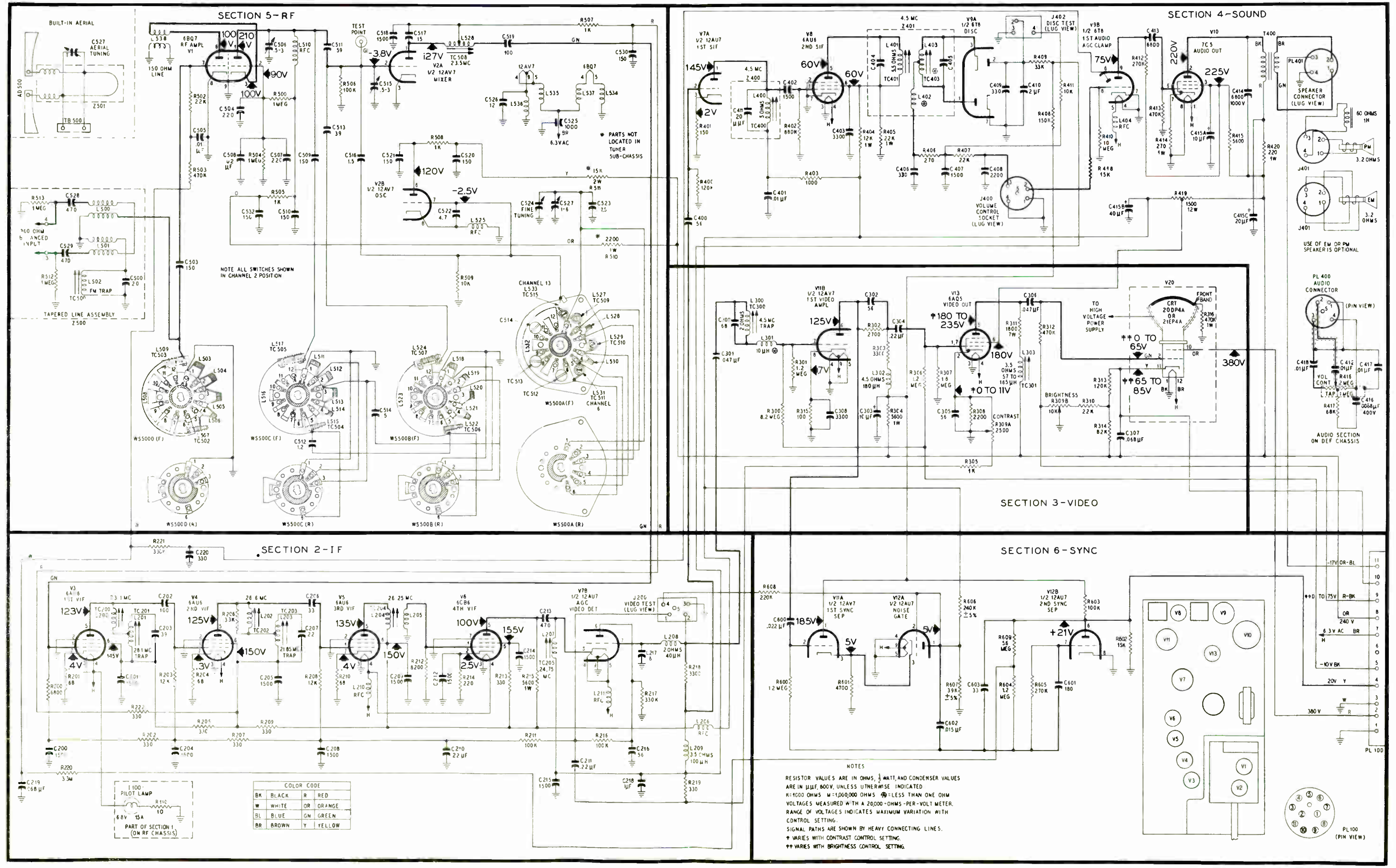


Figure 33. R-F Chassis 42, Schematic Diagram

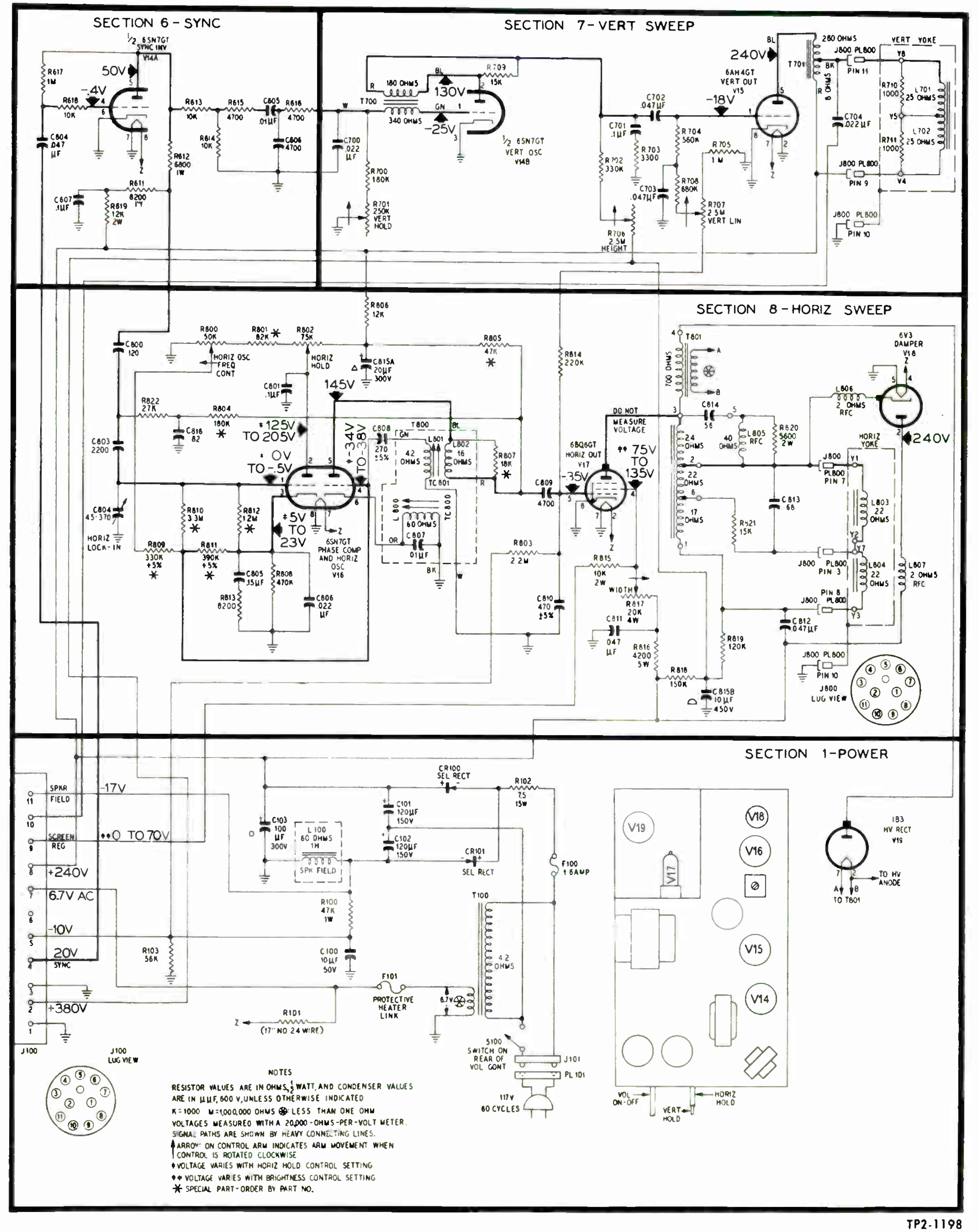


Figure 34. Deflection Chassis G-2, Schematic Diagram

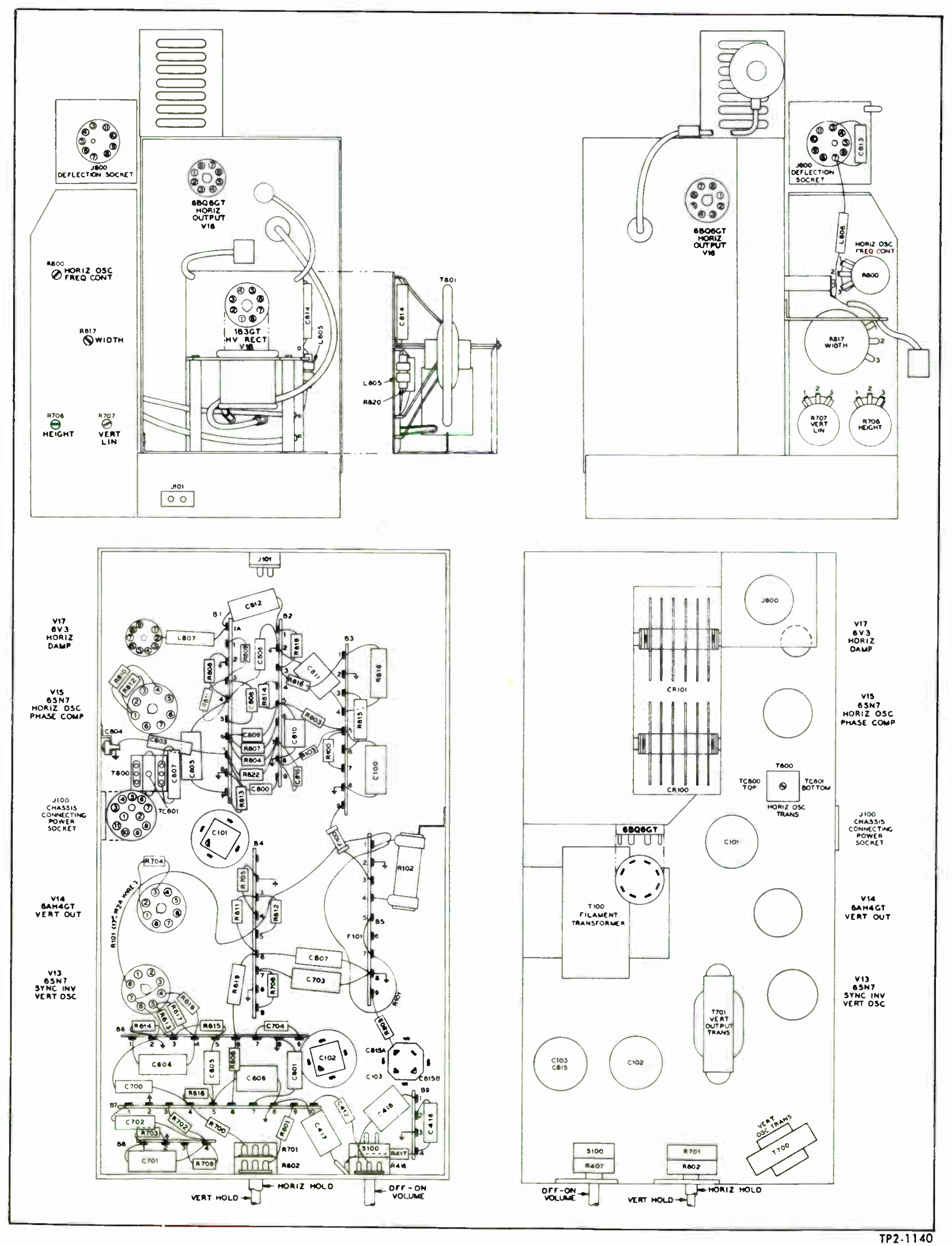


Figure 35. Deflection Chassis G-2, Base Layout

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 should be ordered in this way rather than by model number; in addition, a miscellaneous listing will be found at the end of each chassis type. All parts are symbolized in the schematic diagram and base layouts, for identification purposes.

DEFLECTION CHASSIS G-2

SECTION 1—POWER SUPPLY

Reference Symbol	Description	Service Part No.
C100	Condenser, electrolytic filter, 10 μf., 50v	30-2417-3
C101 and C102	Condenser, electrolytic filter, 120 μf., 150v	30-2570-66
C103	Condenser, electrolytic filter, 100 μf., 300v	30-2584-15
CR100 and CR101	Rectifier, 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 ass'y., chassis connecting	(See Misc. B)
PL101	Plug, a-c line	Part of a-c line cord ass'y. (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, 7.5 ohms, 15 watts	33-3448
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 μμf.	62-033009001
*C603	Condenser, d-c blocking, 180 μμf.	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	Coil, 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 μμf.	60-10125237
*	This part is located on the r-f chassis	
C804	Condenser, horizontal lock-in padder	31-6473-22
C808	Condenser, d-c blocking, 270 μμf. ±5%	60-10275337
C810	Condenser, horizontal drive, 470 μμf. ±5%	60-30475411
C813	Condenser, damping, 68 μμf.	30-1246-1
C814	Condenser, antiringing, 56 μμf.	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
C816	Condenser, by-pass, 82 μμf.	60-00825337
J800	Socket, deflection yoke connector	27-6274-6
L803 and L804	Coil, horizontal deflection	Part of deflection yoke (See Misc. A)
L805	Coil, antiringing, 2.5 millihenrys	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. OSC. FREQ. control, 50,000 ohms	33-5565-30
R801	Resistor, voltage divider, 82,000 ohms, ½ watt	66-3828344
R802	Potentiometer, HORIZ. HOLD control, 75,000 ohms	33-5563-43
R804	Resistor, feedback, 180,000 ohms, ½ watt	66-4188344
R805	Resistor, charging, 47,000 ohms, ½ watt	66-3478244
R807	Resistor, damping, 18,000 ohms, ½ watt	66-3188344
R809	Resistor, voltage divider, 330,000 ohms +5%, ½ watt	66-4338244
R810	Resistor, voltage divider, 3.3 megohms, ½ watt	66-5338344
R811	Resistor, voltage divider, 390,000 ohms +5%, ½ watt	66-4398244
R812	Resistor, grid leak, 1.2 megohms, ½ watt	66-5128344
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, antiringing, 5600 ohms, 2 watts	66-2565340
T800	Transformer, horizontal oscillator	32-8551
T801	Transformer, horizontal output	32-8555

MISCELLANEOUS A

Description	Service Part No.
Beam bender	76-6077-2
Cable ass'y., audio control	41-3974
Cable ass'y., high voltage	41-4064-6
Cable and plug ass'y., deflection	41-4086-18
Cap and lead ass'y., 6BQ6 plate	76-5664-7
Cap and lead ass'y., 6V3 plate	76-5664
Cord, line	41-3865
Deflection yoke ass'y.	32-9648
Focus, ass'y., 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, CRT ass'y.	56-9733

R-F CHASSIS 42

SECTION 2—VIDEO I-F

Reference Symbol	Description	Service Part No.
C202	Condenser, d-c blocking, 100 μμf.	62-110009001
C203	Condenser, fixed trimmer, 39 μμf.	30-1224-63
C206	Condenser, d-c blocking, 33 μμf.	62-033009001
C207	Condenser, fixed trimmer, 22 μμf.	62-022009001
C213	Condenser, d-c blocking, 470 μμf.	62-147001021
C216	Condenser, r-f by-pass, 56 μμf.	62-056409011
C217	Condenser, i-f by-pass, 8 μμf.	30-1224-13
J200	Socket, alignment test	27-6273
L200	Coil, 1st i-f plate tank	32-4486
L201	Coil, 28.1-mc. trap	32-4303-3
L202	Coil, 2nd i-f plate tank	32-4486
L203	Coil, 21.85-mc. trap	32-4496
L204	Coil, 3rd i-f primary	Part of T200
L205	Coil, 3rd i-f secondary	Part of T200
L206	Coil, i-f isolation	32-4112-15
L207	Coil, 4th i-f plate	32-4486
L208	Coil, series peaking, 40 μh.	32-4143-16
L209	Coil, shunt peaking, 100 μh.	32-4143-17
L210	Coil, filament choke	32-4112-15
L211	Coil, filament choke	32-4112-15
R215	Resistor, plate feed, 5600 ohms, 1 watt	66-2564340
T200	Transformer, 3rd i-f	32-4486-6

SECTION 3—VIDEO

Reference Symbol	Description	Service Part No.
C300	Condenser, 4.5-mc. trap, 68 μμf.	62-068409011
C302	Condenser, compensating, 56 μμf.	62-056409011
C303	Condenser, low-frequency compensating, 10 μf., 300v	30-2570-57
C305	Condenser, cathode by-pass	62-056409011
L300	Coil, 4.5-mc. trap	32-4463-2
L301	Coil, 1st video grid, 10 μh.	32-4143-18
L302	Coil, shunt peaking, 180 μh.	32-4480-9
L303	Coil, shunt peaking, video-output plate	32-4467-7
R304	Resistor, low-frequency compensating, 5600 ohms, 1 watt	66-2564340
R309	Potentiometer, dual CONTRAST and BRIGHTNESS control, 2500 ohms, and 10,000 ohms	33-5563-42
R309A	Potentiometer, CONTRAST control	Part of R309
R309B	Potentiometer, BRIGHTNESS control	Part of R309
R311	Resistor, video-output plate load, 1800 ohms, 7 watts	33-1335-102
R316	Resistor, grounding, 470,000 ohms, 1 watt	66-4474340

SECTION 4—AUDIO

Reference Symbol	Description	Service Part No.
C400	Condenser, d-c blocking, 56 μμf.	62-056409011
C406	Condenser, detector, balancing, 330 μμf.	60-10335417
C409	Condenser, r-f by-pass, 330 μμf.	62-133001001
C410	Condenser, filter, 2 μf., 50v	30-2417-7
C415A	Condenser, screen by-pass, 10 μf., 300v	Part of C303
C415B	Condenser, filter, 40 μf., 300v	Part of C303
C415C	Condenser, electrolitic, 20 μf., 300v	Part of C303
J400	Socket, volume control	27-6273
J401	Socket, speaker	27-4785-22
J402	Socket, discriminator test	27-6273
L404	Choke, filament	32-4112-15
PL400	Plug, audio control	Part of audio cable ass'y. (see Misc. A)
PL401	Plug, speaker cable	Part of speaker cable (see cabinet parts)
R404	Resistor, screen dropping, 12,000 ohms 1 watt	66-3124340
R405	Resistor, voltage divider, 22,000 ohms, 1 watt	66-3224340
R414	Resistor, cathode bias, 270 ohms, 1 watt	66-1274340
R416	Potentiometer, volume control, 2 megohms	33-5564-14
R419	Resistor, voltage dropping, 1500 ohms, 12 watts	33-3435-35
T400	Transformer, audio output	32-8242-11
Z400	Transformer, 1st sound i-f ass'y.	32-4449A
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	41-3964-15
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	56-5629-5FA3
Socket and base, 6CB6	29-6203-14
Socket, Loktal	27-6207
Socket, miniature tube, 7-pin	27-6265
Socket, miniature tube, 9-pin	27-6203-5
Speaker	See cabinet parts

TV TUNER PART NO. 76-7070
SECTION 5

Reference Symbol	Description	Service Part No.
C500	Condenser, fixed trimmer, 20 μμf.	62-020309011
C503	Condenser, d-c blocking, 150 μμf.	62-115001011
C504	Condenser, grid by-pass, 220 μμf.	30-1225-11
C507	Condenser, grid by-pass, 220 μμf.	30-1225-11
C508	Condenser, grid by-pass, .02 μf.	30-1238-5
C509	Condenser, d-c blocking, 150 μμf.	62-115001011
C510	Condenser, plate decoupling, 150 μμf.	62-115001011
C512	Condenser, coupling, 1.2 μμf.	30-1221-7
C513	Condenser, d-c blocking, 39 μμf.	62-039409011
C514	Condenser, coupling, 5 μμf.	30-1221-13
C515	Condenser, trimmer, mixer grid, .5 to 3 μμf.	31-6520-3
C516	Condenser, oscillator injection, 1.5 μμf.	30-1224-59
C517	Condenser, fixed trimmer, 15 μμf.	62-015409011
C519	Condenser, d-c blocking, 100 μμf.	62-110001001
C520	Condenser, plate decoupling, 150 μμf.	62-115001011
C521	Condenser, plate by-pass, 150 μμf.	62-115001011
C522	Condenser, d-c blocking, 4.7 μμf. ±5%	30-1224-85
C523	Condenser, fixed trimmer, 7.5 μμf. ±10%	30-1224-84
C524	Condenser, fine tuning	76-5755

Symbol Description	Description	Part No. Service Part No.
C525	Condenser, filament decoupling, 1000 μμf.	30-1245-1
C527	Condenser, trimmer, 1 to 6 μμf.	31-6520-2
C528	Condenser, coupling, 470 μμf.	62-147001001
C529	Condenser, coupling, 470 μμf.	62-147001001
C530	Condenser, decoupling, 150 μμf.	62-115001001
C531	Condenser, a-g-c decoupling, 1000 μμf.	30-1245-1
L500 and L501	Coil, tapered line	Part of Z500
L503 through L509	Coil, r-f grid (Channels 2 through 13, respectively)	Part of WS500D
L510	Coil, r-f choke, plate feed	32-4112-22
L511 through L517	Coil, r-f plate (Channels 2 through 13, respectively)	Part of WS500C
L518 through L524	Coil, mixer grid (Channels 2 through 13, respectively)	Part of WS500B
L525	Coil, r-f choke	32-4112-25
L526	Coil, mixer plate (1st i-f)	32-4359-12
L527 through L533	Coil, oscillator (Channels 2 through 13, respectively)	Part of WS500A
L534	Coil, r-f choke, filament decoupling	312-5132
L535, L536 and L537	Coil, r-f choke, filament decoupling	32-4112-2
L538	Coiled line, 150 ohms	32-4527
R510	Resistor, B plus dropping, 2200 ohms, 1 watt	66-2224340
R511	Resistor, B plus dropping, 15,000 ohms, 2 watts	66-3155340
TB500	Terminal board (aerial)	38-8689
TC500	Tuning core, FM trap	Part of L 502
TC502 and TC503	Tuning core, r-f grid (Channels 6 and 13)	Part of WS500D
TC504 and TC505	Tuning core, r-f plate (Channels 6 and 13)	Part of WS500C

Symbol Reference	Description	Part No. Service
TC506 and TC507	Tuning core, mixer grid (Channels 6 and 13)	Part of WS500B
TC508	Tuning core, 1st i-f	Part of L526
TC509 through TC515	Tuning core, oscillator (Channels 2 through 13, respectively)	Part of WS500A
WS500	Wafer switch ass'y. Not supplied as an ass'y.	
WS500A(F) and WS500A(R)	Switch wafer section (oscillator) with coils	76-6784
WS500B(F) and WS500B(R)	Switch wafer section (mixer grid) with coils	76-7098
WS500C(F) and WS500C(R)	Switch wafer section (r-f plate) with coils	76-6895
WS500D(F) and WS500D(R)	Switch wafer section (r-f grid) with coils	76-7077
Z500	Tapered-line ass'y.	76-7071

MISCELLANEOUS C

Description	Service Part No.
Ball bearing (2 used)	56-8020
Cam-and-shaft ass'y. (FINE TUNING)	76-5846-4
Insulator, tuner shaft	54-4912
Lock washer, trimmer-condenser mtg.	W-1775-3
Plate-and-bracket ass'y., front	76-5924-3
Plunger, FINE TUNING condenser	56-8034
Screw, trimmer-condenser core	2W10617
Shaft	56-8018-6
Shield, tube	56-5629-5
Spring, cam shaft	56-8254
Spring detent	56-8019-1
Spring-and-bracket ass'y., FINE TUNING condenser grounding	76-5961-1
Spring, plunger (FINE TUNING condenser)	56-8035-1
Spring, tuner-shaft insulator	56-9181
Washer, "C", shaft retaining	56-8061

PHILCO
Factory-Supervised
Service

PHILCO CORPORATION
PHILADELPHIA, PA.

PR 2170

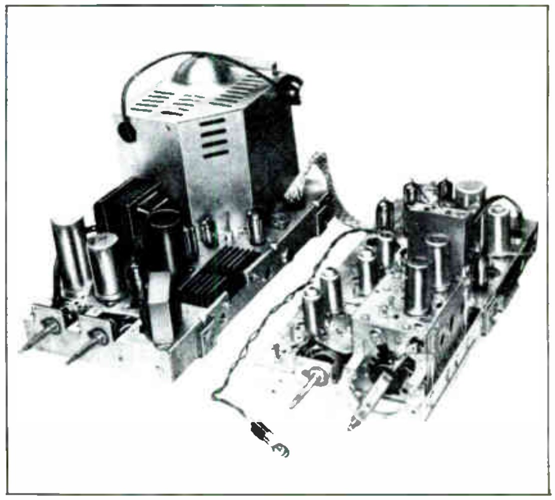
Printed in U.S.A.

PHILCO SERVICE

PHILCO Factory-Supervised Service

TELEVISION

PHILCO
TELEVISION SERVICE MANUAL
FOR
R-F CHASSIS 91
DEFLECTION CHASSIS J-1



SERVICE INFORMATION FOR PHILCO CHASSIS TYPES 91 AND J-1

TABLE OF CONTENTS

PR2200

CIRCUIT DESCRIPTION

The Philco 1953, Code 126, television receivers use two chassis—the r-f chassis 91 containing the r-f, video, audio, and sync circuits, and the deflection chassis J-1 containing 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 r-f amplifier, oscillator, and mixer section is built on a separate subchassis. The r-f amplifier uses a 6BZ7 tube, V1. The oscillator and mixer each use one half of a 12AZ7 tube, V2. The output of the mixer is fed to a four-stage i-f amplifier system employing four 6CB6 tubes, V3, V4, V5, and V6. A 1N64 crystal diode is used for the video detector. One half of a 6U8 tube, V7A, is used as the first video amplifier, which feeds into a 6AQ5 video output amplifier, V8.

Sound i-f (intercarrier) is obtained by utilizing the beat frequency produced when the 45.75-mc. video carrier and the 41.25-mc. sound 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 the video 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 relative amplitude of the two carriers is established in the alignment of the receiver. There is sound output only when both the video and sound 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), which is taken from the video detector is amplified by a 6BA6 tube, V9, and a 6AU6 tube, V10, and is fed to the FM detector, which utilizes two diode sections of a 6T8 tube, V11A. The triode section of the 6T8 tube, V11B, is used as the first audio amplifier. The power amplifier uses a 7C5 tube, V12.

A-G-C voltage for the video i-f system and the r-f amplifier is obtained from a keyed a-g-c system which uses a 6AU6 tube, V13, as the a-g-c gate. Composite video from the video-amplifier plate circuit, V7A, is fed to the grid of the a-g-c gate tube, while a gating or keying pulse, obtained from a winding on the horizontal output transformer located on the deflection chassis, is applied to the plate. The sync-pulse polarity applied to the grid of V13 is positive; therefore, the a-g-c gate can conduct in proportion to the amplitude of the sync-pulse tips if the gating or keying pulse occurs at the same time as the sync. Because the keying or gate pulse is of constant amplitude, approximately 500 volts peak, the amplitude of the sync pulse will determine the amount of conduction in the gate tube. The plate current of the keyed a-g-c gate tube flows through R220, R213, and R212, developing a voltage which is negative in respect to chassis and proportional to the plate current. This negative voltage is used to control the gain of the receiver. Since conduction cannot occur in the a-g-c gate tube unless the sync pulse and gating pulse occur at the same time, noise disturbances that occur between sync-pulse intervals cannot affect the a-g-c voltage.

Composite video for the sync circuits is taken from the plate circuit of the video amplifier, V7A. The plate load of the video amplifier consists of two equal sections, R302 and R303. The full output of the amplifier is fed to the grid of the noise inverter using one half of a 12AU7 tube, V14B, and the output developed across R303 only, is fed to the grid of the sync separator using one half of a 6U8 tube, V7B. The noise inverter is operated with a low value of plate voltage and high bias (applied to the cathode by a voltage divider network) which keeps the tube beyond cut-off. When the composite video signal is applied to the grid of the noise inverter through C601, the sync appears as positive pulses; noise which could affect the sweep circuits also appears as positive pulses. Harmful noise pulses usually have amplitudes far greater than the sync pulses and, therefore, drive the grid of the noise inverter positive sufficiently to allow conduction in the noise-inverter plate circuit. To prevent the noise inverter from conducting during the sync-pulse interval, the gated leveler using one half of a 12AU7 tube, V14A, is employed to clamp the sync pulses below the conduction level of the noise inverter. The gated leveler will conduct only when the sync pulses and gating pulse occur at the same time, thus leveling the noise-inverter input to the sync-pulse level.

The output of the noise inverter consists of negative-going noise pulses. It should be noted that the noise pulses which exceed the sync level have been passed and their polarity reversed by the noise inverter. The output of the noise inverter is now mixed with the composite video and fed to the grid of the sync separator. Since the composite video fed to the grid of the sync separator has positive sync polarity, the positive noise pulses carried with the composite video would be passed by the sync separator; however, the output of the noise inverter consists of these same noise pulses, but they are of opposite polarity; thus, the noise pulses are cancelled. The output of the sync separator contains only the sync pulses which are fed to the deflection chassis through the connecting cable.

The phase splitter, using one half of a 12AU7 tube, V15A, inverts the sync polarity for proper triggering of the vertical oscillator. The vertical sync is separated from the horizontal sync by the integrator circuit and fed to the grid of the vertical blocking oscillator, using one half of a 12AU7 tube, V15B. The output of the vertical oscillator is amplified by the vertical output amplifier using a 12BH7 tube, V16. The output of the amplifier is applied to the vertical deflection coils through the vertical output transformer.

The phase splitter also supplies horizontal sync to the phase-comparer diodes, using a 6AL5 tube, V17. Two horizontal sync outputs are taken from the phase splitter, one from the cathode, the other from the plate circuit. These two outputs are of opposite polarity and are fed to the two diodes of the phase comparer, the negative pulses to the cathode of V17B and the positive pulses to the plate of V17A. A saw-tooth voltage is fed to the plate of V17B and cathode of V17A for comparison of the sync and horizontal sweep voltages. When the sweep and sync are in phase, no voltage will be developed across R800, but when the two signals are out of phase a voltage will be developed across R800. The voltage across R800 will increase the frequency of the horizontal oscillator, using a 12AU7 tube, V18, if it is positive and the same voltage will reduce the frequency of the oscillator if it is negative, thus acting to hold the horizontal oscillator in phase with the sync signal. The HORIZ. HOLD control, R811, adjusts the horizontal oscillator to the proper frequency so that it may be controlled by the phase comparer. The output of the horizontal oscillator is fed to the horizontal output amplifier using a 6BQ6GT tube, V19. The horizontal output tube feeds the deflection coils through the horizontal output transformer. A 6AX4GT tube, V20, is used as the horizontal damper.

The second anode voltage for the picture tube is supplied by a 1B3GT high-voltage rectifier tube, V20. 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 a 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 vertical amplifier, 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 110-volt, 60-cycle stepdown transformer. Filament current for the high-voltage rectifier is supplied by a winding on the horizontal output 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, CR100, and C103, 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, 13-position, wafer-switch incremental tuner; fine tuning of local oscillator

FREQUENCY RANGE ...... Television Channels 2 through 13 and U-H-F position

INTERMEDIATE FREQUENCIES
- Video carrier .... 45.75 mc.
- Sound (intercarrier) .... 4.5 mc.

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

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

POWER CONSUMPTION .... 200 watts

TUBE COMPLEMENT

R-F 91 CHASSIS

REFERENCE SYMBOL	TUBE TYPE	FUNCTION
V1	6BQ7—miniature	R-F amplifier
V2	12AZ7—miniature	Oscillator, mixer
V3, V4, V5, V6	6CB6—miniature	Video i-f amplifiers
V7	6U8—miniature	Video amplifier, sync separator
V8	6AQ5—miniature	Video output
V9	6BA6—miniature	First sound i-f amplifier
V10	6AU6—miniature	Second sound i-f amplifier
V11	6T8—miniature	FM detector, first audio amplifier
V12	6V6GT—octal	Audio output
V13	6AU6—miniature	A-G-C gate
V14	12AU7—miniature	Gated leveler, noise inverter
V22	21EP4	Picture

J-1 DEFLECTION CHASSIS

REFERENCE SYMBOL	TUBE TYPE	FUNCTION
V15	12AU7—miniature	Phase splitter, vertical oscillator
V16	12BH7—miniature	Vertical output
V17	6AL5—miniature	Phase comparer
V18	12AU7—miniature	Horizontal oscillator
V19	6BQ6GT—octal	Horizontal output
V20	6AX4GT—octal	Damper
V21	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 OSCILLATOR ADJUSTMENT

To adjust the horizontal oscillator circuit, tune in a station and proceed as follows:

1. Reduce the width of the picture so that approximately one inch of blank screen appears on the right and left sides of the picture.
2. Increase BRIGHTNESS control setting so that the blanking time becomes visible. This appears as a dark bar to the right and left sides of the picture.
3. Connect a .1-μf. condenser from pin 2 of the gate pulse socket, J801, to ground.
4. Set the HORIZ. HOLD control to the center of its mechanical rotation.
5. Adjust the HORIZ. HOLD CENTERING control to bring the picture into the center of the blanking bars. When the picture is centered in the blanking bars, the bars on the left and right sides of the picture will be of equal width.
6. Remove the .1-μf. condenser from the gate pulse socket. (See step 3.)
7. Adjust the horizontal ringing coil L800 until the picture is again centered in the blanking bar.
8. Rotate the HORIZ. HOLD control through its range. The picture should fall out of sync to both sides of the center of its rotation. If the picture does not fall out of sync to both sides, readjust the HORIZ. HOLD CENTERING control to obtain fall out to either side of sync.
9. Rotate the HORIZ. HOLD control through its range and observe the number of diagonal blanking bars just before the picture pulls into sync. The pull-in should occur with from 1 to 2 diagonal bars when the sync position is approached from either direction. If proper pull-in is not obtained, repeat the above procedure.

TELEVISION ALIGNMENT

General

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

The over-all response curve (r-f, i-f) of the circuits from the antenna terminals to the video detector, after the i-f stages have been aligned, should appear essentially the same regardless of the channel under test. If not, the tuner should be aligned. Before aligning the tuner, refer to the CAUTION given under Television Tuner Alignment Procedure.

The video-carrier intermediate frequency is 45.75 mc., and the sound intermediate (intercarrier) frequency is 4.5 mc. Alignment in 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 if the top of the workbench is metallic. 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 Model 7008 is used, the built-in crystal calibrator provides an excellent means of calibration. 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."

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 may be made through the alignment jack 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, may be used. As an alternate, a Philco alligator-clip adapter, Part No. 45-1636, with as short a ground lead as possible, may be used to connect 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.

Antenna-Input Matching Network

An impedance matching network for coupling the signal generator to the aerial input terminals of the receiver is shown in figure 2 on page 5 of PR-2170. 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 antenna-input circuit. The resistors used in this network should be of carbon-composition construction, and should be chosen with a group to obtain values within ten percent of those indicated. The resistors should be placed in a shield can to prevent variable effects. An antenna-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.

Video I-F Alignment Jig (VIDEO TEST Jack Adapter)

The alignment jig, shown in figure 1, 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 five-pin plug, two 10,000-ohm resistors and a 1500-μμf. condenser for isolation of the bias supply. To isolate the oscilloscope from the receiver circuits a 15,000-ohm resistor by-passed by a 1500-μμf. condenser is used. A suggested method of fabricating the jig is also shown in figure 1. This jig should not be used to observe the composite video from the video detector output.

S-I-F Input Alignment Jig (VIDEO TEST Jack Adapter)

To observe the composite video a jig may be made with a five-pin plug and a 2200-ohm resistor. (See figure 2.) The 2200-ohm resistor should be connected to pin 2. A ground lead should be connected to pin 3. For convenience in applying bias to the a-g-c circuits, a lead should be connected to pin 5. To observe the

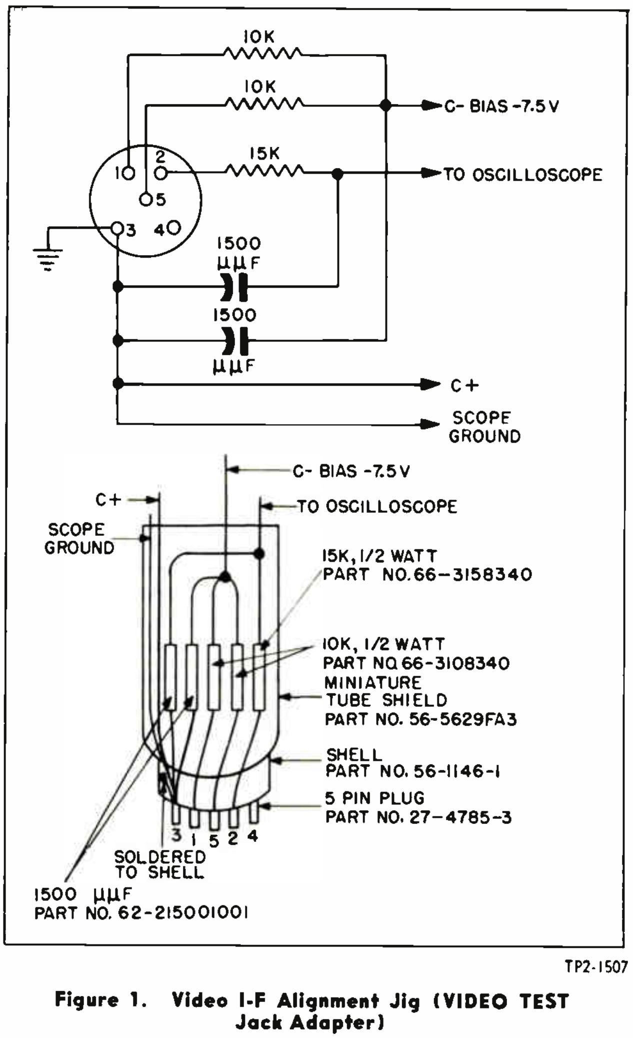
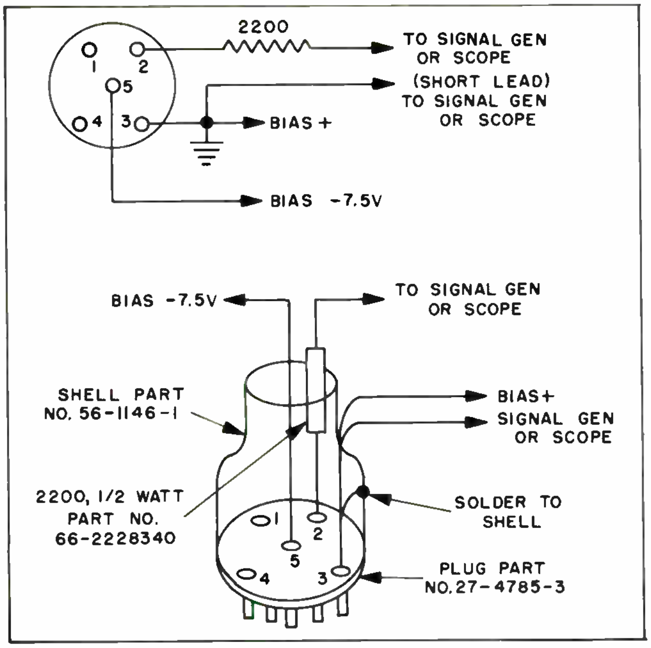


Figure 1. Video I-F Alignment Jig (VIDEO TEST Jack Adapter)



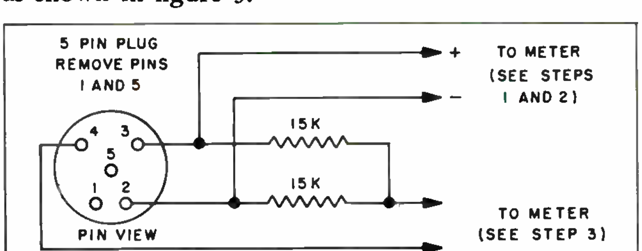
TP2-1519

Figure 2. Sound I-F Input Alignment Jig (VIDEO TEST Jack Adapter)

composite video, connect the oscilloscope to the 2200-ohm resistor and the ground lead. This jig is also used for injection of the 4.5 mc. signal during s-i-f alignment.

S-I-F Output Alignment Jig (FM TEST Jack Adapter)

Figure 3 shows the adapter that should be used to connect the voltmeter to the FM detector test socket, J402. Pins 1 and 5 are removed from a five-pin plug, Part No. 27-4785-3, because a three-pin plug with proper spacing is not readily available. The two 15,000-ohm resistors should have a tolerance of five per cent and should be selected to be as nearly equal in resistance as possible and connected to pins 2 and 3 on the plug. The free ends of the resistors are joined to form a voltage divider across the discriminator tank condenser C413. Leads should be brought out from pins 2 and 4 as shown in figure 3.



TP2-1508

Figure 3. Sound I-F Output Alignment Jig (FM TEST Jack Adapter)

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, 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

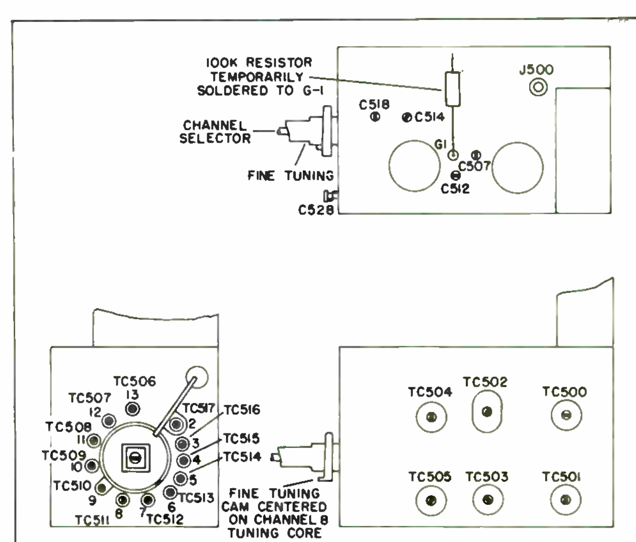
It is possible to place each channel exactly on frequency by adjusting the tuning core of each coil. The adjustment procedure should be carried out with the highest Channel (13) first, since the alignment of each channel will affect the alignment of the channels below it in frequency. The FINE TUNING control should be preset for all adjustments by placing the stop on the fine-tuning cam at Channel 8 oscillator tuning core. See figure 4.

Procedure Using Signal Generators

An r-f signal (unmodulated), at the video carrier frequency of the channel, is fed into the antenna 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 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 accurately calibrated as described in Philco Lesson Series, PR-1745J.

To align the oscillator, proceed as follows:

1. To observe the zero beat, connect the oscilloscope to the video detector output through the video i-f alignment jig. See figure 1. Bias the tuner and i-f a-g-c circuits with one and one half volts and remove the gate pulse plug PL801, from the socket J801. To apply the bias to the tuner connect the battery to the white lead which comes out of the top of the tuner. On later runs of this tuner, the white a-g-c lead connects to a feed through condenser on the top of the tuner. To make certain that good connection is made to the tuner a-g-c circuit remove the glyptol coating on this condenser terminal.
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 loop, 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



TP2-1509

Figure 4. Television Tuner, Showing Location of Adjustments

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 4, 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.

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 4.)

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 Bandpass Alignment

General

The bandpass 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 white a-g-c lead.

An FM (sweep) signal is applied to the antenna-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, a result of poor line regulation, will cause the response and the time base to jump up and down. 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. The scope controls should be adjusted so that the width of the presentation is double the height. Overload may then be checked by changing the generator output while observing the shape of the response curve. When the generator output is changed, the vertical gain of the oscilloscope should be readjusted to keep the scope presentation amplitude the same. Do not readjust the horizontal gain control. 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 antenna input of the tuner. The Antenna-Input Matching Network, shown in figure 2 of PR2170, or Philco Antenna Matching Jig, Part No. 45-1637, may be used for this purpose. If a matching jig is not used, the result obtained will be extremely unreliable.

Regeneration in the test setup will also cause poor and unreliable results. To check for regeneration 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, regeneration is indicated. A check for regeneration 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, regeneration is indicated. The symptoms which indicate regeneration may also be caused by failure to use the proper matching jig as described above.

Procedure

CAUTION: When comparing the response curves from channel to channel, maintain the 2 to 1 width to height relationship in the oscilloscope presentation as described above.

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 4. Connect the ground lead of the oscilloscope as close to the mixer tube as possible.

3. Apply 1.5 volts bias to the white tuner a-g-c lead.

4. Disconnect the tuner coupling link at wiring panel B-13 terminals 1 and 4, and solder a 68-ohm, one-half watt carbon resistor to the open link coming from the tuner. See figure 7. 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 5) by using the marker (AM r-f) signal generator to produce

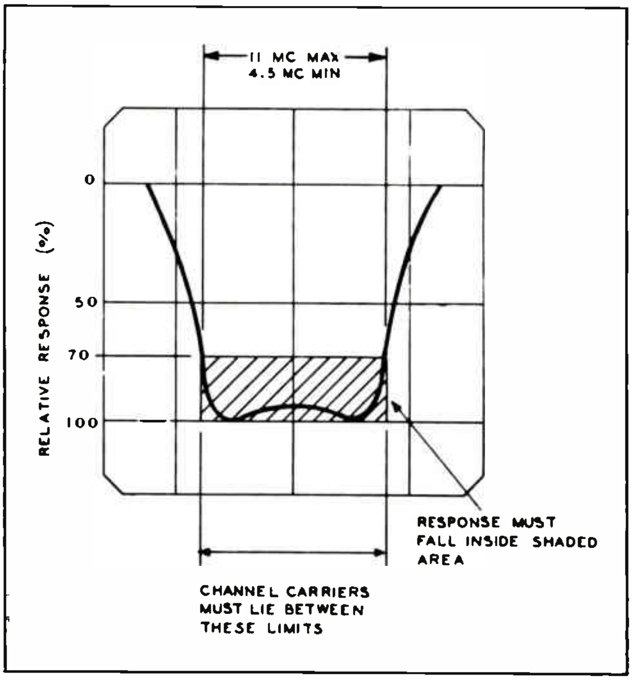
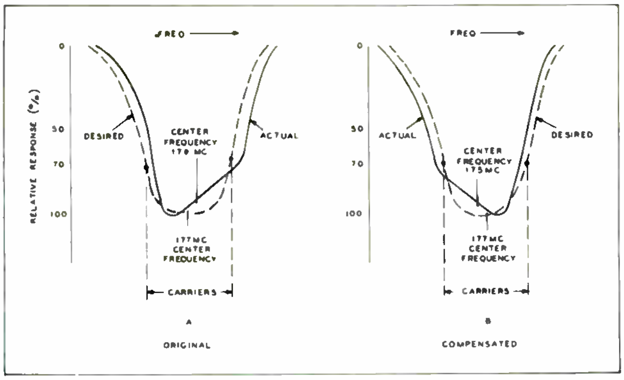


Figure 5. Television Tuner Response Curve, Showing Bandpass Limits



TPO-1174

Figure 6. Television Tuner Response Curve, Showing Tracking Compensation

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 4) 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 antenna circuit is now tuned for the high band channels.

NOTE: On later runs of the tuner, L506 is not tunable and TC500 is omitted, therefore, the adjustments in step 7 should be confined to TC502 and TC504 when later-run tuners are encountered.

8. Readjust TC502 and TC504 for a symmetrical response, centered about 213 mc. and falling within the specifications as shown in figure 5.

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 6, adjust C507 and C512 (figure 4) 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 6A, adjust C506 and C514 until the curve appears as in figure 6B. 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 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 antenna circuit is now tuned for Channels 2 through 6.

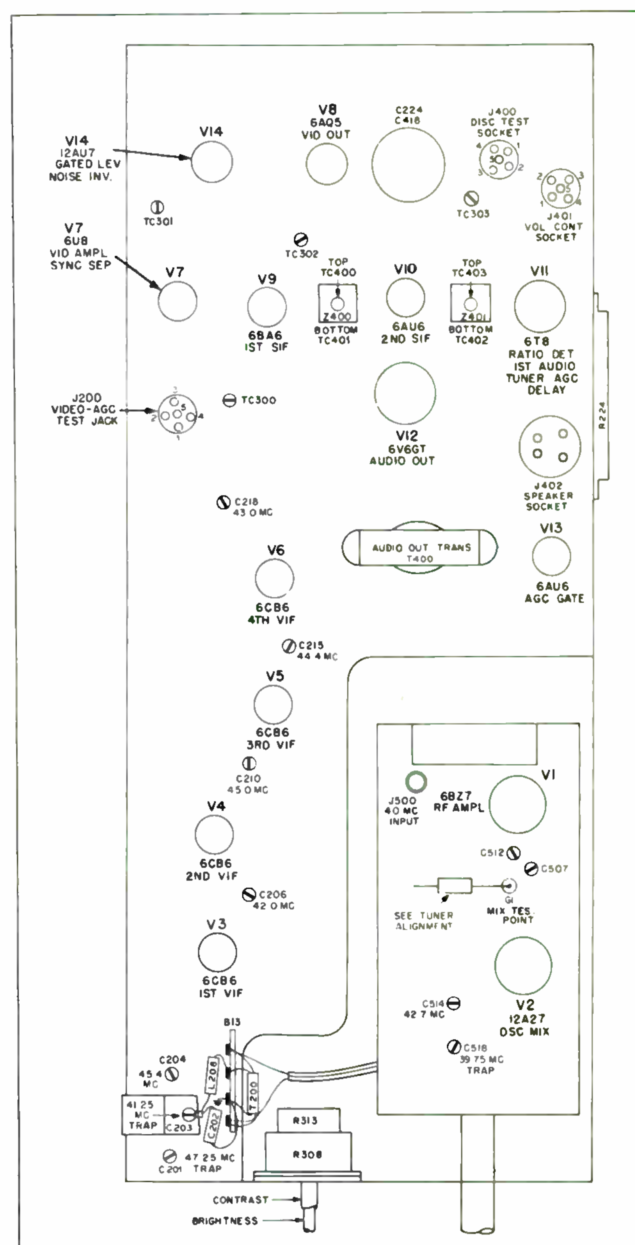
15. Readjust TC503 and TC506 for a symmetrical response, centered about 85 mc. and falling within the specifications as shown in figure 6. Channels 2 through 6 are now correctly aligned.

VIDEO I-F ALIGNMENT

Preliminary

Before proceeding with the i-f alignment or making an alignment check, observe the following preliminary instructions:

1. Preset the CONTRAST and BRIGHTNESS controls to the maximum counterclockwise position.



TP2-1510

Figure 7. R-F Chassis 91, Top View, Showing Location of Adjustments

2. Preset the CHANNEL SELECTOR to Channel 4.
3. Insert the video i-f alignment jig into J200.
4. Connect the oscilloscope to the 15,000-ohm resistor from the video i-f alignment jig. Connect the ground lead of the oscilloscope to the ground lead from the adapter.
5. Connect a 7.5-volt battery to the a-g-c test jack, with the negative terminal to the bias lead and the positive terminal to the ground lead.
6. Connect the AM generator to the mixer test point, G1, through a mixer jig, and adjust the generator for approximately 30 per cent modulation with 400 cycles. Adjust the output of the generator during the alignment to keep the output at the second detector below .6 volt peak-to-peak.

NOTE: If the i-f shield has been removed for repairs, it must be replaced before proceeding with alignment.

Procedure

1. Tune the AM generator to 39.75 mc. and adjust C518 (see figure 7) for minimum output as observed on the oscilloscope.
2. Tune the AM generator to 47.25 mc. and adjust C201 for minimum output as observed on the oscilloscope.
3. Tune the AM generator to 41.25 mc. and adjust C203 for minimum output as observed on the oscilloscope.

NOTE: In steps 1, 2, and 3 it is necessary to keep the generator output sufficiently high so that a null indication may be observed on the oscilloscope; however, avoid overloading of the receiver by excessive signal.

4. Tune the AM generator to the frequencies indicated and adjust the trimmers for maximum output.
   a. 42.7 mc. adjust C514
   b. 45.4 mc. adjust C204
   c. 42.0 mc. adjust C206
   d. 45.0 mc. adjust C210
   e. 44.4 mc. adjust C215
   f. 43.0 mc. adjust C218
5. Connect the sweep generator and r-f marker generator to the antenna terminal through a matching jig. (If separate oscilloscope is used, connect the sweep output of the generator to the horizontal input of the oscilloscope.) Set the CHANNEL SELECTOR to Channel 4 and tune the sweep generator for output on Channel 4. Tune the r-f marker generator for the video carrier frequency of Channel 4 (67.25 mc.) and tune the i-f marker generator (connected to mixer grid) to 45.75 mc. Note that two marker generators are used for this procedure. The r-f marker generator is connected to the antenna terminals while the i-f marker generator is connected to the mixer grid test point, G1. A jig constructed from a piece of fiber tubing, with 3/16 inch inside diameter, and a brass machine screw which fits tightly into the tubing is used to connect the generator to the test point. The screw is adjusted so that it clears the test point by approximately 1/64 inch. The output cable of the marker generator is connected to the head of the brass screw in the jig and to chassis near the mixer tube. Both marker generators should be adjusted for the minimum output required to make the markers barely visible. Failure to observe this precaution or the use of excessive output from the sweep generator will cause misleading results. After the equipment is properly connected, adjust the FINE TUNING control for zero-beat of the two markers, as observed on the oscilloscope. When zero beat is obtained, remove the i-f marker.

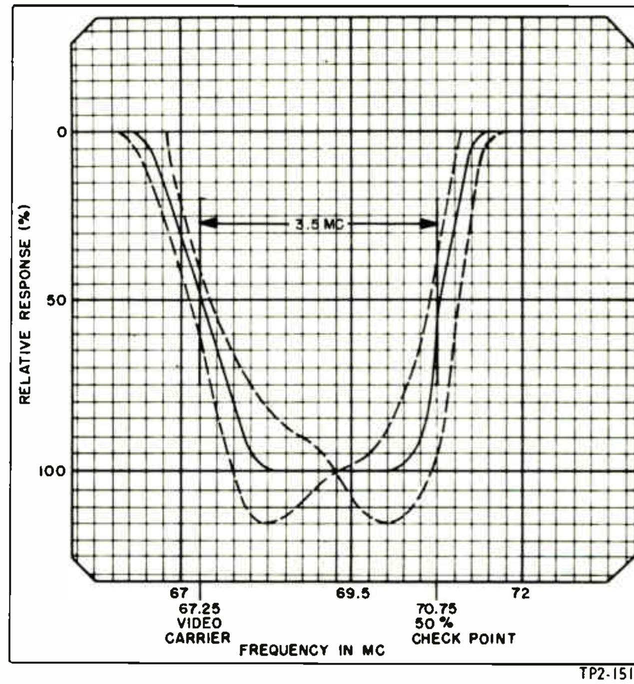


Figure 8. Overall R-F, I-F Response Curve

6. If the response curve does not fall within the limits as shown in figure 9, the adjustment of the trimmers may be touched up slightly, while observing the response curve with the sweep generator. Do not retouch the setting of C518, C201, C203, or C206. To adjust the curve, first adjust C215 and C218, alternately until maximum improvement has been obtained. C215 affects the tilt of the curve and C218 affects the dip of the curve. After C215 and C218 have been adjusted, adjust C514 for proper slope at the 42.25 mc. side of the curve, then adjust C204 and C210 for proper level at the video carrier (45.75 mc.).

CAUTION: Do not turn any of the trimmers excessively. To retouch, only turn the trimmers slightly.

S-I-F ALIGNMENT

The sound i-f system may be aligned by means of the station signal or an accurately calibrated signal generator as the signal source. If the station signal is used, tune the FINE TUNING control for the best picture regardless of sound. It will be necessary to reduce the signal input to the receiver so that the d-c output at the sound detector, as measured between pins 2 and 3 of J400, is kept below 10 volts maximum and preferably below 5 volts. In strong signal areas this may require shorting of the antenna terminals and the application of bias to the a-g-c circuit. The signal input to the receiver may be adjusted by varying the length of the shorting lead. The bias may be applied to the a-g-c circuit by means of the jig shown in figure 2. The s-i-f output alignment jig shown in figure 3 should be used for convenient connection of the meter to the sound detector output.

When an accurately calibrated signal generator is used, bias should be applied to the a-g-c circuit to aid in the reduction of circuit noises from the i-f system. The receiver should be adjusted to a channel on which no station can be received. The generator should be connected to pin 2 of J200 through the 2200 ohms resistor in the sound i-f input alignment jig. The generator should be adjusted for unmodulated output at 4.5 mc.

After the above conditions have been met, proceed as follows:

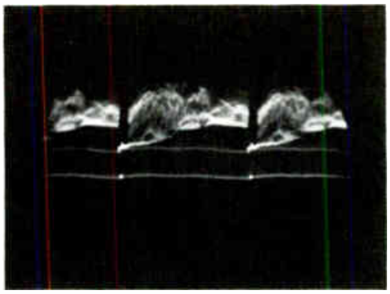
1. Connect the 20,000 ohms-per-volt meter to the leads from pins 2 and 3 of the sound i-f output alignment jig, negative terminal to pin 2 and positive terminal to pin 3.

2. Adjust TC300, TC400, TC401, and TC402 for maximum output as indicated on the meter. If the output exceeds 10 volts, reduce the signal input to the receiver.

3. Connect the meter to the junction of the two 15,000-ohm resistors in the sound i-f output alignment jig and to pin 3. Adjust TC403 for zero crossover. Zero crossover is indicated by a zero indication on the meter, and when TC403 is turned in one direction from this zero point, the meter will swing positive; turning TC403 in the opposite direction will cause a negative swing. (To aid in reading a positive and negative swing of the meter, set the pointer by means of the zero adjust screw to a convenient calibration mark on the scale before connecting to the circuit.)

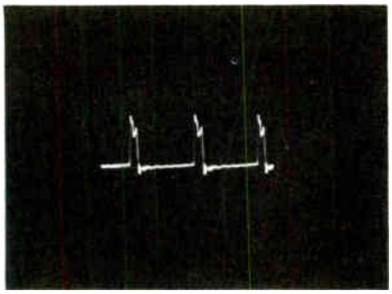
OSCILLOSCOPE WAVEFORM PATTERNS

The waveforms were taken with the receiver adjusted for 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 waveforms—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 are more rounded than those shown, and the peak voltages differ from those shown.



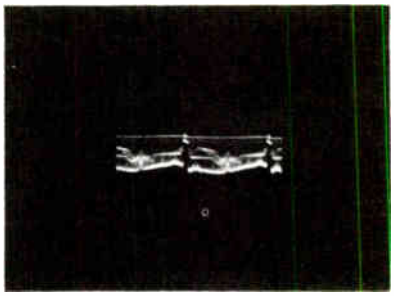
TP1-1200-A

Figure 9. Video-Detector Output, Pin 2 of J200 2 volts 60 C.P.S.



TP2-654

Figure 10. Gate-Pulse Plug, Pin 4 500 Volts 15,750 C.P.S.

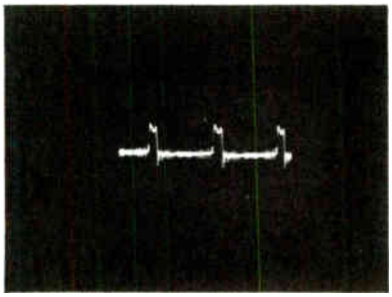


TP2-653

Figure 11. A-G-C Gate Grid, Pin 1 22 Volts 60 C.P.S.

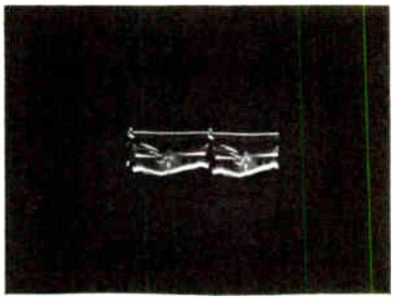
TP2-656

Figure 12. Gate-Pulse Plug, Pin 3 10 Volts 15,750 C.P.S.



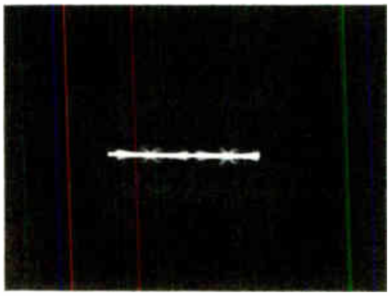
TP2-655

Figure 13. Gated-Leveler Grid, Pin 2 2.5 Volts 15,750 C.P.S.



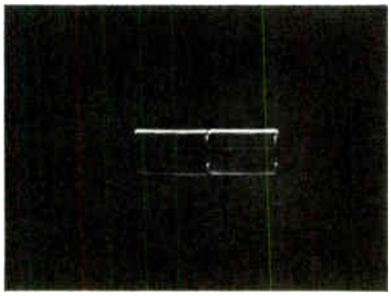
TP2-657

Figure 14. Noise-Inverter Plate, Junction R605, C602 and C603 23 Volts 15,750 C.P.S.



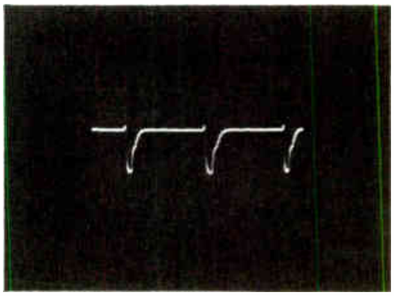
TP2-658

Figure 15. Noise-Inverter Cathode, Pin 8 Waveshape and amplitude vary with noise



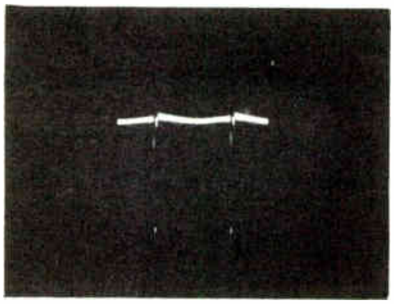
TP2-659

Figure 16. Sync-Separator Plate, Pin 1 17 Volts 60 C.P.S.



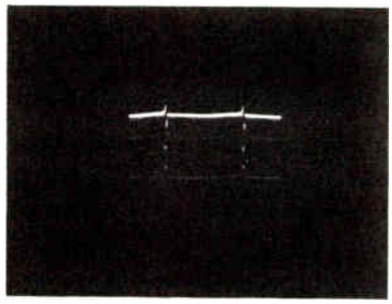
TP2-660

Figure 17. Sync-Separator Plate, Pin 1 17 Volts 15,750 C.P.S.



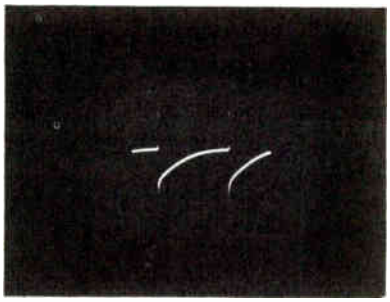
TP2-639

Figure 18. Phase-Splitter Grid, Pin 7
14 Volts 60 C.P.S.



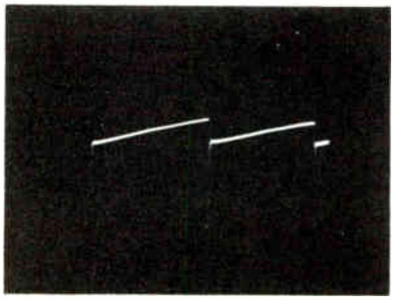
TP2-640

Figure 19. Phase-Splitter Plate, Pin 6
30 Volts 60 C.P.S.



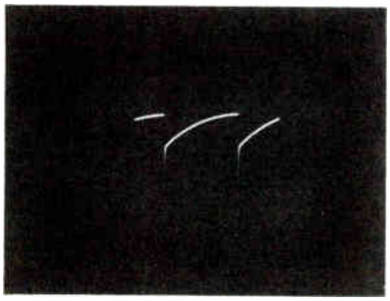
TP2-643

Figure 20. Vertical-Oscillatar Grid, Pin 2
165 Volts 60 C.P.S.



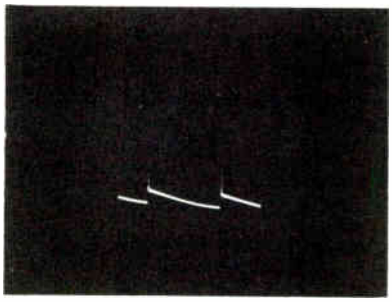
TP2-697

Figure 21. Vertical-Oscillator Plate, Pin 1
130 Volts 60 C.P.S.



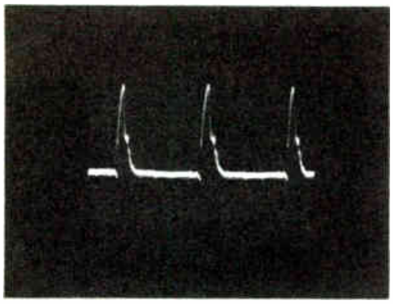
TP2-644

Figure 22. Vertical-Output Grid, Pins 2 and 7
120 Volts 60 C.P.S.



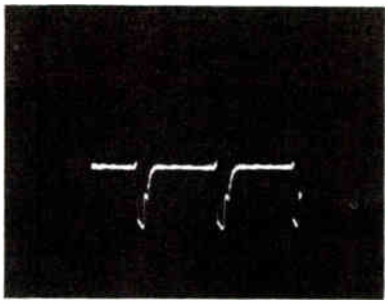
TP2-645

Figure 23. Vertical-Output Plate, Pins 6 and 1
450 Volts 60 C.P.S.



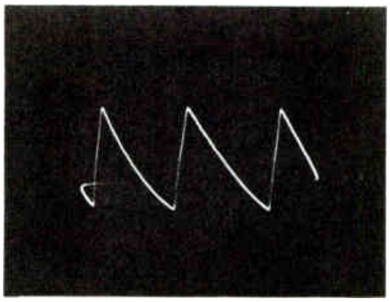
TP2-641

Figure 24. Phase-Splitter Plate, Junction of R614, R615 and C800
10 Volts 15,750 C.P.S.



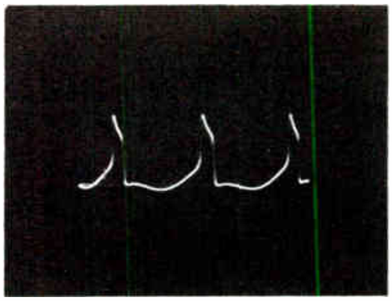
TP2-642

Figure 25. Phase-Splitter Cathode, Pin 8
10 Volts 15,750 C.P.S.



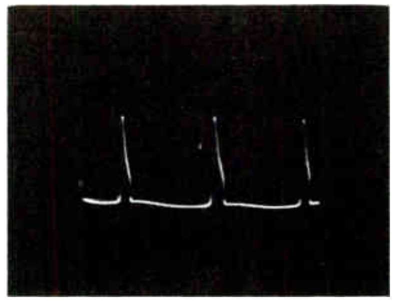
TP2-652

Figure 26. Phase-Comparer, Pins 5 and 6
6 Volts 15,750 C.P.S.



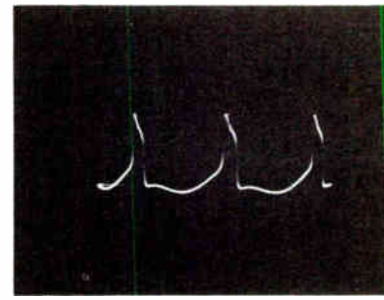
TP2-646

Figure 27. Horizontal Oscillator, Junction of L800, R806, and C806 35 Volts 15,750 C.P.S.



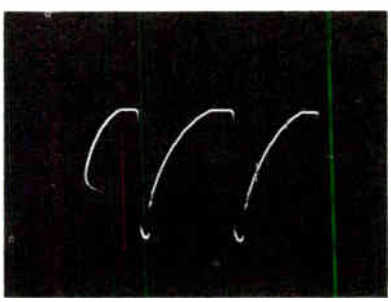
TP2-647

Figure 28. Horizontal-Oscillator Cathode, Pins 8 and 3 16 Volts 15,750 C.P.S.



TP2-648

Figure 29. Horizontal-Oscillator Grid, Pin 2 38 Volts 15,750 C.P.S.

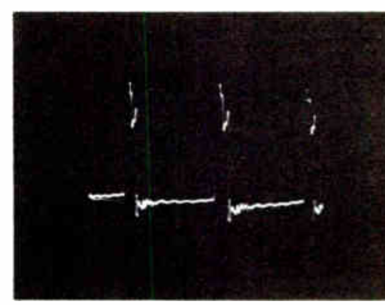


TP2-649

Figure 30. Horizontal-Output Grid, Pin 5 130 Volts 15,750 C.P.S.

TP2-650

Figure 31. Horizontal-Deflection Yoke, *Pin 7 of J800 3000 Volts 15,750 C.P.S. * See Caution



TP2-651

Figure 32. Gate-Pulse Socket, Pin 4 of J801 500 Volts 15,750 C.P.S.

*CAUTION: High-voltage pulses are present in the horizontal-output circuit. The waveform in figure 33 was taken with the alligator clip of the oscilloscope lead clipped over the insulation of the lead connected to pin 7 of J800. (To prevent puncture of the insulation of the lead, file off the teeth of the alligator clip and wrap friction tape around the clip.) Connection to other points in the horizontal output circuit is dangerous because of the high voltages present. The peak-to-peak voltage shown for figure 33 is the actual voltage present; however, the amplitude of the scope presentation depends upon the degree of coupling.

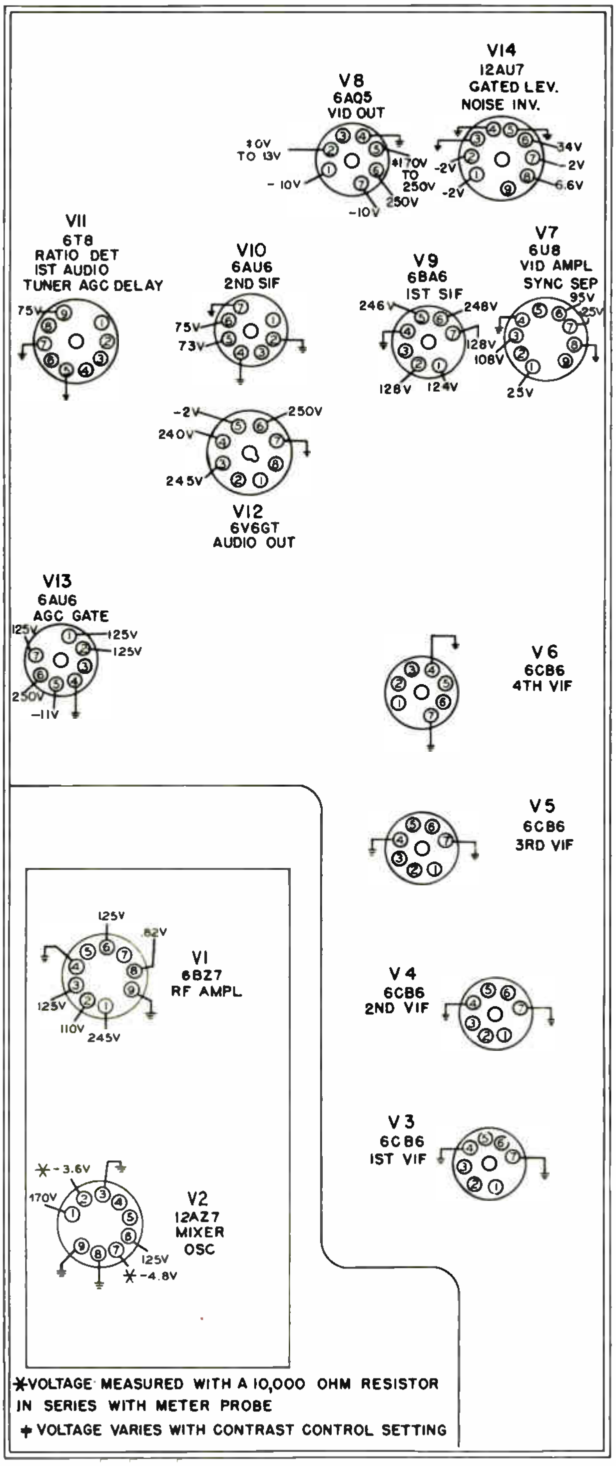
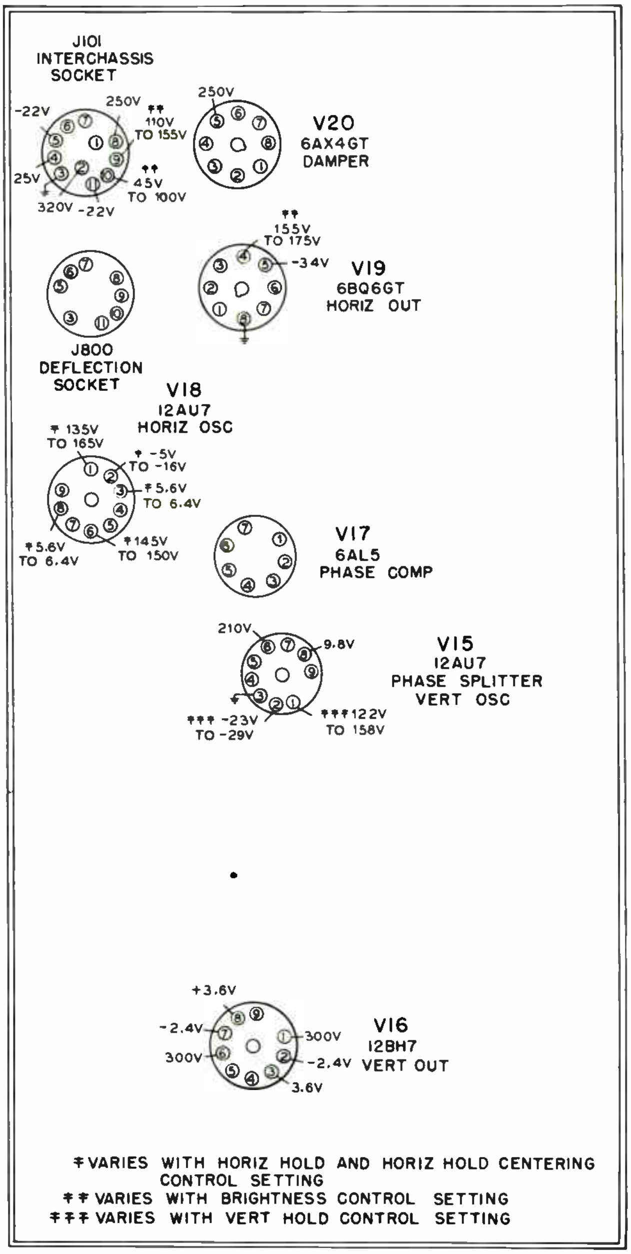


Figure 33. R-F Chassis 91, Bottom View, Showing Voltages at Socket Pins



TP2-1513

Figure 34. Deflection Chassis J-1, Bottom View, Showing Voltages at Socket Pins

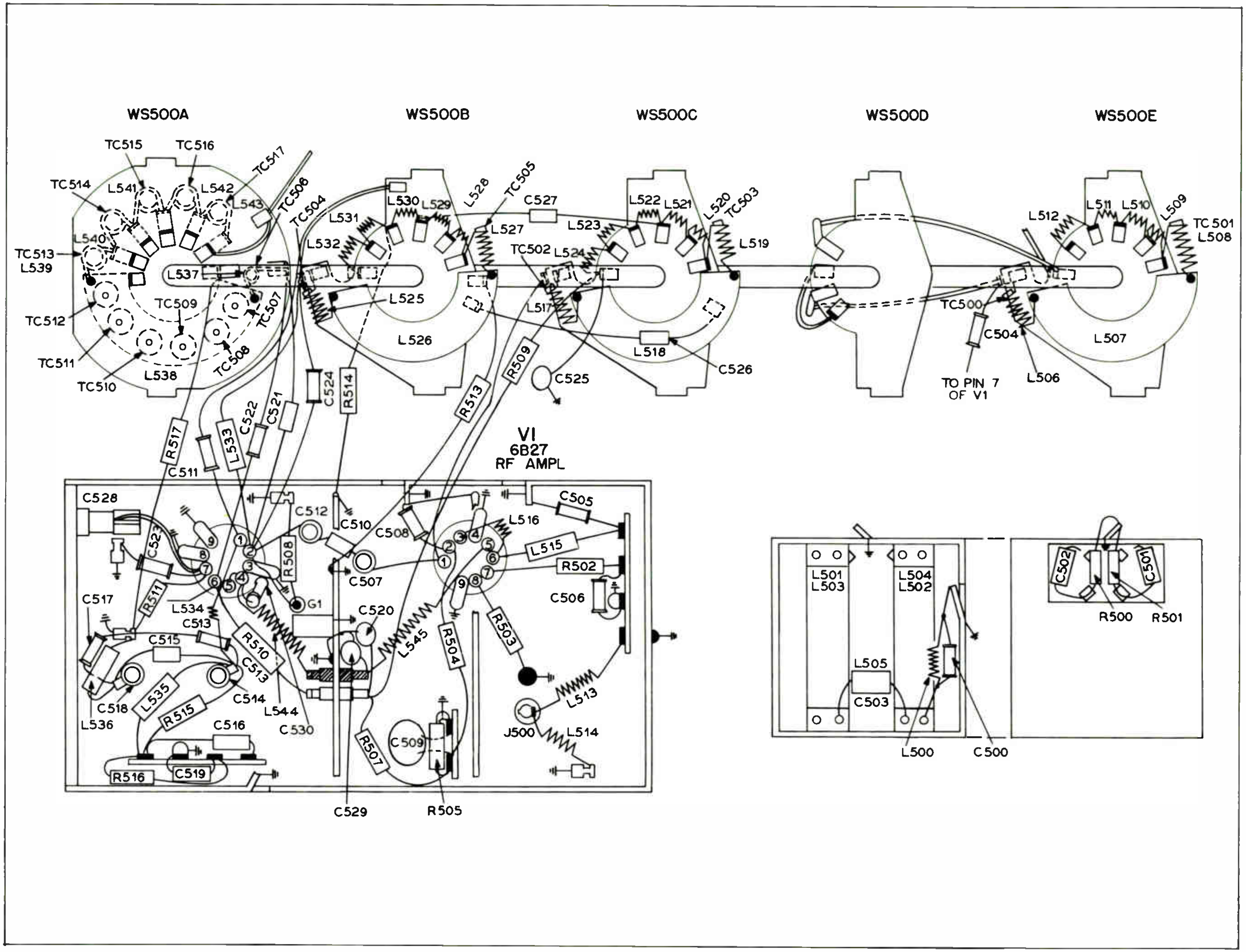


Figure 35. Television Tuner, Part No. 76-7600, Base Layout

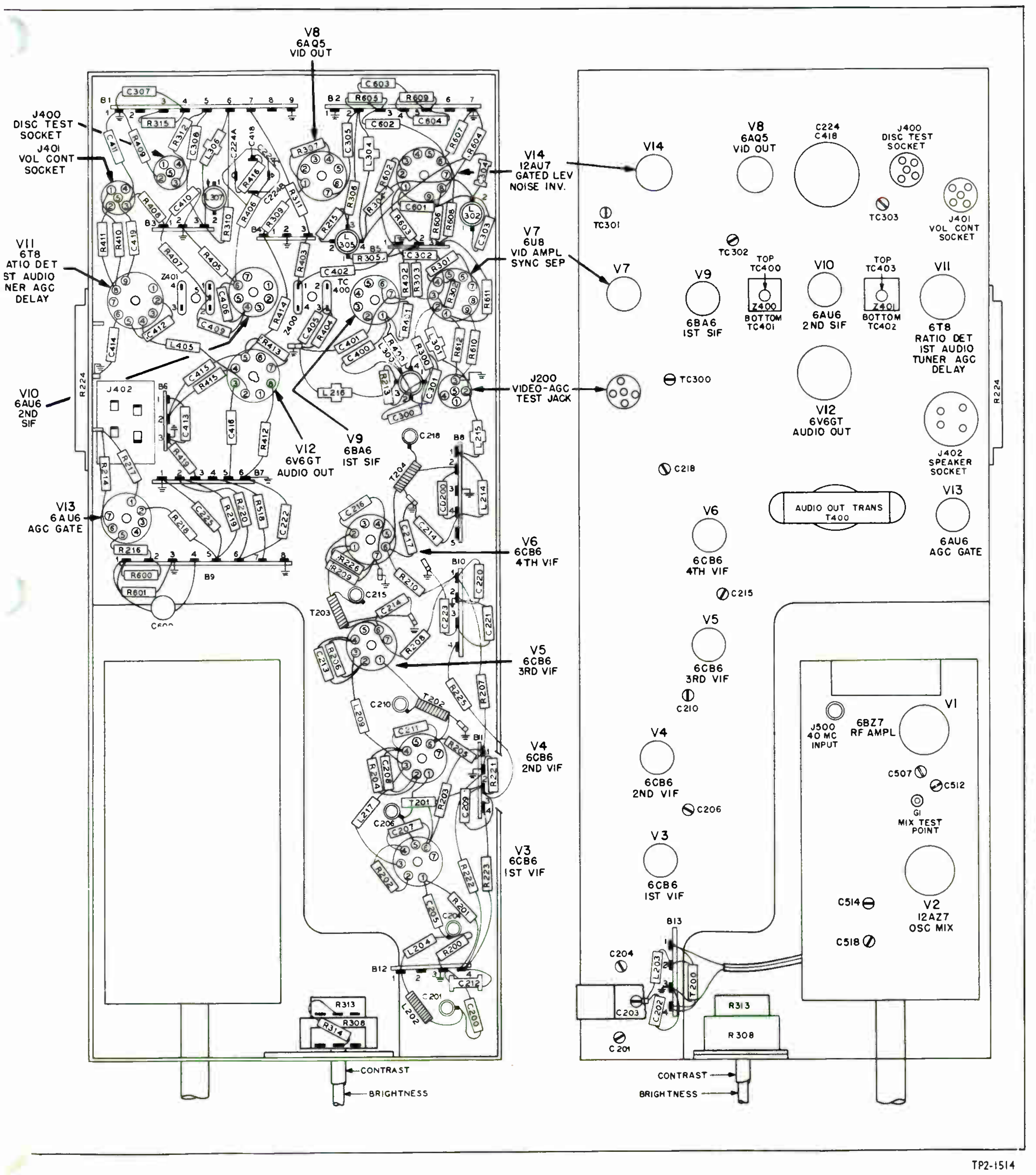


Figure 36. R-F Chassis 91, Base Layout

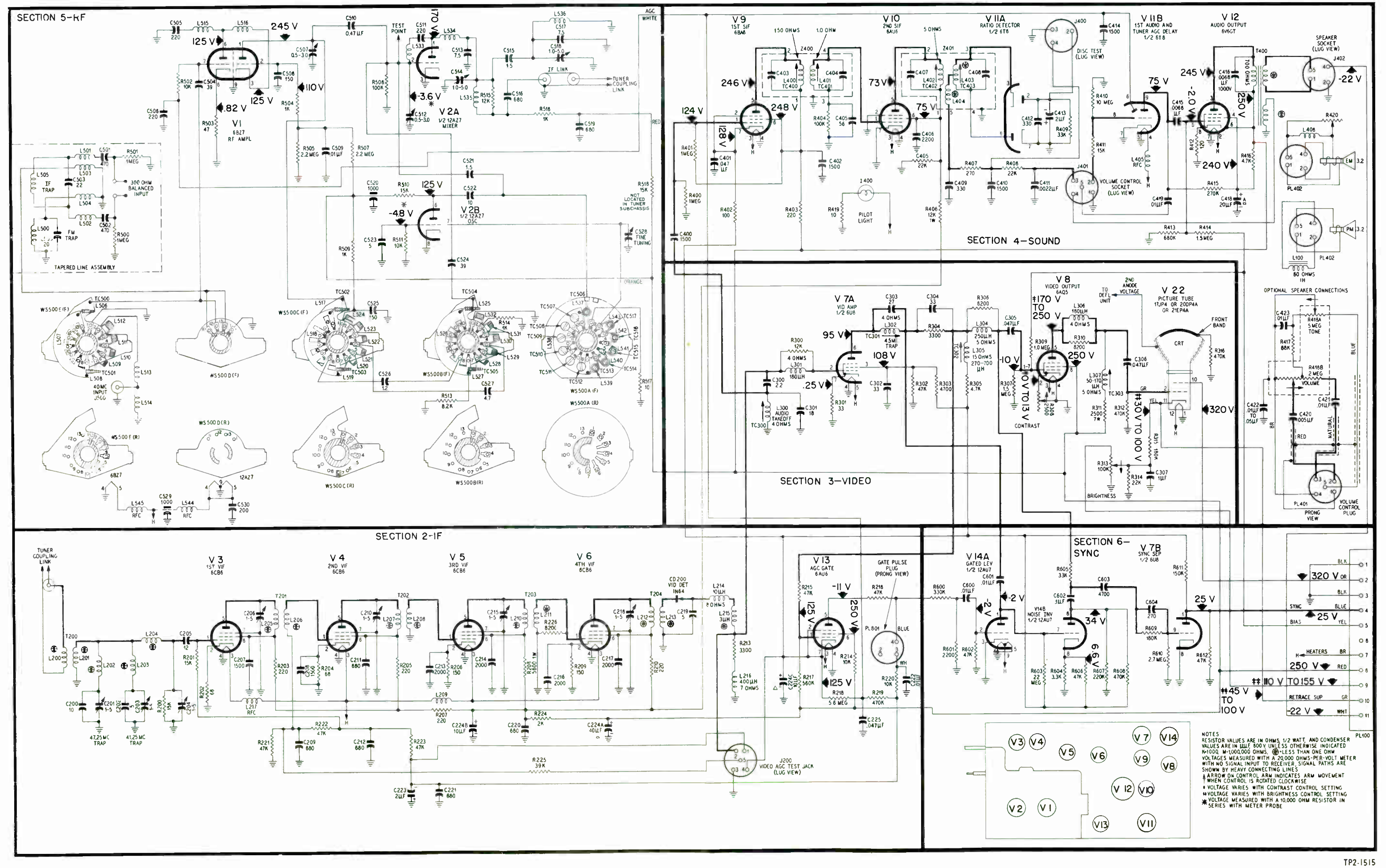


Figure 37. R-F Chassis 91, Schematic Diagram

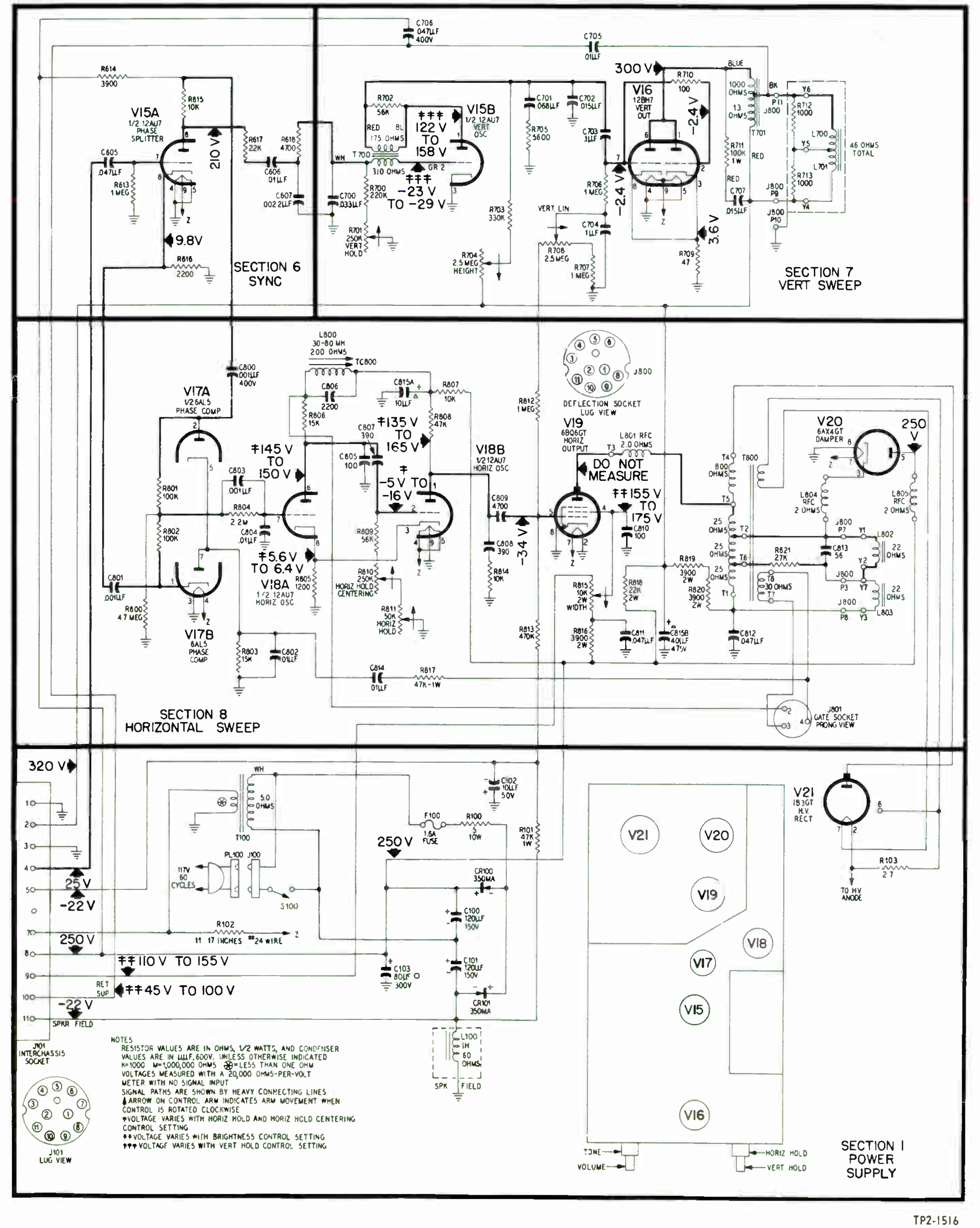


Figure 38. Deflection Chassis J-1, Schematic Diagram

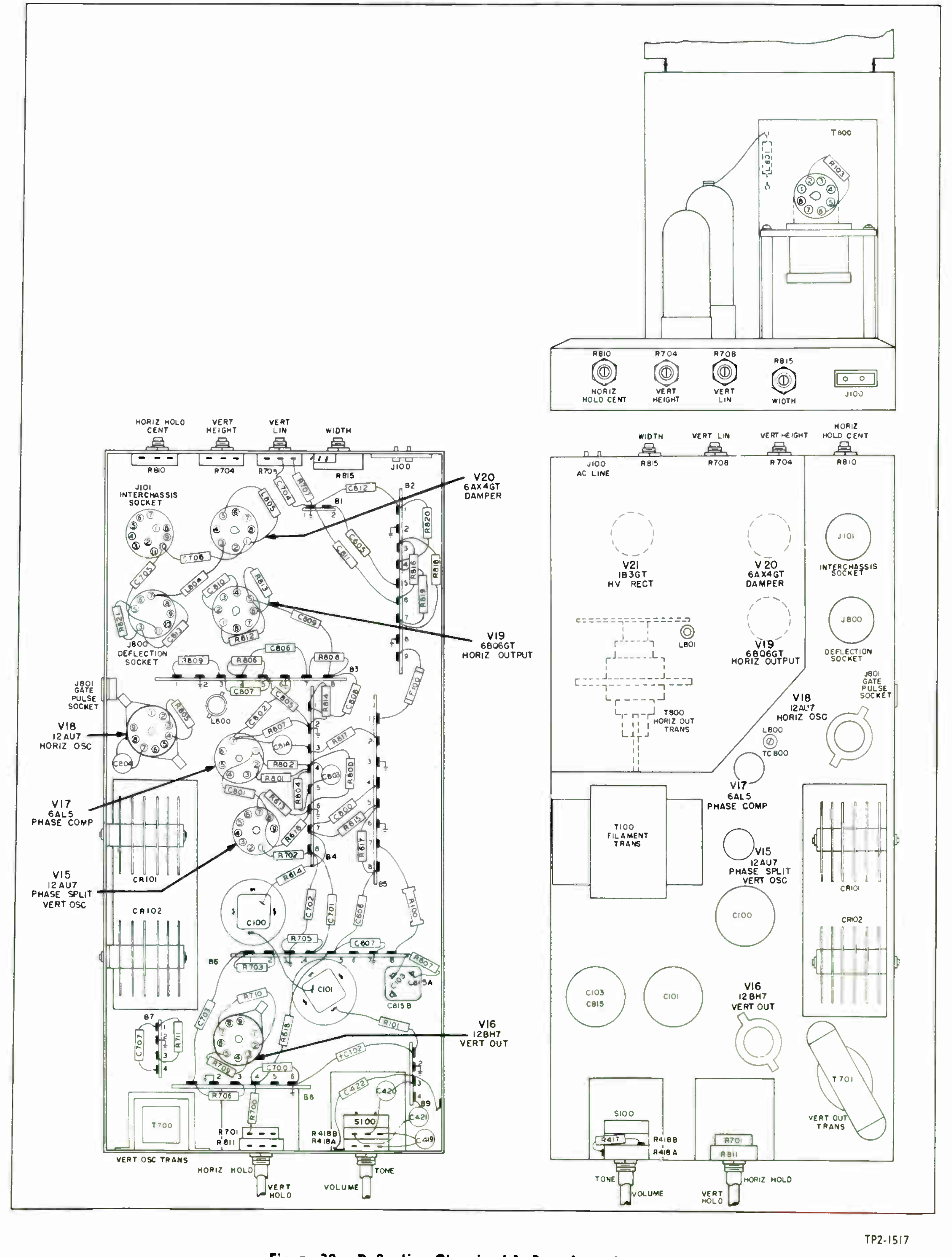


Figure 39. Deflection Chassis, J-1, Base Layout

REPLACEMENT PARTS LIST

IMPORTANT

General replacement items commonly stocked by the serviceman are omitted from this parts list. All condensers 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 should be ordered in this way rather than by model number; in addition, a miscellaneous listing will be found at the end of each chassis type. All parts are symbolized in the schematic diagram and base layout, for identification purposes. NOTE: Part numbers identified by an asterisk (*) are general replacement items. These numbers may not be identical with those on factory parts. Also, the electrical values of some replacement items may differ from the values indicated in the schematic diagram and parts list. The values substituted in any case are so chosen that the operation will either be unchanged or improved. When ordering replacements, use only the "Service Part No."

DEFLECTION CHASSIS J-1

SECTION 1—POWER SUPPLY

Reference Symbol	Description	Service Part No.
C100 and C101	Condenser, filter, electrolytic, 120 μf., 150v	30-2570-66*
C102	Condenser, filter, electroyltic, 10 μf., 25v	30-2417-3
C103	Condenser, filter, electrolytic, 80 μf., 300v	30-2584-20
CR100 and CR101	Rectifier, selenium, 350ma	34-8003-7
F100	Fuse, line, 1.6 amperes	45-2656-23
J100	Socket, a-c line	27-6240-3
J101	Socket, chassis connecting	27-6274-1
L100	Choke, 1 henry	Speaker field
PL100	Plug, a-c line	Part of a-c line cord ass'y. (See Misc. A)
PL101	Plug and cable ass'y., chassis connecting	(See Misc. B)
R100	Resistor, current limiting, 5 ohms, 10 watts	33-3448-5
R101	Resistor, filter, 47,000 ohms, 1 watt	66-3474340
R102	Resistor, voltage dropping, (J-1 chassis)	17 inches No. 24 wire
R103	Resistor, voltage dropping, 2.7 ohms, 1 watt	66-9274360
S100	Switch, off-on	Part of VOLUME control
T100	Transformer, filament, (J-1 chassis)	32-8574

SECTION 7—VERTICAL SWEEP

Reference Symbol	Description	Service Part No.
L700 and L701	Coils, vertical deflection	Part of deflection yoke (See Misc. A)
R701	Potentiometer, VERT HOLD control, 250,000 ohms	Part of R811
R704	Potentiometer, HEIGHT control, 2.5 megohms	33-5565-31
R708	Potentiometer, VERT LIN control, 2.5 megohms	33-5565-31
T700	Transformer, vertical oscillator	32-8431-2*
T701	Transformer, vertical output	32-8577-1*

SECTION 8—HORIZONTAL SWEEP

Reference Symbol	Description	Service Part No.
C803	Condenser, by-pass, .005 μf.	30-1238-1
C804	Condenser, grid blocking, .01 μf.	30-1238-2
C805	Condenser, by-pass, 100 $\mu\mu$f. ±5%	60-10105417*
C807	Condenser, d-c blocking, 390 $\mu\mu$f.	60-10395417
C808	Condenser, charging, 390 $\mu\mu$f.	60-10395417
C810	Condenser, screen by-pass, 100 $\mu\mu$f.	60-10105417*
C813	Condenser, anti-ringing, 56 $\mu\mu$f.	30-1243-5
C815	Condenser, electrolytic	Part of C103
C815A	Condenser, by-pass, 10 μf., 300v	Part of C103
C815B	Condenser, by-pass, 40 μf., 300v	Part of C103
J800	Socket, deflection	27-6274-7
J801	Socket, gate pulse	27-6273
L800	Coil, stabilizing, 30-80 mh.	32-4557
L801	Coil, r-f choke, horizontal output plate	Part of T800
L802 and L803	Coils, horizontal deflection	Part of deflection yoke (See Misc. A)
L804	Coil, r-f choke, damper cathode	32-4112-24
L805	Coil, r-f choke, damper plate	32-4112-24
PL800	Plug deflection	Part of cable ass'y. (See Misc. A)
PL801	Plug, gate pulse	Part of cable ass'y. (See Misc. B)
R810	Potentiometer, HORIZ. HOLD CENTERING	33-5565-17
R811	Potentiometer, HORIZ. HOLD control, 200,000 ohms	33-5563-50
R815	Potentiometer, WIDTH control, 10,000 ohms, 2 watts	33-5546-41
R816	Resistor, screen voltage dropping, 3900 ohms, 2 watts	66-2395340
R817	Resistor, feedback, 47,000 ohms, 1 watt	66-3474340
R818	Resistor, voltage divider, 22,000 ohms, 2 watts	66-3225340
R819	Resistor, voltage divider, 3900 ohms, 2 watts	66-2395340
T800	Transformer, horizontal output	32-8565

MISCELLANEOUS A

Description	Service Part No.
Arm and magnet ass'y., picture tube	76-6594
Beam bender	76-6077-2
Cable assembly, high voltage	41-4664-6*
Cable and plug assembly, deflection	41-4086-25
Cable and plug assembly, VOLUME control (J-1 chassis)	41-4136-4
Cable and plug assembly, VOLUME control (J-4 chassis)	41-4136-2
Cord, line	41-3865
Focus assembly	76-6126-4
Insulator, electrolytic, condenser mounting	27-9508-1
Shield, corona	56-9684
Socket, damper tube	27-6174-7
Socket, high voltage rectifier	27-6290-1
Socket, miniature, 7 pin	27-6203*
Socket, miniature, 9 pin	27-6203-6*
Socket, octal	27-6174
Socket, 12BH7 and 12AU7 tubes	76-6115
Yoke, deflection	32-9648

R-F CHASSIS 91

SECTION 2—VIDEO I.F.

Reference Symbol	Description	Service Part No.
C200	Condenser, 47.25-mc. trap, 10 $\mu\mu$f.	60-00105417
C201	Condenser, trimmer, 47.25-mc. trap, 1 to 5 $\mu\mu$f.	31-6520-9
C202	Condenser, 41.25-mc. trap, 5 $\mu\mu$f.	30-1224-5
C203	Condenser, trimmer, 41.25-mc. trap, 1 to 5 $\mu\mu$f.	31-6520-9
C204	Condenser, trimmer, 1 to 5 $\mu\mu$f.	31-6520-9
C205	Condenser, d-c blocking, 12 $\mu\mu$f.	
C206	Condenser, trimmer, 1 to 5 $\mu\mu$f.	31-6520-9
C209	Condenser, a-g-c by-pass, 680 $\mu\mu$f.	62-168001001*
C210	Condenser, trimmer, 1 to 5 $\mu\mu$f.	31-6520-9
C211	Condenser, screen by-pass, 680 $\mu\mu$f.	62-168001001*
C212	Condenser, by-pass, 680 $\mu\mu$f.	62-168001001*
C215	Condenser, trimmer, 1 to 5 $\mu\mu$f.	31-6520-9
C217	Condenser, screen by-pass, 200 $\mu\mu$f.	62-120001001
C218	Condenser, trimmer, 1 to 5 $\mu\mu$f.	31-6520-9
C219	Condenser, detector by-pass, 5 $\mu\mu$f.	30-1224-28
C220	Condenser, by-pass, 680 $\mu\mu$f.	62-168001001
C221	Condenser, by-pass, 680 $\mu\mu$f.	62-168001001
C223	Condenser, a-g-c filter, 2 μf.	30-2417-7
C224	Condenser, electrolytic	30-2570-57
C224A	Condenser, filter, 40 μf.	Part of C222
C224B	Condenser, filter, 10 μf.	Part of C222
C224C	Condenser, filter, 10 μf.	Part of C222
J200	Socket, alignment test	27-6273*
L200 and L201	Coils, tuner coupling	Part of T200
L202	Coil, 47.25-mc. trap	32-4548-15
L203	Coil, 41.25-mc. trap	32-4112-31
L204	Coil, 1st i-f grid	32-4112-31
L205 and L206	Coils, coupling	Part of T201
L207 and L208	Coils, coupling	Part of T202
L209	Coil, filament choke	32-4112-15
L210 and L211	Coils, coupling	Part of T203
L212 and L213	Coils, coupling	Part of T204
L214	Coil, series peaking, 10 μh.	32-4422-27
L215	Coil, series peaking, 3 μh.	32-4143-22
L216	Coil, shunt peaking, 400 μh.	32-4480-5
L217	Coil, filament choke	32-4112-15
R224	Resistor, voltage dropping, 2000 ohms, 7 watts	33-3446-7
T200	Transformer, video i-f input	32-4548-23
T201	Transformer, 1st video i-f	32-4548-24
T202	Transformer, 2nd video i-f	32-4548-25
T203	Transformer, 3rd video i-f	32-4548-26
T204	Transformer, 4th video i-f	32-4548-18

SECTION 3—VIDEO

Reference Symbol	Description	Service Part No.
C300	Condenser, audio take off, 2.2 $\mu\mu$f.	30-1221-6
C301	Condenser, by-pass, 18 $\mu\mu$f.	62-018400021
C302	Condenser, screen by-pass, 33 $\mu\mu$f.	62-033009001
C303	Condenser, by-pass, 27 $\mu\mu$f.	62-027409001
C304	Condenser, by-pass, 33 $\mu\mu$f.	62-033009001
L300	Coil, audio take off	32-4463-9
L301	Coil, peaking, video amplifier grid, 180 μh.	32-4480-9
L302	Coil, 4.5-mc. trap	32-4463-7
L304	Coil, series peaking, 250 μh.	32-4480-4
L305	Coil, shunt peaking, 170 μh. to 700 μh.	32-4467-11
L306	Coil, series peaking, 180 μh.	32-4480-9
L307	Coil, shunt peaking, 50 μh. to 170 μh.	32-4467-7
R308	Potentiometer, CONTRAST control, 2000 ohms	33-5563-51
R311	Resistor, plate load, 2500 ohms, 7 watts	33-1335-93
R313	Potentiometer, BRIGHTNESS control, 100,000 ohms	Part of R308
R316	Resistor, grounding, 470,000 ohms, 1 watt	66-4474340

SECTION 4—AUDIO

Reference Symbol	Description	Service Part No.
C405	Condenser, by-pass, 56 $\mu\mu$f.	30-1224-25
C409	Condenser, detector, balancing, 330 $\mu\mu$f.	62-133001001
C412	Condenser, r-f by-pass, 330 $\mu\mu$f.	62-133001001
C413	Condenser, filter, 2 μf.	30-2417-7
C416	Condenser, plate by-pass, 6800 $\mu\mu$f., 1000v	45-3505-91
C418	Condenser, filter, 20 μf.	Part of C222
J400	Socket, discriminator test	27-6273*
J401	Socket, VOLUME control	27-6273*
J402	Socket, speaker	27-4785-22
L405	Coil, filament choke	32-4112-15
R406	Resistor, voltage divider, 12,000 ohms, 1 watt	66-3124340
R412	Resistor, cathode bias 120 ohms, 1 watt	66-1124340
R418	Potentiometer dual	33-5563-44
R418A	Potentiometer, VOLUME control, 2 megohms	Part of R418
R418B	Potentiometer, TONE control, 5 megohms	Part of R418
T400	Transformer, audio output (91 chassis)	32-8582
Z400	Transformer, 1st sound i-f	32-4449A*
Z401	Transformer, f-m detector	32-4450-5

SECTION 6—SYNC.

Reference Symbol	Description	Service Part No.
C604	Condenser, by-pass, 270 $\mu\mu$f.	30-1225-9

MISCELLANEOUS B

Description	Service Part No.
Cable and plug assembly, chassis connecting (91 chassis)	41-4146-4
Cable and plug assembly, gate pulse	41-4141
Cable and socket assembly, CRT	41-3964-19
Cable and socket assembly, pilot light	27-6233-5*
Shield, tube 6CB6	56-5629FA3
Shield, tube 6T8	56-5629-5
Socket and base assembly, 6CB6 tube	27-6203-14
Socket and base assembly, 6T8 tube	27-6203-18
Socket, miniature, 6AU6, 6AQ5, and 6BA6 tubes	27-6203
Socket, miniature, 9 pin	27-6203-6*
Socket, octal	27-6174

TV TUNER, PART No. 76-7600

SECTION 5

Reference Symbol	Description	Service Part No.
C500	Condenser, FM trap, 20 $\mu\mu$f. ±5%	62-020309011
C501 and C502	Condensers, antenna isolating, 470 $\mu\mu$f.	30-1225-18
C503	Condenser, i-f trap, 22 $\mu\mu$f.	Part of L505
C504	Condenser, r-f coupling, 39 $\mu\mu$f. ±10%	62-039409011
C505	Condenser, neutralizing, 220 $\mu\mu$f.	62-122001001
C506	Condenser, a-g-c decoupling, 220 $\mu\mu$f.	62-122001001
C507	Condenser, r-f trimmer, .5 to 3 $\mu\mu$f.	31-6520-3
C508	Condenser, r-f by-pass, 150 $\mu\mu$f.	62-115001011
C509	Condenser, grid by-pass, .01 $\mu\mu$f.	30-1238-2
C510	Condenser, coupling, .47 $\mu\mu$f.	30-1221-15
C511	Condenser, neutralizing, 220 $\mu\mu$f.	62-122001001
C512	Condenser, trimmer, mixer-grid, .5 $\mu\mu$f. to 3 $\mu\mu$f.	31-6520-7
C513	Condenser, by-pass, 7.5 $\mu\mu$f.	30-1224-8
C514	Condenser, trimmer, 1 $\mu\mu$f. to 5 $\mu\mu$f.	31-6520-11
C515	Condenser, i-f trap coupling, 1.5 $\mu\mu$f.	30-1221-8
C516	Condenser, i-f link coupling, 680 $\mu\mu$f.	62-168001001
C517	Condenser, i-f trap, 7.5 $\mu\mu$f.	30-1224-8
C518	Condenser, i-f trap trimmer, 1 $\mu\mu$f. to 5 $\mu\mu$f.	31-6520-11
C519	Condenser, by-pass, 680 $\mu\mu$f.	62-168001001
C520	Condenser, by-pass, 1000 $\mu\mu$f.	30-1245-1
C521	Condenser, oscillator injection, 1.5 $\mu\mu$f.	30-1221-8
C522	Condenser, oscillator plate, 12 $\mu\mu$f.	62-012300001
C523	Condenser, grid blocking, 5 $\mu\mu$f.	30-1224-5
C524	Condenser, mixer grid blocking 39 $\mu\mu$f.	62-039409011
C525	Condenser, by-pass, 150 $\mu\mu$f.	62-115001011
C528	Condenser, fine tuning	76-6935-1
C529	Condenser, filament by-pass, 1000 $\mu\mu$f.	30-1221-8
J500	Connector, 40-mc. input	57-0590-2
L500	Coil, FM trap	32-4550-3
L501, L502 L503 and L504	Coils, tapered line assembly	32-4432-1
L505	Coil, i-f trap, (44.75 mc.)	32-4552-1
L506 to L512 inclusive	Coils, r-f grid tuning	Part of WS500E
L513	Coil, 40 mc. channel	32-4550-5
L514	Coil, 40 mc. channel	32-4550-6
L515	Coil, r-f amplifier neutralizing	32-4551-1
L516	Coil, r-f coupling	32-4550-9
L517 to L524 inclusive	Coil, r-f plate tuning	Part of WS500C
L525 to L532 inclusive	Coil, mixer grid	Part of WS500B
L533	Coil, mixer neutralizing	32-4551-1
L534	Coil, mixer plate	32-4550-4
L535	Coil, i-f primary	312-5151-6
L536	Coil, i-f trap	312-5151-5
L537 to L543 inclusive	Coil, oscillator tuning	Part of WS500A
L544 and L545	Coil, r-f choke	32-4550-1
R518	Resistor, B+ dropping, 15,000 ohms, 1 watt	66-3154340
WS500A (F) and WS500A (R)	Switch wafer, oscillator	76-7604
WS500B (F) and WS500B (R)	Switch wafer, mixer grid	76-7606
WS500C (F) and WS500C (R)	Switch wafer, r-f plate	76-7608
WS500D (F) and WS500D (R)	Switch wafer, r-f grid	76-7612
WS500E (F) and WS500E (R)	Switch wafer, r-f grid	76-7610

MISCELLANEOUS C

Description	Service Part No.
Coupling, fine tuning shaft	54-4912
Detent, ball	56-8020
Front panel ass'y.	76-6928-2
Hairpin, plunger grounding	1W42704FA3
Hairpin, plunger	56-9858
Plunger	56-8034-1
Retaining ring	1W61043
Shaft	76-6914
Shaft, extension	56-8358
Cam and shaft, fine tuning	76-6936
Shaft, spring	56-8023
Shield, tube, 9 pin miniature	56-5629-5
Socket, tube, 9 pin miniature	27-6203-21
Spring, plunger	56-9628
Tapered line ass'y.	76-7602
Terminal panel, aerial	76-5504-2
Washer	56-9351
Washer, fiber	27-4109-13
"E" washer	1W60980FE5

PHILCO
Factory-Supervised
Service

PHILCO CORPORATION
PHILADELPHIA, PA.

PR-2200

Printed in U. S. A.

PHILCO SERVICE

PHILCO Factory-Supervised Service

TELEVISION

FILE 3A

ALIGNMENT CHART SUPPLEMENT FOR R-191 CHASSIS

PR-2520-C

PHILCO

ALIGNMENT CHART SUPPLEMENT

TO

TELEVISION SERVICE MANUAL

FOR

R-F CHASSIS R-191 AND

DEFLECTION CHASSIS D-191

TABLE OF CONTENTS

TABLE 1—TUNER OSCILLATOR ALIGNMENT

AM GENERATOR: Connect to receiver antenna-input terminals. (No matching network is required.) Use unmodulated r-f output.

OSCILLOSCOPE: Connect the vertical-input lead, in series with a 1000-ohm resistor, to the mixer plate test point, G2. Connect the scope ground lead to the chassis, near G2.

RECEIVER CIRCUIT ALTERATIONS: Disconnect tuner a-g-c (white) lead from main chassis, and connect a 1.5-volt bias battery, with negative terminal to white lead from tuner, and positive terminal to chassis.

STEP	AM GENERATOR DIAL SETTING	RECEIVER TUNING	ADJUST	REMARKS
1	238.15 mc.	Channel 13	TC506 for zero beat on scope.	a. If regeneration occurs, increase bias; bias may be increased up to 4 or 5 volts, if necessary. b. Preset and mark position of Fine Tuning Cam as shown in figure 4. (Position cam-stop between Channels 7 and 8, and mark for use in step 8 of video i-f alignment.)
2	226.15 mc.	Channel 11	TC507 for zero beat on scope.	
3	214.15 mc.	Channel 9	TC508 for zero beat on scope.	
4	238.15 mc.	Channel 13	TC506	Repeat steps 1, 2, and 3 until Channels 13, 11, and 9 are within 500 kc. of their correct respective frequencies.
	226.15 mc.	Channel 11	TC507	
	214.15 mc.	Channel 9	TC508	
5	202.15 mc.	Channel 7	TC509 for zero beat on scope.	
6	110.15 mc.	Channel 6	TC510 for zero beat on scope.	
7	94.15 mc.	Channel 4	TC511 for zero beat on scope.	

NOTE: The symbols and figures referred to in the charts are those given in Service Manual PR-2507.

TABLE 1—TUNER OSCILLATOR ALIGNMENT

AM GENERATOR: Connect to receiver antenna-input terminals. (No matching network is required.) Use unmodulated r-f output.

OSCILLOSCOPE: Connect the vertical-input lead, in series with a 1000-ohm resistor, to the mixer plate test point, G2. Connect the scope ground lead to the chassis, near G2.

RECEIVER CIRCUIT ALTERATIONS: Disconnect tuner a-g-c (white) lead from main chassis, and connect a 1.5-volt bias battery, with negative terminal to white lead from tuner, and positive terminal to chassis.

STEP	AM GENERATOR DIAL SETTING	RECEIVER TUNING	ADJUST	REMARKS
1	257 mc.	Channel 13	TC506 for zero beat on scope.	a. If regeneration occurs, increase bias; bias may be increased up to 4 or 5 volts, if necessary. b. Preset and mark position of Fine Tuning Cam as shown in figure 4. (Position cam-stop between Channel 7 and 8, and mark for use in step 8 of video i-f alignment.)
2	245 mc.	Channel 11	TC507 for zero beat on scope.	
3	233 mc.	Channel 9	TC508 for zero beat on scope.	
4	257 mc.	Channel 13	TC506	Repeat steps 1, 2, and 3 until channels 13, 11, and 9 are within 500 kc. of their correct respective frequencies.
	245 mc.	Channel 11	TC507	
	233 mc.	Channel 9	TC508	
5	221 mc.	Channel 7	TC509 for zero beat on scope.	
6	129 mc.	Channel 6	TC510 for zero beat on scope.	
7	113 mc.	Channel 4	TC511 for zero beat on scope.	

NOTE*

This page corrects and supersedes page 2 of ALIGNMENT CHART SUPPLEMENT TO TELEVISION SERVICE MANUAL FOR R-F CHASSIS R-191 AND DEFLECTION CHASSIS D-191, PR-2520-C. It is suggested that this corrected page be pasted over the obsolete page in PR-2520-C.

NOTE: The symbols and figures referred to in the charts are those given in Service Manual PR-2507.

TABLE 2—TUNER BANDPASS ALIGNMENT

SWEEP (FM) GENERATOR: Connect to receiver antenna-input circuit through antenna-input matching network. (See figure 1.)

OSCILLOSCOPE: Connect the vertical-input lead, in series with a 1000-ohm resistor, to the mixer plate test point, G2. Connect scope ground lead to the chassis, near G2.

RECEIVER CIRCUIT ALTERATIONS: Disconnect tuner a-g-c (white) lead from main chassis, and connect a 1.5-volt bias battery, with negative terminal to white lead from tuner, and positive terminal to chassis. Disconnect tuner plug, PL500, and connect a 40 to 70-ohm carbon resistor across plug.

STEP	SWEEP (FM) GENERATOR		RECEIVER TUNING	ADJUST	REMARKS
	Sweep Dial Setting	Marker Dial Setting			
1	Channel 13 (213 mc., with 10-mc. sweep width.)	Set first to 210 mc. and note position of marker on response curve. Then set to 216 mc. and note position of marker on response curve.	Channel 13		Use oscilloscope gain as high as possible with respect to hum level and "bounce". Pips fix channel limits on curve. Response curve should be flat between limits (see figure 5). If not, proceed with step 2.
2	Channel 13	213 mc.	Channel 13	TC504 counter-clockwise until single peak appears.	CAUTION: Care must be taken not to unscrew core far enough to make it drop out of the coil.
3	Channel 13	213 mc.	Channel 13	TC502 until peak falls on 213-mc. marker.	It may be necessary to increase sweep-generator output.
4	Channel 7 (177 mc., with 10-mc. sweep width.)	Set first to 174 mc. and note position of marker on response curve. Set to 180 mc. and note position of marker on response curve.	Channel 7		Note curve with respect to tilt and center frequency. Curve should be centered in pass band and symmetrical. If not, proceed with step 5.
5	Channel 7	174 mc. and 180 mc.	Channel 7	C508 and C512 to obtain correct tilt on top of curve.	C508 and C512 compensate for the tuning effect of Channel 13 adjustment upon Channel 7. (See figure 6.)

TABLE 2 (Cont.)

STEP	SWEEP (FM) GENERATOR		RECEIVER TUNING	ADJUST	REMARKS
	Sweep Dial Setting	Marker Dial Setting			
6	Channel 13	213 mc.	Channel 13	Retouch TC502 and TC504 for symmetrical response, centered about 213-mc. marker.	To retouch, only turn cores slightly.
7	Channel 7	117 mc.	Channel 7	Repeat step 5.	Check response curve for correct center frequency and symmetry.
8				Repeat steps 6 and 7.	Repeat Channel 13 and Channel 7 adjustments, alternately, until favorable curves are obtained on both.
9	Channel 6 (85 mc., with 10-mc. sweep width.)	Set first to 82 mc. and note position of marker on response curve. Then set to 88 mc. and note position of marker on response curve.	Channel 6		Curve should be symmetrical and centered in pass band. If not, proceed with step 10.
10	Channel 6	85 mc.	Channel 6	TC505 counter-clockwise until single peak appears.	CAUTION: Care must be taken not to unscrew core far enough to make it drop out of the coil.
11	Channel 6	85 mc.	Channel 6	TC503 until peak falls on 85-mc. marker.	It may be necessary to increase sweep-generator output.
12	Channel 6	85 mc.	Channel 6	TC501 for maximum curve height and symmetry of single peak.	After adjusting TC501, recheck as in step 9. If necessary, reduce sweep-generator output to avoid overloading.
13	Channel 6	85 mc.	Channel 6	Retouch TC503 and TC505 for symmetrical response, centered about 85-mc. marker.	To retouch, only turn cores slightly.

NOTE: The symbols and figures referred to in the charts are those given in Service Manual PR-2507.

TABLE 3—VIDEO I-F ALIGNMENT

AM GENERATOR: Connect to mixer test point, G1, through a mixer jig, and adjust the generator for approximately 30 percent modulation at 400 cycles. Adjust the output of the generator during alignment, to keep the output at the second detector below .6 volt, peak to peak.

SWEEP (FM) GENERATOR: After step 7, connect to antenna-input circuit through antenna-input matching network. (See figure 1.)

OSCILLOSCOPE: Connect the vertical-input lead to the 15,000-ohm resistor of the video i-f alignment jig. Connect scope ground lead to the ground lead of the jig. (See figure 2.) Plug jig into J200.

PRESET: Contrast and Brightness controls fully counterclockwise, and Channel Selector to Channel 4.

BIAS: Apply 6 volts of negative bias, through 10,000-ohm resistor, to pin 1 of video i-f alignment jig; ground positive side of bias supply to pin 3 of jig. (See figure 2.)

NOTE: If the i-f shield has been removed for repairs, it must be replaced before proceeding with the alignment.

STEP	AM GENERATOR DIAL SETTING	SWEEP (FM) GENERATOR		ADJUST	REMARKS
		Sweep Dial Setting	Marker Dial Setting		
1		Not used.	Not used.	Preset C526 counter-clockwise (minimum capacitance).	It is necessary to keep the generator output sufficiently high that a null indication may be observed on the oscilloscope; however, avoid overloading of the receiver by excessive signal.
2	47.25 mc.	Not used.	Not used.	C200 for minimum indication on scope.	
3	45.7 mc.	Not used.	Not used.	C526 for maximum indication on scope.	Adjust the output of the AM generator, when necessary, to keep the output at the second detector below .6 volt, peak to peak. (For convenience, the oscilloscope may be calibrated for this purpose beforehand.)
4	42.6 mc.	Not used.	Not used.	C202 for maximum indication on scope.	
5	45.0 mc.	Not used.	Not used.	C206 for maximum indication on scope.	
6	43.2 mc.	Not used.	Not used.	C210 for maximum indication on scope.	
7	44.3 mc.	Not used.	Not used.	C212 for maximum indication on scope.	
8	Not used.	Channel 4 (69 mc., with 6-mc. sweep width.)	Run marker along curve, checking against the curve limits given in figure 8.	If necessary, retouch C206, C212, C210, C526, and C202 as directed in REMARKS column. CAUTION: Do not touch the setting of C200.	Set Fine Tuning Cam to mark previously made in step 1 of Table 1. If response curve does not fall within limits shown in figure 8, retouch C206 and C212 alternately. C206 affects dip of curve, and C212 affects tilt of curve. Adjust C210 for proper slope at 42.5-mc. side of curve, and C526 for proper level of curve at video carrier frequency. If curve still does not fall within the limits, a slight readjustment of C202 is permissible. CAUTION: To retouch, only turn the adjustments slightly.

NOTE: The symbols and figures referred to in the charts are those given in Service Manual PR-2507.

TABLE 4—SOUND I-F ALIGNMENT

AM GENERATOR: Connect "hot" lead through a 2200-ohm resistor to pin 2 of J200, using the video i-f alignment jig. Connect ground lead of generator to ground lead of jig.

VOLTMETER: Use v.t.v.m. or 20,000-ohms-per-volt voltmeter. Connect to sound i-f alignment jig. (See figure 3.) NOTE: In this procedure, disregard the oscilloscope connections shown in figure 3.

OSCILLOSCOPE: Connect through crystal probe to grid (pin 2) of picture tube.

STEP	AM GENERATOR DIAL SETTING	ADJUST	REMARKS
1	4.5 mc.	TC400 for maximum indication on voltmeter.	Remove 1st video i-f tube, and adjust the Volume control for moderate speaker output.
2	4.5 mc.	TC401 for maximum indication on voltmeter.	
3	4.5 mc.	TC402 for maximum indication on voltmeter and minimum speaker output.	The point of maximum meter indication for TC402 should also be the point of minimum speaker output.
4	4.5 mc.	TC300 for minimum indication on oscilloscope.	If scope and crystal probe are not available, TC300 may be adjusted for minimum beat pattern on picture tube, using station signal.
5	Use station signal.	TC402 for minimum AM (noise or buzz), using speaker output for indication.	Replace 1st video i-f tube, and tune in a station, setting fine tuning control to obtain a crisp picture, with a small amount of beat.

NOTE: The symbols and figures referred to in the charts are those given in Service Manual PR-2507.

Printed in U.S.A.

PHILCO Factory-Supervised Service SERVICE

TELEVISION

FILE 3 — SERVICE INFORMATION FOR PHILCO CHASSIS TYPES R-191 AND D-191 — PR-2507

PHILCO TELEVISION SERVICE MANUAL FOR R-F CHASSIS R-191 AND DEFLECTION CHASSIS D-191

TP3-1045

TABLE OF CONTENTS

CIRCUIT DESCRIPTION

Philco "B" line, Code 140, Television Receivers use two chassis—the r-f chassis R-191, containing the r-f, video, audio, and sync circuits, and deflection chassis D-191, containing 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

A separate subchassis contains the r-f amplifier, the oscillator, and the mixer. The r-f amplifier uses a type 6BZ7 tube, V1. The oscillator and the mixer use a type 6X8 tube, V2, the pentode section of the tube being used for the mixer, and the triode section for the oscillator. The output of the mixer is fed to a three-stage, stagger-tuned, i-f amplifier system employing three type 6CB6 tubes, V3, V4, and V5. A type 1N64 crystal diode, CD200, is used for the video detector, the output of which is amplified by a two-stage video amplifier utilizing a type 6AU6 tube, V6, and a type 6AQ5 output tube, V7. The connections at the detector are such as to produce a composite video signal with negative-going sync pulses. The signal, which is subjected to a 360-degree phase shift through the video amplifier, is applied to the grid of the picture tube, V19; therefore the sync pulses at this point are negative-going. A positive-going blanking pulse, taken from the vertical-output stage, is applied to the cathode of the picture tube for suppression of the vertical retrace.

Sound i.f. (intercarrier) is obtained by utilizing the beat frequency produced when the 45.75-mc. video carrier and the 41.25-mc. sound carrier are mixed in the video detector. The 4.5-mc. beat frequency 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 video 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 during the alignment of the receiver. There is sound output only when both the video and sound 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), which is taken from the plate circuit of the video amplifier, is passed through a 4.5-mc. sound i-f stage using a 6AU6 tube, V8, and is then applied to the FM detector, which utilizes two diode sections of a 6T8 tube, V9A. The triode section of the 6T8, V9B, is used as the first audio amplifier. The power amplifier uses a type 6V6GT tube, V10.

A portion of the video signal appearing at the output of the first video amplifier is applied to grid 3 (pin 7) of the 6CS6 sync separator, V11. Since grid-leak bias is used on grid 3, the tips of the sync pulses are clamped to zero, and the video components swing in a negative direction from zero. Because of the cut-off characteristics of grid 3, the video components are eliminated, and only negative-going sync pulses appear in the plate circuit of the sync separator. At the same time, however, a signal is taken from the video detector and applied to grid 1 (pin 1) of the 6CS6 tube. This grid is returned to B plus, and the bias is maintained close to zero, because of a small grid-current flow. Since the signal applied to grid 1 is composite video with negative-going sync, any noise modulation present in the signal appears in the form of sharp spikes, driving in a negative direction. The circuit constants are chosen to allow grid 1 to cut off plate current whenever the signal goes more negative than the sync pulses. A series grid-limiting resistor, R608, is also incorporated to prevent the video components from appearing in the plate circuit of the sync separator. A-G-C voltage is also developed in the sync separator circuit in the following manner: On tips of the sync pulses, grid 3 (pin 7) of the 6CS6 tube draws current which flows downward through the network R602, R603, R604, R211, and L214, causing capacitors C605, C602, and C603, to assume negative charges proportional to the amount of peak signal applied to grid 3. The tuner a-g-c voltage is delayed by means of a resistor divider network which applies a small positive voltage to the tuner a-g-c circuit. This positive voltage prevents a-g-c action from lowering the tuner gain on weak signals. To prevent the delay voltage from driving the tuner a-g-c voltage positive on weak signals, a diode clamp (part of V9B) is connected across C602.

The negative-going sync pulses appearing in the plate circuit of the sync separator are fed to one half of a 12AU7 tube, V12A, connected as a phase-splitter circuit; positive sync pulses appear in the plate circuit, and negative sync pulses are taken from the cathode.

Proper triggering of the vertical oscillator requires positive synchronizing pulses. The vertical sync signal is separated from the horizontal sync signal by the vertical integrator circuit, and is fed to the grid circuit of the vertical blocking oscillator, one half of a 12AU7 tube (V12B). The output of the vertical oscillator is amplified by a type 12B4 tube, V13, which is employed as the vertical-output amplifier. The output of the amplifier is applied to the vertical-deflection coils through the vertical-output transformer.

The horizontal-sweep circuits require both positive and negative sync pulses. The phase-comparer circuit uses a 6AL5 tube, V14. Positive sync pulses are applied to the plate of V14A, and negative sync pulses are applied to the cathode of V14B. A saw-tooth voltage, taken from the horizontal-output circuit, is fed to the plate of V14B and to the cathode of V14A, for comparison of the sync and horizontal sweep voltages. When the saw-tooth and sync signals are exactly in phase, no voltage is developed across R800, but when the two signals are out of phase, either a positive or a negative voltage is developed, depending upon whether the horizontal-oscillator frequency is lower or higher than the sync-pulse frequency. The grid circuit of the horizontal oscillator, a type 12AU7 tube, V15, operating as a cathode-coupled multivibrator, is connected to R800 through a filter network. When the voltage at this point goes in a positive direction, the frequency of the horizontal oscillator is increased; when the voltage swings negative, the frequency of the oscillator is decreased. In this manner the frequency of the horizontal oscillator is controlled over the lock-in range of the circuit. The horizontal hold control, R811, adjusts the horizontal-oscillator frequency so that it is within the control range of the phase comparer. The output of the horizontal oscillator is fed to the horizontal output amplifier, which makes use of a type 6BQ6GT tube, V16. The screen voltage for the horizontal amplifier is supplied from a voltage-divider network. The network includes R818, R816 (the WIDTH control), R817, R315 (the BRIGHTNESS control), and R316. R816 varies the voltage applied to the screen, thus adjusting for proper picture width. Adjusting R315 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 a variation in the second-anode voltage. However, when the control arm of the BRIGHTNESS control, R315, is moved toward ground, a smaller part of the control is shunted by the 22,000-ohm resistor, R316, and the total resistance of the voltage divider is increased. This increase in resistance results in a decrease in the current through the divider, and the screen voltage on the horizontal amplifier is increased proportionally, thus compensating automatically for the increase in beam current in the picture tube. The horizontal amplifier feeds the deflection coils through the horizontal-output transformer. A 6AX4GT tube, V17, is used as the horizontal damper.

The second-anode voltage for the picture tube is supplied by one 1B3GT high-voltage rectifier tube, V18. 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 from across a 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 vertical oscillator, first audio stage, and the first anode of the picture tube. Filament voltage for all the tubes except the high-voltage rectifier is supplied by a step-down transformer. Filament voltage for the high-voltage rectifier is supplied by a winding of the horizontal-output transformer.

IMPORTANT

A-C LINE ISOLATION

CAUTION: One side of the a-c line is connected to the chassis through C101 and L405. The other side of the a-c line is connected to the chassis through F100, R100, CR100, and C103, 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 test equipment or receiver, or both.

SPECIFICATIONS

VHF TUNING ....Twelve channel, 12-position incremental tuner, covering VHF Television Channels 2 through 13; fine tuning of local oscillator

UHF TUNING (if provided).......Continuous tuning, covering UHF Television Channels 14 through 83; fine and coarse tuning

INTERMEDIATE FREQUENCIES
Video Carrier ....45.75 mc.
Sound (intercarrier) ....4.75 mc.

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

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

POWER CONSUMPTION..without UHF, 175 watts; with UHF, 180 watts

TUBE COMPLEMENT

R-F CHASSIS R-191

REFERENCE SYMBOL	TUBE TYPE	FUNCTION
V1	6BZ7 miniature	R-F Amplifier
V2	6X8 miniature	Oscillator-Mixer
V3, V4, V5	6CB6 miniature	Video I-F Amplifiers
V6	6AU6 miniature	Video Amplifier
V7	6AQ5 miniature	Video Output Amplifier
V8	6AU6 miniature	Sound I-F Amplifier
V9	6T8 miniature	Ratio Detector, First Audio, and Tuner A-G-C Clamp
V10	6V6GT octal	Audio Output
V11	6CS6 miniature	Sync Separator
V19	17YP4 or 21ZP4A	Picture Tube

DEFLECTION CHASSIS D-191

REFERENCE SYMBOL	TUBE TYPE	FUNCTION
V12	12AU7 miniature	Phase Splitter, Vertical Oscillator
V13	12B4 miniature	Vertical-Output Amplifier
V14	6AL5 miniature	Horizontal Phase Comparer
V15	12AU7 miniature	Horizontal Oscillator
V16	6BQ6GT octal	Horizontal-Output Amplifier
V17	6AX4GT octal	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-OSCILLATOR ADJUSTMENT

To adjust the horizontal-oscillator circuit, tune in a station and proceed as follows:

1. Reduce the width of the picture until approximately 1 inch of blank screen appears at the right-hand and left-hand sides of the picture.

2. Increase the BRIGHTNESS control setting until the blanking becomes visible. This will appear as a dark vertical bar on each side of the picture.

3. Connect a .1 μf. condenser from the test point, adjacent to TC800, to ground. (The plate side of the horizontal ringing coil, L800, is connected to the test point.)

4. Set the HORIZONTAL HOLD control to the approximate center of its mechanical rotation.

5. Adjust the HORIZ HOLD CENTERING control until equal portions of the blanking bar appear on both sides of the picture.

6. Remove the .1-μf. condenser from the test point.

7. Adjust the horizontal ringing coil, L800, until equal portions of the blanking bar again appear on both sides of the picture.

8. Rotate the HORIZONTAL HOLD control through its range. The picture should fall out of sync on both sides of the center of its rotation. If the picture does not fall out of sync on both sides, readjust the HORIZ HOLD CENTERING control.

9. Rotate the HORIZONTAL HOLD control through its range, and observe the number of diagonal blanking bars that appear just before the picture pulls into sync. The pull-in should occur with from 1 to 2 diagonal bars when the sync position is approached from either direction. If proper pull-in is not obtained, repeat the above procedure.

VIDEO PEAKING-COIL ADJUSTMENT

The video peaking coil, L303, is adjusted at the factory for proper transient response of the video circuits. Ordinarily, this coil will require no further adjustment by the serviceman. On any station where excessive overshoot or excessive smear is present, a slight adjustment of L303 may improve the picture quality on that station; however, this adjustment may sacrifice the quality on other channels. If L303 is replaced in servicing, adjustment will be required.

Before adjusting L303, check the tuner alignment and i-f alignment. (Never adjust L303 until the alignment of the receiver is correct.) Then tune in a station and adjust L303 until 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 TC301 applies to a particular station exhibiting smear or overshoot. After TC301 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 procedure follows the general pattern of first checking the tuner response with an FM sweep generator and oscilloscope, comparing the response curve with that given in the manual, and aligning the tuner if necessary. After it is established that the tuner is in correct alignment, the video i-f channel is aligned by tuning each coil to its assigned pole frequency, using an AM signal, and then feeding in a sweep signal at the antenna terminals and re-touching the i-f adjustments to obtain the desired pass band. Finally, the sound channel is aligned, using an AM signal, by tuning the sound take-off coil and the i-f and ratio-detector transformers.

The over-all response curve (r-f, i-f) of the circuits from the antenna terminals to the video detector, after the i-f stages have been aligned, should appear essentially the same, regardless of the channel under test. If 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 having the top of the workbench metallic. 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 2 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 Model 7008 is used, the built-in crystal calibrator provides an excellent means of calibration. An alternate method for 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."

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.

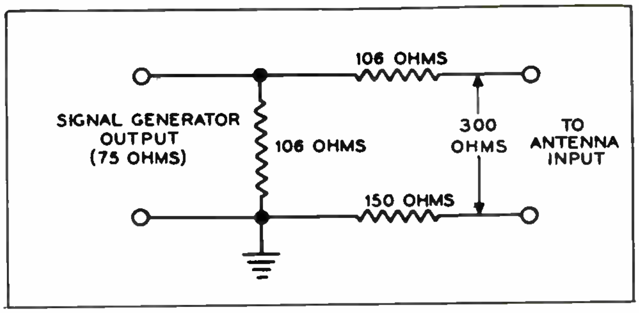


Figure 1. Antenna-Input Matching Network

3. R-F Probe, Philco Part No. 76-3595 (for use with Model 7008 generator).

JIGS AND ADAPTERS REQUIRED

Mixer Jig

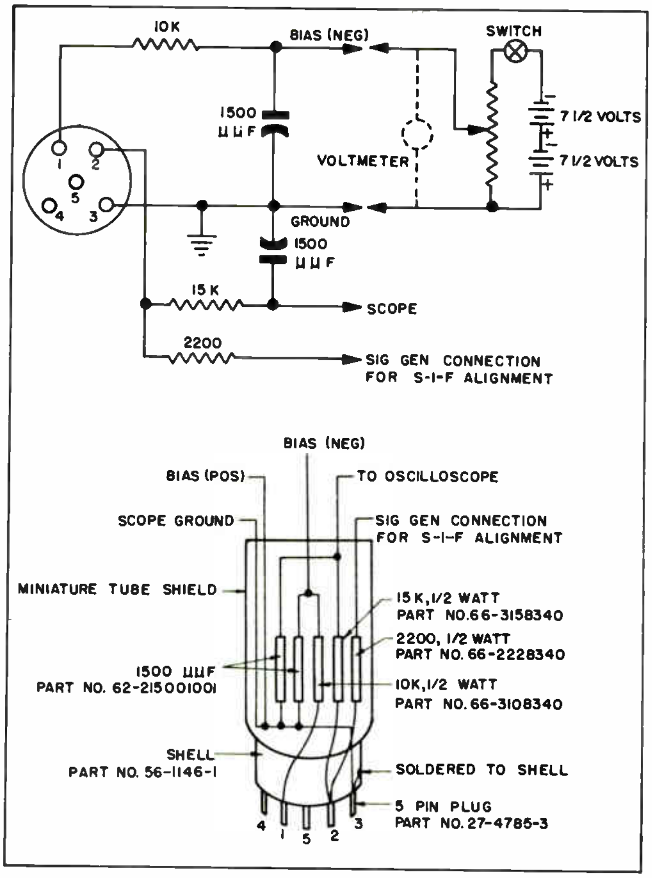
Connections to the grid of the mixer tube may be made through the alignment jack provided for that purpose. To connect the generator to this point, a mixer jig, Philco Part No. 45-1739, and a connecting cable, Philco Part No. 45-1635, may be used. As an alternate, a Philco alligator-clip adapter, Part No. 45-1636, with as short a ground lead as possible, may be used to connect 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.

Antenna-Input Matching Network

Figure 1 shows an impedance-matching network for coupling the signal generator to the antenna-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 antenna-input circuit. The resistors used in this network should be of carbon-composition construction, and should be chosen from a group to obtain values within 10% of those indicated. The resistors should be placed in a shield can, to prevent variable effects. An antenna 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.

Video I-F Alignment Jig
(Video Test Jack Adapter)

The alignment jig shown in figure 2 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 jig consists of a 5-prong plug, a 10,000-ohm potentiometer, two isolating resistors (one 10,000-ohm and one 15,000-ohm), two 1500-



TP3-988

Figure 2. Video I-F Alignment Jig.

micromicrofarad capacitors, two 7½-volt batteries and switch. A suggested method of fabricating the jig is also shown. It is suggested that the bias batteries and potentiometer be mounted in a metal box of convenient size.

The potentiometer and switch are connected across the two 7½-volt batteries. The switch is used to disconnect the potentiometer, to prevent the discharge of the battery while not in use.

Sound I-F Alignment Jig

Figure 3 shows the jig that should be used to connect the voltmeter and oscilloscope to the VOLUME CONTROL socket, J400.

TELEVISION TUNER ALIGNMENT

After the tuner is serviced, or if an i-f alignment is required, the tuner alignment should be checked by observing the tuner response curve, as given under Bandpass Alignment. If the response curve does not fall within the limits shown in figure 5, the tuner should be realigned. 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

Tuning cores are provided in the oscillator coils at channels 13, 11, 9, 7, 6, and 4. By adjusting these tuning cores, all channels may be placed on frequency. This procedure should be carried out with the highest-frequency channel first, since the alignment of each channel affects the alignment of all the channels below it in frequency. The channel adjustments are so arranged that, with one exception, each adjustment corrects the tuning of more than one channel. The coverage of the various adjustments is as follows:

CHANNEL ADJUSTMENT	CHANNELS CORRECTED BY ADJUSTMENT
13	13 and 12
11	11 and 10
9	9 and 8
7	7 only
6	6 and 5
4	4, 3, and 2

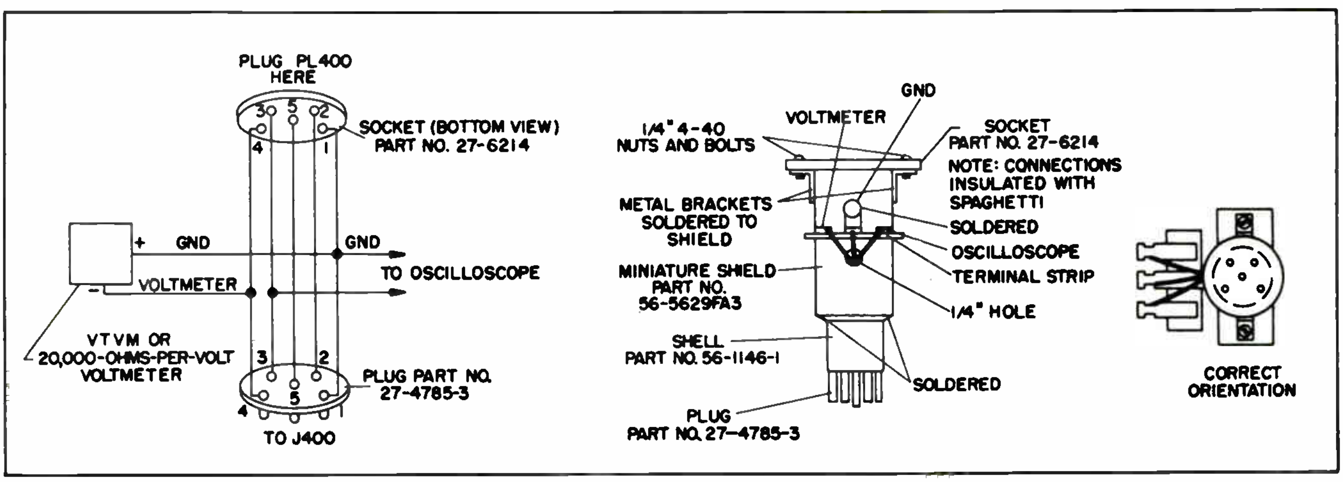
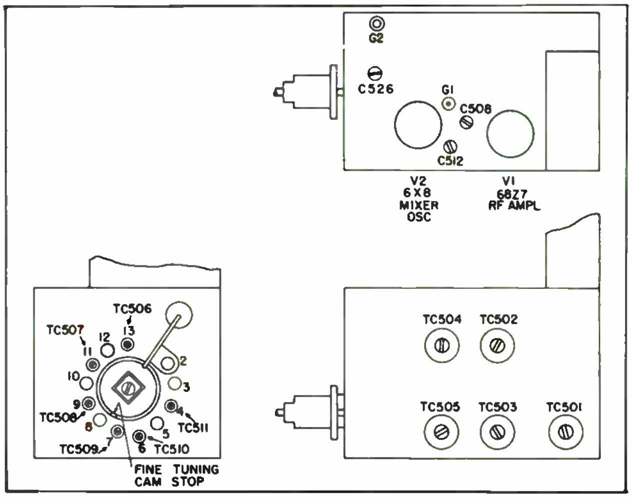


Figure 3. Sound I-F Alignment Jig

TP2-2200



TP2-2201-1

Figure 4. Television Tuner, Showing Locations of Adjustments

The FINE TUNING cam should be preset for all adjustments by placing the stop on the FINE TUNING cam between the Channel 7 and 8 holes on the front plate of the tuner. See figure 4.

Procedure Using Signal Generator

An r-f signal (unmodulated), at the oscillator frequency, is fed into the antenna input from an AM signal generator, and the oscillator tuning cores are adjusted for zero beat. The r-f signal frequency should be accurately determined. It is preferable that the signal be taken from a crystal-controlled source; if this is not available, the signal generator may be calibrated against the television station.

1. Connect the hot lead of the oscilloscope to the mixer plate test point, G2, through a 1000-ohm resistor, and connect the ground lead of the oscilloscope to the chassis, near the test point. (High oscilloscope gain may be necessary to obtain a visual beat. In this instance, base-line hum may be ignored.)
2. Connect the AM (marker) generator to the 300-ohm antenna-input terminals. For this purpose the antenna-input matching network is not required.
3. Disconnect the white lead from the tuner, and connect it to the negative terminal of a 1½-volt battery. Ground the positive terminal. If regeneration is observed, the bias may be increased to 4 or 5 volts, to reduce the regeneration.
4. Mechanically preset the fine-tuning cam stop as shown in figure 4.
5. Feed in an r-f signal (unmodulated), at the oscillator frequency for Channel 13, with the CHANNEL SELECTOR set for Channel 13.
6. Adjust the tuning core for Channel 13 (see figure 4).
7. Reset the signal-generator frequency and the CHANNEL SELECTOR, and adjust the tuning cores for Channels 11 and 9, respectively.
8. Repeat steps 5, 6, and 7 until Channels 13, 11, and 9 are within plus or minus 500 kc. of the correct frequency.
9. Feed in r-f (unmodulated) signals, at the oscillator frequencies for Channels 7, 6, and 4, consecutively (see NOTE below), and adjust the respective tuning cores (see figure 4).

NOTE: The exact position of the FINE TUNING cam should be marked when Channel 4 is correctly aligned. This position is to be used in step 4 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:

1. Mechanically preset the FINE TUNING cam to the center of its range (see figure 4).
2. Tune in the highest-frequency channel to be received.
3. Adjust the tuning core for that channel, or the next higher channel, for the best picture; that is, starting with sound in the picture, turn the tuning core until the sound disappears. Repeat for each channel received in the area.

Bandpass Alignment

General

The bandpass alignment consists of aligning the tuner at Channels 13 and 6, and then making it track down to Channels 7 and 2, respectively.

During the alignment, a fixed bias of 1½ volts is applied to the r-f amplifier tube.

An FM (sweep) signal is applied to the antenna-input circuit, and an oscilloscope is connected to the mixer plate circuit. 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, which are caused by poor line regulation, will cause the response and time base to jump up and down. 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 tuner coupling link should be disconnected from the

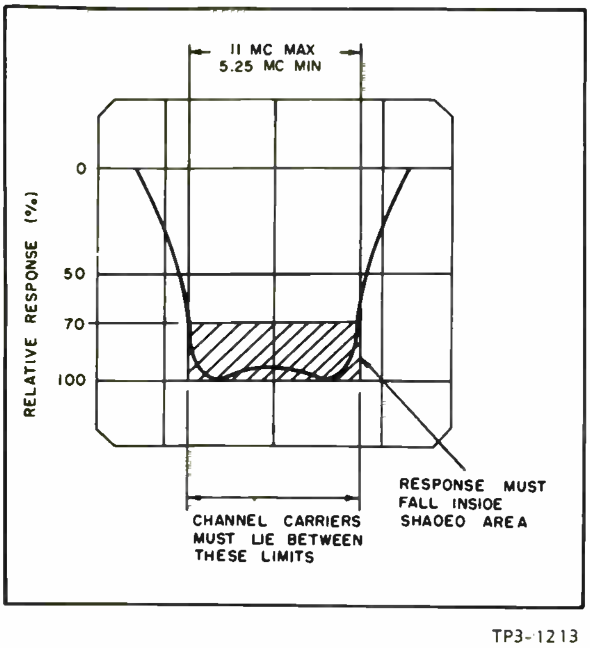


Figure 5. Television Tuner Response Curve, Showing Bandpass

i-f section by removing the plug, PL500, and a 40- to 70-ohm carbon resistor should be connected across the open end of the plug. This is done to eliminate the absorption effect of the tuner link coil, L200, on the response curve.

Procedure

1. Disconnect the white (a-g-c) lead, from the tuner, and connect it to the negative terminal of a 1½-volt battery. Ground the positive terminal.

2. Disconnect the tuner plug, PL500, at terminal board B13 (see figure 33). and connect a 40- to 70-ohm carbon resistor across the plug.

3. Connect a 1000-ohm resistor in series with the hot lead of the oscilloscope. Connect the other end of the resistor to the mixer plate test point, G2, and connect the ground lead of the oscilloscope to the chassis, near the test point.

4. Connect the FM (sweep) generator to the 300-ohm antenna-input terminals through an antenna-input matching network. See figure 1.

5. Set the CHANNEL SELECTOR and FM (sweep) generator to Channel 13 (213 mc.). Adjust the generator for sufficient sweep to show the complete response curve.

6. Establish the channel limits (see figure 5) 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 to 216 mc.) The curve should be reasonably flat between the limits shown in figure 5.

7. Adjust TC502 and TC504 (figure 4) for a symmetrical, approximately centered pass band.

8. Set the CHANNEL SELECTOR and FM generator to Channel 7 (177 mc.).

9. Establish the channel limits by using the marker generator to produce marker pips on the response curve. (Set the generator first to 174 mc., then to 180 mc.) The curve should be reasonably flat between the limits.

10. On Channel 7, note the response curve, with respect to tilt and center frequency. The curve should be centered in the pass band, and should be symmetrical.

11. If the curve is not symmetrical, and appears unbalanced, as shown in figure 6, leave the generator and tuner set to Channel 7, and adjust C508 and C512 (see figure 4) to obtain a response curve which is the mirror image (tilt in the opposite direction) of the original. This is a form of overcompensation, to allow for the effect of Channel 13 adjustment on Channel 7. For example, if the Channel 7 response appears as in figure 6A, then the trimmer should be adjusted to obtain the response shown in figure 6B.

12. Reset the CHANNEL SELECTOR and generators to Channel 13. Readjust TC502 and TC504 for a symmetrical and centered band pass. See step 4.

13. Set the CHANNEL SELECTOR and generators to Channel 7, and check the response for center frequency and symmetry. Repeat steps 8 and 9 as many times as is necessary to obtain the most symmetrical, centered response curves on Channels 13 and 7. Channels 7 through 13 are now correctly aligned.

14. Set the CHANNEL SELECTOR and sweep generator to Channel 6 (85 mc.).

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

16. 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.

> CAUTION: Do not turn the core of TC505 excessively, or it will fall out of the coil.

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 antenna circuit is now tuned for Channels 2 through 6. To prevent overloading, the output of the generator should be reduced after this adjustment is completed.

17. Readjust TC503 and TC505 for a symmetrical response, centered about 85 mc.

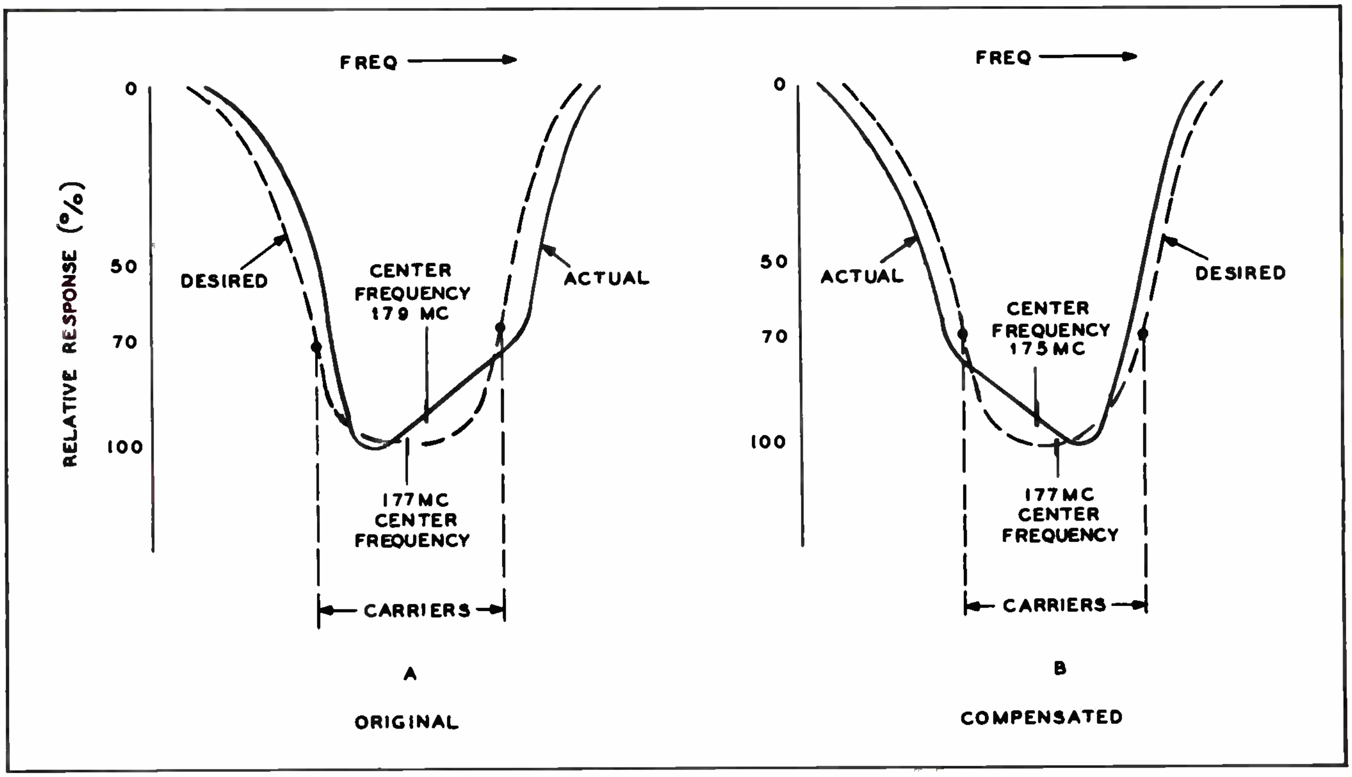


Figure 6. Television Tuner Response Curve, Showing Tracking Compensation

VIDEO I-F ALIGNMENT

Preliminary

Before proceeding with the i-f alignment or making an alignment check, observe the following preliminary instructions:

1. Preset the CONTRAST and BRIGHTNESS controls to the maximum counterclockwise position.
2. Preset the CHANNEL SELECTOR to Channel 4.
3. Insert the video i-f alignment jig (figure 2) into J200.
4. Connect the oscilloscope to the 15,000-ohm resistor from the video i-f alignment jig. Connect the ground lead of the oscilloscope to the ground lead from the adapter.
5. With a voltmeter connected across the points shown in figure 2, set the potentiometer to furnish –6 volts of bias.
6. Connect the AM generator to the mixer test point, G1, through a mixer jig (described in step 4 of procedure given below), and adjust the generator for approximately 30 percent modulation with 400 cycles. Adjust the output of the generator during the alignment to keep the output at the second detector below .6 volt, peak to peak.

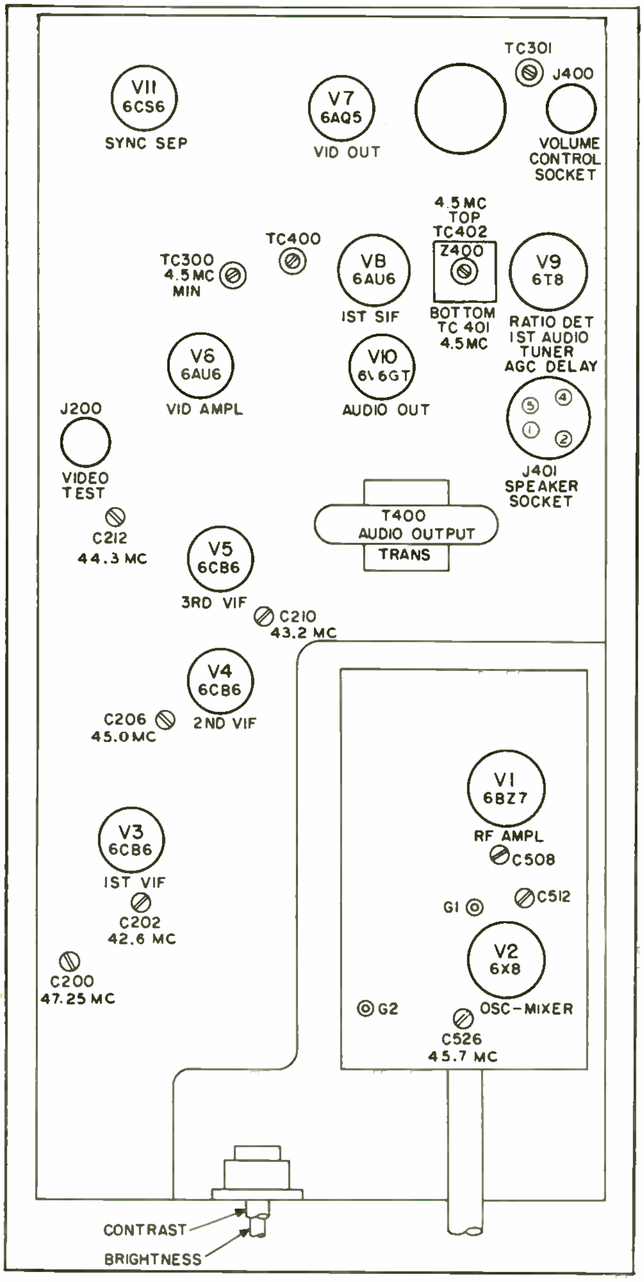
NOTE: If the i-f shield has been removed for repairs, it must be replaced before proceeding with the alignment.

Procedure

1. Preset condenser C526 for minimum capacitance (turn screw counterclockwise).
2. Tune the AM generator to 47.25 mc., and adjust C200 for minimum output, as observed on the oscilloscope. See figure 7.

NOTE: It is necessary to keep the generator output sufficiently high that a null indication may be observed on the oscilloscope; however, avoid overloading of the receiver by excessive signal.

3. Tune the AM generator to the frequencies indicated below, and adjust the trimmers for maximum output, as observed on the oscilloscope.
   a. 45.7 mc.—adjust C526
   b. 42.6 mc.—adjust C202
   c. 45.0 mc.—adjust C206
   d. 43.2 mc.—adjust C210
   e. 44.3 mc.—adjust C212
4. Connect the sweep generator and r-f marker generator to the antenna terminals through a matching jig. (If a separate oscilloscope is used, connect the sweep output of the generator to the horizontal input of the oscilloscope.) Set the CHANNEL SELECTOR to Channel 4, and tune the sweep generator for output on Channel 4. Tune the r-f marker generator to the video carrier frequency of Channel 4 (67.25 mc.),



TP3-905

Figure 7. R-F Chassis R-191, Top View, Showing Locations of Adjustments

and tune the i-f marker generator (capacitively coupled to the mixer grid) to 45.75 mc. Note two marker generators are used for this procedure. The r-f marker generator is connected to the antenna terminals, while the i-f marker generator is coupled capacitively to the mixer grid test point, G1. A jig constructed from a piece of fiber tubing, with $\frac{3}{16}$-inch inside diameter, and a brass machine screw which fits tightly into the tubing, is used to couple the generator capacitively to the test point. The screw is adjusted so that its tip clears the test point by approximately $\frac{1}{64}$ inch. The output cable of the marker generator is connected to the head of the brass screw in the jig and to the chassis near the mixer tube. Both marker generators should be adjusted for the minimum output required to make the markers barely visible. Failure to observe this precaution, or the use of excessive output from the sweep generator, will cause misleading results. After the equipment is properly connected, adjust the FINE TUNING control for zero beat of the two markers, as observed on the oscilloscope. When zero beat is obtained, remove the i-f marker.

5. If the response curve does not fall within the limits shown in figure 8, the adjustment of the trimmers may be touched up slightly, while observing the response curve. Do not retouch the setting of C202 at this point. To adjust the curve, first adjust C206 and C212, alternately, until maximum improvement has been obtained. C212 affects the tilt of the curve, and C206 affects the dip of the curve. After C212 and C206 have been adjusted, adjust C210 for proper slope at the 42.5-mc. side of the curve, then adjust C526 for proper level at the video carrier frequency (45.75 mc.). After these adjustments have been made, if the response curve still does not fall within the limits shown in figure 8, a slight readjustment of C202 is permissible.

CAUTION: Do not turn any of the trimmers excessively. To retouch, turn the trimmers only slightly.

SOUND I-F ALIGNMENT

1. Remove the 1st v-i-f tube, and connect a v.t.v.m. or a 20,000-ohms-per-volt voltmeter to the sound i-f alignment jig (figure 3). Adjust the VOLUME control for moderate speaker output.

2. Feed in an accurately calibrated 4.5-mc. AM signal, through the 2200-ohm resistor in the video i-f alignment jig, to pin 2 of J200.

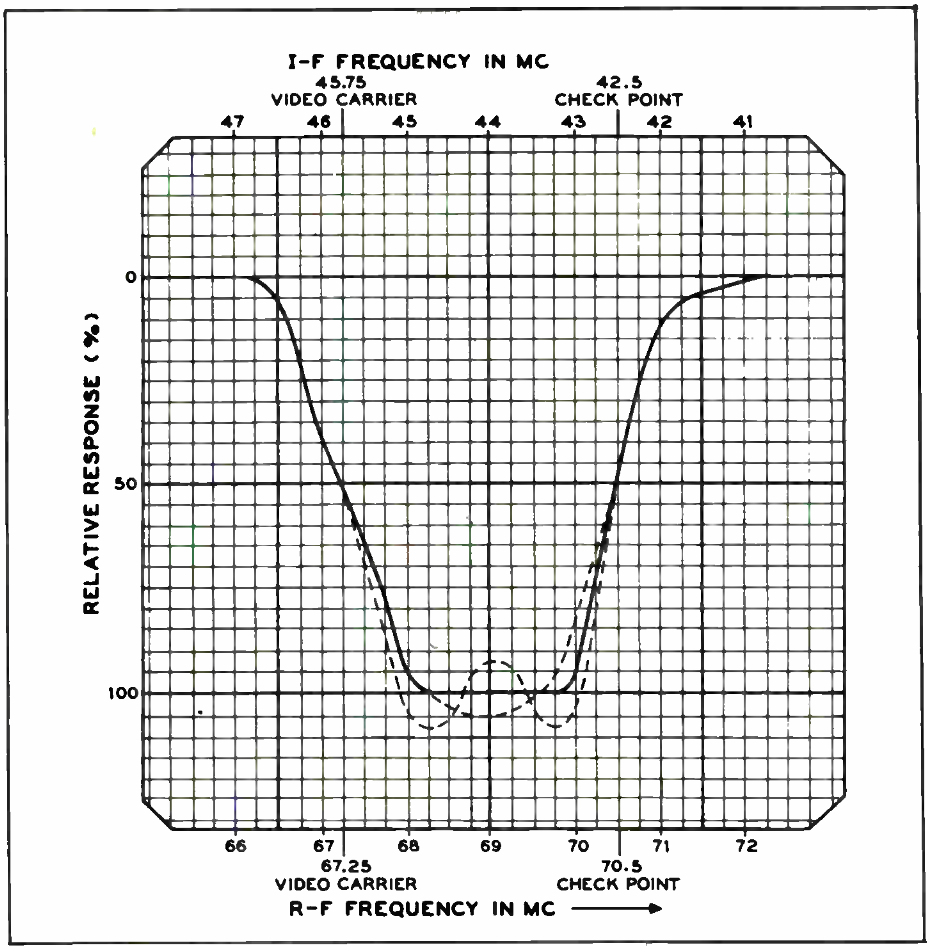
3. Tune TC400, TC401, and TC402 for maximum indications on the meter. The point of maximum meter indication for TC402 should also be the point of minimum speaker output.

4. Tune TC402 for minimum speaker output.

5. Connect an r-f probe or crystal detector to the grid (pin 2) of the picture tube. See NOTE below.

6. Tune TC300 for minimum indication on oscilloscope. (If a crystal detector is not available, TC300 may be adjusted for minimum beat pattern, as observed on the picture tube, with a station picture present.)

7. Replace the 1st v-i-f tube. Tune in a station,



TP3-891

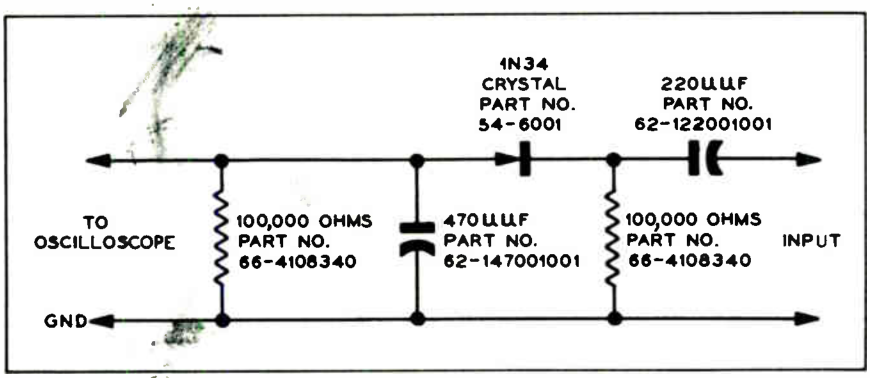
Figure 8. Over-All, R-F, I-F Response Curve, Showing Tolerance Limits

using the speaker output as an indication of correct tuning.

8. Turn the FINE TUNING control clockwise to obtain a slightly fuzzy picture.

9. Tune TC402 for minimum AM (noise) output.

NOTE: The R-F Probe, Part No. 76-3595, is used as a detector of the 4.5-mc. signal, and the oscilloscope is used as an indicating device. An alternate crystal detector may be made up as shown in figure 9.

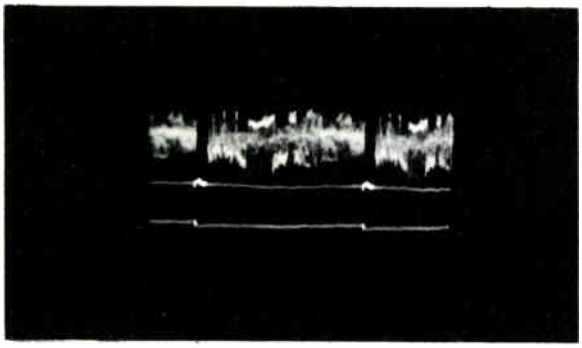


TPO-1150

Figure 9. Wiring Diagram of Crystal Detector

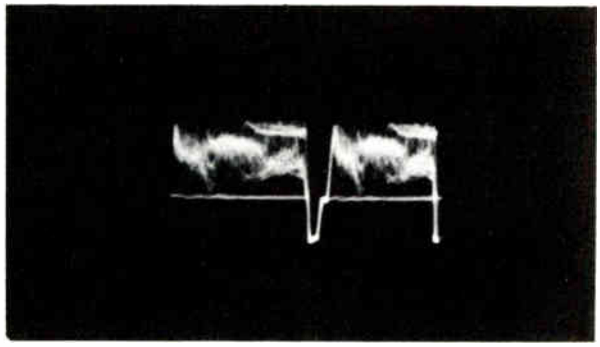
OSCILLOSCOPE WAVEFORM PATTERNS

These waveforms were taken with the receiver adjusted for 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 waveforms—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, and the peak-to-peak voltages will differ from those shown.



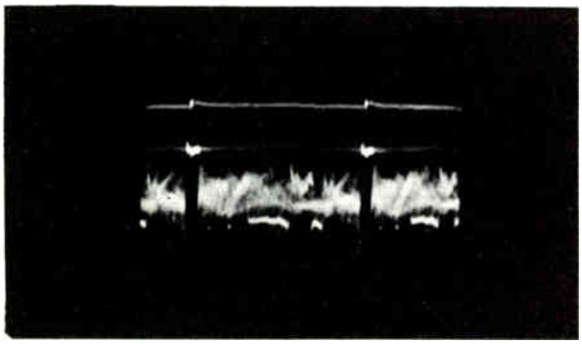
TP2-787

Figure 10. Video Detector Output, Pin 2 of J200 2 volts, 60 c.p.s.



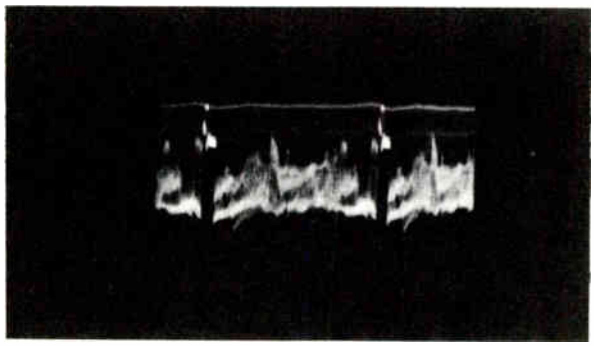
TP2-786

Figure 11. Video Detector Output, Pin 2 of J200 2 volts, 15,750 c.p.s.



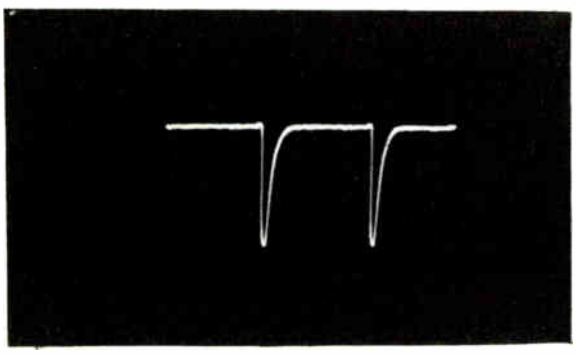
TP2-788

Figure 12. Video Amplifier Plate, Pin 5 50 volts, 60 c.p.s.



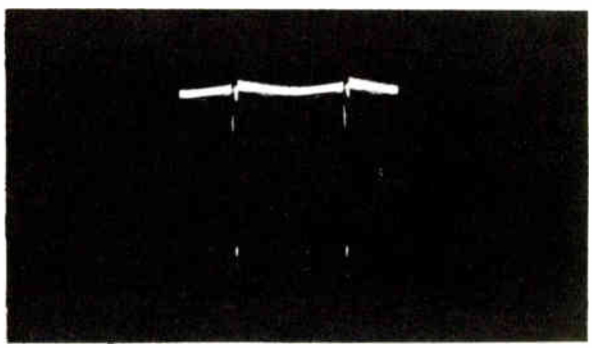
TP2-790

Figure 13. Sync Separator Grid, Pin 7 40 volts, 60 c.p.s.



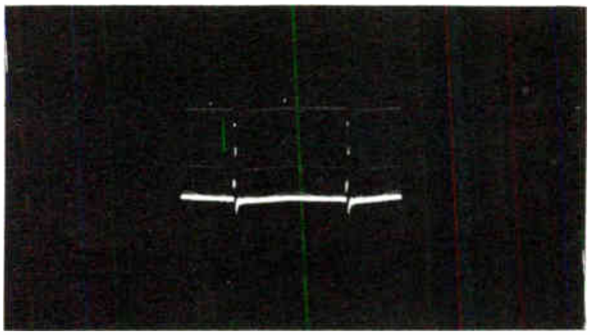
TP2-792

Figure 14. Sync Separator Plate, Pin 5 26 volts, 15,750 c.p.s.



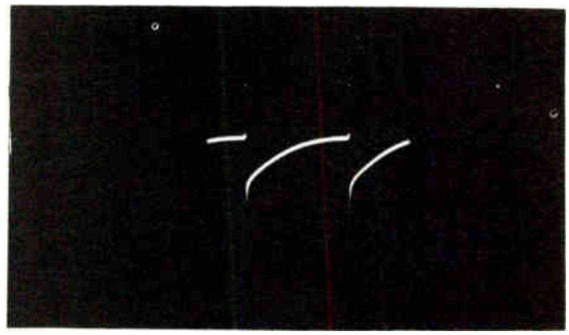
TP2-639

Figure 15. Phase-Splitter Grid, Pin 2 28 volts, 60 c.p.s.



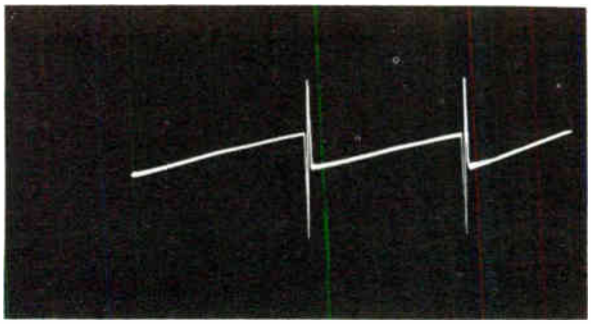
TP2-640

Figure 16. Phase-Splitter Plate, Pin 1
44 volts, 60 c.p.s.



TP2-643

Figure 17. Vertical-Oscillator Grid, Pin 7
390 volts, 60 c.p.s.

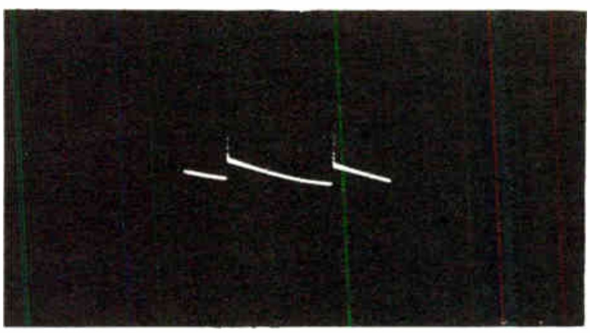


TP2-697A

Figure 18. Vertical-Oscillator Plate, Pin 6
260 volts, 60 c.p.s.

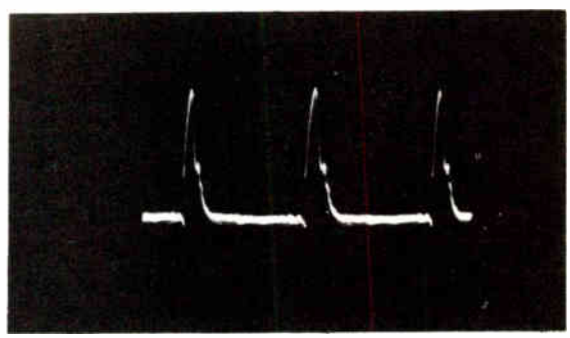
TP2-644A

Figure 19. Vertical-Output Grid, Pin 2
120 volts, 60 c.p.s.



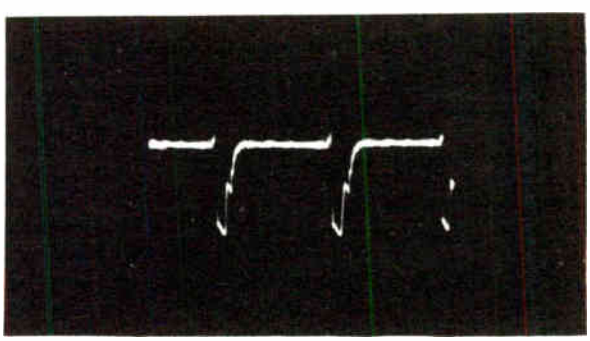
TP2-645

Figure 20. Vertical-Output Plate, Pin 9
450 volts, 60 c.p.s.



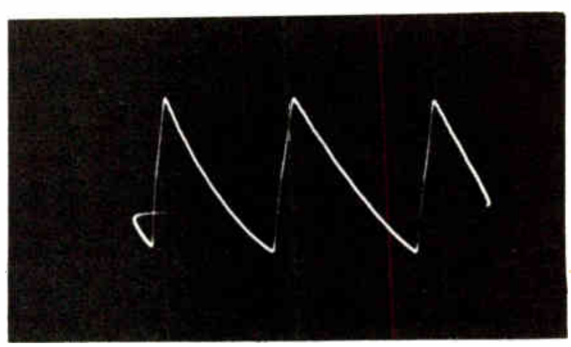
TP2-641

Figure 21. Phase-Splitter Plate, Junction of R613, R614, and C800
13 volts, 15,750 c.p.s.



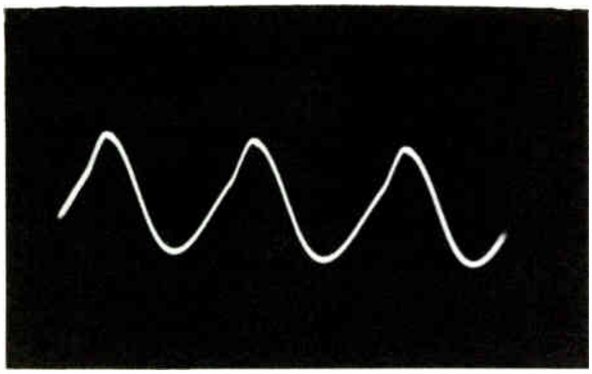
TP2-642

Figure 22. Phase-Splitter Cathode, Pin 3
10 volts, 15,750 c.p.s.



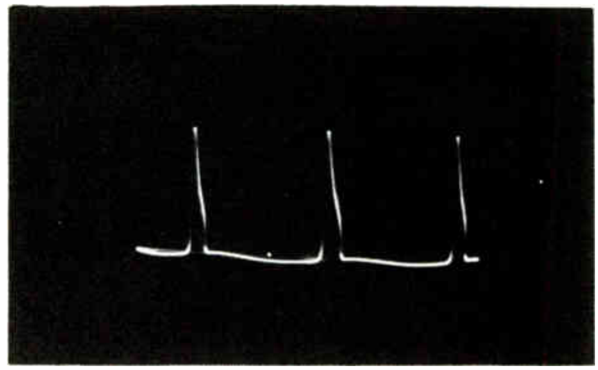
TP2-652

Figure 23. Phase Comparer, Pins 5 and 7
8 volts, 15,750 c.p.s.



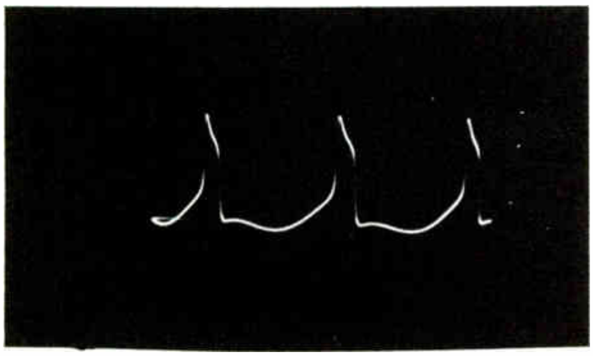
TP2-2852

Figure 24. Horizontal Oscillator, Junction of L800 and R806 34 volts, 15,750 c.p.s.



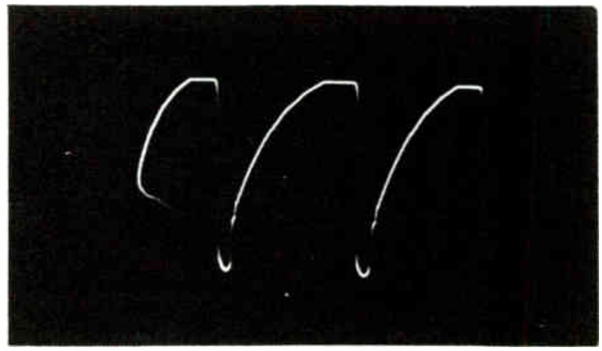
TP2-647

Figure 25. Horizontal-Oscillator Cathode, Pins 3 and 8 12 volts, 15,750 c.p.s.



TP2-648

Figure 26. Horizontal-Oscillator Grid, Pin 2 34 volts, 15,750 c.p.s.



TP2-649

Figure 27. Horizontal-Output Grid, Pin 5 150 volts, 15,750 c.p.s.

TP2-650

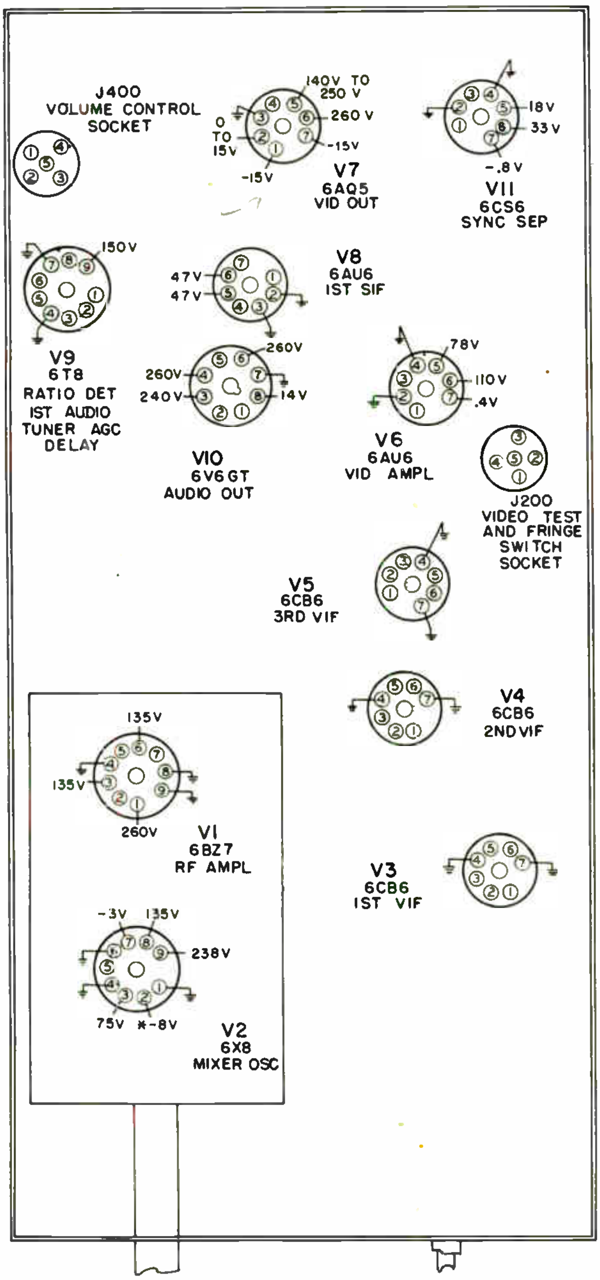
Figure 28. Horizontal-Deflection Yoke, *Pin 7 of J800 2800 volts, 15,750 c.p.s.

*** See CAUTION.**

* CAUTION: High-voltage pulses are present in the horizontal-output circuit. The waveform in figure 28 was taken with the alligator clip of the oscilloscope lead clipped over the insulation of the lead connected to pin 7 of J800. (To prevent puncture of the insulation of the lead, file off the teeth of the alligator clip, and wrap friction tape around the clip.) Connection to other points in the horizontal-output circuit is dangerous, because of the high voltages present. The peak-to-peak voltage shown for figure 28 is the actual voltage present; however, the amplitude of the scope presentation depends upon the degree of coupling.

VOLTAGE MEASUREMENTS

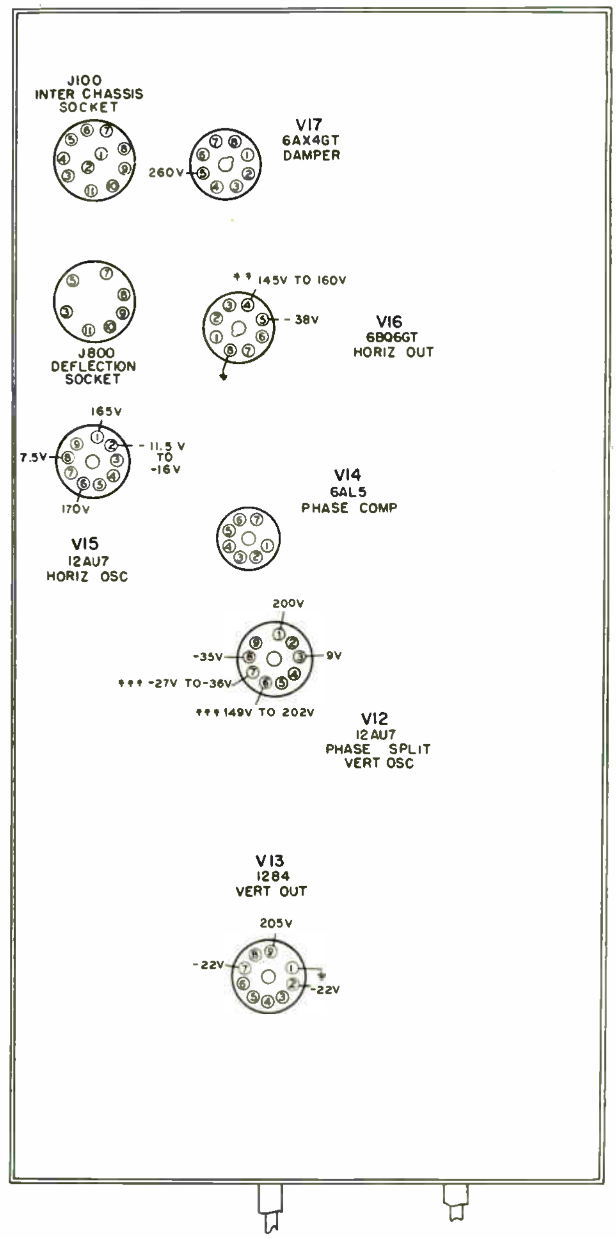
The voltages given here and on the schematics were taken with a 20,000-ohms-per-volt voltmeter, with a line voltage of 117 volts, and no signal input to the receiver. Since voltage readings taken in the video i-f stages vary widely with different test equipment setups, voltage measurements for these stages are omitted from the diagrams.



* VOLTAGE MEASURED WITH 47,000 OHM ISOLATING RESISTOR IN SERIES WITH METER PROBE

TP3-906

Figure 29. R-F Chassis R-191, Bottom View, Showing Voltages at Socket Pins



** VOLTAGE VARIES WITH HORIZ HOLD CONTROL SETTING
*** VOLTAGE VARIES WITH VERT HOLD CONTROL SETTING

TP3-907

Figure 30. Deflection Chassis D-191, Showing Voltages at Socket Pins

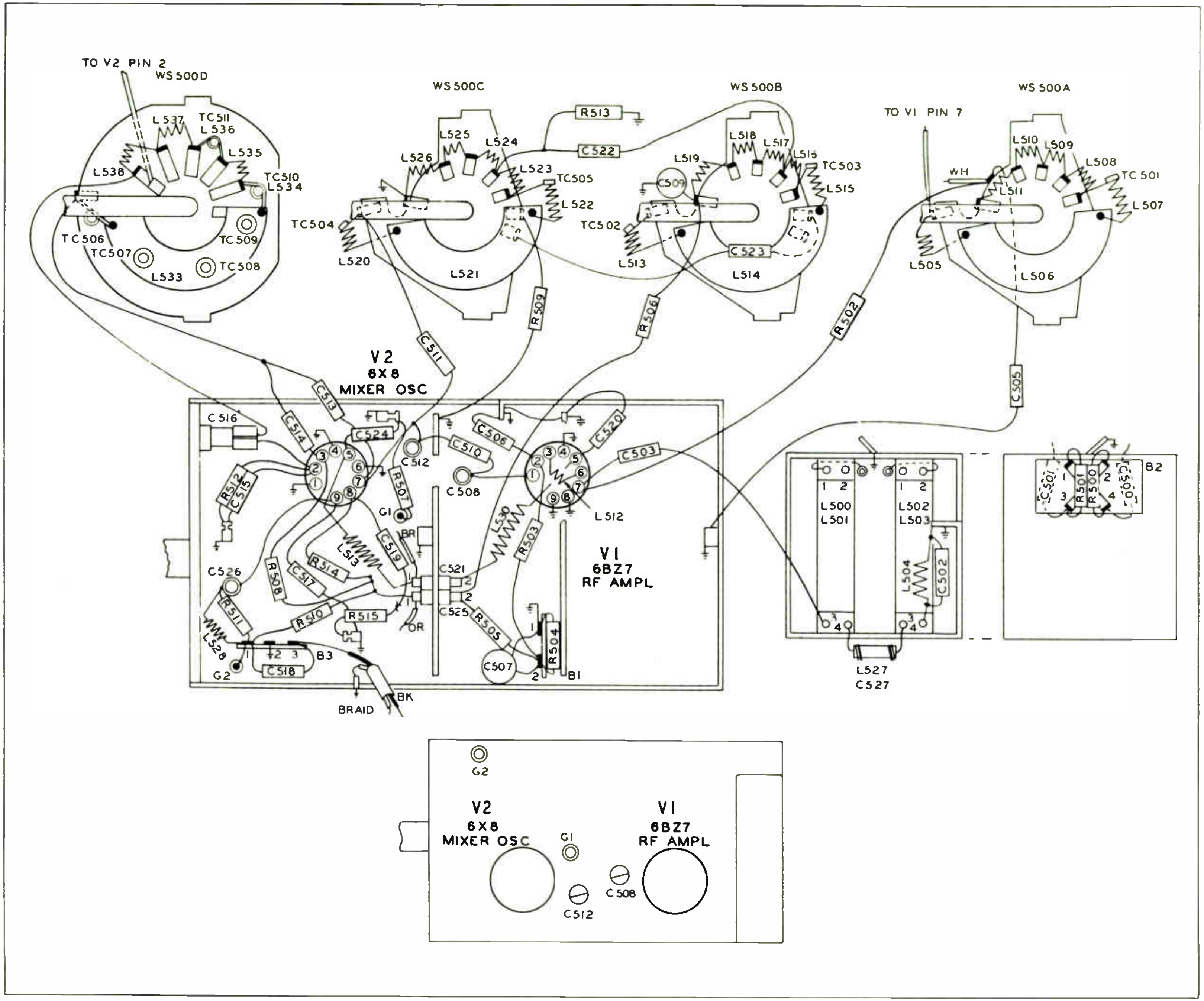
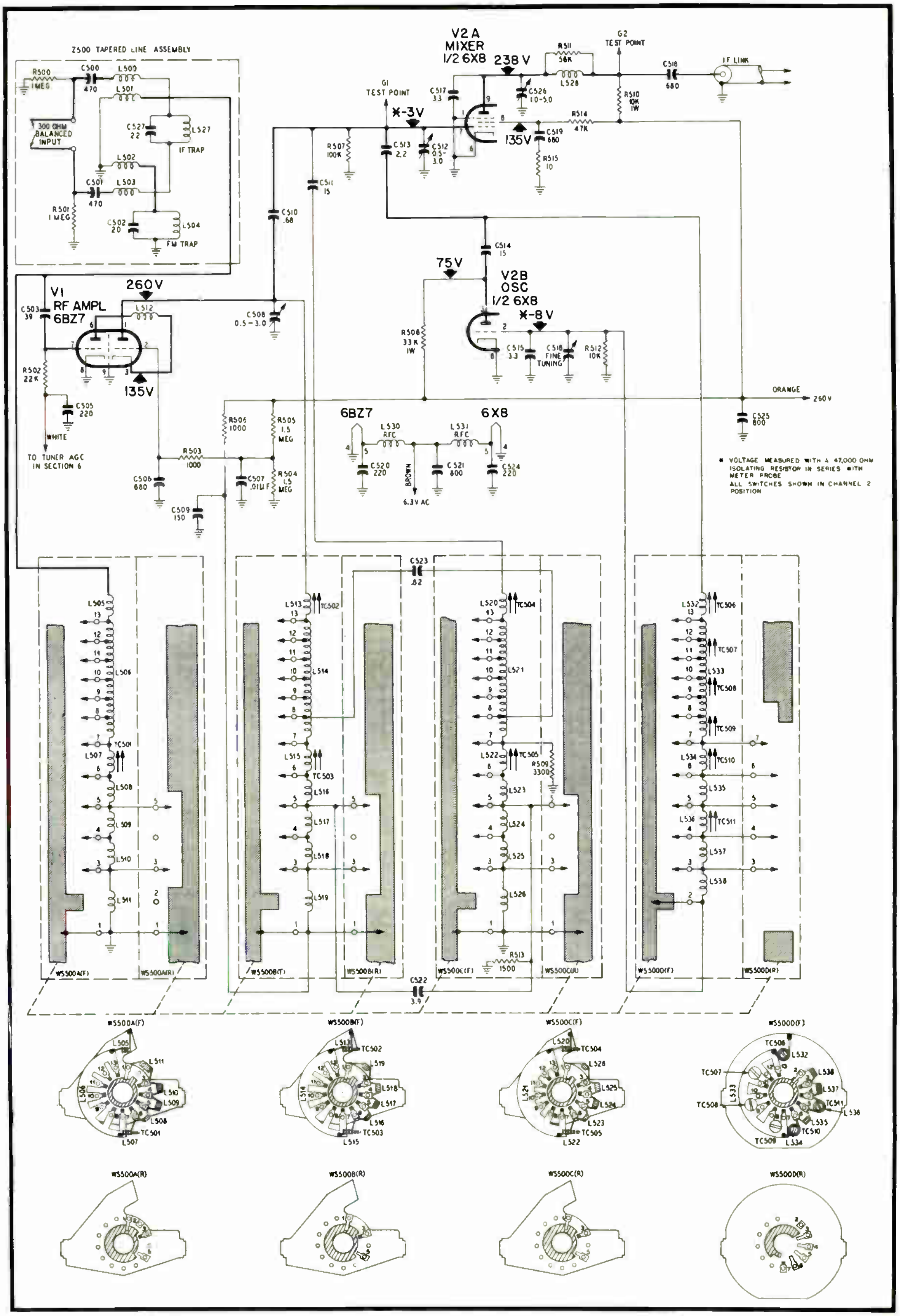
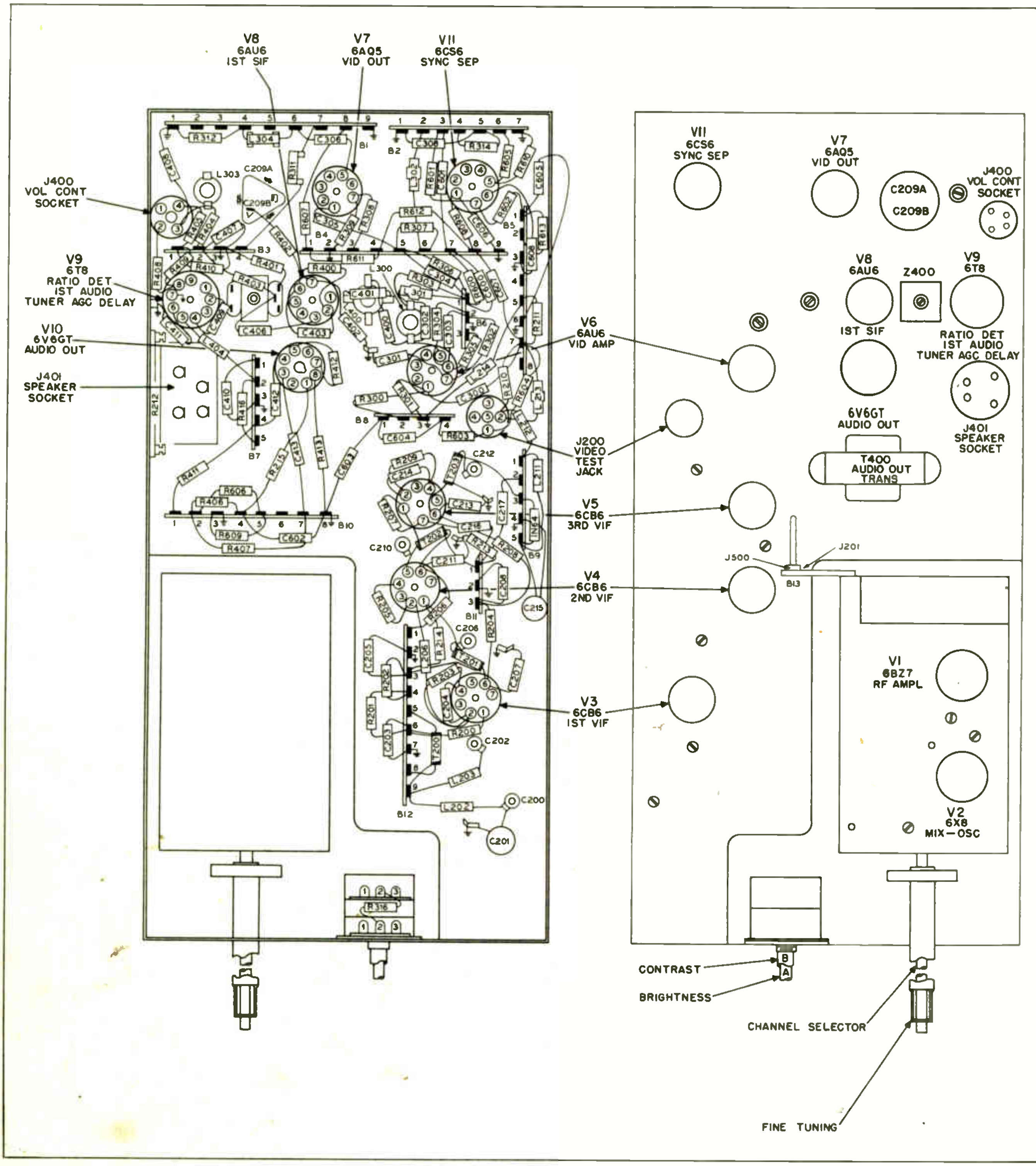


Figure 31. Television (VHF) Tuner, Part No. 76-8400, Base Layout



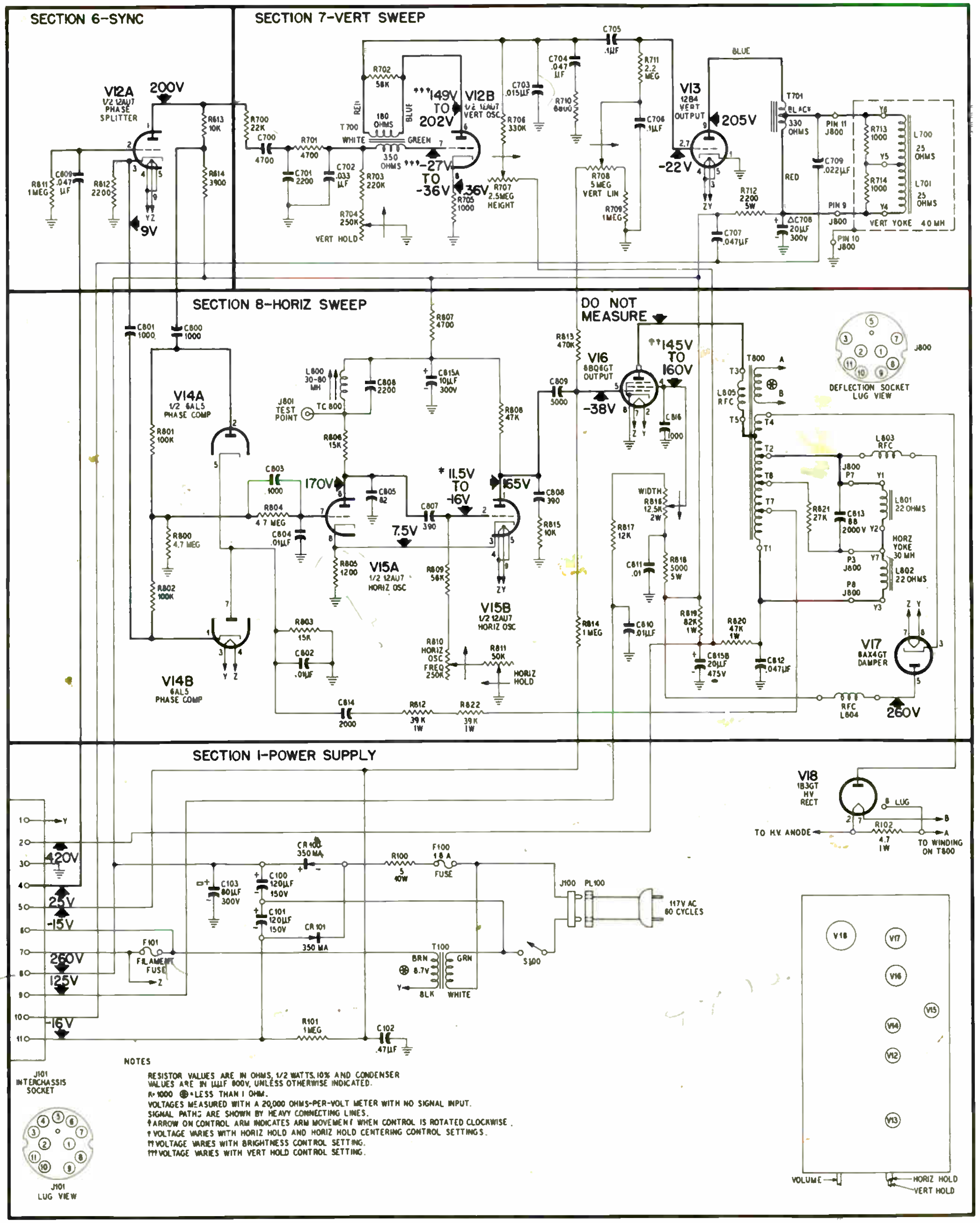
TP3-909

Figure 32. Television (VHF) Tuner, Part No. 76-8400, Schematic Diagram



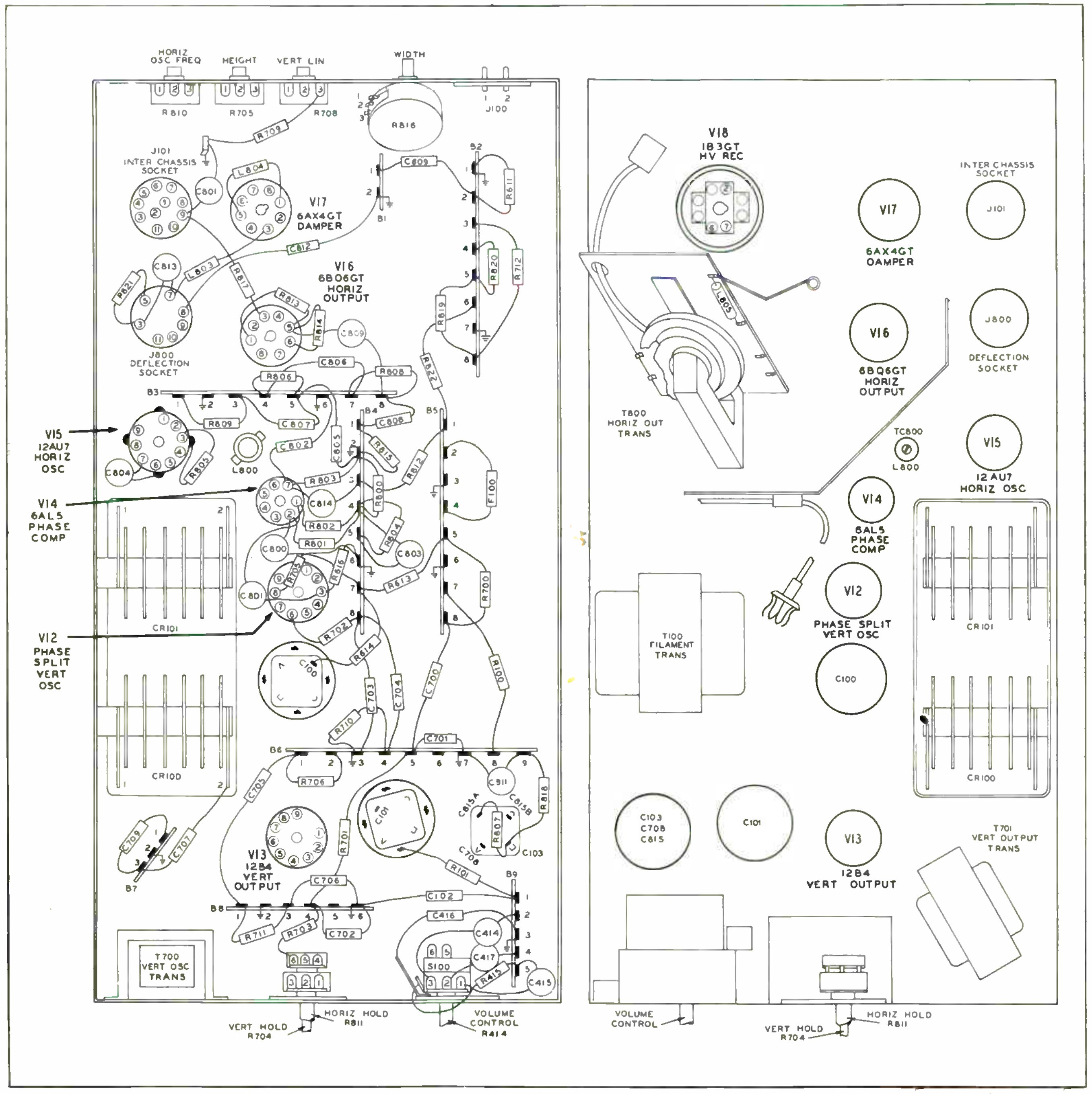
TP3-910

Figure 33. R-F Chassis R-191, Base Layout



TP3-912

Figure 35. Deflection Chassis D-191, Schematic Diagram



TP3-913

Figure 36. Deflection Chassis D-191, Base Layout

UHF TUNER-ADAPTER UT22, PART NO. 43-6703, FOR RECEIVERS USING R-F CHASSIS R-191

UHF Tuner-Adapter UT22, Part No. 43-6703, will provide for the reception of UHF Channels 14 through 83. It is designed for installation in Philco B line television receivers, and is installed on all BU models. These receivers use r-f chassis R-191.

The Tuner-Adapter consists of a UHF tuner, a change-over switch, adapter cables and plugs, a planetary tuner driving assembly, and mounting hardware.

CIRCUIT DESCRIPTION

The incoming UHF signal is coupled through the antenna input line to blocking condensers C1 and C2, leakage resistors R8 and R9, an i-f trap, C5-L1, C6-L2, and a 150-ohm transmission line, to the antenna tank of the tuner. See figure 37. The antenna tank is coupled to the mixer tank by means of the mutual coupling of L2 and L3 and the stray capacitance, C5. The desired signal is selected by tuning the antenna tank and the mixer tank to the correct frequency; this is accomplished by tuning condensers C3A, C3B, C3C, and C3D. These condensers, plus C3E and C3F, located in the oscillator tank circuit, form the manual tuning gang.

The signal is then fed to the crystal mixer circuit by means of the mutual coupling of L4 and L5. The local-oscillator signal is generated by a 6AF4 tube, V1, and its associated circuit. The frequency of oscillation is maintained at 45.75 mc. above the signal frequency in the antenna and mixer tank, in order to effect a 45.75-mc. video carrier intermediate frequency when the two signals are subsequently mixed in the crystal mixer tank.

The output signal from this local oscillator is introduced into the crystal mixer circuit through a 300-ohm, miniature transmission line and the mutual coupling of L7 to L5 and L8 to L6. These four printed inductances, in addition to C7, form the mixer board assembly. The signal is fed into a 6BQ7 preamplifier stage, then to the video i-f circuits, and through the UHF change-over switch, by means of a coaxial connection. On VHF operation, a 150,000-ohm resistor is placed in series with the UHF oscillator plate, rendering this oscillator inoperative.

The two tanks of the UHF tuner, the antenna tank and the mixer tank, are used to prevent the i-f signal from feeding back to the antenna and interfering with other receivers. These two tanks pass incoming signals very readily, but do not pass the i-f signal.

CHANGE-OVER SWITCH

The change-over switch supplied with the Tuner-Adapter is used to switch from VHF to UHF, and vice versa. It is installed on the back of the VHF tuner, and is operated by an actuator mounted on the VHF tuner shaft. When the Channel Selector of the VHF tuner is turned to the UHF position, the change-over switch makes proper connection for UHF operation. In this position, the switch places a 150,000-ohm resistor in series with the VHF B-plus lead, which drops the B-plus voltage applied to the VHF tuner. The antenna is connected to the UHF tuner, the VHF pilot light is turned off, and the UHF pilot lights are turned on; the output of the UHF tuner is connected to the video i-f input circuit.

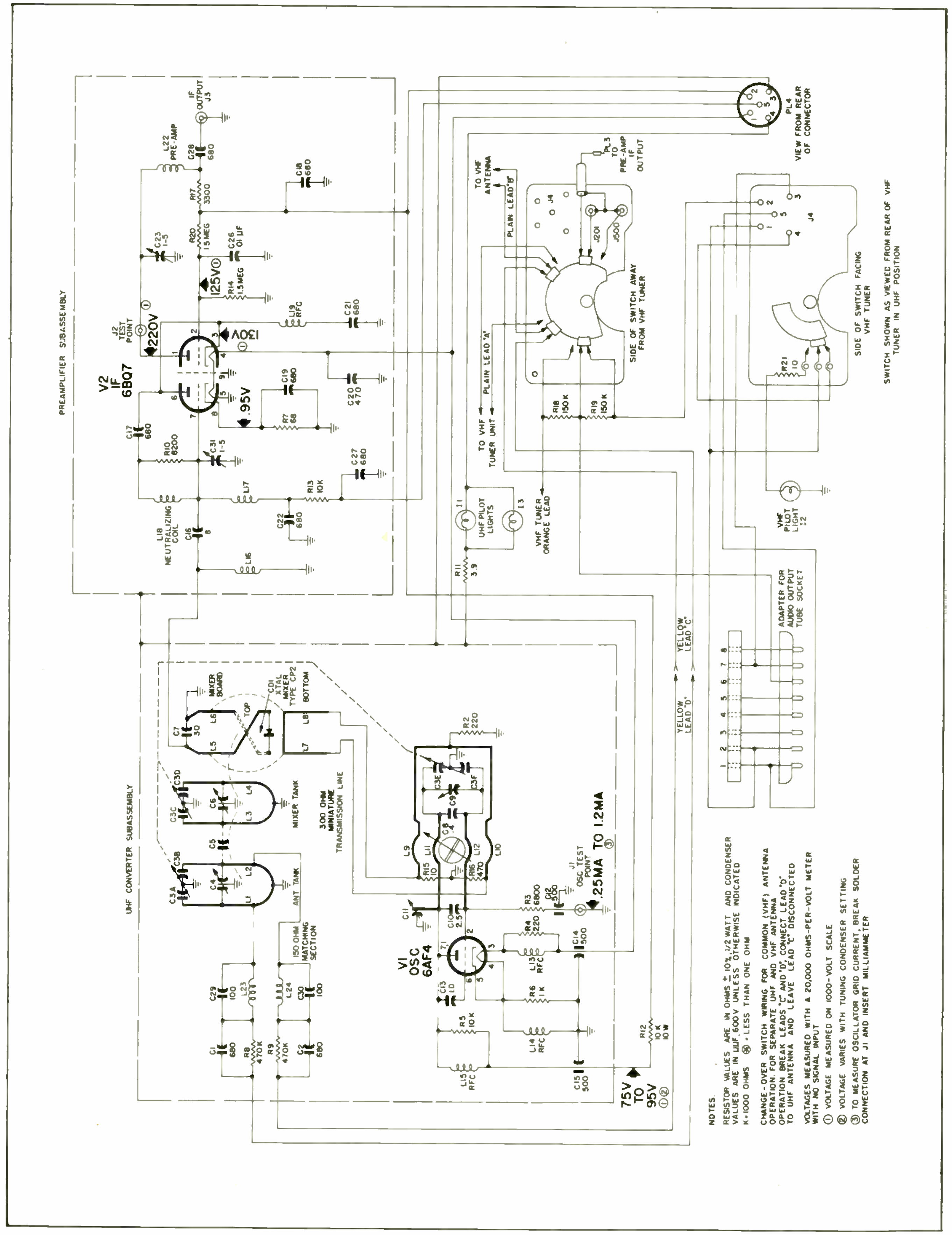
When the VHF Channel Selector is turned to any VHF position, the change-over switch places a 150,000-ohm resistor in series with the UHF local-oscillator plate circuit, which drops the voltage applied to the plate, and disables the oscillator. The switch also connects the antenna to the VHF tuner, turns off the UHF pilot lights, and turns on the VHF pilot light.

ADAPTER CABLES AND PLUGS

The adapter plugs shown in the schematic diagram are not used in factory-installed units; the cables are wired directly into the chassis at the proper places. The plugs are used only in field-installed units. (Refer to the installation instructions for the proper method of inserting and connecting all plugs and cables.)

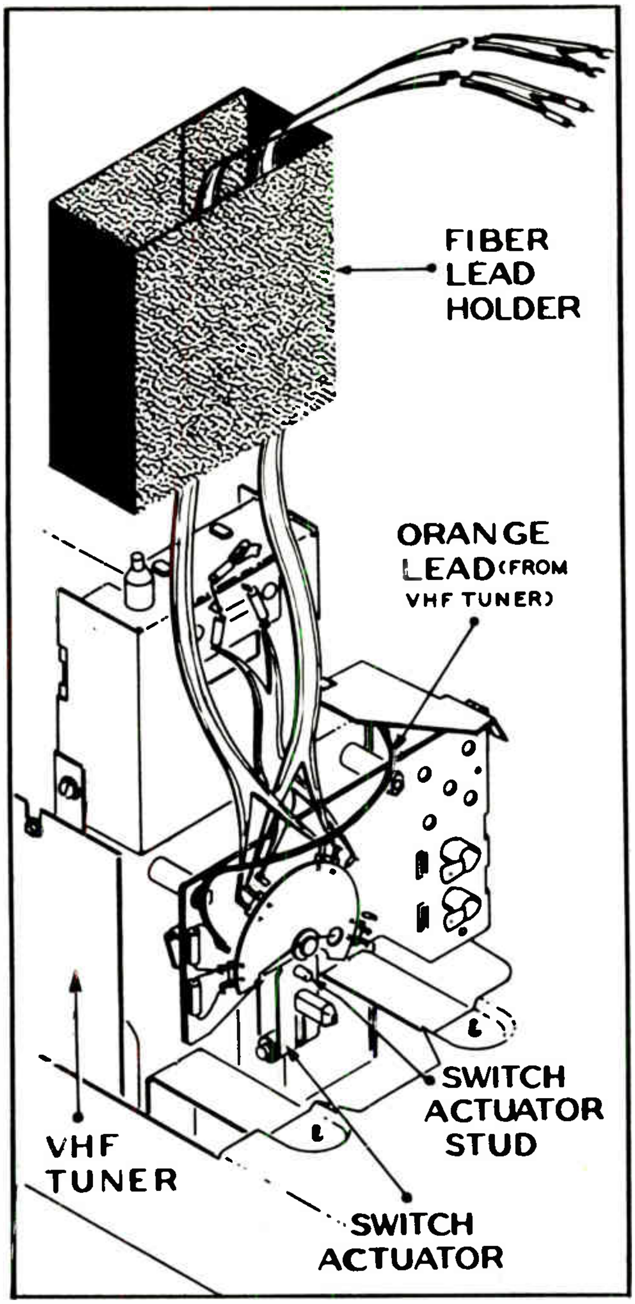
PLANETARY DRIVE

The UHF tuner is tuned by means of a 3-gang tuning condenser, which is driven through a specially designed planetary drive. The planetary drive is constructed so that fine tuning and coarse tuning can be accomplished with a single control knob. The tuning shaft is coupled to the driving shaft through three steel balls, which form a planetary drive that produces a slow rotation for fine tuning. See figure 38. After rotating 180 degrees with the tuning shaft, a pin engages the driving shaft, and the two shafts are direct-coupled, for coarse tuning. To re-engage the planetary drive for fine tuning, it is only necessary to reverse the direction of the rotation. The dial pointer



TP3-863

Figure 37. Philco UHF Tuner-Adapter UT22, Part No. 43-6703, Schematic Diagram



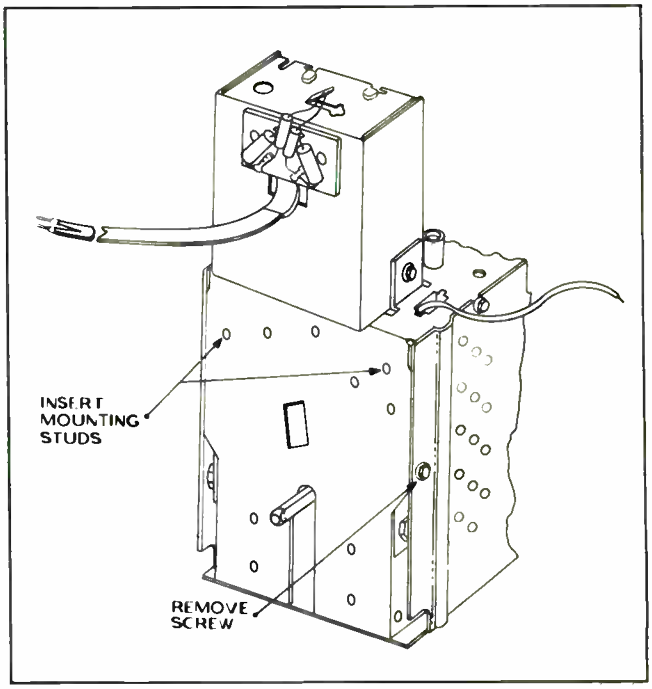
TP3-760

Figure 44. Change-Over Switch, Switch Actuator, and Lead-Dress Details

is connected to the tuning gang through a cord drive, and indicates the channel number to which the tuner is tuned.

ALIGNMENT AND REPAIRS

The frequencies at which the Tuner-Adapter operates are extremely high; therefore, it is necessary that the utmost care be taken to safeguard against upsetting the delicate adjustments of the tuner. It is recommended that the serviceman make only minor repairs to the tuner, such as replacement of the tube or crystal and the wiring of external leads. The



TP3-793

Figure 45. Rear View of VHF Tuner

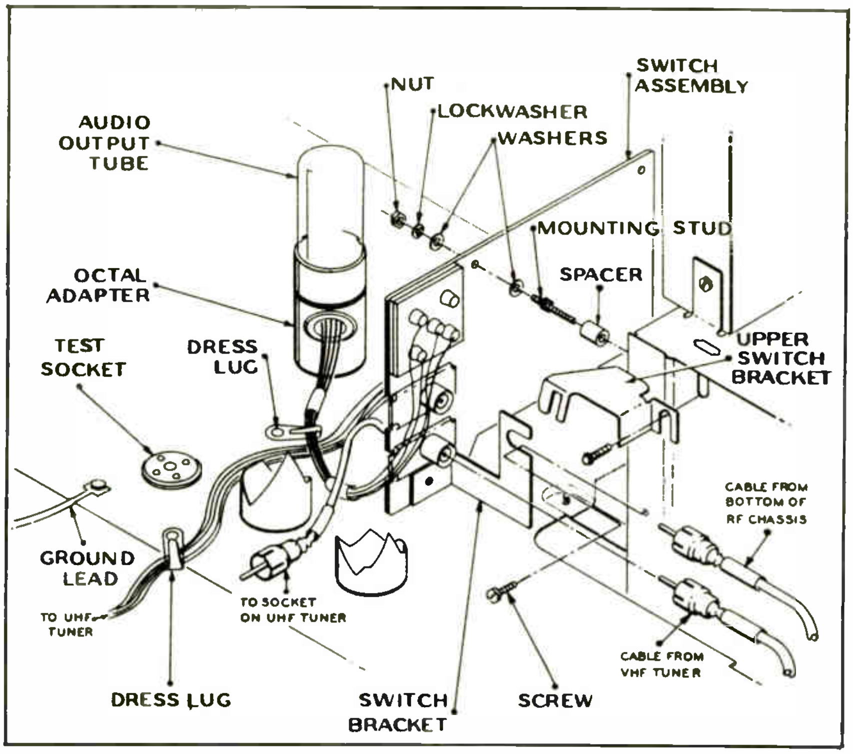
Tuner-Adapter should be returned to the factory for alignment or major repairs, unless the serviceman is properly equipped to perform these jobs. In general, a good rule to follow is not to remove the cover of the Tuner-Adapter, unless so equipped.

> NOTE: Replacing the tube with a new one may detune the tuner. If this occurs, try a number of tubes until one is found that will provide the most satisfactory performance.

INSTALLATION INSTRUCTIONS

To install the UHF Tuner-Adapter on the r-f chassis, proceed as follows:

1. Remove the cabinet back and r-f chassis from the cabinet; then remove the nameplate on the control panel by pushing it out from inside the cabinet.
2. Insert the dial scale and bezel assembly into the hole provided in the cabinet. Fasten the assembly in place with the two nuts provided.
3. Remove the UHF tuner assembly from the mounting board with which it was shipped. Keep the three screws for mounting the tuner in the cabinet.
4. Remove the coaxial cables from the two sockets at the side of the VHF tuner. Remove the bracket and socket assembly (J500 and J201) from the back of the VHF tuner, and discard them.
5. Place the switch-actuator assembly on the shaft extending from the rear of the VHF tuner so that the switch-actuator stud points away from the tuner. See figure 44. Place the spacers on the mounting studs



TP3-795

Figure 46. Change-Over Switch Mounting Details and Lead-Dress Details

and attach to the rear of the VHF tuner on the r-f chassis. See figure 45.

6. Remove the screw on the side of the VHF tuner, as shown in figure 41. Place the switch assembly on the two mounting studs, and fasten it in place with the flat washers, lock washers, and nuts provided. See figure 46. Fasten the upper switch bracket in place as shown in figure 46.

7. Put the VHF Channel Selector in the Channel 2 position. Rotate the switch actuator clockwise (as viewed from the rear of the VHF tuner) on the tuner shaft until the actuator touches the fiber cam on the change-over switch. Fasten the switch actuator in this position. Rotate the Channel Selector to the UHF position. Check the switch operation to make sure that the switch is thrown properly. Rotate the Channel Selector to Channel 13 position and check the switch operation to make sure that the switch is not thrown in this position. Fasten the lower switch bracket to the side of the VHF tuner with the screw removed in step 6. Lubricate the switch-actuator stud and switch cam with cup grease.

8. Remove the audio-output tube from its socket, and insert the adapter plug into the socket. Insert the tube into the adapter. See figure 46.

9. Insert the coaxial cable from the VHF tuner into the bottom socket on the change-over switch. Insert the coaxial cable from the r-f chassis into the top socket on the switch. See figure 46.

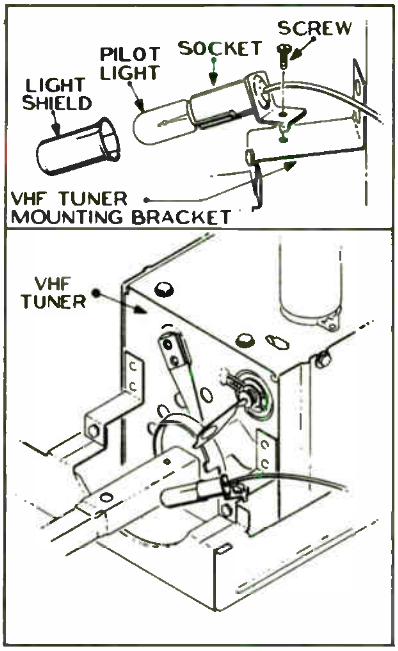
10. Pull the orange lead from the VHF tuner up out of the r-f chassis, and cut it off at the point where it comes through the chassis. Skin the orange lead attached to the VHF tuner, and solder it to the lug on the change-over switch, as shown in figure 44.

CAUTION: The orange lead supplies B plus to the VHF tuner. Tape the loose end to prevent shorting to the chassis.

11. Remove the pilot lamp from the r-f chassis pilot-light socket. Cut the pilot-light lead from the r-f chassis where it passes through the chassis, and discard the socket and lead. Tape up the lead to prevent the possibility of a short circuit. Mount the new pilot-light socket from the change-over switch with the drive screw provided, as shown in figure 47. Insert the pilot light in the socket, and install the shield provided over it.

12. Remove the antenna lead from the VHF tuner, and solder the short lead from the UHF-VHF change-over switch to the VHF tuner terminals from which the antenna lead was removed. Slide the folded fiber lead holder over the tapered-line coil assembly on the VHF tuner, and dress the twin-wire antenna leads through the holder. See figure 44. The fiber holder will prevent the twin-wire leads from touching the tubes on the r-f chassis.

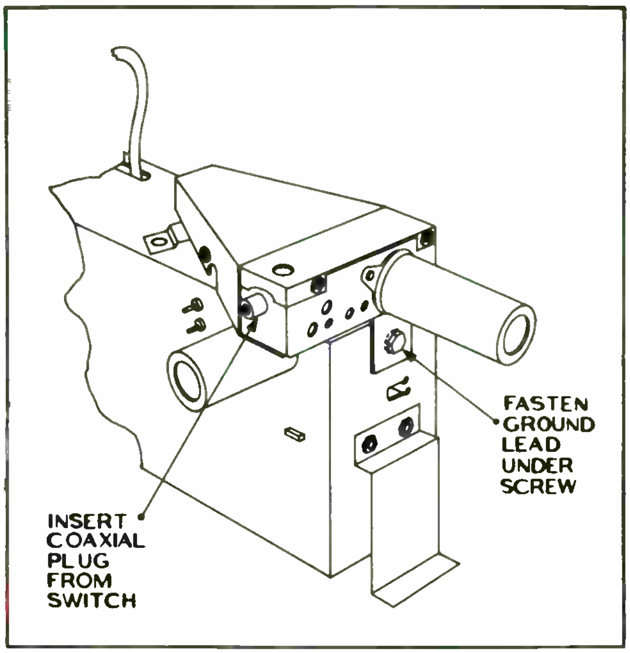
13. Place the UHF tuner in the cabinet between the r-f and deflection chassis, and fasten the UHF



TP3-755

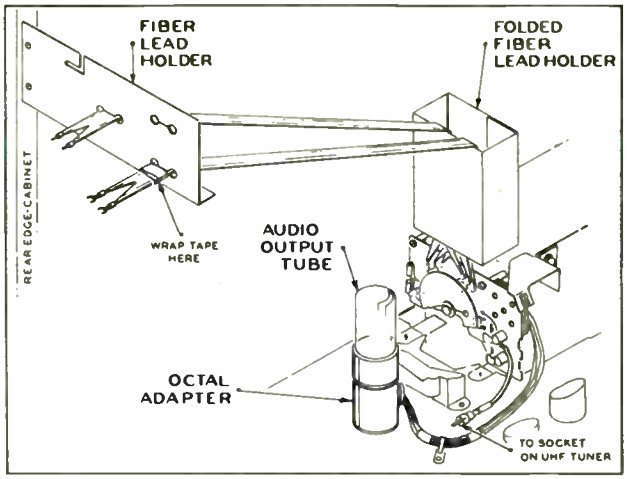
Figure 47. Pilot Light Mounting Details

tuner to the chassis shelf with the three screws removed in step 3. It is important that these screws be tightened securely, so as to hold the UHF tuner in place on the chassis shelf. Turn the UHF tuning shaft to its extreme counterclockwise position, and check the pointer position on the scale. The pointer should be positioned just below the Channel 14 mark on the scale. If the pointer is not properly positioned, loosen the three mounting bolts and move the UHF tuner



TP3-792

Figure 48. UHF Tuner, Showing Location of Ground Lead and Coaxial Socket



TP3-794

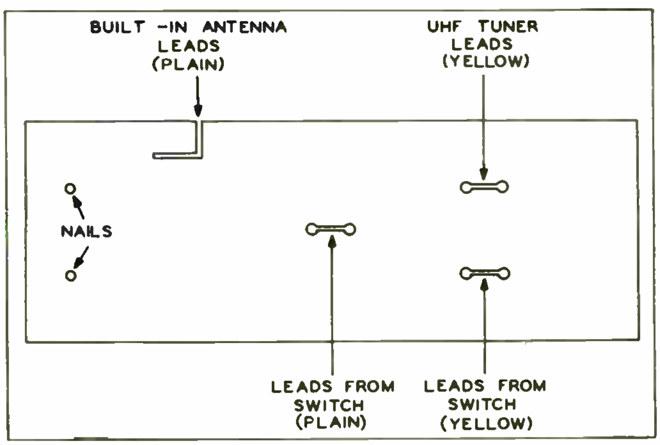
Figure 49. Rear View of VHF Tuner, Showing Lead Dress

assembly to properly position the pointer; then fasten the assembly with the three mounting screws.

14. Fasten the ground lead and the dress lugs to the r-f chassis with drive screws. See figure 46. Install the chassis in the cabinet, and fasten the ground strap under the screw on the UHF tuner as shown in figure 48. Fasten the r-f chassis with the original mounting bolts. Place the original knobs on their shafts, and the felt washer and knob supplied on the UHF tuning shaft.

15. Insert the coaxial plug from the change-over switch into the socket on the UHF tuner. See figure 48. Insert the 5-pin plug from the UHF tuner into the socket on the bracket at the rear of the VHF tuner. Dress the leads under the dress lug as shown in figure 46.

16. Replace the fiber antenna-lead holder with the new holder provided. Fasten the new holder with the nails provided (or screws for metal cabinets), and then pass the twin-wire leads through the holes as shown in figures 49 and 50. Pull the leads through



TP2-3169

Figure 50. Antenna-Lead Holder

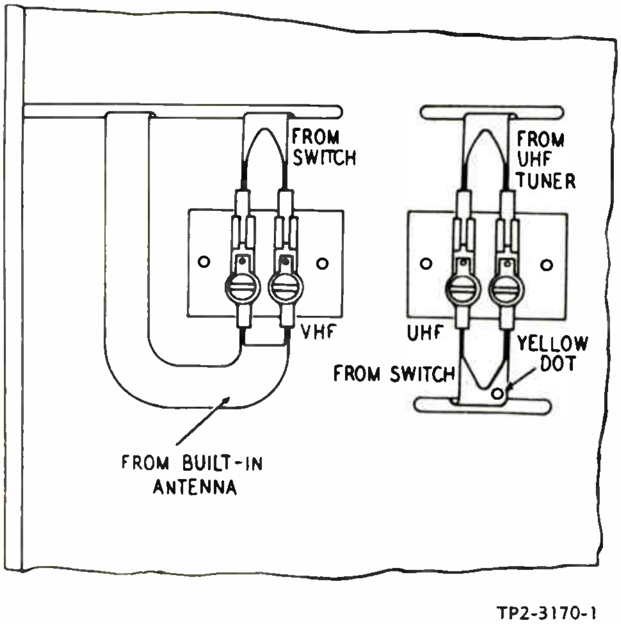


Figure 51. Antenna-Lead Connections, Common Built-In Antenna

the holder until they are tight, making certain that the leads do not contact the tubes or the chassis. Wrap tape around the yellow-marked twin-wire leads with the spade-lug ends, to prevent the leads from passing back through the fiber holder..

17. Fasten the antenna terminal board provided as shown in the illustrations above (figures 51 to 55). Replace the cabinet back, and make the connections as illustrated, according to the type of antenna installation being used.

18. Paste the label provided over the outside-antenna instructions on the cabinet back.

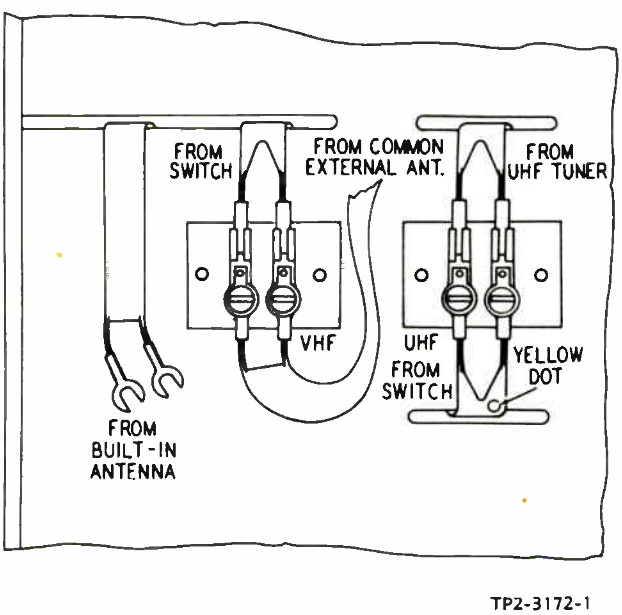


Figure 52. Antenna-Lead Connections, Common External Antenna

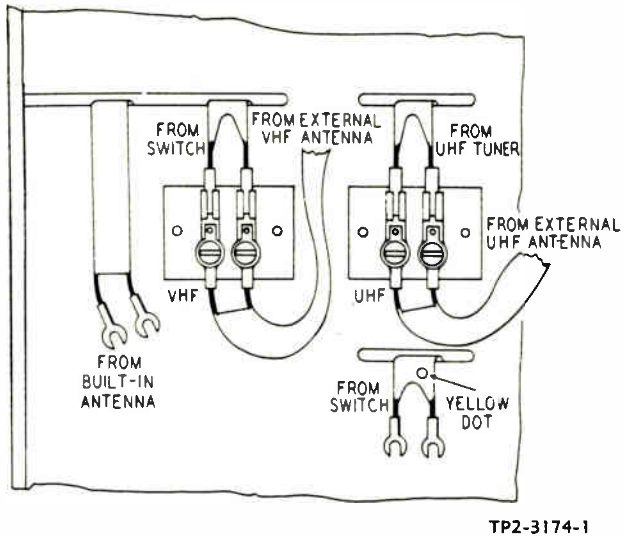


Figure 53. Antenna-Lead Connections, Separate External Antennas

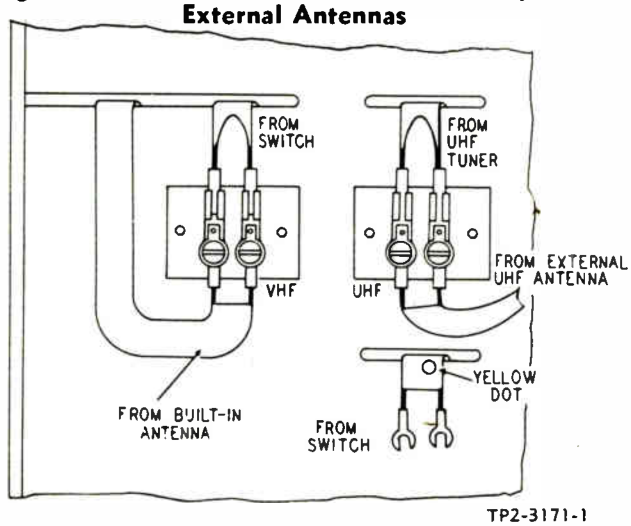


Figure 54. Antenna-Lead Connections, VHF Built-In and UHF External Antennas

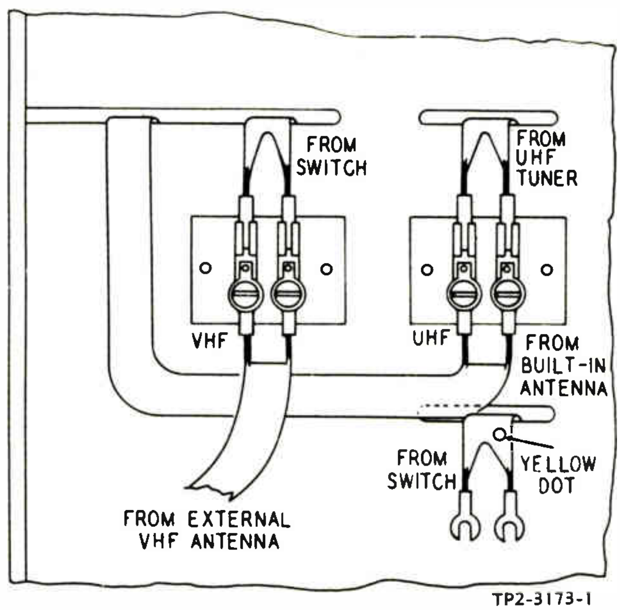
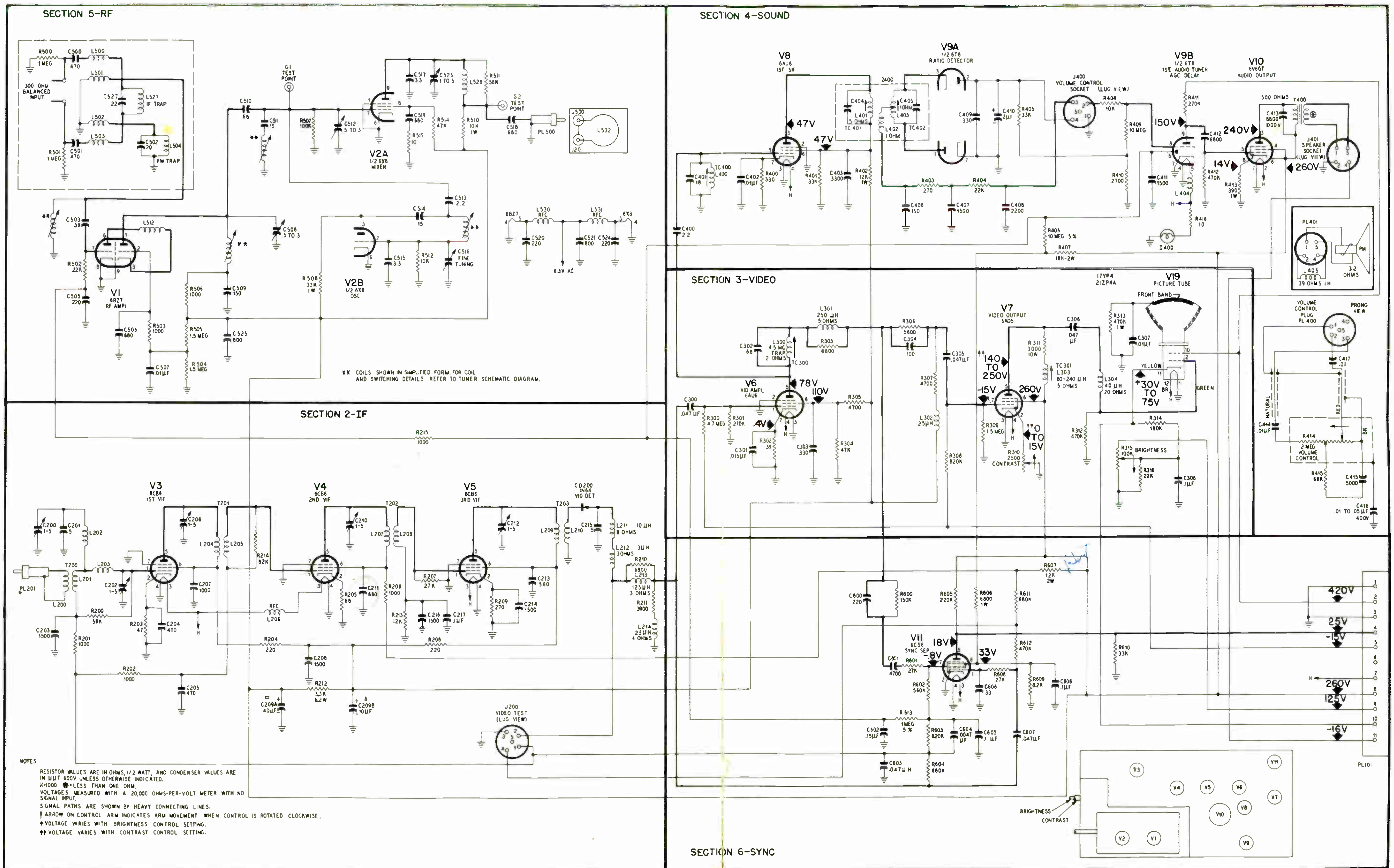
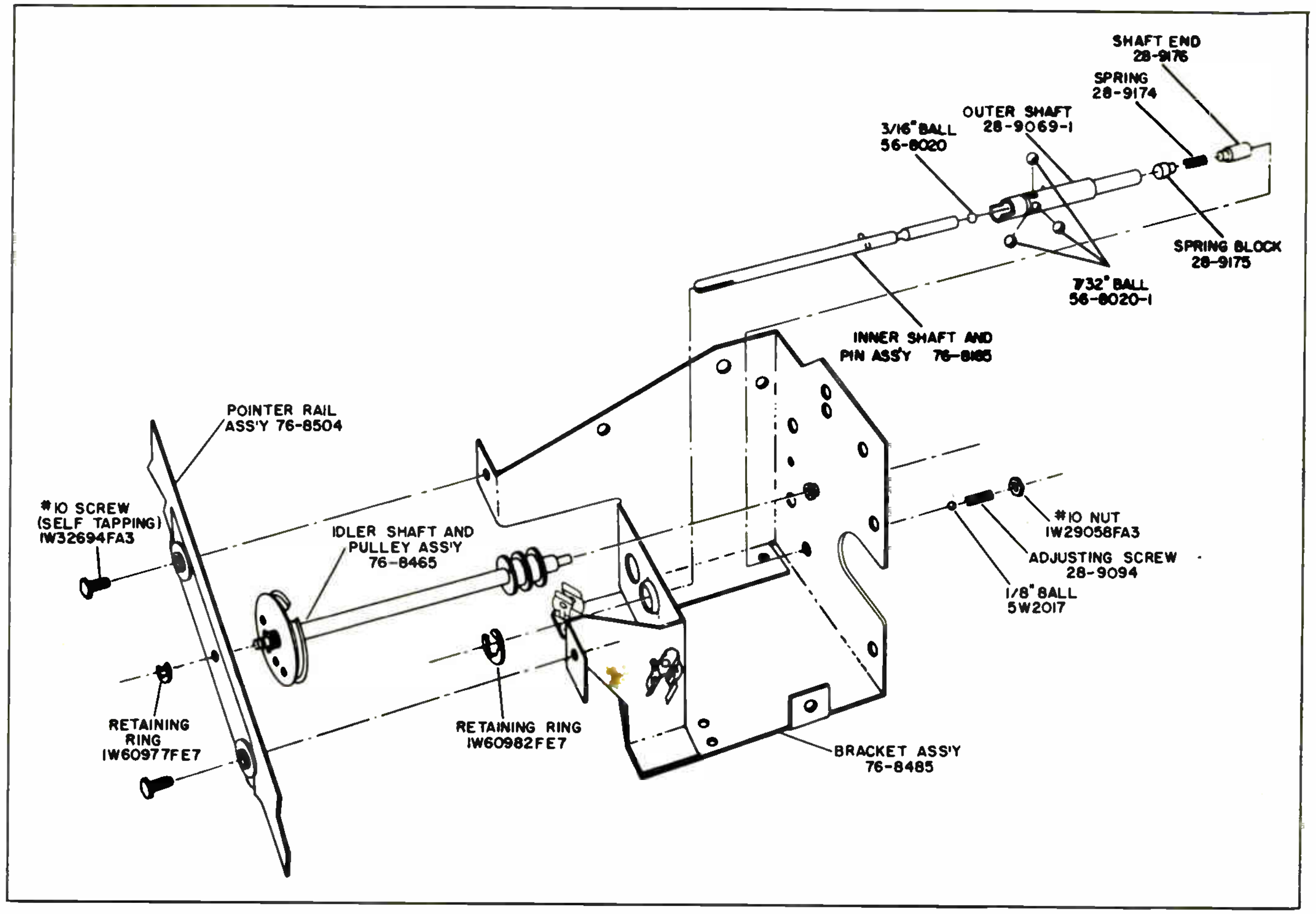


Figure 55. Antenna-Lead Connections, VHF External and UHF Built-In Antennas



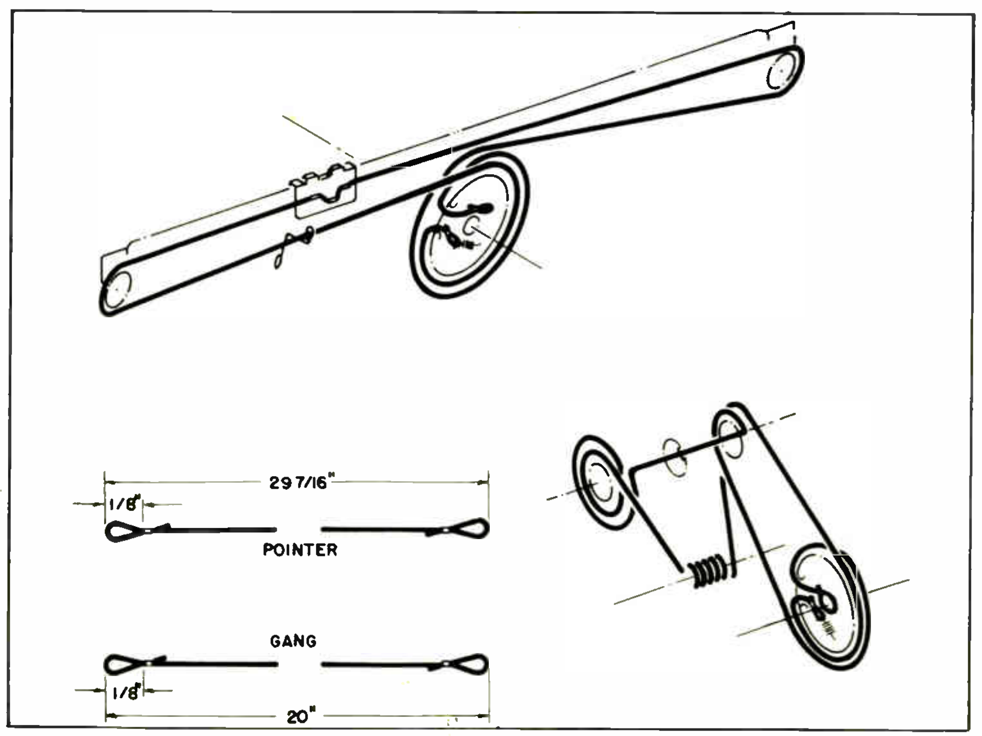
TP3-911

Figure 34. R-F Chassis R-191, Schematic Diagram



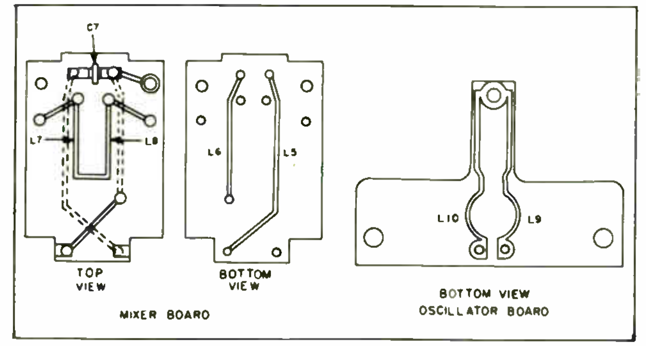
TP3-894

Figure 38. Planetary Assembly, Exploded View, Showing Mechanical Layout



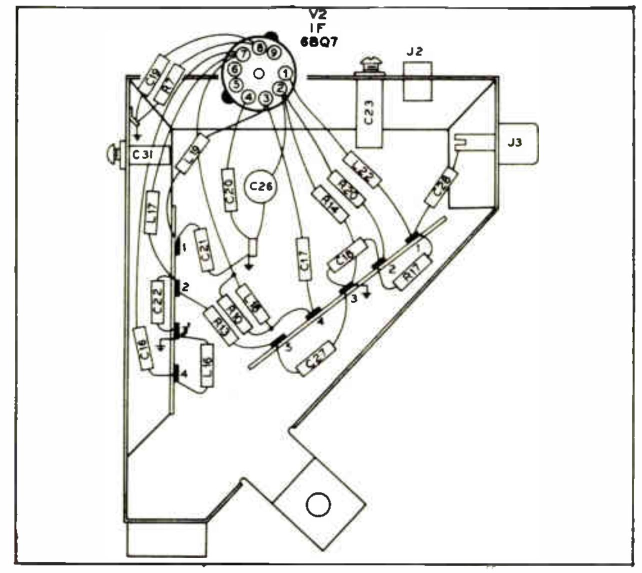
TP3-888

Figure 39. Drive-Cord Stringing Arrangement



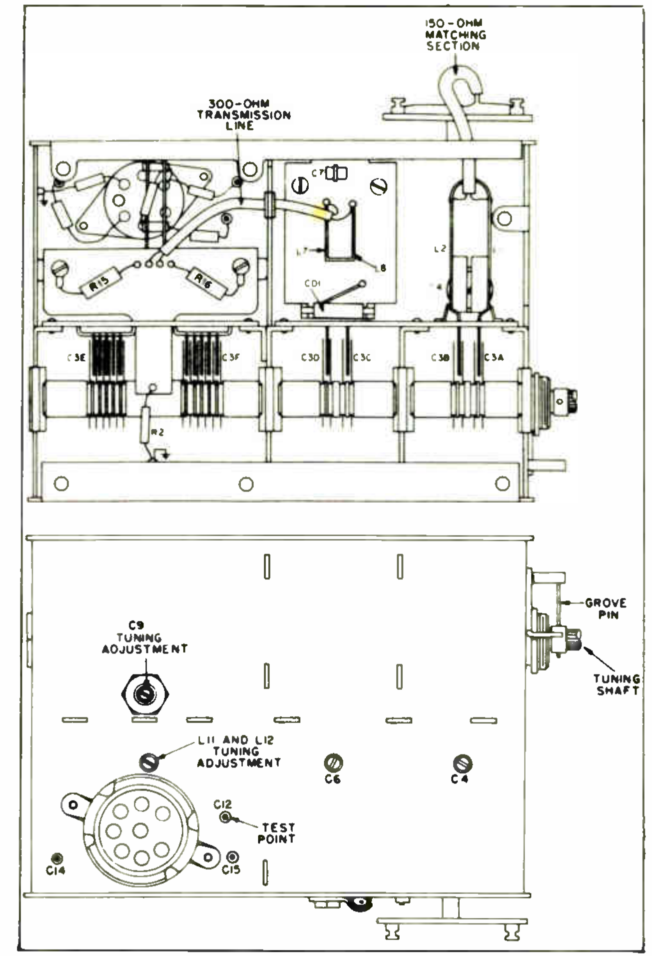
TP2-3175

Figure 40. Oscillator and Mixer Board Layouts



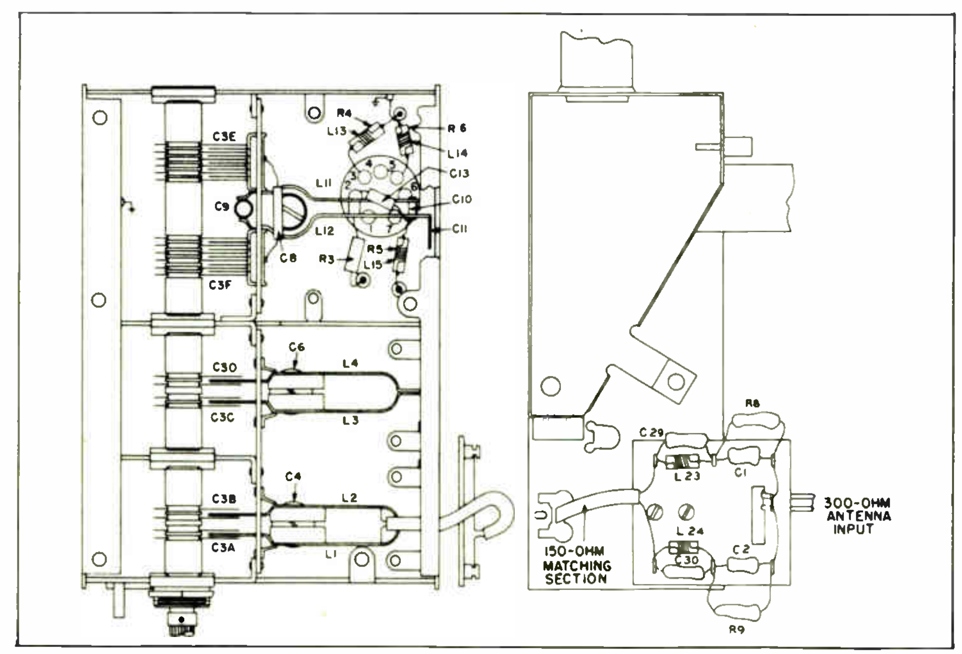
TP3-883

Figure 41. Base View of Preamplifier Assembly of UHF Tuner-Adapter UT22, Part No. 43-6703



TP3-895

Figure 43. Top View and Base View of UHF Tuner-Adapter UT22, Part No. 43-6703, With Board Assemblies



TP3-896

Figure 42. Side View and Base View of UHF Tuner-Adapter UT22, Part No. 43-6703, Without Board Assemblies

REPLACEMENT PARTS LIST

IMPORTANT

General replacement items commonly stocked by the serviceman are omitted from this parts list. All condensers 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 should be ordered in this way rather than by model number. A list of miscellaneous parts is given at the end of the parts list for each chassis type. All parts are symbolized in the schematic diagram and base layout, for identification purposes.

NOTE: Part numbers identified by an asterisk (*) are general replacement items. These numbers may not be identical with those on factory parts. Also, the electrical values of some replacement items may differ from the values indicated in the schematic diagram and parts list. The values substituted in any case are so chosen that the operation will be unchanged. When ordering replacements, use only the "Service Part No."

DEFLECTION CHASSIS D-191

SECTION 1—POWER SUPPLY

Reference Symbol	Description	Service Part No.
C100 and C101	Condensers, electrolytic filter, 120 µf., 150v	30-2568-51
C103	Condenser, electrolytic filter, 80 µf., 300v	30-2584-35
CR100 and CR101	Rectifiers, selenium, 350 ma.	34-8003-16
F100	Fuse, line, 1.6 amperes	45-2656-23
F101	Fuse, heater protective link	Piece of No. 26 wire
J100	Socket, a-c line	27-6240-3
J101	Socket, chassis connecting	27-6274-1
PL100	Plug, chassis, a-c line	Part of a-c line cord ass'y. (see Misc. "A")
PL101	Plug and cable ass'y., chassis connecting	(See Misc. "B")
R100	Resistor, current limiting, 5 ohms, 10 watts	33-3448-5
R102	Resistor, voltage dropping, 4.7 ohms, 1 watt	66-9474340
S100	Switch, off-on	Part of R414
T100	Transformer, filament	32-8590

SECTION 7—VERTICAL SWEEP

Reference Symbol	Description	Service Part No.
C708	Condenser, electrolytic, 20 µf.	Part of C103
L700 and L701	Coils, vertical deflection	Part of deflection yoke (see Misc. "A")
R704	Potentiometer, VERT. HOLD control, 250,000 ohms	Part of R811
R707	Potentiometer, HEIGHT control, 2.5 megohms	33-5565-32
R708	Potentiometer, VERT. LIN. control, 5 megohms	33-5565-31
R712	Resistor, vertical output decoupling, 2200 ohms, 5 watts	33-1335-97
T700	Transformer, vertical oscillator	32-8431-2
T701	Transformer, vertical output	32-8625

SECTION 8—HORIZONTAL SWEEP

Reference Symbol	Description	Service Part No.
C805	Condenser, plate by-pass, 82 µµf.	60-00825317
C807	Condenser, coupling, 390 µµf.	60-10395417
C808	Condenser, saw-tooth forming, 390 µµf.	60-10395417
C813	Condenser, damping, 68 µµf., 2000v	30-1246-1*
C815A	Condenser, electrolytic, 10 µf., 300v	Part of C103
C815B	Condenser, electrolytic, 20 µf., 475v	Part of C103
J800	Socket, deflection-yoke connector	27-6274-8
L800	Coil, horizontal stabilizing, 30 to 80 mh.	32-4557
L801 and L802	Coils, horizontal deflection	Part of deflection yoke (see Misc. "A")
L803	Coil, r-f choke, damper cathode	32-4112-24
L804	Coil, r-f choke, damper plate	32-4112-24
L805	Coil, r-f choke, horizontal-output plate	Part of T800
R810	Potentiometer, HORIZ. OSC. FREQ. control, 250,000 ohms	33-5565-17
PL800	Plug and cable ass'y., deflection (17" picture tube)	41-4086-18
	(21" picture tube)	41-4086-25
R812	Resistor, feedback coupling, 39,000 ohms, 1 watt	66-3394340
R811	Potentiometer, HORIZ. HOLD control, 50,000 ohms	33-5563-50
R818	Resistor, screen-supply divider, 5000 ohms, 5 watts	33-1335-101
R816	Potentiometer, WIDTH control, 12,500 ohms, 2 watts	33-5546-41
R819	Resistor, screen-supply divider, 82,000 ohms, 1 watt	66-3824340
R820	Resistor, B plus boost, filter, 47,000 ohms, 1 watt	66-3474340
R822	Resistor, feedback coupling, 39,000 ohms, 1 watt	66-3394340
T800	Transformer, horizontal output	32-8624

REPLACEMENT PARTS LIST (Cont.)

DEFLECTION CHASSIS D-191 (Cont.)

MISCELLANEOUS "A"

Description	Service Part No.
Arm and magnet ass'y., picture tube	76-6594
Beam bender	76-6077-2
Cable assembly, volume control	41-4136-3
Cable and plug ass'y., deflection (17" picture tube)	41-4086-18
Cable and plug ass'y., deflection (21" picture tube)	41-4086-25
Cable, high voltage	AD-2631
Cord, a-c line	41-3865
Deflection-yoke ass'y.	32-9648
Focus ass'y., p.m.	76-6126-4

Description	Service Part No.
Insulator, electrolytic condenser mtg.	27-9508-1
Shield, h.v. corona	56-9684
Socket, damper (6AX4GT)	27-6174-7
Socket, high-voltage rectifier (1B3GT) ...	27-6290-1
Socket, horizontal oscillator (12AU7)	76-6115-1
Socket, horizontal output (6BQ6GT)	27-6174
Socket, horizontal phase comparer (6AL5)	27-6203-12
Socket, vertical oscillator-phase splitter (12AU7)	27-6203-16
Socket, vertical output (12B4)	76-6115-2
Spring, high-voltage cable	28-9137

R-F CHASSIS R-191

SECTION 2—VIDEO I.F.

Reference Symbol	Description	Service Part No.
C200	Condenser, trimmer, 1—5 $\mu\mu$f.	31-6520-9
C201	Condenser, trap, 5 $\mu\mu$f.	30-1224-28
C202	Condenser, 1st i-f tuning, 1—5 $\mu\mu$f.	31-6520-9
C204	Condenser, cathode by-pass, 470 $\mu\mu$f.	30-1225-18
C205	Condenser, a-g-c decoupling, 470 $\mu\mu$f.	30-1225-18
C206	Condenser, 1st i-f plate tuning, 1—5 $\mu\mu$f.	31-6520-9
C209	Condenser, electrolytic	30-2584-33
C209A	Condenser, filter, 40 μf., 300v	Part of C209
C209B	Condenser, decoupling, filter, 10 μf., 300v	Part of C209
C210	Condenser, 2nd i-f plate tuning, 1—5 $\mu\mu$f.	31-6520-9
C211	Condenser, screen by-pass, 680 $\mu\mu$f.	62-168001001
C212	Condenser, 3rd i-f plate tuning, 1—5 $\mu\mu$f.	31-6520-9
C213	Condenser, screen by-pass, 560 $\mu\mu$f.	62-156001011
C215	Condenser, detector by-pass, 5 $\mu\mu$f.	30-1224-28
CD200	Crystal, video detector 1N64..	34-8022
J200	Socket, video test	27-6273
J201	Socket, tuner to i-f coupling..	Part of connector ass'y. (see Misc. "C")
L200 and L201	Coils, tuner coupling	Part of T200
L202	Coil, trap	32-4597-2
L203	Coil, 1st i-f grid	32-4548-12
L204 and L205	Coils, coupling	Part of T201
L206	Coil, filament choke	32-4112-15
L207 and L208	Coils, coupling	Part of T202
L209 and L210	Coils, coupling	Part of T203

SECTION 2—VIDEO I.F. (Cont.)

Reference Symbol	Description	Service Part No.
L211	Coil, series peaking, 10 μh...	32-4422-27
L212	Coil, series peaking, 3 μh....	
L213	Coil, series peaking, 125 μh..	32-4480-8
L214	Coil, video peaking, 250 μh..	32-4480-4
PL201	Plug, tuner link	Part of cable and plug ass'y. (see Misc. "B")
R212	Resistor, voltage dropping, 3300 ohms, 6.2 watts	33-3446-11
T200	Transformer, video i-f input .	32-4599-1
T201	Transformer, 1st video i-f plate	32-4598-4
T202	Transformer, 2nd video i-f plate	32-4598
T203	Transformer, 3rd video i-f plate	32-4598-2

SECTION 3—VIDEO

Reference Symbol	Description	Service Part No.
C302	Condenser, 4.5-mc. trap, 68 $\mu\mu$f.	62-068409001
C303	Condenser, screen by-pass, 330 $\mu\mu$f.	62-133001001
C304	Condenser, by-pass, 100 $\mu\mu$f. .	62-110409001
L300	Coil, 4.5-mc. trap	32-4463-2
L301	Coil, series peaking, 250 μh. .	32-4480-4
L302	Coil, shunt peaking, 250 μh. .	32-4480-4
L303	Coil, variable video peaking, 60—240 μh.	32-4467-18
L304	Coil, series peaking, 40 μh...	
L310	Potentiometer, CONTRAST, 2500 ohms	Part of R315
R311	Resistor, plate load, 3000 ohms, 10 watts	33-1335-121
R313	Resistor, picture-tube grounding, 470,000 ohms, 1 watt ..	66-4474340
R315	Potentiometer, BRIGHTNESS, 100,000 ohms	33-5563-51

REPLACEMENT PARTS LIST (Cont.)

R-F CHASSIS R-191 (Cont.)

SECTION 4—SOUND

Reference Symbol	Description	Service Part No.
C400	Condenser, coupling, 2.2 μμf.	30-1221-6
C401	Condenser, fixed trimmer, 18 μμf.	62-018400021
C404	Condenser, fixed trimmer	Part of Z400
C405	Condenser, fixed trimmer	Part of Z400
C406	Condenser, detector balancing, 150 μμf.	62-115001011
C409	Condenser, r-f by-pass, 330 μμf.	62-133001001
C410	Condenser, filter, 2 μf.	30-2417-7
C413	Condenser, plate by-pass, 6800 μμf., 1000v	30-4650-91
I400	Pilot light	34-2068
J400	Socket, volume control	27-6273
J401	Socket, speaker	27-4785-22
L400	Coil, audio take-off	32-4463-9
L401, L402, and L403	Coils, ratio detector	Part of Z400
L404	Coils, ratio detector	32-4112-15
L405	Filter choke, 1 henry, 39 ohms	32-8617
PL400	Plug, volume control	(Part of cable and plug ass'y. (see Misc. "A")
PL401	Plug, speaker	Part of speaker cable ass'y. (see cabinet parts)
R400	Resistor, cathode bias, 390 ohms, 1 watt	66-1394340
R402	Resistor, screen dropping, 12,000 ohms, 1 watt	66-3124340*
R407	Resistor, voltage dropping, 18,000 ohms, 2 watts	66-3185340
R413	Resistor, cathode bias, 390 ohms, 1 watt	66-1394340
R414	Potentiometer, VOLUME control, 2 megohms	33-5564-14
T400	Transformer, audio output	32-8629
Z400	Transformer, ratio detector	32-4450-6A

SECTION 6—SYNC

Reference Symbol	Description	Service Part No.
C600	Condenser, by-pass, 220 μμf.	62-122001001
R606	Resistor, voltage divider, 6800 ohms, 1 watt	66-2684340
R607	Resistor, decoupling, 12,000 ohms, 2 watts	66-3125340
R613	Resistor, voltage divider, 1 megohm, ½ watt, ±5%	66-5108240

MISCELLANEOUS "B"

Description	Service Part No.
Cable and plug ass'y., chassis connecting	41-4146-10*
Cable and plug, i.f. to tuner	41-3754-55
Cable and socket ass'y., picture tube	41-3964-19
Cable and socket ass'y., pilot light	27-6233-6*

MISCELLANEOUS "B" (Cont.)

Description	Service Part No.
Insulator, CONTRAST and BRIGHTNESS control	54-8488
Shield, tube (6T8)	56-5629-5
Shield, tube (6CB6)	56-5629FA3
Shield, pilot light	56-9074-2FA3
Socket and base ass'y. (6CB6)	27-6203-14
Socket and base ass'y. (6T8)	27-6203-18
Socket, tube, 7-pin miniature	27-6203
Socket, tube, 7-pin miniature (6AQ5)	27-6294
Socket, tube, 9-pin miniature	27-6203-6*
Socket, tube, octal	27-6174

TV TUNER, PART No. 76-8400

Reference Symbol	Description	Service Part No.
C500 and C501	Condensers, antenna isolating, 470 μμf.	30-1225-18
C502	Condenser, FM trap, 20 μμf.	30-1251-4
C503	Condenser, grid coupling, 39 μμf.	62-039403011
C505	Condenser, a-g-c by-pass, 220 μμf.	62-122001011
C506	Condenser, grid by-pass, 680 μμf.	62-168001011
C507	Condenser, decoupling, .01 μf.	30-1238-6
C508	Condenser, trimmer, r-f plate, .5—3 μμf.	31-6520-3
C509	Condenser, by-pass, 150 μμf.	62-115001011
C510	Condenser, coupling, .68 μμf.	30-1221-11
C511	Condenser, coupling, 15 μμf.	62-015409011
C512	Condenser, trimmer, mixer grid, .5—3 μμf.	31-6520-7
C513	Condenser, oscillator coupling, 2.2 μμf.	30-1221-6
C514	Condenser, grid blocking, 15 μμf.	30-1224-113
C515	Condenser, fixed trimmer, 3.3 μμf.	30-1224-114
C516	Condenser, FINE TUNING, plastic tube	76-6935-1
C517	Condenser, by-pass, 3.3 μμf.	30-1224-58
C518	Condenser, output coupling, 680 μμf.	62-168001021
C519	Condenser, screen by-pass, 680 μμf.	62-168001011
C520	Condenser, filament by-pass, 220 μμf.	62-122001011
C521	Condenser, filament by-pass, 800 μμf.	30-1238-7
C522	Condenser, coupling, 3.9 μμf.	30-1221-14
C523	Condenser, coupling, .82 μμf.	30-1221-10
C524	Condenser, filament by-pass, 220 μμf.	62-122001011
C525	Condenser, by-pass, 800 μμf.	30-1238-7
C527	Condenser, i-f trap, 22 μμf.	Part of L527

REPLACEMENT PARTS LIST (Cont.)

R-F CHASSIS R-191 (Cont.)

TV TUNER, PART No. 76-8400 (Cont.)

Reference Symbol	Description	Service Part No.
J500	Socket, tuner link	Part of Connector ass'y., tuner to i-f (see Misc. "C")
L500, L501, L502, and L503	Coils, tapered line	32-4432-3
L504	Coil, FM trap	32-4550-3
L505 to L511 incl.	Coils, antenna tuning	Part of WS500A
L512	Coil, r-f coupling	312-5145-22
L513 to L519 incl.	Coils, r-f plate tuning	Part of WS500B
L520 to L526 incl.	Coils, mixer grid tuning	Part of WS500C
L527	Coil, i-f trap	32-4552-1
L528	Coil, mixer plate	312-5151-10
L530	Coil, filament choke	32-4550-1
L531	Coil, filament choke	32-4550-11
L532 to L538 incl.	Coils, oscillator tuning	Part of WS500D
PL500	Plug, tuner link	Part of Cable and Plug ass'y. (see Misc. "C")
R508	Resistor, oscillator feed, 33,000 ohms	66-3334340
R510	Resistor, mixer plate feed, 10,000 ohms, 1 watt	66-3104540
WS500A(F) and WS500A(R)	Switch, wafer, antenna	76-8410
WS500B(F) and WS500B(R)	Switch, wafer, r-f plate	76-8409
WS500C(F) and WS500C(R)	Switch, wafer, mixer grid	76-8408
WS500D(F) and WS500D(R)	Switch, wafer, oscillator	76-8407
Z500	Tapered line ass'y.	76-8417

MISCELLANEOUS "C"

Description	Service Part No.
Cam and shaft, fine tuning	76-6936-3
Cable and plug, tuner to i-f	41-3754-55
Connector ass'y., tuner to i-f	76-8521
Coupling, fine tuning shaft	54-4912-2
Detent, ball	56-8020
"E" Washer, detent (in back of fine tuning cam)	1W60980FA3

MISCELLANEOUS "C" (Cont.)

Description	Service Part No.
Front panel ass'y.	76-8395
Hairpin, plunger grounding	56-9858
Hairpin, plunger-pivot lever-pin	1W42704FA3
Pivot pin, lever	56-9149
Lever, plunger	56-9148
Plunger	56-8034-1
Retaining ring	1W61043
Shaft	76-6914-4
Shaft extension	56-8358
Shield, tube, 9-pin miniature	56-5629-5
Socket, tube, 9-pin miniature	27-6203-21
Spring, shaft	56-8023
Spring, plunger	56-9628
Spring, detent index	56-9158
Terminal panel, antenna	76-5504-2
Washer, detent (in back of fine tuning cam)	56-9351
Washer, fiber, fine tuning plunger	27-4109-13
Washer, spring, plunger lever	56-9157

CONNECTING CABLES, PLUGS, AND SOCKETS

Reference Symbol	Description	Service Part No.
J100	Socket, a-c line	27-6240-3
J101	Socket, chassis connecting	27-6274-1
J200	Socket, video test	27-6273
J400	Socket, volume control	27-6273
J401	Socket, speaker	27-4785-22
J800	Socket, deflection-yoke connector	27-6274-8
PL100	Plug and line cord ass'y.	41-3865
PL101	Plug and cable ass'y., chassis connecting	41-4146-10
PL400	Plug and cable ass'y., volume control	41-4136-3
PL401	**Plug and cable ass'y., speaker	See cabinet parts list
PL800	Plug and cable ass'y., deflection	
	(17" picture tube)	41-4086-18
	(21" picture tube)	41-4086-25
	Cable, high voltage	AD-2631
	Cable and socket ass'y., picture tube	41-3964-19
	Cable and socket ass'y., pilot light	27-6233-103

** NOTE: The length of this cable varies with cabinet and speaker size. For Service Part No. refer to cabinet parts list.

REPLACEMENT PARTS LIST (Cont.)

UHF TUNER-ADAPTER UT22, PART No. 43-6703

Reference Symbol	Description	Service Part No.
C1 and C2	Condenser, antenna input, 680 μμf.	Part of panel filter
C3	Condenser, tuning:	
	Shaft and rotor ass'y.	76-7481-4
C3A	Stator, r-f, l.h.	56-9595
C3B	Stator, r-f, r.h.	56-9595-1
C3C	Stator, r-f, l.h.	56-9595
C3D	Stator, r-f, r.h.	56-9595-1
C3E	Stator ass'y., oscillator	76-7479
C3F	Stator ass'y., oscillator	76-7479
C4	Condenser, padder ass'y., r-f.	76-7472
C5	Condenser	Stray capacitance
C6	Condenser, padder ass'y., r-f.	76-7472
C7	Condenser, mixer tank, 30 μμf.	Part of board ass'y., mixer
C8	Condenser, temperature compensating, .4 μμf.	30-1224-109
C9	Condenser, oscillator trimmer	31-6525
C10	Condenser, oscillator tank, 2.5 μμf.	Part of tank ass'y., osc.
C11	Condenser, by-pass	Part of tank ass'y., osc.
C12	Condenser, grid by-pass, 500 μμf.	30-1245-3
C13	Condenser, feedback, 1.0 μμf.	30-1238-2
C14	Condenser, heater by-pass, 500 μμf.	30-1245-3
C15	Condenser, plate by-pass, 500 μμf.	30-1245-3
C16	Condenser, input coupling, 8 μμf.	30-1224-46
C17	Condenser, neutralizing, 680 μμf.	62-168001001
C18	Condenser, decoupling, 680 μμf.	62-168001001
C19	Condenser, cathode by-pass, 680 μμf.	62-168001001
C20	Condenser, filament by-pass, 470 μμf.	62-147001011
C21	Condenser, cathode tuning, 680 μμf.	62-168001001
C22	Condenser, grid by-pass, 680 μμf.	62-168001001
C23	Condenser, plate tuning, 1—5 μμf.	31-6520-10
C26	Condenser, grid by-pass, .01 μf.	30-1238-2
C27	Condenser, decoupling, 680 μμf.	62-168001001
C28	Condenser, output coupling, 680 μμf.	62-168001001
C29 and C30	Condenser, antenna input, 100 μμf.	30-1225-13
C31	Condenser, grid tuning, 1—5 μμf.	31-6520-10
CD1	Crystal detector, mixer circuit	34-8026
I1 and I3	Lamps, pilot, UHF	34-2068
I2	Lamp, pilot, VHF	34-2068
L1	Inductor, r-f, l.h.	Part of C3A-Stator

Reference Symbol	Description	Service Part No.
L2	Inductor, r-f, r.h.	Part of C3B-Stator
L3	Inductor, r-f, l.h.	Part of C3C-Stator
L4	Inductor, r-f, r.h.	Part of C3D-Stator
L5 and L6	Inductors, crystal mixer	Part of board ass'y., mixer
L7 and L8	Inductors, oscillator coupling	Part of board ass'y., mixer
L9 and L10	Inductors, oscillator	Part of board ass'y., osc.
L11 and L12	Inductors, oscillator	76-7627
L13	Choke, heater decoupling	32-4556-3
L14	Choke, heater-cathode decoupling	32-4556-4
L15	Choke, plate decoupling	32-4556-2
L16	Coil, input tuning, primary	32-4597-7
L17	Coil, input tuning, secondary.	32-4597-9
L18	Coil, neutralizing	32-4597-4
L19	Choke, cathode tuning	32-4597-5
L22	Choke, plate decoupling	32-4556-2
L23 and L24	Coils, i-f trap	Part of panel filter
R2	Resistor, damping, 220 ohms	66-1228340
R3	Resistor, decoupling, 6800 ohms	66-2688340
R4	Resistor, decoupling, 220 ohms	Part of L13
R5	Resistor, decoupling, 10,000 ohms	Part of L15
R6	Resistor, cathode bias, 1000 ohms	66-2104240
R7	Resistor, cathode bias, 68 ohms	66-0688340
R8 and R9	Resistor, antenna input, 470,000 ohms	Part of panel filter
R10	Resistor, grid loading, 8200 ohms	66-2828340
R11	Resistor, pilot light, 3.9 ohms	66-9398340
R12	Resistor, B+ dropping, 10,000 ohms, 10 watts	33-1336-58
R13	Resistor, a-g-c decoupling, 10,000 ohms	66-3108340
R14	Resistor, bias divider, 1.5 megohms	66-5158340
R15	Resistor, damping, 10 ohms	66-0108340
R16	Resistor, damping, 470 ohms.	66-1478340
R17	Resistor, plate load, 3300 ohms	66-2338340
R18 and R19	Resistor, tuner disabling, 150,000 ohms	66-4158340
R20	Resistor, bias divider, 1.5 megohms	66-5158340
R21	Resistor, pilot light, 10 ohms.	66-0108340
	Board ass'y., mixer	76-7475-4
	Board ass'y., oscillator	76-7480
	Panel, filter	76-8078
	Tank ass'y., oscillator	76-7627

REPLACEMENT PARTS LIST (Cont.)

UHF TUNER-ADAPTER UT22, PART No. 43-6703 (Cont.)

MISCELLANEOUS ELECTRICAL PARTS

Description	Service Part No.
Adapter cable	41-4120
Connector, twin lead	54-5181
Cable ass'y., pilot light	27-6233-6
Padder ass'y. (L11 and L12 tuning adjustment)	76-8193
Panel, antenna, UHF	76-7097
Switch	42-2008

MECHANICAL PARTS

Description	Service Part No.
Planetary Assembly:	
Ball, 1/8"	5W2017
Ball, 3/16"	56-8020
Ball, 7/32"	56-8020-1
Planetary drive	76-8507
Housing drive	76-8485
Pulley ass'y.	76-8465
Ring, retaining, idler shaft	IW60977FE7
Ring, retaining, shaft drive	IW60982FE7
Shaft, inner end	28-9176
Shaft, outer	28-9069-1
Shaft and pin ass'y., inner	76-8300-1
Screw, adjusting	28-9094
Spring	28-9174
Shaft and Rotor Assembly:	
Ball, bearing (10)	W2510-5
Bearing, front	56-9593
Bearing, rear	56-9609
Nut, front bearing	56-9594
Nut, rear bearing	56-9599

MECHANICAL PARTS (Cont.)

Reference Symbol	Description	Service Part No.
	Nut, insert	W1679-1FA3
	Spring, center (2)	56-9490
	Switch Mounting:	
	Collar stud (2)	28-9126-1
	Lock washer (2)	1W24515FA1
	Nut #8 special (2)	1W20506FA3
	Spacer 3/16" (2)	1W29155FA3
	Washer, fiber (4)	27-4109-29
	Mounting Hardware:	
	Insulator, bottom	27-9437
	Stud, trimount (6)	W2235-7FA9
	Additional Items:	
	Clip, backplate (2)	28-9462
	Foot and insulator	76-8505
	Grommet, feed-through	27-4707
	Grove pin	1W41033FA3
	Knob	54-8508
	Pilot-light assembly	27-6233-103
	Pointer	56-5630-59
	Pointer guide assembly	76-8504
	Power-input cable	41-4141-5
	Pulley, tuner shaft	28-9090
	Ring, retaining, idler shaft	1W60977FE7
	Scale, bezel, and prism ass'y.	76-8524-1
	Screw, pointer rail	1W32694FA3
	Shield, tube, preamplifier	56-5629-5
	Shield, tube, oscillator	56-5629-9
	Socket, 9-pin miniature	27-6203-21
	Spring (3) drive cord	28-9490
	Switch actuator	76-8189-1
	Tuner-preamplifier ass'y.	76-8499

NOTES

[illegible] Vertical control [illegible]
[illegible] shifted [illegible] Vertical
and put [illegible]

PHILCO
Factory-Supervised
Service

Printed in U. S. A.

PHILCO SERVICE

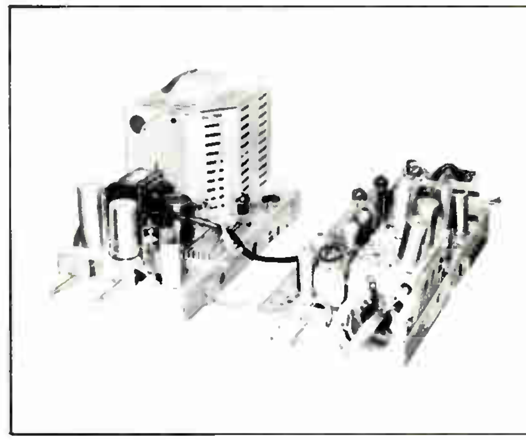
PHILCO Factory-Supervised Service

TELEVISION

Radio

Manual 2

PHILCO TELEVISION SERVICE MANUAL FOR R-F CHASSIS R-201 DEFLECTION CHASSIS D-201 UHF TUNER-ADAPTER UT20B



TP3-1044

TABLE OF CONTENTS

FILE 4 SERVICE INFORMATION FOR PHILCO CHASSIS TYPES R-201, D201 and UT20B PR-2508

CIRCUIT DESCRIPTION

The Philco "B" line, Code 150 television receivers use two chassis, the r-f chassis, R-201, containing the r-f, video, audio, and sync circuits, and the deflection chassis, D-201, containing 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 r-f amplifier, oscillator, and mixer section is built on a separate subchassis. The r-f amplifier uses a 6BZ7 tube, V1. The oscillator and mixer each use one half of a 12AZ7 tube, V2. The output of the mixer is fed to a four-stage, stagger-tuned, i-f amplifier system employing four 6CB6 tubes, V3, V4, V5, and V6. A 1N64 crystal diode is used for the video detector. One half of a 6U8 tube, V7A, is used as the first video amplifier, which drives a 6AQ5 video output amplifier, V8.

Sound i.f. (intercarrier) is obtained by utilizing the beat frequency produced when the 45.75-mc. video carrier and the 41.25-mc. sound 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 the video 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 relative amplitudes of the two carriers are established in the alignment of the receiver. There is sound output only when both the video and sound 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), which is taken from the video detector, is amplified by a 6BA6 tube, V9, and a 6AU6 tube, V10, and is fed to the FM detector, which utilizes two diode sections of a 6T8 tube, V11A. The triode section of the 6T8 tube, V11B, is used as the first audio amplifier. The power amplifier uses a 6V6GT tube, V12.

A-G-C voltage for the video i-f system and the r-f amplifier is obtained from a keyed a-g-c system which uses a 6AU6 tube, V13, as the a-g-c gate. Composite video from the video-amplifier plate circuit, V7A, is fed to the grid of the a-g-c gate tube, while a gating or keying pulse, obtained from a winding on the horizontal-output transformer, located on the deflection chassis, is applied to the plate. The sync-pulse polarity applied to the grid of V13 is positive; therefore, the a-g-c gate can conduct in proportion to the amplitude of the sync-pulse tips if the gating or keying pulse occurs at the same time as the sync. Because the keying or gate pulse is of constant amplitude, approximately 500 volts peak, the amplitude of the sync pulse will determine the amount of conduction in the gate tube. The plate current of the keyed a-g-c gate tube flows through R216, R220, R219, and R218, developing a voltage which is negative with respect to the chassis and whose amplitude is proportional to the plate current. This negative voltage is used to control the gain of the receiver. Since conduction cannot occur in the a-g-c gate tube unless the sync pulse and gating pulse occur at the same time, noise disturbances that occur between sync-pulse intervals cannot affect the a-g-c voltage.

Composite video for the sync circuits is taken from the plate circuit of the video amplifier, V7A. The output of the amplifier is fed to the grid of the noise inverter, one half of a 12AU7 tube, V14B, and to the grid of the sync separator, one half of a 6U8 tube, V7B. The noise inverter is operated with a low value of plate voltage and high bias (applied to the cathode by a voltage-divider network), which keeps the tube beyond cutoff. When the composite video signal is applied to the grid of the noise inverter through C601, the sync appears as positive pulses; noise which could affect the sweep circuits also appears as positive pulses. Harmful noise pulses usually have amplitudes far greater than the sync pulses, and, therefore, drive the grid of the noise inverter positive sufficiently to allow conduction in the noise-inverter plate circuit. To prevent the noise inverter from conducting during the sync-pulse interval, the gated leveler, using one half of a 12AU7 tube, V14A, is employed to clamp the sync pulses below the conduction level of the noise inverter. The gated leveler will conduct only when the sync pulses and gating pulse occur at the same time, thus leveling the noise-inverter input to the sync-pulse level.

The output of the noise inverter consists of negative-going noise pulses. It should be noted that the noise pulses which exceed the sync level have been passed and their polarity reversed by the noise inverter. The output of the noise inverter is now mixed with the composite video and fed to the grid of the sync separator. Since the composite video fed to the grid of the sync separator has positive sync polarity, the positive noise pulses carried with the composite video would be passed by the sync separator; however, the output of the noise inverter consists of these same noise pulses, but they are of opposite polarity; thus, the noise pulses are cancelled. The output of the sync separator contains only the sync pulses which are fed to the deflection chassis through the connecting cable.

The phase splitter, using one half of a 12AU7 tube, V15A, inverts the sync polarity for proper triggering of the vertical oscillator. The vertical sync is separated from the horizontal sync by the integrator circuit, and is fed to the grid of the vertical blocking oscillator, one half of a 12AU7 tube, V15B. The output of the vertical oscillator is amplified by the vertical-output amplifier, using a 12B4 tube, V16. The output of the amplifier is applied to the vertical-deflection coils through the vertical-output transformer.

The phase splitter also supplies horizontal sync to the phase-comparer diodes, using a 6AL5 tube, V17. Two horizontal sync outputs are taken from the phase splitter, one from the cathode, the other from the plate circuit. These two outputs are of opposite polarity, and are fed to the two diodes of the phase comparer, the negative pulses to the cathode of V17B, and the positive pulses to the plate of V17A. A sawtooth voltage is fed to the plate of V17B and the cathode of V17A for comparison of the sync and horizontal-sweep voltages. When the sweep and sync are in phase, no voltage is developed across R800, but when the two signals are out of phase, a voltage is developed. This voltage controls the frequency of the horizontal oscillator, a 12AU7 tube, V18. When the voltage is positive, it increases the frequency of the oscillator; when the voltage is negative, it reduces the frequency of the oscillator. This control voltage holds the horizontal oscillator in phase with the sync signal. The HORIZ. HOLD control, R811, adjusts the horizontal oscillator to the proper frequency, so that it may be controlled by the phase comparer. The output of the horizontal oscillator is fed to the horizontal-output amplifier, which uses a 6BQ6GT tube, V19.

The screen voltage for the horizontal amplifier is supplied from a voltage-divider network. R816, R815 (the WIDTH control), R822, R313 (the BRIGHTNESS control), and R314 are parts of this divider. R815 varies the voltage applied to the screen, thus adjusting for proper picture width. Adjusting R313 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 variation in the second-anode voltage. However, when the control arm of the BRIGHTNESS control, R313, is moved toward ground, a smaller part of the control is shunted by the 22,000-ohm resistor, R314, and the total resistance of the voltage divider is increased. This increase in resistance results in a decrease in the current through the divider, and the screen voltage on the horizontal amplifier is increased proportionately, thus compensating automatically for the increase in beam current in the picture tube. The horizontal amplifier feeds the deflection coils through the horizontal-output transformer. A 6AX4GT tube, V20, is used as the horizontal damper.

The second anode voltage for the picture tube is furnished by a high-voltage winding of the horizontal-output transformer, and is rectified by a 1B3GT high-voltage rectifier tube, V21. 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 from across a filter choke, mounted on the speaker, 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 vertical oscillator and the first anode of the picture tube. Filament voltage for all the tubes except the high-voltage rectifier is supplied by a filament transformer, operating from the power line. Filament voltage for the 1B3GT high-voltage rectifier tube is supplied by a winding on the horizontal-output transformer.

IMPORTANT

A-C LINE ISOLATION

CAUTION: One side of the a-c line is connected to the chassis through C101 and L406. The other side of the a-c line is connected to the chassis through F100, R100, CR100, and C103, 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

VHF TUNING ....Twelve channel, 13-position incremental tuner, covering VHF Television Channels 2 through 13 and UHF position; fine tuning of local oscillator

UHF TUNING ....Continuous tuning, covering UHF Television Channels 14 through 83; fine and coarse tuning

INTERMEDIATE FREQUENCIES
- Video carrier ....45.75 mc.
- Sound (intercarrier) ....4.5 mc.

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

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

POWER CONSUMPTION..without UHF, 200 watts; with UHF, 205 watts

TUBE COMPLEMENT

REFERENCE SYMBOL	TUBE TYPE	FUNCTION
R-F CHASSIS R-201		
V1	6BZ7—miniature	R-F amplifier
V2	12AZ7—miniature	Oscillator, mixer
V3, V4, V5, V6	6CB6—miniature	Video i-f amplifiers
V7	6U8—miniature	Video amplifier, sync separator
V8	6AQ5—miniature	Video output
V9	6BA6—miniature	First sound i-f amplifier
V10	6AU6—miniature	Second sound i-f amplifier
V11	6T8—miniature	FM detector, first audio amplifier
V12	6V6GT—octal	Audio output
V13	6AU6—miniature	A-G-C gate
V14	12AU7—miniature	Gated leveler, noise inverter
V22	17YP4 or 21ZP4A or 21EP4A	Picture tube
DEFLECTION CHASSIS D-201		
V15	12AU7—miniature	Phase splitter, vertical oscillator
V16	12B4—miniature	Vertical output
V17	6AL5—miniature	Phase comparer
V18	12AU7—miniature	Horizontal oscillator
V19	6BQ6GT—octal	Horizontal output
V20	6AX4GT—octal	Damper
V21	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-OSCILLATOR ADJUSTMENT

To adjust the horizontal-oscillator circuit, tune in a station and proceed as follows:

1. Reduce the width of the picture so that approximately one inch of blank screen appears on the right-hand and left-hand sides of the picture.

2. Increase BRIGHTNESS control setting so that the blanking time becomes visible. This appears as a dark bar along the right-hand and left-hand sides of the picture.

3. Connect a .1-μf. condenser from pin 2 of the gate-pulse socket, J801, to ground.

4. Set the HORIZ. HOLD control to the center of its mechanical rotation.

5. Adjust the HORIZ. HOLD CENTERING control to bring the picture into the center of the blanking bars. When the picture is centered in the blanking bars, the bars on the left and right sides of the picture will be of equal width.

6. Remove the .1-μf. condenser from the gate-pulse socket. (See step 3.)

7. Adjust the horizontal ringing coil, L800, until the picture is again centered in the blanking bar.

8. Rotate the HORIZ. HOLD control through its range. The picture should fall out of sync on both sides of the center of its rotation. If the picture does not fall out of sync to both sides, readjust the HORIZ. HOLD CENTERING control to obtain fall-out to either side of sync.

9. Rotate the HORIZ. HOLD control through its range and observe the number of diagonal blanking bars just before the picture pulls into sync. The pull-in should occur with from 1 to 2 diagonal bars when the sync position is approached from either direction. If proper pull-in is not obtained, repeat the above procedure.

VIDEO PEAKING COIL-ADJUSTMENT

The video peaking coils, L305 and L307, are adjusted at the factory for proper transient response of the video amplifiers. Ordinarily, these coils will require no further adjustment by the serviceman except in cases where they have been tampered with, or where replacement becomes necessary. Under normal circumstances, when alignment of the tuner or i-f stages is undertaken, the video peaking coils should not require adjustment.

Before adjusting L305 and L307, check both the tuner and i-f alignment. (Never adjust L305 and L307 until the alignment of the receiver is correct.) Then tune in a station and adjust the receiver to give a picture of the best obtainable quality, with medium contrast. Turn the fine tuning control clockwise until a very slight beat pattern appears in the picture. Carefully observe the appearance of the picture regarding smear or overshoot (trailing whites). A small amount of overshoot may be desirable, to produce a sharper picture. Conversely, in weak-signal areas, a small amount of smear may be desirable, to reduce the harsh appearance of "snow." The adjustments of L305 and L307, and their effects on the picture are as follows:

1. The amount of overshoot may be reduced by turning both TC302 and TC303 counterclockwise.

2. The amount of smear may be reduced by turning both TC302 and TC303 clockwise.

Normally, the point of proper adjustment is where minimum smear and trailing whites appear in the picture; however, a compromise adjustment may be made to suit prevailing conditions. As a rule, when properly adjusted, the adjustment screws (TC302 and TC303) should protrude from the chassis by approximately ½ to ¾ inch.

TELEVISION ALIGNMENT

GENERAL

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

The over-all response curve (r-f, i-f) of the circuits from the antenna terminals to the video detector, after the i-f stages have been aligned, should appear essentially the same, regardless of the channel under test. If not, the tuner should be aligned. Before aligning the tuner, refer to the CAUTION given under TELEVISION TUNER ALIGNMENT.

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 if the top of the workbench is metallic. 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 Model 7008 is used, the built-in crystal calibrator provides an excellent means of calibration. 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."

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.

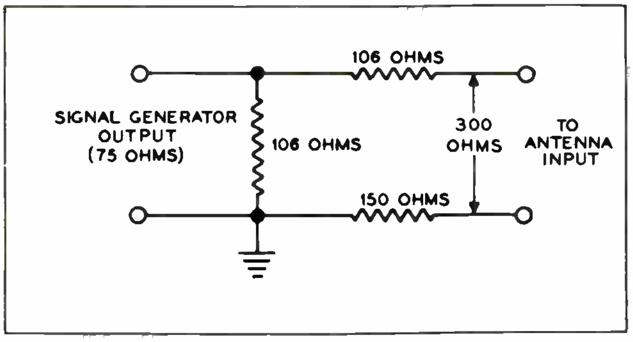
2. Vacuum-tube voltmeter, or 20,000-ohms-per-volt voltmeter.

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 may be made through the alignment jack provided for this 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, may be used. As an alternate, a Philco alligator-clip adapter, Part No. 45-1636, with as short a ground lead as possible, may be used to connect 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.



TPO-1179

Figure 1. Antenna-Input Matching Network

Antenna-Input Matching Network

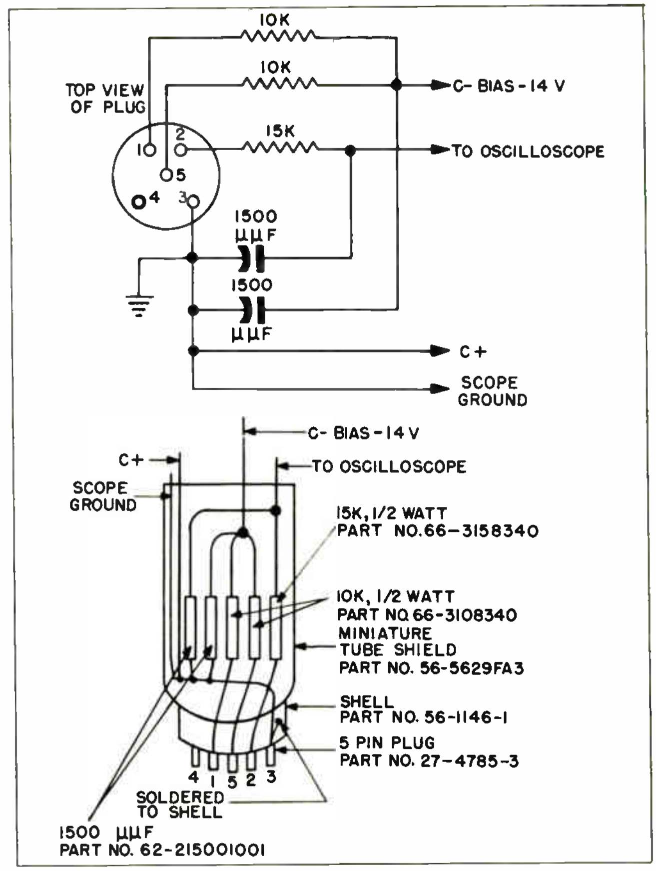
An impedance-matching network for coupling the signal generator to the antenna input terminals of the receiver is shown in figure 1. This network, which is designed to have an input impedance of 75 ohms and an output impedance of 300 ohms, is used to match a 75-ohm generator to a 300-ohm antenna-input circuit. The resistors used in this network should be of carbon-composition construction, and should be chosen from a group, to obtain values within ten percent of those indicated. The resistors should be placed in a shield can, to prevent variable effects. An antenna-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.

Video I-F Alignment Jig
(Video Test Jack Adapter No. 1)

The alignment jig used at J200, and shown in figure 2, 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 five-pin plug, two 10,000-ohm resistors, and a 1500-$\mu\mu$f. condenser for isolation of the bias supply. To isolate the oscilloscope from the receiver circuits, a 15,000-ohm resistor, by-passed by a 1500-$\mu\mu$f. condenser, is used. A suggested method of fabricating the jig is also shown in figure 2. This jig should not be used to observe the composite video from the video detector output.

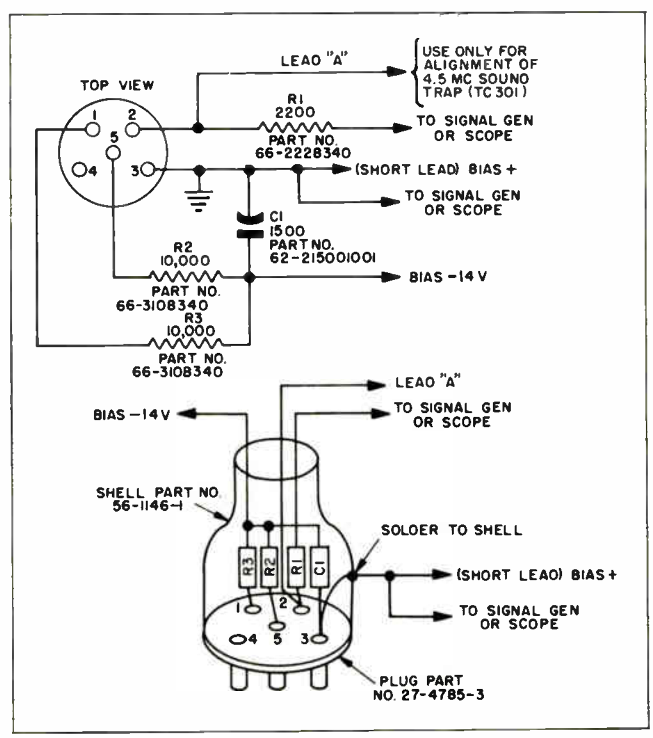
S-I-F Input Alignment Jig
(Video Test Jack Adapter No. 2)

To observe the composite video, at J200, a jig may be made with a five-pin plug and a 2200-ohm resistor. (See figure 3.) The 2200-ohm resistor should be connected to pin 2 of the plug. A ground lead should be connected to pin 3. To observe the composite video, connect the oscilloscope to the 2200-ohm resistor and the ground lead. This jig is also used for injection of the 4.5-mc. signal during s-i-f alignment.



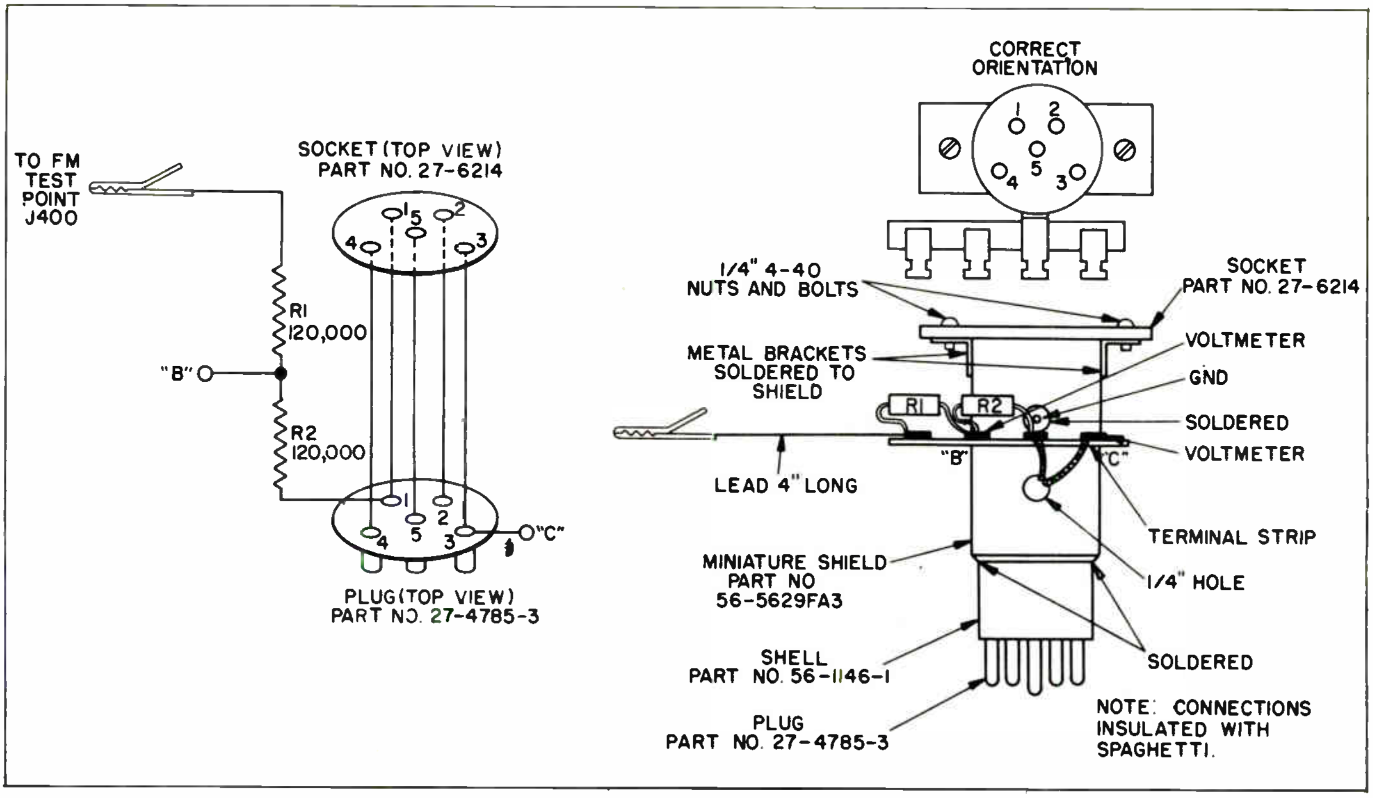
TP2-1507-B

Figure 2. Video I-F Alignment Jig (Video Test Jack Adapter No. 1)



TP2-3265-A

Figure 3. Sound I-F Input Alignment Jig (Video Test Jack Adapter No. 2)



TP2-3263-A

Figure 4. Sound I-F Output Alignment Jig (FM Test Point and Volume Control Jack Adapter)

S-I-F Output Alignment Jig
(FM Test Point and Volume Control Socket Adapter)

Figure 4 shows the adapter that should be used to connect the voltmeter to the FM detector through the volume control socket (J401) and FM test point (J400). The adapter should be inserted into the volume control socket, and the clip lead from the adapter connected to the FM test point. The volume control cable and plug (PL401) is inserted into the socket on top of the adapter.

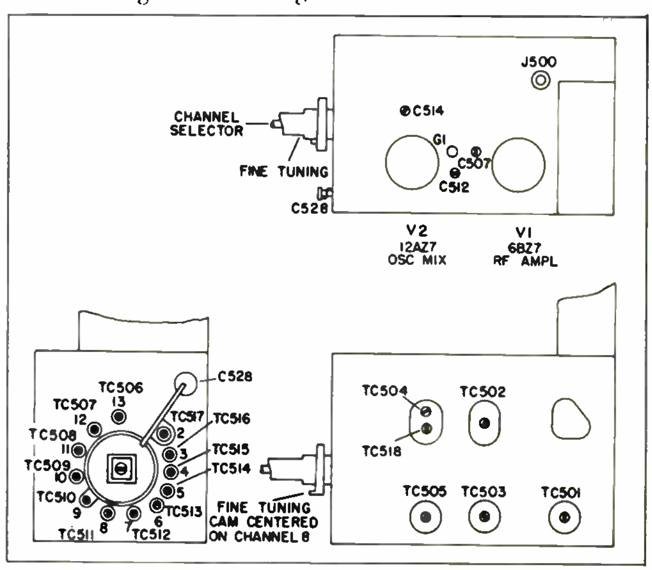
TELEVISION TUNER ALIGNMENT

After the tuner is serviced, or if an i-f alignment is required, 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

If 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 Channel 8 oscillator tuning core. See figure 5.



TP3-942

Figure 5. Television Tuner, Showing Locations of Adjustments

Procedure Using Signal Generators

An r-f signal (unmodulated), at the video carrier frequency of the channel, is fed into the antenna 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 these signals. An oscilloscope 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 accurately calibrated as described in Philco Lesson PR-1745(J).

To align the oscillator, proceed as follows:

1. To observe the zero beat, connect the oscilloscope to the video detector output through the video i-f alignment jig. See figure 2. Bias the tuner and i-f a-g-c circuits with $1\frac{1}{2}$ volts, and remove the gate-pulse plug, PL801, from the socket, J801. To apply the bias to the tuner, connect the battery to the white lead which comes off the feed-through condenser at the top of the tuner. To make certain that good connection is made to the tuner a-g-c circuit, remove the glyptol coating on this condenser terminal.

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 loop, 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 to the video carrier frequency of Channel 13, and connect the output to the antenna-input 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 Channel 12, then 11, etc., each time adjusting the respective tuning core for zero beat. The tuning cores should be adjusted progressively from the highest-frequency channel to the lowest, because the higher channel adjustments will affect the lower channels.

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 as shown in 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-frequency channel and finishing with the lowest channel.

Tuner Bandpass Alignment

General

The bandpass alignment consists of aligning the tuner at Channels 13 and 6, and then making it track properly.

During the alignment, a fixed bias of $1\frac{1}{2}$ volts is applied to the r-f amplifier tube through the white a-g-c lead.

An FM (sweep) signal is applied to the antenna-input circuit through the proper matching jig, and an oscilloscope is connected to the junction of R518 and the tuner red lead. 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 the 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. The scope controls should be adjusted so that the width of the presentation is double the height. Overload may then be checked by changing the generator output while observing the shape of the response curve. When the generator output is changed, the vertical gain of the oscilloscope should be readjusted to keep the scope presentation amplitude the same. Do not readjust the horizontal gain control. 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 antenna input of the tuner. The antenna-input matching network shown in figure 1, or Philco Antenna Matching Jig, Part No. 45-1637, may be used for this purpose. If a matching jig is not used, the result obtained will be extremely unreliable.

Regeneration in the test setup will also cause poor and unreliable results. To check for regeneration, 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 changes as the hand is moved along the cable, regeneration or mismatch is indicated. Another check may also be made with the volume control advanced until noise can be heard from the speaker. If the level of the noise changes as the hand is moved along the generator cable, regeneration or mismatch is indicated. The symptoms which indicate these conditions may also be caused by failure to use the proper matching jig, as described above.

Procedure

CAUTION: When comparing the response curves from channel to channel, maintain the 2-to-1 width-to-height relationship in the oscilloscope presentation, as described above.

1. Connect the FM (sweep) and AM marker generators to the 300-ohm antenna input terminals through an antenna-input matching jig.

2. Connect the oscilloscope to the junction of R518 (15k, 1w) and the tuner red lead.

3. Apply 1½ volts of bias to the white tuner a-g-c lead.

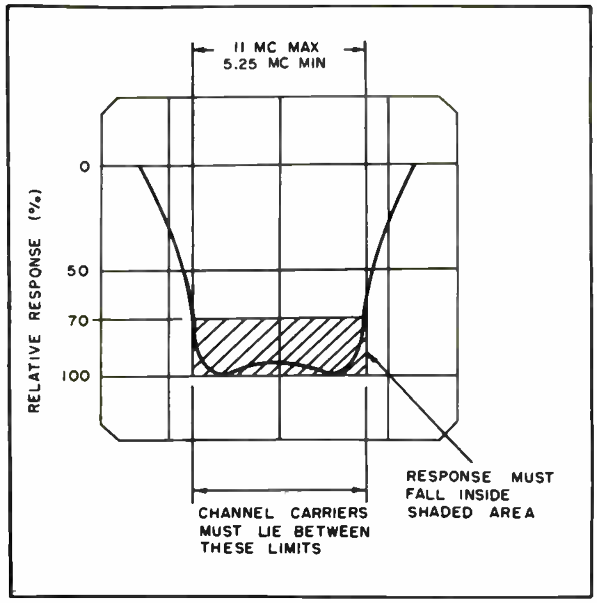
4. Disconnect the tuner coupling link at wiring panel B-14 terminals 1 and 4, and solder a 68-ohm, one-half watt carbon resistor to the open link coming from the tuner. See figure 8. Remove the first i-f tube from its socket.

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 for a symmetrical response, centered about 213 mc. and falling within the specifications, as shown in figure 6.

8. Set the CHANNEL SELECTOR and FM (sweep) 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.



TP3-1213-1

Figure 6. Television Tuner Response Curve, Showing Bandpass Limits

9. On Channel 7, observe the tilt and center frequency of the response curve. The curve should be centered on the pass band and should be symmetrical. If it is not symmetrical, and appears unbalanced, as in figure 7, adjust C507 and C512 (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 C507 and C512 until the curve appears as in figure 7B. This adjustment over-compensates to make allowance for the effect of Channel 13 adjustments (to be made in step 10) upon Channel 7 response.

10. Reset the CHANNEL SELECTOR and generators to Channel 13, and repeat steps 7 through 9 as many times as is necessary, to obtain the most symmetrical and centered response curves on Channels 13 and 7. Channels 7 through 13 are now correctly aligned.

11. Set the CHANNEL SELECTOR and sweep generator to Channel 6 (85 mc.).

12. 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.).

13. 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 antenna circuit is now tuned for Channels 2 through 6.

14. 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.

VIDEO I-F ALIGNMENT

Preliminary

Before proceeding with the i-f alignment or making an alignment check, observe the following preliminary instructions:

1. Preset the CONTRAST and BRIGHTNESS controls to the maximum counterclockwise position.

2. Preset the CHANNEL SELECTOR to Channel 4.

3. Insert the video i-f alignment jig into J200.

4. Connect the oscilloscope to the 15,000-ohm resistor from the video i-f alignment jig. Connect the ground lead of the oscilloscope to the ground lead from the adapter.

5. With a voltmeter connected across the points shown in figure 2, set the potentiometer to furnish −14 volts of bias.

6. Connect the AM generator to the mixer test point, G1, through a mixer jig, and adjust the generator for approximately 30 percent modulation at 400 cycles. Adjust the output of the generator during the alignment to keep the output at the second detector below .6 volt, peak to peak.

NOTE: If the i-f shield has been removed for repairs, it must be replaced before proceeding with the alignment.

Procedure

1. Tune the AM generator to 47.25 mc., and adjust C201 for minimum output, as observed on the oscilloscope.

2. Tune the AM generator to 41.25 mc., and adjust C203 for minimum output, as observed on the oscilloscope.

NOTE: In steps 1 and 2, it is necessary to keep the generator output sufficiently high that a null indication may be observed on the oscilloscope; however, avoid overloading of the receiver by excessive signal.

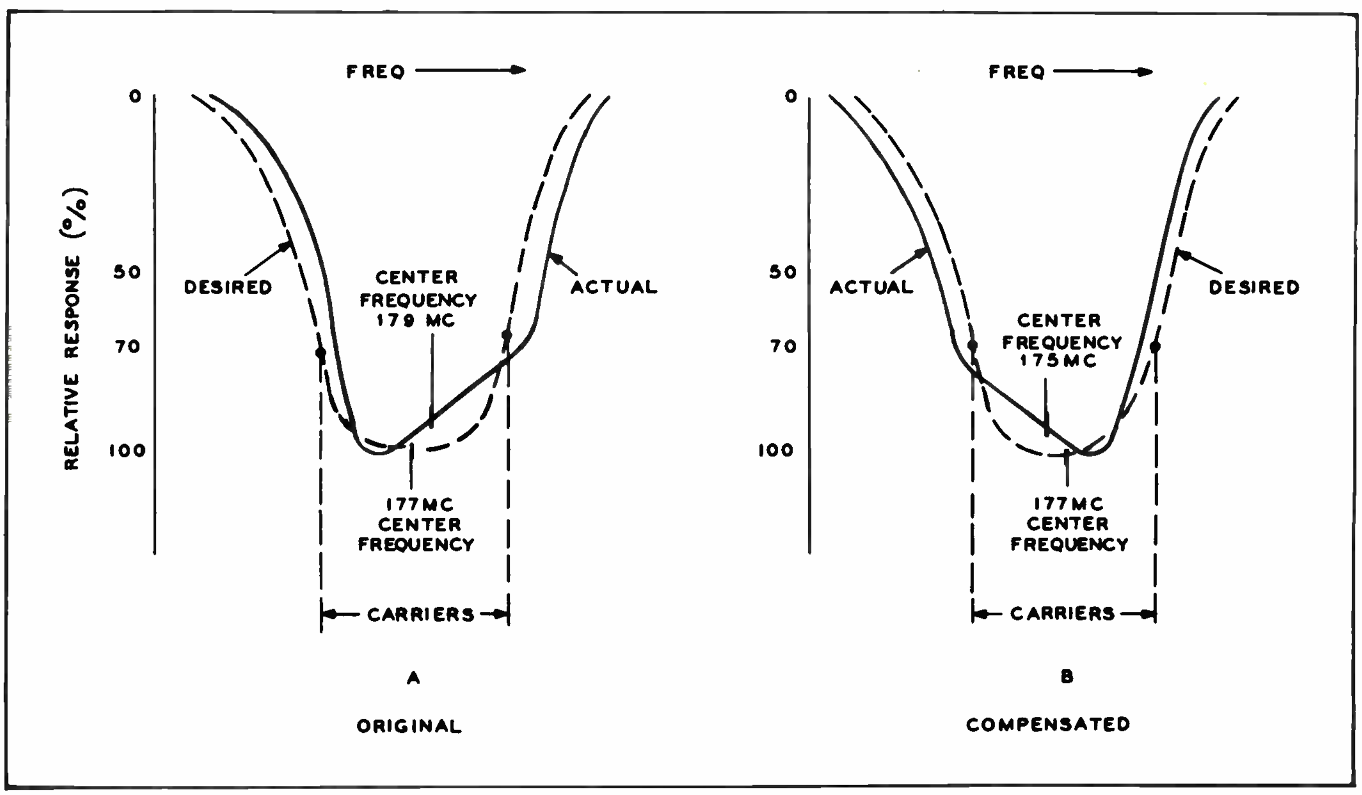
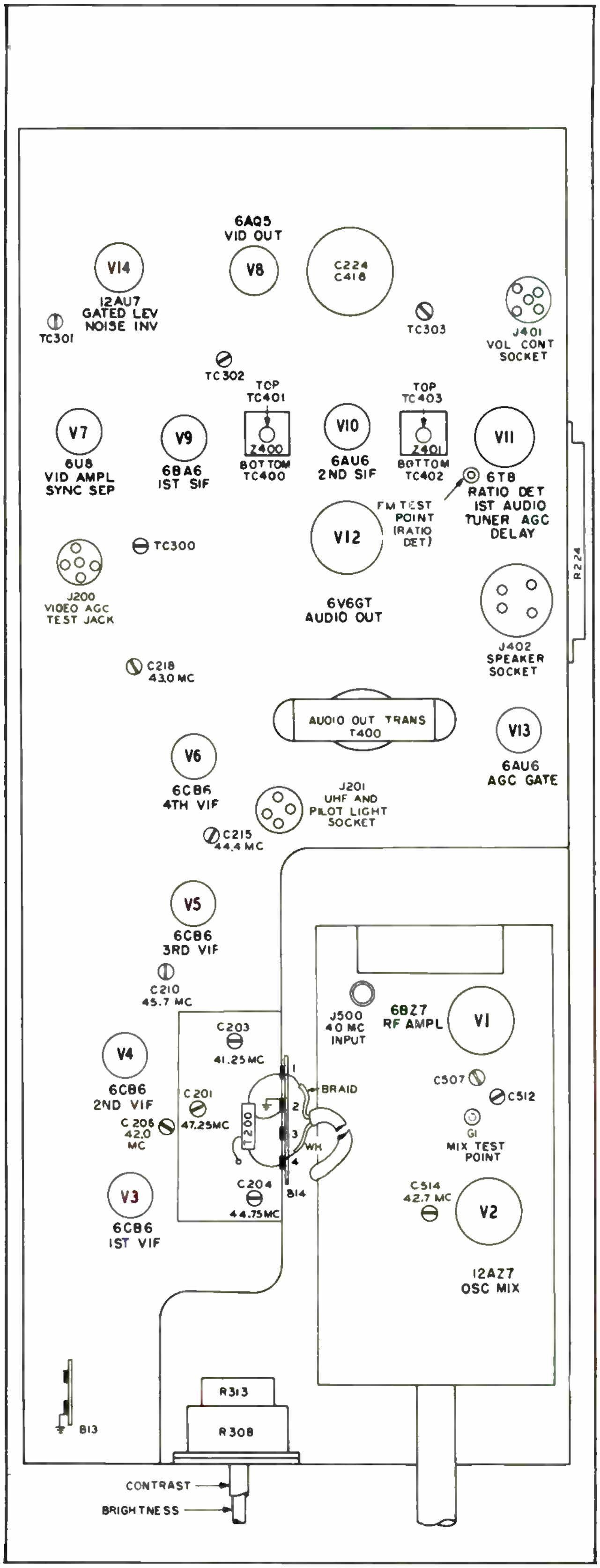


Figure 7. Television Tuner Response Curve, Showing Tracking Compensation



TP3-943

Figure 8. R-F Chassis R-201, Top View, Showing Locations of Adjustments

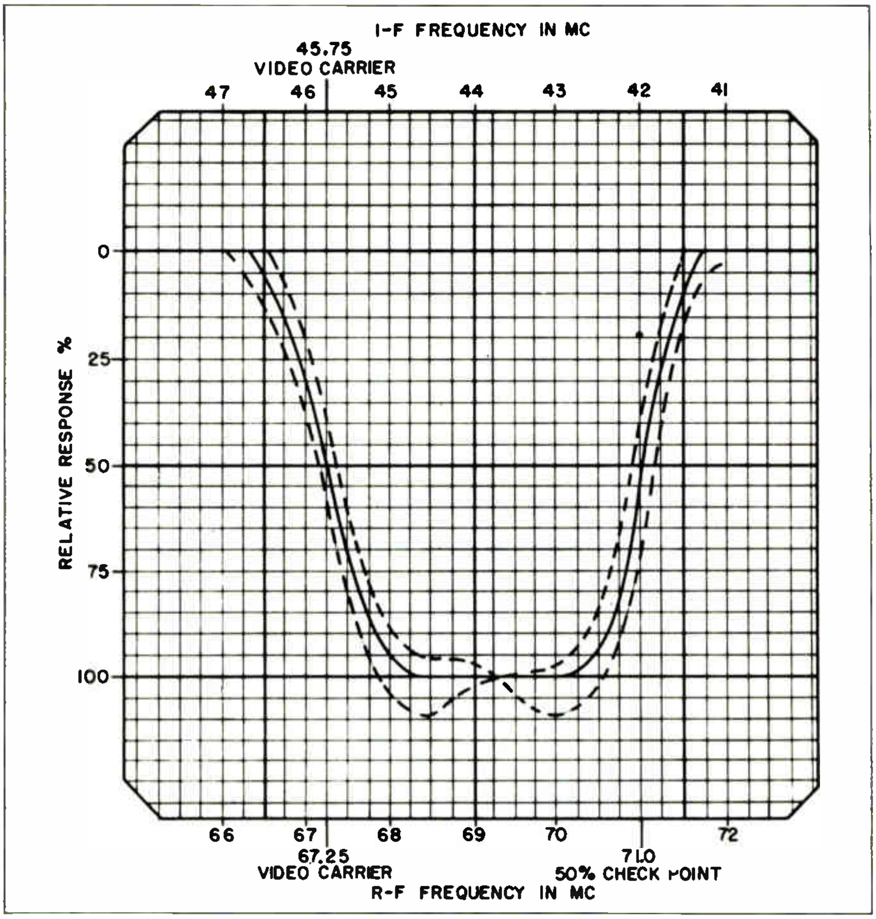
3. Tune the AM generator to the frequencies indicated below, and adjust the trimmers (see figure 8) for maximum output.

a. 42.7 mc.—adjust C514
b. 44.75 mc.—adjust C204
c. 45.7 mc.—adjust C210
d. 44.4 mc.—adjust C215
e. 43.0 mc.—adjust C218
f. 42.0 mc.—adjust C206

4. Increase the bias (by means of the potentiometer) until the scope presentation of step f, above, is reduced to 50 percent of its previous amplitude, and retouch C206 for maximum indication on the oscilloscope.

5. Connect the sweep generator and r-f marker generator to the antenna terminals through a matching jig. (If a separate oscilloscope is used, connect the sweep output of the generator to the horizontal input of the oscilloscope.) Set the CHANNEL SELECTOR to Channel 4, and tune the sweep generator for output on Channel 4. Tune the r-f marker generator for the video carrier frequency of Channel 4 (67.25 mc.), and tune the i-f marker generator (connected through jig to mixer grid) to 45.75 mc. Note that two marker generators are used for this procedure. The r-f marker generator is connected to the antenna terminals, while the i-f marker generator is connected capacitively to the mixer grid test point, G1. A jig constructed from a piece of fiber tubing, with $\frac{3}{16}$ inch inside diameter, and a brass machine screw which fits tightly into the tubing, is used to connect the generator capacitively to the test point. The screw is adjusted so that it clears the test point by approximately $\frac{1}{64}$ inch. The output cable of the marker generator is connected to the head of the brass screw in the jig and to chassis near the mixer tube. Both marker generators should be adjusted for the minimum output required to make the markers barely visible. Failure to observe this precaution, or the use of excessive output from the sweep generator, will cause misleading results. After the equipment is properly connected, adjust the FINE TUNING control for zero-beat of the two markers, as observed on the oscilloscope. When zero beat is obtained, remove the i-f marker.

6. If the response curve does not fall within the limits, as shown in figure 9, the adjustment of the trimmers may be touched up slightly, while observing the response curve. Do not retouch the setting of C201, C203, or C206. To adjust the curve, first adjust C215 and C218 alternately until maximum improvement has been obtained. C215 affects the tilt



TP3-944

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

of the curve, and C218 affects the dip of the curve. After C215 and C218 have been adjusted, adjust C514 for proper slope at the 42.25-mc. side of the curve, and then adjust C204 and C210 for proper level at the video carrier frequency (45.75 mc.).

CAUTION: Do not turn any of the trimmers excessively. To retouch, only turn the trimmers slightly.

SOUND I-F ALIGNMENT

The sound i-f system may be aligned by the use of a station signal or an accurately calibrated signal generator, for the signal source. If the station signal is used, tune the FINE TUNING control for the best picture, regardless of sound. It will be necessary to reduce the signal input to the receiver, so that the d-c output at the sound detector, as measured with the aid of the sound i-f output alignment jig (between point "B" and ground), is kept below 5 volts, maximum, and preferably below 3 volts. To establish this level in strong signal areas, it may be necessary to short the antenna terminals and to apply bias to the a-g-c circuit. The signal input to the receiver may be adjusted by varying the length of the shorting lead. The bias may be applied to the a-g-c circuit by means of the jig shown in figure 3. The sound i-f output alignment jig shown in figure 4 should be used for convenient connection of the meter to the sound-detector output.

When a signal generator is used, bias should be applied to the a-g-c circuit, to avoid any possibility of regeneration, using the sound i-f input alignment jig (figure 3). In addition, the first video i-f tube should be removed, to aid in the reduction of circuit noises from the i-f system.

1. Connect the generator through the 2200-ohm resistor, in the sound i-f input alignment jig, to pin 2 of J200. The generator should be adjusted for unmodulated output at 4.5 mc.

2. Insert the sound i-f output alignment jig into the volume-control socket (J401), and insert the volume-control plug (PL401) into the top of the jig. Connect the clip lead to the FM test point (J400); connect a 20,000-ohms-per-volt voltmeter between point "B" and the ground lug of the jig, with the negative lead of the meter going to point "B."

3. Adjust TC300, TC400, TC401, and TC402 for maximum output, as indicated on the meter. If the

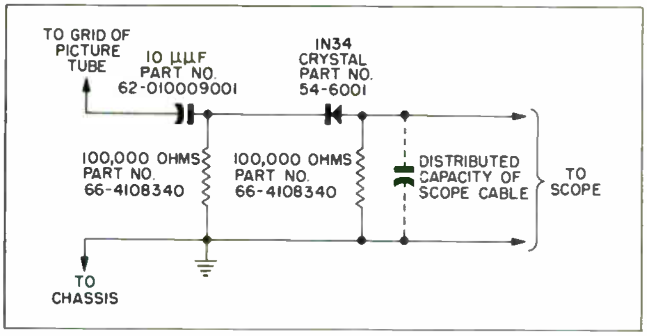


Figure 10. R-F Probe for Sound-Trap Adjustment

output exceeds 5 volts, reduce the signal input to the receiver.

4. Shift the positive lead of the meter to point "C" on the sound i-f output alignment jig, and adjust TC403 for zero crossover. Zero crossover is indicated by a zero indication on the meter. When TC403 is turned in one direction from this zero point, the meter will swing positive; turning TC403 in the opposite direction will cause a negative swing. (To aid in reading a positive and negative swing on the meter, set the pointer, by means of its zero-adjustment screw, to a convenient calibration mark on the scale, before connecting the meter to the circuit.)

5. Replace the first video i-f tube, and tune in a station on the receiver. Turn the FINE TUNING control to obtain a slightly fuzzy picture, and retouch TC403 for minimum AM (noise), using the speaker output as an indication.

ADJUSTMENT OF 4.5-MC. TRAP

To adjust the 4.5-mc. trap in the plate circuit of the first video amplifier, proceed as follows:

1. Connect the output of the signal generator to the lead from pin 2 of the sound i-f input alignment jig (see figure 2). Adjust the generator for 4.5 mc., with 400-cycle modulated output. Set the output attenuator for maximum output from the generator.

2. Connect the input of the r-f probe, shown in figure 10, to the grid of the picture tube, and connect the output of the probe to the vertical input of the oscilloscope. Adjust the vertical gain of the oscilloscope to maximum.

3. Adjust TC301 for minimum indication on the oscilloscope. (The normal setting for TC301 is with the screw approximately ⅝ inch out from the chassis.)

An alternate method for adjustment of TC301 may be used if a 4.5-mc. generator is not available. To adjust TC301 without the generator, proceed as follows:

1. Tune in a strong station signal.

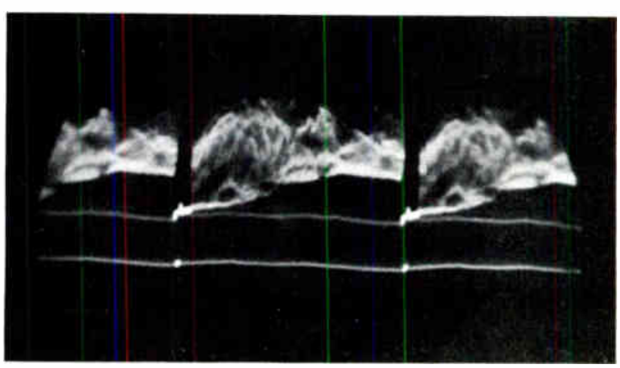
2. Turn the FINE TUNING control in the clockwise direction until a fine beat pattern appears in the picture.

3. Adjust TC301 until the beat disappears or is at a minimum. When correctly adjusted, the screw will be out from the chassis approximately ⅝ inch.

4. If more than one station is available, check the setting of TC301 on all stations.

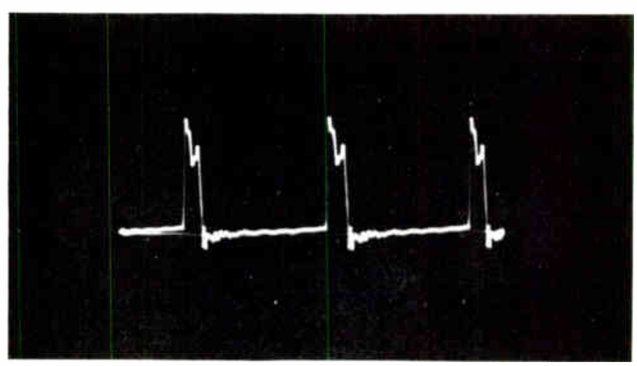
OSCILLOSCOPE WAVEFORM PATTERNS

The waveforms were taken with the receiver adjusted for 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 waveforms—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 are more rounded than those shown, and the peak voltages differ from those shown.



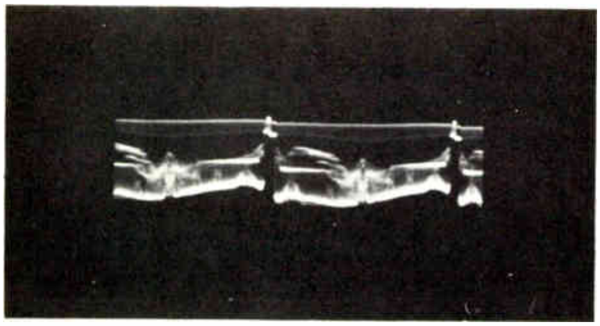
TP1-1200-A

Figure 11. Video Detector Output, Pin 2 of J200
2 volts, 60 c.p.s.



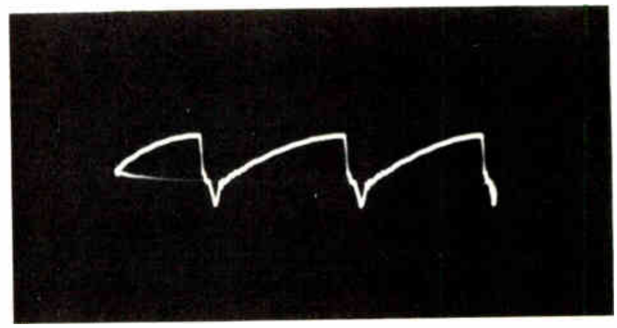
TP2-654

Figure 12. Gate-Pulse Plug, Pin 4
500 volts, 15,750 c.p.s.



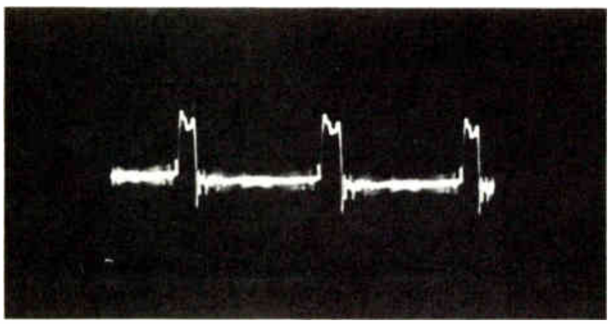
TP2-653

Figure 13. A-G-C Gate Grid,
Pin 1
22 volts, 60 c.p.s.



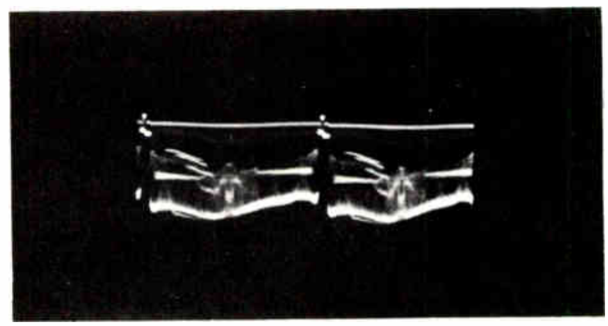
TP2-656

Figure 14. Gate-Pulse Plug,
Pin 3
10 volts, 15,750 c.p.s.



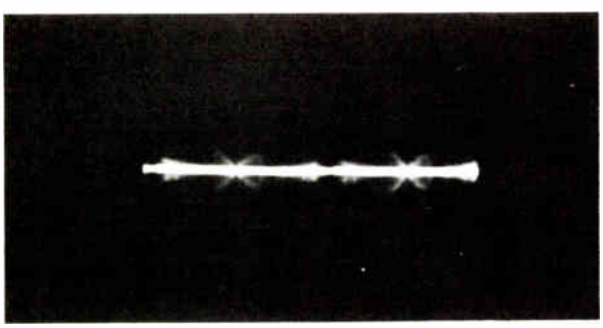
TP2-655

Figure 15. Gated-Leveler Grid,
Pin 2
2.5 volts, 15,750 c.p.s.



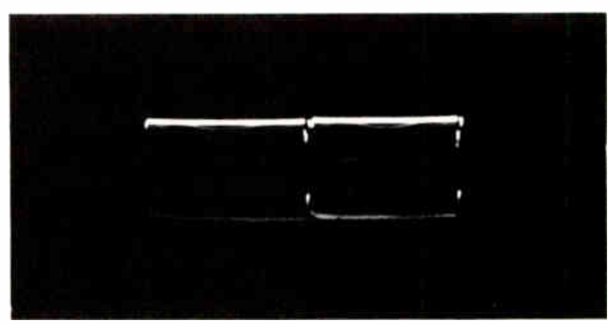
TP2-657

Figure 16. Noise-Inverter Plate,
Junction of R605, C602, and C603
23 volts, 15,750 c.p.s.



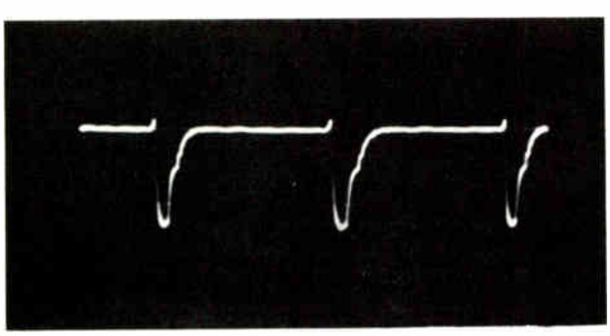
TP2-658

Figure 17. Noise-Inverter Cathode,
Pin 8
(Wave shape and amplitude vary with noise)



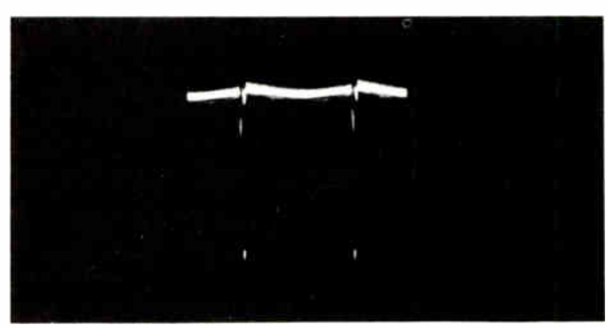
TP2-659

Figure 18. Sync Separator Plate,
Pin 1
17 volts, 60 c.p.s.



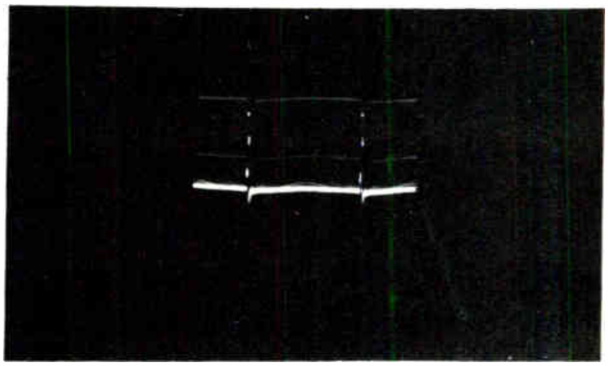
TP2-660

Figure 19. Sync Separator Plate,
Pin 1
17 volts, 15,750 c.p.s.



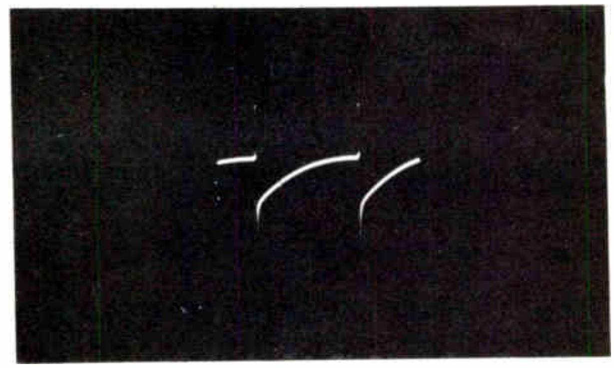
TP2-639

Figure 20. Phase-Splitter Grid,
Pin 7
14 volts, 60 c.p.s.



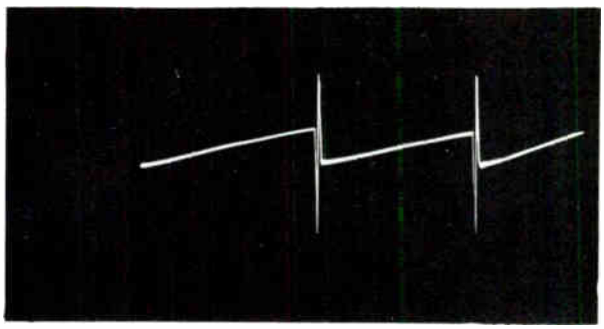
TP2-640

Figure 21. Phase-Splitter Plate, Pin 6
30 volts, 60 c.p.s.



TP2-643

Figure 22. Vertical-Oscillator Grid, Pin 2
165 volts, 60 c.p.s.

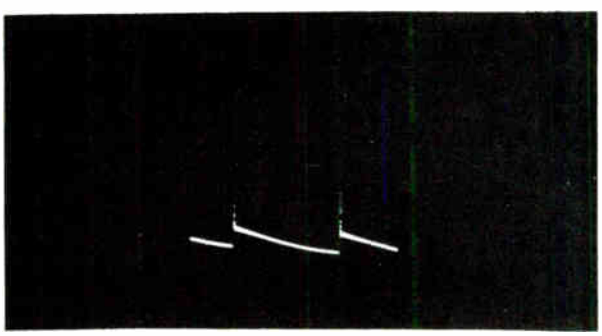


TP2-697-A

Figure 23. Vertical-Oscillator Plate, Pin 1
130 volts, 60 c.p.s.

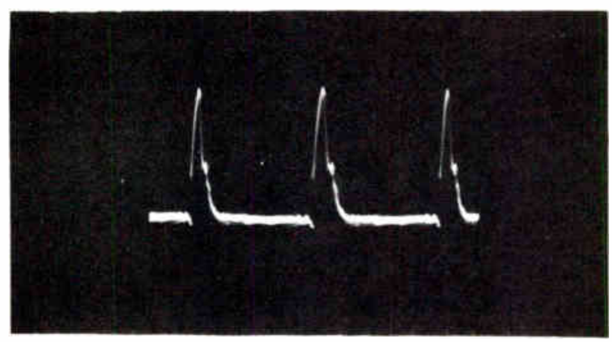
TP2-644-A

Figure 24. Vertical-Output Grid, Pins 2 and 7
120 volts, 60 c.p.s.



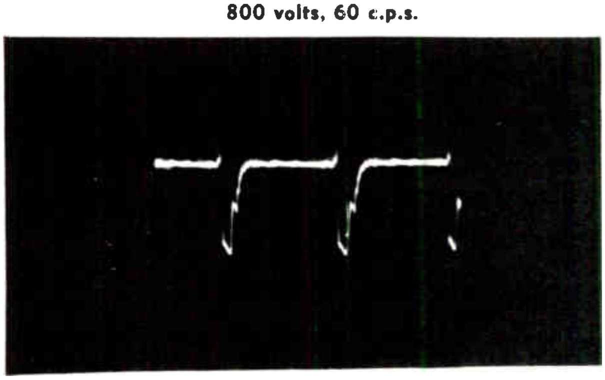
TP2-645

Figure 25. Vertical-Output Plate, Pin 9
800 volts, 60 c.p.s.



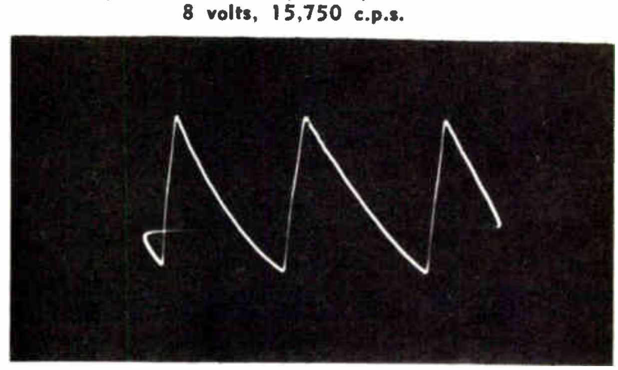
TP2-641

Figure 26. Phase-Splitter Plate, Junction of R614, R615, and C800
8 volts, 15,750 c.p.s.



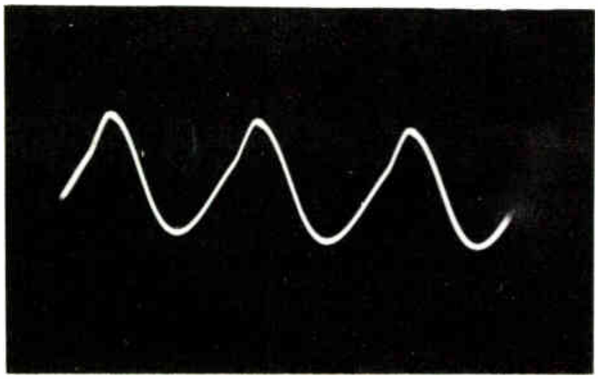
TP2-642

Figure 27. Phase-Splitter Cathode, Pin 8
8 volts, 15,750 c.p.s.



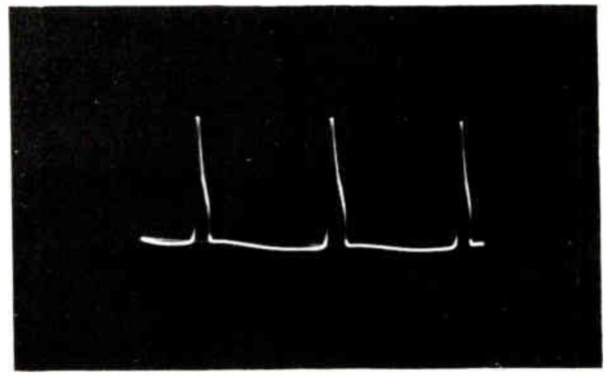
TP2-652

Figure 28. Phase Comparer, Pins 5 and 7
6 volts, 15,750 c.p.s.



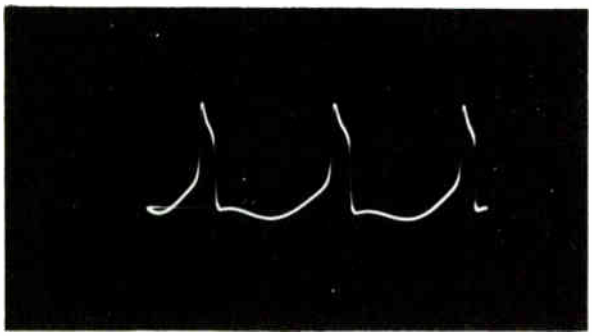
TP2-2852

Figure 29. Horizontal Oscillator, Pin 2 of Gate-Pulse Socket J801
20 volts, 15,750 c.p.s.



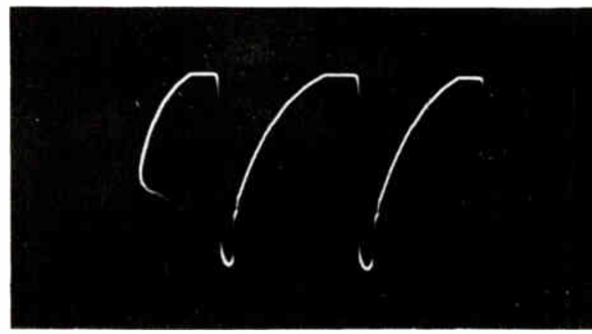
TP2-647

Figure 30. Horizontal-Oscillator Cathode, Pins 8 and 3
16 volts, 15,750 c.p.s.



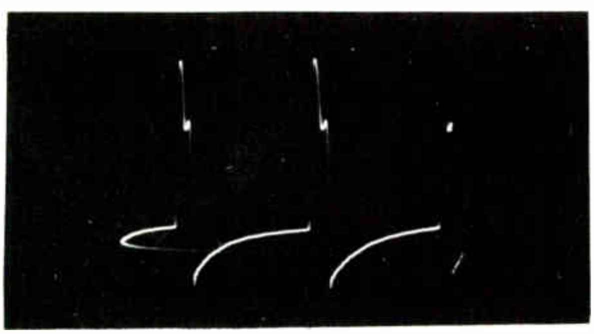
TP2-648

Figure 31. Horizontal-Oscillator Grid, Pin 2
38 volts, 15,750 c.p.s.



TP2-649

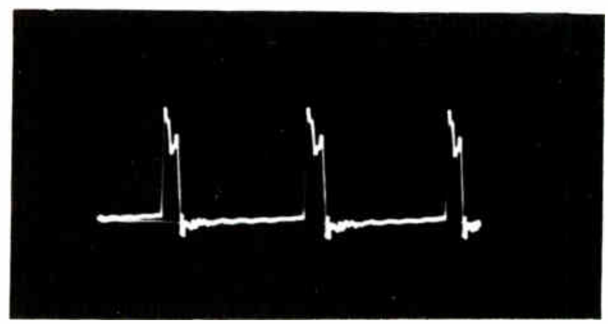
Figure 32. Horizontal-Output Grid, Pin 5
130 volts, 15,750 c.p.s.



TP2-650

Figure 33. Horizontal-Deflection Yoke, *Pin 7 of J800
3000 volts, 15,750 c.p.s.

*See CAUTION.



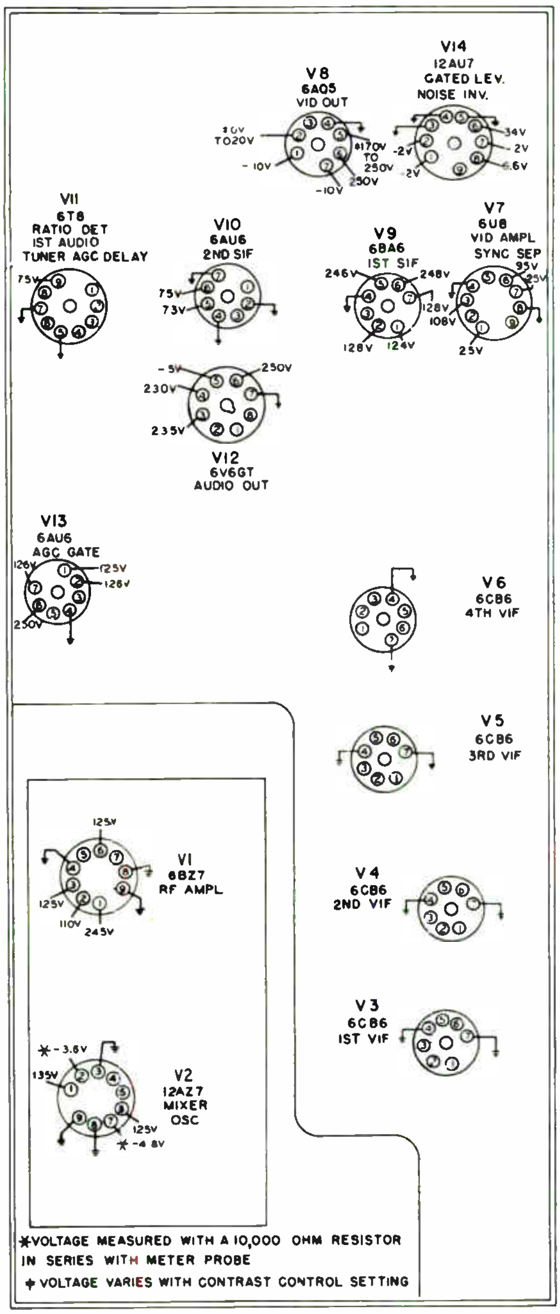
TP2-654

Figure 34. Gate-Pulse Socket, Pin 4 of J801
500 volts, 15,750 c.p.s.

* CAUTION: High-voltage pulses are present in the horizontal-output circuit. The waveform shown in figure 33 was taken with the alligator clip of the oscilloscope lead clipped over the insulation of the lead connected to pin 7 of J800. (To prevent puncture of the insulation of the lead, file off the teeth of the alligator clip, and wrap friction tape around the clip.) Connection to other points in the horizontal-output circuit is dangerous, because of the high voltages present. The peak-to-peak voltage shown for figure 33 is the actual voltage present; however, the amplitude of the scope presentation depends upon the degree of coupling.

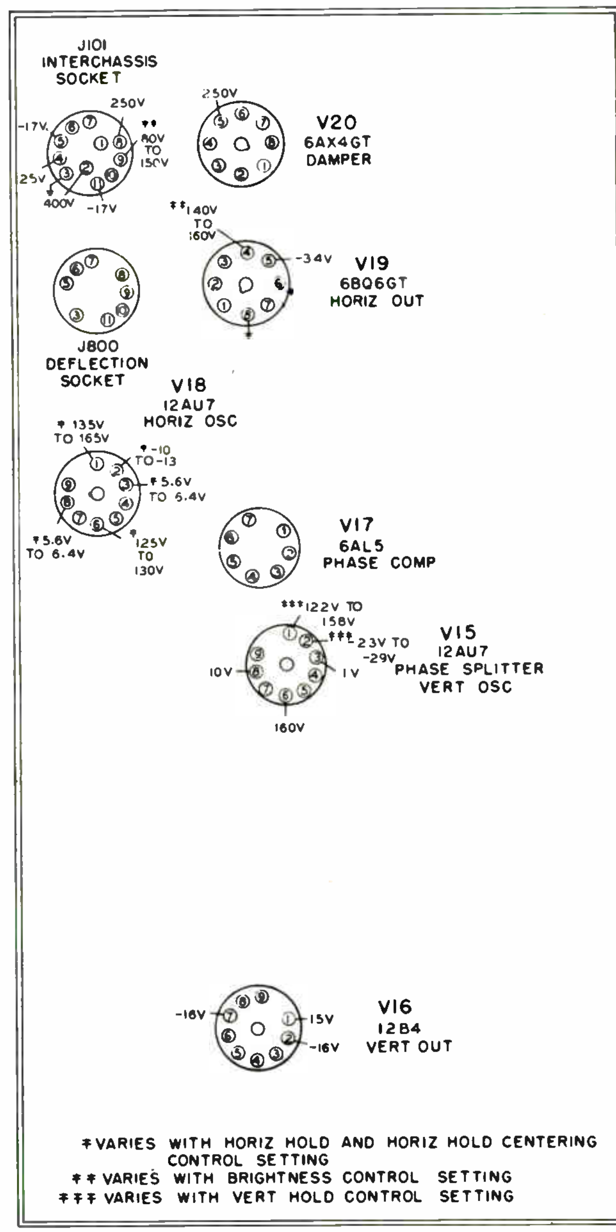
VOLTAGE MEASUREMENTS

The voltages given here and on the schematics were taken with a 20,000-ohms-per-volt voltmeter, with a line voltage of 117 volts, and no signal input to the receiver. Since voltage readings taken in the video i-f stages vary widely with different test equipment setups, voltage measurements for these stages are omitted from the diagrams.



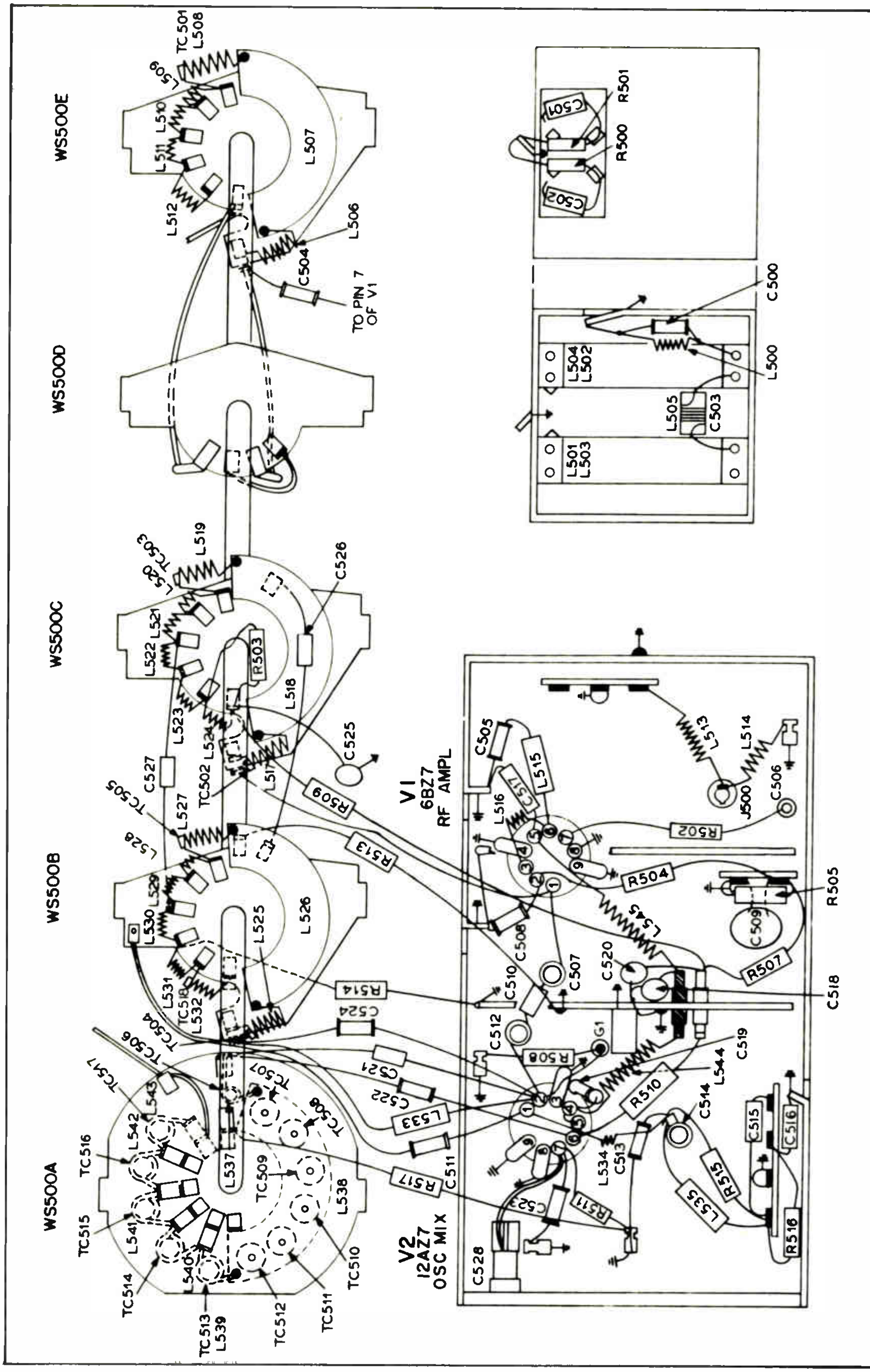
TP3-945

Figure 35. R-F Chassis R-201, Bottom View, Showing Voltages at the Sockets



TP3-946

Figure 36. Deflection Chassis D-201, Bottom View, Showing Voltages at the Sockets



TP3-947

Figure 37. Television Tuner, Part No. 76-7600-3, Base Layout

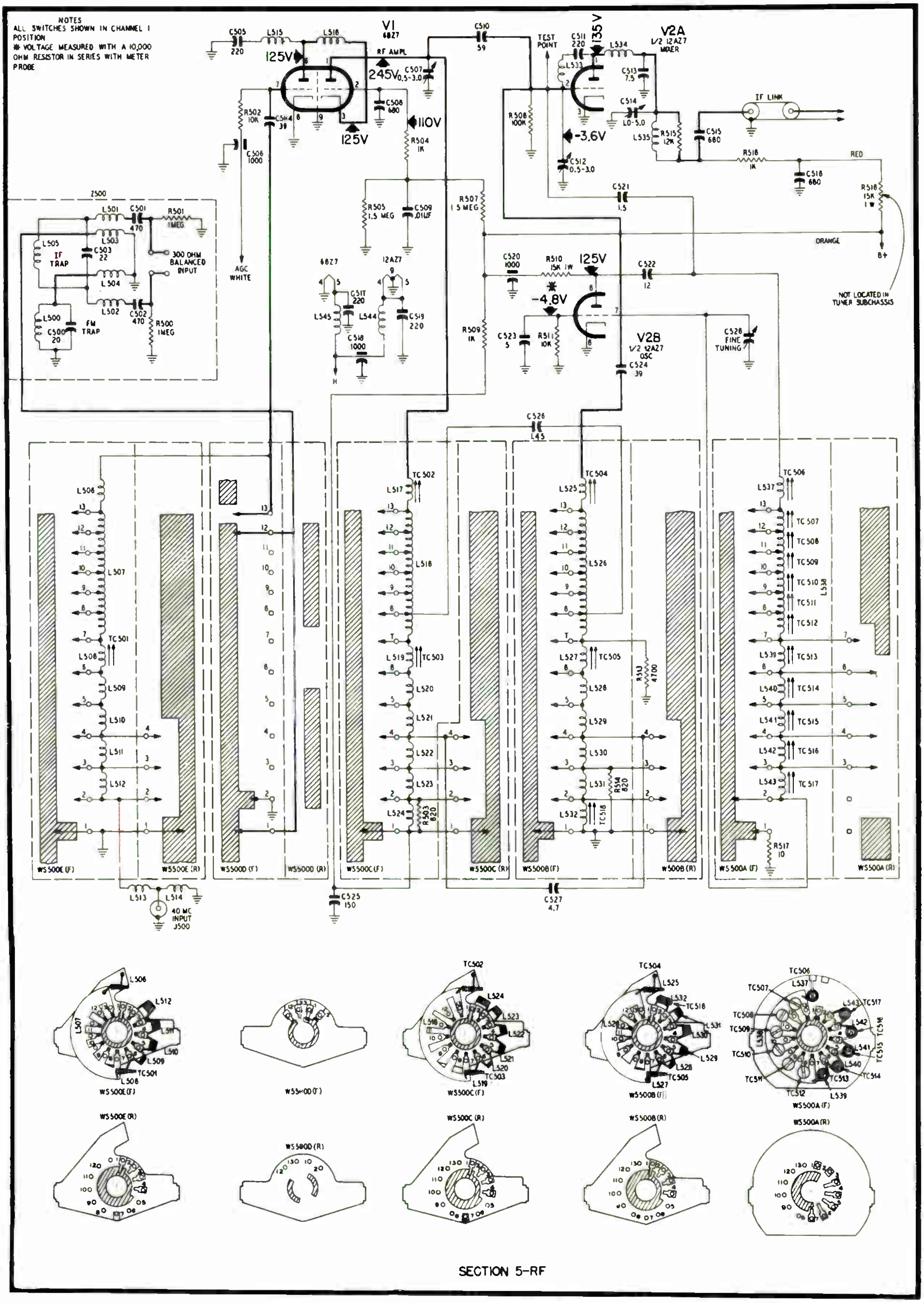


Figure 38. Television Tuner, Part No. 76-7600-3, Schematic Diagram

TP2-2245-A

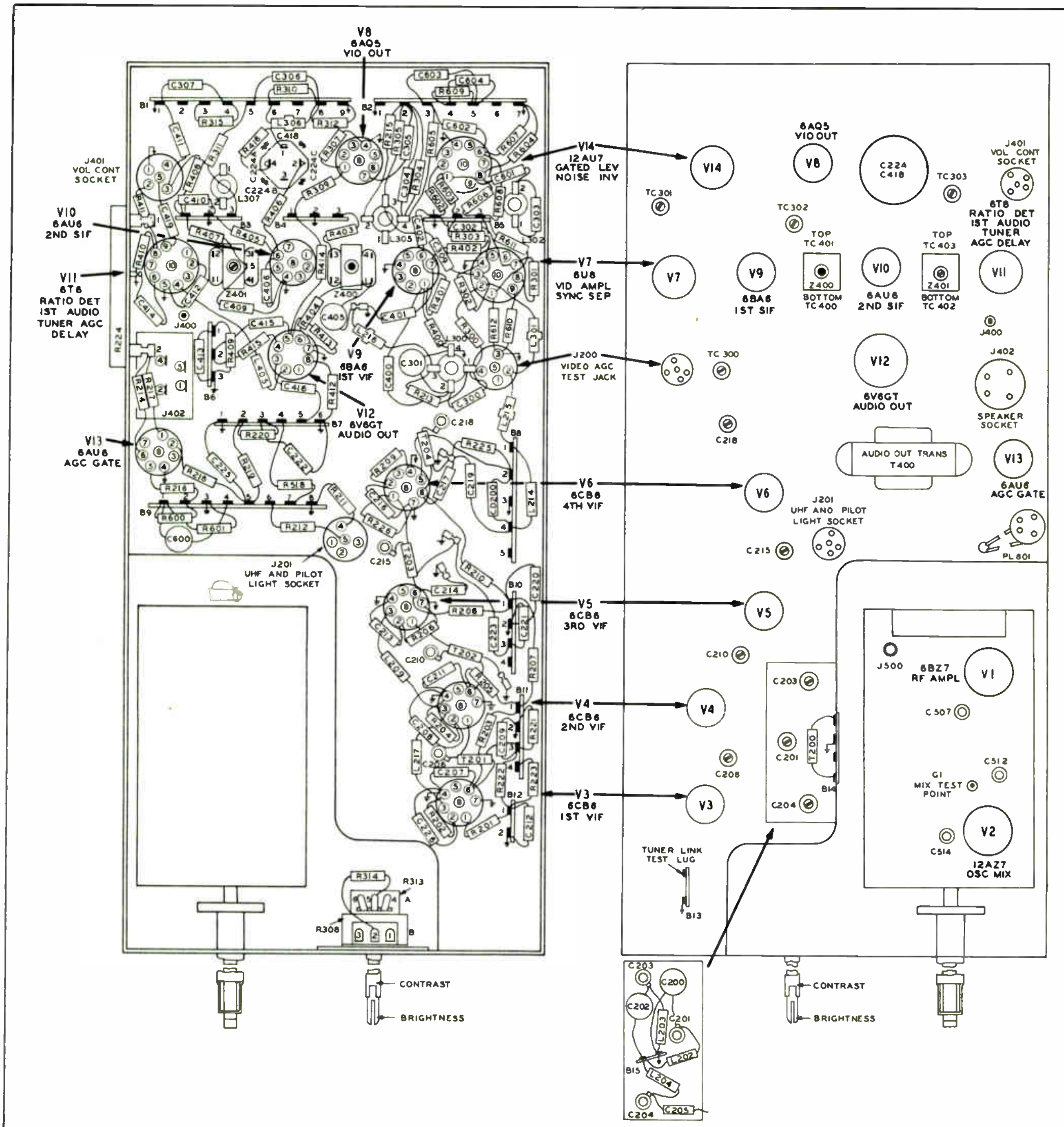


Figure 39. R-F Chassis R-201, Base Layout

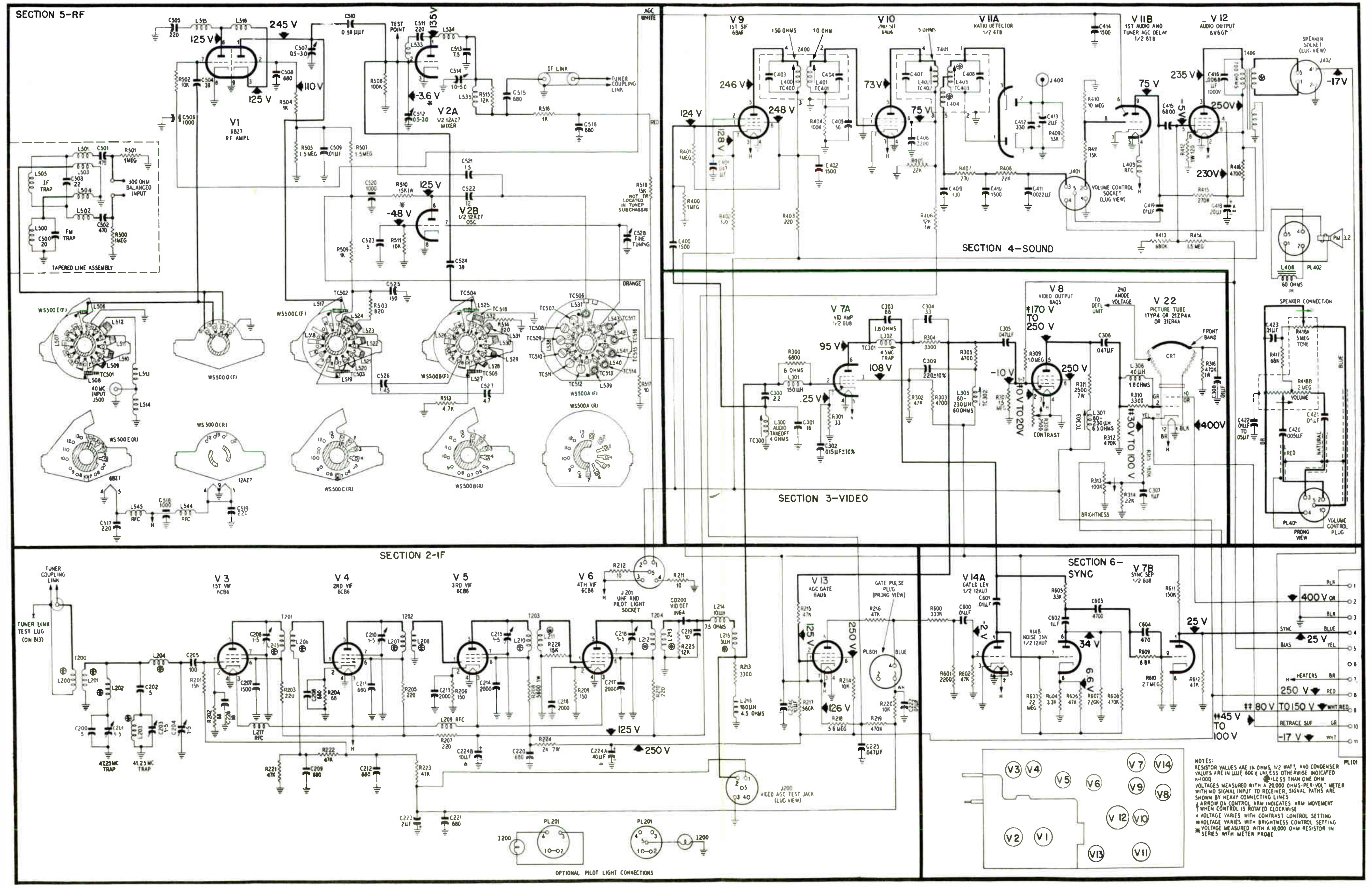


Figure 40. R-F Chassis R-201, Schematic Diagram

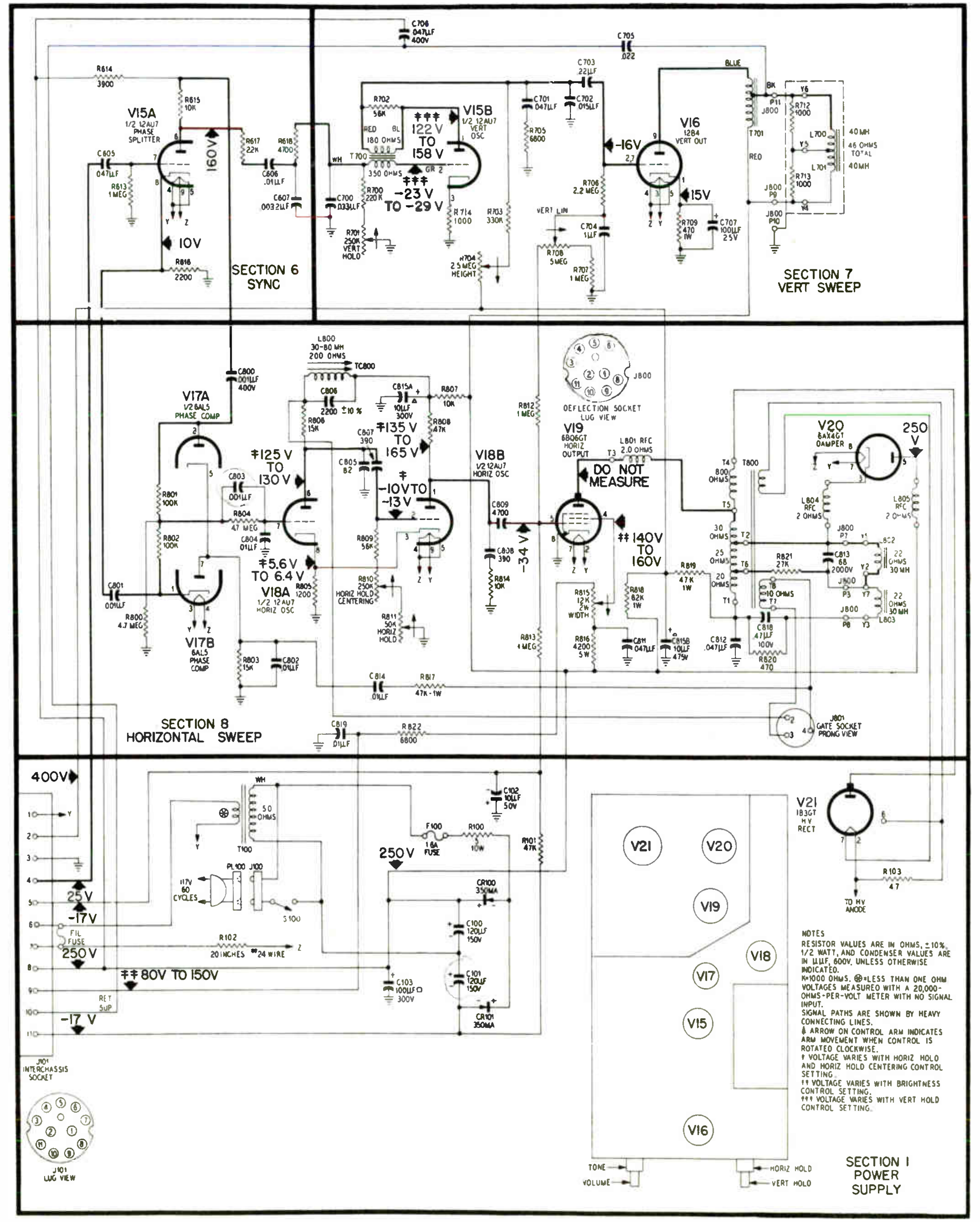


Figure 41. Deflection Chassis D-201, Schematic Diagram

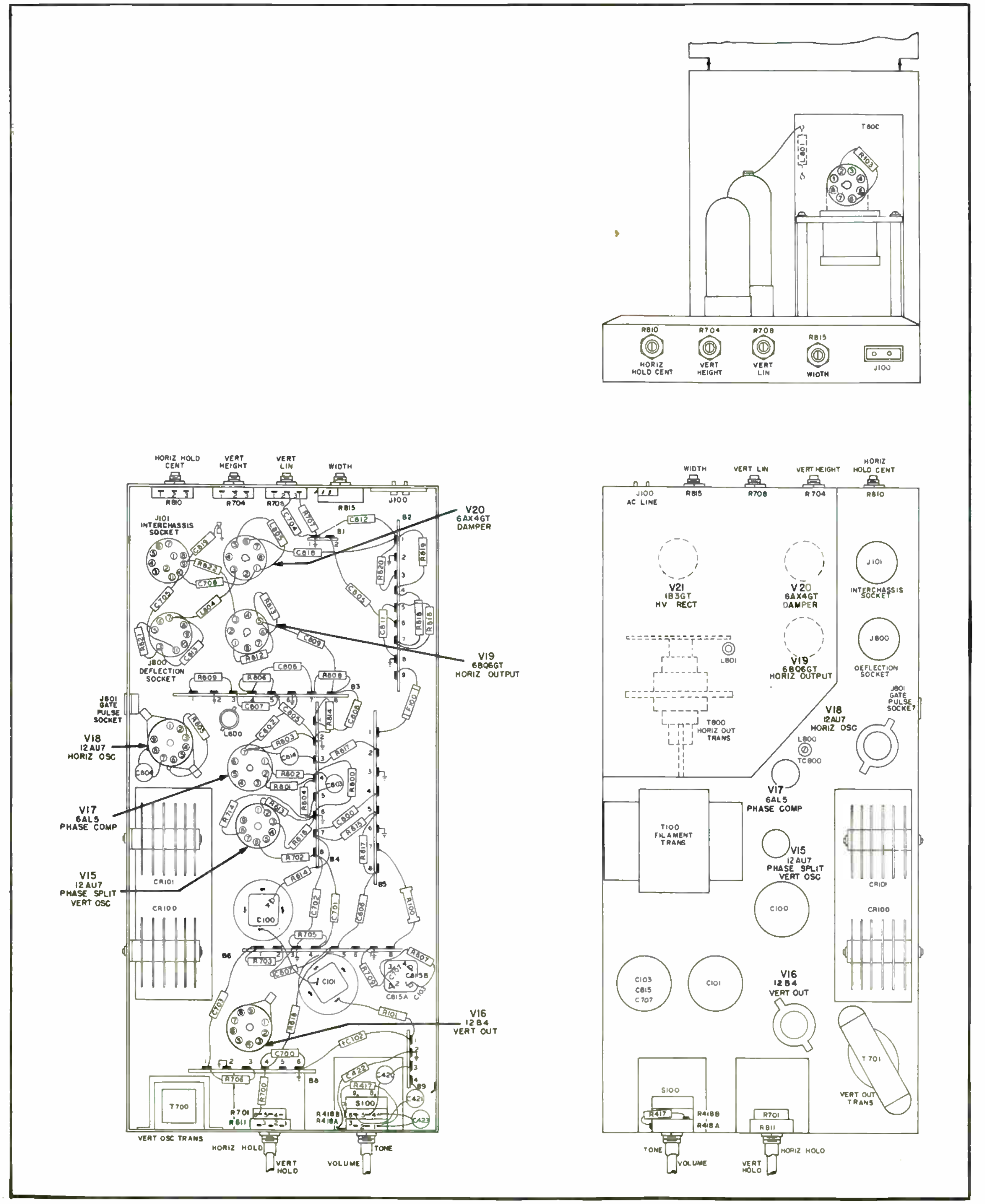


Figure 42. Deflection Chassis D-201, Base Layout

UHF TUNER-ADAPTER UT20B, PART NO. 43-6701

UHF Tuner-Adapter UT20B, Part No. 43-6701, provides for reception of UHF signals on television Channels 14 through 83. UHF Tuner-Adapter UT20B is designed for installation in Philco B line television receiver and is installed on BU models. These receivers use r-f chassis R-201.

The Tuner-Adapter consists of a UHF Tuner, a VHF-UHF change-over switch, adapter cables and plugs, a planetary tuner driving assembly and mounting hardware.

CIRCUIT DESCRIPTION

The UHF tuner converts the UHF signals to the intermediate frequency of the r-f chassis.

The incoming UHF signal is coupled through the antenna input line, and through two i-f traps, two 680-$\mu\mu$f. condensers, and a 150-ohm transmission line to the antenna tank of the tuner. See figures 45 through 48. The antenna tank is coupled to the mixer tank by means of the mutual coupling of L2 and L3 and the stray capacitance, C5. The desired signal is selected by tuning the antenna tank and the mixer tank to the correct frequency, and the signal is then coupled to the crystal mixer circuit by means of the mutual coupling of L4 and L5. The local-oscillator signal is generated by a 6AF4 tube, V1, and the associated circuit. The oscillator circuit is coupled to the crystal mixer circuit by a 300-ohm, miniature transmission line and the mutual coupling of L7 to L5 and L8 to L6. The r-f signal and the oscillator signal are mixed in the crystal mixer circuit to produce a 45.75-mc. video carrier intermediate-frequency signal. This signal is coupled to the VHF tuner through L18, a coaxial cable, and J500 on the VHF tuner. In UHF operation, the local oscillator of the VHF tuner is inoperative, and the r-f amplifier and mixer tubes of the VHF tuner operate as i-f amplifiers.

The two tanks of the UHF tuner, the antenna tank and the mixer tank, are used to prevent the i-f and oscillator signals from feeding back to the antenna and interfering with other receivers. The two tanks pass incoming signals readily, but do not pass the i-f or oscillator signal.

CHANGE-OVER SWITCH

The change-over switch supplied with the Tuner-Adapter is used to switch from VHF to UHF, and vice versa. It is installed on the back of the VHF tuner, and is operated by an actuator mounted on the VHF tuner shaft. When the Channel Selector of the VHF tuner is turned to the UHF position, the change-over switch makes proper connections for UHF operation. In this position, the switch places a 150,000-ohm resistor in series with the VHF mixer plate, which drops the voltage on the plate of the tube. (In the UHF position, the VHF Channel Selector places extra inductances in the VHF r-f and mixer circuits, permitting them to operate as i-f amplifiers, and it also shunts the VHF oscillator grid circuit with a 10-ohm resistor, putting the oscillator out of operation.) The change-over switch also turns off the VHF pilot light, turns on the UHF dial pilot lights, and connects the antenna to the UHF tuner.

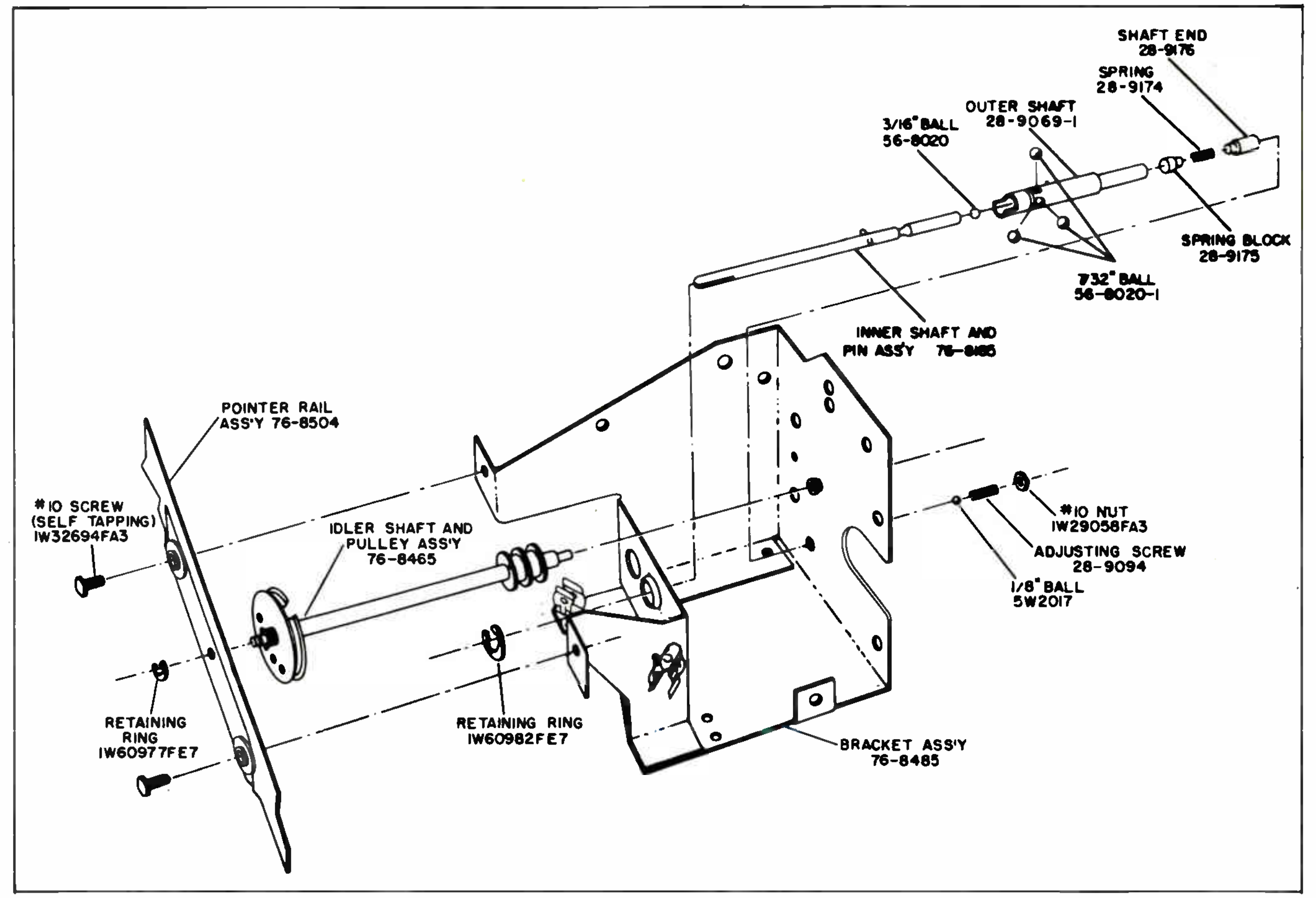
When the VHF Channel Selector is turned to any VHF position, the change-over switch places a 150,000-ohm resistor in series with the UHF local oscillator plate circuit, which drops the voltage applied to the plate, and puts the oscillator out of operation. The switch also turns on the VHF pilot light, turns off the UHF dial pilot lights, and connects the antenna to the VHF tuner.

PLANETARY DRIVE

The UHF tuner is tuned by means of a 3-gang tuning condenser, which is driven through a specially designed planetary drive. See figure 43. The planetary drive is so constructed that fine tuning and coarse tuning can be accomplished with a single control knob. The tuning shaft is coupled to the driving shaft through three balls, which form a planetary drive that produces slow rotation for fine tuning. See figure 2. After rotating 180 degrees with the tuning shaft, a pin engages the driving shaft, and the two shafts are direct-coupled, for coarse tuning. To re-engage the planetary drive for fine tuning, it is only necessary to reverse the direction of rotation. The dial pointer is connected to the tuning gang through a cord drive, and indicates the channel number to which the tuner is tuned. See figure 44.

ALIGNMENT AND REPAIRS

The frequencies at which the Tuner-Adapter operates are extremely high; therefore, it is necessary that the utmost care be taken to safeguard against upsetting the delicate adjustments of the tuner. It is recommended that the serviceman make only minor repairs to the tuner, such as replacement of the tube or crystal and the wiring of external leads. The



TP3-894

Figure 43. UHF Planetary Drive Assembly, Exploded View, Showing Mechanical Construction

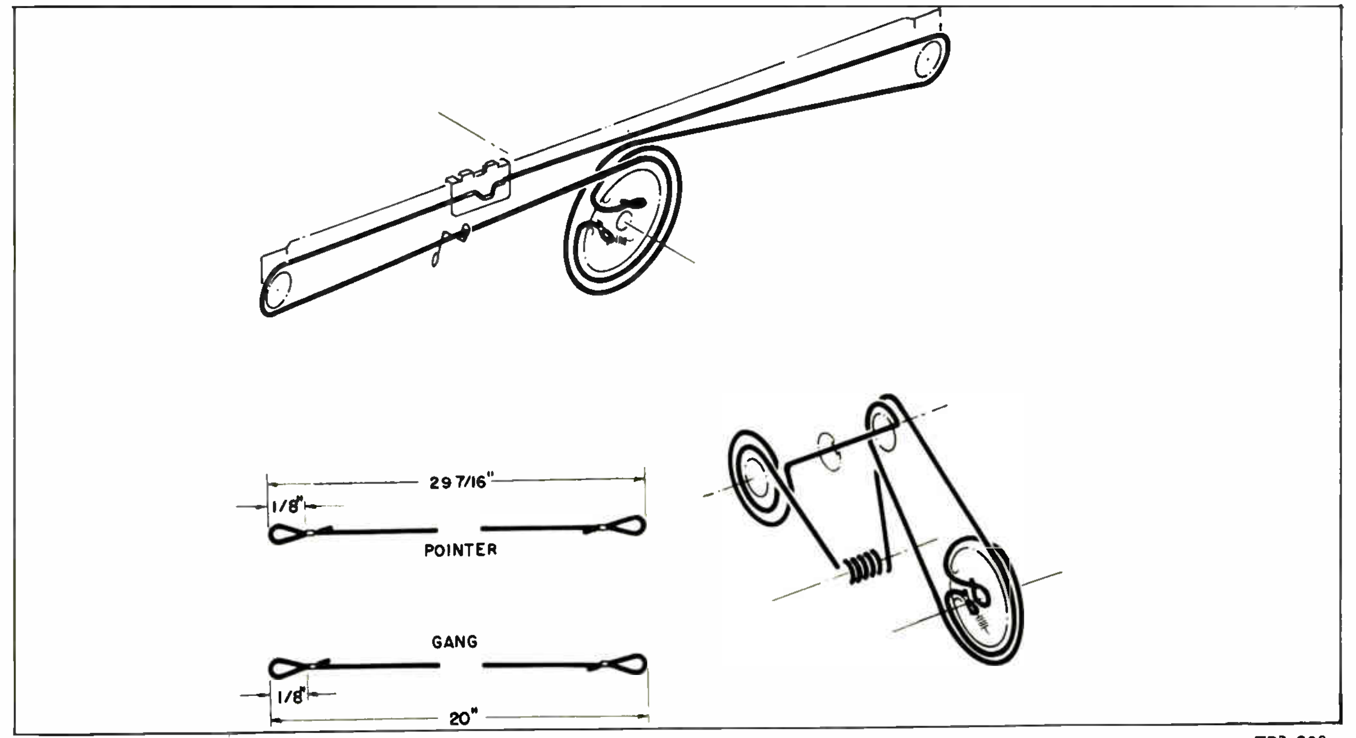
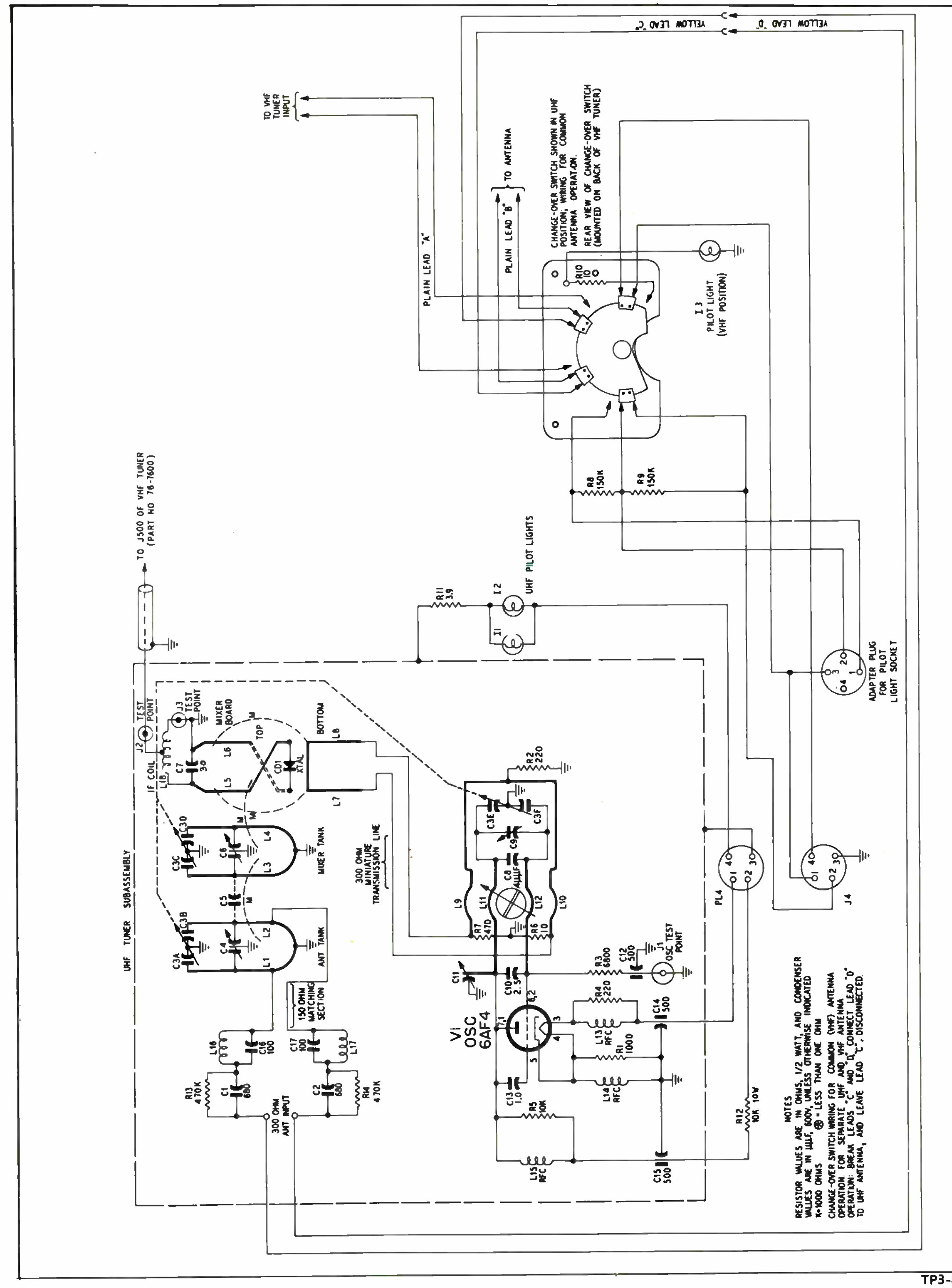


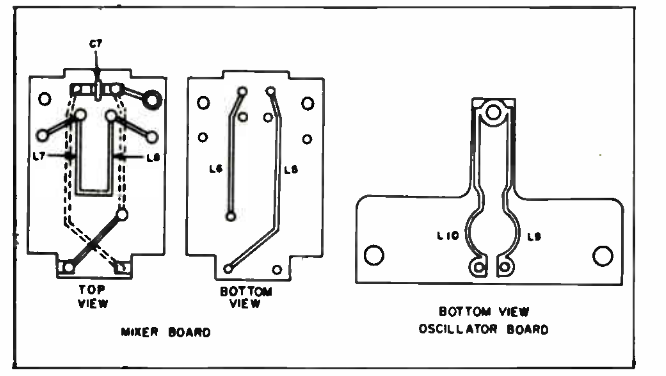
Figure 44. UHF Drive-Cord Stringing Arrangement

TP3-888



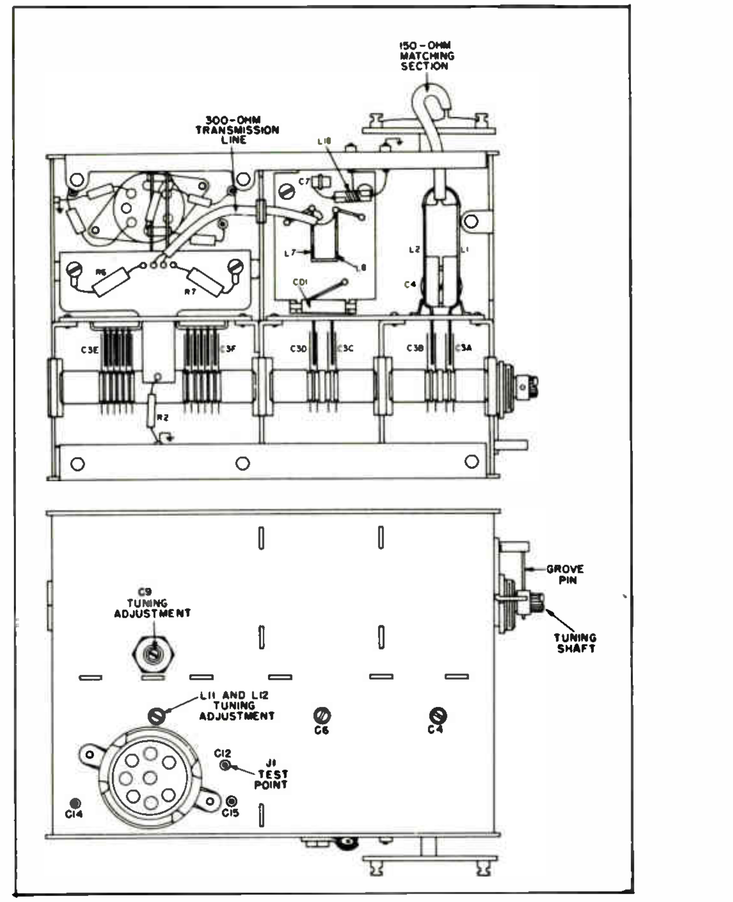
TP3-873

Figure 45. UHF Tuner-Adapter UT20B, Part No. 43-6701, Schematic Diagram



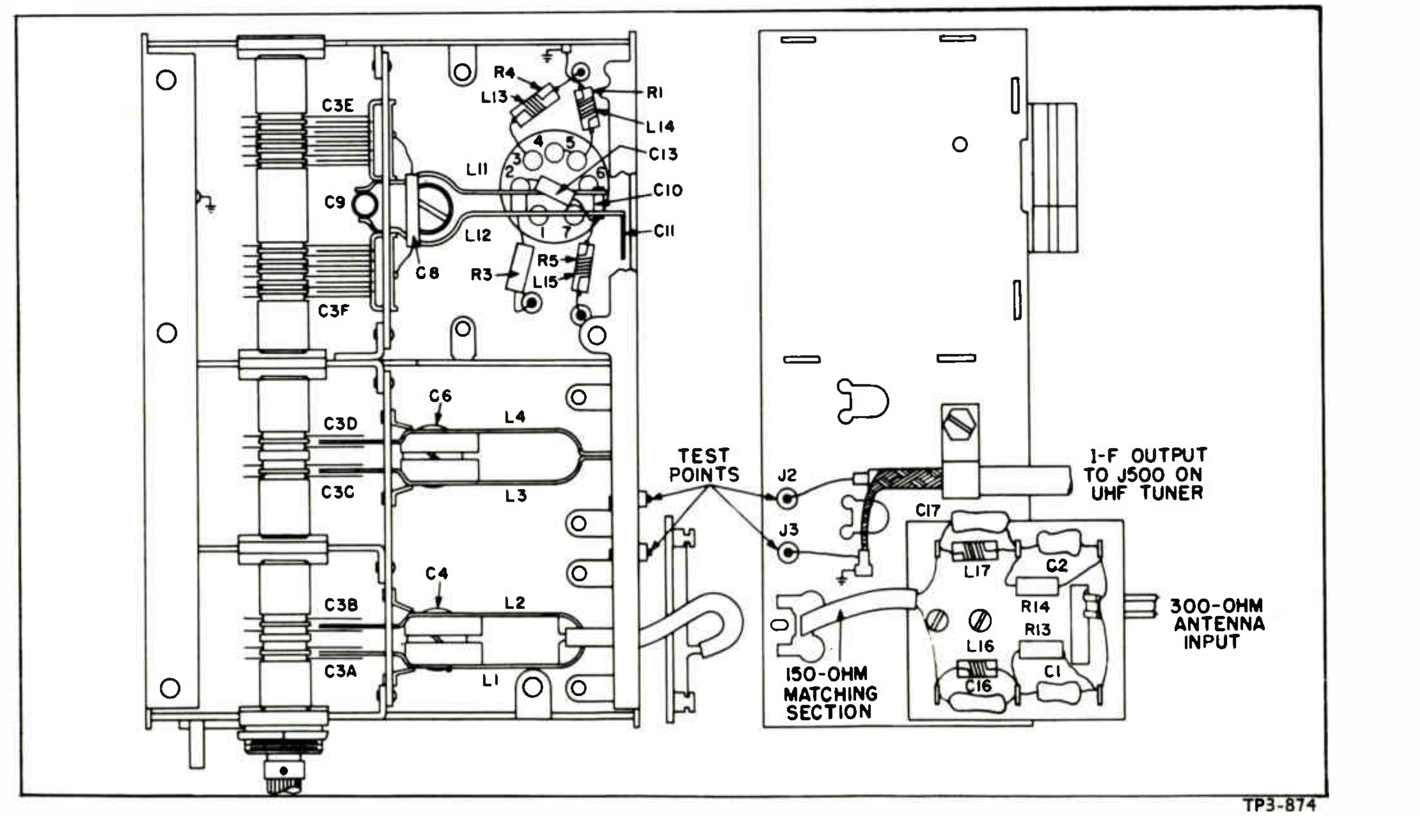
TP2-3175

Figure 46. Oscillator and Mixer Board Layouts, UHF Tuner



TP3-875

Figure 48. Side View and Base View of UHF Tuner-Adapter UT20B, With Board Assemblies



TP3-874

Figure 47. Top View and Base View of UHF Tuner-Adapter UT20B, Without Board Assemblies

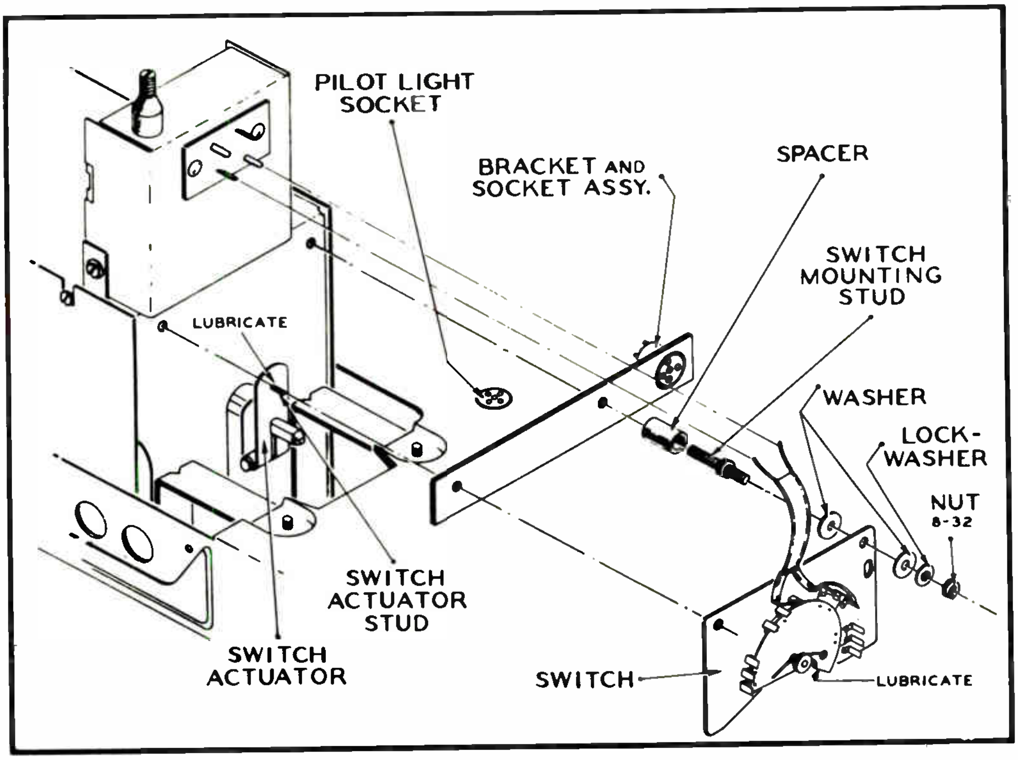


Figure 49. VHF-UHF Change-Over Switch, Mounting Details

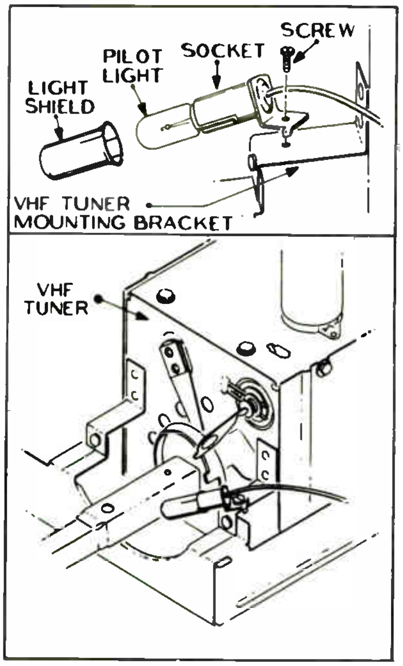
Tuner-Adapter should be returned to the factory for alignment and major repairs, unless the serviceman is properly equipped to perform these jobs. In general, a good rule to follow is not to remove the cover of the Tuner-Adapter.

NOTE: Replacing the tube with a new one may detune the tuner. If this occurs, a number of tubes should be tried, until the most satisfactory substitute for the original is found.

INSTALLATION INSTRUCTIONS FOR UHF TUNER-ADAPTER UT20B

To install the UHF tuner-adapter, proceed as follows:

1. Remove the cabinet back and r-f chassis from the cabinet; then remove the nameplate on the control panel by pushing it out from inside the cabinet.
2. Insert the dial scale and bezel assembly into the hole provided in the cabinet. Fasten the assembly in place with the two 10-32 nuts provided.
3. Remove the tuner assembly from the mounting board with which it was shipped. Keep the three screws for mounting the tuner in the cabinet.
4. Place the spacers on the mounting studs and attach the bracket and socket assembly to the rear of the VHF tuner on the r-f chassis. See figure 49.
5. Place the switch-actuator assembly on the shaft extending from the rear of the VHF tuner so that the switch actuator stud points away from the tuner. See figure 49.
6. Place the switch assembly on the two mounting studs, and fasten it in place with the flat washers, lock washers, and nuts provided. See figure 49.
7. Put the VHF Channel Selector in the Channel 2 position. Rotate the switch actuator clockwise on the tuner shaft until the actuator touches the fiber cam on the change-over switch, and fasten the switch actuator in this position. Rotate the VHF Channel Selector to the UHF position. Check the switch operation, to make sure that the switch is thrown properly. Rotate the VHF Channel Selector to Channel 13 position, and check the switch operation, to make sure that the switch is not thrown in this position. Lubricate the switch-actuator stud and switch cam with cup grease.
8. Remove the pilot lamp from the r-f chassis pilot-light socket. Remove and discard the pilot-light socket and cable assembly from the r-f chassis. Insert the plug from the change-over switch into the socket on the r-f chassis from which the pilot-light cable was removed. Mount the new pilot-light socket from the change-over switch as shown in figure 50. Insert the pilot light in the socket, and install the shield provided over it.



TP3-755
Figure 50. Pilot-Light Socket, Mounting Details

9. Remove the antenna lead from the VHF tuner, and solder the short lead from the UHF-VHF change-over switch to the VHF tuner terminals from which the antenna lead was removed. Slide the folded fiber lead holder over the tapered-line coil assembly on the VHF tuner, and dress the twin-wire antenna leads through the holder. See figure 51. The fiber holder will prevent the twin-wire leads from touching the tubes on the r-f chassis.

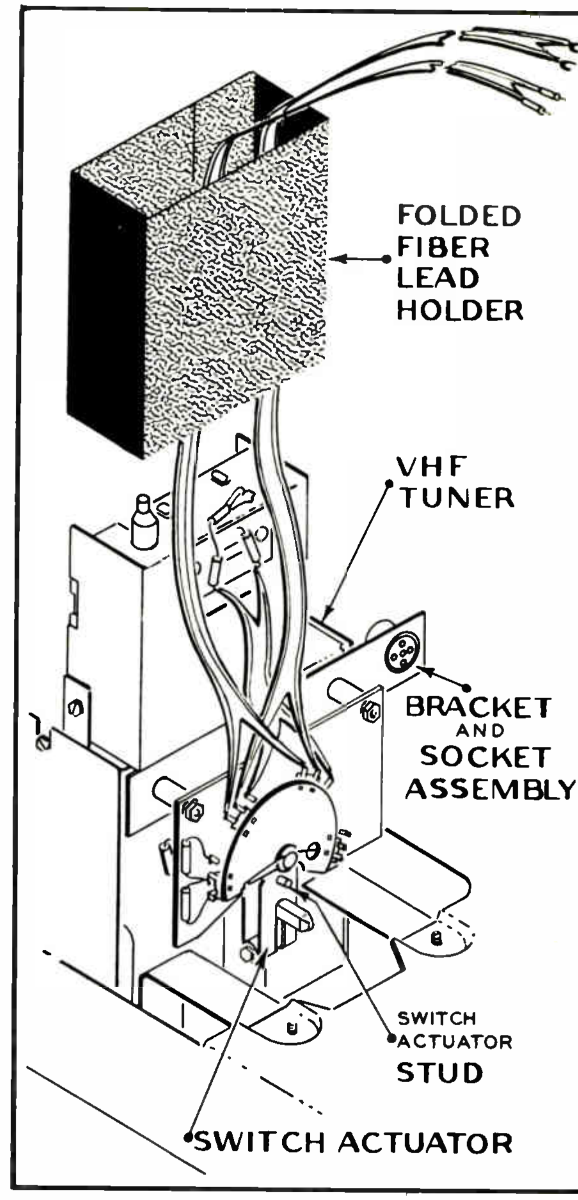
10. Place the UHF tuner in the cabinet between the r-f and deflection chassis, and fasten the UHF tuner to the chassis shelf with the three screws removed in step 3. It is important that these screws be tightened securely, so as to hold the UHF tuner in place on the chassis shelf.

11. Fasten one end of the ground lead to the r-f chassis with the drive screw. See figure 52. Install the chassis in the cabinet, and fasten the other end of the ground lead to the UHF tuner with the 8-32 x 1/4 inch hex-head machine screw. Fasten the r-f chassis with the original mounting bolts. Place the original knobs on their shafts, and the knob provided on the UHF tuning shaft.

12. Insert the plug from the UHF tuner into the socket on the bracket installed in step 4.

13. Insert the coaxial cable into the jack on the VHF tuner. See figure 52.

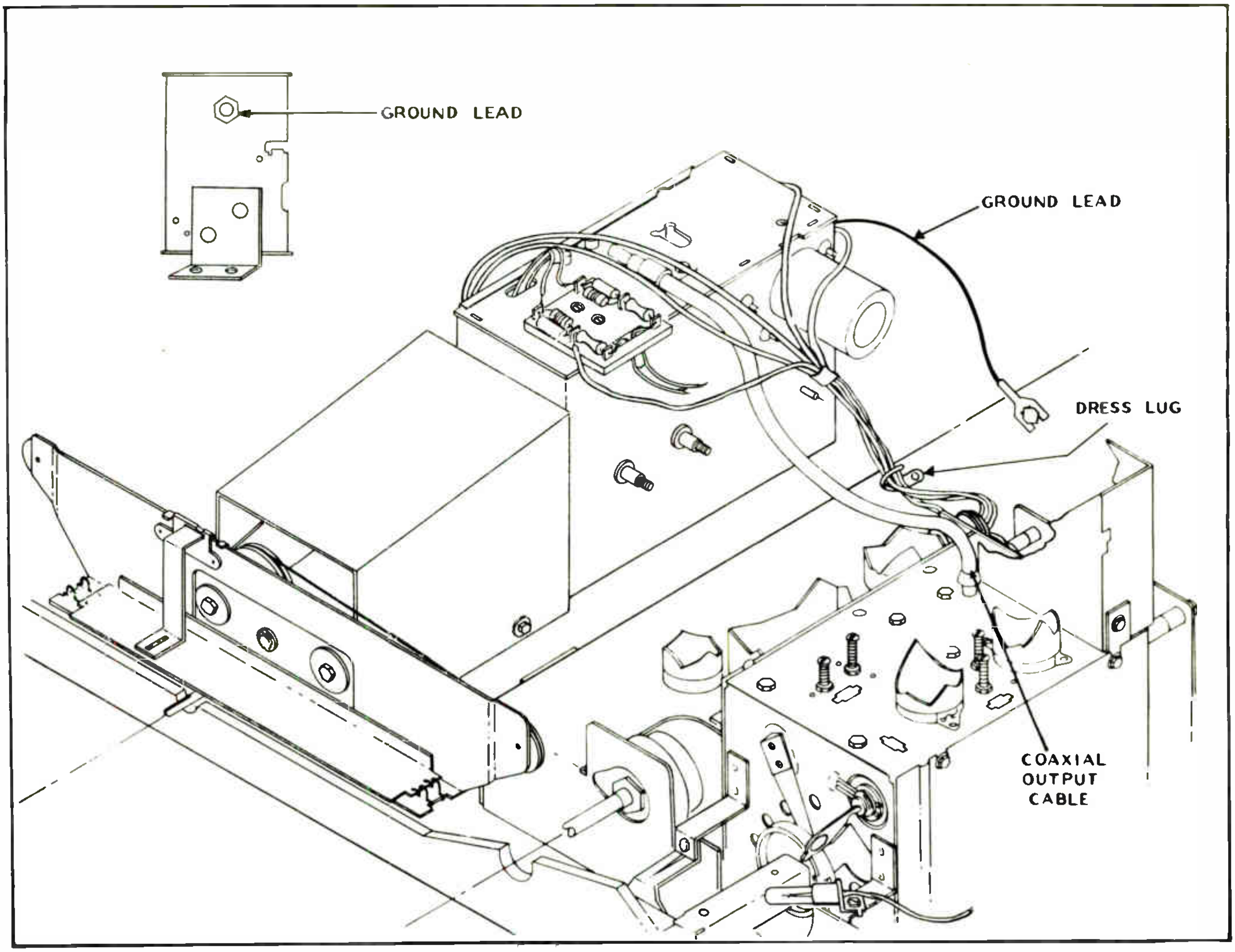
14. Replace the fiber antenna-lead holder with the new holder provided. Fasten the new holder with the nails provided, and then pass the twin-wire leads through the holes as shown in figure 53. Pull the leads through the holder until they are tight, making certain that the leads do not contact the tubes or the chassis. Wrap tape around the yellow-marked twin-wire leads with the spade lug ends, to prevent the leads from passing back through the fiber holder.



TP3-756
Figure 51. Folded Fiber Lead Holder and VHF-UHF Change-Over Switch, Mounting Details

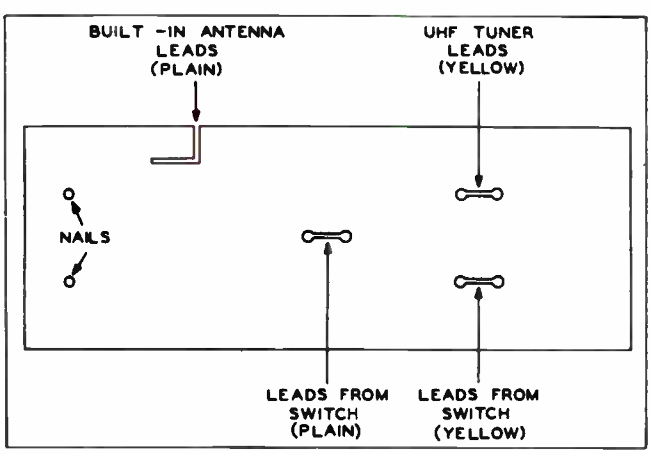
15. Fasten the antenna terminal board provided as shown in figures 54 through 58. Replace the cabinet back and make the connections illustrated for the type of antenna installation being used.

16. Paste the label provided over the outside-antenna instructions on the cabinet back.



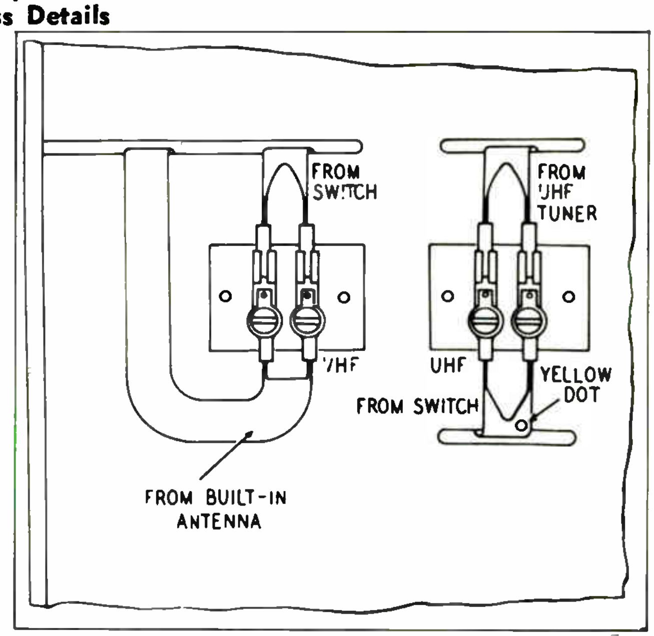
TP3-757

Figure 52. UHF Tuner-Adapter and R-F Chassis, with Lead Dress Details



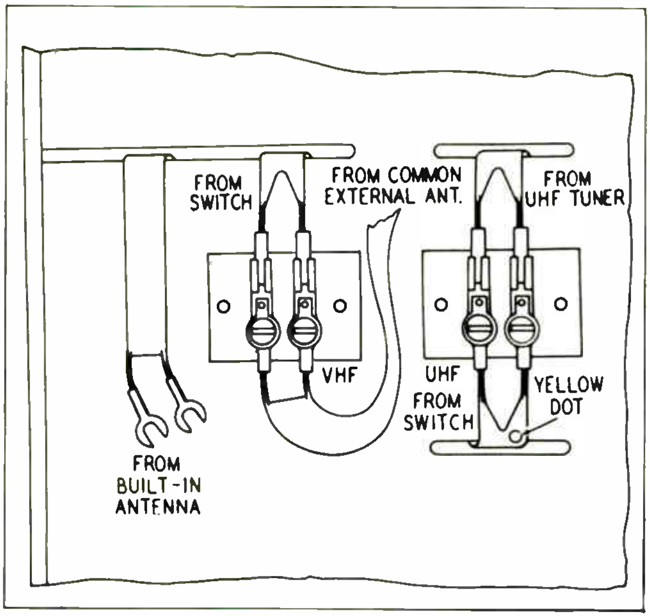
TP2-3169

Figure 53. Fiber Lead Holder, with Lead Dress Details



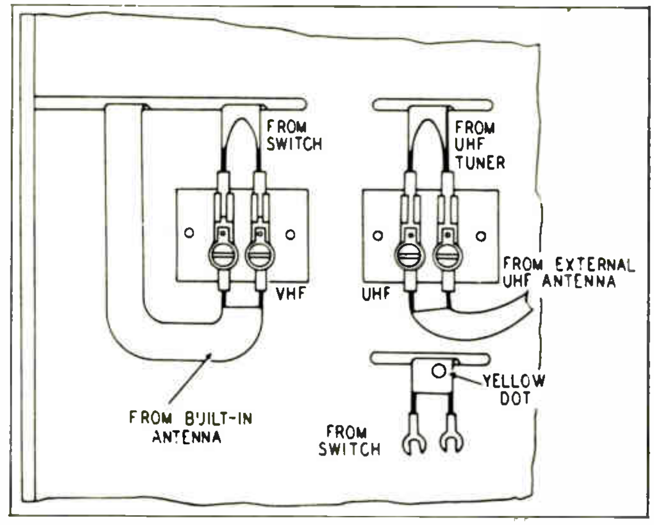
TP2-3170

Figure 54. Antenna-Lead Connections, Common Built-In Antenna



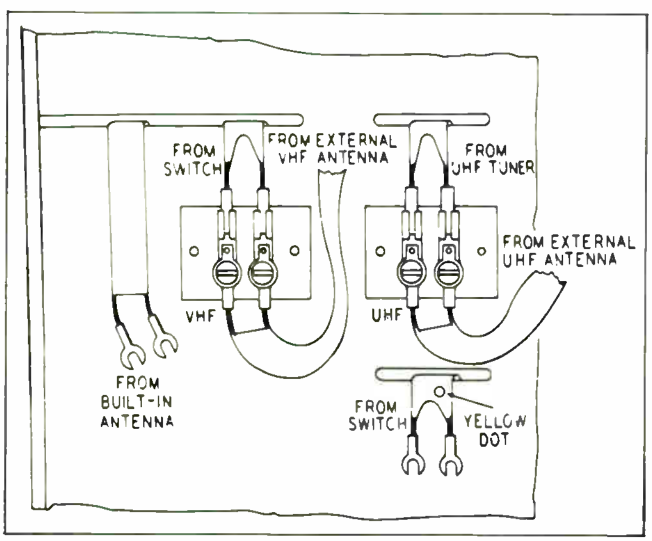
TP2-3172

Figure 55. Antenna-Lead Connections, Common External Antenna



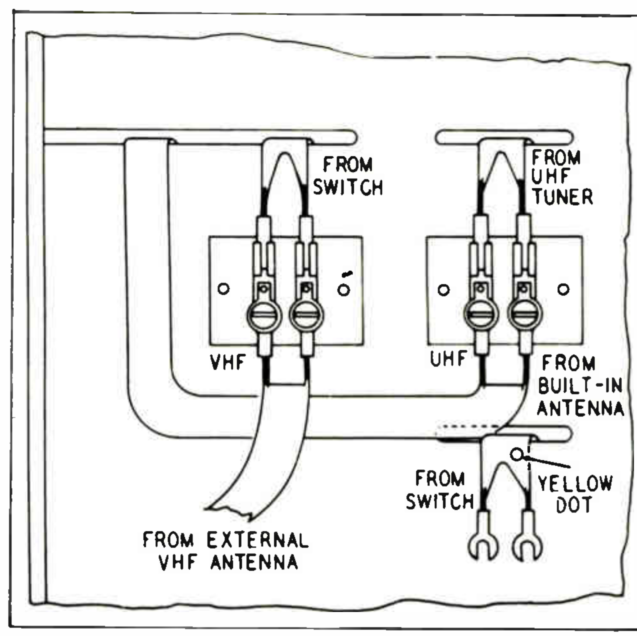
TP2-3171

Figure 57. Antenna-Lead Connections, VHF Built-In and UHF External Antennas



TP2-3174

Figure 56. Antenna-Lead Connections, Separate External Antennas



TP2-3173

Figure 58. Antenna-Lead Connections, VHF External and UHF Built-In Antennas

REPLACEMENT PARTS LIST

IMPORTANT

General replacement items commonly stocked by the serviceman are omitted from this parts list. All condensers are molded-bakelite Philco condensers, with a 600-volt rating, and all resistors are ½ watt, ±10%, unless otherwise indicated. Parts are listed according to chassis type, and should be ordered in this way rather than by model number; in addition, a miscellaneous listing will be found at the end of the parts list for each chassis type. All parts are symbolized in the schematic diagram and base layout, for identification purposes.

DEFLECTION CHASSIS D-201

SECTION 1—POWER SUPPLY

Reference Symbol	Description	Service Part No.
C100 and C101	Condenser, filter, electrolytic, 120 μf., 150v	30-2568-51
C102	Condenser, filter, electrolytic. 10 μf., 50v	30-2417-3
C103	Condenser, filter, electrolytic, 100 μf., 300v	30-2584-27
CR100 and CR101	Rectifier, selenium, 350 ma.	34-8003-7
F100	Fuse, line, 1.6 amperes	45-2656-23
J100	Socket, a-c line	27-6240-3
J101	Socket, chassis connecting	27-6274-1
PL100	Plug, a-c line	Part of a-c line cord ass'y. (See Misc. "A")
PL101	Plug and cable ass'y., chassis connecting	(See Misc. "B")
R100	Resistor, current limiting, 5 ohms, 10 watts	33-3448-5
R101	Resistor, filter, 47,000 ohms, 1 watt	66-3474340
R102	Resistor, voltage dropping	20 inches No. 24 wire
R103	Resistor, voltage dropping, 4.7 ohms, 1 watt	66-9474340
S100	Switch, off-on	Part of volume control
T100	Transformer, filament	32-8574-1

SECTION 7—VERTICAL SWEEP

Reference Symbol	Description	Service Part No.
C707	Condenser, cathode by-pass, 100 μf., 25v	Part of C103
L700 and L701	Coils, vertical deflection	Part of deflection yoke (See Misc. "A")
R701	Potentiometer, VERT. HOLD control, 250,000 ohms	Part of R811
R704	Potentiometer, HEIGHT control, 2.5 megohms	33-5565-32
R708	Potentiometer, VERT. LIN. control, 5 megohms	33-5565-31
T700	Transformer, vertical oscillator	32-8431-2
T701	Transformer, vertical output	32-8539

SECTION 8—HORIZONTAL SWEEP

Reference Symbol	Description	Service Part No.
C803	Condenser, filter, .001 μf.	30-1238-3
C804	Condenser, grid blocking, .01 μf.	30-1238-2
C805	Condenser, by-pass, 82 μμf.	60-00825317
C806	Condenser, ringing, .0022 μf. ±10%	60-20225004
C807	Condenser, d-c blocking, 390 μμf.	60-10395417
C808	Condenser, charging, 390 μμf.	60-10395417
C813	Condenser, anti-ringing, 68 μμf.	30-1246-1
C814	Condenser, horizontal a-f-c feedback, .01 μf.	30-1238-2
C815	Condenser, electrolytic	Part of C103
C815A	Condenser, by-pass, 10 μf., 300v	Part of C103
C815B	Condenser, by-pass, 10 μf., 475v	Part of C103
C818	Condenser, yoke blocking, .47 μf., 100v	30-4651-16
J800	Socket, deflection	27-6274-8
J801	Socket, gate pulse	27-6273
L800	Coil, stabilizing, 30—80 mh.	32-4557
L801	Coil, r-f choke, horizontal-output plate	Part of T800
L802 and L803	Coils, horizontal deflection	Part of deflection yoke (See Misc. "A")
L804	Coil, r-f choke, damper cathode	32-4112-24
L805	Coil, r-f choke, damper plate	32-4112-24
PL800	Plug, deflection	Part of cable ass'y. (See Misc. "A")
PL801	Plug, gate pulse	Part of cable ass'y. (See Misc. "A")
R810	Potentiometer, HORIZ. HOLD CENTERING	33-5565-17
R811	Potentiometer, HORIZ. HOLD control, 200,000 ohms	33-5563-50
R815	Potentiometer, WIDTH control, 12,000 ohms, 2 watts	33-5546-51
R816	Resistor, screen voltage dropping, 4200 ohms, 5 watts	33-1335-101
R817	Resistor, feedback, 47,000 ohms, 1 watt	66-3474340

REPLACEMENT PARTS LIST (Cont.)

SECTION 8—HORIZONTAL SWEEP (Cont.)

Reference Symbol	Description	Service Part No.
R818	Resistor, voltage divider, 82,000 ohms, 1 watt	66-3824340
R819	Resistor, voltage divider, 47,000 ohms, 1 watt	66-3474340
T800	Transformer, horizontal output	32-8607

MISCELLANEOUS "A"

Description	Service Part No.
Cable assembly, high voltage	AD2631
Cable and plug assembly, deflection	41-4086-25

MISCELLANEOUS "A" (Cont.)

Description	Service Part No.
Cable and plug assembly, volume control	41-4136-4
Cord, line	41-3865
Insulator, electrolytic, condenser mounting	27-9508-1
Shield, corona	56-9684
Socket, damper tube	27-6174-7
Socket, high-voltage rectifier	27-6290-1
Socket, miniature, 7-pin	27-6203-12
Socket, miniature, 9-pin	27-6203-6
Socket, octal	27-6174
Socket, 12AU7	76-6115-1
Socket, vertical output, 12B4	76-6115-2

R-F CHASSIS R-201

SECTION 2—VIDEO I.F.

Reference Symbol	Description	Service Part No.
C200	Condenser, 47.25-mc. trap, 5 μμf.	30-1224-28
C201	Condenser, 47.25-mc. trap, 1 to 5 μμf.	31-6520-9
C202	Condenser, 41.25-mc. trap, 5 μμf.	30-1224-28
C203	Condenser, 41.25-mc. trap, 1 to 5 μμf.	31-6520-9
C204	Condenser, trimmer, 1 to 5 μμf.	31-6520-9
C205	Condenser, d-c blocking, 100 μμf.	30-1224-18
C206	Condenser, trimmer, 1 to 5 μμf.	31-6520-9
C207	Condenser, screen by-pass, 1500 μμf.	62-215001011
C208	Condenser, cathode by-pass, 680 μμf.	62-168001001
C209	Condenser, a-g-c by-pass, 680 μμf.	62-168001001
C210	Condenser, trimmer, 1 to 5 μμf.	31-6520-9
C211	Condenser, screen by-pass, 680 μμf.	62-168001001
C212	Condenser, a-g-c by-pass, 680 μμf.	62-168001001
C215	Condenser, trimmer, 1 to 5 μμf.	31-6520-9
C218	Condenser, trimmer, 1 to 5 μμf.	31-6520-9
C219	Condenser, detector by-pass, 10 μμf.	62-010409001
C220	Condenser, by-pass, 680 μμf.	62-168001001
C221	Condenser, by-pass, 680 μμf.	62-168001001
C223	Condenser, a-g-c filter, 2 μf.	30-2417-7
C224	Condenser, electrolytic	30-2570-57
C224A	Condenser, filter, 40 μf.	Part of C224
C224B	Condenser, filter, 10 μf.	Part of C224

SECTION 2—VIDEO I.F. (Cont.)

Reference Symbol	Description	Service Part No.
C224C	Condenser, filter, 10 μf.	Part of C224
C226	Condenser, cathode by-pass, 18 μμf.	62-018400021
CD200	Crystal, video detector	34-8022
I200	Lamp, pilot	34-2068
J200	Socket, video test	27-6273
J201	Socket, pilot light	27-6273
L200 and L201	Coils, tuner coupling	Part of T200
L202	Coil, 47.25-mc. trap	32-4597-2
L203	Coil, 41.25-mc. trap	32-4112-31
L204	Coil, 1st i-f grid	32-4597-3
L205 and L206	Coils, coupling	Part of T201
L207 and L208	Coils, coupling	Part of T202
L209	Coil, filament choke	32-4112-15
L210 and L211	Coils, coupling	Part of T203
L212 and L213	Coils, coupling	Part of T204
L214	Coil, series peaking, 10 μh.	32-4422-27
L215	Coil, series peaking, 1.7 μh.	32-4480-17
L216	Coil, shunt peaking, 180 μh.	32-4480-9
L217	Coil, filament choke	32-4112-15
R208	Resistor, voltage dropping, 5600 ohms, 1 watt	66-2564340
R224	Resistor, B+ dropping, 2000 ohms, 7 watts	33-3446-7
T200	Transformer, video i-f input	32-4599-2
T201	Transformer, 1st video i-f	32-4598-5
T202	Transformer, 2nd video i-f	32-4598-3
T203	Transformer, 3rd video i-f	32-4548-26
T204	Transformer, 4th video i-f	32-4548-27

REPLACEMENT PARTS LIST (Cont.)

R-F CHASSIS (Cont.)

SECTION 3—VIDEO

Reference Symbol	Description	Service Part No.
C300	Condenser, audio take-off, 2.2 μμf.	30-1221-6
C301	Condenser, by-pass, 18 μμf.	62-018400021
C303	Condenser, by-pass, 68 μμf.	62-068409011
C304	Condenser, by-pass, 33 μμf.	62-033009001
C309	Condenser, screen by-pass, 220 μμf.	60-10225417
L300	Coil, audio take-off	32-4463-9
L301	Coil, video-amplifier grid, peaking, 150 μh.	32-4480-18
L302	Coil, 4.5-mc. trap	32-4463-2
L305	Coil, shunt peaking, 60—230 μh.	32-4467-20
L306	Coil, picture-tube grid peaking, 40 μh.	32-4480-1
L307	Coil, shunt peaking, 60—230 μh.	32-4467-19
R308	Potentiometer, CONTRAST control, 2500 ohms	33-5563-51
R311	Resistor, plate load, 2500 ohms, 7 watts	33-1335-93
R313	Potentiometer, BRIGHTNESS control, 100,000 ohms	Part of R308
R316	Resistor, grounding, 470,000 ohms, 1 watt	66-4474340

SECTION 4—AUDIO

Reference Symbol	Description	Service Part No.
C405	Condenser, by-pass, 56 μμf.	30-1224-25
C409	Condenser, detector balancing, 330 μμf.	62-133001001
C412	Condenser, r-f by-pass, 330 μμf.	62-133001001
C413	Condenser, filter, 2 μf.	30-2417-7
C416	Condenser, plate by-pass, 6800 μμf., 1000v	30-4650-91
C418	Condenser, filter, 20 μf.	Part of C224
J400	Socket, discriminator test	27-6273
J401	Socket, volume control	27-6273
J402	Socket, speaker	27-4785-22
L405	Coil, filament choke	32-4112-15
L406	Coil, filter choke	32-8617
R406	Resistor, voltage divider, 12,-000 ohms, 1 watt	66-3124340
R412	Resistor, cathode bias, 120 ohms, 1 watt	66-1124340
R418	Potentiometer, dual	33-5563-44
R418A	Potentiometer, TONE control, 5 megohms	Part of R418
R418B	Potentiometer, VOLUME control, 2 megohms	Part of R418
T400	Transformer, audio output	32-8582
Z400	Transformer, 1st sound i-f	32-4497A
Z401	Transformer, FM detector	32-4450-6A

SECTION 6—SYNC

Reference Symbol	Description	Service Part No.
C604	Condenser, by-pass, 470 μμf.	30-1225-18

MISCELLANEOUS "B"

Description	Service Part No.
Cable and plug assembly, chassis connecting	41-4146-4
Cable and plug assembly, gate pulse	41-4141
Cable and socket assembly, picture tube	41-3964-19
Cable and socket assembly, pilot light	41-4176
Shield, tube, 6CB6	56-5629FA3
Shield, tube, 6T8	56-5629-5
Socket and base assembly, 6CB6 tube	27-6203-14
Socket and base assembly, 6T8 tube	27-6203-18
Socket, miniature, 6AU6, 6AQ5, and 6BA6 tubes	27-6203
Socket, miniature, 9-pin	27-6203-6
Socket, octal	27-6174

SECTION 5—R.F. (T.V. TUNER, PART No. 76-7600-3)

Reference Symbol	Description	Service Part No.
C500	Condenser, FM trap, 20 μμf.	62-020309011
C501 and C502	Condenser, antenna isolating, 470 μμf.	30-1225-18
C503	Condenser, i-f trap, 22 μμf.	Part of L505
C504	Condenser, r-f coupling, 39 μμf.	62-039409011
C505	Condenser, neutralizing, 220 μμf.	62-122001001
C506	Condenser, a-g-c decoupling, 1000 μμf.	30-1245-1
C507	Condenser, r-f trimmer, 0.5 to 3.0 μμf.	31-6520-3
C508	Condenser, r-f by-pass, 680 μμf.	62-168001001
C509	Condenser, grid by-pass, 0.1 μf.	30-1238-2
C510	Condenser, coupling, .59 μμf.	311-5050-3
C511	Condenser, neutralizing, 220 μμf.	62-122001011
C512	Condenser, mixer-grid trimmer, 0.5 to 3.0 μμf.	31-6520-3
C513	Condenser, by-pass, 7.5 μμf.	30-1224-13
C514	Condenser, trimmer, 1 to 5 μμf.	31-6520-11
C515	Condenser, i-f link coupling, 680 μμf.	62-168001021
C516	Condenser, by-pass, 680 μμf.	62-168001021
C517	Condenser, filament decoupling, 220 μμf.	62-122001011
C518	Condenser, filament by-pass, 1000 μμf.	30-1245-1

REPLACEMENT PARTS LIST (Cont.)

UHF TUNER-ADAPTER UT20B, PART No. 43-6701

SECTION 5—R.F. (Cont.)

Reference Symbol	Description	Service Part No.
C519	Condenser, filament decoupling, 220 $\mu\mu$f.	62-122001011
C520	Condenser, by-pass, 1000 $\mu\mu$f.	30-1245-1
C521	Condenser, oscillator injection	30-1221-8
C522	Condenser, oscillator plate, 12 $\mu\mu$f.	30-1224-57
C523	Condenser, grid blocking, 5 $\mu\mu$f.	30-1224-35
C524	Condenser, mixer-grid blocking, 39 $\mu\mu$f.	62-039409011
C525	Condenser, by-pass, 150 $\mu\mu$f.	30-1238-9
C528	Condenser, fine tuning, (bakelite tube)	76-6935-1
J500	Connector, 40-mc. input	57-0590-2
L500	Coil, FM trap	32-4550-3
L501, L502, L503, and L504	Coils, tapered-line assembly	32-4432-3
L505	Coil, i-f trap (44.75 mc.)	32-4552-1
L506 to L512 inclusive	Coils, r-f grid tuning	Part of WS500E
L513	Coil, 40-mc. channel	312-5146-16
L514	Coil, 40-mc. channel	312-5146-19
L515	Coil, r-f amplifier neutralizing	32-4548-13
L516	Coil, r-f coupling	312-5146-22
L517 to L524 inclusive	Coil, r-f plate tuning	Part of WS500C
L525 to L532 inclusive	Coil, mixer grid	Part of WS500B
L533	Coil, mixer neutralizing	32-4551-1
L534	Coil, mixer plate	312-5146-8
L535	Coil, i-f primary	312-5151-6
L537 to L543 inclusive	Coil, oscillator tuning	Part of WS500A
L544 and L545	Coils, r-f choke	32-4550-1
R518	Resistor, B+ dropping, 15,000 ohms, 1 watt	66-3154340
WS500A(F) and WS500A(R)	Switch, wafer, oscillator	76-7604
WS500B(F) and WS500B(R)	Switch wafer, mixer grid	76-7606
WS500C(F) and WS500C(R)	Switch wafer, r-f plate	76-7608
WS500D(F) and WS500D(R)	Switch wafer, r-f grid	76-7612
WS500E(F) and WS500E(R)	Switch wafer, r-f grid	76-7610

MISCELLANEOUS "C"

Description	Service Part No.
Coupling, fine tuning shaft	54-4912
Detent, ball	56-8020
Front plate ass'y.	76-8395
Hairpin, plunger grounding	1W42704FA3
Hairpin, plunger	56-9858
Plunger	56-8034-1
Retaining ring (2 used)	1W61043
Shaft ass'y.	76-6914-4
Shaft, extension	56-8358
Cam and shaft, fine tuning	76-6936-3
Shaft, spring	56-8023
Shield, tube, 9-pin miniature	56-5629-5
Socket, tube, 9-pin miniature	27-6203-21
Spring, detent	56-9158
Spring, plunger	56-9628
Tapered line ass'y.	76-7602
Terminal panel, antenna	76-5504-2
Washer	56-9351
Washer, fiber	27-4109-13
Washer, detent spring	W2556-5
"E" washer	1W60980FE5

Reference Symbol	Description	Service Part No.
C1 and C2	Condenser, antenna coupling, 680 $\mu\mu$f.	Part of Panel, filter
C3	Condenser, tuning:	
	Shaft and rotor ass'y.	76-7481-4
C3A	Stator, r-f, l.h.	56-9595
C3B	Stator, r-f, r.h.	56-9595-1
C3C	Stator, r-f, l.h.	56-9595
C3D	Stator, r-f, r.h.	56-9595-1
C3E	Stator ass'y., oscillator	76-7479
C3F	Stator ass'y., oscillator	76-7479
C4	Condenser, padder ass'y., r-f	76-7472
C5	Condenser	Stray capacitance
C6	Condenser, padder ass'y., r-f	76-7472
C7	Condenser, crystal, mixer tank, 30 $\mu\mu$f.	Part of Board ass'y., mixer
C8	Condenser, temperature compensating, .4 $\mu\mu$f.	30-1224-109
C9	Condenser, oscillator trimmer	31-6525
C10	Condenser, oscillator tank, 2.5 $\mu\mu$f.	Part of Tank ass'y., osc.
C11	Condenser, by-pass	Part of Tank ass'y., osc.
C12	Condenser, grid by-pass, 500 $\mu\mu$f.	30-1245-3
C13	Condenser, temperature compensating, 1.0 $\mu\mu$f.	30-1224-107

REPLACEMENT PARTS LIST (Cont.)

UHF TUNER-ADAPTER UT20B (Cont.)

MISCELLANEOUS "C" (Cont.)

Reference Symbol	Description	Service Part No.
C14	Condenser, filament by-pass, 500 μμf.	30-1245-3
C15	Condenser, plate by-pass, 500 μμf.	30-1245-3
C16 and C17	Condenser, 45.75-mc. i-f trap	Part of Panel, filter
CD1	Crystal detector, mixer circuit	34-8026
I1 and I2	Lamp, pilot, UHF	34-2068
L1	Inductor, r-f, l.h.	Part of C3A Stator
L2	Inductor, r-f, r.h.	Part of C3B Stator
L3	Inductor, r-f, l.h.	Part of C3C Stator
L4	Inductor, r-f, r.h.	Part of C3D Stator
L5	Inductor, crystal mixer	Part of Board ass'y., mixer
L6	Inductor, crystal mixer	Part of Board ass'y., mixer
L7	Inductor, oscillator coupling	Part of Board ass'y., mixer
L8	Inductor, oscillator coupling	Part of Board ass'y., mixer
L9	Inductor, oscillator coupling	Part of Board ass'y., osc.
L10	Inductor, oscillator coupling	Part of Board ass'y., osc.
L11	Inductor, oscillator	Part of Tank ass'y., osc.
L12	Inductor, oscillator	Part of Tank ass'y., osc.
L13	Choke, r-f, heater decoupling	32-4556-3
L14	Choke, r-f, cathode decoupling	32-4556-4
L15	Choke, r-f, plate decoupling	32-4556-2
L16 and L17	Coils, 45.75-mc. i-f trap	Part of Panel, filter
L18	Coil, i-f output	32-4558
R1	Resistor, damping, 1000 ohms	66-2108340
R2	Resistor, damping, 220 ohms.	66-1228340
R3	Resistor, grid leak, 6800 ohms	66-2688340
R4	Resistor, filament decoupling, 220 ohms	Part of L13
R5	Resistor, plate decoupling, 10-000 ohms	Part of L15
R6	Resistor, balancing, 470 ohms	66-1478340
R7	Resistor, balancing, 10 ohms.	66-0108340
R8 and R9	Resistor, B+ dropping, 150,-000 ohms	66-4158340
R10	Resistor, pilot-light dropping, 10 ohms	66-0108340
R11	Resistor, pilot-light dropping, 3.9 ohms	66-9138340
R12	Resistor, B+ dropping, 10,000 ohms, 10 watts	33-1336-58
R13 and R14	Resistor, antenna coupling, 470,000 ohms	66-4478340
	Board ass'y., mixer	76-7475-4
	Board ass'y., oscillator	76-7480
	Panel, filter, i-f trap	76-8078
	Tank ass'y., oscillator	76-7627

MISCELLANEOUS ELECTRICAL PARTS

Description	Service Part No.
Adapter cable	41-4171-2
Cable ass'y., i-f	41-4143
Cable, power input	41-4141-4
Cable, pilot light, UHF (2)	27-6233-6
Cable, pilot light, VHF	27-6233-103
Padder, osc. (L11 and L12 tuning adjustment)	76-8193
Panel, antenna, UHF	76-7097
Socket, oscillator	27-6288
Switch	42-1996-6

MECHANICAL PARTS

Description	Service Part No.
Tuner-shaft and rotor mounting:	
Ball, bearing (10)	W2510-5
Bearing, front	56-9593
Bearing, rear	56-9609
Nut, front bearing	56-9594
Nut, rear bearing	56-9599
Spring, center (2)	56-9590
Spring, end (2)	56-9591
Switch mounting:	
Switch-actuator ass'y.	76-8189-1
Collar stud (2)	28-9126-1
Lock washer (2)	1W24515FA1
Nut, #8, special (2)	1W20506FA3
Spacer, 3/8" (2)	1W29155FA3
Washer, fiber (4)	27-4109-29
Planetary assembly:	
Ball, 1/8"	5W2017
Ball, 3/16"	56-8020
Ball, 7/32" (3)	56-8020-1
Housing, drive	76-8485
Ring, retaining, shaft	1W60982FE7
Screw, adjusting	28-9094
Shaft, inner end	28-9176
Shaft, outer, drive	28-9069-1
Shaft and pin ass'y., inner	76-8300-1
Spring	28-9174
Clip, background plate (2)	28-9462
Background plate	54-8993
Bracket and connector ass'y.	76-8425
Block, spring	28-9175
Dial scale, prism and bezel assembly	76-8506-2
Rear mounting foot and insulator	76-8505
Grommet, feed-through	27-4707
Insulator, tuning shaft	27-9437
Knob	76-8508
Lock washer, antenna panel mounting	1W24515FA1
Nut, antenna panel mounting	1W19982FA3
Pulley, tuner shaft	28-9090
Shield, tube	56-5629-9

REPLACEMENT PARTS LIST (Cont.)

UHF TUNER-ADAPTER UT20B (Cont.)

MECHANICAL PARTS (Cont.)

Description	Service Part No.
Spring, drive cord, pointer	28-9088
Spring, drive cord, tuner	28-9490
Tuner, and planetary ass'y., complete	76-7595-3
Planetary drive assembly	76-8507
Pointer	56-5630-59
Pointer guide ass'y.	76-8504
Ring, retaining, idler shaft	1W60977FE7
Screw, pointer guide mounting (2)	1W19920FA3
Screw, drive housing, mounting (3)	1W61075FA3
Screw, foot mounting (2)	1W32694FA3

MECHANICAL PARTS (Cont.)

Description	Service Part No.
Screw, drive housing insulator mounting (3)	1W19907FA3
Screw, antenna panel mounting (2)	1W10583FA3
Screw, tuner mounting (3)	1W19907FA3
Screw, pilot-light mounting	1W19670FA3
Shaft and pulley, idler	76-8465
Spacer, drive housing mounting (3)	54-8994
Washer, insulator, drive housing mounting (3)	54-8544
Washer, fiber, pointer guide mounting (2)	27-4109-29

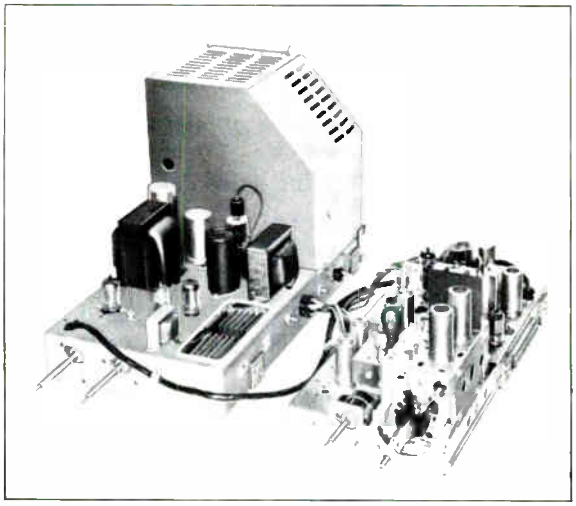
PHILCO
Factory-Supervised
Service

PHILCO *Factory-Supervised* Service

PHILCO SERVICE

TELEVISION

PHILCO TELEVISION SERVICE MANUAL FOR R-F CHASSIS 97 AND DEFLECTION CHASSIS J-7



TP2-2831

TABLE OF CONTENTS

CIRCUIT DESCRIPTION

Philco 1953, Code 127, Television Receivers use two chassis—the r-f chassis 97, containing the r-f, video, audio, and sync circuits, and the deflection chassis J-7, containing 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 r-f amplifier, oscillator, and mixer section is built on a separate subchassis. The r-f amplifier uses a 6BZ7 or 6BQ7 tube, V1. The oscillator and mixer each use one half of a 12AZ7 tube, V2. The output of the mixer is fed to a four-stage i-f amplifier system employing four 6CB6 tubes, V3, V4, V5, and V6. A 1N64 crystal diode is used for the video detector. One half of a 6U8 tube, V7A, is used as the first video amplifier, which feeds into a 6AQ5 video output amplifier, V8.

Sound i-f (intercarrier) is obtained by utilizing the beat frequency produced when the 45.75-mc. video carrier and the 41.25-mc. sound 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 the video 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 relative amplitude of the two carriers is established in the alignment of the receiver. There is sound output only when both the video and sound 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), which is taken from the video detector, is amplified by a 6BA6 tube, V9, and a 6AU6 tube, V10, and is fed to the FM detector, which utilizes two diode sections of a 6T8 tube, V11A. The triode section of the 6T8 tube, V11B, is used as the first audio amplifier. The power amplifier uses a 6L6GA tube, V12.

A-G-C voltage for the video i-f system and the r-f amplifier is obtained from a keyed a-g-c system which uses a 6AU6 tube, V13, as the a-g-c gate. Composite video from the video amplifier plate circuit, V7A, is fed to the grid of the a-g-c gate tube, while a gating or keying pulse, obtained from a winding on the horizontal-output transformer located on the deflection chassis, is applied to the plate. The sync-pulse polarity applied to the grid of V13 is positive; therefore, the a-g-c gate can conduct in proportion to the amplitude of the sync-pulse tips if the gating or keying pulse occurs at the same time as the sync. Because the keying, or gate pulse, is of constant amplitude (approximately 500 volts peak), the amplitude of the sync pulse determines the amount of conduction in the gate tube. The plate current of the keyed a-g-c gate tube flows through R220, R219, and R218, developing a voltage which is negative with respect to the chassis, and is proportional to the plate current. This negative voltage is used to control the gain of the receiver. Since conduction cannot occur in the a-g-c gate tube unless the sync pulse and gating pulse occur at the same time, noise disturbances that occur during the intervals between sync pulses cannot affect the a-g-c voltage.

Composite video for the sync circuits is taken from the plate circuit of the video amplifier, V7A. The plate load of the video amplifier consists of two sections, R304 and R305. The full output of the amplifier is fed to the grid of the noise inverter, one half of a 12AU7 tube, V14B, and to the grid of the sync separator, one half of a 6U8 tube, V7B. The output developed across R305 only is fed to the grid of the a-g-c gate, a 6AU6 tube, V13. The noise inverter is operated with a low value of plate voltage and with high bias (applied to the cathode by a voltage-divider network), which keeps the tube beyond cutoff. When the composite video signal is applied to the grid of the noise inverter through C601, the sync appears as positive pulses, and noise which could affect the sweep circuits also appears as positive pulses. Harmful noise pulses usually have amplitudes far greater than that of the sync pulses and, therefore, drive the grid of the noise inverter positive sufficiently to allow conduction in the noise inverter plate circuit. To prevent the noise inverter from conducting during the sync pulse interval, the gated leveler, using one half of a 12AU7 tube, V14A, is used to clamp the sync pulses below the conduction level of the noise inverter. The gated leveler conducts only when the sync pulses and gating pulse occur at the same time, thus leveling the noise inverter input to the sync-pulse level.

The output of the noise inverter consists of negative-going noise pulses. It should be noted that the noise pulses which exceed the sync level have been passed and their polarity reversed by the noise inverter. The output of the noise inverter is now mixed with the composite video and fed to the grid of the sync separator. Since the composite video fed to the grid of the sync separator has positive sync polarity, the positive noise pulses carried with the composite video would be passed by the sync separator; however, the output of the noise inverter consists of these same noise pulses, but of opposite polarity. Thus, cancellation of the noise pulses is effected. The output of the sync separator contains only the sync pulses, which are fed to the deflection chassis through the connecting cable.

The phase splitter, using one half of a 12AU7 tube, V15A, inverts the sync polarity for proper triggering of the vertical oscillator. The vertical sync is separated from the horizontal sync by the integrator circuits, and is fed to the grid of the vertical blocking oscillator, which uses one half of a 12AU7 tube, V13B. The output of the vertical oscillator is amplified by the vertical-output amplifier, which uses a 6BQ6GT tube, V16. The output of this amplifier is applied to the vertical-deflection coils through the vertical-output transformer.

In addition to the vertical-sync output, two horizontal-sync outputs are taken from the phase splitter, one from the cathode, and the other from the plate circuit. These two outputs are of opposite polarity, and are fed to the two diodes of the phase comparer, a 6AL5 tube, V17; the negative pulses are fed to the cathode of V17B, and the positive pulses, to the plate of V17A. A portion of the horizontal sweep output voltage is taken from the horizontal-output transformer, and is fed to the plate of V17B and the cathode of V17A, for comparison of the horizontal-sync and horizontal-sweep voltages. When the sweep and sync are in phase, no voltage is developed across R800, but when the two signals are out of phase, a voltage is developed across R800. When this voltage is positive, it increases the frequency of the horizontal oscillator (a 12AU7 tube, V18); when the voltage is negative, it reduces the frequency of the oscillator. This action holds the horizontal oscillator in phase with the sync signal. The horizontal hold control, R811, adjusts the horizontal-oscillator frequency so that it may be controlled by the phase comparer. The output of the horizontal oscillator is fed to the horizontal-output amplifier, which uses a 6CD6G tube, V19. The horizontal-output tube feeds the deflection coils through the horizontal-output transformer. A 6V3 tube, V20, is used as the horizontal damper.

The second-anode voltage for the picture tube is supplied by two 1B3GT high-voltage-rectifier tubes, V21 and V22, connected in a voltage-doubler circuit. 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 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 first anode of the picture tube. Filament current for all the tubes except the high-voltage rectifiers is supplied by a 117-volt, 60-cycle step-down transformer. Filament current for the high-voltage rectifiers is supplied by two windings on the horizontal-output transformer.

NOTE: The J-7 Chassis incorporates a protective high-voltage shorting switch (located on the rear of the high-voltage cage), which shorts the output of the 1B3GT high-voltage doubler-rectifier (V22) to ground when the cabinet back is removed. Do not attempt to operate the receiver with the cabinet back removed without first disabling this shorting switch. The switch can be disabled temporarily for service work by removing the two self-tapping screws at the bottom edge of the rear cover of the high-voltage cage, and propping up the rear cover.

IMPORTANT

A-C LINE ISOLATION

CAUTION: One side of the a-c line is connected to the chassis through C101, L100, and R104, in series. The other side of the a-c line is connected to the chassis through R100, F100, CR100, and C103, 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 250 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 test equipment, or receiver, or both.

SPECIFICATIONS

CHANNEL TUNING — Twelve-channel, 13-position, wafer-switch incremental tuner; fine tuning of local oscillator

FREQUENCY RANGE — Television Channels 2 through 13 and U-H-F position

INTERMEDIATE FREQUENCIES
- Video carrier — 45.75 mc.
- Sound (intercarrier) — 4.5 mc.

TRANSMISSION LINE — 300-ohm, twin-wire lead

OPERATING VOLTAGE — 110 to 120 volts, 60 cycles, a.c.

POWER CONSUMPTION — 250 watts

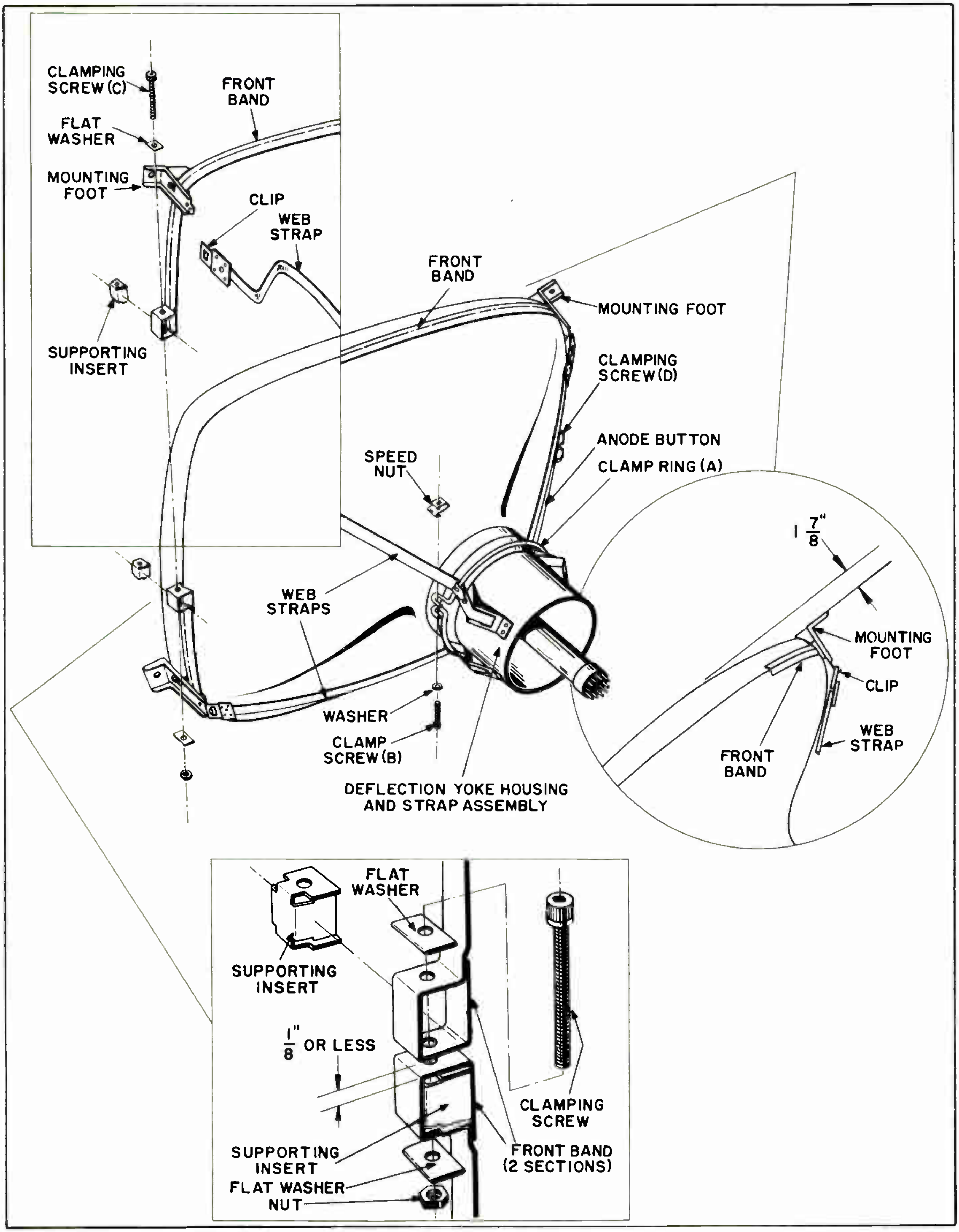
TUBE COMPLEMENT

R-F 97 CHASSIS

Reference Symbol	*Tube Type*	*Function*
V1	6BQ7 or 6BZ7 — miniature	R-F amplifier
V2	12AZ7—miniature	Oscillator, mixer
V3, V4, V5, V6	6CB6—miniature	Video i-f amplifiers
V7	6U8—miniature	Video amplifier, sync separator
V8	6AQ5—miniature	Video output
V9	6BA6—miniature	First sound i-f amplifier
V10	6AU6—miniature	Second sound i-f amplifier
V11	6T8—miniature	FM detector, first audio amplifier
V12	6L6GA—octal	Audio output
V13	6AU6—miniature	A-G-C gate
V14	12AU7—miniature	Gated leveler, noise inverter
V23	27LP4	Picture tube

J-7 DEFLECTION CHASSIS

Reference Symbol	*Tube Type*	*Function*
V15	12AU7—miniature	Phase splitter, vertical oscillator
V16	6BQ6GT—octal	Vertical output
V17	6AL5—miniature	Phase comparer
V18	12AU7—miniature	Horizontal oscillator
V19	6CD6G—octal	Horizontal output
V20	6V3—miniature	Damper
V21, V22	1B3GT—octal	High-voltage rectifier



TP2-3264

Figure 1. 27LP4 Picture-Tube Assembly

REMOVING AND REPLACING 27LP4 PICTURE TUBE

GENERAL

The Philco 27LP4 picture tube is designed for a maximum of safety. Moreover, when properly mounted in the frame assembly, the picture tube is supported in such a manner as to provide a maximum of protection against breakage. Therefore, it is important that the tube be properly installed in its supporting frame. It is suggested that the service technician protect his eyes and the exposed parts of his body when handling all picture tubes. The removal and installation of the 27LP4 picture tube is quite safe if the procedure given below is followed.

CAUTION: Because of the bulkiness and increased weight of the 27LP4 tube, as compared with that of the smaller picture tubes, replacement of the 27LP4 requires two men. These tubes are not delicate when handled in the proper manner; however, care must be taken not to mar the glass in any way, as surface scratches and chips weaken a glass structure considerably. Also, because of its weight, do not attempt to handle this tube by the neck.

PROCEDURE FOR REMOVING 27LP4 TUBE

1. Remove both the deflection chassis and the r-f chassis from the cabinet.

2. Lay the cabinet face-down on the floor, taking precautions against marring the cabinet.

3. Remove the four nuts and washers that secure the mounting feet of the assembly to the front of the cabinet.

4. Remove the two wood screws that secure the rear supporting struts of the tube assembly to the cabinet.

5. Remove the tube assembly (one man on each side of the cabinet).

6. Place the tube assembly face-down on a soft, protective cloth or mat, and slip the beam-bender magnet off the rear end of the tube. Referring to figure 1, loosen clamp ring (A) by means of clamp screw (B), unhook the four clips securing the web straps to the mounting feet, and lift the deflection-yoke housing and strap assembly (containing the deflection yoke and focus assembly) off the neck of the tube.

7. Mark the positions of the four mounting feet on the front band with a pencil or scriber (this is necessary because the mounting feet are free to slide, once the front band is loosened).

8. Loosen the two Allen head clamping screws (C) and (D) with a 5/16-inch Allen wrench, and remove the front band assembly.

PROCEDURE FOR INSTALLING 27LP4 TUBE

1. Place the picture tube face-down on a soft, protective cloth or mat, and position the front band assembly over the tube so that the lateral indentation in the band coincides with the welded seam around the outer edge of the tube's face plate.

Take up slack in the band, tightening both clamping screws (C) and (D) by hand.

NOTE: If the front band is positioned correctly, the distance from the bottom edge of each mounting foot to the surface on which the tube is resting will be 1⅞ inches, as shown in figure 1.

2. Position the mounting feet, on the front band, to coincide with the marks previously made on the front band.

3. Tighten both clamping screws (C) and (D) alternately, using a 5/16-inch Allen wrench.

NOTE: Take up on clamping screws (C) and (D) as tightly as possible. As can be seen from figure 1, the separation between the ends of the bands must be less than ⅛ inch, when tightened.

4. Slip the deflection-yoke housing and strap assembly (containing the deflection yoke and focus assembly) over the neck of the tube, and position it so that clamp screw (B) on clamp ring (A) is on the side of the tube opposite the anode button.

5. Place the clips (on the web straps) over the hooks on the four mounting feet, and tighten clamp ring (A) by means of clamp screw (B).

6. With the cabinet face-down on the floor, place the tube assembly in the cabinet (one man on each side of cabinet), and replace the four nuts and washers that secure the mounting feet to the front of the cabinet.

7. Replace the two wood screws that secure the rear supporting struts of the tube assembly to the cabinet.

8. Stand the cabinet upright, and install the r-f chassis, deflection chassis, and beam-bender magnet.

ADJUSTING 27LP4 PICTURE-TUBE ASSEMBLY

1. Mechanically center the focus assembly, over the neck of the tube, by adjusting the centering plate. It is important that the focus assembly and yoke be concentric with the tube neck for best focus and shadow clearance.

2. Set the HORIZ. CENTERING control (R824) to its extreme counterclockwise position, and set the BRIGHTNESS control for maximum brightness of the picture.

3. Adjust the beam bender for maximum brightness of the picture.

4. If necessary, loosen the wing nuts and rotate the deflection yoke, to correct for picture tilt. Make certain that the deflection yoke is as far forward as possible, and tighten the wing nuts.

5. Adjust the centering plate so that neck shadow is just eliminated on the right-hand side of the screen, at the same time keeping the picture centered vertically. Do not attempt to center the picture horizontally by means of the centering plate.

6. Adjust the FOCUS control (on focus assembly). Set the CONTRAST control for the proper level, and readjust the FOCUS control for the best over-all focus.

7. Repeat steps 3 and 5, if necessary.

8. Adjust the HORIZ. CENTERING control (R824) for proper horizontal centering of the picture.

9. Turn the BRIGHTNESS control slowly toward the minimum position, checking that shadow does not appear at any brightness level. If shadow does appear, repeat steps 5 and 8, and recheck.

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-OSCILLATOR ADJUSTMENT

To adjust the horizontal-oscillator circuit, tune in a station and proceed as follows:

1. Reduce the width of the picture so that approximately one inch of blank screen appears at the right-hand and left-hand sides of the picture.

2. Increase the BRIGHTNESS control setting so that the blanking time becomes visible. This appears as a dark vertical bar at the right-hand and left-hand sides of the picture.

3. Connect a .1-μf. condenser from Test Point J802 to ground.

4. Set the HORIZ. HOLD control to the center of its mechanical rotation.

5. Adjust the HORIZ. HOLD CENTERING control to bring the picture into the center of the blanking bars. When the picture is centered in the blanking bars, the bars at the left-hand and right-hand sides of the picture will be of equal width.

6. Remove the .1-μf. condenser from the Test Point. (See step 3.)

7. Adjust the horizontal ringing coil, L800, until the picture is again centered in the blanking bar.

8. Rotate the HORIZ. HOLD control through its range. The picture should fall out of sync to both sides of the center of rotation. If the picture does not fall out of sync to both sides, readjust the HORIZ. HOLD CENTERING control to obtain fall-out to either side of sync.

9. Rotate the HORIZ. HOLD control through its range, and observe the number of diagonal blanking bars that are visible just before the picture pulls into sync. The pull-in should occur with from 1 to 2 diagonal bars when the sync position is approached from either direction. If proper pull-in is not obtained, repeat the above procedure.

VIDEO PEAKING COIL ADJUSTMENT

The video peaking coils, L305 and L307, are adjusted at the factory for proper transient response of the video amplifiers. Ordinarily, these coils will require no further adjustment by the serviceman except in cases where they have been tampered with, or where replacement becomes necessary. Under normal circumstances, when alignment of the tuner or i-f stages is undertaken, the video peaking coils should not require adjustment.

Before adjusting L305 and L307, check both the tuner and i-f alignment. (Never adjust L305 and L307 until the alignment of the receiver is correct.) Then tune in a station and adjust the receiver to give a picture of the best obtainable quality, with medium contrast. Turn the fine tuning control clockwise until a very slight beat pattern appears in the picture. Carefully observe the appearance of the picture regarding smear or overshoot (trailing whites). A small amount of overshoot may be desirable, to produce a sharper picture. Conversely, in weak-signal areas, a small amount of smear may be desirable, to reduce the harsh appearance of "snow". The adjustments of L305 and L307, and their effects on the picture, are as follows:

1. The amount of overshoot may be reduced by turning both TC302 and TC303 counterclockwise.

2. The amount of smear may be reduced by turning both TC302 and TC303 clockwise.

Normally the point of proper adjustment is where minimum smear and trailing whites appear in the picture; however, a compromise adjustment may be made to suit prevailing conditions. As a rule, when properly adjusted, the adjustment screws (TC302 and TC303) should protrude from the chassis by approximately ½ inch to ¾ inch.

TELEVISION ALIGNMENT PROCEDURE

GENERAL

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

The over-all response curve (r-f, i-f) of the circuits from the antenna terminals to the video detector, after the i-f stages have been aligned, should appear essentially the same, regardless of the channel under test. If not, the tuner should be aligned. Before aligning the tuner, refer to the CAUTION given under TUNER BANDPASS ALIGNMENT.

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 providing the workbench with a metallic top. 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 2 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 sound and video r-f carriers of each channel used during alignment. If Model 7008 is used, the built-in crystal calibrator provides an excellent means of calibration. 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 concerning calibration, refer to Philco Lesson PR-1745 (J), entitled "Television Service in the Home."

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.

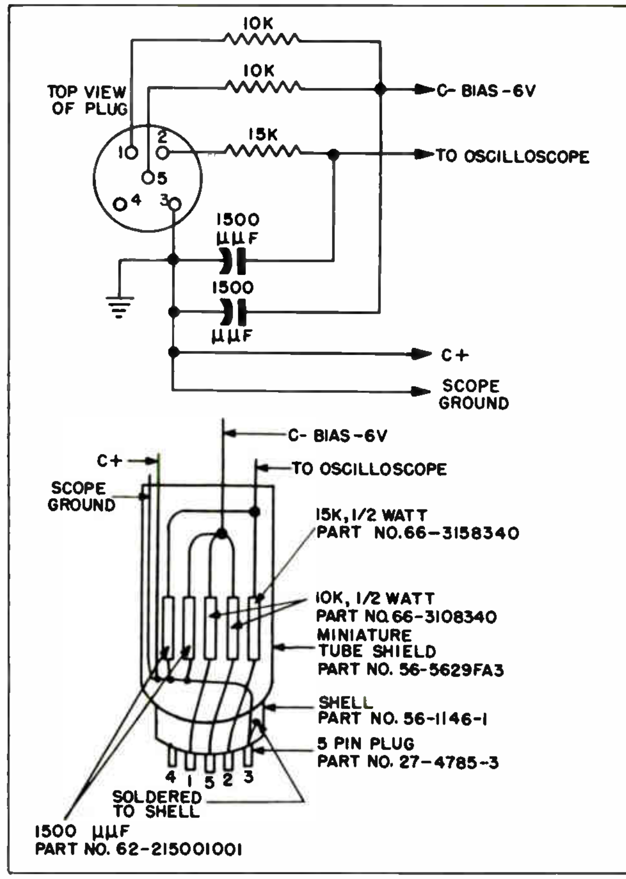
2. Vacuum-tube voltmeter, or 20,000-ohms-per-volt voltmeter.

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 may be made through the alignment jack provided for this 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, may be used. As an alternate, a Philco alligator-clip adapter, Part No. 45-1636, with as short a ground lead as possible, may be used to connect 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 carbon resistor (used with alligator-clip adapter only), so that any regeneration caused by connection of the lead to the mixer is held to a minimum.



TP2-1507-A

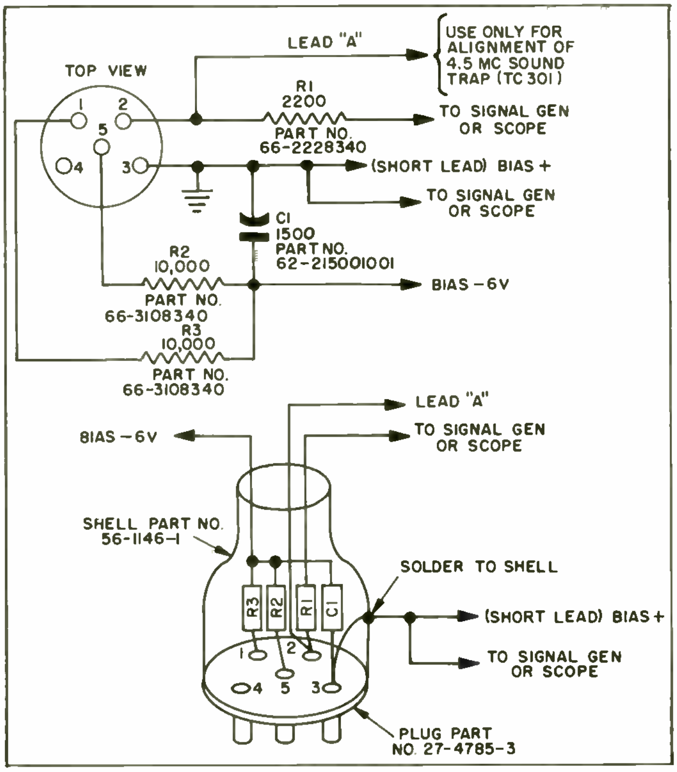
Figure 2. Video I-F Alignment Jig (VIDEO TEST Jack Adapter No. 1)

Antenna-Input Matching Network

An impedance-matching network for coupling the signal generator to the antenna-input terminals of the receiver is shown in figure 2 on page 5 of Service Manual PR-2170. 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 antenna-input circuit. The resistors used in this network should be of carbon-composition construction, and should be chosen from a group, to obtain values within 10% of those indicated. The resistors should be placed in a shield can, to prevent variable effects. An antenna-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.

Video I-F Alignment Jig (VIDEO TEST Jack Adapter No. 1)

The alignment jig shown in figure 2 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, two 10,000-ohm resistors, and a 1500-$\mu\mu$f. condenser for isolation of the bias supply. To isolate the oscillo-



TP2-3265

Figure 3. Sound I-F Input Alignment Jig (VIDEO TEST Jack Adapter No. 2

scope from the receiver circuits, a 15,000-ohm resistor, by-passed by a 1500-$\mu\mu$f. condenser, is used. A suggested method of fabricating the jig is also shown in figure 2. This jig should not be used to observe the composite video from the video-detector output.

Sound I-F Input Alignment Jig (VIDEO TEST Jack Adapter No. 2)

To observe the composite video, a jig may be made with a 5-pin plug and a 2200-ohm resistor. See figure 3. The 2200-ohm resistor should be connected to pin 2 of the plug. A ground lead should be connected to pin 3. For convenience in applying bias to the a-g-c circuits, a lead should be connected to pin 5. To observe the composite video, connect the oscilloscope to the 2200-ohm resistor and the ground lead. This jig is also used for injection of the 4.5-mc. signal during sound i-f alignment.

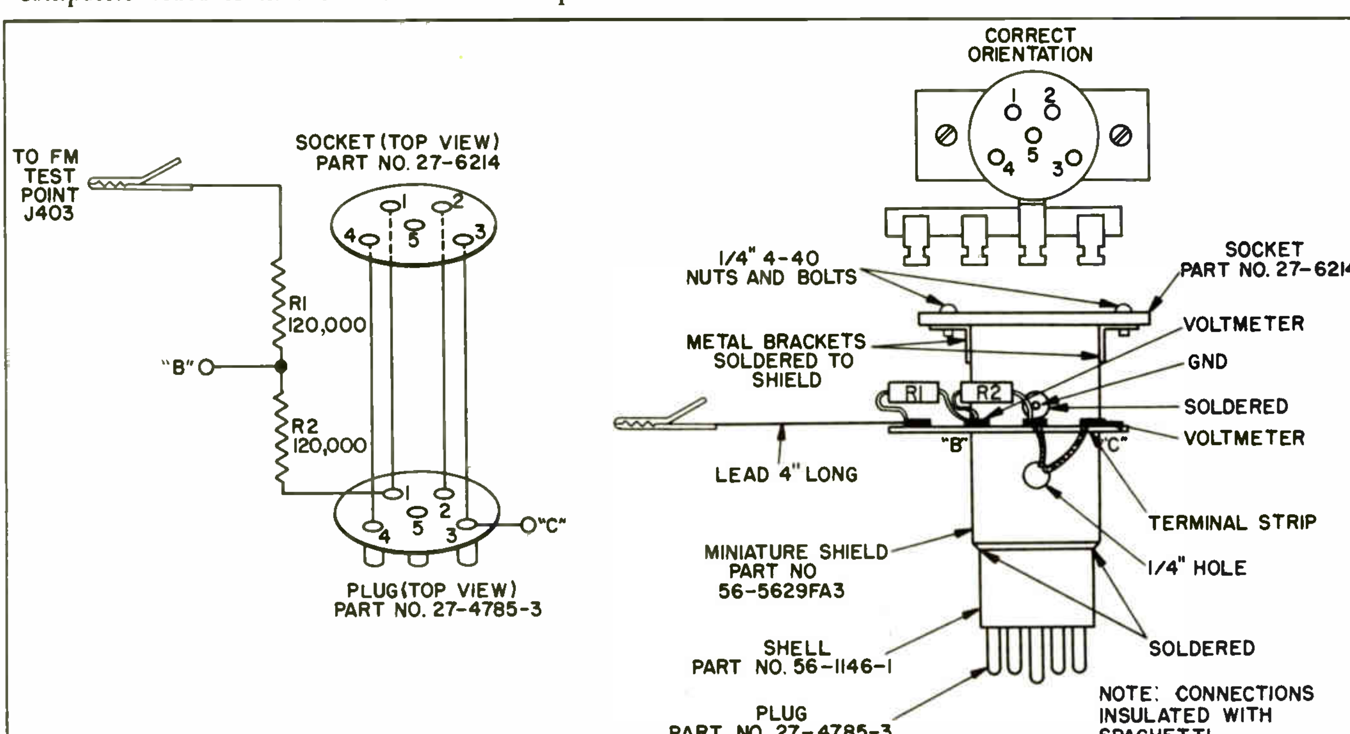
Sound I-F Output Alignment Jig (FM Test Point and Volume Control Socket Adapter)

Figure 4 shows the adapter that should be used to connect the voltmeter to the FM detector through the Volume Control socket (J401) and FM Test Point (J403). The adapter should be inserted into the Volume Control socket, and the clip lead from the adapter connected to the FM Test Point. The Volume Control cable and plug (PL401) is inserted into the socket on top of the adapter.

TELEVISION TUNER ALIGNMENT

After the tuner is serviced, or if an i-f alignment is required, 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.



TP2-3263

Figure 4. Sound I-F Output Alignment Jig (FM Test Point and Volume Control Socket Adapter)

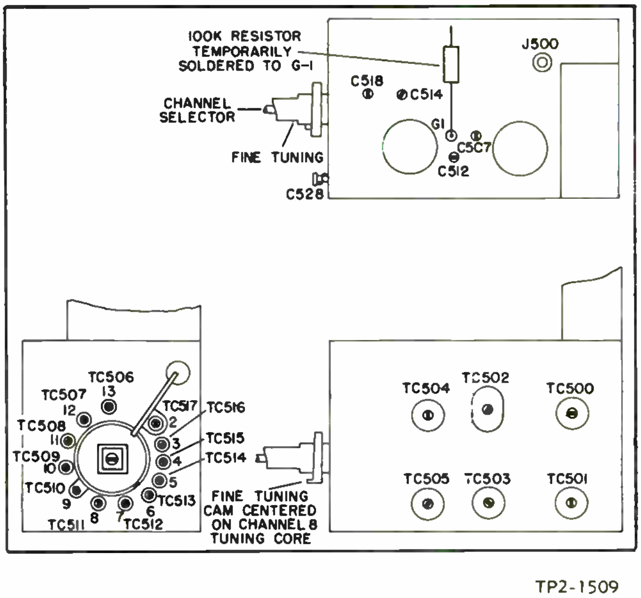


Figure 5. Television Tuner, Showing Location of Adjustments

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-frequency 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 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 antenna 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 is connected to the video detector output. The oscillator core is then adjusted for zero beat on each channel. The two generators should be accurately calibrated, as described in Philco Lesson PR-1745(J).

To align the oscillator, proceed as follows:

1. To observe the zero beat, connect the oscilloscope to the video-detector output through the video i-f alignment jig. See figure 2. Bias the tuner and the i-f a-g-c circuits with 1.5 volts, and remove the Gate Pulse Plug, PL801, from the socket, J801. To apply bias to the tuner, connect the battery to the white lead which comes out of the top of the tuner. On later runs of this tuner, the white a-g-c lead connects to a feed-through condenser on top of the tuner. To make certain that good connection is made to the tuner a-g-c circuit, remove the glyptol coating on this condenser terminal before connecting the bias battery.
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 loop, 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 to the video carrier frequency of Channel 13, and connect the output to the antenna 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 13, then 11, etc., each time adjusting the respective tuning core for zero beat. The tuning cores should be adjusted progressively from the highest-frequency channel to the lowest, because the higher channel adjustments will affect the lower channels.

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-frequency channel and finishing with the lowest.

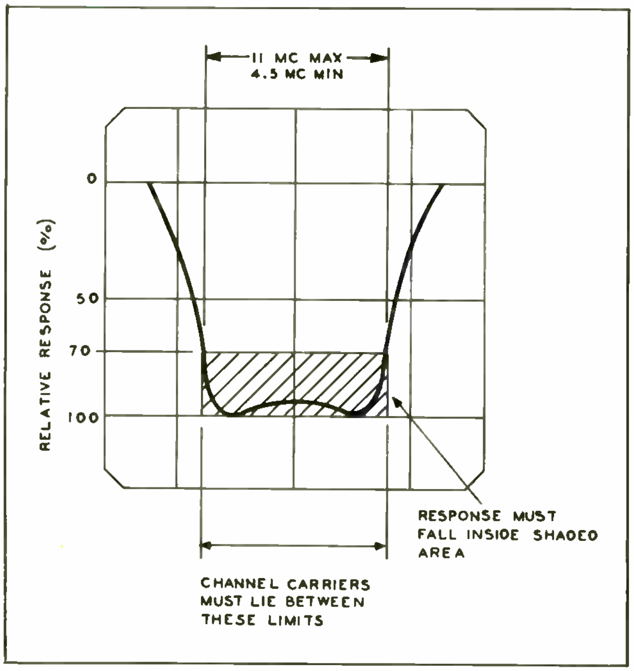
TUNER BANDPASS ALIGNMENT

General

The bandpass 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 white a-g-c lead.

An FM (sweep) signal is applied to the antenna-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" condition. Hum conditions will cause distortion of the time base and response. Bounce conditions will cause the response and the 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



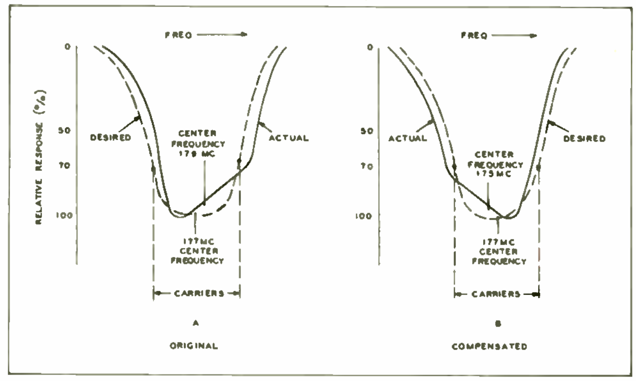
TP9-512B-1

Figure 6. Television Tuner Response Curve, Showing Bandpass Limits

gain necessitates increasing the generator output to a point where the tuner may be overloaded. The scope controls should be adjusted so that the width of the presentation is 2 times the height. Overload may then be checked by changing the generator output while observing the shape of the response curve. When the generator output is changed, the vertical gain of the oscilloscope should be readjusted, to keep the scope presentation amplitude the same. Do not readjust the horizontal gain control. Any flattening 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 antenna input of the tuner. The antenna-input matching network shown in figure 2 of Service Manual PR-2170, or the Philco Antenna Matching Jig, Part No. 45-1637, may be used for this purpose. Correct alignment cannot be obtained without the use of a suitable matching jig.

Regeneration or a mismatch in the test setup will also make it impossible to obtain correct alignment. To check for these conditions, 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 changes as the hand is moved along the cable, regeneration or mismatch is indicated. Another check may also be made with the volume control advanced until noise can be heard from the speaker. If the level of the noise changes as the hand is moved along the generator cable, regeneration or mismatch is indicated. The symptoms which indicate these conditions may also be caused by failure to use the proper matching jig, as described above.



TPO-1174

Figure 7. Television Tuner Response Curve, Showing Tracking Compensation

CAUTION: When comparing the response curves from channel to channel, maintain the 2-to-1 width-to-height relationship in the oscilloscope presentation, as described above.

Procedure

1. Connect the FM (sweep) and AM marker generators to the 300-ohm antenna input through an antenna-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 white tuner a-g-c lead.
4. Disconnect the tuner coupling link at wiring panel B-13, terminals 1 and 4, and solder a 68-ohm, one-half watt carbon resistor to the open link coming from the tuner. See figure 7. Remove the first i-f tube from the 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 the 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 to 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 the 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 antenna circuit is now tuned for the high-band channels.

NOTE: On later runs of the tuner, L506 is not tunable and TC500 is omitted; therefore, the adjustments in step 7 should be confined to TC502 and TC504 when later run tuners are encountered.

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., then to 180 mc.) The curve should be reasonably flat between the limits.

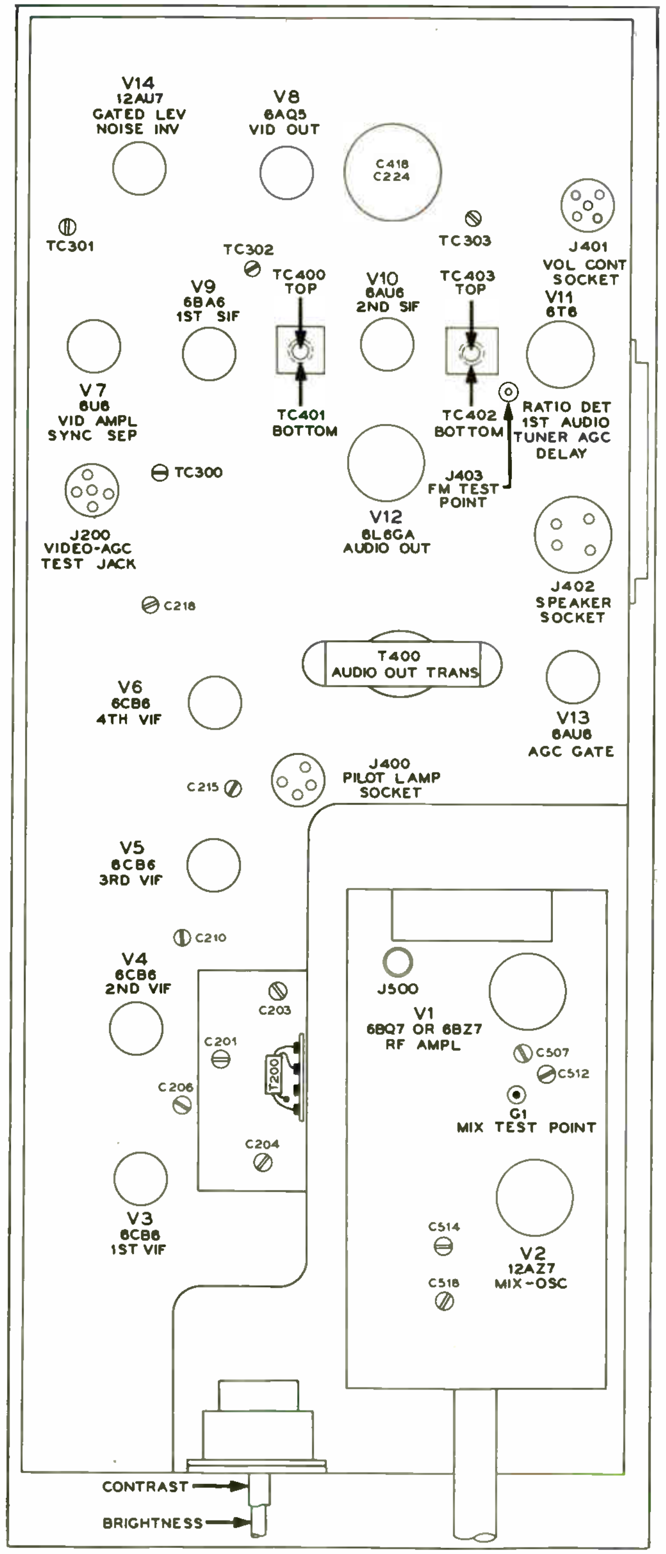


Figure 8. R-F Chassis 97, Top View, Showing Location of Adjustments

10. On Channel 7, observe the tilt and center frequency of the response curve. The curve should be centered on the pass band, and should be symmetrical. If it is not symmetrical, and appears unbalanced, as in figure 7, adjust C507 and C512 (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 antenna 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.

VIDEO I-F ALIGNMENT

PRELIMINARY

Before proceeding with the i-f alignment or making an alignment check, observe the following preliminary instructions:

1. Preset the CONTRAST and BRIGHTNESS controls to the maximum counterclockwise position.
2. Preset the CHANNEL SELECTOR to Channel 4.
3. Insert the video i-f alignment jig into J200.
4. Connect the oscilloscope to the 15,000-ohm resistor from the video i-f alignment jig. Connect the ground lead of the oscilloscope to the ground lead from the adapter.
5. Connect a 6-volt battery to the a-g-c test jack, with the negative terminal to the bias lead and the positive terminal to the ground lead.
6. Connect the AM generator to the mixer-grid test point, G1, through a mixer jig, and adjust the generator for approximately 30 percent modulation at 400 cycles.

> NOTE: If the i-f shield has been removed for repairs, it must be replaced before proceeding with the alignment.

PROCEDURE

1. Tune the AM generator to 39.75 mc., and adjust C518 (see figure 8) for minimum output, as observed on the oscilloscope.
2. Tune the AM generator to 47.25 mc., and adjust C201 for minimum output, as observed on the oscilloscope.
3. Tune the AM generator to 41.25 mc., and adjust C203 for minimum output, as observed on the oscilloscope.

> NOTE: In steps 1, 2, and 3, it is necessary to keep the generator output sufficiently high that a null indication may be observed on the oscilloscope. However, avoid overloading of the receiver by excessive signal.

4. Tune the AM generator to the frequencies indicated below, and adjust the trimmers for maximum output.
   a. 42.7 mc.—adjust C514
   b. 45.4 mc.—adjust C204
   c. 42.0 mc.—adjust C206
   d. 45.0 mc.—adjust C210
   e. 44.4 mc.—adjust C215
   f. 43.0 mc.—adjust C218
5. Connect the sweep generator and r-f marker generator to the antenna terminals through a matching jig. (If a separate oscilloscope is used, connect the sweep output of the generator to the horizontal input of the oscilloscope.) Connect a 7.5-volt battery to the a-g-c test jack, with the negative terminal to the bias lead and the positive terminal to the ground lead. Set the CHANNEL SELECTOR to Channel 4, and tune the sweep generator for output on Channel 4. Tune the r-f marker generator for the video carrier frequency of Channel 4 (67.25 mc.), and tune the i-f marker generator (connected to mixer grid) to 45.75 mc. Note that two marker generators are used for this procedure. The r-f marker generator is connected to the antenna terminals, while the i-f marker generator is connected to the mixer-grid test point, G1. A jig constructed from a piece of fiber tubing, with $^{3}/_{16}$ inch inside diameter, and a brass machine screw which fits tightly into the tubing, is used to connect the generator to the test point. The screw is adjusted so that it clears the test point by approximately $^{1}/_{64}$ inch. The output cable of the marker generator is connected to the head of the brass screw in the jig and to the chassis near the mixer tube. Both marker generators should be adjusted for the minimum output required to make the markers barely visible. Failure to observe this precaution, or the use of excessive output from the sweep generator, will cause misleading results. After the equipment is properly connected, adjust the FINE TUNING control for zero beat of the two markers, as observed on the oscilloscope. When zero beat is obtained, remove the i-f marker.

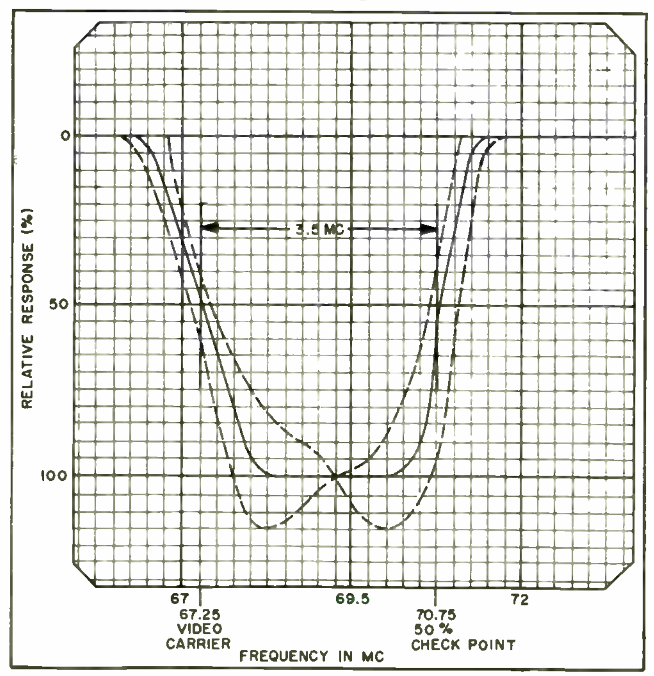


Figure 9. Over-all R-F, I-F Response Curve

6. If the response curve does not fall within the limits, as shown in figure 9, the adjustment of the trimmers may be touched up slightly. Do not retouch the setting of C518, C201, C203, or C206. To adjust the curve, first adjust C215 and C218 alternately, until maximum improvement has been obtained. C215 affects the tilt of the curve, and C218 affects the dip of the curve. After C215 and C218 have been adjusted, adjust C514 for the proper slope at the 42.25-mc. side of the curve, then adjust C204 and C210 for the proper level at the video carrier frequency (45.75 mc.).

> CAUTION: Do not turn any of the trimmers excessively. To retouch, make only a slight adjustment.

SOUND I-F ALIGNMENT

The sound i-f system may be aligned by the use of a station signal or an accurately calibrated signal generator, for the signal source. If the station signal is used, tune the FINE TUNING control for the best picture, regardless of sound. It will be necessary to reduce the signal input to the receiver, so that the d-c output at the sound detector, as measured with the aid of the sound i-f output alignment jig (between point "B" and ground), is kept below 5 volts maximum, and preferably below 3 volts. To establish this level in strong signal areas, it may be necessary to short the antenna terminals and to apply bias to the a-g-c circuit. The signal input to the receiver may be adjusted by varying the length of the shorting lead. The bias may be applied to the a-g-c circuit by means of the jig shown in figure 3. The sound i-f output alignment jig shown in figure 4 should be used for convenient connection of the meter to the sound-detector output.

When signal generator (accurately calibrated) is used, bias should be applied to the a-g-c circuit, to avoid any possibility of regeneration, using the sound i-f input alignment jig (figure 3). In addition, the first video i-f tube should be removed, to aid in the reduction of circuit noises from the i-f system.

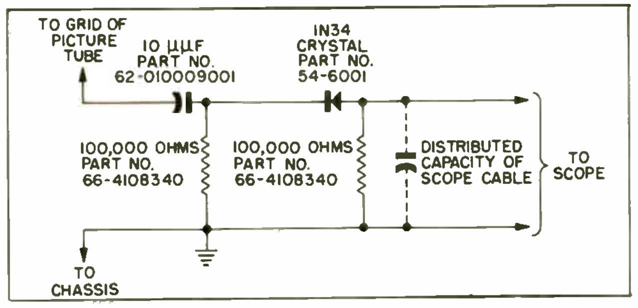
1. Connect the generator through the 2200-ohm resistor, in the sound i-f input alignment jig, to pin 2 of J200. The generator should be adjusted for unmodulated output at 4.5 mc.

2. Insert the sound i-f output alignment jig in the volume-control socket (J401), and insert the volume-control plug (PL401) in the top of the jig. Connect the clip lead to the FM Test Point (J403); connect a 20,000-ohms-per-volt voltmeter between point "B" and the ground lug of the jig, the negative lead of the meter going to point "B."

3. Adjust TC300, TC400, TC401, and TC402 for maximum output, as indicated on the meter. If the output exceeds 5 volts, reduce the signal input to the receiver.

4. Shift the positive lead of the meter to point "C" on the sound i-f output alignment jig, and adjust TC403 for zero crossover. Zero crossover is indicated by a zero indication on the meter. When TC403 is turned in one direction from this zero point, the meter will swing positive; turning TC403 in the opposite direction will cause a negative swing. (To aid in reading a positive and negative swing on the meter, set the pointer, by means of its zero-adjustment screw, to a convenient calibration mark on the scale, before connecting the meter to the circuit.)

5. Replace the first video i-f tube, and tune in a station on the receiver. Turn the FINE TUNING control to obtain a slightly fuzzy picture, and tune TC403 for minimum AM noise, using the speaker output as an indication.



TP2-2670

Figure 10. R-F Probe for Sound-Trap Adjustment

ADJUSTMENT OF 4.5-MC. TRAP

To adjust the 4.5 mc. trap in the plate circuit of the first video amplifier, proceed as follows:

1. Connect the output of the signal generator to lead "A" from pin 2 of the sound i-f input alignment jig (see figure 3). Adjust the generator for 4.5 mc., 400-cycle modulated output. Set the output attenuator for maximum output from the generator.

2. Connect the input of the r-f probe, shown in figure 10, to the grid of the picture tube, and connect the output of the probe to the vertical input of the oscilloscope. Adjust the vertical gain of the oscilloscope to maximum. Adjust the horizontal sweep of the oscilloscope for 400 cycles.

3. Adjust TC301 for minimum indication on the oscilloscope. (The normal setting for TC301 is with the screw approximately ⅝ inch out from the chassis.)

An alternate method for adjustment of TC301 may be used if a 4.5-mc. generator is not available. To adjust TC301 without the generator, proceed as follows:

1. Tune in a strong station signal.

2. Turn the FINE TUNING control in the clockwise direction until a fine beat pattern appears in the picture.

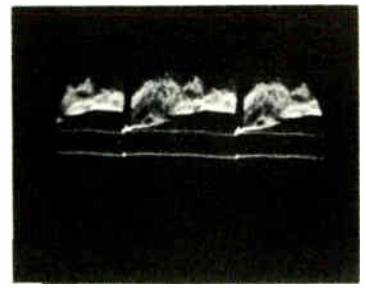
3. Adjust TC301 until the beat disappears or is at a minimum. When correctly adjusted, the screw will be out from the chassis by approximately ⅝ inch.

4. If more than one station is available, check the setting of TC301 on all stations.

OSCILLOSCOPE WAVEFORM PATTERNS

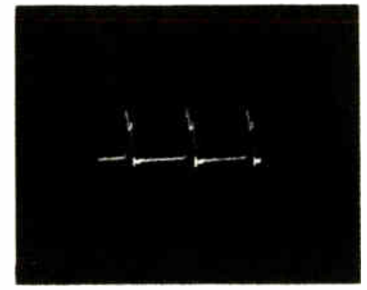
The waveforms shown below were taken with the receiver adjusted for an approximate peak-to-peak output of 2 volts at the video detector. The voltages given with the waveforms are approximate peak-to-peak values. The frequencies shown are those of the waveforms—not the sweep rate of the oscilloscope. 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, and the peak voltages will differ from those shown.

*CAUTION: High-voltage pulses are present in the horizontal-output circuit. The waveform in figure 33 was taken with the alligator clip of the oscilloscope lead clipped over the insulation of the lead connected to pin 7 of J800. (To prevent puncture of the insulation of the lead, file off the teeth of the alligator clip and wrap friction tape around the clip.) Connection to other points in the horizontal-output circuit is dangerous, due to the high voltages present. The peak-to-peak voltage shown for figure 33 is the actual voltage present; however, the amplitude of the scope presentation depends upon the degree of coupling.



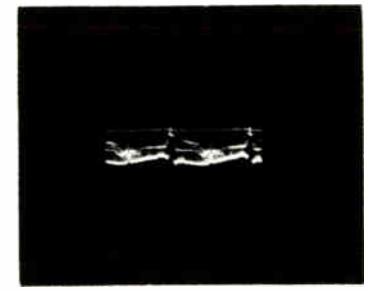
TP1-1200-A

Figure 11. Video-Detector Output, Pin 2 of J200 2 volts, 60 c.p.s.



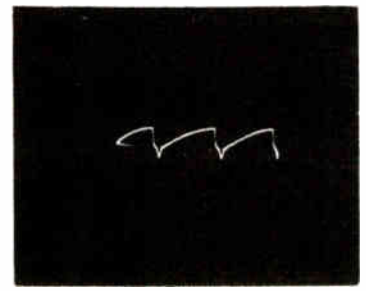
TP2-654

Figure 12. Gate-Pulse Plug, Pin 4 500 volts, 15,750 c.p.s.



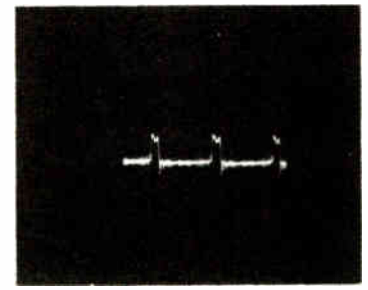
TP2-653

Figure 13. A-G-C Gate Grid, Pin 1 22 volts, 60 c.p.s.



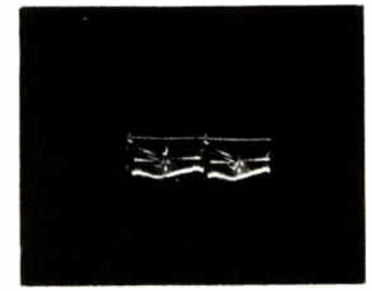
TP2-656

Figure 14. Gate-Pulse Plug, Pin 3 9 volts, 15,750 c.p.s.



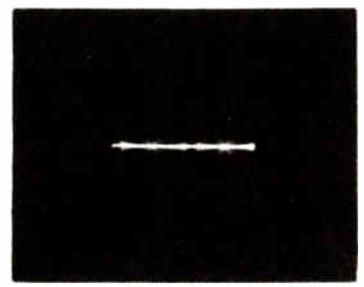
TP2-655

Figure 15. Gated-Leveler Grid, Pin 2 3 volts, 15,750 c.p.s.



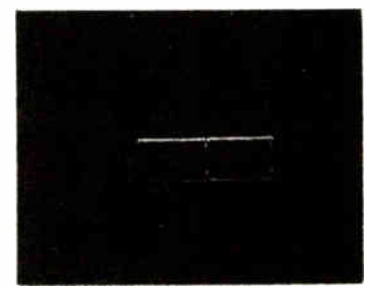
TP2-657

Figure 16. Noise-Inverter Plate, Junction of R605, C602, and C603 23 volts, 15,750 c.p.s.



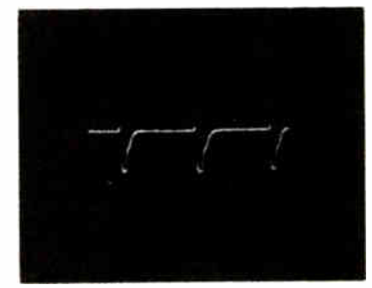
TP2-658

Figure 17. Noise-Inverter Cathode, Pin 8 Wave shape and amplitude vary with noise



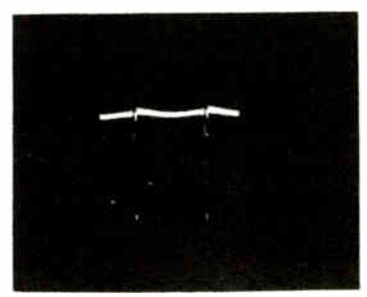
TP2-659

Figure 18. Sync-Separator Plate, Pin 1 17 volts, 60 c.p.s.



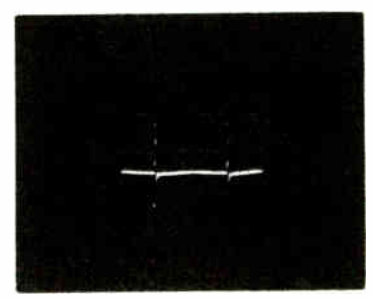
TP2-660

Figure 19. Sync-Separator Plate, Pin 1 17 volts, 15,750 c.p.s.



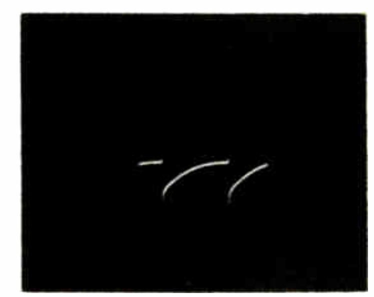
TP2-639

Figure 20. Phase-Splitter Grid, Pin 7 16 volts, 60 c.p.s.



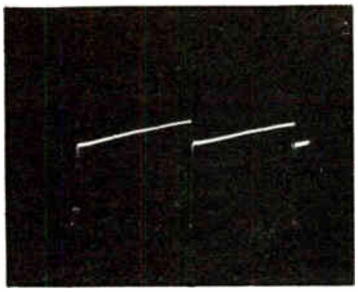
TP2-640

Figure 21. Phase-Splitter Plate, Pin 6 35 volts, 60 c.p.s.



TP2-643

Figure 22. Vertical-Oscillator Grid, Pin 2 170 volts, 60 c.p.s

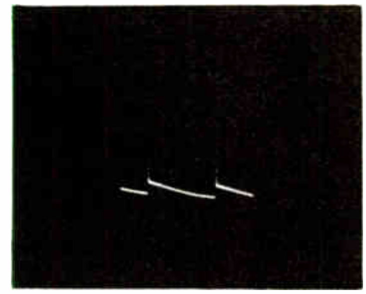


TP2-697

Figure 23. Vertical-Oscillator Plate, Pin 1
130 volts, 60 c.p.s.

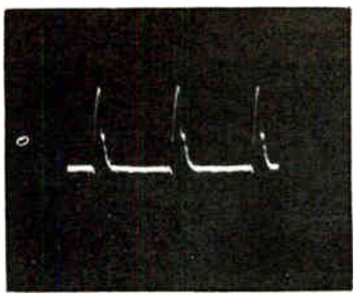
TP2-644

Figure 24. Vertical-Output Grid, Pin 5
40 volts, 60 c.p.s.



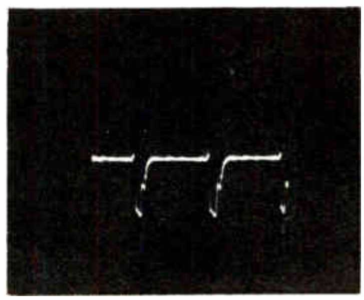
TP2-645

Figure 25. Vertical-Output Plate, Plate Cap
450 volts, 60 c.p.s.



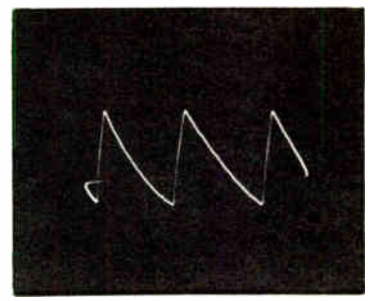
TP2-641

Figure 26. Phase-Splitter Plate, Junction of R614, R615, and C800
13 volts, 15,750 c.p.s.



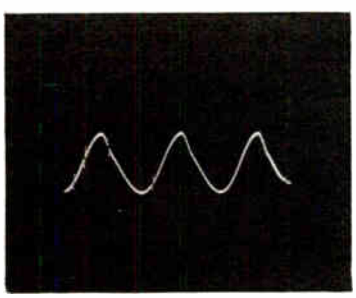
TP2-642

Figure 27. Phase-Splitter Cathode, Pin 8
9 volts, 15,750 c.p.s.



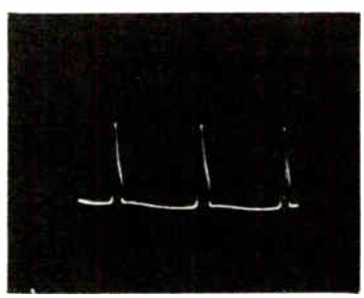
TP2-652

Figure 28. Phase Comparer, Pins 1 and 2
6 volts, 15,750 c.p.s.



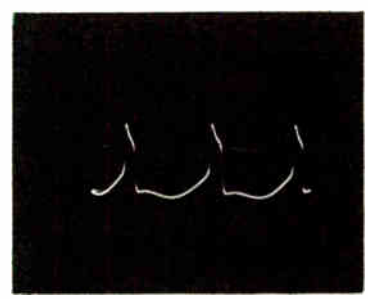
TP2-2852

Figure 29. Horizontal Oscillator, Junction of L800, R806, and C806
20 volts, 15,750 c.p.s.



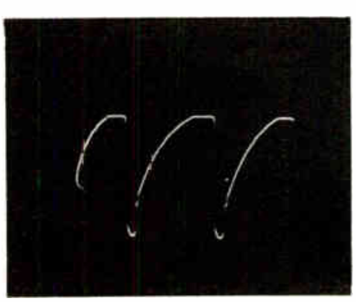
TP2-647

Figure 30. Horizontal-Oscillator Cathode, Pins 8 and 3
12 volts, 15,750 c.p.s.



TP2-648

Figure 31. Horizontal-Oscillator Grid, Pin 2
34 volts, 15,750 c.p.s.



TP2-649

Figure 32. Horizontal-Output Grid, Pin 5
120 volts, 15,750 c.p.s.

TP2-650

Figure 33. Horizontal-Deflection Yoke, *Pin 7 of J800
5600 volts, 15,750 c.p.s.
*See CAUTION above.

TP2-651

Figure 34. Gate-Pulse Socket, Pin 4 of J801
400 volts, 15,750 c.p.s.

REPLACEMENT PARTS LIST

IMPORTANT

General replacement items commonly stocked by the serviceman are omitted from this parts list. All condensers 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 should be ordered in this way rather than by model number; in addition, a miscellaneous listing will be found at the end of the parts list for each chassis type. All parts are symbolized in the schematic diagrams and base layouts, for identification purposes.

NOTE: Part numbers identified by an asterisk (*) are general replacement items. These numbers may not be identical with those on factory parts. Also, the electrical values of some replacement items may differ from the values indicated in the schematic diagram and parts list. The values substituted in any case are so chosen that the operation will either be unchanged or improved. When ordering replacements, use only the "Service Part No."

DEFLECTION CHASSIS J-7

SECTION 1—POWER SUPPLY

Reference Symbol	*Description*	*Service Part No.*
C100 and C101	Condenser, filter, electrolytic, 120 µf., 150v	30-2568-51*
C102	Condenser, filter, electrolytic, 10 µf., 50v	30-2417-3
C103	Condenser, filter, electrolytic, 100 µf., 300v	30-2584-7
C107 and C108	Condenser, 500 µµf., 20,000v	30-1229-6
CR100 and CR101	Rectifier, selenium, 450 ma.	34-8003-8
F100	Fuse, line, 1.6 amperes	45-2656-23
J100	Socket, a-c line	27-6240-3
J101	Socket, television chassis connecting	27-6274-1
J102	Socket, radio chassis connecting	27-6274-4
L100	Choke, 1.5 henrys	32-8600
PL100	Plug, a-c line	Part of line cord assy. (See Misc. "A")
PL101	Plug and cable ass'y., television chassis connecting	See Misc. "B"
PL102	Plug and cable ass'y., radio chassis connecting	See Parts List of Radio Tuner used
R100	Resistor, current limiting, 5 ohms, 20 watts	33-3448-18
R102	Resistor, voltage dropping, .24 ohm	41-4149-2
R104	Resistor, special	33-1354
R105, R106, and R107	Resistor, high voltage, 1.5 megohms	33-1352-2
S100	Switch, off-on	Part of volume control
T100	Transformer, filament	32-8597

SECTION 7—VERTICAL SWEEP

Reference Symbol	*Description*	*Service Part No.*
C702	Condenser, 10 µf., 450v	Part of C103
C707	Condenser, by-pass, 20 µf., 200v	Part of C103

SECTION 7—VERTICAL SWEEP (Cont.)

Reference Symbol	*Description*	*Service Part No.*
L700 and L701	Coils, vertical deflection	Part of deflection yoke (See Misc. "A")
R701	Potentiometer, VERT. HOLD control, 250,000 ohms	Part of R811
R704	Potentiometer, HEIGHT control, 2.5 megohms	33-5565-32
R708	Potentiometer, VERT. LIN. control, 5 megohms	33-5565-31
R710	Resistor, voltage dropping, 22,000 ohms, 2 watts	66-3225340
R711	Resistor, screen dropping, 18,000 ohms, 2 watts	66-3185340
T700	Transformer, vertical oscillator	32-8431-2*
T701	Transformer, vertical output	32-8599

SECTION 8—HORIZONTAL SWEEP

Reference Symbol	*Description*	*Service Part No.*
C805	Condenser, by-pass, 80 µµf., ±5%	60-00825317
C807	Condenser, d-c blocking, 390 µµf., ±5%	60-10395417
C808	Condenser, charging, 270 µµf., ±5%	60-10275417
C813	Condenser, anti-ringing, 100 µµf., 4000v	30-1246-2
C815	Condenser, by-pass, 20 µf., 300v	Part of C103
J800	Socket, deflection	27-6274-7
J801	Socket, gate pulse	27-6273
L800	Coil, stabilizing, 30 to 80 mh.	32-4557
L801	Coil, r-f choke, horizontal output plate	Part of T80C
L802 and L803	Coils, horizontal deflection	Part of deflection yoke (See Misc. "A")
L804	Coil, r-f choke, damper cathode	Part of T800
L805	Coil, r-f choke, damper plate	32-4112-24
PL800	Plug, deflection	Part of cable ass'y. (See Misc. "A")
PL801	Plug, gate pulse	Part of cable ass'y. (See Misc. "B")

(Continued on page 25)

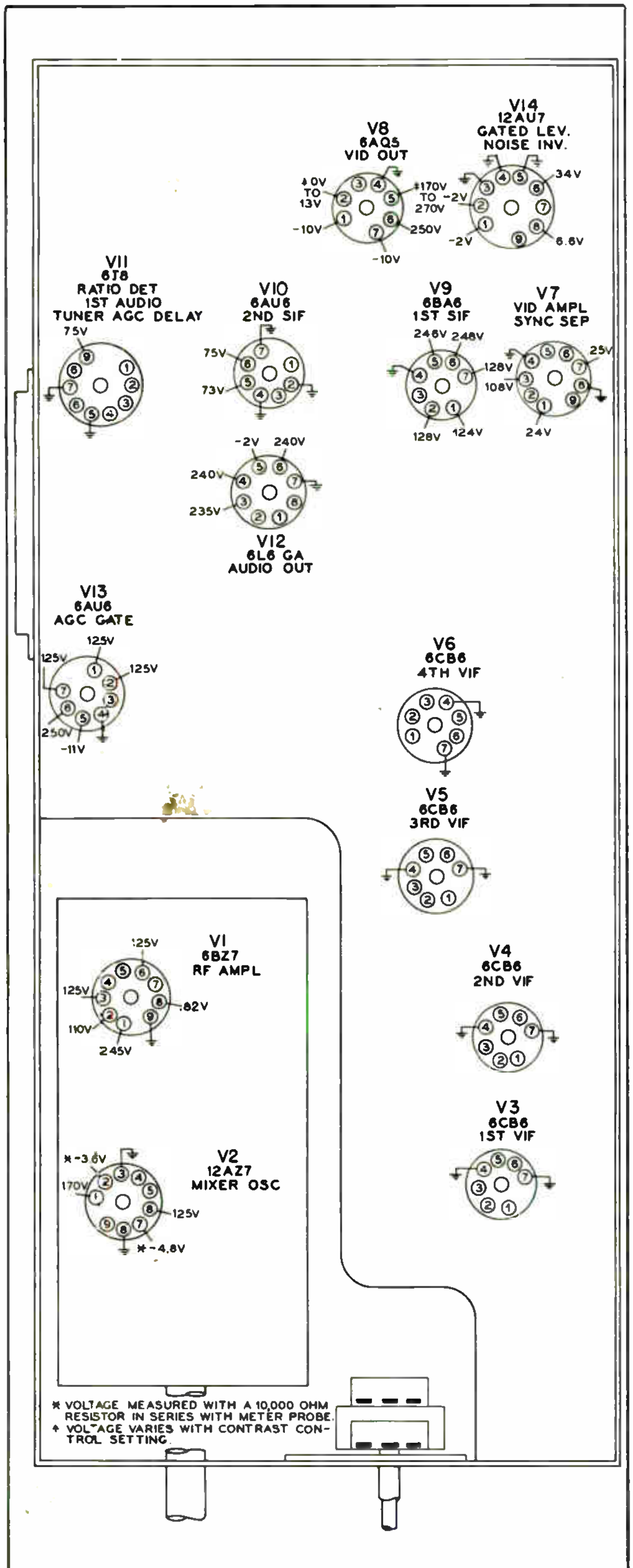


Figure 35. R-F Chassis 97, Bottom View, Showing Voltages at Socket Pins

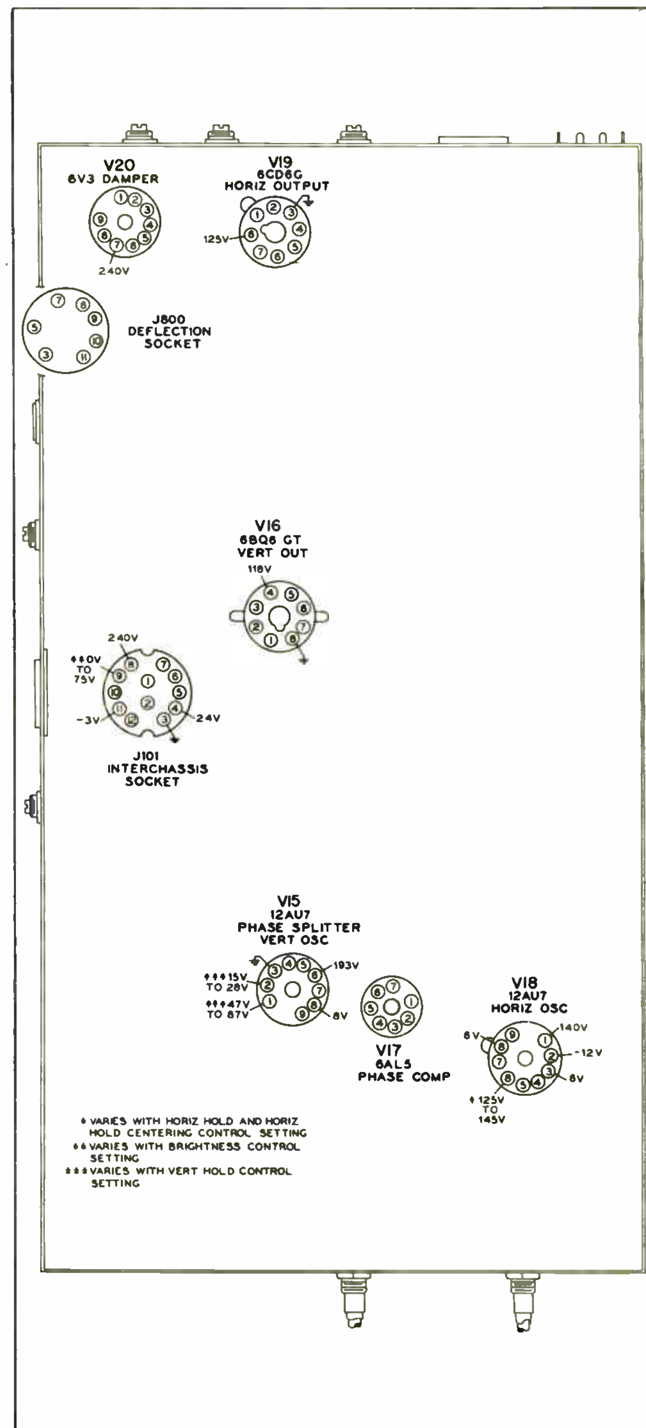


Figure 36. Deflection Chassis J-7, Bottom View, Showing Voltages at Socket Pins

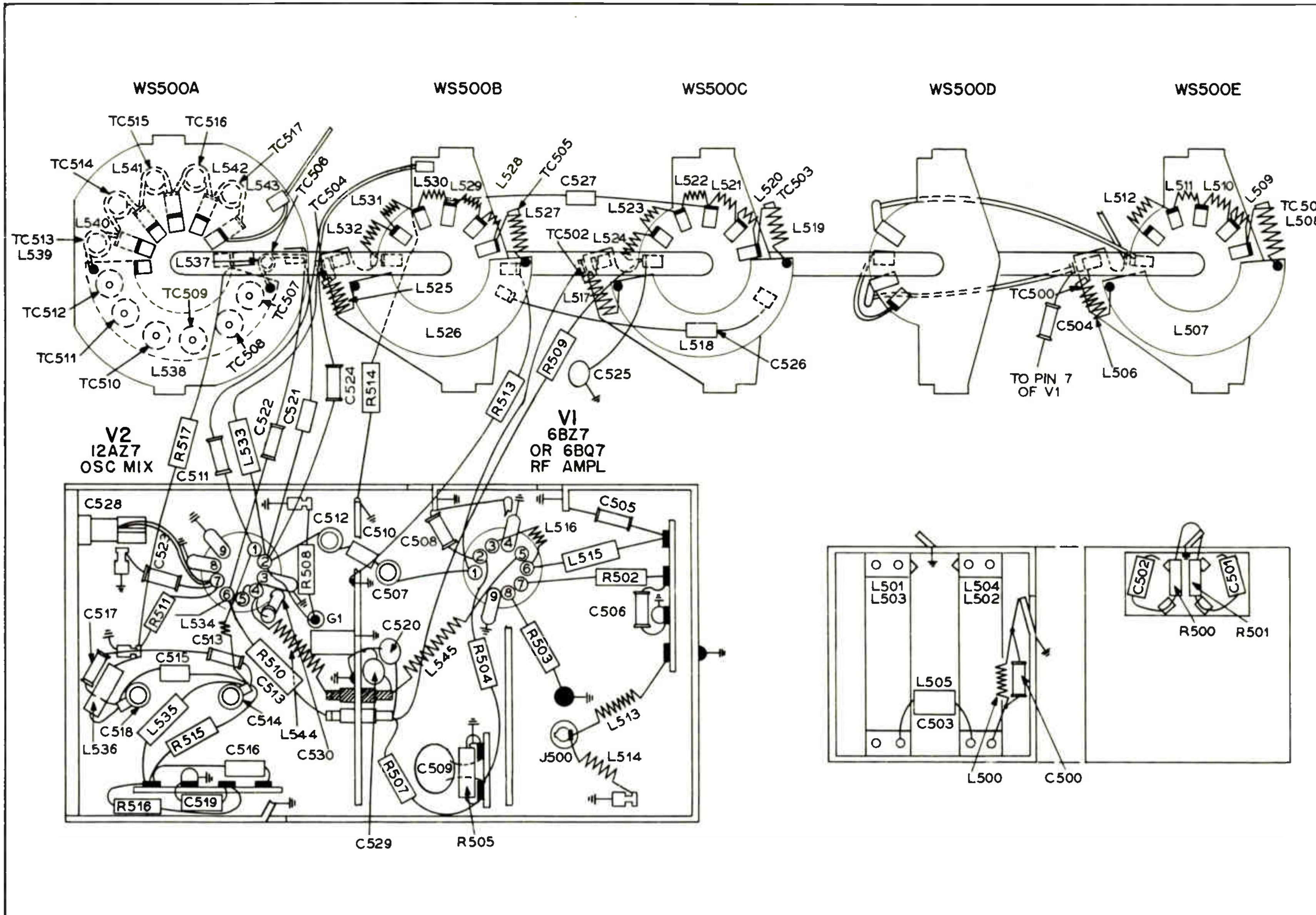


Figure 37. Television Tuner, Part No. 76-7600, Base Layout

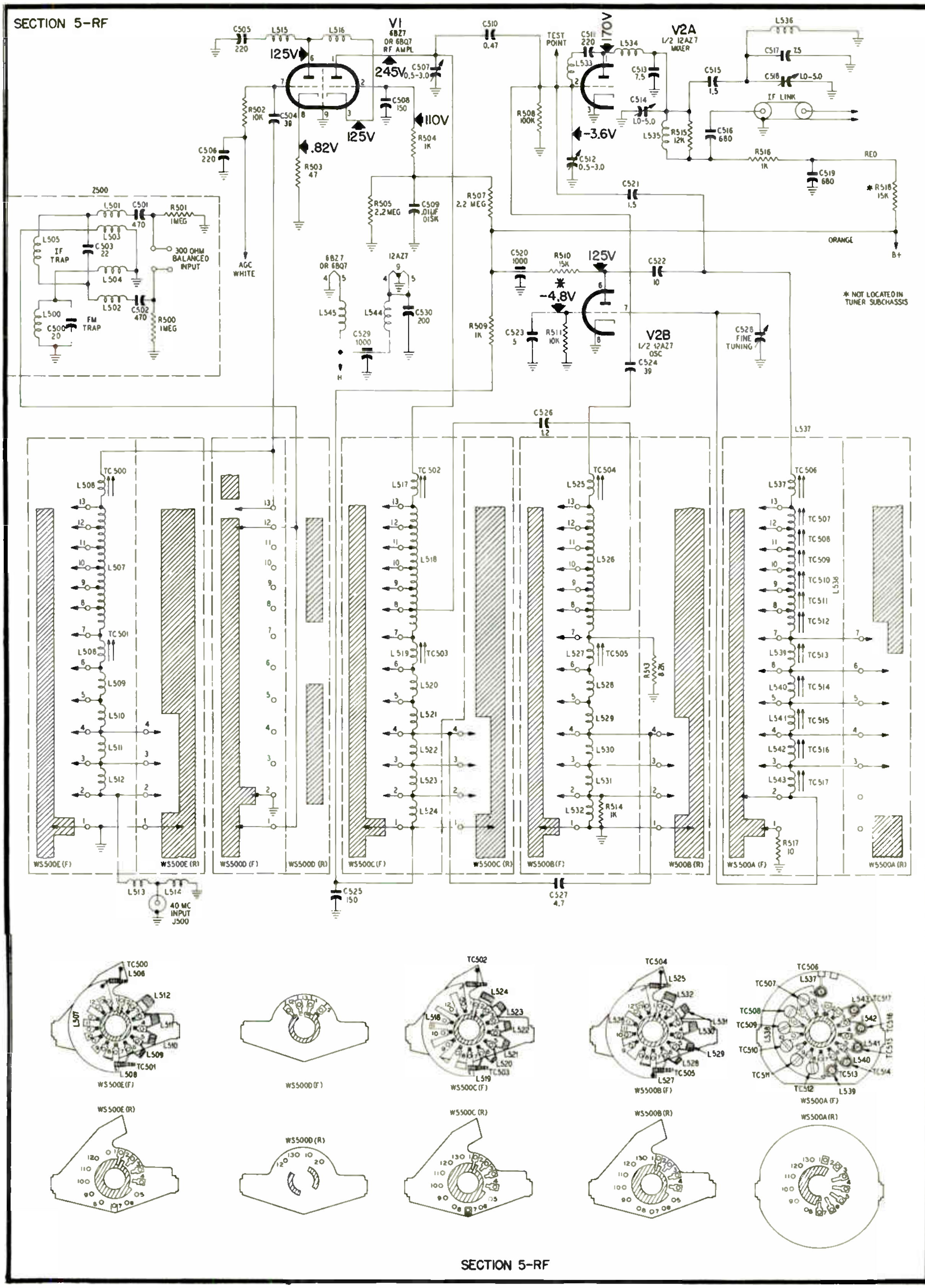
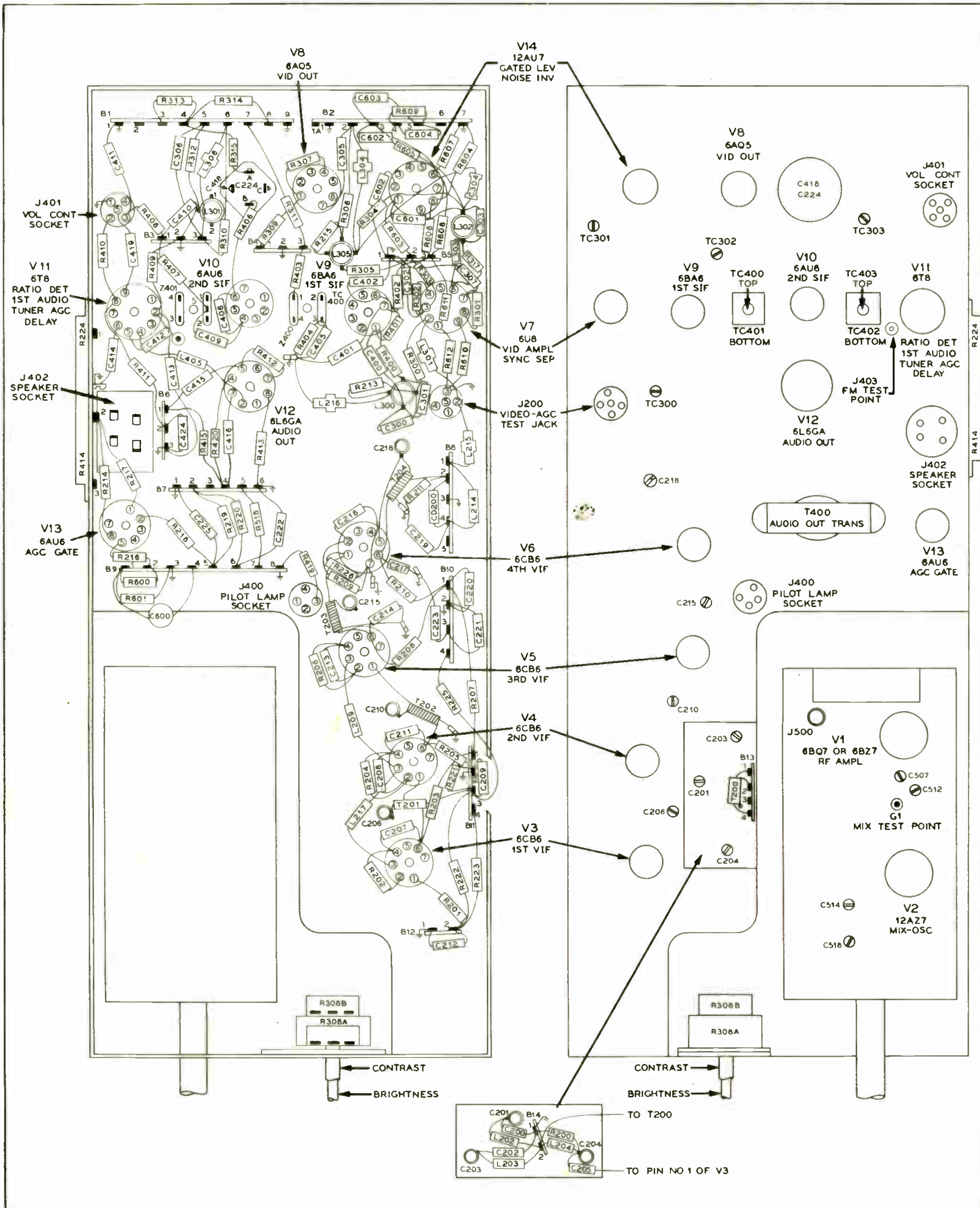


Figure 38. Television Tuner, Part No. 76-7600, Schematic Diagram

TP2-2245



TP2-3186

Figure 39. R-F Chassis 97, Base Layout

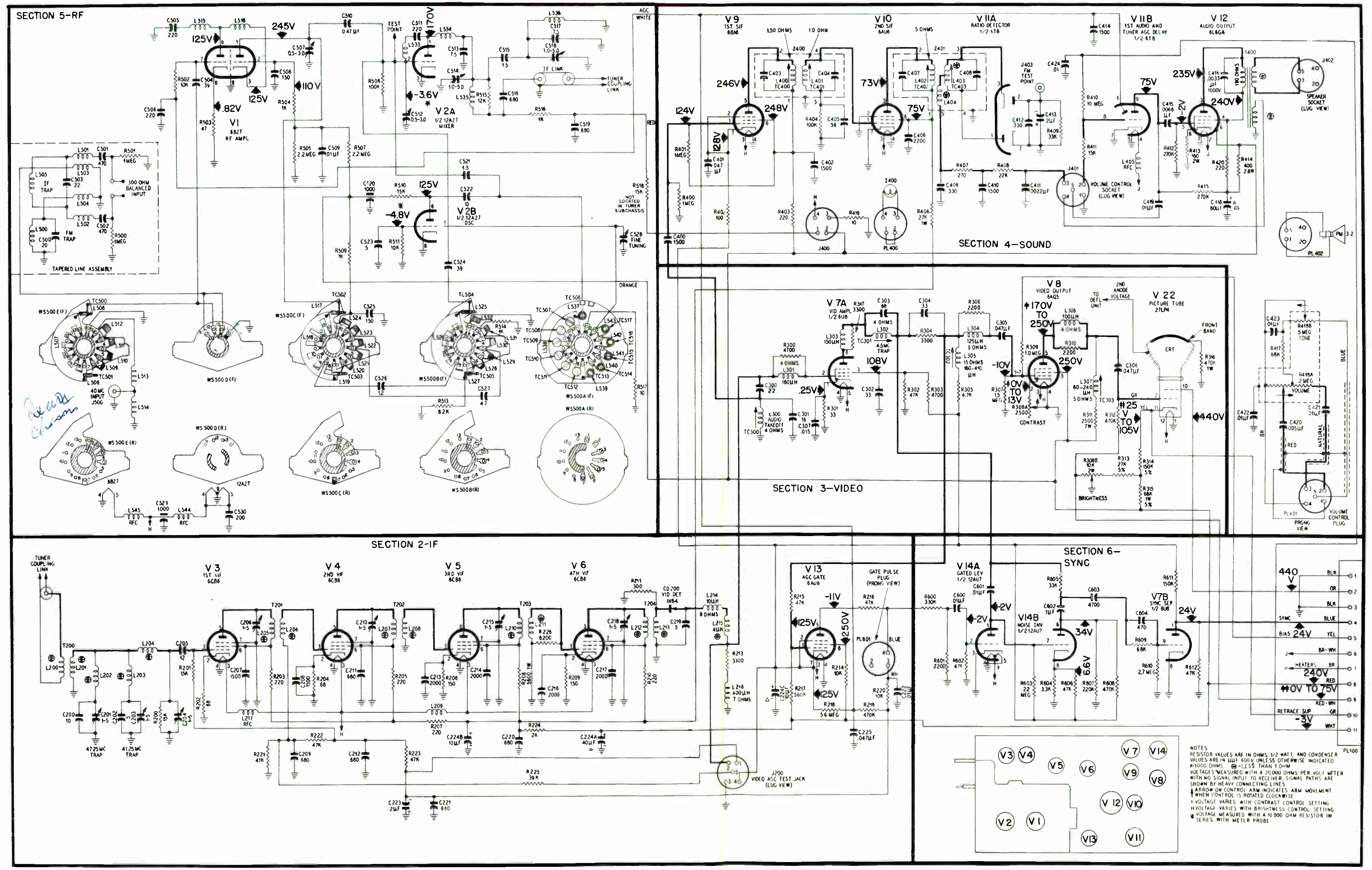


Figure 40. R-F Chassis 97, Schematic Diagram

TP2-3187

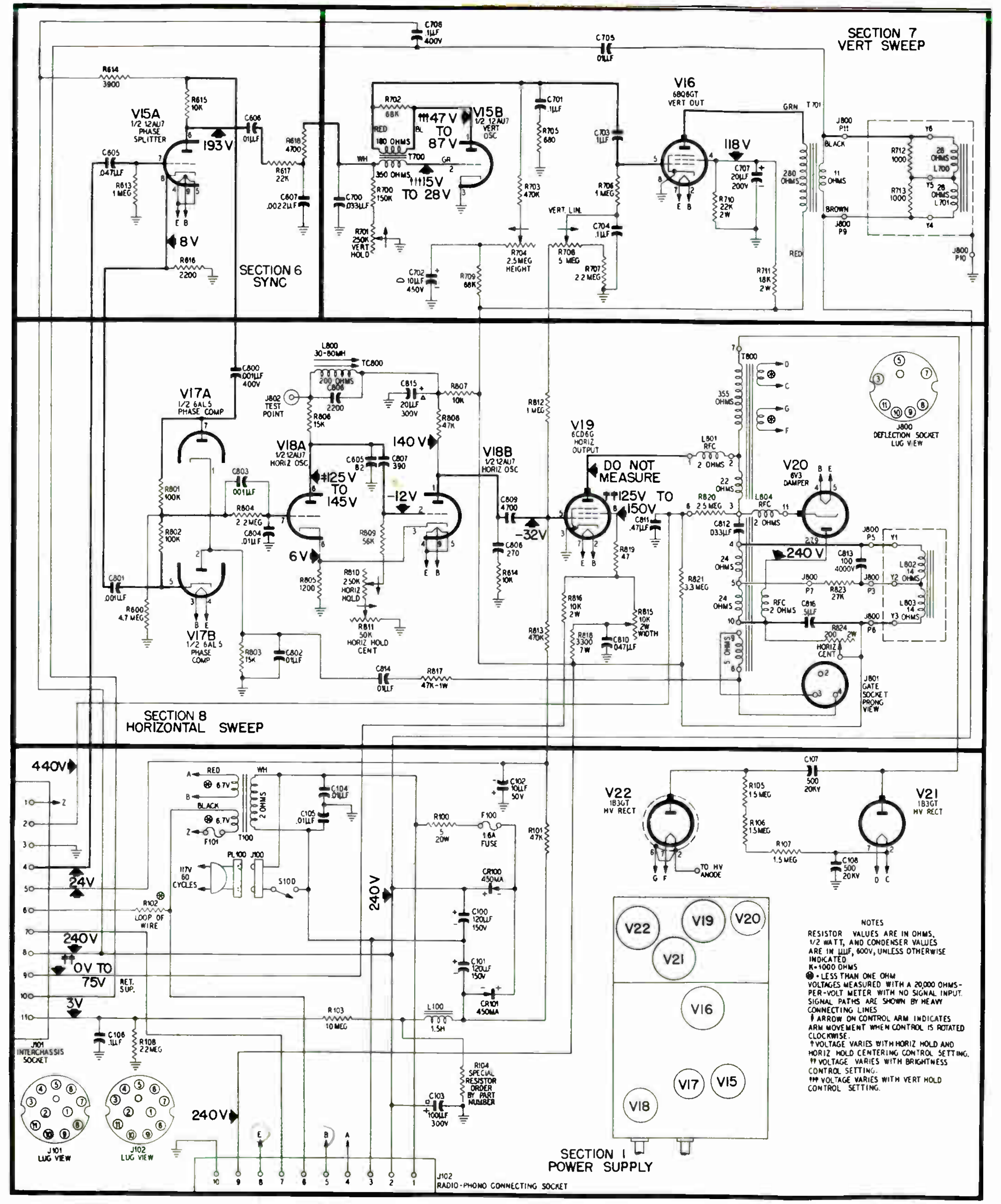


Figure 41. Deflection Chassis J-7, Schematic Diagram

TP2-3188

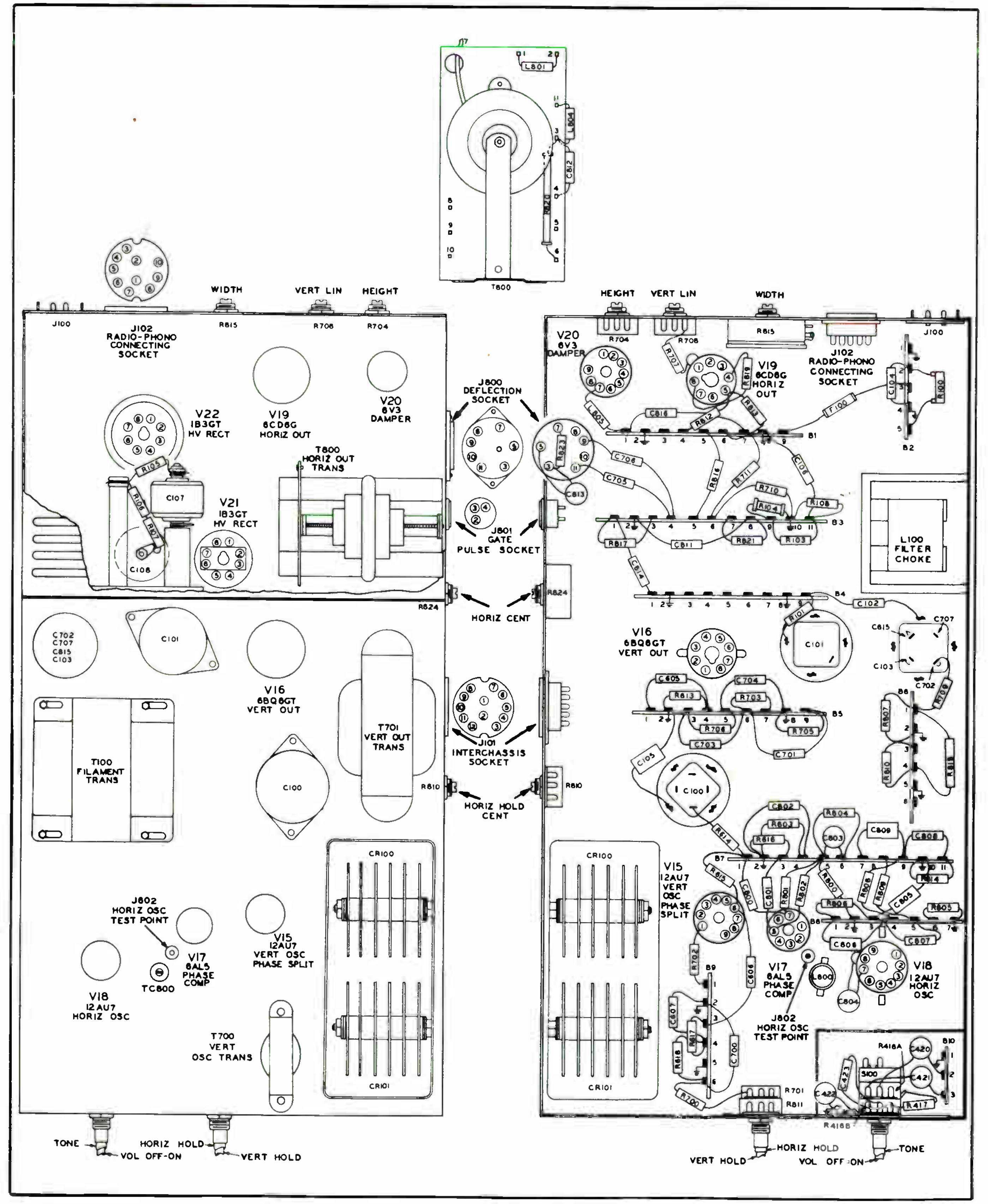


Figure 42. Deflection Chassis J-7, Base Layout

TP2-3189

REPLACEMENT PARTS LIST (Cont.)
DEFLECTION CHASSIS J-7 (Cont.)

SECTION 8—HORIZONTAL SWEEP (Cont.)

Reference Symbol	Description	Service Part No.
R810	Potentiometer, HORIZ. HOLD CENTERING control, 250,000 ohms	33-5565-17
R811	Potentiometer, HORIZ. HOLD control, 50,000 ohms	33-5563-57
R815	Potentiometer, WIDTH control, 10,000 ohms, 2 watts	33-5546-18
R816	Resistor, screen voltage dropping, 10,000 ohms, 2 watts	66-3105340
R817	Resistor, feedback, 47,000 ohms, 1 watt	66-3474340
R818	Resistor, voltage divider, 3300 ohms, 7 watts	33-1335-115
R824	Resistor, HORIZ. CENTERING control, 200 ohms, 2 watts	33-5546-50
T800	Transformer, horizontal output	32-8598

MISCELLANEOUS "A"

Description	Service Part No.
Arm and magnet ass'y., picture tube	76-6594
Beam bender	76-6077-4
Cable assembly, high voltage, picture tube	41-4064-6
Cable and plug assembly, deflection	41-4146-9
Cable and plug assembly, volume control	41-4136-2
Cord, line	41-3865
Focus assembly	76-8087
Insulator, electrolytic condenser mounting	27-9508-1
Shield, corona	56-9684
Socket, high-voltage rectifier (V22)	27-6290-1
Socket, high-voltage rectifier (V21)	27-6290-2
Socket, miniature, 7 pin, 6AL5	27-6203*
Socket, miniature, 9 pin, 6V3 and 12AU7	27-6203-6*
Socket ass'y., octal, 6BQ6GT	76-6119
Socket, octal, 6CD6G	27-6174
Socket, ass'y., miniature, 12AU7	76-6115-1
Stand-off, 2 inch	54-7309-8
Yoke, deflection	32-9650

32-4542-1

R-F CHASSIS 97

SECTION 2—VIDEO I.F.

Reference Symbol	Description	Service Part No.
C200	Condenser, 47.25-mc. trap, 10 μμf., ±5%	60-00105417
C201	Condenser, trimmer, 47.25-mc. trap, 1 to 5 μμf.	31-6520-9
C202	Condenser, 41.25-mc. trap, 5 μμf.	30-1224-28
C203	Condenser, trimmer, 41.25-mc. trap, 1 to 5 μμf.	31-6520-9
C204	Condenser, trimmer, 1 to 5 μμf.	31-6520-12
C205	Condenser, d-c blocking, 12 μμf.	62-012300001
C206	Condenser, trimmer, 1 to 5 μμf.	31-6520-9
C209	Condenser, a-g-c by-pass, 680 μμf.	62-168001001*
C210	Condenser, trimmer, 1 to 5 μμf.	31-6520-9
C211	Condenser, screen by-pass, 680 μμf.	62-168001001*
C212	Condenser, by-pass, 680 μμf.	62-168001001*
C215	Condenser, trimmer, 1 to 5 μμf.	31-6520-9
C218	Condenser, trimmer, 1 to 5 μμf.	31-6520-9
C219	Condenser, detector by-pass, 5 μμf.	30-1224-28
C220	Condenser, by-pass, 680 μμf.	62-168001001
C221	Condenser, by-pass, 680 μμf.	62-168001001
C223	Condenser, a-g-c filter, 2 μf.	30-2417-7
C224	Condenser, electrolytic	30-2584-24
C224A	Condenser, filter, 40 μf., 300v	Part of C224
C224B	Condenser, filter, 10 μf., 300v	Part of C224
C224C	Condenser, filter, 10 μf., 300v	Part of C224
CD200	Crystal, video detector, 1N64	34-8022
J200	Socket, video test	27-6273*
L200 and L201	Coils, tuner coupling	Part of T200
L202	Coil, 47.25-mc. trap	32-4548-15
L203	Coil, 41.25-mc. trap	32-4112-31
L204	Coil, 1st i-f grid	32-4112-31

SECTION 2—VIDEO I.F. (Cont.)

Reference Symbol	Description	Service Part No.
L205 and L206	Coils, coupling	Part of T201
L207 and L208	Coils, coupling	Part of T202
L209	Coil, filament choke	32-4112-15
L210 and L211	Coils, coupling	Part of T203
L212 and L213	Coils, coupling	Part of T204
L214	Coils, series peaking, 10 μh.	32-4422-27
L215	Coil, series peaking, 4 μh.	32-4143-22
L216	Coil, shunt peaking, 400 μh.	32-4480-5
L217	Coil, filament choke	32-4112-15
R208	Resistor, B+ dropping, 5600 ohms, 1 watt	66-2564340
R224	Resistor, voltage dropping, 2,000 ohms, 7 watts	33-3446-8
T200	Transformer, video i-f input	32-4548-23
T201	Transformer, first video i-f	32-4548-28
T202	Transformer, second video i-f	32-4548-25
T203	Transformer, third video i-f	32-4548-26
T204	Transformer, fourth video i-f	32-4548-27

SECTION 3—VIDEO

Reference Symbol	Description	Service Part No.
C300	Condenser, audio take-off, 2.2 μμf.	30-1221-6
C301	Condenser, by-pass, 18 μμf.	62-018400021
C302	Condenser, screen by-pass, 33 μμf.	62-033009001
C303	Condenser, by-pass, 68 μμf.	62-068409011
C304	Condenser, by-pass, 33 μμf.	62-033009001
L300	Coil, audio take-off	32-4463-9
L301	Coil, peaking, video amplifier grid, 180 μh.	32-4480-9

REPLACEMENT PARTS LIST (Cont.)
R-F CHASSIS 97 (Cont.)

SECTION 3—VIDEO (Cont.)

Reference Symbol	Description	Service Part No.
L302	Coil, 4.5-mc. trap	32-4463-7
L303	Coil, series peaking, 150 μh.	32-4480-18
L304	Coil, series peaking, 125 μh.	32-4480-8
L305	Coil, shunt peaking, 160 to 410 μh.	32-4467-16
L306	Coil, series peaking, 100 μh.	32-4480-3
L307	Coil, shunt peaking, 60 to 240 μh.	32-4467-15
R308	Potentiometer, dual	33-5563-42
R308A	Potentiometer, CONTRAST control, 2500 ohms	Part of R308
R308B	Potentiometer, BRIGHTNESS control, 10,000 ohms, 2 watts	Part of R308
R311	Resistor, plate load, 2500 ohms, 7 watts	33-1335-93
R313	Resistor, voltage divider, 27,000 ohms, ±5%	66-3278240
R314	Resistor, voltage divider, 150,000 ohms, ±5%	66-4158240
R315	Resistor, voltage divider, 68,000 ohms, 1 watt, ±5%	66-3684240
R316	Resistor, grounding, 470,000 ohms, 1 watt	66-4474340

SECTION 4—AUDIO

Reference Symbol	Description	Service Part No.
C405	Condenser, by-pass, 56 μμf.	30-1224-25
C409	Condenser, detector, balancing, 330 μμf.	62-133001001
C412	Condenser, r-f by-pass, 330 μμf.	62-133001001
C413	Condenser, filter, 2 μf.	30-2417-7
C416	Condenser, plate by-pass, 6800 μμf., 1000v	30-4650-89
C418	Condenser, filter, 60 μf.	Part of C224
J400	Lamp, pilot	34-2068
J400	Socket, pilot lamp	27-6273*
J401	Socket, volume control	27-6273*
J402	Socket, speaker	27-4785-22
L405	Coil, filament choke	41-4112-15
PL400	Plug and cable ass'y., pilot lamp	See Misc."B"
PL401	Plug and cable ass'y., volume control	See Misc. "A"
PL402	Plug and cable ass'y., speaker	**See Cabinet Parts List
R406	Resistor, voltage dropping, 27,000 ohms, 1 watt	66-3274340
R413	Resistor, cathode bias, 180 ohms, 2 watts	66-1185340
R414	Resistor, voltage dropping, 400 ohms, 2.6 watts	Part of R224
R418	Potentiometer, dual	33-5563-56
R418A	Potentiometer, volume control, 2 megohms	Part of R418
R418B	Potentiometer, tone control, 5 meghoms	Part of R418
T400	Transformer, audio output	32-8579
Z400	Transformer, first sound i-f	32-4497A*
Z401	Transformer, FM detector	32-4450-5

SECTION 6—SYNC

Reference Symbol	Description	Service Part No.
C604	Condenser, by-pass, 470 μμf.	30-1225-7

MISCELLANEOUS "B"

Description	Service Part No.
Cable and plug assembly, television chassis connecting	41-4146-5
Cable and plug assembly, gate pulse	41-4141
Cable and socket assembly, picture tube	41-3964-20
Cable and socket assembly, pilot light	41-4176
Insulator, control	54-8435
Shield, 6CB6 tube	56-5629FA-3
Shield, 6T8 tube	56-5629-5
Socket and base assembly, 6CB6 tube (4)	27-6203-14
Socket and base assembly, 6T8 tube	27-6203-18
Sockets, miniature, 6AU6 (2), 6AQ5, and 6BA6 tubes	27-6203
Socket, miniature, 9 pin (2)	27-6203-6*
Socket, octal	27-6174

TV TUNER, PART NO. 76-7600-2

SECTION 5—R.F.

Reference Symbol	Description	Service Part No.
C500	Condenser, FM trap, 20 μμf. ±5%	62-020309011
C501 and C502	Condensers, antenna isolating, 470 μμf.	30-1225-18
C503	Condenser, i-f trap, 22 μμf.	Part of L505
C504	Condenser, r-f coupling, 39 μμf. ±10%	62-039409011
C505	Condenser, neutralizing, 220 μμf.	62-122001001
C506	Condenser, a-g-c coupling, 220 μμf.	62-122001001
C507	Condenser, r-f trimmer, .5 to 3 μμf.	31-6520-3
C508	Condenser, r-f by-pass, 150 μμf.	62-115001011
C509	Condenser, grid by-pass, .01 μf.	30-1238-2
C510	Condenser, coupling, .47 μf.	30-1221-15
C511	Condenser, neutralizing, 220 μμf.	62-122001001
C512	Condenser, trimmer, mixer grid, .5 to 3 μμf.	31-6520-7
C513	Condenser, by-pass, 7.5 μμf.	30-1224-8
C514	Condenser, trimmer, 1.0 to 5.0 μμf.	31-6520-11
C515	Condenser, i-f trap coupling, 1.5 μμf.	30-1221-8
C516	Condenser, i-f link coupling, 680 μμf.	62-168001001
C517	Condenser, i-f trap, 7.5 μμf.	30-1224-8
C518	Condenser, i-f trap trimmer, 1.0 to 5.0 μμf.	31-6520-11
C519	Condenser, by-pass, 680 μμf.	62-168001001
C520	Condenser, by-pass, 1000 μμf.	30-1245-1
C521	Condenser, oscillator injection, 1.5 μμf.	30-1221-8
C522	Condenser, oscillator plate, 10 μμf.	62-012300001
C523	Condenser, grid blocking, 5 μμf.	30-1224-5
C524	Condenser, mixer grid blocking, 39 μμf.	62-039409011
C525	Condenser, by-pass, 150 μμf.	62-115001011
C526	Condenser, coupling, 1.2 μμf.	30-1221-7
C527	Condenser, coupling, 4.7 μμf.	
C528	Condenser, fine tuning	76-6935-1
C529	Condenser, filament by-pass, 1000 μμf.	30-1245-1
C540	Condenser, filament by-pass, 200 μμf.	62-120001001
J500	Connector, 40 mc., input	57-0590-2
L500	Coil, FM trap	32-4550-2

REPLACEMENT PARTS LIST (Cont.)
TV TUNER, PART NO. 76-7600-2 (Cont.)

SECTION 5—R.F. (Cont.)

Reference Symbol	Description	Service Part No.
L501, L502, L503, and L504	Coils, tapered line assembly	32-4432-1
L505	Coil, i-f trap (44.75 mc.)	32-4552-1
L506 to L512, inc.	Coils, r-f grid tuning	Part of WS500B
L513	Coil, 40-mc. channel	32-4550-5
L514	Coil, 40-mc. channel	32-4550-6
L515	Coil, r-f amplifier neutralizing	32-4551-1
L516	Coil, r-f coupling	32-4550-9
L517 to L524, inc.	Coil, r-f plate tuning	Part of WS500C
L525 to L532, inc.	Coil, mixer grid	Part of WS500B
L533	Coil, mixer neutralizing	32-4551-1
L534	Coil, mixer plate	32-4550-4
L535	Coil, i-f primary	312-5151-6
L536	Coil, i-f trap	312-5151-5
L537 to L543, inc.	Coil, oscillator tuning	Part of WS500A
L544 and L545	Coil, r-f choke	32-4550-1
R518	Resistor, B+ dropping, 15,000 ohms, 1 watt	66-3154340
WS500A (F) and WS500A (R)	Switch wafer, oscillator	76-7604
WS500B (F) and WS500B (R)	Switch wafer, mixer grid	76-7606
WS500C (F) and WS500C (R)	Switch wafer, r-f plate	76-7607
WS500D (F) and WS500D (R)	Switch wafer, r-f grid	76-7612
WS500E (F) and WS500E (R)	Switch wafer, r-f grid	76-7610

MISCELLANEOUS "C"

Description	Service Part No.
Coupling, fine tuning shaft	54-4912
Detent, ball	56-8020
Front panel ass'y.	76-6928-2
Hairpin, plunger grounding	1W42704FA3
Hairpin, plunger	56-9858
Plunger	56-8034-1
Retaining ring	1W61043
Shaft	76-6914
Shaft, extension	56-8358
Cam and shaft, fine tuning	76-6936
Shaft, spring	56-8023
Shield, tube, 9 pin miniature	56-5629-5
Socket, tube, 9 pin miniature	27-6203-21
Spring, plunger	56-9628
Tapered line ass'y.	76-7602
Terminal panel (antenna)	76-5504-2
Washer	56-9351
Washer, fiber	27-4109-13
"E" washer	1W60980FE5

CONNECTING CABLES, PLUGS, AND SOCKETS

Reference Symbol	Description	Service Part No.
J100	Socket, a-c line	27-6240-3
J101	Socket, television chassis connecting	27-6274-1
J102	Socket, radio chassis connecting	27-6274-4
J200	Socket, VIDEO TEST	27-6273*
J400	Socket, pilot lamp	27-6273*
J401	Socket, volume control	27-6273*
J402	Socket, speaker	27-4785-22
J500	Connector, 40-mc. input	57-0590-2
J800	Socket, deflection	27-6274-7
J801	Socket, gate pulse	27-6273
PL100	Plug and line cord ass'y.	41-3865
PL101	Plug and cable ass'y., television chassis connecting	41-4146-5
PL102	Plug and cable ass'y., radio chassis connecting	See Parts List of Radio Tuner used
PL401	Plug and cable ass'y., volume control	41-4136-2
PL402	Plug and cable ass'y., speaker	**See Cabinet Parts List
PL800	Plug and cable ass'y., deflection	41-4158-11
PL801	Plug and cable ass'y., gate pulse	41-4141
	Cable ass'y., high voltage, picture tube	41-4064-6*
	Cable and socket ass'y., picture tube	41-3964-20
	Cable and socket ass'y., pilot light	41-4176

** NOTE: The length of this cable varies with cabinet model and speaker size. For Service Part No., refer to cabinet parts list in Philco Service Bulletins.

PHILCO
Factory-Supervised
Service

PR-2445

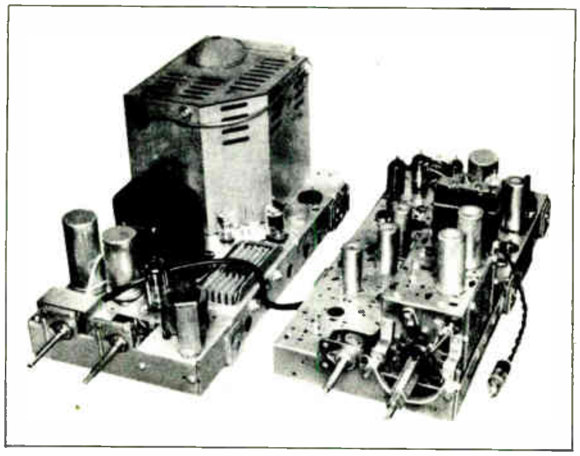
Printed in U. S. A.

PHILCO SERVICE

PHILCO Factory-Supervised Service

TELEVISION

PHILCO
TELEVISION SERVICE MANUAL
FOR
R-F CHASSIS 81
DEFLECTION CHASSIS H-1



TP2-795

SERVICE INFORMATION FOR PHILCO CHASSIS TYPES 81 AND H-1

TABLE OF CONTENTS

PR-2374

CIRCUIT DESCRIPTION

The Philco 1953, Code 123 television receivers make use of a dual chassis arrangement, one chassis containing the r-f, i-f, video, and sync circuits, and the other chassis containing the power and deflection circuits.

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

CAUTION: See A-C LINE ISOLATION.

A separate subchassis contains the r-f amplifier, the oscillator, and the mixer. The r-f amplifier uses a 6BZ7 or a 6BQ7 tube, V1. The oscillator and mixer each use one half of a 12AZ7 tube, V2. The output of the mixer is fed to a three-stage, stagger-tuned, i-f amplifier system employing three 6CB6 tubes. A type 1N64 crystal diode is used for the video detector, the output of which is amplified by a single-stage video amplifier utilizing a type 12BY7 tube, V6. The connections at the detector are such as to produce a composite video signal with negative-going sync pulses. The signal, which is subjected to a 180-degree phase shift through the video amplifier, is applied to the cathode of the picture tube; therefore, the sync pulses at this point are positive-going. The grid of the picture tube is returned to ground through a resistor (R309). A blanking pulse, taken from the vertical output stage, is applied across R309, for suppression of the vertical retrace.

Sound i.f. (intercarrier) is obtained by utilizing the beat frequency produced when the 26.6-mc. video carrier and the 22.1-mc. sound carrier are mixed in the video detector. The 4.5-mc. beat frequency is the difference between 26.6 mc. and 22.1 mc., and contains the FM sound signal. This 4.5-mc. signal contains only a negligible amount of video amplitude modulation, provided that the amplitude of the 22.1-mc. signal is considerably lower than that of the 26.6-mc. signal. The proper relationship between the two carriers is established during the alignment of the receiver. There is sound output only when both the video and sound 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), which is taken from the plate circuit of the video amplifier, is passed through a 4.5-mc. sound i-f stage using a 6AU6 tube, V7, and is then applied to the FM detector, which utilizes two diode sections of a 6T8 tube, V8. The triode section of the 6T8 is used as the first audio amplifier. The power amplifier uses a 6K6GT tube, V9.

A portion of the video signal appearing at the grid of the video amplifier is applied to the pentode section of a 6U8 tube which operates as a sync amplifier, V10A. The output of this stage is composite video with positive-going sync, and is applied to grid 3 (pin 7) of the 6BE6 sync separator, V11. Since grid-leak bias is used on grid 3, the tips of the sync pulses are clamped to zero, and the video components swing in a negative direction from zero. Because of the cutoff characteristics of grid 3, the video components are eliminated, and only negative-going sync pulses appear in the plate circuit of the sync separator. At the same time, however, a signal is taken from the video detector and applied to grid 1 (pin 1) of the 6BE6 tube. This grid is returned to B plus, and the bias is maintained close to zero, because of a small grid-current flow. Since the signal applied to grid 1 is composite video with negative-going sync, any noise modulation present in the signal appears in the form of sharp spikes, driving in a negative direction. The circuit constants are chosen to allow grid 1 to cut off plate current whenever the signal goes more negative than the sync pulses. A series grid-limiting resistor (R614) is also incorporated, to prevent the video components from appearing in the plate circuit of the sync separator. A-G-C voltage is also developed in the sync separator circuit in the following manner: On the tips of the sync pulses, grid 3 (pin 7) of the 6BE6 tube draws current, which flows downward through the network R609, R610, R611, R211, and L214, causing capacitors C604, C602, and C603 to assume negative charges proportionate to the amount of peak signal applied to grid 3. The tuner a-g-c voltage is delayed by means of a resistor divider network which applies a small positive voltage to the tuner a-g-c circuit. This positive voltage prevents a-g-c action from lowering the tuner gain on weak signals. To prevent the delay voltage from driving the tuner a-g-c voltage positive on weak signals, a diode clamp (part of V8B) is connected across C602.

The negative-going sync pulses appearing in the plate circuit of the sync separator are fed to the sync inverter stage, V10B (triode section of the 6U8 tube). This stage acts as a phase-splitter circuit; positive sync pulses appear in the plate circuit, and negative sync pulses are taken from the cathode. Both positive and negative sync pulses are fed through the inter-chassis cable into the deflection chassis.

Proper triggering of the vertical oscillator requires positive synchronizing pulses. The vertical sync signal is separated from the horizontal sync signal by the integrator circuit, and is fed to the grid of the vertical blocking oscillator tube, one-half of a 12BH7, V12. The output of the vertical blocking oscillator is amplified by the other half of the 12BH7 tube, which is employed as the vertical output amplifier. The output of the amplifier is applied to the vertical-deflection coils through the vertical output transformer.

The horizontal sweep circuits require both positive and negative sync pulses. The phase-comparer circuit uses a 6AL5 tube, V13. Positive sync pulses are applied to the plate of V13A, and negative sync pulses are applied to the cathode of V13B. A saw-tooth voltage is fed to the plate of V13B and to the cathode of V13A, for comparison of the sync and horizontal sweep voltages. When the saw-tooth and sync signals are exactly in phase, no voltage is developed across R800, but when the two signals are out of phase, either a positive or a negative voltage is developed, depending upon whether the horizontal-oscillator frequency is lower or higher than the sync-pulse frequency. The grid circuit of the horizontal oscillator, a 12AU7 (V14) cathode-coupled multivibrator, is connected to R800 through a filter network; when the voltage at this point goes in a positive direction, the frequency of the horizontal oscillator is increased, and when the voltage swings negative, the frequency of the oscillator is decreased. In this manner the frequency of the horizontal oscillator is controlled over the lock-in range of the circuit. The horizontal hold control (R811) adjusts the horizontal oscillator frequency so that it is within the control range of the phase comparer. The output of the horizontal oscillator is fed to the horizontal output amplifier, which makes use of a 6BQ6 tube, V15. This amplifier feeds the deflection coils through the horizontal output transformer. A 6AX4GT tube, V16, is used as the horizontal damper.

The second anode voltage for the picture tube is supplied by one 1B3GT high-voltage rectifier tube, V17. 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 from across the speaker field coil (used as a 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 vertical amplifier, vertical oscillator, and the first anode of the picture tube. Filament voltage for all the tubes except the high-voltage rectifier is supplied by a step-down transformer. Filament voltage for the high-voltage rectifier is supplied by a winding on the horizontal output transformer.

IMPORTANT

A-C LINE ISOLATION

CAUTION: One side of the a-c line is connected to the chassis through C101 and L100. The other side of the a-c line is connected to the chassis through R100, CR100, and C103, 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 test equipment or receiver, or both.

SPECIFICATIONS

CHANNEL TUNING .... Twelve Channel, 12-position incremental tuner; fine tuning of local oscillator

FREQUENCY RANGE ...... Television Channels 2 through 13

INTERMEDIATE FREQUENCIES
- Video Carrier .... 26.6 mc.
- Sound (intercarrier) .... 4.5 mc.

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

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

POWER CONSUMPTION .... 175 watts

TUBE COMPLEMENT

RF-81 CHASSIS

REFERENCE SYMBOL	TUBE TYPE	FUNCTION
V1	6BZ7 miniature	R-F Amplifier
V2	12AZ7 miniature	Oscillator-Mixer
V3, V4, V5	6CB6 miniature	Video I-F Amplifiers
V6	12BY7 miniature	Video Output Amplifier
V7	6AU6 miniature	Sound I-F Amplifier
V8	6T8 miniature	Ratio Detector, First Audio, and Tuner A-G-C Clamp
V9	6K6GT	Audio Output
V10	6U8 miniature	Sync Amplifier, Sync Inverter
V11	6BE6 miniature	Sync Separator, A-G-C
V18	17YP4, 20DP4A, or 21EP4A	Picture Tube

H-1 DEFLECTION CHASSIS

REFERENCE SYMBOL	TUBE TYPE	FUNCTION
V12	12BH7 miniature	Vertical Oscillator, Vertical Amplifier
V13	6AL5 miniature	Horizontal Phase Comparer
V14	12AU7 miniature	Horizontal Oscillator
V15	5BQ6GT	Horizontal Amplifier
V16	6AX4GT	Horizontal Damper
V17	1B3GT	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-OSCILLATOR ADJUSTMENT

To adjust the horizontal-oscillator circuit, tune in a station and proceed as follows:

1. Reduce the width of the picture until approximately 1 inch of blank screen appears at the right-hand and left-hand sides of the picture.
2. Increase the BRIGHTNESS control setting until the blanking becomes visible. This will appear as a dark vertical bar on each side of the picture.
3. Connect a .1-μf. condenser from pin 9 of the chassis-connecting power socket, J101, to ground. (The plate side of the horizontal ringing coil, L800, is connected to pin 9 of J101.)
4. Set the HORIZONTAL HOLD control to the approximate center of its mechanical rotation.
5. Adjust the HORIZ HOLD CENTERING control until equal portions of the blanking bar appear on both sides of the picture.
6. Remove the .1-μf. condenser from the chassis-connecting socket.
7. Adjust the horizontal ringing coil, L800, until equal portions of the blanking bar again appear on both sides of the picture.
8. Rotate the HORIZONTAL HOLD control through its range. The picture should fall out of sync on both sides of the center of its rotation. If the picture does not fall out of sync on both sides, readjust the HORIZ HOLD CENTERING control.
9. Rotate the HORIZONTAL HOLD control through its range, and observe the number of diagonal blanking bars that appear just before the picture pulls into sync. The pull-in should occur with from 1 to 2 diagonal bars when the sync position is approached from either direction. If proper pull-in is not obtained, repeat the above procedure.

VIDEO-DETECTOR PEAKING-COIL ADJUSTMENT

The video-detector peaking coil, L214, is adjusted at the factory for proper transient response of the video circuit. Ordinarily, this coil will require no further adjustment by the serviceman. On some stations, however, where excessive overshoot or excessive smear is present, a slight adjustment of L214 may improve the picture quality on that station, but at a possible sacrifice of quality on other channels. If L214 is replaced in servicing, adjustment will be required.

Before adjusting L214, check the tuner alignment and i-f alignment. (Never adjust L214 until the alignment of the receiver is correct.) Then tune in a station and adjust L214 until there are no trailing whites or smear in the picture. Turning TC206 clockwise reduces trailing whites and overshoot; turning TC206 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 TC206 applies to a particular station exhibiting smear or overshoot. After TC206 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 coil to a given frequency, using an AM signal, then feeding in a sweep signal at the antenna terminals and touching up the adjustments to obtain the desired pass band.

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

The video-carrier intermediate frequency is 26.6 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 having the top of the workbench metallic. 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 2 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 Model 7008 is used, the built-in crystal calibrator provides an excellent means of calibration. An alternate method for 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."

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 may be made through the alignment jack 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, may be used. As an alternate, a Philco alligator-clip adapter, Part No. 45-1636, with as short a ground lead as possible, may be used to connect 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.

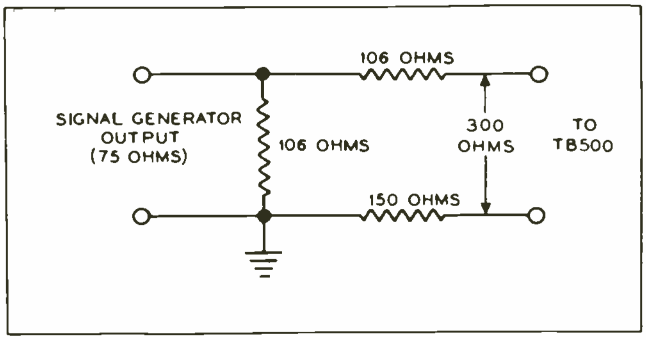


Figure 1. Antenna-Input Matching Network

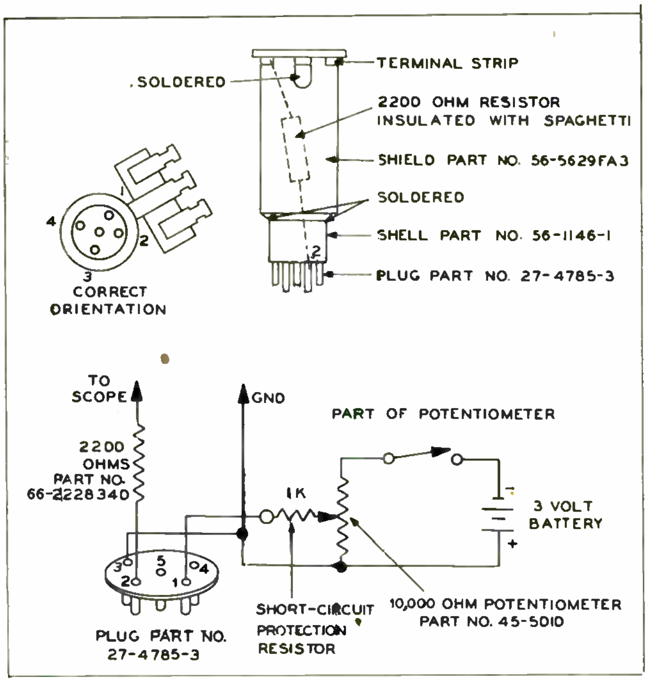
Antenna-Input Matching Network

Figure 1 shows an impedance-matching network for coupling the signal generator to the antenna-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 should be of carbon-composition construction, and should be chosen from a group, to obtain values within 10% of those indicated. The resistors should be placed in a shield can, to prevent variable effects. An antenna 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.

Video I-F Alignment Jig (Video Test Jack Adapter)

The ALIGN TEST jack adapter, shown in figure 2, 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 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 poteniometer and switch are connected across the 3-volt battery. The switch is used to disconnect the poteniometer, 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.



TP0-1441

Figure 2. Video I-F Alignment Jig

Sound I-F Alignment Jig (FM Test Jack Adapter)

Figure 3 shows the adapter that should be used to connect the voltmeter and oscilloscope to the VOLUME CONTROL socket, J400. A suggested method of fabricating the adapter is also shown.

TELEVISION TUNER ALIGNMENT

After the tuner is serviced, or if an i-f alignment is required, the tuner alignment should be checked by observing the tuner response curve as given under BANDPASS ALIGNMENT. If the response curve does not fall within the limits shown in figure 5, the tuner should be realigned. 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

Tuning cores are provided in the oscillator coils at channels 13, 11, 9, 7, 6, and 4. By adjusting these tuning cores all channels may be placed on frequency. This procedure should be carried out with the highest-frequency channel first, since the alignment of each channel affects the alignment of all the channels below it in frequency.

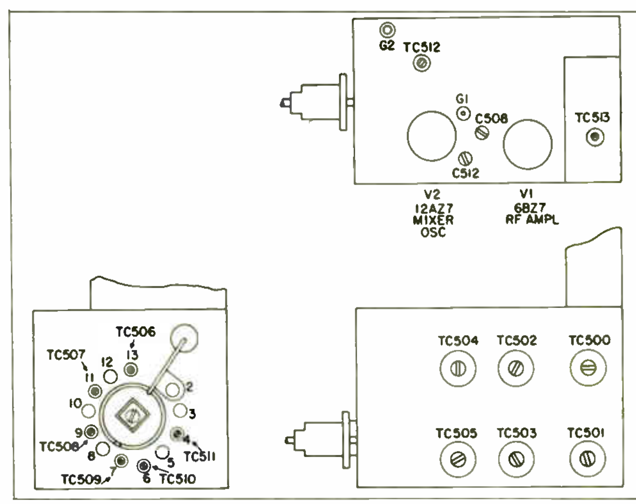
The channel adjustments are so arranged that, with one exception, each adjustment corrects the tuning of more than one channel. The coverage of the various adjustments is as follows:

Channel Adjustment	Channels Corrected By Adjustment
13	13 and 12
11	11 and 10
9	9 and 8
7	7 only
6	6 and 5
4	4, 3, and 2

The FINE TUNING cam should be preset for all adjustments by placing the stop on the FINE TUNING cam between Channel 7 and 8 holes on the front plate of the tuner. See figure 4.

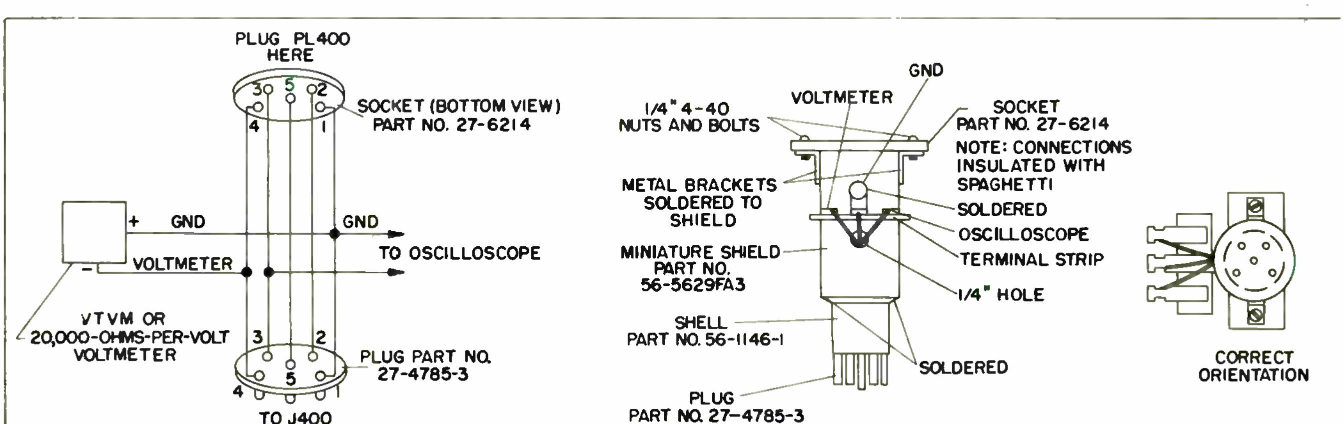
Procedure Using Signal Generator

An r-f signal (unmodulated), at the oscillator frequency, is fed into the antenna input from an AM signal generator, and the oscillator tuning cores are adjusted for zero beat. The r-f signal frequency should be accurately determined. It is preferable that the signal be taken from a crystal-controlled source; if this is



TP2-2201

Figure 4. Television Tuner, Showing Location of Adjustments



TP2-2200

Figure 3. Sound I-F Alignment Jig

not available, the signal generator may be calibrated against the television station.

1. Connect the hot lead of the oscilloscope to the mixer plate test point, G2, through a 1000-ohm resistor, and connect the ground lead of the oscilloscope to the chassis, near the test point. (High oscilloscope gain may be necessary to obtain a visual beat. In this instance, base-line hum may be ignored.)

2. Connect the AM (marker) generator to the 300-ohm antenna-input terminals. For this purpose the antenna-input matching network is not required.

3. If the tuner is being aligned out of the chassis, connect the white lead to the negative terminal of a 1.5-volt battery. Ground the positive terminal.

4. Mechanically preset the FINE TUNING cam, as shown in figure 4.

5. Feed in an r-f signal (unmodulated), at the oscillator frequency for Channel 13, with the CHANNEL SELECTOR set for Channel 13.

6. Adjust the tuning core for Channel 13 (see figure 4).

7. Reset the signal-generator frequency and the CHANNEL SELECTOR, and adjust the tuning cores for Channels 11 and 9, respectively.

8. Repeat steps 5, 6, and 7 until Channels 13, 11, and 9 are within plus or minus 500 kc. of the correct frequency.

9. Feed in r-f (unmodulated) signals, at the oscillator frequencies for Channels 7, 6, and 4, consecutively (see NOTE below), and adjust the respective tuning cores. (See figure 4.)

> NOTE: The exact position of the FINE TUNING cam should be marked when Channel 4 is correctly aligned. This position is to be used in step 4 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:

1. Mechanically preset the FINE TUNING cam to the center of its range (see figure 4).

2. Tune in the highest-frequency channel to be received.

3. Adjust the tuning core for that channel, or the next highest channel, for the best picture; that is, starting with sound in the picture, turn the tuning core until the sound disappears. Repeat for each channel received in the area.

BANDPASS ALIGNMENT

General

The bandpass alignment consists of aligning the tuner at Channels 13 and 6, and then making it track down to Channels 7 and 2, respectively.

During the alignment, a fixed bias of 1.5 volts is applied to the r-f amplifier tube.

An FM (sweep) signal is applied to the antenna-input circuit, and an oscilloscope is connected to the mixer plate circuit. 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, which are caused by poor line regulation, will cause the response and time base to jump up and down. 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 tuner coupling link is disconnected from the i-f section and a 40- to 70-ohm resistor connected across the open end of the link, to eliminate the absorption effect of this coil on the response curve.

1. Disconnect the white (a-g-c) lead from the tuner, and connect it to the negative terminal of a 1.5-volt battery. Ground the positive terminal.

2. Disconnect the tuner link at terminal board B11-7 and B11-8 (see figure 34), and connect a 40- to 70-ohm carbon resistor to the two leads of the link.

3. Connect a 1000-ohm resistor in series with the hot lead of the oscilloscope. Connect the other end of the resistor to the mixer plate test point, G2, and connect the ground lead of the oscilloscope to the chassis, near the test point.

4. Connect the FM (sweep) generator to the 300-ohm antenna input through an antenna-input matching network. See figure 1.

Procedure

1. Set the CHANNEL SELECTOR and FM (sweep) generator to Channel 13 (213 mc.). Adjust the generator for sufficient sweep to show the complete response curve.

2. Establish the channel limits (see figure 5) 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 to 216 mc.) The curve should be reasonably flat between the limits shown in figure 5.

3. Adjust TC502 and TC504 (figure 4) 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 antenna circuit is now tuned for the high-frequency channels.

4. Readjust TC502 and TC504 for a symmetrical

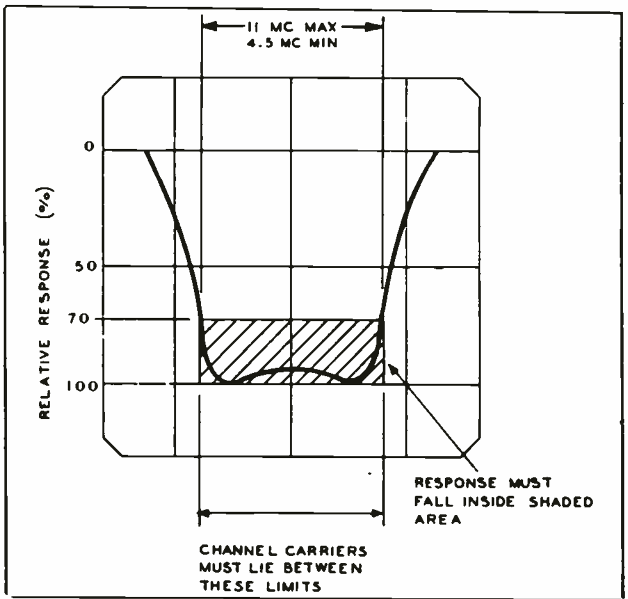
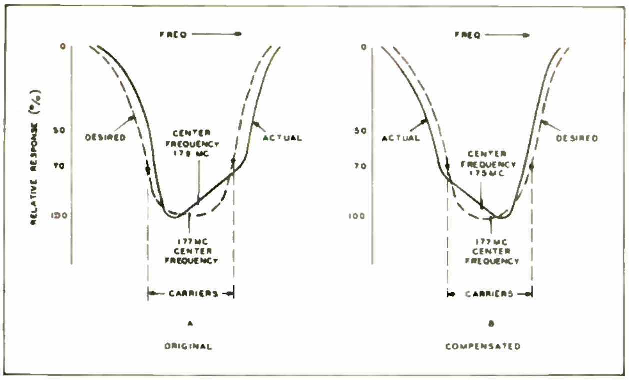


Figure 5. Television Tuner Response Curve, Showing Bandpass Limits



TPO-1174

Figure 6. Television Tuner Response Curve, Showing Tracking Compensation

response, centered about 213 mc. and falling within the limits shown in figure 5.

5. Set the CHANNEL SELECTOR and FM generator to Channel 7 (177 mc.).

6. Establish the channel limits by using the marker-signal generator to produce marker pips on the response curve. (Set the generator first to 174 mc., then to 180 mc.) The curve should be reasonably flat between the limits.

7. On Channel 7, note the response curve, with respect to tilt and center frequency. The curve should be centered in the pass band, and should be symmetrical.

8. If the curve is not symmetrical and appears unbalanced, as shown in figure 6, leave the generator and tuner set to Channel 7 and adjust C507 and C512 (see figure 4) to obtain a response curve which is the mirror image (tilt in the opposite direction) of the original. This is a form of overcompensation, to allow for the effect of Channel 13 adjustment on Channel 7. For example, if the Channel 7 response appears as in figure 6A, then the trimmer should be adjusted to obtain the response shown in figure 6B.

9. Reset the CHANNEL SELECTOR and generators to Channel 13. Readjust TC502 and TC504 for a symmetrical and centered band pass. (See step 4.)

10. Set the CHANNEL SELECTOR and generators to Channel 7, and check the response for center frequency and symmetry. Repeat steps 8 and 9 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.

11. Set the CHANNEL SELECTOR and sweep generator to Channel 6 (85 mc.).

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

13. 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.

> CAUTION: Do not turn TC505 excessively, or it will fall out of the coil.

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 antenna circuit is now tuned for Channels 2 through 6.

14. Readjust TC503 and TC506 for a symmetrical response, centered about 85 mc.

VIDEO I-F ALIGNMENT

PRELIMINARY

Before proceeding with the alignment or making an alignment check, observe the following preliminary instructions:

1. Preset the CONTRAST and BRIGHTNESS controls to the maximum counterclockwise position.
2. Preset the CHANNEL SELECTOR to Channel 4.
3. Insert the video i-f alignment jig into J200.
4. Connect the oscilloscope to the 2200-ohm resistor from the video i-f alignment jig. Connect the ground lead of the oscilloscope to the ground lead of the jig.
5. Connect a 3-volt bias battery to the video i-f alignment jig, with the negative terminal of the battery to the bias lead of the jig, and the positive terminal to the ground lead.
6. Connect the AM generator to the mixer test point, G-1, through a mixer jig, and adjust the generator for approximately 30 percent modulation with 400 cycles. Adjust the output of the generator during alignment to keep the output at the second detector below .6 volt, peak to peak.

> NOTE: If the i-f shield has been removed for repairs, it must be replaced before proceeding with alignment.

PROCEDURE

1. Tune the AM generator to 28.1 mc., and adjust TC200 (see figure 7) for minimum output, as observed on the oscilloscope.
2. Tune the AM generator to 22.1 mc., and adjust TC203 for minimum output, as observed on the oscilloscope.

> NOTE: In steps 1 and 2 it is necessary to keep the generator output sufficiently high that a null indication may be observed on the oscilloscope; however, avoid overloading of the receiver by excessive signal.

3. Tune the AM generator to the frequencies indicated below, and adjust the tuning cores for maximum output.

a. 24.0 mc.—adjust TC512. d. 26.4 mc.—adjust TC204.
b. 25.7 mc.—adjust TC201. e. 24.5 mc.—adjust TC205.
c. 23.6 mc.—adjust TC202.

4. Connect the sweep generator and r-f marker generator to the antenna terminal through a matching jig. (If a separate oscilloscope is used, connect the sweep output of the generator to the horizontal input of the oscilloscope.) Set the CHANNEL SELECTOR to Channel 4, and tune the sweep generator for output on Channel 4. After the equipment is properly connected, adjust the FINE TUNING control to the mark, as indicated in the NOTE under OSCILLATOR ALIGNMENT.

5. If the response curve does not fall within the limits shown in figure 8, the adjustment of the tuning cores may be touched up slightly, while observing the response curve with the sweep generator. Do not retouch the setting of TC200 and TC203. To adjust the curve, adjust TC201 and TC204 for proper video carrier level. The top of the curve may be leveled by adjusting TC205, and the low-frequency side of the curve may be adjusted by adjusting TC202. By means of these adjustments the response curve should be brought within the limits shown in figure 8.

> CAUTION: Do not turn any of the tuning cores excessively. To retouch, only turn the tuning cores slightly.

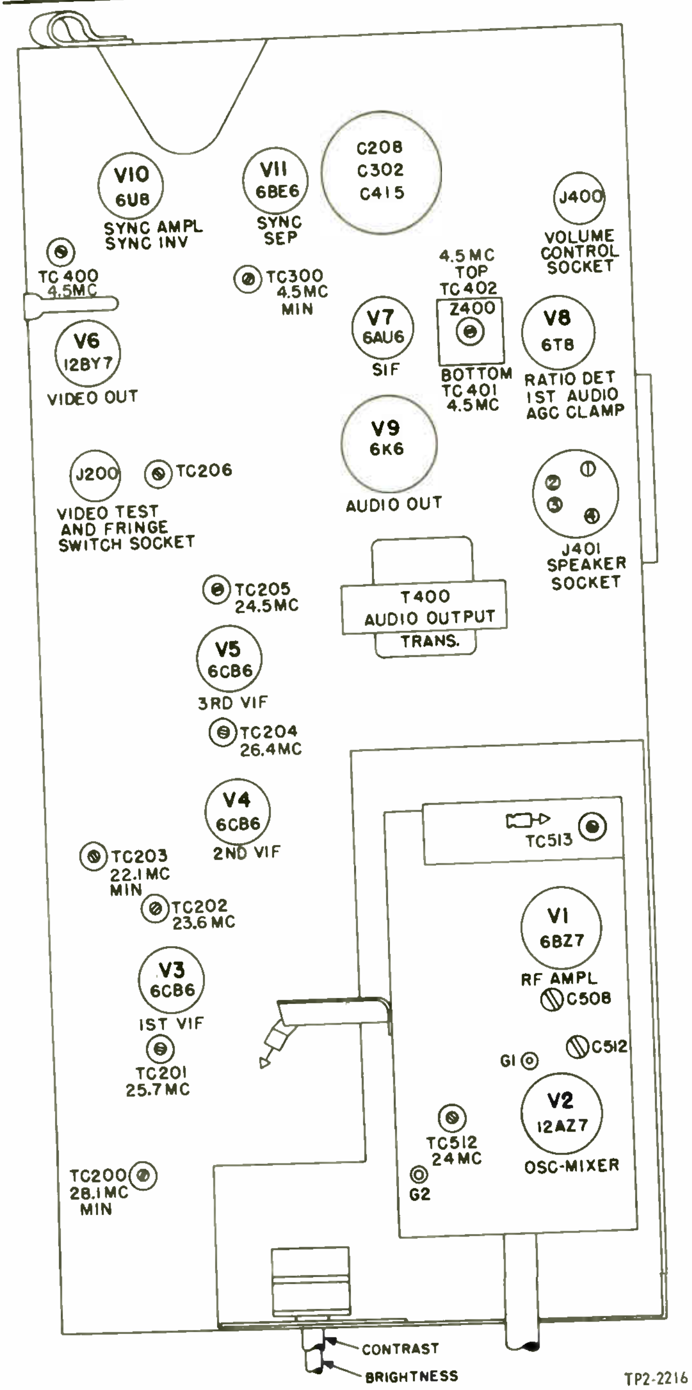


Figure 7. R-F Chassis 81, Top View, Showing Location of Adjustments

SOUND I-F ALIGNMENT

1. Remove the first i-f tube, and connect a v.t.v.m. or a 20,000-ohms-per-volt voltmeter to the FM TEST jack adapter. Adjust the VOLUME control for moderate speaker output.
2. Feed in an accurately calibrated 4.5-mc. AM signal through the 2200-ohm resistor in the video i-f alignment jig to pin 2 of J200.
3. 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 speaker output.
4. Tune TC402 for minimum speaker output.
5. Connect an r-f probe or crystal detector to the grid (pin 2) of the picture tube. See NOTE below.

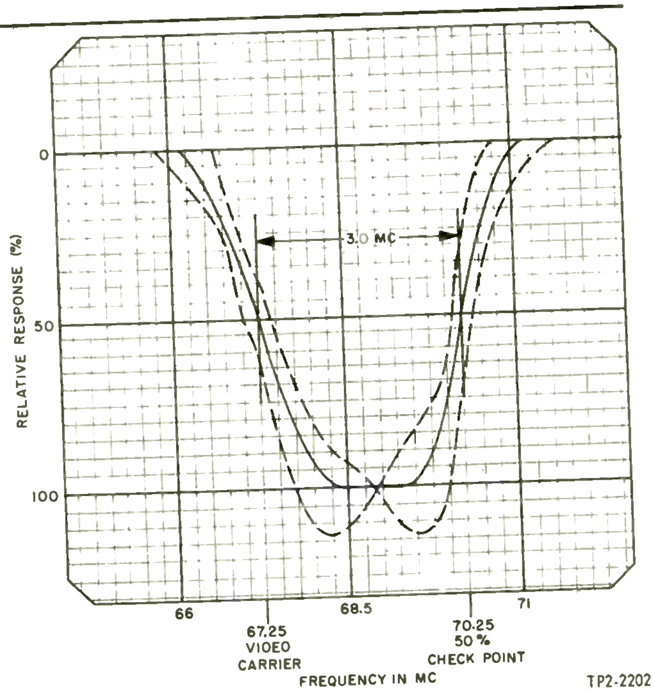


Figure 8. Over-all R-F, I-F Response Curve, Showing Tolerance Limits

6. Tune TC300 for minimum indication on oscilloscope. If a crystal detector is not available, TC300 may be adjusted for minimum beat pattern, observed on the picture tube, with a station picture present.
7. Replace the first i-f tube. Tune in a station and use the speaker output as an indication.
8. Turn the FINE TUNING control clockwise to obtain a slightly fuzzy picture.
9. Tune TC402 for minimum AM (noise) output.

NOTE: The R-F Probe, Part No. 76-3595, is used as a detector of the 4.5-mc. signal, and the oscilloscope as an indicating device. An alternate crystal detector may be made up as shown in figure 9.

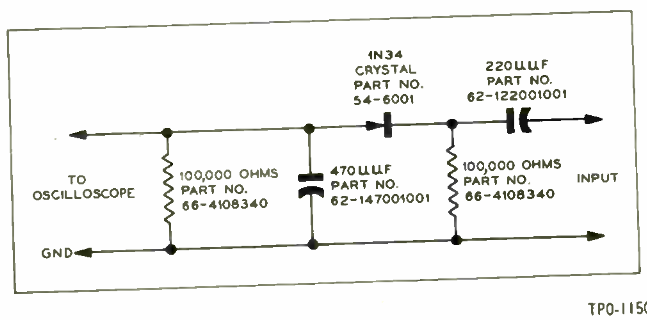
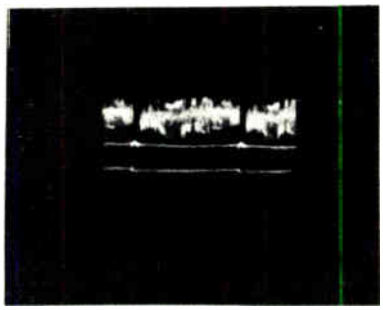


Figure 9. Wiring Diagram of Crystal Detector

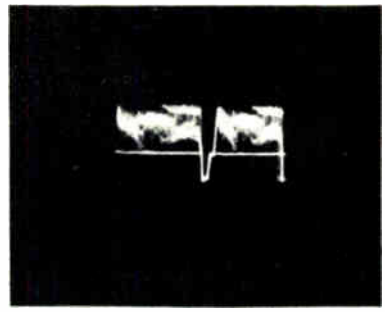
OSCILLOSCOPE WAVEFORM PATTERNS

The waveforms shown on pages 9 and 10 were taken with the receiver adjusted for an approximate peak-to-peak output of 3 volts at the video detector. The voltages given with the waveforms are approximate peak-to-peak values. The frequencies shown are those of the waveforms—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 are more rounded than those shown, and the peak voltages differ from those shown.



TP2-787

Figure 10. Video-Detector Output, Pin 2 of J200
3 volts, 60 c.p.s.



TP2-786

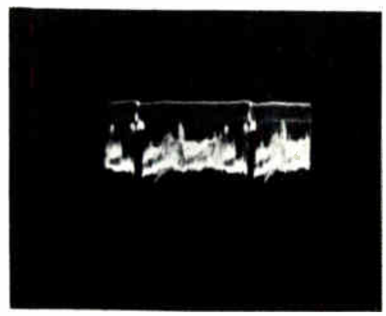
Figure 11. Video-Detector Output, Pin 2 of J200
3 volts, 15,750 c.p.s.

TP2-788

Figure 12. Video Amplifier Plate, Pin 7
66 volts, 60 c.p.s.

TP2-790

Figure 13. Sync Amplifier Plate, Pin 6
66 volts, 60 c.p.s.

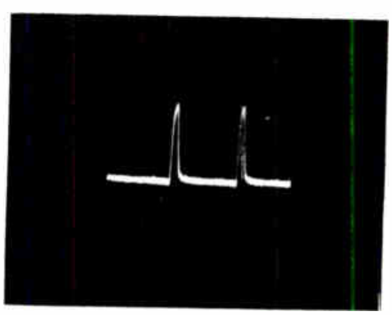


TP2-790

Figure 14. Sync Separator Grid, Pin 7
50 volts, 60 c.p.s.

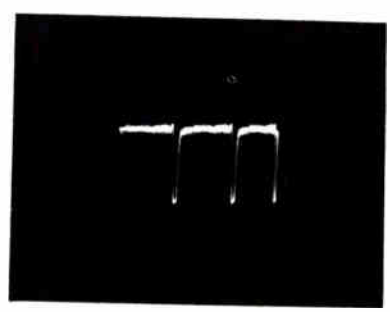
TP2-792

Figure 15. Sync Separator Plate, Pin 5
19.8 volts, 15,750 c.p.s.



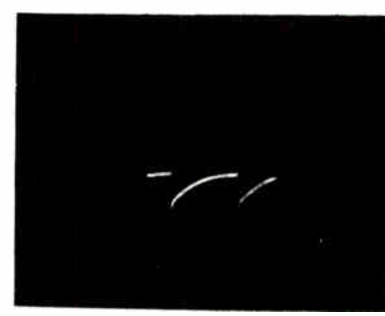
TP2-791

Figure 16. Sync Inverter Plate, Pin 1
20 volts, 15,750 c.p.s.



TP2-793

Figure 17. Sync Inverter Cathode, Pin 8
6.8 volts, 15,750 c.p.s.

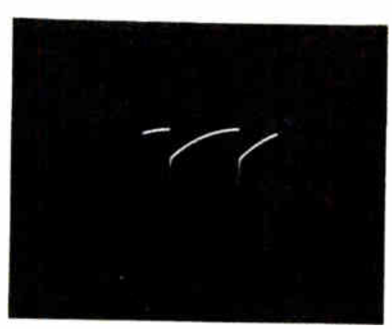


TP2-643

Figure 18. Vertical-Oscillator Grid, Pin 2
165 volts, 60 c.p.s.

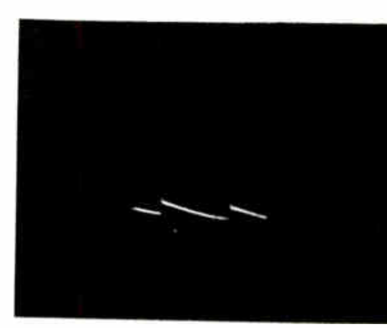
TP2-697

Figure 19. Vertical-Oscillator Plate, Pin 1
130 volts, 60 c.p.s.



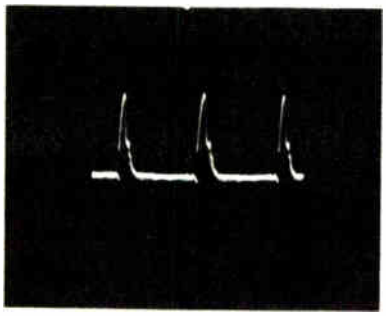
TP2-644

Figure 20. Vertical-Output Grid, Pin 7
120 volts, 60 c.p.s.

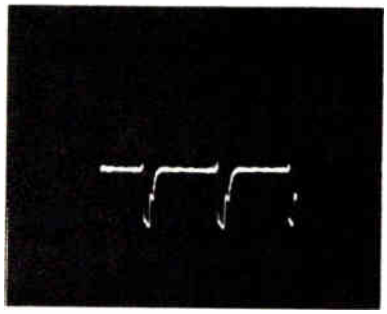


TP2-645

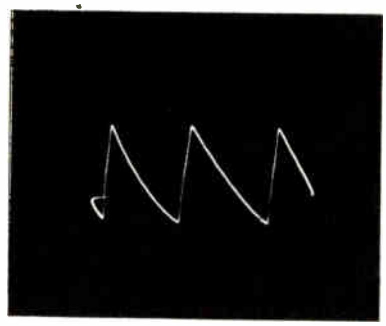
Figure 21. Vertical-Output Plate, Pin 6
450 volts, 60 c.p.s.



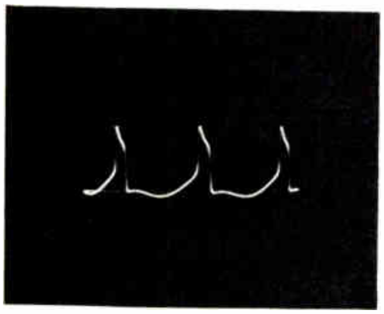
TP2-641
Figure 22. Phase-Comparer Plate, Pin 2
10 volts, 15,750 c.p.s.



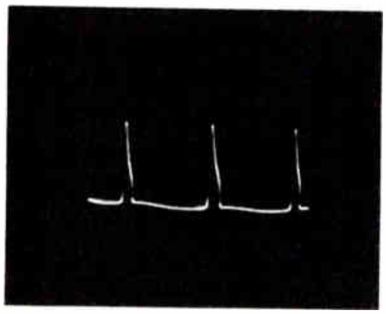
TP2-642
Figure 23. Phase-Comparer Cathode, Pin 1
10 volts, 15,750 c.p.s.



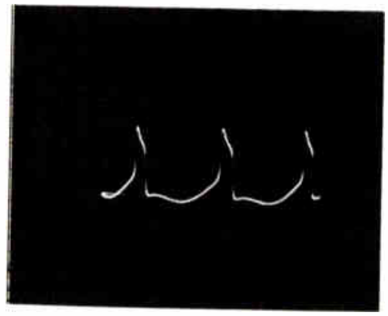
TP2-652
Figure 24. Phase Comparer, Pins 5 and 6
6 volts, 15,750 c.p.s.



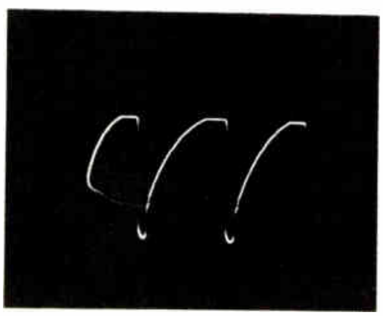
TP2-646
Figure 25. Horizontal Oscillator, Junction of L800, R806, and C806
35 volts, 15,750 c.p.s.



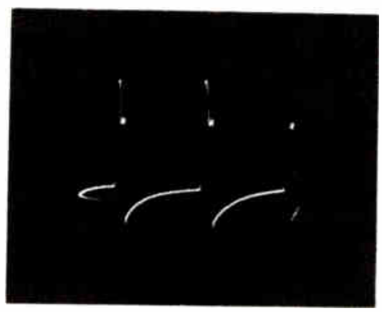
TP2-647
Figure 26. Horizontal-Oscillator Cathode, Pins 8 and 3
16 volts, 15,750 c.p.s.



TP2-648
Figure 27. Horizontal-Oscillator Grid, Pin 2
38 volts, 15,750 c.p.s.



TP2-649
Figure 28. Horizontal-Output Grid, Pin 5
130 volts, 15,750 c.p.s.



TP2-650
Figure 29. Horizontal-Deflection Yoke, *Pin 7 of J800
3000 volts, 15,750 c.p.s.
***See CAUTION below.**

CAUTION: High-voltage pulses are present in the horizontal-output circuit. The waveform in figure 29 was taken with the alligator clip of the oscilloscope lead clipped over the insulation of the lead connected to pin 7 of J800. (To prevent puncture of the insulation of the lead, file off the teeth of the alligator clip and wrap friction tape around the clip.) Connection to other points in the horizontal-output circuit is dangerous, because of the high voltages present. The peak-to-peak voltage shown for figure 29 is the actual voltage present; however, the amplitude of the scope presentation depends upon the degree of coupling.

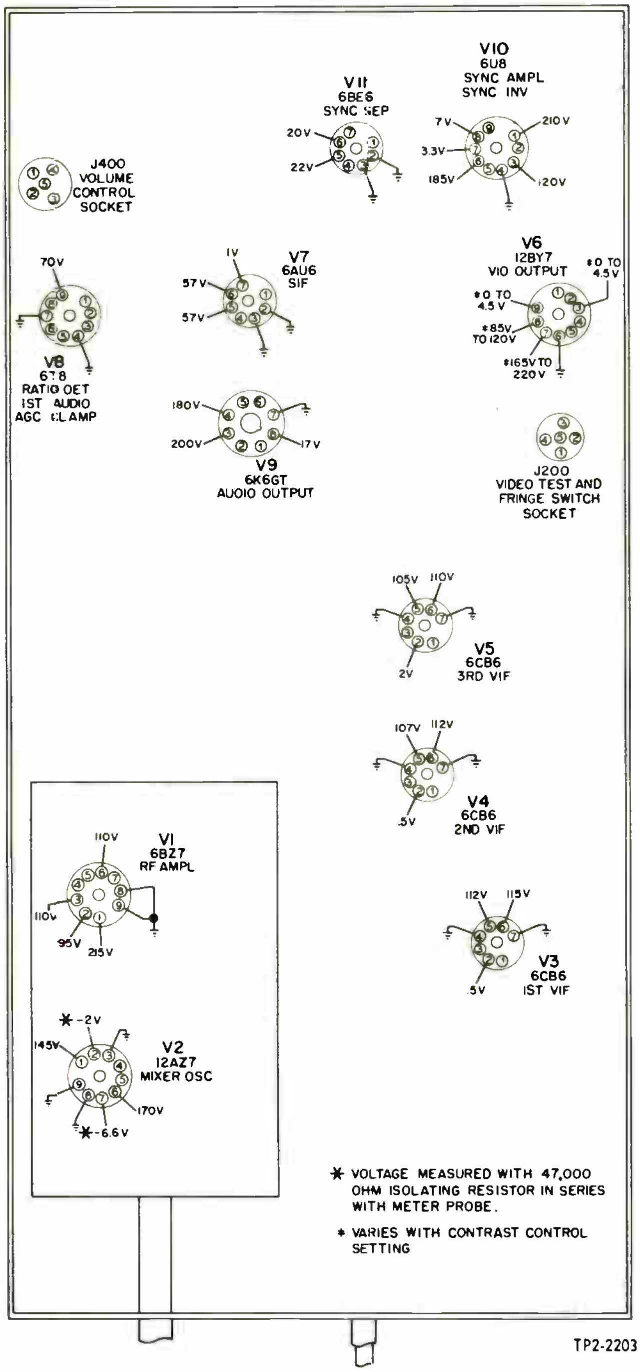


Figure 30. R-F Chassis 81, Bottom View, Showing Voltages at Socket Pins

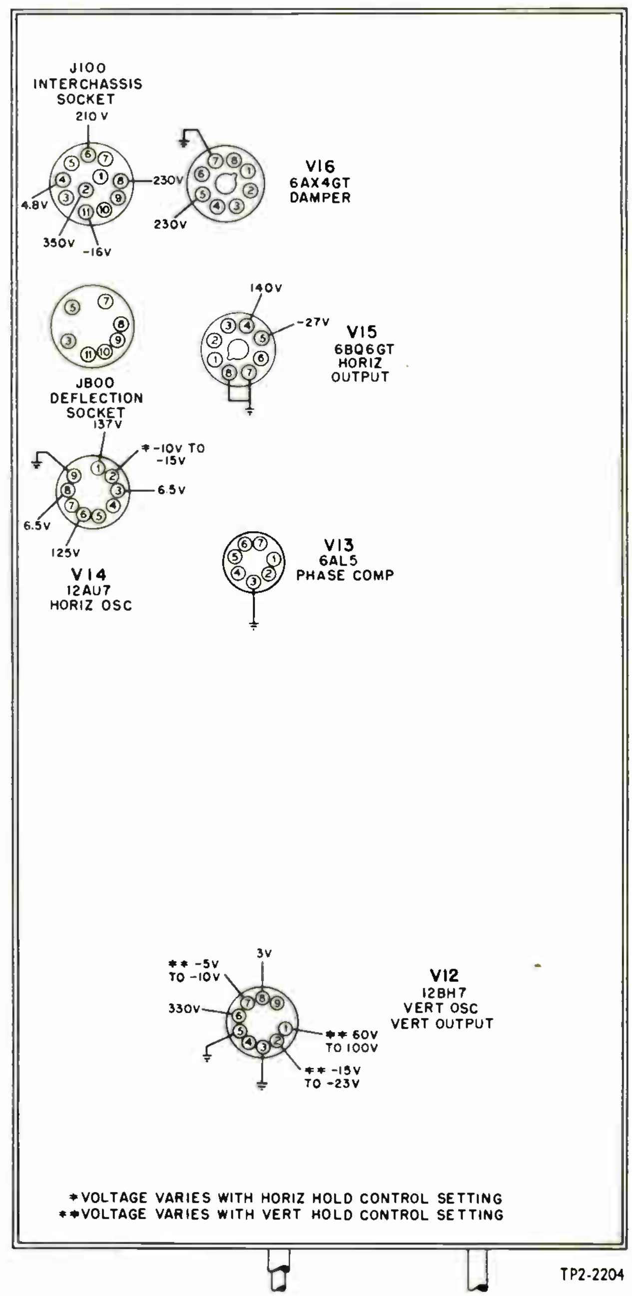


Figure 31. Deflection Chassis H-1, Bottom View, Showing Voltages at Socket Pins

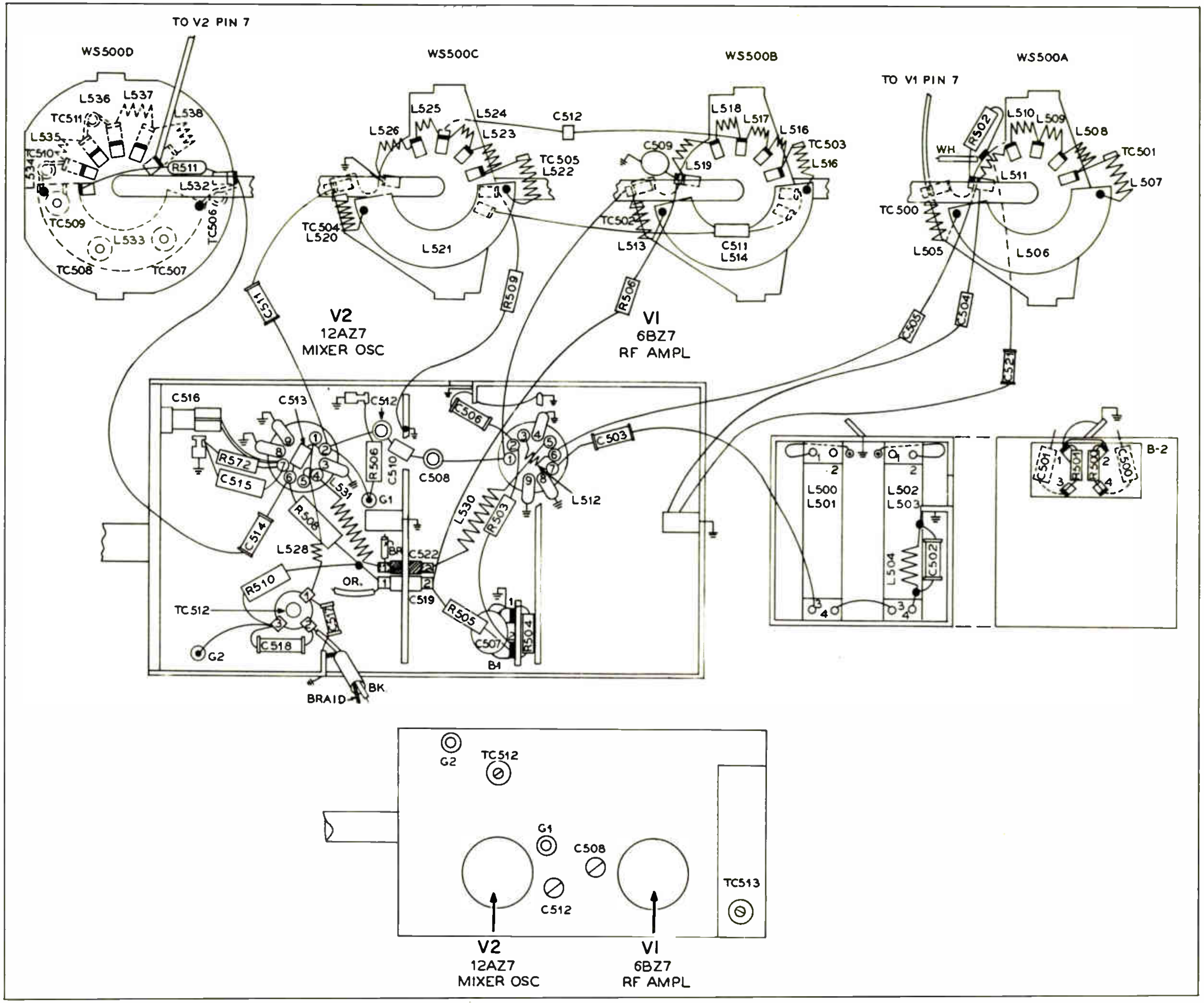


Figure 32. Television Tuner, Part No. 76-7664, Base Layout

TP2-2205

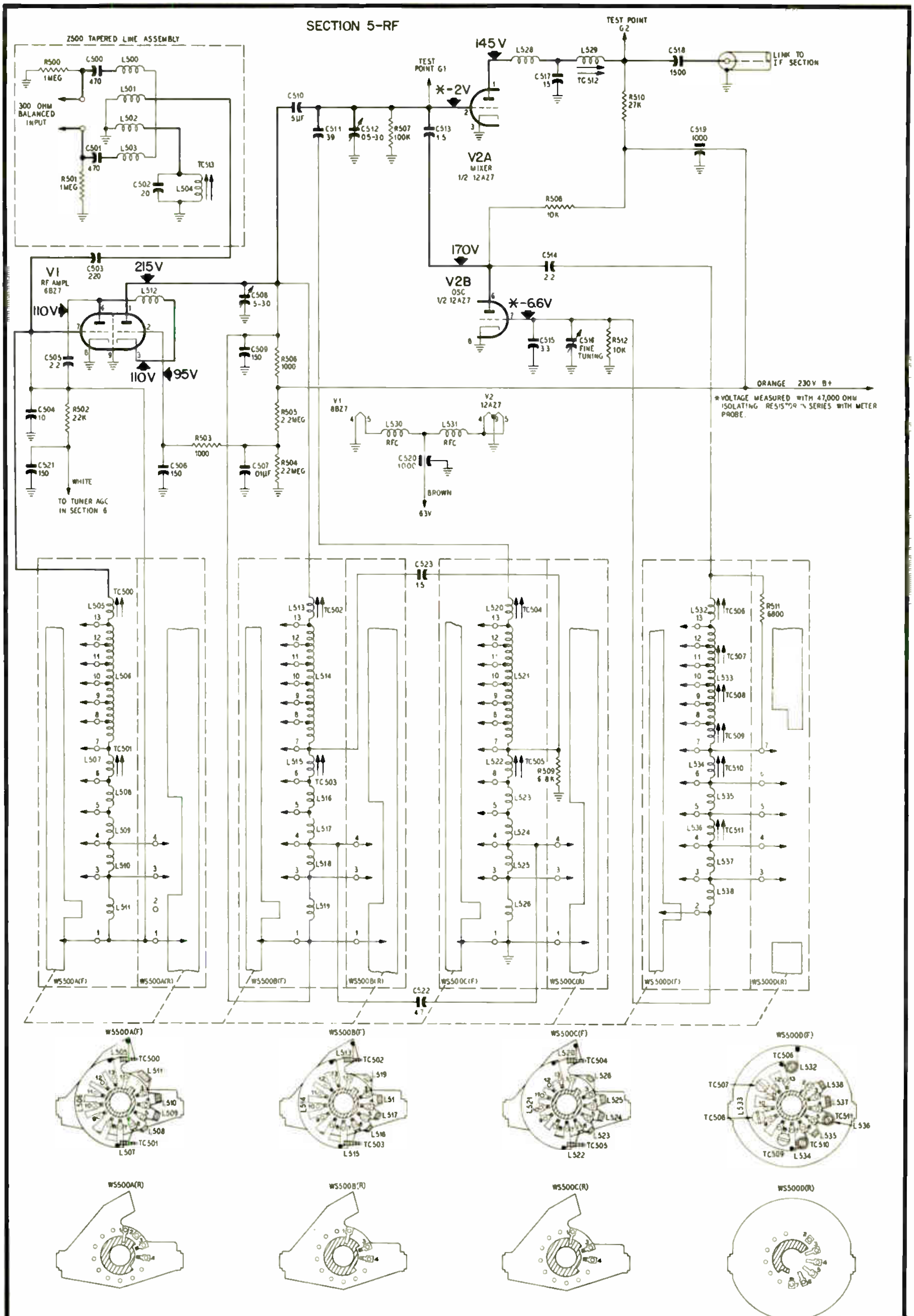
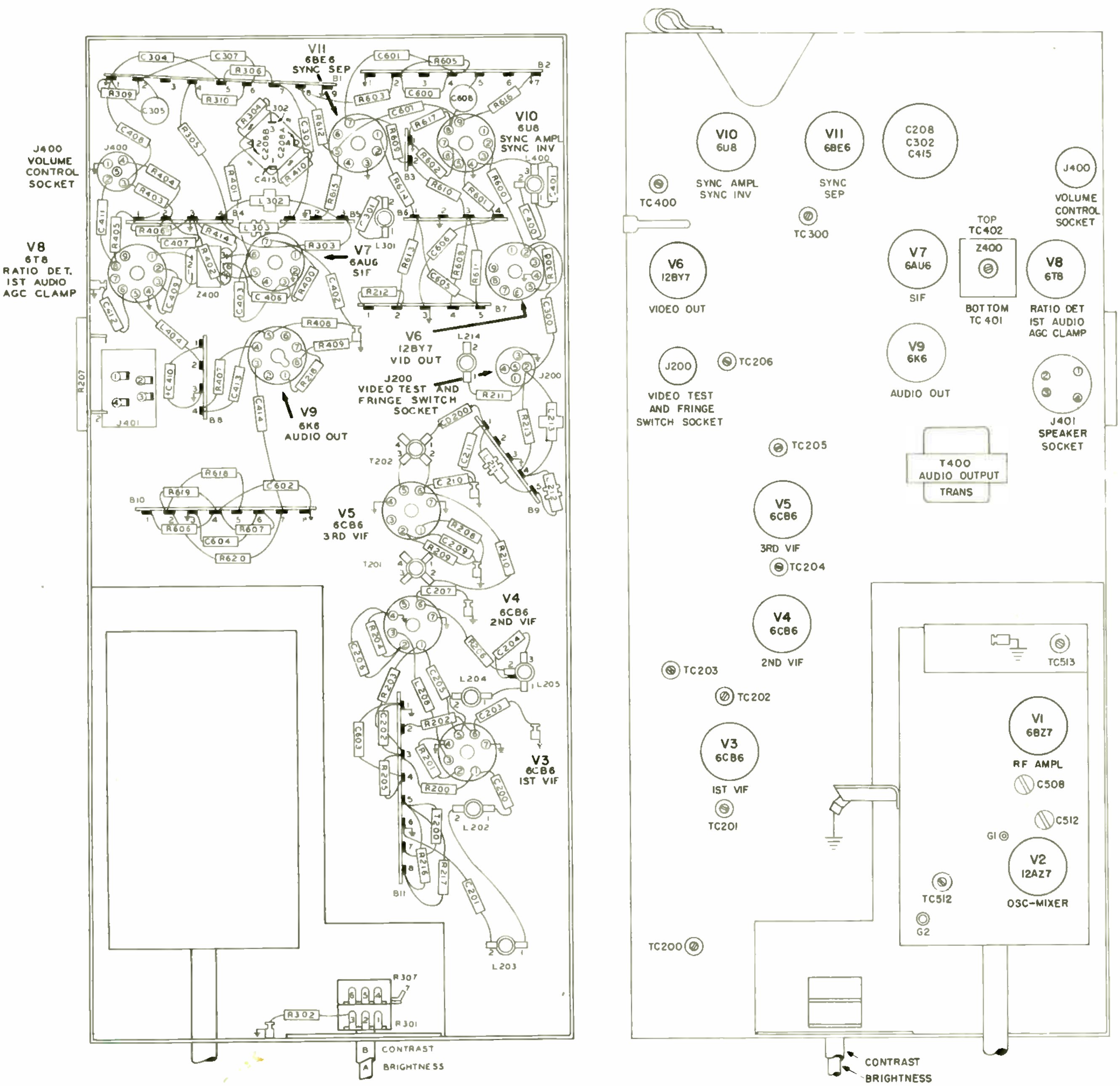


Figure 33. Television Tuner, Part No. 76-7664, Schematic Diagram

TP2-2206



TP2-2207

Figure 34. R-F Chassis 81, Base Layout

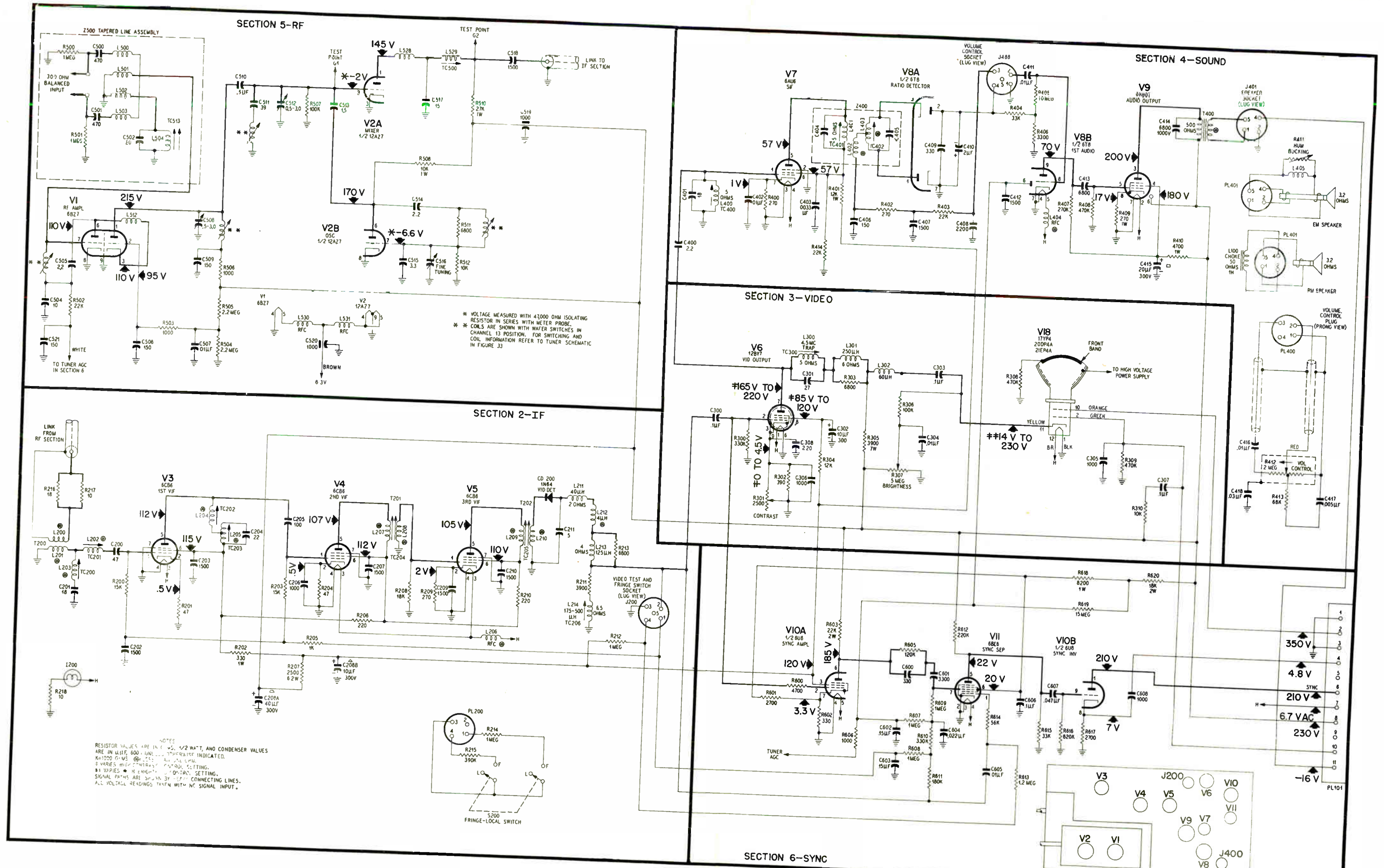


Figure 35. R-F Chassis 81, Schematic Diagram

TP2-2208

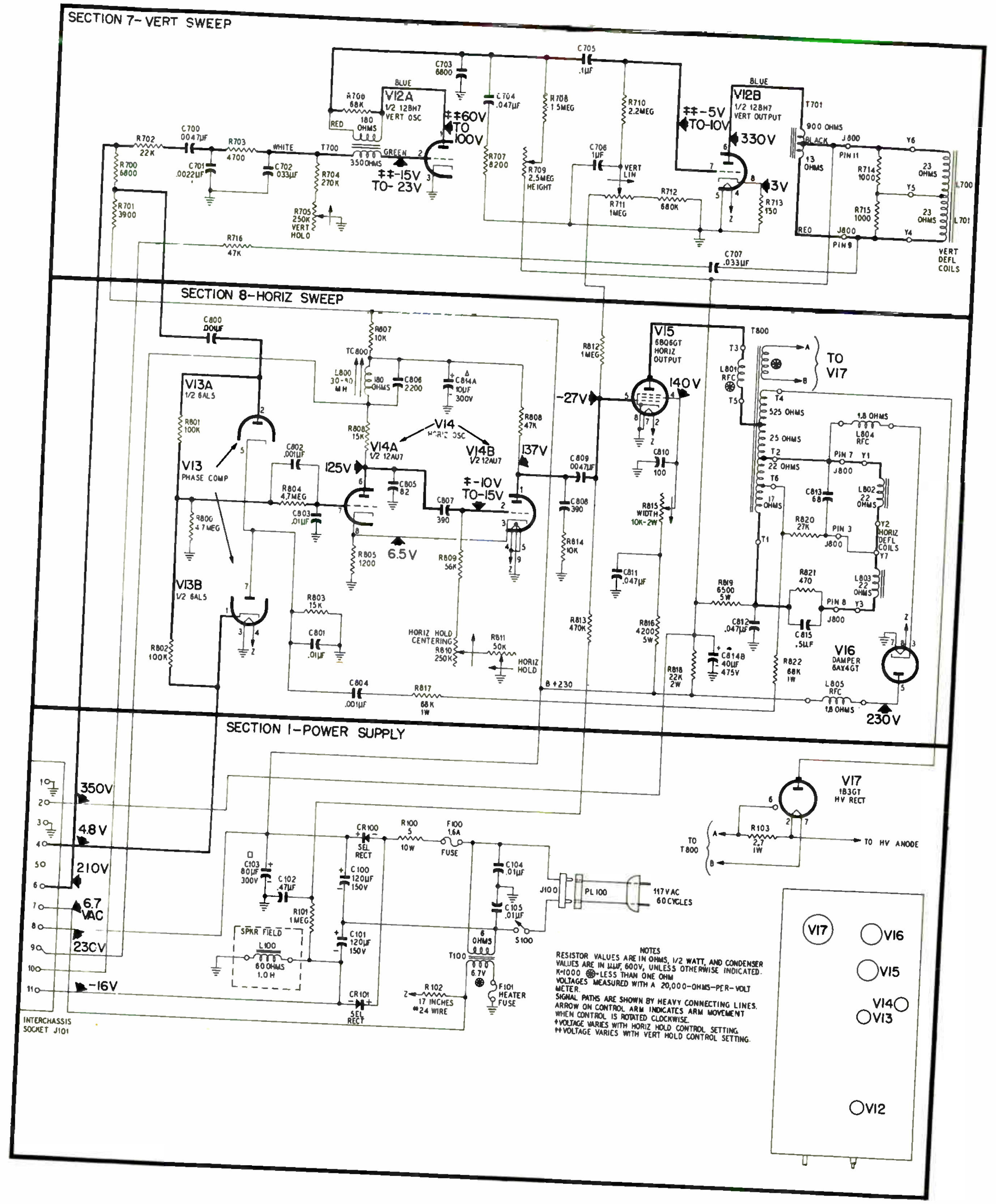


Figure 36. Deflection Chassis H-1, Schematic Diagram

TP2-2209

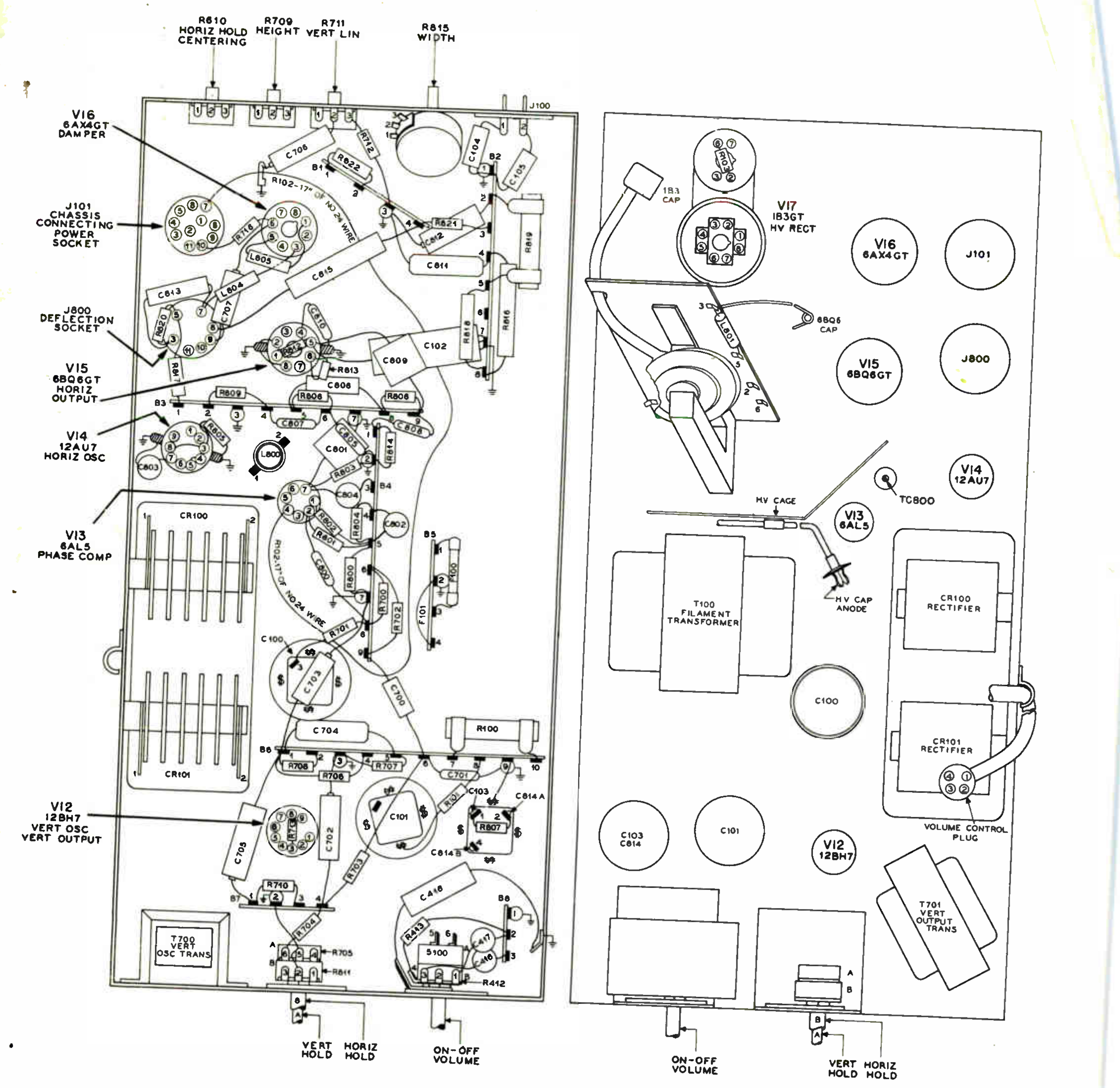


Figure 37. Deflection Chassis H-1, Base Layout

TP2-2210

REPLACEMENT PARTS LIST

IMPORTANT

General replacement items commonly stocked by the serviceman are omitted from this parts list. All condensers 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 should be ordered in this way rather than by model number. A list of miscellaneous parts is given at the end of the parts list for each chassis type. All parts are symbolized in the schematic diagram and base layout, for identification purposes.

NOTE: Part numbers identified by an asterisk (*) are general replacement items. These numbers may not be identical with those on factory parts. Also, the electrical values of some replacement items may differ from the values indicated in the schematic diagram and parts list. The values substituted in any case are so chosen that the operation will either be unchanged or improved. When ordering replacements, use only the "Service Part No."

DEFLECTION CHASSIS H-1

SECTION 1—POWER SUPPLY

Reference Symbol	Description	Service Part No.
C100 and C101	Condensers, electrolytic filter, 120 μf., 150v	30-2568-51
C103	Condenser, electrolytic filter, 80 μf., 300v	30-2584-20
CR100 and CR101	Rectifiers, selenium, 300 ma.	34-8003-14
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 ass'y., chassis connecting	(See Misc. B.)
PL101	Plug, a-c line	Part of a-c line cord ass'y. (See Misc. A.)
R100	Resistor, current limiting, 5 ohms, 10 watts	33-3448-5
R102	Resistor, voltage dropping	17 inches of No. 24 wire
R103	Resistor, voltage dropping, 2.7 ohms, 1 watt	66-9274360
S100	Switch, off-on	Part of R412
T100	Transformer, filament	32-8572

SECTION 7—VERTICAL SWEEP

Reference Symbol	Description	Service Part No.
L700 and L701	Coils, vertical deflection	Part of deflection yoke (See Misc. A.)
R705	Potentiometer, VERT. HOLD control, 250,000 ohms	Part of R811
R709	Potentiometer, HEIGHT control, 2.5 megohms	33-5565-31
R711	Potentiometer, VERT. LIN. control, 1 megohm	33-5565-42
T700	Transformer, vertical oscillator	32-8431-2*
T701	Transformer, vertical output	32-8577-1

SECTION 8—HORIZONTAL SWEEP

Reference Symbol	Description	Service Part No.
C805	Condenser, by-pass, 82 μμf.	60-00825317
C807	Condenser, coupling, 390 μμf.	60-10395417
C808	Condenser, saw-tooth forming, 390 μμf.	60-10395417
C810	Condenser, by-pass, 100 μμf.	60-10105417
C813	Condenser, damping, 68 μμf.	30-1246-1*
C814A	Condenser, electrolytic, 10 μf., 300v	Part of C103
C814B	Condenser, electrolytic, 40 μf., 475v	Part of C103
J800	Socket, deflection yoke connector	27-6274-7
L800	Coil, horizontal stabilizing, 30 to 80 mh.	32-4557
L801	Coil, r-f choke, horizontal output plate	Part of T800
L802 and L803	Coils, horizontal deflection	Part of deflection yoke (See Misc. A.)
L804	Coil, r-f choke, damper cathode	32-4112-24
L805	Coil, r-f choke, damper plate	32-4112-25
R810	Potentiometer, HORIZ. HOLD CENTERING control, 250,000 ohms	33-5565-17
R811	Potentiometer, HORIZ. HOLD control, 50,000 ohms	33-5563-50
R815	Potentiometer, WIDTH control	33-5546-41
R816	Resistor, screen supply divider, 4200 ohms, 5 watts	33-1335-101
R817	Resistor, feedback coupling, 68,000 ohms, 1 watt	66-3684340
R818	Resistor, voltage dropping, 22,000 ohms, 2 watts	66-3225340
R819	Resistor, voltage dropping, 6500 ohms, 5 watts	33-1335-99
R822	Resistor, voltage dropping, 68,000 ohms, 1 watt	66-3684340
T800	Transformer, horizontal output	32-8572

MISCELLANEOUS A

Description	Service Part No.
Arm and magnet ass'y., picture tube	76-6594
Beam bender	76-6077-2
Cable assembly, audio control	41-4136-1*
Cable ass'y., high voltage	41-4064-6*
Cable and plug ass'y., deflection	41-4086-25
Cord, a-c line	41-3865
Deflection yoke ass'y.	32-9648
Focus ass'y., p.m.	76-6126-4
Shock mount, 9-pin miniature, and spring	76-6115-2
Socket, octal	27-6174
Socket, 7-pin miniature	27-6203*
Socket, 1B3GT	27-6290-1
Socket, spring, picture-tube ass'y.	56-9733

REPLACEMENT PARTS LIST (Cont.)

R-F CHASSIS 81

SECTION 2—VIDEO I.F.

Reference Symbol	Description	Service Part No.
C200	Condenser, d-c blocking, 18 μμf.	62-00185317
C201	Condenser, trap, 18 μμf.	62-018400021
C204	Condenser, fixed trimmer, 22 μμf.	62-022009001
C205	Condenser, d-c blocking, 100 μμf.	62-110409001
C208	Condenser, electrolytic	30-2570-57
C208A	Condenser, filter, 40 μf.	Part of C208
C208B	Condenser, decoupling filter, 10 μf.	Part of C208
C211	Condenser, detector by-pass, 5 μμf.	30-1224-5
CD200	Crystal, video detector, 1N64	34-8022
I200	Pilot light	34-2068
J200	Socket, video test and fringe switch	27-6273
L200 and L201	Coils, tuner coupling	Part of T200
L202	Coil, 1st i-f grid	32-4486-32
L203	Coil, 28.1-mc. trap	32-4486-27
L204	Coil, 1st i-f plate	32-4486-30
L205	Coil, 22.1-mc. trap	32-4496
L206	Coil, filament choke	32-4112-15
L207 and L208	Coils, coupling	Part of T201
L209 and L210	Coils, coupling	Part of T202
L211	Coil, series peaking, 40 μh.	32-4143-16
L212	Coil, series peaking, 4 μh.	32-4480-8
L213	Coil, shunt peaking, 125 μh.	32-4143-23
L214	Coil, variable, video peaking, 175—500 μh.	32-4467-13
R202	Resistor, filter, 330 ohms, 1 watt	66-1334340*
R207	Resistor, voltage dropping, 2500 ohms, 6.2 watts	33-3446-5
T200	Transformer, video i-f input	32-4548-29
R201	Transformer, 2nd video i-f	32-4486-30
T202	Transformer, 3rd video i-f	32-4486-33

SECTION 3—VIDEO

Reference Symbol	Description	Service Part No.
C301	Condenser, 4.5-mc. trap, 27 μμf.	62-027409011
C302	Condenser, filter, 10 μf., 300v	Part of C208
L300	Coil, 4.5-mc. trap	32-4463-7
L301	Coil, series peaking, 250 μh	32-4480-4
L302	Coil, series peaking, 60 μh.	32-4480-11
R301	Potentiometer, CONTRAST control, 2500 ohms	Part of R307
R305	Resistor, plate load, 3900 ohms, 7 watts	33-1335-116
R307	Potentiometer, BRIGHTNESS control, 5 megohms	33-5563-53

SECTION 4—SOUND

Reference Symbol	Description	Service Part No.
C400	Condenser, coupling, 2.2 μμf.	30-1221-6
C401	Condenser, fixed trimmer, 18 μμf.	62-018400021
C404	Condenser, fixed trimmer	Part of Z400
C405	Condenser, fixed trimmer	Part of Z400
C406	Condenser, detector balancing, 150 μμf.	62-115001011
C409	Condenser, r-f by-pass, 330 μμf.	62-133001001
C410	Condenser, filter, 2 μf.	30-2417-7
C414	Condenser, plate by-pass, 6800 μμf., 1000v	45-3505-91
C415	Condenser, filter, 20 μf.	Part of C208
J400	Socket, volume control	27-6273
J401	Socket, speaker	27-4785-22
L400	Coil, audio take-off	32-4463-10
L401, L402 and L403	Coils, ratio detector	Part of Z400
L404	Coil, filament choke	32-4112-15
PL400	Plug, volume control	Part of cable and plug ass'y. (See Misc. A.)
PL401	Plug, speaker	Part of speaker cable ass'y. (See cabinet parts.)
R401	Resistor, screen dropping, 12,000 ohms, 1 watt	66-3124340*
R409	Resistor, cathode bias, 270 ohms, 1 watt	66-1274340*
R410	Resistor, screen dropping, 4700 ohms, 1 watt	66-2474340*
R412	Potentiometer, VOLUME CONTROL, 2 megohms	33-5564-14
T400	Transformer, audio output	32-8578
Z400	Transformer, ratio detector	32-4450-5

SECTION 6—SYNC

Reference Symbol	Description	Service Part No.
C600	Condenser, by-pass, 330 μμf.	62-133001001
R603	Resistor, voltage dropping, 22,000 ohms, 2 watts	66-3225340*
R618	Resistor, voltage divider, 8200 ohms, 1 watt	66-2824340*
R620	Resistor, decoupling, 18,000 ohms, 2 watts	66-3185340*

MISCELLANEOUS B

Description	Service Part No.
Cable and plug ass'y., chassis connecting	41-4146-3*
Cable and socket ass'y., picture tube	41-4160
Cable and socket ass'y., pilot light	27-6233-6*
Shield, tube, 6T8	56-5629-5
Shield, tube, 6CB6	56-5629FA3
Shield, pilot light	56-9074-2FA3
Socket and base ass'y., 6CB6	27-6203-14
Socket and base ass'y., 6T8	26-6203-18
Socket, tube, 7-pin miniature	27-6203
Socket, tube, 9-pin miniature	27-6203-6*
Socket, octal	27-6174

TV TUNER, PART No. 76-7664

SECTION 5—R.F.

Reference Symbol	Description	Service Part No.
C500 and C501	Condensers, antenna isolating, 470 μμf.	30-1225-18
C502	Condenser, FM trap, 20 μμf.	62-020309011
C503	Condenser, coupling, 220 μμf.	62-122001001
C504	Condenser, by-pass, 10 μμf.	62-010409001
C505	Condenser, neutralizing, 2.2 μμf.	30-1221-6
C506	Condenser, grid by-pass, 150 μμf.	62-115001011
C507	Condenser, decoupling, .01 μf.	30-1238-2*
C508	Condenser, trimmer, r-f plate, .5—3 μμf.	31-6520-3
C509	Condenser, by-pass, 150 μμf.	62-115001011
C510	Condenser, coupling, .5 μμf.	30-1221-15
C511	Condenser, coupling, 39 μμf.	62-039409011

REPLACEMENT PARTS LIST (Cont.)

TV TUNER, PART No. 76-7664 (Cont.)

Reference Symbol	Description	Service Part No.
C512	Condenser, trimmer, mixer grid, .5—3 μμf.	31-6520-3
C513	Condenser, oscillator coupling, 1.5 μμf.	30-1221-8
C514	Condenser, grid blocking, 22 μμf.	62-022009001
C515	Condenser, fixed trimmer, 3.3 μμf.	30-1224-30
C516	Condenser, FINE TUNING, ceramic tube	76-6935-1
C517	Condenser, fixed trimmer, 15 μμf.	62-015409011
C519	Condenser, feedthrough, 1000 μμf.	30-1245-1
C520	Condenser, feedthrough, 1000 μμf.	30-1245-1
C521	Condenser, by-pass, 150 μμf.	62-115001011
C522	Condenser, coupling, 3.9 μμf.	30-1221-14
C523	Condenser, coupling, 1.2 μμf.	30-1221-7
L500, L501, L502, and L503	Coils, tapered line	32-4432-2
L504	Coil, FM trap	32-4438-2
L505 to L511 incl.	Coils, antenna tuning	Part of WS500A
L512	Coil, r-f coupling	32-4550-10
L513 to L519 incl.	Coils, r-f plate tuning	Part of WS500B
L520 to L526 incl.	Coils, mixer grid tuning	Part of WS500C
L528	Coil, mixer plate	32-4550-7
L529	Coil, i-f primary	32-4359-13
L530 and L531	Coils, r-f choke	32-4500-1
L532 to L538	Coils, oscillator tuning	Part of WS500D
R508	Resistor, oscillator feed, 10,000 ohms, 1 watt	66-3104340
R510	Resistor, mixer plate feed, 27,000 ohms, 1 watt	66-3274340
WS500A(F) and WS500A(R)	Switch, wafer, antenna	76-7654
WS500B(F) and WS500B(R)	Switch, wafer, r-f plate	76-7656
WS500C(F) and WS500C(R)	Switch, wafer, mixer grid	76-7658
WS500D(F) and WS500D(R)	Switch, wafer, oscillator	76-7660
Z500	Tapered line ass'y.	76-7661

MISCELLANEOUS C

Description	Service Part No.
Cam and shaft, fine tuning	76-6936
Coupling, fine tuning shaft	54-4912
Detent, ball	56-8020
Front panel ass'y.	76-6928-2
Hairpin, plunger grounding	1W42704FA3
Hairpin, plunger	56-9858
Pivot pin, lever	56-9149
Lever, plunger	56-9148
Plunger	56-8034-1
Retaining ring	1W61043
Shaft	76-6914-3
Shaft, extension	56-8358
Shield, tube, 9-pin miniature	56-5629-5
Socket, tube, 9-pin miniature	27-6203-21
Spring, shaft	56-8023
Spring, plunger	56-9628
Spring, rotor index, detent	56-9158
Terminal panel, antenna	76-5504-2
Washer	56-9351
Washer, fiber	27-4109-13
"E" washer	1W60980FE5
Washer, spring	56-9157

CONNECTING CABLES, PLUGS, AND SOCKETS

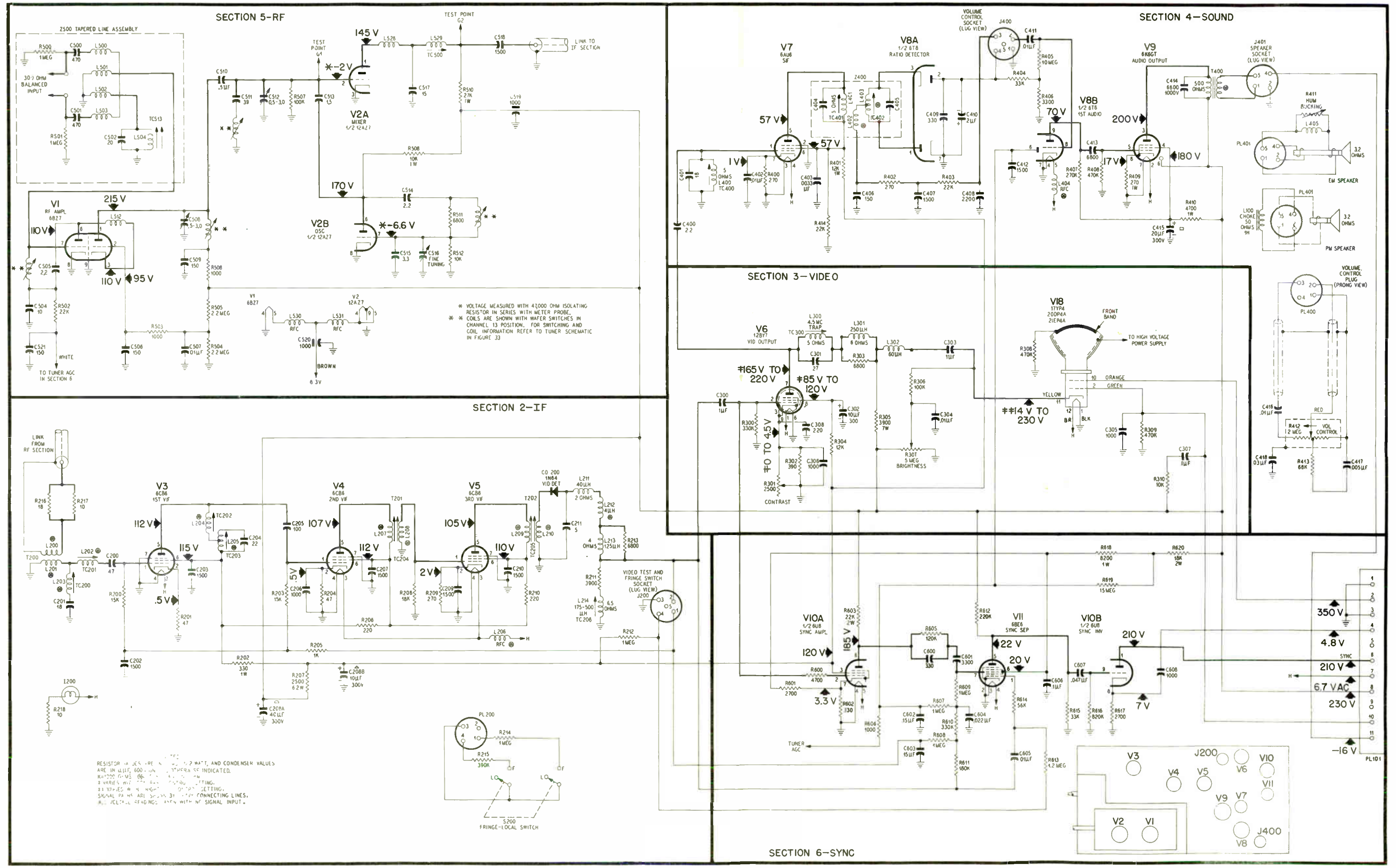
Reference Symbol	Description	Service Part No.
J100	Socket, chassis connecting	27-6274-1
J101	Socket, a-c line	27-6240-3
J200	Socket, video test and fringe switch	27-6273
J400	Socket, volume control	27-6273
J401	Socket, speaker	27-4785-22
J800	Socket, deflection yoke connector	27-6274-7
PL100	Plug and cable ass'y., chassis connecting	41-4146-3*
PL101	Plug and line cord ass'y.	41-3865
PL400	Plug and cable ass'y., volume control	41-4136-1*
PL401	**Plug and cable ass'y., speaker	See cabinet parts list
PL800	Plug and cable ass'y., deflection	41-4086-25
	Cable ass'y., high voltage	41-4064-6
	Cable and socket ass'y., picture tube	41-4160
	Cable and socket ass'y., pilot light	27-6233-6*

**NOTE: The length of this cable varies with cabinet model and speaker size. For Service Part No., refer to cabinet parts list in Philco Service Bulletins.

PHILCO
Factory-Supervised
Service

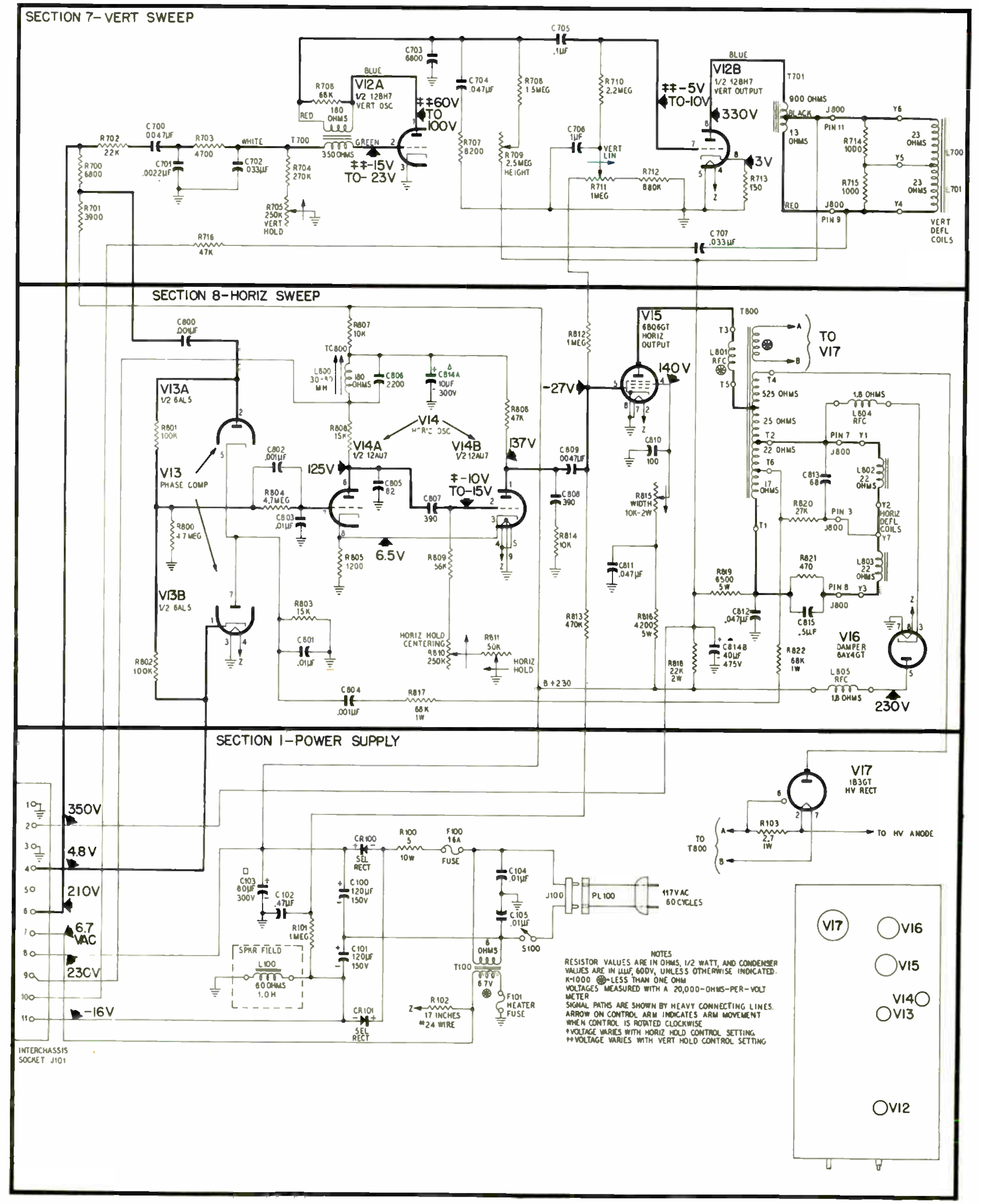
PR-2374

Printed in U.S.A.



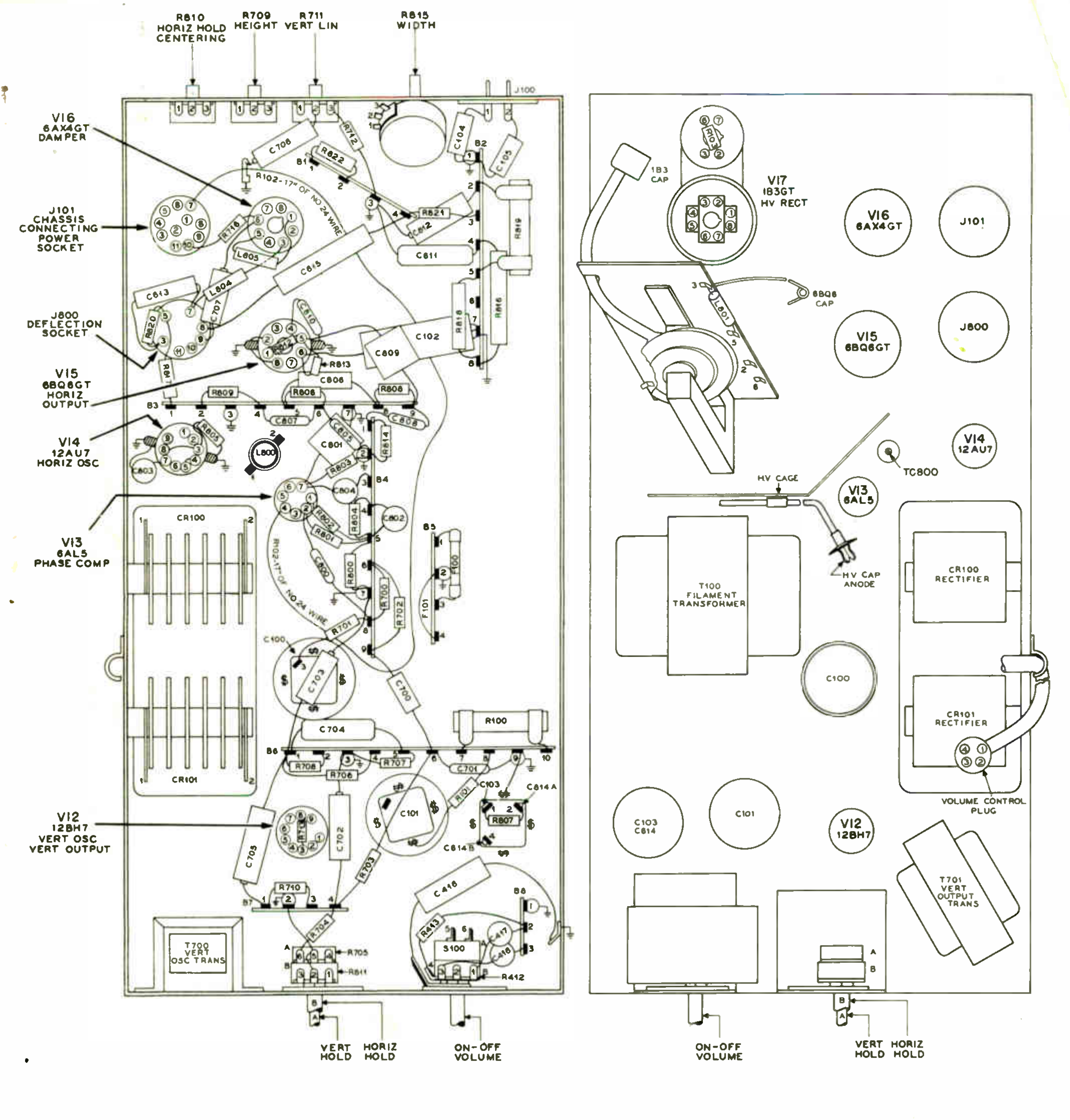
TP2-2208

Figure 35. R-F Chassis 81, Schematic Diagram



TP2-2209

Figure 36. Deflection Chassis H-1, Schematic Diagram



TP2-2210

Figure 37. Deflection Chassis H-1, Base Layout

REPLACEMENT PARTS LIST

IMPORTANT

General replacement items commonly stocked by the serviceman are omitted from this parts list. All condensers 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 should be ordered in this way rather than by model number. A list of miscellaneous parts is given at the end of the parts list for each chassis type. All parts are symbolized in the schematic diagram and base layout, for identification purposes.

NOTE: Part numbers identified by an asterisk (*) are general replacement items. These numbers may not be identical with those on factory parts. Also, the electrical values of some replacement items may differ from the values indicated in the schematic diagram and parts list. The values substituted in any case are so chosen that the operation will either be unchanged or improved. When ordering replacements, use only the "Service Part No."

DEFLECTION CHASSIS H-1

SECTION 1—POWER SUPPLY

Reference Symbol	Description	Service Part No.
C100 and C101	Condensers, electrolytic filter, 120 μf., 150v	30-2568-51
C103	Condenser, electrolytic filter, 80 μf., 300v	30-2584-20
CR100 and CR101	Rectifiers, selenium, 300 ma.	34-8003-14
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 ass'y., chassis connecting	(See Misc. B.)
PL101	Plug, a-c line	Part of a-c line cord ass'y. (See Misc. A.)
R100	Resistor, current limiting, 5 ohms, 10 watts	33-3448-5
R102	Resistor, voltage dropping	17 inches of No. 24 wire
R103	Resistor, voltage dropping, 2.7 ohms, 1 watt	66-9274360
S100	Switch, off-on	Part of R412
T100	Transformer, filament	32-8572

SECTION 7—VERTICAL SWEEP

Reference Symbol	Description	Service Part No.
L700 and L701	Coils, vertical deflection	Part of deflection yoke (See Misc. A.)
R705	Potentiometer, VERT. HOLD control, 250,000 ohms	Part of R811
R709	Potentiometer, HEIGHT control, 2.5 megohms	33-5565-31
R711	Potentiometer, VERT. LIN. control, 1 megohm	33-5565-42
T700	Transformer, vertical oscillator	32-8431-2*
T701	Transformer, vertical output	32-8577-1

SECTION 8—HORIZONTAL SWEEP

Reference Symbol	Description	Service Part No.
C805	Condenser, by-pass, 82 μμf.	60-00825317
C807	Condenser, coupling, 390 μμf.	60-10395417
C808	Condenser, saw-tooth forming, 390 μμf.	60-10395417
C810	Condenser, by-pass, 100 μμf.	60-10105417
C813	Condenser, damping, 68 μμf.	30-1246-1*
C814A	Condenser, electrolytic, 10 μf., 300v	Part of C103
C814B	Condenser, electrolytic, 40 μf., 475v	Part of C103
J800	Socket, deflection yoke connector	27-6274-7
L800	Coil, horizontal stabilizing, 30 to 80 mh.	32-4557
L801	Coil, r-f choke, horizontal output plate	Part of T800
L802 and L803	Coils, horizontal deflection	Part of deflection yoke (See Misc. A.)
L804	Coil, r-f choke, damper cathode	32-4112-24
L805	Coil, r-f choke, damper plate	32-4112-25
R810	Potentiometer, HORIZ. HOLD CENTERING control, 250,000 ohms	33-5565-17
R811	Potentiometer, HORIZ. HOLD control, 50,000 ohms	33-5563-50
R815	Potentiometer, WIDTH control	33-5546-41
R816	Resistor, screen supply divider, 4200 ohms, 5 watts	33-1335-101
R817	Resistor, feedback coupling, 68,000 ohms, 1 watt	66-3684340
R818	Resistor, voltage dropping, 22,000 ohms, 2 watts	66-3225340
R819	Resistor, voltage dropping, 6500 ohms, 5 watts	33-1335-99
R822	Resistor, voltage dropping, 68,000 ohms, 1 watt	66-3684340
T800	Transformer, horizontal output	32-8572

MISCELLANEOUS A

Description	Service Part No.
Arm and magnet ass'y., picture tube	76-6594
Beam bender	76-6077-2
Cable assembly, audio control	41-4136-1*
Cable ass'y., high voltage	41-4064-6*
Cable and plug ass'y., deflection	41-4086-25
Cord, a-c line	41-3865
Deflection yoke ass'y.	32-9648
Focus ass'y., p.m.	76-6126-4
Shock mount, 9-pin miniature, and spring	76-6115-2
Socket, octal	27-6174
Socket, 7-pin miniature	27-6203*
Socket, 1B3GT	27-6290-1
Socket, spring, picture-tube ass'y.	56-9733

REPLACEMENT PARTS LIST (Cont.)

R-F CHASSIS 81

SECTION 2—VIDEO I.F.

Reference Symbol	Description	Service Part No.
C200	Condenser, d-c blocking, 18 μμf.	62-00185317
C201	Condenser, trap, 18 μμf.	62-018400021
C204	Condenser, fixed trimmer, 22 μμf.	62-022009001
C205	Condenser, d-c blocking, 100 μμf.	62-110409001
C208	Condenser, electrolytic	30-2570-57
C208A	Condenser, filter, 40 μf.	Part of C208
C208B	Condenser, decoupling filter, 10 μf.	Part of C208
C211	Condenser, detector by-pass, 5 μμf.	30-1224-5
CD200	Crystal, video detector, 1N64	34-8022
I200	Pilot light	34-2068
J200	Socket, video test and fringe switch	27-6273
L200 and L201	Coils, tuner coupling	Part of T200
L202	Coil, 1st i-f grid	32-4486-32
L203	Coil, 28.1-mc. trap	32-4486-27
L204	Coil, 1st i-f plate	32-4486-30
L205	Coil, 22.1-mc. trap	32-4496
L206	Coil, filament choke	32-4112-15
L207 and L208	Coils, coupling	Part of T201
L209 and L210	Coils, coupling	Part of T202
L211	Coil, series peaking, 40 μh.	32-4143-16
L212	Coil, series peaking, 4 μh.	32-4480-8
L213	Coil, shunt peaking, 125 μh.	32-4143-23
L214	Coil, variable, video peaking, 175—500 μh.	32-4467-13
R202	Resistor, filter, 330 ohms, 1 watt	66-1334340*
R207	Resistor, voltage dropping, 2500 ohms, 6.2 watts	33-3446-5
T200	Transformer, video i-f input	32-4548-29
R201	Transformer, 2nd video i-f	32-4486-30
T202	Transformer, 3rd video i-f	32-4486-33

SECTION 3—VIDEO

Reference Symbol	Description	Service Part No.
C301	Condenser, 4.5-mc. trap, 27 μμf.	62-027409011
C302	Condenser, filter, 10 μf., 300v	Part of C208
L300	Coil, 4.5-mc. trap	32-4463-7
L301	Coil, series peaking, 250 μh	32-4480-4
L302	Coil, series peaking, 60 μh.	32-4480-11
R301	Potentiometer, CONTRAST control, 2500 ohms	Part of R307
R305	Resistor, plate load, 3900 ohms, 7 watts	33-1335-116
R307	Potentiometer, BRIGHTNESS control, 5 megohms	33-5563-53

SECTION 4—SOUND

Reference Symbol	Description	Service Part No.
C400	Condenser, coupling, 2.2 μμf.	30-1221-6
C401	Condenser, fixed trimmer, 18 μμf.	62-018400021
C404	Condenser, fixed trimmer	Part of Z400
C405	Condenser, fixed trimmer	Part of Z400
C406	Condenser, detector balancing, 150 μμf.	62-115001011
C409	Condenser, r-f by-pass, 330 μμf.	62-133001001
C410	Condenser, filter, 2 μf.	30-2417-7
C414	Condenser, plate by-pass, 6800 μμf., 1000v	45-3505-91
C415	Condenser, filter, 20 μf.	Part of C208
J400	Socket, volume control	27-6273
J401	Socket, speaker	27-4785-22
L400	Coil, audio take-off	32-4463-10
L401, L402 and L403	Coils, ratio detector	Part of Z400
L404	Coil, filament choke	32-4112-15
PL400	Plug, volume control	Part of cable and plug ass'y. (See Misc. A.)
PL401	Plug, speaker	Part of speaker cable ass'y. (See cabinet parts.)
R401	Resistor, screen dropping, 12,000 ohms, 1 watt	66-3124340*
R409	Resistor, cathode bias, 270 ohms, 1 watt	66-1274340*
R410	Resistor, screen dropping, 4700 ohms, 1 watt	66-2474340*
R412	Potentiometer, VOLUME CONTROL, 2 megohms	33-5564-14
T400	Transformer, audio output	32-8578
Z400	Transformer, ratio detector	32-4450-5

SECTION 6—SYNC

Reference Symbol	Description	Service Part No.
C600	Condenser, by-pass, 330 μμf.	62-133001001
R603	Resistor, voltage dropping, 22,000 ohms, 2 watts	66-3225340*
R618	Resistor, voltage divider, 8200 ohms, 1 watt	66-2824340*
R620	Resistor, decoupling, 18,000 ohms, 2 watts	66-3185340*

MISCELLANEOUS B

Description	Service Part No.
Cable and plug ass'y., chassis connecting	41-4146-3*
Cable and socket ass'y., picture tube	41-4160
Cable and socket ass'y., pilot light	27-6233-6*
Shield, tube, 6T8	56-5629-5
Shield, tube, 6CB6	56-5629FA3
Shield, pilot light	56-9074-2FA3
Socket and base ass'y., 6CB6	27-6203-14
Socket and base ass'y., 6T8	26-6203-18
Socket, tube, 7-pin miniature	27-6203
Socket, tube, 9-pin miniature	27-6203-6*
Socket, octal	27-6174

TV TUNER, PART No. 76-7664

SECTION 5—R.F.

Reference Symbol	Description	Service Part No.
C500 and C501	Condensers, antenna isolating, 470 μμf.	30-1225-18
C502	Condenser, FM trap, 20 μμf.	62-020309011
C503	Condenser, coupling, 220 μμf.	62-122001001
C504	Condenser, by-pass, 10 μμf.	62-010409001
C505	Condenser, neutralizing, 2.2 μμf.	30-1221-6
C506	Condenser, grid by-pass, 150 μμf.	62-115001011
C507	Condenser, decoupling, .01 μf.	30-1238-2*
C508	Condenser, trimmer, r-f plate, .5—3 μμf.	31-6520-3
C509	Condenser, by-pass, 150 μμf.	62-115001011
C510	Condenser, coupling, .5 μμf.	30-1221-15
C511	Condenser, coupling, 39 μμf.	62-039409011

REPLACEMENT PARTS LIST (Cont.)

TV TUNER, PART No. 76-7664 (Cont.)

Reference Symbol	Description	Service Part No.
C512	Condenser, trimmer, mixer grid, .5—3 μμf.	31-6520-3
C513	Condenser, oscillator coupling, 1.5 μμf.	30-1221-8
C514	Condenser, grid blocking, 22 μμf.	62-022009001
C515	Condenser, fixed trimmer, 3.3 μμf.	30-1224-30
C516	Condenser, FINE TUNING, ceramic tube	76-6935-1
C517	Condenser, fixed trimmer, 15 μμf.	62-015409011
C519	Condenser, feedthrough, 1000 μμf.	30-1245-1
C520	Condenser, feedthrough, 1000 μμf.	30-1245-1
C521	Condenser, by-pass, 150 μμf.	62-115001011
C522	Condenser, coupling, 3.9 μμf.	30-1221-14
C523	Condenser, coupling, 1.2 μμf.	30-1221-7
L500, L501, L502, and L503	Coils, tapered line	32-4432-2
L504	Coil, FM trap	32-4438-2
L505 to L511 incl.	Coils, antenna tuning	Part of WS500A
L512	Coil, r-f coupling	32-4550-10
L513 to L519 incl.	Coils, r-f plate tuning	Part of WS500B
L520 to L526 incl.	Coils, mixer grid tuning	Part of WS500C
L528	Coil, mixer plate	32-4550-7
L529	Coil, i-f primary	32-4359-13
L530 and L531	Coils, r-f choke	32-4500-1
L532 to L538	Coils, oscillator tuning	Part of WS500D
R508	Resistor, oscillator feed, 10,000 ohms, 1 watt	66-3104340
R510	Resistor, mixer plate feed, 27,000 ohms, 1 watt	66-3274340
WS500A(F) and WS500A(R)	Switch, wafer, antenna	76-7654
WS500B(F) and WS500B(R)	Switch, wafer, r-f plate	76-7656
WS500C(F) and WS500C(R)	Switch, wafer, mixer grid	76-7658
WS500D(F) and WS500D(R)	Switch, wafer, oscillator	76-7660
Z500	Tapered line ass'y.	76-7661

MISCELLANEOUS C

Description	Service Part No.
Cam and shaft, fine tuning	76-6936
Coupling, fine tuning shaft	54-4912
Detent, ball	56-8020
Front panel ass'y.	76-6928-2
Hairpin, plunger grounding	1W42704FA3
Hairpin, plunger	56-9858
Pivot pin, lever	56-9149
Lever, plunger	56-9148
Plunger	56-8034-1
Retaining ring	1W61043
Shaft	76-6914-3
Shaft, extension	56-8358
Shield, tube, 9-pin miniature	56-5629-5
Socket, tube, 9-pin miniature	27-6203-21
Spring, shaft	56-8023
Spring, plunger	56-9628
Spring, rotor index, detent	56-9158
Terminal panel, antenna	76-5504-2
Washer	56-9351
Washer, fiber	27-4109-13
"E" washer	1W60980FE5
Washer, spring	56-9157

CONNECTING CABLES, PLUGS, AND SOCKETS

Reference Symbol	Description	Service Part No.
J100	Socket, chassis connecting	27-6274-1
J101	Socket, a-c line	27-6240-3
J200	Socket, video test and fringe switch	27-6273
J400	Socket, volume control	27-6273
J401	Socket, speaker	27-4785-22
J800	Socket, deflection yoke connector	27-6274-7
PL100	Plug and cable ass'y., chassis connecting	41-4146-3*
PL101	Plug and line cord ass'y.	41-3865
PL400	Plug and cable ass'y., volume control	41-4136-1*
PL401	**Plug and cable ass'y., speaker	See cabinet parts list
PL800	Plug and cable ass'y., deflection	41-4086-25
	Cable ass'y., high voltage	41-4064-6
	Cable and socket ass'y., picture tube	41-4160
	Cable and socket ass'y., pilot light	27-6233-6*

**NOTE: The length of this cable varies with cabinet model and speaker size. For Service Part No., refer to cabinet parts list in Philco Service Bulletins.

PHILCO
Factory-Supervised
Service

PR-2374

Printed in U.S.A.